



July 2005

FDFMC2P120

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Integrated P-Channel PowerTrench[®] MOSFET and Schottky Diode

General Description

FDFMC2P120 combines the exceptional performance of Fairchild's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in a MicroFET package.

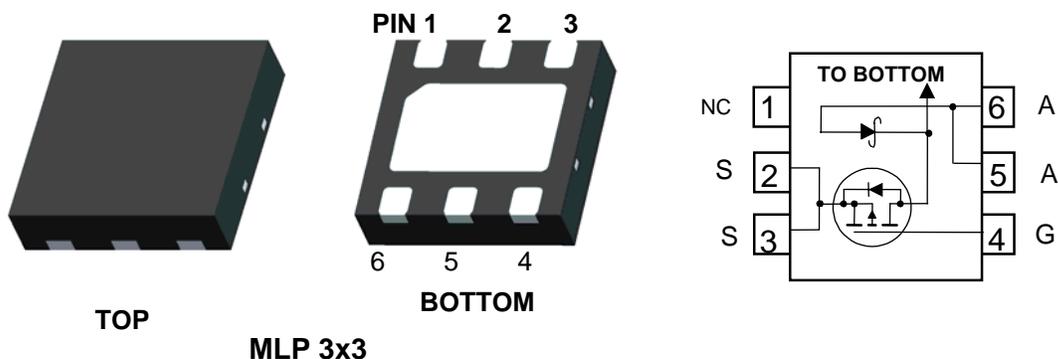
This device is designed specifically as a single package solution for Buck Boost. It features a fast switching, low gate charge MOSFET with very low on-state resistance.

Applications

- Buck Boost

Features

- -2 A, -20 V $R_{DS(ON)} = 125 \text{ m}\Omega @ V_{GS} = -4.5 \text{ V}$
 $R_{DS(ON)} = 200 \text{ m}\Omega @ V_{GS} = -2.5 \text{ V}$
- Low Profile – 0.8mm maximum – in the new package MicroFET 3x3 mm



Absolute Maximum Ratings

$T_A=25^\circ\text{C}$ 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)	-3.5	A
		-10	
V_{RRM}	Schottky Repetitive Peak Reverse Voltage	20	V
I_O	Schottky Average Forward Current (Note a)	2	A
P_D	Power Dissipation (Steady State) (Note 1a)	2.4	W
		1.2 (Note 1b)	
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)	60	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
2P120	FDFMC2P120	7"	12mm	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	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C		-11		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
I_{GSS}	Gate-Body Leakage,	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_G, I_D = -250\ \mu\text{A}$	-0.6	-1.0	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C		3		mV/ $^\circ\text{C}$
$R_{D(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -4.5\text{ V}, I_D = -2\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -2\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -2\text{ A}, T_J = 125^\circ\text{C}$		101 145 136	125 200 180	m Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = -2.5\text{ V}, V_{DS} = -5\text{ V}$	-10			A
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}, I_D = -3.5\text{ A}$		6		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		280		pF
C_{oss}	Output Capacitance			65		pF
C_{rss}	Reverse Transfer Capacitance			35		pF
R_G	Gate Resistance	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$		7		Ω

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$		8	16	ns
t_r	Turn-On Rise Time			12	22	ns
$t_{d(off)}$	Turn-Off Delay Time			11	20	ns
t_f	Turn-Off Fall Time			3.2	6.4	ns
Q_g	Total Gate Charge	$V_{DS} = -10\text{ V}, I_D = -3.5\text{ A},$ $V_{GS} = -4.5\text{ V}$		3	4	nC
Q_{gs}	Gate-Source Charge			0.7		nC
Q_{gd}	Gate-Drain Charge			1		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current				-2	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -2\text{ A}$ (Note 2)		-0.9	-1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = -3.5\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$		13		nS
Q_{rr}	Diode Reverse Recovery Charge			3		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. $R_{\theta JC}$ are guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

- (a). $R_{\theta JA} = 60^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper
 (b). $R_{\theta JA} = 145^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

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

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Schottky Diode Characteristic						
V_R	Reverse Voltage	$I_R = 1\text{mA}$	20			V
I_R	Reverse Leakage	$V_R = 5\text{V}$	$T_J = 25^\circ\text{C}$		100	μA
			$T_J = 100^\circ\text{C}$		10	mA
V_F	Forward Voltage	$I_F = 1\text{A}$		0.32	0.39	V

Typical Characteristics

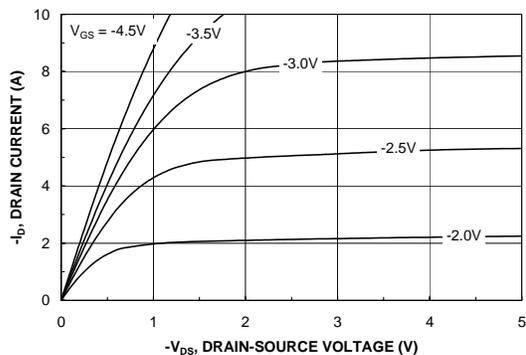


Figure 1. On-Region Characteristics.

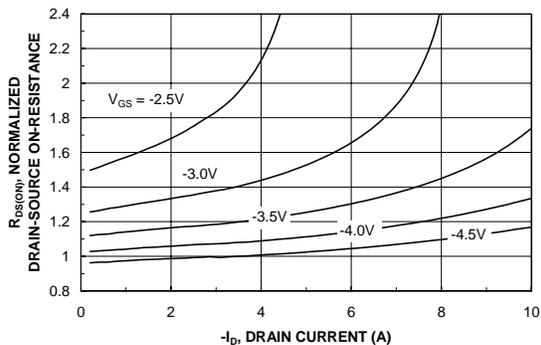


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

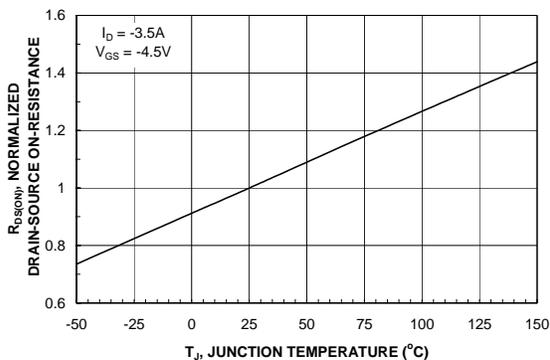


Figure 3. On-Resistance Variation with Temperature.

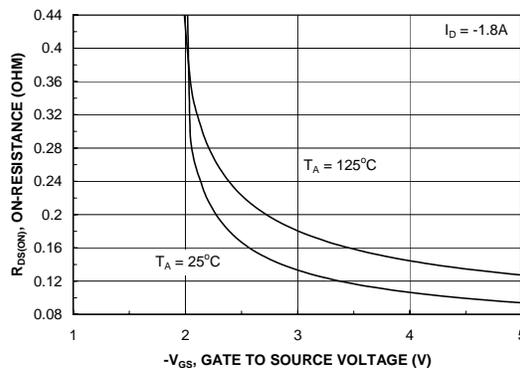


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

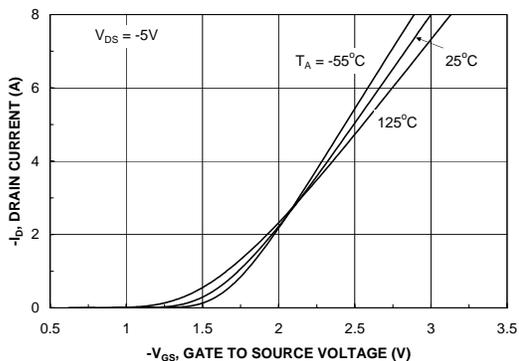


Figure 5. Transfer Characteristics.

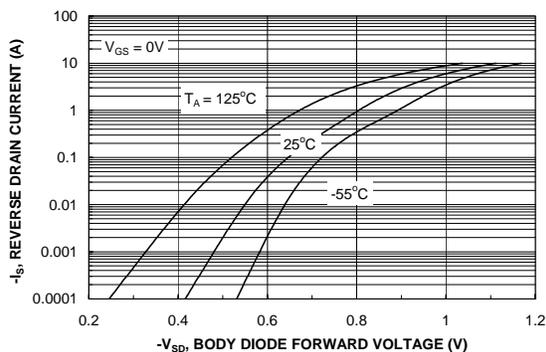


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

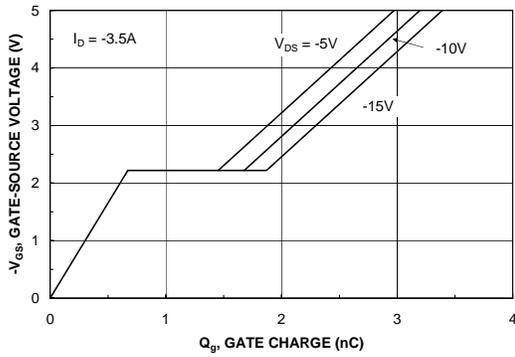


Figure 7. Gate Charge Characteristics.

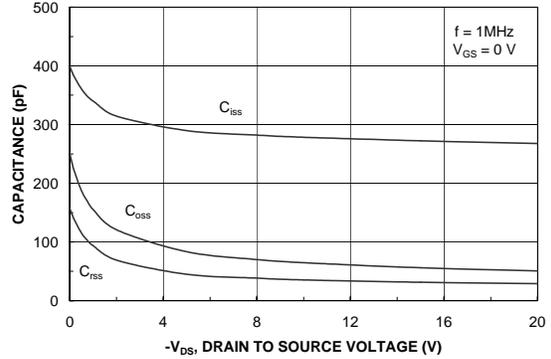


Figure 8. Capacitance Characteristics.

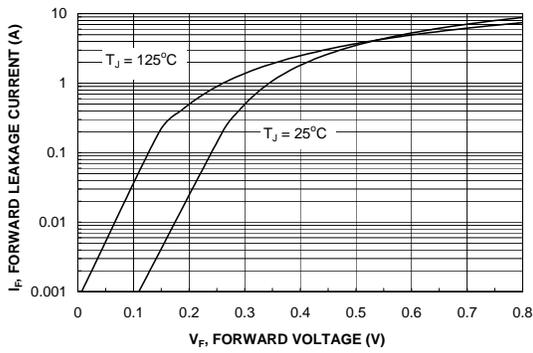


Figure 9. Schottky Diode Forward Voltage.

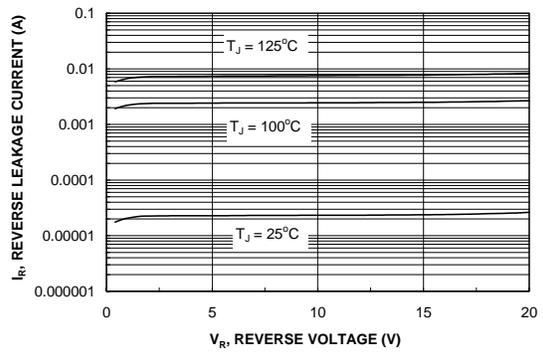


Figure 10. Schottky Diode Reverse Current .

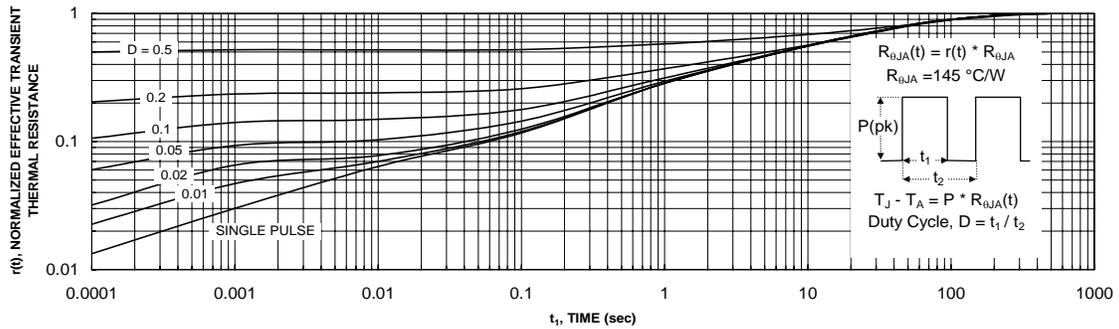
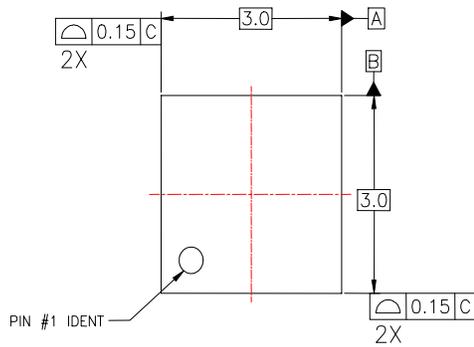
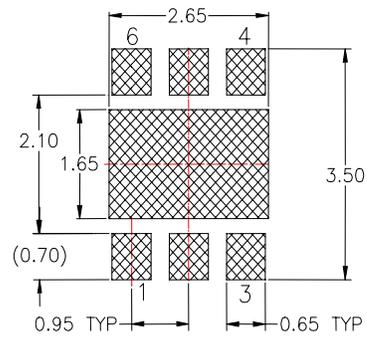


Figure 11. Transient Thermal Response Curve.

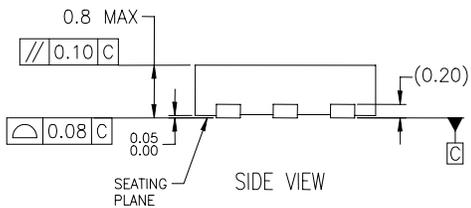
Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.



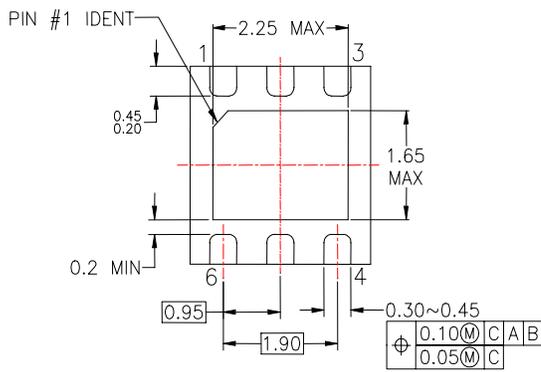
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES :

- A. CONFORMS TO JEDEC REGISTRATION M0-229, VARIATION WEEA, DATE 11/2001.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M 1994

E Y14.5M, 1994

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