SJM PREWELL

# PW290-63

Wideband Gain Block

## Features

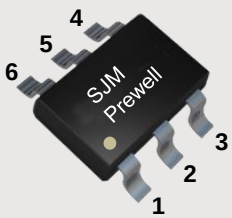
- 5 to 3000MHz
- Gain 14.0dB @ 75MHz
- P1dB 15.1dBm @ 900MHz
- OIP3 31.8dBm @ 75MHz
- Lead-free / Green / RoHS compliant SOT-363 Package

## Applications

- Base station / Repeater / Mobile / Automotive / Military
  - FDD-LTE, TD-LTE, TDS-CDMA, CDMA, WCDMA, WiMAX, PCS, GSM, GPS, GPRS, TETRA
- IoT / Broadcasting / WLAN
  - FM, DMB, DVB, ISM

## Functional Diagram

| | | | |
|---|---|---|---|
| RF IN | **3** | RF OUT / | **6** |
| GND | **1,2,4,5** | Bias | |




## ESD/MSL

**1** ESD sensitive device. Observe handling precautions.

**2** HBM: Class 2 , JESD22-A114

**3** CDM: Class C3 , JESD22-C101F

**4** MSL 3, J-STD-020

## Description

The PW290-63 is a high performance InGaP HBT MMIC Amplifier and consists of Darlington pair amplifiers. The features of PW290-63 are high linear performance, wideband operation and high reliability. The PW290-63 operates from a single voltage supply and requires only two DC-blocking capacitors, a bias resistor and an inductor for operation. The device is a general purpose buffer amplifier that offers high dynamic range in a low cost surface-mounted plastic SOT-363 package. All devices are 100% RF and DC tested.

## Specifications

| Parameter | Units | Frequency (MHz) | | | | |
|---|---|---|---|---|---|---|
| | | 75 | 900 | 1900 | 2300 | 2600 |
| S21 | dB | 14.0 | 14.0 | 13.7 | 13.3 | 12.7 |
| S11 | dB | -14 | -16 | -20 | -17 | -15 |
| S22 | dB | -10 | -14 | -14 | -13 | -13 |
| P1dB | dBm | 15.3 | 15.3 | 15.2 | 15.1 | 14.9 |
| OIP3 | dBm | 31.8 | 31.4 | 29.2 | 28.4 | 27.7 |
| NF | dB | 3.42 | 3.51 | 3.58 | 3.69 | 3.84 |
| V / I | V/mA | 4.3 / 45 | | | | |
| Rth | °C/W | 77 | | | | |

1) Test Conditions : T=25°C, Supply Voltage=5V, Rbias=15ohm, 50ohm System
2) OIP3 measured with two tones at an output power of -3dBm/tone separated by 1MHz.

## Absolute Maximum Ratings

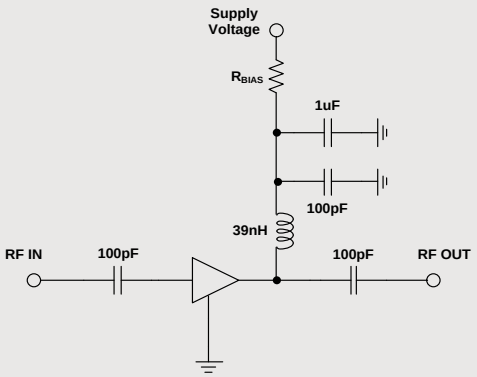
| Parameter | Rating | Unit |
|---|---|---|
| Device Voltage | 8.5 | V |
| Device Current | 170 | mA |
| RF Power Input | 20 | dBm |
| Storage Temperature | -55 to 150 | °C |
| Ambient Operating Temperature | -40 to 85 | °C |
| Junction Temperature | 187 | °C |

1) Stresses above the maximum values listed have may cause permanent damage to the device.
2) MTTF is more than 100 years.

## Typical RF Performance for 1.9GHz Tuned Application Circuit

Supply Bias Voltage = 5V, R(bias)= 15 ohm, Current=45mA

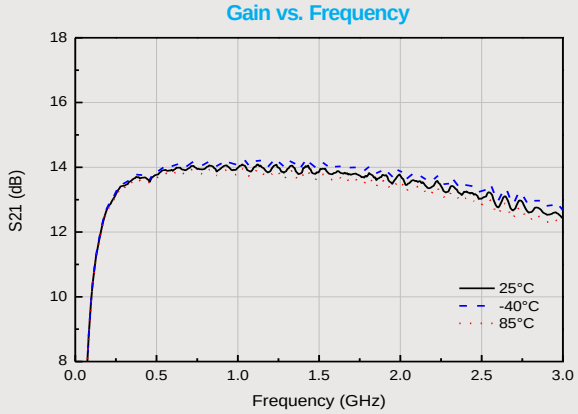
| Parameters | Units | Frequency (MHz) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 500 | 900 | 1500 | 1900 | 2300 | 2600 | 3000 |
| S21 | dB | 13.8 | 14.0 | 13.9 | 13.7 | 13.3 | 12.7 | 12.4 |
| S11 | dB | -12 | -16 | -20 | -20 | -17 | -15 | -12 |
| S22 | dB | -11 | -14 | -14 | -14 | -13 | -13 | -13 |
| P1dB | dBm | 15.1 | 15.3 | 15.1 | 15.2 | 15.1 | 14.9 | 14.5 |
| OIP3 @ -3dBm | dBm | 31.4 | 31.4 | 30.2 | 29.2 | 28.4 | 27.7 | 26.9 |
| NF | dB | 3.58 | 3.51 | 3.53 | 3.58 | 3.69 | 3.84 | 3.97 |



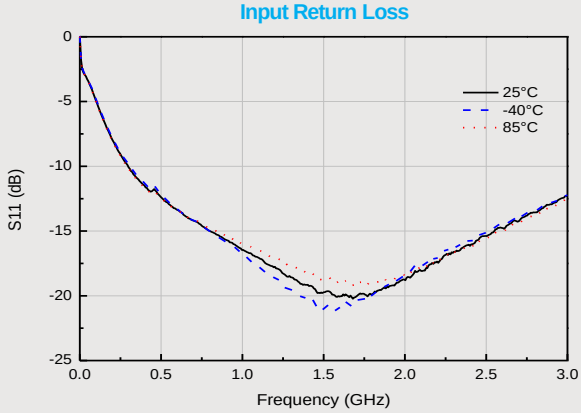

## Recommended Bias Values

| Supply Voltage ( V ) | R bias Value (ohm) | Size |
|---|---|---|
| 5 | 15.0 | 0805 |
| 6 | 37.0 | 0805 |
| 7 | 59.4 | 1210 |
| 8 | 81.5 | 1210 |
| 9 | 103.5 | 2010 |
| 10 | 126.0 | 2010 |
| 12 | 170.0 | 2512 |

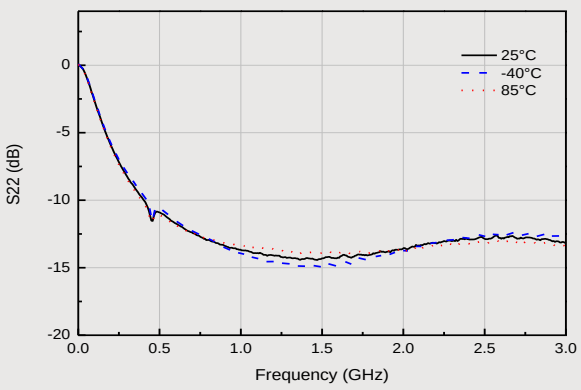
### Gain vs. Frequency



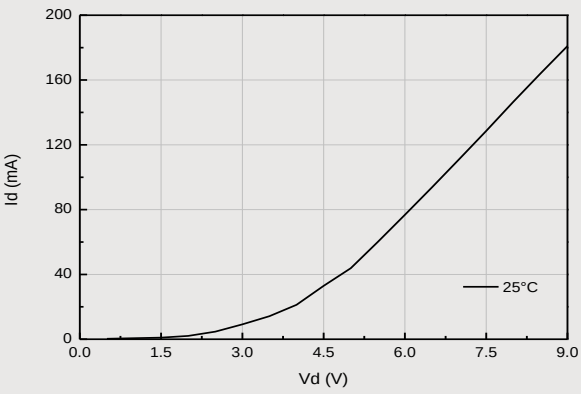

### Input Return Loss



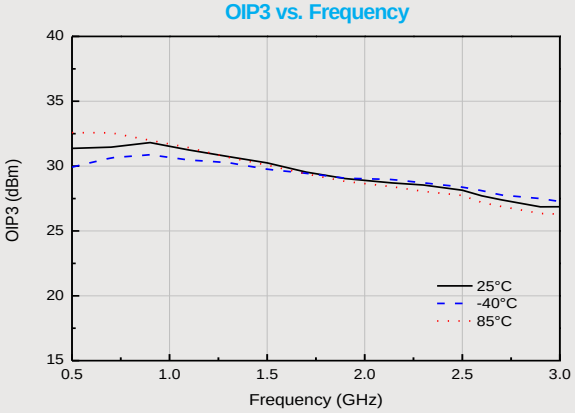

### Output Return Loss



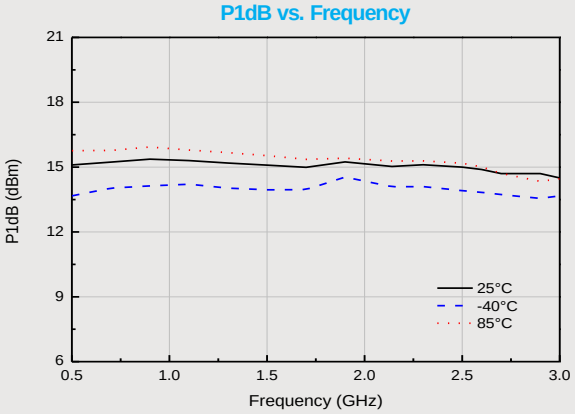

### Vd vs. Id



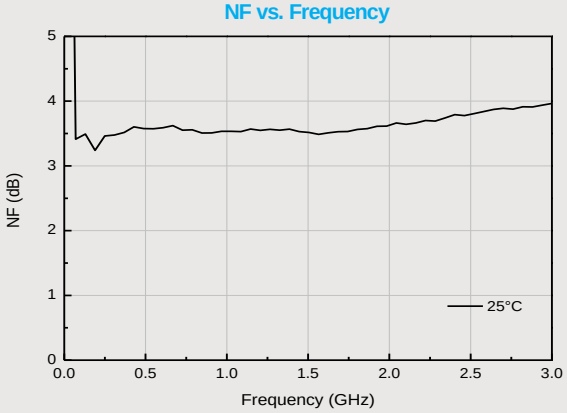
## OIP3 vs. Frequency



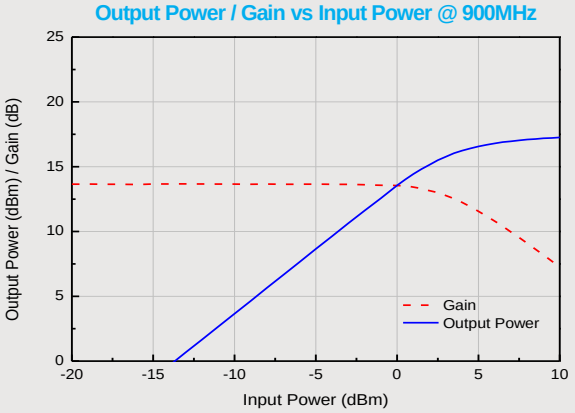

## P1dB vs. Frequency



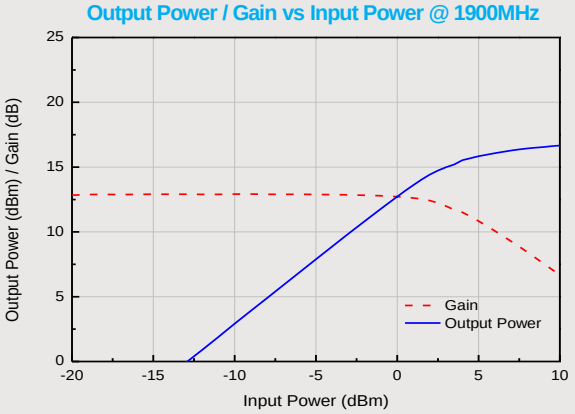

## NF vs. Frequency



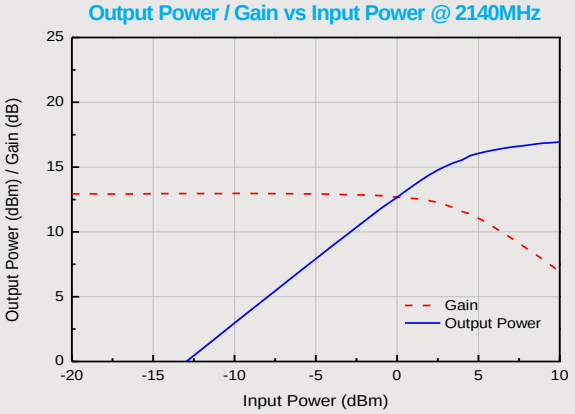

## Output Power / Gain vs Input Power @ 900MHz



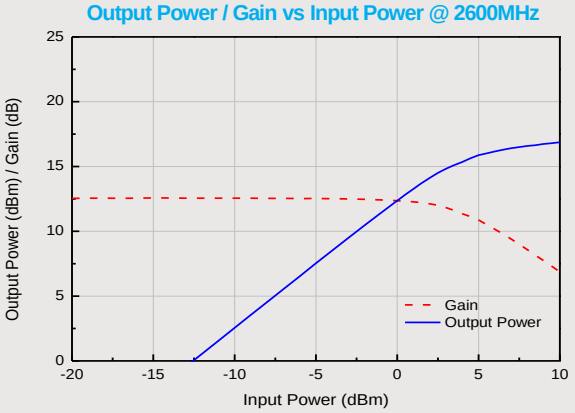

## Output Power / Gain vs Input Power @ 1900MHz



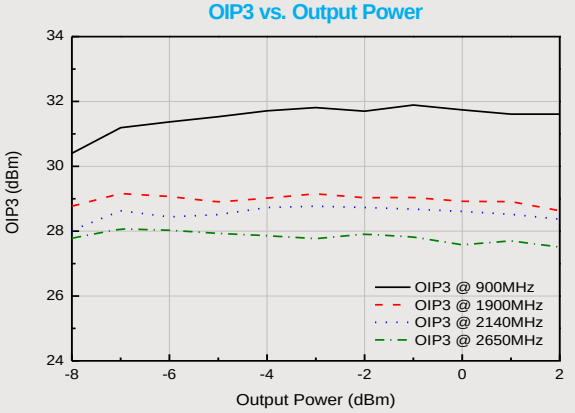

## Output Power / Gain vs Input Power @ 2140MHz




## Output Power / Gain vs Input Power @ 2600MHz

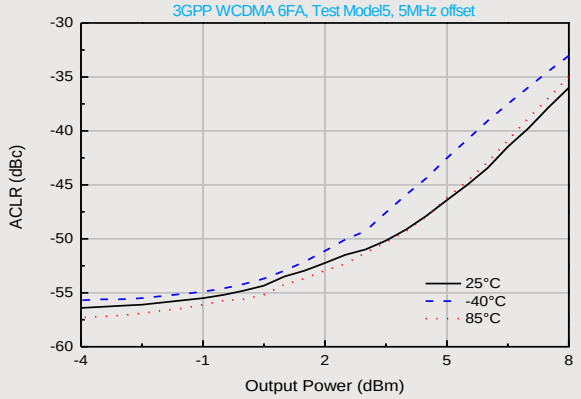



## OIP3 vs. Output Power



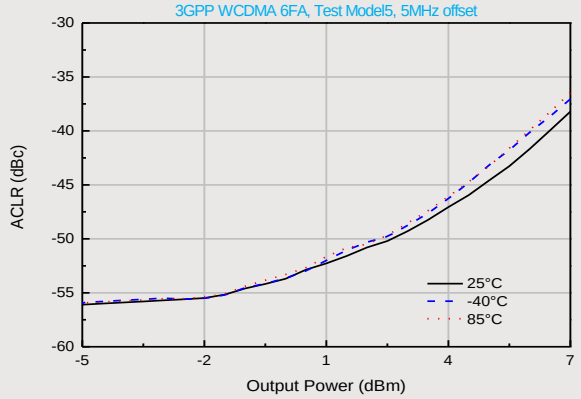
**WCDMA ACLR vs. Output Power @ 1850MHz**

3GPP WCDMA 6FA, Test Model5, 5MHz offset



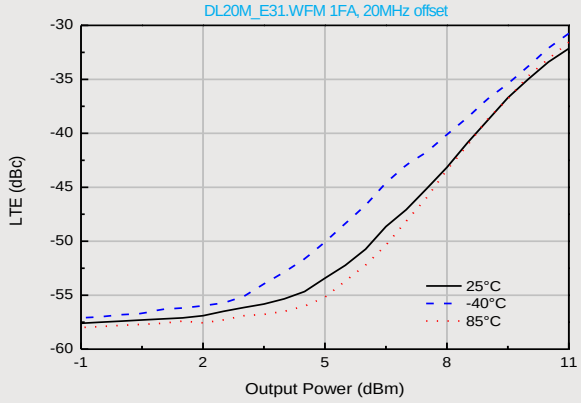

**WCDMA ACLR vs. Output Power @ 2140MHz**

3GPP WCDMA 6FA, Test Model5, 5MHz offset



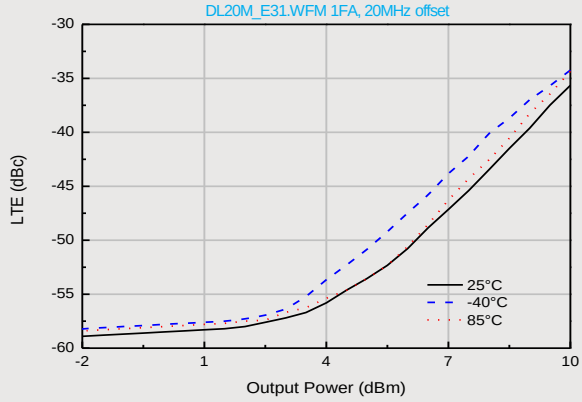

**LTE ACLR vs. Output Power @ 900MHz**

DL20M_E31.WFM 1FA, 20MHz offset



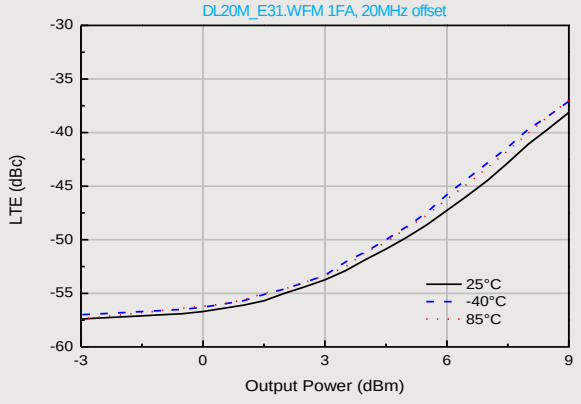

**LTE ACLR vs. Output Power @ 1850MHz**

DL20M_E31.WFM 1FA, 20MHz offset




**LTE ACLR vs. Output Power @ 2650MHz**

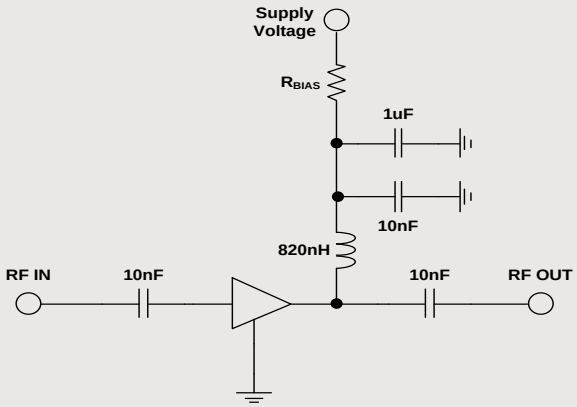
DL20M_E31.WFM 1FA, 20MHz offset

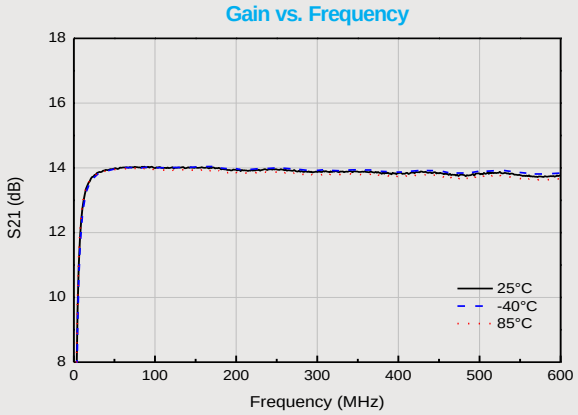


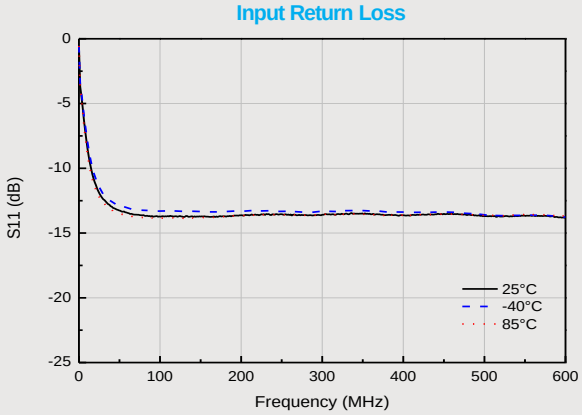
## Typical RF Performance for 50 - 500MHz Tuned Application Circuit

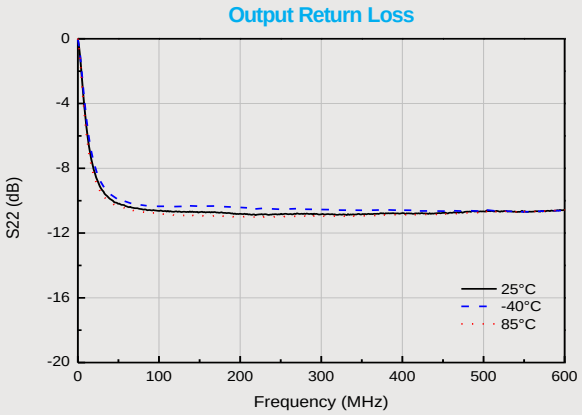
### Supply Bias Voltage = 5V, R(bias)= 15 ohm, Current=45mA

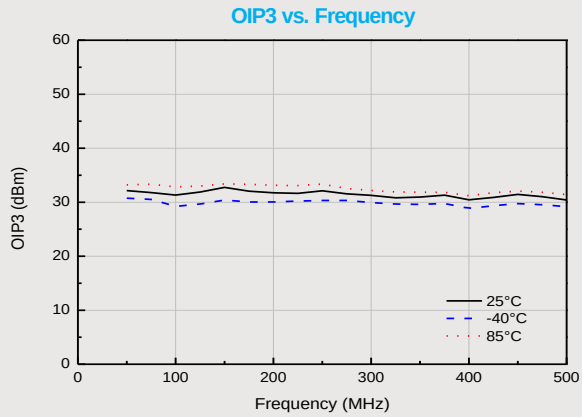
| Parameters | Units | Frequency (MHz) | | | |
|---|---|---|---|---|---|
| | | 75 | 125 | 300 | 500 |
| S21 | dB | 14.0 | 14.0 | 13.9 | 13.8 |
| S11 | dB | -14 | -14 | -14 | -14 |
| S22 | dB | -10 | -11 | -11 | -11 |
| P1dB | dBm | 15.3 | 15.2 | 15.3 | 15.2 |
| OIP3 @ -3dBm | dBm | 31.8 | 31.9 | 31.3 | 30.4 |
| NF | dB | 3.2 | 3.3 | 3.4 | 3.5 |

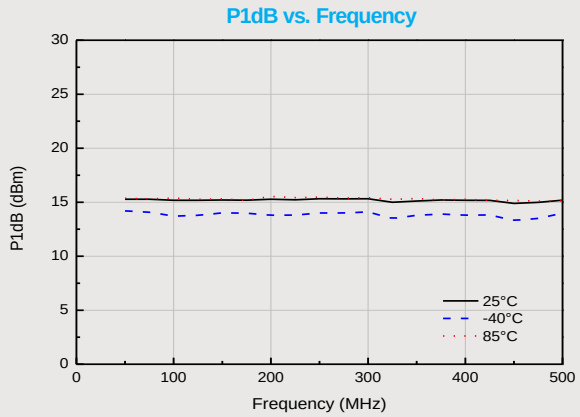


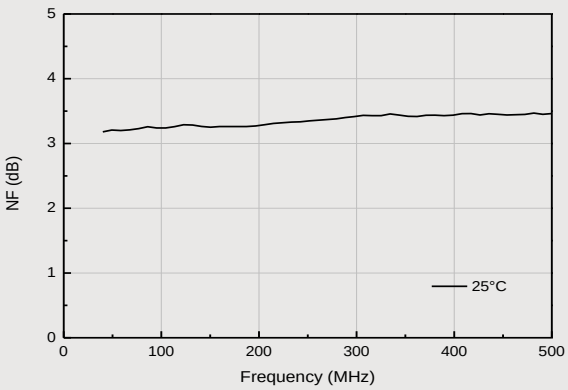



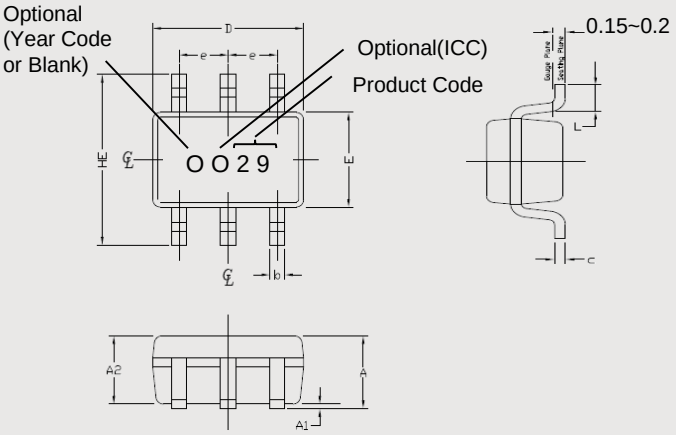



NF vs. Frequency

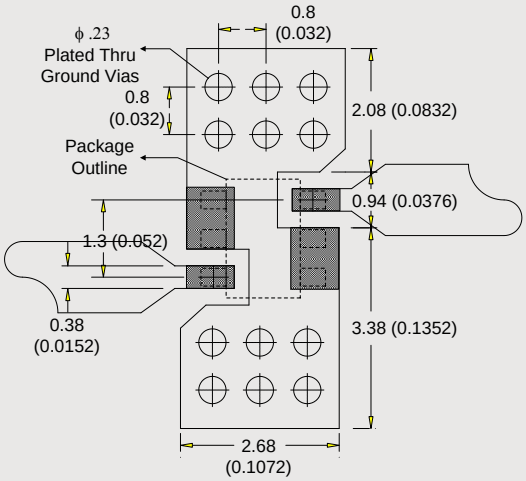


## Lead-free /RoHS Compliant / Green SOT-363 Package Outline

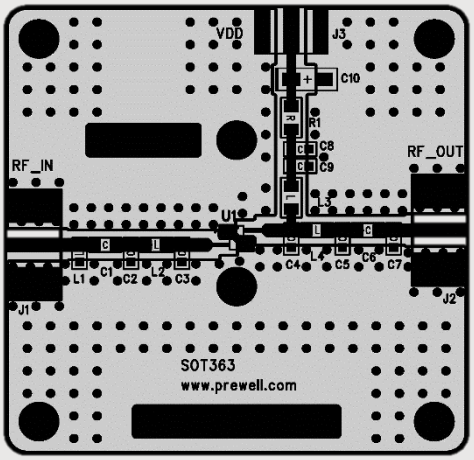



| SYMBOL | MIN. | MAX. |
|---|---|---|
| E | 1.15 | 1.35 |
| D | 1.85 | 2.25 |
| HE | 1.95 | 2.30 |
| A | 0.80 | 1.10 |
| A2 | 0.70 | 1.00 |
| A1 | 0.00 | 0.10 |
| e | 0.65 BSC | |
| b | 0.15 | 0.40 |
| c | 0.08 | 0.25 |
| L | 0.21 | 0.26 |

## Land Pattern




## Evaluation Board Layout (40x40)




## Mounting Instructions

1. Use a large ground pad area with many plated through-holes as shown.
2. We recommend 1 oz copper minimum.
3. Measurement for our data sheet was made on 0.8mm thick FR-4 Board.
4. RF trace width depends on the board material and construction.
5. Add mounting screws near the part to fasten the board to a heatsink.
6. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.