PTFB211501E
PTFB211501F

green Product

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

Description

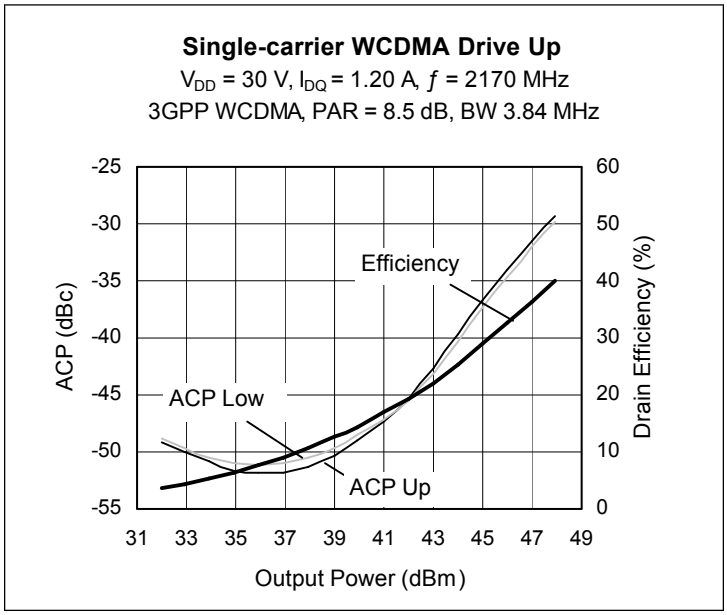
The PTFB211501E and PTFB211501F are thermally-enhanced, 150-watt, LDMOS FETs designed for cellular power amplifier applications in the 2110 – 2170 frequency band. Features include I/O matching, high gain, and thermally-enhanced ceramic open-cavity packages with slotted and earless flanges.

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 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 V, I_{DQ} = 1.2 A, P_{OUT} = 40 W AVG, f = 2170 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°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 V, I_{DQ} = 1.2 A, P_{OUT} = 140 W PEP, f = 2170 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 V, I_{DS} = 10 µA	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
	V_{DS} = 63 V, V_{GS} = 0 V	I_{DSS}	—	—	10.0	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.08	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 1.2 A	V_{GS}	1.6	2.1	3.0	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 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	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 150 W CW)	$R_{\theta JC}$	0.29	°C/W

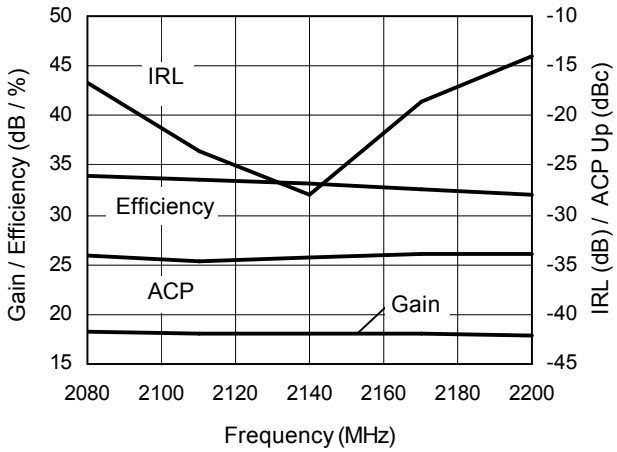
Ordering Information

Type and Version	Ordering Code	Package Description	Shipping
PTFB211501E V1 R0	PTFB211501EV1R0XTMA1	H-36248-2, bolt-down	Tape & Reel, 50 pcs
PTFB211501E V1 R250	PTFB211501EV1R250XTMA1	H-36248-2, bolt-down	Tape & Reel, 250 pcs
PTFB211501F V1 R0	PTFB211501FV1R0XTMA1	H-37248-2, earless flange	Tape & Reel, 50pcs
PTFB211501F V1 R250	PTFB211501FV1R250XTMA1	H-37248-2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in production test fixture)

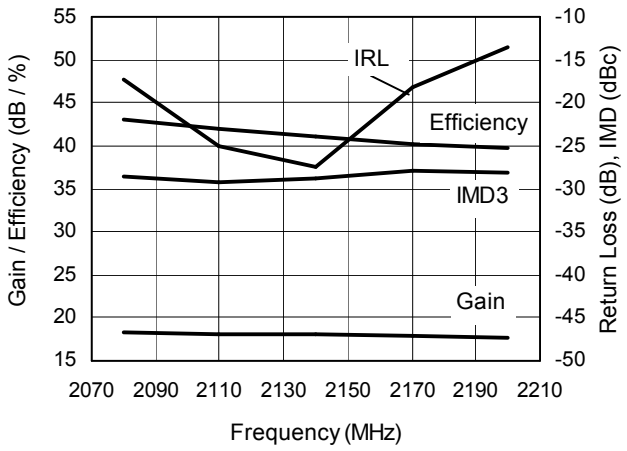
Single-carrier WCDMA, 3GPP Broadband

V_{DD} = 30 V, I_{DQ} = 1.20 A, P_{OUT} = 40 W



Two-tone Broadband

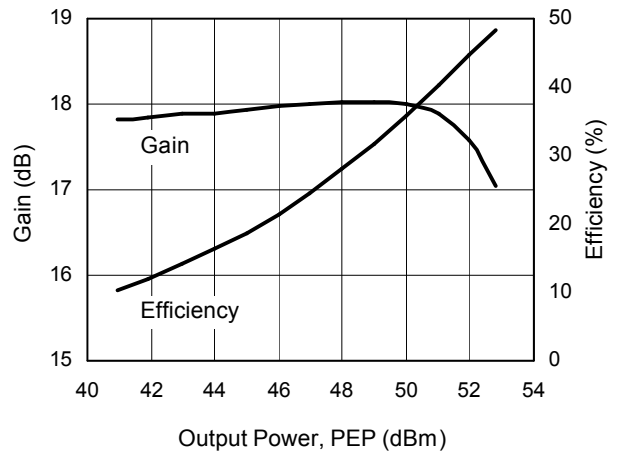
V_{DD} = 30 V, I_{DQ} = 1.20 A, P_{OUT} = 63 W



Two-tone Drive-up

V_{DD} = 30 V, I_{DQ} = 1.20 A,

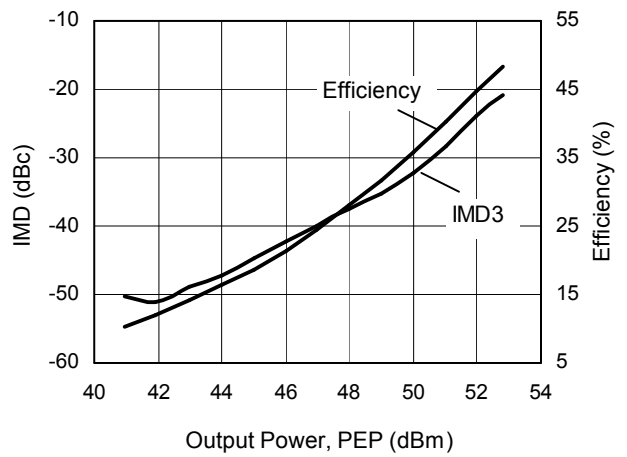
f_1 = 2170 MHz, f_2 = 2169 MHz



Two-tone Drive-up

V_{DD} = 30 V, I_{DQ} = 1.20 A,

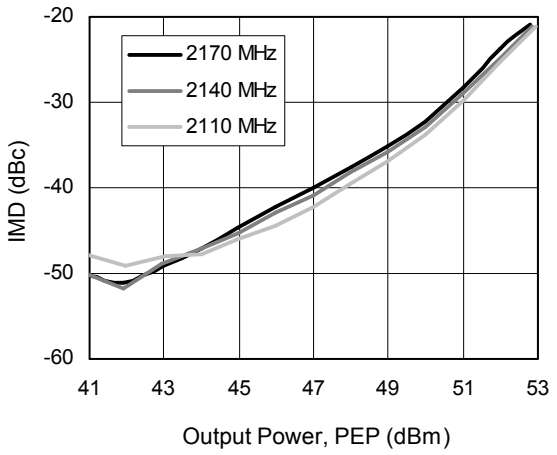
f_1 = 2170 MHz, f_2 = 2169 MHz



Typical Performance (cont.)

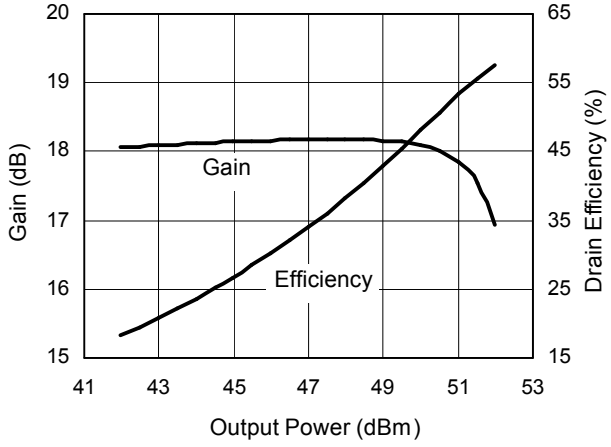
Two-tone Drive-up
at Selected Frequencies

V_{DD} = 30 V, I_{DQ} = 1.20 A, tone spacing = 1 MHz



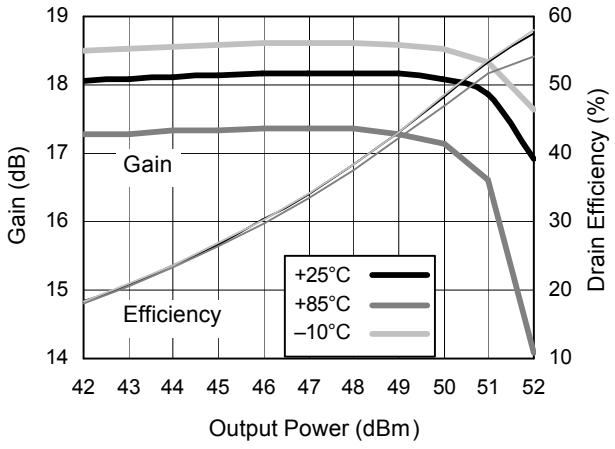
Power Sweep, CW
Gain & Efficiency vs. Output Power

V_{DD} = 30 V, I_{DQ} = 1.20 A, f = 2170 MHz



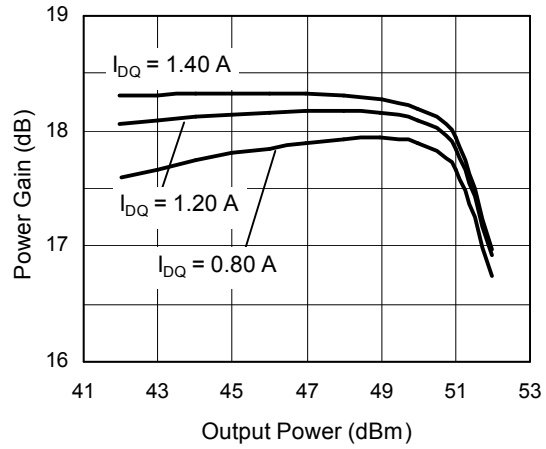
CW Performance
Gain & Efficiency vs. Output Power

V_{DD} = 30 V, I_{DQ} = 1.20 A, f = 2170 MHz

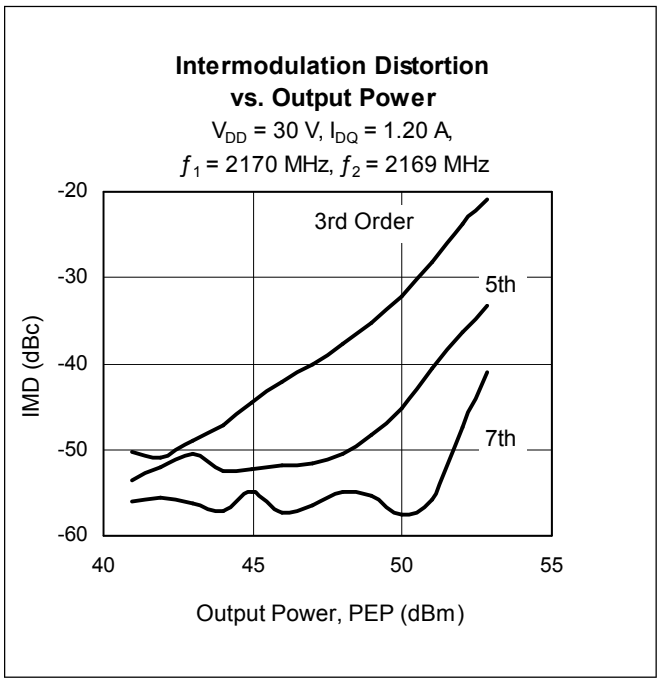


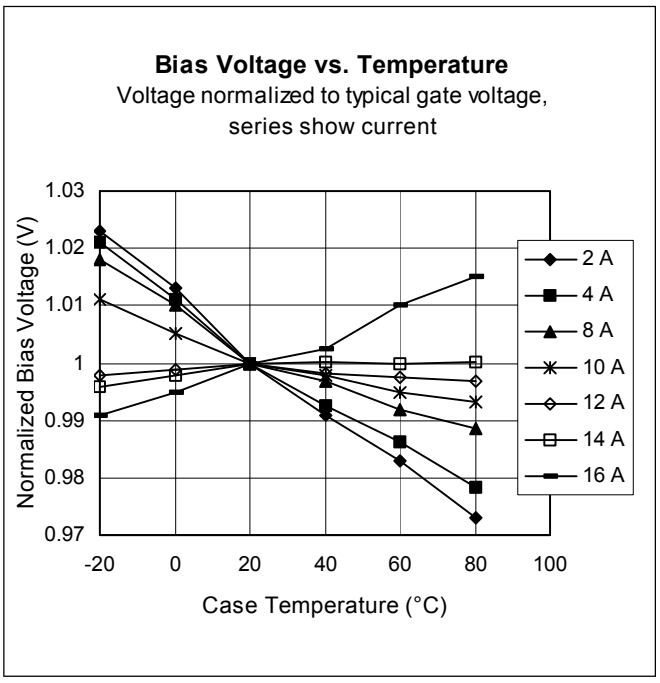
CW Performance
Gain vs. Output Power

V_{DD} = 30 V, f = 2170 MHz

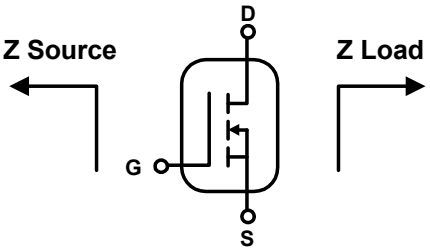


Typical Performance (cont.)

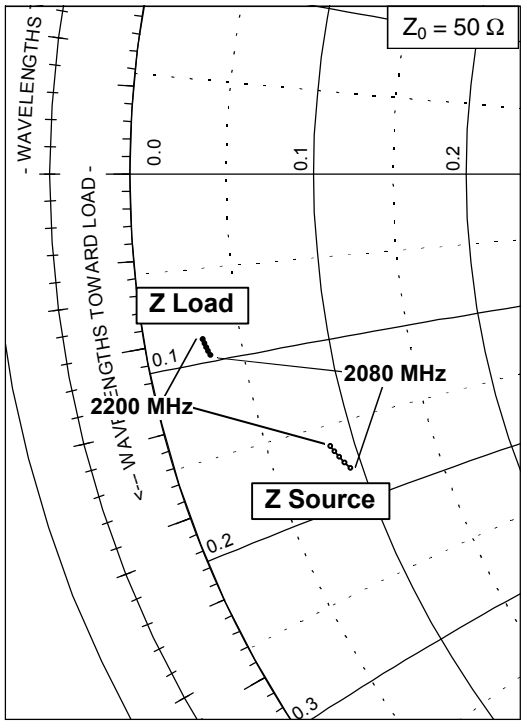




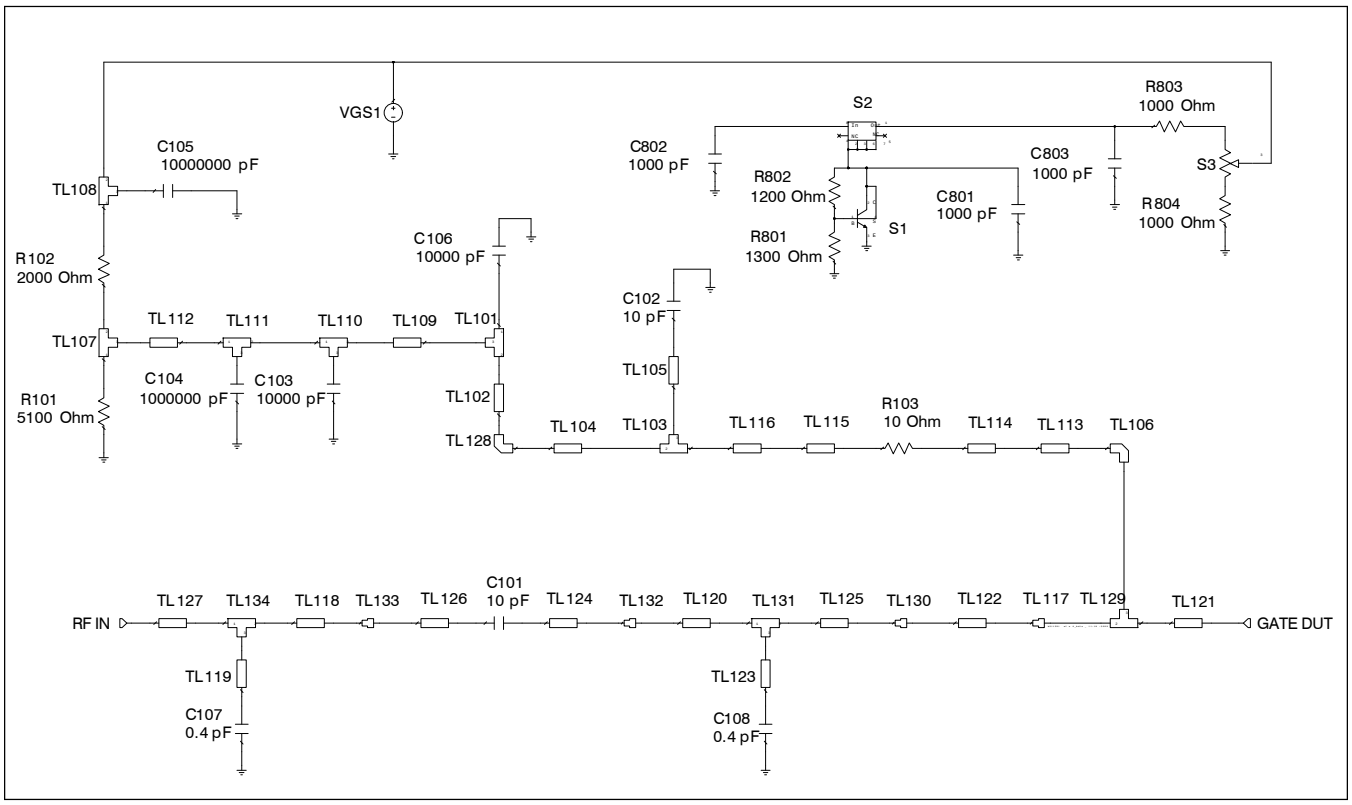
Broadband Circuit Impedance



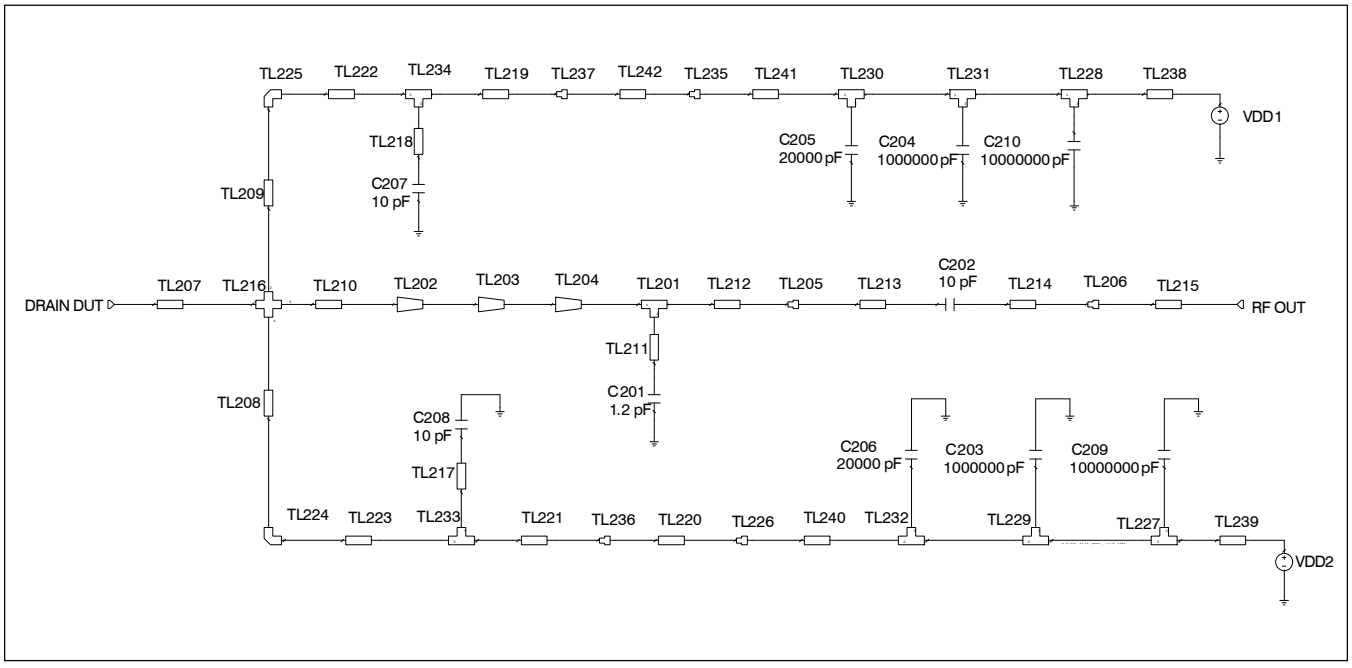
Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
2200	4.29	–8.14	1.49	–4.39
2170	4.36	–8.34	1.52	–4.50
2140	4.45	–8.53	1.55	–4.61
2110	4.55	–8.74	1.58	–4.72
2080	4.67	–8.95	1.62	–4.84



Reference Circuit

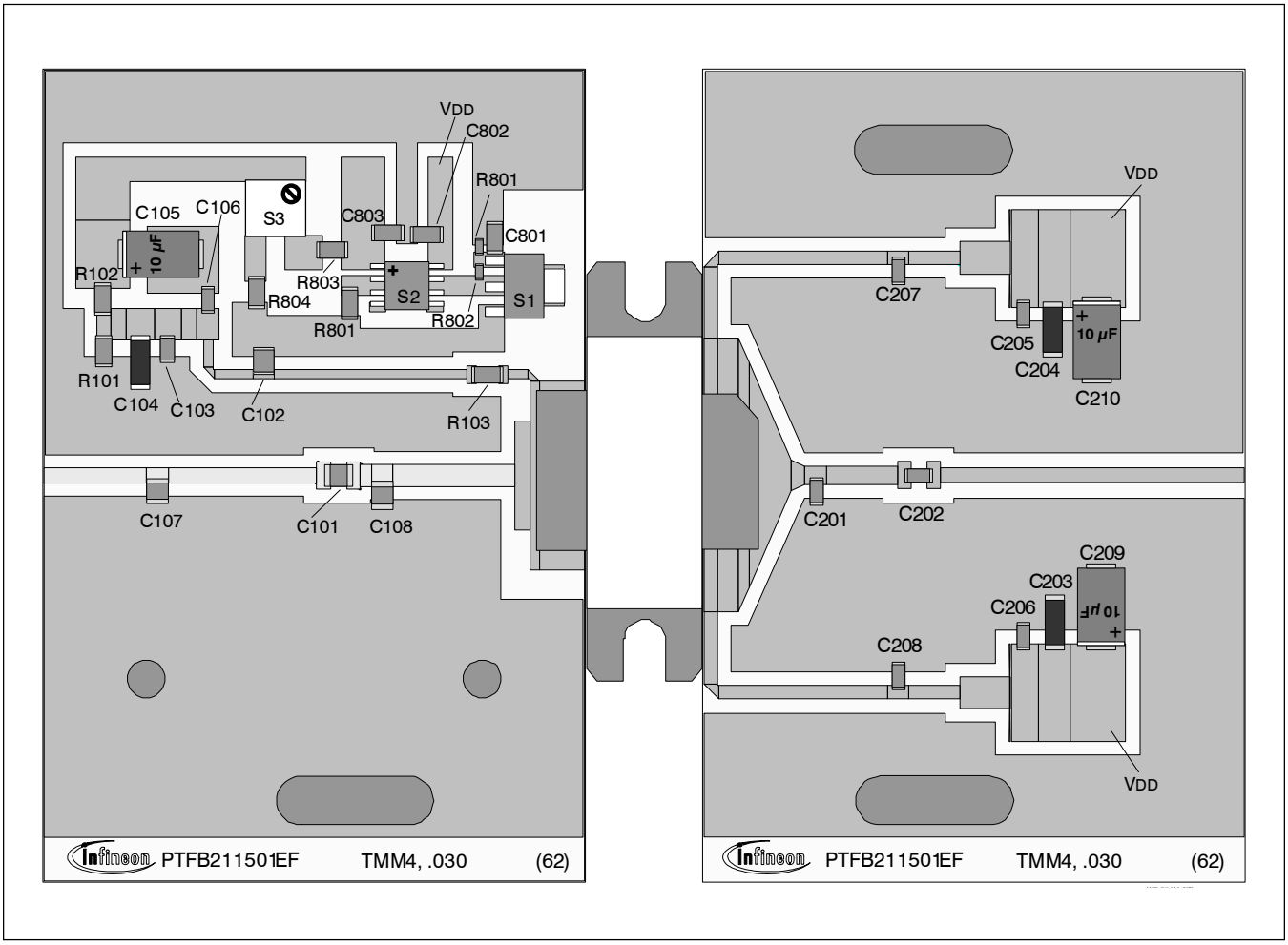


Reference circuit input schematic for ƒ = 2170 MHz



Reference circuit output schematic for ƒ = 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, ε_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 µF	ATC	200B103MW50X
C104	Chip capacitor, 1 µF	Digi-Key	445-1411-2-ND
C105	Capacitor, 10 µF	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 µF	Digi-Key	445-1411-2-ND
C205, C206	Chip capacitor, 0.02 µF	ATC	200B203MW50X
C207, C208	Chip capacitor, 10 pF	ATC	100B100JW500X
C209, C210	Capacitor, 10 µF	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 H-36248-2

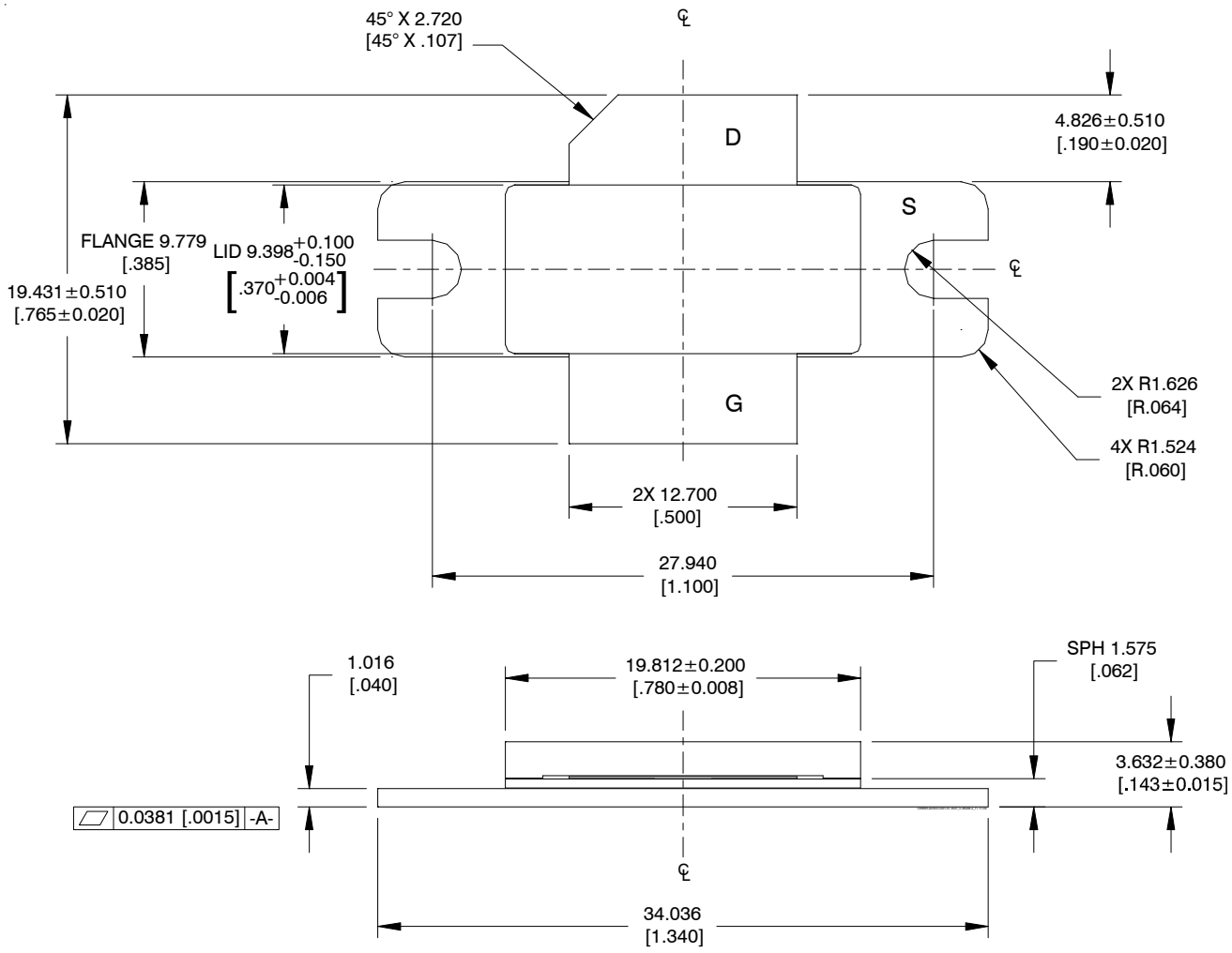


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D – drain; S – source; G – gate.
5. Lead thickness: 0.102 +0.051/–0.025 [0.004 +0.002/–0.001].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch] max.

Package Outline Specifications (cont.)

Package H-37248-2

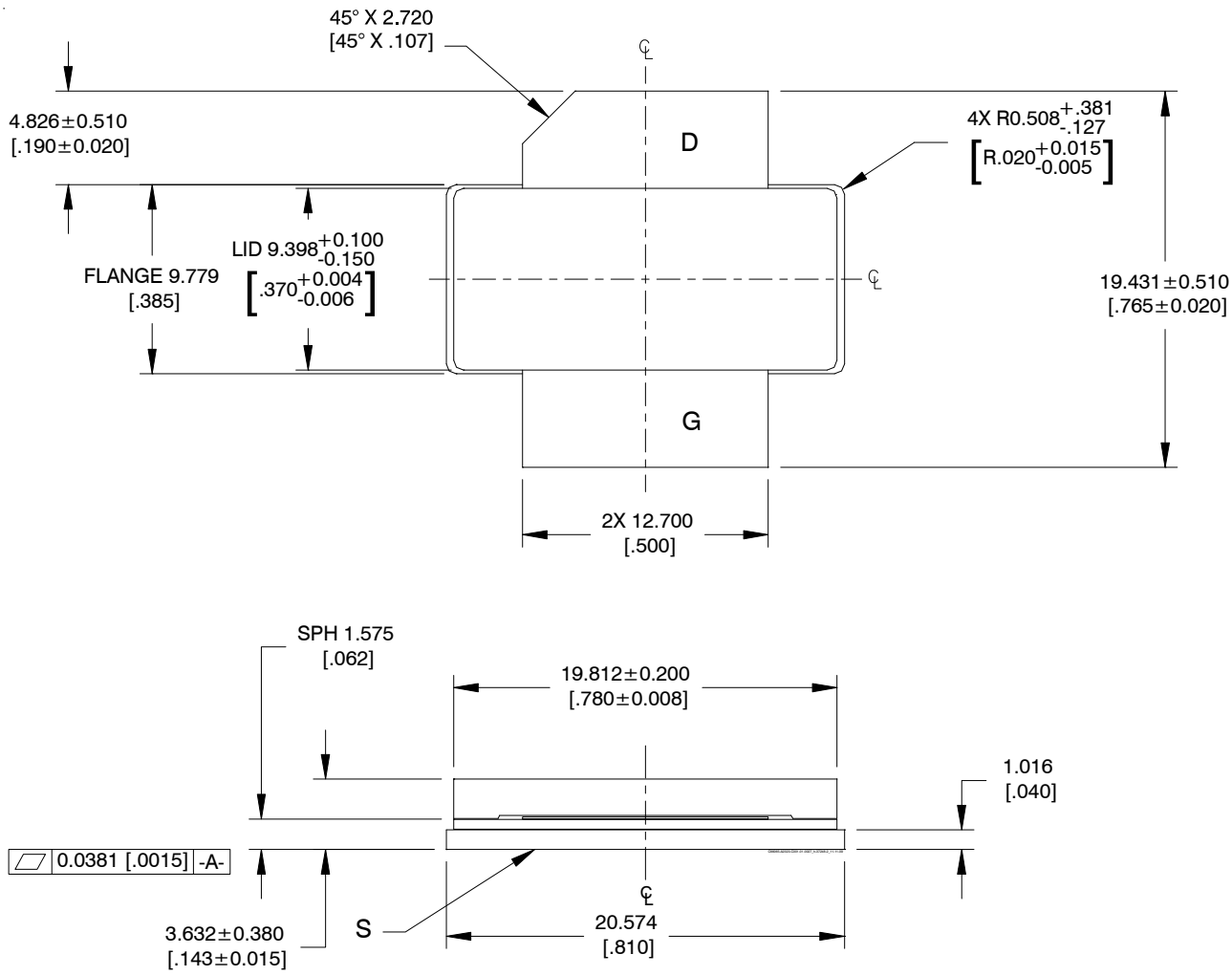


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PTFB211501E/F V1

Revision History:	2016-06-14	Data Sheet
Previous Version:	2012-10-15, Data Sheet	

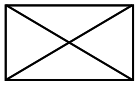
Page	**Subjects (major changes since last revision)**
2	updated ordering information to include R0

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Edition 2016-06-14

Published by
Infineon Technologies AG
81726 Munich, Germany

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