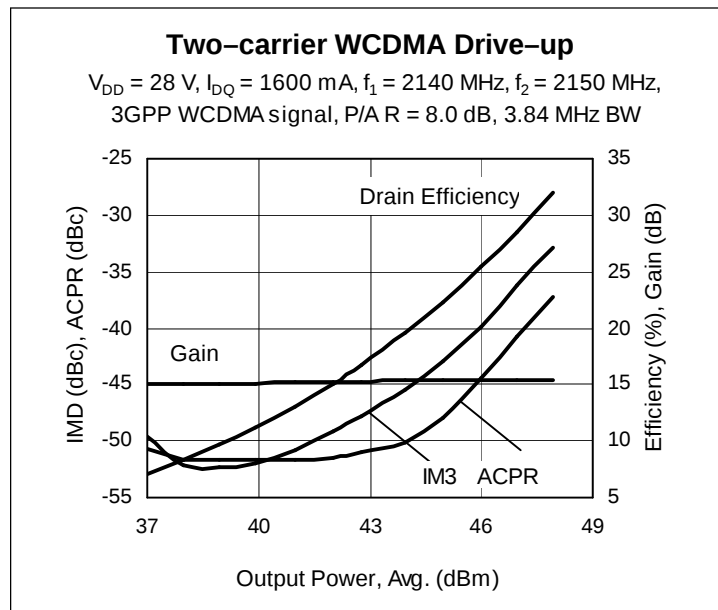


Thermally-Enhanced High Power RF LDMOS FET 200 W, 2110 – 2170 MHz

Description

The PTFA212002E is a 200-watt, internally-matched, laterally double-diffused, **GOLDMOS** push-pull FET. It is characterized for single- and two-carrier WCDMA operation from 2110 to 2170 MHz. Thermally-enhanced packaging provides the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.

PTFA212002E
Package 30275



- Thermally-enhanced packaging
- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 28 V
 - Average output power = 44 W
 - Gain = 15 dB
 - Efficiency = 27%
 - IM3 = -37 dBc
 - ACPR < -40 dBc
- Typical CW performance at 2140 MHz, 28 V
 - Output power at P-1dB = 220 W
 - Efficiency = 56%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability
- Low HCI drift
- Capable of handling 10:1 VSWR @ 28 V, 200 W (CW) output power

RF Characteristics

WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 28\text{ V}$, $I_{DQ} = 2 \times 800\text{ mA}$, $P_{OUT} = 44\text{ W}$ 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	15	—	dB
Drain Efficiency	η_D	25.5	27	—	%
Intermodulation Distortion	IMD	—	-37	-35	dBc

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics (per side)

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	μA
On-State Resistance	$V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.08	—	Ω
Operating Gate Voltage	$V_{DS} = 28\text{ V}, I_{DQ} = 800\text{ mA}$	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	795	W
Above 25 $^{\circ}\text{C}$ derate by		4.55	W/ $^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	−40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}, 200\text{ W CW}$)	$R_{\theta JC}$	0.22	$^{\circ}\text{C/W}$

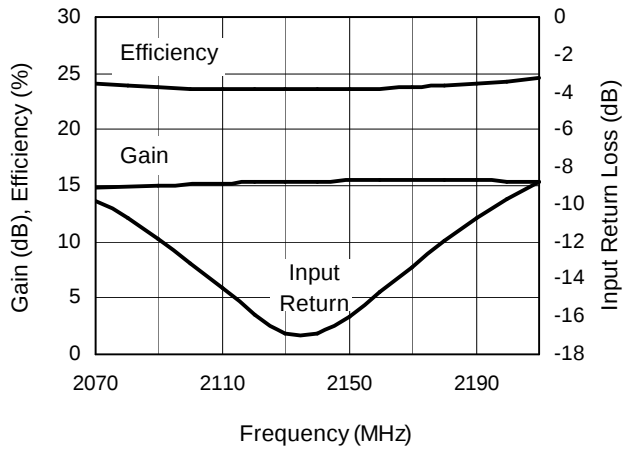
Ordering Information

Type	Package Outline	Package Description	Marking
PTFA212002E	30275	Thermally-enhanced slotted flange, push-pull	PTFA212002E

Typical Performance (data taken in a production test fixture)

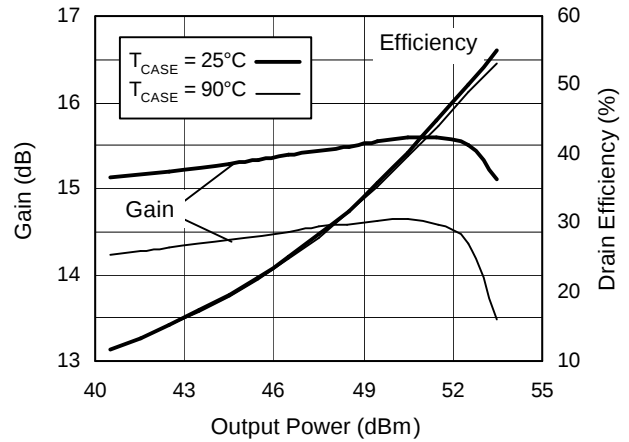
Broadband Circuit Performance

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1600\text{ mA}$, $P_{OUT} = 46.4\text{ dBm CW}$



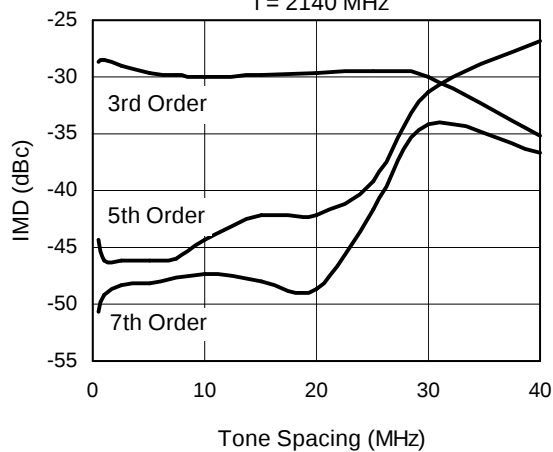
Power Sweep, CW Conditions

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1600\text{ mA}$, $f = 2140\text{ MHz}$



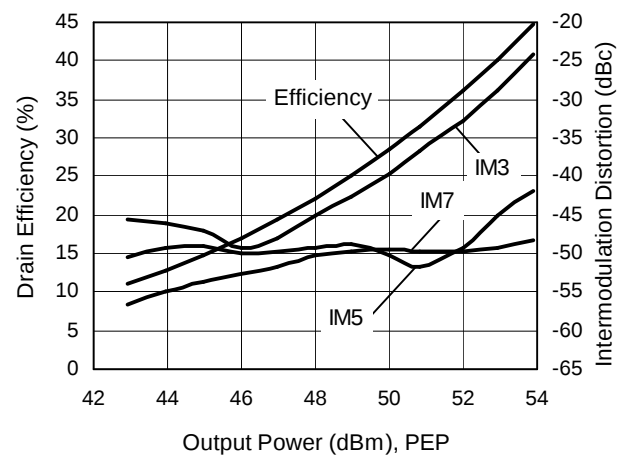
Intermodulation Distortion Products vs. Tone Spacing

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1600\text{ mA}$, $P_{OUT} = 200\text{ W PEP}$,
 $f = 2140\text{ MHz}$



Two-tone Drive-up

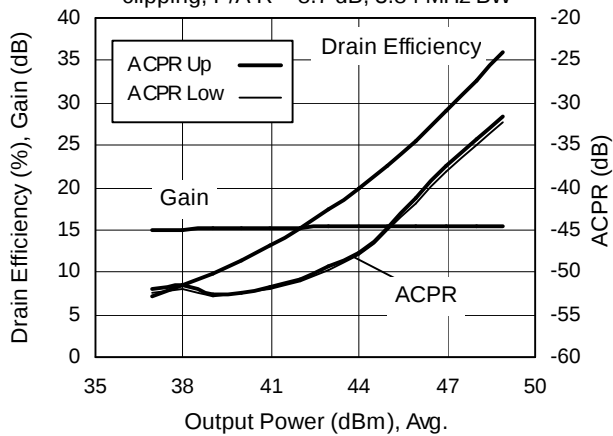
$V_{DD} = 28\text{ V}$, $I_{DQ} = 1600\text{ mA}$, $f = 2140\text{ MHz}$,
tone spacing = 10 MHz



Typical Performance (cont.)

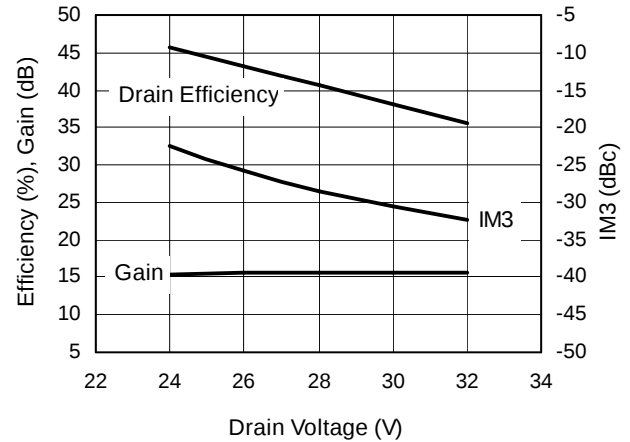
Single-carrier WCDMA Drive-up

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1600\text{ mA}$, $f = 2140\text{ MHz}$,
3GPP WCDMA signal, Test Model 1 w/ 16 DPCH 67%
clipping, P/A R = 8.7 dB, 3.84 MHz BW



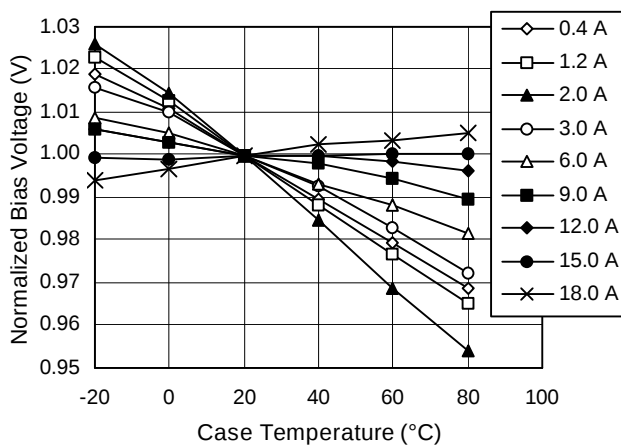
Voltage Sweep

$I_{DQ} = 1600\text{ mA}$, $f = 2140\text{ MHz}$, $P_{OUT} = 200\text{ W PEP}$,
tone spacing = 1 MHz

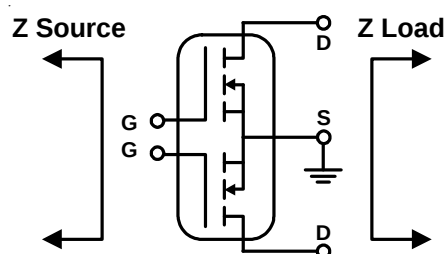


Bias Voltage vs. Temperature

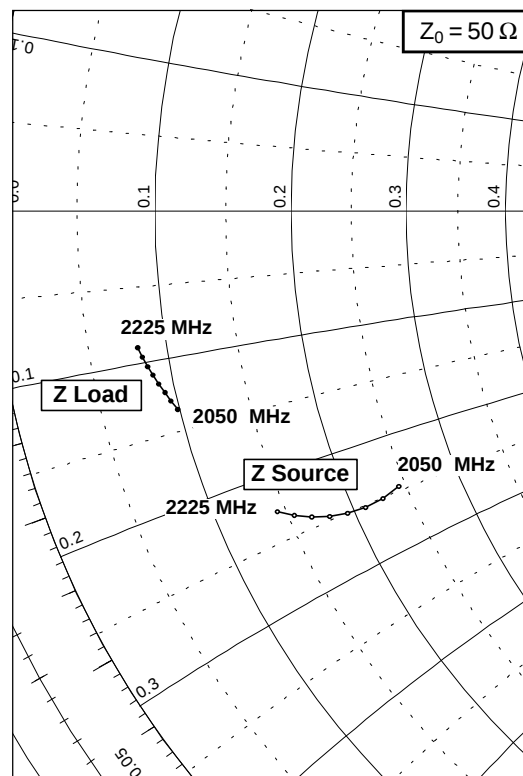
Voltage normalized to typical gate voltage,
series show current



Broadband Circuit Impedance

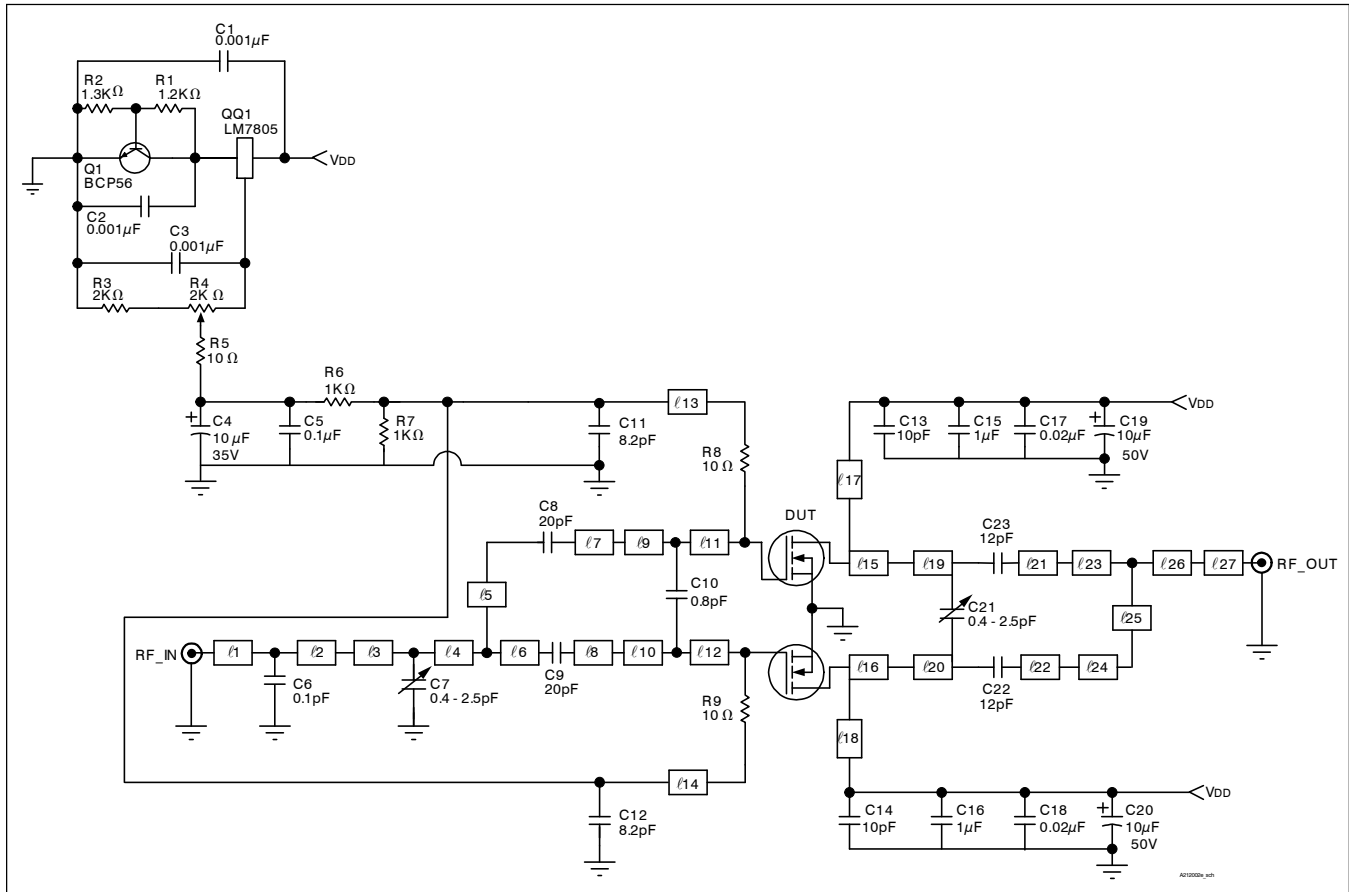


Frequency MHz	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2050	12.21	-12.34	4.95	-6.77
2075	11.36	-12.55	4.80	-6.45
2100	10.52	-12.61	4.66	-6.12
2125	9.73	-12.53	4.52	-5.80
2150	9.00	-12.35	4.39	-5.47
2175	8.33	-12.08	4.27	-5.15
2200	7.73	-11.76	4.16	-4.82
2225	7.20	-11.39	4.06	-4.49



See next page for circuit information.

Reference Circuit



Reference Circuit Schematic for $f = 2140$ MHz

Circuit Assembly Information

DUT	PTFA212002E	LDMOS Transistor	
PCB	0.76 mm [.030"] thick, $\epsilon_r = 3.48$	Rogers 4350	1 oz. copper

Microstrip	Electrical Characteristics at 2140 MHz ¹	Dimensions: L x W (mm)	Dimensions: L x W (in.)
l1	0.060 λ , 50.0 Ω	5.08 x 1.70	0.200 x 0.067
l2	0.225 λ , 50.0 Ω	19.05 x 1.70	0.750 x 0.067
l3	0.210 λ , 36.0 Ω	16.99 x 2.84	0.669 x 0.112
l4	0.090 λ , 36.0 Ω	7.57 x 2.84	0.298 x 0.112
l5	0.550 λ , 50.0 Ω	47.07 x 1.70	1.853 x 0.067
l6	0.050 λ , 50.0 Ω	4.39 x 1.70	0.173 x 0.067
l7, l8	0.110 λ , 32.0 Ω	9.04 x 3.30	0.356 x 0.130
l9, l10	0.070 λ , 22.4 Ω	5.84 x 5.26	0.230 x 0.207
l11, l12	0.090 λ , 9.1 Ω	6.86 x 15.09	0.270 x 0.594
l13, l14	0.280 λ , 50.0 Ω	23.88 x 1.70	0.940 x 0.067
l15, l16	0.129 λ , 8.4 Ω	10.01 x 16.33	0.394 x 0.643

¹Electrical characteristics are rounded.

(table cont. next page)

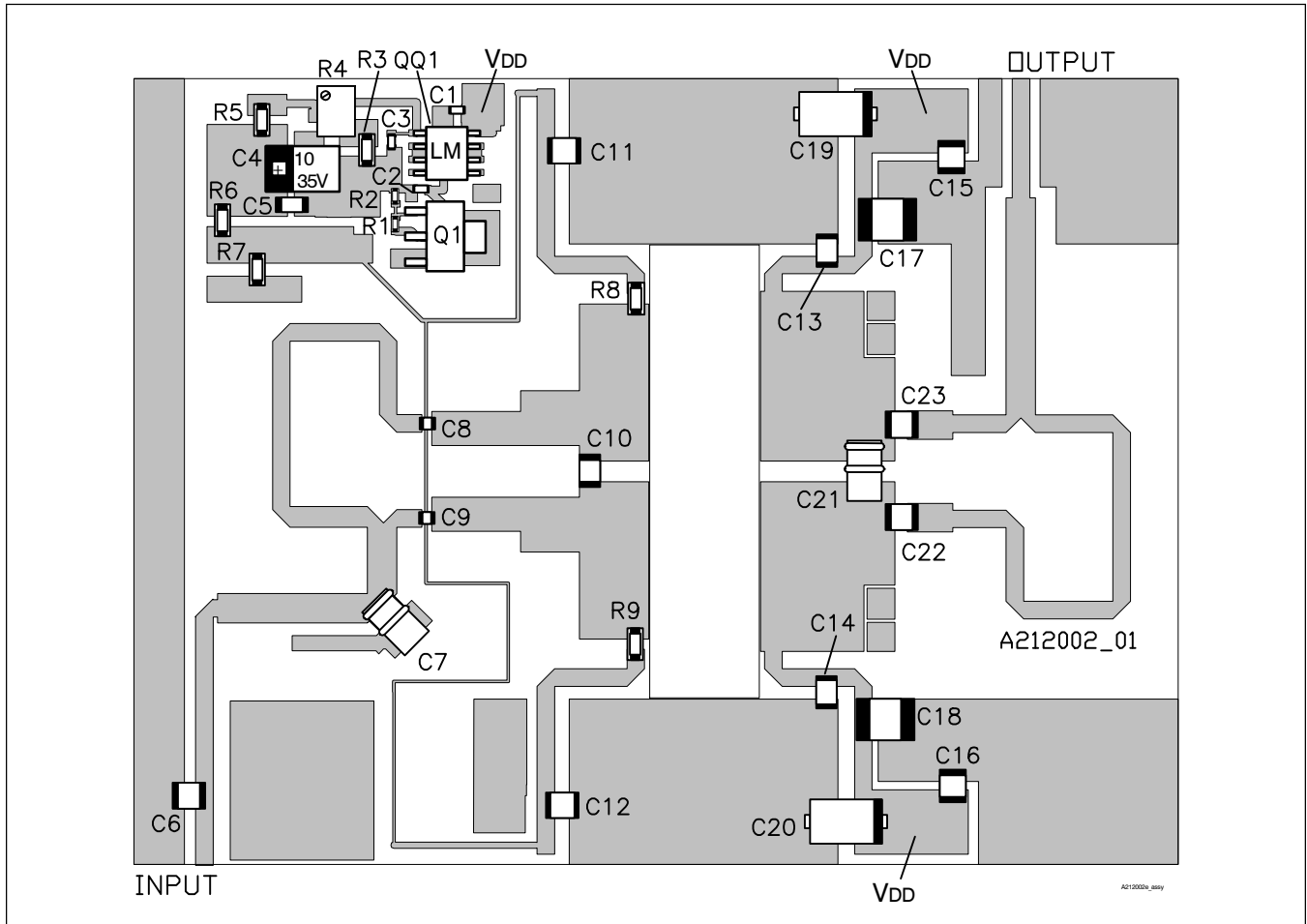
Reference Circuit (cont.)

Circuit Assembly Information (cont.)

Microstrip	Electrical Characteristics at 2140 MHz*	Dimensions: L x W (mm)	Dimensions: L x W (in.)
ℓ17, ℓ18	0.102 λ, 50.0 Ω	8.64 x 1.70	0.340 x 0.067
ℓ19, ℓ20	0.035 λ, 13.1 Ω	2.74 x 9.96	0.108 x 0.392
ℓ21, ℓ22	0.102 λ, 20.5 Ω	4.70 x 2.72	0.185 x 0.107
ℓ23	0.090 λ, 50.0 Ω	6.43 x 1.70	0.253 x 0.067
ℓ24	0.620 λ, 50.0 Ω	52.32 x 1.70	2.060 x 0.067
ℓ25	0.264 λ, 36.0 Ω	21.79 x 2.84	0.858 x 0.112
ℓ26	0.136 λ, 50.0 Ω	11.51 x 1.70	0.453 x 0.067

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C2, C3	Capacitor, 0.001 μF	Digi-Key	PCC1772CT-ND
C4	Capacitor, 10 μF, 35 V, tant TE series	Digi-Key	PCS6106TR-ND, SMD
C5	Capacitor, 0.1 μF	Digi-Key	P4525-ND
C6	Ceramic capacitor, 0.1 pF	ATC	100B 0R1
C7, C21	Variable capacitor, 0.4 – 2.5 pF	TEMEX USA	AT27280
C8, C9	Ceramic capacitor, 20 pF	ATC	100A 200
C10	Ceramic capacitor, 0.8 pF	ATC	100B 0R8
C11, C12	Ceramic capacitor, 8.2 pF	ATC	100B 8R2
C13, C14	Ceramic capacitor, 10 pF	ATC	100B 100
C15, C16	Ceramic capacitor, 1 μF	ATC	920C105
C17, C18	Ceramic capacitor, 0.02 μF	ATC	200B203
C19, C20	Tantalum capacitor, 10 μF, 50 V	Digi-Key	P5182-ND
C22, C23	Ceramic capacitor, 12 pF	ATC	100B 120
Q1	Transistor	Infineon	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, R9	Chip resistor, 10 ohms	Digi-Key	P10ECT-ND
R6, R7	Chip resistor, 1 k-ohms	Digi-Key	P1KECT-ND

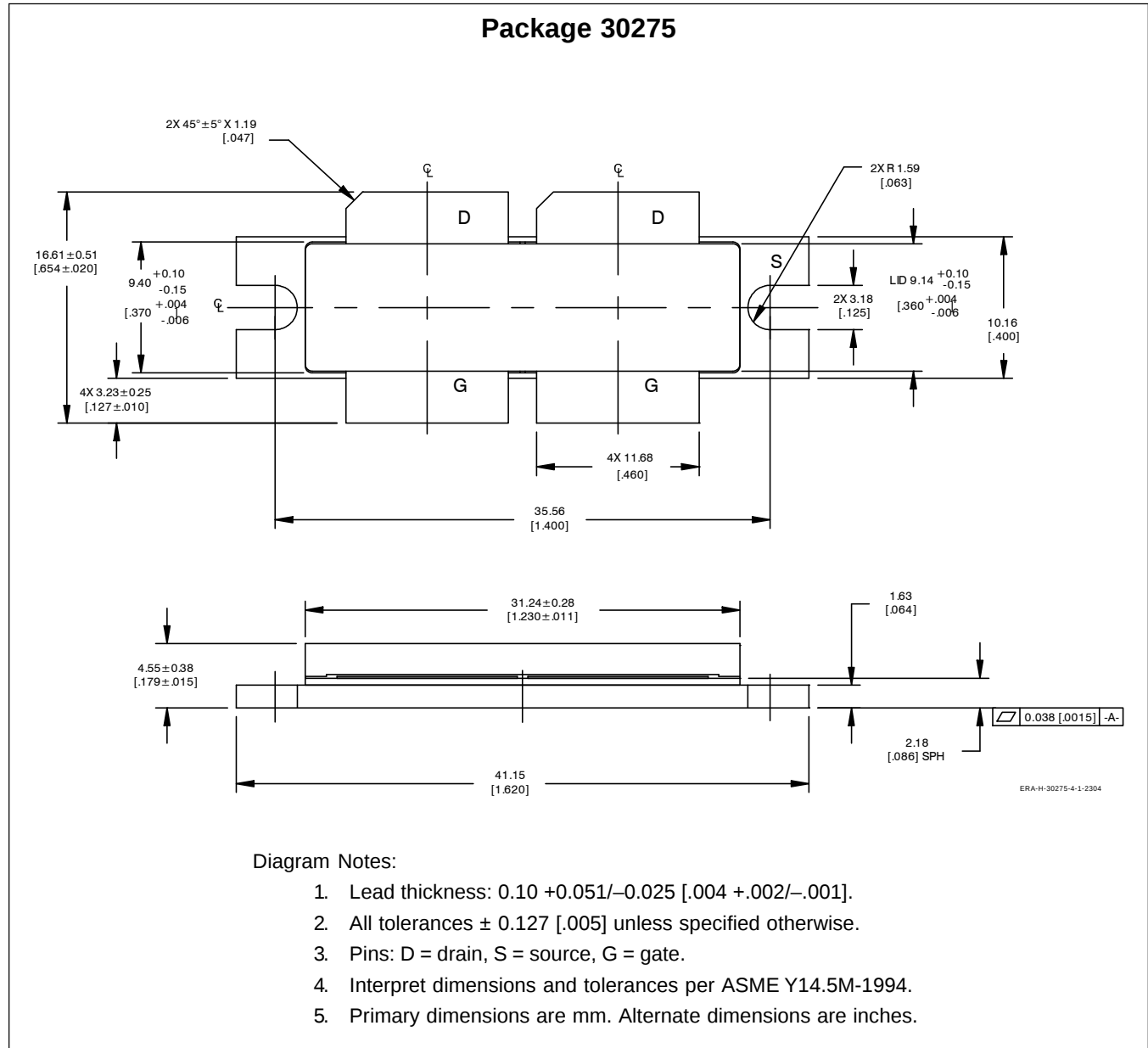
Reference Circuit (cont.)



Reference Circuit (not to scale)*

*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>

Page	Subjects (major changes since last revision)
3 – 8	Added performance and circuit information

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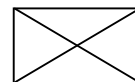
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highpowerRF@infineon.com

To request other information, contact us at:

+1 877 465 3667 (1-877-GOLDMOS) USA

or +1 408 776 0600 International



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81669 München, Germany

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