

# FDM6296

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

30V, 11.5A, 10.5mΩ

### Features

- Max  $r_{DS(on)}$  = 10.5mΩ at  $V_{GS} = 10V$ ,  $I_D = 11.5A$
- Max  $r_{DS(on)}$  = 15mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 10A$
- Low Qg, Qgd and Rg for efficient switching performance
- RoHS Compliant

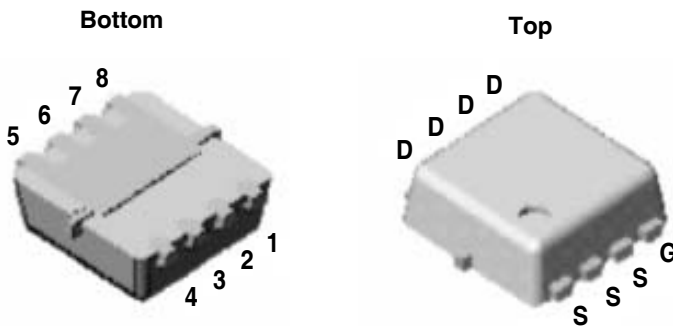


### General Description

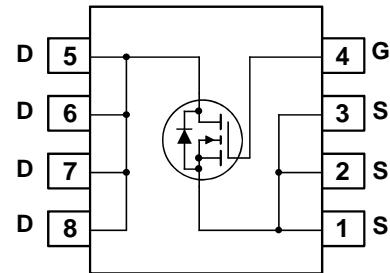
This single N-channel MOSFET in the thermally efficient MicroFET package has been specifically designed to perform well in Point of Load converters. Providing an optimized balance between  $r_{DS(on)}$  and gate charge this device can be effectively used as a "high side" control switch or "low side"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

### Application

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



Power 33



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

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous (Note 1a)	11.5	A
	-Pulsed	40	
$P_D$	Power Dissipation (Note 1a)	2.1	W
	Power Dissipation (Note 1b)	0.9	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	3.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
6296	FDM6296	Power 33	7"	8mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	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 to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source 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 to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 11.5\text{A}$		8.7	10.5	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 10\text{A}$		10.6	15	
		$V_{GS} = 10\text{V}, I_D = 11.5\text{A}, T_J = 125^\circ\text{C}$		13	17	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 11.5\text{A}$		47		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1507	2005	pF
$C_{oss}$	Output Capacitance			415	555	pF
$C_{rss}$	Reverse Transfer Capacitance			128	170	pF
$R_g$	Gate Resistance	$V_{DS} = 15\text{mV}, f = 1\text{MHz}$		1.1		$\Omega$

### Switching Characteristics

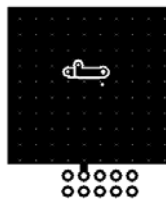
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 1.0\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		10	20	ns
$t_r$	Rise Time			5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
$t_f$	Fall Time			13	23	ns
$Q_g$	Total Gate Charge at 5V	$V_{GS} = 5\text{V}$		12	17	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DD} = 15\text{V}$		4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge	$I_D = 11.5\text{A}$		3		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2\text{A}$ (Note 2)		0.9	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 11.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		29		ns
$Q_{rr}$	Reverse Recovery Charge			20		nC

#### Notes:

- 1:  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.  
 (a)  $R_{\theta JA} = 60^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5x1.5"x0.062" thick PCB.  
 (b)  $R_{\theta JA} = 135^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.



a.  $60^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b.  $135^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty cycle < 2.0%.

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

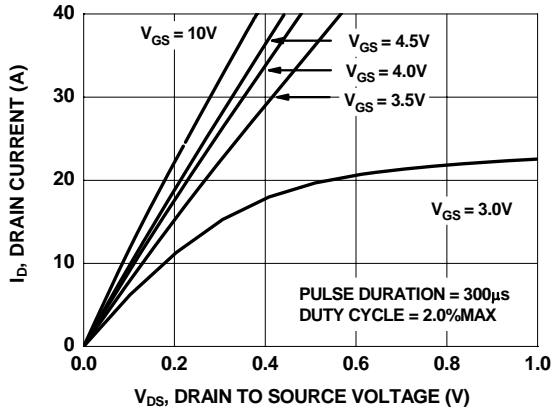


Figure 1. On-Region Characteristics

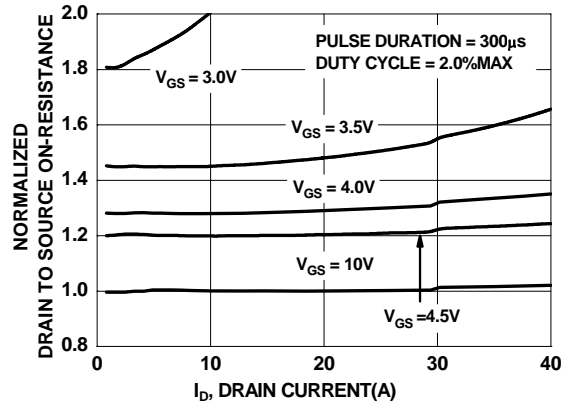


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

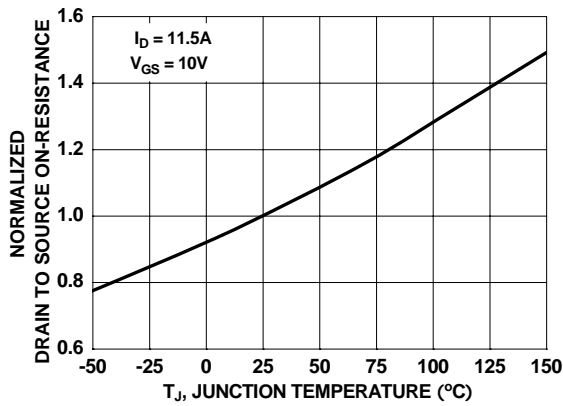


Figure 3. Normalized On-Resistance vs Junction Temperature

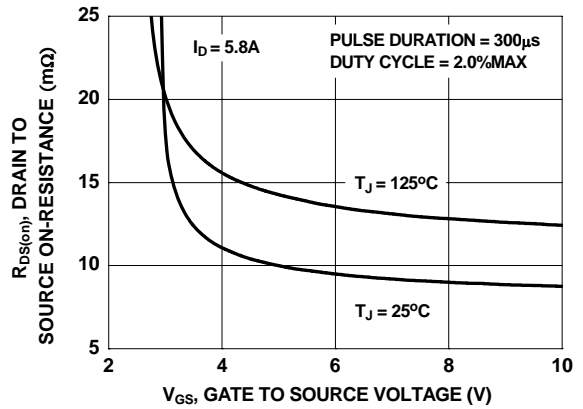


Figure 4. On-Resistance vs Gate to Source Voltage

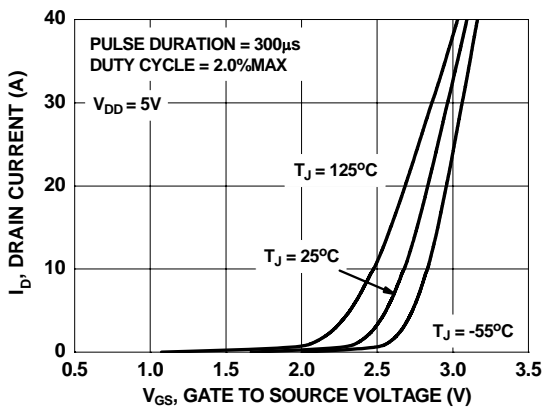


Figure 5. Transfer Characteristics

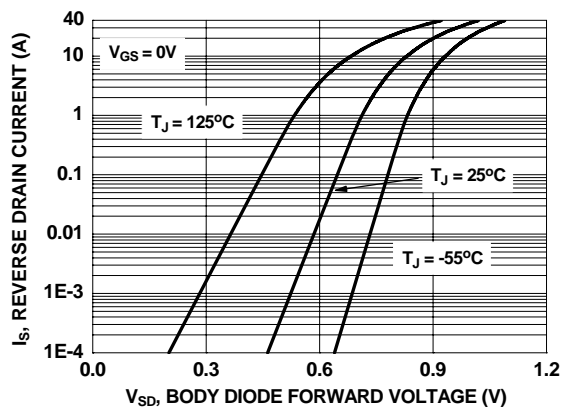
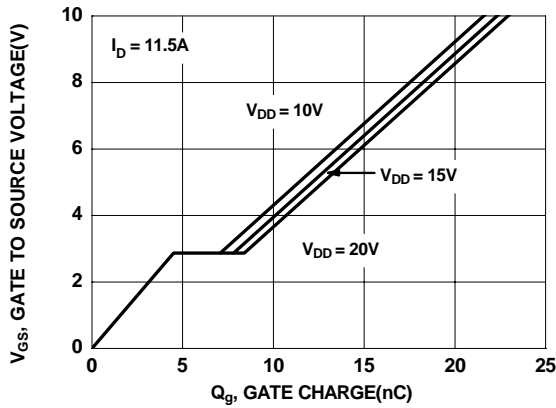
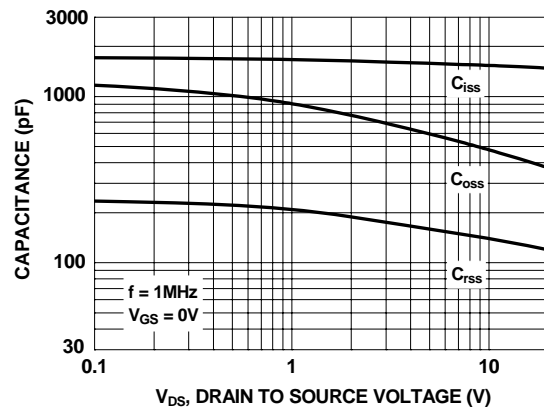


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

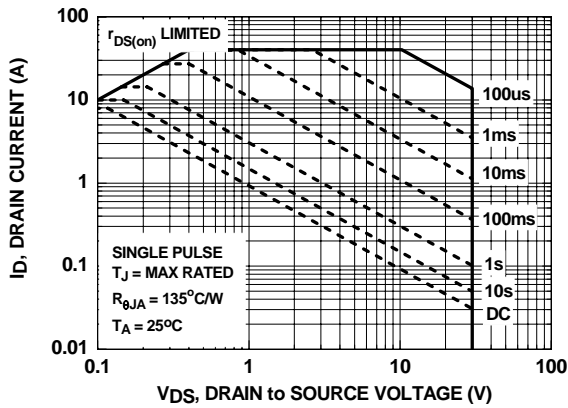
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



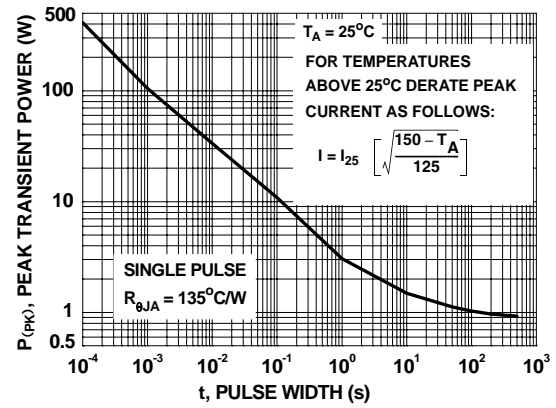
**Figure 7. Gate Charge Characteristics**



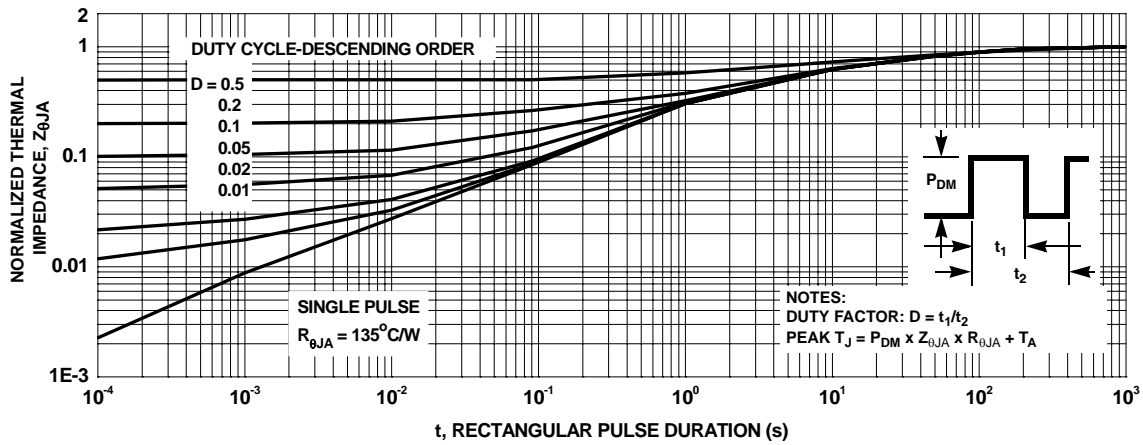
**Figure 8. Capacitance vs Drain to Source Voltage**



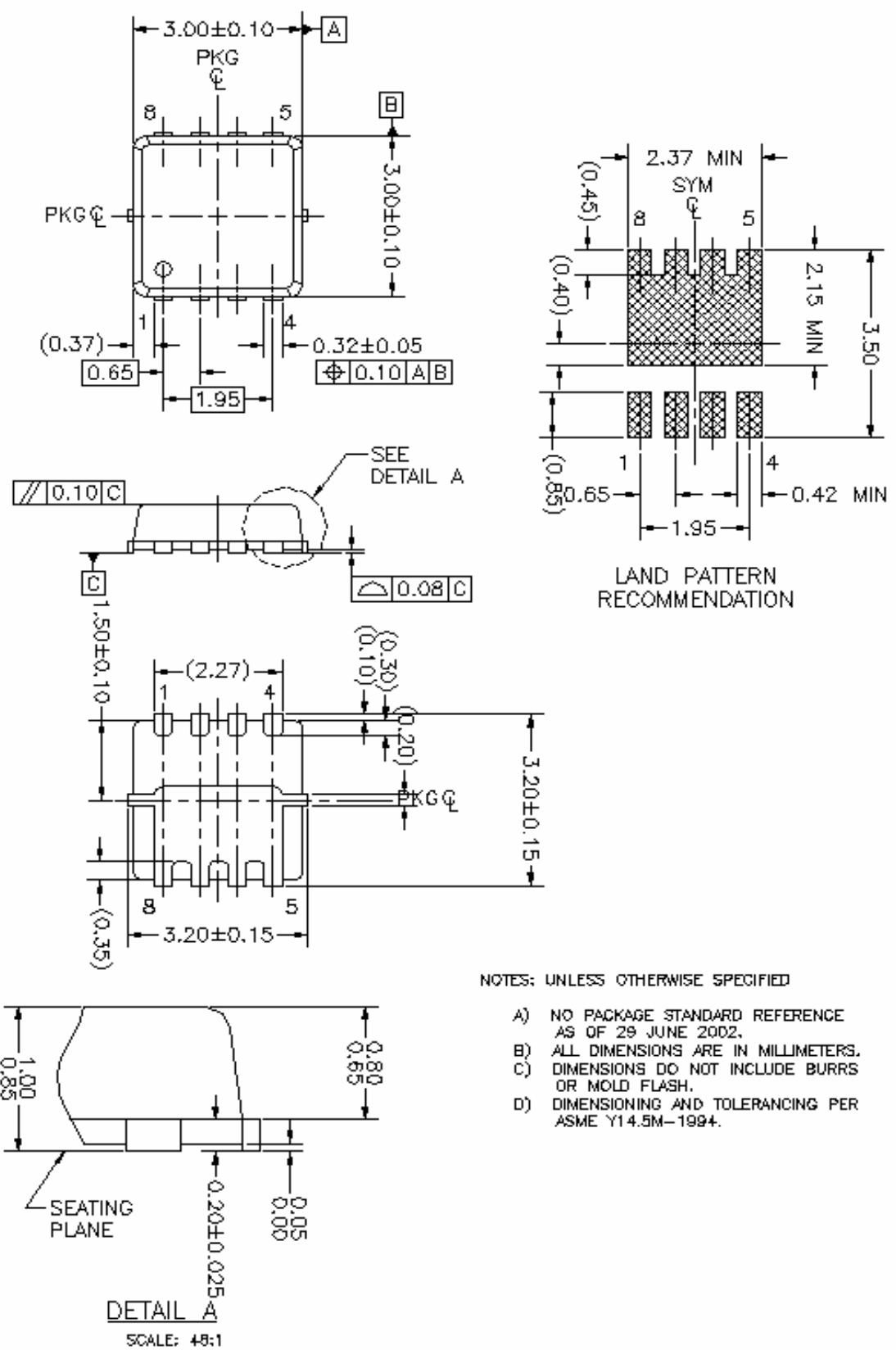
**Figure 9. Forward Bias Safe Operating Area**



**Figure 10. Single Pulse Maximum Power Dissipation**



**Figure 11. Transient Thermal Response Curve**



- 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.

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