FAIRCHILD SEMICONDUCTOR®

September 2009

FDFME3N311ZT

Integrated N-Channel PowerTrench® MOSFET and Schottky Diode
30 V, 1.6 A, 299 mΩ

Features

- Max $r_{DS(on)}$ = 299 mΩ at V_{GS} = 4.5 V, I_D = 1.6 A
- Max $r_{DS(on)}$ = 410 mΩ at V_{GS} = 2.5 V, I_D = 1.3 A
- Low profile: 0.55 mm maximum in the new package MicroFET 1.6x1.6 **Thin**
- Free from halogenated compounds and antimony oxides
- HBM ESD protection level > 1600V (Note3)
- RoHS Compliant

General Description

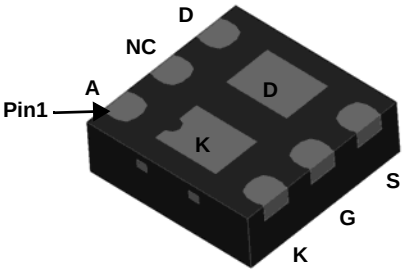
This device is designed specifically as a single package solution for a boost topology in cellular handset and other ultra-portable applications. It features a MOSFET with low input capacitance, total gate charge and on-state resistance. An independently connected schottky diode with low forward voltage and reverse leakage current to maximize boost efficiency.

The MicroFET 1.6x1.6 **Thin** package offers exceptional thermal performance for it's physical size and is well suited to switching and linear mode applications.

Applications

- Boost Functions

BOTTOM



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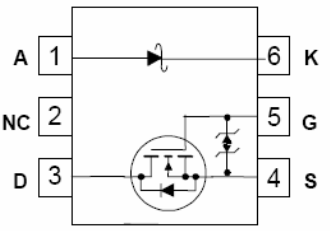


MicroFET 1.6x1.6 Thin

MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±12	V
I_D	Drain Current -Continuous	T_A = 25°C	(Note 1a)	1.6	A
	-Pulsed			4.5	
P_D	Power Dissipation	T_C = 25°C		1.1	W
	Power Dissipation	T_A = 25°C	(Note 1a)	0.5	
V_{RRM}	Schottky Repetitive Peak Reverse Voltage			28	V
I_O	Schottky Average Forward Current			1	A
T_J, T_{STG}	Operating and Storage Junction Temperature Range		(Note 4)	-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	110	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	234	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	95	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	210	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
1T	FDFME3N311ZT	MicroFET 1.6x1.6 **Thin**	7"	8mm	5000 units

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	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		25		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	0.5	1	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-3		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 4.5 V, I_D = 1.6 A		235	299	mΩ
		V_{GS} = 2.5 V, I_D = 1.3 A		296	410	
		V_{GS} = 4.5 V, I_D = 1.6 A,T_J = 150 °C		327	420	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 1.6 A		2.8		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		55	75	pF
C_{oss}	Output Capacitance			15	20	pF
C_{rss}	Reverse Transfer Capacitance			7	10	pF
R_g	Gate Resistance			7.5		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 1.6 A V_{GS} = 4.5 V, R_{GEN} = 6 Ω		6	12	ns
t_r	Rise Time			8	16	ns
$t_{d(off)}$	Turn-Off Delay Time			22	35	ns
t_f	Fall Time			1.4	2.8	ns
Q_g	Total Gate Charge	V_{GS} = 4.5 V V_{DD} = 15 V I_D = 1.6 A		1	1.4	nC
Q_{gs}	Gate to Source Gate Charge			0.2		nC
Q_{gd}	Gate to Drain “Miller” Charge			0.3		nC
Drain-Source Diode Characteristics						
I_S	Maximum continuous Drain-Source Diode Forward Current				1.6	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.9 A (Note 2)		0.9	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 1.6 A, di/dt = 100 A/μs		12	22	ns
Q_{rr}	Reverse Recovery Charge			3.1	10	nC

Schottky Diode Characteristics

I_R	Reverse Leakage	V_R = 28 V	T_J = 25 °C		15	100	μA
			T_J = 85 °C		0.46	4.7	mA
V_F	Forward Voltage	I_F = 1 A	T_J = 25 °C		0.47	0.57	V
			T_J = 85 °C		0.45		
V_F	Forward Voltage	I_F = 500 mA	T_J = 25 °C		0.38	0.48	V
			T_J = 85 °C		0.33		

Electrical Characteristics

Notes:

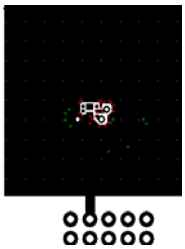
1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

   (a) MOSFET $R_{\theta JA}$ = 110 °C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5 " x 1.5 " x 0.062 " thick PCB.

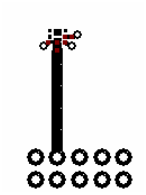
   (b) MOSFET $R_{\theta JA}$ = 234 °C/W when mounted on a minimum pad of 2 oz copper. For single operation.

   (c) Schottky $R_{\theta JA}$ = 95 °C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5 " x 1.5 " x 0.062" thick PCB.

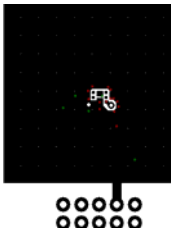
   (d) Schottky $R_{\theta JA}$ = 210 °C/W when mounted on a minimum pad of 2 oz copper. For dual operation.



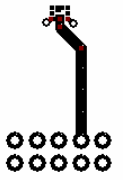
a. 110 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 234 °C/W when mounted on a minimum pad of 2 oz copper.



c. 95 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



d. 210 °C/W when mounted on a minimum pad of 2 oz copper.

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

3. The diode connected between the gate and source serves only as protection ESD. No gate overvoltage rating is implied.

4. Rating is applicable to MOSFET only.

Typical Characteristics T_J = 25°C unless otherwise noted

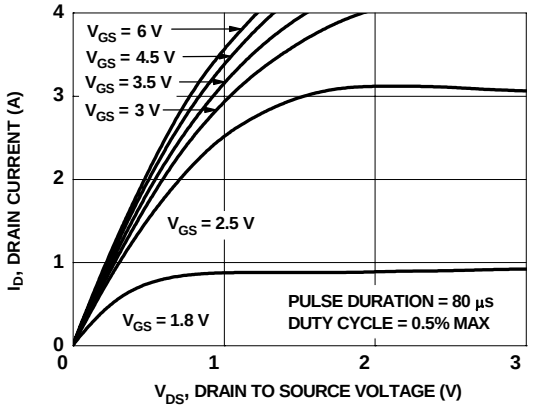


Figure 1. On Region Characteristics

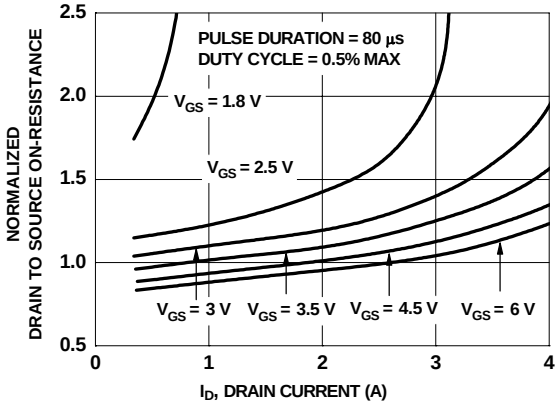


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

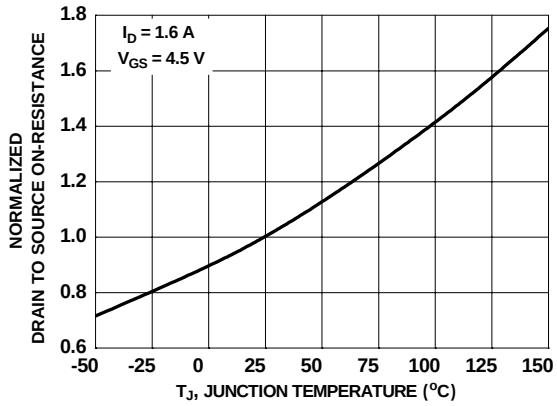


Figure 3. Normalized On Resistance vs Junction Temperature

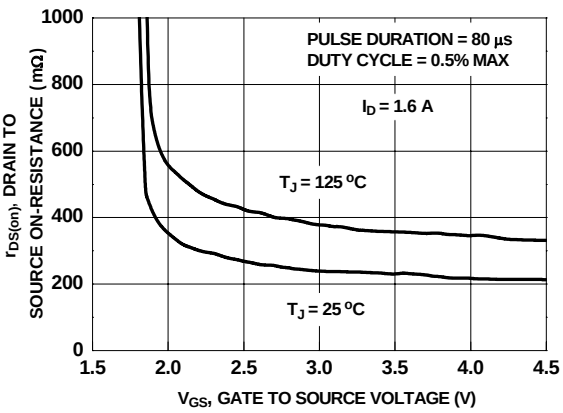


Figure 4. On-Resistance vs Gate to Source Voltage

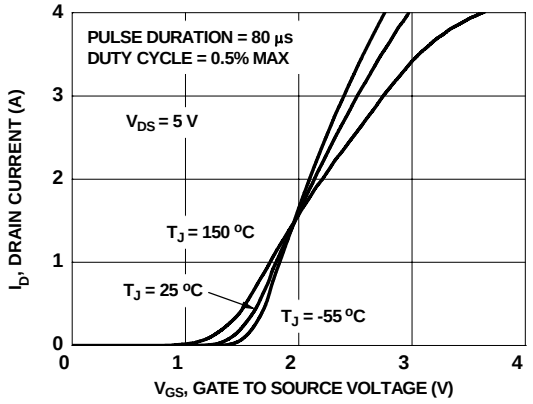


Figure 5. Transfer Characteristics

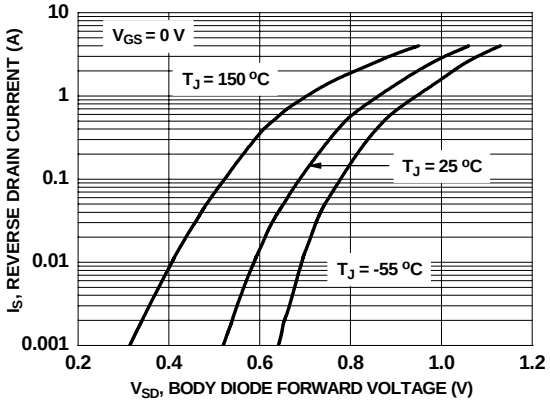


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

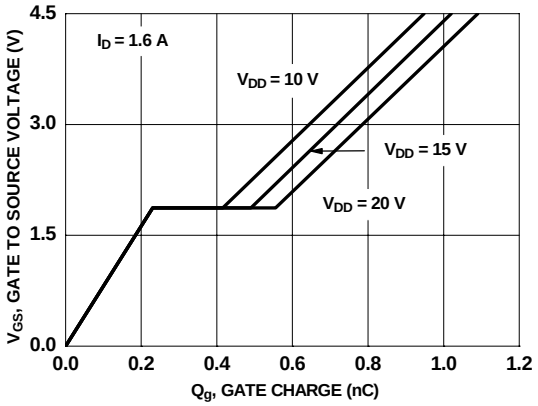


Figure 7. Gate Charge Characteristics

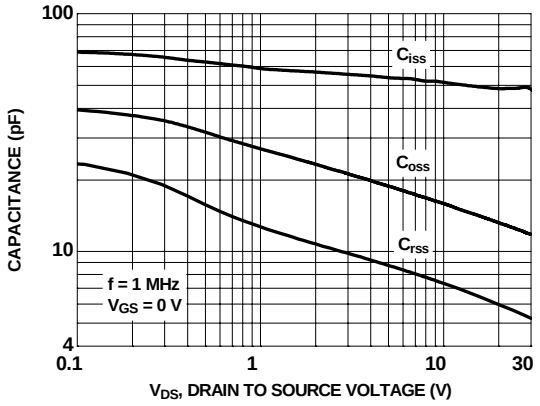


Figure 8. Capacitance vs Drain to Source Voltage

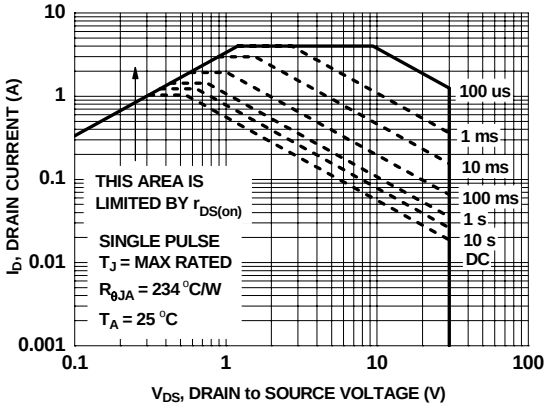


Figure 9. Forward Bias Safe Operating Area

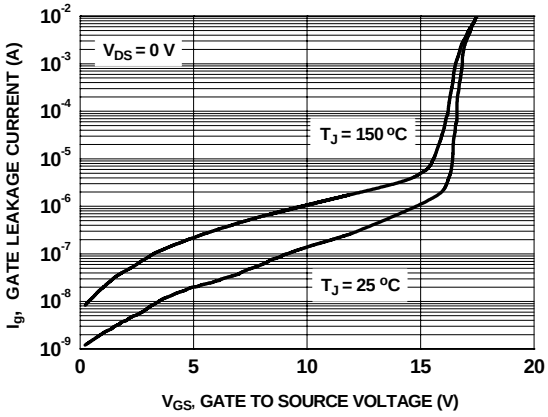


Figure 10. Gate Leakage Current vs Gate to Source Voltage

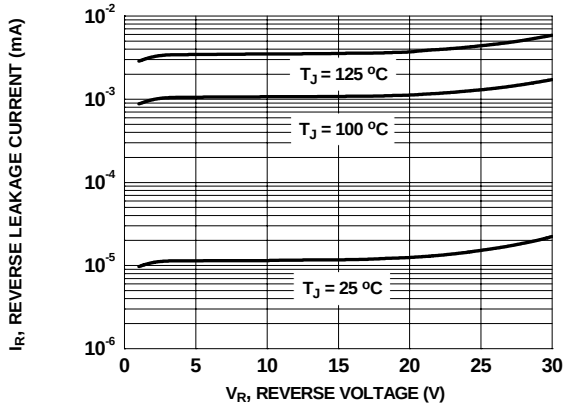


Figure 11. Schottky Diode Reverse Current

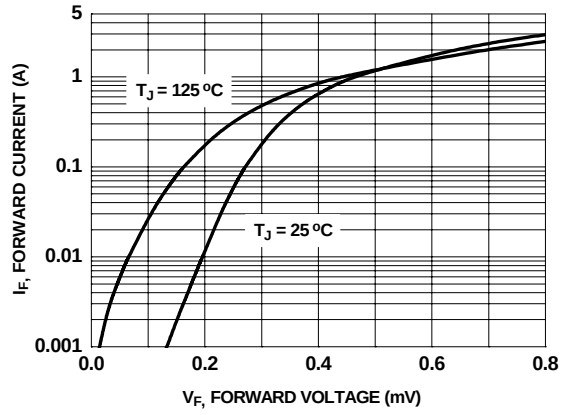


Figure 12. Schottky Diode Forward Voltage

Typical Characteristics T_J = 25°C unless otherwise noted

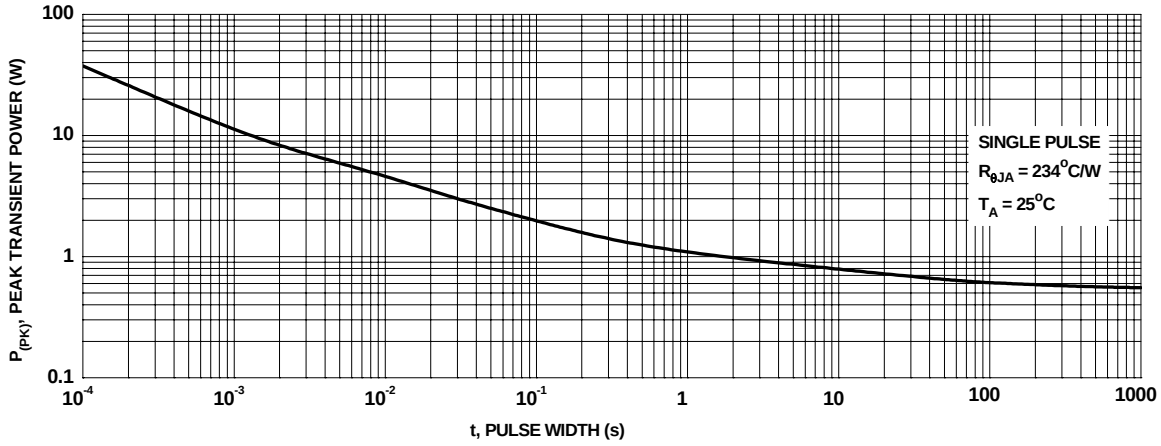


Figure 13. Single Pulse Maximum Power Dissipation

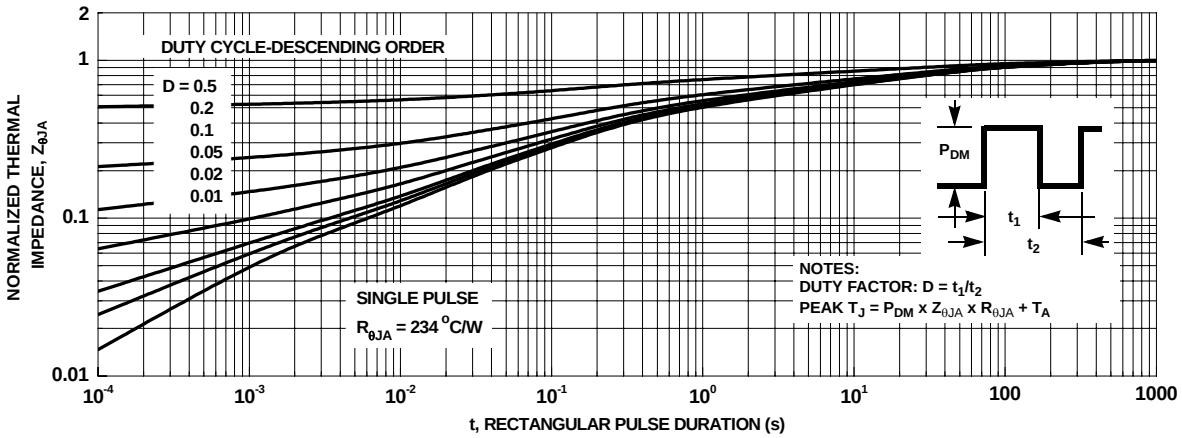
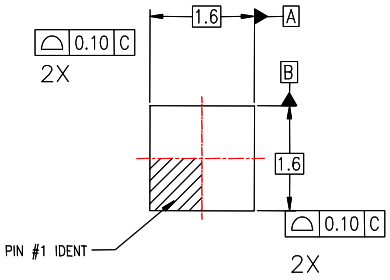
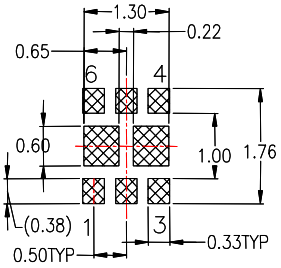


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

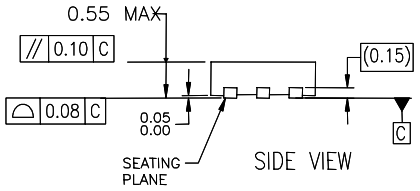
Dimensional Outline and Pad Layout



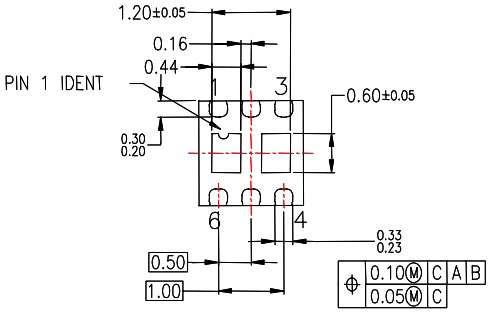
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

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