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FDG327N

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 $R_{\text{DS(ON)}}$ and gate charge (Q_{G}) in a small package.

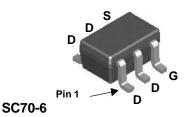
Applications

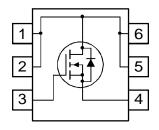
- DC/DC converter
- · Power management
- Load switch

Features

• 1.5 A, 20 V. $R_{DS(ON)} \ = \ 90 \ m\Omega \ @ \ V_{GS} = 4.5 \ V.$ $R_{DS(ON)} \ = \ 100 \ m\Omega \ @ \ V_{GS} = 2.5 \ V$ $R_{DS(ON)} \ = \ 140 \ m\Omega \ @ \ V_{GS} = 1.8 \ V$

- · Fast switching speed
- Low gate charge (4.5 nC typical)
- High performance trench technology for extremely low $R_{\text{DS(ON)}}$
- High power and current handling capability.





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	V
I _D	Drain Current - Continuous	(Note 1a)	1.5	А
	– 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	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.27	FDG327N	7"	8mm	3000 units

	cal Characteristics	T _A = 25°C unless otherwise noted		l	I	l
Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Char	racteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, \qquad I_{D} = 250 \mu\text{A}$	20			V
<u>ΔBVpss</u> ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA,Referenced to 25°C		12		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16 \text{ V}, \qquad V_{GS} = 0 \text{ V}$			1	μΑ
I _{GSSF}	Gate-Body Leakage, Forward	$V_{GS} = 8 \text{ V}, \qquad V_{DS} = 0 \text{ V}$			100	nA
I _{GSSR}	Gate-Body Leakage, Reverse	$V_{GS} = -8 \text{ V}, \qquad V_{DS} = 0 \text{ V}$			-100	nA
On Char	acteristics (Note 2)					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	0.4	0.7	1.5	V
$\Delta V_{GS(th)} \over \Delta T_J$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250 \mu A$, Referenced to 25°C		-3		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	$V_{GS} = 4.5 \text{ V}, I_D = 1.5 \text{ A}$ $V_{GS} = 2.5 \text{ V}, I_D = 1.4 \text{ A}$ $V_{GS} = 1.8 \text{ V}, I_D = 1.2 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 1.5 \text{ A}, T_J = 125^{\circ}\text{C}$		57 66 82 72	90 100 140 115	mΩ
I _{D(on)}	On-State Drain Current	$V_{GS} = 4.5V, V_{DS} = 5 V$	6			Α
g _{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 1.5 \text{ A}$		9		S
Dynamio	Characteristics			•		•
C _{iss}	Input Capacitance	V _{DS} = 10 V, V _{GS} = 0 V		423		pF
Coss	Output Capacitance	f = 1.0 MHz		87		pF
C _{rss}	Reverse Transfer Capacitance			48		pF
Switchir	ng Characteristics (Note 2)					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 10 \text{ V}, I_D = 1 \text{ A},$		6	12	ns
t _r	Turn-On Rise Time	$V_{GS} = 4.5 \text{ V}, R_{GEN} = 6 \Omega$		6.5	13	ns
d(off)	Turn-Off Delay Time			14	29	ns
i _f	Turn-Off Fall Time			2	4	ns
Q_g	Total Gate Charge	$V_{DS} = 10 \text{ V}, I_{D} = 1.5 \text{ A},$		4.5	6.3	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 4.5 V		0.89		nC
Q _{gd}	Gate-Drain Charge	7		0.95		nC
Drain-S	ource Diode Characteristics	and Maximum Ratings				
I _S	Maximum Continuous Drain-Source				0.32	Α
V _{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 0.32 \text{ A} \text{(Note 2)}$		0.75	1.2	V

Notes:

R_{8JA} 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_{8JC} is guaranteed by design while R_{8CA} is determined by the user's board design.



a) 300°C/W when mounted on a 1in² pad of 2 oz copper.



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

2. Pulse Test: Pulse Width < $300\mu s$, Duty Cycle < 2.0%

Typical Characteristics

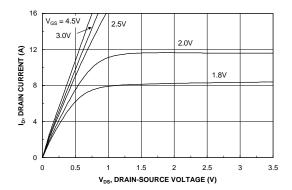


Figure 1. On-Region Characteristics.

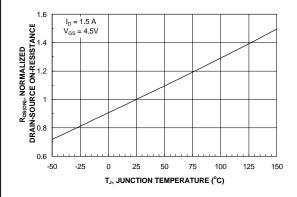


Figure 3. On-Resistance Variation withTemperature.

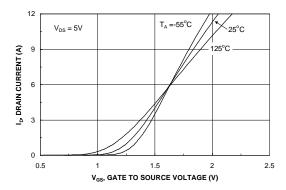


Figure 5. Transfer Characteristics.

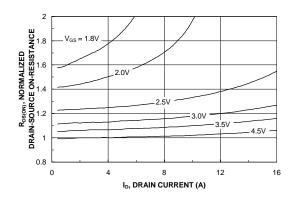


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

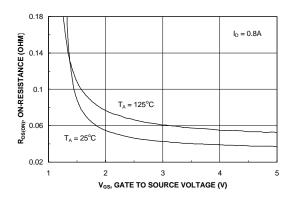


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

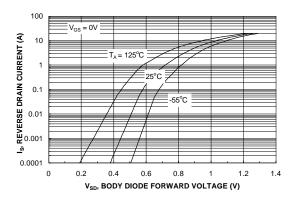
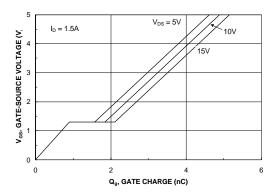


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics



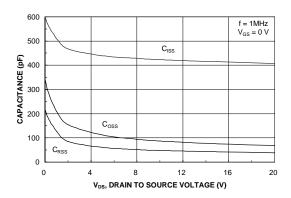
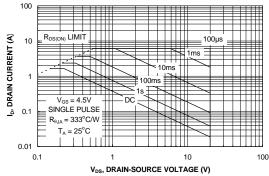


Figure 7. Gate Charge Characteristics.





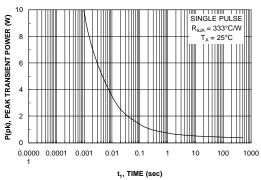


Figure 8. Capacitance Characteristics.

Figure 9. Maximum Safe Operating Area.



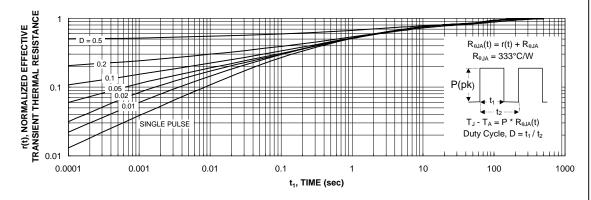


Figure 11. Transient Thermal Response Curve.

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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Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина,

дом 2, корпус 4, литера А.