

DC-to-Microwave, Low-Noise Amplifier

ABSOLUTE MAXIMUM RATINGS

I_D 40mA
 Input Power+13dBm
 Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)
 SOT143-4 (derate 4mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$).....320mW

Operating Temperature Range -40°C to $+85^\circ\text{C}$
 Junction Temperature..... $+150^\circ\text{C}$
 Storage Temperature Range..... -65°C to $+150^\circ\text{C}$
 Lead Temperature (soldering, 10s)..... $+300^\circ\text{C}$

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



CAUTION! ESD SENSITIVE DEVICE

ELECTRICAL CHARACTERISTICS

($I_D = 16\text{mA}$, $Z_0 = 50\Omega$, $f_{IN} = 500\text{MHz}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Temperature Range	(Note 1)	-40		85	$^\circ\text{C}$
Power Gain	$f_{IN} = 100\text{MHz}$		19.0		dB
	$f_{IN} = 500\text{MHz}$	17.3	18.3		
Gain Flatness	$f_{IN} = 100\text{MHz}$ to 500MHz		± 0.3		dB
3dB Bandwidth			1100		MHz
Input Voltage Standing-Wave Maximum Ratio	$f_{IN} = 100\text{MHz}$ to 1500MHz		1.9:1		
Output Voltage Standing-Wave Maximum Ratio	$f_{IN} = 100\text{MHz}$ to 1500MHz		1.6:1		
Output 1dB Compression Point			2.9		dBm
Noise Figure			3.5		dB
Output IP3			13		dBm
Group Delay			210		ps
Device Voltage		3.5	3.8	4.0	V
	$T_A = T_{MIN}$ to T_{MAX} (Note 2)	3.25	3.8	4.26	
Device Voltage Temperature Coefficient			-6.1		mV/ $^\circ\text{C}$

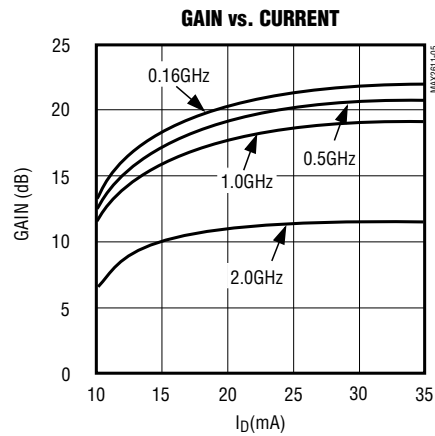
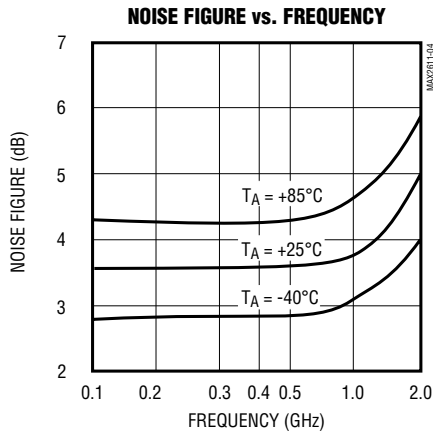
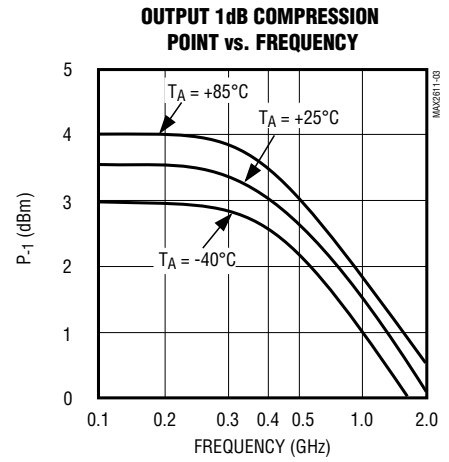
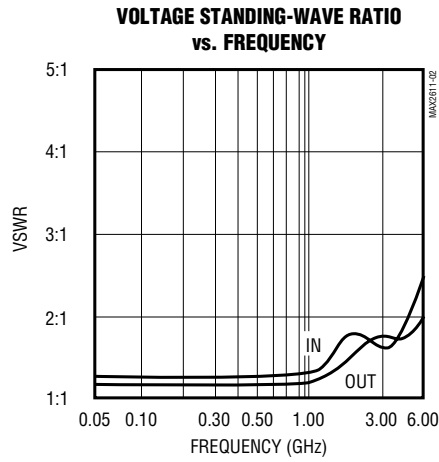
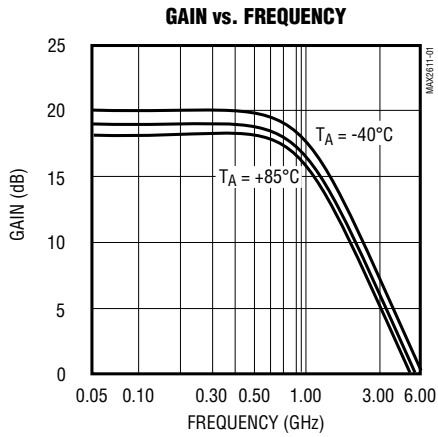
Note 1: Parts are designed to operate over specified temperature range. Specifications are production tested and guaranteed at $+25^\circ\text{C}$.

Note 2: Guaranteed by design, not tested.

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Typical Operating Characteristics

($I_D = 16\text{mA}$, $Z_0 = 50\Omega$, $f_{IN} = 500\text{MHz}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)



MAX2611

DC-to-Microwave, Low-Noise Amplifier

Pin Description

PIN	NAME	FUNCTION
1	OUT	Amplifier Output. Use a series blocking capacitor with less than 3Ω reactance at your lowest operating frequency. Bias with an external resistor and an optional RF choke.
2, 4	GND	Ground Connection. For optimum performance, provide a low-inductance connection to the ground plane.
3	IN	Amplifier Input. Use a series blocking capacitor with less than 3Ω reactance at your lowest operating frequency.

Table 1. Typical Scattering Parameters

($I_D = 16\text{mA}$, $Z_0 = 50\Omega$, $T_A = +25^\circ\text{C}$)

FREQUENCY (GHz)	S11 (mag)	S11 (ang)	S21 (dB)	S21 (mag)	S21 (ang)	S12 (dB)	S12 (mag)	S12 (ang)	S22 (mag)	S22 (ang)	K
0.1	0.12	-11	19.0	8.90	173	-22.6	0.074	2	0.05	53	1.08
0.2	0.11	-44	18.8	8.73	166	-21.9	0.081	4	0.03	12	1.06
0.3	0.13	-58	18.6	8.53	158	-21.6	0.083	5	0.04	45	1.05
0.4	0.14	-78	18.5	8.43	151	-21.6	0.083	6	0.06	32	1.06
0.5	0.15	-89	18.3	8.26	144	-21.6	0.083	7	0.08	34	1.06
0.6	0.15	77	18.1	7.99	137	-21.6	0.083	9	0.09	26	1.07
0.8	0.13	50	17.4	7.45	123	-21.6	0.083	10	0.10	23	1.10
1.0	0.12	16	16.6	6.79	109	-20.9	0.090	10	0.10	35	1.11
1.5	0.32	-60	14.1	5.07	79	-21.8	0.081	11	0.21	-86	1.29
2.0	0.31	-72	10.3	3.27	59	-22.2	0.078	18	0.22	-72	1.87
2.5	0.32	-76	7.9	2.48	47	-22.6	0.074	25	0.26	-53	2.44
3.0	0.20	-70	5.9	1.98	32	-22.3	0.077	37	0.24	-29	3.10
3.5	0.24	-64	3.0	1.41	13	-21.4	0.086	30	0.19	47	3.83
4.0	0.31	-68	-0.7	0.92	17	-23.0	0.070	35	0.24	82	6.66

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Detailed Description

The MAX2611 is a broadband amplifier with flat gain and 50Ω input and output ports. Its small size and simple bias circuitry make it ideal for applications where board space is limited.

Applications Information

External Components

As shown in the *Typical Operating Circuit*, the MAX2611 is easy to use. Input and output series capacitors may be necessary to block DC bias voltages (generated by the MAX2611) from interacting with adjacent circuitry. These capacitors must be large enough to contribute negligible reactance in a 50Ω system at the minimum operating frequency. Use the following equation to calculate their minimum value:

$$C_{\text{BLOCK}} = \frac{53,000}{f} \quad (\text{pF})$$

where f (in MHz) is the minimum operating frequency.

Bias current is supplied to the MAX2611 through an external resistor and optional RF choke connected between V_{CC} and the OUT pin. A bypass capacitor from V_{CC} to GND may be necessary to isolate the V_{CC} line from other circuitry. The resistor value determines the bias current from the following equation:

$$I_D = \frac{V_{CC} - V_D}{R_{\text{BIAS}}}$$

where V_D is the device voltage, nominally 3.8V.

An optional RF choke can be added to improve the MAX2611's gain and output power. The choke should be large enough to reduce the loading effect that the bias resistor has on the amplifier output. This is a function of R_{BIAS} , frequency of operation, and output impedance.

Grounding

Proper grounding of the GND pins is essential. If the PC board uses a topside RF ground, the GND pins should be connected directly to it. For a board where the ground plane is not on the component side, the best technique is to connect the GND pins to it through multiple plated through-holes.

PC Board Layout Example

An example PC board layout is given in Figure 1. It uses FR-4 with 31mil layer thickness between the RF lines and the ground plane. This board satisfies all the above requirements.

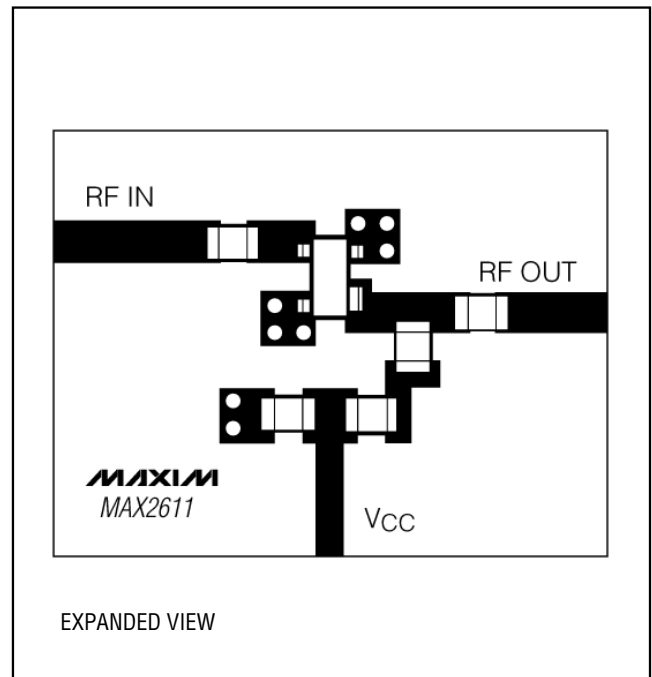
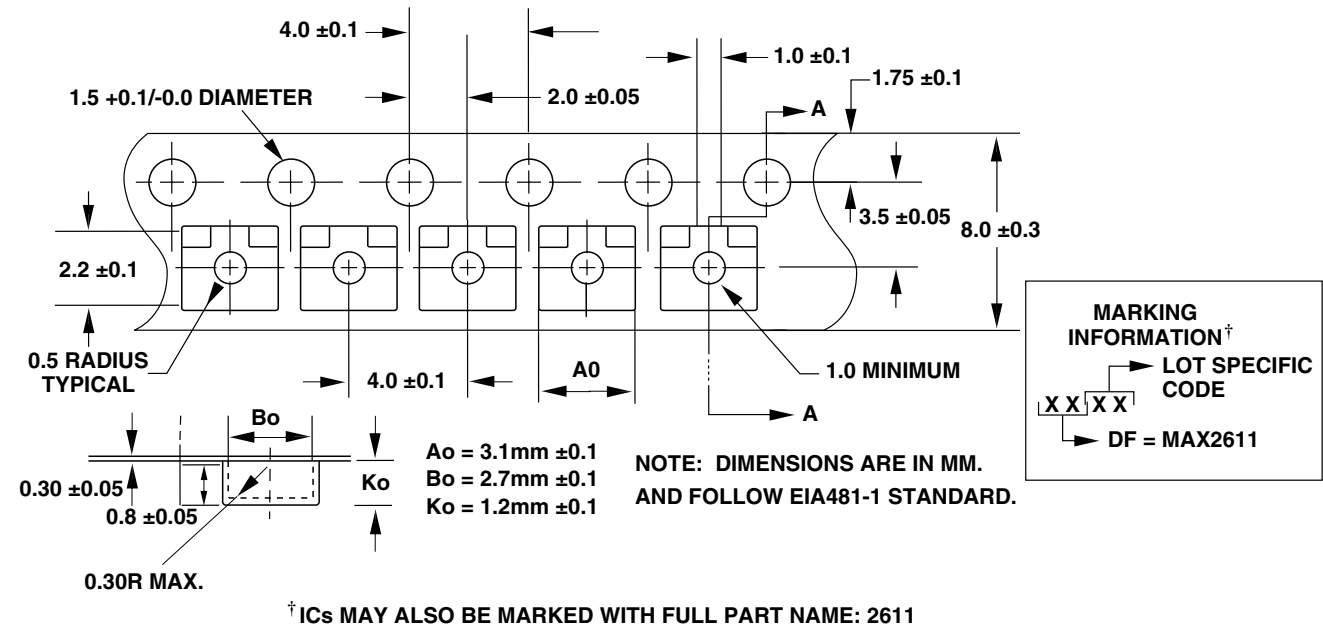


Figure 1. Example PC Board Layout

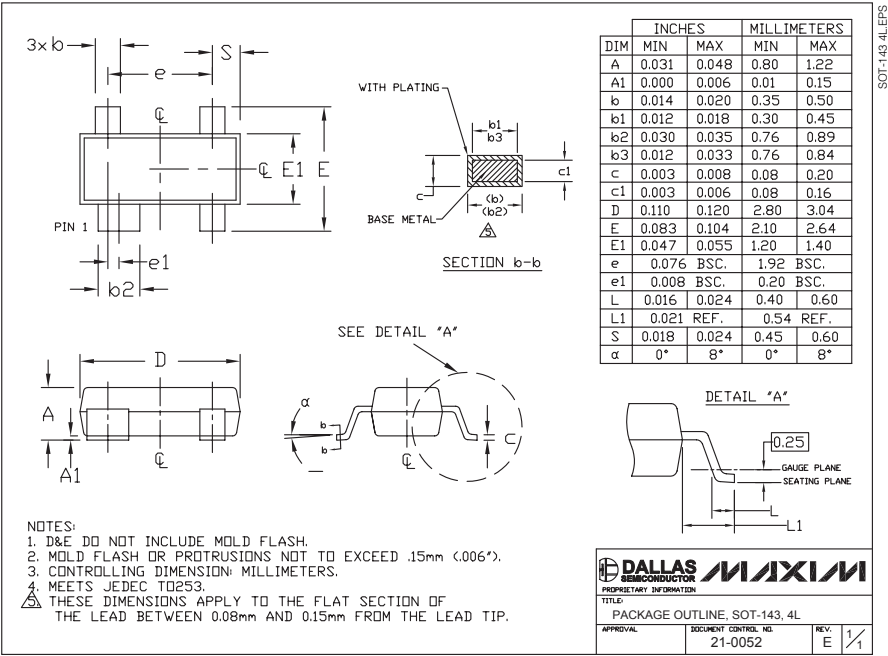
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Tape-and-Reel Information



Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)



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