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## Thermally-Enhanced High Power RF LDMOS FETs 220 W, 920 – 960 MHz

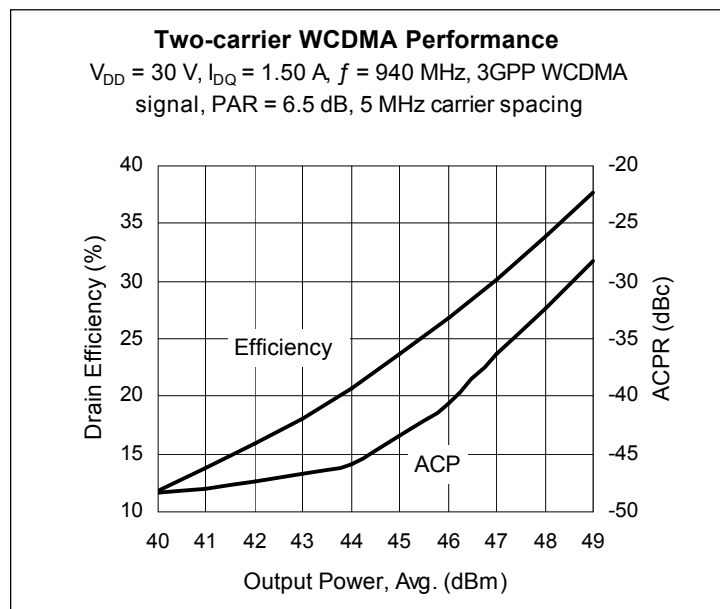
### Description

The PTFA092211EL and PTFA092211FL are 220-watt, internally-matched LDMOS FETs intended for EDGE and WCDMA applications in the 920 to 960 MHz band. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFA092211EL  
Package H-33288-2



PTFA092211FL  
Package H-34288-2



### Features

- Broadband internal matching
- Typical two-carrier WCDMA performance at 940 MHz, 30 V
  - Average output power = 50 W
  - Linear Gain = 18.0 dB
  - Efficiency = 30%
  - Intermodulation distortion = -37 dBc
- Typical CW performance, 940 MHz, 30 V
  - Output power at P-1dB = 250 W
  - Gain = 17.0 dB
  - Efficiency = 59%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 30 V, 220 W (CW) output power
- Pb-free, RoHS-compliant and thermally-enhanced packages

### RF Characteristics

#### Two-carrier WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1750\text{ mA}$ ,  $P_{OUT} = 50\text{ W (AVG)}$ ,

$f_1 = 937.5\text{ MHz}$ ,  $f_2 = 942.5\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 7.5 dB @ 0.01% CCDF

| Characteristic             | Symbol   | Min  | Typ  | Max | Unit |
|----------------------------|----------|------|------|-----|------|
| Gain                       | $G_{ps}$ | 17.0 | 18.0 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | 28.5 | 30   | —   | %    |
| Intermodulation Distortion | IMD      | —    | -34  | -32 | dBc  |

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

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

## RF Characteristics (cont.)

### Two-tone Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1750\text{ mA}$ ,  $P_{OUT} = 220\text{ W PEP}$ ,  $f = 940\text{ MHz}$ , tone spacing = 1 MHz

| Characteristic             | Symbol   | Min | Typ  | Max | Unit |
|----------------------------|----------|-----|------|-----|------|
| Gain                       | $G_{ps}$ | —   | 18.0 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | —   | 44   | —   | %    |
| Intermodulation Distortion | IMD      | —   | -29  | —   | 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            | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$   | $R_{DS(on)}$  | —   | 0.04 | —    | $\Omega$      |
| Operating Gate Voltage         | $V_{DS} = 30\text{ V}$ , $I_{DQ} = 1750\text{ mA}$ | $V_{GS}$      | 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

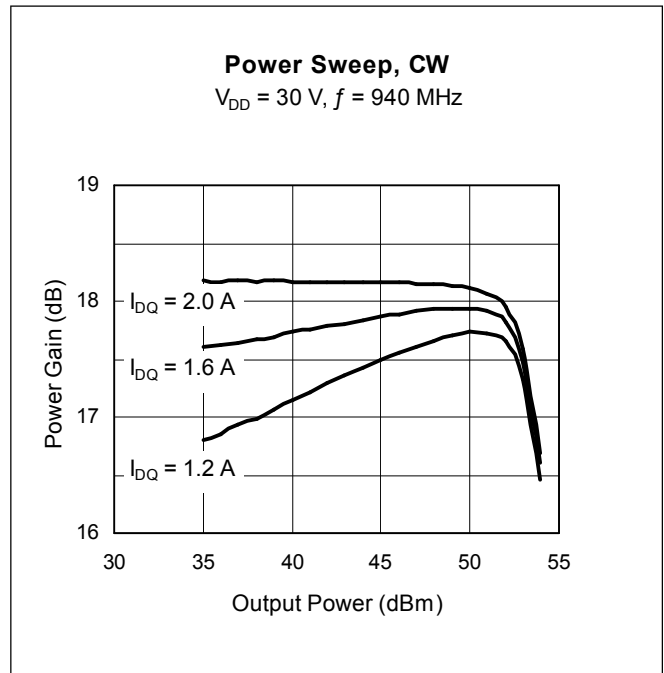
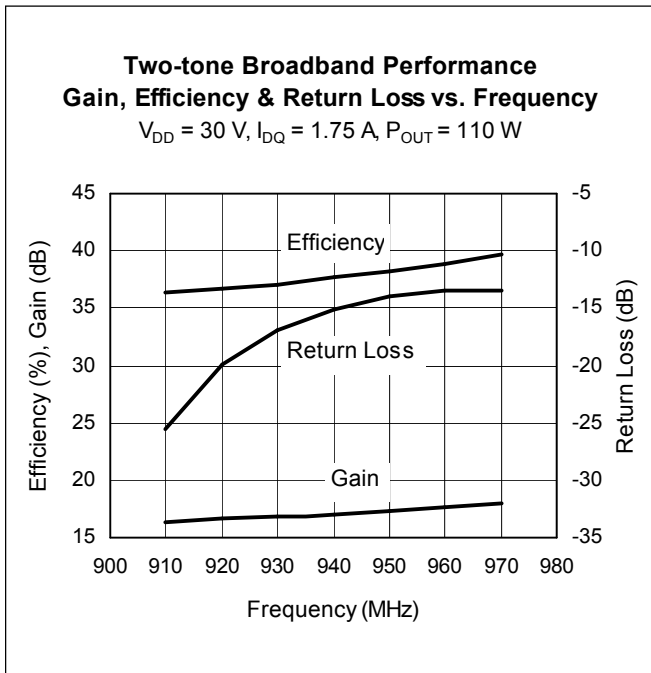
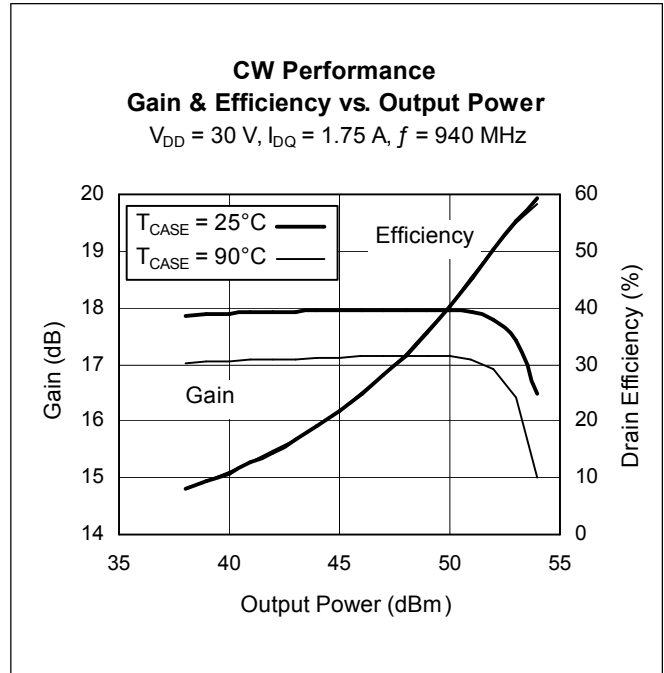
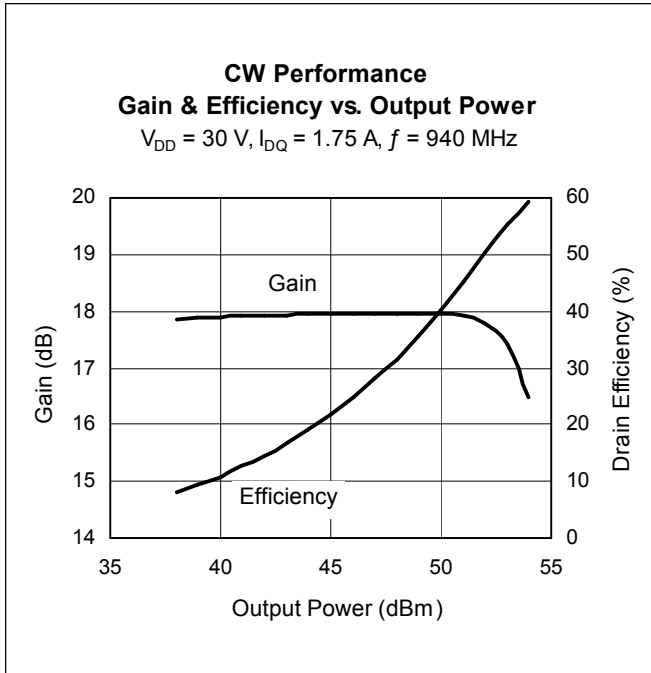
| Parameter  | Symbol          | Value                                 | Unit                        |
|--|-----------------|---------------------------------------|-----------------------------|
| Drain-Source Voltage   | $V_{DSS}$       | 65                                    | V                           |
| Gate-Source Voltage  | $V_{GS}$        | -0.5 to +12                           | V                           |
| Junction Temperature   | $T_J$           | 200                                   | $^{\circ}\text{C}$          |
| Total Device Dissipation   | $P_D$           | 700                                   | W                           |
|  |                 | Above 25 $^{\circ}\text{C}$ derate by | 4.0                         |
| Storage Temperature Range  | $T_{STG}$       | -40 to +150                           | $^{\circ}\text{C}$          |
| Thermal Resistance ( $T_{CASE} = 70\text{ }^{\circ}\text{C}$ , 220 W CW) | $R_{\theta JC}$ | 0.25                                  | $^{\circ}\text{C}/\text{W}$ |

## Ordering Information

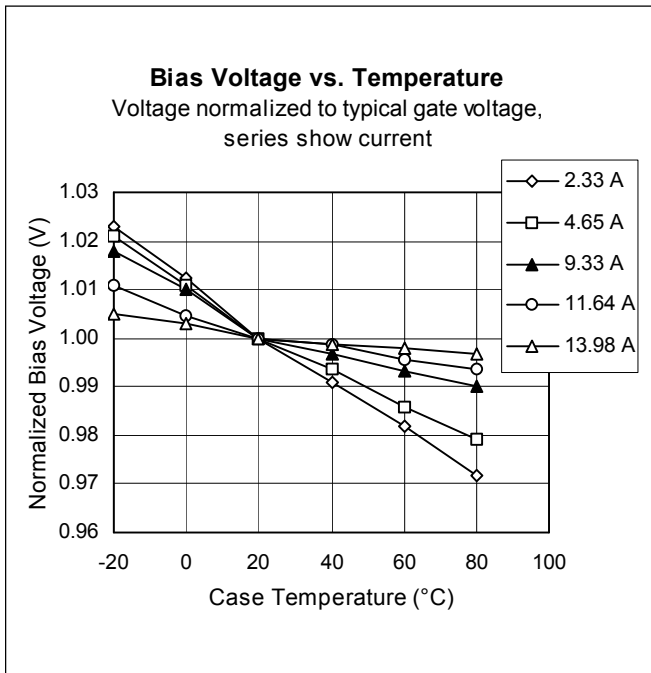
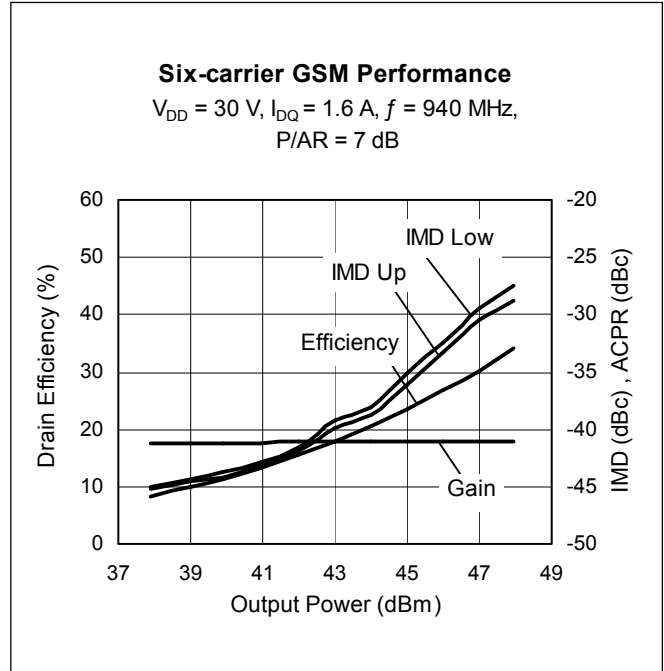
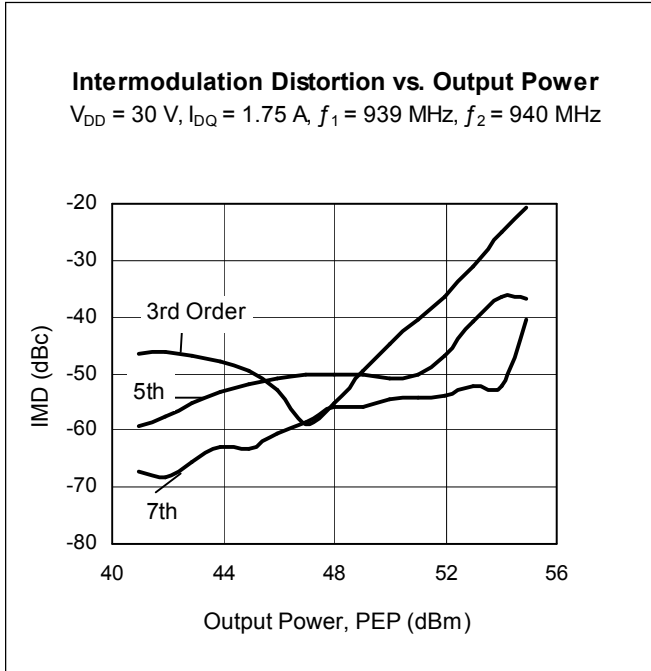
| Type and Version | Package Type | Package Description                             | Shipping | Marking      |
|------------------|--------------|---|----------|--------------|
| PTFA092211EL V4  | H-33288-2    | Thermally-enhanced slotted flange, single-ended | Tray     | PTFA092211EL |
| PTFA092211FL V4  | H-34288-2    | Thermally-enhanced earless flange, single-ended | Tray     | PTFA092211FL |



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

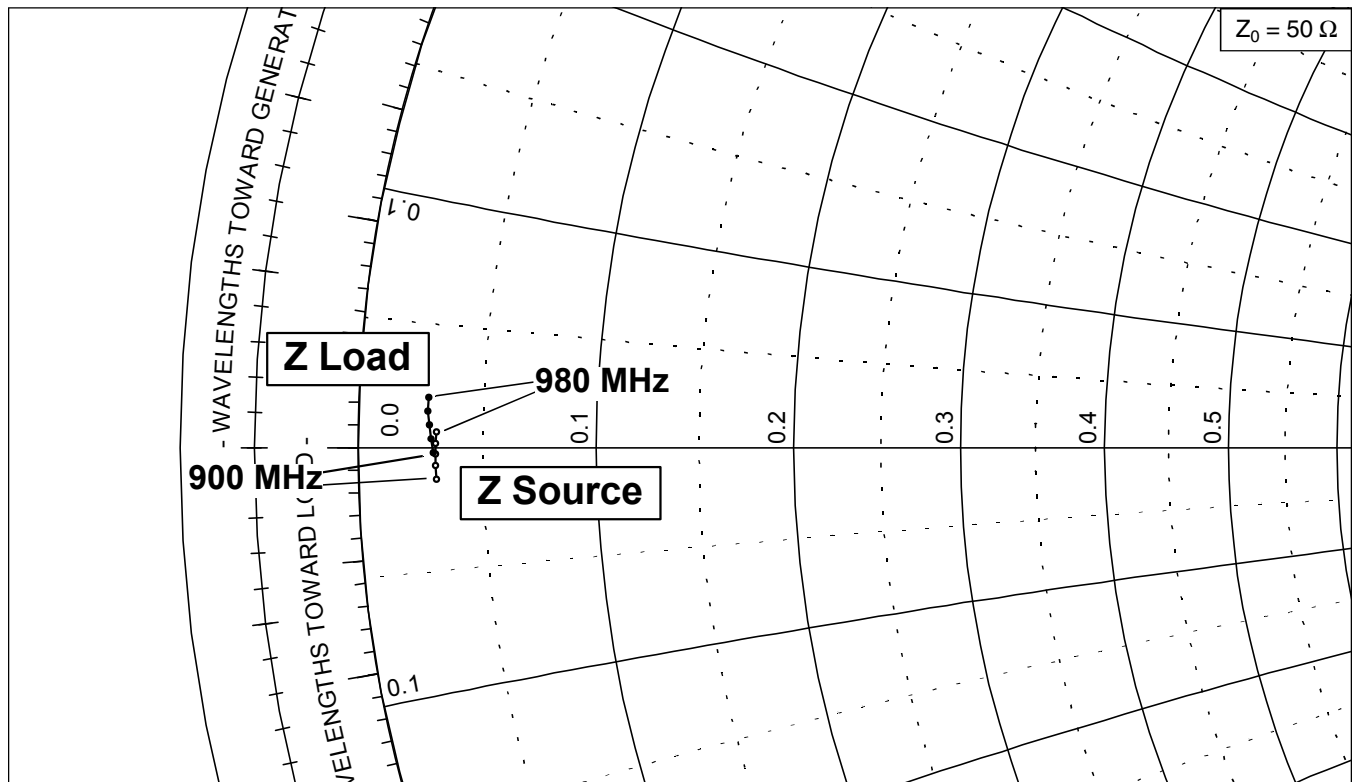
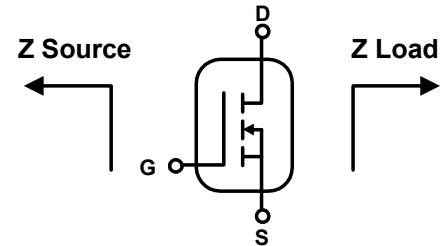


Typical Performance (cont.)

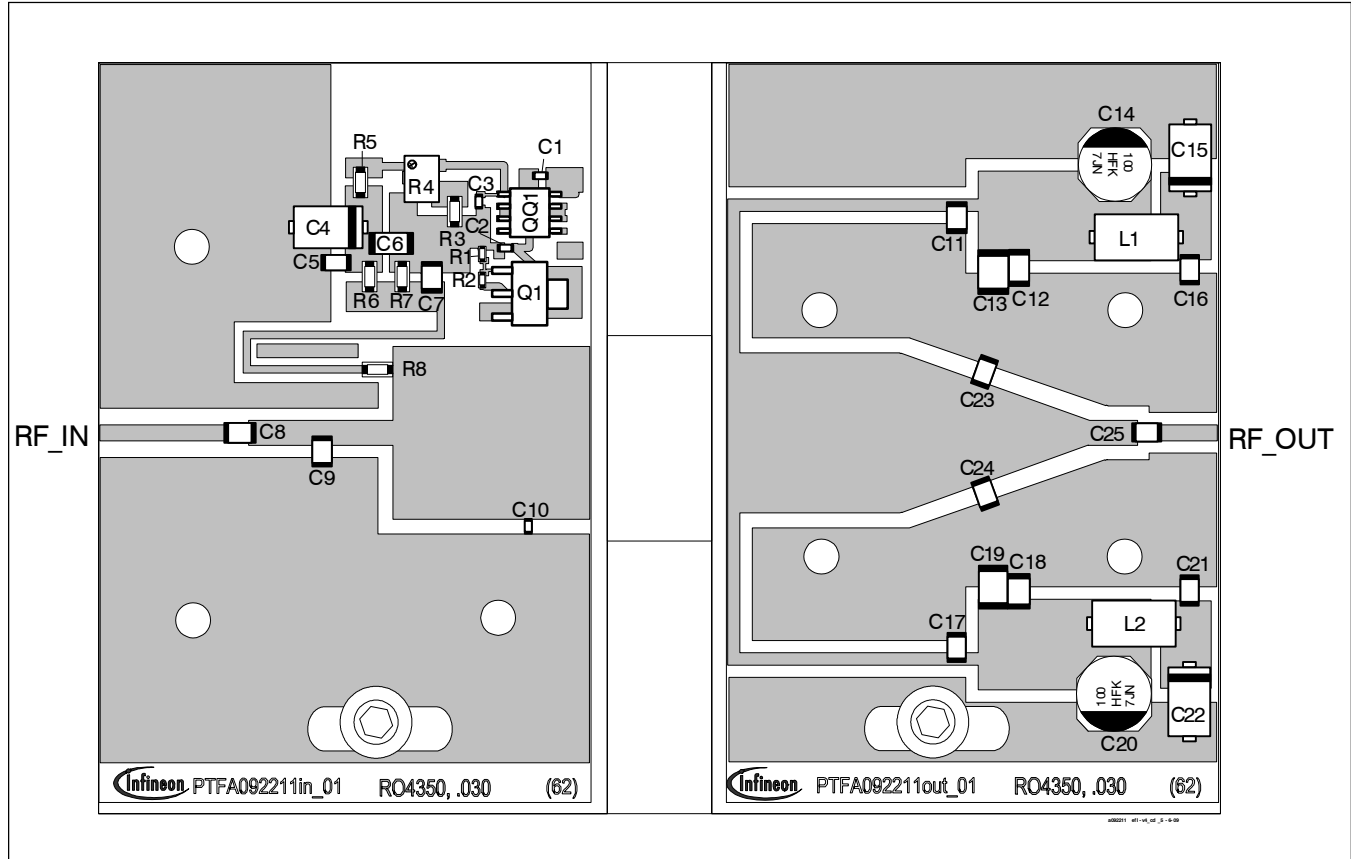


### Broadband Circuit Impedance

| Frequency<br>MHz | Z Source $\Omega$ |        | Z Load $\Omega$ |        |
|------------------|-------------------|--------|-----------------|--------|
|                  | R                 | jX     | R               | jX     |
| 900              | 1.530             | -0.650 | 1.480           | -0.110 |
| 920              | 1.520             | -0.380 | 1.430           | 0.180  |
| 940              | 1.520             | -0.140 | 1.390           | 0.470  |
| 960              | 1.520             | 0.090  | 1.360           | 0.750  |
| 980              | 1.540             | 0.330  | 1.360           | 1.020  |



Reference Circuit



Reference circuit block diagram for  $f = 960 \text{ MHz}$

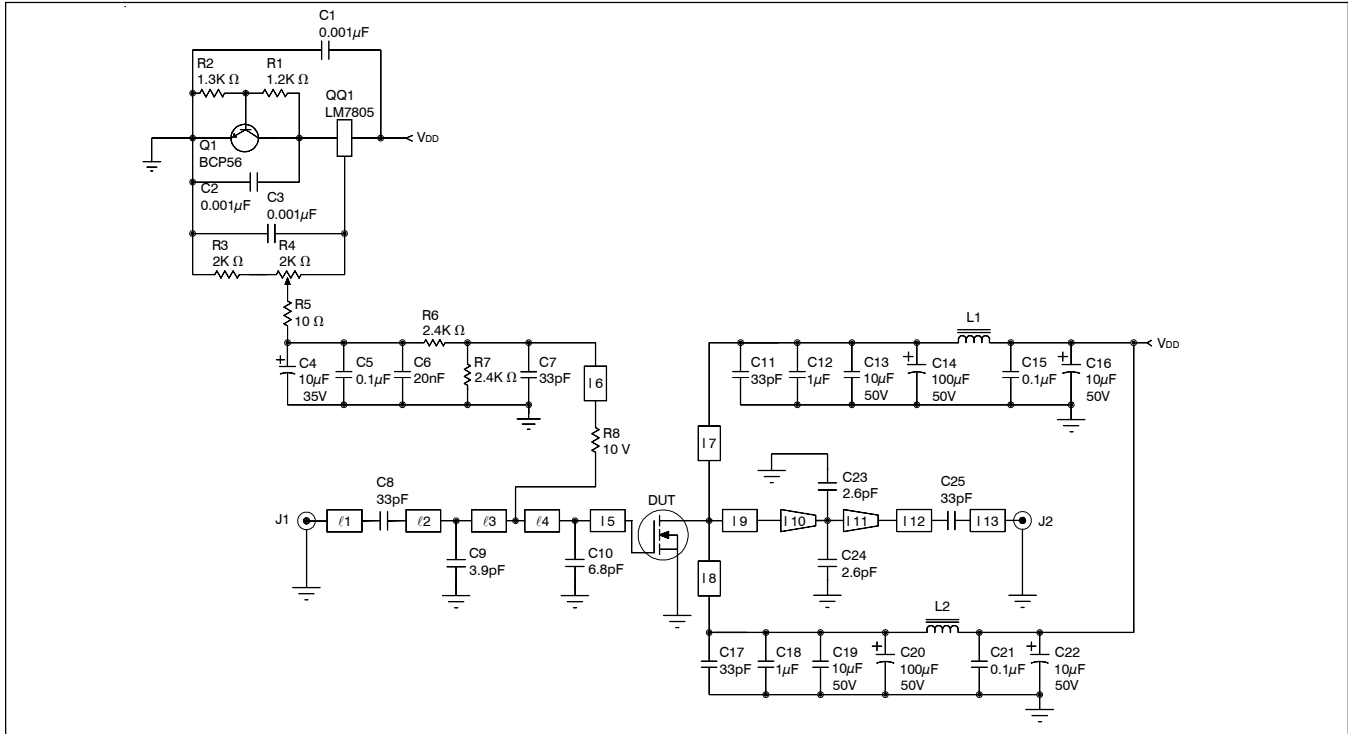
Circuit Assembly Information

|     |  |                  |              |
|-----|--|------------------|--------------|
| DUT | PTFA092211EL or PTFA092211FL               | LDMOS Transistor |              |
| PCB | 0.76 mm [.030"] thick, $\epsilon_r = 3.48$ | Rogers RO4350    | 1 oz. copper |

| Microstrip       | Electrical Characteristics at 960 MHz <sup>1</sup> | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|------------------|--|------------------------|-------------------------|
| $l_1$            | $0.068 \lambda$ , 52.0 W                           | 12.78 x 1.60           | 0.503 x 0.063           |
| $l_2$            | $0.041 \lambda$ , 38.0 $\Omega$                    | 7.57 x 2.54            | 0.298 x 0.100           |
| $l_3$            | $0.040 \lambda$ , 38.0 $\Omega$                    | 7.34 x 2.54            | 0.289 x 0.100           |
| $l_4$            | $0.056 \lambda$ , 7.8 $\Omega$                     | 9.65 x 17.83           | 0.380 x 0.702           |
| $l_5$            | $0.061 \lambda$ , 7.8 $\Omega$                     | 10.59 x 17.83          | 0.417 x 0.702           |
| $l_6$            | $0.208 \lambda$ , 78.3 $\Omega$                    | 40.64 x 0.74           | 1.600 x 0.029           |
| $l_7, l_8$       | $0.200 \lambda$ , 60.1 $\Omega$                    | 38.10 x 1.24           | 1.500 x 0.049           |
| $l_9$            | $0.102 \lambda$ , 8.4 $\Omega$                     | 17.65 x 16.48          | 0.695 x 0.649           |
| $l_{10}$ (taper) | $0.044 \lambda$ , 8.4 $\Omega$ / 12.0 $\Omega$     | 7.82 x 16.48 / 11.0    | 0.308 x 0.649 / 0.433   |
| $l_{11}$ (taper) | $0.065 \lambda$ , 12.0 $\Omega$ / 37.7 $\Omega$    | 11.43 x 11.00 / 2.64   | 0.450 x 0.433 / 0.104   |
| $l_{12}$         | $0.022 \lambda$ , 37.0 $\Omega$                    | 4.04 x 2.64            | 0.159 x 0.104           |
| $l_{13}$         | $0.035 \lambda$ , 52.0 $\Omega$                    | 6.55 x 1.60            | 0.258 x 0.063           |

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

Reference Circuit (cont.)



Reference circuit assembly diagram (not to scale)\*

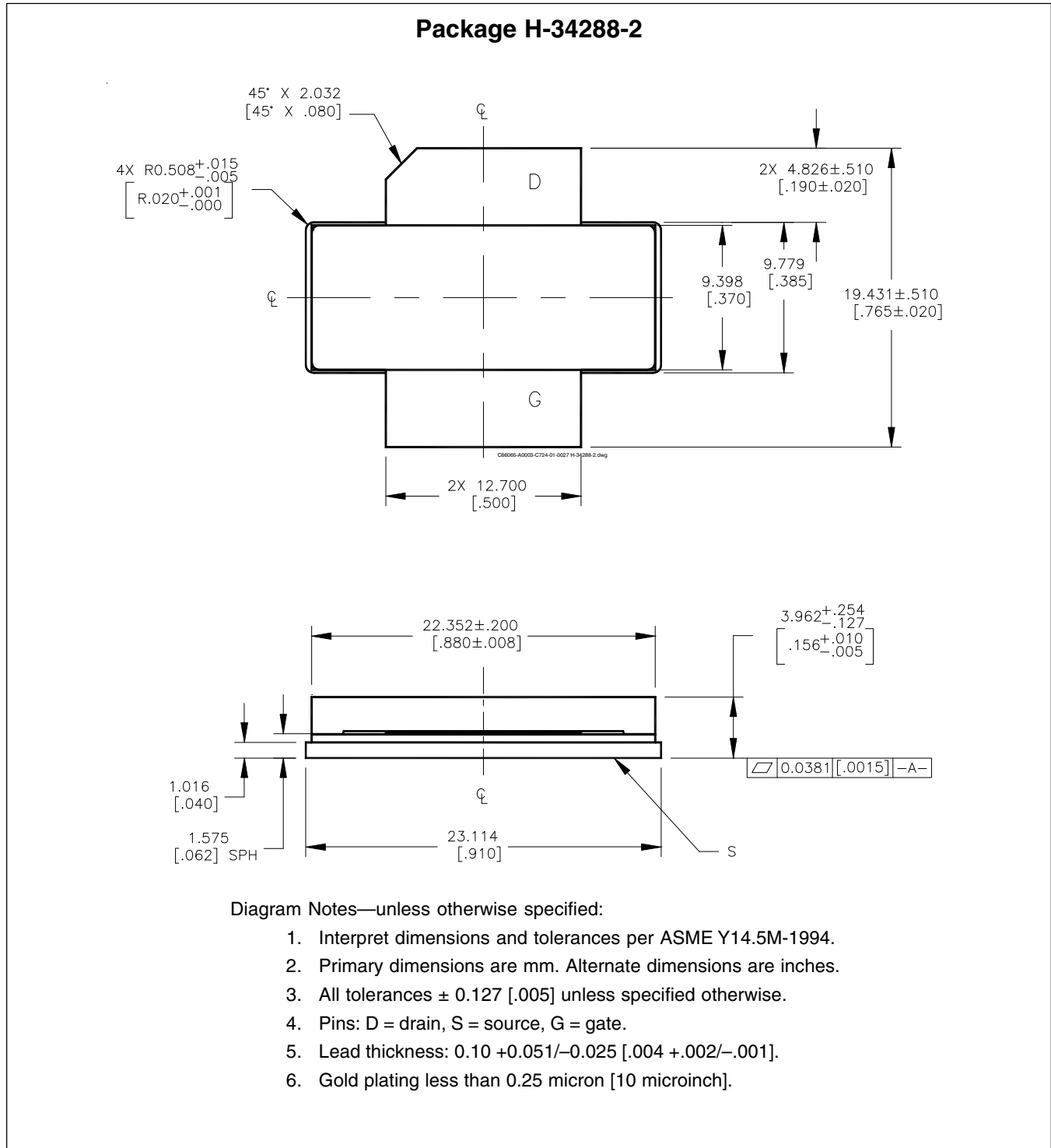
| Component             | Description                                    | Suggested Manufacturer | P/N or Comment    |
|-----------------------|--|------------------------|-------------------|
| C1, C2, C3            | Capacitor, 0.001 $\mu$ F                       | Digi-Key               | PCC1772CT-ND      |
| C4                    | Tantalum Capacitor, 10 $\mu$ F, 35 V           | Digi-Key               | 399-1655-2-ND     |
| C5, C15, C21          | Capacitor, 0.1 $\mu$ F                         | Digi-Key               | PCC104BCT-ND      |
| C12, C18              | Capacitor, 1 $\mu$ F                           | Digi-Key               | 445-1411-1-ND     |
| C7, C8, C11, C17, C25 | Ceramic Capacitor, 33 pF                       | ATC                    | 100B 330          |
| C9                    | Ceramic Capacitor, 3.9 pF                      | ATC                    | 100B 3R9          |
| C10                   | Ceramic Capacitor, 6.8 pF                      | ATC                    | 100A 6R8          |
| C16, C22              | Tantalum Capacitor, 10 $\mu$ F, 50 V           | Garrett Electronics    | TPSE106K050R0400  |
| C13, C19              | Multilayer Ceramic Capacitor, 10 $\mu$ F, 50 V | Digi-Key               | 445-3497-2-ND     |
| C14, C20              | Electrolytic Capacitor, 100 $\mu$ F, 50 V      | Digi-Key               | P5571-ND          |
| C23, C24              | Ceramic Capacitor, 2.6 pF                      | ATC                    | 100B 2R6          |
| C6                    | Capacitor, 20 nF                               | ATC                    | ATC200B 203       |
| L1, L2                | Ferrite, 8.9 mm                                | Elna Magnetics         | BDS 4.6/3/8.9-4S2 |
| Q1                    | Transistor                                     | Infineon Technologies  | BCP56             |
| QQ1                   | Voltage Regulator                              | National Semiconductor | LM7805            |
| R1                    | 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, R8                | Chip Resistor, 10 ohms                         | Digi-Key               | P10ECT-ND         |
| R6, R7                | Chip Resistor, 5.1 k-ohms                      | Digi-Key               | P5.1KECT-ND       |

\*Gerber Files for this circuit available on request





Package Outline Specifications (cont.)



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

Revision History: 2009-05-27

Data Sheet

Previous Version: 2009-04-17 Preliminary Data Sheet

| Page | Subjects (major changes since last revision) |
|------|--|
| 1, 2 | Update information                           |
| 3, 4 | Modify and update graphs                     |
| 6, 7 | Update circuit diagrams and information      |
| 5    | Update impedance data                        |
|      |  |

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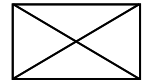
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