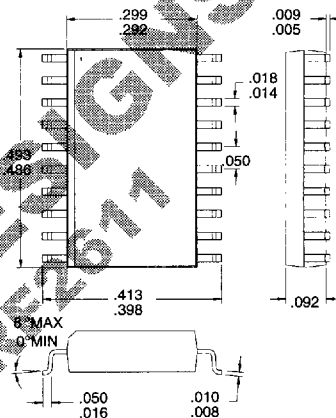


Typical Applications

- UHF Digital and Analog Receivers
- Digital Communication Systems
- Spread Spectrum Communication Systems
- Commercial and Consumer Systems
- Portable Battery Powered Equipment

Product Description

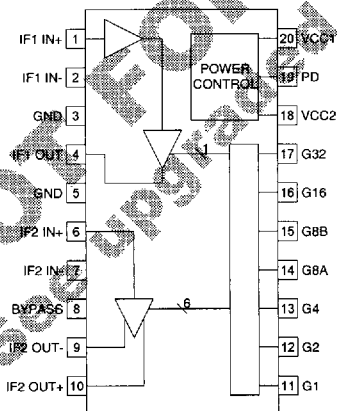
The RF2601 is a monolithic integrated IF receiver section intended for use in digital mobile radio receivers. In this application it is necessary to linearly amplify the signals (no clipping) and provide receiver gain control which can be set by a digital processor. The RF2601 is intended for use in single IF systems where the IF frequency is as high as 70MHz. The IC contains all of the required components to implement the IF gain function of the receiver except for the passive filtering. The chip contains two IF sections with a tap for interstage filtering. The gain is digitally programmable in 1dB steps over a range of 71dB. When used with the RF Micro Devices RF2401 front-end, the receiver's gain control range is 94dB.



Optimum Technology Matching™ Applied

- Si BJT GaAs HBT GaAs MESFET
 Si Bi-CMOS

Package Style: SOP-20



Functional Block Diagram

Features

- Single 5V Power Supply
- Complete Receiver IF Section
- Monolithic Construction
- Digital Gain Control
- Digitally Controlled Power Down Mode
- 100kHz to 70MHz Operation

Ordering Information

- RF2601 Gain Controlled IF Amplifier
RF2601 PCBA Fully Assembled Evaluation Board

RF Micro Devices, Inc.
7625 Thorndike Road
Greensboro, NC 27409, USA

Tel (910) 664 1233
Fax (910) 664 0454
<http://www.rfmd.com>

RF2601

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +7.0	V _{DC}
Input RF Level	+6	dBm
Storage Temperature	-40 to +150	°C
Ambient Operating Temperature	-40 to +85	°C



Caution! ESD sensitive device.

RF Micro Devices believes the furnished information is correct and accurate at the time of this printing. However, RF Micro Devices reserves the right to make changes to its products without notice. RF Micro Devices does not assume responsibility for the use of the described product(s).

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25°C, V _{CC} =5.0V, Freq=50MHz
Frequency Range		0.1 to 70		MHz	3dB Bandwidth
Voltage Gain		18		dB	Minimum gain setting, differential output
		91		dB	Maximum gain setting, differential output
Gain Accuracy (Deviation from Setting)	-0.2	+0.1	+0.3	dB	G1
	-0.3	+0.1	+0.5	dB	G2
	-0.4	+0.1	+0.6	dB	G4
	-0.7	+0.3	+2.0	dB	G8A, G8B
	-0.7	+0.2	+2.3	dB	G16
	-1.6	+0.7	+4.5	dB	G32
Noise Figure		4		dB	Maximum gain setting
First IF Section					
Frequency Range		0.1 to 70		MHz	3dB bandwidth, depends on layout parasitics
IF1 Input Impedance		370-j160		Ω	At 50 MHz
IF1 Output Impedance		1300-j400		Ω	At 50 MHz
Voltage Gain		38		dB	At minimum gain setting
		70		dB	At maximum gain setting
Input P _{1dB}		70		mV _{PP}	
Input IP ₃		-7		dBm	Referenced to 50Ω
Second IF Section					Single ended 1500Ω load
Frequency Range		0.1 to 70		MHz	
Input Impedance		1400-j600		Ω	At 50 MHz
Output Impedance		300		Ω	At 50 MHz
Voltage Gain		11		dB	Minimum gain setting
		50		dB	Maximum gain setting
Input P _{1dB}		160		mV _{PP}	Minimum gain setting
Gain Control					
Gain "ON"	2.3	4.0		V	Voltage supplied to control input
Gain "OFF"		0.5	1.0	V	Voltage supplied to control input
Switch Time			<100	ns	
Power Down					
Power Down "ON"	4.5	5.0		V	Voltage supplied to control input; device is "ON"
Power Down "OFF"		0.5	1.0	V	Voltage supplied to control input; device is "OFF"
PD Input Impedance	5k			Ω	
Power Supply					
Operating Voltage		4.5 to 5.5		V	
Current Consumption	8	12	16	mA	Power Down "ON"
Current Consumption			10	μA	Power Down "OFF"

10

IF AMPLIFIERS

9004131 0000773 976

Pin	Function	Description	Interface Schematic
1	IF1 IN+	Balanced IF input for the buffer amplifier for the first gain stage. An external DC blocking capacitor of 4.7nF is recommended.	
2	IF1 IN-	Balanced IF input for the buffer amplifier for the first gain stage. An external DC blocking capacitor of 4.7nF is recommended. When a single-ended input is used this port can be connected to ground through the DC blocking capacitor.	See pin 1.
3	GND	Ground connection. Keep traces physically short and connect immediately to the ground plane for best performance.	
4	IF1 OUT	Single-ended output of the first gain stage. The gain of this stage is set with G32 (pin 17). When G32 is high the gain is typically 38dB. An external DC blocking capacitor of 4.7nF or a DC blocking filter is needed. It is highly recommended to use an IF filter between this pin and the IF2 IN to limit the noise bandwidth when the part is set to maximum gain. Not filtering may cause the output (IF2 OUT) to run into saturation due to high noise levels. Also, to avoid instability when in maximum gain the filter is recommended.	
5	GND	Same as pin 3.	
6	IF2 IN+	Balanced IF input for the second gain stage. An external DC blocking capacitor of 4.7nF is recommended.	
7	IF2 IN-	Balanced IF input for the second gain stage. An external DC blocking capacitor of 4.7nF is recommended. When a single-ended input is used this port can be connected to ground through the DC blocking capacitor.	See pin 6.
8	BYPASS	An external decoupling capacitor of 4.7nF is required on this pin.	
9	IF2 OUT-	Balanced output 300Ω output. An external DC blocking capacitor of 4.7nF is recommended.	
10	IF2 OUT+	Balanced output 300Ω output. An external DC blocking capacitor of 4.7nF is recommended.	See pin 9.
11	G1	Gain control for the 1dB step. The gain is low when this pin is "low". A "low" is typically less than 1.0V. Gain is high when this pin is "high". A "high" is typically higher than 2.3V.	

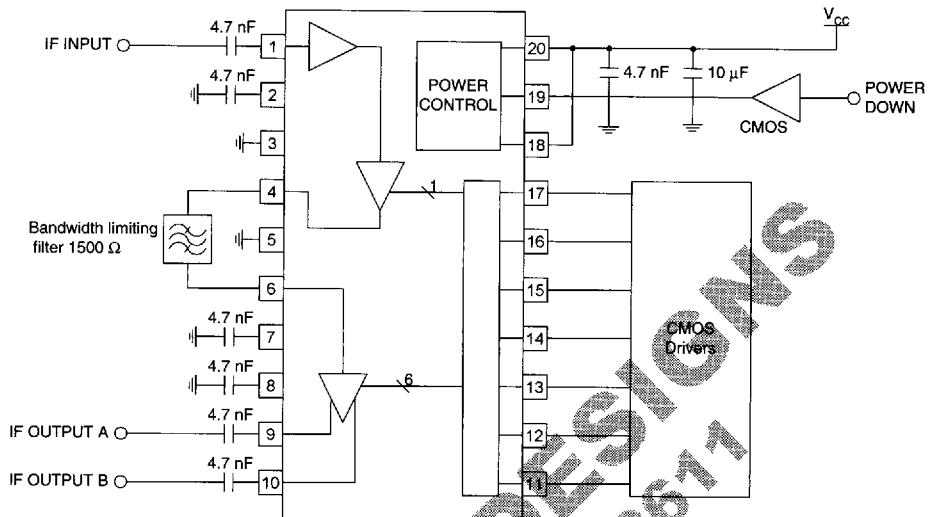
RF2601

12	G2	Gain control of the 2dB step. The same comments as for G1 apply.	Same as pin 11.
13	G4	Gain control of the 4dB step. The same comments as for G1 apply.	Same as pin 11.
14	G8A	Gain control of the 8dB step. The same comments as for G1 apply.	Same as pin 11.
15	G8B	Gain control of the second 8dB step. The same comments as for G1 apply.	Same as pin 11.
16	G16	Gain control of the 16dB step. The same comments as for G1 apply.	Same as pin 11.
17	G32	Gain control of the 32dB step of the first IF stage. Whenever the gain of this stage is toggled, the phase of the RF signal will not change.	Same as pin 11.
18	VCC2	Power supply for the second IF stage. External bypass capacitors of 4.7nF and 10μF are recommended.	
19	PD	Power Down control. The part is turned off when PD is held at less than 1.2V and is turned on when PD is at V _{CC} . If PD is less than V _{CC} -0.5V performance of the part is degraded.	
20	VCC1	Power supply for the first IF stage. External bypass capacitors of 4.7nF and 10μF are recommended.	

NOT FOR NEW DESIGN

See upgraded product RF2601

Application Schematic



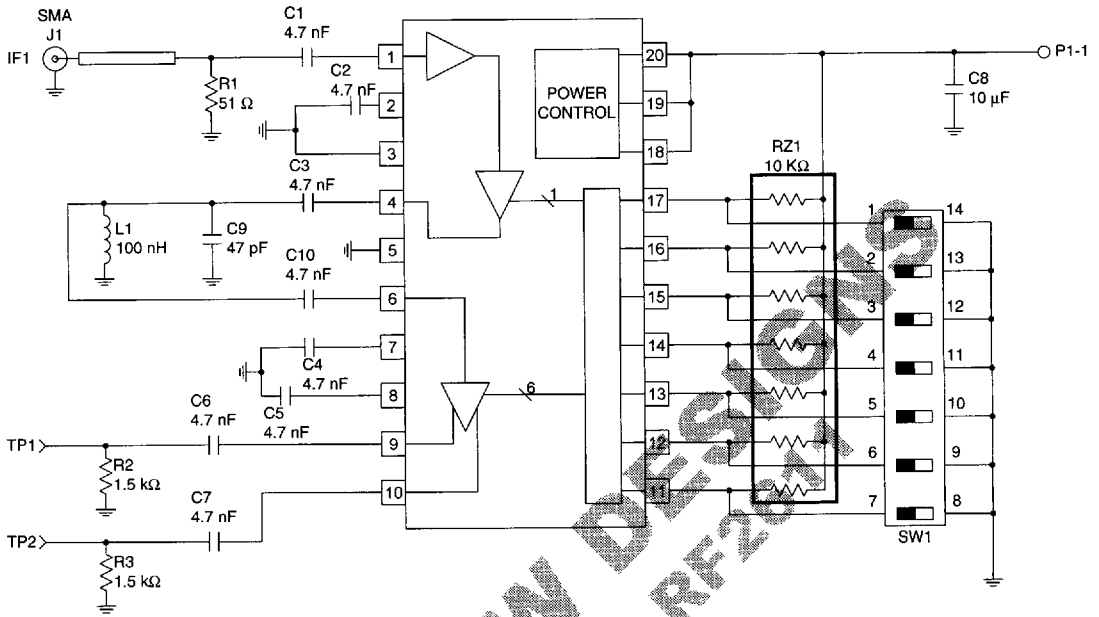
Notes:

1. The decoupling capacitors shown vary depending on the IF frequency. The values shown are for 70 MHz.
2. If Power Down is not used the pin can be tied directly to VCC.
3. The configuration shown is typical, with a balanced output and a bandpass filter is used to allow uncompressed operation at high gain.

NOT FOR NEW DESIGNS
See upgraded product RF2617

RF2601

Evaluation Board Schematic

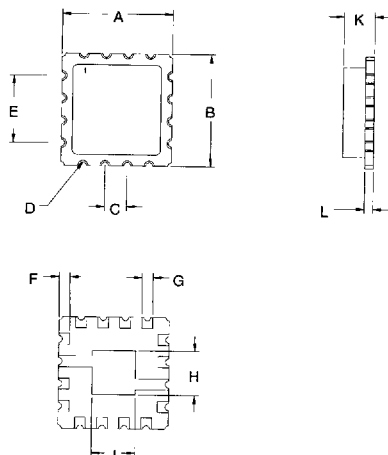
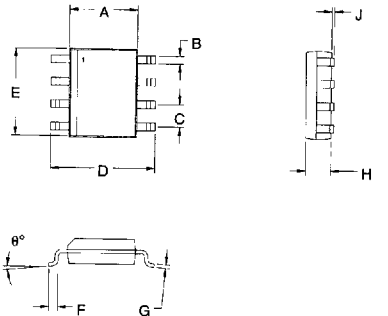
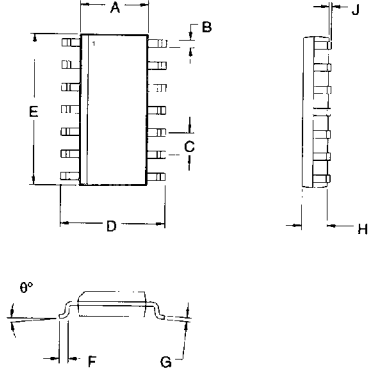


NOT FOR NEW DESIGN
See upgraded product RF2601

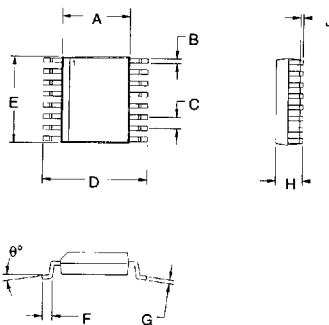
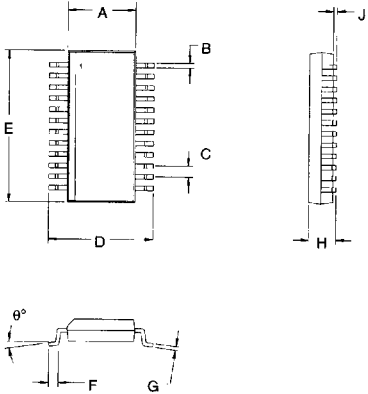
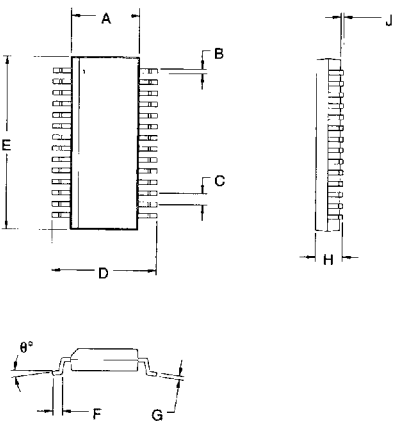
10

IF AMPLIFIERS

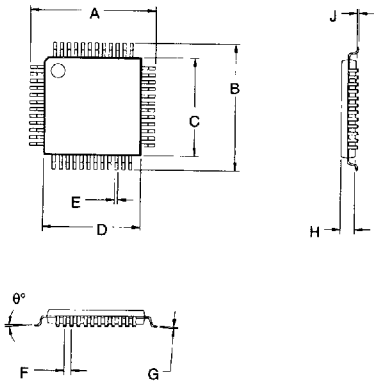
9004131 0000777 511

Package Drawing	Dimension	Measurement (mm)		Measurement (inches)	
		Typical	Tolerance	Typical	Tolerance
QLCC-16 	A	6.35	±0.20	0.250	±0.008
	B	6.35	±0.20	0.250	±0.008
	C	1.27		0.050	
	D	Radius 0.20		Radius 0.008	
	E	3.81		0.150	
	F	0.64	±0.20	0.025	±0.008
	G	0.64		0.025	
	H	2.49		0.098	
	J	2.49		0.098	
	K	1.78	±0.13	0.070	±0.005
	L	0.51	±0.05	0.020	±0.002
	SOP-8 	A	3.90	±0.05	0.154
B		0.43		0.017	
C		1.27		0.050	
D		6.00	±0.10	0.236	±0.004
E		4.90	±0.20	0.193	±0.008
F		0.50	±0.05	0.020	±0.002
G		0.20		0.008	
H		1.37	±0.05	0.054	±0.002
J		0.10 Min		0.004 Min	
θ		5°		5°	
SOP-14 	A	3.90	±0.09	0.154	±0.004
	B	0.41	±0.05	0.016	±0.002
	C	1.27		0.050	
	D	6.00	±0.20	0.236	±0.008
	E	8.65	±0.09	0.340	±0.003
	F	0.84	±0.43	0.033	±0.017
	G	0.22	±0.03	0.009	+0.001, -0.002
	H	1.61	±0.09	0.063	+0.004, -0.003
	J	0.18	+0.07, -0.08	0.007	±0.003
	θ	0° to 8°		0° to 8°	

Package Drawing	Dimension	Measurement (mm)		Measurement (inches)	
		Typical	Tolerance	Typical	Tolerance
SOP-16 	A	3.90	±0.09	0.154	±0.004
	B	0.41	±0.05	0.016	±0.002
	C	1.27		0.050	
	D	6.00	±0.20	0.236	±0.008
	E	9.89	±0.09	0.390	+0.003, -0.004
	F	0.84	±0.43	0.033	±0.017
	G	0.22	±0.03	0.009	+0.001, -0.002
	H	1.41	±0.09	0.063	+0.004, -0.003
	J	0.18	+0.07, -0.08	0.007	±0.003
	θ	0° to 8°		0° to 8°	
	SOP-20 	A	7.50	±0.10	0.295
B		0.41	±0.05	0.016	±0.002
C		1.27		0.050	
D		10.31	±0.20	0.406	±0.008
E		12.75	±0.10	0.502	±0.004
F		0.76	±0.25	0.030	±0.010
G		0.27	±0.05	0.011	±0.002
H		2.34		0.092	
J		0.20	±0.10	0.008	±0.004
θ		0° to 8°		0° to 8°	
PSOP-8 		A	3.91	+0.08, -0.10	0.154
	B	0.41	±0.08	0.016	±0.003
	C	1.27		0.050	
	D	6.02	±0.18	0.237	±0.007
	E	4.90	+0.08, -0.10	0.193	+0.003, -0.004
	F	0.64	+0.25, -0.23	0.025	+0.010, -0.009
	G	0.23	+0.03, -0.05	0.009	+0.001, -0.002
	H	1.47	±0.08	0.058	±0.003
	J	0.18	±0.08	0.007	±0.003
	K	2.92	±0.20	0.115	±0.008
	L	2.00	±0.20	0.079	±0.008
θ	0° to 8°		0° to 8°		

Package Drawing	Dimension	Measurement (mm)		Measurement (inches)	
		Typical	Tolerance	Typical	Tolerance
SSOP-16 	A	3.90	±0.09	0.154	±0.003
	B	0.26	±0.05	0.010	±0.002
	C	0.64		0.025	
	D	6.00	±0.20	0.236	±0.008
	E	4.89	±0.09	0.192	±0.003
	F	0.84	±0.43	0.033	±0.017
	G	0.22	±0.03	0.009	+0.001, -0.002
	H	1.55	±0.20	0.061	+0.007, -0.008
	J	0.18	+0.07, -0.08	0.007	±0.003
	θ	0° to 8°		0° to 8°	
SSOP-24 	A	3.90	±0.09	0.154	±0.003
	B	0.26	±0.05	0.010	±0.002
	C	0.64		0.025	
	D	6.00	±0.20	0.236	±0.008
	E	8.60	±0.09	0.340	±0.003
	F	0.84	±0.43	0.033	±0.017
	G	0.22	±0.03	0.009	+0.001, -0.002
	H	1.55	±0.20	0.061	+0.007, -0.008
	J	0.18	+0.07, -0.08	0.007	±0.003
	θ	0° to 8°		0° to 8°	
SSOP-28 	A	3.90	±0.09	0.154	±0.003
	B	0.26	±0.05	0.010	±0.002
	C	0.64		0.025	
	D	6.00	±0.20	0.236	±0.008
	E	9.89	±0.09	0.340	+0.003, -0.004
	F	0.84	±0.43	0.033	±0.017
	G	0.22	±0.03	0.009	+0.001, -0.002
	H	1.55	±0.20	0.061	+0.007, -0.008
	J	0.18	+0.07, -0.08	0.007	±0.003
	θ	0° to 8°		0° to 8°	

Package Drawing	Dimension	Measurement (mm)		Measurement (inches)	
		Typical	Tolerance	Typical	Tolerance
SOP-8-C 	A	7.87	±0.13	0.310	±0.005
	B	4.22	Square	0.166	Square
	C	0.38	±0.05	0.015	±0.002
	D	4.57	Max	0.180	Max
	E	1.27		0.050	
	F	0.38	±0.05	0.015	±0.002
	G	0.13	±0.03	0.005	±0.001
	H	1.45	Max	0.057	Max
	J	0 to 0.10		0 to 0.004	
	θ	0° to 4°		0° to 4°	
SOP-16 Batwing 	A	3.91	±0.10	0.154	±0.004
	B	0.43	±0.08	0.017	±0.003
	C	1.27		0.050	
	D	6.02	±0.18	0.237	±0.007
	E	9.88	±0.08	0.389	±0.003
	F	0.64	+0.25, -0.23	0.025	+0.010, -0.009
	G	0.23	±0.03	0.009	±0.001
	H	1.45	+0.05, -0.08	0.057	+0.002, -0.003
	J	0.17	+0.06, -0.08	0.007	+0.002, -0.003
	K	1.69	+0.06, -0.07	0.067	+0.002, -0.003
θ	0° to 8°		0° to 8°		
SOP-16 QBW1 	A	3.91	±0.10	0.154	±0.004
	B	0.43	±0.08	0.017	±0.003
	C	1.27		0.050	
	D	6.02	±0.18	0.237	±0.007
	E	9.88	±0.08	0.389	±0.003
	F	0.64	+0.25, -0.23	0.025	+0.010, -0.009
	G	0.23	±0.03	0.009	±0.001
	H	1.45	+0.05, -0.08	0.057	+0.002, -0.003
	J	0.17	+0.06, -0.08	0.007	+0.002, -0.003
	K	1.69	+0.06, -0.07	0.067	+0.002, -0.003
θ	0° to 8°		0° to 8°		

Package Drawing	Dimension	Measurement (mm)		Measurement (inches)	
		Typical	Tolerance	Typical	Tolerance
TQFP-48 	A	8.99	±0.20	0.354	±0.008
	B	8.99	±0.20	0.354	±0.008
	C	7.01	+0.18, -0.20	0.276	+0.007, -0.008
	D	7.01	+0.18, -0.20	0.276	+0.007, -0.008
	E	0.23	±0.05	0.009	±0.002
	F	0.51		0.020	
	G	0.13	Max	0.005	Max
	H	0.99	±0.05	0.039	±0.002
	J	0.05 to 0.15		0.002 to 0.006	
	θ	0° to 7°		0° to 7°	