FAIRCHILD SEMICONDUCTOR®

August 2008

FDG327NZ

20V N-Channel PowerTrench® MOSFET

General Description

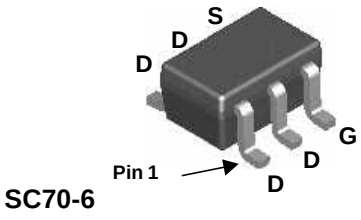
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized use in small switching regulators, providing an extremely low $R_{DS(ON)}$ and gate charge (Q_G) in a small package.

Applications

- DC/DC converter
- Power management
- Load switch

Features

- 1.5 A, 20 V. $R_{DS(ON)}$ = 90 mΩ @ V_{GS} = 4.5 V.
  $R_{DS(ON)}$ = 100 mΩ @ V_{GS} = 2.5 V
  $R_{DS(ON)}$ = 140 mΩ @ V_{GS} = 1.8 V
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability.



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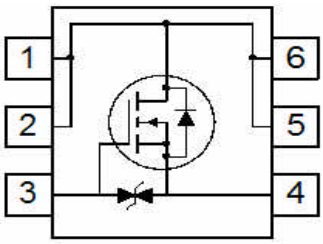


Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		± 8	
I_D	Drain Current – Continuous	(Note 1a)	1.5	A
	– Pulsed		6	
P_D	Power Dissipation for Single Operation	(Note 1a)	0.42	W
		(Note 1b)	0.38	
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)	300	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	333	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.37	FDG327NZ	7''	8mm	3000 units

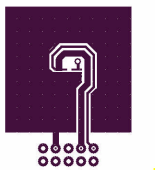
Electrical Characteristics

T_A = 25°C unless otherwise noted

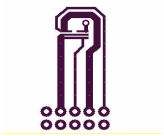
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		11		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
I_{GSS}	Gate–Body Leakage	V_{GS} = ± 8 V, V_{DS} = 0 V			±10	µA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.4	0.7	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	ID = 250 µA, Referenced to 25°C		–2		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 4.5 V, I_D = 1.5 A V_{GS} = 2.5 V, I_D = 1.4 A V_{GS} = 1.8 V, I_D = 1.2 A V_{GS} = 4.5 V, I_D = 1.5 A, T_J =125°C		68 77 90 86	90 100 140 123	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 4.5V, V_{DS} = 5 V	3			A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 1.5 A		2.2		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V f = 1.0 MHz		412		pF
C_{oss}	Output Capacitance			81		pF
C_{rss}	Reverse Transfer Capacitance			44		pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		1.9		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 10 V, I_D = 1 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		6.2	13	ns
t_r	Turn–On Rise Time			2.3	10	ns
$t_{d(off)}$	Turn–Off Delay Time			18	33	ns
t_f	Turn–Off Fall Time			2.9	10	ns
Q_g	Total Gate Charge	V_{DS} = 10 V, I_D = 1.5 A, V_{GS} = 4.5 V		4.2	6	nC
Q_{gs}	Gate–Source Charge			0.4		nC
Q_{gd}	Gate–Drain Charge			1		nC
Drain–Source Diode Characteristics and Maximum Ratings						
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.32 A (Note 2)		0.6	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 1.5 A, d_{iF}/d_t = 100 A/µs		4		nS
Q_{rr}	Diode Reverse Recovery Charge			2		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) 300°C/W when mounted on a 1in^2 pad of 2 oz copper.



b) 333°C/W when mounted on a minimum pad of 2 oz copper.

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

Typical Characteristics

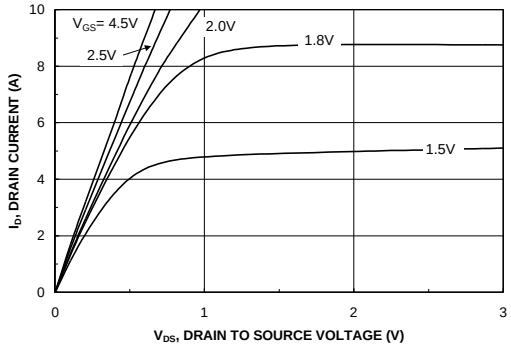


Figure 1. On-Region Characteristics.

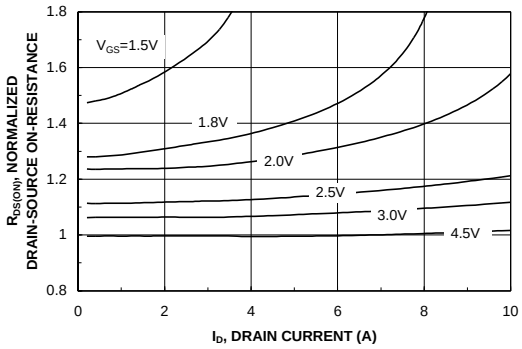


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

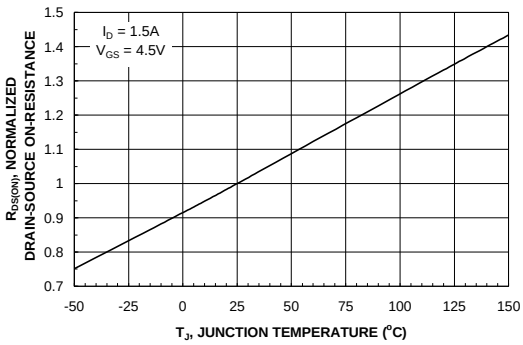


Figure 3. On-Resistance Variation withTemperature.

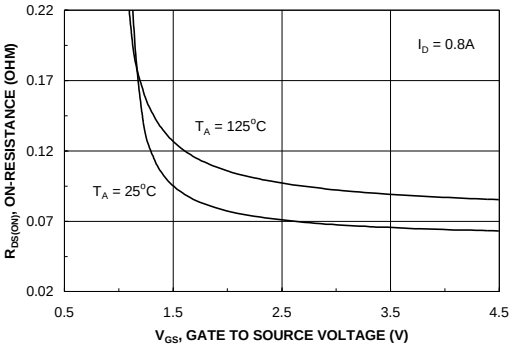


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

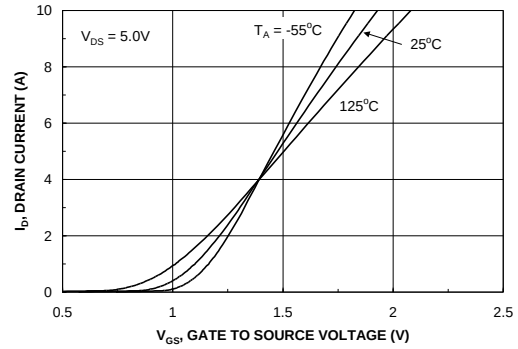


Figure 5. Transfer Characteristics.

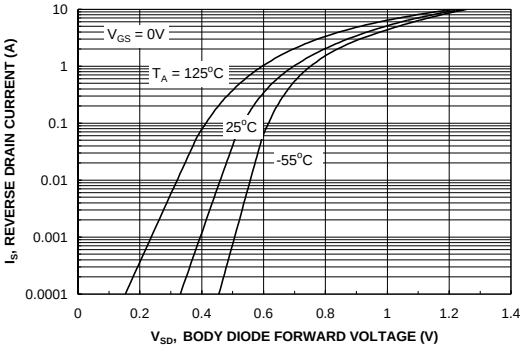


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

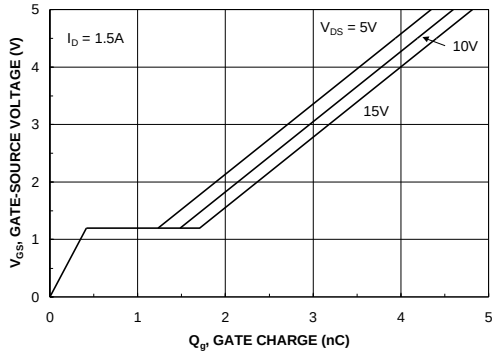


Figure 7. Gate Charge Characteristics.

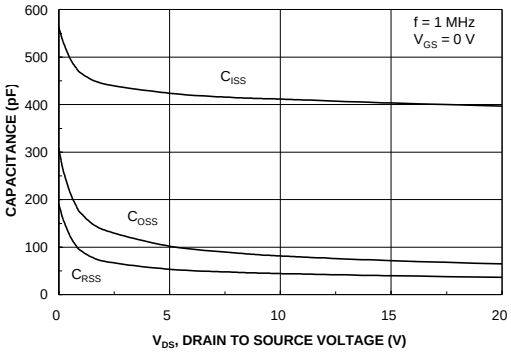


Figure 8. Capacitance Characteristics.

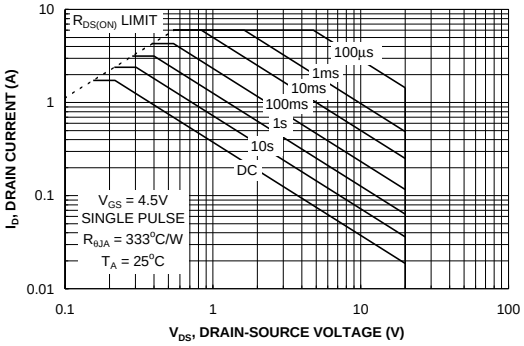


Figure 9. Maximum Safe Operating Area.

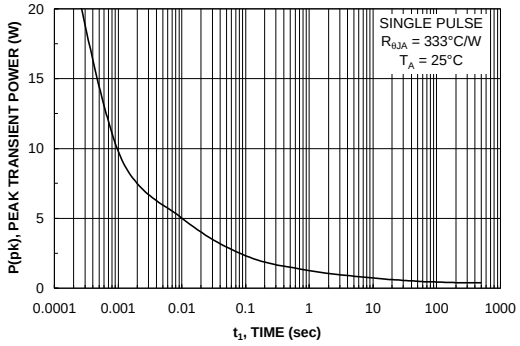


Figure 10. Single Pulse Maximum Power Dissipation.

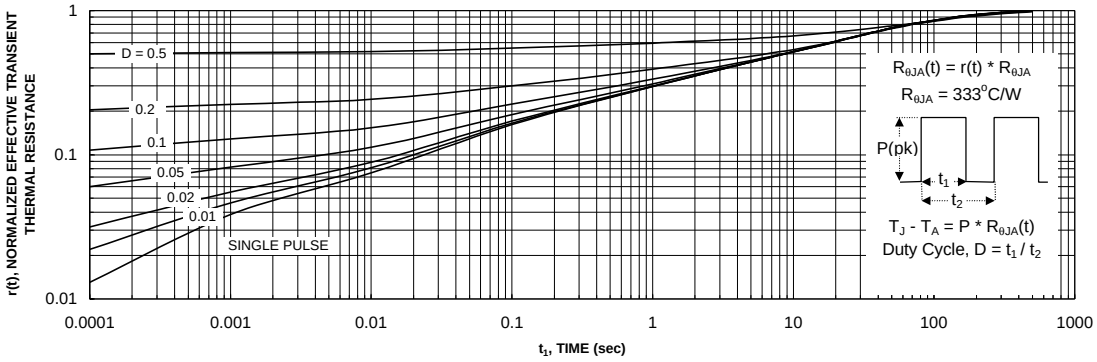


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

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Rev. I35