BT09VG

5-4000 MHz Wideband Medium Power Amplifier

Device Features

- OIP3 = 41.0 dBm @ 1900 MHz
- Gain = 15.5 dB @ 1900 MHz
- Output P1 dB = 25.5 dBm @ 1900 MHz
- 50 Ω Cascadable
- Lead-free/RoHS-compliant SOT-89 SMT package

Product Description

BeRex's BT09VG is a high performance and a high dynamic range amplifier in a low cost surface mount package(SOT-89) with a RoHS -compliant, that incorporates reliable het-erojunction-bipolar-transistor (HBT) devices fabricated with InGaP GaAs technology. This device is designed for use where high linearity is required and features high OIP3 and P1 .

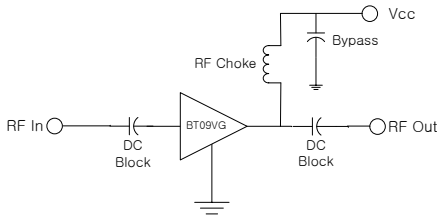
Requires a few external matching compo-nents such as a DC blocking capacitors on the In/Output pin, a bypass capacitor and a RF choke for the out port.

All devices are 100% RF/DC tested.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial/Military wireless system

Application Circuits



*external matching circuit: refer to the page 5 to 14.

Typical Performance[1]

Parameter	Frequency				Unit
	900	1900	2450	3500	MHz
Gain	21.5	15.5	13.5	10.8	dB
S11	-16.0	-30.0	-14.0	-15.0	dB
S22	-24.0	-19.0	-19.0	-14.0	dB
OIP3[2]	39.0	41.0	41.0	42.0	dBm
P1dB	24.5	25.5	27.0	25.0	dBm
Noise Figure	3.7	4.0	4.7	5.4	dB

[1] Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω system.

[2] OIP3 _ measured with two tones at an output of 13 dBm per tone separated by 1 MHz.

	Min.	Typical	Max.	Unit
Bandwidth	5		4000	MHz
I_C @ (Vc = 5V)	140	160	180	mA
V_C		5.0		V
R_{TH}		50		°C/W

Absolute Maximum Ratings

Parameter	Rating	Unit
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	+220	°C
Operating Voltage	+7.0	V
Supply Current	220	mA
Input RF Power	23	dBm

*Operation of this device above any of these parameters may result in permanent damage.

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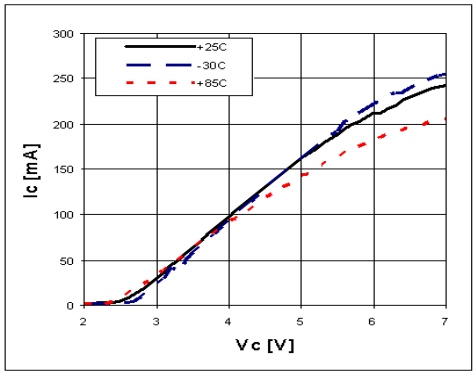
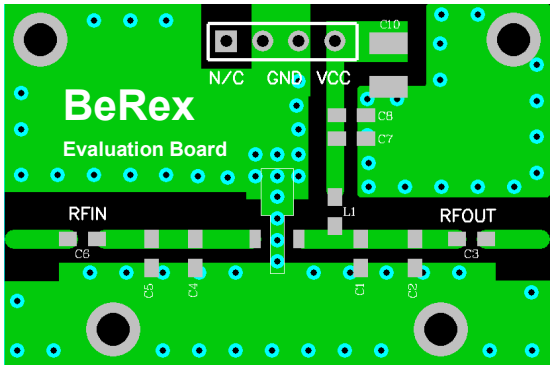
5-4000 MHz Wideband Medium Power Amplifier

V-I Characteristics



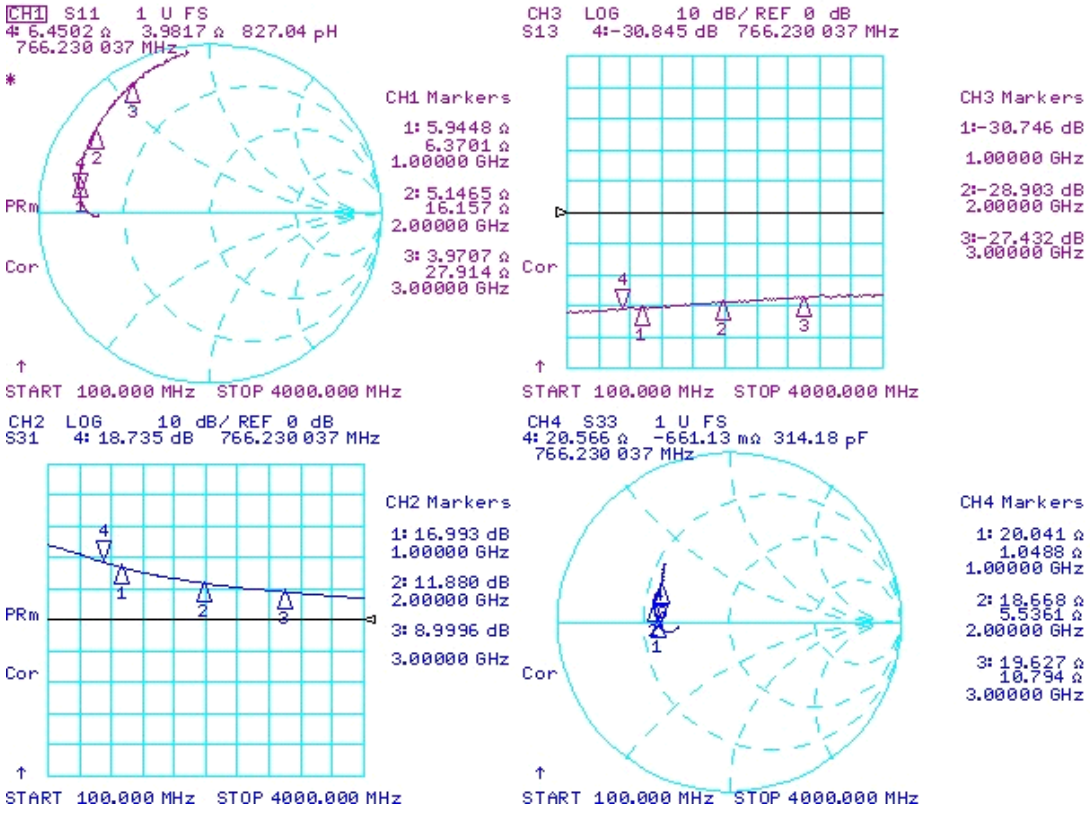
BeRex SOT89 Evaluation Board



*Dielectric constant _ 4.2 *RF pattern width 52mil *31mil thick FR4 PCB

Typical Device Data

S-parameters (Vc=5V, Ic=160mA, T=25°C)

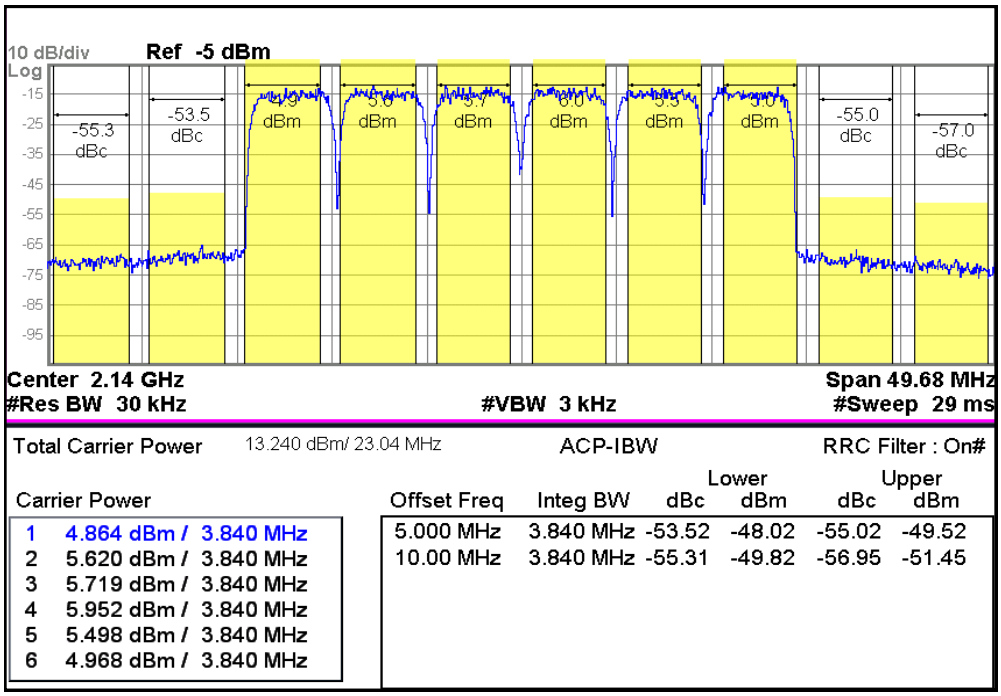


S-Parameter

(Vdevice = 5.0V, Icc = 160mA, T = 25 °C, calibrated to device leads)

Freq [MHz]	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
100	0.65	-180.00	16.00	170.00	0.03	2.50	0.30	-170.00
500	0.74	180.00	11.00	130.00	0.03	8.90	0.38	-170.00
1000	0.79	170.00	7.00	98.00	0.03	14.00	0.42	180.00
1500	0.81	150.00	5.00	82.00	0.03	18.00	0.44	170.00
2000	0.83	140.00	3.90	69.00	0.04	19.00	0.46	170.00
2500	0.85	130.00	3.20	57.00	0.04	19.00	0.45	160.00
3000	0.88	120.00	2.80	46.00	0.04	18.00	0.45	150.00
3500	0.92	110.00	2.50	35.00	0.04	14.00	0.48	140.00
4000	0.96	98.00	2.20	23.00	0.05	11.00	0.51	140.00

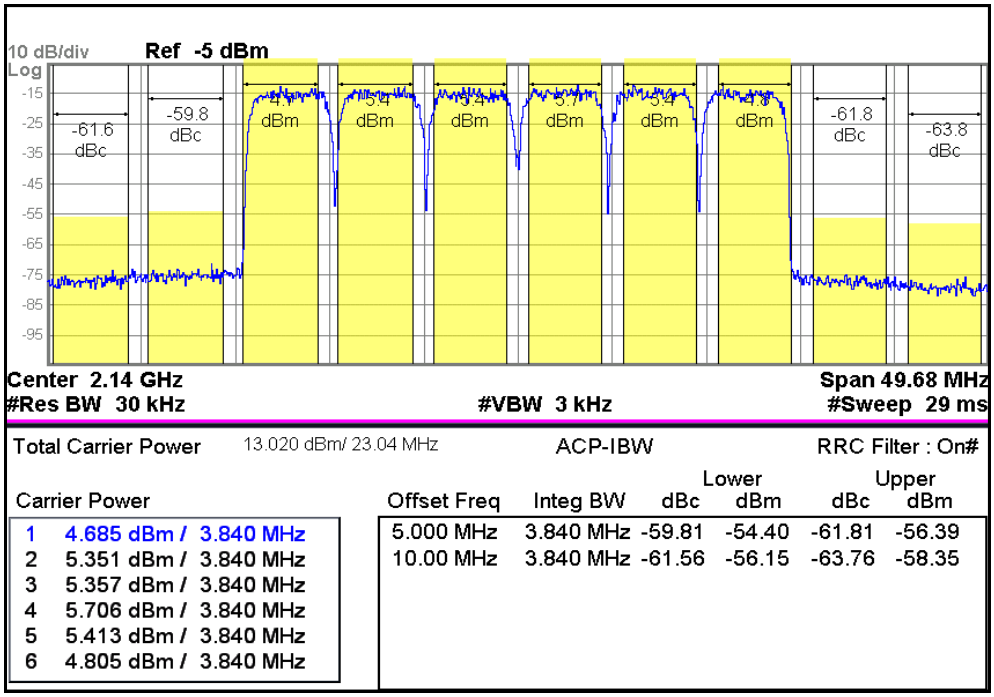
WCDMA 6FA 2140 –55dBc



Total Carrier Power 13.240 dBm/ 23.04 MHz ACP-IBW RRC Filter : On#

Carrier Power			Offset Freq	Integ BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
1	4.864 dBm /	3.840 MHz	5.000 MHz	3.840 MHz	-53.52	-48.02	-55.02	-49.52
2	5.620 dBm /	3.840 MHz	10.00 MHz	3.840 MHz	-55.31	-49.82	-56.95	-51.45
3	5.719 dBm /	3.840 MHz						
4	5.952 dBm /	3.840 MHz						
5	5.498 dBm /	3.840 MHz						
6	4.968 dBm /	3.840 MHz						

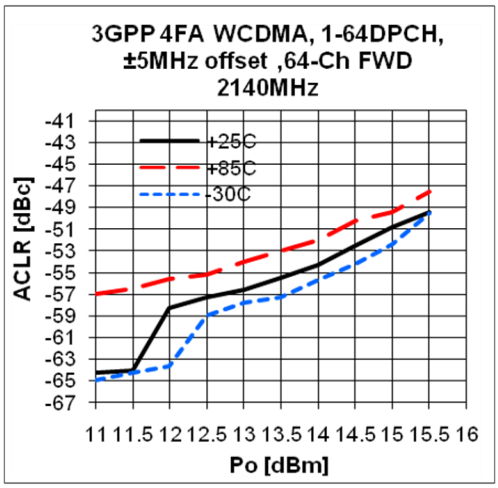
WCDMA 6FA 2140 –60dBc



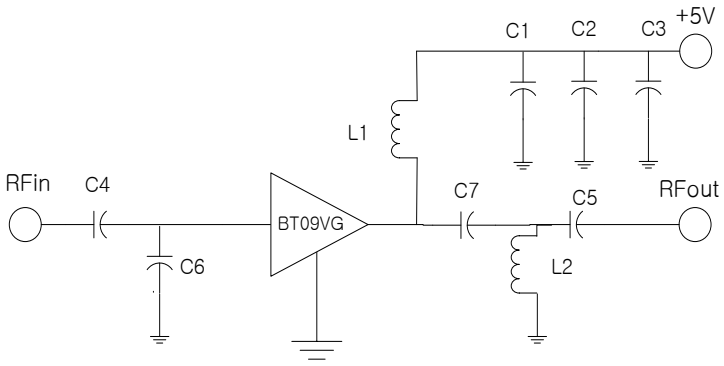
Total Carrier Power 13.020 dBm/ 23.04 MHz ACP-IBW RRC Filter : On#

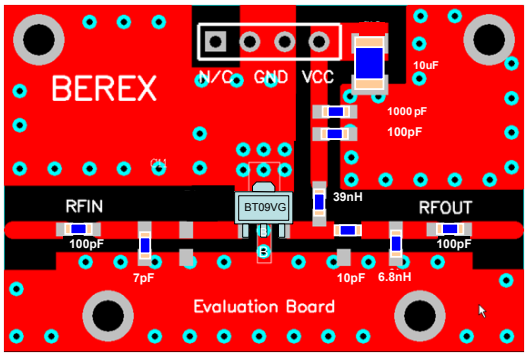
Carrier Power			Offset Freq	Integ BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
1	4.685 dBm /	3.840 MHz	5.000 MHz	3.840 MHz	-59.81	-54.40	-61.81	-56.39
2	5.351 dBm /	3.840 MHz	10.00 MHz	3.840 MHz	-61.56	-56.15	-63.76	-58.35
3	5.357 dBm /	3.840 MHz						
4	5.706 dBm /	3.840 MHz						
5	5.413 dBm /	3.840 MHz						
6	4.805 dBm /	3.840 MHz						

ACLR



Application Circuit: 900 MHz

Schematic Diagram	BOM		Tolerance
	C1	100pF	±5%
	C2	1000pF	±5%
	C3*	10uF	±20%
	C4	100pF	±5%
	C5	100pF	±5%
	C6	7pF	±5%
	C7	10pF	±5%
	L1	39nH	5%
	L2	6.8nH	5%

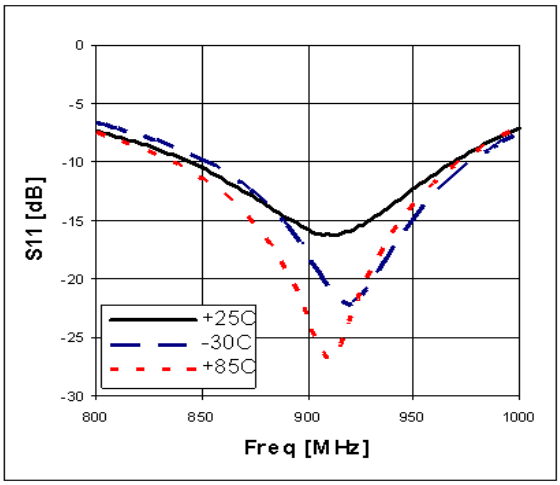


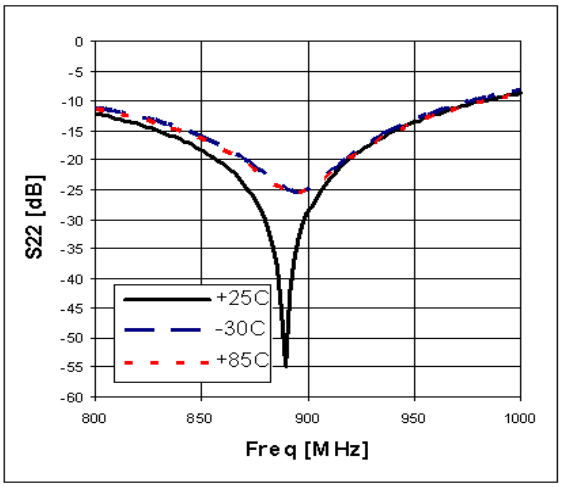
Note:

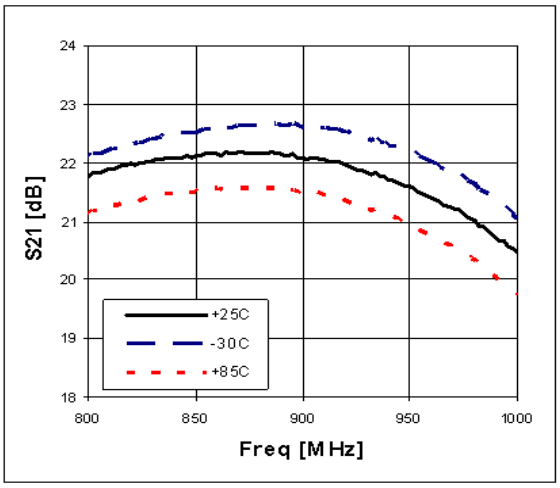
1. PCB: 31mil thick FR4.
2. Distance between the center of the shunt cap(C6) and the input pin of BT09VG _ ***7.0mm.***
3. Distance between the center of the series cap(C7) and the output pin of BT09VG _ ***3.5mm.***
4. Distance between the center of the shunt inductor(L2) and the output pin of BT09VG _ ***5.5mm.***

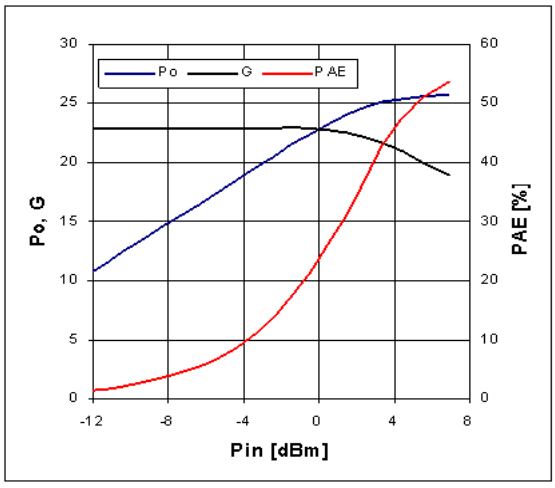
***Skipping C3 reduces device ruggedness.**

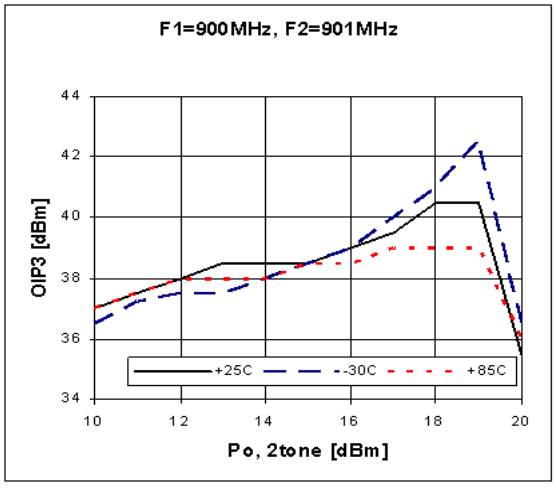
Typical Performance

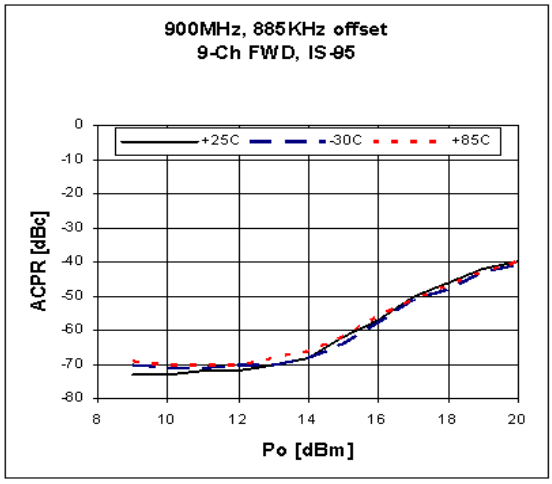




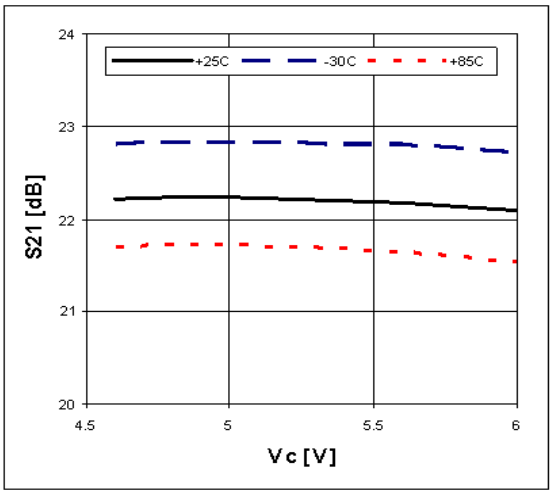


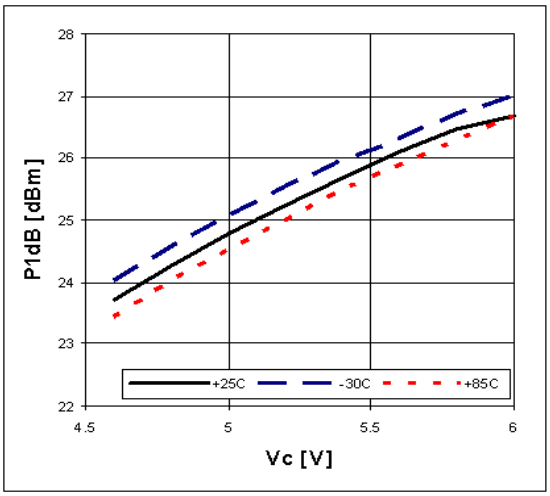


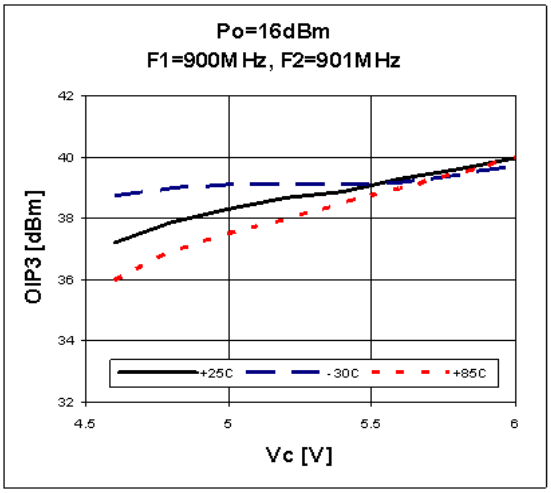


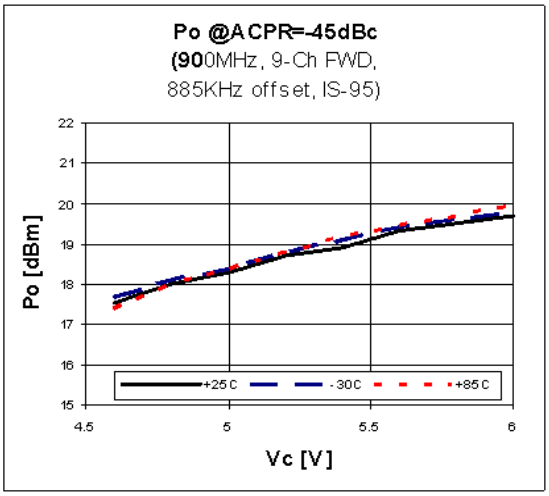


Performance Variation with Supply Voltage





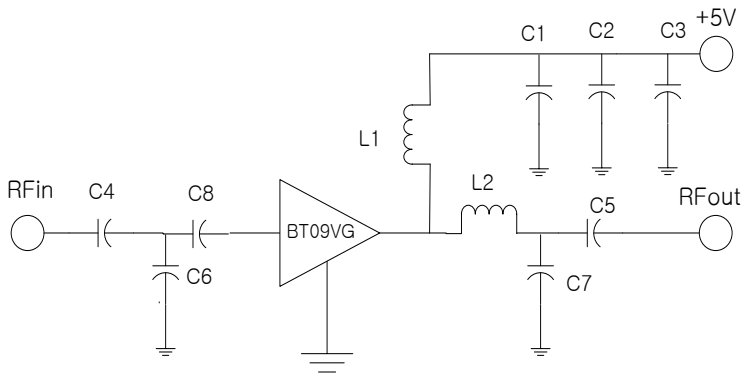


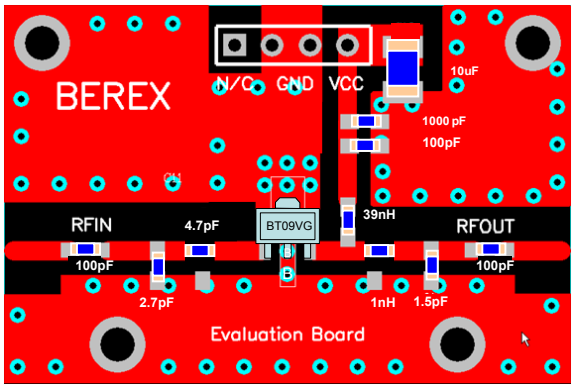


BT09VG

5-4000 MHz Wideband Medium Power Amplifier

Application Circuit: 1900MHz

Schematic Diagram	BOM		Tolerance
	C1	100pF	±5%
	C2	100pF	±5%
	C3*	10uF	±20%
	C4	100pF	±5%
	C5	100pF	±5%
	C6	2.7pF	±5%
	C7	1.5pF	±5%
	C8	4.7pF	±5%
	L1	39nH	5%
	L2	1nH	2%



Note:1. PCB: 31mil thick FR4.

2. Distance between the center of the series cap(C8) and the input pin of BT09VG _ ***2.5mm.***

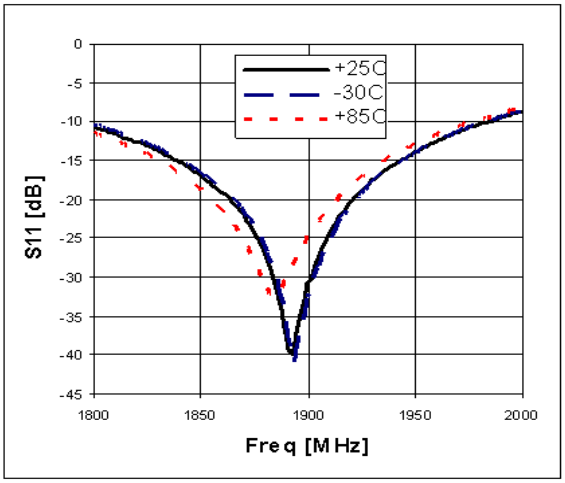
3. Distance between the center of the shunt cap(C6) and the input pin of BT09VG _ ***4.0mm.***

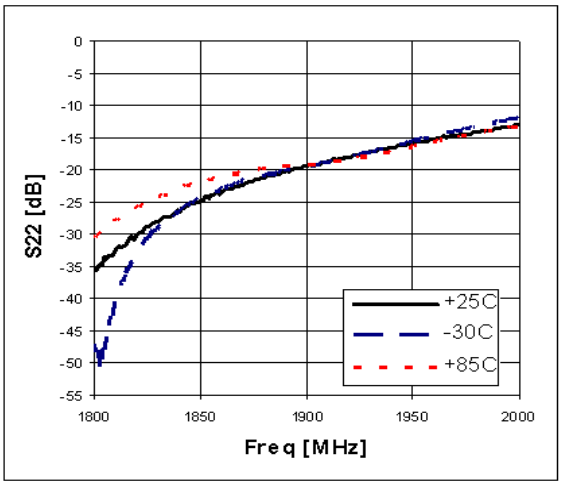
4. Distance between the center of the series inductor (L2) and the output pin of BT09VG _ ***3.5mm.***

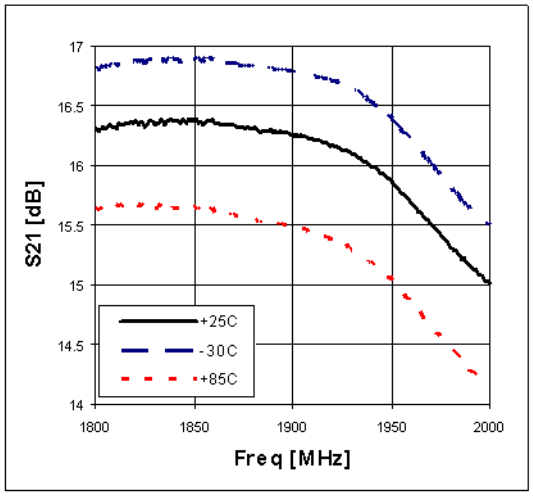
5. Distance between the center of the shunt cap(C7) and the output pin of BT09VG _ ***8.0mm.***

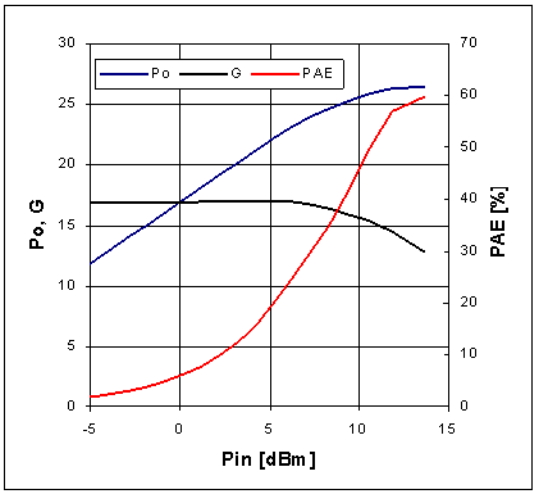
***Skipping C3 reduces device ruggedness.**

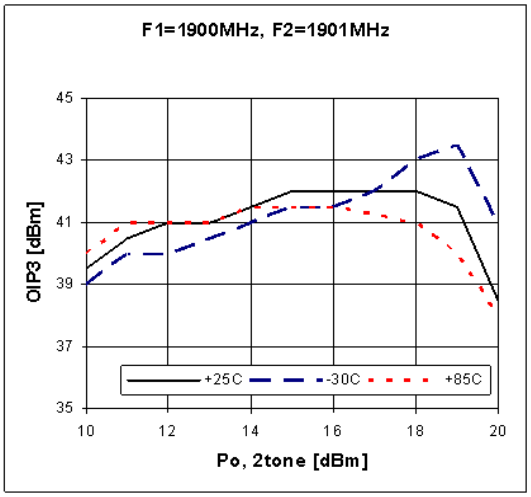
Typical Performance

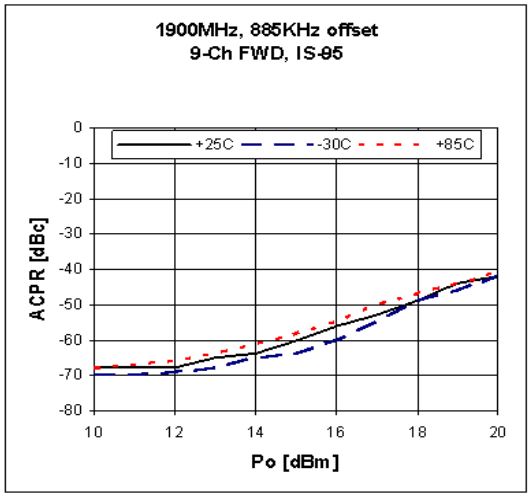




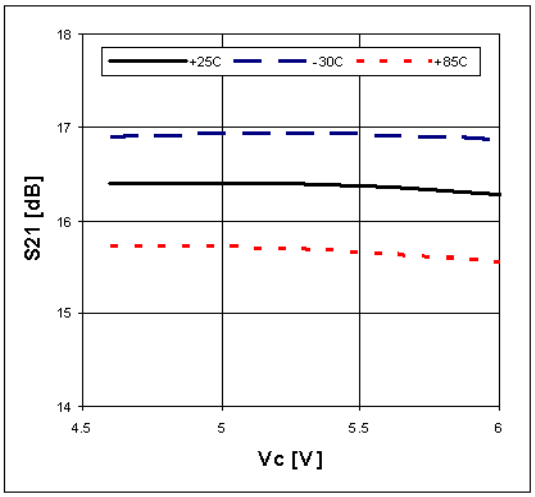


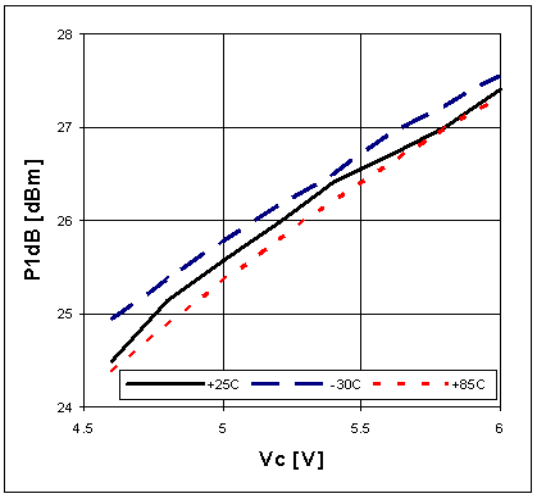


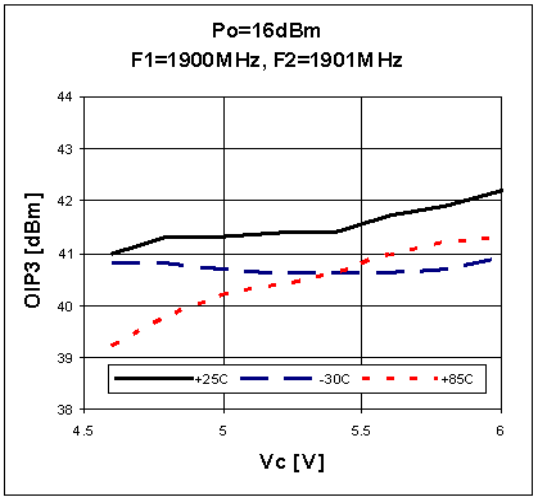


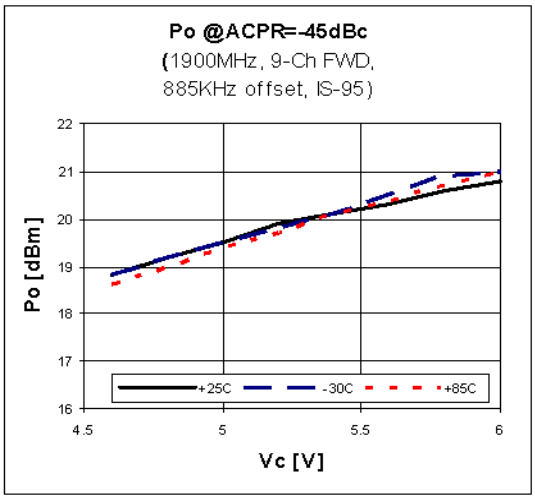


Performance Variation with Supply Voltage

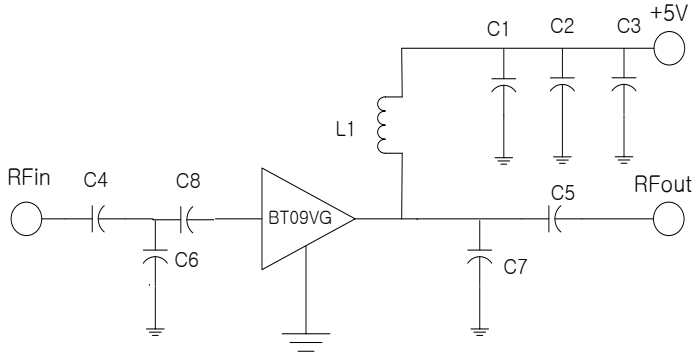


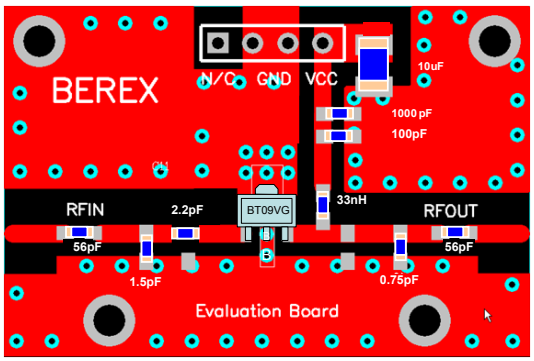






Application Circuit: 2450MHz

Schematic Diagram	BOM		Tolerance
	C1	100pF	±5%
	C2	1000pF	±5%
	C3*	10uF	±20%
	C4	56pF	±5%
	C5	56pF	±5%
	C6	1.5pF	±5%
	C7	0.75pF	±5%
	C8	2.2pF	±5%
	L1	33nH	5%

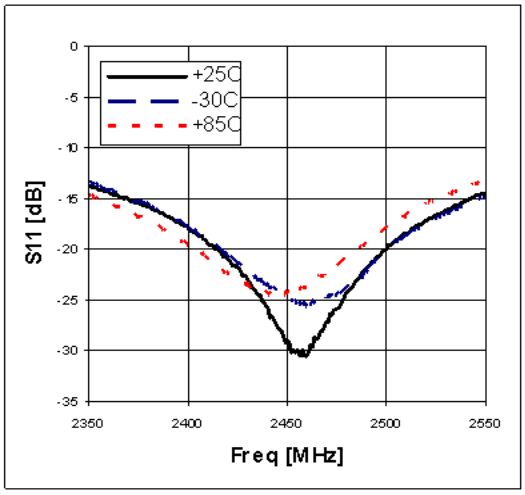


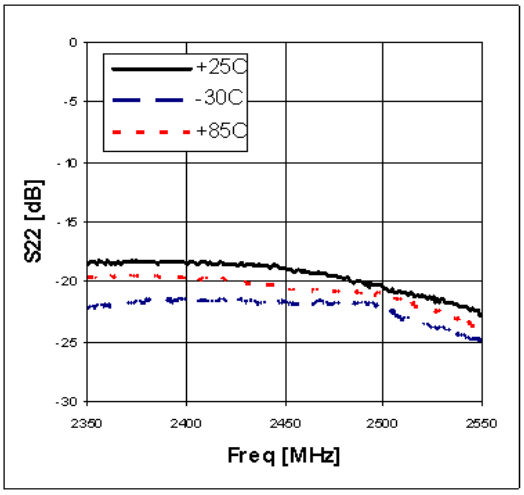
Note:

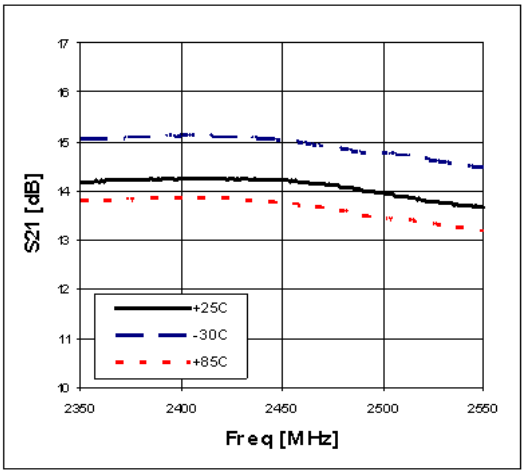
1. PCB: 31mil thick FR4.
2. Distance between the center of the series cap(C8) and the input pin of BT09VG _ ***2.5mm.***
3. Distance between the center of the shunt cap(C6) and the input pin of BT09VG _ ***4.0mm.***
4. Distance between the center of the shunt cap(C7) and the output pin of BT09VG _ ***6.2mm.***

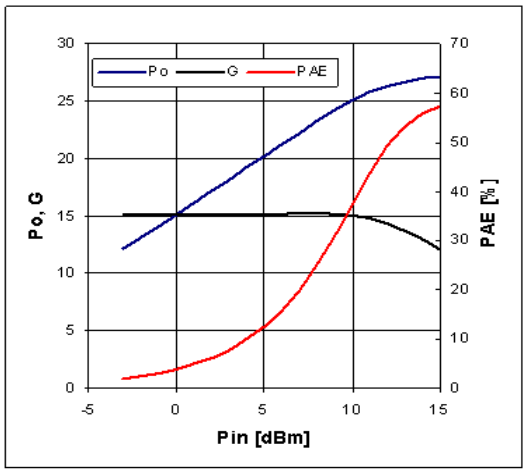
***Skipping C3 reduces device ruggedness.**

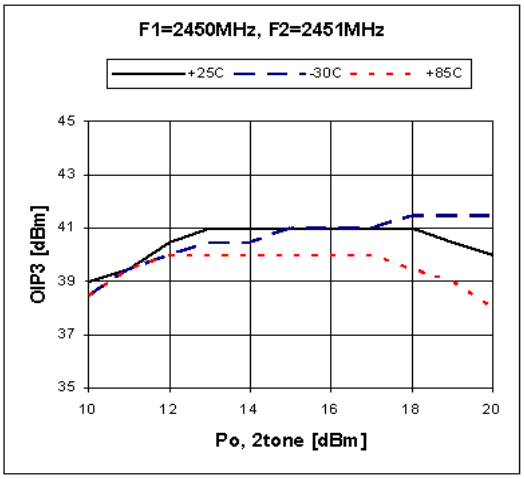
Typical Performance



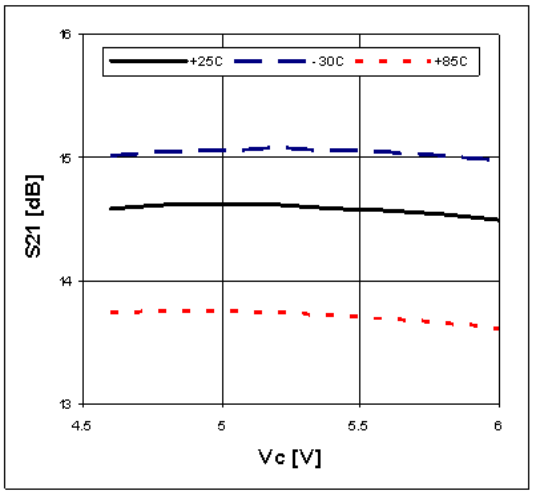


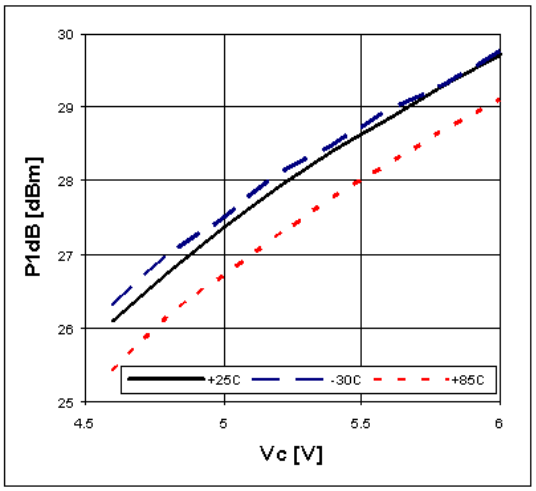


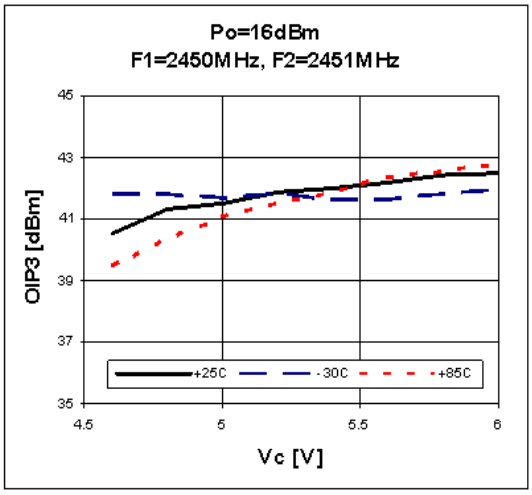


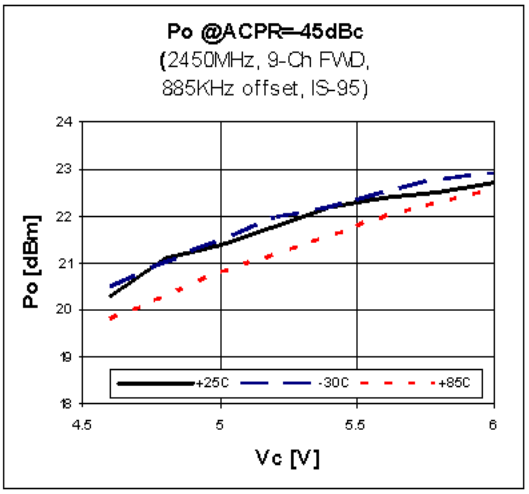


Performance Variation with Supply Voltage

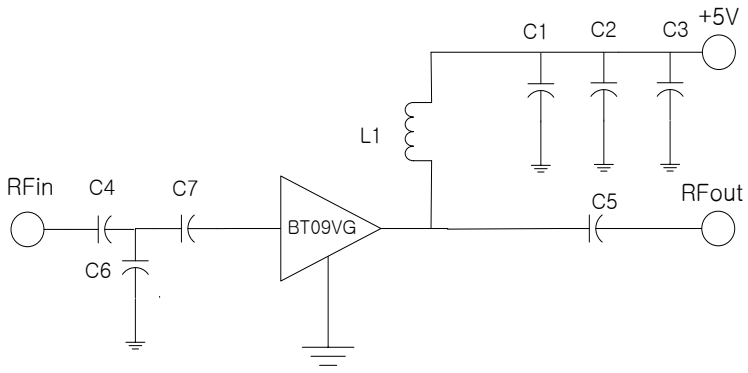


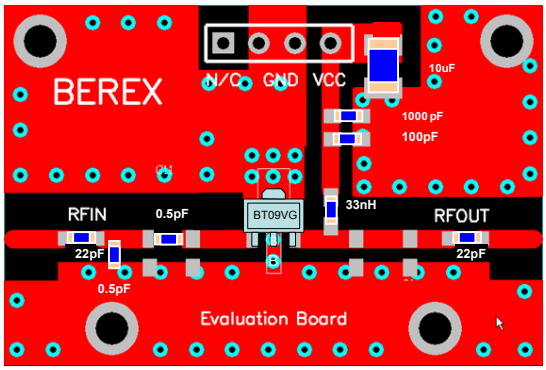






Application Circuit: 3500MHz

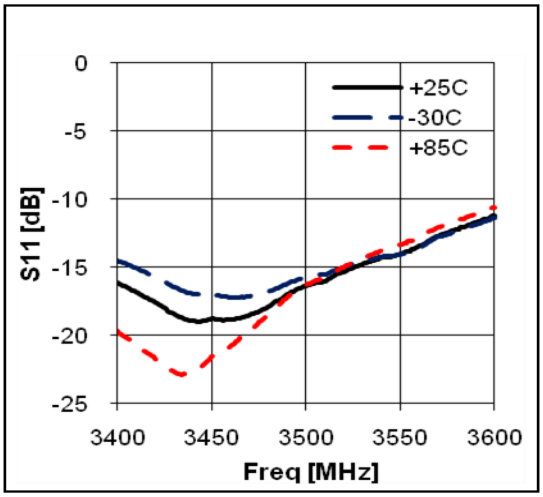
Schematic Diagram	BOM		Tolerance
	C1	100pF	±5%
	C2	1000pF	±5%
	C3	10uF	±20%
	C4	22pF	±5%
	C5	22pF	±5%
	C6	0.5pF	±5%
	C7	0.5pF	±5%
	L1	33nH	±5%

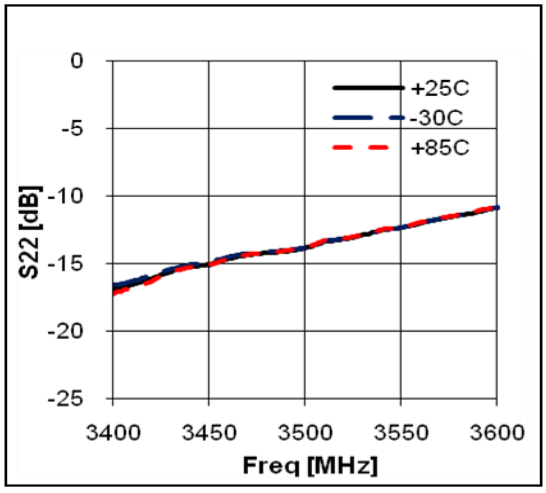


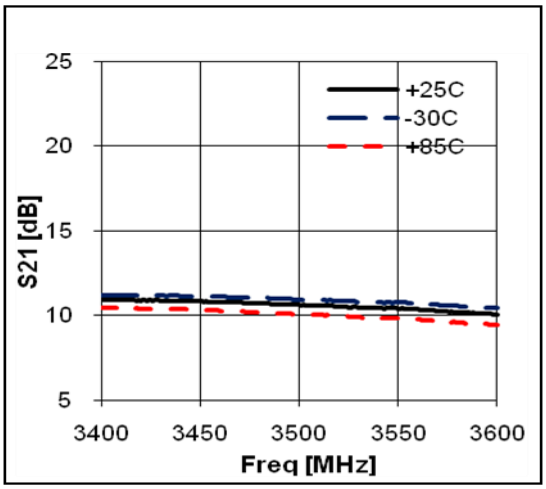
Note:

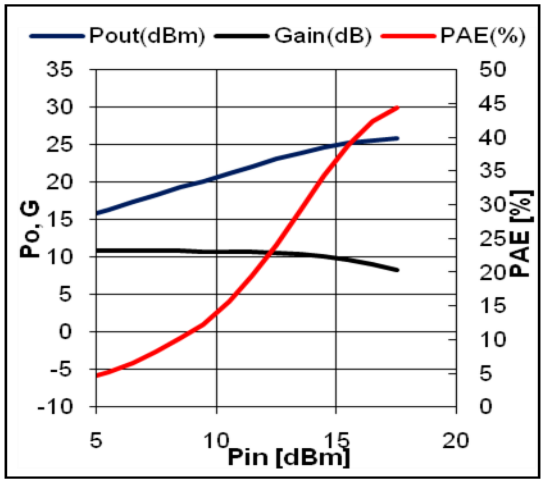
1. PCB: 31mil thick FR4.
2. Distance between the center of the series cap(C7) and the input pin of BT09VG _ ***2.5mm.***
3. Distance between the center of the shunt cap(C6) and the input pin of BT09VG _ ***8.5mm.***

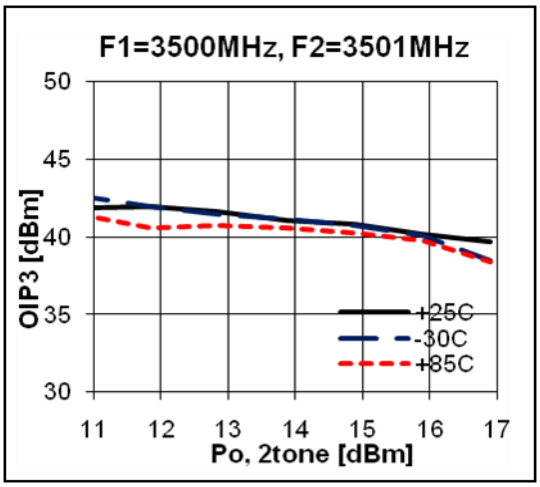
Typical Performance



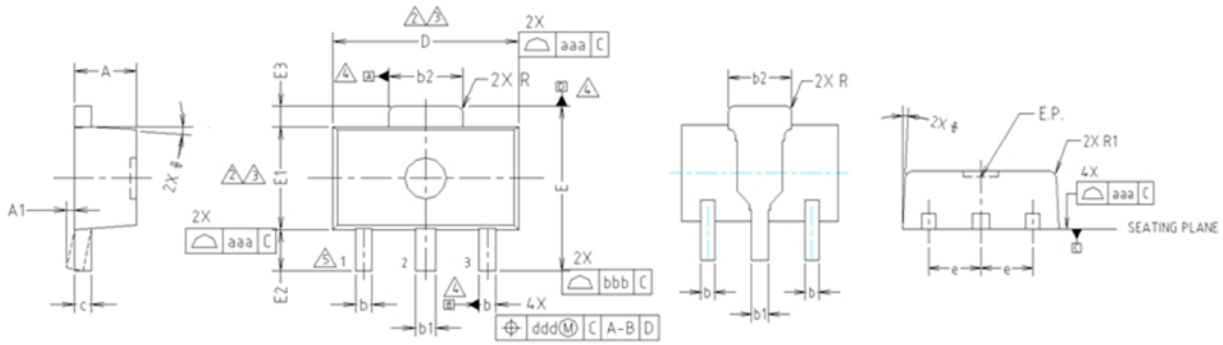








Package Outline Dimension



NOTE:

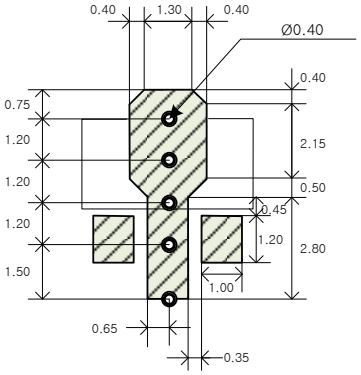
1. DIMENSIONS IN MILLIMETERS.
2. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER SIDE.
3. DIMENSIONS D AND E1 ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
4. DATUMS A, B AND D TO BE DETERMINED 0.18mm FROM THE LEAD TIP.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

SYMBOL	MILLIMETERS MINIMUM	NOMINAL	MAXIMUM	NOTE
A	1.40	1.50	1.60	
A1	0.00	–	0.10	
b	0.38	0.42	0.48	
b1	0.48	0.52	0.58	
b2	1.79	1.82	1.87	
c	0.40	0.42	0.46	
D	4.40	4.50	4.70	2,3
E	3.70	4.00	4.30	
E1	2.40	2.50	2.70	2,3
E2	0.80	1.00	1.20	
E3	0.40	0.50	0.60	
e	1.50 TYP.			
θ	4° TYP.			
R	0.15 TYP.			
R1	–	–	0.20	

SYMBOL	TOLERANCES OF FORM AND POSITION	NOTE
aaa	0.15	
bbb	0.20	
ccc	0.10	
ddd	0.10	

Suggested PCB Land Pattern and PAD Layout

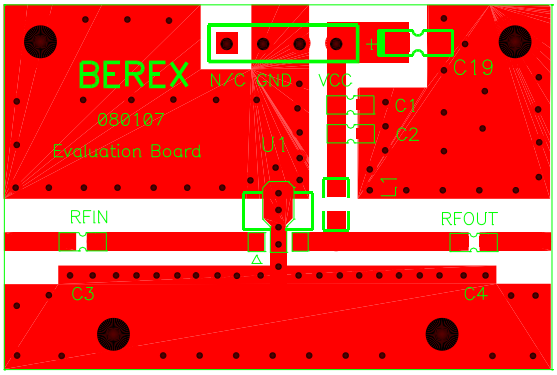
PCB Land Pattern



Note : All dimension are in millimeters

PCB lay out _ on BeRex website

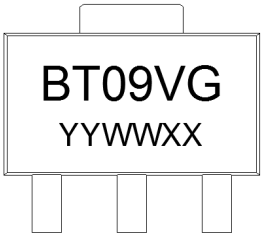
PCB Mounting



BT09VG

5-4000 MHz Wideband Medium Power Amplifier

Package Marking

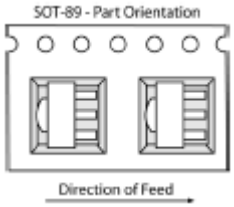


Pin 1

YY = Year, WW = Working Week,
XX = Wafer No.

Tape & Reel

SOT89



Packaging information:

Tape Width (mm): 12

Reel Size (inches): 7

Device Cavity Pitch (mm): 8

Devices Per Reel: 1000

Lead plating finish

100% Tin Matte finish

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

ESD Rating:	Class 1B
Value:	**Passes <1000V**
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	**Level 1 at +265°C convection reflow**
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

2	**N**	**9**	**6**	**F**