RFMD
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# SPA-2318(Z)

## 1700MHz to 2200MHz 1 WATT POWER AMP WITH ACTIVE BIAS

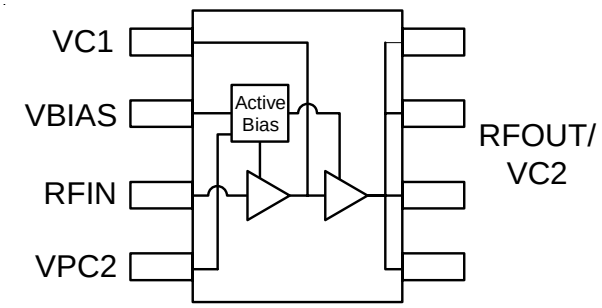
**RFMD Green, RoHS Compliant, Pb-Free (Z Part Number)**
**Package: ESOP-8**

## Product Description

RFMD's SPA-2318 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

- Now Available in Lead-Free, RoHS Compliant, and Green Packaging
- High Linearity Performance: +21dBm IS-95 Channel Power at -55dBc ACP; +20.7dBm WCDMA Channel Power at -50dBc ACP; +47dBm Typ. $OIP_3$
- 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: $Z_0$=50Ω Temp=25°C $V_{CC}$=5.0V [1] Optimal ACP tune [2] Optimal $IP_3$ tune





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## 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 |

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

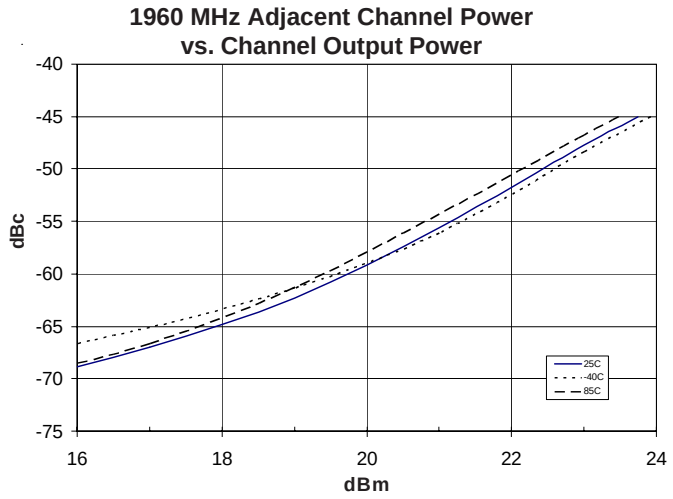
**Caution!** ESD sensitive device.

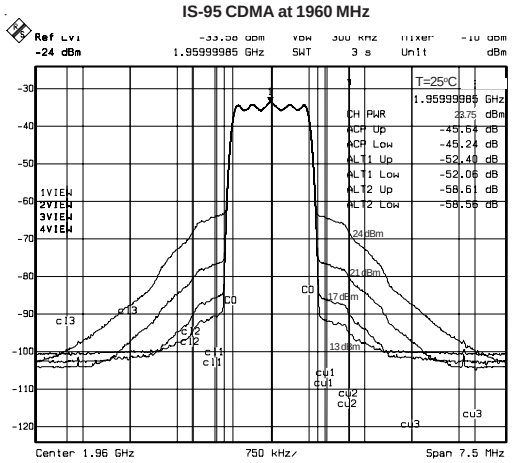
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute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

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

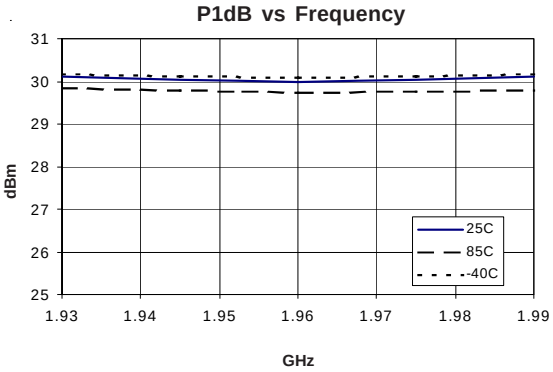


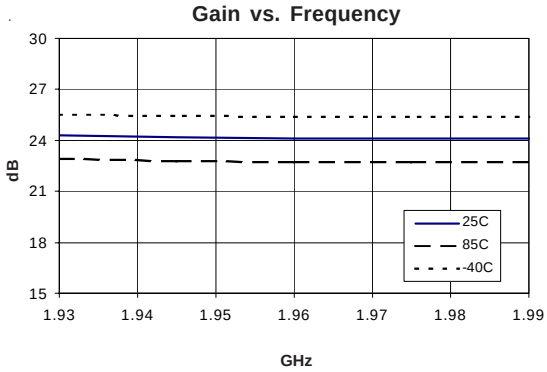
### ACP Optimized 1960MHz Application Circuit Data, $I_{CC}$=400mA, $V_{CC}$=5V IS-95, 9 Channels Forward




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



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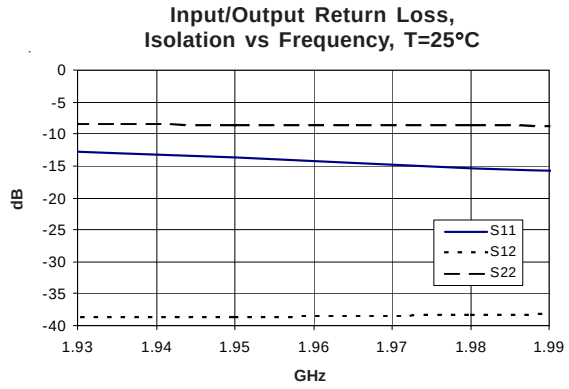
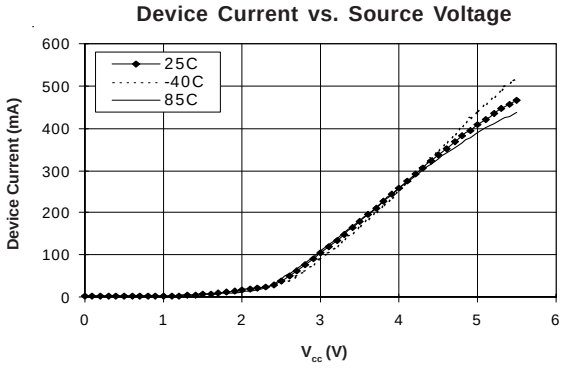
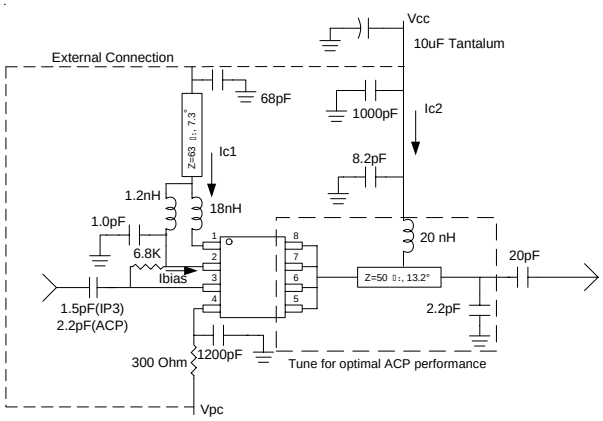
**ACP Optimized 1960MHz Application Circuit Data, $I_{CC}$=400mA, $V_{CC}$=5V**

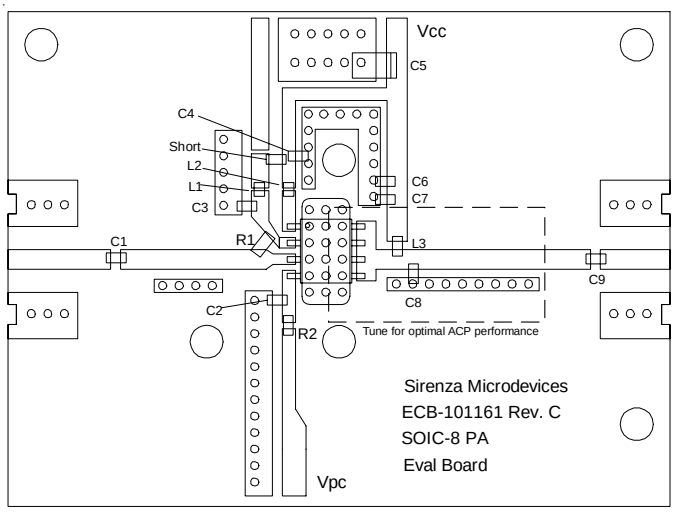



## 1930MHz to 1990MHz Application Schematic

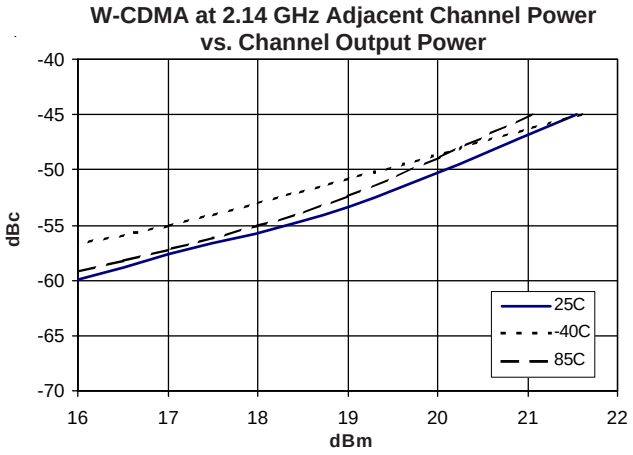


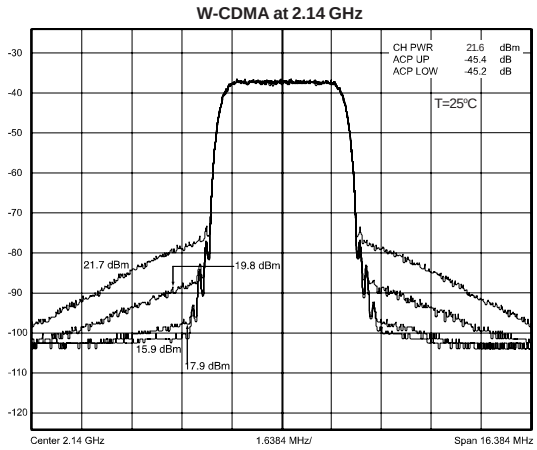

## 1930MHz to 1990MHz Evaluation Board Layout and Bill of Materials



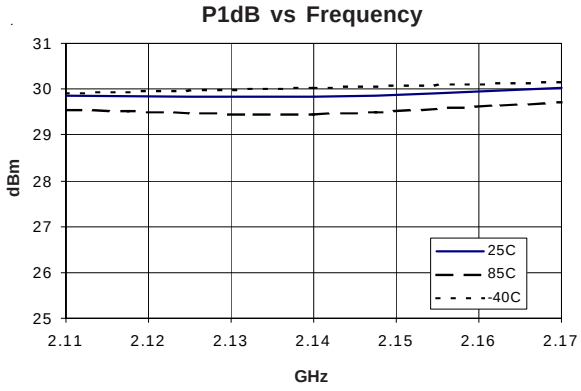

| Ref. Des. | Value | Part Number |
|---|---|---|
| C1 | 1.5pF, ±0.25pF (IP3)<br>2.2pF, ±0.25pF (ACP) | Rohm MCH18 series |
| C2 | 1200pF, 5% | Rohm MCH18 series |
| C3 | 1.0pF, ±0.25pF | Rohm MCH18 series |
| C4 | 68pF, 5% | Rohm MCH18 series |
| C5 | 10uF, 10% | AVX TAJB106K020R |
| C6 | 1000pF, 5% | Rohm MCH18 series |
| C7 | 8.2pF, ±0.5pF | Rohm MCH18 series |
| C8 | 2.2pF, ±0.25pF | Rohm MCH18 series |
| C9 | 20pF, 5% | Rohm MCH18 series |
| L1 | 1.2nH, ±0.3nH | Toko LL1608-FS series |
| L2 | 18nH, 5% | Toko LL1608-FS series |
| L3 | 20nH, 5% | Coilcraft HQ 0805 series |
| R1 | 6.8K Ohm, 5% | Rohm MCR03 series |
| R2 | 300 Ohm, 5% | Rohm MCR03 series |

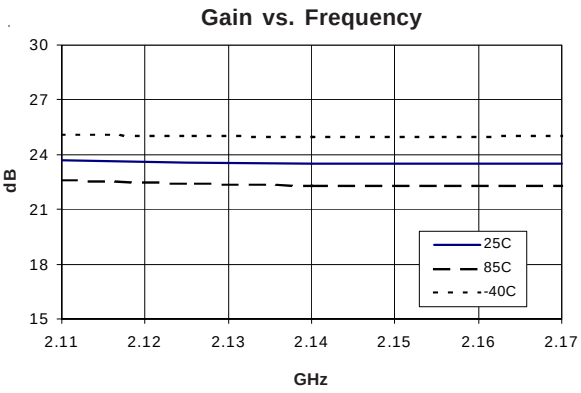
**ACP Optimized 2140MHz Application Circuit Data, $I_{CC}$=400mA, $V_{CC}$=5V IS-95, WCDMA setup is PCCPCH+PSCH+SSCH+CPICH+PICH+64DPCH, 10.5dB peak to average at 0.001% probability**

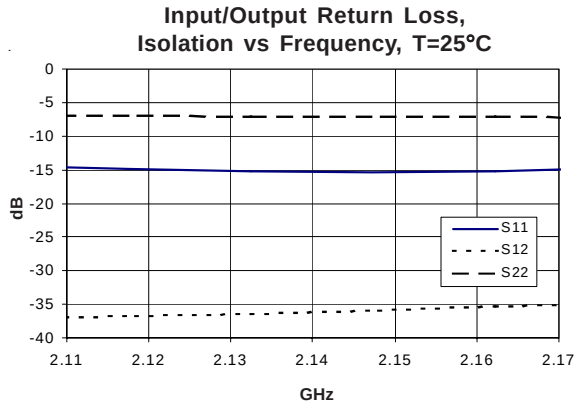


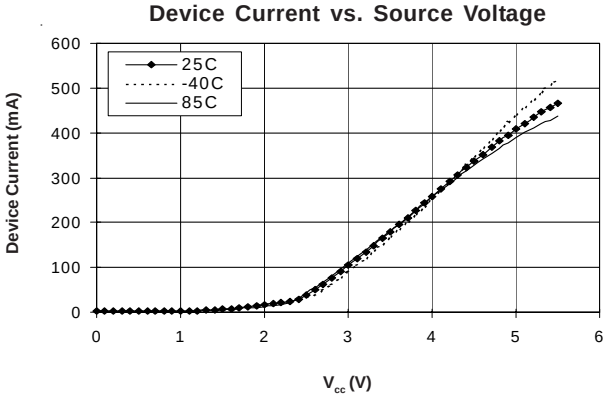




**ACP Optimized at 2140MHz Application Circuit Data, $I_{CC}$=400mA, $V_{CC}$=5V**



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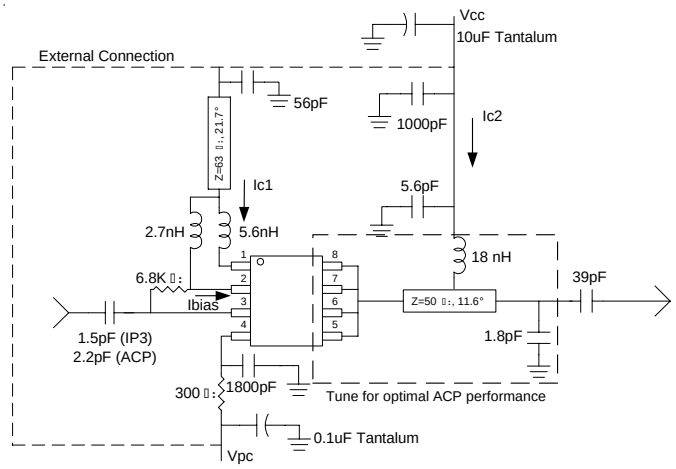
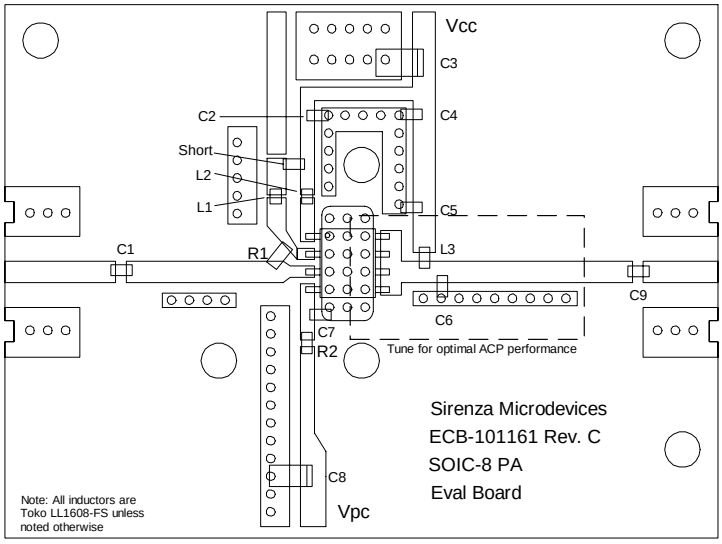
## 2110 MHz to 2170 MHz Application Schematic



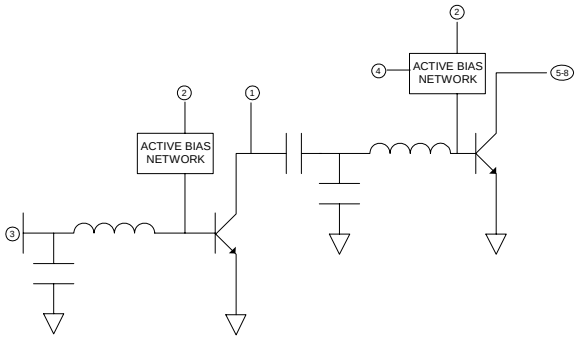

## 2110 MHz to 2170 MHz Evaluation Board Layout and Bill of Materials




| Ref. Des. | Value | Part Number |
|---|---|---|
| C1 | 1.5pF, ±0.25pF (IP3)<br>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 |

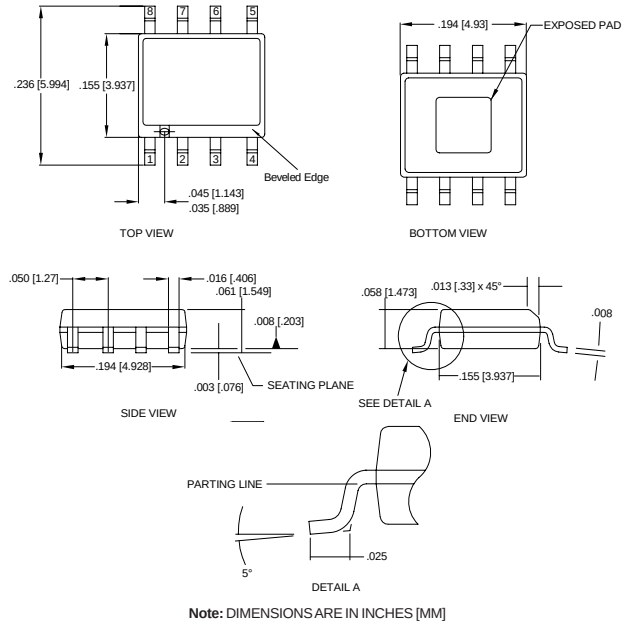
| Pin | Function | Description |
|---|---|---|
| 1 | VC1 | VC1 is the supply voltage for the first stage transistor. The configuration as shown on the Application Schematic is required for optimum RF performance. |
| 2 | VBIAS | VBias is the bias control pin for the active bias network. Recommended configuration 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.




**Note:** DIMENSIONS ARE IN INCHES [MM]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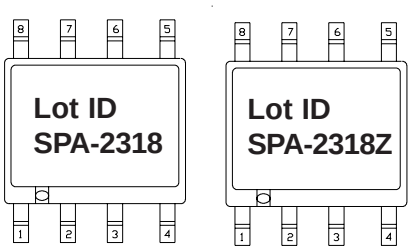
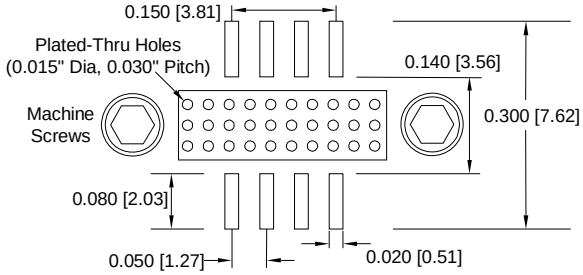
## Part Identification Marking




## Recommended Land Pattern




## Ordering Information

| Part Number | Reel Size | Devices/Reel |
|---|---|---|
| SPA-2318 | 7” | 500 |
| SPA-2318Z | 7” | 500 |

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