DCCSIS®3.1 PRODUCT GUIDE

The Next Generation Technology for CATV and Broadband



Connecting Mini-Circuits & Israel

Mini-Circuits®

NTRODUCTION

The Industry's Widest Variety of RF/IF and Microwave Products for the Next Generation of Broadband Applications

As consumer demand for higher data capacity continues to intensify, network operators deploying optical and hybrid fiber-coaxial (HFC) infrastructure continue to push the limits of their equipment to operate under the new, DOCSIS® 3.1 standard. Competition at the operator level is driving rapid qualification and development of new equipment, with testing and certification for deployment expected to expand in the very near term. To meet the new standard and accelerate time to market, program managers, system designers and purchasing managers in the broadband space need components with tightly specified performance and high reliability with value pricing and fast delivery.

Mini-Circuits is deeply committed to supporting equipment manufacturers and operators in the broadband market as this transition occurs. Many of our components are already being successfully designed into DOCSIS 3.1 applications from head-end infrastructure to customer-premises equipment. In support of this transition to DOCSIS 3.1, Mini-Circuits has expanded our product portfolio to include a variety of new models developed especially to meet the unique requirements of this standard.

We're very pleased to present our product offering for the next generation of CATV and Broadband applications in our new DOCSIS® 3.1 Product Guide. Inside you'll find detailed information on a wide range of RF components from passive devices including transformers, couplers, and splitter/combiners to active elements including amplifiers, equalizers and more - all designed and carefully specified to meet DOCSIS 3.1 standards. We hope this material gives you a convenient reference to make an informed decision as you evaluate parts for your design.

With the industry's broadest variety of off-the-shelf RF/IF and microwave products, chances are, we have you covered, but even if you don't see what you need here, we're always here to support you. We invite you to get in touch with our applications team (apps@minicircuits.com) to discuss any questions or special requirements you may have. Our engineers can design custom components to meet your exact requirements for low cost and with exceptionally fast turnaround times.

Thank you for your interest in Mini-Circuits and our extensive offering of RF products for the most advanced implementation of cable network technology to date. We hope this information gives you a valuable tool in your search for the right components to make your project a success.

Sincerely

Ted Heil President

Mini-Circuits

Performance You Can Count On:

Precision Test and Measurement of 75 Ω Products

Weeting the new standard for data over cable systems demands components that perform reliably to meet the precise requirements of your design. Mini-Circuits has long been highly regarded in the industry for the sophistication of our test and measurement techniques, and our expertise in this area enables us to qualify the performance of our products for broadband and cable network applications to a superior level of accuracy. Characterizing RF products for use in cable and broadband networks poses the unique problem of how to perform test and measurement of 75 Ω components using the industrystandard 50Ω vector network analyzer equipment. The accuracy and precision of this testing depends entirely on the measurement method employed.

Two traditional methods for performing these measurements are building matching circuits for each DUT into test fixtures and back-to-back transformer measurement. Building matching circuits to compensate for impedance mismatch could require dozens of different matching circuits to test different components, which makes it both costly and impractical. Furthermore, compensating for the losses of matching circuits undermines measurement accuracy. At the same time, back-to-back transformer measurement is dependent on the matching and losses of the transformers used and therefore only provides an approximation of the real performance of the DUT.

Fortunately, in recent years, the RF industry introduced vector network analyzers capable of performing virtual impedance conversion or "Z-conversion." Measurement with virtual impedance conversion avoids the need for test fixtures with matching circuits, eliminating the problem of compensating for loss. The fixture is used with 50Ω at all ports, calibration is performed using a 50Ω calibration kit, and then autoport extension and Z-conversion are applied. This method allows precision measurement of components with 75Ω impedance and is especially effective with passive components such as splitters, couplers and transformers.

By using virtual impedance conversion to characterize the performance of our 75 Ω product portfolio, Mini-Circuits is able to provide our customers with tight performance specifications for every product we produce. In the broadband cable market where high demand and competition are driving requirements for high system performance and speed to market, designers need parts they can rely on to meet those requirements. As you evaluate parts for your design, it's important to consider how suppliers are qualifying performance given the special challenges of test and measurement for 75Ω products. With Mini-Circuits, you can know we're using the most advanced tools and the most accurate measurement methods available, so you can have confidence in the performance of our products.

For more information about test and measurement at Mini-Circuits, we invite you to reach out to us. Our engineers are ready to discuss any questions or special requirements you may have. We're here to support you!

Contact:

Mini-Circuits Applications

apps@minicircuits.com

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PHA-22+	16	17	50	1500	14-15
MGVA-62+	15.7	12.2	40	3000	16-17
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16.5	5	1250	26-27
6.7	5	1250	28-29
12.7	5	1250	30
17.5	5	1250	30
20	40	1200	31
20	40	1200	31
6	5	1250	32-33
9.3		1200	34
12		1200	34
16		1500	35
20.5		1250	35
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ADP-2-20-75+	2-Way 0°	5	2000	54
CDP-2-122-75+	2-Way 0°	5	1200	55
SYPS-2-282-75+	2-Way 0°	5	2750	55
CDP-2-122W-75X+	2-Way 0°	1	1250	56-57
TCP-2-122-75X+	2-Way 0°	5	1250	58-59
SBTCJ-122-75+	2-Way180°	5	1250	60
SYPS-3-12W-75+	3-Way 0°	5	1200	60
SCA-4-15-75+	4-Way 0°	10	1500	61
SCPA-8-122-75+	8-Way 0°	5	1250	61
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 SWIIGHES	

Switches Introduction				64-65
Model Number	Switch Type		Max Freq. MHz	
JSW2-33DR-75+	SPDT	5	3000	66-67
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JSW3-23DR-75+	SP3T	5	2000	70-71
JSW4-23DR-75+	SP4T	5	2000	72-73
JSW5-23DR-75+	SP5T	5	2000	74-75
JSW6-23DR-75+	SP6T	5	2000	76-77
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TRANSFORMERS

Transformers Introduc	tion			78-79
Model Number	Impedance Ratio	Min Freq. MHz	Max Freq. MHz	
ADTL1 -4-75+	1	0.5	1000	80-81
ADTL1-18-75+	1	5	1800	82-83
TC1-1-13M-75X+	1	4.5	3000	84-85
TC1-33-75G2A+	1	5	3000	86-87
TC1.33-282X+	$1.33 (100 \Omega \text{to} 75 \Omega)$	5	2800	88-89
TC1-1T-75X+	` 1	5	120	90-91
TC4-6T-75X+	4	1	300	92-93
TRS1-182-75+	1	10	1800	94-95
ADTL1-15-75+	1	10	1500	96
TC1-33-75G2+	1	5	3000	96
TRS1-23-75+	1	10	2200	97
TX-2-5-1+	2	20	1250	97

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TEST ACCESSORIES

Matching Pads

Model Number	Impedance Ω	Min Freq. MHz	Max Freq. MHz	
BMP-5075+	50/75	DC	2000	100
BMP-5075R+	50/75	DC	2000	100
UNMP-5075+	50/75	DC	3000	101
UNMP-5075-33+	50/75	DC	3000	101

Test Cables

Model Number	Connector Type	Min Freq. MHz	Max Freq. MHz	
CBL-2FM-75+	F	DC	3000	102
CBL-3 FM-75+	F	DC	3000	102
CBL-6FM-75+	F	DC	3000	103
CBL-1MFM-75+	F	DC	3000	103

USB Power Sensors

Model Number	Dynamic Range dB	Min Freq. MHz	Max Freq. MHz	
PWR-2.5GHS-75	-30 to +20 dBm	0.1	2500	104-105

CONTROL PRODUCTS

Voltage Variable Attenuators

Model Number	Max Attenuation dB	Min Freq. MHz	Max Freq. MHz	
EVA-23-75+	40	10	2000	108-109
EVA-2-75+	40	50	2000	110-111

Voltage Variable Equalizers Model Number May Attenuation dB

Model Number	Max Attenuation dB	Min Freq. MHz	Max Freq. MHz	
VAEQ-1220-75+	11	50	1220	112-113

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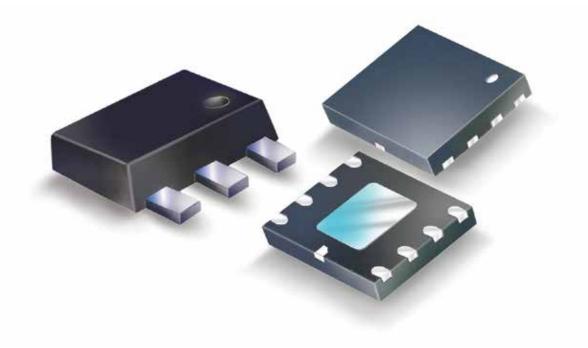
All Products are RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

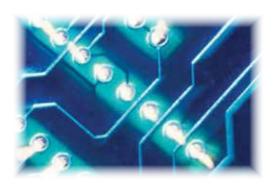


MMIC **AMPLIFIERS**

Our selection of amplifiers for CATV and broadband systems provides frequency ranges supporting both upstream and downstream bandwidth requirements for the DOCSIS 3.1 standard. These amplifiers provide outstanding dynamic range and gain flatness, enabling excellent system performance across broad bandwidths. Manufactured using E-PHEMT and InGap HBT technology on GaAs, they come in packages as small as SOT-89 with designed-in ESD protection and excellent unit-to-unit repeatability.



- ▶ Low Noise
- ► Discrete and Dual-Matched Models
- ► Upstream and Downstream Bands
- ► Tiny Size





Monolithic Amplifier

0.05-1.5 GHz

PGA-106-75+

Product Features

- High IP3, 37 dBm typ. at 0.5 GHz
- Gain, 17.4 dB typ. at 0.5 GHz
- High Pout, P1dB 19.8 dBm typ. at 0.5 GHz
- Low Noise Figure, 3.1 dB at 0.5 GHz



CASE STYLE: DF782

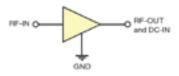
Typical Applications

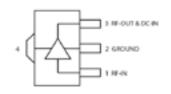
- CATV
- GPON
- MOCA
- DBS

General Description

PGA-106-75+ (RoHS compliant) is an advanced wideband amplifier fabricated using E-PHEMT* technology and offers extremely high dynamic range over a broad frequency range and with low noise figure and flat gain. In addition, the PGA-106-75+ has excellent input and output return loss over a broad frequency range. Lead finish is SnAgNi. It has repeatable performance from lot to lot and is enclosed in a SOT-89 package for very good thermal performance.

simplified schematic and pin description





Function	Pin Number	Description
RF IN	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	3	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig. 2
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

^{*}Enhanced mode pseudomorhic High Electron Mobility Transistor.

Electrical Specifications at 25°C, 75Ω and 5.0V⁽¹⁾, unless noted

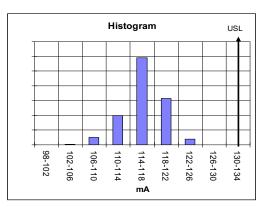
Monolithic E-PHEMT MMIC Amplifier

Parameter	Condition (GHz)	Min.	Тур.	Max.	Units
Frequency Range		0.05		1.5	GHz
Gain	0.05	_	17.8	_	dB
	0.5	_	17.4	_	
	1.0	15.5	16.9	19.5	
	1.2	_	16.7	_	
	1.5	_	16.1	_	
Input Return Loss	0.05		14.9		dB
	0.5		14.5		
	1.0		21.0		
	1.2		25.3		
	1.5		18.4		
Output Return Loss	0.05		21.2		dB
	0.5		16.0		
	1.0		15.5		
	1.2		14.6		
	1.5		12.5		
Reverse Isolation	1.0		24.4		dB
Output Power @1 dB compression	0.05		19.2		dBm
·	0.5		19.8		
	1.0		20.1		
	1.2		19.8		
	1.5		19.3		
Output IP3	0.05		37.5		dBm
	0.5		37.3		
	1.0		36.2		
	1.2		36.0		
	1.5		35.0		
Output IP2 (2)	0.05		61.0		dBm
·	0.5		59.8		
	1.0		58.4		
	1.2		52.2		
	1.5		59.8		
Noise Figure	0.05		3.3		dB
v	0.5		3.1		
	1.0		3.3		
	1.2		3.3		
	1.5		3.7		
Device Operating Voltage (Vd)		4.8	5.0	5.2	V
Device Operating Current			116	132	mA
Device Current Variation vs. Temperature ⁽⁴⁾			97		μΑ/°C
Device Current Variation vs Voltage			0.05		mA/mV
Thermal Resitance ⁽³⁾			76	-	°C/W

Absolute Maximum Ratings

	<u> </u>
Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Operating Current at 5.0V	170 mA
Power Dissipation	0.85 W
Input Power (CW)	+26 dBm (5 minutes) +14 dBm (continuous)
DC Voltage on Pin 3	6 V

Permanent damage may occur if any of these limits are exceeded Electrical maximum ratings are not intended for continuous normal operation.



⁽²⁾ Output IP2 measured at sum frequency of the two tones (f meas= f1+f2).

⁽³⁾ Junction to ground lead.
(4) (Current at 85°C - Current at -45°C)/130

75Ω Flat Gain, High Dynamic Range

Monolithic Amplifier

5-250 MHz

PGA-106R-75+

Product Features

- High IP3, 34 dBm typ.
- Gain, 17.9 dB typ.
- High Pout, P1dB 19.5 dBm typ.
- Excellent gain flatness, ± 0.1 dB typ.



CASE STYLE: DF782

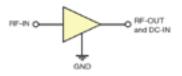
Typical Applications

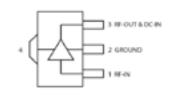
CATV Return path

General Description

PGA-106R-75+ (RoHS compliant) is an advanced wideband amplifier fabricated using E-PHEMT* technology and offers extremely high dynamic range over a broad frequency range and with low noise figure and flat gain. In addition, the PGA-106R-75+ has excellent input and output return loss over a broad frequency range. Lead finish is SnAqNi. It has repeatable performance from lot to lot and is enclosed in a SOT-89 package for very good thermal performance.

simplified schematic and pin description





Function	Pin Number	Description
RF IN	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	3	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig. 2
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

^{*}Enhanced mode pseudomorhic High Electron Mobility Transistor.

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		250	MHz
Gain	5 - 250	16.3	17.9	19.9	dB
Gain Flatness (±)	5 - 250		0.1		dB
Input Return Loss	5 - 250		15.3		dB
Output Return Loss	5 - 250		19.0		dB
Reverse Isolation	5 - 250		23.4		dB
Output Power @ 1dB compression	5 - 250		19.5		dBm
Output IP3	5 - 250		34.4		dBm
Output IP2 (2)	5 - 250		62.0		dBm
	10	_	6.0	_	
Noise Figure	50	_	3.3	_	dB
	250	_	3.1	_	
Device Operating Voltage (Vd)		4.8	5.0	5.2	V
Device Operating Current		_	116	132	mA
Device Current Variation vs. Temperature ⁽⁴⁾			97		μΑ/°C
Device Current Variation vs Voltage			0.05		mA/mV
Thermal Resitance ⁽³⁾			76		°C/W

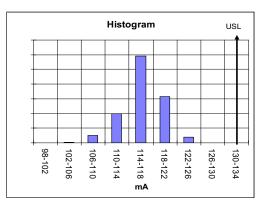
⁽¹⁾ Measured on Mini-Circuits Characterization Test board TB-587+. See Characterization Test Circuit (Fig. 1)

Monolithic E-PHEMT MMIC Amplifier

Absolute Maximum Ratings

Parameter	Ratings					
Operating Temperature (ground lead)	-40°C to 85°C					
Storage Temperature	-65°C to 150°C					
Operating Current at 5.0V	170 mA					
Power Dissipation	0.85 W					
Input Power (CW)	+23 dBm (5 minutes) +14 dBm (continuous)					
DC Voltage on Pin 3	6 V					

Permanent damage may occur if any of these limits are exceeded. Electrical maximum ratings are not intended for continuous normal operation.



⁽²⁾ Output IP2 measured at sum frequency of the two tones (f meas= f1+f2).
(3) Junction to ground lead.

^{(4) (}Current at 85°C - Current at -45°C)/130

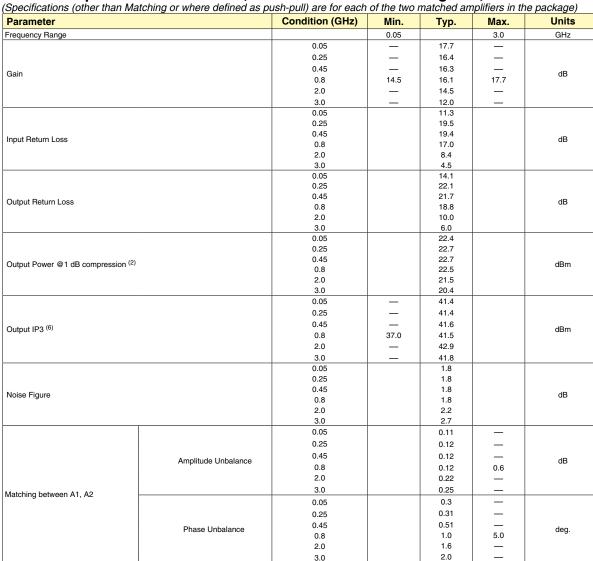
Dual Matched MMIC Amplifier

.05-3 GHz

CASE STYLE: DL1020

Electrical Specifications¹ at 25°C, Zo=50Ω and Device Voltage 5V, unless noted

Monolithic E-PHEMT MMIC Amplifier



Product Features

- Two matched amplifiers in one package
- High IP3, +44 dBm at 0.8 GHz in push-pull configuration
- High IP2, +78 dBm at 0.8 GHz in push-pull configuration
- Gain, 16 dB typ. at 0.8 GHz
- P1dB, +22 dBm typ. at 0.8 GHz
- Low noise figure, 1.8 dB typ. at 0.8 GHz
- May be used as replacement for WJ AH11^{a,b}

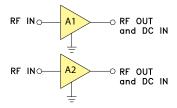
Typical Applications

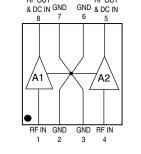
- CATV
- FTTH
- Optical networks
- Base station infrastructure
- Balanced amplifiers
- 75 Ohm push-pull and balanced amplifiers

General Description

PHA-11+ is a dual matched wideband high dynamic range amplifier. Enclosed in a 6.0 x 4.9 mm MCLP plastic package. PHA-11+ is fabricated using E-PHEMT* technology and is ideal for use in balanced and push-pull amplifiers.

simplified schematic (each of A1, A2) and pin description





Function	Pin Number	Description
RF IN, A1	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A1	8	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
RF IN, A2	4	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A2	5	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
GND	2,3,6,7 & paddle	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

Enhancement mode pseudomorphic High Electron Mobility Transistor.

Thermal Resistance, junction-to-ground lead

Device Operating Current (each amplifier)

Device Current Variation vs. Temperature

Device Current Variation vs Voltage

Absolute Maximum I	Ratings (4)
Parameter	Ratings
Operating Temperature ⁽⁵⁾	-40°C to 85°C
Storage Temperature	-55°C to 150°C
Operating Current at 5V ⁽⁶⁾	200 mA
Power Dissipation ⁽⁶⁾	1000 mW
Input Power (CW)	+24
DC Voltage (pads 5.8)	6V

Notes:
(1) Measured on Mini-Circuits Test Board TB-561-11+ (characterization test circuit, Fig 1a.)
(2) Current increases at P10B
(3) Unesured on evaluation boards (nush-pull amplifiers)

Device Operating Voltage

(2) Current increases at P1dB
 Measured on evaluation boards (push-pull amplifiers)
 TB-566-50-11+, TB-666-50-11+ (50Ω) and TB-566-75-11+ (75Ω).
 See Characterization Test Circuit (Fig. 1b)
 (4) Permanent damage may occur if any of these limits are exceeded.
 These ratings are not intended for continuous normal operation.
 Defined with reference to ground pad temperature.
 (6) Per single ended amplifier
 (7) e); = Junction Temperature-85°C
 Voltage X sum of current in A1 & A2

Push-Pull Amplifier Typical Performance (3)

4.8

110

l_ [- 1	1B-566-75-11+ (7512)			IB-566-50-11+ (50Ω)			1B-666-50-11+ (50\(\Omega\)	
Freq. GHZ	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)	Gain (dB)	Output IP3 (dBm)	OutputIP2 (dBm)
0.05	14.2	45.0	79.0	15.2	45.0	82.0	14.1	40.1	71.4
0.25	13.7	43.0	79.0	13.8	45.0	84.0	13.8	40.7	70.5
0.45	14.0	42.0	81.0	13.8	44.0	81.0	14.1	42.2	75.6
0.85	14.1	43.0	72.0	13.0	44.0	76.0	13.1	40.4	71.5
1.20	13.8	40.6	78.0	12.0	43.0	72.0	12.9	39.4	62.1
1.30	13.5	40.3	78.0				12.8	40.0	56.8
1.50							12.2	39.7	60.8
2.00							11.8	41.0	65.2
3.00							8.6	36.2	70.8

5.0

146

23

0.053

5.2

180

V

mΑ

μΑ/°C mA/mV

°C/W

PHA-11+

a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, compatibility with other components and environmental conditions and stresses

b. The WJ part number is used for identification and comparison purposes only.

Dual Matched MMIC Amplifier

.05-1.5 GHz

CASE STYLE: DL1020

Product Features

- Two matched amplifiers in one package
- High IP3, +44 dBm at 0.8 GHz in push-pull configuration
- High IP2, +78 dBm at 0.8 GHz in push-pull configuration
- Gain, 16 dB typ. at 0.8 GHz
- P1dB, +22 dBm typ. at 0.8 GHz
- Low noise figure, 1.8 dB typ. at 0.8 GHz
- May be used as replacement for WJ AH22^{a,b}

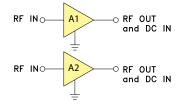
Typical Applications

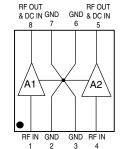
- CATV
- FTTH
- Optical networks
- Base station infrastructure
- Balanced amplifiers
- 75 Ohm push-pull and balanced amplifiers

General Description

PHA-22+ is a dual matched wideband high dynamic range amplifier. Enclosed in a 6.0 x 4.9 mm MCLP plastic package. PHA-22+ is fabricated using E-PHEMT* technology and is ideal for use in balanced and push-pull amplifiers.

simplified schematic (each of A1, A2) and pin description





Function	Pin Number	Description
RF IN, A1	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application Circuit, Fig 2.)
RF-OUT and DC-IN, A1	8	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
RF IN, A2	4	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application Circuit, Fig 2.)
RF-OUT and DC-IN, A2	5	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
GND	2,3,6,7 & paddle	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

^{*} Enhancement mode pseudomorphic High Electron Mobility Transistor.

Electrical Specifications¹ at 25°C, Zo=50Ω and Device Voltage 5V, unless noted

(Specifications (other than Matching or where defined as push-pull) are for each of the two matched amplifiers in the package)

Parameter		Condition (GHz)	Min.	Тур.	Max.	Units
Frequency Range			0.05		1.5	GHz
		0.05	_	17.7	_	
Gain		0.8	14.5	16.1	17.7	dB
		1.5	_	15.4	1.5 ————————————————————————————————————	
		0.05		11.3		
Input Return Loss		0.8		17.0	17.0	
		1.5		11.7		
		0.05		14.1		
Output Return Loss		0.8		18.8		dB
		1.5		13.1	1.5 — 17.7 — 0.6 — 5.0 — 5.2	
		0.05		22.4		
Output Power @1 dB compression (2)		0.8		22.5		dBm
		1.5		22.5		
		0.05	_	41.4		
Output IP3 (6)		0.8	37.0	41.5		dBm
		1.5	_	42.9		
		0.05		1.8		
Noise Figure		0.8		1.8		dB
		1.5		2.0	0.6 — —	
		0.05		0.11	_	
	Amplitude Unbalance	0.8		0.12	0.6	dB
		1.5		0.22	_	
Matching between A1, A2		0.05		0.3	_	
	Phase Unbalance	0.8		1.0	5.0	deg.
		1.5		1.6	l	
Device Operating Voltage	1	-	4.8	5.0	5.2	V
Device Operating Current (each amplifier)		110	146	180	mA
Device Current Variation vs. Temperature				23		μA/°C
Device Current Variation vs Voltage				0.053		mA/mV

Push-Pull Amplifier Typical Performance (3)

i don't dii Ampinici Typical i citorilance								
_	TB-566-75+ (75Ω)			TB-566-50+ (50Ω)				
Frequency (GHZ)	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)		
0.05	14.2	45.0	79.0	15.2	45.0	82.0		
0.25	13.7	43.0	79.0	13.8	45.0	84.0		
0.45	14.0	42.0	81.0	13.8	44.0	81.0		
0.85	14.1	43.0	72.0	13.0	44.0	76.0		
1.20	13.8	40.6	78.0	12.0	43.0	72.0		
1.30	13.5	40.3	78.0					

Absolute Maximum Ratings (4)

Parameter	Ratings				
Operating Temperature ⁽⁵⁾	-40°C to 85°C				
Storage Temperature	-55°C to 150°C				
Operating Current at 5V ⁽⁶⁾	200 mA				
Power Dissipation ⁽⁶⁾	1000 mW				
Input Power (CW)	+24 dBm				
DC Voltage (pads 5,8)	6V				

- (1) Measured on Mini-Circuits Test Board TB-561-22+ (characterization test circuit, Fig 1a (2) Current increases at P1dB
- $^{(3)}$ Measured on evaluation boards (push-pull amplifiers) TB-566-50+ (50 Ω) and
- TB-566-75+ (75 Ω). See Characterization Test Circuit (Fig. 1b) (4) Permanent damage may occur if any of these limits are exceeded.
- These ratings are not intended for continuous normal operation.
- (5) Defined with reference to ground pad temperature.
- (6) Per single ended amplifier (7) Θjc= <u>Junction Temperature-85°C</u>
- Voltage X sum of current in A1 & A2

a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, compatibility with other components and environmental conditions and stresses

b. The WJ part number is used for identification and comparison purposes only.

Dual Matched MMIC Amplifier

.04-3 GHz

CASE STYLE: DL1020

Product Features

- Two matched amplifiers in one package
- High IP3, +37.9 dBm at 0.9 GHz
- High IP2, +70 dBm at 0.9 GHz in push-pull configuration
- Gain, 15.7 dB typ at 0.9 GHz
- Excellent Gain flatness, ±0.5 dB (0.05-3 GHz)
- P1dB, +19.6 dBm typ at 0.9 GHz

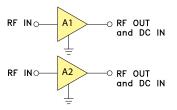
Typical Applications

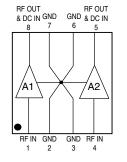
- SATCOM
- CATV
- FTTH
- Optical networks • Base station infrastructure
- Balanced amplifiers
- 75 Ohm push-pull and balanced amplifiers

General Description

MGVA-62+ (RoHS compliant) is an advanced ultra-flat gain amplifier fabricated using InGaP HBT technology and offers high dynamic range over a broad frequency range. In addition, the MGVA-62+ has good input and output return loss over a broad frequency range without the need for external matching components. Lead finish is SnAgNi and is enclosed in a 4.9 x 6 mm MCLP package for good thermal performance.

simplified schematic (each of A1, A2) and pad description





Function	Pad Number	Description
RF IN, A1	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A1	8	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
RF IN, A2	4	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A2	5	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
GND	2,3,6,7 & paddle	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

Monolithic InGap HBT MMIC Amplifier

Electrical Specifications 1 at 25°C, Zo=50 Ω and Device Voltage 5V, unless noted (Specifications (other than Matching or where defined as push-pull) are for each of the two matched amplifiers in the package)

Parameter		Condition (GHz)	Min.	Тур.	Max.	Units
Frequency Range			0.04		3.0	GHz
		0.04	_	16.7	_	
		0.5	_	15.7	_	
0-:-		0.9	14.1	15.7	17.3	dB
Gain		2.0	_	15.8	_	QB
		2.6	_	15.8	_	
			_	15.7	_	
Gain Flatness		0.05-3.0		±0.5		dB
		0.04		16.7		
		0.5		13.3		
Innut Datum Loss		0.9		12.2		dB
Input Return Loss		2.0		9.3		ub
		2.6		8.0		
		3.0		7.1		
		0.04		12.5		
		0.5		18.1		
Output Return Loss		0.9		19.4		dB
Output Hetaili Loss		2.0		18.2		ub ub
		2.6		12.9		
		3.0		10.2		
		0.04		19.8		dBm
		0.5		19.8		
Output Power @1 dB compression	on (2,3)	0.9		19.6		
Culput I Ower @ I ab compression	511	2.0		19.4		
		2.6		18.4		
		3.0		17.4		
		0.04	_	36.3	_	
		0.5	-	37.9	_	
Output IP3 (3)		0.9	34.8	37.9	_	dBm
		2.0	-	34.3	_	
		2.6	_	31.7	_	
		3.0		29.9	_	
		0.04		4.7		
		0.5		4.8		
Noise Figure		0.9		4.8		dB
· ·		2.0		5.1		
		2.6		5.4		
		3.0		5.3		
		0.04	_	0.0	_	
		0.5		0.1	_	
	Amplitude Unbalance	0.9		0.1	0.5	dB
		2.0 2.6	_	0.1 0.1	_	
		3.0	_	0.1	_	
Matching between A1, A2		0.04	_	0.2	_	
		0.04		0.0	_	
		0.9	_	0.1	5.0	
	Phase Unbalance	2.0		0.3	5.0	deg.
		2.6	_	0.7	_	
		3.0	_	0.7		
Device Operating Voltage	0.0	4.8	5.0	5.2	V	
Device Operating Voltage Device Operating Current (each a	amplifier)		7.0	82	92	mA
Device Current Variation vs. Tem				61	J.L.	μΑ/°C
Dovido Junioni vanadon va. 1611	+	-				
Device Current Variation vs Volta	age			0.036		mA/mV

Measured on Mini-Circuits Test Board TB-561-62+, see characterization circuit, Fig 1.
 Current increases at P1dB

Absolute Maximum Ratings(6)

Absolute waxiiiluiii hatiiigs						
Parameter	Ratings					
Operating Temperature ⁷	-40°C to 85°C					
Storage Temperature	-55°C to 150°C					
Operating Current at 5V	120 mA					
Power Dissipation	0.725 W					
Input Power (CW)	24 dBm					
DC Voltage (pads 5, 8)	6.0					

⁽⁶⁾ Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation. (7) Defined with reference to ground pad temperature.

Push-Pull Amplifier Typical Performance (5)

don't dir Ampinier Typicari eriormanice							
_	TB-666-50-62+ (50Ω)						
Freq. GHz	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)				
0.04	13.3	36.4	68.7				
0.5	13.1	37.0	69.5				
0.9	12.9	39.5	70.0				
2.0	12.7	35.6	50.6				
2.6	12.4	32.3	72.6				
3.0	11.2	31.4	68.0				

⁽⁵⁾ Measured on evaluation boards TB-666-50-62+ (push-pull amplifier)

⁽³⁾ Per single ended amplifier (4) Gipc= (Junction Temperature - 85°C) / (Voltage X sum of current in A1 & A2)

Dual Matched MMIC Amplifier

0.04-3 GHz

Product Features

- Two matched amplifiers in one package
- High IP3, +34.3 dBm at 0.9 GHz
- High IP2, +70 dBm at 0.9 GHz in push-pull configuration
- Gain, 21.4 dB typ at 0.9 GHz
- P1dB, +19.4 dBm typ at 0.9 GHz



CASE STYLE: DL1020

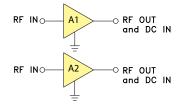
Typical Applications

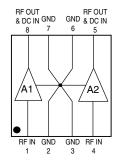
- SATCOM
- CATV
- FTTH
- Optical networks
- Base station infrastructure
- Balanced amplifiers
- 75 Ohm push-pull and balanced amplifiers

General Description

MGVA-63+ (RoHS compliant) is a high gain amplifier fabricated using InGaP HBT technology and offers high dynamic range over a broad frequency range. Lead finish is SnAgNi and is enclosed in a 4.9 x 6 mm MCLP package for good thermal performance.

simplified schematic (each of A1, A2) and pad description





Function	Pad Number	Description
RF IN, A1	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A1	8	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
RF IN, A2	4	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A2	5	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
GND	2,3,6,7 & paddle	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

^{*} Enhancement mode pseudomorphic High Electron Mobility Transistor.

Monolithic InGap HBT MMIC Amplifier

MGVA-63+

Electrical Specifications¹ at 25°C, Zo=50Ω and Device Voltage 5V, unless noted

(Specifications (other than Matching or where defined as push-pull) are for each of the two matched amplifiers in the package)

Parameter		Condition (GHz)	Min.	Тур.	Max.	Units
Frequency Range			0.04		3.0	GHz
		0.04	_	22.2	_	
		0.5	_	21.4	_	
Gain	0.9	19.2	21.4	23.5	-ID	
Gani		2.0	_	20.8	_	dB
		2.6	_	19.8	-	
		3.0	_	18.9	_	
Gain Flatness		0.05-3.0		±1.5		dB
		0.04		16.3		
		0.5		18.1		
Input Poturn Logo		0.9		16.6		dB
Input Return Loss		2.0		11.8		иь
		2.6		9.2		
		3.0		7.7		
		0.04		13.5		
		0.5		20.5		
Output Return Loss		0.9		17.2		dB
Caspat Hotain 2000		2.0		8.5		u _D
		2.6		6.3		
		3.0		5.2		
		0.04		19.3		dBm
		0.5		19.0		
Output Power @1 dB compressi	on ^(2,3)	0.9		19.4		
		2.0		19.0		
		2.6		18.0		
		3.0		17.4		
		0.04	_	33.6	_	dBm
		0.5	_	34.3	_	
Output IP3 (3)		0.9	31.0	34.3	_	
		2.0 2.6	_	32.2 30.7	_	
			_	29.6	_	
		3.0 0.04	_		_	
		0.04		3.6 3.6		
		0.9		3.6		
Noise Figure		2.0		3.6		dB
		2.6		3.8		
		3.0		3.6		
		0.04	_	0.1	_	
		0.5	_	0.1	_	
		0.9	_	0.1	0.5	
	Amplitude Unbalance	2.0	_	0.1	- 0.5	dB
		2.6	_	0.2	_	
		3.0	_	0.1	_	
Matching between A1, A2		0.04	_	0.0	_	
		0.5	_	0.6	_	
		0.9	_	0.9	5.0	
	Phase Unbalance	2.0	_	1.5	_	deg.
		2.6	_	1.5	_	
		3.0	_	0.6	_	
Device Operating Voltage	1	4.8	5.0	5.2	V	
Device Operating Current (each	amplifier)		-	69	78	mA
Device Current Variation vs. Ten				69		μΑ/°C
Device Current Variation vs Volta				0.043		mA/mV
Thermal Resistance, junction-to-				58.4		°C/W

Measured on Mini-Circuits Test Board TB-561-63+, see characterization circuit, Fig 1
 Current increases at P1dB

Absolute Maximum Ratings(6)

Absolute Maximum Hatings						
Parameter	Ratings					
Operating Temperature ⁷	-40°C to 85°C					
Storage Temperature	-55°C to 150°C					
Operating Current at 5V	100 mA					
Power Dissipation	0.5 W					
Input Power (CW)	13 dBm					
DC Voltage (pads 5, 8)	5.7					

Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation.
 Defined with reference to ground pad temperature.

⁽³⁾ Per single ended amplifier (4) Ojc= (Junction Temperature - 85°C) / (Voltage X sum of current in A1 & A2) Push-Pull Amplifier Typical Performance (5)

. doi: r dii riii piiiloi 1 y piodi 1 oi loi ilidailoo							
_	TB-666-50-63+ (50Ω)						
Freq. (GHz)	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)				
0.04	18.5	32.2	58.1				
0.5	19.1	32.1	64.1				
0.9	18.9	35.9	68.4				
2.0	18.2	32.7	49.5				
2.6	17.1	30.7	67.9				
3.0	16.4	30.2	67.6				

⁽⁵⁾ Measured on evaluation boards TB-666-50-63+ (push-pull amplifier)

Dual Matched MMIC Amplifier

0.04-3 GHz

CASE STYLE: DL1020

Product Features

- Two matched amplifiers in one package
- High IP3, +37.5 dBm at 0.9 GHz
- High IP2, +59 dBm at 0.9 GHz in push-pull configuration
- Gain, 14.4 dB typ. at 0.9 GHz
- Excellent Gain Flatness, ±0.5 dB (0.1-2 GHz)
- P1dB, +21 dBm typ. at 0.9 GHz
- Low noise figure, 1.9 dB typ. at 0.9 GHz

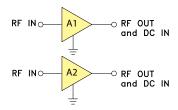
Typical Applications

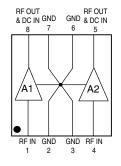
- SATCOM
- CATV
- FTTH
- Optical networks
- Base station infrastructure
- Balanced amplifiers
- 75 Ohm push-pull and balanced amplifiers

General Description

MPGA-105+ (RoHS compliant) is an advanced ultra-flat gain amplifier fabricated using E-PHEMT technology and offers extremely high dynamic range over a broad frequency range and with low noise figure. In addition, the MPGA-105+ has good input and output return loss over a broad frequency range without the need for external matching components. Lead finish is SnAgNi and is enclosed in a 4.9 x 6 mm MCLP package for good thermal performance.

simplified schematic (each of A1, A2) and pad description





Function	Pad Number	Description
RF IN, A1	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A1	8	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
RF IN, A2	4	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. (see Application circuit, Fig 2.)
RF-OUT and DC-IN, A2	5	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig 2
GND	2,3,6,7 & paddle	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

^{*} Enhancement mode pseudomorphic High Electron Mobility Transistor

Dual Matched MMIC Amplifier

MPGA-105+

Electrical Specifications ¹ at 25°C, Zo=50Ω and Device Voltage 5V, unless noted (Specifications other than Matching or where defined as push-pull are for each of the two matched amplifiers in the package)

Parameter	Parameter		Min.	Тур.	Max.	Units	
Frequency Range	Frequency Range		0.04		3.0	GHz	
		0.04		16.0			
		0.5		14.6			
0-1-	0.9	13.0	14.4	15.9	-ID		
Gain	2.0		14.1		dB		
				14.3			
		2.6 3.0		14.0			
Gain Flatness		0.1-2.0		±0.5		dB	
		0.04		11.3			
1		0.5		24.3			
		0.9	15.0	20.6			
Input Return Loss		2.0		19.0		dB	
		2.6		11.6			
		3.0		10.5			
		0.04		12.6			
		0.5		20.5			
		0.9		15.1			
Output Return Loss		2.0		8.2		dB	
		2.6		7.4	1		
		3.0		7.4			
					-		
		0.04		21.0			
		0.5		20.5			
Output Power @1 dB compression	(2,6)	0.9		21.0		dBm	
		2.0		19.8			
		2.6		19.8			
		3.0		20.1			
		0.04		35.9			
		0.5		37.6			
Output IP3 (6)		0.9	35.5	37.8		dBm	
Output IF3 (4)		2.0		34.1		dbiii	
		2.6		32.5			
		3.0		32.1			
		0.04		1.7			
		0.5		1.9			
N : =		0.9		1.9			
Noise Figure		2.0		1.8		dB	
		2.6		1.7	1		
		3.0		1.8	1		
		0.04		0.0			
		0.5		0.1			
		0.9		0.1	1		
	Amplitude Unbalance	2.0		0.2		dB	
		2.6		0.2	1		
		3.0		0.3	1		
Matching between A1, A2		0.04		0.2	 		
		0.04		0.7	1		
		0.5		0.4			
	Phase Unbalance			1		deg.	
		2.0		1.6	1		
		2.6		1.4	1		
Device Operating Voltage		3.0	4.0	0.8	5.0	V	
Device Operating Voltage Device Operating Current (each am	nlifier)		4.8	5.0 63	5.2 77	mA	
Device Operating Current (each am Device Current Variation vs. Tempe				80	11	mA μΑ/°C	
				-			
Device Current Variation vs Voltage				0.014	-	mA/mV	
Thermal Resistance, junction-to-gro	ound lead (1)	1		47	<u> </u>	°C/W	

Absolute Maximum Ratings(4)

Parameter	Ratings			
Operating Temperature	-40°C to 85°C			
Storage Temperature	-65°C to 150°C			
Operating Current at 5V ⁽⁶⁾	94 mA			
Power Dissipation ⁽⁶⁾	0.47 W			
Input Power (CW) ⁽⁶⁾	23 dBm (5 minutes max, 17 dBm (continuous)			
DC Voltage (pads 5, 8) 5.5V				
1)				

(1) Measured on Mini-Circuits Test Board TB-561-105+, see characterization circuit, Fig 1

| Measured on Mini-Circuits 1est Board TB-561-105+, see characterization circuit, Courrent increases at PfdB | | Measured on evaluation boards (push-pull amplifiers) TB-666-50-11+. See characterization Test Circuit (Fig 1b) | | Permanent damage may occur if any of these limits are exceeded. | | Defined with reference to ground pad temperature. | | Per single ended amplifier. | | Ojc= (Junction Temperature - 85°C) / (Voltage X sum of current in A1 & A2) |

Frequency (GHz)	Gain (dB)	Output IP3 (dBm)	Output IP2 (dBm)
0.04	12.2	34.4	66.6
0.5	12.3	35.8	58.7
0.9	11.4	43.3	59.4
2.0	10.4	35.1	55.3
2.6	8.7	35.0	66.9
3.0	8.1	34.9	67.8

DIRECTIONAL COUPLERS

With 20 standard catalog models specified for DOCSIS 3.1 requirements, Mini-Circuits' wide selection of directional couplers spans coupling values from 6 to 25 dB. Core and wire models feature Mini-Circuits unique Top Hat® feature to improve speed and accuracy of pick and place assembly. All models offer flat coupling across frequency, low mainline loss, and good directivity.

















5 to 1250 MHz 75Ω 10 dB

Features

- wideband, 5 to 1250 MHz
- low mainline loss, 1.7 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

Applications

- DOCSIS® 3.1 Systems
- VHF/UHF
- CATV

Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Тур.	Max.	Unit
Frequency Range		5		1250	MHz
	5-50	_	1.1	1.5	
Mainline Loss¹ (above theoretical 0.1 dB)	50-1000	_	1.5	1.9	dB
	1000-1250	_	1.7	2.0	
Nominal Coupling	5-1250	_	10.0±0.5	_	dB
Coupling Flatness(±)	5-1250	_	0.3	0.6	dB
	5-250	16	21	_	
Directivity	250-1000	10	15	_	dB
	1000-1250	8	12	_	
	5-50	17	20	_	
Return Loss (Input)	50-1000	16	22	_	dB
	1000-1250	16	20	_	
	5-50	20	25	_	
Return Loss (Output)	50-1000	18	22	_	dB
	1000-1250	18	20	_	
	5-50	17	18	_	
Return Loss (Coupling)	50-1000	16	22	_	dB
	1000-1250	16	20	_	
Input Power	5-200	_	_	0.5	w
input i onci	200-1250	_	_	1.0	1

^{1.} Mainline loss includes theoretical power loss at coupled port.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C*
Storage Temperature	-55°C to 100°C

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

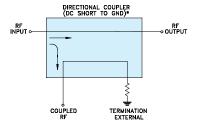
Function	Pin Number
INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
75Ω TERM EXTERNAL	6

CASE STYLE: AT1521

Available Tape and Reel at no extra cost
el Size Devices/Reel

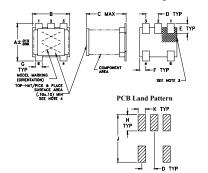
1000, 2000

Electrical Schematic



TCD-10-122-75X+

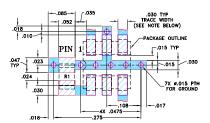
Outline Drawing



Outline Dimensions (inch)

F	Е	D	С	В	Α
.025	.040	.050	.160	.150	.150
0.64	1.02	1.27	4.06	3.81	3.81
wt		ĸ	J	н	G
WL		I.	J	п	G
grams		.030	.190	.065	.028
0.15		0.76	4 83	1.65	0.71

Demo Board MCL P/N: TB-72 Suggested PCB Layout (PL-010)



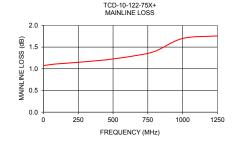
RESISTOR R1: 75 ± 1% Ohm. 0805 SIZE

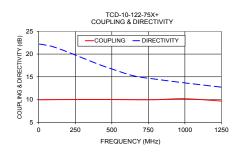
: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

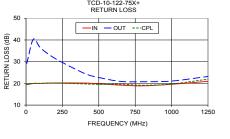
- DENOTES POB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Directivity (dB)	In	Return Loss (dB) Out	Cpl
5	1.08	9.94	22.19	19.41	29.19	19.41
50	1.10	9.95	21.96	19.96	40.31	20.02
100	1.11	9.97	21.58	19.99	36.32	20.02
200	1.14	10.00	20.43	20.21	31.46	20.13
400	1.19	10.01	17.86	20.16	24.64	19.76
500	1.23	10.00	16.73	19.82	22.71	19.53
650	1.30	9.96	15.21	19.18	20.91	19.66
800	1.40	9.97	14.48	18.87	20.77	19.14
1000	1.70	10.18	13.66	19.58	21.07	19.72
1250	1.76	9.67	12.72	20.97	23.18	21.94







Additional Notes

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- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 apps@minicircuits.com

^{*} Case temperature is defined as temperature on ground leads.

Surface Mount Directional Coupler

5 to 1250 MHz 75Ω 16.5 dB

Features

- wideband, 5 to 1250 MHz
- low mainline loss, 1.5 dB tvp.
- aqueous washable
- · leads for excellent solderability
- protected by US Patent 6,140,887

Applications

- DOCSIS® 3.1 Systems
- VHF/UHF
- CATV
- cellular





Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Тур.	Max.	Unit	
Frequency Range		5		1250	MHz	
	5 - 50	_	1.5	2.0		
Mainline Loss ¹ (above theoretical 0.1 dB)	50 - 1000	_	1.4	1.8	dB	
	1000 - 1250	_	1.5	1.9		
Nominal Coupling	5 - 1250	_	16.5±0.5	_	dB	
Coupling Flatness(±)	5 - 1250	_	0.3	0.6	dB	
Directivity	5 - 50	15	20	_		
	50 - 1000	18	22	_	dB	
	1000 - 1250	15	23	_		
	5 - 50	13	15	_		
Return Loss (Input)	50 - 1000	17	25	_	dB	
	1000 - 1250	17	20	_		
	5 - 50	14	16	_		
Return Loss (Output)	50 - 1000	18	23	_	dB	
, ,	1000 - 1250	17	20	_		
Return Loss (Coupling)	5 - 50	10	12	_		
	50 - 1000	14	17	_	dB	
	1000 - 1250	17	20	_		
Innut Dawar	5 - 100	_	_	0.5	W	
Input Power	100 - 1250	_	_	1.0	VV	

^{1.} Mainline loss includes theoretical power loss at coupled port.

Maximum Ratings

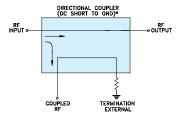
Parameter	Ratings
Operating Temperature	-40°C to 85°C*
Storage Temperature	-55°C to 100°C

Permanent damage may occur if any of these limits are exceeded. * Case temperature is defined as temperature on ground leads.

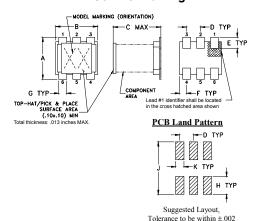
Pin Connections

Function	Pin Number
INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
75Ω TERM EXTERNAL	6
NOT USED	5

Electrical Schematic



Outline Drawing

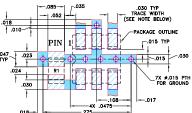


Outline Dimensions (inch)

F	E	D	С	В	Α	
.025	.040	.050	.160	.150	.160	
0.64	1.02	1.27	4.06	3.81	4.06	
w		K	J	Н	G	
grams		.030	.190	.065	.028	
0.15		0.76	4.83	1.65	0.71	

TCD-16-122-75X+

Demo Board MCL P/N: TB-72 Suggested PCB Layout (PL-010)



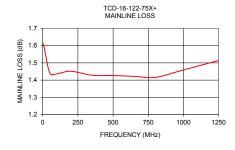
RESISTOR R1: 75 \pm 1% Ohm, 0805 SIZE

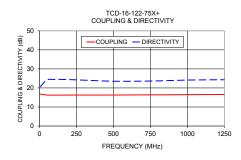
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED

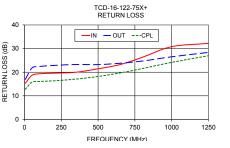
- TO BE MODIFIED.
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	-	Return Loss (dB)	
	In-Out	In-Cpl		ln	Out	Cpl
5	1.61	16.76	20.64	15.28	16.94	12.76
50	1.44	16.26	24.21	18.65	21.72	15.75
100	1.44	16.24	24.47	19.33	22.41	16.07
200	1.45	16.26	24.38	19.58	22.85	16.34
350	1.43	16.28	23.92	19.98	23.26	17.08
500	1.43	16.28	23.52	21.44	23.20	18.18
650	1.42	16.34	23.54	23.23	23.78	19.68
800	1.42	16.38	23.69	26.28	24.72	21.52
1000	1.46	16.48	24.14	30.79	26.51	24.16
1250	1.51	16.56	24.31	32.20	28.37	26.96







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Surface Mount Directional Coupler

5 to 1250 MHz 6.7 dB 75Ω

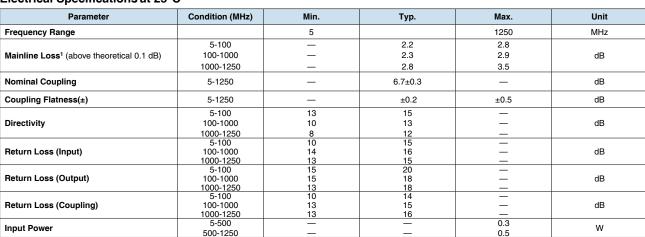
Features

- wideband, 5 to 1250 MHz
- low mainline loss, 2.5 dB tvp.
- aqueous washable
- · leads for excellent solderability
- protected by US Patent 6,140,887

Applications

- DOCSIS® 3.1 Systems
- VHF/UHF
- CATV • cellular

Electrical Specifications at 25°C



^{1.} Mainline loss includes theoretical power loss 1.1dB at coupled port

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C*
Storage Temperature	-55°C to 100°C

Permanent damage may occur if any of these limits are exceeded. * Case temperature is defined as temperature on ground leads

Pin Connections

Function	Pin Number
INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
75Ω TERM EXTERNAL	6

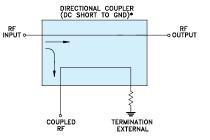
CASE STYLE: AT1521

Available Tape and Reel at no extra cost

1000, 2000

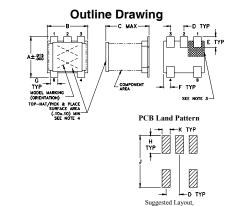
Devices/Reel 20, 50, 100, 200, 500

Electrical Schematic



* ELECTRICAL SCHEMATIC IS FOR DIRECTIONAL COUPLER WITH INTERNAL TRANSFORMER(S) AND EXTERNAL TERMINATION.

TCD-6-122-75X+

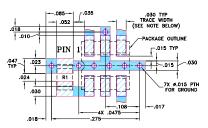


- Notes:
 1. Case Material: Plastic
 2. Termination Finish: Tin plate over Nickel plate.
 3. Lead#1 identifier shall be located in the cross-halt identifier may be either a molded or marked feature.
 4. Top-Hat total thickness: 013 inches max.

Outline Dimensions (inch)

F	E	D	С	В	Α
.025	.040	.050	.160	.150	.150
0.64	1.02	1.27	4.06	3.81	3.81
wt		K	J	Н	G
grams		.030	.190	.065	.028
0.15		0.76	4.83	1 65	0.71

Demo Board MCL P/N: TB-72 Suggested PCB Layout (PL-010)



RESISTOR R1: 75 ± 1% 0hm, 0805 SIZE

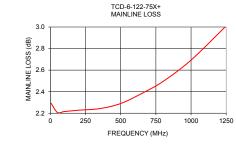
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED

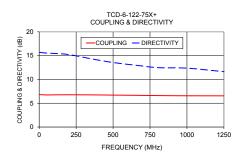
- TO BE MODIFIED.

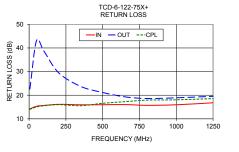
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)		Return Loss (dB)	
,	In-Out	In-Cpl	ζ,	In	Out	Cpl
5	2.29	6.81	15.68	14.24	22.63	14.03
50	2.21	6.74	15.53	15.33	43.05	15.02
100	2.22	6.76	15.46	15.68	38.71	15.5
200	2.23	6.78	15.23	16.14	29.54	16.00
350	2.24	6.76	14.34	15.95	23.73	15.5
500	2.29	6.71	13.55	15.97	21.16	16.59
650	2.38	6.66	13.00	16.04	19.32	17.20
800	2.49	6.61	12.48	15.72	18.60	17.93
1000	2.69	6.57	12.37	15.96	18.91	18.00
1250	3.01	6.56	11.63	16.81	19.55	18.56







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- entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

TCD-13-122-75X+

75Ω **12.7 dB 5 to 1250 MHz**

Features

- wideband 5 to 1250 MHz
- low mainline loss, 1.2 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

Electrical Specifications at 25°C

Model No.	Frequency Range	Mainline Loss (dB)	Coupling (dB)	Coupling Directivity Return Loss (dB) (dB) (dB)				Input Power
	(MHz)	Typ.	Typ.	Typ.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
	5 - 500	0.9	12.7±0.5	20	19	22	20	0.5
EW! TCD-13-122-75X+	500 - 1000	1.0	12.7±0.5	15	22	24	23	1.0
_	1000 - 1250	1.2	12.7±0.5	11	20	20	20	1.0

			Available Tape and Reel at no extra cost
	Input	Reel Size	Devices/Reel
	Power	7"	20, 50, 100, 200, 500
	(W)	13"	1000, 2000
g	Max.		
	iviax.		
	0.5		

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C

Permanent damage may occur if any of these limits are exceeded.

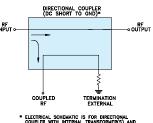
Pin Connections

Input	3
Output	4
Coupled	1
Ground	2
75Ω Term External*	6
Not used	5

*Case temperature is defined as temperature on ground leads

Electrical Schematic

CASE STYLE: DB1627



TCD-18-122-75X+

75Ω 17.5 dB 5 to 1250 MHz





CASE STYLE: DB1627

Features

- wideband 5 to 1250 MHz
- · low mainline loss, 1.0 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

Electrical Specifications at 25°C

Model No.	Frequency Range	Mainline Loss (dB)	Coupling (dB)	Ŭ,		Return Loss (dB)				Input Power
	(MHz)	Тур.	Typ.	Typ.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.		
	5 - 50	1.2	17.5±0.8	18	17	18	17	0.5		
W! TCD-18-122-75X+	50 - 1000	1.0	17.5±0.8	22	22	23	23	1.0		
_	1000 - 1250	1.1	17.5±0.8	18	24	18	25	1.0		



Maximum Ratings

maximum maningo	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C

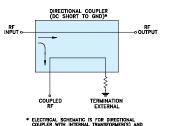
Permanent damage may occur if any of these limits are exceeded.

Pin Connections

riii Collifections	
Input	3
Output	4
Coupled	1
Ground	2
75Ω Term External*	6
Not used	5

*Case temperature is defined as temperature on ground leads

Electrical Schematic



TCD-20-4-75+

75Ω 20 dB 40 to 1200 MHz

Features

- wideband 40 to 1200 MHz
- excellent flatness, ±0.5 dB typ. each band
- better performance than MA-COM EMDC-20-2-75
- footprint compatible to EMDC-10-1-75
- aqueous washable

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
	40 - 500	0.5	21±0.5	20	10.4	1.0
TCD-20-4-75+	500 - 870	0.6	20±0.6	23	10.4	1.0
	870 - 1200	0.6	19.5±0.7	20	10.4	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°C			
Storage Temperature	-55°C to 100°C			
Permanent damage may occur if any of these limits are exceeded.				

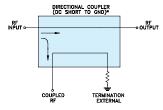
Pin Connections

Input	3
Output	4
Coupled	1
Ground	2
75Ω Term External	6
Not used	5

CASE STYLE: DB714



Electrical Schematic



TCD-20-4-75X+

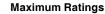
- excellent flatness, ±0.5 dB typ. each band
- better performance than MA-COM EMDC-20-2-75
- footprint compatible to EMDC-10-1-75

wideband 40 to 1200 MHz

- aqueous washable

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
	40 - 500	0.5	21±0.5	20	10.4	1.0
TCD-20-4-75X+	500 - 870	0.6	20±0.6	23	10.4	1.0
	870 - 1200	0.6	19.5±0.7	20	10.4	1.0



Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Permanent damage may occur if any of	these limits are exceeded.

Pin Connections

Input	3
Output	4
Coupled	1
Ground	2
75Ω Term External	6
Not used	5

40 to 1200 MHz

 75Ω

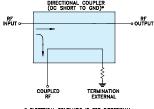




CASE STYLE: DB1627



Electrical Schematic



Visit www.minicircuits.com for pricing,

availability, and complete model information.

Directional Coupler

6dB 5 to 1250 MHz

Features

- very flat coupling
- · very broadband, multi octave
- temperature stable, LTCC base
- all welded construction
- · leads attached for better solderability
- · micro miniature coupler
- · aqueous washable
- protected by US Patents 6,140,887 & 6,784,521

Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Тур.	Max.	Unit
Frequency Range		5		1250	MHz
	5-50	_	2.2	3.1	
Mainline Loss	50-500	_	2.2	2.6	dB
Wallille Loss	500-1000	_	2.3	2.8	l ap
	1000-1250	_	2.3	2.9	
Nominal Coupling	5-1250	_	6.8 ±0.3	_	dB
Coupling Flatness(±)	5-1250	_	_	±0.8	dB
Directivity	5-50	13	15	_	
	50-500	13	17	_	dB
	500-1000	10	16	_	
	1000-1250	7	12	_	
Return Loss (Input)	5-1250	_	15.56	_	dB
Return Loss (Output)	5-1250	_	15.56	_	dB
Return Loss (Coupling)	5-1250	_	15.56	_	dB
	5-500	_	_	0.5	
Input Power	50-500	_	_	1.0	w
iliput rowei	500-1000	_	_	1.0	Į vv
	1000-1250	_	_	1.0	

Maximum Ratings

Parameter	Ratings					
Operating Temperature	-40°C to 85°C					
Storage Temperature	-55°C to 100°C					

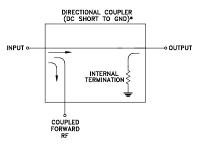
Permanent damage may occur if any of these limits are exceeded.

Pin Connections

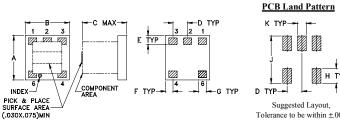
Function	Pin Number
INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
NOT USED	6

CASE STYLE: AT790-1

Electrical Schematic



Outline Drawing



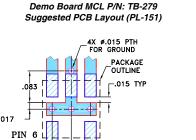
Tolerance to be within ±.002

Outline Dimensions (inch)

wt	K	J	Н	G	F	E	D	С	В	Α
ams	.030 g	.160	.050	.028	.025	.030	.050	.150	.150	.150
0.10	0.76	4.06	1.27	0.71	0.64	0.76	1.27	3.81	3.81	3.81

DBTC-6-4-75+

_.030 TRACE WIDTH, 3 PL. (SEE NOTE BELOW)



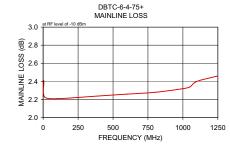
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GRO

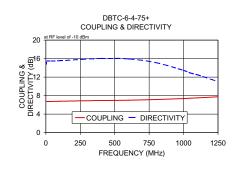
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

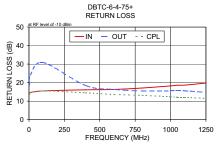
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	I	Return Loss (dB)	
` ,	In-Oút	In-Cpl	(- /	In	Out	Cpl
5.00	2.41	6.80	14.87	13.53	18.73	13.56
10.00	2.23	6.72	15.49	14.64	24.15	14.72
100.00	2.21	6.78	15.54	15.55	30.88	15.56
400.00	2.24	6.94	16.04	16.09	18.42	14.47
600.00	2.26	7.01	15.94	16.32	16.33	13.60
800.00	2.28	7.16	15.12	17.08	15.48	13.11
1000.00	2.32	7.36	13.45	18.22	15.61	12.36
1050.00	2.34	7.44	12.88	18.62	15.75	12.10
1100.00	2.40	7.51	12.50	18.66	15.58	12.04
1250.00	2.46	7.75	11.03	19.78	14.75	11.49







Additional Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

DBTC-9-4-75L+

5 to 1200 MHz 75Ω 9.3 dB

Features

- wideband 5 to 1200 MHz
- temperature stable, LTCC base
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887 & 6,784,521

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
DBTC-9-4-75L+	5 - 50	1.3	9.3±0.5	20	10.4	0.5
	50- 500	1.4	9.3±0.5	19	9.8	0.5
	500 - 1000	1.5	9.3±0.5	18	9.8	0.5
	1000 - 1200	1.8	9.3±0.5	17	9.8	0.5

Coupling

Typ.

12±0.5

12±0.5

12±0.5

Loss

Тур.

1.1

1.2

-55°C to 100°C

Maximum Ratings

Operating Temperature	-40°C to 85°C				
Storage Temperature	-55°C to 100°C				
Permanent damage may occur if any of these limits are exceeded.					

Pin Connections

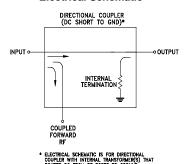
Input	3
Output	4
Coupled	1
Ground	2
Not used	6



CASE STYLE: AT1030



Electrical Schematic



DBTC-16-5-75L+

75Ω 16 dB 5 to 1500 MHz

Features

- wideband 5 to 1500 MHz
- · temperature stable, LTCC base
- · aqueous washable
- · leads for excellent solderability
- protected by US Patent 6,140,887 & 6,784,521

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
DDTC 16 F 751 ·	5 - 1000	1.0	16.3±0.5	21	17.7	1.0
DBTC-16-5-75L+	1000 -1500	1.3	16.8±0.7	19	17.7	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Permanent damage may occur if any or	these limits are exceeded.

Pin Connections

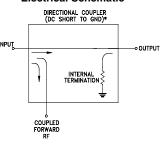
Input	3
Output	4
Coupled	1
Ground	2
Not used	6



CASE STYLE: AT1030



Electrical Schematic



20.5 dB

5 to 1250 MHz

DBTC-12-4-75+

Features

- wideband 5 to 1200 MH
- temperature stable, LTCC base
- · aqueous washable
- protected by US Patent 6,140,887 & 6,784,521

Frequency

Range

(MHz)

500 - 1000

Permanent damage may occur if any of these limits are exceeded.

Electrical Specifications at 25°C

12 dB

 75Ω

CASE STYLE: AT790-1

5 to 1200 MHz

Available Tape and Reel at no extra cost Devices/Reel 20, 50, 100, 200, 500 1000, 2000

Electrical Specifications at 25°C

Permanent damage may occur if any of these limits are exceeded.

protected by US Patent 6,140,887 & 6,784,521

DBTC-20-4-75L+

• wideband 5 to 1250 MHz

· aqueous washable

Maximum Ratings

Operating Temperature

Storage Temperature

• temperature stable, LTCC base

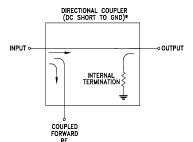
Features

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
DBTC-20-4-75L+	5 - 1250	0.6	20.5±0.5	19	17.7	1.0

Available Tape and Reel at no extra cost Devices/Reel 20, 50, 100, 200, 500 1000, 2000

CASE STYLE: AT790-1

Electrical Schematic



50- 500 DBTC-12-4-75L+

Storage Temperature

1000 - 1	200 1.3	12±0.
Maximum Ratings		
Operating Temperature	-40°C to 85°	C

Directivity

Тур.

19

17

13

Fill Collinections	
Input	3
Output	4
Coupled	1
Ground	2
Not used	6

Return Loss

Тур.

17.7

17.7

17.7

Input

Power

Max.

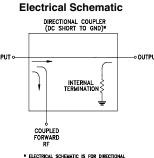
0.5

1.0

1.0

1.0

	(DC SHORT TO GND)*	1
INPUT •		OUTPL
IN OF	INTERNAL TERMINATION S	700110
	COUPLED FORWARD RF	



Visit www.minicircuits.com for pricing,

-40°C to 85°C

-55°C to 100°C

Pin Connections

Input

Output

Coupled Ground Not used

ADC-8-4-75+ 7.9 dB 5 to 1250 MHz

Features

- · wideband, 5-1250 MHz
- excellent coupling flatness, ±0.15 typ.
- aqueous washable
- protected by U.S Patents 6,133,525 & 6,140,887

CASE STYLE: CD542

Electrical Specifications at 25°C

Model No.	Frequency Range	Mainline Loss (dB)	Coupling Directivity (dB) (dB)		,			Input Power
	(MHz)	Тур. Тур.	Тур.	Тур. Тур.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
ADC 0 4 75 :	5 - 870	1.8	7.9±0.5	16	16	22	16	1.0
ADC-8-4-75+	870 - 1250	2.0	7.9±0.5	13	18	20	19	1.0

Reel Size Devices/Reel 7" 20, 50, 100, 200, 500

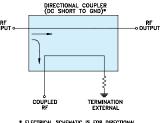
Maximum Ratings

Operating Temperature	-40°C to 85°C			
Storage Temperature	-55°C to 100°C			
Permanent damage may occur if any of	these limits are exceeded.			

Pin Connections

Input	1
Output	6
Coupled	3
Ground	2
75Ω Term External	4
Isolate (Do not use)	5





10.5 dB

ADC-12-4-75+

12.5 dB 5 to 1250 MHz

Features

- low mainline loss, 0.9 dB typ.
- good directivity, 18 dB typ.
- good VSWR, 1.25:1 typ.
- excellent coupling flatness, ±0.15 dB typ.
- aqueous washable
- protected by U.S Patents 6,133,525 & 6,140,887

Electrical Specifications at 25°C

Model No. Frequency Range		Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	R	eturn Loss (dB)	Input Power*
	(MHz)	Typ.	Typ.	Typ.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
NDO 40 4 75	5 - 870	0.85	12.5±0.5	18	19	22	19	0.5
NDC-12-4-75+	870 - 1250	1.0	12.5±0.5	12	18	18	16	1.0

^{* 5-20} MHz. 0.5W Max : 20-1250 MHz. 1.0W Max

Maximum Ratings

Operating Temperat	ure -40°C to 85°C
Storage Temperatur	e -55°C to 100°C
Permanent damage may occ	cur if any of these limits are exceeded.

Pin Connections

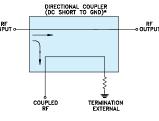
Input	1
Output	6
Coupled	3
Ground	2
75Ω Term External	4
Isolate (Do not use)	5



CASE STYLE: CD542



Electrical Schematic



16.3 dB 5 to 1250 MHz

ADC-10-4-75+

Features • wideband, 5-1250 MHz

- low mainline loss, 1.0 dB typ.
- excellent coupling flatness, ±0.3 typ.
- aqueous washable
- protected by U.S Patents 6,133,525 & 6,140,887

5 to 1250 MHz

CASE STYLE: CD542

Reel Size Devices/Reel

500, 1000

• protected by U.S Patents 6,133,525 & 6,140,887 Electrical Specifications at 25°C

excellent coupling flatness, ±0.1 dB typ.

ADC-16-4-75+

• low mainline loss, 0.7 dB typ.

• high directivity, 20 dB typ.

• good VSWR, 1.15:1 typ.

agueous washable

Features

Model No.	Frequency Range	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	R	eturn Loss (dB)	Input Power*
	(MHz)	Тур.	Тур.	Тур.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
ADO 40 4 75 :	5 - 500	0.7	16.3±0.5	25	23	25	22	0.5
<u>ADC-16-4-75+</u>	500 - 1250	0.9	16.3±0.5	15	25	26	26	1.0

^{* 5-50} MHz, 0.5W Max.; 50-1250 MHz, 1.0W Max.

Maximum Ratings

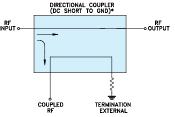
Operating Temperature	-40°C to 85°C		
Storage Temperature	-55°C to 100°C		
Permanent damage may occur if any of these limits are exceeded.			

Pin Connections Input Output Coupled Ground 75Ω Term External





Electrical Schematic



Electrical Specifications at 25°C

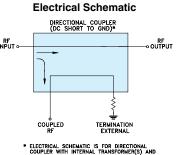
Model No.	Frequency Range	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	Re	eturn Loss (dB)	Input Power
	(MHz)	Тур.	Тур.	Тур.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
ADC 10 4 75 .	5 - 500	0.9	10.5±0.5	20	23	27	19	1.0
ADC-10-4-75+	500 - 1250	1.1	10.5±0.5	15	22	25	18	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°C			
Storage Temperature	-55°C to 100°C			
Permanent damage may occur if any of these limits are exceeded.				

Pin Connections

i ili ooliilootiolio	
Input	1
Output	6
Coupled	3
Ground	2
75Ω Term External	4
Isolate (Do not use)	5



Visit www.minicircuits.com for pricing,

availability, and complete model information.

ADC-20-4-75+ 19.7 dB 5 to 1250 MHz

Features

- low mainline loss, 0.5 dB typ.
- high directivity, 23 dB typ.
- excellent coupling flatness, ±0.15 dB typ.
- protected by U.S Patents 6,133,525 & 6,140,887

Electrical Specifications at 25°C

Model No.	Frequency Range	Mainline Loss (dB)	Coupling (dB)	Directivity (dB)	Re	eturn Loss (dB)	Input Power
	(MHz)	Тур.	Тур.	Тур.	Input Typ.	Output Typ.	Coupling Typ.	(W) Max.
ADO 00 4 75 :	5 - 870	0.5	19.7±0.5	25	25	25	20	1.0
ADC-20-4-75+	870 - 1250	0.7	19.7±0.5	17	22	22	15	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°C		
Storage Temperature	-55°C to 100°C		
Permanent damage may occur if any of these limits are exceeded.			

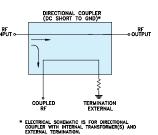
Pin Connections

Input	1
Output	6
Coupled	3
Ground	2
75Ω Term External	4
Isolate (Do not use)	5

CASE STYLE: CD542



Electrical Schematic



TCD-9-1W-75X+

75Ω 8.9 dB 5 to 2000 MHz

Features

- low mainline loss, 1.3 dB typ. (5-1000 MHz)
- aqueous washable
- · leads for excellent solderability
- protected by U.S Patent 6,140,887

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB) Typ.	Input Power (W) Max.
TOD 0 1W 7EV	5 - 1000	1.3	8.9±0.5	15	17.7	1.0
TCD-9-1W-75X+	1000 - 2000	2.5	8.5±0.5	10	17.7	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°C -55°C to 100°C		
Storage Temperature			
Permanent damage may occur if any of these limits are exceeded.			

Pin Connections

Input	3
Output	4
Coupled	1
Ground	2
75Ω Term External	6
Not used	5

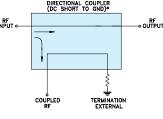




CASE STYLE: DB1627



Electrical Schematic



 75Ω

10 dB

ADC-25-4-75+

Features

- low mainline loss, 0.3 dB typ.
- · high coupling, 25 dB typ.
- excellent VSWR, 1.2:1 typ.
- · aqueous washable

Model No.

ADC-25-4-75+

protected by U.S Patents 6,133,525 & 6,140,887

Frequency

Range

(MHz)

5 - 500

500 - 1250

Mainline Loss

(dB)

Тур.

0.3

0.5

Coupling

Тур.

25±1.0

25±1.0

Electrical Specifications at 25°C

25 dB 5 to 1250 MHz

CASE STYLE: CD636



LRDC-10-2W-75+

Features

- low mainline loss, 1.1 dB typ.
- high directivity, 22 dB typ.



10 to 1200 MHz

CASE STYLE: QQQ130

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Mainline Loss (dB) Typ.	Coupling (dB) Typ.	Directivity (dB) Typ.	Return Loss (dB)	Input Power (W)
					Тур.	Max.
LRDC-10-2W-75+	30 - 1200	1.1	10±0.5	22	17.7	1.0

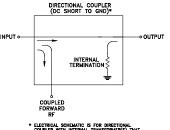
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Permanent damage may occur if any o	of these limits are exceeded.

Pin Connections

Input	6
Output	1
Coupled	4
Ground	2,5
Isolato (Do not uso)	-

Electrical Schematic



Maximum Ratings

Operating Temperature	-40°C to 85°C			
Storage Temperature	-55°C to 100°C			
D				

Pin Connections

Directivity

Тур.

20

16

Input	1
Output	6
Coupled	3
Ground	2
75Ω Term External	4
Isolate (Do not use)	5

Input

Тур.

26

20

Return Loss (dB)

Output

Тур.

26

21

Coupling

Typ.

25

20

Power

(W)

Max.

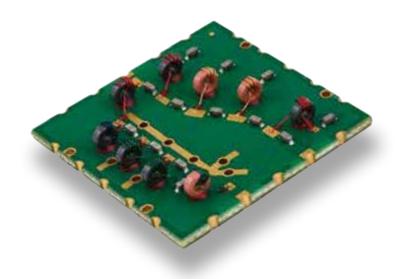
0.5

0.5

Electrical Schematic

HIGH PERFORMANCE DIPLEXERS

Designed specifically for CATV and broadband systems and equipment, Mini-Circuits' DPB-family of 75Ω diplexers are ideal for diplexing multiband signals into two channels. Excellent return loss and low insertion loss minimize signal loss through both channels, while high out-of-channel rejection with very steep transitions eliminates unwanted spurious signals in the pass bands. 4 models in the DPB-family offer 4 different channel splits within the DC to 1220 band to meet various system requirements.



FEATURES

- ▶ Insertion Loss as low as 0.8 dB
- ► Excellent Return Loss, 22 dB
- ► High Out-of-Channel Rejection, 50 dB
- ▶ Power Handling up to +30 dBm
- ► Various Channel Splits





Surface Mount **Diplexer**

DC to 1220 MHz (DC-42, 54-1220 MHz)

Maximum Ratings

Operating Temperature	-40° to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	27dBm Max.

Pin Connections

HIGH PASS PORT	7
LOW PASS PORT	9
COMMON PORT	18
GROUND	1-6,8,10-17,19,20

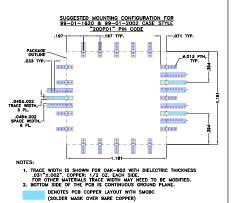
Outline Drawing



Outline Dimensions (inch mm)

Α	В	С	D	E	F	G	H	J	K
1.181	1.181	.300	.197	.394	.591	.787	.984	.071	.079
30.00	30.00	7.62	5.00	10.00	15.00	20.00	25.00	1.80	2.00
L	М	N	Р	Q	R	s	т	U	Wt.
.111	.394	.179	1.221	1.221	.079	.091	.280	.178	grams
2.82	10.00	4.54	31.01	31.01	2.01	2.31	7.11	4.52	3.8

Demo Board MCL P/N: TB-786+ Suggested PCB Layout (PL-435)



DENOTES COPPER LAND PATTERN FREE OF SOLDERMASI

Features

- · Low insertion loss
- 75Ω Impedance
- Excellent return loss
- High rejection

CASE STYLE: PA2002

Applications

- Cable TV systems (DOCSIS 3.1 stanard)
- Multiband radio systems

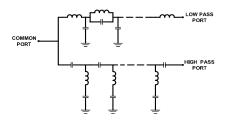
Electrical Specifications at 25°C

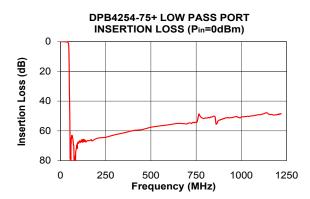
Par	ameter	Port Frequency (MHz)		Min.	Тур.	Max.	Unit
	Insertion Loss	Insertion Loss Low Pass High Pass		-	0.8 0.8	1.5 1.5	dB
Barra Barra		Low Pass	DC-42	18	22	-	
Pass Band Ret	Datum Lasa	High Pass	54-1220	17	22	-	40
	Hetum Loss	Return Loss Common	DC-42	18	22	-	dB
			54-1220	17	22	-	
Stop Band Isolation		Low Pass	54-700	45	50	-	
		Low Pass	700-1220	43	45	-	dB
		High Pass	DC-42	45	50	-	

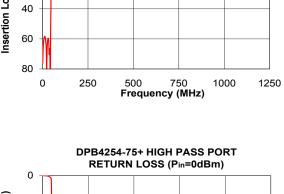
Typical Performance Data at 25°C

FREQUENCY (MHz)	INSERTION LOSS (dB)			RETURN LOSS (dB)	
	Low Pass Port	High Pass Port	Common Port	Low Pass Port	High Pass Port
1.0	0.04	76.19	46.46	47.21	0.02
10.0	0.10	58.76	31.99	34.11	0.03
40.0	0.55	68.16	28.57	26.99	0.58
42.0	0.73	77.07	26.13	24.80	0.70
44.5	1.37	51.98	16.71	17.61	0.89
45.5	2.57	40.72	9.25	8.78	1.01
46.0	3.86	33.91	6.59	5.82	1.09
47.0	8.60	19.25	3.73	2.37	1.45
47.5	12.18	13.40	3.49	1.57	1.93
48.0	16.74	8.74	4.15	1.12	2.96
49.5	34.02	2.28	13.39	0.65	12.04
50.0	37.91	1.73	18.70	0.59	16.67
54.0	70.61	0.78	30.05	0.40	27.62
55.0	72.01	0.71	30.35	0.38	27.25
60.0	64.95	0.51	28.76	0.34	25.46
100.0	68.36	0.29	32.99	0.27	32.67
250.0	64.30	0.28	28.44	0.17	28.74
300.0	62.66	0.29	26.35	0.16	26.71
500.0	57.58	0.35	21.76	0.15	22.03
700.0	55.33	0.42	19.69	0.19	20.30
1000.0	50.67	0.49	20.87	0.32	22.66
1220.0	48.51	0.67	26.83	0.44	31.42

Functional Schematic

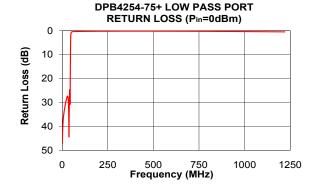


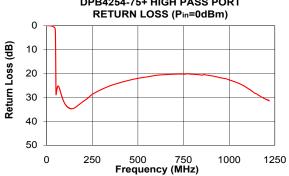


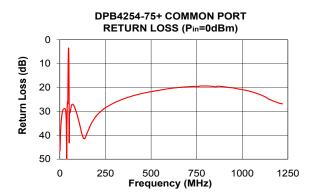


DPB4254-75+ HIGH PASS PORT

INSERTION LOSS (Pin=0dBm)







Performance Charts

Diplexer

DC to 1220 MHz (DC-65, 88-1220 MHz)

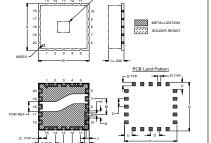
Maximum Ratings

Operating Lemperature	-40° to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	27dBm Max.
Permanent damage may occur if any o	

Pin Connections

HIGH PASS PORT	7
LOW PASS PORT	9
COMMON PORT	18
GROUND	1-6,8,10-17,19,20

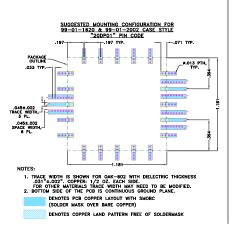
Outline Drawing



Outline Dimensions (inch mm)

	C	U			G		J	r.
1.181	.300	.197	.394	.591	.787	.984	.071	.079
30.00	7.62	5.00	10.00	15.00	20.00	25.00	1.80	2.00
M	N	P	Q	R	S	T	U	Wt.
.394	.179	1.221	1.221	.079	.091	.280	.178	grams
10.00	4.54	31.01	31.01	2.01	2.31	7.11	4.52	3.8
	30.00 M .394	1.181 .300 30.00 7.62 M N .394 .179	1.181 .300 .197 30.00 7.62 5.00 M N P .394 .179 1.221	1.181 .300 .197 .394 30.00 7.62 5.00 10.00 M N P Q .394 .179 1.221 1.221	1.181 .300 .197 .394 .591 30.00 7.62 5.00 10.00 15.00 M N P Q R .394 .179 1.221 1.221 .079	1.181 .300 .197 .394 .591 .787 30.00 7.62 5.00 10.00 15.00 20.00 M N P Q R S .394 .179 1.221 1.221 .079 .091	1.181 .300 .197 .394 .591 .787 .984 30.00 7.62 5.00 10.00 15.00 20.00 25.00 M N P Q R S T .394 .179 1.221 1.291 .079 .091 .280	30.00 7.62 5.00 10.00 15.00 20.00 25.00 1.80 M N P Q R S T U .394 .179 1.221 1.221 .079 .091 2.80 .178

Demo Board MCL P/N: TB-786+ Suggested PCB Layout (PL-435)



Features

- · Low insertion loss
- 75Ω Impedance
- Excellent return loss
- · High rejection

Applications

- Cable TV systems (DOCSIS 3.1 stanard)
- Multiband radio systems

Electrical Specifications at 25°C

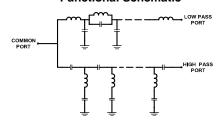
Par	ameter	Port	Frequency (MHz)	Min.	Min. Typ. Max.		Unit	
	Insertion Loss	Low Pass High Pass	DC-65 88-1220	-	0.9 1.2	1.5 1.6	dB	
Pass Band		Low Pass	DC-65	18	22	-		
Pass Band	Detum Less	High Pass	88-1220	17	22	-		
	Return Loss	0	DC-65	18	22 -	dB		
		Common	88-1220	17	22	-		
		Low Pass	88-900	45	50	-		
Stop Band Iso	olation	LOW Fass	900-1220	43	45	-	dB	
		High Pass	DC-65	45	50	-		

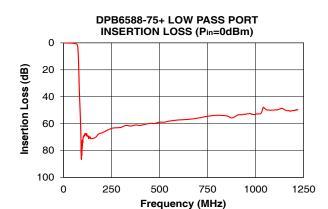
CASE STYLE: PA2002

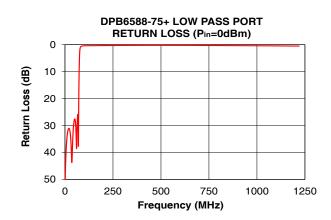
Typical Performance Data at 25°C

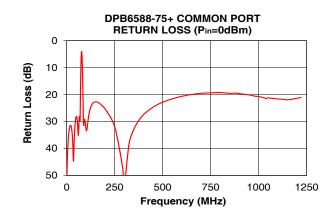
FREQUENCY (MHz)		ON LOSS B)	RETURN LOSS (dB)		
	Low Pass Port	High Pass Port	Common Port	Low Pass Port	High Pass Port
1.0	0.04	85.70	51.54	51.03	0.03
10.0	0.08	75.18	34.87	34.81	0.01
50.0	0.30	79.72	28.11	27.57	0.25
60.0	0.50	71.47	35.00	38.45	0.45
65.0	0.71	72.36	29.02	27.15	0.59
70.0	1.13	46.18	28.91	37.15	0.77
74.0	2.87	32.11	9.96	9.24	1.03
75.0	4.28	26.87	7.10	6.07	1.16
76.0	6.45	20.73	5.18	3.87	1.36
78.0	13.24	10.96	4.02	1.70	2.37
79.5	20.35	6.32	5.25	1.12	4.27
80.0	23.05	5.24	6.05	1.01	5.22
81.5	31.33	3.12	9.48	0.81	8.99
85.0	45.19	1.54	21.56	0.61	22.52
88.0	56.57	1.20	31.45	0.53	40.52
100.0	73.85	0.78	32.40	0.42	26.41
250.0	63.55	0.43	31.93	0.32	24.72
300.0	62.79	0.43	53.49	0.30	26.76
500.0	58.93	0.46	22.84	0.26	21.95
900.0	54.17	0.56	19.64	0.37	21.78
1000.0	52.95	0.56	20.72	0.41	27.02
1220.0	49.63	0.61	21.03	0.53	25.18

Functional Schematic

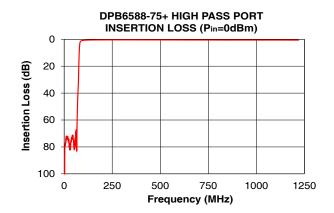


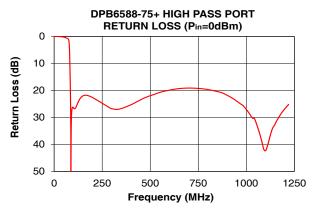






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Performance Charts DPB85102-75+

Diplexer

DC to 1220 MHz (DC-85, 102-1220 MHz)

Maximum Ratings

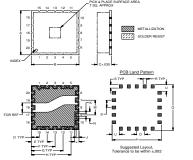
Operating Temperature	-40° to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	29dBm Max.

Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation

Pin Connections

HIGH PASS PORT	7
LOW PASS PORT	9
COMMON PORT	18
GROUND	1-6,8,10-17,19,20

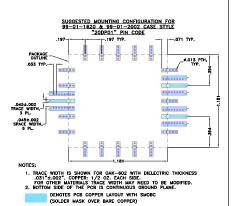
Outline Drawing



Outline Dimensions (inch mm)

Α	В	С	D	E	F	G	Н	J	K	
1.181	1.181	.300	.197	.394	.591	.787	.984	.071	.079	
30.00	30.00	7.62	5.00	10.00	15.00	20.00	25.00	1.80	2.00	
L	M	N	P	Q	R	s	T	U	Wt.	
.111	.394	.179	1.221	1.221	.079	.091	.280	.178	grams	
2.82										

Demo Board MCL P/N: TB-786+ Suggested PCB Layout (PL-435)



Features

- Low insertion loss
- 75Ω Impedance
- Excellent return loss
- High rejection

Applications

- Cable TV systems (DOCSIS 3.1 stanard)
- Multiband radio systems

Electrical Specifications at 25°C

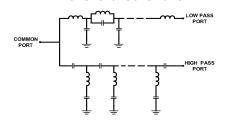
Pai	rameter	Port	Frequency (MHz)	Min.	Min. Typ. Max.		Unit	
	Insertion Loss	Low Pass	DC-85	-	1.2	1.7	dB	
	IIISEILIOII LOSS	High Pass	102-1220	-	1.3	1.8	ub	
Pass Band		Low Pass	DC-85	18	22	-		
Pass Band	Dotum Loop		22	-	dB			
	Return Loss	Heturn Loss	Common	DC-85	18	22	-	aв
		Common	102-1220	16	22	-		
Stop Band Iso	Mation	Low Pass	102-1220	45	50	-	dB	
Stop Ballu ist	nation	High Pass	DC-85	45	50	-		

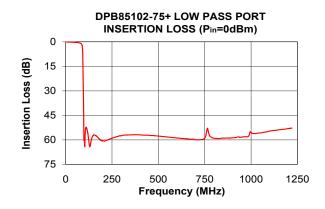
CASE STYLE: PA2002

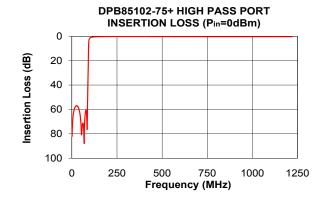
Typical Performance Data at 25°C

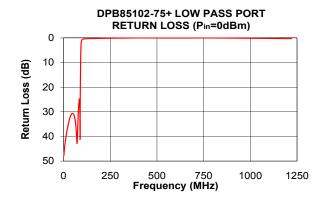
FREQUENCY (MHz)		ON LOSS IB)	RETURN LOSS (dB)		
	Low Pass Port	High Pass Port	Common Port	Low Pass Port	High Pass Port
1.00	0.05	82.15	48.38	47.86	0.01
5.00	0.08	67.67	44.83	44.43	0.01
40.00	0.21	60.39	33.40	31.22	0.04
85.00	1.24	72.24	27.77	24.80	0.68
89.00	2.20	36.13	23.42	25.52	1.32
89.50	2.49	32.61	20.47	20.48	1.52
91.00	4.26	21.51	13.82	10.74	2.86
92.00	7.42	12.06	12.82	6.27	6.51
93.00	13.76	5.92	16.55	3.25	19.52
95.00	26.94	3.01	15.60	1.46	13.76
96.00	34.49	2.45	16.53	1.16	14.84
96.50	38.73	2.24	17.34	1.06	15.77
97.75	51.51	1.83	20.16	0.88	18.87
98.00	54.54	1.77	20.83	0.85	19.61
100.00	58.26	1.39	28.35	0.69	26.39
102.00	62.58	1.16	39.66	0.59	30.56
120.00	56.29	0.53	28.34	0.34	26.26
150.00	57.08	0.33	26.90	0.26	26.50
250.00	58.93	0.22	29.28	0.12	26.09
500.00	57.61	0.25	19.89	0.02	19.52
1000.00	55.35	0.32	20.86	0.13	21.99
1220.00	52.81	0.31	24.85	0.29	34.21

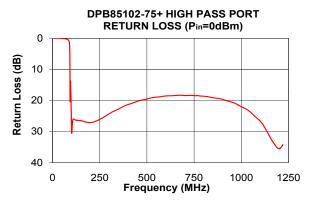
Functional Schematic

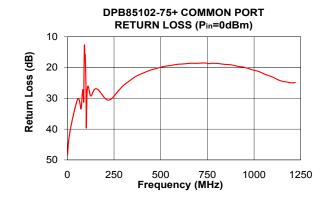












0

250

Surface Mount

Diplexer

75Ω DC to 1220 MHz (DC-204, 258-1220 MHz)

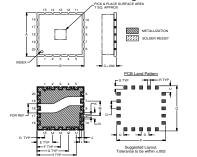
Maximum Ratings

Permanent damage may occur if any of These ratings are not intended for con-	
RF Power Input	30dBm Max.
Storage Temperature	-55°C to 100°C
Operating Temperature	-40° to 85°C

Pin Connections

HIGH PASS PORT	
LOW PASS PORT	9
COMMON PORT	18
GROUND	1-6 8 10-17 19 20

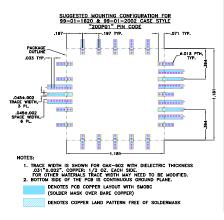
Outline Drawing



Outline Dimensions (inch mm)

K	J	H	G	F	E	D	C	В	A
.079	.071	.984	.787	.591	.394	.197	.300	1.181	1.181
2.00	1.80	25.00	20.00	15.00	10.00	5.00	7.62	30.00	30.00
Wt.	U	т	s	R	Q	Р	N	M	L
grams	.178	.280	.091	.079	1.221	1.221	.179	.394	.111
3.8	4.52	7.11	2.31	2.01	31.01	31.01	4.54	10.00	2.82

Demo Board MCL P/N: TB-786+ Suggested PCB Layout (PL-435)



Features

- · Low insertion loss
- 75Ω Impedance
- Excellent return loss • High rejection

- **Applications** • Cable TV systems (DOCSIS 3.1 stanard)
- Multiband radio systems

Electrical Specifications at 25°C

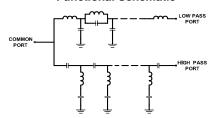
Parameter		Port	Frequency (MHz)	Min.	Тур.	Max.	Unit
Pass Band	Insertion Loss	Low Pass	DC-204	-	0.9	1.5	dB
		High Pass	258-1220	-	0.8	1.5	
	Return Loss	Low Pass	DC-204	18	22	-	
		High Pass	258-1220	17	22	-	dB
		Common	DC-204	18	22	-	ub
			Common	258-1220	17	22	-
Stop Band Isolation		Low Pass	258-1220	45	50	-	dB
		High Pass	DC-204	45	50	-	uБ

CASE STYLE: PA2002

Typical Performance Data at 25°C

FREQUENCY (MHz)	INSERTION LOSS (dB)		RETURN LOSS (dB)		
	Low Pass Port	High Pass Port	Common Port	Low Pass Port	High Pass Port
1	0.05	91.13	50.42	49.61	0.01
5	0.07	81.39	46.61	47.07	0.01
100	0.27	68.22	28.06	27.70	0.12
204	0.87	51.03	29.08	32.38	0.82
215	1.30	31.20	22.25	21.83	1.04
220	1.84	24.43	16.62	14.67	1.28
221	2.03	22.93	15.37	13.31	1.36
225	3.51	15.09	10.47	7.87	1.95
228	6.31	8.98	7.98	4.34	3.14
230	9.46	6.10	7.53	2.78	4.52
234	17.85	3.13	9.11	1.39	8.11
236	22.07	2.44	10.55	1.12	10.01
240	28.90	1.66	13.95	0.85	13.92
242	31.62	1.44	15.82	0.78	15.96
250	42.10	0.97	24.68	0.62	25.25
258	55.20	0.77	33.72	0.54	31.25
260	59.43	0.74	33.18	0.53	30.46
300	74.38	0.45	27.98	0.42	28.66
500	53.15	0.26	30.92	0.14	27.45
700	52.18	0.25	27.06	0.01	28.43
1000	52.11	0.31	21.69	0.09	21.74
1220	51.52	0.31	26.68	0.26	27.11

Functional Schematic



DPB204258-75+ LOW PASS PORT INSERTION LOSS (Pin=0dBm) 0 Insertion Loss (dB) 20 60 100

500

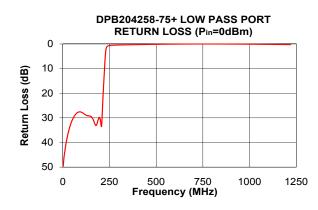
750

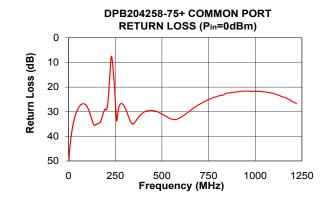
Frequency (MHz)

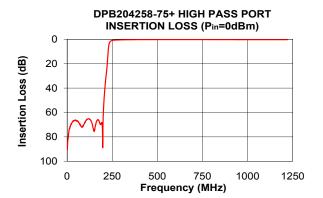
1000

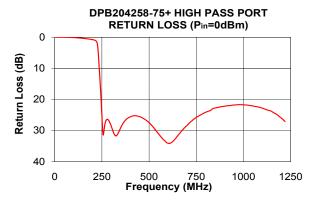
1250

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POWER SPLITTERS/ COMBINERS

Mini-Circuits offers a diverse range of RF splitter/combiners for DOCSIS 3.1 applications. Our selection includes models from 2 to 8 ways in-phase, as well as 2-way 180° hybrids. They come in a variety of case styles including core and wire and printed laminate, and all models provide low insertion loss, high isolation and minimal phase and amplitude unbalance.





Power Splitter/Combiner

5 to 1250 MHz

Features

- wideband, 5 to 1250 MHz
- low insertion loss, 0.9 dB typ.
- aqueous washable
- protected under U.S. Patent 6,133,525

Applications

- DOCSIS® 3.1 Systems
- cellular
- VHF/UHF
- communication systems
- CATV

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Frequency Range		5		1250	MHz
	5-50	_	0.25	0.5	
Insertion Loss, above 3.0 dB	50-1000	_	0.75	1.2	dB
	1000-1250	_	1.00	1.6	
	5-50	17	20	_	
Isolation	50-1000	18	22	_	dB
	1000-1250	17	19		
	5-50	_	0.5	1.0	
Phase Unbalance	50-1000	_	1.5	3.5	Degree
	1000-1250	_	2.0	4.0	
	5-50	_	0.1	0.2	
Amplitude Unbalance	50-1000	_	0.15	0.3	dB
	1000-1250	_	0.2	0.4	
VSWR (Port S)	5-1000	_	1.15	1.30	:1
VSWN (FOILS)	1000-1250	_	1.25	1.35	.1
VCWD (Dort 1 and Dort 0)	5-1000	_	1.25	1.4	
VSWR (Port 1 and Port 2)	1000-1250	_	1.2	1.4	:1

Maximum Ratings

Parameter	Ratings					
Operating Temperature	-40°C to 85°C					
Storage Temperature	-55°C to 100°C					
Power Input (as a splitter)	0.5W max.					
Internal Dissipation	0.125 W max.					

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

Function	Pin Number				
SUM PORT	1				
PORT 1	3				
PORT 2	4				
GROUND	6				
NOT USED	2,5				

CASE STYLE: CD636

Available Tape and Reel at no extra cost

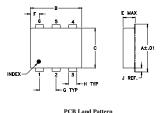
Devices/Reel 20, 50, 100, 200, 500

Electrical Schematic



ADP-2-122-75+

Outline Drawing

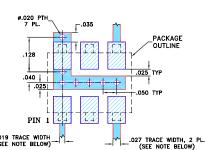




Outline Dimensions (inch)

A 272 3.91	B .310 7.87	C .220 5.59	D .100 2.54	E . 162 4.11	F .055 1.40	. 10 2.5
H 030).76	J . 026 0.66	K . 065 1.65	L . 300 7.62			gram 0.2

Demo Board MCL P/N: TB-243 Suggested PCB Layout (PL-141)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002". COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

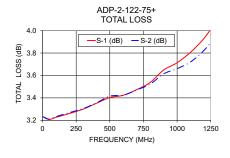
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

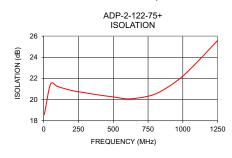
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

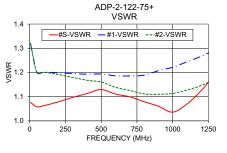
Typical Performance Data

Frequency (MHz)	Total (d	Loss¹ B)	Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2	, ,		,			
5	3.23	3.23	0.00	18.60	0.03	1.08	1.32	1.32
50	3.21	3.21	0.00	21.49	0.17	1.06	1.20	1.20
100	3.23	3.23	0.01	21.23	0.33	1.06	1.20	1.20
200	3.26	3.27	0.01	20.87	0.66	1.08	1.20	1.19
300	3.30	3.30	0.00	20.64	0.93	1.10	1.20	1.18
400	3.35	3.35	0.00	20.43	1.21	1.11	1.19	1.17
500	3.40	3.42	0.01	20.26	1.43	1.13	1.19	1.16
600	3.42	3.42	0.00	20.07	1.56	1.11	1.19	1.14
700	3.47	3.47	0.00	20.19	1.68	1.10	1.19	1.13
800	3.54	3.52	0.01	20.52	1.80	1.08	1.19	1.11
900	3.65	3.61	0.03	21.24	1.76	1.06	1.21	1.11
1000	3.71	3.66	0.05	22.22	1.84	1.04	1.22	1.11
1100	3.81	3.72	0.09	23.50	1.90	1.07	1.24	1.13
1200	3.93	3.82	0.11	24.89	1.96	1.13	1.27	1.15
1300	4.10	3.97	0.13	26.28	1.92	1.19	1.29	1.17

1. Total Loss = Insertion Loss + 3dB splitter loss.







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2-Way 0° Power Splitters

ADP-2-10-75M+ 5 to 1200 MHz

Features

- wideband, 5 to 1200 MHz
- · high isolation, 27 dB typ.

Maximum Ratings

Power Input (as a splitter)

Operating Temperature

Storage Temperature

Internal Dissipation

- aqueous washable
- protected under U.S. Patent 6,133,525

CASE STYLE: CD636

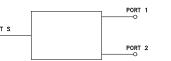
Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Insertion Loss Above 3 dB (dB) Typ.	Isolation (dB) Typ.	Phase Unbalance (Deg.) Max.	Amplitude Unbalance (dB) Max.
	5 - 50	0.2	26	1.0	0.1
ADD 0 10 75M.	50 - 500	0.4	27	2.0	0.2
<u>ADP-2-10-75M+</u> -	500 - 1000	0.7	29	4.0	0.3
	1000 - 1200	1.0	27	5.0	0.4

SUM Port	1
Port 1	3
Port 2	
Ground	6
Externally connect together & isolate	2,5

Electrical Schematic





ADP-2-20-75M+

Permanent damage may occur if any of these limits are exceeded.

-40°C to 85°C

-55°C to 100°C

0.125 W

Features

- wideband, 5 to 2000 MHz
- low insertion loss, 0.5 dB typ.
- aqueous washable
- protected under U.S. Patent 6,133,525

5 to 2000 MHz

CASE STYLE: CD542

20, 50, 100, 200, 500 500, 1000

		-	at 110 or
		Reel Size	Devices/Reel
		7"	20, 50, 100, 20
Phase	Amplitude	13"	500, 1000
Jnbalance	Unbalance		
(Deg.)	(dB)		
Max.	Max.		
····			
1.0	0.15		

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Insertion Loss Above 3 dB (dB) Typ.	Isolation (dB) Typ.	Phase Unbalance (Deg.) Max.	Amplitude Unbalance (dB) Max.
	5 - 50	0.4	16	1.0	0.15
ADP-2-20-75+	50 - 1000	0.5	16	4.0	0.3
	1000 - 2000	0.6	28	5.0	0.6

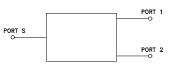
Maximum Ratings

Operating Temperature	-40°C to 85°C				
Storage Temperature	-55°C to 100°C				
Power Input (as a splitter)	0.5W				
Internal Dissipation	0.25 W				
Permanent damage may occur if any of these limits are exceeded.					

Pin Connections

SUM Port	1
Port 1	3
Port 2	4
Ground	6
lot used	2,5

Electrical Schematic



CDP-2-122-75+

Features

- wideband, 5 to 1200 MHz
- low insertion loss, 0.8 dB typ.
- excellent matching return loss, 20 dB typ.
- aqueous washable

Electrical Specifications at 25°C

Model No.	Frequency Range	Insertion Loss Above 3 dB	Isolation (dB)	Phase Unbalance	Amplitude Unbalance	VSWR (:1)		
		(MHz)	(dB) Typ.	Typ.	(Deg.) Max.	(dB) Max.	Port-S Typ.	Port 1 & 2 Typ.
		5 - 50	0.4	24	3.0	0.5	1.05	1.20
NEW	CDP-2-122-75+	50 - 600	0.6	25	3.0	0.4	1.10	1.15
	_	600 - 1200	1.0	20	5.0	0.6	1.25	1.10

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W
Internal Dissipation	0.125 W
Permanent damage may occur if any of t	hese limits are exceeded

Pin Connections

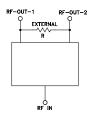
SUM Port	6
Port 1	3
Port 2	4
Ground	1
Not used	2,5
Ext. resistor 165 Ω	3,4

Electrical Schematic

 75Ω

5 to 1200 MHz

CASE STYLE: TT1491-2



SYPS-2-282-75+

- wideband, 5 to 2750 MHz
- low insertion loss, 0.8 dB typ.
- high isolation, 25 dB typ.

5 to 2750 MHz 75Ω

Features

CASE STYLE: AH202-2

Electrical Specifications at 25°C

Model No.	Frequency Range (MHz)	Insertion Loss Above 3 dB (dB) Typ.	Isolation (dB) Typ.	Phase Unbalance (Deg.) Max.	Amplitude Unbalance (dB) Max.
	5 - 50	0.5	20	2.0	0.2
SYPS-2-282-75+	50 - 1375	0.8	25	4.0	0.4
	1375 - 2700	1.5	22	6.0	1.0

Maximum Ratings

Operating Temperature	-40°C to 85°				
Storage Temperature	-55°C to 100°C				
Power Input (as a splitter)	0.5 W				
Internal Dissipation	0.05 W				
Permanent damage may occur if any of these limits are exceeded.					

Pin Connections

SUM Port	8
Port 1	4
Port 2	5
Ground	1,2,3,6,7

Electrical Schematic



Visit www.minicircuits.com for pricing,

availability, and complete model information.

CDP-2-122W-75+

2-Way 0°

 75Ω

1 to 1250 MHz

Features

- wideband, 1 to 1250 MHz
- low insertion loss, 0.8 dB typ.
- good isolation, 21 dB typ.
- aqueous washable

Applications

- DOCSIS® 3.1 Systems
- cellular VHF/UHF
- communication systems

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit	
Frequency Range		1		1250	MHz	
	1-10	_	0.4	0.9		
Insertion Loss Above 3.0 dB	10-870	_	0.8	1.3	dB	
Insertion Loss Above 3.0 dB	870-1000	_	1.1	1.5	ав	
	1000-1250	_	1.5	1.9		
	1-10	17	23.0			
Isolation	10-870	16	21.0	_	dB	
Isolation	870-1000	16	19.0	_	ub	
	1000-1250	15	19.0			
	1-10	_	2.0	5.0		
Phase Unbalance	10-870	_	1.5	4.0	Doggo	
Phase Unbalance	870-1000	_	1.5	4.0	Degree	
	1000-1250	_	1.0	4.0		
	1-10	_	0.25	0.6		
Association of the state of	10-870	_	0.20	0.6	dB	
Amplitude Unbalance	870-1000	_	0.25	0.6	aв	
	1000-1250	_	0.30	0.7		
	1-10	_	1.16	1.35		
	10-870	_	1.15	1.25		
VSWR (Port S)	870-1000	_	1.20	1.35	:1	
	1000-1250	_	1.20	1.40		
	1-10	_	1.25	1.50		
	10-870 —		1.15	1.30		
VSWR (Port 1-2)	870-1000	_	1.25	1.40	:1	
	1000-1250	_	1.30	1.60		

^{1.} Mainline loss includes theoretical power loss at coupled port.

Maximum Ratings

Parameter	Ratings				
Operating Temperature	-40°C to 85°C				
Storage Temperature	-55°C to 100°C				
Power Input (as a splitter)	1W max.				
Internal Dissipation	0.125W max.				

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

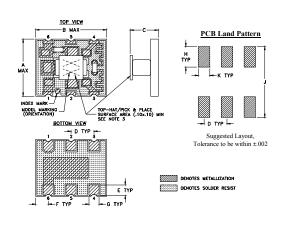
Function	Pin Number					
SUM PORT	1					
PORT 1	3					
PORT 2	4					
GROUND	6					
NOT USED	2,5					

Electrical Schematic

CASE STYLE: TT1491-1



Outline Drawing



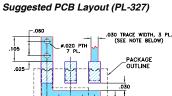
Outline Dimensions (inch mm)

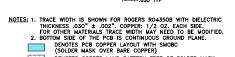
 A
 B
 C
 D
 E
 F
 G
 H
 J
 K

 .255
 .310
 .100
 .050
 .055
 .044
 .090
 .310
 .050

 6.48
 7.87
 3.38
 2.54
 1.27
 1.40
 1.12
 2.29
 7.87
 1.27

Demo Board MCL P/N: TB-565+

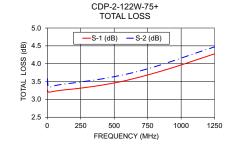


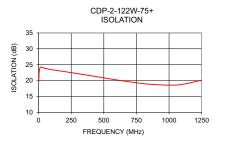


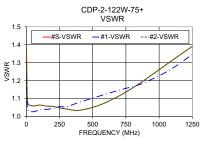
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

			, ·					
Frequency (MHz)		Loss¹ B)	Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
1	3.26	3.58	0.32	19.50	2.05	1.23	1.24	1.37
10	3.20	3.35	0.15	23.90	0.41	1.16	1.04	1.08
50	3.23	3.38	0.15	23.81	0.10	1.15	1.03	1.06
100	3.25	3.42	0.16	23.40	0.23	1.15	1.04	1.06
150	3.28	3.44	0.17	23.11	0.33	1.15	1.04	1.06
200	3.29	3.46	0.17	22.81	0.41	1.15	1.05	1.06
250	3.32	3.49	0.17	22.49	0.49	1.14	1.06	1.05
300	3.34	3.51	0.17	22.16	0.56	1.14	1.05	1.04
400	3.40	3.57	0.17	21.52	0.68	1.13	1.08	1.04
550	3.50	3.67	0.18	20.51	0.81	1.13	1.11	1.06
700	3.63	3.81	0.17	19.57	0.99	1.12	1.15	1.12
850	3.79	3.97	0.18	18.83	0.90	1.14	1.18	1.18
1000	3.96	4.16	0.19	18.56	0.52	1.16	1.23	1.26
1100	4.09	4.29	0.20	18.77	0.15	1.17	1.27	1.31
1250	4.28	4.47	0.19	20.11	0.66	1.14	1.35	1.39
		1. To	tal Loss = Insertion Los	ss + 3dB splitter loss.				







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2-Way 0° 75Ω 5 to 1250 MHz

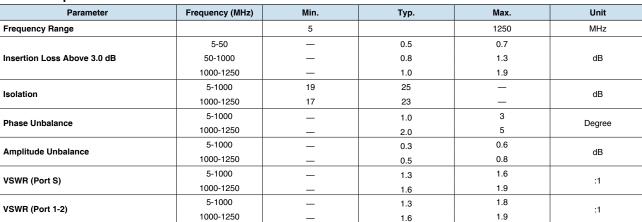
Features

- low insertion, 0.8 dB typ.
- excellent amplitude unbalance, 0.3 dB typ.
- very good phase unbalance, 1.0 deg. typ.
- external resistor & capacitor required
- aqueous washable
- leads for excellent solderability
- · low cost

Applications

- DOCSIS® 3.1 Systems
- VHF/UHF
- CATV
- cellular

Electrical Specifications at 25°C



^{1.} Mainline loss includes theoretical power loss at coupled port.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	0.5W max.

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

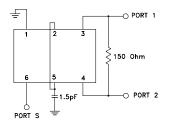
Function	Pin Number
SUM PORT	6
PORT 1	3
PORT 2	4
GROUND	1
CONNECT	2,5
EXT. RESISTOR 150 Ω	3,4
EXT. CAPACITOR 1.5pF	2 OR 5 TO GND

Electrical Schematic

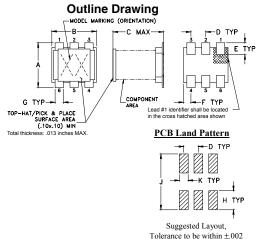
CASE STYLE: DB1627

Available Tape and Reel at no extra cost

20, 50, 100, 200, 500



TCP-2-122-75X+



Outline Dimensions (inch mm)

J K .190 .030 4.83 0.76

.050 1.27

.160 4.06

H .065 1.65

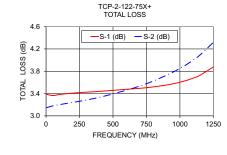
RESISTOR R1: 150 Ohm, 0805 SIZE CAPACITOR C1: 1.5 pF, 0805 SIZE NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE POB IS CONTINUOUS GROUND PLANE. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER) DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Demo Board MCL P/N: TB-124 Suggested PCB Layout (PL-002)

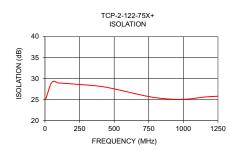
Typical Performance Data

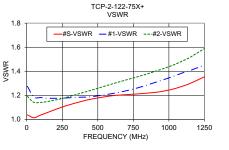
Frequency (MHz)		Loss¹ B)	Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2	(,		(* - 3 /			
5	3.39	3.15	0.24	25.09	1.29	1.04	1.27	1.19
50	3.36	3.18	0.19	29.10	0.06	1.01	1.19	1.14
100	3.38	3.20	0.18	28.95	0.10	1.04	1.18	1.14
150	3.40	3.22	0.17	28.84	0.21	1.06	1.18	1.15
250	3.42	3.26	0.16	28.59	0.39	1.10	1.18	1.17
350	3.43	3.31	0.12	28.33	0.53	1.14	1.18	1.21
450	3.45	3.36	0.09	27.89	0.64	1.17	1.19	1.24
600	3.48	3.46	0.02	26.81	0.72	1.20	1.21	1.29
700	3.49	3.53	0.04	26.06	0.67	1.21	1.24	1.33
800	3.52	3.62	0.10	25.45	0.51	1.21	1.27	1.36
925	3.56	3.76	0.19	25.07	0.09	1.23	1.32	1.41
1025	3.62	3.88	0.27	25.11	0.42	1.25	1.36	1.45
1100	3.68	4.00	0.32	25.39	0.90	1.28	1.39	1.49
1150	3.73	4.09	0.36	25.61	1.30	1.30	1.41	1.52
1250	3.88	4.32	0.44	25.80	1.99	1.35	1.45	1.59

1. Total Loss = Insertion Loss + 3dB splitter loss



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Power Splitters/Combiners

2-Way 180°

5 to 1250 MHz

SBTCJ-122-75X+





CASE STYLE: DB1627

Features

- wideband, 5 to 1250 MHz
- low insertion loss, 1.5 dB typ.
 leads for excellent solderability
- low cost

Electrical Specifications at 25°C

	Model No.	Frequency Range	Insertion Loss Above 3 dB	Isolation (dB)	Phase Unbalance	Amplitude Unbalance	VSWR (:1)	
		(MHz)	(dB) Typ.	Тур.	(Deg.) Max.	IVIAX.	Port-S Typ.	Port 1 & 2 Typ.
		5 - 50	1.1	29	3.0	0.6	1.27	1.23
NEW!	SBTCJ-122-75+	50 - 1000	1.5	28	9.0	0.9	1.25	1.28
	-	1000 - 1250	2.1	20	12.0	1.7	1.25	1.68

Maximum Ratings

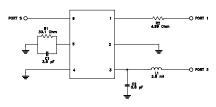
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1.0 W

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

Sum port	6
Port 1 (180°)	1
Port 2 (0°)	3
Ground	4
Ext. inductor series 3-6hH	3
Ext. capacitor 0.8pF	3 to gnd
Ext. capacitor 3.6pF	5 to gnd
Ext. resistor 30.1Ω	5 to gnd
Ext. resistor series 4.99Ω	1
Ground or not used	2

Electrical Schematic



4-Way 0°

10 to 1500 MHz

SCA-4-15-75+

Features

- wideband, 10 to 1500 MHz
- high isolation, 25 dB typ.

Maximum Ratings

Power Input (as a splitter)

Operating Temperature

Storage Temperature

Internal Dissipation

excellent amplitude unbalance, 0.3 dB typ.



CASE STYLE: DZ943

20, 50, 100, 200, 500 500, 1000

Electrical Specifications at 25°C

Permanent damage may occur if any of these limits are exceeded.

Model No.	Frequency Range (MHz)	Insertion Loss Above 6 dB (dB) Typ.	Isolation (dB) Typ.	Phase Unbalance (Deg.) Max.	Amplitude Unbalance (dB) Max.
SCA-4-15-75+ -	10 - 40	0.5	19	8	0.8
	40 - 900	1.2	25	9	0.9
	900 - 1200	1.4	19	12	1.0
	1200 - 1500	2.0	18	16	1.1

-40°C to 85°C

0.5W

0.375 W

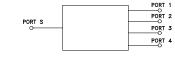
-55°C to 100°C

Pin Connection	ons
----------------	-----

SUM Port	3
Port 1	6
Port 2	7
Port 3	9
Port 4	10
Ground	12458

Electrical Schematic

Reel Size Devices/Reel



3-Way 0°

SYPS-3-12W-75+



CASE STYLE: AH202

5 to 1200 MHz



- wideband, 5 to 1200 MHz
- low insertion loss, 0.7 dB typ.
- good isolation, 25 dB typ.
- wide frequency band, 5 to 1200 MHz, useable 5 to 1300 MHz
- · low amplitude unbalance, 0.2 dB typ.
- · low phase unbalance, 2.0 deg. typ.

Electrical Specifications at 25°C

Model No.	Frequency Range	Insertion Loss Above 4.8 dB	Isolation (dB)	Phase Unbalance	Amplitude Unbalance		SWR :1)
	(MHz)	(dB) Typ.	Тур.	(Deg.) Max.	(dB) Max.	Port-S Typ.	Port 1 & 2 Typ.
	5 - 20	0.6	26	_	_	1.0	1.3
SYPS-3-12W-75+	20 - 860	0.7	25	3.0	0.1	1.2	1.2
-	860 - 1200	1.2	20	5.0	0.8	1.25	1.25

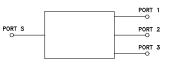
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W
Internal Dissipation	0.15 W
Permanent damage may occur if any of t	hasa limits ara avcaarlarl

Pin Connections

SUM Port	8
Port 1	1
Port 2	4
Port 3	5
Ground	2,3,6,7

Electrical Schematic



8-Way 0°

• wideband, 5 to 1250 MHz

· good isolation, 25 dB typ.

aqueous washable

shielded metal case

Features

75Ω **5 to 1250 MHz**

SCPA-8-122-75+



CASE STYLE: HU1371

Electrical Specifications at 25°C

	Model No.	Frequency Range	Insertion Loss Above 9 dB	Isolation (dB)	Phase Unbalance	Amplitude Unbalance (dB) Max.		SWR :1)
		(MHz)	(dB) Typ.	Тур.	(Deg.) Max.		Port-S Typ.	Port 1 - 8 Typ.
		5 - 50	0.9	30	8.0	0.3	1.4	1.3
NEW! SCPA-8-122-75+	M 00DA 0 400 75	50 - 500	1.6	20	9.0	0.8	1.3	1.2
	V! SCPA-8-122-75+	500 - 1000	2.6	20	10.0	2.0	1.5	1.4
	1000 - 1250	4.0	18	18.0	2.8	1.9	1.6	

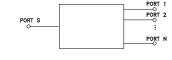
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W
Internal Dissipation	0.875 W
Permanent damage may occur if any o	of these limits are exceeded.

Pin Connections

i ili oolilicctions	
SUM Port	
Port 1	
Port 2	
Port 3	
Port 4	
Port 5	
Port 6	1
Port 7	1
Port 8	1:
Ground	2,7,8,13,1

Electrical Schematic



Visit www.minicircuits.com for pricing,

availability, and complete model information.

Power Splitter/Combiner

5 to 1250 MHz



CASE STYLE: YY161

Features

- wideband, 5 to 1250 MHz
- high isolation,25 dB typ
- excellent amplitude unbalance, 0.4 dB typ.

Applications

- DOCSIS® 3.1 Systems
- cellular CATV
- receivers/transmitters

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Frequency Range		5		1250	MHz
	5-100	_	0.6	1.0	
Insertion Loss, above 6.0 dB	100-1000	_	1.1	1.9	dB
	1000-1250	_	2.0	2.9	
1.16	5-1000	16	25	_	dB
Isolation	1000-1250	14	18	_	иь
	5-100	_	1.0	3.0	
Phase Unbalance	100-1000	_	6.0	12.0	Degree
	1000-1250	_	9.0	16.0	
Amplitude I Inhalance	5-1000	_	0.5	0.9	dB
Amplitude Unbalance	1000-1250	_	0.9	1.5	иь
VSWR (Port S)	5-1000	1.32	1.22	_	.4
VSWH (POILS)	1000-1250	1.49	1.28	_	:1
VOND (D-+1 4 4)	5-1000	1.57	1.28	_	.4
VSWR (Port 1 - 4)	1000-1250	2.32	1.57	_	:1

Maximum Ratings

B	B. 17
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W max.
Internal Dissipation	0.375W max.

Permanent damage may occur if any of these limits are exceeded.

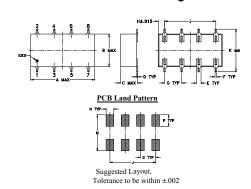
Pin Connections

Function	Pin Number
SUM PORT	3
PORT 1	2
PORT 2	4
PORT 3	6
PORT 4	8
GND	1,5,7

Electrical Schematic



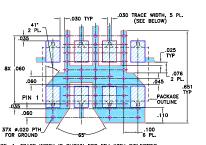
Outline Drawing



Outline Dimensions (inch)

	F	Е	D	С	В	Α
0	0.02	0.05	0.01	0.28	0.38	0.75
5.0	0.51	1.27	0.25	7.11	9.65	19.05
١	Р	N	M	K	J	Н
gram	0.15	0.1	0.47	0.45	0.6	0.075
1.6	3.81	2.54	11.94	11.43	15.24	1.91

Demo Board MCL P/N: TB-184 Suggested PCB Layout (PL-175)



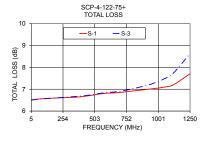
DENOTES PCB COPPER LAYOUT

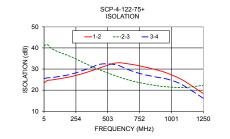
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

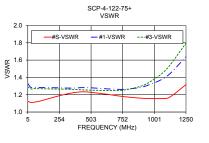
Typical Performance Data

Freq. (MHz)	S-1		Loss¹ B) S-3	S-4	Amp. Unbal. (dB)	ls 1-2	olatior (dB) 2-3	n 3-4	Phase Unbal. (deg.)	VSWR S	VSWR 1	VSWR 2	VSWR 3	VSWR 4
5	6.51	6.52	6.51	6.51	0.01	23.35	41.04	25.49	0.04	1.12	1.33	1.33	1.29	1.29
30	6.53	6.52	6.52	6.52	0.01	24.56	41.58	25.80	0.21	1.11	1.28	1.28	1.27	1.26
60	6.55	6.55	6.55	6.55	0.00	24.80	39.92	25.94	0.43	1.12	1.28	1.29	1.27	1.27
100	6.57	6.57	6.56	6.57	0.01	25.14	38.55	26.26	0.69	1.13	1.28	1.29	1.27	1.27
220	6.60	6.62	6.61	6.61	0.02	26.46	35.72	27.61	1.54	1.18	1.28	1.29	1.27	1.27
350	6.63	6.69	6.67	6.67	0.06	28.67	31.99	30.18	2.29	1.22	1.28	1.29	1.26	1.28
450	6.70	6.77	6.72	6.72	0.07	30.72	29.37	32.35	2.87	1.23	1.28	1.29	1.25	1.28
570	6.80	6.90	6.83	6.83	0.10	32.89	26.67	31.97	3.65	1.22	1.27	1.28	1.25	1.29
670	6.84	6.97	6.88	6.86	0.13	32.39	24.74	29.56	4.45	1.20	1.26	1.28	1.25	1.29
770	6.90	7.08	6.98	6.95	0.19	31.27	23.33	27.62	5.21	1.18	1.26	1.30	1.26	1.30
890	6.98	7.24	7.15	7.09	0.26	29.53	22.08	26.12	6.22	1.16	1.28	1.33	1.30	1.34
960	7.02	7.34	7.26	7.19	0.31	28.23	21.60	25.34	6.90	1.16	1.31	1.36	1.34	1.39
1050	7.10	7.49	7.48	7.37	0.40	26.00	21.27	23.61	7.81	1.16	1.37	1.42	1.43	1.48
1120	7.20	7.66	7.74	7.59	0.54	23.64	21.31	21.29	8.47	1.17	1.44	1.50	1.53	1.59
1250	7.71	8.31	8.63	8.39	0.92	18.38	22.30	16.15	9.57	1.32	1.64	1.68	1.80	1.85

1. Total Loss = Insertion Loss + 6dB splitter loss.



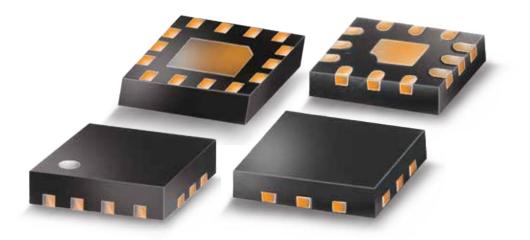




HIGH-POWER REFLECTIVE MMIC SWITCHES

For highly reliable signal routing in CATV and broadband systems,

Mini-Circuits offers a series of 75Ω MMIC switches made using Silicon-on-Insulator process technology with built-in CMOS drivers. Available in SPDT, SP3T, SP4T, SP5T and SP6T designs, they provide extremely fast switching, low insertion loss, high isolation, and high IP3 in tiny packages with very low current consumption.



FEATURES

- ► Fast switching, 1.9 µs
- ▶ Insertion Loss as low as 0.38 dB
- ► High Isolation, up to 42 dB
- ► High IP3, up to +56 dBm
- ► High Power Handling, up to 3W
- ► Low Current Consumption, as low as 37 µA
- ► Tiny Size, 2x2mm





SPDT RF Switch

75Ω 5-3000 MHz

CASE STYLE: MT1818

Reflective RF Switch with internal driver. Single Supply Voltage, +2.3V to +4.8V, High Power 3W

Product Features

- High Isolation, 42 dB typ. at 1 GHz
- Low insertion loss, 0.38 dB typ. at 1 GHz
- High IP3, 56 dBm typ. at 1 GHz
- Low current consumption, 37 μA typ.
- High Power, P0.1dB 3W

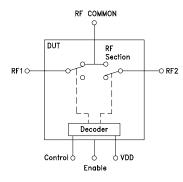
Typical Applications

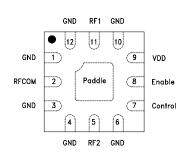
- CATV systems
- SATCOM system
- Automated Test Stations

General Description

JSW2-33DR-75+ is a high power (35 dBm) reflective SPDT switch with integral CMOS driver, operates with single positive supply voltage while consuming, 37µA typical. JSW is a reflective short on output port in OFF state. It has been designed for very wideband operation of 5-3000 MHz. It is packaged in a tiny 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B for ESD (HBM)

Simplified Schematic and Pad Description





Function	Pad Number	Description
RF COM	2	RF Common/ SUM Port, (see Fig. 2)
RF1	11	RF Out #1/In Port #1, (see Fig. 2)
RF2	5	RF Out #1/In Port #2, (see Fig. 2)
Control	7	CMOS Control IN
VDD	9	Supply Voltage
Enable	8	Shutdown mode enabled by connecting to logic low
GND	1,3,4,6,10,12	Ground

SPDT RF Switch

JSW2-33DR-75+

RF Electrical Speci ications⁽¹⁾, 5 - 3000 MHz, T_{AMB} =25°C, V_{DD} = +2.3 to 4.8V

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		3000	MHz
	5 to 1000		0.38	0.48	
Insertion Loss ⁽²⁾	1000 to 1500		0.48	0.58	dB
(ON STATE)	1500 to 2000		0.54	0.64	ив
	2000 to 3000		0.53	3000 0.48 0.58	
	5 to 1000	40	42		
habita babasa Osaman natari BEI/DEO Bata	1000 to 1500	35	38		dB
Isolation between Common port and RF1/RF2 Ports	1500 to 2000	32	35		ав
	2000 to 3000	28	31		
	5 to 1000	40	45		
Isolation between RF1 and RF2 ports ⁽³⁾	1000 to 1500	35	41		dB
Isolation between HFT and HF2 ports	1500 to 2000	32	37		
	2000 to 3000	28	32		
	5 to 1000		19		
Determine (ON OTATE) all parts	1000 to 1500		16		dB
Return Loss (ON STATE), all ports	1500 to 2000		16		ав
	2000 to 3000		17		
	5 to 1000		56		
	1000 to 1500		62		-ID
Input IP3 (V _{DD} =3V)	1500 to 2000		63		dBm
	2000 to 3000	3000			
0.1dB Input Compression ⁽⁴⁾	5 to 3000		35.0		dBm

DC Operating Electrical Specifications

Parameter	Min.	Тур.	Max.	Units
VDD, Supply Voltage	2.3		4.8	V
Supply Current		37		μΑ
Control Enable Voltage Low	0		0.4	V
Control Enable Voltage High	1.65		VDD	V
Control Current		1		μΑ
Shutdown mode - Supply Current		7		μΑ

- 1. Tested on Mini-Circuit's test board TB-723-N+ (see Characterization Test Circuit, Fig.1).
- Insertion loss values include test board loss.
 Enable voltage "HI", either RF1 or RF2 are ON.
 Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

Parameter	Min.	Тур.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.5 (Rise Time) 0.7 (Fall Time)		μSec
Switching Time, 50% CTRL to 90/10% RF	_	1.9 (ON Time) 1.1 (OFF Time)	_	μSec
Video Feedthrough, (control 0 to 1.65V, freq.=10 KHz)	_	3.0	_	mV _{P-P}

SPDT RF Switch

75Ω 5-3000 MHz

JSW2-33HDR-75+

Reflective RF Switch with internal driver. Single Supply Voltage, +2.3V to +4.8V, High Power 3W

Product Features

- High IP3, +70 dBm typ. at 150 MHz
- High Power, P0.1dB 3W
- High Isolation, 42 dB typ. at 1 GHz
- Low insertion loss, 0.38 dB typ. at 1 GHz
- Low current consumption, 37 μA typ.

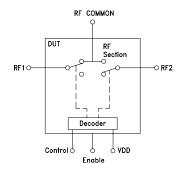
Typical Applications

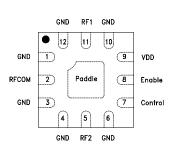
- CATV systems
- SATCOM system
- Automated Test Stations

General Description

JSW2-33HDR-75+ is a high power (35 dBm) reflective SPDT switch with integral CMOS driver, operates with single positive supply voltage while consuming, 37μA typical. JSW is a reflective short on output port in OFF state. It has been designed for very wideband operation of 5-3000 MHz. It is packaged in a tiny 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B for ESD (HBM)

Simplified Schematic and Pad Description





CASE STYLE: MT1818

Function	Pad Number	Description
RF COM	2	RF Common/ SUM Port, (see Fig. 2)
RF1	11	RF Out #1/In Port #1, (see Fig. 2)
RF2	5	RF Out #1/In Port #2, (see Fig. 2)
Control	7	CMOS Control IN
VDD	9	Supply Voltage
Enable	8	Shutdown mode enabled by connecting to logic low
GND	1,3,4,6,10,12	Ground

RF Electrical Speci ications⁽¹⁾, 5 - 3000 MHz, T_{AMB}=25°C, V_{DD}= +2.3 to 4.8V

SPDT RF Switch

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		3000	MHz
	5 to 1000		0.38	0.48	
Insertion Loss ⁽²⁾	1000 to 1500		0.48	0.58	٩D
(ON STATE)	1500 to 2000		0.54	0.64	dB
	2000 to 3000		0.53	0.64	
least IDO (v. ov)	150		+70		dBm
Input IP3 (V _{DD} =3V)	1800		+70		abm
0.1dB Input Compression ⁽⁴⁾	20 to 3000		35.0		dBm
	5 to 1000	40	42		dB
Isolation between Common port and RF1/RF2 Ports	1000 to 1500	35	38		
Isolation between Common port and hr 1/hr2 Forts	1500 to 2000	32	35		
	2000 to 3000	28	31		
	5 to 1000	40	45		
Isolation between RF1 and RF2 ports ⁽³⁾	1000 to 1500	35	41		dB
Isolation between hri and hrz ports	1500 to 2000	32	37		uБ
	2000 to 3000	28	32		
	5 to 1000		19		
Deturn Loss (ON STATE), all parts	1000 to 1500		16		dB
Return Loss (ON STATE), all ports	1500 to 2000		16		uB
	2000 to 3000		17		

DC Operating Electrical Specifications

20 operating Electrical operations						
Parameter	Min.	Тур.	Max.	Units		
VDD, Supply Voltage	2.3		4.8	V		
Supply Current		37		μΑ		
Control Enable Voltage Low	0		0.4	V		
Control Enable Voltage High	1.65		VDD	V		
Control Current		1		μΑ		
Shutdown mode - Supply Current		7		μΑ		

- Tested on Mini-Circuit's test board TB-723-N+ (see Characterization Test Circuit, Fig.1).
- 2. Insertion loss values include test board loss.
 3. Enable voltage "HI", either RF1 or RF2 are ON.
 4. Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

Parameter	Min.	Тур.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.5 (Rise Time) 0.7 (Fall Time)	_	μSec
Switching Time, 50% CTRL to 90/10% RF	_	1.9 (ON Time) 1.1 (OFF Time)	_	μSec
Video Feedthrough, (control 0 to 1.65V, freq.=10 KHz)	_	3.0	_	mV _{P-P}

SP3T RF Switch

75Ω 5-2000 MHz

JSW3-23DR-75+

Reflective RF Switch with internal driver. Single Supply Voltage, +2.5V to +4.8V

Product Features

- High Isolation, 38 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 μA typ.



CASE STYLE: MT1817

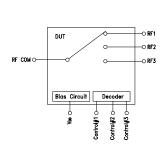
Typical Applications

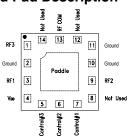
- CATV systems
- SATCOM system
- Automated Test Stations
- Telecom systems

General Description

JSW3-23DR-75+ is a reflective SPDT switch with integral driver, operates with single positive supply voltage while consuming, 40 µA typical. It has been designed for very wideband operation of 5-2000 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.

Simplified Schematic and Pad Description





Function	Pad Number	Description	Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port	Control #1	7	Control IN #1
RF1	3	RF Out #1/In Port #1	Control #2	6	Control IN #2
RF2	9	RF Out #2/In Port #2	Control #3	5	Control IN #3
GND	2	Ground	VDD	4	Supply Voltage
GND	10	Ground	GND	Paddle	Ground
RF3	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
GND	11	Ground			

RF Electrical Speci ications⁽¹⁾, 5 - 2000 MHz, $T_{AMB}=25^{\circ}C$, $V_{DD}=+2.5$ to 4.8V

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		2000	MHz
	5 to 1000	_	0.7	0.9	
Insertion Loss ⁽²⁾ (ON STATE)	1000 to 1500	_	0.8	1.0	dB
	1500 to 2000	_	1.1	1.3	
	5 to 1000	35	38	_	
Isolation between Common Port and RF1 to RF3 Ports (3)	1000 to 1500	29	32	_	dB
	1500 to 2000	22	25	_	
	5 to 1000	_	15	_	
Return Loss (ON STATE) RF-COM, RF1 to RF3 Ports	1000 to 1500	_	14	_	dB
,	1500 to 2000	_	10	_	
Input IP3 V _{DD} =2.5 to 4.8V	5 to 500	_	55	_	dDm
V _{DD} =3.0V	1000 to 2000	_	59	_	dBm
0.1dB Input Compression ⁽⁴⁾	5 to 2000	_	35	_	dBm

DC Electrical Specifications

SP3T RF Switch

Parameter	Min.	Тур.	Max.	Units
VDD, Supply Voltage	2.5	3.0	4.8	V
Supply Current (V _{DD} = 3V)		40		μΑ
Control Voltage Low	0		0.4	V
Control Voltage High	1.35	1.8	2.7/V _{DD}	V
Control Current		0.5	1.0	μΑ
Shutdown Current at V _{DD} = 3V		5		μA

- 1. As measured in Mini-Circuit's test board TB-722-3-F+ (see Characterization Test Circuit, Fig.1).
- 2. Insertion loss values are de-embedded from test board loss.
- 3. Isolations for other port combinations, see Tables 1 & 2 4. Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

Parameter	Min.	Тур.	Max.	Units	
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.42 (Rise Time) 0.84 (Fall Time)		μSec	
Switching Time, 50% CTRL to 90/10% RF (ON/OFF)	_	1.9 (ON Time) 1.4 (OFF Time)		μSec	
Video Feedthrough, (control 0 to 1.8V, freq.=10 KHz, V _{DD} =3V)	_	4.0	_	mV _{P-P}	

SP4T RF Switch

75Ω 5-2000 MHz

JSW4-23DR-75+

Reflective RF Switch with internal driver. Single Supply Voltage, +2.5V to +4.8V, High Power 3W

Product Features

- High Isolation, 38 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 μA typ.
- High Power, P0.1dB 3W



CASE STYLE: MT1817

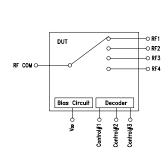
Typical Applications

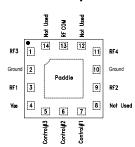
- CATV systems
- SATCOM system
- Automated Test Stations
- Telecom systems

General Description

JSW4-23DR-75+ is a high power 3W reflective SP4T switch with integral driver, operates with single positive supply voltage while consuming, 40 µA typical. It has been designed for very wideband operation of 5-2000 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.

Simplified Schematic and Pad Description





Function	Pad Number	Description	Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port	Control #1	7	Control IN #1
RF1	3	RF Out #1/In Port #1	Control #2	6	Control IN #2
RF2	9	RF Out #2/In Port #2	Control #3	5	Control IN #3
GND	2	Ground	VDD	4	Supply Voltage
GND	10	Ground	GND	Paddle	Ground
RF3	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
RF4	11	RF Out #6/In Port #6			

RF Electrical Speci ications⁽¹⁾, 5 - 2000 MHz, T_{AMB}=25°C, V_{DD}= +2.5 to 4.8V

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		2000	MHz
	5 to 1000	_	0.7	0.9	
Insertion Loss ⁽²⁾ (ON STATE)	1000 to 1500	_	0.8	1.0	dB
,	1500 to 2000	_	1.1	1.3	
	5 to 1000	35	38	_	
Isolation between Common Port and RF1 to RF4 Ports (3)	1000 to 1500	29	32	_	dB
	1500 to 2000	22	25	_	
	5 to 1000	_	15	_	
Return Loss (ON STATE) RF-COM, RF1 to RF4 Ports	1000 to 1500	_	14	_	dB
	1500 to 2000	_	10	_	
Input IP3 V _{DD} =2.5 to 4	8V 5 to 500	_	55	_	dBm
V _{DD} =3	.0V 1000 to 2000	_	59		ubili
0.1dB Input Compression ⁽⁴⁾	5 to 2000	_	35	_	dBm

DC Electrical Specifications

SP4T RF Switch

Parameter	Min.	Тур.	Max.	Units
VDD, Supply Voltage	2.5	3.0	4.8	V
Supply Current (V _{DD} = 3V)		40		μA
Control Voltage Low	0		0.4	V
Control Voltage High	1.35	1.8	2.7/V _{DD}	V
Control Current		0.5	1.0	μA
Shutdown Current at V _{DD} = 3V		5		μA

- 1. As measured in Mini-Circuit's test board TB-722-4-F+ (see Characterization Test Circuit, Fig.1).
- 2. Insertion loss values are de-embedded from test board loss 3. Isolations for other port combinations, see Tables 1 & 2
- 4. Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

- mining openionic				
Parameter	Min.	Тур.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.42 (Rise Time) 0.84 (Fall Time)	_	μSec
Switching Time, 50% CTRL to 90/10% RF (ON/OFF)	_	1.9 (ON Time) 1.4 (OFF Time)	_	μSec
Video Feedthrough, (control 0 to 1.8V, freq.=10 KHz, V _{DD} =3V)	_	4.0	_	mV _{P-P}

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SP5T RF Switch

75Ω 5-2000 MHz

CASE STYLE: MT1817

JSW5-23DR-75+ **SP5T RF Switch**

Reflective RF Switch with internal driver. Single Supply Voltage, +2.5V to +4.8V, High Power 3W

Product Features

- High Isolation, 38 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 μA typ.
- High Power, P0.1dB 3W

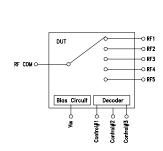
Typical Applications

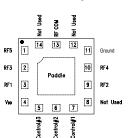
- CATV systems
- SATCOM system
- Automated Test Stations
- Telecom systems

General Description

JSW5-23DR-75+ is a high power 3W reflective SP5T switch with integral driver, operates with single positive supply voltage while consuming, 40 µA typical. It has been designed for very wideband operation of 5-2000 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.

Simplified Schematic and Pad Description





Function	Pad Number	Description	Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port	Control #1	7	Control IN #1
RF1	3	RF Out #1/In Port #1	Control #2	6	Control IN #2
RF2	9	RF Out #2/In Port #2	Control #3	5	Control IN #3
RF3	2	RF Out #3/In Port #3	VDD	4	Supply Voltage
RF4	10	RF Out #4/In Port #4	GND	Paddle	Ground
RF5	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
GND	11	Ground			

RF Electrical Speci ications⁽¹⁾, 5 - 2000 MHz, T_{AMB} =25°C, V_{DD} = +2.5 to 4.8V

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units
Frequency Range		5		2000	MHz
	5 to 1000	_	0.7	0.9	
Insertion Loss ⁽²⁾ (ON STATE)	1000 to 1500	_	0.8	1.0	dB
	1500 to 2000	_	1.1	1.3	
	5 to 1000	35	38	_	
Isolation between Common Port and RF1 to RF5 Ports (3)	1000 to 1500	29	32	_	dB
	1500 to 2000	22	25	_	
	5 to 1000	_	15	_	
Return Loss (ON STATE) RF-COM, RF1 to RF5 Ports	1000 to 1500	_	14	_	dB
,	1500 to 2000	_	10	_	
Input IP3 V _{DD} =2.5 to 4.8V	5 to 500	_	55	_	dBm
V _{DD} =3.0V	1000 to 2000	_	59	_	ubili
0.1dB Input Compression ⁽⁴⁾	5 to 2000	_	35	_	dBm

DC Electrical Specifications

Parameter	Min.	Тур.	Max.	Units
VDD, Supply Voltage	2.5	3.0	4.8	V
Supply Current (V _{DD} = 3V)		40		μΑ
Control Voltage Low	0		0.4	V
Control Voltage High	1.35	1.8	2.7/V _{DD}	V
Control Current		0.5	1.0	μΑ
Shutdown Current at V _{DD} = 3V		5		μA

- 1. As measured in Mini-Circuit's test board TB-722-5-F+ (see Characterization Test Circuit, Fig.1).
- Insertion loss values are de-embedded from test board loss.
 Isolations for other port combinations, see Tables 1 & 2
- 4. Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

Parameter	Min.	Тур.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.42 (Rise Time) 0.84 (Fall Time)	_	μSec
Switching Time, 50% CTRL to 90/10% RF (ON/OFF)	_	1.9 (ON Time) 1.4 (OFF Time)	_	μSec
Video Feedthrough, (control 0 to 1.8V, freq.=10 KHz, V _{DD} =3V)	_	4.0	_	mV _{P-P}

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SP6T RF Switch

75Ω 5-2000 MHz **SP6T RF Switch**

Reflective RF Switch with internal driver. Single Supply Voltage, +2.5V to +4.8V, High Power 3W

Product Features

- High Isolation, 38 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 µA typ.
- High Power, P0.1dB 3W



CASE STYLE: MT1817

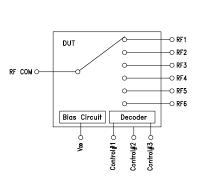
Typical Applications

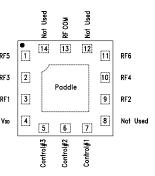
- CATV systems
- SATCOM system
- Automated Test Stations
- Telecom systems

General Description

JSW6-23DR-75+ is a high power 3W reflective SPDT switch with integral driver, operates with single positive supply voltage while consuming, 40 µA typical. It has been designed for very wideband operation of 5 - 2000 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.

Simplified Schematic and Pad Description





Function	Pad Number	Description	Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port	Control #1	7	Control IN #1
RF1	3	RF Out #1/In Port #1	Control #2	6	Control IN #2
RF2	9	RF Out #2/In Port #2	Control #3	5	Control IN #3
RF3	2	RF Out #3/In Port #3	VDD	4	Supply Voltage
RF4	10	RF Out #4/In Port #4	GND	Paddle	Ground
RF5	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
RF6	11	RF Out #6/In Port #6			

RF Electrical Speci ications⁽¹⁾, 5 - 2000 MHz, T_{Aug}=25°C, V_{pp}= +2.5 to 4.8V

Parameter	Condition (MHz)	Min.	Тур.	Max.	Units	
Frequency Range		5		2000	MHz	
	5 to 1000	_	0.7	0.9		
Insertion Loss ⁽²⁾ (ON STATE)	1000 to 1500	_	0.8	1.0	dB	
,	1500 to 2000	_	1.1	1.3		
	5 to 1000	35	38	_		
Isolation between Common Port and RF1 to RF6 Ports (3)	1000 to 1500	29	32	_	dB	
	1500 to 2000	22	25	_		
	5 to 1000	_	15	_		
Return Loss (ON STATE) RF-COM, RF1 to RF6 Ports	1000 to 1500	_	14	_	dB	
	1500 to 2000	_	10	_		
Input IP3 V _{DD} =2.5 to 4.	5 to 500	_	55	_	dBm	
V _{DD} =3.	1000 to 2000	_	59	_	ubm	
0.1dB Input Compression ⁽⁴⁾	5 to 2000	_	35	_	dBm	

JSW6-23DR-75+

DC Electrical Specifications

Parameter	Min.	Тур.	Max.	Units
VDD, Supply Voltage	2.5	3.0	4.8	V
Supply Current (V _{DD} = 3V)		40		μΑ
Control Voltage Low	0		0.4	V
Control Voltage High	1.35	1.8	2.7/V _{DD}	V
Control Current		0.5	1.0	μA
Shutdown Current at V _{DD} = 3V		5		μΑ

- 1. As meaured in Mini-Circuit's test board TB-722-N+ (see Characterization Test Circuit, Fig.1).
- 2. Insertion loss values are deembedded from test board loss
- Isolations for other port combinations, see Tables 1 & 2
 Do not exceed RF input power as shown in Absolute Maximum Rating table.

Switching Specifications

<u> </u>				
Parameter	Min.	Тур.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	_	0.42 (Rise Time) 0.84 (Fall Time)	_	μSec
Switching Time, 50% CTRL to 90/10% RF (ON/OFF)	_	1.9 (ON Time) 1.4 (OFF Time)	_	μSec
Video Feedthrough, (control 0 to 1.8V, freq.=10 KHz, V _{DD} =3V)	_	4.0	_	mV _{P-P}

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RF TRANSFORMERS

Mini-Circuits offers an industry-leading selection of RF transformers for DOCSIS 3.1 compliant systems and equipment. Our line includes a variety of configurations including balanced-to-balanced, balanced-to-unbalanced, and unbalanced-to-balanced designs with impedance ratios ranging from 1:1 to 4:1. Featuring both core and wire and printed laminate case styles, all models offer excellent return loss, low insertion loss and low unbalance.





FEATURES

- ▶ Impedance Ratios from 1:1 to 4:1
- ► Various Configurations with and without Center Taps
- ► Low Phase and Amplitude Unbalance (as low as 1°/0.1 dB)
- ► Power Handling up to 1W
- ► Top Hat® Feature on Core and Wire Models



Surface Mount **Transformer**

0.5 to 1000 MHz

Features

- wideband, 0.5 to 1000 MHz
- balanced transmission line
- excellent amplitude unbalance, 0.3 dB typ.
- and phase unbalance, 1 deg. typ. in 1 dB bandwidth
- aqueous washable
- protected under US patent 6,133,525



CASE STYLE: CD542



Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		0.5		1000	MHz
	0.5 -1000		3.0		
Insertion Loss*	1 - 600		2.0		dB
	5 -400		1.0		
A soulite of a Limbola so	1 - 600		0.3		dB
Amplitude Unbalance	5 - 400		0.3		
Phase Unbalance	1 - 600		2.0		Degree
	5 - 400		1.0		

 $^{^{\}star}$ Insertion Loss is referenced to mid-band loss, 0.2 dB typ.

Maximum Ratings

Parameter	Ratings			
Operating Temperature	-20°C to 85°C			
Storage Temperature	-55°C to 100°C			
RF Power	1W			
DC Current	30mA			

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

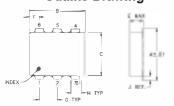
Function	Pin Number
PRIMARY DOT	1
PRIMARY	3
SECONDARY DOT	6
SECONDARY	4
NOT USED	2,5

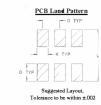
Config. G



Outline Drawing

ADTL1-4-75+



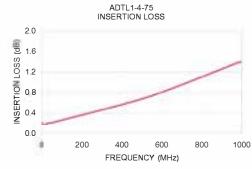


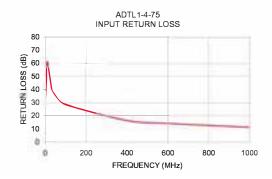
Outline Dimensions (inch)

.100 2.54	F .055 1.40	.112 2.84	.100 2.54	C . 220 5.59	B .310 7.87	A . 272 6.91
grams			.300	.065	.026	.030

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
0.50	0.23	32.81	0.57	4.57
1.00	0.21	36.36	0.48	2.95
5.00	0.17	47.97	0.29	0.91
10.00	0.17	61.49	0.27	0.37
30.00	0.21	40.69	0.27	0.13
50.00	0.22	35.25	0.28	0.27
100.00	0.27	28.41	0.27	0.57
400.00	0.57	16.57	0.02	1.33
600.00	0.81	14.32	0.24	0.63
1000.00	1.41	11.48	0.35	4.51





Additional Notes

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B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



5 to 1800 MHz

CASE STYLE: CD542



Features

- wideband, 5 to 1800 MHz
- balanced transmission line
- aqueous washable
- protected under US patent 6,133,525

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		5		1800	MHz
Insertion Loss*	5 - 1800 25 - 1200		2.0 1.0		dB
Amplitude Unbalance	5 - 1800 25 - 1200		0.4 0.4		dB
Phase Unbalance	5 - 1800 25 - 1200		4.0 3.0		Degree

Insertion Loss is referenced to mid-band loss, 0.4 dB typ.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-20°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	1W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

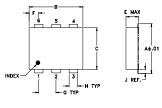
Pin Connections

Function	Pin Number
PRIMARY DOT	1
PRIMARY	3
SECONDARY DOT	6
SECONDARY	4
NOT USED	2,5

Config. G



Outline Drawing



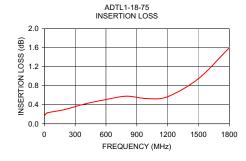


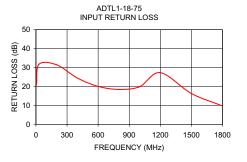
Outline Dimensions (inch)

G	F	E	D	C	B	A
.100	.055	.112	. 100	. 220	.310	. 272
2.54	1.40	2.84	2.54	5.59	7.87	6.91
wt grams 0.20			L .300 7.62	K .065 1.65	J .026 0.66	H . 030 0.76

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	0.18	20.90	1.01	20.51
30.00	0.23	31.73	0.72	4.08
200.00	0.30	31.44	0.54	0.47
400.00	0.42	24.44	0.42	2.05
600.00	0.51	20.03	0.28	3.18
800.00	0.58	18.44	0.11	3.74
1000.00	0.53	19.85	0.07	3.93
1200.00	0.57	27.29	0.27	3.67
1500.00	0.95	16.27	0.46	3.10
1800.00	1.60	9.71	0.44	2.21





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ADTL1-18-75+



4.5 to 3000 MHz

Features

- wideband, 4.5 to 3000 MHz
- balanced transmission line
- good return loss
- excellent amplitude unbalance, 0.7 dB typ. and phase unbalance, 2 deg typ. in 1 dB bandwidth
- plastic base with leads
- aqueous washable





Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		4.5		3000	MHz
	2000 - 3000		3.0		
Insertion Loss*	1000 - 2000		2.0		dB
	4.5 - 1000		1.0		
Amplitude Unbalance	1000 - 2000		0.5		ID.
Amplitude Oribalarice	4.5 - 1000		0.7		dB
Dhaca I Inhalana	1000 - 2000		3.0		Degree
Phase Unbalance	4.5 - 1000		2.0		Degree

^{*} Insertion Loss is referenced to mid-band loss, 0.5 dB typ.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

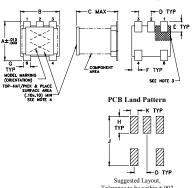
Function	Pin Number			
PRIMARY DOT	6			
PRIMARY	4			
SECONDARY DOT	1			
SECONDARY	3			
NOT USED	2			

Config. G



TC1-1-13M-75X+

Outline Drawing

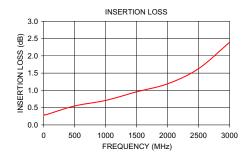


Outline Dimensions (inch)

F	E	D	С	В	Α
.025	.040	.050	.160	.150	.150
0.64	1.02	1.27	4.06	3.81	3.81
wt		K	J	Н	G
grams		.030	.190	.065	.028
0.15		0.76	4.83	1.65	0.71

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
4.50	0.31	29.45	1.10	5.08
10.00	0.29	29.98	0.90	2.60
50.00	0.30	33.14	0.88	0.06
100.00	0.33	34.00	0.91	0.32
500.00	0.55	21.95	0.65	0.81
1000.00	0.71	16.13	0.61	2.12
1500.00	0.96	13.75	0.21	1.23
2000.00	1.19	12.82	0.30	0.38
2500.00	1.63	10.98	0.47	4.03
3000.00	2.39	8.36	0.49	8.50





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Surface Mount **Transformer**

5 to 3000 MHz

Features

- suitable for tin/lead and RoHS solder systems
- wideband, 5 to 3000 MHz
- balanced transmission line
- good return loss, 20 dB typ. at 1 dB band
- excellent amplitude unbalance, 0.3 dB typ. and phase unbalance, 3 deg typ. in 1 dB bandwidth
- aqueous washable





Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		5		3000	MHz
	2000 - 3000		3.0		dB
Insertion Loss*	1200 - 2000		2.0		
	5 -1200		1.0		
A constituent of the land of	1200 - 2000		1.0		-ID
Amplitude Unbalance	5 -1200		0.3		dB
Dhara Habalana	1200 - 2000		4.0		D
Phase Unbalance	5 -1200		3.0		Degree

^{*} Insertion Loss is referenced to mid-band loss, 1.0 dB typ.

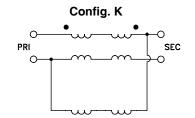
Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

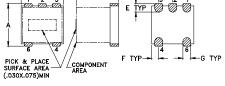
Pin Connections

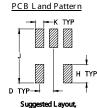
Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
NOT USED	2



TC1-33-75G2A+

Outline Drawing





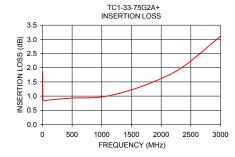
Tolerance to be within ±002

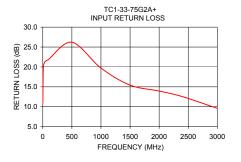
Outline Dimensions (inch)

Α	В	С	D	Е	F
.150	.150	.150	.050	.030	.025
3.81	3.81	3.81	1.27	0.76	0.64
G	Н	J	K		wt
.028	.065	.190	.030		grams
	.003	.190	.030		grams

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
1.00	1.85	10.86	0.38	2.91
10.00	0.88	20.01	0.04	0.84
40.00	0.84	21.37	0.00	0.58
100.00	0.86	21.90	0.01	0.92
500.00	0.93	26.20	0.10	3.63
1000.00	0.97	19.72	0.18	4.76
1500.00	1.22	15.43	0.77	3.62
2000.00	1.62	13.94	1.40	0.56
2400.00	2.08	12.54	1.84	4.10
3000.00	3.11	9.59	2.06	12.70





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100 to 75Ω

5 to 2800 MHz

Features

- suitable for tin/lead and RoHS solder systems wideband, 5 to 2800 MHz
- balanced transmission line
- good return loss, 20 dB typ. at 1 dB band
- excellent amplitude unbalance, 0.3 dB typ.
- aqueous washable





Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio (secondary/primary)			1.33		Ohm
Frequency Range		5		2800	MHz
	5 - 2800		3.0		dB
Insertion Loss*	30 - 2000		2.0		
	50 - 1500		1.0		
Amplitude I Inhelence	50 - 1500		0.3		dB
Amplitude Unbalance	30 - 2000		1.0		
Phase Unbalance	50 - 1500		6.0		Dograd
Priase Unbalance	30 - 2000		6.0		Degree

 $^{^{\}star}$ Insertion Loss is referenced to mid-band loss, 1.0 dB typ. Measured in 75 Ω system.

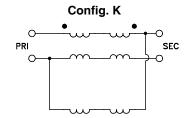
Maximum Ratings

······································				
Parameter	Ratings			
Operating Temperature	-40°C to 85°C			
Storage Temperature	-55°C to 100°C			
RF Power	0.25W			
DC Current	30mA			

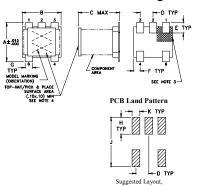
Permanent damage may occur if any of these limits are exceeded.

Pin Connections

Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
NOT USED	2



Outline Drawing



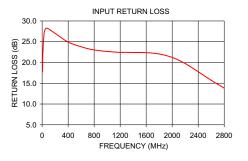
Outline Dimensions (inch mm)

	E	D	С	В	Α
.02	.040	.050	.160	.150	.150
0.6	1.02	1.27	4.06	3.81	3.81
v		K	J	Н	G
gram		.030	.190	.065	.028
0.1		0.76	4.83	1.65	0.71

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	1.48	17.72	0.38	3.28
10.00	1.20	21.95	0.21	2.17
30.00	1.08	27.05	0.11	0.55
50.00	1.08	28.04	0.09	0.06
100.00	1.09	28.09	0.08	1.09
500.00	0.99	24.29	0.21	5.00
1000.00	0.97	22.66	0.07	6.34
1500.00	1.20	22.41	0.71	5.18
2000.00	1.64	21.22	1.49	1.64
2400.00	2.13	17.79	2.00	3.40
2800.00	2.76	13.83	2.31	10.70





Additional Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



TC1.33-282X+



5 to 120 MHz 75Ω

Features

- DOCSIS 3.1 suitable
- plastic base with leads
- aqueous washable

Applications

- impedance matching
- unbalance to balance transformation
- cable/CATV and broadband fiber networks



Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		5	_	120	MHz
Insertion Loss*	5 - 75	_	0.1	0.4	-ID
Insertion Loss*	75 - 120	_	0.3	0.6	dB
Amolituda Habalanaa	5 - 75	_	0.1	0.2	dB
Amplitude Unbalance	75 - 120	_	0.2	0.3	ав
Phase Unbalance	5 - 75	_	1	4	Dagras
Phase Unbalance	75 - 120	_	3	6	Degree
	5 - 20	25	30	_	
Return Loss	20-75	23	28	_	dB
	75-120	20	25	_	

*Insertion Loss is referenced to mid-band loss, 0.25 dB typ.

Maximum Ratings

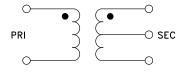
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

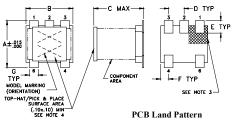
Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
SECONDARY CT	2

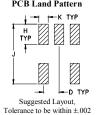
Config. A



TC1-1T-75X+

Outline Drawing





- Notes:

 1. Case Material: Plastic

 2. Termination Finish: Tin plate over Nickel plate.

 3. Lead# ti dentifier shall be located in the cross-hatched area shown, on bottom view. Identifier may be either a molded or marked feature.

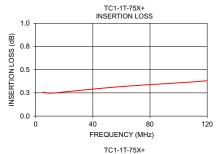
 4. Top-Hat total thickness: .013 inches max.

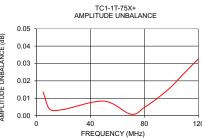
Outline Dimensions (inch)

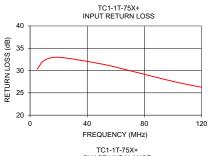
Α	В	С	D	E	F
.150	.150	.160	.050	.040	.025
3.81	3.81	4.06	1.27	1.02	0.64
G	н	J	K		wt
G .028	H .065	J .190	.030		wt grams

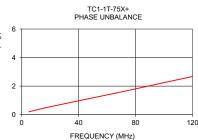
Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	0.26	30.33	0.01	0.20
10.00	0.25	32.29	0.00	0.32
20.00	0.26	32.98	0.00	0.55
50.00	0.31	31.47	0.01	1.18
70.00	0.33	29.95	0.00	1.59
80.00	0.34	29.15	0.00	1.81
90.00	0.35	28.34	0.01	2.03
100.00	0.36	27.58	0.02	2.25
110.00	0.37	26.88	0.02	2.46
120.00	0.38	26.26	0.03	2.68











1 to 300 MHz

TC4-6T-75X+

- Features
 DOCSIS 3.1 suitable
- plastic base with leads
- aqueous washable

Applications

- impedance matching
- unbalance to balance transformation
- cable/CATV and broadband fiber networks



CASE STYLE: AT1521

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio (secondary/primary)			4		Ohm
Frequency Range		1	_	300	MHz
Insertion Loss*	1- 300	_	_	0.8	dB
Amplitude Unbalance	1- 300	_	0.1	0.5	dB
Phase Unbalance	1- 300	_	0.2	2	Degree
Return Loss	1- 300	13	20	_	dB

*Insertion Loss is referenced to mid-band loss, 0.7 dB typ.

Maximum Ratings

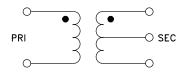
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

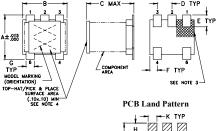
Pin Connections

Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
SECONDARY CT	2

Config. A



Outline Drawing



A B C D E F .150 .150 .160 .050 .040 .025 3.81 3.81 4.06 1.27 1.02 0.64 G H J K .028 .065 .190 .030 0.71 1.65 4.83 0.76

Outline Dimensions (inch)

Suggested Layout, Tolerance to be within ±.002

- Notes:

 1. Case Material: Plastic

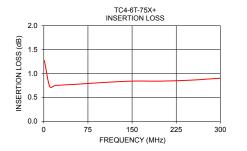
 2. Termination Finish: Tin plate over Nickel plate.

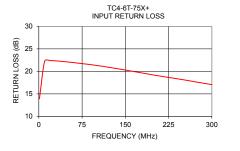
 3. Lead## identifier shall be located in the cross-hatched area shown, on bottom view. Identifier may be either a molded or marked feature.

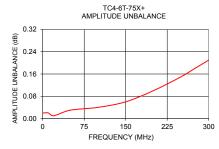
 4. Top-Hat total thickness: .013 inches max.

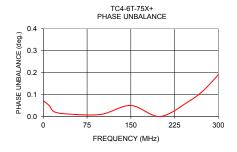
Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
1.00	1.27	13.91	0.02	0.07
10.00	0.73	22.21	0.02	0.05
20.00	0.75	22.40	0.01	0.02
50.00	0.77	22.09	0.03	0.01
100.00	0.81	21.32	0.04	0.01
150.00	0.84	20.30	0.06	0.05
200.00	0.84	19.17	0.10	0.00
250.00	0.86	18.15	0.15	0.07
275.00	0.88	17.59	0.18	0.12
300.00	0.90	17.06	0.21	0.19











10 to 1800 MHz

TRS1-182-75+

Features

- suitable for tin/lead and RoHS solder systems
- wideband, 10 to 1800 MHz
- balanced transmission line
- good return loss, 20 dB typ. at 1 dB band
- excellent amplitude unbalance, 0.3 dB typ.
- aqueous washable
- excellent intermod suppression



CASE STYLE: TT1618-1

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		10		1800	MHz
	50 -1200	_	0.6	1.0	
Insertion Loss*	10-1800	_	0.9	2.0	dB
Amplitude Unbalance	50-1000	_	0.3	0.7	
	1000-1200	_	0.5	0.7	dB
	10-1800	_	0.7	1.4	
	50-1000	_	2	4	
Phase Unbalance	1000-1200	_	3	8	Degree
	10-1800		7.5	15	
	50-500	16	22	_	
	500-1000	13	20	_	٩D
Primary Return Loss (Input)	1000-1200	13	20	_	dB
	10-1800	8	12.5	_	

^{*}Insertion Loss is referenced to mid-band loss, 0.25 dB typ.

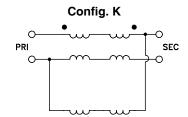
Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	1W
DC Current	30mA

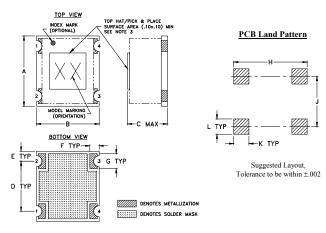
Permanent damage may occur if any of these limits are exceeded.

Pin Connections

Function	Pin Number
PRIMARY DOT	4
PRIMARY	1
SECONDARY DOT	2
SECONDARY	3



Outline Drawing

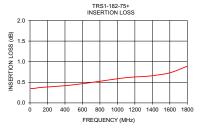


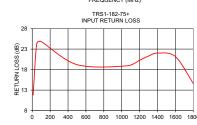
Outline Dimensions (inch)

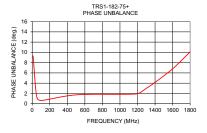
F	E	D	С	В	Α
.037	.040	.200	.16	.250	.280
0.94	1.02	5.08	4.06	6.35	7.11
wt.	L	K	J	Н	G
grams	.061	.061	.200	.293	.060
3	1.55	1.55	5.08	7.44	1.52

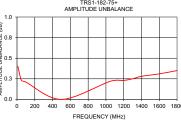
Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
10.0	0.05	. , ,	0.40	
10.0	0.35	11.81	0.40	9.31
50.0	0.35	24.24	0.23	1.45
100.0	0.37	24.82	0.21	0.64
500.0	0.44	19.21	0.00	1.73
1000.0	0.60	18.90	0.22	1.84
1200.0	0.63	20.28	0.23	1.96
1300.0	0.64	21.30	0.25	3.00
1400.0	0.66	22.02	0.28	4.17
1600.0	0.73	21.17	0.31	6.80
1800.0	0.80	1/158	0.35	10.12









Transformers

ADTL1-15-75+ 10 to 1500 MHz

realures

- wideband, 10 to 1500 MHz
- balanced transmission line

Maximum Ratings

- excellent amplitude & phase unbalance
- aqueous washable
- protected by US Patent 6,133,525

Electrical Specifications at 25°C

Model No.	Ω Ratio	Frequency Range (MHz)	over f	Insertion Loss requency range		,,	Phase ice (Deg)	,,	nplitude nce (dB)
		(IVII IZ)	3 dB	2dB	1dB	1dB	2dB	1dB	2dB
ADTL1-15-75+	1	10 - 1500	_	10 -1500	30 - 1000	3	3	0.15	0.3

Operating Temperature	-20°C to 85°C				
Storage Temperature	-55°C to 100°C				
RF Power	0.5W				
DC Current	30mA				
Parmanant damaga may accur if any of those limits are evacaded					

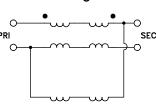
Pin Connections

Primary Dot	1
Primary	3
Secondary Dot	6
Secondary	4
Not used	2,5

Config. K

CASE STYLE: CD542

20, 50, 100, 200, 500



TC1-33-75G2+ 5 to 3000 MHz

reatures

- wideband, 5 to 3000 MHz
- balanced transmission line · excellent amplitude & phase unbalance

Electrical Specifications at 25°C

aqueous washable

CASE STYLE: AT224-3

Available Tape and Reel at no extra cost

 Reel Size
 Devices/Reel

 7"
 20, 50, 100, 200, 500
 1000, 2000

Model No.	Ω	Frequency		Insertion Loss		Typ F	Phase	Tvn Ar	nnlituda
Wiodel No.	Ratio	Range (MHz)	over fr	over frequency range (MHz)		Typ. Phase Unbalance (Deg)		Typ. Amplitude Unbalance (dB)	
		/	3 dB	2dB	1dB	1dB	2dB	1dB	2dB
C1-33-75G2+	1	5 -3000	2000 - 3000	1200 - 2000	5 -1200	3	4	0.3	1.0

Model No.	Ω Ratio	Frequency Range (MHz)		Insertion Loss equency range	(MHz)	,,	Phase ce (Deg)	,,	nplitude nce (dB)
		(**** 12)	3 dB	2dB	1dB	1dB	2dB	1dB	2dB
TC1-33-75G2+	1	5 -3000	2000 - 3000	1200 - 2000	5 -1200	3	4	0.3	1.0

Maximum Ratings

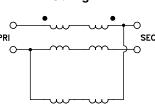
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

Primary Dot	6
Primary	4
Secondary Dot	1
Secondary	3
Not used	2

Config. K



TRS1-23-75+

Features

- wideband, 10 to 2200 MHz
- balanced transmission line
- excellent amplitude unbalance
- aqueous washable

10 t o 2200 MHz

CASE STYLE: AT577-1

 75Ω

Electrical Specifications at 25°C

Model No.	Ω Ratio	Frequency Range (MHz)	Insertion Loss over frequency range (MHz)				Phase ce (Deg)		nplitude nce (dB)
		(1411 12)	3 dB	2dB	1dB	1dB	2dB	1dB	2dB
TRS1-23-75+	1	10 - 2200	10 - 2200	30 -1500	50 - 1000	3	5	0.4	0.6

Maximum Ratings

Operating Temperature	-40°C to 85°C				
Storage Temperature	-55°C to 100°C				
RF Power	0.5W				
DC Current 300m/					
Permanent damage may occur if any of these limits are exceeded.					

Pin Connections

Primary Dot	1
Primary	3
Secondary Dot	6
Secondary	4
Not used	2,5

Config. G



TX-2-5-1+

Features

- wideband, 20 to 1250 MHz
- · excellent return loss, 25 dB in 1 bandwidth excellent amplitude balance, 0.4 dB typ. and phase
- unbalance, 3 deg typ.
- R class transformer

20 to 1250 MHz

CASE STYLE: TT240

Electrical Specifications at 25°C

Model No.	Ω Ratio	Frequency Range (MHz)	Insertion Loss over frequency range (MHz)				Phase nce (Deg)		nplitude nce (dB)
	(141112)	3 dB	2dB	1dB	1dB	2dB	1dB	2dB	
TX-2-5-1+	2	20 - 1250	_	20 - 1250	100 - 800	3	_	0.4	_

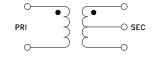
Maximum Ratings

Operating Temperature	-20°C to 85°C	
Storage Temperature	-55°C to 100°C	
RF Power	0.25W	
DC Current	30mA	
Permanent damage may occur if any of these limits are exceeded.		

Pin Connections

Primary Dot	
Primary	
Secondary Dot	
Secondary	
Secondary CT	
Not used	

Config. A



Visit www.minicircuits.com for pricing,

availability, and complete model information.

TEST ACCESSORIES

To support your testing needs from R&D to production test, Mini-Circuits provides a vast array of products for lab environments. We've highlighted a few of these products here, which we believe are uniquely applicable to testing in CATV systems, but we encourage you to visit our website to explore our full offering of test solutions and accessories, which includes everything from adapters to integrated rack-mounted test systems.



Matching Pads

Features

- ► 50/75Ω Impedance Conversion
- ► Excellent VSWR,1.15 typ.
- ► Power Handling up to 0.5W
- ► BNC and N-Type Connectors

75Ω USB Smart Power Sensor **Features**

- CW Power Measurements
- ► Wide Dynamic Range, -30 to +20 dBm
- ► Fast Measurement Speed, 30ms
- ► Good VSWR, 1:03:1
- ► User-Friendly GUI Software Included
- ► Built-in Measurement Applications
- ► Complete DLLs for 32/64-bit Windows® Systems Included
- ► Complete Programming Instructions for Windows & Linux® environments

75 Ω **Test Cables Features**

- Performance Qualified to 20,000 flexures
- Return Loss up to 38 dB
- Low insertion loss
- ► Power Handling up to 338W
- ► Stainless Steel F-Type Connectors
- Available in Wide Variety of Lengths



Matching Pads

BMP-5075+ $50/75\Omega$ DC to 2000 MHz

Features

- wideband DC to 2000 MHz
- excellent VSWR, 1.15 typ.
- excellent flatness



CASE STYLE: FF747 Connectors **75**ΩM-BNC 50ΩF-BNC

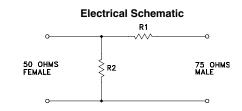
Electrical Specifications at 25°C

Model No. Frequency		Attenuation		VSWR	Power
	Range (MHz)	(dB) Flatness Nom. Max.		(:1) Max.	(W)
	DC - 100	5.7±0.1	0.2	1.06	0.25
BMP-5075+	100 - 1000	5.7±0.1	0.3	1.22	0.25
	1000 - 2000	5.7±0.1	0.4	1.4	0.25

Maximum Ratings

-55°C to 100°C
-55°C to 100°C
0.25W

Permanent damage may occur if any of these limits are exceeded.



 $50/75\Omega$

BMP-5075R+

Features

- wideband DC to 2000 MHz
- excellent VSWR, 1.15 typ.
- excellent flatness



DC to 2000 MHz

CASE STYLE: FF747 Connectors **75**ΩM-BNC **50** Ω F-BNC

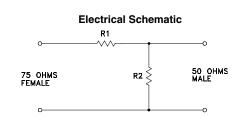
Electrical Specifications at 25°C

Model No.	Frequency Range	Range (dB)		VSWR (:1)	Power (W)
	(MHz)	Nom.	Flatness Max.	Max.	
	DC - 100	5.7±0.1	0.2	1.06	0.25
BMP-5075R+	100 - 1000	5.7±0.1	0.3	1.22	0.25
	1000 - 2000	5.7+0.1	0.4	1.4	0.25

Maximum Ratings

RF Input Power	0.25W
Storage Temperature	-55°C to 100°C
Operating Temperature	-55°C to 100°C

Permanent damage may occur if any of these limits are exceeded.



UNMP-5075+

$50/75\Omega$ DC to 3000 MHz

Features

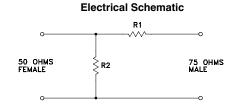
- wideband, DC to 3000 MHz
- 0.5 watt rating
- rugged unibody construction
- off-the-shelf availability
- very low cost

Electrical Specifications at 25°C

Model No. Frequency Range		Attenuation (dB)		VSWR (:1)	Power (W)
(MHz)	Nom.	Flatness Max.	Max.		
	DC - 100	5.7±0.1	0.2	1.10	0.5
VMP-5075+	100 - 1000	5.7±0.1	0.3	1.30	0.5
	1000 - 3000	5.7±0.1	0.4	1.50	0.5

Maximum Ratings

Operating Temperature	-45°C to 100°C
Storage Temperature	-55°C to 100°C
Permanent damage may occur if any of	these limits are exceeded.



 $50/75\Omega$

UNMP-5075-33+

Features

- wideband, DC to 3000 MHz
- excellent VSWR
- rugged unibody construction
- off-the-shelf availability
- very low cost

DC to 3000 MHz

CASE STYLE: FF779

Connectors 75ΩM-N

50ΩF-N

CASE STYLE: FF779 Connectors 75ΩM-N **50**ΩF-N

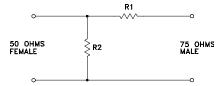
Electrical Specifications at 25°C

Model No.	Frequency Range	Attenuation (dB)		VSWR (:1)	Power (W)
	(MHz)	Nom.	Flatness Max.	Max.	, ,
	DC - 100	5.7±0.15	0.2	1.10	0.35
UNMP-5075-33+	100 - 1000	5.7±0.15	0.3	1.10	0.35
	1000 - 3000	5.7±0.15	0.4	1.20	0.35

Maximum Ratings

Operating Temperature	-45°C to 100°C			
Storage Temperature	-55°C to 100°C			
RF Input Power	0.5W			
Permanent damage may occur if any of these limits are exceeded				

Electrical Schematic



Visit www.minicircuits.com for pricing,

availability, and complete model information.

Test Cables

CBL-2FM-75+ 75 Ω DC to 3000 MHz

Features

- wideband coverage, DC to 3000 MHz
- · extra rugged construction with strain relief for longer life
- stainless steel F-Male connectors for long mating-cycle life
- useful over temperature range, -55°C to 105°C
- triple shield cable for excellent shielding effectiveness
- flexible for easy connection & bend radius

Electrical Specifications at 25°C

Model No.	Length (FT)	Frequency Range (MHz)	Insertion Loss (dB) Typ.	Return Loss (dB) Typ.
CBL-2FM-75+		DC - 500	0.22	38
	0	500 - 1000	0.32	38
	2 -	1000 - 2000	0.45	34
	_	2000 - 3000	0.61	25

M	axim	ıum	Ratings	

Operating Temperature	-55°C to 105°C
Storage Temperature	-55°C to 105°C
Power Handling at 25°C,	338W at 0.5 GHz
Sea Level	210W at 1 GHz
	143W at 2 GHz
	98W at 3 GHz

Permanent damage may occur if any of these limits are exceeded.

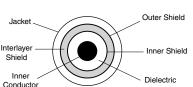
Cable Constructi	ion
Inner Conductor	Solid Silver Plated Copper Clad Steel
Dielectric	Solid PTFE
Shield	Silver-Plated Copper Flat Ribbon Braid Aluminum-Polymide Tape Interlayer Silver-Plated Copper Braid (90%k)
Jacket	Blue FEP
Connectors	
passivated stainless gold plated beryllium	s steel n copper center contacts

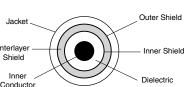


CASE STYLE: ND1919-2

Connectors		Model
Conn1 F-MALE	Conn2 F-MALE	CBL-2FM-75+

Cable Cross Section





CBL-3FM-75+

- **Features** • wideband coverage, DC to 3000 MHz
- extra rugged construction with strain relief for longer life
- stainless steel F-Male connectors for long mating-cycle life • useful over temperature range, -55°C to 105°C
- triple shield cable for excellent shielding effectiveness
- flexible for easy connection & bend radius

Electrical Specifications at 25°C

•				
Model No.	Length (FT)	Frequency Range (MHz)	Insertion Loss (dB) Typ.	Return Loss (dB) Typ.
		DC - 500	0.28	35.2
CBL-3FM-75+	0	500 - 1000	0.41	30.4
	3 -	1000 - 2000	0.60	29.3
	_	2000 - 3000	0.77	26.8

Maximum Ratings

Operating Temperature	-55°C to 105°C
Storage Temperature	-55°C to 105°C
Power Handling at 25°C,	338W at 0.5 GHz
Sea Level	210W at 1 GHz
	143W at 2 GHz
	98W at 3 GHz

Permanent damage may occur if any of these limits are exceeded.

Cable Construction	1	
Inner Conductor	Solid Silver Plated Copper Clad Steel	
Dielectric	Solid PTFE	
Shield	Silver-Plated Copper Flat Ribbon Braid Aluminum-Polymide Tape Interlayer Silver-Plated Copper Braid (90%k)	
Jacket	Blue FEP	
Connectors		
passivated stainless st gold plated beryllium c PTEE dielectric		



DC to 3000 MHz

Cable Cross Section Outer Shield Inner, Dielectric

CBL-1MFM-75+

CBL-6FM-75+

Model No.

CBL-6FM-75+

Maximum Ratings

Operating Temperature

Storage Temperature

Sea Level

• wideband coverage, DC to 3000 MHz

• extra rugged construction with strain relief for longer life

triple shield cable for excellent shielding effectiveness

(FT)

-55°C to 105°C

-55°C to 105°C

210W at 1 GHz

143W at 2 GHz

98W at 3 GHz

• useful over temperature range, -55°C to 105°C

 flexible for easy connection & bend radius Electrical Specifications at 25°C

stainless steel F-Male connectors for long mating-cycle life

Frequency

Range (MHz)

DC - 500

500 - 1000

1000 - 2000

2000 - 3000

Features

Features

• wideband coverage, DC to 3000 MHz

Power Handling at 25°C, 338W at 0.5 GHz

Permanent damage may occur if any of these limits are exceeded

- extra rugged construction with strain relief for longer life
- stainless steel F-Male connectors for long mating-cycle life
- useful over temperature range, -55°C to 105°C
- triple shield cable for excellent shielding effectiveness
- flexible for easy connection & bend radius

Electrical Specifications at 25°C

Model No.	Length (M)	Frequency Range (MHz)	Insertion Loss (dB) Typ.	Return Loss (dB) Typ.
		DC - 500	0.32	37
ODL 1MEM 75.		500 - 1000	0.49	32
CBL-1MFM-75+		1000 - 2000	0.78	32
		2000 - 3000	0.89	24.3

Maximum Ratings

Operating Temperature	-55°C to 105°C
Storage Temperature	-55°C to 105°C
Power Handling at 25°C,	338W at 0.5 GHz
Sea Level	210W at 1 GHz
	143W at 2 GHz
	98W at 3 GHz

Permanent damage may occur if any of these limits are exceeded.

Cable Construction Inner Conductor Solid Silver Plated Copper Clad Steel Solid PTFE Silver-Plated Copper Flat Ribbon Braid Aluminum-Polymide Tape Interlayer Silver-Plated Copper Braid (90%k) Blue FEP Connectors gold plated beryllium copper center contacts PTFE dielectric

Insertion Loss

Тур.

0.53

0.77

1.12

1.43

gold plated beryllium copper center contacts
 PTFE dielectric

Cable Construction

Inner Conductor

Jacket

Connectors

Return Loss

Typ. 33.9

32 4

29.5

28.3

Solid Silver Plated Copper Clad Steel

Silver-Plated Copper Flat Ribbon Braid

Aluminum-Polymide Tape Interlaye Silver-Plated Copper Braid (90%k)

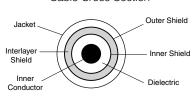
75Ω DC to 3000 MHz



CASE STYLE: ND1919-6

Connectors		Model	
Conn1	Conn2		
F-MALE	F-MALE	CBL-6FM-75+	

Cable Cross Section



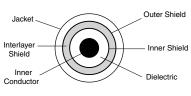
DC to 3000 MHz

FLEX

CASE STYLE: ND1919-3.28

Connectors		Model
Conn1	Conn2	
F-MALE	F-MALE	CBL-1MFM-75+





Visit www.minicircuits.com for pricing,

availability, and complete model information.

USB Smart Power Sensor

100 kHz to 2500 MHz

Product Features

- · Wide bandwidth, 100 kHz to 2500 MHz
- 50 dB Dynamic Range, -30 to +20 dBm
- Good VSWR, 1.03:1 typ.
- · Fast measurement speed, 30 msec typ.
- · Automatic frequency calibration & temperature compensation
- Multi-sensor capability (up to 24)
- · Built in Application Measurement Software
- Remote operation via internet
- Effective, easy-to-use Windows® GUI
- Linux® support
- Compatible with 32/64-bit Windows® or Linux® operating systems
- · Supports a wide range of programming environments (See application note AN-49-001 for details)





Case Style: JL1337

Model No. Description PWR-2.5GHS-75 USB smart Power Sensor Included Accessories

6 ft data cable (USB Type-A Plug) USB-CBL+

PWR-SEN-CD

Typical Applications

- Turn almost any Windows or Linux PC into a Power Meter
- · Pocket-sized portability for benchtop testing anywhere
- · Remote location monitoring
- · Automatic, scheduled data collection
- Evaluate high-power, multi-port devices with built-in virtual couplers/attenuators & other software tools

PWRSN-2.5GHS-75 Power Sensor Head Installation CD

Mini-Circuits Power Meter Program for Smart USB Power Sensor



USB Smart Power Sensor

PWR-2.5GHS-75

Electrical Specifications (CW) 2, -30 dBm to +20 dBm, 100 kHz to 2500 MHz

Parameter		Freq. Range (MHz)	Min.	Тур.	Max.	Units
Dynamic Range ³		0.1 - 2500	-30	-	+20	dBm
VSWR		0.1 - 2500	-	1.03	1.20	:1
	0.001 5.10	0.1 - 1000	-	± 0.10	± 0.30	dB
	@ -30 to +5 dBm	1000 - 2500	-	± 0.05	± 0.30	dB
Uncertainty of	@ . 5 to . 40 dD	0.1 - 1000	-	± 0.05	± 0.25	dB
Power Measurement @ 25°C	@ +5 to +12 dBm	1000 - 2500	-	± 0.05	± 0.20	dB
	@ +12 to +20 dBm	0.1 - 1000	-	± 0.10	± 0.30	dB
	@ +12 to +20 dBm	1000 - 2500	-	± 0.15	± 0.40	dB
	@ -30 to +5 dBm	0.1 - 1000	-	± 0.10	-	dB
	@ -30 to +5 dbiii	1000 - 2500	-	± 0.10	-	dB
Uncertainty of Power Measurement	@ +5 to +12 dBm	0.1 - 1000	-	± 0.10	-	dB
@ 0°C to 50°C	@ +5 t0 +12 dBill	1000 - 2500	-	± 0.10	-	dB
	@ . 10 to . 00 dB	0.1 - 1000	-	± 0.10	-	dB
	@ +12 to +20 dBm	1000 - 2500	-	± 0.15	-	dB
Linearity @ 25°C		0.1 - 2500	-	± 2.3	-	%
Measurement Resolution		0.1 - 2500	0.01	-	-	dB
Averaging Range		0.1 - 2500	1	-	999	-
Management On and	@ Low Noise Mode	0.4 0500	-	100	-	0
Measurement Speed	@ Faster Mode	0.1 - 2500	-	30	-	mSec
Current (via host USB)		0.1 - 2500	-	40	70	mA

Minimum System Requirements

Parameter	Requirements
Interface	USB HID
Host operating system	32 Bit operating system: Windows 98 [®] , Windows XP [®] , Windows Vista [®] , Windows 7 [®] , Windows 8 [®] 64 Bit operating system: Windows Vista [®] , Windows 7 [®] , Windows 8 [®] Linux [®] support: 32/64 Bit operating system
Hardware	Pentium® II or higher, RAM 256 Mb, USB port
USB cable (supplied)	Power sensor to be used with the supplied USB cable only

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	0°C to 50°C
Storage Temperature	-30°C to 70°C
DC Voltage at RF port	4V
CW Power	+25dBm

Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

 All specifications apply to continuous wave (CW) signals.
 Maximum continuous safe operational power limit: +23 dBm. Performance is guaranteed up to +20 dBm

CONTROL PRODUCTS

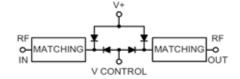
Mini-Circuits voltage variable attenuators and equalizers are perfect for systems where precise control over signal strength is needed. Our VVAs are ideal for adjusting the amplitude of input/output signals in Automatic Level Control (ALC) circuits, and our Voltage Variable Equalizers allow operators to compensate for cable losses without having to measure the length of each cable, saving significant cost and resources deployed in the field. All models are designed for 75Ω networks and characterized to meet DOCSIS 3.1 bandwidth requirements!





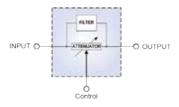
Voltage Variable Attenuator Features

- ▶ Attenuation from 18 to 40 dB
- ► High linearity, +50 dBm IP3
- ▶ No external bias or matching required
- ► Low power consumption
- ► Ideal for adjusting input/output signals in ALC circuits



Voltage Variable Equalizer **Features**

- ► Adjustable attenuation slope
- ► High linearity, +50 dBm IP3
- ▶ Low deviation from linear loss, ±0.5 dB
- ► Low power consumption
- ► Enables easy compensation for cable loss



Performance Charts

EVA-23-75+

Voltage Variable Attenuator

75Ω 10 to 2000 MHz

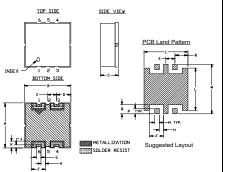
Maximum Ratings

Operating Temperature	-45°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage(V+)	6V
Absolute Max. Control Voltage(Vctrl)	10V
Absolute Max. RF Input Level	+22dBm
Permanent damage may occur if any of these li	mits are exceeded.

Pin Connections

RF IN	1
RF OUT	6
V CONTROL	3
V+	4
GROUND	2,5

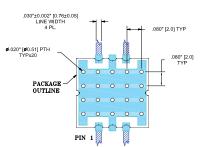
Outline Drawing



Outline Dimensions (inch mm)

Α	В	С	D	E	F	G	Н	
.394	.394	.150	.122	.075	.120	.038	.037	
10.01	10.01	3.81	3.10	1.90	3.05	0.97	0.94	
J	K	L	M	N	Р	Q	R	wt.
.026	.061	.370	.434	.038	.046	.081	.110	grams
0.66	1.55	0.40	11 02	0.07	1 17	2.06	2 70	0.7

Demo Board MCL P/N: TB-381 Suggested PCB Layout (PL-238)



1. TRACE WIDTH IS SHOWN FOR RO4350 WITH DIELECTRIC THICKNESS .030°±.002°. COPPER: 1/2 0Z. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES COPPER LAND PATTERN FREE OF SOLDERMAS

Features

- Frequency range, 10-2000 MHz
- High IP3, 50 dBm typ.
- Maximum attenuation at minimum current
- · No external bias and RF matching network required
- Small size, shielded case



CASE STYLE: HE1135

Applications

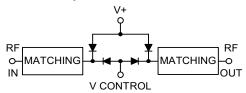
- · CATV
- Variable gain amplifiers
- Feed forward amplifiers
- ALC circuits

Electrical Specifications (T_{AMB}= 25°C)

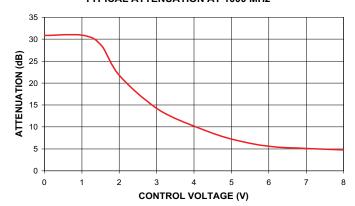
	FRI (MI		MIN. INS LOSS, d		MAX. ATTI		INPUT POWER (dBm)		-	-	RETURN LOSS (dB)	POWER Voltage (V)	SUPPLY Current (mA)
L	Min.	Max.	Typ.	Max.	Тур.	Min.	Max.		Max.	Тур.	Тур.		Max.
		1000		5.5 6.0	40 27	25 18	+22 +22	0 - 8 0 - 8	15 15	48 52	19 14	+3 +3	4 4

Rise/Fall time: $15\mu Sec$ Typ. Switching Time, turn on/off: 20µSec. Typ.

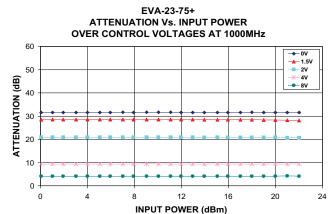
Equivalent Schematic

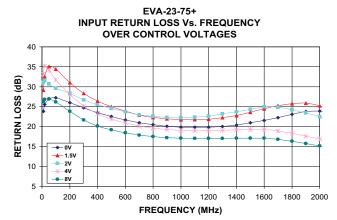


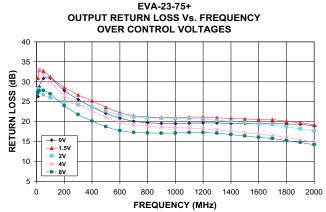
EVA-23-75+ **TYPICAL ATTENUATION AT 1000 MHz**

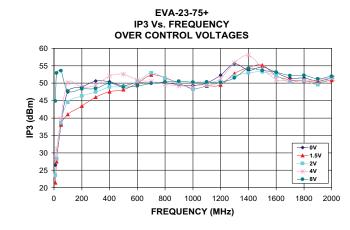


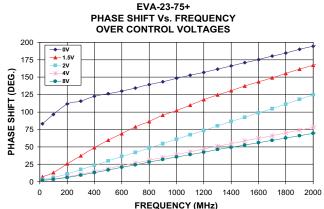
EVA-23-75+ **ATTENUATION Vs. FREQUENCY OVER CONTROL VOLTAGES** → 0V → 1.5V 200 400 600 800 1000 1200 1400 1600 1800 2000 FREQUENCY (MHz)











Performance Charts

EVA-2-75+

Voltage Variable Attenuator

75Ω 50 to 2000 MHz

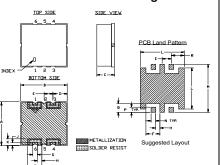
Maximum Ratings

Operating Temperature	-45°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage(V+)	7V
Absolute Max. Control Voltage(Vctrl)	9V
Absolute Max. RF Input Level	+22 dBm
Permanent damage may occur if any of these lin	nits are exceeded.

Pin Connections

RF IN	1
RF OUT	6
V CONTROL	3
V+	4
GROUND	2,5

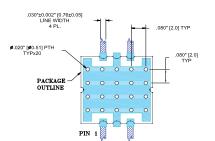
Outline Drawing



Outline Dimensions (inch)

Α	В	С	D	E	F	G	Н	
.394	.394	.150	.122	.075	.120	.038	.037	
10.01	10.01	3.81	3.10	1.90	3.05	0.97	0.94	
J	K	L	M	N	Р	Q	R	wt.
.026	061	370	434	038	.046	.081	.110	grams

Demo Board MCL P/N: TB-381 Suggested PCB Layout (PL-238)



- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

Features

- Frequency range, 50-2000 MHz
- IP3, 50 dBm typ.
- Maximum attenuation at minimum current No external bias and RF matching network required
- Small size, shielded case
- Aqueous washable



Applications

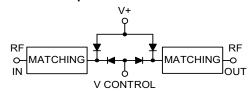
- · CATV
- Variable gain amplifiers
- Feed forward amplifiersALC circuits

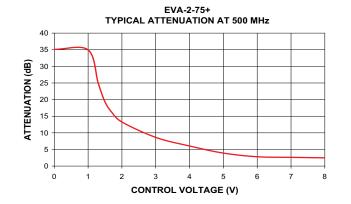
Electrical Specifications (T_{AMB}= 25°C)

FRI (MI	EQ. Hz)		SERTION dB (+8V)		ENUATION (0V)	INPUT POWER (dBm)		TROL Current (mA)	_	RETURN LOSS (dB)	_	SUPPLY Current (mA)
Min.	Max.	Тур.	Max.	Тур.	Min.	Max.		Max.	Тур.	Тур.		Max.
	- 1000 - 2000		3.5 4.7	40 24	25 20	+22 +22	0 - 8 0 - 8	40 40	48 51	27 20	+5 +5	3

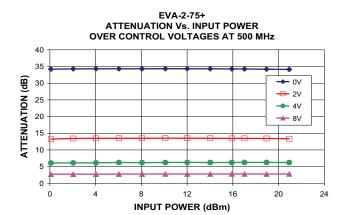
Rise/Fall time: 15µSec/36µSec Typ. Switching Time, turn on/off: 40µSec. Typ.

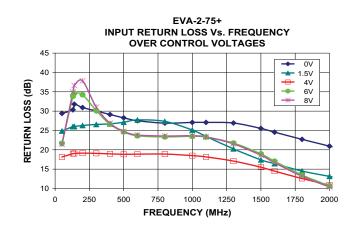
Equivalent Schematic

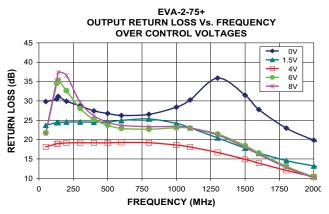


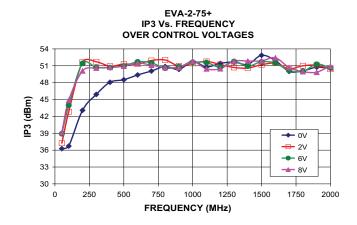


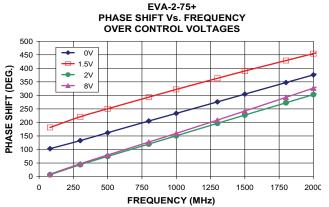
EVA-2-75+ ATTENUATION Vs. FREQUENCY **OVER CONTROL VOLTAGES** 1.5V 2V (dB) 1000 250 FREQUENCY (MHz)











Voltage Variable Equalizer

 75Ω 50 to 1220 MHz

Features

- · Wide bandwidth
- · Low insertion loss
- Low deviation from linear loss, ± 0.5 dB typ.
- High IP3 +50 dBm typ.
- Shielded case
- Aqueous washable

Applications

- Cable loss compensation
- Instrumentation



Electrical Specifications at 25°C, V+=5V_{DC} unless otherwise noted

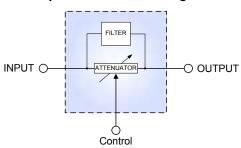
Parameter	Condition	Min.	Тур.	Max.	Units	
Frequency Range		50		1220	MHz	
Incortion Loop	50 MHz, Control Voltage, 0 - 7V		15 - 1.7		dB	
Insertion Loss	1220 MHz, Control Voltage, 0 - 7V		3.1 - 1.6		ав	
Deviation from Linear Loss	Control Voltage 0 - 7V		± 0.5		dB	
IP3	Control Voltage, 2.5 - 7V	+42	+50		dBm	
1 dB Compression	Control Voltage, 0 - 7V		+30		dBm	
Input Return Loss	Control Voltage, 0 - 7V		15		dB	
Output Return Loss	Control Voltage, 0 - 7V		13		dB	
Supply Voltage (V+)	Control Voltage, 0 - 7V	3.5	5	5.5	V	
Owner to Owner to	Control Voltage 7V,		0			
Supply Current	Control Voltage 0V,		10	16	mA	
Control Comment	Control Voltage 7V		12	20		
Control Current	Control Voltage 2.5V	Control Voltage 2.5V 0			mA	

Maximum Ratings

Parameter	Ratings
Operating Temperature	0°C to 85°C
Storage Temperature	-55°C to 100°C
Input Power	+23 dBm
Control voltage	11 V
Supply Voltage (V+)	7 V

Permanent damage may occur if any of these limits are exceeded.

Simplified Functional Diagram



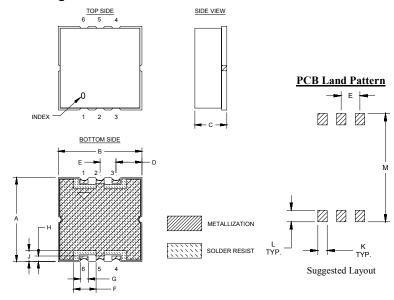
Pin Connections

Function	Pin Number
RF IN	1
RF OUT	6
V CONTROL	3
V+	4
GROUND	2,5

Voltage Variable Equalizer

VAEQ-1220-75+

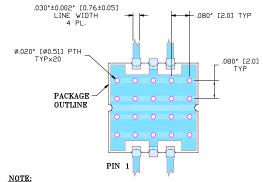
Outline Drawing



Outline Dimensions (inch)

A B C D E F G H J K L M grams .394 .394 .150 .122 .075 .098 .038 .026 .051 .038 .046 .434 10.01 10.01 3.81 3.10 1.90 2.49 0.97 0.66 1.29 0.97 1.17 11.02

Demo Board MCL P/N: TB-549+ Suggested PCB Layout (PL-315)



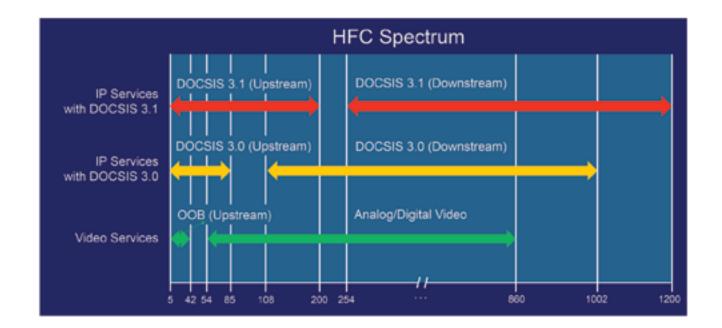
- 1. TRACE WIDTH IS SHOWN FOR RO4350 WITH DIELECTRIC THICKNESS. .030"±.002". COPPER: 1/2 OZ. EACH SIDE.
- FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Pin Connections

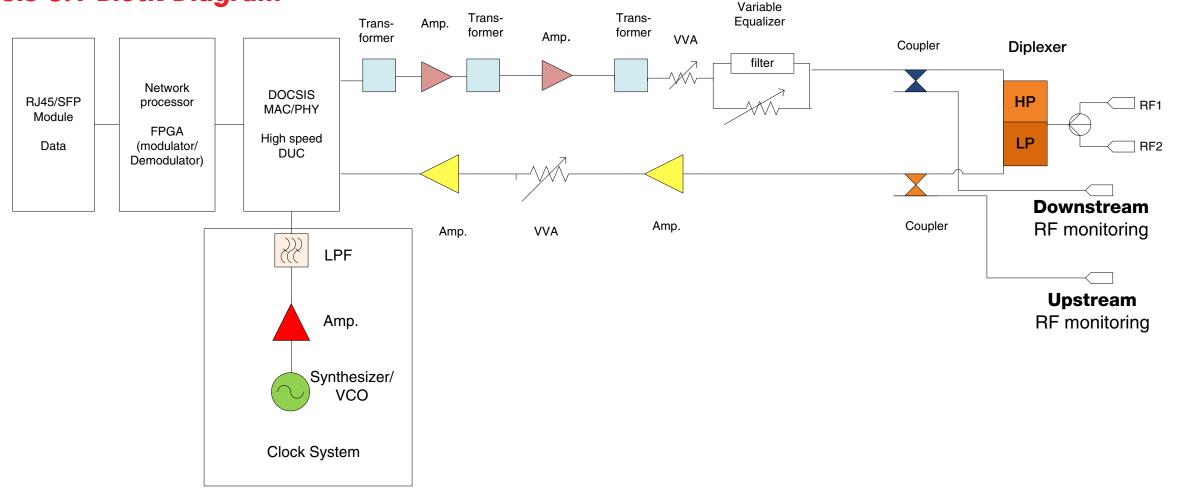
Function	Pin Number
RF IN	1
RF OUT	6
V CONTROL	3
V+	4
GROUND	2,5

DOCSIS 3.1 Features

- Speed: 10 Gbps downstream, 1 Gbps upstream
- Capacity: 50% more data over the same spectrum on existing HFC networks
- Efficiency: Increase cable modem energy efficiency.
- Quality: Reduce network delay, improving responsiveness for applications
- Migration: DOCSIS 3.1 modems are designed to co-exist with older versions, enabling incremental deployment based on market demand



DOCSIS 3.1 Block Diagram



DOCSIS® 3.1

The Next Generation Technology for CATV and Broadband



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