

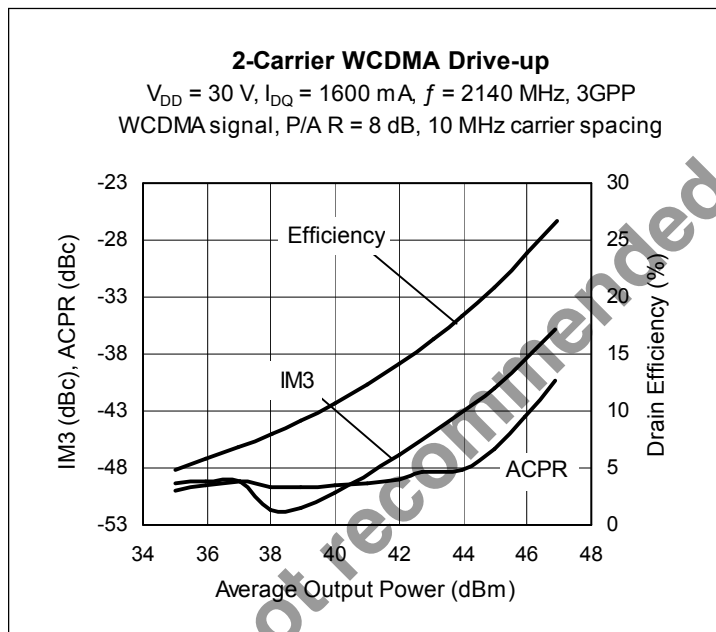
Thermally-Enhanced High Power RF LDMOS FETs 200 W, 2110 – 2170 MHz

Description

The PTFA212001E and PTFA212001F are 200-watt LDMOS FETs designed for single- and two-carrier WCDMA power amplifier applications in the 2110 to 2170 MHz band. Features include input and output matching, and thermally-enhanced packages with slotted or earless flanges. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFA212001E
Package H-36260-2

PTFA212001F
Package H-37260-2



Features

- Thermally-enhanced packages, Pb-free and RoHS compliant
- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 30 V
 - Average output power = 50 W
 - Linear Gain = 15.8 dB
 - Efficiency = 28%
 - Intermodulation distortion = -35.5 dBc
 - Adjacent channel power = -40 dBc
- Typical single-carrier WCDMA performance at 2140 MHz, 30 V, 3GPP signal, P/AR = 7.5 dB
 - Average output power = 70 W
 - Linear Gain = 15.5 dB
 - Efficiency = 34%
 - Adjacent channel power = -37 dBc
- Typical CW performance, 2170 MHz, 30 V
 - Output power at P-1dB = 220 W
 - Efficiency = 54%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 5:1 VSWR @ 30 V, 200 W (CW) output power

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics

WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.6\text{ A}$, $P_{OUT} = 50\text{ W}$ 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} | 15.3 | 15.8 | — | dB |
| Drain Efficiency | η_D | 26.5 | 28 | — | % |
| Intermodulation Distortion | IMD | — | -35.5 | -34 | dBc |

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

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.6\text{ A}$, $P_{OUT} = 200\text{ W PEP}$, $f = 2140\text{ MHz}$, tone spacing = 1 MHz

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------------------|----------|-----|------|-----|------|
| Gain | G_{ps} | — | 15.8 | — | dB |
| Drain Efficiency | η_D | — | 38.5 | — | % |
| Intermodulation Distortion | IMD | — | -28 | — | 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 | $V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 1.0 | μA |
| | $V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$ | I_{DSS} | — | — | 10.0 | μA |
| On-State Resistance | $V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$ | $R_{DS(on)}$ | — | 0.05 | — | Ω |
| Operating Gate Voltage | $V_{DS} = 30\text{ V}$, $I_{DQ} = 1.6\text{ A}$ | 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 | μA |

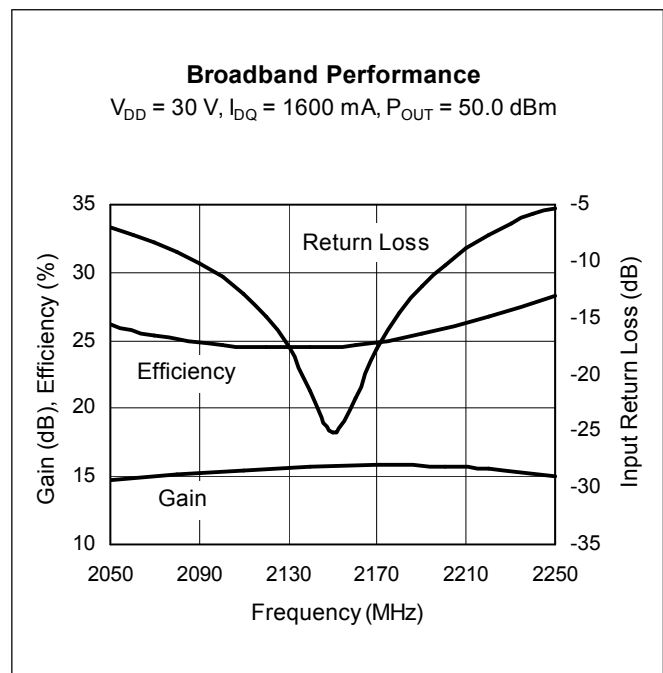
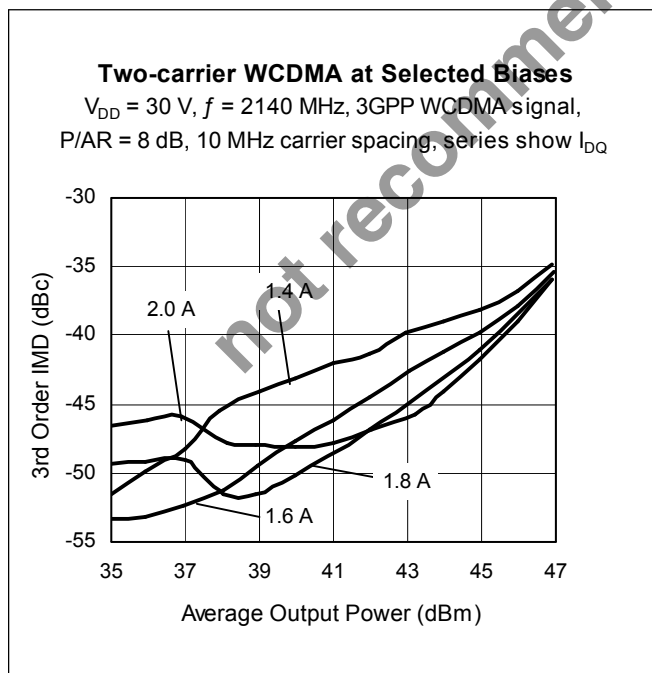
Maximum Ratings

| 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 | °C |
| Total Device Dissipation | P_D | 625 | W |
| Above 25°C derate by | | 3.57 | W/°C |
| Storage Temperature Range | T_{STG} | -40 to +150 | °C |
| Thermal Resistance ($T_{CASE} = 70^\circ\text{C}$, 200 W CW) | $R_{\theta JC}$ | 0.28 | °C/W |

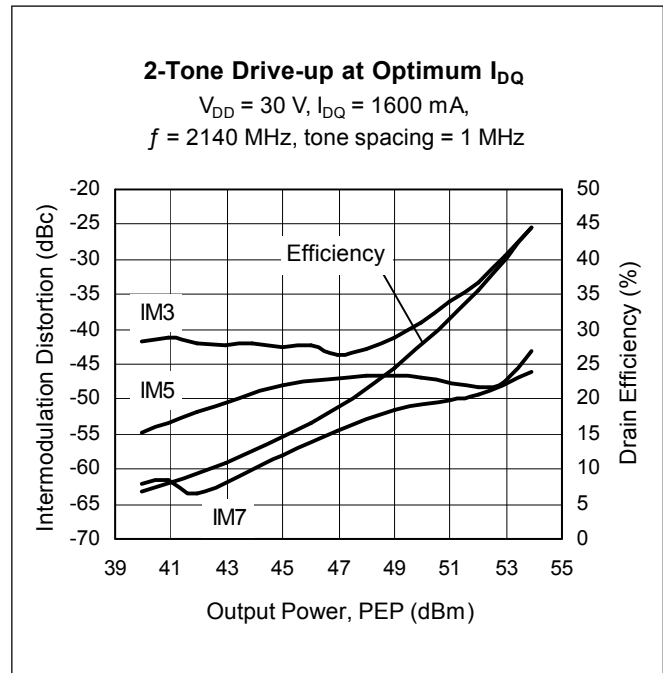
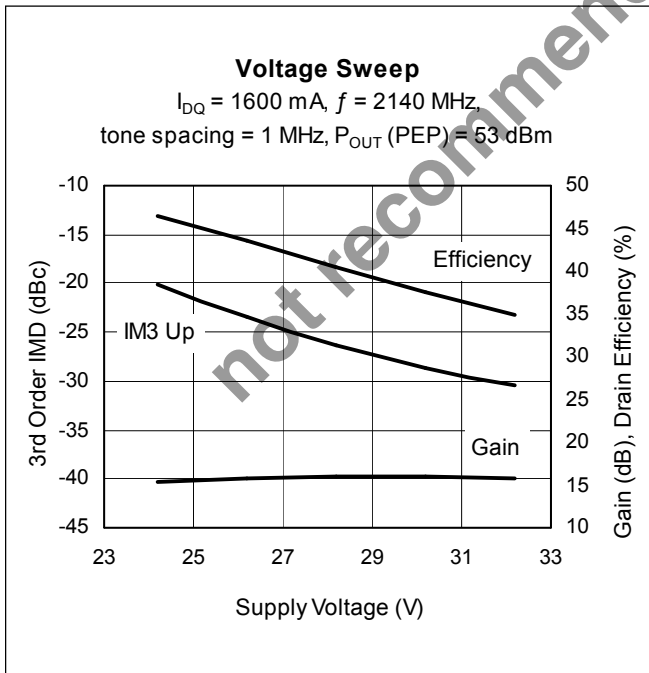
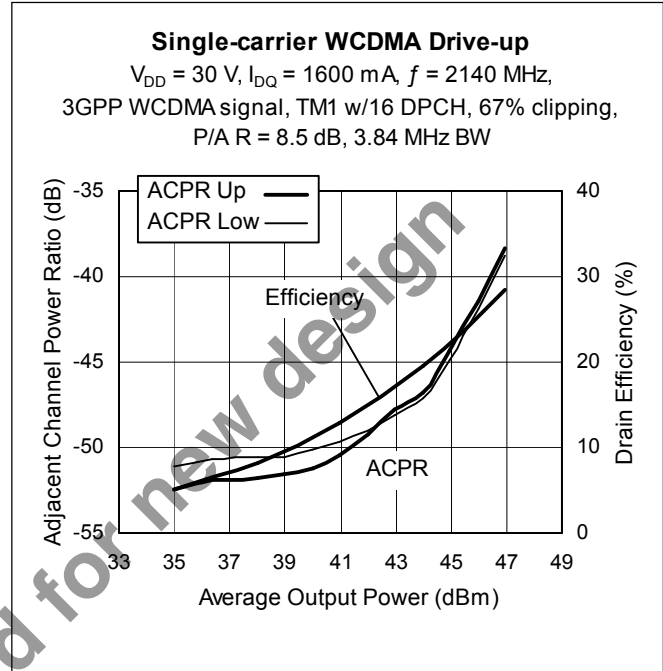
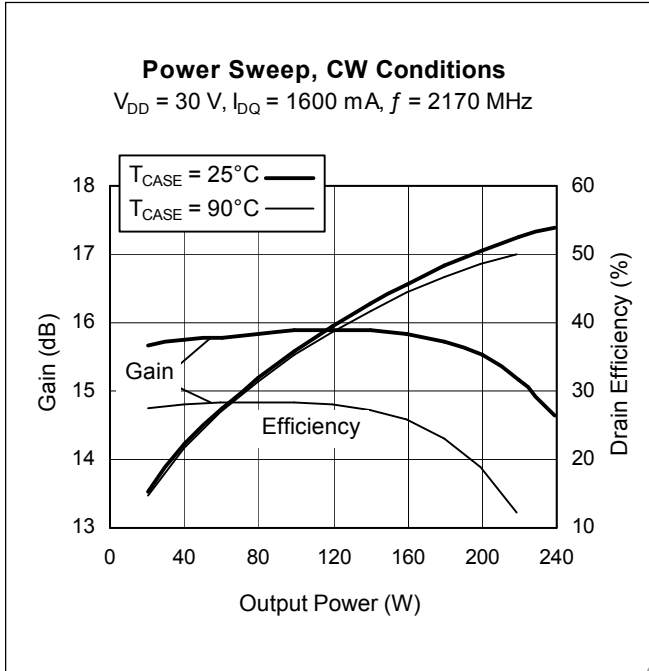
Ordering Information

| Type and Version | Package Type | Package Description | Marking |
|------------------|--------------|---|-------------|
| PTFA212001E V4 | H-36260-2 | Thermally-enhanced slotted flange, single-ended | PTFA212001E |
| PTFA212001F V4 | H-37260-2 | Thermally-enhanced earless flange, single-ended | PTFA212001F |

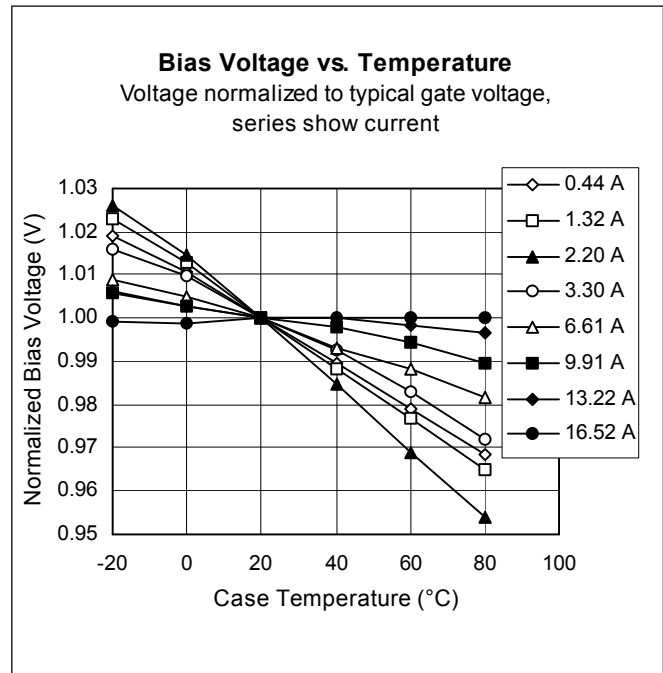
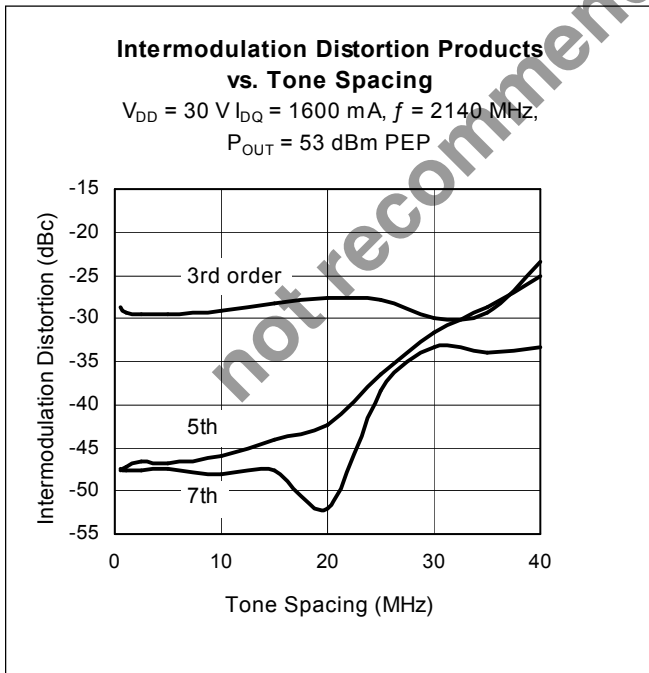
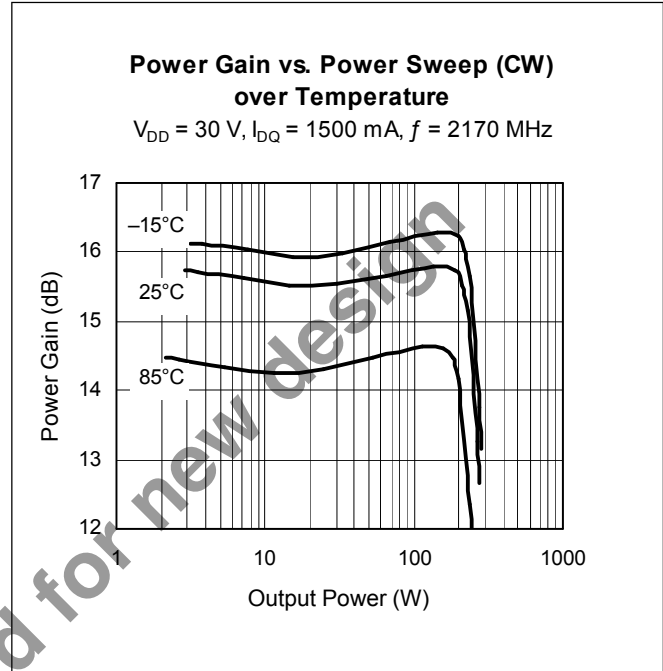
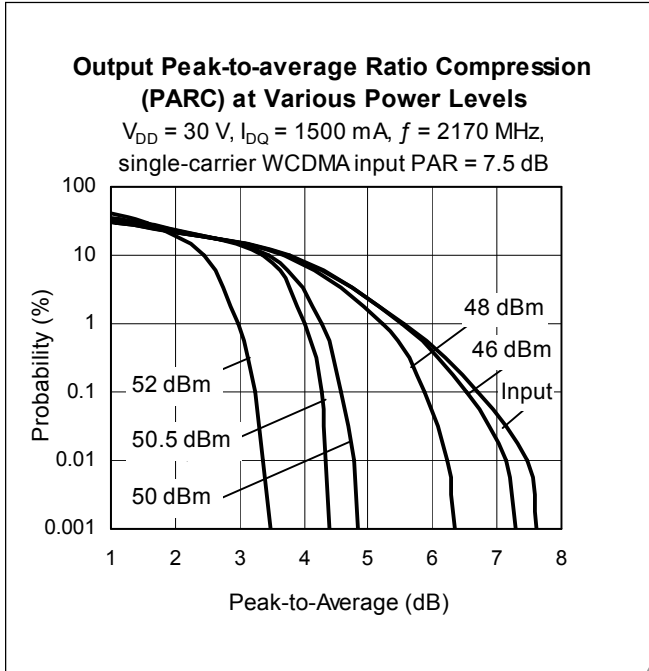
Typical Performance (data taken in a production test fixture)



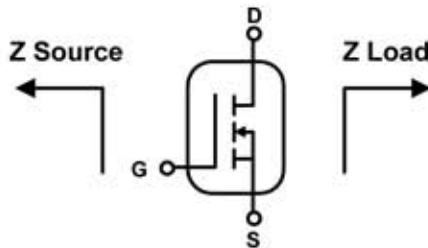
Typical Performance (cont.)



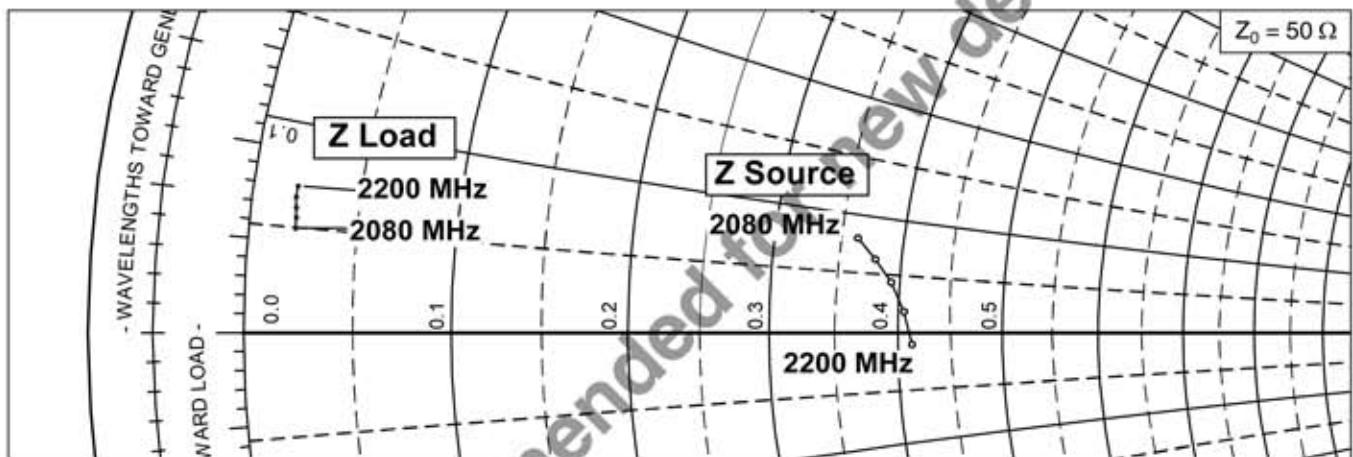
Typical Performance (cont.)



Broadband Circuit Impedance



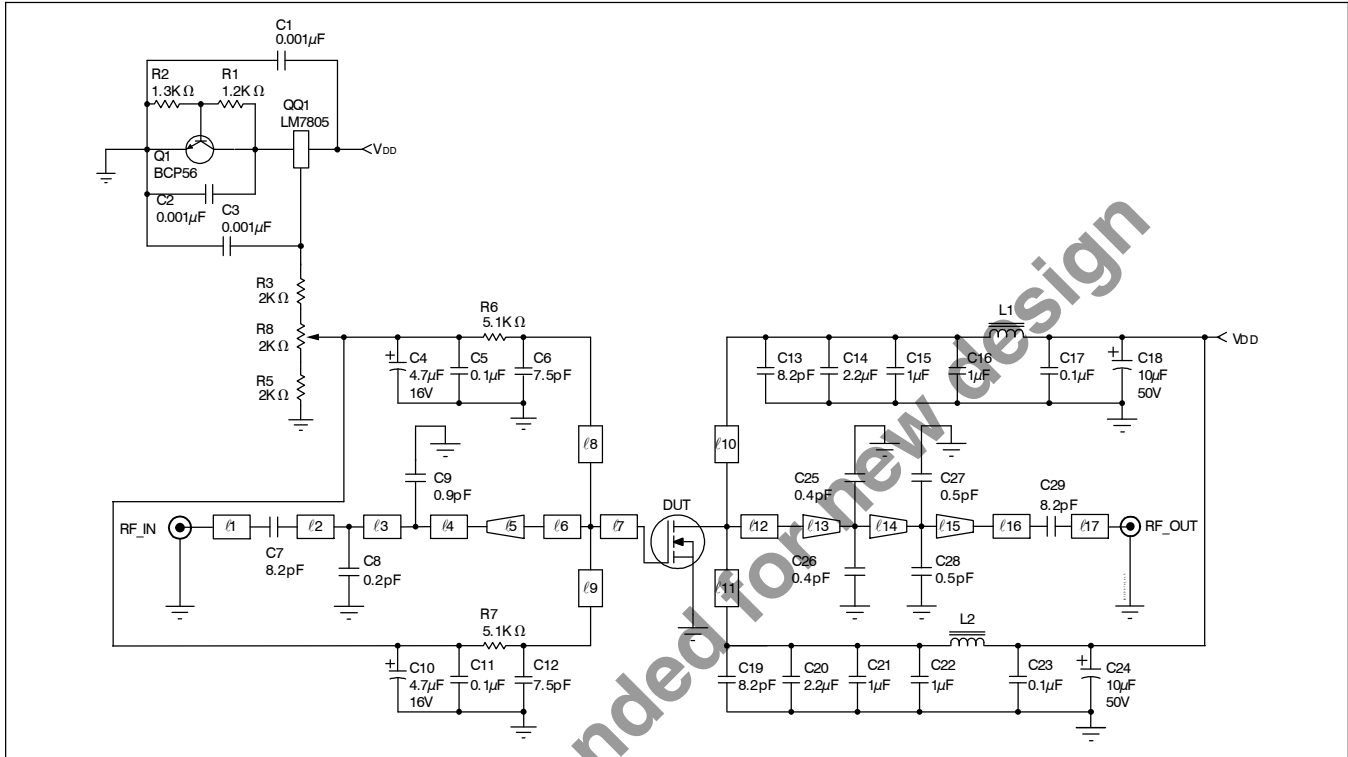
| Frequency MHz | Z Source Ω | | Z Load Ω | |
|------------------|-------------------|------|-----------------|-----|
| | R | jX | R | jX |
| 2080 | 18.2 | 4.1 | 1.1 | 2.5 |
| 2110 | 19.0 | 3.2 | 1.0 | 2.8 |
| 2140 | 19.8 | 2.3 | 1.0 | 3.0 |
| 2170 | 20.4 | 1.0 | 1.0 | 3.2 |
| 2200 | 20.8 | -0.6 | 1.0 | 3.5 |



See next page for circuit information

not recommended for new design

Reference Circuit



Reference circuit schematic for $f = 2140$ MHz

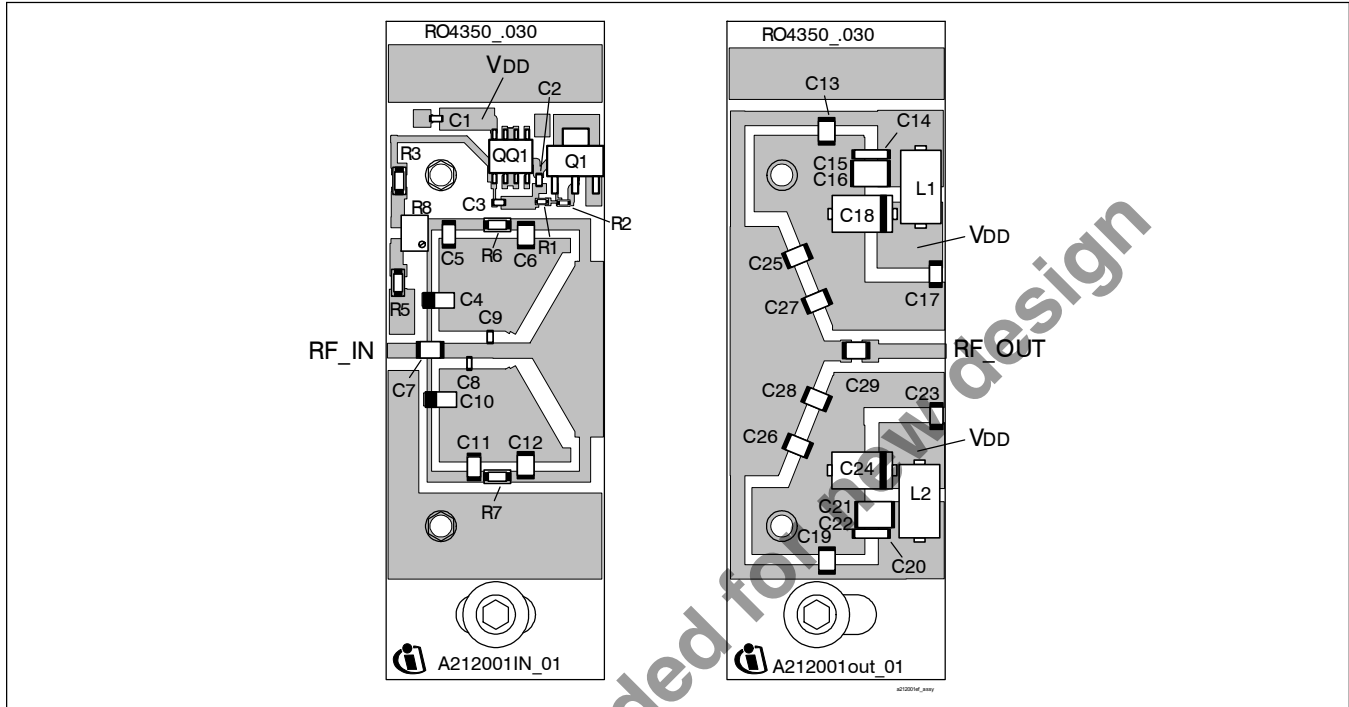
Circuit Assembly Information

| | | | |
|-----|---|------------------|--------------|
| DUT | PTFA212001E or PTFA212001F | LDMOS Transistor | |
| PCB | 0.76 mm [0.030"] thick, $\epsilon_r = 3.48$ | Rogers RO4350 | 1 oz. copper |

| Microstrip | Electrical Characteristics at 2140 MHz ¹ | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|-------------|---|------------------------|-------------------------|
| l1 | 0.042 λ , 50.0 Ω | 3.56 x 1.68 | 0.140 x 0.066 |
| l2 | 0.048 λ , 50.0 Ω | 4.11 x 1.68 | 0.162 x 0.066 |
| l3 | 0.026 λ , 50.0 Ω | 2.08 x 1.68 | 0.082 x 0.066 |
| l4 | 0.059 λ , 50.0 Ω | 5.03 x 1.68 | 0.198 x 0.066 |
| l5 (taper) | 0.062 λ , 50.0 Ω / 6.9 Ω | 5.00 x 1.68 / 20.32 | 0.197 x 0.066 / 0.800 |
| l6 | 0.015 λ , 6.9 Ω | 1.14 x 20.32 | 0.045 x 0.800 |
| l7 | 0.028 λ , 6.9 Ω | 2.16 x 20.32 | 0.085 x 0.800 |
| l8, l9 | 0.136 λ , 60.0 Ω | 11.63 x 1.27 | 0.458 x 0.050 |
| l10, l11 | 0.254 λ , 51.2 Ω | 21.51 x 1.65 | 0.847 x 0.065 |
| l12 | 0.071 λ , 5.0 Ω | 5.49 x 28.83 | 0.216 x 1.135 |
| l13 (taper) | 0.019 λ , 5.0 Ω / 6.8 Ω | 1.52 x 28.83 / 20.62 | 0.060 x 1.135 / 0.812 |
| l14 (taper) | 0.026 λ , 6.8 Ω / 13.5 Ω | 2.11 x 20.62 / 9.65 | 0.083 x 0.812 / 0.380 |
| l15 (taper) | 0.026 λ , 13.5 Ω / 40.9 Ω | 2.06 x 9.65 / 2.34 | 0.081 x 0.380 / 0.092 |
| l16 | 0.029 λ , 40.9 Ω | 2.77 x 2.34 | 0.109 x 0.092 |
| l17 | 0.107 λ , 50.0 Ω | 9.04 x 1.68 | 0.356 x 0.066 |

¹Electrical characteristics are rounded.

Reference Circuit (cont.)

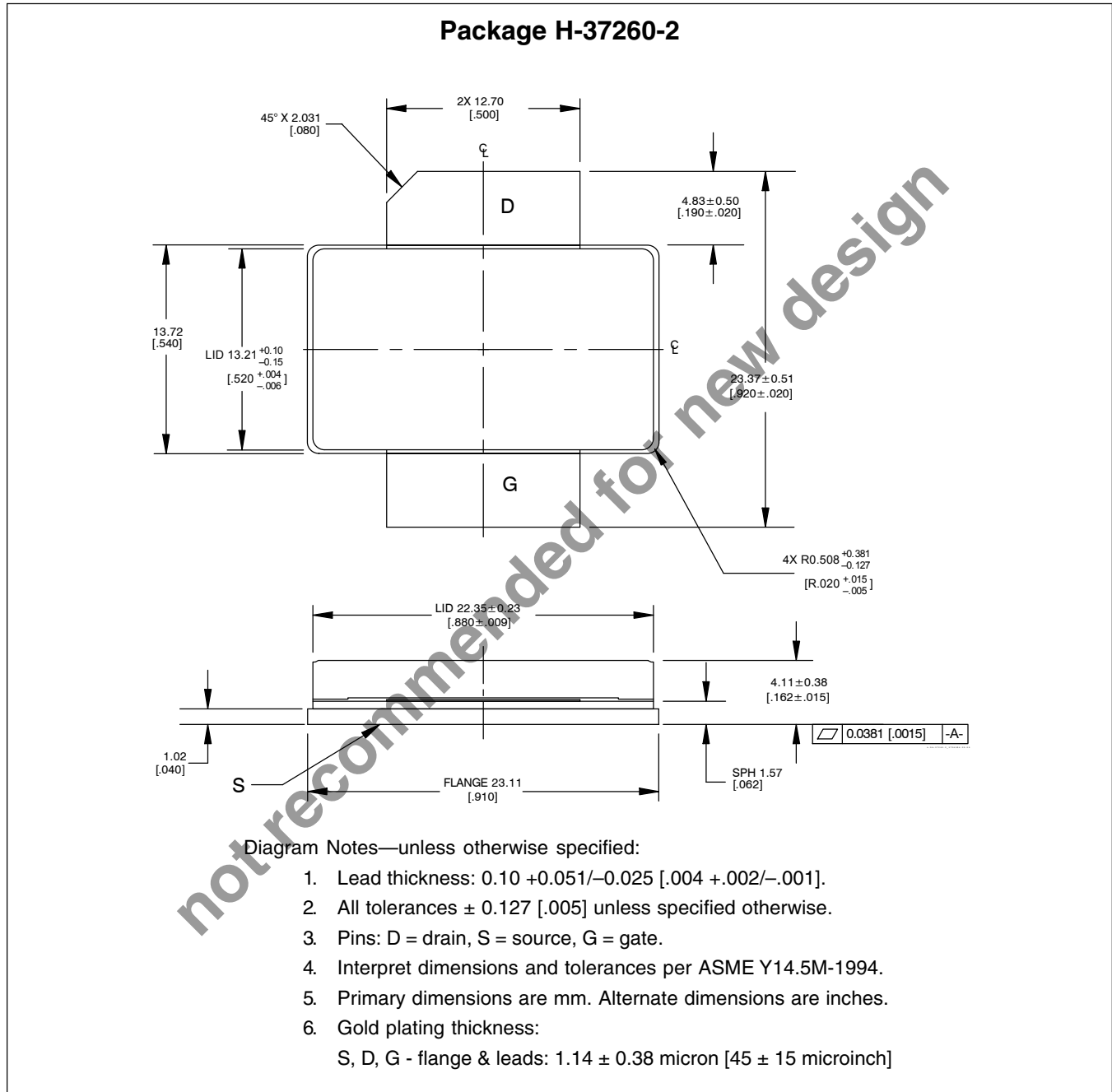


Reference circuit assembly diagram* (not to scale)

| Component | Description | Suggested Manufacturer | P/N or Comment |
|--------------------|--------------------------------------|------------------------|-------------------|
| C1, C2, C3 | Capacitor, 0.001 μ F | Digi-Key | PCC1772CT-ND |
| C4, C10 | Capacitor, 4.7 μ F, 16 V | Digi-Key | PCS3475CT-ND |
| C5, C11, C17, C23 | Capacitor, 0.1 μ F | Digi-Key | PCC104BCT-ND |
| C6, C12 | Ceramic capacitor, 7.5 pF | ATC | 100B 7R5 |
| C7, C13, C19, C29 | Ceramic capacitor, 8.2 pF | ATC | 100B 8R2 |
| C8 | Ceramic capacitor, 0.2 pF | ATC | 600S 0R2 BT |
| C9 | Ceramic capacitor, 0.9 pF | ATC | 600A 0R9 BT |
| C14, C20 | Capacitor, 2.2 μ F | Digi-Key | 445-1474-2-ND |
| C15, C16, C21, C22 | Ceramic capacitor, 1 μ F | Digi-Key | 445-1411-2-ND |
| C18, C24 | Tantalum capacitor, 10 μ F, 50 V | Garrett Electronics | TPSE106K050R0400 |
| C25, C26 | Ceramic capacitor, 0.4 pF | ATC | 100B 0R4 |
| C27, C28 | Ceramic capacitor, 0.5 pF | ATC | 100B 0R5 |
| 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, R5 | Chip resistor 2 k-ohms | Digi-Key | P2KECT-ND |
| R4 | not used | | |
| R6, R7 | Chip resistor 5.1 k-ohms | Digi-Key | P5.1KECT-ND |
| R8 | Potentiometer 2 k-ohms | Digi-Key | 3224W-202ETR-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: 2015-03-03

Data Sheet

Previous Version: 2009-02-24, Data Sheet

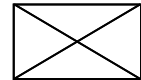
| Page | Subjects (major changes since last revision) |
|------|--|
| All | Not recommended for new design. |
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