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ON Semiconductor®

FDS6612A

Single N-Channel, Logic-Level, PowerTrench® MOSFET

General Description

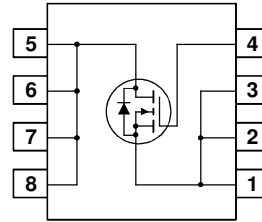
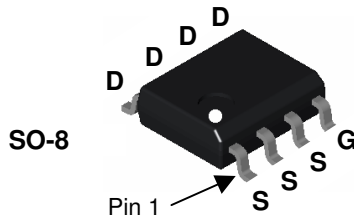
This N-Channel Logic Level MOSFET is produced using ON Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.



Features

- 8.4 A, 30 V. $R_{DS(ON)} = 22\text{ m}\Omega @ V_{GS} = 10\text{ V}$
 $R_{DS(ON)} = 30\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(ON)}$
- 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	30	V
V _{GSS}	Gate-Source Voltage	±20	V
I _D	Drain Current – Continuous (Note 1a)	8.4	A
		40	
P _D	Power Dissipation for Single Operation (Note 1a)	2.5	W
		1.0	
E _{AS}	Single Pulse Avalanche Energy (Note 3)	24	mJ
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	50	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1b)	125	
R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	25	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS6612A	FDS6612A	13"	12mm	2500 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV _{DSS}	Drain–Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		26		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 24 V, V _{GS} = 0 V			1	μA
		V _{DS} = 24 V, V _{GS} = 0 V, T _J = 55°C			10	μA
I _{GSS}	Gate–Body Leakage	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA

On Characteristics (Note 2)

V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		–4.4		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = 10 V, I _D = 8.4 A V _{GS} = 4.5 V, I _D = 7.2 A V _{GS} = 10 V, I _D = 8.4 A, T _J = 125°C		19 24 25	22 30 37	mΩ
I _{D(on)}	On–State Drain Current	V _{GS} = 10 V, V _{DS} = 5 V	20			A
g _{FS}	Forward Transconductance	V _{DS} = 15 V, I _D = 8.4 A		30		S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 15 V, V _{GS} = 0 V,		560		pF
C _{oss}	Output Capacitance	f = 1.0 MHz		140		pF
C _{rss}	Reverse Transfer Capacitance			55		pF
R _G	Gate Resistance	V _{GS} = 15 mV, f = 1.0 MHz		2.5		Ω

Switching Characteristics (Note 2)

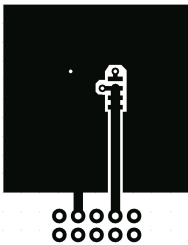
t _{d(on)}	Turn–On Delay Time	V _{DD} = 15 V, I _D = 1 A,		7	14	ns
t _r	Turn–On Rise Time	V _{GS} = 10 V, R _{GEN} = 6 Ω		5	10	ns
t _{d(off)}	Turn–Off Delay Time			22	35	ns
t _f	Turn–Off Fall Time			3	6	ns
Q _g	Total Gate Charge	V _{DS} = 15 V, I _D = 8.4 A,		5.4	7.6	nC
Q _{gs}	Gate–Source Charge	V _{GS} = 5 V		1.7		nC
Q _{gd}	Gate–Drain Charge			1.9		nC

Drain–Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 2.1 A (Note 2)		0.77	1.2	V
t _{rr}	Diode Reverse Recovery Time	I _F = 8.4 A, d _{I_F}/d_t = 100 A/μs}		19		ns
Q _{rr}	Diode Reverse Recovery Charge			9		nC

Notes:

- R_{θJA} 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_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.



- a) 50 °C/W when mounted on a 1 in² pad of 2 oz copper



- b) 125 °C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

- Test: Pulse Width < 300 μs, Duty Cycle < 2.0%
- Starting T_J = 25°C, L = 1 mH, I_{AS} = 7 A, V_{DD} = 27V, V_{GS} = 10V

Typical Characteristics

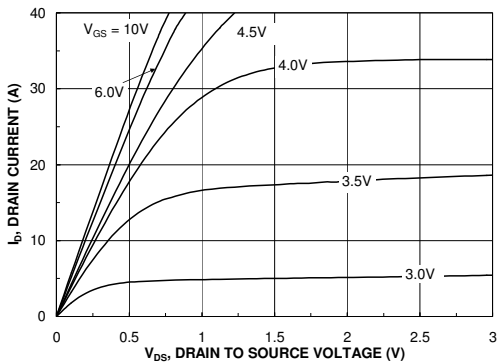


Figure 1. On-Region Characteristics.

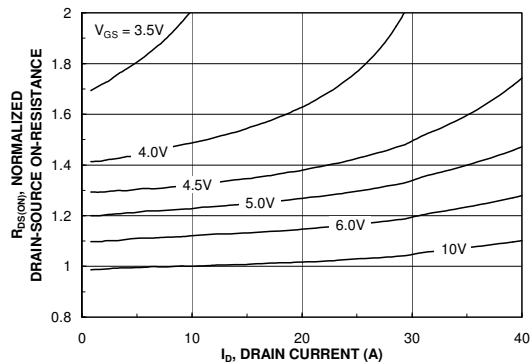


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

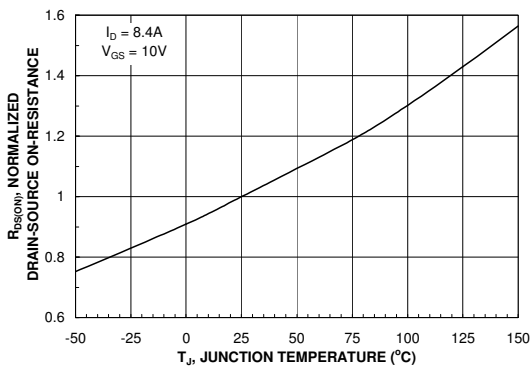


Figure 3. On-Resistance Variation with Temperature.

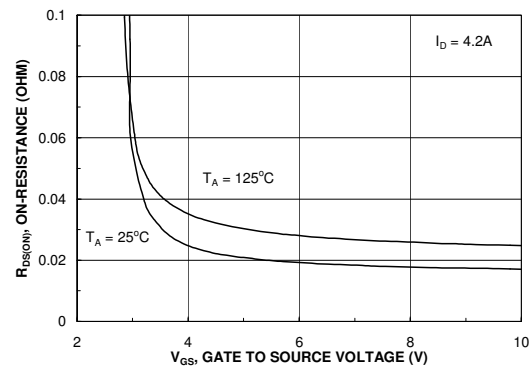


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

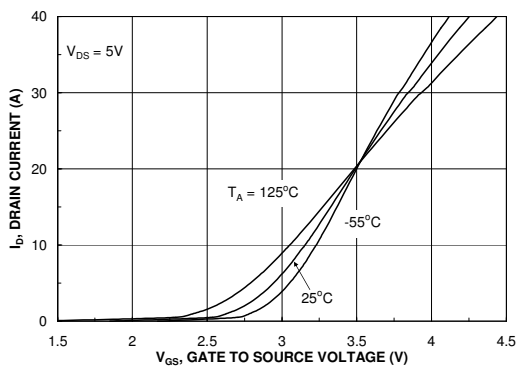


Figure 5. Transfer Characteristics.

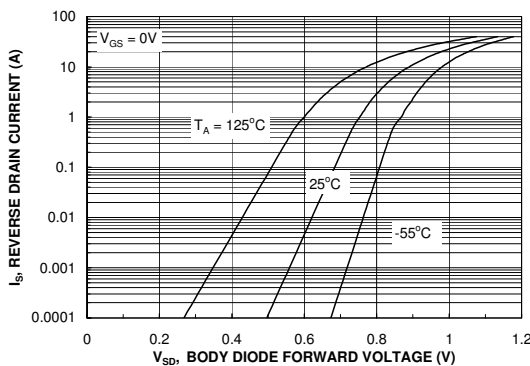


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

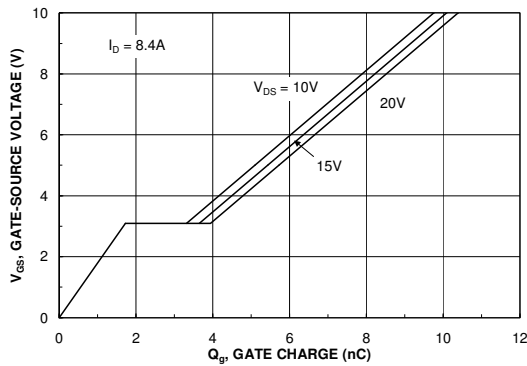


Figure 7. Gate Charge Characteristics.

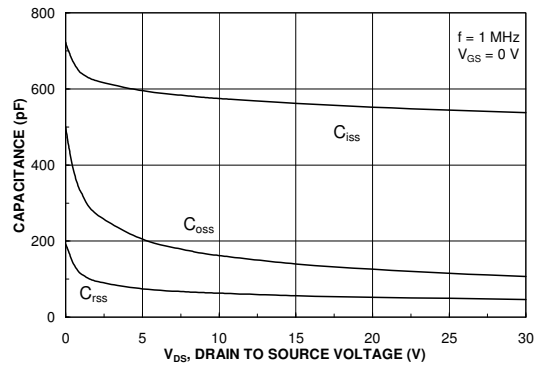


Figure 8. Capacitance Characteristics.

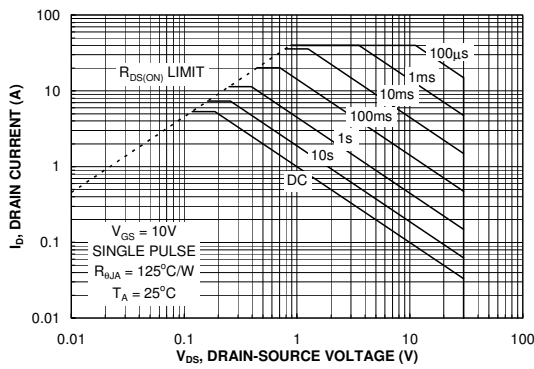


Figure 9. Maximum Safe Operating Area.

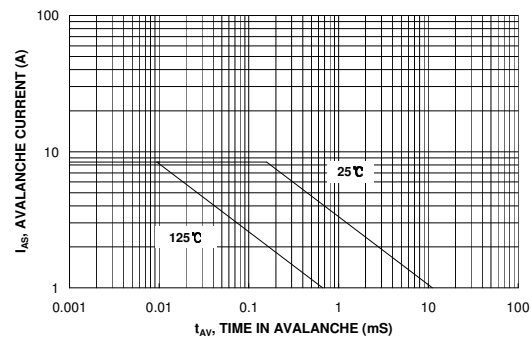


Figure 10. Unclamped Inductive Switching Capability

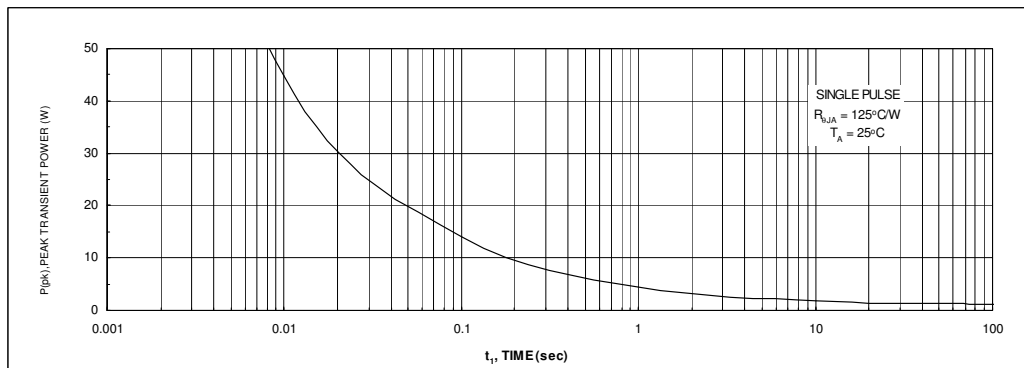


Figure 11. Single Pulse Maximum Power Dissipation.

Typical Characteristics

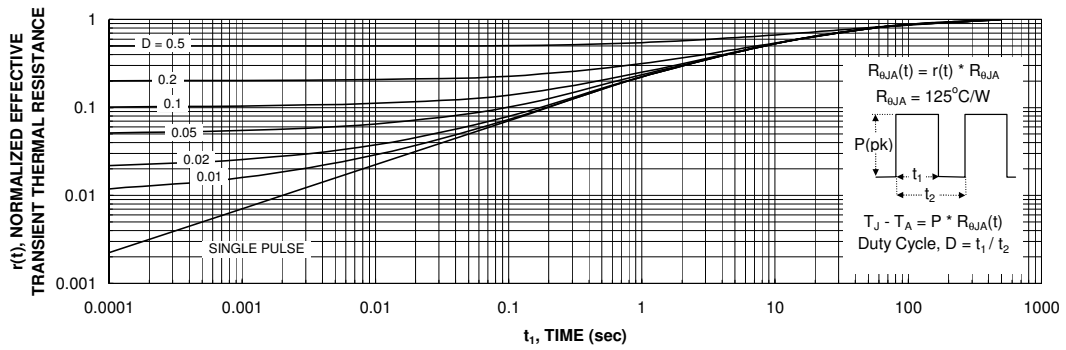


Figure 12. Transient Thermal Response Curve.

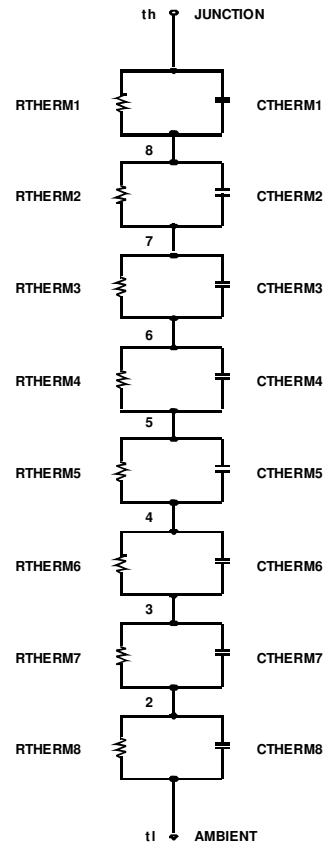
Thermal characterization performed using the conditions described in Note 1c.
 Transient thermal response will change depending on the circuit board design.

SPICE Thermal Model

```
.SUBCKT FDS6612A_THERM TH TL
*THERMAL MODEL SUBCIRCUIT
*REV A - JULY 2003
*MIN PAD RJA
```

CTHERM1	TH	8	0.005
CTHERM2	8	7	0.05
CTHERM3	7	6	0.10
CTHERM4	6	5	0.35
CTHERM5	5	4	0.45
CTHERM6	4	3	0.50
CTHERM7	3	2	0.55
CTHERM8	2	TL	3.00
RTHERM1	TH	8	5.000
RTHERM2	8	7	6.250
RTHERM3	7	6	7.500
RTHERM4	6	5	8.750
RTHERM5	5	4	10.625
RTHERM6	4	3	11.875
RTHERM7	3	2	31.250
RTHERM8	2	TL	43.750

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