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# 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  $Q_g$ ,  $Q_{gd}$  and  $R_g$  for efficient switching performance
- RoHS Compliant

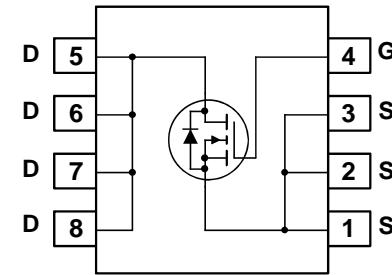
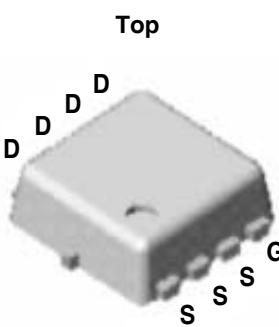
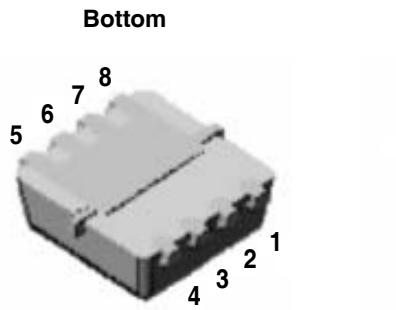


### General Description

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 $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	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)	A
	-Pulsed	40	
$P_D$	Power Dissipation	(Note 1a)	W
	Power Dissipation	(Note 1b)	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		29		$\text{mV}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 100$	nA

**On Characteristics**

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-5		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 11.5\text{A}$		8.7	10.5	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 10\text{A}$		10.6	15	
		$V_{GS} = 10\text{V}, I_D = 11.5\text{A}, T_J = 125^\circ\text{C}$		13	17	
$g_{\text{FS}}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 11.5\text{A}$		47		S

**Dynamic Characteristics**

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

**Switching Characteristics**

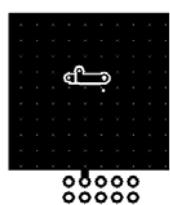
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 1.0\text{A}$ $V_{GS} = 10\text{V}, R_{\text{GEN}} = 6\Omega$		10	20	ns
$t_r$	Rise Time			5	10	ns
$t_{d(\text{off})}$	Turn-Off Delay Time			27	44	ns
$t_f$	Fall Time			13	23	ns
$Q_g$	Total Gate Charge at 5V	$V_{GS} = 5\text{V}$ $V_{DD} =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

**Notes:**

1:  $R_{\text{QJA}}$  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.  $R_{\text{QJC}}$  is guaranteed by design while  $R_{\text{QJA}}$  is determined by the user's board design.  
 (a)  $R_{\text{QJA}} = 60^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5'x1.5'x0.062' thick PCB.  
 (b)  $R_{\text{QJA}} = 135^\circ\text{C}/\text{W}$  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 < 300μs, Duty cycle < 2.0%.

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

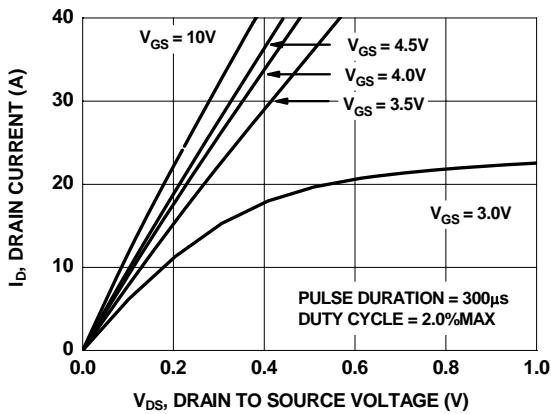


Figure 1. On-Region Characteristics

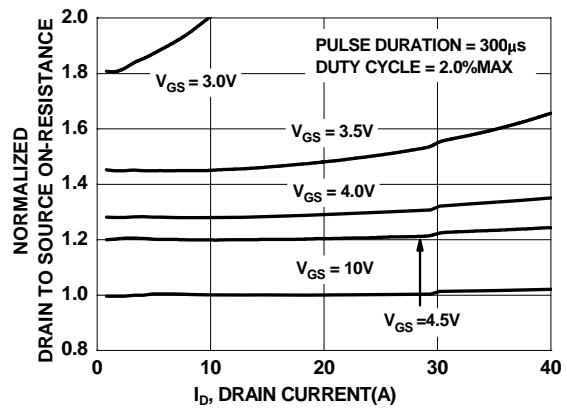


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

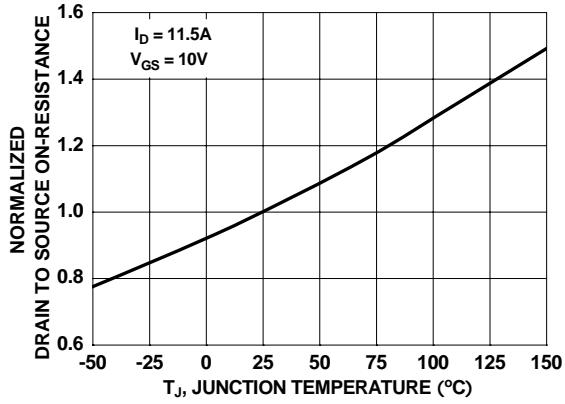


Figure 3. Normalized On-Resistance vs Junction Temperature

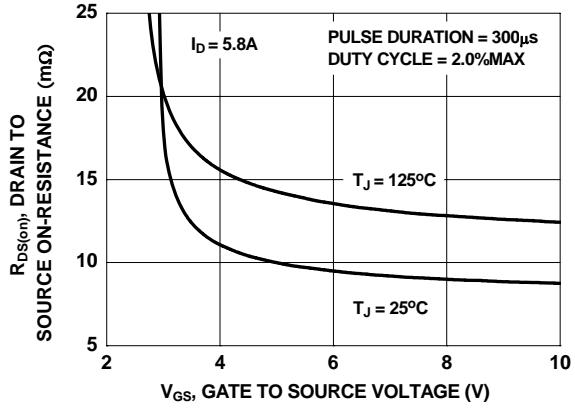


Figure 4. On-Resistance vs Gate to Source Voltage

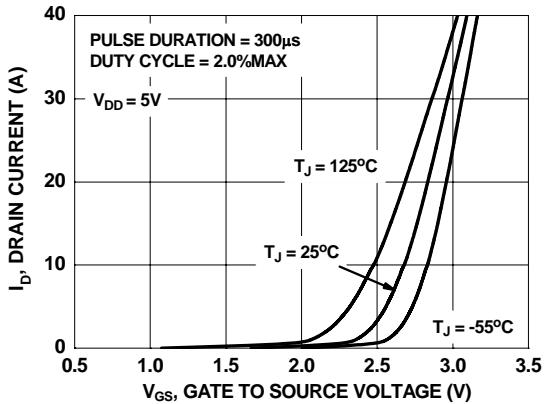


Figure 5. Transfer Characteristics

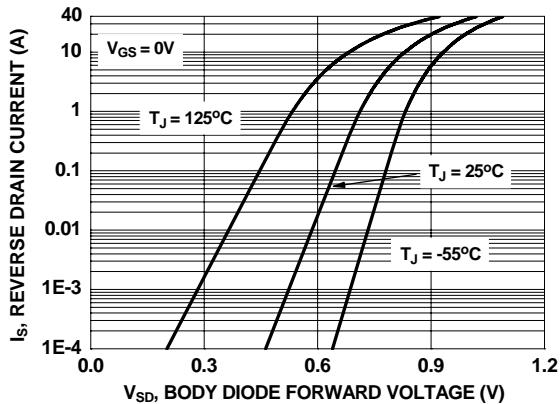
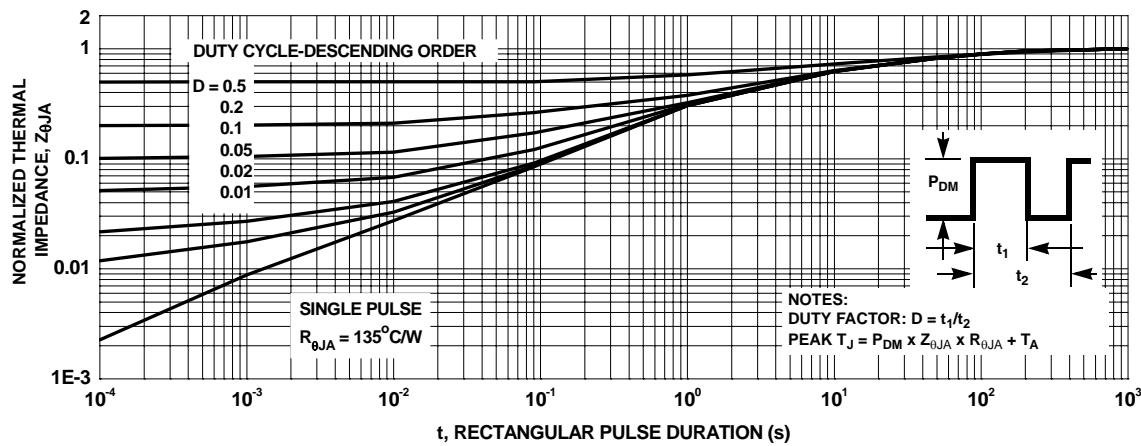
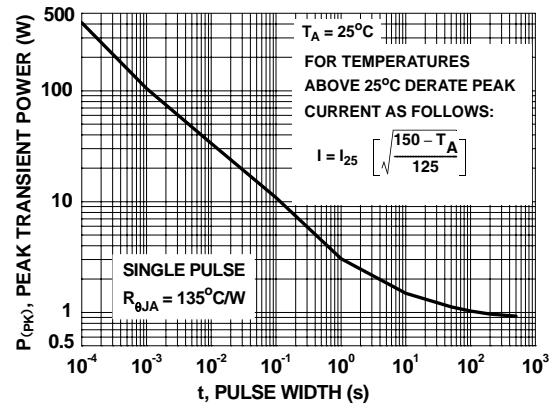
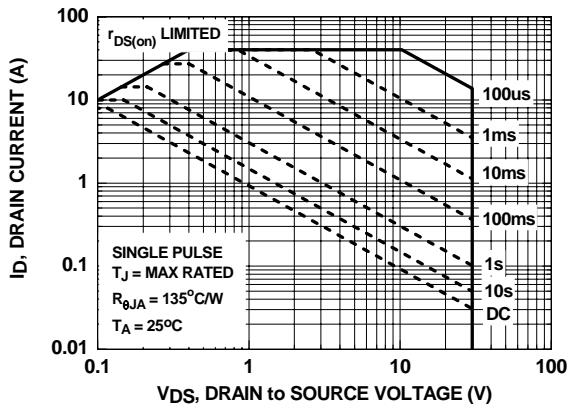
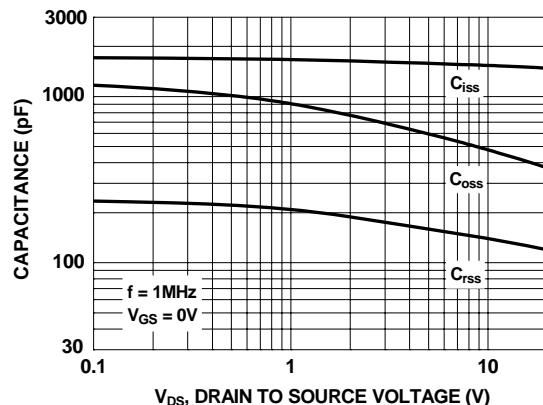
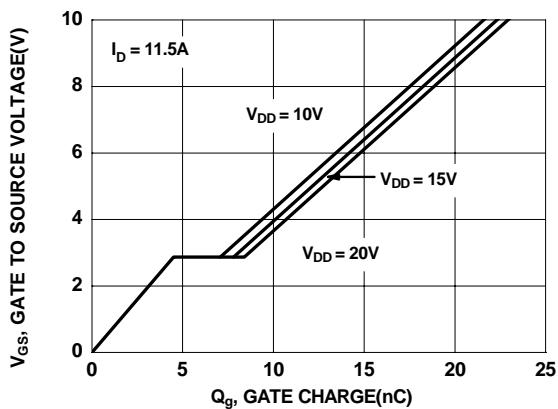
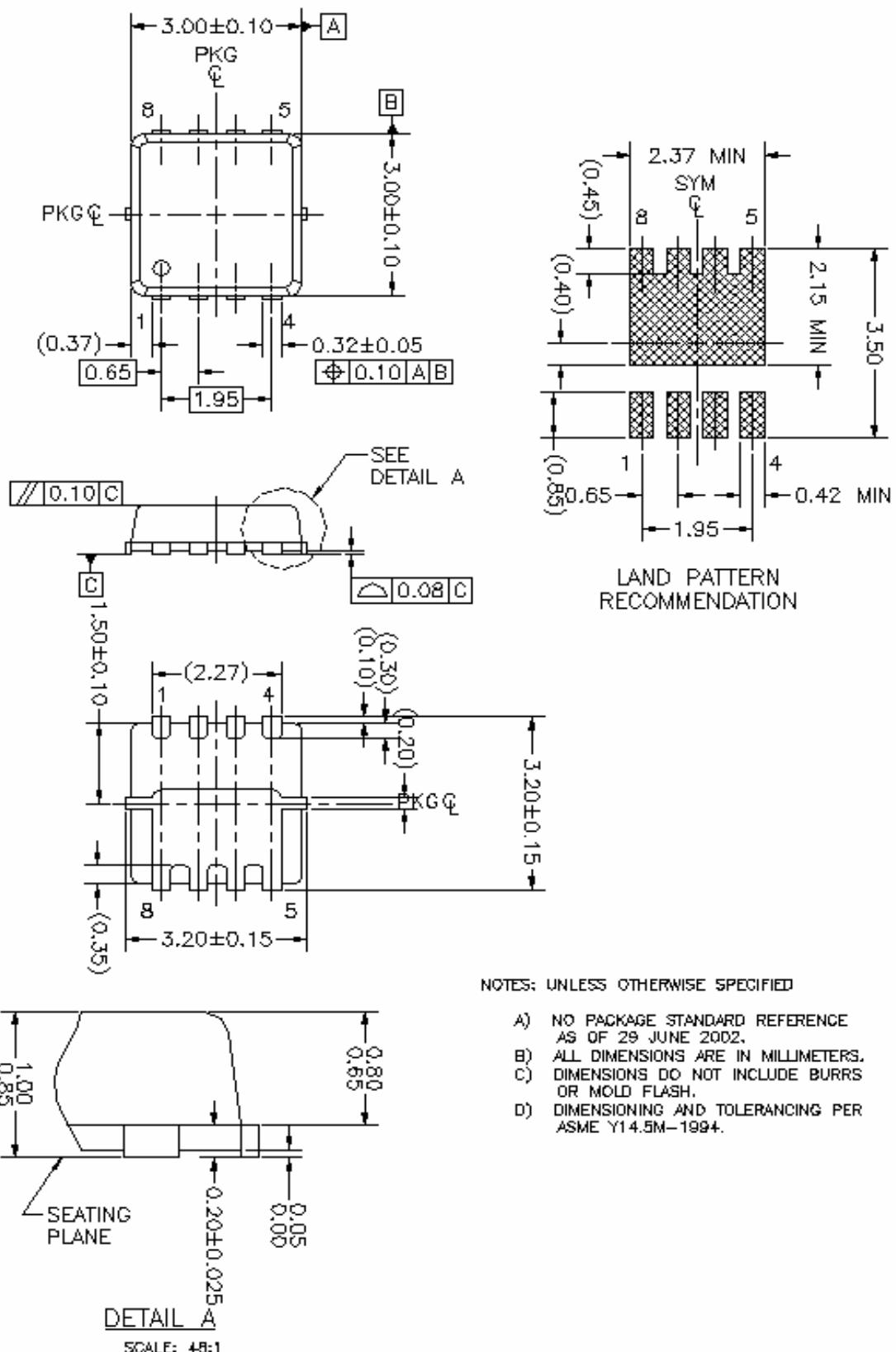


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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



# FDM6296 Single N-Channel Logic-Level PowerTrench® MOSFET



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