Product Features

Operating Frequency: 0.02GHz ~ 8GHz

Noise Figure: 2.7dB@1GHz

Gain: 16.8dB@1GHz

Output Third-Order Interception:

34.6dBm@1GHz

Output Power for 1dB Compression:

21.1dBm@1GHz

+5V Single Power Supply

Supply Current:

97mA@ Vdd=+5 (Normal Operation Mode)

60mA@ Vdd=+5(Low-power Operation Mode)

Package: QFN16 (3mm×3mm)

Application

Radio Communication

Communication Base Station

Testing and Measuring Equipment

Radar and Electronic Countermeasures

Navigation Equipment

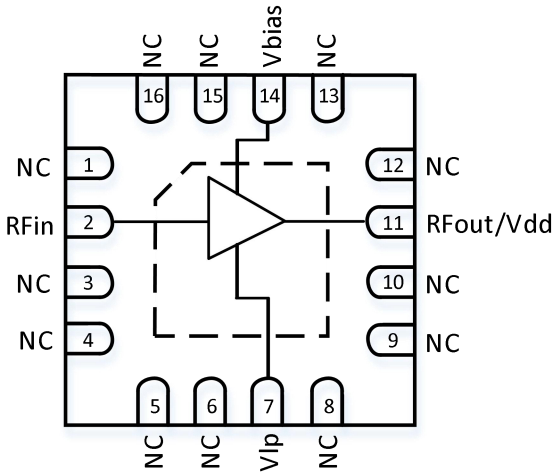
Ordering Information

Part Number	Package	Description
BR9641FDJ	QFN16	0.02GHz ~ 8GHz Gain Block Amplifier

General Description

BR9641FDJ is a broadband high-performance MMIC gain amplifier designed using GaAs process. Covering a frequency range of 0.02GHz~8GHz, the amplifier is internally matched to 50 ohms, and only requires an external RF choke and blocking/bypass capacitors. The amplifier contains on-chip active bias network to ensure that the quiescent current is not affected by temperature. The amplifier has the characteristics of high gain flatness and high linearity when powered by a single supply operation of +5V in normal operation mode. The product is compatible with low-power operation mode to meet the requirements of applications with stringent power consumption demands.

Functional Block Diagram



Electrical Specifications

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Gain	1GHz	-	16.8	-	dB
	4GHz	-	16.4	-	
	8GHz	-	17.5	-	
Input Return Loss	1GHz	-	-18.1	-	dB
	4GHz	-	-13.5	-	
	8GHz	-	-10.7	-	
Output Return Loss	1GHz	-	-36.8	-	dB
	4GHz	-	-13.0	-	
	8GHz	-	-11.1	-	
Reverse Isolation	1GHz	-	-22.1	-	dB
	4GHz	-	-23.3	-	
	8GHz	-	-25.3	-	
Output Power for 1dB Compression	1GHz	-	21.1	-	dBm
	4GHz	-	20.1	-	
	8GHz	-	16.9	-	
Output Third-Order Interception	1GHz	-	34.6	-	dBm
	4GHz	-	29.7	-	
	8GHz	-	26.3	-	
Noise Figure	1GHz	-	2.7	-	dB
	4GHz	-	3.2	-	
	8GHz	-	3.9	-	
Supply Voltage	-	-	+5	-	V
Supply Current	-	-	97	-	mA
Test Conditions: Vdd=+5V, Idd=97mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C					

Absolute Maximum Ratings

Maximum Supply Voltage (Vdd): +6V

Maximum RF input Power: 19dBm

Recommended Working Conditions

Supply Voltage: +5V

Supply Current:

97mA @ Vdd=5V (Normal Operation Mode)

60mA @ Vdd=5V (Low-power Operation Mode)

Operating Temperature: -55℃ ~ +125℃

Storage Temperature: -65℃ ~ +150℃

Note: Operation of the device outside the parameter ranges given absolute-maximum-ratings conditions may cause permanent damage, and exposure to absolute-maximum-ratings conditions for extended periods will affect the reliability.

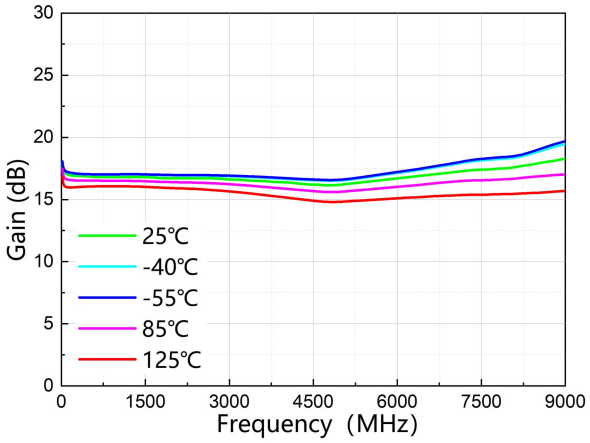
ESD WARNING

ELECTROSTATIC SENSITIVE DEVICE

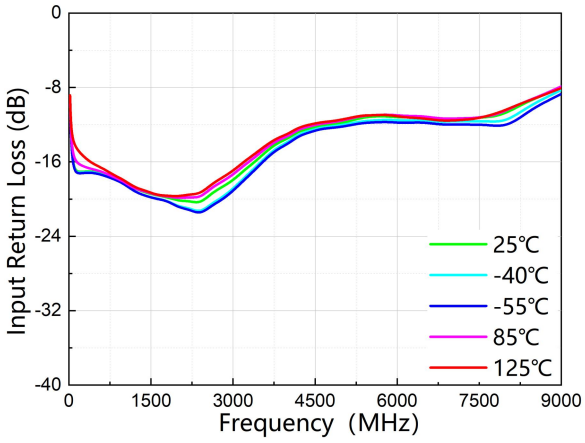
OBSERVE HANDLING PRECAUTIONS

Typical Performance (EVB test results at +5V supply voltage in normal operation mode)

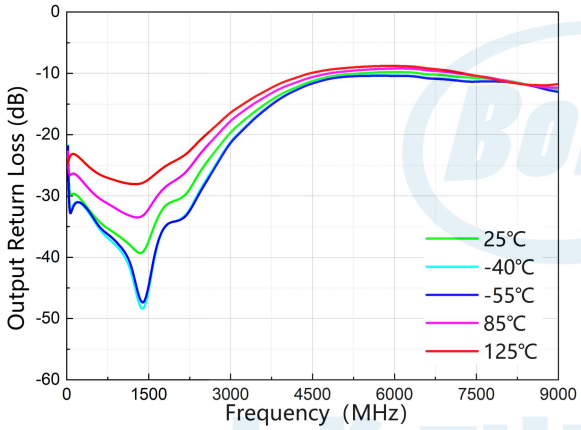
Parameter	Typ.									Units
Frequency	20	50	200	600	1000	1600	2000	2600	3000	MHz
Gain	17.9	17.2	16.9	16.8	16.8	16.8	16.7	16.7	16.6	dB
Input Return Loss	-9.1	-15.0	-17.1	-17.2	-18.1	-19.6	-20.2	-19.4	-18.0	dB
Output Return Loss	-21.8	-30.1	-29.8	-34.4	-36.8	-34.5	-30.8	-24.0	-19.5	dB
Reverse Isolation	-22.5	-21.9	-21.9	-22.1	-22.1	-22.4	-22.4	-22.5	-22.7	dB
Output Power for 1dB Compression	18.1	19.2	20.5	20.9	21.1	21.1	21.0	20.9	20.7	dBm
Output Third-Order Interception	33.1	33.6	34.8	35.1	34.6	33.7	33.1	32.0	31.3	dBm
Noise Figure	2.9	3.1	2.8	2.7	2.7	2.7	2.8	2.8	2.9	dB
Parameter	**Typ.**									**Units**
Frequency	3600	4000	4600	5000	5600	6000	6600	7000	8000	MHz
Gain	16.5	16.4	16.2	16.2	16.5	16.7	17.0	17.2	17.5	dB
Input Return Loss	-14.9	-13.5	-12.1	-11.8	-11.1	-11.2	-11.2	-11.4	-10.7	dB
Output Return Loss	-15.2	-13.0	-11.0	-10.3	-9.9	-9.8	-10.2	-10.4	-11.1	dB
Reverse Isolation	-23.1	-23.3	-23.7	-23.9	-24.0	-24.2	-24.3	-24.6	-25.3	dB
Output Power for 1dB Compression	20.2	20.1	19.5	19.1	18.3	17.9	17.7	17.5	16.9	dBm
Output Third-Order Interception	30.3	29.7	29.1	28.8	28.6	28.5	28.2	27.8	26.3	dBm
Noise Figure	3.1	3.2	3.2	3.2	3.3	3.4	3.5	3.5	3.9	dB
Test Conditions: Vdd=+5V, Idd=97mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25℃										



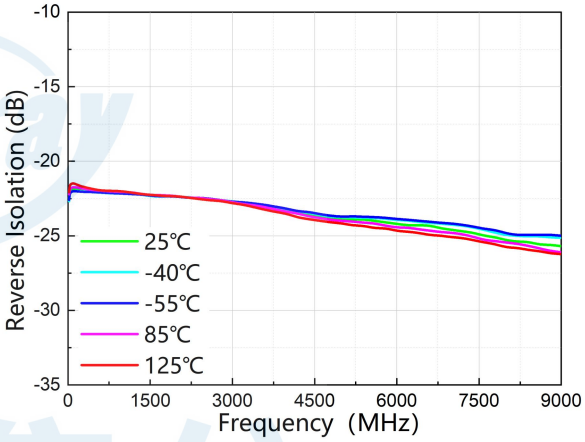
Gain vs. Freq



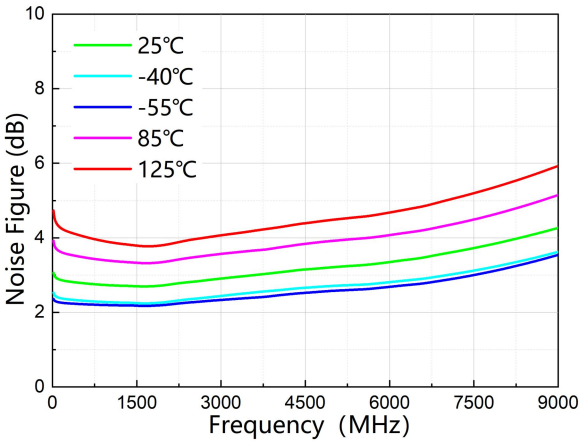
Input Return Loss vs. Freq



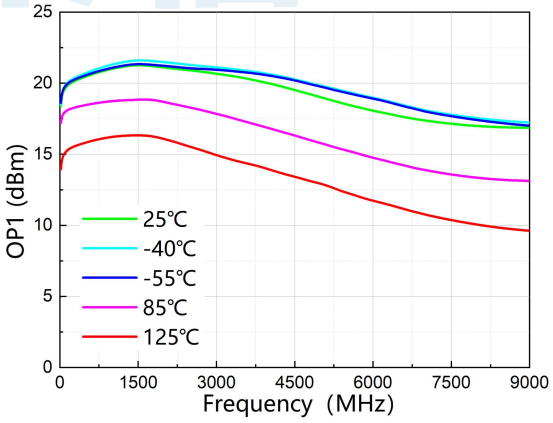
Output Return Loss vs. Freq



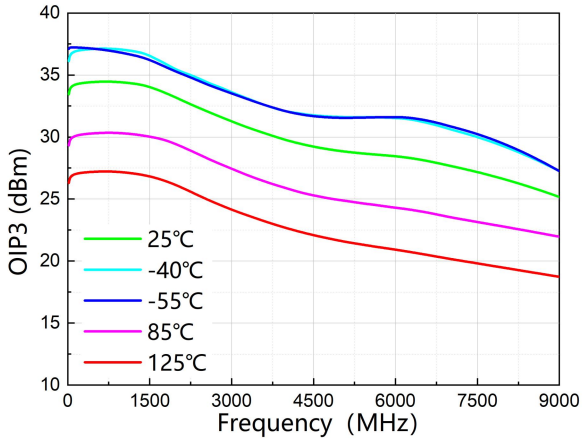
Reverse Isolation vs. Freq



Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq

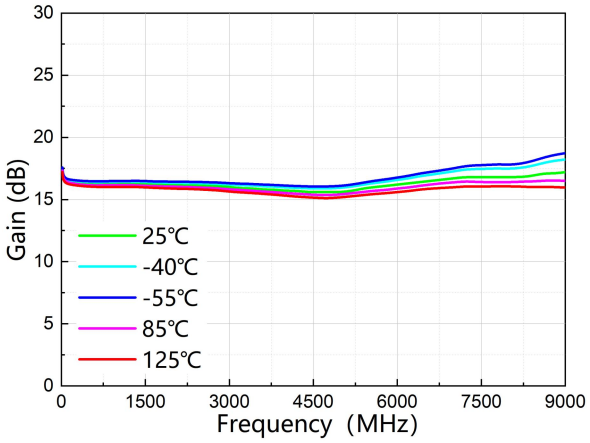


Output Third-Order Interception vs. Freq

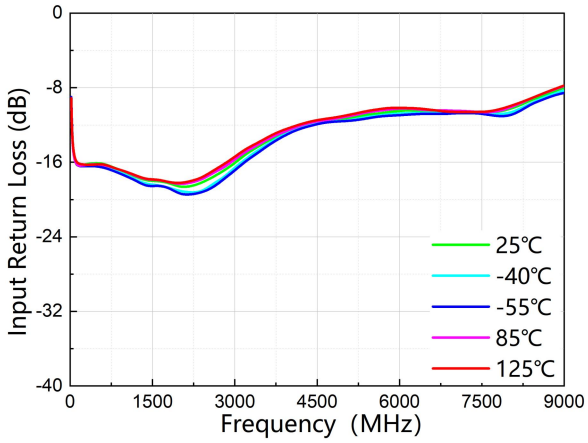
Typical Performance (EVB test results at +5V supply voltage in low-power operation mode)

Parameter	Typ.									Units
Frequency	20	50	200	600	1000	1600	2000	2600	3000	MHz
Gain	17.4	16.7	16.4	16.3	16.3	16.2	16.2	16.1	16.0	dB
Input Return Loss	-9.2	-14.7	-16.3	-16.1	-17.0	-18.0	-18.7	-17.6	-16.1	dB
Output Return Loss	-17.3	-18.5	-22.1	-23.2	-23.8	-22.7	-21.4	-18.1	-15.7	dB
Reverse Isolation	-22.4	-21.7	-21.8	-21.9	-21.9	-22.3	-22.2	-22.6	-22.8	dB
Output Power for 1dB Compression	19.7	19.5	19.9	20.1	20.1	20.0	19.7	19.4	19.1	dBm
Output Third-Order Interception	32.6	32.6	32.7	32.6	32.3	31.5	31.2	30.4	29.6	dBm
Noise Figure	2.7	3.0	2.9	2.8	2.8	2.9	2.9	2.9	3.0	dB
Parameter	**Typ.**									**Units**
Frequency	3600	4000	4600	5000	5600	6000	6600	7000	8000	MHz
Gain	15.8	15.7	15.6	15.6	16.0	16.2	16.5	16.7	16.8	dB
Input Return Loss	-13.7	-12.6	-11.6	-11.3	-10.8	-10.5	-10.6	-10.5	-10.3	dB
Output Return Loss	-12.7	-11.1	-9.6	-9.2	-9.4	-9.7	-10.6	-11.1	-11.5	dB
Reverse Isolation	-23.0	-23.4	-23.7	-23.7	-24.0	-23.8	-24.3	-24.5	-24.9	dB
Output Power for 1dB Compression	18.2	17.8	17.4	17.3	17.6	17.9	18.3	18.3	17.6	dBm
Output Third-Order Interception	28.4	27.7	27.1	27.1	27.5	28.1	29.3	29.9	28.9	dBm
Noise Figure	3.0	3.2	3.1	3.1	3.2	3.3	3.4	3.5	3.7	dB

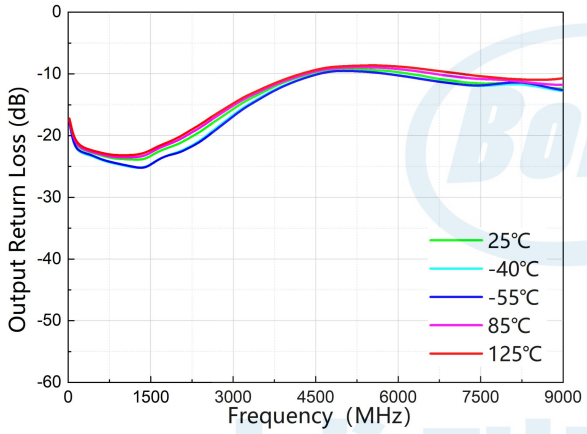
Test Condition: Vdd=+5V, I=60mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C



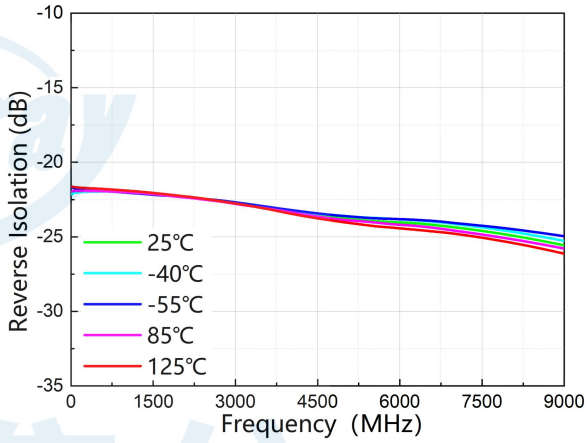
Gain vs. Freq



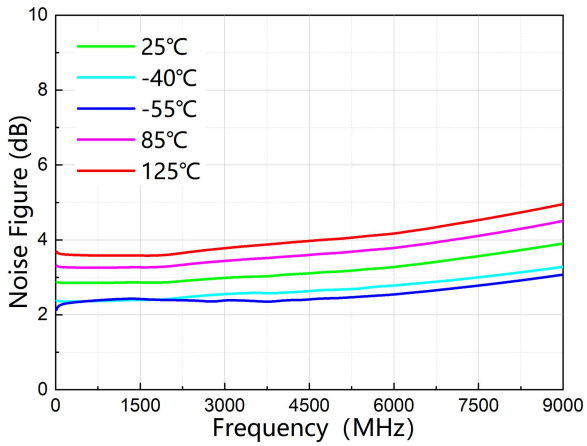
Input Return Loss vs. Freq



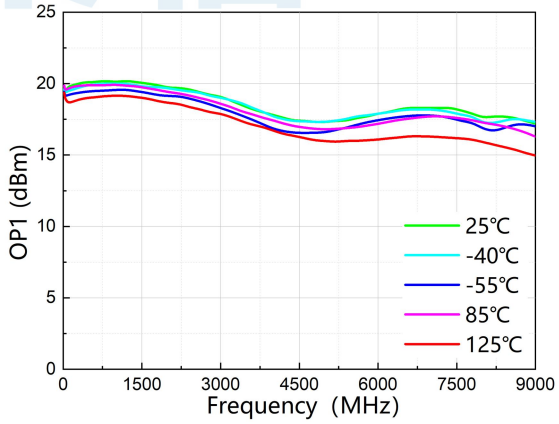
Output Return Loss vs. Freq



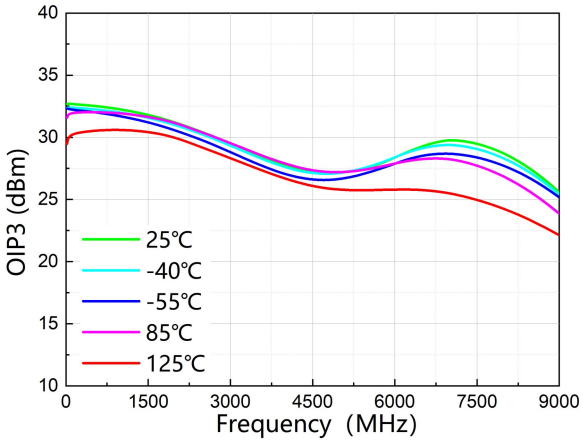
Reverse Isolation vs. Freq



Noise Figure vs. Freq

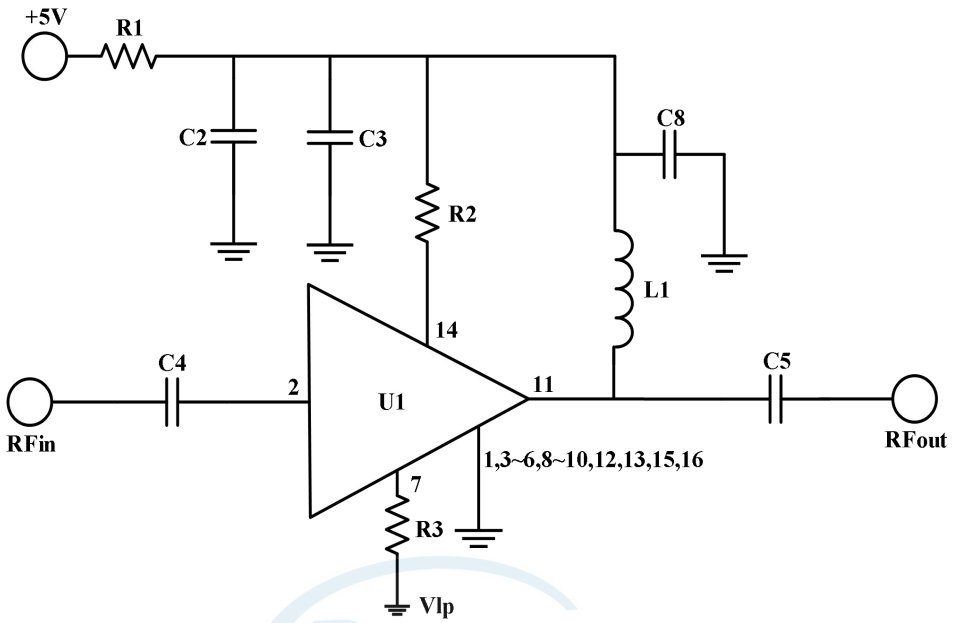


Output Power for 1dB Compression vs. Freq



Output Third-Order Interception vs. Freq

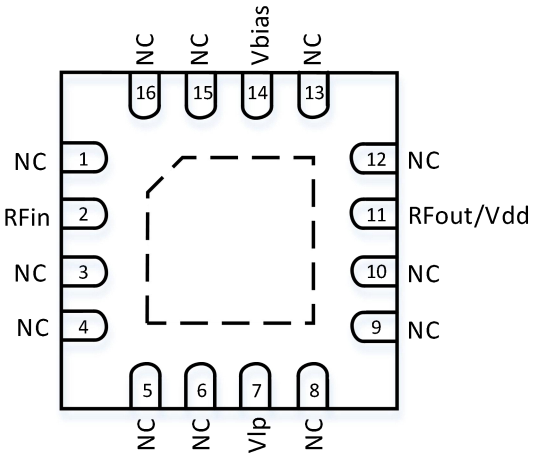
Typical Application Schematic



Bill of Material

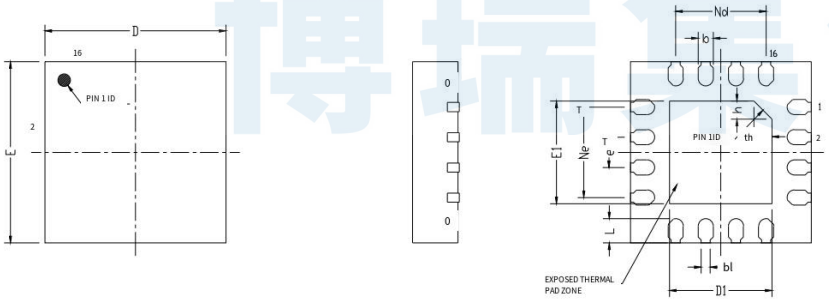
Reference Designator	Package Size	Value	P/N
U1	QFN16	0.02GHz~8GHz Gain Block Amplifier	BR9641FDJ
L1	1008	1.1uH	1008AF-112XJRB
C2	0402	100nF	GRM155R71H104KE14D
C3, C8	0402	10nF	GRM155R71H103JA88D
C4, C5	0402	330pF	GRM1555C1H331JA01D
R1	0402	0Ω	RC0402JR-070RL
R2	0402	5.6Ω	RC0402JR-075R6L
R3 (Normal operation mode)	/	Idle	/
R3 (low-power operation mode)	0402	0Ω	RC0402JR-070RL

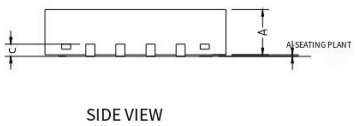
Pin Configuration and Description



Pin Number	Pin Name	Description
2	RFin	RF input pin. A DC Block is required.
7	Vlp	Operation modes set pin; This pin is suspended in normal operation mode and grounded in low-power operation mode.
11	RFout/Vdd	RF output pin. DC bias will also need to be injected through a RF bias choke/inductor for operation.
14	Vbias	Sets the Icq bias point for the device.
1,3,4,5,6,8,9,10,12,13,15,16	NC	No electrical connection. This pin and package substrate must be connected to RF/DC ground.
-	EP	Exposed pins that must be connected to RF/DC ground.

Package Dimensions (mm)





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.20	0.25	0.30
b1	0.15REF		
c	0.203REF		
D	2.90	3.00	3.10
D1	1.60	1.70	1.80
e	0.50BSC		
Ne	1.50BSC		
Nd	1.50BSC		
E	2.90	3.00	3.10
E1	1.60	1.70	1.80
L	0.25	0.30	0.35
h	0.25	0.30	0.35