FAIRCHILD SEMICONDUCTOR®

August 2005

FDFMA2P853

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode

General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features a MOSFET with low on-state resistance and an independently connected low forward voltage schottky diode for minimum conduction losses.

The MicroFET 2x2 package offers exceptional thermal performance for it's physical size and is well suited to linear mode applications.

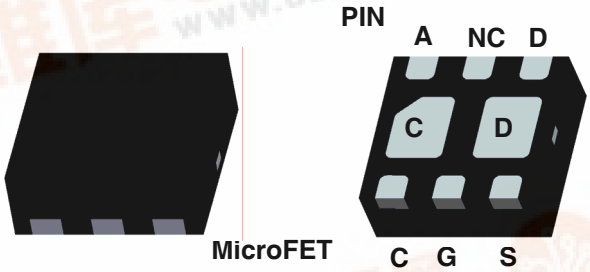
Features

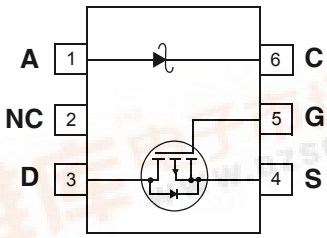
MOSFET:

- -3.0 A, -20V. $R_{DS(ON)}$ = 120 mΩ @ V_{GS} = -4.5 V
  $R_{DS(ON)}$ = 160 mΩ @ V_{GS} = -2.5 V
  $R_{DS(ON)}$ = 240 mΩ @ V_{GS} = -1.8 V
- Low Profile - 0.8 mm maximun - in the new package MicroFET 2x2 mm

Schottky:

- V_F < 0.46 V @ 500 mA





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	MOSFET Drain-Source Voltage		-20	V
V_{GSS}	MOSFET Gate-Source Voltage		±8	V
I_D	Drain Current -Continuous	(Note 1a)	-2.2	A
	-Pulsed		-6	
V_{RRM}	Schottky Repetitive Peak Reverse voltage		20	V
I_O	Schottky Average Forward Current	(Note 1a)	1	A
P_D	Power dissipation for Single Operation	(Note 1a)	1.4	W
	Power dissipation for Single Operation	(Note 1b)	0.7	
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)	86	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	173	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1c)	86	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1d)	140	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
.853	FDFMA2P853	7inch	8mm	3000 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = -250μA	-20	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	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} = ±8V, V_{DS} = 0V	-	-	±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	-0.4	-0.7	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = -250μA, Referenced to 25°C	-	2	-	mV/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -4.5V, I_D = -3.0A	-	90	120	mΩ
		V_{GS} = -2.5V, I_D = -2.5A	-	120	160	
		V_{GS} = -1.8V, I_D = -1.0A	-	172	240	
		V_{GS} = -4.5V, I_D = -3.0A T_J = 125°C	-	118	160	
$I_{D(on)}$	On-State Drain Current	V_{GS} = -4.5V, V_{DS} = -5V	-20	-	-	A
g_{FS}	Forward Transconductance	V_{DS} = -5V, I_D = -3.0A	-	7	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz	-	435	-	pF
C_{oss}	Output Capacitance		-	80	-	pF
C_{rss}	Reverse Transfer Capacitance		-	45	-	pF
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	18	ns
t_r	Turn-On Rise Time		-	11	19	ns
$t_{d(off)}$	Turn-Off Delay Time		-	15	27	ns
t_f	Turn-Off Fall Time		-	6	12	ns
Q_g	Total Gate Charge	V_{DS} = -10V, I_D = -3.0A, V_{GS} = -4.5V	-	4	6	nC
Q_{gs}	Gate-Source Charge		-	0.8	-	nC
Q_{gd}	Gate-Drain Charge		-	0.9	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	-1.1	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = -1.1 A (Note 2)	-	-0.8	-1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F= -3.0A, dI_F/dt=100A/μs	-	17	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	6	-	nC

Schottky Diode Characteristic

I_R	Reverse Leakage	V_R = 20V	T_J = 25°C	-	9.9	100	μA
			T_J = 85°C	-	0.3	1	mA
			T_J = 125°C	-	2.3	10	mA
V_F	Forward Voltage	I_F = 500mA	T_J = 25°C	-	0.4	0.46	V
			T_J = 125°C	-	0.3	0.35	

Electrical Characteristics T_A = 25°C unless otherwise noted

Notes:

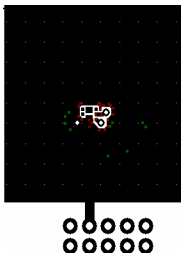
1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

(a) MOSFET $R_{\theta JA}$ = 86°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB

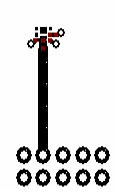
(b) MOSFET $R_{\theta JA}$ = 173°C/W when mounted on a minimum pad of 2 oz copper

(c) Schottky $R_{\theta JA}$ = 86°C/W when mounted on a 1 in^2 pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB

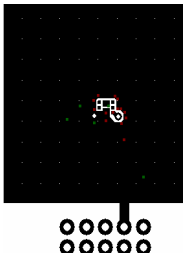
(d) Schottky $R_{\theta JA}$ = 140°C/W when mounted on a minimum pad of 2 oz copper



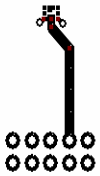
a) 86°C/W when mounted on a 1in^2 pad of 2 oz copper



b) 173°C/W when mounted on a minimum pad of 2 oz copper



c) 86°C/W when mounted on a 1in^2 pad of 2 oz copper



d) 140°C/W when mounted on a minimum pad of 2 oz copper

Scale 1: 1 on letter size paper

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

Typical Characteristics

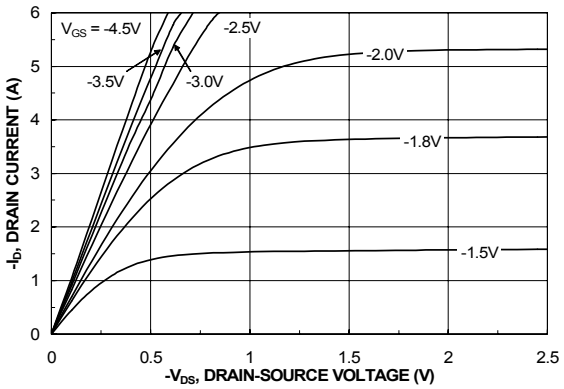


Figure 1. On-Region Characteristics

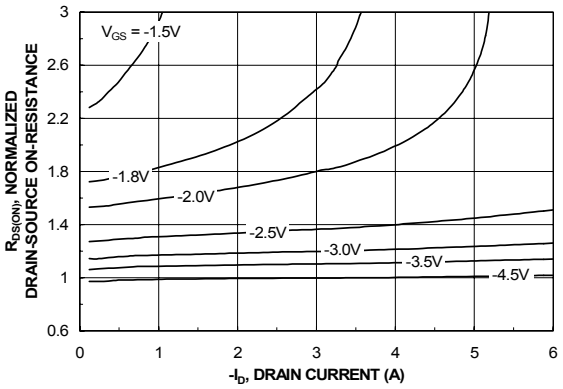


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

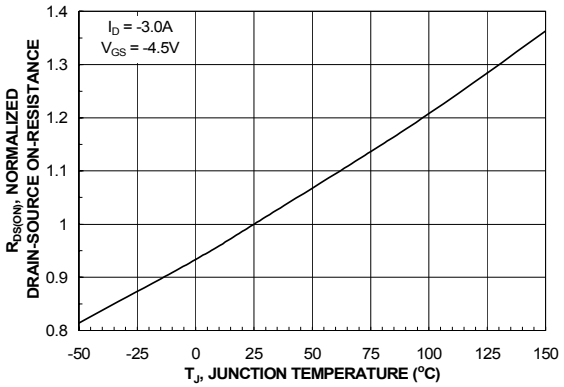


Figure 3. On-Resistance Variation with Temperature

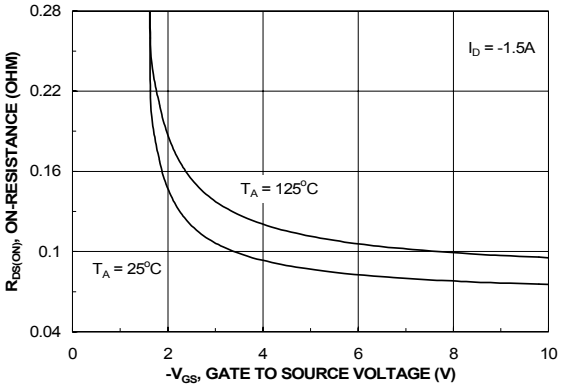


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

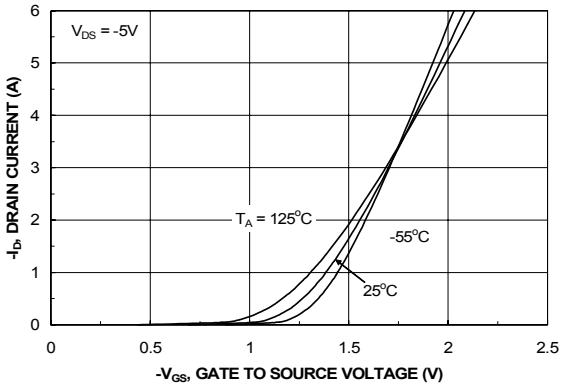


Figure 5. Transfer Characteristics

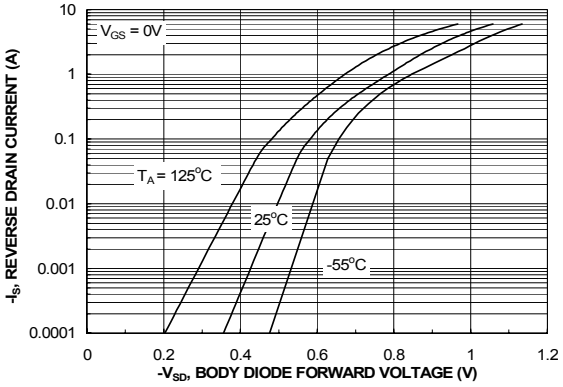


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

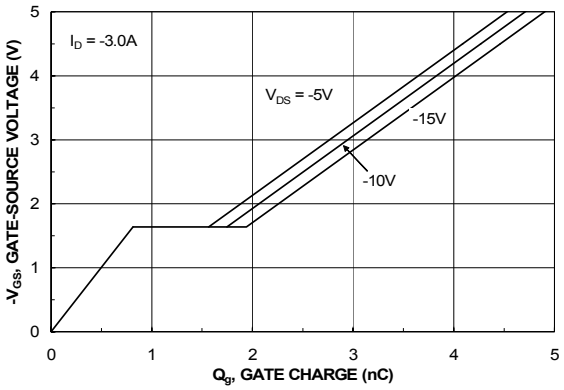


Figure 7. Gate Charge Characteristics

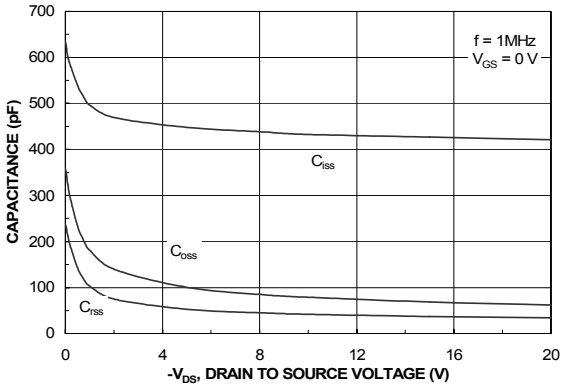


Figure 8. Capacitance Characteristics

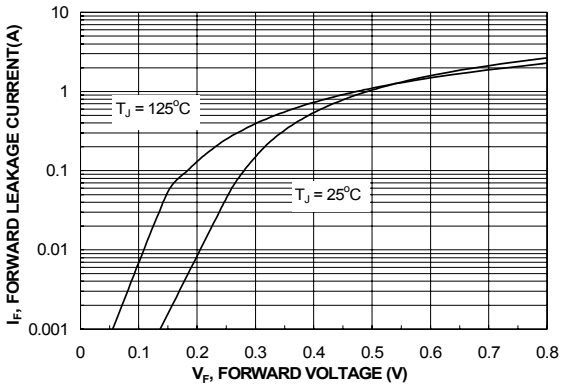


Figure 9. Schottky Diode Forward Voltage

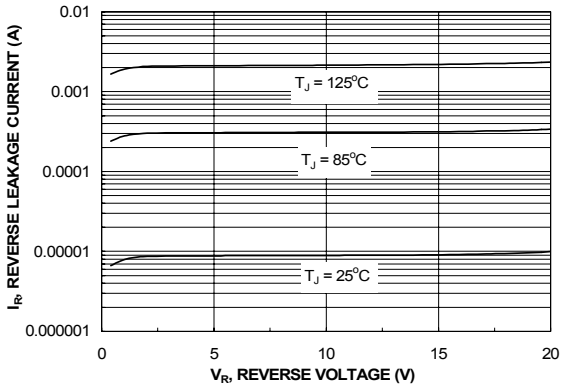


Figure 10. Schottky Diode Reverse Current

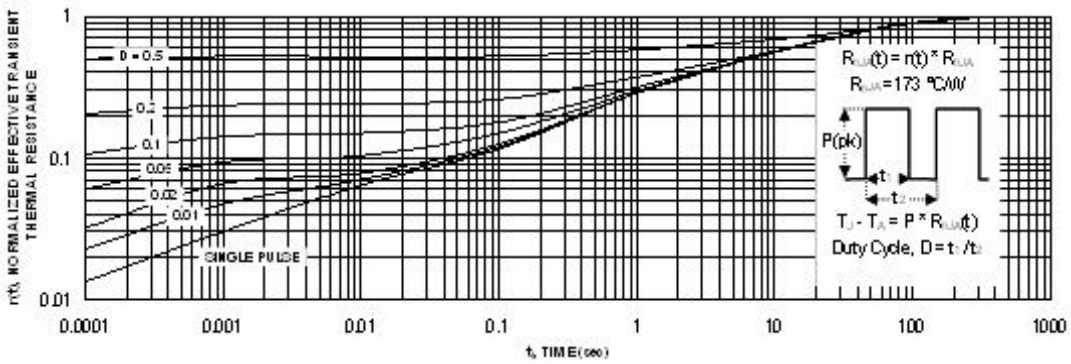
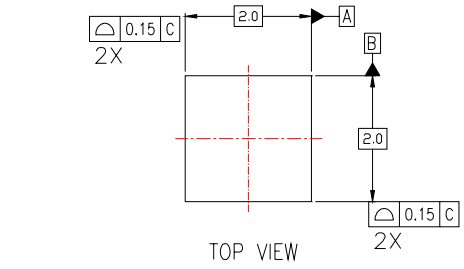
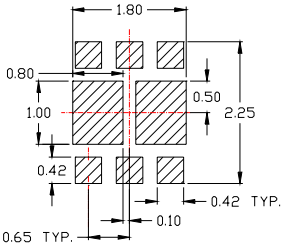


Figure 11. Transient Thermal Response Curve

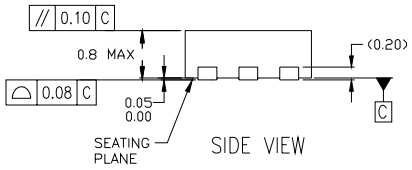
Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.



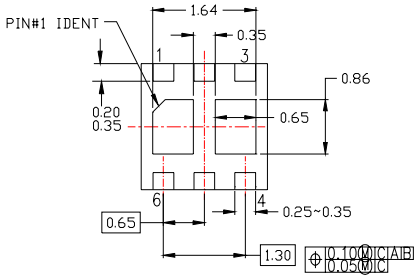
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VCCC, DATED 11/2001

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP06JrevB

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The Power Franchise®		OCXPro™	µSerDes™	UniFET™
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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