UMW NVD5C688NLT4G

60V N-Channel MOSFET

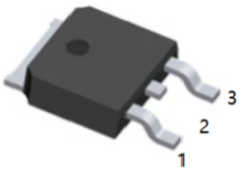
1.Features

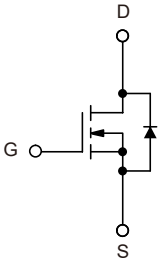
- $V_{DS\ (V)}$=60V
- I_D=17A
- $R_{DS(ON)}$<28mΩ(V_{GS}=10V)
- $R_{DS(ON)}$<30mΩ(V_{GS}=4.5V)
- Low $R_{DS(ON)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses

2.Pinning information

Pin	Symbol	Description
1	G	GATE
2	D	DRAIN
3	S	SOURCE

TO-252(DPAK)
top view





3.Absolute Maximum Ratings T_J= 25°C

Parameter			Symbol	Value	Units
Drain−to−Source Voltage			V_{DSS}	60	V
Gate−to−Source Voltage − Continuous			V_{GS}	±16	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1 & 3)	Steady State	T_C=25°C	I_D	17	A
		T_C=100°C		12	A
Continuous Drain Current ($R_{\theta JC}$) (Note1)		T_C=25°C	P_D	18	W
		T_C=100°C		9	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2 & 3)		T_A=25°C	I_D	7	A
		T_A=100°C		5	A
Power Dissipation $R_{\theta JA}$ (Notes 1 & 2)		T_A=25°C	P_D	2.9	W
		T_A=100°C		1.45	W
Pulsed Drain Current	T_A=25°C, t_p=10μs		I_{DM}	77	A
Operating Junction and Storage Temperature			T_J,T_{STG}	-55 to 175	°C

Source Current (Body Diode)	I_S	20	A
Single Pulse Drain−to−Source Avalanche Energy (T_J=25°C, $I_{L(pk)}$=1A)	E_{AS}	48	mJ
Lead Temperature for Soldering Purposes (1/8” from case for 10 s)	T_L	260	°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.

4.Thermal resistance rating

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

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 mm2, 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.

5.Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=250μA		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_{DS}=0V	T_J=25°C			10	μA
		V_{DS}=60V	T_J=125°C			250	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=20V				100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=15μA		1.2		2.1	V
Negative Temperature Coefficient	$V_{GS(th)}/T_J$				4.4		mV/°C
Drain−to−Source on Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A			20	28	mΩ
		V_{GS}=4.5V, I_D=10A			25	30	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V, I_D=10A			20		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz			400		pF
Output Capacitance	C_{oss}				170		pF
Reverse Transfer Capacitance	C_{rss}				12		pF
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=48V	V_{GS}=4.5V		3.4		nC
		I_D=10A	V_{GS}=10V		7		nC
Threshold Gate Charge	$Q_{G(TH)}$	V_{GS}=4.5V, V_{DS}=48V, I_D=10A			0.9		nC
Gate-to-Source Charge	Q_{GS}				1.5		nC
Gate-to-Drain Charge	Q_{GD}				1.1		nC
Plateau Voltage	V_{GP}				2.9		V

SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(on)}$	V_{GS}=4.5V, V_{DD}=48V I_D=10A, R_G=2.5Ω		8		ns
Rise Time	t_r			42		ns
Turn-Off Delay Time	$t_{D(off)}$			11		ns
Fall Time	t_f			24		ns
DRAIN−SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS}=0V, I_D=10A	T_J=25°C	0.9	1.2	V
			T_J=125°C	0.8		V
Reverse Recovery Time	t_{rr}	V_{GS}=0V, dIs/dt=100A/μs I_S=10A		17		ns
Charge Time	t_a			8		ns
Discharge Time	t_b			9		ns
Reverse Recovery Time	Q_{rr}			10		nC

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

6.1Typical Characterisitics

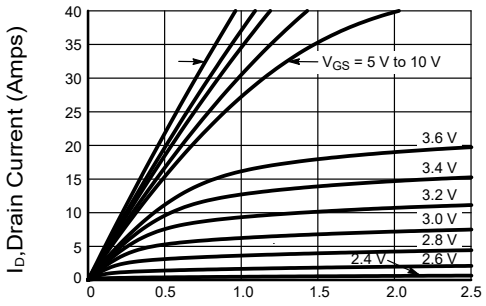


Figure 1: On−Region Characteristics

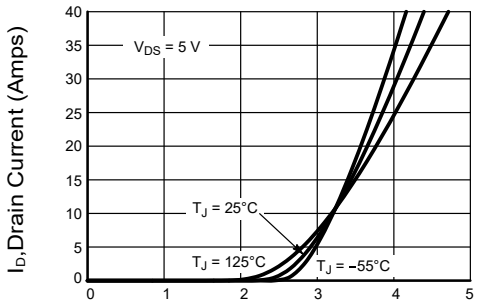


Figure 2: Transfer Characteristics

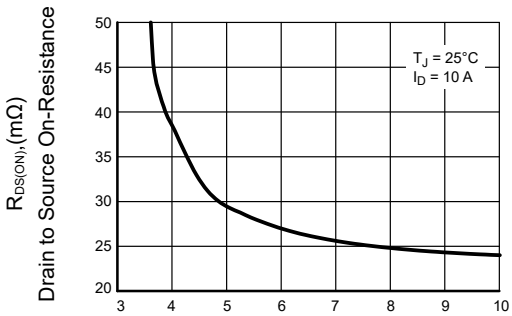


Figure 3: On−Resistance vs. Gate−to−Source Voltage

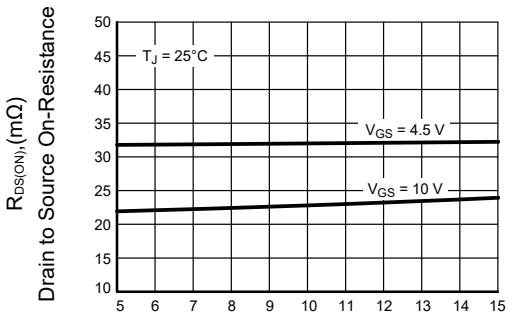


Figure 4: On−Resistance versus Drain Current and Gate Voltage

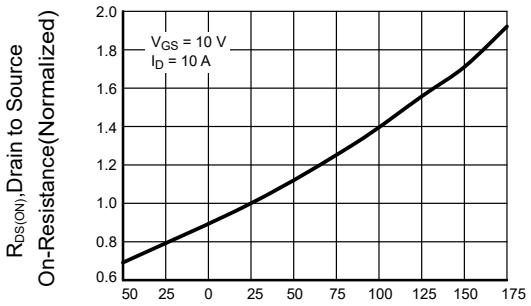


Figure 5: On−Resistance Variation with Temperature

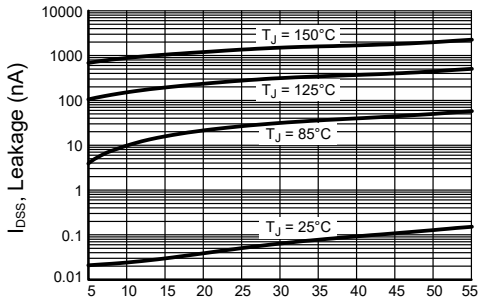
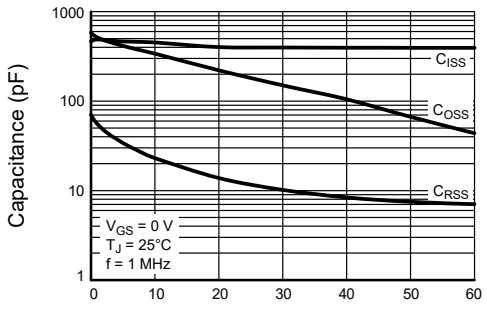


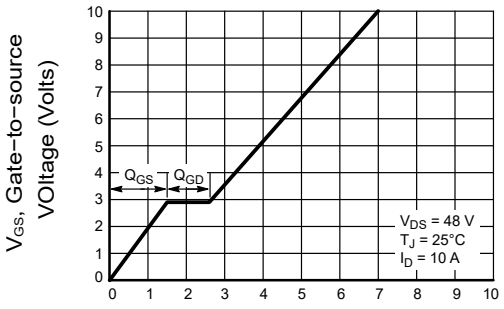
Figure 6: Drain−To−Source Leakage Current versus Voltage

6.2Typical Characterisitics



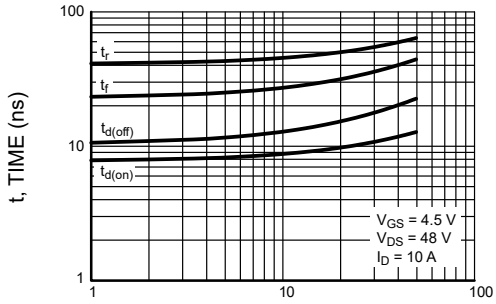
V_{DS},Drain-to-Source Voltage (V)

Figure 7: Capacitance Variation



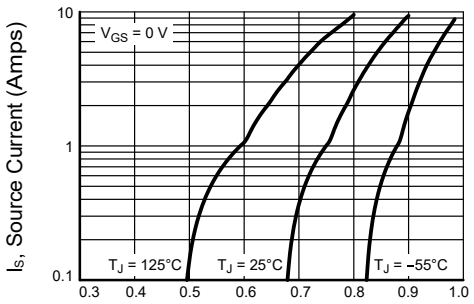
Q_G, Total Gate Charge (nC)

Figure 8: Gate−To−Source and Drain−To−Source Voltage vs. Total Charge



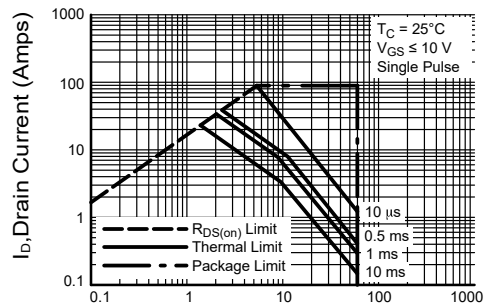
R_G, Gate Resistance (Ω)

Figure 9: Resistive Switching Time Variation vs. Gate Resistance



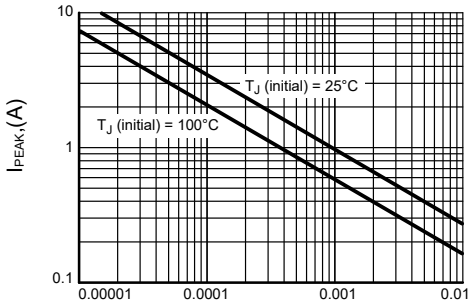
V_{SD}, Source−to−drain Voltage (VOLTS)

Figure 10: On−Resistance versus Drain Current and Gate Voltage



V_{DS}, Drain−to−source Voltage (Volts)

Figure 11: Maximum Rated Forward Biased Safe Operating Area



Time In Avalanche (s)

Figure 12: Maximum Avalanche Energy vs. Starting Junction Temperature

6.3Typical Characterisitics

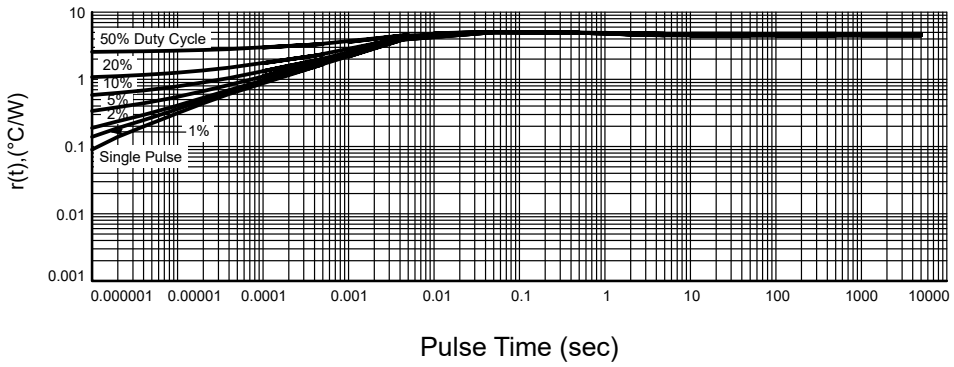
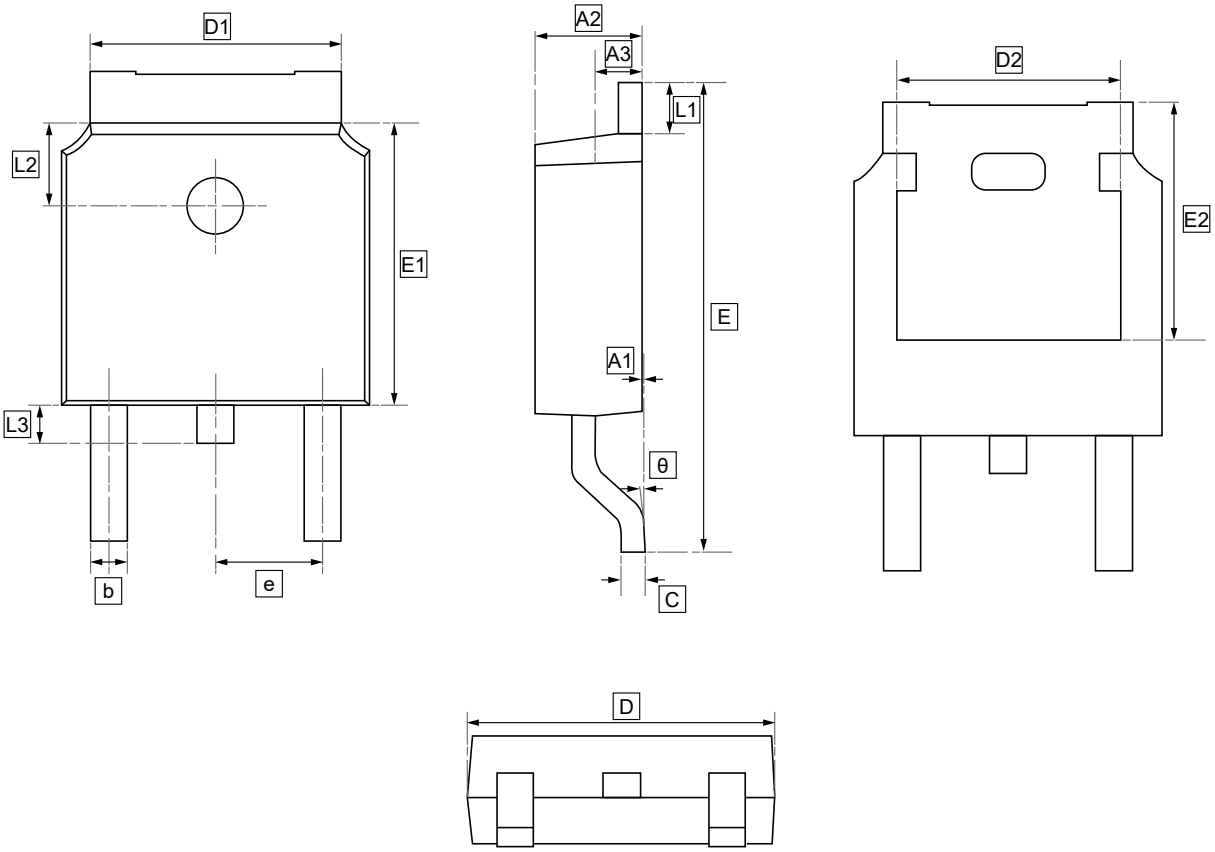


Figure 13: Thermal Response

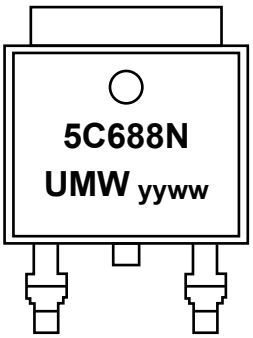
7.TO-252 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38	BSC	1.27	1.90	1.00	8.00

8.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW NVD5C688NLT4G	TO-252	2500	Tape and reel

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