

Thermally-Enhanced High Power RF LDMOS FETs

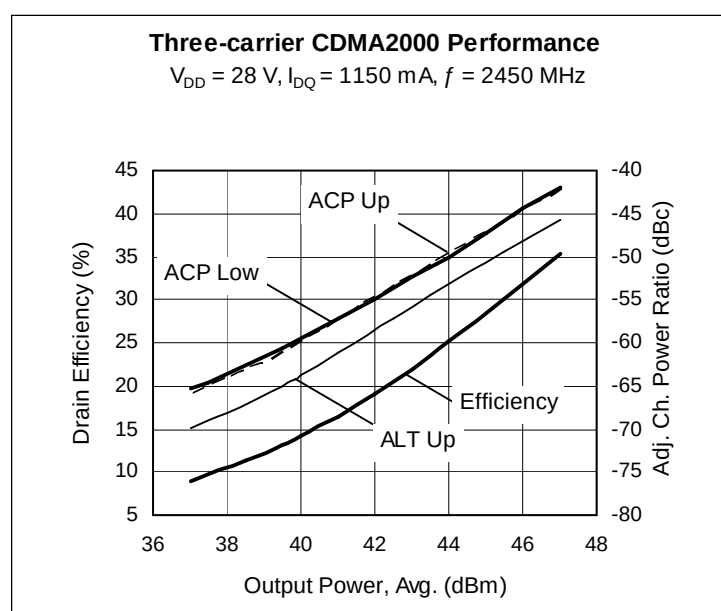
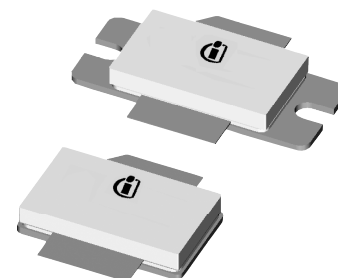
130 W, 2420 – 2480 MHz

Description

The PTFA241301E and PTFA241301F are thermally-enhanced 130-watt, internally matched **GOLDMOS®** FETs intended for ultra-linear applications. They are characterized for CDMA, CDMA2000, Super3G (3GPP TSG RAN), and WiMAX operation from 2420 to 2480 MHz. Full gold metallization ensures excellent device lifetime and reliability.

PTFA241301E
 Package H-30260-2

PTFA241301F
 Package H-31260-2



Features

- Thermally-enhanced packaging, Pb-free and RoHS-compliant
- Broadband internal matching
- Typical CDMA2000 performance at 2450 MHz
 - Average output power = 25 W
 - Linear Gain = 14 dB
 - Efficiency = 25%
- Typical CW performance, 2420 MHz, 28 V
 - Output power at P-1dB = 140 W
 - Efficiency = 50%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 130 W (CW) output power

RF Characteristics

Three-carrier CDMA2000 Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$, $P_{OUT} = 25\text{ W}$ average, $f = 2450\text{ MHz}$

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	14	—	dB
Drain Efficiency	η_D	—	25	—	%
Adjacent Channel Power Ratio	ACPR	—	-50	—	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)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$, $P_{OUT} = 130\text{ W PEP}$, $f = 2420\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	13.0	14	—	dB
Drain Efficiency	η_D	36	38	—	%
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	μA
	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10.0	μA
On-State Resistance	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.07	—	Ω
Operating Gate Voltage	$V_{DS} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$	V_{GS}	2	2.4	3	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 Above 25 $^{\circ}\text{C}$ derate by	P_D	438	W
		2.5	W/ $^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 130 W CW)	$R_{\theta JC}$	0.40	$^{\circ}\text{C/W}$

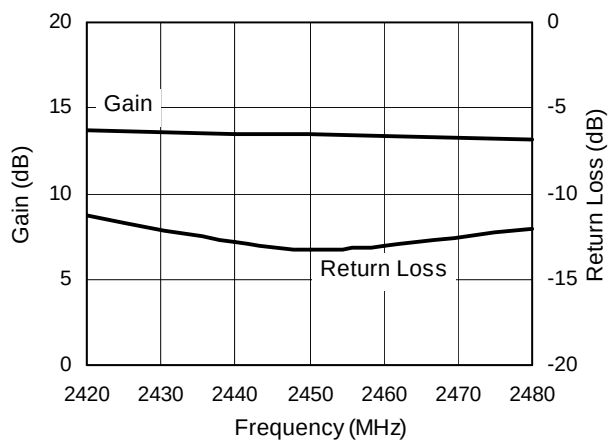
Ordering Information

Type	Package Outline	Package Description	Marking
PTFA241301E	H-30260-2	Thermally-enhanced slotted flange, single-ended	PTFA241301E
PTFA241301F	H-31260-2	Thermally-enhanced earless flange, single-ended	PTFA241301F

Typical Performance (data taken in a production test fixture)

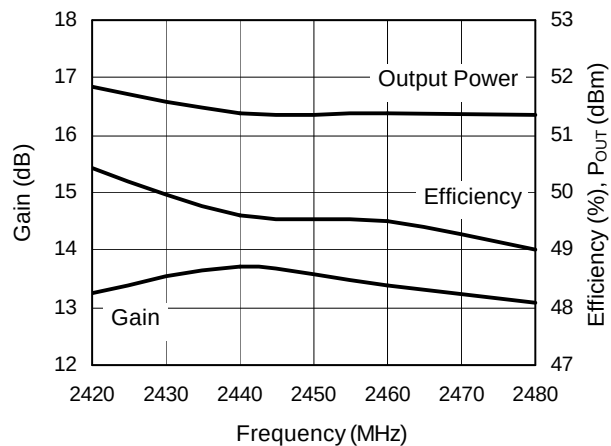
Linear Broadband Performance

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$, $P_{OUT, Avg.} = 45.5\text{ dBm}$



Broadband CW Performance (at P-1dB)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$

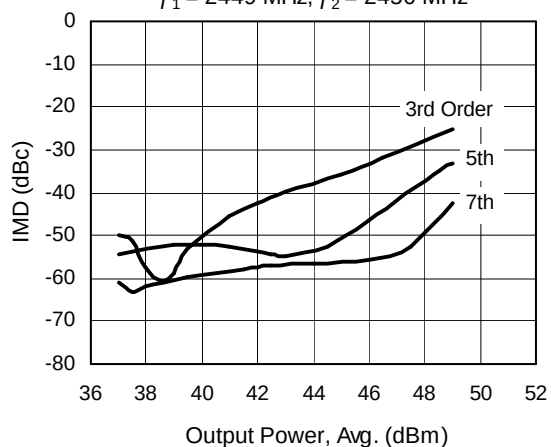


Intermodulation Distortion vs. Output Power

(as measured in a broadband circuit)

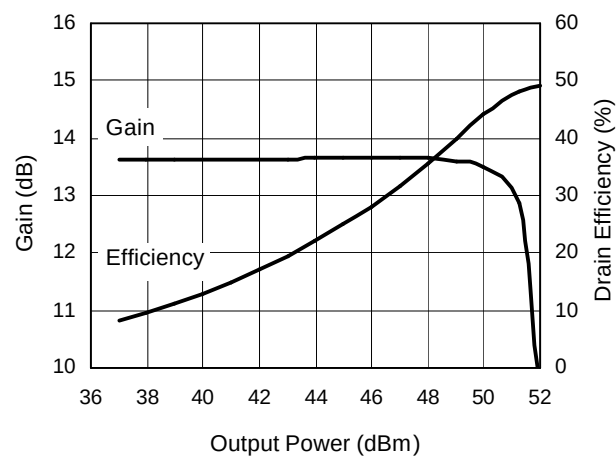
$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$,

$f_1 = 2449\text{ MHz}$, $f_2 = 2450\text{ MHz}$

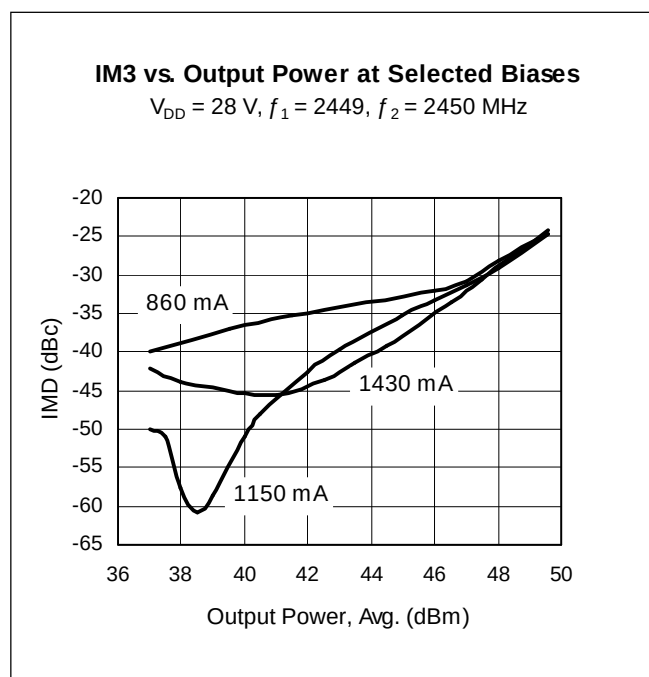
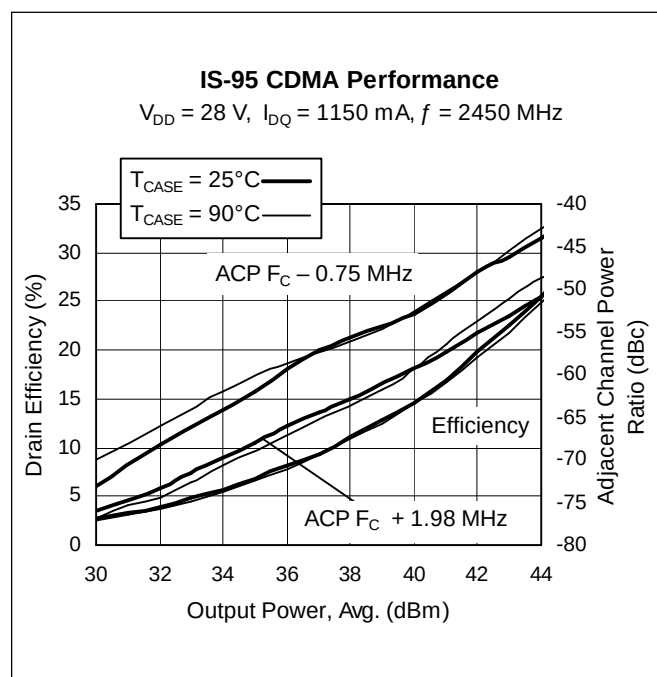
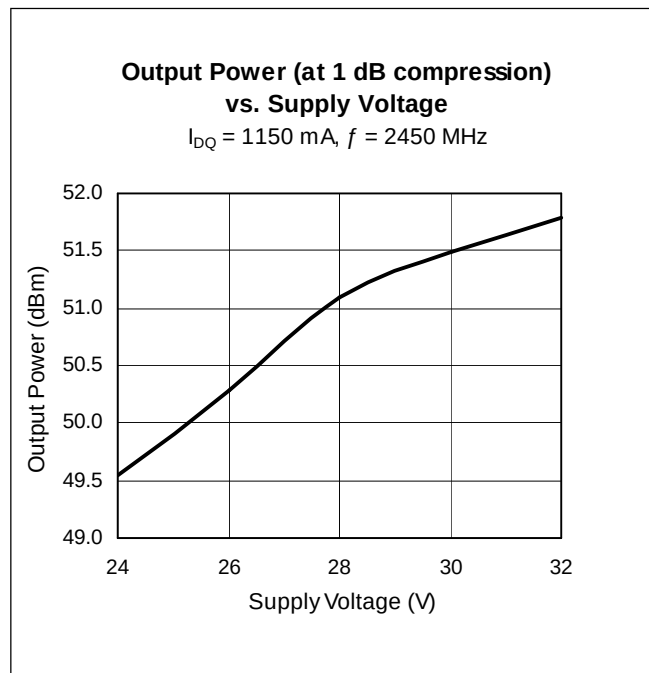
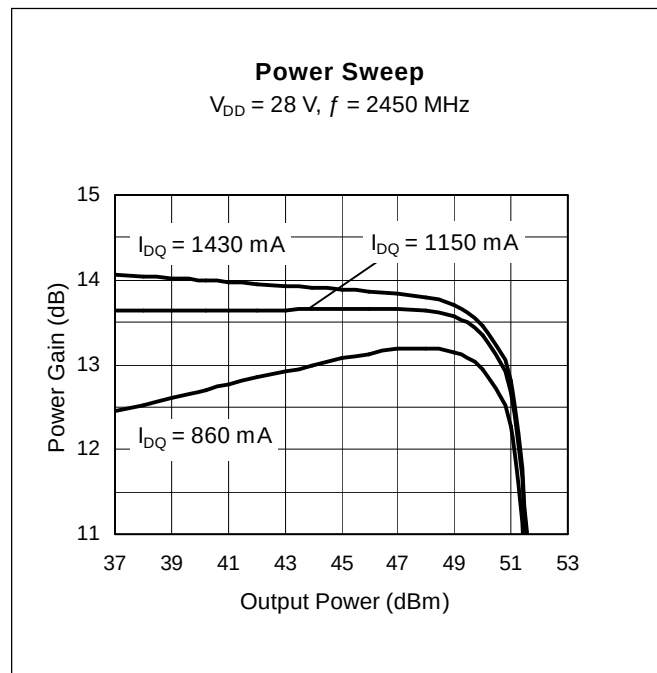


Gain & Efficiency vs. Output Power

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1150\text{ mA}$, $f = 2450\text{ MHz}$



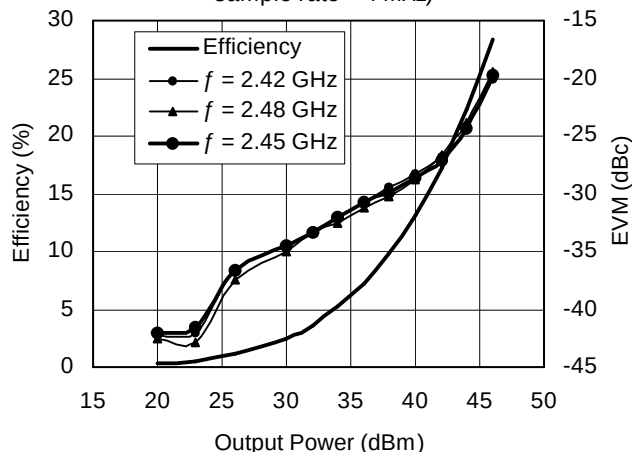
Typical Performance (cont.)



Typical Performance (cont.)

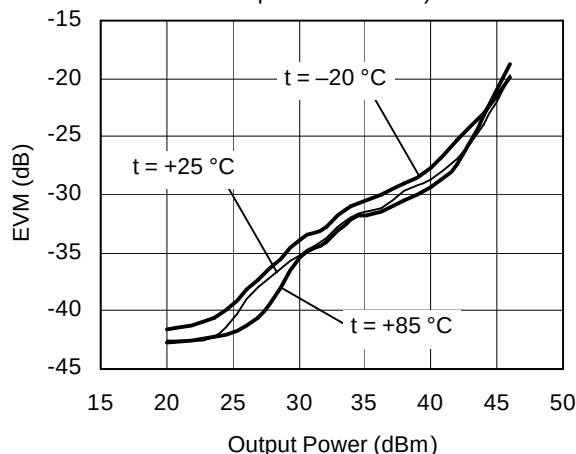
WiMAX Performance

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$,
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)



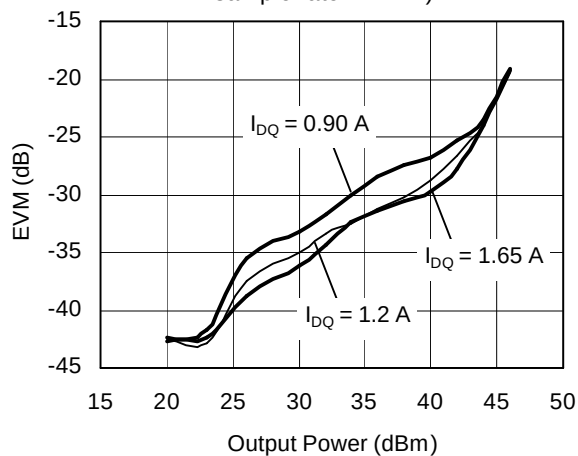
WiMAX Performance

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $f = 2480\text{ MHz}$,
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)



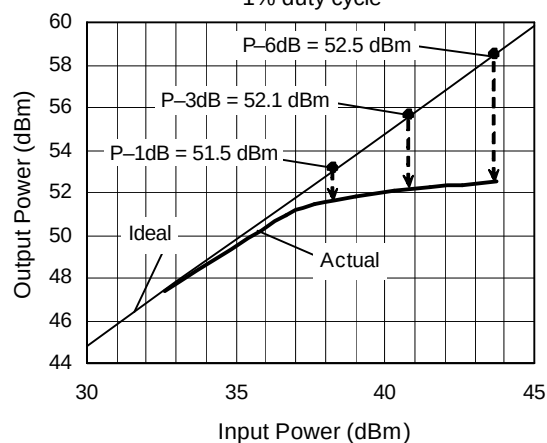
WiMAX Performance

$V_{DD} = 28\text{ V}$, $f = 2480\text{ MHz}$,
(modulation = 64 QAM2/3, channel bandwidth = 3.5 MHz,
sample rate = 4 MHz)

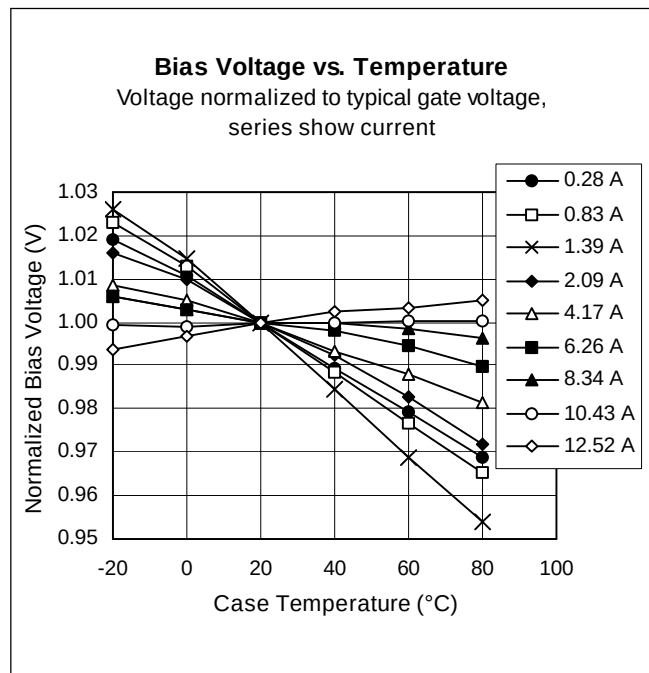
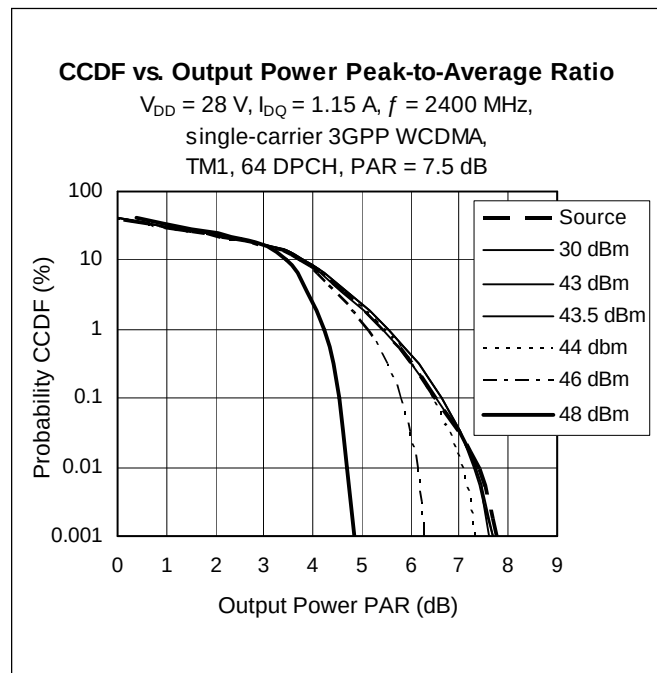


Power Sweep, under Pulsed Conditions

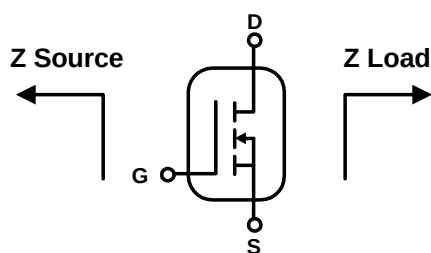
$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.15\text{ A}$, $f = 2420\text{ MHz}$,
pulse period = 800 μs , pulse width = 80 μs ,
1% duty cycle



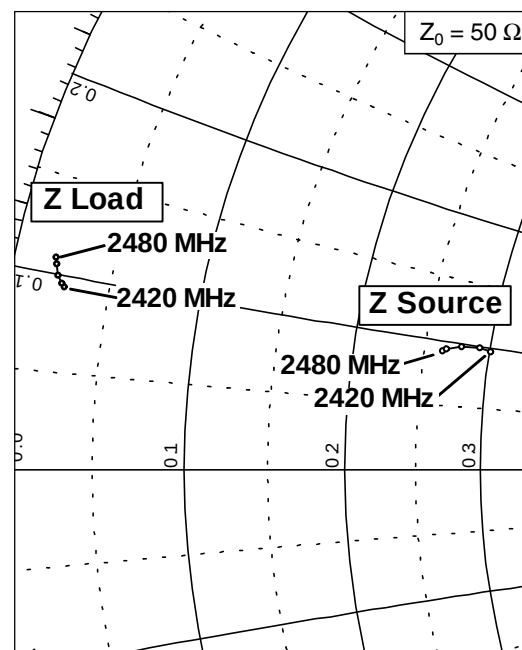
Typical Performance (cont.)



Broadband Circuit Impedance

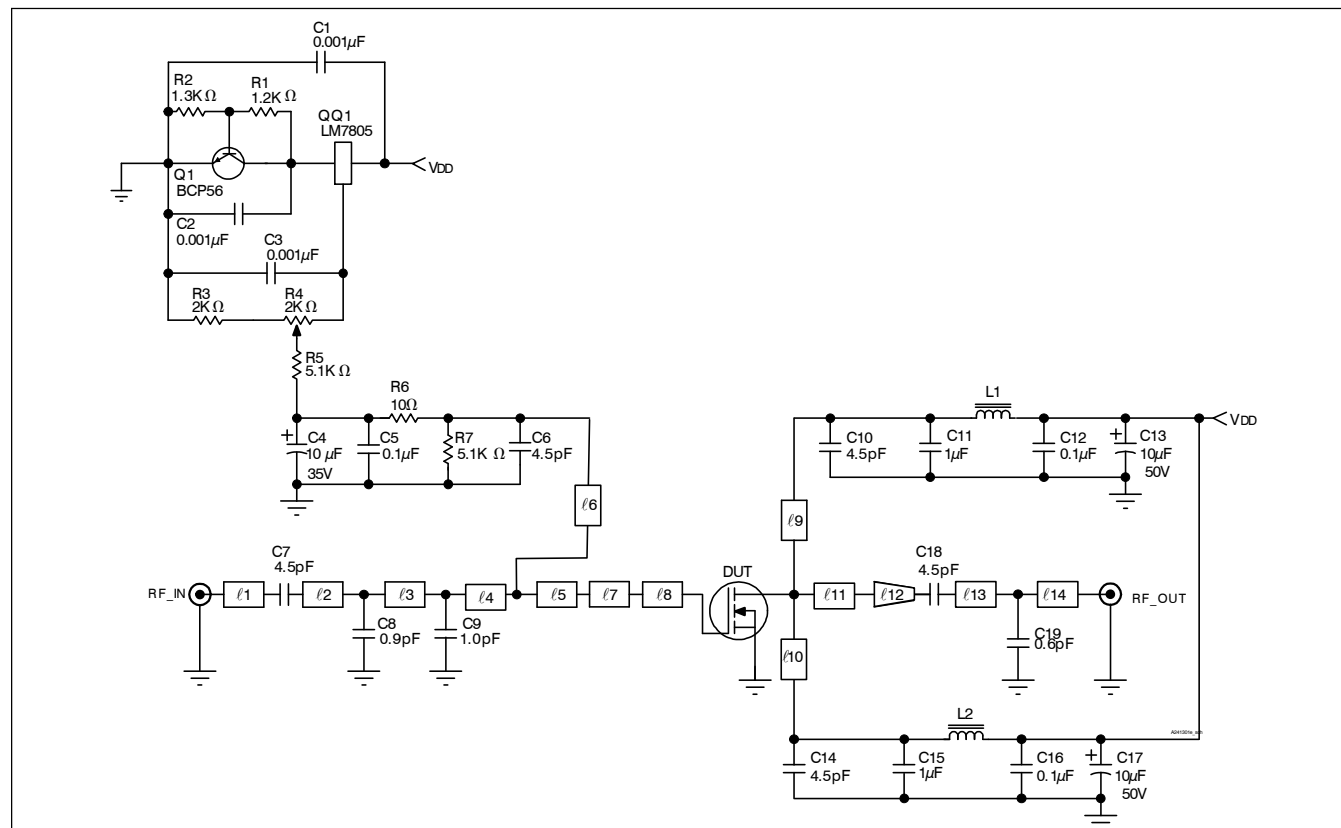


Frequency MHz	Z Source W		Z Load W	
	R	jX	R	jX
2420	13.20	4.69	1.35	4.73
2430	13.30	4.75	1.28	4.80
2450	13.85	4.94	1.14	4.99
2470	14.59	5.00	1.06	5.27
2480	15.01	4.91	1.01	5.43



See next page for circuit information

Reference Circuit



Reference circuit schematic for $f = 2420$ MHz

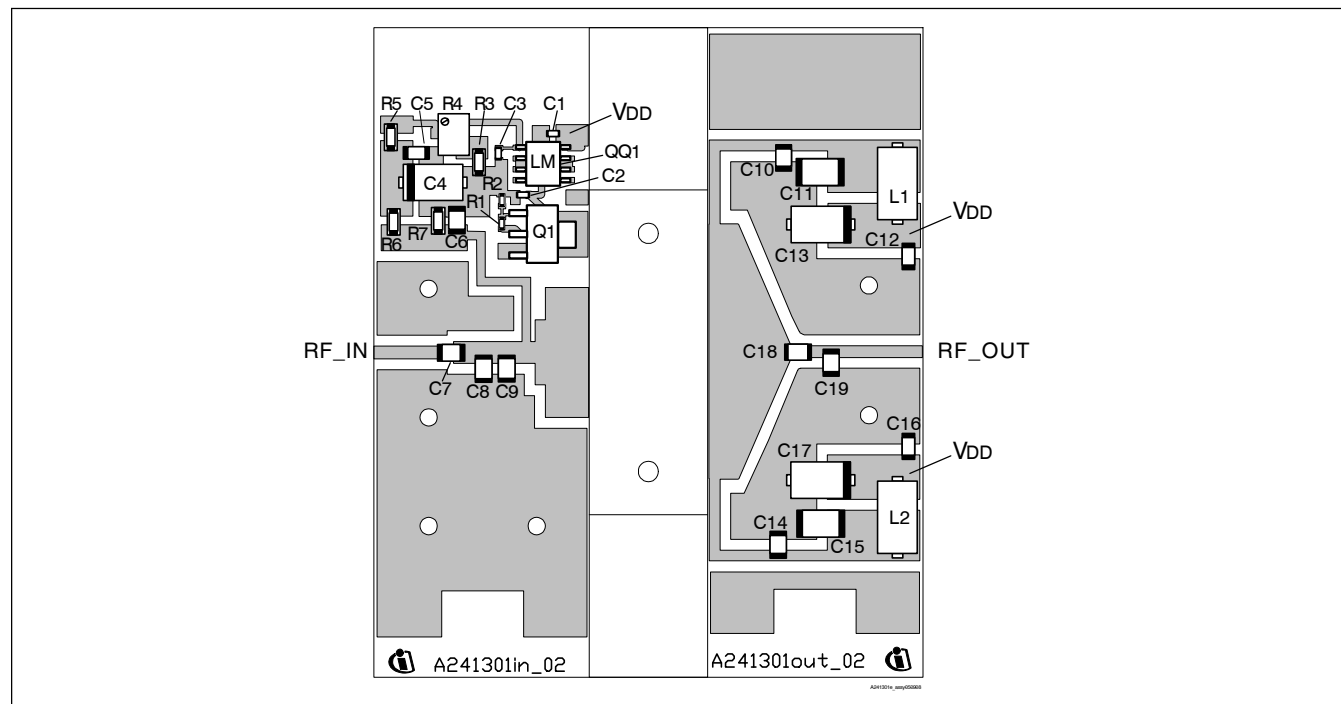
Circuit Assembly Information

DUT	PTFA241301E or PTFA241301F	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, $\epsilon_r = 4.5$	Rogers TMM4	2 oz. copper

Microstrip	Electrical Characteristics at 2420 MHz ¹	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ_1	0.112λ , 50.0 Ω	7.52 x 1.37	0.296 x 0.054
ℓ_2	0.039λ , 34.0 Ω	2.54 x 2.54	0.100 x 0.100
ℓ_3	0.045λ , 34.0 Ω	2.92 x 2.54	0.115 x 0.100
ℓ_4	0.044λ , 34.0 Ω	2.87 x 2.54	0.113 x 0.100
ℓ_5	0.017λ , 34.0 Ω	1.09 x 2.54	0.043 x 0.100
ℓ_6	0.307λ , 60.0 Ω	21.01 x 0.97	0.827 x 0.038
ℓ_7	0.019λ , 14.7 Ω	1.17 x 7.62	0.046 x 0.300
ℓ_8	0.083λ , 8.0 Ω	5.03 x 15.24	0.198 x 0.600
ℓ_9, ℓ_{10}	0.237λ , 50.0 Ω	16.00 x 1.27	0.630 x 0.050
ℓ_{11}	0.057λ , 4.3 Ω	3.43 x 29.85	0.135 x 1.175
ℓ_{12} (taper)	0.098λ , 4.3 Ω / 50.0 Ω	5.99 x 29.85 / 1.37	0.236 x 1.175 / 0.054
ℓ_{13}	0.034λ , 50.0 Ω	2.29 x 1.37	0.090 x 0.054
ℓ_{14}	0.164λ , 50.0 Ω	11.13 x 1.37	0.438 x 0.054

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	366-1655-2-ND
C5, C12, C16	Capacitor, 0.1 μ F	Digi-Key	PCC104BCT-ND
C6, C7, C10, C14, C18	Ceramic capacitor 4.5 pF	ATC	100B 4R5
C8	Ceramic capacitor 0.9 pF	ATC	100B 0R9
C9	Ceramic capacitor 1 pF	ATC	100B 1R0
C11, C15	Ceramic capacitor 1 μ F	Digi-Key	19528-ND
C13, C17	Capacitor, 10 μ F, 50 V	Garrett Electronics	TPS106K050R0400
C19	Ceramic capacitor 0.6 pF	ATC	100B 0R6
L1, L2	Ferrite, 6 mm	Ferroxcube	53/3/4.6-452
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	P22KECT-ND
R4	Potentiometer, 2 k-ohms	Digi-Key	3224W-202ETR-ND
R5, R7	Chip resistor, 5.1 k-ohms	Digi-Key	P5.1KECT-ND
R6	Chip resistor, 10 ohms	Digi-Key	P10ECT-ND

*Gerber Files for this circuit available on request

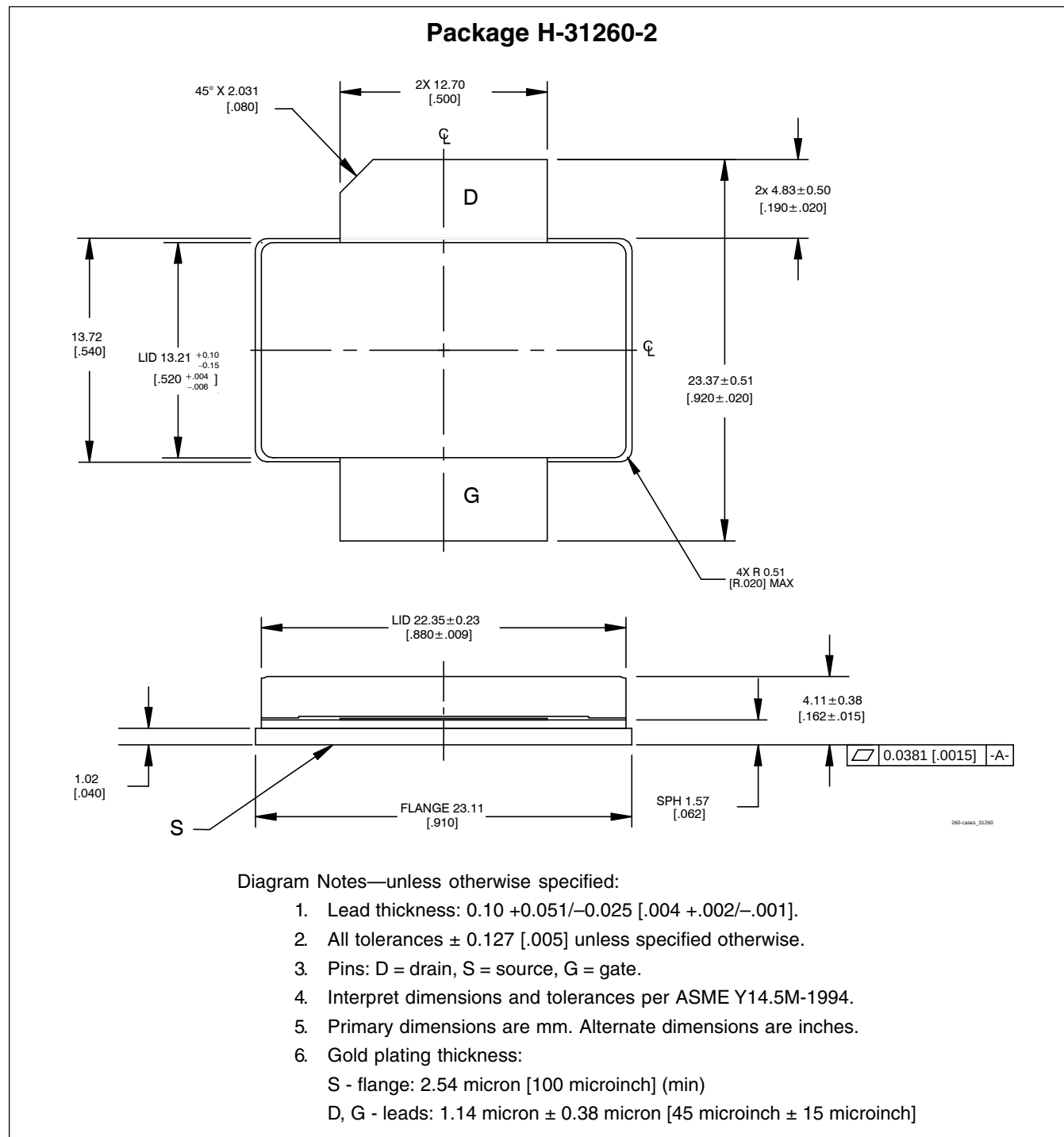
Package H-30260-2



1. Lead thickness: 0.10 +0.051/−0.025 [.004 +.002/−.001].
2. All tolerances ± 0.127 [.005] unless specified otherwise.
3. Pins: D = drain, S = source, G = gate.
4. Interpret dimensions and tolerances per ASME Y14.5M-1994.
5. Primary dimensions are mm. Alternate dimensions are inches.
6. Gold plating thickness:
S - flange: 2.54 micron [100 microinch] (min)
D, G - leads: 1.14 micron $\pm$ 0.38 micron [45 microinch $\pm$ 15 microinch]

Rev. 05, 2007-05-11

Package Outline Specifications (cont.)



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PTFA241301EF

Revision History: **2007-05-11**

Data Sheet

Previous Version: 2006-06-29, Data Sheet

Page	Subjects (major changes since last revision)
5, 6	Add two graphs.
9	Update package outline diagram for Package H-30260-2.

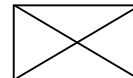
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