December 2005

FDMB506P

P-Channel 1.8V Logic Level PowerTrench® MOSFET

General Description

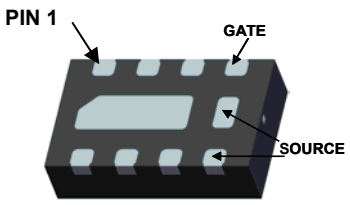
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance. These devices are well suited for portable electronics applications.

Applications

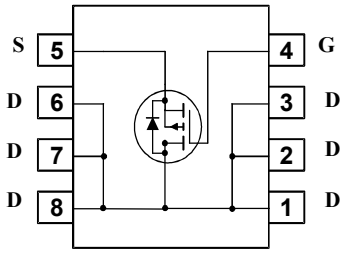
- Load switch
- DC/DC Conversion

Features

- –6.8 A, –20V. $R_{DS(ON)}$ = 30 mΩ @ V_{GS} = –4.5V
  $R_{DS(ON)}$ = 38 mΩ @ V_{GS} = –2.5V
  $R_{DS(ON)}$ = 70 mΩ @ V_{GS} = –1.8V
- Low profile – 0.8 mm maximum
- Fast switching
- RoHS compliant



MicroFET
3x1.9



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		±8	V
I_D	Drain Current – Continuous	(Note 1a)	–6.8	A
	– Pulsed		70	
P_D	Power Dissipation	(Note 1a)	1.9	W
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)	65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	208	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
506	FDMB506P	7''	8mm	3000 units

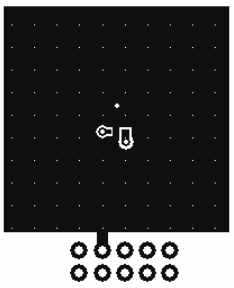
Electrical Characteristics

T_A = 25°C unless otherwise noted

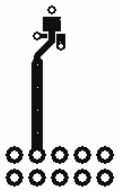
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = –250 μA	–20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 μA, Referenced to 25°C		–13		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –16 V, V_{GS} = 0 V			–1	μA
I_{GSS}	Gate–Body Leakage	V_{GS} = ± 8 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = –250 μA	–0.4	–0.7	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 μA, Referenced to 25°C		3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –4.5 V, I_D = –6.8 A V_{GS} = –2.5 V, I_D = –2.5 A V_{GS} = –1.8 V, I_D = –1.8 A V_{GS}= –4.5 V, I_D = –6.8 A, T_J=125°C		25 30 40 36	30 38 70 44	mΩ
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –6.8 A		26		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –10 V, V_{GS} = 0 V, f = 1.0 MHz		2216	2960	pF
C_{oss}	Output Capacitance			351	470	pF
C_{rss}	Reverse Transfer Capacitance			167	260	pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = –10 V, I_D = –1 A, V_{GS} = –4.5 V, R_{GEN} = 6 Ω		14	25	ns
t_r	Turn–On Rise Time			8	16	ns
$t_{d(off)}$	Turn–Off Delay Time			175	280	ns
t_f	Turn–Off Fall Time			80	128	ns
Q_g	Total Gate Charge	V_{DS} = –10 V, I_D = –6.8 A, V_{GS} = –4.5 V		21	30	nC
Q_{gs}	Gate–Source Charge			3.5		nC
Q_{gd}	Gate–Drain Charge			4.5		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				1.6	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = –0.8 A (Note 2)		–0.6	–1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = –6.8 A, d_{iF}/d_t = 100 A/μs		26	48	nS
Q_{rr}	Diode Reverse Recovery Charge			12	22	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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 65°C/W when mounted on a 1in² pad of 2 oz copper

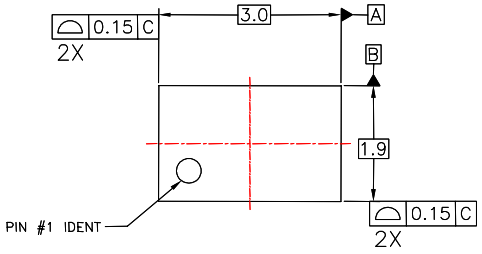


b) 208°C/W when mounted on a minimum pad of 2 oz copper

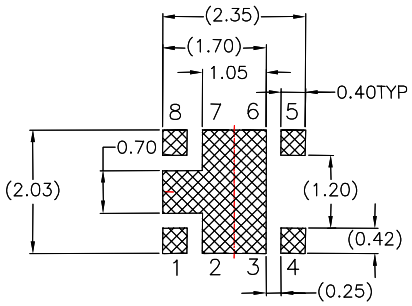
Scale 1 : 1 on letter size paper

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

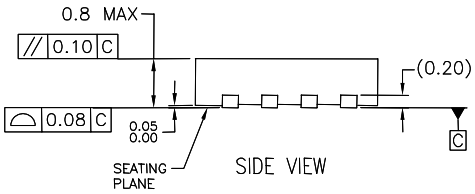
Dimensional Outline and Pad Layout



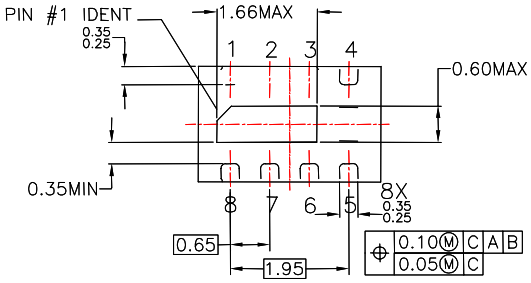
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES:

A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229, DATED 11/2001.

B. DIMENSIONS ARE IN MILLIMETERS.

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

Typical Characteristics

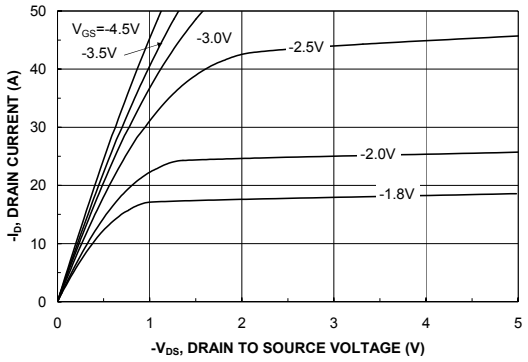


Figure 1. On-Region Characteristics.

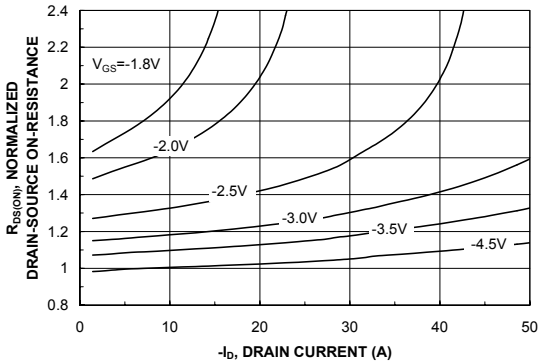


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

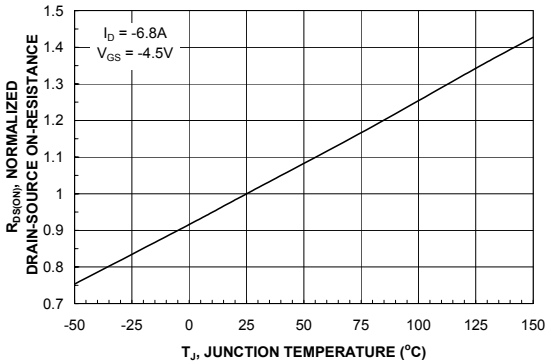


Figure 3. On-Resistance Variation with Temperature.

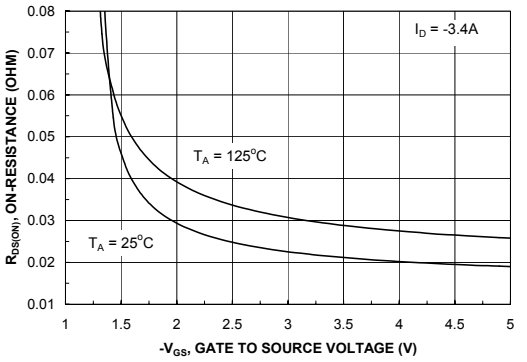


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

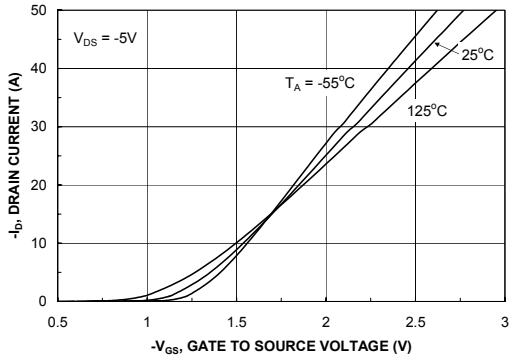


Figure 5. Transfer Characteristics.

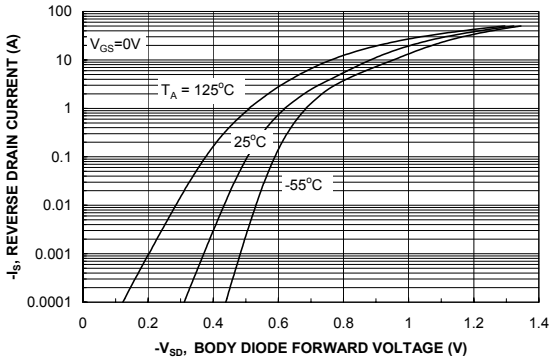


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

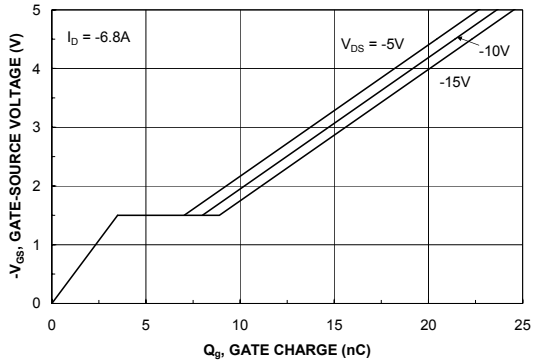


Figure 7. Gate Charge Characteristics.

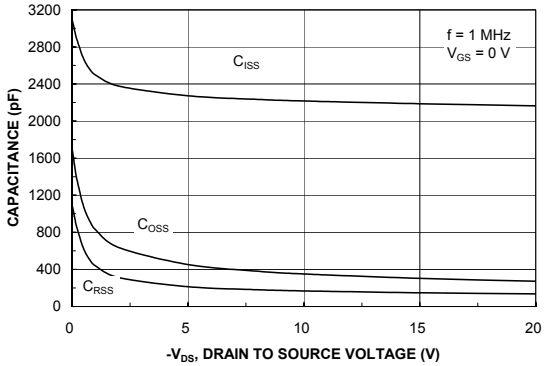


Figure 8. Capacitance Characteristics.

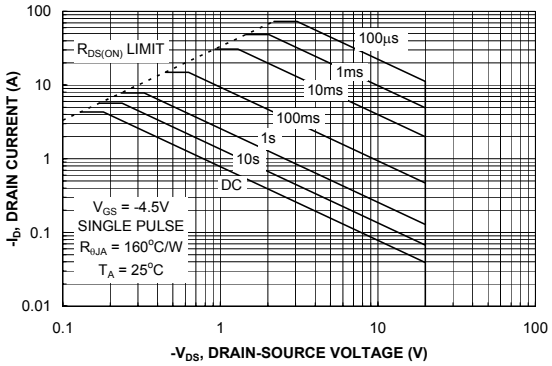


Figure 9. Maximum Safe Operating Area.

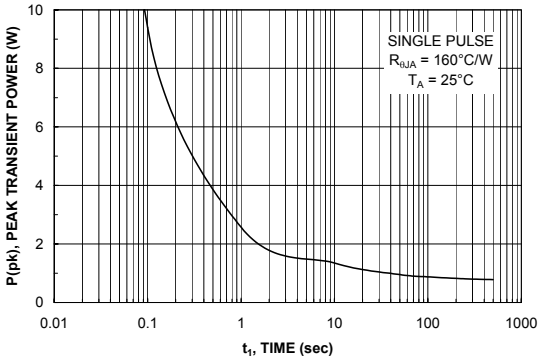


Figure 10. Single Pulse Maximum Power Dissipation.

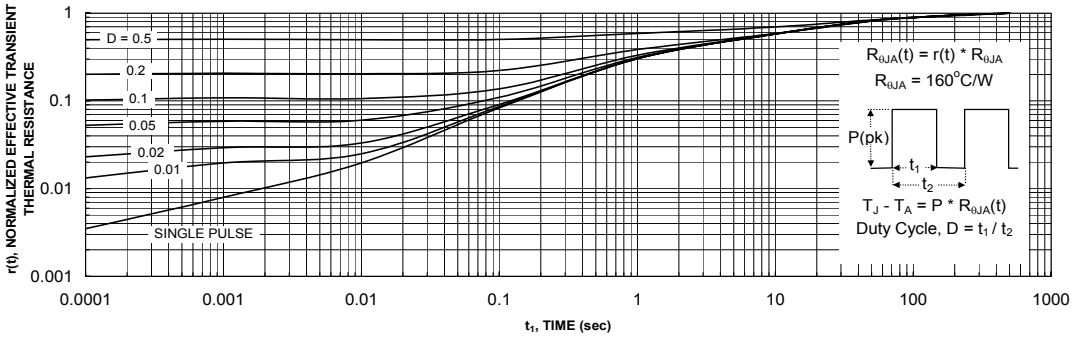


Figure 9. Transient Thermal Response Curve.

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

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EcoSPARK™	I^2C™	MSXPro™	RapidConfigure™	TINYOPTO™
E^2CMOS™	*i-Lo*™	OCX™	RapidConnect™	TruTranslation™
EnSigna™	ImpliedDisconnect™	OCXPro™	µSerDes™	UHC™
FACT™	IntelliMAX™	OPTOLOGIC®	ScalarPump™	UniFET™
FACT Quiet Series™		OPTOPLANAR™	SILENT SWITCHER®	UltraFET®
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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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