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September 2016

FDV045P20L

P-Channel PowerTrench® MOSFET

-20 V, -1.15 A, 108 mΩ

Features

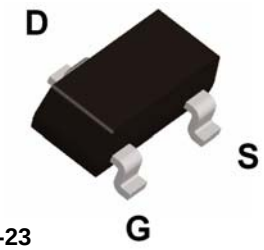
- Max $r_{DS(on)}$ = 108 mΩ at V_{GS} = -4.5 V, I_D = -1.15 A
- Max $r_{DS(on)}$ = 121 mΩ at V_{GS} = -2.5 V, I_D = -0.7 A
- Very low $r_{DS(on)}$ Mid Voltage P-channel Silicon Technology Optimised for Low Qg
- This product is optimised for fast switching applications as well as load switch applications
- 100% UIL Tested
- RoHS Compliant

General Description

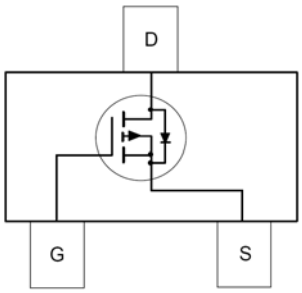
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been optimized for the on-state resistance and yet maintain superior switching performance.

Applications

- Active Clamp Switch
- Load Switch



SOT-23



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		-20	V
V_{GS}	Gate to Source Voltage		±8	V
I_D	-Continuous	(Note 1a)	-1.15	A
	-Pulsed	(Note 4)	-33	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	13	mJ
P_D	Power Dissipation	(Note 1a)	1.6	W
	Power Dissipation	(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)	80	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	180	

Package Marking and Ordering Information

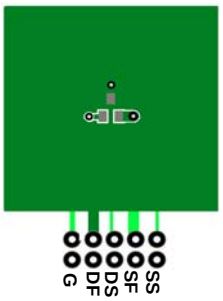
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDV045P20L	FDV045P20L	SOT-23	7 ”	8 mm	3000 units

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Electrical Characteristics T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = -250 μA, V_{GS} = 0 V	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		-18		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250 μA	-0.5	-0.9	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		3		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -4.5 V, I_D = -1.15 A		86	108	mΩ
		V_{GS} = -2.5 V, I_D = -0.7 A		97	121	
		V_{GS} = -1.8 V, I_D = -0.5 A		121	160	
		V_{GS} = -4.5 V, I_D = -1.15A, T_J = 125 °C		110	138	
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -1.15 A		3		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz		812	1220	pF
C_{oss}	Output Capacitance			119	167	pF
C_{rss}	Reverse Transfer Capacitance			108	151	pF
R_g	Gate Resistance			20		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10 V, I_D = -1.15 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		8.4	17	ns
t_r	Rise Time			6.5	13	ns
$t_{d(off)}$	Turn-Off Delay Time			76	122	ns
t_f	Fall Time			26	42	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to -4.5 V; V_{DD} = -10 V, I_D = -1.15A		7.2	10	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to -2.5 V; V_{DD} = -10 V, I_D = -1.15A		4.4	6.2	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = -10 V, I_D = -1.15A		1.2		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = -10 V, I_D = -1.15A		1.8		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = -1.15 A (Note 2)		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	I_F = -1.15 A, di/dt = 100 A/μs		11	20	ns
Q_{rr}	Reverse Recovery Charge			2	10	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) 80 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 180 °C/W when mounted on a minimum pad.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Starting T_J = 25 °C; P-ch: L = 3 mH, I_{AS} = -3 A, V_{DD} = -20 V, V_{GS} = -6.4 V.
4. Pulsed Id refer to Fig 10 SOA curve for more details.

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Typical Characteristics T_J = 25 °C unless otherwise noted.

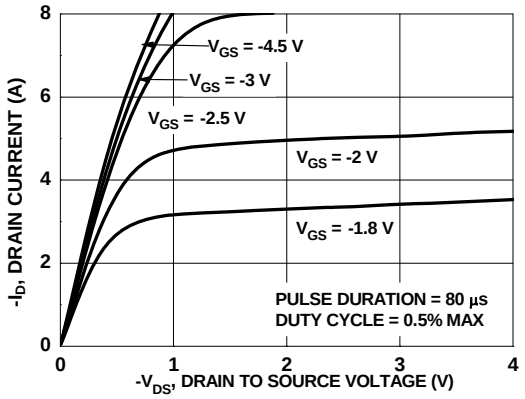


Figure 1. On Region Characteristics

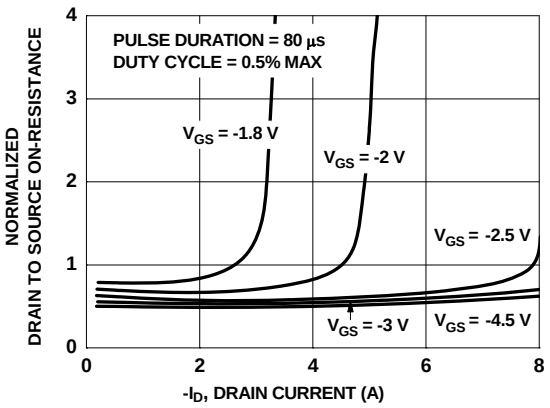


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

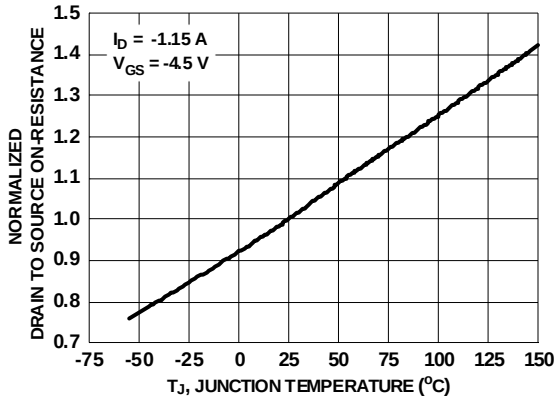


Figure 3. Normalized On Resistance vs. Junction Temperature

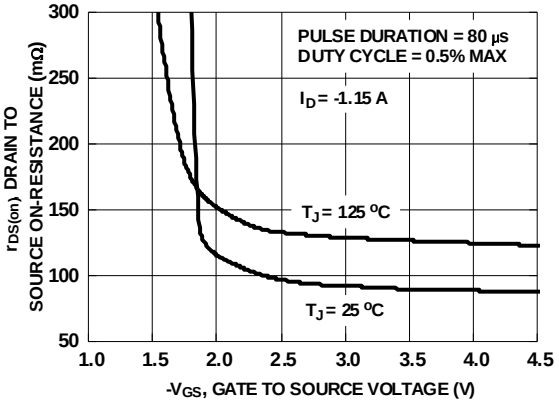


Figure 4. On-Resistance vs. Gate to Source Voltage

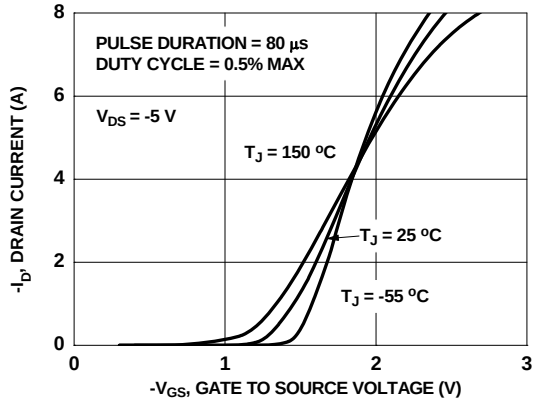


Figure 5. Transfer Characteristics

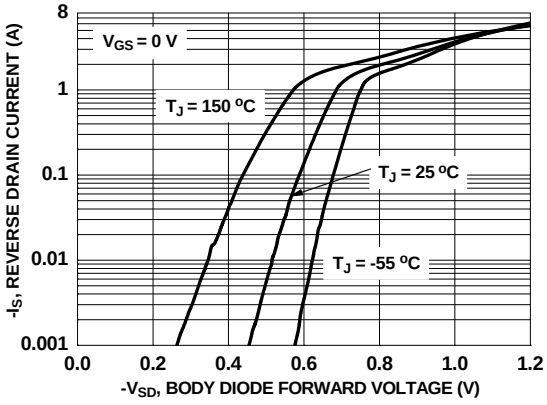


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

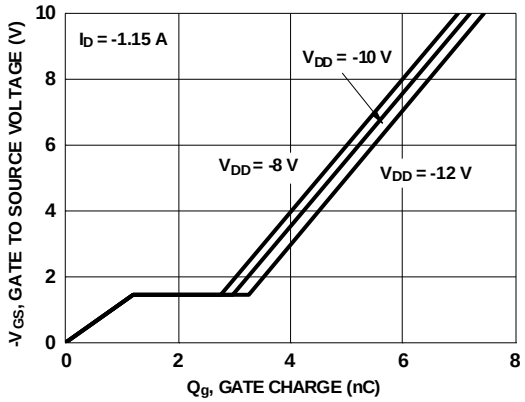


Figure 7. Gate Charge Characteristics

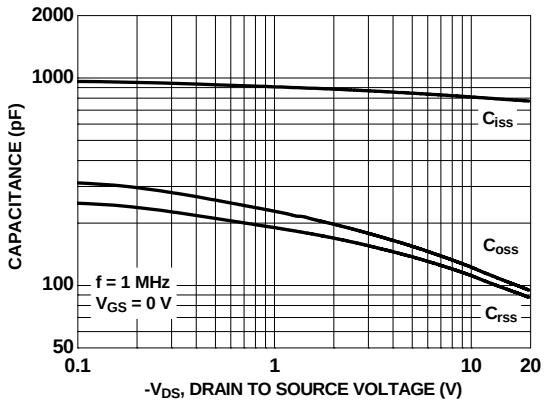


Figure 8. Capacitance vs. Drain to Source Voltage

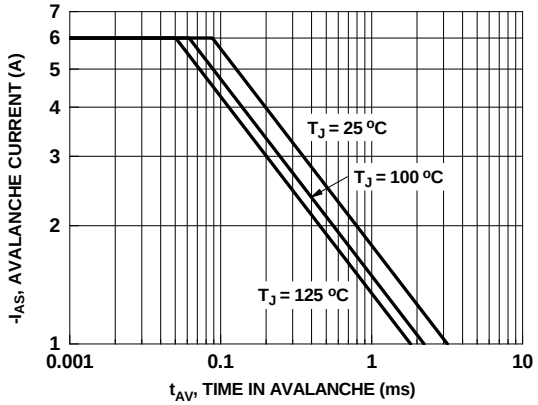


Figure 9. Unclamped Inductive Switching Capability

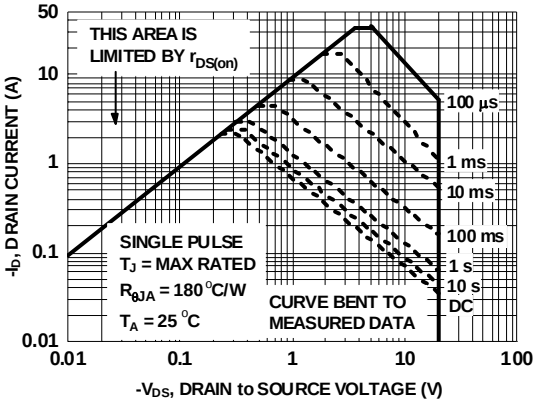


Figure 10. Forward Bias Safe Operating Area

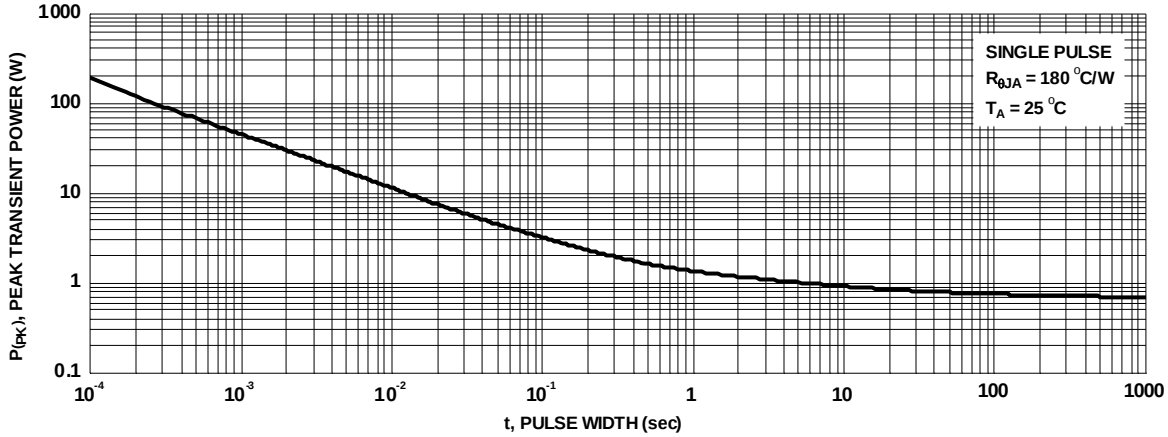


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

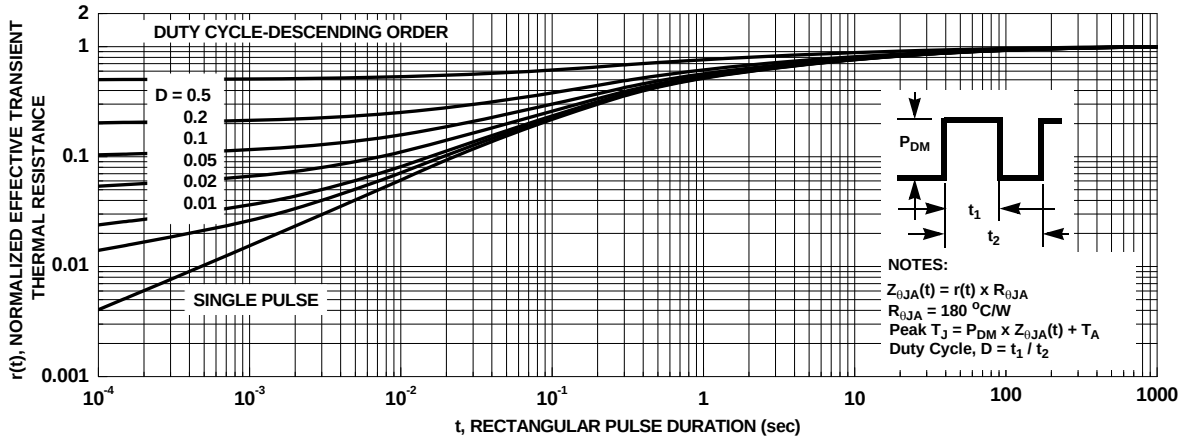


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

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