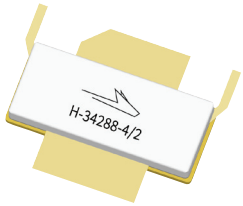
PTFB211503FL

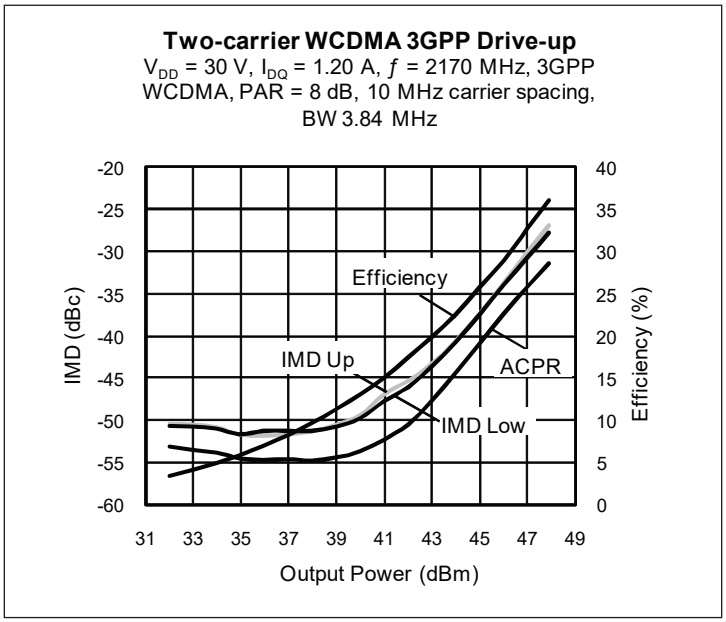
Thermally-Enhanced High Power RF LDMOS FET
150 W, 2110 – 2170 MHz

Description

The PTFB211503FL is a thermally-enhanced, 150-watt, LDMOS FET 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 package with earless flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTFB211503FL
H-34288-4/2





Features

- Broadband internal matching
- Enhanced for use in DPD error correction systems
- Typical CW performance, 2170 MHz, 30 V
  - Output power at P_{1dB} = 150 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 Wolfspeed test fixture)
V_{DD} = 30 V, I_{DQ} = 1.2 A, P_{OUT} = 32 W AVG, f_1 = 2135 MHz, f_2 = 2145 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	ηD	—	29	—	%
Adjacent Channel Power Ratio	ACPR	—	–36	—	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 (tested in wolfspeed test fixture)
V_{DD} = 30 V, I_{DQ} = 1.2 A, P_{OUT} = 150 W PEP, f = 2170 MHz, tone spacing = 1 MHz

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

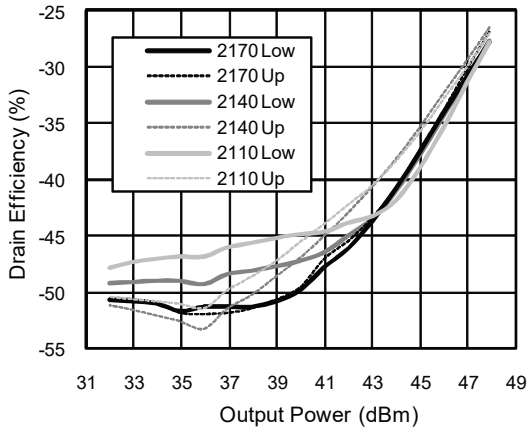
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 150 W CW)	$R_{\theta JC}$	0.27	°C/W

Ordering Information

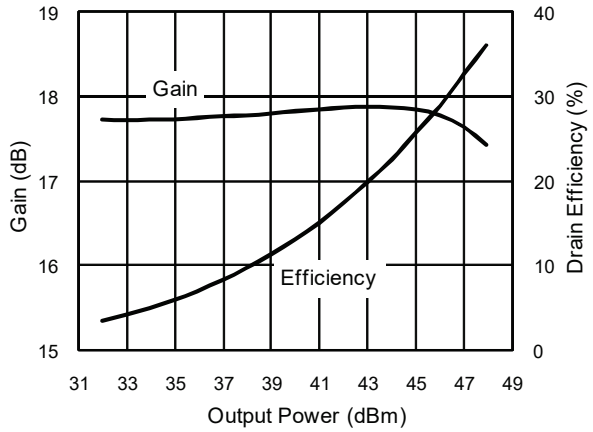
Type and Version	Order Code	Package Description	Shipping
PTFB211503FL V2 R0	PTFB211503FL-V2-R0	H-34288-4/2, earless flange	Tape & Reel, 50 pcs
PTFB211503FL V2 R250	PTFB211503FL-V2-R250	H-34288-4/2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

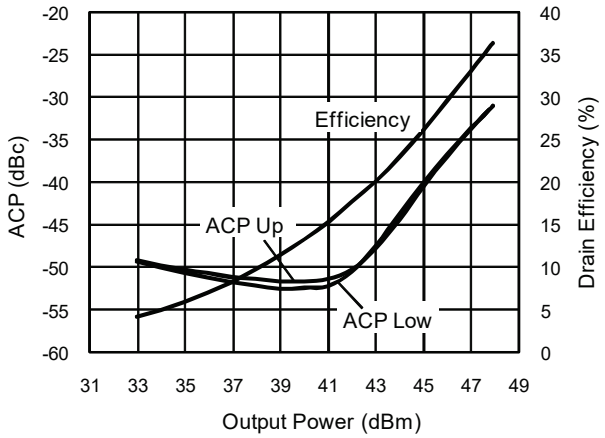
Two-carrier WCDMA 3GPP Drive-up
V_{DD} = 30 V, I_{DQ} = 1.20 A, 3GPP WCDMA, PAR = 8 dB, 10 MHz carrier spacing, BW 3.84 MHz



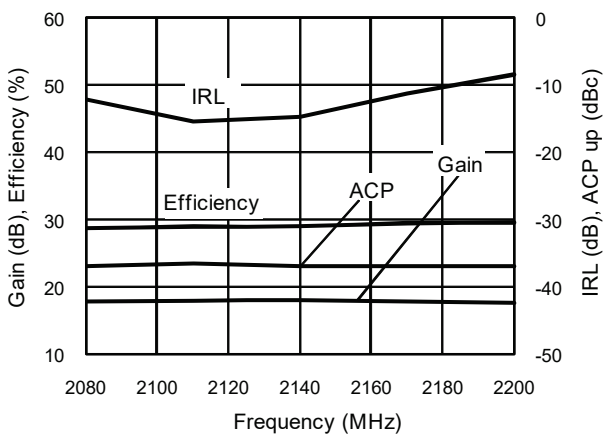
Two-carrier WCDMA 3GPP
V_{DD} = 30 V, I_{DQ} = 1.20 A, f = 2170 MHz, 3GPP WCDMA, PAR = 8 dB, 10 MHz carrier spacing, BW 3.84MHz



Single-carrier WCDMA Drive-Up
V_{DD} = 30 V, I_{DQ} = 1.20 A, f = 2170 MHz
3GPP WCDMA, PAR = 8 dB, BW 3.84 MHz

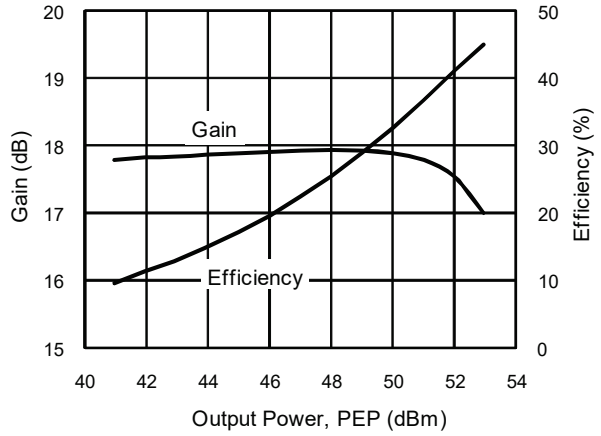


Single-carrier WCDMA, 3GPP Broadband
V_{DD} = 30 V, I_{DQ} = 1.20 A, P_{OUT} = 40 W

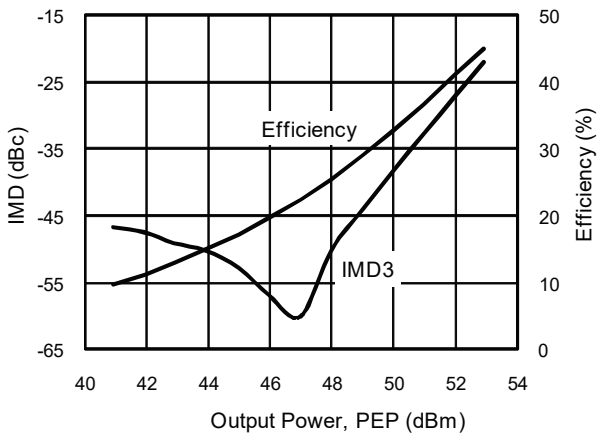


Typical Performance (cont.)

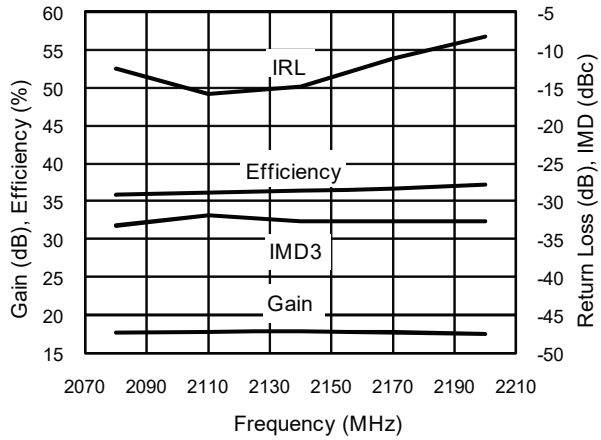
Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 1.20 A,
f_1 = 2170 MHz, f_2 = 2169 MHz



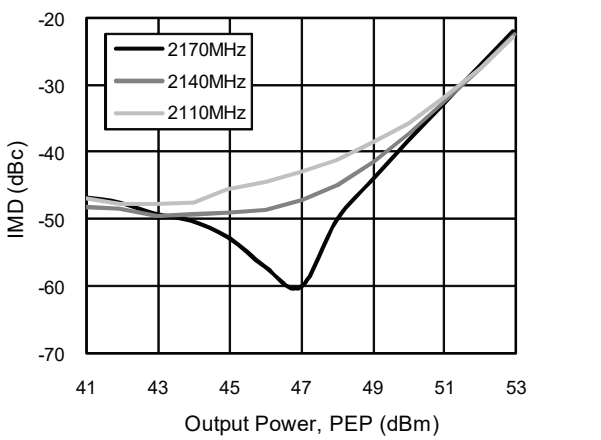
Two-tone Drive-up
V_{DD} = 30 V, I_{DQ} = 1.20 A,
f_1 = 2170 MHz, f_2 = 2169 MHz



Two-tone Broadband Performance
V_{DD} = 30 V, I_{DQ} = 1.20 A, P_{OUT} = 63 W

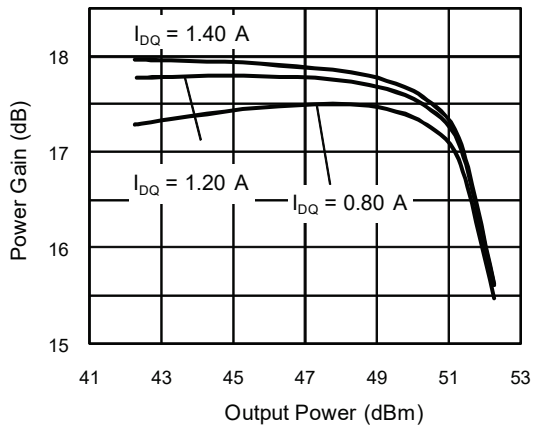


Two-tone Drive-up at Selected Frequencies
V_{DD} = 30 V, I_{DQ} = 1.20 A, tone spacing = 1 MHz

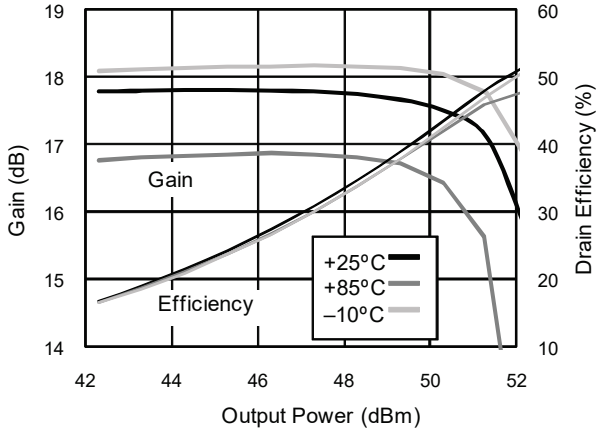


Typical Performance (cont.)

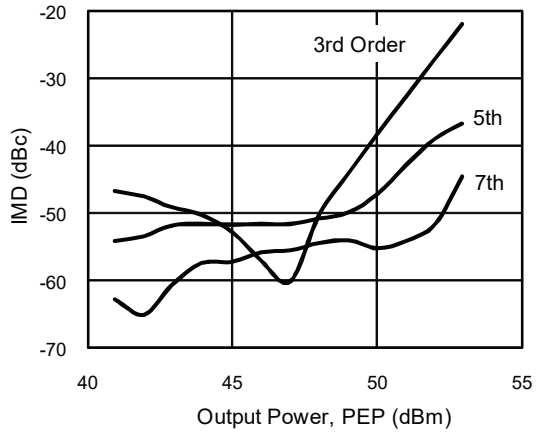
CW Performance
Gain vs. Output Power
V_{DD} = 30 V, f = 2170 MHz



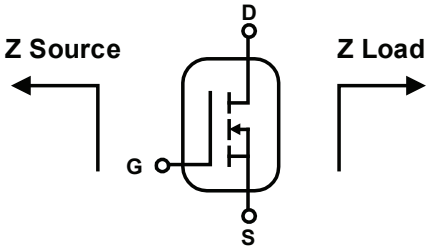
Power Sweep, CW
Gain & Efficiency vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.20 A, f = 2170 MHz

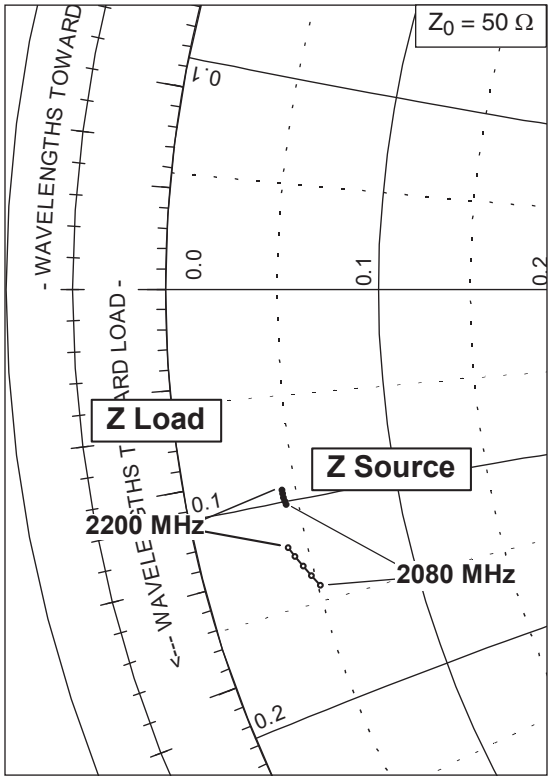


Intermodulation Distortion
vs. Output Power
V_{DD} = 30 V, I_{DQ} = 1.20 A,
f_1 = 2170 MHz, f_2 = 2169 MHz



Broadband Circuit Impedance

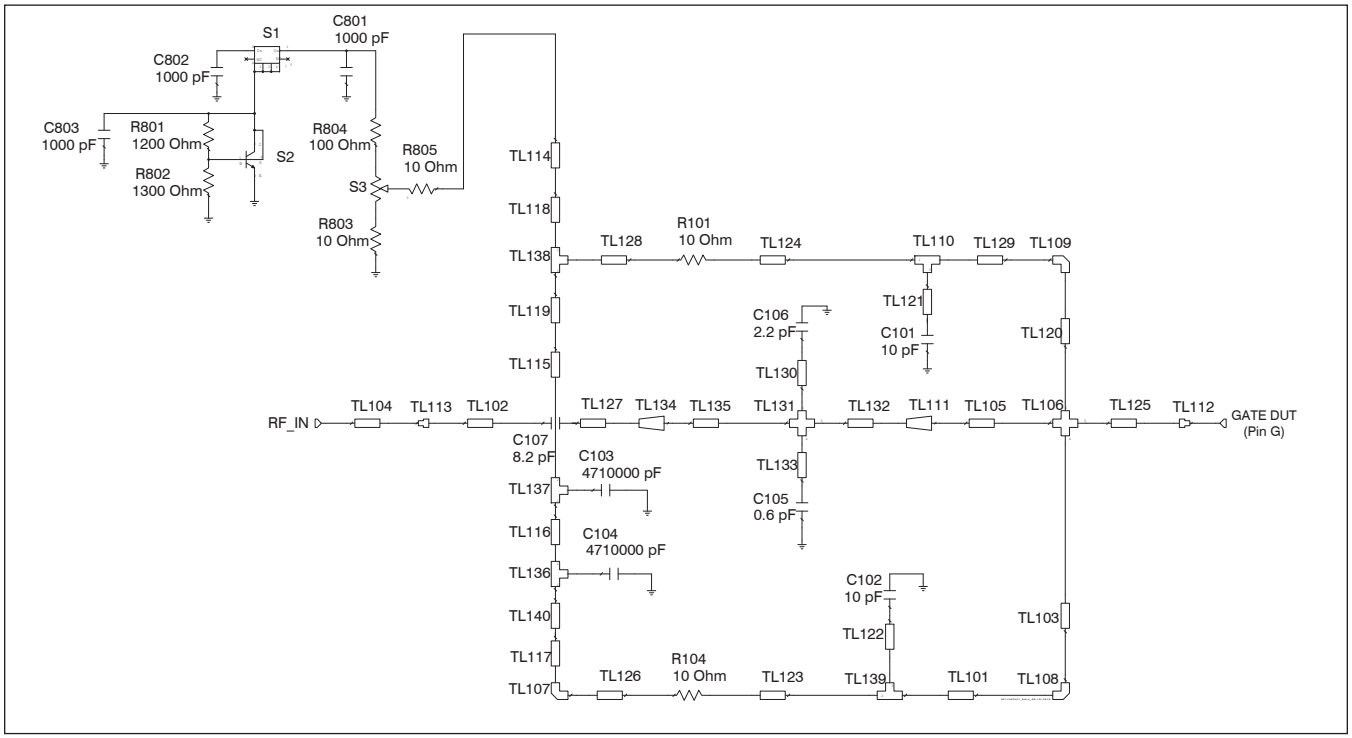




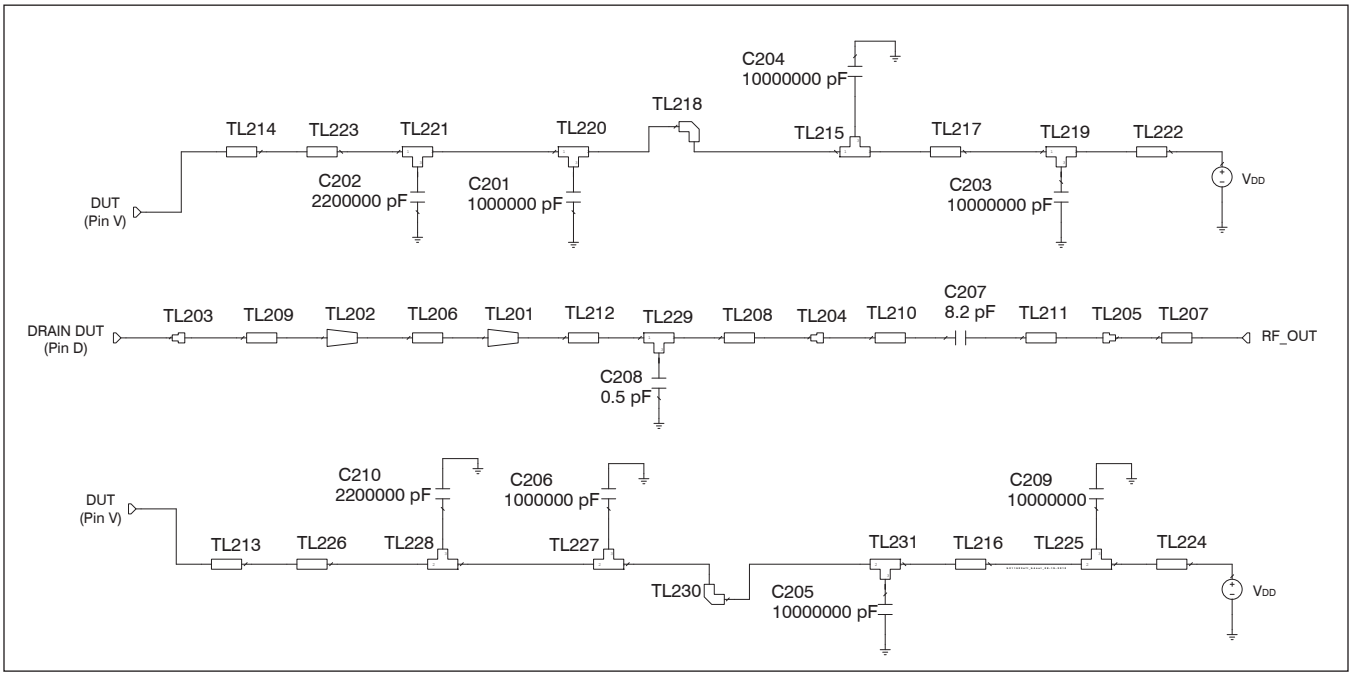
Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
2200	2.06	–6.08	2.19	–4.73
2170	2.17	–6.33	2.19	–4.82
2140	2.30	–6.59	2.20	–4.91
2110	2.43	–6.86	2.21	–5.00
2080	2.58	–7.14	2.22	–5.09

See next page for reference circuit information

Reference Circuit



Reference circuit input schematic for ƒ = 2170 MHz



Reference circuit output schematic for ƒ = 2170 MHz

Reference Circuit (cont.)

Description	
DUT	PTFB211503FL
PCB	0.508 mm [.020"] thick, εr = 3.48, Rogers 4350, 1 oz. copper

Electrical Characteristics at 2170 MHz

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

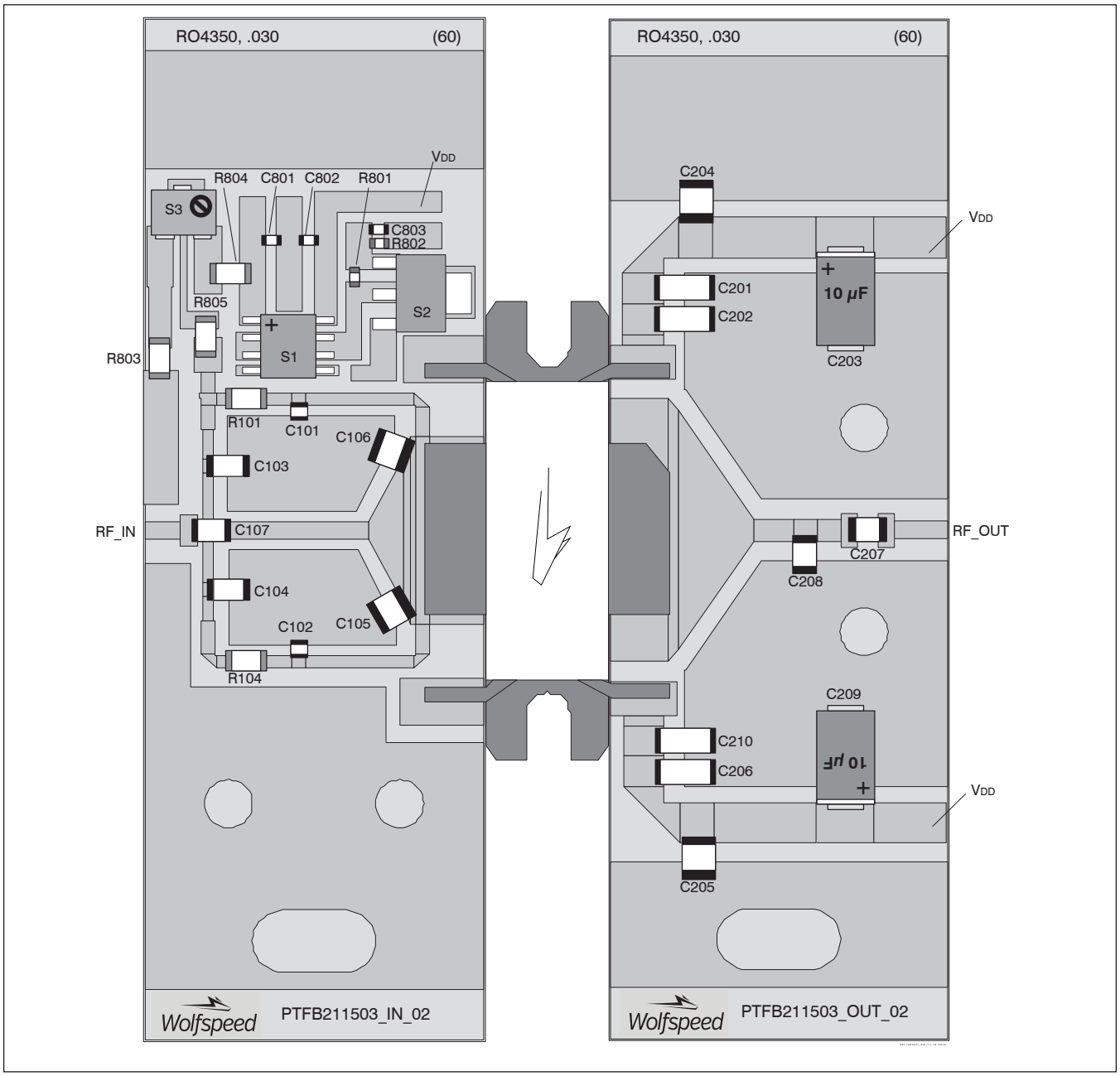
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201 (taper)	0.074 λ, 5.33 Ω / 39.51 Ω	W1 = 17.780, W2 = 1.651, L = 5.613	W1 = 700, W2 = 65, L = 221
TL202 (taper)	0.010 λ, 4.84 Ω / 5.33 Ω	W1 = 19.685, W2 = 17.780, L = 0.787	W1 = 775, W2 = 700, L = 31
TL203		W1 = 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 Wolfspeed Web site at *www.wolfspeed.com/RF*



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 µF	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 µF	Digi-Key	445-1411-2-ND
C202, C210	Chip capacitor, 2.2 µF	Digi-Key	445-1447-2-ND
C203, C209	Capacitor, 10 µF	Digi-Key	281M5002106K
C204, C205	Capacitor, 10 µF	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 H-34288-4/2

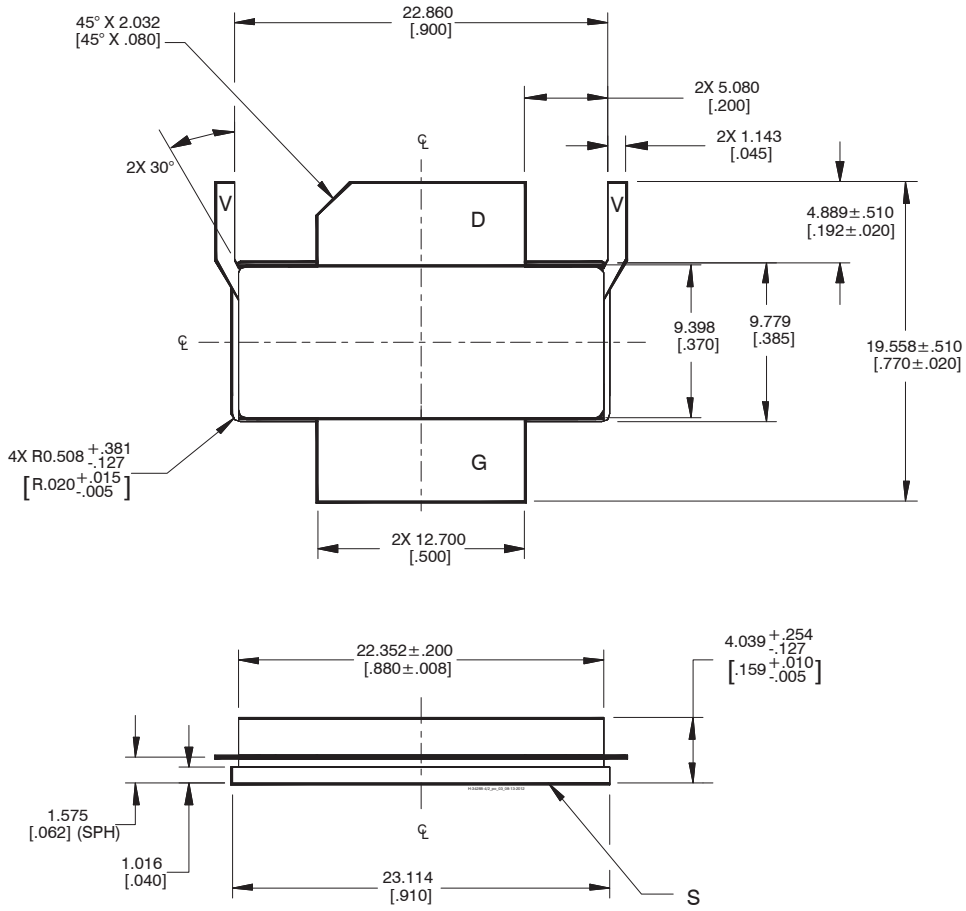


Diagram Notes—unless otherwise specified:

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; V = V_{DD}.
5. Lead thickness: 0.10 + 0.051/–0.025 mm [.004 +0.002/–0.001 inch].
6. Gold plating thickness: 0.25 micron [10 microinch] max.

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes at each revision)
04.1	2016-06-14	Production	2	Updated ordering information
05	2018-06-29	Production	All	Converted to Wolfspeed Data Sheet

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919.407.7816

Notes

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