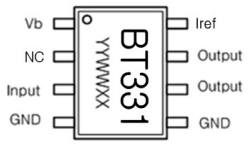
BT331

700-2700 MHz 1.5~2.0W Power Amplifier

Preliminary Datasheet

Device Features

- OIP3 = 51.0 dBm @ 1900 MHz
- Gain = 19.5 dB @ 900 MHz
- Output P1 dB = 33.3 dBm @ 1900 MHz
- 50 Ω Cascadable
- Highly Reliable InGaP/GaAs HBT Technology
- Lead-free/RoHS-compliant SOIC-8 SMT package



YY = Year, WW = Work week,
XX = Wafer Number

Product Description

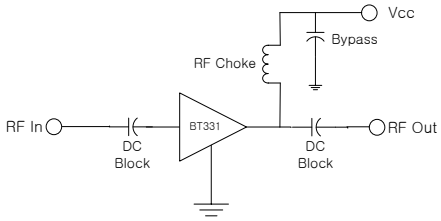
BeRex's BT331 is a high power and a high dynamic range amplifier in a low cost surface mount package(SOIC-8) with a RoHS-compliant, that incorporates reliable heterojunction-bipolar-transistor (HBT) devices fabricated with InGaP GaAs technology.

This device is designed for use where high linearity is required and features high OIP3 and Power with low consumption current (400mA) and requires a few external matching components such as a DC blocking capacitors on the In/Output pin, a bypass capacitor and a RF choke for the out port.

Applications

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

Application Circuits



*external matching circuit: refer to the page 4 to 16.

Typical Performance[1]

Parameter	Frequency					Unit
	900	1900	2140	2450	2600	MHz
Gain	19.5	14.0	13.0	12.0	12.1	dB
S11	-16.0	-14.0	-15.0	-20.0	-19.0	dB
S22	-11.0	-11.0	-12.0	-10.0	-12.7	dB
OIP3[2]	50.0	51.0	51.0	50.0	47.0	dBm
P1dB	31.5	33.3	32.3	31.0	31.2	dBm
IS-95C ACPR	23.3	-	-	-	-	dBm
WCDMA ACLR	-	23.3	23.4	21.5	21.5	dBm
Noise Figure	4.8	5.0	5.0	5.3	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 20 dBm per tone separated by 1 MHz.

*ACPR CH Power is measured at 55dBc, ACLR CH Power _ measured at 50dBc.

*ACPR Test set-up: IS-95 CDMA, 9Ch. FWD, +885KHz offset, PAR 9.7dB at 0.01% Prob.

*ACLR Test set-up: 3GPP WCDMA, TM1+64DPCH, +5MHz offset, PAR 10.34 at 0.01% Prob.

	Min.	Typical	Max.	Unit
Bandwidth	700		2700	MHz
I_C @ (Vc = 5V)	360	410	440	mA
V_C		5.0		V
R_{TH}		10.0		°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	+5.5	V
Supply Current	900	mA
Input RF Power	28	dBm

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

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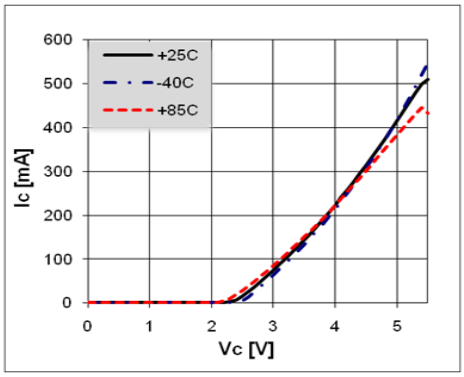
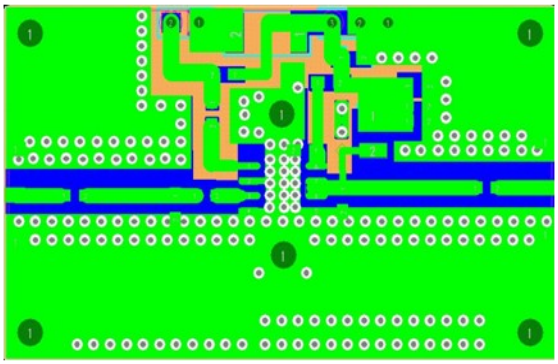
700-2700 MHz 1.5~2.0W Power Amplifier

Preliminary Datasheet

V-I Characteristics



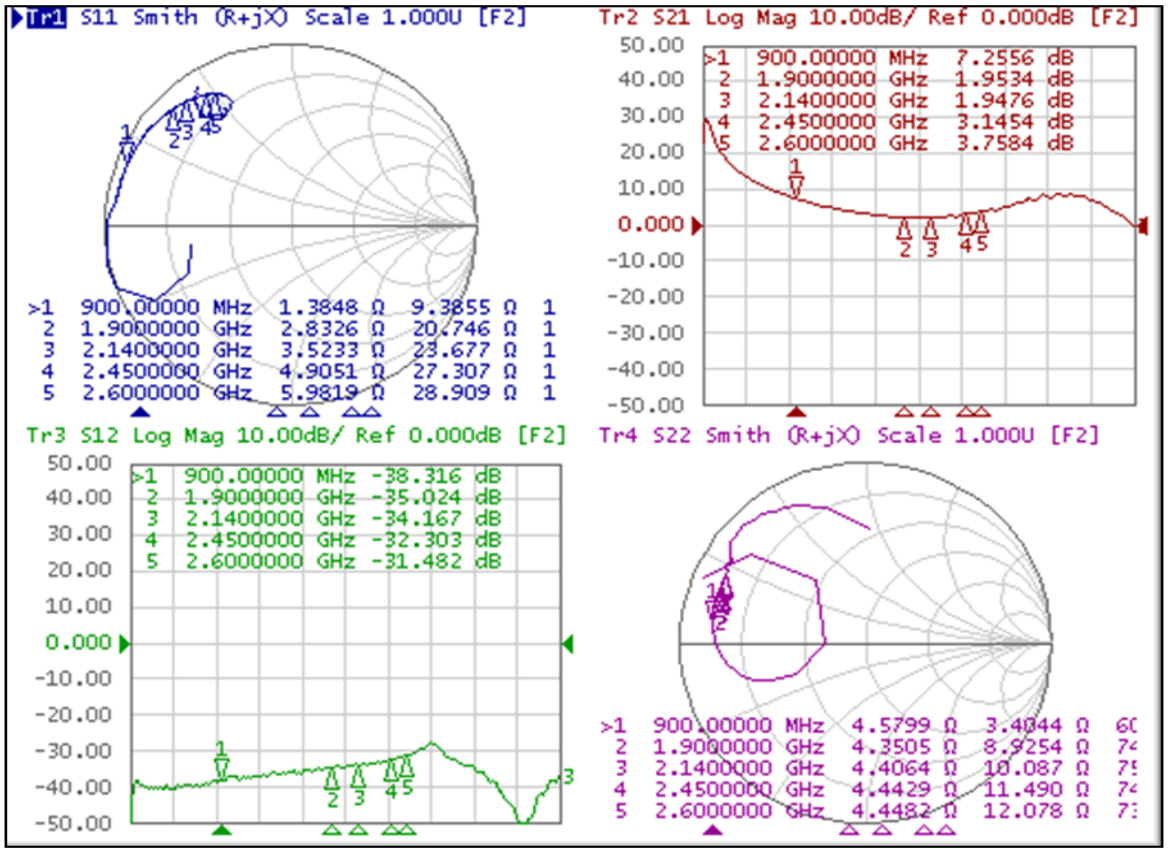
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vc=5V, Ic=400mA, T=25°C)



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S-Parameter

(Vdevice = 5.0V, Icc = 400mA, 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	0.919	-155.332	27.202	171.888	0.011	81.778	0.335	151.426
500	0.949	168.743	4.153	90.122	0.010	35.600	0.805	-179.714
1000	0.941	156.029	2.065	78.875	0.011	47.384	0.833	170.693
1500	0.929	143.815	1.444	71.101	0.016	48.347	0.840	163.704
2000	0.895	131.767	1.226	65.133	0.019	50.235	0.838	158.159
2500	0.847	120.721	1.393	57.189	0.024	47.782	0.839	153.001
3000	0.735	118.042	2.132	32.334	0.024	2.709	0.848	147.516
3500	0.757	125.918	2.326	-38.115	0.007	-11.874	0.904	140.189
4000	0.910	122.065	0.796	-127.288	0.014	66.759	0.495	79.167

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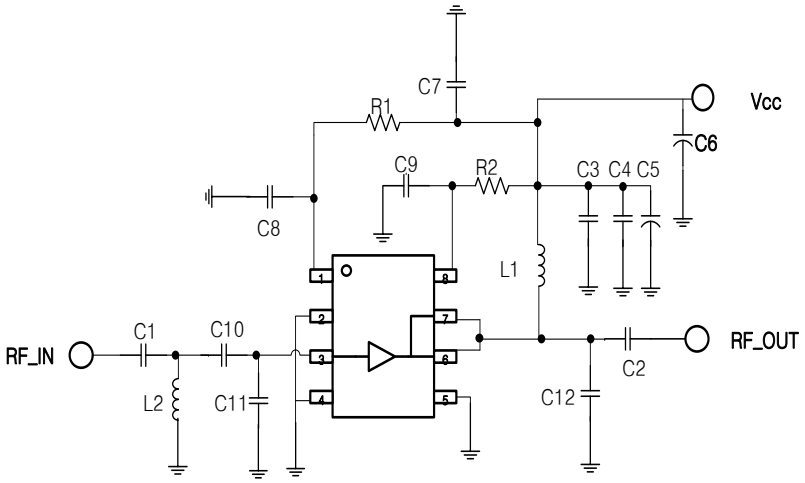
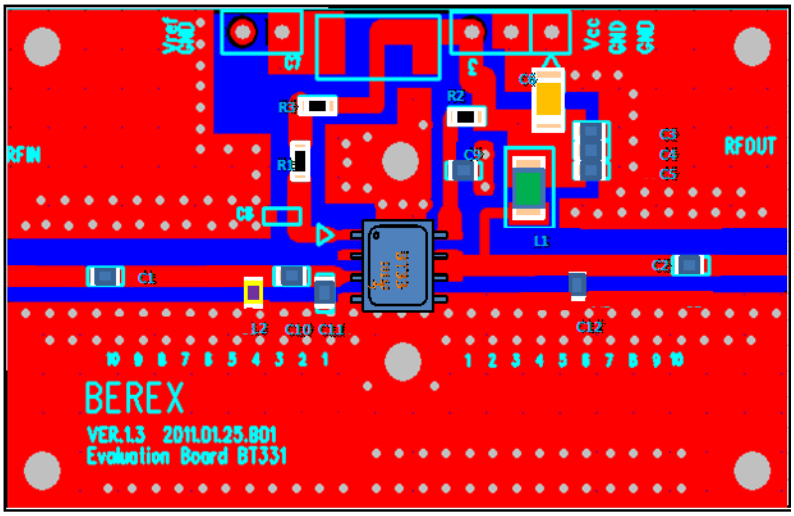
Application Circuit: 900 MHz

Schematic Diagram



BOM			Toler-ance
C1	1680	100pF	±5%
C2	1608	100pF	±5%
C3	1608	100pF	±5%
C4	1608	1nF	±5%
C5	1608	1uF	±5%
C6	3216	10uF	±20%
C7		NC	
C8		NC	
C9	1608	1pF	±5%
C10	1608	3.3pF	±5%
C11	1608	10pF	±5%
C12	1608	8pF	±5%
L1	1608	18nH	±5%
L2	1608	8.2nH	±5%
R1	1608	4.3KΩ	±5%
R2	1608	100Ω	±5%

PCB Diagram



Notice

1. PCB: 31mil thick FR4
2. Distance between the center of the shunt Inductor(L2) and the input pin of BT331 _ ***6.45 mm***.
3. Distance between the center of the series cap.(C10) and the input pin of BT331 _ ***2.8mm.***
4. Distance between the center of the shunt cap.(C11) and the input pin of BT331 _ ***1.5 mm***.
5. Distance between the center of the shunt cap.(C12) and the output pin of BT331 _ ***8.25 mm***.

※ BT331 with both input and output ports opened simultaneously may cause instability. Please See an application note or contact company for application support.

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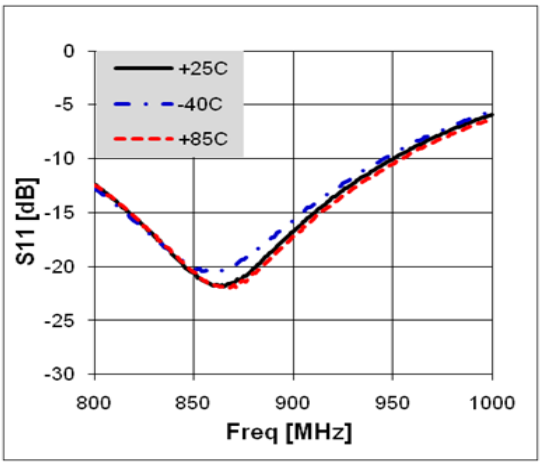
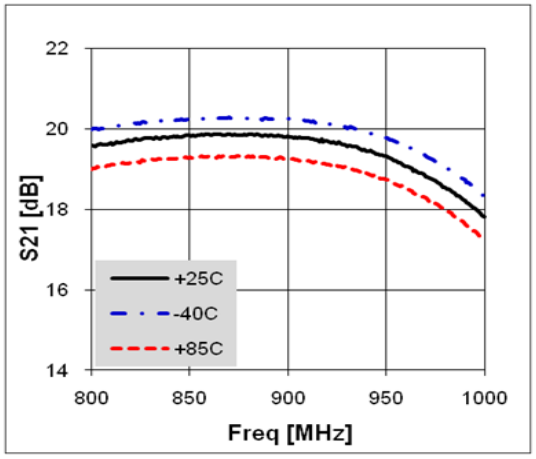
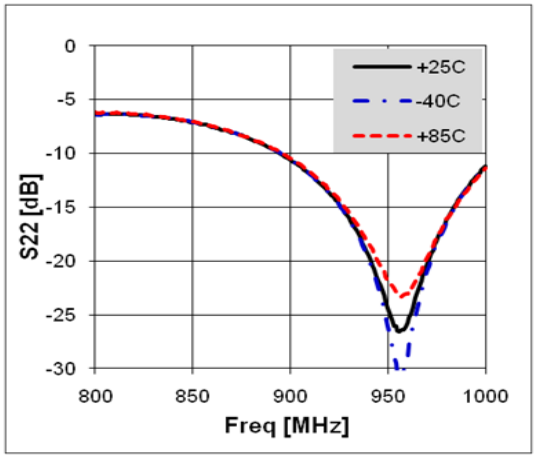
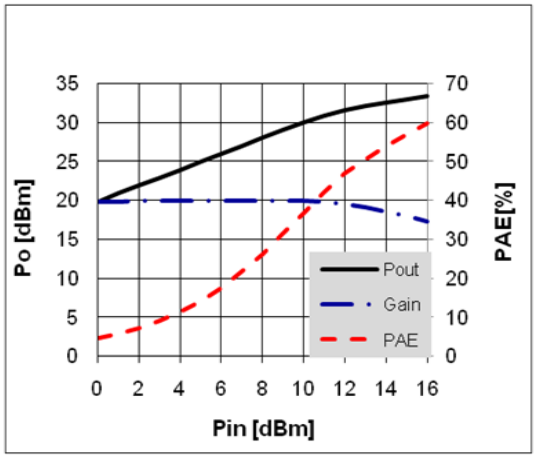
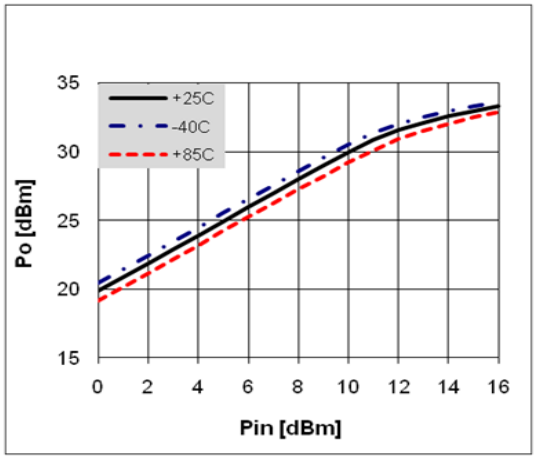
Typical Performance

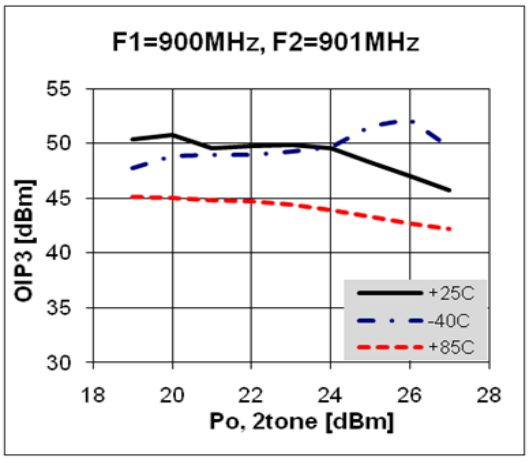












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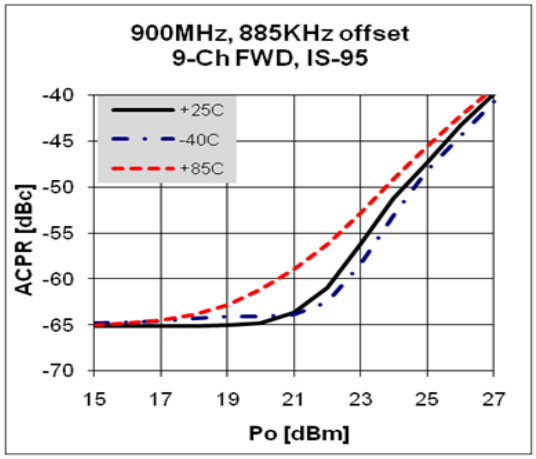
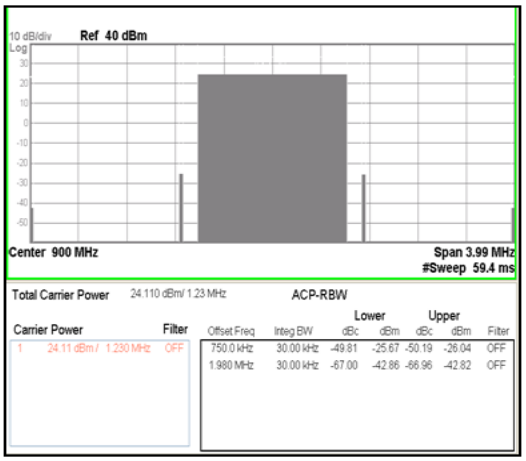
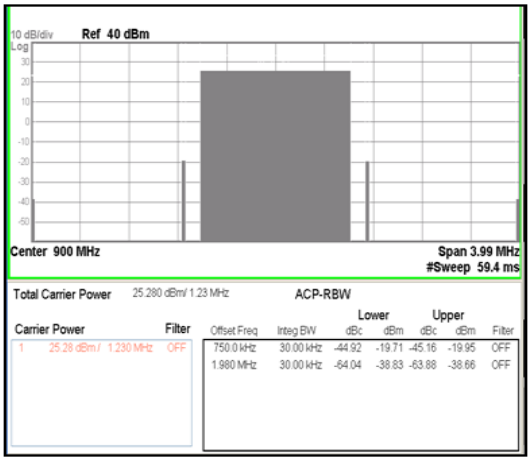
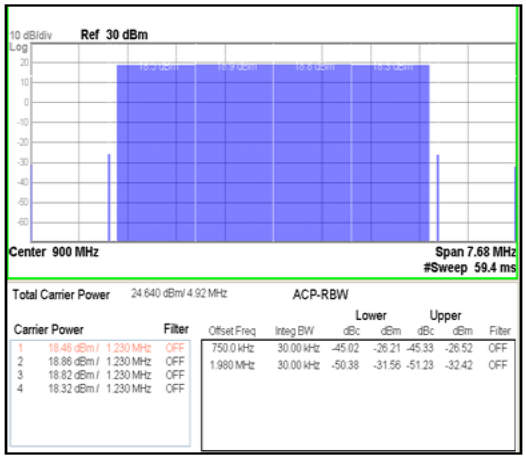
Typical Performance









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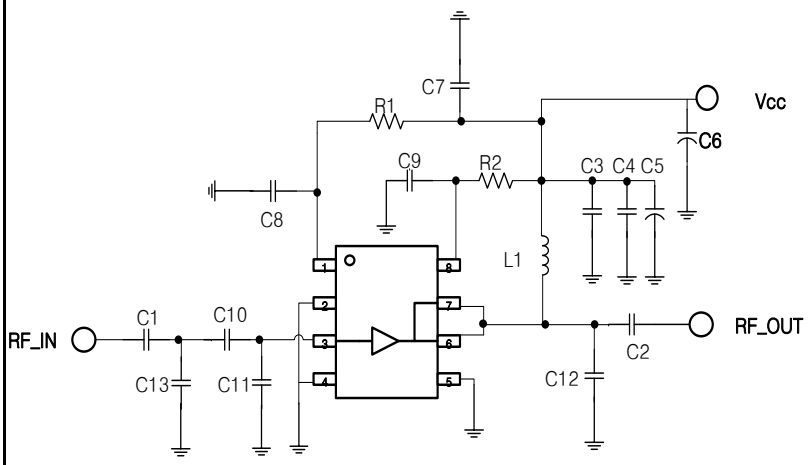
Preliminary Datasheet

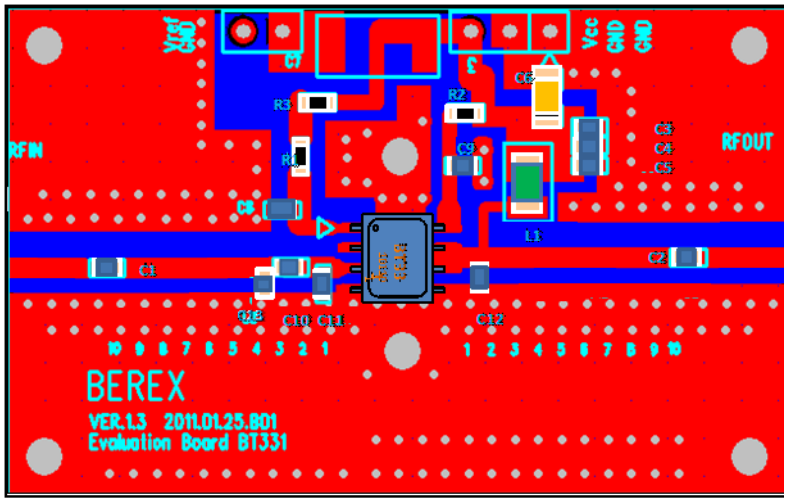
Application Circuit: 1900 MHz

Schematic Diagram



BOM			Toler-ance
C1	1608	100pF	±5%
C2	1608	100pF	±5%
C3	1608	100pF	±5%
C4	1608	1nF	±5%
C5	1608	1uF	±5%
C6	3216	10uF	±20%
C7		NC	
C8	1608	2pF	±5%
C9	1608	10pF	±5%
C10	1608	3pF	±5%
C11	1608	0.5pF	±5%
C12	1608	2.7pF	±5%
C13	1608	2.5pF	±5%
L1	1608	56nH	±5%
R1	1608	4.3KΩ	±5%
R2	1608	100Ω	±5%

PCB Diagram



Notice

1. PCB: 31mil thick FR4
2. Distance between the center of the shunt cap.(C13) and the input pin of BT331 _ ***5.25 mm***.
3. Distance between the center of the series cap.(C10) and the input pin of BT331 _ ***2.8mm.***
4. Distance between the center of the shunt cap.(C11) and the input pin of BT331 _ ***1.5 mm***.
5. Distance between the center of the shunt cap.(C12) and the output pin of BT331 _ ***2.25 mm***.

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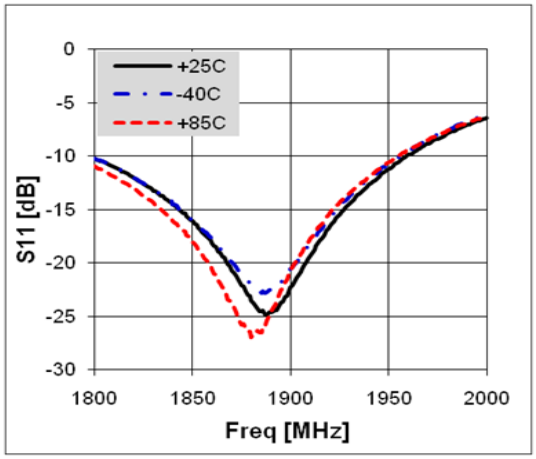
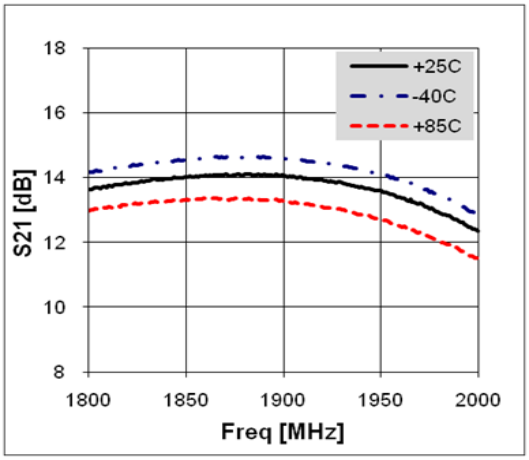
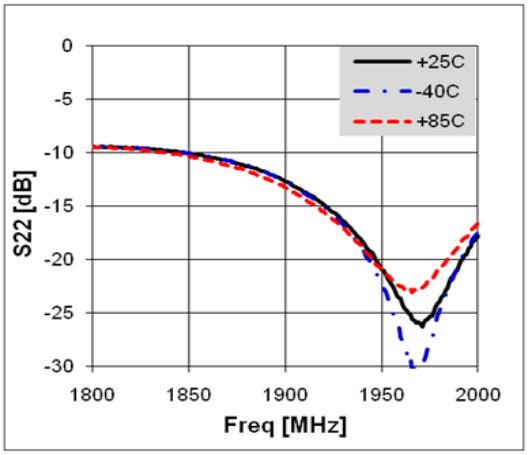
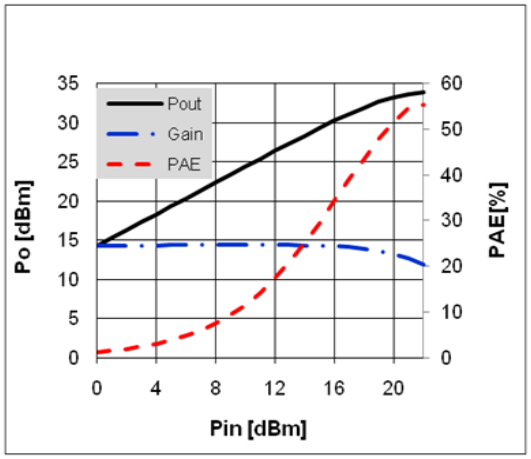
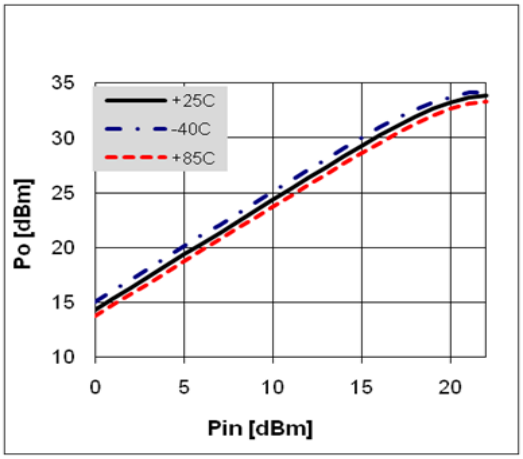
Typical Performance

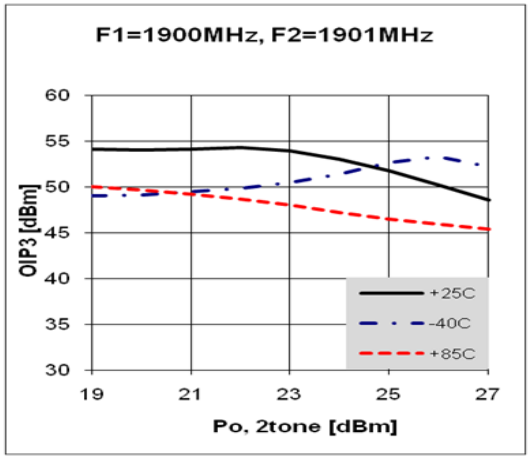












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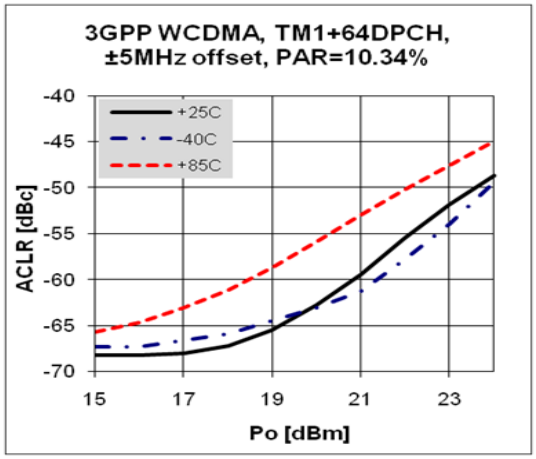
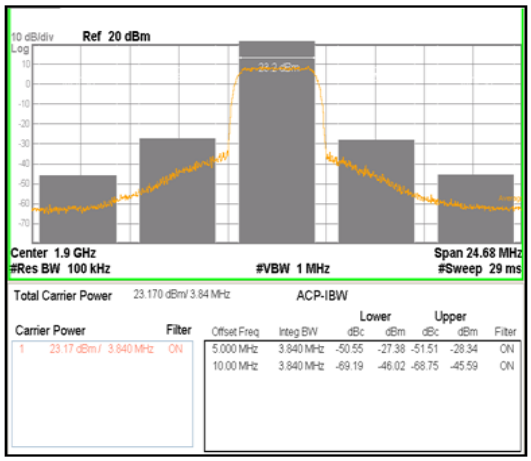
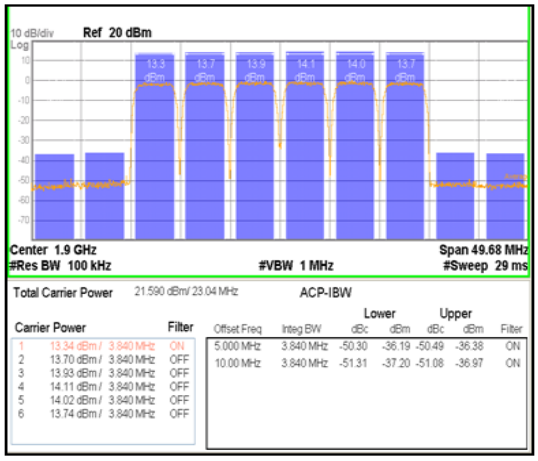
Typical Performance







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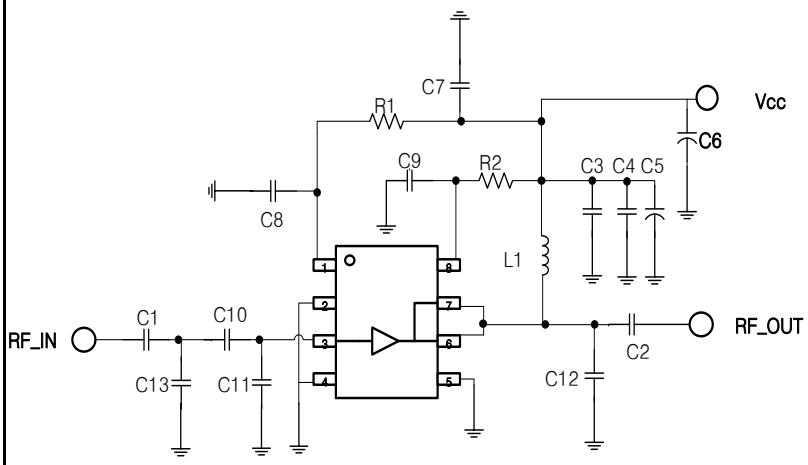
Preliminary Datasheet

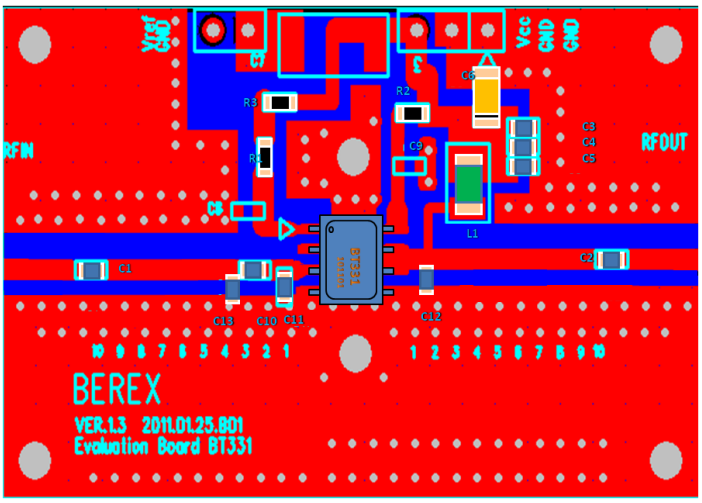
Application Circuit: 2140 MHz

Schematic Diagram



BOM			Toler-ance
C1	1608	100pF	±5%
C2	1608	100pF	±5%
C3	1608	100pF	±5%
C4	1608	1nF	±5%
C5	1608	1uF	±5%
C6	3216	10uF	±20%
C7		NC	
C8	1608	5pF	±5%
C9		NC	
C10	1608	1.8pF	±5%
C11	1608	0.5pF	±5%
C12	1608	2pF	±5%
C13	1608	2pF	±5%
L1	1608	22nH	±5%
R1	1608	5.6KΩ	±5%
R2	1608	100Ω	±5%

PCB Diagram



Notice

1. PCB: 31mil thick FR4
2. Distance between the center of the shunt cap.(C13) and the input pin of BT331 _ ***5.25 mm***.
3. Distance between the center of the series cap.(C10) and the input pin of BT331 _ ***2.8mm.***
4. Distance between the center of the shunt cap.(C11) and the input pin of BT331 _ ***1.5 mm***.
5. Distance between the center of the shunt cap.(C12) and the output pin of BT331 _ ***2.25 mm***.

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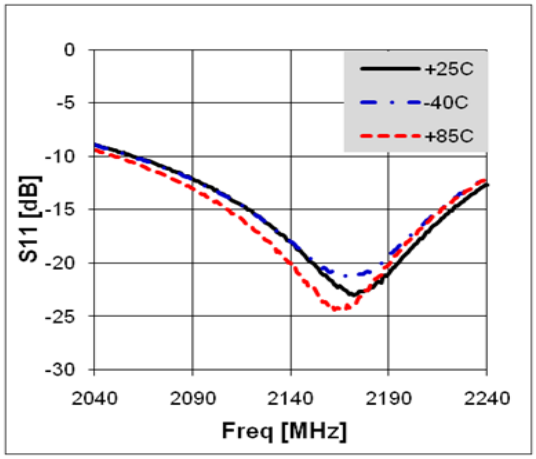
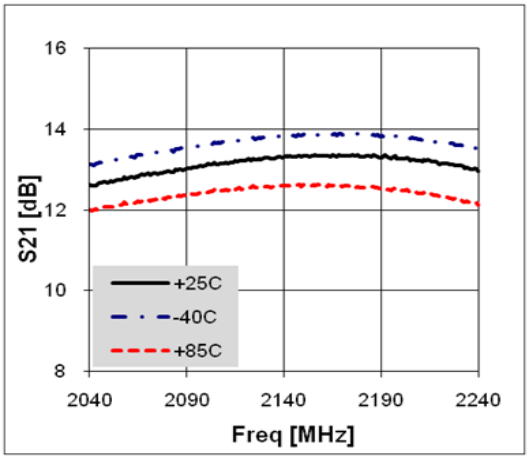
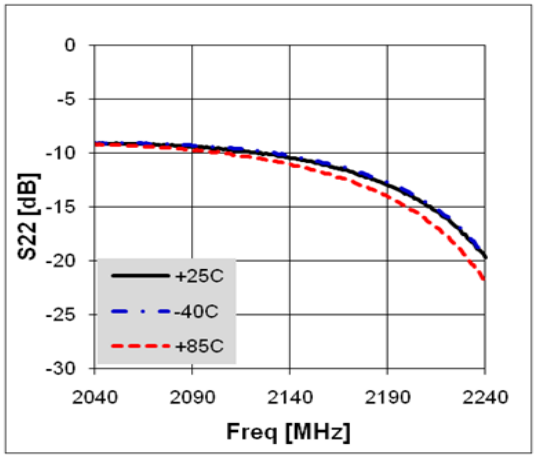
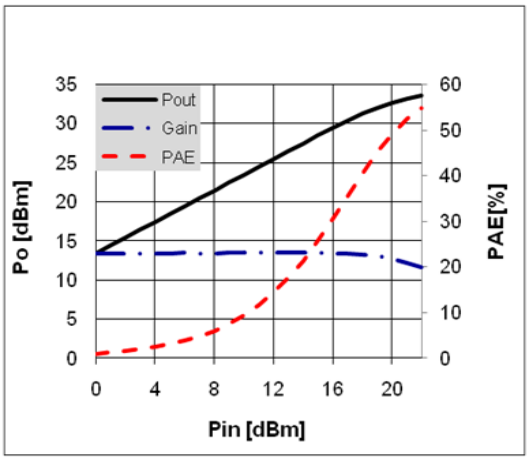
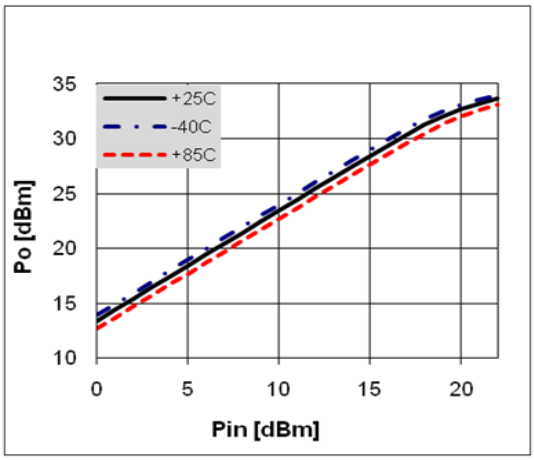
Typical Performance

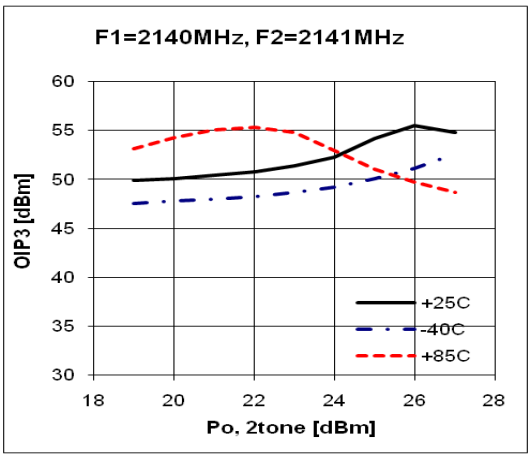












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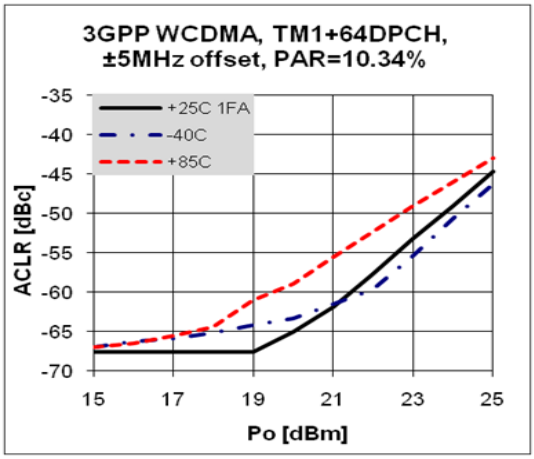
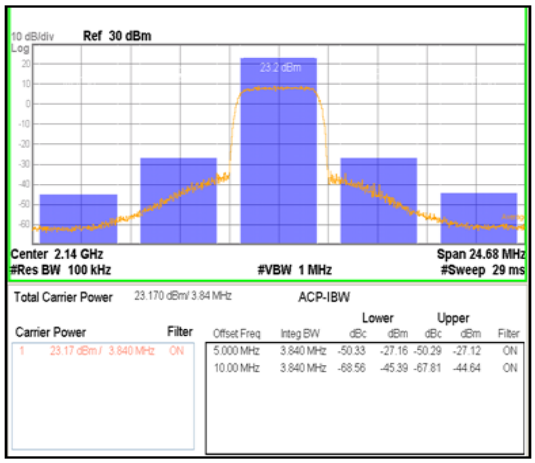
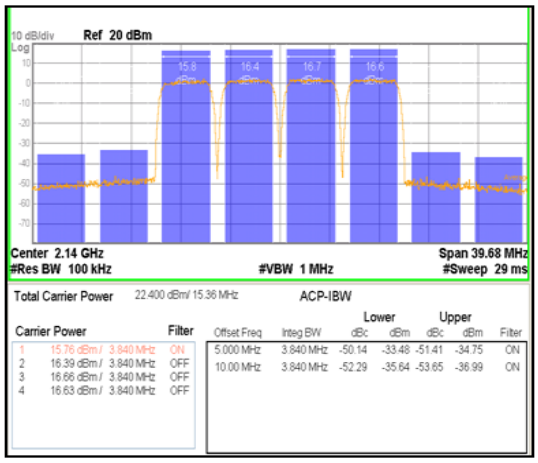
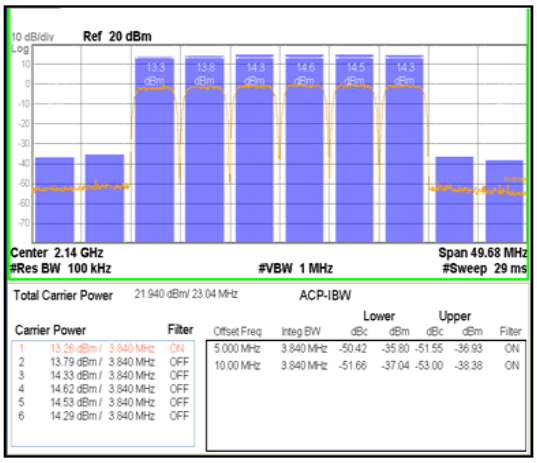
Typical Performance









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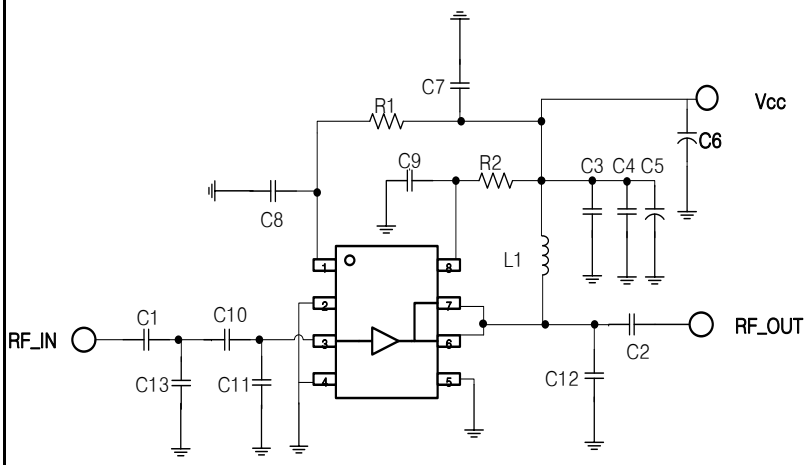
Preliminary Datasheet

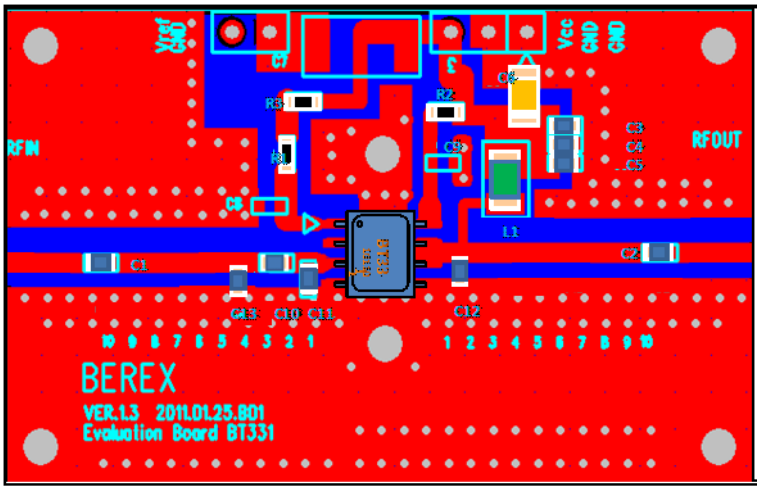
Application Circuit: 2450 MHz

Schematic Diagram



BOM			Toler-ance
C1	1608	100pF	±5%
C2	1608	100pF	±5%
C3	1608	100pF	±5%
C4	1608	1nF	±5%
C5	1608	1uF	±5%
C6	3216	10uF	±20%
C7		NC	
C8		NC	
C9		NC	
C10	1608	1pF	±5%
C11	1608	0.5pF	±5%
C12	1608	1.8pF	±5%
C13	1608	1pF	±5%
L1	1608	5.7nH	±5%
R1	1608	5.6KΩ	±5%
R2	1608	100Ω	±5%

PCB Diagram



Notice

1. PCB: 31mil thick FR4
2. Distance between the center of the shunt cap.(C13) and the input pin of BT331 _ ***6.0 mm***.
3. Distance between the center of the series cap.(C10) and the input pin of BT331 _ ***2.8mm.***
4. Distance between the center of the shunt cap.(C11) and the input pin of BT331 _ ***1.5 mm***.
5. Distance between the center of the shunt cap.(C12) and the output pin of BT331 _ ***2.5 mm***.

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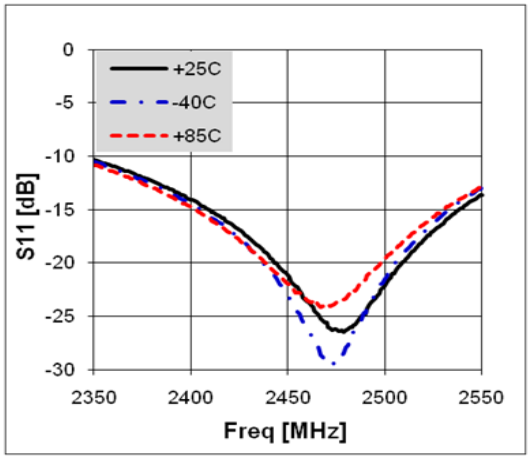
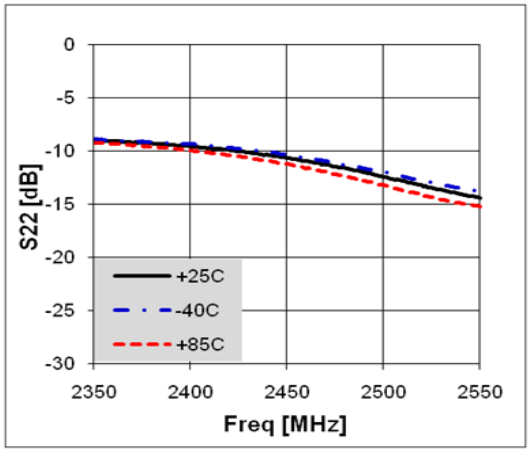
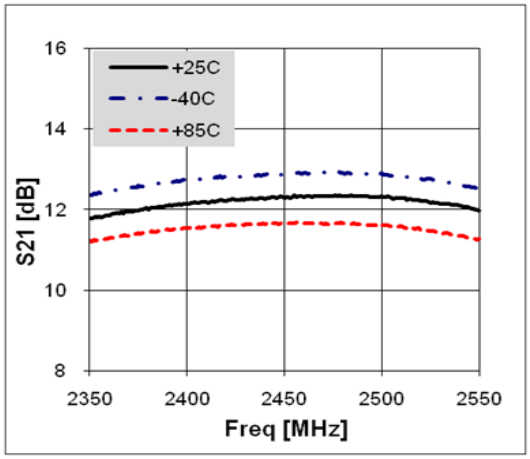
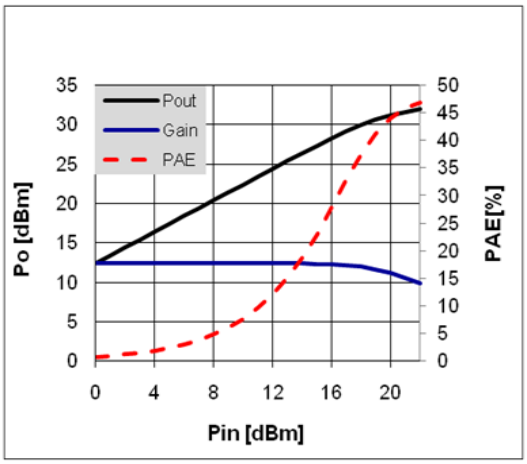
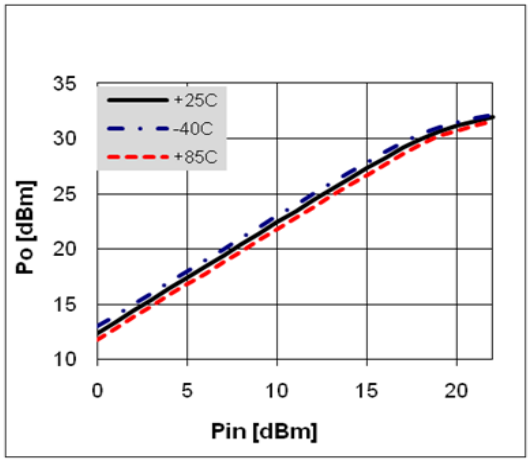
Typical Performance

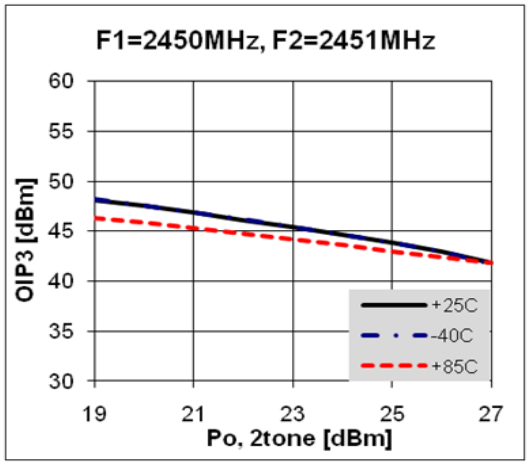












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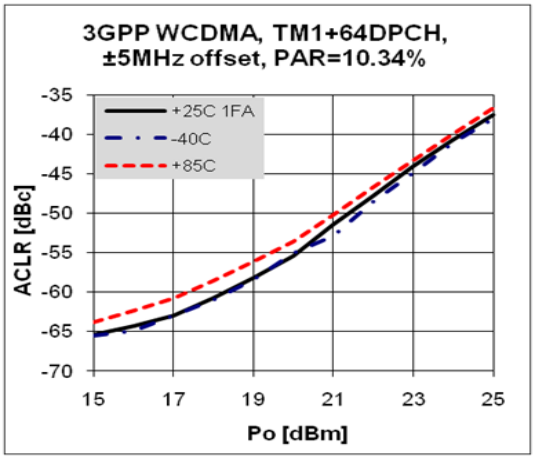
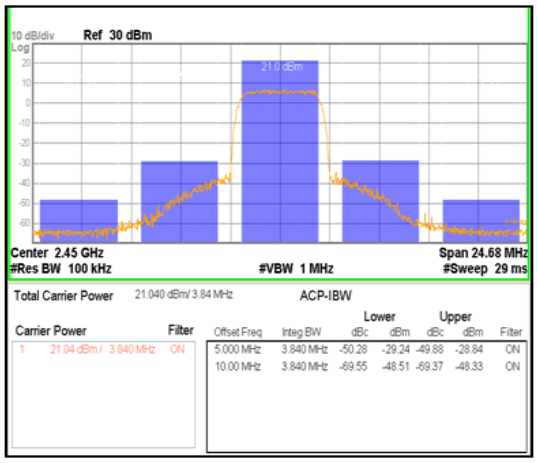
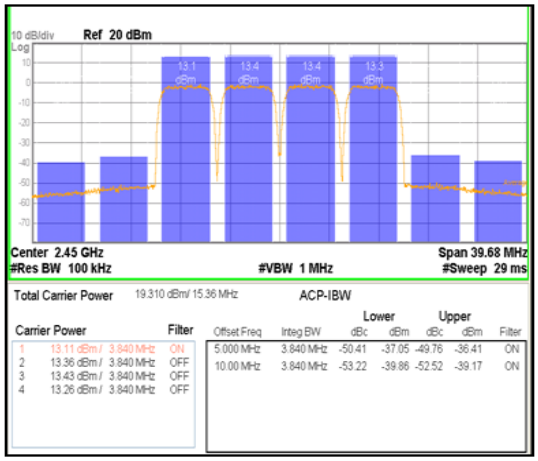
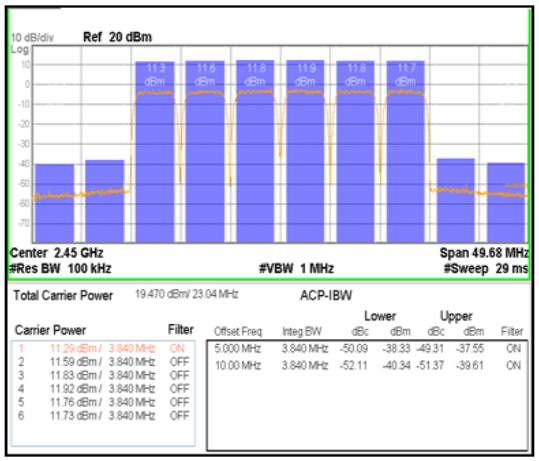
Typical Performance









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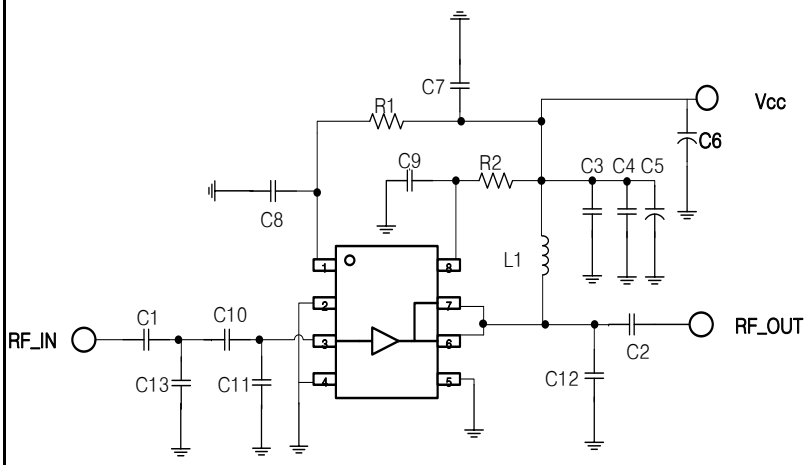
Preliminary Datasheet

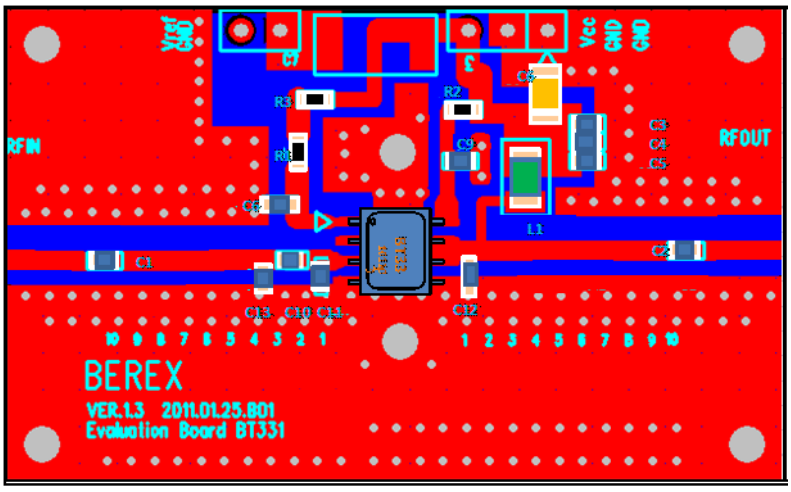
Application Circuit: 2600 MHz

Schematic Diagram



BOM			Toler-ance
C1	1608	100pF	±5%
C2	1608	100pF	±5%
C3	1608	100pF	±5%
C4	1608	1nF	±5%
C5	1608	1uF	±5%
C6	3216	10uF	±20%
C7		NC	
C8	1608	5pF	±5%
C9	1608	2.5pF	±5%
C10	1608	1pF	±5%
C11	1608	0.5pF	±5%
C12	1608	1.8pF	±5%
C13	1608	1pF	±5%
L1	1608	5.7nH	±5%
R1	1608	5.6KΩ	±5%
R2	1608	100Ω	±5%

PCB Diagram



Notice

1. PCB: 31mil thick FR4
2. Distance between the center of the shunt cap.(C13) and the input pin of BT331 _ ***5.25 mm***.
3. Distance between the center of the series cap.(C10) and the input pin of BT331 _ ***2.8mm.***
4. Distance between the center of the shunt cap.(C11) and the input pin of BT331 _ ***1.5 mm***.
5. Distance between the center of the shunt cap.(C12) and the output pin of BT331 _ ***1.5 mm***.

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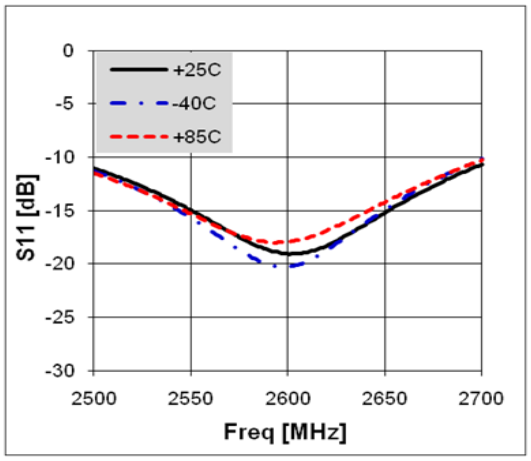
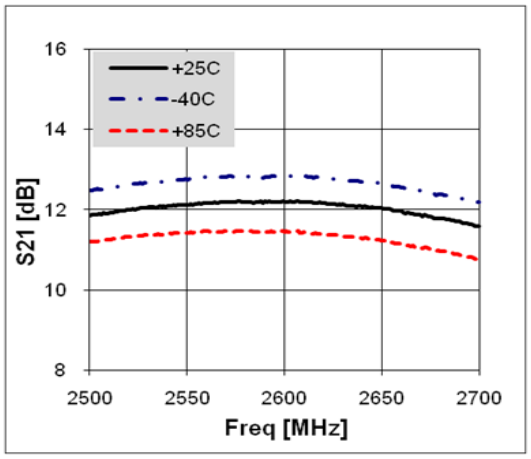
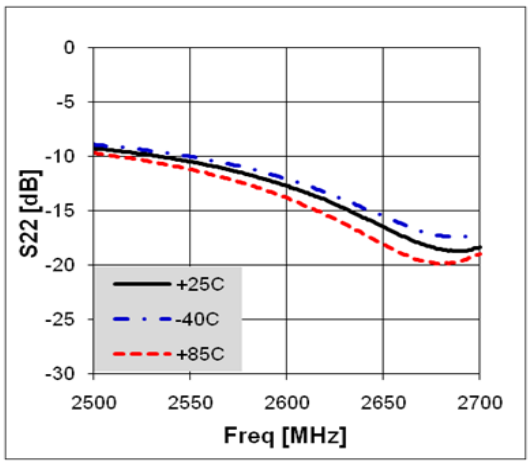
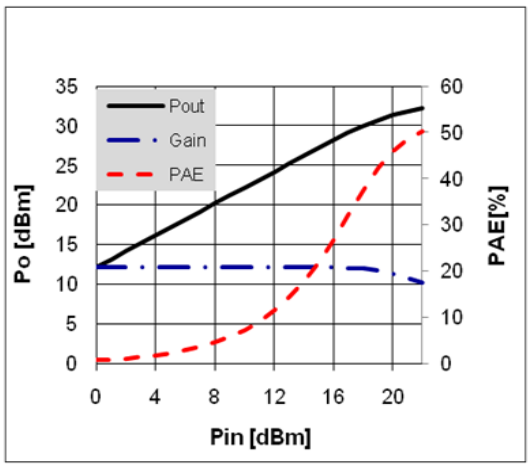
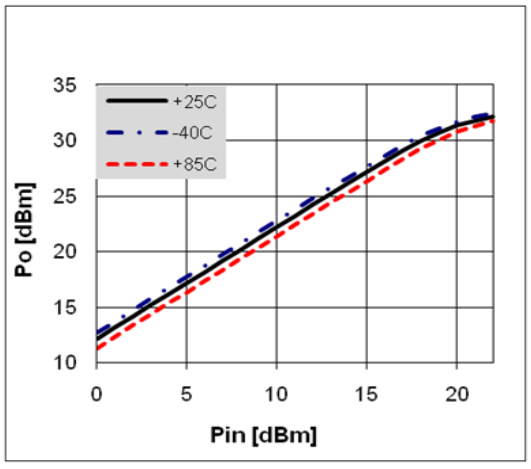
Typical Performance

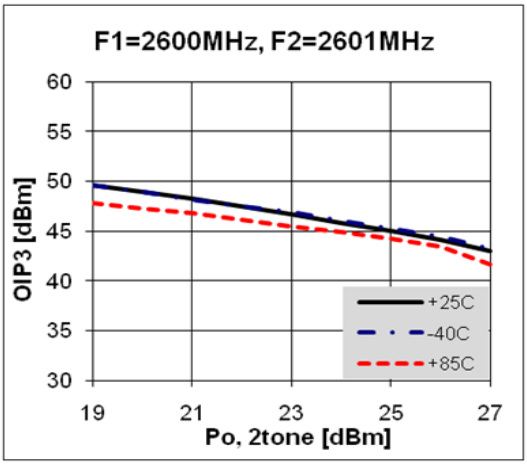












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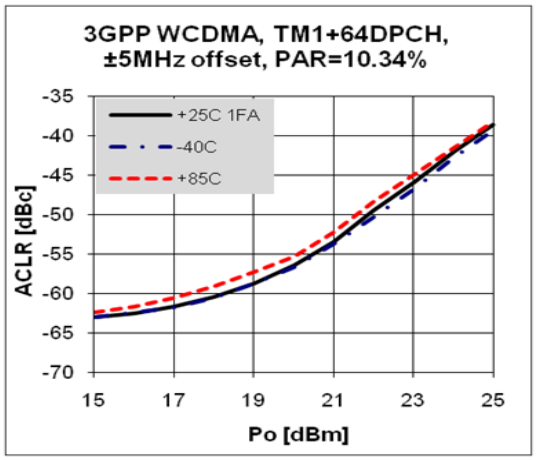
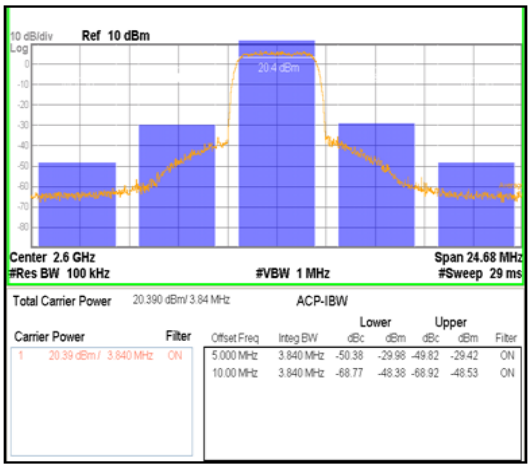
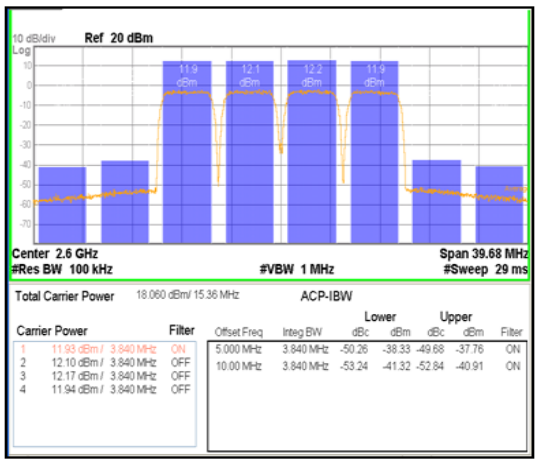
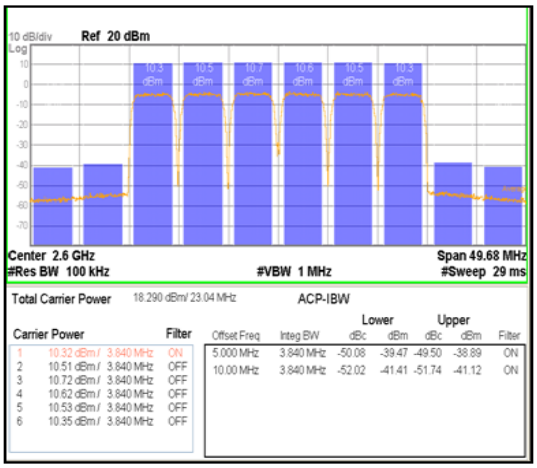
Typical Performance









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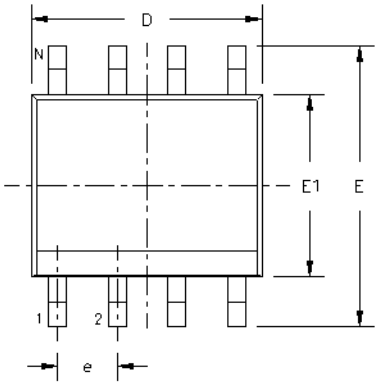
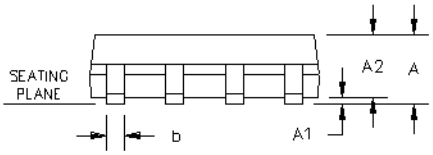
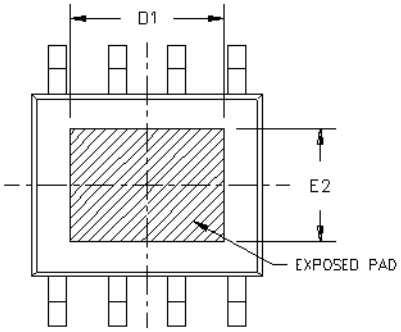
Package Outline Dimension



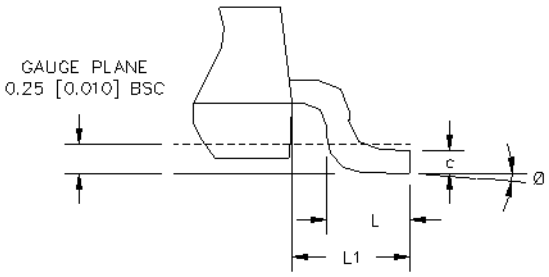
TOP VIEW



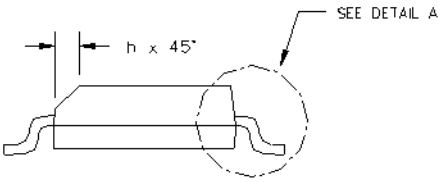
SIDE VIEW



BOTTOM VIEW



DETAIL A



	DIMENSION IN INCHES			DIMENSION IN MM		
SYM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.056	0.058	0.061	1.42	1.47	1.55
A1	0.001	0.004	0.005	0.025	0.102	0.127
A2	0.051	0.054	0.057	1.30	1.37	1.45
b	0.014	0.016	0.020	0.36	0.41	0.51
c	0.007	0.008	0.010	0.18	0.20	0.25
D	0.191	0.193	0.195	4.85	4.90	4.95
E1	0.151	0.153	0.155	3.84	3.89	3.94
E	0.234	0.240	0.244	5.94	6.10	6.20
e		0.050			1.27	
L	0.020	0.027	0.032	0.51	0.69	0.81
L1	0.042	0.044	0.046	1.07	1.12	1.17
Ø	0°	–	8°	0°	–	8°
h	0.011	0.015	0.019	0.28	0.38	0.48
D1	0.120	–	0.130	3.05	–	3.30
E2	0.085	–	0.095	2.16	–	2.41

NOTES:
1. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
2. COPLANARITY APPLIES TO THE TERMINALS. COPLANARITY SHALL NOT EXCEED 0.003" [0.08 mm]
3. BASED FROM JEDEC MS-012 VARIATION AA.

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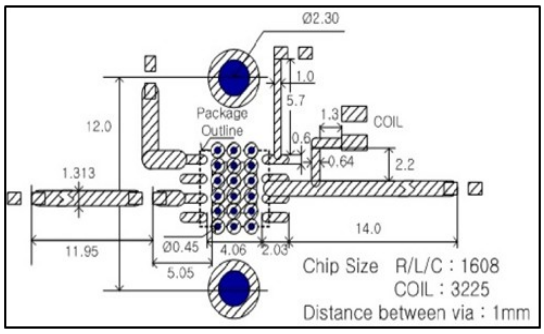
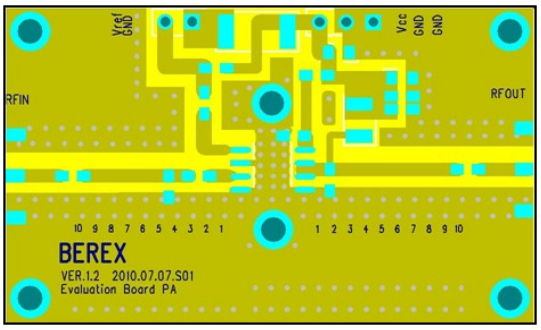
Suggested PCB Land Pattern and PAD Layout

PCB Land Pattern



PCB Mounting



Note : All dimension are in millimeters

PCB lay out _ on BeRex website

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 2
Value:	**Passes <4000V**
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	**Level 3 at +265°C convection reflow**
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

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

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