

Thermally-Enhanced High Power RF LDMOS FETs 150 W, 2110 – 2170 MHz

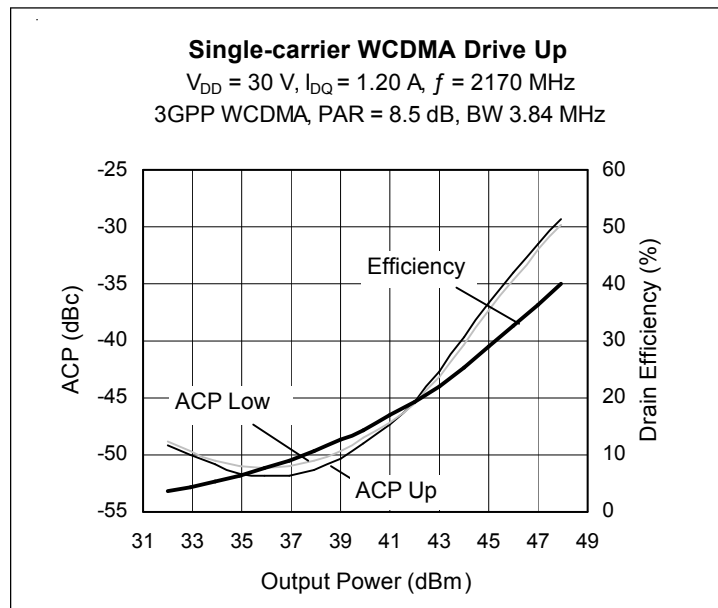
Description

The PTFB211501E and PTFB211501F are thermally-enhanced, 150-watt, LDMOS FETs designed for cellular power amplifier applications in the 2110 – 2170 frequency band. Features include I/O matching, high gain, and thermally-enhanced ceramic open-cavity packages with slotted and earless flanges.

PTFB211501E
 Package H-36248-2



PTFB211501F
 Package H-37248-2



Features

- Broadband internal matching
- Typical single-carrier WCDMA performance at 2170 MHz, 30 V, $I_{DQ} = 1.2\text{ A}$, 3GPP signal, channel bandwidth = 3.84 MHz, PAR = 8.5 dB @ 0.01% CCDF
 - Average output power = 40 W
 - Linear Gain = 18 dB
 - Efficiency = 32%
 - Adjacent channel power = -34 dBc
- Typical CW performance, 2170 MHz, 30 V
 - Output power at P-1dB = 150 W
 - Efficiency = 55%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Capable of handling 10:1 VSWR @ 30 V, 150 W (CW) output power
- Pb-Free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 40\text{ W AVG}$, $f = 2170\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8.5 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17	18	—	dB
Drain Efficiency	η_D	27	32	—	%
Intermodulation Distortion	IMD	—	-34	-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 Measurement (not subject to production test - verified by design / characterization in Infineon test fixture)
 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 140\text{ W PEP}$, $f = 2170\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	40	—	%
Intermodulation Distortion	IMD	—	-30	—	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ }\mu\text{A}$	$V_{(BR)DSS}$	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	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.08	—	Ω
Operating Gate Voltage	$V_{DS} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$	V_{GS}	1.6	2.1	3.0	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1.0	μA

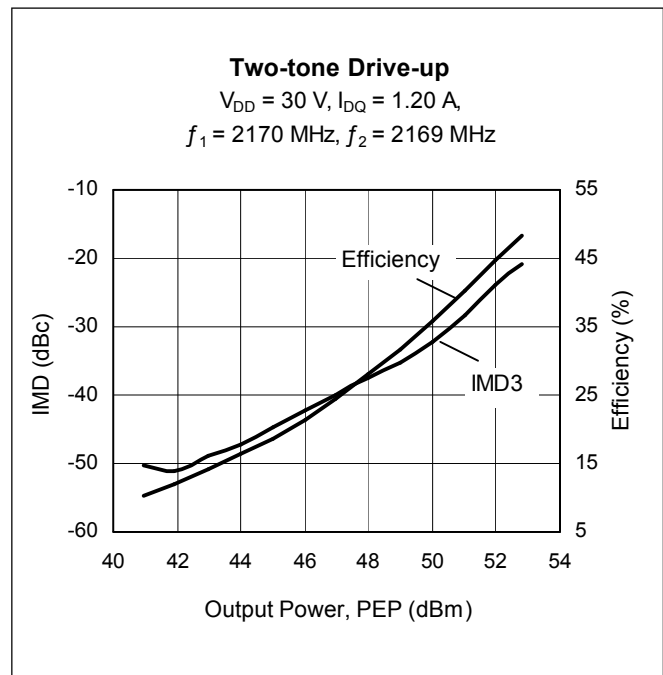
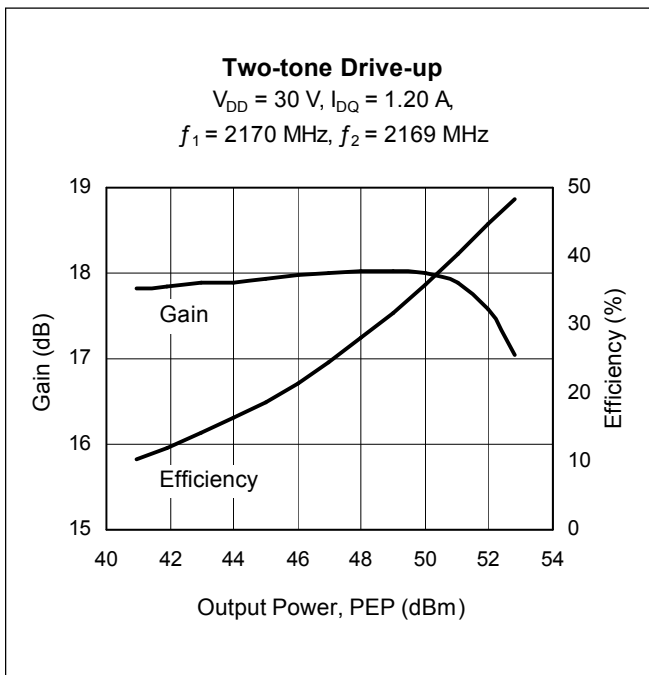
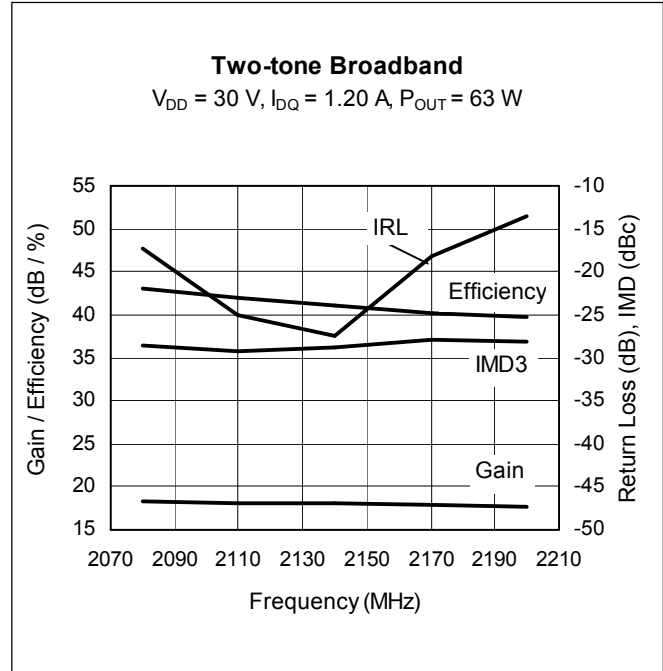
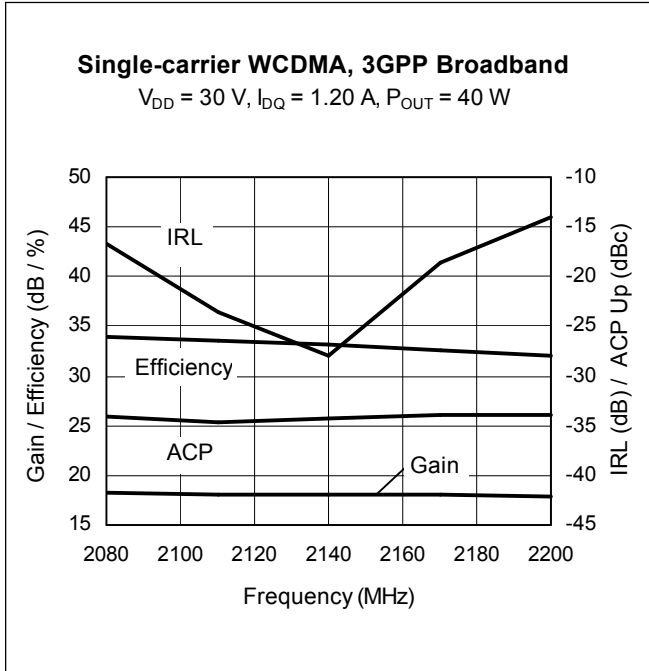
Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	-6 to +10	V
Junction Temperature	T_J	200	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-40 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 70^{\circ}\text{C}$, 150 W CW)	$R_{\theta JC}$	0.29	$^{\circ}\text{C/W}$

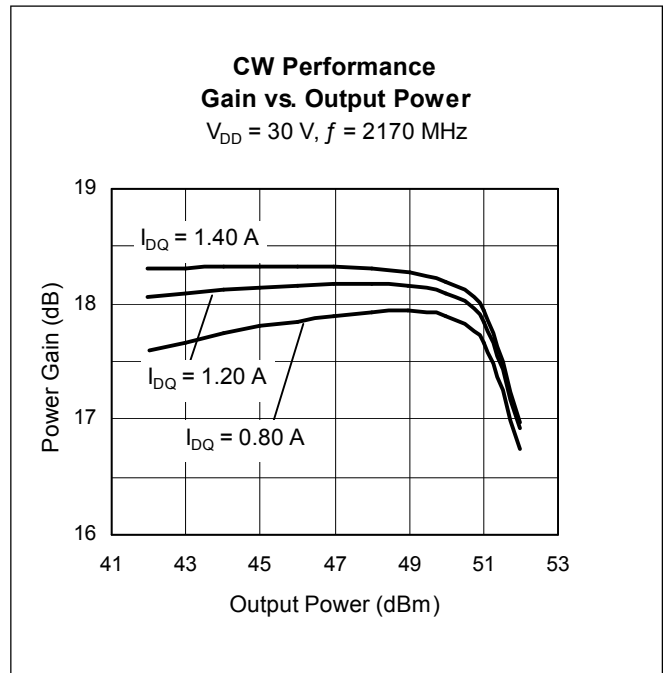
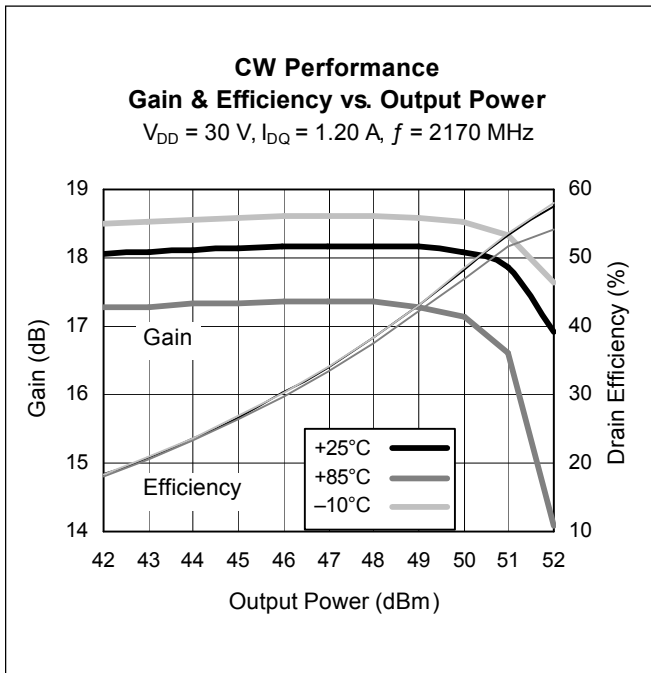
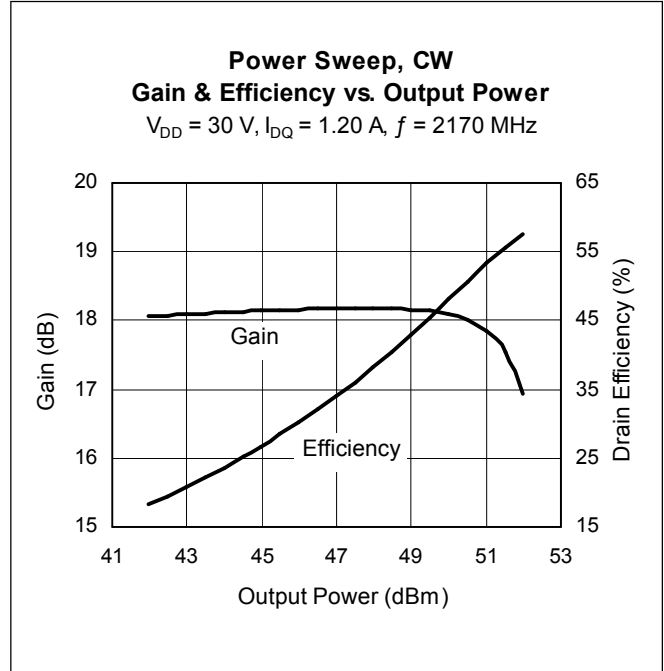
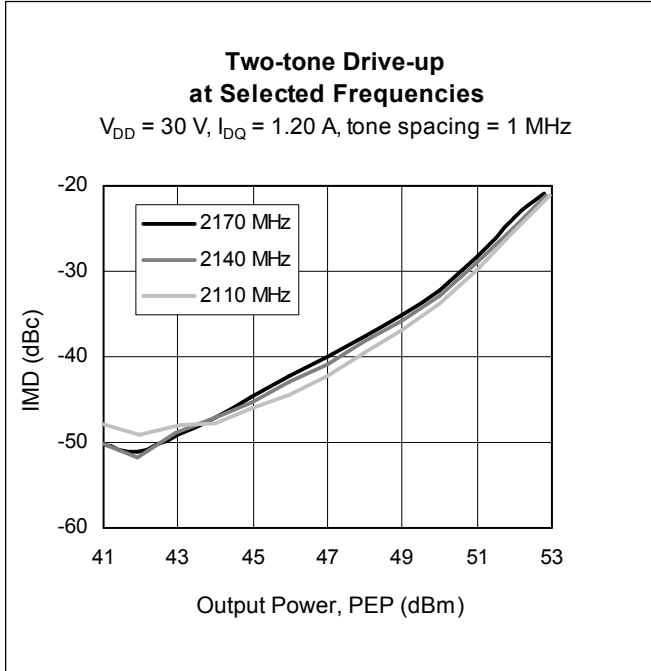
Ordering Information

Type and Version	Package Outline	Package Description	Shipping
PTFB211501E V4	H-36248-2	Slotted flange, single-ended	Tray
PTFB211501E V4 R250	H-36248-2	Slotted flange, single-ended	Tape & Reel 250 pcs
PTFB211501F V4	H-37248-2	Earless flange, single-ended	Tray
PTFB211501F V4 R250	H-37248-2	Earless flange, single-ended	Tape & Reel 250 pcs

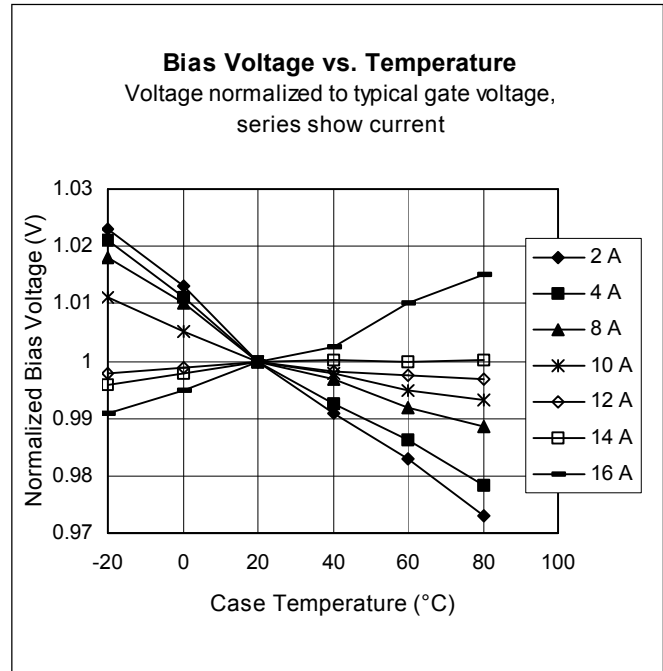
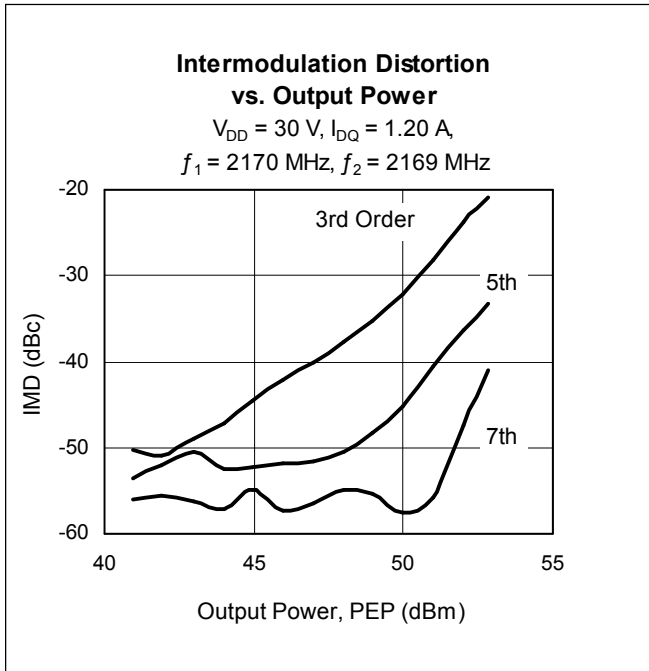
Typical Performance (data taken in production test fixture)



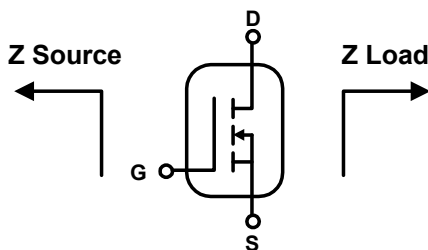
Typical Performance (cont.)



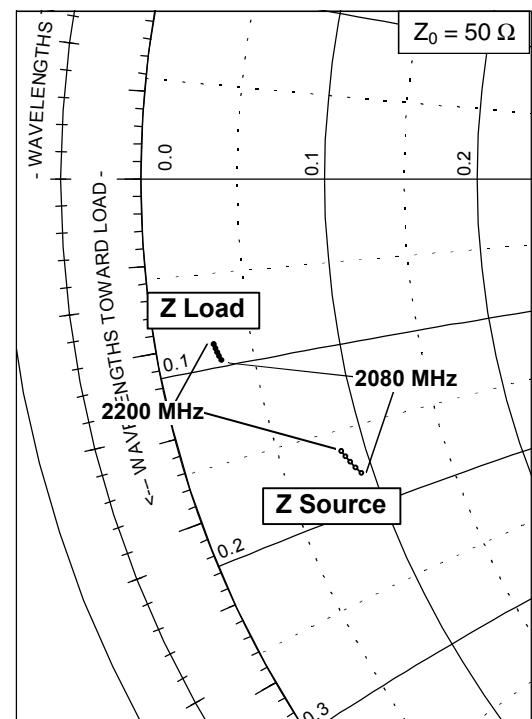
Typical Performance (cont.)



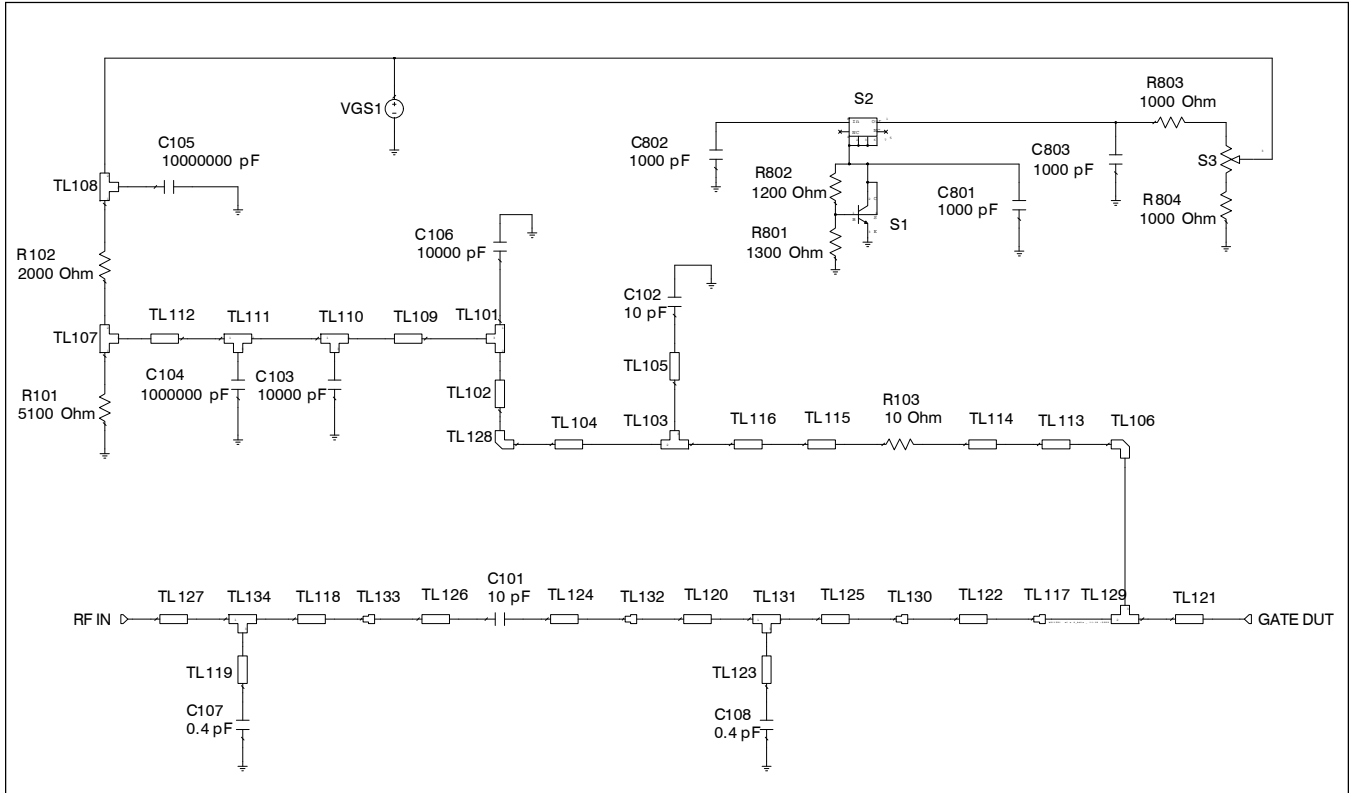
Broadband Circuit Impedance



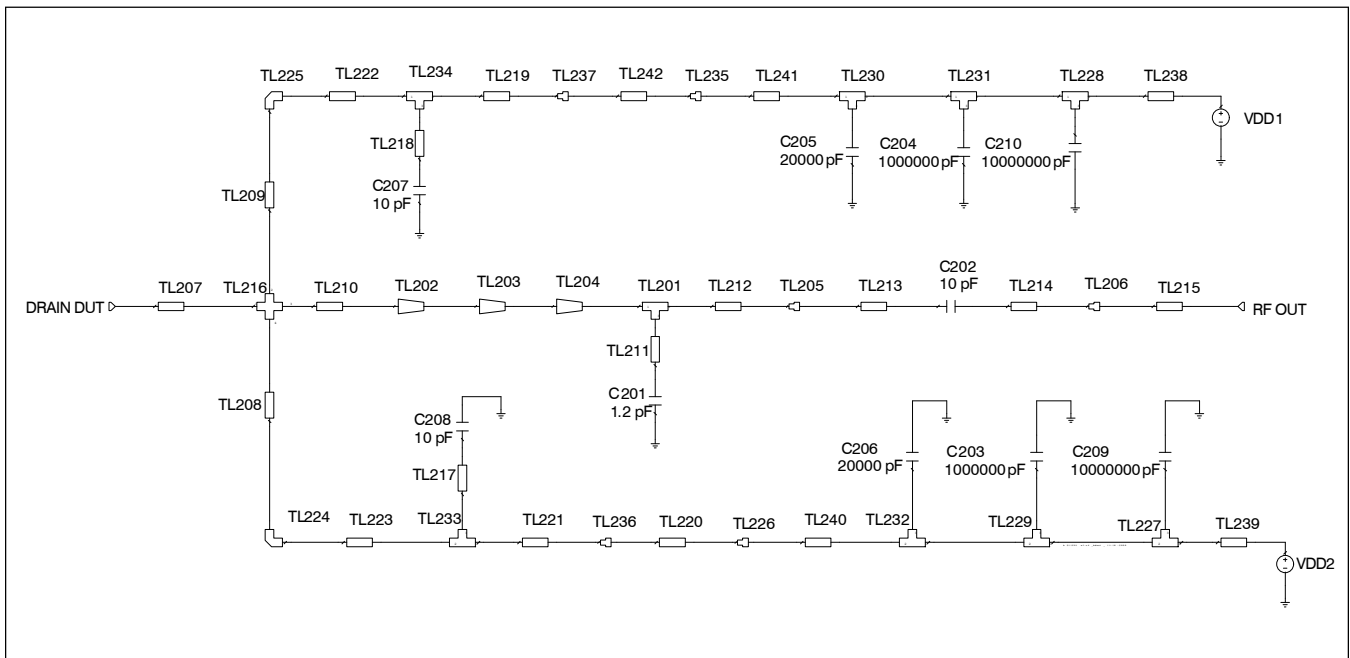
Frequency MHz	Z Source W		Z Load W	
	R	jX	R	jX
2200	4.29	-8.14	1.49	-4.39
2170	4.36	-8.34	1.52	-4.50
2140	4.45	-8.53	1.55	-4.61
2110	4.55	-8.74	1.58	-4.72
2080	4.67	-8.95	1.62	-4.84



Reference Circuit

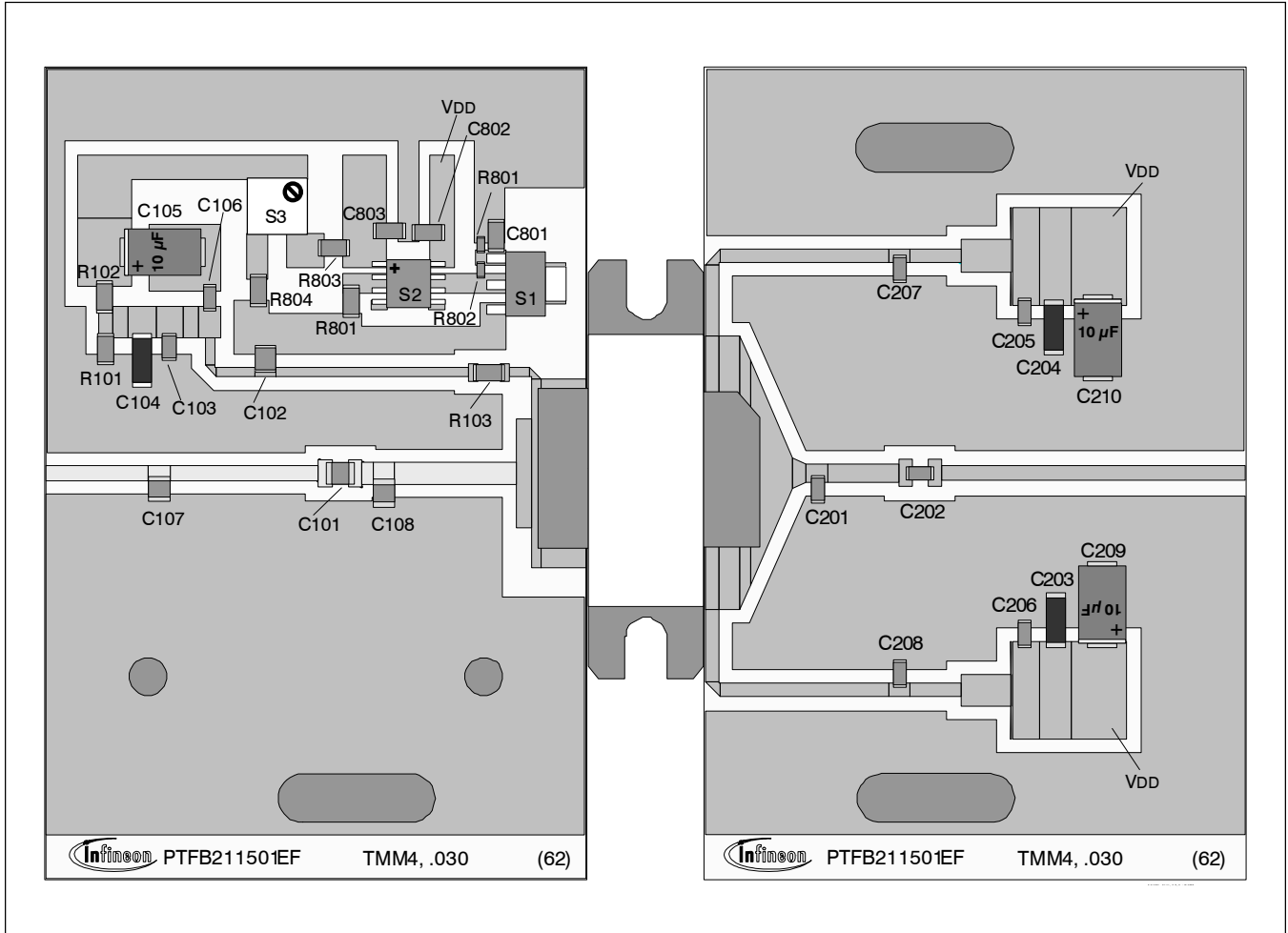


Reference circuit input schematic for $f = 2170$ MHz



Reference circuit output schematic for $f = 2170$ MHz

Reference Circuit (cont.)



Reference circuit assembly diagram (not to scale)*

* Gerber Files for this circuit available on request

Reference Circuit (cont.)

Circuit Assembly Information

DUT	PTFB211501E or PTFB211501F		LDMOS Transistor	
PCB	LTN/PTFB211501EF	0.76 mm [.030"] thick, $\epsilon_r = 4.5$	TMM4	2 oz. copper

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102	Chip capacitor, 10 pF	ATC	100B100JW500X
C103, C106	Chip capacitor, 0.01 μ F	ATC	200B103MW50X
C104	Chip capacitor, 1 μ F	Digi-Key	445-1411-2-ND
C105	Capacitor, 10 μ F	Digi-Key	399-1655-2-ND
C107, C108	Chip capacitor, 0.4 pF	ATC	100B0R4CW500X
C801, C802, C803	Chip capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101	Resistor, 5100 Ω	Digi-Key	P5.1KECT-ND
R102	Resistor, 2000 Ω	Digi-Key	P2.0KECT-ND
R103	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1300 Ω	Digi-Key	P1.3KECT-ND
R802	Resistor, 1200 Ω	Digi-Key	P1.2KECT-ND
R803, R804	Resistor, 1000 Ω	Digi-Key	P1.0KECT-ND
S1	Transistor	Infineon Technologies	BCP56
S2	Voltage regulator	National Semiconductor	LM7805
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
Output			
C201	Chip capacitor, 1.2 pF	ATC	100B1R2CW500X
C202	Chip capacitor, 10 pF	ATC	100B100JW500X
C203, C204	Chip capacitor, 1 μ F	Digi-Key	445-1411-2-ND
C205, C206	Chip capacitor, 0.02 μ F	ATC	200B203MW50X
C207, C208	Chip capacitor, 10 pF	ATC	100B100JW500X
C209, C210	Capacitor, 10 μ F	Garrett Electronics	TPSE106K050R0400

Reference Circuit (cont.)

Electrical Characteristics at 2170 MHz

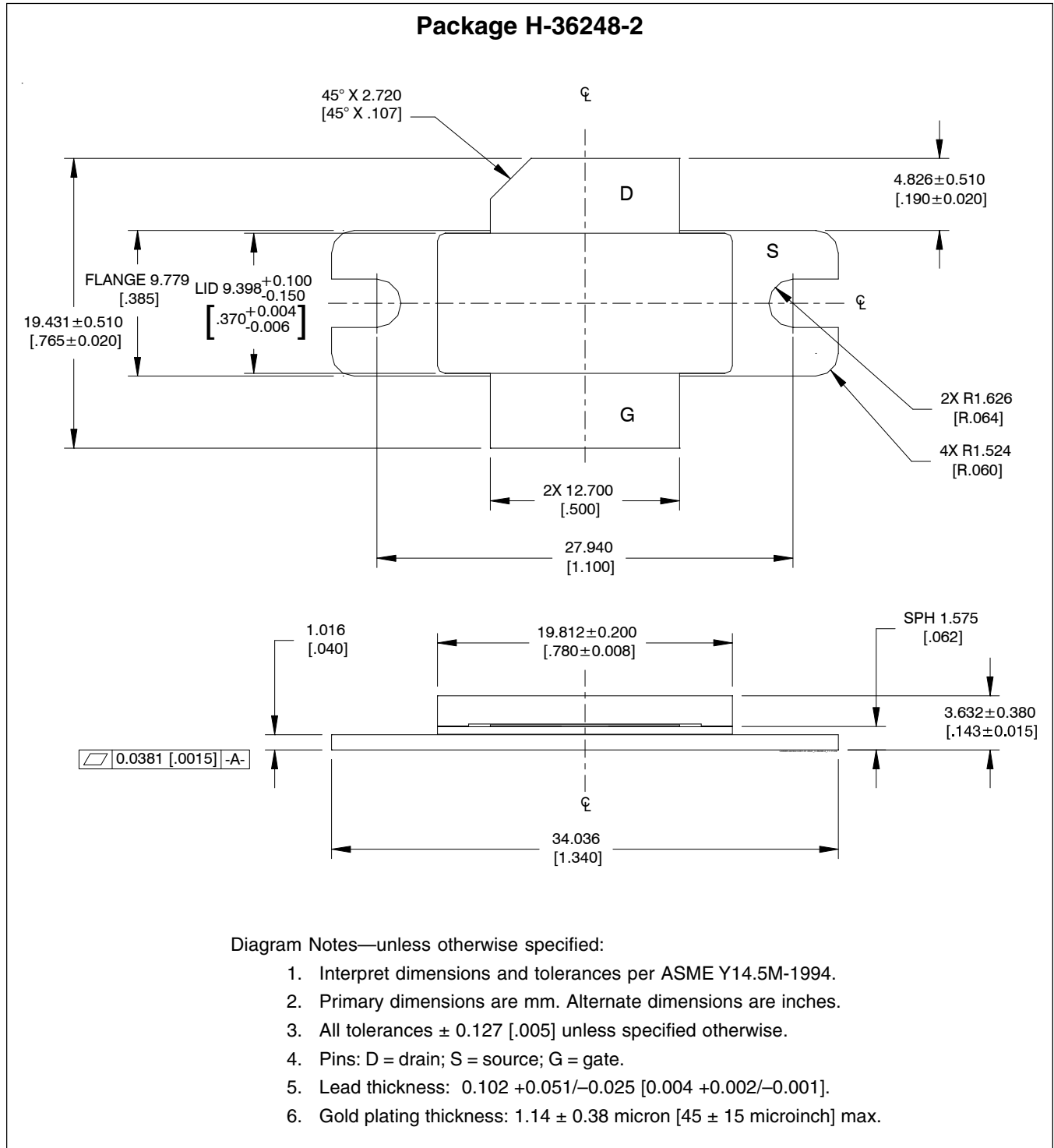
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101	0.041 λ , 40.30 Ω	W1 = 2.032, W2 = 2.032, W3 = 3.048	W1 = 80, W2 = 80, W3 = 120
TL102	0.033 λ , 65.15 Ω	W = 0.889, L = 2.540	W = 35, L = 100
TL103	0.027 λ , 65.15 Ω	W1 = 0.889, W2 = 0.889, W3 = 2.032	W1 = 35, W2 = 35, W3 = 80
TL104	0.047 λ , 65.15 Ω	W = 0.889, L = 3.556	W = 35, L = 140
TL105	0.000 λ , 40.30 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL106, TL128		W = 0.889	W = 35
TL107	0.040 λ , 53.88 Ω	W1 = 1.270, W2 = 1.270, W3 = 3.048	W1 = 50, W2 = 50, W3 = 120
TL108	0.089 λ , 20.46 Ω	W1 = 5.080, W2 = 5.080, W3 = 6.350	W1 = 200, W2 = 200, W3 = 50
TL109, TL112	0.021 λ , 30.35 Ω	W = 3.048, L = 1.524	W = 120, L = 60
TL110, TL111	0.035 λ , 30.35 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.540	W1 = 120, W2 = 120, W3 = 100
TL113	0.025 λ , 65.15 Ω	W = 0.889, L = 1.905	W = 35, L = 75
TL114, TL115	0.012 λ , 46.07 Ω	W = 1.651, L = 0.889	W = 65, L = 35
TL116	0.236 λ , 65.15 Ω	W = 0.889, L = 18.034	W = 35, L = 710
TL117		W1 = 10.160, W2 = 17.780	W1 = 400, W2 = 700
TL118	0.186 λ , 50.98 Ω	W = 1.397, L = 13.970	W = 55, L = 550
TL119, TL123	0.000 λ , 40.30 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL120	0.014 λ , 40.30 Ω	W = 2.032, L = 1.016	W = 80, L = 40
TL121	0.062 λ , 6.87 Ω	W = 17.780, L = 4.191	W = 700, L = 165
TL122	0.020 λ , 11.38 Ω	W = 10.160, L = 1.397	W = 400, L = 55
TL124, TL126	0.017 λ , 34.60 Ω	W = 2.540, L = 1.270	W = 100, L = 50
TL125	0.155 λ , 40.30 Ω	W = 2.032, L = 11.430	W = 80, L = 450
TL127	0.127 λ , 50.98 Ω	W = 1.397, L = 9.525	W = 55, L = 375
TL129	0.013 λ , 6.87 Ω	W1 = 17.780, W2 = 17.780, W3 = 0.889	W1 = 700, W2 = 700, W3 = 35
TL130		W1 = 2.032, W2 = 10.160	W1 = 80, W2 = 400
TL131	0.027 λ , 40.30 Ω	W1 = 2.032, W2 = 2.032, W3 = 2.032	W1 = 80, W2 = 80, W3 = 80
TL132		W1 = 2.540, W2 = 2.032	W1 = 100, W2 = 80
TL133		W1 = 1.397, W2 = 2.540	W1 = 55, W2 = 100
TL134	0.027 λ , 50.98 Ω	W1 = 1.397, W2 = 1.397, W3 = 2.032	W1 = 55, W2 = 55, W3 = 80

Reference Circuit (cont.)

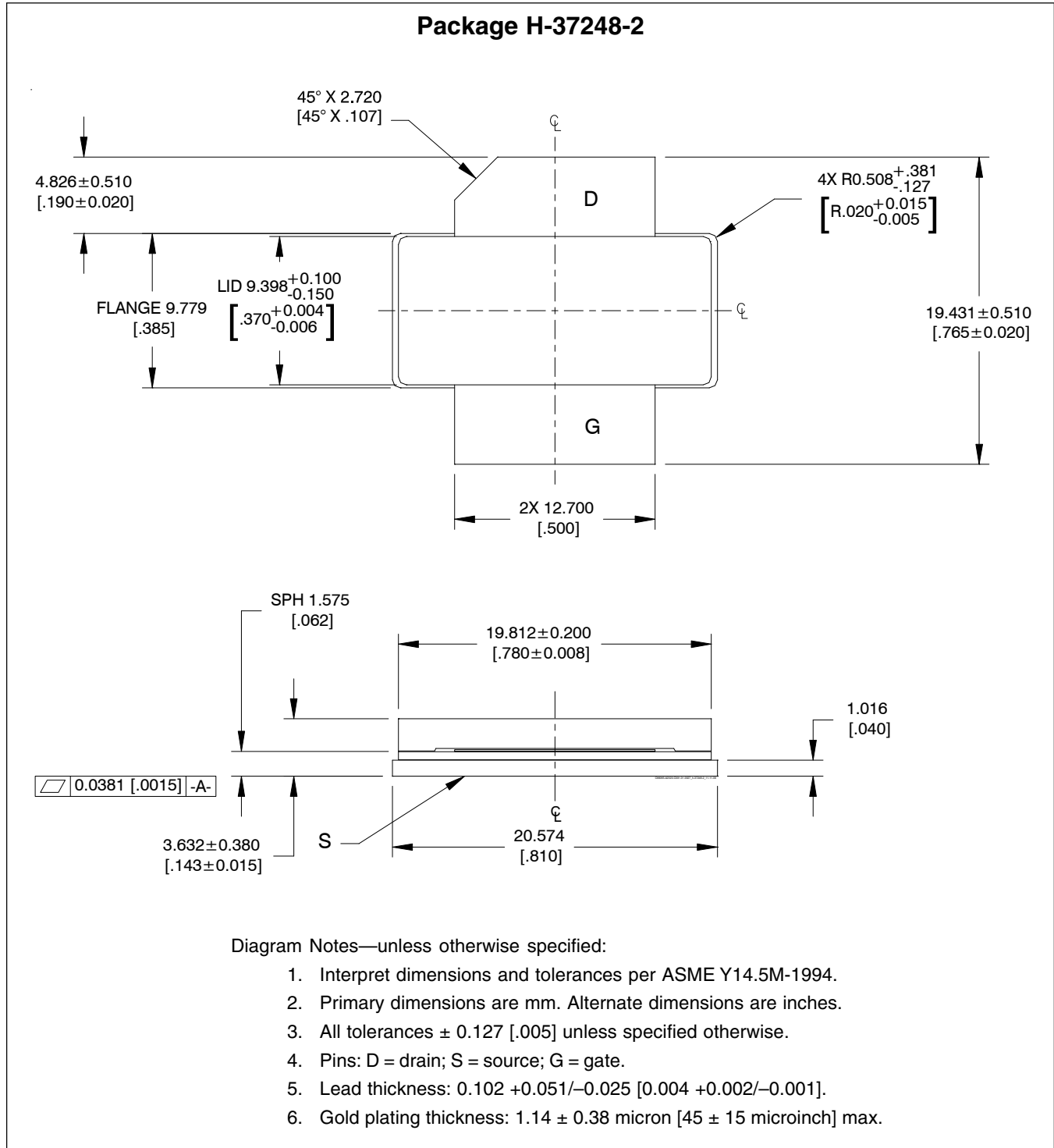
Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201	0.027 λ , 43.96 Ω	W1 = 1.778, W2 = 1.778, W3 = 2.032	W1 = 70, W2 = 70, W3 = 80
TL202 (taper)	0.016 λ , 4.88 Ω / 5.86 Ω	W1 = 25.654, W2 = 21.107, L = 1.041	W1 = 1010, W2 = 831, L = 41
TL203 (taper)	0.058 λ , 5.86 Ω / 32.33 Ω	W1 = 21.107, W2 = 2.794, L = 3.937	W1 = 831, W2 = 110, L = 155
TL204 (taper)	0.017 λ , 32.33 Ω / 43.96 Ω	W1 = 2.794, W2 = 1.778, L = 1.270	W1 = 110, W2 = 70, L = 50
TL205		W1 = 1.778, W2 = 2.540	W1 = 70, W2 = 100
TL206		W1 = 2.540, W2 = 1.397	W1 = 100, W2 = 55
TL207	0.000 λ , 4.88 Ω	W = 25.654, L = 0.025	W = 1010, L = 1
TL208, TL209	0.089 λ , 53.88 Ω	W = 1.270, L = 6.731	W = 50, L = 265
TL210	0.028 λ , 4.88 Ω	W = 25.654, L = 1.905	W = 1010, L = 75
TL211, TL217, TL218	0.000 λ , 40.30 Ω	W = 2.032, L = 0.025	W = 80, L = 1
TL212	0.089 λ , 43.96 Ω	W = 1.778, L = 6.604	W = 70, L = 260
TL213, TL214	0.017 λ , 34.60 Ω	W = 2.540, L = 1.270	W = 100, L = 50
TL215	0.378 λ , 50.98 Ω	W = 1.397, L = 28.423	W = 55, L = 1119
TL216		W1 = 25.654, W2 = 1.270, W3 = 25.654, W4 = 1.270	W1 = 1010, W2 = 50, W3 = 1010, W4 = 50
TL219, TL221	0.062 λ , 53.88 Ω	W = 1.270, L = 4.699	W = 50, L = 185
TL220, TL242	0.065 λ , 30.35 Ω	W = 3.048, L = 4.699	W = 120, L = 185
TL222, TL223	0.209 λ , 53.88 Ω	W = 1.270, L = 15.748	W = 50, L = 620
TL224, TL225		W = 1.270	W = 50
TL226, TL235		W1 = 3.048, W2 = 9.144	W1 = 120, W2 = 360
TL227, TL228	0.073 λ , 12.48 Ω	W1 = 9.144, W2 = 9.144, W3 = 5.080	W1 = 360, W2 = 360, W3 = 200
TL229, TL231	0.044 λ , 12.48 Ω	W1 = 9.144, W2 = 9.144, W3 = 3.048	W1 = 360, W2 = 360, W3 = 120
TL230, TL232	0.037 λ , 12.48 Ω	W1 = 9.144, W2 = 9.144, W3 = 2.540	W1 = 360, W2 = 360, W3 = 100
TL233, TL234	0.027 λ , 53.88 Ω	W1 = 1.270, W2 = 1.270, W3 = 2.032	W1 = 50, W2 = 50, W3 = 80
TL236, TL237		W1 = 1.270, W2 = 3.048,	W1 = 50, W2 = 120
TL238, TL239, TL240, TL241	0.002 λ , 12.48 Ω	W = 9.144, L = 0.127	W = 360, L = 5

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>

Revision History: 2009-11-19

Data Sheet

Previous Version: 2009-07-27, Preliminary Data Sheet

Page	Subjects (major changes since last revision)
All	Data sheet reflects released product specifications

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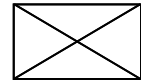
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