

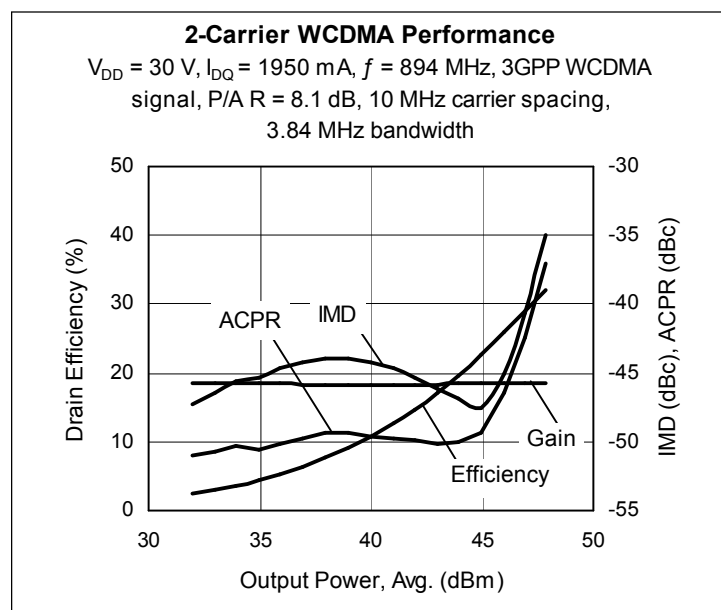
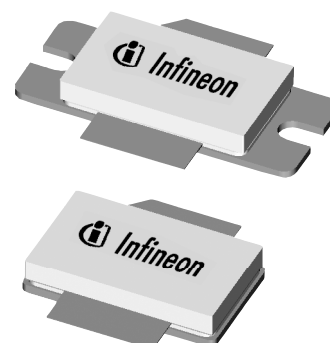
## Thermally-Enhanced High Power RF LDMOS FETs 220 W, 869 – 894 MHz

### Description

The PTFA082201E and PTFA082201F are 220-watt LDMOS FETs designed for CDMA and WCDMA power amplifier applications in the 869 to 894 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.

PTFA082201E  
Package H-36260-2

PTFA082201F  
Package H-37260-2



### Features

- Thermally-enhanced packages, Pb-free and RoHS compliant
- Broadband internal matching
- Typical two-carrier WCDMA performance at 894 MHz, 30 V
  - Average output power = 55 W
  - Linear Gain = 18.0 dB
  - Efficiency = 30%
  - Intermodulation distortion = -37 dBc
  - Adjacent channel power = -39.5 dBc
- Typical CW performance, 894 MHz, 30 V
  - Output power at P-1dB = 250 W
  - Efficiency = 59%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR at 30 V, 220 W (CW) output power

### RF Characteristics

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

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1950\text{ mA}$ ,  $P_{OUT} = 55\text{ W}$  average

$f_1 = 884\text{ MHz}$ ,  $f_2 = 894\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8.1 dB @ 0.01% CCDF

| Characteristic             | Symbol   | Min | Typ  | Max | Unit |
|----------------------------|----------|-----|------|-----|------|
| Gain                       | $G_{ps}$ | —   | 18.0 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | —   | 30   | —   | %    |
| Intermodulation Distortion | IMD      | —   | -37  | —   | 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.)

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

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1950\text{ mA}$ ,  $P_{OUT} = 220\text{ W PEP}$ ,  $f = 894\text{ MHz}$ , tone spacing = 1 MHz

| Characteristic             | Symbol   | Min  | Typ  | Max | Unit |
|----------------------------|----------|------|------|-----|------|
| Gain                       | $G_{ps}$ | 17.5 | 18.0 | —   | dB   |
| Drain Efficiency           | $\eta_D$ | 40   | 43   | —   | %    |
| 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         | $V_{DS} = 30\text{ V}$ , $I_{DQ} = 1950\text{ mA}$ | $V_{GS}$      | 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<br>Above 25 $^{\circ}\text{C}$ derate by | $P_D$           | 700         | W                     |
|                                                                   |                 | 4.0         | W/ $^{\circ}\text{C}$ |
| Storage Temperature Range                                         | $T_{STG}$       | -40 to +150 | $^{\circ}\text{C}$    |
| Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 220 W CW)  | $R_{\theta JC}$ | 0.25        | $^{\circ}\text{C/W}$  |

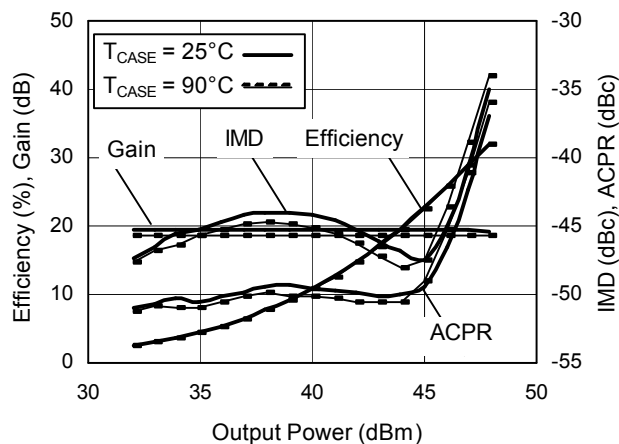
## Ordering Information

| Type and Version | Package Outline | Package Description                             | Shipping | Marking     |
|------------------|-----------------|-------------------------------------------------|----------|-------------|
| PTFA082201E V4   | H-36260-2       | Thermally-enhanced slotted flange, single-ended | Tray     | PTFA082201E |
| PTFA082201F V4   | H-37260-2       | Thermally-enhanced earless flange, single-ended | Tray     | PTFA082201F |

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

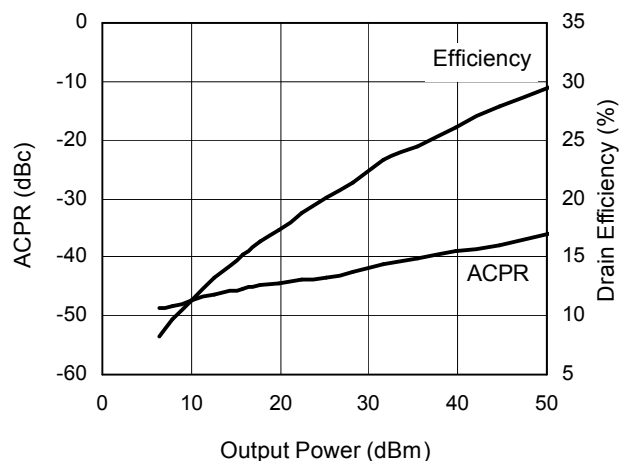
### 2-Carrier WCDMA Performance

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1950\text{ mA}$ ,  $f = 894\text{ MHz}$ , 3GPP WCDMA signal, P/A R = 8.1 dB, 10 MHz carrier spacing, 3.84 MHz bandwidth



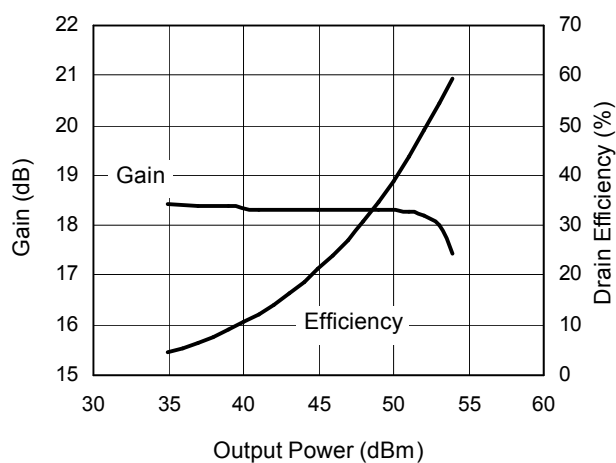
### Two-carrier WCDMA Power Sweep

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1600\text{ mA}$ ,  $f_1 = 889\text{ MHz}$ ,  $f_2 = 894\text{ MHz}$



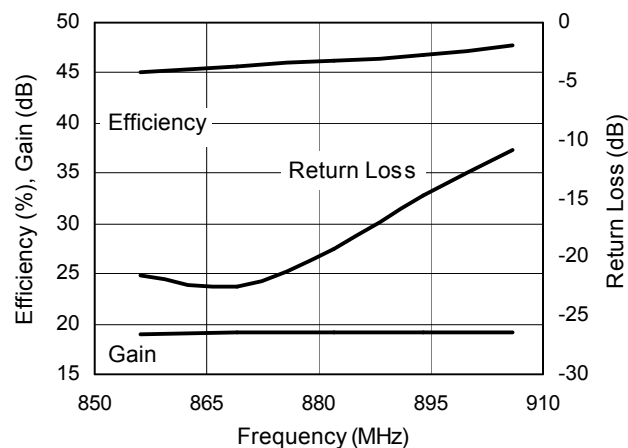
### Gain & Efficiency vs. Output Power

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1950\text{ mA}$ ,  $f = 894\text{ MHz}$

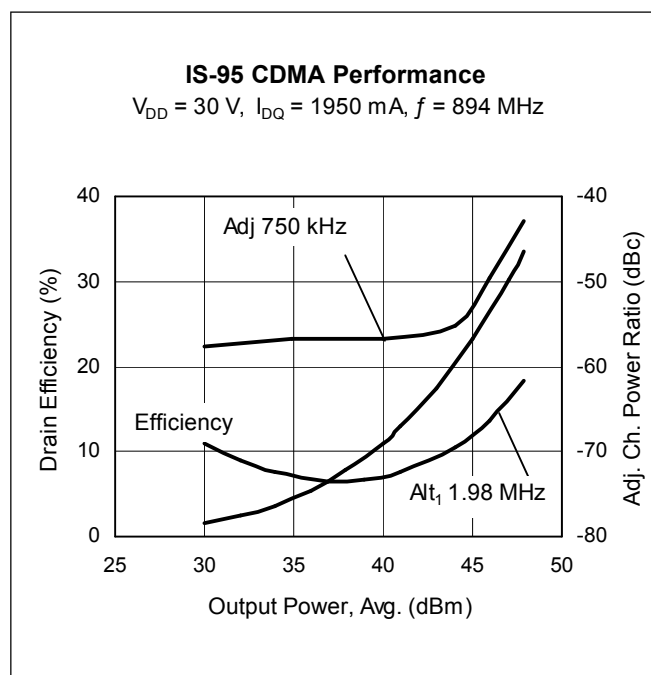
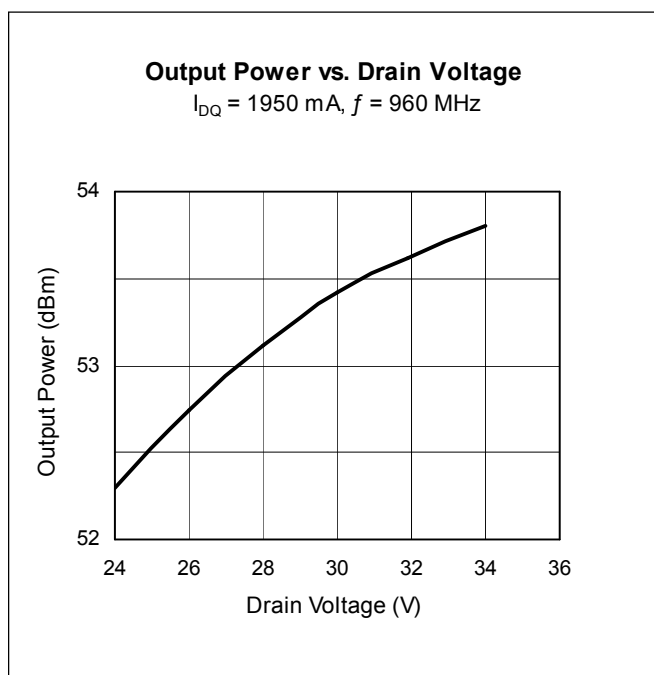
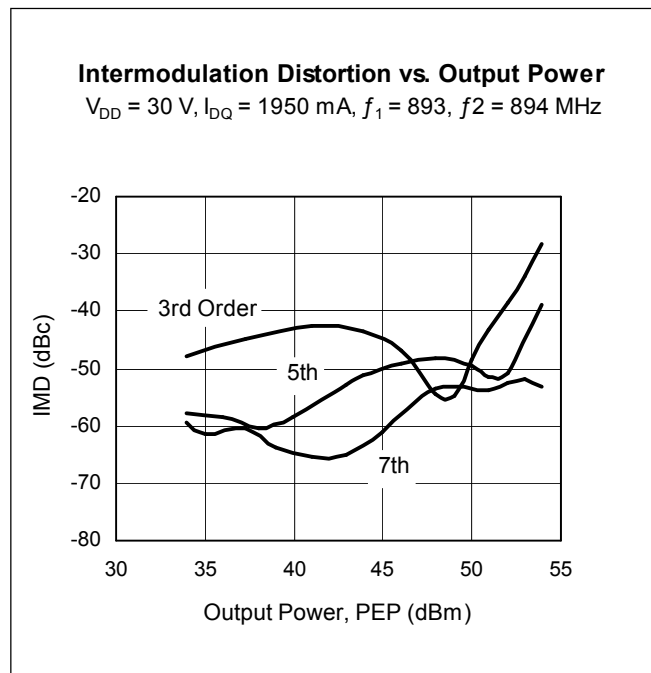
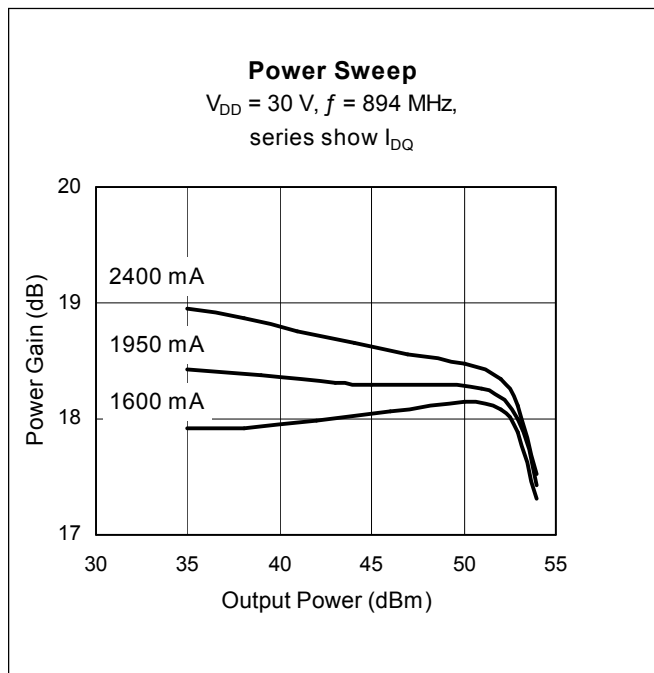


### 2-Tone Broadband Performance

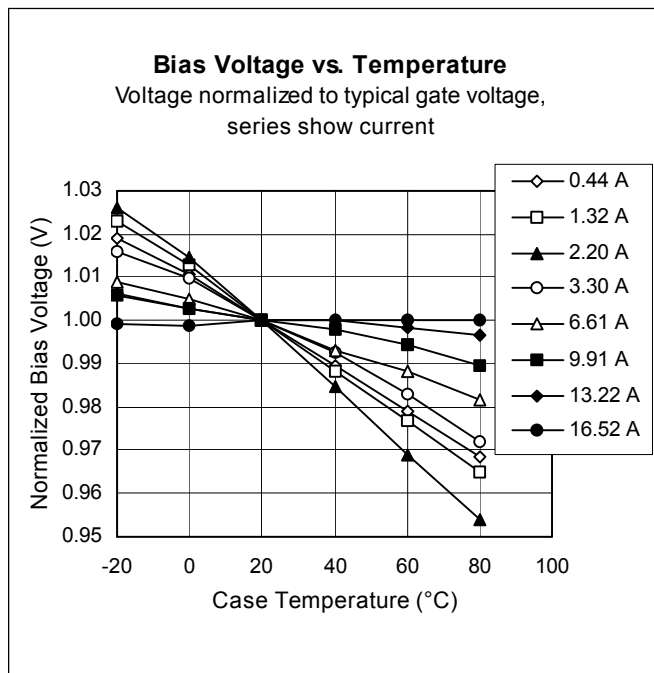
$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1950\text{ mA}$ ,  $P_{OUT} = 110\text{ W}$



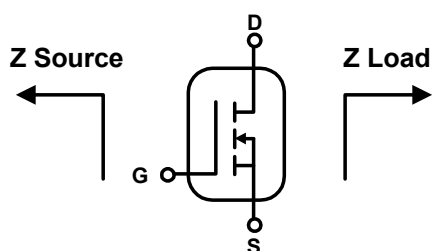
## Typical Performance (cont.)



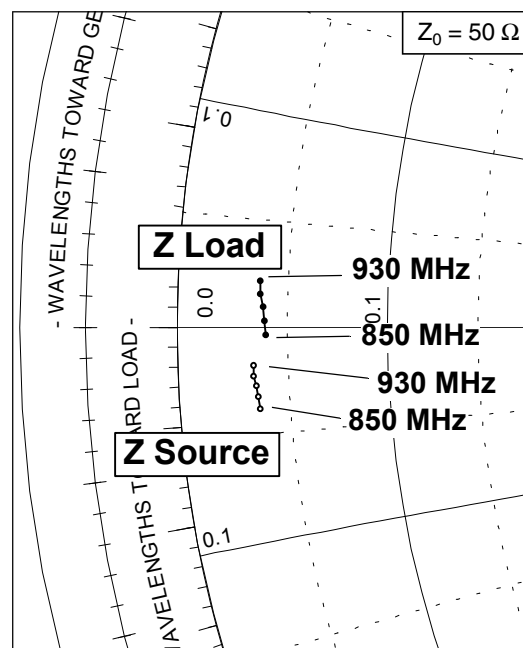
## Typical Performance (cont.)



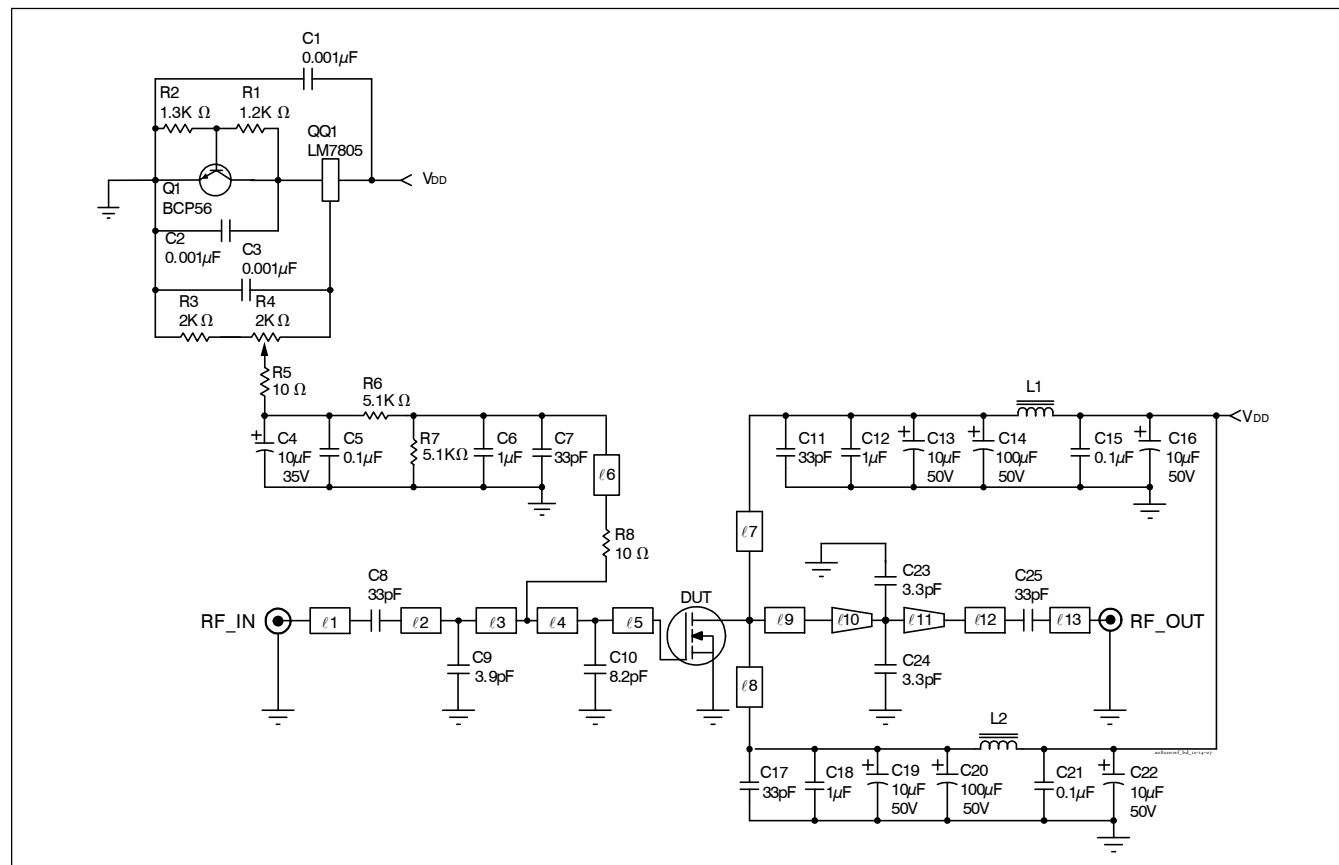
## Broadband Circuit Impedance



| Frequency<br>MHz | Z Source W |        | Z Load W |        |
|------------------|------------|--------|----------|--------|
|                  | R          | jX     | R        | jX     |
| 850              | 1.792      | -1.910 | 1.999    | -0.196 |
| 870              | 1.764      | -1.624 | 1.963    | 0.165  |
| 890              | 1.737      | -1.360 | 1.924    | 0.485  |
| 910              | 1.693      | -1.147 | 1.854    | 0.793  |
| 930              | 1.703      | -0.896 | 1.853    | 1.087  |



## Reference Circuit



Reference circuit schematic for  $f = 894 \text{ MHz}$

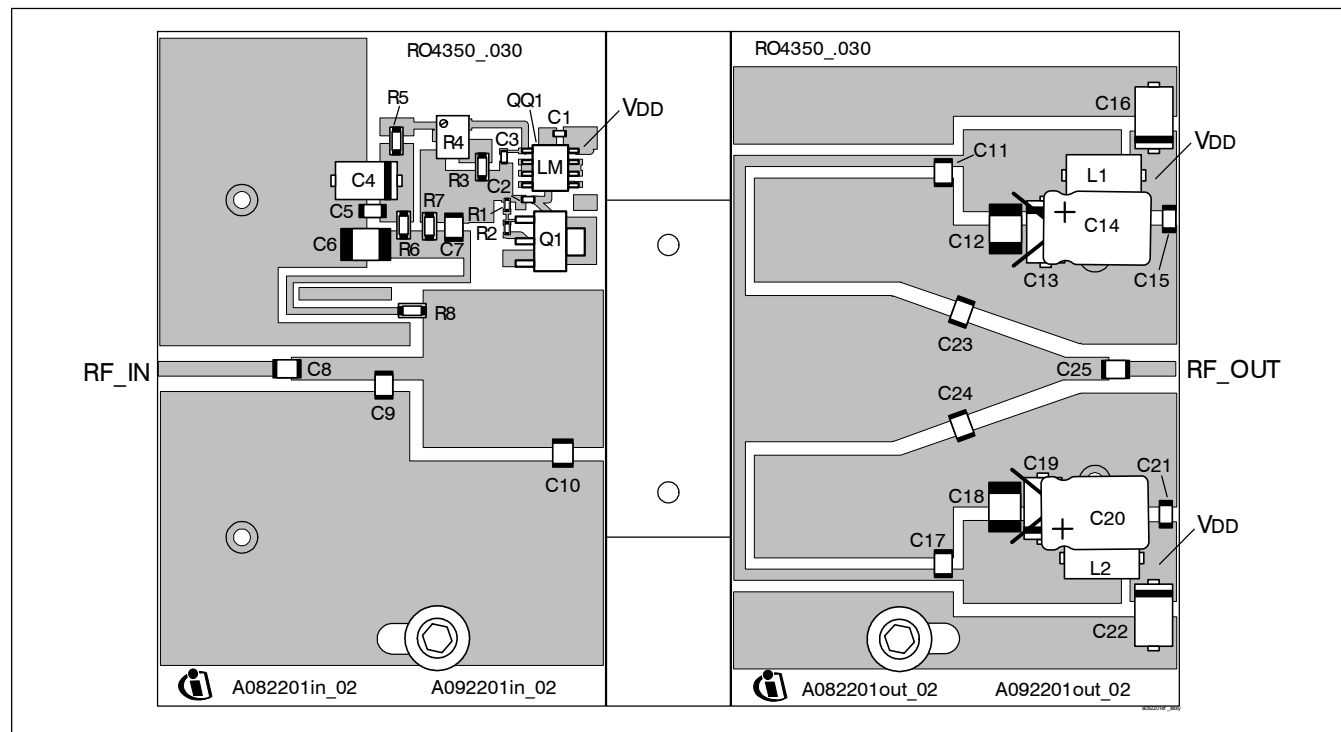
### Circuit Assembly Information

|     |                                            |                  |              |
|-----|--------------------------------------------|------------------|--------------|
| DUT | PTFA082201E or PTFA082201F                 | LDMOS Transistor |              |
| PCB | 0.76 mm [.030"] thick, $\epsilon_r = 3.48$ | Rogers RO4350    | 1 oz. copper |

| Microstrip          | Electrical Characteristics at 894 MHz <sup>1</sup> | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|---------------------|----------------------------------------------------|------------------------|-------------------------|
| $\ell_1$            | $0.065 \lambda$ , 50.0 $\Omega$                    | 13.13 x 1.60           | 0.517 x 0.063           |
| $\ell_2$            | $0.049 \lambda$ , 38.0 $\Omega$                    | 9.78 x 2.54            | 0.385 x 0.100           |
| $\ell_3$            | $0.024 \lambda$ , 38.0 $\Omega$                    | 4.83 x 2.54            | 0.190 x 0.100           |
| $\ell_4$            | $0.083 \lambda$ , 7.8 $\Omega$                     | 15.44 x 17.83          | 0.608 x 0.702           |
| $\ell_5$            | $0.027 \lambda$ , 7.8 $\Omega$                     | 4.95 x 17.83           | 0.195 x 0.702           |
| $\ell_6$            | $0.190 \lambda$ , 78.0 $\Omega$                    | 40.64 x 0.74           | 1.600 x 0.029           |
| $\ell_7, \ell_8$    | $0.183 \lambda$ , 60.0 $\Omega$                    | 37.54 x 1.24           | 1.478 x 0.049           |
| $\ell_9$            | $0.095 \lambda$ , 8.4 $\Omega$                     | 17.68 x 16.48          | 0.696 x 0.649           |
| $\ell_{10}$ (taper) | $0.031 \lambda$ , 8.4 $\Omega$ / 11.2 $\Omega$     | 5.94 x 16.48 / 11.91   | 0.234 x 0.649 / 0.469   |
| $\ell_{11}$ (taper) | $0.077 \lambda$ , 11.2 $\Omega$ / 37.0 $\Omega$    | 14.53 x 11.91 / 2.64   | 0.572 x 0.469 / 0.104   |
| $\ell_{12}$         | $0.025 \lambda$ , 37.0 $\Omega$                    | 4.98 x 2.64            | 0.196 x 0.104           |
| $\ell_{13}$         | $0.028 \lambda$ , 50.0 $\Omega$                    | 5.74 x 1.60            | 0.226 x 0.063           |

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

## Reference Circuit (cont.)



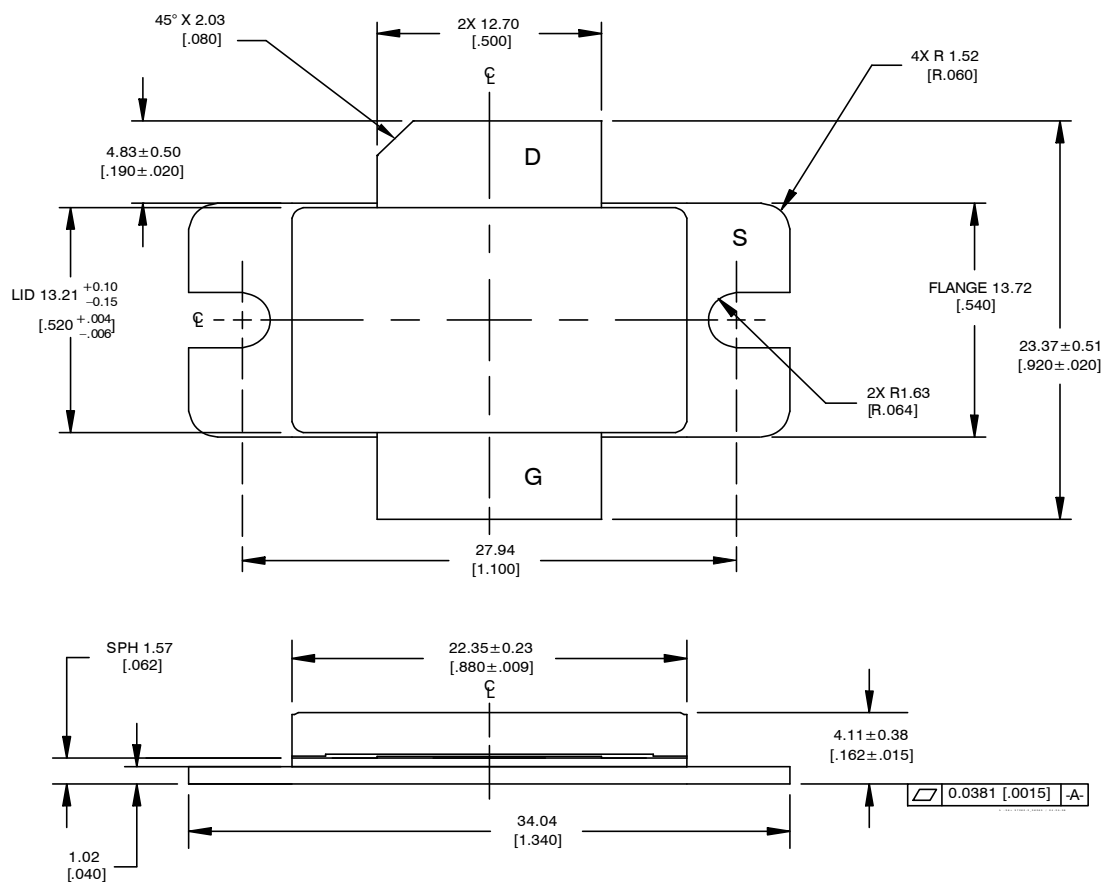
Reference circuit assembly diagram (not to scale)\*

| 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      |
| C6, C12, C18          | Capacitor, 1 $\mu$ F                      | ATC                    | 920C105           |
| C7, C8, C11, C17, C25 | Ceramic capacitor, 33 pF                  | ATC                    | 100B 330          |
| C9                    | Ceramic capacitor, 3.9 pF                 | ATC                    | 100B 3R9          |
| C10                   | Ceramic capacitor, 8.2 pF                 | ATC                    | 100B 8R2          |
| C13, C16, C19, C22    | Tantalum capacitor, 10 $\mu$ F, 50 V      | Garrett Electronics    | TPSE106K050R0400  |
| C14, C20              | Electrolytic capacitor, 100 $\mu$ F, 50 V | Digi-Key               | P5182-ND          |
| C23, C24              | Ceramic capacitor, 3.3 pF                 | ATC                    | 100B 3R3          |
| 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

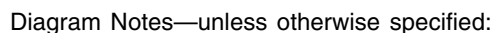
Package H-36260-2



### 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, D, G - flange & leads: 1.14 ± 0.38 micron [45 ± 15 microinch]

## Package H-37260-2



1. Lead thickness:  $0.10 + 0.051/-0.025$  [ $.004 + .002/- .001$ ].
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Rev. 04.1, 2009-02-20

Revision History: 2009-02-20 Data Sheet

Previous Version: 2008-07-08 and 2007-12-13, Data Sheets

| Page        | Subjects (major changes since last revision)                                           |
|-------------|----------------------------------------------------------------------------------------|
| 1, 2, 9, 10 | Update product to V4, with new package technologies. Updated package outline diagrams. |
| 1 – 4       | Update RF characteristics.                                                             |
| 7           | Revise block diagram.                                                                  |
| 7           | Fixed typing error                                                                     |
|             |                                                                                        |

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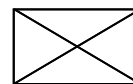
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