MMIC SURFACE MOUNT

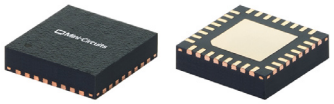
Wideband LNA

AVA-0233LN+

50Ω 2 to 30 GHz

THE BIG DEAL

- Wide Bandwidth, 2 to 30 GHz
- Flat Gain Response, Typ. 16.3 dB ± 1 dB
- Noise Figure, Typ. 2.4 dB
- 5x5mm 32-Lead SMT Package
- Gain Control, Typ. 30 dB



Generic photo used for illustration purposes only

CASE STYLE: DG1677-4

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

APPLICATIONS

- 5G MIMO and Back Haul Radio Systems
- Satellite Ka-Band Communications
- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems

PRODUCT OVERVIEW

The AVA-0233LN+ is a GaAs pHEMT MMIC Distributed Amplifier that operates from 2 to 30 GHz. The amplifier provides solid performance of 16.3 dB gain, 2.4 dB noise figure, +13.6 dB P1dB, and +25.7 dBm OIP3 from a self-biased single +5V supply drawing only 65 mA. The control voltage bias input VC enables the gain to be varied by over 30 dB across the operating band. The AVA-0233LN+ MMIC amplifier is housed in an industry standard 5x5mm QFN-style package, with RF ports internally matched to 50Ω, facilitating easy integration into microwave system PC boards.

KEY FEATURES

Features	Advantages
Wideband response with adjustable Gain: 2-30 GHz, Typ. Gain 16.3 dB, 30 dB dynamic range	General purpose wideband amplifier with adjustable gain vs. control voltage is suitable for wide variety of applications.
Noise Figure: 2 dB Typ. 6-20 GHz 4 dB Typ. 2-30 GHz	Usable as first or second stage amplifier.
OIP3: +26 dBm Typ. 2-20 GHz +23 dBm Typ. 20-30 GHz	Easy to integrate into signal chain.
Return Loss 15 dB Typ. 2-20 GHz 10 dB Typ. 20-30 GHz	
5 x 5mm 32-Lead QFN-style package	Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

Wideband LNA

AVA-0233LN+

50Ω 2 to 30 GHz

ELECTRICAL SPECIFICATIONS[1] AT 25°C, Zo=50Ω, VDD=+5V, VC = OPEN, UNLESS NOTED OTHERWISE.

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		2		30	GHz
Gain	2	16.9	17.2	17.8	dB
	10	15.8	16.7	17.4	
	20	15.2	16.3	17.3	
	28	12.9	14.7	16.5	
	30	12.7	15.5	17.5	
Input Return Loss	2		20.0		dB
	10		14.8		
	20		12.5		
	28		8.9		
	30		17.2		
Output Return Loss	2		11.5		dB
	10		19.3		
	20		13.1		
	28		6.5		
	30		11.4		
Reverse Isolation	2-30		37.0		dB
Output Power @ 1 dB Compression	2		+16.4		dBm
	10		+15.1		
	20		+13.6		
	28		+11.5		
	30		+11.5		
Output Third-Order Intercept Pout = 0 dBm/Tone	2		+28.4		dBm
	10		+27.0		
	20		+25.7		
	28		+22.5		
	30		+20.6		
Noise Figure	2		4.2		dB
	10		1.5		
	20		2.4		
	28		4.5		
	30		4.8		
Device Operating Voltage (VDD)		+4.75	+5	+5.25	V
Device Operating Current (IDD)			65	92	mA
Device Control Voltage (VC)		-1.2	Open	+2.4	V
Gain Variation over Control Voltage (VC)[4] over -1.2V to 0V	2-30		30		dB
Gain Variation over Control Voltage (VC)[4] over 0V to +2.4V	2-30		1		dB
Device Current (IDD) Variation vs. Temperature[2]			-10		µA/°C
Device Current (IDD) Variation vs. Voltage[3]			0.0128		mA/mV
Thermal Resistance, Junction-to-Ground-Lead (ΘJC)			14.7		°C/W

1. Measured on Mini-Circuits Characterization Test Board TB-AVA-0233LNC+. See Characterization and Application Circuit (Fig.1).
2. Device Current Variation vs. Temperature = (Current in mA at +85°C – Current in mA at -45°C)/+130°C
3. Device Current Variation vs. Voltage = (Current in mA at +5.25V – Current in mA at +4.75V) / (+5.25V-+4.75V)*1000mA/mV)
4. Gain is nominal when VC = Open. When VC is left floating, there is a measured voltage of +2V on the pin. To reduce gain, add a negative bias.

MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Case Temperature	-45°C to +85°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	1.55W
Junction Temperature	+150°C
RF Input Power (CW)	+20 dBm
DC Voltage at VDD	+8V
DC Voltage at VC	-2.5V to +3V
Current IDD	140mA
Current IC	5mA
DC Voltage on RF-IN and RF-OUT	+18V

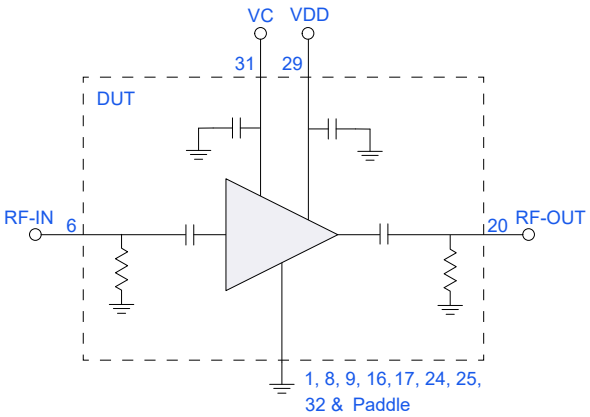
5. Permanent damage may occur if any of those limits are exceeded. Electrical maximum ratings are not intended for continuous normal operation.

Wideband LNA

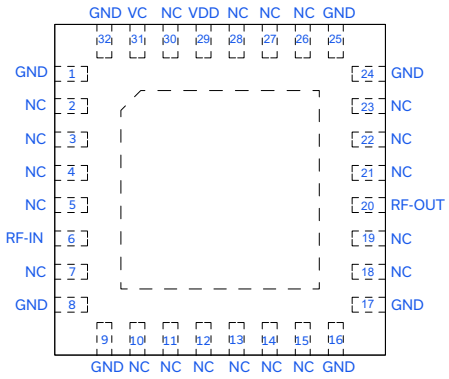
AVA-0233LN+

50Ω 2 to 30 GHz

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



TOP VIEW



Function	Pad Number	Description (Refer to Figure 1)
RF-IN	6	RF-Input Pad connects to RF-Input through an integrated shunt resistor for ESD protection and DC blocking capacitor.
RF-OUT	20	RF-Output Pad connects to RF-Output through an integrated shunt resistor for ESD protection and DC blocking capacitor.
VDD	29	DC Input Pad connects to the voltage input of the device and passes through C2 and an integrated capacitor.
VC	31	Control Voltage Bias Pad connects to the control voltage input of the device and passes through C1 and an integrated capacitor.
Ground	1, 8, 9, 16, 17, 24, 25, 32	Connects to ground.
No Connection	2 - 5, 7, 10 - 15, 18, 19, 21 - 23, 26 - 28, 30	Not used internally. Connected to ground on test board.

CHARACTERIZATION TEST & APPLICATION CIRCUIT

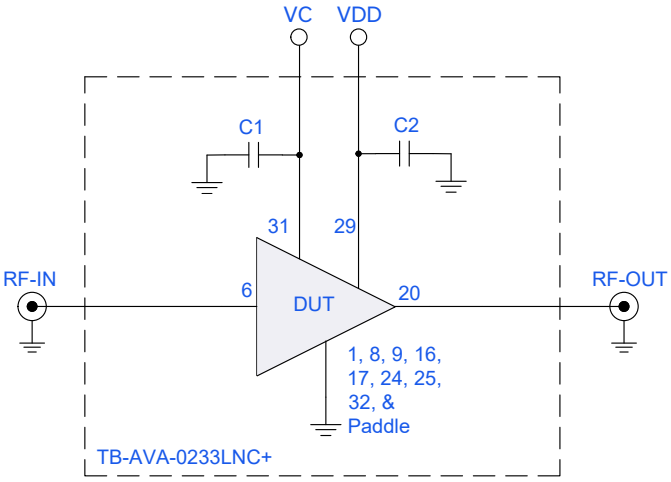
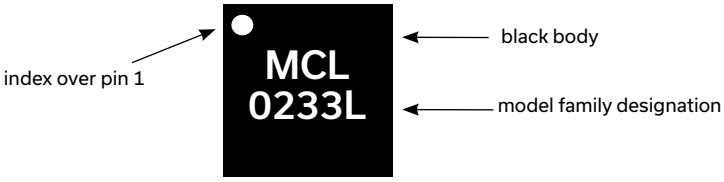


Fig 1. Characterization and Application Circuit
Note: This block diagram is used for characterization (DUT is soldered on Mini-Circuits Test Board TB-AVA-0233LNC+). Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Keysight PNA-X N5247B Microwave Network Analyzer.

Conditions:
1. VDD = +5V, VC = Open
2. Gain and Return Loss P_{IN} = -25 dBm
3. Output IP3 (OIP3): Two Tones, spaced 1 MHz apart, 0 dBm/Tone at output.

Component	Size	Value	Manufacturer	P/N
C1, C2	0402	0.1uF	Murata	GRM155R71C104KA88D

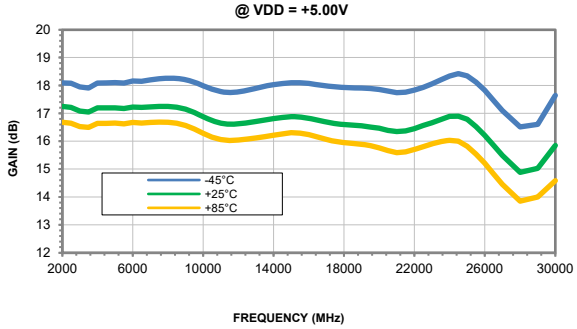
PRODUCT MARKING



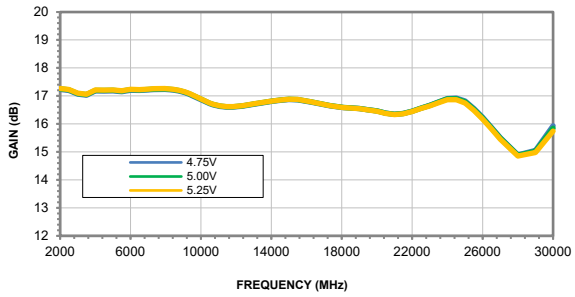
Marking may contain other features or characters for internal lot control

TYPICAL PERFORMANCE CURVES

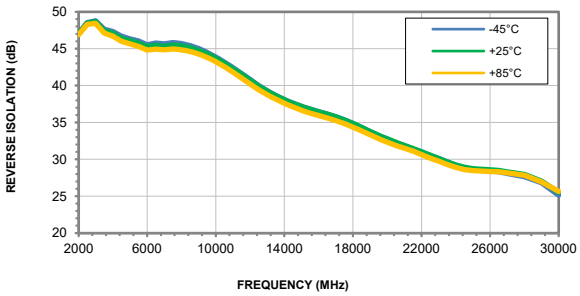
GAIN vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



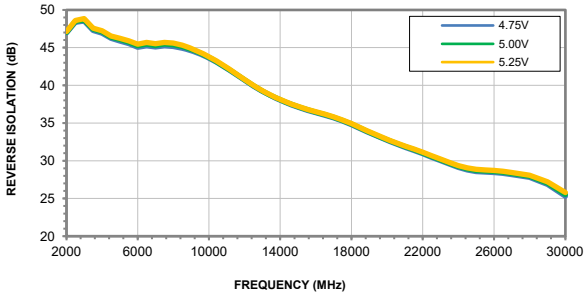
GAIN vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



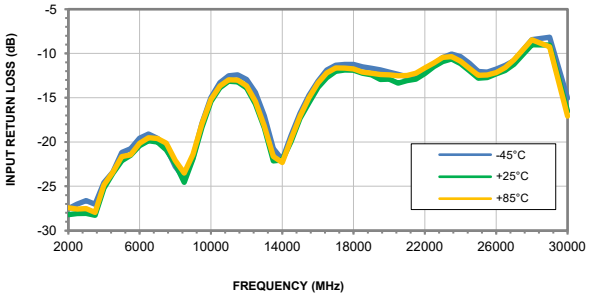
REVERSE ISOLATION vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



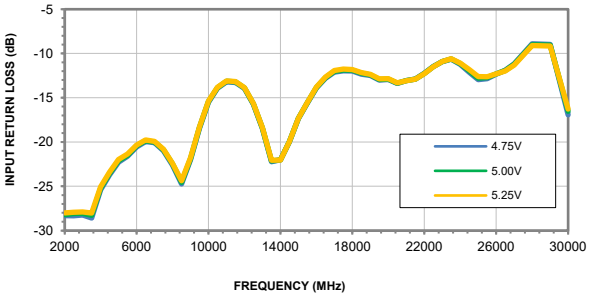
REVERSE ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



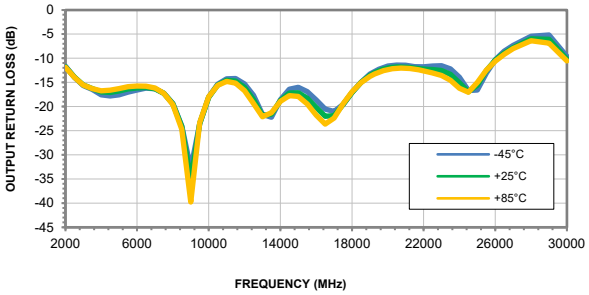
INPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V



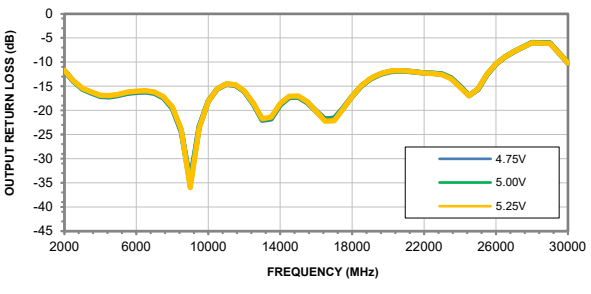
INPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C



OUTPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V



OUTPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C



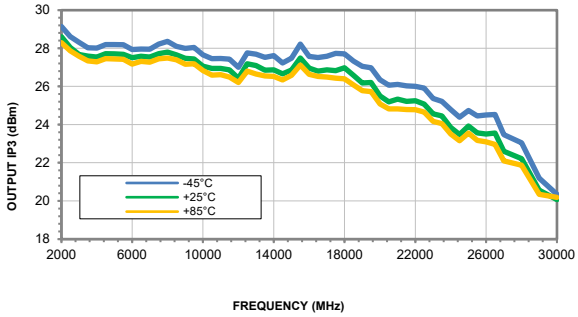
Wideband LNA

AVA-0233LN+

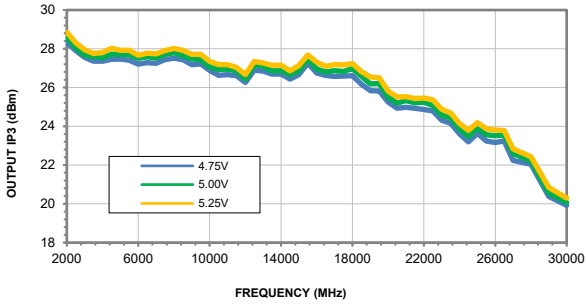
50Ω 2 to 30 GHz

TYPICAL PERFORMANCE CURVES

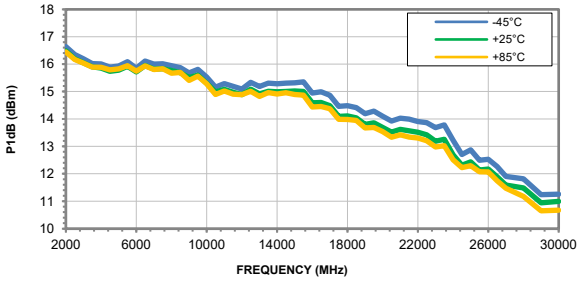
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



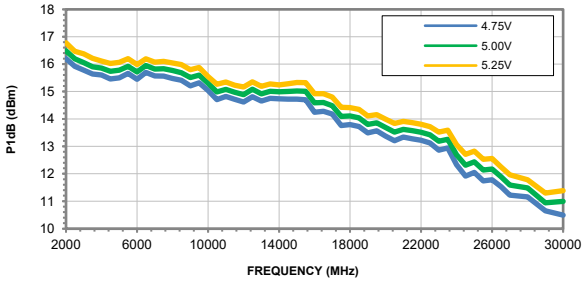
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



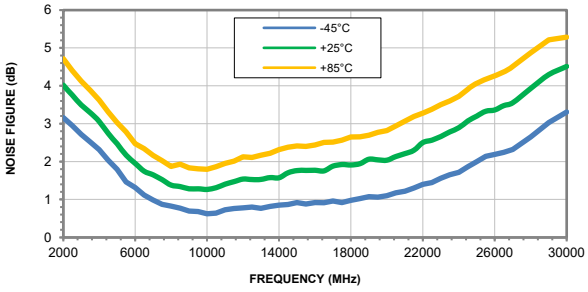
P1dB vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



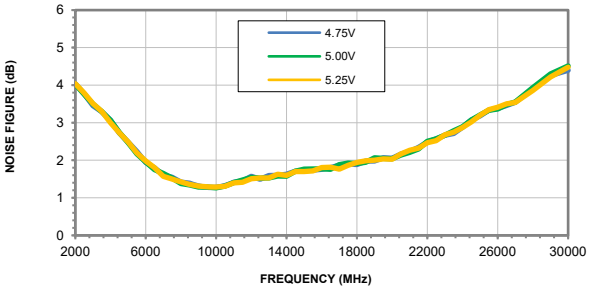
P1dB vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



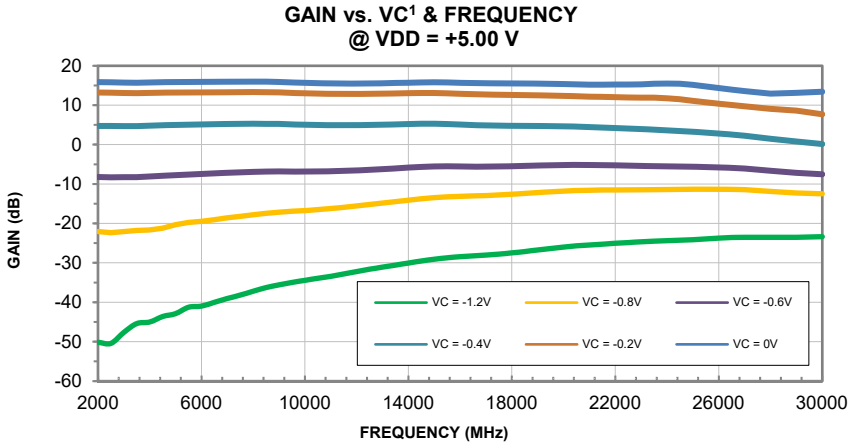
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00 V

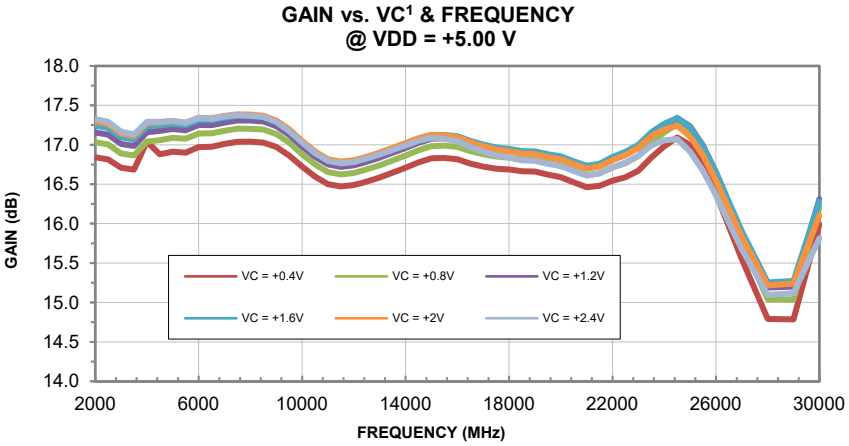


NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C

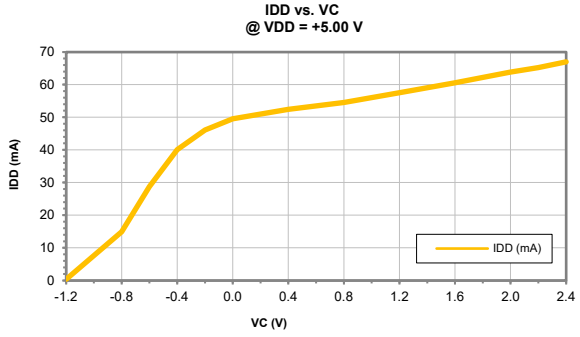


VC CONTROL VS. GAIN, FREQUENCY, & CONTROL CURRENT





1. Gain is nominal when VC = Open. When VC is left floating, there is a measured voltage of +2V on the pin.



Wideband LNA

AVA-0233LN+

50Ω 2 to 30 GHz

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DG1677-4 QFN-style package, exposed paddle, lead finish: PPF
Tape & Reel **Standard quantities available on reel**	F66 7" reels with 20, 50, 100, 200, 500 or 1000 devices
Suggested Layout for PCB Design	PL-741
Evaluation Board	TB-AVA-0233LNC+
Environmental Ratings	ENV08T10
Product Handling	The use of no-clean solder is recommended. This package cannot be subjected to aqueous wash.

ESD RATING

Human Body Model (HBM): Class 1A (250V) in accordance with ANSI/ESDA/JEDEC JS-001-2017
Charged Device Model (CDM): Class C3 (1000V) in accordance with JESD22-C101F

MSL RATING

Moisture Sensitivity: MSL3 in accordance with IPC/JEDEC J-STD-020E and IPC/JEDEC J-STD-033C.

NOTES

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

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: VDD= 4.75V, IDD = 63mA @ 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)
2000	17.23	46.96	28.32	11.83	14.30	0.94	28.32	16.20	4.03
2500	17.19	48.36	28.33	13.99	17.34	0.96	27.90	15.92	3.77
3000	17.06	48.53	28.25	15.61	18.21	0.97	27.55	15.78	3.46
3500	17.02	47.27	28.58	16.41	15.90	0.98	27.35	15.64	3.29
4000	17.17	46.92	25.40	17.12	15.03	0.98	27.36	15.60	3.07
4500	17.17	46.24	23.71	17.21	13.88	0.98	27.46	15.46	2.72
5000	17.18	45.88	22.28	16.93	13.26	0.98	27.46	15.50	2.48
5500	17.15	45.53	21.62	16.48	12.74	0.98	27.40	15.66	2.23
6000	17.20	45.04	20.56	16.28	11.96	0.98	27.21	15.45	1.94
6500	17.19	45.25	19.96	16.19	12.25	0.98	27.28	15.69	1.80
7000	17.21	45.08	20.08	16.46	12.00	0.98	27.25	15.57	1.61
7500	17.23	45.24	21.01	17.43	12.27	0.99	27.44	15.56	1.54
8000	17.23	45.16	22.60	19.62	12.27	0.99	27.51	15.48	1.42
8500	17.20	44.93	24.73	24.41	12.11	1.00	27.44	15.41	1.39
9000	17.13	44.58	22.01	34.53	11.73	1.00	27.17	15.21	1.32
9500	17.01	44.15	18.45	23.36	11.19	1.01	27.21	15.32	1.28
10000	16.86	43.61	15.52	18.09	10.44	1.01	26.89	15.04	1.28
10500	16.72	42.97	13.93	15.61	9.63	1.01	26.63	14.71	1.32
11000	16.64	42.23	13.21	14.62	8.80	1.01	26.66	14.82	1.41
11500	16.59	41.47	13.28	14.79	8.09	1.01	26.61	14.72	1.45
12000	16.61	40.67	13.95	16.10	7.48	1.01	26.26	14.62	1.57
12500	16.65	39.90	15.74	18.67	7.00	1.01	26.90	14.81	1.49
13000	16.70	39.21	18.47	22.07	6.58	1.00	26.84	14.65	1.59
13500	16.75	38.57	22.23	21.79	6.14	0.99	26.68	14.75	1.60
14000	16.80	38.02	22.02	18.94	5.68	0.99	26.70	14.74	1.63
14500	16.84	37.51	19.99	17.35	5.29	0.98	26.43	14.72	1.71
15000	16.87	37.08	17.36	17.30	4.98	0.99	26.66	14.72	1.72
15500	16.86	36.71	15.61	18.40	4.77	1.00	27.26	14.70	1.74
16000	16.81	36.38	13.89	20.17	4.59	1.02	26.74	14.24	1.76
16500	16.74	36.04	12.81	21.79	4.41	1.03	26.62	14.28	1.80
17000	16.67	35.70	12.10	21.62	4.24	1.04	26.57	14.18	1.87
17500	16.63	35.27	11.96	19.52	4.04	1.03	26.59	13.76	1.90
18000	16.59	34.79	11.98	17.12	3.82	1.02	26.61	13.79	1.88
18500	16.57	34.26	12.34	15.03	3.57	1.01	26.17	13.72	1.98
19000	16.55	33.72	12.49	13.58	3.30	1.00	25.84	13.49	1.98
19500	16.50	33.20	13.01	12.64	3.09	0.99	25.82	13.57	2.06
20000	16.46	32.68	12.94	12.11	2.93	0.97	25.25	13.37	2.05
20500	16.38	32.24	13.39	11.84	2.88	0.94	24.92	13.21	2.16
21000	16.34	31.81	13.07	11.89	2.78	0.93	24.98	13.34	2.23
21500	16.37	31.37	12.88	12.08	2.61	0.95	24.93	13.28	2.34
22000	16.45	30.94	12.24	12.26	2.40	0.97	24.87	13.22	2.48
22500	16.56	30.46	11.47	12.32	2.20	0.99	24.80	13.12	2.57
23000	16.66	30.01	10.92	12.46	2.08	0.99	24.31	12.86	2.67
23500	16.78	29.56	10.65	13.25	2.02	0.98	24.16	12.94	2.71
24000	16.90	29.11	11.25	14.97	1.98	0.96	23.61	12.33	2.88
24500	16.92	28.78	12.12	16.91	1.96	0.96	23.20	11.92	3.07
25000	16.81	28.57	12.96	15.67	1.95	0.94	23.63	12.05	3.18
25500	16.55	28.50	12.84	12.62	1.95	0.90	23.23	11.74	3.33
26000	16.23	28.43	12.34	10.44	1.93	0.87	23.16	11.78	3.38
26500	15.88	28.34	11.89	8.96	1.83	0.88	23.24	11.53	3.46
27000	15.51	28.16	11.17	7.84	1.67	0.89	22.24	11.22	3.54
27500	15.18	27.95	9.98	6.78	1.55	0.87	22.06	11.28	3.65
28000	14.89	27.80	8.90	5.95	1.57	0.78	22.04	11.15	3.91
28500	14.81	27.49	8.32	5.66	1.63	0.70	21.07	10.99	4.14
29000	15.05	26.88	8.98	6.05	1.57	0.70	20.38	10.65	4.26
29500	15.54	26.04	11.14	7.52	1.46	0.78	19.78	10.37	4.40
30000	15.93	25.30	16.94	10.21	1.47	0.81	19.92	10.49	4.40

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: VDD = 5.00V, IDD = 64mA @ 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)
2000	17.25	47.02	28.20	11.77	14.35	0.93	28.60	16.49	4.02
2500	17.21	48.47	28.08	13.91	17.52	0.96	28.04	16.19	3.76
3000	17.08	48.68	28.06	15.51	18.46	0.97	27.67	16.05	3.49
3500	17.04	47.45	28.28	16.30	16.17	0.98	27.59	15.90	3.29
4000	17.19	47.11	25.23	17.00	15.31	0.98	27.54	15.86	3.06
4500	17.19	46.39	23.54	17.09	14.08	0.98	27.71	15.74	2.74
5000	17.20	46.09	22.12	16.80	13.56	0.98	27.71	15.78	2.47
5500	17.17	45.73	21.50	16.35	13.01	0.98	27.68	15.92	2.17
6000	17.22	45.27	20.42	16.15	12.24	0.98	27.51	15.71	1.95
6500	17.21	45.47	19.85	16.06	12.52	0.98	27.58	15.95	1.75
7000	17.23	45.29	20.00	16.32	12.25	0.98	27.53	15.82	1.65
7500	17.25	45.49	20.89	17.28	12.58	0.99	27.71	15.83	1.52
8000	17.24	45.39	22.47	19.44	12.57	0.99	27.80	15.76	1.38
8500	17.22	45.16	24.55	24.18	12.40	1.00	27.65	15.68	1.34
9000	17.15	44.75	21.89	35.30	11.93	1.00	27.47	15.51	1.28
9500	17.03	44.28	18.34	23.52	11.33	1.01	27.44	15.60	1.28
10000	16.88	43.71	15.44	18.10	10.53	1.01	27.06	15.30	1.27
10500	16.74	43.04	13.87	15.58	9.69	1.01	26.94	14.99	1.31
11000	16.65	42.30	13.14	14.57	8.84	1.01	26.94	15.08	1.40
11500	16.61	41.52	13.22	14.72	8.12	1.01	26.86	14.97	1.47
12000	16.62	40.72	13.89	16.02	7.50	1.01	26.42	14.89	1.54
12500	16.66	39.95	15.71	18.57	7.02	1.01	27.18	15.08	1.53
13000	16.71	39.24	18.41	21.90	6.60	1.00	27.09	14.92	1.53
13500	16.76	38.62	22.14	21.59	6.16	0.99	26.85	15.01	1.58
14000	16.81	38.08	22.03	18.77	5.71	0.99	26.87	14.99	1.57
14500	16.85	37.58	19.96	17.21	5.32	0.98	26.65	15.00	1.71
15000	16.88	37.15	17.34	17.16	5.01	0.99	26.85	15.02	1.76
15500	16.87	36.78	15.56	18.29	4.80	1.00	27.49	15.01	1.77
16000	16.82	36.45	13.83	20.19	4.61	1.02	26.95	14.59	1.77
16500	16.75	36.12	12.73	22.02	4.44	1.03	26.80	14.60	1.76
17000	16.68	35.76	12.01	21.89	4.26	1.04	26.87	14.48	1.88
17500	16.64	35.34	11.86	19.61	4.07	1.03	26.83	14.09	1.92
18000	16.60	34.86	11.89	17.12	3.84	1.02	26.97	14.11	1.91
18500	16.57	34.33	12.24	14.99	3.59	1.01	26.58	14.04	1.95
19000	16.55	33.79	12.42	13.53	3.32	1.00	26.18	13.80	2.06
19500	16.50	33.26	12.93	12.58	3.11	0.99	26.21	13.86	2.05
20000	16.46	32.75	12.90	12.05	2.95	0.97	25.50	13.69	2.04
20500	16.38	32.32	13.36	11.79	2.90	0.94	25.19	13.52	2.14
21000	16.34	31.89	13.07	11.86	2.80	0.93	25.33	13.62	2.21
21500	16.37	31.46	12.90	12.06	2.64	0.95	25.21	13.57	2.30
22000	16.45	31.04	12.27	12.26	2.43	0.98	25.25	13.52	2.50
22500	16.56	30.57	11.50	12.36	2.23	0.99	25.08	13.42	2.57
23000	16.66	30.12	10.92	12.53	2.11	0.99	24.56	13.19	2.66
23500	16.78	29.67	10.62	13.35	2.04	0.98	24.45	13.26	2.78
24000	16.89	29.24	11.16	15.09	2.01	0.97	23.85	12.69	2.89
24500	16.90	28.92	11.96	16.94	1.99	0.96	23.48	12.31	3.07
25000	16.79	28.72	12.79	15.60	1.98	0.94	23.92	12.44	3.21
25500	16.52	28.64	12.73	12.57	1.98	0.91	23.56	12.13	3.33
26000	16.21	28.58	12.31	10.41	1.96	0.88	23.51	12.17	3.36
26500	15.85	28.48	11.92	8.94	1.86	0.88	23.56	11.89	3.48
27000	15.49	28.31	11.22	7.83	1.70	0.89	22.60	11.59	3.55
27500	15.17	28.09	10.05	6.78	1.58	0.87	22.26	11.62	3.64
28000	14.88	27.94	9.00	5.97	1.60	0.78	22.21	11.48	3.93
28500	14.80	27.64	8.41	5.70	1.66	0.70	21.34	11.28	4.14
29000	15.02	27.04	9.06	6.10	1.60	0.71	20.56	10.95	4.30
29500	15.49	26.25	11.16	7.57	1.50	0.78	19.98	10.77	4.39
30000	15.85	25.55	16.53	10.21	1.52	0.82	20.07	10.99	4.51

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: VDD = 5.25V, IDD = 65mA @ 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)
2000	17.27	47.12	28.02	11.72	14.49	0.93	28.86	16.78	4.04
2500	17.23	48.59	27.94	13.84	17.71	0.96	28.31	16.46	3.79
3000	17.09	48.86	27.90	15.42	18.80	0.97	27.95	16.37	3.51
3500	17.06	47.57	28.02	16.19	16.36	0.98	27.75	16.21	3.30
4000	17.21	47.24	25.06	16.88	15.52	0.98	27.80	16.11	3.00
4500	17.21	46.54	23.40	16.96	14.29	0.98	28.02	16.02	2.73
5000	17.21	46.24	21.98	16.68	13.76	0.98	27.92	16.06	2.48
5500	17.18	45.89	21.36	16.23	13.21	0.98	27.92	16.20	2.19
6000	17.23	45.44	20.34	16.03	12.46	0.98	27.66	15.98	1.98
6500	17.22	45.67	19.77	15.94	12.79	0.98	27.77	16.19	1.80
7000	17.24	45.51	19.93	16.19	12.55	0.98	27.74	16.07	1.57
7500	17.26	45.69	20.82	17.14	12.84	0.99	27.91	16.10	1.50
8000	17.26	45.60	22.40	19.27	12.85	0.99	28.01	16.04	1.42
8500	17.23	45.32	24.39	23.95	12.61	1.00	27.92	15.98	1.35
9000	17.16	44.88	21.77	35.99	12.10	1.00	27.71	15.80	1.31
9500	17.04	44.39	18.28	23.68	11.46	1.01	27.71	15.88	1.29
10000	16.89	43.80	15.38	18.12	10.63	1.01	27.35	15.55	1.29
10500	16.75	43.11	13.82	15.55	9.75	1.01	27.18	15.27	1.31
11000	16.66	42.37	13.10	14.52	8.90	1.01	27.19	15.34	1.40
11500	16.61	41.56	13.18	14.66	8.14	1.01	27.04	15.23	1.41
12000	16.63	40.77	13.87	15.95	7.53	1.01	26.67	15.16	1.51
12500	16.66	39.99	15.65	18.48	7.05	1.01	27.34	15.35	1.53
13000	16.71	39.28	18.36	21.74	6.62	1.00	27.26	15.19	1.53
13500	16.76	38.67	22.06	21.40	6.19	0.99	27.14	15.27	1.63
14000	16.81	38.13	22.05	18.62	5.74	0.99	27.16	15.24	1.60
14500	16.85	37.63	19.94	17.07	5.34	0.98	26.86	15.28	1.70
15000	16.88	37.21	17.33	17.03	5.04	0.99	27.13	15.33	1.70
15500	16.87	36.84	15.54	18.19	4.83	1.00	27.68	15.32	1.72
16000	16.83	36.50	13.78	20.20	4.64	1.02	27.31	14.92	1.81
16500	16.76	36.18	12.66	22.24	4.47	1.03	27.09	14.92	1.81
17000	16.68	35.83	11.93	22.15	4.29	1.04	27.18	14.80	1.76
17500	16.64	35.40	11.77	19.71	4.09	1.04	27.17	14.43	1.87
18000	16.59	34.92	11.81	17.11	3.87	1.02	27.23	14.41	1.94
18500	16.57	34.40	12.15	14.95	3.62	1.01	26.82	14.35	1.98
19000	16.54	33.85	12.35	13.48	3.34	1.00	26.54	14.11	2.00
19500	16.50	33.33	12.87	12.53	3.13	0.99	26.51	14.15	2.03
20000	16.45	32.82	12.86	12.00	2.97	0.97	25.82	13.99	2.03
20500	16.37	32.39	13.32	11.74	2.92	0.94	25.52	13.83	2.17
21000	16.33	31.97	13.07	11.82	2.83	0.93	25.52	13.91	2.26
21500	16.36	31.55	12.91	12.04	2.66	0.95	25.43	13.87	2.32
22000	16.44	31.13	12.29	12.27	2.46	0.98	25.46	13.81	2.47
22500	16.55	30.66	11.51	12.39	2.26	1.00	25.37	13.72	2.52
23000	16.64	30.22	10.92	12.60	2.14	0.99	24.88	13.52	2.68
23500	16.75	29.78	10.59	13.45	2.07	0.99	24.68	13.59	2.74
24000	16.86	29.36	11.09	15.20	2.04	0.97	24.15	13.06	2.87
24500	16.86	29.06	11.82	16.97	2.02	0.97	23.79	12.71	3.02
25000	16.74	28.86	12.62	15.52	2.01	0.95	24.19	12.83	3.20
25500	16.48	28.79	12.63	12.51	2.02	0.91	23.87	12.53	3.35
26000	16.17	28.72	12.30	10.37	1.99	0.88	23.81	12.56	3.41
26500	15.81	28.62	11.97	8.92	1.89	0.88	23.78	12.24	3.50
27000	15.45	28.44	11.30	7.82	1.73	0.89	22.83	11.96	3.54
27500	15.14	28.23	10.14	6.79	1.62	0.86	22.68	11.94	3.62
28000	14.85	28.08	9.09	5.99	1.64	0.78	22.42	11.78	3.86
28500	14.77	27.80	8.50	5.74	1.70	0.71	21.64	11.58	4.08
29000	14.98	27.21	9.15	6.16	1.64	0.71	20.84	11.30	4.21
29500	15.41	26.45	11.19	7.63	1.54	0.79	20.15	11.12	4.38
30000	15.74	25.80	16.28	10.20	1.57	0.83	20.31	11.38	4.48

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: VDD = 4.75V, IDD =63mA @ 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)
2000	18.05	46.95	27.73	11.70	12.98	0.93	28.79	16.31	3.17
2500	18.04	48.41	27.16	14.03	15.82	0.96	28.22	16.02	2.95
3000	17.91	48.67	26.88	15.73	16.79	0.97	27.84	15.89	2.69
3500	17.87	47.49	27.41	16.55	14.80	0.98	27.63	15.68	2.53
4000	18.04	47.16	24.83	17.66	14.01	0.98	27.59	15.67	2.33
4500	18.05	46.53	23.58	17.91	13.01	0.99	27.77	15.54	2.05
5000	18.06	46.17	21.33	17.67	12.42	0.99	27.78	15.58	1.78
5500	18.05	45.89	20.92	17.08	12.01	0.99	27.74	15.75	1.57
6000	18.12	45.33	19.66	16.67	11.12	0.99	27.53	15.51	1.32
6500	18.11	45.55	19.21	16.28	11.40	0.98	27.65	15.79	1.17
7000	18.16	45.45	19.69	16.43	11.22	0.99	27.51	15.66	0.99
7500	18.20	45.63	20.70	17.36	11.46	0.99	27.76	15.67	0.94
8000	18.22	45.51	22.84	19.51	11.40	0.99	27.82	15.58	0.77
8500	18.21	45.22	24.29	24.21	11.15	1.00	27.73	15.52	0.72
9000	18.17	44.88	21.88	32.49	10.77	1.00	27.56	15.31	0.68
9500	18.08	44.40	17.96	23.40	10.17	1.01	27.53	15.46	0.65
10000	17.95	43.79	15.03	18.02	9.38	1.01	27.26	15.19	0.62
10500	17.83	43.11	13.35	15.43	8.57	1.01	27.02	14.79	0.63
11000	17.75	42.36	12.55	14.33	7.78	1.01	27.05	14.95	0.71
11500	17.71	41.59	12.45	14.25	7.11	1.02	27.03	14.85	0.75
12000	17.74	40.80	12.98	15.40	6.56	1.02	26.65	14.72	0.78
12500	17.80	39.97	14.44	17.76	6.10	1.02	27.34	14.97	0.75
13000	17.87	39.24	17.12	21.74	5.75	1.00	27.30	14.82	0.79
13500	17.94	38.62	20.83	22.39	5.38	0.99	27.10	14.95	0.83
14000	18.00	38.05	22.04	18.74	4.97	0.98	27.16	14.92	0.75
14500	18.04	37.55	19.27	16.55	4.61	0.98	26.88	14.93	0.87
15000	18.07	37.12	16.75	16.14	4.34	0.98	27.11	14.93	0.91
15500	18.07	36.75	14.75	17.03	4.14	1.00	27.84	14.95	0.88
16000	18.04	36.40	13.17	18.67	3.96	1.01	27.21	14.50	0.90
16500	18.00	36.07	11.93	20.40	3.80	1.03	27.08	14.58	0.93
17000	17.96	35.70	11.39	20.83	3.64	1.04	27.22	14.46	0.95
17500	17.92	35.28	11.32	19.48	3.47	1.04	27.26	14.03	0.99
18000	17.91	34.79	11.31	17.08	3.27	1.02	27.20	14.06	1.02
18500	17.89	34.25	11.58	15.05	3.04	1.01	26.85	14.00	1.05
19000	17.89	33.70	11.73	13.34	2.79	1.00	26.59	13.77	1.07
19500	17.87	33.14	11.92	12.34	2.58	0.99	26.55	13.89	1.09
20000	17.83	32.61	12.13	11.69	2.46	0.97	25.91	13.67	1.04
20500	17.78	32.13	12.36	11.49	2.42	0.93	25.57	13.50	1.13
21000	17.72	31.72	12.62	11.49	2.36	0.92	25.57	13.64	1.21
21500	17.74	31.30	12.43	11.78	2.22	0.94	25.55	13.59	1.28
22000	17.81	30.85	11.88	11.82	2.02	0.97	25.51	13.50	1.38
22500	17.91	30.40	11.18	11.60	1.86	0.98	25.42	13.45	1.48
23000	18.04	29.99	10.43	11.53	1.77	0.97	24.96	13.25	1.53
23500	18.18	29.51	10.05	12.14	1.72	0.94	24.81	13.36	1.65
24000	18.33	29.04	10.40	13.84	1.69	0.93	24.41	12.75	1.69
24500	18.43	28.66	11.22	16.58	1.66	0.93	24.00	12.28	1.89
25000	18.36	28.46	12.21	16.67	1.66	0.92	24.39	12.39	1.98
25500	18.14	28.35	12.24	13.20	1.66	0.88	24.03	11.99	2.12
26000	17.84	28.27	11.82	10.40	1.62	0.84	24.00	12.05	2.16
26500	17.47	28.18	11.34	8.58	1.50	0.85	24.05	11.82	2.26
27000	17.10	27.95	10.77	7.38	1.33	0.87	22.88	11.50	2.35
27500	16.79	27.69	9.46	6.34	1.23	0.83	22.71	11.59	2.44
28000	16.50	27.51	8.34	5.45	1.28	0.71	22.67	11.40	2.65
28500	16.39	27.24	7.53	4.97	1.35	0.59	21.65	11.27	2.91
29000	16.59	26.66	8.01	5.15	1.27	0.59	20.95	10.91	3.00
29500	17.15	25.78	9.84	6.48	1.13	0.71	20.26	10.53	3.12
30000	17.70	24.90	15.15	9.55	1.18	0.75	20.25	10.82	3.35

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: VDD = 5.00V, IDD = 65mA @ 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)
2000	18.09	47.03	27.52	11.65	13.03	0.93	29.14	16.64	3.16
2500	18.08	48.53	27.02	13.98	15.96	0.96	28.61	16.35	2.95
3000	17.95	48.77	26.63	15.66	16.89	0.97	28.31	16.20	2.72
3500	17.91	47.62	27.03	16.47	14.94	0.98	28.02	16.02	2.52
4000	18.09	47.31	24.59	17.58	14.18	0.98	28.01	16.01	2.31
4500	18.09	46.68	23.41	17.83	13.17	0.99	28.19	15.89	2.04
5000	18.10	46.32	21.18	17.59	12.57	0.99	28.19	15.93	1.80
5500	18.08	46.04	20.76	17.01	12.16	0.99	28.18	16.09	1.46
6000	18.16	45.51	19.57	16.58	11.31	0.99	27.93	15.85	1.31
6500	18.15	45.75	19.10	16.19	11.61	0.98	27.96	16.11	1.11
7000	18.20	45.64	19.60	16.32	11.41	0.98	27.94	16.00	0.98
7500	18.24	45.83	20.64	17.25	11.67	0.99	28.22	16.01	0.87
8000	18.25	45.68	22.76	19.38	11.58	0.99	28.36	15.94	0.82
8500	18.25	45.41	24.10	24.05	11.33	1.00	28.10	15.87	0.77
9000	18.21	45.02	21.78	32.90	10.90	1.00	27.99	15.68	0.69
9500	18.11	44.48	17.90	23.53	10.21	1.01	28.04	15.81	0.68
10000	17.99	43.86	14.98	18.03	9.41	1.01	27.65	15.53	0.62
10500	17.86	43.17	13.30	15.40	8.59	1.01	27.45	15.16	0.64
11000	17.78	42.42	12.52	14.28	7.80	1.01	27.46	15.29	0.73
11500	17.74	41.65	12.41	14.19	7.12	1.02	27.42	15.19	0.76
12000	17.77	40.84	12.95	15.32	6.56	1.02	27.00	15.09	0.78
12500	17.83	40.00	14.40	17.67	6.10	1.02	27.76	15.34	0.80
13000	17.90	39.29	17.05	21.61	5.76	1.00	27.69	15.19	0.77
13500	17.97	38.66	20.74	22.23	5.39	0.99	27.52	15.30	0.82
14000	18.03	38.10	22.01	18.61	4.98	0.98	27.61	15.28	0.85
14500	18.07	37.60	19.26	16.42	4.62	0.98	27.22	15.31	0.87
15000	18.10	37.17	16.75	16.02	4.35	0.98	27.48	15.32	0.92
15500	18.10	36.81	14.73	16.93	4.16	1.00	28.21	15.35	0.88
16000	18.07	36.46	13.14	18.65	3.98	1.01	27.57	14.94	0.92
16500	18.03	36.13	11.87	20.53	3.81	1.03	27.51	14.99	0.91
17000	17.98	35.76	11.32	21.03	3.64	1.04	27.58	14.86	0.96
17500	17.95	35.34	11.24	19.58	3.48	1.04	27.73	14.46	0.92
18000	17.93	34.84	11.24	17.08	3.28	1.03	27.71	14.48	0.98
18500	17.91	34.32	11.50	15.01	3.06	1.01	27.33	14.41	1.02
19000	17.91	33.76	11.67	13.28	2.80	1.00	27.05	14.19	1.07
19500	17.89	33.21	11.86	12.28	2.59	0.99	26.97	14.28	1.06
20000	17.85	32.68	12.10	11.63	2.47	0.97	26.35	14.10	1.10
20500	17.79	32.21	12.35	11.44	2.43	0.93	26.06	13.92	1.17
21000	17.74	31.80	12.63	11.44	2.38	0.92	26.10	14.03	1.22
21500	17.76	31.39	12.46	11.75	2.23	0.94	26.03	13.99	1.30
22000	17.83	30.93	11.91	11.80	2.03	0.97	26.00	13.90	1.40
22500	17.93	30.49	11.22	11.61	1.88	0.98	25.91	13.87	1.44
23000	18.06	30.09	10.46	11.56	1.78	0.97	25.37	13.68	1.56
23500	18.20	29.62	10.06	12.21	1.74	0.95	25.22	13.78	1.65
24000	18.34	29.18	10.36	13.95	1.71	0.94	24.78	13.22	1.72
24500	18.43	28.80	11.10	16.68	1.68	0.94	24.38	12.70	1.86
25000	18.34	28.61	12.03	16.59	1.68	0.92	24.74	12.87	2.00
25500	18.12	28.50	12.10	13.11	1.68	0.88	24.45	12.49	2.14
26000	17.83	28.42	11.77	10.33	1.64	0.85	24.50	12.53	2.19
26500	17.46	28.31	11.35	8.52	1.51	0.85	24.53	12.26	2.24
27000	17.10	28.08	10.81	7.34	1.34	0.87	23.47	11.90	2.32
27500	16.80	27.83	9.54	6.32	1.25	0.83	23.18	11.98	2.41
28000	16.52	27.64	8.44	5.45	1.30	0.71	23.04	11.82	2.65
28500	16.41	27.36	7.66	4.99	1.36	0.59	21.96	11.59	2.90
29000	16.60	26.81	8.15	5.19	1.29	0.60	21.20	11.24	3.03
29500	17.13	25.96	9.99	6.56	1.16	0.72	20.39	11.00	3.15
30000	17.64	25.14	15.06	9.64	1.21	0.76	20.35	11.25	3.31

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: VDD = 5.25V, IDD = 67mA @ 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)
2000	18.12	47.06	27.35	11.60	13.00	0.93	29.61	17.01	3.16
2500	18.11	48.62	26.76	13.93	16.06	0.96	29.08	16.69	2.94
3000	17.98	48.91	26.41	15.61	17.09	0.97	28.60	16.53	2.70
3500	17.94	47.78	26.78	16.43	15.16	0.98	28.41	16.34	2.52
4000	18.11	47.47	24.33	17.53	14.39	0.98	28.40	16.34	2.29
4500	18.11	46.84	23.18	17.77	13.38	0.99	28.59	16.24	2.01
5000	18.12	46.50	21.02	17.52	12.78	0.99	28.62	16.29	1.76
5500	18.11	46.20	20.63	16.94	12.34	0.99	28.59	16.42	1.50
6000	18.18	45.70	19.47	16.51	11.52	0.99	28.35	16.20	1.32
6500	18.17	45.97	19.01	16.09	11.87	0.98	28.45	16.44	1.17
7000	18.22	45.86	19.53	16.21	11.67	0.98	28.33	16.32	1.00
7500	18.26	46.06	20.57	17.12	11.95	0.99	28.55	16.35	0.90
8000	18.27	45.90	22.64	19.23	11.83	0.99	28.62	16.29	0.82
8500	18.27	45.58	23.99	23.89	11.53	1.00	28.62	16.22	0.72
9000	18.23	45.15	21.67	33.19	11.03	1.00	28.49	16.04	0.68
9500	18.13	44.59	17.83	23.64	10.33	1.01	28.37	16.15	0.68
10000	18.00	43.98	14.93	18.04	9.53	1.01	28.06	15.83	0.59
10500	17.88	43.25	13.26	15.37	8.64	1.01	27.85	15.51	0.66
11000	17.80	42.48	12.49	14.23	7.83	1.01	27.94	15.62	0.72
11500	17.76	41.68	12.38	14.12	7.13	1.02	27.75	15.50	0.71
12000	17.78	40.89	12.91	15.24	6.58	1.02	27.33	15.43	0.80
12500	17.84	40.06	14.36	17.57	6.13	1.02	28.10	15.69	0.76
13000	17.91	39.35	17.01	21.49	5.79	1.00	28.10	15.53	0.77
13500	17.98	38.72	20.68	22.14	5.42	0.99	27.87	15.63	0.84
14000	18.03	38.17	22.02	18.51	5.02	0.98	27.98	15.61	0.83
14500	18.07	37.67	19.27	16.30	4.65	0.98	27.59	15.65	0.87
15000	18.10	37.25	16.73	15.88	4.38	0.98	27.90	15.69	0.89
15500	18.10	36.90	14.71	16.80	4.19	1.00	28.50	15.74	0.88
16000	18.08	36.54	13.09	18.58	4.01	1.01	28.00	15.35	0.90
16500	18.03	36.21	11.83	20.59	3.84	1.04	27.95	15.37	0.92
17000	17.99	35.84	11.25	21.21	3.68	1.04	27.97	15.24	0.94
17500	17.95	35.44	11.17	19.70	3.52	1.04	28.13	14.87	0.96
18000	17.93	34.92	11.16	17.10	3.30	1.03	28.35	14.86	1.00
18500	17.91	34.40	11.43	14.98	3.08	1.01	27.88	14.80	1.02
19000	17.91	33.85	11.60	13.24	2.82	1.01	27.49	14.58	1.11
19500	17.89	33.29	11.82	12.22	2.61	0.99	27.37	14.65	1.07
20000	17.85	32.77	12.06	11.57	2.50	0.96	26.95	14.48	1.08
20500	17.79	32.30	12.33	11.37	2.46	0.93	26.46	14.29	1.15
21000	17.74	31.90	12.64	11.40	2.40	0.92	26.46	14.37	1.21
21500	17.76	31.49	12.48	11.73	2.25	0.94	26.36	14.36	1.31
22000	17.83	31.04	11.95	11.80	2.06	0.97	26.32	14.27	1.40
22500	17.93	30.62	11.25	11.64	1.90	0.98	26.25	14.23	1.46
23000	18.05	30.23	10.49	11.61	1.81	0.97	25.73	14.08	1.53
23500	18.19	29.76	10.07	12.27	1.77	0.95	25.54	14.16	1.66
24000	18.32	29.33	10.32	14.05	1.74	0.94	25.10	13.64	1.73
24500	18.40	28.97	11.00	16.77	1.71	0.95	24.74	13.20	1.93
25000	18.31	28.78	11.87	16.55	1.71	0.93	25.10	13.34	2.02
25500	18.09	28.67	11.96	13.06	1.71	0.89	24.86	12.95	2.10
26000	17.80	28.58	11.72	10.30	1.66	0.85	24.96	13.02	2.22
26500	17.43	28.47	11.37	8.50	1.54	0.86	24.98	12.70	2.24
27000	17.07	28.23	10.89	7.31	1.37	0.87	23.89	12.37	2.38
27500	16.78	27.99	9.63	6.30	1.28	0.83	23.58	12.39	2.44
28000	16.50	27.79	8.56	5.45	1.32	0.71	23.32	12.18	2.65
28500	16.40	27.52	7.78	5.01	1.39	0.60	22.38	11.94	2.90
29000	16.59	27.00	8.28	5.25	1.31	0.61	21.42	11.72	3.04
29500	17.09	26.18	10.11	6.65	1.20	0.73	20.49	11.38	3.14
30000	17.55	25.42	14.90	9.72	1.25	0.77	20.51	11.78	3.23

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: VDD = 4.75V, IDD = 63mA @ 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)
2000	16.67	46.80	27.60	11.94	15.00	0.94	28.06	16.21	4.71
2500	16.63	48.14	27.76	14.06	18.05	0.96	27.59	15.94	4.41
3000	16.51	48.22	27.58	15.67	18.72	0.97	27.22	15.81	4.12
3500	16.48	46.95	28.14	16.40	16.29	0.98	27.08	15.67	3.87
4000	16.63	46.54	25.00	16.88	15.30	0.98	27.09	15.64	3.56
4500	16.63	45.81	23.55	16.74	14.05	0.98	27.26	15.46	3.24
5000	16.64	45.46	21.75	16.40	13.41	0.98	27.20	15.48	3.01
5500	16.61	45.10	21.51	16.01	12.87	0.98	27.19	15.71	2.71
6000	16.66	44.57	20.22	15.88	12.01	0.98	26.96	15.50	2.52
6500	16.64	44.71	19.56	15.91	12.24	0.98	27.13	15.70	2.33
7000	16.66	44.61	19.70	16.30	12.09	0.98	27.03	15.59	2.12
7500	16.68	44.73	20.21	17.43	12.30	0.99	27.22	15.52	2.02
8000	16.67	44.62	22.17	19.79	12.29	0.99	27.28	15.42	1.91
8500	16.63	44.40	23.67	25.03	12.15	1.00	27.19	15.36	1.82
9000	16.56	44.08	21.52	38.29	11.82	1.01	26.99	15.14	1.83
9500	16.43	43.64	18.01	23.15	11.26	1.01	26.98	15.29	1.77
10000	16.28	43.10	15.24	17.98	10.51	1.01	26.59	14.97	1.84
10500	16.14	42.44	13.72	15.65	9.68	1.01	26.33	14.64	1.86
11000	16.06	41.72	12.99	14.86	8.86	1.01	26.41	14.79	1.98
11500	16.03	40.94	13.03	15.24	8.14	1.02	26.29	14.70	2.06
12000	16.04	40.15	13.68	16.79	7.53	1.02	25.93	14.56	2.11
12500	16.08	39.37	15.44	19.48	7.03	1.01	26.65	14.78	2.13
13000	16.11	38.68	18.22	22.29	6.62	1.00	26.51	14.57	2.22
13500	16.16	38.09	21.64	21.47	6.20	0.99	26.34	14.66	2.26
14000	16.22	37.53	22.30	19.12	5.75	0.99	26.32	14.69	2.28
14500	16.26	37.01	19.65	17.91	5.34	0.99	26.12	14.63	2.35
15000	16.31	36.55	17.10	18.07	5.01	0.99	26.34	14.61	2.36
15500	16.29	36.19	15.00	19.58	4.79	1.01	26.89	14.58	2.42
16000	16.24	35.83	13.36	21.77	4.58	1.03	26.44	14.13	2.46
16500	16.15	35.52	12.24	23.36	4.42	1.04	26.23	14.18	2.46
17000	16.07	35.16	11.69	22.14	4.24	1.05	26.11	14.10	2.52
17500	16.00	34.76	11.72	19.37	4.08	1.04	26.12	13.69	2.59
18000	15.96	34.28	11.80	16.97	3.87	1.02	26.15	13.71	2.59
18500	15.92	33.76	12.16	15.10	3.63	1.01	25.77	13.68	2.67
19000	15.90	33.22	12.28	13.81	3.36	1.00	25.49	13.40	2.71
19500	15.85	32.70	12.40	12.97	3.13	1.00	25.49	13.44	2.76
20000	15.78	32.22	12.43	12.43	2.99	0.98	24.85	13.26	2.83
20500	15.68	31.80	12.51	12.11	2.94	0.96	24.44	13.05	2.92
21000	15.61	31.41	12.47	12.04	2.87	0.95	24.65	13.15	3.04
21500	15.63	31.02	12.21	12.29	2.72	0.96	24.53	13.07	3.15
22000	15.72	30.54	11.61	12.65	2.49	0.99	24.58	13.04	3.25
22500	15.81	30.06	11.04	12.99	2.29	1.01	24.44	12.95	3.42
23000	15.92	29.63	10.43	13.51	2.16	1.02	23.95	12.69	3.49
23500	16.00	29.18	10.38	14.49	2.10	1.01	23.82	12.74	3.60
24000	16.06	28.77	10.93	16.12	2.07	0.99	23.31	12.18	3.71
24500	16.03	28.47	11.81	17.02	2.05	0.98	22.90	11.85	3.84
25000	15.85	28.33	12.57	15.07	2.07	0.95	23.30	11.95	4.05
25500	15.57	28.26	12.48	12.51	2.09	0.92	22.93	11.71	4.16
26000	15.24	28.21	12.13	10.63	2.08	0.89	22.83	11.72	4.22
26500	14.86	28.17	11.55	9.19	2.00	0.89	22.82	11.42	4.38
27000	14.48	28.03	10.64	8.02	1.83	0.92	21.86	11.11	4.46
27500	14.16	27.84	9.35	7.01	1.69	0.90	21.65	11.09	4.64
28000	13.88	27.68	8.36	6.34	1.70	0.84	21.69	10.91	4.84
28500	13.83	27.34	8.15	6.24	1.79	0.77	20.81	10.65	5.10
29000	14.05	26.74	9.19	6.84	1.77	0.76	20.08	10.32	5.19
29500	14.46	26.00	12.00	8.44	1.71	0.81	19.78	10.13	5.27
30000	14.67	25.42	17.45	10.60	1.71	0.83	20.02	10.26	5.38

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: VDD = 5.00V, IDD = 64mA @ 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)
2000	16.68	46.87	27.43	11.88	15.10	0.94	28.29	16.45	4.71
2500	16.64	48.29	27.57	13.98	18.33	0.96	27.86	16.17	4.40
3000	16.52	48.44	27.52	15.57	19.15	0.97	27.58	16.04	4.12
3500	16.50	47.09	27.94	16.29	16.53	0.98	27.34	15.89	3.88
4000	16.64	46.68	24.87	16.75	15.52	0.98	27.28	15.88	3.63
4500	16.64	46.00	23.42	16.62	14.31	0.98	27.45	15.79	3.31
5000	16.65	45.66	21.66	16.28	13.68	0.98	27.44	15.82	3.03
5500	16.62	45.29	21.44	15.89	13.14	0.98	27.42	15.94	2.78
6000	16.67	44.80	20.15	15.76	12.31	0.98	27.17	15.74	2.47
6500	16.65	44.93	19.51	15.79	12.52	0.98	27.31	15.94	2.34
7000	16.67	44.84	19.61	16.16	12.38	0.98	27.26	15.80	2.16
7500	16.68	44.96	20.13	17.28	12.61	0.99	27.44	15.83	2.02
8000	16.68	44.85	22.08	19.60	12.61	0.99	27.49	15.67	1.87
8500	16.64	44.61	23.51	24.74	12.43	1.00	27.39	15.70	1.93
9000	16.57	44.29	21.39	39.76	12.09	1.01	27.16	15.40	1.83
9500	16.44	43.81	17.94	23.30	11.46	1.01	27.19	15.56	1.81
10000	16.28	43.24	15.20	18.00	10.67	1.01	26.83	15.28	1.80
10500	16.15	42.55	13.67	15.62	9.79	1.01	26.59	14.89	1.86
11000	16.06	41.81	12.97	14.81	8.95	1.01	26.62	15.02	1.95
11500	16.03	41.02	13.00	15.17	8.21	1.02	26.49	14.90	2.01
12000	16.04	40.23	13.66	16.71	7.59	1.02	26.20	14.89	2.12
12500	16.08	39.43	15.42	19.37	7.08	1.01	26.80	15.01	2.11
13000	16.11	38.75	18.21	22.12	6.67	1.00	26.65	14.82	2.17
13500	16.16	38.16	21.63	21.28	6.25	0.99	26.54	14.96	2.22
14000	16.21	37.61	22.32	18.96	5.80	0.99	26.53	14.91	2.31
14500	16.26	37.09	19.67	17.75	5.38	0.99	26.34	14.95	2.38
15000	16.30	36.64	17.10	17.91	5.06	0.99	26.58	14.89	2.41
15500	16.29	36.26	15.01	19.45	4.83	1.01	27.12	14.87	2.40
16000	16.24	35.92	13.34	21.80	4.63	1.03	26.63	14.44	2.44
16500	16.15	35.60	12.21	23.65	4.46	1.04	26.52	14.46	2.51
17000	16.06	35.24	11.63	22.40	4.28	1.05	26.49	14.37	2.51
17500	15.99	34.85	11.66	19.45	4.12	1.04	26.43	13.99	2.57
18000	15.95	34.37	11.74	16.97	3.91	1.02	26.40	13.98	2.65
18500	15.91	33.85	12.10	15.07	3.66	1.01	26.08	13.94	2.65
19000	15.89	33.31	12.23	13.77	3.39	1.00	25.78	13.67	2.70
19500	15.84	32.79	12.37	12.93	3.16	1.00	25.72	13.69	2.77
20000	15.76	32.30	12.42	12.39	3.03	0.98	25.08	13.54	2.82
20500	15.66	31.89	12.52	12.07	2.97	0.96	24.82	13.33	2.94
21000	15.59	31.52	12.49	12.00	2.90	0.95	24.82	13.42	3.07
21500	15.62	31.13	12.23	12.27	2.75	0.96	24.78	13.34	3.19
22000	15.71	30.64	11.64	12.66	2.52	0.99	24.78	13.30	3.28
22500	15.80	30.17	11.08	13.03	2.33	1.01	24.65	13.20	3.38
23000	15.91	29.75	10.44	13.58	2.20	1.02	24.17	12.98	3.50
23500	15.98	29.30	10.36	14.58	2.13	1.01	24.05	13.02	3.60
24000	16.03	28.91	10.87	16.21	2.10	1.00	23.51	12.51	3.72
24500	16.00	28.61	11.69	17.04	2.09	0.98	23.15	12.22	3.91
25000	15.81	28.47	12.46	15.04	2.11	0.96	23.55	12.29	4.07
25500	15.54	28.41	12.42	12.50	2.12	0.92	23.17	12.07	4.17
26000	15.21	28.35	12.17	10.62	2.12	0.89	23.09	12.07	4.27
26500	14.83	28.31	11.61	9.19	2.04	0.90	22.96	11.74	4.36
27000	14.45	28.17	10.71	8.02	1.87	0.92	22.10	11.47	4.51
27500	14.13	27.99	9.42	7.02	1.73	0.90	21.92	11.38	4.66
28000	13.85	27.83	8.45	6.36	1.75	0.84	21.87	11.17	4.87
28500	13.79	27.50	8.22	6.27	1.82	0.77	20.99	10.95	5.09
29000	14.00	26.93	9.25	6.87	1.82	0.77	20.34	10.65	5.21
29500	14.39	26.20	11.99	8.46	1.75	0.82	19.98	10.49	5.25
30000	14.58	25.66	17.07	10.55	1.76	0.84	20.19	10.67	5.29

Typical Performance Data

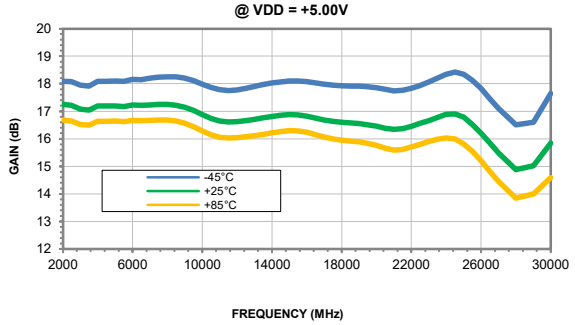
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: VDD = 5.25V, IDD = 65mA @ Temperature = +85°C

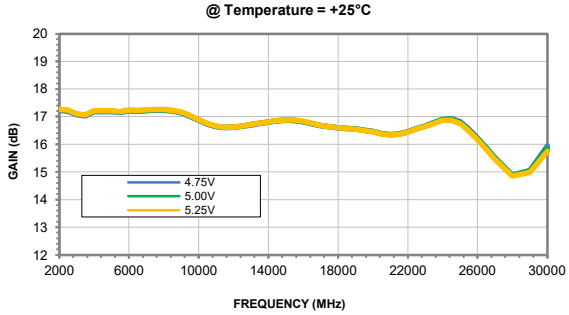
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
2000	16.70	46.97	27.38	11.83	15.22	0.94	28.36	16.66	4.71
2500	16.66	48.45	27.43	13.91	18.62	0.96	28.07	16.37	4.43
3000	16.54	48.58	27.31	15.48	19.42	0.97	27.73	16.20	4.12
3500	16.51	47.20	27.75	16.18	16.70	0.98	27.53	16.09	3.88
4000	16.65	46.87	24.68	16.64	15.84	0.98	27.51	16.06	3.57
4500	16.65	46.14	23.30	16.50	14.52	0.98	27.66	16.01	3.28
5000	16.66	45.84	21.54	16.17	13.94	0.98	27.63	16.05	3.00
5500	16.63	45.47	21.34	15.78	13.37	0.98	27.65	16.13	2.74
6000	16.68	44.99	20.06	15.64	12.55	0.98	27.44	15.94	2.53
6500	16.66	45.17	19.42	15.67	12.84	0.98	27.53	16.14	2.31
7000	16.69	45.09	19.53	16.04	12.72	0.98	27.48	16.00	2.13
7500	16.70	45.21	20.06	17.13	12.96	0.99	27.68	16.04	2.06
8000	16.69	45.09	21.95	19.43	12.93	0.99	27.78	15.99	1.92
8500	16.65	44.80	23.39	24.48	12.69	1.00	27.72	15.91	1.89
9000	16.58	44.41	21.31	41.25	12.25	1.01	27.43	15.66	1.83
9500	16.45	43.93	17.88	23.44	11.60	1.01	27.48	15.78	1.80
10000	16.29	43.32	15.15	18.01	10.76	1.01	27.08	15.50	1.80
10500	16.15	42.62	13.64	15.59	9.86	1.01	26.84	15.21	1.87
11000	16.06	41.87	12.93	14.76	9.00	1.01	26.86	15.22	1.97
11500	16.03	41.08	12.98	15.11	8.24	1.02	26.81	15.11	2.05
12000	16.04	40.29	13.64	16.63	7.63	1.02	26.41	15.11	2.12
12500	16.08	39.48	15.40	19.26	7.12	1.01	27.05	15.22	2.12
13000	16.12	38.82	18.17	21.96	6.72	1.00	26.99	15.13	2.15
13500	16.16	38.22	21.60	21.10	6.29	0.99	26.82	15.15	2.32
14000	16.21	37.67	22.30	18.80	5.83	0.99	26.81	15.09	2.26
14500	16.26	37.15	19.68	17.60	5.42	0.99	26.57	15.17	2.32
15000	16.30	36.70	17.10	17.76	5.09	0.99	26.87	15.18	2.45
15500	16.29	36.35	14.99	19.33	4.88	1.01	27.40	15.16	2.39
16000	16.24	35.99	13.30	21.80	4.67	1.03	26.94	14.75	2.46
16500	16.15	35.68	12.16	23.93	4.49	1.04	26.81	14.75	2.49
17000	16.07	35.32	11.58	22.65	4.31	1.05	26.65	14.65	2.53
17500	15.99	34.93	11.58	19.53	4.16	1.04	26.66	14.30	2.60
18000	15.94	34.44	11.67	16.96	3.93	1.02	26.85	14.28	2.61
18500	15.91	33.92	12.05	15.03	3.69	1.01	26.36	14.25	2.68
19000	15.88	33.38	12.18	13.73	3.41	1.00	26.10	13.96	2.69
19500	15.83	32.86	12.35	12.88	3.19	1.00	26.03	14.04	2.81
20000	15.75	32.39	12.39	12.34	3.06	0.98	25.37	13.82	2.82
20500	15.65	31.98	12.51	12.03	3.00	0.96	25.00	13.62	2.97
21000	15.58	31.60	12.50	11.97	2.93	0.95	25.11	13.75	3.08
21500	15.61	31.22	12.27	12.25	2.78	0.96	25.05	13.70	3.21
22000	15.70	30.74	11.68	12.66	2.55	0.99	25.12	13.65	3.30
22500	15.79	30.28	11.10	13.06	2.36	1.01	24.97	13.50	3.46
23000	15.89	29.86	10.46	13.64	2.23	1.02	24.45	13.29	3.52
23500	15.97	29.42	10.34	14.67	2.16	1.01	24.29	13.33	3.65
24000	16.01	29.04	10.80	16.31	2.13	1.00	23.78	12.85	3.77
24500	15.97	28.74	11.57	17.05	2.12	0.99	23.46	12.58	3.89
25000	15.78	28.61	12.34	15.00	2.14	0.96	23.90	12.64	4.04
25500	15.51	28.55	12.37	12.47	2.16	0.92	23.55	12.45	4.18
26000	15.18	28.49	12.18	10.60	2.16	0.89	23.42	12.41	4.26
26500	14.80	28.45	11.67	9.18	2.07	0.90	23.35	12.08	4.40
27000	14.42	28.29	10.78	8.02	1.90	0.91	22.40	11.77	4.55
27500	14.10	28.12	9.51	7.03	1.77	0.90	22.24	11.68	4.66
28000	13.83	27.97	8.52	6.38	1.78	0.84	22.01	11.40	4.89
28500	13.76	27.65	8.31	6.29	1.86	0.78	21.26	11.27	5.07
29000	13.96	27.10	9.30	6.90	1.86	0.77	20.59	10.96	5.21
29500	14.32	26.39	11.97	8.48	1.80	0.82	20.14	10.85	5.26
30000	14.51	25.89	16.73	10.52	1.81	0.85	20.53	11.07	5.29

Typical Performance Curves

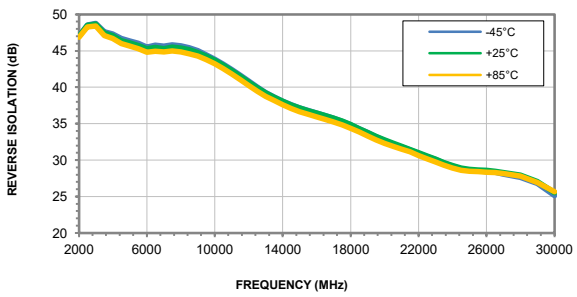
GAIN vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



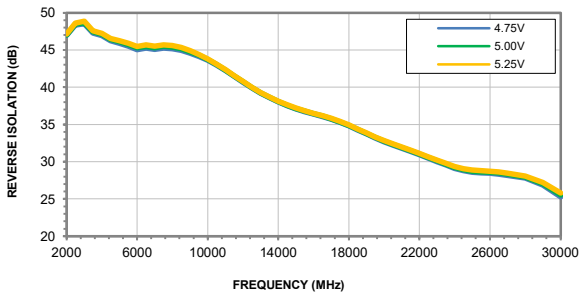
GAIN vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



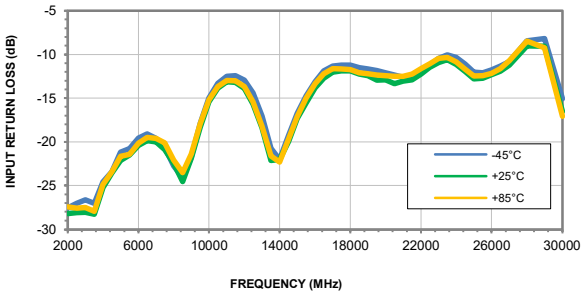
REVERSE ISOLATION vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



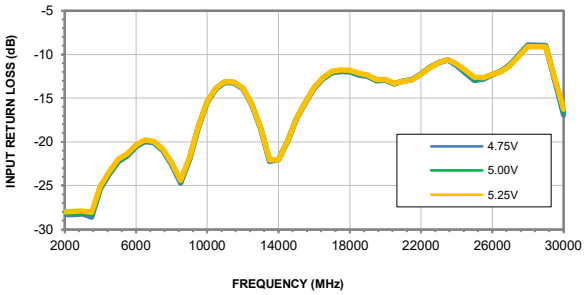
REVERSE ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



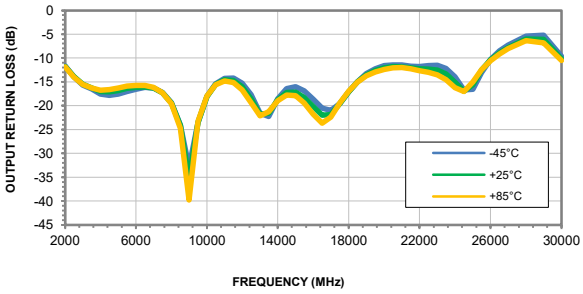
INPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V



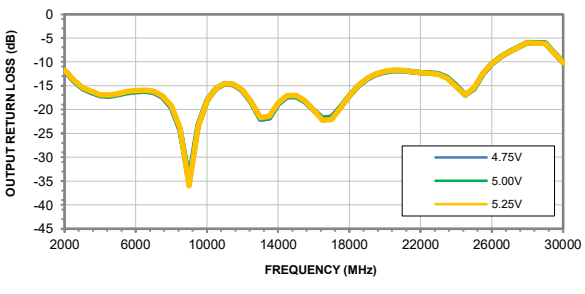
INPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C



OUTPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V

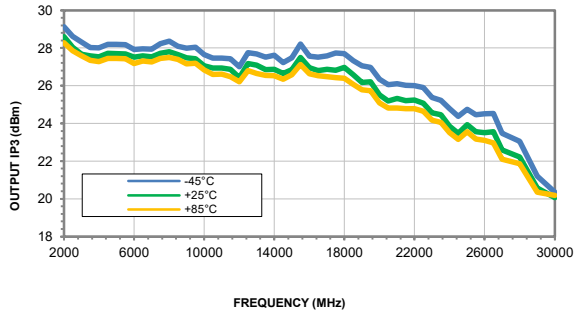


OUTPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C

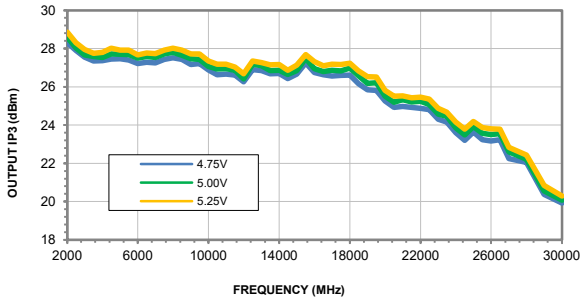


Typical Performance Curves

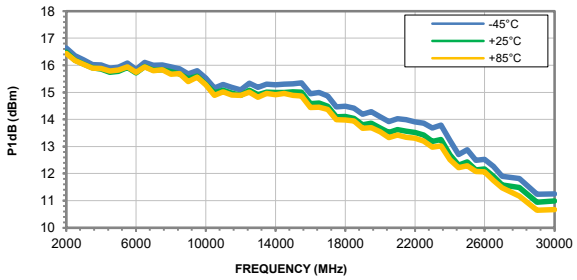
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



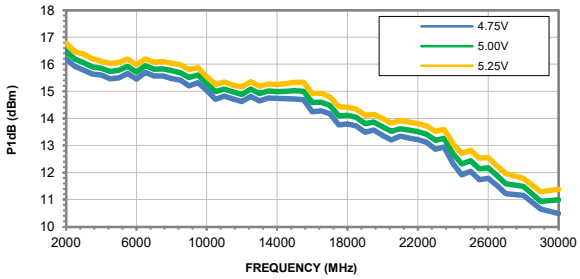
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



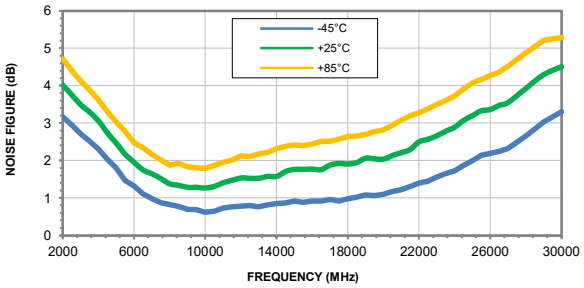
P1dB vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



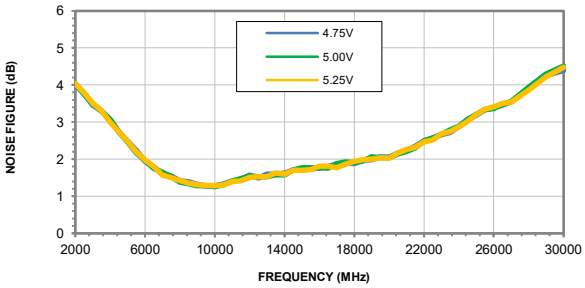
P1dB vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



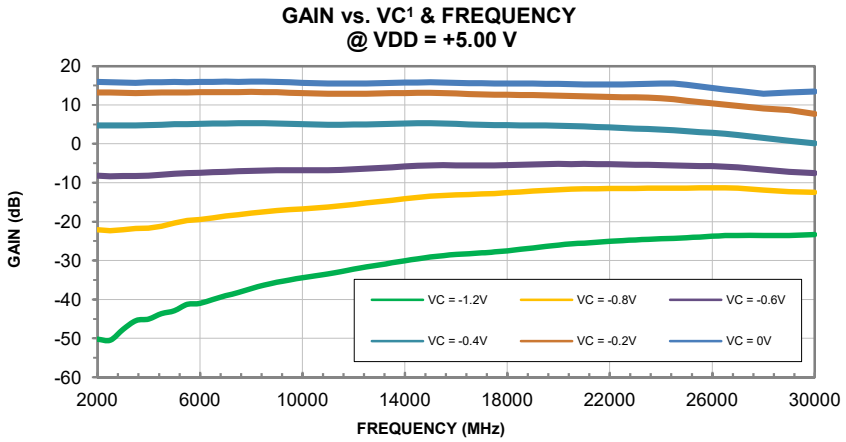
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00 V

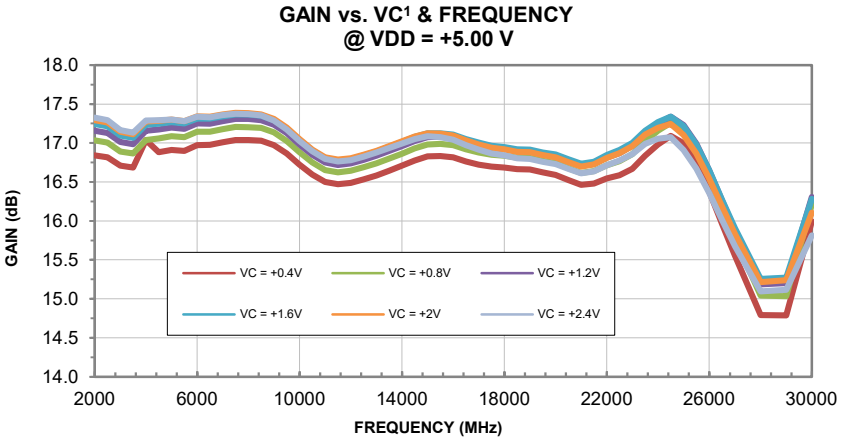


NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C

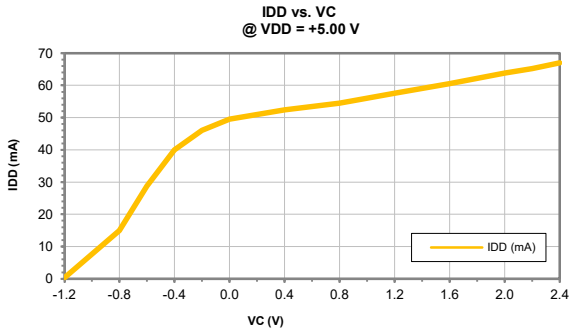


Typical Performance Curves





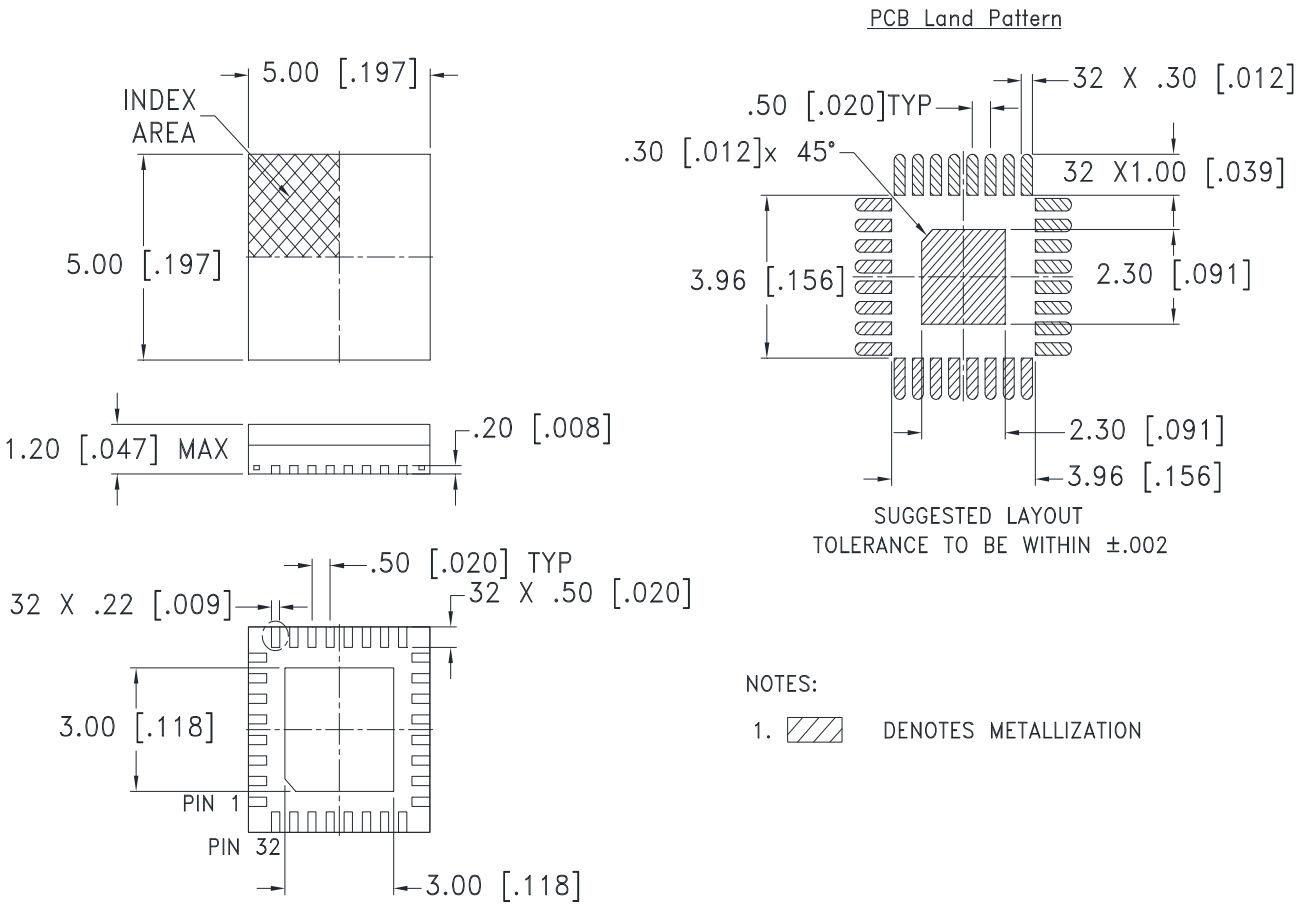
1. Gain is nominal when VC = Open. When VC is left floating, there is a measured voltage of +2V on the pin.



Case Style DG

Outline Dimensions

DG1677-4



Weight: 0.1 Grams

Dimensions are in mm(inches). Tolerances: 2 Pl. ± .25(.01); 3 Pl. ± .127(.005)

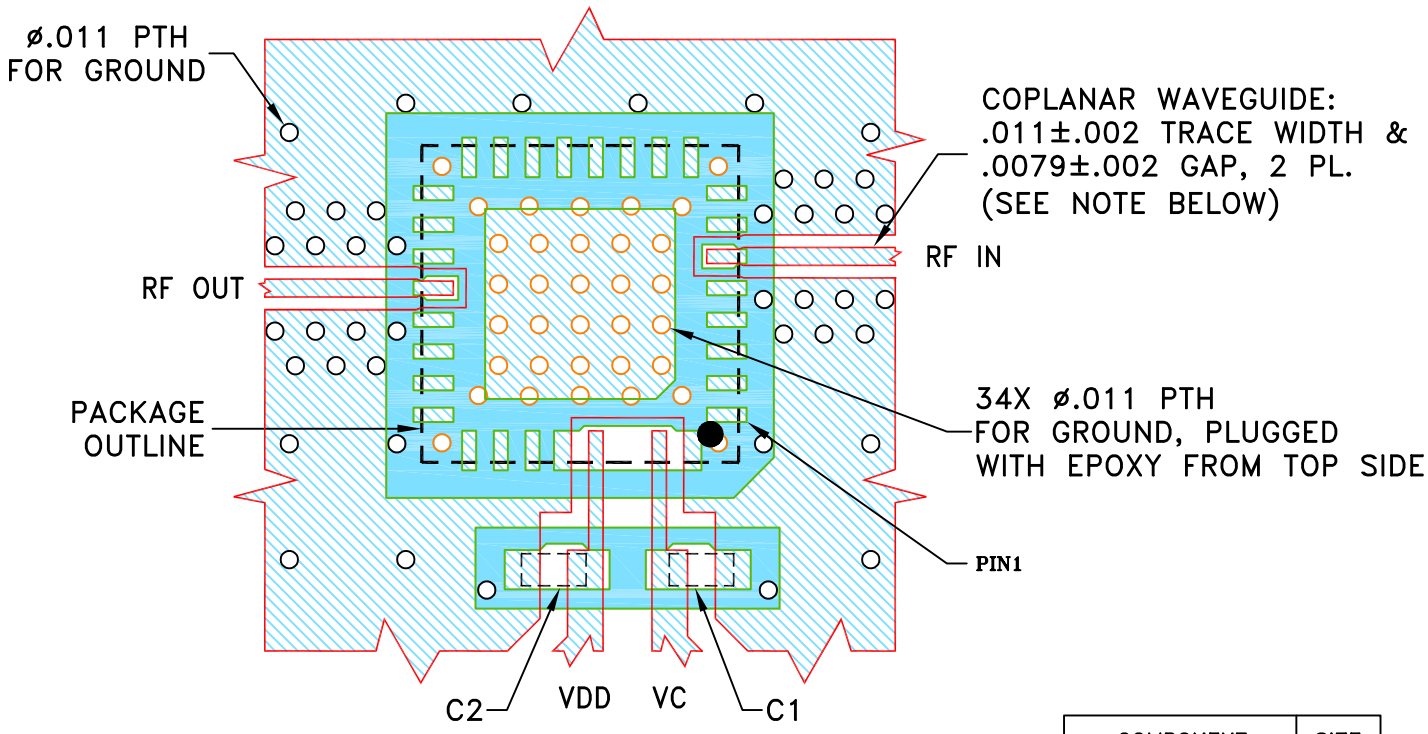
Notes:

1. Case material: Plastic.
2. Termination finish: PPF (NiPdAu Plating 0.5 µm/0.02µm/0.05µm)

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-015708	NEW RELEASE	11/09/22	ITG	IL

SUGGESTED MOUNTING CONFIGURATION
FOR DG1677-4 CASE STYLE



COMPONENT	SIZE
C1, C2	0402

NOTES:

1. TRACE WIDTH ANG GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0066"±.0007". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-AVA-0233LNC+.
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	ITG	11/09/22
TOLERANCES ON:	CHECKED	GF	11/09/22
2 PL DECIMALS ±	APPROVED	IL	11/09/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

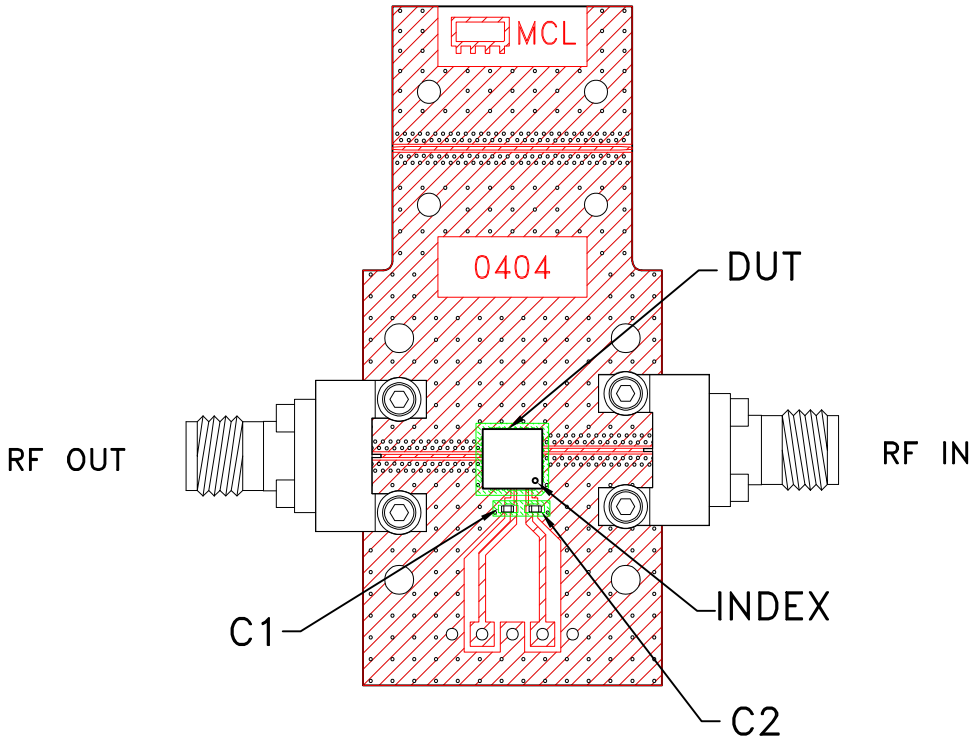
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, DG1677-4, TB-AVA-0233LNC+

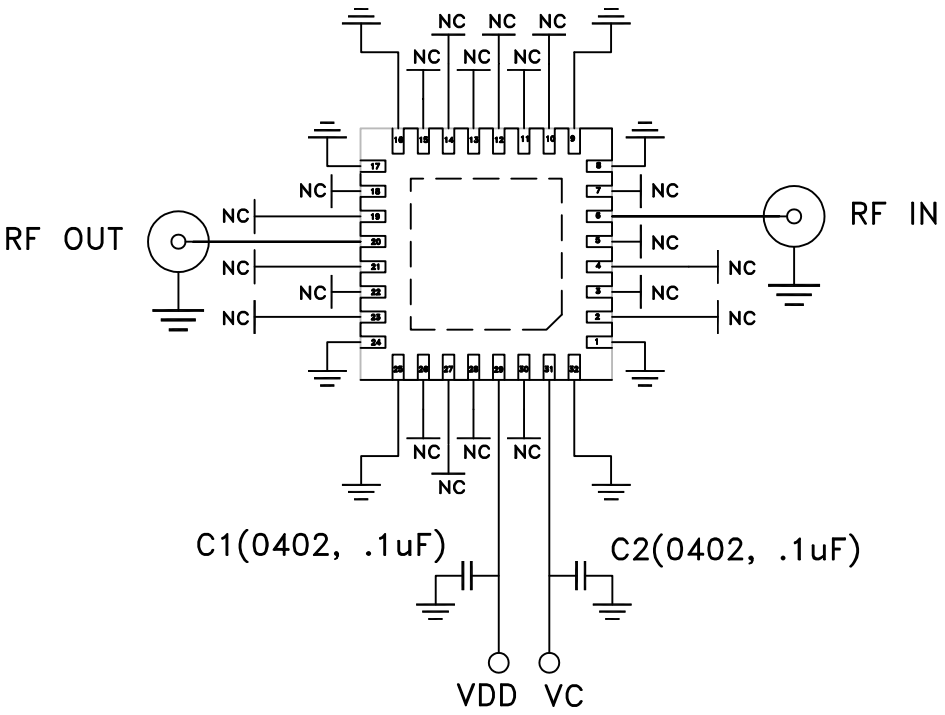
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-741	OR

FILE:	SCALE:	SHEET:
98PL741	8:1	1 OF 1

Evaluation Board and Circuit



TB-AVA-0233LNC+



Schematic Diagram

Notes:

1. 50 Ohm 2.4 mm Female end launch connectors.
2. PCB Material: RO4350B or equivalent,
   Dielectric Constant=3.5 Thickness=.0066 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications **ENV08T10**

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	-45° to +85° C	Indicidual Model Data Sheet
Storage Temperature	-65° to 150°C	Individual Model Data Sheet
Moisture Sensitivity: Level 3	Bake at 125°C for 24 hours. Soak at 30°C/60%RH for 192 hours, Reflow 3 cycles at 260°C peak	J-STD-020D
Unbiased HAST	Temperature: 130°C, RH: 85%, Pressure: 33.3 psia Duration: 96 hours	JESD22-A118A, Test Condition A
Temperature Cycling	-65°C to +150°C, Dwell Time: 15 mins 500 cycles	JESD22-A104E, Condition C
HTSL	Temperature: 150°C Duration: 1000 hours	JESD22-A103E, Test Condition B
HTOL	1000 Hours at 125°C	JESD22-A108
ESD HBM	Refer datasheet for classification	JS-001
Vibration (Variable Frequency)	Sinusoidal vibration, 20 - 2000 Hz, 4 min sweeps, 16 min along each of 3 axis, amplitude limits of 20g and 0.06 in	MIL-STD-883, Method 2007, Condition A
Drop Test	1m drops onto concrete in final packed box in 6 orientations	--
Bend Test	1mm deflection for 5 seconds. Board thickness: 0.024", Span: 2.75"	--
Solderability	10x magnification	J-STD-002 Method B, B1

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
Resistance to Soldering Heat	Sn-Pb Eutectic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020