

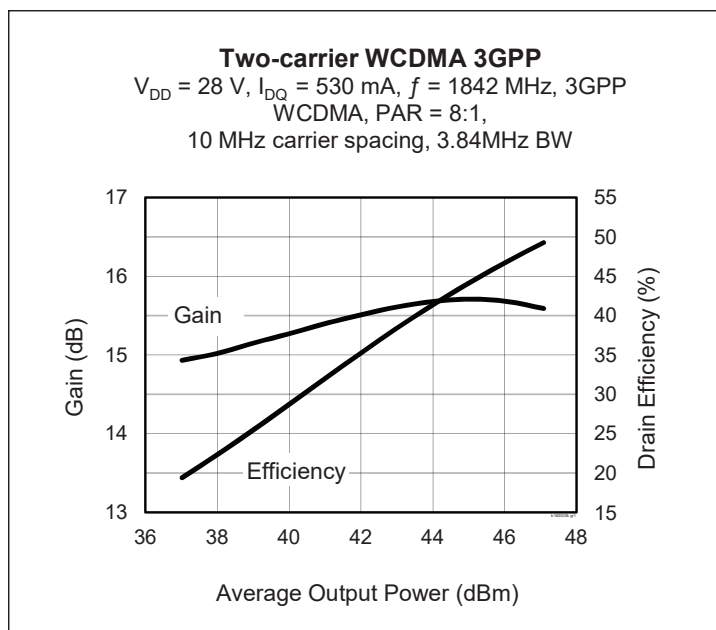
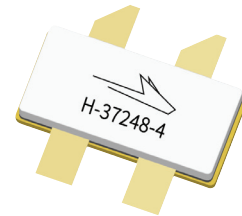
PTAB182002FC

Thermally-Enhanced High Power RF LDMOS FET 190 W, 28 V, 1805 – 1880 MHz

Description

The PTAB182002FC is a 190-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 1805 to 1880 MHz frequency band. Features include input and output matching, high gain and thermally-enhanced package with earless flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTAB182002FC
Package H-37248-4



Features

- Asymmetric Doherty design
 - Main: $P_{1dB} = 70\text{ W Typ}$
 - Peak: $P_{1dB} = 120\text{ W Typ}$
- Broadband internal matching
- Typical two-carrier WCDMA performance at 1842 MHz, 28 V (Doherty configuration)
 - Average output power = 44.6 dBm
 - Linear Gain = 15.5 dB
 - Efficiency = 46%
 - IMD = -25 dBc
- Increased negative gate-source voltage range for improved performance in Doherty amplifiers
- Integrated ESD protection
- Capable of handling 3:1 VSWR @ 30 V, 50 W (average) output power (one-carrier WCDMA signal, 10 dB PAR, Doherty test fixture)
- Pb-free and RoHS-compliant

RF Characteristics

Two-carrier WCDMA Measurements (tested in Wolfspeed Doherty test fixture)

$V_{DD} = 28\text{ V}$, $V_{GSPK} = (V_{GS} \text{ at } I_{DQ} = 900\text{ mA}) - 1.80\text{ V}$, $I_{DQ} = 520\text{ mA}$, $P_{OUT} = 29\text{ W avg.}$, $f_1 = 1870\text{ MHz}$, $f_2 = 1880\text{ MHz}$, 7.5 dB PAR

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	14.5	15.5	—	dB
Drain Efficiency	η_D	42	44	—	%
Intermodulation Distortion	IMD	—	-26.5	-24	dBc

All published data at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	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 (main)	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.15	—	Ω
On-state Resistance (peak)	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.09	—	Ω
Operating Gate Voltage (main)	$V_{DS} = 28\text{ V}$, $I_{DQ} = 520\text{ mA}$	V_{GS}	2.5	3.0	3.5	V
Operating Gate Voltage (peak)	$V_{DS} = 28\text{ V}$, $I_{DQ} = 0\text{ mA}$	V_{GS}	0.7	1.1	1.5	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	°C
Storage Temperature Range	T_{STG}	−40 to +150	°C
Thermal Resistance (main, $T_{CASE} = 70^{\circ}\text{C}$, 80 W CW class AB)	$R_{\theta JC}$	0.86	°C/W
(peak, $T_{CASE} = 70^{\circ}\text{C}$, 110 W CW class C)	$R_{\theta JC}$	0.64	°C/W

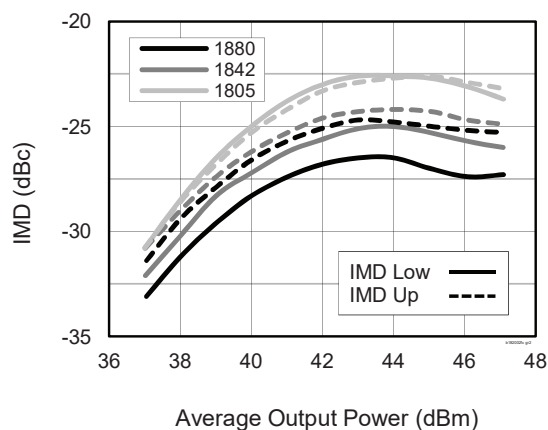
Ordering Information

Type and Version	Order Code	Package and Description	Shipping
PTAB182002FC V1 R0	PTAB182002FC-V1-R0	H-37248-4, ceramic open-cavity, earless flange	Tape & Reel, 50 pcs
PTAB182002FC V1 R250	PTAB182002FC-V1-R250	H-37248-4, ceramic open-cavity, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production Doherty test fixture)

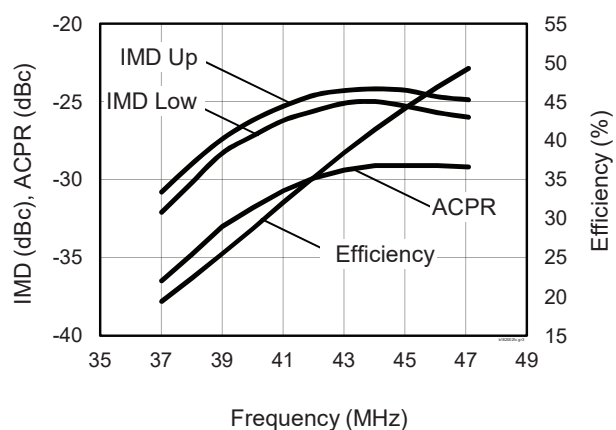
Two-carrier WCDMA 3GPP Drive-up

$V_{DD} = 28\text{ V}$, $I_{DQ} = 530\text{ mA}$,
3GPP WCDMA signal, PAR = 8 dB,
10 MHz carrier spacing, 3.84 MHz BW



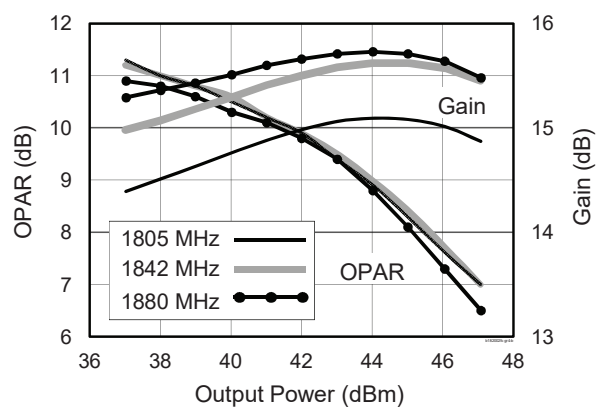
Two-carrier WCDMA 3GPP Drive-up

$V_{DD} = 28\text{ V}$, $I_{DQ} = 530\text{ mA}$, $f = 1842\text{ MHz}$, 3GPP
WCDMA, PAR = 8 dB,
10 MHz carrier spacing, 3.84 MHz BW



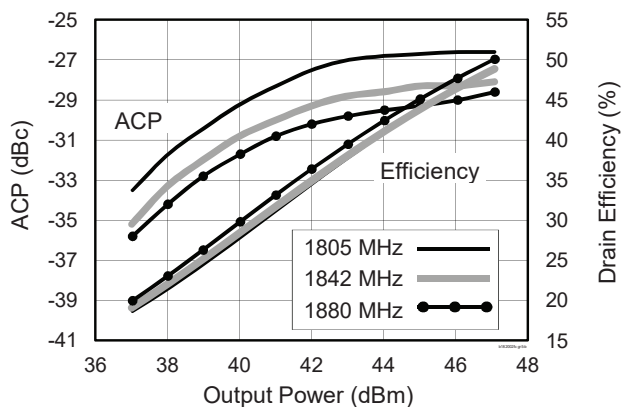
Single-carrier WCDMA

$V_{DD} = 28\text{ V}$, $I_{DQ} = 530\text{ mA}$, $V_{GS} = 1.2\text{ V}$
3GPP WCDMA signal,
10 dB PAR, 3.84 MHz BW

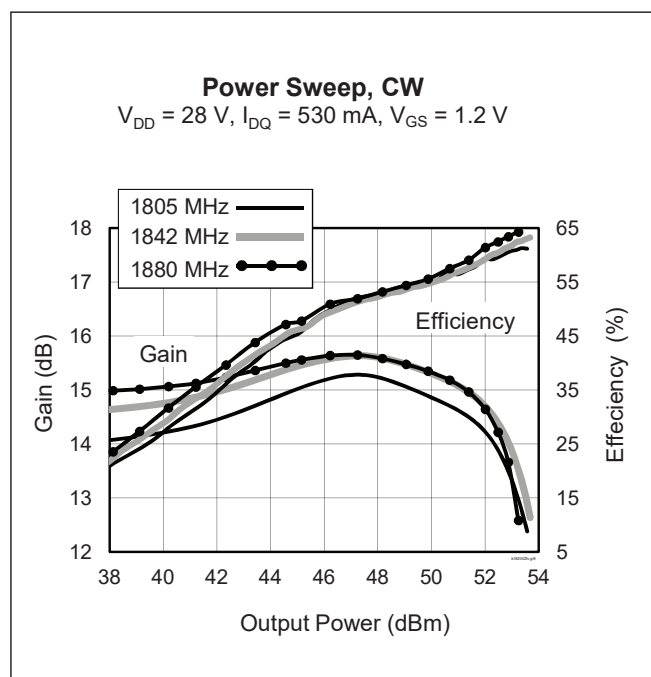
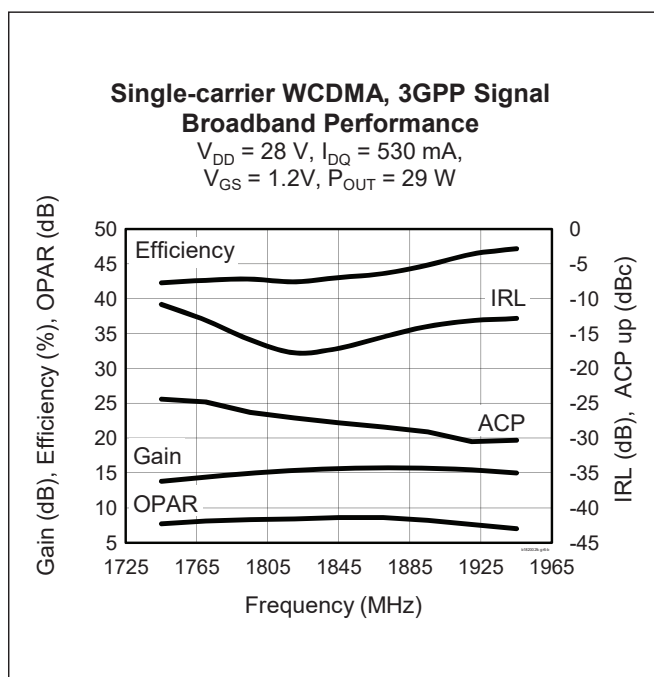


Single-carrier WCDMA

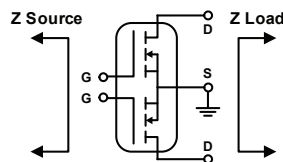
$V_{DD} = 28\text{ V}$, $I_{DQ} = 530\text{ mA}$, $V_{GS} = 1.2\text{ V}$
3GPP_WCDMA, 10 dB PAR, 3.84 MHz BW



Typical Performance (cont.)



Load Pull Performance



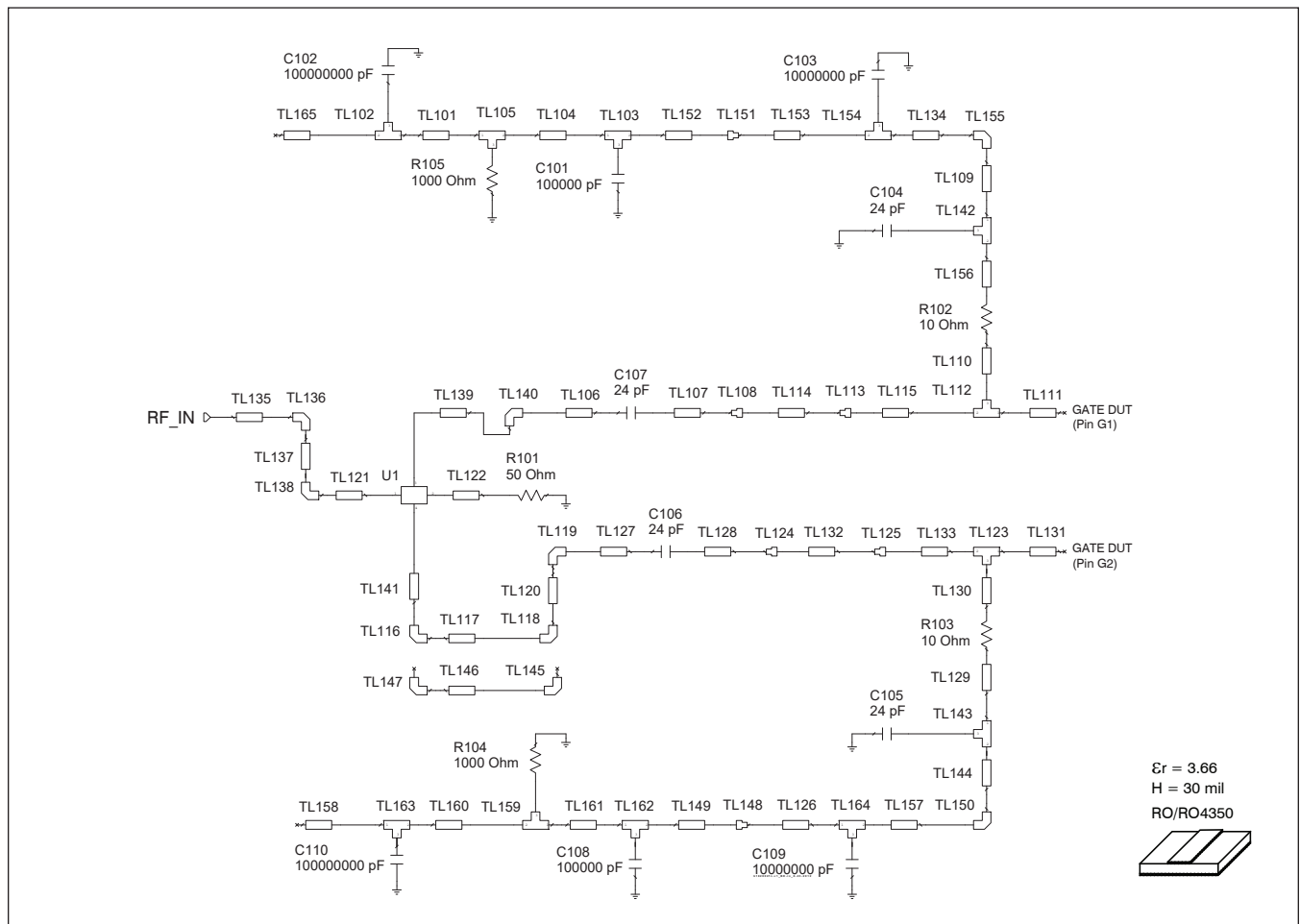
Main Side Load Pull Performance – Pulsed CW signal: 12 μsec , 10% duty cycle; 28 V, 530 mA

Class AB		P _{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Z _s Ω	Z _L Ω	Gain [dB]	P _{OUT} [dBm]	P _{OUT} [W]	PAE %	Z _L Ω	Gain [dB]	P _{OUT} [dBm]	P _{OUT} [W]	PAE %
1805	5.9 – j9.5	2.8 – j5.4	17.4	50.50	112	56.0	6.1 – j6.3	19.7	48.63	73	67.0
1842	7.5 – j9.7	2.7 – j5.7	17.2	50.26	106	54.4	6.9 – j4.8	20.0	48.08	64	66.2
1880	9.5 – j10.3	3.0 – j5.7	17.8	50.28	107	56.1	6.7 – j5.2	20.1	48.38	69	66.3

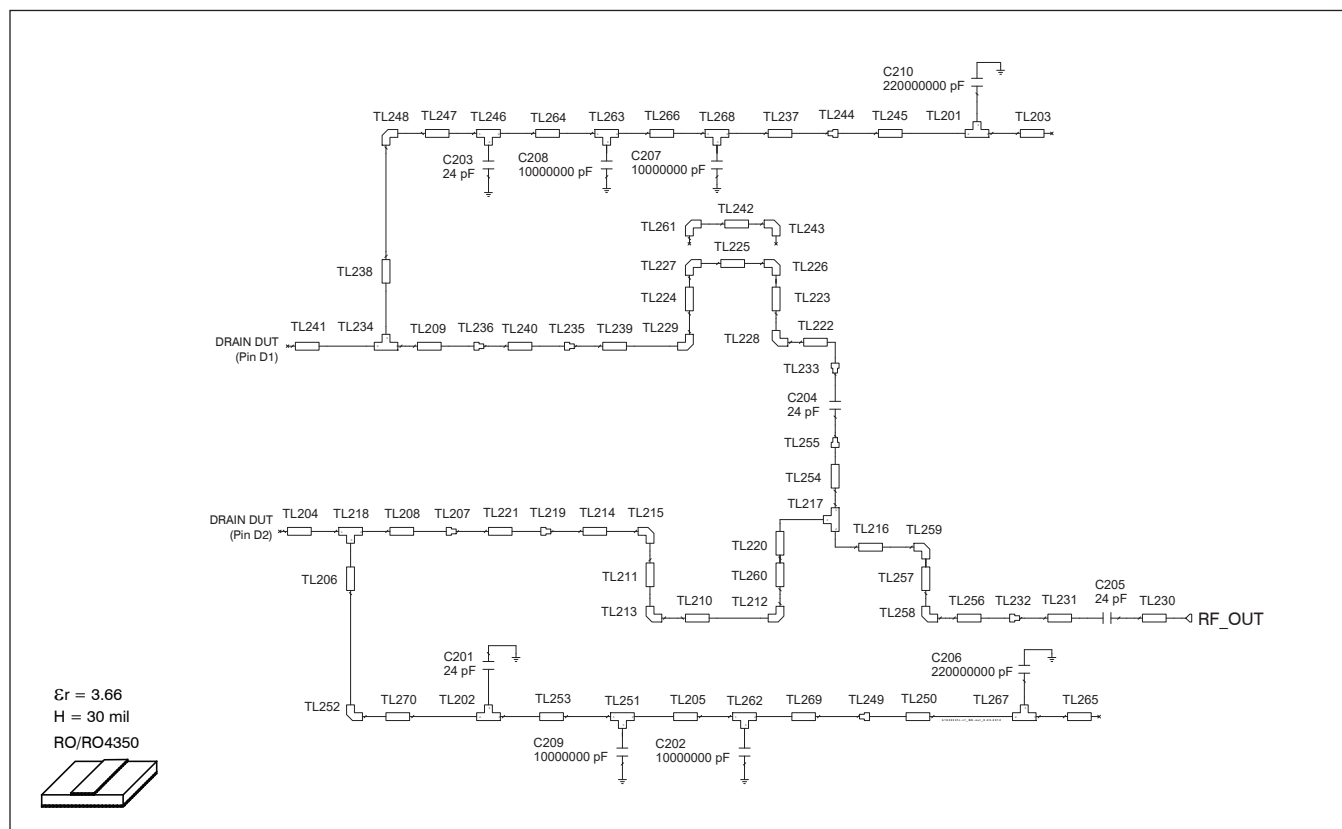
Peak Side Load Pull Performance – Pulsed CW signal: 12 μsec , 10% duty cycle; 28 V, 10 mA

Class C		P _{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Z _s Ω	Z _L Ω	Gain [dB]	P _{OUT} [dBm]	P _{OUT} [W]	PAE %	Z _L Ω	Gain [dB]	P _{OUT} [dBm]	P _{OUT} [W]	PAE %
1805	11.0 – j6.1	1.3 – j5.5	15.7	52.43	175	54.4	2.8 – j4.5	17.7	50.60	115	70.2
1842	8.0 – j4.8	1.3 – j5.8	16.2	52.38	173	54.7	2.7 – j4.7	17.8	50.50	112	69.0
1880	6.7 – j2.4	1.4 – j6.0	16.8	52.33	171	54.9	2.7 – j4.8	18.0	50.40	110	68.5

Reference Circuit



Reference Circuit (cont.)

Reference circuit output schematic for $f = 1880$ MHz

Reference Circuit

DUT PTAB182002FC

Test Fixture Part No. LTA/PTAB182002FC

PCB Rogers 4350, 0.762 mm [.030"] thick, 2 oz. copper, $\epsilon_r = 3.66$ Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF

Reference Circuit (cont.)**Reference Circuit Assembly****Electrical Characteristics at 1880 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input			
TL101	0.029λ , 28.26 Ω	W = 3.81, L = 2.67	W = 150, L = 105
TL102, TL103, TL105, TL159, TL162, TL163	0.014λ , 28.26 Ω	W1 = 3.81, W2 = 3.81, W3 = 1.27	W1 = 150, W2 = 150, W3 = 50
TL104	0.020λ , 28.26 Ω	W = 3.81, L = 1.83	W = 150, L = 72
TL106	0.032λ , 51.05 Ω	W = 1.63, L = 3.05	W = 64, L = 120
TL107	0.091λ , 51.05 Ω	W = 1.63, L = 8.64	W = 64, L = 340
TL109	0.022λ , 76.77 Ω	W = 0.76, L = 2.16	W = 30, L = 85
TL110, TL130	0.026λ , 76.77 Ω	W = 0.76, L = 2.54	W = 30, L = 100
TL111	0.012λ , 12.71 Ω	W = 10.03, L = 1.02	W = 395, L = 40
TL112	0.009λ , 12.71 Ω	W1 = 10.03, W2 = 10.03, W3 = 0.76	W1 = 395, W2 = 395, W3 = 30
TL114	0.014λ , 23.02 Ω	W = 4.95, L = 1.27	W = 195, L = 50
TL115	0.098λ , 12.71 Ω	W = 10.03, L = 8.59	W = 395, L = 338
TL117, TL146	0.013λ , 51.05 Ω	W = 1.63, L = 1.27	W = 64, L = 50
TL120	0.066λ , 51.05 Ω	W = 1.63, L = 6.27	W = 64, L = 247
TL121	0.038λ , 51.05 Ω	W = 1.63, L = 3.56	W = 64, L = 140
TL122	0.060λ , 51.05 Ω	W = 1.63, L = 5.69	W = 64, L = 224
TL123	0.009λ , 11.33 Ω	W1 = 11.43, W2 = 11.43, W3 = 0.76	W1 = 450, W2 = 450, W3 = 30
TL126	0.144λ , 76.77 Ω	W = 0.76, L = 14	W = 30, L = 551
TL127	0.037λ , 51.05 Ω	W = 1.63, L = 3.45	W = 64, L = 136
TL128	0.013λ , 51.05 Ω	W = 1.63, L = 1.19	W = 64, L = 47
TL129	0.055λ , 76.77 Ω	W = 0.76, L = 5.38	W = 30, L = 212
TL131	0.012λ , 11.33 Ω	W = 11.43, L = 1.02	W = 450, L = 40
TL132	0.055λ , 38.04 Ω	W = 2.54, L = 5.08	W = 100, L = 200
TL133	0.102λ , 11.33 Ω	W = 11.43, L = 8.89	W = 450, L = 350
TL134	0.031λ , 76.77 Ω	W = 0.76, L = 2.97	W = 30, L = 117
TL135	0.040λ , 51.05 Ω	W = 1.63, L = 3.81	W = 64, L = 149
TL137	0.023λ , 51.05 Ω	W = 1.63, L = 2.16	W = 64, L = 85
TL139	0.043λ , 51.05 Ω	W = 1.63, L = 4.06	W = 64, L = 160
TL141	0.118λ , 51.05 Ω	W = 1.63, L = 11.18	W = 64, L = 440
TL142, TL143, TL 154, TL164	0.013λ , 76.77 Ω	W1 = 0.76, W2 = 0.76, W3 = 1.27	W1 = 30, W2 = 30, W3 = 50
TL144	0.010λ , 76.77 Ω	W = 0.76, L = 0.97	W = 30, L = 38

table continued on next page

Reference Circuit (cont.)**Electrical Characteristics at 1880 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Input (cont.)			
TL149	0.078λ , 28.26 Ω	W = 3.81, L = 7.09	W = 150, L = 279
TL152	0.009λ , 28.26 Ω	W = 3.81, L = 0.81	W = 150, L = 32
TL153	0.192λ , 76.77 Ω	W = 0.76, L = 18.62	W = 30, L = 733
TL156	0.054λ , 76.77 Ω	W = 0.76, L = 5.23	W = 30, L = 206
TL157	0.024λ , 76.77 Ω	W = 0.76, L = 2.31	W = 30, L = 91
TL158, TL165	0.042λ , 28.26 Ω	W = 3.81, L = 3.81	W = 150, L = 150
TL160	0.013λ , 28.26 Ω	W = 3.81, L = 1.19	W = 150, L = 47
TL161	0.025λ , 28.26 Ω	W = 3.81, L = 2.31	W = 150, L = 91

Output

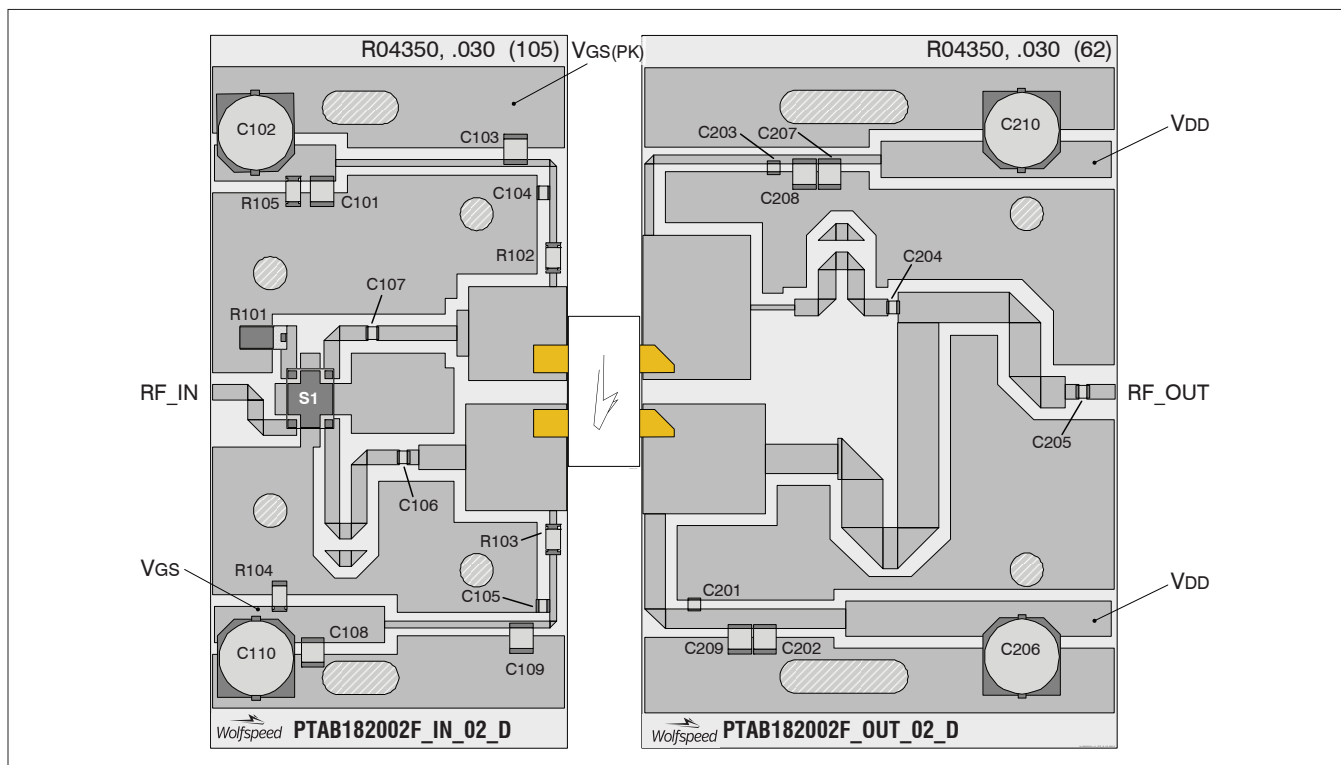
TL201, TL267	0.014λ , 28.26 Ω	W1 = 3.81, W2 = 3.81, W3 = 1.27	W1 = 150, W2 = 150, W3 = 50
TL202, TL251, TL262	0.014λ , 42.19 Ω	W1 = 2.18, W2 = 2.18, W3 = 1.27	W1 = 86, W2 = 86, W3 = 50
TL203, TL265	0.099λ , 28.26 Ω	W = 3.81, L = 9.04	W = 150, L = 356
TL204	0.002λ , 11.04 Ω	W = 11.76, L = 0.13	W = 463, L = 5
TL205	0.015λ , 42.19 Ω	W = 2.18, L = 1.42	W = 86, L = 56
TL206	0.109λ , 42.19 Ω	W = 2.18, L = 10.16	W = 86, L = 400
TL208	0.123λ , 11.04 Ω	W = 11.76, L = 10.72	W = 463, L = 422
TL209	0.120λ , 8.6 Ω	W = 15.52, L = 10.39	W = 611, L = 409
TL210	0.017λ , 25.19 Ω	W = 4.42, L = 1.52	W = 174, L = 60
TL211, L260	0.057λ , 25.19 Ω	W = 4.42, L = 5.13	W = 174, L = 202
TL214	0.005λ , 25.19 Ω	W = 4.42, L = 0.43	W = 174, L = 17
TL216	0.083λ , 31.13 Ω	W = 3.35, L = 7.62	W = 132, L = 300
TL217	0.048λ , 31.13 Ω	W1 = 3.35, W2 = 3.35, W3 = 4.42	W1 = 132, W2 = 132, W3 = 174
TL218	0.025λ , 11.04 Ω	W1 = 11.76, W2 = 11.76, W3 = 2.18	W1 = 463, W2 = 463, W3 = 86
TL220	0.184λ , 25.19 Ω	W = 4.42, L = 16.71	W = 174, L = 658
TL221	0.084λ , 32.41 Ω	W = 3.18, L = 7.77	W = 125, L = 306
TL222, TL239	0.027λ , 47.41 Ω	W = 1.83, L = 2.54	W = 72, L = 100
TL223, TL224	0.034λ , 47.41 Ω	W = 1.83, L = 3.18	W = 72, L = 125
TL225, TL242	0.014λ , 47.41 Ω	W = 1.83, L = 1.27	W = 72, L = 50
TL230	0.032λ , 51.05 Ω	W = 1.63, L = 3.05	W = 64, L = 120
TL231	0.016λ , 51.05 Ω	W = 1.63, L = 1.5	W = 64, L = 59

table continued on next page

Reference Circuit (cont.)**Electrical Characteristics at 1880 MHz**

Transmission Line	Electrical Characteristics	Dimensions: mm	Dimensions: mils
Output (cont.)			
TL234	0.011 λ , 8.6 Ω	W1 = 15.52, W2 = 15.52, W3 = 0.91	W1 = 611, W2 = 611, W3 = 36
TL237	0.051 λ , 70.38 Ω	W = 0.91, L = 4.93	W = 36, L = 194
TL238	0.079 λ , 70.38 Ω	W = 0.91, L = 7.62	W = 36, L = 300
TL240	0.049 λ , 89.14 Ω	W = 0.53, L = 4.78	W = 21, L = 188
TL241	0.002 λ , 8.6 Ω	W = 15.52, L = 0.13	W = 611, L = 5
TL245	0.156 λ , 28.26 Ω	W = 3.81, L = 14.27	W = 150, L = 562
TL246, TL263, TL268	0.013 λ , 70.38 Ω	W1 = 0.91, W2 = 0.91, W3 = 1.27	W1 = 36, W2 = 36, W3 = 50
TL247	0.127 λ , 70.38 Ω	W = 0.91, L = 12.24	W = 36, L = 482
TL250	0.198 λ , 28.26 Ω	W = 3.81, L = 18.11	W = 150, L = 713
TL253	0.038 λ , 42.19 Ω	W = 2.18, L = 3.58	W = 86, L = 141
TL254	0.0003 λ , 31.13 Ω	W = 3.35, L = 0.03	W = 132, L = 1
TL256	0.028 λ , 31.13 Ω	W = 3.35, L = 2.54	W = 132, L = 100
TL257	0.062 λ , 31.13 Ω	W = 3.35, L = 5.69	W = 132, L = 224
TL264	0.021 λ , 70.38 Ω	W = 0.91, L = 2.03	W = 36, L = 80
TL266	0.015 λ , 70.38 Ω	W = 0.91, L = 1.42	W = 36, L = 56
TL269	0.086 λ , 42.19 Ω	W = 2.18, L = 8	W = 86, L = 315
TL270	0.027 λ , 42.19 Ω	W = 2.18, L = 2.51	W = 86, L = 99

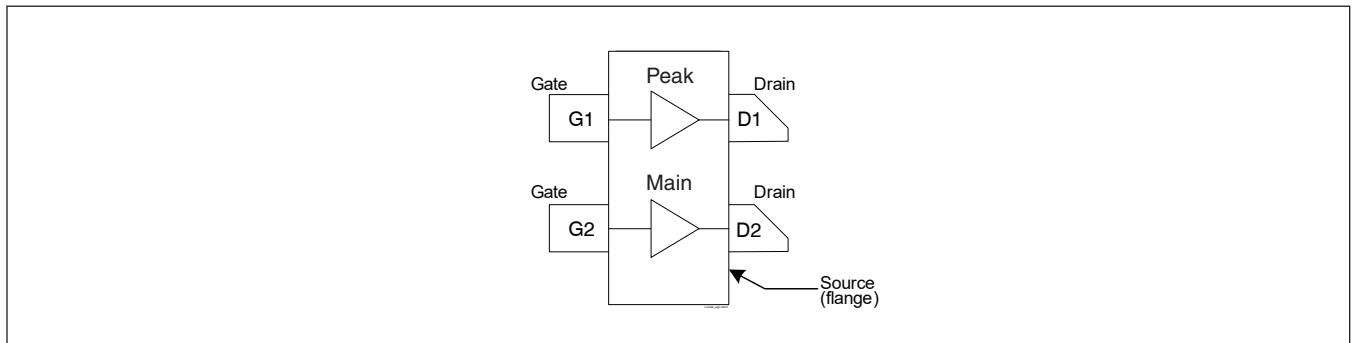
Reference Circuit (cont.)



Reference circuit assembly diagram (not to scale)

Components Information

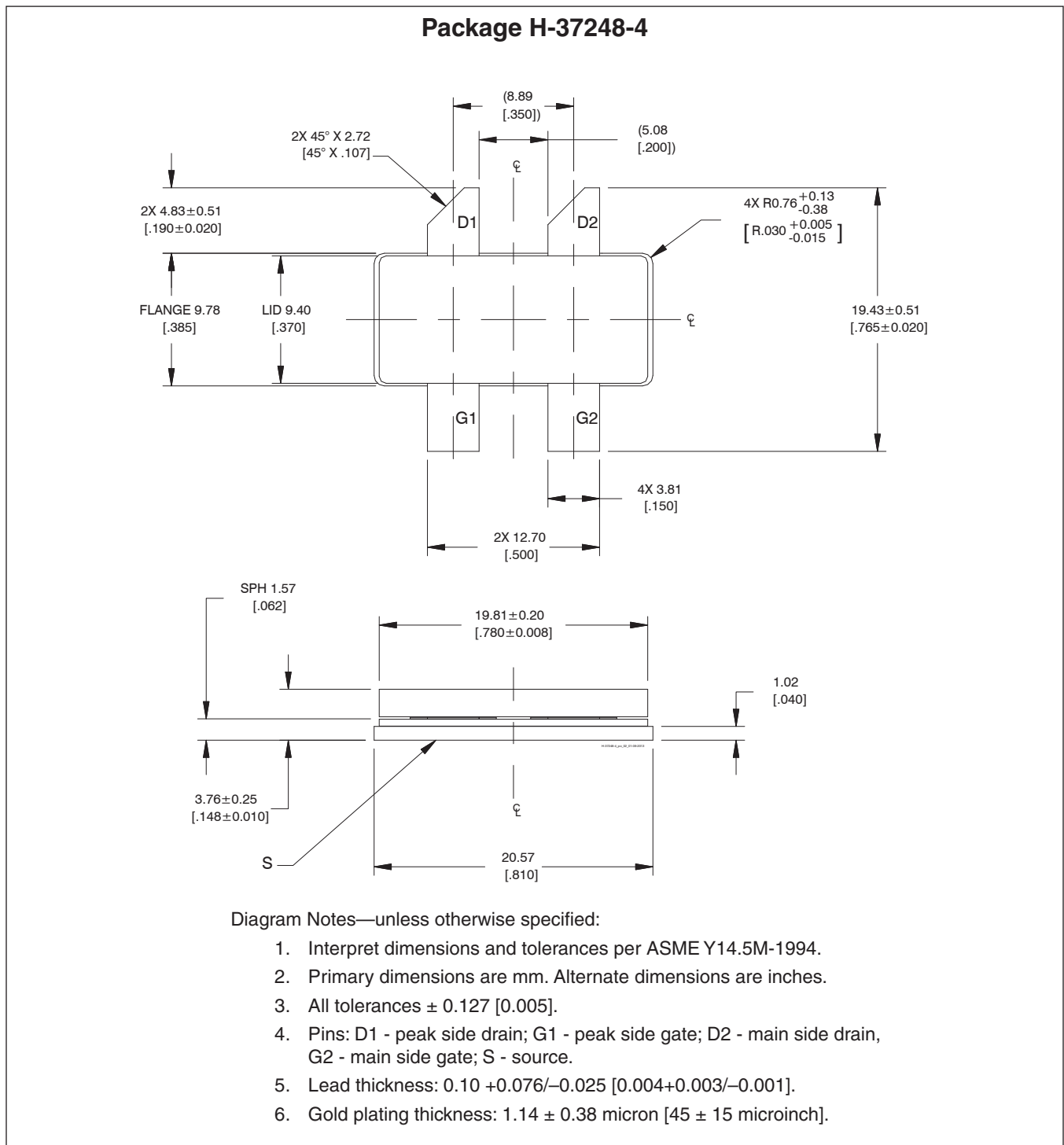
Component	Description	Suggested Supplier	P/N
Input			
C101, C108	Chip capacitor, 0.1 μ F	Kemet	C120C104K5RACTU
C102, C110	Capacitor, 100 μ F	Panasonic	EEE-FP1V101AP
C103, C109	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
C104, C105, C106, C107	Chip capacitor, 24 pF	ATC	ATC100A240JW150XB
R101	Resistor, 50 Ω	Anaren	C16A5024
R102, R103	Resistor, 10 Ω	Panasonic	ERJ-8GEYJ100V
R104, R105	Resistor, 1000 Ω	Panasonic	ERJ-8GEYJ102V
U1 / S1	90° RF directional coupler	Anaren	X3C19P1-05S
Output			
C201, C203, C204, C205	Chip capacitor, 24 pF	ATC	ATC100A240JW150XB
C202, C207, C208, C209	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
C206, C210	Capacitor, 220 μ F	Panasonic	EEEF1V221AP

Pinout Diagram (top view)

Lead connections for PTAB182002FC

See next page for Package Outline Specifications

Package Outline Specifications



Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
04.1	2016-06-09	Data Sheet	2	Updated ordering code to R0
05	2018-06-22	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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