

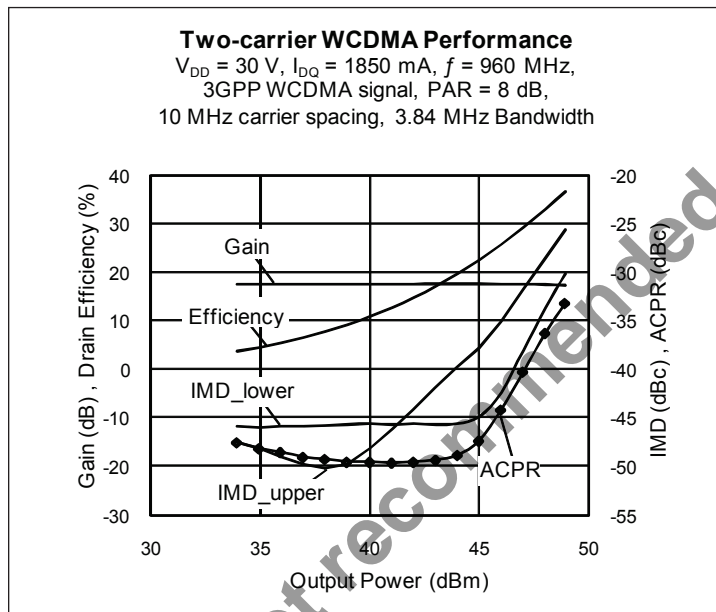
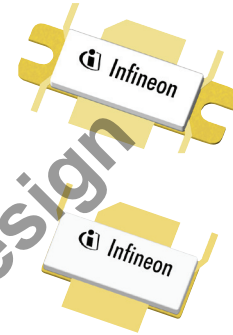
## Thermally-Enhanced High Power RF LDMOS FETs 220 W, 920 – 960 MHz

### Description

The PTFA092213EL and PTFA092213FL are 220-watt, internally-matched LDMOS FETs designed for use in cellular power amplifier applications in the 920 to 960 MHz band. These devices feature internal I/O matching and thermally-enhanced open-cavity ceramic packages with slotted or earless flanges. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFA092213EL  
Package H-33288-6

PTFA092213FL  
Package H-34288-4/2



### Features

- Broadband internal matching
- Typical two-carrier WCDMA performance at 960 MHz, 30 V
  - Average output power = 50 W
  - Linear Gain = 17.5 dB
  - Efficiency = 29%
  - Intermodulation distortion = -32 dBc
  - Adjacent channel power = -42.5 dBc
- Typical CW performance, 960 MHz, 30 V
  - Output power at  $P_{1\text{dB}}$  = 250 W
  - Linear Gain = 17.5 dB
  - Efficiency = 52%
- 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
- Pb-free, RoHS-compliant

### RF Characteristics

**Two-carrier WCDMA Measurements** (not subject to production test—verified by design/characterization in Infineon test fixture)  
 $V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1850\text{ mA}$ ,  $P_{OUT} = 50\text{ W}$  average,  $f_1 = 950\text{ MHz}$ ,  $f_2 = 960\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	—	17.5	—	dB
Drain Efficiency	$\eta_D$	—	29	—	%
Intermodulation Distortion	IMD	—	-32	—	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)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1850\text{ mA}$ ,  $P_{OUT} = 200\text{ W PEP}$ ,  $f = 960\text{ MHz}$ , tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	17	17.5	—	dB
Drain Efficiency	$\eta_D$	40	42	—	%
Intermodulation Distortion	IMD	—	-30	-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	$\mu\text{A}$
	$V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	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	$V_{DS} = 30\text{ V}$ , $I_{DQ} = 1850\text{ mA}$	$V_{GS}$	2.0	2.5	3.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1.0	$\mu\text{A}$

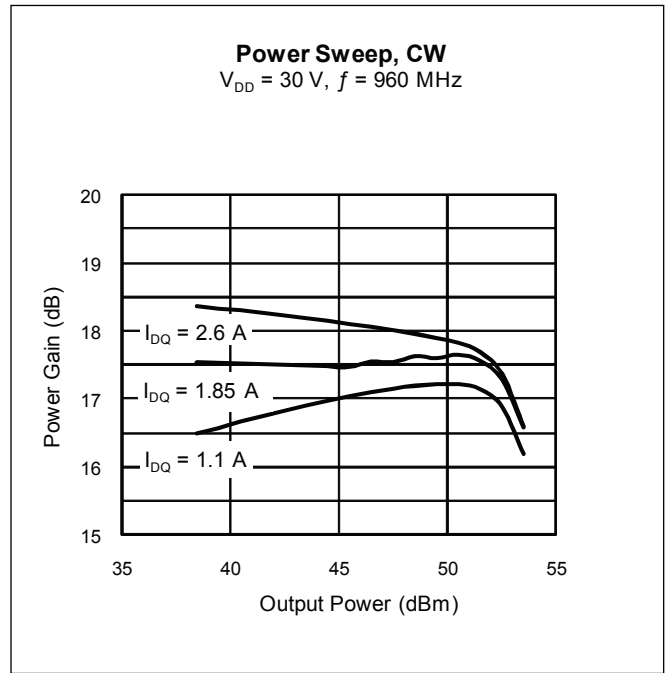
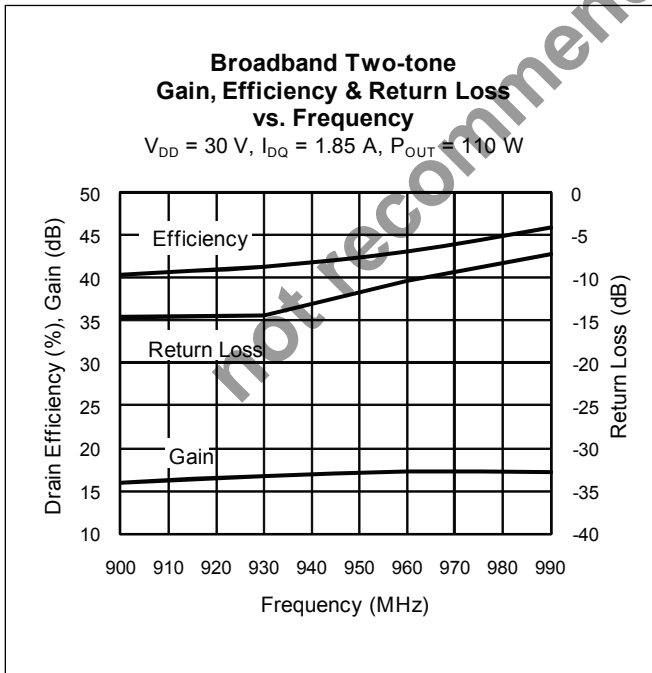
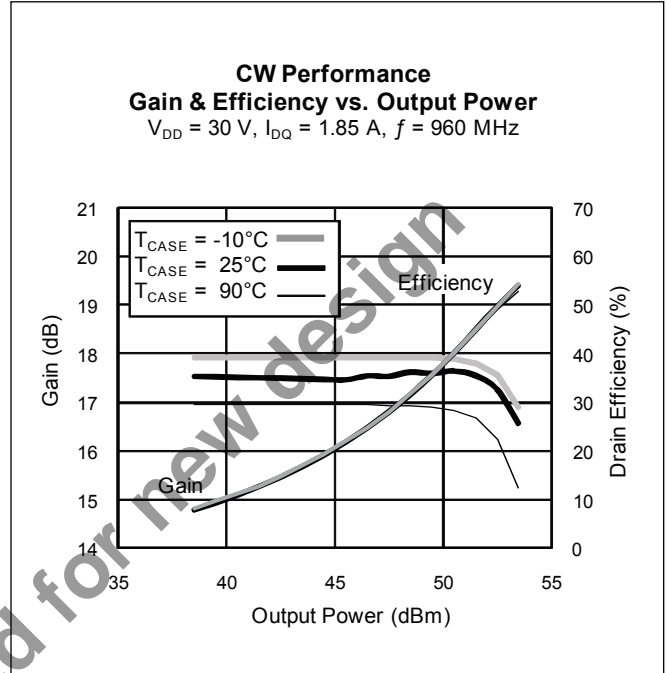
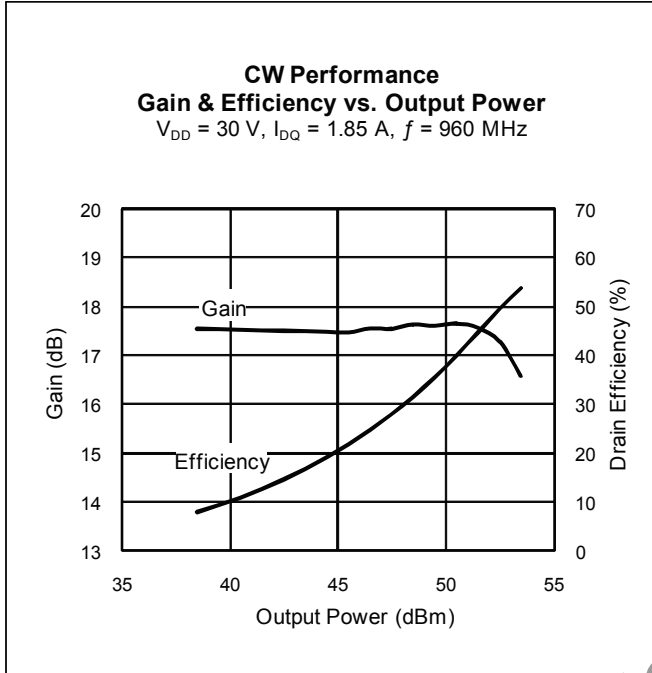
## Maximum Ratings

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	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ( $T_{CASE} = 70\text{ }^{\circ}\text{C}$ , 220 W CW)	$R_{\theta JC}$	0.23	$^{\circ}\text{C/W}$

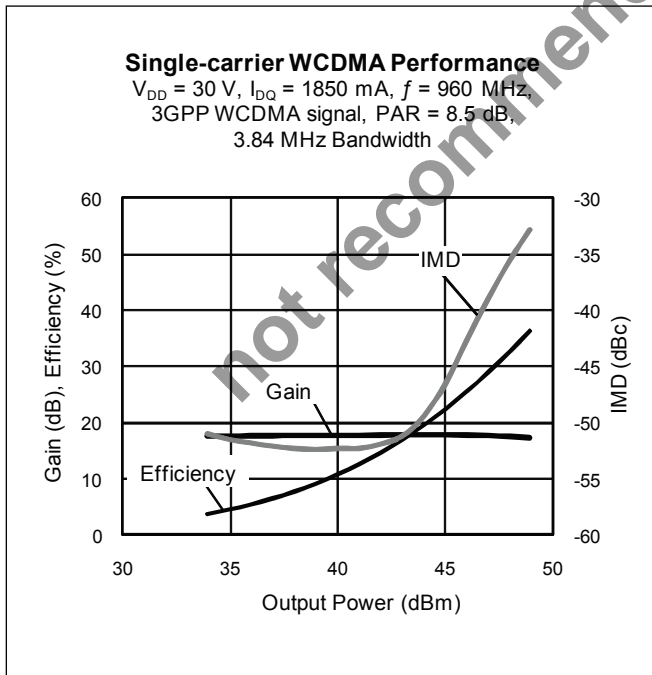
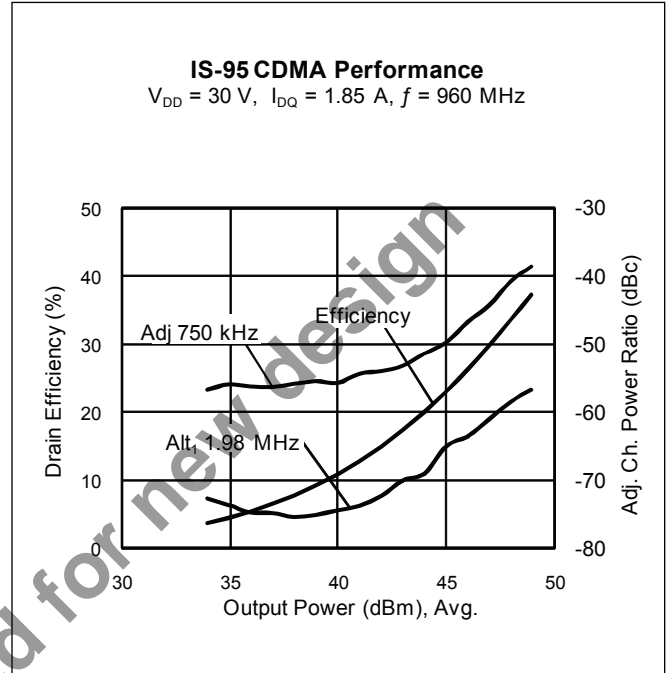
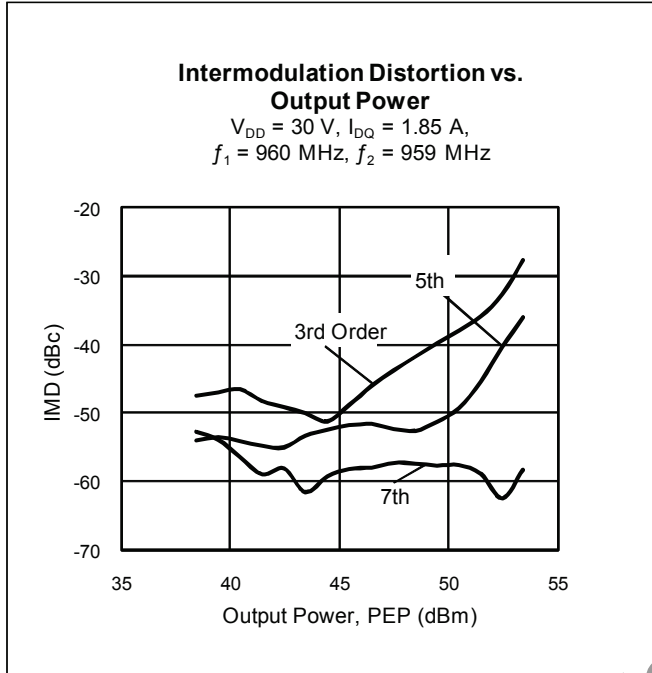
## Ordering Information

Type and Version	Package Outline	Package Description	Shipping
PTFA092213EL V4	H-33288-6	Thermally-enhanced, slotted flange, single-ended	Tray
PTFA092213EL V4 R250	H-33288-6	Thermally-enhanced, slotted flange, single-ended	Tape & Reel, 250 pcs
PTFA092213FL V5	H-34288-4/2	Thermally-enhanced, earless flange, single-ended	Tray
PTFA092213FL V5 R250	H-34288-4/2	Thermally-enhanced, earless flange, single-ended	Tape & Reel, 250 pcs

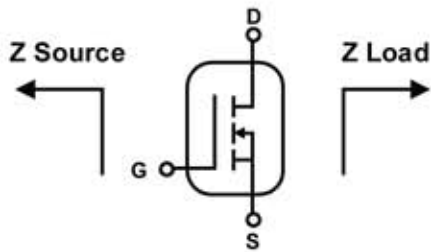
### Typical Performance



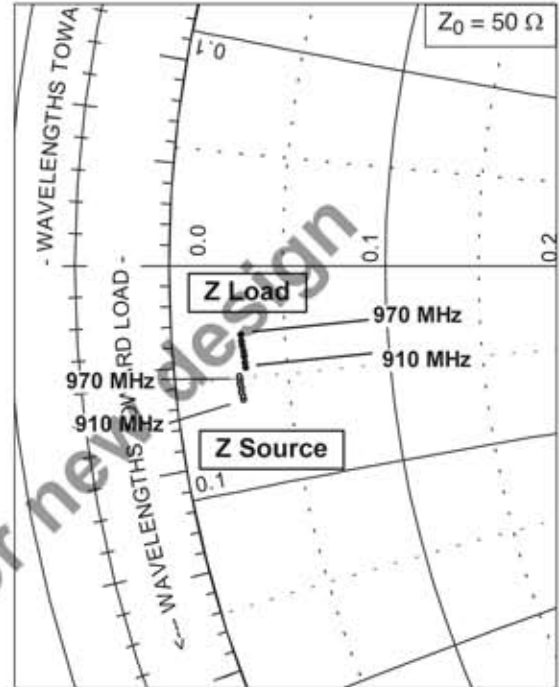
Typical Performance (cont.)



### Broadband Circuit Impedance



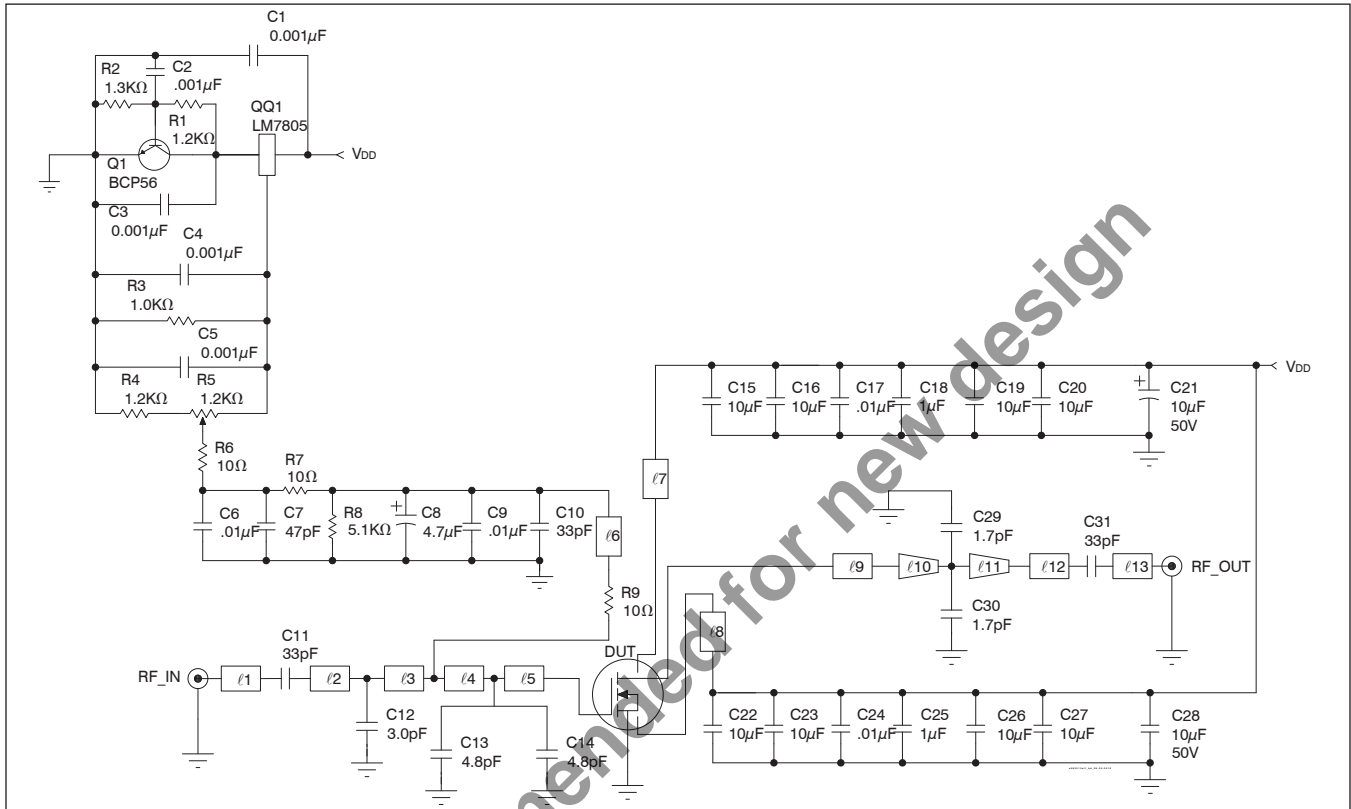
Frequency MHz	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
910	1.44	-3.01	1.57	-2.30
920	1.43	-2.92	1.56	-2.18
930	1.42	-2.83	1.55	-2.05
940	1.42	-2.74	1.54	-1.93
950	1.41	-2.66	1.53	-1.81
960	1.41	-2.57	1.52	-1.69
970	1.41	-2.48	1.51	-1.56



See next page for reference circuit information

not recommended for new design

## Reference Circuit



Reference circuit block diagram for  $f = 960$  MHz

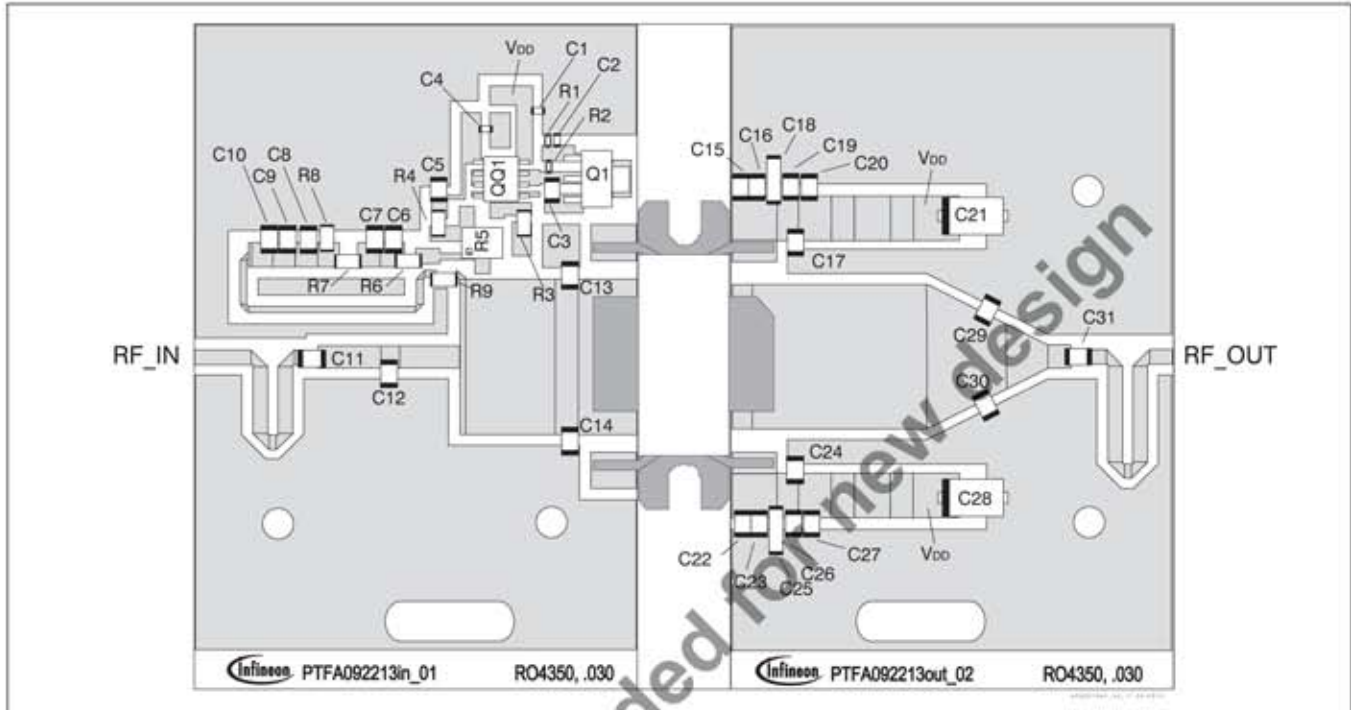
### Circuit Assembly Information

DUT	PTFA092213EL or PTFA092213FL	
PCB	LTN/PTFA092213EF	0.76 mm [.030"] thick, $\epsilon_r = 3.48$ , Rogers RO4350, 1 oz. copper

### Electrical Characteristics at 960 MHz

Transmission Line	Electrical Characteristics	Dimensions: L x W (mm)	Dimensions: L x W (in.)
l1	$0.167 \lambda$ , $50.1 \Omega$	31.75 x 1.65	1.250 x 0.065
l2	$0.047 \lambda$ , $38.0 \Omega$	8.38 x 2.54	0.330 x 0.100
l3	$0.039 \lambda$ , $38.0 \Omega$	7.37 x 2.54	0.290 x 0.100
l4	$0.072 \lambda$ , $7.8 \Omega$	12.45 x 17.78	0.490 x 0.700
l5	$0.046 \lambda$ , $7.8 \Omega$	7.87 x 17.78	0.310 x 0.700
l6	$0.163 \lambda$ , $78.3 \Omega$	31.75 x 0.74	1.250 x 0.029
l7, l8	$0.043 \lambda$ , $23.5 \Omega$	7.75 x 4.95	0.305 x 0.195
l9	$0.130 \lambda$ , $8.3 \Omega$	22.61 x 16.51	0.890 x 0.650
l10 (taper)	$0.032 \lambda$ , $8.3 \Omega / 11.7 \Omega$	5.72 x 16.51 / 11.30	0.225 x 0.650 / 0.445
l11 (taper)	$0.053 \lambda$ , $11.7 \Omega / 37.0 \Omega$	9.78 x 11.30 / 2.64	0.385 x 0.445 / 0.104
l12	$0.009 \lambda$ , $37.0 \Omega$	16.51 x 2.64	0.650 x 0.104
l13	$0.167 \lambda$ , $50.1 \Omega$	31.75 x 1.65	1.250 x 0.065

Reference Circuit (cont.)

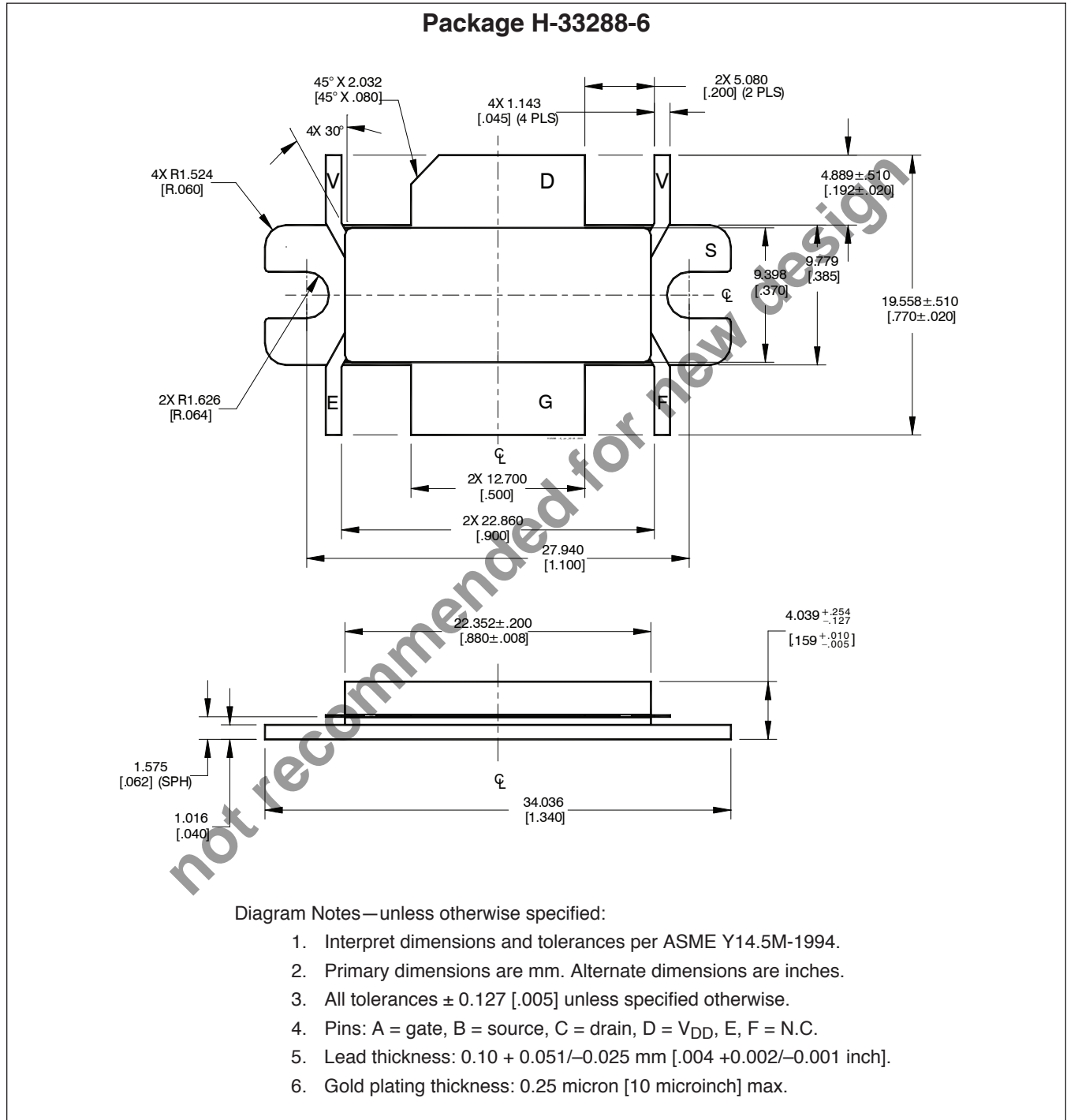


Reference circuit assembly diagram (not to scale)\*

Component	Description	Suggested Manufacturer	P/N
C1, C2, C3, C4, C5	Capacitor, 0.001 $\mu$ F	Digi-Key	PCC1772CT-ND
C18, C25	Capacitor, 1 $\mu$ F	ATC	920C105
C8	Capacitor, 4.7 $\mu$ F, 16 V	Digi-Key	PCS3475CT-ND
C6, C9, C17, C24	Capacitor, 0.01 $\mu$ F	ATC	200B 103
C15, C16, C19, C20, C22, C23, C26, C27	Tantalum Capacitor, 10 $\mu$ F, 50 V	Garrett Electronics	TPSE106K050R0400
C21, C28	Tantalum Capacitor, 10 $\mu$ F, 50 V	Digi-Key	P5571-ND
C29, C30	Ceramic Capacitor, 1.7 pF	ATC	100B 1R7
C13, C14	Ceramic Capacitor, 4.8 pF	ATC	100B 4R8
C12	Ceramic Capacitor, 3.0 pF	ATC	100B 3R0
C10, C11, C31	Ceramic Capacitor, 33 pF	ATC	100B 330
C7	Ceramic Capacitor, 47 pF	ATC	100B 470
Q1	Transistor	Infineon Technologies	BCP56
QQ1	Voltage Regulator	National Semiconductor	LM7805
R1, R4	Chip Resistor, 1.2 k $\Omega$	Digi-Key	P1.2KGCT-ND
R2	Chip Resistor, 1.3 k $\Omega$	Digi-Key	P1.3KGCT-ND
R3	Chip Resistor, 2 k $\Omega$	Digi-Key	P2KECT-ND
R5	Potentiometer, 2 k $\Omega$	Digi-Key	3224W-202ETR-ND
R8	Chip Resistor, 5.1 k $\Omega$	Digi-Key	P5.1KECT-ND
R6, R7, R9	Chip Resistor, 10 $\Omega$	Digi-Key	P10ECT-ND

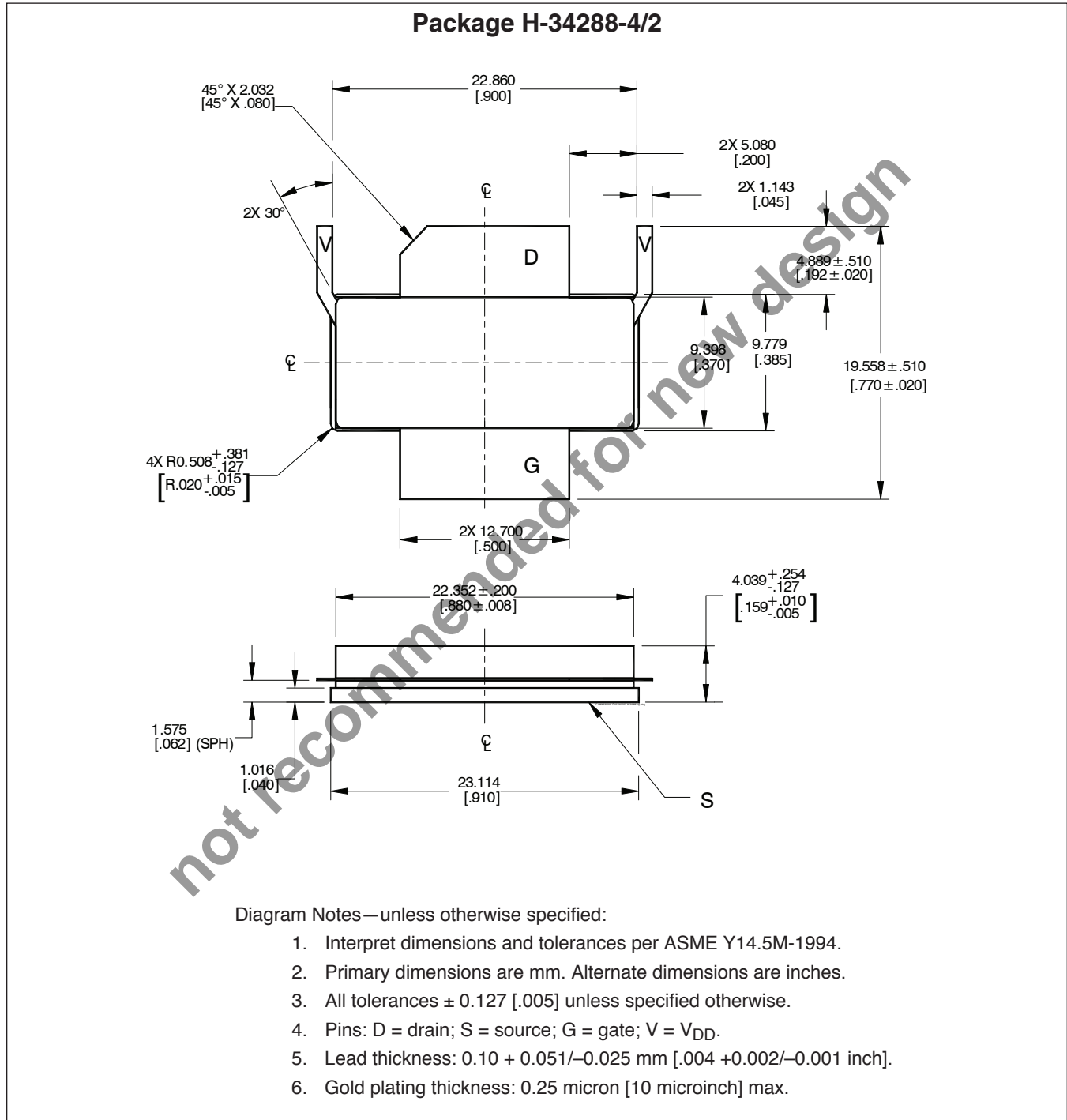
\* Gerber Files for this circuit available on request  
Data Sheet

### Package Outline Specifications





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>

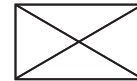
<b>Revision History:</b>	2015-03-04	Data Sheet
Previous Version:	2010-11-04, Data Sheet	
Page	Subjects (major changes since last revision)	
All	Not recommended for new design	

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[highpowerRF@infineon.com](mailto: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



Not recommended for new design

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