ULTRA LOW NOISE, HIGH IP3

Monolithic Amplifier CMA-162LN+

50Ω 0.7 to 1.6 GHz

THE BIG DEAL

- Ceramic, Hermetic, Nitrogen Filled
- Low Noise Figure, 0.5 dB at 1 GHz
- High IP3, +30 dBm Typ. at 1 GHz
- Adjustable Gain, 19.7-23.5 dB at 1 GHz
- High P1dB, +20 dBm Typ. at 1 GHz
- 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

- Base Station Infrastructure
- Portable Wireless
- LTE
- GPS
- GSM
- Airborne Radar

PRODUCT OVERVIEW

Mini-Circuits CMA-162LN+ is a E-pHEMT based Ultra-Low Noise MMIC Amplifier with a unique combinations of low noise and high IP3 making this amplifier ideal for sensitive high dynamic range receiver applications. This design operates on a single +4 V supply. 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
Ultra Low Noise, 0.5 dB at 1.0 GHz	Outstanding world class noise figure performance.
High IP3, +30 dBm at 1.0 GHz	Combining Low Noise and High IP3 makes this MMIC amplifier ideal for use in Low Noise Receiver Front End (RFE) as it gives the user advantages at both ends of the dynamic range: sensitivity & two-tone IM performance.
Adjustable Gain	By changing feedback resistor R1, gain can be changed from19.7 to 23.5 dB at 1GHz
Ceramic Hermetic Package	Low inductance, repeatable performance, excellent reliability
Max Input Power, +25 dBm	Ruggedized design operates up to high input powers often seen at Receiver inputs eliminating the need for an external resistor.
High Reliability	Low, small signal operating current of 55 mA nominal maintains junction temperatures typically below +100°C at +85°C ground lead temperature.
Class 1B ESD (+500 V HBM)	The CMA-162LN+ is a super low noise pHEMT based design. Mini-Circuits incorporates ESD protection on die to achieve industry leading ESD performance for a low noise amplifier.

REV. D
ECO-025417
CMA-162LN+
MCL NY
250502

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ELECTRICAL SPECIFICATIONS[1,2] AT +25°C AND +4 V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	R1=267Ω[1]			R1=93Ω[2]			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range		0.7		1.6	0.7		1.6	GHz
Noise Figure	0.7		0.62			0.62		dB
	0.8		0.53			0.50		
	1.0		0.49			0.44		
	1.3		0.55			0.59		
	1.6		0.76			0.70		
Gain	0.7		25.2			23.4		dB
	0.8		24.7			22.8		
	1.0	20.9	23.2	24.5		21.4		
	1.3		21.0			19.7		
	1.6		19.1			18.2		
Input Return Loss	0.7		13.9			14.9		dB
	0.8		24.0			28.4		
	1.0		15.0			17.3		
	1.3		11.0			12.6		
	1.6		9.7			10.9		
Output Return Loss	0.7		14.2			23.1		dB
	0.8		16.8			19.3		
	1.0		19.8			18.2		
	1.3		15.0			15.5		
	1.6		9.8			11.1		
Output Power @ 1 dB Compression[3]	0.7		+19.5			+18.3		dBm
	0.8		+19.8			+18.9		
	1.0		+19.9			+19.7		
	1.3		+19.7			+19.8		
	1.6		+18.8			+19.0		
Output IP3	0.7		+29.1			+28.3		dBm
	0.8		+30.3			+29.5		
	1.0		+30.3			+29.0		
	1.3		+30.1			+29.2		
	1.6		+29.4			+28.5		
Device Operating Voltage		+3.8	+4.0	+4.2	+3.8	+4.0	+4.2	V
Device Operating Current at +4 V			55	60		55	60	mA
DC Current Variation vs. Temperature at +4 V[4]			2			2		µA/°C
DC Current Variation vs. Voltage at +25°C			0.016			0.016		mA/mV
Thermal Resistance			53			53		°C/W

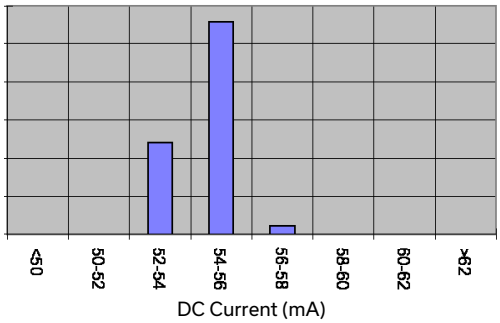
1. Measured on Mini-Circuits Characterization test board TB-756+. See Characterization Test Circuit (Fig. 1) R1=267Ω.
2. Measured on Mini-Circuits Characterization test board TB-756+. See Characterization Test Circuit (Fig. 1) R1=93Ω.
3. Current increases at P1dB.
4. (Current at +85°C - Current at -45°C)/130

ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature (Ground Lead)	-55°C to +105°C
Storage Temperature	-65°C to +125°C
Junction Temperature	+150°C
Total Power Dissipation	0.55 W
Input Power (CW), V_d=+4 V	+25 dBm
DC Voltage	+5.5 V

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

DC CURRENT HISTOGRAM



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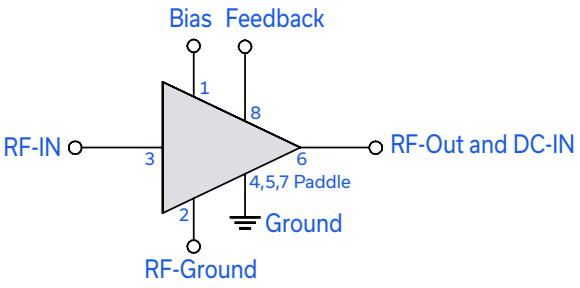
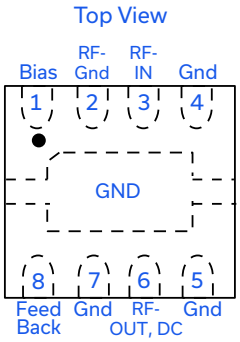
SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION





Function	Pin Number	Description
RF-IN	3	Connects to RF input via C1 and Pad 2 via L1
RF-OUT, DC	6	Connects to RF out via C2, Pad 8 via R1, and C3
RF-Ground	2	Connects to ground via C4 and Pad 3 via L1
Bias	1	Connects to Supply voltage (V_S) via Rbias
Feedback	8	Connected to pads 6, 1 via R1 and C3
Ground	4,5,7 & Paddle	Connects to ground

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RECOMMENDED APPLICATION AND CHARACTERIZATION TEST CIRCUIT

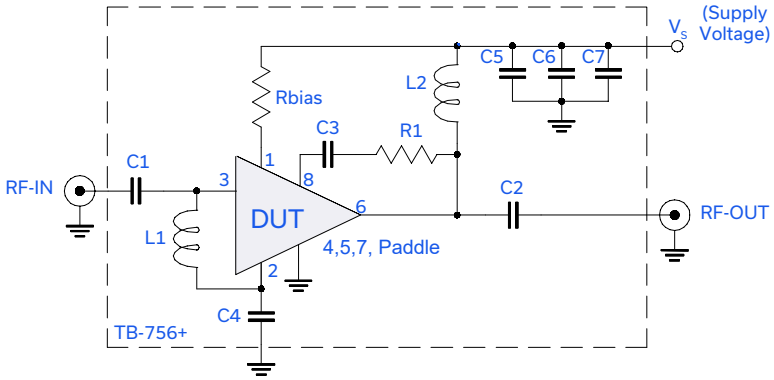
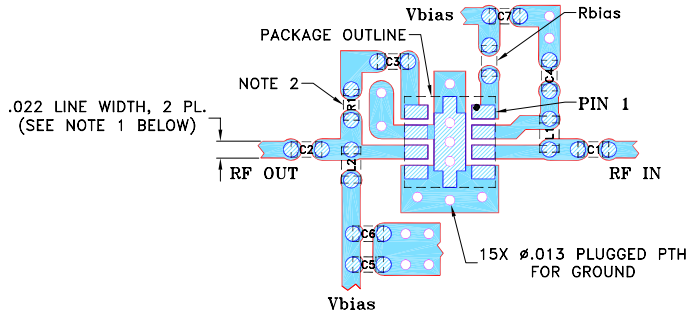


Fig 1. Application and Characterization circuit
Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-756+) Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return Loss: P_{IN}= -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

SUGGESTED PCB LAYOUT (PL-404)

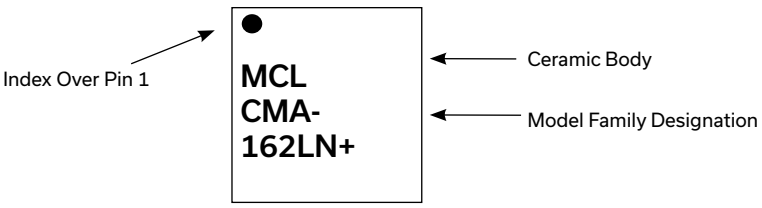


NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0402 SIZE CHIP FOOT PRINTS SHOWN FOR REFERENCE, FOR COMPONENT VALUE REFER TO TB-756+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

PRODUCT MARKING



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

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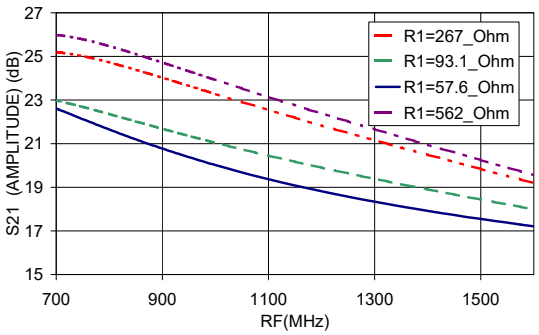
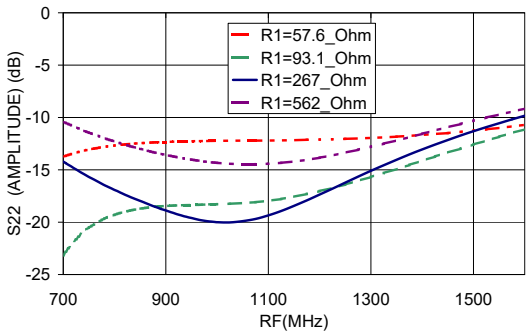
ADJUSTABLE GAIN PERFORMANCE (VS. R1)

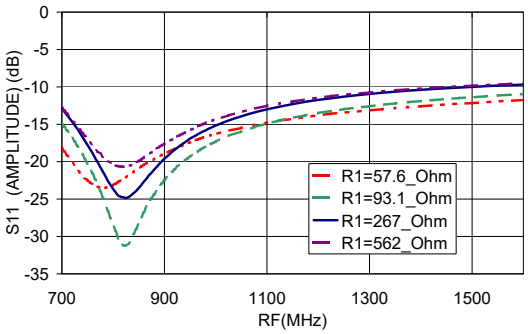
S21 (AMPLITUDE,dB) Vs. Freqency and R1 Values



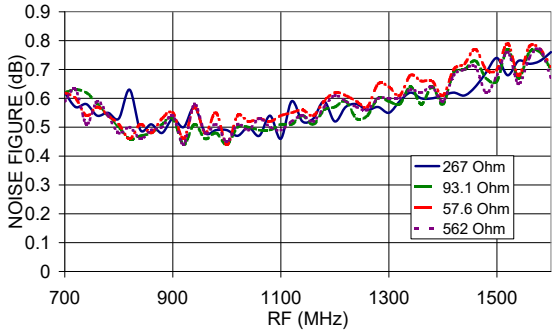
S22 (AMPLITUDE,dB) Vs. Freqency and R1 Values



S11 (AMPLITUDE,dB) Vs. Freqency and R1 Values



NOISE FIGURE (dB) vs. Frequency and R1 Values



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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-404
Evaluation Board	TB-756+
Environmental Ratings	ENV68

ESD RATING

Human Body Model (HBM): Class 1B (500 to < 1000 V) in accordance with ANSI/ESD STM 5.1 - 2001
Machine Model (MM): Class M1 (pass 25 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

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 = 4.00V, Id = 53.22mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.66	41.81	2.37	6.87	1.91	1.17	28.99	16.61	1.37
520.0	23.30	40.98	2.92	7.53	1.91	1.15	28.52	17.01	1.11
540.0	23.84	40.32	3.59	8.25	1.92	1.12	28.24	17.28	1.08
560.0	24.27	39.72	4.35	9.00	1.94	1.09	28.47	17.59	0.94
580.0	24.61	39.23	5.21	9.78	1.95	1.06	28.71	18.00	0.87
600.0	24.87	38.85	6.17	10.58	1.98	1.04	28.64	18.39	0.82
620.0	25.05	38.52	7.25	11.38	2.00	1.01	28.66	18.63	0.71
640.0	25.17	38.27	8.43	12.16	2.02	0.98	28.73	18.93	0.71
660.0	25.23	38.07	9.74	12.91	2.05	0.96	29.01	19.10	0.60
680.0	25.25	37.93	11.17	13.62	2.08	0.95	29.38	19.40	0.63
700.0	25.23	37.83	12.74	14.30	2.11	0.94	29.50	19.64	0.61
720.0	25.18	37.75	14.52	14.92	2.14	0.93	29.40	19.68	0.57
740.0	25.10	37.70	16.50	15.52	2.17	0.93	29.75	19.68	0.58
760.0	25.01	37.67	18.72	16.03	2.20	0.93	29.91	19.75	0.53
780.0	24.90	37.67	21.17	16.52	2.24	0.93	30.04	19.89	0.47
800.0	24.77	37.64	23.60	17.03	2.27	0.93	30.35	19.98	0.53
820.0	24.65	37.65	25.25	17.46	2.30	0.93	30.91	19.71	0.58
840.0	24.51	37.67	24.85	17.90	2.34	0.94	30.59	19.93	0.49
860.0	24.37	37.69	23.33	18.27	2.38	0.94	30.71	19.87	0.52
880.0	24.23	37.72	21.60	18.62	2.41	0.95	30.70	20.09	0.46
900.0	24.08	37.75	20.06	18.92	2.45	0.96	31.05	19.70	0.51
920.0	23.93	37.79	18.80	19.20	2.49	0.96	31.21	19.69	0.51
960.0	23.64	37.85	16.87	19.61	2.57	0.98	30.76	20.11	0.50
980.0	23.48	37.90	16.08	19.71	2.62	0.98	31.35	19.36	0.47
1000.0	23.33	37.94	15.44	19.74	2.66	0.99	30.04	20.13	0.46
1100.0	22.60	38.16	13.20	18.81	2.88	1.01	31.18	19.75	0.46
1200.0	21.89	38.38	11.89	16.73	3.11	1.03	31.03	19.72	0.53
1300.0	21.20	38.57	11.08	14.55	3.33	1.03	30.79	19.44	0.55
1400.0	20.53	38.72	10.49	12.56	3.53	1.02	30.59	19.33	0.59
1500.0	19.88	39.00	10.08	10.92	3.79	1.00	30.50	18.95	0.72
1600.0	19.22	39.32	9.77	9.53	4.08	0.97	30.47	18.91	0.78
1700.0	18.58	39.53	9.52	8.35	4.30	0.94	30.50	18.26	0.74
1800.0	17.94	39.71	9.29	7.33	4.50	0.90	32.87	18.01	0.83
1900.0	17.29	39.98	9.11	6.46	4.74	0.85	33.27	17.71	0.85
2000.0	16.61	40.10	8.96	5.82	4.96	0.81	32.62	17.31	0.90

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 = 3.80V, Id = 50.04mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.51	41.53	2.35	6.86	1.88	1.17	28.51	16.15	1.35
520.0	23.16	40.71	2.91	7.53	1.88	1.15	28.17	16.59	1.12
540.0	23.70	40.05	3.58	8.25	1.90	1.12	27.92	16.81	1.10
560.0	24.15	39.43	4.35	9.01	1.91	1.09	28.12	17.17	0.94
580.0	24.49	38.95	5.22	9.81	1.92	1.06	28.23	17.56	0.86
600.0	24.75	38.56	6.19	10.62	1.95	1.03	28.39	17.95	0.83
620.0	24.94	38.23	7.28	11.43	1.97	1.00	28.21	18.19	0.71
640.0	25.06	37.97	8.48	12.24	1.99	0.98	28.40	18.50	0.71
660.0	25.12	37.78	9.81	13.00	2.02	0.96	28.74	18.65	0.59
680.0	25.14	37.64	11.27	13.74	2.04	0.95	29.07	18.96	0.64
700.0	25.12	37.54	12.88	14.45	2.07	0.94	28.98	19.19	0.62
720.0	25.07	37.47	14.70	15.09	2.10	0.93	29.17	19.22	0.57
740.0	24.98	37.41	16.69	15.70	2.13	0.93	29.61	19.24	0.61
760.0	24.89	37.37	18.90	16.23	2.16	0.92	29.73	19.31	0.54
780.0	24.78	37.37	21.31	16.72	2.20	0.93	29.78	19.45	0.52
800.0	24.66	37.37	23.37	17.25	2.23	0.93	30.10	19.54	0.52
820.0	24.53	37.38	24.35	17.70	2.27	0.93	30.59	19.30	0.58
840.0	24.39	37.40	23.59	18.14	2.30	0.94	30.39	19.50	0.49
860.0	24.25	37.40	22.11	18.52	2.33	0.95	30.42	19.44	0.50
880.0	24.10	37.44	20.52	18.88	2.37	0.95	30.46	19.66	0.48
900.0	23.95	37.48	19.15	19.18	2.41	0.96	30.68	19.27	0.49
920.0	23.81	37.52	18.02	19.46	2.45	0.97	30.87	19.28	0.48
960.0	23.51	37.58	16.22	19.87	2.53	0.98	30.47	19.70	0.48
980.0	23.35	37.62	15.49	19.96	2.57	0.99	31.04	18.95	0.45
1000.0	23.20	37.66	14.88	19.98	2.61	0.99	29.85	19.73	0.51
1100.0	22.46	37.90	12.78	18.95	2.83	1.02	31.17	19.39	0.46
1200.0	21.75	38.10	11.53	16.81	3.04	1.03	30.74	19.37	0.52
1300.0	21.05	38.30	10.77	14.59	3.27	1.03	30.50	19.08	0.55
1400.0	20.39	38.46	10.20	12.59	3.47	1.02	30.41	18.98	0.59
1500.0	19.73	38.72	9.81	10.93	3.71	1.00	30.19	18.61	0.71
1600.0	19.07	39.04	9.52	9.54	3.99	0.98	30.07	18.61	0.75
1700.0	18.43	39.26	9.29	8.36	4.22	0.94	30.09	17.92	0.73
1800.0	17.79	39.44	9.07	7.34	4.41	0.90	32.86	17.70	0.81
1900.0	17.14	39.73	8.91	6.47	4.66	0.86	32.07	17.39	0.90
2000.0	16.47	39.87	8.77	5.83	4.88	0.82	31.02	16.96	0.92

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 = 4.20V, Id = 55.75mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.81	42.09	2.38	6.86	1.94	1.17	29.47	16.97	1.37
520.0	23.44	41.28	2.95	7.52	1.94	1.15	29.10	17.41	1.13
540.0	23.97	40.61	3.60	8.23	1.96	1.12	28.43	17.70	1.08
560.0	24.40	40.03	4.37	8.97	1.97	1.09	28.77	18.02	0.96
580.0	24.73	39.56	5.21	9.74	1.99	1.06	29.00	18.42	0.89
600.0	24.99	39.16	6.16	10.52	2.01	1.04	29.09	18.83	0.81
620.0	25.16	38.85	7.22	11.29	2.04	1.01	29.05	19.07	0.71
640.0	25.28	38.60	8.39	12.04	2.06	0.99	29.10	19.35	0.71
660.0	25.34	38.40	9.66	12.76	2.08	0.97	29.52	19.49	0.61
680.0	25.36	38.26	11.06	13.45	2.12	0.95	29.76	19.80	0.61
700.0	25.34	38.17	12.60	14.10	2.15	0.94	29.92	20.04	0.63
720.0	25.29	38.08	14.33	14.69	2.18	0.93	29.81	20.08	0.57
740.0	25.21	38.01	16.27	15.27	2.21	0.93	30.29	20.06	0.59
760.0	25.12	37.97	18.48	15.75	2.24	0.93	30.16	20.12	0.53
780.0	25.02	37.98	20.93	16.21	2.28	0.93	30.46	20.26	0.51
800.0	24.89	37.97	23.65	16.71	2.32	0.93	30.62	20.35	0.53
820.0	24.76	37.98	25.97	17.13	2.35	0.93	31.13	20.09	0.60
840.0	24.63	37.99	26.27	17.55	2.39	0.94	30.81	20.29	0.48
860.0	24.50	38.00	24.86	17.91	2.42	0.94	30.78	20.27	0.51
880.0	24.35	38.03	22.87	18.26	2.47	0.95	31.12	20.45	0.49
900.0	24.21	38.05	21.17	18.56	2.50	0.96	31.27	20.06	0.53
920.0	24.06	38.08	19.74	18.84	2.54	0.96	31.23	20.04	0.50
960.0	23.77	38.16	17.60	19.27	2.63	0.97	30.98	20.47	0.49
980.0	23.62	38.18	16.74	19.40	2.67	0.98	31.39	19.70	0.44
1000.0	23.47	38.23	16.04	19.46	2.71	0.99	30.43	20.46	0.49
1100.0	22.74	38.47	13.64	18.71	2.95	1.01	31.14	20.09	0.46
1200.0	22.04	38.67	12.28	16.76	3.17	1.02	31.08	20.04	0.53
1300.0	21.35	38.87	11.43	14.62	3.41	1.02	30.95	19.75	0.57
1400.0	20.69	39.02	10.80	12.64	3.62	1.01	30.54	19.61	0.60
1500.0	20.04	39.29	10.35	10.99	3.88	1.00	30.49	19.26	0.72
1600.0	19.38	39.60	10.02	9.60	4.16	0.97	30.49	19.23	0.79
1700.0	18.74	39.81	9.77	8.41	4.40	0.93	30.36	18.52	0.74
1800.0	18.11	39.97	9.53	7.39	4.59	0.89	31.83	18.30	0.82
1900.0	17.46	40.25	9.33	6.51	4.84	0.85	32.52	18.06	0.89
2000.0	16.79	40.36	9.16	5.87	5.05	0.81	32.22	17.57	0.92

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 = 4.00V, Id = 53.54mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	23.11	42.16	2.19	6.69	1.81	1.17	29.13	16.93	0.99
520.0	23.74	41.37	2.71	7.35	1.82	1.15	28.72	17.31	0.75
540.0	24.27	40.69	3.32	8.07	1.84	1.13	28.49	17.63	0.78
560.0	24.70	40.11	4.03	8.83	1.86	1.11	28.75	17.90	0.62
580.0	25.04	39.63	4.81	9.62	1.88	1.08	29.01	18.29	0.59
600.0	25.30	39.21	5.69	10.42	1.90	1.05	28.90	18.64	0.56
620.0	25.49	38.86	6.67	11.22	1.93	1.02	28.83	18.85	0.47
640.0	25.63	38.61	7.73	12.01	1.95	1.00	29.36	19.14	0.49
660.0	25.69	38.39	8.90	12.77	1.98	0.98	29.29	19.26	0.37
680.0	25.73	38.24	10.16	13.50	2.01	0.96	29.73	19.57	0.40
700.0	25.71	38.11	11.54	14.20	2.04	0.95	29.83	19.74	0.41
720.0	25.68	38.01	13.06	14.82	2.06	0.94	29.74	19.80	0.36
740.0	25.60	37.94	14.73	15.44	2.10	0.93	29.98	19.80	0.42
760.0	25.52	37.90	16.58	15.95	2.12	0.93	30.30	19.84	0.35
780.0	25.43	37.88	18.64	16.43	2.16	0.93	30.40	19.98	0.32
800.0	25.31	37.85	21.10	16.96	2.19	0.93	30.51	20.07	0.34
820.0	25.20	37.84	23.74	17.39	2.22	0.93	30.88	19.82	0.36
840.0	25.07	37.83	26.42	17.81	2.25	0.93	30.63	20.01	0.31
860.0	24.94	37.84	27.80	18.16	2.29	0.93	30.71	19.97	0.32
880.0	24.80	37.86	26.68	18.49	2.32	0.94	30.73	20.15	0.31
900.0	24.66	37.87	24.72	18.75	2.35	0.94	30.92	19.78	0.32
920.0	24.52	37.88	22.80	18.98	2.39	0.95	30.93	19.77	0.29
960.0	24.24	37.95	19.90	19.29	2.47	0.96	30.32	20.17	0.31
980.0	24.09	37.97	18.83	19.36	2.50	0.97	31.19	19.44	0.24
1000.0	23.95	37.99	17.96	19.40	2.54	0.97	30.14	20.20	0.32
1100.0	23.25	38.17	15.18	18.92	2.74	0.99	30.68	19.83	0.27
1200.0	22.57	38.31	13.55	17.42	2.93	1.01	30.44	19.77	0.34
1300.0	21.92	38.46	12.62	15.31	3.14	1.01	30.17	19.47	0.34
1400.0	21.27	38.57	11.85	13.14	3.31	1.00	29.99	19.35	0.38
1500.0	20.63	38.82	11.31	11.36	3.54	0.98	29.72	19.00	0.47
1600.0	19.97	39.10	10.83	9.89	3.78	0.96	29.49	18.96	0.51
1700.0	19.35	39.27	10.56	8.64	3.97	0.93	29.54	18.32	0.48
1800.0	18.73	39.46	10.27	7.58	4.15	0.89	31.40	18.07	0.53
1900.0	18.10	39.76	10.02	6.68	4.38	0.85	30.85	17.78	0.58
2000.0	17.43	39.91	9.83	6.01	4.59	0.81	30.23	17.32	0.59

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 = 3.80V, Id = 50.21mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.75	41.91	2.14	6.60	1.80	1.17	28.62	16.15	0.98
520.0	23.40	41.12	2.66	7.25	1.81	1.15	28.20	16.48	0.74
540.0	23.95	40.42	3.27	7.95	1.83	1.13	27.88	16.80	0.72
560.0	24.40	39.82	3.97	8.70	1.85	1.10	28.21	17.12	0.70
580.0	24.76	39.32	4.78	9.48	1.87	1.08	28.43	17.44	0.60
600.0	25.03	38.91	5.67	10.29	1.89	1.05	28.62	17.84	0.55
620.0	25.23	38.55	6.68	11.09	1.91	1.02	28.49	18.06	0.50
640.0	25.37	38.29	7.77	11.88	1.94	0.99	28.79	18.36	0.48
660.0	25.45	38.08	8.99	12.65	1.97	0.97	29.09	18.57	0.38
680.0	25.48	37.92	10.31	13.39	2.00	0.95	29.38	18.90	0.41
700.0	25.47	37.81	11.76	14.09	2.03	0.94	29.25	19.12	0.41
720.0	25.43	37.70	13.35	14.72	2.05	0.93	29.39	19.19	0.36
740.0	25.36	37.64	15.12	15.34	2.09	0.93	29.51	19.24	0.41
760.0	25.28	37.59	17.04	15.86	2.11	0.92	30.04	19.28	0.35
780.0	25.18	37.58	19.17	16.34	2.15	0.92	29.80	19.42	0.32
800.0	25.06	37.56	21.48	16.86	2.18	0.93	30.12	19.51	0.33
820.0	24.93	37.56	23.64	17.29	2.21	0.93	30.67	19.29	0.37
840.0	24.81	37.56	24.71	17.70	2.24	0.93	30.36	19.50	0.29
860.0	24.67	37.58	24.30	18.05	2.28	0.94	30.31	19.49	0.32
880.0	24.52	37.60	22.99	18.37	2.32	0.94	30.36	19.67	0.31
900.0	24.38	37.64	21.43	18.62	2.36	0.95	30.43	19.29	0.33
920.0	24.24	37.65	20.04	18.84	2.39	0.95	30.44	19.29	0.30
960.0	23.95	37.70	17.81	19.13	2.46	0.97	29.91	19.73	0.28
980.0	23.80	37.74	16.97	19.21	2.49	0.97	30.55	18.98	0.29
1000.0	23.65	37.77	16.27	19.23	2.53	0.98	29.66	19.77	0.31
1100.0	22.94	37.96	13.92	18.76	2.74	1.00	30.30	19.45	0.26
1200.0	22.25	38.13	12.53	17.30	2.94	1.02	30.07	19.39	0.34
1300.0	21.58	38.30	11.70	15.23	3.15	1.02	29.78	19.12	0.35
1400.0	20.93	38.42	11.02	13.09	3.33	1.01	29.64	18.99	0.37
1500.0	20.28	38.69	10.54	11.32	3.57	1.00	29.35	18.68	0.48
1600.0	19.63	38.95	10.12	9.86	3.80	0.97	29.06	18.65	0.51
1700.0	19.00	39.14	9.89	8.62	4.00	0.94	28.96	17.97	0.48
1800.0	18.37	39.34	9.65	7.57	4.19	0.90	30.89	17.71	0.53
1900.0	17.74	39.61	9.45	6.67	4.42	0.86	29.94	17.42	0.59
2000.0	17.07	39.78	9.29	6.00	4.64	0.82	29.04	16.95	0.59

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 = 4.20V, Id = 57.23mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	23.10	42.49	2.18	6.62	1.85	1.17	29.18	17.45	0.97
520.0	23.73	41.67	2.70	7.26	1.86	1.15	28.86	17.79	0.74
540.0	24.26	41.01	3.30	7.96	1.88	1.13	28.52	18.12	0.76
560.0	24.70	40.42	4.00	8.69	1.90	1.11	28.82	18.39	0.65
580.0	25.04	39.93	4.79	9.45	1.93	1.08	29.04	18.73	0.59
600.0	25.30	39.54	5.64	10.23	1.95	1.05	29.16	19.16	0.58
620.0	25.49	39.18	6.62	10.99	1.98	1.02	29.18	19.36	0.46
640.0	25.63	38.92	7.68	11.74	2.00	1.00	29.32	19.66	0.48
660.0	25.70	38.69	8.82	12.46	2.03	0.98	29.62	19.78	0.37
680.0	25.73	38.54	10.08	13.15	2.06	0.96	29.82	20.07	0.40
700.0	25.72	38.43	11.45	13.80	2.09	0.95	30.05	20.29	0.39
720.0	25.69	38.33	12.95	14.39	2.12	0.94	29.95	20.31	0.36
740.0	25.61	38.25	14.59	14.96	2.15	0.93	30.15	20.33	0.38
760.0	25.54	38.21	16.40	15.44	2.18	0.93	30.46	20.36	0.32
780.0	25.44	38.20	18.43	15.90	2.22	0.93	30.55	20.50	0.29
800.0	25.33	38.17	20.82	16.39	2.25	0.93	30.57	20.59	0.33
820.0	25.21	38.16	23.45	16.79	2.29	0.93	31.05	20.33	0.36
840.0	25.08	38.15	26.08	17.19	2.32	0.93	30.97	20.52	0.30
860.0	24.95	38.16	27.48	17.52	2.35	0.94	30.58	20.48	0.30
880.0	24.81	38.17	26.65	17.84	2.39	0.94	30.87	20.68	0.29
900.0	24.68	38.20	24.74	18.09	2.43	0.94	31.12	20.28	0.34
920.0	24.54	38.23	22.86	18.32	2.47	0.95	31.15	20.28	0.29
960.0	24.25	38.28	19.93	18.65	2.54	0.96	30.46	20.71	0.31
980.0	24.11	38.30	18.90	18.74	2.58	0.97	31.04	19.93	0.24
1000.0	23.97	38.34	18.03	18.80	2.62	0.97	30.28	20.72	0.29
1100.0	23.26	38.52	15.21	18.52	2.84	0.99	30.66	20.35	0.27
1200.0	22.59	38.68	13.57	17.25	3.05	1.01	30.34	20.32	0.33
1300.0	21.93	38.83	12.62	15.29	3.26	1.01	30.20	19.99	0.34
1400.0	21.29	38.94	11.86	13.18	3.44	1.00	29.95	19.87	0.36
1500.0	20.65	39.21	11.30	11.40	3.69	0.98	29.77	19.48	0.46
1600.0	20.00	39.49	10.82	9.94	3.95	0.96	29.46	19.47	0.52
1700.0	19.37	39.67	10.54	8.70	4.15	0.93	29.33	18.80	0.48
1800.0	18.75	39.86	10.27	7.63	4.34	0.89	31.04	18.54	0.53
1900.0	18.12	40.12	10.03	6.73	4.56	0.85	30.71	18.23	0.57
2000.0	17.45	40.27	9.84	6.05	4.78	0.81	30.34	17.81	0.58

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 = 4.00V, Id = 53.48mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.18	41.81	2.41	6.97	2.02	1.18	28.68	16.48	1.66
520.0	22.85	41.01	2.98	7.64	2.02	1.16	28.31	16.76	1.41
540.0	23.41	40.33	3.66	8.35	2.03	1.13	27.89	17.03	1.34
560.0	23.86	39.75	4.45	9.10	2.04	1.10	28.01	17.35	1.23
580.0	24.22	39.26	5.34	9.87	2.05	1.07	28.17	17.66	1.11
600.0	24.48	38.86	6.34	10.66	2.07	1.04	28.11	18.02	1.11
620.0	24.67	38.53	7.46	11.43	2.09	1.01	28.15	18.21	0.97
640.0	24.79	38.28	8.69	12.18	2.12	0.98	28.26	18.51	0.93
660.0	24.86	38.11	10.07	12.90	2.15	0.96	28.44	18.71	0.80
680.0	24.87	37.97	11.59	13.58	2.18	0.95	28.63	18.93	0.79
700.0	24.85	37.88	13.29	14.23	2.21	0.94	28.79	19.13	0.78
720.0	24.80	37.81	15.20	14.81	2.24	0.93	28.57	19.19	0.74
740.0	24.72	37.77	17.33	15.37	2.27	0.93	28.93	19.23	0.82
760.0	24.62	37.75	19.63	15.82	2.31	0.93	29.22	19.31	0.69
780.0	24.51	37.78	21.87	16.27	2.35	0.93	29.31	19.42	0.68
800.0	24.38	37.76	23.24	16.69	2.38	0.94	29.47	19.51	0.69
820.0	24.25	37.78	23.11	17.07	2.42	0.94	29.86	19.31	0.69
840.0	24.11	37.81	21.75	17.42	2.46	0.95	29.65	19.51	0.63
860.0	23.96	37.84	20.20	17.72	2.50	0.95	29.86	19.48	0.64
880.0	23.81	37.90	18.82	18.00	2.55	0.96	29.80	19.68	0.63
900.0	23.66	37.95	17.66	18.24	2.59	0.97	29.92	19.36	0.66
920.0	23.51	37.99	16.67	18.45	2.64	0.98	30.13	19.33	0.63
960.0	23.21	38.10	15.09	18.74	2.73	0.99	29.69	19.77	0.61
980.0	23.05	38.14	14.46	18.81	2.77	1.00	29.97	19.05	0.60
1000.0	22.90	38.20	13.90	18.82	2.82	1.01	29.21	19.74	0.63
1100.0	22.14	38.50	11.99	18.04	3.08	1.03	30.18	19.44	0.58
1200.0	21.42	38.78	10.88	16.31	3.34	1.05	30.07	19.43	0.70
1300.0	20.73	39.05	10.19	14.36	3.62	1.05	29.79	19.18	0.73
1400.0	20.06	39.28	9.69	12.50	3.88	1.04	29.46	19.04	0.77
1500.0	19.41	39.52	9.32	10.90	4.14	1.02	29.26	18.73	0.92
1600.0	18.75	39.87	9.08	9.55	4.48	0.99	29.48	18.69	0.96
1700.0	18.11	40.11	8.88	8.39	4.75	0.96	29.07	18.11	0.98
1800.0	17.48	40.31	8.69	7.38	4.98	0.91	30.46	17.91	1.05
1900.0	16.83	40.53	8.56	6.51	5.24	0.87	30.80	17.63	1.12
2000.0	16.15	40.64	8.43	5.88	5.48	0.83	30.59	17.20	1.18

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 = 3.80V, Id = 50.31mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	21.97	41.67	2.37	6.94	2.01	1.18	28.21	15.86	1.71
520.0	22.64	40.85	2.94	7.60	2.01	1.16	27.80	16.24	1.41
540.0	23.21	40.14	3.62	8.31	2.02	1.13	27.42	16.51	1.33
560.0	23.67	39.53	4.41	9.05	2.02	1.10	27.71	16.76	1.22
580.0	24.04	39.06	5.30	9.82	2.04	1.07	27.86	17.11	1.11
600.0	24.31	38.67	6.29	10.60	2.06	1.04	27.98	17.46	1.08
620.0	24.50	38.34	7.41	11.37	2.08	1.01	27.74	17.67	0.97
640.0	24.64	38.11	8.64	12.12	2.11	0.98	27.83	18.01	0.91
660.0	24.70	37.90	10.00	12.84	2.13	0.96	27.91	18.24	0.80
680.0	24.73	37.77	11.52	13.52	2.16	0.95	28.33	18.57	0.79
700.0	24.71	37.70	13.22	14.16	2.20	0.94	28.31	18.78	0.80
720.0	24.66	37.61	15.11	14.74	2.22	0.93	28.32	18.85	0.74
740.0	24.57	37.58	17.17	15.29	2.26	0.93	28.66	18.88	0.78
760.0	24.48	37.56	19.34	15.74	2.29	0.93	28.82	18.95	0.71
780.0	24.37	37.59	21.21	16.18	2.34	0.93	28.96	19.09	0.81
800.0	24.24	37.58	22.17	16.60	2.37	0.94	29.17	19.21	0.65
820.0	24.10	37.62	21.88	16.97	2.41	0.94	29.67	18.99	0.69
840.0	23.97	37.65	20.64	17.31	2.45	0.95	29.40	19.18	0.62
860.0	23.82	37.68	19.29	17.61	2.49	0.96	29.47	19.14	0.65
880.0	23.67	37.74	18.05	17.89	2.54	0.96	29.59	19.33	0.63
900.0	23.52	37.79	16.97	18.13	2.58	0.97	29.77	19.02	0.66
920.0	23.37	37.85	16.07	18.35	2.62	0.98	29.86	19.00	0.64
960.0	23.06	37.95	14.58	18.67	2.72	1.00	29.54	19.43	0.60
980.0	22.90	38.01	13.99	18.75	2.76	1.00	29.97	18.74	0.62
1000.0	22.75	38.07	13.48	18.79	2.81	1.01	28.94	19.40	0.64
1100.0	21.99	38.38	11.64	18.14	3.07	1.04	30.09	19.11	0.59
1200.0	21.27	38.68	10.55	16.47	3.34	1.06	30.04	19.12	0.68
1300.0	20.58	38.97	9.91	14.53	3.62	1.06	29.61	18.88	0.72
1400.0	19.92	39.21	9.41	12.67	3.88	1.05	29.36	18.77	0.76
1500.0	19.27	39.45	9.06	11.05	4.15	1.03	29.14	18.42	0.90
1600.0	18.61	39.83	8.84	9.69	4.51	1.00	29.45	18.45	0.97
1700.0	17.98	40.06	8.65	8.52	4.78	0.97	29.21	17.76	0.97
1800.0	17.35	40.26	8.46	7.49	5.01	0.93	30.70	17.57	1.04
1900.0	16.70	40.52	8.34	6.61	5.29	0.88	31.40	17.29	1.13
2000.0	16.03	40.64	8.22	5.98	5.54	0.84	31.10	16.84	1.19

Typical Performance Data

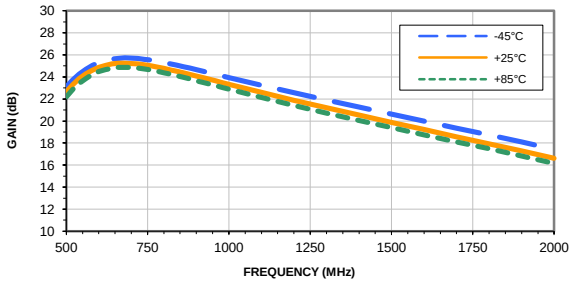
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.20V, Id = 56.66mA @ Temperature = +85°C

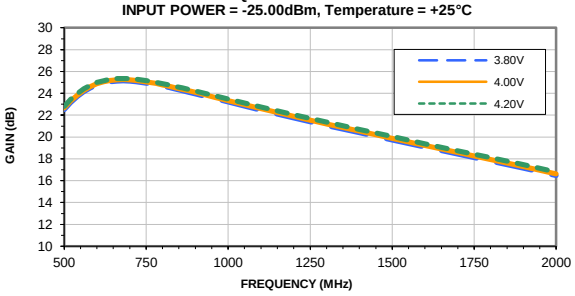
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
500.0	22.29	42.18	2.42	6.95	2.07	1.18	29.06	16.79	1.74
520.0	22.95	41.40	3.00	7.60	2.08	1.16	28.66	17.10	1.41
540.0	23.50	40.74	3.67	8.30	2.09	1.13	28.29	17.39	1.36
560.0	23.95	40.14	4.46	9.02	2.10	1.10	28.36	17.65	1.20
580.0	24.30	39.68	5.34	9.76	2.12	1.07	28.43	17.95	1.11
600.0	24.56	39.28	6.32	10.51	2.14	1.04	28.59	18.27	1.09
620.0	24.74	38.98	7.43	11.24	2.17	1.01	28.50	18.45	0.94
640.0	24.87	38.72	8.63	11.95	2.18	0.99	28.52	18.72	0.91
660.0	24.93	38.54	9.97	12.62	2.21	0.97	28.77	18.89	0.79
680.0	24.95	38.42	11.47	13.25	2.25	0.95	29.23	19.16	0.80
700.0	24.93	38.32	13.12	13.85	2.28	0.94	29.08	19.32	0.80
720.0	24.88	38.25	15.01	14.38	2.31	0.93	29.13	19.42	0.72
740.0	24.80	38.21	17.13	14.89	2.35	0.93	29.41	19.45	0.74
760.0	24.71	38.19	19.51	15.31	2.39	0.93	29.44	19.55	0.70
780.0	24.60	38.22	21.87	15.73	2.43	0.93	29.82	19.67	0.65
800.0	24.47	38.23	23.75	16.12	2.48	0.93	29.83	19.77	0.68
820.0	24.35	38.25	24.08	16.47	2.52	0.94	30.03	19.57	0.72
840.0	24.21	38.26	22.82	16.80	2.55	0.95	30.00	19.76	0.64
860.0	24.06	38.31	21.18	17.09	2.60	0.95	30.25	19.73	0.63
880.0	23.92	38.36	19.65	17.36	2.65	0.96	30.26	19.90	0.64
900.0	23.77	38.41	18.38	17.60	2.70	0.97	30.26	19.61	0.62
920.0	23.62	38.46	17.31	17.83	2.74	0.97	30.18	19.58	0.64
960.0	23.32	38.56	15.63	18.18	2.84	0.99	30.17	20.00	0.62
980.0	23.17	38.60	14.94	18.28	2.88	0.99	30.13	19.30	0.59
1000.0	23.01	38.66	14.35	18.34	2.93	1.00	29.68	20.01	0.63
1100.0	22.27	38.98	12.33	17.88	3.21	1.03	30.43	19.67	0.60
1200.0	21.56	39.27	11.16	16.39	3.50	1.04	30.21	19.65	0.69
1300.0	20.87	39.55	10.45	14.54	3.79	1.05	29.91	19.42	0.73
1400.0	20.21	39.80	9.91	12.72	4.08	1.04	29.68	19.30	0.77
1500.0	19.57	40.07	9.53	11.11	4.37	1.02	29.42	18.98	0.91
1600.0	18.91	40.42	9.28	9.75	4.73	0.99	29.61	18.89	0.97
1700.0	18.28	40.65	9.06	8.57	5.01	0.96	29.25	18.35	0.95
1800.0	17.65	40.84	8.86	7.54	5.26	0.92	30.17	18.15	1.06
1900.0	17.01	41.05	8.72	6.66	5.52	0.87	30.70	17.92	1.12
2000.0	16.34	41.10	8.58	6.02	5.74	0.84	30.39	17.50	1.17

Typical Performance Curves

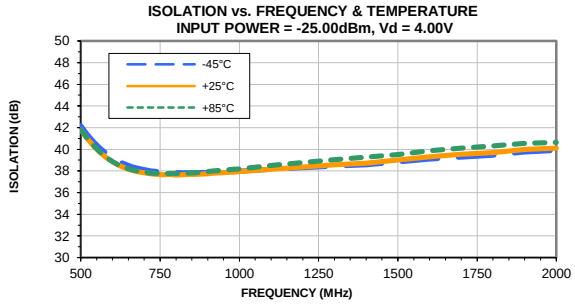
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



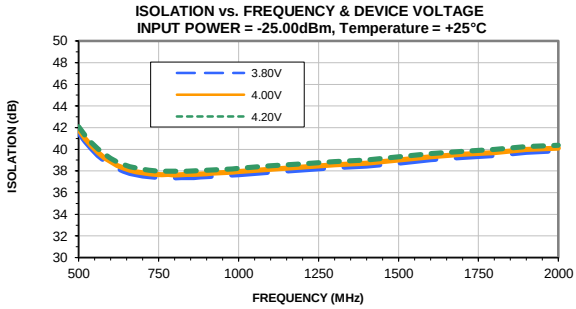
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



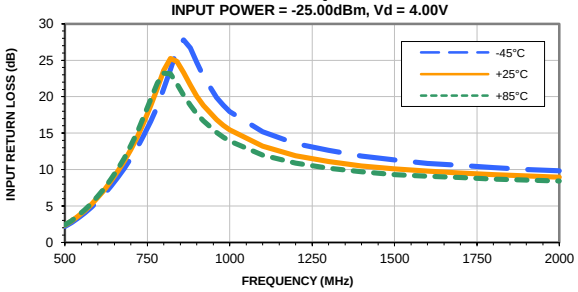
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



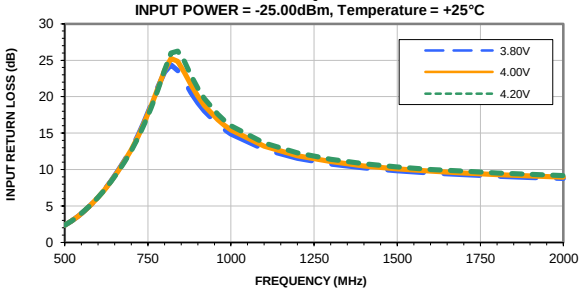
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



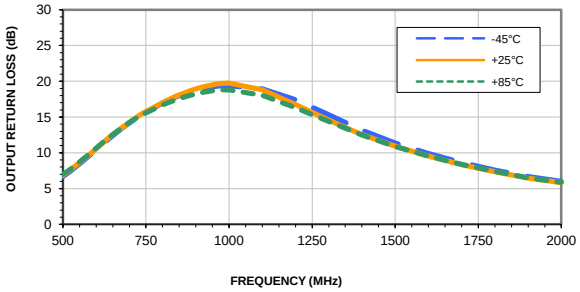
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



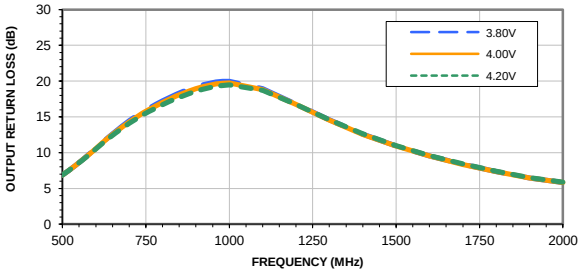
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



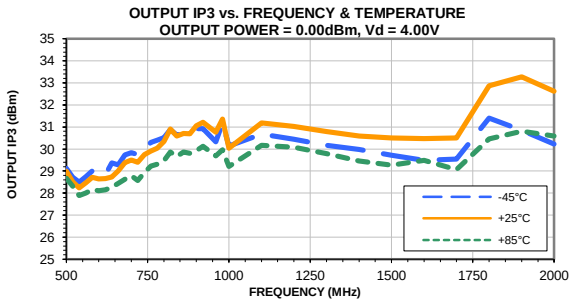
OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V

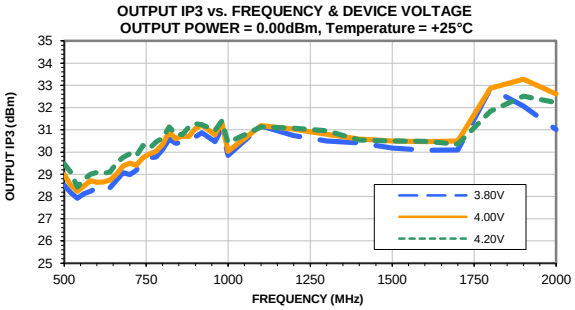


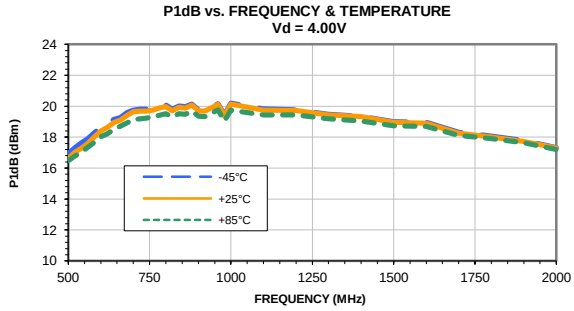
OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C

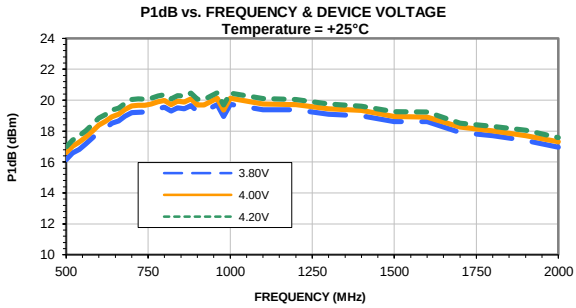


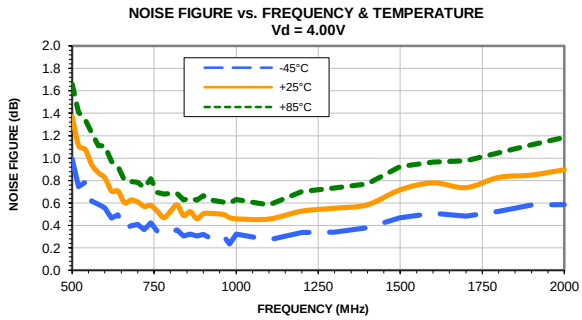
Typical Performance Curves

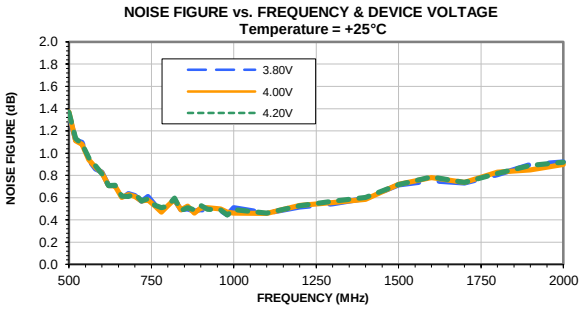


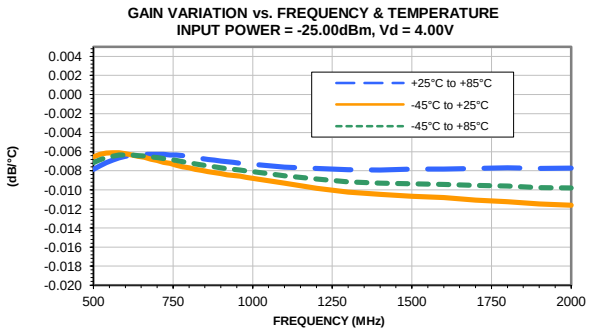






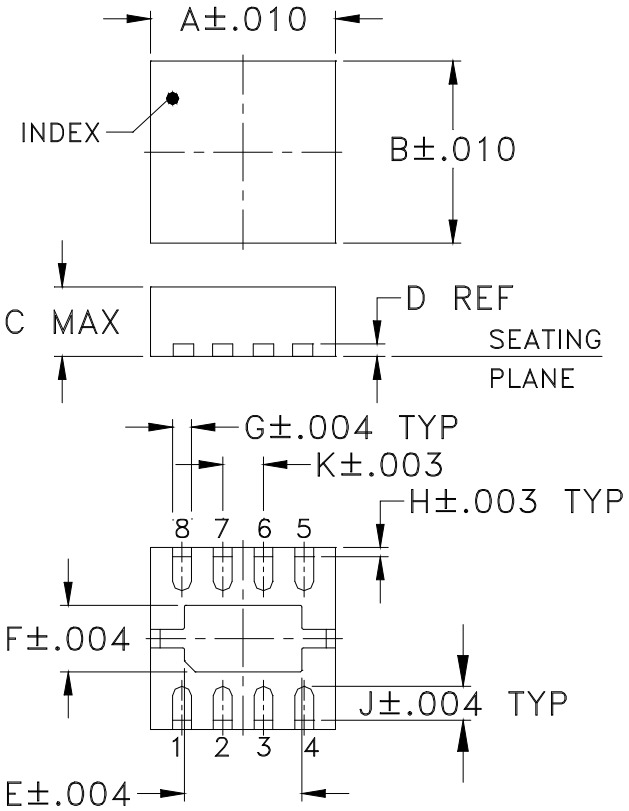




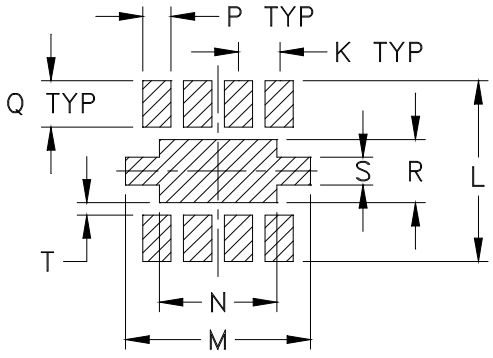


DL1721

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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. ± .004, unless otherwise specified.

Notes:

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

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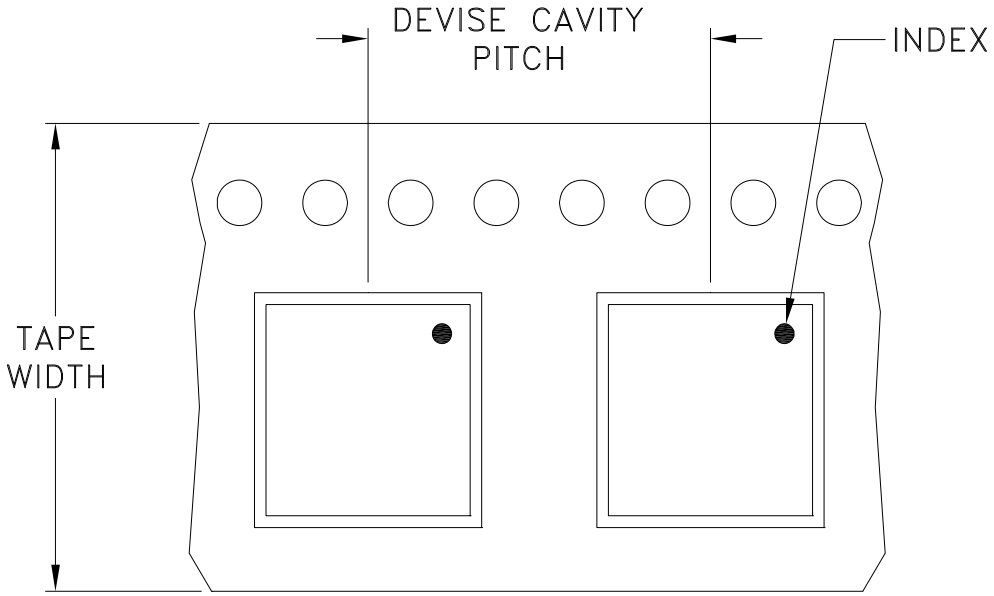
Tape & Reel Packaging TR-F66-1



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

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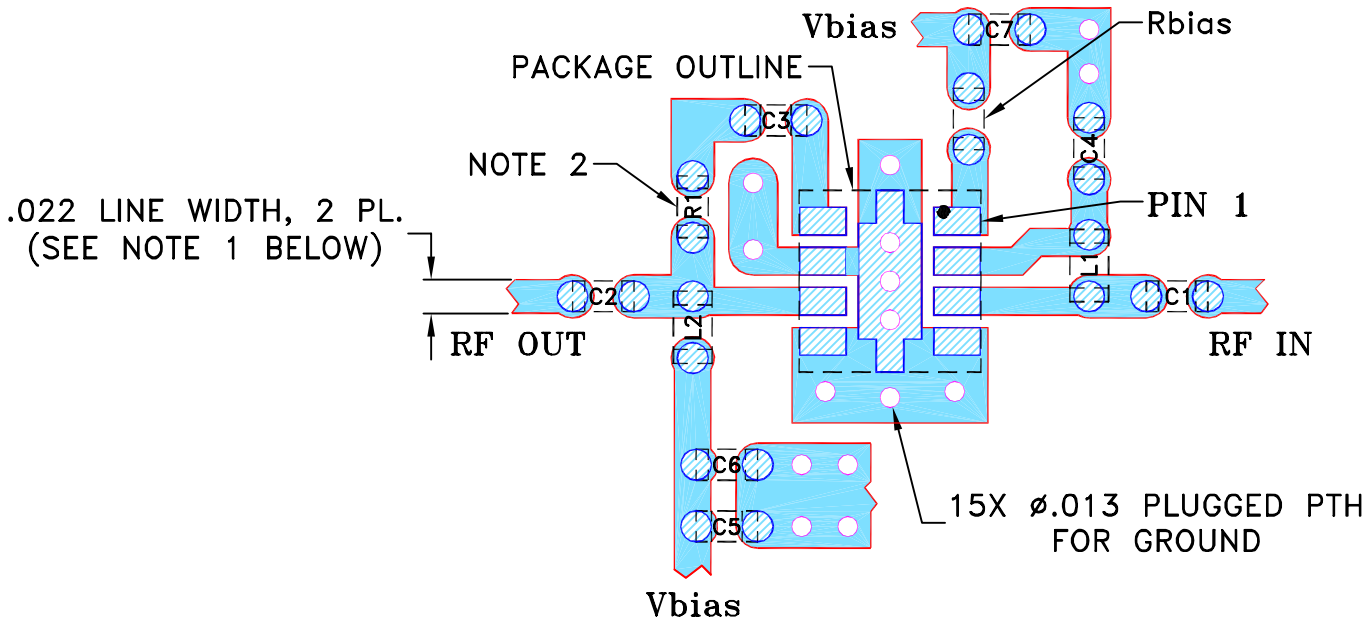
THIRD ANGLE PROJECTION

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

SUGGESTED MOUNTING CONFIGURATION FOR DG1721 CASE STYLE, "08AM12" PIN CODE



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0402 SIZE CHIP FOOT PRINTS SHOWN FOR REFERENCE, FOR COMPONENT VALUE REFER TO TB-756+.
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
DIMENSIONS ARE IN INCHES	DRAWN	AV	11/21/13
TOLERANCES ON:	CHECKED	IL	11/21/13
2 PL DECIMALS ±	APPROVED	DJ	11/22/13
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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ASHEETA1.DWG REV:A DATE:01/12/95

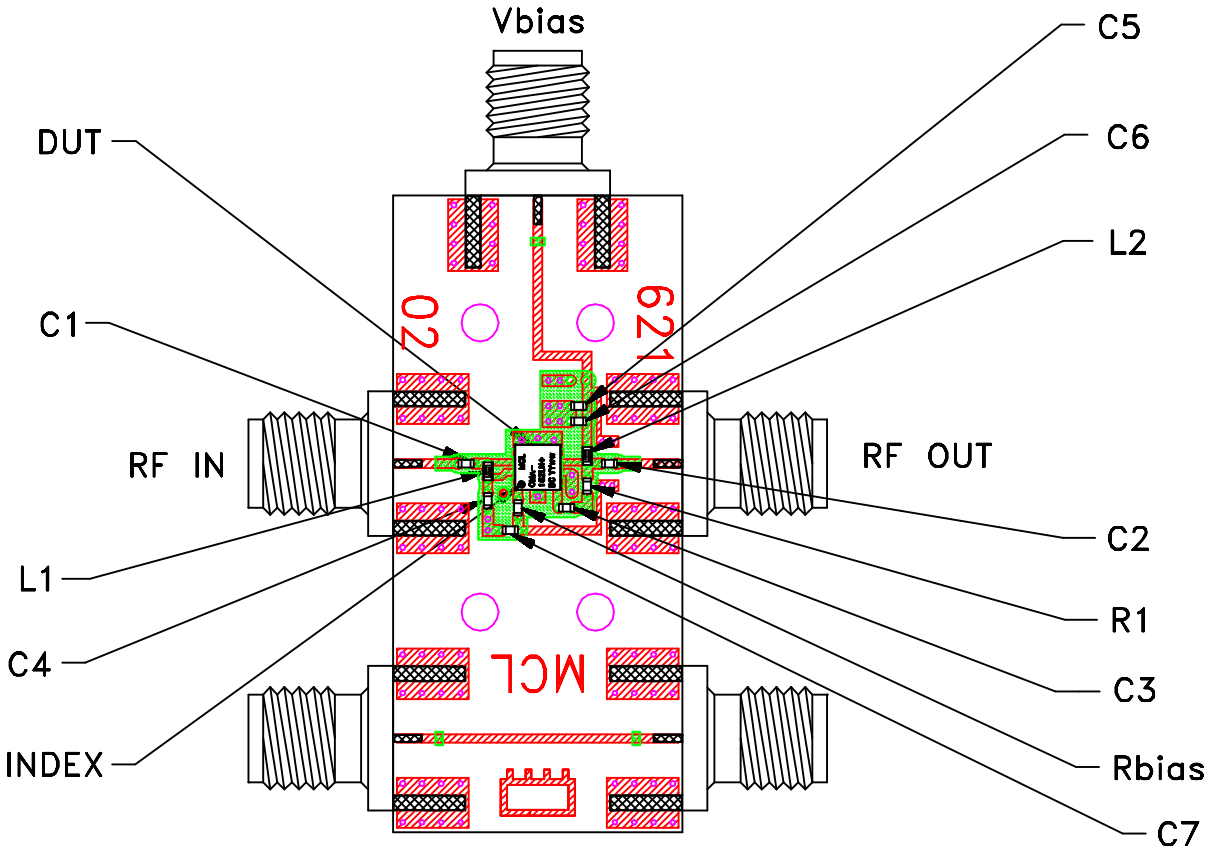
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 08AM12, DG1721, TB-756+

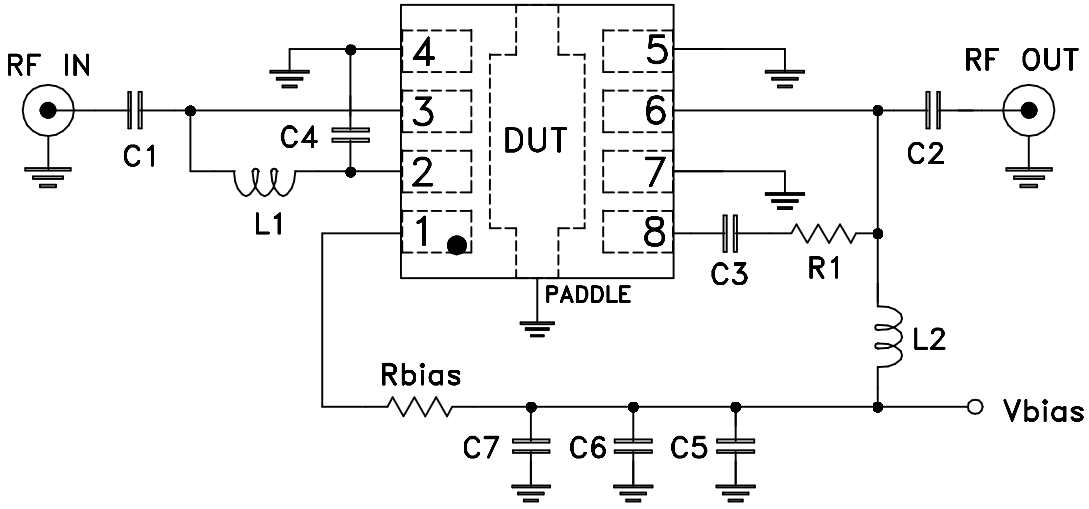
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-404	OR

FILE:	SCALE:	SHEET:
98PL404	8:1	1 OF 1

Evaluation Board and Circuit



TB-756+



Schematic Diagram

ITEM	DESCRIPTION
C1, C6	CAP, 9.1pF
C2, C4	CAP, 100pF
C3	CAP, 5.6pF
C5, C7	CAP, 0.1uF
R1	RES, 267 Ohm
Rbias	RES, 750 Ohm
L1	IND, 6.8nH
L2	IND, 15nH
DUT	CMA-162LN+

NOTES:

1. SMA Female connectors.
2. PCB material: Rogers RO4350 or equivalent, dielectric constant=3.5, dielectric thickness=.010 inch.

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Environmental Specifications ENV68

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

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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
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JEDEC-STD-22-B, Method A102

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