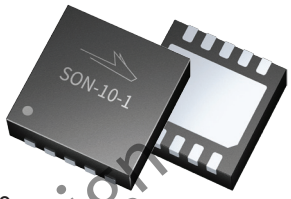
PTFC270051M

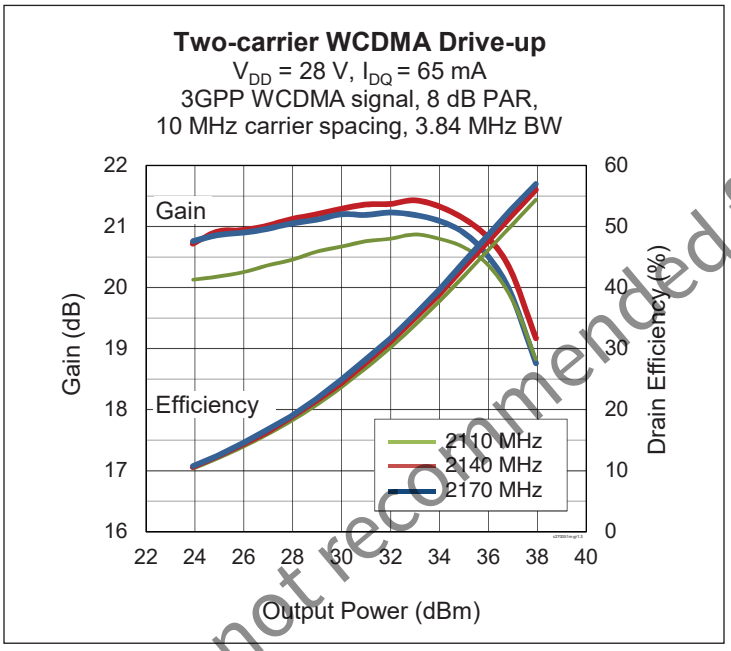
High Power RF LDMOS Field Effect Transistor
5 W, 28 V, 900 – 2700 MHz

Description

The PTFC270051M is an unmatched 5-watt LDMOS FET suitable for power amplifier applications with frequencies from 900 MHz to 2700 MHz. This LDMOS transistor offers excellent gain, efficiency and linearity performance in a small overmolded plastic package.



PTFC270051M
Package PG-SON-10



Features

- Unmatched
- Typical CW performance, 940 MHz, 28 V
  - Output power (P_{1dB}) = 6.5 W
  - Gain = 23 dB
  - Efficiency = 62%
- Typical CW performance, 2170 MHz, 28 V
  - Output power (P_{1dB}) = 7.3 W
  - Gain = 20.3 dB
  - Efficiency = 60%
- Typical CW performance, 2655 MHz, 28 V
  - Output power (P_{1dB}) = 7.3 W
  - Gain = 19.9 dB
  - Efficiency = 59.5%
- Capable of handling 10:1 VSWR @ 28 V, 5 W (CW) output power
- Integrated ESD protection: Human Body Model Class 1A (per JESD22-A114)
- Pb-free and RoHS compliant

RF Characteristics, 2170 MHz

CW Specifications (tested in Wolfspeed test fixture)

V_{DD} = 28 V, I_{DQ} = 65 mA, P_{OUT} = 5 W, f_1 = 2110 MHz, f_2 = 2170 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	18.5	19.5	—	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} = 60 V, V_{GS} = 0 V	I_{DSS}	—	—	1	µA
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	2	—	Ω
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 65 mA	V_{GS}	2.2	2.7	3.2	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 Resistance (T_{CASE} 70°C, 5.5 W CW)	$R_{\theta JC}$	3.84	°C/W

Moisture Sensitivity Level

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

Ordering Information

Type	Order Code	Package and Description	Shipping
PTFC270051M V2 R1K	PTFC270051M-V2-R1K	PG-SON-10, molded plastic, SMD	Tape & Reel, 1000 pcs

Evaluation Boards

Order Code	Frequency	Description
LTN/PTFC270051M V2	2110 – 2170 MHz	Class AB with combined outputs, R04360, 0.508 mm thick
LTN/PTFC270051M E3	2620 – 2690 MHz	Class AB with combined outputs, R04360, 0.508 mm thick
LTN/PTFC270051M E4	920 – 960 MHz	Class AB with combined outputs, R04360, 0.508 mm thick
LTN/PTFC270051M E5	1930 – 1990 MHz	Class AB with combined outputs, R04360, 0.508 mm thick
LTN/PTFC270051M E6	1805 – 1880 MHz	Class AB with combined outputs, R04360, 0.508 mm thick

Find Gerber files for these reference fixtures on the Wolfspeed Web site at **www.wolfspeed.com/RF**

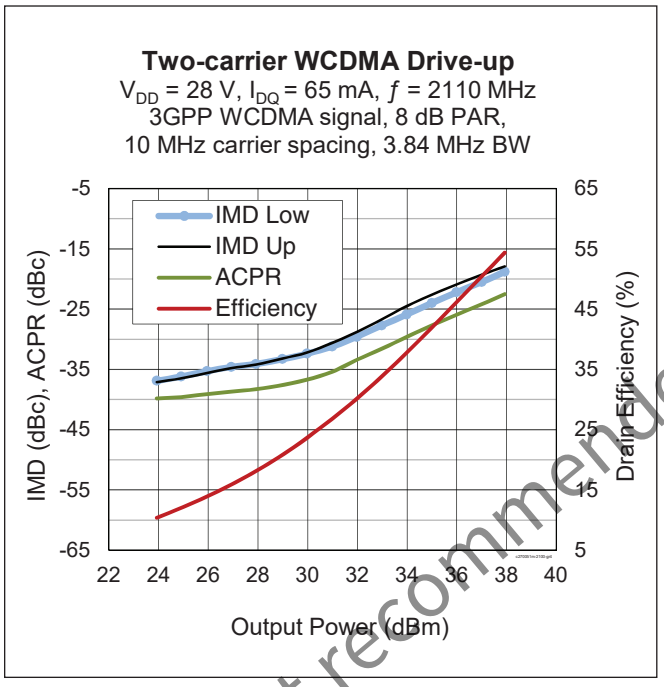
RF Characteristics, 2170 MHz

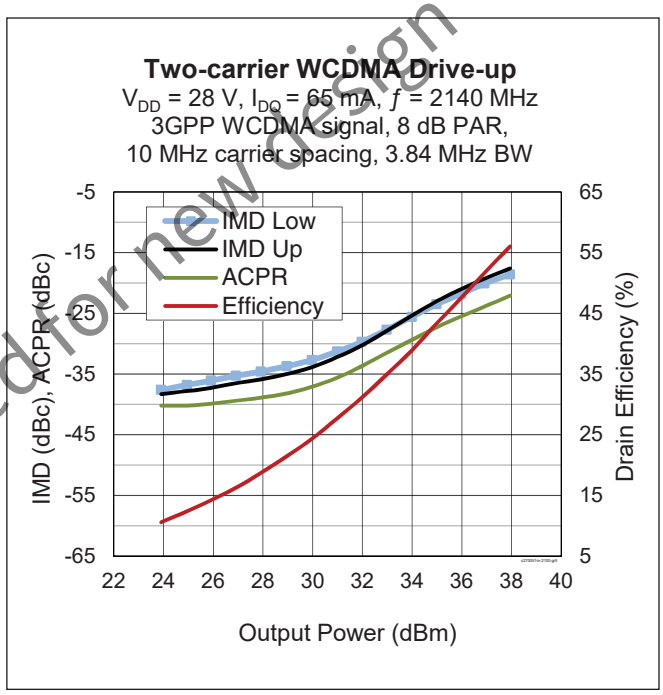
Two-carrier WCDMA Specifications (not subject to production test—verified by design/characterization in Wolfspeed test fixture)

V_{DD} = 28 V, I_{DQ} = 65 mA, P_{OUT} = 0.8 W avg, f_1 = 2157.5 MHz, f_2 = 2167.5 MHz
3GPP WCDMA signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	21	—	dB
Drain Efficiency	η_D	—	21.5	—	%
Intermodulation Distortion	IMD	—	–35.5	—	dBc

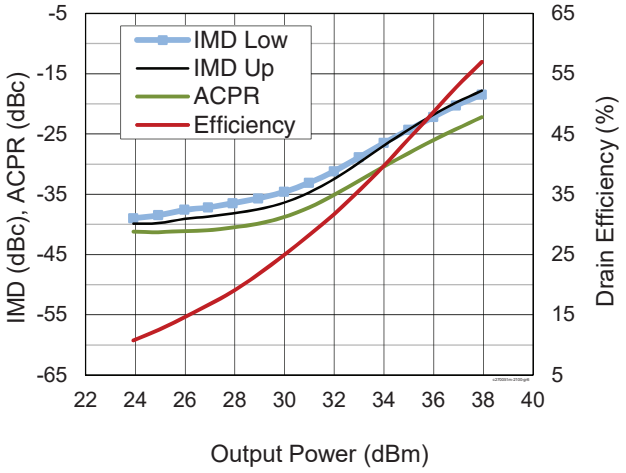
Typical Performance, 2170 MHz (data taken in a production test fixture)



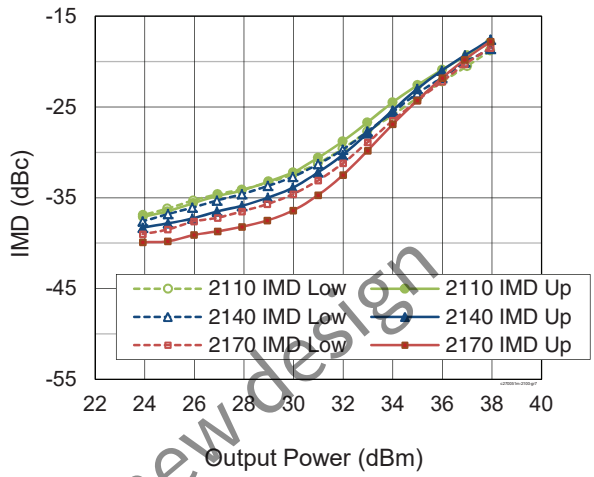


Typical Performance, 2170 MHz (cont.)

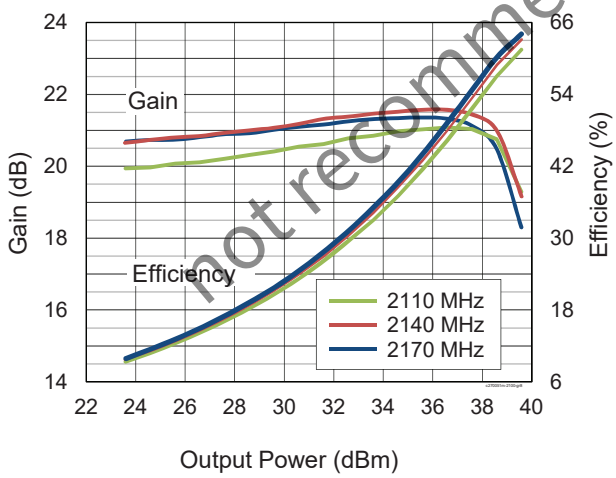
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 65 mA, f = 2170 MHz
3GPP WCDMA signal, 8 dB PAR,
10 MHz carrier spacing, 3.84 MHz BW



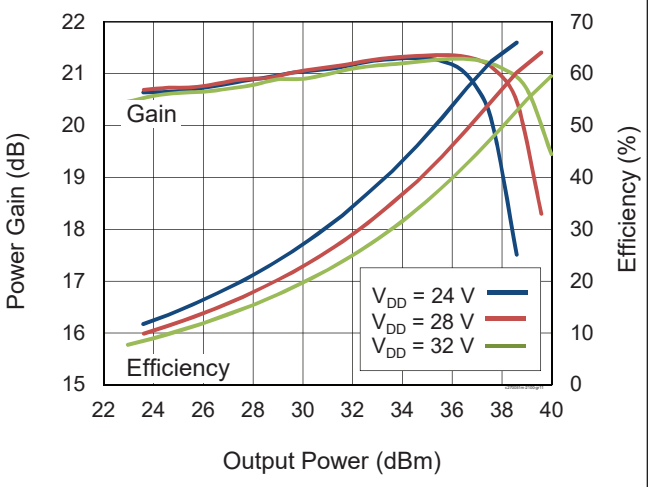
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 65 mA,
3GPP WCDMA signal, 8 dB PAR,
10 MHz carrier spacing, 3.84 MHz BW



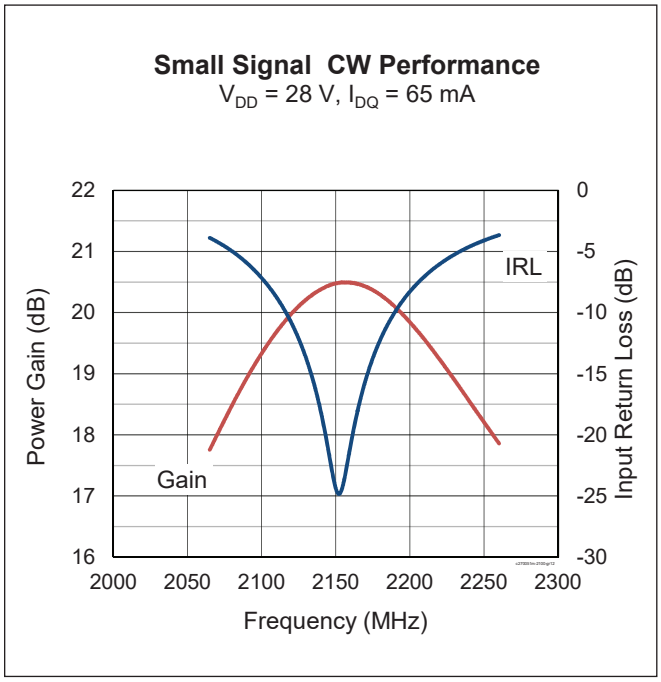
CW Performance
V_{DD} = 28 V, I_{DQ} = 65 mA



CW Performance
at selected supply voltage
I_{DQ} = 65 mA, f = 2170 MHz

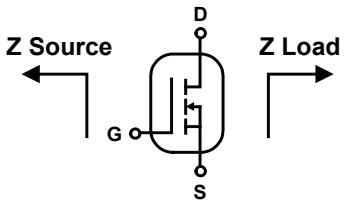


Typical Performance, 2170 MHz (cont.)



Broadband Circuit Impedance, 2170 MHz

Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2110	1.5	–2.6	9.5	5.4
2140	1.5	–2.7	8.7	5.5
2170	1.5	–2.9	7.7	5.6



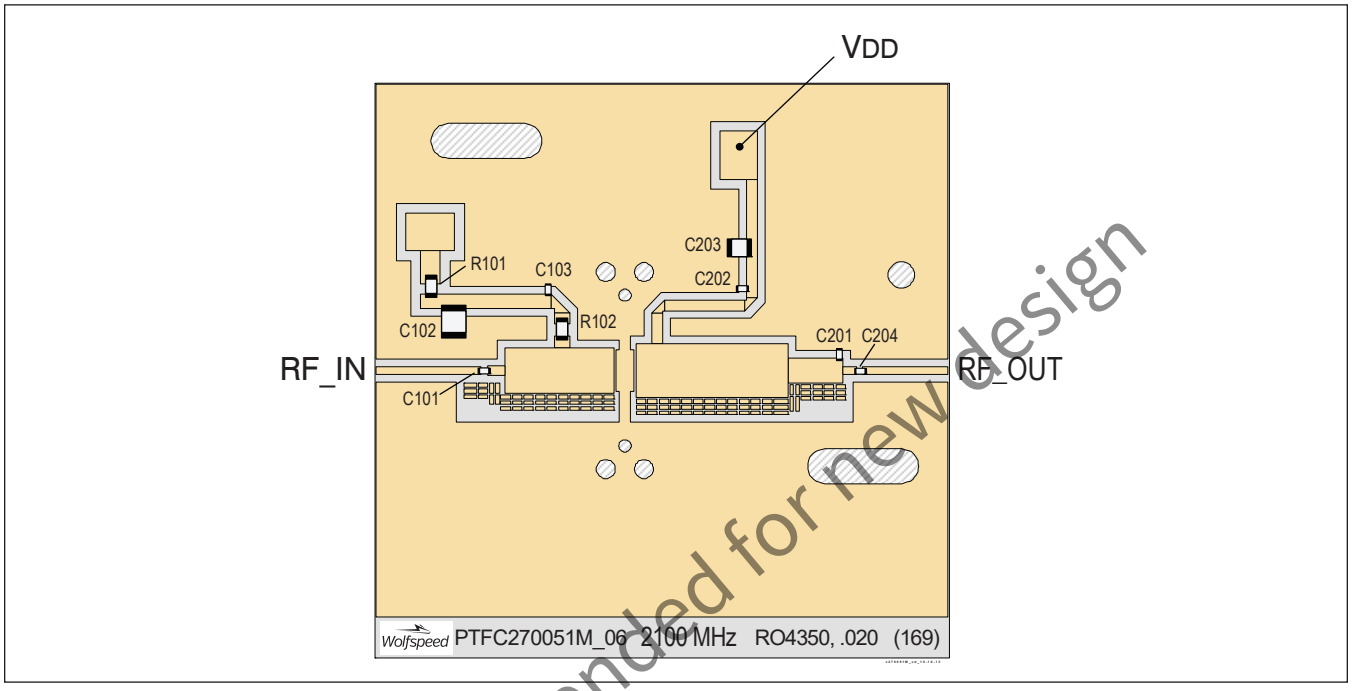
Load Pull Performance

Pulsed CW signal: 160 µsec, 10% duty cycle; 28 V, 65 mA

Class AB		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]
2110	1.5 – j2.6	10.6 + j2.6	20.6	55.0	39.50	8.9	8.3 + j8.2	22.5	64.9	38.50	7.1
2140	1.4 – j2.7	9.8 + j2.8	20.5	56.4	39.46	8.8	7.6 + j8.8	22.9	64.1	37.90	6.2
2170	1.4 – j2.9	9.2 + j2.8	20.7	56.2	39.20	8.3	6.2 + j8.3	23.0	63.8	37.40	5.5

Reference Circuit, 2170 MHz

DUT	PTFC270051M
Test Fixture Part No.	LTN/PTFC270051M V2
PCB	Rogers 4350, 0.508 mm [.020"] thick, 2 oz. copper, ε_r = 3.66
Find Gerber files for this test fixture on the Wolfspeed Web site at (**www.wolfspeed.com/RF**)	



Production test circuit assembly diagram (not to scale)

Components Information

Component	Description	Supplier	P/N
C101	Chip capacitor, 1 pF	ATC	ATC600S1R0BI250X
C102	Chip capacitor, 2.2 µF	TDK Corporation	C4532X7R1H225M160KA
C103	Chip capacitor, 12 pF	ATC	ATC600S120BT250X
C201	Chip capacitor, 1.1 pF	ATC	ATC600S1R1BT250X
C202	Chip capacitor, 12 pF	ATC	ATC600S120BT250X
C203	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C204	Chip capacitor, 12 pF	ATC	ATC600S120BT250X
R101, R102	Resistor, 10 Ω	Panasonic	ERJ-8GEYJ100V

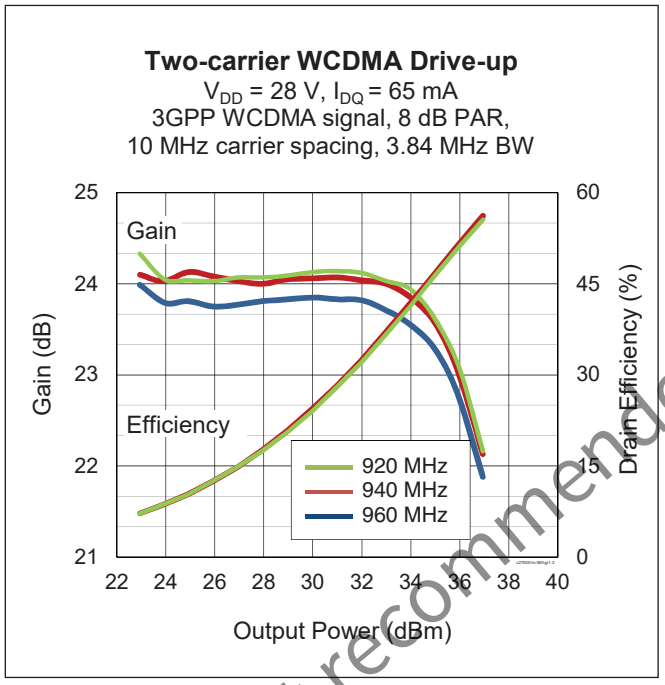
RF Characteristics, 940 MHz

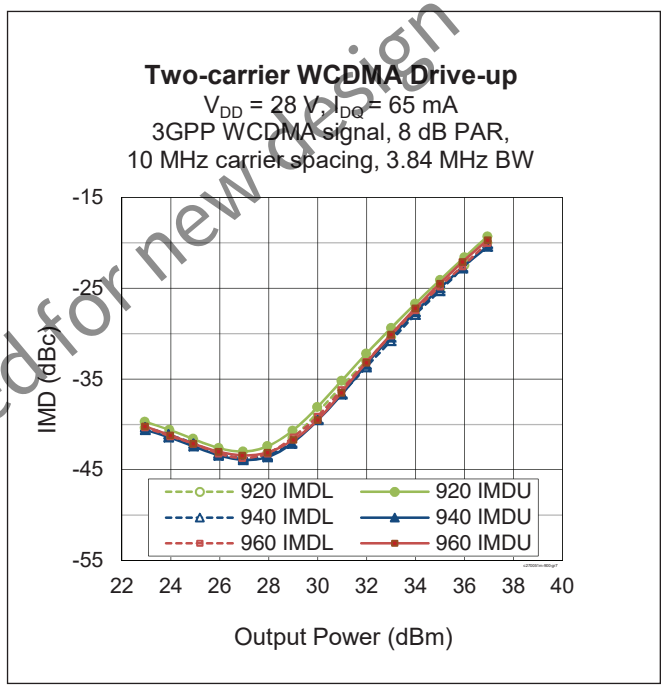
Two-carrier WCDMA Specifications (not subject to production test—verified by design/characterization in Wolfspeed test fixture)

V_{DD} = 28 V, I_{DQ} = 65 mA, P_{OUT} = 0.8 W avg, f_1 = 935 MHz, f_2 = 945 MHz
3GPP WCDMA signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

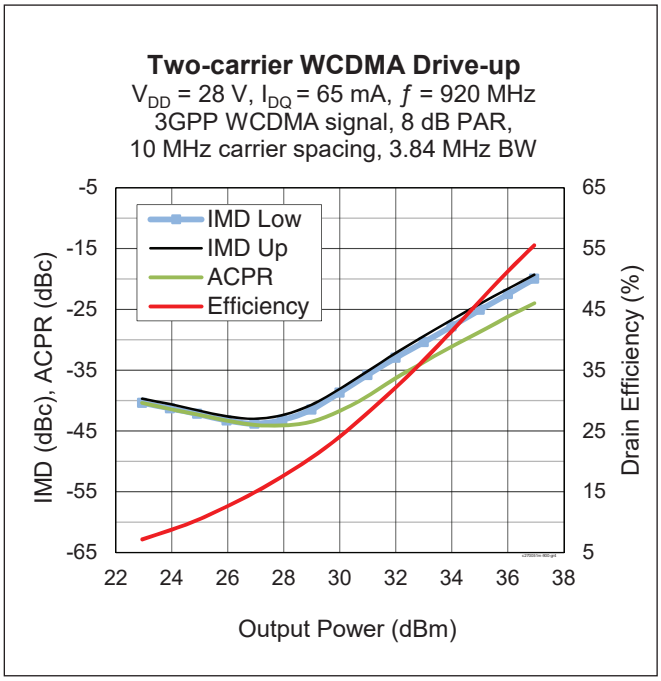
Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	24	—	dB
Drain Efficiency	η_D	—	20.7	—	%
Intermodulation Distortion	IMD	—	–42	—	dBc

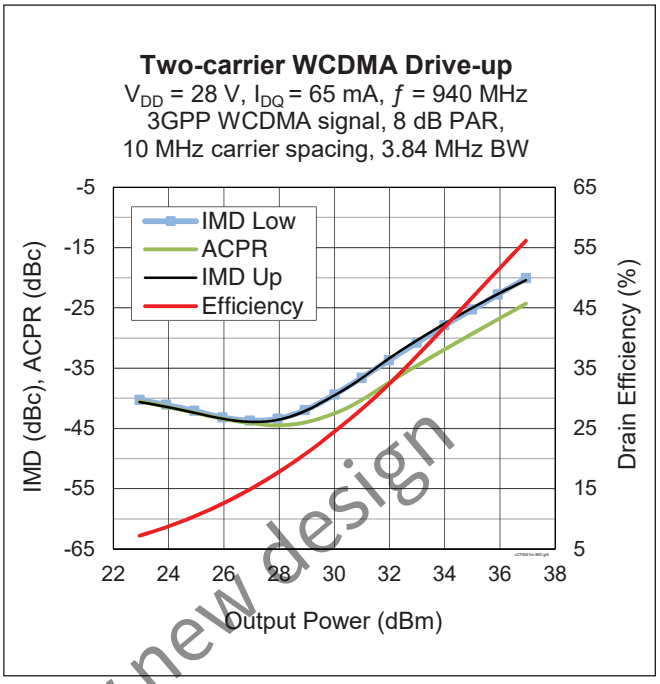
Typical Performance, 940 MHz

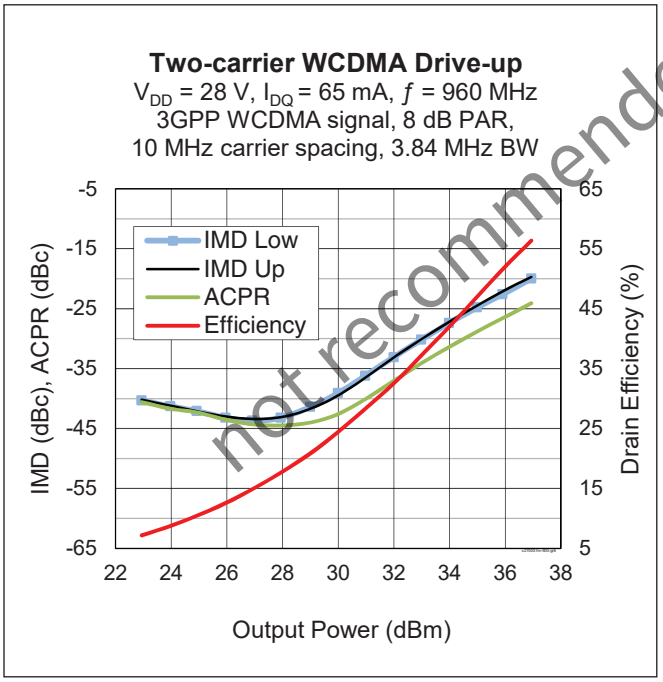


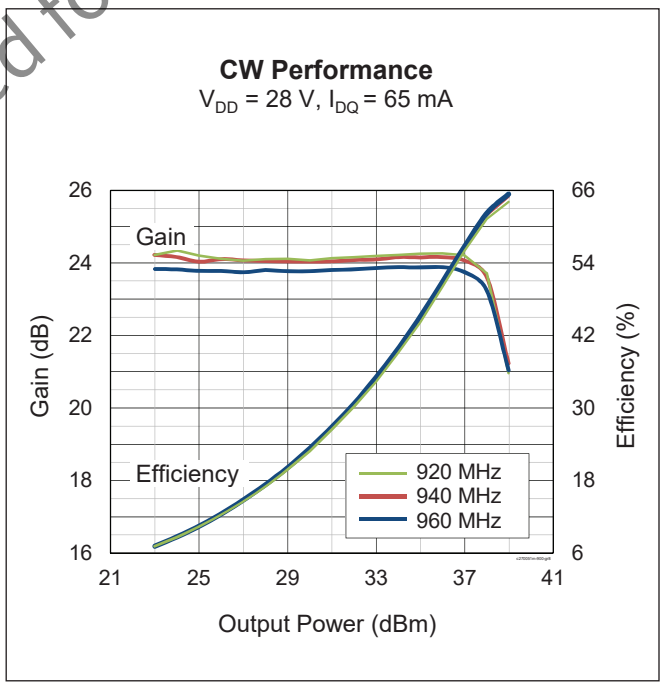


Reference Circuit, 940 MHz (cont.)

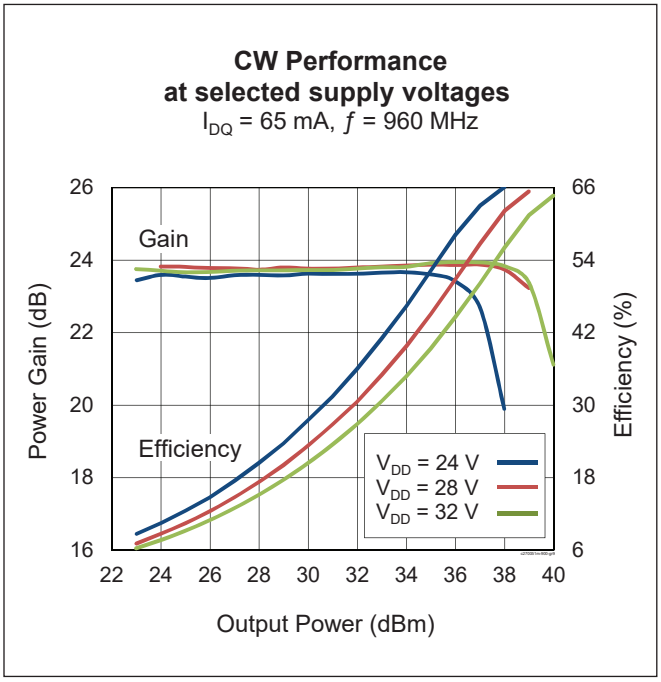


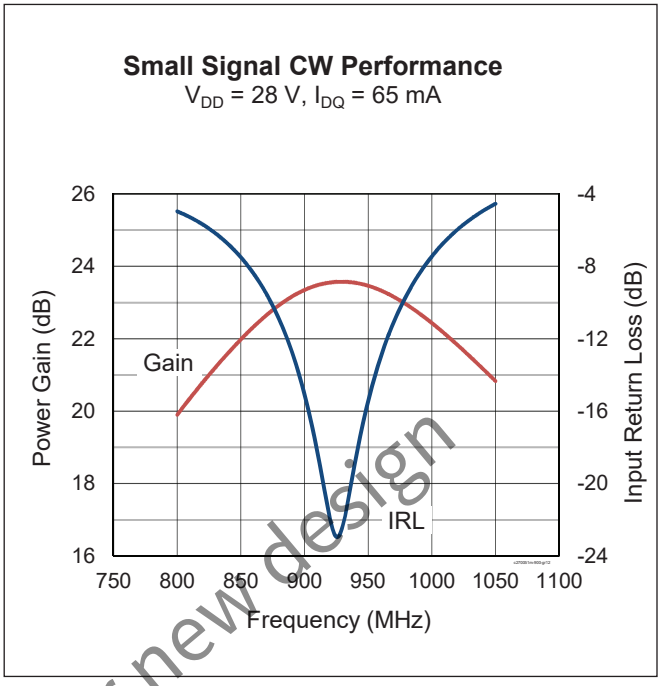






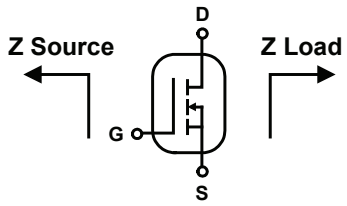
Typical Performance, 940 MHz (cont.)





Broadband Circuit Impedance

Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
920	3.3	10	25.6	13.2
940	3.4	10.2	24.7	13.3
960	3.5	10.3	24.3	14.7



Loadpull Performance

Pulsed CW signal: 160 µsec, 10% duty cycle; 28 V, 65 mA

Class AB		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]
920	3.35 + j10	25.7 + j4.7	25.5	62.2	39.40	8.7	25.6 + j21.7	27.6	70.7	38.00	6.3
940	3.4 + j10.2	24.8 + j6.3	25.6	62.1	39.35	8.6	24.6 + j20.4	27.3	69.2	38.10	6.5
960	3.55 + j10.3	24.4 + j6.6	25.3	60.3	39.10	8.1	24.1 + j22.8	27.3	68.2	37.50	5.6

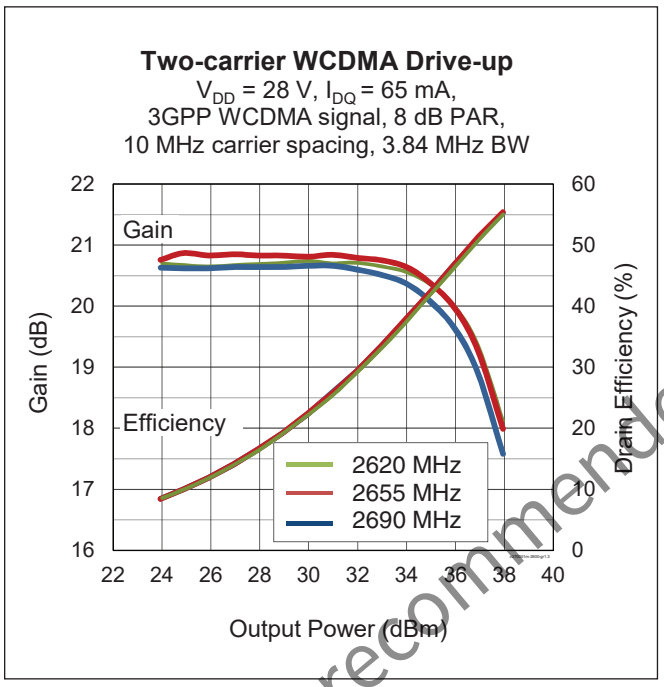
RF Characteristics, 2655 MHz

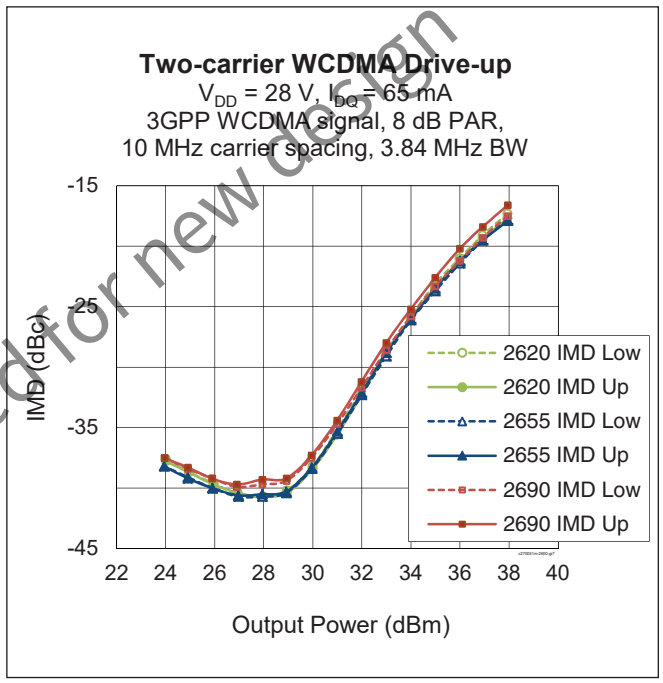
Two-carrier WCDMA Specifications (not subject to production test—verified by design/characterization in Wolfspeed test fixture)

V_{DD} = 28 V, I_{DQ} = 65 mA, P_{OUT} = 0.8 W avg, f_1 = 2650 MHz, f_2 = 2660 MHz
3GPP WCDMA signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	—	20.9	—	dB
Drain Efficiency	η_D	—	19	—	%
Intermodulation Distortion	IMD	—	–40	—	dBc

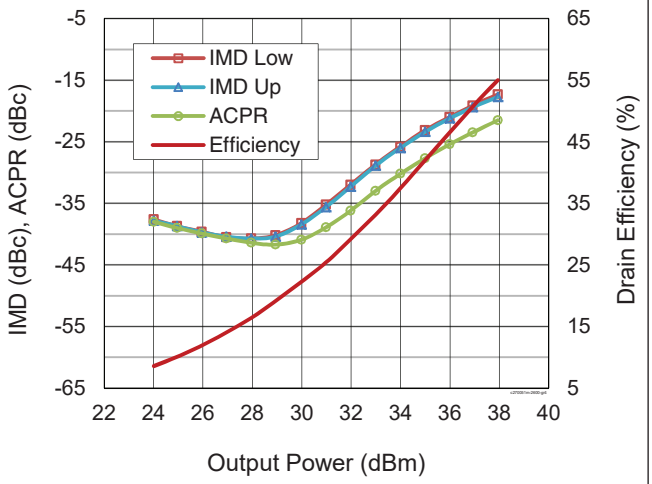
Typical Performance, 2655 MHz



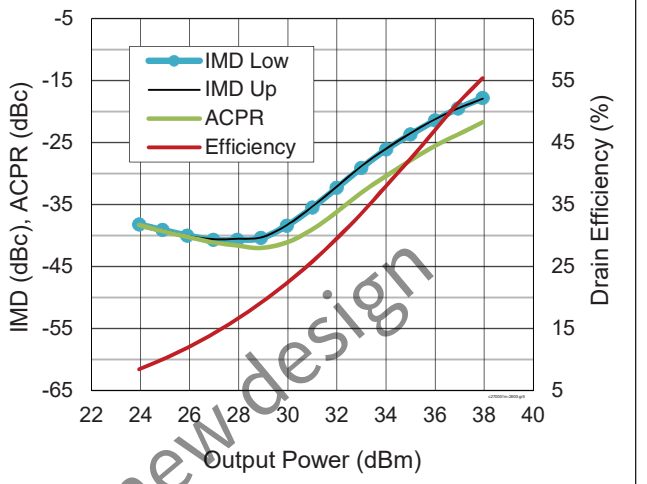


Typical Performance, 2655 MHz (cont.)

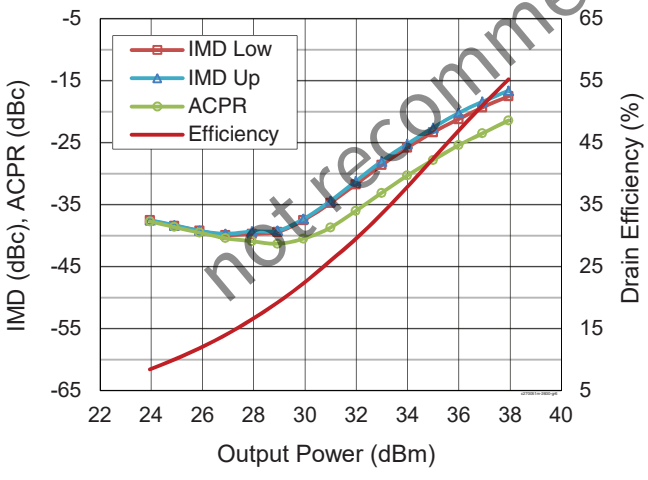
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 65 mA, f = 2620 MHz
3GPP WCDMA signal, 8 dB PAR,
10 MHz carrier spacing, 3.84 MHz BW



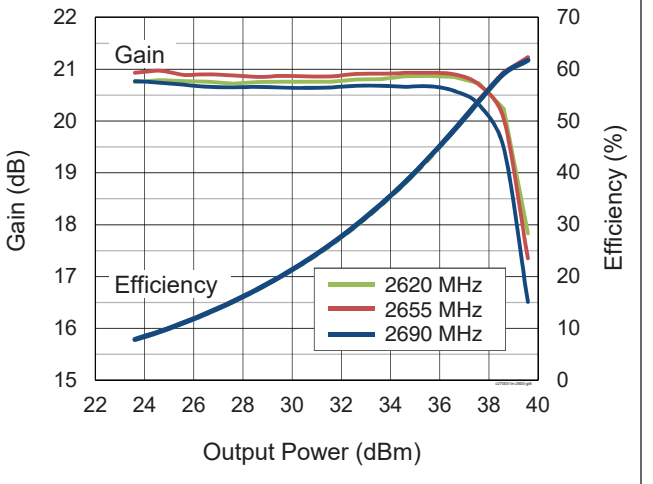
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 65 mA, f = 2655 MHz
3GPP WCDMA signal, 8 dB PAR,
10 MHz carrier spacing, 3.84 MHz BW



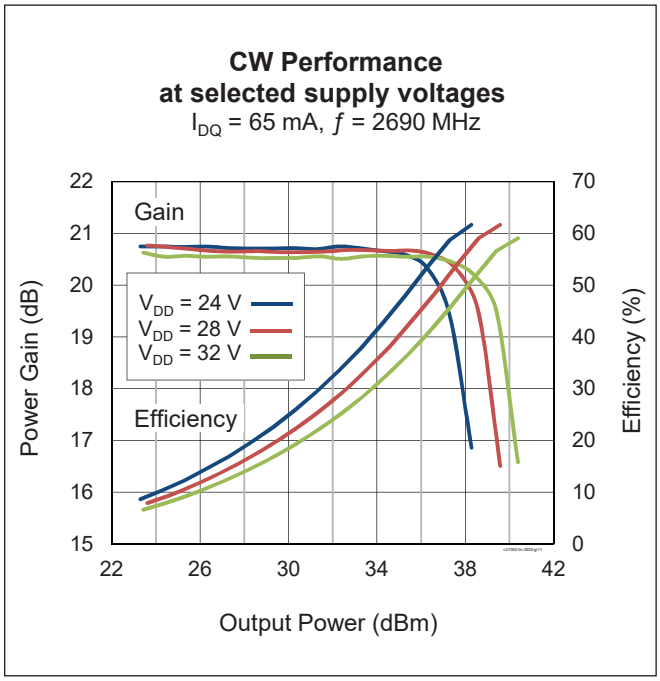
Two-carrier WCDMA Drive-up
V_{DD} = 28 V, I_{DQ} = 65 mA, f = 2690 MHz
3GPP WCDMA signal, 8 dB PAR,
10 MHz carrier spacing, 3.84 MHz BW

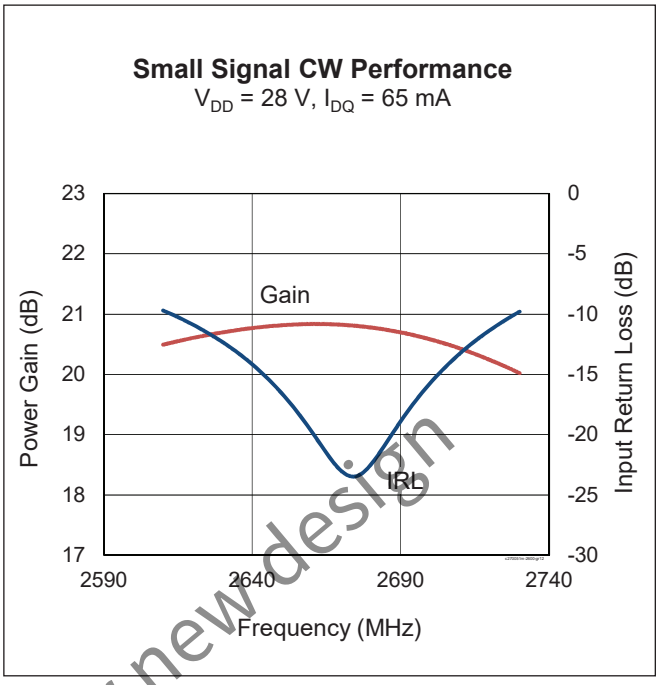


CW Performance
V_{DD} = 28 V, I_{DQ} = 65 mA



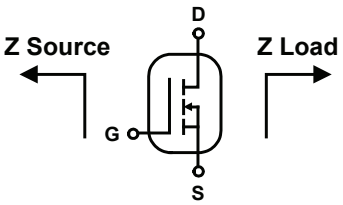
Typical Performance, 2655 MHz (cont.)





Broadband Circuit Impedance

Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
2490	1.5	–4.1	7.2	1.5
2590	1.5	–4.6	6.6	0.7
2690	1.5	–5.5	6.3	-0.6



Load Pull Performance

Pulsed CW signal: 160 µsec, 10% duty cycle; 28 V, 65 mA

Class AB		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]	Zl [Ω]	Gain [dB]	PAE [%]	P_{OUT} [dBm]	P_{OUT} [W]
2490	1.5 – j4.1	8.2 + j0.3	19.7	55.6	39.0	7.94	6.2 + j2.8	20.9	62.2	38.4	6.9
2590	1.5 – j4.6	6.9 – j0.8	18.8	55.6	39.0	7.94	5.0 + j2.1	21.0	63.4	37.9	6.2
2690	1.5 – j5.5	7.8 – j2.0	18.4	55.6	39.0	7.94	4.9 + j0.8	20.4	63.6	37.8	6.0

Package Outline Specifications

Package PG-SON-10

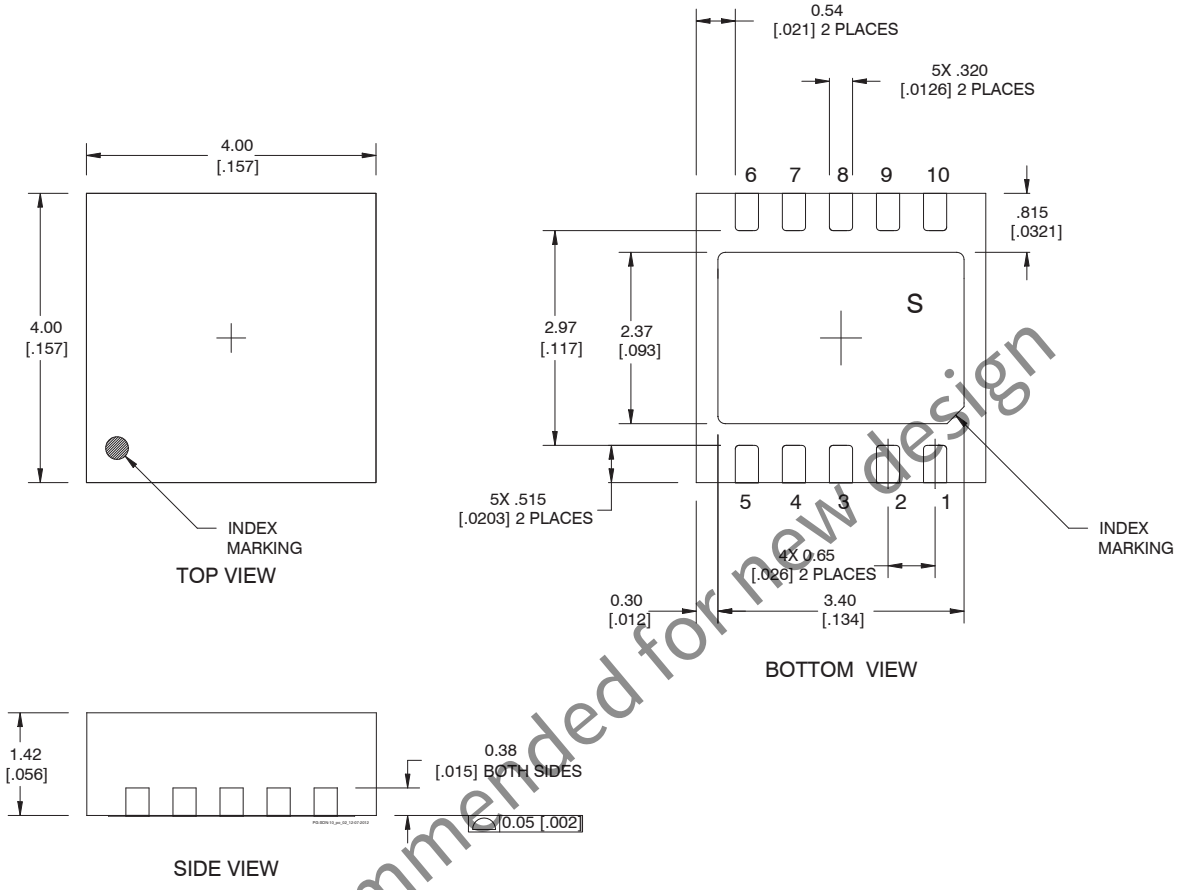


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.10 [0.004].
4. Package dimensions: 4.0 mm X 4.0 mm X 1.42 mm.
5. Pins: 1 – 5, gate; 6 – 10, drain; S (bottom side metallization), source.
6. Gold plating thickness: 0.025 – 0.127 micron [1 – 5 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2015-03-20	Production	All	Specifications and performance represent released product.
01.1	2016-07-26	Production	2	Add ordering information for additional evaluation boards.
02	2018-06-20	Production	All	Converted to Wolfspeed Data Sheet
03	2021-05-09	Production	All	Not recommended for new design

For more information, please contact:

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Durham, North Carolina, USA 27703
www.wolfspeed.com/rf

Sales Contact
rfsales@cree.com

Notes & Disclaimer

Specifications are subject to change without notice. “Typical” parameters are the average values expected by Cree in large quantities and are provided for information purposes only. Cree products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. No responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from use of the information contained herein. No license is granted by implication or otherwise under any patent or patent rights of Cree.

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PTFC270051M-V2-R1K