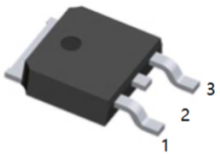
30V N-Channel MOSFET

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses



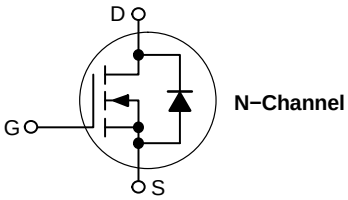
1.G 2.D 3.S

TO-252(DPAK) top view

Applications

- CPU Power Delivery
- DC−DC Converters
- Low Side Switching

- V_{DS}(V) = 30V
- I_D = 88A (V_{GS}= 10V)
- $R_{DS(ON)}$ < 5.0mΩ (V_{GS} = 10V)
- $R_{DS(ON)}$ < 7.4mΩ (V_{GS} = 4.5V)



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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	30	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current ($R_{\theta JA}$) (Note 1)	Steady State	T_A = 25°C	I_D	17.4	A
		T_A = 85°C		13.5	
Power Dissipation ($R_{\theta JA}$) (Note 1)		T_A = 25°C	P_D	2.65	W
Continuous Drain Current ($R_{\theta JA}$) (Note 2)		T_A = 25°C	I_D	12.7	A
		T_A = 85°C		9.8	
Power Dissipation ($R_{\theta JA}$) (Note 2)		T_A = 25°C	P_D	1.41	W
Continuous Drain Current ($R_{\theta JC}$) (Note 1)		T_C = 25°C	I_D	95	A
		T_C = 85°C		73	
Power Dissipation ($R_{\theta JC}$) (Note 1)		T_C = 25°C	P_D	79	W
Pulsed Drain Current	t_p=10μs	T_A = 25°C	I_{DM}	175	A
Current Limited by Package		T_A = 25°C	$I_{DmaxPkg}$	45	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 175	°C
Source Current (Body Diode)			I_S	55	A
Source Current (Body Diode) Pulsed t_p=20 μs			I_{SM}	175	A
Drain to Source dV/dt			dV/dt	6.0	V/ns
Single Pulse Drain−to−Source Avalanche Energy (V_{DD} = 24 V, V_{GS} = 10 V, L = 1.0 mH, $I_{L(pk)}$ = 24 A, R_G = 25 Ω)			E_{AS}	288	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	1.9	°C/W
Junction−to−TAB (Drain)	$R_{\theta JC-TAB}$	3.5	
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	56.6	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	106.6	

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			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 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.86		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 to 11.5 V	I_D = 30 A		4.3	5.0	mΩ
			I_D = 15 A		4.2		
		V_{GS} = 4.5 V	I_D = 30 A		6.0	7.4	
			I_D = 15 A		5.8		
Forward Transconductance	g_{FS}	V_{DS} = 15 V, I_D = 15 A			17		S
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 12 V			2865		pF
Output Capacitance	C_{oss}				610		
Reverse Transfer Capacitance	C_{rss}				338		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 30 A			20.5	26	nC
Threshold Gate Charge	$Q_{G(TH)}$				4.05		
Gate−to−Source Charge	Q_{GS}				8.28		
Gate−to−Drain Charge	Q_{GD}				8.36		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 11.5 V, V_{DS} = 15 V, I_D = 30 A			48		nC
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			17.2		ns
Rise Time	t_r				20.3		
Turn−Off Delay Time	$t_{d(off)}$				20.8		
Fall Time	t_f				8.0		
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 11.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			10.8		ns
Rise Time	t_r				20.5		
Turn−Off Delay Time	$t_{d(off)}$				30.8		
Fall Time	t_f				4.4		

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 30 A	T_J = 25°C		0.87	1.2	V
			T_J = 125°C		0.76		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/μs, I_S = 30 A			25.7		ns
Charge Time	ta				13.1		
Discharge Time	tb				12.6		
Reverse Recovery Time	Q_{RR}				18		nC
Source Inductance	L_S	T_A = 25°C			2.49		nH
Drain Inductance, DPAK	L_D				0.0164		
Drain Inductance, IPAK	L_D				1.88		
Gate Inductance	L_G				3.46		
Gate Resistance	R_G				0.8		Ω

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.

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

TYPICAL PERFORMANCE CURVES

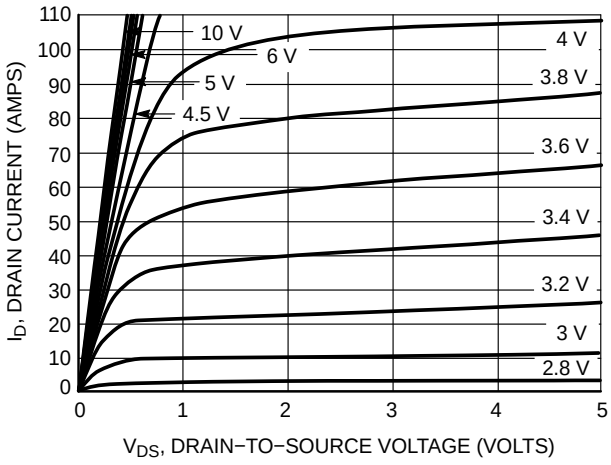


Figure 1. On−Region Characteristics

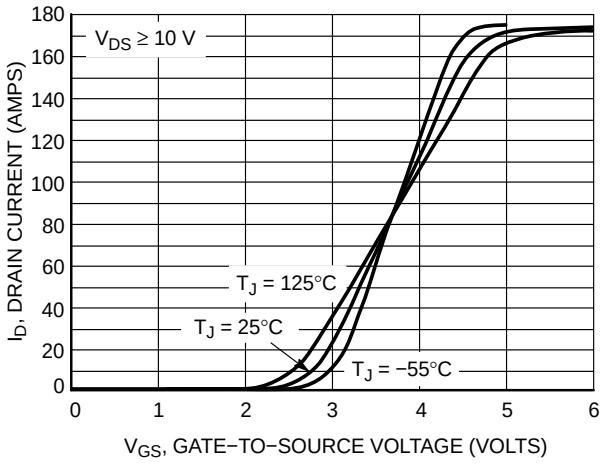


Figure 2. Transfer Characteristics

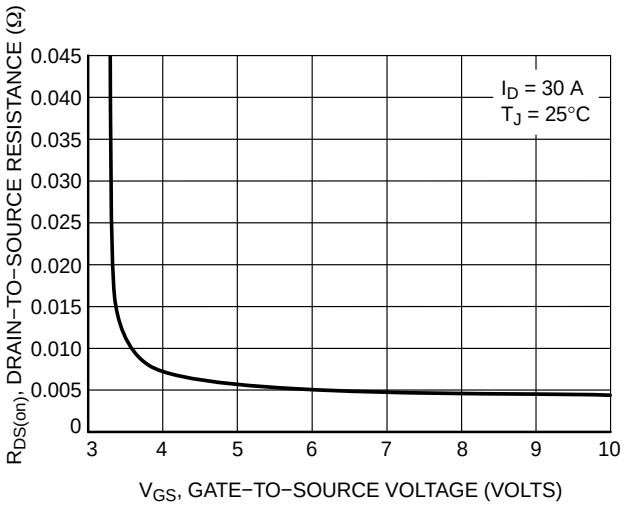


Figure 3. On−Resistance vs. Gate−to−Source Voltage

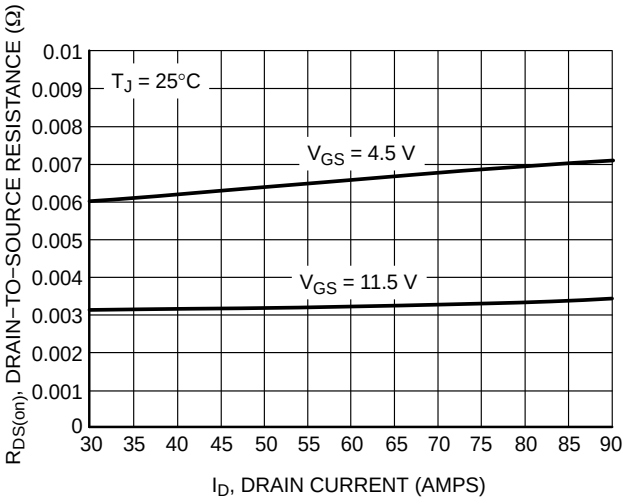


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

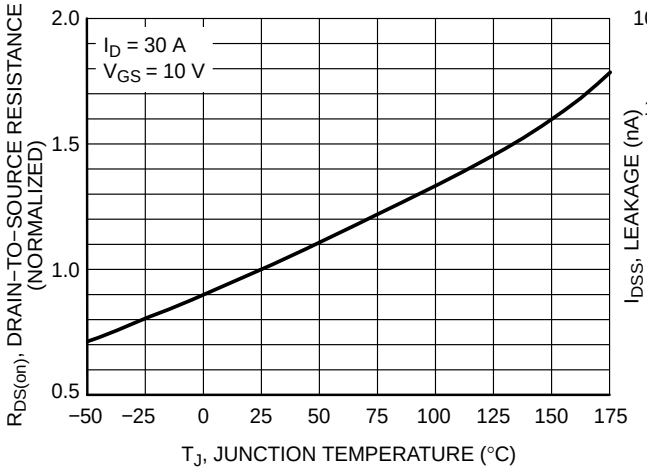


Figure 5. On−Resistance Variation with Temperature

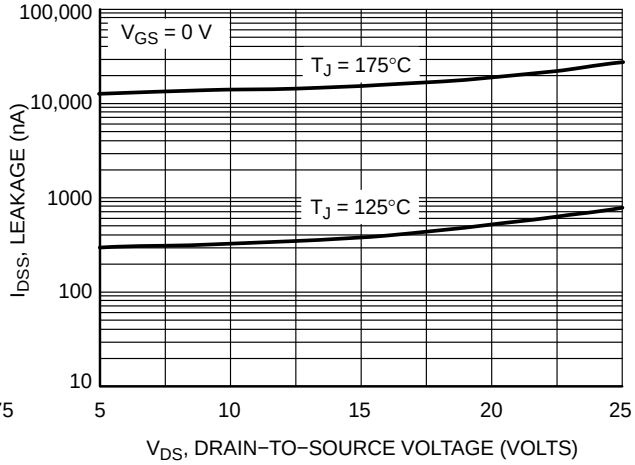


Figure 6. Drain−to−Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

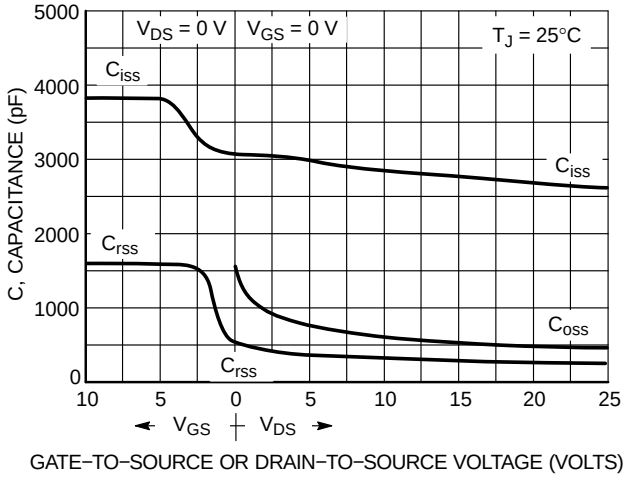


Figure 7. Capacitance Variation

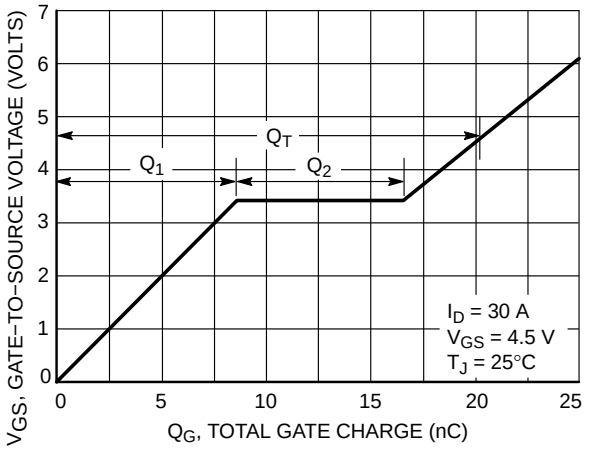


Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

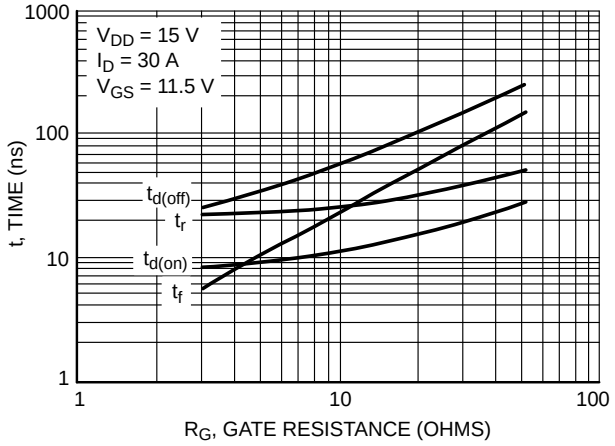


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

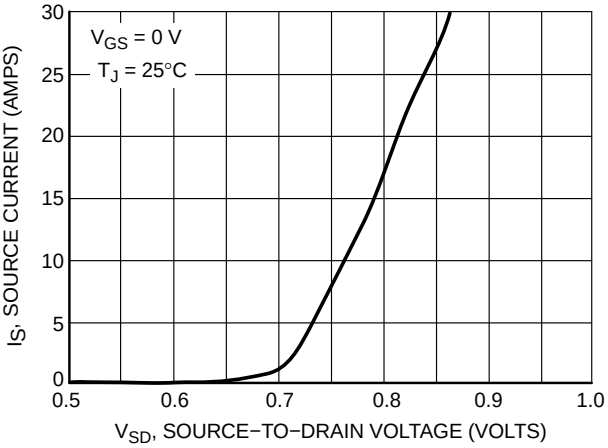


Figure 10. Diode Forward Voltage vs. Current

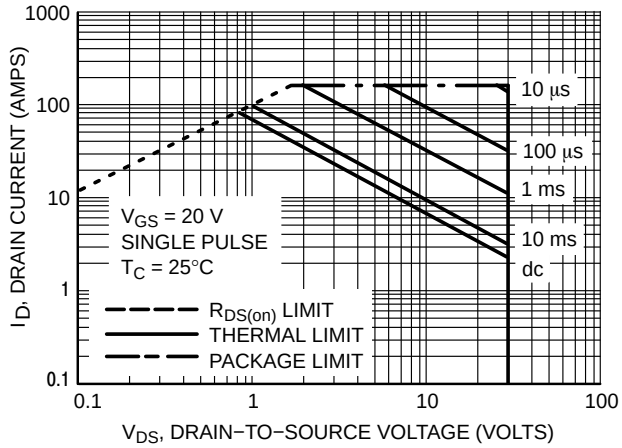


Figure 11. Maximum Rated Forward Biased Safe Operating Area

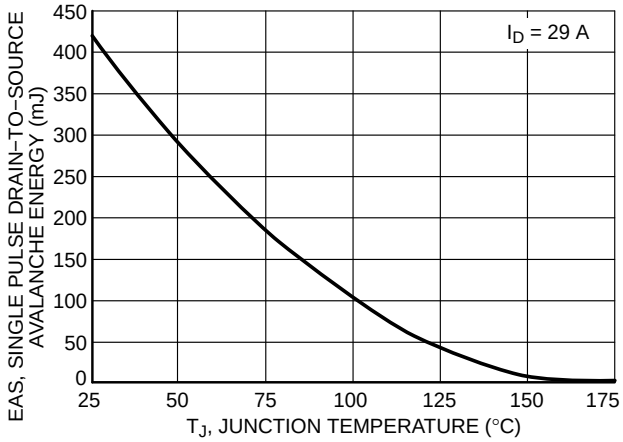


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL PERFORMANCE CURVES

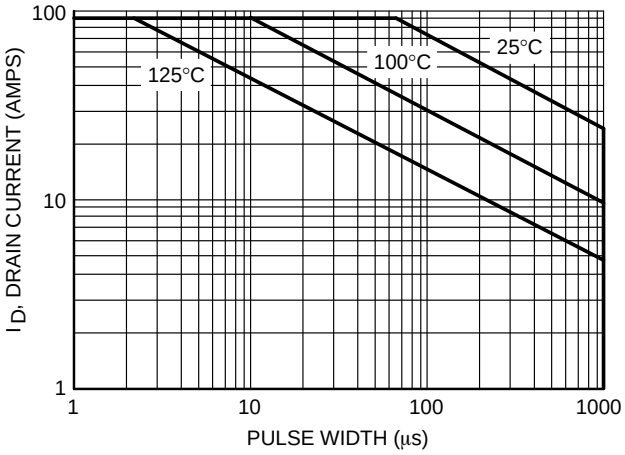


Figure 13. Avalanche Characteristics

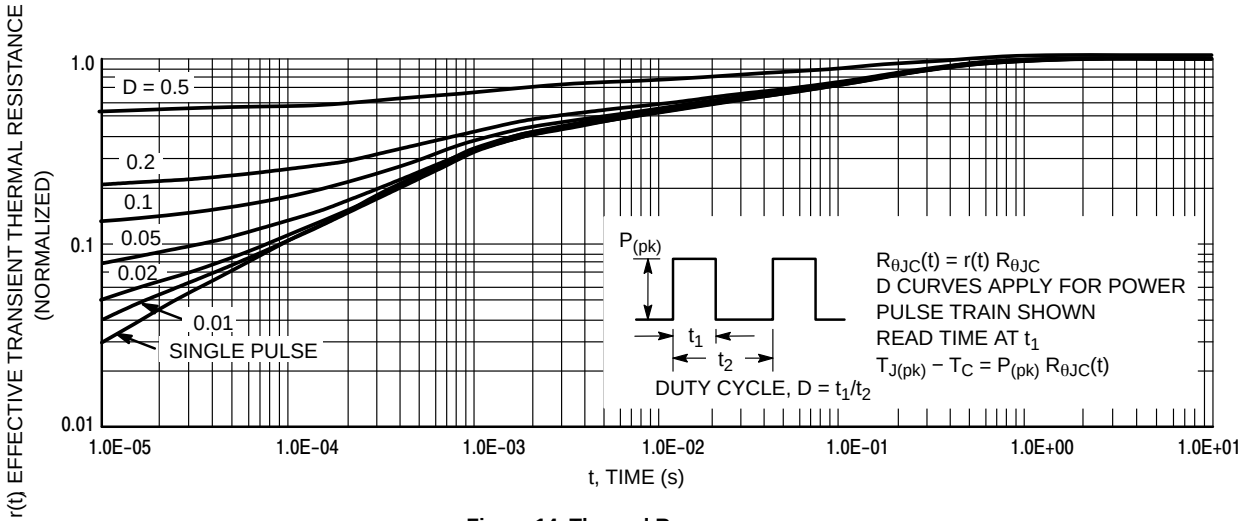
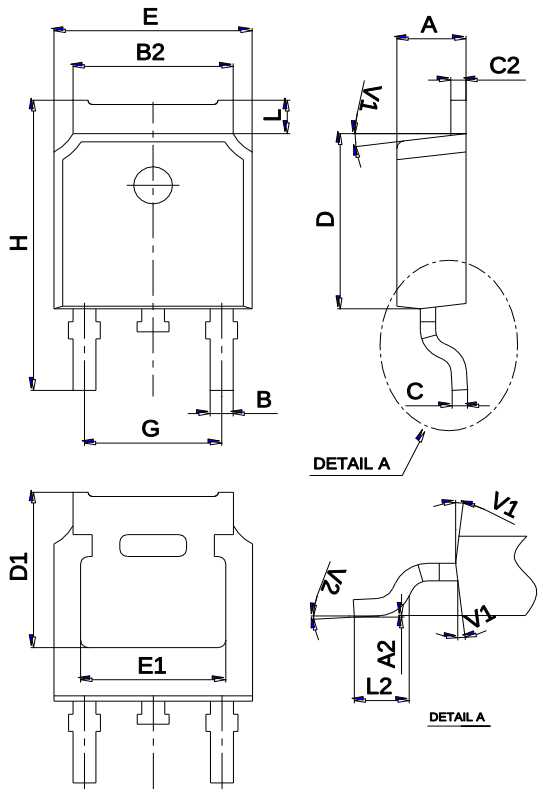


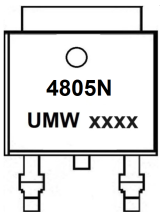
Figure 14. Thermal Response

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 NTD4805NT4G	TO-252	2500	Tape and reel

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