

## FDM606P

### P-Channel 1.8V Logic Level Power Trench® MOSFET

#### General Description

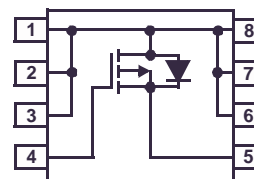
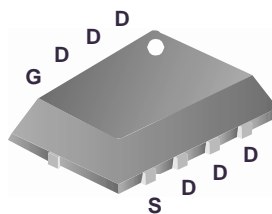
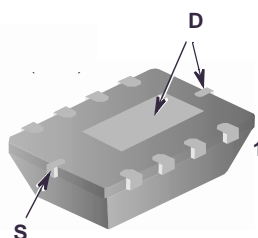
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance. These devices are well suited for portable electronics applications.

#### Features

- Fast switching
- $r_{DS(ON)} = 0.026\Omega$  (Typ),  $V_{GS} = -4.5V$
- $r_{DS(ON)} = 0.033\Omega$  (Typ),  $V_{GS} = -2.5V$
- $r_{DS(ON)} = 0.052\Omega$  (Typ),  $V_{GS} = -1.8V$

#### Applications

- Load switch
- Battery charge
- Battery disconnect circuits



**MicroFET 3x2-8**

#### MOSFET Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	-20	V
$V_{GS}$	Gate to Source Voltage	$\pm 8$	V
$I_D$	Drain Current		
	Continuous ( $T_C = 25^\circ\text{C}$ , $V_{GS} = -4.5V$ )	-6.8	A
	Continuous ( $T_C = 100^\circ\text{C}$ , $V_{GS} = -2.5V$ )	-3.8	A
	Continuous ( $T_C = 100^\circ\text{C}$ , $V_{GS} = -1.8V$ )	-3.0	A
	Pulsed	Figure 4	
$P_D$	Power dissipation	1.92	W
	Derate above $25^\circ\text{C}$	15.4	mW/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to 150	$^\circ\text{C}$

#### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case (Note 1)	6.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 2)	65	$^\circ\text{C/W}$

#### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.06P	FDM606P	MicroFET3x2	178 mm	8 mm	3000

**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**

$B_{VDSS}$	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$	-20	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{V}$ $V_{GS} = 0\text{V}$ $T_A = 100^\circ\text{C}$	-	-	-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(TH)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$	-0.4	-0.9	-1.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	$I_D = -6.8\text{A}$ , $V_{GS} = -4.5\text{V}$	-	0.026	0.030	$\Omega$
		$I_D = -3.8\text{A}$ , $V_{GS} = -2.5\text{V}$	-	0.033	0.038	
		$I_D = -3.0\text{A}$ , $V_{GS} = -1.8\text{V}$	-	0.052	0.070	

**Dynamic Characteristics**

$C_{ISS}$	Input Capacitance	$V_{DS} = -10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	2200	-	pF	
$C_{OSS}$	Output Capacitance		-	350	-	pF	
$C_{RSS}$	Reverse Transfer Capacitance		-	160	-	pF	
$Q_{g(TOT)}$	Total Gate Charge at -4.5V	$V_{GS} = 0\text{V}$ to -4.5V	$V_{DD} = -10\text{V}$ $I_D = -3.0\text{A}$ $I_g = 1.0\text{mA}$	-	20	30	nC
$Q_{g(-2.5)}$	Total Gate Charge at -2.5V	$V_{GS} = 0\text{V}$ to -2.5V		-	12	18	nC
$Q_{gs}$	Gate to Source Gate Charge			-	3.0	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	3.8	-	nC

**Switching Characteristics** ( $V_{GS} = -4.5\text{V}$ )

$t_{ON}$	Turn-On Time	$V_{DD} = -10\text{V}$ , $I_D = -3.0\text{A}$ $V_{GS} = -4.5\text{V}$ , $R_{GS} = 6.8\Omega$	-	-	81	ns
$t_{d(ON)}$	Turn-On Delay Time		-	9	-	ns
$t_r$	Rise Time		-	46	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	134	-	ns
$t_f$	Fall Time		-	71	-	ns
$t_{OFF}$	Turn-Off Time		-	-	308	ns

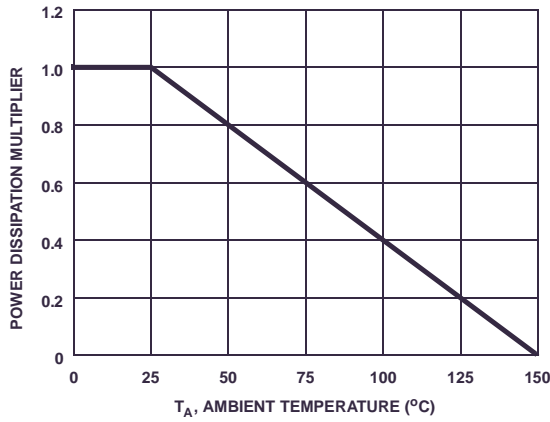
**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = -6.8\text{A}$	-	-0.9	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = -3.0\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	28	ns
$Q_{RR}$	Reverse Recovered Charge	$I_{SD} = -3.0\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	20	nC

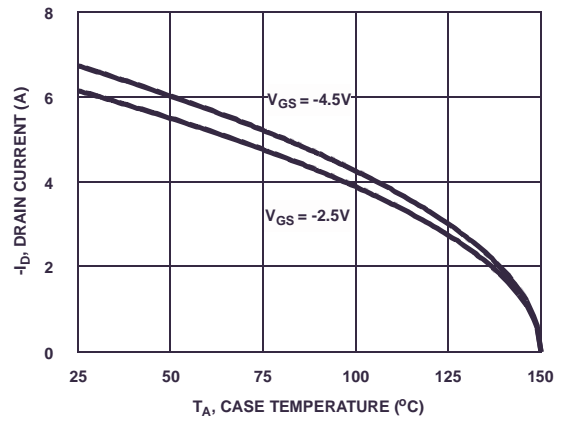
**Notes:**

- $R_{\theta JA}$  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 center drain pad.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by user's board design.
- $R_{\theta JA}$  is  $65^\circ\text{C}/\text{W}$  (steady state) when mounted on a  $1\text{ inch}^2$  copper pad on FR-4.

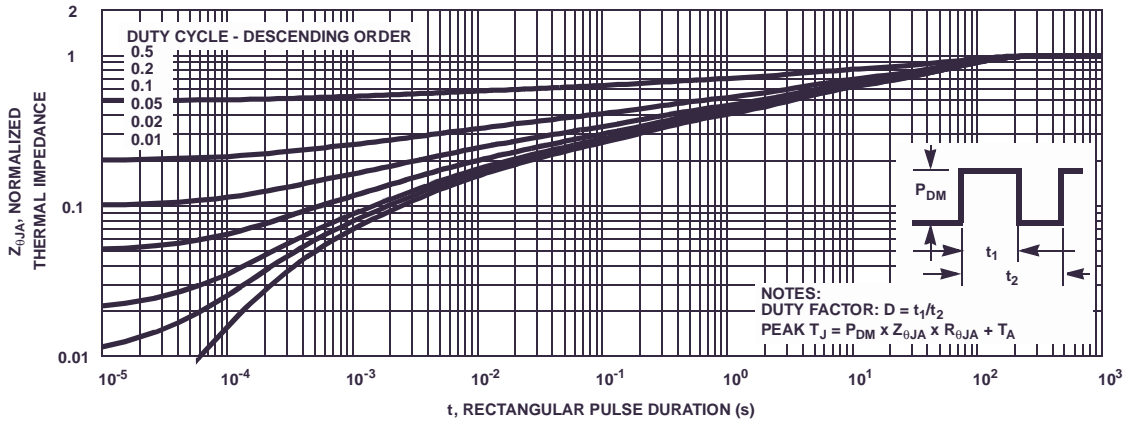
**Typical Characteristic**  $T_A = 25^\circ\text{C}$  unless otherwise noted



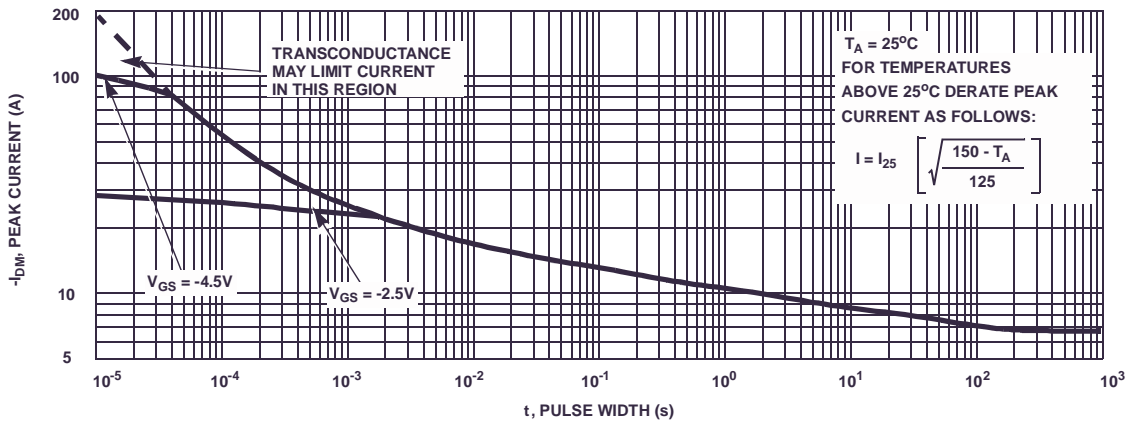
**Figure 1. Normalized Power Dissipation vs Ambient Temperature**



**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

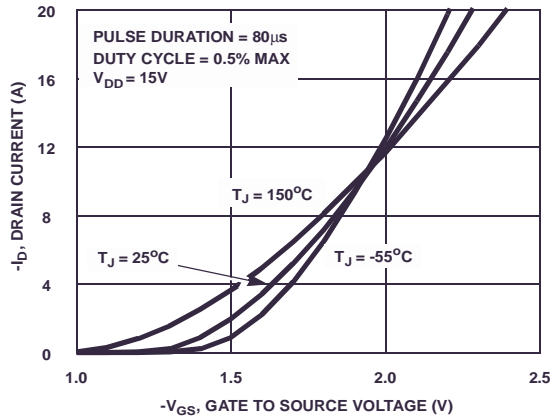


**Figure 3. Normalized Maximum Transient Thermal Impedance**

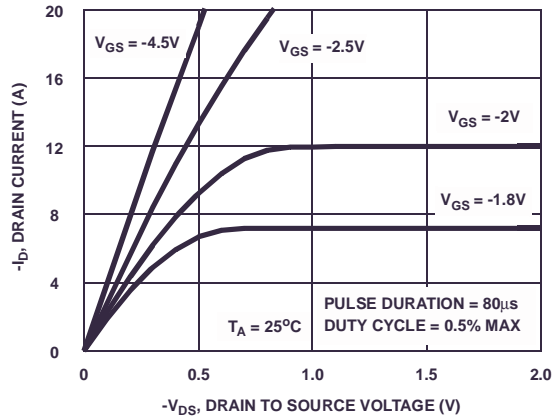


**Figure 4. Peak Current Capability**

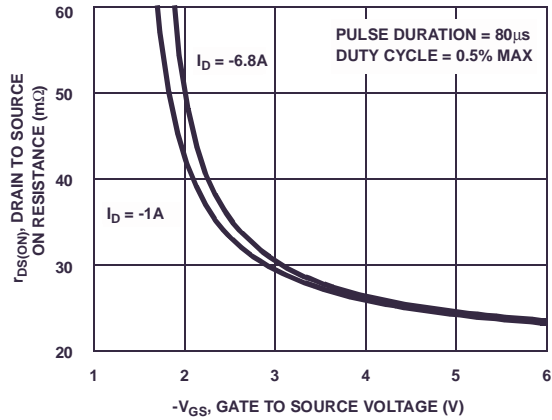
**Typical Characteristic** (Continued)  $T_A = 25^\circ\text{C}$  unless otherwise noted



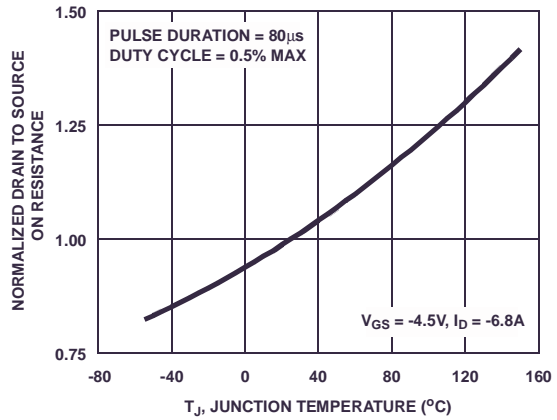
**Figure 5. Transfer Characteristics**



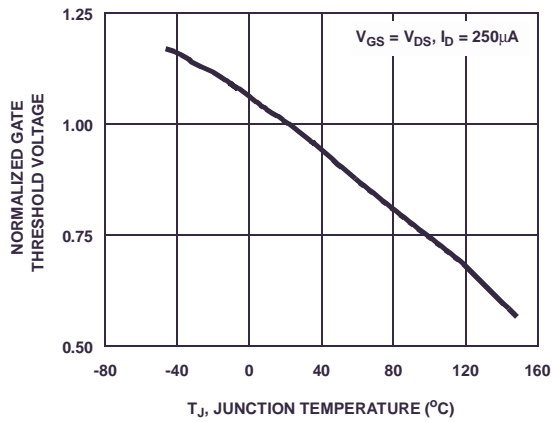
**Figure 6. Saturation Characteristics**



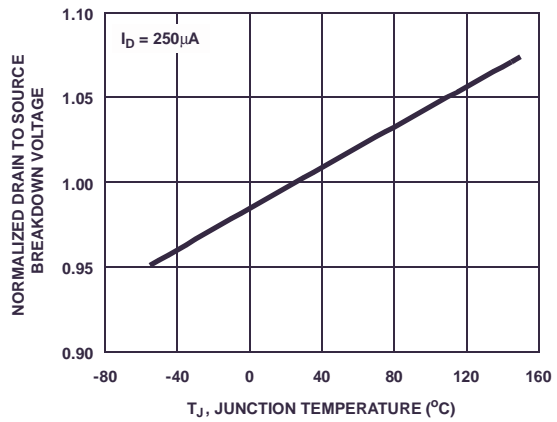
**Figure 7. Drain to Source On Resistance vs Gate Voltage and Drain Current**



**Figure 8. Normalized Drain to Source On Resistance vs Junction Temperature**

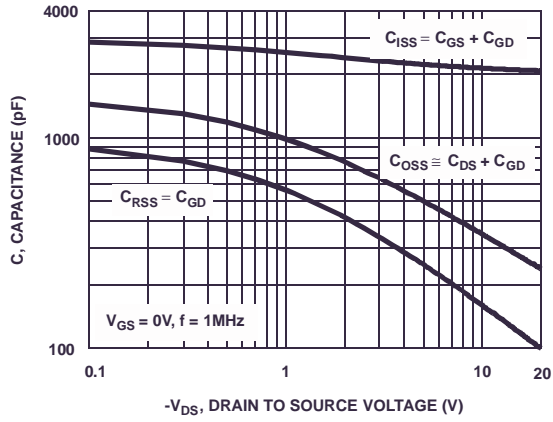


**Figure 9. Normalized Gate Threshold Voltage vs Junction Temperature**

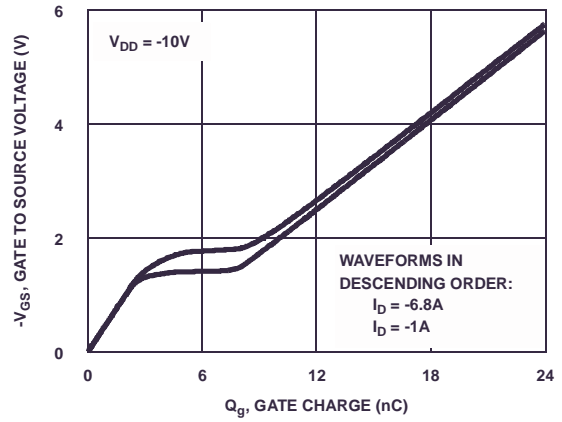


**Figure 10. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

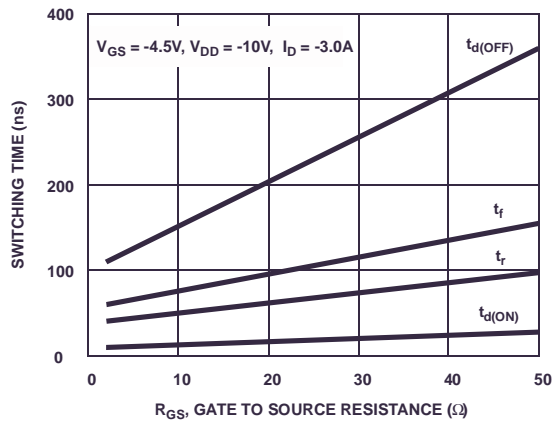
**Typical Characteristic** (Continued)  $T_A = 25^\circ\text{C}$  unless otherwise noted



**Figure 11. Capacitance vs Drain to Source Voltage**



**Figure 12. Gate Charge Waveforms for Constant Gate Currents**



**Figure 13. Switching Time vs Gate Resistance**

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