

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

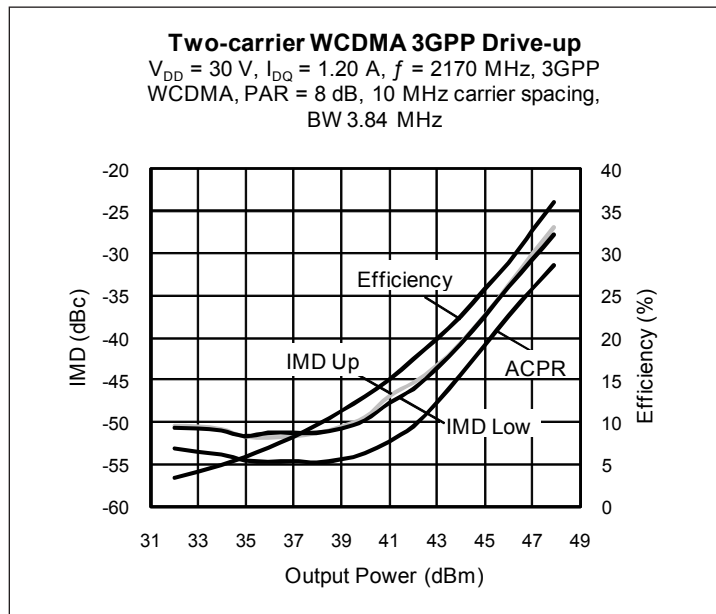
Description

The PTFB211503EL and PTFB211503FL are thermally-enhanced, 150-watt, LDMOS FETs designed for cellular power amplifier applications in the 2110 to 2170 frequency band. Features include I/O matching, high gain, and thermally-enhanced ceramic open-cavity packages with slotted and earless flanges. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFB211503EL
H-33288-6



PTFB211503FL
H-34288-4/2



Features

- Broadband internal matching
- Enhanced for use in DPD error correction systems
- Typical two-carrier WCDMA performance at 2170 MHz, 30 V
 - Average output power = 32 W
 - Linear Gain = 18 dB
 - Efficiency = 29%
 - Intermodulation distortion = -34 dBc
 - Adjacent channel power = -37 dBc
- Typical CW performance, 2170 MHz, 30 V
 - Output power at $P_{1dB} = 150\text{ W}$
 - Efficiency = 55%
- Increased negative gate-source voltage range for improved performance in Doherty peaking amplifiers
- Integrated ESD protection
- Capable of handling 10:1 VSWR @ 30 V, 150 W (CW) output power
- Pb-Free and RoHS compliant

RF Characteristics

Two-carrier WCDMA Measurements (not subject to production test—verified by design/characterization in Infineon test fixture)
 $V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 32\text{ W AVG}$, $f_1 = 2135\text{ MHz}$, $f_2 = 2145\text{ MHz}$, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	18	—	dB
Drain Efficiency	η_D	—	29	—	%
Adjacent Channel Power Ratio	ACPR	—	-36	—	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 (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{OUT} = 150\text{ W PEP}$, $f = 2170\text{ MHz}$, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	Gps	16.5	18	—	dB
Drain Efficiency	η_D	39	40	—	%
Intermodulation Distortion	IMD	—	-30	-28	dBc

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ }\mu\text{A}$	$V_{(BR)DSS}$	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

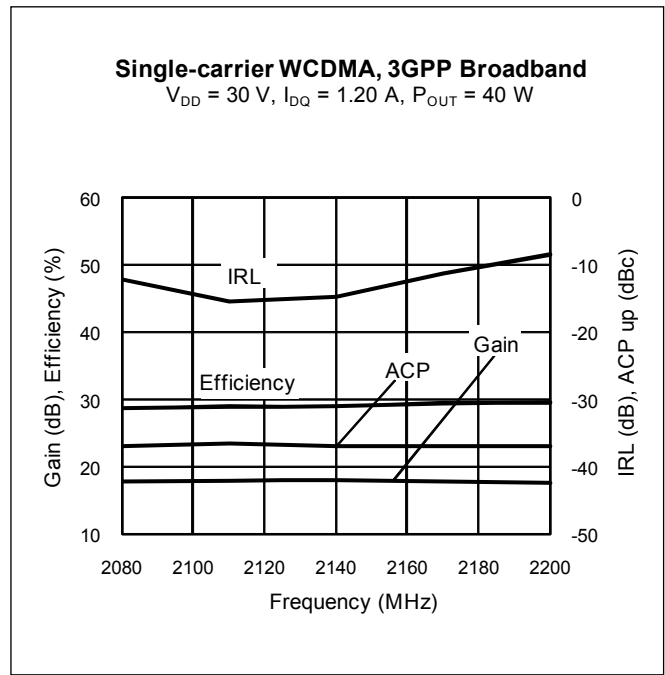
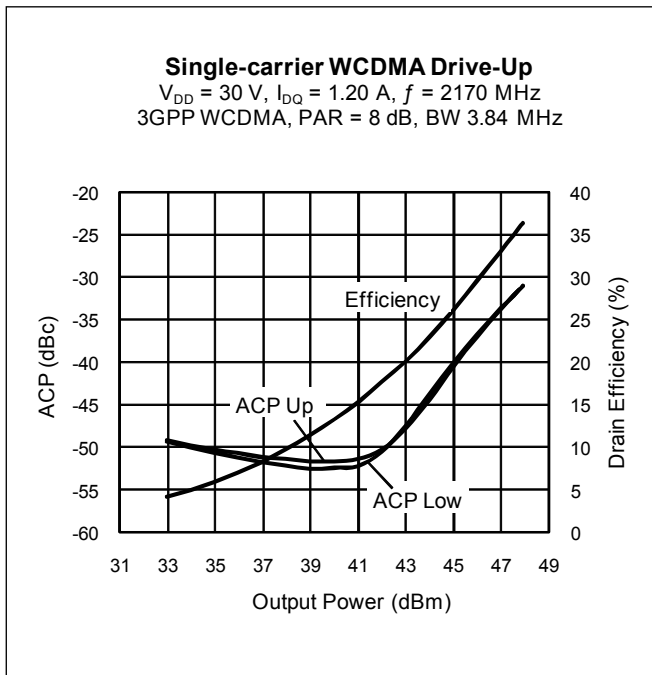
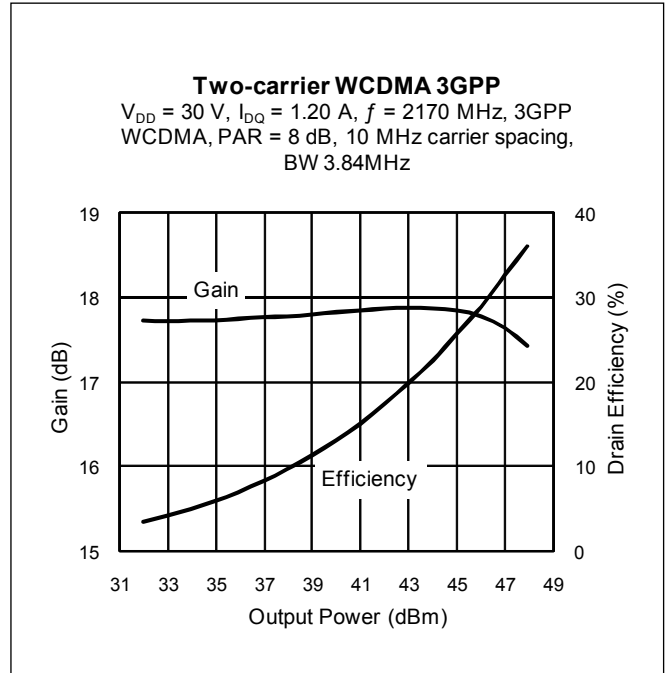
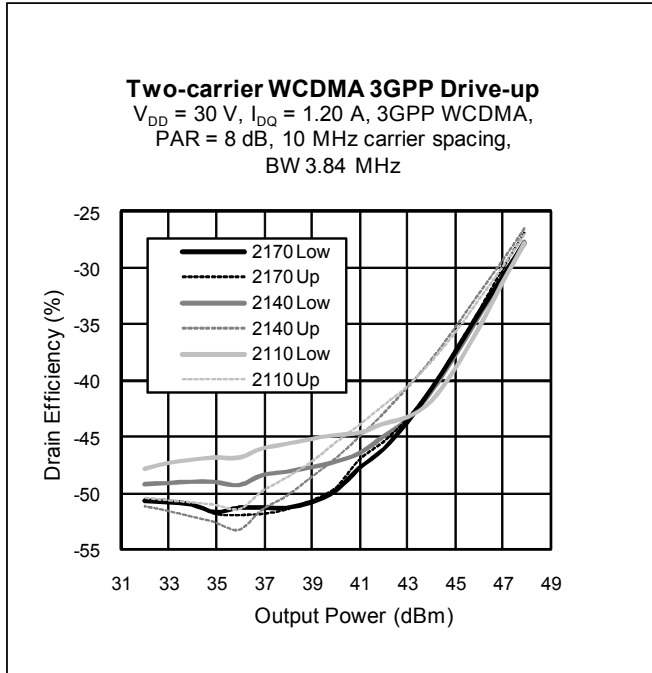
Maximum Ratings

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)	$R_{\theta JC}$	0.27	$^{\circ}\text{C/W}$

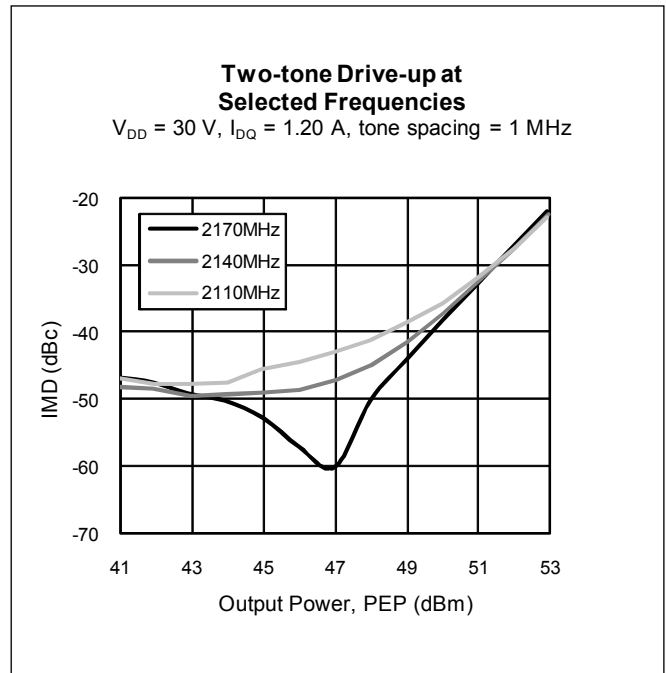
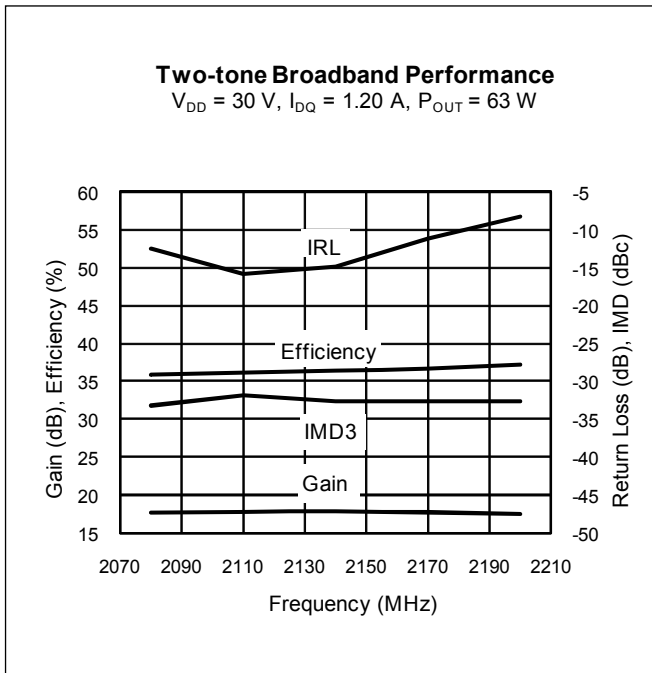
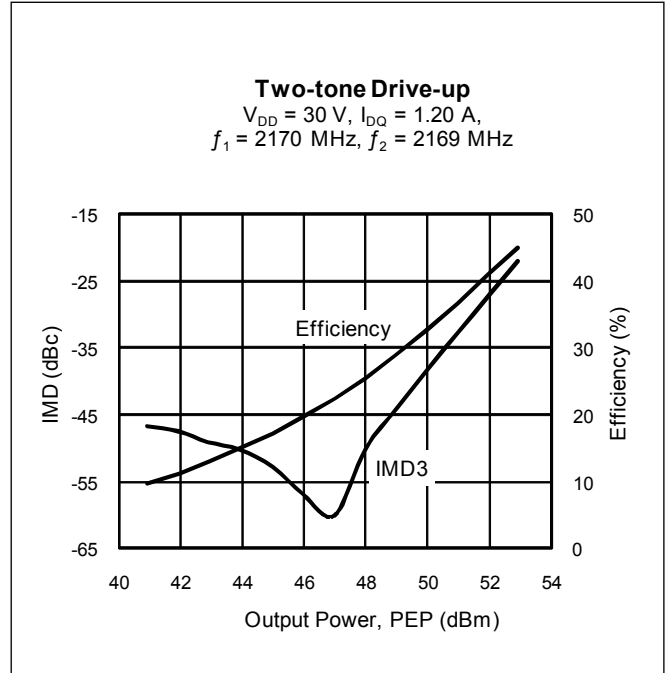
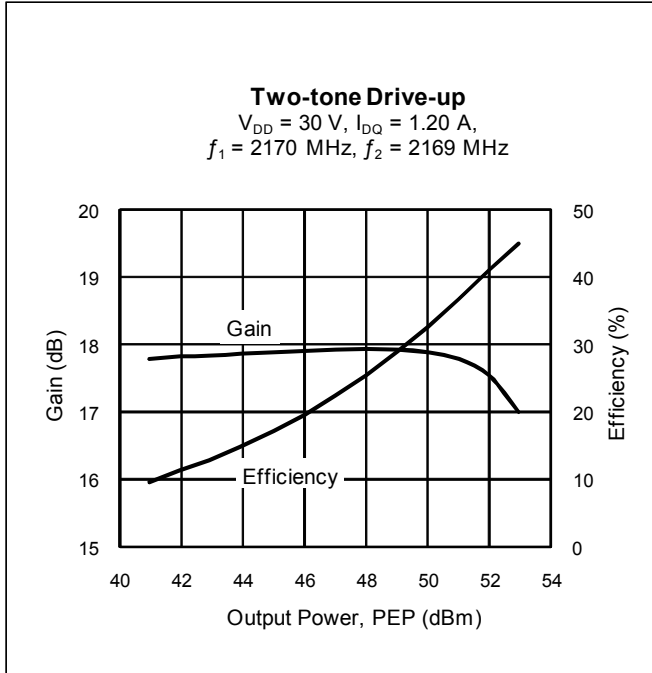
Ordering Information

Type and Version	Package Outline	Package Description	Shipping
PTFB211503EL V1	H-33288-6	Slotted flange, single-ended	Tray
PTFB211503EL V1 R250	H-33288-6	Slotted flange, single-ended	Tape & Reel 250 pcs
PTFB211503FL V2	H-34288-4/2	Earless flange, single-ended	Tray
PTFB211503FL V2 R250	H-34288-4/2	Earless flange, single-ended	Tape & Reel 250 pcs

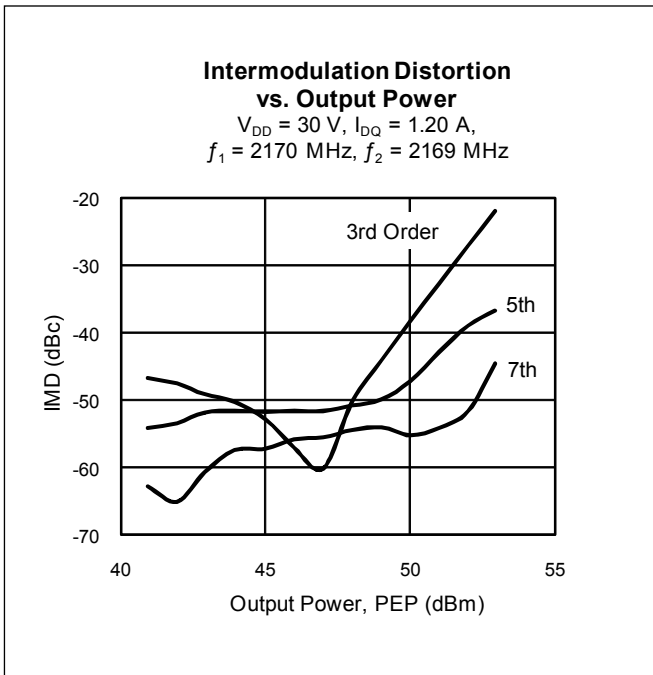
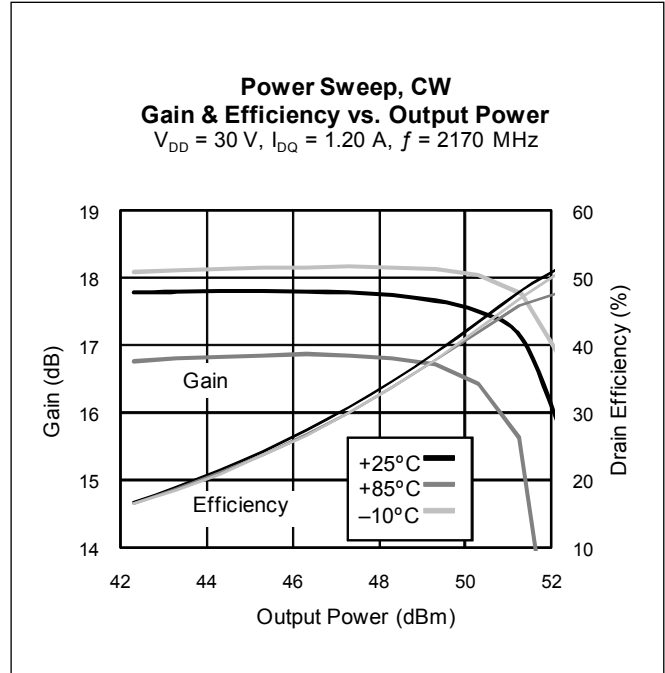
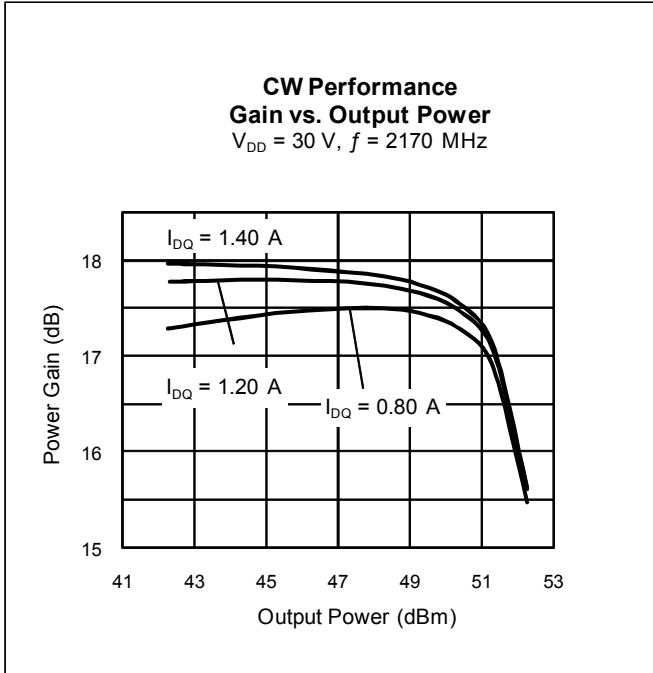
Typical Performance (data taken in a production test fixture)



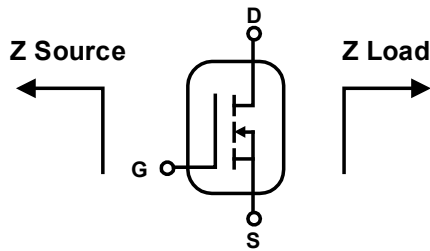
Typical Performance (cont.)



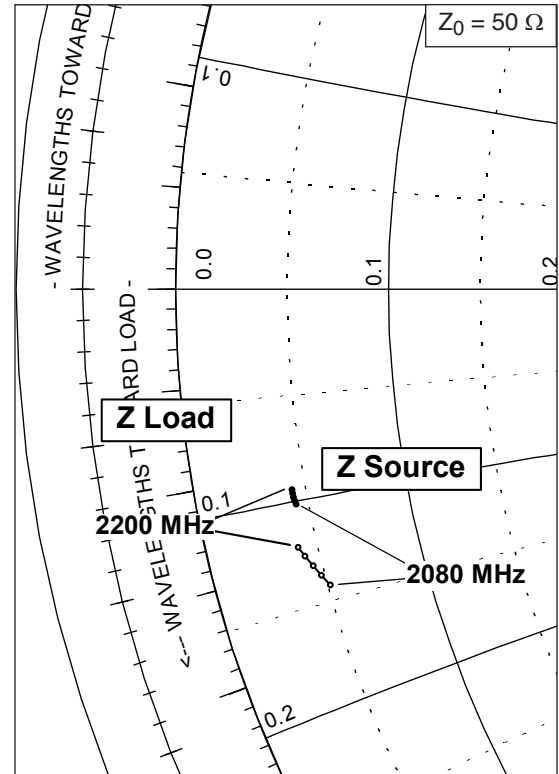
Typical Performance (cont.)



Broadband Circuit Impedance

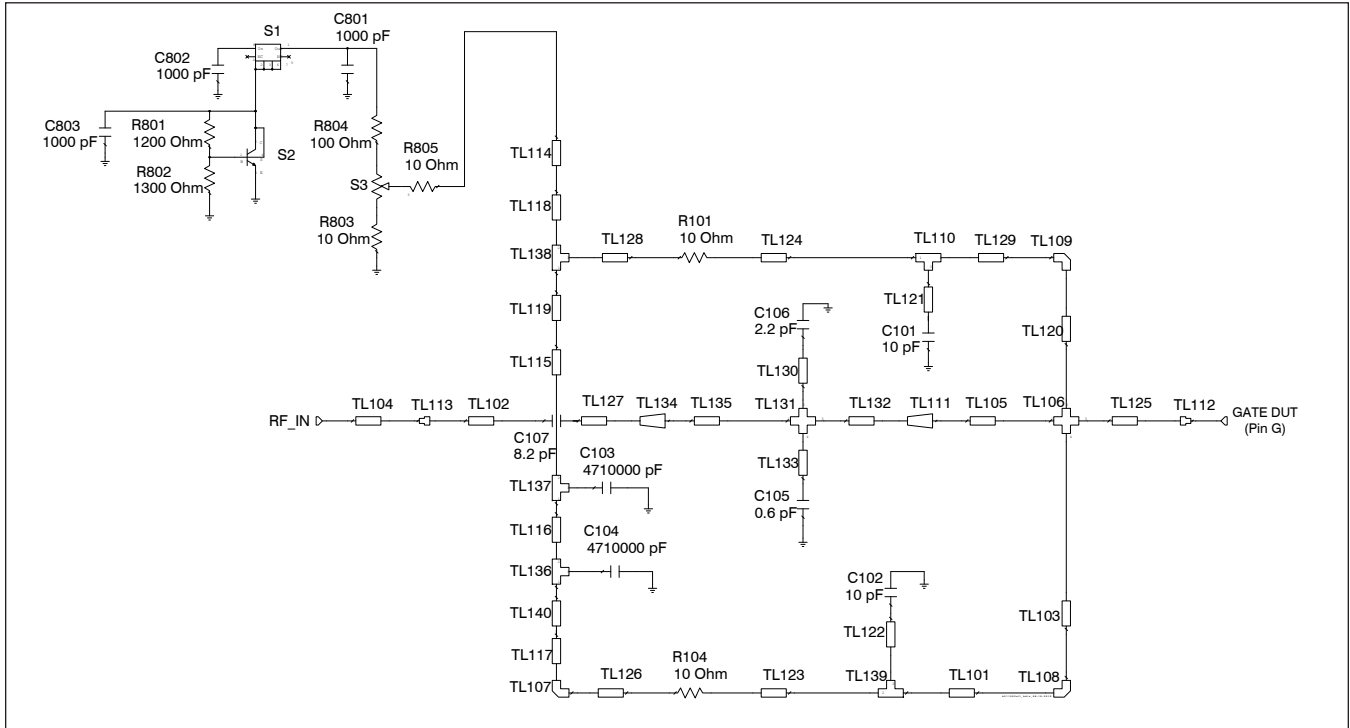


Frequency MHz	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2200	2.06	-6.08	2.19	-4.73
2170	2.17	-6.33	2.19	-4.82
2140	2.30	-6.59	2.20	-4.91
2110	2.43	-6.86	2.21	-5.00
2080	2.58	-7.14	2.22	-5.09

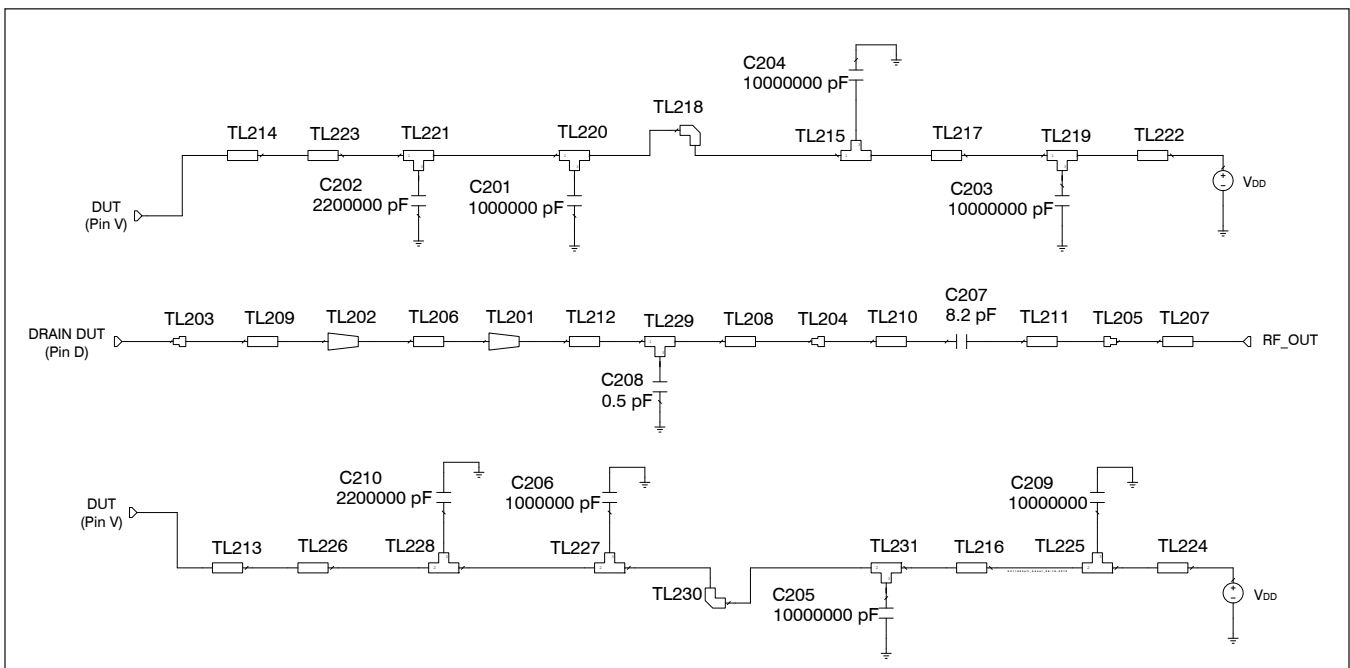


See next page for reference circuit information

Reference Circuit



Reference circuit input schematic for $f = 2170$ MHz



Reference circuit output schematic for $f = 2170$ MHz

Reference Circuit (cont.)

Description

DUT	PTFB211503EL or PTFB211503FL
PCB	0.508 mm [.020"] thick, $\epsilon_r = 3.48$, Rogers 4350, 1 oz. copper

Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL129	0.095λ , 54.17 Ω	W = 1.016, L = 8.001	W = 40, L = 315
TL102	0.016λ , 31.24 Ω	W = 2.286, L = 1.270	W = 90, L = 50
TL103	0.026λ , 54.17 Ω	W = 1.016, L = 2.159	W = 40, L = 85
TL104	0.032λ , 47.12 Ω	W = 1.270, L = 2.692	W = 50, L = 106
TL105	0.005λ , 6.67 Ω	W = 13.970, L = 0.381	W = 550, L = 15
TL106		W1 = 13.970, W2 = 1.016, W3 = 13.970, W4 = 1.016	W1 = 550, W2 = 40, W3 = 550, W4 = 40
TL107, TL108, TL109		W = 1.016	W = 40
TL110, TL139	0.012λ , 54.17 Ω	W1 = 1.016, W2 = 1.016, W3 = 1.016	W1 = 40, W2 = 40, W3 = 40
TL111 (taper)	0.006λ , 6.67 Ω / 8.37 Ω	W1 = 13.970, W2 = 10.922, L = 0.483	W1 = 550, W2 = 430, L = 19
TL112		W1 = 17.780, W2 = 12.700	W1 = 700, W2 = 500
TL113		W1 = 1.270, W2 = 2.286	W1 = 50, W2 = 90
TL114	0.031λ , 34.72 Ω	W = 1.981, L = 2.540	W = 78, L = 100
TL115	0.027λ , 63.89 Ω	W = 0.762, L = 2.286	W = 30, L = 90
TL116	0.096λ , 63.89 Ω	W = .762, L = 8.136	W = 30, L = 320
TL117	0.029λ , 54.17 Ω	W = 1.016, L = 2.451	W = 40, L = 97
TL118	0.018λ , 54.17 Ω	W = 1.016, L = 1.524	W = 40, L = 60
TL119	0.021λ , 54.17 Ω	W = 1.016, L = 1.727	W = 40, L = 68
TL120	0.026λ , 54.17 Ω	W = 1.016, L = 2.159	W = 40, L = 85
TL121, TL122	0.002λ , 54.17 Ω	W = 1.016, L = 0.127	W = 40, L = 5
TL123, TL124	0.030λ , 54.17 Ω	W = 1.016, L = 2.540	W = 40, L = 100
TL125	0.053λ , 6.67 Ω	W = 13.970, L = 4.064	W = 550, L = 160
TL126	0.012λ , 54.17 Ω	W = 1.016, L = 1.021	W = 40, L = 40
TL127	0.134λ , 47.12 Ω	W = 1.270, L = 11.151	W = 50, L = 439
TL128	0.012λ , 54.17 Ω	W = 1.016, L = 1.016	W = 40, L = 40
TL130, TL133	0.000λ , 144.35 Ω	W = 0.025, L = 0.025	W = 1, L = 1
TL131		W1 = 10.922, W2 = 0.025, W3 = 10.922, W4 = 0.025	W1 = 430, W2 = 1, W3 = 430, W4 = 1
TL132, TL135	0.000λ , 8.37 Ω	W = 10.922, L = 0.000	W = 430, L = 0
TL134 (taper)	0.033λ , 8.37 Ω / 47.12 Ω	W1 = 10.922, W2 = 1.270, L = 2.540	W1 = 430, W2 = 50, L = 100
TL136, TL137	0.012λ , 63.89 Ω	W1 = 0.762, W2 = 0.762, W3 = 1.016	W1 = 30, W2 = 30, W3 = 40
TL138	0.012λ , 54.17 Ω	W1 = 1.016, W2 = 1.270, W3 = 1.016	W1 = 40, W2 = 50, W3 = 40
TL140	0.021λ , 63.89 Ω	W = 0.762, L = 1.778	W = 30, L = 70

table continued on page 9

Reference Circuit (cont.)

Electrical Characteristics at 2170 MHz

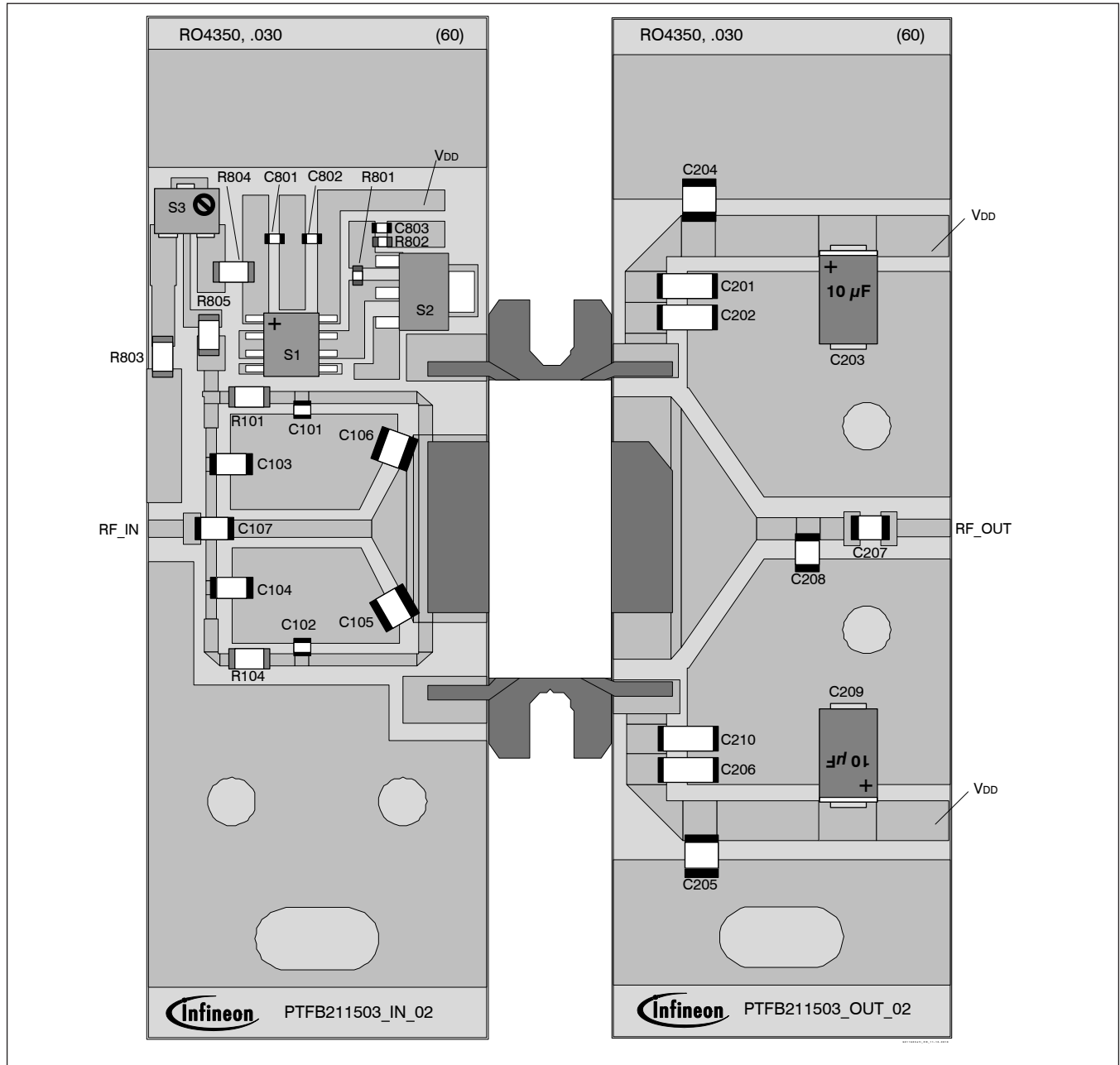
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201 (taper)	0.074 λ , 5.33 Ω / 39.51 Ω	W1 = 17.780, W2 = 1.651, L = 5.613	W1 = 700, W2 = 65, L = 221
TL202 (taper)	0.010 λ , 4.84 Ω / 5.33 Ω	W1 = 19.685, W2 = 17.780, L = 0.787	W1 = 775, W2 = 700, L = 31
TL203		W1 = 12.700, W2 = 17.780	W1 = 500, W2 = 700
TL204		W1 = 1.651, W2 = 2.540	W1 = 65, W2 = 100
TL205		W1 = 1.270, W2 = 2.540	W1 = 50, W2 = 100
TL206	0.000 λ , 5.33 Ω	W = 17.780, L = 0.025	W = 700, L = 1
TL207	0.047 λ , 47.12 Ω	W = 1.270, L = 3.886	W = 50, L = 153
TL208	0.021 λ , 39.51 Ω	W = 1.651, L = 1.753	W = 65, L = 69
TL209	0.057 λ , 4.84 Ω	W = 19.685, L = 4.318	W = 775, L = 170
TL210, TL211	0.016 λ , 28.85 Ω	W = 2.540, L = 1.270	W = 100, L = 50
TL212	0.035 λ , 39.51 Ω	W = 1.651, L = 2.896	W = 65, L = 114
TL213	0.032 λ , 16.90 Ω	W = 4.928, L = 2.540	W = 194, L = 100
TL214	0.032 λ , 17.05 Ω	W = 4.877, L = 2.540	W = 192, L = 100
TL215, TL231	0.032 λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.540	W1 = 120, W2 = 120, W3 = 100
TL216, TL217	0.095 λ , 25.04 Ω	W = 3.048, L = 7.645	W = 120, L = 301
TL218, TL230		W = 3.048	W = 120
TL219, TL225	0.054 λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 4.318	W1 = 120, W2 = 120, W3 = 170
TL220, TL221	0.029 λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.286	W1 = 120, W2 = 120, W3 = 90
TL222, TL224	0.067 λ , 25.04 Ω	W = 3.048, L = 5.359	W = 120, L = 211
TL223, TL226	0.010 λ , 25.04 Ω	W = 3.048, L = 0.762	W = 120, L = 30
TL227, TL228	0.029 λ , 25.04 Ω	W1 = 3.048, W2 = 3.048, W3 = 2.286	W1 = 120, W2 = 120, W3 = 90
TL229	0.022 λ , 39.51 Ω	W1 = 1.651, W2 = 1.651, W3 = 1.778	W1 = 65, W2 = 65, W3 = 70

Reference Circuit (cont.)

Circuit Assembly Information

Test Fixture Part No. LTN/PTFB211503EF

Find Gerber files for this test fixture on the Infineon Web site at <http://www.infineon.com/rfpower>



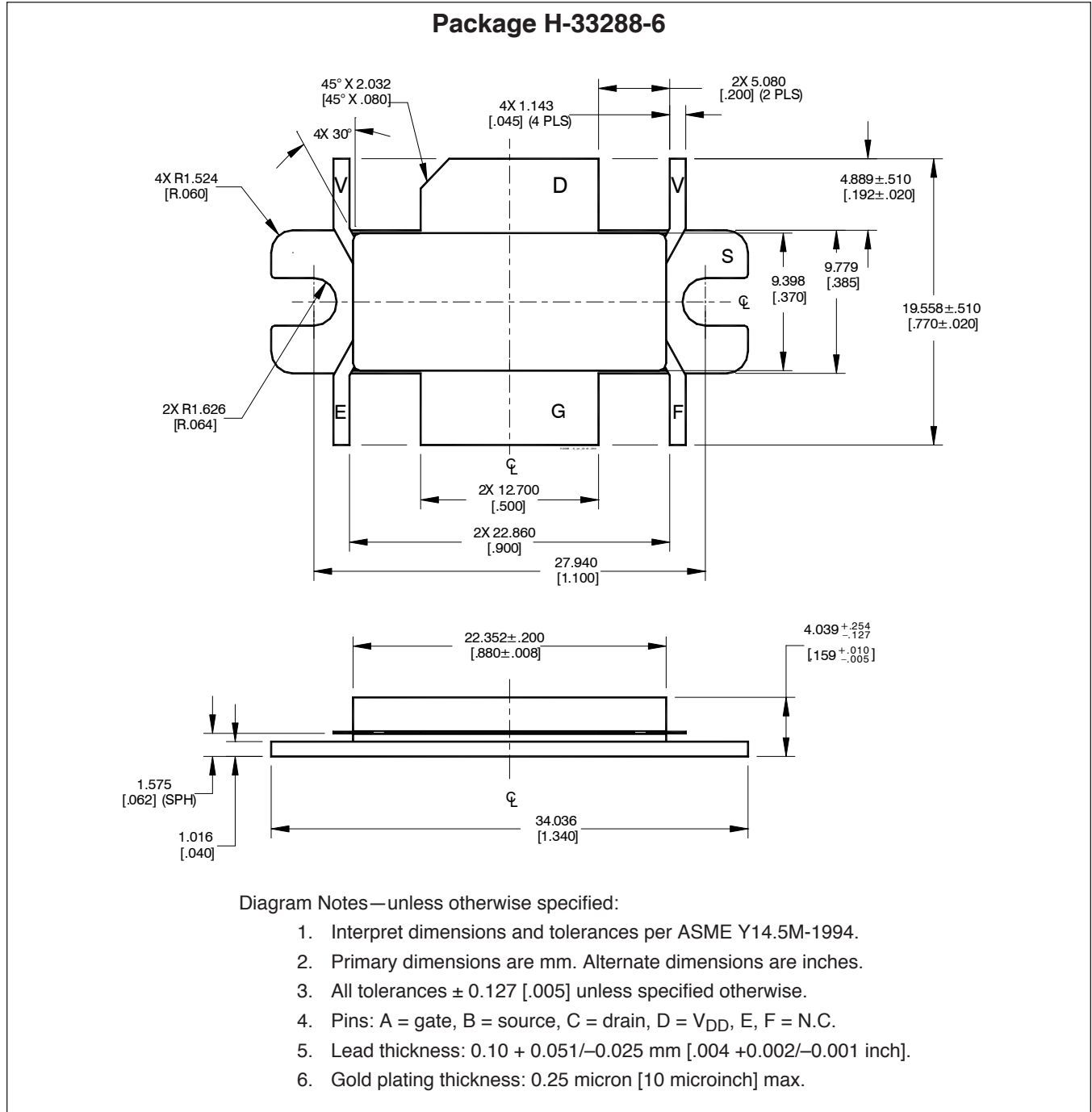
Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

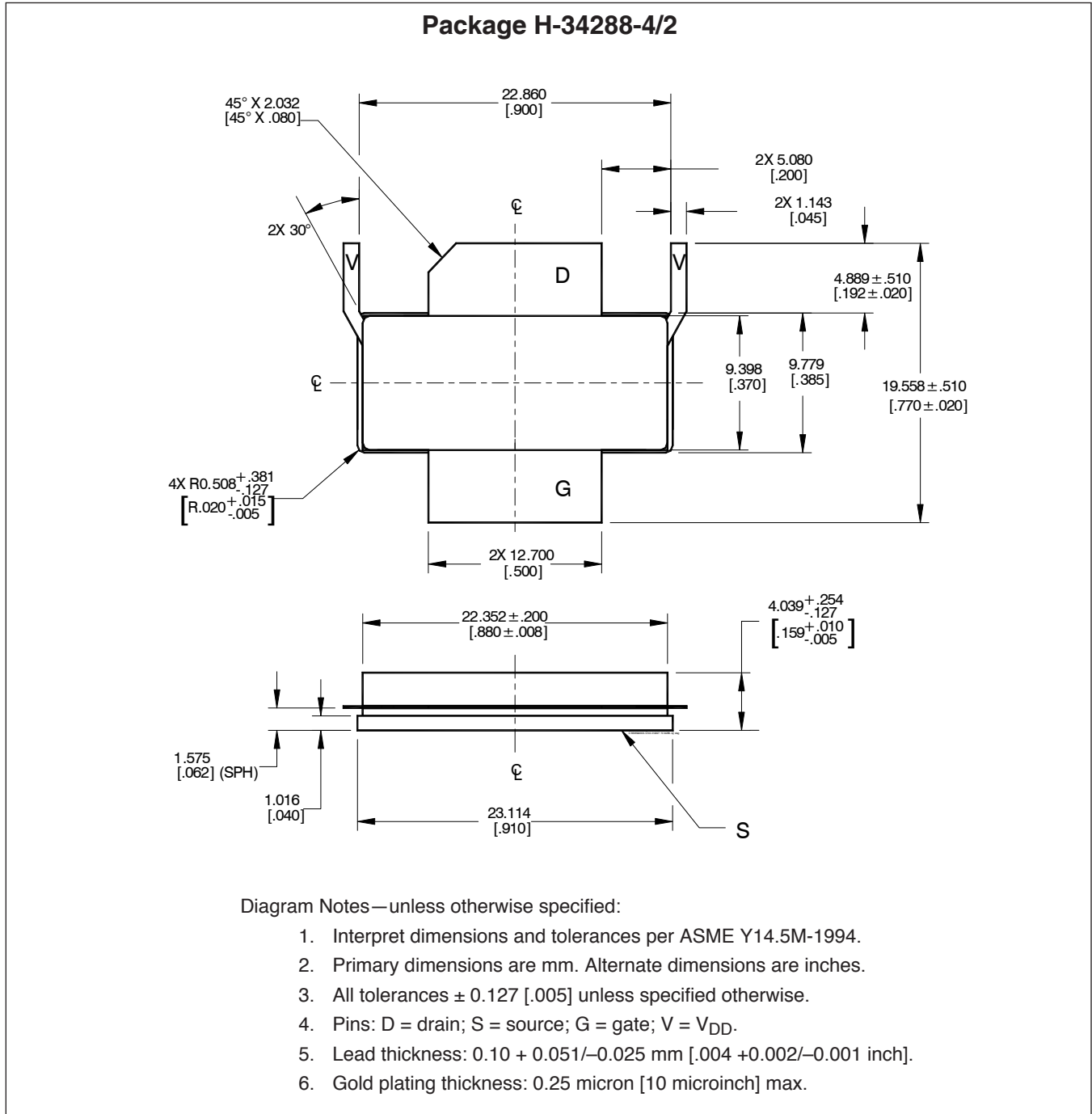
Component Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C102	Chip capacitor, 10 pF	ATC	ATC100A100FW150XB
C103, C104	Chip capacitor, 4.71 μ F	Digi-Key	493-2372-2-ND
C105	Chip capacitor, 0.6 pF	ATC	ATC100B0R6BW500XB
C106	Chip capacitor, 2.2 pF	ATC	ATC100B2R2BW500XB
C107	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C801, C802, C803	Capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
R101, R104, R803, R805	Resistor, 10 Ω	Digi-Key	P10ECT-ND
R801	Resistor, 1200 Ω	Digi-Key	P1.2KGCT-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KGCT-ND
R804	Resistor, 100 Ω	Digi-Key	P100ECT-ND
S1	Voltage Regulator	Digi-Key	LM78L05ACM-LD
S2	Transistor	Digi-Key	BCP5616TA-ND
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
Output			
C201, C206	Chip capacitor, 1 μ F	Digi-Key	445-1411-2-ND
C202, C210	Chip capacitor, 2.2 μ F	Digi-Key	445-1447-2-ND
C203, C209	Capacitor, 10 μ F	Digi-Key	281M5002106K
C204, C205	Capacitor, 10 μ F	Digi-Key	587-1818-2-ND
C207	Chip capacitor, 8.2 pF	ATC	ATC100B8R2BW500XB
C208	Chip capacitor, 0.5 pF	ATC	ATC100B0R5BW500XB

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: 2011-03-07

Data Sheet

Previous Version: 2010-11-10, Data Sheet

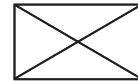
Page	Subjects (major changes since last revision)
1	Updated features
2	Corrected typo

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