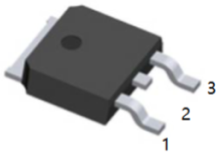
30V N-Channel MOSFET

Features

- Ultra−Low $R_{DS(on)}$, Single Base, Advanced Technology
- SPICE Parameters Available
- Diode is Characterized for use in Bridge Circuits
- I_{DSS} and $V_{(on)}$ Specified at Elevated Temperatures
- High Avalanche Energy Specified

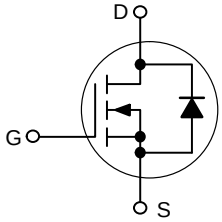


1.G 2.D 3.S

TO-252(DPAK) top view

Typical Applications

- Power Supplies
- Inductive Loads
- PWM Motor Controls



- V_{DS} (V) = 30V
- $R_{DS(ON)}$ < 27mΩ (V_{GS} = 5V)

MAXIMUM RATINGS(T_C = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	30	Vdc
Drain−to−Gate Voltage (R_{GS} = 1.0 MΩ)	V_{DGR}	30	Vdc
Gate−to−Source Voltage − Continuous − Non−Repetitive ($t_p \leq 10$ ms)	 V_{GS} V_{GS}	 ±20 ±24	Vdc
Drain Current − Continuous @ T_A = 25°C − Continuous @ T_A = 100°C − Single Pulse ($t_p \leq 10$ μs)	 I_D I_D I_{DM}	 20 16 60	 Adc Apk
Total Power Dissipation @ T_A = 25°C Derate above 25°C Total Power Dissipation @ T_C = 25°C (Note 1)	P_D	74 0.6 1.75	W W/°CW
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 150	°C
Single Pulse Drain−to−Source Avalanche Energy − Starting T_J = 25°C (V_{DD} = 30 Vdc, V_{GS} = 5 Vdc, L = 1.0 mH, $I_{L(pk)}$ = 24 A, V_{DS} = 34 Vdc)	E_{AS}	288	mJ
Thermal Resistance − Junction−to−Case − Junction−to−Ambient − Junction−to−Ambient (Note 1)	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	 1.67 100 71.4	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	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.

1. When surface mounted to an FR4 board using the minimum recommended pad size and repetitive rating; pulse width limited by maximum junction temperature.

ELECTRICAL CHARACTERISTICS (T_C= 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain−to−Source Breakdown Voltage (Note 2) (V_{GS} = 0 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	30	 43		Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 30 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 30 Vdc, V_{GS} = 0 Vdc, T_J =150°C)	I_{DSS}			 10 100	μAdc
Gate−Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)	I_{GSS}			±100	nAdc
ON CHARACTERISTICS (Note 2)					
Gate Threshold Voltage (Note 2) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0	 1.7 5.0	2.5	Vdc mV/°C
Static Drain−to−Source On−Resistance (Note 2) (V_{GS} = 4.0 Vdc, I_D = 10 Adc) (V_{GS} = 5.0 Vdc, I_D = 10 Adc)	$R_{DS(on)}$		 28 23	 31 27	mΩ
Static Drain−to−Source On−Voltage (Note 2) (V_{GS} = 5.0 Vdc, I_D = 20 Adc) (V_{GS} = 5.0 Vdc, I_D = 10 Adc, T_J = 150°C)	$V_{DS(on)}$		 0.48 0.40	 0.54	Vdc
Forward Transconductance (Note 2) (V_{DS} = 5.0 Vdc, I_D = 10 Adc)	g_{FS}		21		mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}		1005	1260	pF
Output Capacitance		C_{oss}		271	420	
Transfer Capacitance		C_{rss}		87	112	
SWITCHING CHARACTERISTICS (Note 3)						
Turn−On Delay Time	(V_{DD} = 20 Vdc, I_D = 20 Adc, V_{GS} = 5.0 Vdc, R_G = 9.1 Ω) (Note 2)	$t_{d(on)}$		17	25	ns
Rise Time		t_r		137	160	
Turn−Off Delay Time		$t_{d(off)}$		38	45	
Fall Time		t_f		31	40	
Gate Charge	(V_{DS} = 48 Vdc, I_D = 15 Adc, V_{GS} = 10 Vdc) (Note 2)	Q_T		13.8	18.9	nC
		Q_1		2.8		
		Q_2		6.6		
SOURCE−DRAIN DIODE CHARACTERISTICS						
Forward On−Voltage	(I_S = 20 Adc, V_{GS} = 0 Vdc) (Note 2) (I_S = 20 Adc, V_{GS} = 0 Vdc, T_J = 125°C)	V_{SD}		 1.0 0.9	 1.15	Vdc
Reverse Recovery Time	(I_S =15 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 2)	t_{rr}		23		ns
		t_a		13		
		t_b		10		
Reverse Recovery Stored Charge		Q_{RR}		0.017		μC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperature.

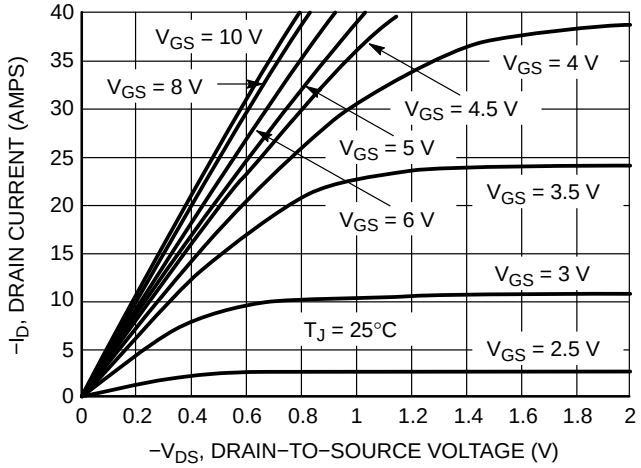


Figure 1. On−Region Characteristics

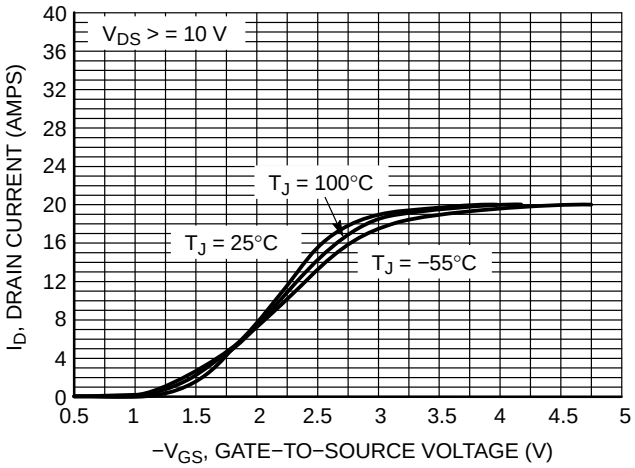


Figure 2. Transfer Characteristics

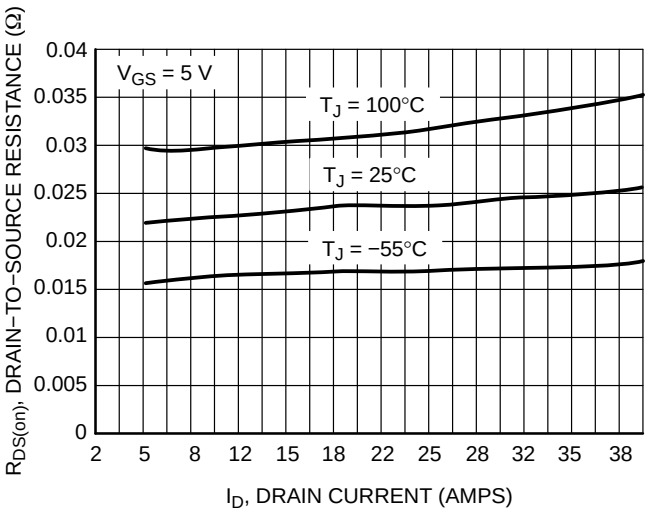


Figure 3. On−Resistance vs. Drain Current and Temperature

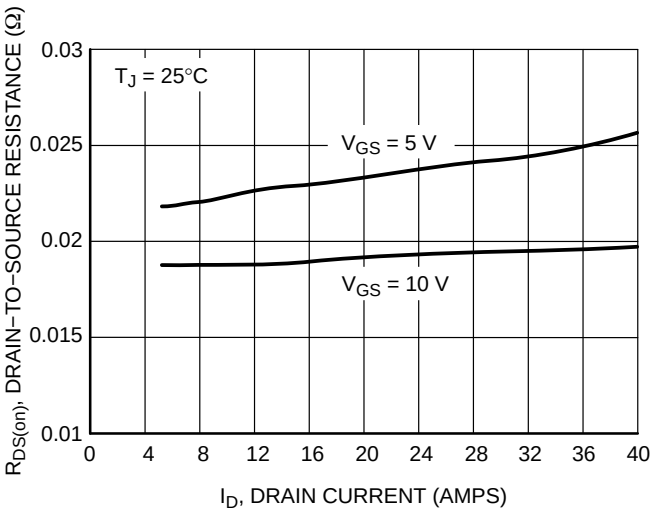


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

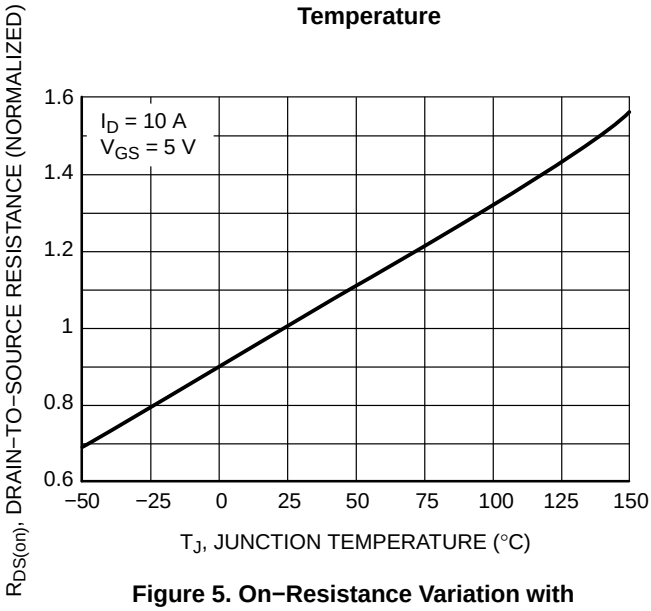


Figure 5. On−Resistance Variation with Temperature

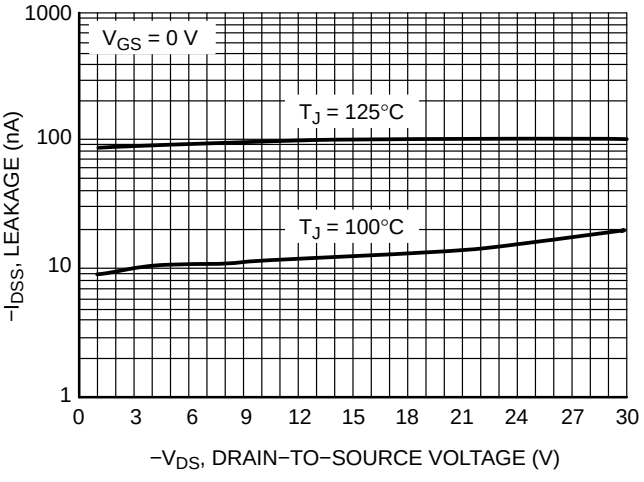


Figure 6. Drain−to−Source Leakage Current vs. Voltage

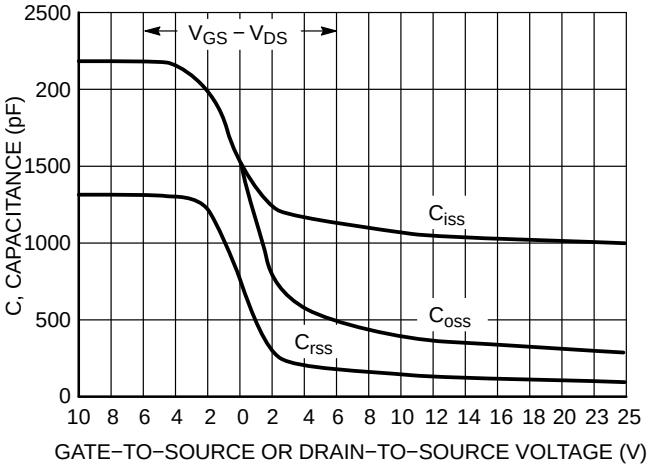


Figure 7. Capacitance Variation

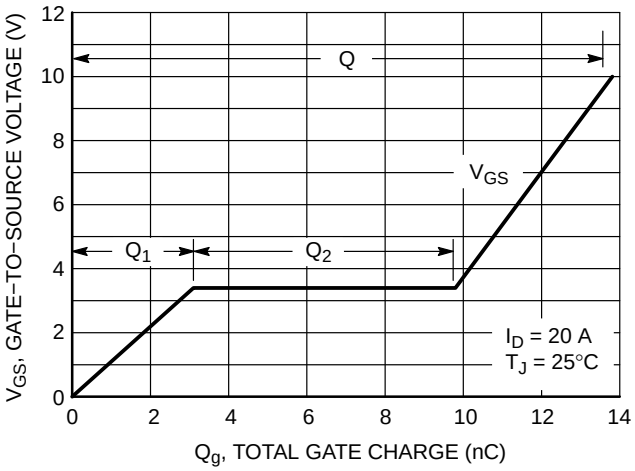


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

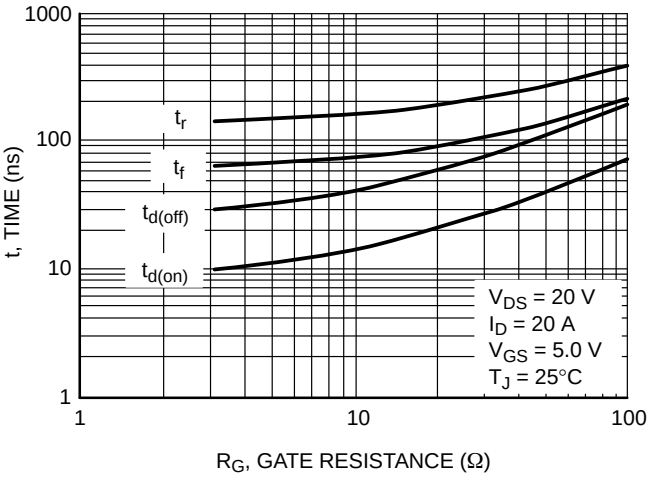


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

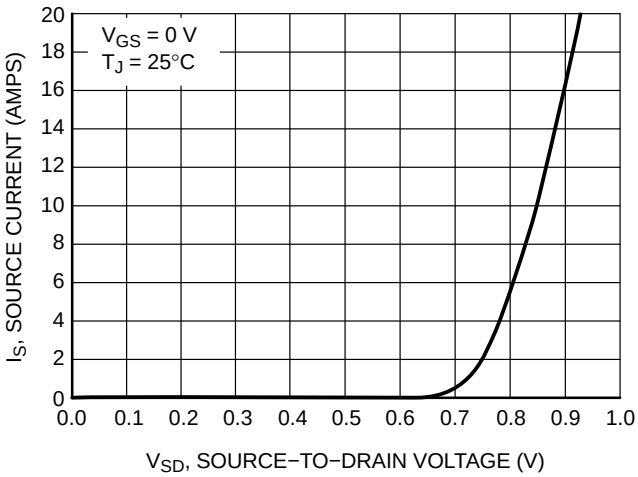


Figure 10. Diode Forward Voltage vs. Current

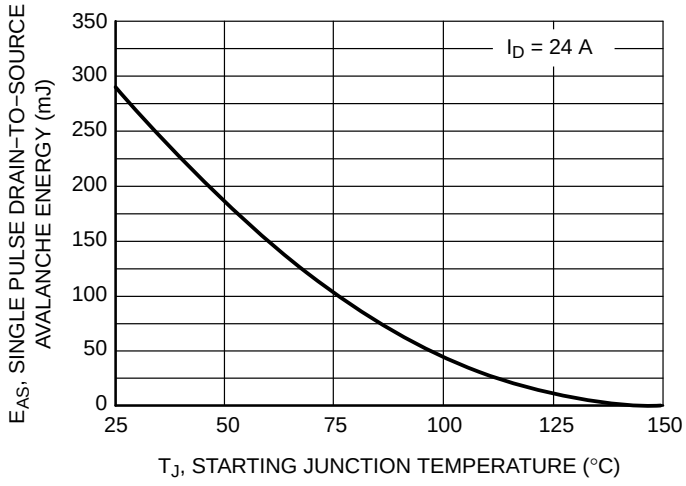
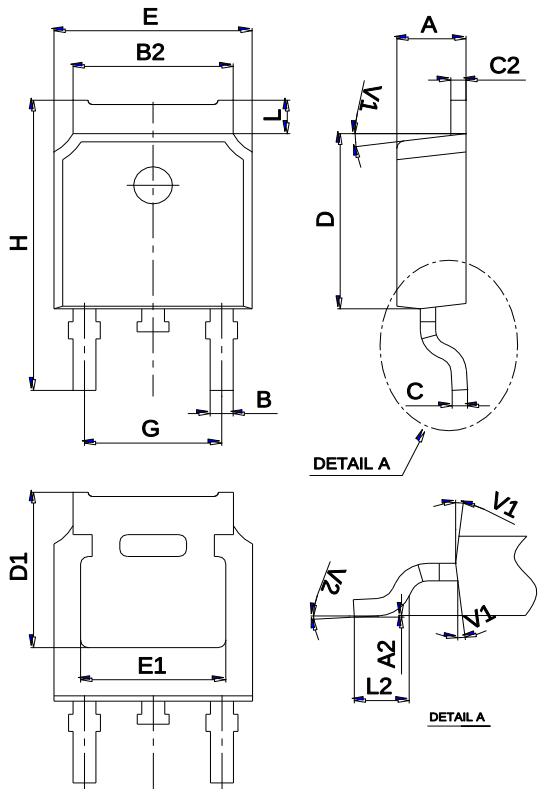


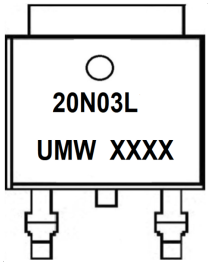
Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

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 NTD20N03L27T4G	TO-252	2500	Tape and reel

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