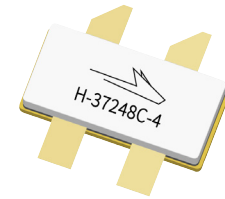


GTRA364002FC

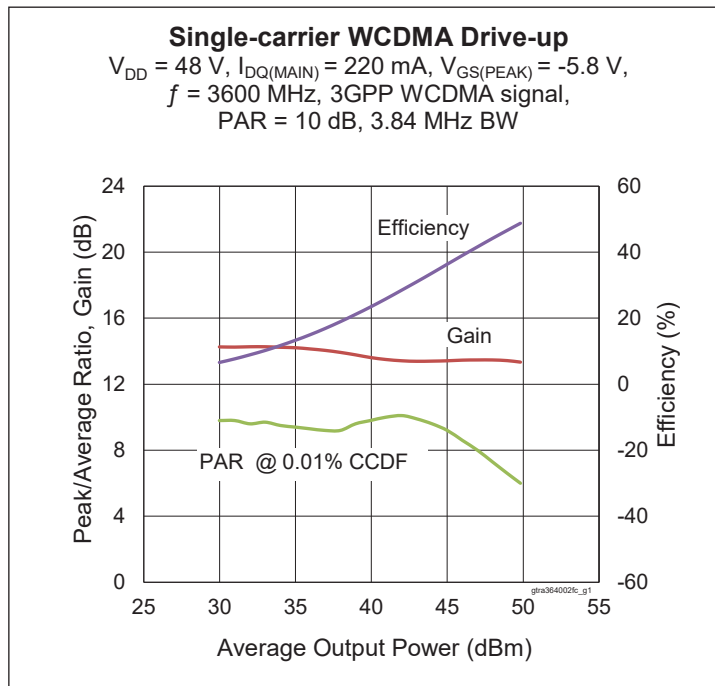
Thermally-Enhanced High Power RF GaN on SiC HEMT 400 W, 48 V, 3400 – 3600 MHz

Description

The GTRA364002FC is a 400-watt (P_{SAT}) GaN on SiC high electron mobility transistor (HEMT) designed for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.



GTRA364002FC
Package H-37248C-4



Features

- GaN on SiC HEMT technology
- Input matched
- Asymmetrical Doherty design
 - Main: $P_{3dB} = 170\text{ W Typ}$
 - Peak: $P_{3dB} = 230\text{ W Typ}$
- Typical Pulsed CW performance, 3400 to 3600 MHz, 48 V, combined outputs, Doherty @ P_{3dB} , 10 μs , 10% duty cycle
 - Output power = 400 W
 - Efficiency = 60 %
 - Gain = 14 dB
- Capable of handling 10:1 VSWR @ 48 V, 50 W (WCDMA) output power
- Human Body Model Class 1A, (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in Wolfspeed Doherty production test fixture)

$V_{DD} = 48\text{ V}$, $I_{DQ} = 220\text{ mA}$, $P_{OUT} = 50\text{ W avg}$, $V_{GS(peak)} = V_{GS} @ I_{DQ} = 200\text{ mA} - 2.7\text{ V}$, $f = 3600\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------------------|----------|-----|-----|-----|------|
| Gain | G_{ps} | 12 | 13 | — | dB |
| Drain Efficiency | η_D | 36 | 40 | — | % |
| Adjacent Channel Power Ratio | ACPR | — | -30 | -27 | dBc |
| Output PAR @ 0.01% CCDF | OPAR | 6.4 | 7.7 | — | dB |

All published data at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|---------------------------------------|---|---------------|------|------|------|------|
| Drain-source Breakdown Voltage (main) | $V_{GS} = -8\text{ V}, I_D = 3\text{ mA}$ | $V_{(BR)DSS}$ | 150 | — | — | V |
| | (peak) $V_{GS} = -8\text{ V}, I_D = 4\text{ mA}$ | $V_{(BR)DSS}$ | 150 | — | — | V |
| Drain-source Leakage Current | $V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$ | I_{DSS} | — | — | 5 | mA |
| Gate Threshold Voltage (main) | $V_{DS} = 10\text{ V}, I_D = 21.6\text{ mA}$ | $V_{GS(th)}$ | -3.8 | -3.0 | -2.3 | V |
| | (peak) $V_{DS} = 10\text{ V}, I_D = 28.8\text{ mA}$ | $V_{GS(th)}$ | -3.8 | -3.0 | -2.3 | V |

Recommended Operating Conditions

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|------------------------|---|-------------|------|------|------|------|
| Operating Voltage | | V_{DD} | 0 | — | 50 | V |
| Gate Quiescent Voltage | $V_{DS} = 48\text{ V}, I_D = 220\text{ mA}$ | $V_{GS(Q)}$ | -3.7 | -2.9 | -2.1 | V |

Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---------------------------|--------------|-------------|------|
| Drain-source Voltage | V_{DSS} | 125 | V |
| Gate-source Voltage | V_{GS} | -10 to +2 | V |
| Operating Voltage | V_{DD} | 55 | V |
| Gate Current (main) | I_G | 21.6 | mA |
| | (peak) I_G | 28.8 | mA |
| Drain Current (main) | I_D | 8.1 | A |
| | (peak) I_D | 10.8 | A |
| Junction Temperature | T_J | 225 | °C |
| Storage Temperature Range | T_{STG} | -65 to +150 | °C |

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

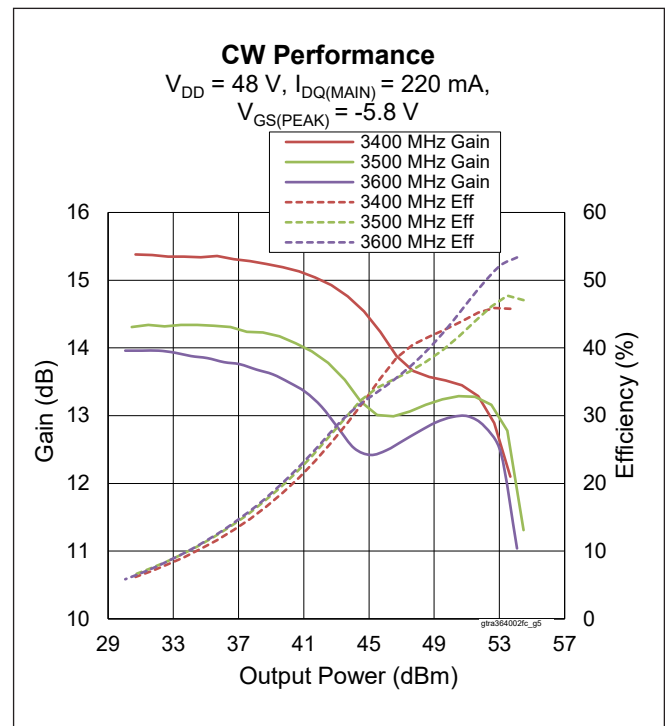
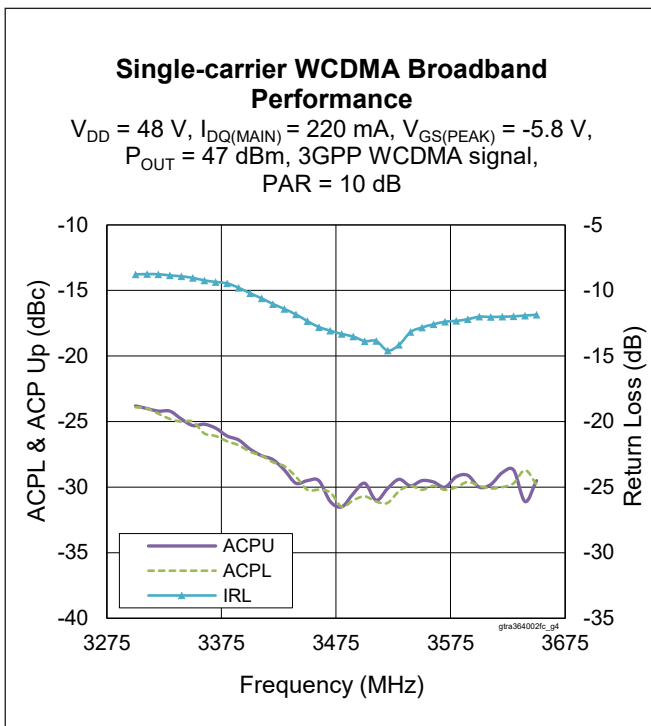
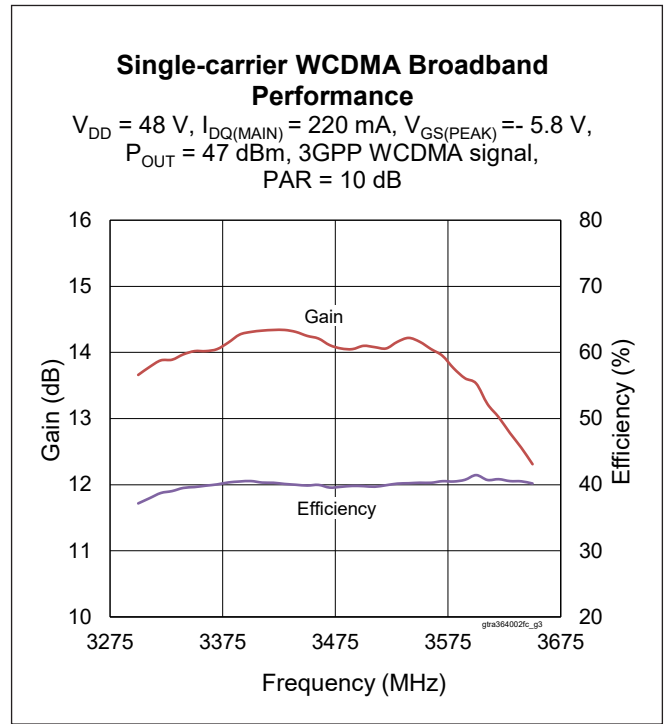
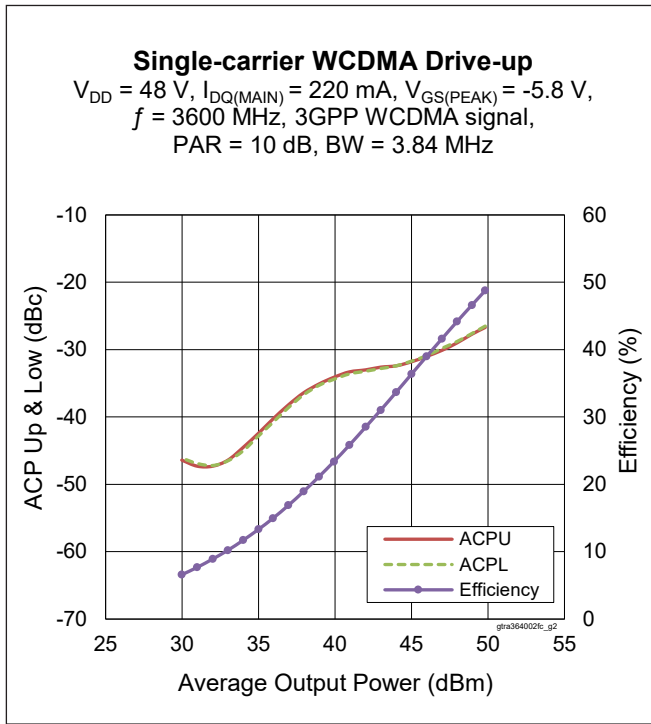
Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|---|-----------------|------|
| Thermal Resistance (main, $T_{CASE} = 70\text{ °C}, 101\text{ W DC}$) | $R_{\theta JC}$ | 1.55 | °C/W |
| | (peak, $T_{CASE} = 70\text{ °C}, 130\text{ W DC}$) | $R_{\theta JC}$ | 1.20 |

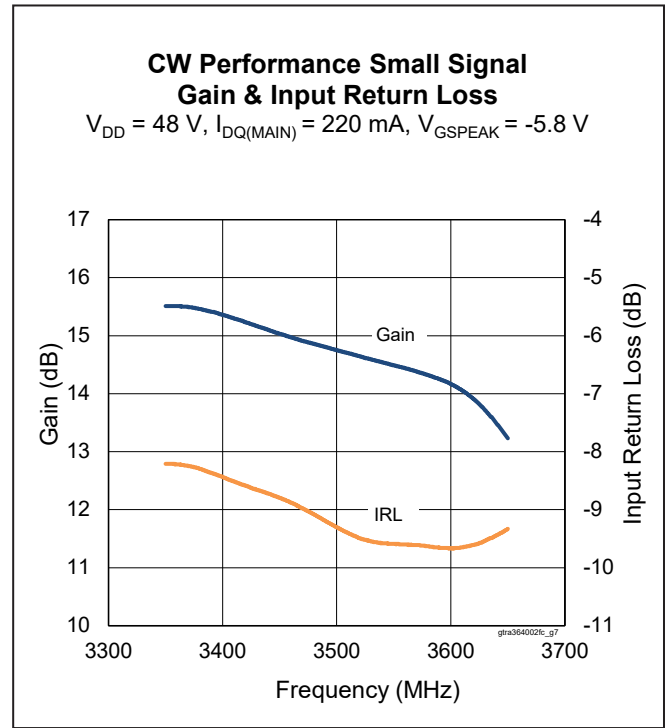
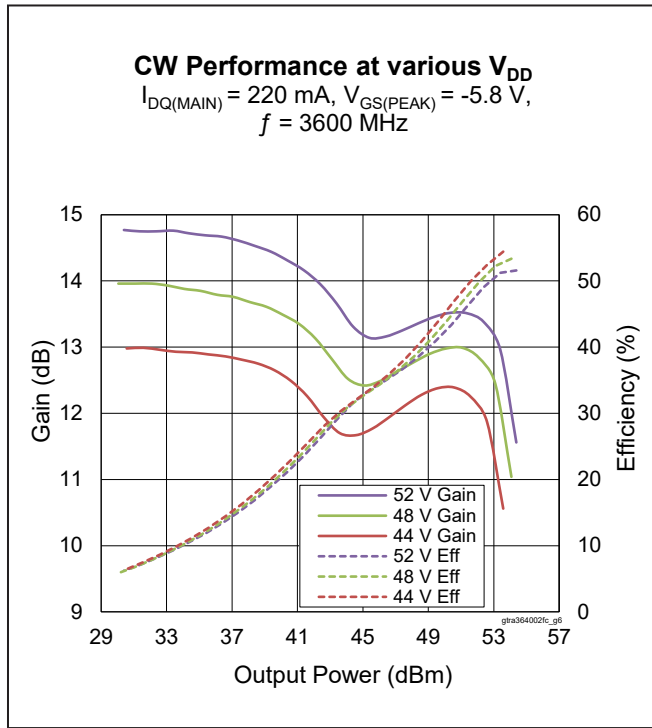
Ordering Information

| Type and Version | Order Code | Package | Shipping |
|--------------------|--------------------|------------|----------------------|
| GTRA364002FC V1 R0 | GTRA364002FC-V1-R0 | H-37248C-4 | Tape & Reel, 50 pcs |
| GTRA364002FC V1 R2 | GTRA364002FC-V1-R2 | H-37248C-4 | Tape & Reel, 250 pcs |

Typical Performance (data taken in test fixture)



Typical Performance (cont.)



Load Pull Performance

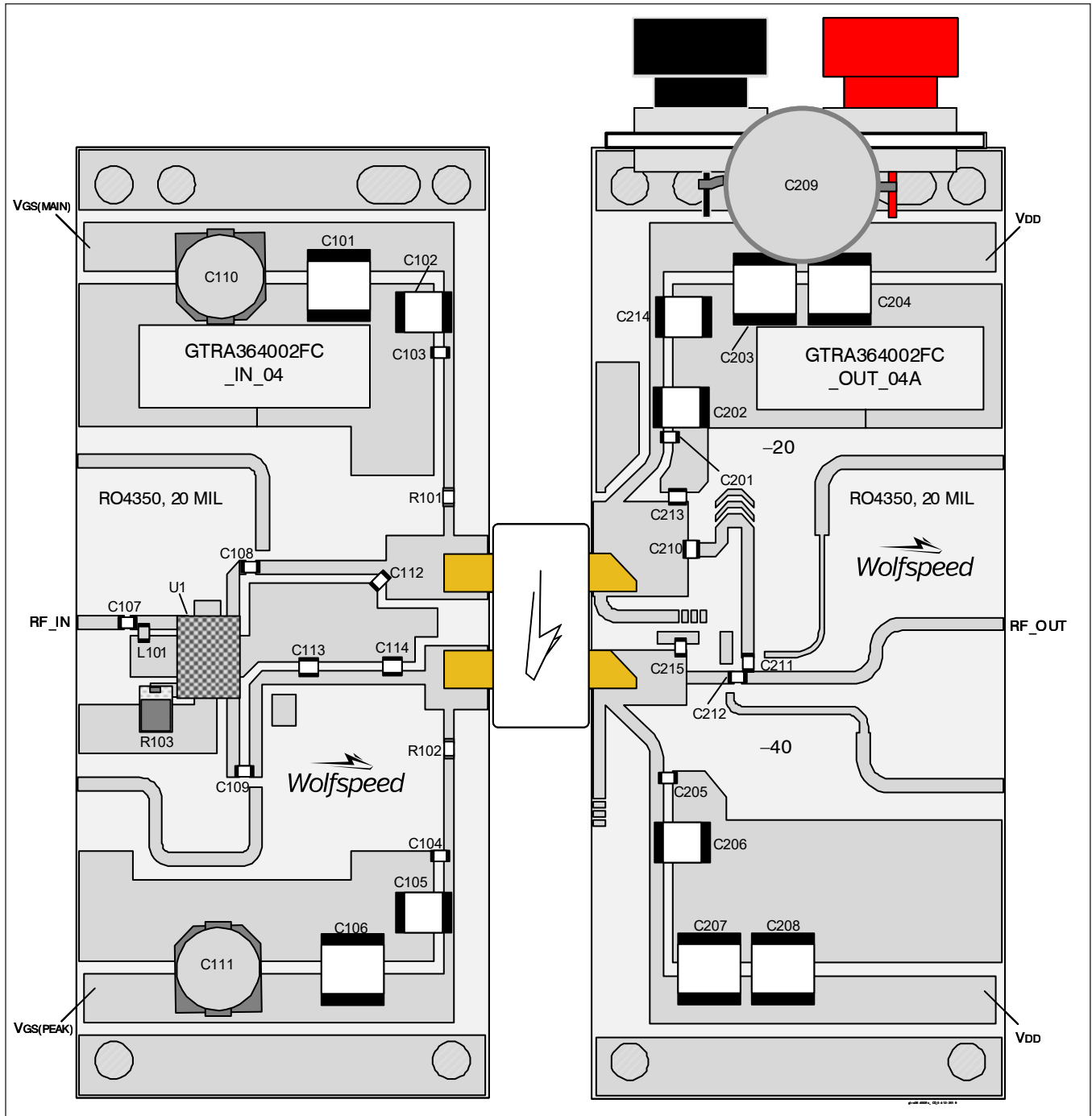
Main Side Load Pull Performance – Pulsed CW signal: 10 μs , 10% duty cycle, 48 V, $I_{DQ} = 220 \text{ mA}$, class AB

| Freq [MHz] | Z_s [W] | P_{3dB} | | | | | | | | | |
|------------|-----------|------------------|-----------|-----------------|---------------|--------------|----------------------|-----------|-----------------|---------------|--------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| | | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] |
| 3400 | 9.0-j3.4 | 4.3-j6.5 | 15.3 | 53.90 | 245 | 62.5 | 1.7-j3.5 | 17.3 | 52.40 | 174 | 74.0 |
| 3500 | 5.0-j5.2 | 3.8-j7.0 | 15.4 | 54.00 | 251 | 63.9 | 2.2-j5.0 | 17.4 | 52.10 | 162 | 76.0 |
| 3600 | 3.5-j7.0 | 4.4-j7.1 | 14.9 | 53.80 | 240 | 61.2 | 2.4-j5.2 | 16.8 | 52.10 | 162 | 74.0 |

Peak Side Load Pull Performance – Pulsed CW signal: 10 μs , 10% duty cycle, 48 V, $I_{DQ} = 280 \text{ mA}$, class AB

| Freq [MHz] | Z_s [W] | P_{3dB} | | | | | | | | | |
|------------|-----------|------------------|-----------|-----------------|---------------|--------------|----------------------|-----------|-----------------|---------------|--------------|
| | | Max Output Power | | | | | Max Drain Efficiency | | | | |
| | | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] | Z_L [W] | Gain [dB] | P_{3dB} [dBm] | P_{3dB} [W] | η_D [%] |
| 3400 | 16.5-j22 | 3.1-j6.2 | 15.6 | 55.10 | 324 | 59.0 | 2.1-j4.4 | 17.8 | 53.70 | 234 | 70.0 |
| 3500 | 20-j13 | 2.8-j6.6 | 15.8 | 55.10 | 324 | 59.5 | 1.9-j4.7 | 18.3 | 53.00 | 200 | 69.0 |
| 3600 | 15.7-j7.4 | 3.7-j6.8 | 15.3 | 54.90 | 309 | 56.0 | 2.0-j4.8 | 17.5 | 53.00 | 200 | 66.0 |

Reference Circuit, 3400 – 3600 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

| | |
|---|---|
| DUT | GTRA364002FC-V1 |
| Test Fixture Part No. | LTA/GTRA364002FC-V1 |
| PCB | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 3400 - 3600$ MHz |
| Find Gerber files for this test fixture on the WolfSpeed Web site at www.wolfspeed.com/RF | |

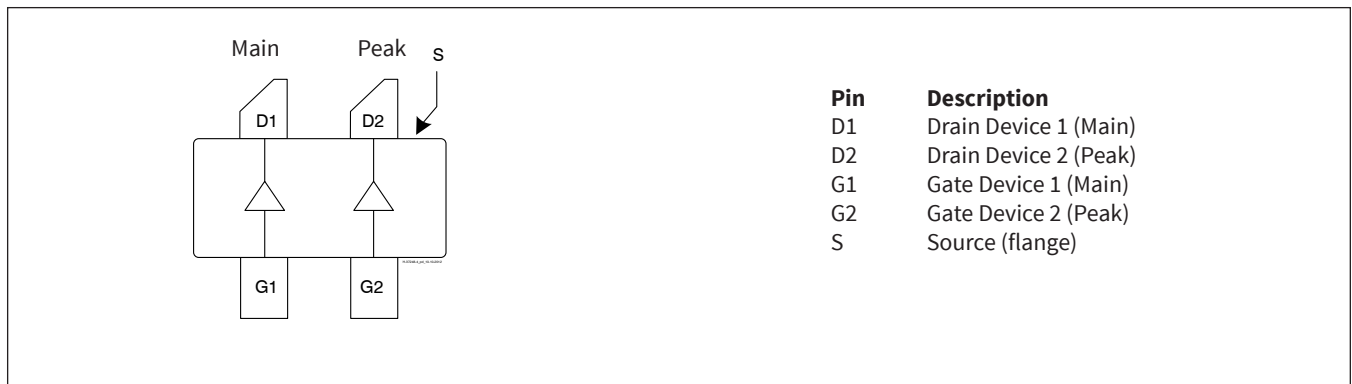


Reference Circuit (cont.)

Components Information

| Component | Description | Manufacturer | P/N |
|------------------------------|-------------------------------|---------------------------------|---------------------|
| Input | | | |
| C101, C106 | Capacitor, 10 μ F, 100 V | TDK Corporation | C5750X7S2A106M230KB |
| C102, C105 | Capacitor, 1 μ F | TDK Corporation | C4532X7R2A105M230KA |
| C103, C104, C107, C108, C109 | Capacitor, 10 pF | ATC | ATC800A100JT250T |
| C110, C111 | Capacitor, 100 μ F, 35 V | Panasonic Electronic Components | EEE-FT1V101AP |
| C112, C114 | Capacitor, 0.2 pF | ATC | ATC800A0R2BT250T |
| C113 | Capacitor, 0.8 pF | ATC | ATC800A0R8CT250T |
| L101 | Inductor, 4.7 nH | EPCOS (TDK) | B82496C3479J000 |
| R101, R102 | Resistor, 10 ohms | Panasonic Electronic Components | ERJ-3GEYJ100V |
| R103 | Resistor, 50 ohms | Richardson | C8A50Z4A |
| U1 | Hybrid Coupler | Anaren | XC3500P-03S |
| Output | | | |
| C201, C205, C211, C212 | Capacitor, 10 pF | ATC | ATC800A100JT250T |
| C202, C206, C214 | Capacitor, 1 μ F | TDK Corporation | C4532X7R2A105M230KA |
| C203, C204, C207, C208 | Capacitor, 10 μ F, 100 V | TDK Corporation | C5750X7S2A106M230KB |
| C209 | Capacitor, 220 μ F, 100 V | Panasonic Electronic Components | ECA-2AHG221 |
| C210 | Capacitor, 1 pF | ATC | ATC800A1R0CT250T |
| C213 | Capacitor, 0.2 pF | ATC | ATC800A0R2BT250T |
| C215 | Capacitor, 0.6 pF | ATC | ATC800A0R6CT250T |

Pinout Diagram (top view)



Package Outline Specifications

