

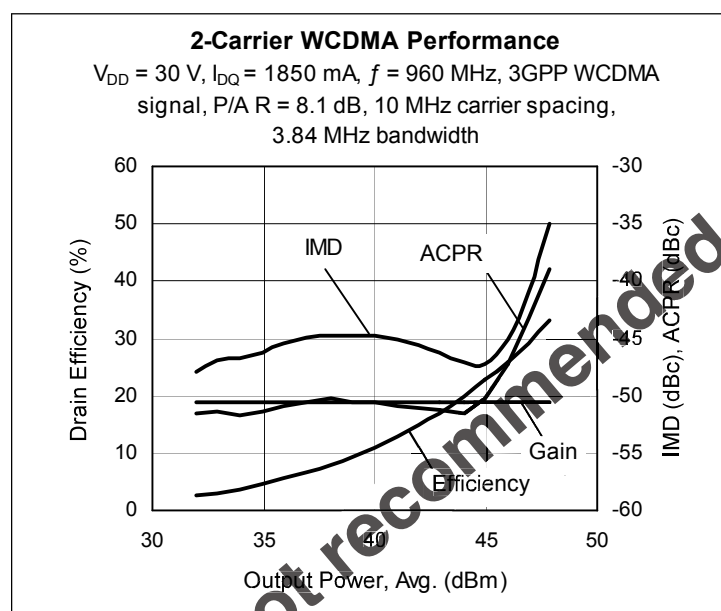
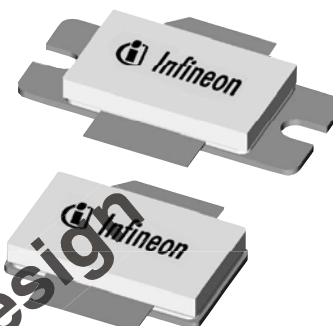
Thermally-Enhanced High Power RF LDMOS FETs 220 W, 920 – 960 MHz

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



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-1 dB = 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)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1850\text{ mA}$, $P_{OUT} = 55\text{ W}$ average

$f_1 = 950\text{ MHz}$, $f_2 = 960\text{ MHz}$, 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 $T_{CASE} = 25\text{ °C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-tone Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1850\text{ mA}$, $P_{OUT} = 220\text{ W PEP}$, $f = 960\text{ MHz}$, 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	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	$V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	1.0	μA
	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.04	—	Ω
Operating Gate Voltage	$V_{DS} = 30\text{ V}$, $I_{DQ} = 1850\text{ mA}$	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	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	$^{\circ}\text{C}$
Total Device Dissipation	P_D	700	W
Above 25 $^{\circ}\text{C}$ derate by		4.0	W/ $^{\circ}\text{C}$
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	$^{\circ}\text{C/W}$

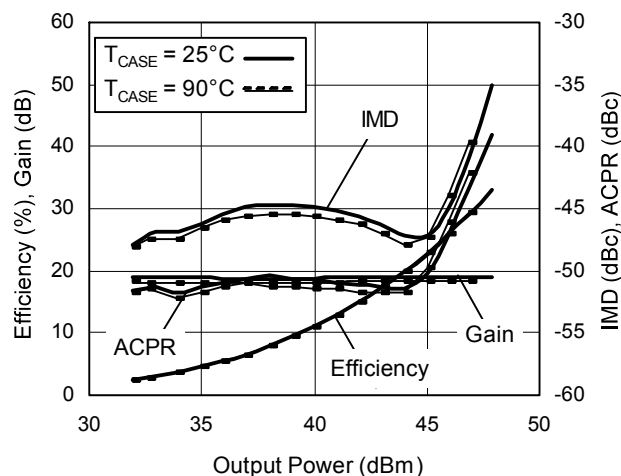
Ordering Information

Type and Version	Order Code	Package Description	Shipping
PTFA092201E V4 R0	PTFA092201EV4R0XTMA1	H-36260-2, bolt-down	Tape & Reel, 50pcs
PTFA092201E V4 R250	PTFA092201EV4R250XTMA1	H-36260-2, bolt-down	Tape & Reel, 250pcs
PTFA092201F V4 R0	PTFA092201FV4R0XTMA1	H-37260-2, earless flange	Tape & Reel, 50pcs
PTFA092201F V4 R250	PTFA092201FV4R250XTMA1	H-37260-2, earless flange	Tape & Reel, 250pcs

Typical Performance (data taken in a production test fixture)

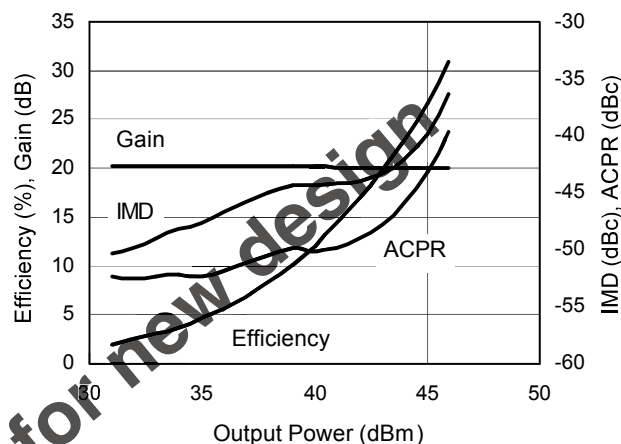
2-Carrier WCDMA Performance

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



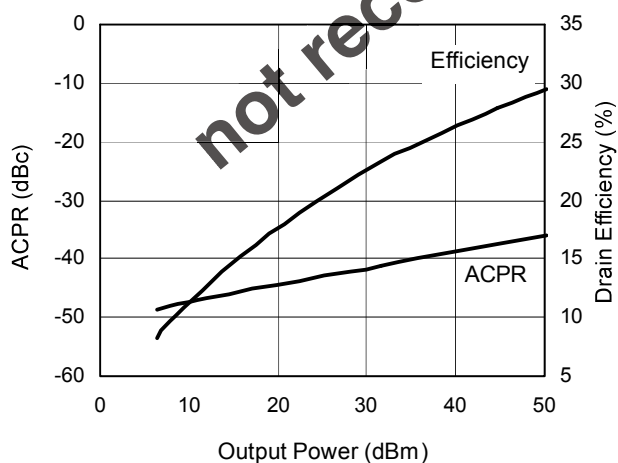
2-Carrier WCDMA (high gain tune)

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



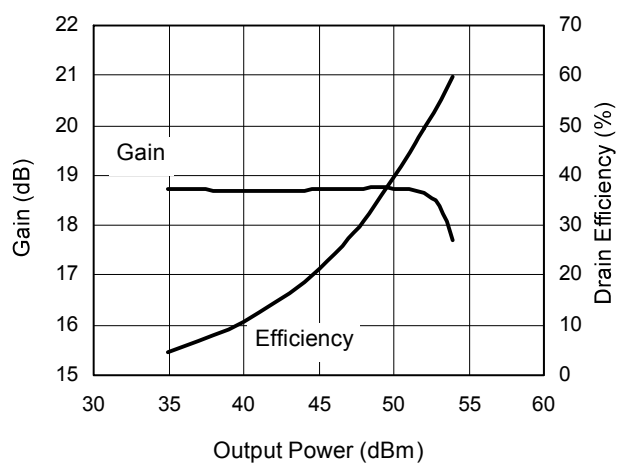
Two-carrier WCDMA Power Sweep

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

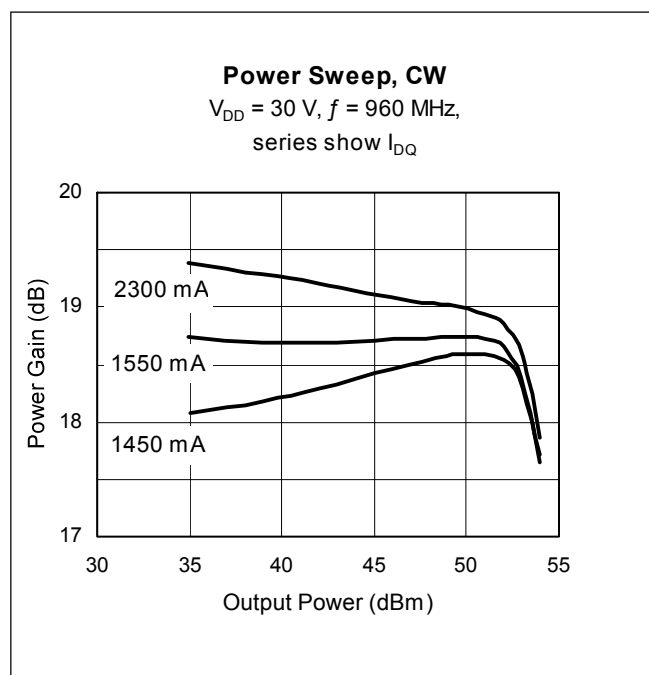
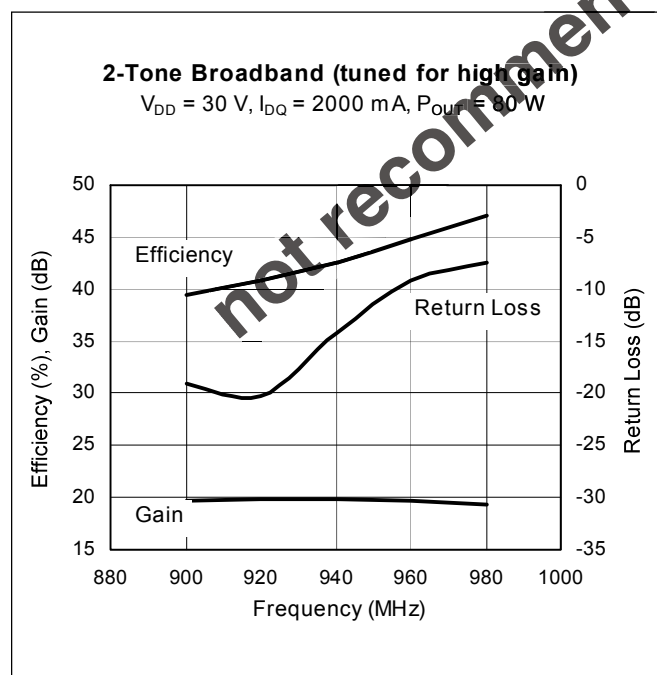
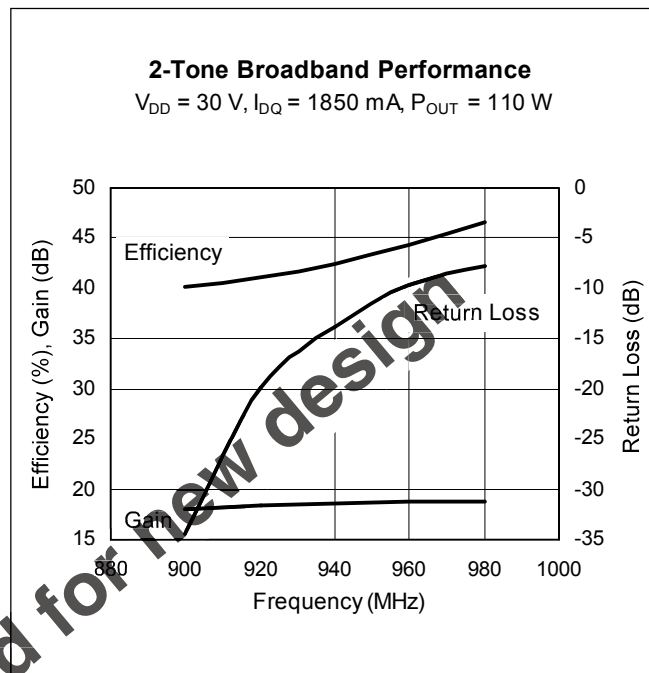
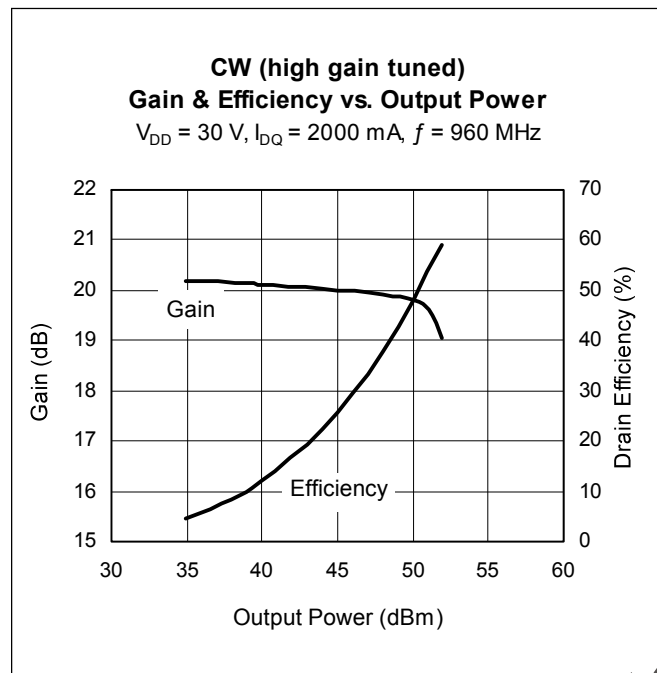


Gain & Efficiency vs. Output Power

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



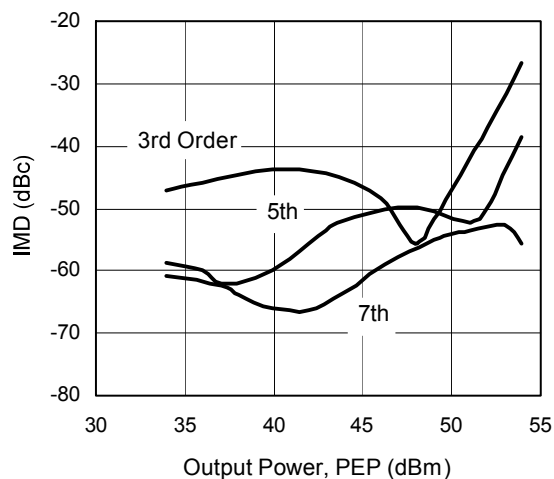
Typical Performance (cont.)



Typical Performance (cont.)

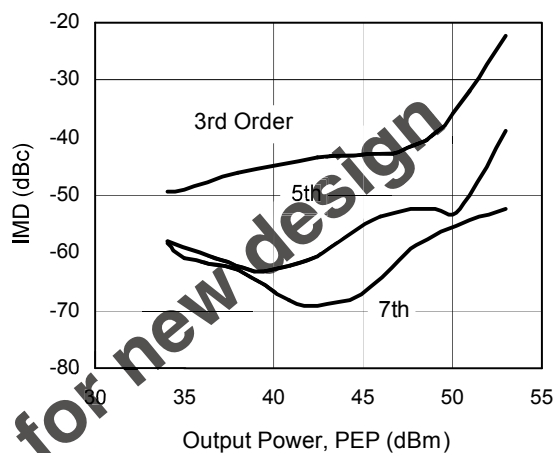
Intermodulation Distortion vs. Output Power

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1850\text{ mA}$, $f_1 = 960$, $f_2 = 959\text{ MHz}$



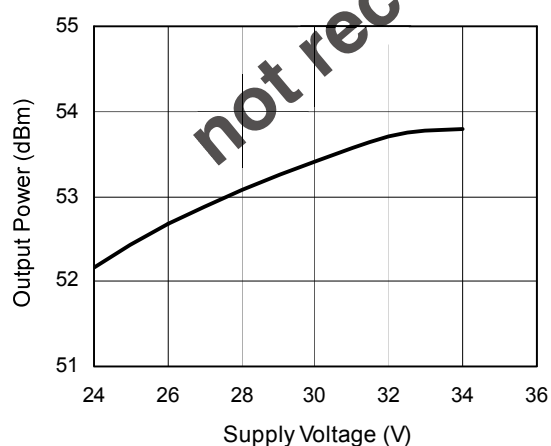
Intermodulation Distortion vs. Output Power (high gain tune)

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



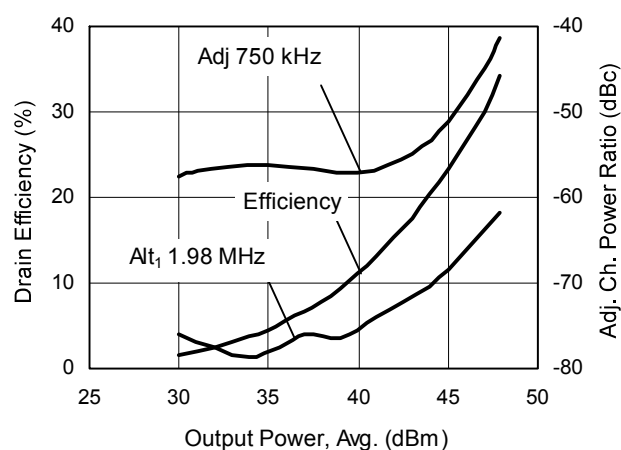
Output Power vs. Supply Voltage

$I_{DQ} = 1850\text{ mA}$, $f = 960\text{ MHz}$

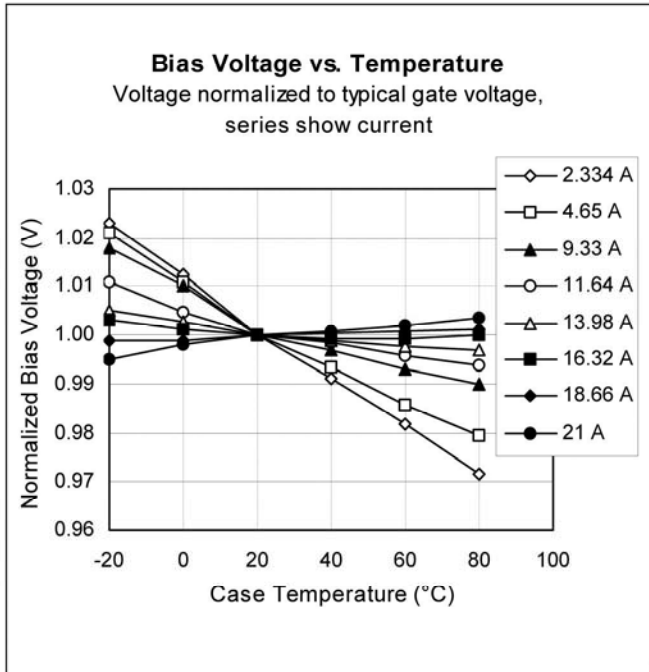


IS-95 CDMA Performance

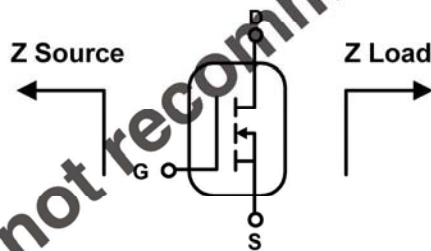
$V_{DD} = 30\text{ V}$, $I_{DQ} = 1850\text{ mA}$, $f = 960\text{ MHz}$



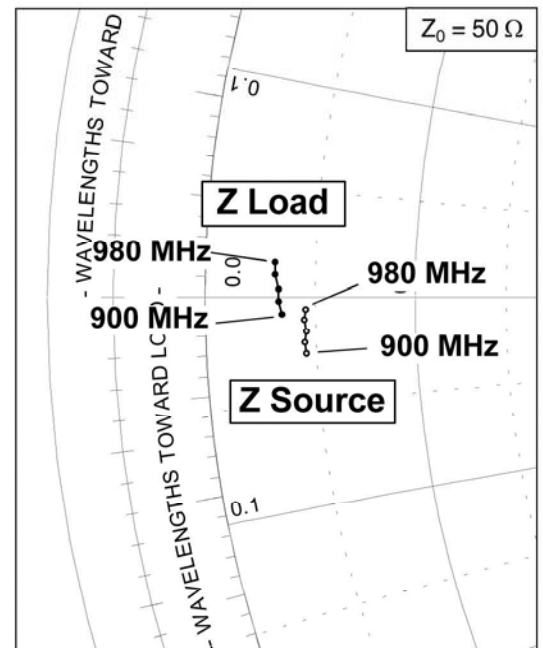
Typical Performance (cont.)



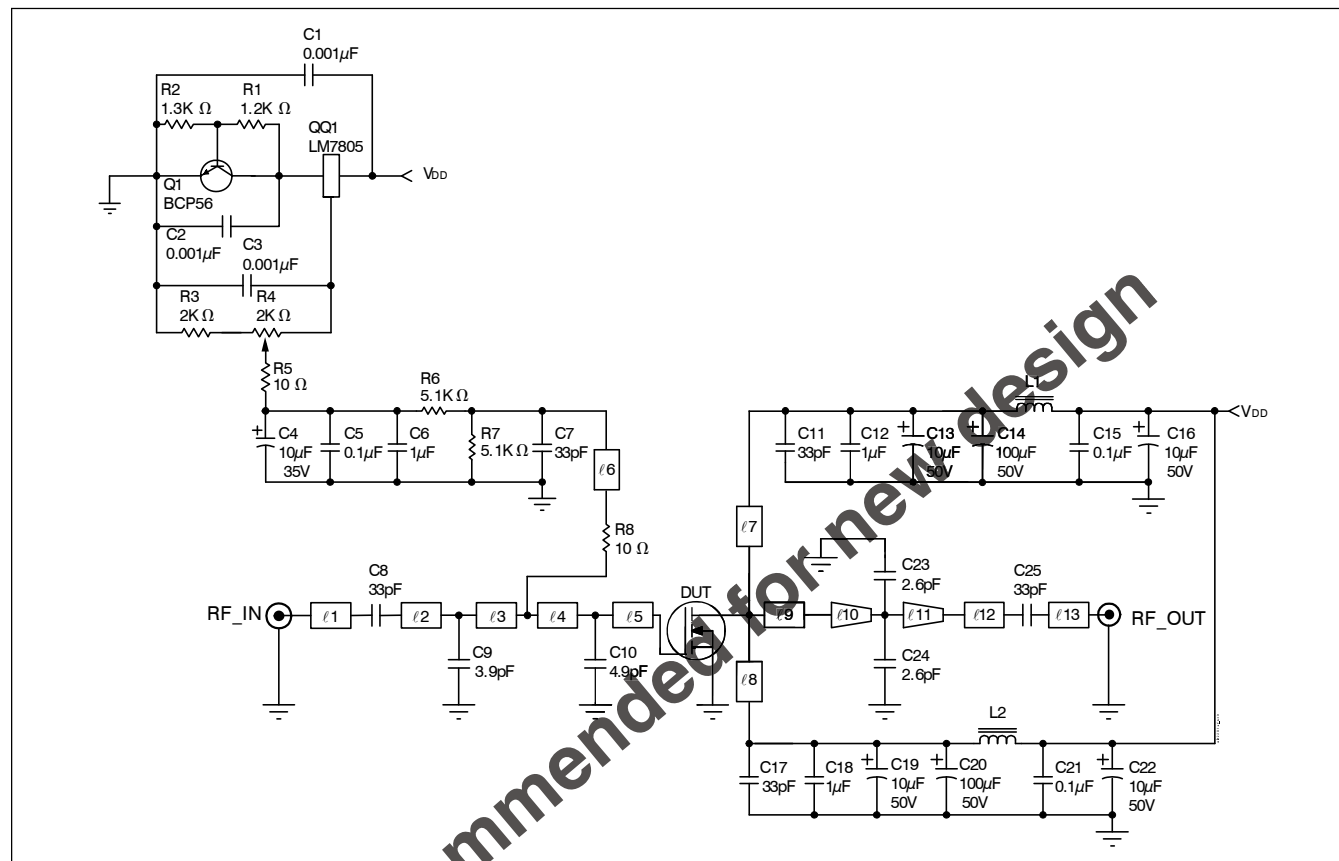
Broadband Circuit Impedance



Frequency MHz	Z Source Ω		Z Load Ω	
	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 $f = 960 \text{ MHz}$

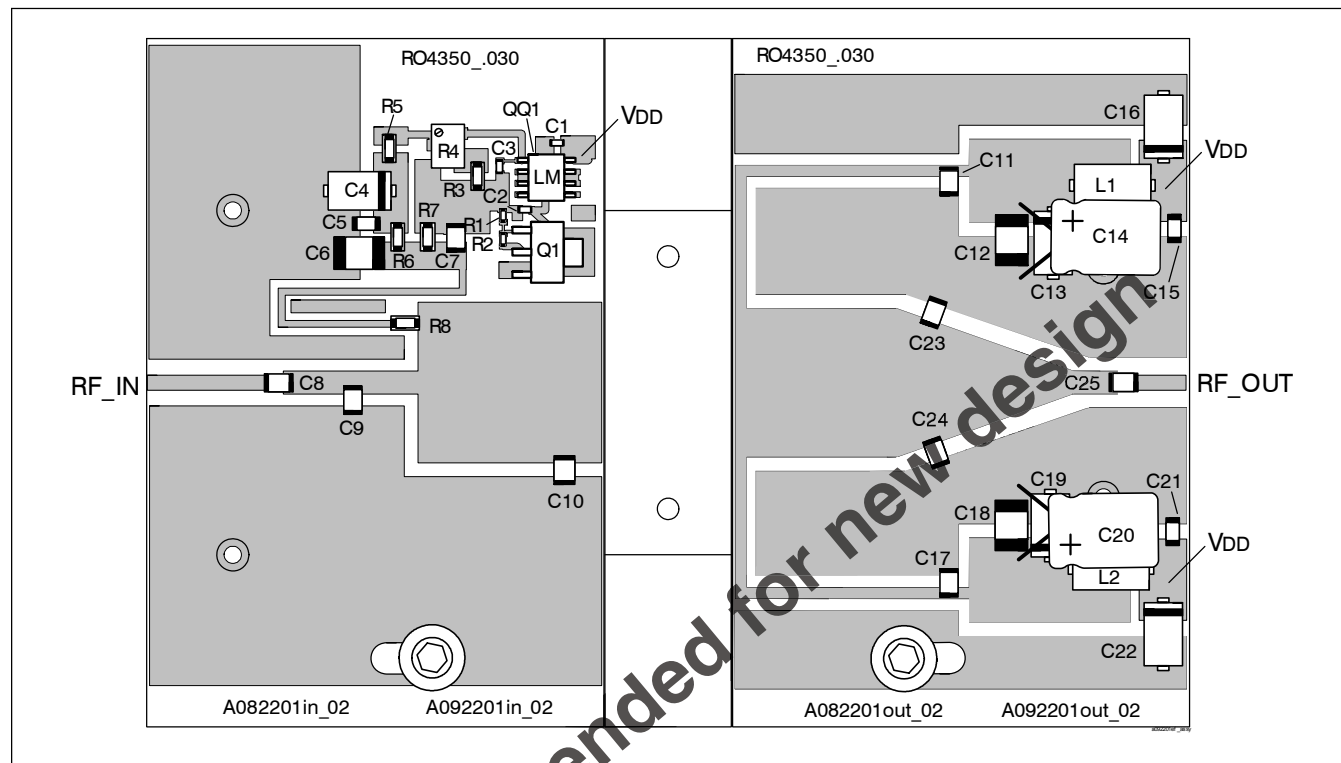
Circuit Assembly Information

DUT	PTFA092201E or PTFA092201F	LDMOS Transistor	
PCB	0.76 mm [0.030"] thick, $\epsilon_r = 3.48$	Rogers RO4350	1 oz. copper

Microstrip	Electrical Characteristics at 960 MHz ¹	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ_1	0.068 λ , 52.0 Ω	12.78 x 1.60	0.503 x 0.063
ℓ_2	0.041 λ , 38.0 Ω	7.57 x 2.54	0.298 x 0.100
ℓ_3	0.040 λ , 38.0 Ω	7.34 x 2.54	0.289 x 0.100
ℓ_4	0.092 λ , 7.8 Ω	15.95 x 17.83	0.628 x 0.702
ℓ_5	0.025 λ , 7.8 Ω	4.29 x 17.83	0.169 x 0.702
ℓ_6	0.208 λ , 78.3 Ω	40.64 x 0.74	1.600 x 0.029
ℓ_7, ℓ_8	0.200 λ , 60.1 Ω	40.64 x 1.24	1.500 x 0.049
ℓ_9	0.102 λ , 8.4 Ω	17.65 x 16.48	0.695 x 0.649
ℓ_{10} (taper)	0.021 λ , 8.4 Ω / 10.1 Ω	3.56 x 16.48 / 13.36	0.140 x 0.649 / 0.526
ℓ_{11} (taper)	0.094 λ , 10.1 Ω / 37.7 Ω	16.38 x 13.36 / 2.64	0.645 x 0.526 / 0.104
ℓ_{12}	0.022 λ , 37.0 Ω	4.04 x 2.64	0.159 x 0.104
ℓ_{13}	0.035 λ , 52.0 Ω	6.55 x 1.60	0.258 x 0.063

¹Electrical characteristics are rounded.

Reference Circuit (cont.)

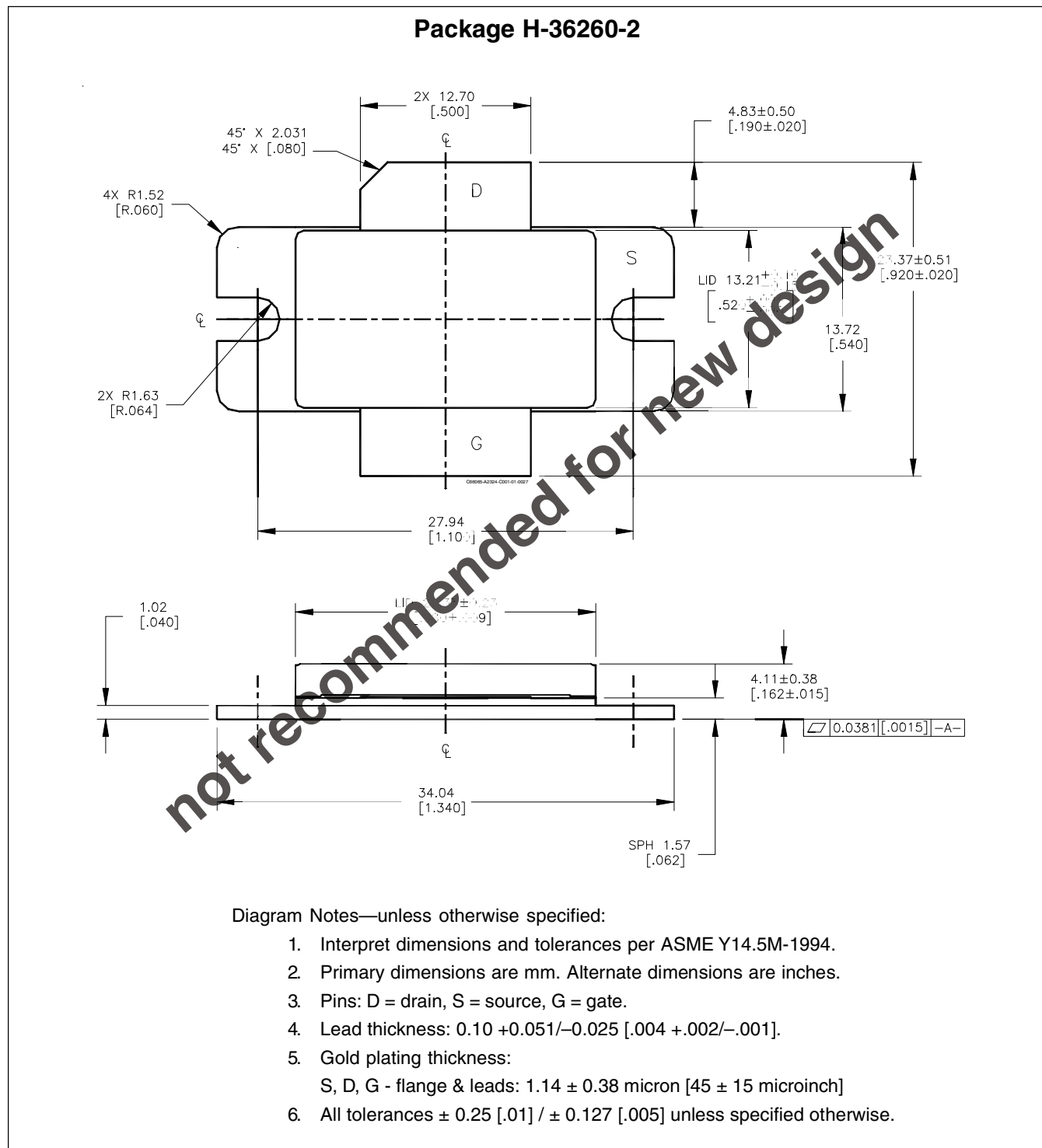


Reference circuit assembly diagram (not to scale)

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C2, C3	Capacitor, 0.001 μ F	Digi-Key	PCC1772CT-ND
C4	Tantalum capacitor, 10 μ F, 35 V	Digi-Key	399-1655-2-ND
C5, C15, C21	Capacitor, 0.1 μ F	Digi-Key	PCC104BCT-ND
C6, C12, C18	Capacitor, 1 μ F	ATC	920C105
C7, C8, C11, C17, C23	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 μ F, 50 V	Garrett Electronics	TPSE106K050R0400
C14, C20	Electrolytic capacitor, 100 μ F, 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

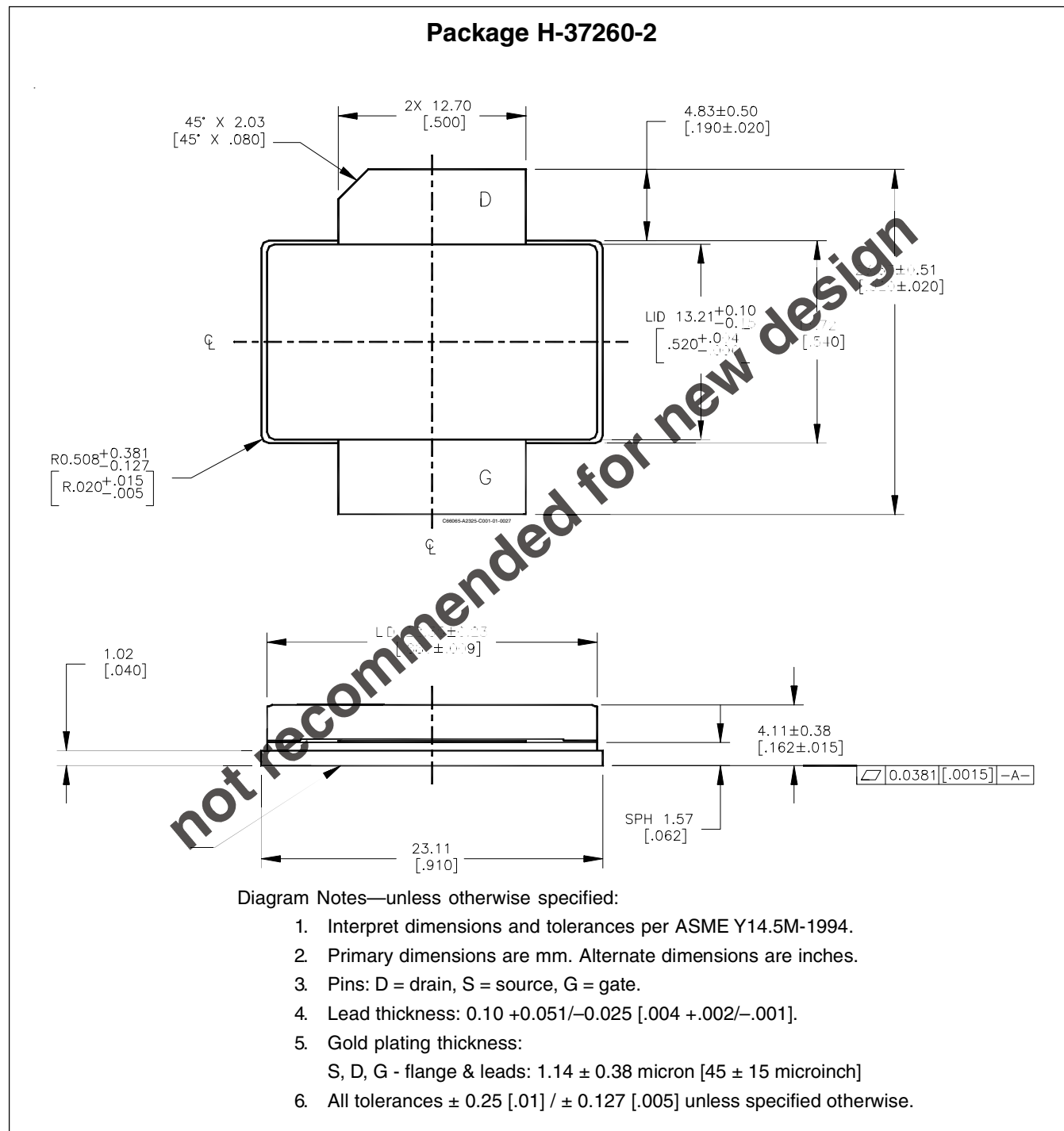
*Gerber Files for this circuit available on request

Package Outline Specifications



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

Package Outline Specifications (cont.)



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Revision History: 2018-02-21

Data Sheet

Previous Version: 2016-06-21, Data Sheet Rev. 03.2

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

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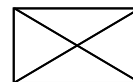
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