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October 2015

FDMA86251

Single N-Channel PowerTrench® MOSFET

150 V, 2.4 A, 175 mΩ

Features

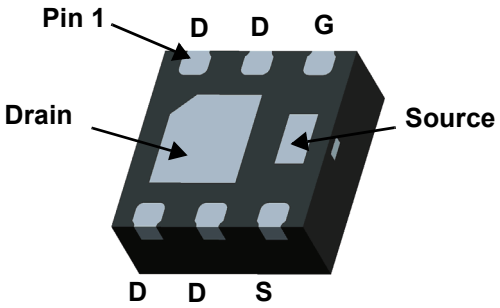
- Max $r_{DS(on)}$ = 175 mΩ at V_{GS} = 10 V, I_D = 2.4 A
- Max $r_{DS(on)}$ = 237 mΩ at V_{GS} = 6 V, I_D = 2.0 A
- Low Profile - 0.8 mm maximum in the new package MicroFET 2x2 mm
- Free from halogenated compounds and antimony oxides
- RoHS Compliant

General Description

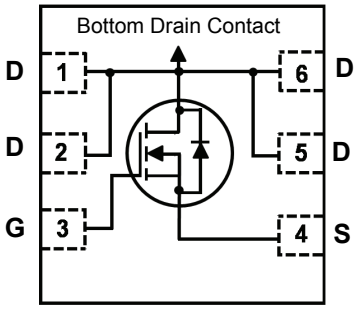
This device has been designed to provide maximum efficiency and thermal performance for synchronous buck converters. The low rDS(on) and gate charge provide excellent switching performance.

Applications

- DC – DC Primary Switch
- Load Switch



MicroFET 2X2 (Bottom View)



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			150	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Curre -Continuous	T_A = 25 °C	(Note 1a)	2.4	A
	-Pulsed		(Note 4)	12	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	13	mJ
P_D	Power Dissipation	T_A = 25 °C	(Note 1a)	2.4	W
	Power Dissipation	T_A = 25 °C	(Note 1b)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	52	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
251	FDMA86251	MicroFET 2X2	7 ”	8 mm	3000 units

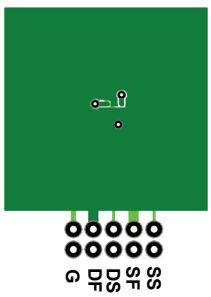
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Electrical Characteristics T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		108		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	2.8	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.4 A		148	175	mΩ
		V_{GS} = 6 V, I_D = 2.0 A		175	237	
		V_{GS} = 10 V, I_D = 2.4 A, T_J = 125 °C		272	333	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 2.4 A		4.7		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz		259	363	pF
C_{oss}	Output Capacitance			24	34	pF
C_{rss}	Reverse Transfer Capacitance			1.5	2.4	pF
R_g	Gate Resistance		0.1	1.5	3.0	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75V, I_D = 2.4 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		5.9	12	ns
t_r	Rise Time			1.7	10	ns
$t_{d(off)}$	Turn-Off Delay Time			10	20	ns
t_f	Fall Time			2.3	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 75 V, I_D = 2.4 A		4.1	5.8	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 6 V; V_{DD} = 75 V, I_D = 2.4 A		2.7	3.8	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 75 V, I_D = 2.4 A		1.2		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 75 V, I_D = 2.4 A		1.0		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.4 A (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 2.4 A, di/dt = 100 A/μs		49	79	ns
Q_{rr}	Reverse Recovery Charge			38	61	nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 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. 52 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 145 °C/W when mounted on a minimum pad of 2 oz copper.

2: Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3: E_{AS} of 13 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 3 A, V_{DD} = 150 V, V_{GS} = 10 V. 100% tested at L = 0.3 mH, I_{AS} = 8 A.

4: Pulsed Id please refer to Fig 9 SOA graph for more details.

Typical Characteristics T_J = 25 °C unless otherwise noted.

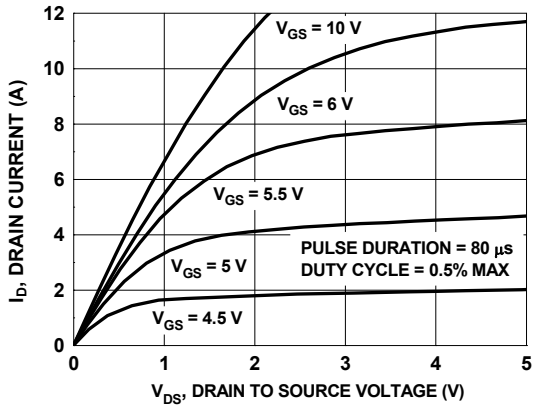


Figure 1. On Region Characteristics

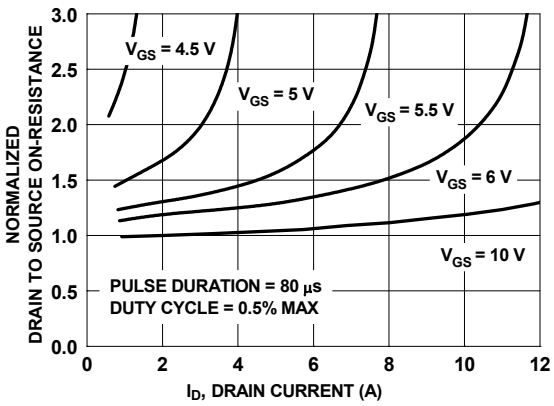


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

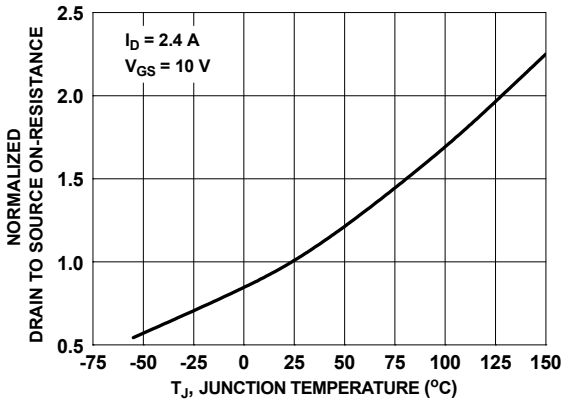


Figure 3. Normalized On Resistance vs. Junction Temperature

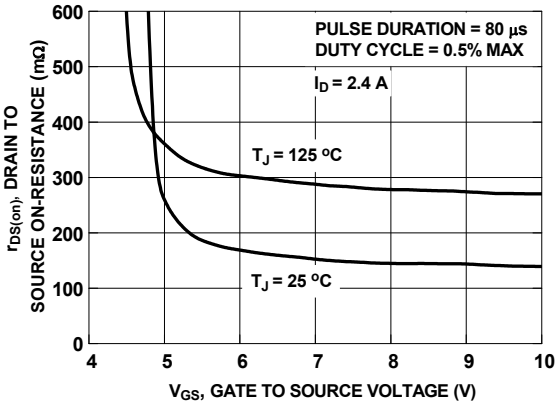


Figure 4. On-Resistance vs. Gate to Source Voltage

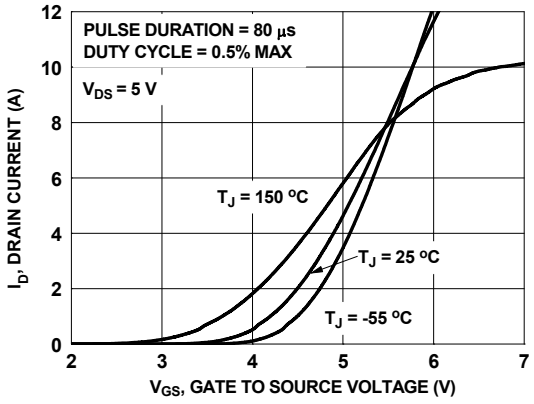


Figure 5. Transfer Characteristics

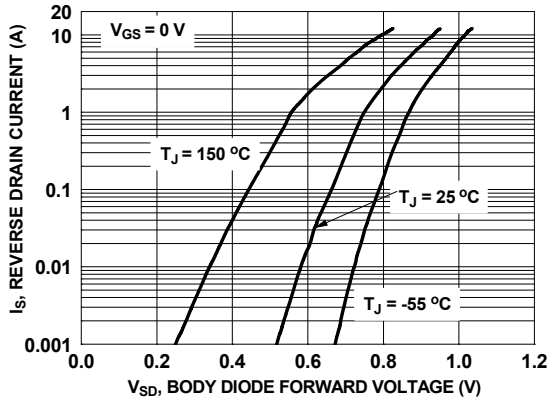


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

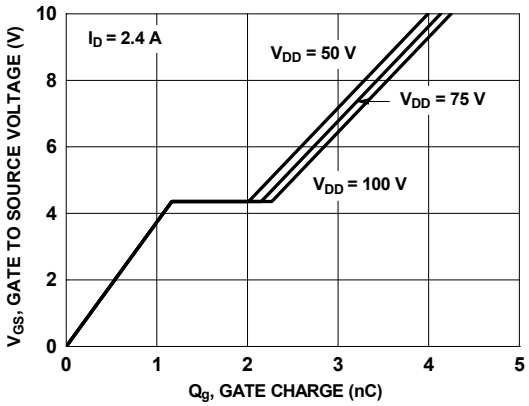


Figure 7. Gate Charge Characteristics

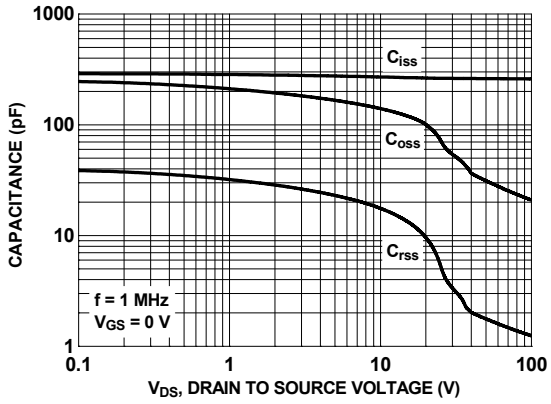


Figure 8. Capacitance vs. Drain to Source Voltage

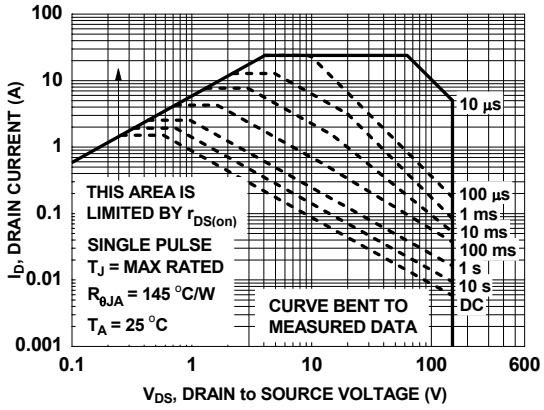


Figure 9. Forward Bias Safe Operating Area

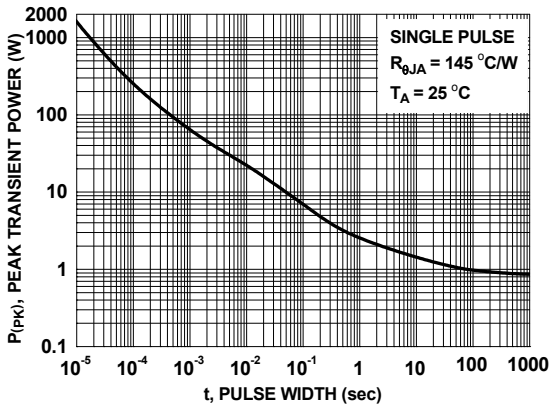


Figure 10. Single Pulse Maximum Power Dissipation

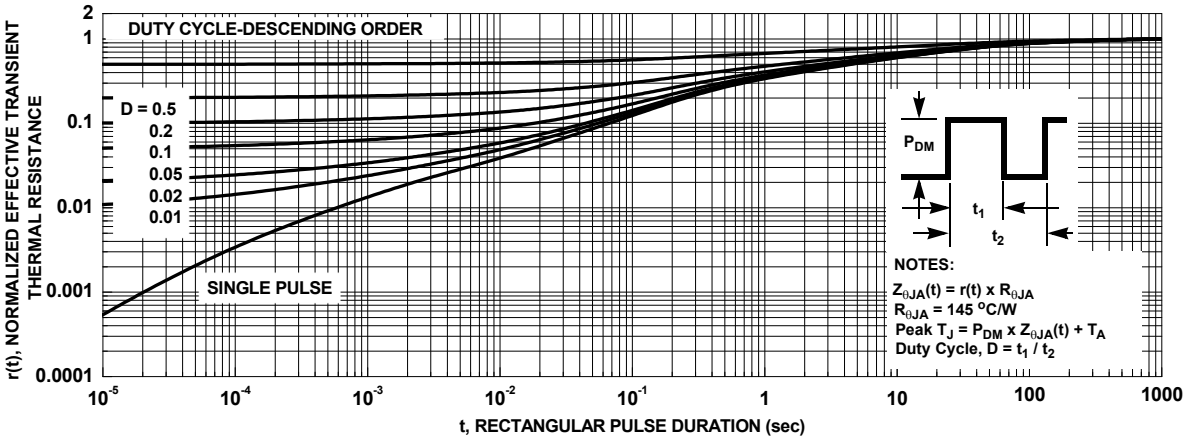
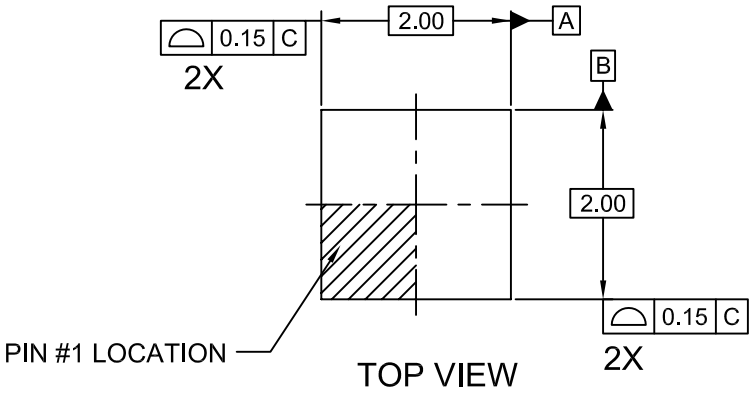
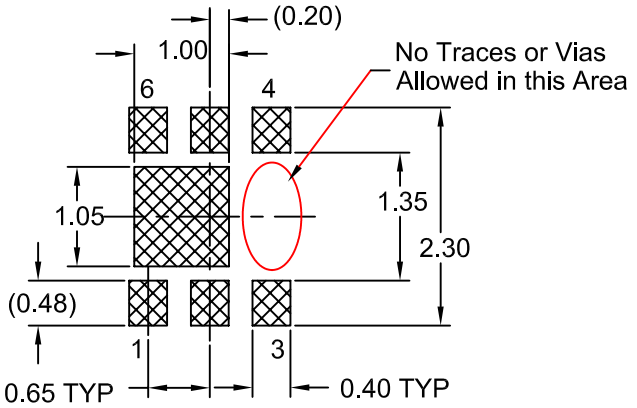


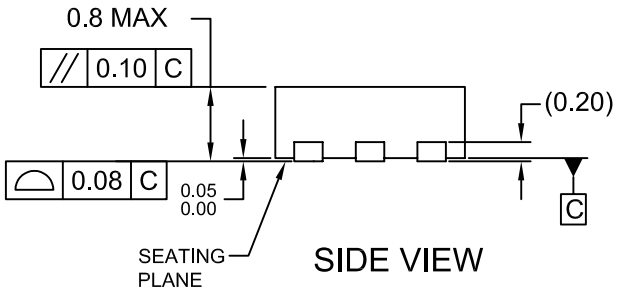
Figure 11. Junction-to-Ambient Transient Thermal Response Curve



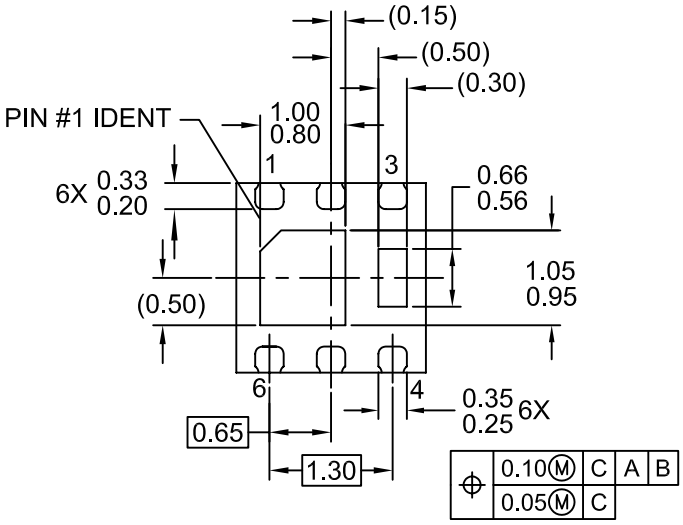
TOP VIEW



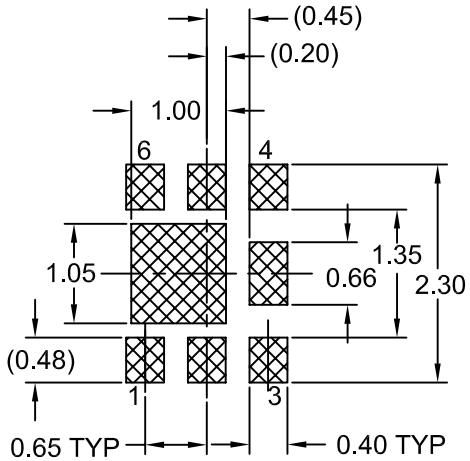
RECOMMENDED LAND PATTERN OPT 1



SIDE VIEW



BOTTOM VIEW



RECOMMENDED LAND PATTERN OPT 2

NOTES:

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