

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.

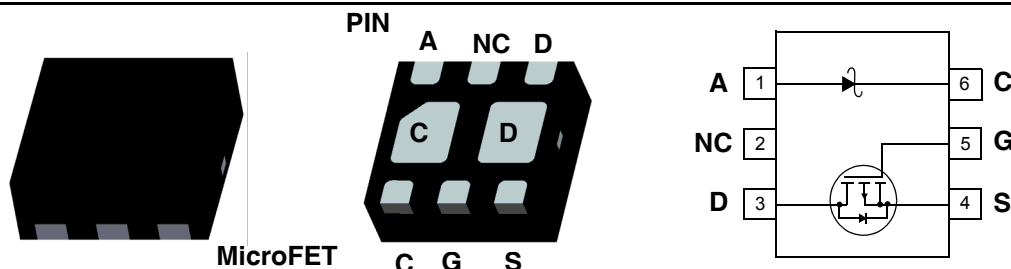
Features

MOSFET:

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

Schottky:

- $V_F < 0.46\text{ V} @ 500\text{ mA}$



Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ 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	-2.2	A
	-Pulsed	-6	
V_{RRM}	Schottky Repetitive Peak Reverse voltage	20	V
I_O	Schottky Average Forward Current	1	A
P_D	Power dissipation for Single Operation	1.4	W
	Power dissipation for Single Operation	0.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	86	$^\circ\text{C/W}$
$R_{\theta JA}$	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 $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	-20	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu A$, Referenced to 25°C	-	-12	-	mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16V, V_{GS} = 0V$	-	-	-1	μA
I_{GSS}	Gate-Body Leakage,	$V_{GS} = \pm 8V, V_{DS} = 0V$	-	-	± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.4	-0.7	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\mu A$, Referenced to 25°C	-	2	-	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -4.5V, I_D = -3.0A$	-	90	120	m Ω
		$V_{GS} = -2.5V, I_D = -2.5A$	-	120	160	
		$V_{GS} = -1.8V, I_D = -1.0A$	-	172	240	
		$V_{GS} = -4.5V, I_D = -3.0A$ $T_J = 125^\circ\text{C}$	-	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	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	-	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	$V_{DD} = -10V, I_D = -1A$ $V_{GS} = -4.5V, R_{GEN} = 6\Omega$	-	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	$I_F = -3.0A, dI_F/dt = 100A/\mu s$	-	17	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	6	-	nC

Schottky Diode Characteristic

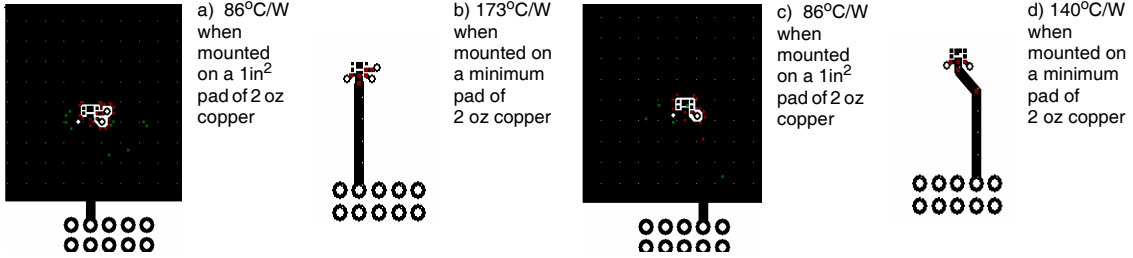
I_R	Reverse Leakage	$V_R = 20V$	$T_J = 25^\circ\text{C}$	-	9.9	100	μA
			$T_J = 85^\circ\text{C}$	-	0.3	1	mA
			$T_J = 125^\circ\text{C}$	-	2.3	10	mA
V_F	Forward Voltage	$I_F = 500\text{mA}$	$T_J = 25^\circ\text{C}$	-	0.4	0.46	V
			$T_J = 125^\circ\text{C}$	-	0.3	0.35	

Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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 $R_{\theta JA} = 86^\circ\text{C/W}$ when mounted on a 1 in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB
- (b) MOSFET $R_{\theta JA} = 173^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper
- (c) Schottky $R_{\theta JA} = 86^\circ\text{C/W}$ when mounted on a 1 in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB
- (d) Schottky $R_{\theta JA} = 140^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper



Scale 1: 1 on letter size paper

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

Typical Characteristics

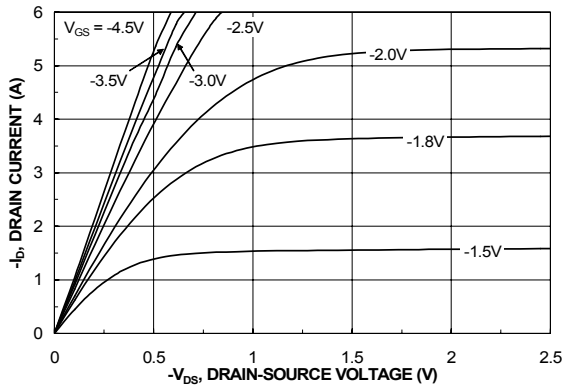


Figure 1. On-Region Characteristics

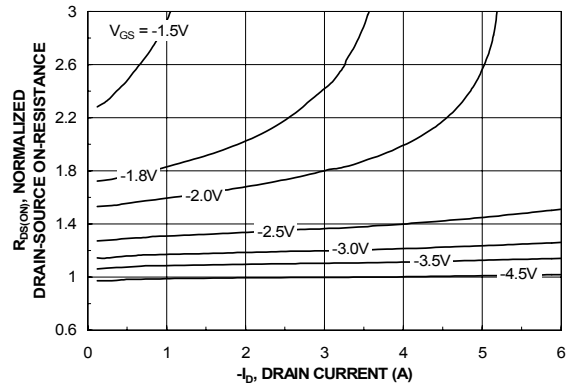


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

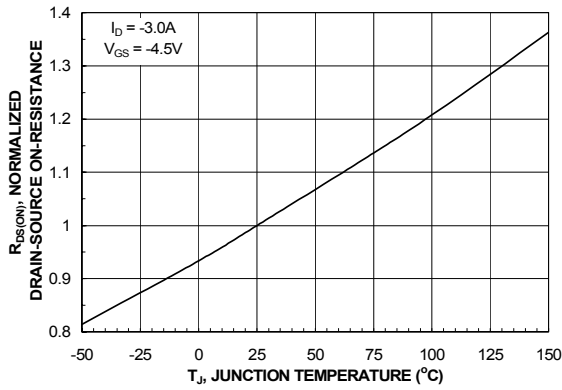


Figure 3. On-Resistance Variation with Temperature

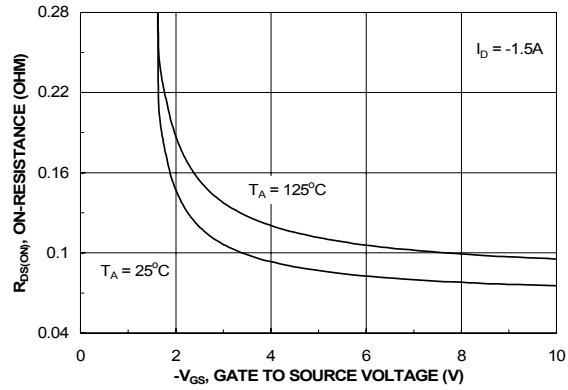


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

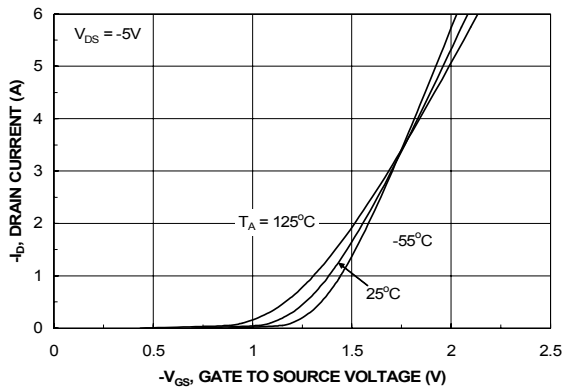


Figure 5. Transfer Characteristics

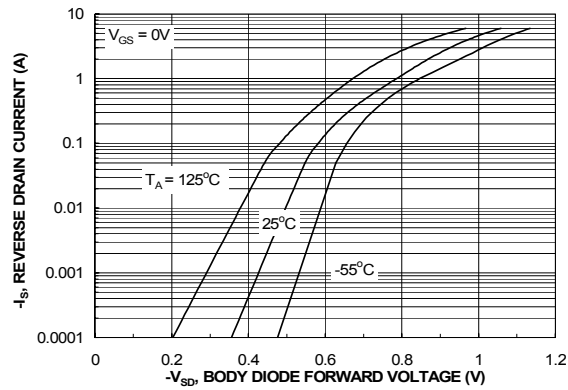


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

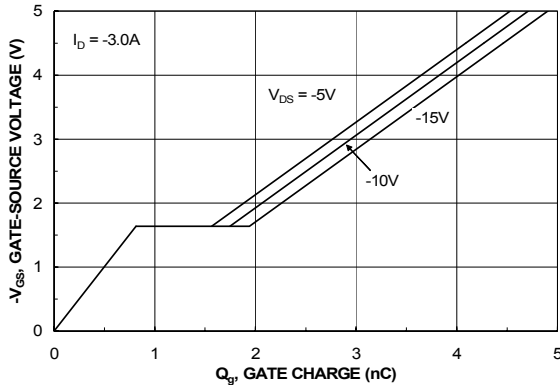


Figure 7. Gate Charge Characteristics

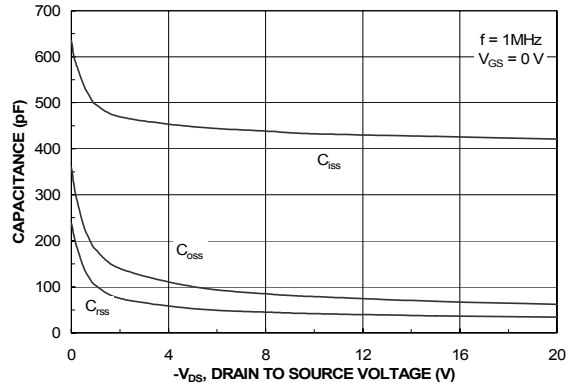


Figure 8. Capacitance Characteristics

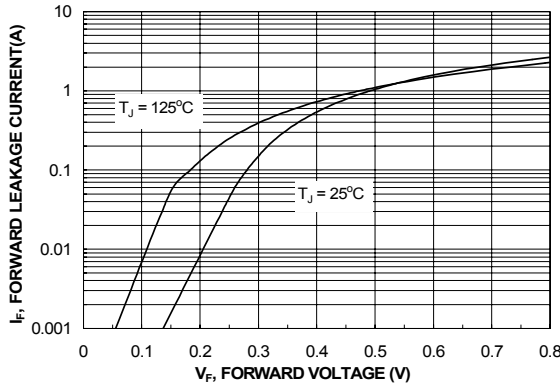


Figure 9. Schottky Diode Forward Voltage

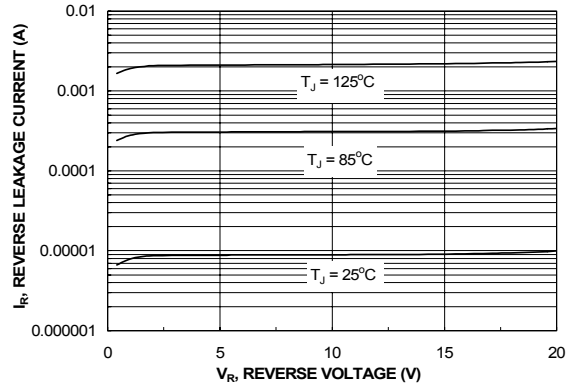


Figure 10. Schottky Diode Reverse Current

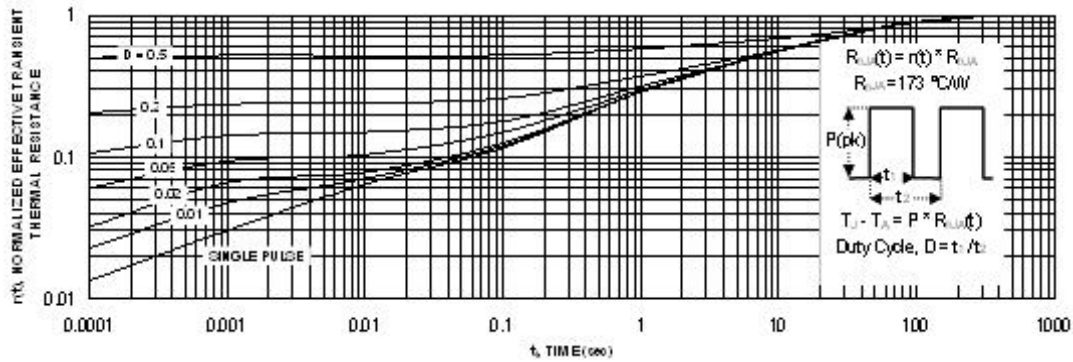
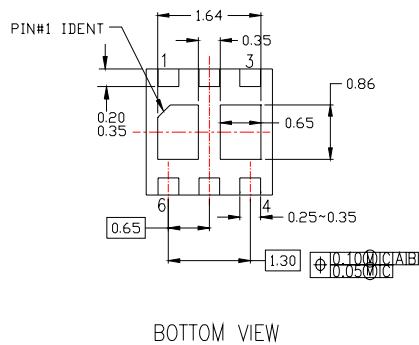
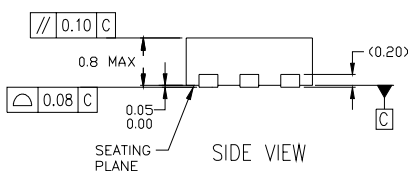
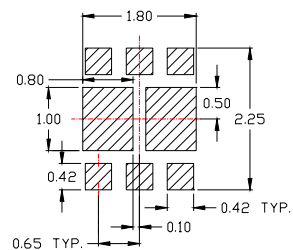
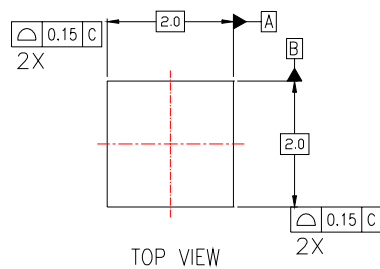


Figure 11. Transient Thermal Response Curve

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



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

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