FAIRCHILD
SEMICONDUCTOR®

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FDM6296
Single N-Channel Logic-Level PowerTrench® MOSFET

30V,11.5A, 10.5mΩ

Features

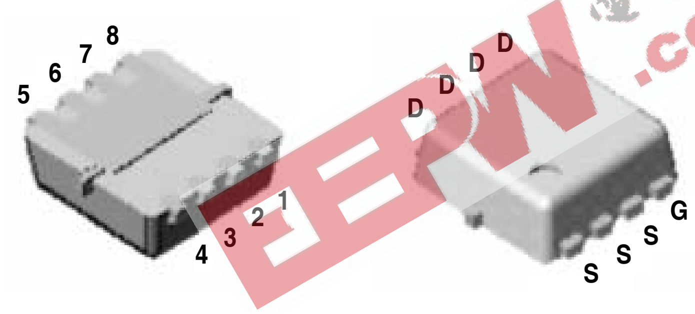
- Max $r_{DS(on)}$ = 10.5mΩ at V_{GS} = 10V, I_D = 11.5A
- Max $r_{DS(on)}$ = 15mΩ at V_{GS} = 4.5V, I_D = 10A
- Low Qg, Qgd and Rg for efficient switching performance
- RoHS Compliant

General Description

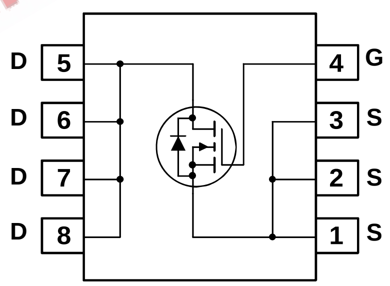
This single N-channel MOSFET in the thermally efficient MicroFET package has been specifically designed to perform well in Point of Load converters. Providing an optimized balance between $r_{DS(on)}$ and gate charge this device can be effectively used as a “high side” control switch or “low side” synchronous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

Application

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



Power 33



MOSFET Maximum Ratings T_A = 25°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

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250µA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C		29		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V			1	µA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 11.5A		8.7	10.5	mΩ
		V_{GS} = 4.5V, I_D = 10A		10.6	15	
		V_{GS} = 10V, I_D = 11.5A , T_J = 125°C		13	17	
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 11.5A		47		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		1507	2005	pF
C_{oss}	Output Capacitance			415	555	pF
C_{rss}	Reverse Transfer Capacitance			128	170	pF
Rg	Gate Resistance	V_{DS} = 15mV, f = 1MHz		1.1		Ω

Switching Characteristics

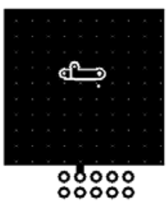
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 1.0A V_{GS} = 10V, R_{GEN} = 6Ω		10	20	ns
t_r	Rise Time			5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
t_f	Fall Time			13	23	ns
Q_g	Total Gate Charge at 5V	V_{GS} = 5V V_{DD} = 15V I_D = 11.5A		12	17	nC
Q_{gs}	Gate to Source Gate Charge			4		nC
Q_{gd}	Gate to Drain “Miller” Charge			3		nC

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 2A (Note 2)		0.9	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 11.5A, di/dt = 100A/µs		29		ns
Q_{rr}	Reverse Recovery Charge			20		nC

Notes:

1: $R_{\theta JA}$ 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
(a)$R_{\theta JA}$ = 60°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5’x1.5’x0.062’ thick PCB.
(b)$R_{\theta JA}$ = 135°C/W when mounted on a minimum pad of 2 oz copper.



a. 60°C/W when mounted on a 1 in^2 pad of 2 oz copper

b. 135°C/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°C unless otherwise noted

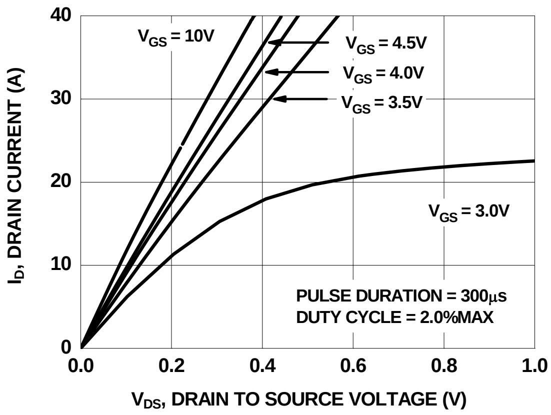


Figure 1. On-Region Characteristics

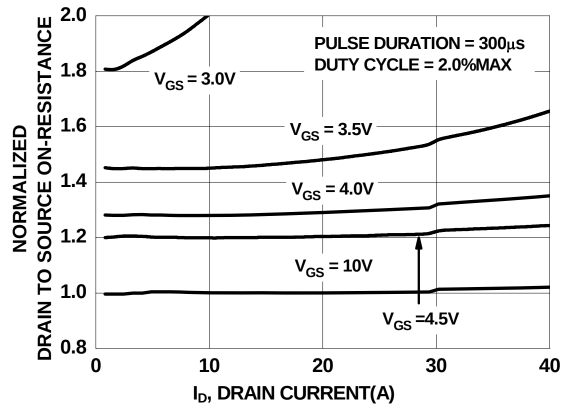


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

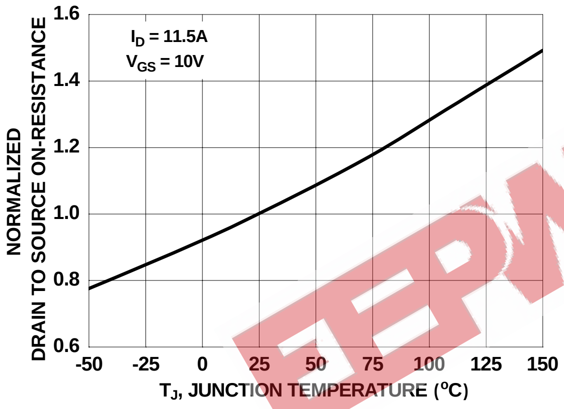


Figure 3. Normalized On-Resistance vs Junction Temperature

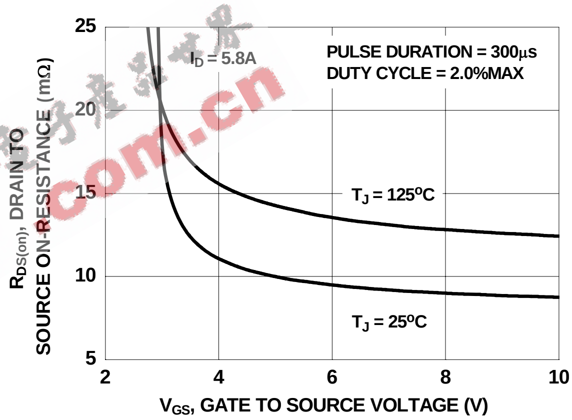


Figure 4. On-Resistance vs Gate to Source Voltage

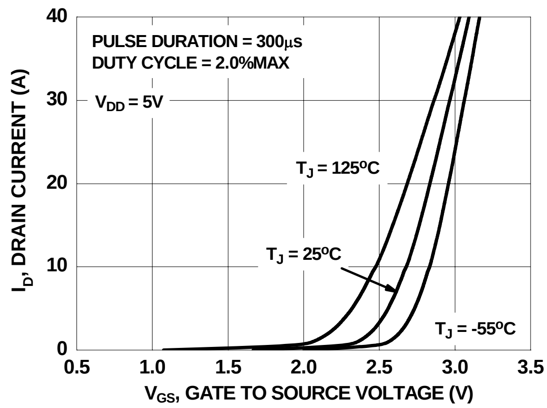


Figure 5. Transfer Characteristics

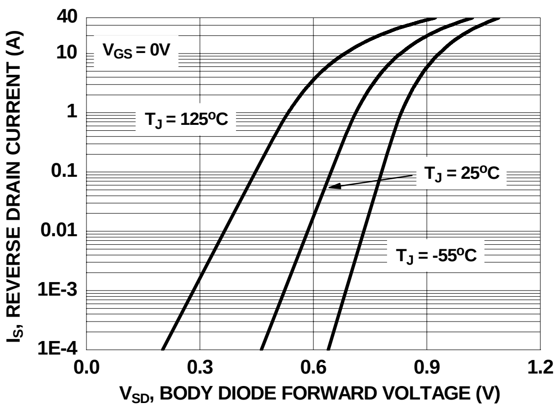


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

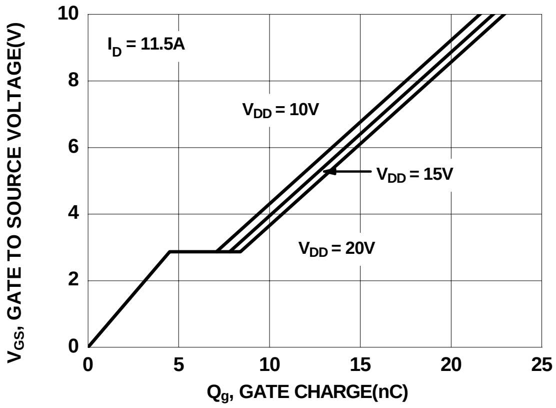


Figure 7. Gate Charge Characteristics

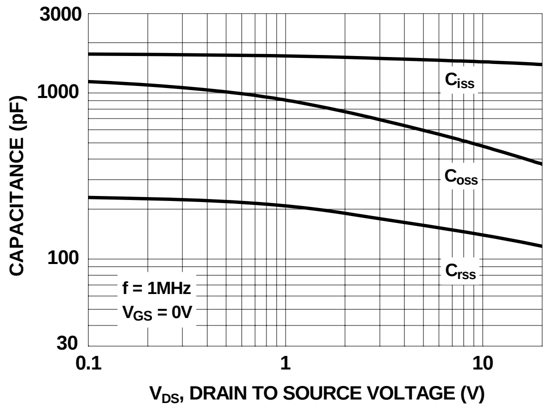


Figure 8. Capacitance vs Drain to Source Voltage

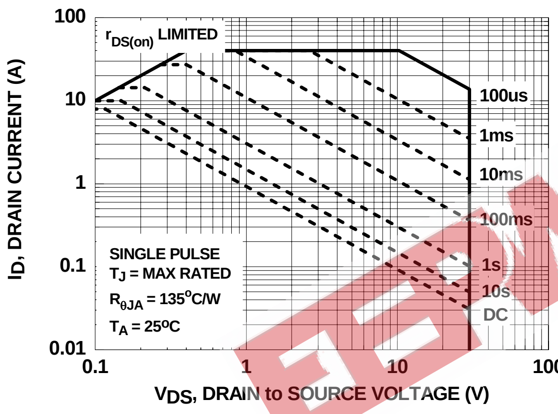


Figure 9. Forward Bias Safe Operating Area

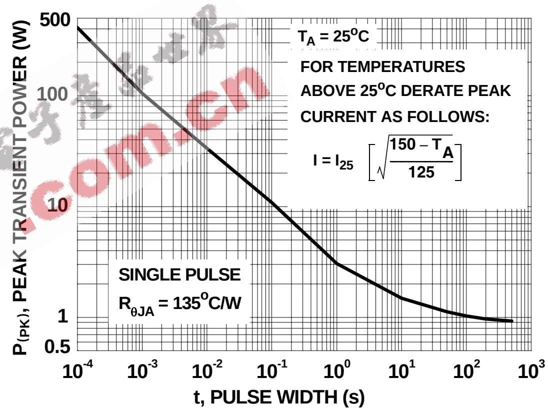


Figure 10. Single Pulse Maximum Power Dissipation

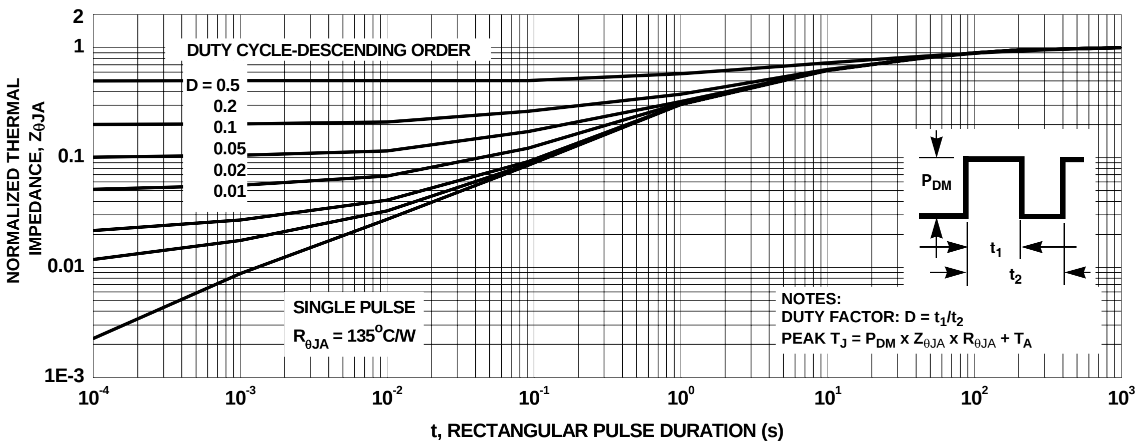
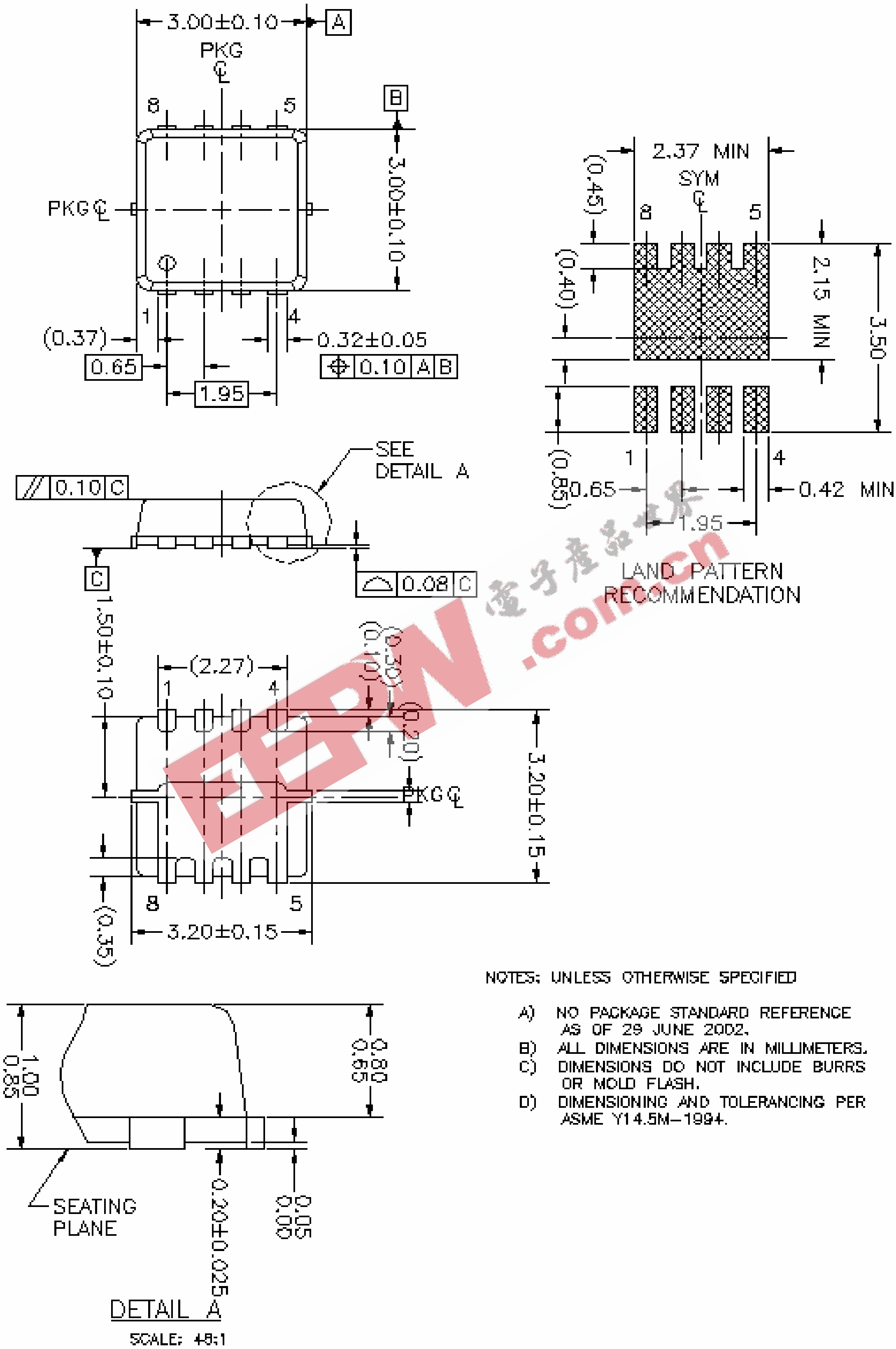


Figure 11. Transient Thermal Response Curve



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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