PTFB210801FA

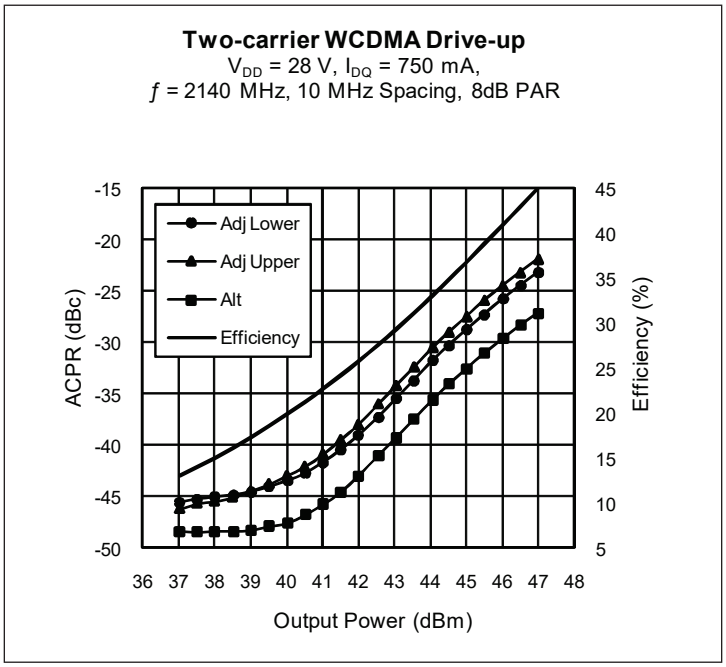
Thermally-Enhanced High Power RF LDMOS FET
80 W, 28 V, 2110 – 2170 MHz

Description

The PTFB210801FA LDMOS FET is designed for use in multi-standard cellular power amplifier applications in the 2110 to 2170 MHz frequency band. Features include input and output matching, high gain and thermally-enhanced packages with earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTFB210801FA
Package H-37265-2





Features

- Broadband internal matching
- Typical single-carrier WCDMA performance at 2170 MHz, 28 V
  - Average output power = 25 W
  - Linear Gain = 18.5 dB
  - Efficiency = 32.5%
  - Adjacent channel power = –37 dBc
- Typical CW performance, 2170 MHz, 28 V
  - Output power at P_{1dB} = 80 W
  - Efficiency = 55%
- Integrated ESD protection
- Capable of handling 10:1 VSWR @ 28 V, 80 W (CW) output power
- Pb-free and RoHS compliant

RF Characteristics

Two-carrier WCDMA Measurements (tested in Wolfspeed test fixture)
V_{DD} = 28 V, I_{DQ} = 750 mA, P_{OUT} = 20 W average, f_1 = 2160 MHz, f_2 = 2170 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	18.5	—	dB
Drain Efficiency	ηD	28	31	—	%
Intermodulation Distortion	IMD	—	–30	–28	dBc

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
Drain Leakage Current	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	$R_{DS(on)}$	—	0.05	—	Ω
Operating Gate Voltage	V_{DS} = 30 V, I_{DQ} = 750 mA	V_{GS}	2.3	3.0	3.3	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

Maximum Ratings

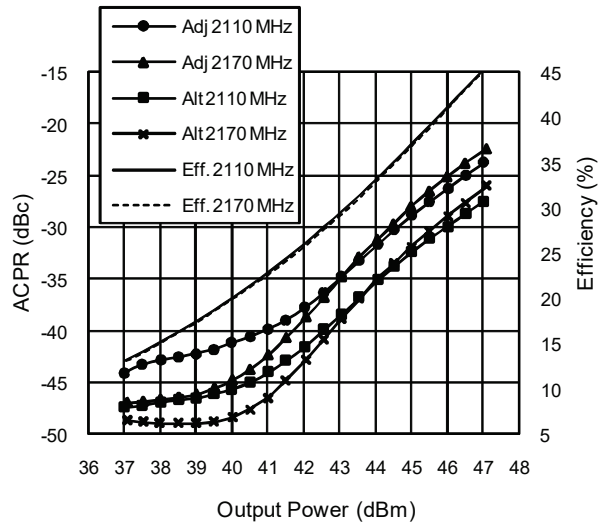
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 80 W CW)	$R_{\theta JC}$	0.50	°C/W

Ordering Information

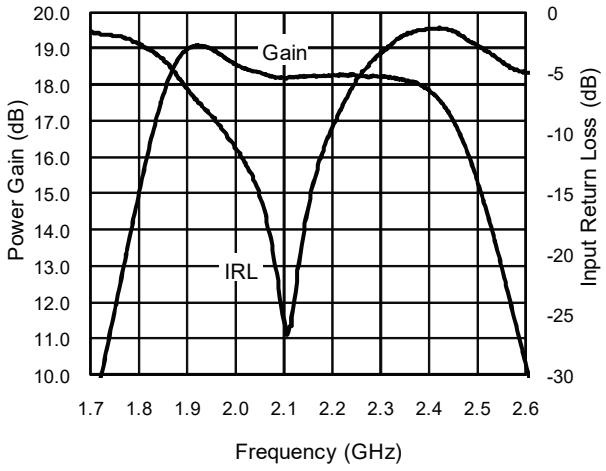
Type and Version	Order Code	Package Description	Shipping
PTFB210801FA V1 R0	PTFB210801FA-V1-R0	H-37265-2, earless flange	Tape & Reel, 50 pcs
PTFB210801FA V1 R250	PTFB210801FA-V1-R250	H-37265-2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

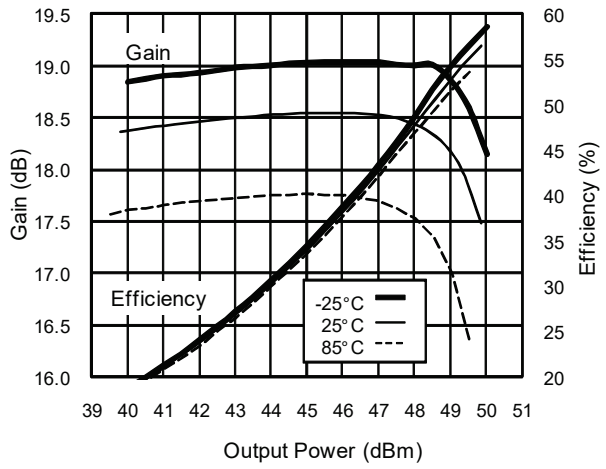
Two-carrier WCDMA vs. Frequency
V_{DD} = 28 V, I_{DQ} = 750 mA,
10 MHz Spacing, PAR = 8 dB



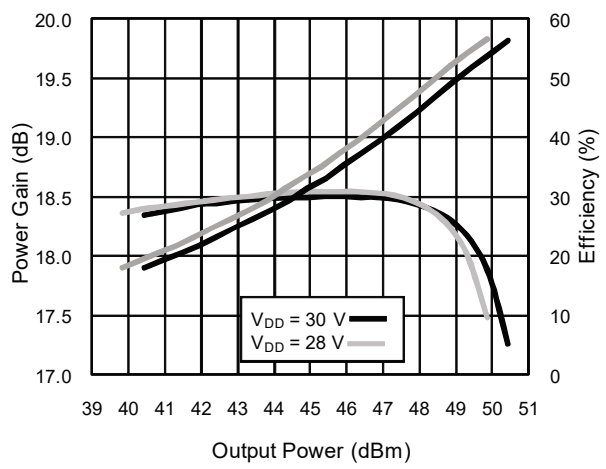
Single Side Small Signal CW Gain & Input Return Loss
V_{DD} = 28 V, I_{DQ} = 750 mA



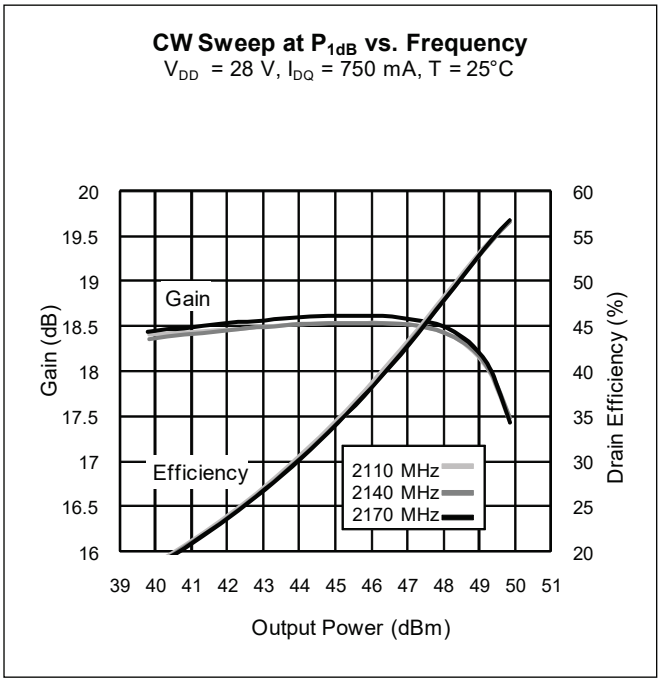
CW Performance vs. Temperature
V_{DD} = 28 V, I_{DQ} = 750 mA, f = 2140 MHz

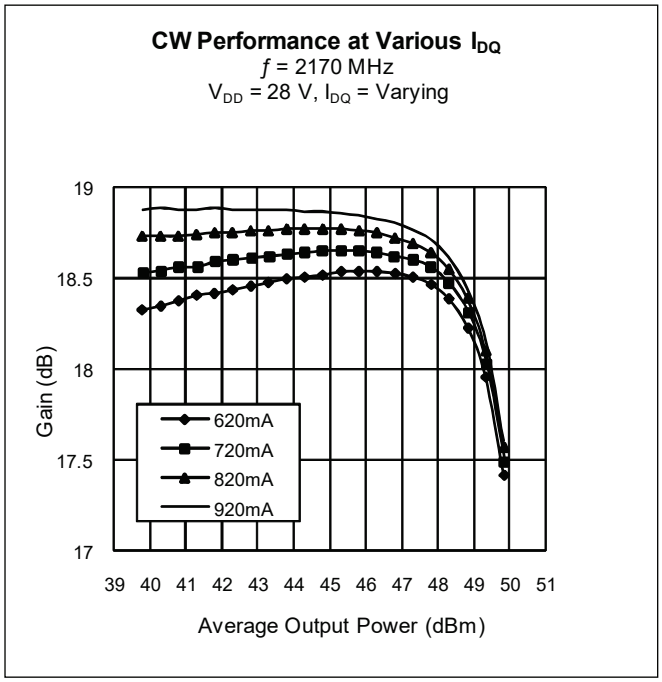


CW Gain & Efficiency vs. Output Power & VDD
f = 2140 MHz, I_{DQ} = 750 mA

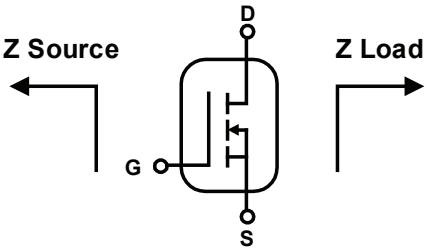


Typical Performance (cont.)



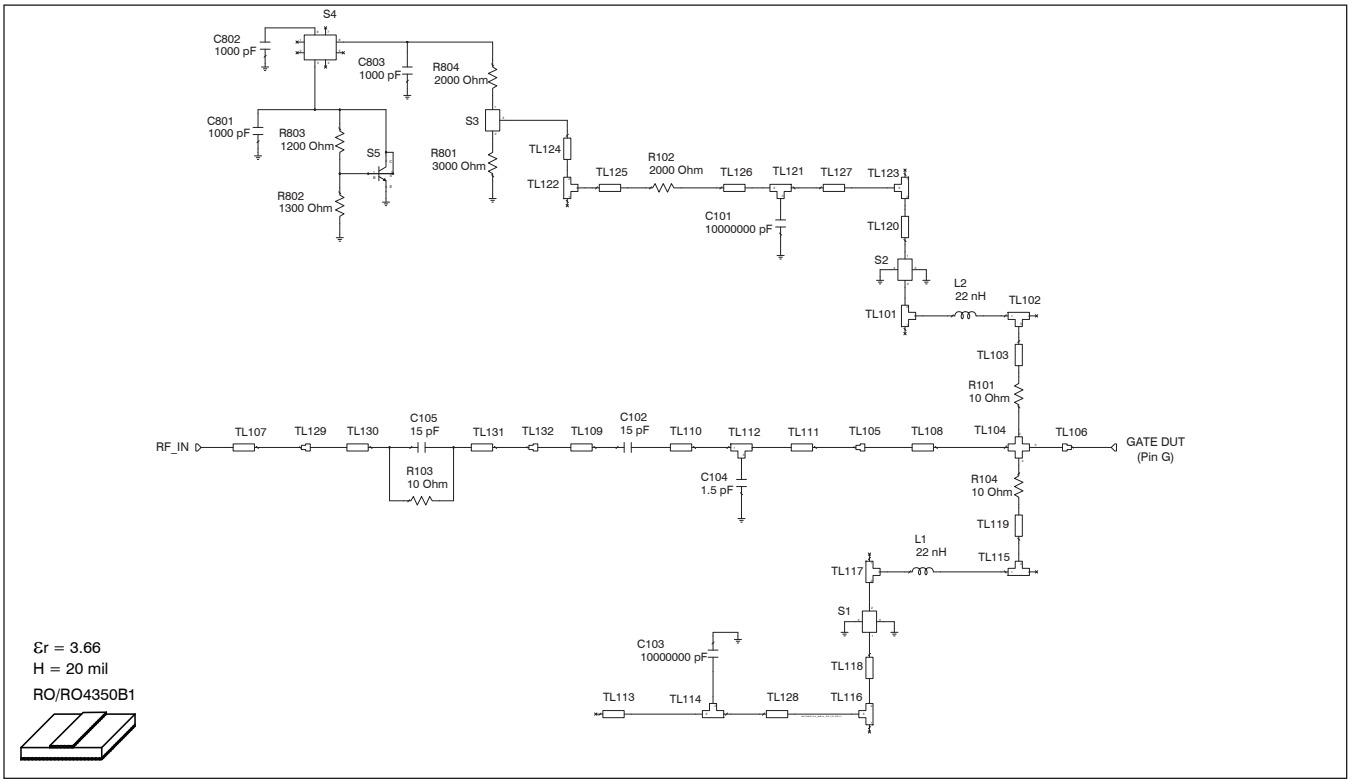


Broadband Circuit Impedance

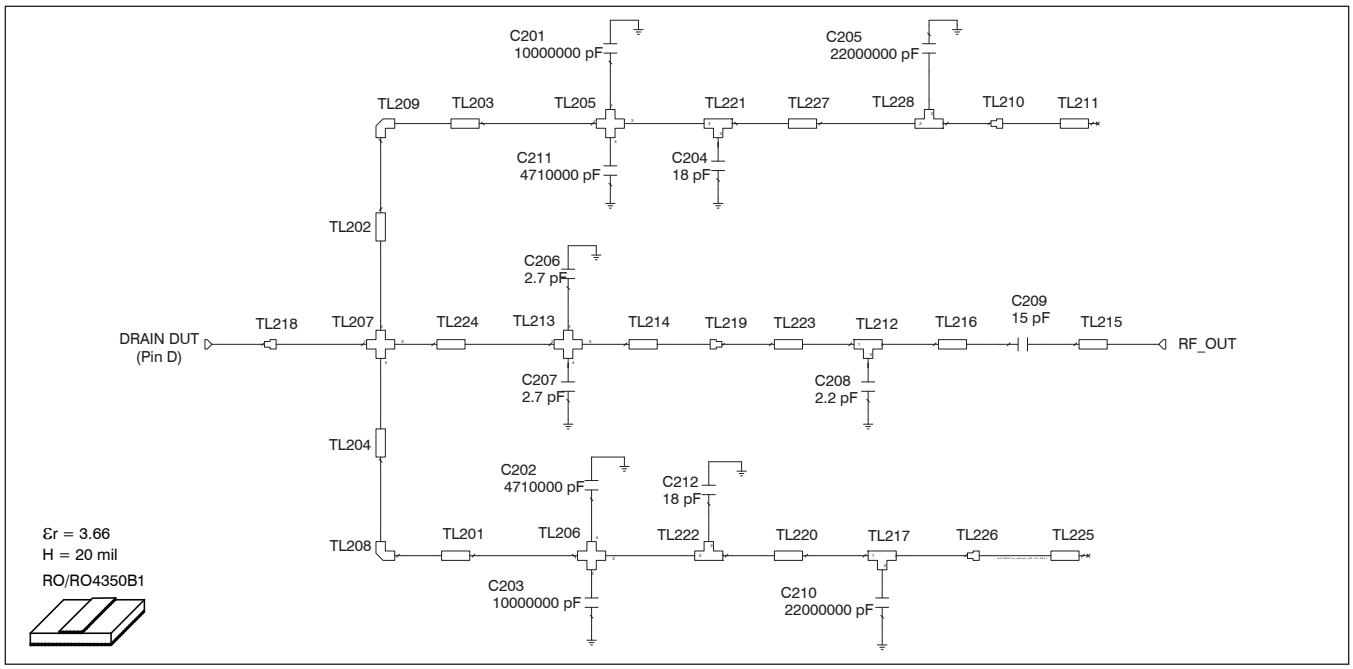


Frequency	Z Source Ω		Z Load Ω	
MHz	R	jX	R	jX
2110	16.3	–4.6	2.2	–4.1
2140	13.6	–4.0	2.3	–4.1
2170	11.3	–2.9	2.2	–4.4

Reference Circuit



Reference circuit input schematic for ƒ = 2170 MHz



Reference circuit output schematic for ƒ = 2170 MHz

Reference Circuit (cont.)

Description	
DUT	PTFB210801FA
PCB	0.508 mm [.020"] thick, εr = 3.66, Rogers 4350, 1 oz. copper

Electrical Characteristics at 2170 MHz

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101, TL117	0.023 λ, 35.71 Ω	W1 = 1.905, W2 = 1.905, W3 = 1.905	W1 = 75, W2 = 75, W3 = 75
TL102, TL115	0.012 λ, 35.71 Ω	W1 = 1.905, W2 = 1.905, W3 = 1.016	W1 = 75, W2 = 75, W3 = 40
TL103	0.021 λ, 54.17 Ω	W = 1.016, L = 1.778	W = 40, L = 70
TL104		W1 = 9.398, W2 = 1.270, W3 = 9.398, W4 = 1.270	W1 = 370, W2 = 50, W3 = 370, W4 = 40
TL105		W1 = 1.024, W2 = 9.398	W1 = 40, W2 = 370
TL106		W1 = 9.398, W2 = 9.398	W1 = 370, W2 = 370
TL107	0.050 λ, 53.93 Ω	W = 1.024, L = 4.153	W = 40, L = 164
TL108	0.025 λ, 9.59 Ω	W = 9.398, L = 1.905	W = 370, L = 75
TL109	0.019 λ, 53.93 Ω	W = 1.024, L = 1.605	W = 40, L = 63
TL110	0.092 λ, 53.93 Ω	W = 1.024, L = 7.696	W = 40, L = 303
TL111	0.072 λ, 53.93 Ω	W = 1.024, L = 5.994	W = 40, L = 236
TL112	0.011 λ, 53.93 Ω	W1 = 1.024, W2 = 1.024, W3 = 0.889	W1 = 40, W2 = 40, W3 = 35
TL113	0.212 λ, 47.12 Ω	W = 1.270, L = 17.577	W = 50, L = 692
TL114, TL121	0.039 λ, 47.12 Ω	W1 = 1.270, W2 = 1.270, W3 = 3.200	W1 = 50, W2 = 50, W3 = 126
TL116, TL122, TL123	0.016 λ, 35.71 Ω	W1 = 1.905, W2 = 1.905, W3 = 1.270	W1 = 75, W2 = 75, W3 = 50
TL118, TL120	0.004 λ, 35.71 Ω	W = 1.905, L = 0.361	W = 75, L = 14
TL119	0.021 λ, 54.17 Ω	W = 1.016, L = 1.778	W = 40, L = 70
TL124	0.039 λ, 35.71 Ω	W = 1.905, L = 3.172	W = 75, L = 125
TL125	0.048 λ, 47.12 Ω	W = 1.270, L = 4.013	W = 50, L = 158
TL126	0.071 λ, 47.12 Ω	W = 1.270, L = 5.906	W = 50, L = 233
TL127, TL128	0.005 λ, 47.12 Ω	W = 1.270, L = 0.406	W = 50, L = 16
TL129		W1 = 1.024, W2 = 2.032	W1 = 40, W2 = 80
TL130, TL131	0.012 λ, 34.08 Ω	W = 2.032, L = 1.016	W = 80, L = 40
TL132		W1 = 2.032, W2 = 1.024	W1 = 80, W2 = 40

table continued on page 7

Reference Circuit (cont.)

Electrical Characteristics at 2170 MHz

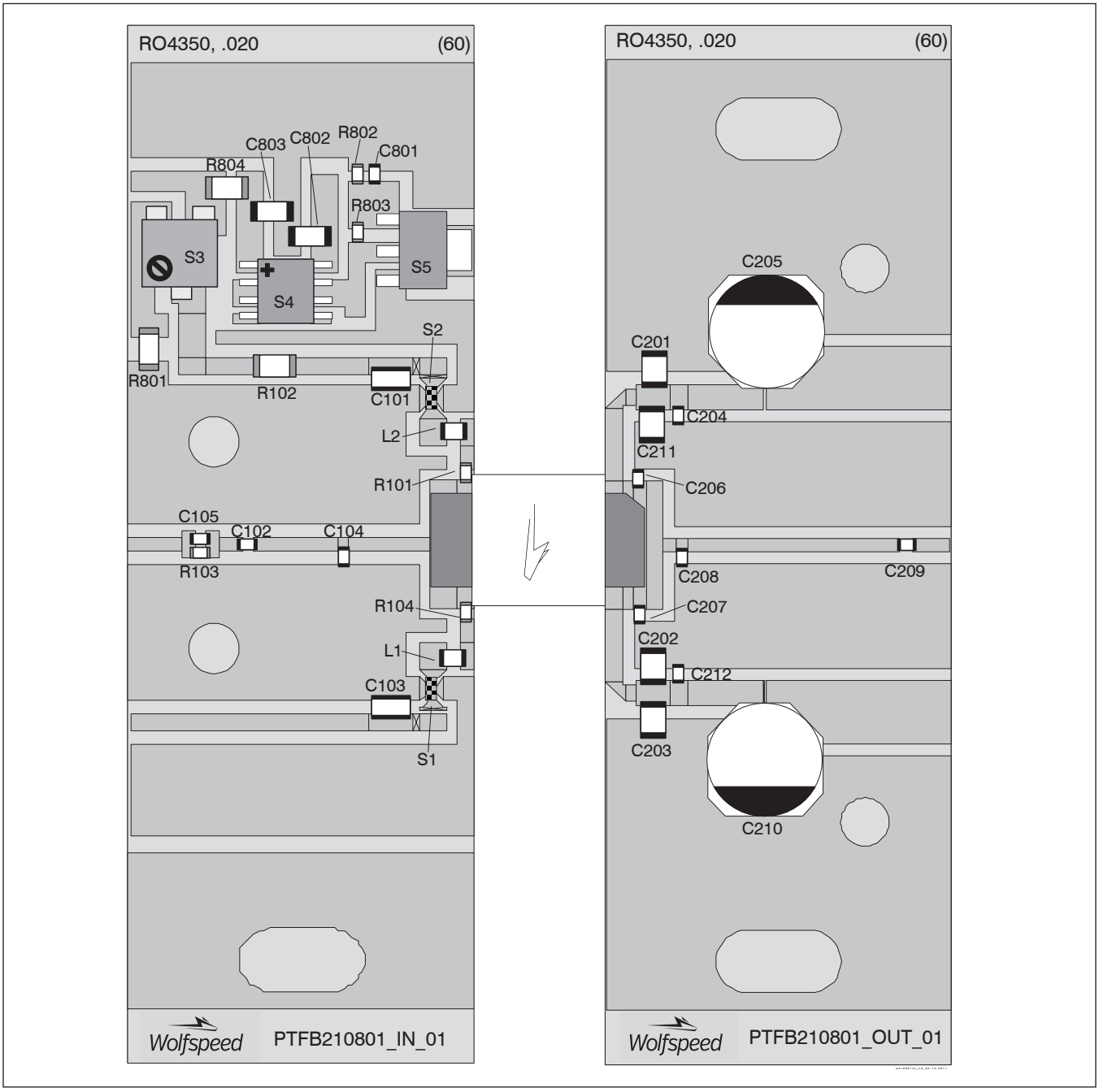
Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output			
TL201, TL203	0.009 λ, 47.12 Ω	W = 1.270, L = 0.762	W = 50, L = 30
TL202, TL204	0.064 λ, 47.12 Ω	W = 1.270, L = 5.334	W = 50, L = 210
TL205, TL206		W1 = 1.905, W2 = 2.540, W3 = 1.905 W4 = 2.540	W1 = 75, W2 = 100, W3 = 75, W4 = 100
TL207		W1 = 9.398, W2 = 1.270, W3 = 9.398 W4 = 1.270	W1 = 370, W2 = 50, W3 = 370, W4 = 50
TL208, TL209		W = 1.270	W = 50
TL210		W1 = 0.002, W2 = 0.005, Offset = 0.001	W1 = 2, W2 = 184, Offset = 55
TL211, TL225	0.172 λ, 17.67 Ω	W = 4.674, L = 13.564	W = 184, L = 534
TL212	0.011 λ, 53.93 Ω	W1 = 1.024, W2 = 1.024, W3 = 0.889	W1 = 40, W2 = 40, W3 = 35
TL213		W1 = 9.398, W2 = 0.889, W3 = 9.398 W4 = 0.889	W1 = 370, W2 = 35, W3 = 370, W4 = 35
TL214	0.016 λ, 9.59 Ω	W = 9.398, L = 1.219	W = 370, L = 48
TL215	0.032 λ, 53.93 Ω	W = 1.024, L = 2.713	W = 40, L = 107
TL216	0.185 λ, 53.93 Ω	W = 1.024, L = 15.491	W = 40, L = 610
TL217, TL228	0.002 λ, 35.71 Ω	W1 = 1.905, W2 = 1.905, W3 = 0.127	W1 = 75, W2 = 75, W3 = 5
TL218		W1 = 9.398, W2 = 9.398	W1 = 370, W2 = 370
TL219		W1 = 1.024, W2 = 9.398	W1 = 40, W2 = 370
TL220, TL227	0.068 λ, 35.71 Ω	W = 1.905, L = 5.588	W = 75, L = 220
TL221, TL222	0.016 λ, 35.71 Ω	W1 = 1.905, W2 = 1.905, W3 = 1.270	W1 = 75, W2 = 75, W3 = 50
TL223	0.012 λ, 53.93 Ω	W = 1.024, L = 0.991	W = 40, L = 39
TL224	0.011 λ, 9.59 Ω	W = 9.398, L = 0.813	W = 370, L = 32
TL226		W1 = 0.002, W2 = 0.005, Offset = –0.001	W1 = 2, W2 = 184, Offset = –55

Reference Circuit (cont.)

Circuit Assembly Information

Test Fixture Part No.	LTN/PTFB210801FA

Find Gerber files for this test fixture on the Wolfspeed Web site at *www.wolfspeed.com/RF*



Reference circuit assembly diagram (not to scale)

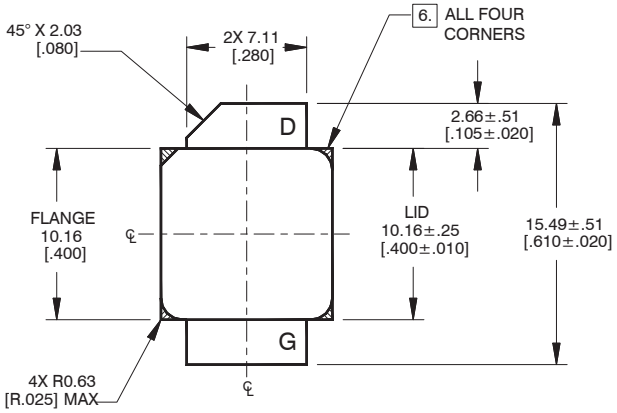
Reference Circuit (cont.)

Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C103	Capacitor, 10 µF	Digi-Key	490-4393-2-ND
C102, C105	Chip capacitor, 15 pF	ATC	800A150GT
C104	Chip capacitor, 1.5 pF	ATC	800A1T5GR
C801, C802, C803	Capacitor, 1000 pF	Digi-Key	PCC1772CT-ND
L1, L2	Inductor, 22 nH	Coilcraft	0805CS-220X_BG
R101, R103, R104	Resistor, 10 Ω	Digi-Key	P10GCT-ND
R102, R804	Resistor, 2000 Ω	Digi-Key	P2.0KECT-ND
R801	Resistor, 3000 Ω	Digi-Key	P3.0KECT-ND
R802	Resistor, 1300 Ω	Digi-Key	P1.3KGECT-ND
R803	Resistor, 1200 Ω	Digi-Key	P1.2KGECT-ND
S1, S2	EMI Suppression Capacitor	Digi-Key	NFM18PS105R0J3D
S3	Potentiometer, 2k Ω	Digi-Key	3224W-202ECT-ND
S4	Voltage Regulator	Digi-Key	LM7805
S5	Transistor	Digi-Key	BCP56
Output			
C201, C203	Capacitor, 10 µF	Digi-Key	587-1818-2-ND
C202, C211	Chip capacitor, 4.71 µF	ATC	490-1864-2-ND
C204, C212	Chip capacitor, 18 pF	ATC	800A180JT
C205, C210	Capacitor, 22 µF	Digi-Key	PCE4444TR-ND
C206, C207	Chip capacitor, 2.7 pF	ATC	800A2R7BT
C208	Chip capacitor, 2.2 pF	ATC	800A2R2BT
C209	Chip capacitor, 15 pF	ATC	800A150GT

Package Outline Specifications

Package H-37265-2



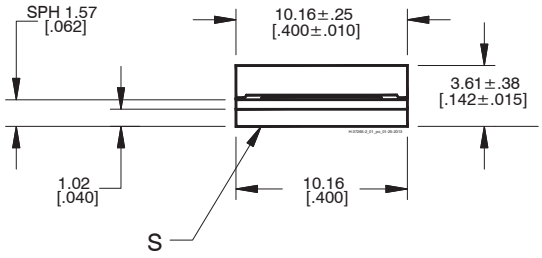


Diagram Notes—unless otherwise specified:

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: 0.10 +0.051/–0.025 [.004 +.002/–.001].
6. Exposed metal plane on top and bottom of ceramic insulator.
7. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes at each revision)
01	2011-03-30	Production	All	Data Sheet reflects advance specification for product development
01.1	2016-06-14	Production	2	Updated ordering information
02	2018-06-27	Production	All	Converted to Wolfspeed Data Sheet

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com
919.407.7816

Notes

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