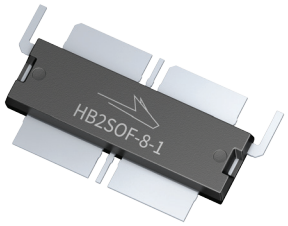
PXAE213708NB

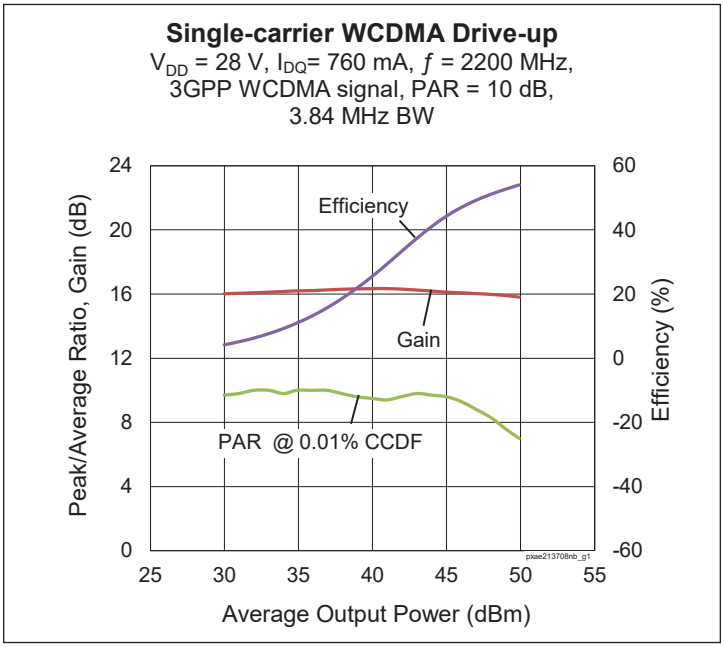
Thermally-Enhanced High Power RF LDMOS FET
400 W, 28 V, 2110 – 2200 MHz



PXAE213708NB
Package PG-HB2SOF-8-1

Description

The PXAE213708NB is a 400-watt (P_{3dB}) LDMOS Doherty transistor intended for use in multi-standard cellular power amplifier applications in the 2110 to 2200 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} = 290 W Typ
- Typical Pulsed CW performance, 2200 MHz, 28 V, doherty configuration, 10 µs, 10% duty cycle, class AB
  - Output power at P_{3dB} = 400 W
  - Efficiency = 60%
  - Gain = 13.3 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} = 760 mA, P_{OUT} = 54 W avg, V_{GSPK} = 1.5 V, f = 2200 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	16	—	dB
Drain Efficiency	η_D	48.5	52	—	%
Adjacent Channel Power Ratio	ACPR	—	–28	–25	dBc
Output PAR at 0.01% probability on CCDF	OPAR	7.5	8	—	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	$R_{DS(on)}$	—	0.05	—	Ω
Operating Gate Voltage (main)	V_{DS} = 28 V, I_{DQ} = 760 mA	V_{GS}	2.85	3.05	3.35	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)	$R_{\theta JC}$	0.60	°C/W

Moisture Sensitivity Level

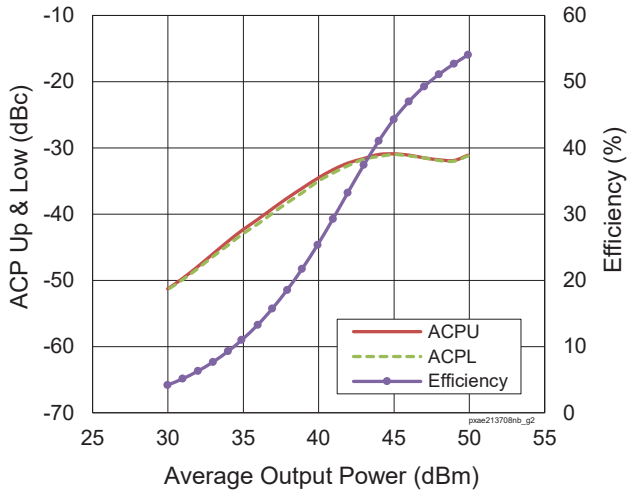
Level	Test Signal	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

Ordering Information

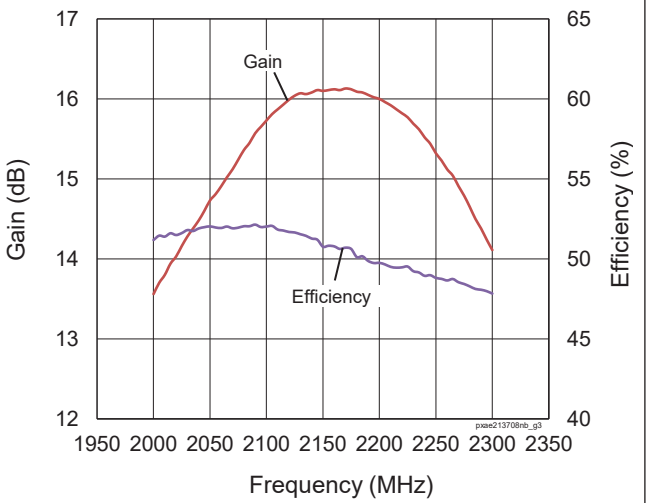
Type and Version	Order Code	Package	Shipping
PXAE213708NB V1 R2	PXAE213708NB-V1-R2	PG-HB2SOF-8-1	Tape & Reel, 250 pcs

Typical Performance (data taken in test fixture)

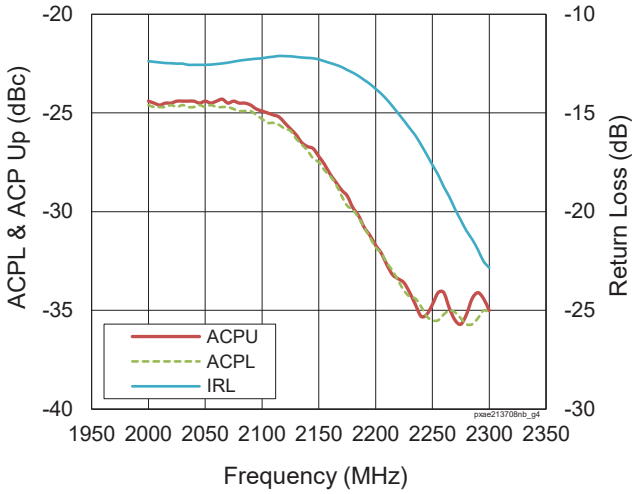
Single-carrier WCDMA Drive-up
V_{DD} = 28 V, $I_{DQ(MAIN)}$ = 760 mA, f = 2200 MHz,
3GPP WCDMA signal, PAR = 10 dB,
BW = 3.84 MHz



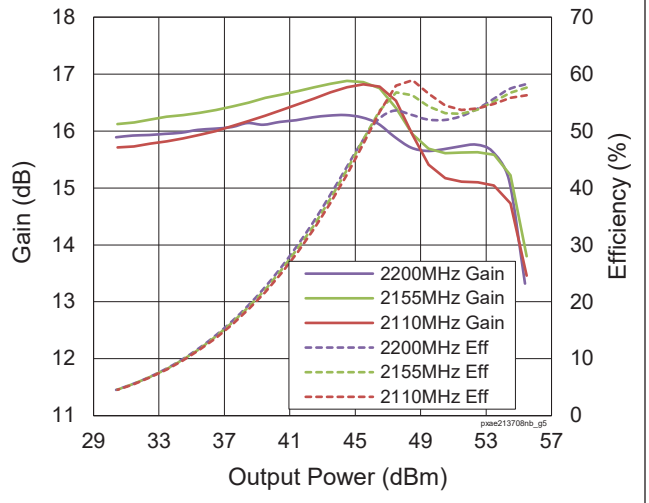
Single-carrier WCDMA Broadband Performance
V_{DD} = 28 V, I_{DQ} = 760 mA, P_{OUT} = 47.32 dBm,
3GPP WCDMA signal, PAR = 10 dB



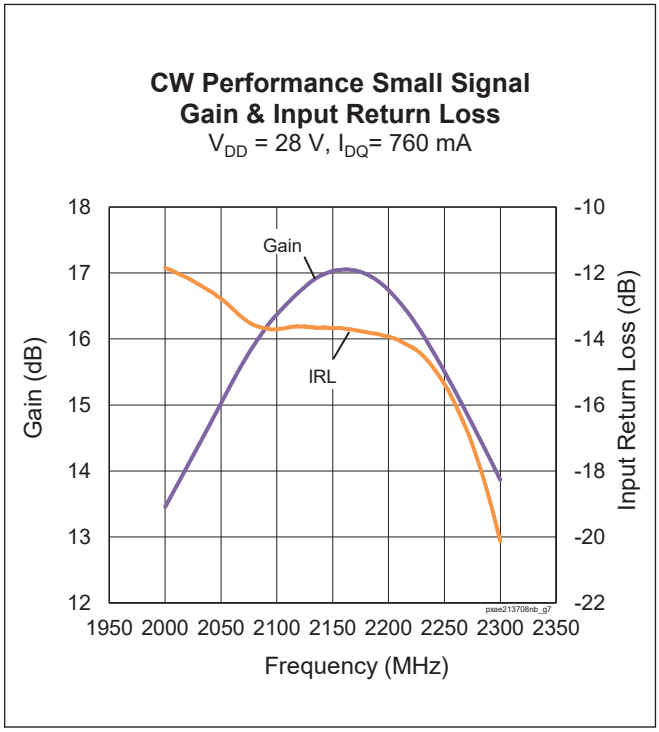
Single-carrier WCDMA Broadband Performance
V_{DD} = 28 V, I_{DQ}= 760 mA, P_{OUT} = 47.32 dBm,
3GPP WCDMA signal, PAR = 10 dB



CW Performance
V_{DD} = 28 V, I_{DQ} = 760 mA



Typical Performance (data taken in test fixture)



Load Pull Performance

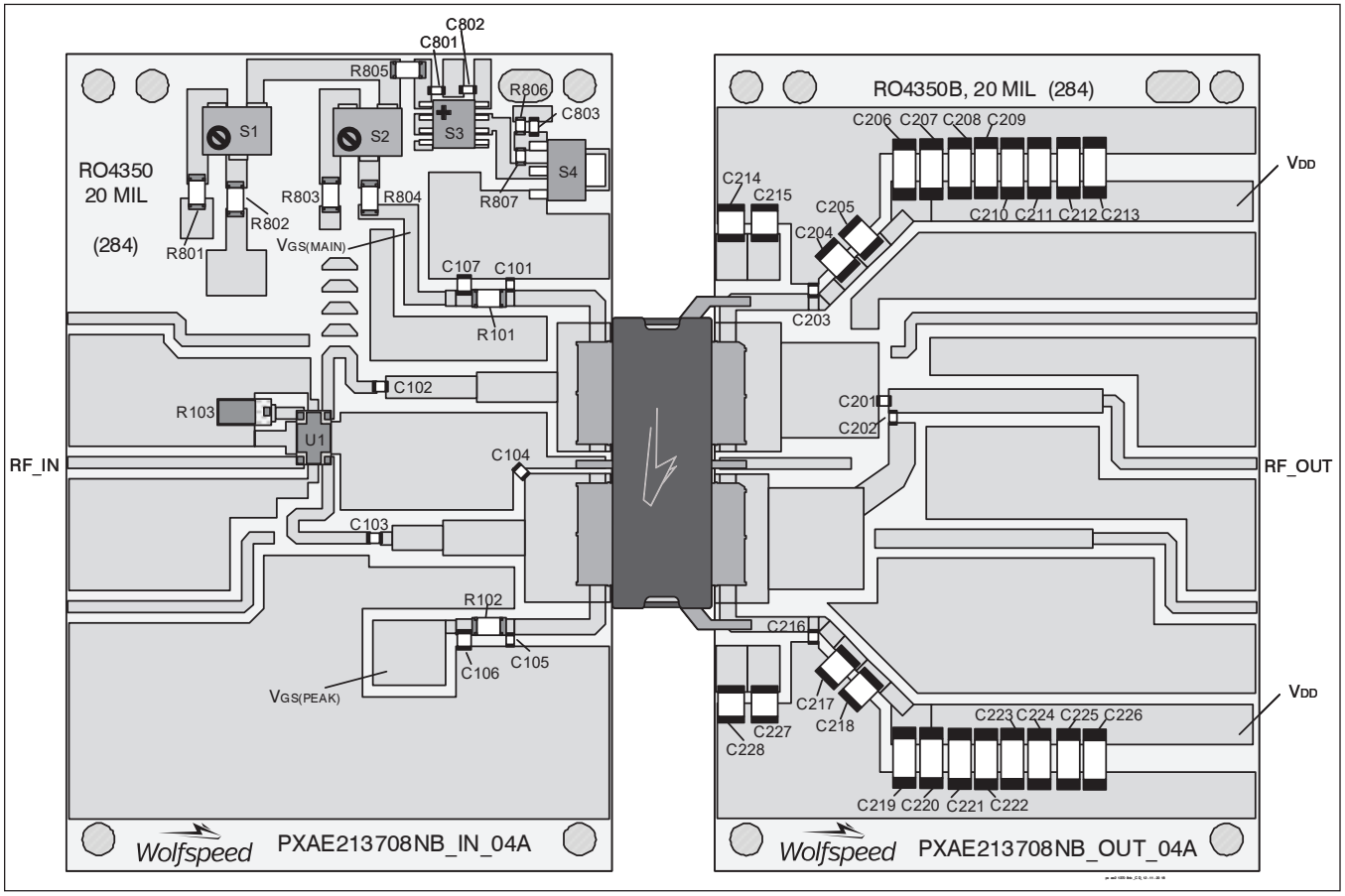
Main Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 28 V, I_{DQ} = 850 mA, class AB

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	ZL [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	ZL [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2110	6.88-j10.14	1.45-j3.46	16.35	52.75	188.4	56.72	2.75-j2.93	17.79	51.61	144.9	65.59
2155	10.79-j12.22	1.43-j3.59	16.36	52.82	191.4	57.65	2.78-j2.65	18.02	51.22	132.4	66.44
2200	17.44-j10.37	1.26-j3.83	16.25	52.99	199.1	57.69	2.35-j2.75	18.14	51.32	135.5	67.40

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

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [W]	ZL [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	ZL [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2110	2.39-j6.39	3.90-j5.38	14.77	54.79	301.3	52.77	3.65-j2.94	15.59	53.90	245.5	58.76
2155	4.53-j7.79	3.94-j5.41	14.74	54.86	306.2	53.59	3.31-j2.66	15.65	53.71	235.0	61.20
2200	7.76-j6.76	3.90-j5.30	17.93	54.90	309.0	54.90	2.93-j2.88	15.82	53.66	232.3	63.25

Reference Circuit, 2110 – 2200 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

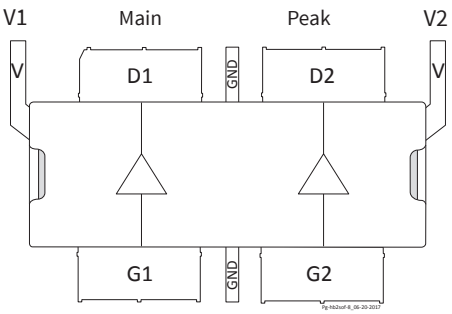
DUT	PXAE213708NB-V1
Test Fixture Part No.	LTA/PXAE213708NB-V1
PCB	Rogers 4350, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66, f = 2110 – 2200 MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

Reference Circuit, 2110 – 2200 MHz

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C102, C103, C105	Capacitor, 33 pF	ATC	ATC800A330JT250XT
C104	Capacitor, 0.7 pF	ATC	ATC800A0R7BT250XT
C106, C107	Capacitor, 0.1 µF	Murata Electronics North America	GCM21BR71H104KA37K
R101, R102	Resistor, 2.49 ohms	Vishay Dale	CRCW12062R49FKEA
R103	Resistor, 50 ohms	Richardson	C8A50Z4A
U1	Hybrid Coupler	Anaren	X3C20F1-02S
C801,C802, C803	Capacitor, 1000 pF	Murata Electronics North America	GRM188R71H102KA01J
R801, R802, R804, R805	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R803	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R806	Resistor, 1.3K ohms	Panasonic Electronic Components	ERJ-3GEYJ132V
R807	Resistor, 1.2K ohms	Panasonic Electronic Components	ERJ-3GEYJ122V
S1, S2	Resistor, 2K ohms	Bourns Inc.	3224W-1-202E
S3	Voltage Regulator	Texas Instruments	LM78L05ACM
S4	Transistor	Diodes Incorporated	BCP5616TA
Output			
C201	Capacitor, 4.7 pF	ATC	ATC800A7R7BT250XT
C202, C203, C216	Capacitor, 33 pF	ATC	ATC800A330JT250XT
C204, C205, C214, C215, C217, C218, C227, C228	Capacitor, 100 V, 10 µF	Murata Electronics North America	GRM32EC72A106KE05L
C206, C207, C208, C209, C210, C211, C212, C213, C219, C220, C221, C222, C223, C224, C225, C226	Capacitor, 100 V, 10 µF	TDK Corporation	C5750X7S2A106M230KB

Pinout Diagram (top view)



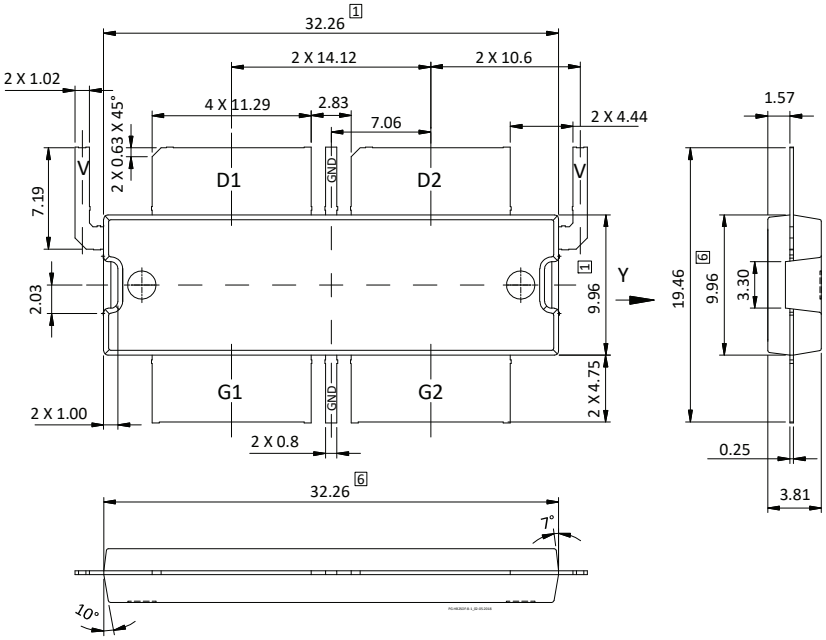
Pin	Description
D1	Drain Device 1 (Main)
D2	Drain Device 2 (Peak)
G1	Gate Device 1(Main)
G2	Gate Device 2 (Peak)
GND	Ground
V1, V2	Drain video decoupling, no DC bias

Lead connections for PXAE213708NB

Package Outline Specifications

Package PG-HB2SOF-8-1

Top and Side View



Bottom View

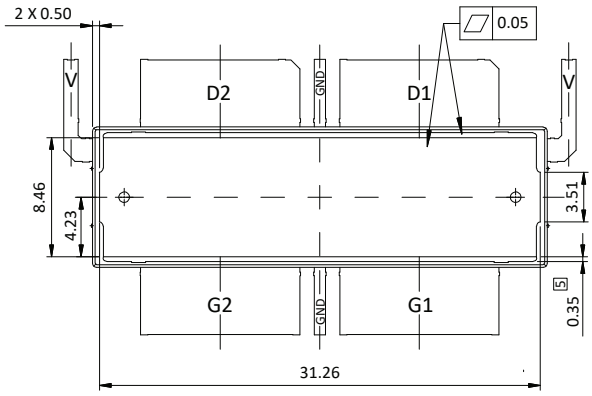


Diagram Notes–unless otherwise specified:

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	2018-09-26	Advance	All	Converted to Wolfspeed Data Sheet
03	2019-03-11	Production	All	Data Sheet reflects released product specification

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Notes

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