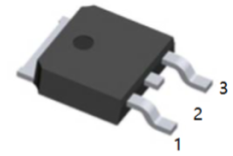


**Features**

- $V_{DS}(V) = 60V$
- $I_D = 17A$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 28m\Omega$  ( $V_{GS} = 10V$ )  
 $R_{DS(ON)} < 40m\Omega$  ( $V_{GS} = 4.5V$ )
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses

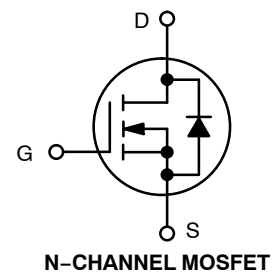


1.G 2.D 3.S  
TO-252(DPAK) top view

**MAXIMUM RATINGS** ( $T_J = 25^\circ C$  unless otherwise noted)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	60	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 16$	V	
Continuous Drain Current $R_{\theta JC}$ (Notes 1 & 3)	Steady State	$T_C = 25^\circ C$	17	A
		$T_C = 100^\circ C$	12	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ C$	18	W
		$T_C = 100^\circ C$	9.0	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2 & 3)	Steady State	$T_A = 25^\circ C$	7.0	A
		$T_A = 100^\circ C$	5.0	
Power Dissipation $R_{\theta JA}$ (Notes 1 & 2)	Steady State	$T_A = 25^\circ C$	2.9	W
		$T_A = 100^\circ C$	1.45	
Pulsed Drain Current	$T_A = 25^\circ C, t_p = 10 \mu s$	$I_{DM}$	77	A
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to 175	$^\circ C$	
Source Current (Body Diode)	$I_S$	20	A	
Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^\circ C, I_{L(pk)} = 1 A$ )	$E_{AS}$	48	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ C$	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



**THERMAL RESISTANCE MAXIMUM RATINGS**

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain) (Note 1)	$R_{\theta JC}$	8.05	$^\circ C/W$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	51.6	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			27		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		10	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

**ON CHARACTERISTICS** (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 15\ \mu\text{A}$	1.2		2.1	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.4		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		23	28	mΩ
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		32	40	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 10\text{ A}$		20		S

**CHARGES, CAPACITANCES AND GATE RESISTANCES**

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		400		pF
Output Capacitance	$C_{oss}$			170		
Reverse Transfer Capacitance	$C_{rss}$			12		
Total Gate Charge	$Q_G(TOT)$	$V_{DS} = 48\text{ V}, I_D = 10\text{ A}$	$V_{GS} = 4.5\text{ V}$	3.4		nC
			$V_{GS} = 10\text{ V}$	7.0		
Threshold Gate Charge	$Q_G(TH)$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 10\text{ A}$		0.9		nC
Gate-to-Source Charge	$Q_{GS}$			1.5		
Gate-to-Drain Charge	$Q_{GD}$			1.1		
Plateau Voltage	$V_{GP}$			2.9		

**SWITCHING CHARACTERISTICS** (Note 5)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 10\text{ A}, R_G = 2.5\ \Omega$		8		ns
Rise Time	$t_r$			42		
Turn-Off Delay Time	$t_{d(off)}$			11		
Fall Time	$t_f$			24		

**DRAIN-SOURCE DIODE CHARACTERISTICS**

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.9	1.2	V
			$T_J = 125^\circ\text{C}$		0.8		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s}, I_S = 10\text{ A}$		17		ns	
Charge Time	$t_a$			8			
Discharge Time	$t_b$			9			
Reverse Recovery Charge	$Q_{RR}$			10			nC

4. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

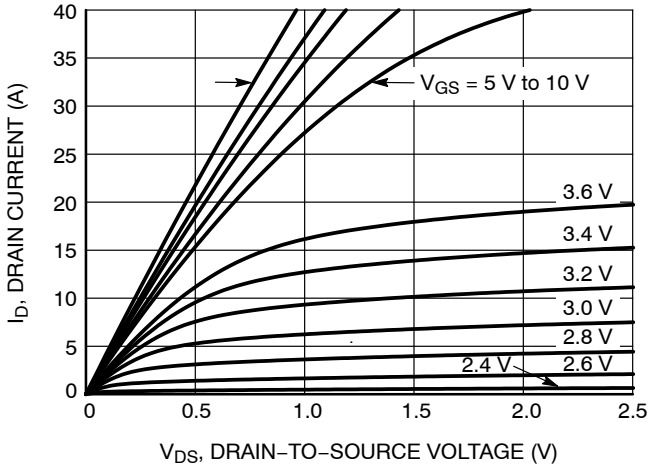


Figure 1. On-Region Characteristics

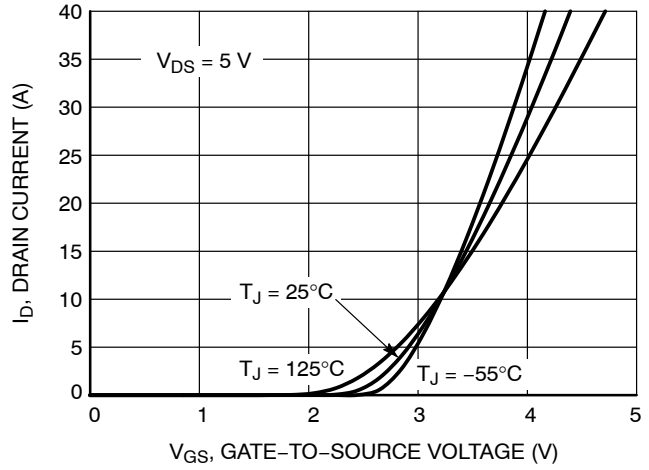


Figure 2. Transfer Characteristics

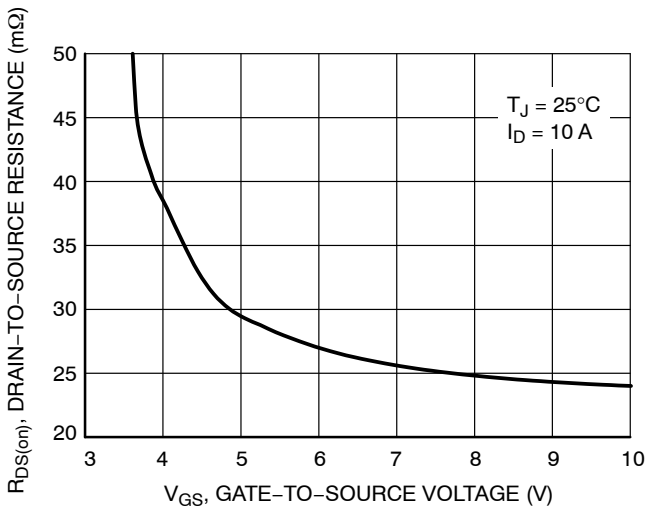


Figure 3. On-Resistance vs. Gate-to-Source Voltage

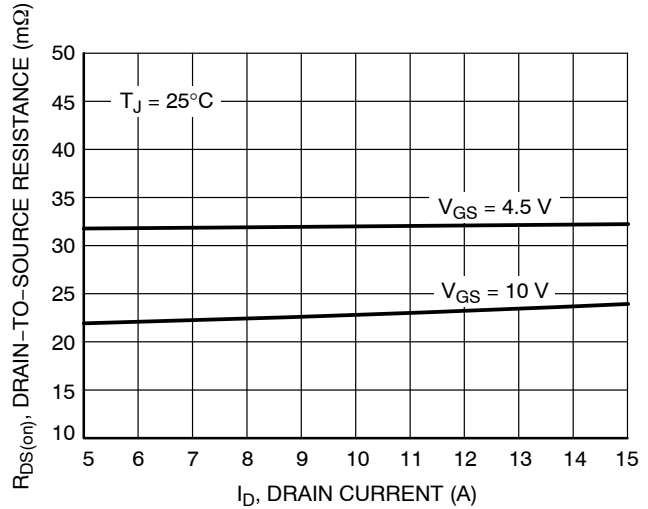


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

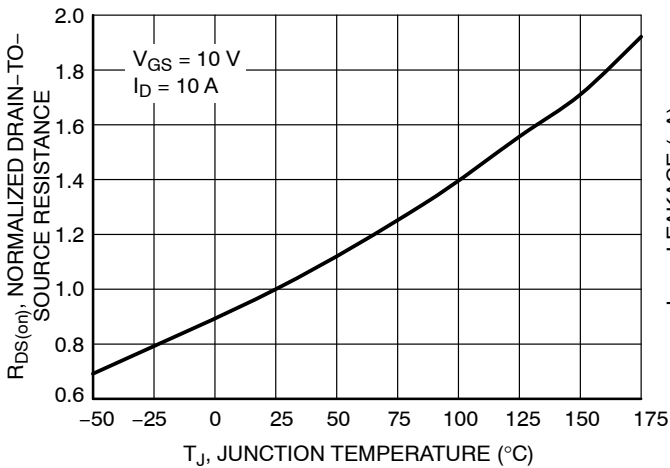


Figure 5. On-Resistance Variation with Temperature

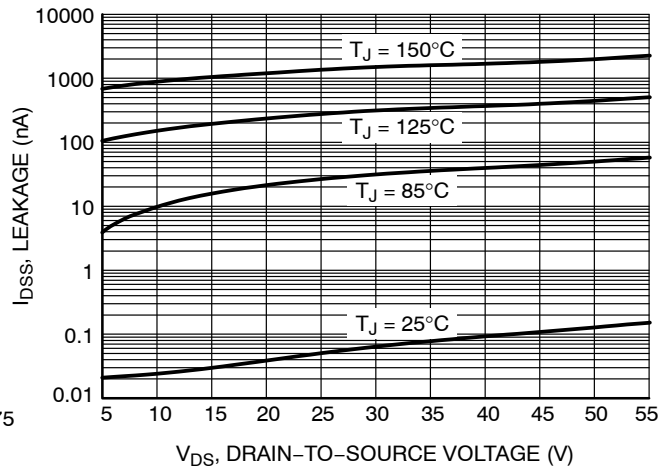


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

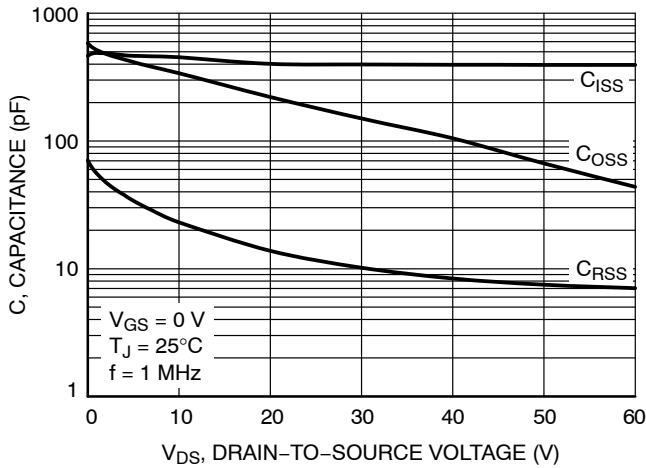


Figure 7. Capacitance Variation

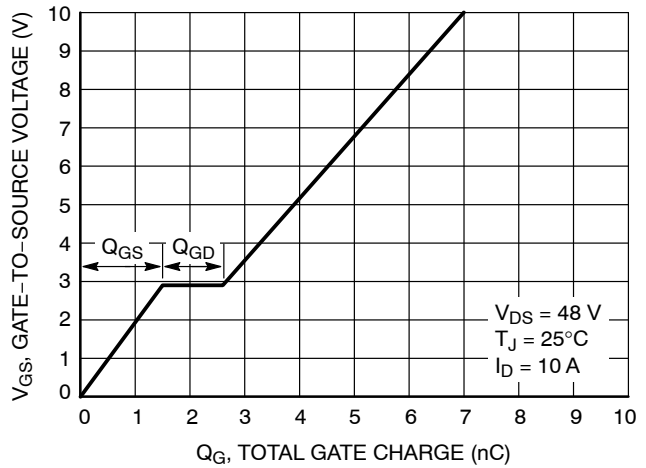


Figure 8. Gate-to-Source vs. Total Charge

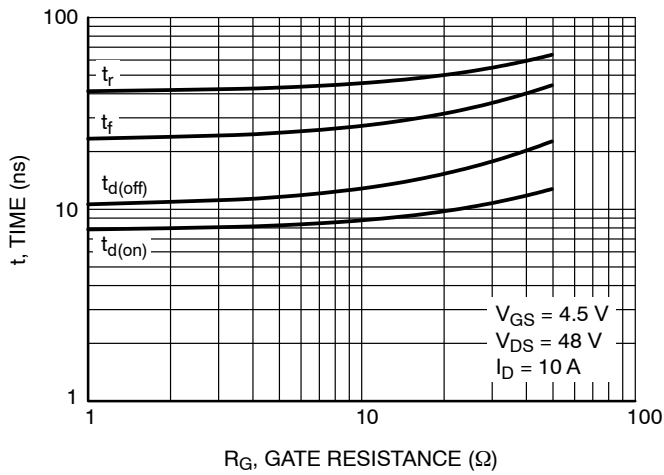


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

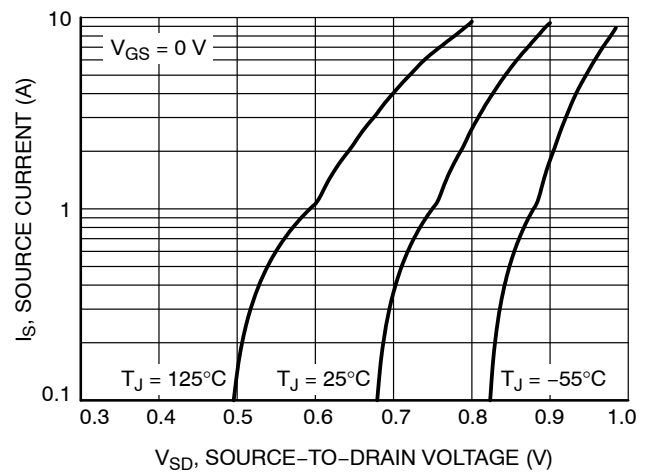


Figure 10. Diode Forward Voltage vs. Current

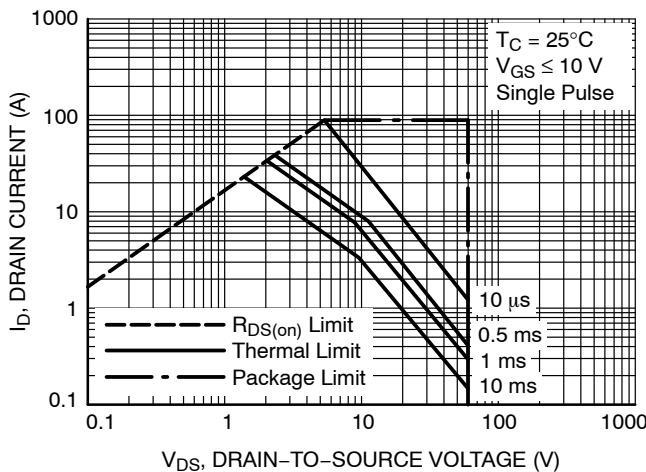


Figure 11. Maximum Rated Forward Biased Safe Operating Area

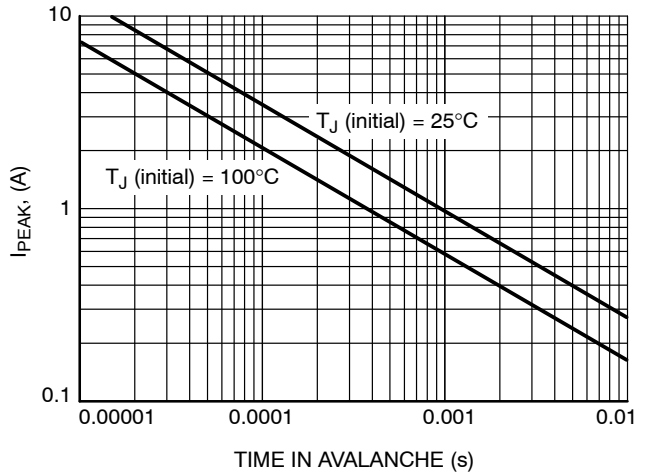


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

TYPICAL CHARACTERISTICS

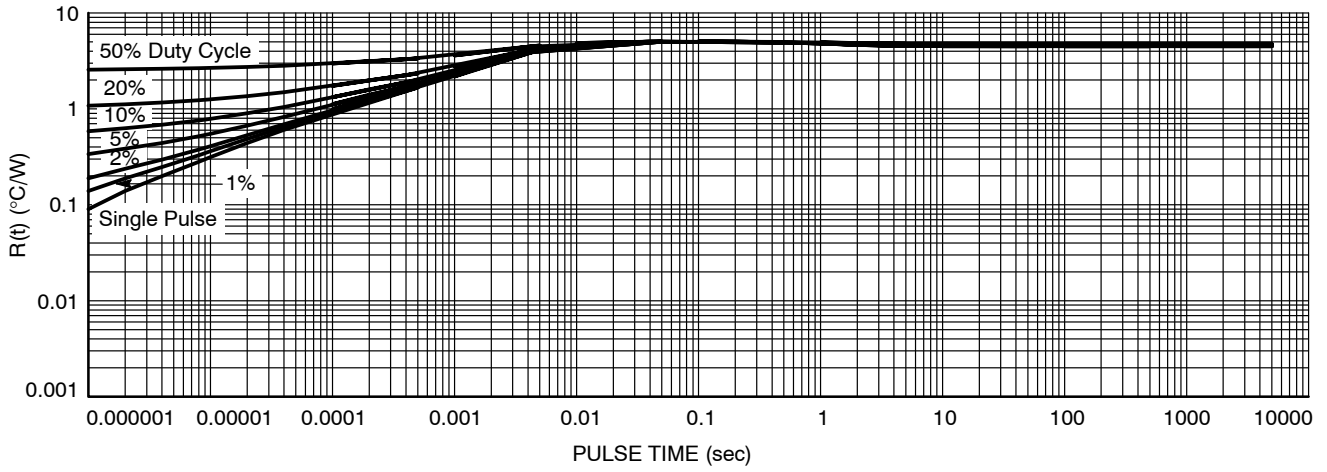
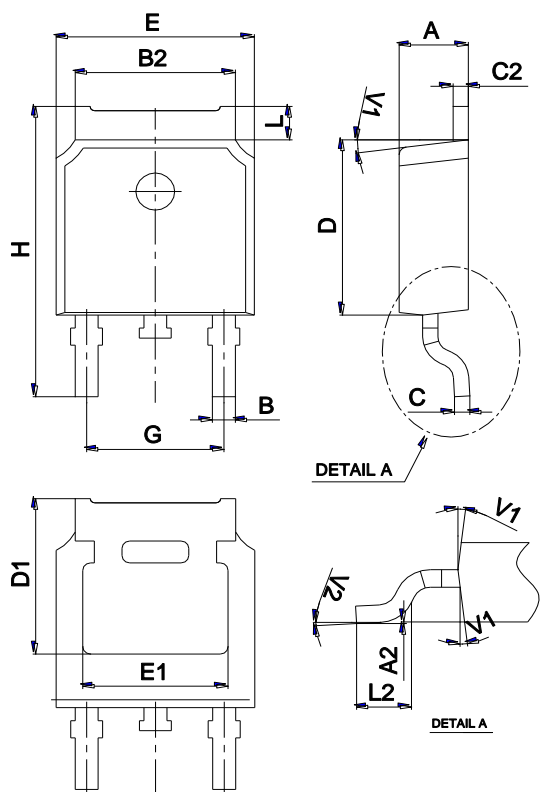


Figure 13. Thermal Response

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 NVD5C688NLT4G	TO-252	2500	Tape and reel

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