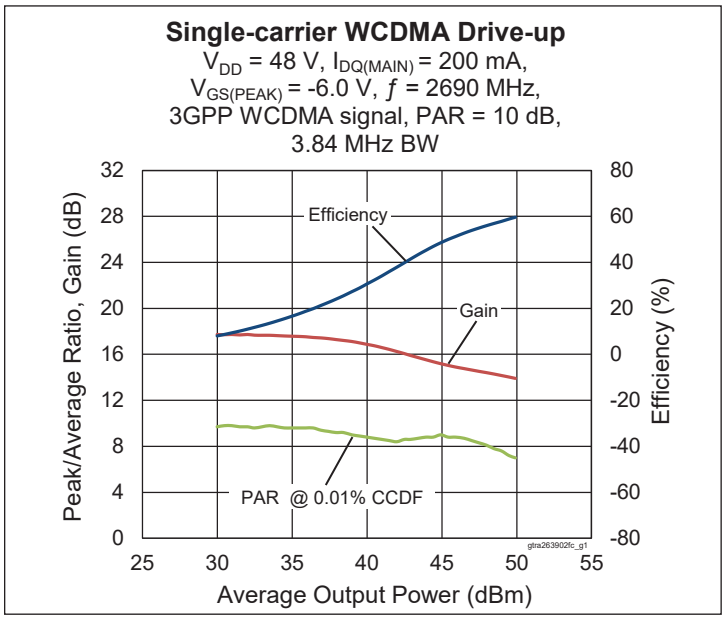
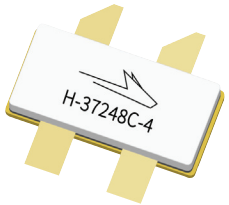
GTRA263902FC

Thermally-Enhanced High Power RF GaN on SiC HEMT
370 W, 48 V, 2495 – 2690 MHz

Description

The GTRA263902FC is a 370-watt (P_{3dB}) GaN on SiC high electron mobility transistor (HEMT) for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.





GTRA263902FC
Package H-37248C-4

Features

- GaN on SiC HEMT technology
- Input matched
- Typical Pulsed CW performance, 2690 MHz, 48 V, combined outputs
  - Output power at P_{3dB} = 370 W
  - Efficiency = 70%
  - Gain = 15 dB
- Capable of handling 10:1 VSWR @48 V, 56 W (CW) output power
- Human Body Model class 1A (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in Wolfspeed Doherty production test fixture)
V_{DD} = 48 V, I_{DQ} = 200 mA, $V_{GS(PEAK)}$ = V_{GS} @ I_{DQ} = 280 mA –3.0 V, P_{OUT} = 56.2 W avg, f = 2690 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}	12.5	13.8	—	dB
Drain Efficiency	η_D	50	54	—	%
Adjacent Channel Power Ratio	ACPR	—	–27	–23	dBc
Output PAR @ 0.01% CCDF	OPAR	5	6.7	—	dB

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

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DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-source Breakdown Voltage (Main)	V_{GS} = –8 V, I_D = 10 mA	$V_{(BR)DSS}$	150	—	—	V
(Peak)	V_{GS} = –8 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current (Main)	V_{GS} = –8 V, V_{DS} = 10 V	I_{DSS}	—	—	2.7	mA
Gate Threshold Voltage (Main)	V_{DS} = 10 V, I_D = 20 mA	$V_{GS(th)}$	–3.8	–3	–2.3	V
(Peak)	V_{DS} = 10 V, I_D = 28.8 mA	$V_{GS(th)}$	–3.8	–3	–2.3	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Voltage		V_{DD}	0	—	55	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 200 mA	$V_{GS(Q)}$	—	–3	—	V

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	–10 to +2	V
Gate Current	I_G	20	mA
Drain Current	I_D	7.5	A
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

Thermal Characteristics

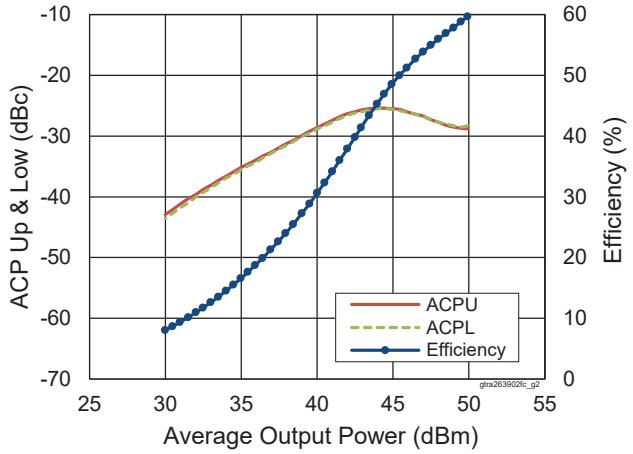
Characteristic	Symbol	Value	Unit
Thermal Resistance (Main, T_{CASE} = 70°C, P_{DISS} = 77 DC)	$R_{\theta JC}$	1.8	°C/W

Ordering Information

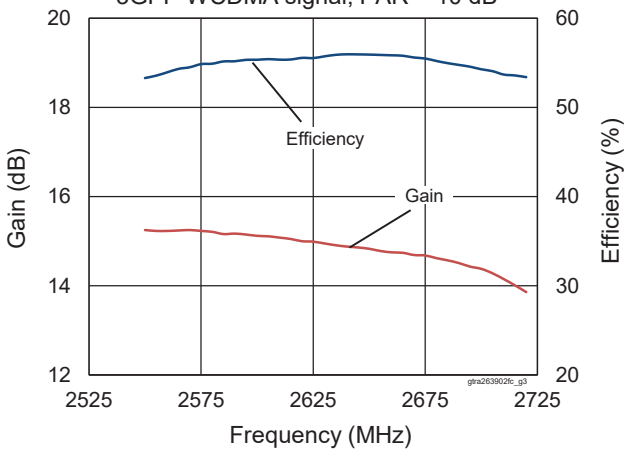
Type and Version	Order Code	Package Description	Shipping
GTRA263902FC V2 R0	GTRA263902FC-V2-R0	H-37248C-4, earless flange	Tape & Reel, 50 pcs
GTRA263902FC V2 R2	GTRA263902FC-V2-R2	H-37248C-4, earless flange	Tape & Reel, 250 pcs

Typical RF Performance (data taken in production test fixture)

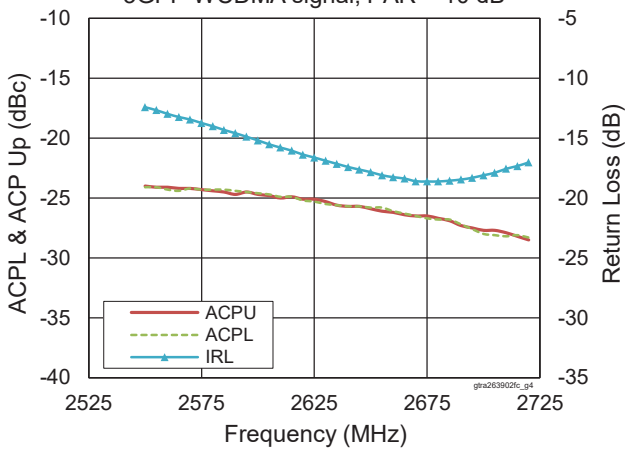
Single-carrier WCDMA Drive-up
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 200 mA,
$V_{GS(PEAK)}$ = -6.0 V, f = 2690 MHz,
3GPP WCDMA signal, PAR = 10 dB,
BW = 3.84 MHz



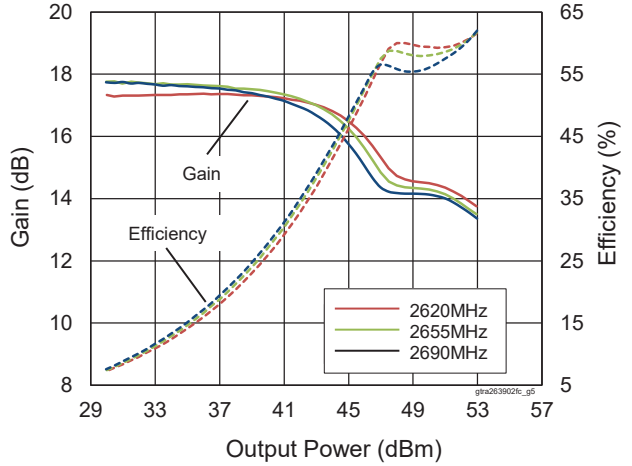
Single-carrier WCDMA Broadband Performance
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 200 mA,
$V_{GS(PEAK)}$ = -6.0 V, P_{OUT} = 47.5 dBm,
3GPP WCDMA signal, PAR = 10 dB



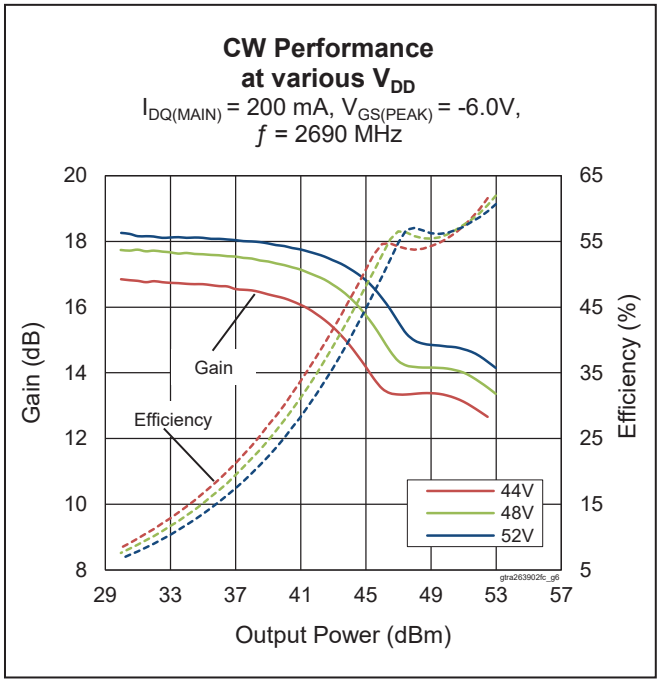
Single-carrier WCDMA Broadband Performance
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 200 mA,
$V_{GS(PEAK)}$ = -6.0 V, P_{OUT} = 47.5 dBm,
3GPP WCDMA signal, PAR = 10 dB

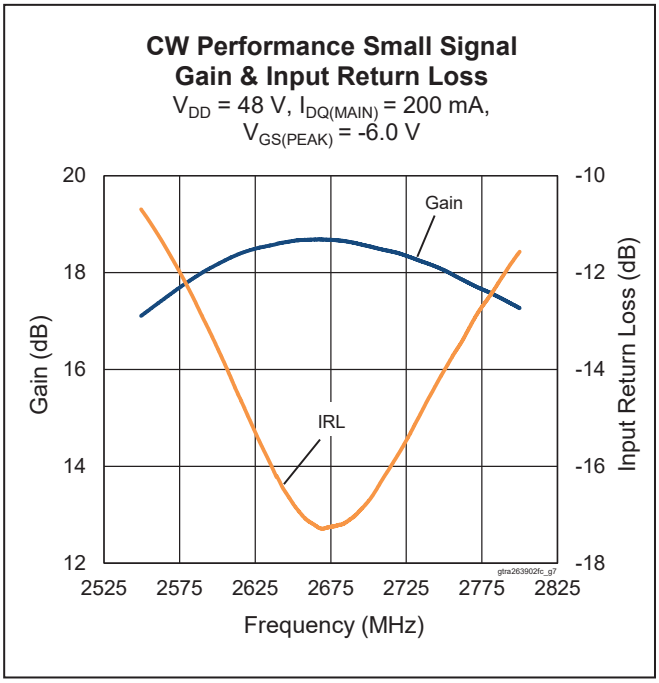


CW Performance
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 200 mA,
$V_{GS(PEAK)}$ = -6.0 V



Typical RF Performance (cont.)





Load Pull Performance

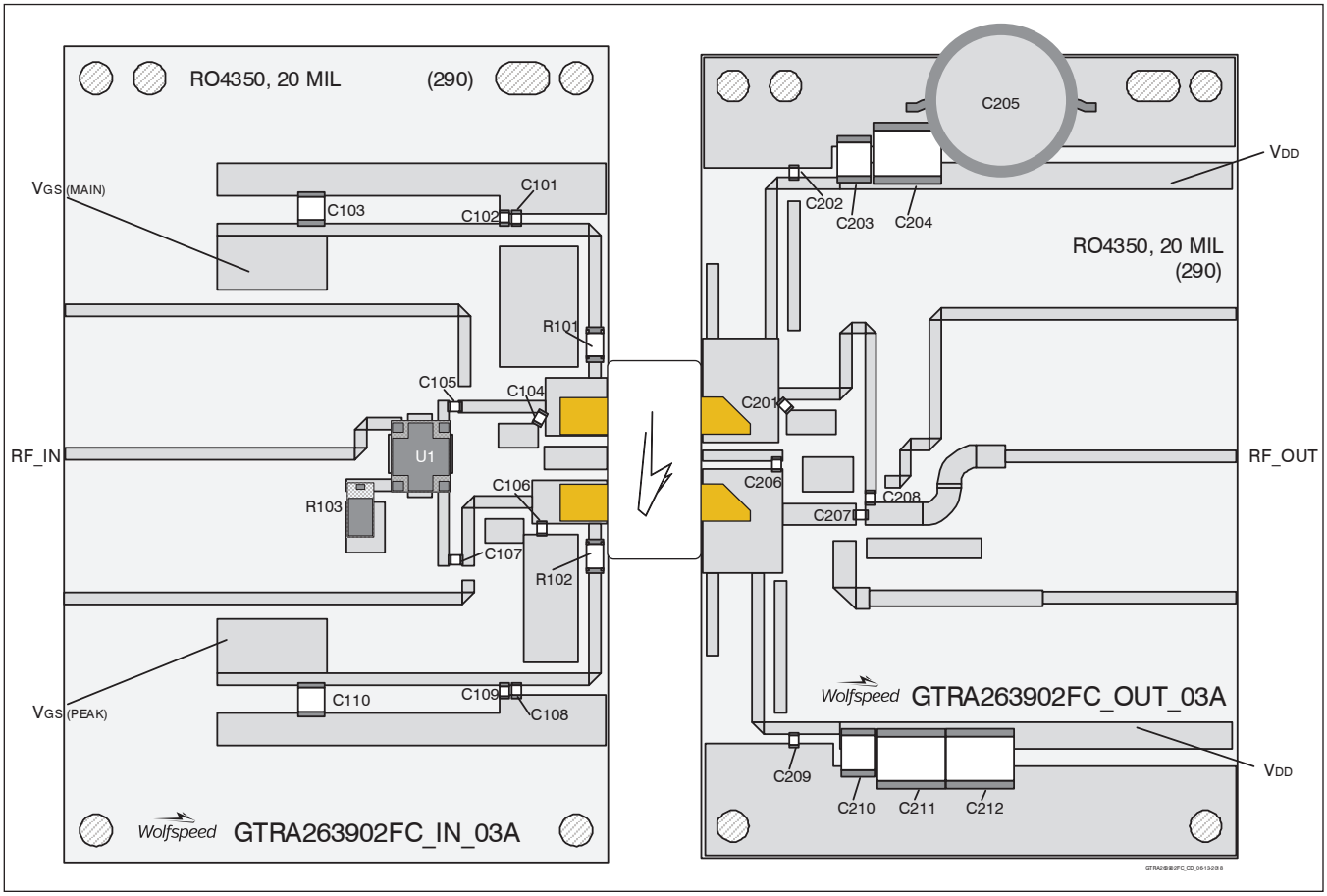
Main Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 48 V, I_{DQ} = 200 mA, class AB

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Z_L [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_L [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2620	10.4 – j6.7	3.88 – j4.7	16.37	52.80	190.55	65.2	2.84 – j2.35	18.15	50.98	125.3	75.3
2690	7.6 – j6.7	3.91 – j5.35	15.79	52.85	192.75	62.4	2.55 – j2.27	18.05	50.69	117.2	76.6

Peak Side Load Pull Performance – Pulsed CW signal: 10 µs, 10% duty cycle, 48 V, $V_{GS(PEAK)}$ = -5 V, class C

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Z_L [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]	Z_L [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	ηD [%]
2620	16.8 – j16.8	2.35 – j3.92	14.72	54.55	285.1	68.1	1.68 – j2.17	16	52.29	169.43	77.6
2690	20 – j7.5	2.5 – j4.37	14.32	54.67	293.1	66.4	2.14 – j2.52	15.3	53.12	205.11	77.7

Reference Circuit, 2620 – 2690 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

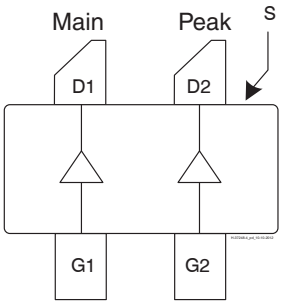
Reference Circuit Assembly

DUT	GTRA263902FC V2
Test Fixture Part No.	LTA/GTRA263902FC V2
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, ε_r = 3.66, f = 2620 – 2690 MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C105, C107, C108	Capacitor, 10 pF	ATC	ATC800A100JT250T
C102, C109	Capacitor, 1 µF	Murata Electronics North America	GRM21BR71H105KA12L
C103, C110	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C104	Capacitor, 1.0 pF	ATC	ATC600S1R0JT250T
C106	Capacitor, 1.2 pF	ATC	ATC600S1R2JT250T
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid Coupler	Anaren	X3C26P1-03S
Output			
C201, C206	Capacitor, 1.5 pF	ATC	ATC600S1R5JT250T
C202, C209	Capacitor, 10 pF	ATC	ATC800A100JT250T
C203, C210	Capacitor, 1 µF	TDK Corporation	C4532X7R2A105M230KA
C204, C211,C212	Capacitor, 10 µF	AVX Corporation	2225PC105KAT1A
C205	Capacitor, 220 µF	Panasonic Electronic Components	ECA-2AHG221
C207, C208	Capacitor, 10 pF	ATC	ATC600F100JW250T

Pinout Diagram (top view)



Pin	Description
D1	Drain Device 1
D2	Drain Device 2
G1	Gate Device 1
G2	Gate Device 2
S	Source (flange)

Package Outline Specifications (top view)

Package H-37248C-4

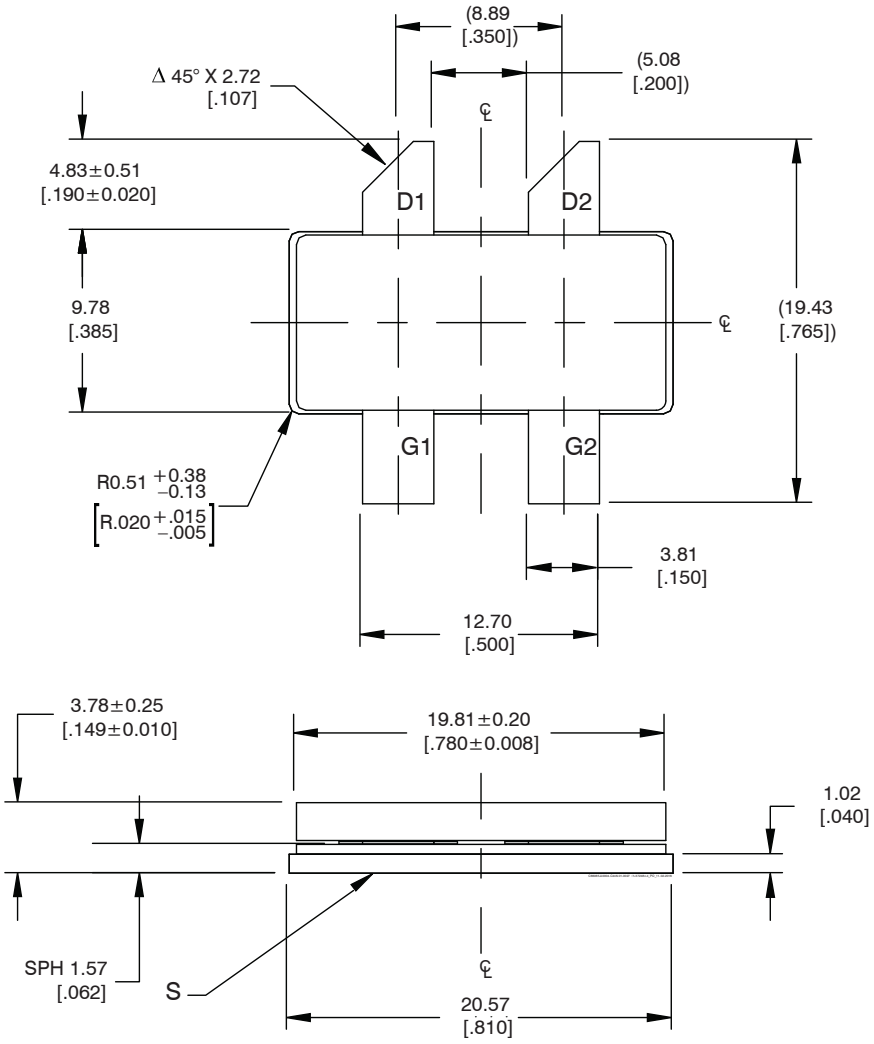


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994
2. Primary dimensions are mm, alternate dimensions are inches
3. All tolerances ± 0.127 [0.005]
4. Pins: D1, D2 – drain, G1, G2 – gate, S – source (flange)
5. Lead thickness: 0.13 ± 0.05 [0.005 ± 0.002]
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch]

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2016-09-14	Advance	All	Data Sheet reflects advance specification for product development
02	2017-05-09	Production	All	Data Sheet reflects released product specification
02.1	2017-09-18	Production	2 5, 6	Updated operating voltage, added ordering code Added C212 to circuit, corrected P/N for C104, C106, C201, C206
03	2018-03-08	Production	All 2	Revised product from V1 to V2, ordering code change, products manufacture with new assembly technology Updated thermal characteristics
04	2018-07-05	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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