FAIRCHILD SEMICONDUCTOR®

January 2006

FDMA420NZ

Single N-Channel 2.5V Specified PowerTrench® MOSFET
20V, 5.7A, 30mΩ

General Description

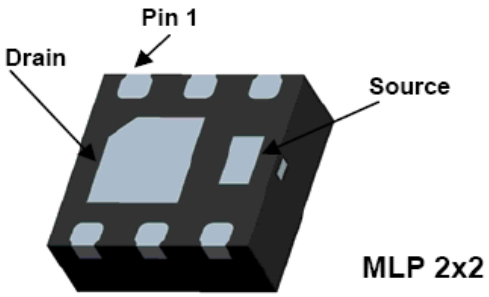
This Single N-Channel MOSFET has been designed using Fairchild Semiconductor's advanced Power Trench process to optimize the R_{DS}(on) @V_{GS}=2.5V on special MicroFET leadframe.

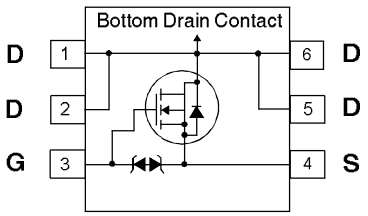
Applications

- Li-Ion Battery Pack

Features

- $R_{DS(on)}$ = 30mΩ @ V_{GS} = 4.5 V, I_D = 5.7A
- $R_{DS(on)}$ = 40mΩ @ V_{GS} = 2.5 V, I_D = 5.0A
- Low Profile-0.8mm maximum-in the new package MicroFET 2x2 mm
- RoHS Compliant





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		±12	V
I_D	Drain Current -Continuous	(Note 1a)	5.7	A
	-Pulsed		24	
P_D	Power dissipation (Steady State)	(Note 1a)	0.9	W
		(Note 1b)	2.4	
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)	145	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	52	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
420	FDMA420NZ	7"	12mm	3000 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V , I_D = 250μA	20			V
$\frac{\Delta B_{VDSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C		12		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16V, V_{GS} = 0V,			1	μA
I_{GSS}	Gate-Body Leakage	V_{GS} = ±12V, V_{DS} = 0V			±10	μA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	0.6	0.83	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C		-3.1		mV/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 4.5V, I_D = 5.7A		16.8	30	mΩ
		V_{GS} = 4.0V, I_D = 5.7A		17.3	31	
		V_{GS} = 3.1V, I_D = 5.0A		18.9	33	
		V_{GS} = 2.5V, I_D = 5.0A		21.2	40	
		V_{GS} = 4.5V, I_D = 5.7A, T_J =150°C		24.8	44	
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 5.7A		28.3		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz		701	935	pF
C_{oss}	Output Capacitance			163	220	pF
C_{rss}	Reverse Transfer Capacitance			125	190	pF
R_G	Gate Resistance			1.92		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10V, I_D = 1A, V_{GS} = 4.5V, R_{GEN} = 6Ω		9.8	20	ns
t_r	Turn-On Rise Time			8.6	18	ns
$t_{d(off)}$	Turn-Off Delay Time			21.5	43	ns
t_f	Turn-Off Fall Time			8.6	18	ns
Q_g	Total Gate Charge	V_{DS} = 10V, I_D = 5.7A, V_{GS} = 4.5V		8.8	12	nC
Q_{gs}	Gate-Source Charge			0.9	2	nC
Q_{gd}	Gate-Drain Charge			2.4	4	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				2.0	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 2.0A		0.69	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 5.7A, di/dt = 100A/μs			20	ns
Q_{rr}	Diode Reverse Recovery Charge				5	nC

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.

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

b. 52°C/W when mounted on a 1 in^2 pad of 2 oz copper.

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

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

Typical Characteristics T_J = 25°C unless otherwise noted

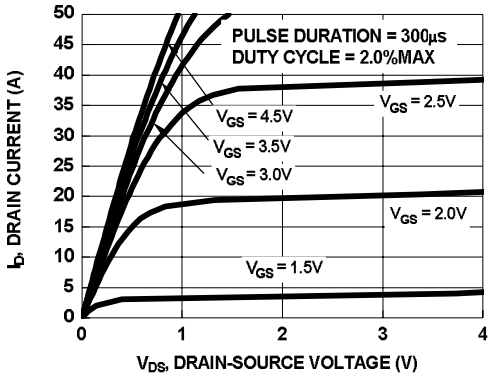


Figure 1. On Region Characteristics

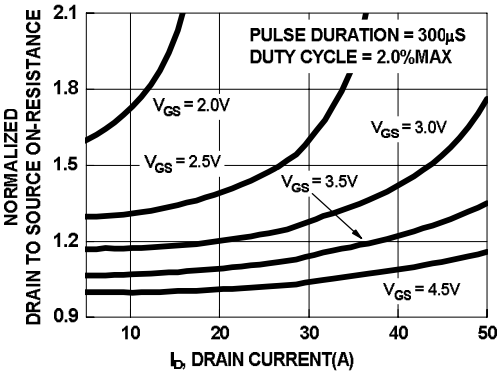


Figure 2. On-Resistance vs Drain Current and Gate Voltage

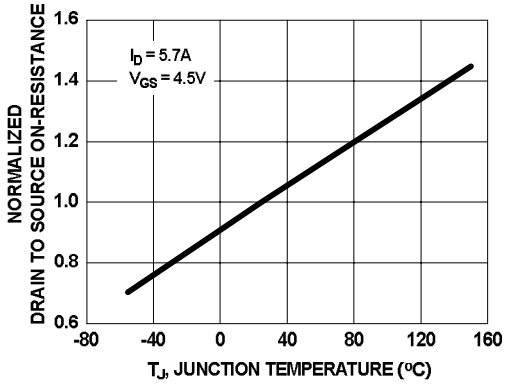


Figure 3. Normalized On Resistance vs Junction Temperature

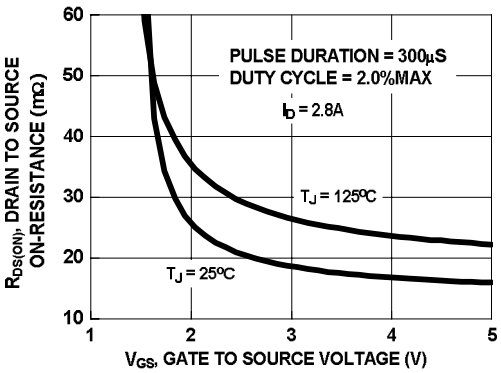


Figure 4. On-Resistance vs Gate to Source Votlage

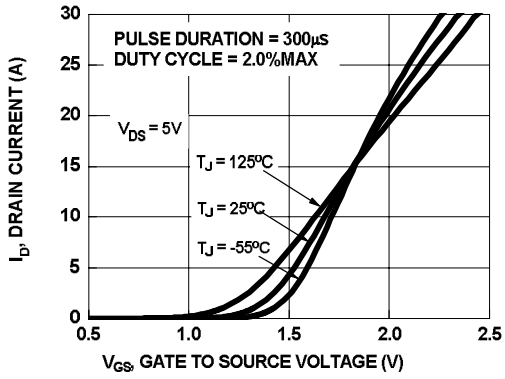


Figure 5. Transfer Characteristics

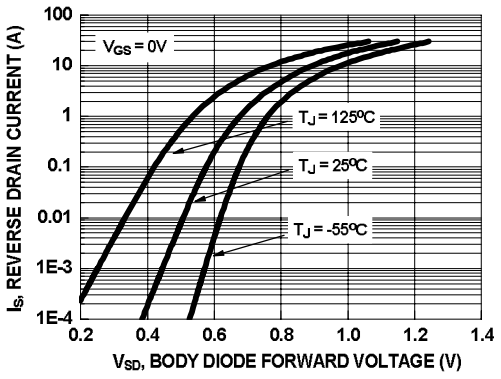


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

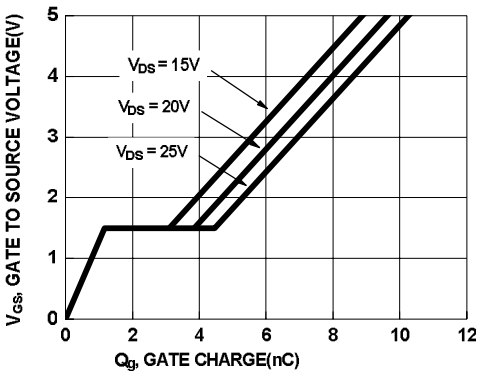


Figure 7. Gate Charge Characteristics

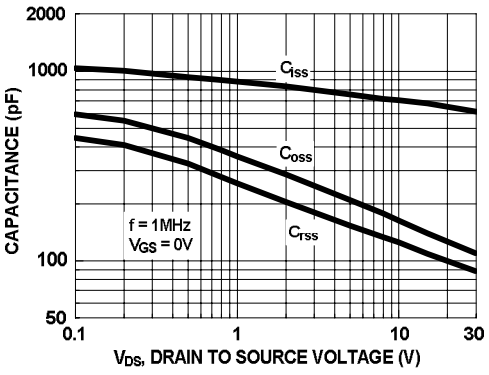


Figure 8. Capacitance vs Drain to Source Voltage

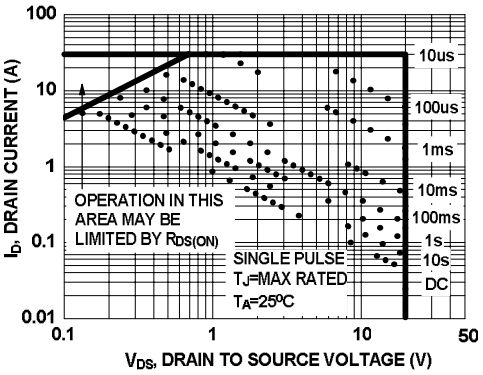


Figure 9. Forward Bias Safe Operating Area

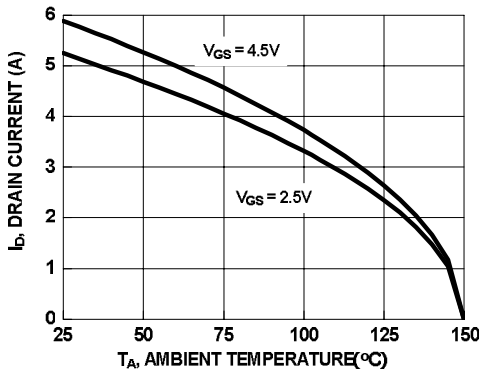


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

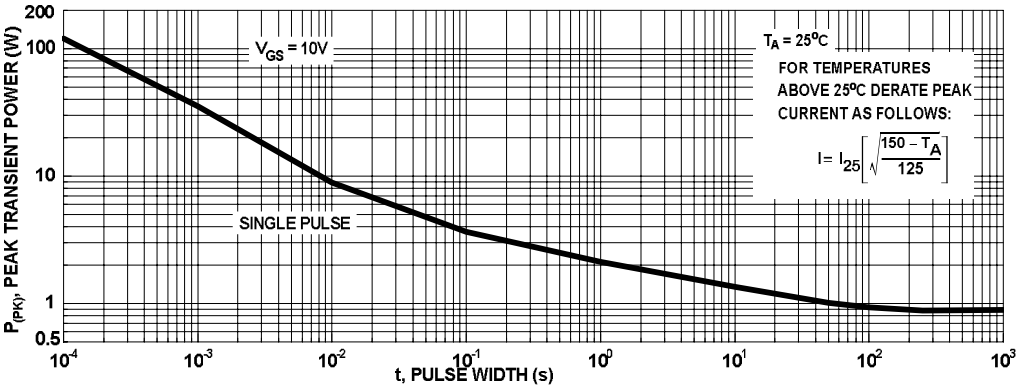


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

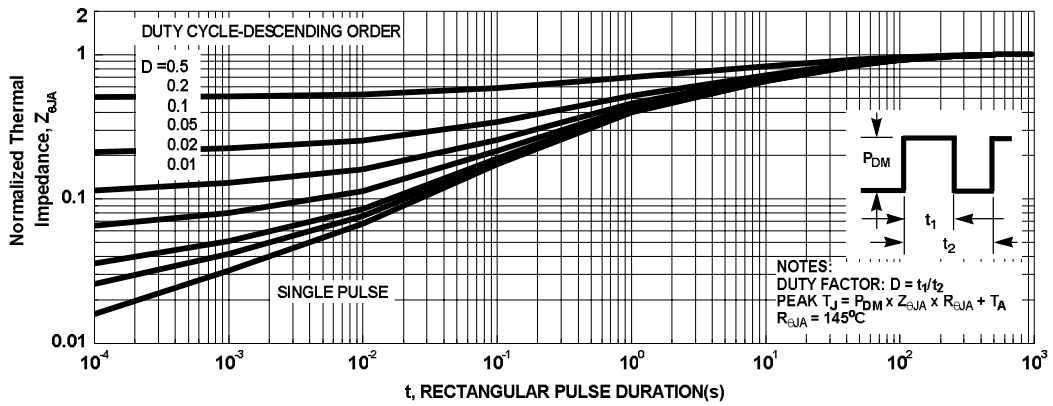
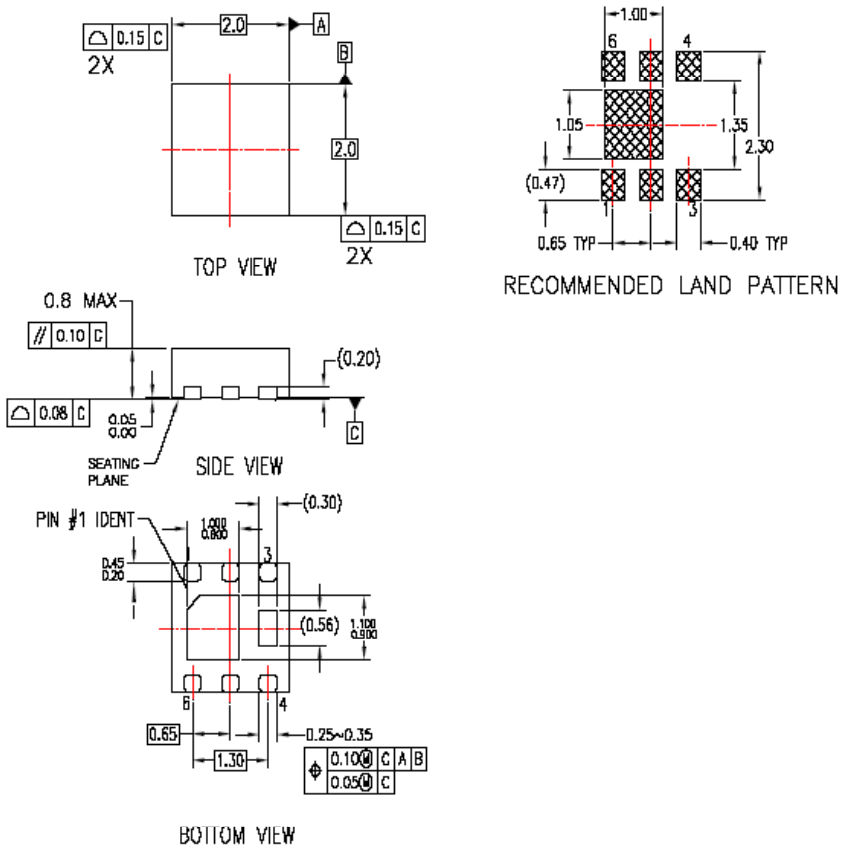


Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

A. NOT FULLY CONFORM TO JEDEC REGISTRATION MO-229 DATED AUG/2003.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASMEY14.5M,1994

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