

## Thermally-Enhanced High Power RF LDMOS FETs 240 W, 1930 – 1990 MHz

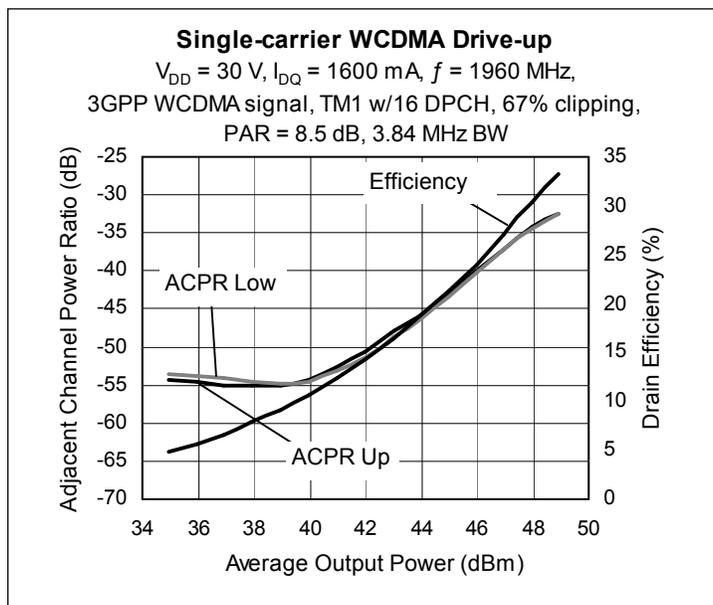
### Description

The PTFA192401E and PTFA192401F are 240-watt LDMOS FETs intended for single- and two-carrier WCDMA and CDMA applications from 1930 to 1990 MHz. 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.

PTFA192401E  
 Package H-36260-2



PTFA192401F  
 Package H-37260-2



### Features

- Pb-free, RoHS-compliant and thermally-enhanced packages
- Broadband internal matching
- Typical two-carrier WCDMA performance at 1960 MHz, 30 V
  - Average output power = 47.0 dBm
  - Linear Gain = 16 dB
  - Efficiency = 27.5%
  - Intermodulation distortion = -35 dBc
  - Adjacent channel power = -41 dBc
- Typical single-carrier WCDMA performance at 1960 MHz, 30 V, 3GPP signal, PAR = 8.5 dB
  - Average output power = 49 dBm
  - Linear Gain = 16 dB
  - Efficiency = 33%
  - Adjacent channel power = -33 dBc
- Typical CW performance, 1960 MHz, 30 V
  - Output power at P-1dB = 240 W
  - Efficiency = 54%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 5:1 VSWR @ 30 V, 240 W (CW) output power

All published data at  $T_{CASE} = 25^{\circ}\text{C}$  unless otherwise indicated

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

## RF Characteristics

### WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1.6\text{ A}$ ,  $P_{OUT} = 50\text{ W}$  average

$f_1 = 1955\text{ MHz}$ ,  $f_2 = 1965\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	15	16	—	dB
Drain Efficiency	$\eta_D$	25	27	—	%
Intermodulation Distortion	IMD	—	-36	-34	dBc

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

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 1.6\text{ A}$ ,  $P_{OUT} = 220\text{ W PEP}$ ,  $f = 1960\text{ MHz}$ , tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	—	15.8	—	dB
Drain Efficiency	$\eta_D$	—	40	—	%
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	$\mu\text{A}$
Drain Leakage Current	$V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10.0	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.03	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 30\text{ V}$ , $I_{DQ} = 1.6\text{ A}$	$V_{GS}$	2.0	2.5	3.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1.0	$\mu\text{A}$

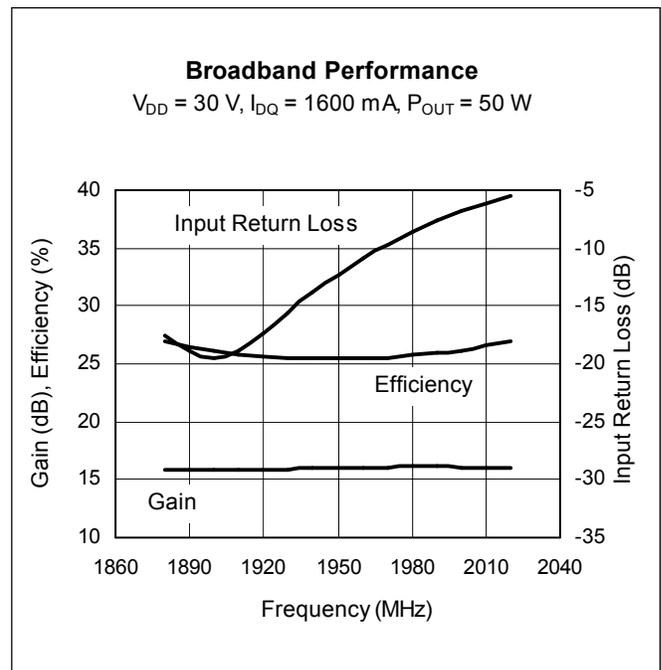
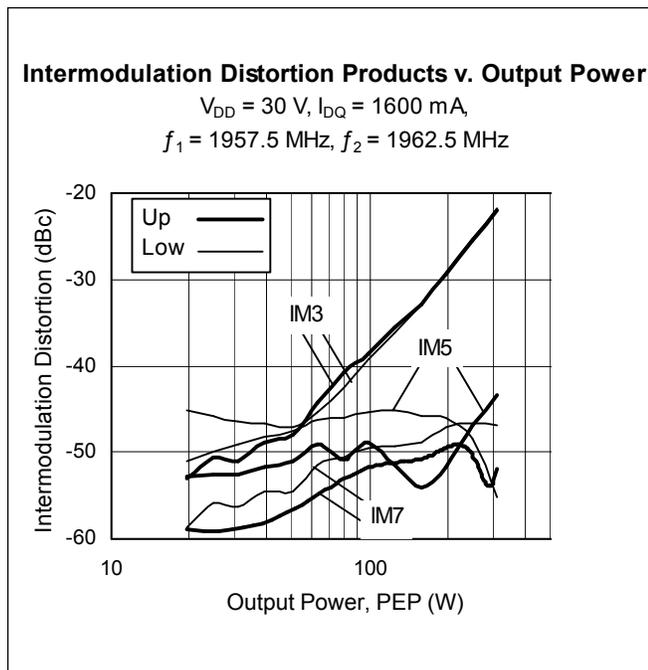
## Maximum Ratings

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	$P_D$	761	W
Above 25 $^{\circ}\text{C}$ derate by		4.35	W/ $^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 50 W WCDMA)	$R_{\theta JC}$	0.23	$^{\circ}\text{C}/\text{W}$

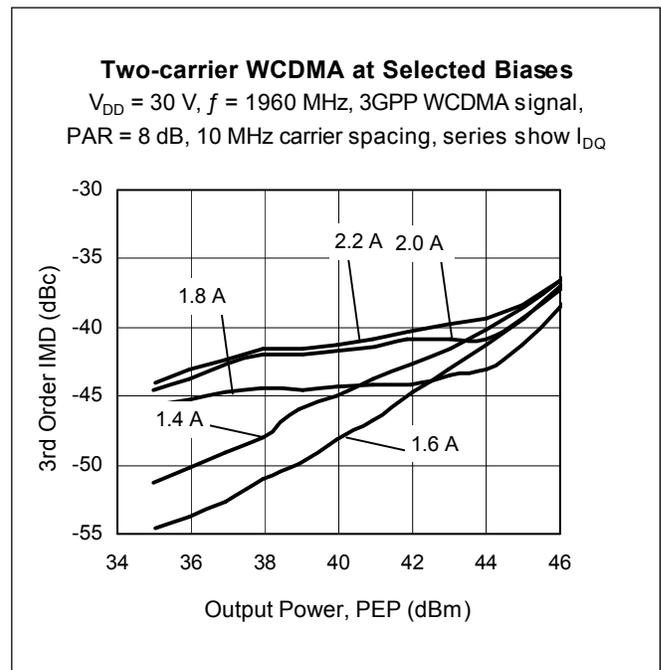
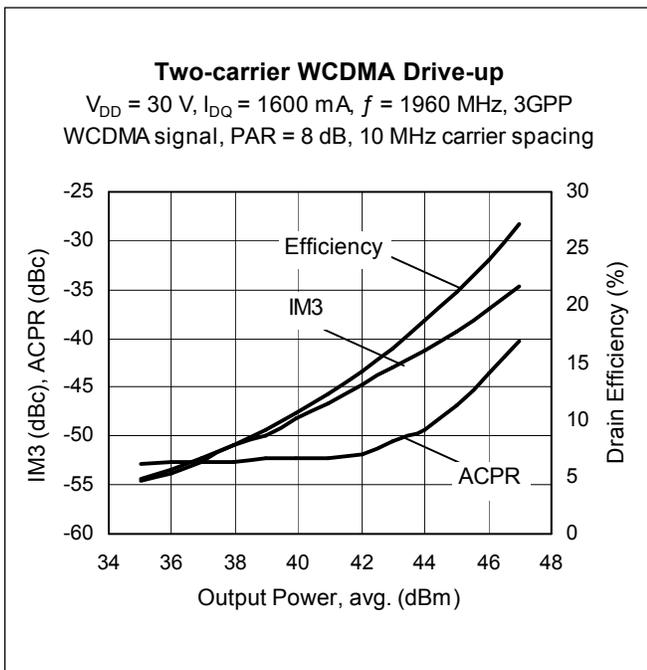
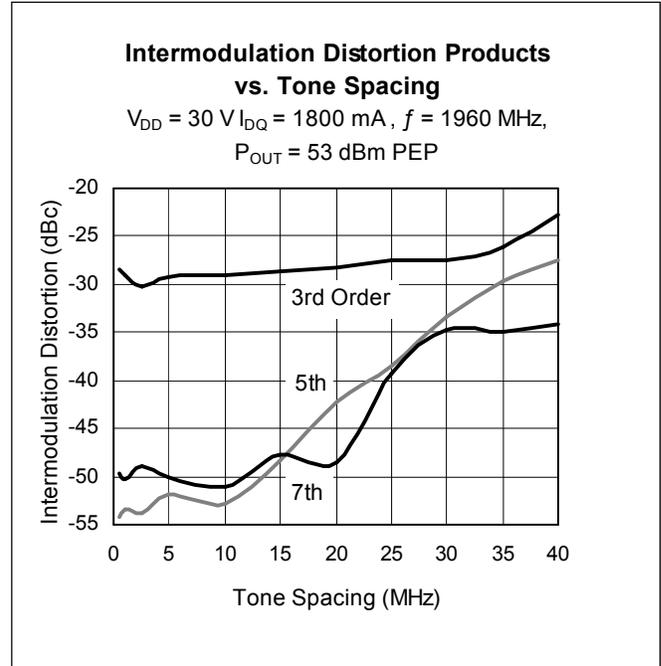
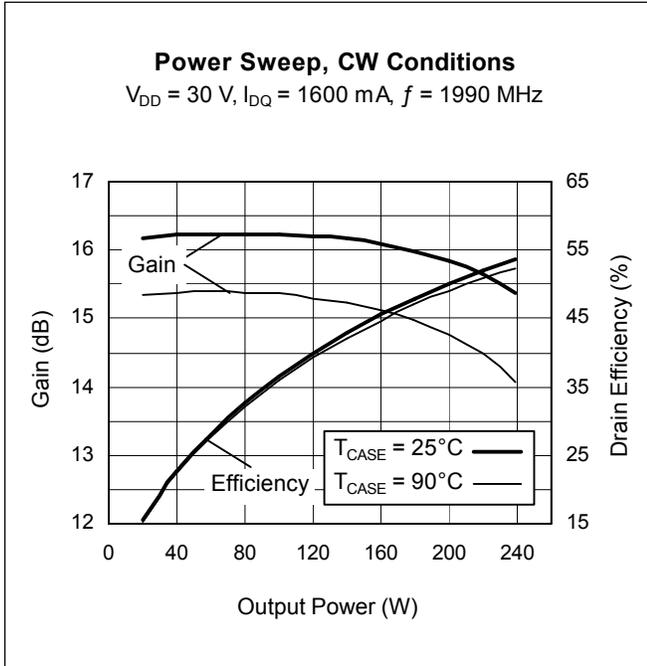
### Ordering Information

Type and Version	Package Type	Package Description	Marking
PTFA192401E V4	H-36260-2	Thermally-enhanced slotted flange, single-ended	PTFA192401E
PTFA192401F V4	H-37260-2	Thermally-enhanced earless flange, single-ended	PTFA192401F

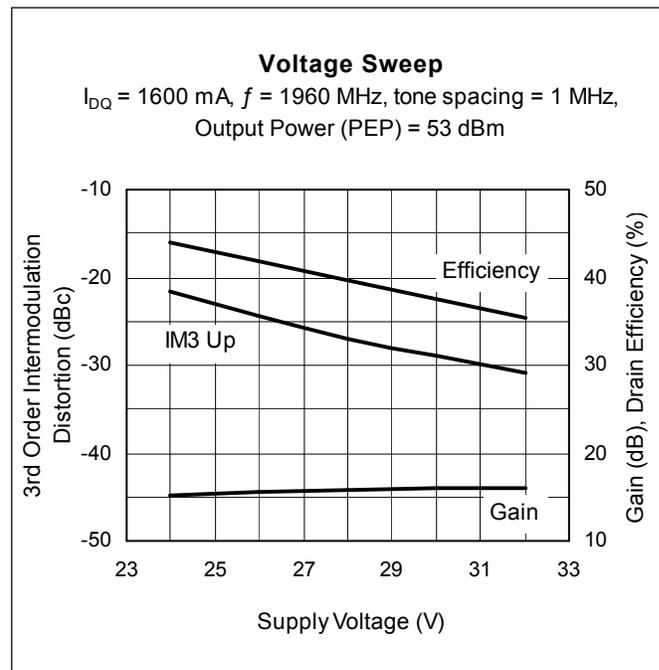
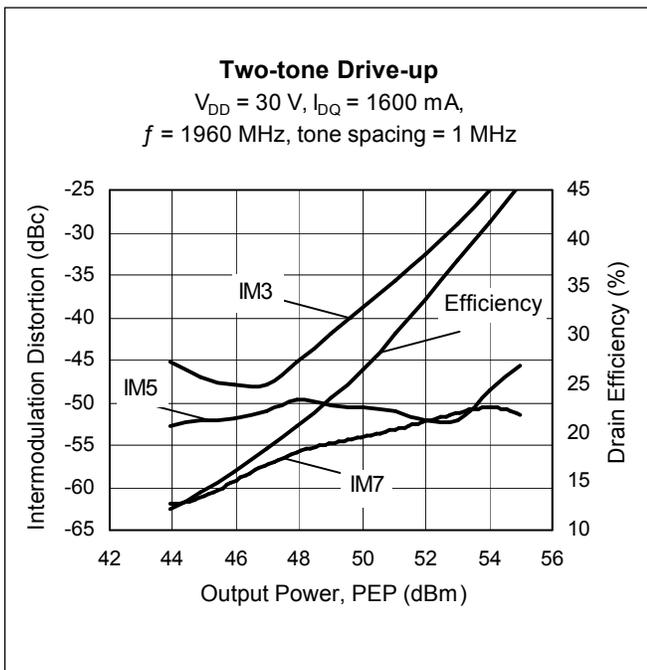
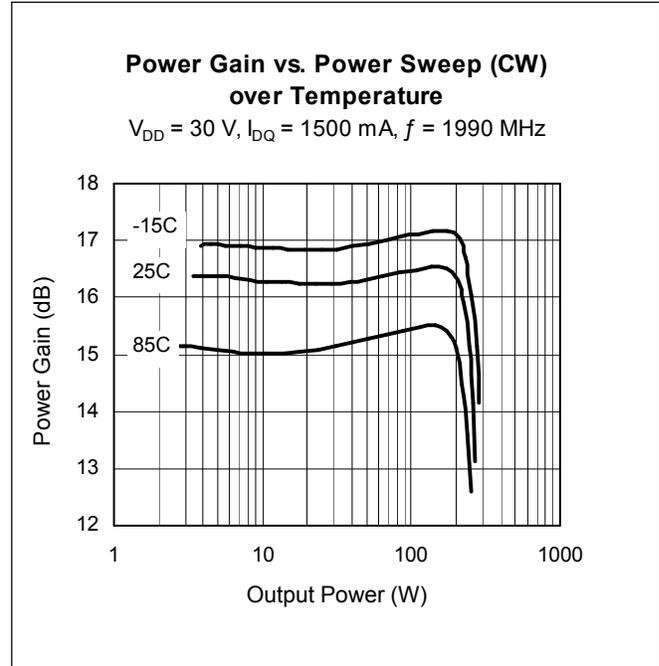
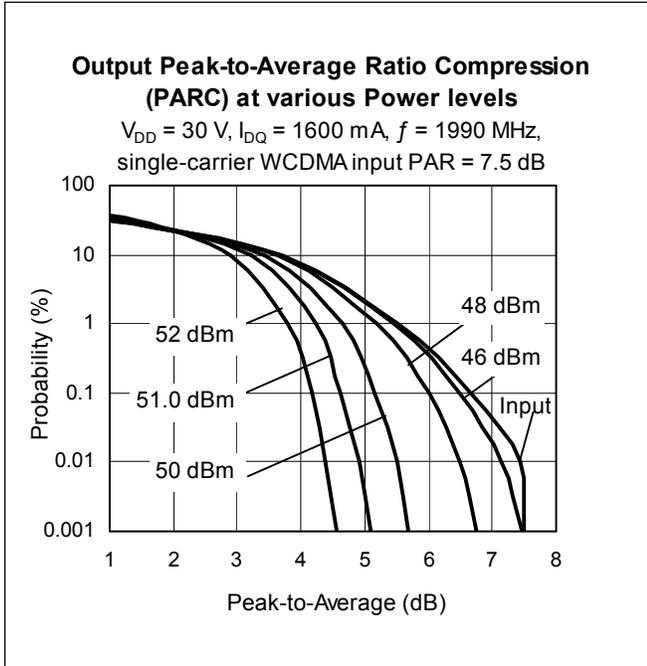
### Typical Performance (data taken in a production test fixture)



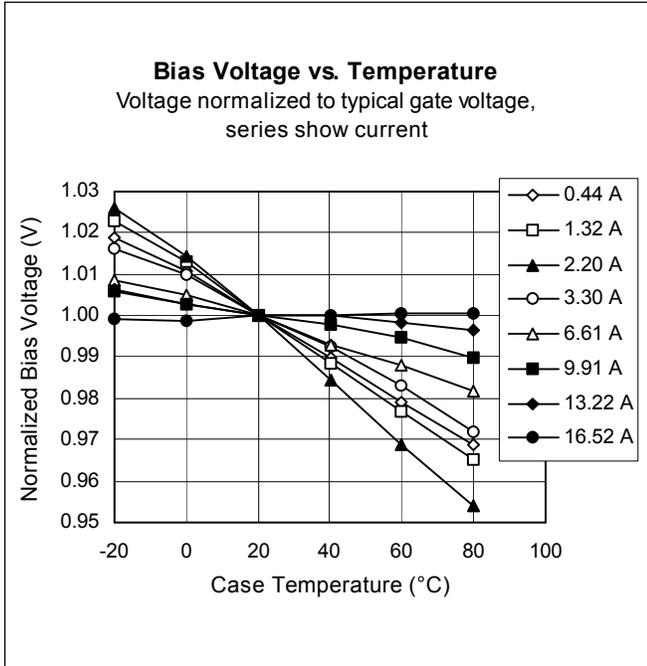
**Typical Performance (cont.)**



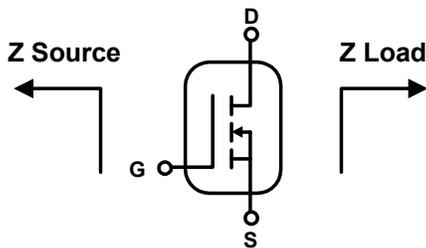
Typical Performance (cont.)



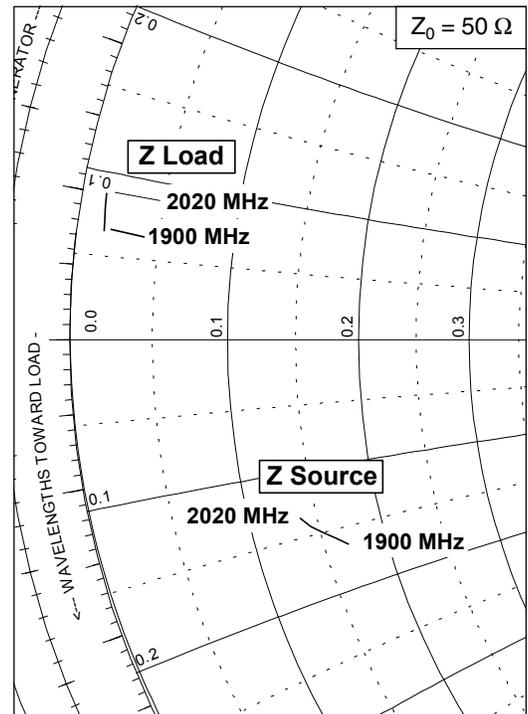
Typical Performance (cont.)



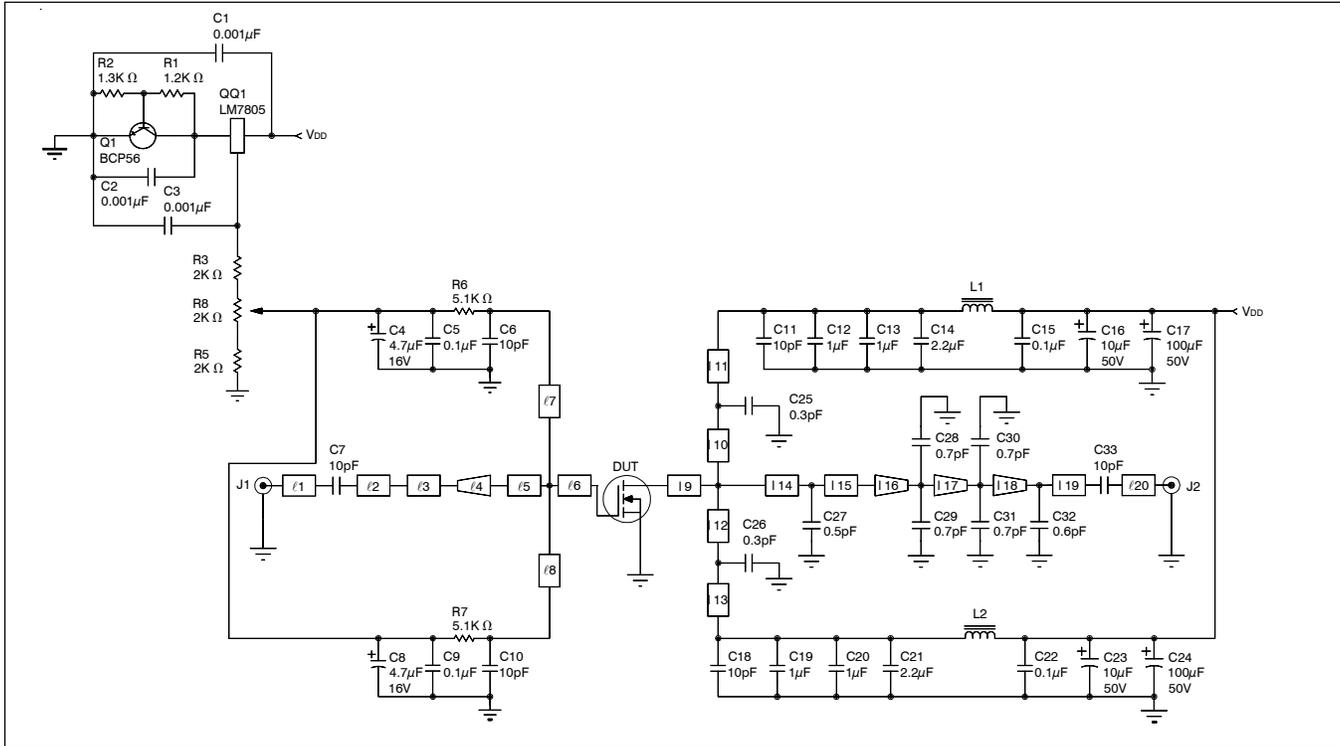
Broadband Circuit Impedance



Frequency MHz	Z Source $\Omega$		Z Load $\Omega$	
	R	jX	R	jX
1900	8.43	-8.22	0.80	3.26
1930	8.00	-7.86	0.78	3.56
1960	7.57	-7.51	0.76	3.84
1990	7.19	-7.17	0.73	4.12
2020	6.86	-6.77	0.72	4.38



### Reference Circuit



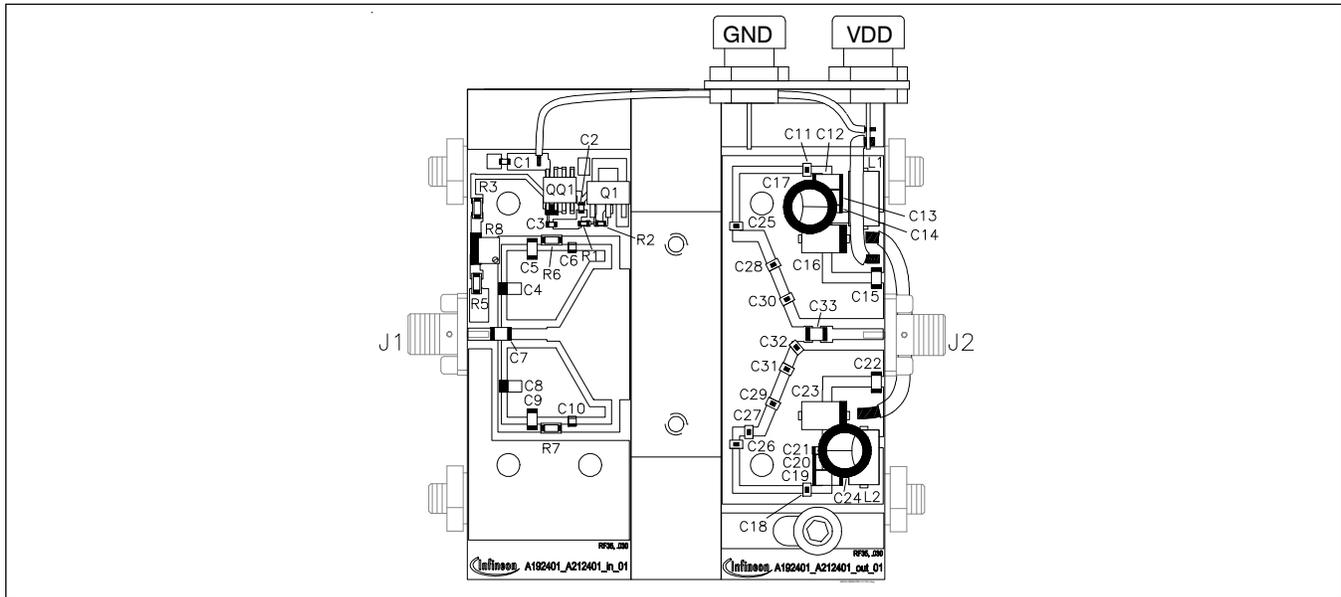
Reference circuit schematic for  $f = 1960 \text{ MHz}$

#### Circuit Assembly Information

DUT	PTFA192401E or PTFA192401F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, RF35, $\epsilon_r = 3.48$	Rogers RO4350	1 oz. copper

Microstrip	Electrical Characteristics at 1960 MHz	Dimensions: L x W ( mm )	Dimensions: L x W (in.)
$\ell_1$	$0.038 \lambda$ , $50.0 \Omega$	3.51 x 1.70	0.138 x 0.067
$\ell_2$	$0.071 \lambda$ , $50.0 \Omega$	6.60 x 1.70	0.260 x 0.067
$\ell_3$	$0.022 \lambda$ , $43.1 \Omega$	2.01 x 2.16	0.079 x 0.085
$\ell_4$	$0.060 \lambda$ , $43.1 \Omega / 6.9 \Omega$	5.28 x 2.16 / 20.32	0.208 x 0.085 / 0.800
$\ell_5$	$0.040 \lambda$ , $6.9 \Omega$	3.33 x 20.32	0.131 x 0.800
$\ell_6$	$0.026 \lambda$ , $6.9 \Omega$	2.21 x 20.32	0.087 x 0.800
$\ell_7, \ell_8$	$0.123 \lambda$ , $59.9 \Omega$	11.48 x 1.24	0.452 x 0.049
$\ell_9$	$0.010 \lambda$ , $5.0 \Omega$	0.84 x 28.91	0.033 x 1.138
$\ell_{10}, \ell_{12}$	$0.027 \lambda$ , $51.0 \Omega$	2.54 x 1.65	0.100 x 0.065
$\ell_{11}, \ell_{13}$	$0.228 \lambda$ , $51.0 \Omega$	21.03 x 1.65	0.828 x 0.065
$\ell_{14}, \ell_{15}$	$0.028 \lambda$ , $5.0 \Omega$	2.36 x 28.91	0.093 x 1.138
$\ell_{16}$	$0.011 \lambda$ , $5.0 \Omega / 6.0 \Omega$	0.89 x 28.91 / 23.65	0.035 x 1.138 / 0.931
$\ell_{17}$	$0.030 \lambda$ , $6.0 \Omega / 12.3 \Omega$	2.54 x 23.65 / 10.67	0.100 x 0.931 / 0.420
$\ell_{18}$	$0.019 \lambda$ , $12.3 \Omega / 41.2 \Omega$	1.78 x 10.67 / 2.29	0.070 x 0.420 / 0.090
$\ell_{19}$	$0.033 \lambda$ , $41.2 \Omega$	3.05 x 2.29	0.120 x 0.090
$\ell_{20}$	$0.096 \lambda$ , $50.0 \Omega$	8.99 x 1.70	0.354 x 0.067

Reference Circuit (cont.)

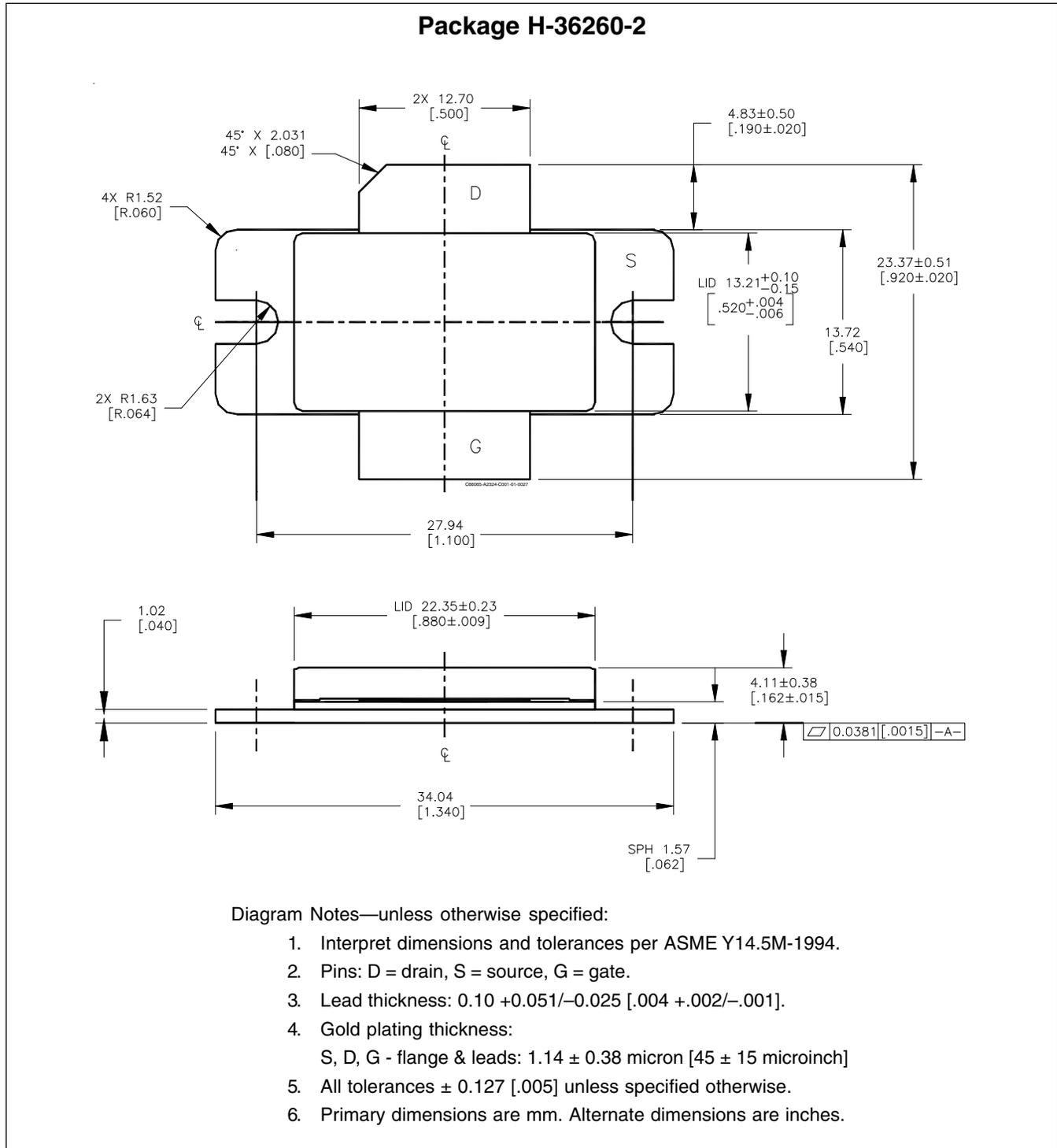


Reference circuit assembly diagram\* (not to scale)

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C2, C3	Capacitor, 0.001 $\mu$ F	Digi-Key	PCC1772CT-ND
C4, C8	Capacitor, 4.7 $\mu$ F, 16V	Digi-Key	PCS3475CT-ND
C5, C9, C15, C22	Capacitor, 0.1 $\mu$ F	Digi-Key	PCC104BCT-ND
C6, C10	Ceramic capacitor, 10 pF	ATC	100A 100
C7, C33	Ceramic capacitor, 10 pF	ATC	100B 100
C11, C18	Capacitor, 10 pF	AVX	08051J100GBTTR
C12, C13, C19, C20	Ceramic capacitor, 1 $\mu$ F	Digi-Key	445-1411-1-ND
C14, C21	Capacitor, 2.2 $\mu$ F	Digi-Key	445-1447-2-ND
C16, C23	Tantalum capacitor, 10 $\mu$ F, 50 V	Garrett Electronics	TPSE106K050R0400
C17, C24	Electrolytic capacitor, 100 $\mu$ F, 50 V	Digi-Key	P5571-ND
C25, C26	Capacitor, 0.3 pF	AVX	08051J0R3BBTTR
C27	Capacitor, 0.5 pF	AVX	08051J0R5BBTTR
C28, C29, C30, C31	Capacitor, 0.7 pF	AVX	08051J0R7BBTTR
C32	Capacitor, 0.6 pF	ATC	600S0R6BT
L1, L2	Ferrite, 8.9mm	Elna Magnetics	BDS 4.6/3/8.9-4S2
Q1	Transistor	Infineon Technologies	BCP56
QQ1	Voltage regulator	National Semiconductor	LM7805
R1	Chip resistor 1.2k ohms	Digi-Key	P1.2KGCT-ND
R2	Chip resistor 1.3k ohms	Digi-Key	P1.3KGCT-ND
R3, R5	Chip resistor 2k ohms	Digi-Key	P2KECT-ND
R4	Chip resistor 10 ohms	Digi-Key	P10ECT-ND
R6, R7	Chip resistor 5.1k ohms	Digi-Key	P5.1KECT-ND
R8	Potentiometer 2k ohms	Digi-Key	3224W-202ETR-ND

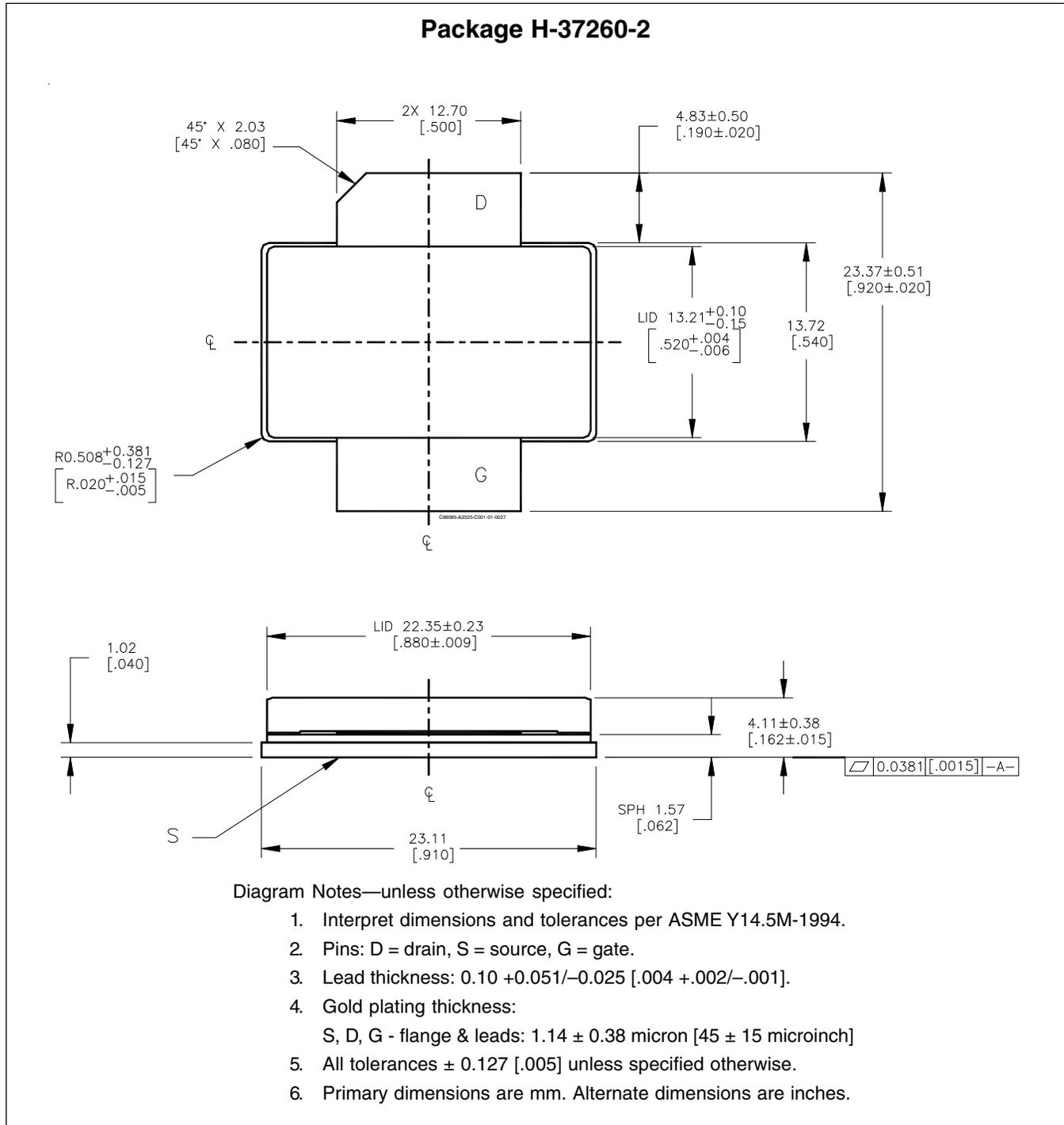
\*Gerber files for this circuit available on request

## Package Outline Specifications



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Package Outline Specifications (cont.)



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Revision History: 2009-04-01

Data Sheet

Previous Version: 2008-10-06

Page	Subjects (major changes since last revision)
9, 10	Update package information

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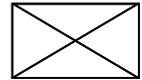
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**Edition 2009-04-01**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

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