

FDG332PZ

P-Channel PowerTrench® MOSFET

-20V, -2.6A, 97mΩ

Features

- Max $r_{DS(on)}$ = 95mΩ at $V_{GS} = -4.5V$, $I_D = -2.6A$
- Max $r_{DS(on)}$ = 115mΩ at $V_{GS} = -2.5V$, $I_D = -2.2A$
- Max $r_{DS(on)}$ = 160mΩ at $V_{GS} = -1.8V$, $I_D = -1.9A$
- Max $r_{DS(on)}$ = 330mΩ at $V_{GS} = -1.5V$, $I_D = -1.0A$
- Very low level gate drive requirements allowing operation in 1.5V circuits
- Very small package outline SC70-6
- RoHS Compliant

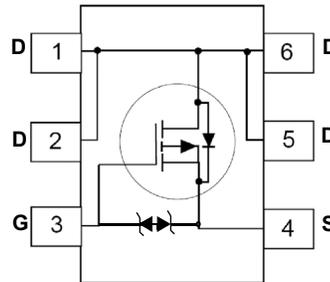
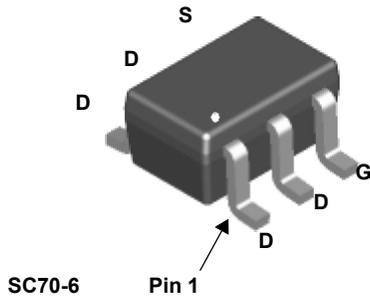


General Description

This P-Channel MOSFET uses Fairchild's advanced low voltage PowerTrench® process. It has been optimized for battery power management applications.

Applications

- Battery management
- Load switch



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

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	± 8	V
I_D	Drain Current -Continuous	-2.6	A
	-Pulsed	-9	
P_D	Power Dissipation (Note 1a)	0.75	W
	Power Dissipation (Note 1b)	0.48	
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 Single operation (Note 1a)	170	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Single operation (Note 1b)	260	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.32	FDG332PZ	SC70-6	7"	8 mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		-13		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

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-0.4	-0.7	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		2.5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5\text{V}, I_D = -2.6\text{A}$		73	95	m Ω
		$V_{GS} = -2.5\text{V}, I_D = -2.2\text{A}$		90	115	
		$V_{GS} = -1.8\text{V}, I_D = -1.9\text{A}$		117	160	
		$V_{GS} = -1.5\text{V}, I_D = -1.0\text{A}$		147	330	
		$V_{GS} = -4.5\text{V}, I_D = -2.6\text{A}, T_J = 125^\circ\text{C}$		100	133	
g_{FS}	Forward Transconductance	$V_{DD} = -5\text{V}, I_D = -2.6\text{A}$		9		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		420	560	pF
C_{oss}	Output Capacitance			85	115	pF
C_{rss}	Reverse Transfer Capacitance			75	115	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}, I_D = -2.6\text{A}, V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$		5.2	10	ns
t_r	Rise Time			4.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			59	95	ns
t_f	Fall Time			28	45	ns
Q_g	Total Gate Charge			7.6	10.8	nC
Q_{gs}	Gate to Source Charge	$V_{GS} = -4.5\text{V}, V_{DD} = -10\text{V}, I_D = -2.6\text{A}$		0.9		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.9		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current			-0.6	A	
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -0.6\text{A}$ (Note 2)		-0.7	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 2.6\text{A}, di/dt = 100\text{A}/\mu\text{s}$		28	45	ns
Q_{rr}	Reverse Recovery Charge			8	13	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{in.}$ board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $170^\circ\text{C}/\text{W}$ when mounted on a 1in^2 pad of 2 oz copper.



b. $260^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < $300\mu\text{s}$, Duty cycle < 2.0%.

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

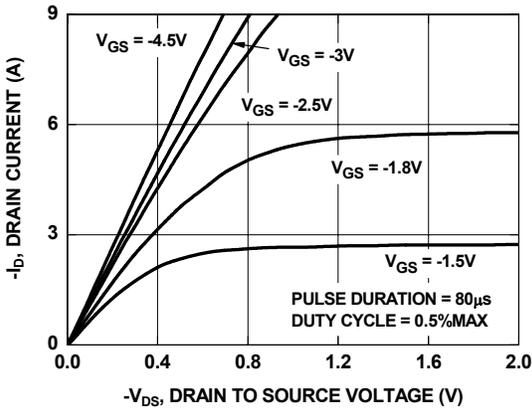


Figure 1. On-Region Characteristics

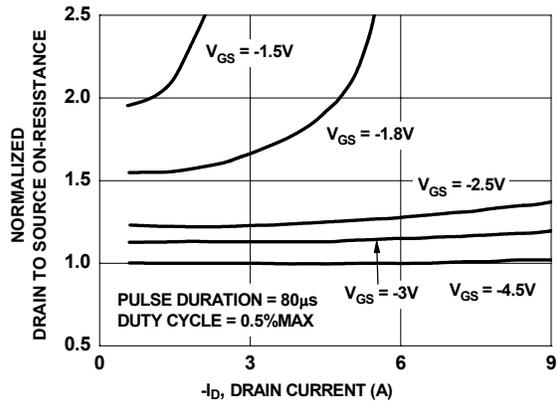


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

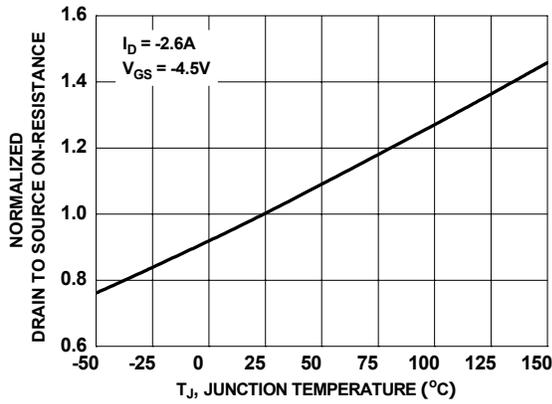


Figure 3. Normalized On-Resistance vs Junction Temperature

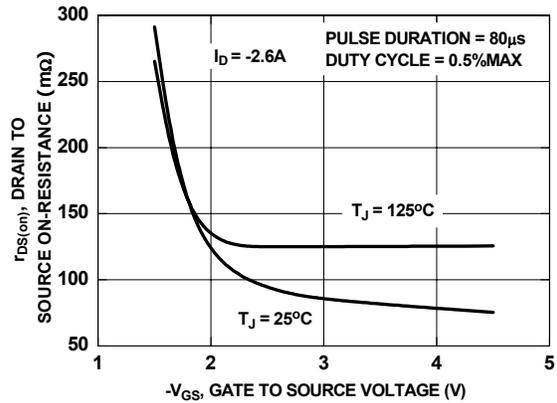


Figure 4. On-Resistance vs Gate to Source Voltage

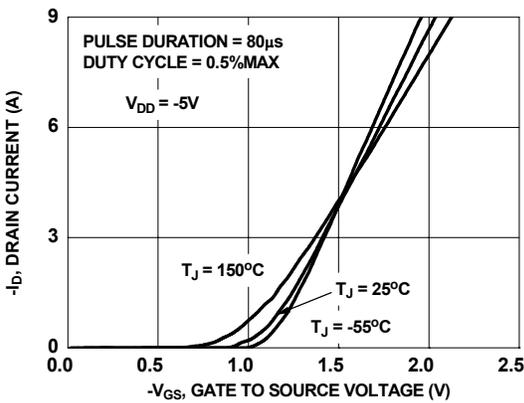


Figure 5. Transfer Characteristics

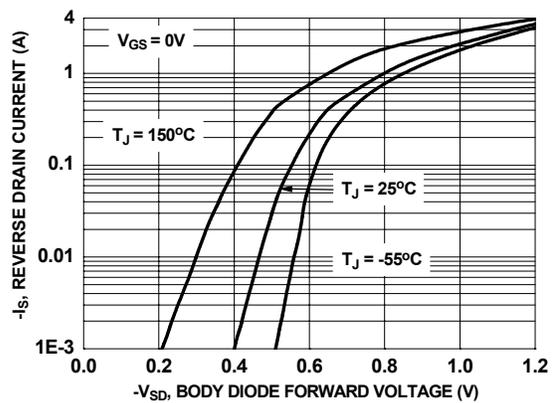


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

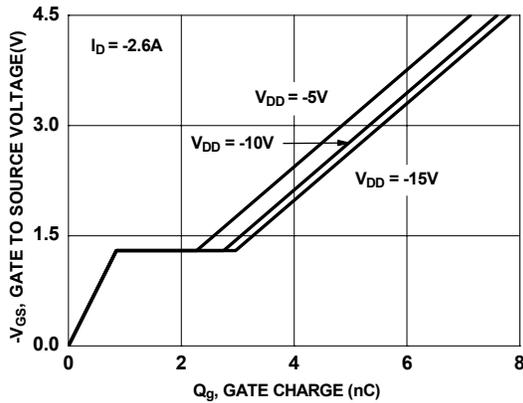


Figure 7. Gate Charge Characteristics

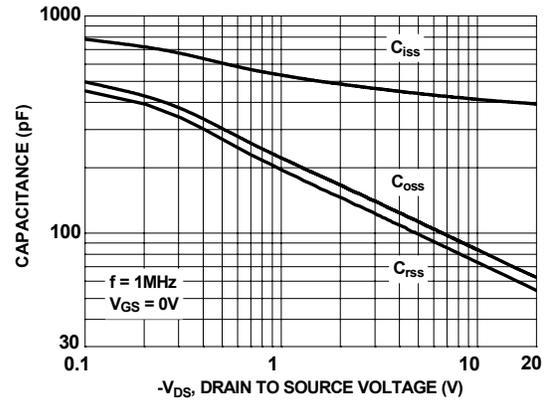


Figure 8. Capacitance vs Drain to Source Voltage

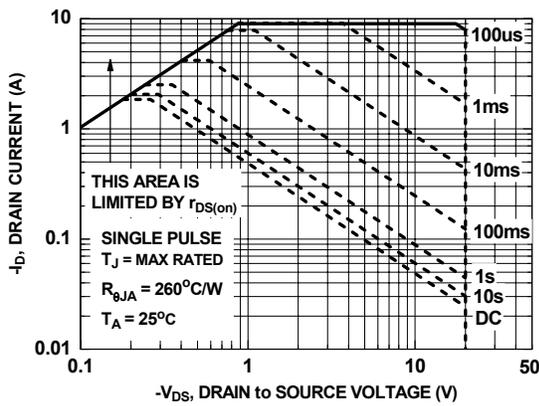


Figure 9. Forward Bias Safe Operating Area

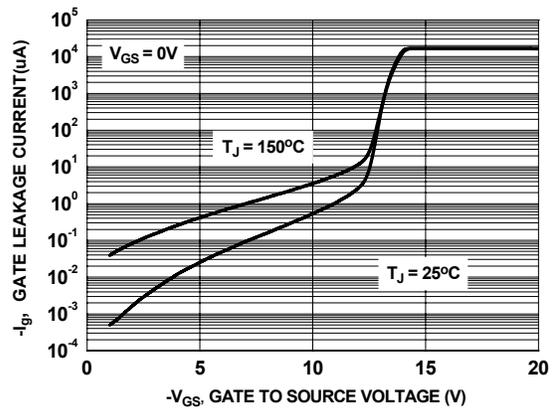


Figure 10. Gate Leakage Current vs Gate to Source Voltage

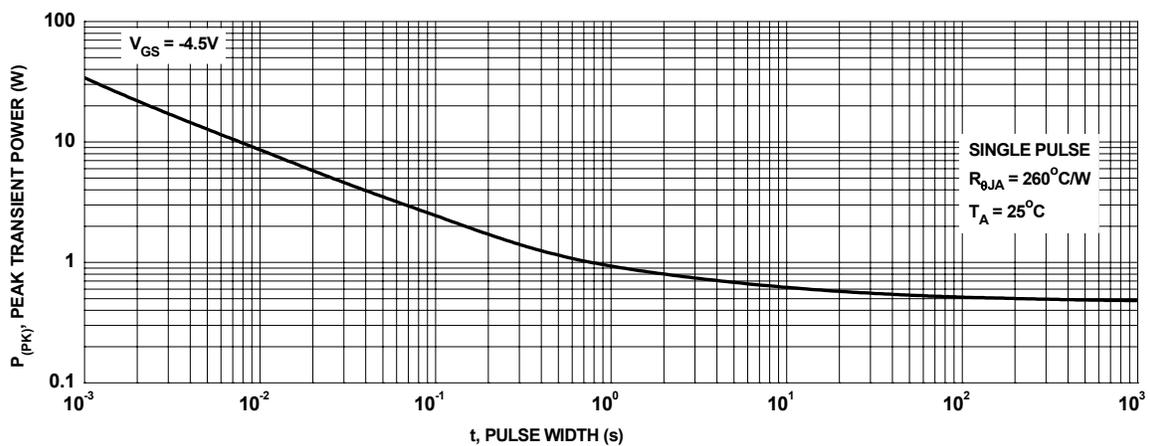


Figure 11. Transient Thermal Response Curve

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

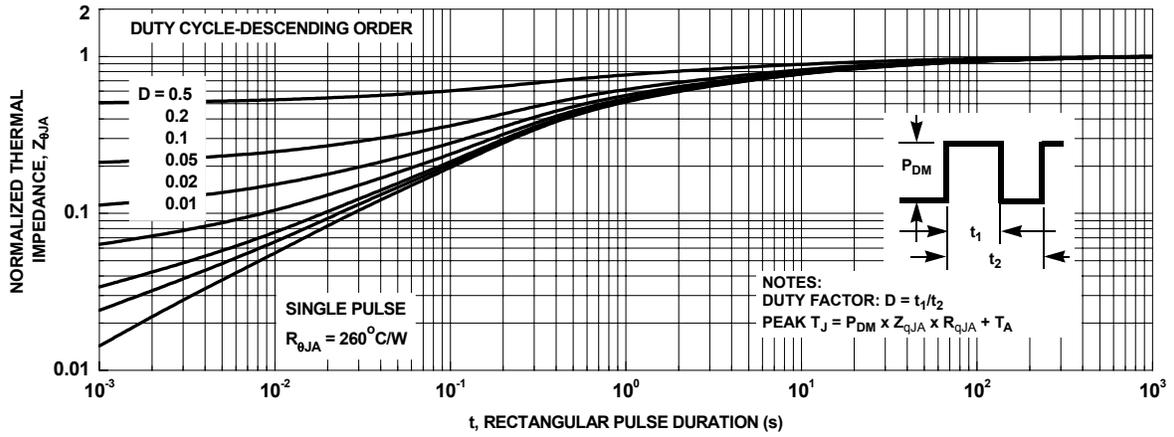


Figure 12. Transient Thermal Response Curve



TRADEMARKS

The following are registered and unregistered trademarks and service marks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx [®]	Green FPS [™] e-Series [™]	POWEREDGE [®]	SuperSOT [™] -8
Build it Now [™]	GOT [™]	Power-SPM [™]	SyncFET [™]
CorePLUS [™]	<i>i-Lo</i> [™]	PowerTrench [®]	The Power Franchise [®]
CROSSVOLT [™]	IntelliMAX [™]	Programmable Active Droop [™]	 [™]
CTL [™]	ISOPLANAR [™]	QFET [®]	TinyBoost [™]
Current Transfer Logic [™]	MegaBuck [™]	QS [™]	TinyBuck [™]
EcoSPARK [®]	MICROCOUPLER [™]	QT Optoelectronics [™]	TinyLogic [®]
FACT Quiet Series [™]	MicroFEET [™]	Quiet Series [™]	TINYOPTO [™]
FACT [®]	MicroPak [™]	RapidConfigure [™]	TinyPower [™]
FAST [®]	Motion-SPM [™]	SMART START [™]	TinyPWM [™]
FastvCore [™]	OPTOLOGIC [®]	SPM [®]	TinyWire [™]
FPS [™]	OPTOPLANAR [®]	STEALTH [™]	μSerDes [™]
FRFET [®]	PDP-SPM [™]	SuperFET [™]	UHC [®]
Global Power Resource SM	Power220 [®]	SuperSOT [™] -3	UniFET [™]
Green FPS [™]	Power247 [®]	SuperSOT [™] -6	VCX [™]

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

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; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only.

Rev. I29