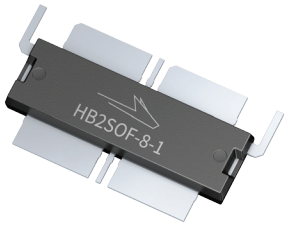
PXAE183708NB

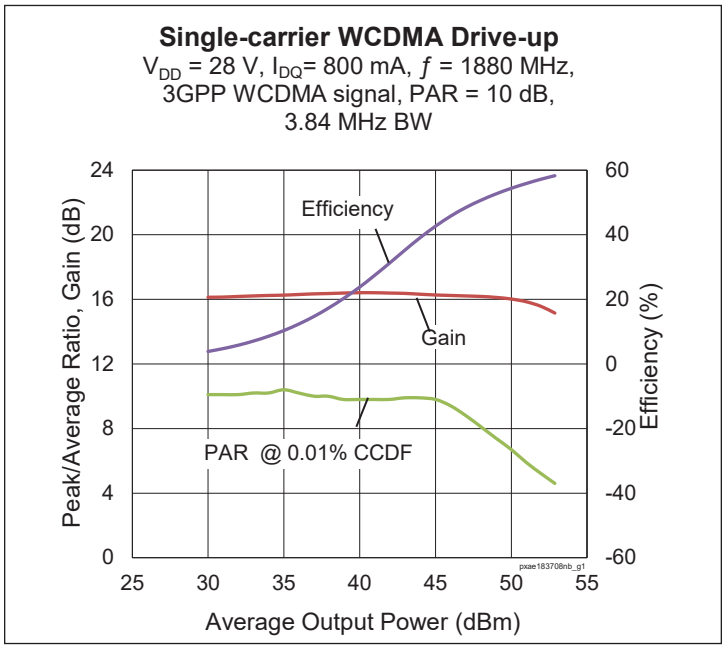
Thermally-Enhanced High Power RF LDMOS FET
320 W, 28 V, 1805 – 1880 MHz



PXAE183708NB
Package PG-HB2SOF-8-1

Description

The PXAE183708NB is a 320-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.



Features

- Broadband internal input and output matching
- Asymmetrical Doherty design
  - Main: P_{3dB} = 160 W Typ
  - Peak: P_{3dB} = 315 W Typ
- Typical Pulsed CW performance, 1880 MHz, 28 V, Doherty configuration, 10 µs pulse width, 10% duty cycle, Class AB (main), Class C (peak)
  - Output power at P_{1dB} = 320 W
  - Output power at P_{3dB} = 430 W
  - Drain efficiency = 60%
  - Gain = 13.5 dB
- Capable of handling 10:1 VSWR @ 28 V, 54 W (1C WCDMA) output power
- Human Body Model Class 2 (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 production test fixture)
V_{DD} = 28 V, I_{DQ} = 800 mA, P_{OUT} = 54 W avg, V_{GSPK} = 1.5 V, f = 1880 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	15.3	16	—	dB
Drain Efficiency	η_D	48	50.5	—	%
Adjacent Channel Power Ratio	ACPR	—	–29.5	–25	dBc
Output PAR at 0.01% probability on CCDF	OPAR	6.8	7.7	—	dB

All published data at T_{CASE} = 25°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 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} = 60 V, V_{GS} = 0 V	I_{DSS}	—	—	10	µA
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1	µA
On-State Resistance (main)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.08	—	Ω
(peak)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.04	—	Ω
Operating Gate Voltage (main)	V_{DS} = 28 V, I_{DQ} = 800 mA	V_{GS}	2.7	2.9	3.3	V
(peak)	V_{DS} = 28 V, I_{DQ} = 0 mA	V_{GS}	—	1.5	—	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

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance (Main, T_{CASE} = 70°C, 54 W CW)	$R_{\theta JC}$	0.63	°C/W

Moisture Sensitivity Level

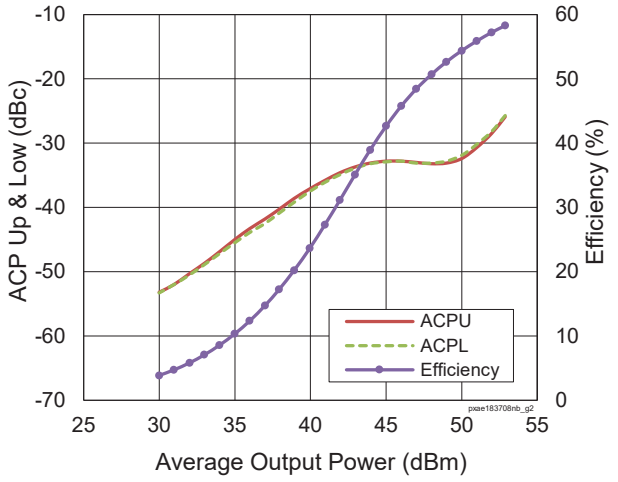
Level	Test Signal	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

Ordering Information

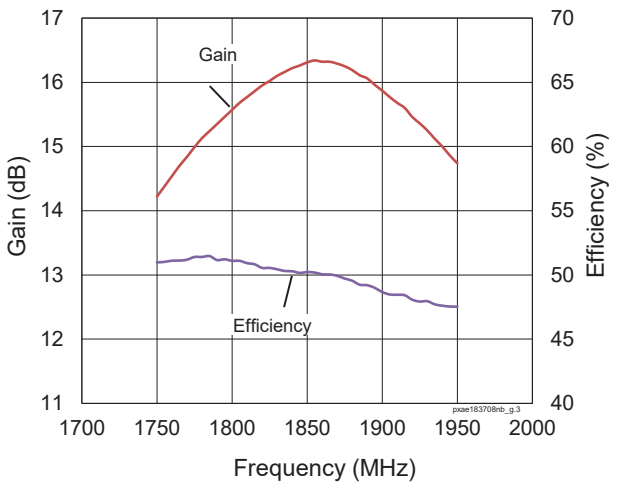
Type and Version	Order Code	Package	Shipping
PXAE183708NB V1 R2	PXAE183708NB-V1-R2	PG-HB2SOF-8-1	Tape & Reel, 250 pcs

Typical Performance (data taken in test fixture)

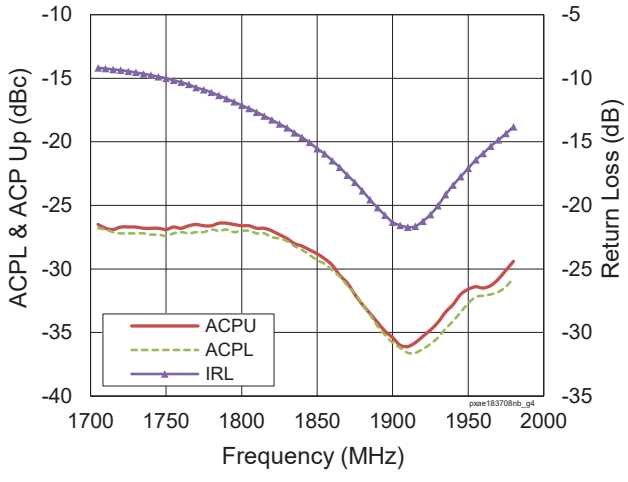
Single-carrier WCDMA Drive-up
V_{DD} = 28 V, $I_{DQ(MAIN)}$ = 800 mA, f = 1880 MHz,
3GPP WCDMA signal, PAR = 10 dB,
BW = 3.84 MHz



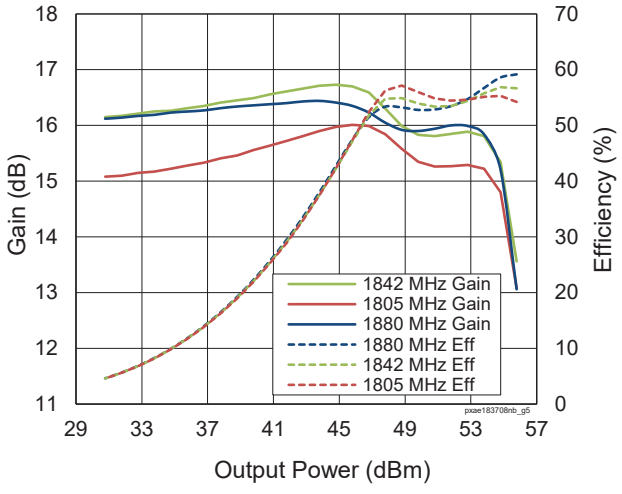
Single-carrier WCDMA Broadband Performance
V_{DD} = 28 V, I_{DQ} = 800 mA, P_{OUT} = 47.3 dBm,
3GPP WCDMA signal, PAR = 10 dB



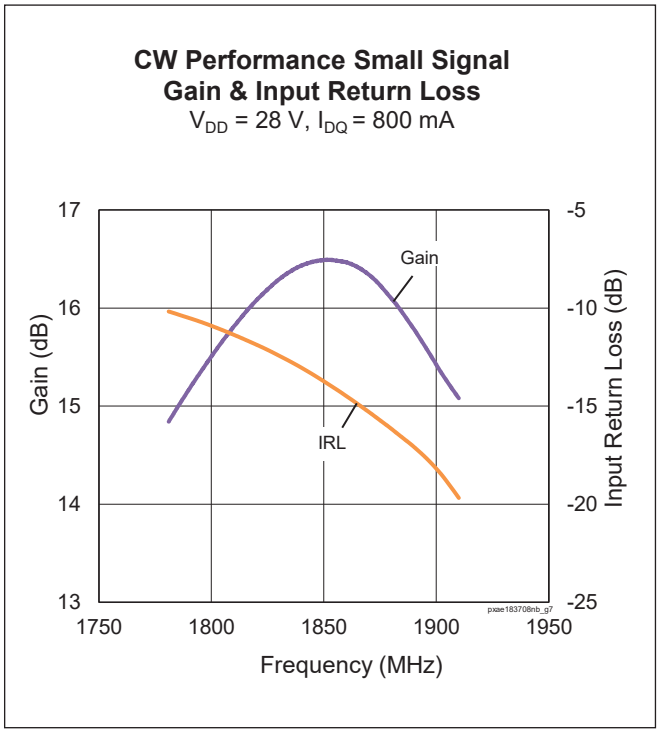
Single-carrier WCDMA Broadband Performance
V_{DD} = 28 V, I_{DQ} = 800 mA, P_{OUT} = 47.3 dBm,
3GPP WCDMA signal, PAR = 10 dB



CW Performance
V_{DD} = 28 V, I_{DQ} = 800 mA



Typical Performance (data taken in test fixture)



Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 28 V, I_{DQ} = 850 mA, class AB

		P_{1dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	Z_L [W]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	ηD [%]	Z_L [W]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	ηD [%]
1805	4.4-j10.8	1.2 - j2.5	19.4	52.30	171	57.6	2.4 - j1.3	21.9	50.10	103	68.4
1842.5	7.4-j13.2	1.2 - j2.7	19.2	52.30	170	56.7	2.1 - j1.5	21.7	50.50	112	67.9
1880	16.8-j14.6	1.2 - j2.9	19.3	52.20	165	55.9	2.1 - j1.7	21.7	50.30	106	65.8

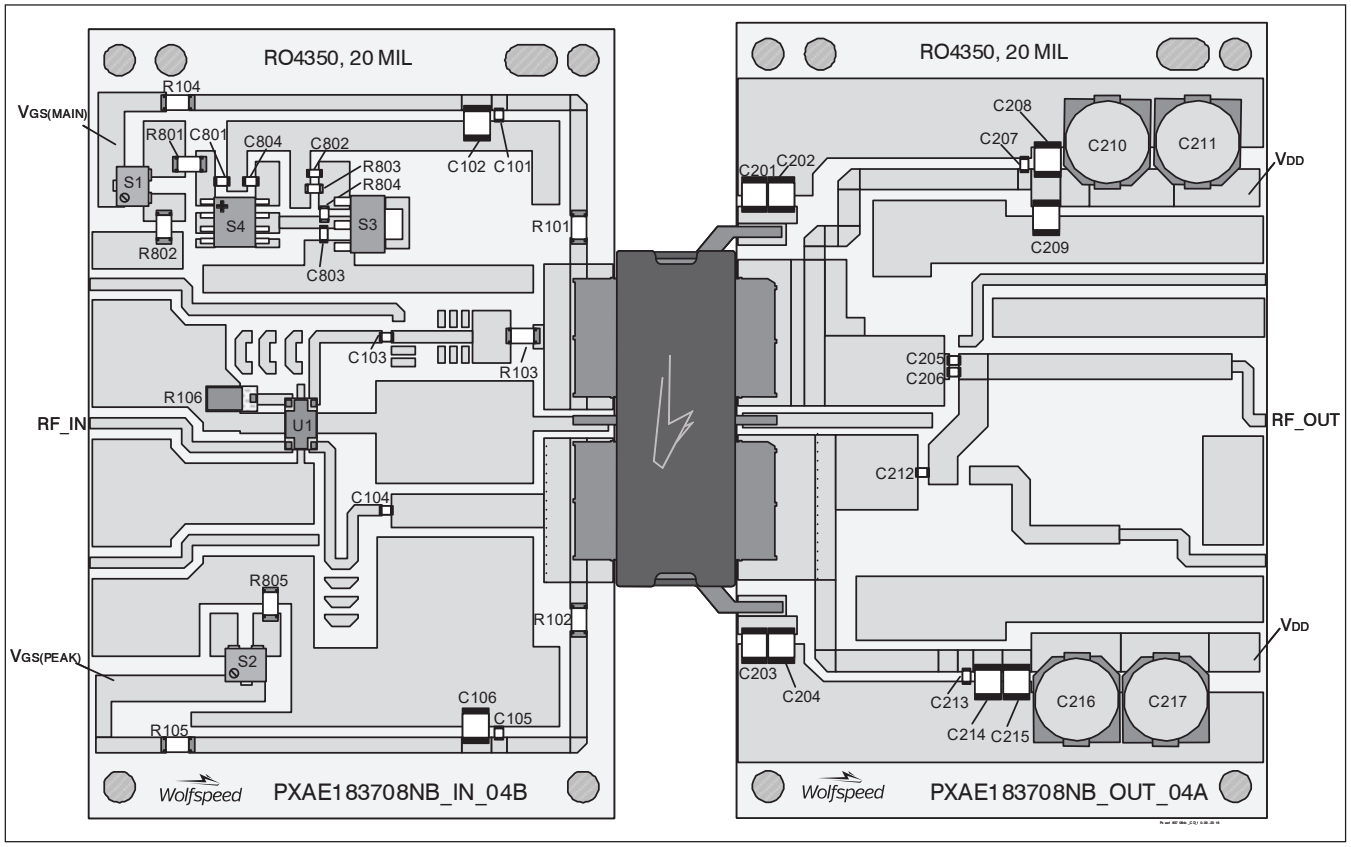
		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
1805	4.4 - j10.8	1.2 - j2.6	17.3	53.20	209	60.5	2.1 - j1.9	19.3	51.90	155	71.0
1842.5	7.4 - j13.2	1.2 - j2.9	17.2	53.10	204	58.9	2.0 - j1.7	19.5	51.60	144	70.6
1880	16.8 - j14.6	1.3 - j3.0	17.4	53.00	200	59.4	2.0 - j1.9	19.4	51.60	143	69.0

Peak Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 28 V, $V_{GS(PEAK)}$ = 2.4 V, class B

		P_{1dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	Z_L [W]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	ηD [%]	Z_L [W]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	ηD [%]
1805	2.9 - j6.7	2.0 - j4.5	17.4	54.90	306	56.0	2.2 - j1.7	18.9	52.20	164	69.1
1842.5	5.4 - j7.1	2.4 - j4.8	17.6	54.80	305	54.4	2.1 - j2.1	19.2	52.60	181	69.0
1880	8.4 - j4.2	2.4 - j4.9	17.9	54.80	300	55.4	2.1 - j2.2	19.3	52.20	166	68.3

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
1805	2.9 - j6.7	2.4 - j4.6	15.3	55.70	369	59.1	2.6 - j2.1	16.7	53.70	234	68.8
1842.5	5.4 - j7.1	2.5 - j4.8	15.6	55.60	366	57.7	2.6 - j2.6	16.9	54.20	260	68.3
1880	8.4 - j4.2	2.9 - 5.1	15.7	55.50	357	57.5	2.5 - j2.7	17.1	53.90	245	68.4

Reference Circuit, 1805 – 1880 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

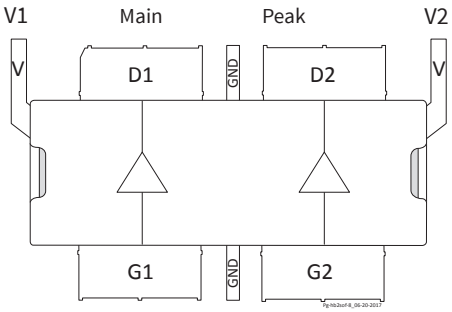
DUT	PXAE183708NB-V1
Test Fixture Part No.	LTA/PXAE183708NB-V1
PCB	Rogers 4350, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66, f = 1805 – 1800 MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

Reference Circuit, 1805 – 1880 MHz

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C105	Capacitor, 33 pF	ATC	ATC800A330JT250XT
C102, C106	Capacitor, 10 µF, 50 V	Taiyo Yuden	UMK325C7106MM-T
C103, C104	Capacitor, 22 pF	ATC	ATC800A220JT250XT
R101, R102	Resistor, 5.1 ohms	Panasonic Electronic Components	ERJ-8GEYJ5R1V
R103, R104, R105	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R106	Resistor, 50 ohms	Richardson	C16A50Z4
C801,C802, C803, C804	Capacitor, 1000 pF	Murata Electronics North America	GRM188R71H102KA01J
R801	Resistor, 1K ohms	Panasonic Electronic Components	ERJ-8GEYJ102V
R802	Resistor, 51 ohms	Panasonic Electronic Components	ERJ-8GEYJ510V
R803	Resistor, 1.3K ohms	Panasonic Electronic Components	ERJ-3GEYJ132V
R804	Resistor, 1.2K ohms	Panasonic Electronic Components	ERJ-3GEYJ122V
R805	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
S1, S2	Potentiometer, 2K ohms	Bourns Inc.	3224W-1-202E
S3	Voltage Regulator	Texas Instruments	LM78L05ACM
S4	Transistor	Diodes Incorporated	BCP5616TA
U1	Hybrid coupler	Anaren	X3C20F1-02S
Output			
C201, C202, C203, C204, C208, C209, C214, C215	Capacitor, 10 µF, 100 V	TDK Corporation	C5750X7S2A106M230KB
C205, C206	Capacitor, 2.4 pF	ATC	ATC800A2R4CT250XT
C207, C212, C213	Capacitor, 33 pF	ATC	ATC800A330JT250XT
C210, C211, C216, C217	Capacitor, 220 µF	Panasonic Electronic Components	EEE-FP1V221AP

Pinout Diagram (top view)



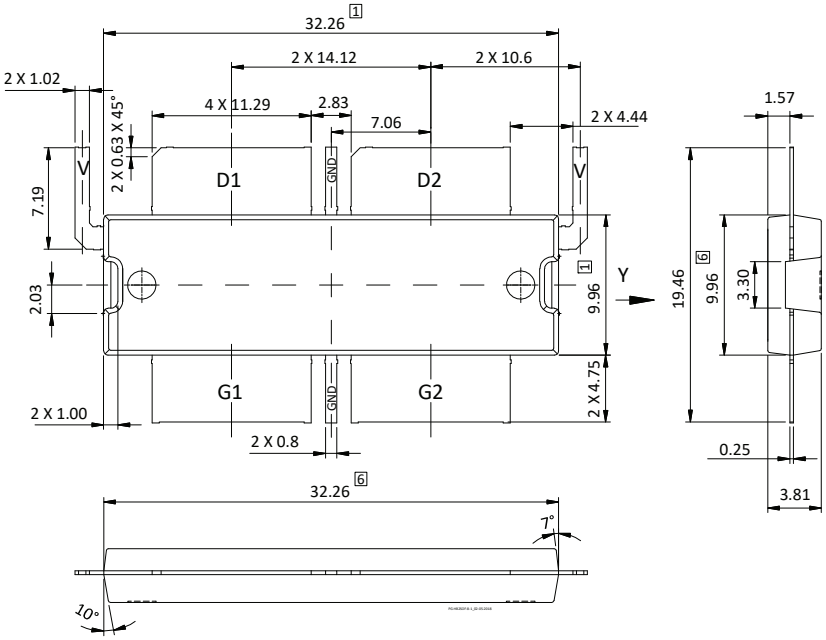
Pin	Description
D1	Drain Device 1 (Main)
D2	Drain Device 2 (Peak)
G1	Gate Device 1(Main)
G2	Gate Device 2 (Peak)
GND	Ground
V1, V2	Drain video decoupling, no DC bias

Lead connections for PXAE183708NB

Package Outline Specifications

Package PG-HB2SOF-8-1

Top and Side View



Bottom View

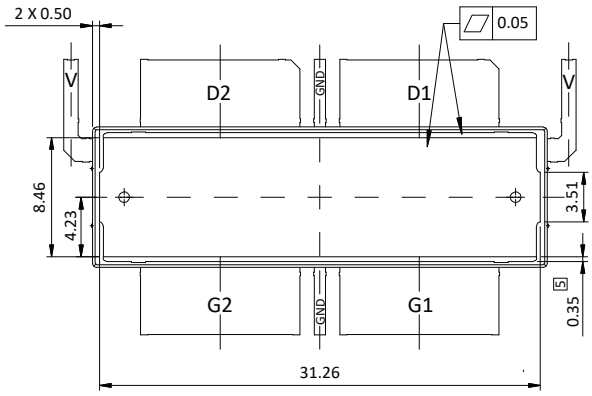


Diagram Notes–unless otherwise specified:

1. Mold/Dam Bar/Metal protusion of 0.30mm max per side not included.
2. Fillets and radii: all radii are 0.3 mm max unless specified otherwise
3. Interpret dimensions and tolerances per ISO 8015
4. Dimensions are mm
5. Exposed metal surface are tin plated, may not be covered by mold compound
6. Does not include mold/dam bar/metal protusion.
7. All tolerances ± 0.1mm unless specified otherwise
9. All metal surfaces pre-plated, except area of cut
9. Lead thickness: 0.25 mm
10. Pins: D1, D2 – drain; G1, G2 – gate; GND – ground; V – Drain video decoupling, no DC bias

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2018-03-26	Advance	All	Data Sheet reflects advance specification for product development
02	2018-04-26	Advance	All	Converted to Wolfspeed Data Sheet
03	2019-02-07	Production	All	Data Sheet reflects released product specification

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Notes

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