Anexo A

Placas de evaluación construidas

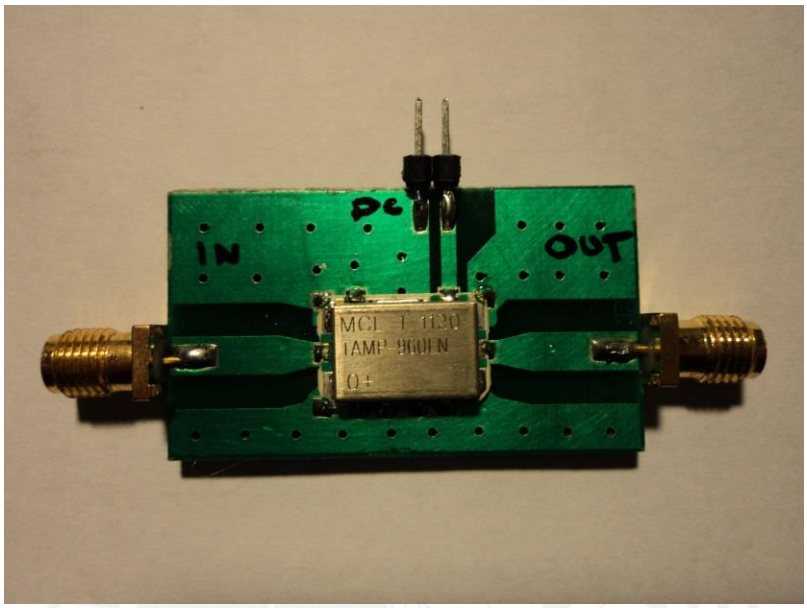


Figura A.1 LNA

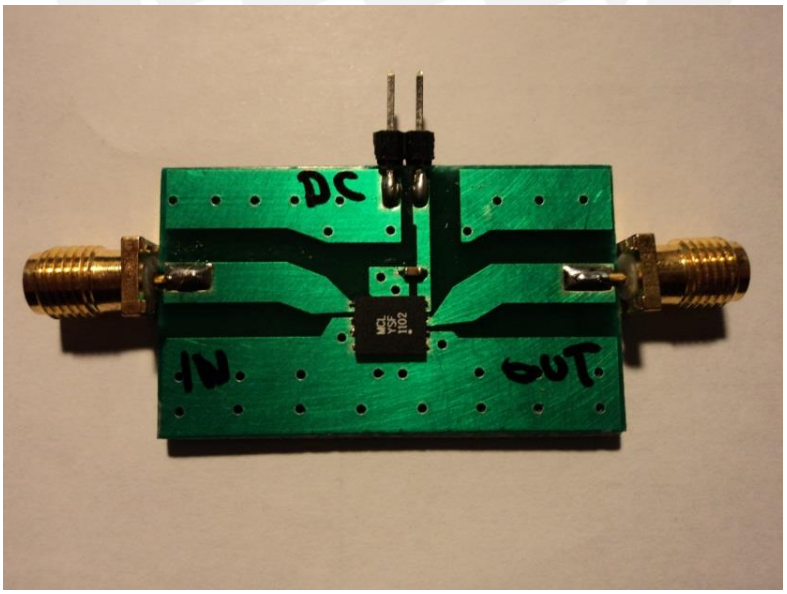


Figura A.2 MA

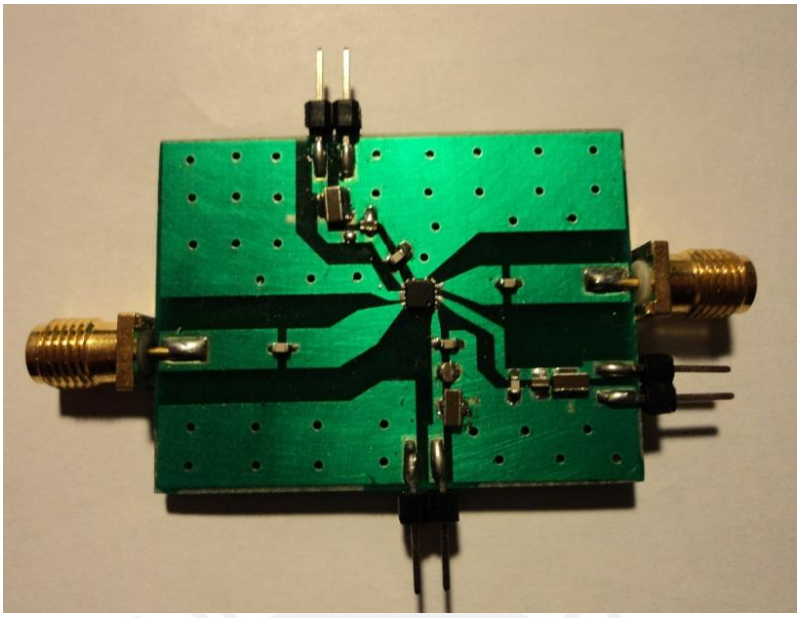


Figura A.3 PA

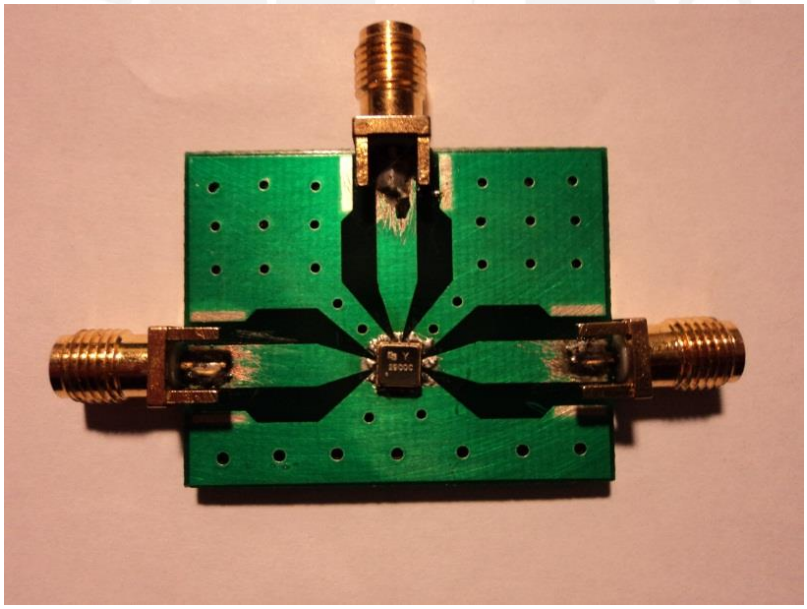


Figura A.4 Duplexor

700 MHz to 1000 MHz GaAs Matched RF PA Predriver

ADL5322

FEATURES

Internally matched to 50 Ω input and output
Internally biased
Operating frequency: 700 MHz to 1000 MHz
Gain: 20 dB
OIP3: 45 dBm
P1 dB: 27 dBm
Noise figure: 5 dB
3 mm × 3 mm LFCSP
Power supply: 5 V

APPLICATIONS

CDMA2000, WCDMA, and GSM base station transceivers and high power amplifiers

FUNCTIONAL BLOCK DIAGRAM

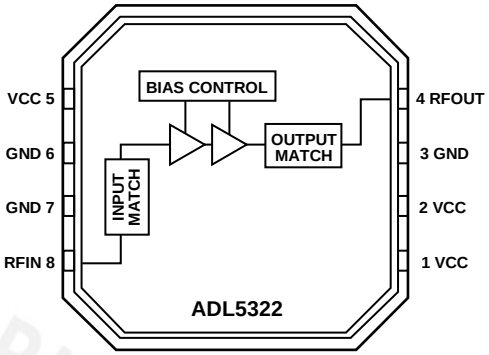


Figure 1.

GENERAL DESCRIPTION

The ADL5322 is a high linearity GaAs driver amplifier that is internally matched to 50 Ω for operation in the 700 MHz to 1000 MHz frequency range. The amplifier, which has a gain of 20 dB, is specially designed for use in the output stage of a cellular base station radio or as an input preamplifier in a multicarrier base station power amplifier. Matching and biasing are all on-chip. The ADL5322 is available in a Pb-free, 3mm × 3 mm, 8-lead LFCSP package with an operating temperature from −40°C to +85°C.

Rev. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 **www.analog.com**
Fax: 781.461.3113

TABLE OF CONTENTS

REVISION HISTORY

7/06—Revision 0: Initial Version

SPECIFICATIONS

V_{CC} = 5 V, T_A = 25°C.

Table 1.

Parameter	Conditions	Min	Typ	Max	Unit
FREQUENCY RANGE		700		1000	MHz
GAIN	Frequency = 850 MHz	19	20.3	21.4	dB
vs. Frequency	832 MHz to 870 MHz		±0.125		dB
vs. Temperature	−40°C to +85°C		±1		dB
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.1		dB
	Frequency = 900 MHz	18.6	19.9	21.1	dB
vs. Frequency	869 MHz to 894 MHz		±0.125		dB
vs. Temperature	−40°C to +85°C		±1		dB
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.1		dB
	Frequency = 950 MHz	18.3	19.6	20.8	dB
vs. Frequency	925 MHz to 960 MHz		±0.125		dB
vs. Temperature	−40°C to +85°C		±1.1		dB
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.1		dB
P1 dB	Frequency = 850 MHz	27.0	27.7		dBm
vs. Frequency	832 MHz to 870 MHz		±0.1		dBm
vs. Temperature	−40°C to +85°C		±1		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.3		dBm
	Frequency = 900 MHz	27.3	27.9		dBm
vs. Frequency	869 MHz to 894 MHz		±0.1		dBm
vs. Temperature	−40°C to +85°C		±1		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.4		dBm
	Frequency = 950 MHz	26.7	27.5		dBm
vs. Frequency	925 MHz to 960 MHz		±0.2		dBm
vs. Temperature	−40°C to +85°C		±1		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.4		dBm
NOISE FIGURE	Frequency = 830 MHz to 960 MHz		5		dB
INPUT RETURN LOSS	Frequency = 830 MHz to 960 MHz		−10		dB
OUTPUT RETURN LOSS	Frequency = 830 MHz to 960 MHz		−10		dB
OIP3	Carrier spacing = 1 MHz, P_{OUT} = 5 dBm per carrier				
	Frequency = 850 MHz		44.8		dBm
vs. Frequency	832 MHz to 870 MHz		±0.25		dBm
vs. Temperature	−40°C to +85°C		±3.0		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.5		dBm
	Frequency = 900 MHz		45.3		dBm
vs. Frequency	869 MHz to 894 MHz		±0.25		dBm
vs. Temperature	−40°C to +85°C		±2.7		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.8		dBm
	Frequency = 950 MHz		44.4		dBm
vs. Frequency	925 MHz to 960 MHz		±0.25		dBm
vs. Temperature	−40°C to +85°C		±2.2		dBm
vs. Voltage	5 V, @ 5% (4.75 V to 5.25 V)		±0.8		dBm
POWER SUPPLY					
Supply Voltage		4.75	5	5.25	V
Supply Current	P_{OUT} = 5 dBm		320		mA
Operating Temperature		−40		+85	°C

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage, VPOS	6 V
Input Power (re: 50 Ω)	18 dBm
Equivalent Voltage	1.8 V rms
θ_{JC} (Soldered)	28.5°C/W
Maximum Junction Temperature	150°C
Operating Temperature Range	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
Soldering Temperature	260°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

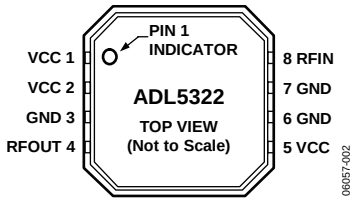


Figure 2. Pin Configuration

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
1, 2, 5	VCC	Positive 5 V Supply Voltage. Bypass these three pins with independent power supply decoupling networks (100 pF, 10 nF, and 10 µF).
3, 6, 7	GND	Device Ground.
4	RFOUT	RF Output. Internally matched to 50 Ω.
8	RFIN	RF Input. Internally matched to 50 Ω.
N/A	EP	Exposed Paddle. Connect to ground plane via a low impedance path.

Table 4. S-Parameters

Frequency	ADL5322 (1, 1)	ADL5322 (1, 2)	ADL5322 (2, 1)	ADL5322 (2, 2)
700.0 MHz	0.210/109.457	0.002/97.018	+11.221/−158.622	0.436/150.470
720.0 MHz	0.195/104.437	0.002/93.284	+11.108/−166.579	0.392/145.211
740.0 MHz	0.179/99.101	0.002/87.856	+11.013/−174.596	0.345/137.443
760.0 MHz	0.165/93.363	0.002/86.137	10.931/177.282	0.295/133.051
780.0 MHz	0.151/86.953	0.002/78.668	10.856/169.006	0.242/125.612
800.0 MHz	0.138/79.928	0.002/74.072	10.781/160.613	0.187/116.434
820.0 MHz	0.125/71.950	0.002/68.940	10.698/152.065	0.130/102.897
840.0 MHz	0.114/62.829	0.002/62.269	10.605/143.342	0.079/76.154
860.0 MHz	0.103/52.162	0.002/56.742	10.493/134.489	0.061/18.090
880.0 MHz	0.095/39.531	0.002/56.696	10.361/125.433	+0.098/−26.962
900.0 MHz	0.090/24.952	0.003/43.549	10.210/116.239	+0.153/−46.741
920.0 MHz	0.088/9.188	0.003/37.254	10.033/106.889	+0.211/−58.300
940.0 MHz	+0.090/−7.350	0.003/29.904	9.837/97.326	+0.269/−66.606
960.0 MHz	+0.095/−23.642	0.003/24.334	9.614/87.600	+0.324/−73.265
980.0 MHz	+0.104/−39.131	0.003/16.521	9.364/77.609	+0.376/−78.914
1.000 GHz	+0.115/−53.477	0.003/8.139	9.081/67.342	+0.424/−83.911

TYPICAL PERFORMANCE CHARACTERISTICS

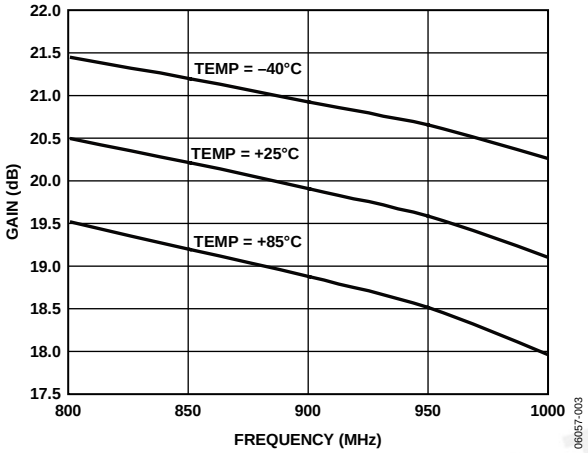


Figure 3. Gain vs. Frequency, V_{CC} = 5 V, T_A = –40°C, +25°C, and +85°C

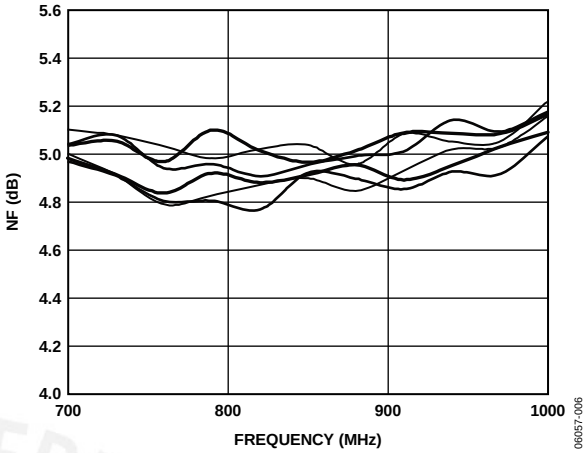


Figure 6. Noise Figure vs. Frequency, Multiple Devices, V_S = 5 V, T_A = 25°C

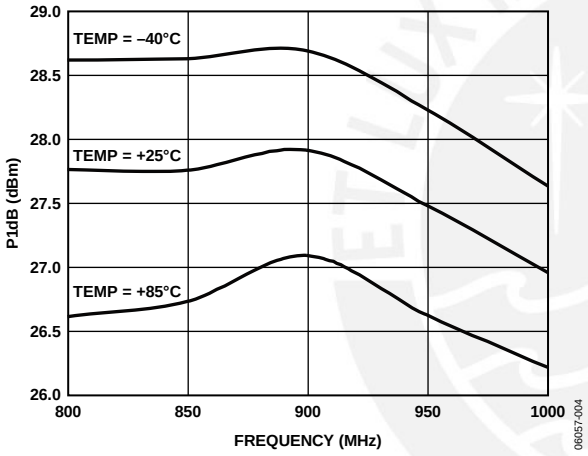


Figure 4. P1 dB vs. Frequency, V_{CC} = 5 V, T_A = –40°C, +25°C, and +85°C

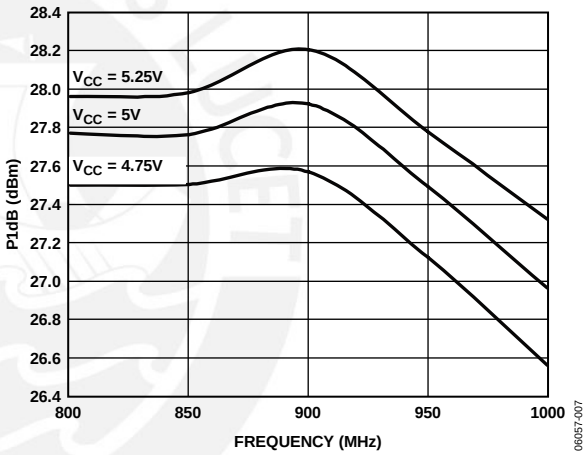


Figure 7. P1 dB vs. Frequency, V_{CC} = 4.75 V, 5 V, and 5.25 V, T_A = 25°C

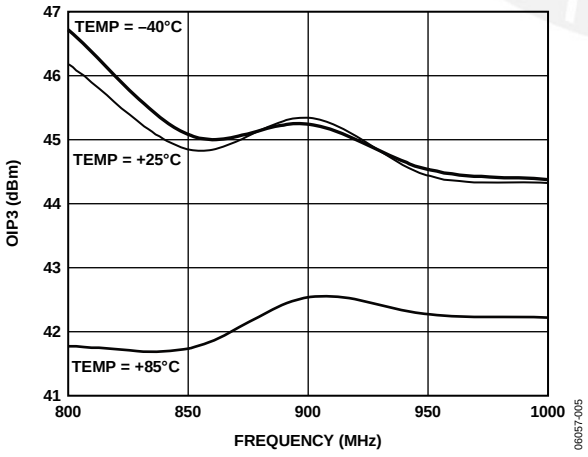


Figure 5. OIP3 vs. Frequency, V_{CC} = 5 V, T_A = –40°C, +25°C, and +85°C

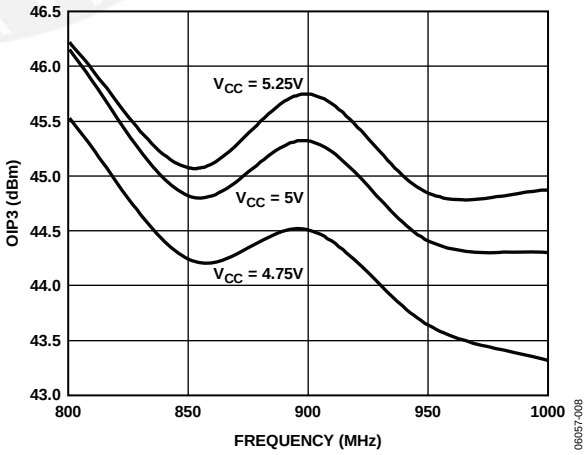


Figure 8. OIP3 vs. Frequency, V_{CC} = 4. 75 V, 5 V, and 5.25 V, T_A = 25°C

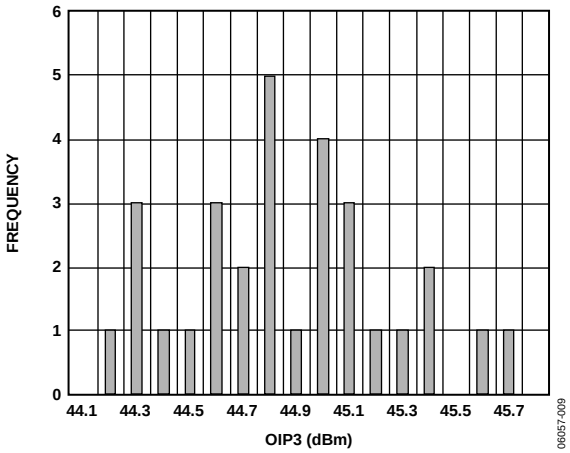


Figure 9. Distribution of OIP3 at 850 MHz

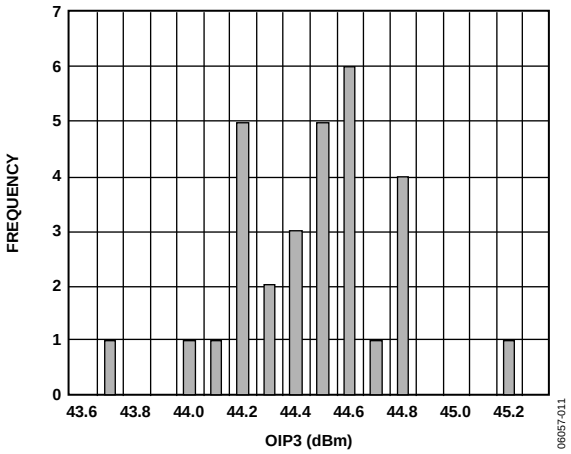


Figure 11. Distribution of OIP3 at 950 MHz

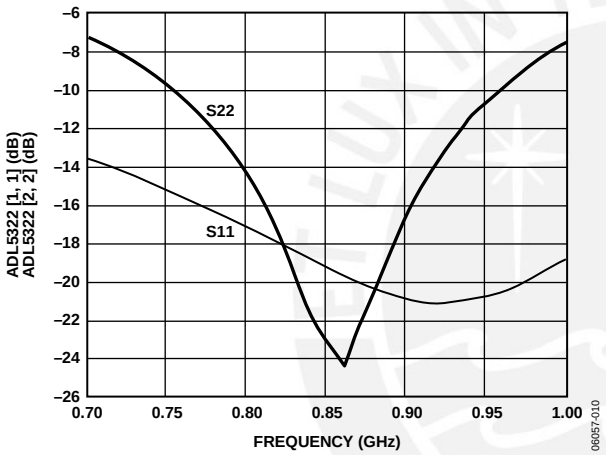


Figure 10. Input S11 and Output S22 Return Loss vs. Frequency

BASIC CONNECTIONS

Figure 14 shows the basic connections for operating the ADL5322. Each of the three power supply lines should be decoupled with 10 µF, 10 nF, and 100 pF capacitors. Pin 3, Pin 6, Pin 7, and the exposed paddle under the device should all be connected to a low impedance ground plane. If multiple ground planes are being used, these should be stitched together with vias under the device to optimize thermal conduction. See recommended land pattern in Figure 12.

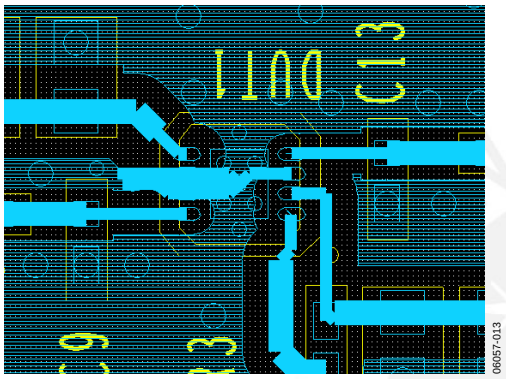


Figure 12. Recommended Land Pattern

CDMA2000 DRIVING APPLICATION

Figure 13 shows a plot of the spectrum of an ADL5323 driving at 4-carrier CDMA2000 signal at 0 dBm per carrier (total carrier power = 6 dBm), centered at 880 MHz. At 750 kHz and 1.98 MHz offset, adjacent channel power ratios of −59 dBc and −84 dBc (measured in 30 kHz with respect to the 1.22 MHz carrier) are observed. At 4 MHz carrier offset, −73 dBc is measured in a 1 MHz bandwidth (−133 dBm/Hz). Note that the spectrum of the four carriers is slightly rounded due the frequency response of the cavity-tuned filter that was used to filter out the noise and distortion of the source signal.

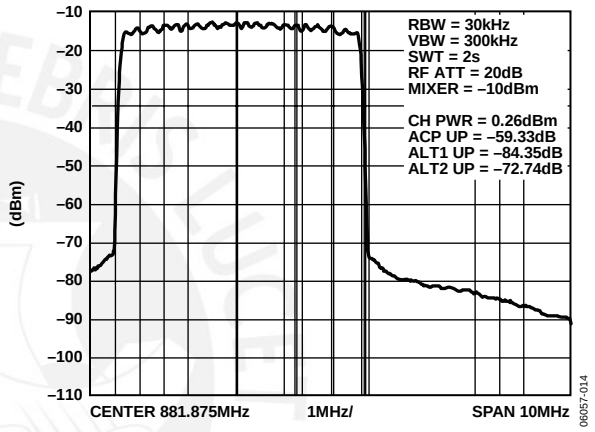


Figure 13. Spectrum of 4 Adjacent CDMA2000 Carriers Centered at 880 MHz; Total Carrier Power = 6 dBm (0 dBm per Carrier)

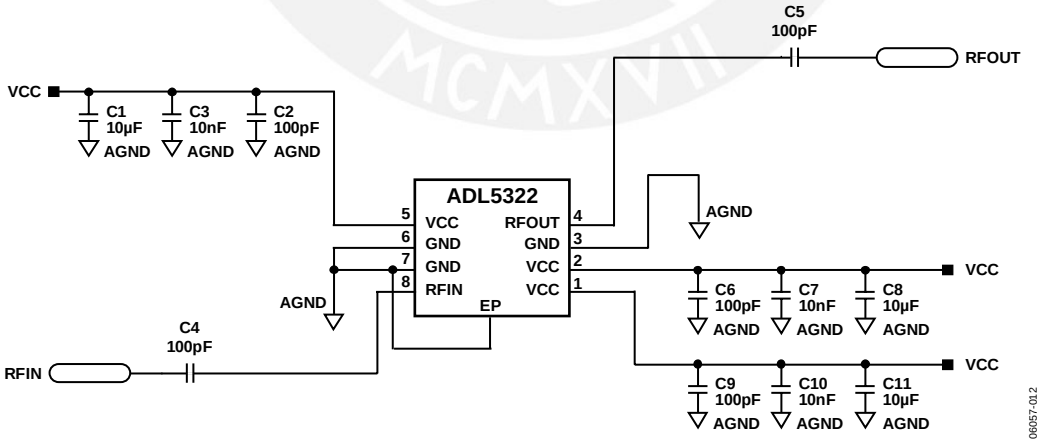


Figure 14. Basic Connections

Figure 15 shows how ACP varies with output power level. The close-in ACP is a function of the signal coding and is unaffected by output headroom at these power levels. The ACP measured at 1.98 MHz carrier offset is −72 dBc at 10 dBm output power (12 dB below the required 60 dBc). At 4 MHz carrier offset, the noise and distortion measured in a 1 MHz bandwidth is −75 dBm at 6 dBm (total) output power (0 dBm per carrier). In a 50 dBm transmitter, this corresponds to an antenna-referred output power of −31 dBm (1 MHz), which is 18 dB below what is required by the CDMA2000 standard.

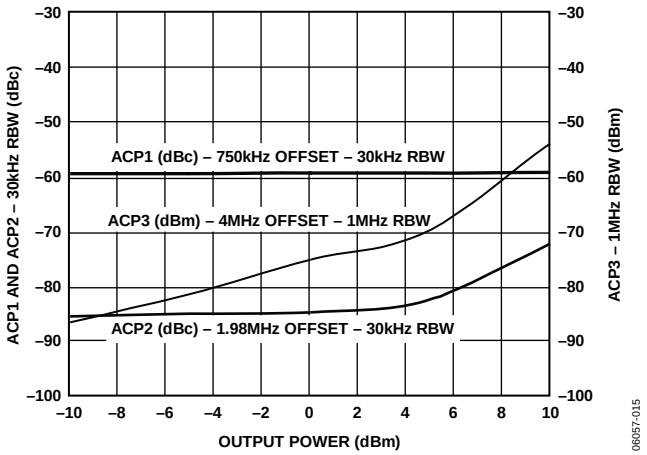


Figure 15. CDMA2000 ACP vs. Output Power per Carrier; 4 Adjacent Carriers

EVALUATION BOARD

Figure 17 shows the schematic of the ADL5322 evaluation board. The board is powered by a single supply in the 4.75 V to 5.25 V range. The power supply is decoupled on each of the three power supply pins by 10 µF, 10 nF, and 100 pF capacitors. See Table 5 for exact evaluation board component values. Note that all three VCC pins (Pin 1, Pin 2, and Pin 5) should be independently bypassed as shown in Figure 17 for proper operation.

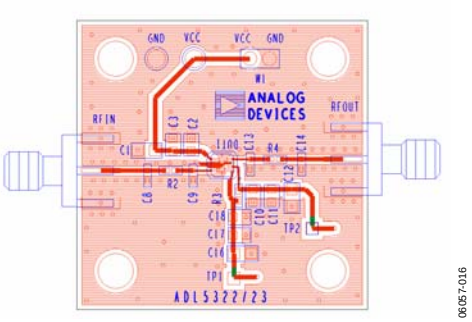


Figure 16. Evaluation Board Component Side View

Table 5. Evaluation Board Components

Component	Function	Default Value
DUT1	Driver amplifier	ADL5322
C1, C12, C16	Low frequency bypass capacitors	10 µF, 0603
C3, C11, C17	Low frequency bypass capacitors	10 nF, 0402
C2, C10, C18	High frequency bypass capacitors	100 pF, 0402
C8, C9, C13, C14, R3	Open	Open, 0402
R2, R4	AC coupling capacitors	100 pF, 0402

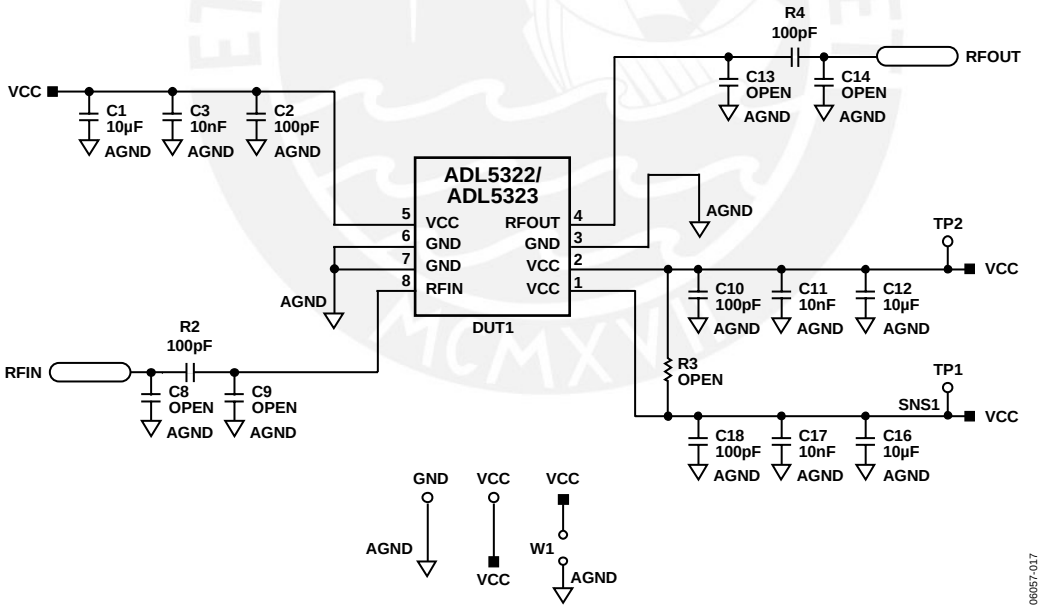


Figure 17. Evaluation Board Schematic

OUTLINE DIMENSIONS

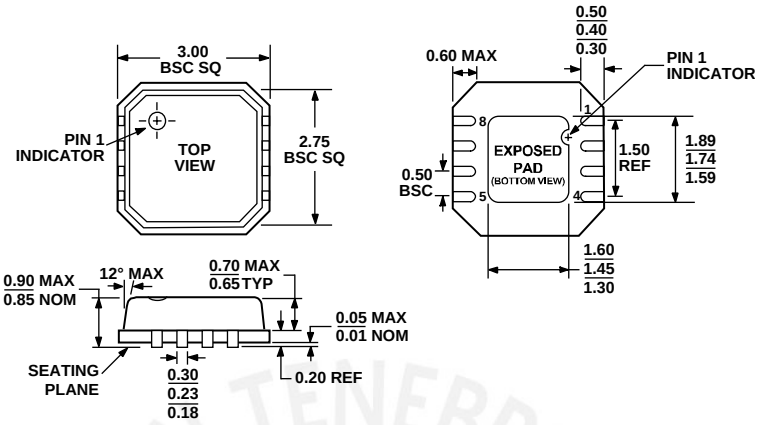


Figure 18. 8-Lead Lead Frame Chip Scale Package [LFCSP_VD]
3 mm × 3 mm Body, Very Thin, Dual Lead
(CP-8-2)
Dimensions shown in millimeters

ORDERING GUIDE

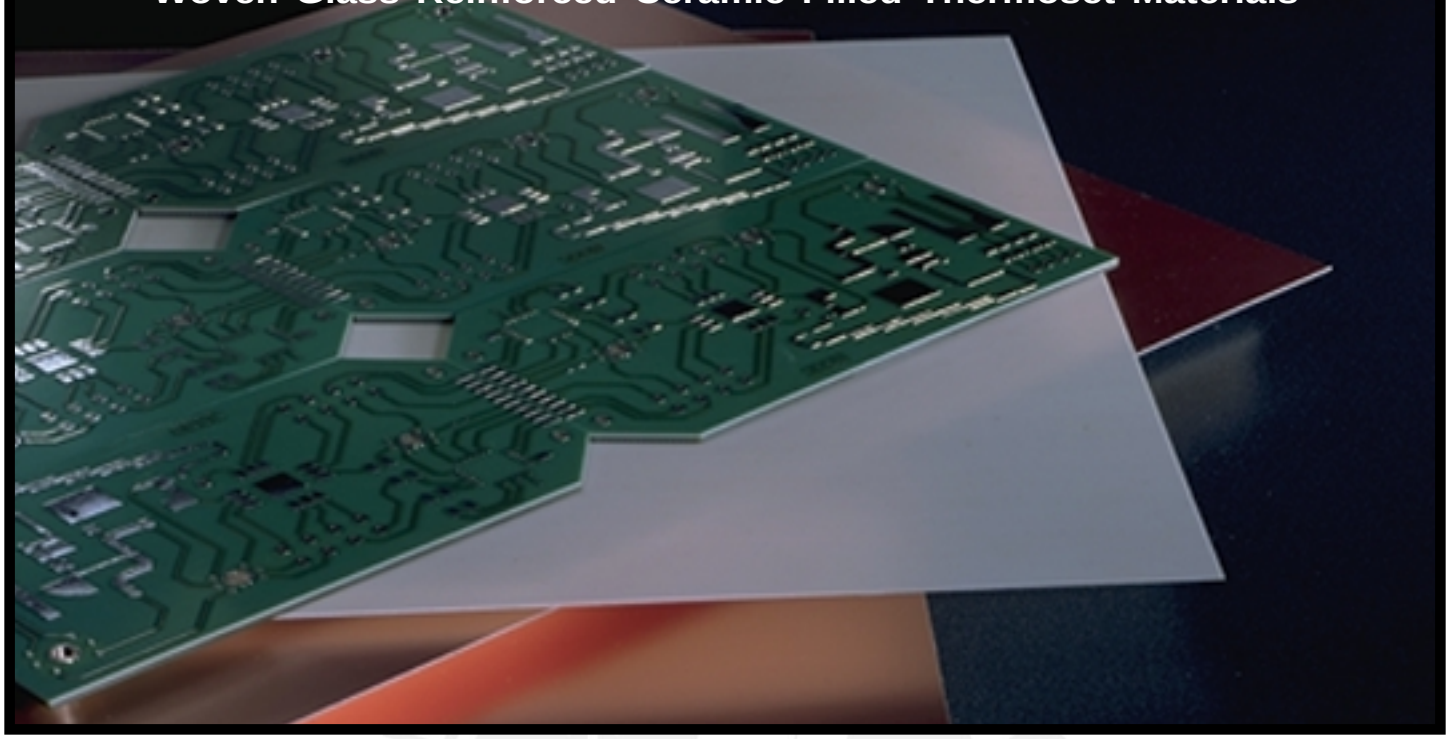
Model	Temperature Range	Package Description	Package Option	Branding	Ordering Quantity
ADL5322ACPZ-R7[1]	−40°C to +85°C	8-Lead LFCSP_VD, 7" Tape and Reel	CP-8-2	OP	1500
ADL5322ACPZ-WP[1]	−40°C to +85°C	8-Lead LFCSP_VD, Waffle Pack	CP-8-2	OP	50
ADL5322-EVAL		Evaluation Board			1

[1] Z = Pb-free part.

NOTES

RO4003®, RO4350® High Frequency Laminates

Woven Glass Reinforced Ceramic Filled Thermoset Materials



FEATURES AND BENEFITS:

Non-PTFE.

- Fabricates like FR4.
- Processable by a larger number of fabricators.
- UL flammability rating (RO4350).
- No special through-hole treatments or handling required.
- Lower processing and assembly costs.

Excellent high frequency performance due to low dielectric tolerance and loss.

- Ideal for applications with higher operating frequency requirements.

Stable electrical properties versus frequency.

- Repeatable designs.
- Ideal for multilayer and mixed dielectric constructions (hybrid).

Low thermal coefficient of dielectric constant.

- Ideal for applications sensitive to temperature change.

Low Z-axis expansion.

- Ensures reliable plated through hole quality.

Low in-plane expansion coefficient.

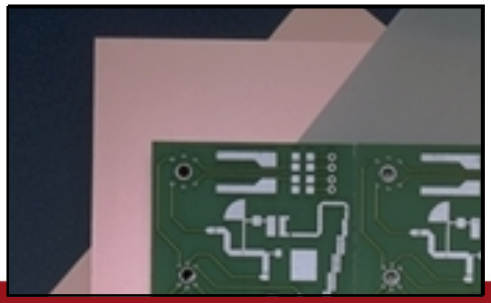
- Excellent reliability of surface mounted assemblies.
- Suitable for use with epoxy glass multilayer board hybrid designs.

Excellent dimensional stability.

- High production yields.

Volume manufacturing process.

- Economical laminate pricing.



High glass transition temperature (280°C).

- Will not warp during reflow assembly.
- Ensures plated through hole reliability.

Typical Applications:

- *LNB's for Direct Broadcast Satellites*
- *Microstrip Patch Antennas*
- *PCS and Cellular Base Station Antennas and Power Amplifiers*
- *Spread Spectrum Communication Systems*
- *RF Identification Tags*

ROGERS SINCE 1832

Rogers Corporation, Microwave Materials Division, 100 S. Roosevelt Avenue, Chandler AZ 85226-3415 Tel: 480 961-1382 Fax: 480 961-4533

PROPERTY		Typical Values RO4003	RO4350	Units
Dielectric Constant @10 GHz		3.38 ± 0.05	3.48 ± 0.05	–
Thermal Coefficient of ε_r @ 0 to 100°C		+40	+50	ppm/°C
Dissipation Factor @10 GHz		0.0027	0.0040	–
Youngs Modulus	X	3700 (25,510)		kpsi (MPa)
	Y	3900 (26,889)	1664 (11,473)	
Volume Resistivity		1.7 x 10^{10}	1.2 x 10^{10}	Mohm•cm
Surface Resistivity		4.2 x 10^{9}	5.7 x 20^{9}	Mohm
Moisture Absorption		0.06	0.06	%
Dimensional Stability	X,Y	<0.3	<0.5	mm/m
Specific Gravity 23°C		1.8	1.9	–
Peel Strength		1.1 (6.4)	0.9 (5.3)	N/m (pli)
Thermal Conductivity		0.64	0.62	W/m/°K
Coefficient of Thermal Expansion @ 0 to 100°C	X	11	14	ppm/°C
	Y	14	16	
	Z	46	50	
Glass Transition (Tg)		>280	>280	°C
UL Flammability Rating		NO	94-VO	–

Availability:

Standard Thicknesses:

RO4350: 0.0066"(0.168mm), 0.010" (0.254mm), 0.020" (0.508mm), 0.030" (0.762mm), 0.060" (1.524mm)

RO4003: 0.008" (0.203mm), 0.020" (0.508mm), 0.032" (0.813mm), 0.060" (1.524mm)

Standard Sheet Sizes: 24" X18" (610 X 457mm), 12"X18" (305 X 457mm)

Standard Copper Cladding: 1/2 oz (17µm) and 1 oz (35µm) electrodeposited copper.

Rogers laminates can be purchased by contacting your U.S. customer service representative or one of our overseas offices. Telephone numbers are listed below.

The information and guidelines contained in this document are intended to assist you in designing with RO4000 series. They are not intended to and do not create any warranties, express or implied, including any warranty of merchantability or fitness for a particular application. The user should determine the suitability of Rogers materials for each application. Values are averages and not guaranteed.

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ROGERS
SINCE 1832

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 Printed in U.S.A. Revised 10/99 0551-109 -5.0-ON

Rogers Corp: Microwave Materials Unit/Standard Thickness

Standard Thickness' and Panels Sizes for RO3000® and RO4000® Series High Frequency Circuit Materials

RO3000® Series LaminateStandard Dielectric ThicknessStandard Panel Sizes GradeDielectric Constant

RO3003™

RO3035™3.00

3.500.005" (0.13 mm)± 0.0005

0.010"(0.25 mm) ± 0.0007

0.020"(0.50 mm)± 0.001

0.030" (0.75 mm)±0.0015

0.060" (1.52 mm) ±0.00312"x18" (304.8 x457.2 mm)

24"x18" (609.6 x457.2 mm)

RO3006™

RO3010™6.15

10.20.005" (0.13 mm) ± 0.0005

0.010" (0.25 mm) ±0.0007

0.025" (0.64 mm) ±0.001

0.050" (1.27 mm) ±0.00218"x 12" (457.2 mm x 304.8mm)

18" x 24"" (457.2 mm x609.6mm)

RO3203™3.020.010" (0.254 mm)± 0.0007

0.020" (0.508 mm) ±0.001

0.030" (0.762 mm)±0.0015

0.060" (1.524 mm) ±0.00318" x12' (457.2 X 304.8 mm)

18" x24" (457.2 X 609.6 mm)

RO3206™

RO3210™6.15

10.20.025" (0.635 mm) ± 0.001

0.050" (1.27 mm) ±0.00218" x12' (457.2 X 304.8 mm)

18" x24" (457.2 X 609.6 mm)

RO3000 series material standard cladding is: 1/2 oz. (17 µm) and 1 oz.(35 µm) two sides

RO4000® Series High Frequency Circuit MaterialsStandard Dielectric ThicknessStandard Panel Sizes GradeDielectric Constant

RO4003C™3.380.008" (0.203mm) ± 0.0010

0.012" (0.305mm) ± 0.0010

0.016" (0.406mm) ± 0.0015

0.020" (0.508 mm)±0.0015

0.032" (0.813 mm)±0.0020

0.060" (1.524 mm) ±0.004012"x18" (304.8 mm x 457.2mm)

24"x18" (609.6 mm x 457.2mm)

RO4003C material standard cladding is: 1/2 oz.(17 µm) and 1 oz.(35 µm) electrodeposited copper two sides.

4350B™3.480.0066" (0.168mm) ± 0.0007

0.010" (0.25 mm) ± 0.0010

0.0133" (0.338mm) ± 0.0015

0.0166" (0.422mm) ± 0.0015

0.020" (0.51 mm) ±0.0015

0.030" (0.76 mm)±0.0020

0.060" (1.52 mm) ±0.004012"x18" (304.8 mm x 457.2mm)
24"x18" (609.6 mm x457.2mm)
RO4350™ material standard cladding is: 1/2 OZ (17mm) and 1 oz. (35 µm) electrodeposited copper two sides

Panel sizes and thicknesses for RT/duroid, TMM, and ULTRALAM 2000 high frequency laminates.

For other claddings or panel sizes please contact our Customer Service Department.

Rogers Corporation,
Advanced Circuit Materials Division
High Frequency Laminates
100 S. Roosevelt Ave, Chandler, AZ 85226
Flexible Circuit Materials
100 N. Dobson Road, Chandler, AZ 85224
Phone: 480 961-1382/ Fax: 480 961-4533/ Site Feedback

The world runs better with Rogers.™

Low Noise Amplifier TAMP-960LN+

50Ω 824 to 960 MHz

The Big Deal

- Ultra Low Noise Figure, 0.55 dB typ.
- High IP3, 30 dBm typ.
- Good VSWR, 1.2:1 typ.
- Low Current, 40mA at +5V
- Integrated Bias Matching and Stabilization Circuits

CASE STYLE: JQ1382

Product Overview

The TAMP-960LN+ (RoHS compliant) utilizes advanced E-PHEMT technology in a single stage low noise amplifier design built into a shielded case (size: .591"x.394"x.118"). The drop-in module offers ultra low noise figure and high output IP3 with good input and output return loss over the entire frequency range and without the need of external matching components.

Key Features

Feature	Advantages
Ultra Low NF	With only 0.55 dB NF, the TAMP-960LN+ enables greater sensitivity for receiver applications. It includes all matching and stability circuits making this Drop-in LNA module a turn-key solution for ensuring low system sensitivity in demanding applications.
High Output IP3	At +30 dBm IP3, in combination with its low noise performance, the TAMP-960LN+ can improve a systems' spur-free dynamic range which is often the critical driver in many receiver applications.
Low Current, 40mA typ.	At only 40mA, the TAMP-960LN+ is ideal for applications with limited available power or densely packed applications where termal and power management is critical.
High P1dB: 16.5dBm typ.	High P1dB enables the amplifier to operate in linear region in the presence of strong interfering signals.
Well Matched input/ output ports	With typical input VSWR of 1.1:1 and output VSWR of 1.35:1, the TAMP-960LN+ can be used in cascade with many 50 Ohm components and maintain minimal interaction or reflections.
Drop-in Module	Eliminates the need for designers to optimize low noise transistor bias and matching circuitry. The TAMP-960LN+ provides the outstanding combined performance and does not require any external elements. The case PCB area is smaller than most LNA transistor designs with external circuitry.
Metal Case	Provides a protective enclosure improving handling robustness in addition to shielding the sensitive high gain devices from close by circuitry.
Unconditionally stable	No adverse effects due to reactive loads at the input and output ports avoiding potential instability which can be a critical requirement when integrating high gain, high frequency devices on an open PCB assembly.

Surface Mount

Low Noise Amplifier

TAMP-960LN+

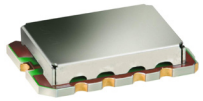
50Ω 824 to 960 MHz

Features

- Ultra low noise figure, 0.55 dB typ.
- High Output IP3, 30 dBm typ.
- Output power, up to +16.5 dBm typ.
- Low current consumption
- Good VSWR, 1.2:1 typ.
- Unconditionally stable

Applications

- Base station transceiver, tower mounted amplifier, repeater
- CDMA: 824 to 894 MHz
- GSM Rx: 880 to 915 MHz
- GSM Tx: 925 to 960 MHz
- General purpose low noise amplifier



CASE STYLE: JQ1382
PRICE: $9.95 ea. QTY (5-49)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

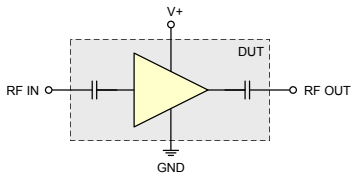
Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		824		960	MHz
Noise Figure	824 - 960		0.55	0.80	dB
	824 - 894		0.60	0.80	
	880 - 915		0.55	0.70	
	925 - 960		0.55	0.70	
Gain	824 - 960	16.5	18.0		dB
	824 - 894	16.5	18.0		
	880 - 915	16.5	18.0		
	925 - 960	16.5	17.5		
Gain Flatness	824 - 960		± 0.6	± 1.2	dB
	824 - 894		± 0.4	± 0.8	
	880 - 915		± 0.2	± 0.4	
	925 - 960		± 0.2	± 0.4	
Output Power at 1dB compression	824 - 960	15.5	16.5		dBm
	824 - 894	15.5	16.5		
	880 - 915	15.5	16.5		
	925 - 960	15.5	16.5		
Output third order intercept point (OIP3)	824 - 960		30		dBm
	824 - 894		30		
	880 - 915		30		
	925 - 960		30		
Input VSWR	824 - 960		1.1		:1
	824 - 894		1.1		
	880 - 915		1.1		
	925 - 960		1.1		
Output VSWR	824 - 960		1.4		:1
	824 - 894		1.3		
	880 - 915		1.4		
	925 - 960		1.5		
DC Supply Voltage			5.0		V
DC Supply Current			40	45	mA

Pin Connections

RF IN	10
RF OUT	5
V+	7
GROUND	1,2,3,4,6,8,9,11

Simplified Schematic



Maximum Ratings

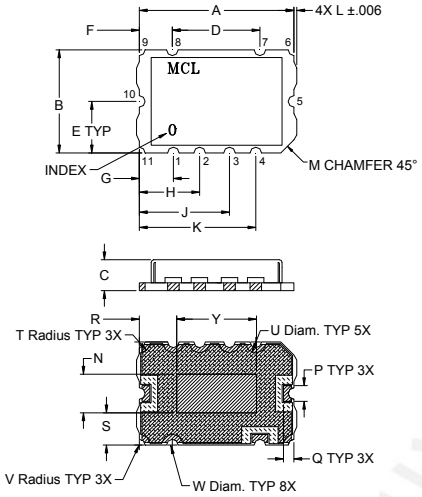
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Operating Voltage	5.5 V
Input RF Power (no damage)	+10 dBm
Power Consumption	250 mW

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

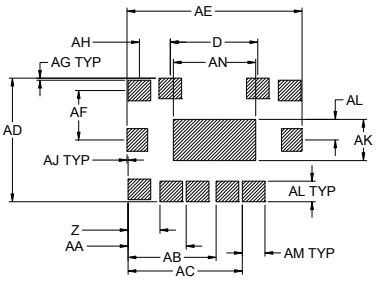
ESD Rating

Human Body Model (HBM): Class 1A (250 V to < 500 V) in accordance with ANSI/ESD STM 5.1 - 2001
Machine Model (MM): Class M1 (40 V) in accordance with ANSI/ESD STM 5.2 - 1999

Outline Drawing



PCB Land Pattern

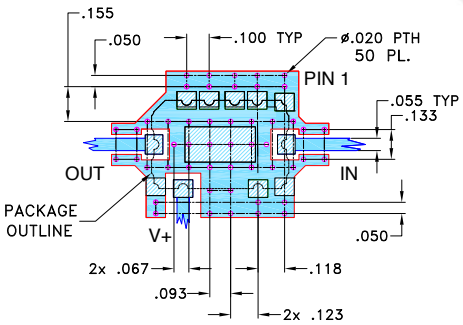


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
.591	.394	.118	.335	.197	.126	.130	.230	.344	.445	.011	.050	.148	.060	.040	.143	.123	.042	.084
15.0	10.0	3.0	8.5	5.0	3.2	3.3	5.85	8.75	11.3	.28	1.27	3.75	1.52	1.02	3.63	3.13	1.07	2.13

V	W	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	AN	wt.
.022	.044	.305	.122	.222	.337	.437	.472	.669	.189	.008	.118	.004	.158	.079	.087	.315	grams
.56	1.12	7.75	3.1	5.65	8.55	11.1	12.0	17.0	4.8	.20	3.0	.10	4.0	2.0	2.2	8.0	0.8

Demo Board MCL P/N: TB-468+
Suggested PCB Layout (PL-293)



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B 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.

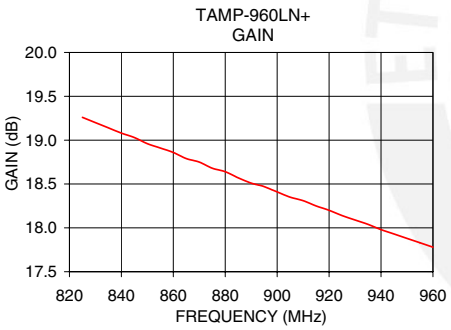
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

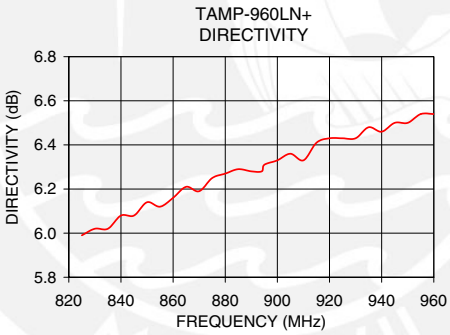
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

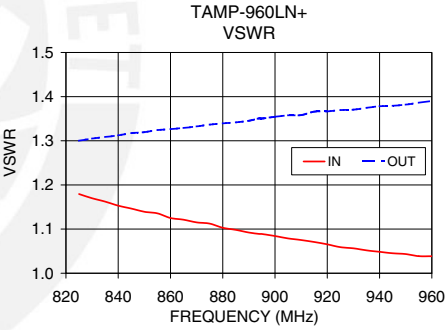
Typical Performance Data/Curves

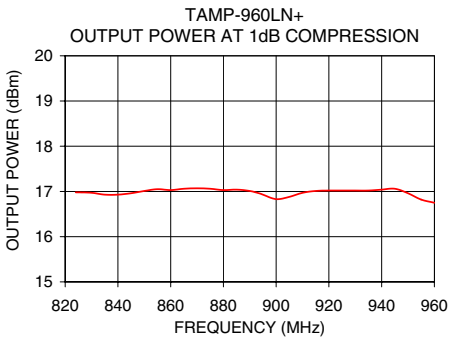
TAMP-960LN+

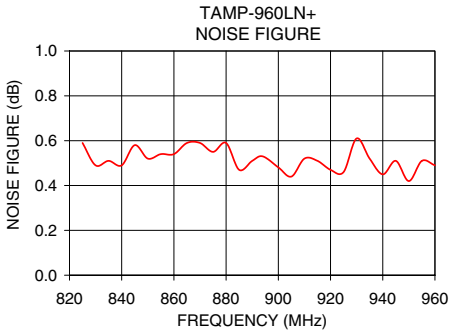
FREQUENCY (MHz)	GAIN (dB)	DIRECTIVITY (dB)	VSWR IN (:1)	VSWR OUT (:1)	NOISE FIGURE (dB)	P. OUT @ 1dB COMPR. (dBm)	OUTPUT IP3 (dBm)
824.00	19.26	6.03	1.18	1.30	0.67	16.98	29.63
830.00	19.20	6.02	1.17	1.30	0.49	16.97	29.84
835.00	19.14	6.02	1.16	1.31	0.51	16.93	30.08
845.00	19.03	6.08	1.15	1.32	0.58	16.96	30.54
850.00	18.96	6.14	1.14	1.32	0.52	17.01	30.44
855.00	18.91	6.12	1.14	1.32	0.54	17.05	30.69
860.00	18.86	6.16	1.13	1.33	0.54	17.03	30.53
870.00	18.75	6.19	1.12	1.33	0.59	17.07	29.81
875.00	18.68	6.25	1.11	1.34	0.55	17.06	29.78
880.00	18.64	6.27	1.10	1.34	0.59	17.03	29.84
885.00	18.57	6.29	1.10	1.34	0.47	17.04	29.85
894.00	18.48	6.28	1.09	1.35	0.53	16.95	29.98
900.00	18.41	6.33	1.08	1.35	0.48	16.83	30.84
905.00	18.35	6.36	1.08	1.36	0.44	16.88	30.81
915.00	18.25	6.41	1.07	1.37	0.51	17.01	31.10
925.00	18.14	6.43	1.06	1.37	0.46	17.02	30.72
930.00	18.09	6.43	1.06	1.37	0.61	17.02	30.77
935.00	18.04	6.48	1.05	1.37	0.52	17.02	30.70
945.00	17.93	6.50	1.05	1.38	0.51	17.06	30.23
960.00	17.78	6.54	1.04	1.39	0.49	16.75	31.15

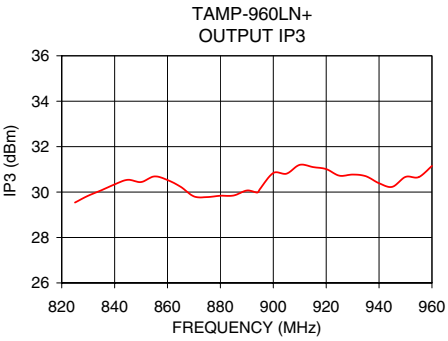












MSiP™ *Mini-Circuits System In Package*

Flat Gain Amplifier YSF-122+

The Big Deal:

- Ultra Flat Gain Response: ± 0.2 dB over 800-1200 MHz
- Excellent Combination of gain, P1dB, IP3 and NF
- 50Ω Input and Output: no External Components Required

CASE STYLE: DL1020

Product Overview:

YSF-122+ is an advanced amplifier module in a Mini-Circuits System In Package MSiP™. This module is fully matched to 50Ω in/out impedance and has built-in Input & Output DC block capacitors. It is enclosed in a 5 x 6 mm MCLP plastic package. The YSF-122+ uses E-PHEMT technology enabling it to work with a single positive supply voltage.

Key Features

Feature	Advantages
Superior Gain Flatness ± 0.2dB	The YSF-122+ provides industry leading gain flatness over the full cellular communications L band (800-1200 MHz) making this ideal for use in applications where gain-flatness and repeatability are critical performance requirements.
High Gain	The YSF-122+ is a two-stage design with internal feedback and bias to provide flat 20 dB nominal gain, supporting applications where a single gain block must overcome large system losses such as long cable runs and lossy components.
Strong Combination of Performance	The YSF-122+ provides a strong combination of performance parameters including high gain (20 dB), high IP3 (+37 dBm) and P1dB (+20 dBm) and low noise figures (3.4 dB) that are difficult to achieve in a single stage design and available only in the YSF amplifier series.
Integrated Matching, DC Blocking and Bias in Small Package	The YSF-122+ includes all support circuits including: Matching, Bias and DC Blocking, all integrated into a single 5x6mm package making the total footprint equal to or smaller than most solutions.
Excellent Return Loss	The YSF-122+ includes integrated input and output matching and bias circuits to make this amplifier a simple, complete drop-in solution. The matching circuits provide excellent output return loss (17dB), and are designed to give optimal P1dB and IP3 performance in a 50Ω environment.
High Reverse Isolation	With 30 dB of reverse isolation – the YSF-122+ is an ideal gain block for use in integrated systems to minimize VSWR interactions resulting from cascading highly reflective components such as sharp filters.

MSiP™ *Mini-Circuits System In Package*

Flat Gain Amplifier 0.8-1.2 GHz

Product Features

- Matched 50-ohm surface mount amplifier
- High gain, 20 dB typ.
- Up to +20 dBm typ. output power
- High IP3, +37 dBm
- Low Noise Figure, 3.4 dB typ.
- High directivity, 32 dB isolation
- Internal Input & Output DC Block
- Separate terminal for DC

YSF-122+

CASE STYLE: DL1020
PRICE: $2.69 ea. QTY. (20)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

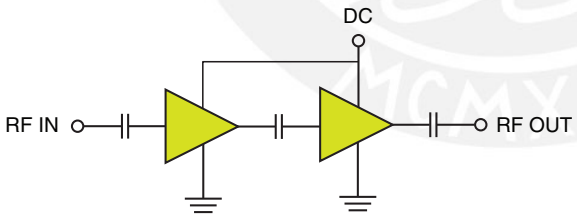
Typical Applications

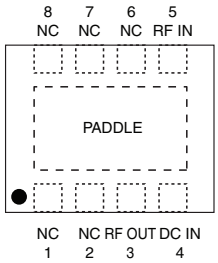
- Cellular
- Portable Wireless
- Receivers & transmitters
- Radar

General Description

YSF-122+ is an advanced amplifier module in a Mini-Circuits System In Package MSiP™. This module is fully matched to 50Ω in/out impedance and has built-in Input & Output DC block capacitors. It is enclosed in a 5 x 6 mm MCLP plastic package. The YSF-122+ uses E-PHEMT* technology enabling it to work with a single positive supply voltage.

simplified schematic and pad description





Function	Pad Number	Description
RF-IN	5	RF Input
RF-OUT	3	RF Output
DC	4	DC Supply
GND	Paddle	Connected to ground
NOT USED	1,2,6,7,8	No internal connection

*Enhancement mode Pseudomorphic High Electron Mobility Transistor

Electrical Specifications[1] at 25°C, Zo=50Ω unless noted

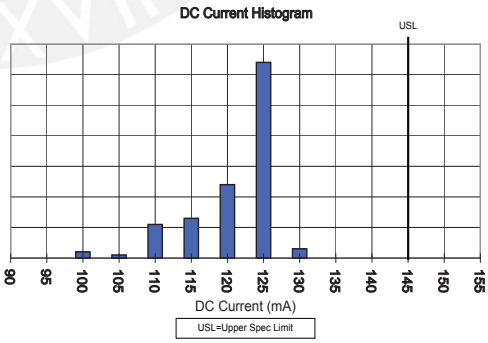
Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		800		1200	MHz
Gain	800	18.1	20.1	22.1	dB
	1000	18.4	20.4	22.4	
	1200	18.3	20.3	22.3	
Gain Flatness			±0.2		dB
Input Return Loss	800	9.0	8.8		dB
	1000		11.0		
	1200		11.0		
Output Return Loss	800	11.0	13.0		dB
	1000		15.0		
	1200		17.3		
Reverse Isolation			32.0		dB
Output Power @1 dB compression	800	18.5	20.5		dBm
	1000		20.5		
	1200		20.4		
Output Power @ 3 dB compression			21.3		dBm
Output IP3	800	31.0	37.0		dBm
	1000		36.0		
	1200		36.0		
Noise Figure	800		3.5	4.4	dB
	1000		3.4		
	1200		3.4		
Device Operating Voltage			5		V
Device Operating Current			118	145	mA
Device Current Variation vs. Temperature[2]			2		µA/°C
Device Current Variation vs Voltage			0.002		mA/mV
Thermal Resistance, junction-to-ground lead [3]			56		°C/W

[1] Measured on Mini-Circuits Characterization test board TB-589+. See Characterization Test Circuit (Fig. 1)
[2] Δ(+85°C to -45°C)
[3] Thermal Resistance= Hot spot temperature - Ground lead temperature / Power Dissipation

Absolute Maximum Ratings

Parameter	Ratings	Units
Operating Temperature[4]	-40 to 85	°C
Storage Temperature	-65 to 150	°C
DC Voltage on Pad 4	7	V
Power Dissipation	1.5	W
Input Power	21	dBm

Note: Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.
[4] Case is defined as ground paddle.



Characterization Test Circuit

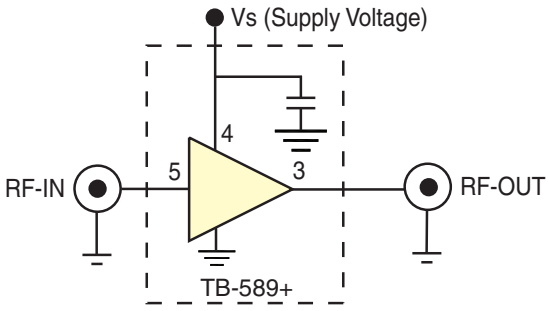


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Fixture TB-589+) Gain, Return loss, Output power at 1dB compression (P1 dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 10 MHz apart, 2.5 dBm/tone at output.

Recommended Application Circuit

(refer to evaluation board for PCB Layout and component values)

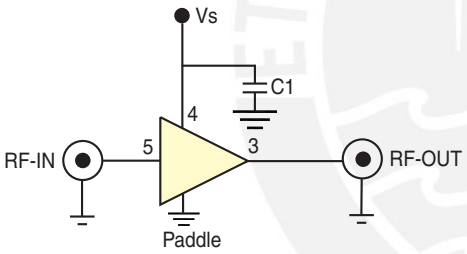
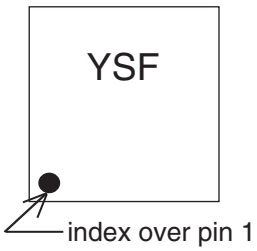


Fig 2. Recommended Application Circuit

Product Marking



Additional Detailed Technical Information *(additional information is available on our web site. To access this information enter the model number on our web site home page)*		
Performance Data	Data Table	go!
	Swept Graphs	go!
	S-Parameter (S2P Files) Data Set (.zip file)	go!
Case Style	DL1020 *Plastic package, exposed paddle, lead finish: tin/silver/nickel*	go!
Tape & Reel **Standard quantities available on reel**	F68 *7" reels with 20, 50, 100, 200, 500, or 1K devices.*	go!
Suggested Layout for PCB Design	PL-335	go!
Evaluation Board	TB-589-2+	go!
Environmental Ratings	ENV08T1	go!

ESD Rating

Human Body Model (HBM): Class 1A in accordance with ANSI/ESD STM 5.1 - 2001

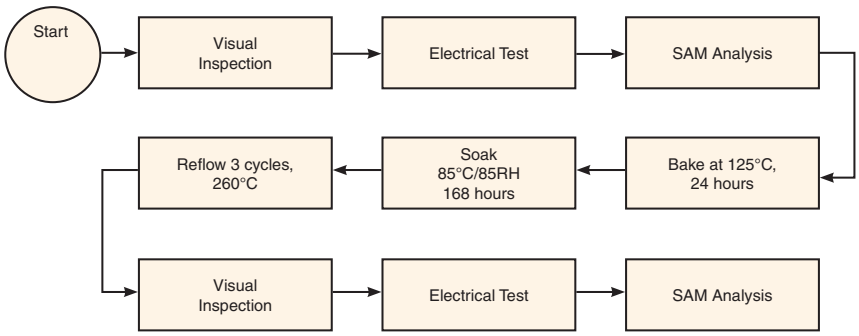
Machine Model (MM): Class M1 (25V) in accordance with ANSI/ESD STM5.2-1999

Attention
Observe precautions
for handling electrostatic
sensitive devices

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart



TriQuint SEMICONDUCTOR

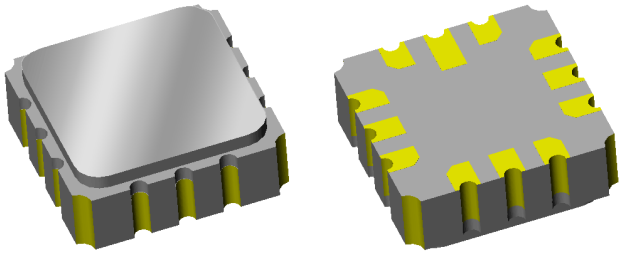
Part Number 856356

836.5/881.5 MHz SAW Duplexer

Data Sheet

Features

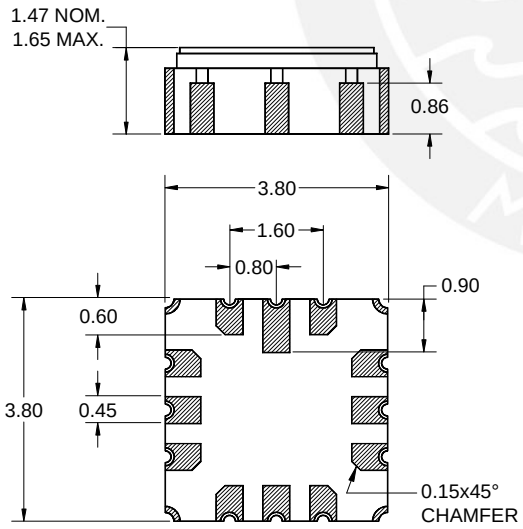
- For CDMA, WCDMA 850 and AMPS applications
- Usable bandwidth 25 MHz (each band)
- High Tx-Rx isolation
- Low insertion loss
- High attenuation
- Single-ended operation
- No matching required for operation at 50Ω
- Ceramic Surface Mount Package (SMP)
- Hermetic
- Qualified for Automotive Applications
- Manufacturing facilities are certified with ISO/TS 16949:2002
- RoHS compliant (2002/95/EC), Pb-free



Package

Surface Mount 3.80 x 3.80 x 1.47 mm

SMP-15F

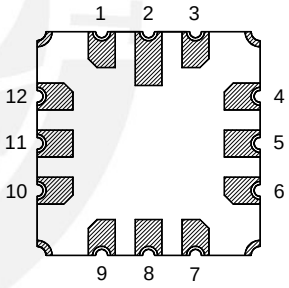


Dimensions shown are nominal in millimeters
All tolerances are ±0.15mm except overall length and width ±0.10mm

Body: Al_2O_3 ceramic
Lid: *Kovar*, *Ni* plated
Terminations: *Au* plating 0.5 - 1.0µm, over a 2 - 6µm *Ni* plating

Pin Configuration

Bottom View



Pin No.	Description
5	Rx
8	Antenna
11	Tx
1,2,3,4,6	Case ground
7,9,10,12	Case ground

Electrical Specifications [1]

Operating Temperature: [2] +25 °C

Parameter [3]	Minimum	Typical	Maximum	Unit
Tx-Ant Specification				
Center Frequency	-	836.5	-	MHz
Maximum Insertion Loss [4]				
824 - 849 MHz	-	1.9	2.3	dB
Amplitude Ripple				
824 - 849 MHz	-	0.5	0.7	dB
Absolute Attenuation				
10 - 750 MHz	24	30	-	dB
869 - 894 MHz	45	50	-	dB
1050 - 1100 MHz	20	24	-	dB
1250 - 1325 MHz	14	18	-	dB
Second Harmonic Attenuation				
1648 - 1698 MHz	7	10	-	dB
Third Harmonic Attenuation				
2472 - 2547 MHz	8	12	-	dB
Return Loss at Tx Terminal [4]				
824 - 849 MHz	10	13	-	dB
Ant-Rx Specification				
Center Frequency	-	881.5	-	MHz
Maximum Insertion Loss [4]				
869 - 894 MHz	-	2.3	3.0	dB
Amplitude Ripple				
869 - 894 MHz	-	0.6	1.2	dB
869 - 894 MHz (over any 5MHz span)	-	0.4	0.8	dB
Absolute Attenuation				
10 - 779 MHz	25	32	-	dB
779 - 804 MHz	34	38	-	dB
824 - 849 MHz	52	56	-	dB
1039 - 1065 MHz	30	38	-	dB
1100 - 1270 MHz	36	42	-	dB
1648 - 1698 MHz	35	42	-	dB
2472 - 2547 MHz	20	27	-	dB
3000 - 6000 MHz	7	10	-	dB
Return Loss at Rx Terminal [4]				
869 - 894 MHz	9	12	-	dB
Tx-Rx Specification				
Tx to Rx Isolation				
824 - 849 MHz	55	60	-	dB
869 - 894 MHz	45	50	-	dB

Notes:

1. All specifications are based on the test circuit shown on page 6
2. This specification is valid for room temperature only. The specification over the full temperature range(s) is available on the next page(s)
3. Electrical margin has been built into the design to account for the variations due to manufacturing tolerances
4. Excluding losses due to PCB

Electrical Specifications [1]

Operating Temperature Range: [2] -30 to +85 °C

Parameter [3]	Minimum	Typical	Maximum	Unit
Tx-Ant Specification				
Center Frequency	-	836.5	-	MHz
Maximum Insertion Loss [4]				
824 - 849 MHz	-	1.9	2.3	dB
Amplitude Ripple				
824 - 849 MHz	-	0.6	1	dB
Absolute Attenuation				
10 - 750 MHz	24	30	-	dB
869 - 894 MHz	45	50	-	dB
1050 - 1100 MHz	20	24	-	dB
1250 - 1325 MHz	14	18	-	dB
Second Harmonic Attenuation				
1648 - 1698 MHz	7	10	-	dB
Third Harmonic Attenuation				
2472 - 2547 MHz	8	12	-	dB
Return Loss at Tx Terminal [4]				
824 - 849 MHz	10	12	-	dB
Ant-Rx Specification				
Center Frequency	-	881.5	-	MHz
Maximum Insertion Loss [4]				
869 - 894 MHz	-	2.6	3.2	dB
Amplitude Ripple				
869 - 894 MHz	-	0.9	1.4	dB
869 - 894 MHz (over any 5MHz span)	-	0.4	0.8	dB
Absolute Attenuation				
10 - 779 MHz	25	32	-	dB
779 - 804 MHz	34	38	-	dB
824 - 849 MHz	50	56	-	dB
1039 - 1065 MHz	30	38	-	dB
1100 - 1270 MHz	36	42	-	dB
1648 - 1698 MHz	35	42	-	dB
2472 - 2547 MHz	20	27	-	dB
3000 - 6000 MHz	7	10	-	dB
Return Loss at Rx Terminal [4]				
869 - 894 MHz	9	12	-	dB
Tx-Rx Specification				
Tx to Rx Isolation				
824 - 849 MHz	54	60	-	dB
869 - 894 MHz	45	49	-	dB

Notes:

1. All specifications are based on the test circuit shown on page 6
2. In production, devices will be tested at room temperature to a guardbanded specification to ensure electrical compliance over temperature
3. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances
4. Excluding losses due to PCB

Electrical Specifications [1]

Operating Temperature Range: [2] -40 to +85 °C

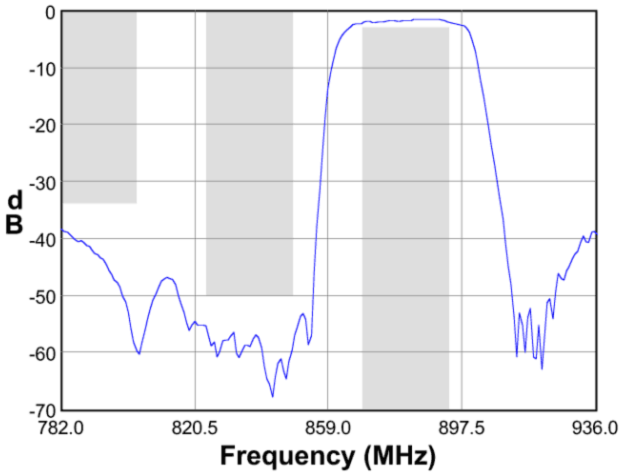
Parameter [3]	Minimum	Typical	Maximum	Unit
Tx-Ant Specification				
Center Frequency	-	836.5	-	MHz
Maximum Insertion Loss [4]				
824 - 849 MHz	-	1.9	2.5	dB
Absolute Attenuation				
DC - 800 MHz	12	30	-	dB
869 - 894 MHz	42	50	-	dB
1715 - 1785 MHz	7	10	-	dB
Second Harmonic Attenuation				
1648 - 1698 MHz	7	10	-	dB
Third Harmonic Attenuation				
2472 - 2547 MHz	8	12	-	dB
Return Loss at Tx Terminal [4]				
824 - 849 MHz	10	12	-	dB
Ant-Rx Specification				
Center Frequency	-	881.5	-	MHz
Maximum Insertion Loss [4]				
869 - 894 MHz	-	2.6	3.6	dB
Absolute Attenuation				
DC - 800 MHz	25	32	-	dB
824 - 849 MHz	50	56	-	dB
1738 - 1788 MHz	25	30	-	dB
2604 - 2682 MHz	15	22	-	dB
Return Loss at Rx Terminal [4]				
869 - 894 MHz	9	12	-	dB
Tx-Rx Specification				
Tx to Rx Isolation				
824 - 849 MHz	54	60	-	dB
869 - 894 MHz	44	49	-	dB

Notes:

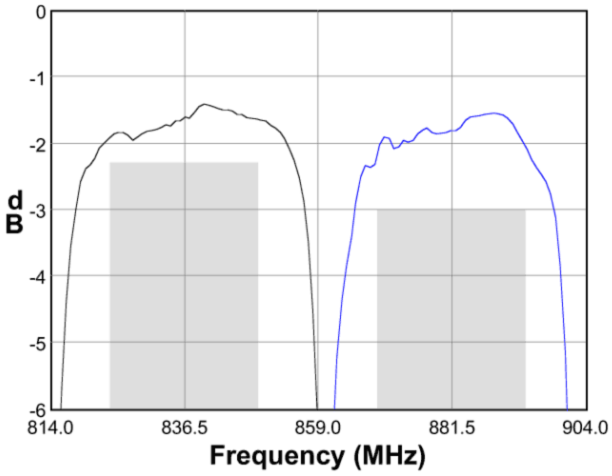
1. All specifications are based on the test circuit shown on page 6
2. In production, devices will be tested at room temperature to a guardbanded specification to ensure electrical compliance over temperature
3. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances
4. Excluding losses due to PCB

Typical Performance

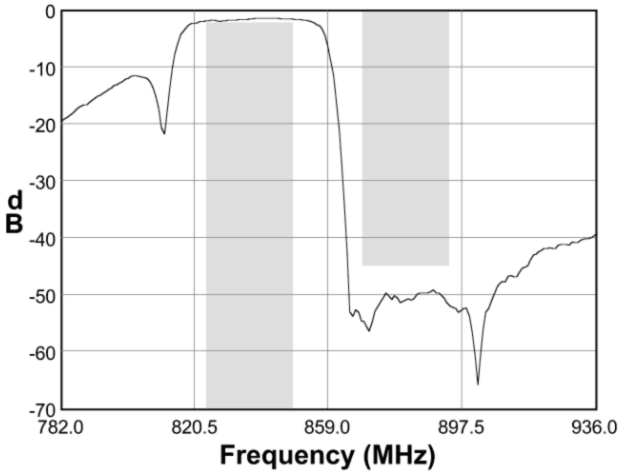
Rx Response



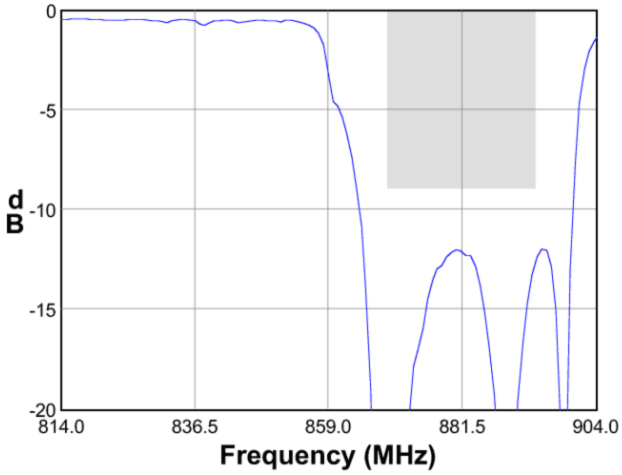
Passband Response



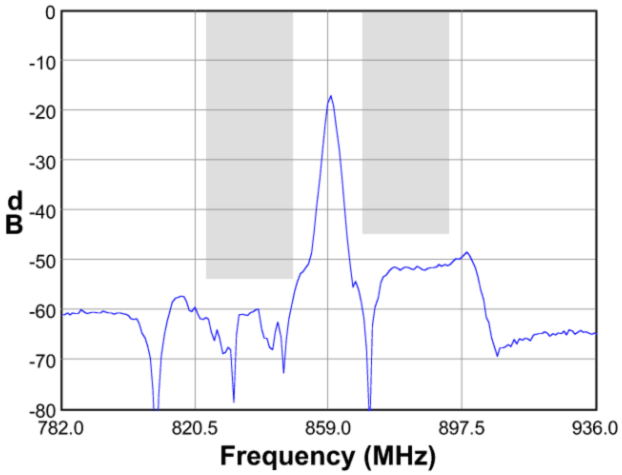
Tx Response



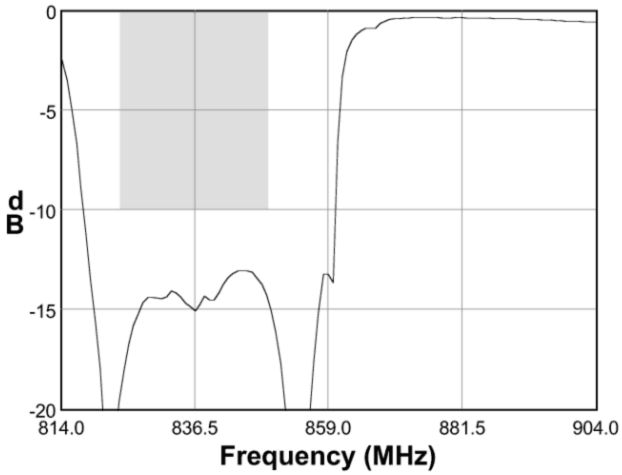
Rx Return Loss



Isolation Response



Tx Return Loss



TriQuint SEMICONDUCTOR

Part Number 856356

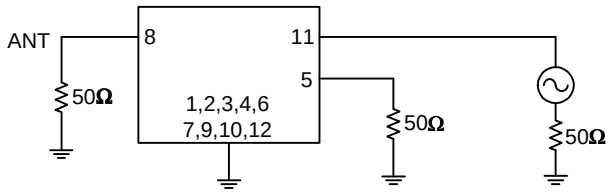
836.5/881.5 MHz SAW Duplexer

Data Sheet

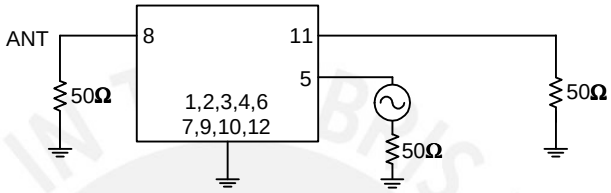
Matching Schematics

Actual matching values may vary due to PCB layout and parasitics

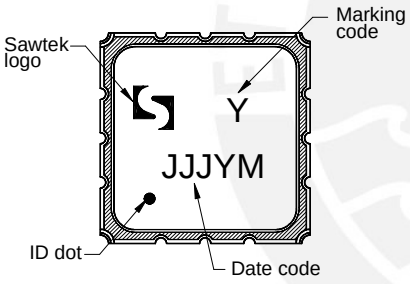
50 Ω Single-ended Input



50 Ω Single-ended Input

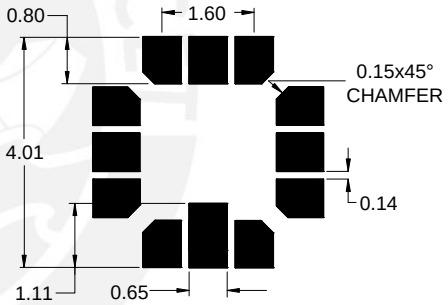


Marking



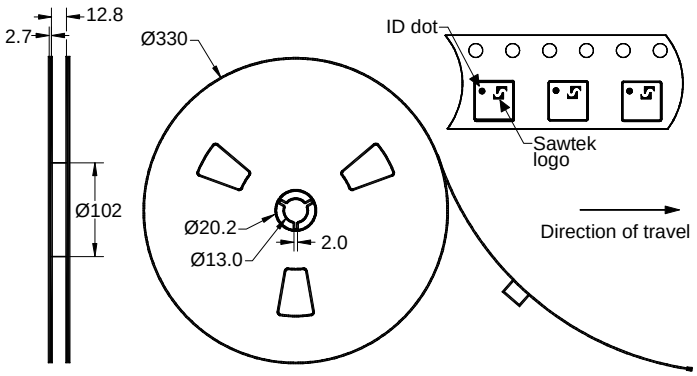
The date code consists of: JJJ = Julian day,
Y = last digit of year, M = manufacturing site code

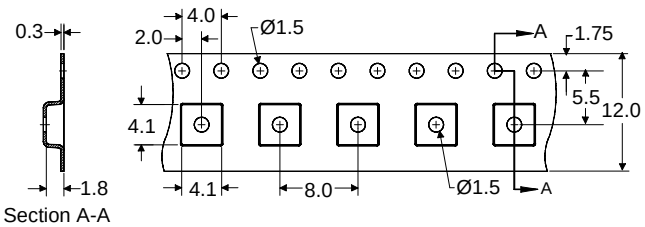
PCB Footprint



This footprint represents a recommendation only
Dimensions shown are nominal in millimeters

Tape and Reel





Dimensions shown are nominal in millimeters
Packaging quantity: 4000 units/reel

836.5/881.5 MHz SAW Duplexer

Data Sheet

Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Unit
Operating Temperature Range	T	-30	+85	°C
Storage Temperature Range	T_{stg}	-40	+85	°C
RF Power	P_{in}	-	+31	dBm

Important Notes

Warnings

- Electrostatic Sensitive Device (ESD)
- Avoid ultrasonic exposure

RoHS Compliance

- This product complies with EU directive 2002/95/EC (RoHS)

Solderability

Compatible with JEDEC J-STD-020C **Pb**-free process, **260℃** peak reflow temperature (see soldering profile)

Links to Additional Technical Information

PCB Layout Tips | Qualification Flowchart | Soldering Profile

S-Parameters | Other Technical Information

Contact Information

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Email: info-product@tqs.com
Web: www.triquint.com

Or contact one of our worldwide Network of sales offices, Representatives or distributors

Diagrama esquemático del repetidor