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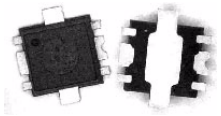
Preliminary

SPA-1426Z

0.7GHz to 2.2GHz 1W InGaP HBT AMPLIFIER



RoHS Compliant and Pb-Free Product
Package: SOF-26

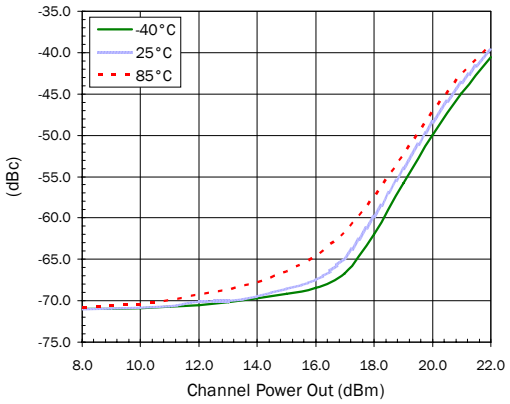
Product Description

RFMD's SPA-1426Z is a high linearity single-stage class A Heterojunction Bipolar Transistor (HBT) power amplifier. The SPA-1426Z is made with InGaP-on-GaAs device technology and fabricated with MOCVD for an ideal combination of low cost and high reliability. It is well suited for use as a driver stage in macro/micro-cell infrastructure equipment, or as the final output stage in pico-cell infrastructure equipment. It features an input power detector, on/off power control, ESD protection, excellent overall robustness and a hand reworkable and thermally enhanced SOF-26 package.

Optimum Technology Matching® Applied

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☑ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ☐ SiGe HBT
- ☐ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ RF MEMS

ACP versus Channel Power, 2140MHz, W-CDMA



Features

- P_{1dB} = 29.5dBm @ 2140MHz
- ACP = -65dBc with 17.0dBm Channel Power @ 2140MHz
- Low Thermal Resistance Package
- Power Up/Down Control < 1µs
- Robust Class 1C ESD

Applications

- Macro/Micro-Cell Driver Stage
- Pico-Cell Output Stage
- GSM, CDMA, TDSCDMA, WCDMA, IS-95
- Single and Multi-Carrier Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Small Signal Gain		16.5		dB	885MHz
		14.0		dB	1960MHz
		14.0		dB	2140MHz
Output Power at 1dB Compression		29.5		dBm	885MHz
		28.5		dBm	1960MHz
		29.5		dBm	2140MHz
Output Third Order Intercept Point, 18dBm per tone, 1MHz spacing		43.0		dBm	885MHz
		47.0		dBm	1960MHz
		46.5		dBm	2140MHz
W-CDMA Channel Power					3GPP 3.5, test model 1, 64 DPCH
-65dBc ACP		14.2		dBm	885MHz
-55dBc ACP		18.4		dBm	885MHz
-65dBc ACP		16.5		dBm	1960MHz
-55dBc ACP		18.5		dBm	1960MHz
-65dBc ACP		17.0		dBm	2140MHz
-55dBc ACP		19.0		dBm	2140MHz
Input Return Loss	15.0	18.0		dB	1960MHz
Output Return Loss	8.0	10.5		dB	1960MHz
Noise Figure		5.4		dB	1960MHz
Operating Current (V_{CC}=5V), Quiescent		325.0		mA	
Operating Voltage		5.0	5.5	V	
Power Up Control Current (V_{PC}=5V)		2.1		mA	
V_{CC} Leakage Current (V_{CC}=5V, V_{PC}=0V)			100.0	µA	
Thermal Resistance (junction to lead)		21		°C/W	

Test Conditions: V_{CC}=5V I_{CQ}=325mA Typ. T_L=25°C Z_S=Z_L=50Ω

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Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Current (I_{CE})	750	mA
Max Device Voltage (V_{CC})*	6	V
Power Dissipation	3	W
Max CW Input Power, 50Ω Output Load	29	dBm
Max CW Input Power, 10:1 VSWR Output Load	18	dBm
Max Modulated (W-CDMA) Input Power, 50Ω Output Load**	22	dBm
Max Modulated (W-CDMA) Input Power, 10:1 VSWR Output Load**	15	dBm
Max RF Output Power with 50Ω Output Load (Continuous long term operation)	27	dBm
Max Junction Temperature (TJ)	+150	°C
Operating Temperature Range (T_L)	-40 to +85	°C
Maximum Storage Temperature	+150	°C
ESD Rating - Human Body Model (HBM)	Class 1C	
Moisture Sensitivity Level	MSL 1	

*Note: No RF Drive

**Note: W-CDMA, 64DPCH

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.
Bias Conditions should also satisfy the following expression:
$I_D V_D < (T_J - T_L)/R_{TH}$, j-l and $T_L = T_{LEAD}$

Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

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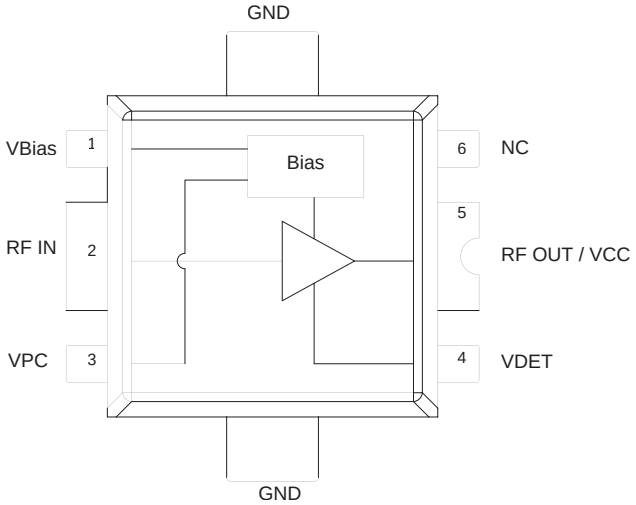
Simplified Device Schematic



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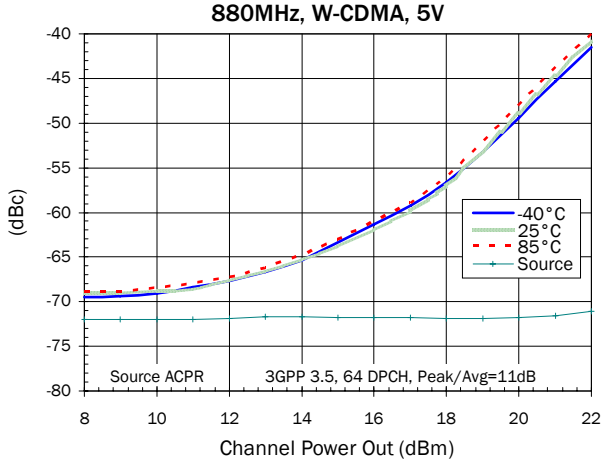
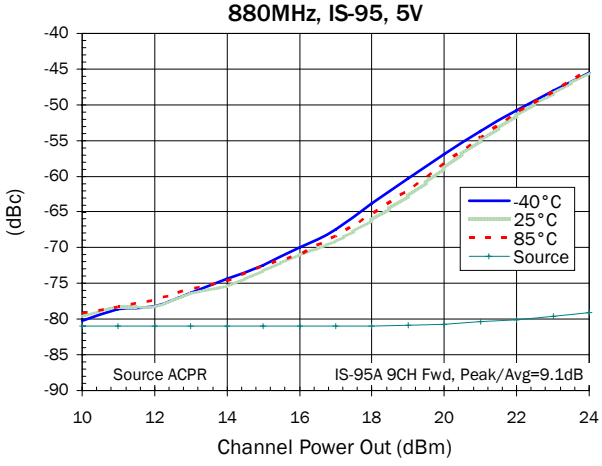
Typical RF Performance 850MHz to 910MHz Application Circuit

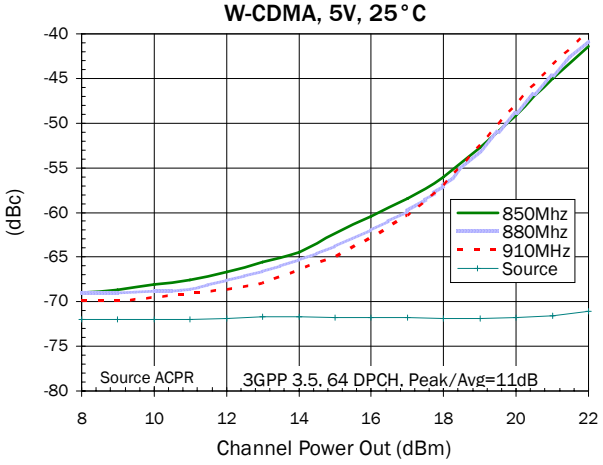
ACP versus Channel Power Out
880MHz, W-CDMA, 5V



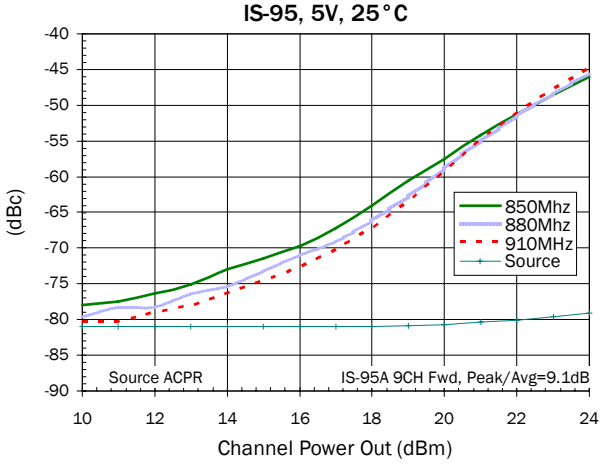
ACP versus Channel Power Out
880MHz, IS-95, 5V



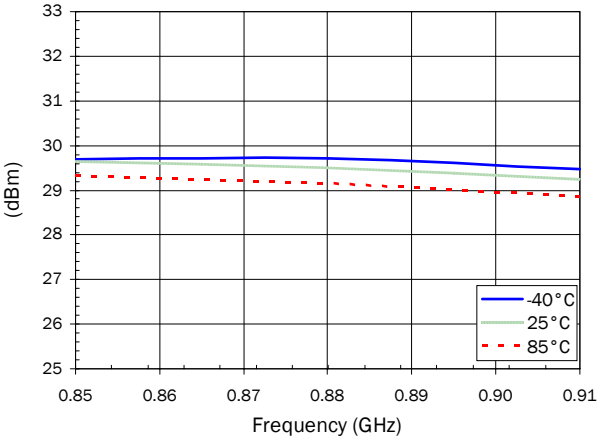
ACP versus Channel Power Out
W-CDMA, 5V, 25°C



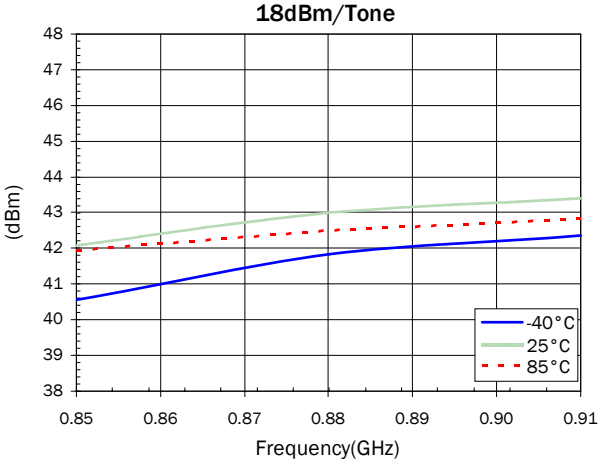
ACP versus Channel Power Out
IS-95, 5V, 25°C



P1dB versus Frequency

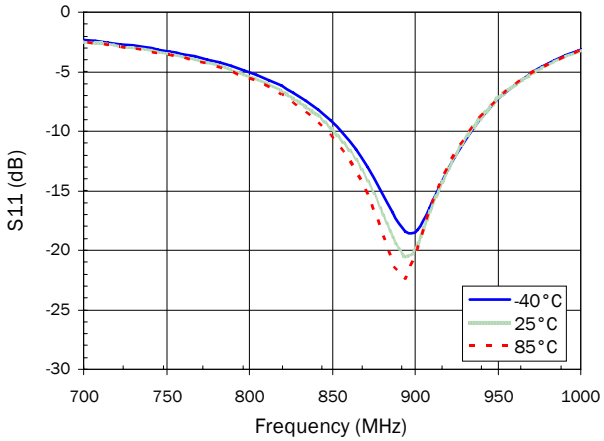


OIP3 versus Frequency
18dBm/Tone

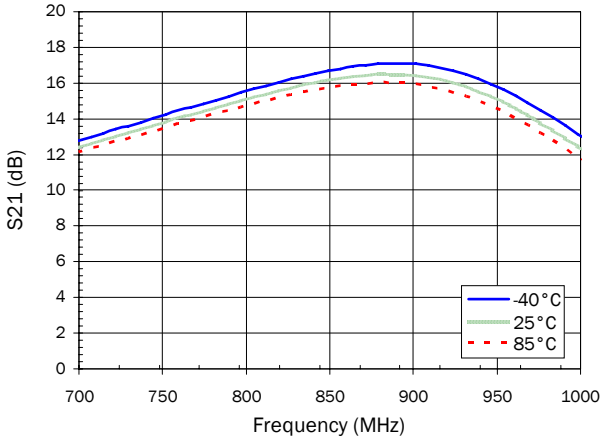


Typical RF Performance 850MHz to 910MHz Application Circuit

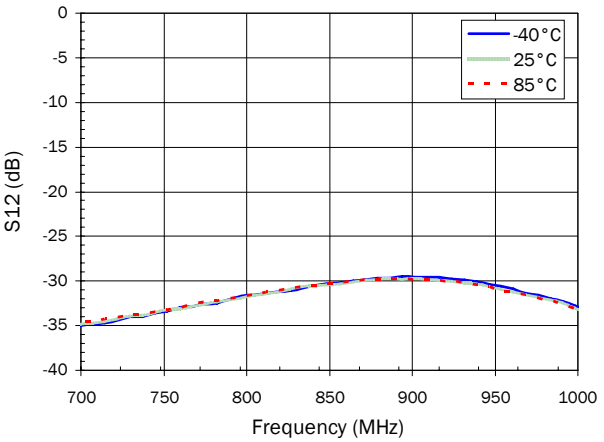
S11 versus Frequency



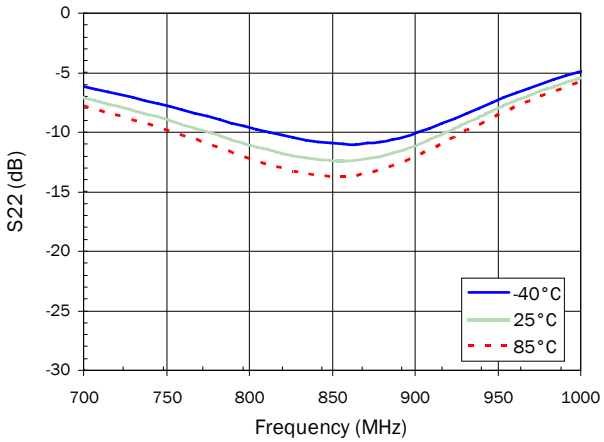
S21 versus Frequency



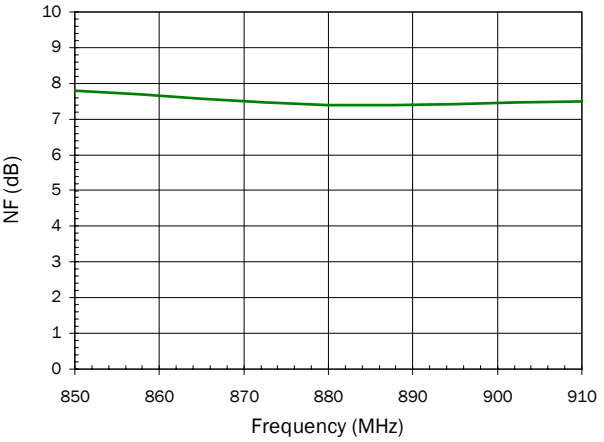
S12 versus Frequency



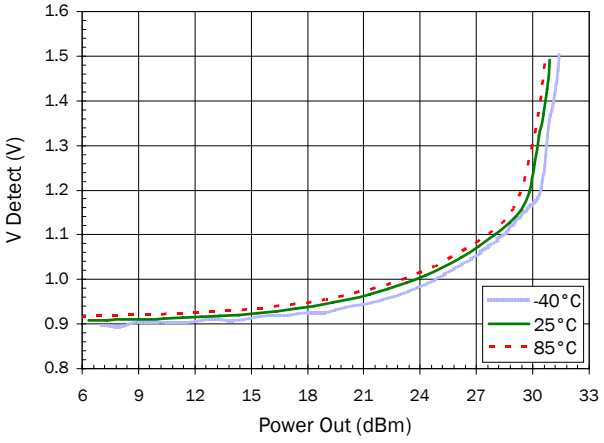
S22 versus Frequency



Noise Figure versus Frequency



V-Detect versus Output Power at 880MHz



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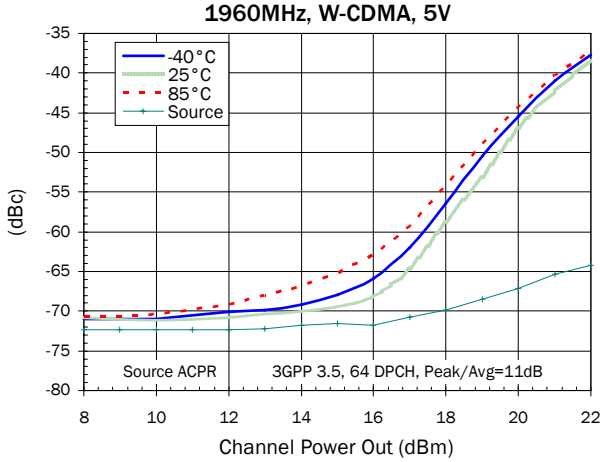
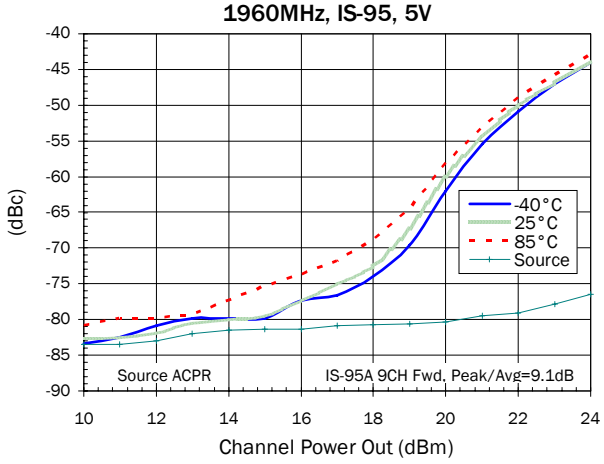
Typical RF Performance 1930MHz to 1960MHz Application Circuit

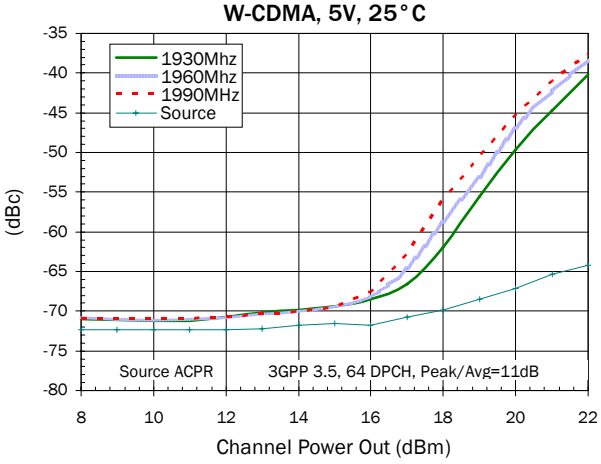
ACP versus Channel Power Out
1960MHz, W-CDMA, 5V



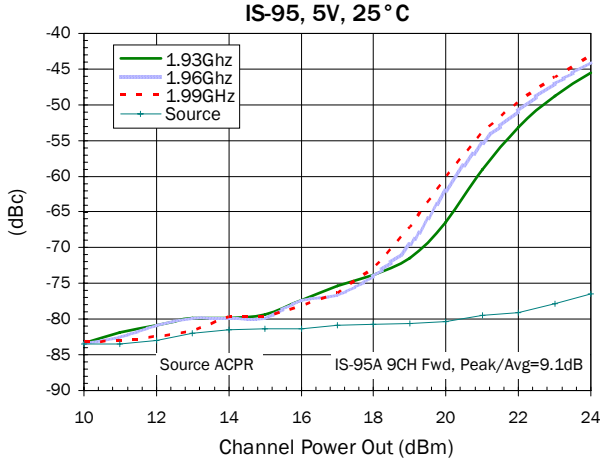
ACP versus Channel Power Out
1960MHz, IS-95, 5V



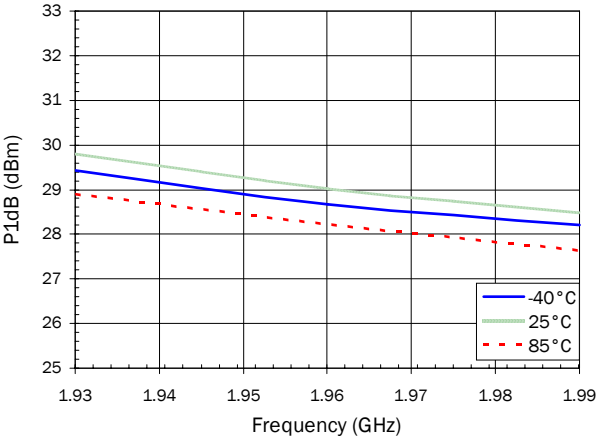
ACP versus Channel Power Out
W-CDMA, 5V, 25°C



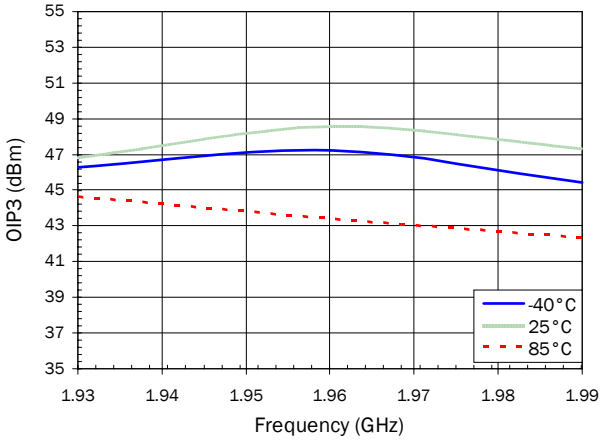
ACP versus Channel Power Out
IS-95, 5V, 25°C



P1dB versus Frequency

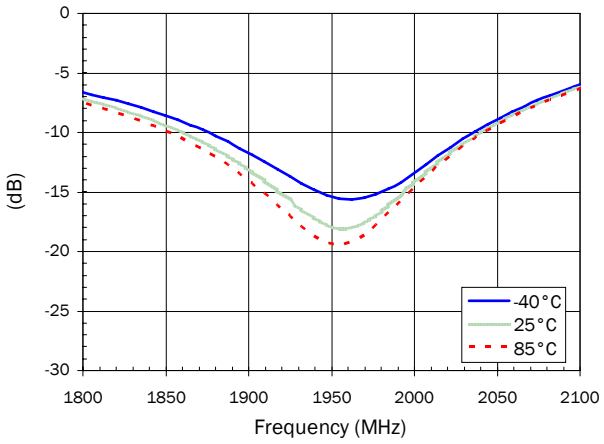


OIP3 versus Frequency

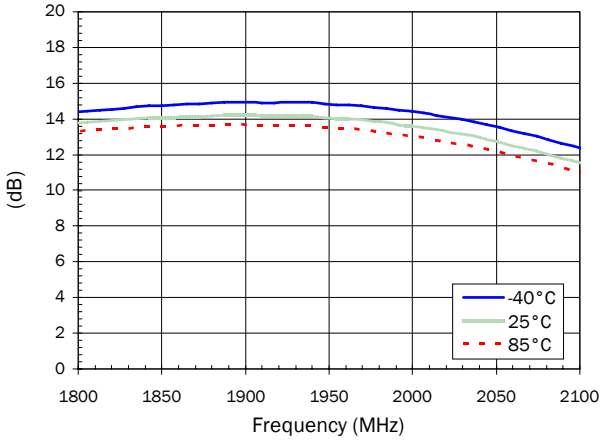


Typical RF Performance 1930MHz to 1960MHz Application Circuit

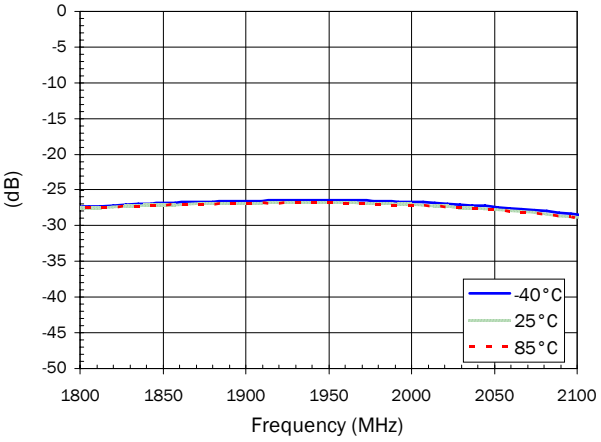
S11 versus Frequency



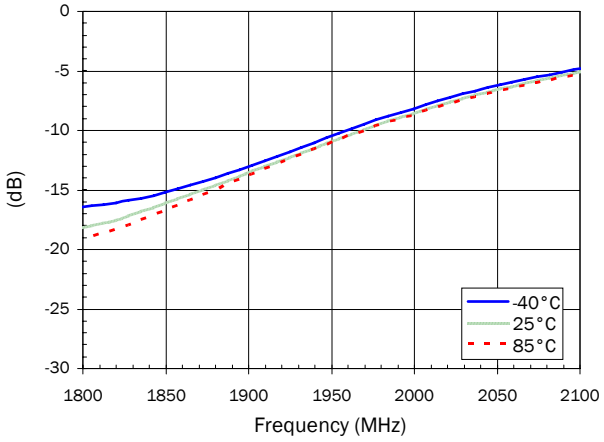
S21 versus Frequency



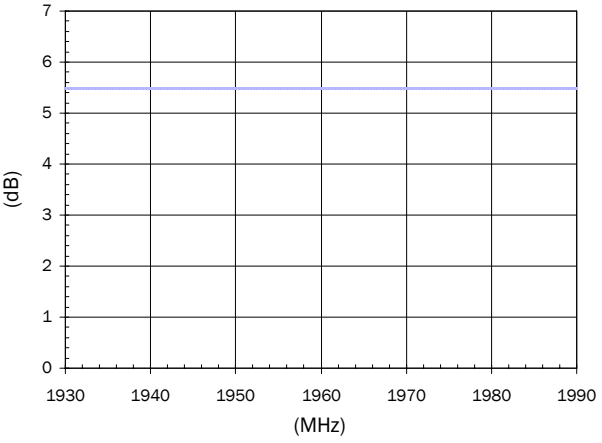
S12 versus Frequency



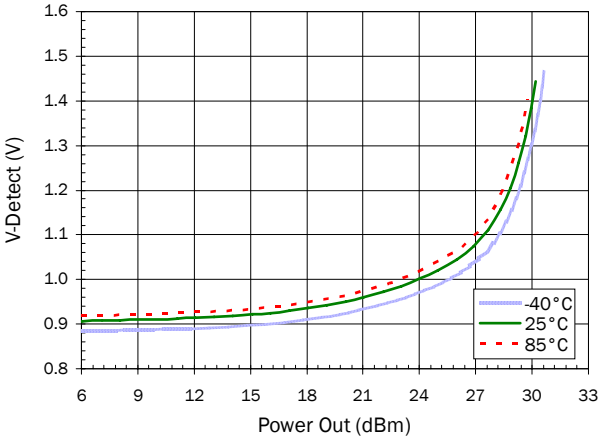
S22 versus Frequency



Noise Figure at 25°C



V-Detect versus Output Power at 1960MHz



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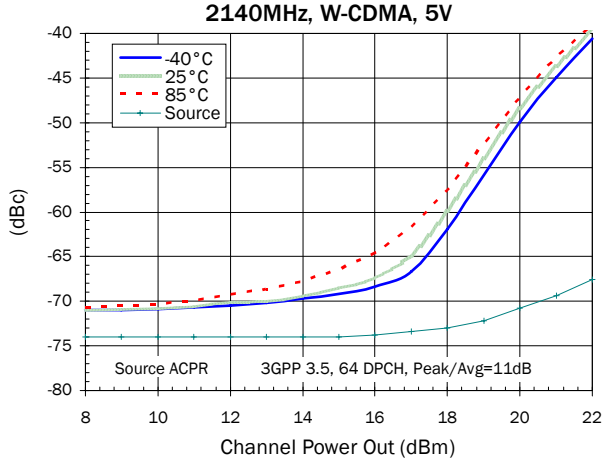
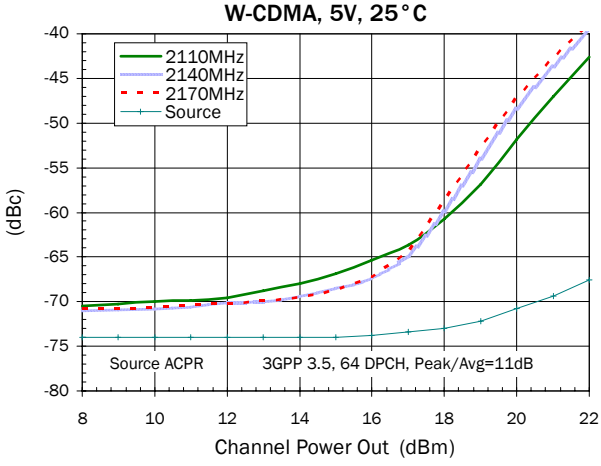
Typical RF Performance 2110 MHz to 2170 MHz Application Circuit

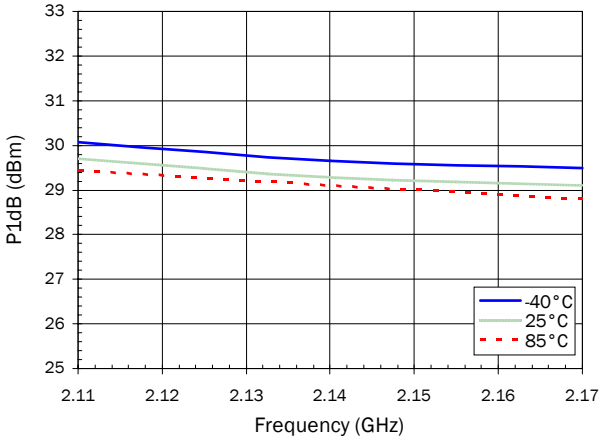
ACP versus Channel Power Out
2140MHz, W-CDMA, 5V



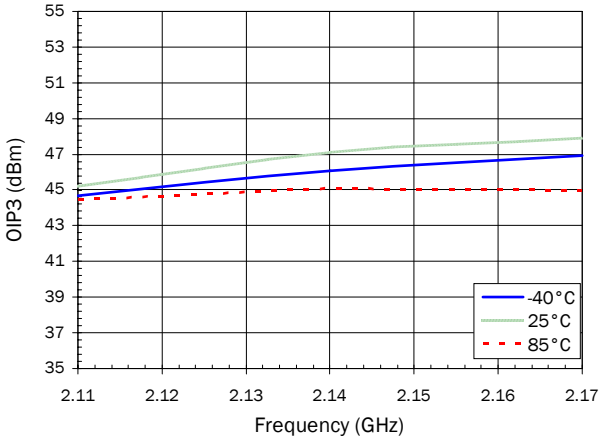
ACP versus Channel Power Out
W-CDMA, 5V, 25°C



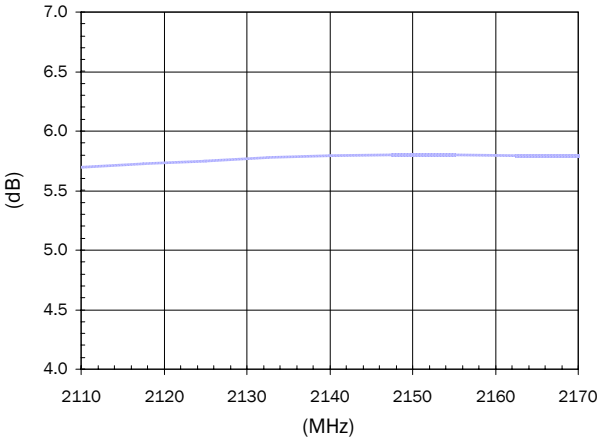
P1dB versus Frequency



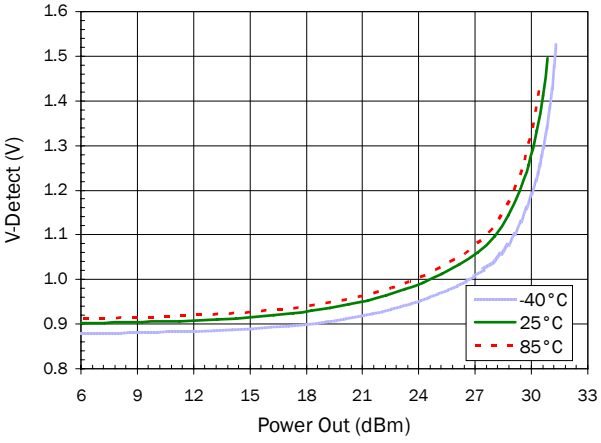
OIP3 versus Frequency



Noise Figure at 25°C

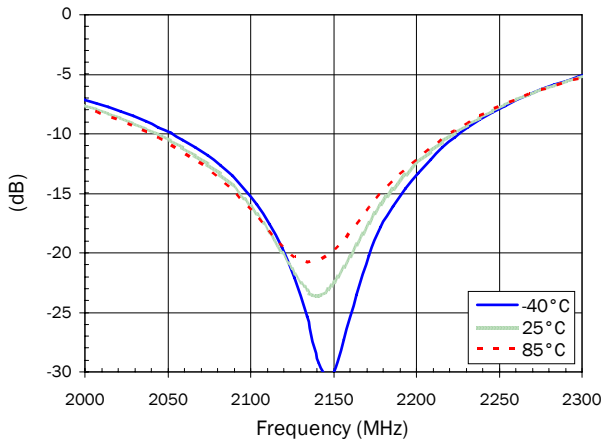


V-Detect versus Output Power
at 2140MHz

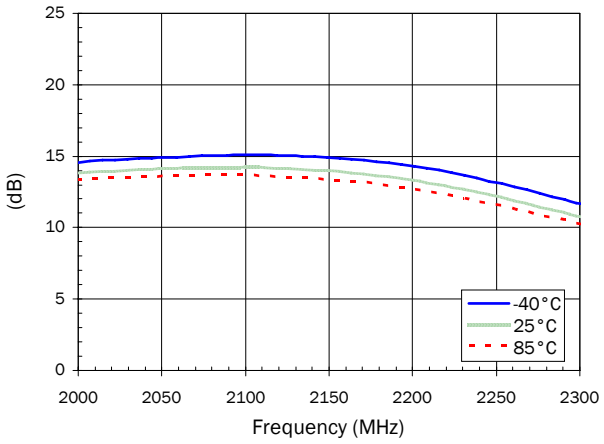


Typical RF Performance 2110 MHz to 2170 MHz Application Circuit

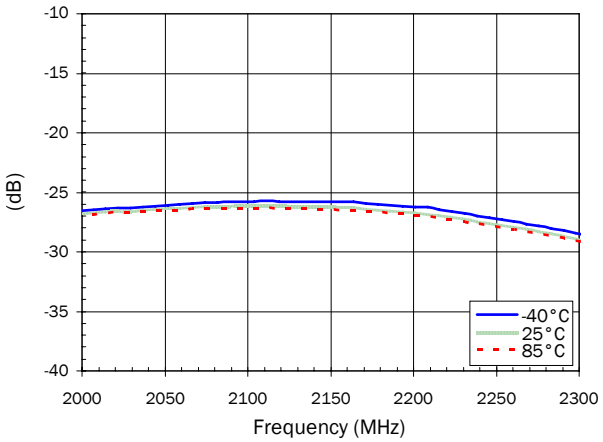
S11 versus Frequency



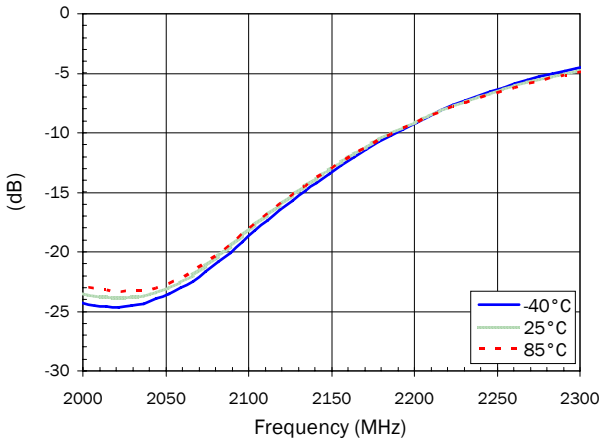
S21 versus Frequency



S12 versus Frequency



S22 versus Frequency



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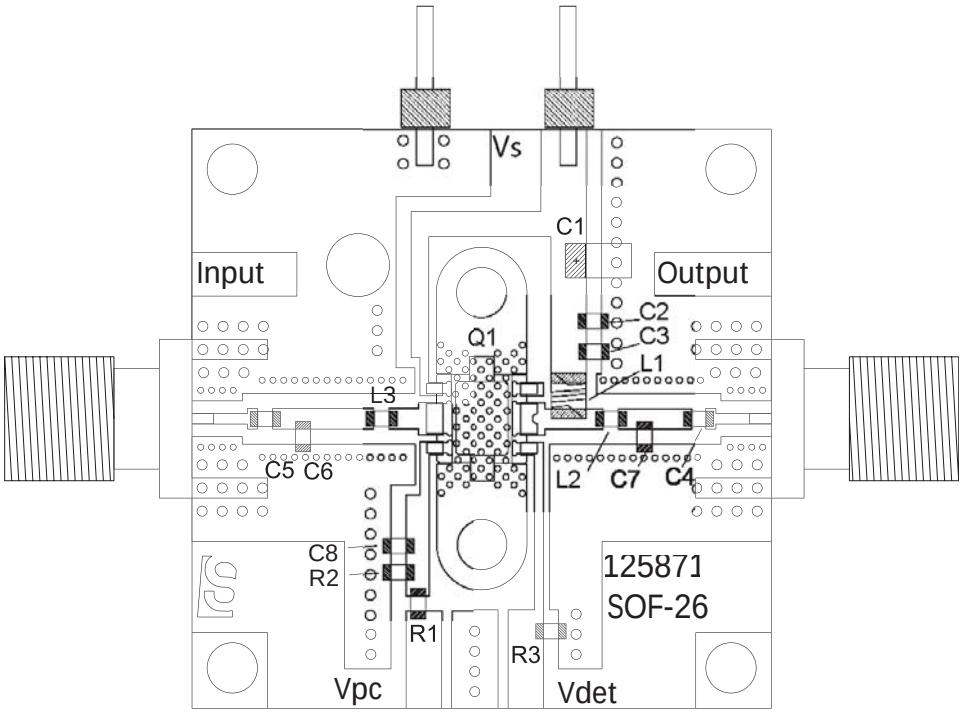
Evaluation Board Layout and Bill of Materials

850MHz to 910MHz Application Circuit (V_{CC} and V_{PC}=5.0V)



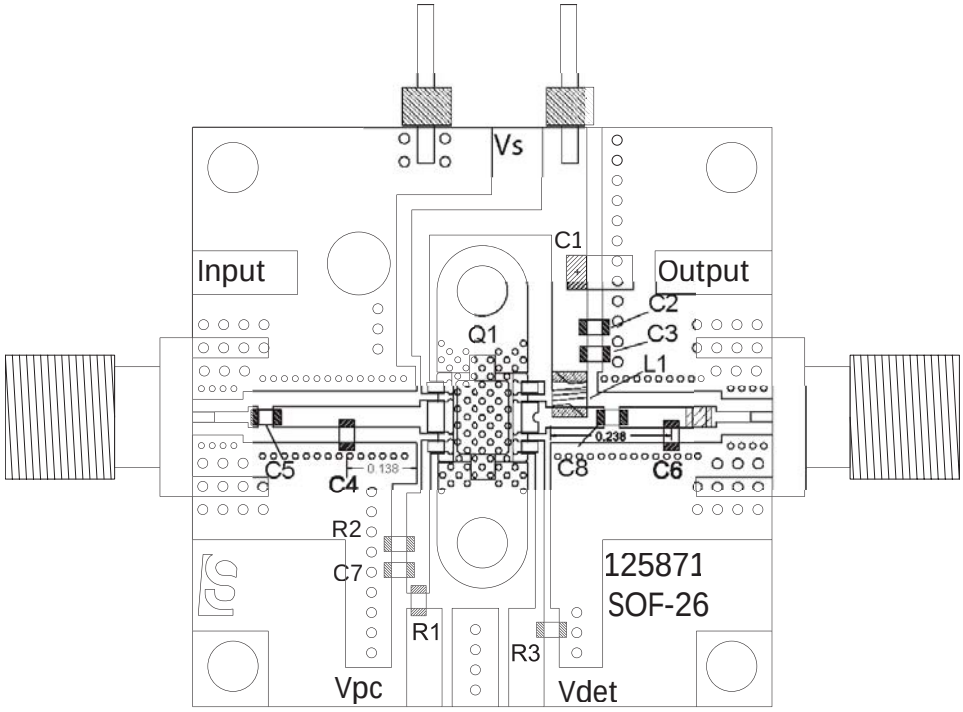
Bill of Materials

Q1	SPA-1426Z	
R1	887ohm 1%	
R2	4.02K ohm 1%	
R3	47k ohm	
C1	TAJA105K020R	1.0uF
C2	MCH185CN104KK	0.1uF
C3	MCH185A680DK	68pF
C4	MCH185A680DK	68pF
C5	MCH185A680JK	68pF
C6	MCH185A8R2JK	8.2pF
C7	MCH185A5R6JK	5.6pF
C8	MCH185A221JK	220pf
L1	0805HQ-48NX_BC	48nH Coil Craft
L2	LL1608FS-3n3S	3.3nH Toko
L3	LL1608FS-3N9S	3.9nH Toko

PCB 125871

Evaluation Board Layout and Bill of Materials

1930MHz to 1990MHz Application Circuit (V_{CC} and V_{PC}=5.0V)



Bill of Materials

Q1	SPA-1426Z	
R1	887ohm 1%	
R2	4.02K ohm 1%	
R3	47k ohm	
C1	TAJA105K020R	1.0uF
C2	MCH185CN104KK	0.1uF
C3	MCH185A100DK	10pF
C4	06035J3R0GBT	3.0pF AVX
C5	MCH185A101JK	100pF
C6	06035J2R4BBT	2.4pF AVX
C8	MCH185A101JK	100pf
C7	MCH185CN331JK	330pF
L1	0805HQ-20NX_BC	20nH Coil Craft

PCB 125871

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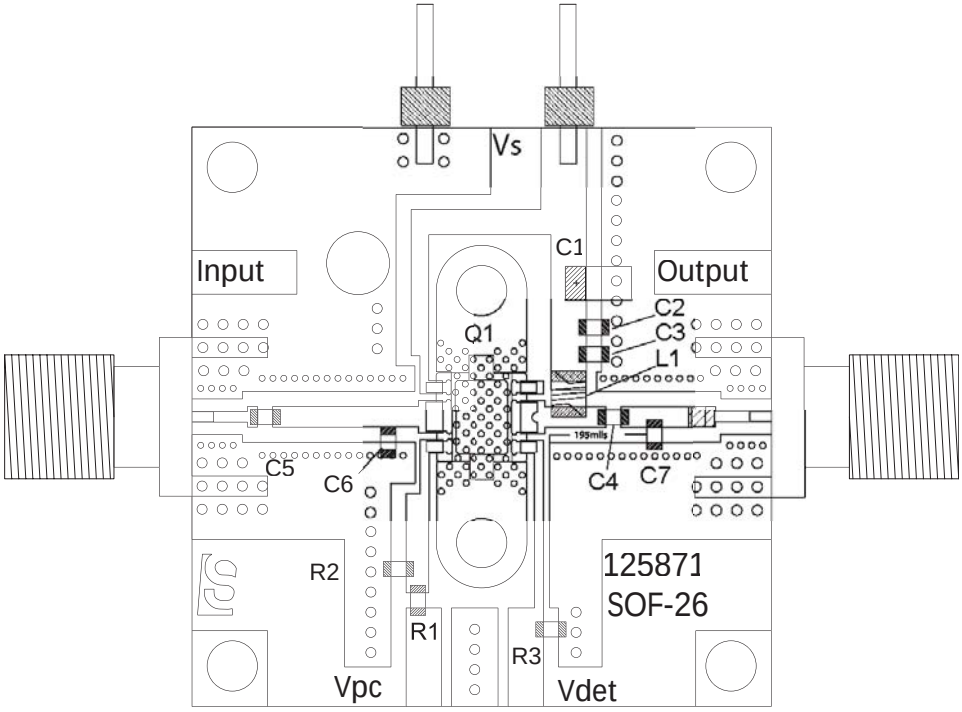
Evaluation Board Layout and Bill of Materials

2110MHz to 2170MHz Application Circuit (V_{CC} and V_{PC}=5.0V)



Bill of Materials

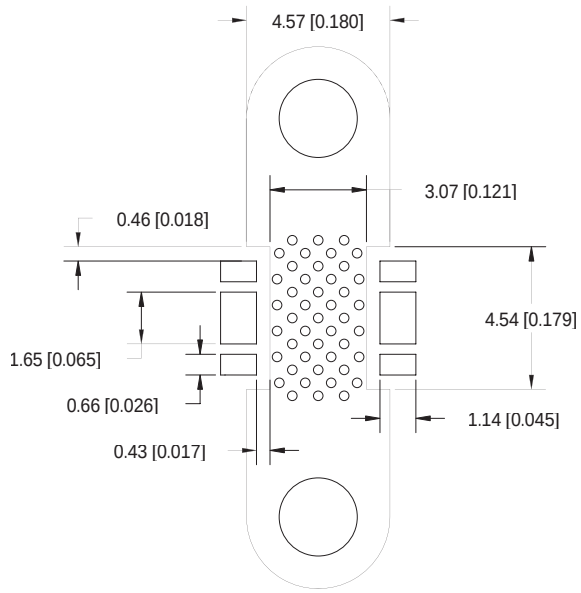
Q1	SPA-1426Z	
R1	887ohm 1%	
R2	4.02K ohm 1%	
R3	47k ohm	
C1	TAJA105K020R	1.0uF
C2	MCH185CN104KK	0.1uF
C3	06035J8R2GBT	8.2pF AVX
C4	06035J220GBT	22pF AVX
C5	MCH185A101JK	100pF
C6	06035J3R0BBT	3.0pF AVX
C7	06035J2R4BBT	2.4pF AVX
L1	0805HQ-20NX_BC	20nH Coil Craft

PCB 125871

Pin	Function	Description
1	VBIAS	This is the supply voltage for the active bias circuit.
2	RF IN	This is the RF input pin and has a DC voltage present. An external DC block is required.
3	VPC	Power up/down control pin. The voltage on this pin should never exceed the voltage on pin 1 by more than 0.5V unless the supply current from pin 3 is limited <10mA.
4	VDET	This is the output port for the power detector. It samples the power at the input of the amplifier.
5	RF OUT/VCC	This is the RF output pin and DC connection to the collector.
6	NC	Not connected
GND	GND	These pins are DC connected to the backside paddle. They provide good thermal connection to the backside paddle for hand soldering and rework. Many thermal and electrical GND vias are required as shown in the recommended land pattern.

Suggested Pad Layout

Dimensions in mm (inches)



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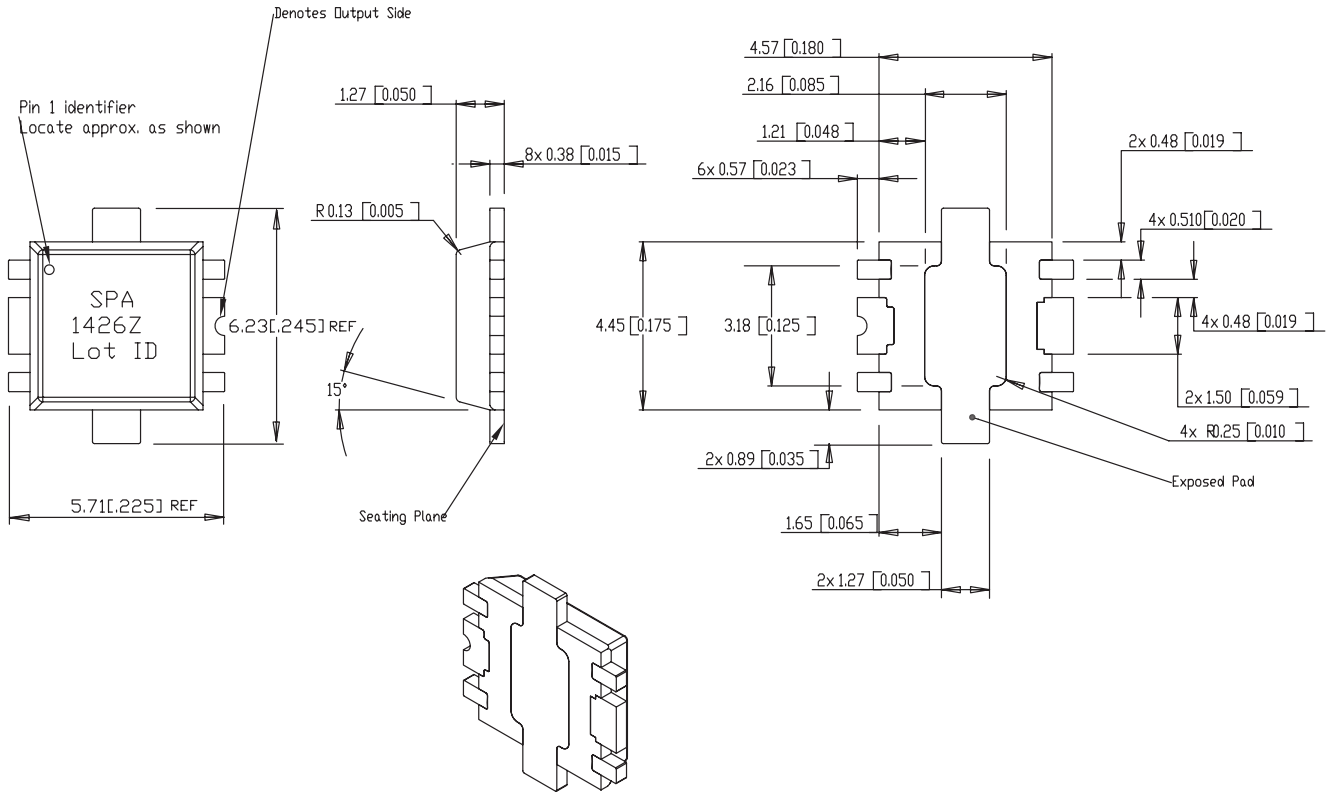
Package Drawing

Dimensions in mm (inches)
Refer to drawing posted at www.rfmd.com for tolerances.



Ordering Information

Part Number	Description	Reel Size	Devices/Reel
SPA-1426Z	Lead Free, RoHS Compliant	7”	1000
SPA-1426Z-EVB1	850MHz to 910MHz Evaluation Board	N/A	N/A
SPA-1426Z-EVB2	1930MHz to 1960MHz Evaluation Board	N/A	N/A
SPA-1426Z-EVB3	2110MHz to 2170MHz Evaluation Board	N/A	N/A

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