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April 2014

FDY102PZ

Single P-Channel (–1.5 V) Specified PowerTrench® MOSFET

–20 V, –0.83 A, 0.5 Ω

Features

- Max $r_{DS(on)}$ = 0.5 Ω at $V_{GS} = -4.5$ V, $I_D = -0.83$ A
- Max $r_{DS(on)}$ = 0.7 Ω at $V_{GS} = -2.5$ V, $I_D = -0.70$ A
- Max $r_{DS(on)}$ = 1.2 Ω at $V_{GS} = -1.8$ V, $I_D = -0.43$ A
- Max $r_{DS(on)}$ = 1.8 Ω at $V_{GS} = -1.5$ V, $I_D = -0.36$ A
- HBM ESD protection level = 1400 V (Note 3)
- RoHS Compliant

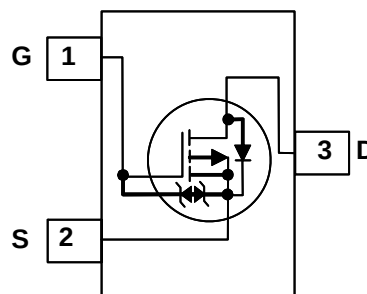
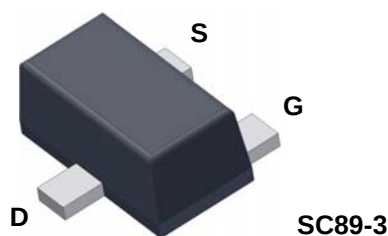


General Description

This Single P-Channel MOSFET has been designed using Fairchild Semiconductor's advanced Power Trench process to optimize the $r_{DS(on)}$ at $V_{GS} = -1.5$ V.

Application

- Li-Ion Battery Pack



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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	Drain Current –Continuous (Note 1a)	–0.83	A
	–Pulsed	–1.0	
P_D	Power Dissipation (Note 1a)	0.625	W
	Power Dissipation (Note 1b)	0.446	
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)	200	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	280	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
E	FDY102PZ	SC89-3	7"	8 mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		-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 to Source Leakage Current	$V_{GS} = \pm 8\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 5\text{ V}$, $V_{DS} = 0\text{ V}$			± 0.5	μA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-0.4	-0.7	-1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		3		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On-Resistance	$V_{GS} = -4.5\text{ V}$, $I_D = -0.83\text{ A}$		0.28	0.5	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -0.70\text{ A}$		0.36	0.7	
		$V_{GS} = -1.8\text{ V}$, $I_D = -0.43\text{ A}$		0.47	1.2	
		$V_{GS} = -1.5\text{ V}$, $I_D = -0.36\text{ A}$		0.62	1.8	
		$V_{GS} = -4.5\text{ V}$, $I_D = -0.83\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		0.39	0.85	
g_{FS}	Forward Transconductance	$V_{DD} = -5\text{ V}$, $I_D = -0.83\text{ A}$		2		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		100	135	pF
C_{oss}	Output Capacitance			23	35	pF
C_{rss}	Reverse Transfer Capacitance			18	30	pF

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}$, $I_D = -0.83\text{ A}$ $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		3.5	10	ns
t_r	Rise Time			2.9	10	ns
$t_{d(off)}$	Turn-Off Delay Time			23	37	ns
t_f	Fall Time			13	23	ns
Q_g	Total Gate Charge	$V_{DD} = -10\text{ V}$, $I_D = -0.83\text{ A}$ $V_{GS} = -4.5\text{ V}$		2.2	3.1	nC
Q_{gs}	Gate to Source Charge			0.3		nC
Q_{gd}	Gate to Drain "Miller" Charge			0.6		nC

Drain-Source Diode Characteristics and Maximum Rating

I _S	Maximum Continuous Drain-Source Diode Forward Current				-0.52	A
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0 V, I _S = -0.52 A (Note 2)		-1.0	-1.2	V
t _{rr}	Reverse Recovery Time	I _F = -0.83 A, dI _F /dt = 100 A/μs		18	31	ns
Q _{rr}	Reverse Recovery Charge			3.8	10	nC

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) 200 $^{\circ}\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b) 280 $^{\circ}\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

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

3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

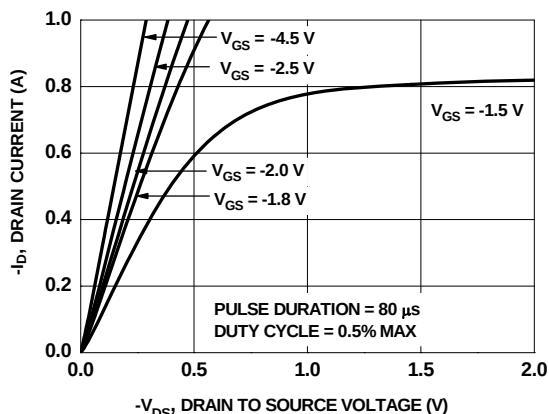


Figure 1. On Region Characteristics

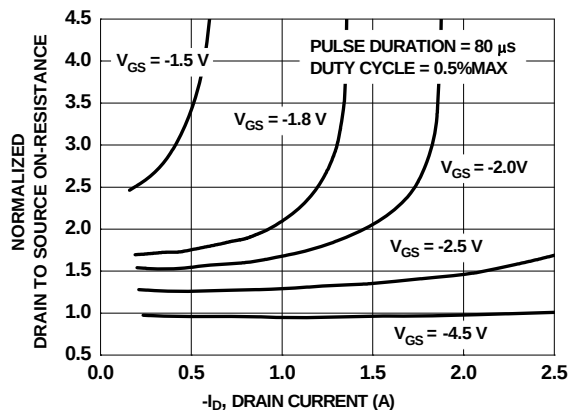


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

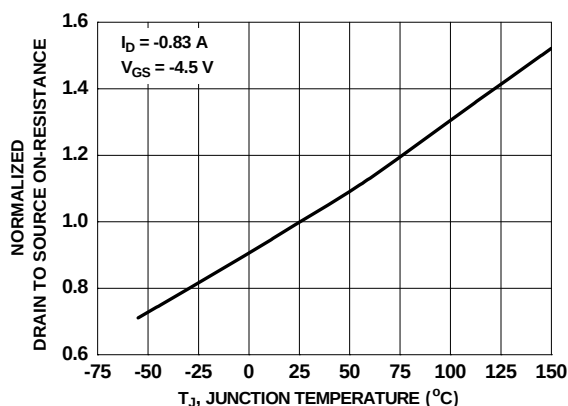


Figure 3. Normalized On Resistance vs Junction Temperature

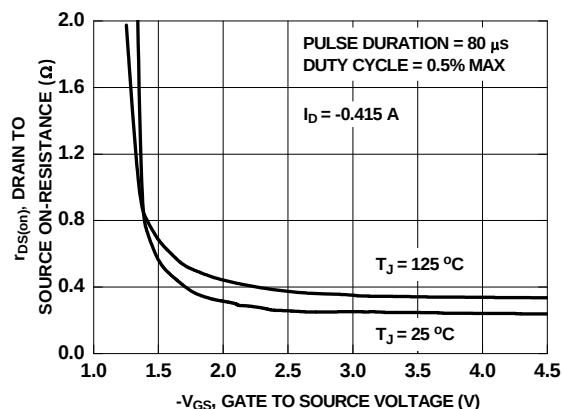


Figure 4. On-Resistance vs Gate to Source Voltage

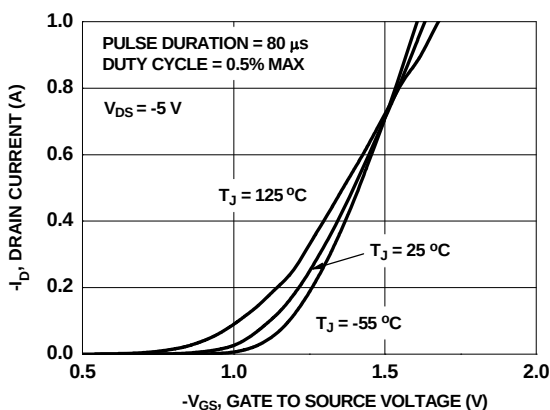


Figure 5. Transfer Characteristics

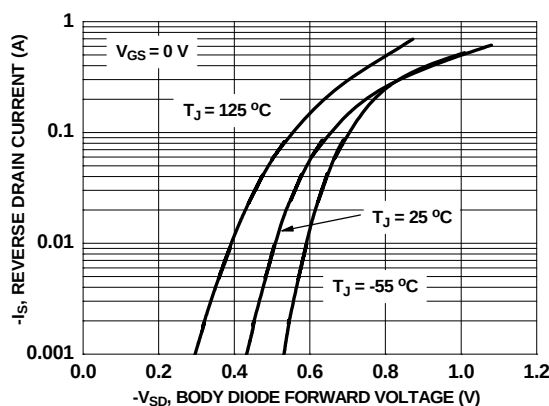


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

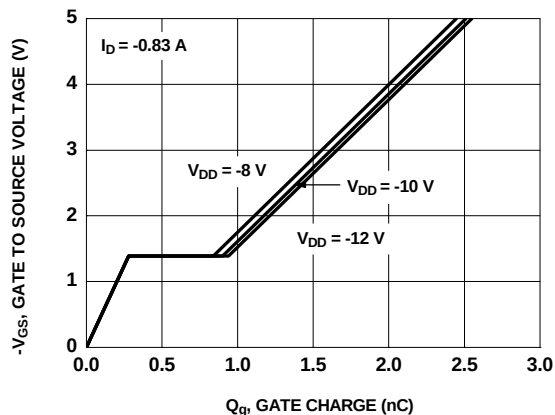


Figure 7. Gate Charge Characteristics

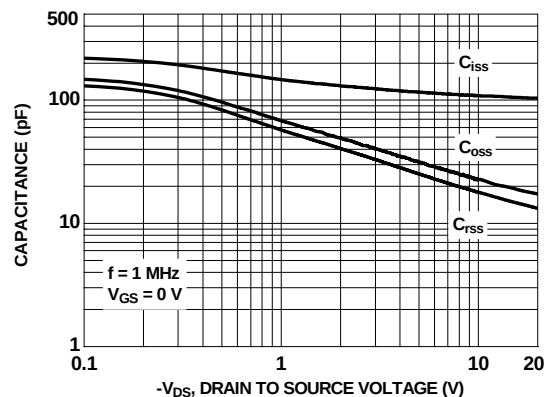


Figure 8. Capacitance vs Drain to Source Voltage

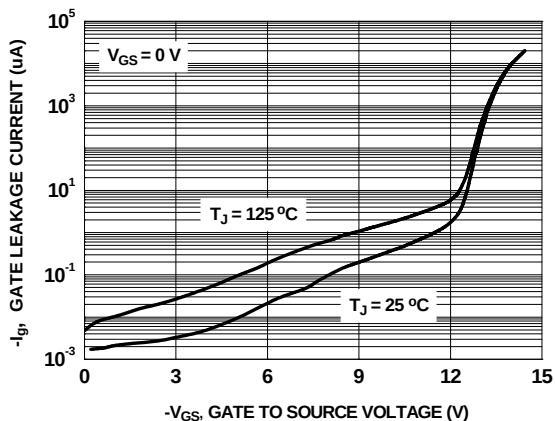


Figure 9. Gate Leakage Current vs Gate to Source Voltage

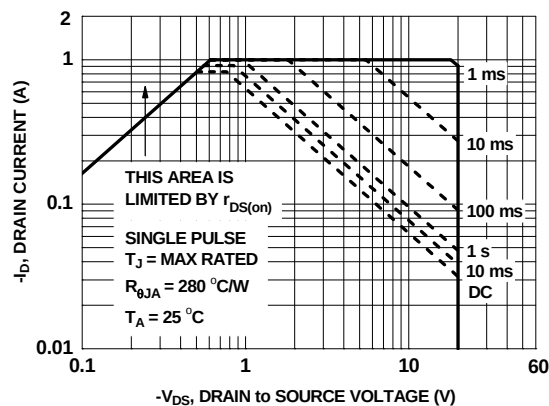


Figure 10. Forward Bias Safe Operating Area

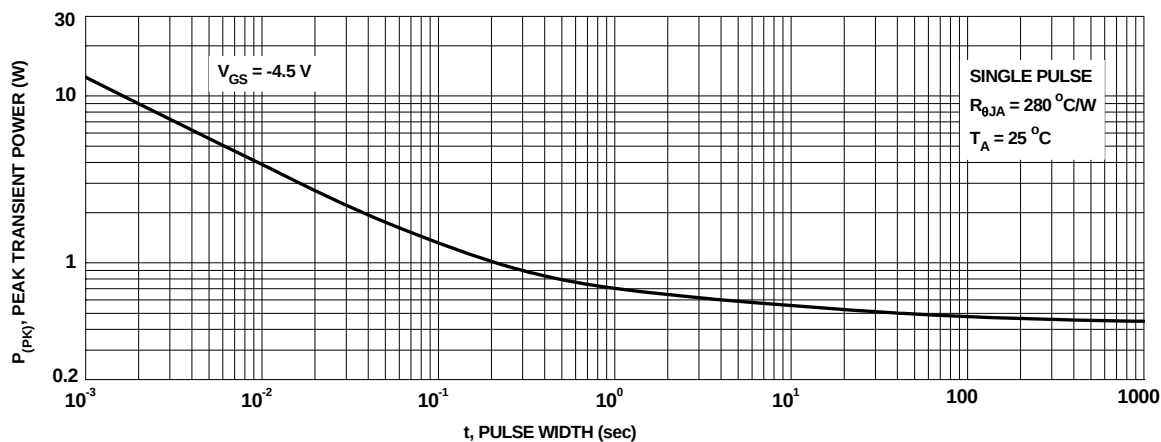
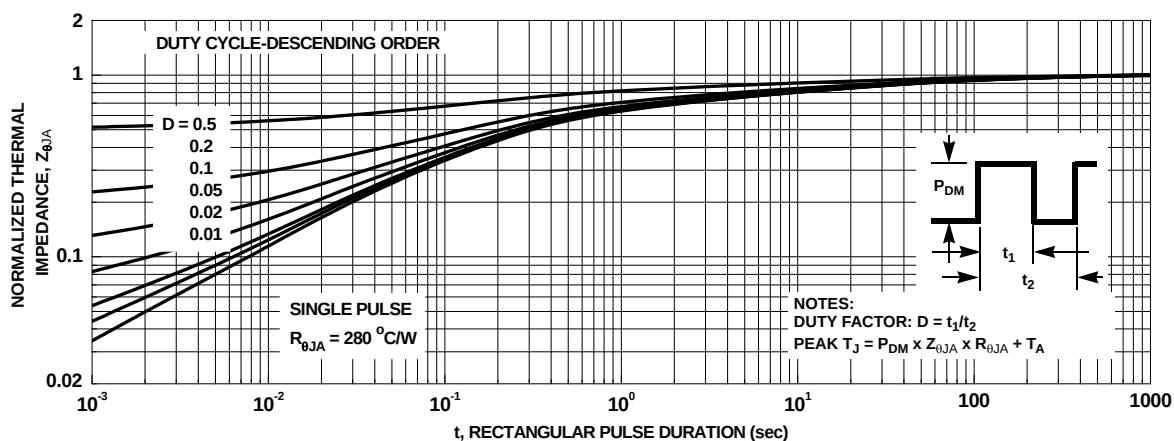
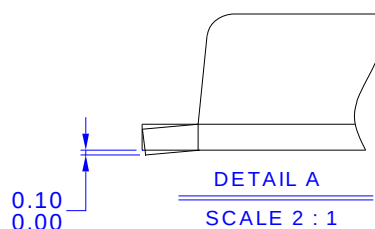
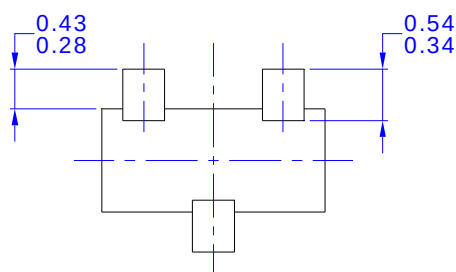
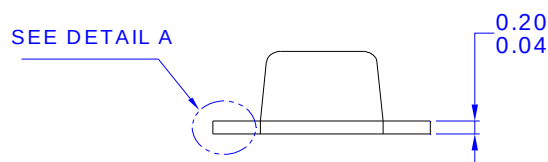
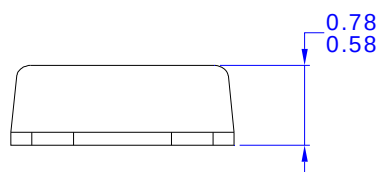
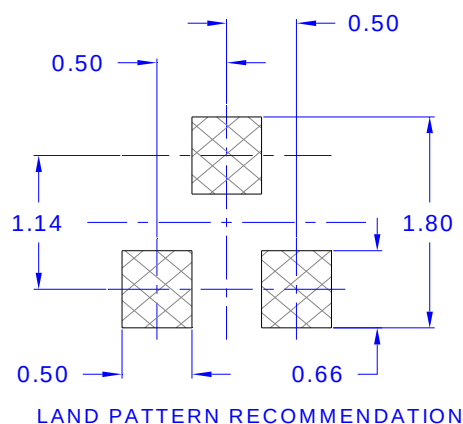
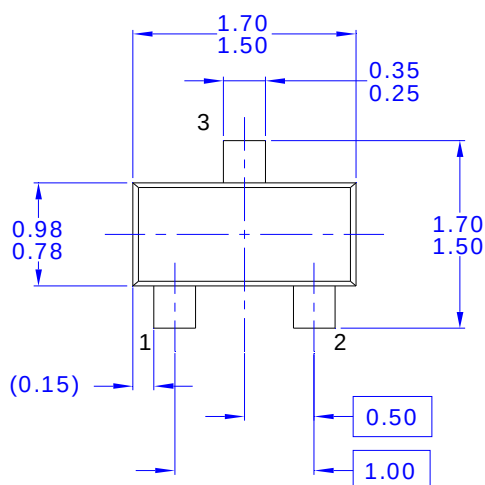


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted



Dimensional Outline and Pad Layout



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