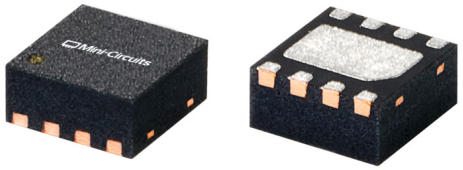
MMIC SURFACE MOUNT

Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

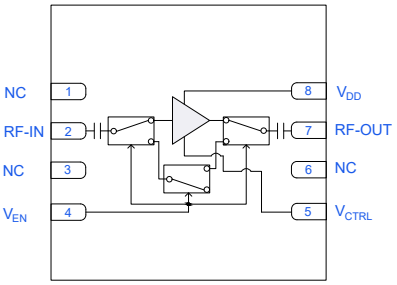
THE BIG DEAL

- Wideband, 500 to 5000MHz
- Very Fast Bypass Switching
- Low Noise Figure, Typ. 1.2dB
- High Gain, Typ. 21.7dB
- High IP3 in Bypass, Typ. +47 dBm
- Minimal External Circuitry
- 2x2mm 8-lead QFN-Style Package



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

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

PRODUCT OVERVIEW

Mini-Circuits' TSS2-53LNB+ is an advanced low noise amplifier, fabricated using E-pHEMT technology and offering extremely high dynamic range over a broad frequency range. It has integrated switches enabling users to bypass the amplifier during high signal conditions. In addition, the TSS2-53LNB+ provides excellent input and output return loss over a broad frequency range using minimal external matching components. It is enclosed in a compact 2x2mm 8-lead QFN-style package with ground paddle for good thermal performance.

KEY FEATURES

Features	Advantages
Wideband, 500 to 5000MHz	Ideal for a wide range of receiver applications including defense, communication, and test and measurement equipment. Effective for broadband or multi-band applications. Just one, cost-efficient model required for multiple frequency usage.
Minimal External Matching	Minimizes the need for external matching networks, simplifying circuit designs and enabling the amplifier to operate over multiple bands in a single application circuit.
High Dynamic Range	Low noise figure and high IP3 enable minimal signal degradation in active mode and enhanced linearity in bypass mode under high signal conditions.
Internal Bypass Switch Feature	Unique design handles low to high signal levels with minimal noise distortion.
Built-in DC Blocking Cap at RF-Out Port & Separate pads for RF-Out & V_{DD}	Simplifies biasing and eliminates need for bias-tee at output.
Compact Size, 2x2x0.9mm	Saves space in dense system layouts. Low inductance, repeatable transitions, and excellent thermal contact.

Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

ELECTRICAL SPECIFICATIONS[1] AT +25°C, Zo = 50Ω AND V_{DD} = +5V; V_{CTRL} TIED TO V_{EN} THROUGH 3.92KΩ RESISTOR UNLESS NOTED OTHERWISE

Parameter	Condition (MHz)	Amplifier-ON V_{EN} = +5V Min.	Typ.	Max.	Units
Frequency Range		500		5000	MHz
Noise Figure	500		1.3		dB
	1000		1.1		
	2000		1.2		
	3000		1.3		
	4000		1.3		
	5000		1.3		
Gain	500		22.6		dB
	1000		22.5		
	2000		21.7		
	3000		20.6		
	4000		19.6		
	5000		18.6		
Input Return Loss	500		16.1		dB
	1000		15.5		
	2000		14.0		
	3000		11.5		
	4000		11.9		
	5000		15.4		
Output Return Loss	500		12.7		dB
	1000		14.0		
	2000		22.4		
	3000		14.8		
	4000		12.8		
	5000		10.4		
Output Power at 1dB Compression (OP1dB)	500		+19.6		dBm
	1000		+19.4		
	2000		+19.0		
	3000		+18.8		
	4000		+19.2		
	5000		+18.3		
Output Third-Order Intercept Point (P_{OUT} = 0dBm/Tone)	500		+28.7		dBm
	1000		+31.6		
	2000		+29.3		
	3000		+31.2		
	4000		+28.9		
	5000		+25.0		
Device Operating Voltage (V_{DD})		+4.75	+5.0	+5.25	V
Device Operating Current (I_{DD}) [2]			80	94	mA
Enable Voltage (V_{EN})		+4.5	+5.0	+5.5	V
Enable Current (I_{EN})			2.0		mA
Control Voltage (V_{CTRL})			+1.5		V
Control Current (I_{CTRL})			0.9		mA
DC Current (I_{DD}) Variation vs. Temperature [3]			-77		µA/°C
DC Current (I_{DD}) Variation vs. Voltage [4]			0.002		mA/mV

1. Tested on Mini-Circuits Characterization Test/Evaluation Board TB-TSS2-53LNBC+.
2. Current at P_{IN} = -25dBm. Increases to 96mA at P1dB.
3. ((Currentat +85°C) – (Currentat -45°C)) / (+130°C)
4. ((Currentat +5.25V) - (Currentat +4.75V))/(+5.25V - +4.75V)

Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

ELECTRICAL SPECIFICATIONS[5] AT +25°C, Zo = 50Ω AND V_{DD} = +5V; V_{CTRL} TIED TO V_{EN} THROUGH 3.92KΩ RESISTOR UNLESS NOTED OTHERWISE

Parameter	Condition (MHz)	Amplifier-Bypass V_{EN} = 0V Min.	Typ.	Max.	Units
Frequency Range		500		5000	MHz
Gain	500		-0.7		dB
	1000		-0.7		
	2000		-0.9		
	3000		-1.0		
	4000		-1.0		
	5000		-0.9		
Input Return Loss	500		23.7		dB
	1000		16.4		
	2000		11.2		
	3000		11.1		
	4000		13.9		
	5000		18.2		
Output Return Loss	500		21.2		dB
	1000		15.7		
	2000		11.6		
	3000		12.1		
	4000		16.0		
	5000		18.4		
Input Power at 1dB Compression (IP1dB)	500		+34.4		dBm
	1000		+34.5		
	2000		+29.1		
	3000		+29.9		
	4000		+29.8		
	5000		+30.1		
Output Third-Order Intercept Point (P_{OUT} = 0dBm/Tone)	500		+47.0		dBm
	1000		+46.8		
	2000		+42.6		
	3000		+38.3		
	4000		+39.4		
	5000		+39.1		
Device Operating Voltage (V_{DD})			+5.0		V
Device Operating Current (I_{DD})			2		mA
Enable Voltage (V_{EN})		0	—	0.5	V
Enable Current (I_{EN})			0		mA
Control Voltage (V_{CTRL})			0		V
Control Current (I_{CTRL})				0.012	µA

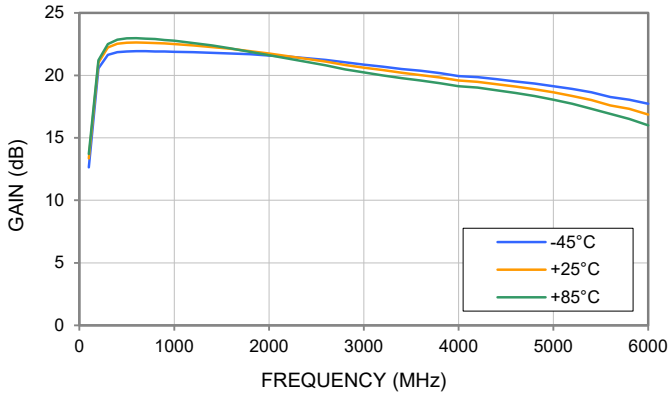
5. Tested on Mini-Circuits Characterization Test/Evaluation Board TB-TSS2-53LNBC+.

Low Noise Bypass Amplifier TSS2-53LNB+

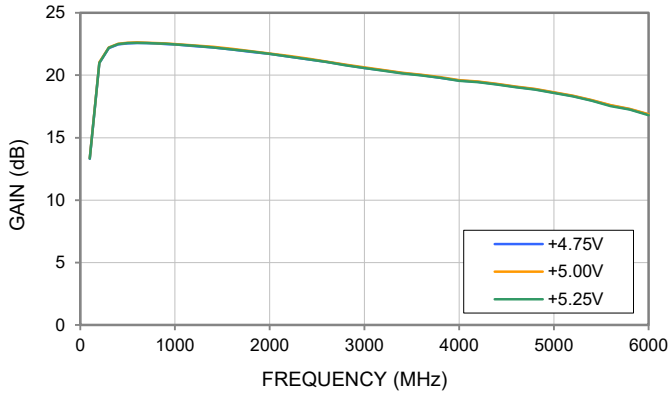
50Ω 500 to 5000 MHz

TYPICAL PERFORMANCE GRAPHS
LNA MODE

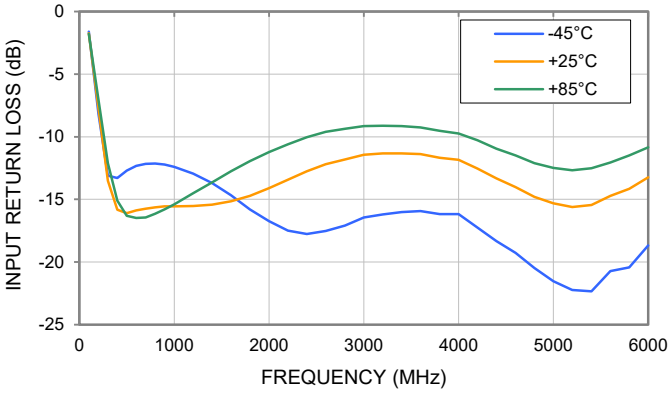
GAIN vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



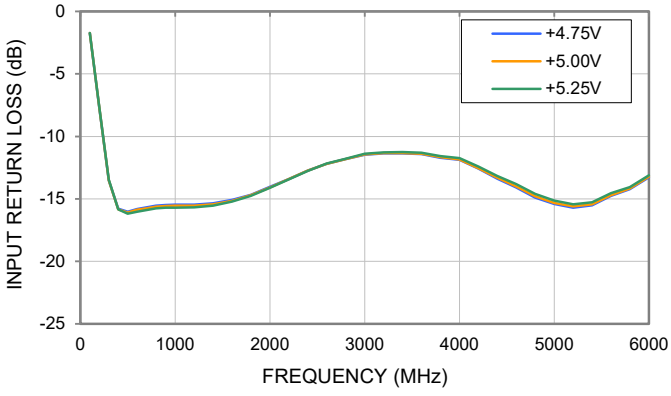
GAIN vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



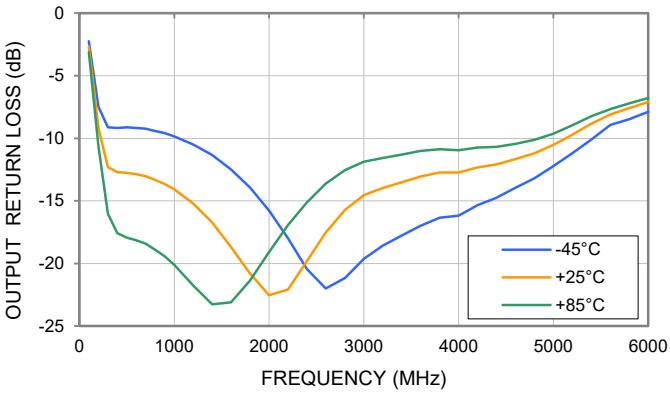
INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



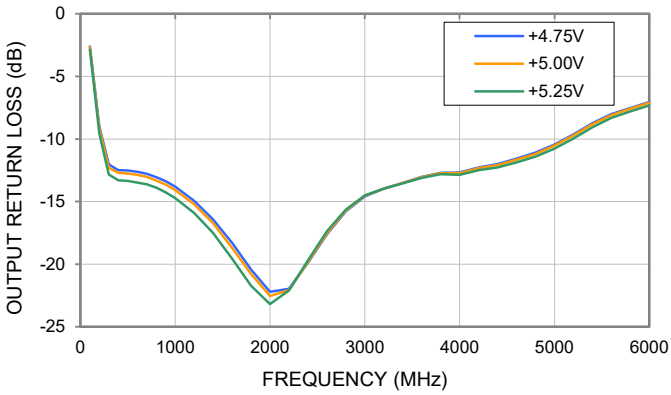
INPUT RETURN LOSS vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



OUTPUT RETURN LOSS vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C

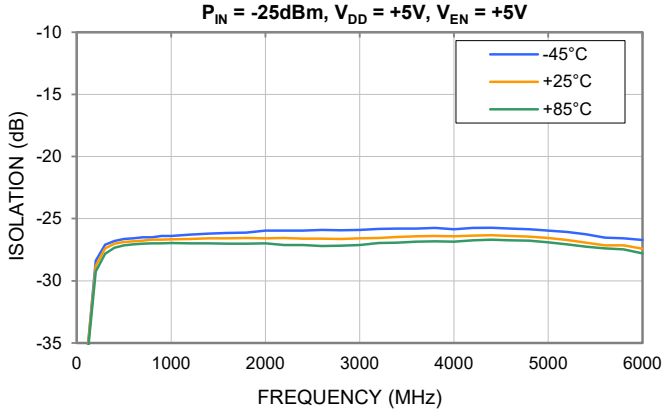


Low Noise Bypass Amplifier TSS2-53LNB+

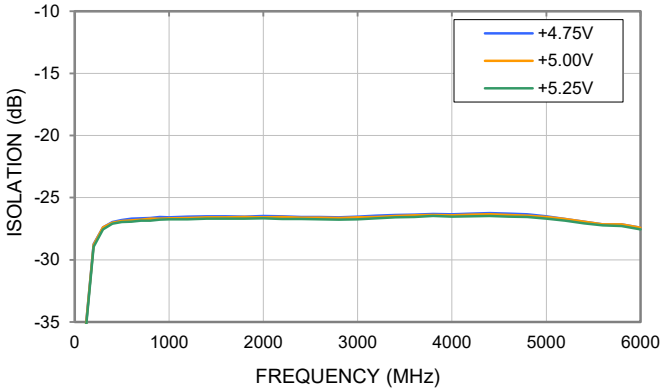
50Ω 500 to 5000 MHz

TYPICAL PERFORMANCE GRAPHS
LNA MODE

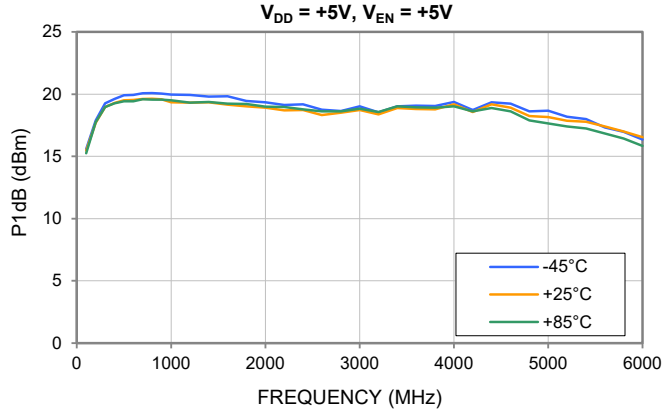
ISOLATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



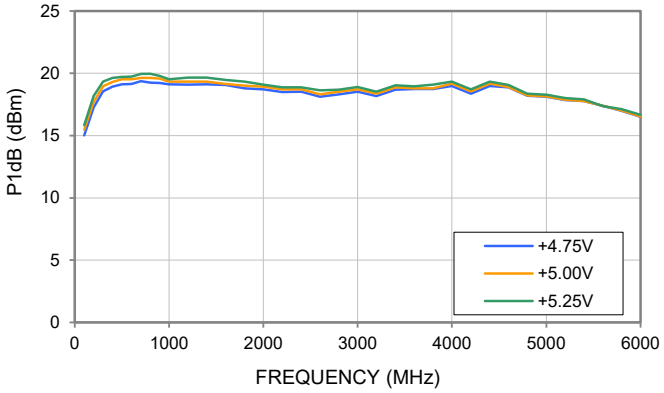
ISOLATION vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



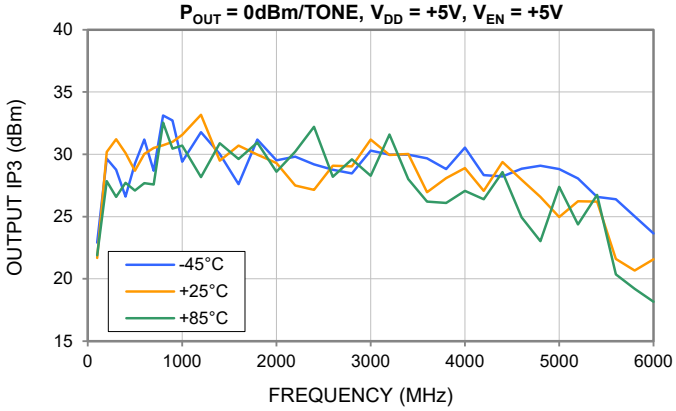
P1dB vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = +5V



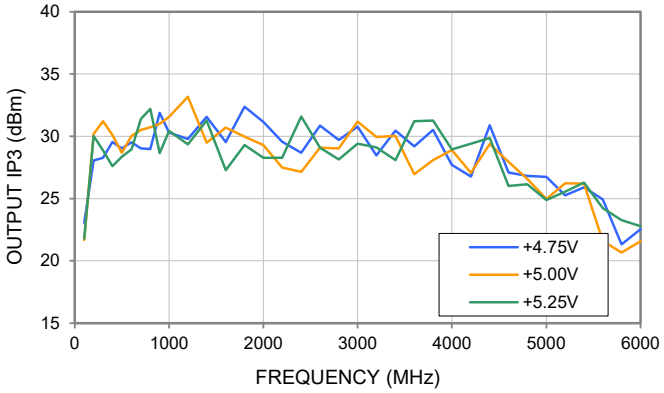
P1dB vs. DEVICE VOLTAGE
V_{EN} = +5V, TEMPERATURE = +25°C



OUTPUT IP3 vs. TEMPERATURE
P_{OUT} = 0dBm/TONE, V_{DD} = +5V, V_{EN} = +5V



OUTPUT IP3 vs. DEVICE VOLTAGE
P_{OUT} = 0dBm/TONE, V_{EN} = +5V, TEMPERATURE = +25°C

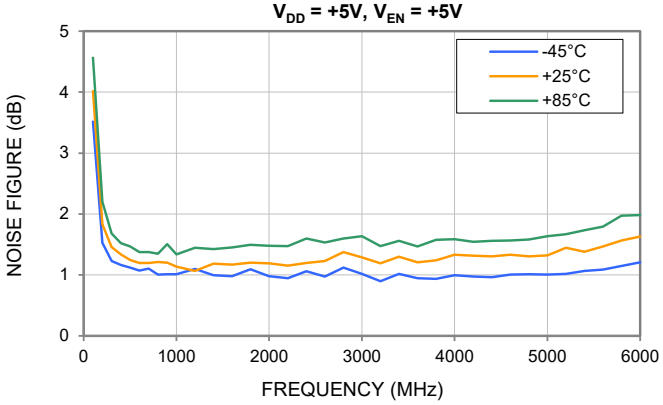


Low Noise Bypass Amplifier TSS2-53LNB+

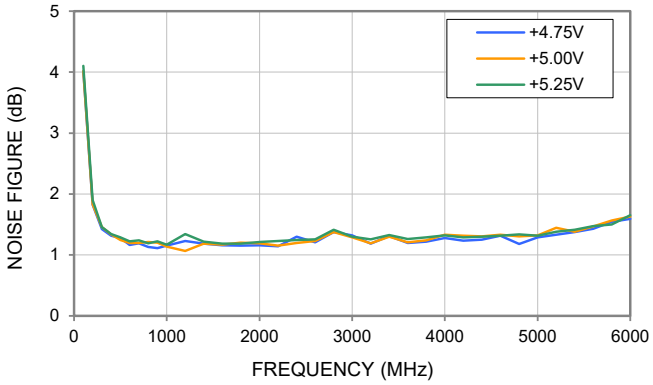
50Ω 500 to 5000 MHz

TYPICAL PERFORMANCE GRAPHS
LNA MODE

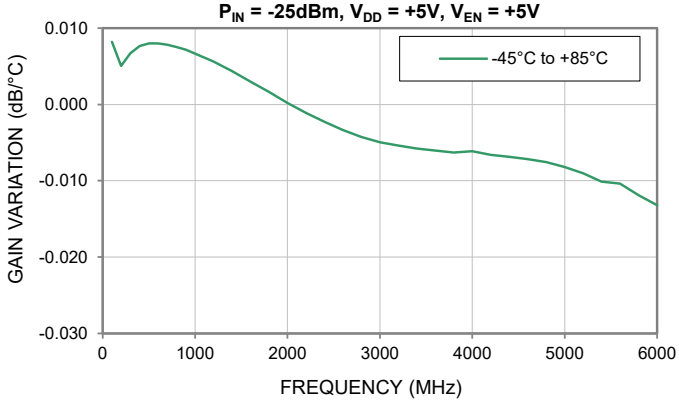
NOISE FIGURE vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = +5V



NOISE FIGURE vs. DEVICE VOLTAGE
V_{EN} = +5V, TEMPERATURE = +25°C



GAIN VARIATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V

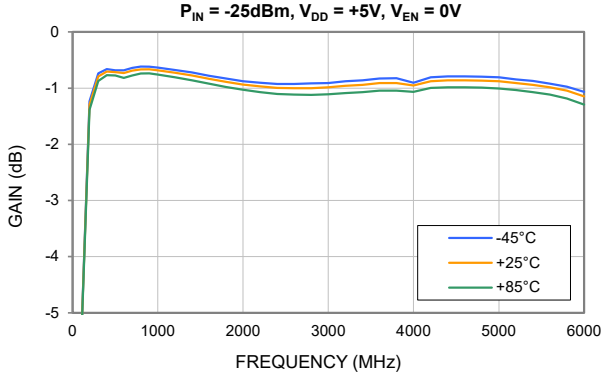


Low Noise Bypass Amplifier TSS2-53LNB+

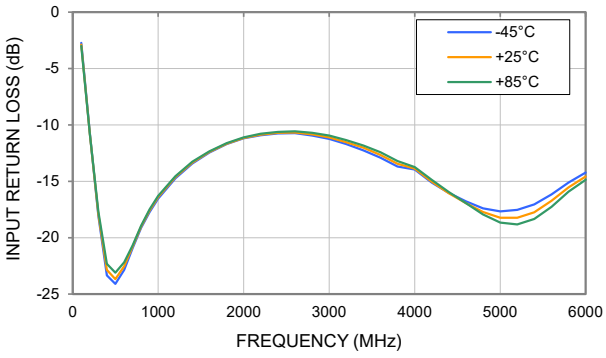
50Ω 500 to 5000 MHz

TYPICAL PERFORMANCE GRAPHS
BYPASS MODE

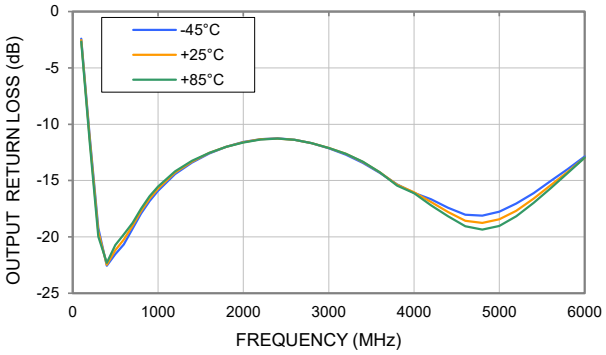
GAIN vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



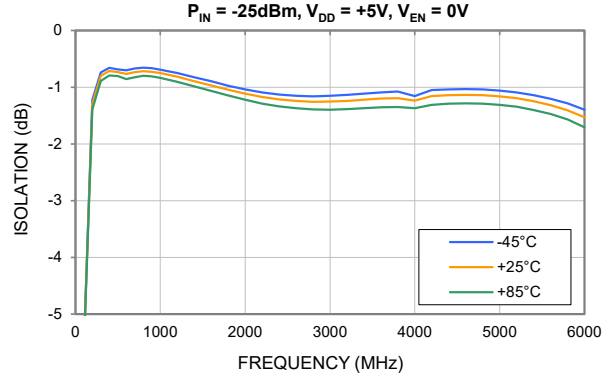
INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



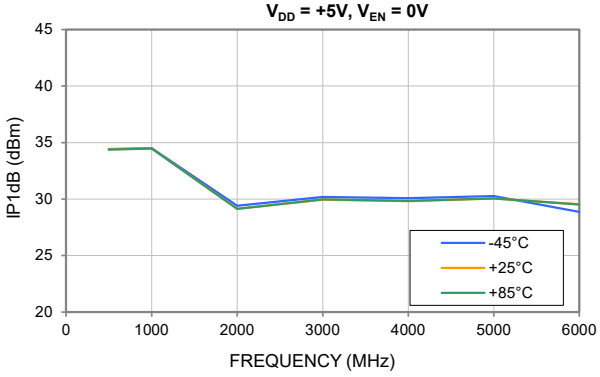
OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



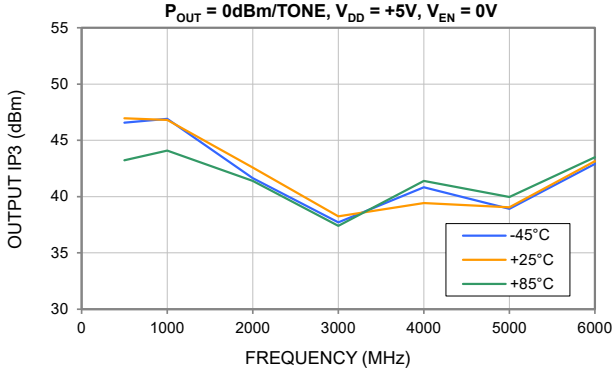
ISOLATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



INPUT P1dB vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = 0V



OUTPUT IP3 vs. TEMPERATURE
P_{OUT} = 0dBm/TONE, V_{DD} = +5V, V_{EN} = 0V



Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

ABSOLUTE MAXIMUM RATINGS[6]

Parameter		Ratings
Operating Temperature (ground lead)		-45°C to 85°C
Storage Temperature		-65°C to 150°C
Total Power Dissipation		0.7W
Input Power	Amplifier-ON	+19dBm
	Amplifier-Bypass	+29dBm
DC Voltage V_{DD}		+7.0V
DC Voltage V_{EN}		+7.0V
DC Voltage V_{CTRL}		+7.0V
DC Voltage on RF-OUT		+15.0V

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

ENABLE VOLTAGE (V_{EN})

	Min.	Typ.	Max.	Units
Amplifier-ON	+4.5	+5.0	+5.5	V
Amplifier-Bypass	0	—	+0.5	V

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{jc})[7]	53.8°C/W

7. Θ_{jc}= (Hot Spot Temperature on Die - Temperature at Ground Lead)/Dissipated Power

ESD RATING

	Class	Voltage Range	Reference Standard
Human Body Model (HBM)	1A	250V to <500V	ANSI/ESDA/JEDEC JS-001-2017
Charged Device Model (CDM)	C3	>1000V	JESD22-C101F

ESD HANDLING PRECAUTION: This device is designed to be Class 1A for HBM. Static charges may easily produce potentials higher than this with improper handling and can discharge into DUT and damage it. As a preventive measure Industry standard ESD handling precautions should be used at all times to protect the device from ESD damage.

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020E /JEDEC J-STD-033C

SWITCHING SPECIFICATIONS (RISE/FALL TIME)

Parameter		Min.	Typ.	Max.	Units
Amplifier ON to Bypass	OFF TIME (50% Control to 10% RF)	-	39	-	ns
	FALL TIME (90% to 10% RF)	-	12	-	
Amplifier Bypass to ON	ON TIME (50% Control to 90% RF)	-	650	-	ns
	RISE TIME (10% to 90% RF)	-	250	-	
Control Voltage Leakage		-	+49	-	mV

Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

FUNCTIONAL DIAGRAM

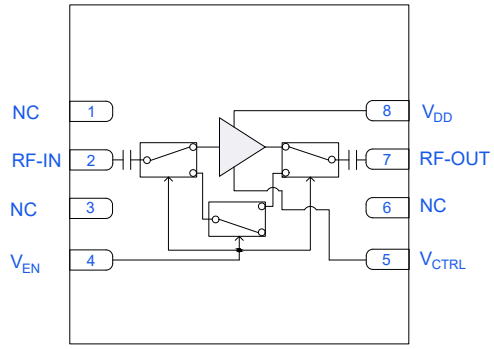


Figure 1. TSS2-53LNB+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Application Description (Refer to Figure 2)
RF-IN	2	RF-Input pad. Connect to Ground Via L1.
RF-OUT	7	RF-Output pad. No external DC blocking capacitor required.
V_{CTRL}	5	Voltage Control pad. Voltage level on this pad sets the I_{DD}. May be tied to V_{EN} through a fixed resistor.
V_{EN}	4	Voltage Enable Pad. Voltage level on this pad determines if the Amplifier is on or bypassed.
V_{DD}	8	Supply Voltage Pad. Connect to V_{DD} via L2.
Ground	Paddle	Connects to ground.
NC	1,3,6	No internal connection. Recommended to be grounded.

CHARACTERIZATION TEST CIRCUIT

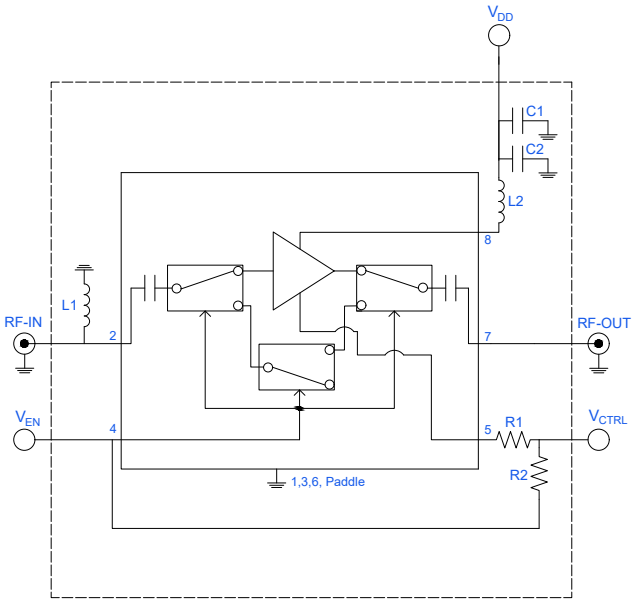


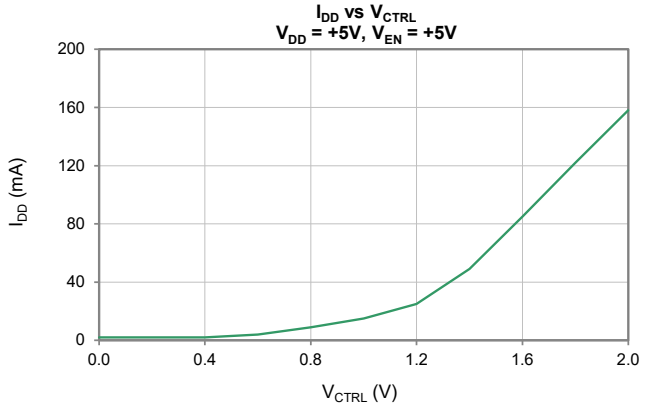
Figure 2. DUT soldered on Mini-Circuits Characterization Test Board: TB-TSS2-53LNBC+.

Electrical Parameters and Conditions

Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using N5242A PNA-X Microwave Network Analyzer.

Conditions:

1. Gain and Return Loss: P_{IN}= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1MHz apart, 0dBm/tone at output.
3. Switching Time: P_{IN}=-25dBm at 500MHz. V_{EN}=4.5, 5.0, 5.5V at 10kHz. V_{DD} =4.75, 5.0 and 5.25V. V_{CTRL} and V_{EN} are tied together per Figure 2.
4. If V_{CTRL} and V_{EN} are tied together, apply +5V (typical) to V_{EN} only. After that, a value of +1.5V will be seen at V_{CTRL}.
5. If V_{CTRL} is used independently of V_{EN}, then R2 must be removed and connection between V_{CTRL} and V_{EN} shall be left opened. Furthermore, R1 0Ω resistor shall be replaced with a 3.92KΩ resistor. This allows for current control of the amplifier through V_{CTRL} adjustment per graph below.



Component	Value	Size	Part Number	Manufacturer
L1	47nH	0402	LL1005-FHL47NJ	Toko
L2	56nH	0402	0402HPH-56NXGLW	Coilcraft
C1	0.1µF	0402	GRM155R71C04KA88D	Murata
C2	10pF	0402	GJM1555C1H100JB01	Murata
R1	0Ω	0402	RK73Z1ETTP	Koa Speer
R2	3.92KΩ	0402	RK73H1ETTP3921F	Koa Speer

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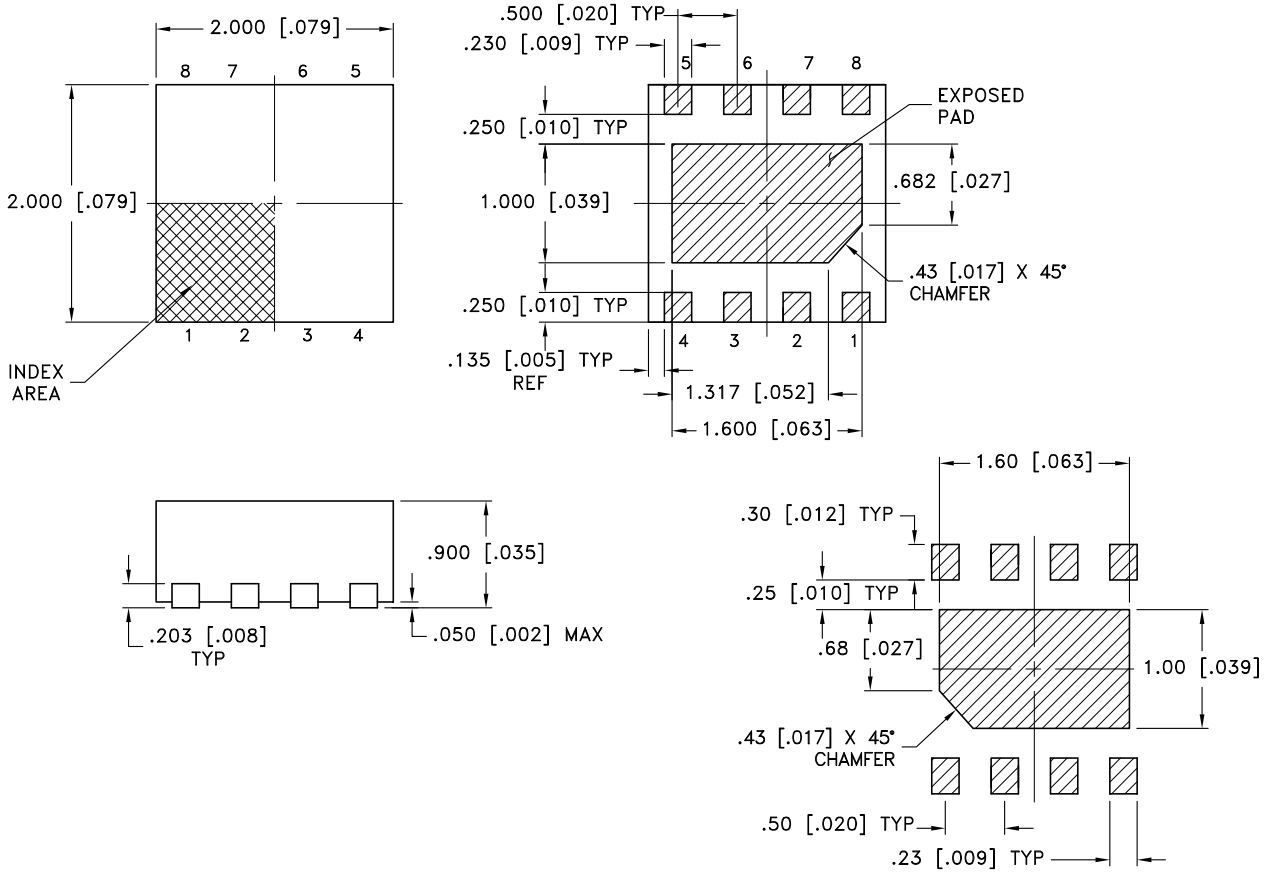
CASE STYLE DRAWING

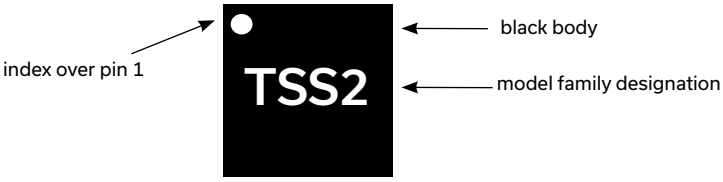


DENOTES METALLIZATION

Suggested Layout

Weight: .011 grams
Dimensions are in mm [inches]. Tolerances: 3 Pl.±.0.050[0.002] mm [Inches]

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Low Noise Bypass Amplifier TSS2-53LNB+

50Ω 500 to 5000 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC3007 Plastic package, exposed paddle, Lead Finish: Matte-Tin
RoHs Status	Compliant
Tape & Reel **Standard quantities available on reel**	F66 7" reels with 20, 50, 100, 200, 500,1K or 2K devices
Suggested Layout for PCB Design	PL-760
Evaluation Board	TB-TSS2-53LNBC+
Environmental Ratings	ENV12T2

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)
Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: V_{DD} = 5.0V, V_{EN} = 5.0V, I_{DD} = 78mA @ 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)
100.00	13.4	36.7	1.7	2.7	1.6	0.7	21.7	15.5	4.0
200.00	21.0	28.8	7.7	9.2	1.2	0.8	30.2	17.7	1.8
300.00	22.2	27.4	13.5	12.3	1.1	0.7	31.2	19.0	1.5
400.00	22.5	27.0	15.8	12.7	1.1	0.6	30.1	19.3	1.3
500.00	22.6	26.9	16.1	12.8	1.1	0.6	28.7	19.5	1.2
600.00	22.6	26.8	15.9	12.9	1.1	0.6	30.0	19.5	1.2
700.00	22.6	26.8	15.8	13.0	1.1	0.6	30.5	19.6	1.2
800.00	22.6	26.7	15.6	13.3	1.1	0.6	30.7	19.6	1.2
900.00	22.6	26.7	15.6	13.7	1.1	0.6	31.0	19.6	1.2
1000.00	22.5	26.7	15.5	14.1	1.1	0.6	31.6	19.3	1.1
1200.00	22.4	26.6	15.5	15.2	1.1	0.6	33.2	19.3	1.1
1400.00	22.3	26.6	15.4	16.7	1.1	0.6	29.5	19.3	1.2
1600.00	22.1	26.6	15.2	18.7	1.1	0.7	30.7	19.2	1.2
1800.00	21.9	26.5	14.7	20.8	1.1	0.7	30.0	19.0	1.2
2000.00	21.7	26.6	14.1	22.5	1.1	0.7	29.3	18.9	1.2
2200.00	21.5	26.6	13.4	22.1	1.1	0.8	27.5	18.7	1.2
2400.00	21.3	26.6	12.7	19.8	1.1	0.8	27.1	18.7	1.2
2600.00	21.1	26.6	12.2	17.5	1.1	0.8	29.1	18.3	1.2
2800.00	20.8	26.6	11.8	15.7	1.2	0.8	29.0	18.5	1.4
3000.00	20.6	26.6	11.4	14.5	1.2	0.8	31.2	18.7	1.3
3200.00	20.4	26.5	11.3	14.0	1.2	0.8	29.9	18.4	1.2
3400.00	20.2	26.5	11.3	13.5	1.2	0.8	30.0	18.9	1.3
3600.00	20.0	26.4	11.4	13.0	1.2	0.8	27.0	18.8	1.2
3800.00	19.8	26.4	11.7	12.7	1.2	0.8	28.1	18.8	1.2
4000.00	19.6	26.4	11.8	12.7	1.2	0.8	28.9	19.2	1.3
4200.00	19.5	26.4	12.5	12.3	1.2	0.8	27.1	18.6	1.3
4400.00	19.3	26.3	13.3	12.1	1.3	0.8	29.4	19.2	1.3
4600.00	19.1	26.4	14.0	11.6	1.3	0.8	28.0	18.9	1.3
4800.00	18.9	26.4	14.8	11.2	1.3	0.8	26.6	18.2	1.3
5000.00	18.6	26.6	15.3	10.5	1.3	0.8	25.0	18.1	1.3
5200.00	18.4	26.7	15.6	9.7	1.3	0.8	26.2	17.9	1.4
5400.00	18.0	26.9	15.4	8.8	1.4	0.8	26.2	17.8	1.4
5600.00	17.6	27.1	14.7	8.1	1.4	0.8	21.6	17.4	1.5
5800.00	17.3	27.2	14.2	7.6	1.4	0.8	20.7	17.0	1.6
6000.00	16.9	27.4	13.2	7.1	1.5	0.8	21.6	16.5	1.6

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 4.75V, V_{EN} = 5.0V, I_{DD} = 77mA @ 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)
100.00	13.3	36.8	1.7	2.6	1.6	0.7	23.1	15.0	4.0
200.00	21.0	28.7	7.7	9.0	1.2	0.8	28.1	17.2	1.8
300.00	22.2	27.4	13.5	12.0	1.1	0.7	28.3	18.5	1.4
400.00	22.5	27.0	15.8	12.5	1.1	0.6	29.5	18.9	1.3
500.00	22.6	26.8	16.0	12.5	1.1	0.6	29.0	19.1	1.3
600.00	22.6	26.7	15.8	12.6	1.1	0.6	29.5	19.2	1.2
700.00	22.6	26.7	15.7	12.8	1.1	0.6	29.0	19.4	1.2
800.00	22.5	26.6	15.6	13.1	1.1	0.6	29.0	19.2	1.1
900.00	22.5	26.6	15.5	13.4	1.1	0.6	31.9	19.2	1.1
1000.00	22.5	26.6	15.5	13.8	1.1	0.6	30.3	19.1	1.2
1200.00	22.3	26.5	15.5	14.9	1.1	0.6	29.8	19.1	1.2
1400.00	22.2	26.5	15.4	16.4	1.1	0.6	31.6	19.1	1.2
1600.00	22.1	26.5	15.1	18.3	1.1	0.7	29.5	19.1	1.2
1800.00	21.9	26.5	14.7	20.4	1.1	0.7	32.4	18.8	1.2
2000.00	21.7	26.5	14.0	22.2	1.1	0.7	31.1	18.7	1.2
2200.00	21.5	26.5	13.4	22.0	1.1	0.8	29.6	18.5	1.1
2400.00	21.3	26.5	12.7	19.9	1.1	0.8	28.7	18.5	1.3
2600.00	21.1	26.6	12.2	17.6	1.1	0.8	30.9	18.1	1.2
2800.00	20.8	26.6	11.8	15.8	1.2	0.8	29.7	18.3	1.4
3000.00	20.6	26.5	11.5	14.6	1.2	0.8	30.8	18.5	1.3
3200.00	20.4	26.4	11.4	14.0	1.2	0.8	28.5	18.2	1.2
3400.00	20.2	26.4	11.4	13.5	1.2	0.8	30.5	18.7	1.3
3600.00	20.0	26.4	11.4	13.0	1.2	0.8	29.2	18.7	1.2
3800.00	19.8	26.3	11.7	12.7	1.2	0.8	30.5	18.7	1.2
4000.00	19.6	26.3	11.9	12.7	1.2	0.8	27.7	19.0	1.3
4200.00	19.5	26.3	12.6	12.3	1.2	0.8	26.8	18.4	1.2
4400.00	19.3	26.2	13.4	12.0	1.2	0.8	30.9	19.0	1.3
4600.00	19.1	26.3	14.1	11.6	1.3	0.8	27.1	18.9	1.3
4800.00	18.9	26.3	14.9	11.1	1.3	0.8	26.8	18.2	1.2
5000.00	18.6	26.5	15.4	10.4	1.3	0.8	26.7	18.1	1.3
5200.00	18.3	26.6	15.7	9.6	1.3	0.8	25.3	17.9	1.3
5400.00	18.0	26.8	15.5	8.8	1.4	0.8	25.9	17.8	1.4
5600.00	17.6	27.1	14.8	8.0	1.4	0.8	24.9	17.4	1.4
5800.00	17.3	27.1	14.2	7.5	1.4	0.8	21.3	17.0	1.5
6000.00	16.9	27.3	13.3	7.0	1.4	0.8	22.6	16.5	1.6

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 5.25V, V_{EN} = 5.0V, I_{DD} = 79mA @ 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)
100.00	13.3	37.0	1.7	2.9	1.7	0.7	21.8	15.8	4.1
200.00	21.0	28.9	7.7	9.6	1.2	0.8	30.0	18.2	1.9
300.00	22.2	27.5	13.5	12.8	1.1	0.7	28.9	19.3	1.5
400.00	22.5	27.1	15.9	13.3	1.1	0.6	27.6	19.6	1.3
500.00	22.6	27.0	16.2	13.3	1.1	0.6	28.3	19.7	1.3
600.00	22.6	26.9	16.0	13.5	1.1	0.6	29.0	19.7	1.2
700.00	22.6	26.9	15.9	13.6	1.1	0.6	31.4	20.0	1.2
800.00	22.5	26.8	15.8	13.9	1.1	0.6	32.2	20.0	1.2
900.00	22.5	26.8	15.7	14.3	1.1	0.6	28.7	19.8	1.2
1000.00	22.5	26.8	15.7	14.7	1.1	0.6	30.4	19.5	1.2
1200.00	22.4	26.7	15.7	15.9	1.1	0.6	29.3	19.7	1.3
1400.00	22.2	26.7	15.5	17.5	1.1	0.7	31.3	19.7	1.2
1600.00	22.1	26.7	15.2	19.6	1.1	0.7	27.3	19.5	1.2
1800.00	21.9	26.7	14.8	21.7	1.1	0.7	29.3	19.3	1.2
2000.00	21.7	26.7	14.1	23.2	1.1	0.7	28.3	19.1	1.2
2200.00	21.5	26.7	13.4	22.1	1.1	0.8	28.3	18.9	1.2
2400.00	21.3	26.7	12.8	19.7	1.1	0.8	31.6	18.9	1.2
2600.00	21.1	26.7	12.2	17.4	1.2	0.8	29.1	18.6	1.3
2800.00	20.8	26.8	11.8	15.6	1.2	0.8	28.2	18.7	1.4
3000.00	20.6	26.8	11.4	14.5	1.2	0.8	29.4	18.9	1.3
3200.00	20.4	26.7	11.3	14.0	1.2	0.8	29.1	18.5	1.3
3400.00	20.2	26.6	11.3	13.6	1.2	0.8	28.1	19.0	1.3
3600.00	20.0	26.6	11.3	13.1	1.2	0.8	31.2	19.0	1.3
3800.00	19.8	26.5	11.6	12.8	1.2	0.8	31.3	19.1	1.3
4000.00	19.6	26.5	11.7	12.9	1.2	0.8	29.0	19.3	1.3
4200.00	19.4	26.5	12.4	12.5	1.3	0.8	29.4	18.7	1.3
4400.00	19.2	26.5	13.2	12.3	1.3	0.8	29.9	19.3	1.3
4600.00	19.0	26.5	13.8	11.9	1.3	0.8	26.0	19.1	1.3
4800.00	18.8	26.5	14.6	11.4	1.3	0.8	26.1	18.4	1.3
5000.00	18.6	26.7	15.1	10.8	1.4	0.8	24.9	18.3	1.3
5200.00	18.3	26.9	15.4	10.0	1.4	0.8	25.6	18.0	1.4
5400.00	18.0	27.1	15.3	9.1	1.4	0.8	26.3	17.9	1.4
5600.00	17.5	27.2	14.5	8.3	1.4	0.8	24.2	17.4	1.5
5800.00	17.2	27.3	14.0	7.8	1.4	0.8	23.3	17.1	1.5
6000.00	16.8	27.5	13.1	7.3	1.5	0.8	22.8	16.7	1.7

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 5.0V, V_{EN} = 5.0V, I_{DD} = 83mA @ 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)
100.00	12.6	36.8	1.6	2.2	1.5	0.6	22.9	15.6	3.5
200.00	20.6	28.4	8.2	7.5	1.2	0.7	29.6	17.9	1.5
300.00	21.6	27.1	13.1	9.1	1.1	0.6	28.8	19.3	1.2
400.00	21.9	26.8	13.3	9.2	1.1	0.5	26.6	19.6	1.2
500.00	21.9	26.6	12.7	9.1	1.1	0.5	29.2	19.9	1.1
600.00	21.9	26.6	12.3	9.2	1.1	0.5	31.2	19.9	1.1
700.00	21.9	26.5	12.2	9.2	1.1	0.5	28.7	20.1	1.1
800.00	21.9	26.5	12.1	9.4	1.1	0.5	33.1	20.1	1.0
900.00	21.9	26.4	12.2	9.6	1.1	0.5	32.7	20.1	1.0
1000.00	21.9	26.4	12.4	9.8	1.1	0.5	29.4	20.0	1.0
1200.00	21.9	26.3	12.9	10.5	1.1	0.5	31.8	19.9	1.1
1400.00	21.8	26.2	13.7	11.3	1.1	0.6	30.0	19.8	1.0
1600.00	21.8	26.1	14.7	12.5	1.1	0.6	27.6	19.8	1.0
1800.00	21.7	26.1	15.8	13.9	1.1	0.6	31.2	19.5	1.1
2000.00	21.6	26.0	16.7	15.8	1.1	0.6	29.5	19.3	1.0
2200.00	21.5	26.0	17.5	18.0	1.1	0.7	29.8	19.1	0.9
2400.00	21.4	26.0	17.8	20.4	1.1	0.7	29.2	19.2	1.1
2600.00	21.2	25.9	17.5	22.0	1.1	0.7	28.8	18.7	1.0
2800.00	21.0	25.9	17.1	21.2	1.1	0.7	28.5	18.6	1.1
3000.00	20.9	25.9	16.4	19.6	1.1	0.7	30.3	19.0	1.0
3200.00	20.7	25.8	16.2	18.6	1.2	0.7	30.0	18.5	0.9
3400.00	20.5	25.8	16.0	17.8	1.2	0.7	30.0	19.0	1.0
3600.00	20.4	25.8	15.9	17.0	1.2	0.7	29.7	19.1	0.9
3800.00	20.2	25.8	16.2	16.3	1.2	0.7	28.8	19.0	0.9
4000.00	19.9	25.9	16.2	16.2	1.2	0.8	30.5	19.4	1.0
4200.00	19.9	25.7	17.2	15.4	1.2	0.7	28.3	18.7	1.0
4400.00	19.7	25.7	18.3	14.8	1.2	0.7	28.2	19.3	1.0
4600.00	19.5	25.8	19.3	13.9	1.2	0.7	28.9	19.2	1.0
4800.00	19.3	25.9	20.5	13.2	1.3	0.7	29.1	18.6	1.0
5000.00	19.1	25.9	21.5	12.2	1.3	0.7	28.8	18.7	1.0
5200.00	18.9	26.1	22.2	11.2	1.3	0.7	28.1	18.2	1.0
5400.00	18.6	26.3	22.3	10.1	1.3	0.7	26.6	18.0	1.1
5600.00	18.3	26.5	20.7	8.9	1.3	0.7	26.4	17.3	1.1
5800.00	18.1	26.6	20.4	8.5	1.3	0.7	25.0	17.0	1.1
6000.00	17.7	26.7	18.7	7.9	1.4	0.7	23.7	16.4	1.2

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 4.75V, V_{EN} = 5.0V, I_{DD} = 81mA @ 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)
100.00	12.6	36.7	1.6	2.2	1.5	0.6	23.2	15.2	3.5
200.00	20.5	28.4	8.2	7.5	1.2	0.7	28.9	17.2	1.5
300.00	21.6	27.1	13.1	9.1	1.1	0.6	26.3	18.7	1.2
400.00	21.8	26.8	13.4	9.2	1.1	0.5	28.0	19.2	1.1
500.00	21.9	26.6	12.8	9.1	1.1	0.5	30.5	19.5	1.1
600.00	21.9	26.5	12.4	9.2	1.1	0.5	31.3	19.4	1.0
700.00	21.9	26.5	12.2	9.2	1.1	0.5	29.3	19.6	1.1
800.00	21.9	26.4	12.2	9.4	1.1	0.5	30.2	19.6	1.0
900.00	21.9	26.4	12.3	9.6	1.1	0.5	30.6	19.6	1.1
1000.00	21.9	26.3	12.5	9.8	1.1	0.5	31.6	19.4	1.0
1200.00	21.8	26.3	13.0	10.5	1.1	0.5	30.8	19.4	1.0
1400.00	21.8	26.2	13.7	11.4	1.1	0.6	31.4	19.4	0.9
1600.00	21.7	26.1	14.7	12.5	1.1	0.6	33.0	19.3	1.0
1800.00	21.7	26.0	15.7	13.9	1.1	0.6	28.1	19.1	1.0
2000.00	21.6	26.0	16.6	15.8	1.1	0.6	29.7	19.0	0.9
2200.00	21.5	25.9	17.3	18.0	1.1	0.7	28.7	18.9	0.9
2400.00	21.3	25.9	17.6	20.3	1.1	0.7	29.9	18.8	1.3
2600.00	21.2	25.9	17.3	21.8	1.1	0.7	28.9	18.5	0.9
2800.00	21.0	25.9	16.9	20.8	1.1	0.7	28.9	18.4	1.1
3000.00	20.8	25.9	16.3	19.3	1.1	0.7	28.5	18.8	1.0
3200.00	20.7	25.8	16.1	18.4	1.2	0.7	30.4	18.3	0.8
3400.00	20.5	25.8	15.9	17.5	1.2	0.7	32.4	18.8	1.0
3600.00	20.4	25.7	15.9	16.8	1.2	0.7	29.9	18.9	0.9
3800.00	20.2	25.7	16.2	16.1	1.2	0.7	29.1	18.8	0.9
4000.00	19.9	25.8	16.2	16.0	1.2	0.8	29.5	19.2	1.0
4200.00	19.9	25.7	17.3	15.2	1.2	0.7	28.6	18.7	1.0
4400.00	19.7	25.7	18.4	14.6	1.2	0.7	28.1	19.1	1.0
4600.00	19.5	25.8	19.4	13.8	1.2	0.7	27.5	19.1	1.0
4800.00	19.3	25.8	20.7	13.0	1.2	0.7	28.5	18.6	1.0
5000.00	19.1	26.0	21.7	12.1	1.3	0.7	29.6	18.6	1.0
5200.00	18.9	26.1	22.4	11.1	1.3	0.7	28.7	18.2	1.1
5400.00	18.6	26.2	22.5	10.0	1.3	0.7	26.6	18.0	1.0
5600.00	18.2	26.5	20.9	8.8	1.3	0.7	24.8	17.5	1.1
5800.00	18.0	26.5	20.6	8.4	1.3	0.7	24.1	17.1	1.7
6000.00	17.7	26.7	18.9	7.8	1.4	0.7	22.6	16.4	1.2

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 5.25V, V_{EN} = 5.0V, I_{DD} = 84mA @ 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)
100.00	12.7	36.8	1.6	2.3	1.5	0.6	21.3	16.0	3.5
200.00	20.6	28.6	8.1	7.7	1.2	0.7	31.7	18.2	1.6
300.00	21.7	27.2	13.1	9.4	1.1	0.6	27.6	19.6	1.2
400.00	21.9	26.9	13.4	9.4	1.1	0.5	27.6	20.0	1.2
500.00	22.0	26.8	12.8	9.4	1.1	0.5	30.5	20.2	1.1
600.00	22.0	26.7	12.4	9.4	1.1	0.5	29.1	20.2	1.1
700.00	22.0	26.6	12.2	9.5	1.1	0.5	31.5	20.4	1.0
800.00	22.0	26.6	12.2	9.7	1.1	0.5	31.1	20.4	1.0
900.00	22.0	26.6	12.3	9.9	1.1	0.5	30.3	20.3	1.5
1000.00	22.0	26.5	12.4	10.1	1.1	0.5	29.8	20.1	1.0
1200.00	21.9	26.4	13.0	10.8	1.1	0.5	29.3	20.2	1.1
1400.00	21.9	26.4	13.8	11.6	1.1	0.6	30.4	20.0	1.0
1600.00	21.8	26.3	14.7	12.8	1.1	0.6	28.9	19.9	1.0
1800.00	21.8	26.2	15.8	14.3	1.1	0.6	29.9	19.7	1.0
2000.00	21.7	26.1	16.8	16.2	1.1	0.6	28.3	19.6	1.0
2200.00	21.6	26.1	17.4	18.6	1.1	0.7	29.2	19.2	1.0
2400.00	21.4	26.1	17.7	21.0	1.1	0.7	29.9	19.3	1.9
2600.00	21.3	26.1	17.4	22.4	1.1	0.7	30.5	18.8	1.0
2800.00	21.1	26.1	17.0	21.2	1.1	0.7	30.6	18.8	1.1
3000.00	20.9	26.0	16.3	19.6	1.2	0.7	29.0	19.2	1.0
3200.00	20.8	26.0	16.1	18.6	1.2	0.7	29.8	18.6	0.9
3400.00	20.6	25.9	16.0	17.8	1.2	0.7	30.8	19.2	1.0
3600.00	20.4	25.9	15.9	17.0	1.2	0.7	29.5	19.1	0.8
3800.00	20.2	25.8	16.1	16.4	1.2	0.7	27.7	19.1	0.9
4000.00	20.0	25.9	16.1	16.2	1.2	0.8	30.8	19.4	1.0
4200.00	19.9	25.8	17.2	15.5	1.2	0.7	32.8	18.7	0.9
4400.00	19.7	25.8	18.3	14.9	1.2	0.7	29.0	19.4	1.0
4600.00	19.6	25.9	19.2	14.0	1.2	0.7	28.2	19.3	0.9
4800.00	19.4	26.0	20.4	13.3	1.3	0.7	30.6	18.4	1.0
5000.00	19.2	26.0	21.4	12.3	1.3	0.7	27.7	18.5	1.0
5200.00	18.9	26.2	22.0	11.3	1.3	0.7	27.3	17.8	1.0
5400.00	18.7	26.3	22.2	10.2	1.3	0.7	26.2	17.5	1.0
5600.00	18.3	26.6	20.6	9.0	1.3	0.7	23.9	16.6	1.1
5800.00	18.1	26.7	20.4	8.5	1.4	0.7	23.3	16.6	1.5
6000.00	17.7	26.9	18.6	8.0	1.4	0.7	22.4	15.8	1.2

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 5.0V, V_{EN} = 5.0V, I_{DD} = 74mA @ 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)
100.00	13.7	37.1	1.8	3.1	1.7	0.8	21.9	15.2	4.6
200.00	21.2	29.2	7.0	10.6	1.2	0.9	27.8	17.7	2.2
300.00	22.5	27.8	12.1	16.0	1.1	0.7	26.6	19.0	1.7
400.00	22.9	27.3	15.1	17.6	1.1	0.7	27.7	19.3	1.5
500.00	23.0	27.1	16.3	17.9	1.1	0.6	27.1	19.4	1.5
600.00	23.0	27.1	16.5	18.2	1.1	0.6	27.7	19.4	1.4
700.00	22.9	27.0	16.4	18.4	1.1	0.6	27.6	19.6	1.4
800.00	22.9	27.0	16.2	18.9	1.1	0.6	32.5	19.6	1.4
900.00	22.8	27.0	15.8	19.4	1.1	0.6	30.5	19.6	1.5
1000.00	22.8	27.0	15.4	20.1	1.1	0.7	30.7	19.5	1.3
1200.00	22.6	27.0	14.5	21.8	1.1	0.7	28.2	19.3	1.4
1400.00	22.4	27.0	13.6	23.3	1.1	0.7	30.9	19.4	1.4
1600.00	22.1	27.0	12.7	23.1	1.1	0.7	29.6	19.2	1.5
1800.00	21.9	27.0	12.0	21.4	1.1	0.8	31.0	19.2	1.5
2000.00	21.6	27.0	11.2	19.1	1.1	0.8	28.6	19.0	1.5
2200.00	21.4	27.1	10.6	17.0	1.1	0.8	30.2	19.0	1.5
2400.00	21.1	27.1	10.0	15.1	1.1	0.8	32.2	18.8	1.6
2600.00	20.8	27.2	9.6	13.6	1.2	0.8	28.2	18.6	1.5
2800.00	20.5	27.2	9.4	12.6	1.2	0.8	29.6	18.6	1.6
3000.00	20.2	27.1	9.1	11.9	1.2	0.8	28.3	18.8	1.6
3200.00	20.0	27.0	9.1	11.6	1.2	0.8	31.6	18.6	1.5
3400.00	19.8	26.9	9.2	11.3	1.2	0.8	28.0	19.0	1.6
3600.00	19.6	26.8	9.3	11.0	1.2	0.8	26.2	18.9	1.5
3800.00	19.4	26.8	9.5	10.9	1.2	0.8	26.1	18.9	1.6
4000.00	19.1	26.8	9.7	11.0	1.3	0.8	27.1	19.0	1.6
4200.00	19.0	26.7	10.3	10.7	1.3	0.8	26.4	18.6	1.5
4400.00	18.8	26.7	10.9	10.7	1.3	0.8	28.6	18.9	1.6
4600.00	18.6	26.7	11.5	10.4	1.3	0.8	24.9	18.6	1.6
4800.00	18.4	26.8	12.1	10.1	1.3	0.8	23.0	17.9	1.6
5000.00	18.1	26.9	12.5	9.6	1.4	0.8	27.4	17.7	1.6
5200.00	17.7	27.1	12.7	9.0	1.4	0.8	24.4	17.4	1.7
5400.00	17.3	27.3	12.5	8.2	1.4	0.8	26.7	17.2	1.7
5600.00	16.9	27.4	12.1	7.7	1.4	0.8	20.4	16.8	1.8
5800.00	16.5	27.5	11.5	7.2	1.5	0.8	19.2	16.4	2.0
6000.00	16.0	27.8	10.8	6.8	1.5	0.8	18.2	15.8	2.0

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 4.75V, V_{EN} = 5.0V, I_{DD} = 72mA @ 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)
100.00	13.7	37.0	1.8	3.0	1.7	0.8	22.5	14.8	4.6
200.00	21.2	29.2	7.0	10.5	1.2	0.9	27.5	17.3	2.1
300.00	22.5	27.7	12.0	15.8	1.1	0.7	28.5	18.6	1.6
400.00	22.8	27.2	15.0	17.5	1.1	0.7	31.3	18.9	1.5
500.00	22.9	27.1	16.2	17.9	1.1	0.6	29.2	19.2	1.4
600.00	22.9	27.0	16.4	18.1	1.1	0.6	31.4	19.2	1.4
700.00	22.9	26.9	16.3	18.4	1.1	0.6	29.7	19.4	1.4
800.00	22.9	26.9	16.0	18.8	1.1	0.6	29.4	19.2	1.3
900.00	22.8	26.9	15.6	19.4	1.1	0.6	30.9	19.3	1.4
1000.00	22.7	26.9	15.2	20.1	1.1	0.7	31.3	19.3	1.4
1200.00	22.5	26.9	14.3	21.7	1.1	0.7	30.9	19.1	1.4
1400.00	22.3	26.9	13.4	23.1	1.1	0.7	30.0	19.1	1.4
1600.00	22.1	26.9	12.5	22.9	1.1	0.7	29.0	19.0	1.4
1800.00	21.8	26.9	11.8	21.1	1.1	0.8	27.8	19.0	1.4
2000.00	21.6	26.9	11.0	18.8	1.1	0.8	29.9	18.8	1.5
2200.00	21.3	27.0	10.4	16.8	1.1	0.8	29.7	18.7	1.4
2400.00	21.0	27.1	9.9	14.9	1.1	0.8	28.9	18.6	1.6
2600.00	20.7	27.1	9.5	13.5	1.1	0.8	29.7	18.4	1.5
2800.00	20.4	27.1	9.2	12.4	1.2	0.8	28.4	18.5	1.7
3000.00	20.2	27.1	9.0	11.7	1.2	0.8	30.5	18.6	1.6
3200.00	19.9	26.9	9.0	11.4	1.2	0.8	28.1	18.3	1.5
3400.00	19.7	26.8	9.1	11.2	1.2	0.8	29.1	18.8	1.6
3600.00	19.5	26.8	9.2	10.9	1.2	0.8	27.9	18.7	1.5
3800.00	19.3	26.7	9.4	10.7	1.2	0.8	27.6	18.7	1.5
4000.00	19.1	26.7	9.6	10.8	1.2	0.8	27.4	18.8	1.6
4200.00	18.9	26.6	10.2	10.5	1.3	0.8	26.9	18.4	1.5
4400.00	18.7	26.6	10.9	10.5	1.3	0.8	27.1	18.7	1.5
4600.00	18.5	26.6	11.4	10.2	1.3	0.8	25.1	18.4	1.6
4800.00	18.3	26.7	12.0	9.9	1.3	0.8	23.4	17.8	1.6
5000.00	18.0	26.8	12.4	9.4	1.4	0.8	26.4	17.6	1.6
5200.00	17.7	27.0	12.6	8.8	1.4	0.8	23.2	17.3	1.7
5400.00	17.3	27.1	12.4	8.0	1.4	0.8	23.5	17.2	1.7
5600.00	16.8	27.3	11.9	7.5	1.4	0.8	22.3	16.6	1.8
5800.00	16.4	27.4	11.4	7.1	1.5	0.8	18.6	16.4	1.8
6000.00	15.9	27.7	10.7	6.6	1.5	0.8	18.6	15.6	2.0

Typical Performance Data

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

TEST CONDITIONS: V_{DD} = 5.25V, V_{EN} = 5.0V, I_{DD} = 74mA @ 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)
100.00	13.6	37.3	1.8	3.6	1.9	0.9	22.6	15.5	4.7
200.00	21.1	29.6	6.9	11.5	1.2	0.9	29.0	18.0	2.3
300.00	22.4	28.0	11.9	17.6	1.2	0.8	28.1	19.1	1.7
400.00	22.8	27.6	14.8	19.6	1.1	0.7	27.6	19.4	1.6
500.00	22.9	27.4	16.1	20.1	1.1	0.7	29.8	19.7	1.5
600.00	22.9	27.3	16.4	20.3	1.1	0.7	30.1	19.7	1.4
700.00	22.9	27.3	16.4	20.6	1.1	0.7	28.5	19.7	1.5
800.00	22.8	27.2	16.1	21.2	1.1	0.7	28.9	19.7	1.4
900.00	22.7	27.2	15.7	21.8	1.1	0.7	29.0	19.7	1.4
1000.00	22.7	27.2	15.3	22.5	1.1	0.7	30.2	19.6	1.4
1200.00	22.5	27.2	14.4	24.1	1.1	0.7	31.1	19.4	1.4
1400.00	22.3	27.2	13.5	24.7	1.1	0.7	28.8	19.4	1.5
1600.00	22.0	27.2	12.6	23.1	1.1	0.8	29.0	19.3	1.5
1800.00	21.8	27.3	11.8	20.7	1.1	0.8	29.6	19.3	1.5
2000.00	21.5	27.3	11.1	18.4	1.1	0.8	27.6	19.1	1.5
2200.00	21.2	27.3	10.5	16.4	1.2	0.8	27.2	18.9	1.5
2400.00	20.9	27.4	9.9	14.7	1.2	0.8	29.6	18.8	1.7
2600.00	20.7	27.5	9.5	13.3	1.2	0.9	27.9	18.7	1.7
2800.00	20.3	27.5	9.3	12.4	1.2	0.9	28.9	18.7	1.7
3000.00	20.1	27.4	9.0	11.8	1.2	0.9	29.8	18.9	1.7
3200.00	19.8	27.3	9.0	11.5	1.2	0.9	30.1	18.6	1.6
3400.00	19.6	27.2	9.0	11.4	1.2	0.9	29.3	19.0	1.7
3600.00	19.4	27.1	9.1	11.1	1.3	0.8	26.7	19.0	1.6
3800.00	19.2	27.1	9.4	11.0	1.3	0.8	27.1	19.0	1.7
4000.00	19.0	27.1	9.6	11.2	1.3	0.9	27.1	19.0	1.7
4200.00	18.8	27.0	10.1	11.0	1.3	0.8	27.6	18.5	1.6
4400.00	18.6	26.9	10.8	11.0	1.3	0.8	28.5	18.9	1.7
4600.00	18.4	27.0	11.3	10.9	1.4	0.8	27.5	18.6	1.7
4800.00	18.1	27.0	11.9	10.6	1.4	0.8	23.3	17.9	1.7
5000.00	17.8	27.2	12.3	10.1	1.4	0.8	24.1	17.6	1.7
5200.00	17.5	27.4	12.5	9.4	1.5	0.8	23.2	17.2	1.9
5400.00	17.1	27.5	12.4	8.7	1.5	0.8	23.4	17.0	1.8
5600.00	16.7	27.6	12.0	8.1	1.6	0.8	20.5	16.6	2.0
5800.00	16.2	27.8	11.4	7.7	1.6	0.8	19.6	16.4	2.1
6000.00	15.7	28.1	10.8	7.2	1.7	0.8	18.0	15.8	2.1

MMIC Amplifier

Typical Performance Data

NOTE: Use PDF Bookmarks to view DATA at required conditions

Definitions:

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

TEST CONDITIONS: V_{DD}=5.0 V, V_{EN}= 0V, I_{DD} = 2mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	IP-3 Output	1dB Comp. Input
(MHz)	(dB)	(dB)	(dB)	(dB)	(dBm)	(dBm)
100.00	-5.5	5.5	2.9	2.5		
200.00	-1.3	1.3	10.8	11.4		
300.00	-0.8	0.8	17.9	19.5		
400.00	-0.7	0.7	22.9	22.5		
500.00	-0.7	0.7	23.7	21.2	47.0	34.4
600.00	-0.7	0.8	22.5	20.2		
700.00	-0.7	0.7	20.8	19.0		
800.00	-0.7	0.7	19.0	17.7		
900.00	-0.7	0.7	17.6	16.6		
1000.00	-0.7	0.8	16.4	15.7	46.8	34.5
1200.00	-0.7	0.8	14.6	14.3		
1400.00	-0.8	0.9	13.3	13.3		
1600.00	-0.8	1.0	12.4	12.5		
1800.00	-0.9	1.0	11.7	12.0		
2000.00	-0.9	1.1	11.2	11.6	42.6	29.1
2200.00	-1.0	1.2	10.9	11.3		
2400.00	-1.0	1.2	10.7	11.3		
2600.00	-1.0	1.2	10.7	11.4		
2800.00	-1.0	1.3	10.8	11.7		
3000.00	-1.0	1.3	11.1	12.1	38.3	29.9
3200.00	-1.0	1.2	11.5	12.6		
3400.00	-0.9	1.2	12.0	13.4		
3600.00	-0.9	1.2	12.7	14.3		
3800.00	-0.9	1.2	13.5	15.4		
4000.00	-1.0	1.2	13.9	16.0	39.4	29.8
4200.00	-0.9	1.2	15.0	16.9		
4400.00	-0.9	1.1	16.1	17.8		
4600.00	-0.9	1.1	16.9	18.6		
4800.00	-0.9	1.1	17.7	18.7		
5000.00	-0.9	1.2	18.2	18.4	39.1	30.1
5200.00	-0.9	1.2	18.2	17.7		
5400.00	-0.9	1.2	17.7	16.6		
5600.00	-1.0	1.3	16.7	15.4		
5800.00	-1.0	1.4	15.5	14.2		
6000.00	-1.1	1.5	14.6	13.0	43.2	29.5

MMIC Amplifier

Typical Performance Data

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

TEST CONDITIONS: V_{DD}=5.0 V, V_{EN}= 0V, I_{DD} = 2mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	IP-3 Output	1dB Comp. Input
(MHz)	(dB)	(dB)	(dB)	(dB)	(dBm)	(dBm)
100.00	-5.5	5.5	2.7	2.4		
200.00	-1.2	1.2	10.8	11.2		
300.00	-0.7	0.7	18.1	19.2		
400.00	-0.7	0.7	23.3	22.6		
500.00	-0.7	0.7	24.1	21.5	46.6	34.4
600.00	-0.7	0.7	22.9	20.7		
700.00	-0.6	0.7	20.9	19.3		
800.00	-0.6	0.7	19.1	17.9		
900.00	-0.6	0.7	17.7	16.8		
1000.00	-0.6	0.7	16.5	15.9	46.9	34.5
1200.00	-0.7	0.8	14.7	14.4		
1400.00	-0.7	0.8	13.4	13.4		
1600.00	-0.8	0.9	12.4	12.6		
1800.00	-0.8	1.0	11.7	12.0		
2000.00	-0.9	1.0	11.2	11.6	41.7	29.4
2200.00	-0.9	1.1	10.9	11.3		
2400.00	-0.9	1.1	10.7	11.3		
2600.00	-0.9	1.2	10.7	11.4		
2800.00	-0.9	1.2	10.9	11.7		
3000.00	-0.9	1.2	11.2	12.1	37.7	30.2
3200.00	-0.9	1.1	11.7	12.7		
3400.00	-0.9	1.1	12.3	13.4		
3600.00	-0.8	1.1	12.9	14.3		
3800.00	-0.8	1.1	13.7	15.3		
4000.00	-0.9	1.2	14.0	16.1	40.8	30.1
4200.00	-0.8	1.1	15.1	16.7		
4400.00	-0.8	1.0	16.0	17.4		
4600.00	-0.8	1.0	16.8	18.0		
4800.00	-0.8	1.0	17.4	18.1		
5000.00	-0.8	1.1	17.7	17.8	38.9	30.3
5200.00	-0.8	1.1	17.5	17.0		
5400.00	-0.9	1.1	17.1	16.1		
5600.00	-0.9	1.2	16.2	15.1		
5800.00	-1.0	1.3	15.1	14.0		
6000.00	-1.1	1.4	14.2	12.9	42.9	28.9

MMIC Amplifier

Typical Performance Data

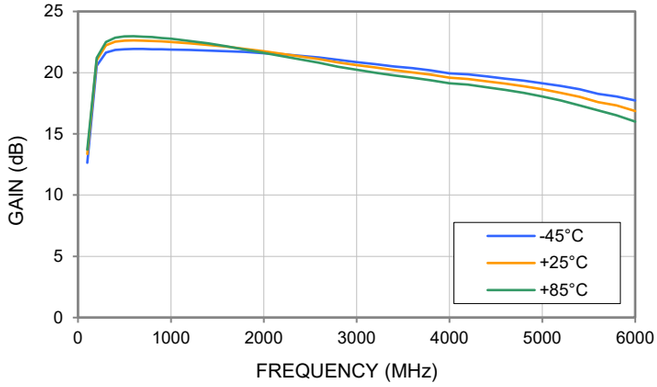
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: V_{DD}=5.0 V, V_{EN}= 0V, I_{DD} = 2mA @ Temperature = +85°C

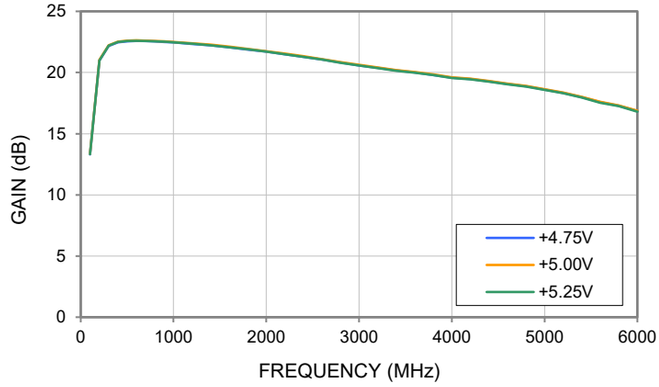
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	IP-3 Output	1dB Comp. Input
(MHz)	(dB)	(dB)	(dB)	(dB)	(dBm)	(dBm)
100.00	-5.6	5.6	3.0	2.7		
200.00	-1.4	1.4	10.8	11.7		
300.00	-0.9	0.9	17.7	20.0		
400.00	-0.8	0.8	22.3	22.3		
500.00	-0.8	0.8	23.1	20.7	43.2	34.4
600.00	-0.8	0.9	22.2	19.8		
700.00	-0.8	0.8	20.7	18.8		
800.00	-0.7	0.8	18.9	17.5		
900.00	-0.7	0.8	17.5	16.4		
1000.00	-0.8	0.8	16.3	15.5	44.1	34.5
1200.00	-0.8	0.9	14.5	14.2		
1400.00	-0.9	1.0	13.3	13.2		
1600.00	-0.9	1.1	12.3	12.5		
1800.00	-1.0	1.1	11.6	12.0		
2000.00	-1.0	1.2	11.1	11.6	41.4	29.1
2200.00	-1.1	1.3	10.8	11.4		
2400.00	-1.1	1.3	10.6	11.3		
2600.00	-1.1	1.4	10.6	11.4		
2800.00	-1.1	1.4	10.7	11.7		
3000.00	-1.1	1.4	10.9	12.1	37.4	30.0
3200.00	-1.1	1.4	11.3	12.6		
3400.00	-1.1	1.4	11.8	13.3		
3600.00	-1.0	1.4	12.4	14.3		
3800.00	-1.0	1.3	13.2	15.5		
4000.00	-1.1	1.4	13.8	16.1	41.4	29.8
4200.00	-1.0	1.3	14.9	17.2		
4400.00	-1.0	1.3	16.0	18.2		
4600.00	-1.0	1.3	16.9	19.0		
4800.00	-1.0	1.3	17.9	19.3		
5000.00	-1.0	1.3	18.7	19.0	40.0	30.1
5200.00	-1.0	1.3	18.8	18.2		
5400.00	-1.1	1.4	18.3	17.0		
5600.00	-1.1	1.5	17.3	15.7		
5800.00	-1.2	1.6	15.9	14.4		
6000.00	-1.3	1.7	14.9	13.0	43.5	29.5

Typical Performance Curves

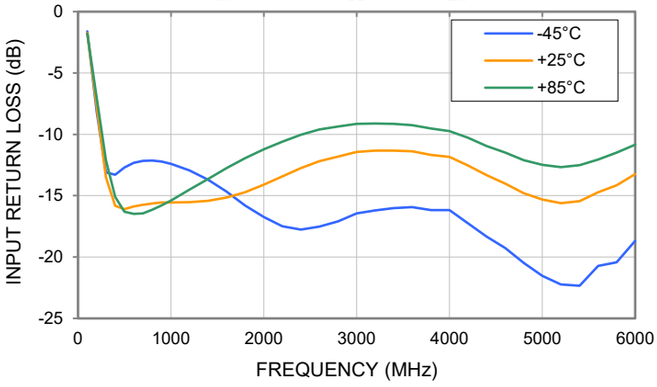
GAIN vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



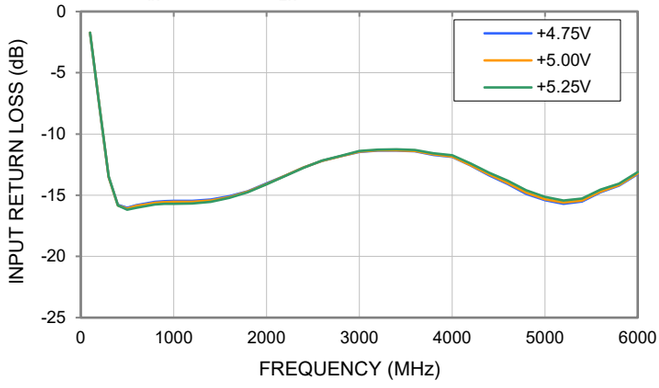
GAIN vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



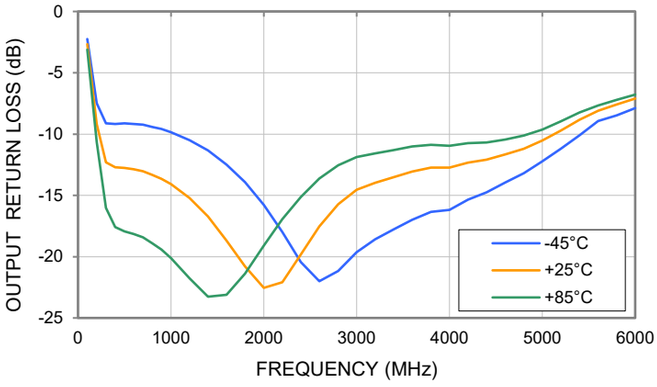
INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



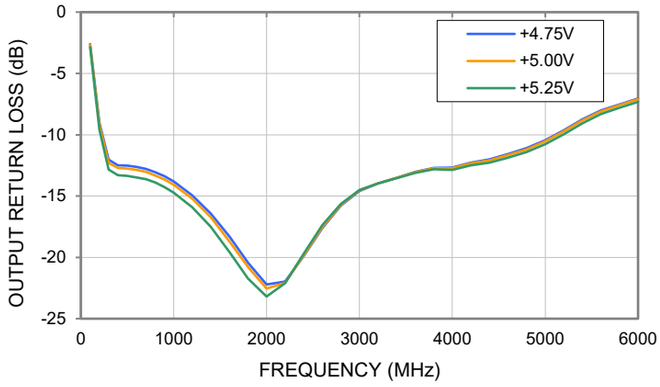
INPUT RETURN LOSS vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V

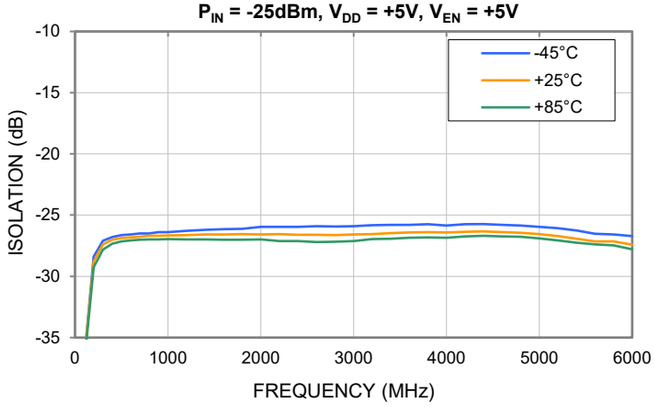


OUTPUT RETURN LOSS vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C

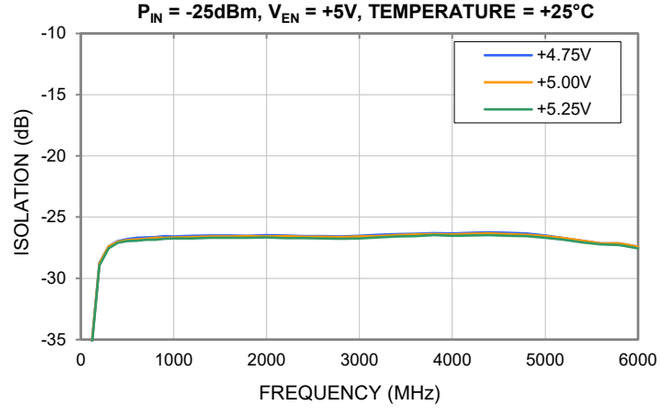


Typical Performance Curves

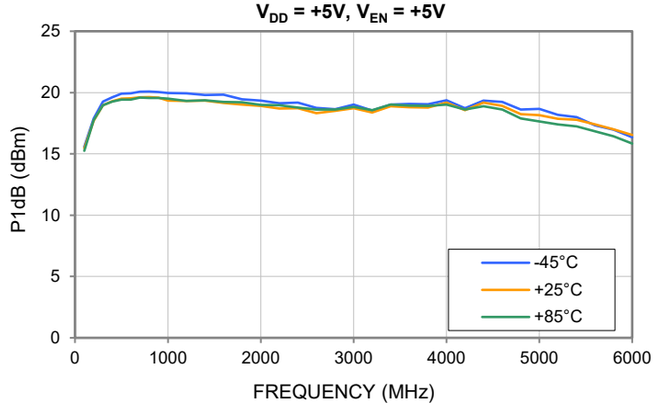
ISOLATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V



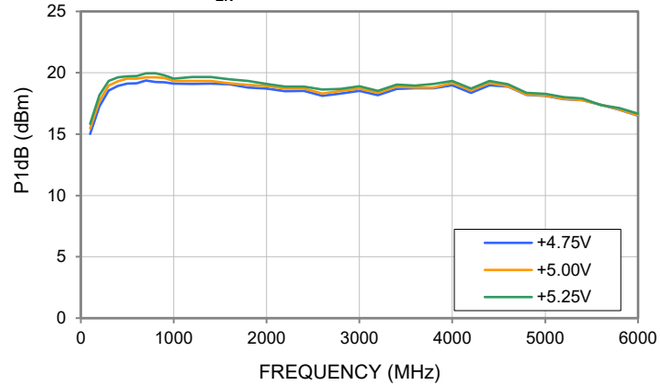
ISOLATION vs. DEVICE VOLTAGE
P_{IN} = -25dBm, V_{EN} = +5V, TEMPERATURE = +25°C



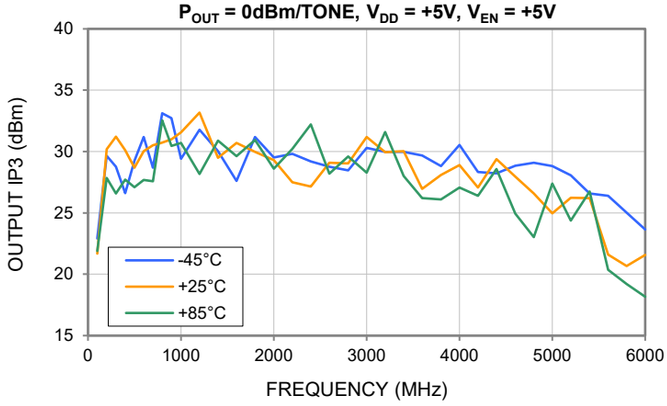
P1dB vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = +5V



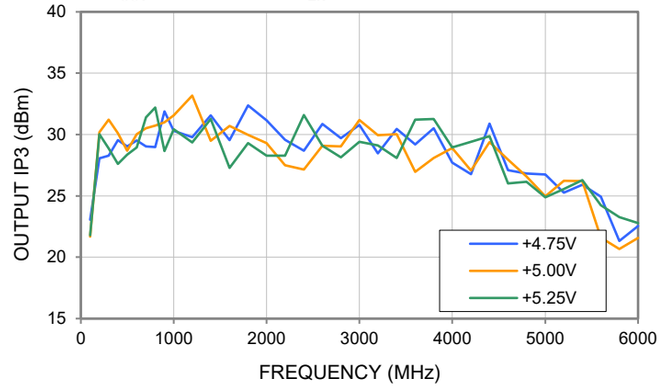
P1dB vs. DEVICE VOLTAGE
V_{EN} = +5V, TEMPERATURE = +25°C



OUTPUT IP3 vs. TEMPERATURE
P_{OUT} = 0dBm/TONE, V_{DD} = +5V, V_{EN} = +5V

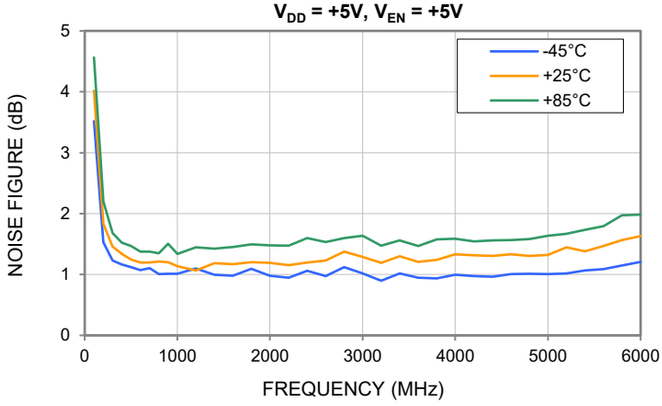


OUTPUT IP3 vs. DEVICE VOLTAGE
P_{OUT} = 0dBm/TONE, V_{EN} = +5V, TEMPERATURE = +25°C

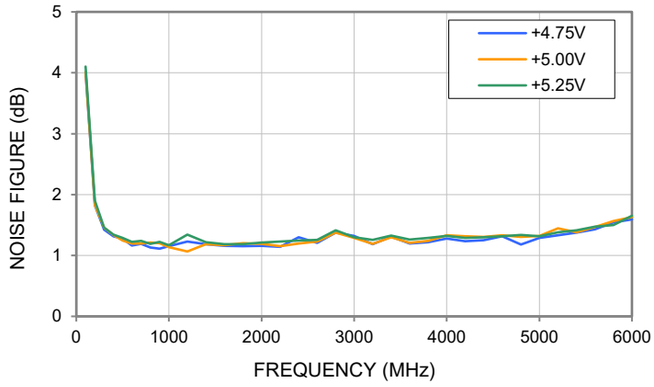


Typical Performance Curves

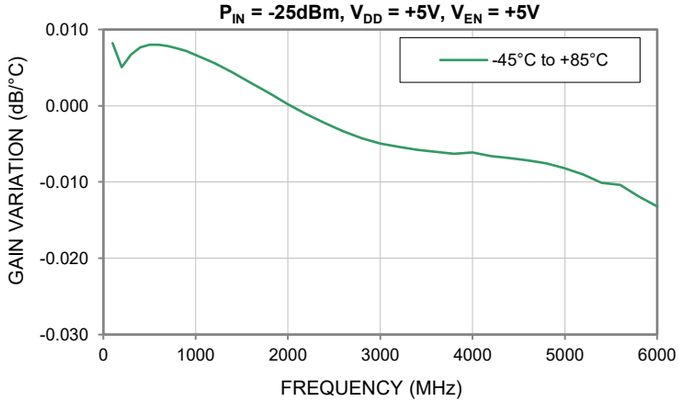
NOISE FIGURE vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = +5V



NOISE FIGURE vs. DEVICE VOLTAGE
V_{EN} = +5V, TEMPERATURE = +25°C

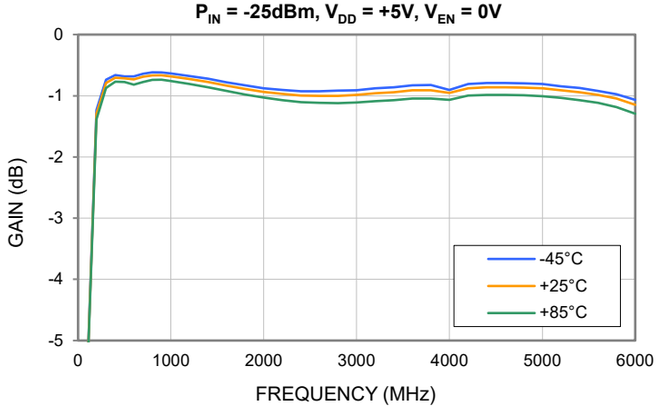


GAIN VARIATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = +5V

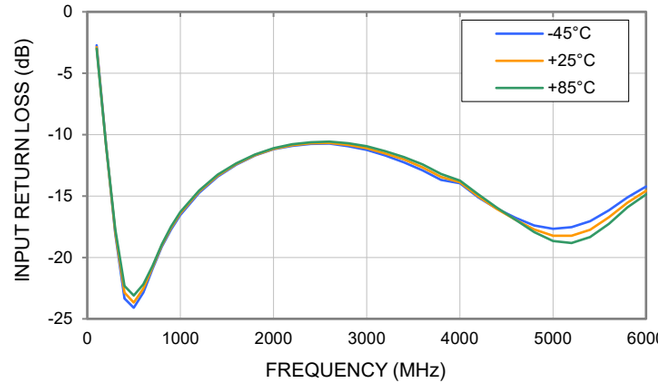


Typical Performance Curves

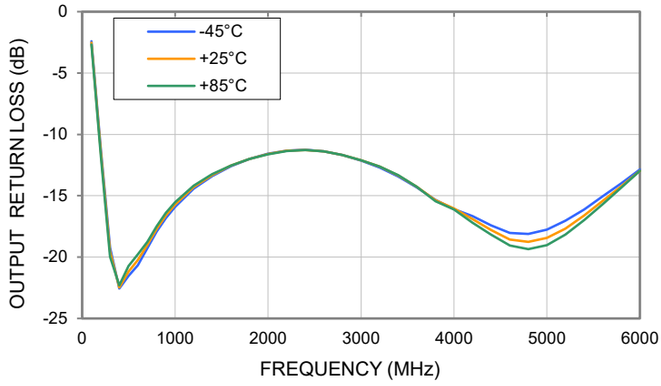
GAIN vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



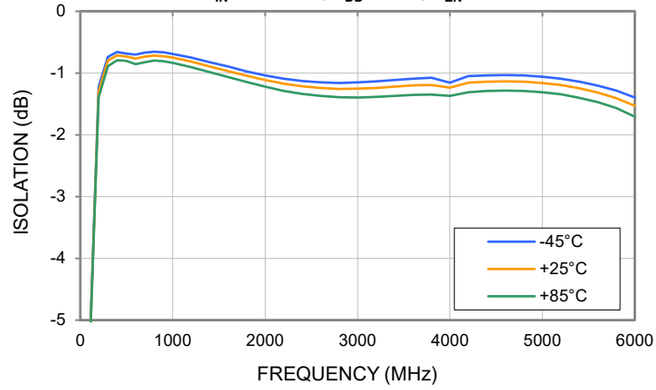
INPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



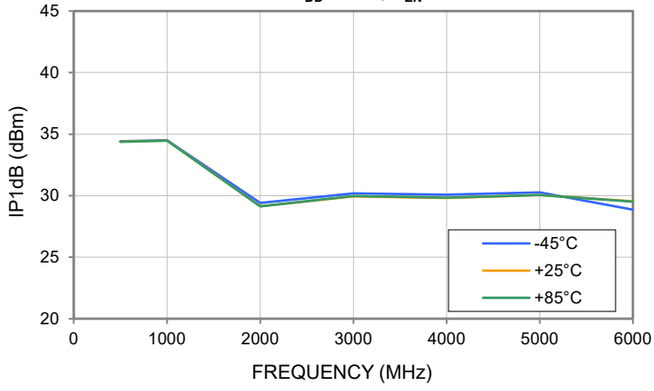
OUTPUT RETURN LOSS vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



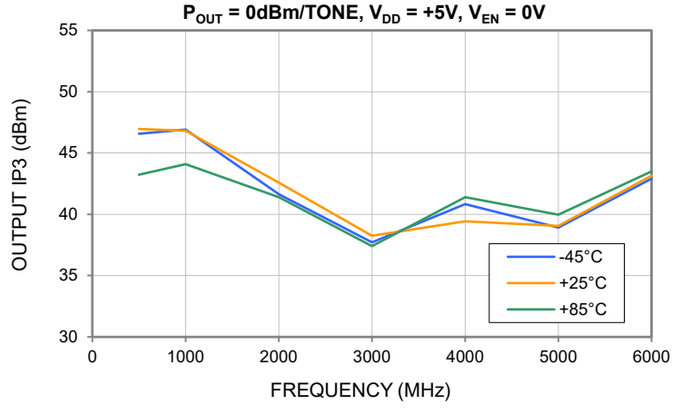
ISOLATION vs. TEMPERATURE
P_{IN} = -25dBm, V_{DD} = +5V, V_{EN} = 0V



INPUT P1dB vs. TEMPERATURE
V_{DD} = +5V, V_{EN} = 0V



OUTPUT IP3 vs. TEMPERATURE
P_{OUT} = 0dBm/TONE, V_{DD} = +5V, V_{EN} = 0V

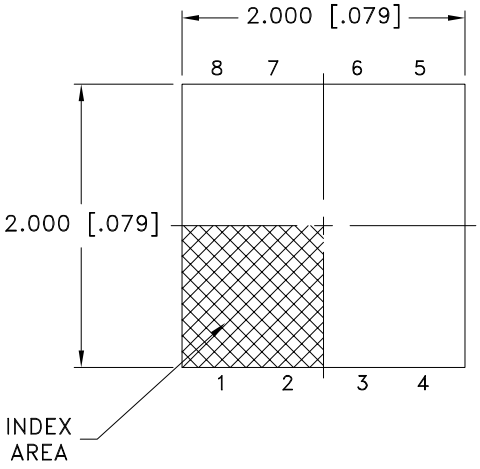


Case Style MC

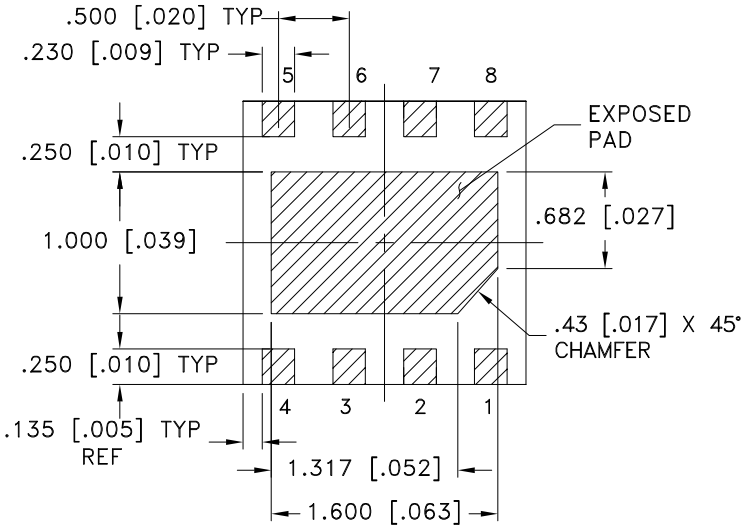
Outline Dimensions

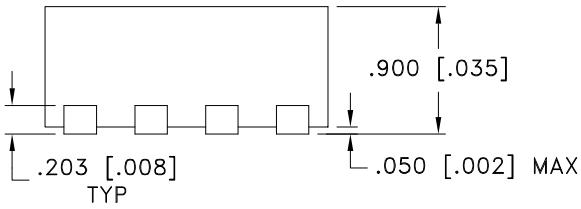
MC3007

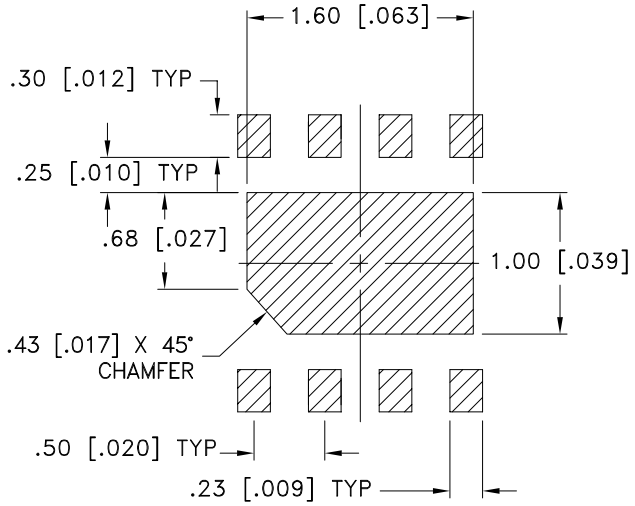
TOP VIEW



BOTTOM VIEW







DENOTES METALLIZATION

Suggested Layout

Weight: .011 grams

Dimensions are in mm [inches]. Tolerances: 3 Pl.±.0.050[0.002] mm[Inches]

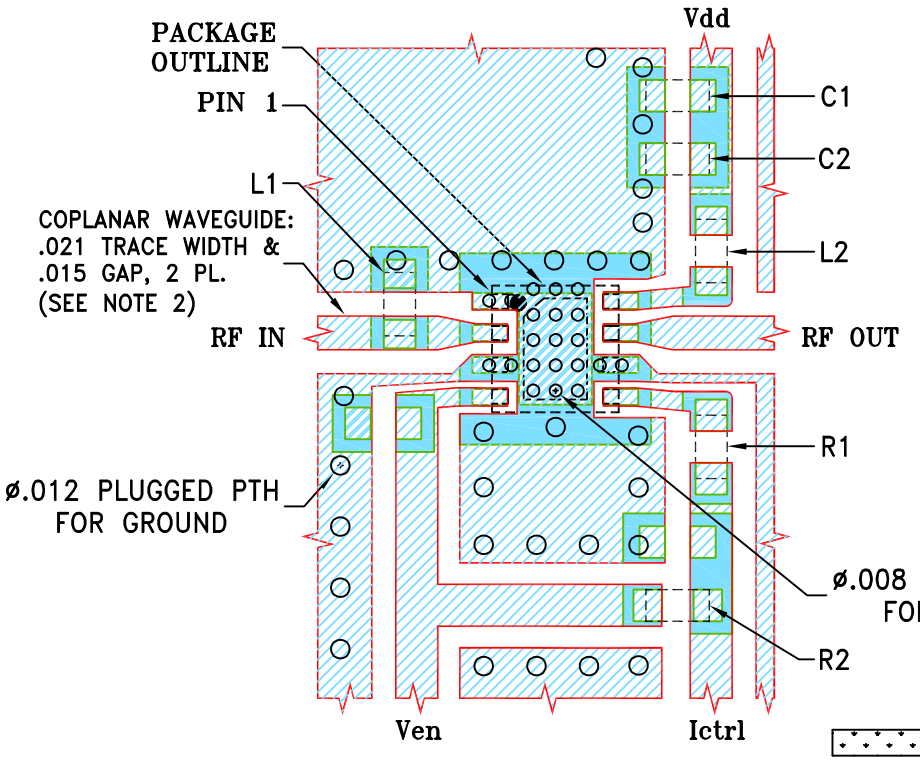
Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin plated (See Data sheet).
   All models, (+) suffix.
3. Lead #1 identifier shall be located in the cross-hatched area shown.
   Identifier may be either a molded or marked feature.

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-019109	NEW RELEASE	09/06/23	ITG	CC

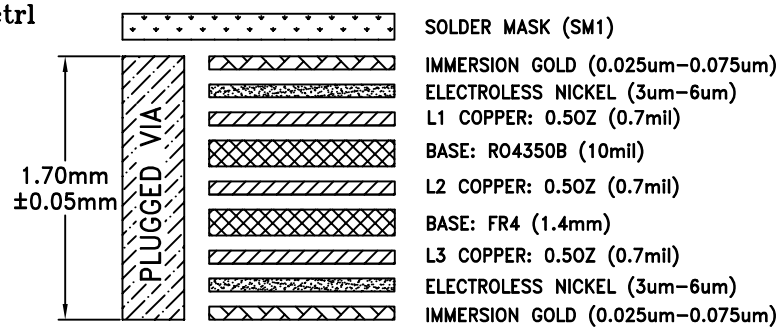
SUGGESTED MOUNTING CONFIGURATION FOR MC3007/99-02-3007 CASE STYLE



TOP VIEW

COMPONENT	SIZE
C1,C2	0402
L1,L2	0402
R1,R2	0402

3 LAYER STACKUP DETAIL



NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-TSS2-53LNBC+.
4. COPPER LAYERS L2 & L3 OF THE PCB ARE CONTINUOUS GROUND PLANES.

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	09/06/23
TOLERANCES ON:	CHECKED	GF	09/06/23
2 PL DECIMALS ±	APPROVED	IL	09/06/23
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

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

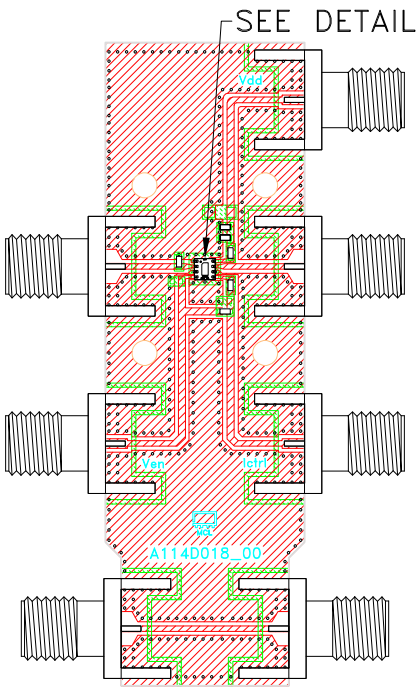
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

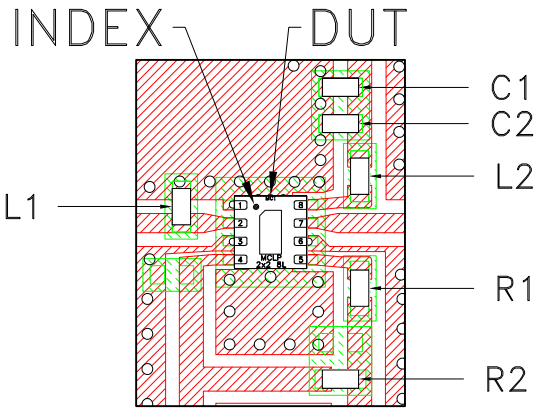
PL, MC3007, TB-TSS2-53LNBC+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-760	OR

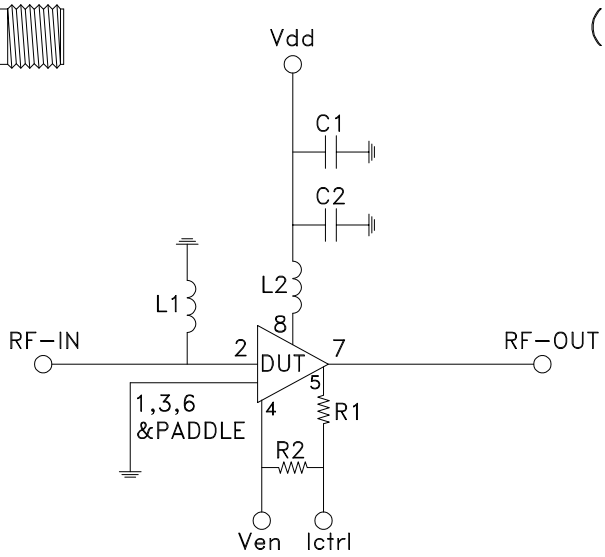
FILE:	SCALE:	SHEET:
98PL760	8:1	1 OF 1

Evaluation Board and Circuit





DETAIL "A"
LOCATION OF COMPONENTS
ON THE PCB
(SCALE 3:1)



SCHEMATIC DIAGRAM

Component	Size	Value	Part Number	Manufacturer
C1	0402	0.1uF	GRM155R71C104KA88D	Murata
C2	0402	10pF	GJM1555C1H100JB01D	Murata
L1	0402	47nH	LQG15WH47NJ02D	Murata
L2	0402	56nH	0402HPH-56NXGRW	Coilcraft
R1	0402	0Ohm	RK73Z1ETTP	KOA Speer
R2	0402	3.92KOhm	RK73H1ETTP3921F	KOA Speer

Notes:

1. 50 Ohm SMA Female Connectors.
2. PCB Material: Roger RO4350B or equivalent,
   Dielectric constant=3.5, Thickness=0.010 inch

Mini-Circuits®

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Environmental Specifications ENV12T2

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 1	Bake at 125°C for 24 hours. Reflow 3 cycles at 260°C peak	J-STD-020D
Autoclave	Temperature: 121°C. RH 100%. Pressure: 29.7 psla Duration: 96 hours	JESD22-A102E, Test Condition C
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	JESD22-A108
ESD HBM	Refer datasheet for classification	JS-001
ESD CDM	Refer datasheet for classification	JESD22-C101
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
Bend Test	1mm deflection for 5 seconds. Board thickness: 0.024", Span: 2.75"	--
Solderability	10x magnification	J-STD-002 Method B, B1