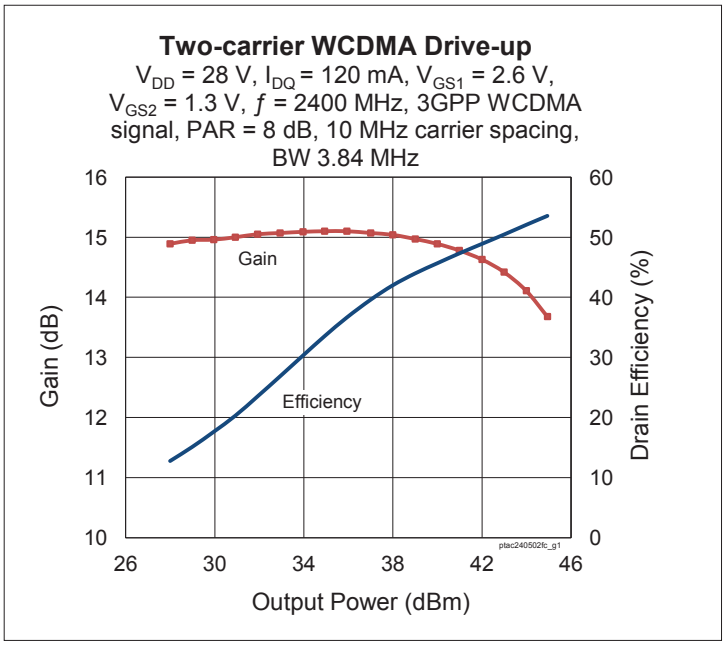
green Product

# Thermally-Enhanced High Power RF LDMOS FET
# 50 W, 28 V, 2300 – 2400 MHz

## Description

The PTAC240502FC is a 47-watt LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 2300 to 2400 MHz frequency band. Features include dual-path design, input matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Infineon's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.




PTAC240502FC
Package H-37248-4


## Features

- Input matched
- Asymmetric Doherty design
  - Main: P1dB = 17 W Typ
  - Peak: P1dB = 33 W Typ
- Typical Pulsed CW performance, 2350 MHz, 28 V, 160 µs pulse width, 10% duty cycle, Doherty Configuration
  - Output power at $P_{1dB}$ = 45.7 W
  - Efficiency = 46.2%
  - Gain = 14.6 dB
- Typical single-carrier WCDMA performance, 2350 MHz, 28 V, 8.4 dB PAR @ 0.01% CCDF
  - Output power = 8.91 W
  - Efficiency = 44.2%
  - Gain = 14.2 dB
  - ACPR = –31 dBc @ 5 MHz
- Capable of handling 10:1 VSWR @28 V, 50 W (CW) output power
- Integrated ESD protection : Human Body Model, Class 1B (per JESD22-A114)
- Low thermal resistance
- Pb-free and RoHS compliant

## RF Characteristics

**Two-carrier WCDMA Specifications** (tested in Infineon Doherty test fixture)
$V_{DD}$ = 28 V, $I_{DQ}$ = 120 mA, $P_{OUT}$ = 10 W avg, $V_{GS2}$ = 1.3 V, $f_1$ = 2345 MHz, $f_2$ = 2355 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Linear Gain | $G_{ps}$ | 13 | 14.3 | — | dB |
| Drain Efficiency | $\eta_D$ | 41 | 44 | — | % |
| Intermodulation Distortion | IMD | — | –33 | –25 | dBc |

*All published data at $T_{CASE}$ = 25°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 | $V_{GS}$ = 0 V, $I_{DS}$ = 10 mA | $V_{(BR)DSS}$ | 65 | — | — | V |
| Drain Leakage Current | $V_{DS}$ = 28 V, $V_{GS}$ = 0 V | $I_{DSS}$ | — | — | 1 | µA |
| | $V_{DS}$ = 63 V, $V_{GS}$ = 0 V | $I_{DSS}$ | — | — | 10 | µA |
| On-State Resistance (main) | $V_{GS}$ = 10 V, $V_{DS}$ = 0.1 V | $R_{DS(on)}$ | — | 0.4 | — | Ω |
| (peak) | $V_{GS}$ = 10 V, $V_{DS}$ = 0.1 V | $R_{DS(on)}$ | — | 0.2 | — | Ω |
| Operating Gate Voltage (main) | $V_{DS}$ = 28 V, $I_{DQ}$ = 120 mA | $V_{GS}$ | 2.6 | 2.7 | 2.8 | V |
| (peak) | $V_{DS}$ = 28 V, $I_{DQ}$ = 0 mA | $V_{GS}$ | 1.2 | 1.3 | 1.5 | V |
| Gate Leakage Current | $V_{GS}$ = 10 V, $V_{DS}$ = 0 V | $I_{GSS}$ | — | — | 1 | µA |

## Maximum Ratings

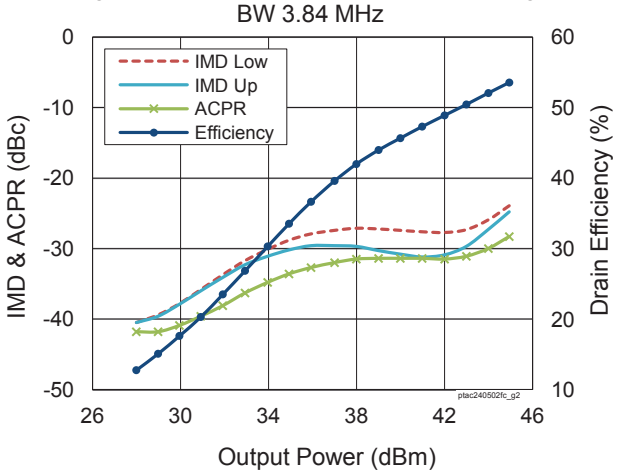
| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 65 | V |
| Gate-Source Voltage | $V_{GS}$ | –6 to +10 | V |
| Operating Voltage | $V_{DD}$ | 0 to +32 | V |
| Junction Temperature | $T_J$ | 225 | °C |
| Storage Temperature Range | $T_{STG}$ | –65 to +150 | °C |
| Thermal Resistance ($T_{CASE}$ = 60°C, 50 W CW) | $R_{\theta JC}$ | 1.29 | °C/W |

## Ordering Information

| Type and Version | Order Code | Package Description | Shipping |
|---|---|---|---|
| PTAC240502FC V1 R0 | PTAC240502FCV1R0XTMA1 | H-37248-4, earless flange | Tape & Reel, 50 pcs |
| PTAC240502FC V1 R250 | PTAC240502FCV1R250XTMA1 | H-37248-4, earless flange | Tape & Reel, 250 pcs |

## Typical Performance (data taken in a production test fixture)

**Two-carrier WCDMA Drive-up**
$V_{DD}$ = 28 V, $I_{DQ}$ = 120 mA, $V_{GS1}$ = 2.6 V, $V_{GS2}$ = 1.3 V, $f$ = 2400 MHz, 3GPP WCDMA signal, PAR = 8 dB, 10 MHz carrier spacing, BW 3.84 MHz

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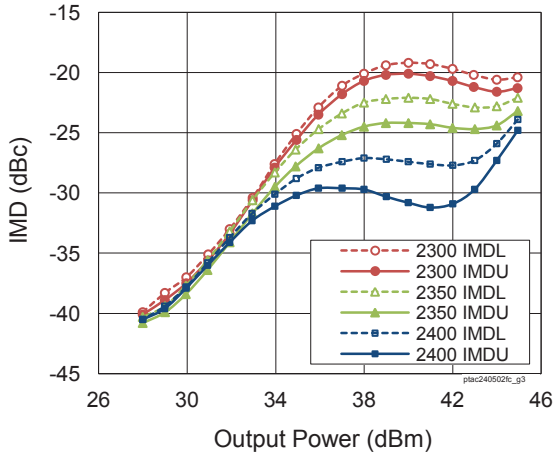
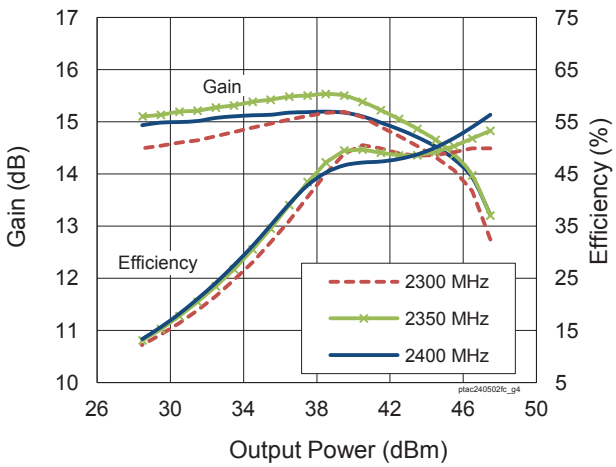
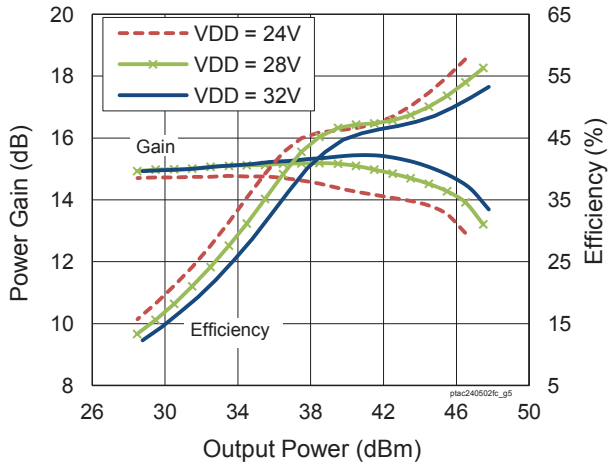


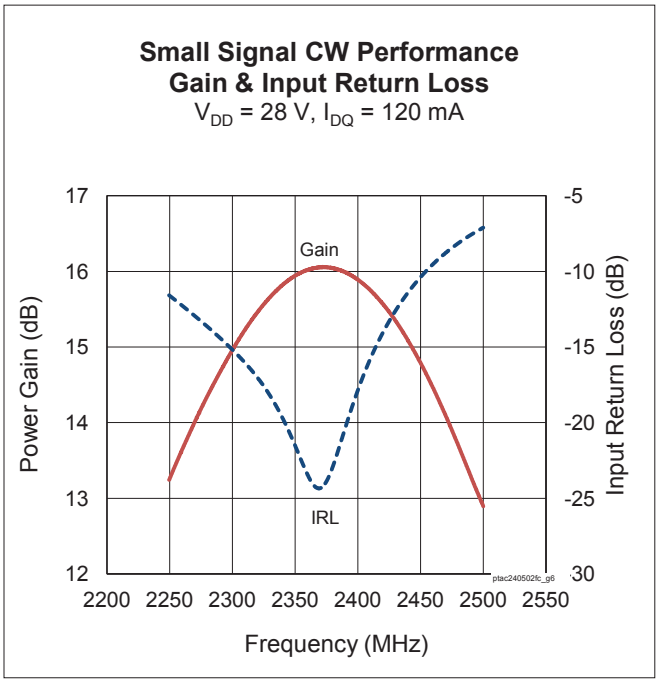

**CW Performance**
$V_{DD}$ = 28 V, $I_{DQ}$ = 120 mA




**CW Performance at various $V_{DD}$**
$I_{DQ}$ = 120 mA, $f$ = 2400 MHz



## Typical Performance (cont.)




## Load Pull Performance

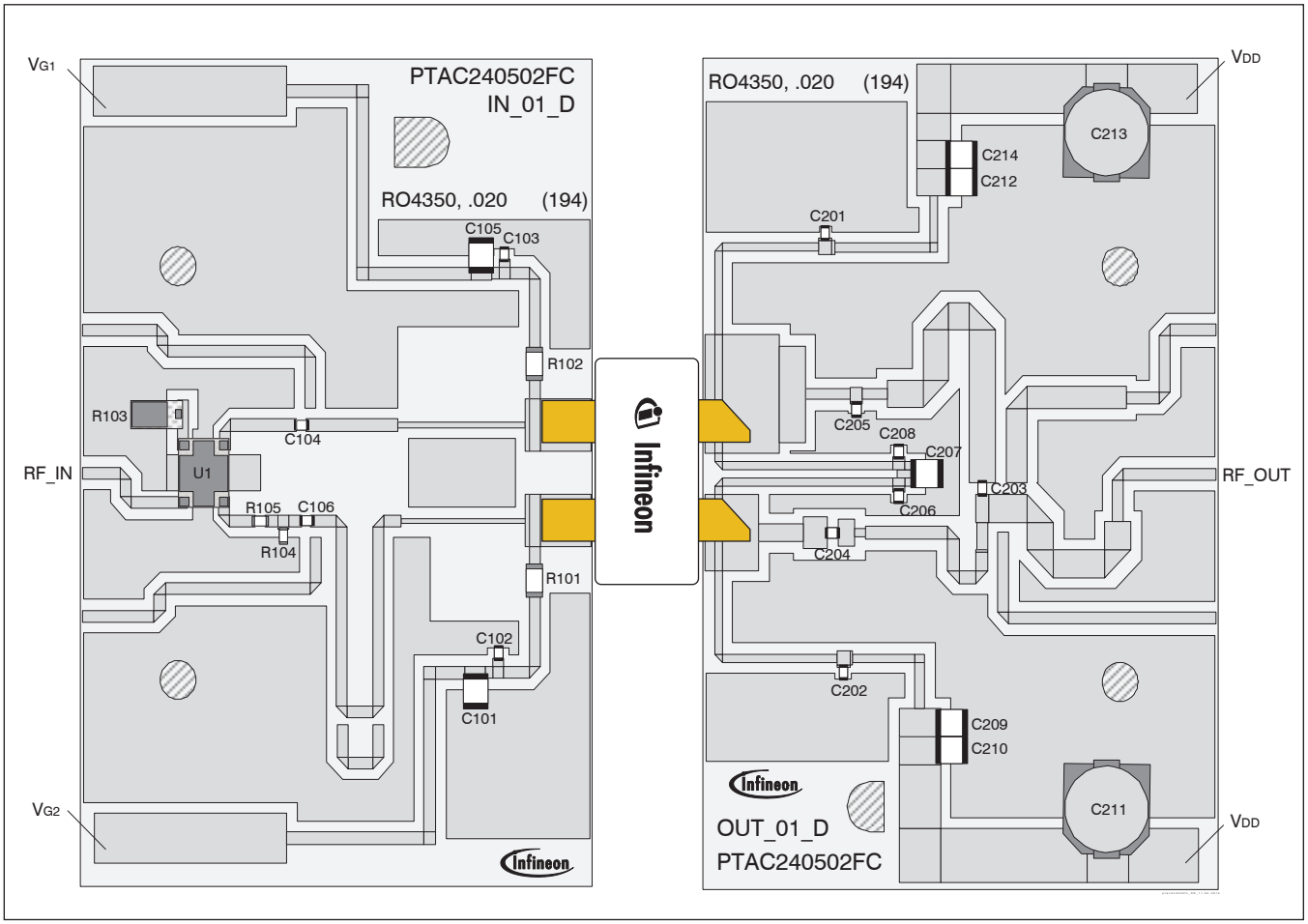
**Main Side Load Pull Performance** – Pulsed CW signal: 160 µs, 10% duty cycle, 28 V, 114 mA

| | | $P_{1dB}$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max Output Power | | | | | Max PAE | | | | |
| Freq [MHz] | Zs [Ω] | ZI [Ω] | Gain [dB] | $P_{OUT}$ [dBm] | $P_{OUT}$ [W] | PAE [%] | ZI [Ω] | Gain [dB] | $P_{OUT}$ [dBm] | $P_{OUT}$ [W] | PAE [%] |
| 2300 | 10–j31 | 9.4–j11.6 | 20.96 | 42.89 | 19.45 | 53.2 | 4.7–j8.3 | 22.8 | 41.03 | 12.68 | 61.5 |
| 2350 | 12.7–j35 | 9.7–j12.2 | 20.7 | 42.83 | 19.19 | 52.7 | 5.1–j9.4 | 22.4 | 41.34 | 13.61 | 62.1 |
| 2400 | 16.2–j38 | 9.31–j12.6 | 20.8 | 42.65 | 18.41 | 52.6 | 5.2–j10.2 | 22.2 | 41.45 | 13.96 | 61.3 |

**Peak Side Load Pull Performance** – Pulsed CW signal: 160 µs, 10% duty cycle, 28 V, 252 mA

| | | $P_{1dB}$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max Output Power | | | | | Max PAE | | | | |
| Freq [MHz] | Zs [Ω] | ZI [Ω] | Gain [dB] | $P_{OUT}$ [dBm] | $P_{OUT}$ [W] | PAE [%] | ZI [Ω] | Gain [dB] | $P_{OUT}$ [dBm] | $P_{OUT}$ [W] | PAE [%] |
| 2300 | 5.6–j22 | 3.0–j7.0 | 18.2 | 46.50 | 44.67 | 52.1 | 2.2–j5.8 | 20.5 | 45.20 | 33.11 | 56.9 |
| 2350 | 6.7–j25 | 2.9–j7.9 | 17.4 | 46.46 | 44.26 | 48.5 | 2.2–j5.9 | 21.1 | 44.91 | 30.97 | 55.9 |
| 2400 | 9.7–j29 | 3.3–j7.9 | 17.9 | 46.62 | 45.92 | 49.6 | 2.2–j6.2 | 20.8 | 45.31 | 33.96 | 57.2 |

## Reference Circuit , 2300 – 2400 MHz




*Reference circuit assembly diagram (not to scale)*

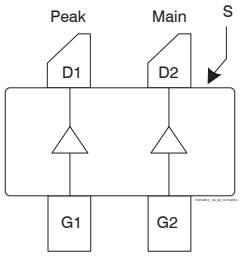
## Reference Circuit (cont.)

| Reference Circuit Assembly | |
|---|---|
| DUT | PTAC240502FC V1 |
| Test Fixture Part No. | LTA/PTAC240502FC V1 |
| PCB | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\varepsilon_r$ = 3.66, $f$ = 2300 – 2400 MHz |
| Find Gerber files for this test fixture on the Infineon Web site at *http://www.infineon.com/rfpower* | |

### Components Information

| Component | Description | Suggested Manufacturer | P/N |
|---|---|---|---|
| **Input** | | | |
| C101, C105 | Capacitor, 4.7 µF | Murata Electronics North America | GRM32ER71H475KA88L |
| C102, C103, C104, C106 | Capacitor, 18 pF | ATC | ATC800A180JT250T |
| R101, R102 | Resistor, 10 Ω | Panasonic Electronic Components | ERJ-8GEYJ100V |
| R103 | Resistor, 50 Ω | Anaren | 060120A15Z50 |
| R104 | Resistor, 300 Ω | Venkel | CR0603-16W-3010FB |
| R105 | Resistor, 12.1 Ω | Venkel | CR0603-16W-12R1FB |
| U1 | Directional coupler | Anaren | X3C25P1-05S |
| | | | |
| **Output** | | | |
| C201, C202, C203, C204, C206, C208 | Capacitor, 18 pF | ATC | ATC800A180JT250T |
| C205 | Capacitor, 0.5 pF | ATC | ATC800A180JT250T |
| C207, C210, C214 | Capacitor, 4.71 µF | Murata Electronics North America | GRM32ER71H475KA88L |
| C209, C212 | Capacitor, 10 µF | Taiyo Yuden | UMK325C7106MM-T |
| C211, C213 | Capacitor, 100 µF | Panasonic Electronic Components | EEE-FP1V101AP |

## Pinout Diagram (top view)




| Pin | Description |
|---|---|
| D1 | Drain device 1 (Peak) |
| D2 | Drain device 2 (Main) |
| G1 | Gate device 1 (Peak) |
| G2 | Gate device 2 (Main) |
| S | Source (flange) |

*Lead connections for PTAC240502FC*

## Package Outline Specifications

### Package H-37248-4

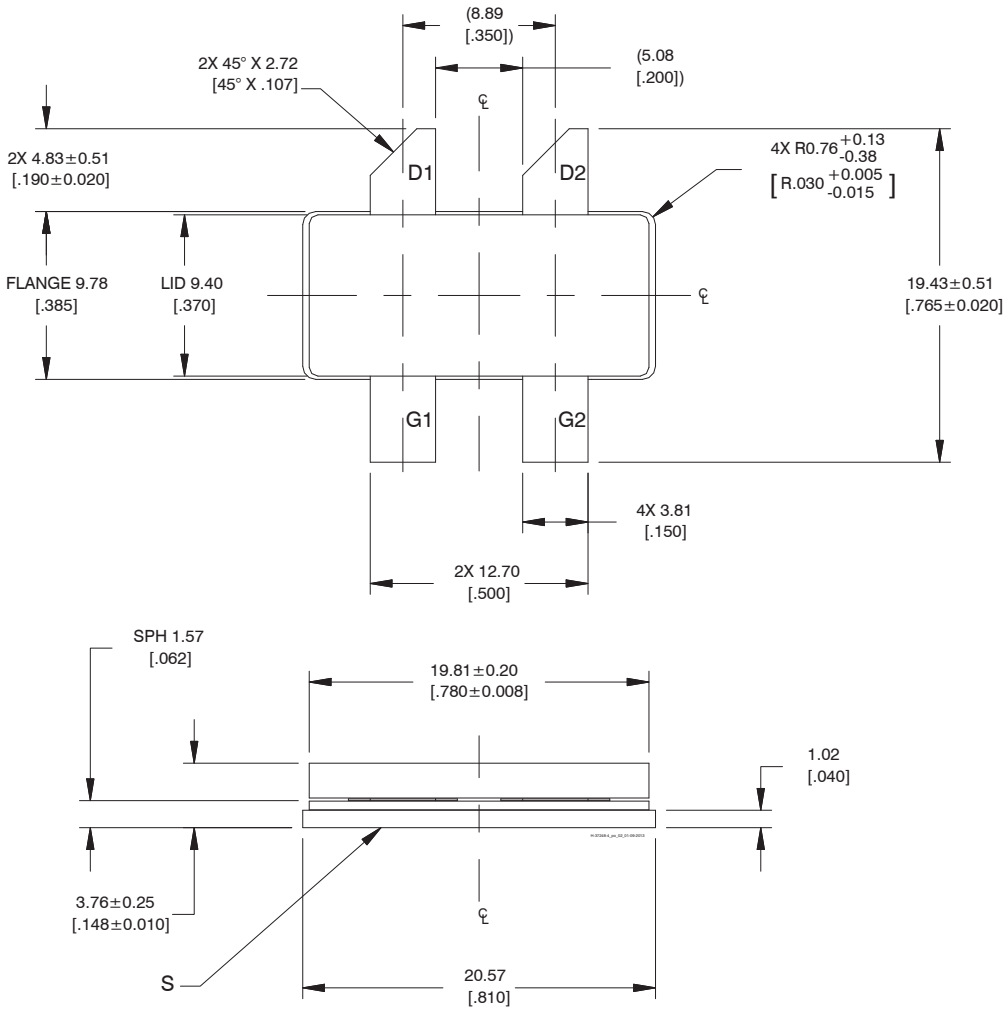



Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D1, D2 – drains; G1, G2 – gates; S – source.
5. Lead thickness: 0.10 + 0.076/–0.025 mm [0.004+0.003/–0.001 inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

*Find the latest and most complete information about products and packaging at the Infineon Internet page http://www.infineon.com/rfpower*

## Revision History

| Revision | Date | Data Sheet Type | Page | Subjects (major changes since last revision) |
|---|---|---|---|---|
| 01 | 2013-07-16 | Advance | All | Data Sheet reflects advance specification for product development |
| 02 | 2013-11-13 | Production | All | Data Sheet reflects released product specification |
| 02.1 | 2013-11-27 | Production | 1 | Revised ESD classification |
| 02.2 | 2014-05-14 | Production | 2 | Revised juntion temperature in Maximum Ratings table |
| 02.3 | 2016-06-21 | Production | 2 | Updated ordering information |

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**highpowerRF@infineon.com**

To request other information, contact us at:
+1 877 465 3667 (1-877-GO-LDMOS) USA
or +1 408 776 0600 International

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