

# FDM6296

## Single N-Channel, Logic-Level, PowerTrench® MOSFET

### Features

- 11.5 A, 30 V  $R_{DS(ON)} = 10.5 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$   
 $R_{DS(ON)} = 15 \text{ m}\Omega @ V_{GS} = 4.5 \text{ V}$
- Low Qg, Qgd and Rg for efficient switching performance
- Low Profile – MicroFET 3.3 x 3.3 mm

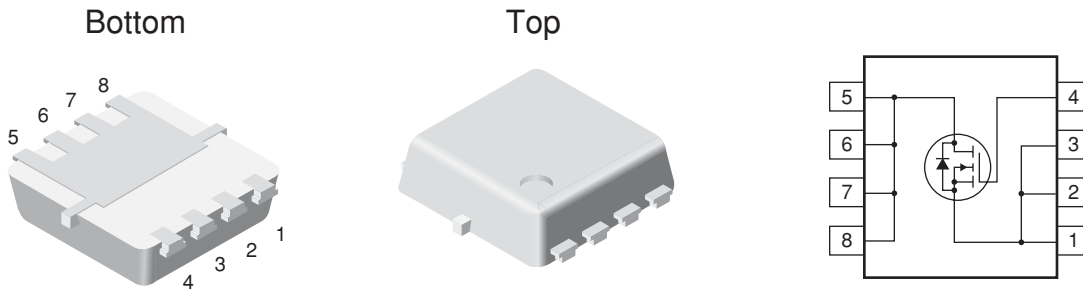
### Applications

- Point of Load Converter
- 1/16 Brick Synchronous Rectifier

### General Description

This single N-Channel MOSFET in the thermally efficient MicroFET package has been specifically designed to perform well in Point of Load converters. Providing an optimized balance between  $R_{ds(on)}$  and gate charge this device can be effectively used as a "high side" control switch or "low side" synchronous rectifier.

### MicroFET



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	30	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous (Note 1a) – Pulsed	11.5	A
		40	
$P_D$	Power Dissipation (Steady State) (Note 1a) (Note 1b)	2.5	W
		1.2	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	52	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1b)	108	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	5	

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
6296	FDM6296	7"	12mm	3000 units

### Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		29		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate–Body Leakage	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 100$	nA
<b>On Characteristics (Note 2)</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		–5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10\text{ V}, I_D = 11.5\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 11.5\text{ A}, T_J = 125^\circ\text{C}$		8.7 10.6 13	10.5 15 17	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 11.5\text{ A}$		47		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		1507		pF
$C_{oss}$	Output Capacitance			415		pF
$C_{rss}$	Reverse Transfer Capacitance			128		pF
$R_G$	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		1.1		$\Omega$
<b>Switching Characteristics (Note 2)</b>						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		10	20	ns
$t_r$	Turn–On Rise Time			5	10	ns
$t_{d(off)}$	Turn–Off Delay Time			27	44	ns
$t_f$	Turn–Off Fall Time			13	23	ns
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 11.5\text{ A},$ $V_{GS} = 5\text{ V}$		12	17	nC
$Q_{gs}$	Gate–Source Charge			4		nC
$Q_{gd}$	Gate–Drain Charge			3		nC
<b>Drain–Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain–Source Diode Forward Current				2	A
$V_{SD}$	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ (Note 2)		0.9	1.2	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 11.5\text{ A},$ $d_{IF}/d_t = 100\text{ A}/\mu\text{s}$		29		nS
$Q_{rr}$	Diode Reverse Recovery Charge			20		nC

**Notes:**

- $R_{\theta JA}$  is determined with the device mounted on a 1 in\_ 2 oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  are guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.
  - $R_{\theta JA} = 52^\circ\text{C}/\text{W}$  when mounted on a 1in<sup>2</sup> pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB
  - $R_{\theta JA} = 108^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper
- Pulse Test: Pulse Width < 300ms, Duty Cycle < 2.0%

## Typical Characteristics

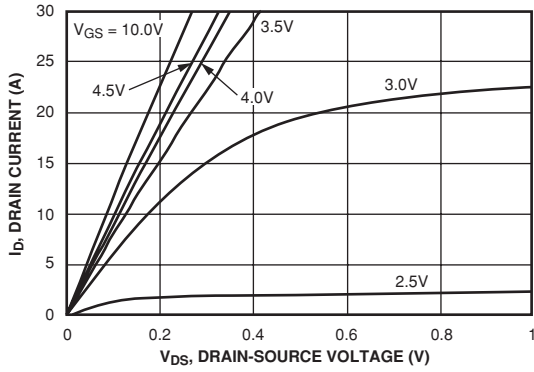


Figure 1. On-Region Characteristics

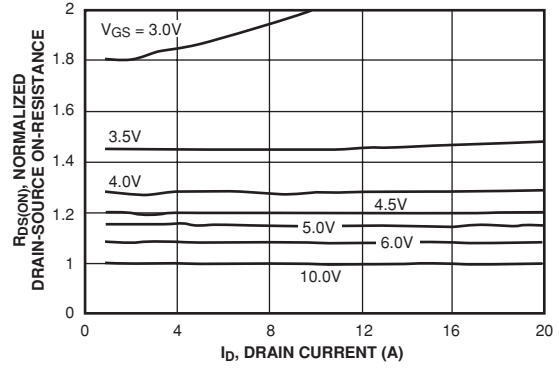


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

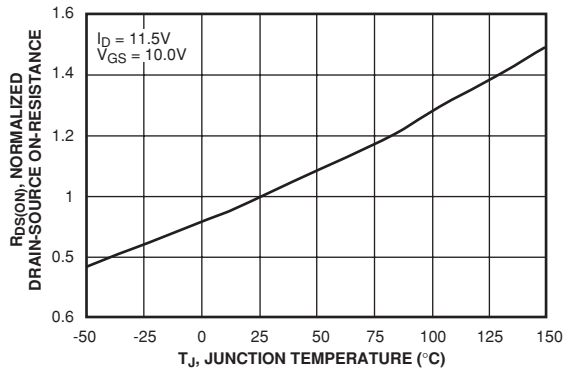


Figure 3. On-Resistance Variation with Temperature

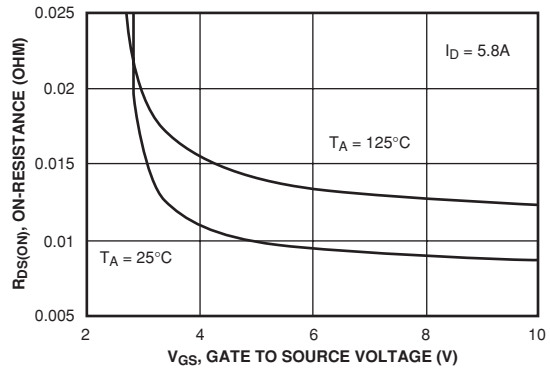


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

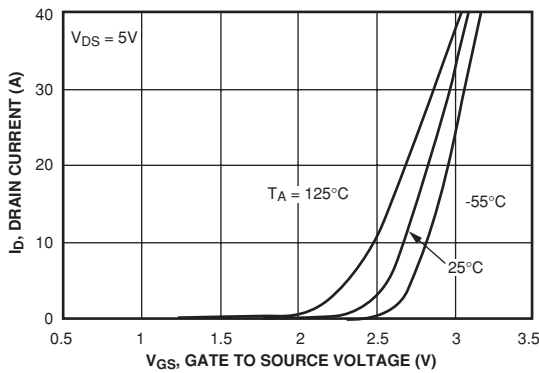


Figure 5. Transfer Characteristics

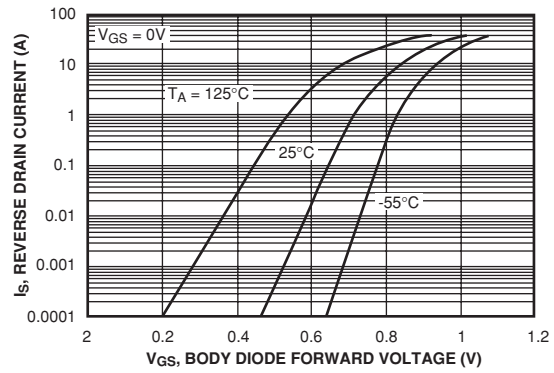


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

## Typical Characteristics

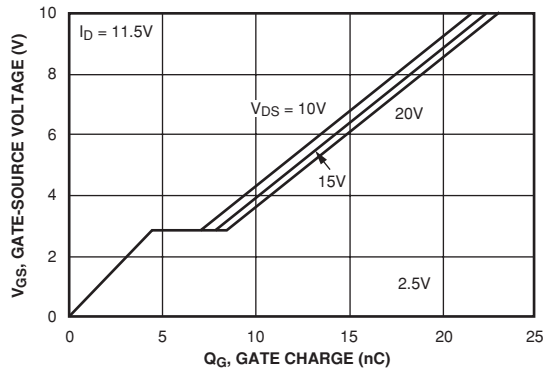


Figure 7. Gate Charge Characteristics

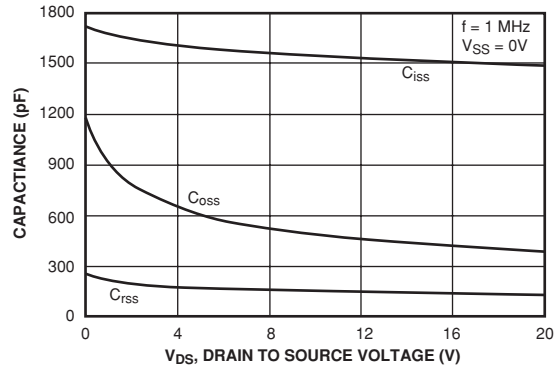


Figure 8. Capacitance Characteristics

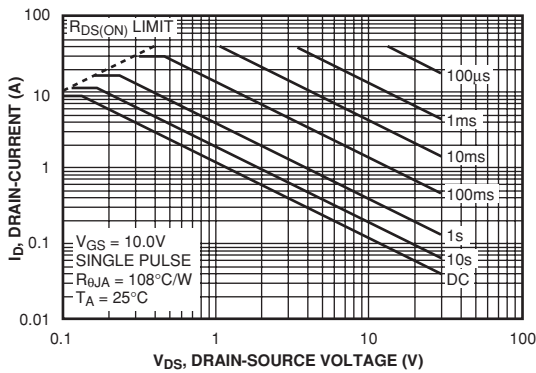


Figure 9. Maximum Safe Operating Area

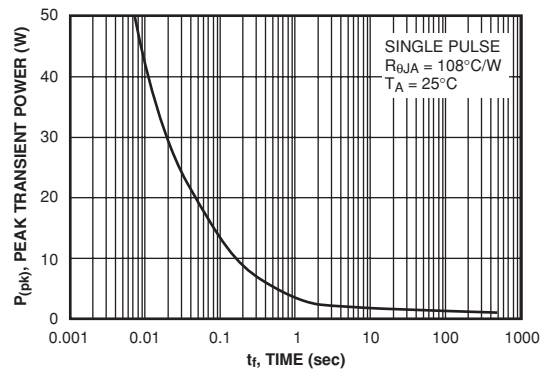


Figure 10. Single Pulse Maximum Power Dissipation

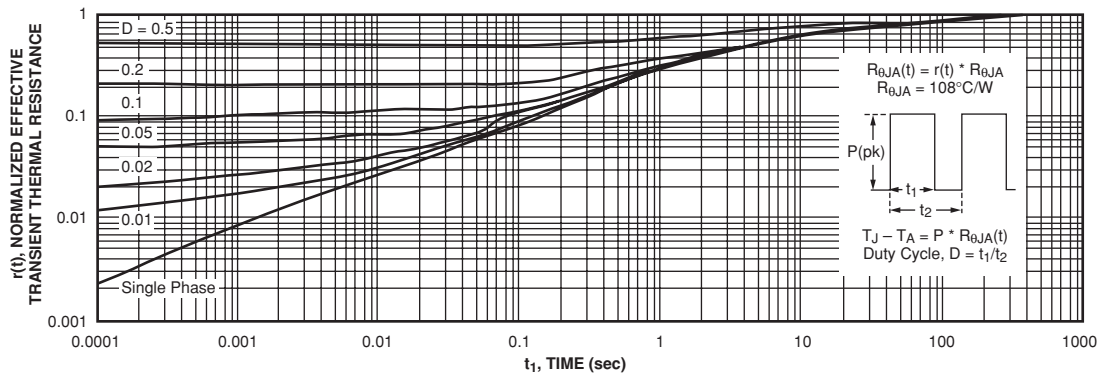
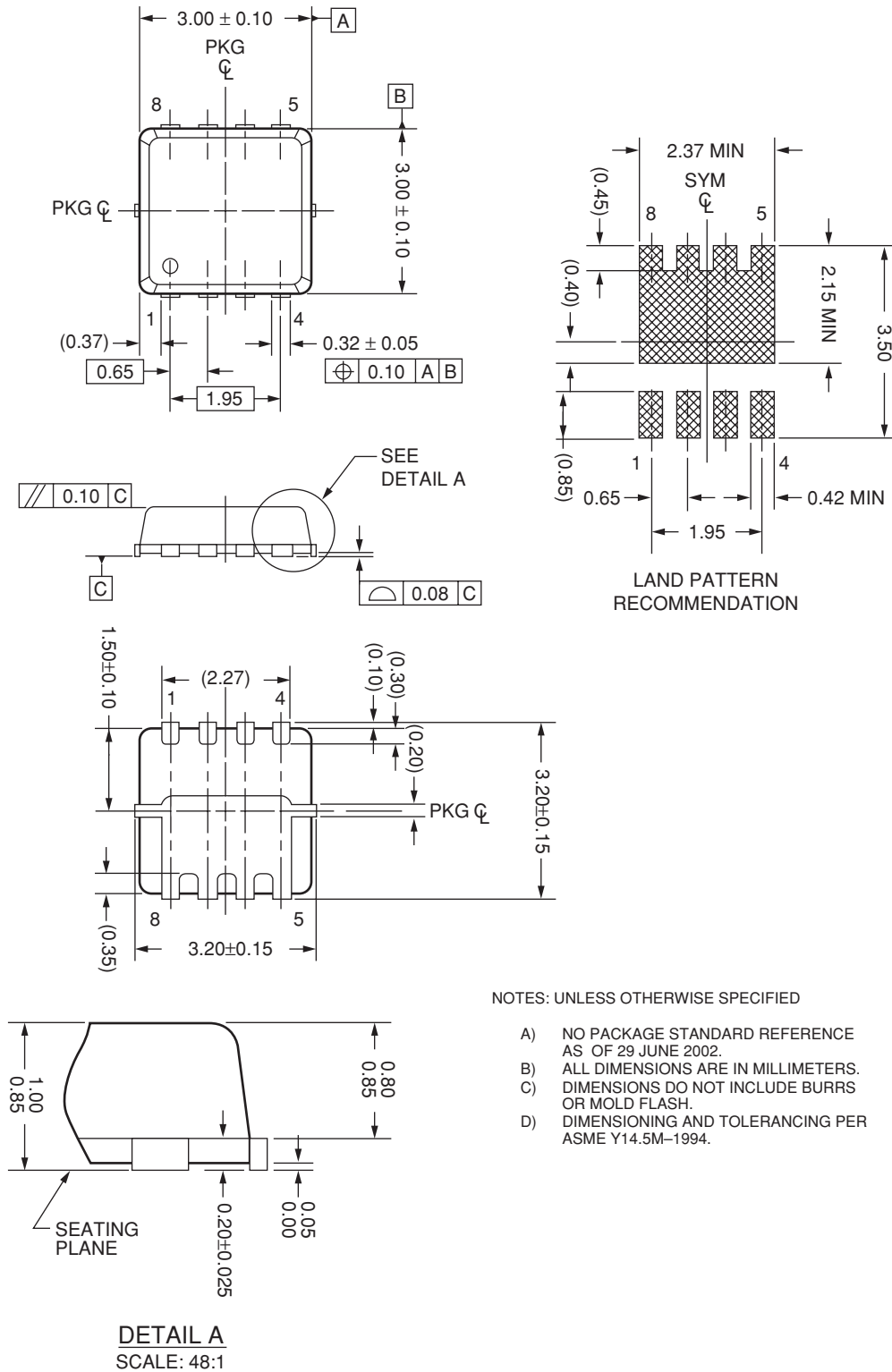


Figure 5. Transfer Characteristics

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

### Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

- A) NO PACKAGE STANDARD REFERENCE AS OF 29 JUNE 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

**DETAIL A**  
SCALE: 48:1

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CROSSVOLT™	GlobalOptoisolator™	MicroPak™	QFET®	SuperSOT™-8
DOME™	GTO™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	HiSeC™	MSX™	QT Optoelectronics™	TinyLogic®
E <sup>2</sup> CMOS™	IC™	MSXPro™	Quiet Series™	TINYOPTO™
EnSigna™	i-Lo™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
FACT Quiet Series™		OPTOLOGIC®	μSerDes™	UltraFET®
Across the board. Around the world.™		OPTOPLANAR™	SILENT SWITCHER®	UniFET™
The Power Franchise®		PACMAN™	SMART START™	VCX™
Programmable Active Droop™		POP™	SPM™	

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