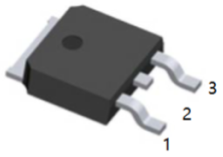
General Description

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.

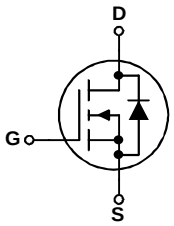


1.G 2.D 3.S

TO-252(DPAK) top view

Applications

- DC/DC converter
- Motor Drives



Features

- V_{DS}(V) = 30V
- I_D =56A (V_{GS}= 10V)
- $R_{DS(ON)}$ <9.5mΩ (V_{GS} = 10V)
- $R_{DS(ON)}$ <13mΩ (V_{GS} = 4.5V)
- Low gate charge
- Fast Switching

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	Continuous Drain Current	@T_C=25°C	(Note 3)	56	A
		@T_A=25°C	(Note 1a)	14	
		Pulsed	(Note 1a)	100	
P_D	Power Dissipation	@T_C=25°C	(Note 3)	60	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

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	45	
$R_{\theta JA}$		(Note 1b)	96	

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
E_{AS}	Drain-Source Avalanche Energy	Single Pulse, V_{DD} = 15 V, I_D= 14A			174	mJ
I_{AS}	Drain-Source Avalanche Current				14	A
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
I_{GSS}	Gate–Body Leakage	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		–5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 14 A V_{GS} = 4.5 V, I_D = 12 A		7.5 9.6	9.5 13	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	50			A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 14 A		56		S
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		1425		pF
C_{oss}	Output Capacitance			350		pF
C_{rss}	Reverse Transfer Capacitance			150		pF
R_G	Gate Resistance	V_{OSC} = 15 mV, f = 1.0 MHz		1.3		pF
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		11	20	ns
t_r	Turn–On Rise Time			9	18	ns
$t_{d(off)}$	Turn–Off Delay Time			31	50	ns
t_f	Turn–Off Fall Time			13	23	ns
Q_g	Total Gate Charge	V_{DS} = 15V, I_D = 14 A, V_{GS} = 5 V		14	20	nC
Q_{gs}	Gate–Source Charge			4		nC
Q_{gd}	Gate–Drain Charge			5		nC

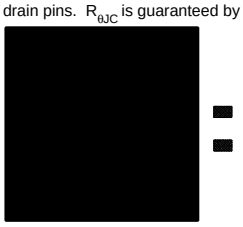
Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.3	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.3 A (Note 2)		0.74	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 14 A, d_{iF}/d_t = 100 A/µs		23		nS
Q_{rr}	Diode Reverse Recovery Charge			11		nC

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) $R_{\theta JA}$ = 45°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

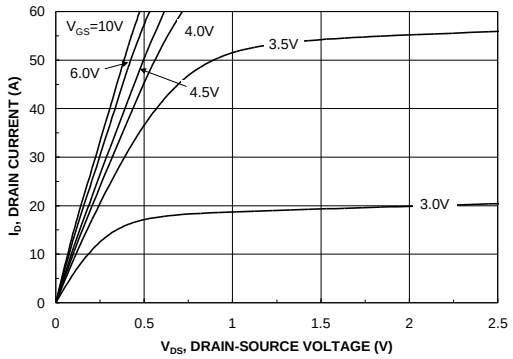


Figure 1. On-Region Characteristics

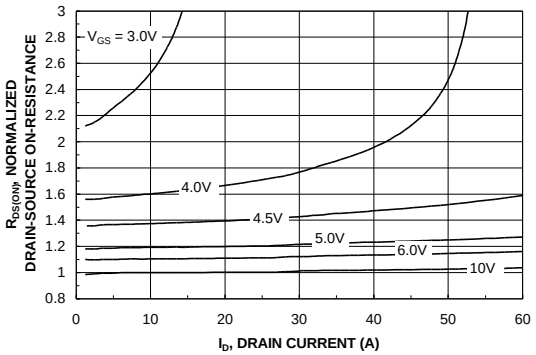


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

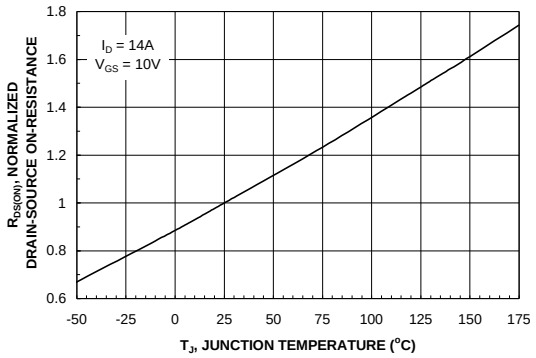


Figure 3. On-Resistance Variation withTemperature

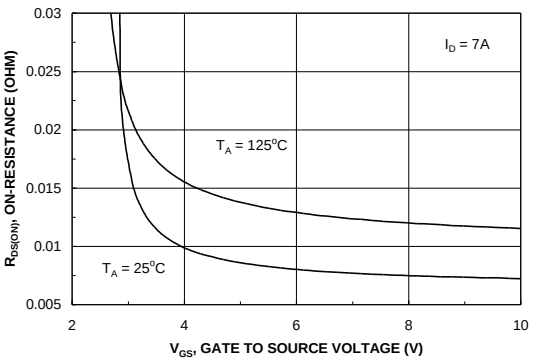


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

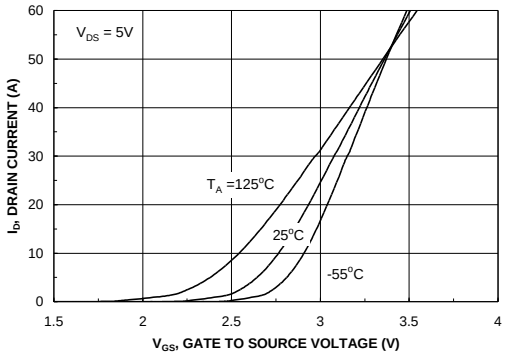


Figure 5. Transfer Characteristics

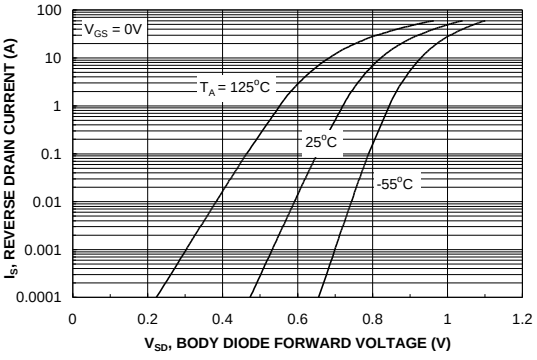


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

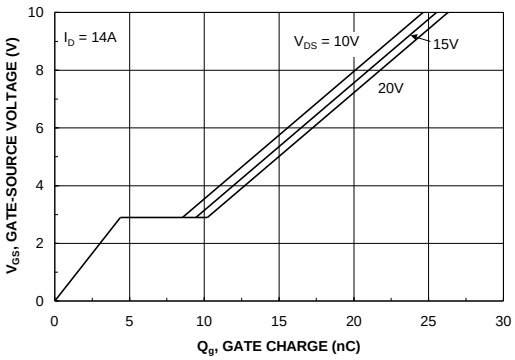


Figure 7. Gate Charge Characteristics

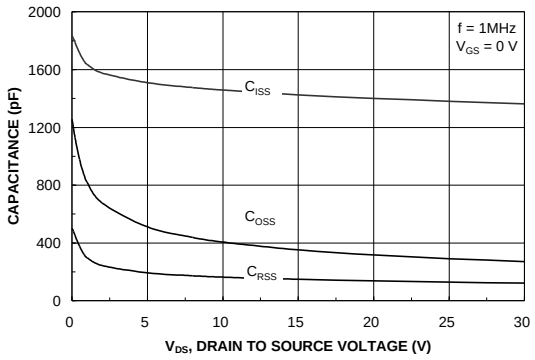


Figure 8. Capacitance Characteristics

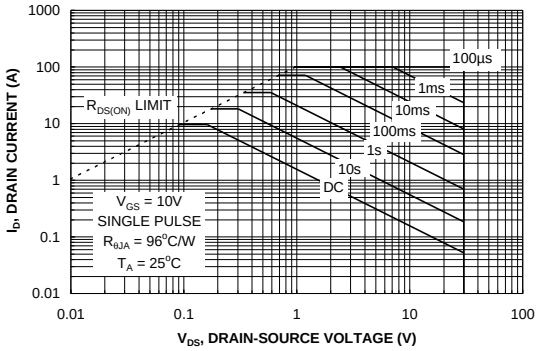


Figure 9. Maximum Safe Operating Area

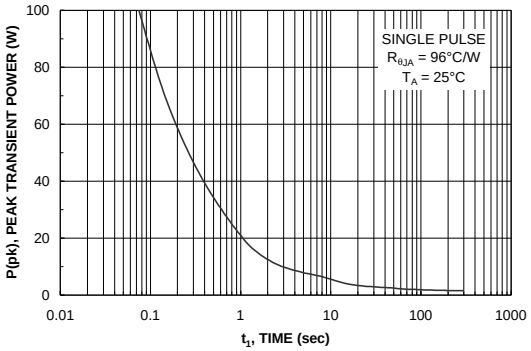


Figure 10. Single Pulse Maximum Power Dissipation

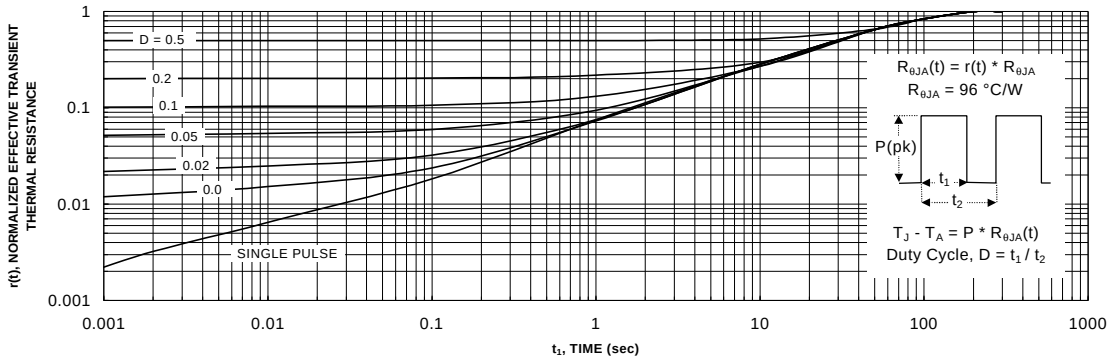
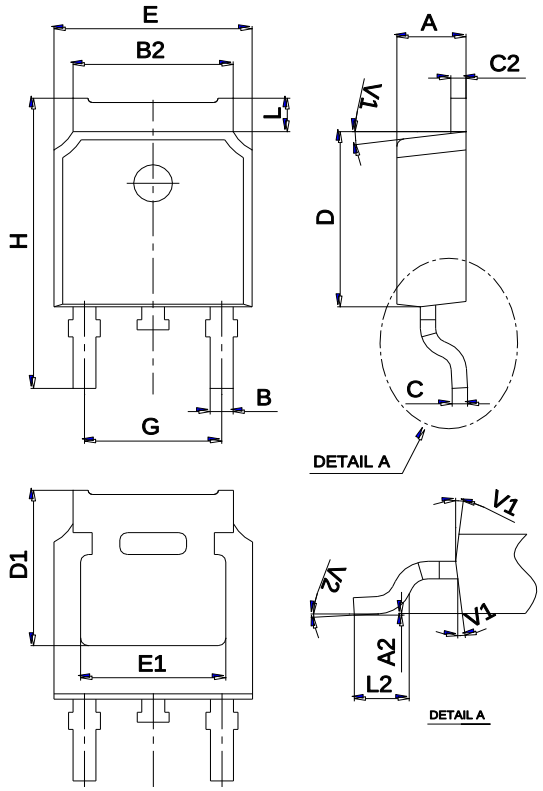


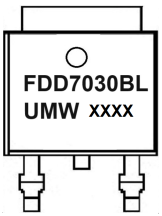
Figure 11. Transient Thermal Response Curve

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

Package Mechanical Data TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW FDD7030BL	TO-252	2500	Tape and reel

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