

# PTRA082808NF

## Thermally-Enhanced High Power RF LDMOS FET 280 W, 48 V, 790 – 820 MHz

### Description

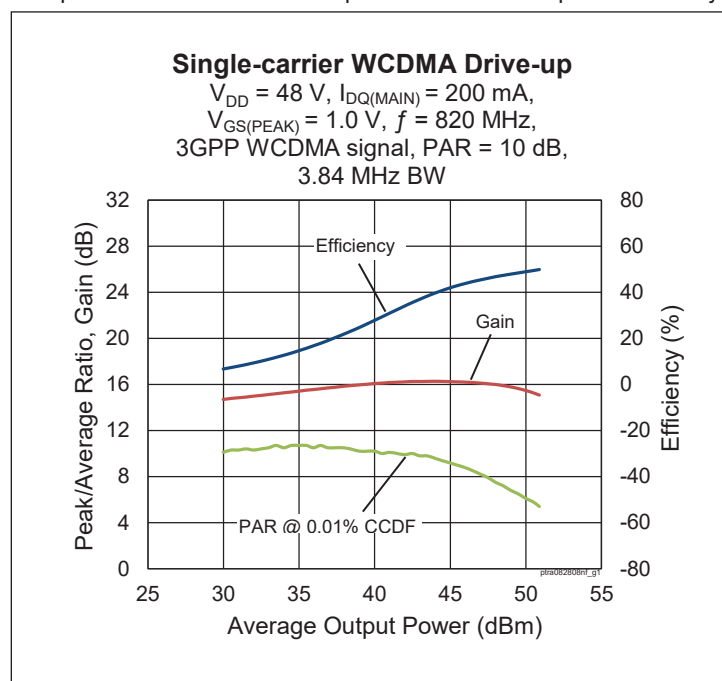
The PTRA082808NF is a 280-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 790 to 820 MHz frequency band. Features include input and output matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTRA082808NF  
Package PG-HBSOF-6-2

### Features

- Broadband internal input and output matching
- Asymmetrical design
  - Main :  $P_{1dB} = 115\text{ W Typ}$
  - Peak :  $P_{1dB} = 165\text{ W Typ}$
- Typical Pulsed CW performance, 820 MHz, 48 V, Doherty configuration
  - Output power at  $P_{3dB} = 250\text{ W}$
  - Efficiency = 55.6 %
  - Gain = 16.2 dB
- Capable of handling 10:1 VSWR @ 48 V, 56.2 W (CW) output power
- Human Body Model Class 1C (per ANSI/ESDA/ JEDEC JS-001)
- Integrated ESD protection
- Low thermal resistance
- Pb-free and RoHS compliant



### RF Characteristics

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

$V_{DD} = 48\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$ ,  $V_{GS(PEAK)} = 1.0\text{ V}$ ,  $P_{OUT} = 56.2\text{ W avg}$ ,  $f = 820\text{ MHz}$ , 3GPP, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	15.2	15.5	—	dB
Drain Efficiency	$\eta_D$	42.7	44.5	—	%
Adjacent Channel Power Ratio	ACPR	—	-36.4	-33.5	dBc
Output PAR @ 0.01% CCDF	OPAR	6.6	7.3	—	dB

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	$V_{GS} = 0\text{ V}, I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	1	$\mu\text{A}$
	$V_{DS} = 105\text{ V}, V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	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)	$V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.3	—	$\Omega$
	(Peak) $V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	0.12	—	$\Omega$
Operating Gate Voltage (Main)	$V_{DS} = 3.6\text{ V}, I_{DQ} = 0.2\text{ A}$	$V_{GS}$	3.0	3.6	4.1	V
	(Peak) $V_{DS} = 1.0\text{ V}, I_{DQ} = 0\text{ A}$	$V_{GS}$	—	1	—	V

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	105	V
Gate-Source Voltage	$V_{GS}$	-6 to +12	V
Operating Voltage	$V_{DD}$	0 to +55	V
Junction Temperature	$T_J$	225	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}\text{C}$

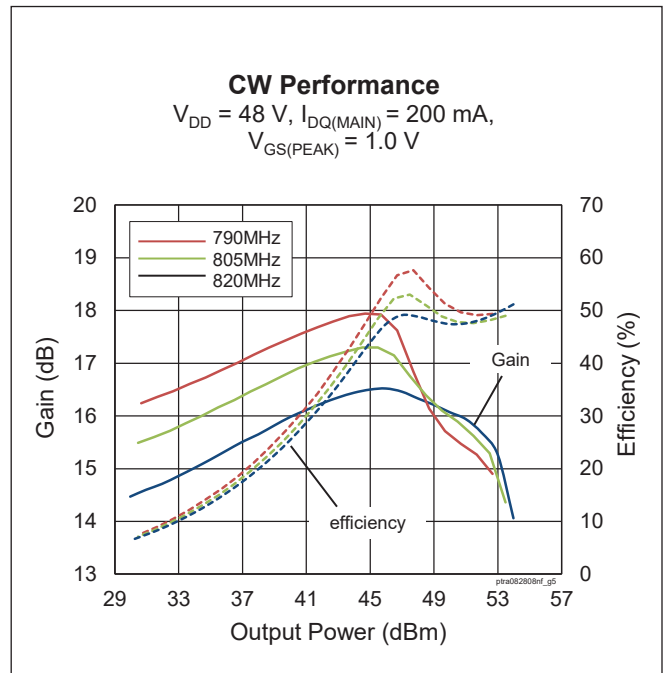
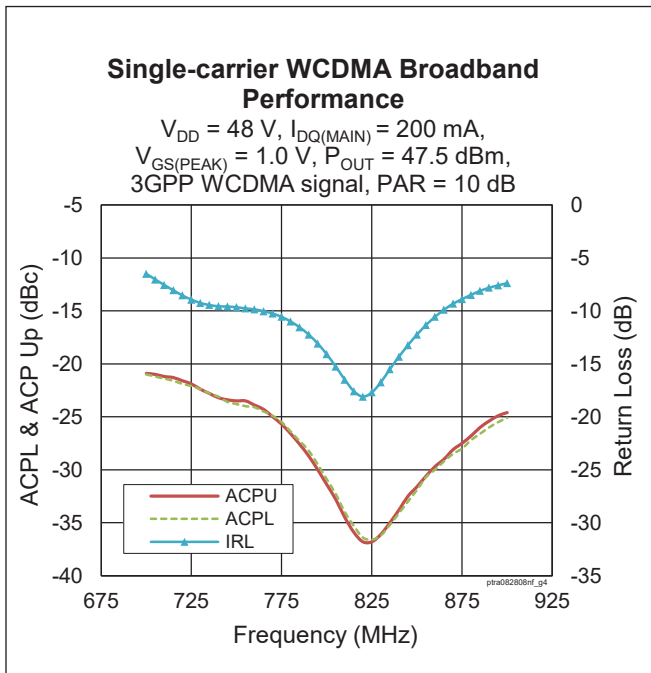
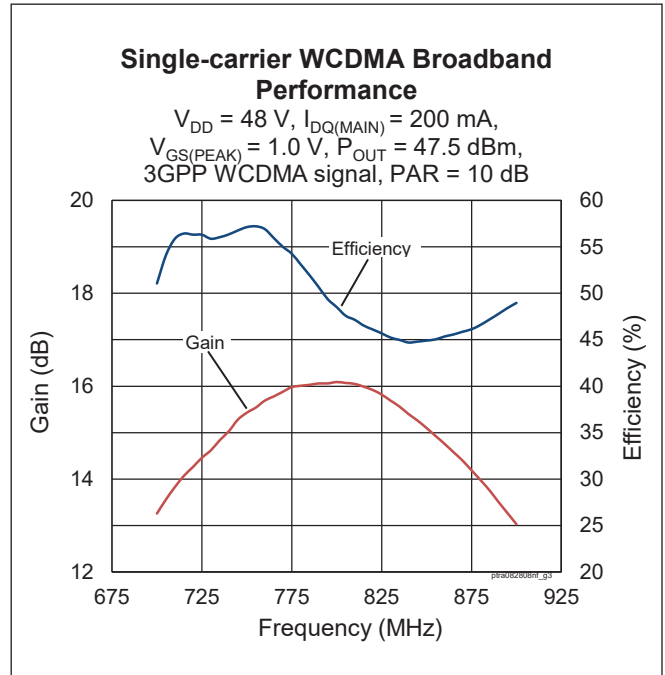
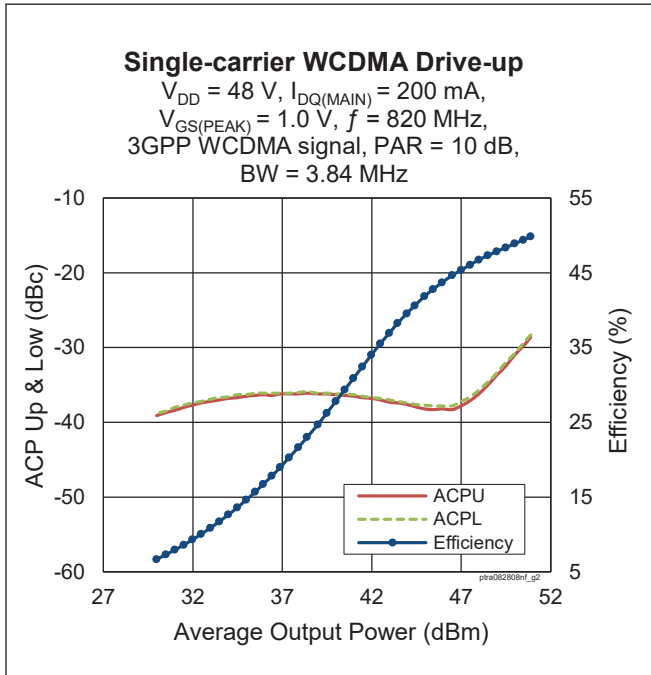
**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal Resistance (Main, $T_{CASE} = 70^{\circ}\text{C}, 56.2\text{ W CW}$ )	$R_{\theta JC}$	0.766	$^{\circ}\text{C/W}$
(Peak, $T_{CASE} = 70^{\circ}\text{C}, 200\text{ W CW}$ )	$R_{\theta JC}$	0.208	$^{\circ}\text{C/W}$

**Ordering Information**

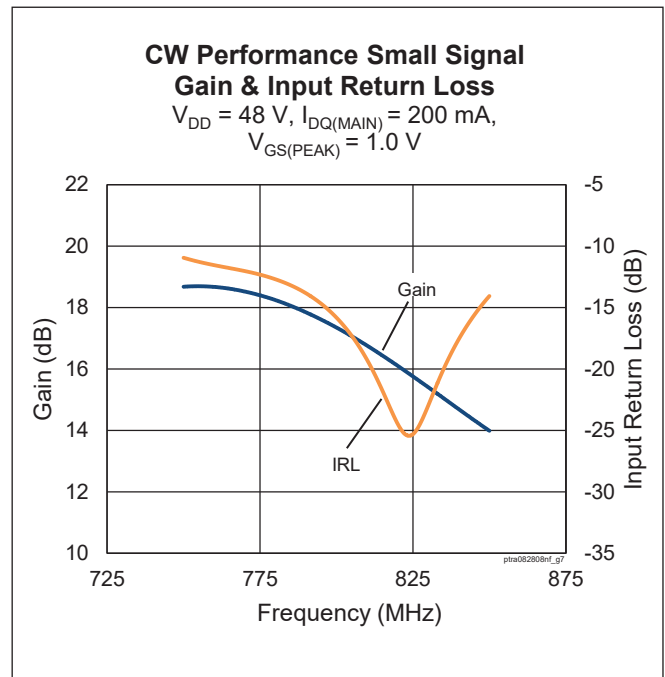
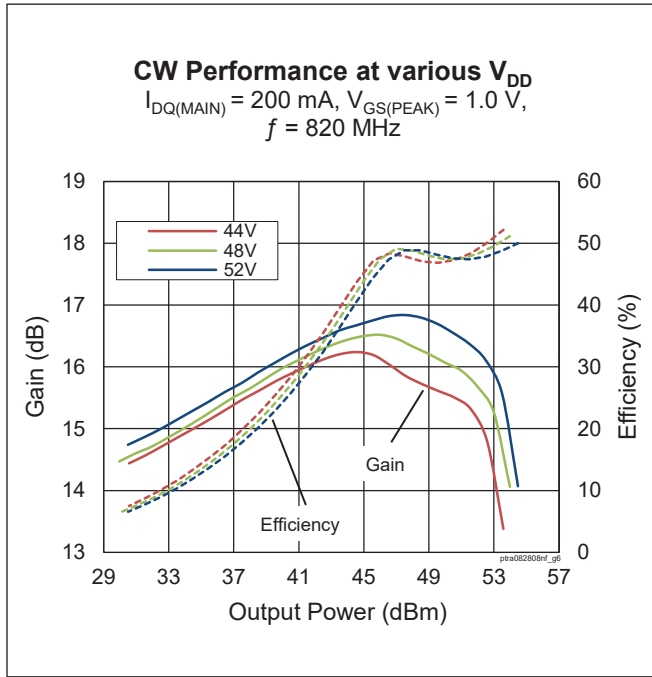
Type and Version	Order Code	Package Description	Shipping
PTRA082808NF V1 R5	PTRA082808NF-V1-R5	PG-HBSOF-6-2	Tape & Reel, 500 pcs

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





Typical Performance (cont.)





### Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle, 48 V,  $I_{DQ} = 250$  mA

		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 [%]
790	1.8 – j4.4	2.4 – j1.6	20.24	51.73	149	58.9	5.4 + j2.6	22.49	48.72	74	69.8
805	1.8 – j5.2	2.6 – j1.8	20.28	51.47	140	58.6	5.4 + j2.5	22.41	48.74	75	70.2
820	1.8 – j5.2	2.9 – j1.8	20.65	51.41	138	60.9	5.3 + j1.9	22.51	48.97	79	70.4

		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 [%]
790	1.8 – j4.4	2.6 – j1.9	18.3	52.53	179	62.7	5.5 + j0.2	20.27	50.63	116	71.2
805	1.8 – j5.2	2.8 – j2.6	18.3	52.29	169	60.2	5.6 + j0.0	20.18	50.61	115	71.2
820	1.8 – j5.2	2.9 – j3.1	18.4	52.24	168	60.0	5.6 + j1	20.45	50.13	103	71.3

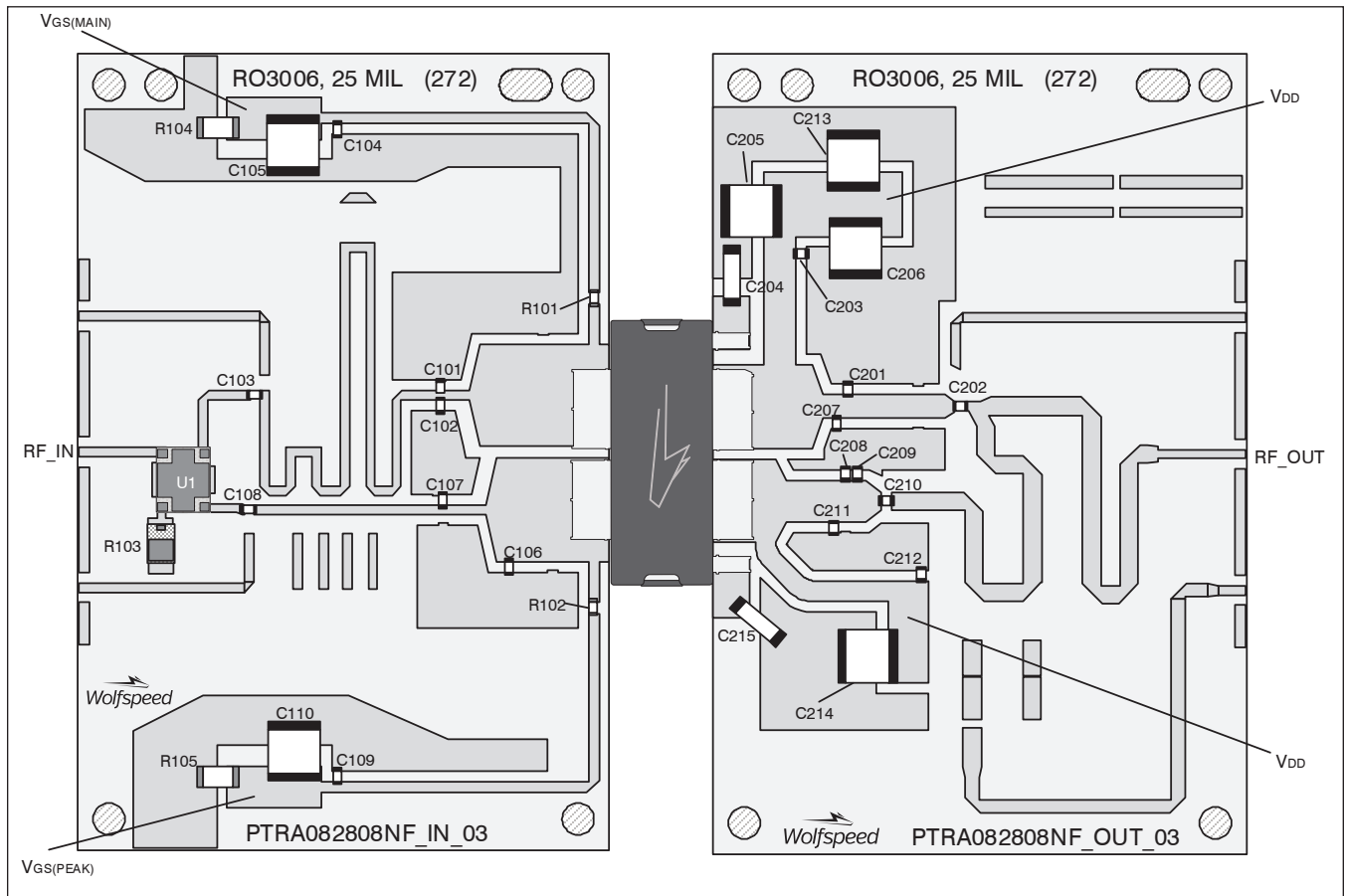
Peak Side Load Pull Performance – Pulsed CW signal: 10  $\mu$ s, 10% duty cycle, 48 V,  $I_{DQ} = 350$  mA

		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 [%]
790	1.5 – j4.1	1.8 – j1.3	16.26	53.30	214	60.4	3.9 + j1.2	17.03	50.89	123	72.8
805	1.5 – j4.1	1.9 – j1.3	16.02	53.07	203	60.1	3.6 + j1.3	16.84	50.77	119	73.2
820	1.4 – j4.6	2.0 – j1.4	16.4	53.00	200	61.0	3.1 + j2.2	16.87	50.78	120	73.0

		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 [%]
790	1.5 – j4.1	2.0 – j1.4	14.37	54.07	255	65.3	3.6 – j0.1	15.05	52.54	180	73.9
805	1.5 – j4.1	2.0 – j2.3	14.84	53.86	243	60.5	3.7 + j1.2	14.84	51.42	139	73.8
820	1.4 – j4.6	2.1 – j1.5	14.43	53.77	238	64.0	3.6 + j0.7	15.13	51.83	152	73.6



### Reference Circuit , 790 – 820 MHz



Reference circuit assembly diagram (not to scale)



**Reference Circuit** (cont.)

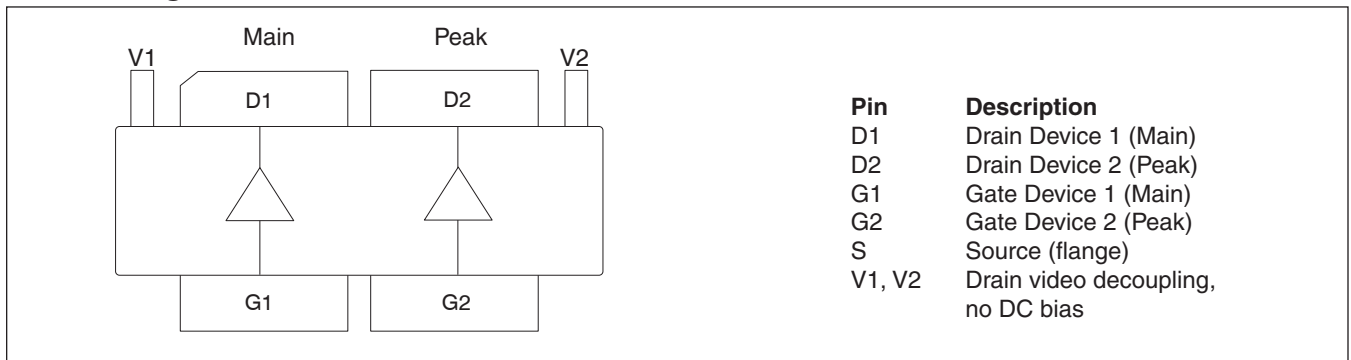
**Reference Circuit Assembly**

DUT	PTRA082808NF V1
Test Fixture Part No.	LTA/PTRA082808NF V1
PCB	Rogers 3006, 0.635 mm [0.025"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 790 - 820$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a>	

**Components Information**

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101, C102	Capacitor, 5.6 pF	ATC	ATC800A5R6CT250T
C103, C104, C108, C109	Capacitor, 56 pF	ATC	ATC800A560JT250T
C105, C110	Capacitor, 10 $\mu$ F	TDK Corporation	C5750X5R1H106K230KA
C106	Capacitor, 10 pF	ATC	ATC800A100JT250T
C107	Capacitor, 1.5 pF	ATC	ATC800A1R5CT250T
R101, R102	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R103	Resistor, 50 ohms	ANAREN	C8A50Z4A
R104, R105	Resistor, 1000 ohms	Panasonic Electronic Components	ERJ-8GEYJ102V
U1	Hybrid Coupler	ANAREN	X3C07P1-05S
<b>Output</b>			
C201	Capacitor, 3.0 pF	ATC	ATC800A3R0CT250T
C202	Capacitor, 15 pF	ATC	ATC800A150JT250T
C203, C210, C212	Capacitor, 82 pF	ATC	ATC800A820JT250T
C204, C205, C206, C213, C214, C215	Capacitor, 10 $\mu$ F , 100V	TDK Corporation	C5750X7S2A106M230KB
C207	Capacitor, 6.8 pF	ATC	ATC800A6R8CT250T
C208	Capacitor, 3.9 pF	ATC	ATC800A3R9CT250T
C209	Capacitor, 2.2 pF	ATC	ATC800A2R2CT250T
C211	Capacitor, 10 pF	ATC	ATC800A100JT250T

**Pinout Diagram** (top view)





**Package Outline Specifications**

**Package PG-HBSOF-6-2 (top view)**

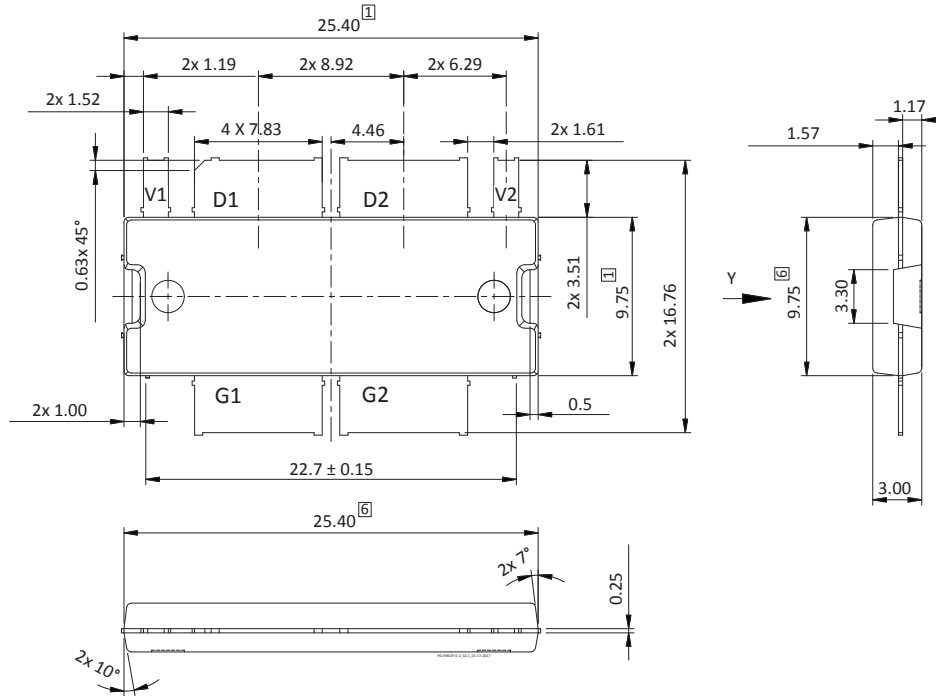


Diagram Notes—unless otherwise specified:

- 1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
- 2. Metal protrusions are connected to source and shall not exceed 0.10 mm max.
- 3. Fillets and radii: all radii are 0.3 mm max.
- 4. Interpret dimensions and tolerances per ISO 8015.
- 5. Dimensions are mm.
- 6. Does not include mold/dam bar and metal protrusion.
- 7. Exposed metal surface is tin-plated, may not be covered by mold compound.
- 8. All tolerances  $\pm 0.1$  mm unless specified otherwise.
- 9. All metal surfaces are tin-plated, except area of cut.
- 10. Lead thickness: 0.25 mm.
- 11. Pins: D1, D2 = drain; G1, G2 = gate; V1, V2 = drain video decoupling, no DC bias



**Package Outline Specifications** (cont.)

**Package PG-HBSOF-6-2** (bottom view)

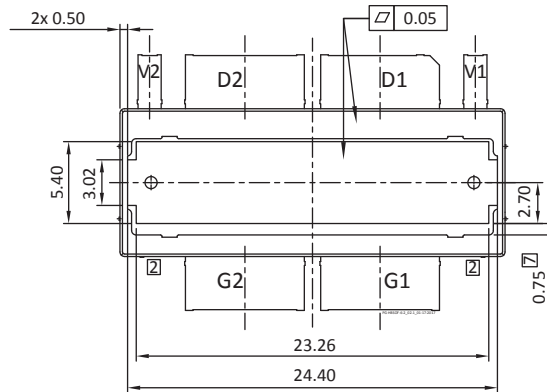


Diagram Notes—unless otherwise specified:

1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
2. Metal protrusions are connected to source and shall not exceed 0.10 mm max.
  3. Fillets and radii: all radii are 0.3 mm max.
  4. Interpret dimensions and tolerances per ISO 8015.
  5. Dimensions are mm.
6. Does not include mold/dam bar and metal protrusion.
7. Exposed metal surface is tin-plated, may not be covered by mold compound.
  8. All tolerances  $\pm 0.1$  mm unless specified otherwise.
  9. All metal surfaces are tin-plated, except area of cut.
  10. Lead thickness: 0.25 mm.
  11. Pins: D1, D2 = drain; G1, G2 = gate; V1, V2 = drain video decoupling, no DC bias

## Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2016-05-18	Advance	All	Data Sheet reflects advance specification for product development
01.1	2016-09-06	Advance	1	Revised frequency range
02	2016-11-01	Advance	2 3,4	Revised pinout diagram Revised package outline
03	2016-11-04	Production	All	Data Sheet reflects released product specification
03.1	2016-12-07	Production	1	Revised Maximum Ratings table
03.2	2017-01-12	Production	8, 9	Revised typo in package outline
03.3	2017-03-30	Production	1 3, 4	Updated RF Characteristics table Fixed missing labels on CW performance graphs
04	2017-08-21	Production	6, 7	Updated PCB layout and components information
04.1	2017-01-30	Production	1, 2	Corrected unit for OPAR. Corrected Operating gate voltage for main and peak sides.
05	2018-06-20	Production	All	Converted to Wolfspeed Data Sheet

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## Notes

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