



LOW NOISE, HIGH IP3

# Monolithic Amplifier CMA-545G1+

50Ω 0.4 to 2.2 GHz

## THE BIG DEAL

- Ceramic, Hermetic, Nitrogen Filled
- High Gain, 32 dB Typ. at 0.9 GHz
- Ultra Low Noise Figure, 0.8 dB Typ. at 0.9 GHz
- High IP3, +36 dBm Typ. at 0.9 GHz
- High P<sub>OUT</sub>, P1dB, Up to +22 dBm Typ. at 0.9 GHz
- Single Positive Supply Voltage, +5 V
- Class 1B HBM ESD Rating (+500 V)
- Small Size, 3x3x1.14 mm
- No External Matching Components Required



Generic photo used for illustration purposes only

CASE STYLE: DL1721

### +RoHS Compliant

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

MIL SCREENING AVAILABLE  
PLEASE CONSULT APPLICATIONS DEPT.

## APPLICATIONS

- Cellular
- ISM
- GSM
- WCDMA
- LTE
- GPS

## PRODUCT OVERVIEW

Mini-Circuits CMA-545G1+ is a E-pHEMT based Low Noise MMIC Amplifier operating from 0.4 to 2.2 GHz with a unique combination of low noise and high IP3 making this amplifier ideal for sensitive receiver applications. This design operates on a single +5 V supply and is internally matched to 50Ω. The MMIC amplifier is bonded to a multilayer integrated LTCC substrate and then hermetically sealed under a controlled nitrogen atmosphere with gold-plated covers and eutectic AuSn solder. These amplifiers are capable of meeting MIL requirements for gross leak, fine leak, thermal shock, vibration, acceleration, mechanical shock, and HTOL. The testing can be done if requested.

## KEY FEATURES

Feature	Advantages
High Gain, 25-32 dB	Incorporating multiple stages of amplification, the CMA-545G1+ provides high gain reducing cost and PCB board space.
Ultra Low Noise, 0.8 dB at 0.9 GHz	Excellent Noise Figure, measured in a 50Ω environment – without any external matching. When combined with high gain of this design, it suppresses second stage NF contribution.
High IP3, +36 dBm at 0.9 GHz	Combining Low Noise and High IP3 makes this MMIC amplifier ideal for Low Noise Receiver Front End (RFE) giving the user advantages at both ends of the dynamic range: sensitivity & two-tone IM dynamic range.
Output Power, +22 dBm at 0.9 GHz	The CMA-545G1+ maintains consistent output power capability over the full operating temperature range making it ideal to be used in remote applications such as LNB's as the L Band driver stage.
Max Input Power, +25 dBm	Ruggedized design operates up to input powers often seen at Receiver inputs.
Internally Matched	No external matching elements required to achieve the advertised noise and output power over the full band.
Ceramic Hermetic Package	Low inductance, repeatable performance, excellent reliability
High Reliability	Low, small signal operating current of 160 mA nominal maintains junction temperatures typically below +130°C at +85°C ground lead temperature.

REV. D  
ECO-025417  
CMA-545G1+  
MCL NY  
250502





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50Ω 0.4 to 2.2 GHz

## ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C, V<sub>d</sub>=+5 V, Z<sub>o</sub>=50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.4		2.2	GHz
Noise Figure	0.4		1.0		dB
	0.9		0.8		
	1.2		0.9		
	1.6		1.1		
	2.2		1.2		
Gain	0.4		32.3		dB
	0.9		31.8		
	1.2	28.1	31.6	34.5	
	1.6		30.0		
	2.2		25.4		
Input Return Loss	0.4		15.3		dB
	0.9		9.1		
	1.2		9.7		
	1.6		12.2		
	2.2		16.5		
Output Return Loss	0.4		21.3		dB
	0.9		17.1		
	1.2		14.7		
	1.6		14.2		
	2.2		21.5		
Output Power @ 1 dB Compression <sup>2</sup>	0.4		+22.1		dBm
	0.9		+22.8		
	1.2	+20.0	+23.3		
	1.6		+23.7		
	2.2		+23.4		
Output IP3	0.4		+35.7		dBm
	0.9		+36.1		
	1.2		+36.5		
	1.6		+37.2		
	2.2		+37.3		
DC Volts (V <sub>d</sub> )		+4.8	+5.0	+5.2	V
DC Current (I <sub>d</sub> )			158	186	mA
DC Current Variation vs. Temperature <sup>3</sup>			-0.156		mA/°C
DC Current Variation vs. Voltage			0.027		mA/mV
Thermal Resistance <sup>4</sup>			48		°C/W

1. Measured on Mini-Circuits Characterization test board TB-758+. See Characterization Test Circuit (Fig. 1).

2. Current increases at P1dB.

3. (Current at +85°C - Current at -45°C)/130

4. Defined with reference to ground pad temperature.

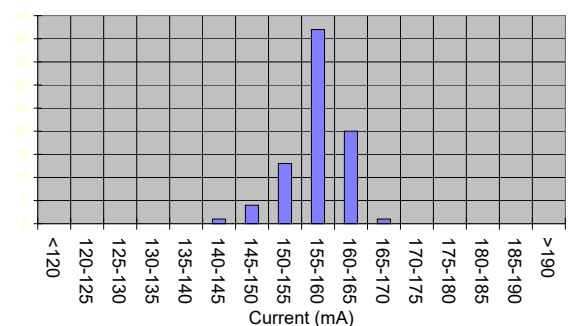
## ABSOLUTE MAXIMUM RATINGS<sup>5</sup>

Parameter	Ratings
Operating Temperature <sup>6</sup>	-55°C to +105°C
Storage Temperature	-65°C to +125°C
Channel Temperature	+150°C
DC Voltage	+6 V
Power Dissipation	1.35 W
Input Power	+25 dBm

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

6. Defined with reference to ground pad temperature.

DC Current Histogram



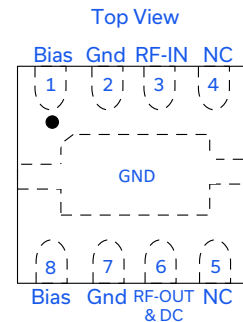
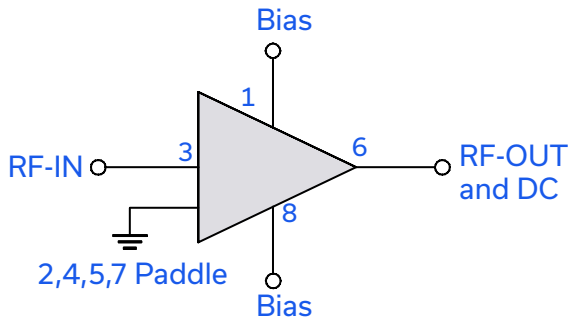


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## SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pin Number	Description (See Application Circuit, Fig. 2)
RF-IN	3	RF input pad (connected to RF-IN via C1)
RF-OUT and DC	6	RF output pad (connected to RF-OUT via blocking external cap C2, and Supply voltage $V_s$ via RF Choke L2)
BIAS	1 & 8	Bias pad 1 connects to $V_s$ via L1 & pad 8 connects to $V_s$
GND	Bottom Paddle, 2 & 7	Connected to ground
NOT USED	4,5	No internal connection; recommend connecting to ground

## CHARACTERIZATION TEST CIRCUIT

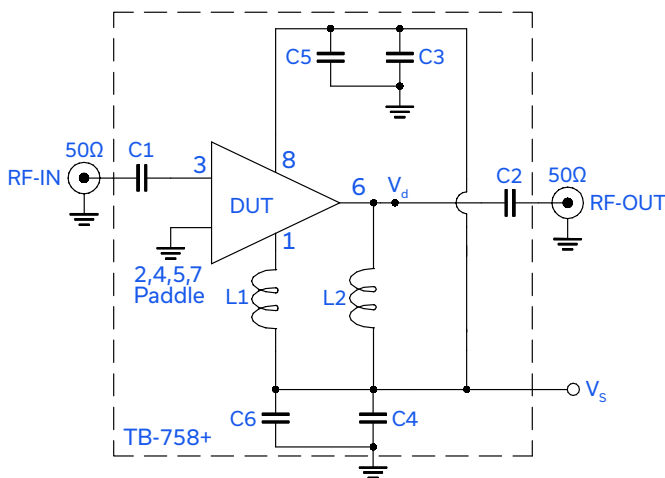


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-758+) Gain, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3), Noise Figure are measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain:  $P_{IN} = -25$  dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.
3.  $V_s$  adjusted for +5 V at device ( $V_d$ ), compensating loss of bias tee.



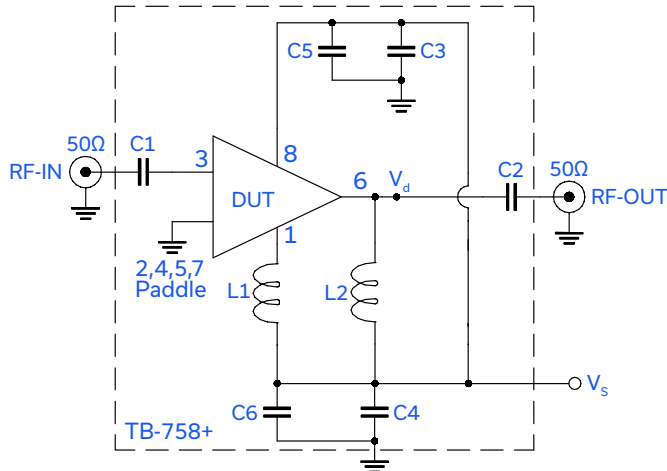
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## RECOMMENDED APPLICATION CIRCUIT

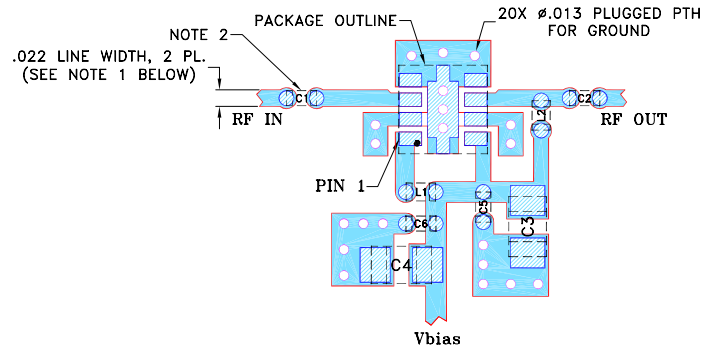
(Refer to evaluation board for PCB Layout and component values)



Component	Description
DUT	CMA-545G1+
C1, C2, C5, C6	100 pF
C3, C4	1 μF
L1	36 nH
L2	47 nH

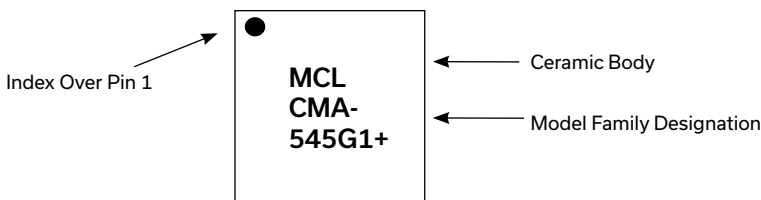
Fig 2. Recommended Application Circuit

## SUGGESTED PCB LAYOUT (PL-405)



- NOTES:
- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - 0402 AND 0805 SIZE CHIP FOOT PRINTS SHOWN FOR REFERENCE, FOR COMPONENT VALUE REFER TO TB-758+.
  - 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

## PRODUCT MARKING



Markings in addition to model number designation may appear for internal quality control purposes.





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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. [CLICK HERE](#)

Performance Data & Graphs	Table Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DL1721 Ceramic package, exposed paddle, Terminal Finish: Ni,Pd,Au
Tape & Reel Standard Quantities Available on Reel	F66-1 7" Reels with 20, 50, 100, 200, 500, 1000 & 2000 devices
Suggested Layout for PCB Design	PL-405
Evaluation Board	TB-758+
Environmental Ratings	ENV68

## ESD RATING

Human Body Model (HBM): Class 1B (500 V to < 1000 V) in accordance with ANSI/ESD STM 5.1 - 2001  
Machine Model (MM): Class M1 (pass 35 V) in accordance with ANSI/ESD STM5.2-1999

## MSL RATING

Moisture Sensitivity: MSL1 (these parts are hermetic, air cavity and therefore, MSL ratings do not strictly apply. For handling purpose, use MSL1)

## QUALIFICATION TESTING

The table below shows the initial qualification testing performed. If required, parts can be subjected to 100% screening and qualifications testing per MIL standard requirement.

	Test Description	Test Method/Process	Results
1	Hermeticity (fine and gross leak)	MIL-STD-202 Method 112, Cond. C & D	Pass
2	Acceleration, 30Kg, Y1 Direction	MIL-STD-883 Method 2001 Cond. E	Pass
3	Vibration , 10-2000Hz sine, 20g, 3 axis	MIL-STD-202 Method 204, Cond. D	Pass
4	Mechanical shock	MIL-STD-202 Method 213, Cond . A	Pass
5	PIND 20G's @130 Hz	MIL-STD-750 Method 2052.2	Pass
6	Temp Cycle -55C/+125C, 1000 Cycles	MIL-STD-202 Method 107	Pass
7	Autoclave, 121C, RH 100%, 15 Psig, 96 hrs	JESD22-A102C	Pass
8	HTOL, 1000hrs, 105C at rated Voltage condition	MIL-STD-202 Method 108, Cond . D	Pass
9	Bend Test	JESD22-B113	Pass
10	Resistance to soldering heat, 3x reflow, 260C peak	JESD22-B102	Pass
11	Drop Test	JESD22-B111	Pass
12	Adhesion Strength	Push Test>10 lb	Pass

### 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-Circuits' 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



## Typical Performance Data

**NOTE: Use PDF Bookmarks to view DATA at required conditions**

**Definitions:**

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Id = 152.87mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.75	68.00	6.23	19.26	27.48	1.22	35.44	20.34	3.12
350.0	31.90	65.58	10.97	20.61	22.07	1.07	35.89	21.30	1.30
400.0	32.30	64.82	15.72	21.29	20.43	1.02	36.92	22.05	1.05
450.0	32.35	63.50	15.45	21.22	17.41	1.02	36.73	22.51	0.95
500.0	32.27	62.75	13.24	20.95	15.78	1.04	36.10	22.62	0.99
550.0	32.27	60.50	11.84	21.54	11.98	1.06	36.17	22.49	1.01
600.0	32.20	60.15	10.84	20.41	11.35	1.07	35.98	22.58	0.99
650.0	32.10	59.34	10.16	19.66	10.27	1.09	36.47	22.43	0.97
700.0	32.03	58.79	9.68	19.09	9.59	1.10	36.20	22.81	1.02
750.0	31.98	58.13	9.40	18.58	8.85	1.10	36.07	22.71	0.99
800.0	31.94	57.33	9.22	18.10	8.04	1.10	36.33	22.69	1.01
850.0	31.92	56.68	9.12	17.62	7.45	1.11	36.53	22.86	0.95
900.0	31.90	56.00	9.09	17.21	6.88	1.10	36.77	22.76	0.98
950.0	31.88	55.30	9.11	16.70	6.35	1.10	36.90	23.19	0.97
1000.0	31.85	54.55	9.15	16.27	5.83	1.10	35.81	23.34	1.01
1050.0	31.84	53.88	9.26	15.84	5.42	1.09	36.60	23.20	0.99
1100.0	31.80	53.34	9.39	15.44	5.12	1.09	37.14	23.32	0.99
1150.0	31.74	52.70	9.58	15.06	4.80	1.08	37.06	23.10	1.02
1200.0	31.67	52.16	9.78	14.71	4.56	1.07	37.21	23.45	1.09
1250.0	31.58	51.63	10.05	14.42	4.36	1.06	37.20	23.40	1.11
1300.0	31.47	51.19	10.34	14.18	4.22	1.05	37.66	23.57	1.12
1350.0	31.33	50.70	10.63	13.97	4.08	1.04	37.75	23.36	1.06
1400.0	31.16	50.29	10.99	13.85	4.00	1.03	37.28	23.58	1.06
1450.0	30.96	49.85	11.38	13.74	3.92	1.03	37.71	23.63	1.13
1500.0	30.72	49.56	11.85	13.77	3.93	1.02	37.31	23.78	1.10
1550.0	30.45	49.13	12.33	13.81	3.89	1.01	37.89	23.61	1.06
1600.0	30.16	48.94	12.82	13.96	3.97	1.01	37.47	23.94	1.09
1650.0	29.85	48.77	13.31	14.20	4.07	1.00	37.79	23.95	1.16
1700.0	29.51	48.48	13.82	14.43	4.13	1.00	37.71	24.00	1.12
1750.0	29.16	48.31	14.32	14.80	4.25	1.00	37.84	24.00	1.13
1800.0	28.79	48.19	14.83	15.25	4.41	1.00	37.92	24.02	1.12
1850.0	28.41	48.14	15.29	15.75	4.61	1.00	38.04	23.97	1.11
1900.0	28.01	47.91	15.76	16.30	4.73	1.00	38.60	23.96	1.17
1950.0	27.61	47.87	16.17	17.00	4.96	1.00	37.86	24.20	1.13
2000.0	27.20	47.88	16.54	17.76	5.23	1.00	38.16	24.04	1.17
2100.0	26.37	47.74	17.13	19.30	5.71	1.00	37.55	23.84	1.19
2200.0	25.54	47.70	17.49	20.80	6.28	1.00	37.00	23.52	1.20
2300.0	24.71	47.81	17.66	21.21	7.01	1.00	37.35	23.43	1.24
2400.0	23.89	47.78	17.67	20.05	7.66	1.00	37.01	23.39	1.29
2500.0	23.07	47.99	17.60	18.21	8.57	1.00	36.55	23.17	1.35

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id = 145.01mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.63	68.18	6.22	19.01	28.39	1.22	35.55	20.52	3.11
350.0	31.78	65.66	10.99	20.13	22.56	1.07	36.32	21.33	1.28
400.0	32.18	64.38	15.76	20.60	19.69	1.02	36.96	21.91	1.02
450.0	32.23	63.40	15.52	20.46	17.44	1.02	37.21	22.24	0.95
500.0	32.15	62.54	13.25	20.18	15.60	1.04	35.91	22.22	0.99
550.0	32.15	60.41	11.88	20.69	11.99	1.06	35.90	22.03	1.01
600.0	32.08	60.04	10.88	19.69	11.34	1.07	35.61	22.09	0.98
650.0	31.99	59.20	10.18	19.03	10.22	1.08	35.78	21.95	0.96
700.0	31.92	58.80	9.70	18.52	9.70	1.09	35.94	22.33	0.99
750.0	31.88	58.22	9.41	18.06	9.03	1.10	35.50	22.22	0.99
800.0	31.84	57.28	9.23	17.63	8.08	1.10	35.81	22.17	1.04
850.0	31.82	56.62	9.12	17.20	7.46	1.10	36.27	22.35	0.93
900.0	31.81	55.80	9.09	16.82	6.77	1.10	36.29	22.26	0.96
950.0	31.79	55.18	9.11	16.36	6.31	1.10	36.53	22.70	0.97
1000.0	31.77	54.55	9.15	15.96	5.87	1.10	35.43	22.87	1.01
1050.0	31.76	53.86	9.27	15.56	5.45	1.09	36.13	22.72	1.00
1100.0	31.72	53.23	9.38	15.18	5.09	1.08	36.59	22.86	0.96
1150.0	31.67	52.61	9.59	14.82	4.78	1.08	36.68	22.61	1.01
1200.0	31.61	52.07	9.79	14.48	4.54	1.07	36.81	22.98	1.06
1250.0	31.51	51.61	10.05	14.21	4.38	1.06	37.17	22.94	1.10
1300.0	31.41	51.06	10.33	13.97	4.18	1.05	37.10	23.12	1.09
1350.0	31.26	50.69	10.65	13.77	4.10	1.04	37.28	22.90	1.06
1400.0	31.10	50.21	11.00	13.65	3.98	1.03	37.02	23.15	1.02
1450.0	30.90	49.79	11.39	13.52	3.91	1.02	37.14	23.20	1.09
1500.0	30.67	49.45	11.87	13.55	3.90	1.01	37.19	23.37	1.11
1550.0	30.41	49.12	12.34	13.59	3.90	1.01	37.55	23.18	1.05
1600.0	30.12	48.84	12.85	13.73	3.94	1.00	37.06	23.57	1.08
1650.0	29.82	48.63	13.35	13.95	4.02	1.00	37.54	23.57	1.14
1700.0	29.48	48.39	13.87	14.16	4.10	0.99	37.28	23.62	1.11
1750.0	29.13	48.27	14.39	14.53	4.24	0.99	37.66	23.62	1.11
1800.0	28.76	48.10	14.91	14.94	4.37	0.99	37.83	23.62	1.13
1850.0	28.39	48.06	15.37	15.40	4.57	0.99	38.31	23.58	1.11
1900.0	27.99	47.87	15.87	15.90	4.71	0.99	38.13	23.56	1.16
1950.0	27.60	47.79	16.26	16.55	4.92	0.99	37.68	23.83	1.11
2000.0	27.19	47.72	16.65	17.25	5.14	1.00	38.07	23.65	1.17
2100.0	26.37	47.64	17.24	18.64	5.64	1.00	37.33	23.48	1.17
2200.0	25.54	47.66	17.64	19.96	6.24	1.00	36.94	23.20	1.21
2300.0	24.72	47.73	17.78	20.35	6.93	1.00	37.37	23.07	1.24
2400.0	23.89	47.69	17.80	19.40	7.57	1.00	36.87	23.05	1.28
2500.0	23.08	47.91	17.70	17.77	8.47	1.00	36.41	22.83	1.36

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 160.49mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.85	68.50	6.24	19.53	28.80	1.22	33.51	19.81	3.22
350.0	32.00	66.00	10.98	21.20	22.91	1.07	34.80	21.04	1.39
400.0	32.40	64.54	15.60	22.15	19.56	1.02	35.79	21.99	1.06
450.0	32.45	63.68	15.25	22.22	17.57	1.02	36.50	22.60	0.98
500.0	32.37	62.71	13.06	21.96	15.54	1.04	35.96	22.86	1.01
550.0	32.36	60.49	11.71	22.66	11.83	1.06	36.25	22.82	1.05
600.0	32.28	60.23	10.73	21.32	11.34	1.08	35.82	22.95	1.02
650.0	32.18	59.43	10.07	20.45	10.28	1.09	36.27	22.84	1.01
700.0	32.10	58.80	9.59	19.79	9.51	1.10	36.33	23.22	1.04
750.0	32.05	58.11	9.33	19.20	8.76	1.10	36.38	23.14	1.04
800.0	32.00	57.41	9.15	18.65	8.05	1.11	36.44	23.12	1.09
850.0	31.98	56.65	9.06	18.09	7.37	1.11	36.78	23.28	0.98
900.0	31.95	55.92	9.02	17.63	6.77	1.11	37.19	23.21	0.99
950.0	31.93	55.19	9.04	17.08	6.23	1.10	36.99	23.60	1.00
1000.0	31.90	54.64	9.08	16.61	5.86	1.10	35.92	23.75	1.05
1050.0	31.88	54.01	9.20	16.14	5.47	1.10	36.88	23.62	1.03
1100.0	31.84	53.44	9.32	15.71	5.15	1.09	37.28	23.74	1.01
1150.0	31.79	52.80	9.51	15.31	4.83	1.08	37.30	23.54	1.04
1200.0	31.71	52.25	9.71	14.94	4.59	1.07	37.09	23.86	1.10
1250.0	31.61	51.74	9.98	14.64	4.40	1.06	38.01	23.81	1.14
1300.0	31.50	51.23	10.27	14.39	4.23	1.05	37.34	23.95	1.14
1350.0	31.35	50.79	10.56	14.18	4.11	1.05	37.58	23.77	1.12
1400.0	31.18	50.39	10.90	14.05	4.03	1.04	37.75	23.96	1.09
1450.0	30.98	49.90	11.29	13.93	3.93	1.03	37.51	23.99	1.14
1500.0	30.74	49.60	11.76	13.98	3.94	1.02	37.26	24.12	1.15
1550.0	30.46	49.28	12.23	14.05	3.95	1.01	37.98	23.97	1.07
1600.0	30.17	49.02	12.71	14.21	4.01	1.01	37.29	24.25	1.12
1650.0	29.86	48.83	13.20	14.47	4.10	1.01	37.87	24.27	1.17
1700.0	29.52	48.61	13.66	14.70	4.19	1.00	37.73	24.31	1.13
1750.0	29.16	48.38	14.19	15.13	4.29	1.00	37.65	24.33	1.15
1800.0	28.78	48.26	14.68	15.60	4.45	1.00	37.90	24.34	1.16
1850.0	28.40	48.20	15.10	16.13	4.65	1.00	38.25	24.33	1.12
1900.0	27.99	48.00	15.57	16.72	4.80	1.00	38.13	24.33	1.18
1950.0	27.60	48.00	15.94	17.49	5.05	1.00	37.53	24.51	1.15
2000.0	27.18	47.94	16.32	18.33	5.28	1.00	38.20	24.40	1.20
2100.0	26.35	47.82	16.87	20.08	5.78	1.00	37.63	24.17	1.22
2200.0	25.51	47.78	17.23	21.82	6.37	1.01	37.00	23.80	1.21
2300.0	24.68	47.84	17.39	22.22	7.06	1.01	37.30	23.73	1.29
2400.0	23.85	47.83	17.45	20.76	7.74	1.00	36.76	23.69	1.31
2500.0	23.03	48.00	17.36	18.62	8.62	1.00	36.52	23.45	1.38



## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Id = 155.48mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.56	67.24	6.53	18.69	26.21	1.20	39.99	21.99	3.06
350.0	31.85	65.47	11.09	19.42	21.90	1.06	40.23	22.65	1.23
400.0	32.47	64.21	17.71	19.51	18.80	1.00	41.17	23.11	0.91
450.0	32.71	63.23	22.07	19.09	16.50	0.99	40.80	23.37	0.79
500.0	32.77	62.41	17.98	18.57	14.73	1.00	39.31	23.32	0.83
550.0	32.87	59.99	15.35	19.03	10.88	1.02	38.82	23.09	0.88
600.0	32.89	59.94	13.58	18.13	10.60	1.03	38.48	23.14	0.80
650.0	32.85	59.16	12.42	17.56	9.57	1.04	38.59	22.96	0.77
700.0	32.80	58.65	11.58	17.17	8.93	1.05	39.02	23.37	0.80
750.0	32.78	58.03	11.05	16.86	8.25	1.06	38.82	23.22	0.81
800.0	32.76	57.26	10.70	16.57	7.50	1.06	38.42	23.15	0.84
850.0	32.75	56.65	10.50	16.25	6.95	1.06	39.05	23.31	0.73
900.0	32.76	55.92	10.42	15.97	6.37	1.06	38.83	23.19	0.76
950.0	32.75	55.21	10.38	15.59	5.86	1.06	39.72	23.67	0.75
1000.0	32.74	54.61	10.36	15.26	5.46	1.06	38.38	23.84	0.76
1050.0	32.73	53.93	10.49	14.91	5.05	1.06	39.50	23.63	0.79
1100.0	32.71	53.34	10.64	14.58	4.74	1.05	39.32	23.76	0.74
1150.0	32.68	52.69	10.86	14.27	4.43	1.04	40.39	23.48	0.78
1200.0	32.62	52.29	11.07	13.97	4.27	1.03	39.74	23.87	0.84
1250.0	32.54	51.69	11.32	13.72	4.03	1.03	40.73	23.80	0.86
1300.0	32.44	51.24	11.63	13.48	3.89	1.02	40.41	24.00	0.86
1350.0	32.31	50.77	11.95	13.27	3.75	1.01	41.02	23.72	0.82
1400.0	32.14	50.40	12.27	13.13	3.68	1.00	40.17	23.99	0.81
1450.0	31.95	50.04	12.58	12.98	3.63	1.00	40.75	24.05	0.84
1500.0	31.72	49.55	13.10	12.91	3.55	0.99	40.05	24.25	0.86
1550.0	31.47	49.26	13.60	12.89	3.55	0.98	40.49	23.99	0.77
1600.0	31.18	49.02	14.20	12.97	3.60	0.98	39.81	24.50	0.78
1650.0	30.88	48.81	14.73	13.15	3.66	0.97	40.79	24.47	0.87
1700.0	30.55	48.61	15.26	13.28	3.74	0.97	39.98	24.53	0.81
1750.0	30.21	48.31	15.93	13.56	3.79	0.97	41.01	24.50	0.85
1800.0	29.85	48.17	16.64	13.92	3.92	0.97	40.44	24.52	0.84
1850.0	29.48	48.18	17.30	14.30	4.12	0.97	40.72	24.47	0.81
1900.0	29.08	47.94	18.03	14.71	4.22	0.97	41.07	24.44	0.88
1950.0	28.68	47.87	18.64	15.27	4.40	0.97	40.38	24.80	0.82
2000.0	28.28	47.88	19.20	15.86	4.64	0.98	41.36	24.59	0.86
2100.0	27.46	47.80	19.98	17.08	5.09	0.98	40.14	24.53	0.88
2200.0	26.63	47.67	20.50	18.30	5.54	0.99	39.55	24.25	0.88
2300.0	25.80	47.76	20.61	18.81	6.17	0.99	40.21	24.15	0.92
2400.0	24.97	47.75	20.11	18.30	6.76	0.99	39.32	24.22	0.95
2500.0	24.14	47.89	19.57	17.12	7.50	0.99	39.06	24.03	1.00

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id = 148.04mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.51	67.19	6.53	18.38	26.22	1.20	40.07	21.82	3.01
350.0	31.79	65.60	11.09	18.95	22.35	1.06	39.23	22.35	1.21
400.0	32.40	64.20	17.73	18.96	18.91	1.00	40.13	22.69	0.89
450.0	32.64	62.81	22.03	18.54	15.82	0.99	39.71	22.87	0.78
500.0	32.70	62.65	17.96	18.04	15.23	1.00	38.15	22.76	0.81
550.0	32.81	60.11	15.34	18.46	11.10	1.01	37.86	22.51	0.88
600.0	32.82	59.90	13.56	17.64	10.60	1.03	37.60	22.55	0.79
650.0	32.78	59.01	12.40	17.13	9.46	1.04	37.72	22.36	0.77
700.0	32.74	58.67	11.58	16.77	9.00	1.05	37.91	22.78	0.81
750.0	32.72	57.96	11.04	16.50	8.21	1.06	37.90	22.63	0.79
800.0	32.71	57.33	10.69	16.24	7.59	1.06	37.91	22.57	0.82
850.0	32.70	56.58	10.49	15.95	6.92	1.06	38.18	22.73	0.72
900.0	32.71	55.91	10.41	15.70	6.38	1.06	38.41	22.62	0.75
950.0	32.70	55.18	10.37	15.35	5.85	1.06	38.52	23.10	0.75
1000.0	32.69	54.50	10.35	15.04	5.41	1.06	37.60	23.29	0.78
1050.0	32.69	53.88	10.47	14.70	5.04	1.05	38.42	23.06	0.76
1100.0	32.67	53.33	10.63	14.39	4.74	1.05	38.65	23.20	0.75
1150.0	32.64	52.77	10.86	14.09	4.48	1.04	38.91	22.91	0.77
1200.0	32.58	52.19	11.07	13.81	4.23	1.03	39.24	23.33	0.82
1250.0	32.50	51.68	11.33	13.56	4.04	1.02	39.78	23.26	0.83
1300.0	32.40	51.15	11.63	13.33	3.86	1.02	39.60	23.47	0.85
1350.0	32.28	50.76	11.95	13.14	3.76	1.01	39.49	23.17	0.83
1400.0	32.11	50.38	12.28	13.01	3.68	1.00	39.75	23.47	0.79
1450.0	31.93	50.01	12.59	12.85	3.62	0.99	39.61	23.53	0.86
1500.0	31.70	49.53	13.10	12.79	3.54	0.99	39.62	23.73	0.85
1550.0	31.45	49.25	13.62	12.76	3.55	0.98	40.06	23.47	0.77
1600.0	31.17	49.01	14.20	12.83	3.59	0.97	40.05	24.01	0.83
1650.0	30.87	48.78	14.75	13.00	3.65	0.97	39.66	23.97	0.87
1700.0	30.54	48.54	15.29	13.13	3.71	0.97	40.06	24.04	0.80
1750.0	30.19	48.32	15.94	13.40	3.79	0.97	40.28	24.01	0.83
1800.0	29.84	48.22	16.68	13.74	3.94	0.97	40.11	24.02	0.82
1850.0	29.47	48.13	17.36	14.10	4.09	0.97	41.24	23.96	0.79
1900.0	29.07	47.87	18.06	14.50	4.18	0.97	40.85	23.94	0.86
1950.0	28.68	47.87	18.68	15.04	4.40	0.97	39.83	24.32	0.82
2000.0	28.28	47.79	19.29	15.60	4.59	0.97	40.54	24.08	0.86
2100.0	27.46	47.71	20.11	16.73	5.03	0.98	39.96	24.03	0.85
2200.0	26.64	47.66	20.59	17.86	5.53	0.98	39.37	23.81	0.86
2300.0	25.81	47.71	20.71	18.33	6.12	0.99	39.20	23.69	0.92
2400.0	24.98	47.70	20.26	17.87	6.71	0.99	39.19	23.74	0.91
2500.0	24.16	47.90	19.65	16.78	7.49	0.98	38.68	23.53	1.00

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 163.74mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.76	66.85	6.52	18.85	24.52	1.21	40.79	21.87	3.03
350.0	32.05	65.96	11.09	19.77	22.69	1.06	40.83	22.67	1.25
400.0	32.66	64.46	17.64	20.00	18.95	1.01	41.40	23.26	0.89
450.0	32.89	63.23	21.56	19.64	16.17	1.00	40.77	23.65	0.82
500.0	32.94	62.44	17.71	19.13	14.49	1.00	39.36	23.70	0.82
550.0	33.04	60.34	15.17	19.66	11.12	1.02	39.90	23.54	0.84
600.0	33.04	59.84	13.44	18.68	10.30	1.03	39.30	23.61	0.82
650.0	32.99	59.29	12.30	18.07	9.56	1.04	39.14	23.43	0.80
700.0	32.94	58.79	11.48	17.65	8.94	1.05	39.77	23.85	0.80
750.0	32.91	58.08	10.98	17.31	8.18	1.06	39.55	23.70	0.81
800.0	32.89	57.36	10.63	17.00	7.48	1.07	39.57	23.66	0.85
850.0	32.87	56.72	10.43	16.66	6.92	1.07	39.97	23.80	0.74
900.0	32.87	55.98	10.36	16.36	6.34	1.07	40.54	23.70	0.77
950.0	32.86	55.34	10.32	15.96	5.87	1.07	40.51	24.14	0.77
1000.0	32.84	54.71	10.32	15.61	5.46	1.06	38.90	24.30	0.79
1050.0	32.83	54.06	10.43	15.23	5.07	1.06	39.86	24.11	0.78
1100.0	32.81	53.42	10.58	14.87	4.74	1.05	39.81	24.23	0.75
1150.0	32.77	52.90	10.81	14.54	4.49	1.04	41.04	23.97	0.80
1200.0	32.70	52.35	11.01	14.23	4.26	1.04	40.90	24.34	0.86
1250.0	32.62	51.79	11.26	13.97	4.05	1.03	41.26	24.27	0.88
1300.0	32.51	51.31	11.56	13.73	3.89	1.02	40.87	24.46	0.86
1350.0	32.38	50.88	11.87	13.53	3.78	1.01	41.69	24.19	0.82
1400.0	32.21	50.44	12.20	13.40	3.68	1.01	40.61	24.45	0.82
1450.0	32.02	50.15	12.51	13.23	3.65	1.00	41.04	24.50	0.86
1500.0	31.78	49.72	13.00	13.19	3.60	0.99	40.36	24.69	0.87
1550.0	31.52	49.33	13.52	13.16	3.57	0.99	41.70	24.45	0.78
1600.0	31.23	49.14	14.10	13.25	3.63	0.98	40.93	24.91	0.81
1650.0	30.92	48.95	14.63	13.44	3.71	0.98	41.28	24.90	0.88
1700.0	30.59	48.67	15.16	13.59	3.76	0.98	40.53	24.96	0.82
1750.0	30.24	48.50	15.79	13.90	3.87	0.97	41.17	24.93	0.86
1800.0	29.87	48.27	16.48	14.28	3.96	0.97	41.44	24.94	0.87
1850.0	29.50	48.26	17.13	14.69	4.15	0.97	41.78	24.90	0.82
1900.0	29.09	48.06	17.82	15.14	4.28	0.98	42.64	24.89	0.87
1950.0	28.70	47.99	18.42	15.74	4.47	0.98	41.41	25.21	0.85
2000.0	28.29	47.95	18.96	16.39	4.68	0.98	41.82	25.03	0.87
2100.0	27.46	47.84	19.70	17.71	5.12	0.99	40.93	24.96	0.86
2200.0	26.63	47.79	20.20	19.06	5.63	0.99	39.91	24.62	0.88
2300.0	25.79	47.83	20.33	19.59	6.24	0.99	40.85	24.56	0.94
2400.0	24.95	47.77	19.92	18.92	6.80	0.99	40.06	24.63	0.95
2500.0	24.13	47.97	19.37	17.55	7.60	0.99	39.48	24.46	1.02

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Id = 149.81mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.57	68.20	5.82	19.69	27.82	1.25	29.90	17.91	3.28
350.0	31.61	65.80	10.33	21.69	23.13	1.08	31.06	19.26	1.55
400.0	31.83	64.47	13.34	23.11	20.36	1.04	32.19	20.37	1.26
450.0	31.73	63.46	12.44	23.53	18.12	1.05	32.91	21.03	1.17
500.0	31.55	62.56	10.85	23.55	16.24	1.08	32.85	21.31	1.21
550.0	31.46	60.82	9.85	24.14	13.12	1.10	33.16	21.37	1.25
600.0	31.33	59.96	9.13	22.62	11.78	1.12	33.19	21.52	1.23
650.0	31.21	59.59	8.68	21.61	11.25	1.13	33.26	21.47	1.23
700.0	31.12	58.87	8.38	20.84	10.33	1.14	33.45	21.77	1.24
750.0	31.05	58.01	8.18	20.13	9.34	1.14	33.36	21.83	1.25
800.0	31.00	57.31	8.05	19.49	8.60	1.15	33.64	21.81	1.29
850.0	30.96	56.60	7.99	18.84	7.93	1.15	33.87	21.99	1.20
900.0	30.94	55.95	8.00	18.31	7.36	1.14	34.05	22.00	1.25
950.0	30.92	55.17	8.06	17.66	6.74	1.14	34.00	22.26	1.23
1000.0	30.90	54.45	8.14	17.13	6.23	1.13	33.32	22.38	1.26
1050.0	30.87	53.82	8.29	16.64	5.83	1.13	33.89	22.38	1.29
1100.0	30.83	53.22	8.43	16.19	5.48	1.12	34.20	22.49	1.26
1150.0	30.78	52.62	8.64	15.77	5.17	1.11	34.24	22.40	1.31
1200.0	30.71	52.02	8.85	15.39	4.89	1.10	34.16	22.60	1.33
1250.0	30.61	51.52	9.13	15.10	4.71	1.09	34.69	22.61	1.40
1300.0	30.50	50.96	9.43	14.84	4.50	1.08	34.39	22.69	1.41
1350.0	30.35	50.57	9.76	14.66	4.42	1.07	34.55	22.64	1.39
1400.0	30.18	50.18	10.11	14.54	4.35	1.06	34.53	22.74	1.37
1450.0	29.98	49.73	10.49	14.45	4.27	1.05	34.67	22.75	1.41
1500.0	29.74	49.38	10.93	14.52	4.26	1.04	34.44	22.83	1.42
1550.0	29.47	49.06	11.39	14.61	4.28	1.03	34.94	22.78	1.34
1600.0	29.17	48.80	11.83	14.79	4.34	1.03	34.43	22.89	1.37
1650.0	28.86	48.61	12.30	15.09	4.44	1.02	34.74	22.95	1.43
1700.0	28.52	48.37	12.73	15.35	4.53	1.02	34.83	22.93	1.41
1750.0	28.16	48.21	13.17	15.80	4.68	1.02	34.89	22.99	1.43
1800.0	27.79	48.08	13.58	16.33	4.85	1.02	35.15	23.02	1.43
1850.0	27.41	48.00	13.95	16.90	5.06	1.01	35.10	23.07	1.44
1900.0	27.00	47.84	14.32	17.57	5.24	1.01	35.18	23.08	1.48
1950.0	26.60	47.80	14.63	18.39	5.49	1.01	34.75	23.07	1.44
2000.0	26.19	47.75	14.95	19.32	5.75	1.02	35.17	23.07	1.49
2100.0	25.36	47.71	15.39	21.35	6.34	1.02	34.71	22.74	1.53
2200.0	24.54	47.69	15.67	23.41	6.99	1.02	34.15	22.36	1.53
2300.0	23.71	47.80	15.82	23.78	7.80	1.02	34.51	22.25	1.58
2400.0	22.89	47.78	15.91	21.73	8.53	1.01	34.06	22.05	1.63
2500.0	22.08	47.92	15.95	19.16	9.47	1.01	33.84	21.71	1.72

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id = 142.87mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.47	68.31	5.77	19.26	28.37	1.25	31.23	18.52	3.22
350.0	31.49	66.38	10.32	20.74	25.00	1.08	32.03	19.62	1.54
400.0	31.71	64.45	13.37	21.62	20.56	1.04	33.05	20.48	1.26
450.0	31.60	63.33	12.47	21.75	18.09	1.05	33.53	21.00	1.16
500.0	31.42	62.58	10.88	21.69	16.48	1.07	33.15	21.15	1.22
550.0	31.33	60.59	9.85	22.17	12.92	1.10	33.27	21.11	1.27
600.0	31.21	59.98	9.14	21.08	11.95	1.11	32.98	21.21	1.25
650.0	31.09	59.53	8.68	20.33	11.31	1.13	33.07	21.13	1.22
700.0	31.00	58.67	8.38	19.75	10.21	1.13	33.47	21.41	1.25
750.0	30.94	57.98	8.18	19.20	9.40	1.14	32.93	21.41	1.26
800.0	30.89	57.39	8.05	18.70	8.78	1.14	33.43	21.41	1.28
850.0	30.86	56.50	7.99	18.17	7.91	1.14	33.62	21.58	1.21
900.0	30.84	55.80	7.99	17.73	7.30	1.14	33.74	21.60	1.23
950.0	30.82	55.02	8.06	17.16	6.68	1.14	33.89	21.85	1.25
1000.0	30.80	54.36	8.14	16.69	6.22	1.13	33.18	21.99	1.27
1050.0	30.78	53.70	8.28	16.25	5.79	1.12	33.65	21.96	1.27
1100.0	30.74	53.15	8.43	15.84	5.48	1.12	34.22	22.07	1.25
1150.0	30.70	52.46	8.63	15.45	5.12	1.11	34.04	21.99	1.31
1200.0	30.63	51.87	8.85	15.08	4.84	1.10	33.95	22.21	1.35
1250.0	30.53	51.42	9.13	14.80	4.68	1.09	34.51	22.22	1.39
1300.0	30.43	50.94	9.45	14.55	4.52	1.08	34.27	22.32	1.43
1350.0	30.28	50.46	9.77	14.37	4.39	1.07	34.30	22.25	1.37
1400.0	30.12	50.04	10.13	14.25	4.30	1.06	34.34	22.37	1.37
1450.0	29.92	49.65	10.51	14.15	4.24	1.05	34.44	22.38	1.41
1500.0	29.68	49.27	10.96	14.19	4.22	1.04	34.15	22.50	1.39
1550.0	29.41	48.91	11.41	14.27	4.22	1.03	34.63	22.42	1.32
1600.0	29.12	48.67	11.89	14.42	4.29	1.02	34.50	22.58	1.37
1650.0	28.81	48.50	12.36	14.69	4.40	1.02	34.80	22.63	1.42
1700.0	28.47	48.26	12.78	14.92	4.49	1.02	34.66	22.63	1.36
1750.0	28.12	48.09	13.26	15.31	4.63	1.01	34.77	22.66	1.42
1800.0	27.75	47.96	13.67	15.79	4.79	1.01	34.93	22.70	1.44
1850.0	27.38	47.93	14.06	16.30	5.02	1.01	35.16	22.72	1.42
1900.0	26.98	47.74	14.46	16.87	5.18	1.01	35.15	22.73	1.48
1950.0	26.58	47.69	14.76	17.59	5.43	1.01	34.89	22.77	1.42
2000.0	26.17	47.63	15.07	18.37	5.67	1.01	35.14	22.73	1.47
2100.0	25.35	47.62	15.53	20.00	6.28	1.01	34.66	22.43	1.50
2200.0	24.53	47.56	15.83	21.54	6.88	1.01	34.34	22.08	1.50
2300.0	23.71	47.75	15.98	21.89	7.74	1.01	34.51	21.95	1.56
2400.0	22.89	47.70	16.03	20.49	8.44	1.01	34.03	21.76	1.59
2500.0	22.08	47.90	16.06	18.45	9.43	1.01	33.83	21.45	1.70

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

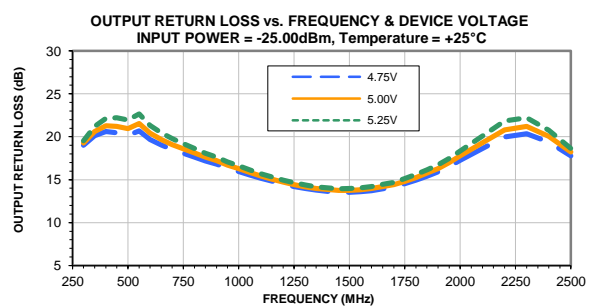
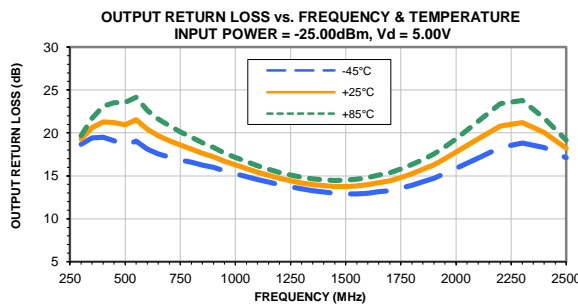
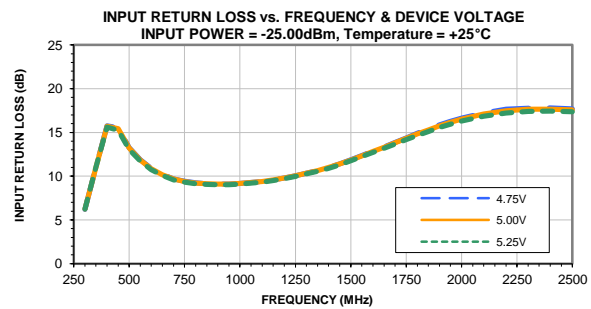
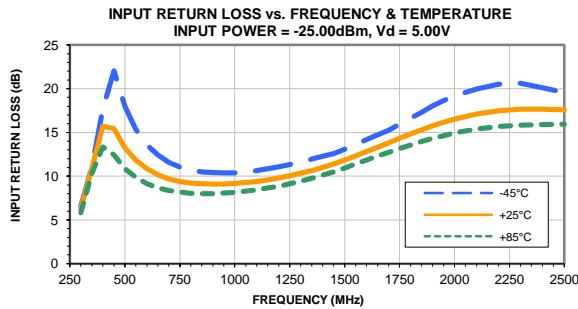
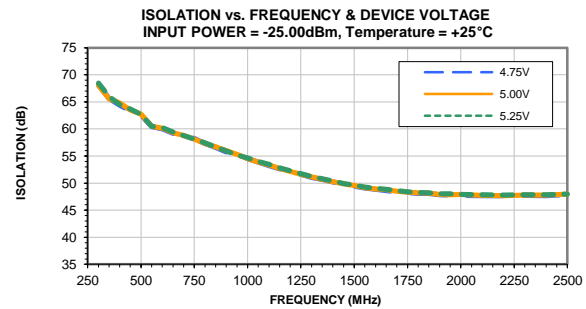
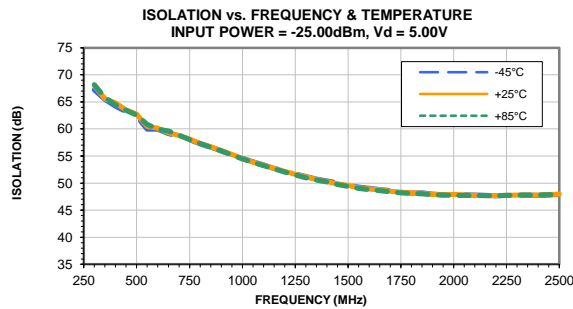
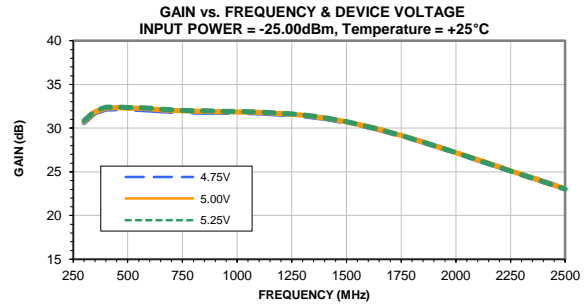
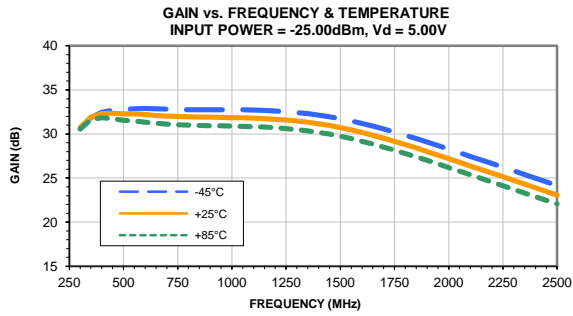
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

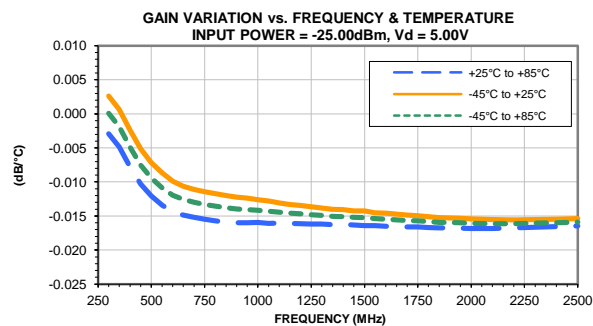
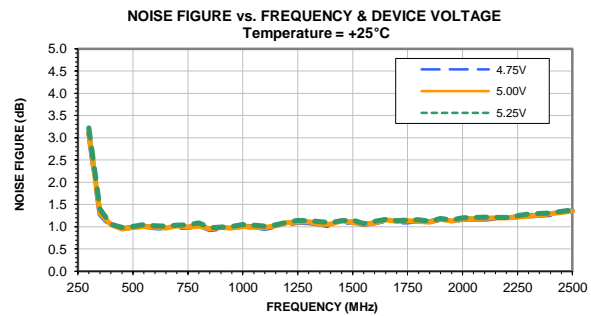
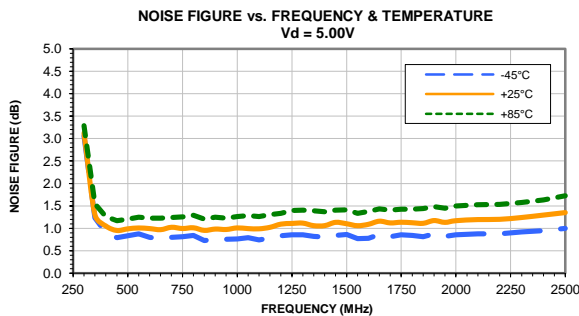
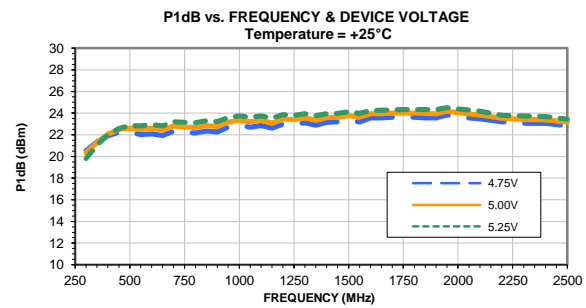
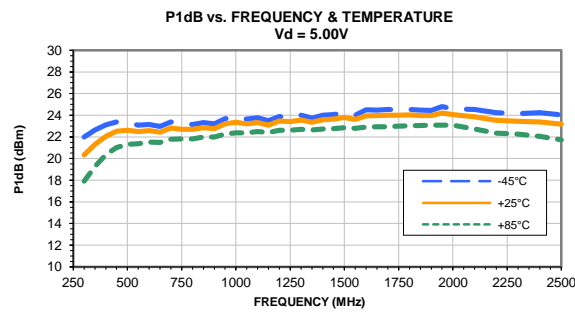
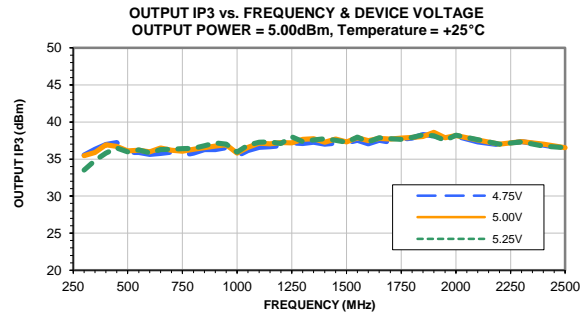
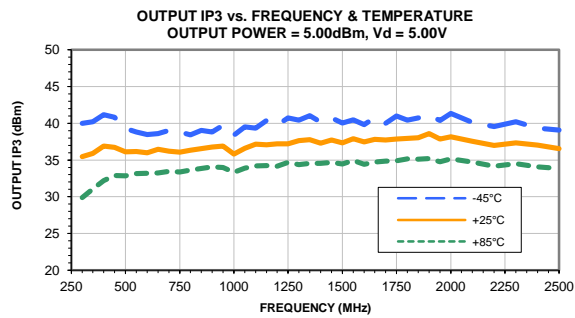
TEST CONDITIONS: Vd = 5.25V, Id = 156.02mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
					K	Measure			
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
300.0	30.57	68.48	5.85	19.89	28.83	1.25	27.74	16.91	3.18
350.0	31.61	66.51	10.24	22.18	25.05	1.09	29.15	18.40	1.57
400.0	31.83	65.08	12.96	23.97	21.76	1.05	30.50	19.77	1.27
450.0	31.73	63.97	12.06	24.62	19.13	1.06	31.62	20.72	1.22
500.0	31.54	62.49	10.57	24.69	16.03	1.08	31.81	21.19	1.23
550.0	31.45	60.63	9.61	25.33	12.77	1.11	32.33	21.37	1.25
600.0	31.32	60.27	8.94	23.48	12.16	1.12	32.51	21.61	1.26
650.0	31.20	59.39	8.51	22.29	10.96	1.13	32.90	21.63	1.24
700.0	31.10	58.88	8.23	21.40	10.32	1.14	32.81	21.95	1.27
750.0	31.03	58.25	8.05	20.59	9.59	1.15	33.02	22.01	1.26
800.0	30.97	57.47	7.93	19.88	8.76	1.15	33.43	22.05	1.31
850.0	30.93	56.69	7.88	19.16	8.00	1.15	33.54	22.22	1.23
900.0	30.91	56.01	7.89	18.58	7.41	1.15	33.74	22.29	1.26
950.0	30.89	55.17	7.96	17.89	6.74	1.14	33.69	22.50	1.26
1000.0	30.86	54.49	8.04	17.32	6.27	1.14	33.20	22.61	1.30
1050.0	30.83	53.90	8.18	16.81	5.89	1.13	33.59	22.64	1.29
1100.0	30.79	53.29	8.33	16.34	5.54	1.12	33.96	22.76	1.29
1150.0	30.73	52.73	8.54	15.91	5.25	1.11	34.09	22.70	1.31
1200.0	30.66	52.06	8.75	15.52	4.93	1.10	33.93	22.86	1.35
1250.0	30.56	51.59	9.02	15.23	4.76	1.09	34.32	22.89	1.43
1300.0	30.45	51.06	9.32	14.97	4.57	1.08	34.14	22.94	1.43
1350.0	30.30	50.66	9.64	14.80	4.48	1.07	34.19	22.92	1.42
1400.0	30.12	50.24	9.98	14.69	4.40	1.06	34.09	22.98	1.39
1450.0	29.92	49.78	10.35	14.60	4.31	1.06	34.29	22.97	1.43
1500.0	29.68	49.47	10.78	14.68	4.32	1.05	34.09	23.04	1.46
1550.0	29.40	49.14	11.22	14.79	4.34	1.04	34.42	23.02	1.36
1600.0	29.11	48.88	11.66	14.98	4.40	1.03	34.18	23.06	1.41
1650.0	28.79	48.67	12.11	15.30	4.50	1.03	34.37	23.13	1.47
1700.0	28.44	48.45	12.52	15.58	4.61	1.02	34.47	23.11	1.43
1750.0	28.09	48.33	12.95	16.05	4.78	1.02	34.48	23.16	1.49
1800.0	27.71	48.15	13.33	16.61	4.93	1.02	34.55	23.21	1.48
1850.0	27.33	48.15	13.69	17.21	5.18	1.02	34.90	23.26	1.47
1900.0	26.93	47.93	14.06	17.93	5.33	1.02	34.81	23.29	1.51
1950.0	26.52	47.84	14.34	18.82	5.56	1.02	34.39	23.20	1.45
2000.0	26.11	47.82	14.65	19.83	5.84	1.02	34.61	23.26	1.53
2100.0	25.28	47.81	15.07	22.09	6.47	1.02	34.19	22.90	1.54
2200.0	24.45	47.80	15.35	24.52	7.14	1.02	33.80	22.49	1.58
2300.0	23.62	47.87	15.50	24.89	7.93	1.02	34.12	22.39	1.63
2400.0	22.80	47.82	15.60	22.34	8.66	1.02	33.73	22.16	1.68
2500.0	21.98	47.99	15.63	19.49	9.65	1.01	33.48	21.80	1.77

## Typical Performance Curves

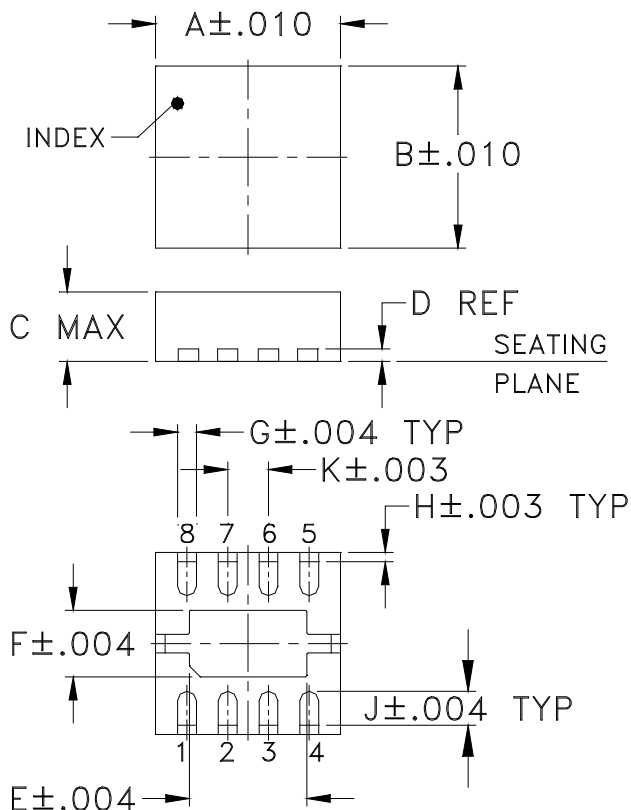


## Typical Performance Curves

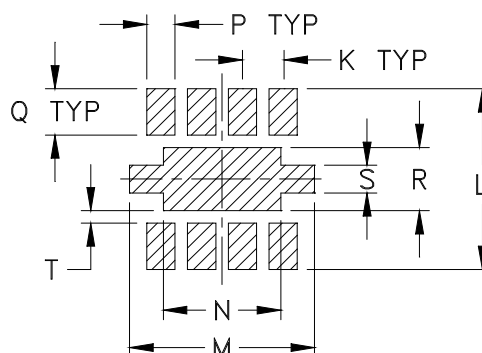




### Outline Dimensions



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
DL1721	.118 (3.00)	.118 (3.00)	.045 (1.14)	.008 (0.20)	.075 (1.91)	.043 (1.09)	.012 (0.30)	.006 (0.15)	.022 (0.56)	.026 (0.66)	.117 (2.97)	.118 (3.00)	.075 (1.91)

CASE #	P	Q	R	S	T	WT. GRAM
DL1721	.018 (0.46)	.030 (0.76)	.041 (1.04)	.018 (0.46)	.008 (0.20)	.02

Dimensions are in inches (mm). Tolerances: 3Pl.  $\pm .004$ , unless otherwise specified.

#### Notes:

1. Case material: LTCC.
2. Termination finish: Nickel-Palladium-Gold plating.



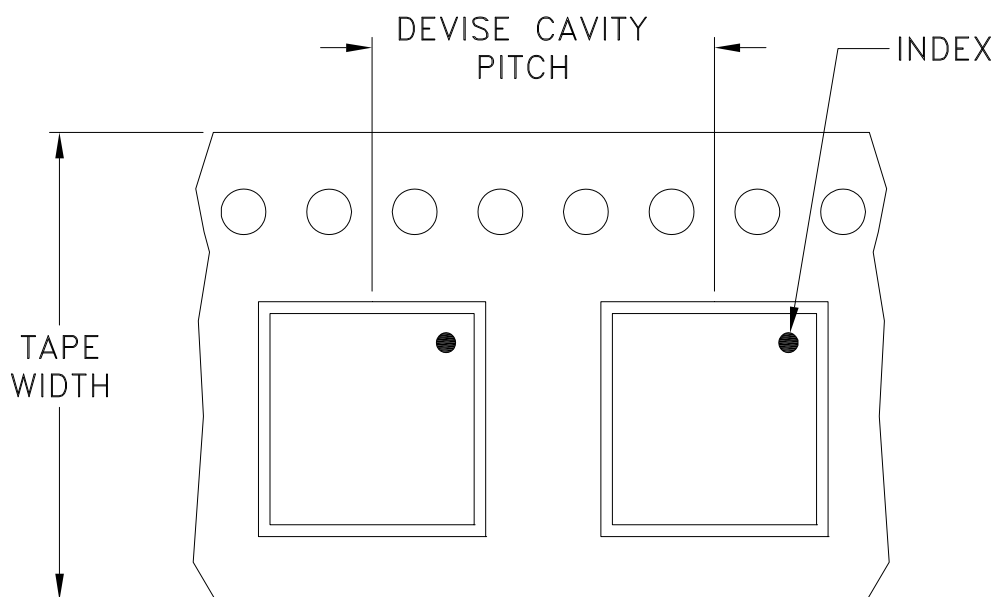
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F66-1



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



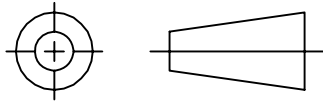
INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

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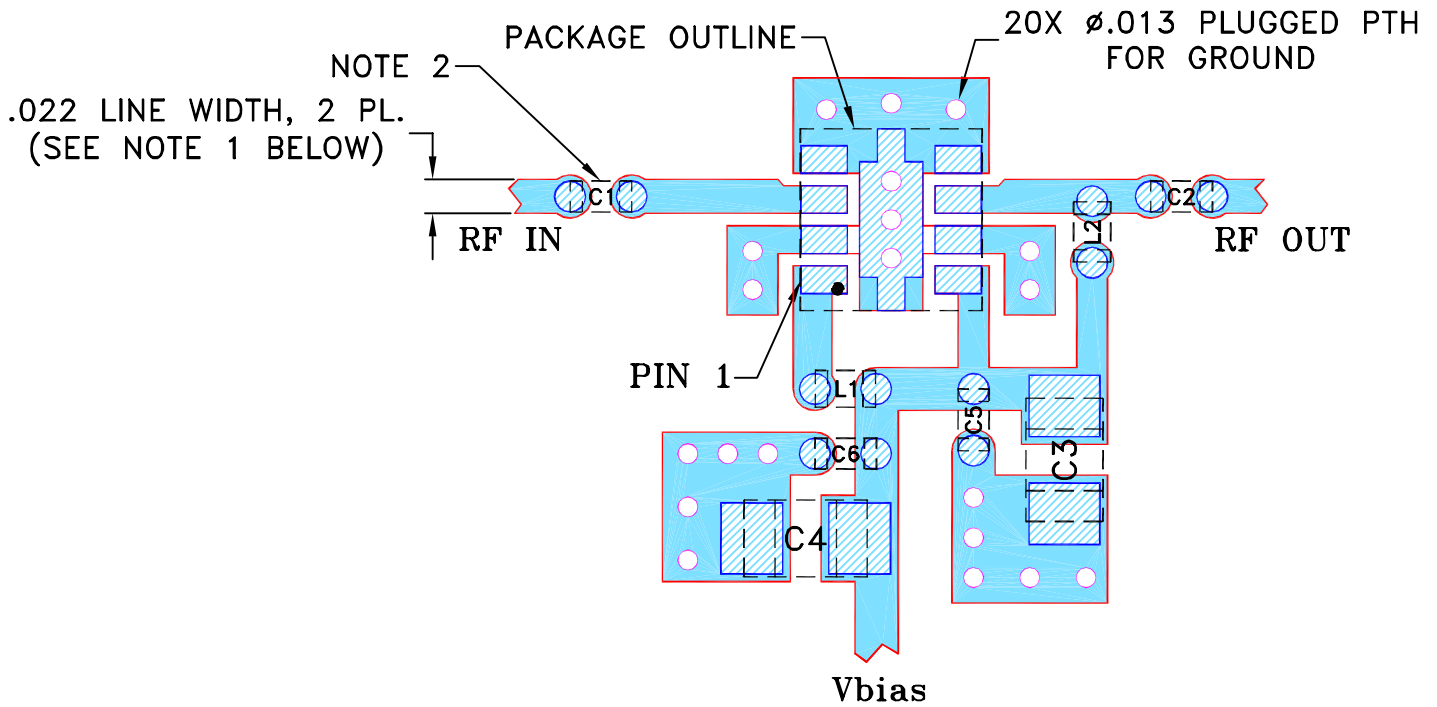
THIRD ANGLE PROJECTION



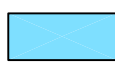
REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M144210	NEW RELEASE	11/22/13	AV	DJ

SUGGESTED MOUNTING CONFIGURATION FOR DG1721 CASE STYLE, "08AM13" PIN CODE



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
 2. 0402 AND 0805 SIZE CHIP FOOT PRINTS SHOWN FOR REFERENCE, FOR COMPONENT VALUE REFER TO TB-758+.  
 3. 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

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DRAWN	AV	11/21/13
CHECKED	IL	11/21/13
APPROVED	DJ	11/22/13



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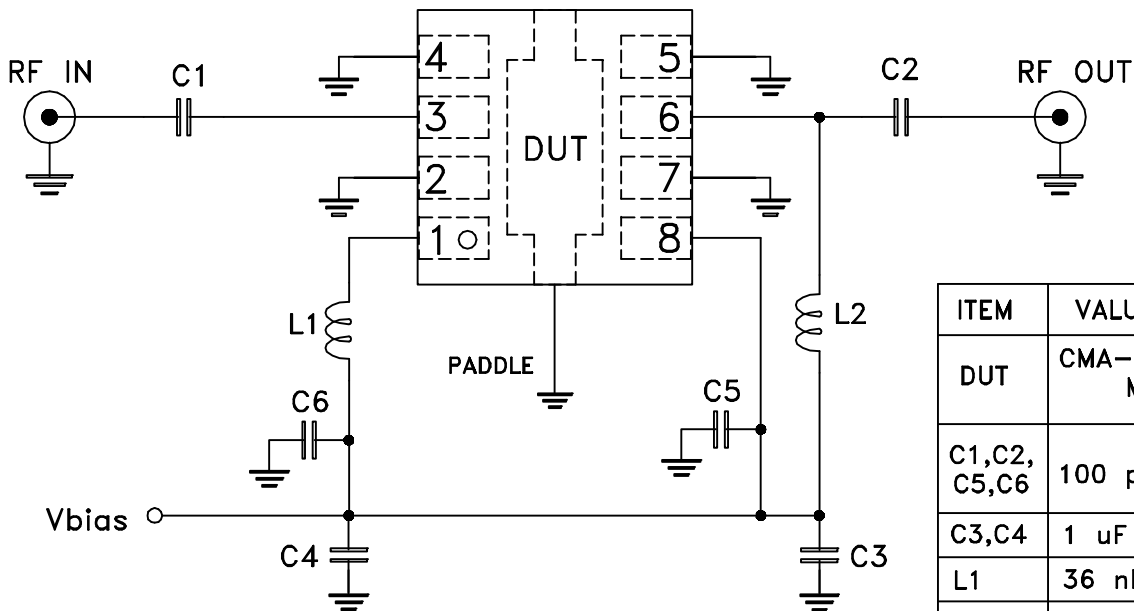
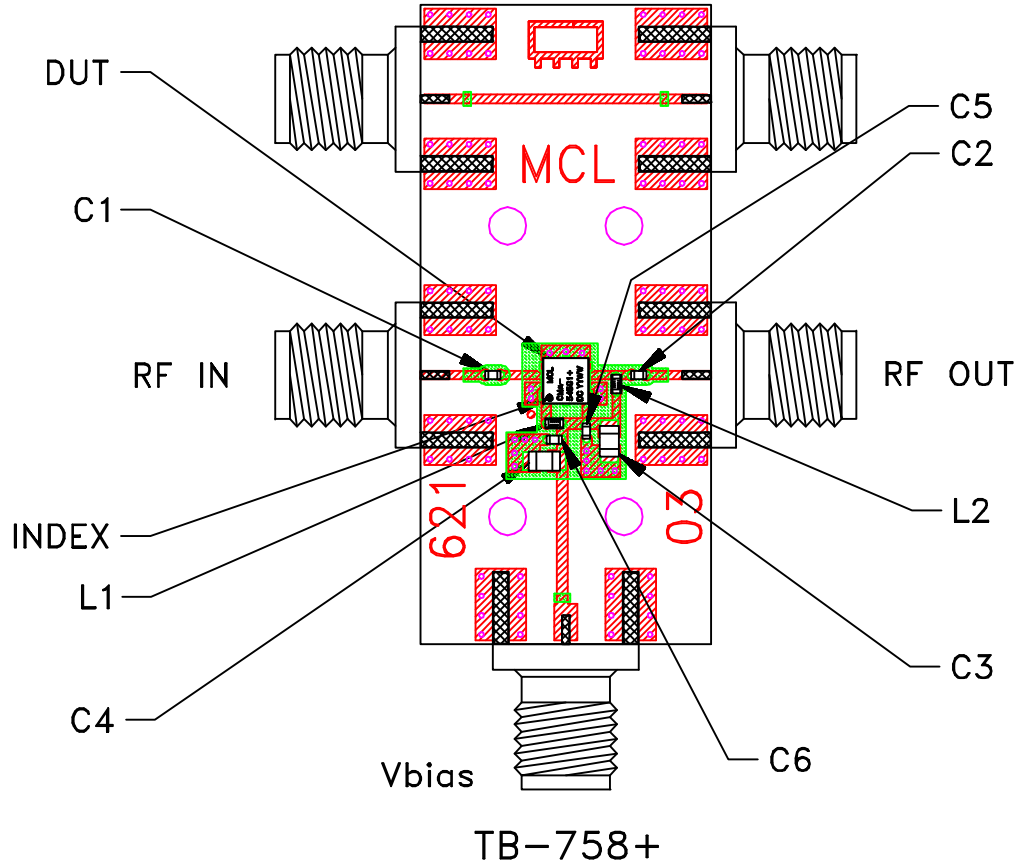
13 Neptune Avenue  
Brooklyn NY 11235

PL, 08AM13, DG1721, TB-758+

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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-405	OR
FILE:	98PL405	SCALE:	8:1
SHEET:	1	OF	1

# Evaluation Board and Circuit




ITEM	VALUE	SIZE
DUT	CMA-545G1+, MCL	
C1,C2, C5,C6	100 pF	0402
C3,C4	1 uF	0805
L1	36 nH	0402
L2	47 nH	

Schematic Diagram

## NOTES:

1. SMA Female connectors.
2. PCB material: Rogers R04350 or equivalent, dielectric constant=3.5, dielectric thickness=.010 inch.

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All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 105°C	Individual Model Data Sheet
Storage Temperature	-65° to 125° C	Individual Model Data Sheet
Thermal Shock (device level)	-55° to 125°C, 100 cycles	MIL-STD-202, Method 107
Thermal Shock (board level)	-55° to 125°C, 1000 cycles	MIL-STD-202, Method 107
Constant Acceleration	Y1 plane only, 30 Kg	MIL-STD-883, Method 2001, Cond. E
Vibration	10-2000MHz sine, 20g, 3 axis	MIL-STD-202, Method 204, Cond. D
Mechanical Shock	Y1 plane, 5 pulses, .5ms, 1.5 Kg	MIL-STD-202, Method 213, Cond. A
PIND	20G's @130 Hz	MIL-STD-750, Method 2052.2
Resistance to Soldering Heat	3X Reflow, Peak Temperature 260°C, electrical End points	JESD22-B102
Resistance to Solvent	15 pieces, 5 pieces each solvent, marking permanency	MIL-STD-202, Method 215
Moisture Sensitivity Level	Hermetic device, MSL-1 by construction	JESD22-A113, MSL1/260
Hermeticity	Fine Leak, Gross Leak	MIL-STD-202, Method 112, Cond. C&D



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JEDEC-STD-22-B, Method A102