NTD20N03L27

Power MOSFET

20 Amps, 30 Volts, N−Channel DPAK

This logic level vertical power MOSFET is a general purpose part that provides the “best of design” available today in a low cost power package. Avalanche energy issues make this part an ideal design in. The drain−to−source diode has a ideal fast but soft recovery.

Features

- Pb−Free Packages are Available
- Ultra−Low $R_{DS(on)}$, Single Base, Advanced Technology
- SPICE Parameters Available
- Diode is Characterized for use in Bridge Circuits
- I_{DSS} and $V_{DS(on)}$ Specified at Elevated Temperatures
- High Avalanche Energy Specified
- ESD JEDAC rated HBM Class 1, MM Class A, CDM Class 0

Typical Applications

- Power Supplies
- Inductive Loads
- PWM Motor Controls
- Replaces MTD20N03L in many Applications

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/°C W
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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

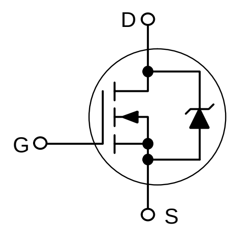
1. When surface mounted to an FR4 board using the minimum recommended pad size and repetitive rating; pulse width limited by maximum junction temperature.

ON Semiconductor®

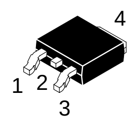
http://onsemi.com

20 A, 30 V, $R_{DS(on)}$ = 27 mΩ

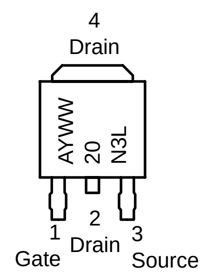
N−Channel

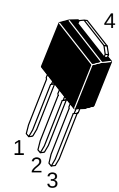


MARKING DIAGRAMS

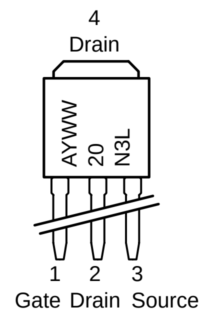


DPAK
CASE 369C
STYLE 2





DPAK−3
CASE 369D
STYLE 2



20N3L	= Device Code
A	= Assembly Location
Y	= Year
WW	= Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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 −	1.6 5.0	2.0 −	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

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
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

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

ORDERING INFORMATION

Device	Package	Shipping†
NTD20N03L27	DPAK	75 Units/Rail
NTD20N03L27G	DPAK (Pb−Free)	75 Units/Rail
NTD20N03L27−1	DPAK−3	75 Units/Rail
NTD20N03L27−1G	DPAK (Pb−Free)	75 Units/Rail
NTD20N03L27T4	DPAK	2500 Tape & Reel
NTD20N03L27T4G	DPAK (Pb−Free)	2500 Tape & Reel

†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.

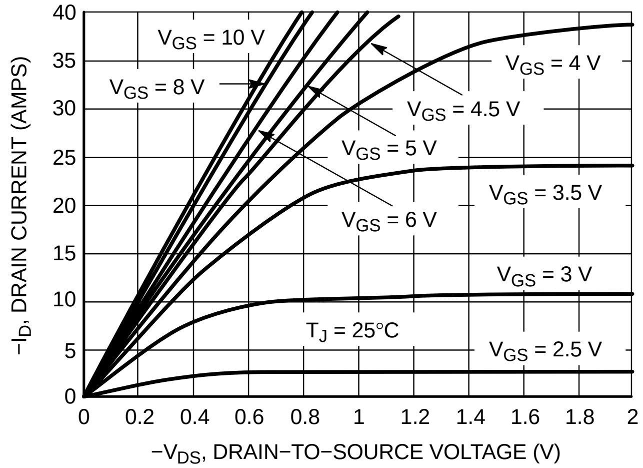


Figure 1. On−Region Characteristics

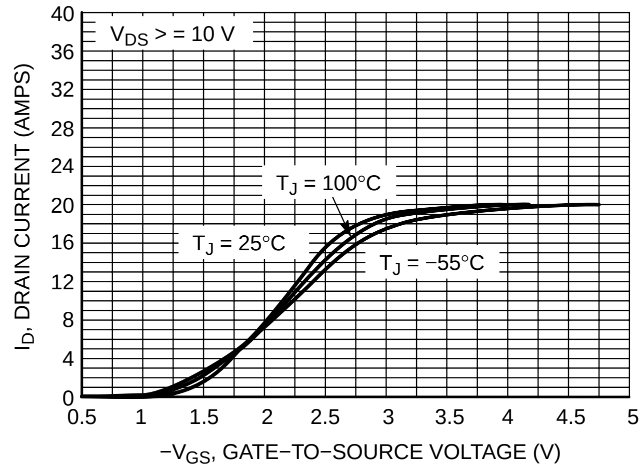


Figure 2. Transfer Characteristics

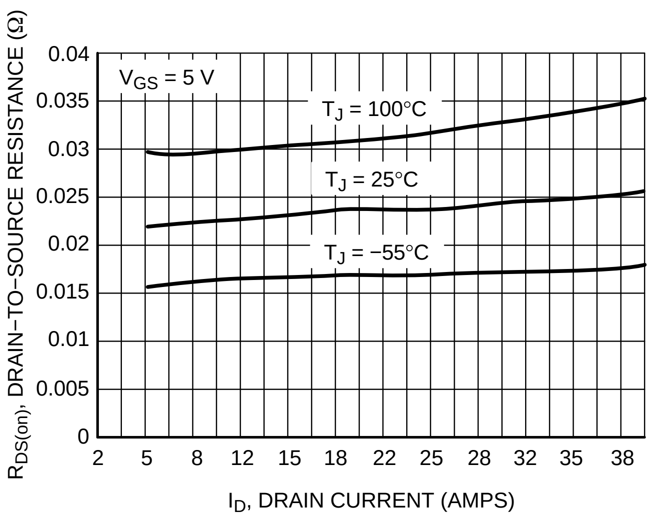


Figure 3. On−Resistance vs. Drain Current and Temperature

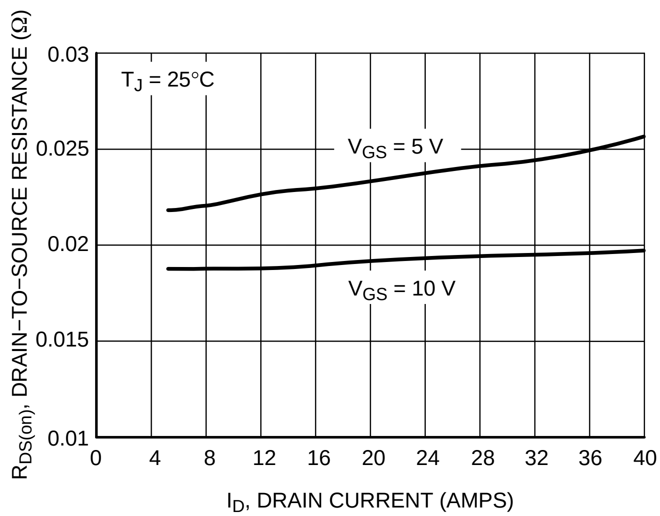


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

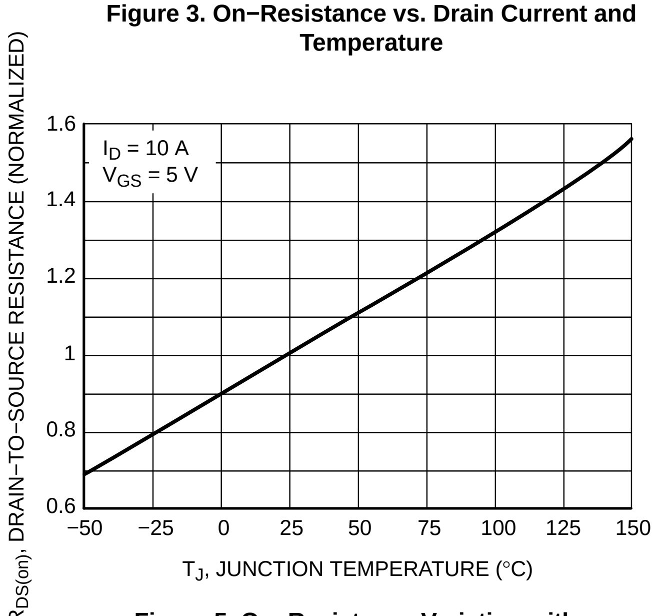


Figure 5. On−Resistance Variation with Temperature

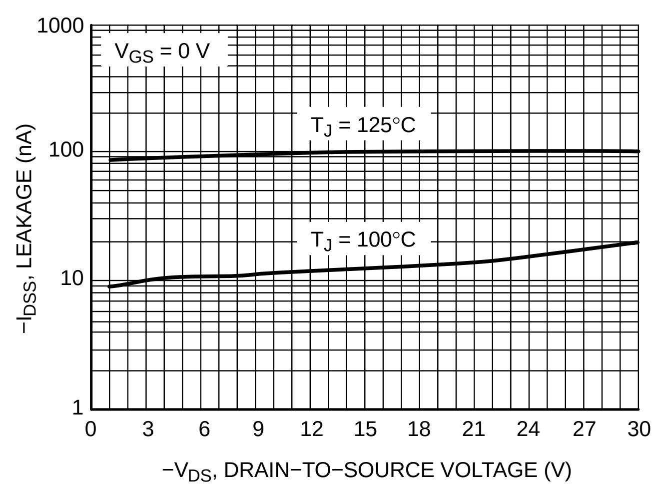


Figure 6. Drain−to−Source Leakage Current vs. Voltage

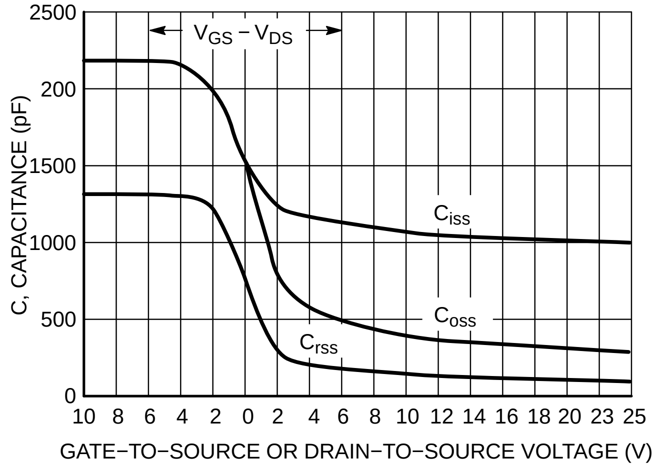


Figure 7. Capacitance Variation

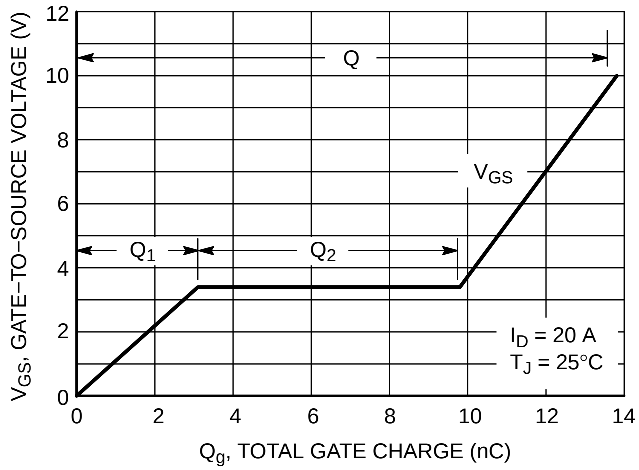


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

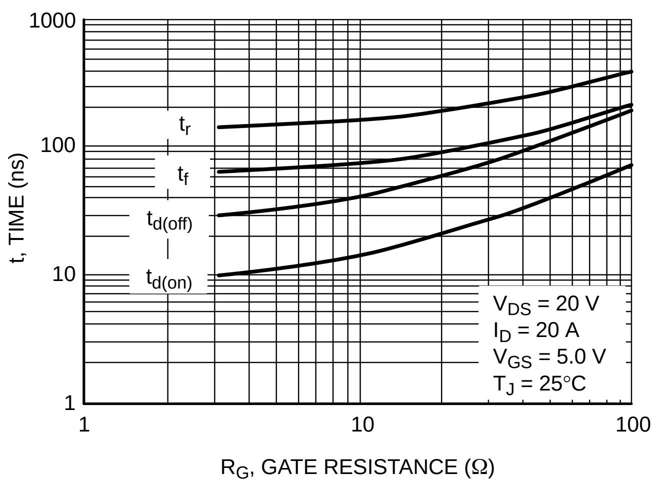


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

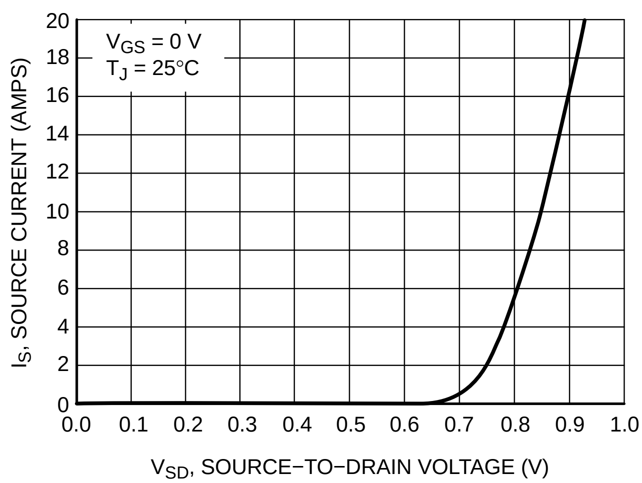


Figure 10. Diode Forward Voltage vs. Current

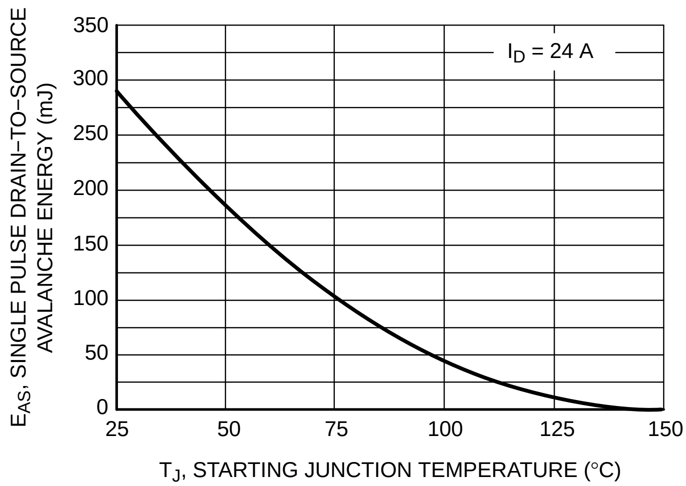
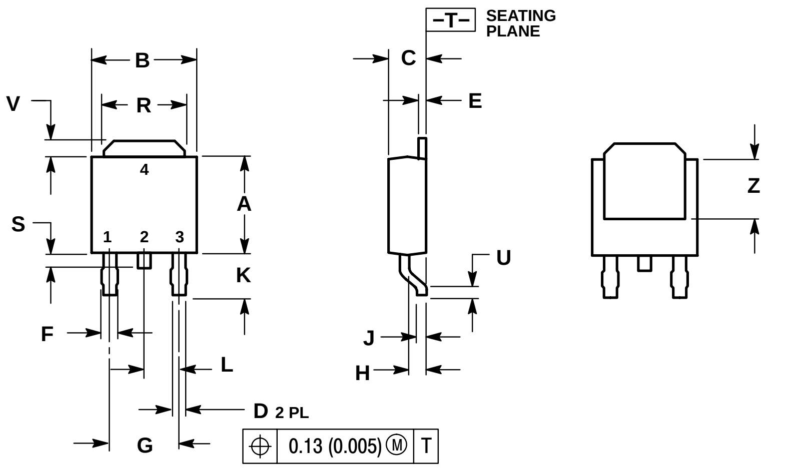


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

PACKAGE DIMENSIONS

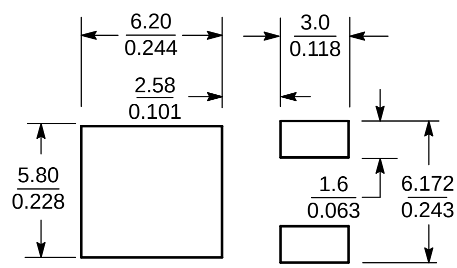
DPAK
CASE 369C−01
ISSUE O



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	−−−	0.51	−−−
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

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

SOLDERING FOOTPRINT*

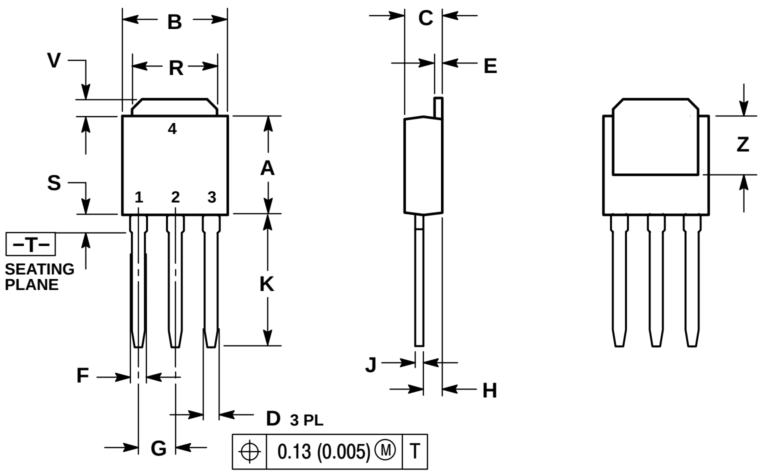


SCALE 3:1 (mm / inches)

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

DPAK−3
CASE 369D−01
ISSUE B



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	**MIN**	**MAX**	**MIN**	**MAX**
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.