NTD4302

Power MOSFET

68 A, 30 V, N−Channel DPAK

Features

- Ultra Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- I_{DSS} Specified at Elevated Temperature
- DPAK Mounting Information Provided
- These Devices are Pb−Free and are RoHS Compliant

Applications

- DC−DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery Powered Products: i.e., Computers, Printers, Cellular and Cordless Telephones, and PCMCIA Cards

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

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	30	Vdc
Gate−to−Source Voltage − Continuous	V_{GS}	±20	Vdc
Thermal Resistance − Junction−to−Case Total Power Dissipation @ T_C = 25°C Continuous Drain Current @ T_C = 25°C (Note 4) Continuous Drain Current @ T_C = 100°C	$R_{\theta JC}$ P_D I_D I_D	1.65 75 68 43	°C/W W A A
Thermal Resistance − Junction−to−Ambient (Note 2) Total Power Dissipation @ T_A = 25°C Continuous Drain Current @ T_A = 25°C Continuous Drain Current @ T_A = 100°C Pulsed Drain Current (Note 3)	$R_{\theta JA}$ P_D I_D I_D I_{DM}	67 1.87 11.3 7.1 36	°C/W W A A A
Thermal Resistance − Junction−to−Ambient (Note 1) Total Power Dissipation @ T_A = 25°C Continuous Drain Current @ T_A = 25°C Continuous Drain Current @ T_A = 100°C Pulsed Drain Current (Note 3)	$R_{\theta JA}$ P_D I_D I_D I_{DM}	120 1.04 8.4 5.3 28	°C/W W A A A
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} = 10 Vdc, Peak I_L = 17 Apk, L = 5.0 mH, R_G = 25 Ω)	E_{AS}	722	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8 in 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 the minimum recommended pad size.
2. When surface mounted to an FR4 board using 0.5 sq. in. drain pad size.
3. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.
4. Current Limited by Internal Lead Wires.

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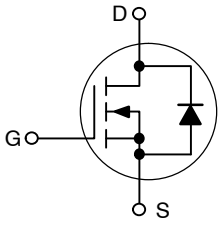
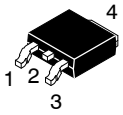
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
30 V	7.8 mΩ @ 10 V	68 A

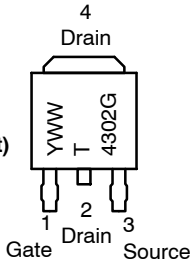
N−Channel

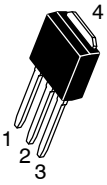


MARKING DIAGRAMS & PIN ASSIGNMENTS

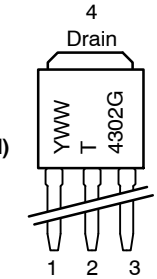


DPAK
CASE 369C
(Surface Mount)
STYLE 2





DPAK
CASE 369D
(Straight Lead)
STYLE 2



Y	= Year
WW	= Work Week
T4302	= Device Code
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 noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−Source Breakdown Voltage		$V_{(BR)DSS}$				Vdc
(V_{GS} = 0 Vdc, I_D = 250 μA)			30	–	–	
Positive Temperature Coefficient			–	25	–	mV/°C
Zero Gate Voltage Drain Current		I_{DSS}				μAdc
(V_{GS} = 0 Vdc, V_{DS} = 30 Vdc, T_J = 25°C)			–	–	1.0	
(V_{GS} = 0 Vdc, V_{DS} = 30 Vdc, T_J = 125°C)			–	–	10	
Gate−Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS						
Gate Threshold Voltage		$V_{GS(th)}$				Vdc
(V_{DS} = V_{GS}, I_D = 250 μAdc)			1.0	1.9	3.0	
Negative Temperature Coefficient			–	−3.8	–	
Static Drain−Source On−State Resistance		$R_{DS(on)}$				Ω
(V_{GS} = 10 Vdc, I_D = 20 Adc)			–	0.0078	0.010	
(V_{GS} = 10 Vdc, I_D = 10 Adc)			–	0.0078	0.010	
(V_{GS} = 4.5 Vdc, I_D = 5.0 Adc)			–	0.010	0.013	
Forward Transconductance (V_{DS} = 15 Vdc, I_D = 10 Adc)		gFS	–	20	–	Mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 24 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	–	2050	2400	pF
Output Capacitance		C_{oss}	–	640	800	
Reverse Transfer Capacitance		C_{rss}	–	225	310	
SWITCHING CHARACTERISTICS (Note 6)						
Turn−On Delay Time	(V_{DD} = 25 Vdc, I_D = 1.0 Adc, V_{GS} = 10 Vdc, R_G = 6.0 Ω)	$t_{d(on)}$	–	11	20	ns
Rise Time		t_r	–	15	25	
Turn−Off Delay Time		$t_{d(off)}$	–	85	130	
Fall Time		t_f	–	55	90	
Turn−On Delay Time	(V_{DD} = 25 Vdc, I_D = 1.0 Adc, V_{GS} = 10 Vdc, R_G = 2.5 Ω)	$t_{d(on)}$	–	11	20	ns
Rise Time		t_r	–	13	20	
Turn−Off Delay Time		$t_{d(off)}$	–	55	90	
Fall Time		t_f	–	40	75	
Turn−On Delay Time	(V_{DD} = 24 Vdc, I_D = 20 Adc, V_{GS} = 10 Vdc, R_G = 2.5 Ω)	$t_{d(on)}$	–	15	–	ns
Rise Time		t_r	–	25	–	
Turn−Off Delay Time		$t_{d(off)}$	–	40	–	
Fall Time		t_f	–	58	–	
Gate Charge	(V_{DS} = 24 Vdc, I_D = 2.0 Adc, V_{GS} = 10 Vdc)	Q_T	–	55	80	nC
		Q_{gs} (Q1)	–	5.5	–	
		Q_{gd} (Q2)	–	15	–	
BODY−DRAIN DIODE RATINGS (Note 5)						
Diode Forward On−Voltage		V_{SD}				Vdc
(I_S = 2.3 Adc, V_{GS} = 0 Vdc)			–	0.75	1.0	
(I_S = 20 Adc, V_{GS} = 0 Vdc)			–	0.90	–	
(I_S = 2.3 Adc, V_{GS} = 0 Vdc, T_J = 125°C)			–	0.65	–	
Reverse Recovery Time	(I_S = 2.3 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	–	39	65	ns
		t_a	–	20	–	
		t_b	–	19	–	
Reverse Recovery Stored Charge		Q_{rr}	–	0.043	–	μC

5. Indicates Pulse Test: Pulse Width = 300 μsec max, Duty Cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperature.

TYPICAL CHARACTERISTICS

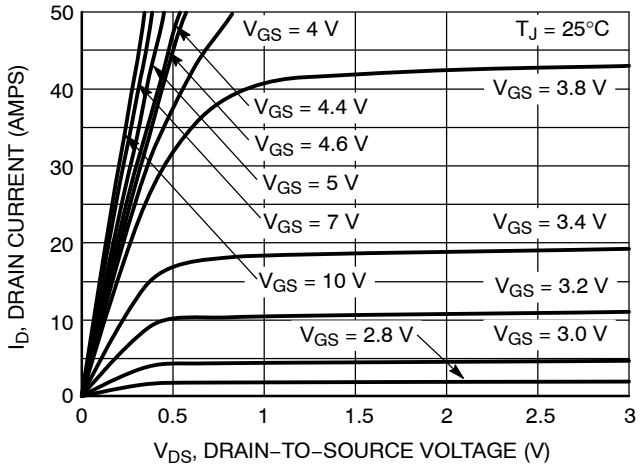


Figure 1. On−Region Characteristics

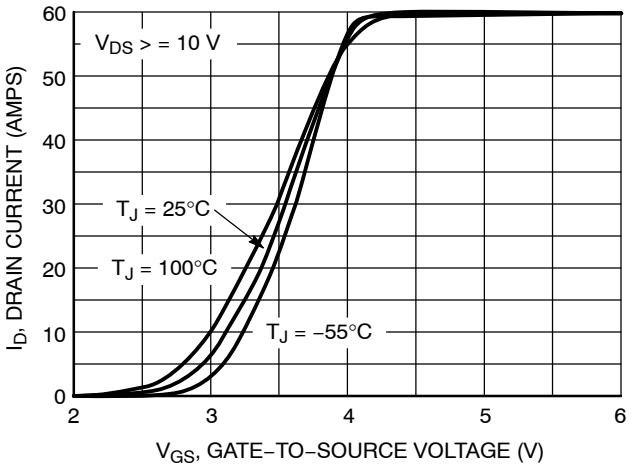


Figure 2. Transfer Characteristics

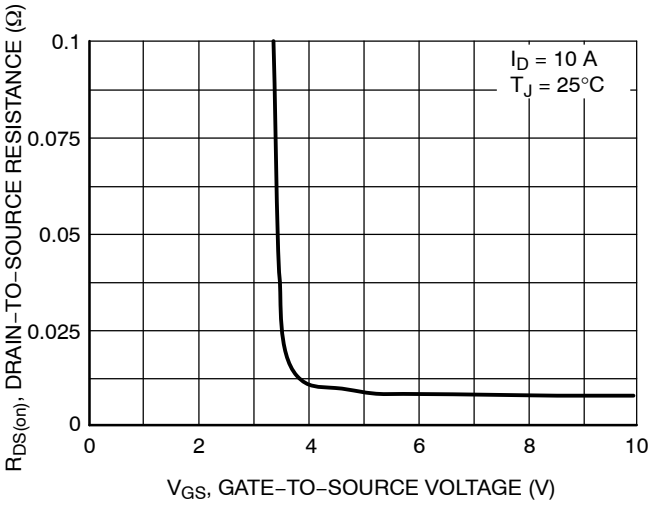


Figure 3. On−Resistance vs. Gate−To−Source Voltage

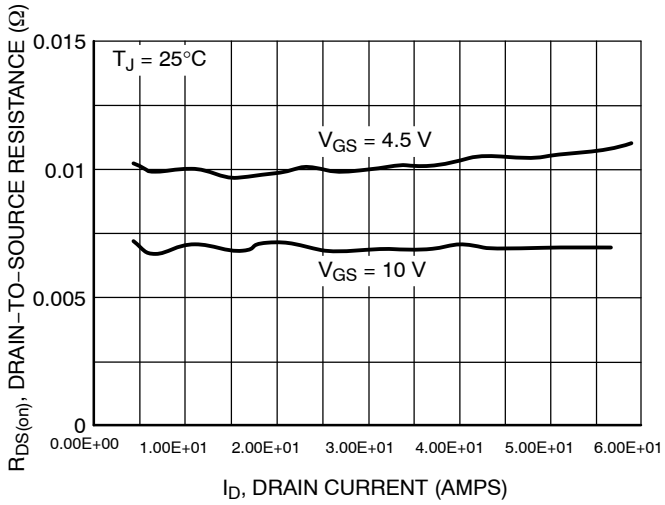


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

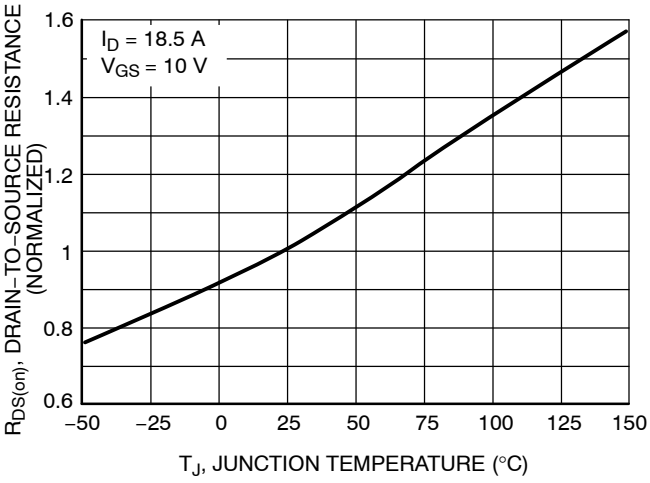


Figure 5. On−Resistance Variation with Temperature

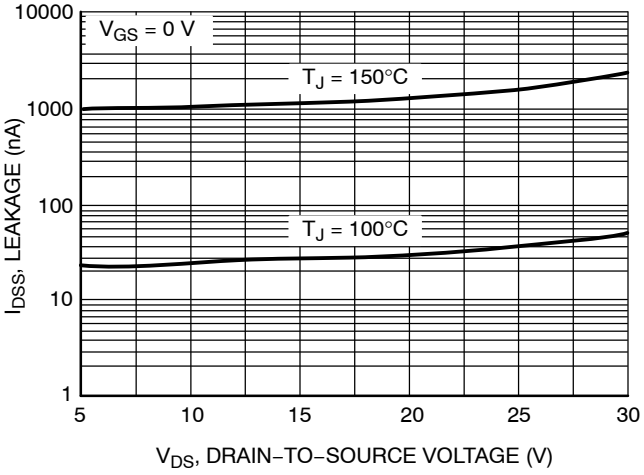


Figure 6. Drain−To−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

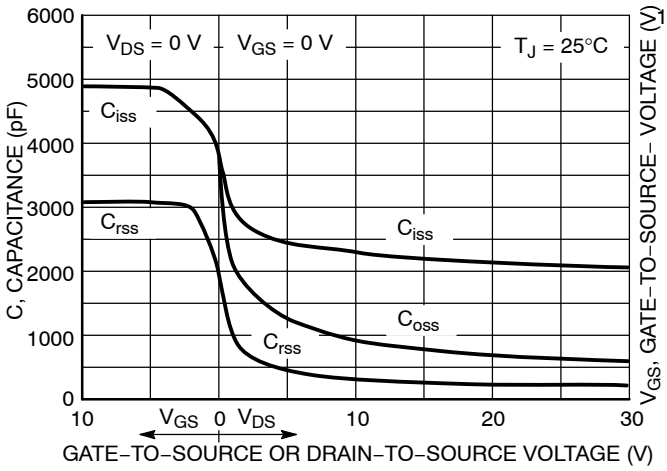


Figure 7. Capacitance Variation

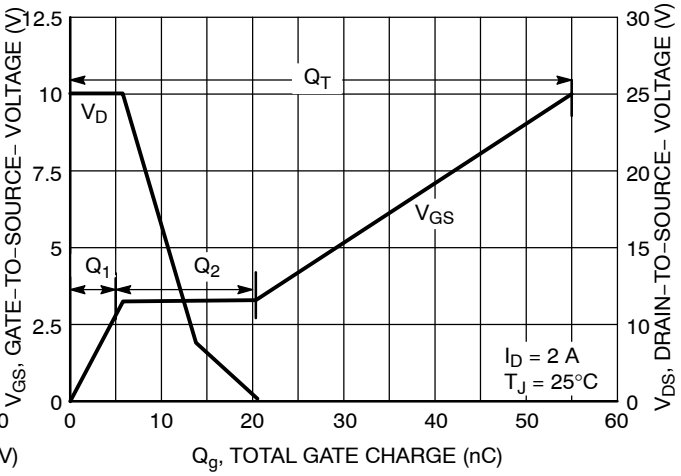


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

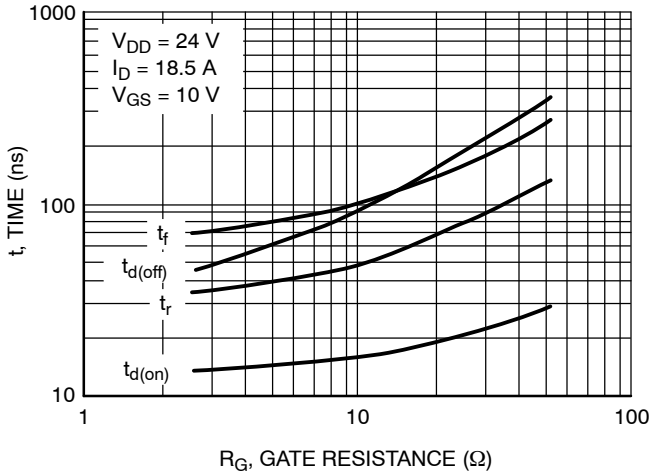


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

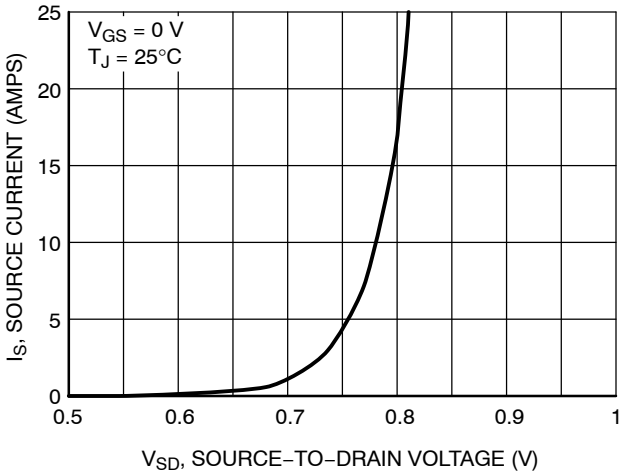


Figure 10. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

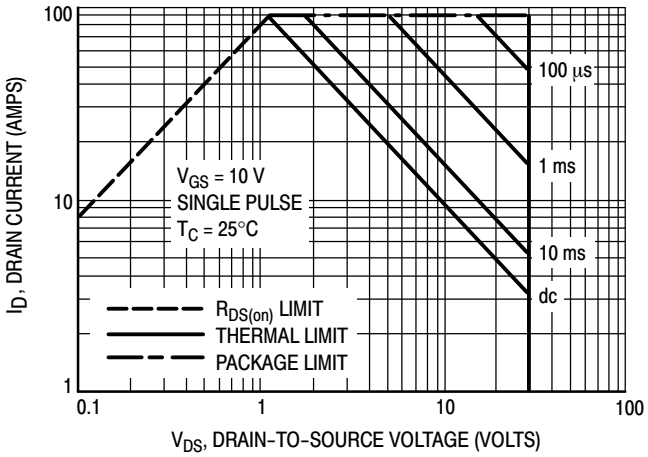


Figure 11. Maximum Rated Forward Biased Safe Operating Area

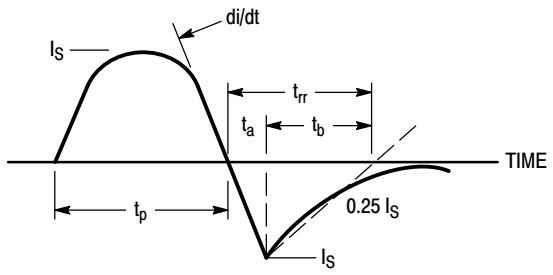


Figure 12. Diode Reverse Recovery Waveform

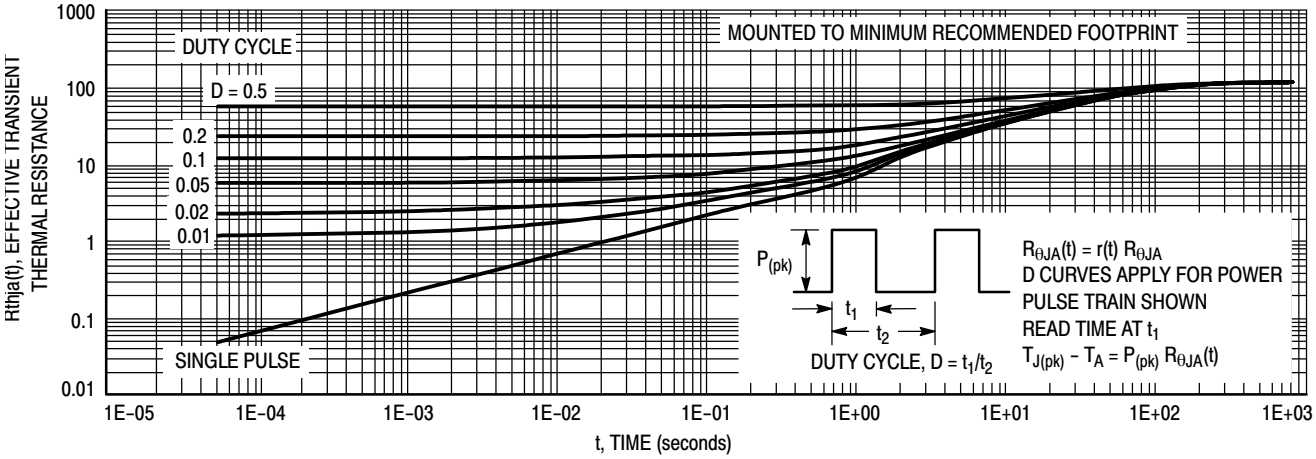


Figure 13. Thermal Response – Various Duty Cycles

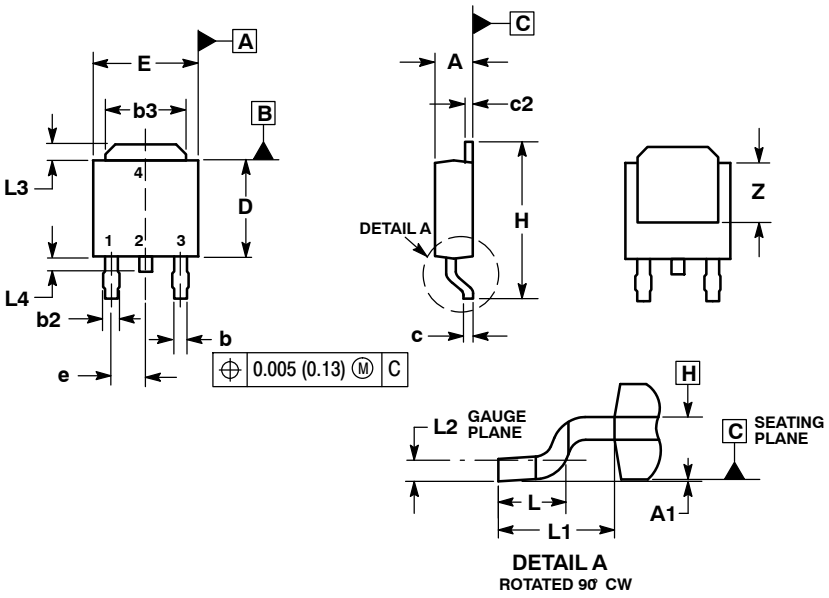
ORDERING INFORMATION

Device	Package Type	Package	Shipping†
NTD4302G	DPAK	369C (Pb−Free)	75 Units / Rail
NTD4302−1G	DPAK−3	369D (Pb−Free)	75 Units / Rail
NTD4302T4G	DPAK	369C (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 (SINGLE GAUGE)
CASE 369C−01
ISSUE D

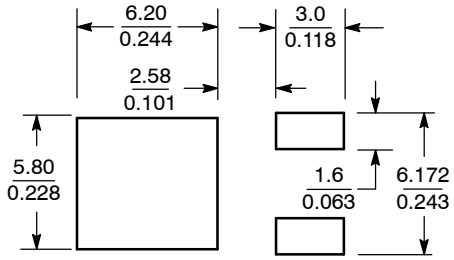


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	−−−	0.040	−−−	1.01
Z	0.155	−−−	3.93	−−−

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

SOLDERING FOOTPRINT*

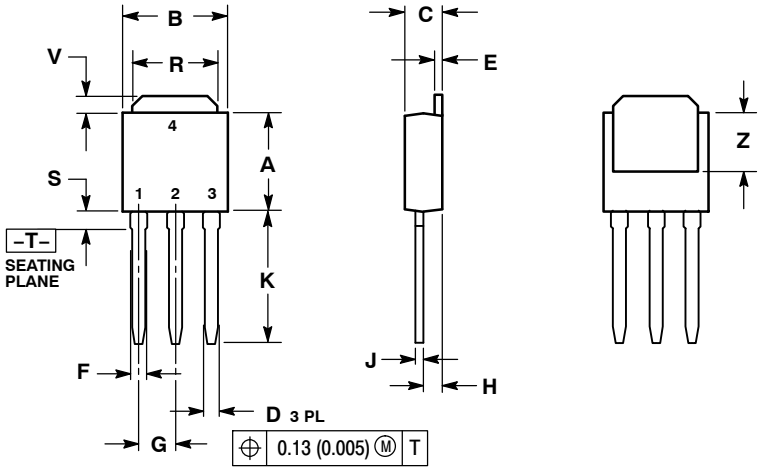


SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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
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:
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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

ON Semiconductor Website: **www.onsemi.com**

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