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FDG327NZ

20V N-Channel PowerTrench$^{\circ}$ 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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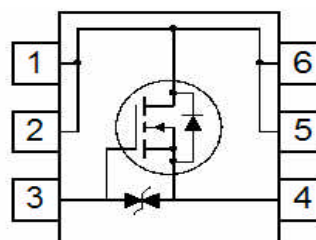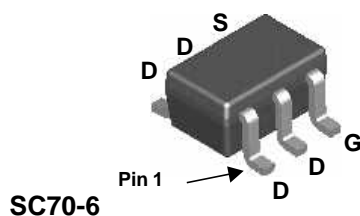
Absolute Maximum Ratings T_A=25°C unless otherwise noted

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		13	23	ns
t_r	Turn–On Rise Time			12	22	ns
$t_{d(off)}$	Turn–Off Delay Time			33	53	ns
t_f	Turn–Off Fall Time			18	20	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%
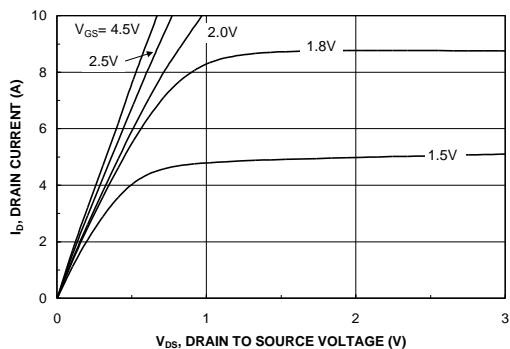
Typical Characteristics
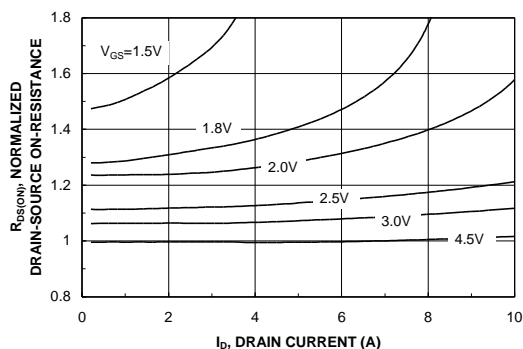

Figure 1. On-Region Characteristics.

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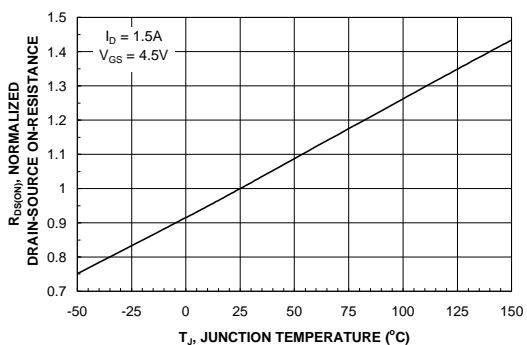

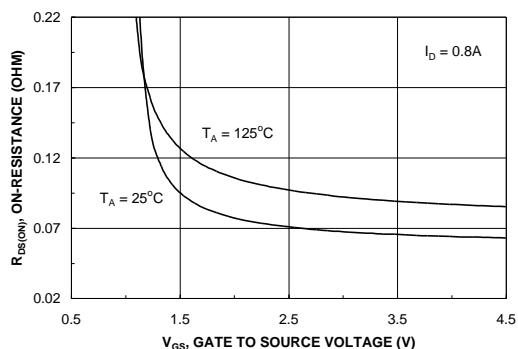**Figure 3. On-Resistance Variation withTemperature.**

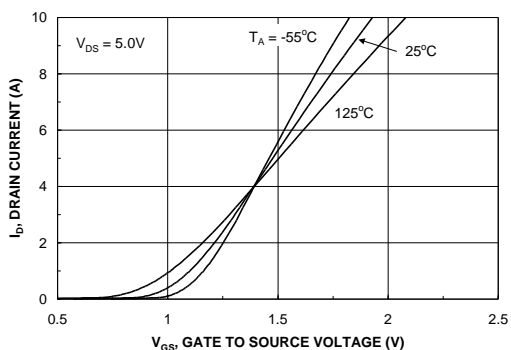**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

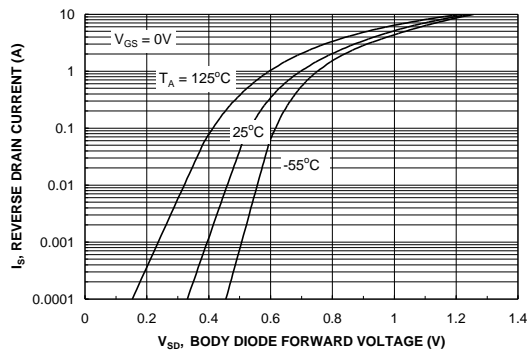**Figure 5. Transfer Characteristics.**

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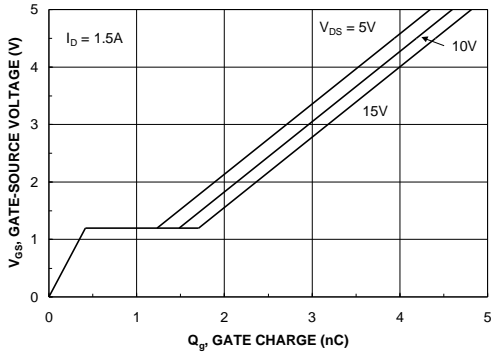
Typical Characteristics
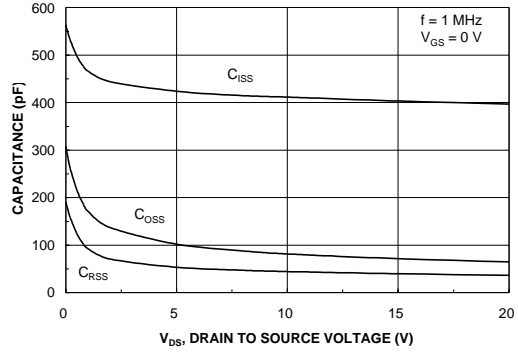

Figure 7. Gate Charge Characteristics.

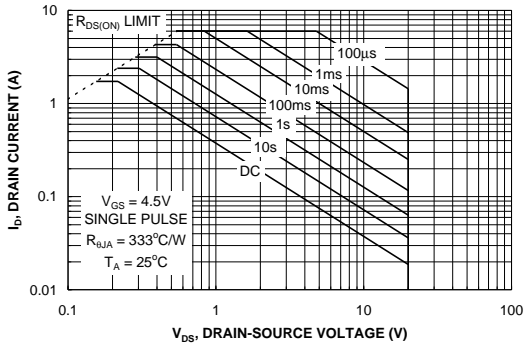**Figure 8. Capacitance Characteristics.**

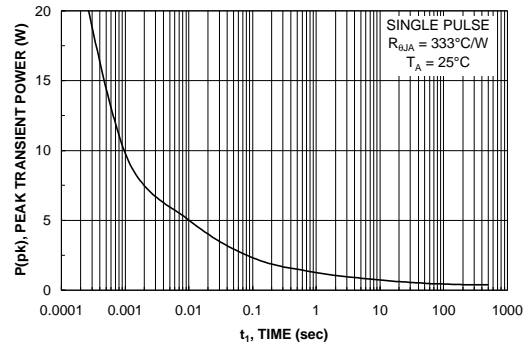**Figure 9. Maximum Safe Operating Area.**

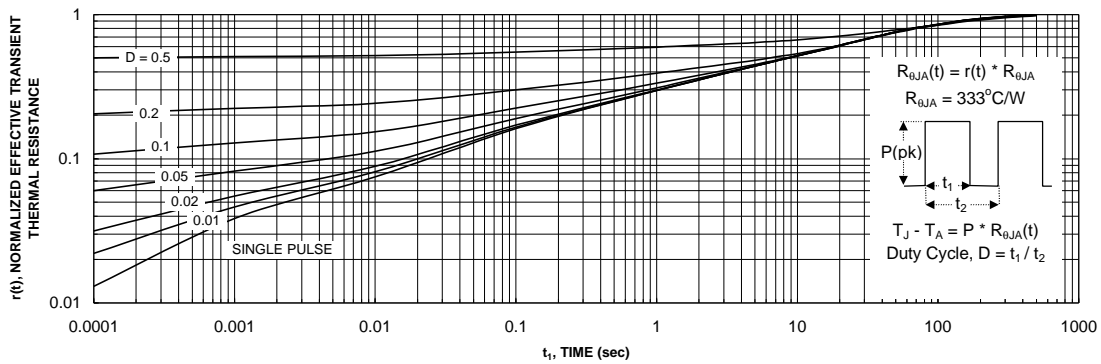**Figure 10. Single Pulse Maximum Power Dissipation.**

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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