LOW CURRENT, WIDEBAND

Monolithic Amplifier

EHC-24L+

50Ω DC to 20 GHz

THE BIG DEAL

- Very Wideband, DC to 20 GHz
- Low Current, Typ. 19.1 mA
- Excellent Gain Flatness
  Typ. ±1.1 dB up to 10 GHz
  Typ. ±2.7 dB up to 20 GHz
- Repeatable Performance



Generic photo used for illustration purposes only

CASE STYLE: AF320

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

APPLICATIONS

- Instrumentation
- Cable Infrastructure
- 5G

PRODUCT OVERVIEW

The EHC-24L+ is a low current, wideband gain block that operates up to 20 GHz and is fabricated using a highly reliable HBT process. This Darlington pair amplifier delivers excellent gain flatness and good return loss with low current consumption across a very wide bandwidth. The specified performance is achieved with no external matching components, making this part extremely simple to implement. It has highly repeatable performance from lot to lot and it is enclosed in a 4-lead ceramic package.

KEY FEATURES

Feature	Advantages
Very Wideband: DC to 20 GHz	General purpose wideband amplifier is suitable for various applications.
Low Current, 19.1 mA Typ.	Low current consumption is ideal for use in amplifier chains where power consumption needs to be minimized.
Excellent Gain Flatness ± 1.1 dB up to 10 GHz Typ. ± 2.7 dB up to 20 GHz Typ.	As a desirable characteristic of a wideband amplifier, excellent gain flatness allows amplification of a signal with minimal impact to cascaded performance.
No External Matching Components Required	EHC-24L+ provides good input and output return loss up to 20 GHz without the need for any external matching components.

Monolithic Amplifier

EHC-24L+

50Ω DC to 20 GHz

ELECTRICAL SPECIFICATIONS AT +25°C, V_S= +5 V UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	V_S= +5 V[1] Min.	Typ.	Max.	Units
Frequency Range[2]		0.01		20	GHz
Gain	0.01	11.9	15.5	14.7	dB
	5		14.1		
	8		13.4		
	12		12.8		
	15		12.5		
	20		10.2		
Input Return Loss	0.01		18		dB
	5		14		
	8		15		
	12		10		
	15		15		
	20		11		
Output Return Loss	0.01		15		dB
	5		14		
	8		16		
	12		11		
	15		16		
	20		11		
Reverse Isolation	10		21		dB
Output Power @ 1 dB Compression	0.01		+7.0		dBm
	5		+5.5		
	8		+6.8		
	12		+4.4		
	15		+2.6		
	20		-0.6		
Output IP3[3]	0.01		+19.2		dBm
	5		+17.0		
	8		+16.6		
	12		+12.8		
	15		+11.3		
	20		+9.6		
Noise Figure	0.01		5.2		dB
	5		5.2		
	8		5.1		
	12		5.3		
	15		5.2		
	20		5.7		
DC Supply (V_S)		+4.75	+5	+5.25	V
Device Operating Current			19.1	24	mA
Device Current Variation vs. Temperature[4]			60		µA/°C
Device Current Variation vs. Voltage[5]			0.0188		mA/mV
Thermal Resistance, Junction-to-Ground Lead at +85°C Stage Temp.			349		°C/W

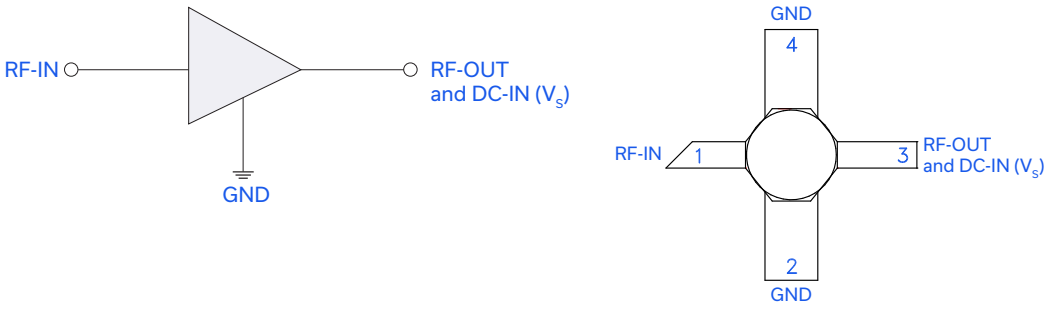
1. Measured on Mini-Circuits Characterization test board TB-EHC-24L+. See Characterization Test Circuit (Fig. 1).
2. Low frequency cut-off determined by external coupling capacitors & RF choke.
3. Tested at P_{OUT}= -5 dBm/tone.
4. (Current at +85°C - Current -45°C) / 130.
5. (Current at +5.25 V - Current at +4.75 V) / 1000.

ABSOLUTE MAXIMUM RATINGS[6]

Parameter	Ratings
Operating Temperature (Ground Lead)	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Junction Temperature	+150°C
Power Dissipation	0.2 W
Input Power (CW)	+22 dBm (5 minutes max.) +8 dBm (continuous)
V_S Supply Voltage (Pin 3)	+6 V

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

SIMPLIFIED SCHEMATIC & PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	1	RF input
RF-OUT & DC-IN (V_S)	3	RF output and DC input
GND	2,4	Ground

CHARACTERIZATION TEST CIRCUIT

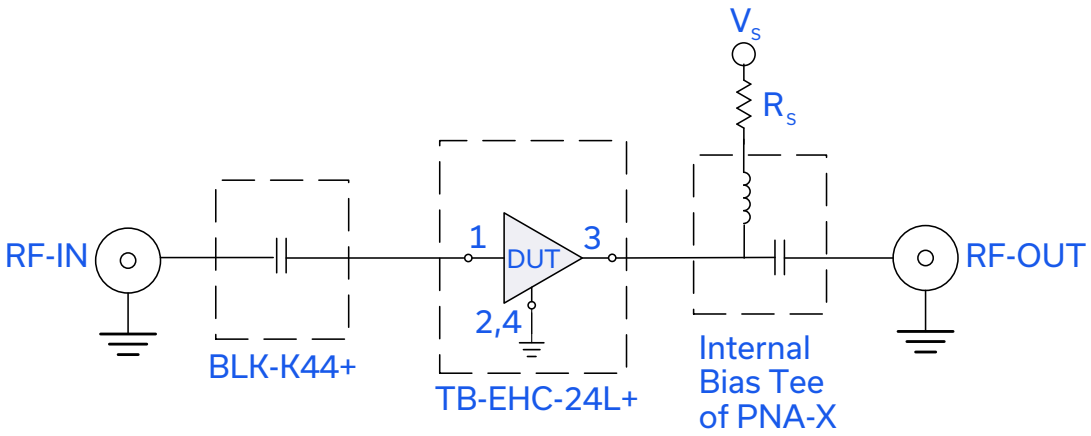
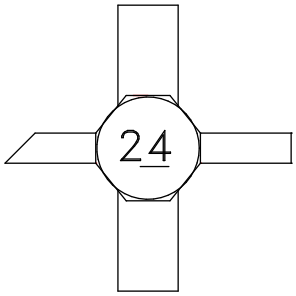


Fig 1. Characterization Circuit
Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-EHC-24L+) Gain, Return Loss, Output Power at 1 dB Compression (P1 dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA- X microwave network analyzer. R_S= 49.9Ω, V_S= +5 V

Conditions:
1. Gain and Return Loss: P_{IN}= -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.

PRODUCT MARKING



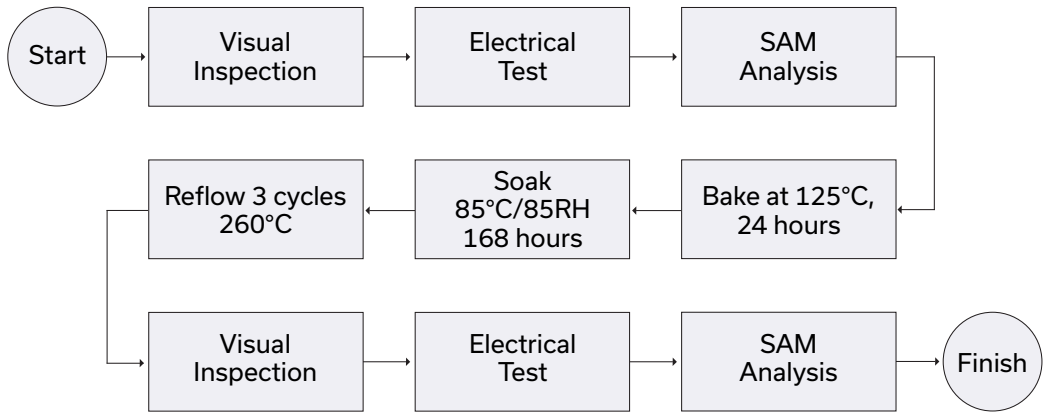
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	AF320 Ceramic Package
Tape & Reel **Standard Quantities Available on Reel**	F26 7" Reels 1K devices
Suggested Layout for PCB Design	PL-597
Evaluation Board	TB-EHC-24L+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 1A (Pass 250 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL TEST FLOW CHART



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

NOTE: Use PDF Bookmarks to view DATA at required conditions

Definitions:

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

TEST CONDITIONS: Vd = 5.00V, Id = 15.89mA @ 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)
10	15.43	18.74	18.58	15.46	1.06	0.49	19.17	6.79	5.22
100	15.54	18.83	18.46	15.22	1.06	0.49	18.84	6.58	4.87
150	15.53	18.83	18.47	15.20	1.06	0.49	18.84	6.54	4.88
200	15.52	18.86	18.41	15.17	1.06	0.49	18.86	6.35	4.85
250	15.51	18.83	18.47	15.17	1.06	0.49	19.08	6.51	4.86
300	15.50	18.84	18.42	15.17	1.06	0.49	18.54	5.99	4.80
350	15.49	18.87	18.40	15.21	1.06	0.50	19.16	6.34	4.91
400	15.49	18.88	18.43	15.19	1.07	0.50	19.23	6.43	4.93
450	15.47	18.88	18.44	15.21	1.07	0.50	18.88	6.18	4.95
500	15.46	18.89	18.34	15.19	1.07	0.50	18.37	6.19	4.92
550	15.46	18.91	18.35	15.22	1.07	0.50	18.55	6.22	4.96
600	15.45	18.87	18.27	15.15	1.07	0.50	18.54	6.23	4.87
650	15.44	18.91	18.18	15.15	1.07	0.51	18.35	6.01	4.94
700	15.43	18.89	18.18	15.12	1.07	0.51	18.66	6.22	4.94
750	15.42	18.89	18.14	15.11	1.07	0.51	18.92	6.44	4.91
800	15.41	18.91	18.06	15.14	1.07	0.51	18.92	6.41	4.93
1000	15.36	18.92	17.83	15.01	1.07	0.52	18.65	6.65	4.98
2000	15.09	19.02	16.56	14.60	1.08	0.55	18.80	6.15	5.11
3000	14.76	19.12	15.31	13.90	1.10	0.59	17.94	5.74	5.13
4000	14.46	19.16	15.53	14.91	1.12	0.63	18.86	6.48	5.06
5000	14.17	19.13	15.70	15.11	1.14	0.65	17.85	6.05	5.05
6000	13.77	19.28	13.56	13.82	1.16	0.68	17.36	5.93	5.16
7000	13.46	19.47	12.90	13.07	1.19	0.72	16.99	5.97	5.13
8000	13.38	19.44	15.43	16.36	1.21	0.75	16.44	6.74	5.09
9000	13.39	19.57	16.36	16.62	1.23	0.75	15.49	6.26	5.13
10000	13.33	19.77	14.33	15.34	1.25	0.76	14.66	6.18	5.17
11000	13.10	20.21	11.45	12.60	1.27	0.77	13.86	5.28	5.35
12000	12.84	20.70	9.97	11.19	1.30	0.80	13.05	4.23	5.28
13000	12.85	20.78	12.41	13.21	1.34	0.82	12.22	3.88	5.13
14000	12.76	20.87	14.45	13.91	1.39	0.82	12.04	3.21	5.07
15000	12.41	21.09	13.04	14.27	1.46	0.85	11.15	2.48	5.17
16000	11.93	21.41	12.35	12.69	1.55	0.85	10.89	1.62	5.31
17000	11.31	21.99	10.04	12.58	1.68	0.91	10.95	1.04	5.51
18000	10.50	22.88	8.27	9.73	1.82	0.91	10.35	0.68	5.71
19000	10.00	23.33	8.68	8.34	1.96	0.86	10.69	0.29	5.72
20000	10.14	23.13	10.64	10.28	2.05	0.89	9.42	-0.48	5.78
21000	10.11	22.94	12.03	16.95	2.15	0.98	9.34	-0.97	5.92
22000	8.93	23.66	8.47	12.21	2.28	1.04	9.68	-1.59	6.43
23000	7.93	24.10	7.42	9.15	2.42	1.01	9.30	-1.76	6.55
24000	7.92	23.46	8.49	9.96	2.41	0.99	8.91	-2.27	6.67

Typical Performance Data

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

TEST CONDITIONS: Vd = 4.75V, Id = 11.50mA @ 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)
10	14.62	18.56	15.13	13.20	1.08	0.53	14.94	3.05	5.19
100	14.69	18.45	15.22	12.75	1.07	0.50	14.73	2.74	4.81
150	14.69	18.40	15.17	12.75	1.07	0.50	14.74	2.74	4.82
200	14.68	18.44	15.16	12.74	1.07	0.50	14.65	2.53	4.82
250	14.67	18.46	15.21	12.76	1.07	0.51	14.95	2.69	4.82
300	14.66	18.43	15.19	12.75	1.07	0.50	14.42	2.21	4.84
350	14.65	18.44	15.18	12.77	1.07	0.51	14.99	2.53	4.89
400	14.65	18.47	15.21	12.77	1.07	0.51	15.07	2.68	4.91
450	14.64	18.49	15.23	12.81	1.08	0.51	14.73	2.37	4.91
500	14.63	18.49	15.17	12.78	1.08	0.51	14.30	2.41	4.86
550	14.62	18.49	15.19	12.79	1.08	0.52	14.39	2.42	4.84
600	14.61	18.49	15.13	12.76	1.08	0.52	14.41	2.43	4.87
650	14.60	18.48	15.08	12.75	1.08	0.52	14.25	2.25	4.93
700	14.59	18.49	15.10	12.74	1.08	0.52	14.46	2.49	4.89
750	14.58	18.50	15.08	12.73	1.08	0.52	14.73	2.63	4.95
800	14.57	18.50	15.03	12.77	1.08	0.52	14.82	2.62	4.90
1000	14.53	18.52	14.93	12.69	1.08	0.53	14.52	2.86	4.92
2000	14.28	18.62	14.26	12.51	1.09	0.56	14.70	2.39	5.03
3000	13.98	18.76	13.48	12.08	1.11	0.59	14.12	2.04	5.07
4000	13.74	18.77	13.83	13.02	1.13	0.63	15.37	2.80	5.00
5000	13.49	18.75	14.08	13.28	1.15	0.65	14.91	2.50	5.02
6000	13.11	18.91	12.33	12.34	1.17	0.68	15.03	2.55	5.08
7000	12.84	19.12	11.91	11.82	1.20	0.71	15.59	2.72	5.04
8000	12.82	19.04	14.39	14.80	1.22	0.74	17.33	3.77	5.00
9000	12.83	19.18	14.86	15.08	1.24	0.75	17.98	3.78	5.06
10000	12.73	19.45	12.99	13.75	1.26	0.75	18.12	4.45	5.14
11000	12.45	19.92	10.46	11.46	1.28	0.77	16.48	4.26	5.24
12000	12.19	20.44	9.47	10.26	1.32	0.79	15.96	3.38	5.17
13000	12.24	20.48	12.04	12.14	1.37	0.81	14.41	3.56	5.00
14000	12.12	20.67	13.76	12.84	1.44	0.82	13.21	2.88	4.93
15000	11.74	20.94	12.56	12.97	1.51	0.85	12.25	2.26	5.03
16000	11.22	21.31	11.75	11.57	1.61	0.85	11.92	1.52	5.16
17000	10.58	22.00	9.65	11.42	1.76	0.91	11.65	0.97	5.36
18000	9.76	22.82	8.21	8.87	1.91	0.89	11.30	0.82	5.57
19000	9.25	23.39	8.80	7.66	2.08	0.84	11.42	0.30	5.59
20000	9.40	23.20	10.73	9.35	2.18	0.88	9.85	-0.45	5.59
21000	9.36	23.02	11.51	14.61	2.30	0.98	9.82	-0.98	5.67
22000	8.19	23.71	8.18	11.18	2.42	1.04	10.16	-1.50	6.21
23000	7.22	24.35	7.32	8.42	2.62	0.98	9.77	-1.60	6.40
24000	7.25	23.63	8.42	9.06	2.58	0.97	9.25	-2.37	6.40

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: Vd = 5.25V, Id = 20.92mA @ 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)
10	15.91	19.07	20.95	17.50	1.06	0.49	22.49	9.78	5.29
100	16.02	19.11	21.31	17.12	1.06	0.48	22.27	9.53	4.94
150	16.01	19.06	21.19	17.10	1.06	0.48	22.38	9.46	4.95
200	15.99	19.11	21.22	17.06	1.06	0.48	22.35	9.30	4.97
250	15.99	19.14	21.16	17.11	1.06	0.49	22.56	9.42	4.93
300	15.98	19.10	21.16	17.08	1.06	0.48	22.10	8.93	5.02
350	15.97	19.09	21.12	17.07	1.06	0.48	22.91	9.26	4.97
400	15.95	19.13	21.12	17.06	1.06	0.49	22.87	9.36	5.03
450	15.94	19.17	21.08	17.11	1.06	0.50	22.53	9.11	5.05
500	15.93	19.14	20.94	17.06	1.06	0.49	21.90	9.10	5.01
550	15.93	19.14	20.90	17.08	1.06	0.49	22.01	9.15	5.02
600	15.91	19.14	20.76	17.00	1.06	0.50	22.04	9.15	5.00
650	15.90	19.17	20.62	16.96	1.06	0.50	21.84	8.95	5.08
700	15.89	19.15	20.58	16.91	1.06	0.50	22.20	9.15	5.06
750	15.88	19.16	20.48	16.89	1.06	0.50	22.32	9.38	5.04
800	15.87	19.16	20.32	16.92	1.06	0.50	22.35	9.35	5.02
1000	15.82	19.17	19.82	16.71	1.06	0.51	22.06	9.58	5.06
2000	15.52	19.22	17.55	15.88	1.07	0.55	22.12	9.09	5.15
3000	15.14	19.29	15.73	14.81	1.09	0.59	20.91	8.64	5.22
4000	14.76	19.27	15.51	15.51	1.10	0.63	21.25	9.27	5.16
5000	14.41	19.21	15.45	15.48	1.12	0.65	19.41	8.78	5.16
6000	13.95	19.30	13.25	13.95	1.14	0.69	18.34	8.49	5.25
7000	13.57	19.48	12.50	12.96	1.17	0.72	17.34	8.26	5.22
8000	13.43	19.39	14.75	15.58	1.19	0.75	16.34	8.10	5.22
9000	13.40	19.52	15.66	15.59	1.21	0.75	15.13	7.24	5.23
10000	13.29	19.69	13.79	14.58	1.23	0.75	14.14	6.48	5.38
11000	12.98	20.15	11.10	11.92	1.26	0.77	13.33	5.51	5.48
12000	12.65	20.64	9.75	10.66	1.29	0.80	12.47	4.58	5.45
13000	12.60	20.69	12.11	12.22	1.34	0.82	11.62	4.13	5.30
14000	12.48	20.81	14.16	12.82	1.40	0.82	11.49	3.33	5.21
15000	12.11	21.03	12.89	13.16	1.48	0.85	10.61	2.62	5.36
16000	11.60	21.39	12.23	11.81	1.57	0.85	10.29	1.67	5.56
17000	10.99	22.03	10.03	11.81	1.72	0.90	10.31	1.05	5.76
18000	10.18	22.90	8.33	9.23	1.87	0.90	9.57	0.60	5.97
19000	9.66	23.52	8.76	7.92	2.04	0.85	9.98	0.10	5.98
20000	9.83	23.29	10.81	9.74	2.13	0.88	8.91	-0.56	6.04
21000	9.85	23.06	12.23	15.72	2.23	0.97	8.75	-1.16	6.20
22000	8.71	23.82	8.56	11.74	2.37	1.03	9.01	-1.81	6.92
23000	7.72	24.34	7.48	8.84	2.53	0.99	8.63	-1.94	6.92
24000	7.72	23.74	8.57	9.49	2.51	0.98	8.32	-2.52	6.90

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 = 5.00V, Id = 11.94mA @ 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)
10	15.11	18.70	16.74	14.13	1.07	0.51	14.90	2.99	4.24
100	15.16	18.65	16.10	13.47	1.06	0.49	14.64	2.74	3.86
150	15.16	18.72	16.07	13.45	1.07	0.49	14.62	2.66	3.89
200	15.16	18.65	16.15	13.55	1.06	0.49	14.56	2.56	3.87
250	15.17	18.67	16.26	13.66	1.07	0.49	14.80	2.67	3.86
300	15.16	18.66	16.25	13.60	1.06	0.49	14.20	2.20	3.79
350	15.15	18.69	16.15	13.52	1.07	0.49	14.83	2.53	3.86
400	15.14	18.69	16.10	13.52	1.07	0.49	14.92	2.63	3.93
450	15.14	18.66	16.21	13.61	1.07	0.49	14.58	2.41	3.94
500	15.14	18.67	16.19	13.65	1.07	0.49	14.20	2.45	3.95
550	15.13	18.68	16.18	13.64	1.07	0.49	14.29	2.45	3.88
600	15.12	18.69	15.98	13.47	1.07	0.49	14.31	2.45	3.87
650	15.11	18.67	15.89	13.40	1.07	0.49	14.13	2.25	3.95
700	15.11	18.67	16.01	13.47	1.07	0.50	14.36	2.45	3.95
750	15.11	18.67	16.20	13.62	1.07	0.50	14.68	2.69	3.92
800	15.11	18.68	16.27	13.77	1.07	0.50	14.77	2.69	3.90
1000	15.06	18.70	15.75	13.34	1.07	0.50	14.49	2.90	3.92
2000	14.89	18.72	15.96	13.86	1.08	0.53	14.74	2.57	3.99
3000	14.55	18.88	14.10	12.48	1.09	0.56	13.93	2.12	4.06
4000	14.32	18.87	14.67	13.80	1.11	0.60	15.24	2.81	3.94
5000	14.14	18.79	16.85	15.39	1.12	0.63	14.74	2.55	3.87
6000	13.69	19.04	11.91	11.58	1.14	0.63	14.67	2.45	4.08
7000	13.48	19.08	13.13	12.55	1.16	0.67	15.32	2.88	3.90
8000	13.59	19.05	17.98	17.75	1.18	0.71	16.57	3.71	3.84
9000	13.49	19.11	14.77	15.41	1.18	0.71	17.23	3.82	3.94
10000	13.49	19.38	15.20	14.10	1.20	0.71	18.69	4.48	3.94
11000	13.55	19.63	13.44	14.58	1.21	0.73	19.31	5.10	4.05
12000	13.04	20.38	8.57	9.47	1.21	0.73	19.06	3.99	4.07
13000	13.37	20.29	12.32	12.57	1.24	0.77	19.03	4.91	3.77
14000	13.38	20.34	14.60	12.42	1.27	0.75	15.99	4.33	3.79
15000	13.11	20.54	12.05	12.91	1.30	0.79	14.62	3.97	3.84
16000	12.91	20.73	15.02	12.67	1.36	0.78	13.92	3.32	3.85
17000	12.33	21.37	10.59	12.57	1.46	0.86	13.10	2.48	4.03
18000	11.54	22.32	7.45	9.19	1.54	0.87	12.90	2.54	4.21
19000	10.80	23.36	7.06	6.50	1.65	0.78	13.49	2.03	4.34
20000	11.20	23.17	10.12	8.69	1.78	0.83	10.91	1.14	4.22
21000	11.52	23.02	12.77	12.17	1.86	0.89	10.24	0.49	4.31
22000	9.68	24.77	5.91	7.87	1.85	1.02	11.00	-0.43	5.15
23000	9.19	25.11	6.20	6.36	2.01	0.89	10.84	-0.07	4.84
24000	10.15	23.61	8.96	12.42	2.05	1.01	9.60	-0.68	4.70

Typical Performance Data

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

TEST CONDITIONS: Vd = 4.75V, Id = 7.68mA @ 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)
10	13.28	18.09	11.86	10.43	1.10	0.55	12.23	-3.07	4.23
100	13.27	17.93	11.52	9.86	1.09	0.52	11.81	-3.28	3.96
150	13.27	17.93	11.51	9.84	1.09	0.52	12.02	-3.31	3.96
200	13.28	17.91	11.56	9.90	1.09	0.52	11.93	-3.43	3.92
250	13.29	17.93	11.63	9.98	1.09	0.52	12.27	-3.32	3.89
300	13.27	17.90	11.62	9.93	1.09	0.52	12.51	-3.72	4.00
350	13.27	17.89	11.57	9.89	1.09	0.52	12.57	-3.51	3.98
400	13.27	17.91	11.56	9.89	1.09	0.52	12.45	-3.31	4.03
450	13.27	17.91	11.63	9.96	1.09	0.52	12.36	-3.54	3.97
500	13.27	17.90	11.62	9.98	1.09	0.52	11.83	-3.48	4.00
550	13.26	17.91	11.61	9.97	1.09	0.52	11.76	-3.50	3.92
600	13.25	17.93	11.50	9.87	1.09	0.52	11.76	-3.48	3.96
650	13.23	17.93	11.44	9.83	1.09	0.52	11.76	-3.72	4.04
700	13.24	17.92	11.54	9.88	1.09	0.52	11.72	-3.50	4.06
750	13.25	17.93	11.66	9.98	1.09	0.52	11.66	-3.31	3.97
800	13.25	17.91	11.71	10.08	1.09	0.53	11.89	-3.33	4.01
1000	13.21	17.94	11.45	9.81	1.09	0.52	11.30	-3.16	3.98
2000	13.09	17.97	11.81	10.26	1.11	0.55	11.93	-3.44	4.08
3000	12.79	18.19	10.85	9.53	1.12	0.57	11.77	-3.87	4.10
4000	12.71	18.15	11.52	10.58	1.14	0.61	11.68	-3.27	3.97
5000	12.64	18.02	13.04	11.89	1.15	0.63	11.50	-3.46	3.93
6000	12.17	18.43	9.70	9.18	1.16	0.63	11.54	-3.76	4.09
7000	12.12	18.43	10.98	10.13	1.19	0.66	11.41	-3.28	3.92
8000	12.38	18.28	14.84	14.14	1.20	0.70	11.55	-2.42	3.87
9000	12.28	18.47	12.31	12.45	1.21	0.70	11.83	-2.29	3.94
10000	12.27	18.74	12.68	11.50	1.22	0.70	12.21	-1.53	3.92
11000	12.30	19.09	10.58	12.45	1.24	0.75	13.93	-0.61	4.06
12000	11.78	19.85	7.74	8.09	1.24	0.71	12.73	-1.48	4.03
13000	12.27	19.70	11.75	10.77	1.29	0.74	14.94	0.82	3.73
14000	12.24	19.95	12.24	11.34	1.33	0.76	18.17	1.10	3.73
15000	11.99	20.26	11.48	11.15	1.38	0.78	16.21	1.59	3.82
16000	11.79	20.54	13.18	11.35	1.45	0.79	14.42	1.27	3.73
17000	11.19	21.30	9.78	11.09	1.57	0.87	12.65	1.14	3.97
18000	10.40	22.22	7.49	7.92	1.64	0.84	12.31	0.98	4.12
19000	9.63	23.35	7.07	5.63	1.74	0.74	12.98	0.33	4.22
20000	10.16	23.12	10.62	7.80	1.92	0.80	10.24	0.21	4.13
21000	10.41	23.03	11.49	10.47	1.99	0.89	9.60	-0.13	4.24
22000	8.49	24.80	5.48	6.67	1.93	0.98	10.21	-1.16	5.13
23000	8.13	25.03	6.14	5.44	2.09	0.83	9.94	-1.01	4.82
24000	9.22	23.65	8.77	10.32	2.19	0.98	8.99	-1.45	4.57

Typical Performance Data

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

TEST CONDITIONS: Vd = 5.25V, Id = 16.17mA @ 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)
10	15.78	18.99	19.63	16.22	1.06	0.49	19.08	6.86	4.33
100	15.89	19.03	19.28	15.81	1.06	0.48	19.03	6.58	3.90
150	15.88	19.02	19.21	15.78	1.06	0.47	19.08	6.52	3.91
200	15.88	19.03	19.35	15.88	1.06	0.48	19.07	6.39	3.91
250	15.88	19.04	19.54	16.02	1.06	0.48	19.24	6.51	3.89
300	15.87	19.04	19.46	15.93	1.06	0.48	18.66	6.00	3.98
350	15.86	19.04	19.27	15.83	1.06	0.48	19.40	6.34	3.95
400	15.86	19.02	19.24	15.78	1.06	0.48	19.47	6.46	3.96
450	15.85	19.03	19.42	15.95	1.06	0.48	19.11	6.22	3.97
500	15.85	19.04	19.40	16.01	1.06	0.48	18.64	6.25	3.96
550	15.84	19.04	19.33	15.97	1.06	0.48	18.80	6.25	3.96
600	15.83	19.04	18.99	15.74	1.06	0.48	18.81	6.25	3.96
650	15.82	19.04	18.86	15.65	1.06	0.48	18.64	6.05	4.00
700	15.82	19.03	19.05	15.73	1.06	0.48	18.93	6.26	3.98
750	15.82	19.04	19.33	15.94	1.06	0.49	19.24	6.50	3.91
800	15.81	19.04	19.42	16.12	1.06	0.49	19.30	6.50	3.93
1000	15.77	19.04	18.57	15.54	1.06	0.49	18.96	6.71	3.95
2000	15.57	19.09	18.53	16.08	1.07	0.52	19.35	6.34	4.05
3000	15.23	19.22	16.02	14.20	1.08	0.55	18.49	5.85	4.13
4000	14.96	19.24	16.49	15.72	1.10	0.60	19.82	6.54	4.00
5000	14.72	19.16	18.99	17.57	1.12	0.63	19.16	6.25	3.97
6000	14.31	19.37	13.17	12.86	1.13	0.63	18.85	6.05	4.14
7000	14.04	19.48	14.30	13.85	1.15	0.68	19.28	6.38	3.98
8000	14.12	19.42	19.36	20.10	1.17	0.71	18.99	7.15	3.95
9000	14.00	19.59	16.19	17.16	1.18	0.72	18.41	7.03	3.98
10000	14.05	19.78	16.54	15.98	1.19	0.72	17.68	7.50	3.98
11000	14.15	20.01	15.76	16.19	1.20	0.73	16.51	7.26	4.14
12000	13.72	20.67	9.04	10.47	1.20	0.75	16.01	6.06	4.15
13000	14.00	20.62	12.40	14.09	1.22	0.78	14.98	6.08	3.87
14000	14.10	20.58	15.83	13.64	1.23	0.75	14.20	5.20	3.88
15000	13.85	20.75	12.10	14.67	1.25	0.80	13.20	4.60	3.91
16000	13.70	20.84	15.68	14.19	1.30	0.78	12.67	3.79	3.92
17000	13.20	21.34	11.10	14.23	1.37	0.85	12.48	2.92	4.15
18000	12.43	22.31	7.39	10.21	1.45	0.88	12.09	2.71	4.36
19000	11.76	23.25	6.93	7.17	1.54	0.80	12.55	2.31	4.48
20000	12.13	23.09	9.58	9.66	1.64	0.86	10.65	1.39	4.34
21000	12.52	22.86	13.47	13.97	1.70	0.88	9.94	0.55	4.53
22000	10.70	24.59	6.14	8.43	1.67	1.04	10.81	-0.36	5.47
23000	10.20	24.88	6.13	6.97	1.82	0.93	10.59	0.01	4.97
24000	11.10	23.42	8.92	13.84	1.84	1.03	9.59	-0.72	4.99

Typical Performance Data

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

TEST CONDITIONS: Vd = 5.00V, Id = 19.80mA @ 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)
10	15.59	18.76	19.32	16.43	1.06	0.48	21.45	9.39	5.90
100	15.70	18.90	20.19	16.30	1.06	0.49	21.44	9.03	5.70
150	15.69	18.96	20.18	16.40	1.06	0.50	21.56	8.98	5.71
200	15.66	18.95	19.96	16.25	1.06	0.50	21.60	8.77	5.70
250	15.65	18.89	19.80	16.15	1.06	0.49	21.77	8.93	5.70
300	15.64	18.95	19.73	16.10	1.06	0.50	21.29	8.42	5.76
350	15.63	18.98	19.72	16.17	1.07	0.50	22.00	8.75	5.75
400	15.62	18.97	19.75	16.18	1.07	0.50	22.08	8.88	5.80
450	15.60	18.94	19.69	16.16	1.06	0.50	21.73	8.62	5.78
500	15.59	18.99	19.49	16.09	1.07	0.51	21.10	8.59	5.84
550	15.58	18.98	19.45	16.09	1.07	0.51	21.19	8.61	5.80
600	15.57	18.99	19.33	16.04	1.07	0.51	21.23	8.62	5.79
650	15.55	18.99	19.22	16.02	1.07	0.51	21.01	8.45	5.80
700	15.54	19.00	19.12	15.94	1.07	0.51	21.35	8.64	5.83
750	15.52	19.02	18.92	15.83	1.07	0.52	21.55	8.85	5.88
800	15.51	19.00	18.68	15.81	1.07	0.52	21.64	8.81	5.80
1000	15.45	19.02	18.42	15.83	1.07	0.53	21.28	9.06	5.88
2000	15.10	19.07	16.06	14.74	1.08	0.57	21.51	8.52	5.97
3000	14.68	19.09	14.72	13.98	1.09	0.60	20.52	8.13	6.04
4000	14.22	19.09	13.68	14.35	1.11	0.66	20.69	8.69	6.01
5000	13.77	19.01	13.29	13.65	1.13	0.67	18.61	8.07	5.98
6000	13.27	19.09	12.47	12.96	1.16	0.71	17.44	7.77	6.11
7000	12.74	19.27	10.93	11.87	1.19	0.75	16.06	7.17	6.15
8000	12.59	19.24	13.22	13.57	1.23	0.77	14.93	6.66	6.12
9000	12.40	19.27	14.39	13.57	1.26	0.77	13.69	5.67	6.22
10000	12.11	19.62	11.76	13.33	1.31	0.80	12.83	4.90	6.35
11000	11.53	20.13	9.78	9.96	1.36	0.79	12.05	3.71	6.44
12000	11.16	20.63	9.99	10.39	1.47	0.83	11.33	2.96	6.47
13000	10.91	20.85	12.13	11.05	1.56	0.85	10.62	2.47	6.35
14000	10.66	20.96	14.12	11.75	1.66	0.85	10.64	1.66	6.30
15000	10.12	21.33	12.32	12.06	1.80	0.89	9.89	1.10	6.54
16000	9.51	21.79	12.21	10.83	1.97	0.88	9.66	0.31	6.67
17000	8.74	22.41	9.75	11.22	2.18	0.94	9.79	-0.16	6.99
18000	7.91	23.16	9.44	8.67	2.42	0.89	8.96	-0.59	7.18
19000	7.62	23.33	11.78	8.02	2.58	0.84	9.38	-1.03	7.12
20000	7.51	23.16	10.78	11.33	2.72	0.96	8.67	-1.41	7.41
21000	7.25	22.98	12.55	14.92	2.89	0.99	8.47	-1.98	7.59
22000	6.29	23.32	11.23	10.70	3.09	0.96	8.63	-2.40	8.01
23000	5.33	23.81	7.63	10.32	3.23	1.05	8.32	-2.42	8.50
24000	5.01	23.56	9.52	9.39	3.36	0.97	7.93	-3.24	8.51

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: Vd = 4.75V, Id = 14.79mA @ 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)
10	15.01	18.62	16.78	14.38	1.07	0.51	18.36	6.16	5.83
100	15.10	18.61	17.15	14.21	1.07	0.50	18.09	5.90	5.60
150	15.09	18.59	17.24	14.29	1.07	0.50	18.11	5.86	5.62
200	15.07	18.64	17.08	14.18	1.07	0.50	18.08	5.67	5.59
250	15.06	18.67	16.99	14.12	1.07	0.51	18.41	5.81	5.63
300	15.05	18.65	16.94	14.06	1.07	0.51	17.74	5.33	5.65
350	15.03	18.64	16.95	14.13	1.07	0.51	18.48	5.67	5.63
400	15.03	18.66	17.01	14.15	1.07	0.51	18.60	5.76	5.72
450	15.02	18.67	16.99	14.17	1.07	0.51	18.13	5.51	5.69
500	15.00	18.69	16.86	14.11	1.07	0.52	17.61	5.52	5.67
550	14.99	18.67	16.87	14.12	1.07	0.52	17.78	5.53	5.73
600	14.98	18.68	16.80	14.08	1.07	0.52	17.78	5.54	5.68
650	14.97	18.69	16.74	14.09	1.08	0.52	17.57	5.33	5.70
700	14.95	18.72	16.69	14.03	1.08	0.52	17.82	5.54	5.72
750	14.94	18.68	16.57	13.96	1.08	0.52	18.01	5.73	5.73
800	14.92	18.72	16.46	13.95	1.08	0.53	18.15	5.69	5.76
1000	14.88	18.74	16.44	14.01	1.08	0.53	17.80	5.91	5.75
2000	14.58	18.85	15.20	13.48	1.09	0.57	17.85	5.39	5.86
3000	14.25	18.92	14.41	13.19	1.11	0.60	17.09	5.09	5.94
4000	13.91	18.97	13.85	13.87	1.13	0.65	17.98	5.71	5.90
5000	13.55	18.97	13.66	13.48	1.15	0.67	16.82	5.23	5.91
6000	13.16	19.09	12.86	13.23	1.18	0.71	16.38	5.18	6.02
7000	12.74	19.31	11.31	12.14	1.21	0.74	15.74	5.12	6.01
8000	12.67	19.29	13.74	14.41	1.24	0.77	15.10	5.65	5.94
9000	12.56	19.34	14.88	14.74	1.27	0.77	14.05	4.87	6.04
10000	12.34	19.73	12.12	14.28	1.31	0.80	13.38	4.61	6.16
11000	11.88	20.17	9.89	10.56	1.34	0.79	12.60	3.61	6.25
12000	11.57	20.63	10.10	11.08	1.43	0.83	11.88	2.70	6.25
13000	11.37	20.79	12.15	11.93	1.51	0.85	11.19	2.36	6.12
14000	11.13	21.00	14.12	12.69	1.61	0.86	11.15	1.71	6.06
15000	10.59	21.28	12.26	12.96	1.73	0.89	10.45	1.07	6.24
16000	9.97	21.67	12.10	11.57	1.87	0.89	10.26	0.35	6.33
17000	9.18	22.29	9.64	11.87	2.07	0.95	10.40	-0.07	6.62
18000	8.33	22.97	9.27	9.09	2.29	0.90	9.73	-0.37	6.88
19000	8.04	23.02	11.53	8.45	2.43	0.85	10.04	-0.81	6.76
20000	7.87	23.01	10.58	11.97	2.59	0.97	9.20	-1.33	6.99
21000	7.56	22.81	12.33	15.88	2.75	1.00	9.07	-1.81	7.20
22000	6.58	23.17	11.14	11.29	2.98	0.97	9.30	-2.18	7.43
23000	5.58	23.60	7.53	10.79	3.08	1.06	8.93	-2.19	7.95
24000	5.23	23.37	9.41	9.80	3.24	0.99	8.47	-3.01	7.92

Typical Performance Data

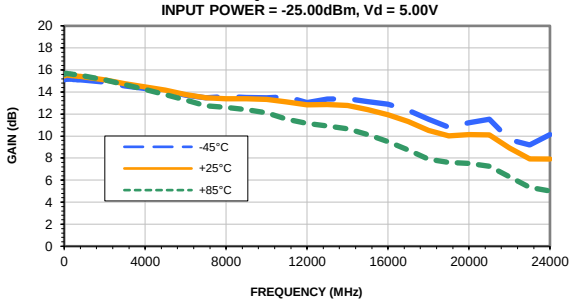
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 24.45mA @ Temperature = +85°C

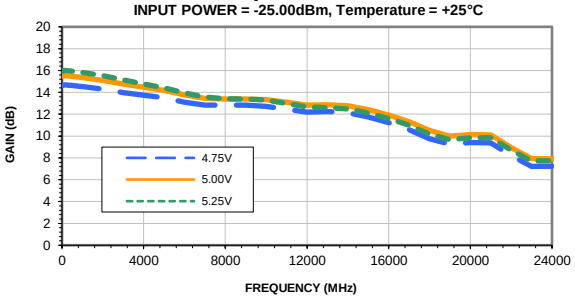
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
10	15.92	19.20	21.83	18.03	1.07	0.51	24.64	11.47	6.02
100	16.01	19.11	22.39	17.78	1.06	0.49	24.00	11.25	5.80
150	16.00	19.09	22.31	17.82	1.06	0.49	24.14	11.22	5.82
200	15.98	19.13	22.10	17.65	1.06	0.49	24.13	11.01	5.82
250	15.97	19.16	21.84	17.52	1.06	0.50	24.57	11.11	5.82
300	15.95	19.13	21.70	17.46	1.06	0.49	24.05	10.62	5.82
350	15.94	19.14	21.69	17.50	1.06	0.50	24.76	10.97	5.83
400	15.93	19.13	21.63	17.51	1.06	0.50	24.84	11.08	5.90
450	15.91	19.15	21.49	17.48	1.06	0.50	24.60	10.81	5.89
500	15.90	19.15	21.17	17.37	1.06	0.50	23.71	10.82	5.83
550	15.88	19.15	21.06	17.35	1.06	0.50	23.88	10.85	5.84
600	15.87	19.17	20.83	17.27	1.06	0.51	23.97	10.85	5.89
650	15.85	19.15	20.65	17.21	1.06	0.51	23.77	10.63	6.02
700	15.84	19.16	20.45	17.10	1.06	0.51	24.24	10.83	5.87
750	15.82	19.16	20.15	16.94	1.06	0.51	24.34	11.05	5.90
800	15.80	19.16	19.78	16.90	1.06	0.51	24.32	11.02	5.90
1000	15.74	19.17	19.16	16.84	1.06	0.52	24.05	11.27	5.96
2000	15.32	19.14	15.78	15.01	1.06	0.56	25.17	10.75	6.09
3000	14.80	19.08	14.05	13.77	1.07	0.60	23.94	10.31	6.18
4000	14.23	19.02	12.78	13.73	1.09	0.66	22.36	10.56	6.14
5000	13.68	18.88	12.30	12.83	1.11	0.68	19.26	9.54	6.16
6000	13.08	18.92	11.57	11.95	1.14	0.71	17.51	8.58	6.30
7000	12.45	19.06	10.20	10.96	1.17	0.75	15.79	7.39	6.32
8000	12.24	19.00	12.30	12.19	1.21	0.77	14.51	6.35	6.33
9000	11.97	19.04	13.24	11.99	1.26	0.76	13.20	5.29	6.44
10000	11.58	19.40	10.99	11.84	1.31	0.80	12.30	4.29	6.60
11000	10.89	19.96	9.26	8.96	1.37	0.78	11.60	3.11	6.75
12000	10.44	20.50	9.58	9.31	1.50	0.82	10.90	2.35	6.76
13000	10.16	20.69	11.89	9.91	1.61	0.84	10.22	1.99	6.67
14000	9.88	20.89	13.64	10.45	1.74	0.84	10.26	1.22	6.65
15000	9.32	21.32	11.94	10.76	1.90	0.88	9.52	0.65	6.95
16000	8.69	21.81	11.98	9.73	2.09	0.87	9.29	-0.13	7.12
17000	7.92	22.46	9.52	10.08	2.33	0.93	9.44	-0.48	7.49
18000	7.09	23.23	9.46	7.95	2.60	0.87	8.50	-0.91	7.74
19000	6.80	23.45	12.13	7.34	2.78	0.81	9.01	-1.36	7.76
20000	6.72	23.37	10.73	10.08	2.95	0.94	8.38	-1.55	8.11
21000	6.53	23.13	12.34	13.16	3.12	0.98	8.16	-2.24	8.34
22000	5.59	23.52	11.18	9.71	3.34	0.94	8.26	-2.58	8.76
23000	4.68	24.12	7.63	9.40	3.52	1.02	8.03	-2.83	9.24
24000	4.41	23.80	9.49	8.78	3.63	0.96	7.68	-3.48	9.33

Typical Performance Curves

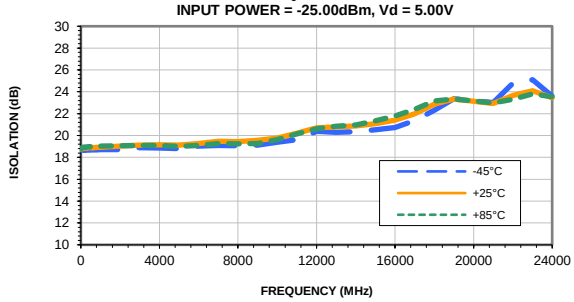
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



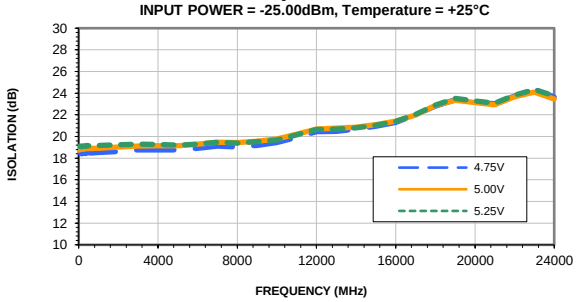
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



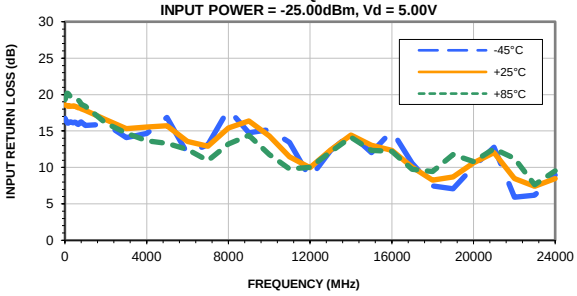
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



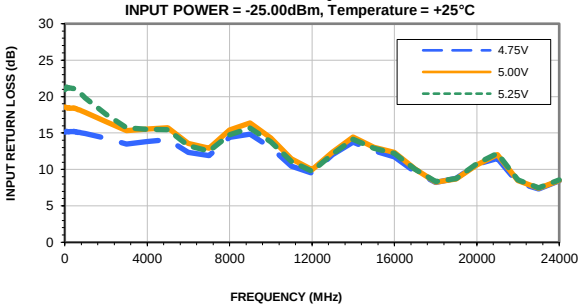
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



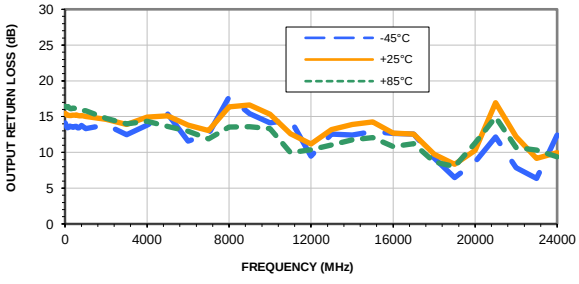
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



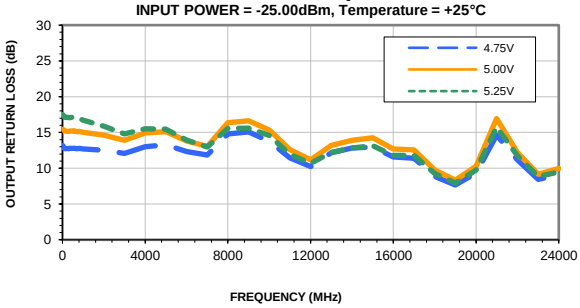
INPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V

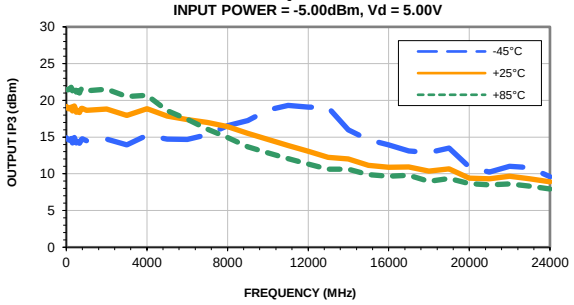


OUTPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C

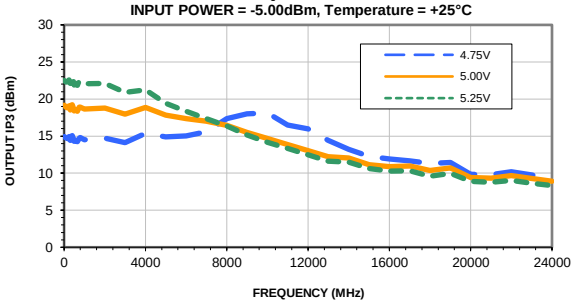


Typical Performance Curves

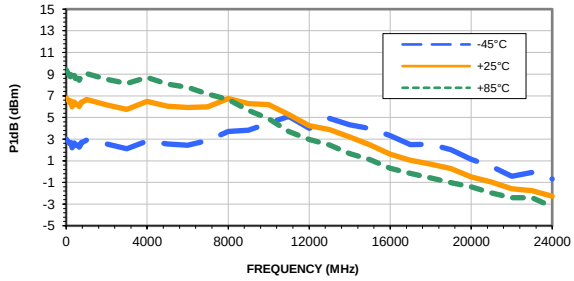
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
INPUT POWER = -5.00dBm, Vd = 5.00V



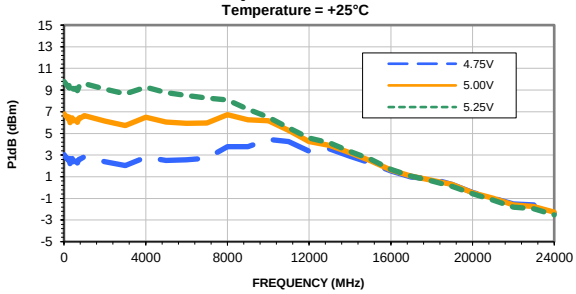
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -5.00dBm, Temperature = +25°C



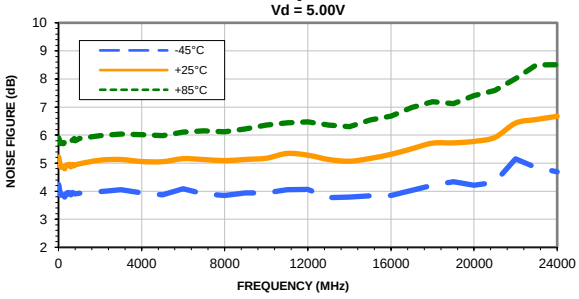
P1dB vs. FREQUENCY & TEMPERATURE
Vd = 5.00V



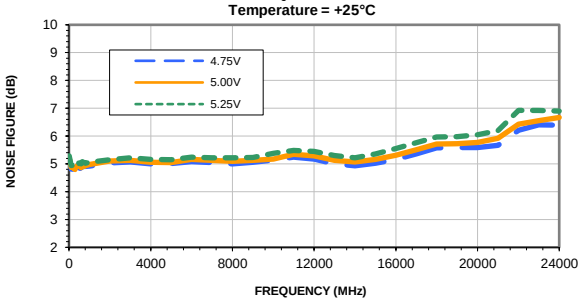
P1dB vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



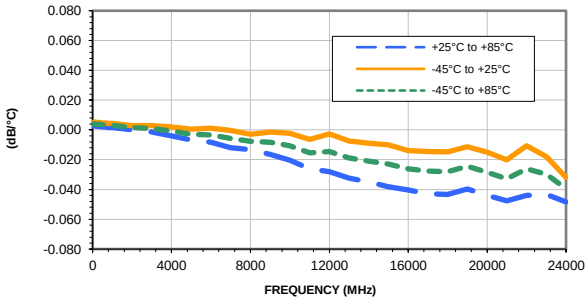
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
Vd = 5.00V



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



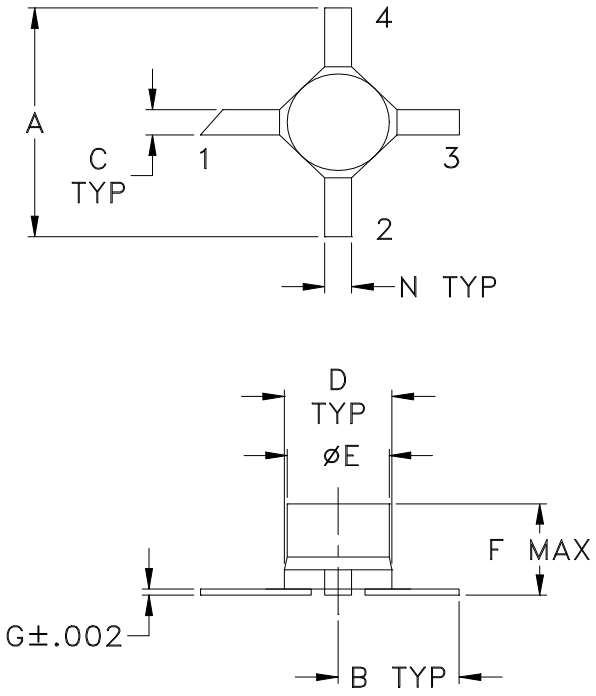
GAIN VARIATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 5.00V



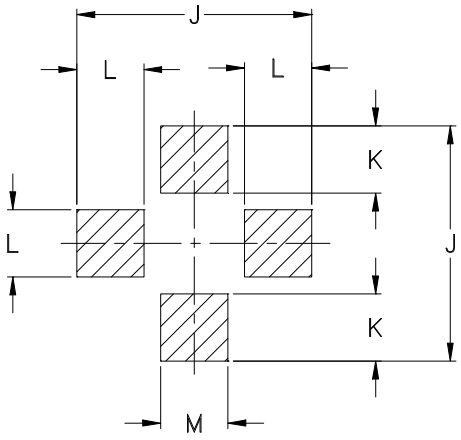
Case Style AF

AF320

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	WT. GRAM
AF320	.200 (5.08)	.100 (2.54)	.020 (0.51)	.070 (1.78)	.068 (1.73)	.057 (1.45)	.005 (0.13)	-	.230 (5.84)	.065 (1.65)	.060 (1.52)	.080 (2.03)	.040 (1.02)	.04

Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

Notes:

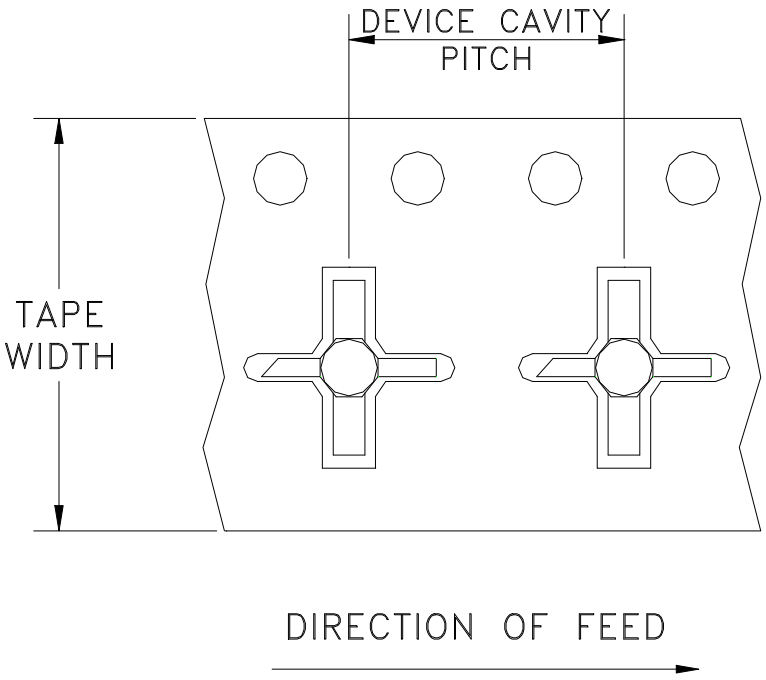
1. Case material: Ceramic.
2. Termination material:
   Nickel-Iron alloy 42.
3. Termination finish:
   For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. (See Data Sheet)
   For RoHS-5 Case Styles: Tin-Lead plate.
4. Termination (1):
   May have diagonal cut. Input and output interchangeable for PAT models only.
5. Special Tolerances: Termination width ± .005 inch, termination thickness ± .002 inch, cap diameter ±.005 inch.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

This document and its contents are the property of Mini-Circuits.

Tape & Reel Packaging TR-F26

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
12	8	7	1000

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

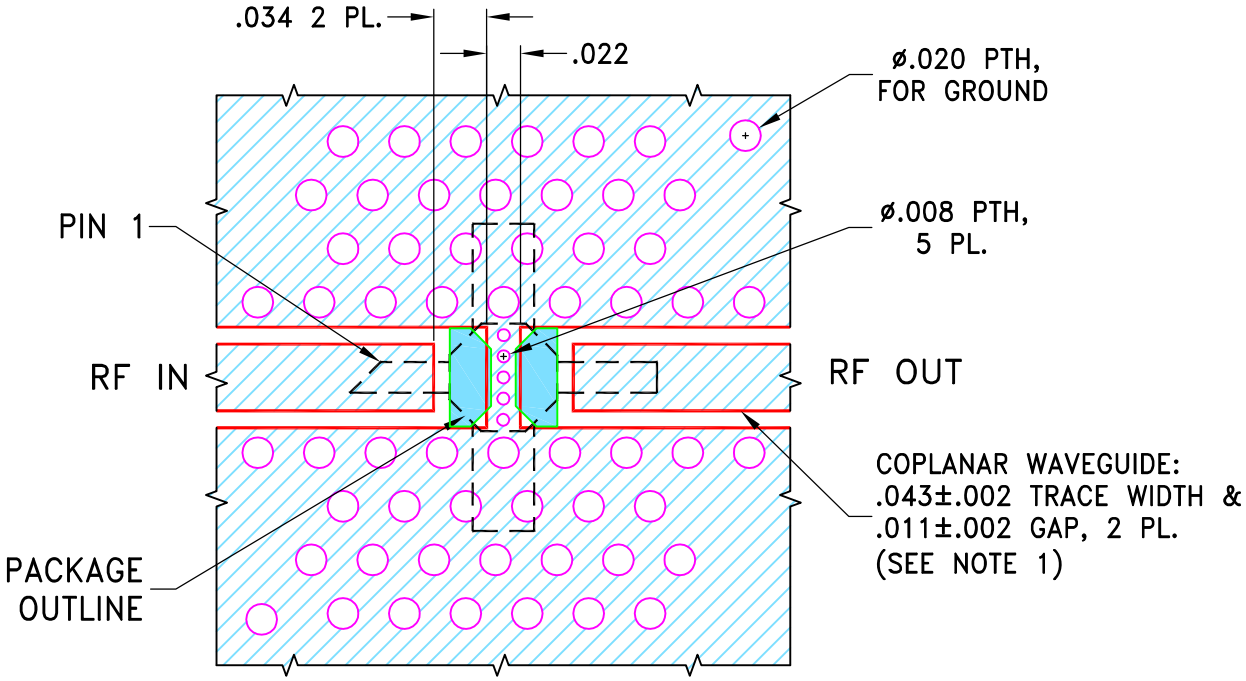
Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

This document and its contents are the property of Mini-Circuits.

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168675	NEW RELEASE	07/06/18	GF	GH
A	M168511	UPDATED SOLDER MASK	08/10/18	ITG	GH

SUGGESTED MOUNTING CONFIGURATION FOR AF320 CASE STYLES, "04AM05" PIN CONNECTION



NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"±.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. UNIT LAND PATTERN WAS ADJUSTED FOR HIGH FREQUENCY PERFOPMENCE AND DIFFERENT FROM SUGESTED LAYOUT AS PER AF320.
3. TO PREVENT SOLDER WICKING ø.020 PTH MAY BE PLUGGED.
4. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB SOLDER MASK LAYOUT

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	GF	06/26/18
TOLERANCES ON:	CHECKED	IL	07/05/18
2 PL DECIMALS ±	APPROVED	GH	07/06/18
3 PL DECIMALS ± .005			
ANGLES ± 1°			
FRACTIONS ±			

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

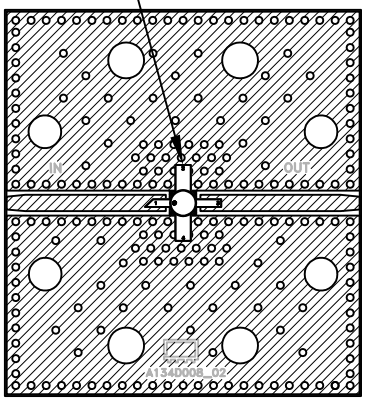
PL, 04AM05, AF320, MB-022

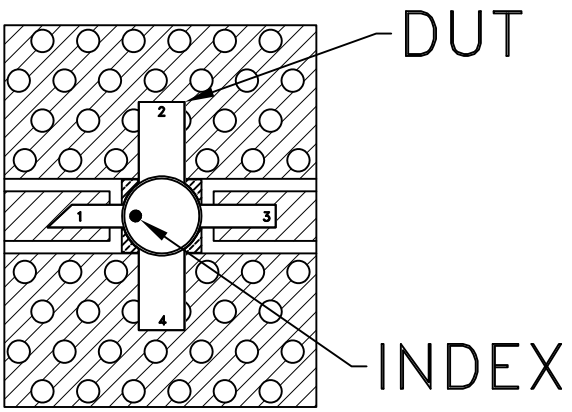
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-597	A

FILE:	SCALE:	SHEET:
98PL597	8:1	1 OF 1

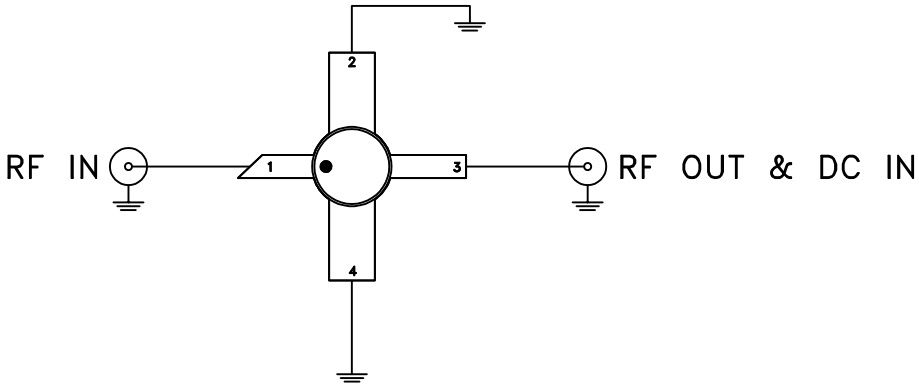
Evaluation Board and Circuit

SEE DETAIL "A"





DETAIL "A"
(SCALE 3:1)



SCHEMATIC DIAGRAM
(SCALE 3:1)

Function	Pad
RF IN	1
RF OUT & DC IN	3
GND	2,4

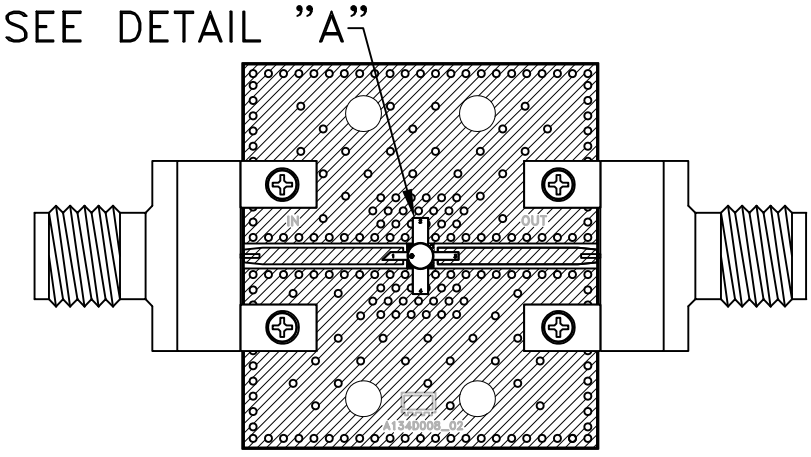
NOTES:

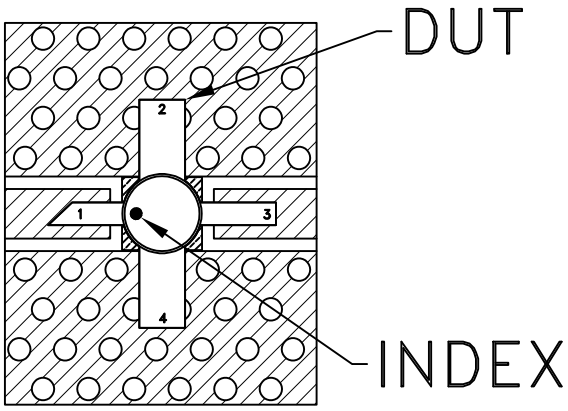
1. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.03 inch

Mini-Circuits®

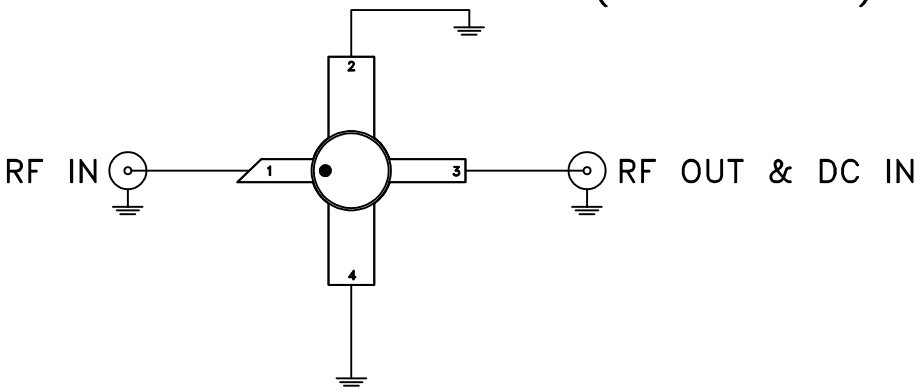
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.

Evaluation Board and Circuit





DETAIL "A"
(SCALE 3:1)



SCHEMATIC DIAGRAM
(SCALE 3:1)

Function	Pad
RF IN	1
RF OUT & DC IN	3
GND	2,4

NOTES:

1. 2.92mm Female Connectors.
2. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.03 inch

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.

Mini-Circuits

Environmental Specifications **ENV08T1**

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	-40° to 85° C or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020

This document and its contents are the property of Mini-Circuits.

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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215

This document and its contents are the property of Mini-Circuits.