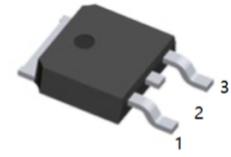


### General Description

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.



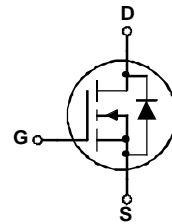
1.G 2.D 3.S  
TO-252(DPAK) top view

### Applications

- DC/DC converter
- Motor Drives

### Features

- $V_{DS}(V) = -30V$
- $R_{DS(ON)} = 8\text{ m}\Omega$  ( $V_{GS} = 10\text{ V}$ )
- $R_{DS(ON)} = 10\text{ m}\Omega$  ( $V_{GS} = 4.5\text{ V}$ )
- Low gate charge
- Fast Switching
- High performance trench technology for extremely low  $R_{DS(ON)}$



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	30	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current @ $T_C=25^\circ\text{C}$ (Note 3) @ $T_A=25^\circ\text{C}$ (Note 1a) Pulsed (Note 1a)	66	A
		15	
		100	
$P_D$	Power Dissipation @ $T_C=25^\circ\text{C}$ (Note 3) @ $T_A=25^\circ\text{C}$ (Note 1a) @ $T_A=25^\circ\text{C}$ (Note 1b)	63	W
		3.2	
		1.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	2.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	40	
$R_{\theta JA}$	(Note 1b)	96	

### Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$E_{AS}$	Drain-Source Avalanche Energy	Single Pulse, $V_{DD} = 15\text{ V}$ , $I_D = 66\text{ A}$			67	mJ
$I_{AS}$	Drain-Source Avalanche Current				66	A
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$	30			V
$\Delta BV_{DSS}$ $\Delta T_j$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		26		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1	1.8	3	V
$\Delta V_{GS(th)}$ $\Delta T_j$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 13\text{ A}$		6.3 7.9	8 10	$\text{m}\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 5\text{ V}$	50			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 15\text{ A}$		60		S
$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$		1755		pF
$C_{oss}$	Output Capacitance			430		pF
$C_{rss}$	Reverse Transfer Capacitance			180		pF
$R_G$	Gate Resistance	$V_{GS} = 15\text{ mV}$ , $f = 1.0\text{ MHz}$		1.3		$\Omega$
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$ , $I_D = 1\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\ \Omega$		11	20	ns
$t_r$	Turn-On Rise Time			12	21	ns
$t_{d(off)}$	Turn-Off Delay Time			29	47	ns
$t_f$	Turn-Off Fall Time			19	34	ns
$Q_g$	Total Gate Charge				16	22
$Q_{gs}$	Gate-Source Charge	$V_{DS} = 15\text{ V}$ , $I_D = 15\text{ A}$ , $V_{GS} = 5\text{ V}$		4.6		nC
$Q_{gd}$	Gate-Drain Charge			6.2		nC

**Electrical Characteristics  $T_A = 25^\circ\text{C}$  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	$V_{GS} = 0\text{ V}, I_S = 2.3\text{ A}$ (Note 2)		0.74	1.2	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 15\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$		28		ns
$Q_{rr}$	Diode Reverse Recovery Charge			18		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)  $R_{\theta JA} = 45^\circ\text{C/W}$  when mounted on a 1in<sup>2</sup> pad of 2 oz copper



b)  $R_{\theta JA} = 96^\circ\text{C/W}$  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  $T_C = 25^\circ\text{C}$  and  $R_{DS(on)}$  is at  $T_{J(max)}$  and  $V_{GS} = 10\text{V}$ . Package current limitation is 21A

Typical Characteristics

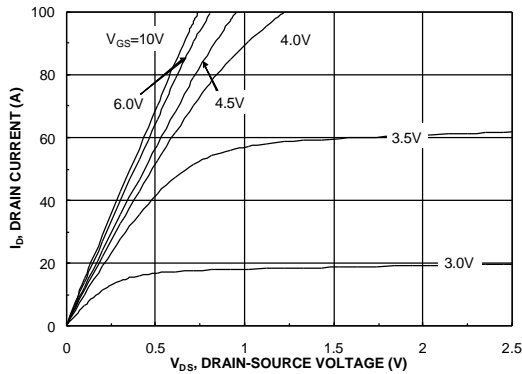


Figure 1. On-Region Characteristics

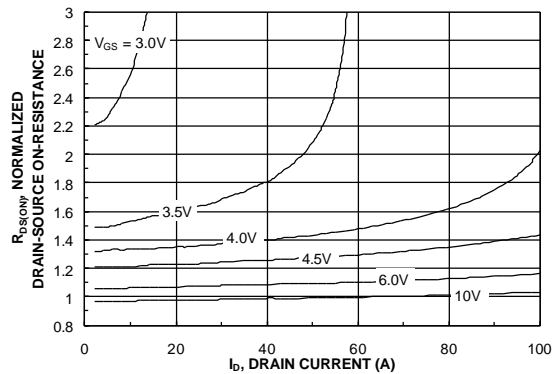


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

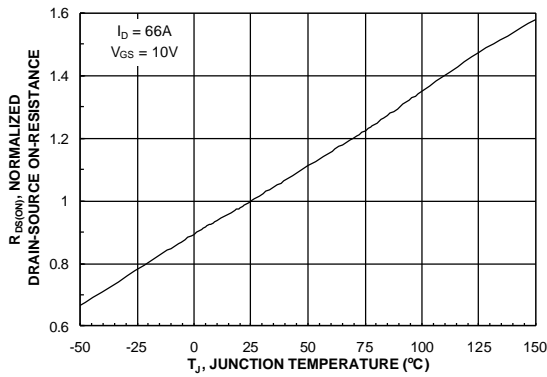


Figure 3. On-Resistance Variation with Temperature

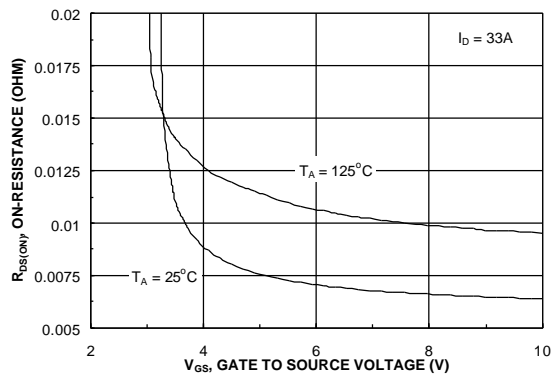


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

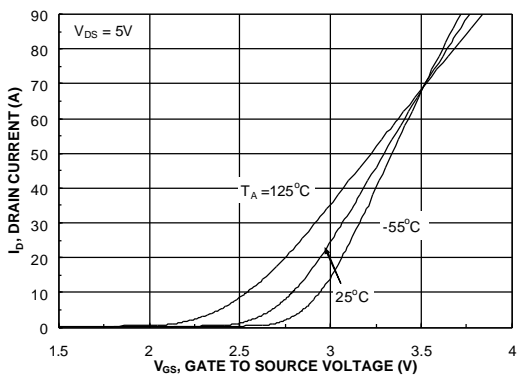


Figure 5. Transfer Characteristics

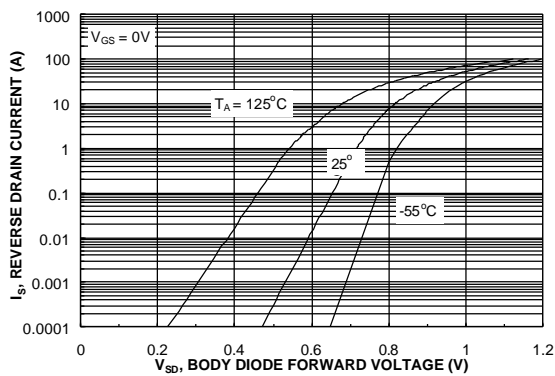


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

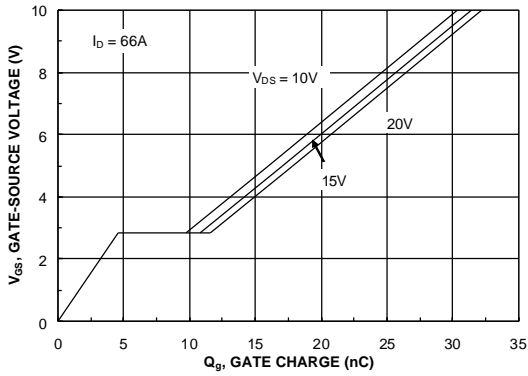


Figure 7. Gate Charge Characteristics

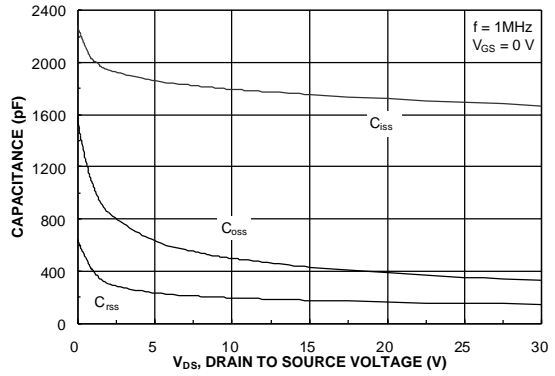


Figure 8. Capacitance Characteristics

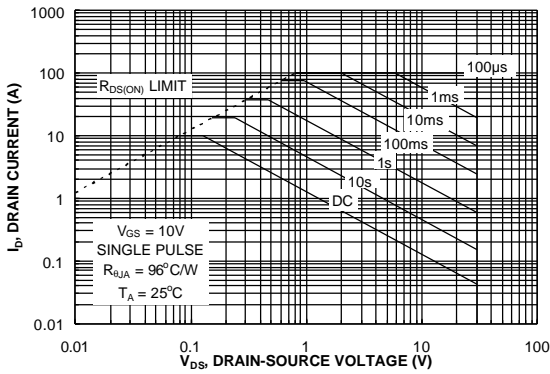


Figure 9. Maximum Safe Operating Area

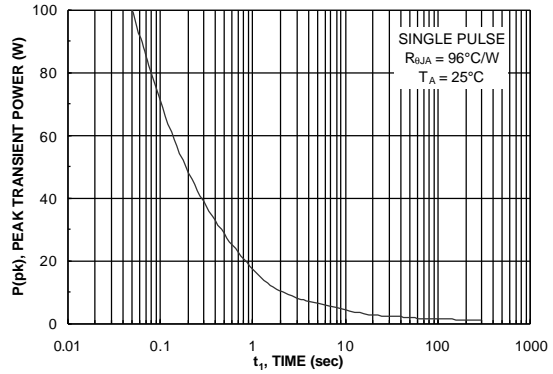


Figure 10. Single Pulse Maximum Power Dissipation

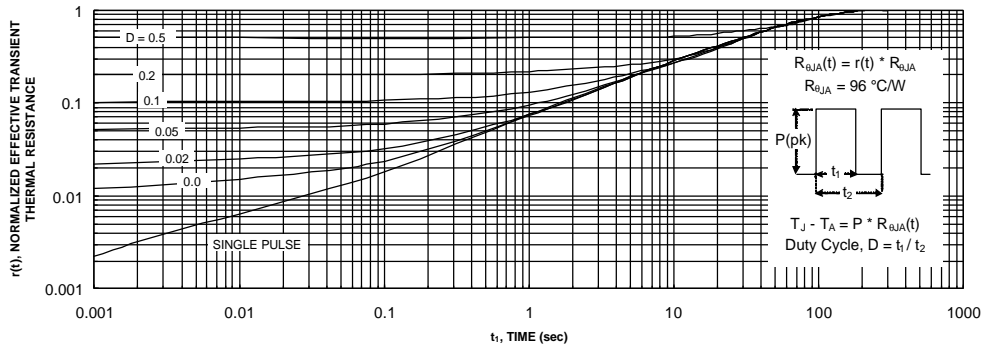
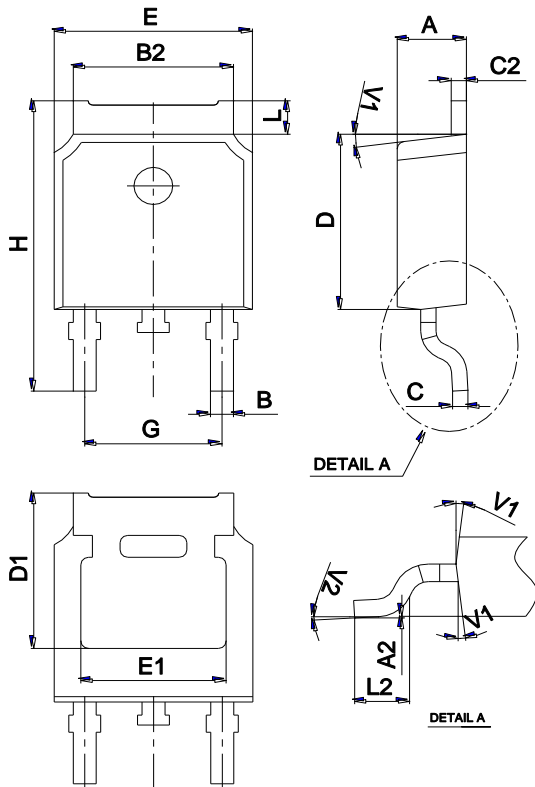


Figure 11. Transient Thermal Response Curve

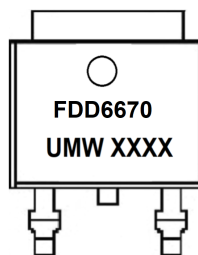
Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

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°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW FDD6670A	TO-252	2500	Tape and reel

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