

Package: SOF-26



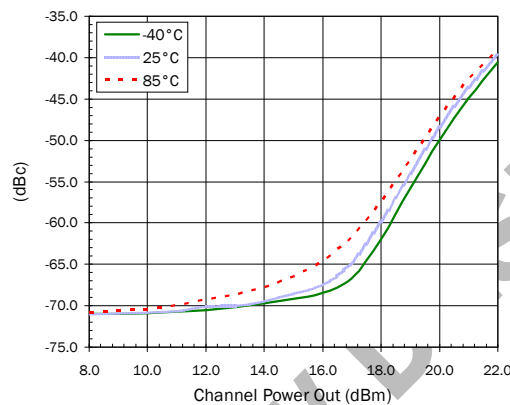
### Product Description

RFMD's SPA1426Z is a high linearity single-stage class A Heterojunction Bipolar Transistor (HBT) power amplifier. The SPA1426Z 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
- ☐ InP HBT
- ☐ RF MEMS
- ☐ LDMOS

ACP versus Channel Power, 2140MHz, W-CDMA



### Features

- $P_{1dB} = 29.5\text{dBm}$  @ 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                         |
|                                                                  | 12.7          | 14.1  | 15.5  | dB   | 2140MHz                         |
| Output Power at 1dB Compression                                  |               | 29.5  |       | dBm  | 885MHz                          |
|                                                                  |               | 28.5  |       | dBm  | 1960MHz                         |
|                                                                  | 28.0          | 29.5  |       | dBm  | 2140MHz                         |
| Output Third Order Intercept Point, 18dBm per Tone, 1MHz Spacing |               | 43    |       | dBm  | 885MHz                          |
|                                                                  |               | 47    |       | dBm  | 1960MHz                         |
|                                                                  | 42            | 47    |       | 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                         |
| 19dBm ACP                                                        |               | -55.0 | -50.0 | dBc  | 2140MHz                         |
| Input Return Loss                                                |               | 18    |       | dB   | 1960MHz                         |
| Output Return Loss                                               |               | 10.5  |       | dB   | 1960MHz                         |
| Noise Figure                                                     |               | 5.3   |       | dB   | 1960MHz                         |

## 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, 50 $\Omega$ Output Load                                       | 29         | dBm  |
| Max CW Input Power, 10:1 VSWR Output Load                                         | 18         | dBm  |
| Max Modulated (W-CDMA) Input Power, 50 $\Omega$ Output Load**                     | 22         | dBm  |
| Max Modulated (W-CDMA) Input Power, 10:1 VSWR Output Load**                       | 15         | dBm  |
| Max RF Output Power with 50 $\Omega$ Output Load (Continuous long term operation) | 27         | dBm  |
| Max Junction Temperature ( $T_J$ )                                                | +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:

$$I_D V_D < (T_J - T_L) / R_{TH}, \text{ j-l and } T_L = T_{LEAD}$$



## 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.

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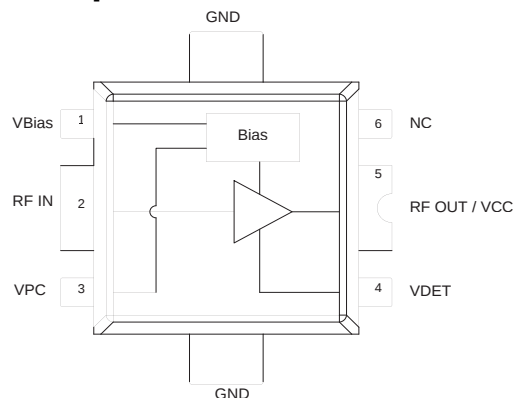


RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

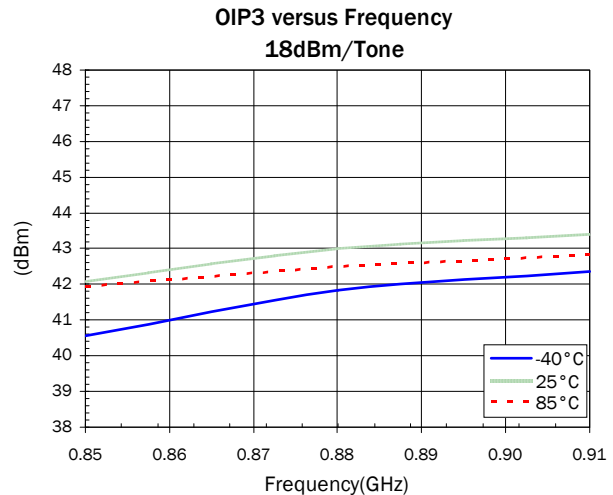
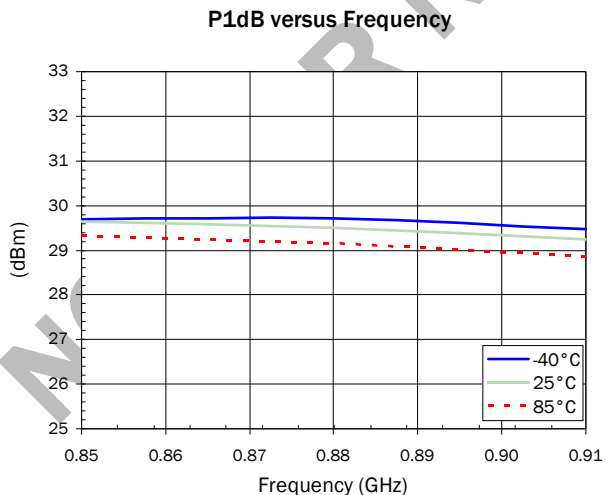
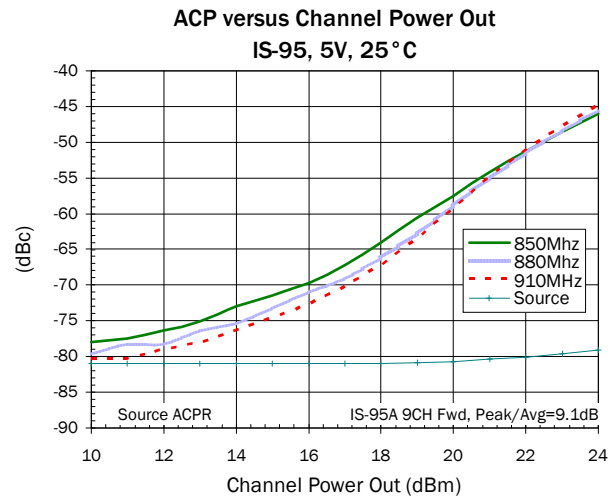
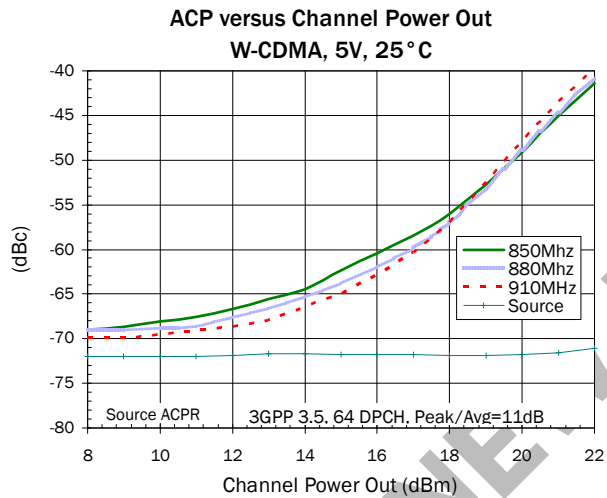
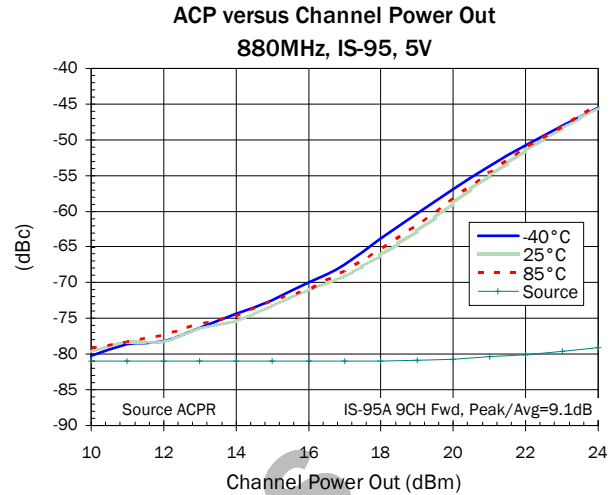
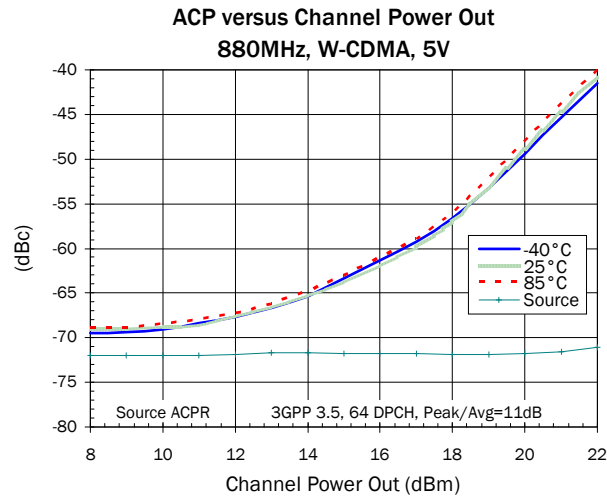
| Parameter                                              | Specification |      |      | Unit    | Condition        |
|--------------------------------------------------------|---------------|------|------|---------|------------------|
|                                                        | Min.          | Typ. | Max. |         |                  |
| Operating Current ( $V_{CC}=5V$ ), Quiescent           | 286           | 318  | 350  | 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  | $\mu A$ |                  |
| Thermal Resistance                                     |               | 21   |      | °C/W    | junction to lead |

Test Conditions:  $V_{CC}=5V$ ,  $I_{CQ}=318mA$  Typ.,  $T_L=25^\circ C$ ,  $Z_S=Z_L=50\Omega$

## Simplified Device Schematic

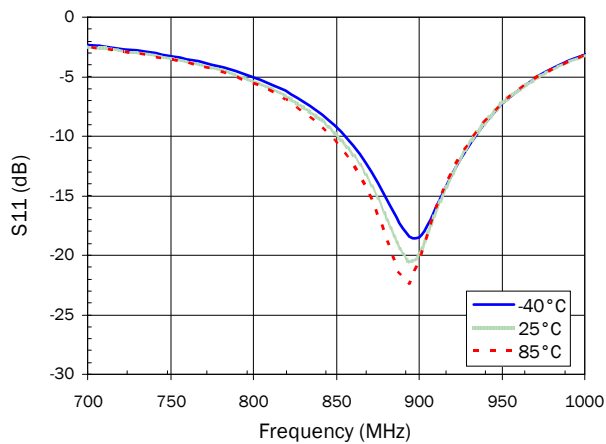


## Typical RF Performance 850MHz to 910MHz Application Circuit

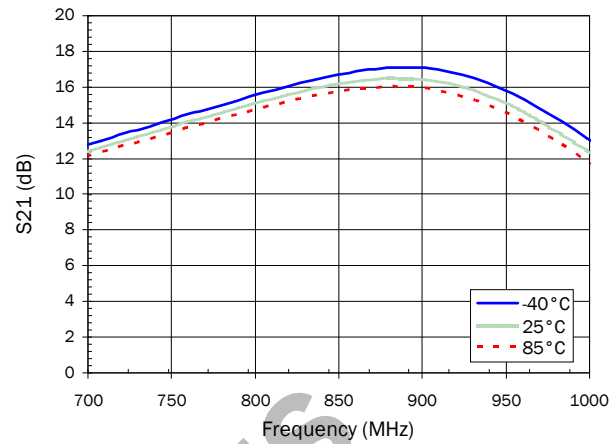


## Typical RF Performance 850MHz to 910MHz Application Circuit

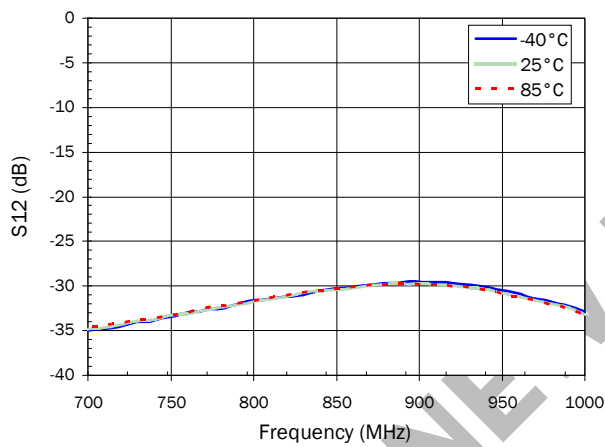
**S11 versus Frequency**



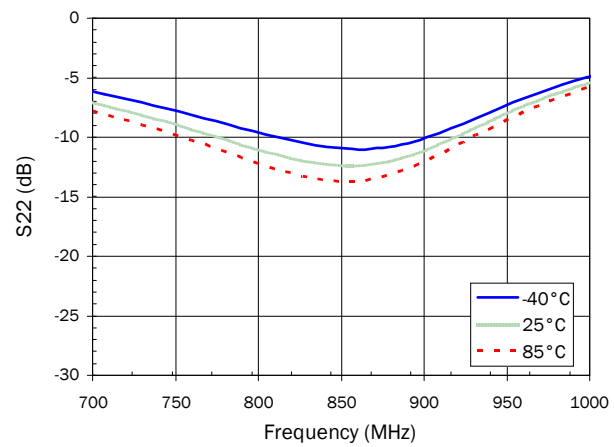
**S21 versus Frequency**



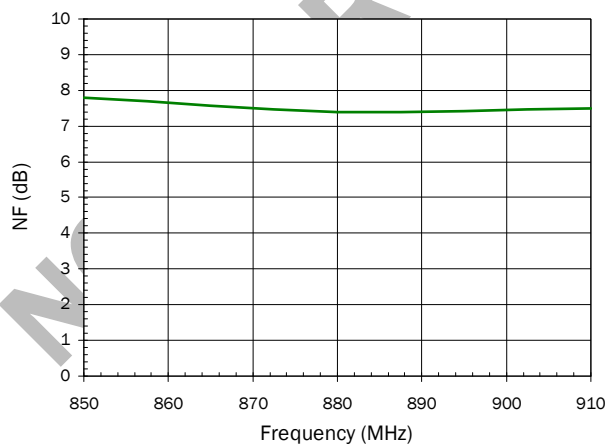
**S12 versus Frequency**



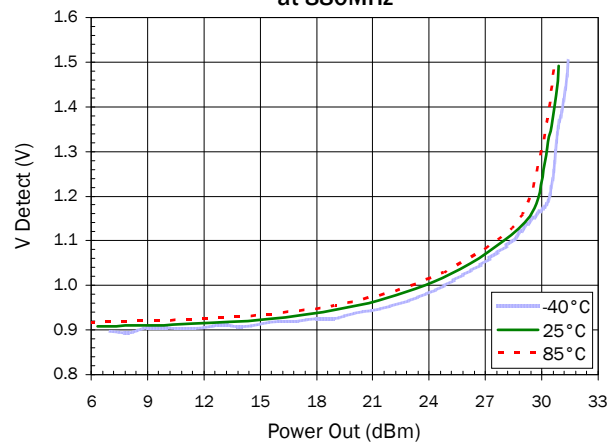
**S22 versus Frequency**



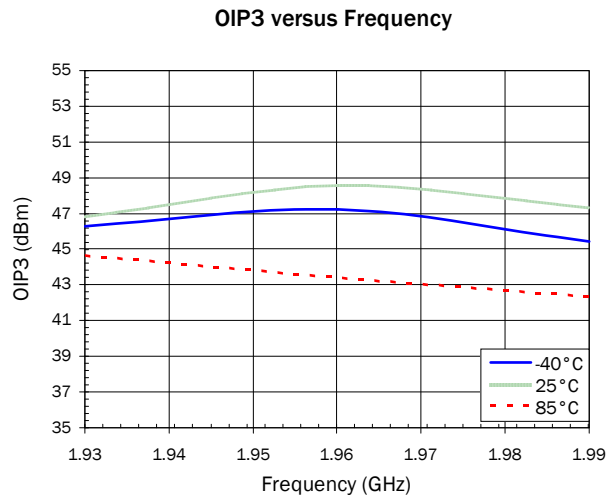
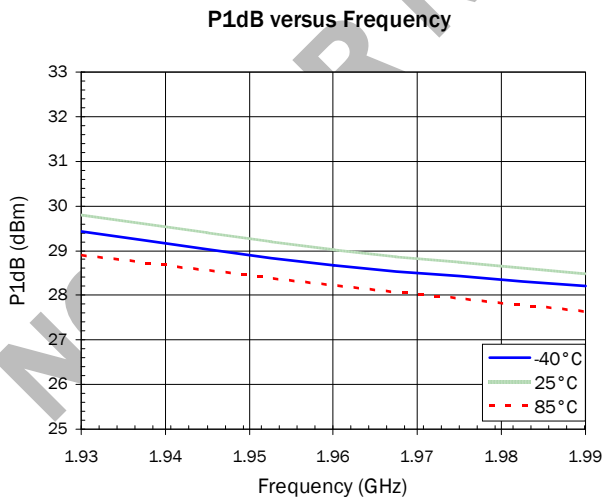
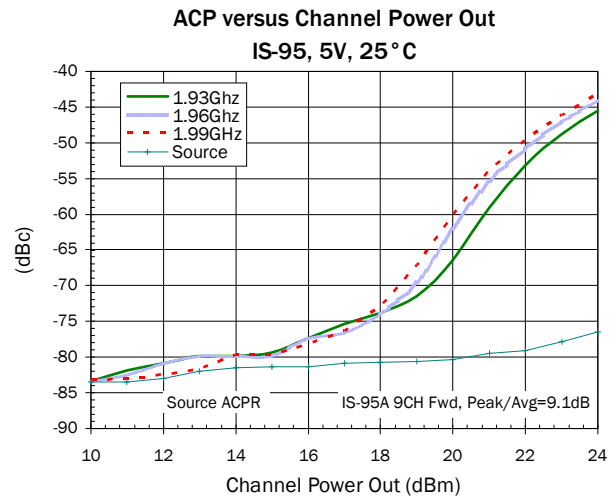
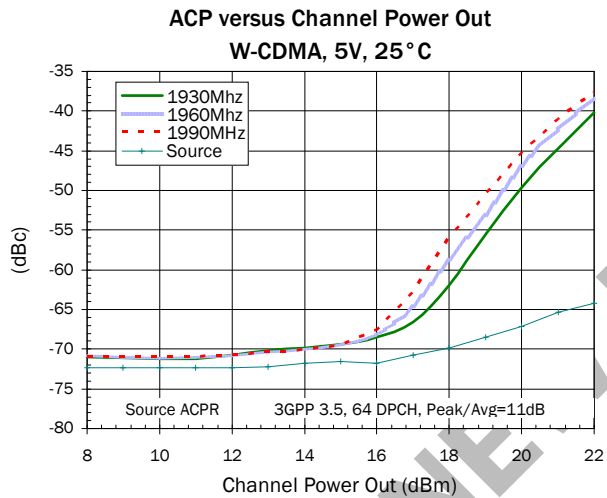
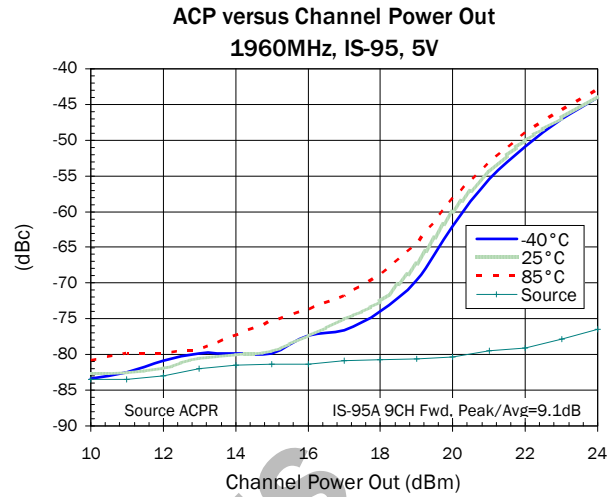
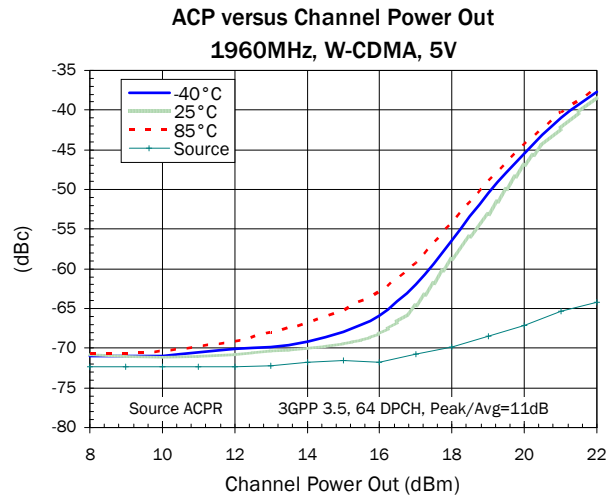
**Noise Figure versus Frequency**



**V-Detect versus Output Power at 880MHz**

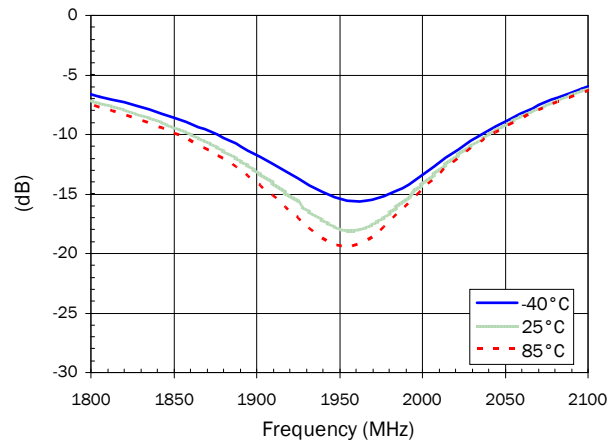


## Typical RF Performance 1930MHz to 1960MHz Application Circuit

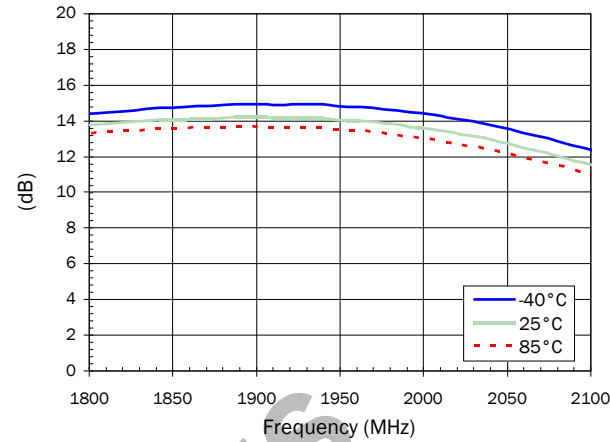


Typical RF Performance 1930MHz to 1960MHz Application Circuit

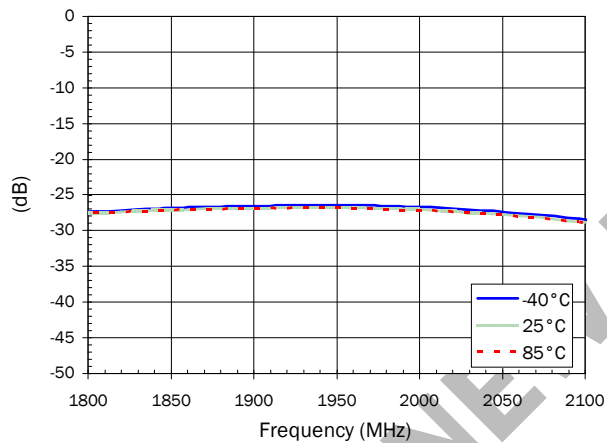
S11 versus Frequency



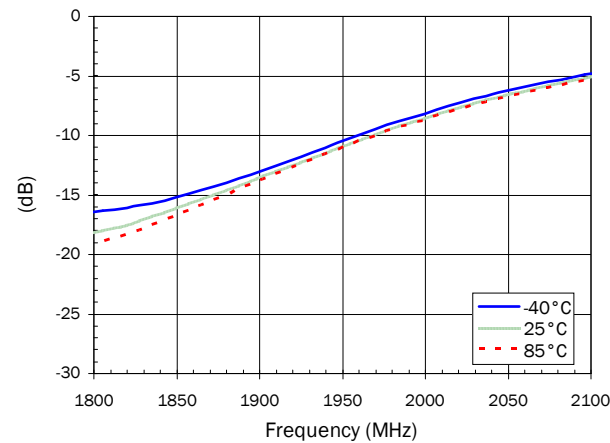
S21 versus Frequency



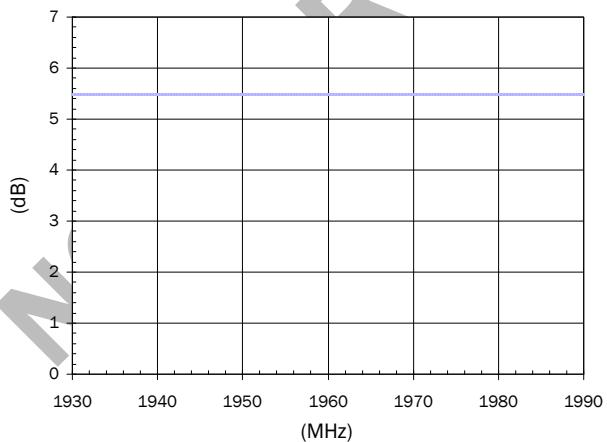
S12 versus Frequency



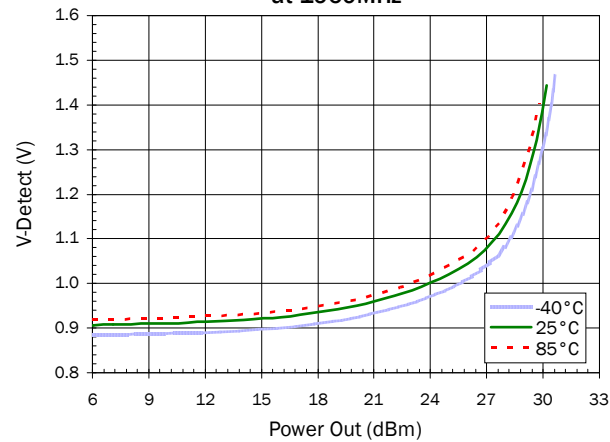
S22 versus Frequency



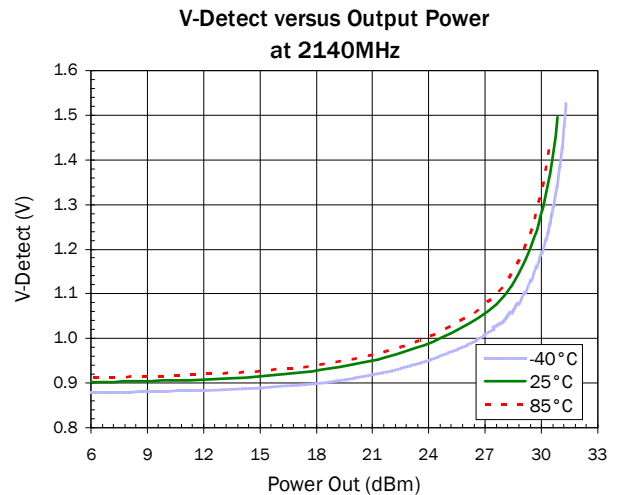
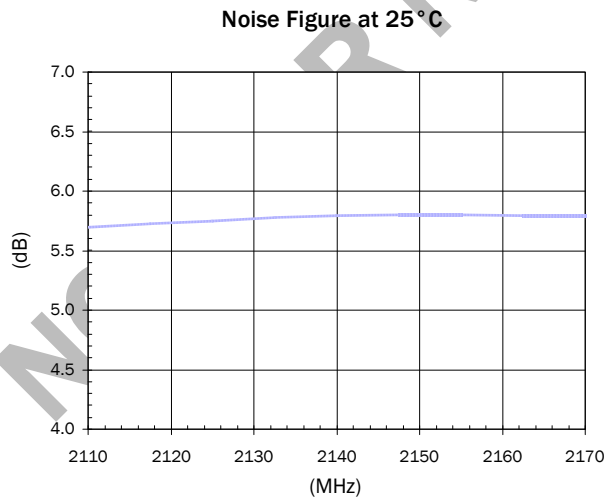
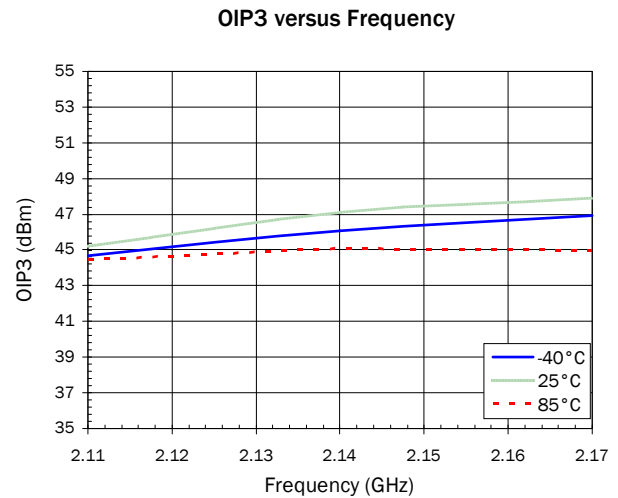
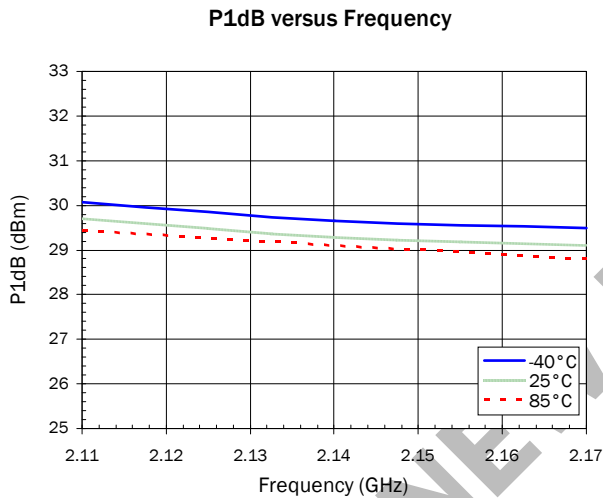
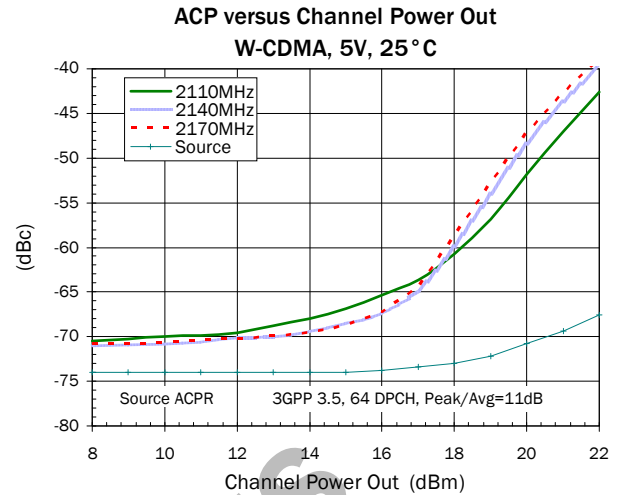
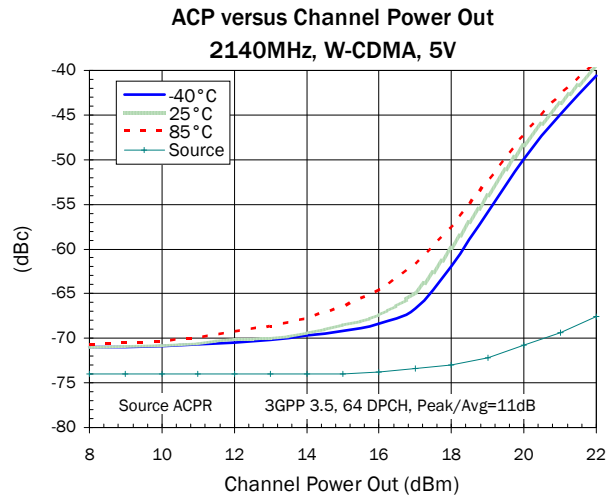
Noise Figure at 25°C



V-Detect versus Output Power at 1960MHz

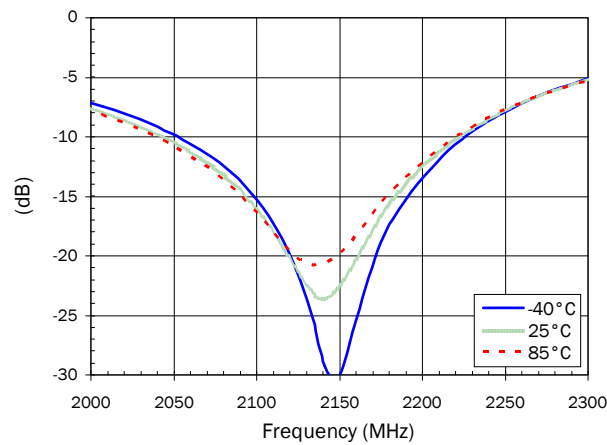


Typical RF Performance 2110MHz to 2170 MHz Application Circuit

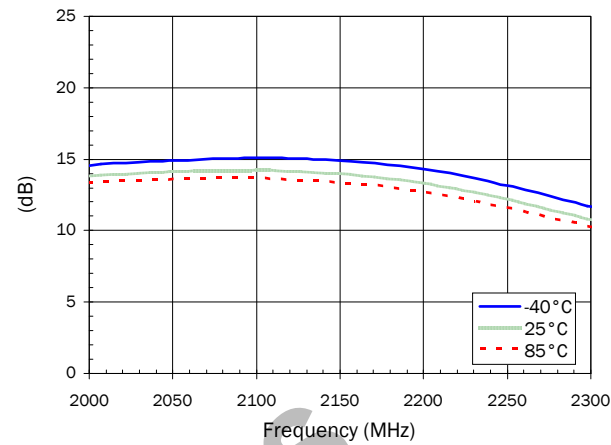


Typical RF Performance 2110MHz to 2170 MHz Application Circuit

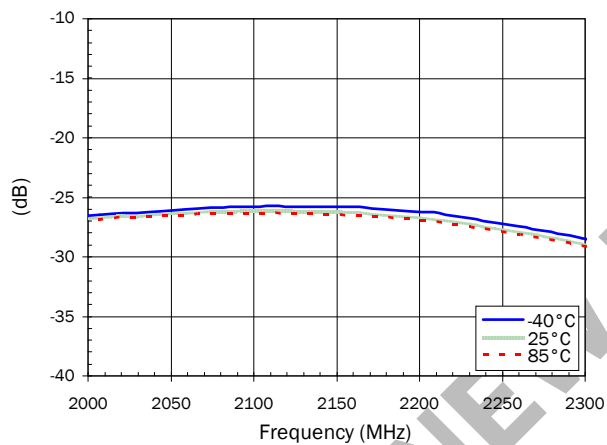
S11 versus Frequency



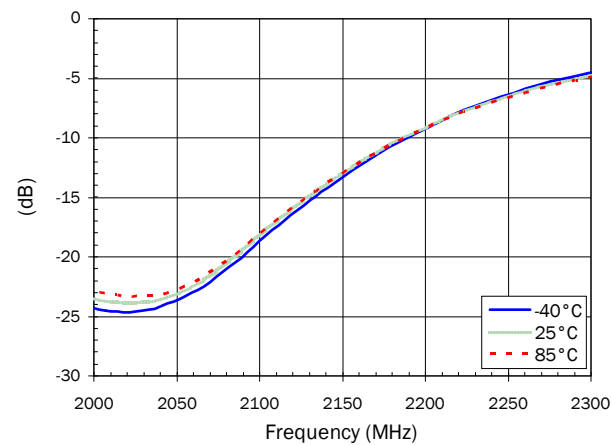
S21 versus Frequency



S12 versus Frequency

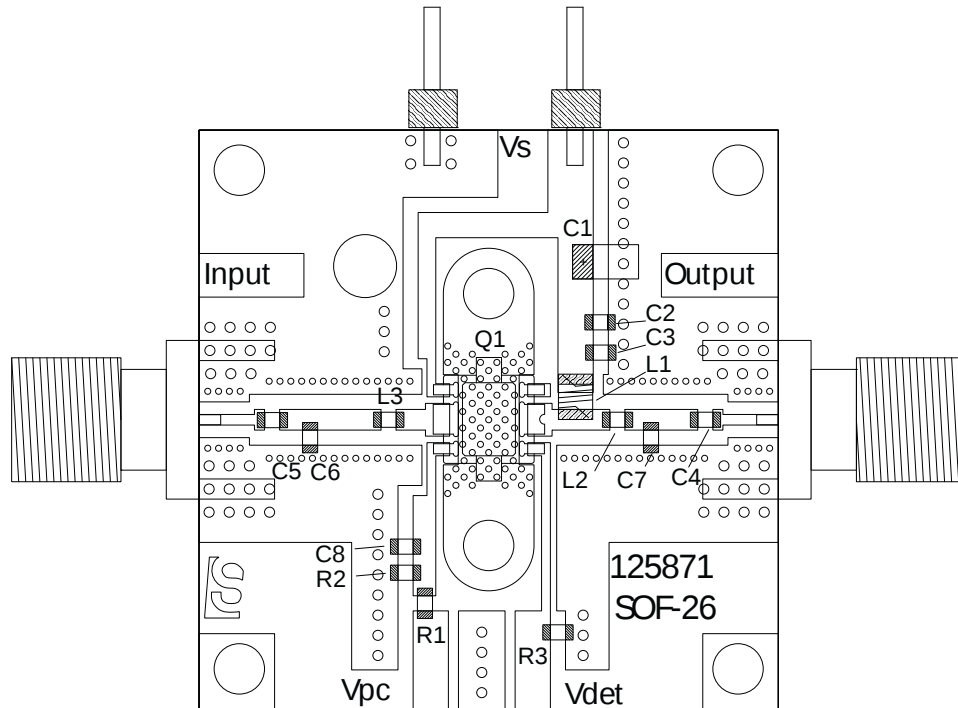


S22 versus Frequency



## Evaluation Board Layout and Bill of Materials

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

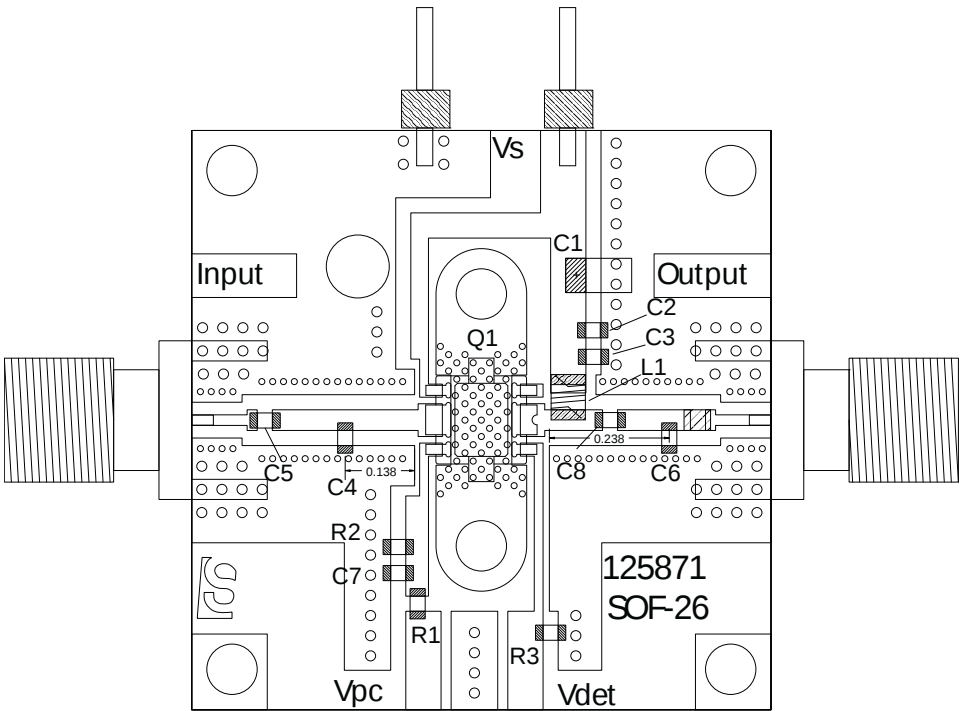


### Bill of Materials

|     |                                |
|-----|--------------------------------|
| Q1  | SPA1426Z                       |
| 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                         |

NOT

Evaluation Board Layout and Bill of Materials  
1930MHz to 1990MHz Application Circuit ( $V_{CC}$  and  $V_{PC}=5.0V$ )



Bill of Materials

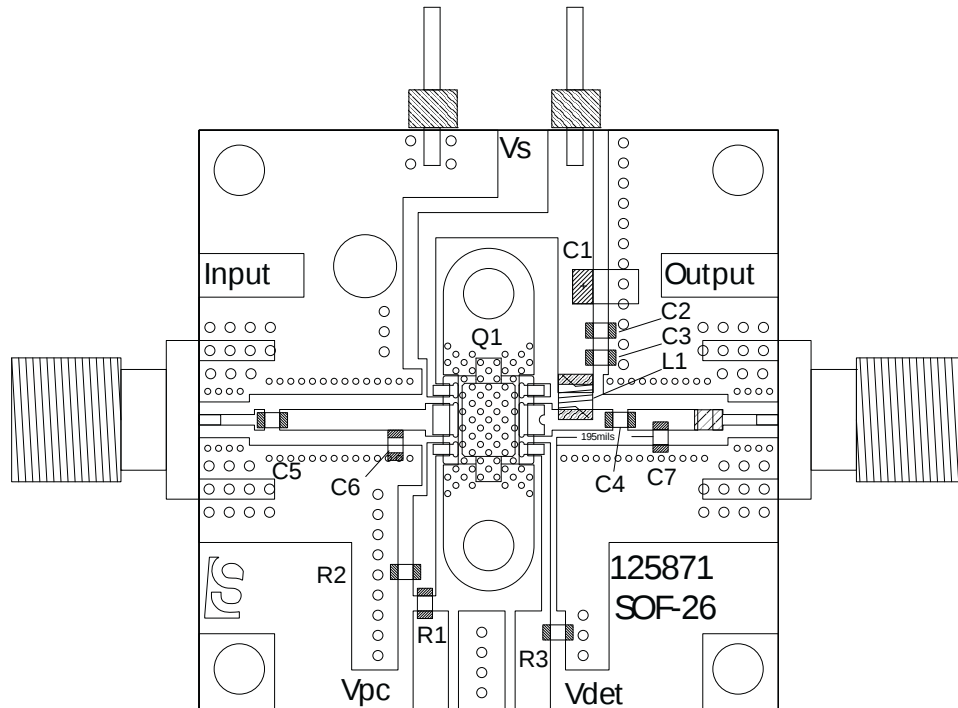
|    |                                |
|----|--------------------------------|
| Q1 | SPA1426Z                       |
| R1 | 887ohm 1%                      |
| R2 | 4.02K ohm 1%                   |
| R3 | 47k ohm                        |
| C1 | TAJA105K020R 1.0uF             |
| C2 | MCH185CN104KK 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

NOT

## Evaluation Board Layout and Bill of Materials

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



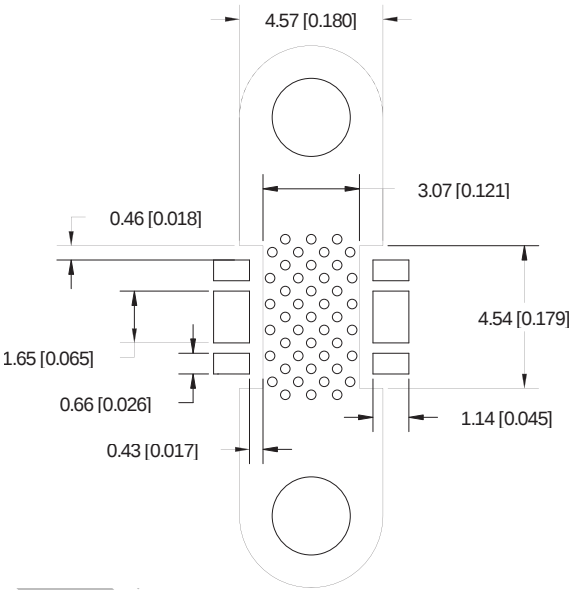
### Bill of Materials

|     |                                |
|-----|--------------------------------|
| Q1  | SPA1426Z                       |
| 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                         |

NOT F

| 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. |

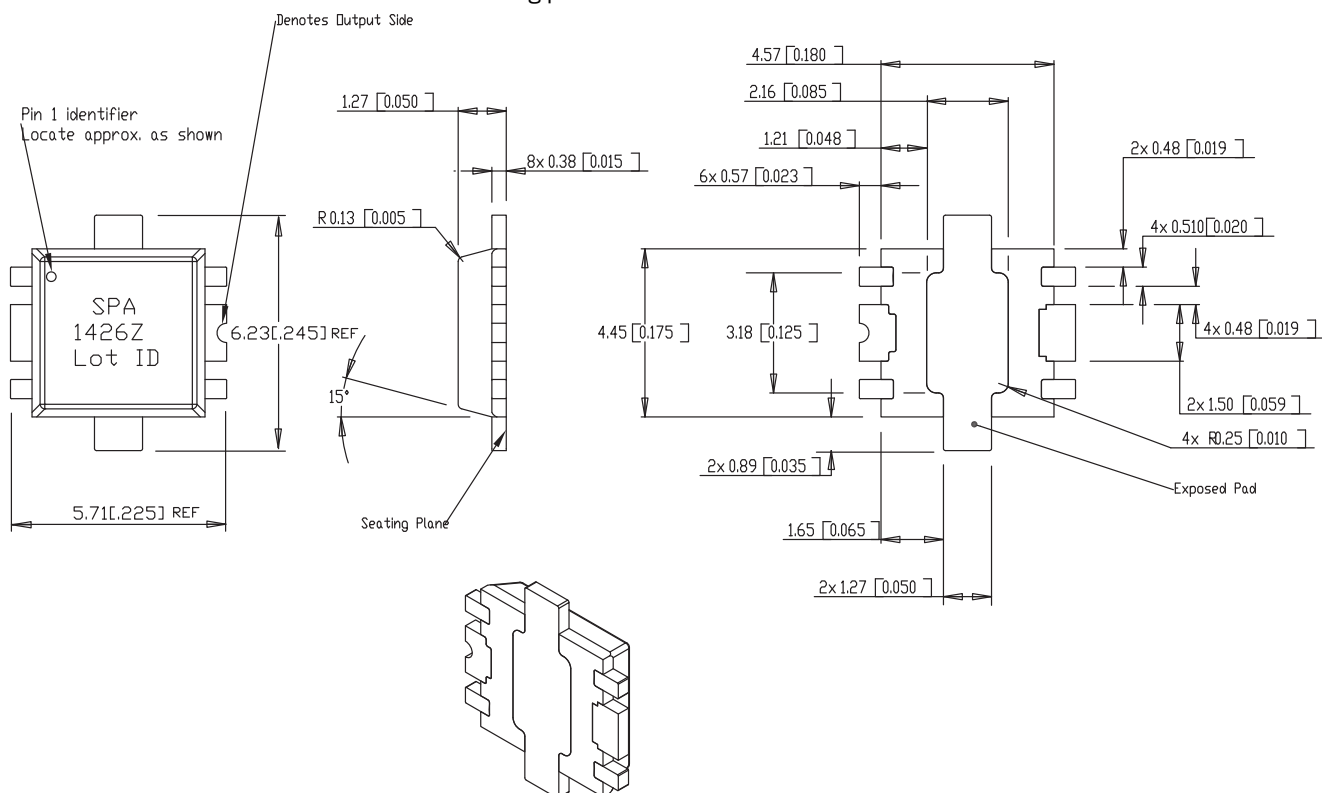
Suggested Pad Layout  
Dimensions in mm (inches)



## Package Drawing

Dimensions in mm (inches)

Refer to drawing posted at [www.rfmd.com](http://www.rfmd.com) for tolerances.



## Ordering Information

| Ordering Code | Description                                     |
|---------------|-------------------------------------------------|
| SPA1426Z      | 7" Reel with 1000 pieces                        |
| SPA1426ZSQ    | Sample Bag with 25 pieces                       |
| SPA1426ZSR    | 7" Reel with 100 pieces                         |
| SPA1426ZPCK1  | 850MHz to 910MHz PCBA with 5 piece Sample Bag   |
| SPA1426ZPCK2  | 1930MHz to 1960MHz PCBA with 5 piece Sample Bag |
| SPA1426ZPCK3  | 2110MHz to 2170MHz PCBA with 5 piece Sample Bag |