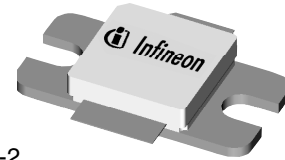


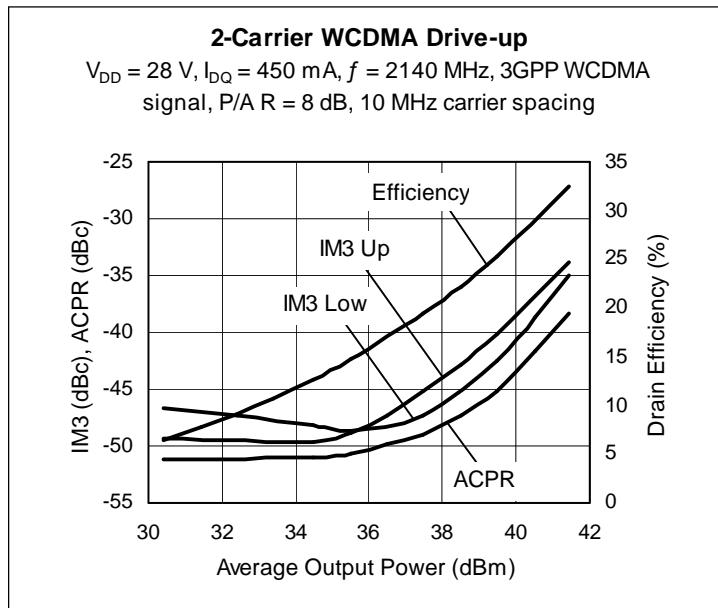
## Thermally-Enhanced High Power RF LDMOS FET 45 W, 2110 – 2170 MHz

### Description

The PTFA210451E is a thermally-enhanced, 45-watt, internally matched **GOLDMOS<sup>®</sup>** FET intended for WCDMA applications. It is characterized for single- and two-carrier WCDMA operation from 2110 to 2170 MHz. Thermally-enhanced packaging provides the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.



PTFA210451E  
Package H-30265-2



### Features

- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V
  - Average output power = 11 W
  - Linear Gain = 16.5 dB
  - Efficiency = 28.0%
  - Intermodulation distortion = -37 dBc
  - Adjacent channel power = -42 dBc
- Typical CW performance, 2170 MHz, 28 V
  - Output power at P-1dB = 60 W
  - Efficiency = 60%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 45 W (CW) output power
- Pb-free and RoHS compliant

### RF Characteristics

#### WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 450\text{ mA}$ ,  $P_{OUT} = 11\text{ W}$  average

$f_1 = 2135\text{ MHz}$ ,  $f_2 = 2145\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

| Characteristic             | Symbol   | Min  | Typ  | Max | Unit |
|----------------------------|----------|------|------|-----|------|
| Gain                       | $G_{ps}$ | 15.5 | 16.5 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | 27   | 28   | —   | %    |
| Intermodulation Distortion | IMD      | —    | -37  | -36 | dBc  |

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

**ESD:** Electrostatic discharge sensitive device—observe handling precautions!

**RF Characteristics** (cont.)

**CW Measurements** (tested in Infineon test fixture)

 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 450\text{ mA}$ ,  $P_{OUT} = 45\text{ W}$  average,  $f = 2170\text{ MHz}$ 

| Characteristic   | Symbol     | Min | Typ | Max | Unit |
|------------------|------------|-----|-----|-----|------|
| Gain Compression | $G_{comp}$ | —   | 0.5 | 1.0 | dB   |

**Two-Tone Measurements** (not subject to production test—verified by design/characterization in Infineon test fixture)

 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 450\text{ mA}$ ,  $P_{OUT} = 45\text{ W}$  PEP,  $f = 2140\text{ MHz}$ , tone spacing = 1 MHz

| Characteristic             | Symbol   | Min | Typ  | Max | Unit |
|----------------------------|----------|-----|------|-----|------|
| Gain                       | $G_{ps}$ | —   | 16.5 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | —   | 41   | —   | %    |
| Intermodulation Distortion | IMD      | —   | -31  | —   | dBc  |

**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          | $V_{DS} = 28\text{ V}$ , $V_{GS} = 0\text{ V}$    | $I_{DSS}$     | —   | —    | 1.0  | $\mu\text{A}$ |
|                                | $V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$    | $I_{DSS}$     | —   | —    | 10.0 | $\mu\text{A}$ |
| On-State Resistance            | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$  | $R_{DS(on)}$  | —   | 0.91 | —    | $\Omega$      |
| Operating Gate Voltage         | $V_{DS} = 28\text{ V}$ , $I_{DQ} = 450\text{ mA}$ | $V_{GS}$      | 2.0 | 2.5  | 3.0  | V             |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$    | $I_{GSS}$     | —   | —    | 1.0  | $\mu\text{A}$ |

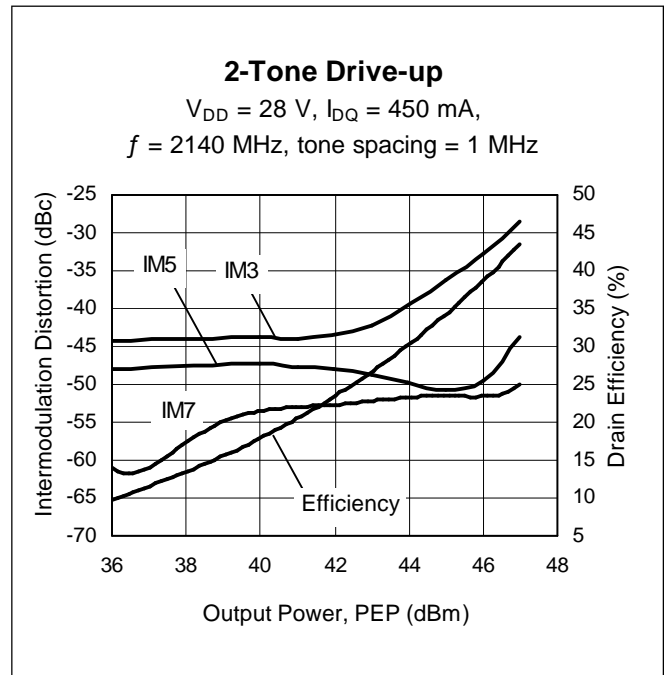
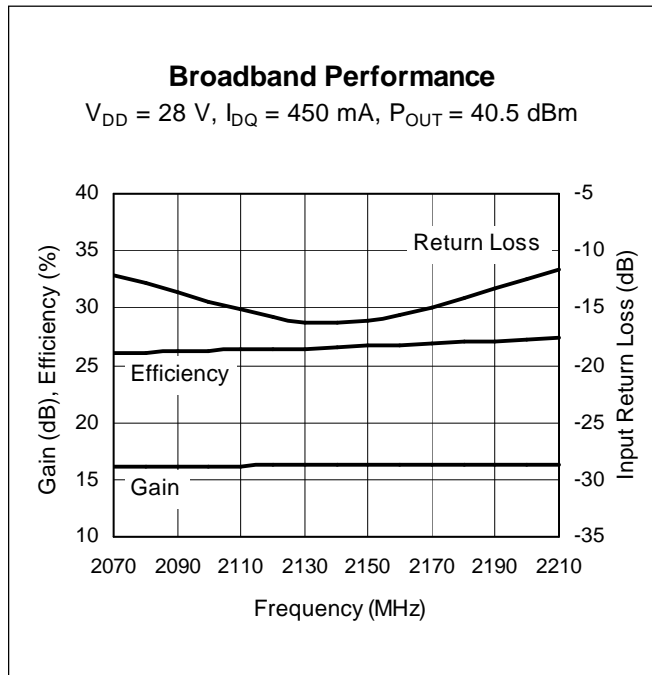
**Maximum Ratings**

| Parameter   | Symbol          | Value                                 | Unit                 |
|---|-----------------|---------------------------------------|----------------------|
| Drain-Source Voltage  | $V_{DSS}$       | 65                                    | V                    |
| Gate-Source Voltage   | $V_{GS}$        | -0.5 to +12                           | V                    |
| Junction Temperature  | $T_J$           | 200                                   | $^{\circ}\text{C}$   |
| Total Device Dissipation  | $P_D$           | 211                                   | W                    |
|   |                 | Above 25 $^{\circ}\text{C}$ derate by | 1.21                 |
| Storage Temperature Range                                       | $T_{STG}$       | -40 to +150                           | $^{\circ}\text{C}$   |
| Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 45 W CW) | $R_{\theta JC}$ | 0.83                                  | $^{\circ}\text{C/W}$ |

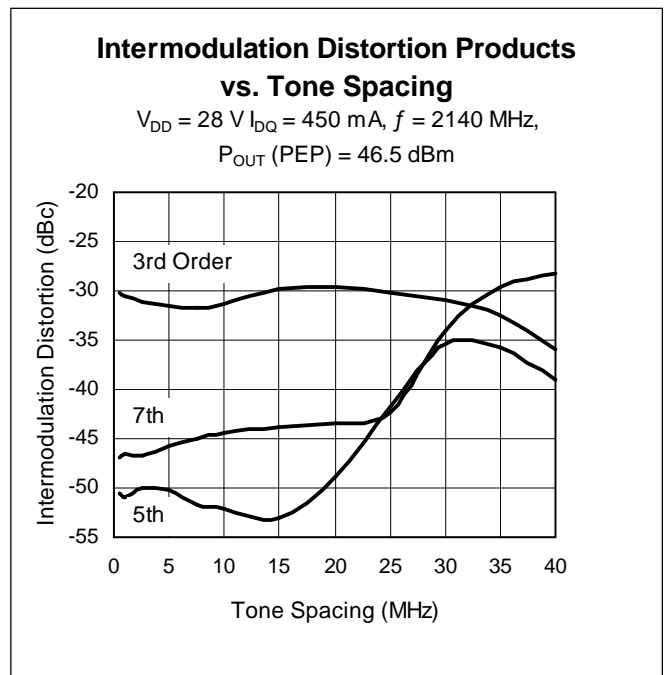
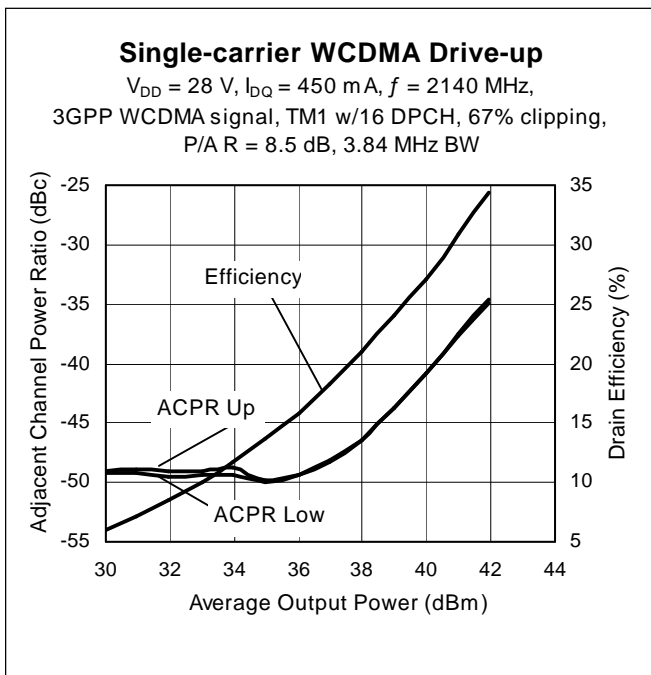
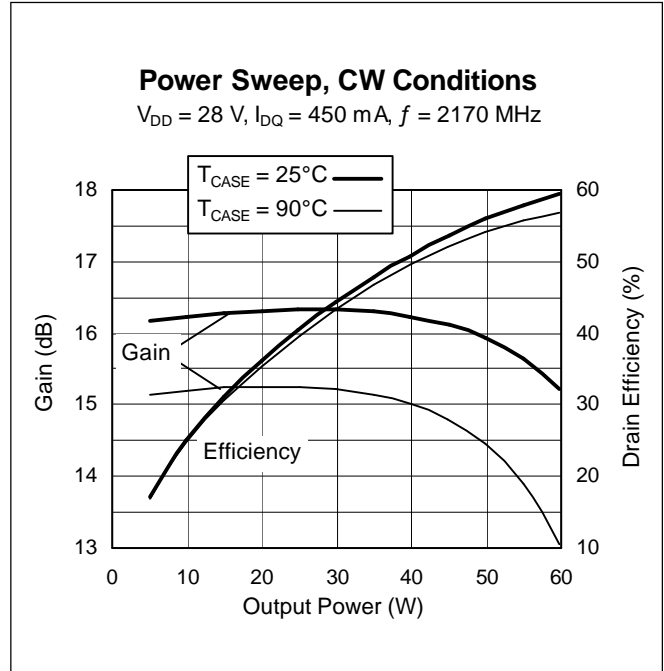
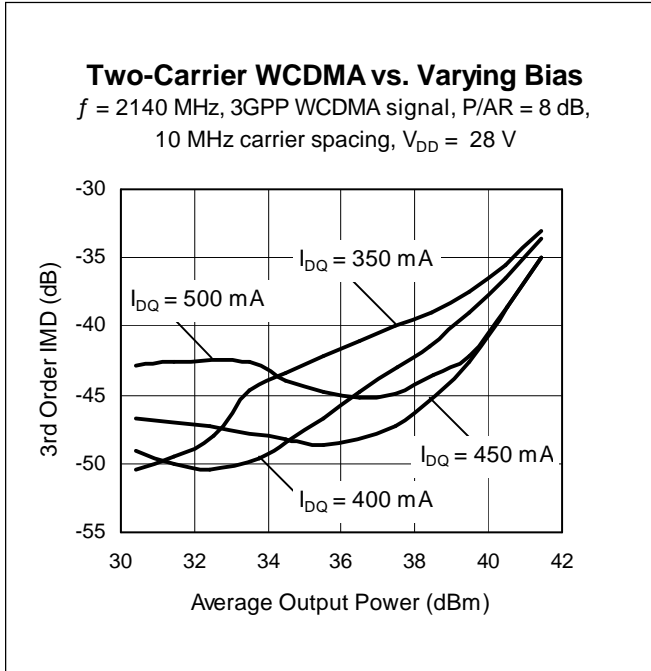
### Ordering Information

| Type and Version | Package Outline | Package Description                             | Marking     |
|------------------|-----------------|---|-------------|
| PTFA210451E V1   | H-30265-2       | Thermally-enhanced slotted flange, single-ended | PTFA210451E |

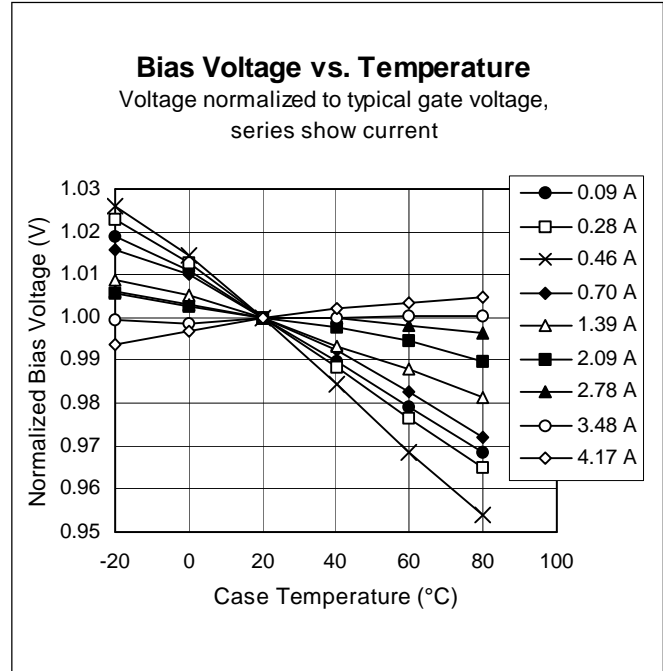
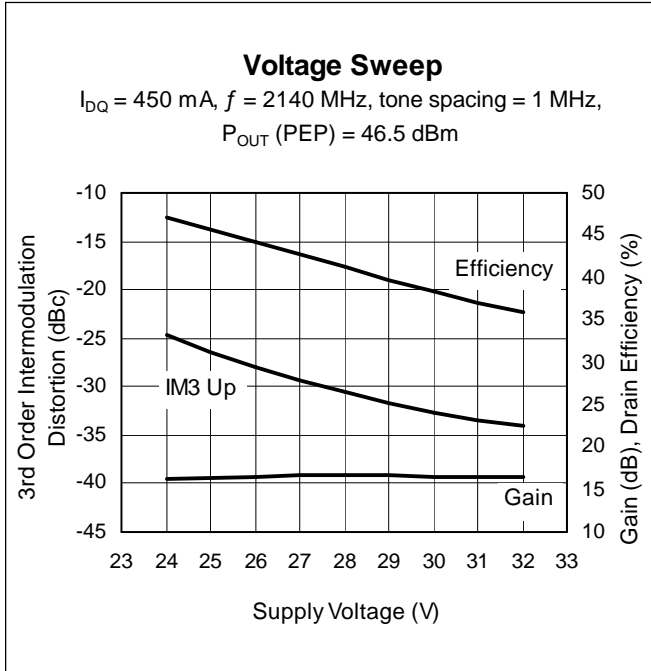
### Typical Performance (data taken in a production test fixture)



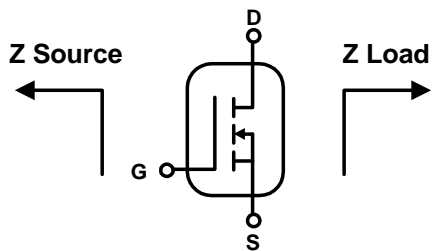
Typical Performance (cont.)



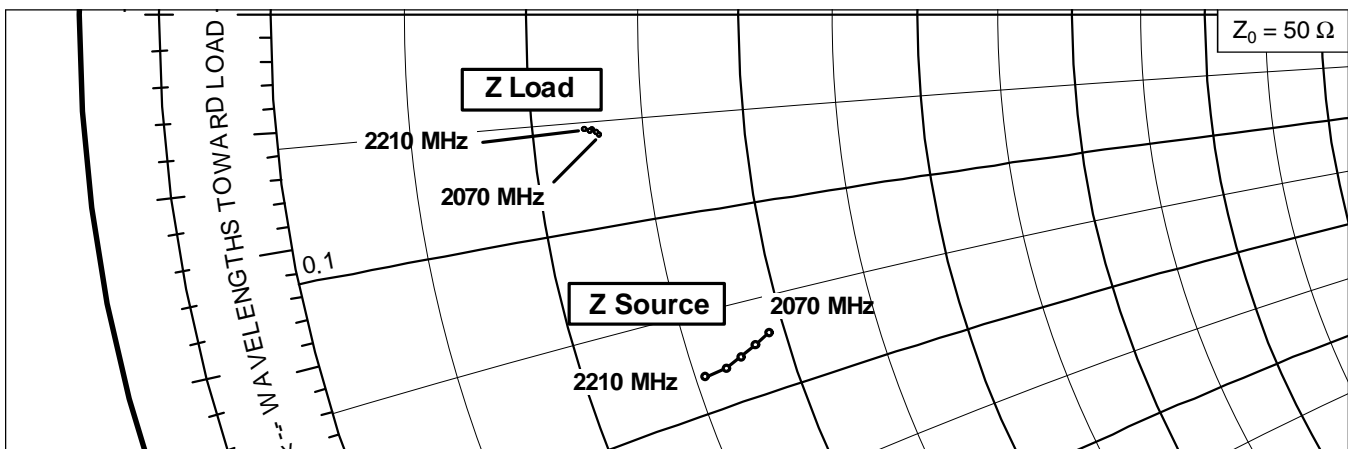
Typical Performance (cont.)



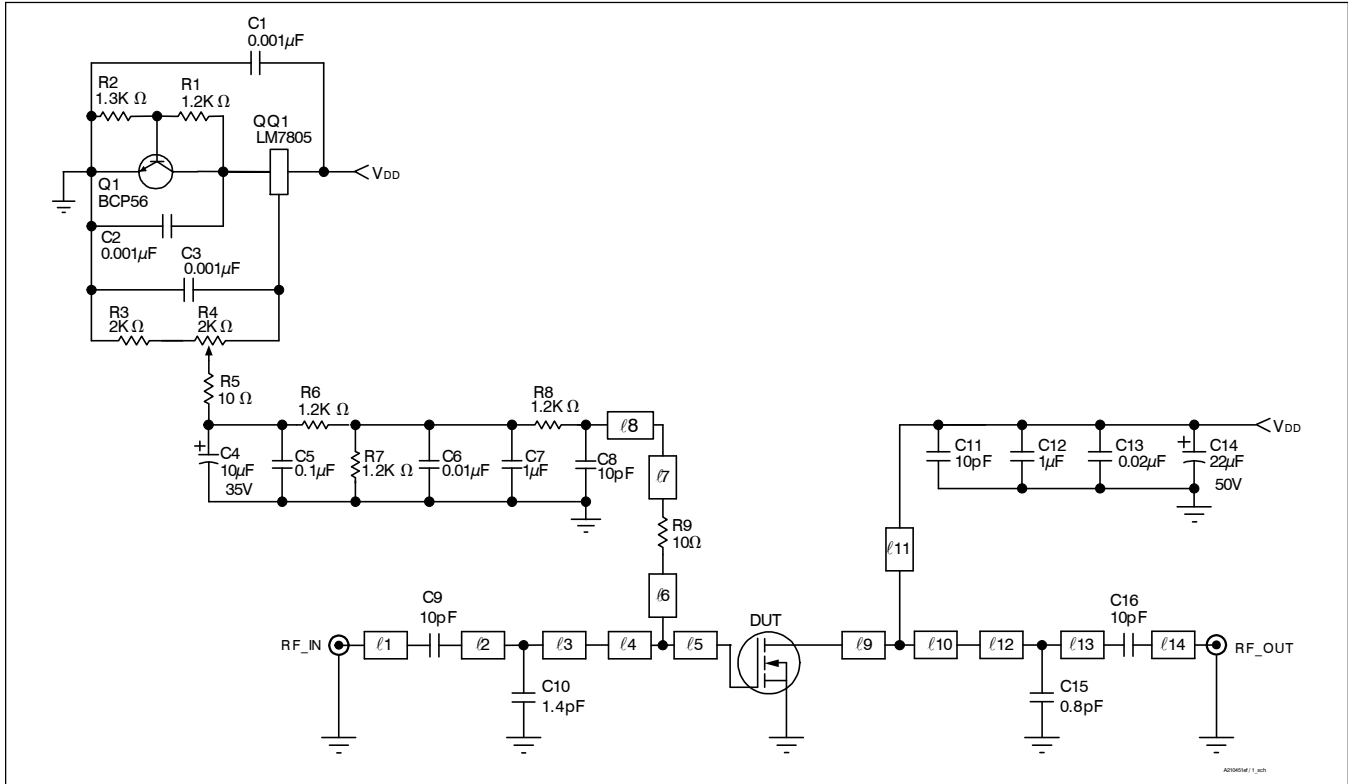
Broadband Circuit Impedance



| Frequency<br>MHz | Z Source W |       | Z Load W |       |
|------------------|------------|-------|----------|-------|
|                  | R          | jX    | R        | jX    |
| 2070             | 9.66       | -8.48 | 6.48     | -2.85 |
| 2110             | 9.17       | -8.73 | 6.41     | -2.76 |
| 2140             | 8.75       | -8.90 | 6.33     | -2.73 |
| 2170             | 8.29       | -9.08 | 6.28     | -2.73 |
| 2210             | 7.66       | -9.16 | 6.17     | -2.70 |



Reference Circuit



Reference circuit schematic for  $f = 2140 \text{ MHz}$

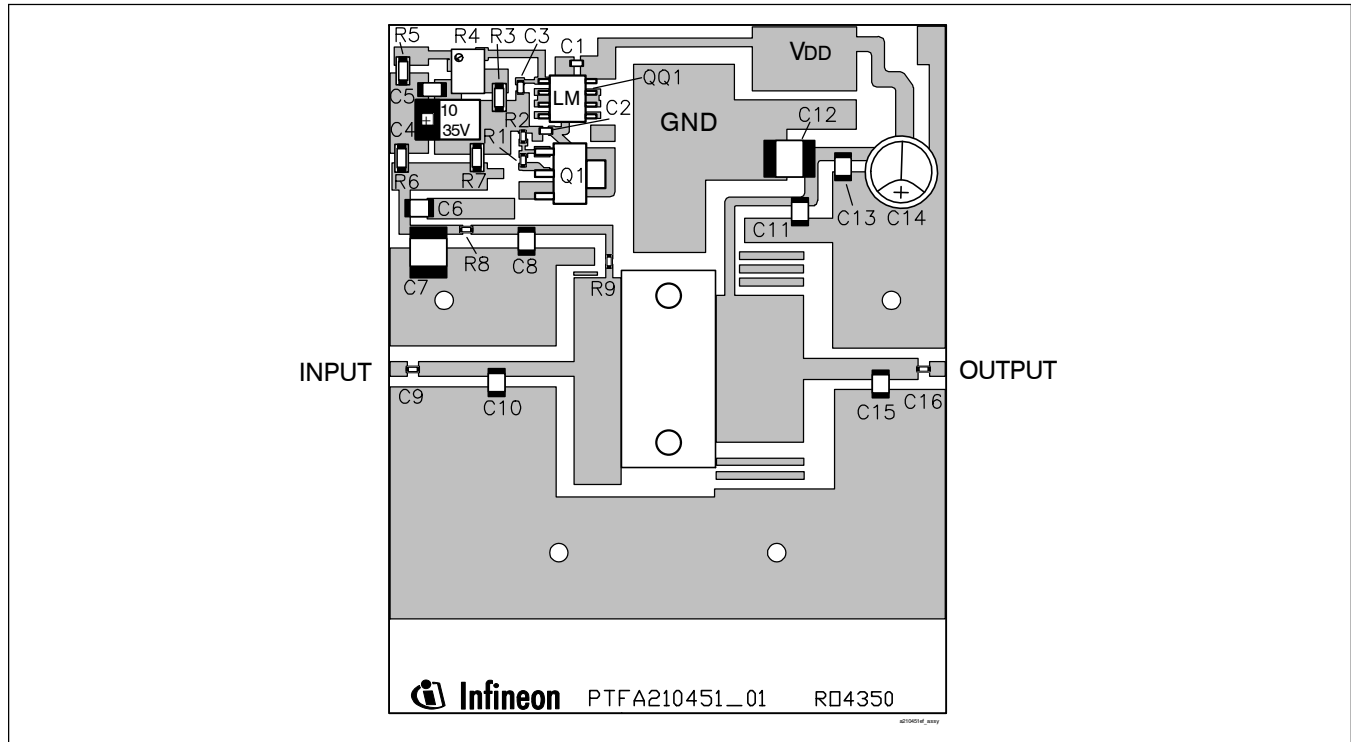
Circuit Assembly Information

|     |  |                  |              |
|-----|--|------------------|--------------|
| DUT | PTFA210451E                                | LDMOS Transistor |              |
| PCB | 0.76 mm [.030"] thick, $\epsilon_r = 3.48$ | Rogers 4350      | 1 oz. copper |

| Microstrip | Electrical Characteristics at 2140 MHz <sup>1</sup> | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|------------|---|------------------------|-------------------------|
| l1         | 0.026 $\lambda$ , 50.0 $\Omega$                     | 2.24 x 1.57            | 0.088 x 0.062           |
| l2         | 0.098 $\lambda$ , 50.0 $\Omega$                     | 8.33 x 1.57            | 0.328 x 0.062           |
| l3         | 0.108 $\lambda$ , 50.0 $\Omega$                     | 9.14 x 1.57            | 0.360 x 0.062           |
| l4         | 0.050 $\lambda$ , 6.2 $\Omega$                      | 3.84 x 22.86           | 0.151 x 0.900           |
| l5         | 0.017 $\lambda$ , 6.2 $\Omega$                      | 1.27 x 22.86           | 0.050 x 0.900           |
| l6         | 0.019 $\lambda$ , 80.0 $\Omega$                     | 1.65 x 0.69            | 0.065 x 0.027           |
| l7         | 0.033 $\lambda$ , 80.0 $\Omega$                     | 2.90 x 0.69            | 0.114 x 0.027           |
| l8         | 0.122 $\lambda$ , 66.0 $\Omega$                     | 10.49 x 1.02           | 0.413 x 0.040           |
| l9         | 0.017 $\lambda$ , 8.5 $\Omega$                      | 1.32 x 16.26           | 0.052 x 0.640           |
| l10        | 0.106 $\lambda$ , 8.5 $\Omega$                      | 8.18 x 16.26           | 0.322 x 0.640           |
| l11        | 0.220 $\lambda$ , 71.0 $\Omega$                     | 18.80 x 0.89           | 0.740 x 0.035           |
| l12        | 0.105 $\lambda$ , 40.0 $\Omega$                     | 8.76 x 2.39            | 0.345 x 0.094           |
| l13        | 0.046 $\lambda$ , 40.0 $\Omega$                     | 3.78 x 2.39            | 0.149 x 0.094           |
| l14        | 0.026 $\lambda$ , 50.0 $\Omega$                     | 2.18 x 1.57            | 0.086 x 0.062           |

<sup>1</sup>Electrical characteristics are rounded.

Reference Circuit (cont.)

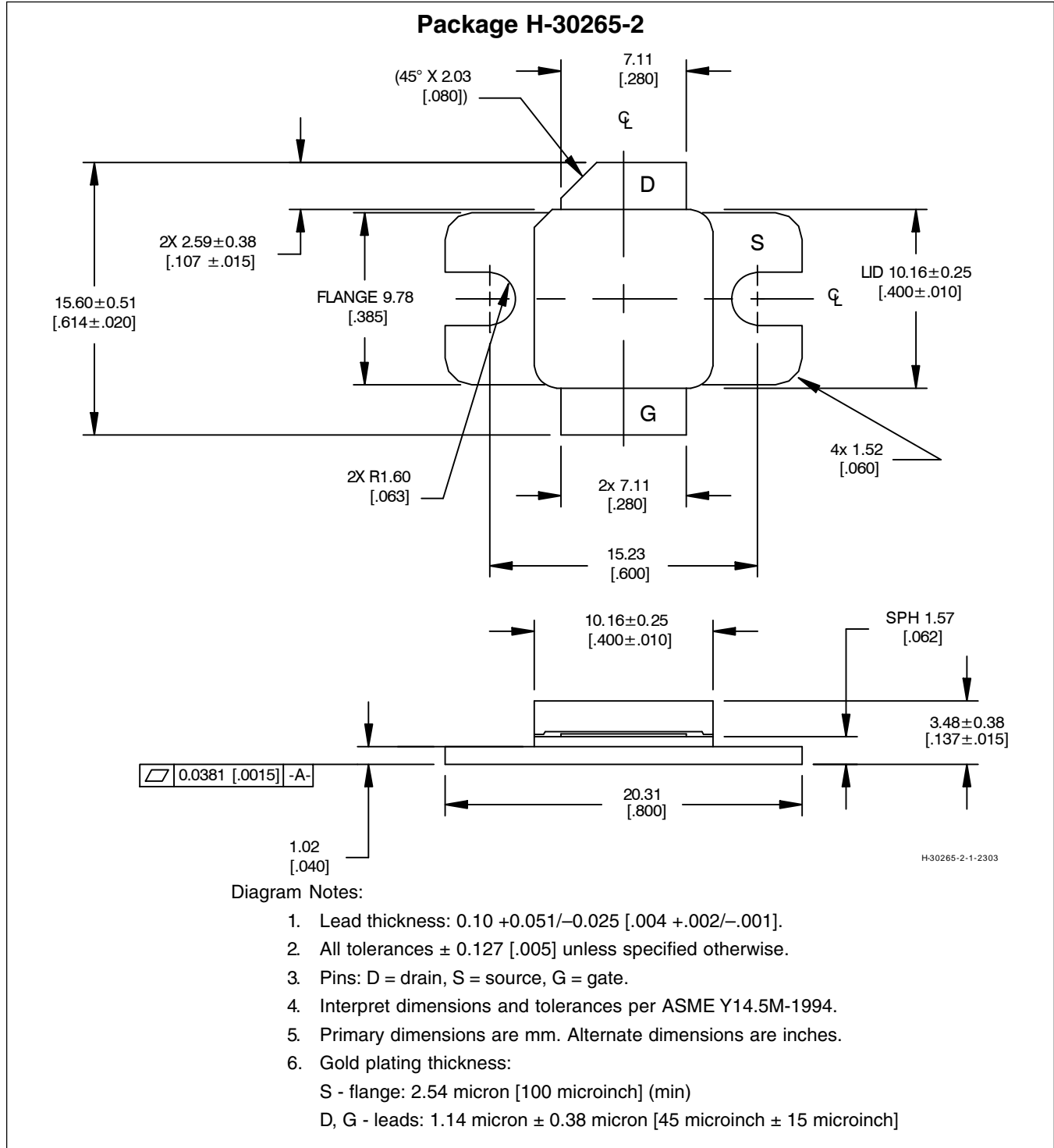


Reference circuit assembly diagram\* (not to scale)

| Component  | Description                         | Suggested Manufacturer | P/N or Comment  |
|------------|-------------------------------------|------------------------|-----------------|
| C1, C2, C3 | Capacitor, 0.001 $\mu$ F            | Digi-Key               | PCC1772CT-ND    |
| C4         | Tantalum capacitor 10 $\mu$ F, 35 V | Digi-Key               | PCS6106TR-ND    |
| C5         | Capacitor, 0.1 $\mu$ F              | Digi-Key               | P4525-ND        |
| C6         | Capacitor, 0.01 $\mu$ F             | ATC                    | 200B 103        |
| C7, C12    | Capacitor, 1 $\mu$ F                | ATC                    | 920C105         |
| C8, C11    | Ceramic capacitor 10 pF             | ATC                    | 100B 100        |
| C9, C16    | Ceramic capacitor 10 pF             | ATC                    | 100A 100        |
| C10        | Ceramic capacitor 1.4 pF            | ATC                    | 100B 1R4        |
| C13        | Capacitor, 0.02 $\mu$ F             | ATC                    | 100B 203        |
| C14        | Capacitor, 22 $\mu$ F, 50 V         | Digi-Key               | PCE3374CT-ND    |
| C15        | Ceramic capacitor 0.8 pF            | ATC                    | 100B 0R8        |
| Q1         | Transistor                          | Infineon               | BCP56           |
| QQ1        | Voltage regulator                   | National Semiconductor | LM7805          |
| R1, R8     | Chip resistor, 1.2 k-ohms           | Digi-Key               | P1.2KGCT-ND     |
| R2         | Chip resistor, 1.3 k-ohms           | Digi-Key               | P1.3KGCT-ND     |
| R3         | Chip resistor, 2 k-ohms             | Digi-Key               | P2KECT-ND       |
| R4         | Potentiometer, 2 k-ohms             | Digi-Key               | 3224W-202ETR-ND |
| R5         | Chip resistor, 10 ohms              | Digi-Key               | P10ECT-ND       |
| R6, R7     | Chip resistor, 1.2 k-ohms           | Digi-Key               | P1.2KECT-ND     |
| R9         | Chip resistor, 10 ohms              | Digi-Key               | P10GCT-ND       |

\*Gerber Files for this circuit available on request

Package Outline Specifications



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



**Revision History:** 2008-03-10

Data Sheet

Previous Version: 2005-12-09, Data Sheet

| Page | Subjects (major changes since last revision) |
|------|--|
| All  | Remove references to alternate products.     |
|      |  |
|      |  |
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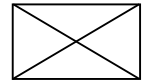
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