July 2000

FDC6327C

Dual N & P-Channel 2.5V Specified PowerTrench™ MOSFET

General Description

These N & P-Channel 2.5V specified MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain low gate charge for superior switching performance.

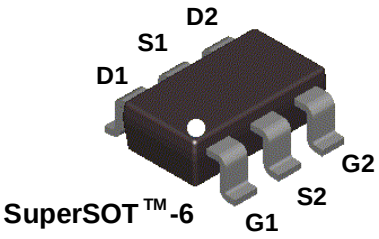
These devices have been designed to offer exceptional power dissipation in a very small footprint for applications where the bigger more expensive SO-8 and TSSOP-8 packages are impractical.

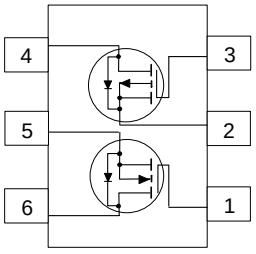
Applications

- DC/DC converter
- Load switch
- Motor driving

Features

- N-Channel 2.7A, 20V. $R_{DS(on)}$ = 0.08Ω @ V_{GS} = 4.5V
  $R_{DS(on)}$ = 0.12Ω @ V_{GS} = 2.5V
- P-Channel -1.6A, -20V. $R_{DS(on)}$ = 0.17Ω @ V_{GS} = -4.5V
  $R_{DS(on)}$ = 0.25Ω @ V_{GS} = -2.5V
- Fast switching speed.
- Low gate charge.
- High performance trench technology for extremely low $R_{DS(ON)}$.
- SuperSOT™-6 package: small footprint (72% smaller than SO-8); low profile (1mm thick).





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		N-Channel	P-Channel	Units
V_{DSS}	Drain-Source Voltage		20	-20	V
V_{GSS}	Gate-Source Voltage		±8	±8	V
I_D	Drain Current - Continuous	(Note 1a)	2.7	-1.9	A
	- Pulsed		8	-8	
P_D	Power Dissipation	(Note 1a)	0.96		W
		(Note 1b)	0.9		
		(Note 1c)	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)	130	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	60	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
.327	FDC6327C	7”	8mm	3000

Electrical Characteristics

T_A = 25°C unless otherwise noted

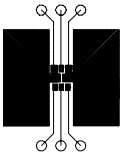
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA V_{GS} = 0 V, I_D = - 250 μA	N-Ch P-Ch	20 -20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C I_D = - 250 μA, Referenced to 25°C	N-Ch P-Ch		12 -19		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V V_{DS} = -16 V, V_{GS} = 0 V	N-Ch P-Ch			1 -1	μA
I_{GSSF}	Gate-Body Leakage, Forward	V_{GS} = 8 V, V_{DS} = 0 V	All			100	nA
I_{GSSR}	Gate-Body Leakage, Reverse	V_{GS} = -8 V, V_{DS} = 0 V	All			-100	nA
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA V_{DS} = V_{GS}, I_D = -250 μA	N-Ch P-Ch	0.4 -0.4	0.9 -0.9	1.5 -1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C I_D = - 250 μA, Referenced to 25°C	N-Ch P-Ch		-2.1 2.3		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 4.5 V, I_D = 2.7 A V_{GS} = 4.5 V, I_D = 2.7 A, T_J = 125°C V_{GS} = 2.5 V, I_D = 2.2 A V_{GS} = -4.5 V, I_D = -1.6 A V_{GS} = -4.5 V, I_D = -1.6 A, T_J = 125°C V_{GS} = -2.5 V, I_D = -1.3 A	N-Ch N-Ch N-Ch P-Ch P-Ch P-Ch		0.069 0.094 0.093 0.141 0.203 0.205	0.08 0.13 0.12 0.17 0.27 0.25	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = 4.5 V, V_{DS} = 5 V V_{GS} = -4.5 V, V_{DS} = -5 V	N-Ch P-Ch	8 -8			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 2.7 A V_{DS} = -5 V, I_D = -1.9 A	N-Ch P-Ch		7.7 4.5		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	N-Channel V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz	N-Ch P-Ch		325 315		pF
C_{oss}	Output Capacitance	P-Channel	N-Ch P-Ch		75 65		pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz	N-Ch P-Ch		35 24		pF

Electrical Characteristics (continued) T_A = 25°C unless otherwise noted

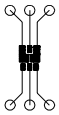
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	N-Channel V_{DD} = 10 V, I_D = 1 A, V_{GS} = 4.5V, R_{GEN} = 6 Ω	N-Ch P-Ch		5 7	15 14	ns
t_r	Turn-On Rise Time		N-Ch P-Ch		9 14	18 25	ns
$t_{d(off)}$	Turn-Off Delay Time	P-Channel V_{DD} = -10 V, I_D = -1 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω	N-Ch P-Ch		12 14	22 25	ns
t_f	Turn-Off Fall Time		N-Ch P-Ch		3 3	9 9	ns
Q_g	Total Gate Charge	N-Channel V_{DS} = 10 V, I_D = 2.7 A, V_{GS} = 4.5V	N-Ch P-Ch		3.25 2.85	4.5 4.0	nC
Q_{gs}	Gate-Source Charge	P-Channel V_{DS} = -10 V, I_D = -1.9 A, V_{GS} = -4.5V	N-Ch P-Ch		0.65 0.68		nC
Q_{gd}	Gate-Drain Charge		N-Ch P-Ch		0.90 0.65		nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-Ch P-Ch			0.8 -0.8	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.8 A (Note 2) V_{GS} = 0 V, I_S = - 0.8 A (Note 2)	N-Ch P-Ch		0.76 -0.79	1.2 -1.2	V

Notes:

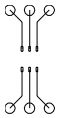
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design. Both devices are assumed to be operating and sharing the dissipated heat energy equally.



a) 130 °C/W when mounted on a 0.125 in² pad of 2 oz. copper.



b) 140 °C/W when mounted on a 0.005 in² pad of 2 oz. copper.



c) 180 °C/W when mounted on a 0.0015 in² pad of 2 oz. copper.

Scale 1 : 1 on letter size paper

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

Typical Characteristics: N-Channel

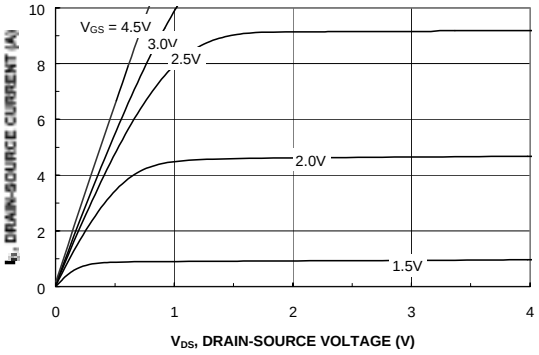


Figure 1. On-Region Characteristics.

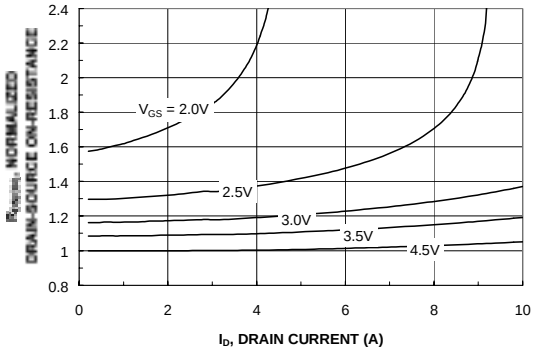


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

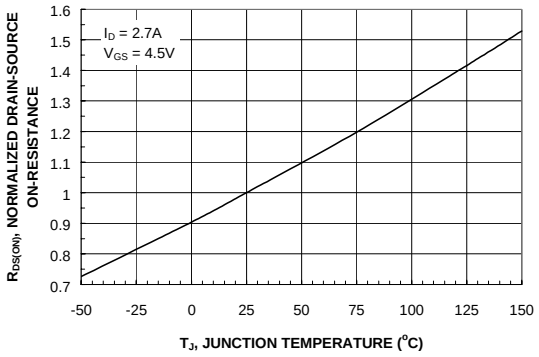


Figure 3. On-Resistance Variation with Temperature.

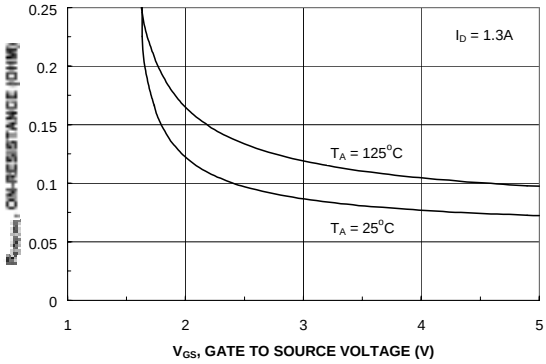


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

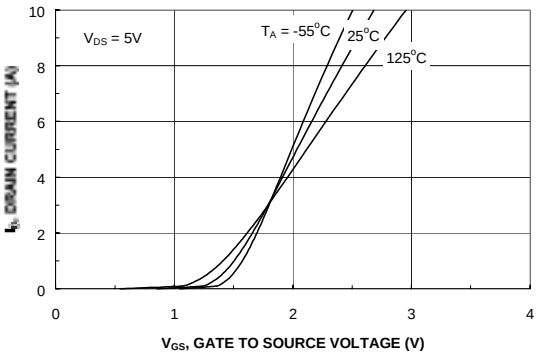


Figure 5. Transfer Characteristics.

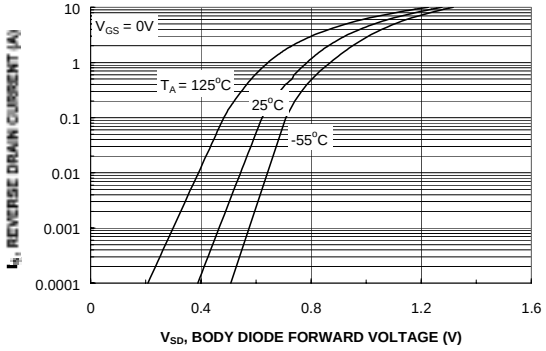


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: N-Channel (continued)

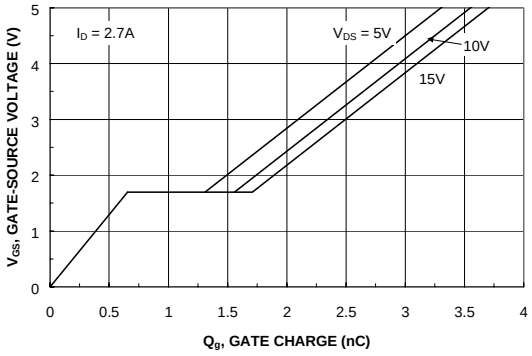


Figure 7. Gate-Charge Characteristics.

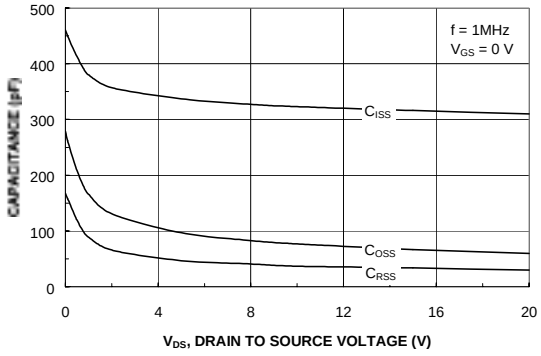


Figure 8. Capacitance Characteristics.

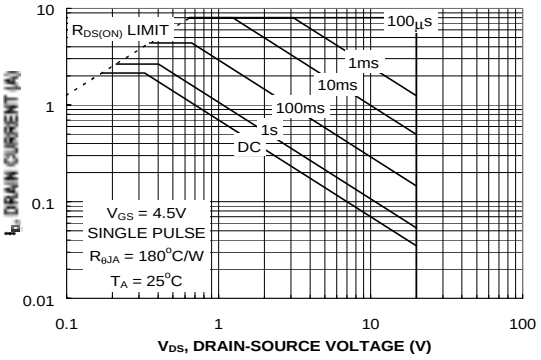


Figure 9. Maximum Safe Operating Area.

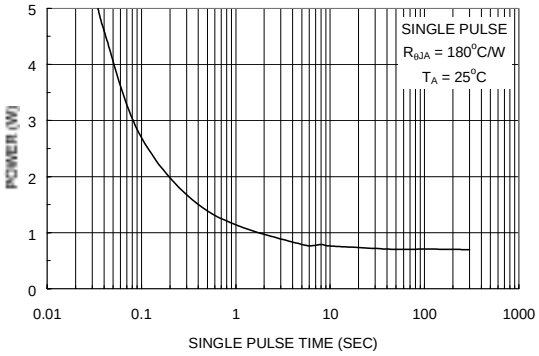


Figure 10. Single Pulse Maximum Power Dissipation.

Typical Characteristics: P-Channel

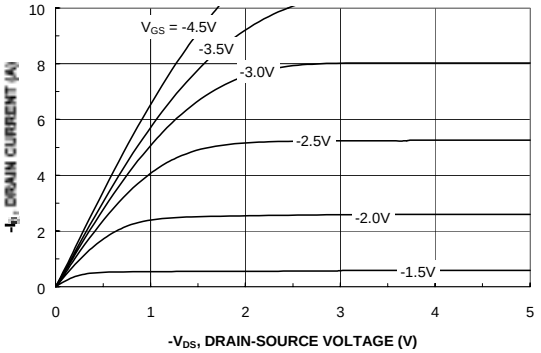


Figure 11. On-Region Characteristics.

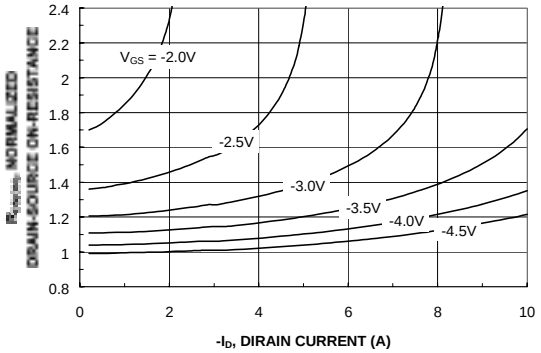


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

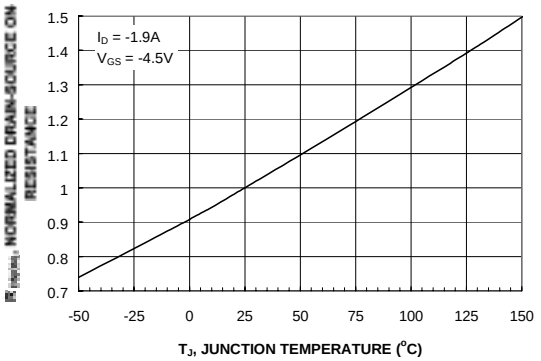


Figure 13. On-Resistance Variation with Temperature.

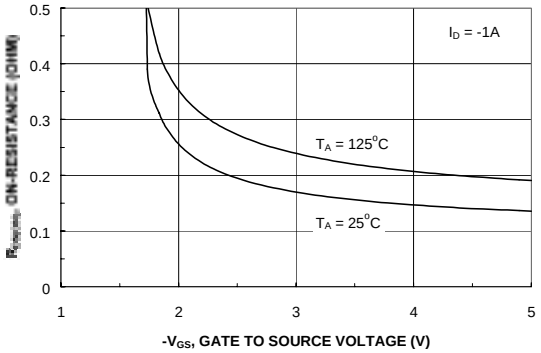


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

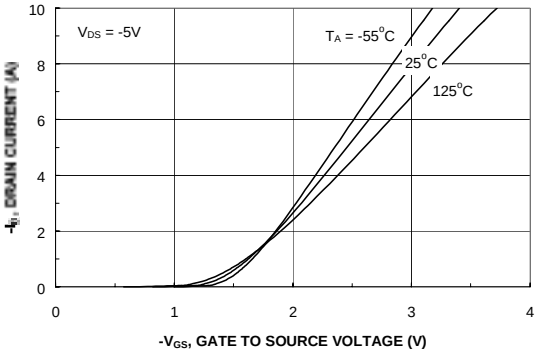


Figure 15. Transfer Characteristics.

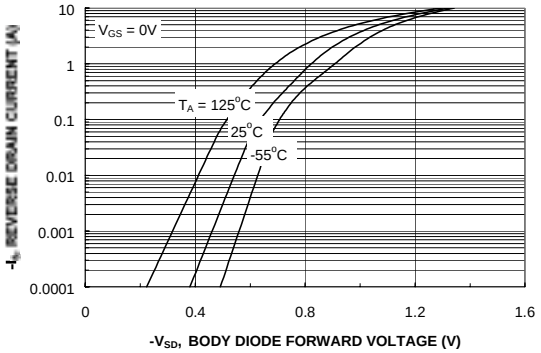


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: P-Channel (continued)

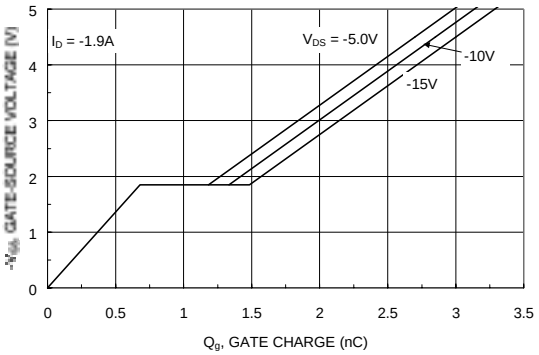


Figure 17. Gate-Charge Characteristics.

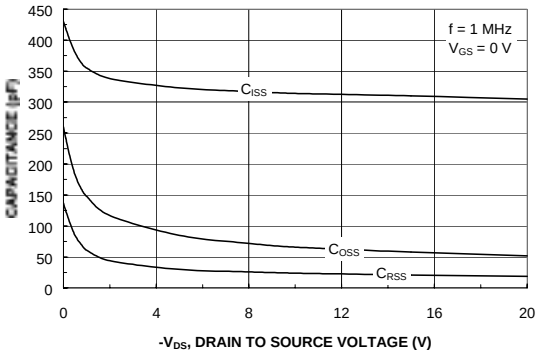


Figure 18. Capacitance Characteristics.

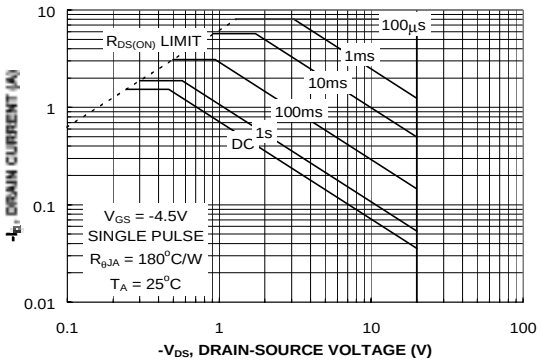


Figure 19. Maximum Safe Operating Area.

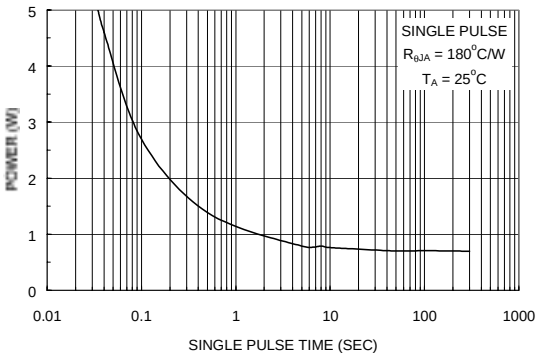


Figure 20. Single Pulse Maximum Power Dissipation.

Typical Characteristics: N & P-Channel (continued)

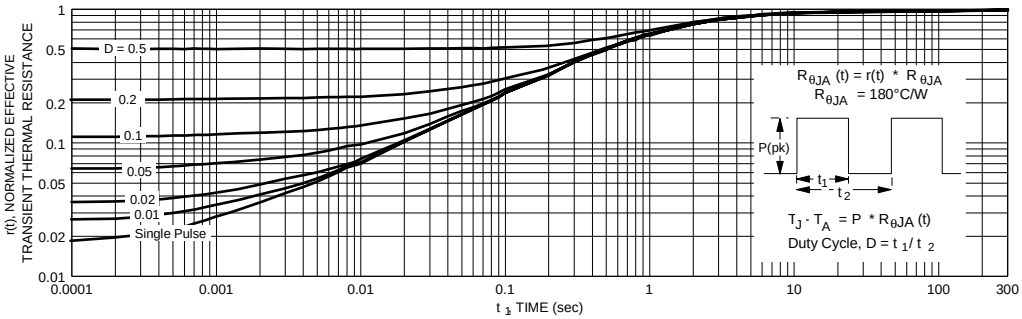


Figure 21. Transient Thermal Response Curve.

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2. A critical component is 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, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order 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 in order to improve design.
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Rev. F1