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January 2007

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

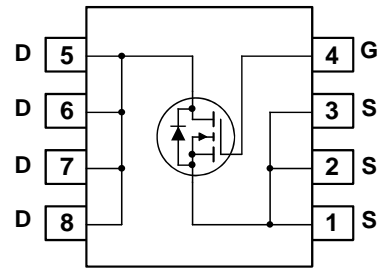
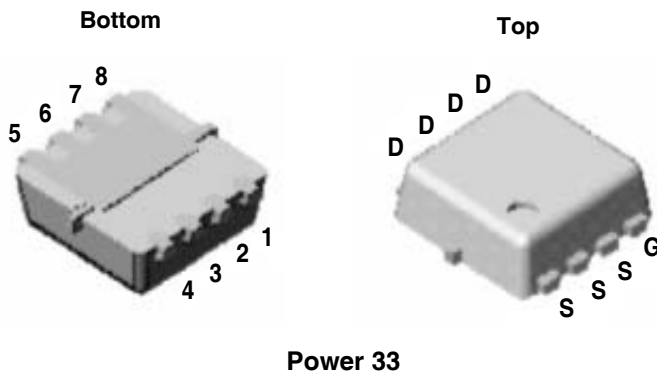


General Description

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



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	±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	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	3.0	°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

FDM6296 Single N-Channel Logic-Level PowerTrench[®] MOSFET

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°C		29		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 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°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 Ω
		$V_{GS} = 4.5\text{V}, I_D = 10\text{A}$		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		Ω

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

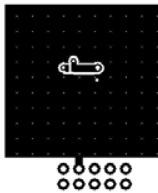
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2\text{A}$ (Note 2)		0.9	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 11.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		29		ns
Q_{rr}	Reverse Recovery Charge			20		nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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 in² pad of 2 oz copper, 1.5x1.5x0.062" 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 in² 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 μs , Duty cycle < 2.0%.

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

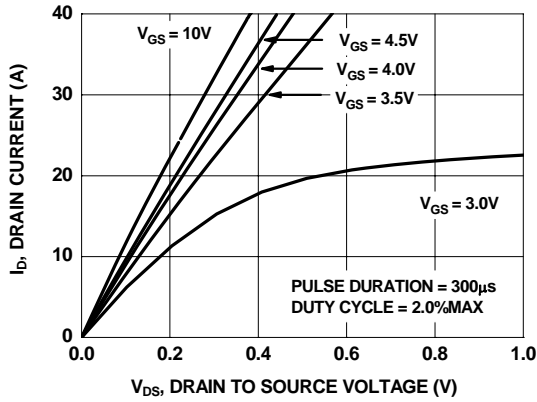


Figure 1. On-Region Characteristics

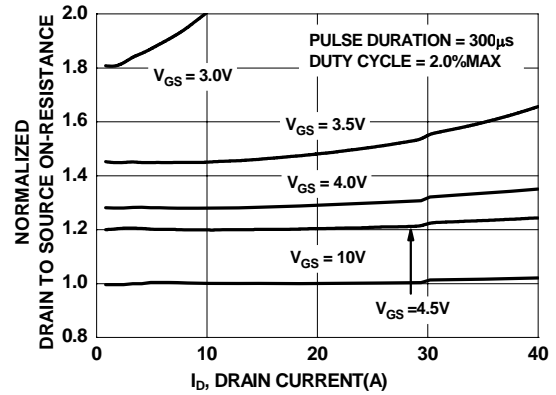


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

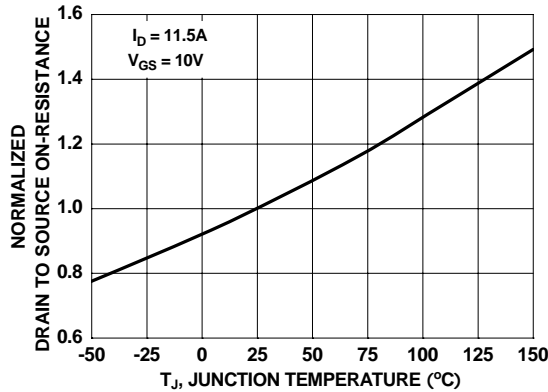


Figure 3. Normalized On-Resistance vs Junction Temperature

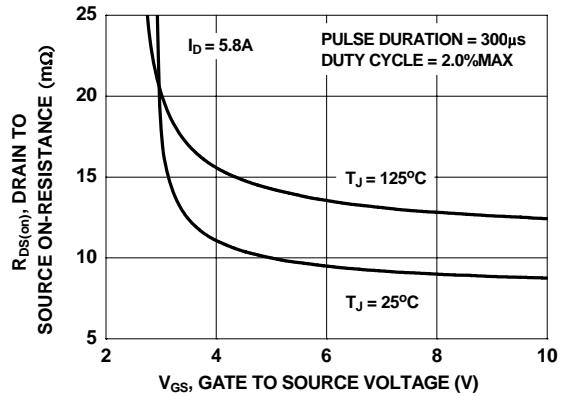


Figure 4. On-Resistance vs Gate to Source Voltage

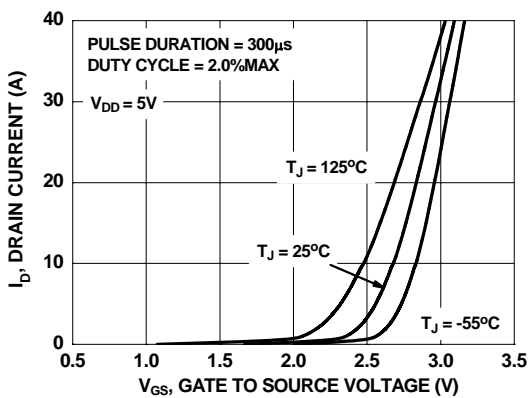


Figure 5. Transfer Characteristics

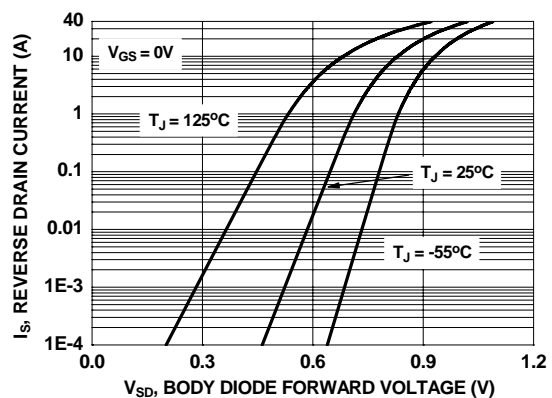


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

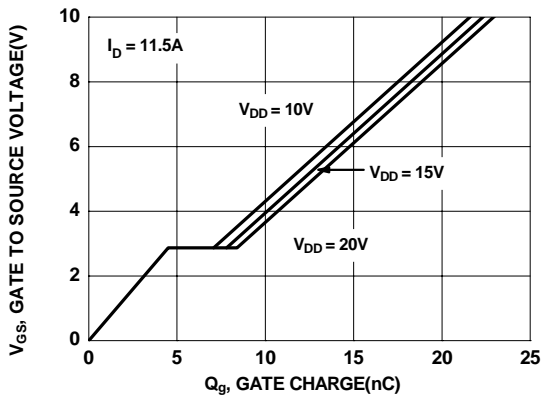


Figure 7. Gate Charge Characteristics

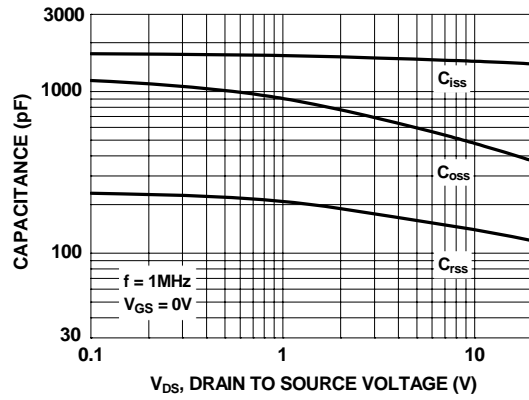


Figure 8. Capacitance vs Drain to Source Voltage

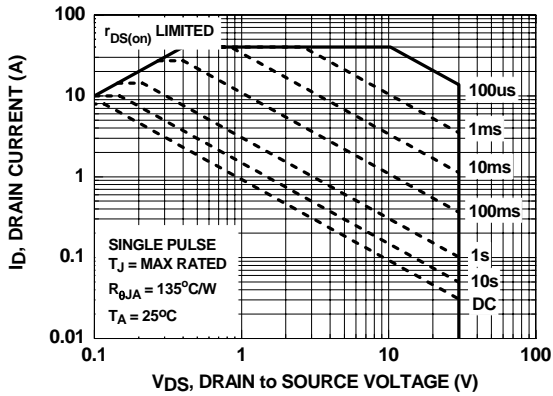


Figure 9. Forward Bias Safe Operating Area

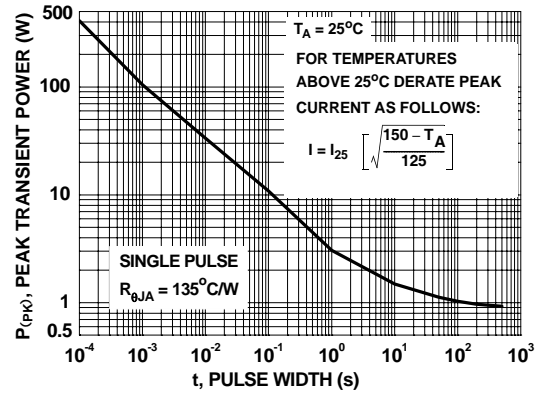


Figure 10. Single Pulse Maximum Power Dissipation

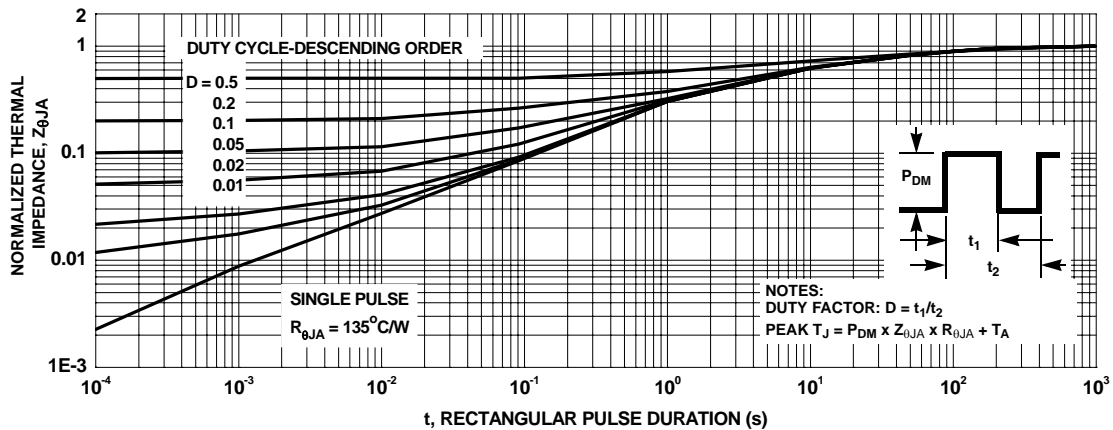
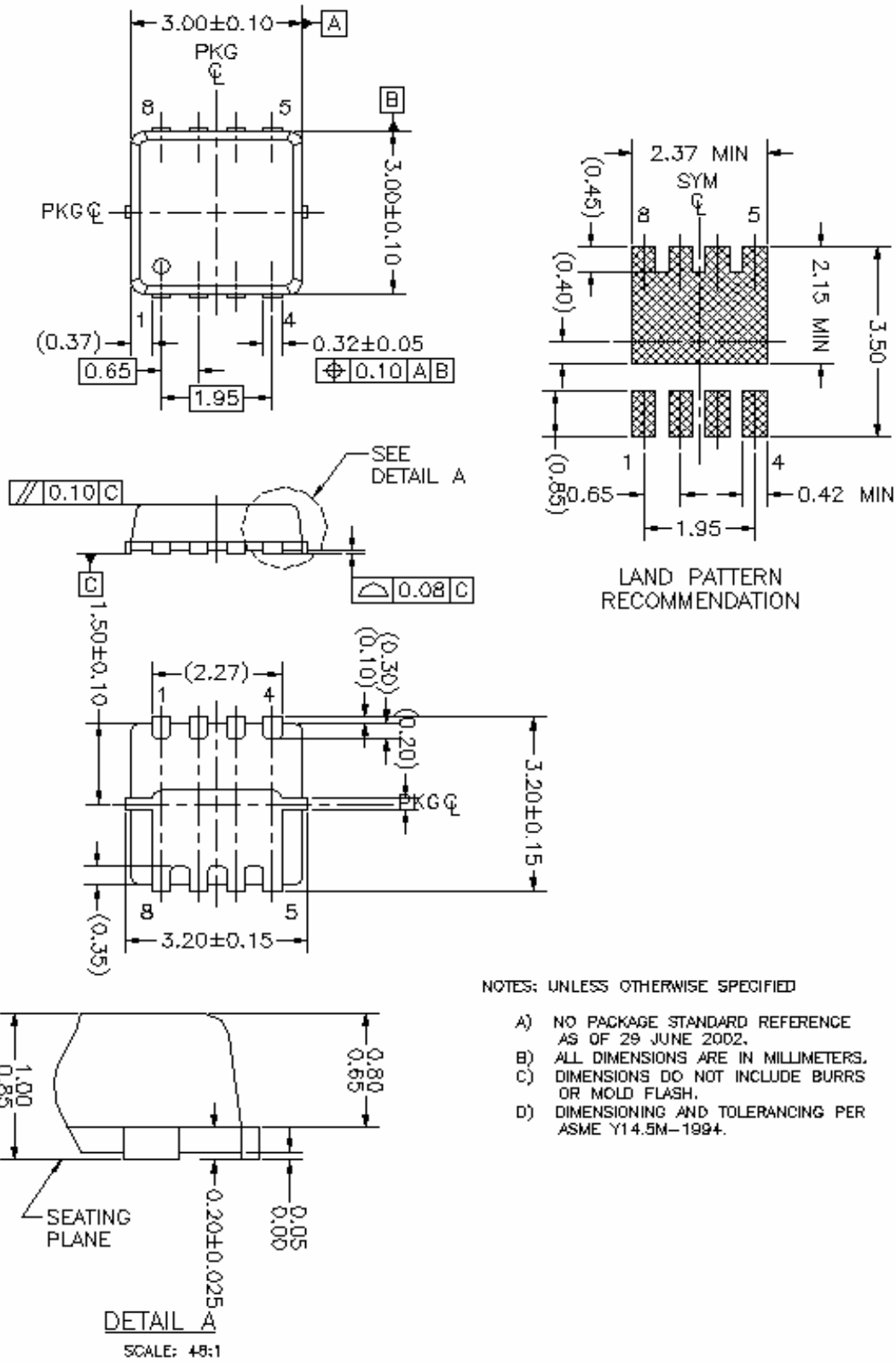


Figure 11. Transient Thermal Response Curve



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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