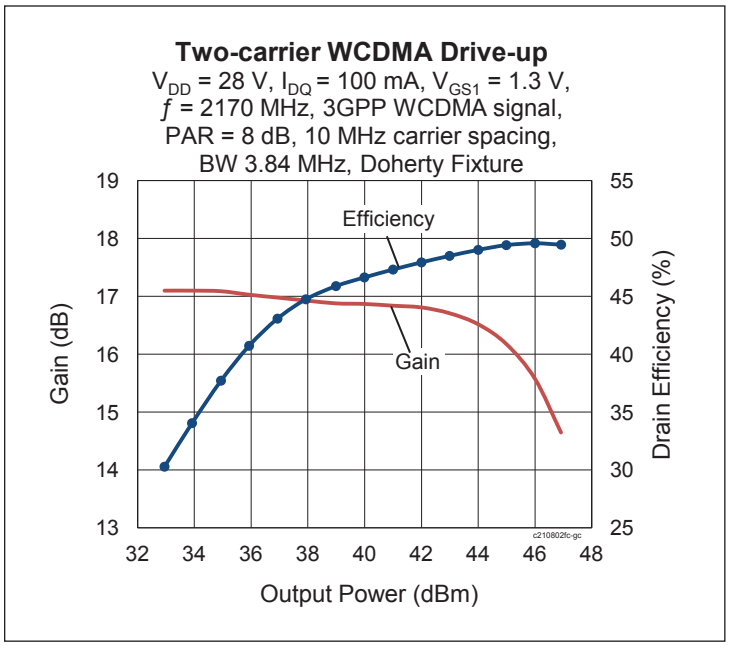
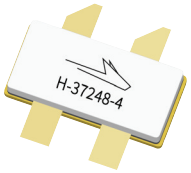
PTAC210802FC

Thermally-Enhanced High Power RF LDMOS FET
80 W, 28 V, 1805 – 2170 MHz

Description

The PTAC210802FC is an 80-watt LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 1805 to 2170 MHz frequency band. Features include dual-path design, input 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.





PTAC210802FC
Package H-37248-4

Features

- Asymmetrical design
  - Main: P1dB = 19 W Typ
  - Peak: P1dB = 60 W Typ
- Broadband internal matching
- Wide video bandwidth
- Typical CW pulsed performance, 2170 MHz, 28 V (Doherty fixture)
  - Output power @ P_{3dB} = 75 W
  - Efficiency = 48%
  - Gain @ P3dB = 14 dB
- Typical CW pulsed performance, 1880 MHz, 28 V (Doherty fixture)
  - Output power @ P_{1dB} = 45 W
  - Output power @ P_{3dB} = 80 W
  - Efficiency = 48%
  - Gain@ P_{3dB} = 14 dB
- Capable of handling 10:1 VSWR @28 V, 80 W (CW) output power
- Integrated ESD protection : Human Body Model, Class 1B (per JESD22-A114)
- Pb-free and RoHS compliant

RF Characteristics

Two-carrier WCDMA Specifications (tested in Wolfspeed Doherty test fixture)
V_{DD} = 28 V, I_{DQ} = 85 mA, V_{GS1} = 1.3 V, P_{OUT} = 5 W avg, f_1 = 2165 MHz, f_2 = 2175 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF, 10 MHz carrier spacing

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	15.5	—	17.5	dB
Drain Efficiency	η_D	39	43	—	%
Intermodulation Distortion	IMD	—	–31	–26	dBc
Output PAR at 0.01% probability on CCDF	OPAR	8	—	—	dB

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-carrier WCDMA Specifications (not subject to production test, verified by design/characterization in Wolfspeed Doherty test fixture)
V_{DD} = 28 V, I_{DQ} = 150 mA, V_{GS1} = 2 V, P_{OUT} = 5 W avg, f_1 = 1880 MHz, f_2 = 1870 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF, 10 MHz carrier spacing

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	18.3	19.5	dB
Drain Efficiency	η_D	33.5	36	—	%
Adjacent Channel Power Ratio	ACPR	—	–38	–33	dBc

DC Characteristics (each side)

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	µA
		V_{DS} = 63 V, V_{GS} = 0 V	I_{DSS}	—	—	10	µA
Gate Leakage Current		V_{GS} = 10 V, I_{DQ} = 0 V	I_{GSS}	—	—	1	V
On-State Resistance	(main)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.6	—	Ω
	(peak)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.19	—	Ω
Operating Gate Voltage	(main)	V_{DS} = 28 V, I_{DQ} = 85 mA	V_{GS}	2.30	2.65	3.0	V
	(peak)	V_{DS} = 28 V, I_{DQ} = 360 mA	V_{GS}	2.35	2.70	3.05	V

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–6 to +10	V
Operating Voltage	V_{DD}	0 to +32	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

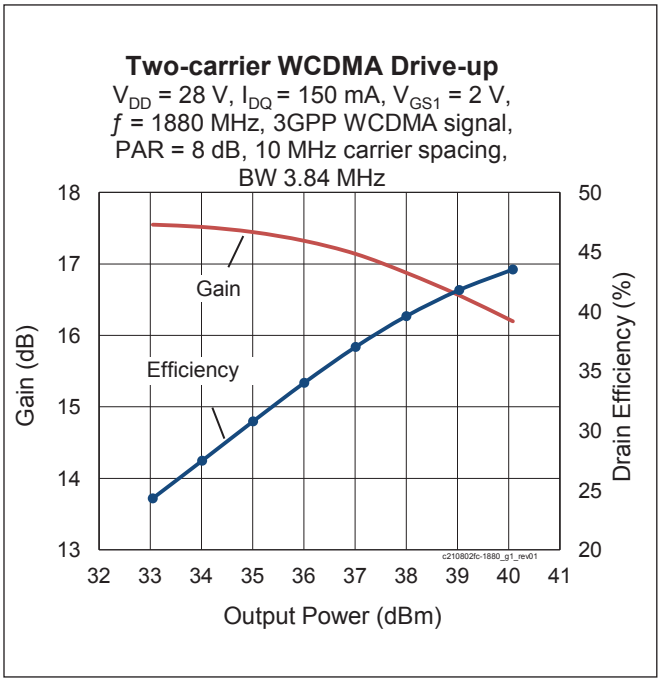
Thermal Characteristics

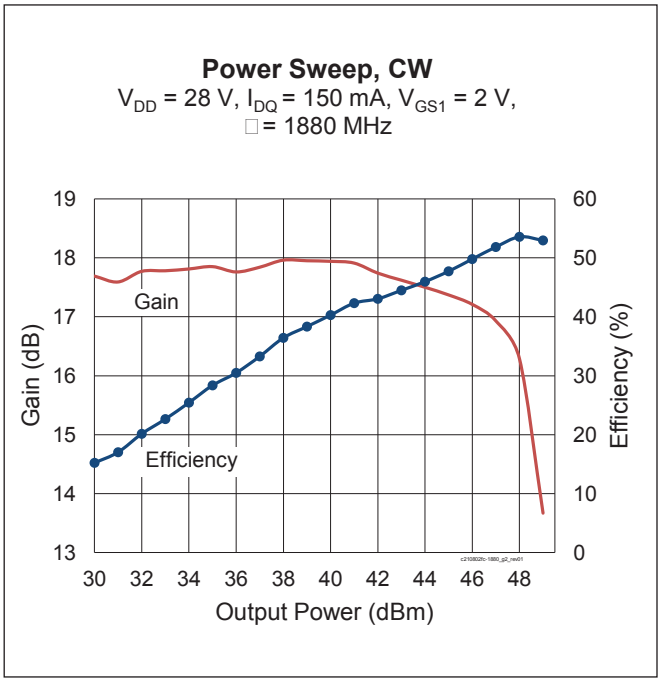
Characteristic	Symbol	Value	Unit
Thermal Resistance (main) (T_{CASE} = 70 °C, 19 W (CW), V_{DD} = 28 V, I_{DQ} = 85 mA	$R_{\theta JC}$	2.5	°C/W
Thermal Resistance (peak) (T_{CASE} = 70 °C, 60 W (CW), V_{DD} = 28 V, I_{DQ} = 360 mA	$R_{\theta JC}$	0.8	°C/W

Ordering Information

Type and Version	Order Code	Package Description	Shipping
PTAC210802FC V1 R0	PTAC210802FC-V1-R0	H-37248-4, earless flange	Tape & Reel, 50 pcs
PTAC210802FC V1 R250	PTAC210802FC-V1-R250	H-37248-4, earless flange	Tape & Reel, 250 pcs
PTAC210802FC V1 S250	PTAC210802FC-V1-S250	H-37248-4, earless flange	Tape & Reel, 250 pcs

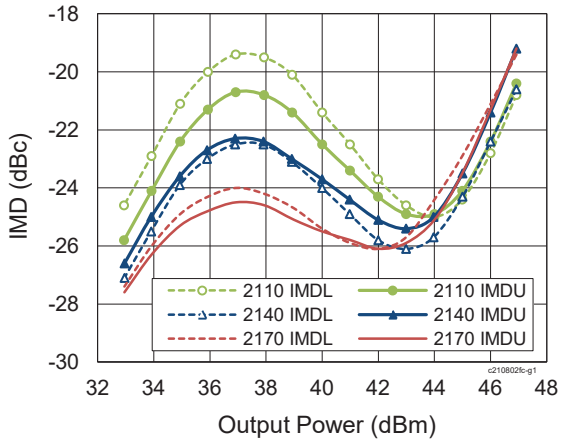
Typical Performance (data taken in a Doherty test fixture)



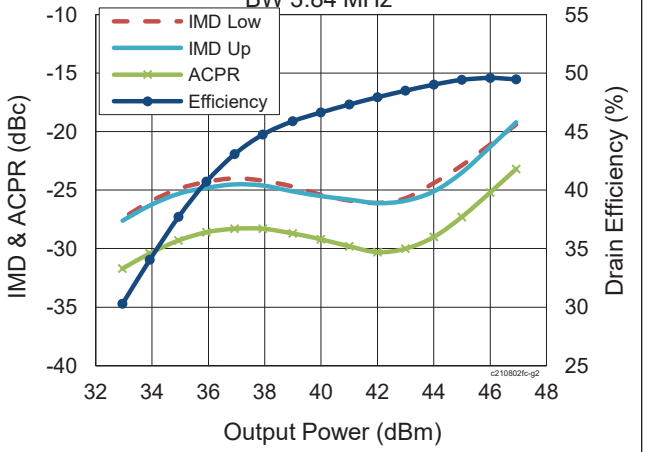


Typical Performance (cont.)

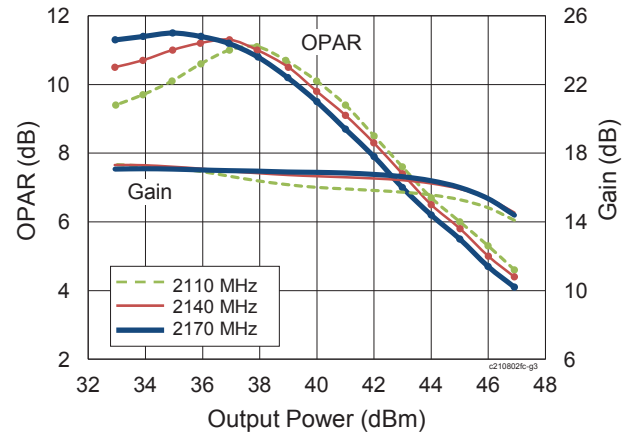
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 100 mA, V_{GS1} = 1.3 V,
3GPP WCDMA signal, PAR = 8 dB,
10 MHz carrier spacing, BW 3.84 MHz



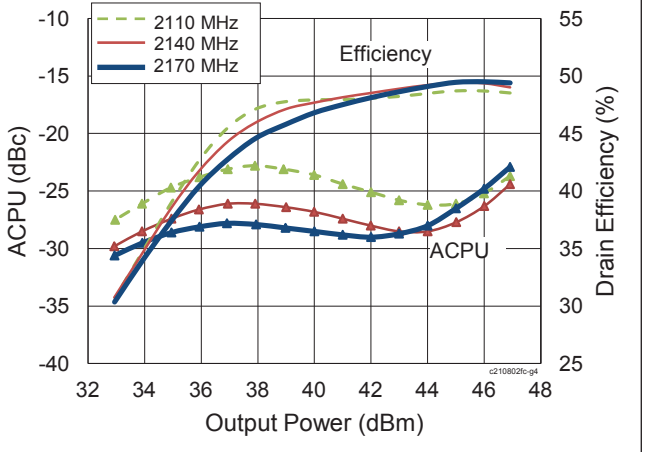
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 100 mA, V_{GS1} = 1.3 V,
f = 2170 MHz, 3GPP WCDMA signal,
PAR = 8 dB, 10 MHz carrier spacing,
BW 3.84 MHz



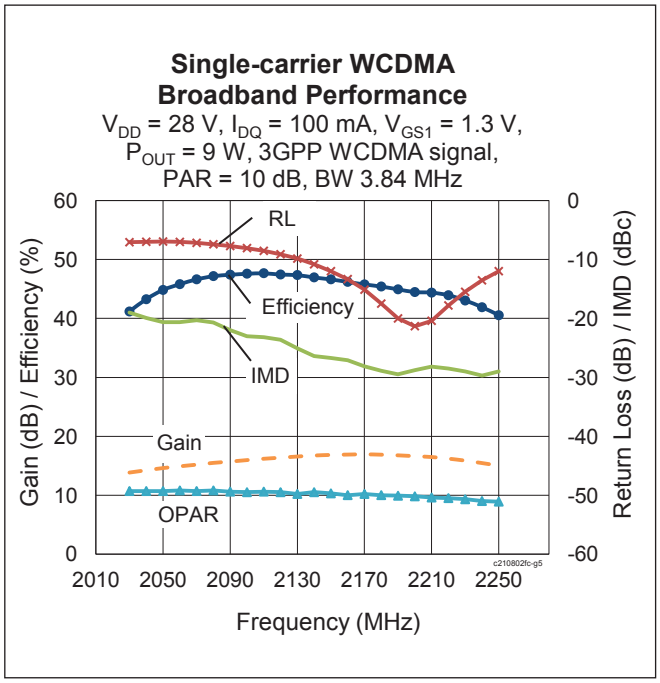
Single-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 100 mA, V_{GS1} = 1.3 V
3GPP WCDMA signal, PAR = 10 dB,
BW 3.84 MHz

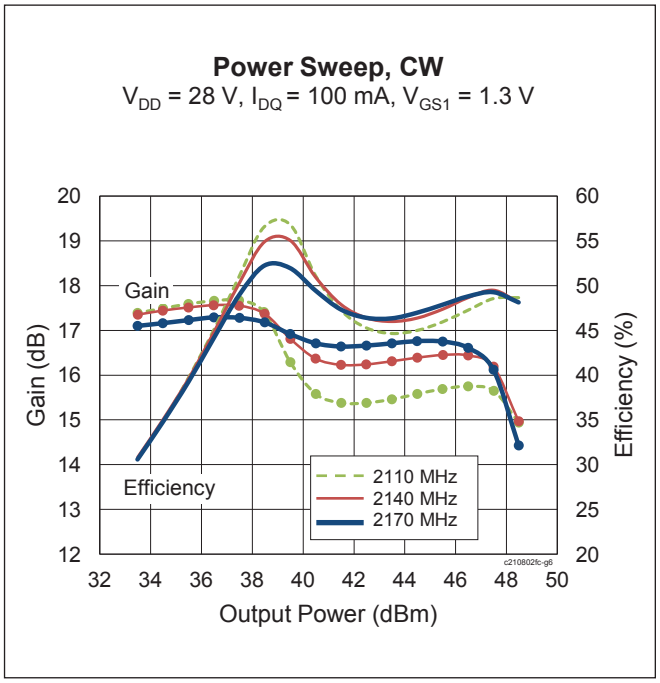


Single-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 100 mA, V_{GS1} = 1.3 V,
3GPP WCDMA signal, PAR = 10 dB,
BW 3.84 MHz

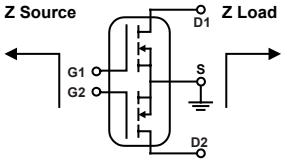


Typical Performance (cont.)





Load Pull Performance



Main Side Load Pull Performance – Pulsed CW signal: 16 µsec, 10% duty cycle; V_{DD} = 28 V, 100 mA

		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]
2110	28.4 – j28.1	15.1 – j11.9	20.8	43.40	22	50	4.6 – j5.2	23.6	41.3	13	68.1
2140	32.4 – j27.7	7.7 – j10	22.0	43.50	22	61	4.15 – j6	23.9	41.3	13	71.9
2170	45.1 – j33.3	10.8 – j10.6	21.6	43.64	23	58	5.2 – j7.2	23.4	42.1	16	68.6

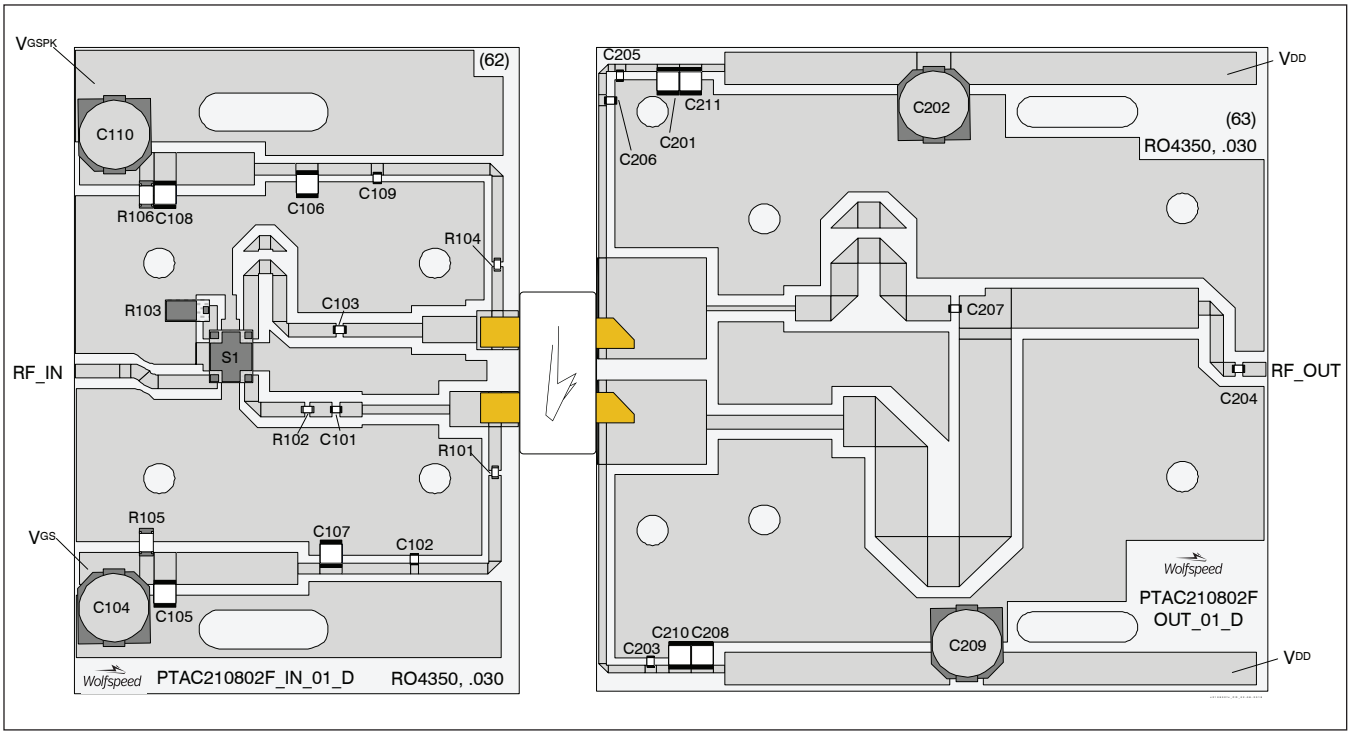
Peak Side Load Pull Performance – Pulsed CW signal: 16 µsec, 10% duty cycle; V_{DD} = 28 V, V_{Gs1} = 1.41 V, Doherty Class C

		P_{3dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]
2110	14.8 – j14.6	2.4 – j7.4	14.1	49.60	91	62.0	1.6 – j6.0	15.3	48.3	68	72.5
2140	20.6 – j13.6	2.7 – j7.8	14.0	49.50	89	58.8	1.8 – j6.5	15.2	48.7	74	68.5
2170	24.5 – j9.8	2.6 – j8.1	13.9	49.60	91	57.7	2.0 – j6.6	15.3	48.6	72	67.9

Reference Circuit

Reference Circuit Assembly	
DUT	PTAC210802FC
Test Fixture Part No.	LTA/PTAC210802FC
PCB	Rogers 4350, 0.762 mm [0.030"] thick, 2 oz. copper, ε_r = 3.66

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



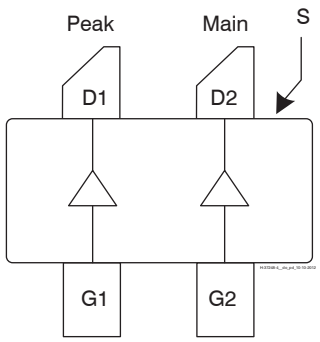
Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

Components Information

Component	Description	Supplier	P/N
Input			
C101, C102, C103, C109	Chip capacitor, 24 pF	ATC	ATC800A240JT250XB
C104, C110	Capacitor, 100 µF	Panasonic Electronic Components	EEE-FP1V101AP
C105, C108	Chip capacitor, 0.1 µF	Kemet	C1210C104K5RACTU
C106, C107	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
R101, R102, R104	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-3GEYJ100V
R103	Resistor, 50 Ω	Anaren	C16A50Z4
R105, R106	Resistor, 1000 Ω	Panasonic Electronic Components	ERJ-8GEYJ102V
S1	Hybrid coupler	Anaren	X3C21P1-03S
Output			
C201, C208, C210, C211	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C202, C209	Capacitor, 220 µF	Panasonic Electronic Components	EEE-FP1V221AP
C203, C204, C205, C206, C207	Chip capacitor, 24 pF	ATC	ATC800A240JT250XB

Pinout Diagram (top view)



Pin	Description
D1	Drain device 1 (Peak)
D2	Drain device 2 (Main)
G1	Gate device 1 (Peak)
G2	Gate device 2 (Main)
S	Source (flange)

Lead connections for PTAC210802FC

Package Outline Specifications

Package H-37248-4

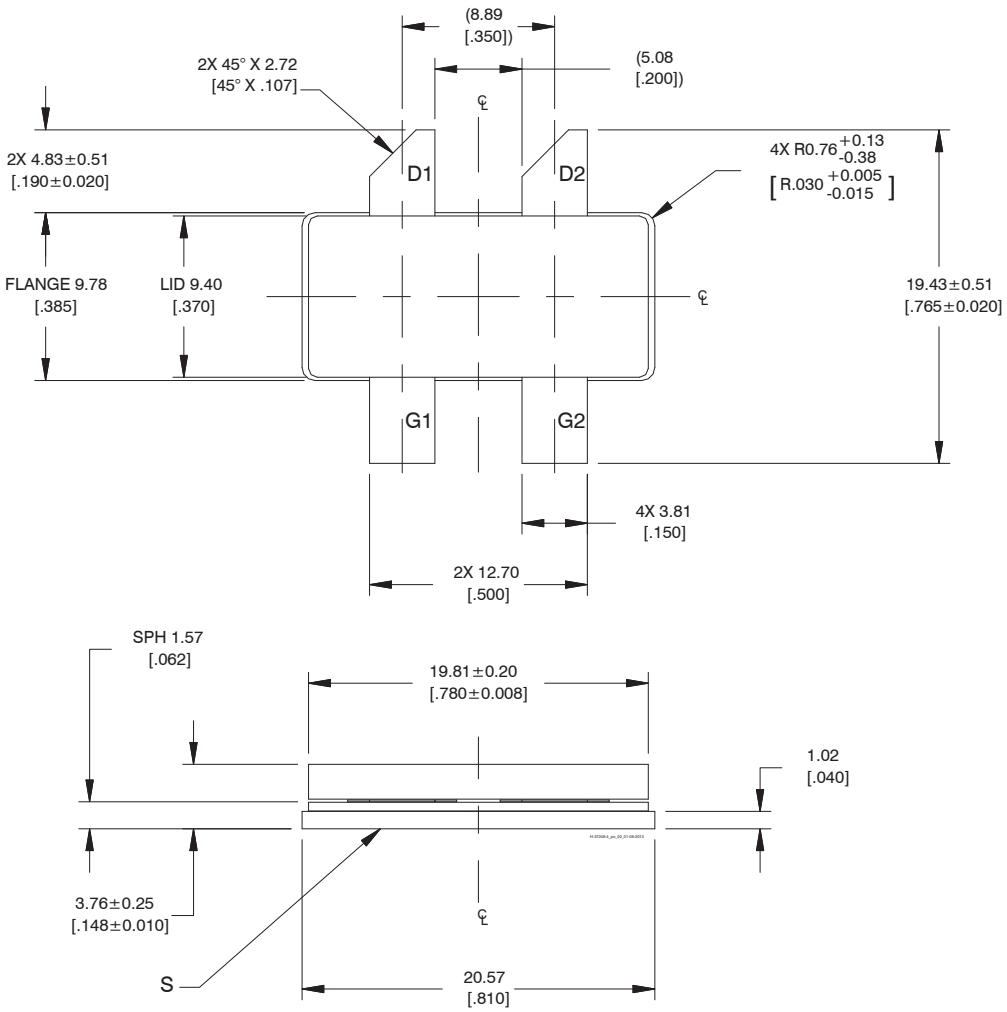


Diagram Notes—unless otherwise specified:

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: D1, D2 – drains; G1, G2 – gates; S – source.
5. Lead thickness: 0.10 + 0.076/–0.025 mm [0.004+0.003/–0.001 inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2013-06-11	Advance	All	Data Sheet reflects advance specification for product development
01.1	2012-06-12	Advance	2	Updated power level measured for thermal data
02	2013-10-17	Production	All	Data Sheet reflects released product specification
03	2013-12-17	Production	1 2 7	Added ESD classification, revised two-carrier WCDMA Specifications Added operating voltage in Maximum Ratings table Updated package outline
04	2014-05-14	Production	2	Revised juntion temperature in Maximum Ratings table
05	2014-10-31	Production	1	Revised ESD classification. Corrected IMD to ACPR in RF Characteristics table.
05.1	2015-12-23	Production	2	DC Chracteristic Table
05.2	2016-06-17	Production	2	Updated ordering code to include R0
06	2017-04-07	Production	1	Updated RF Characteristics table to include OPAR
06.1	2018-02-08	Production	1, 3	Updated RF Characteristics table and ordering information
07	2018-06-25	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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