

# FDG8842CZ

## Complementary PowerTrench® MOSFET

Q1: 30V, 0.75A, 0.4Ω; Q2: -25V, -0.41A, 1.1Ω

### Features

Q1: N-Channel

- Max  $r_{DS(on)}$  = 0.4Ω at  $V_{GS} = 4.5V$ ,  $I_D = 0.75A$
- Max  $r_{DS(on)}$  = 0.5Ω at  $V_{GS} = 2.7V$ ,  $I_D = 0.67A$

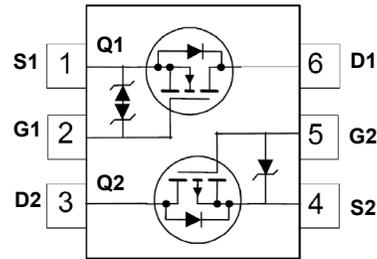
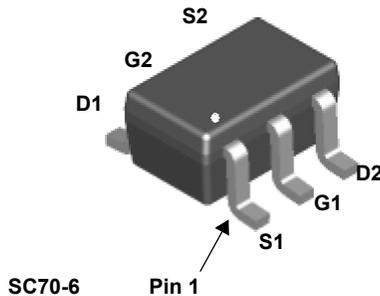
Q2: P-Channel

- Max  $r_{DS(on)}$  = 1.1Ω at  $V_{GS} = -4.5V$ ,  $I_D = -0.41A$
- Max  $r_{DS(on)}$  = 1.5Ω at  $V_{GS} = -2.7V$ ,  $I_D = -0.25A$
- Very low level gate drive requirements allowing direct operation in 3V circuits ( $V_{GS(th)} < 1.5V$ )
- Very small package outline SC70-6
- RoHS Compliant



### General Description

These N & P-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs. Since bias resistors are not required, this dual digital FET can replace several different digital transistors, with different bias resistor values.



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

Symbol	Parameter	Q1	Q2	Units
$V_{DS}$	Drain to Source Voltage	30	-25	V
$V_{GS}$	Gate to Source Voltage	±12	-8	V
$I_D$	Drain Current -Continuous	0.75	-0.41	A
	-Pulsed	2.2	-1.2	
$P_D$	Power Dissipation for Single Operation	(Note 1a)	0.36	W
		(Note 1b)	0.30	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150		°C

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Single operation	(Note 1a)	350	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Single operation	(Note 1b)	415	

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
.42	FDG8842CZ	7"	8mm	3000 units

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ $I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	Q1 Q2	30 -25			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$ $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$	Q1 Q2		25 -21		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$	Q1 Q2			1 -1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$ $V_{GS} = -8\text{V}, V_{DS} = 0\text{V}$	Q1 Q2			$\pm 10$ -100	$\mu\text{A}$ nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ $V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	Q1 Q2	0.65 -0.65	1.0 -0.8	1.5 -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 $25^\circ\text{C}$ $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$	Q1 Q2		-3.0 1.8		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 4.5\text{V}, I_D = 0.75\text{A}$ $V_{GS} = 2.7\text{V}, I_D = 0.67\text{A}$ $V_{GS} = 4.5\text{V}, I_D = 0.75\text{A}, T_J = 125^\circ\text{C}$ $V_{GS} = -4.5\text{V}, I_D = -0.41\text{A}$ $V_{GS} = -2.7\text{V}, I_D = -0.25\text{A}$ $V_{GS} = -4.5\text{V}, I_D = -0.41\text{A}, T_J = 125^\circ\text{C}$	Q1 Q2		0.25 0.29 0.36 0.87 1.20 1.22	0.4 0.5 0.6 1.1 1.5 1.9	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 0.75\text{A}$ $V_{DS} = -5\text{V}, I_D = -0.41\text{A}$	Q1 Q2		3 8		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	Q1 $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	Q1 Q2		90 70	120 100	pF
$C_{oss}$	Output Capacitance	Q2 $V_{DS} = -10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	Q1 Q2		20 30	30 40	pF
$C_{rss}$	Reverse Transfer Capacitance		Q1 Q2		15 15	25 25	pF

**Switching Characteristics (note 2)**

$t_{d(on)}$	Turn-On Delay Time	Q1 $V_{DD} = 5\text{V}, I_D = 0.5\text{A},$ $V_{GS} = 4.5\text{V}, R_{GEN} = 6\Omega$	Q1 Q2		4 6	10 12	ns
$t_r$	Rise Time	Q2 $V_{DD} = 5\text{V}, I_D = 0.5\text{A},$ $V_{GS} = 4.5\text{V}, R_{GEN} = 6\Omega$	Q1 Q2		1 16	10 29	ns
$t_{d(off)}$	Turn-Off Delay Time	Q1 $V_{DD} = -5\text{V}, I_D = -0.5\text{A},$ $V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$	Q1 Q2		9 35	18 56	ns
$t_f$	Fall Time	Q2 $V_{DD} = -5\text{V}, I_D = -0.5\text{A},$ $V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$	Q1 Q2		1 40	10 64	ns
$Q_g$	Total Gate Charge	Q1 $V_{GS} = 4.5\text{V}, V_{DD} = 5\text{V}, I_D = 0.75\text{A}$	Q1 Q2		1.03 1.20	1.44 1.68	nC
$Q_{gs}$	Gate to Source Charge	Q2 $V_{GS} = 4.5\text{V}, V_{DD} = 5\text{V}, I_D = 0.75\text{A}$	Q1 Q2		0.29 0.31		nC
$Q_{gd}$	Gate to Drain "Miller" Charge	$V_{GS} = -4.5\text{V}, V_{DD} = -5\text{V}, I_D = -0.41\text{A}$	Q1 Q2		0.17 0.22		nC

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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**Drain-Source Diode Characteristics and Maximum Ratings**

$I_S$	Maximum Continuous Drain-Source Diode Forward Current		Q1 Q2			0.3 -0.3	A
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0V, I_S = 0.3A$ (Note 2) $V_{GS} = 0V, I_S = -0.3A$ (Note 2)	Q1 Q2		0.76 -0.84	1.2 -1.2	V

**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 drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.



a.  $350^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper.



b.  $415^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

Scale 1:1 on letter size paper.

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

**Typical Characteristics (Q1 N-Channel)**  $T_J = 25^\circ\text{C}$  unless otherwise noted

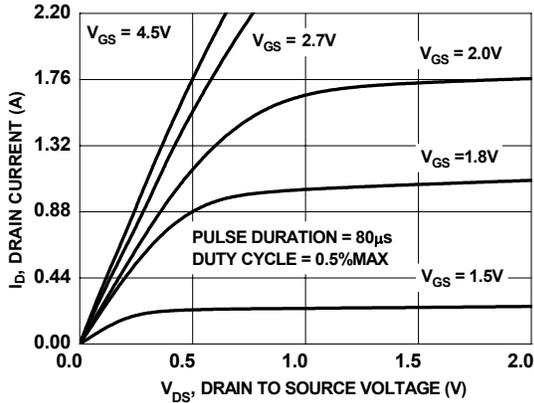


Figure 1. On-Region Characteristics

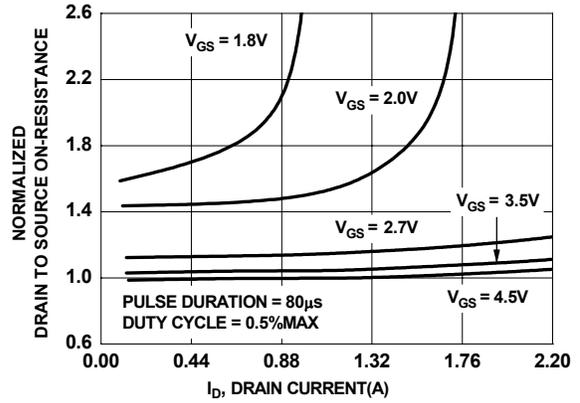


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

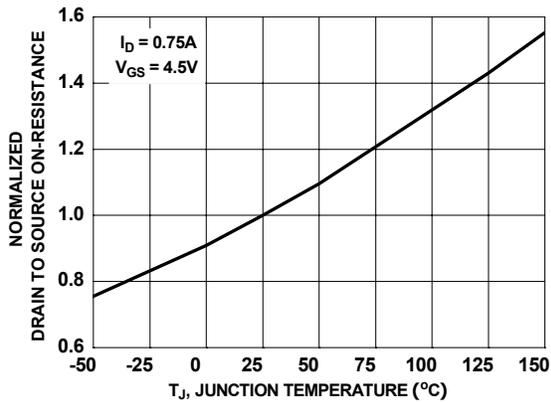


Figure 3. Normalized On-Resistance vs Junction Temperature

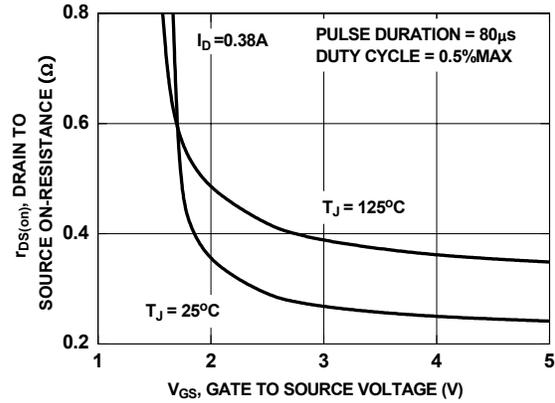


Figure 4. On-Resistance vs Gate to Source Voltage

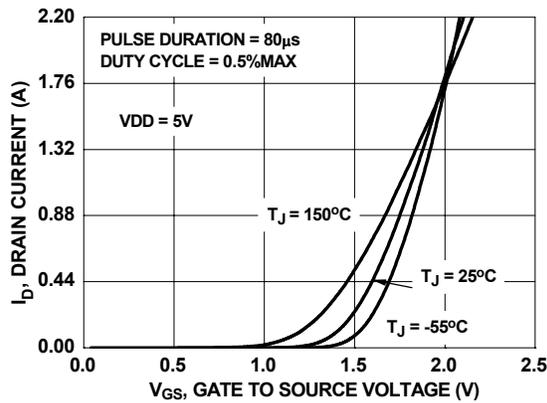


Figure 5. Transfer Characteristics

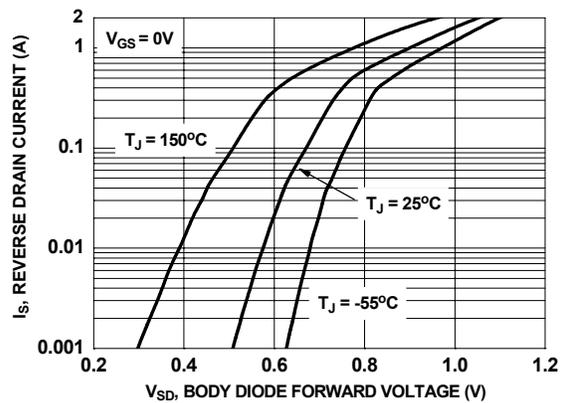
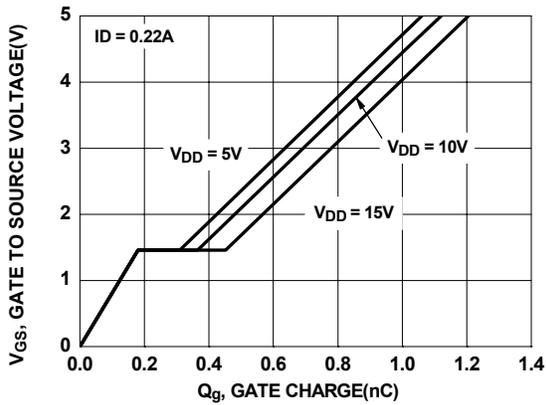
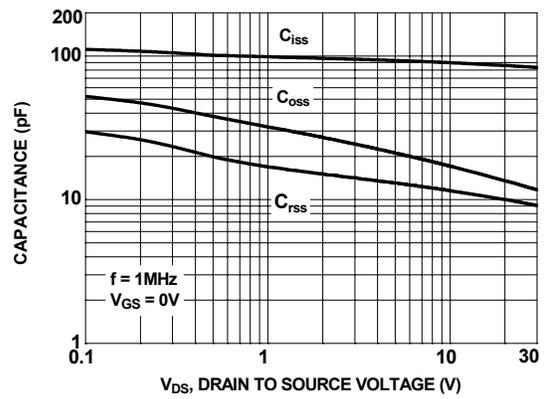


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

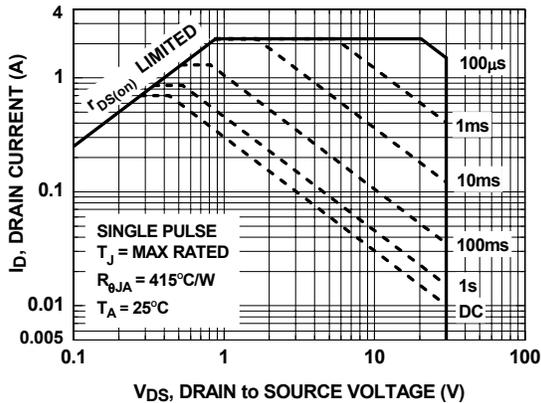
**Typical Characteristics (Q1 N-Channel)**  $T_J = 25^\circ\text{C}$  unless otherwise noted



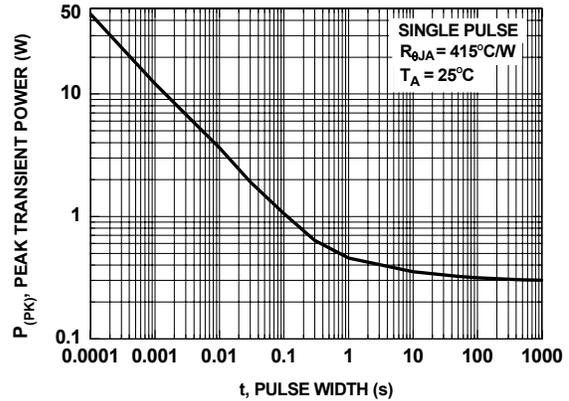
**Figure 7. Gate Charge Characteristics**



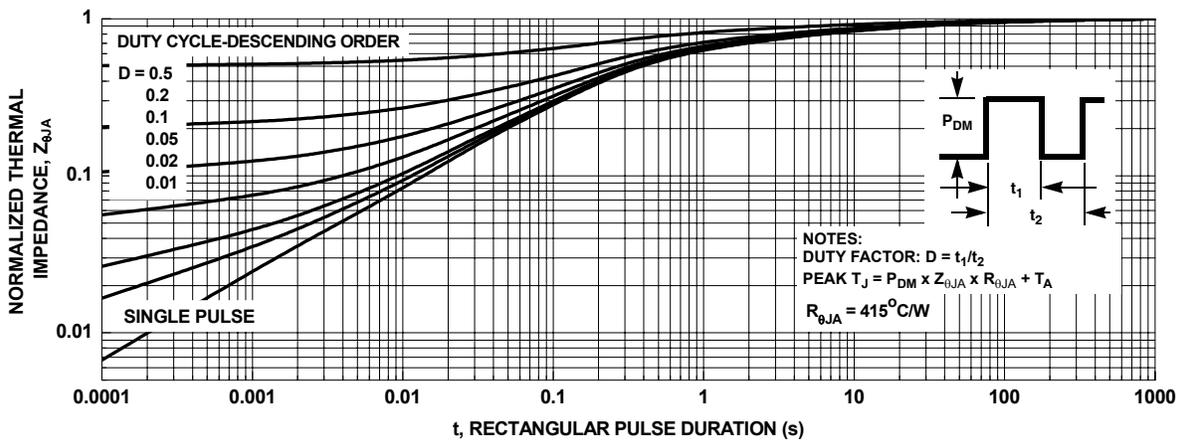
**Figure 8. Capacitance vs Drain to Source Voltage**



**Figure 9. Forward Bias Safe Operating Area**



**Figure 10. Single Pulse Maximum Power Dissipation**



**Figure 11. Transient Thermal Response Curve**

**Typical Characteristics (Q2 P-Channel)**  $T_J = 25^\circ\text{C}$  unless otherwise noted

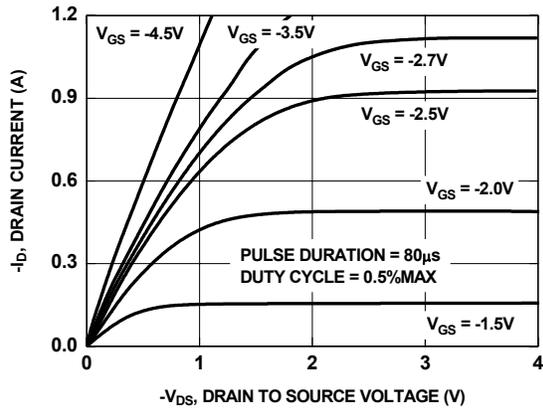


Figure 13. On Region Characteristics

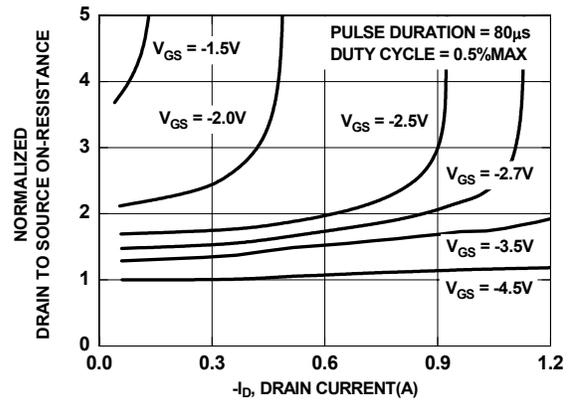


Figure 14. Normalized on-Resistance vs Drain Current and Gate Voltage

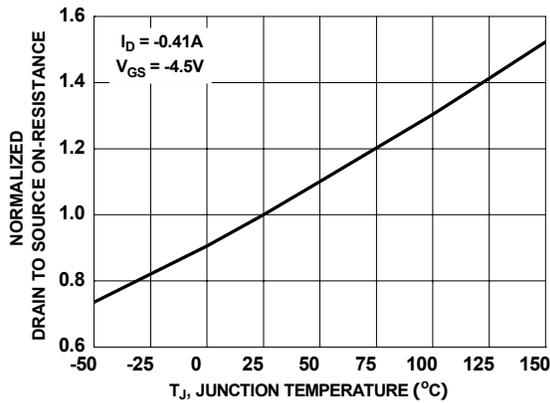


Figure 15. Normalized On Resistance vs Junction Temperature

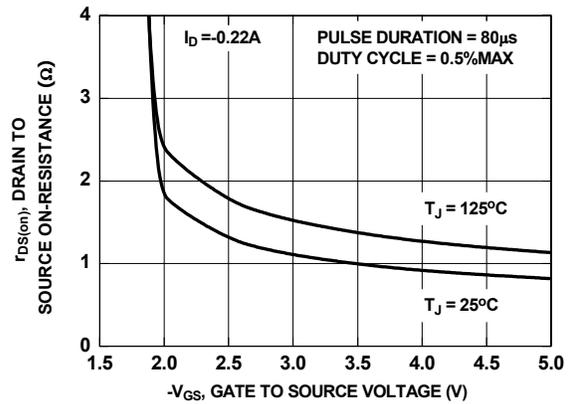


Figure 16. On-Resistance vs Gate to Source Voltage

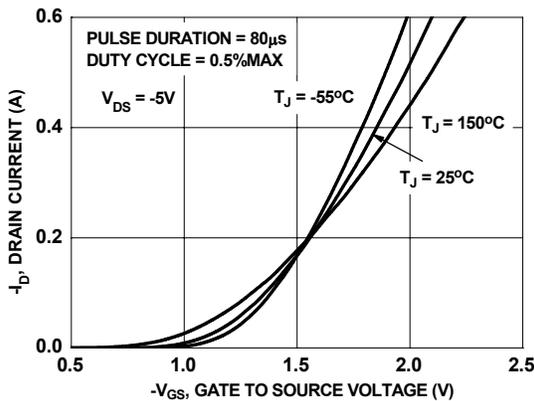


Figure 17. Transfer Characteristics

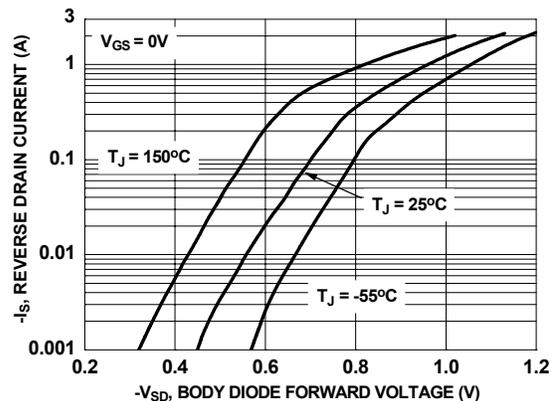
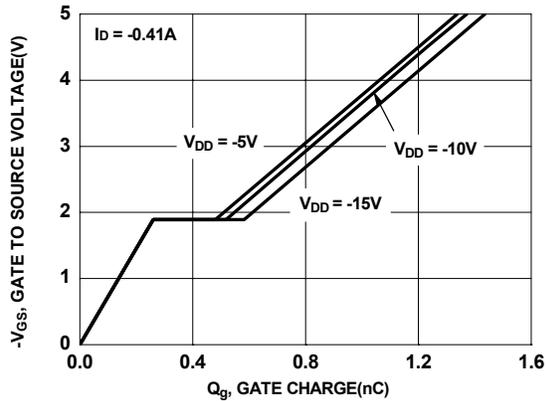
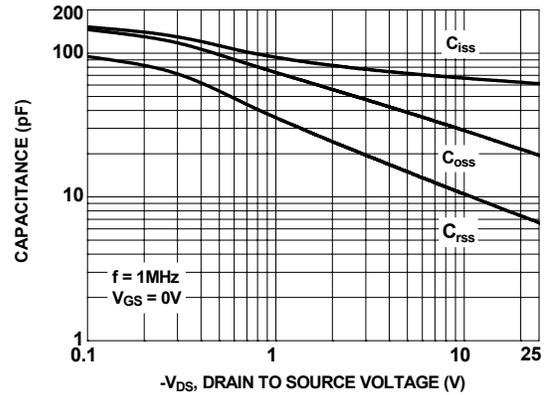


Figure 18. Source to Drain Diode Forward Voltage vs Source Current

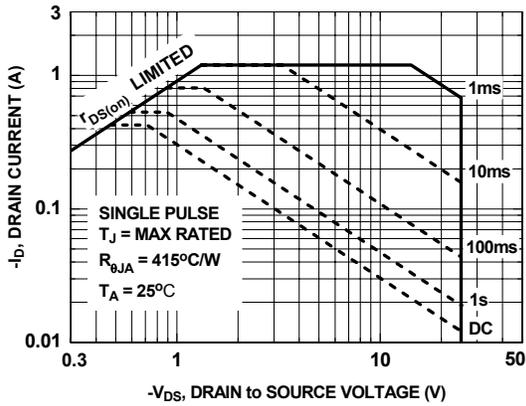
**Typical Characteristics(Q2 P-Channel)  $T_J = 25^\circ\text{C}$  unless otherwise noted**



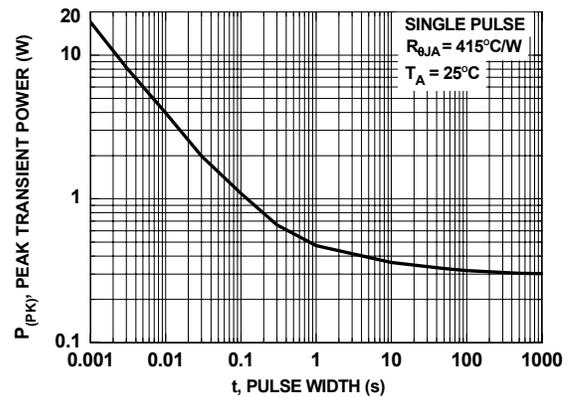
**Figure 19. Gate Charge Characteristics**



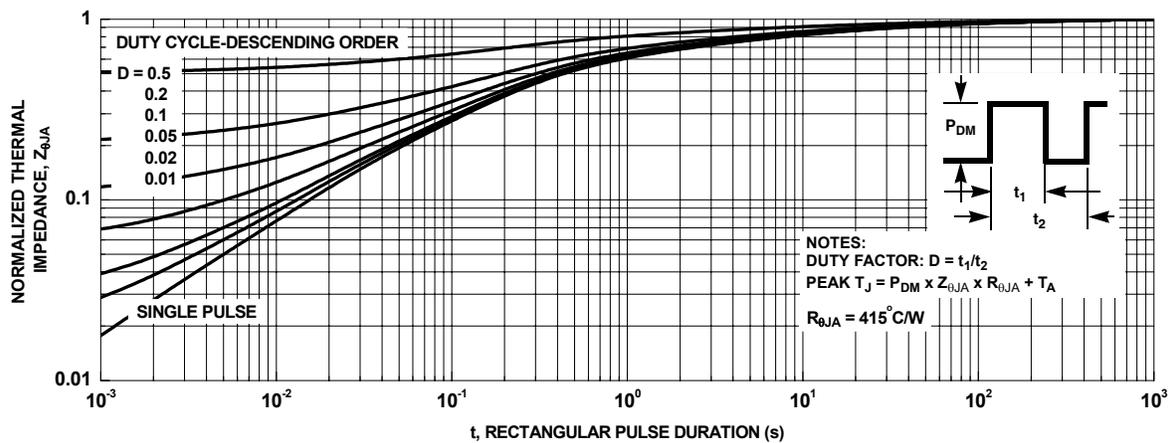
**Figure 20. Capacitance vs Drain to Source Voltage**



**Figure 21. Forward Bias Safe Operating Area**



**Figure 22. Single Pulse Maximum Power Dissipation**



**Figure 23. Transient Thermal Response Curve**



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DOME™	MSXPro™	ScalarPump™	UniFET™
E <sup>2</sup> C MOS™	OCX™	SMART START™	VCX™
EcoSPARK®	OCXPro™	SPM®	Wire™
EnSigna™	OPTOLOGIC®	STEALTH™	
FACT Quiet Series™	OPTOPLANAR®	SuperFET™	
FACT®	PACMAN™	SuperSOT™-3	
FAST®	PDP-SPM™	SuperSOT™-6	
FASTr™	POP™	SuperSOT™-8	
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**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.
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