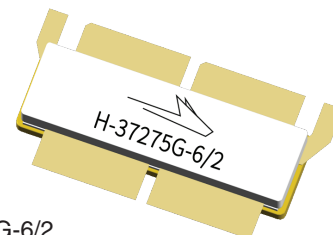


# PXAD214218FV

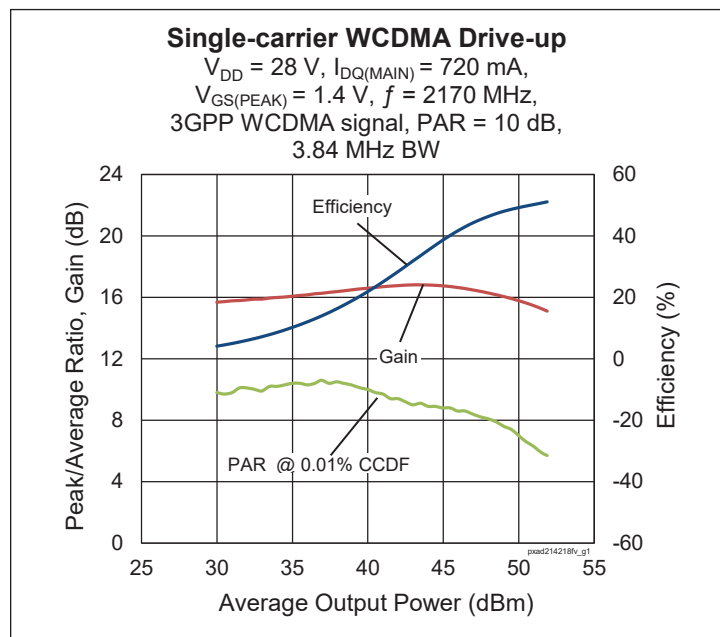
## Thermally-Enhanced High Power RF LDMOS FET 430 W, 28 V, 2110 – 2170 MHz

### Description

The PXAD214218FV is a 430-watt ( $P_{3dB}$ ) LDMOS FET with an asymmetrical design intended for use in multi-standard cellular power amplifier applications in the 2110 to 2170 MHz frequency band. Features include dual-path design, input and output 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.



PXAD214218FV  
Package H-37275G-6/2



### Features

- Broadband internal input and output matching
- Asymmetrical Doherty design
  - Main :  $P_{1dB} = 130\text{ W Typ}$
  - Peak :  $P_{1dB} = 290\text{ W Typ}$
- Typical Pulsed CW performance, 2140 MHz, 28 V, Doherty configuration
  - Output power at  $P_{3dB} = 436\text{ W}$
  - Efficiency = 55%
  - Gain = 13.5 dB
- Capable of handling 10:1 VSWR @28 V, 110 W (WCDMA) output power
- Integrated ESD protection
- Human Body Model class 2 (per ANSI/ESDA/ JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

### RF Characteristics

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

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 720\text{ mA}$ ,  $V_{GS(PEAK)} = 1.5\text{ V}$ ,  $P_{OUT} = 56\text{ W avg}$ ,  $f = 2170\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Linear Gain	$G_{ps}$	15	16	—	dB
Drain Efficiency	$\eta_D$	45	48.7	—	%
Adjacent Channel Power Ratio	ACPR	—	-24.5	-22	dBc
Output PAR@0.01% CCDF	OPAR	6.1	7.4	—	dBc

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

**DC Characteristics** (each side)

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	$\mu\text{A}$
	$V_{DS} = 63\text{ V}, V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	10	$\mu\text{A}$
Gate Leakage Current	$V_{GS} = 10\text{ V}, V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	1	$\mu\text{A}$
On-State Resistance (Main)	$V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.09	—	$\Omega$
	(Peak) $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.05	—	$\Omega$
Operating Gate Voltage (Main)	$V_{DS} = 28\text{ V}, I_{DQ} = 720\text{ mA}$	$V_{GS}$	2.3	2.7	2.9	V
	(Peak) $V_{DS} = 28\text{ V}, I_{DQ} = 0\text{ mA}$	$V_{GS}$	—	1.4	—	V

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	65	V
Gate-Source Voltage	$V_{GS}$	-6 to +10	V
Junction Temperature	$T_J$	225	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}\text{C}$

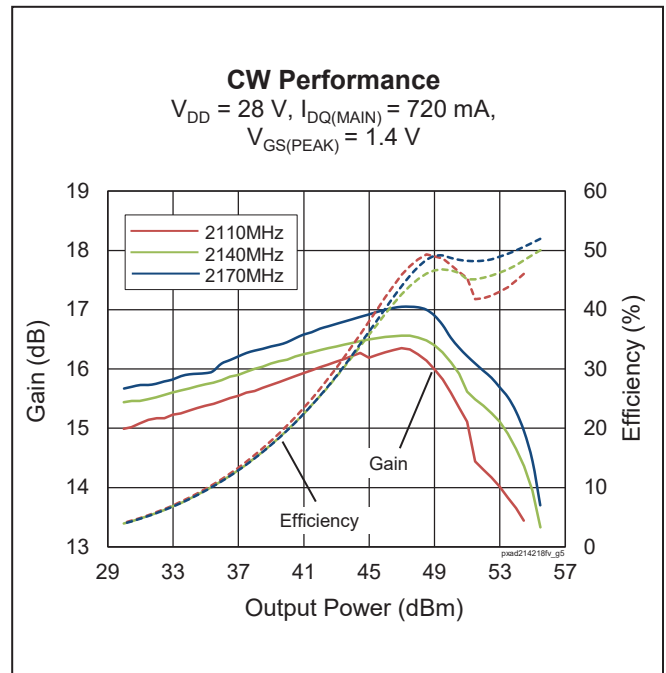
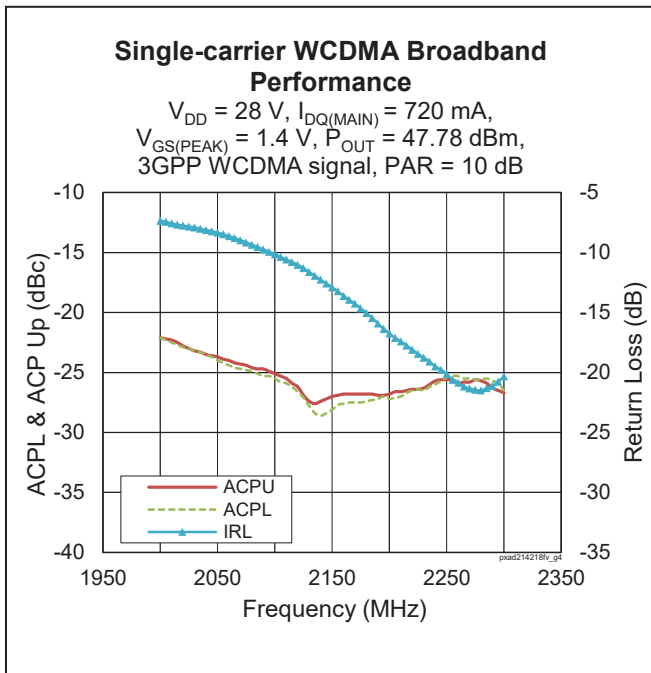
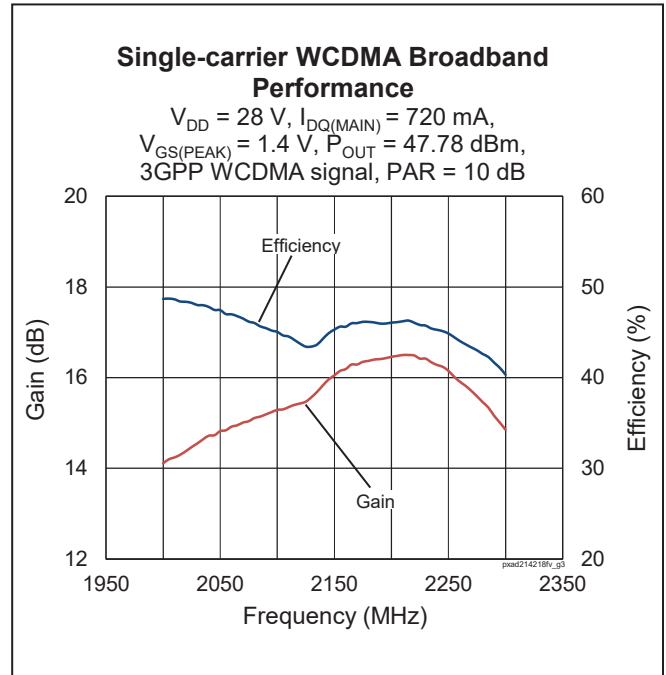
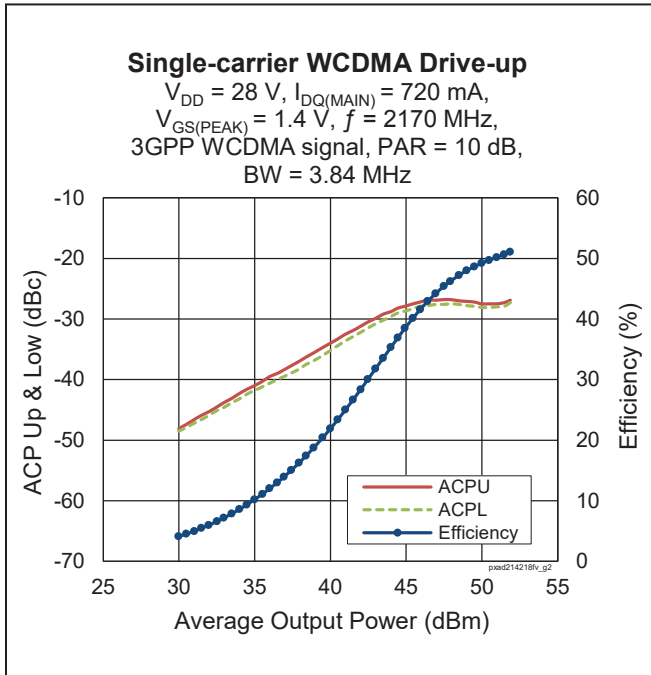
**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal Resistance (Main, $T_{CASE} = 70^{\circ}\text{C}$ , 60 W CW)	$R_{\theta JC}$	0.44	$^{\circ}\text{C}/\text{W}$
(Peak, $T_{CASE} = 70^{\circ}\text{C}$ , 280 W CW)	$R_{\theta JC}$	0.246	$^{\circ}\text{C}/\text{W}$

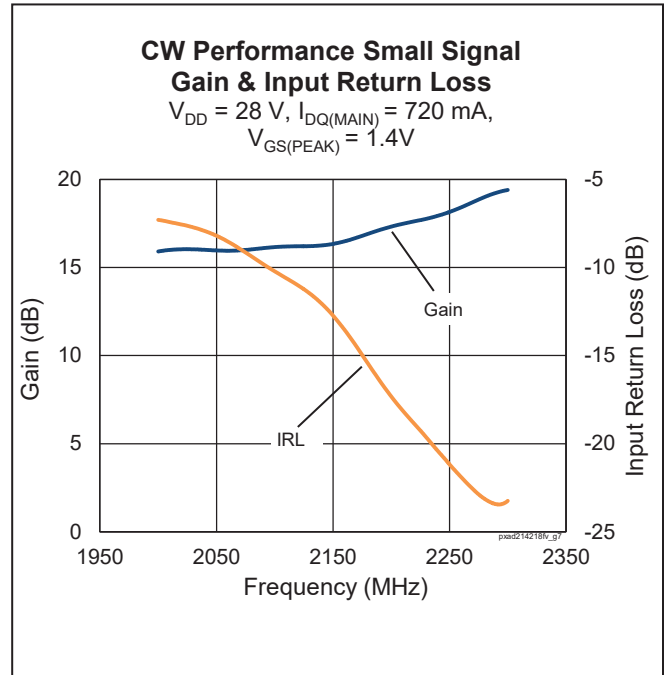
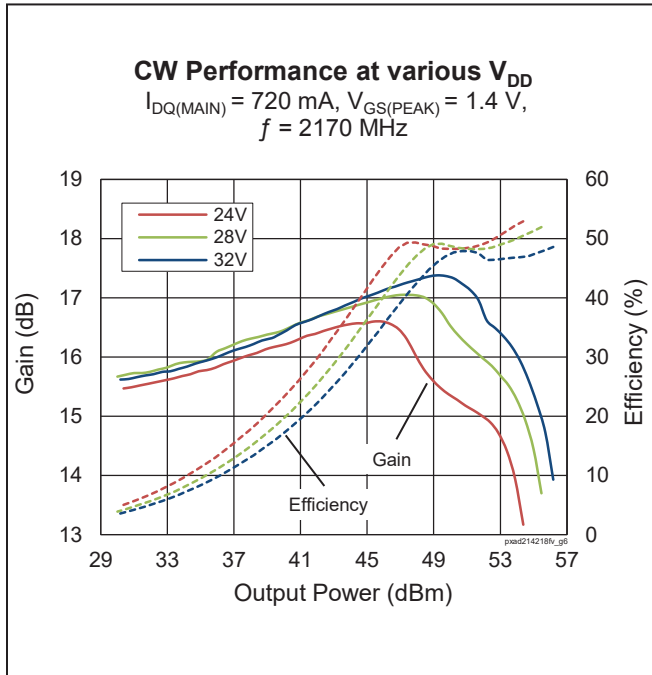
**Ordering Information**

Type and Version	Order Code	Package Description	Shipping
PXAD214218FV V1 R0	PXAD214218FV-V1-R0	H-37275G-6/2,	Tape & Reel, 50 pcs
PXAD214218FV V1 R2	PXAD214218FV-V1-R2	H-37275G-6/2,	Tape & Reel, 250 pcs

**Typical RF Performance** (data taken in production test fixture)



**Typical RF Performance (cont.)**



## Load Pull Performance

**Main Side Load Pull Performance** – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle,  $V_{DD} = 28$  V,  $I_{DQ} = 960$  mA, class AB

		P <sub>1dB</sub>									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z <sub>s</sub> [ $\Omega$ ]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>1dB</sub> [dBm]	P <sub>1dB</sub> [W]	$\eta^D$ [%]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>1dB</sub> [dBm]	P <sub>1dB</sub> [W]	$\eta^D$ [%]
2110	3.7 - j8.1	1.4 - j3.7	19.7	52.58	181	57.3	2.7 - j3.1	21.7	51.21	132	65.8
2140	5.2 - j8.0	1.5 - j3.8	20.4	52.53	179	59.2	2.4 - j3.2	22	51.40	138	65.5
2170	7.2 - j9.5	1.4 - j3.8	19.7	52.60	182	57.7	2.2 - j3.1	21.5	51.43	139	65.1

		P <sub>3dB</sub>									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z <sub>s</sub> [ $\Omega$ ]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>3dB</sub> [dBm]	P <sub>3dB</sub> [W]	$\eta^D$ [%]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>3dB</sub> [dBm]	P <sub>3dB</sub> [W]	$\eta^D$ [%]
2110	3.7 - j8.1	1.4 - j3.8	17.6	53.26	212	58.4	2.7 - j3.0	19.8	51.79	151	67.1
2140	5.2 - j8.0	1.4 - j4.0	17.8	53.22	210	56.7	2.6 - j3.0	20.2	51.76	150	67.4
2170	7.2 - j9.5	1.5 - j4.2	17.7	53.28	213	59.4	2.5 - j2.8	19.9	51.64	146	67.3

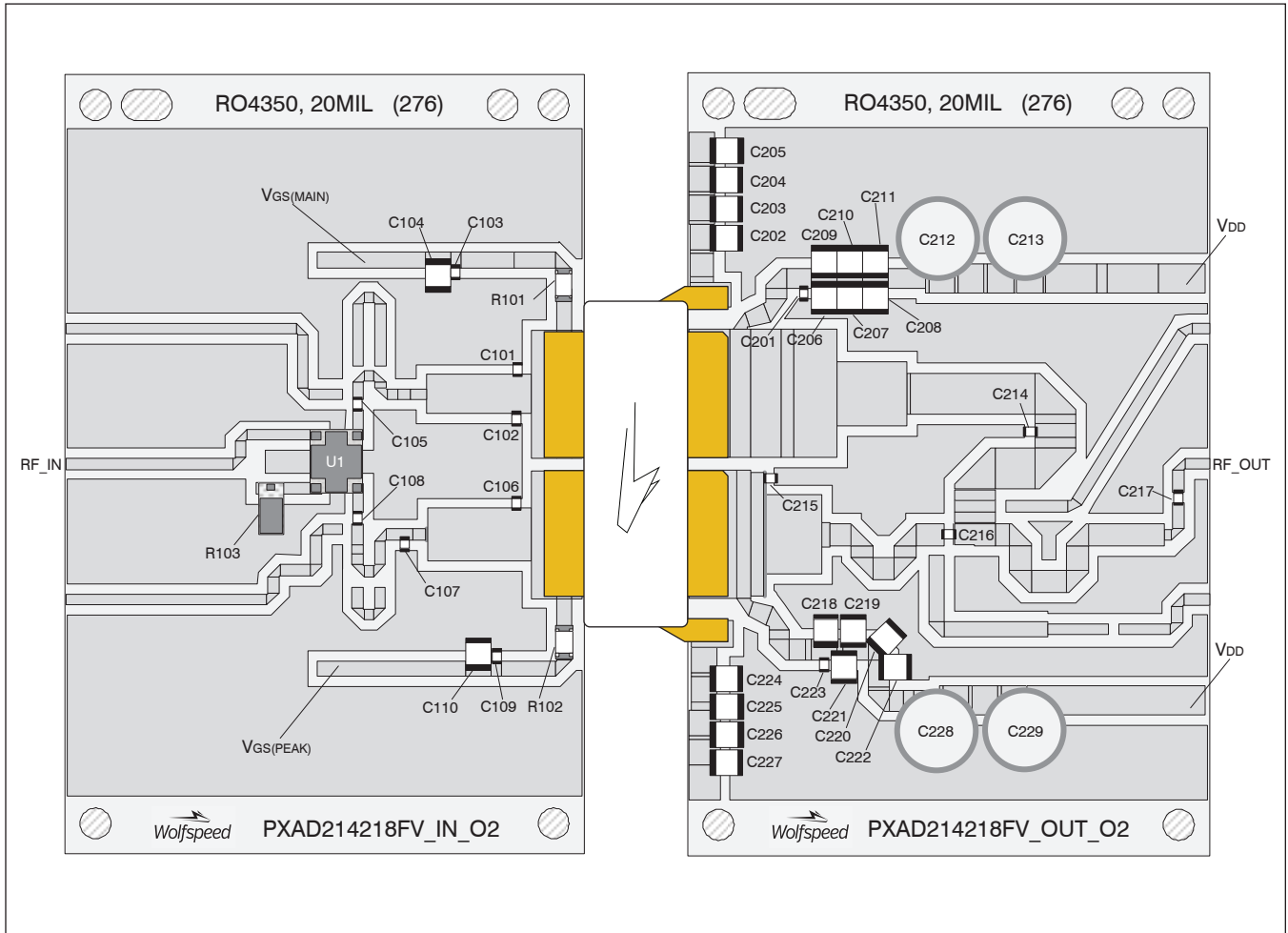
**Peak Side Load Pull Performance** – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle,  $V_{DD} = 28$  V,  $I_{DQ} = 10$  mA, class B

		P <sub>1dB</sub>									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z <sub>s</sub> [ $\Omega$ ]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>1dB</sub> [dBm]	P <sub>1dB</sub> [W]	$\eta^D$ [%]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>1dB</sub> [dBm]	P <sub>1dB</sub> [W]	$\eta^D$ [%]
2110	3.0 - j6.2	2.3 - j5.8	16.2	55.39	346	54.0	3.4 - j3.3	17.6	53.62	230	65.2
2140	4.0 - j6.1	2.6 - j6.1	16.6	55.43	349	55.1	3.0 - j3.3	18	53.46	222	65.1
2170	5.0 - j5.3	2.9 - j6.7	16.2	55.33	341	52.8	3.1 - j3.0	17.8	53.00	200	64.9

		P <sub>3dB</sub>									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Z <sub>s</sub> [ $\Omega$ ]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>3dB</sub> [dBm]	P <sub>3dB</sub> [W]	$\eta^D$ [%]	Z <sub>l</sub> [ $\Omega$ ]	Gain [dB]	P <sub>3dB</sub> [dBm]	P <sub>3dB</sub> [W]	$\eta^D$ [%]
2110	3.0 - j6.2	2.6 - j6.2	14.1	56.13	410	56.1	3.2 - j3.7	15.7	54.55	285	65.4
2140	4.0 - j6.1	2.8 - j6.6	14.2	56.13	410	55.3	3.4 - j3.9	15.8	54.64	291	65.7
2170	5.0 - j5.3	3.0 - j6.8	14.1	56.03	401	54.7	3.2 - j4.0	15.8	54.59	288	65.0



Reference Circuit, 2110 – 2170 MHz



Reference circuit assembly diagram (not to scale)



**Reference Circuit** (cont.)

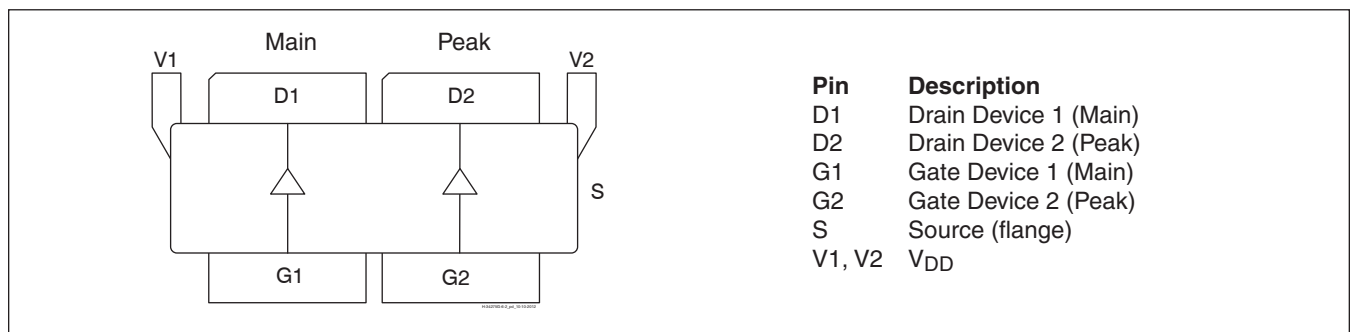
**Reference Circuit Assembly**

DUT	PXAD214218FV V1
Test Fixture Part No.	LTA/PXAD214218FV V1
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 2110 - 2170$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">http://www.wolfspeed.com/RF</a>	

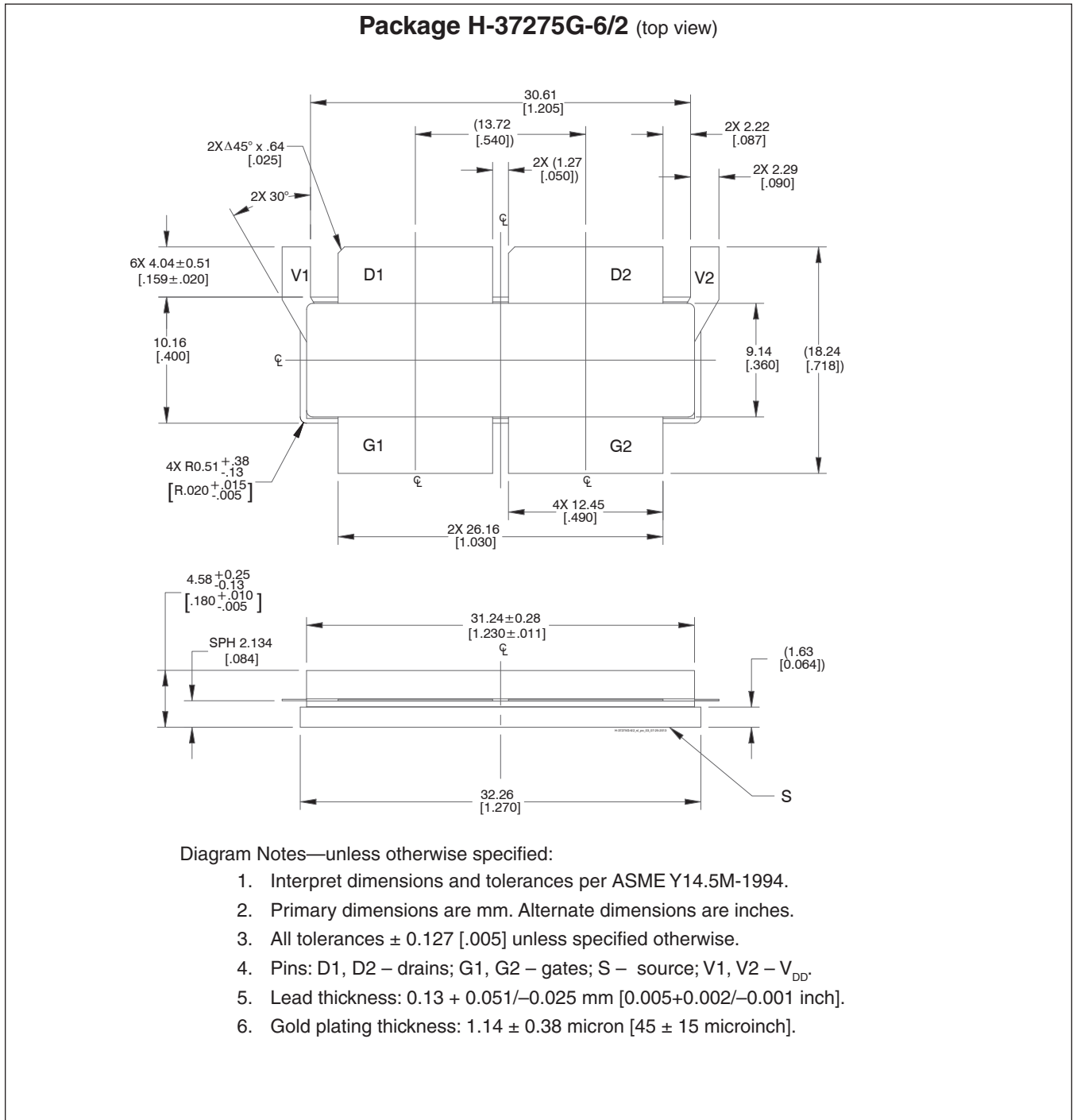
**Components Information**

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101, C102, C106	Capacitor, 0.5 pF	ATC	ATC800A0R5CT250T
C103, C105, C108, C109	Capacitor, 18 pF	ATC	ATC800A180JT250T
C104, C110	Capacitor, 10 $\mu$ F	Taiyo Yuden	UMK325C7106MM-T
C107	Capacitor, 0.4 pF	ATC	ATC800A0R4CT250T
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid Coupler	Anaren	X3C21P1-04S
<b>Output</b>			
C201, C216, C217, C223	Capacitor, 18 pF	ATC	ATC800A180JT250T
C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C218, C219, C220, C221, C222, C224, C225, C226, C227	Capacitor, 10 $\mu$ F	Taiyo Yuden	UMK325C7106MM-T
C212, C213, C228, C229	Capacitor, 220 $\mu$ F	Panasonic Electronic Components	EEE-FP1V221AP
C214	Capacitor, 0.3 pF	ATC	ATC800A0R3CT250T
C215	Capacitor, 1.2 pF	ATC	ATC800A1R2CT250T

**Pinout Diagram** (top view)



Package Outline Specifications







### Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2016-04-20	Advance	All	Data Sheet reflects advance specification for product development
02	2016-11-07	Production	All	Data Sheet reflects released product specification
02.1	2016-12-07	Production	1, 5	Revised typo in Features, revised PAE to Drain Eff in Load Pull performance
02.2	2017-03-30	Production	1 3. 4	Updated RF Characteristics table Fixed missing labels on CW performance graphs
03	2018-07-02	Production	All	Converted to Wolfspeed Data Sheet

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### Notes

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