

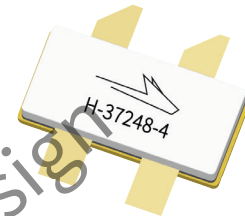
PTAC240502FC

Thermally-Enhanced High Power RF LDMOS FET
50 W, 28 V, 2300 – 2400 MHz

Description

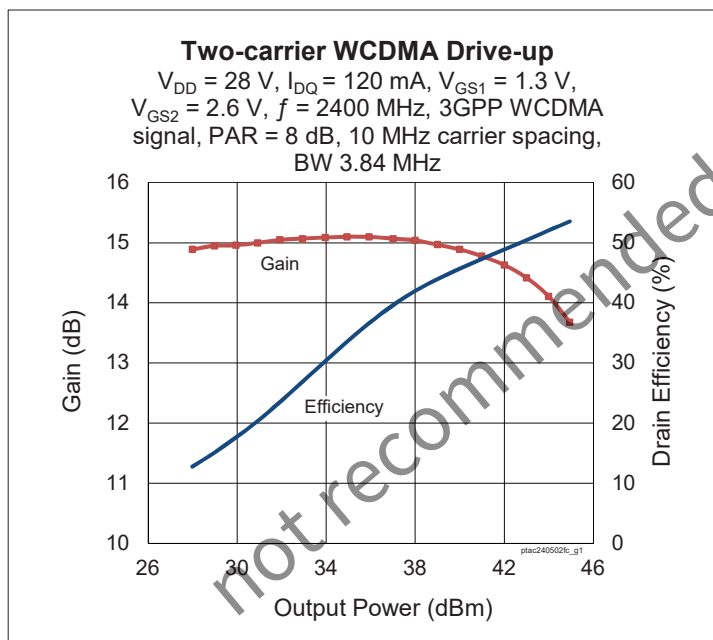
The PTAC240502FC is a 47-watt LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 2300 to 2400 MHz frequency band. Features include dual-path design, input matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTAC240502FC
Package H-37248-4



Features

- Input matched
- Asymmetric Doherty design
 - Main: P1dB = 17 W Typ
 - Peak: P1dB = 33 W Typ
- Typical Pulsed CW performance, 2350 MHz, 28 V, 160 μ s pulse width, 10% duty cycle, Doherty Configuration
 - Output power at P1dB = 45.7 W
 - Efficiency = 46.2%
 - Gain = 14.6 dB
- Typical single-carrier WCDMA performance, 2350 MHz, 28 V, 8.4 dB PAR @ 0.01% CCDF
 - Output power = 8.91 W
 - Efficiency = 44.2%
 - Gain = 14.2 dB
 - ACPR = -31 dBc @ 5 MHz
- Capable of handling 10:1 VSWR @ 28 V, 50 W (CW) output power
- Integrated ESD protection : Human Body Model, Class 1B (per JESD22-A114)
- Low thermal resistance
- Pb-free and RoHS compliant



RF Characteristics

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

$V_{DD} = 28$ V, $I_{DQ} = 120$ mA, $P_{OUT} = 10$ W avg, $V_{GS1} = 1.3$ V, $f_1 = 2345$ MHz, $f_2 = 2355$ MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Linear Gain	G_{ps}	13	14.3	—	dB
Drain Efficiency	η_D	41	44	—	%
Intermodulation Distortion	IMD	—	-33	-25	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	μA
	$V_{DS} = 63\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	—	—	10	μA
On-State Resistance (main)	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.4	—	Ω
	(peak) $V_{GS} = 10\text{ V}$, $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.2	—	Ω
Operating Gate Voltage (main)	$V_{DS} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$	V_{GS}	2.6	2.7	2.8	V
	(peak) $V_{DS} = 28\text{ V}$, $I_{DQ} = 0\text{ mA}$	V_{GS}	1.2	1.3	1.5	V
Gate Leakage Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	—	—	1	μA

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	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-65 to +150	$^{\circ}\text{C}$
Thermal Resistance ($T_{CASE} = 60^{\circ}\text{C}$, 50 W CW)	$R_{\theta JC}$	1.29	$^{\circ}\text{C/W}$

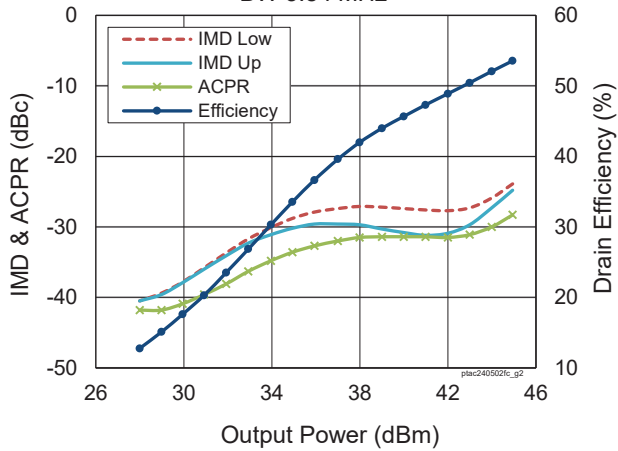
Ordering Information

Type and Version	Order Code	Package Description	Shipping
PTAC240502FC V1 R0	PTAC240502FC-V1-R0	H-37248-4, earless flange	Tape & Reel, 50 pcs
PTAC240502FC V1 R250	PTAC240502FC-V1-R250	H-37248-4, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

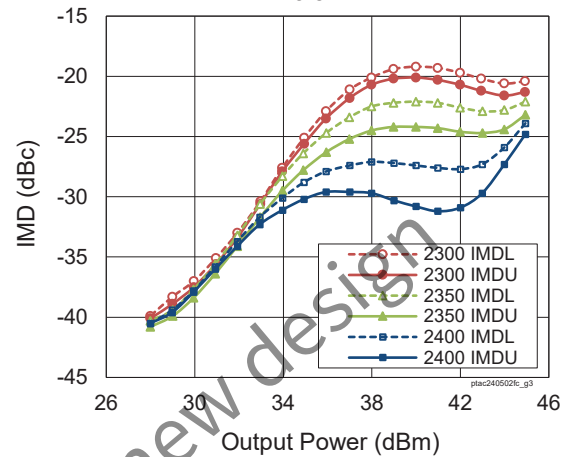
Two-carrier WCDMA Drive-up

$V_{DD} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$, $V_{GS1} = 1.3\text{ V}$,
 $V_{GS2} = 2.6\text{ V}$, $f = 2400\text{ MHz}$, 3GPP WCDMA
 signal, PAR = 8 dB, 10 MHz carrier spacing,
 BW 3.84 MHz



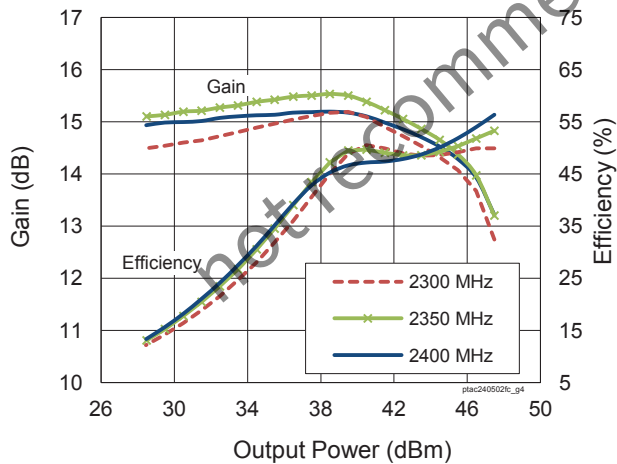
Two-carrier WCDMA Drive-up

$V_{DD} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$, $V_{GS1} = 1.3\text{ V}$,
 $V_{GS2} = 2.6\text{ V}$, 3GPP WCDMA signal,
 PAR = 8 dB, 10 MHz carrier spacing,
 BW 3.84 MHz



CW Performance

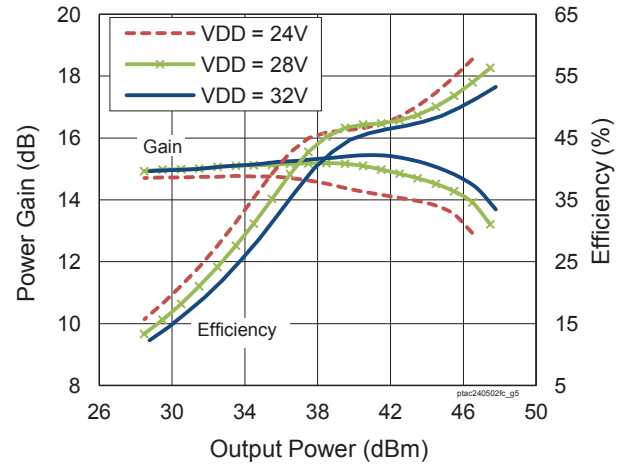
$V_{DD} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$



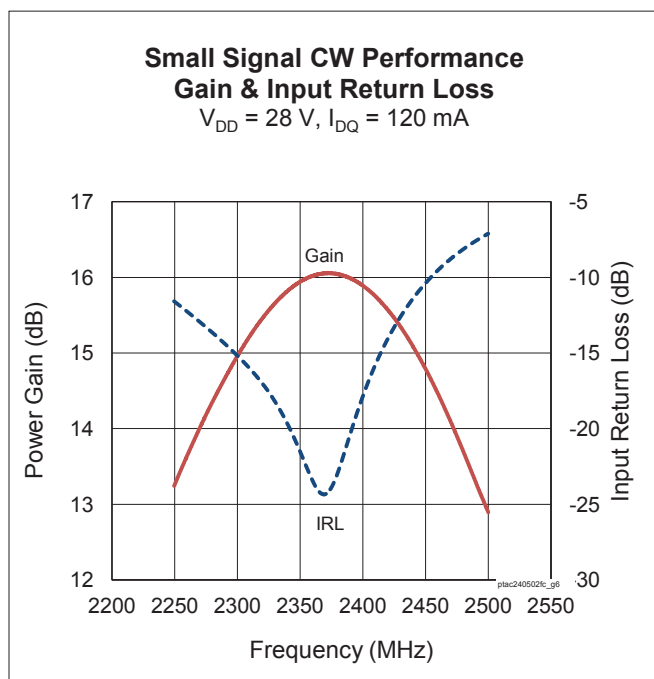
CW Performance

at various V_{DD}

$I_{DQ} = 120\text{ mA}$, $f = 2400\text{ MHz}$



Typical Performance (cont.)



Load Pull Performance

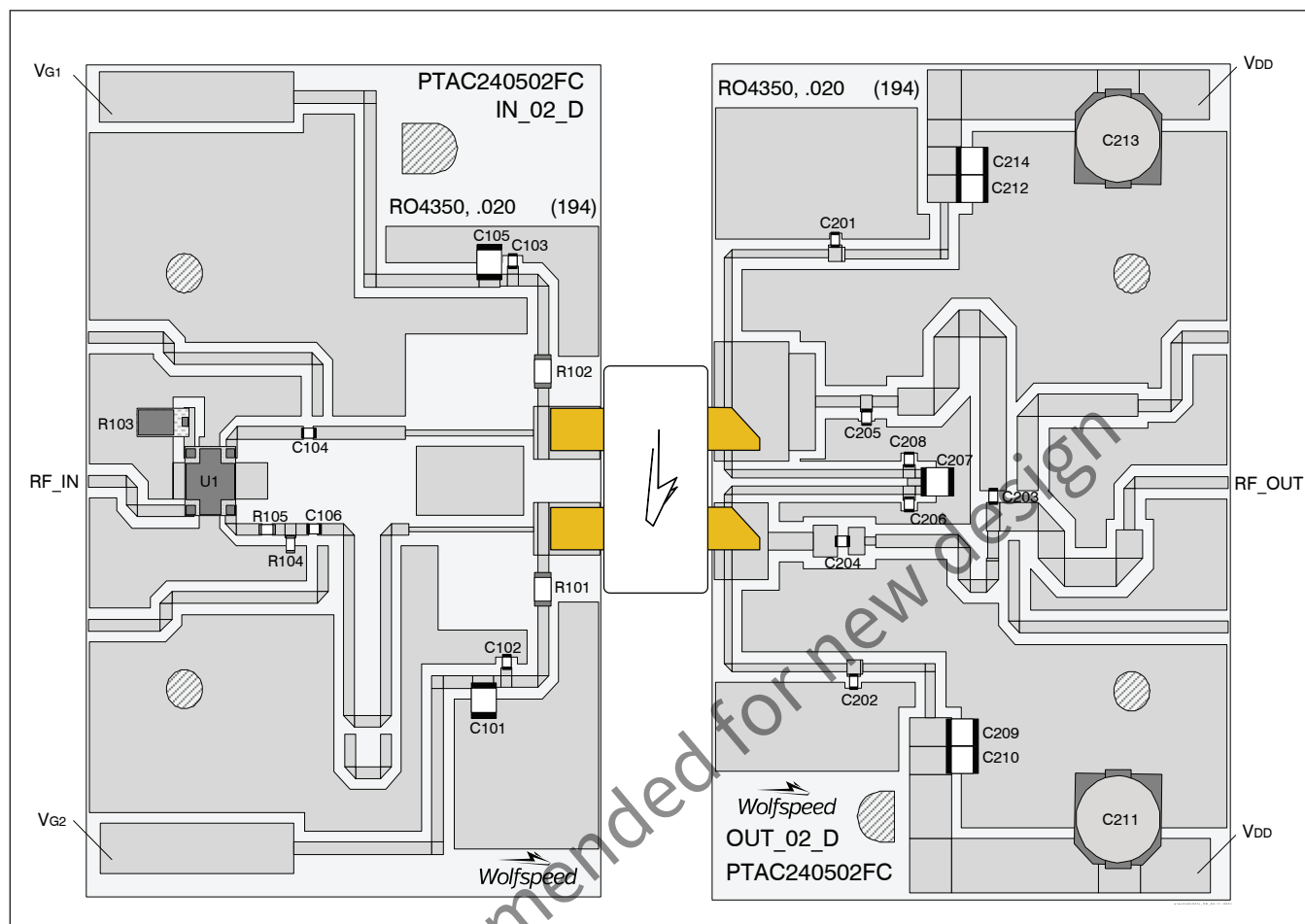
Main Side Load Pull Performance – Pulsed CW signal: 160 μs , 10% duty cycle, 28 V, 114 mA

		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]
2300	10-j31	9.4-j11.6	20.96	42.89	19.45	53.2	4.7-j8.3	22.8	41.03	12.68	61.5
2350	12.7-j35	9.7-j12.2	20.7	42.83	19.19	52.7	5.1-j9.4	22.4	41.34	13.61	62.1
2400	16.2-j38	9.31-j12.6	20.8	42.65	18.41	52.6	5.2-j10.2	22.2	41.45	13.96	61.3

Peak Side Load Pull Performance – Pulsed CW signal: 160 μs , 10% duty cycle, 28 V, 252 mA

		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 [%]
2300	5.6-j22	3.0-j7.0	18.2	46.50	44.67	52.1	2.2-j5.8	20.5	45.20	33.11	56.9
2350	6.7-j25	2.9-j7.9	17.4	46.46	44.26	48.5	2.2-j5.9	21.1	44.91	30.97	55.9
2400	9.7-j29	3.3-j7.9	17.9	46.62	45.92	49.6	2.2-j6.2	20.8	45.31	33.96	57.2

Reference Circuit , 2300 – 2400 MHz

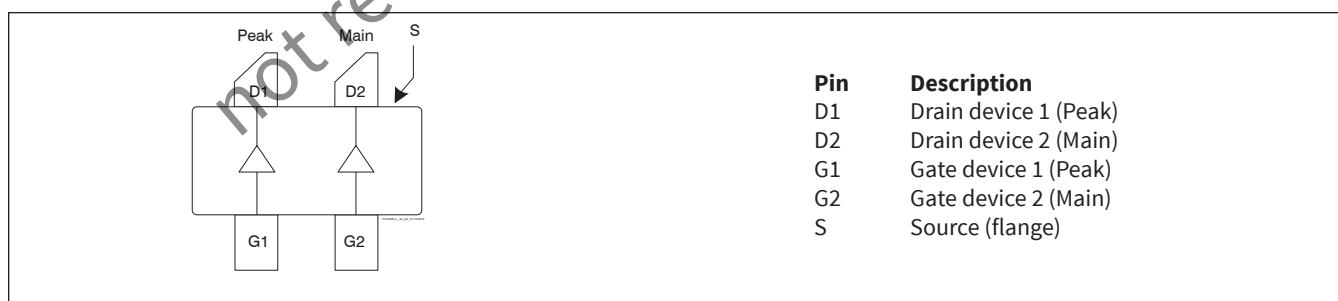


Reference Circuit (cont.)**Reference Circuit Assembly**

DUT	PTAC240502FC V1
Test Fixture Part No.	LTA/PTAC240502FC-V1
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 2300 - 2400$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

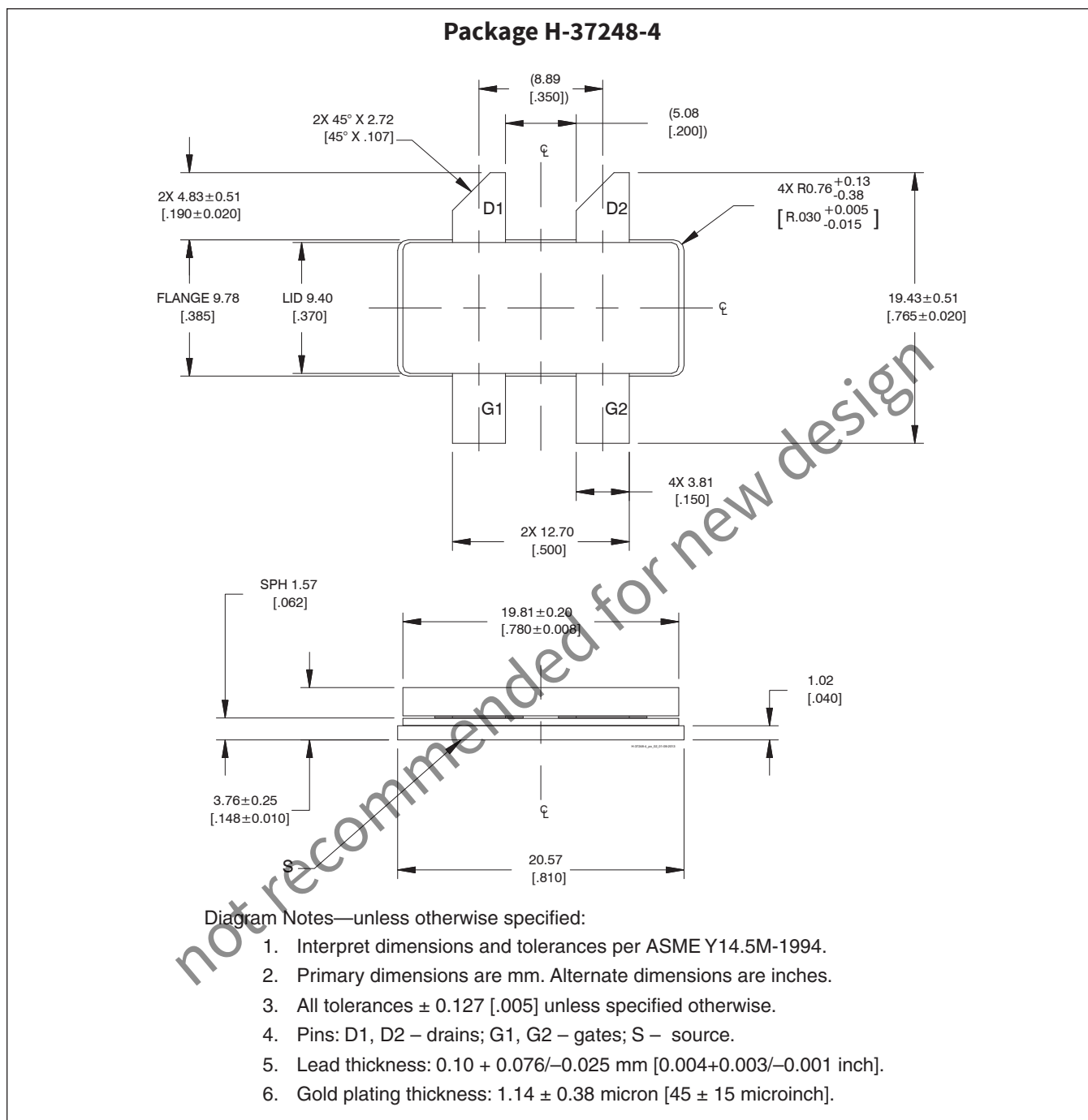
Components Information

Component	Description	Suggested Manufacturer	P/N
Input			
C101, C105	Capacitor, 4.7 μ F	Murata Electronics North America	GRM32ER71H475KA88L
C102, C103, C104, C106	Capacitor, 18 pF	ATC	ATC800A180JT250T
R101, R102	Resistor, 10 Ω	Panasonic Electronic Components	ERJ-8GEYJ100V
R103	Resistor, 50 Ω	Anaren	060120A15Z50
R104	Resistor, 300 Ω	Venkel	CR0603-16W-3010FB
R105	Resistor, 12.1 Ω	Venkel	CR0603-16W-12R1FB
U1	Directional coupler	Anaren	X3C25P1-05S
Output			
C201, C202, C203, C204, C206, C208	Capacitor, 18 pF	ATC	ATC800A180JT250T
C205	Capacitor, 0.5 pF	ATC	ATC800A180JT250T
C207, C210, C214	Capacitor, 4.71 μ F	Murata Electronics North America	GRM32ER71H475KA88L
C209, C212	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
C211, C213	Capacitor, 100 μ F	Panasonic Electronic Components	EEE-FP1V101AP

Pinout Diagram (top view)

Lead connections for PTAC240502FC

Package Outline Specifications



Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2013-07-16	Advance	All	Data Sheet reflects advance specification for product development
02	2013-11-13	Production	All	Data Sheet reflects released product specification
02.1	2013-11-27	Production	1	Revised ESD classification
02.2	2014-05-14	Production	2	Revised junction temperature in Maximum Ratings table
02.3	2016-06-21	Production	2	Updated ordering information
03	2018-07-02	Production	All	Converted to Wolfspeed Data Sheet
03.1	2019-10-31	Production	1, 3	Corrected Vgs1 and Vgs2
03.2	2021-03-11	Production	5	Updated reference circuit revision number

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Notes & Disclaimer

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