

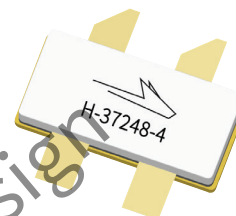
# PTAC240502FC

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

## Description

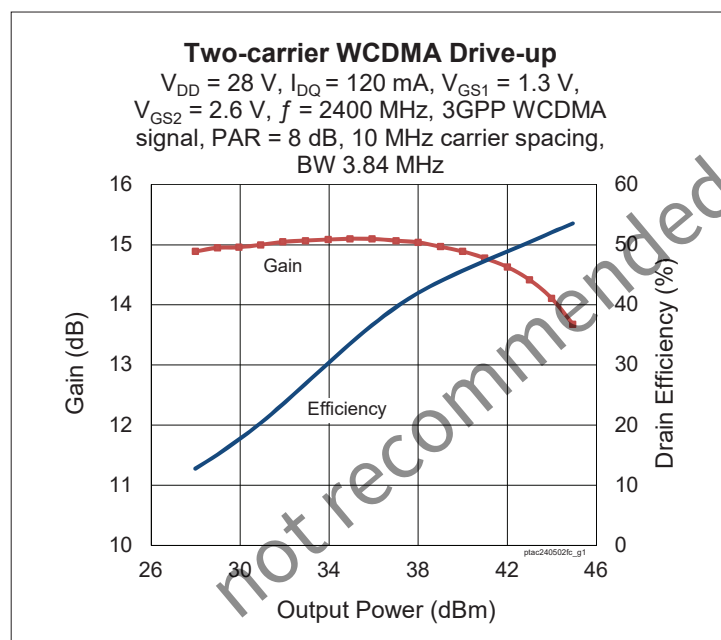
The PTAC240502FC is a 47-watt LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 2300 to 2400 MHz frequency band. Features include dual-path design, input matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Wolfspeed'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  $\mu$ s pulse width, 10% duty cycle, Doherty Configuration
  - Output power at P1dB = 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 Wolfspeed Doherty test fixture)

$V_{DD} = 28$  V,  $I_{DQ} = 120$  mA,  $P_{OUT} = 10$  W avg,  $V_{GS1} = 1.3$  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  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

## DC Characteristics

| Characteristic                 | Conditions                                              | Symbol        | Min | Typ | Max | Unit          |
|--------------------------------|---------------------------------------------------------|---------------|-----|-----|-----|---------------|
| Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$         | $V_{(BR)DSS}$ | 65  | —   | —   | V             |
| Drain Leakage Current          | $V_{DS} = 28\text{ V}$ , $V_{GS} = 0\text{ V}$          | $I_{DSS}$     | —   | —   | 1   | $\mu\text{A}$ |
|                                | $V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$          | $I_{DSS}$     | —   | —   | 10  | $\mu\text{A}$ |
| On-State Resistance (main)     | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$        | $R_{DS(on)}$  | —   | 0.4 | —   | $\Omega$      |
|                                | (peak) $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$  | —   | 0.2 | —   | $\Omega$      |
| Operating Gate Voltage (main)  | $V_{DS} = 28\text{ V}$ , $I_{DQ} = 120\text{ mA}$       | $V_{GS}$      | 2.6 | 2.7 | 2.8 | V             |
|                                | (peak) $V_{DS} = 28\text{ V}$ , $I_{DQ} = 0\text{ mA}$  | $V_{GS}$      | 1.2 | 1.3 | 1.5 | V             |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$          | $I_{GSS}$     | —   | —   | 1   | $\mu\text{A}$ |

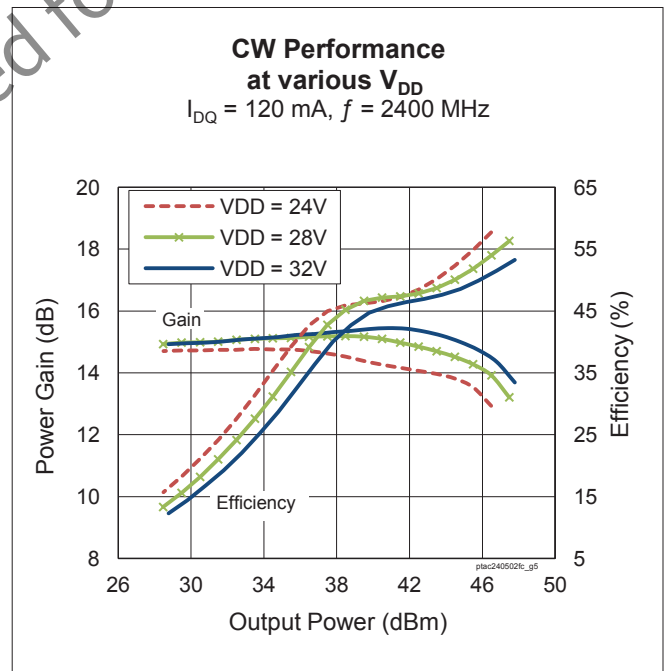
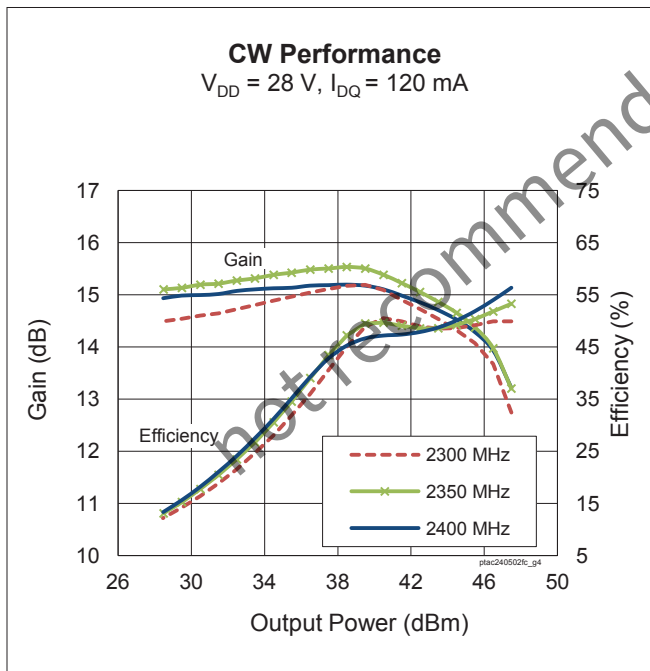
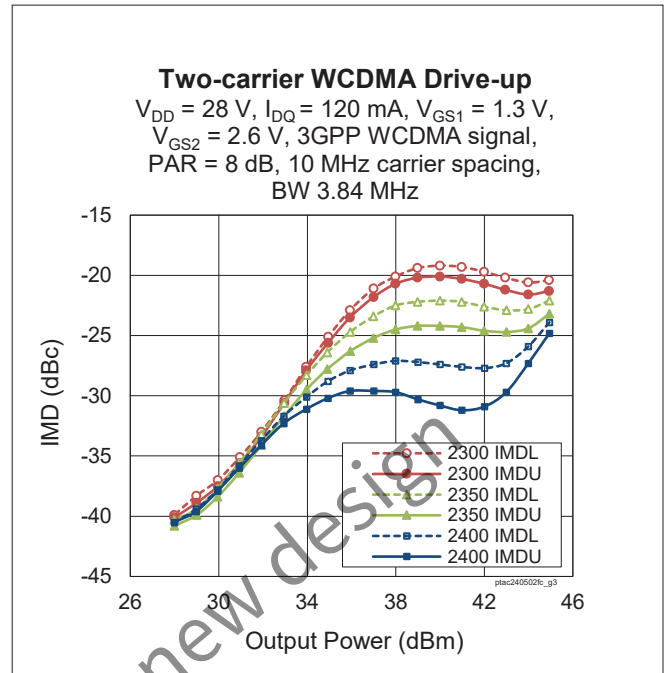
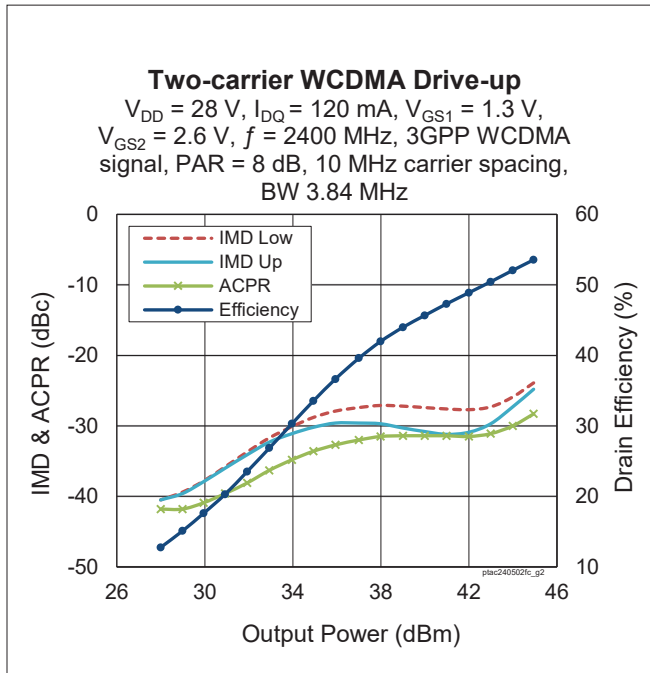
## Maximum Ratings

| 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         | $^{\circ}\text{C}$   |
| Storage Temperature Range                                       | $T_{STG}$       | -65 to +150 | $^{\circ}\text{C}$   |
| Thermal Resistance ( $T_{CASE} = 60^{\circ}\text{C}$ , 50 W CW) | $R_{\theta JC}$ | 1.29        | $^{\circ}\text{C/W}$ |

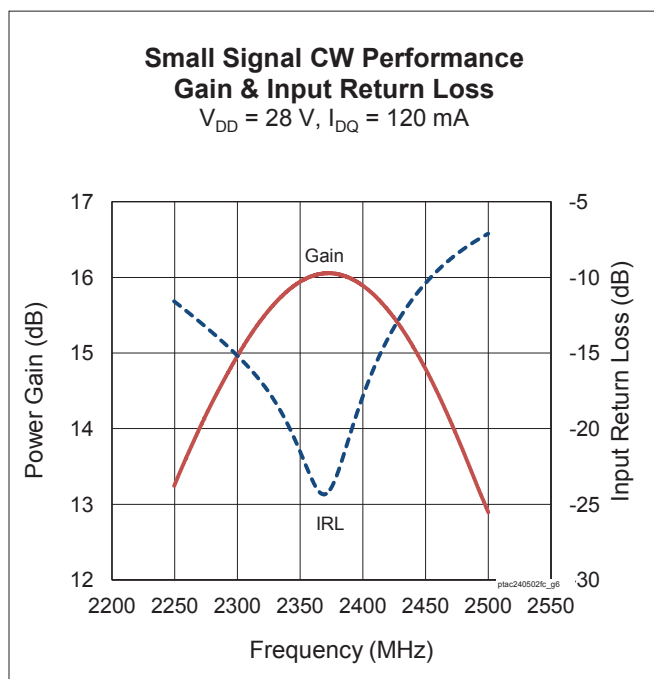
## Ordering Information

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

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



## Typical Performance (cont.)



## Load Pull Performance

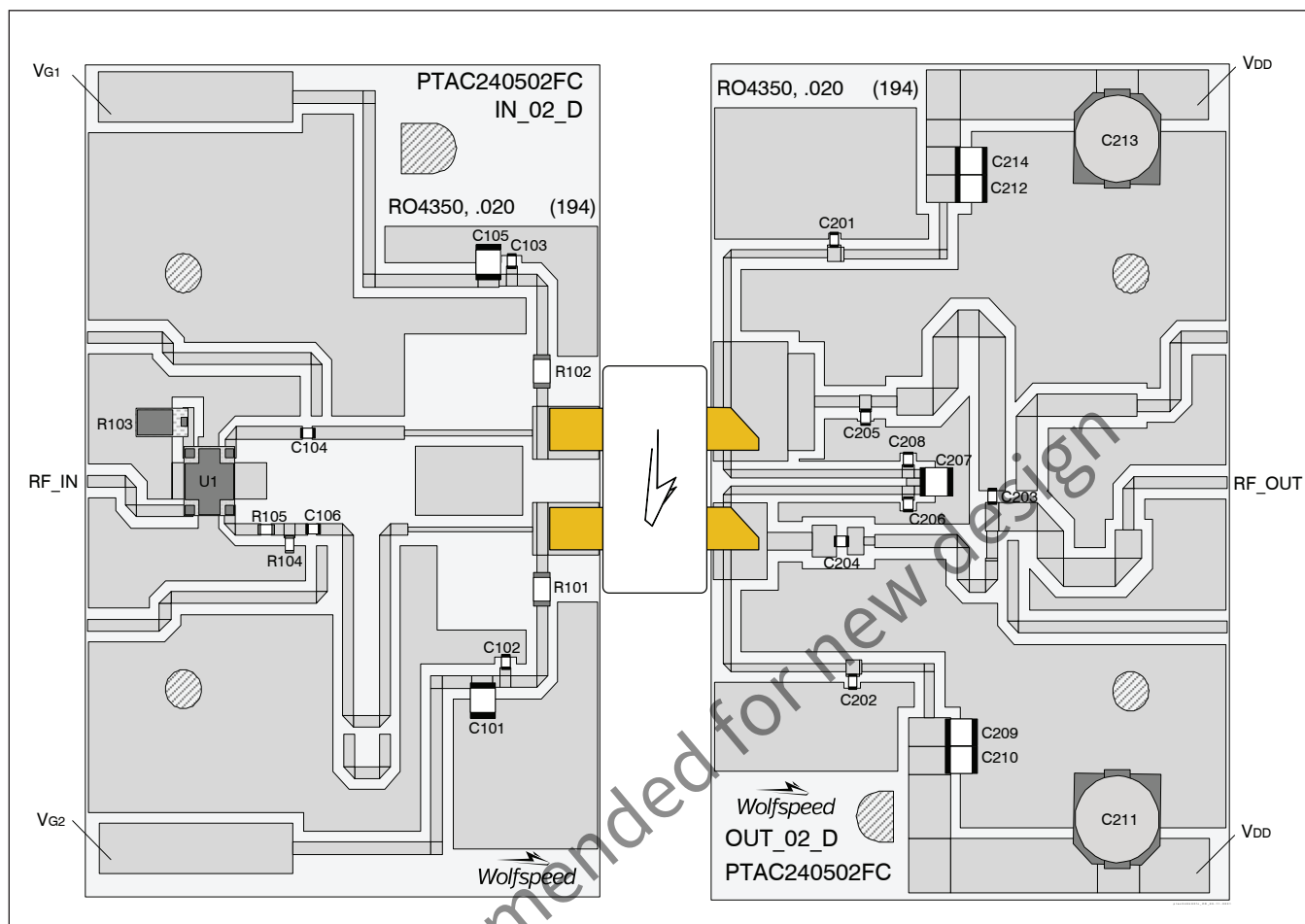
**Main Side Load Pull Performance** – Pulsed CW signal: 160  $\mu\text{s}$ , 10% duty cycle, 28 V, 114 mA

|            |                    | P <sub>1dB</sub>   |           |                        |                      |         |                    |           |                        |                      |         |
|------------|--------------------|--------------------|-----------|------------------------|----------------------|---------|--------------------|-----------|------------------------|----------------------|---------|
|            |                    | Max Output Power   |           |                        |                      |         | Max PAE            |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [Ω] | Z <sub>L</sub> [Ω] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>L</sub> [Ω] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [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  $\mu\text{s}$ , 10% duty cycle, 28 V, 252 mA

|            |                    | P <sub>1dB</sub>   |           |                        |                      |         |                    |           |                        |                      |         |
|------------|--------------------|--------------------|-----------|------------------------|----------------------|---------|--------------------|-----------|------------------------|----------------------|---------|
|            |                    | Max Output Power   |           |                        |                      |         | Max PAE            |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [Ω] | Z <sub>L</sub> [Ω] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>L</sub> [Ω] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [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

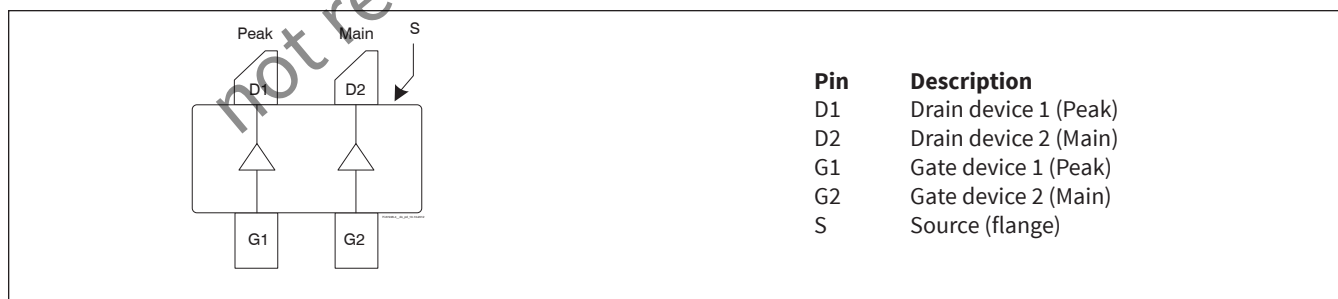


**Reference Circuit** (cont.)**Reference Circuit Assembly**

|                                                                                                                                     |                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| DUT                                                                                                                                 | PTAC240502FC V1                                                                                 |
| Test Fixture Part No.                                                                                                               | LTA/PTAC240502FC-V1                                                                             |
| PCB                                                                                                                                 | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 2300 - 2400$ MHz |
| Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a> |                                                                                                 |

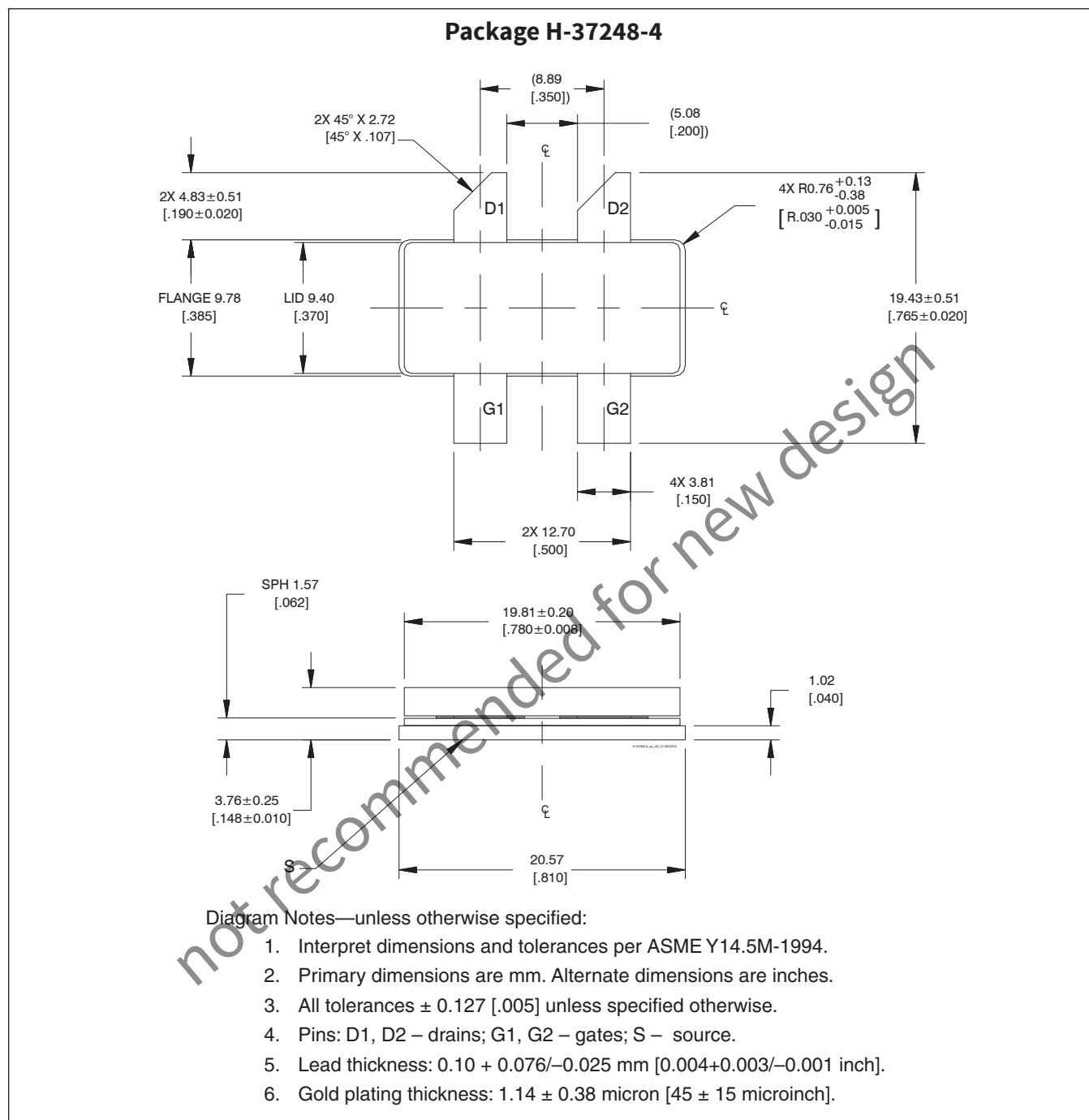
**Components Information**

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

**Pinout Diagram** (top view)

Lead connections for PTAC240502FC

## Package Outline Specifications



## 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 junction temperature in Maximum Ratings table             |
| 02.3     | 2016-06-21 | Production      | 2    | Updated ordering information                                      |
| 03       | 2018-07-02 | Production      | All  | Converted to Wolfspeed Data Sheet                                 |
| 03.1     | 2019-10-31 | Production      | 1, 3 | Corrected Vgs1 and Vgs2                                           |
| 03.2     | 2021-03-11 | Production      | 5    | Updated reference circuit revision number                         |

For more information, please contact:

4600 Silicon Drive  
Durham, North Carolina, USA 27703  
[www.wolfspeed.com/rf](http://www.wolfspeed.com/rf)

Sales Contact  
[rfsales@cree.com](mailto:rfsales@cree.com)

## Notes & Disclaimer

Specifications are subject to change without notice. "Typical" parameters are the average values expected by Cree in large quantities and are provided for information purposes only. Cree products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. No responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from use of the information contained herein. No license is granted by implication or otherwise under any patent or patent rights of Cree.

© 2018 - 2021 Cree, Inc. All rights reserved. Wolfspeed® and the Wolfspeed logo are registered trademarks of Cree, Inc.