NTP4813NL

Power MOSFET
30 V, 51 A, Single N−Channel, TO−220AB

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Low R_G
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Power Motor Control
- High Current, High Side Switching
- DC−DC Converters

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

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	12.8	A
		T_A = 85°C		9.9	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	3.75	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	ID	10.2	A
		T_A = 85°C		7.9	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	2.40	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	51	A
		T_C = 85°C		39.5	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	60	W
Pulsed Drain Current	t_p=10μs	T_A = 25°C	I_{DM}	154	A
Current Limited by Package		T_A = 25°C	$I_{DmaxPkg}$	95	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)			I_S	50	A
Drain to Source dV/dt			dV/dt	6	V/ns
Single Pulse Drain−to−Source Avalanche Energy (V_{DD} = 24 V, V_{GS} = 10 V, I_L = 18 A_{pk}, L = 0.3 mH, R_G = 25 Ω)			EAS	48.6	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

ON Semiconductor®

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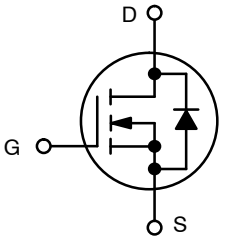
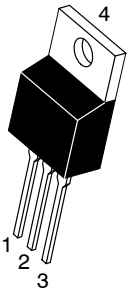
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	13.1 mΩ @ 10 V	51 A
	22 mΩ @ 4.5 V	

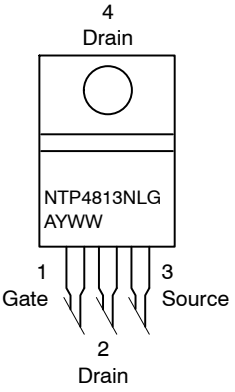


N−CHANNEL MOSFET

MARKING DIAGRAM & PIN ASSIGNMENT



TO−220AB
CASE 221A
STYLE 5



A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	2.5	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	40	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	62.5	

1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
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	$V_{(BR)DSS}/T_J$				24.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25 °C			1	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.5		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A		10.5	13.1	mΩ
		V_{GS} = 4.5 V	I_D = 20 A		17.6	22	
Forward Transconductance	g_{FS}	V_{DS} = 15 V, I_D = 10 A			6.7		S
Gate Resistance	R_G	T_A = 25°C			0.80		Ω
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 12 V			895		pF
Output Capacitance	C_{OSS}				220		
Reverse Transfer Capacitance	C_{RSS}				120		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			7.7	10.8	nC
Threshold Gate Charge	$Q_{G(TH)}$				1.6		
Gate−to−Source Charge	Q_{GS}				3.4		
Gate−to−Drain Charge	Q_{GD}				3.6		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 11.5 V, V_{DS} = 15 V; I_D = 30 A			17		nC
SWITCHING CHARACTERISTICS (Note 4)							
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			10		ns
Rise Time	t_r				21.5		
Turn−Off Delay Time	$t_{d(OFF)}$				12		
Fall Time	t_f				3.2		
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			6.3		ns
Rise Time	t_r				13.4		
Turn−Off Delay Time	$t_{d(OFF)}$				17.6		
Fall Time	t_f				1.6		

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 30 A	T_J = 25°C		0.95	1.2	V
			T_J = 125°C		0.85		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/μs, I_S = 30 A			14.8		ns
Charge Time	t_a				8.3		
Discharge Time	t_b				6.5		
Reverse Recovery Charge	Q_{RR}				5.3		nC

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

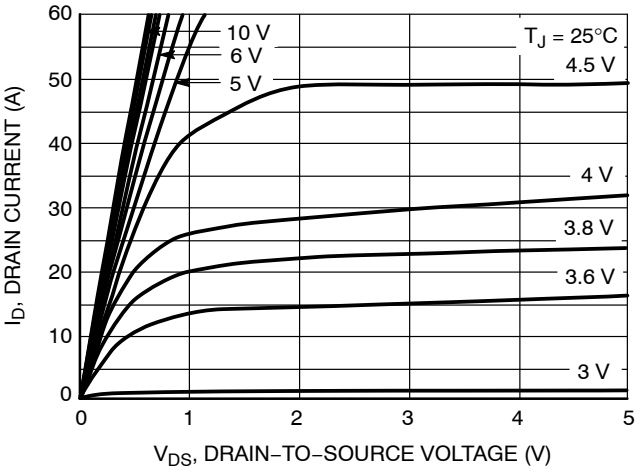


Figure 1. On−Region Characteristics

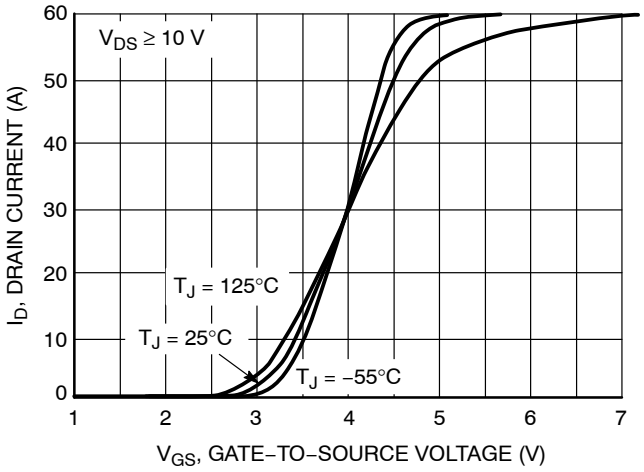


Figure 2. Transfer Characteristics

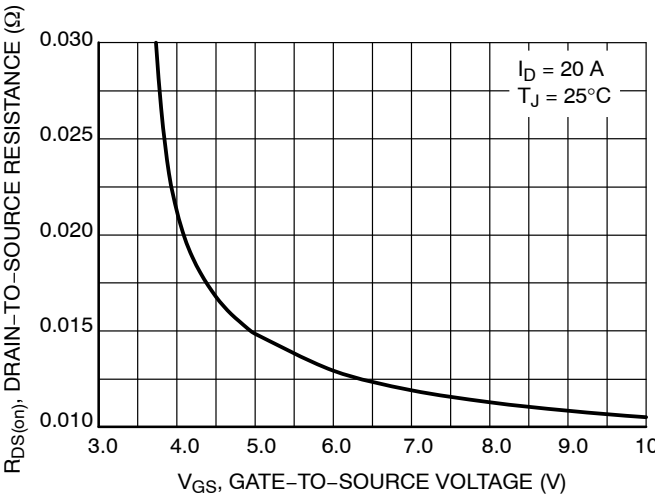


Figure 3. On−Resistance vs. Gate−to−Source Voltage

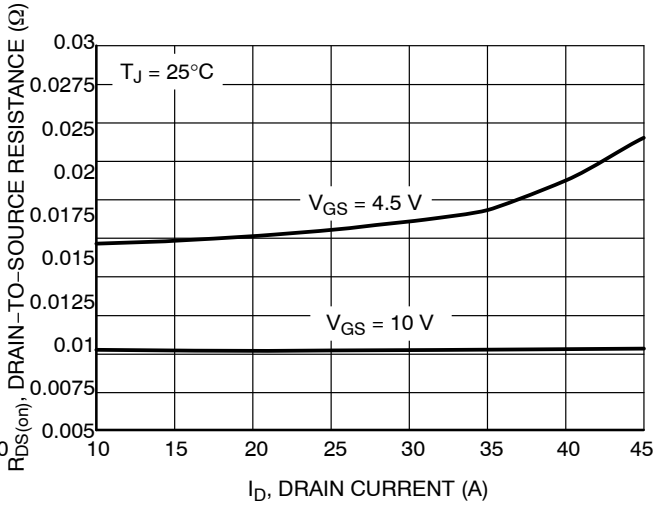


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

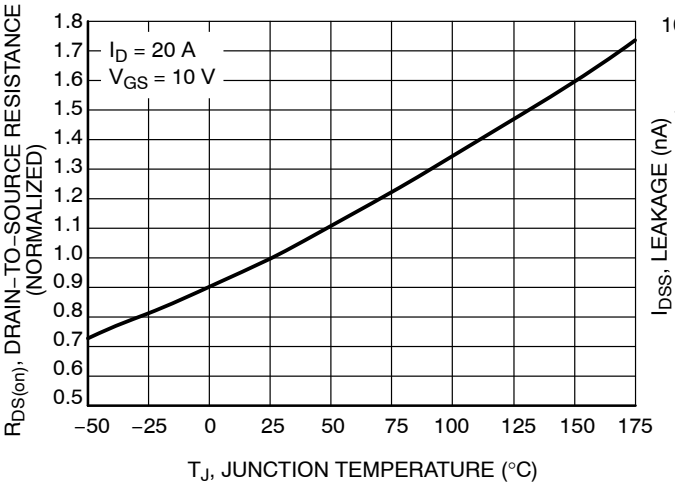


Figure 5. On−Resistance Variation with Temperature

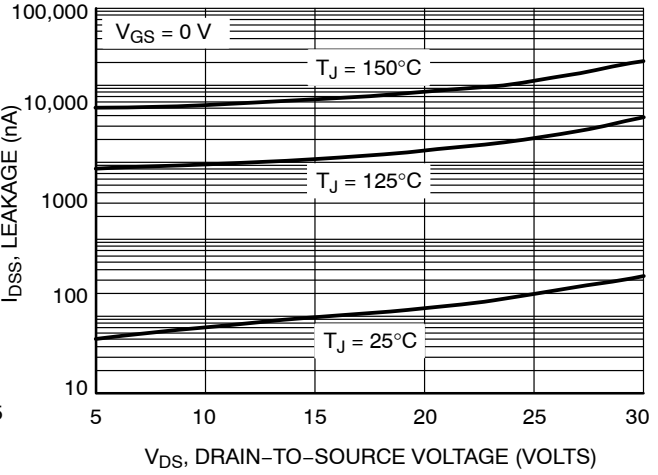


Figure 6. Drain−to−Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

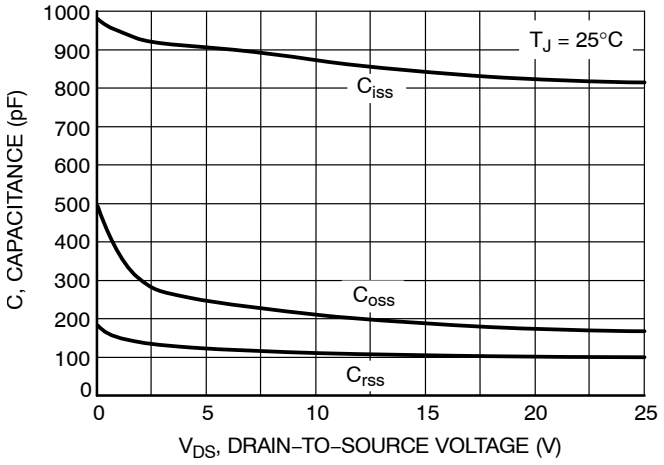


Figure 7. Capacitance Variation

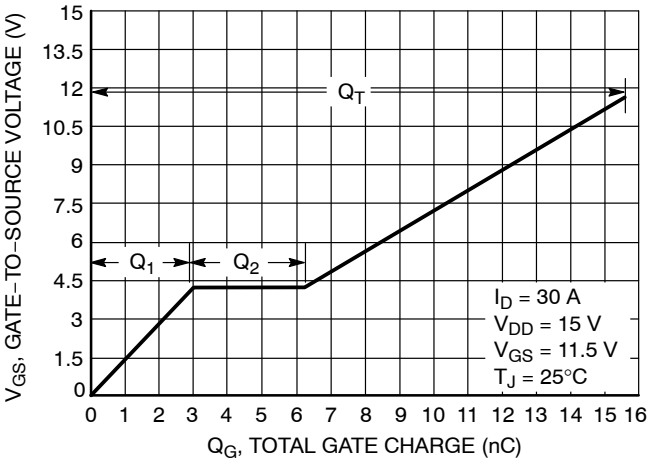


Figure 8. Gate–To–Source and Drain–To–Source Voltage vs. Total Charge

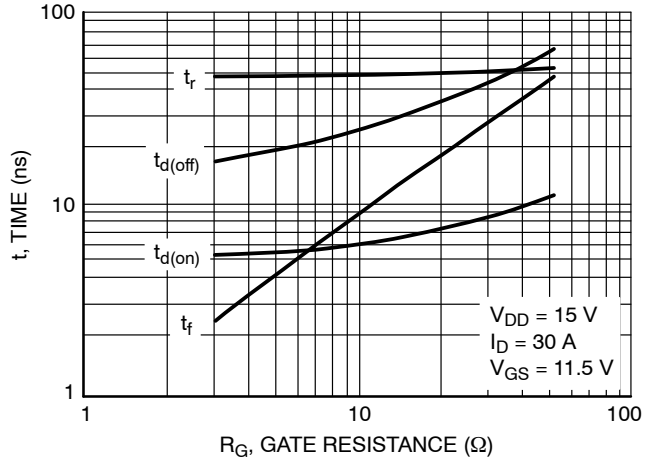


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

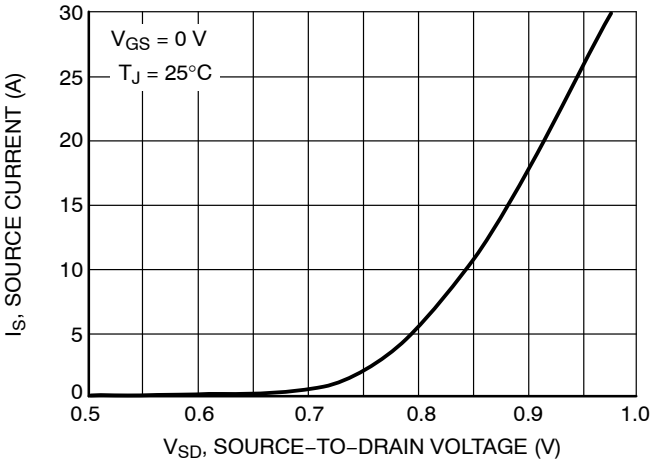


Figure 10. Diode Forward Voltage vs. Current

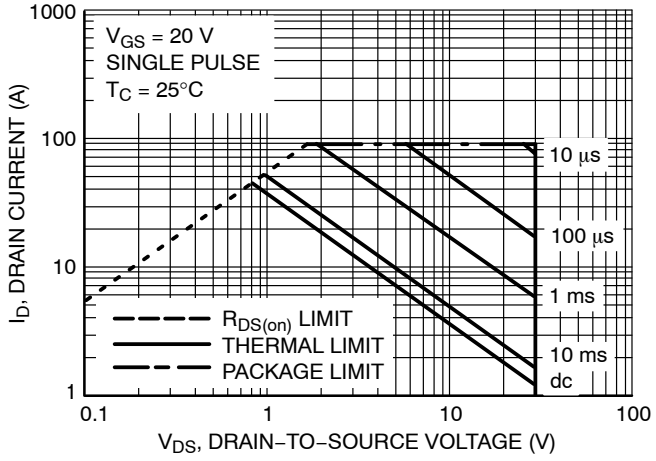


Figure 11. Maximum Rated Forward Biased Safe Operating Area

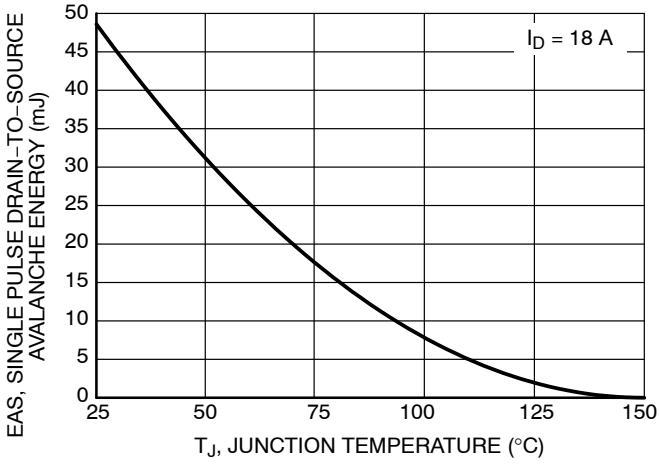


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL PERFORMANCE CURVES

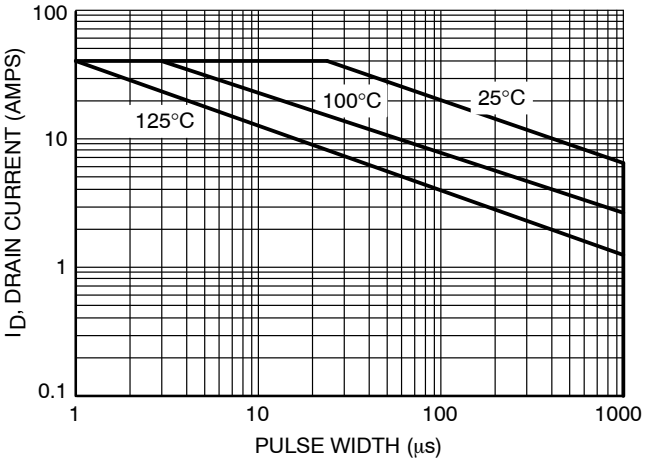


Figure 13. Avalanche Characteristics

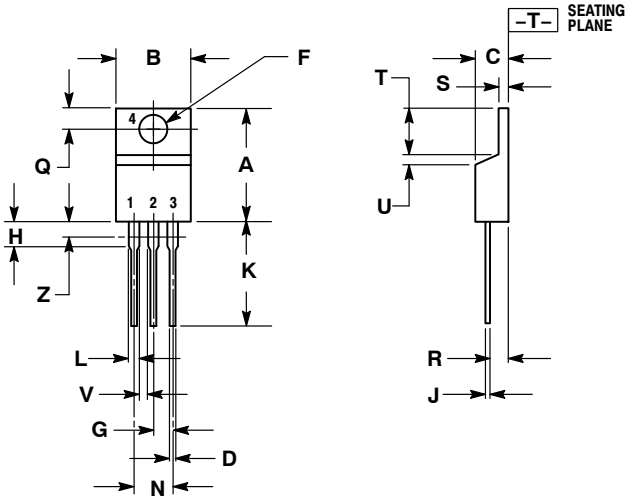
ORDERING INFORMATION

Device	Package	Shipping†
NTP4813NLT4G	TO−220AB (Pb−Free)	50 Units / Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−220, SINGLE GAUGE
CASE 221AB
ISSUE A



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. PRODUCT SHIPPED PRIOR TO 2008 HAD DIMENSIONS S = 0.045 − 0.055 INCHES (1.143 − 1.397 MM)

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.020	0.024	0.508	0.61
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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