PTFA092201E
PTFA092201F

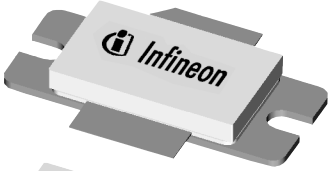
green Product

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

Description

The PTFA092201E and PTFA092201F 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.

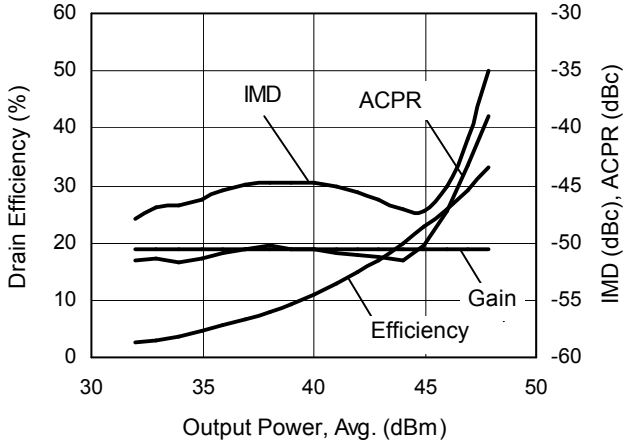
PTFA092201E
Package H-36260-2



PTFA092201F
Package H-37260-2

2-Carrier WCDMA Performance

V_{DD} = 30 V, I_{DQ} = 1850 mA, f = 960 MHz, 3GPP WCDMA signal, P/A R = 8.1 dB, 10 MHz carrier spacing, 3.84 MHz bandwidth



Features

- Pb-free, RoHS-compliant and thermally-enhanced packages
- Broadband internal matching
- Typical two-carrier WCDMA performance at 960 MHz, 30 V
  - Average output power = 55 W
  - Linear Gain = 18.5 dB
  - Efficiency = 30%
  - Intermodulation distortion = –37 dBc
  - Adjacent channel power = –39 dBc
- Typical CW performance, 960 MHz, 30 V
  - Output power at P–1dB = 250 W
  - Gain = 17.5 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

RF Characteristics

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

V_{DD} = 30 V, I_{DQ} = 1850 mA, P_{OUT} = 55 W average
f_1 = 950 MHz, f_2 = 960 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8.1 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Intermodulation Distortion	IMD	—	–37	—	dBc
Gain	G_{ps}	—	18.5	—	dB
Drain Efficiency	η_D	—	30	—	%

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} = 30 V, I_{DQ} = 1850 mA, P_{OUT} = 220 W PEP, f = 960 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	18.5	—	dB
Drain Efficiency	η_D	42	44	—	%
Intermodulation Distortion	IMD	—	—	–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	$R_{DS(on)}$	—	0.04	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 1850 mA	V_{GS}	2.0	2.5	3.0	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	700	W
Above 25 °C derate by		4.0	W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70 °C, 220 W CW)	$R_{\theta JC}$	0.25	°C/W

Ordering Information

Type and Version	Package Outline	Package Description	Shipping	Marking
PTFA092201E V4	H-36260-2	Thermally-enhanced slotted flange, single-ended	Tray	PTFA092201E
PTFA092201F V4	H-37260-2	Thermally-enhanced earless flange, single-ended	Tray	PTFA092201F

Typical Performance (data taken in a production test fixture)

2-Carrier WCDMA Performance

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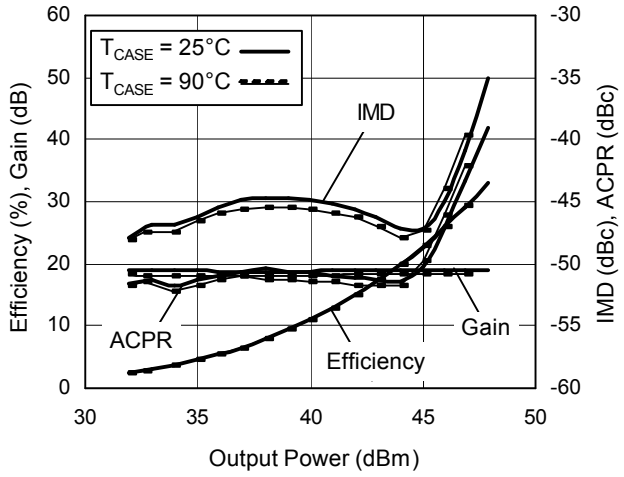
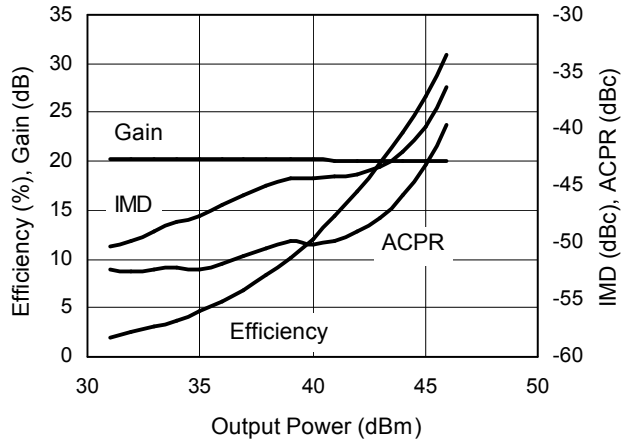


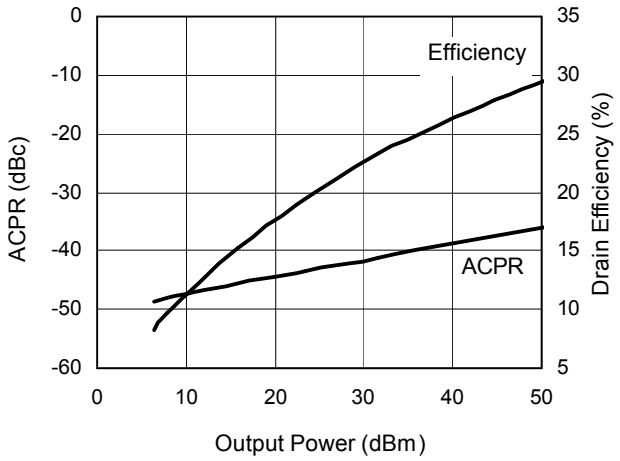
2-Carrier WCDMA (high gain tune)

V_{DD} = 30 V, I_{DQ} = 2000 mA, f = 960 MHz, 3GPP WCDMA signal, P/A R = 8.1 dB, 10 MHz carrier spacing, 3.84 MHz bandwidth



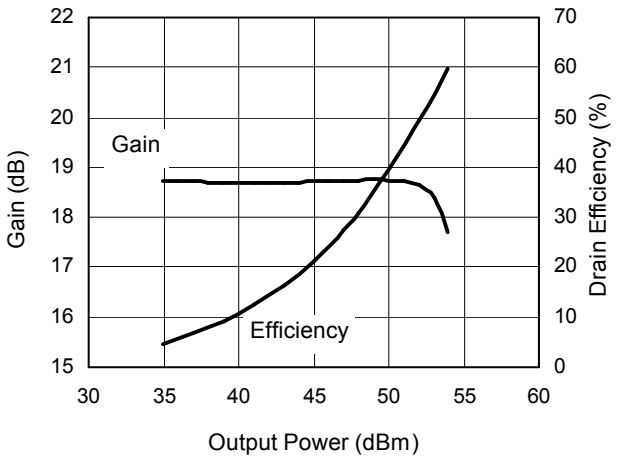
Two-carrier WCDMA Power Sweep

V_{DD} = 30 V, I_{DQ} = 1600 mA, f_1 = 889 MHz, f_2 = 894, PAR = 7.1 dB each carrier at 0.01% probability



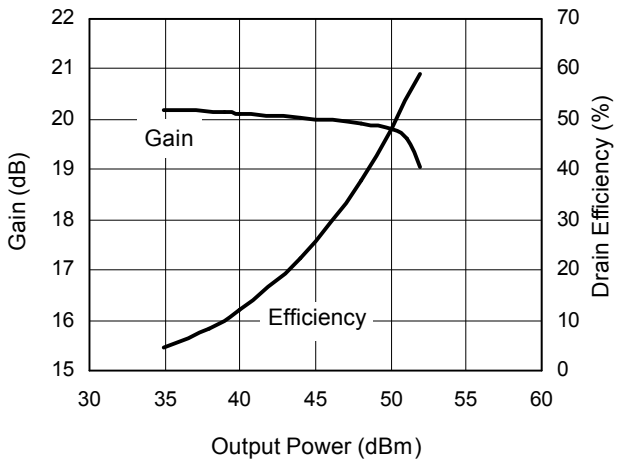
Gain & Efficiency vs. Output Power

V_{DD} = 30 V, I_{DQ} = 1850 mA, f = 960 MHz

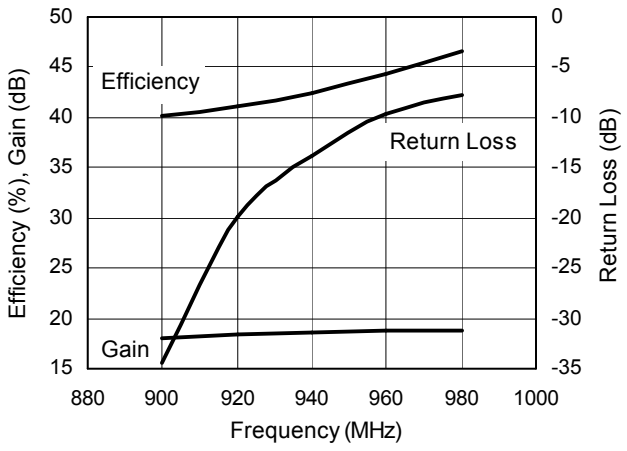


Typical Performance (cont.)

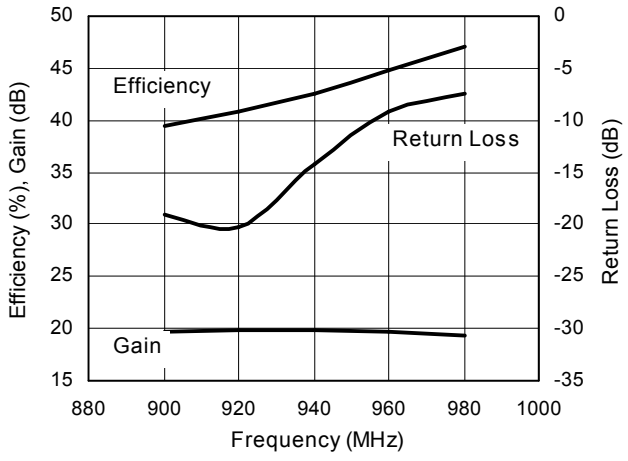
CW (high gain tuned)
Gain & Efficiency vs. Output Power
V_{DD} = 30 V, I_{DQ} = 2000 mA, f = 960 MHz



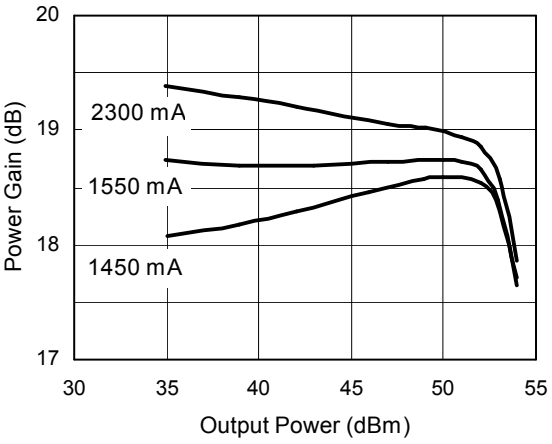
2-Tone Broadband Performance
V_{DD} = 30 V, I_{DQ} = 1850 mA, P_{OUT} = 110 W



2-Tone Broadband (tuned for high gain)
V_{DD} = 30 V, I_{DQ} = 2000 mA, P_{OUT} = 80 W



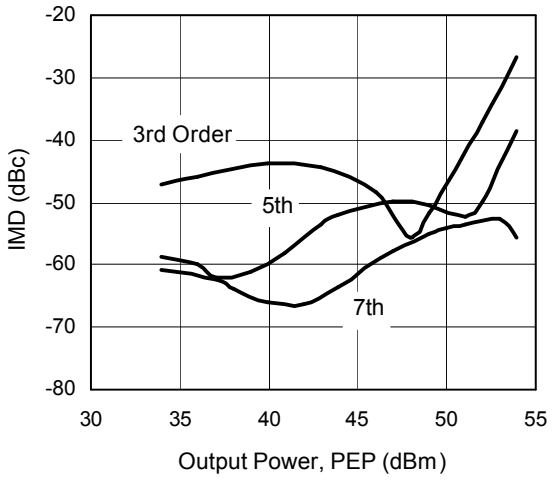
Power Sweep, CW
V_{DD} = 30 V, f = 960 MHz,
series show I_{DQ}



Typical Performance (cont.)

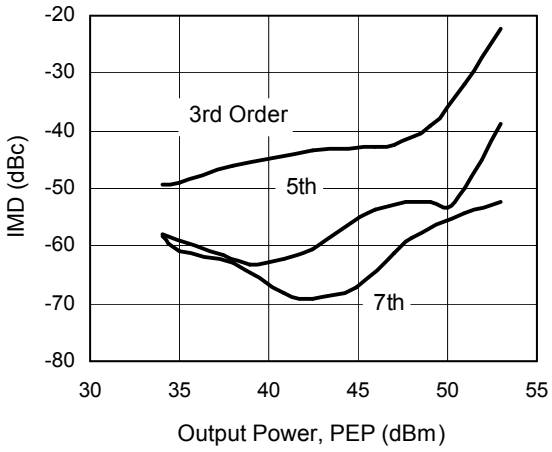
Intermodulation Distortion vs. Output Power

V_{DD} = 30 V, I_{DQ} = 1850 mA, f_1 = 960, $f2$ = 959 MHz



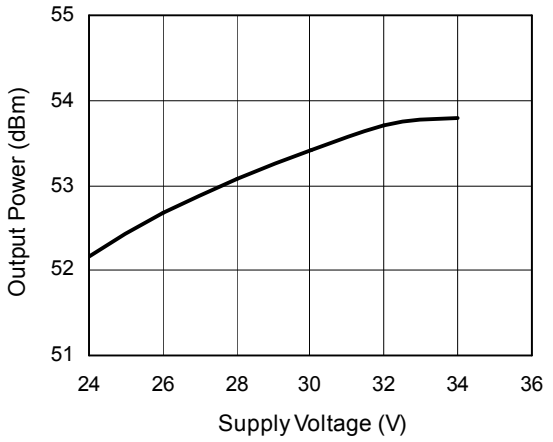
Intermodulation Distortion vs. Output Power (high gain tune)

V_{DD} = 30 V, I_{DQ} = 2000 mA, f_1 = 859, f_2 = 960 MHz



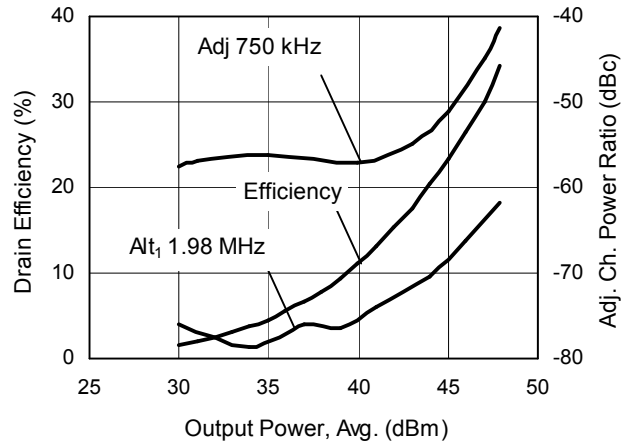
Output Power vs. Supply Voltage

I_{DQ} = 1850 mA, f = 960 MHz

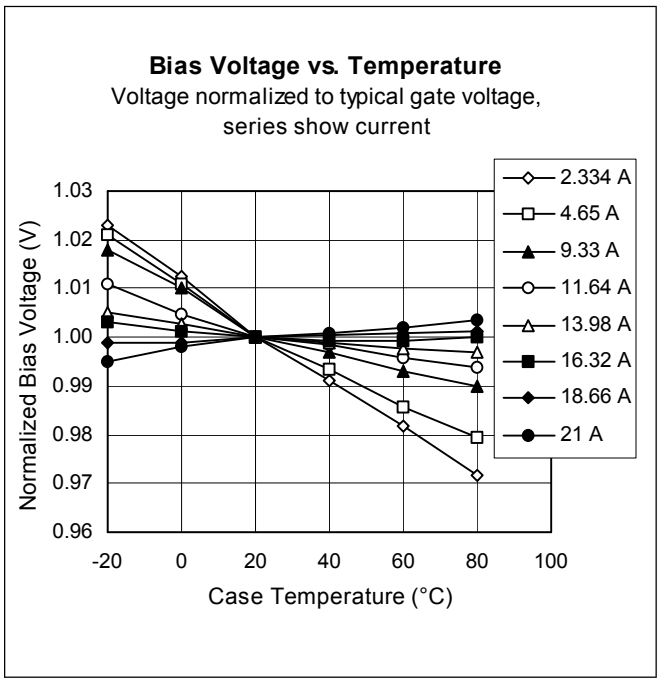


IS-95 CDMA Performance

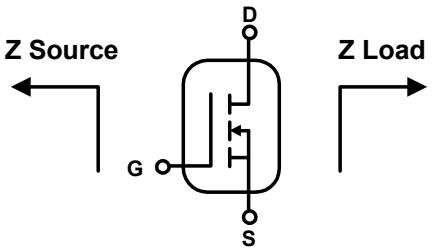
V_{DD} = 30 V, I_{DQ} = 1850 mA, f = 960 MHz



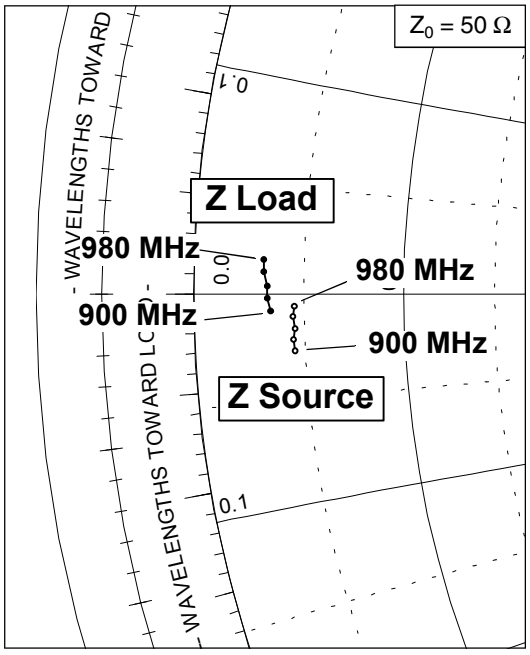
Typical Performance (cont.)



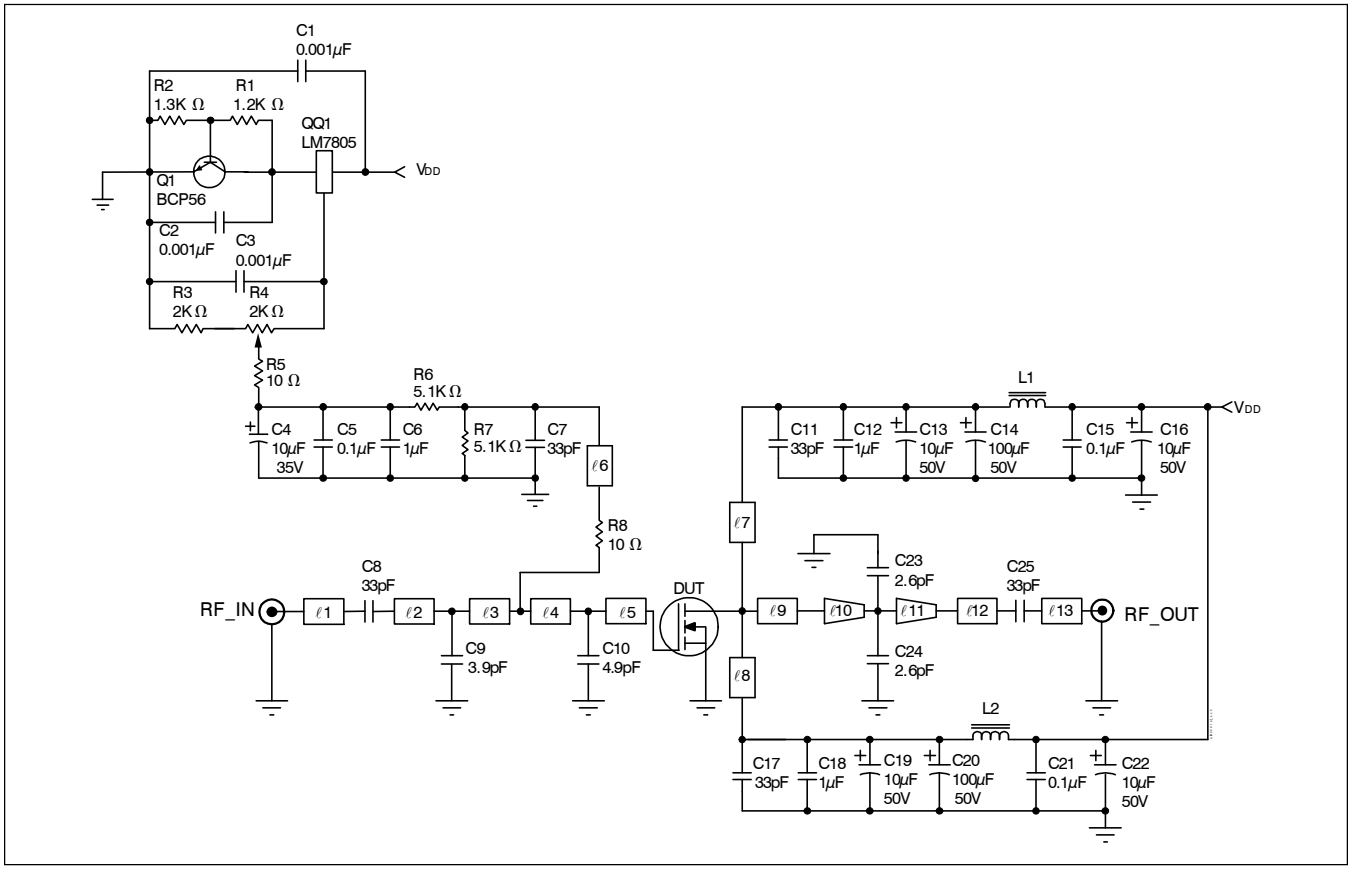
Broadband Circuit Impedance



Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
900	2.256	–1.363	1.722	–0.413
920	2.250	–1.094	1.653	–0.109
940	2.282	–0.826	1.651	0.186
960	2.239	–0.545	1.562	0.518
980	2.288	–0.307	1.562	0.795



Reference Circuit



Reference circuit block diagram for ƒ = 960 MHz

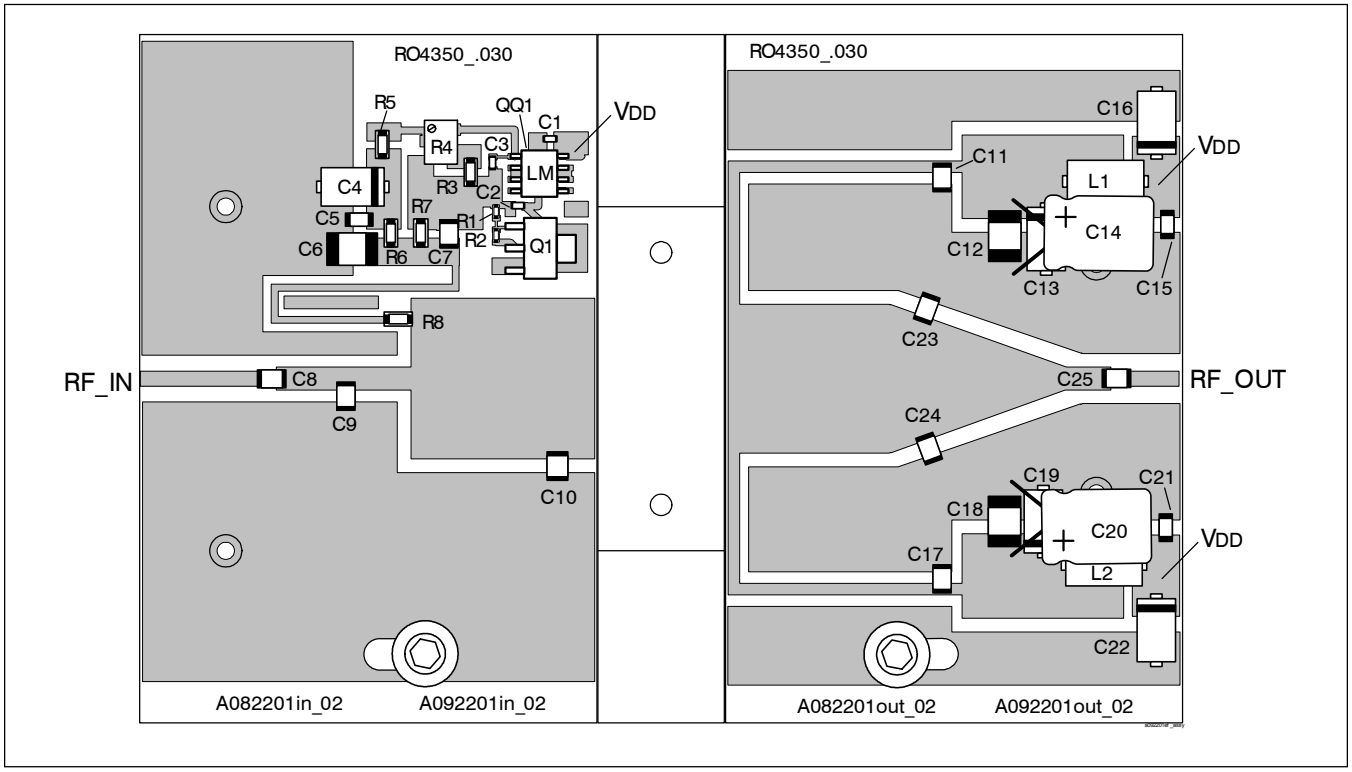
Circuit Assembly Information

DUT	PTFA092201E or PTFA092201F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, ε_r = 3.48	Rogers RO4350	1 oz. copper

Microstrip	Electrical Characteristics at 960 MHz[1]	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ1	0.068 λ, 52.0 Ω	12.78 x 1.60	0.503 x 0.063
ℓ2	0.041 λ, 38.0 Ω	7.57 x 2.54	0.298 x 0.100
ℓ3	0.040 λ, 38.0 Ω	7.34 x 2.54	0.289 x 0.100
ℓ4	0.092 λ, 7.8 Ω	15.95 x 17.83	0.628 x 0.702
ℓ5	0.025 λ, 7.8 Ω	4.29 x 17.83	0.169 x 0.702
ℓ6	0.208 λ, 78.3 Ω	40.64 x 0.74	1.600 x 0.029
ℓ7, ℓ8	0.200 λ, 60.1 Ω	40.64 x 1.24	1.500 x 0.049
ℓ9	0.102 λ, 8.4 Ω	17.65 x 16.48	0.695 x 0.649
ℓ10 (taper)	0.021 λ, 8.4 Ω / 10.1 Ω	3.56 x 16.48 / 13.36	0.140 x 0.649 / 0.526
ℓ11 (taper)	0.094 λ, 10.1 Ω / 37.7 Ω	16.38 x 13.36 / 2.64	0.645 x 0.526 / 0.104
ℓ12	0.022 λ, 37.0 Ω	4.04 x 2.64	0.159 x 0.104
ℓ13	0.035 λ, 52.0 Ω	6.55 x 1.60	0.258 x 0.063

[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	399-1655-2-ND
C5, C15, C21	Capacitor, 0.1 µF	Digi-Key	PCC104BCT-ND
C6, C12, C18	Capacitor, 1 µF	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, 4.9 pF	ATC	100B 4R9
C13, C16, C19, C22	Tantalum capacitor, 10 µF, 50 V	Garrett Electronics	TPSE106K050R0400
C14, C20	Electrolytic capacitor, 100 µF, 50 V	Digi-Key	P5571-ND
C23, C24	Ceramic capacitor, 2.6 pF	ATC	100B 2R6
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

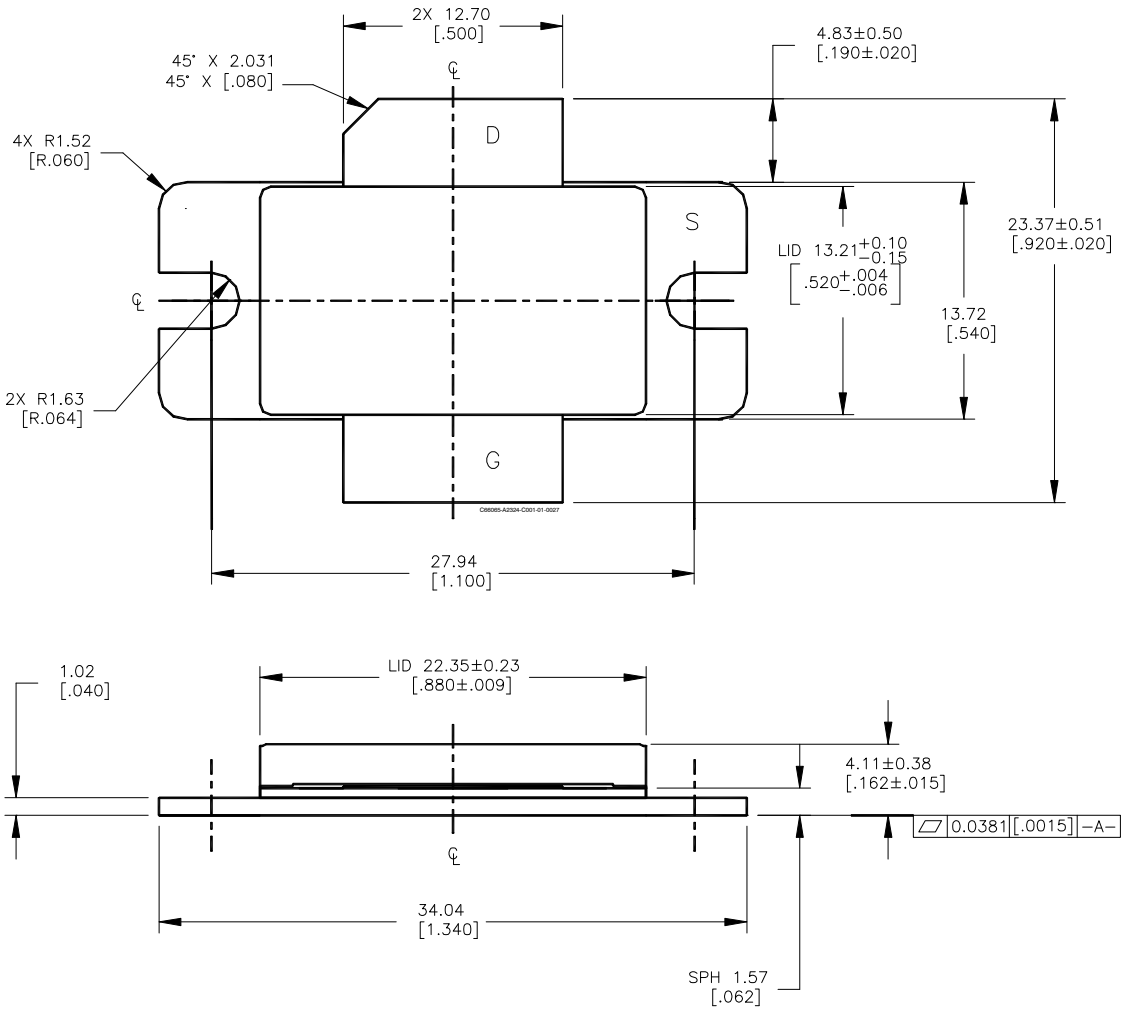


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. Pins: D = drain, S = source, G = gate.
4. Lead thickness: 0.10 +0.051/–0.025 [.004 +.002/–.001].
5. Gold plating thickness:
   S, D, G - flange & leads: 1.14 ± 0.38 micron [45 ± 15 microinch]
6. All tolerances ± 0.25 [.01] / ± 0.127 [.005] unless specified otherwise.

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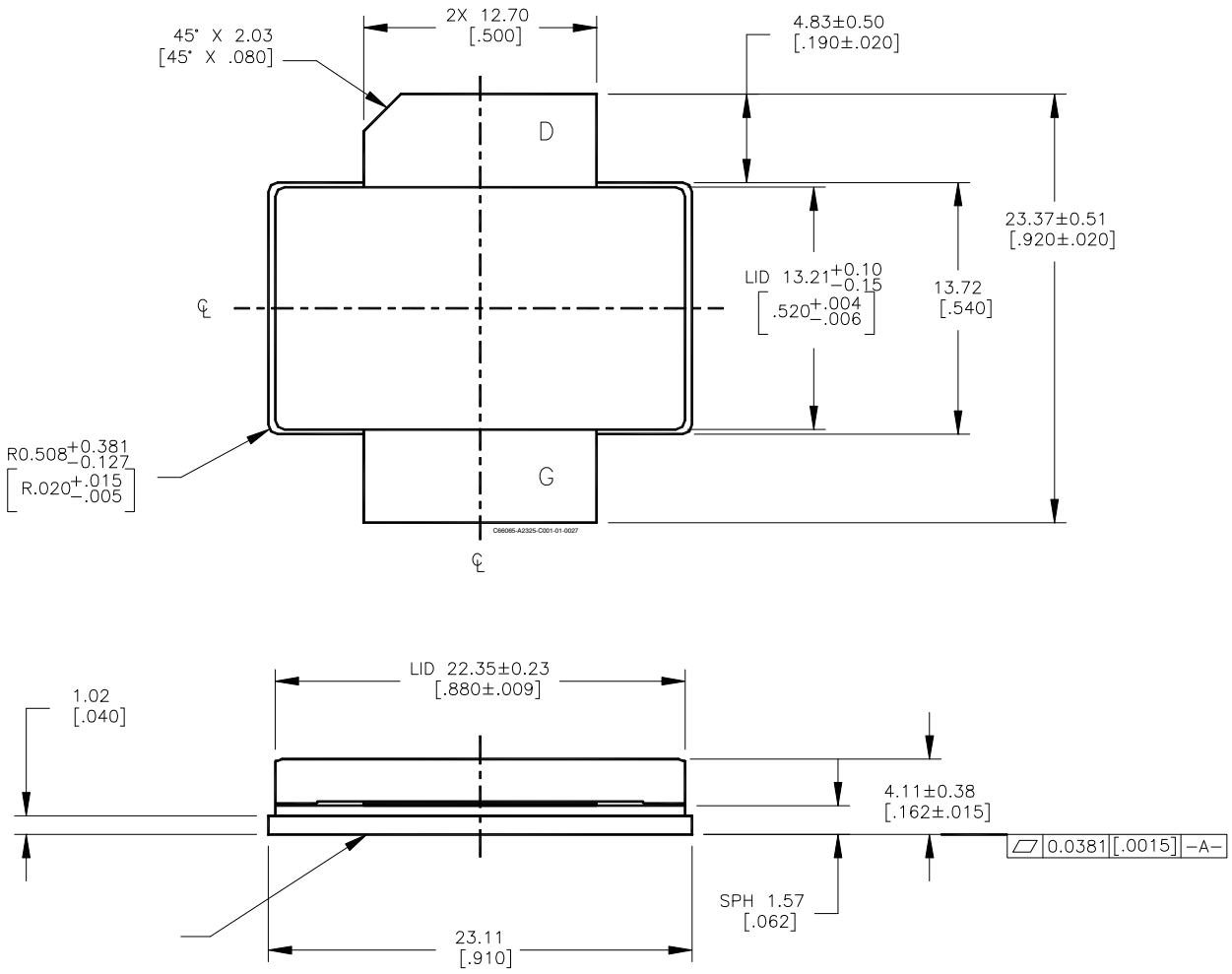
Package Outline Specifications (cont.)

Package H-37260-2



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PTFA092201E/F V4

Revision History:	2009-02-20	Data Sheet
Previous Version:	2006-06-05, Data Sheet Rev. 02, Product V1	

Page	Subjects (major changes since last revision)
all	New product version V4, new package diagram and information.
8	Fixed typing error

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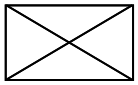

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