

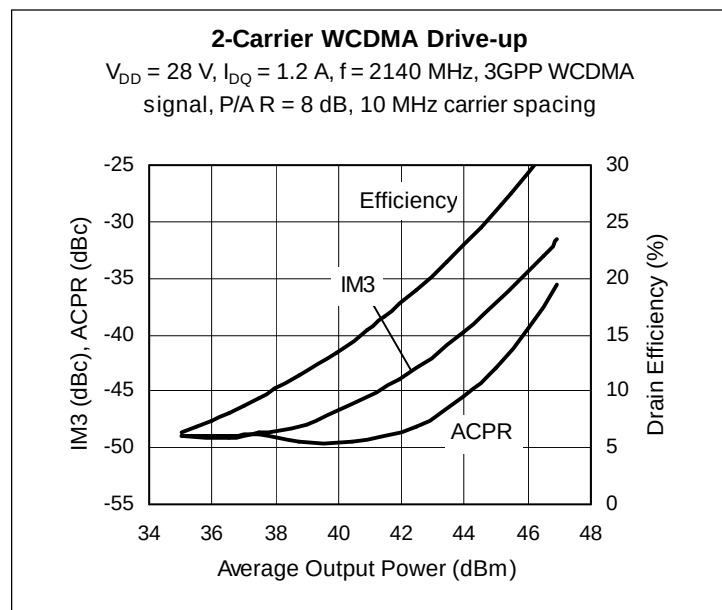
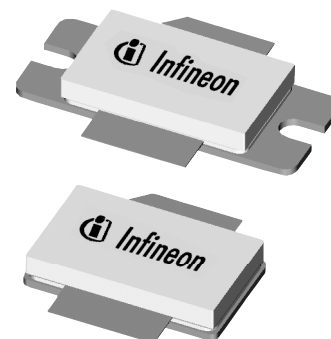
Thermally-Enhanced High Power RF LDMOS FETs 180 W, 2110 – 2170 MHz

Description

The PTFA211801E and PTFA211801F are thermally-enhanced, 180-watt, internally matched LDMOS FETs intended for WCDMA applications. They are characterized for single- and two-carrier WCDMA operation from 2110 to 2170 MHz. Thermally-enhanced packaging provides the coolest operation available.

PTFA211801E
Package H-36260-2

PTFA211801F
Package H-37260-2



Features

- Thermally-enhanced packages, Pb-free and RoHS-compliant
- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V
 - Average output power = 45.5 dBm
 - Linear Gain = 15.5 dB
 - Efficiency = 27.5%
 - Intermodulation distortion = -36 dBc
 - Adjacent channel power = -41 dBc
- Typical CW performance, 2170 MHz, 30 V
 - Output power at P-1dB = 180 W
 - Efficiency = 52%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 150 W (CW) output power

RF Characteristics

WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 35\text{ W}$ average

$f_1 = 2135\text{ MHz}$, $f_2 = 2145\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	14.5	15.5	—	dB
Drain Efficiency	η_D	26	27.5	—	%
Intermodulation Distortion	IMD	—	-36	-34	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.)

CW Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 150\text{ W}$ average, $f = 2170\text{ MHz}$

Characteristic	Symbol	Min	Typ	Max	Unit
Gain Compression	G_{comp}	—	0.5	1.0	dB

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

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 140\text{ W PEP}$, $f = 2140\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	15.5	—	dB
Drain Efficiency	η_D	—	38.5	—	%
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
Drain Leakage Current	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.05	—	Ω
Operating Gate Voltage	$V_{DS} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$	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	μA

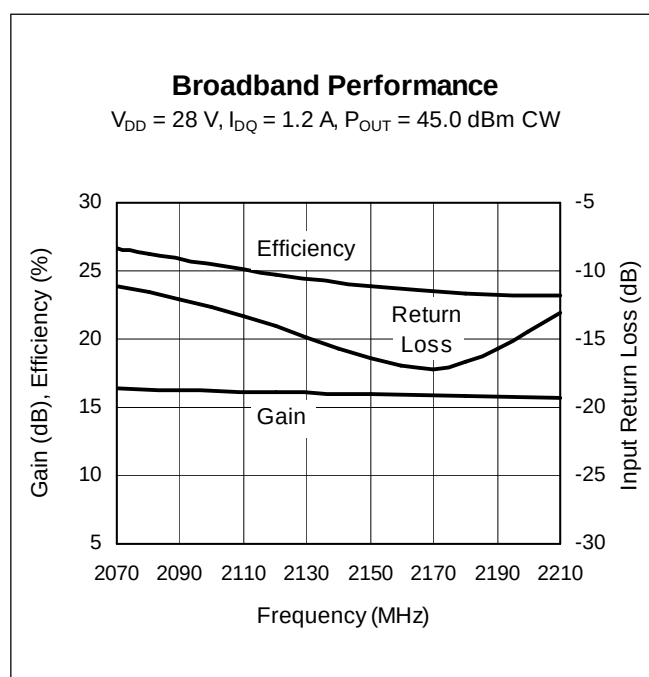
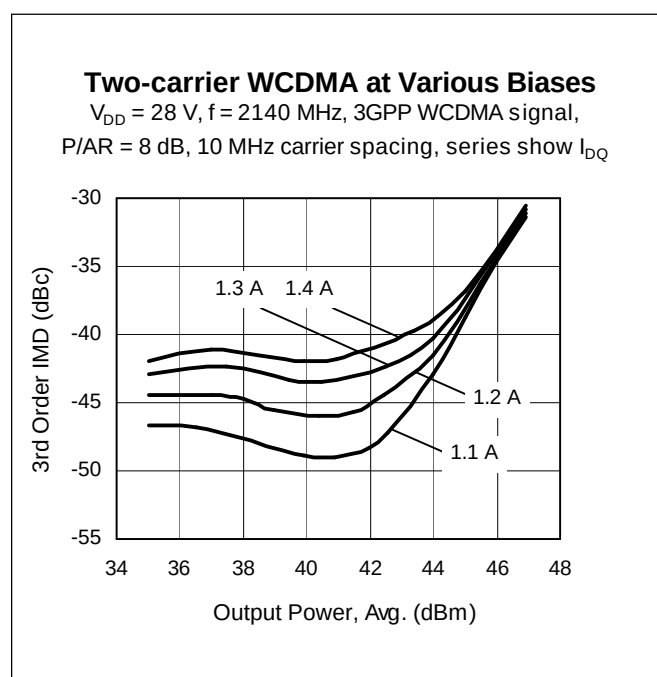
Maximum Ratings

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	565	W
Above 25 $^{\circ}\text{C}$ derate by		3.23	W/ $^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	−40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 150 W CW)	$R_{\theta JC}$	0.31	$^{\circ}\text{C/W}$

Ordering Information

Type and Version	Package Type	Package Description	Marking
PTFA211801E V4	H-36260-2	Thermally-enhanced slotted flange, single-ended	PTFA211801E
PTFA211801F V4	H-37260-2	Thermally-enhanced earless flange, single-ended	PTFA211801F

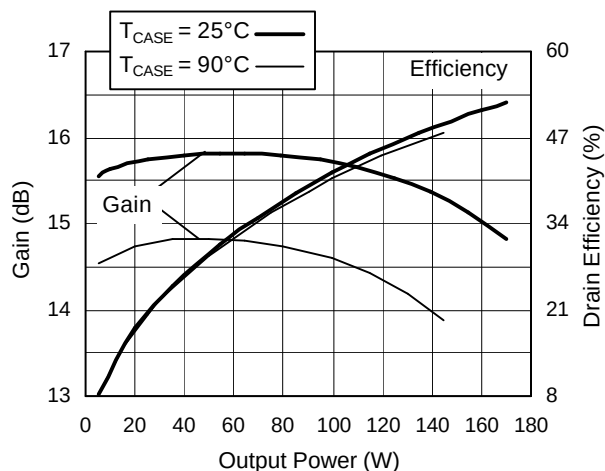
Typical Performance (data taken in a production test fixture)



Typical Performance (cont.)

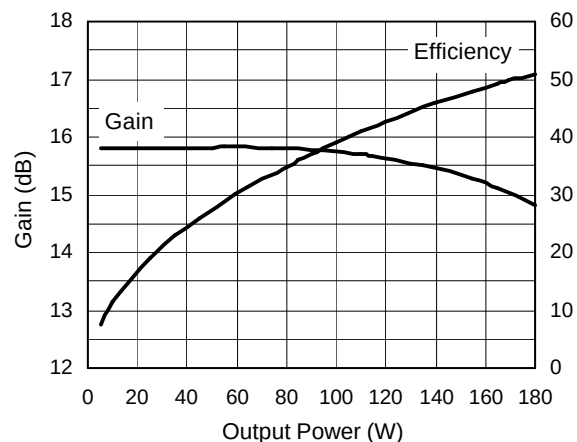
Power Sweep, CW Conditions

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $f = 2170\text{ MHz}$



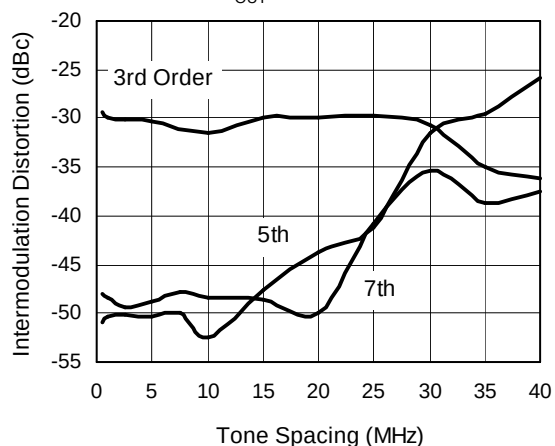
Power Sweep, CW Conditions

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $f = 2170\text{ MHz}$



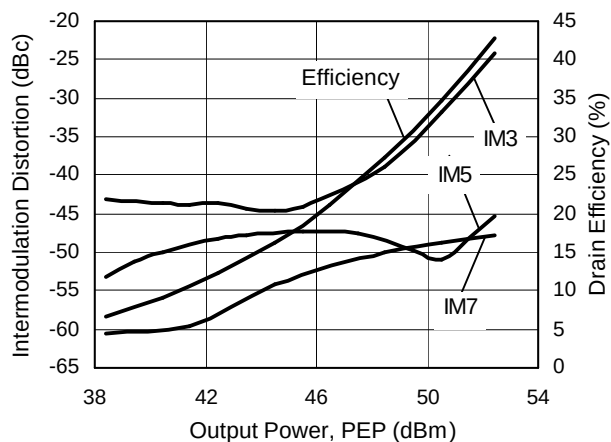
Intermodulation Distortion Products vs. Tone Spacing

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $f = 2140\text{ MHz}$,
 $P_{OUT} = 51\text{ dBm PEP}$



2-Tone Drive-up

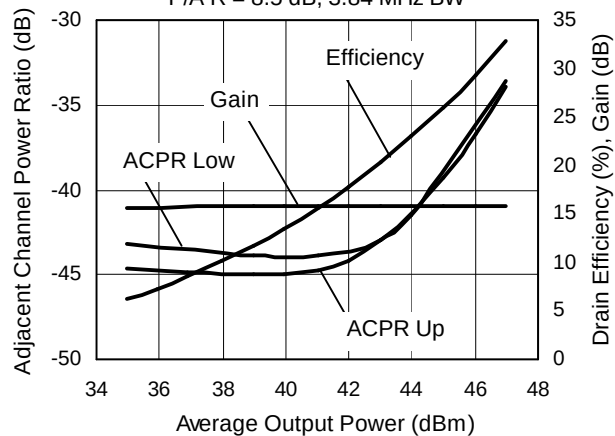
$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$,
 $f = 2140\text{ MHz}$, tone spacing = 1 MHz



Typical Performance (cont.)

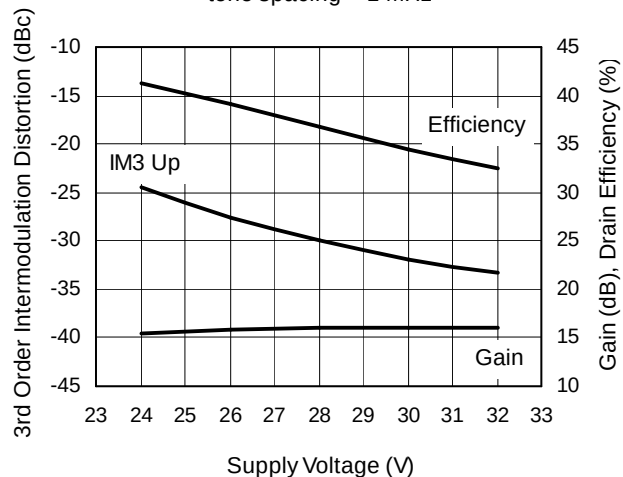
Single-carrier WCDMA Drive-up

$V_{DD} = 28 \text{ V}$, $I_{DQ} = 1.2 \text{ A}$, $f = 2140 \text{ MHz}$,
3GPP WCDMA signal, TM1 w/16 DPCH, 67% clipping,
P/A R = 8.5 dB, 3.84 MHz BW



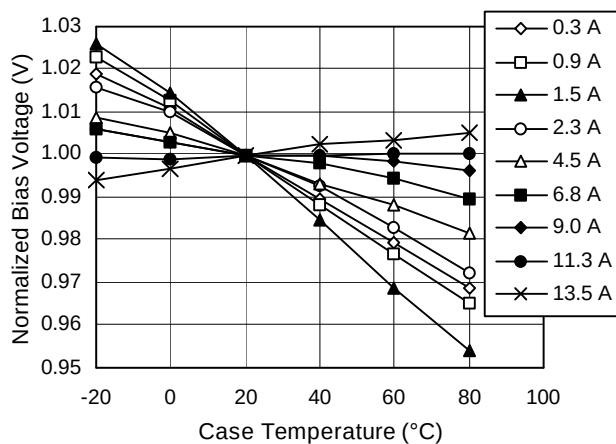
Voltage Sweep

$I_{DQ} = 1.2 \text{ A}$, $f = 2140 \text{ MHz}$, $P_{OUT} = 51 \text{ dBm PEP}$,
tone spacing = 1 MHz

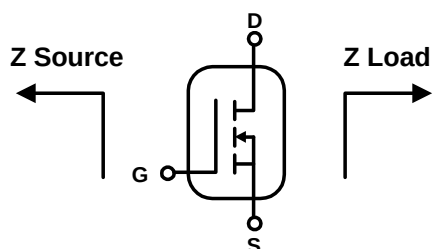


Bias Voltage vs. Temperature

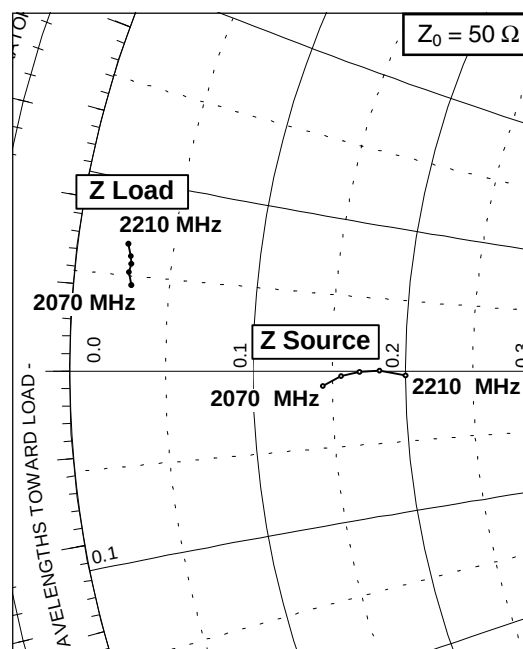
Voltage normalized to typical gate voltage,
series show current



Broadband Circuit Impedance

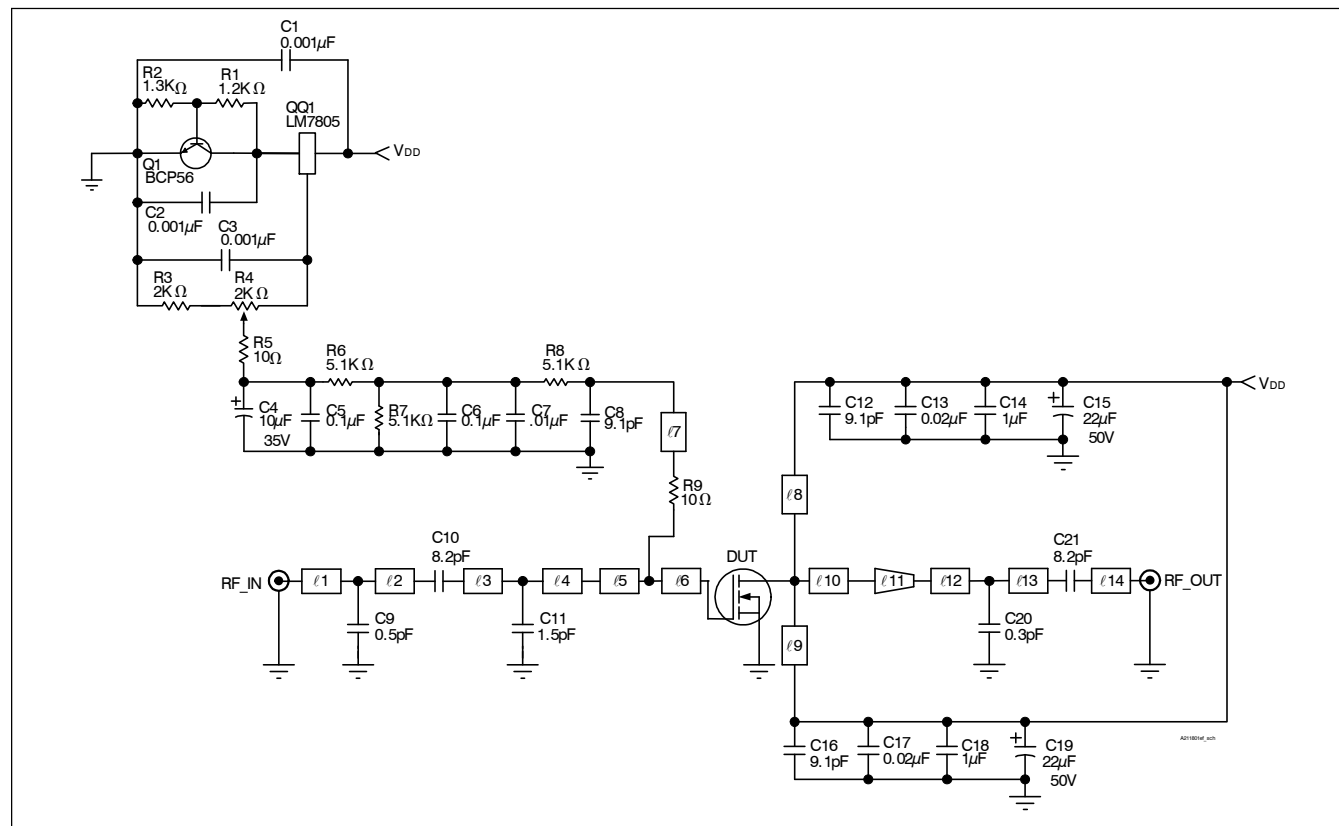


Frequency MHz	Z Source W		Z Load W	
	R	jX	R	jX
2070	7.2	-0.5	1.5	2.3
2110	7.8	-0.2	1.4	2.6
2140	8.4	-0.0	1.4	2.8
2170	9.1	0.0	1.4	3.0
2210	10.0	-0.2	1.3	3.4



See next page for reference circuit information

Reference Circuit



Reference circuit schematic for $f = 2140$ MHz

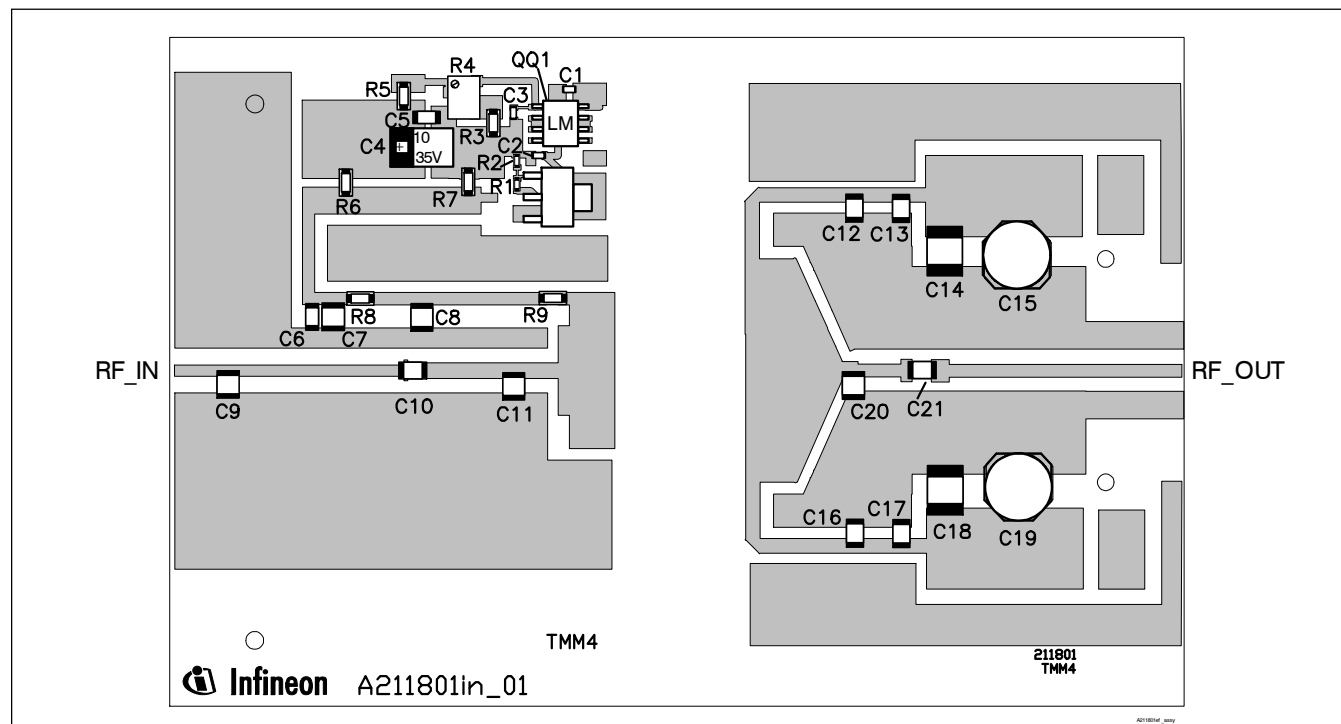
Circuit Assembly Information

DUT	PTFA211801E or PTFA211801F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, $\epsilon_r = 4.5$	Rogers TMM4	2 oz. copper

Microstrip	Electrical Characteristics at 2140 MHz ¹	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ_1	0.097 λ , 50.0 Ω	7.37 x 1.40	0.290 x 0.055
ℓ_2	0.267 λ , 50.0 Ω	19.86 x 1.40	0.782 x 0.055
ℓ_3	0.136 λ , 42.0 Ω	10.24 x 1.85	0.403 x 0.073
ℓ_4	0.087 λ , 42.0 Ω	6.50 x 1.85	0.256 x 0.073
ℓ_5	0.018 λ , 11.4 Ω	1.24 x 10.24	0.049 x 0.403
ℓ_6	0.077 λ , 6.9 Ω	5.23 x 17.78	0.206 x 0.700
ℓ_7	0.207 λ , 48.0 Ω	15.70 x 1.50	0.618 x 0.059
ℓ_8, ℓ_9	0.256 λ , 45.0 Ω	19.30 x 1.65	0.760 x 0.065
ℓ_{10}	0.087 λ , 5.0 Ω	5.84 x 25.40	0.230 x 1.000
ℓ_{11} (taper)	0.073 λ , 5.0 Ω / 40.0 Ω	5.59 x 25.40 / 1.98	0.220 x 1.000 / 0.078
ℓ_{12}	0.019 λ , 40.0 Ω	1.45 x 1.98	0.057 x 0.078
ℓ_{13}	0.087 λ , 50.0 Ω	6.65 x 1.40	0.262 x 0.055
ℓ_{14}	0.403 λ , 50.0 Ω	30.73 x 1.40	1.210 x 0.055

¹Electrical characteristics are rounded.

Reference Circuit (cont.)

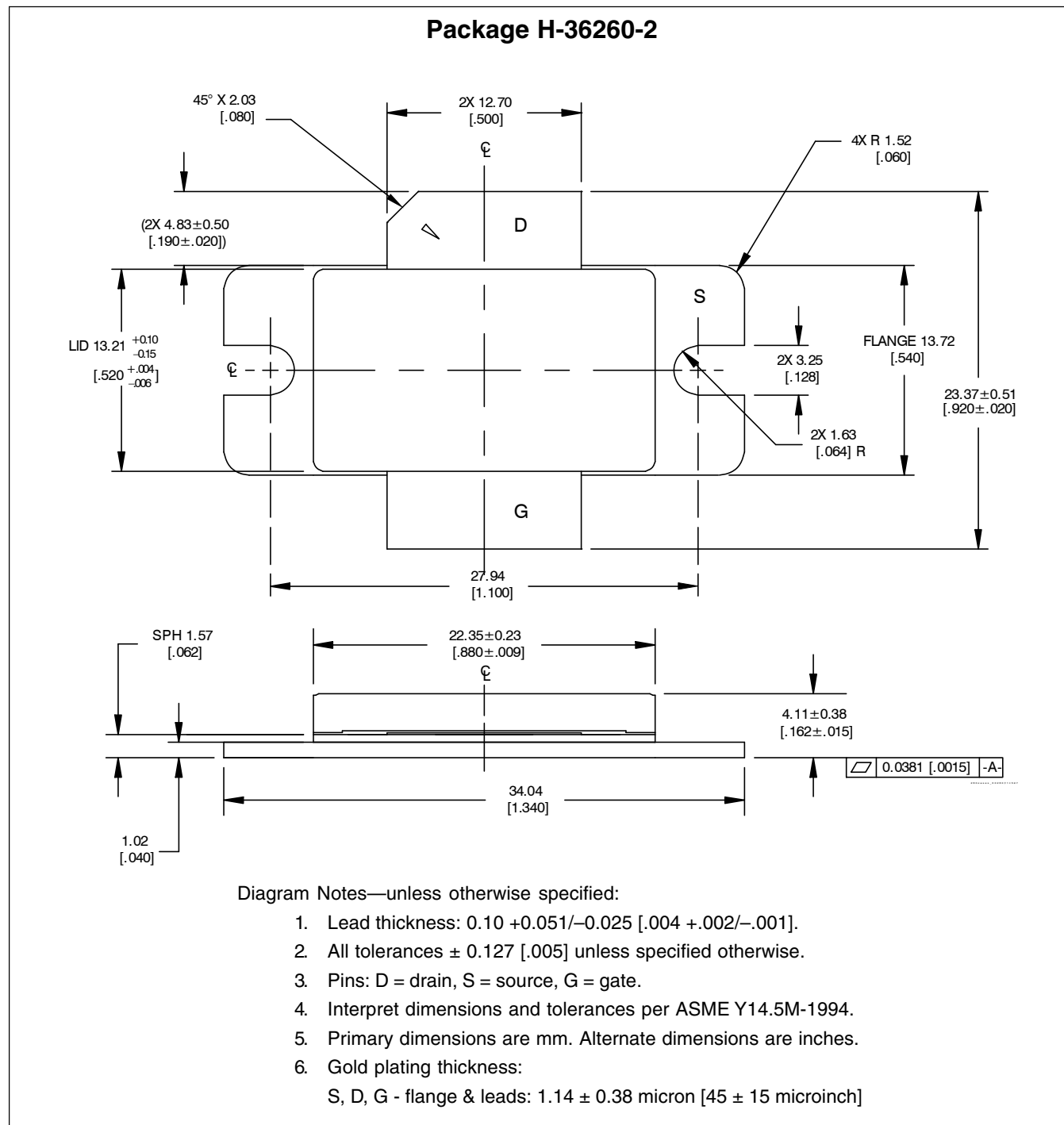


Reference circuit assembly diagram* (not to scale)

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	PCS6106TR-ND
C5, C6	Capacitor, 0.1 μ F	Digi-Key	PCC104BCT
C7	Capacitor, 0.01 μ F	ATC	200B103
C8, C12, C16	Ceramic capacitor, 9.1 pF	ATC	100B 9R1
C9	Ceramic capacitor, 0.5 pF	ATC	100B 0R5
C10, C21	Ceramic capacitor, 8.2 pF	ATC	100B 8R2
C11	Ceramic capacitor, 1.5 pF	ATC	100B 1R5
C13, C17	Ceramic capacitor, 0.02 μ F	ATC	200B 203
C14, C18	Ceramic capacitor, 1 μ F	ATC	920C105
C15, C19	Electrolytic capacitor, 22 μ F, 50 V	Digi-Key	PCE3374CT-ND
C20	Ceramic capacitor, 0.3 pF	ATC	100B 0R3
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, R9	Chip resistor, 10 ohms	Digi-Key	P10ECT-ND
R6, R7, R8	Chip resistor, 5.1 k-ohms	Digi-Key	P5.1KECT-ND

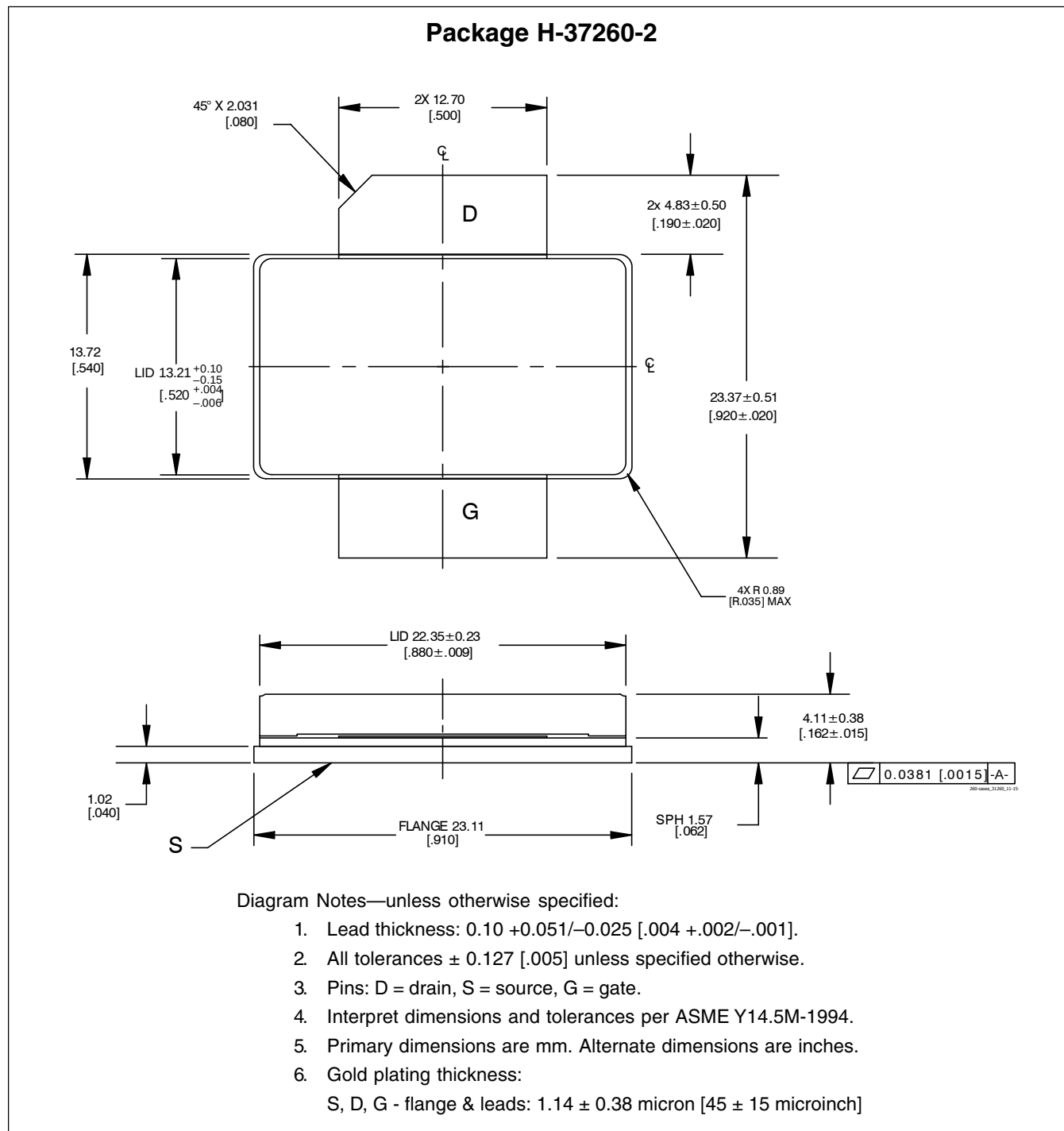
*Gerber Files for this circuit available on request

Package Outline Specifications



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Package Outline Specifications (cont.)



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Revision History: 2007-11-15

Data Sheet

Previous Version: 2005-06-10, Data Sheet

Page	Subjects (major changes since last revision)
1, 3, 9, 10	Update product to V 4.1, with new package technologies. Update package outline diagrams.

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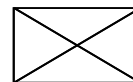
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highpowerRF@infineon.com

To request other information, contact us at:

+1 877 465 3667 (1-877-GO-LDMOS) USA

or +1 408 776 0600 International



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