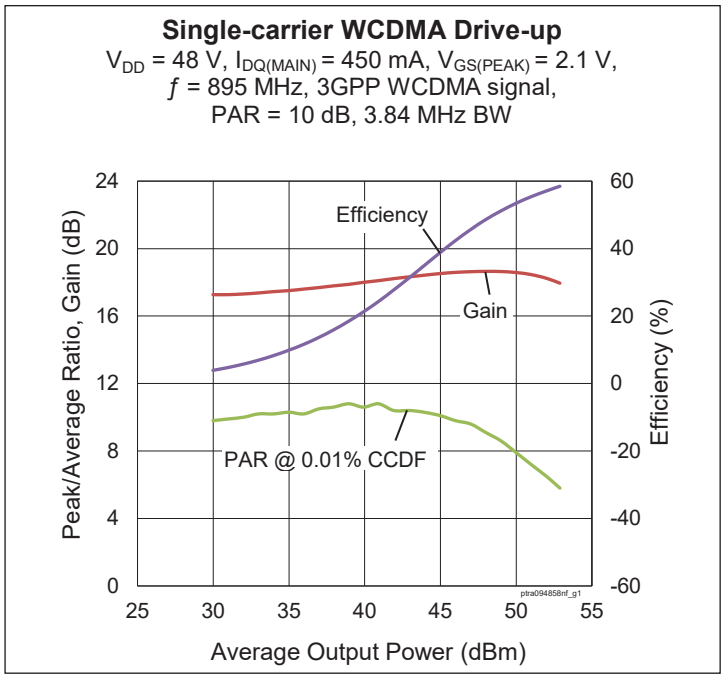
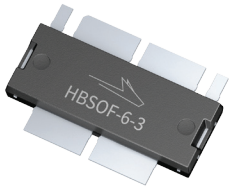
PTRA094858NF

Thermally-Enhanced High Power RF LDMOS FET
400 W, 48 V, 859 – 960 MHz

Description

The PTRA094858NF is a 400-watt Doherty LDMOS transistor intended for use in multi-standard cellular power amplifier applications in the 859 to 960 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.





PTRA094858NF
Package PG-HBSOF-6-3

Features

- Broadband internal input and output matching
- Asymmetrical Doherty design
  - Main : P_{1dB} = 150 W Typ
  - Peak : P_{1dB} = 250 W Typ
- Typical Pulsed CW performance, 895 MHz, 48 V, Doherty configuration, 10 µsec pulse width, 10% duty cycle, class AB
  - Output power at P_{1dB} = 400 W
  - Output power at P_{3dB} = 500 W
  - Efficiency = 63%
  - Gain = 18.5 dB
- Capable of handling 10:1 VSWR @ 48 V, 87 W (CW) output power
- Integrated ESD protection
- Human Body Model Class 1C (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

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

V_{DD} = 48 V, I_{DQ} = 450 mA, P_{OUT} = 87 W avg, $V_{GS(PEAK)}$ = 2.1 V, f = 895 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	16.8	17.75	—	dB
Drain Efficiency	η_D	48	52	—	%
Adjacent Channel Power Ratio	ACPR	—	–29	—26.5	dBc
Output PAR @ 0.01% CCDF	OPAR	6.5	7.2	—	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	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	V_{DS} = 48 V, V_{GS} = 0 V	I_{DSS}	—	—	1	µA
	V_{DS} = 105 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	$R_{DS(on)}$	—	0.2	—	Ω
(Peak)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.13	—	Ω
Operating Gate Voltage (Main)	V_{DS} = 48 V, I_{DQ} = 450 mA	V_{GS}	3.4	3.6	3.9	V
(Peak)	V_{DS} = 48 V, I_{DQ} = 0 mA	V_{GS}	—	2.1	—	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	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C

1. 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.
2. Parameters values can be affected by end application and product usage. Values may change over time.

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance (main, T_{CASE} = 70°C, 87.1 W CW)	$R_{\theta JC}$	0.41	°C/W

Moisture Sensitivity Level

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

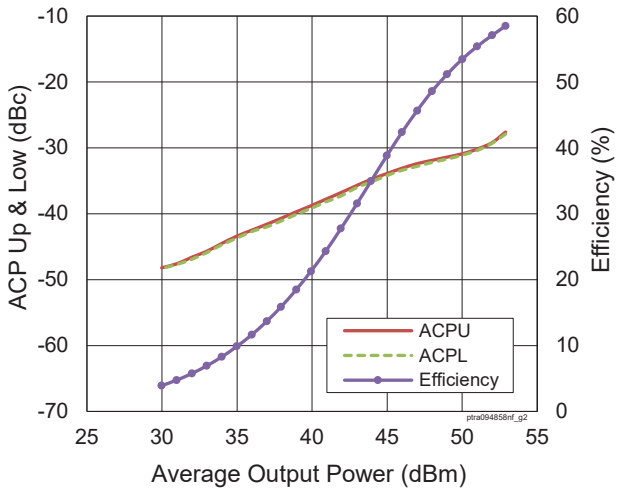
Ordering Information

Type and Version	Order Code	Package	Shipping
PTRA094858NF V1 R5	PTRA094858NF-V1-R5	PG-HBSOF-6-3	Tape & Reel, 500 pcs

Typical Performance (data taken in test fixture)

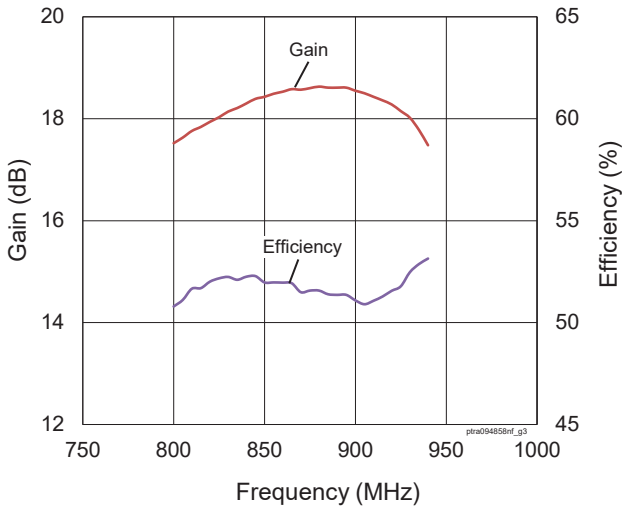
Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 450 mA, $V_{GS(PEAK)}$ = 2.1 V,
f = 895 MHz, 3GPP WCDMA signal,
PAR = 10 dB, BW = 3.84 MHz



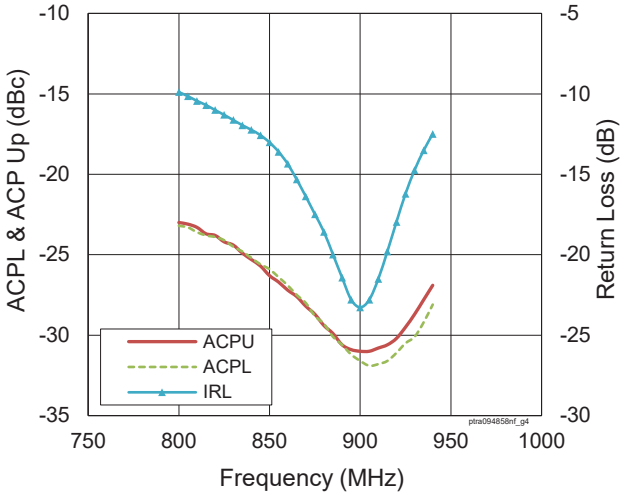
Single-carrier WCDMA Broadband Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 450 mA, $V_{GS(PEAK)}$ = 2.1 V,
P_{OUT} = 49.4 dBm, 3GPP WCDMA signal,
PAR = 10 dB



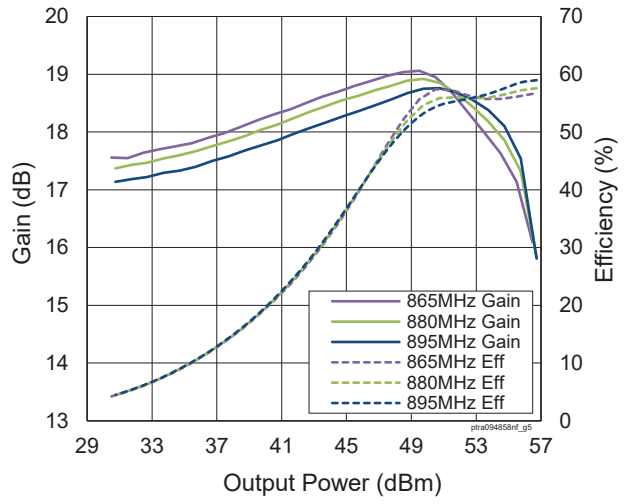
Single-carrier WCDMA Broadband Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 450 mA, $V_{GS(PEAK)}$ = 2.1 V,
P_{OUT} = 49.4 dBm, 3GPP WCDMA signal,
PAR = 10 dB



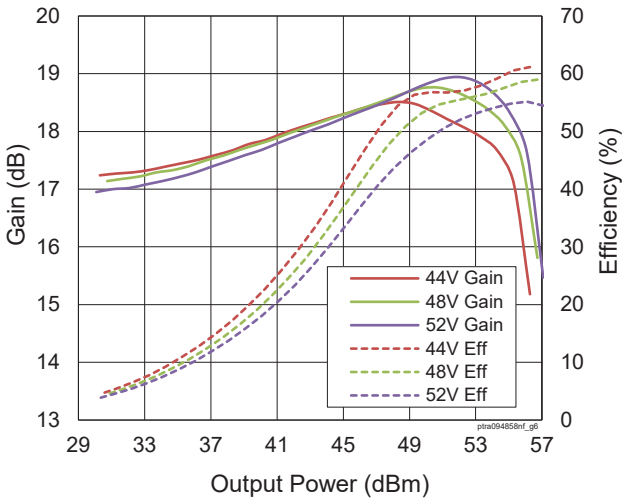
CW Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 450 mA,
$V_{GS(PEAK)}$ = 2.1 V

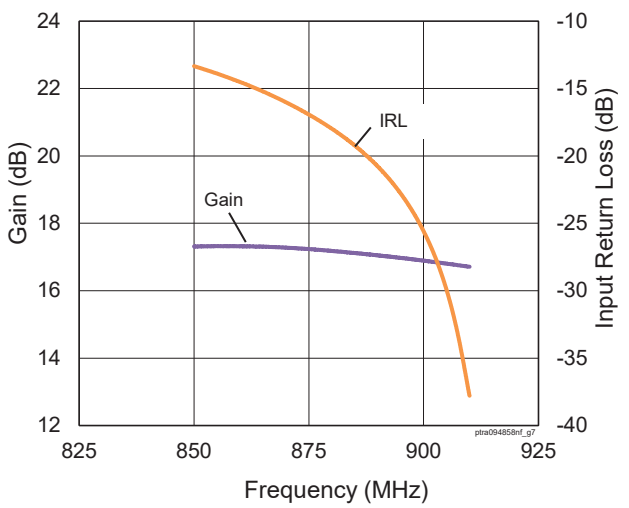


Typical Performance (cont.)

CW Performance at various V_{DD}
$I_{DQ(MAIN)}$ = 450 mA, $V_{GS(PEAK)}$ = 2.1 V,
f = 895 MHz



CW Performance Small Signal Gain & Input Return Loss
V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 450 mA,
V_{GSPEAK} = 2.1 V



Load Pull Performance

Main Side Load Pull Performance – Pulsed CW signal: 10 µsec, 10% duty cycle, V_{DD} = 48 V, I_{DQ} = 450 mA, class AB

		P_{1dB}									
		Max Output Power					**Max Drain Efficiency**				
Freq [MHz]	**Zs [Ω]**	**Zl [Ω]**	**Gain [dB]**	**P_{1dB} [dBm]**	**P_{1dB} [W]**	**η_D [%]**	**Zl [Ω]**	**Gain [dB]**	**P_{1dB} [dBm]**	**P_{1dB} [W]**	**η_D [%]**
865	1.43 – j5.04	2.29 – j0.67	21.06	53.32	214.78	54.9	4.77 + j1.31	22.83	51.65	146.22	66.0
895	2.31 – j6.58	2.26 – j0.24	21.03	53.47	222.33	57.0	4.26 + j1.68	22.7	51.84	152.76	68.1

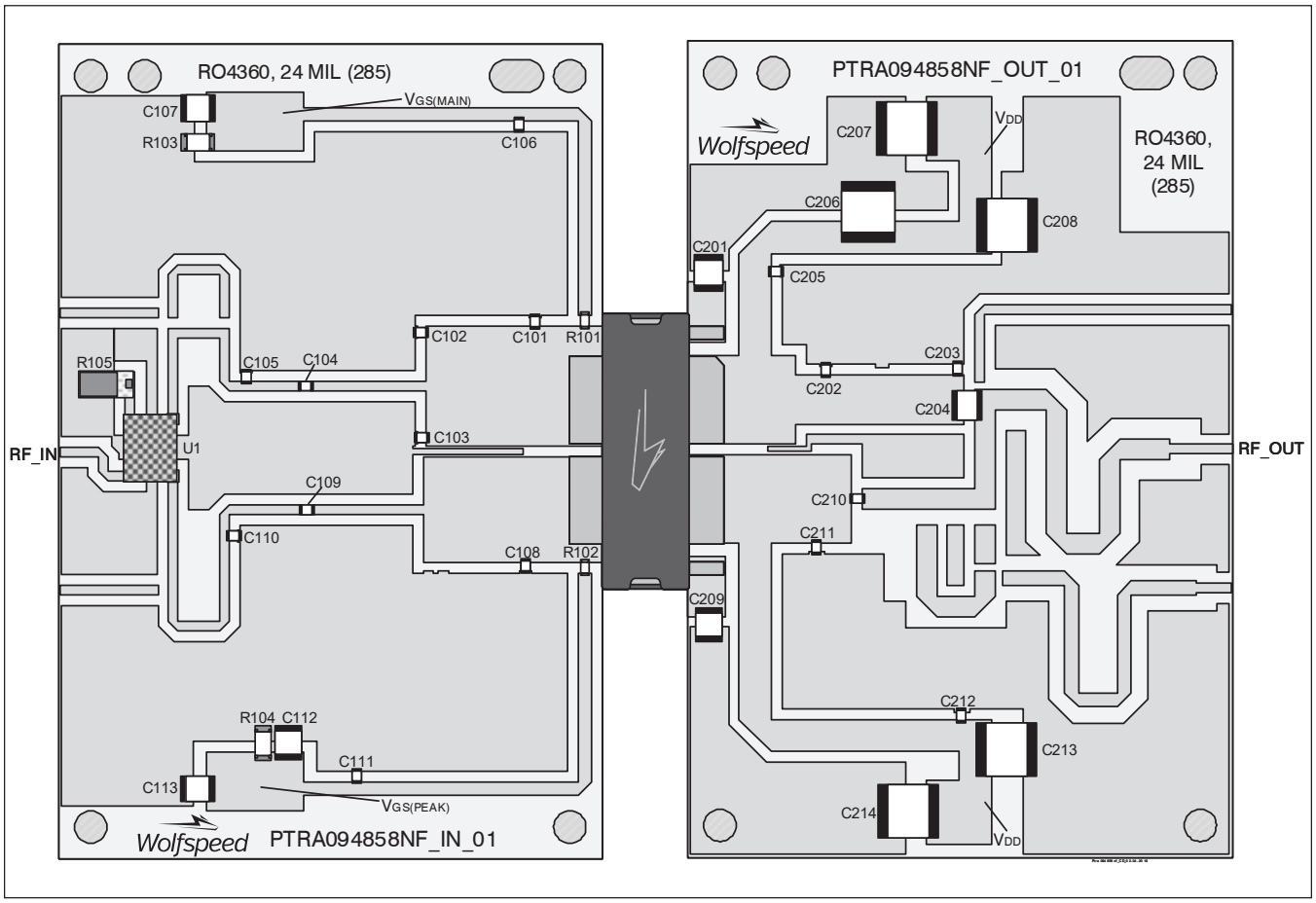
		P_{3dB}									
		Max Output Power					**Max Drain Efficiency**				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
865	1.43 – j5.04	2.32 – j0.79	19.07	54.24	265.46	58.5	4.68 + j1.09	20.78	52.59	181.55	67.3
895	2.31 – j6.58	2.29 – j0.32	19.03	54.35	272.27	60.4	4.14 + j1.5	20.64	52.77	189.23	69.3

Peak Side Load Pull Performance – Pulsed CW signal: 10 µsec, 10% duty cycle, V_{DD} = 48 V, $V_{GS(PEAK)}$ = 2.1 V, class C

		P_{1dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	η_D [%]	Zl [Ω]	Gain [dB]	P_{1dB} [dBm]	P_{1dB} [W]	η_D [%]
865	1.78 – j4.94	1.20 – j0.29	16.83	55.60	363.08	57.9	0.97 + j1.36	17.44	52.28	169.04	74.5
895	2.94 – j6.74	1.34 – j0.19	16.54	55.65	367.28	58.9	0.98 + j1.35	17.24	52.81	191	74.2

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Zl [Ω]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
865	1.78 – j4.94	1.36 – j0.19	15.03	56.38	434.51	63.4	1.17 + j0.98	15.72	54.31	269.77	72.5
895	2.94 – j6.74	1.36 – j0.19	14.54	56.45	441.57	61.2	1.15 + j1	15.54	54.69	294.44	74.0

Reference Circuit, 865 – 895 MHz



Reference circuit assembly diagram (not to scale)

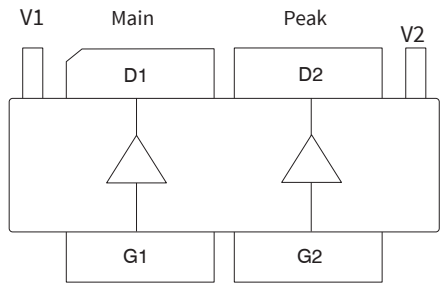
Reference Circuit Assembly

DUT	PTRA094858NF V1
Test Fixture Part No.	LTA/PTRA094858NF-V1
PCB	Rogers 4360, 0.024" thick, 2 oz. copper, ε_r = 6.4, f = 865 – 895 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, C108	Capacitor, 6.8 pF	ATC	ATC600F6R8CT250XT
C102	Capacitor, 2.7 pF	ATC	ATC600F2R7CT250XT
C103, C105	Capacitor, 1.8 pF	ATC	ATC600F1R8CT250XT
C104, C109	Capacitor, 33 pF	ATC	ATC600F330JT250XT
C106, C111	Capacitor, 68 pF	ATC	ATC600F680JT250XT
C107, C112, C113	Capacitor, 10 µF, 50 V	Murata Electronics North America	GRM31CR61H106KA12K
C110	Capacitor, 3 pF	ATC	ATC600F3R0CT250XT
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103, R104	Resistor, 1000 ohms	Panasonic Electronic Components	ERJ-8GEYJ102V
R105	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid Coupler	RN2 Tech	RN2 CMX09Q02
Output			
C201, C209	Capacitor, 10 µF, 100 V	TDK Corporation	C5750X7S2A106M230KB
C202	Capacitor, 10 pF	ATC	ATC600F100JT250XT
C203	Capacitor, 3.3 pF	ATC	ATC600F3R3CT250XT
C204	Capacitor, 20 pF	ATC	ATC100B200KW500XT
C205	Capacitor, 68 pF	ATC	ATC600F680JT250XT
C206, C207, C208, C213, C214	Capacitor, 10 µF, 100 V	TDK Corporation	C5750X7S2A106M230KB
C210, C212	Capacitor, 47 pF	ATC	ATC600F470JT250XT
C211	Capacitor, 15 pF	ATC	ATC600F150JT250XT

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)
S	Source (flange)
V1, V2	Drain video decoupling, no DC Bias

Lead connections for PTRA094858NF

Package Outline Specifications

Package PG-HBSOF-6-3

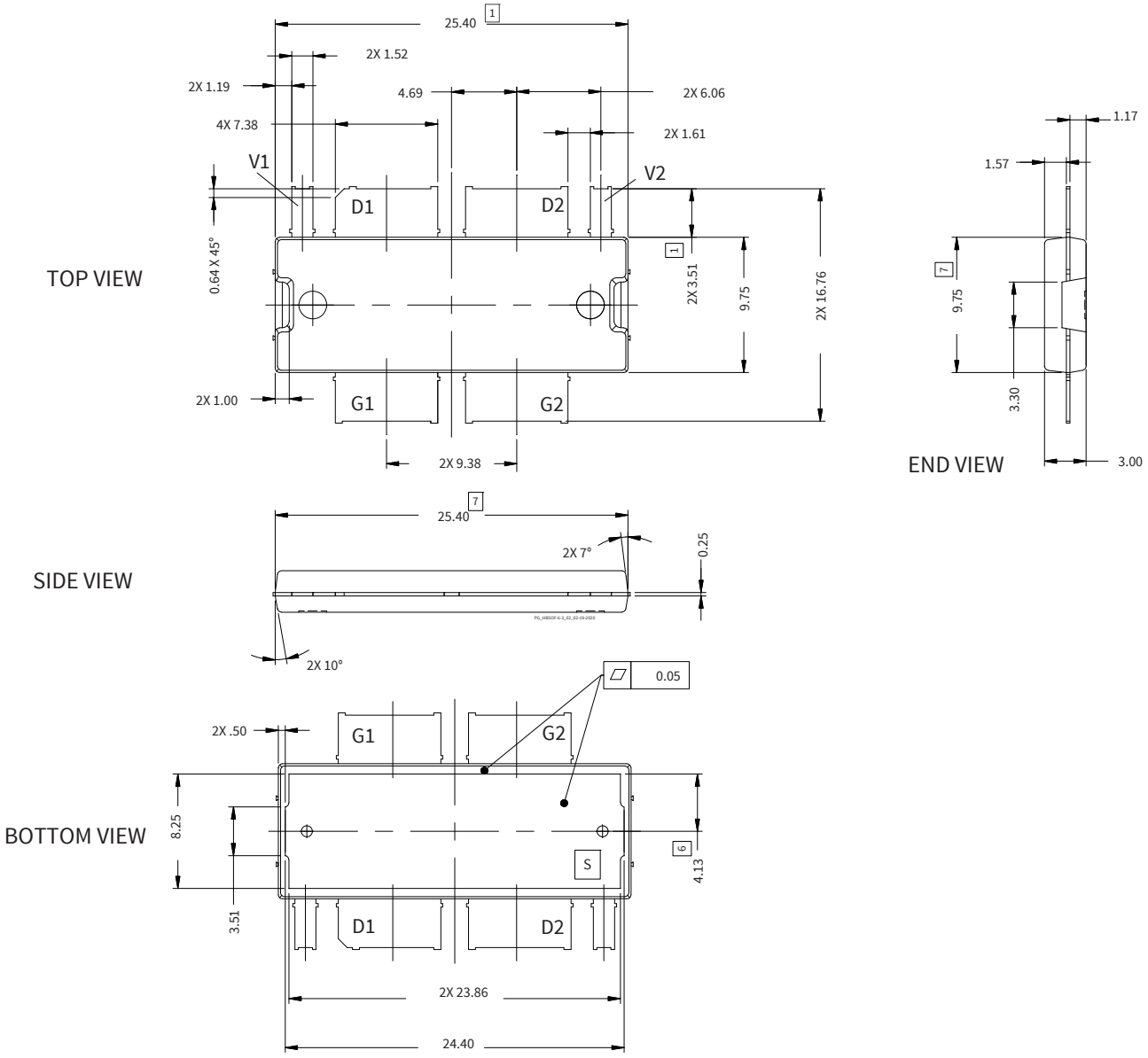


Diagram Notes–unless otherwise specified:

1. Mold/dam bar/metal protusion of 0.30 mm max per side not included.
2. Metal protrusion 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. Exposed metal surface is tin-plated, may not be covered by mold compound.
7. Does not include mold/dam bar/metal protusion.
8. All tolerances ± 0.1 mm unless specified otherwise.
9. All metal surfaces pre-plated, except area of cut.
10. Lead thickness: 0.25 mm.
11. Pins: D1, D2 = drain; G1, G2 = gate; S = source; V1, V2 = drain video decoupling, not for DC bias.

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2019-02-06	Preliminary	All	Data Sheet reflects preliminary specification
02	2019-04-03	Final	All	Corrected package throughout, updated HBM classification, Data Sheet reflects released product specification
02.1	2020-03-02	Final	8	Updated package outline

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com
919.407.7816

Notes

Disclaimer

Specifications are subject to change without notice. Cree, Inc. believes the information contained within this data sheet to be accurate and reliable. However, no responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Cree. Cree makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose. “Typical” parameters are the average values expected by Cree in large quantities and are provided for information purposes only. These values can and do vary in different applications and actual performance can vary over time. All operating parameters should be validated by customer’s technical experts for each application. Cree products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Cree product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.

© 2019 Cree, Inc. All rights reserved. Wolfspeed® and the Wolfspeed logo are registered trademarks of Cree, Inc.

ENTEGRECİ

Bu belge www.entegreci.com üzerinden sunulmaktadır.

Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

www.entegreci.com

Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

www.entegreci.com | **destek@entegreci.com** | **0850 305 90 34**

Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.