

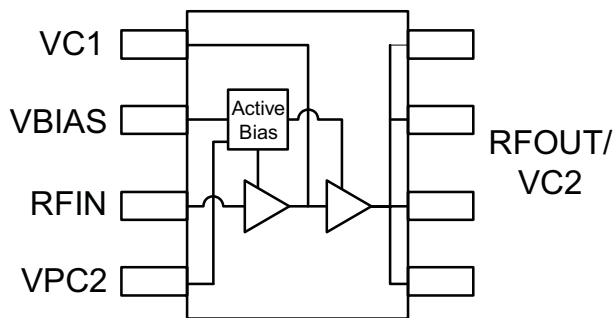


Product Description

RFMD's SPA2318Z is a high efficiency GaAs Heterojunction Bipolar Transistor (HBT) amplifier housed in a low-cost surface-mountable plastic package. These HBT amplifiers are fabricated using molecular beam epitaxial growth technology which produces reliable and consistent performance from wafer to wafer and lot to lot. This product is specifically designed for use as a driver amplifier for infrastructure equipment in the 1960MHz and 2140MHz bands. Its high linearity makes it an ideal choice for multi-carrier and digital applications. The matte tin finish on the lead-free package utilizes a post annealing process to mitigate tin whisker formation and is RoHS compliant per EU Directive 2002/95. This package is also manufactured with green molding compounds that contain no antimony trioxide or halogenated fire retardants.

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



Features

- High Linearity Performance:
 - +21dBm IS-95 Channel Power at -55dBc ACP;
 - +20.7dBm WCDMA Channel Power at -50dBc ACP;
 - +47dBm Typ. OIP₃
- On-Chip Active Bias Control
- High Gain: 24dB Typ. at 1960MHz
- Patented High Reliability GaAs HBT Technology
- Surface-Mountable Plastic Package

Applications

- WCDMA Systems
- PCS Systems
- Multi-Carrier Applications

| Parameter | Specification | | | Unit | Condition |
|---|---------------|-------|-------|------|---|
| | Min. | Typ. | Max. | | |
| Frequency of Operation | 1700 | | 2200 | MHz | |
| Output Power at 1dB Compression ^[1] | | 29.5 | | dBm | 1960MHz |
| | | 29.5 | | dBm | 2140MHz |
| Adjacent Channel Power ^[1] | | -55.0 | | dBc | 1960MHz, IS-95 at P _{OUT} =21.0dBm, WCDMA at P _{OUT} =20.7dBm |
| | | -50.0 | -47.0 | dBc | 2140MHz |
| Small Signal Gain ^[1,2] | | 24.0 | | dB | 1960MHz |
| | 21.0 | 23.5 | 24.5 | dB | 2140MHz |
| Input VSWR ^[1,2] | | 1.6:1 | | | 1960MHz |
| | | 1.6:1 | | | 2140MHz |
| Output Third Order Intercept Point ^[2] | | 46.5 | | dBm | 1960MHz, Power out per tone = +14dBm |
| | | 47.0 | | dBm | 2140MHz |
| Noise Figure ^[1,2] | | 5.5 | | dB | 1960MHz |
| | | 5.5 | | dB | 2140MHz |
| Device Current ^[1,2] | 360 | 400 | 425 | mA | I _{BIAS} = 10mA, I _{C1} = 70mA, I _{C2} = 320mA |
| Device Voltage ^[1,2] | 4.75 | 5.0 | 5.25 | V | |
| Thermal Resistance (Junction - Lead) | | 31 | | °C/W | T _L = 85°C |

Test Conditions: Z₀ = 50Ω Temp = 25°C V_{CC} = 5.0V [1] Optimal ACP tune [2] Optimal IP₃ tune

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|--------|------|
| Max Supply Current (I _{C1}) at V _{CC} typ. | 150 | mA |
| Max Supply Current (I _{C2}) at V _{CC} typ. | 750 | mA |
| Max Device Voltage (V _{CC}) at I _{CC} typ. | 6.0 | V |
| Max RF Input Power | 16 | dBm |
| Max Junction Temp (T _J) | +160 | °C |
| Max Storage Temp | +150 | °C |
| Moisture Sensitivity Level | 3 | MSL |

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:

$$I_D V_D < (T_J - T_{LJ}) / R_{TH, J-I}$$



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.

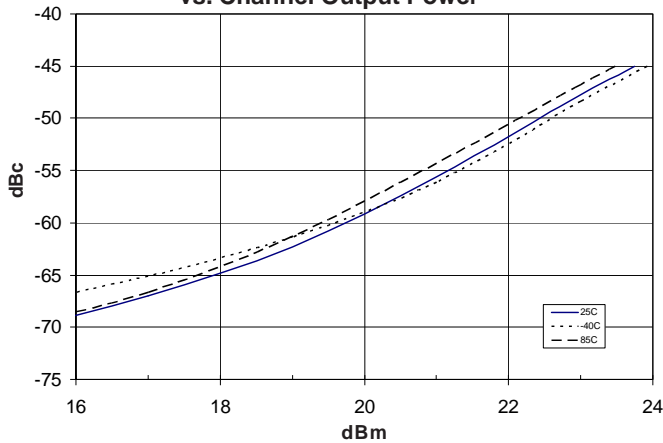
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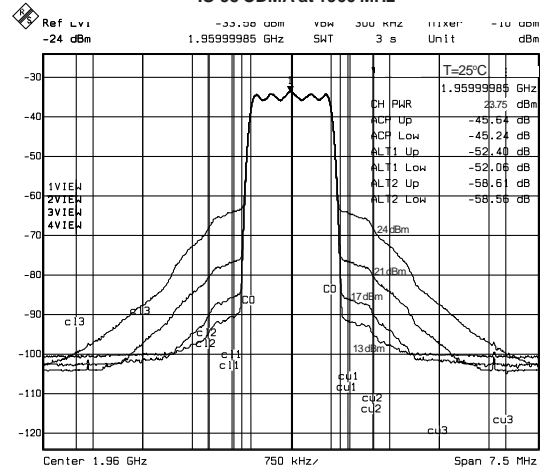
RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

ACP Optimized 1960MHz Application Circuit Data, I_{CC}=400mA, V_{CC}=5V IS-95, 9 Channels Forward

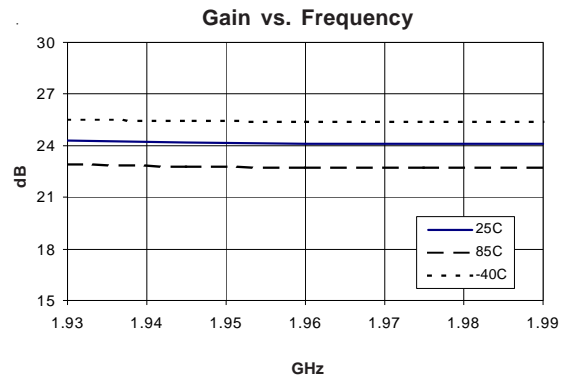
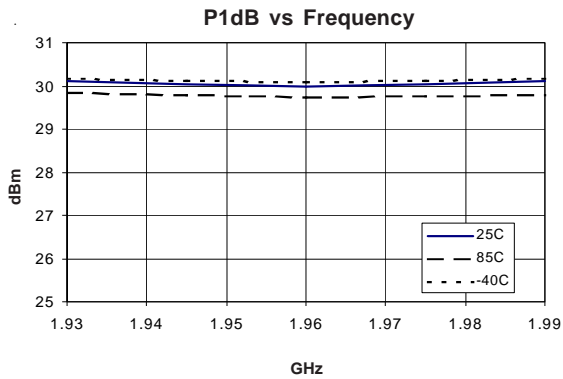
1960 MHz Adjacent Channel Power vs. Channel Output Power



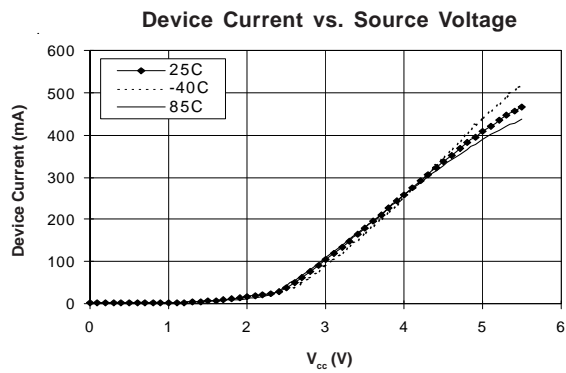
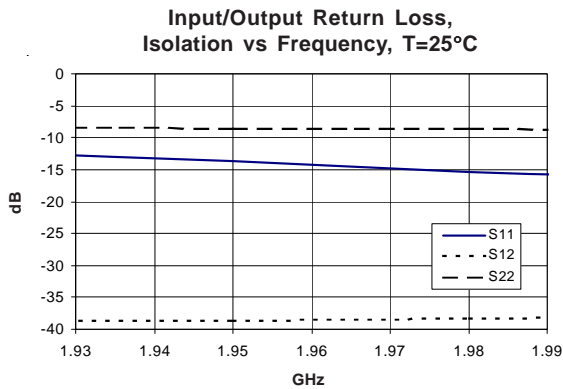
IS-95 CDMA at 1960 MHz



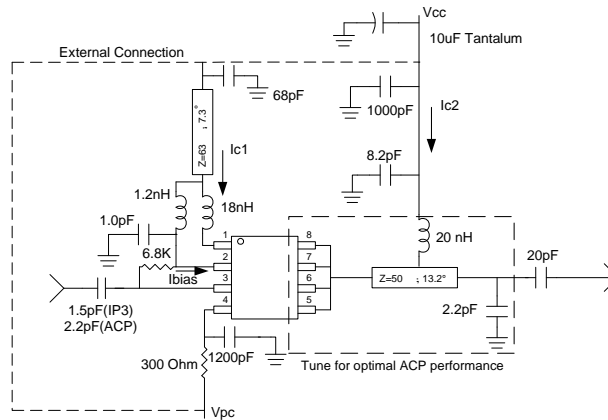
ACP Optimized 1960MHz Application Circuit Data, $I_{CC}=400\text{ mA}$, $V_{CC}=5\text{ V}$



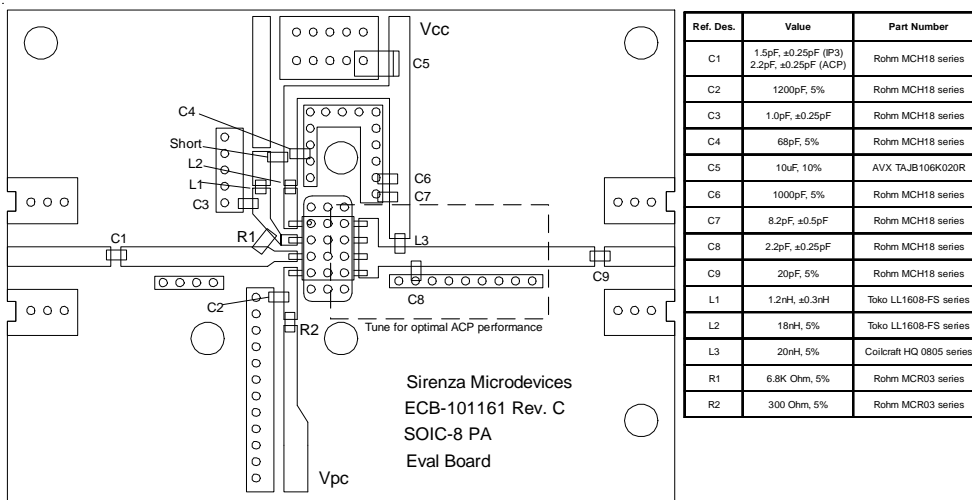
ACP Optimized 1960MHz Application Circuit Data, $I_{CC}=400\text{ mA}$, $V_{CC}=5\text{ V}$



1930 MHz to 1990 MHz Application Schematic

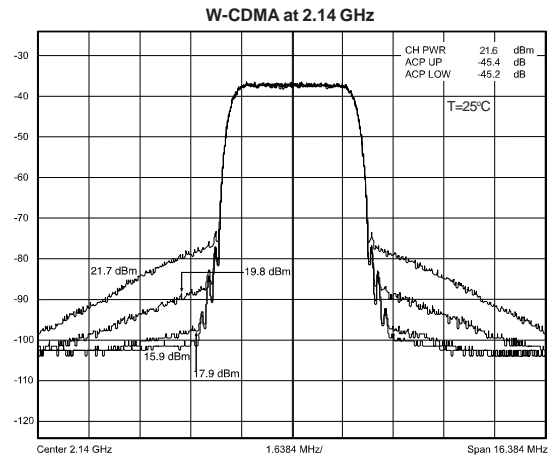
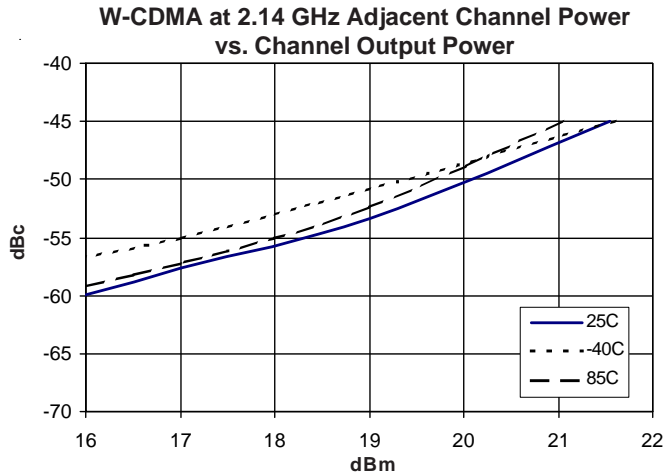


1930 MHz to 1990 MHz Evaluation Board Layout and Bill of Materials

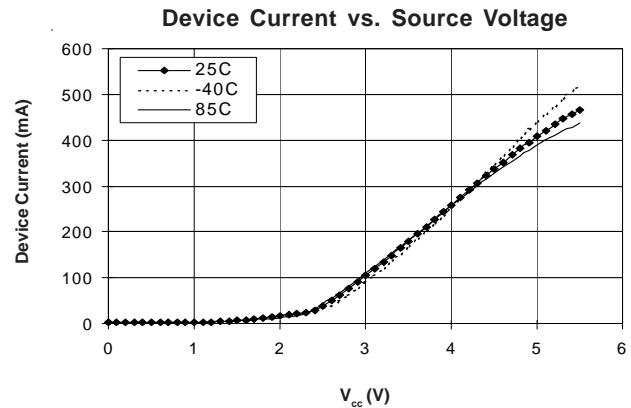
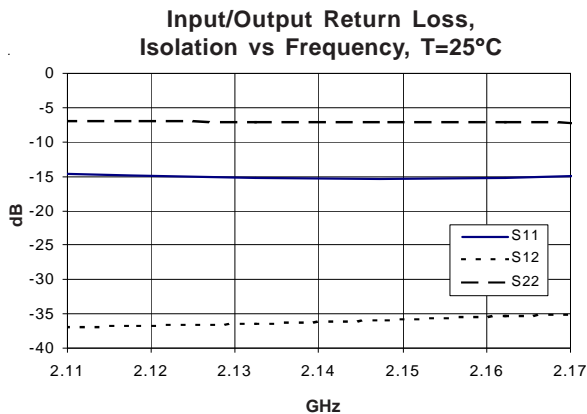
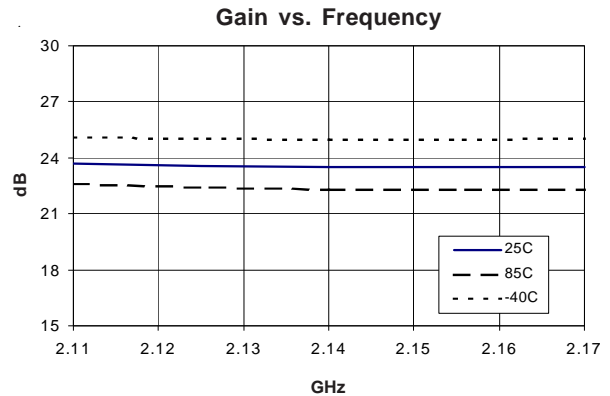
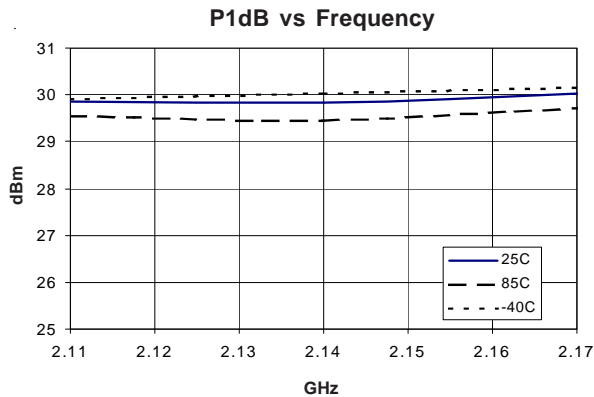


ACP Optimized 2140MHz Application Circuit Data, $I_{CC}=400\text{mA}$, $V_{CC}=5\text{V}$ IS-95, WCDMA setup is

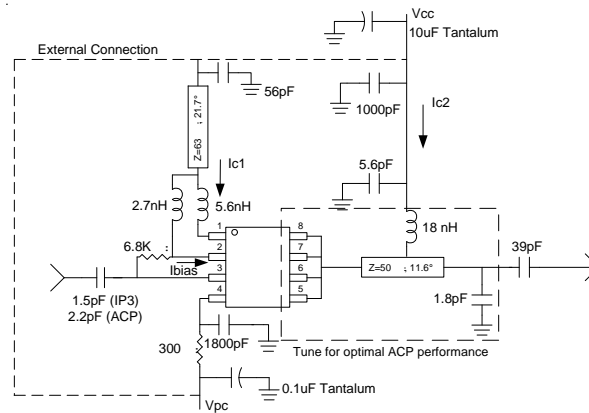
PCCPCH+PSCH+SSCH+CPICH+PICH+64DPCH, 10.5dB peak to average at 0.001% probability



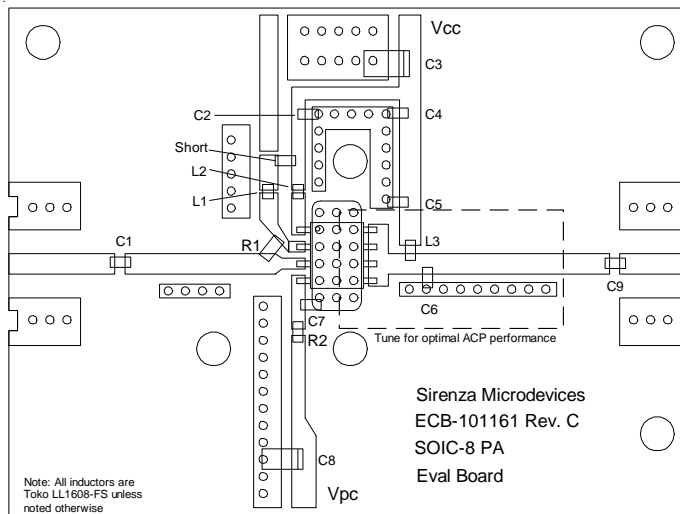
ACP Optimized at 2140MHz Application Circuit Data, $I_{CC}=400\text{mA}$, $V_{CC}=5\text{V}$



2110MHz to 2170MHz Application Schematic



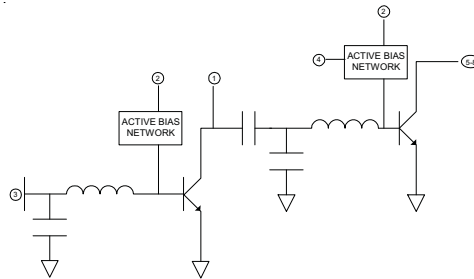
2110MHz to 2170MHz Evaluation Board Layout and Bill of Materials



| Ref. Des. | Value | Part Number |
|-----------|--|-----------------------|
| C1 | 1.5pF, ±0.25pF (IP3) 2.2pF, ±0.25pF (ACP) | Rohm MCH18 series |
| C2 | 56pF, 5% | Rohm MCH18 series |
| C3 | 10uF, 10% | AVX TAJB106K020R |
| C4 | 1000pF, 5% | Rohm MCH18 series |
| C5 | 5.6pF, ±0.5pF | Rohm MCH18 series |
| C6 | 1.8pF, ±0.25pF | Rohm MCH18 series |
| C7 | 1800pF, 5% | Rohm MCH18 series |
| C8 | 0.1uF, 10% | Matsuo 267M3502104K |
| C9 | 39pF, 5% | Rohm MCH18 series |
| L1 | 2.7nH, ±0.3nH | Toko LL1608-FS series |
| L2 | 5.6nH, ±0.3nH | Toko LL1608-FS series |
| L3 | 18nH, 5% | Toko LL1608-FS series |
| R1 | 6.8K Ohm, 5% | Rohm MCR03 series |
| R2 | 300 Ohm, 5% | Rohm MCR03 series |

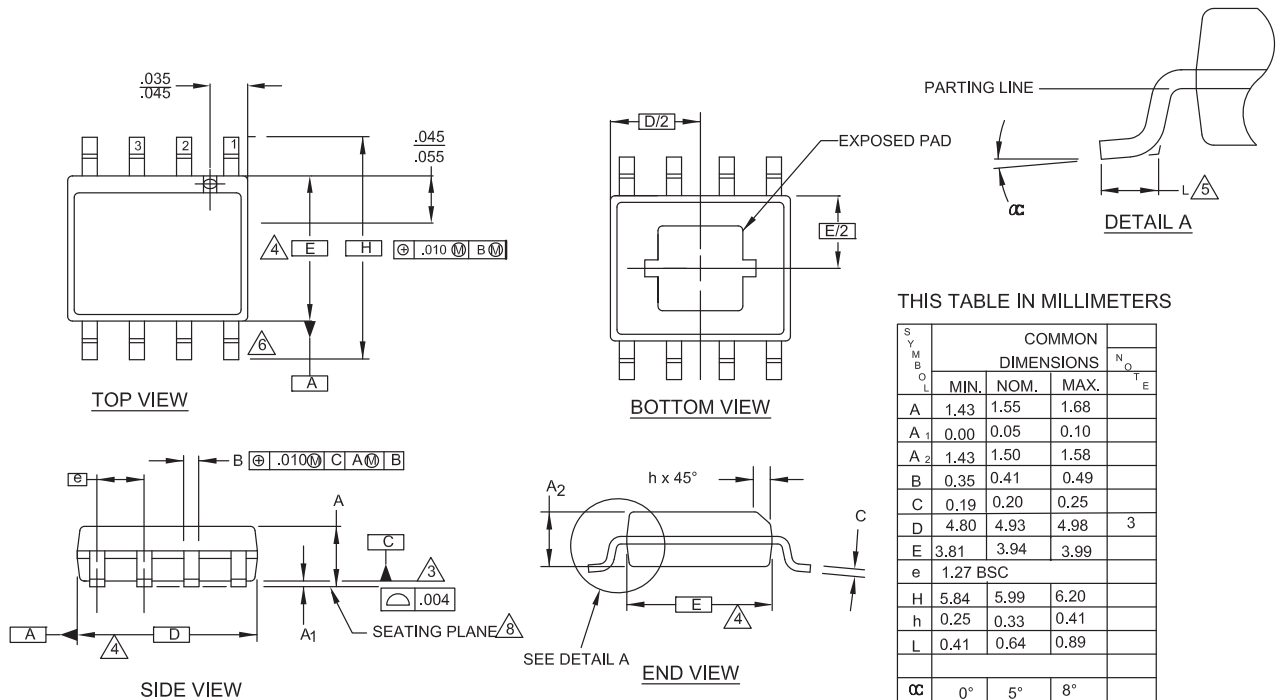
| Pin | Function | Description |
|------------|--------------|--|
| 1 | VC1 | VC1 is the supply voltage for the first stage transistor. The configuration as shown on the Application Schematic is required for optimum RF performance. |
| 2 | VBIAS | VBIAS is the bias control pin for the active bias network. Recommended configuration is shown in the Application Schematic. |
| 3 | RF IN | RF input pin. This pin requires the use of an external DC blocking capacitor as shown in the Application Schematic. |
| 4 | VPC2 | VPC2 is the bias control pin for the active bias network for the second stage. The recommended configuration is shown in the Application Schematic. |
| 5, 6, 7, 8 | RF OUT / VC2 | RF output and bias pins. Bias should be supplied to this pin through an external RF choke. Because DC biasing is present on this pin, a DC blocking capacitor should be used in most applications (see Application Schematic). The supply side of the bias network should be well bypassed. An output matching network is necessary for optimum performance. |
| EPAD | GND | Exposed area on the bottom side of the package needs to be soldered to the ground plane of the board for thermal and RF performance. Several vias should be located under the EPAD as shown in the recommended land pattern. |

Simplified Device Schematic

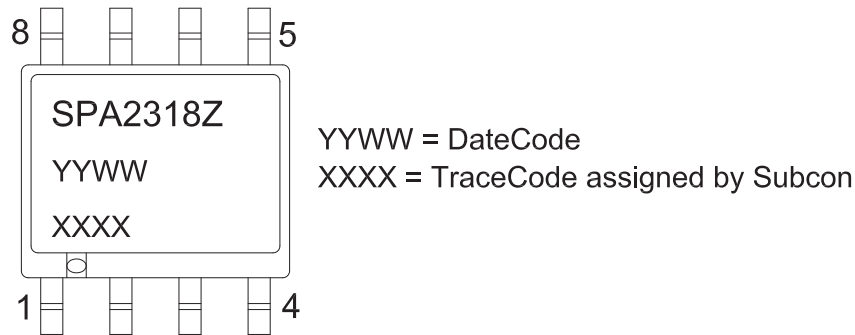


Package Drawing

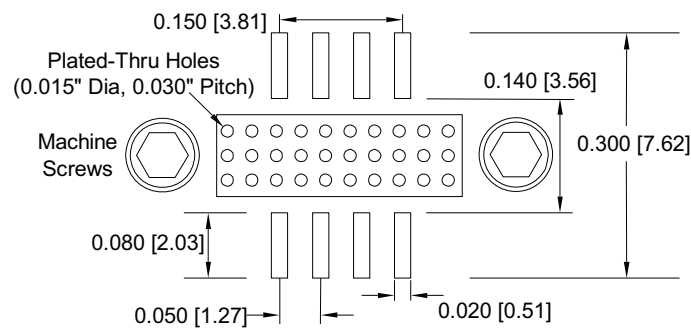
Dimensions in inches (millimeters)
Refer to drawing posted at www.rfmd.com for tolerances.



Branding Diagram



Recommended Land Pattern



Ordering Information

| Ordering Code | Description |
|---------------|---------------------------|
| SPA2318Z | 7" Reel with 500 pieces |
| SPA2318ZSQ | Sample bag with 25 pieces |
| SPA2318ZSR | 7" Reel with 100 pieces |
| SPA2318Z-EVB1 | 1960MHz PCBA |
| SPA2318Z-EVB2 | 2140MHz PCBA |