NTD23N03R

Power MOSFET

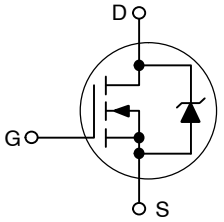
23 A, 25 V, N−Channel DPAK

ON Semiconductor®

http://onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
25 V	32 mΩ	23 A

N−CHANNEL



Features

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{iss} to Minimize Driver Loss
- Low Gate Charge
- Optimized for High Side Switching Requirements in High−Efficiency DC−DC Converters
- Pb−Free Packages are Available

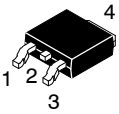
MAXIMUM RATINGS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	25	Vdc
Gate−to−Source Voltage − Continuous	V_{GS}	±20	Vdc
Thermal Resistance, Junction−to−Case Total Power Dissipation @ T_C = 25°C Drain Current − Continuous @ T_C = 25°C, Chip − Continuous @ T_C = 25°C, Limited by Package − Single Pulse	$R_{\theta JC}$ P_D I_D I_D I_{DM}	5.6 22.3 23 17.1 40	°C/W W A A A
Thermal Resistance, Junction−to−Ambient (Note 1) Total Power Dissipation @ T_A = 25°C Drain Current − Continuous @ T_A = 25°C	$R_{\theta JA}$ P_D I_D	76 1.64 4.5	°C/W W A
Thermal Resistance, Junction−to−Ambient (Note 2) Total Power Dissipation @ T_A = 25°C Drain Current − Continuous @ T_A = 25°C	$R_{\theta JA}$ P_D I_D	110 1.14 3.8	°C/W W A
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 150	°C
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

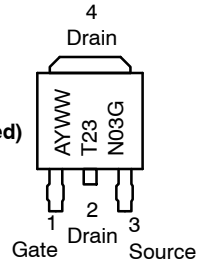
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

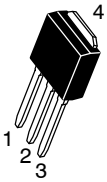
1. When surface mounted to an FR4 board using 0.5 sq in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.

MARKING DIAGRAMS

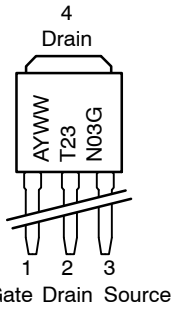


DPAK
CASE 369AA
(Surface Mounted)
STYLE 2





DPAK−3
CASE 369D
(Straight Lead)
STYLE 2



T23N03	= Device Code
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 5 of this data sheet.

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

Characteristics		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage (Note 3) (V_{GS} = 0 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)		$V(br)_{DSS}$	 25 –	 28 –	 – –	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc, T_J = 150°C)		I_{DSS}	 – –	 – –	 1.0 10	μAdc
Gate−Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS (Note 3)						
Gate Threshold Voltage (Note 3) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)		$V_{GS(th)}$	 1.0 –	 1.8 –	 2.0 –	Vdc mV/°C
Static Drain−to−Source On−Resistance (Note 3) (V_{GS} = 4.5 Vdc, I_D = 6 Adc) (V_{GS} = 10 Vdc, I_D = 6 Adc)		$R_{DS(on)}$	 – –	 50.3 32.3	 60 45	mΩ
Forward Transconductance (Note 3) (V_{DS} = 10 Vdc, I_D = 6 Adc)		g_{FS}	 –	 13	 –	Mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 20 Vdc, V_{GS} = 0 V, f = 1 MHz)	C_{iss}	–	225	–	pF
Output Capacitance		C_{oss}	–	108	–	
Transfer Capacitance		C_{rss}	–	48	–	
SWITCHING CHARACTERISTICS (Note 4)						
Turn−On Delay Time	(V_{GS} = 10 Vdc, V_{DD} = 10 Vdc, I_D = 6 Adc, R_G = 3 Ω)	$t_{d(on)}$	–	2.0	–	ns
Rise Time		t_r	–	14.9	–	
Turn−Off Delay Time		$t_{d(off)}$	–	9.9	–	
Fall Time		t_f	–	2.0	–	
Gate Charge	(V_{GS} = 4.5 Vdc, I_D = 6 Adc, V_{DS} = 10 Vdc) (Note 3)	Q_T	–	3.76	–	nC
		Q_1	–	1.7	–	
		Q_2	–	1.6	–	
SOURCE−DRAIN DIODE CHARACTERISTICS						
Forward On−Voltage	(I_S = 6 Adc, V_{GS} = 0 Vdc) (Note 3) (I_S = 6 Adc, V_{GS} = 0 Vdc, T_J = 125°C)	V_{SD}	 – –	 0.87 0.74	 1.2 –	Vdc
Reverse Recovery Time	(I_S = 6 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 3)	t_{rr}	–	8.7	–	ns
		t_a	–	5.2	–	
		t_b	–	3.5	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.003	–	μC

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

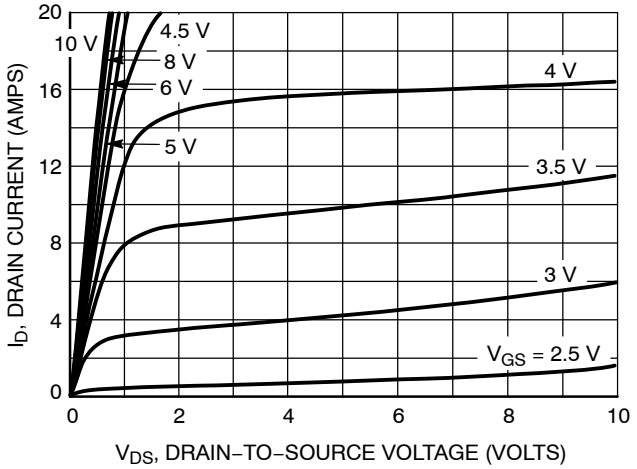


Figure 1. On−Region Characteristics

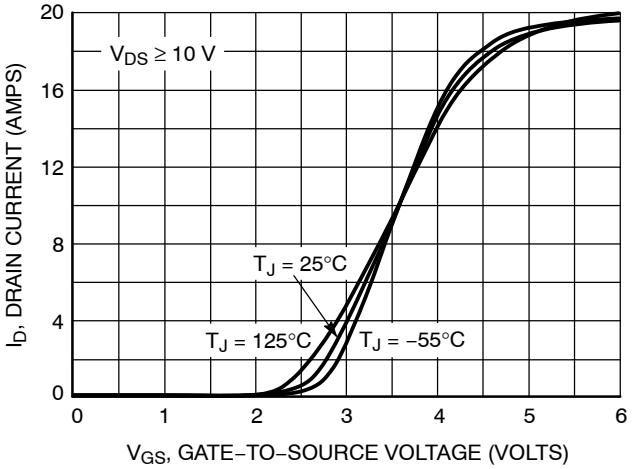


Figure 2. Transfer Characteristics

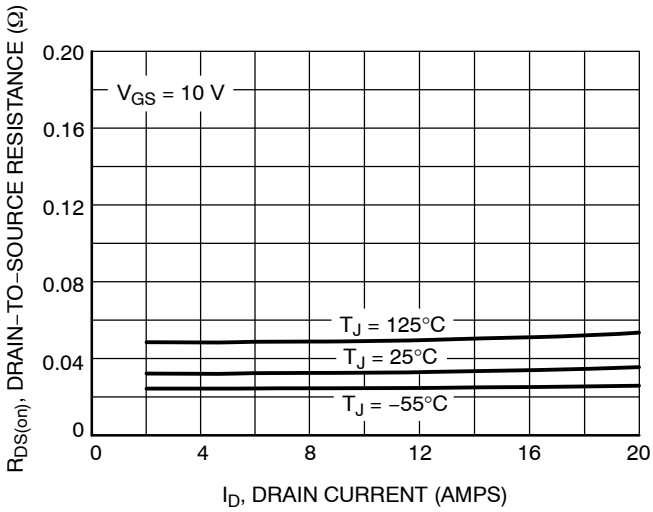


Figure 3. On−Resistance versus Drain Current and Temperature

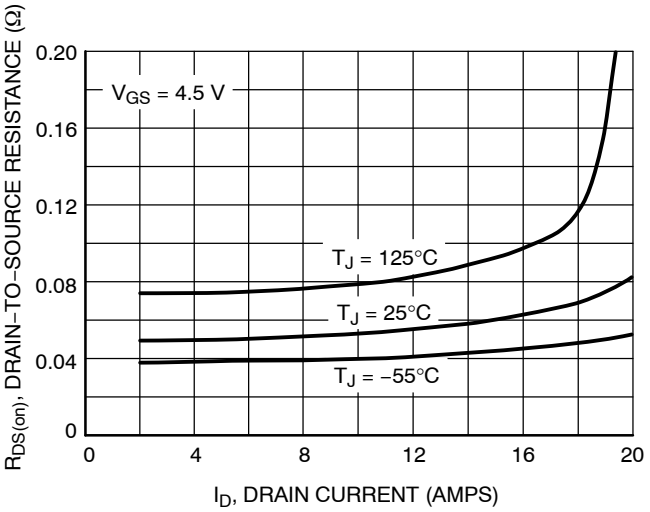


Figure 4. On−Resistance versus Drain Current and Temperature

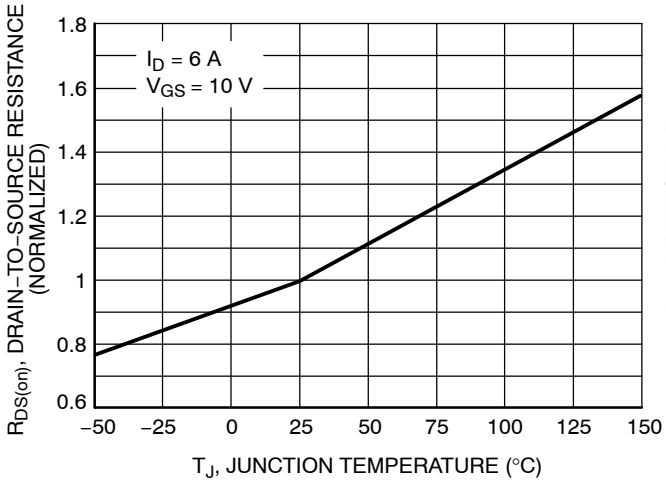


Figure 5. On−Resistance Variation with Temperature

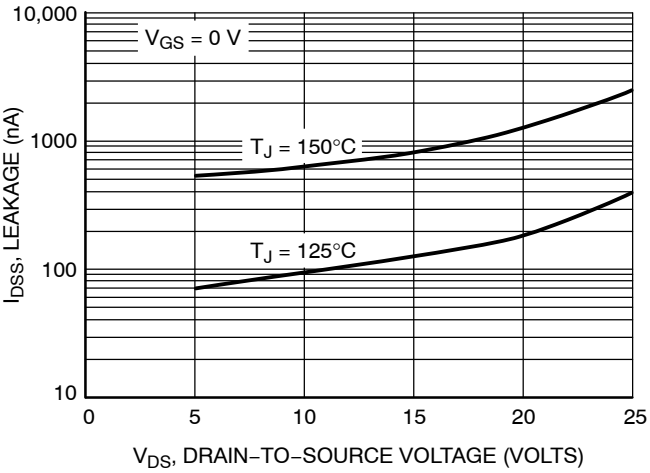


Figure 6. Drain−to−Source Leakage Current versus Voltage

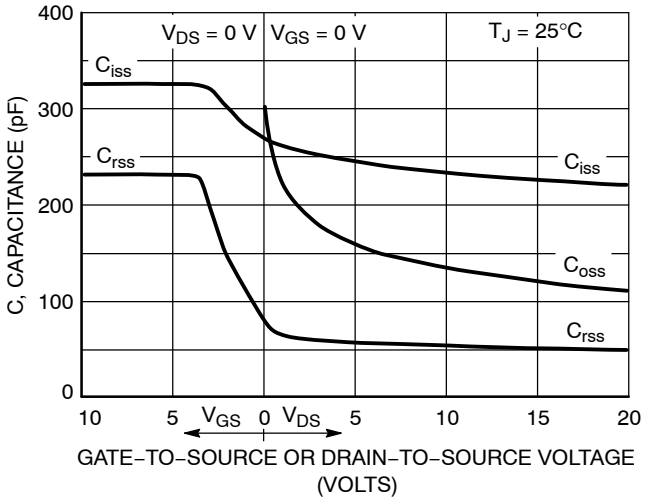


Figure 7. Capacitance Variation

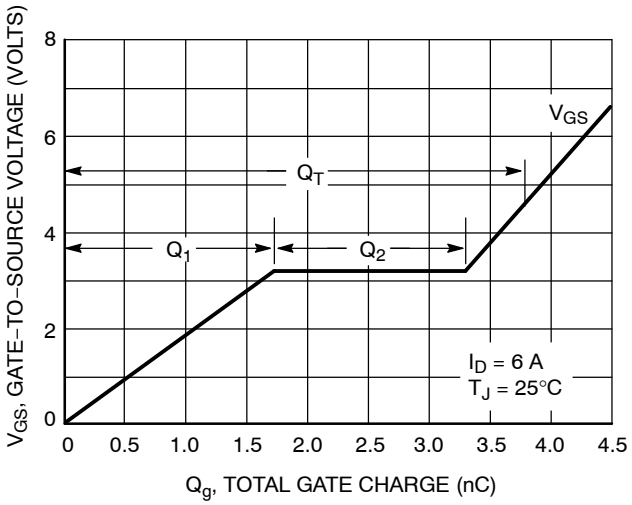


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

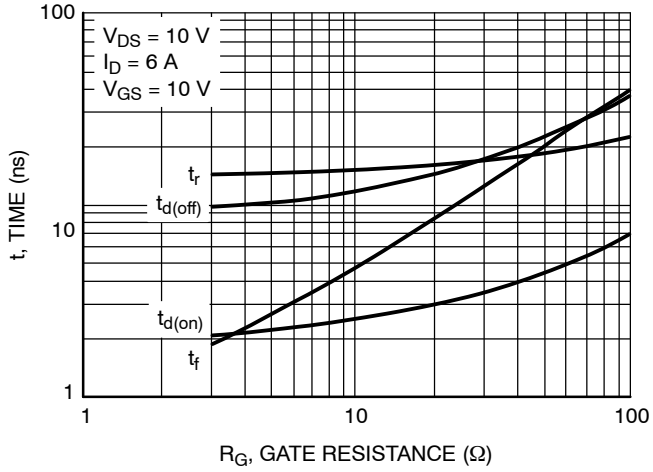


Figure 9. Resistive Switching Time Variation versus Gate Resistance

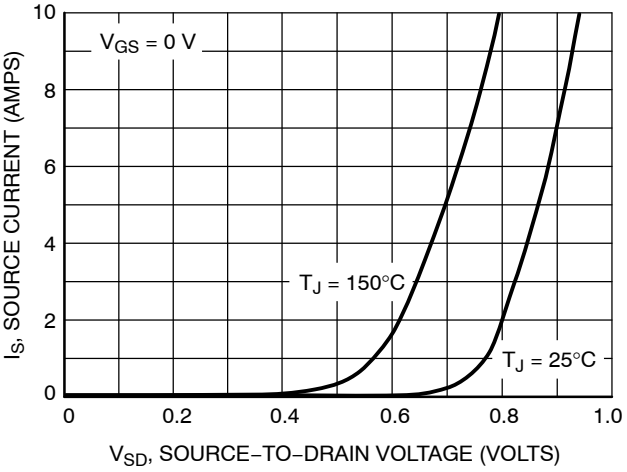


Figure 10. Diode Forward Voltage versus Current

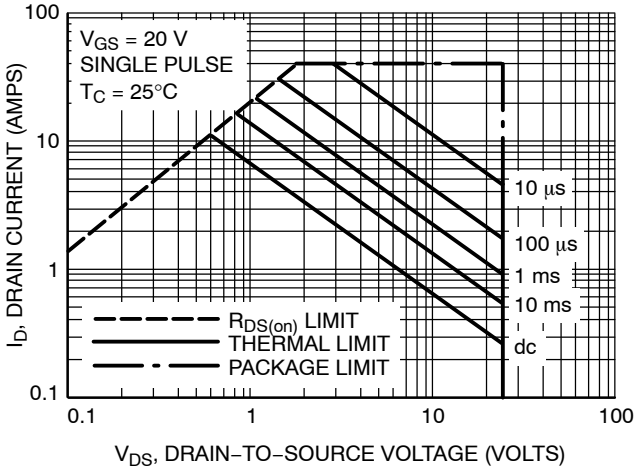


Figure 11. Maximum Rated Forward Biased Safe Operating Area

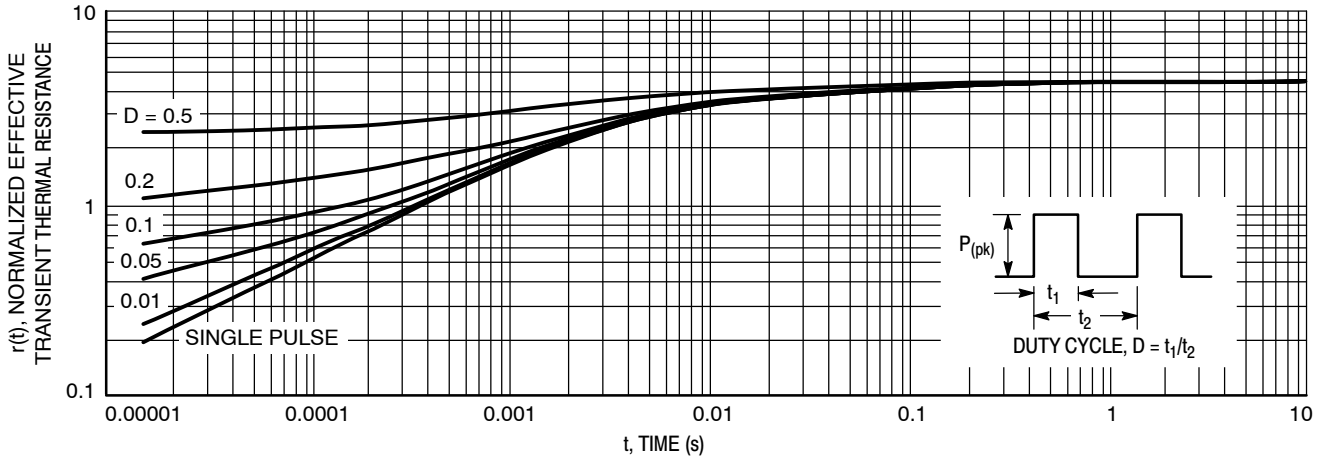


Figure 12. Thermal Response

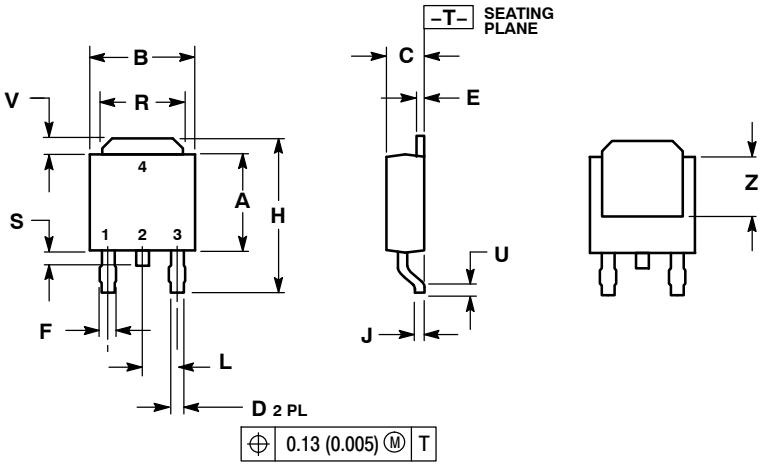
ORDERING INFORMATION

Device	Package	Shipping†
NTD23N03RG	DPAK (Pb−Free)	75 Units/Rail
NTD23N03R−1G	DPAK−3 (Pb−Free)	75 Units/Rail
NTD23N03RT4	DPAK	2500 Tape & Reel
NTD23N03RT4G	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.

PACKAGE DIMENSIONS

DPAK
CASE 369AA−01
ISSUE O

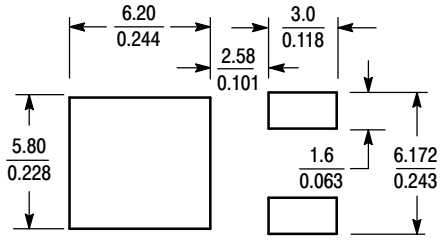


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.025	0.035	0.63	0.89
E	0.018	0.024	0.46	0.61
F	0.030	0.045	0.77	1.14
H	0.386	0.410	9.80	10.40
J	0.018	0.023	0.46	0.58
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.024	0.040	0.60	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*

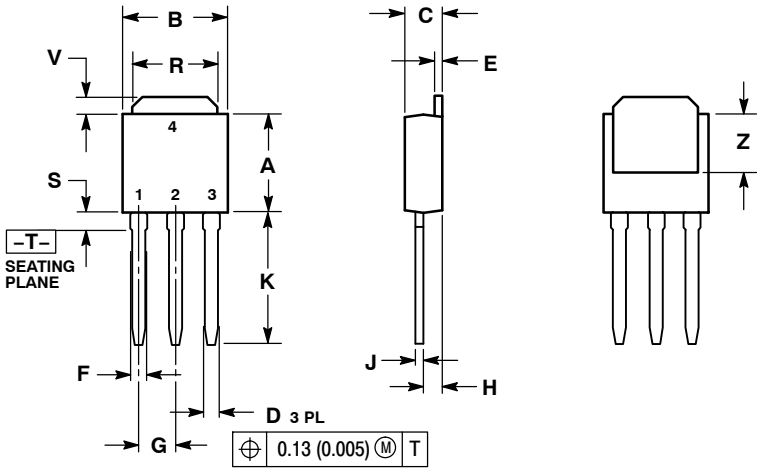


SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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 5163, Denver, Colorado 80217 USA
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

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