FDD6296/FDU6296

30V N-Channel Fast Switching PowerTrench® MOSFET

General Description

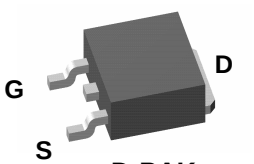
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

Applications

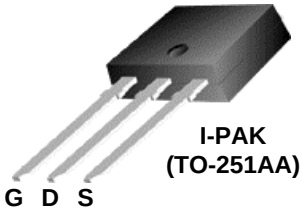
- DC/DC converter
- Power management

Features

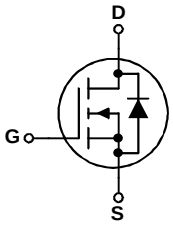
- 50A, 30 V $R_{DS(ON)}$ = 8.8 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 11.3 mΩ @ V_{GS} = 4.5 V
- Low gate charge
- Fast switching
- High performance trench technology for extremely low $R_{DS(ON)}$



D-PAK
(TO-252)



I-PAK
(TO-251AA)



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	
I_D	Continuous Drain Current	@T_C=25°C	(Note 3)	50	A
		@T_A=25°C	(Note 1a)	15	
		Pulsed	(Note 1a)	100	
P_D	Power Dissipation	@T_C=25°C	(Note 3)	52	W
		@T_A=25°C	(Note 1a)	3.8	
		@T_A=25°C	(Note 1b)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			–55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	2.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	40	
	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape width	Quantity
FDD6296	FDD6296	D-PAK (TO-252)	13''	12mm	2500 units
FDU6296	FDU2696	I-PAK (TO-251)	Tube	N/A	75

Electrical Characteristics

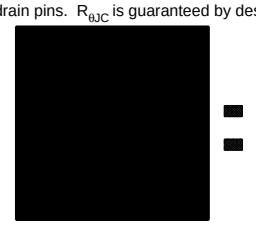
T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 2)						
E_{AS}	Drain-Source Avalanche Energy	Single Pulse, V_{DD} = 15 V, I_D=15A			165	mJ
I_{AS}	Drain-Source Avalanche Current				15	A
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		29		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	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	1.7	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		–0.5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 15 A V_{GS} = 4.5 V, I_D = 13 A V_{GS} = 10 V, I_D = 15 A, T_J=125°C		7.5 9.0 9.3	8.8 11.3 15.0	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 15 A		58		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		1440		pF
C_{oss}	Output Capacitance			400		pF
C_{rss}	Reverse Transfer Capacitance			140		pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		1.3		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		11	19	ns
t_r	Turn–On Rise Time			6	11	ns
$t_{d(off)}$	Turn–Off Delay Time			29	46	ns
t_f	Turn–Off Fall Time			13	23	ns
Q_g	Total Gate Charge	V_{DS} = 15V, I_D = 15 A, V_{GS} = 10 V		22.5	31.5	nC
Q_g	Total Gate Charge	V_{DS} = 15V, I_D = 15 A, V_{GS} = 5 V		12.2	17	nC
Q_{gs}	Gate–Source Charge			4		nC
Q_{gd}	Gate–Drain Charge			3.5		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				3.2	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 3.2 A (Note 2)		0.74	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 15 A, d_{iF}/d_t = 100 A/μs		25		nS
Q_{rr}	Diode Reverse Recovery Charge			13		nC

Electrical Characteristics (cont'd)

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) $R_{\theta JA}$ = 40°C/W when mounted on a 1in^2 pad of 2 oz copper

b) $R_{\theta JA}$ = 96°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%

3. Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$ where P_D is maximum power dissipation at T_C = 25°C and $R_{DS(on)}$ is at $T_{J(max)}$ and V_{GS} = 10V. Package current limitation is 21A

Typical Characteristics

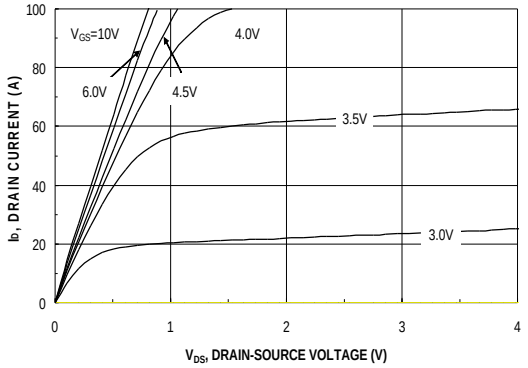


Figure 1. On-Region Characteristics

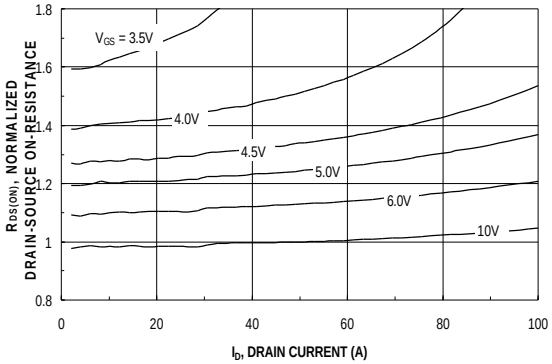


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

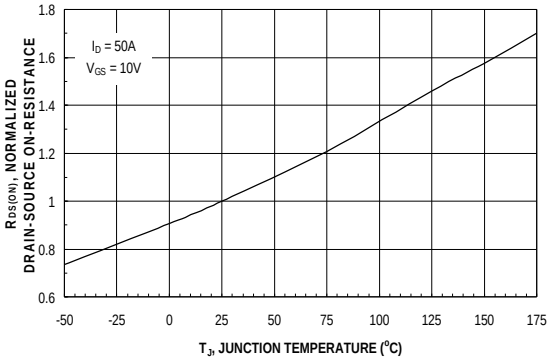


Figure 3. On-Resistance Variation with Temperature

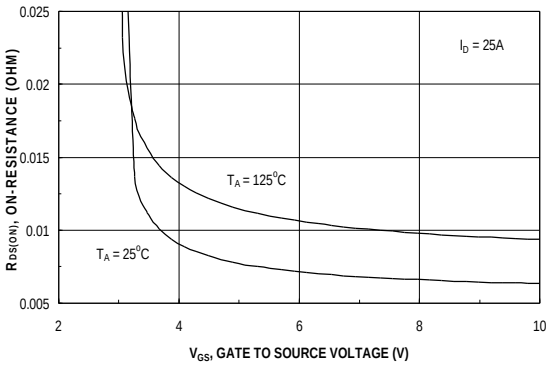


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

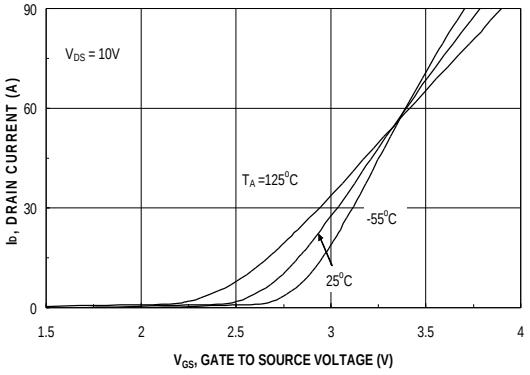


Figure 5. Transfer Characteristics

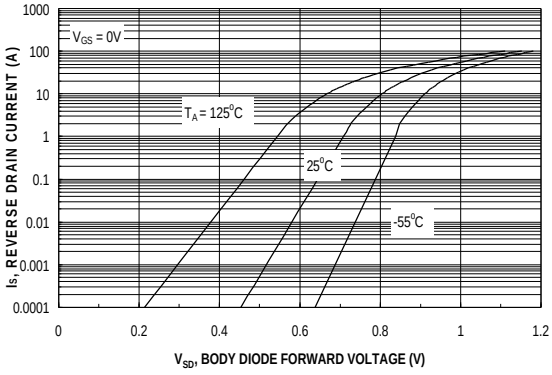


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature