

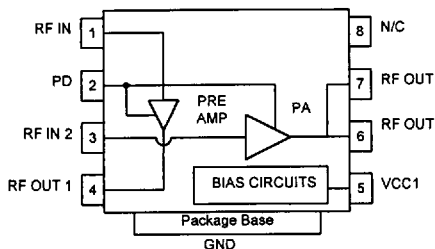
Typical Applications

- Digital Communications Systems
- Spread Spectrum Communications Systems
- Driver for Higher Power Linear Applications
- Portable Battery Powered Equipment
- Commercial and Consumer Systems
- Base Station Equipment

Product Description

The RF2113 is a medium to high power linear amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final linear RF amplifier in UHF radio transmitters operating between 1 MHz and 1 GHz. It may also be used as a driver amplifier in higher power applications. The device is packaged in an 8-lead plastic SOIC package with a backside ground. The device is self-contained with the exception of the output matching network, power supply feed line, and bypass capacitors. It produces an output power level of >1 W (CW) at frequencies below 450 MHz and >500 mW at frequencies up to 1 GHz. **The device can be used in 3 cell battery applications.** The maximum CW output at 3V is 125 mW. The unit has a total gain of 31 dB, depending upon the output matching network.

Handle with care: ESD sensitive.



Functional Block Diagram

Features

- 1 MHz to 1000 MHz Operation
- Over 1W CW Output Power
- 31 dB Small Signal Gain
- Single 2.7 to 7.5 V Supply
- 42% Efficiency
- Digitally Controlled Power Down Mode

4
POWER AMPLIFIERS

Parameter: Specified at 25°C and 6 V	Specification			Units	
	Min	Typ	Max		
Overall:					
Frequency Range		1 - 1000		MHz	
Output Power (f < 450 MHz)		> 1		W	
Output Power (f > 450 MHz)		> 0.5		W	
Power Gain (f < 450 MHz)		TBD		dB	
Second Harmonic (without second harmonic trap)		-24		dBc	
Third Harmonic		-30		dBc	
Output Noise Power		< -125		dBm/Hz	
Input VSWR (with external matching network; see application schematic)		< 3:1			
Z _{in} (with external matching network; see application schematic)		50		Ω	
Output Z _{LOAD} (optimal match)		18+ <i>j</i> 0		Ω	
Power Supply Voltage		2.7 - 6.5		V	
Power Supply Idle Current (V _{cc} = +6.3 Vdc)		80		mA	
Total "OFF" Current Drain (V _{pd} < 0.1 Vdc)			10	μA	
Turn-on Time (from V _{pd} = 0 to +4 Vdc)		< 100		nsec	
Nominal 5.8 V Configuration:					
Power Gain	Conditions: V _{cc} = 5.8 Vdc V _{pd} = 4.0 Vdc Freq. = 830 MHz Z _{load} = 18Ω T = 25°C		31	dB	
CW Peak Power Output		24	26.5		dBm
IM3 (at P _{out} = 18.5 dBm for each tone)			-40	-25	dBc
IM5 (at P _{out} = 18.5 dBm for each tone)			-43	-30	dBc
VCC1&VCC2 Current (CW)			175	250	mA
Power Down Control Current (PD)			< 3.5		mA
CW Total Efficiency			47		%
Two Tone Total Efficiency (at P _{out} = 18.5 dBm for each tone)		26		%	
Operating Temperature Range		-40	+85	°C	
Package Style:	8 lead SOIC (PSOP2-8)				

Absolute Maximum Ratings

	Value	Units
Supply Voltage (V _{cc})	+7.5	Vdc
PA DC Input Current	250	mA
Power Down Voltage (V _{pd})	+5	V
Input RF Power	+6	dBm
Case Temperature	+100	°C

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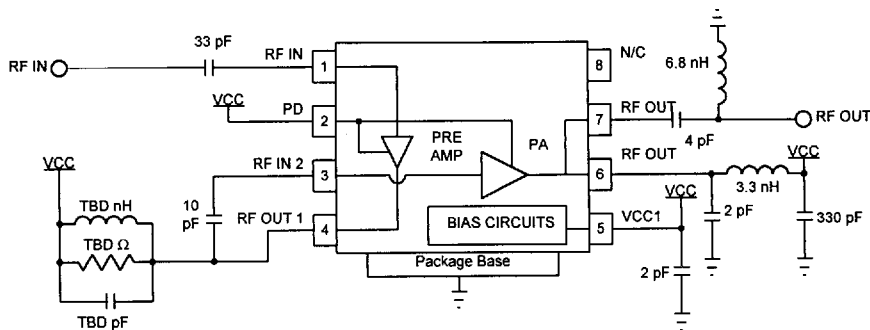
Ordering Information

Part No.	Description
RF2113	Linear Amplifier
RF2113PCBA	Fully Assembled Evaluation PCB
RF2113PCB	Evaluation PCB Only

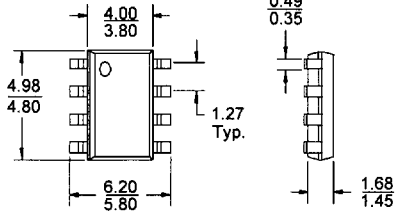
For:	Contact:
<ul style="list-style-type: none"> • Pricing Information • Application Assistance • Samples 	RF Micro Devices, Inc. (910) 855-8085

Pin	Function	Description
1	RF Input	RF input pin. This pin is internally connected to the bias circuits. An external DC blocking capacitor is required. The value of this capacitor depends on the actual operating frequency.
2	PD	Power down control voltage. When this pin is at 0V, the device will be in power down mode, dissipating minimum DC power. When this pin is at VCC (3V to 6.5V), the device will be in full power mode delivering maximum gain and output power capability. This pin may also be used to perform some degree of gain control or power control when set to voltages between 0V and VCC. It is not optimized for this function so the transfer function is not linear over a wide range as with other devices specifically designed for analog gain control, however, it may be useable for course adjustment or in some closed loop AGC systems. This pin should not, in any circumstance, be higher in voltage than VCC. This pin should also have an external bypassing capacitor.
3	RF IN2	RF input of the power stage. This pin is internally connected to the bias circuits. An external DC blocking capacitor is required. This same capacitor can also be used for interstage matching. Typically this capacitor will be between pin 3 and 4 and have a value of 20 pF at 500 MHz, and 10 pF at 915 MHz.
4	OUT1	RF output of the pre-amplifier. Power supply needs to be supplied to this pin through an inductor with a parallel resistor to avoid oscillations. A parallel capacitor is also needed to tune for parallel resonance at the operating frequency. This output is normally connected to pin 3 through a capacitor.
5	VCC1	Positive supply for the active bias circuits. This needs to be bypassed with a single capacitor, placed as close as possible to the package. Additional bypassing of 1μF is also recommended, but proximity to the package is not as critical.
6	RF OUT	Amplifier RF output. This is an unmatched collector output of the final amplifier transistor. It is internally connected to pins 6 and 7. Bias for the final power amplifier output transistor must also be provided through one of these two pins. Typically, pin 6 is connected to a network that provides the DC bias and also creates a second harmonic trap. For 915 MHz operation, this harmonic trap network is simply a single 2 pF capacitor from the pin to ground. This capacitor series resonates with internal bond wires and acts as a trap at two times the operating frequency, effectively shorting out the 2nd harmonic. Shorting out this harmonic serves to increase the amplifier's maximum output power and efficiency, as well as to lower the level of the 2nd harmonic output. Typically, pin 7 is externally connected very close to the package and used as the RF output with a matching network that presents the optimum load impedance to the PA for maximum power and efficiency, as well as providing DC blocking at the output.
7	RF OUT	Same as pin 6.
8	N/C	Not connected.
Package Base	Ground	The package base need to be connected directly to the ground plane. Especially at higher frequencies this requires to have vias under the device.

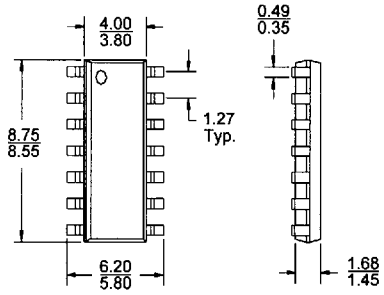
RF2113 Application Schematic: 915 MHz Operation



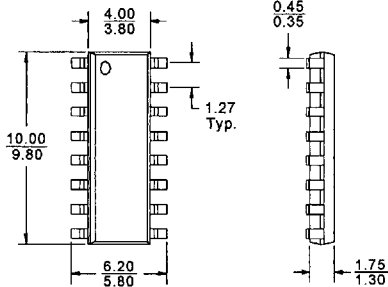
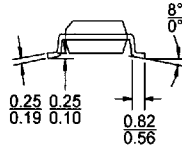
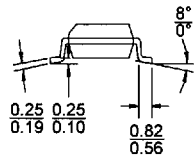
Max. All dimensions in millimeters
Min.



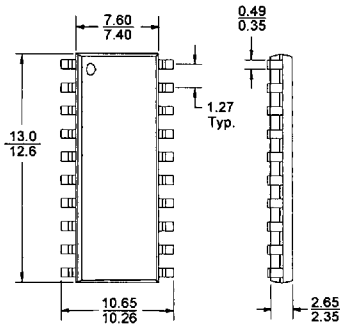
SOIC-8



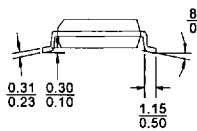
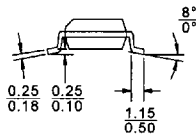
SOIC-14

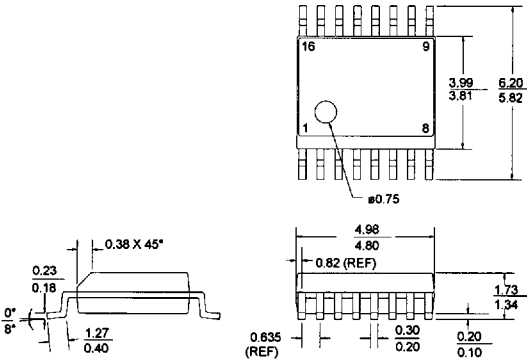


SOIC-16

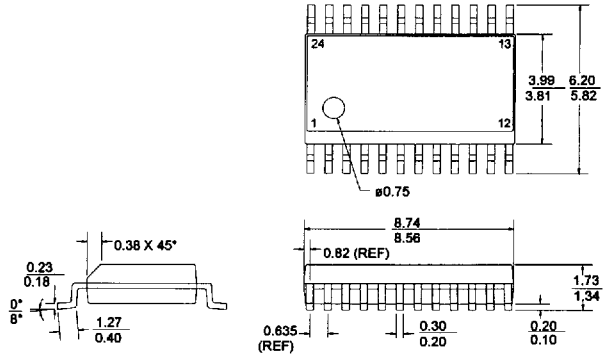


SOIC-20

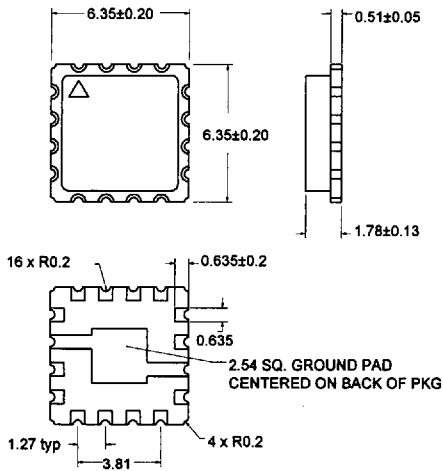




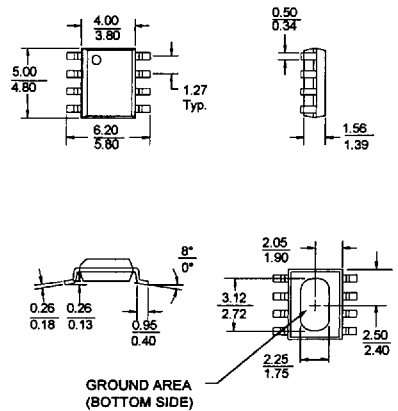
QSOP-16



QSOP-24



QLCC-16



PSOP2-8