**PTFA241301E**
**PTFA241301F**

green Product

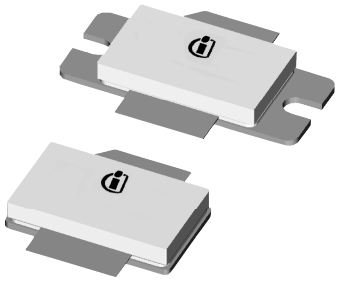
# Thermally-Enhanced High Power RF LDMOS FETs
# 130 W, 2420 – 2480 MHz

## Description

The PTFA241301E and PTFA241301F are thermally-enhanced 130-watt, internally matched *GOLDMOS*® FETs intended for ultra-linear applications. They are characterized for CDMA, CDMA2000, Super3G (3GPP TSG RAN), and WiMAX operation from 2420 to 2480 MHz. Full gold metallization ensures excellent device lifetime and reliability.

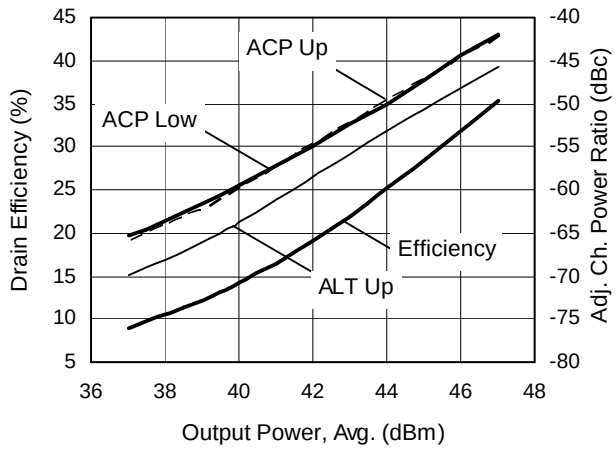
PTFA241301E
Package H-30260-2

PTFA241301F
Package H-31260-2



**Three-carrier CDMA2000 Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $f$ = 2450 MHz




## Features

- Thermally-enhanced packaging, Pb-free and RoHS-compliant
- Broadband internal matching
- Typical CDMA2000 performance at 2450 MHz
  - Average output power = 25 W
  - Linear Gain = 14 dB
  - Efficiency = 25%
- Typical CW performance, 2420 MHz, 28 V
  - Output power at P–1dB = 140 W
  - Efficiency = 50%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 130 W (CW) output power

## RF Characteristics

**Three-carrier CDMA2000 Measurements** (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $P_{OUT}$ = 25 W average, $f$ = 2450 MHz

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | — | 14 | — | dB |
| Drain Efficiency | $\eta_D$ | — | 25 | — | % |
| Adjacent Channel Power Ratio | ACPR | — | –50 | — | dBc |

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

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

## RF Characteristics (cont.)

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

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $P_{OUT}$ = 130 W PEP, $f$ = 2420 MHz, tone spacing = 1 MHz

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Gain | $G_{ps}$ | 13.0 | 14 | — | dB |
| Drain Efficiency | $\eta_D$ | 36 | 38 | — | % |
| Intermodulation Distortion | IMD | — | –30 | –28 | dBc |

## DC Characteristics

| Characteristic | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_{DS}$ = 10 mA | $V_{(BR)DSS}$ | 65 | — | — | V |
| Drain Leakage Current | $V_{DS}$ = 28 V, $V_{GS}$ = 0 V | $I_{DSS}$ | — | — | 1.0 | µA |
| | $V_{DS}$ = 63 V, $V_{GS}$ = 0 V | $I_{DSS}$ | — | — | 10.0 | µA |
| On-State Resistance | $V_{GS}$ = 10 V, $V_{DS}$ = 0.1 V | $R_{DS(on)}$ | — | 0.07 | — | Ω |
| Operating Gate Voltage | $V_{DS}$ = 28 V, $I_{DQ}$ = 1150 mA | $V_{GS}$ | 2 | 2.4 | 3 | V |
| Gate Leakage Current | $V_{GS}$ = 10 V, $V_{DS}$ = 0 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 | $P_D$ | 438 | W |
| Above 25°C derate by | | 2.5 | W/°C |
| Storage Temperature Range | $T_{STG}$ | –40 to +150 | °C |
| Thermal Resistance ($T_{CASE}$ = 70°C, 130 W CW) | $R_{\theta JC}$ | 0.40 | °C/W |

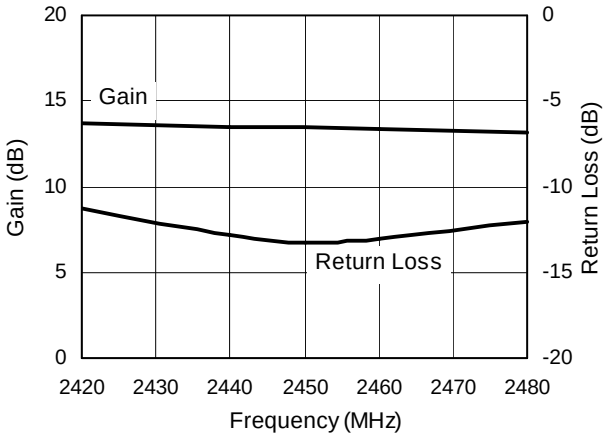
## Ordering Information

| Type | Package Outline | Package Description | Marking |
|---|---|---|---|
| PTFA241301E | H-30260-2 | Thermally-enhanced slotted flange, single-ended | PTFA241301E |
| PTFA241301F | H-31260-2 | Thermally-enhanced earless flange, single-ended | PTFA241301F |

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

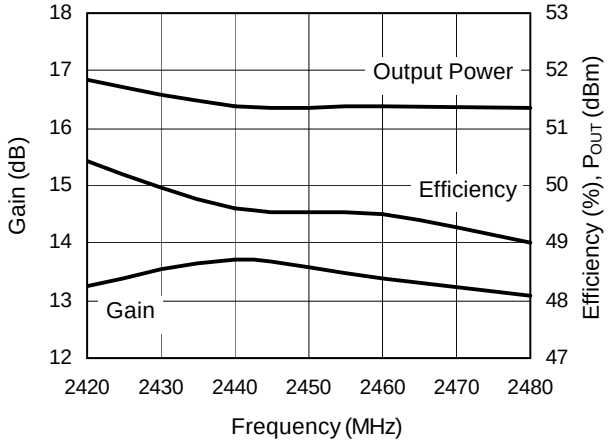
**Linear Broadband Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $P_{OUT}$, Avg. = 45.5 dBm




**Broadband CW Performance (at P–1dB)**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA

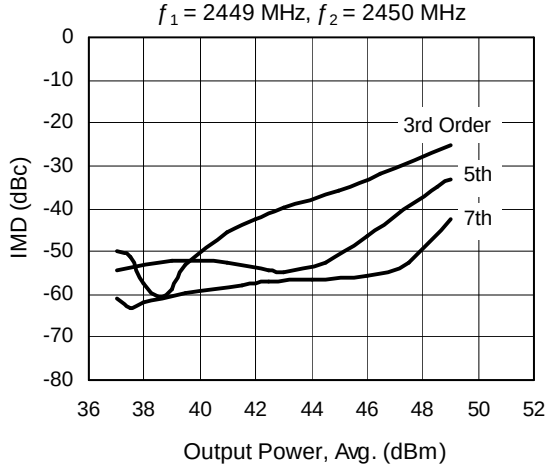



**Intermodulation Distortion vs. Output Power**

(as measured in a broadband circuit)

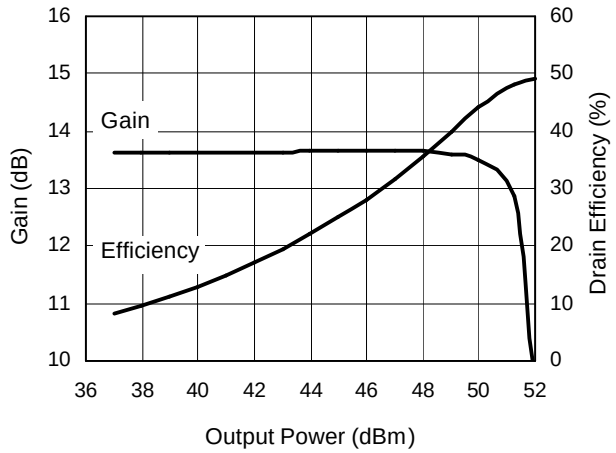
$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA,

$f_1$ = 2449 MHz, $f_2$ = 2450 MHz




**Gain & Efficiency vs. Output Power**

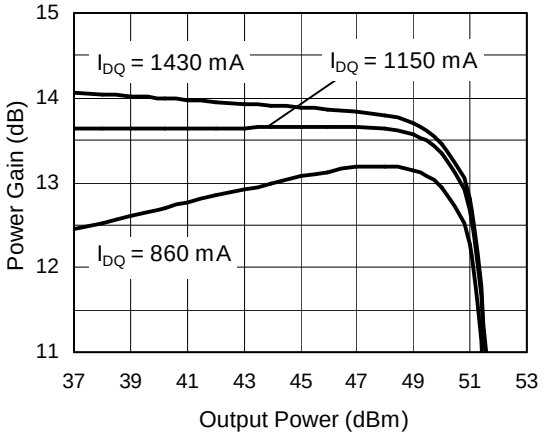
$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $f$ = 2450 MHz



## Typical Performance (cont.)

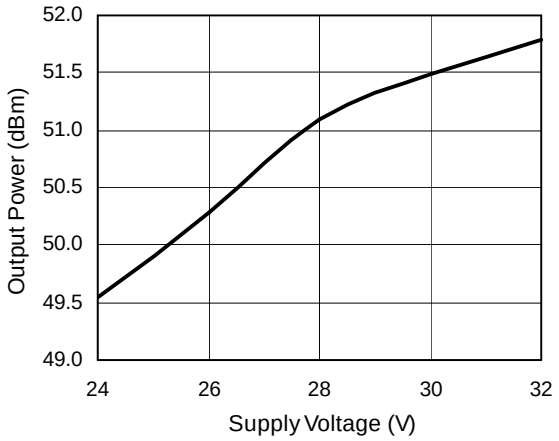
**Power Sweep**

$V_{DD}$ = 28 V, $f$ = 2450 MHz



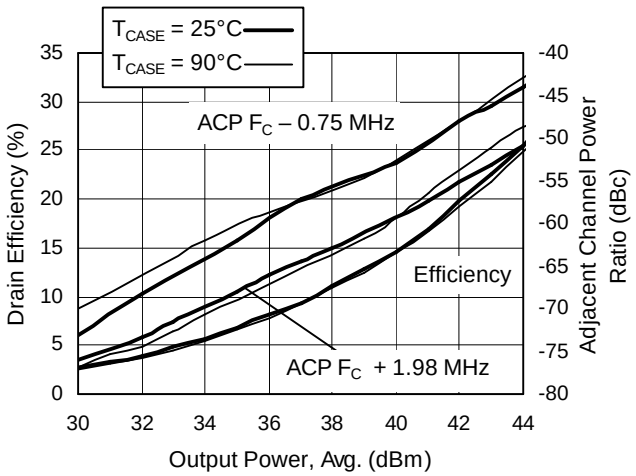

**Output Power (at 1 dB compression) vs. Supply Voltage**

$I_{DQ}$ = 1150 mA, $f$ = 2450 MHz



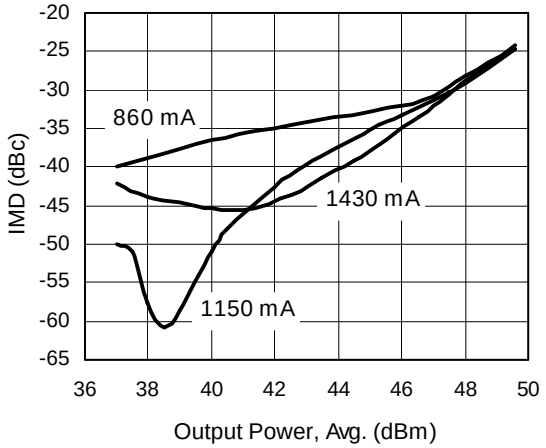

**IS-95 CDMA Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1150 mA, $f$ = 2450 MHz




**IM3 vs. Output Power at Selected Biases**

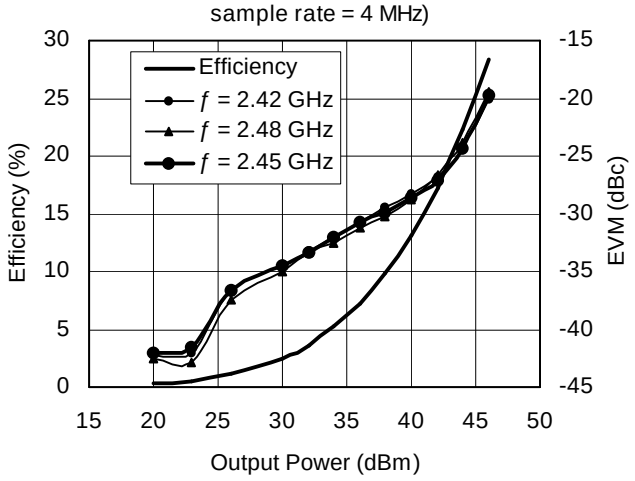
$V_{DD}$ = 28 V, $f_1$ = 2449, $f_2$ = 2450 MHz



## Typical Performance (cont.)

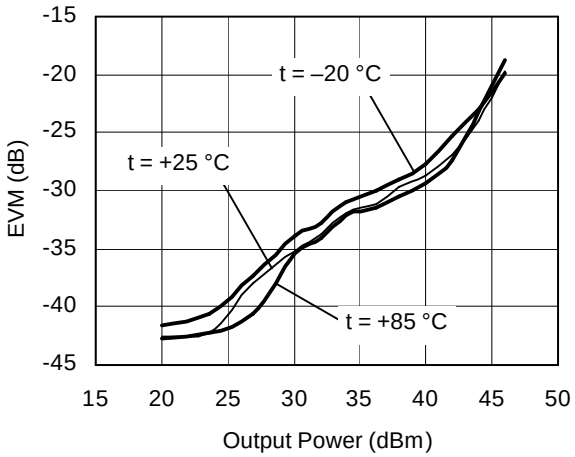
**WiMAX Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1.2 A,
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)



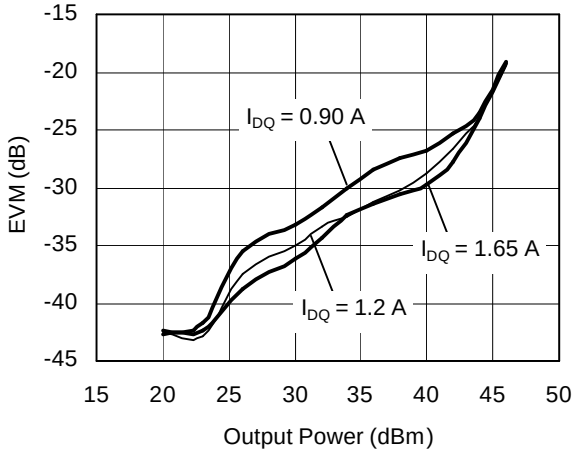

**WiMAX Performance**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1.2 A, $f$ = 2480 MHz,
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)



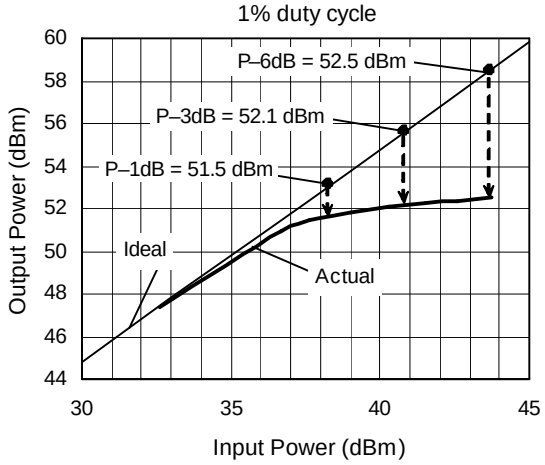

**WiMAX Performance**

$V_{DD}$ = 28 V, $f$ = 2480 MHz
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)

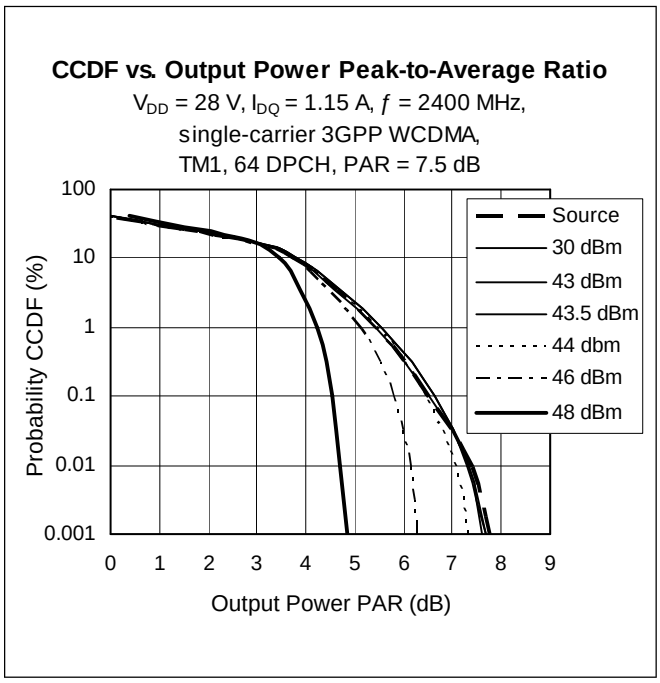


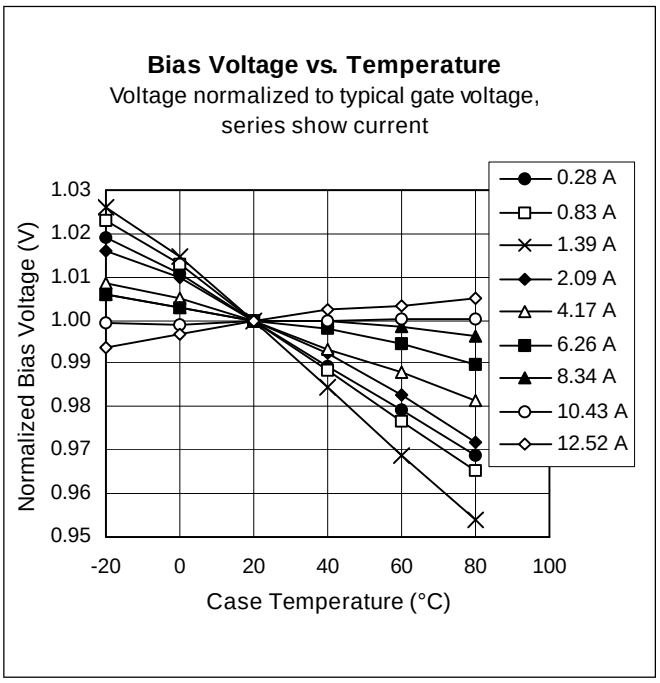

**Power Sweep, under Pulsed Conditions**

$V_{DD}$ = 28 V, $I_{DQ}$ = 1.15 A, $f$ = 2420 MHz,
pulse period = 800 µs, pulse width = 80 µs,
1% duty cycle

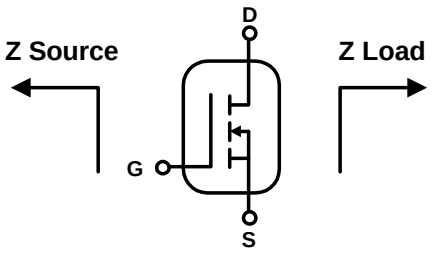


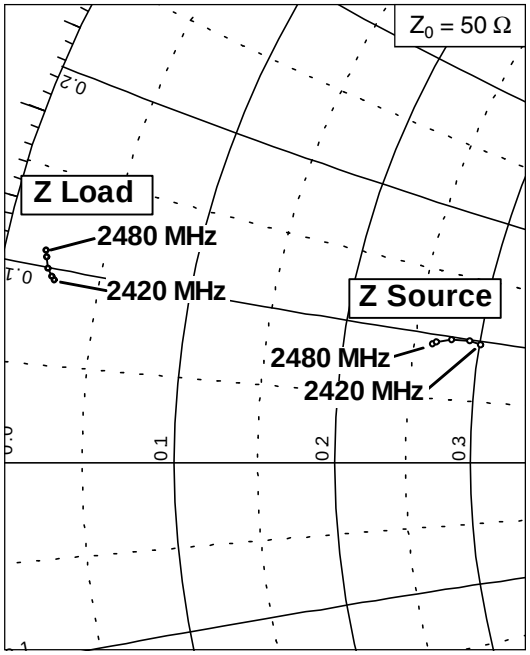
## Typical Performance (cont.)




## Broadband Circuit Impedance

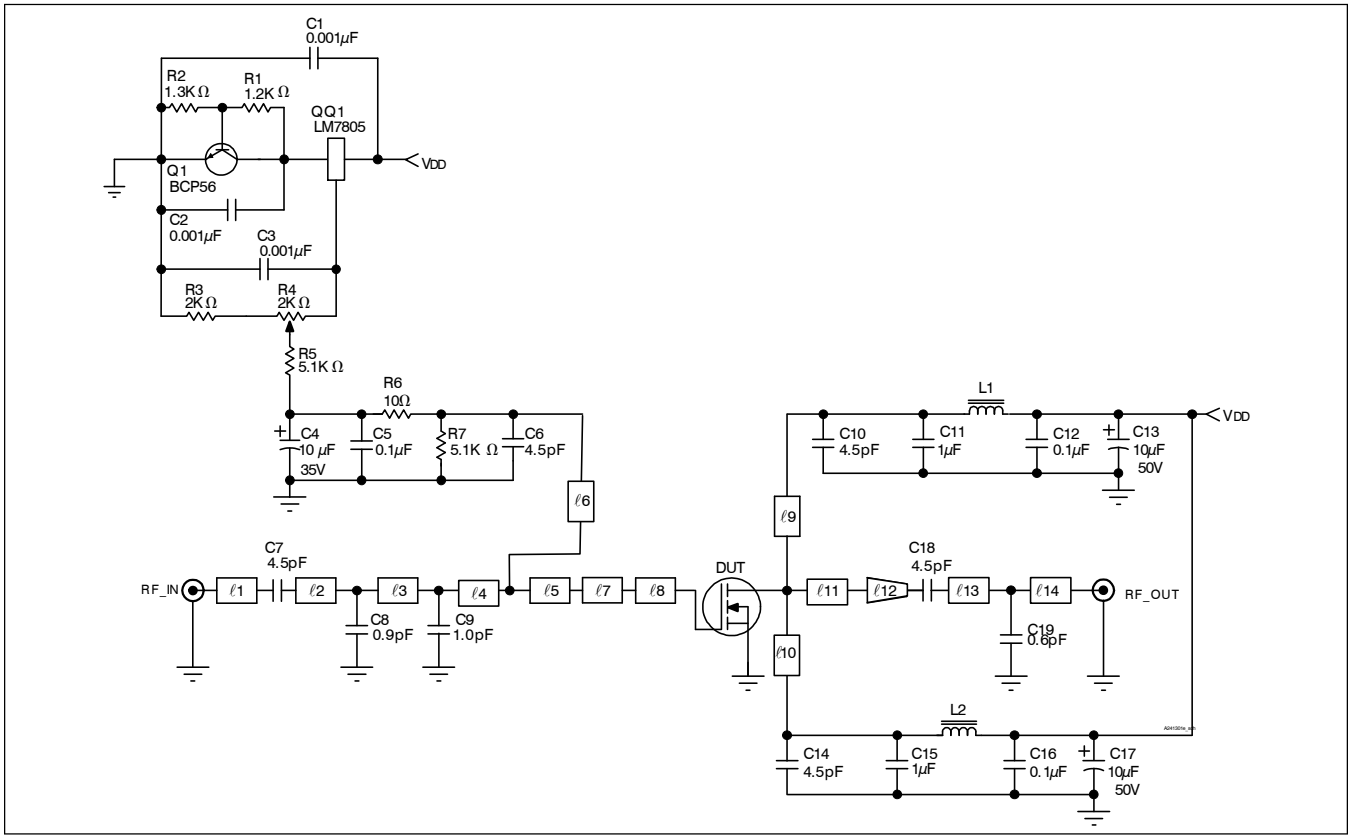



| Frequency | Z Source W | | Z Load W | |
|---|---|---|---|---|
| MHz | R | jX | R | jX |
| 2420 | 13.20 | 4.69 | 1.35 | 4.73 |
| 2430 | 13.30 | 4.75 | 1.28 | 4.80 |
| 2450 | 13.85 | 4.94 | 1.14 | 4.99 |
| 2470 | 14.59 | 5.00 | 1.06 | 5.27 |
| 2480 | 15.01 | 4.91 | 1.01 | 5.43 |

**See next page for circuit information**

## Reference Circuit



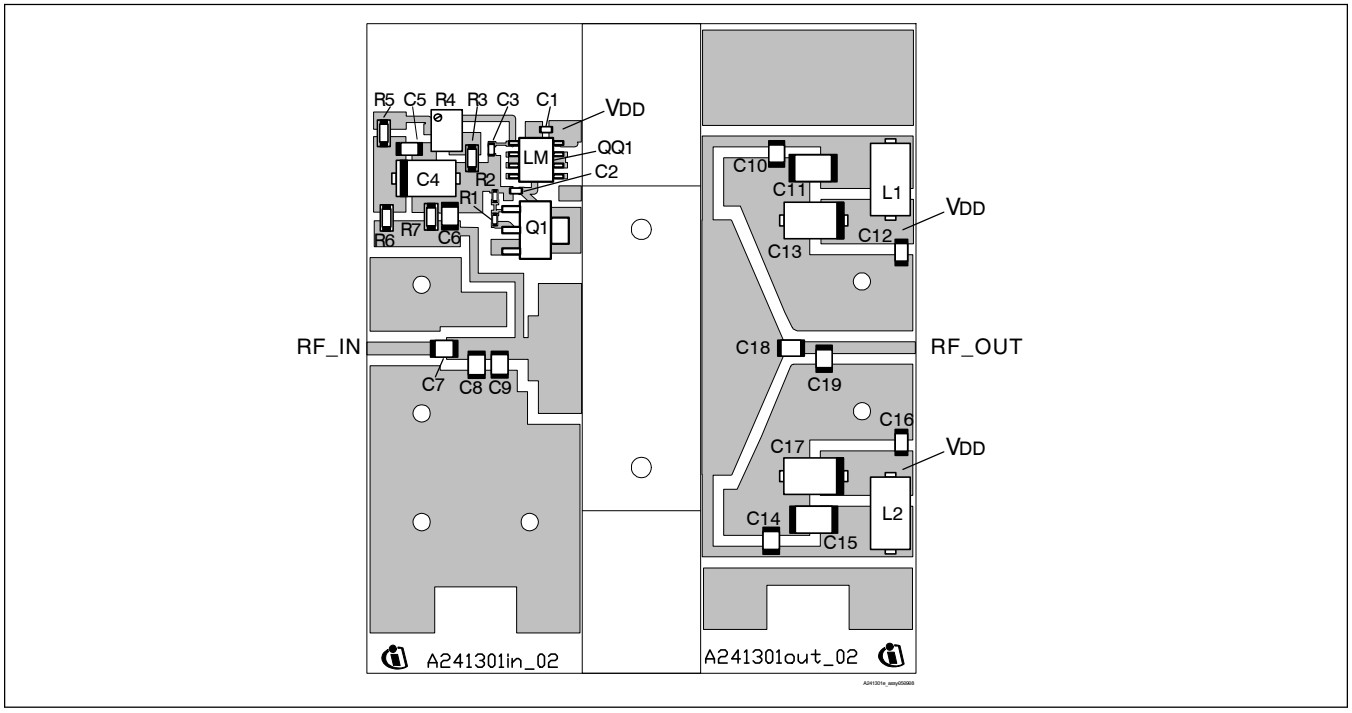

*Reference circuit schematic for ƒ = 2420 MHz*

| Circuit Assembly Information | | | |
|---|---|---|---|
| DUT | PTFA241301E or PTFA241301F | LDMOS Transistor | |
| PCB | 0.76 mm [.030"] thick, $\varepsilon_r$ = 4.5 | Rogers TMM4 | 2 oz. copper |

| Microstrip | Electrical Characteristics at 2420 MHz[1] | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|---|---|---|---|
| ℓ1 | 0.112 λ, 50.0 Ω | 7.52 x 1.37 | 0.296 x 0.054 |
| ℓ2 | 0.039 λ, 34.0 Ω | 2.54 x 2.54 | 0.100 x 0.100 |
| ℓ3 | 0.045 λ, 34.0 Ω | 2.92 x 2.54 | 0.115 x 0.100 |
| ℓ4 | 0.044 λ, 34.0 Ω | 2.87 x 2.54 | 0.113 x 0.100 |
| ℓ5 | 0.017 λ, 34.0 Ω | 1.09 x 2.54 | 0.043 x 0.100 |
| ℓ6 | 0.307 λ, 60.0 Ω | 21.01 x 0.97 | 0.827 x 0.038 |
| ℓ7 | 0.019 λ, 14.7 Ω | 1.17 x 7.62 | 0.046 x 0.300 |
| ℓ8 | 0.083 λ, 8.0 Ω | 5.03 x 15.24 | 0.198 x 0.600 |
| ℓ9, ℓ10 | 0.237 λ, 50.0 Ω | 16.00 x 1.27 | 0.630 x 0.050 |
| ℓ11 | 0.057 λ, 4.3 Ω | 3.43 x 29.85 | 0.135 x 1.175 |
| ℓ12 (taper) | 0.098 λ, 4.3 Ω / 50.0 Ω | 5.99 x 29.85 / 1.37 | 0.236 x 1.175 / 0.054 |
| ℓ13 | 0.034 λ, 50.0 Ω | 2.29 x 1.37 | 0.090 x 0.054 |
| ℓ14 | 0.164 λ, 50.0 Ω | 11.13 x 1.37 | 0.438 x 0.054 |

[1]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 µF | Digi-Key | PCC1772CT-ND |
| C4 | Tantalum capacitor, 10 µF, 35 V | Digi-Key | 366-1655-2-ND |
| C5, C12, C16 | Capacitor, 0.1 µF | Digi-Key | PCC104BCT-ND |
| C6, C7, C10, C14, C18 | Ceramic capacitor 4.5 pF | ATC | 100B 4R5 |
| C8 | Ceramic capacitor 0.9 pF | ATC | 100B 0R9 |
| C9 | Ceramic capacitor 1 pF | ATC | 100B 1R0 |
| C11, C15 | Ceramic capacitor 1 µF | Digi-Key | 19528-ND |
| C13, C17 | Capacitor, 10 µF, 50 V | Garrett Electronics | TPS106K050R0400 |
| C19 | Ceramic capacitor 0.6 pF | ATC | 100B 0R6 |
| L1, L2 | Ferrite, 6 mm | Ferroxcube | 53/3/4.6-452 |
| 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 | P22KECT-ND |
| R4 | Potentiometer, 2 k-ohms | Digi-Key | 3224W-202ETR-ND |
| R5, R7 | Chip resistor, 5.1 k-ohms | Digi-Key | P5.1KECT-ND |
| R6 | Chip resistor, 10 ohms | Digi-Key | P10ECT-ND |

**Gerber Files for this circuit available on request*

## Package Outline Specifications

### Package H-30260-2

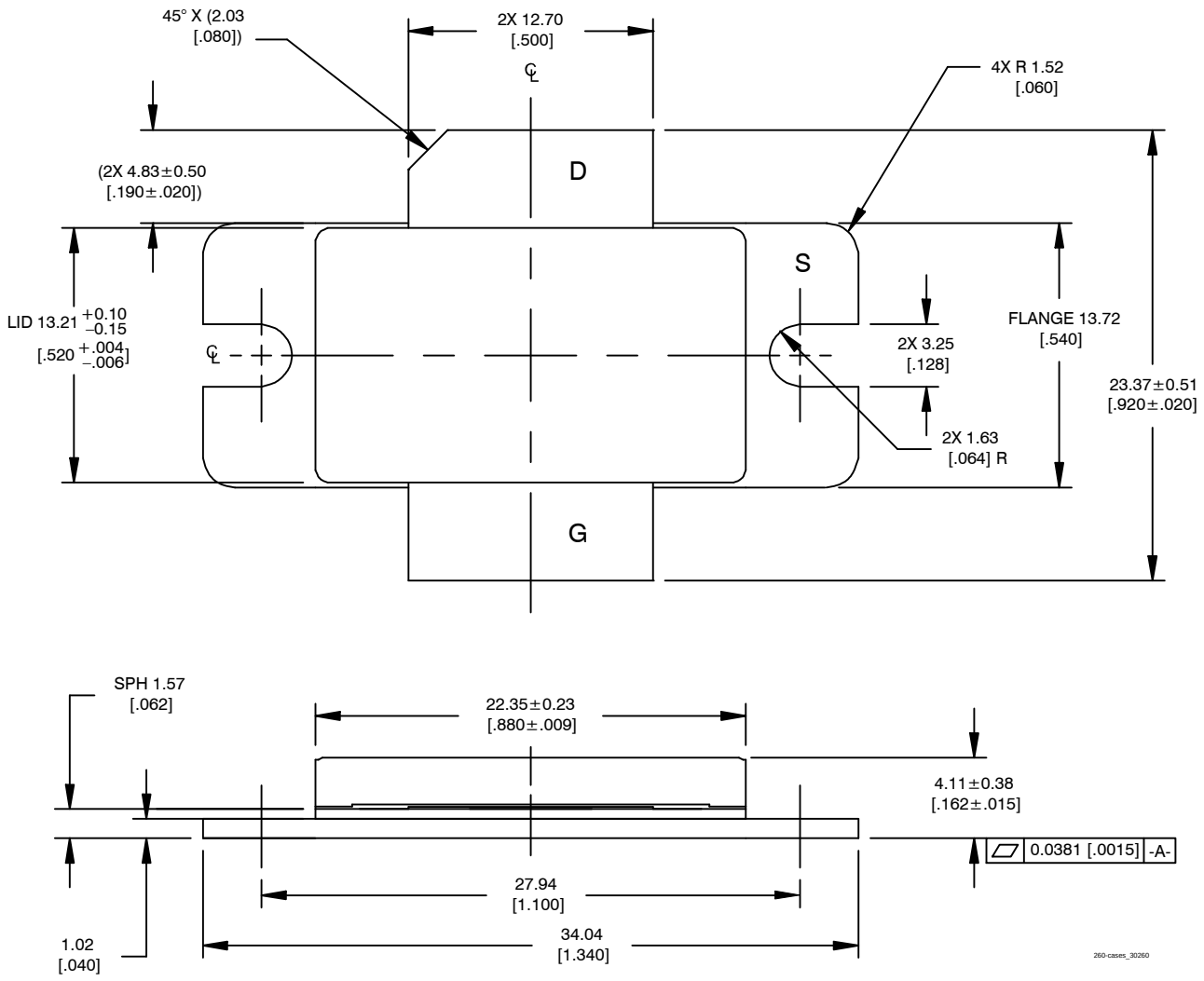



Diagram Notes—unless otherwise specified:

1. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001].
2. All tolerances ± 0.127 [.005] unless specified otherwise.
3. Pins: D = drain, S = source, G = gate.
4. Interpret dimensions and tolerances per ASME Y14.5M-1994.
5. Primary dimensions are mm. Alternate dimensions are inches.
6. Gold plating thickness:
   S - flange: 2.54 micron [100 microinch] (min)
   D, G - leads: 1.14 micron ± 0.38 micron [45 microinch ± 15 microinch]

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

## Package Outline Specifications (cont.)

### Package H-31260-2

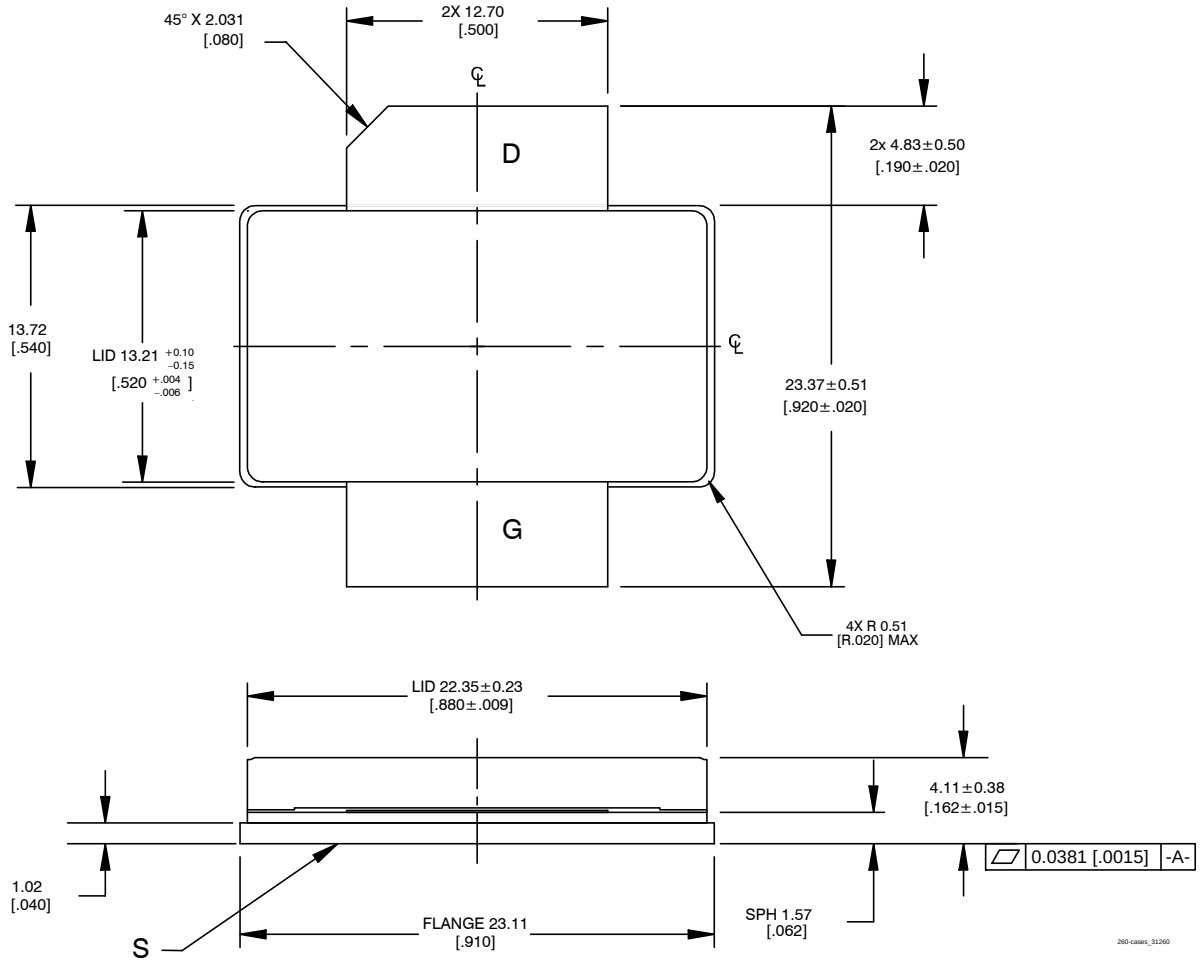



Diagram Notes—unless otherwise specified:

1. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001].
2. All tolerances ± 0.127 [.005] unless specified otherwise.
3. Pins: D = drain, S = source, G = gate.
4. Interpret dimensions and tolerances per ASME Y14.5M-1994.
5. Primary dimensions are mm. Alternate dimensions are inches.
6. Gold plating thickness:
   S - flange: 2.54 micron [100 microinch] (min)
   D, G - leads: 1.14 micron ± 0.38 micron [45 microinch ± 15 microinch]

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

| **Revision History:** | **2007-05-11** | Data Sheet |
|---|---|---|
| Previous Version: | 2006-06-29, Data Sheet | |

| Page | Subjects (major changes since last revision) |
|---|---|
| 5, 6 | Add two graphs. |
| 9 | Update package outline diagram for Package H-30260-2. |
| | |
| | |
| | |

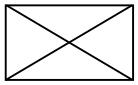
## Notes:

**We Listen to Your Comments**

Any information within this document that you feel is wrong, unclear or missing at all?
Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to:

**highpowerRF@infineon.com**

To request other information, contact us at:
+1 877 465 3667 (1-877-GO-LDMOS) USA
or +1 408 776 0600 International



*GOLDMOS*® is a registered trademark of Infineon Technologies AG.

**Edition 2007-05-11**

**Published by**
**Infineon Technologies AG**
**81726 München, Germany**

**© Infineon Technologies AG 2005.**
**All Rights Reserved.**

**Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”). With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

**Information**

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com/rfpower**).

**Warnings**

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.