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FDC3612

100V 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 for low gate charge, low $R_{\text{DS(ON)}}$ and fast switching speed.

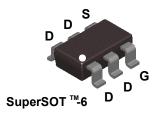
Applications

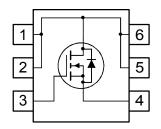
DC/DC converter

Features

• 2.6 A, 100 V $R_{DS(ON)} = 125 \text{ m}\Omega$ @ $V_{GS} = 10 \text{ V}$ $R_{DS(ON)} = 135 \text{ m}\Omega$ @ $V_{GS} = 6 \text{ V}$

- High performance trench technology for extremely low $R_{\mbox{\scriptsize DS}(\mbox{\scriptsize ON})}$
- Low gate charge (14nC typ)
- · High power and current handling capability
- · Fast switching speed





Absolute Maximum Ratings TA=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V _{DSS}	Drain-Source Voltage		100	V
V _{GSS}	Gate-Source Voltage		± 20	V
I _D	Drain Current - Continuous	(Note 1a)	2.6	А
	- Pulsed		20	
E _{AS}	Single Pulse Avalanche Energy	(Note 3)	37	mJ
P _D	Maximum Power Dissipation	(Note 1a)	1.6	W
		(Note 1b)	0.8	
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)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	30	°C/W

Package Marking and Ordering Information

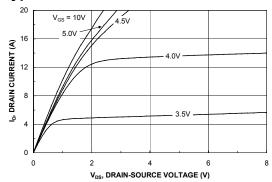
Device Marking	Device	Reel Size	Tape width	Quantity
.362	FDC3612	7"	8mm	3000 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Drain-So	ource Avalanche Ratings (Note	÷ 2)				•
W _{DSS}	Drain-Source Avalanche Energy	Single Pulse, V_{DD} = 50 V, I_D =2.6 A			90	mJ
I _{AR}	Drain-Source Avalanche Current				2.6	Α
Off Char	acteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	100			V
<u>ΔBV_{DSS}</u> ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		99		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 80 V, V _{GS} = 0 V			10	μΑ
I _{GSSF}	Gate–Body Leakage, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
On Char	acteristics (Note 2)	•				
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	2	2.3	4	V
$\Delta V_{GS(th)} \over \Delta T_J$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		- 6		mV/°C
R _{DS(on)}	Static Drain–Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 2.6 \text{ A}$ $V_{GS} = 6.0 \text{ V}, I_D = 2.5 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 2.6 \text{ A}; T_J = 125^{\circ}\text{C}$		86 91 157	125 135 240	mΩ
I _{D(on)}	On-State Drain Current	V _{GS} = 10 V, V _{DS} = 5 V	10			Α
g _{FS}	Forward Transconductance	V _{DS} = 10 V, I _D = 2.6 A		10		S
Dvnamio	Characteristics		•			
C _{iss}	Input Capacitance	$V_{DS} = 50 \text{ V}, \qquad V_{GS} = 0 \text{ V},$		660		pF
Coss	Output Capacitance	f = 1.0 MHz		55		pF
C _{rss}	Reverse Transfer Capacitance	<u>-</u>		40		pF
R _g	Gate Resistance		0.1	1.4	3.0	Ω
	ng Characteristics (Note 2)				1	
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 50 \text{ V}, \qquad I_D = 1 \text{ A},$		6	11	ns
t _r	Turn–On Rise Time	$V_{GS} = 10 \text{ V}, \qquad R_{GEN} = 6 \Omega$		3.5	7	ns
t _{d(off)}	Turn-Off Delay Time			23	37	ns
t _f	Turn–Off Fall Time			3.7	7.4	ns
Q _g	Total Gate Charge	$V_{DS} = 50 \text{ V}, \qquad I_{D} = 2.6 \text{ A},$		14	20	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		2.3		nC
Q_{gd}	Gate-Drain Charge			3.6		nC
Drain-Se	ource Diode Characteristics	and Maximum Ratings	•		•	
I _s	Maximum Continuous Drain–Source				1.3	Α
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 1.3 A (Note 2)		0.76	1.2	V
t _{rr}	Diode Reverse Recovery Time	I _F = 2.6 A		31		nS
Q _{rr}	Diode Reverse Recovery Charge	$d_{iF}/d_t = 100 \text{ A/}\mu\text{s}$ (Note 2)		56		nC

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 $R_{\theta CA}$ is determined by the user's board design.
- a. 78°C/W when mounted on a 1in² pad of 2oz copper on FR-4 board.
- b. 156°C/W when mounted on a minimum pad.
- 2. Pulse Test: Pulse Width $\leq 300~\mu\text{s},~\text{Duty Cycle} \leq 2.0\%$
- 3. E_{AS} of 37 mJ is based on starting T_J = 25 °C; N-ch: L = 3 mH, I_{AS} = 5 A, V_{DD} = 100 V, V_{QS} = 10 V. 100% test at L = 0.3 mH, I_{AS} = 11 A.

Typical Characteristics



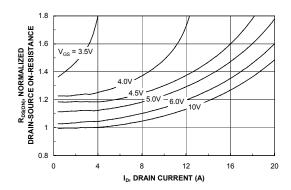
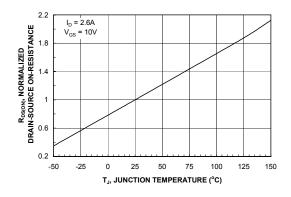


Figure 1. On-Region Characteristics.

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



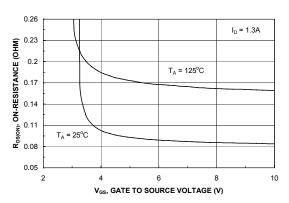
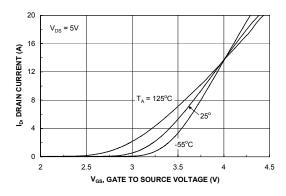


Figure 3. On-Resistance Variation with Temperature.

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



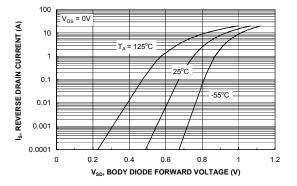
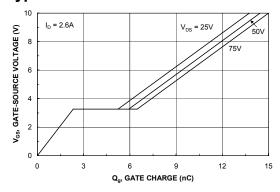


Figure 5. Transfer Characteristics.

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

Typical Characteristics



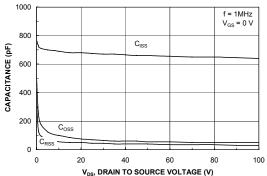


Figure 7. Gate Charge Characteristics.

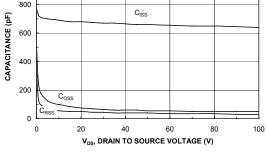
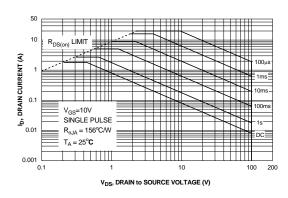


Figure 8. Capacitance Characteristics.



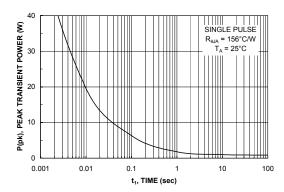


Figure 9. Maximum Safe Operating Area.



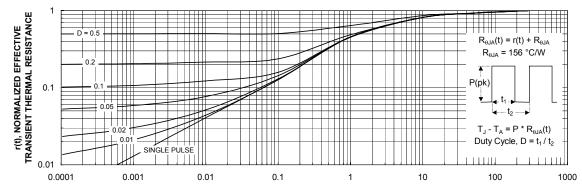
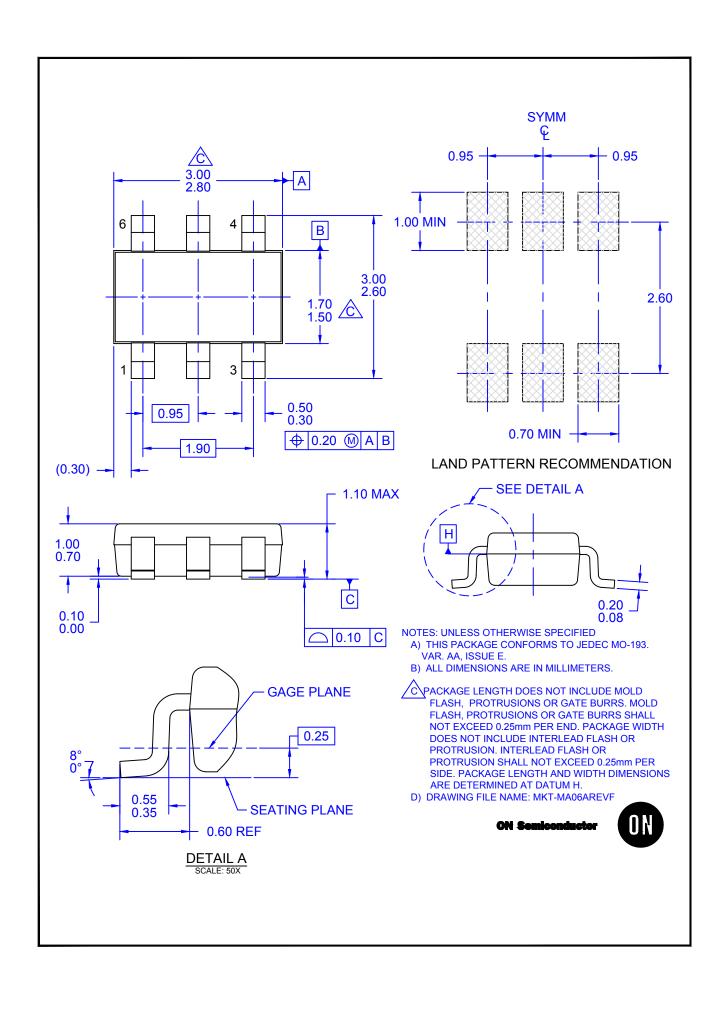


Figure 11. Transient Thermal Response Curve.

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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