HIGH POWER, 1W

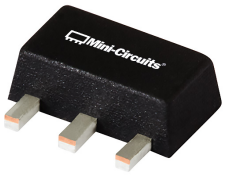
Monolithic Amplifier

GVA-91+

50Ω 869 - 2170 MHz

THE BIG DEAL

- High power, 29.5 dBm typ. at 920 MHz
- High gain, 20.4 dB typ.
- High power added efficiency
- High P1dB, 29.5 dBm at 920 MHz and 27.4 dBm at 2140 MHz.



Generic photo used for illustration purposes only

CASE STYLE: DF782

+RoHS Compliant

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

APPLICATIONS

- Base station infrastructure
- LTE
- WCDMA

PRODUCT OVERVIEW

Mini-Circuits GVA-91+ (RoHS compliant) is an advanced wideband amplifier fabricated using GaAs HBT technology, offering high gain and excellent power output with excellent power added efficiency in application bands. It has repeatable performance from lot to lot and is housed in an SOT-89 package for very good thermal performance.

KEY FEATURES

Feature	Advantages
Optimized over 869 – 960 MHz and 2110 – 2170 MHz	Matched for best power added efficiency in primary wireless communications bands: Cellular and LTE. Application Circuit with component values provided to minimize design effort at customer end.
High power output at P1dB: • 29 dBm over 869-960 MHz • 27 dBm over 2110-2170 MHz	With a power added efficiency at 41-54%, GVA-91+ delivers high power with low DC power consumption.
High gain: • 20.4 dB typ. at 920 MHz • 15.9 dB typ. at 2140 MHz	High gain results in fewer amplifier stages and cost savings.
Excellent ESD: • HBM: class 2 (2000 to <4000V) • MM: class M1 (50 to <100V)	Built-in ESD protection for a robust product.

REV. B
ECO-010563
GVA-91+
TH/RS/CP
110921

ELECTRICAL SPECIFICATIONS[1] AT 25°C AND VCC=5V, UNLESS NOTED

Parameter	Condition (MHz)	900 MHz Match			Condition (MHz)	2100 MHz Match			Units
		Min.	Typ.	Max.		Min.	Typ.	Max.	
Frequency Range		869		960		2110		2170	MHz
Gain	869		20.6		2110		16.3		dB
	920	18.6	20.4	22.7	2140	14.6	15.9	17.8	
	960		19.7		2170		15.4		
Input Return Loss	869		11.0		2110		14.2		dB
	920		10.9		2140		9.6		
	960		7.3		2170		6.9		
Output Return Loss	869		18.6		2110		11.1		dB
	920		16.9		2140		9.7		
	960		12.4		2170		8.3		
Reverse Isolation	869 - 920		34.5		2110 - 2170		29.9		dB
Output Power at 1dB Compression[2]	869		29.5		2110		27.4		dBm
	920		28.8		2140		27.0		
	960		28.0		2170		26.7		
Output Power at 3dB Compression	869		30.6		2110		28.4		dBm
	920		29.7		2140		27.9		
	960		29.0		2170		27.5		
Output IP3	869		39.9		2110		41.3		dBm
	920		39.9		2140		42.2		
	960		39.8		2170		43.4		
Efficiency Power Added at P1dB (PAE)	869 - 920		47.2		2110 - 2170		45.2		%
Noise Figure	869		6.4		2110		4.2		dB
	920		6.4		2140		4.6		
	960		6.6		2170		4.5		
Device Operating Voltage (Vcc)		4.8	5.0	5.2		4.8	5.0	5.2	V
Device Operating Current[2]			147	176			147	176	mA
Device Current Variation vs. Temperature[3]			135				130		µA/°C
Device Current Variation vs. Voltage			0.067				0.066		mA/mW
Thermal Resistance, junction-to-ground lead			25.6				25.6		°C/W

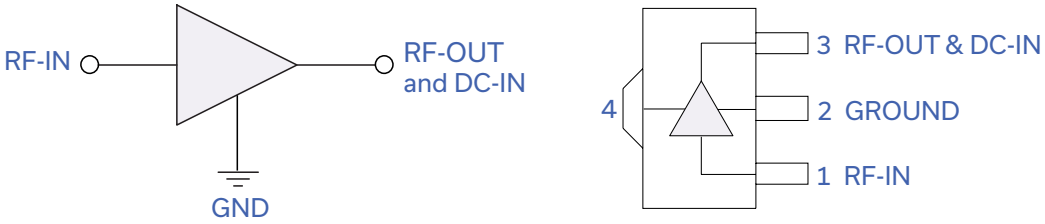
(1) Measured on Mini-Circuits Characterization test board TB-753+ (900 MHz match) and TB-752+ (2100 MHz match). See Characterization Test Circuit (Fig. 1).
(2) Current with no RF or small signal, increases at P1dB to 335 mA typ at 920 MHz and 291 mA at 2140 MHz
(3) Current at 85°C — Current at -45°C)/130

MAXIMUM RATINGS[4]

Parameter	Ratings		
Operating Temperature (ground lead)	-40°C to 85°C		
Storage Temperature	-65°C to 150°C		
Power Dissipation	1.7 W		
Input Power (CW)[(1)]		Continuous	5 Minutes Max.
	900 MHz	21 dBm	30 dBm
	2100 MHz	23 dBm	30 dBm
DC Voltage on Pin 3	6V		

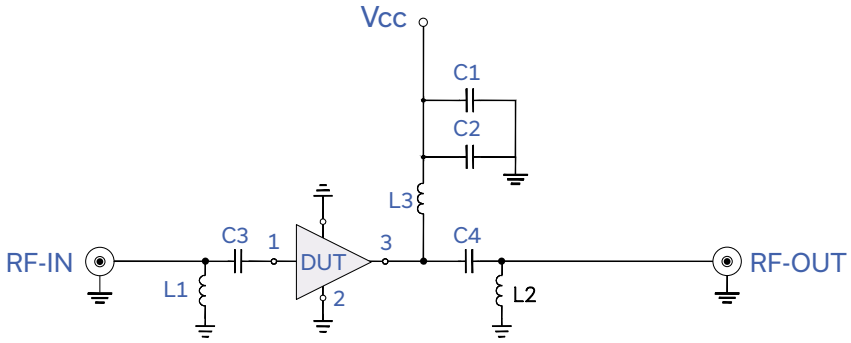
(4) Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation unless specified.

SIMPLIFIED SCHEMATIC AND PIN DESCRIPTION



Function	Pin Number	Description
RF IN	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	3	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig. 2
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

CHARACTERIZATION TEST AND APPLICATION CIRCUIT



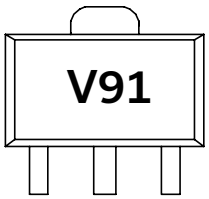
Component	TB-753+ 896-960 MHz		TB-752+ 2110-2170 MHz	
	Value	Size	Value	Size
DUT	GVA-91+	—	GVA-91+	—
C1	1.0 µF	0402	1.0 µF	0402
C2	100 pF		22 pF	
C3	8.2 pF		1.5 pF	
C4	6.2 pF		1.8 pF	
L1	2.7 nH		1.2 nH	
L2	5.6 nH		1.8 nH	
L3	33 nH		18 nH	

Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-753+(869-960 MHz) and TB-752+(2110-2170 MHz)

Gain, Return loss, Output power at 1dB compression (P1 dB) , output IP3 (OIP3) and noise figure measured using Agi lent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 20 dBm/tone at output.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

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

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DF782 (SOT 89) Plastic package, exposed paddle lead finish: Matte-tin
Tape & Reel **Standard quantities available on reel**	F55 7" reels with 20, 50, 100, 200, 500 or 1K devices
Suggested Layout for PCB Design	PL-370
Evaluation Board	TB-753+ (869-960 MHz) TB-752+ (2110-2140 MHz)
Environmental Ratings	ENV08T1

ESD RATING

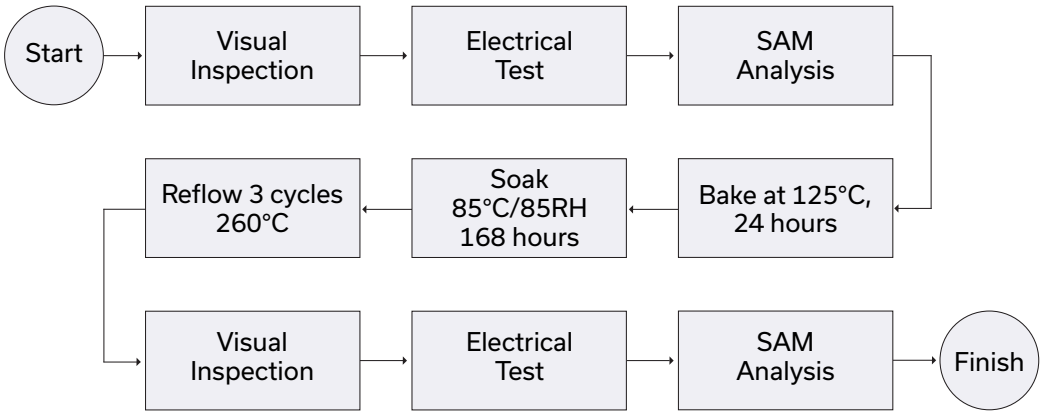
Human Body Model (HBM): Class 2 (2000 to <4000V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (50 to <100V) in accordance with ANSI/ESD STM5.2-2009

MSL RATING

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

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/MCLStore/terms.jsp

MMIC Amplifier GVA-91+

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)

900 MHz Match

TEST CONDITIONS: Vd = 5V, Id = 161.8 mA @ Temperature = +25degC

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)
800.00	19.82	37.08	6.62	13.21	2.80	1.14	40.38	30.25	7.02
820.00	20.27	36.45	8.23	14.71	2.75	1.08	39.48	30.21	6.80
840.00	20.61	35.99	10.26	16.68	2.72	1.03	39.43	29.55	6.67
860.00	20.82	35.25	12.66	19.32	2.57	1.00	39.41	29.45	6.56
869.00	20.87	35.22	13.62	20.65	2.59	0.99	39.38	29.23	6.52
880.00	20.89	35.04	14.33	21.94	2.55	0.99	39.04	29.27	6.60
900.00	20.81	34.82	13.58	21.20	2.49	0.99	38.93	28.83	6.59
920.00	20.61	34.88	11.29	17.91	2.48	1.01	39.48	28.66	6.59
960.00	19.88	35.27	7.39	12.67	2.45	1.06	40.26	27.95	6.89
980.00	19.41	35.42	6.09	10.96	2.40	1.08	40.40	27.68	6.94
1000.00	18.89	35.75	5.08	9.65	2.39	1.10	40.16	27.21	7.07

2100 MHz Match

TEST CONDITIONS: Vd = 5V, Id = 160.17 mA @ Temperature = +25degC

2000.00	15.47	30.55	6.56	12.46	2.26	1.09	39.48	29.70	4.70
2020.00	15.81	30.06	7.86	12.97	2.22	1.04	39.88	29.66	4.49
2040.00	16.10	29.76	9.56	13.67	2.22	0.99	40.69	29.37	4.36
2060.00	16.30	29.34	11.71	14.40	2.17	0.96	41.58	28.78	4.29
2080.00	16.42	29.11	14.20	15.09	2.16	0.94	42.55	28.69	4.25
2100.00	16.45	28.90	15.83	15.35	2.12	0.93	43.22	28.59	4.22
2110.00	16.42	28.95	15.65	15.17	2.14	0.93	43.54	28.27	4.22
2140.00	16.20	28.91	12.31	13.88	2.10	0.95	46.54	28.10	4.27
2170.00	15.78	29.03	9.10	11.93	2.07	0.97	45.04	27.69	4.41
2180.00	15.61	29.22	8.25	11.29	2.08	0.98	48.10	27.58	4.48
2200.00	15.21	29.53	6.86	10.12	2.08	1.00	41.11	27.10	4.56

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id =145.86 mA @ Temperature = +25degC									
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)**
800.00	19.70	36.77	6.44	13.00	2.71	1.14	40.03	29.73	6.82
820.00	20.17	36.12	8.00	14.44	2.65	1.08	39.44	29.70	6.58
840.00	20.52	35.45	10.02	16.29	2.57	1.03	39.69	29.01	6.47
860.00	20.76	35.06	12.49	18.67	2.53	1.00	40.08	28.92	6.34
869.00	20.81	34.71	13.57	19.82	2.46	0.99	40.37	28.65	6.30
880.00	20.85	34.63	14.49	20.78	2.45	0.98	39.84	28.75	6.41
900.00	20.79	34.47	14.03	20.06	2.42	0.98	39.70	28.31	6.40
920.00	20.59	34.34	11.68	17.18	2.36	0.99	40.49	28.10	6.33
960.00	19.88	34.63	7.57	12.28	2.31	1.04	40.40	27.43	6.62
980.00	19.40	34.79	6.21	10.64	2.27	1.06	40.40	27.15	6.60
1000.00	18.88	35.24	5.17	9.37	2.28	1.07	39.13	26.72	6.79

2100 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id =144.19 mA @ Temperature = +25degC									
2000.00	15.42	30.37	6.41	12.75	2.21	1.10	39.02	29.34	4.52
2020.00	15.77	29.85	7.68	13.31	2.17	1.05	39.41	29.29	4.34
2040.00	16.06	29.43	9.33	14.04	2.15	1.00	40.25	28.98	4.19
2060.00	16.27	29.12	11.41	14.78	2.13	0.96	41.41	28.34	4.09
2080.00	16.39	28.80	13.80	15.44	2.10	0.94	42.71	28.30	4.05
2100.00	16.43	28.76	15.47	15.55	2.10	0.93	43.76	28.15	4.04
2110.00	16.40	28.58	15.41	15.32	2.06	0.93	44.48	27.83	4.02
2140.00	16.19	28.75	12.29	13.76	2.07	0.94	53.51	27.66	4.05
2170.00	15.76	28.96	9.10	11.70	2.06	0.97	41.59	27.25	4.28
2180.00	15.58	29.07	8.25	11.06	2.05	0.97	44.47	27.13	4.24
2200.00	15.18	29.35	6.86	9.87	2.05	0.99	38.95	26.65	4.33

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 178.41 mA @ Temperature = +25degC									
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)**
800.00	19.91	37.33	6.78	13.32	2.89	1.13	40.68	30.62	7.25
820.00	20.35	36.89	8.41	14.81	2.88	1.08	39.55	30.64	6.98
840.00	20.67	36.17	10.47	16.86	2.77	1.03	39.29	29.97	6.86
860.00	20.86	35.82	12.79	19.69	2.73	1.00	39.08	29.87	6.79
869.00	20.90	35.45	13.63	21.28	2.65	0.99	38.91	29.68	6.75
880.00	20.92	35.43	14.16	22.98	2.65	0.99	38.68	29.73	6.85
900.00	20.83	35.20	13.18	22.56	2.58	1.00	38.54	29.29	6.80
920.00	20.61	35.23	10.97	18.79	2.56	1.02	38.97	29.08	6.84
960.00	19.88	35.55	7.24	13.13	2.51	1.08	39.87	28.38	7.14
980.00	19.40	35.64	5.98	11.35	2.45	1.10	40.06	28.10	7.20
1000.00	18.89	36.08	5.01	9.98	2.46	1.12	40.43	27.67	7.37

2100 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 176.59 mA @ Temperature = +25degC									
2000.00	15.50	30.74	6.69	12.16	2.30	1.08	40.11	30.19	4.89
2020.00	15.84	30.25	8.04	12.66	2.26	1.03	40.50	30.16	4.68
2040.00	16.12	29.88	9.78	13.33	2.24	0.99	41.12	29.86	4.55
2060.00	16.32	29.58	11.99	14.06	2.23	0.95	41.73	29.22	4.48
2080.00	16.43	29.27	14.57	14.78	2.19	0.93	42.45	29.19	4.44
2100.00	16.46	29.18	16.18	15.15	2.18	0.93	42.88	29.09	4.41
2110.00	16.43	29.03	15.89	15.08	2.15	0.93	43.04	28.76	4.42
2140.00	16.21	29.13	12.34	14.03	2.14	0.95	44.57	28.54	4.46
2170.00	15.79	29.30	9.11	12.19	2.12	0.98	49.12	28.18	4.65
2180.00	15.62	29.43	8.25	11.57	2.12	1.00	46.86	28.07	4.70
2200.00	15.23	29.71	6.86	10.38	2.12	1.02	43.59	27.53	4.79

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 5V, Id =146.75 mA @ Temperature = -45degC									
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)**
800.00	20.54	37.29	6.51	14.65	2.65	1.16	39.48	30.85	5.96
820.00	20.99	36.54	8.13	16.42	2.57	1.10	38.50	30.77	5.75
840.00	21.32	35.85	10.27	18.70	2.49	1.04	38.22	29.98	5.62
860.00	21.52	35.49	12.89	21.30	2.46	1.00	38.07	29.84	5.50
869.00	21.56	35.35	14.02	22.07	2.44	0.99	37.76	29.60	5.46
880.00	21.58	35.15	14.92	21.83	2.40	0.98	37.68	29.63	5.58
900.00	21.49	34.93	14.08	18.92	2.35	0.97	37.63	29.16	5.52
920.00	21.26	34.99	11.52	15.72	2.33	0.99	37.96	28.98	5.55
960.00	20.48	35.31	7.37	11.25	2.28	1.02	38.88	28.24	5.84
980.00	19.98	35.53	6.03	9.79	2.25	1.04	39.10	27.96	5.83
1000.00	19.44	35.87	5.01	8.63	2.23	1.05	39.46	27.56	6.03

2100 MHz Match									
TEST CONDITIONS: Vd = 5V, Id =145.44 mA @ Temperature = -45degC									
2000.00	16.13	30.41	6.01	12.58	2.02	1.11	38.69	30.33	3.75
2020.00	16.47	29.89	7.20	12.93	1.99	1.05	39.09	30.25	3.56
2040.00	16.77	29.43	8.72	13.44	1.96	1.00	39.81	29.89	3.42
2060.00	16.98	29.09	10.64	13.98	1.95	0.95	40.45	29.29	3.35
2080.00	17.12	28.81	12.86	14.45	1.93	0.92	41.05	29.20	3.31
2100.00	17.15	28.65	14.56	14.53	1.91	0.91	41.52	29.05	3.29
2110.00	17.13	28.56	14.68	14.31	1.90	0.91	41.72	28.71	3.29
2140.00	16.92	28.61	12.06	12.98	1.89	0.92	42.95	28.47	3.31
2170.00	16.48	28.77	8.98	11.09	1.86	0.94	45.41	28.05	3.53
2180.00	16.30	28.96	8.12	10.46	1.87	0.95	44.59	27.98	3.52
2200.00	15.88	29.29	6.71	9.33	1.87	0.97	42.98	27.42	3.60

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id =131.44 mA @ Temperature = -45degC									
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)**
800.00	20.41	36.90	6.33	14.26	2.54	1.16	39.66	30.41	5.78
820.00	20.87	36.17	7.91	15.92	2.48	1.10	38.80	30.29	5.56
840.00	21.22	35.52	10.01	17.98	2.41	1.04	38.69	29.50	5.42
860.00	21.45	35.12	12.68	20.19	2.37	1.00	38.69	29.33	5.32
869.00	21.50	34.87	13.92	20.85	2.33	0.98	38.51	29.09	5.28
880.00	21.52	34.73	15.07	20.65	2.31	0.97	38.33	29.13	5.41
900.00	21.45	34.56	14.58	18.29	2.28	0.96	38.25	28.66	5.32
920.00	21.23	34.60	11.93	15.32	2.26	0.97	38.71	28.47	5.32
960.00	20.47	34.78	7.55	11.01	2.18	1.00	39.45	27.77	5.59
980.00	19.97	35.15	6.14	9.57	2.18	1.02	39.58	27.49	5.61
1000.00	19.43	35.21	5.08	8.44	2.11	1.03	39.46	27.04	5.76

2100 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id =130.48 mA @ Temperature = -45degC									
2000.00	16.03	30.16	5.90	12.85	1.98	1.12	38.42	29.87	3.61
2020.00	16.38	29.81	7.06	13.23	1.98	1.06	38.82	29.79	3.41
2040.00	16.68	29.27	8.54	13.78	1.94	1.00	39.59	29.43	3.27
2060.00	16.91	28.87	10.42	14.35	1.92	0.96	40.54	28.77	3.24
2080.00	17.04	28.68	12.58	14.80	1.92	0.93	41.34	28.74	3.17
2100.00	17.09	28.44	14.28	14.79	1.89	0.91	42.08	28.59	3.18
2110.00	17.07	28.38	14.43	14.53	1.88	0.91	42.48	28.20	3.14
2140.00	16.86	28.49	12.02	12.97	1.88	0.92	45.02	27.96	3.18
2170.00	16.42	28.70	8.97	10.97	1.86	0.93	44.48	27.55	3.40
2180.00	16.24	28.81	8.11	10.34	1.85	0.94	45.82	27.47	3.35
2200.00	15.82	29.14	6.71	9.20	1.86	0.96	40.60	26.91	3.43

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 163.05 mA @ Temperature = -45degC									
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)**
800.00	20.65	37.47	6.67	14.88	2.71	1.15	39.18	31.29	6.16
820.00	21.08	36.75	8.34	16.75	2.63	1.09	38.20	31.22	5.93
840.00	21.39	36.28	10.48	19.21	2.60	1.04	37.86	30.46	5.82
860.00	21.57	35.79	13.05	22.24	2.53	1.00	37.61	30.32	5.72
869.00	21.61	35.66	14.06	23.29	2.52	0.99	37.25	30.03	5.67
880.00	21.62	35.54	14.73	23.11	2.49	0.99	37.23	30.11	5.82
900.00	21.51	35.34	13.65	19.74	2.44	0.99	37.21	29.67	5.74
920.00	21.27	35.35	11.17	16.23	2.41	1.00	37.41	29.45	5.77
960.00	20.49	35.68	7.22	11.56	2.35	1.04	38.30	28.72	6.09
980.00	19.99	35.86	5.93	10.04	2.31	1.06	38.57	28.44	6.11
1000.00	19.45	36.16	4.94	8.86	2.29	1.07	39.00	28.00	6.31

2100 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 161.63 mA @ Temperature = -45degC									
2000.00	16.19	30.47	6.12	12.33	2.03	1.10	39.05	30.76	3.90
2020.00	16.54	30.02	7.33	12.65	2.01	1.04	39.38	30.69	3.71
2040.00	16.82	29.66	8.90	13.13	2.00	0.99	39.93	30.38	3.56
2060.00	17.04	29.22	10.87	13.67	1.97	0.95	40.35	29.73	3.51
2080.00	17.16	29.03	13.14	14.18	1.96	0.92	40.78	29.65	3.47
2100.00	17.20	28.82	14.87	14.34	1.94	0.91	41.09	29.55	3.46
2110.00	17.17	28.79	14.93	14.19	1.93	0.91	41.16	29.16	3.43
2140.00	16.96	28.82	12.13	13.05	1.92	0.92	41.84	28.96	3.48
2170.00	16.52	29.03	9.00	11.23	1.90	0.95	43.49	28.55	3.73
2180.00	16.34	29.10	8.13	10.64	1.89	0.96	43.09	28.42	3.71
2200.00	15.93	29.37	6.72	9.51	1.88	0.98	44.29	27.91	3.77

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 5V, Id = 162.5 mA @ Temperature = +85degC									
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)**
800.00	19.26	36.88	6.71	12.29	2.91	1.12	40.07	29.77	7.59
820.00	19.71	36.25	8.31	13.62	2.85	1.06	39.85	29.81	7.33
840.00	20.05	35.63	10.30	15.38	2.77	1.02	40.29	29.19	7.25
860.00	20.27	35.32	12.60	17.75	2.74	1.00	40.93	29.11	7.16
869.00	20.32	34.90	13.48	19.09	2.64	0.99	41.34	28.90	7.11
880.00	20.35	34.81	14.10	20.64	2.63	0.99	40.86	28.96	7.21
900.00	20.29	34.52	13.32	21.76	2.55	1.00	40.69	28.54	7.22
920.00	20.10	34.64	11.18	19.24	2.56	1.02	41.51	28.39	7.19
960.00	19.41	34.83	7.42	13.72	2.48	1.07	41.32	27.72	7.42
980.00	18.95	35.03	6.13	11.87	2.45	1.10	41.19	27.40	7.47
1000.00	18.46	35.38	5.14	10.44	2.45	1.12	39.95	26.99	7.64

2100 MHz Match									
TEST CONDITIONS: Vd = 5V, Id = 160.09 mA @ Temperature = +85degC									
2000.00	14.93	30.58	6.82	12.24	2.41	1.08	39.30	29.36	5.28
2020.00	15.28	30.17	8.19	12.88	2.39	1.04	39.78	29.35	5.07
2040.00	15.57	29.70	9.97	13.70	2.34	0.99	40.70	29.06	4.95
2060.00	15.78	29.44	12.28	14.62	2.33	0.96	41.61	28.50	4.87
2080.00	15.90	29.16	14.98	15.56	2.30	0.94	42.69	28.46	4.82
2100.00	15.93	28.97	16.72	16.10	2.27	0.94	43.54	28.37	4.81
2110.00	15.90	28.89	16.40	16.07	2.25	0.94	44.20	27.99	4.79
2140.00	15.70	29.00	12.62	14.90	2.25	0.96	47.85	27.89	4.85
2170.00	15.29	29.16	9.29	12.84	2.22	0.99	42.54	27.50	4.99
2180.00	15.12	29.32	8.42	12.14	2.23	1.01	46.01	27.39	5.04
2200.00	14.74	29.49	7.01	10.88	2.21	1.03	39.87	26.87	5.13

Typical Performance Data

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

900 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id = 147.89 mA @ Temperature = +85degC									
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)**
800.00	19.18	36.48	6.53	12.19	2.78	1.12	39.53	29.35	7.38
820.00	19.65	35.78	8.09	13.49	2.70	1.07	39.55	29.34	7.16
840.00	20.01	35.18	10.07	15.20	2.63	1.02	40.29	28.71	7.03
860.00	20.25	34.67	12.45	17.41	2.56	0.99	41.69	28.65	6.93
869.00	20.30	34.55	13.46	18.57	2.55	0.98	42.95	28.39	6.89
880.00	20.34	34.49	14.28	19.86	2.55	0.98	42.12	28.49	6.99
900.00	20.29	34.16	13.78	20.49	2.46	0.98	41.88	28.07	6.94
920.00	20.11	34.26	11.57	18.23	2.46	1.00	42.45	27.88	6.92
960.00	19.43	34.58	7.59	13.19	2.42	1.06	40.53	27.19	7.13
980.00	18.98	34.68	6.25	11.44	2.37	1.08	40.35	26.92	7.21
1000.00	18.48	34.97	5.22	10.07	2.35	1.10	38.49	26.50	7.35

2100 MHz Match									
TEST CONDITIONS: Vd = 4.75V, Id = 145.79 mA @ Temperature = +85degC									
2000.00	14.87	30.46	6.69	12.53	2.39	1.09	38.95	28.89	5.12
2020.00	15.22	30.01	8.03	13.20	2.36	1.04	39.35	28.93	4.93
2040.00	15.51	29.56	9.75	14.10	2.32	1.00	40.23	28.64	4.81
2060.00	15.73	29.19	11.98	15.06	2.28	0.97	41.32	28.01	4.71
2080.00	15.85	28.95	14.63	16.00	2.26	0.95	42.40	27.97	4.66
2100.00	15.89	28.77	16.42	16.45	2.24	0.94	43.37	27.88	4.66
2110.00	15.86	28.78	16.21	16.32	2.24	0.94	44.13	27.51	4.63
2140.00	15.66	28.79	12.63	14.84	2.22	0.96	44.79	27.36	4.67
2170.00	15.26	28.98	9.31	12.62	2.19	0.99	39.94	27.02	4.86
2180.00	15.09	29.10	8.44	11.92	2.19	1.00	42.41	26.91	4.85
2200.00	14.70	29.31	7.02	10.64	2.18	1.02	38.03	26.39	4.94

Typical Performance Data

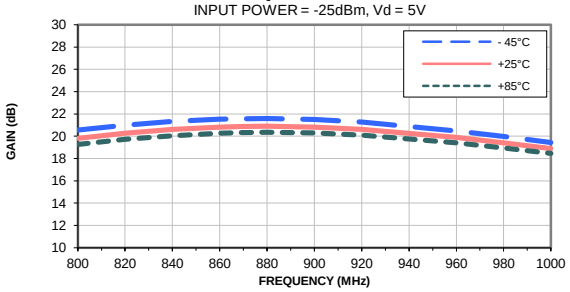
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

900 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 176.96 mA @ Temperature = +85degC									
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)**
800.00	19.31	37.20	6.86	12.29	3.03	1.11	40.63	30.14	7.81
820.00	19.75	36.64	8.49	13.63	2.99	1.06	40.18	30.24	7.57
840.00	20.07	35.97	10.50	15.41	2.88	1.02	40.33	29.66	7.46
860.00	20.28	35.62	12.70	17.89	2.83	1.00	40.53	29.58	7.37
869.00	20.32	35.41	13.48	19.29	2.79	0.99	40.59	29.37	7.33
880.00	20.34	35.25	13.92	21.14	2.76	0.99	40.26	29.46	7.47
900.00	20.26	35.02	12.97	23.06	2.69	1.01	40.12	29.04	7.48
920.00	20.06	35.10	10.86	20.43	2.68	1.03	40.71	28.85	7.40
960.00	19.37	35.43	7.26	14.35	2.64	1.10	41.27	28.18	7.70
980.00	18.92	35.43	6.03	12.35	2.55	1.12	41.34	27.87	7.75
1000.00	18.43	35.65	5.07	10.87	2.52	1.14	40.99	27.46	7.92

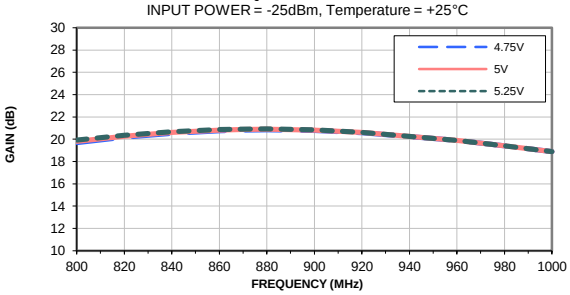
2100 MHz Match									
TEST CONDITIONS: Vd = 5.25V, Id = 174.09 mA @ Temperature = +85degC									
2000.00	14.96	30.80	6.95	11.95	2.47	1.08	39.82	29.75	5.44
2020.00	15.31	30.31	8.35	12.56	2.42	1.03	40.34	29.82	5.25
2040.00	15.59	29.94	10.17	13.34	2.40	0.99	41.22	29.53	5.10
2060.00	15.79	29.64	12.54	14.22	2.38	0.96	41.96	28.97	5.02
2080.00	15.91	29.43	15.33	15.14	2.36	0.94	42.90	28.93	4.99
2100.00	15.94	29.26	17.01	15.83	2.34	0.94	43.55	28.84	4.96
2110.00	15.91	29.23	16.59	15.87	2.33	0.94	43.96	28.52	4.97
2140.00	15.71	29.21	12.62	15.02	2.30	0.97	46.75	28.37	5.01
2170.00	15.30	29.39	9.28	13.10	2.27	1.00	46.14	27.97	5.25
2180.00	15.14	29.49	8.41	12.42	2.27	1.02	53.18	27.87	5.25
2200.00	14.76	29.75	7.00	11.17	2.27	1.04	42.20	27.35	5.32

Typical Performance Curves (900 MHz Match)

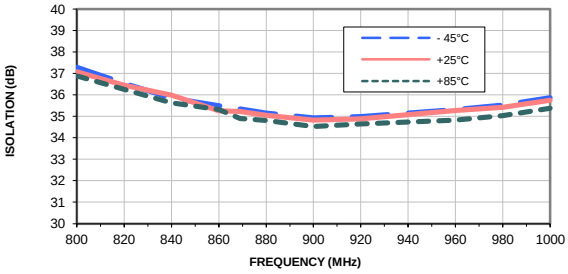
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



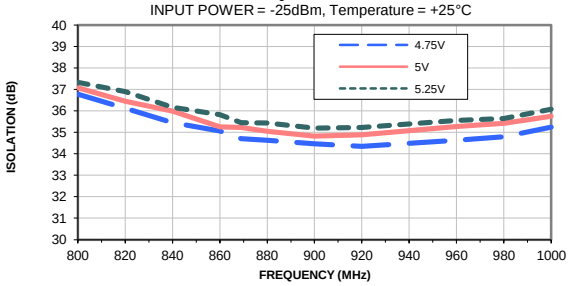
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



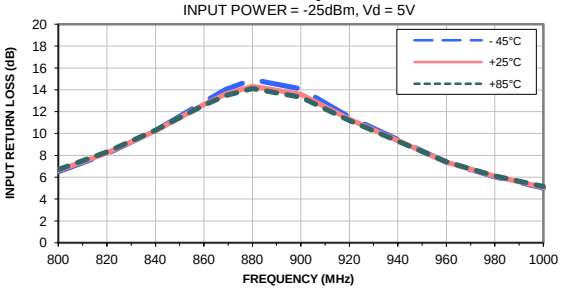
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



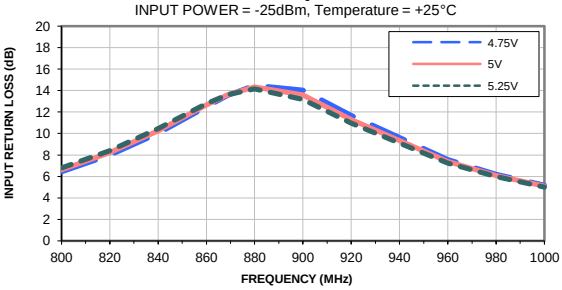
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



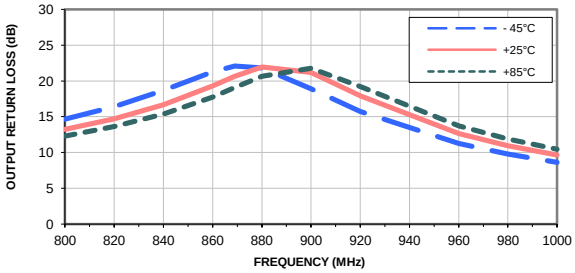
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



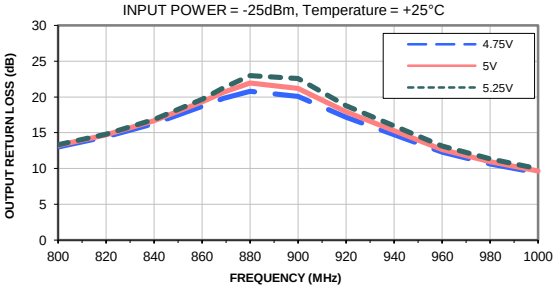
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V

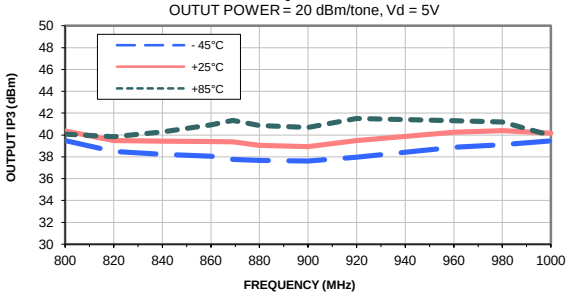


OUTPUT RETURN LOSS vs. DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C

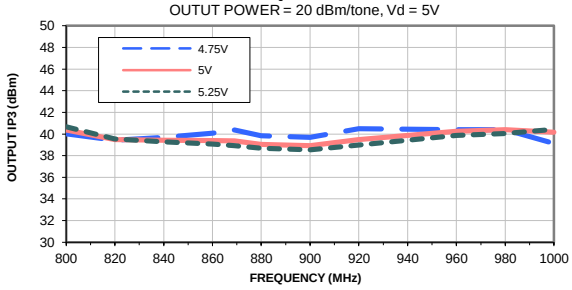


Typical Performance Curves (900 MHz Match)

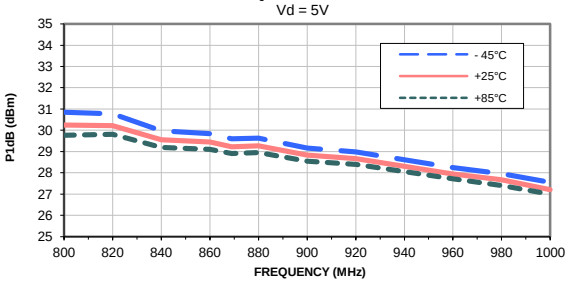
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
OUTUT POWER = 20 dBm/tone, Vd = 5V



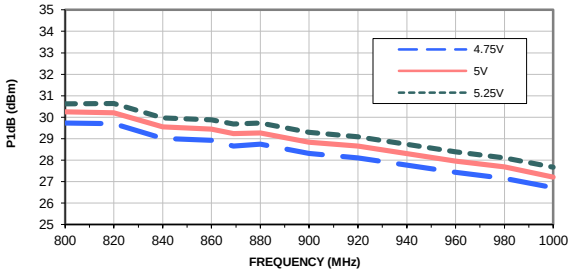
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
OUTUT POWER = 20 dBm/tone, Vd = 5V



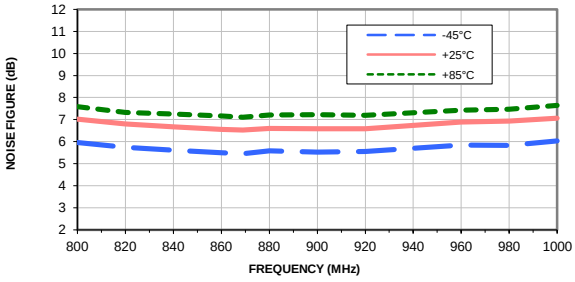
P1dB vs. FREQUENCY & TEMPERATURE
Vd = 5V



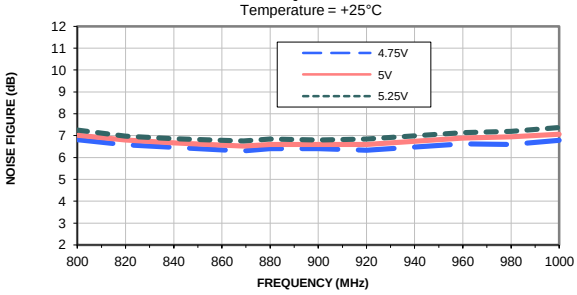
P1dB vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



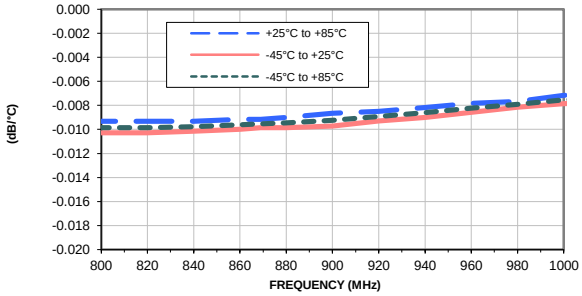
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
Vd = 5V



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

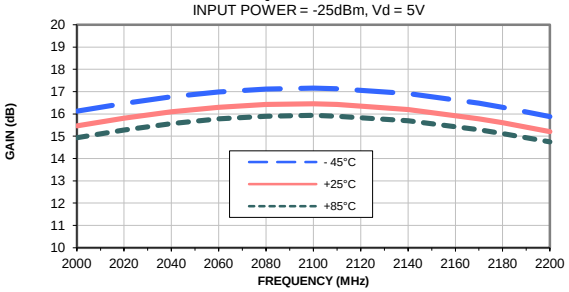


GAIN VARIATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V

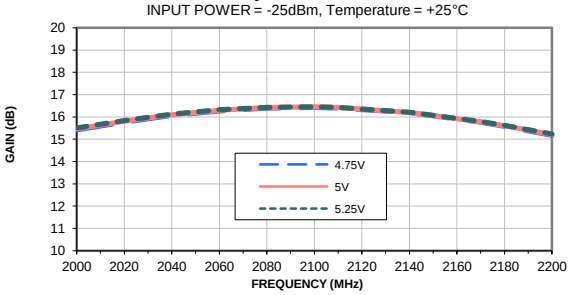


Typical Performance Curves (2100 MHz Match)

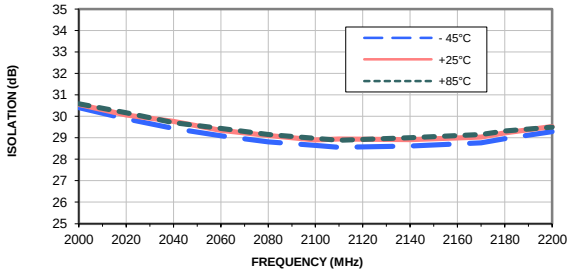
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



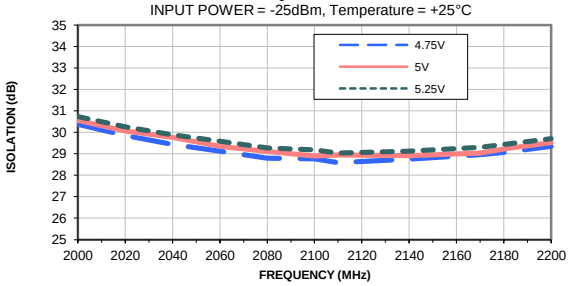
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



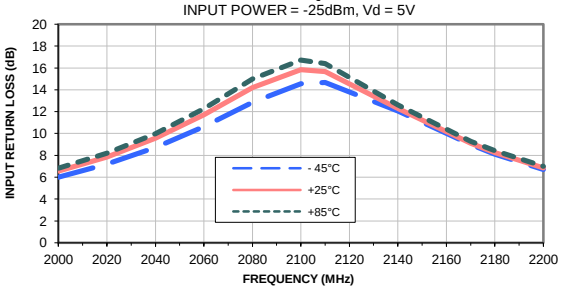
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



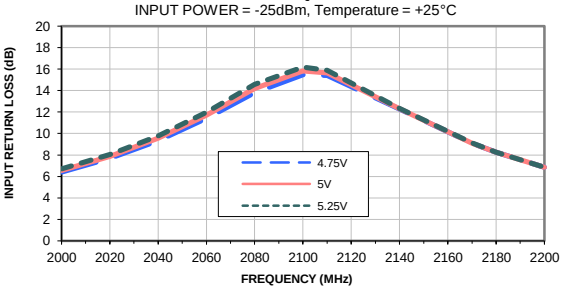
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



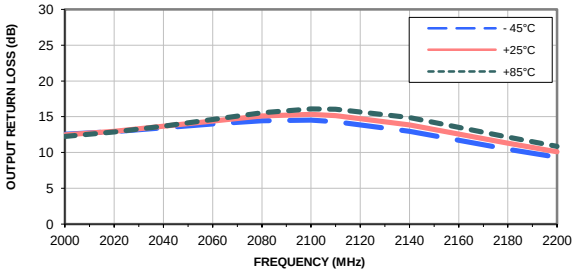
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



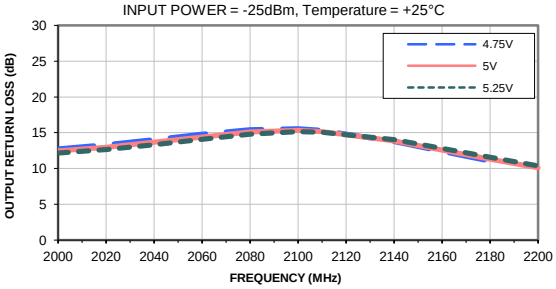
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V

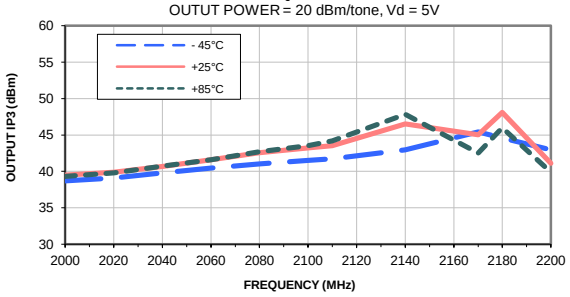


OUTPUT RETURN LOSS vs. DEVICE VOLTAGE
INPUT POWER = -25dBm, Temperature = +25°C

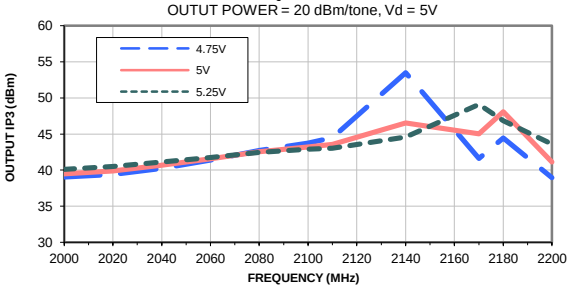


Typical Performance Curves (2100 MHz Match)

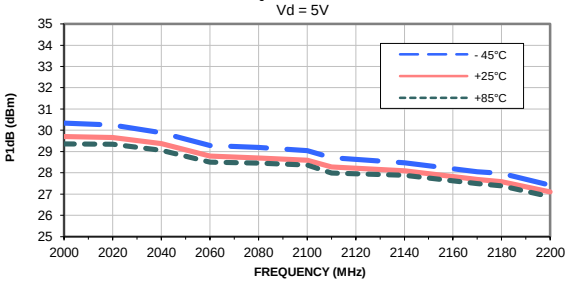
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
OUTUT POWER = 20 dBm/tone, Vd = 5V



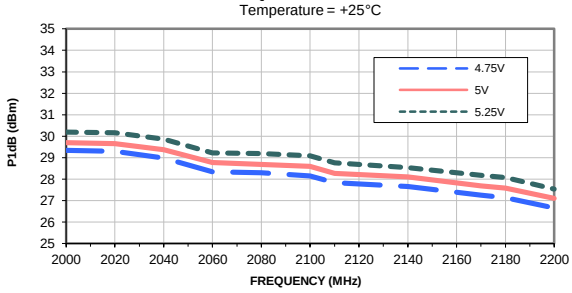
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
OUTUT POWER = 20 dBm/tone, Vd = 5V



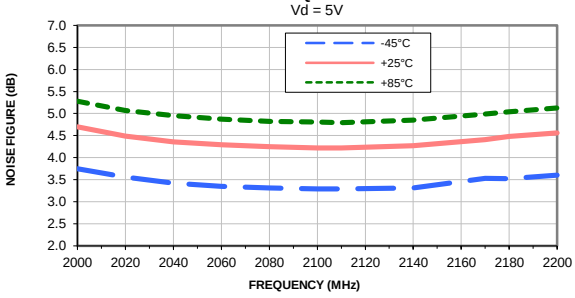
P1dB vs. FREQUENCY & TEMPERATURE
Vd = 5V



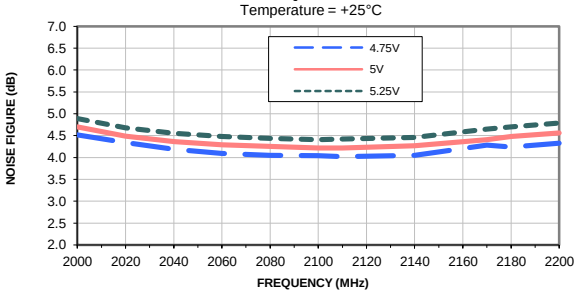
P1dB vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



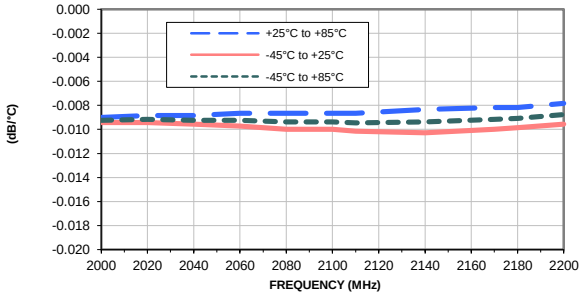
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
Vd = 5V



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



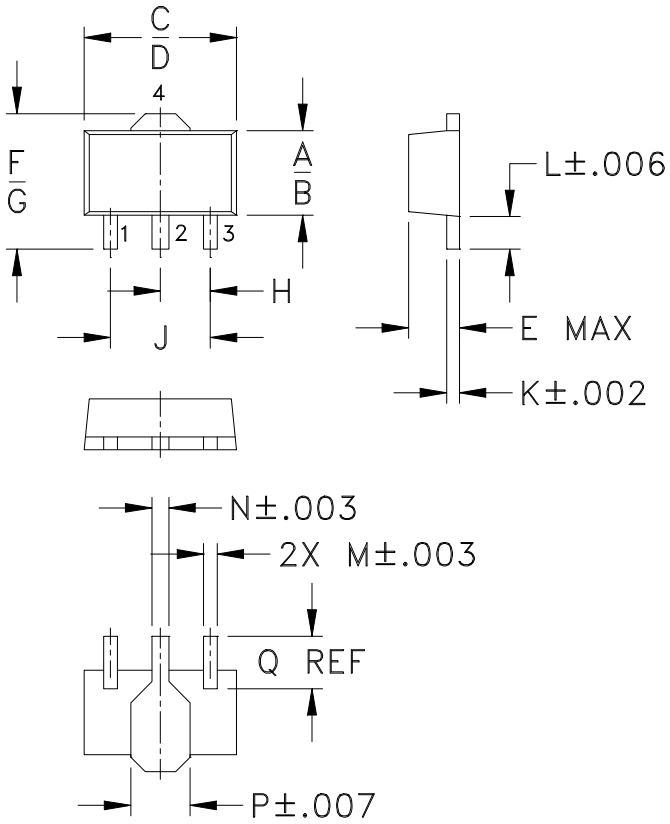
GAIN VARIATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25dBm, Vd = 5V



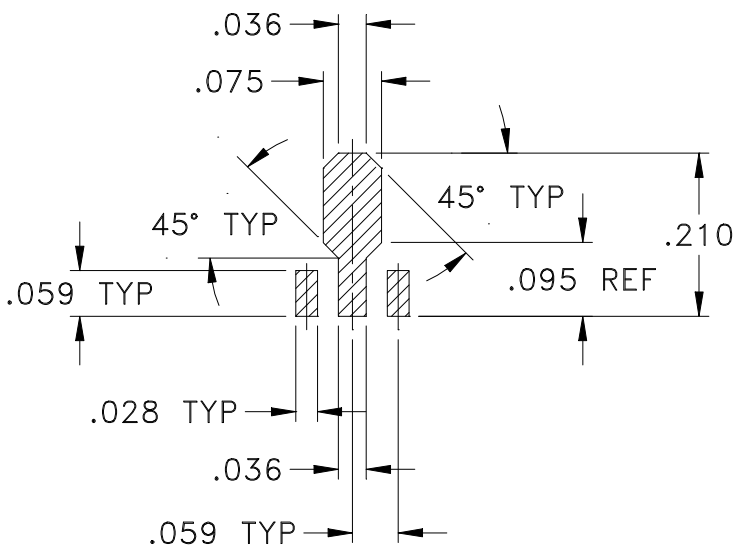
Case Style DF

DF782

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
DF782	.102 (2.59)	.090 (2.29)	.181 (4.60)	.173 (4.39)	.063 (1.60)	.167 (4.24)	.155 (3.94)	.059 (1.50)	.118 (3.00)	.015 (0.38)	.041 (1.04)	.016 (0.41)

CASE #	N	P	Q	WT. GRAM
DF782	.019 (0.48)	.065 (1.65)	.062 (1.57)	.2

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

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin.
   All models, (+) suffix. See model Data sheet.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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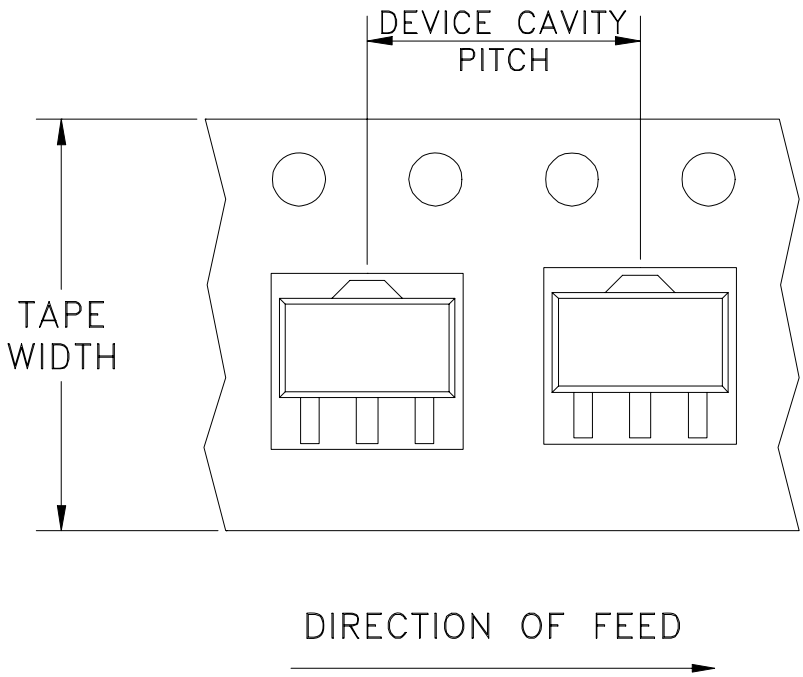
Tape & Reel Packaging TR-F55

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standard (see note)	20
				50
				100
				200
				500
			Standard	1000

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

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

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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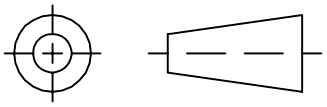
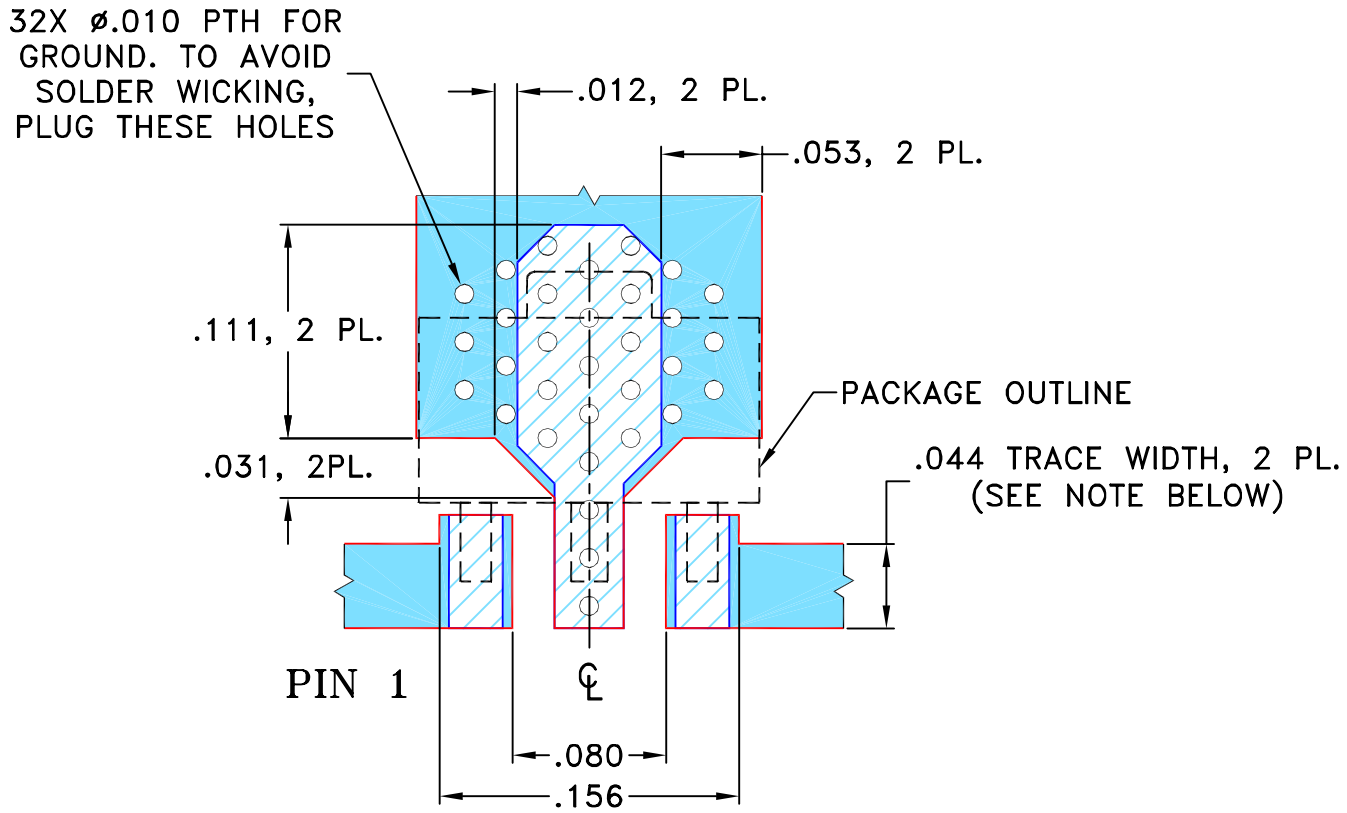
THIRD ANGLE PROJECTION



REVISIONS

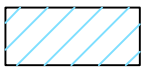
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M137326	NEW RELEASE	07/10/12	PW	DJ

SUGGESTED MOUNTING CONFIGURATION FOR DF782 CASE STYLE, "04AM03" PIN CODE



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	PW	06/01/12
TOLERANCES ON:	CHECKED	IL	07/10/12
2 PL DECIMALS ±	APPROVED	DJ	07/10/12
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

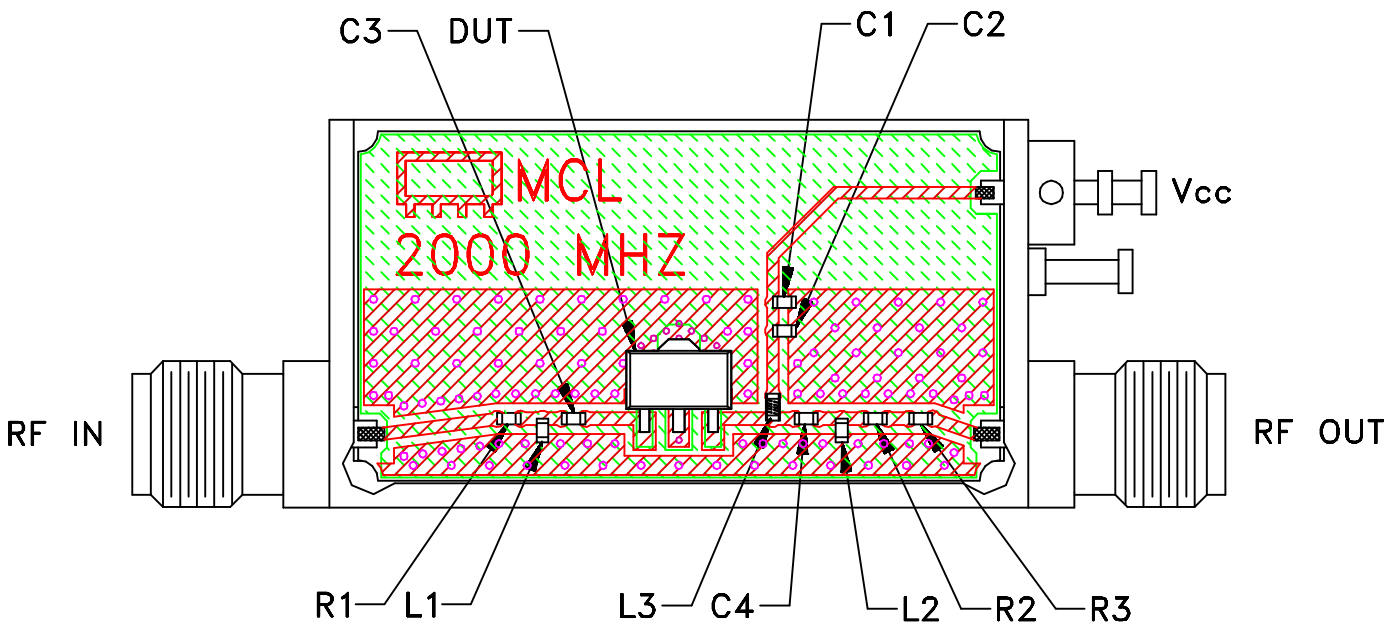
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 04AM03, DF782, TB-678-105+

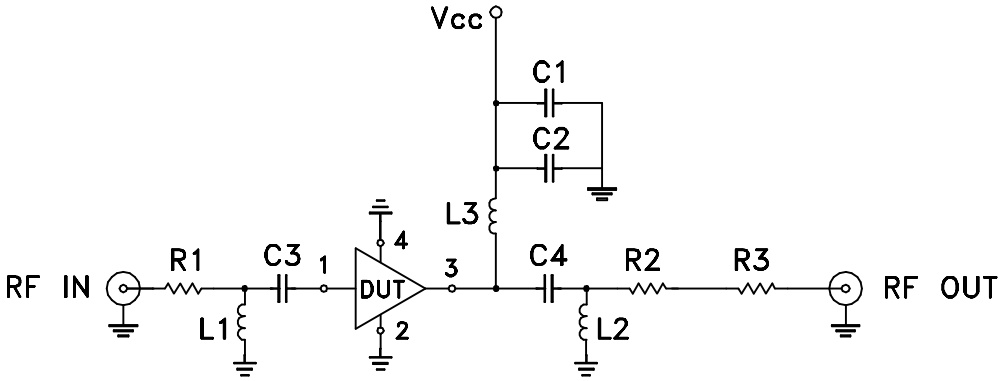
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-370	OR

FILE:	SCALE:	SHEET:
98PL370	10:1	1 OF 1

Evaluation Board and Circuit



TB-752+



COMPONENT	VALUE	SIZE
DUT	GVA-91+	0402
C1	1.0 uF	
C2	22 pF	
C3	1.5 pF	
C4	1.8 pF	
R1,R2,R3	0 Ohm	
L1	1.2 nH	
L2	1.8 nH	
L3	18 nH	

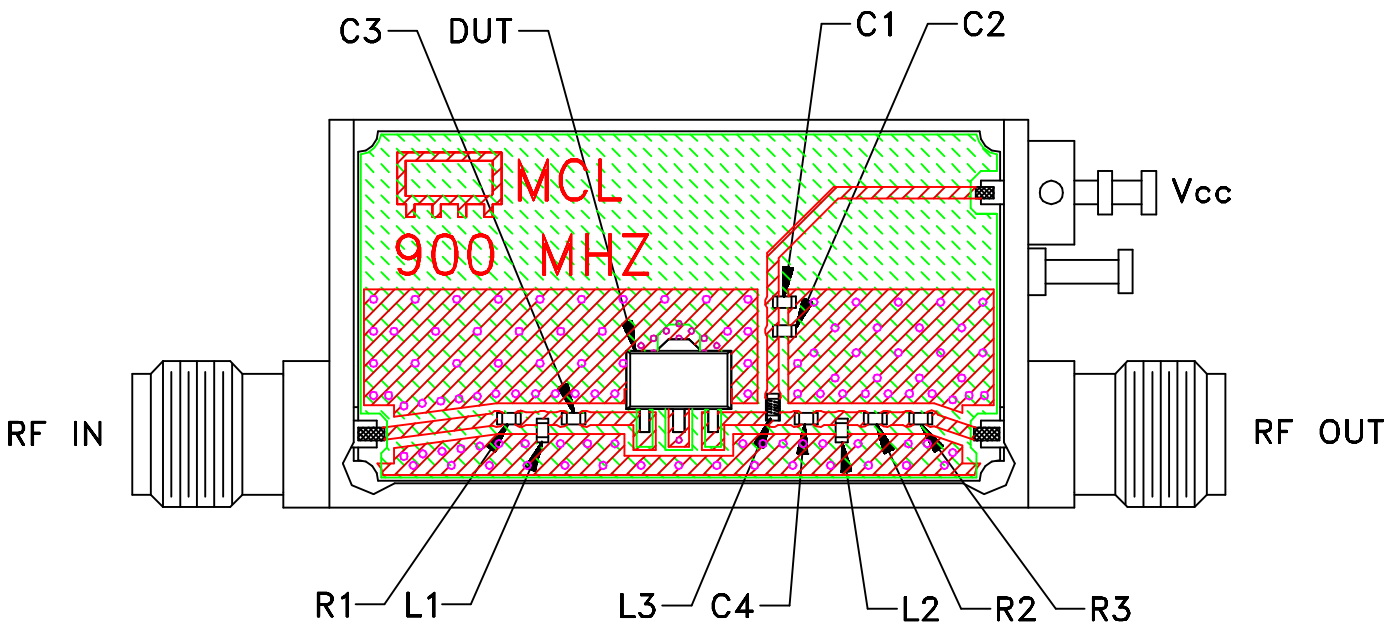
Schematic Diagram

Notes:

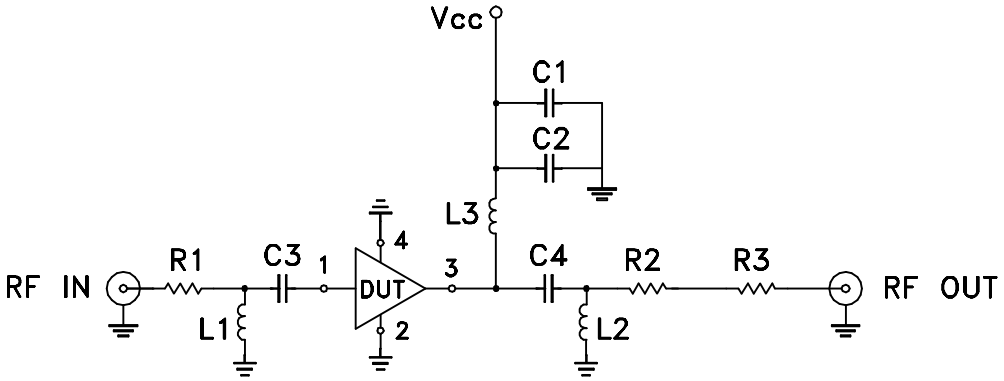
1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

Mini-Circuits®

Evaluation Board and Circuit



TB-753+



COMPONENT	VALUE	SIZE
DUT	GVA-91+	0402
C1	1.0 uF	
C2	100 pF	
C3	8.2 pF	
C4	6.2 pF	
R1,R2,R3	0 Ohm	
L1	2.7 nH	
L2	5.6 nH	
L3	33 nH	

Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

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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 Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether +	MIL-STD-202, Method 215

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
	monoethanolamine at 63°C to 70°C	