

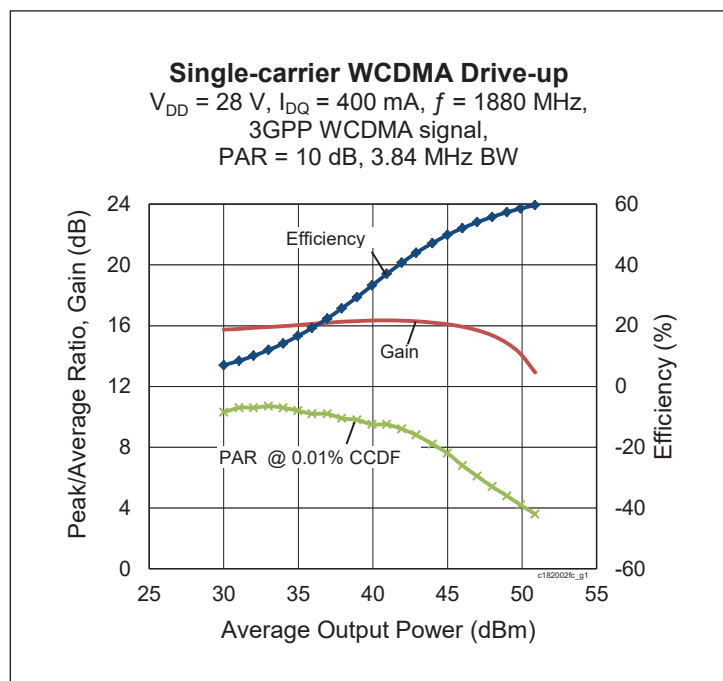
# PXAC182002FC

## Thermally-Enhanced High Power RF LDMOS FET 180 W, 28 V, 1805 – 1880 MHz

### Description

The PXAC182002FC is a 180-watt LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 1805 to 1880 MHz frequency band. Features include dual-path design, input and output 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.

PXAC182002FC  
Package H-37248-4



### Features

- Broadband internal input and output matching
- Asymmetrical Doherty design
  - Main: 70 W Typ ( $P_{1dB}$ )
  - Peak: 110 W Typ ( $P_{1dB}$ )
- Typical pulsed CW performance, 1880 MHz, 28 V, combined outputs
  - Output power at  $P_{3dB} = 194\text{ W}$
  - Efficiency = 64%
  - Gain = 14 dB
- Capable of handling 10:1 VSWR @ 28 V, 110 W (CW) output power
- Integrated ESD protection
- Human Body Model Class 1C (per ANSI/ESDA/ JEDEC/JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

### RF Characteristics

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

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 400\text{ mA}$ ,  $V_{GSPEAK} = 1.1\text{ V}$ ,  $P_{OUT} = 28.2\text{ W avg}$ ,  $f = 1880\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

| Characteristic               | Symbol   | Min  | Typ  | Max | Unit |
|------------------------------|----------|------|------|-----|------|
| Gain                         | $G_{ps}$ | 15.5 | 16.5 | —   | dB   |
| Drain Efficiency             | $\eta_D$ | 48.5 | 51   | —   | %    |
| Adjacent Channel Power Ratio | ACPR     | —    | -30  | -26 | dBc  |

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

**DC Characteristics** (each side)

| 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          | $V_{DS} = 28\text{ V}$ , $V_{GS} = 0\text{ V}$          | $I_{DSS}$     | —    | —     | 0.1  | $\mu\text{A}$ |
|                                | $V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$          | $I_{DSS}$     | —    | —     | 1.0  | $\mu\text{A}$ |
| On-State Resistance (main)     | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$        | $R_{DS(on)}$  | —    | 0.18  | —    | $\Omega$      |
|                                | (peak) $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$  | —    | 0.135 | —    | $\Omega$      |
| Operating Gate Voltage (main)  | $V_{DS} = 28\text{ V}$ , $I_{DQ} = 400\text{ mA}$       | $V_{GS}$      | 2.55 | 2.65  | 2.75 | V             |
|                                | (peak) $V_{DS} = 28\text{ V}$ , $I_{DQ} = 0\text{ A}$   | $V_{GS}$      | 0.9  | 1.2   | 1.3  | V             |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$          | $I_{GSS}$     | —    | —     | 0.1  | $\mu\text{A}$ |

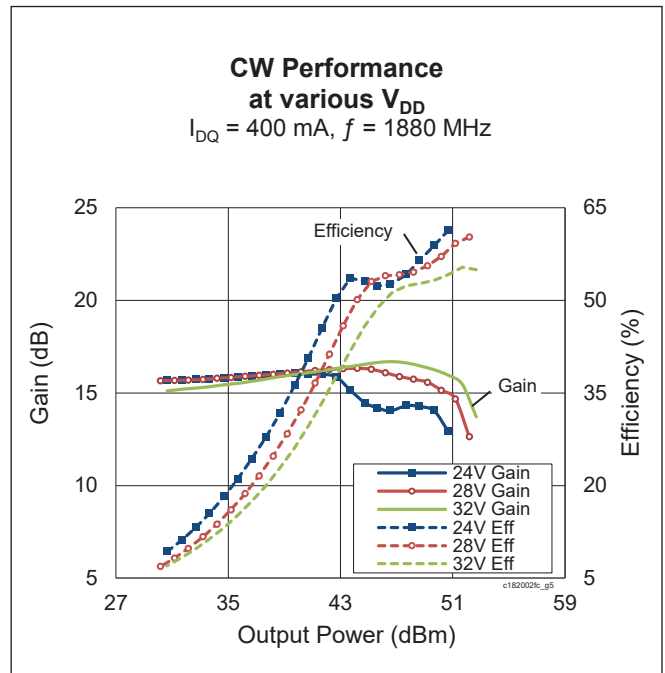
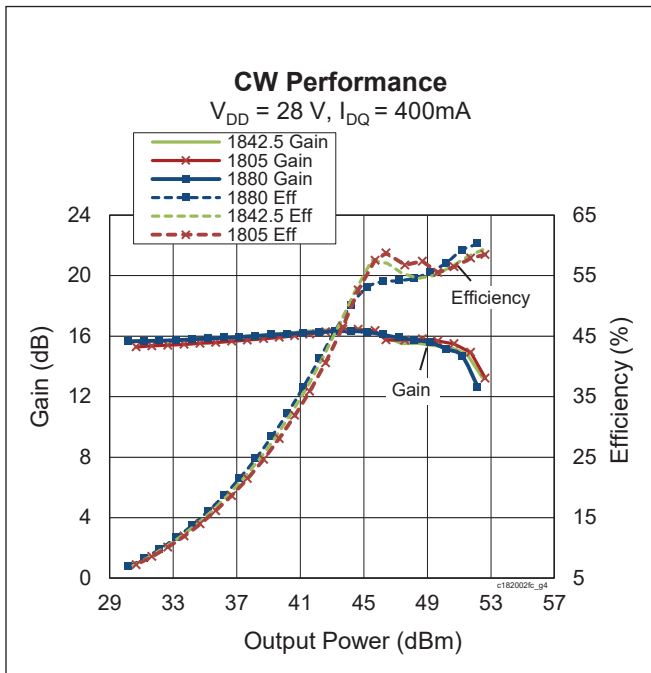
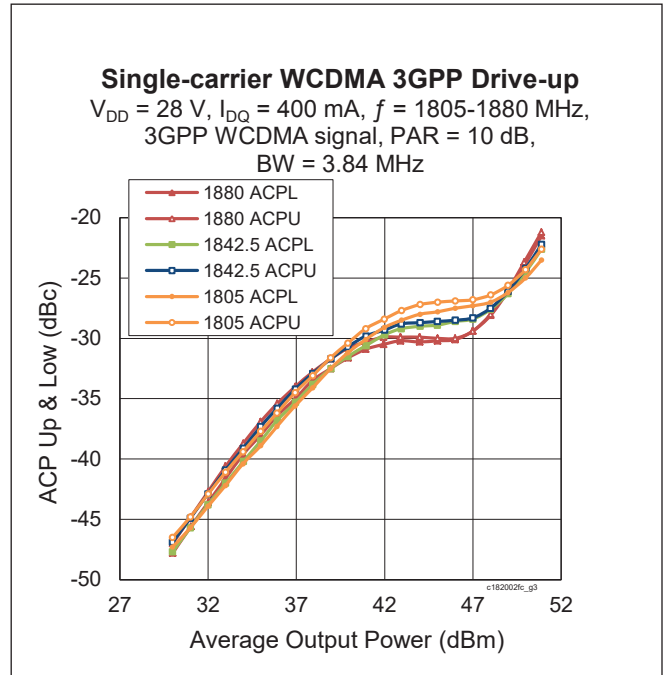
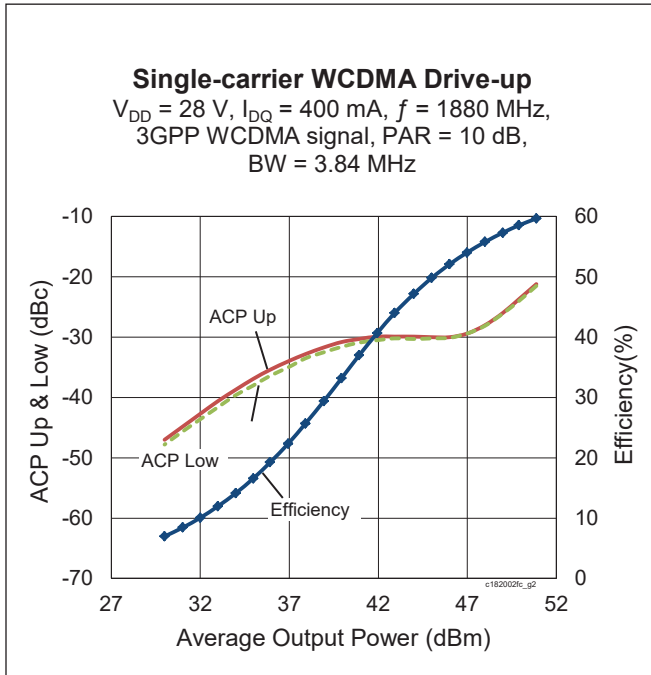
**Maximum Ratings**

| 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 (main, $T_{CASE} = 70^{\circ}\text{C}$ , 28 W CW) | $R_{\theta JC}$                                    | 1.088           | $^{\circ}\text{C}/\text{W}$ |
|  | (peak, $T_{CASE} = 70^{\circ}\text{C}$ , 100 W CW) | $R_{\theta JC}$ | 0.587                       |

**Ordering Information**

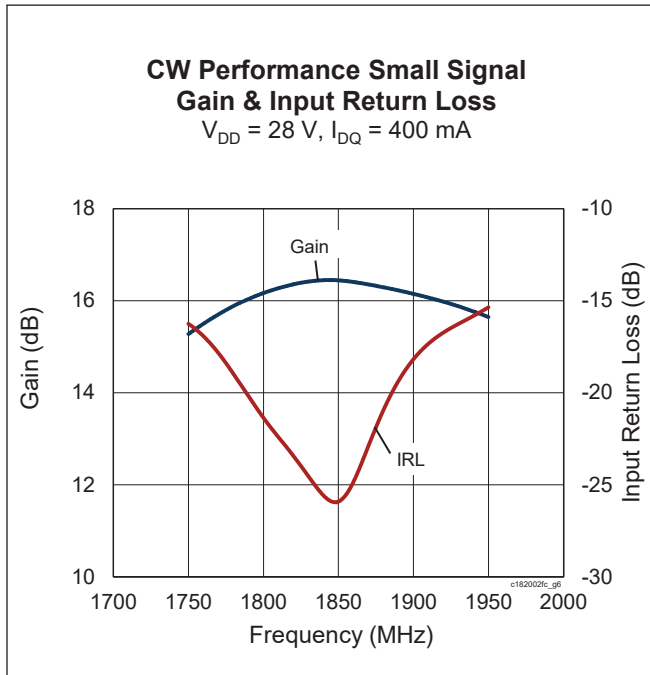
| Type and Version     | Order Code           | Package Description       | Shipping             |
|----------------------|----------------------|---------------------------|----------------------|
| PXAC182002FC V1 R0   | PXAC182002FC-V1-R0   | H-37248-4, earless flange | Tape & Reel, 50 pcs  |
| PXAC182002FC V1 R250 | PXAC182002FC-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**

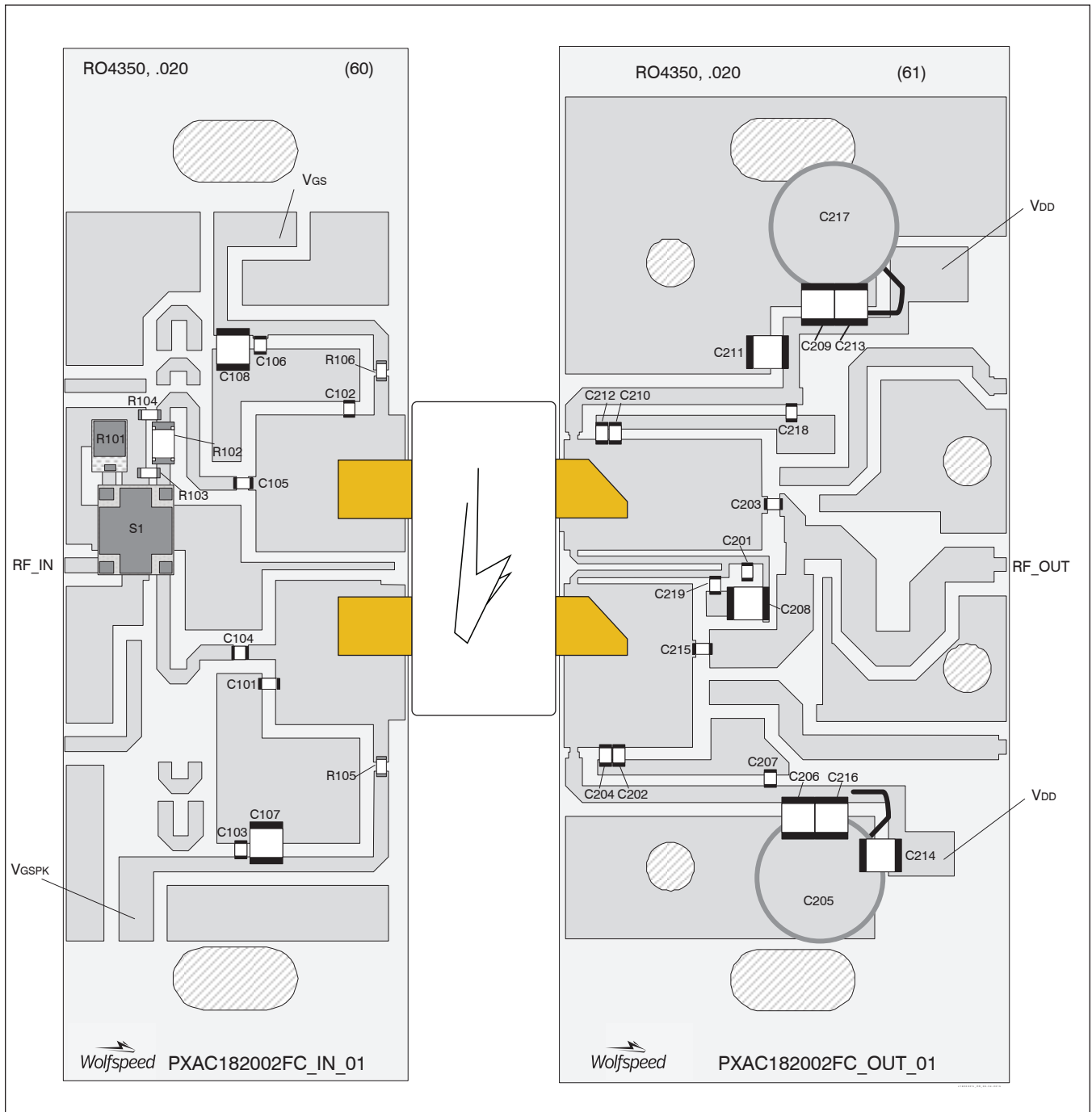
**Main Side Load Pull Performance** – Pulsed CW signal: 160  $\mu\text{s}$ , 10% duty cycle, 28 V,  $I_{DQ} = 405\text{ mA}$

|                   |  | <b>P<sub>1dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>OUT</sub> [dBm]</b> | <b>P<sub>OUT</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>OUT</sub> [dBm]</b> | <b>P<sub>OUT</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 1810              | 3.94 – j10.15                              | 2.92 – j5.27                               | 19.2             | 49.4                         | 86                         | 54.0                           | 6.49 – j2.19                               | 21.9             | 47.2                         | 52                         | 66.6                           |
| 1840              | 5.13 – j10.93                              | 2.93 – j4.16                               | 19.5             | 49.3                         | 85                         | 57.6                           | 5.82 – j2.44                               | 21.7             | 47.5                         | 56                         | 66.3                           |
| 1880              | 5.90 – j12.44                              | 2.73 – j5.17                               | 19.2             | 49.5                         | 89                         | 55.2                           | 4.53 – j2.29                               | 21.5             | 47.7                         | 59                         | 67.9                           |

**Peak Side Load Pull Performance** – Pulsed CW signal: 160  $\mu\text{s}$ , 10% duty cycle, 28 V,  $I_{DQ} = 685\text{ mA}$

|                   |  | <b>P<sub>1dB</sub></b>                     |                  |                              |                            |                                |  |                  |                              |                            |                                |
|-------------------|--|--|------------------|------------------------------|----------------------------|--------------------------------|--|------------------|------------------------------|----------------------------|--------------------------------|
|                   |  | <b>Max Output Power</b>                    |                  |                              |                            |                                | <b>Max Drain Efficiency</b>                |                  |                              |                            |                                |
| <b>Freq [MHz]</b> | <b>Z<sub>s</sub> [<math>\Omega</math>]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>OUT</sub> [dBm]</b> | <b>P<sub>OUT</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> | <b>Z<sub>l</sub> [<math>\Omega</math>]</b> | <b>Gain [dB]</b> | <b>P<sub>OUT</sub> [dBm]</b> | <b>P<sub>OUT</sub> [W]</b> | <b><math>\eta_D</math> [%]</b> |
| 1810              | 3.71 – j9.13                               | 4.64 – j5.44                               | 20.5             | 50.9                         | 123                        | 55.5                           | 3.52 – j2.84                               | 22.7             | 49.7                         | 94                         | 66.2                           |
| 1840              | 4.76 – j8.65                               | 4.66 – j5.68                               | 20.6             | 50.7                         | 117                        | 54.5                           | 3.39 – j3.01                               | 23.2             | 49.2                         | 84                         | 64.1                           |
| 1880              | 6.40 – j9.13                               | 4.63 – j5.74                               | 20.8             | 50.7                         | 116                        | 54.3                           | 2.83 – j3.50                               | 23.1             | 49.2                         | 83                         | 64.3                           |

### Reference Circuit , 1805 – 1880 MHz



Reference circuit assembly diagram (not to scale)



**Reference Circuit** (cont.)

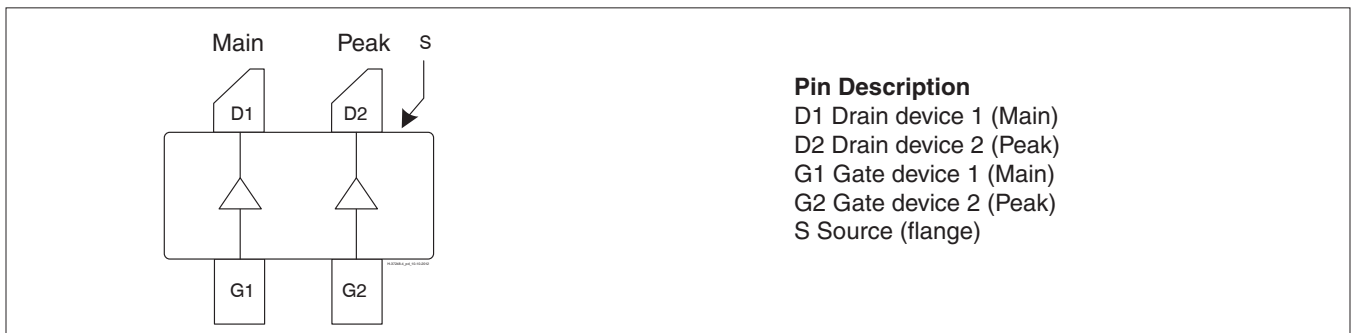
**Reference Circuit Assembly**

|   |   |
|---|---|
| DUT   | PXAC182002FC V1   |
| Test Fixture Part No.   | LTA/PXAC182002FC V1   |
| PCB   | Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 1805 - 1880$ 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**

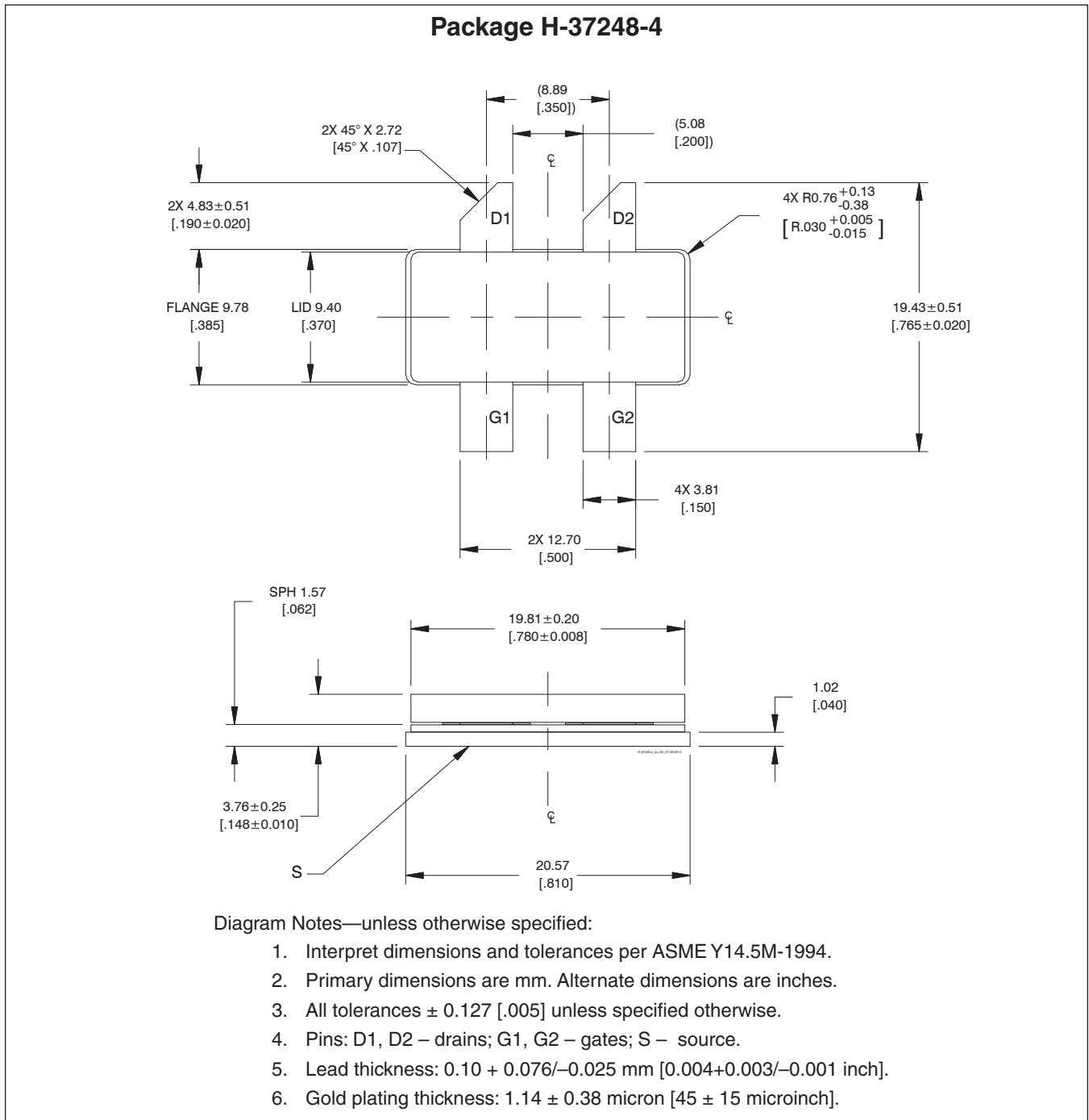
| Component                                | Description            | Manufacturer                    | P/N               |
|--|------------------------|---------------------------------|-------------------|
| <b>Input</b>                             |                        |                                 |                   |
| C101                                     | Capacitor, 1.2 pF      | ATC                             | ATC600F1R2CW250T  |
| C102                                     | Capacitor, 0.5 pF      | ATC                             | ATC600F0R5CW250T  |
| C103, C104, C105, C106                   | Capacitor, 18 pF       | ATC                             | ATC600F180JW250T  |
| C107, C108                               | Capacitor, 10 $\mu$ F  | Taiyo Yuden                     | UMK325C7106MM-T   |
| R101                                     | Resistor, 50 $\Omega$  | Richardson                      | C8A50Z4A          |
| R102                                     | Resistor, 18 ohms      | Panasonic Electronic Components | ERJ-8GEYJ180V     |
| R103, R104                               | Resistor, 301 $\Omega$ | Venkel                          | CR0603-16W-3010FT |
| R105, R106                               | Resistor, 10 $\Omega$  | Panasonic Electronic Components | ERJ-3GEYJ100V     |
| S1                                       | Hybrid Coupler         | Anaren                          | X3C19P1-03S       |
| <b>Output</b>                            |                        |                                 |                   |
| C201, C207, C215, C218, C219             | Capacitor, 18 pF       | ATC                             | ATC600F180JW250T  |
| C202                                     | Capacitor, 0.8 pF      | ATC                             | ATC600F0R8AW250T  |
| C203                                     | Capacitor, 5.1 pF      | ATC                             | ATC600F5R1AW250T  |
| C204                                     | Capacitor, 1.6 pF      | ATC                             | ATC600F1R6AW250T  |
| C205, C217                               | Capacitor, 220 $\mu$ F | Cornell Dubilier Electronics    | SK221M050ST       |
| C206, C208, C209, C211, C213, C214, C216 | Capacitor, 10 $\mu$ F  | Taiyo Yuden                     | UMK325C7106MM-T   |
| C210                                     | Capacitor, 0.5 pF      | ATC                             | ATC600F0R5AW250T  |
| C212                                     | Capacitor, 1.6 pF      | ATC                             | ATC600F1R6AW250T  |

**Pinout Diagram** (top view)



Lead connections for PXAC182002FC

Package Outline Specifications



## Revision History

| Revision | Date       | Data Sheet Type | Page       | Subjects (major changes since last revision)  |
|----------|------------|-----------------|------------|---|
| 01       | 2014-09-23 | Advance         | All        | Data Sheet reflects advance specification for product development   |
| 02       | 2015-03-24 | Production      | All<br>All | Data Sheet reflects released product specification<br>Revised all data and includes updated final specs, typical performance graphs, loadpull, reference circuit, package outline |
| 02.1     | 2015-05-20 | Production      | 1          | Updated single-carrier WCDMA test spec  |
| 02.2     | 2015-06-05 | Production      | 1          | Corrected I/O in description paragraph, removed $f_1$ from single-carrier WCDMA test spec condition   |
| 02.3     | 2016-06-17 | Production      | 1, 2       | Updated ESD rating and ordering information to include R0   |
| 03       | 2018-06-25 | Production      | All        | Converted to Wolfspeed Data Sheet   |

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## Notes

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