February 2004



FDD6612A/FDU6612A

30V N-Channel PowerTrench^o 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 $R_{DS(ON)}$, fast switching speed and extremely low $R_{DS(ON)}$ in a small package.

Applications

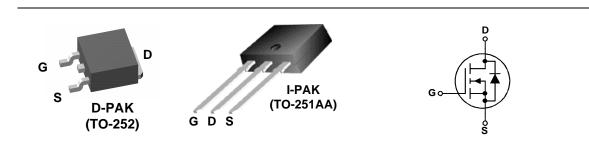
- DC/DC converter
- Motor Drives

Features

• 30 A, 30 V
$$R_{DS(ON)} = 20 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$$

 $R_{DS(ON)} = 28 \text{ m}\Omega @ V_{GS} = 4.5 \text{ V}$

- Low gate charge
- Fast Switching
- High performance trench technology for extremely low R_{DS(ON)}



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Para	meter		Ratings	Units
V _{DSS}	Drain-Source Voltage			30	V
V _{GSS}	Gate-Source Voltage			±20	V
ID	Continuous Drain Current	@T _C =25°C	(Note 3)	30	А
		@T _A =25°C	(Note 1a)	9.5	
		Pulsed	(Note 1a)	60	
P _D	Power Dissipation	@T _C =25°C	(Note 1)	36	W
		@T _A =25°C	(Note 1a)	2.8	
		@T _A =25°C	(Note 1b)	1.3	
T _J , T _{STG}	Operating and Storage Junction Temperature Range			-55 to +175	°C

$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	3.9	°C/W
R _{0JA}	Thermal Resistance, Junction-to-Ambient	(Note 1a)	45	°C/W
$R_{ ext{ hetaJA}}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape width	Quantity
FDD6612A	FDD6612A	D-PAK (TO-252)	13"	12mm	2500 units
FDU6612A	FDU6612A	I-PAK (TO-251)	Tube	N/A	75

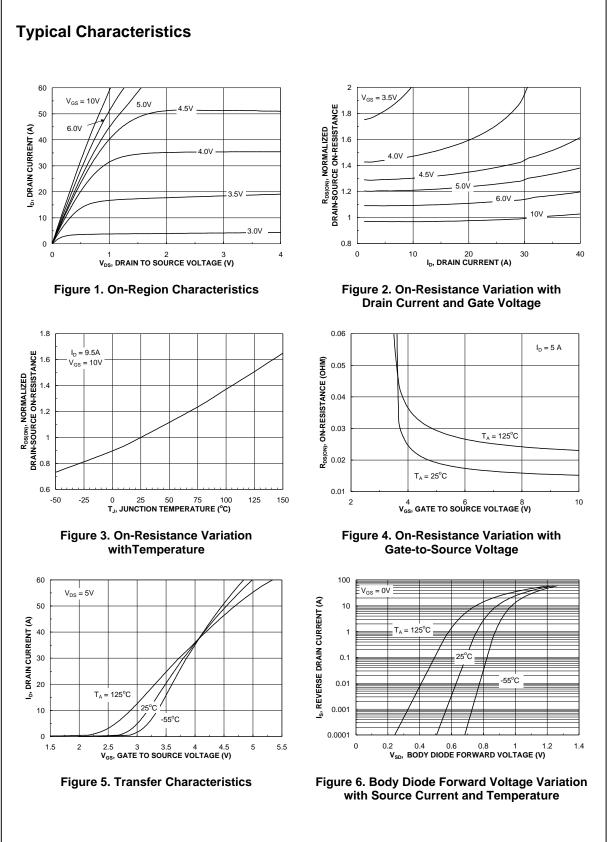
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Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Drain-Sc	ource Avalanche Ratings (Not	e 2)				
W _{DSS}	Drain-Source Avalanche Energy	Single Pulse, $V_{DD} = 27 \text{ V}$, $I_D = 10 \text{ A}$			51	mJ
I _{AR}	Drain-Source Avalanche Current				10	А
Off Char	acteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 V$, $I_D = 250 \mu A$	30			V
$\Delta BV_{DSS} \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		25		mV/°C
IDSS	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 24 \text{ V}, \qquad V_{\text{GS}} = 0 \text{ V}$			1	μΑ
I _{GSS}	Gate-Body Leakage	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$			±100	nA
On Char	acteristics (Note 2)					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \ \mu A$	1	2.0	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250 \ \mu\text{A}, \text{Referenced to } 25^\circ\text{C}$		-5.1		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	$ \begin{array}{ll} V_{GS} = 10 \; V, & I_D = 9.5 \; A \\ V_{GS} = 4.5 \; V, & I_D = 8 \; A \\ V_{GS} = 10 \; V, & I_D = 9.5 \; A, \; T_J \!=\! 125^\circ \! C \end{array} $		15 20 23	20 28 33	mΩ
g fs	Forward Transconductance	$V_{DS} = 5 V$, $I_D = 9.5 A$		28		S
Dynamic	Characteristics					
C _{iss}	Input Capacitance			660		pF
Coss	Output Capacitance	$V_{DS} = 15 V$, $V_{GS} = 0 V$,		170		pF
Crss	Reverse Transfer Capacitance	f = 1.0 MHz		90		pF
R _G	Gate Resistance	V _{GS} = 15 Mv, f = 1.0 MHz		2.3		Ω
Switchir	g Characteristics (Note 2)					
t _{d(on)}	Turn–On Delay Time			9	18	ns
t _r	Turn–On Rise Time	$V_{DD} = 15 V, I_D = 1 A,$		5	10	ns
t _{d(off)}	Turn–Off Delay Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$		24	38	ns
t _f	Turn–Off Fall Time	1		4	8	ns
Q _g	Total Gate Charge			6.7	9.4	nC
Q _{gs}	Gate-Source Charge	$V_{DS} = 15 V$, $I_D = 9.5 A$, $V_{GS} = 5 V$		2.1		nC
Q _{gd}	Gate-Drain Charge	- v _{GS} - J v		2.7		nC

V_{SD} Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}, \text{ I}_S = 2.3 \text{ A}$ (Note 2)0.81.2VrrDiode Reverse Recovery TimeIF = 9.5 A, diF/dt = 100 A/µs20nS	Asimum Continuous Drain–Source Diode Forward Current 2.3 A I_{SD} Drain–Source Diode Forward $V_{GS} = 0$ V, $I_S = 2.3$ A (Note 2) 0.8 1.2 V I_{SD} Diode Reverse Recovery Time IF = 9.5 A, diF/dt = 100 A/µs 20 nS I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nS I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nS I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nS I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nC I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nC I_{TT} Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs b) $R_{0,A} = 96^{\circ}C/W$ when mounting surface of e drain pins. $R_{0,A}$ is determined by the user's board design. If $R_{0,A} = 96^{\circ}C/W$ when mounted on a 1in ² pad of 2 oz copper If $R_{0,A} = 96^{\circ}C/W$ when mounted on a minimum pad. cale 1 : 1 on letter size paper a) $R_{0,A} = 45^{\circ}C/W$ when mounted on a minimum pad. If $R_{0,A} = 96^{\circ}C/W$ when mounted on a minimum pad. Ataximum current is calculated as: $\frac{P_0$	Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
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Vsp. Drain–Source Diode Forward Voltage V _{GS} = 0 V, I _S = 2.3 A (Note 2) 0.8 1.2 V rr Diode Reverse Recovery Time IF = 9.5 A, diF/dt = 100 A/µs 20 nS Qrr Diode Reverse Recovery Charge 10 nC es: e_{04A} 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 one drain pins. R_{04C} is guaranteed by design while R_{0CA} is determined by the user's board design. b) $R_{04A} = 96^{\circ}C/W$ when mounted on a $1in^2$ pad of 2 oz copper b) $R_{04A} = 96^{\circ}C/W$ when mounted on a minimum pad. iscale 1 : 1 on letter size paper $\sqrt{\frac{P_D}{R_{DS(0N)}}}$ $\sqrt{\frac{P_D}{R_{DS(0N)}}$	SD Drain-Source Diode Forward Voltage $V_{GS} = 0$ V, $I_S = 2.3$ A (Note 2) 0.8 1.2 V r Diode Reverse Recovery Time IF = 9.5 A, diF/dt = 100 A/µs 20 nS trr Diode Reverse Recovery Charge IF = 9.5 A, diF/dt = 100 A/µs 20 nS as: as: 10 nC as: as: as: R _{0JA} is determined by the user's board design. b) R _{0JA} = 96°C/W when mounting surface of erain pins. R _{0JC} is guaranteed by design while R _{0CA} is determined by the user's board design. b) R _{0JA} = 96°C/W when mounted on a 1in ² pad of 2 oz copper b) R _{0JA} = 96°C/W when mounted on a minimum pad. cale 1 : 1 on letter size paper $\sqrt{\frac{P_D}{R_{DS(0N)}}}$ $\sqrt{\frac{P_D}{R_{DS(0N)}}$ $\sqrt{\frac{P_D}{R_{DS(0N)}}$ $\sqrt{\frac{P_D}{R_{DS(0N)}}$	S					2.3	А
Qrr Diode Reverse Recovery Charge 10 nC es: ReLA 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 or the drain pins. R_{eUC} is guaranteed by design while R_{eCA} is determined by the user's board design. b) ReLA = 96°C/W when mounted on a 1in ² pad of 2 oz copper b) ReLA = 96°C/W when mounted on a minimum pad. Scale 1 : 1 on letter size paper a) $R_{eLA} = 45°C/W$ when mounted on a $1in^2$ pad of 2 oz copper b) $R_{eLA} = 96°C/W$ when mounted on a minimum pad. Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$ $\sqrt{\frac{P_D}{R_{DS(ON)}}$ $\sqrt{\frac{P_D}{R_{DS(ON)}}$	Image: Diode Reverse Recovery Charge 10 nC as: BAA 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 e drain pins. R_{eJC} is guaranteed by design while R_{eCA} is determined by the user's board design. b) $R_{eJA} = 96^{\circ}C/W$ when mounted on a $1in^2$ pad of 2 oz copper b) $R_{eJA} = 96^{\circ}C/W$ when mounted on a minimum pad. cale 1 : 1 on letter size paper ulse Test: Pulse Width < 300 µs, Duty Cycle < 2.0%	/ _{SD}				0.8	1.2	V
es: R_{aJA} 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_{aJC} is guaranteed by design while R_{aCA} is determined by the user's board design. a $R_{aJA} = 45^{\circ}$ C/W when mounted on a $1in^2$ pad of 2 oz copper b $R_{aJA} = 96^{\circ}$ C/W when mounted on a minimum pad. b $R_{aJA} = 96^{\circ}$ C/W when mounted on a minimum pad. b $R_{aJA} = 96^{\circ}$ C/W when mounted on a minimum pad. b $R_{aJA} = 96^{\circ}$ C/W when mounted on a minimum pad.	a b b c c e drain pins. $R_{\theta,UC}$ is guaranteed by design while $R_{\theta,CA}$ is determined by the user's board design. a a a b b b b c b c c c c c c c c	rr	Diode Reverse Recovery Time	IF = 9.5 A, diF/dt = 100 A/µs		20		nS
r_{eJA} 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_{eJC} is guaranteed by design while R_{eCA} is determined by the user's board design. a) $R_{eJA} = 45^{\circ}$ C/W when mounted on a 1 in ² pad of 2 oz copper b) $R_{eJA} = 96^{\circ}$ C/W when mounted on a 1 in ² pad of 2 oz copper b) $R_{eJA} = 96^{\circ}$ C/W when mounted on a minimum pad. B cale 1 : 1 on letter size paper Pulse Test: Pulse Width < 300 µs, Duty Cycle < 2.0% Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$	And 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 e drain pins. R_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design. (a) $R_{0JA} = 45^{\circ}C/W$ when mounted on a $1in^2$ pad of 2 oz copper (b) $R_{0JA} = 96^{\circ}C/W$ when mounted on a $1in^2$ pad of 2 oz copper (cale 1 : 1 on letter size paper (cale 1 : 1 on letter size paper (cale 1 : 2.0%) (from the calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$	Qrr	Diode Reverse Recovery Charge			10		nC
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Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0% Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$	ulse Test: Pulse Width < 300 μ s, Duty Cycle < 2.0% <i>A</i> aximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$	Scale 1 : 1 on l	etter size paper					
Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$	Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$							
· ·		uise rest. Fui						
· ·		Maximum curr	ent is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$					
		where P _p is m	•	$S_{(20)}$ is at $T_{1(202)}$ and $V_{CS} = 10V$. Package current	limitation is 2	21A		
		Where I Dio III		s(on) to at 1 J(max) and VGS = 1000. I doktage out off	infinitation to 2			

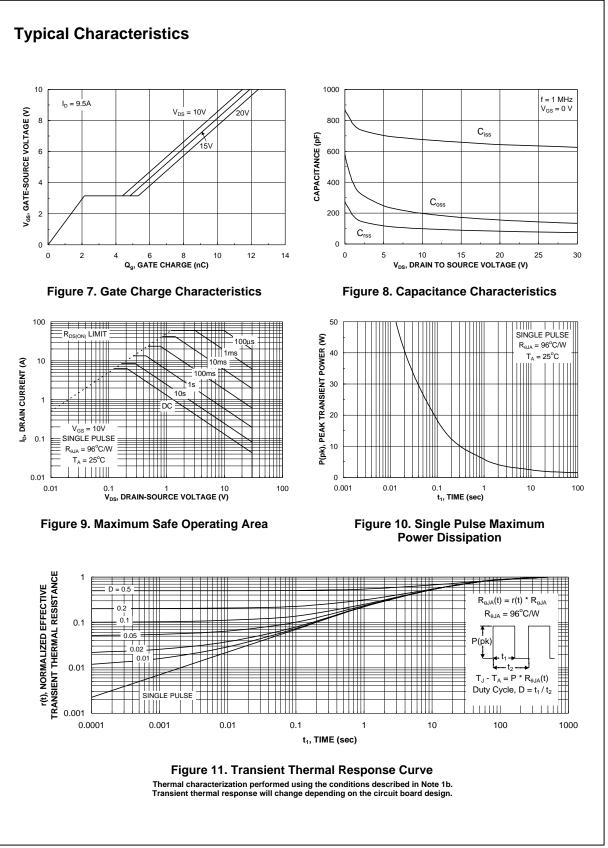
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