NDF04N62Z, NDD04N62Z

N-Channel Power MOSFET 620 V, 2.0 Ω

Features

- Low ON Resistance
- Low Gate Charge
- ESD Diode−Protected Gate
- 100% Avalanche Tested
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

ON Semiconductor®

http://onsemi.com

V_{DSS}	$R_{DS(ON)}$ (MAX) @ 2 A
620 V	2.0 Ω

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

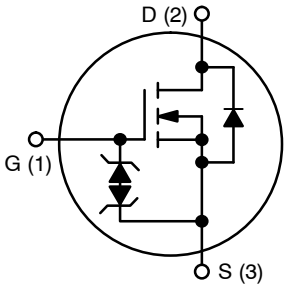
Parameter	Symbol	NDF	NDD	Unit
Drain−to−Source Voltage	V_{DSS}	620		V
Continuous Drain Current $R_{\theta JC}$	I_D	4.4 (Note 2)	4.1	A
Continuous Drain Current $R_{\theta JC}$, T_A = 100°C	I_D	2.8 (Note 2)	2.6	A
Pulsed Drain Current, V_{GS} @ 10V	I_{DM}	18 (Note 2)	16	A
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	28	83	W
Gate−to−Source Voltage	V_{GS}	±30		V
Single Pulse Avalanche Energy, I_D = 4.0 A	E_{AS}	120		mJ
ESD (HBM) (JESD22−A114)	V_{esd}	3000		V
RMS Isolation Voltage (t = 0.3 sec., R.H. ≤ 30%, T_A = 25°C) (Figure 14)	V_{ISO}	4500	–	V
Peak Diode Recovery	dv/dt	4.5 (Note 3)		V/ns
Continuous Source Current (Body Diode)	I_S	4.0		A
Maximum Temperature for Soldering Leads, 0.063″ (1.6 mm) from Case for 10 s Package Body for 10 s	T_L T_{PKG}	300 260		°C
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−55 to 150		°C

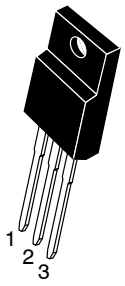
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface mounted on FR4 board using 1″ sq. pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Limited by maximum junction temperature
3. I_{SD} = 4.0 A, di/dt ≤ 100 A/μs, $V_{DD} \le BV_{DSS}$, T_J = +150°C

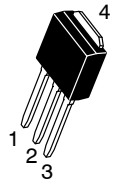
This document contains information on some products that are still under development. ON Semiconductor reserves the right to change or discontinue these products without notice.

N−Channel

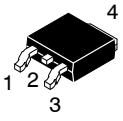




NDF04N62ZG
TO−220FP
CASE 221D



NDD04N62Z−1G
IPAK
CASE 369D



NDD04N62ZT4G
DPAK
CASE 369AA

ORDERING INFORMATION

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

THERMAL RESISTANCE

Parameter		Symbol	Value	Unit
Junction−to−Case (Drain)	NDF04N62Z NDD04N62Z	$R_{\theta JC}$	4.4 1.5	°C/W
Junction−to−Ambient Steady State	(Note 4) NDF04N62Z (Note 1) NDD04N62Z (Note 4) NDD04N62Z−1	$R_{\theta JA}$	50 38 80	

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

Characteristic	Test Conditions		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA		BV_{DSS}	620			V
Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D = 1 mA		$\Delta BV_{DSS}/\Delta T_J$		0.6		V/°C
Drain−to−Source Leakage Current	V_{DS} = 620 V, V_{GS} = 0 V	25°C	I_{DSS}			1	μA
		125°C				50	
Gate−to−Source Forward Leakage	V_{GS} = ±20 V		I_{GSS}			±10	μA
ON CHARACTERISTICS (Note 5)							
Static Drain−to−Source On−Resistance	V_{GS} = 10 V, I_D = 2.0 A		$R_{DS(on)}$		1.8	2.0	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 50 μA		$V_{GS(th)}$	3.0		4.5	V
Forward Transconductance	V_{DS} = 15 V, I_D = 2.0 A		g_{FS}		3.3		S
DYNAMIC CHARACTERISTICS							
Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		C_{iss}		535		pF
Output Capacitance			C_{oss}		62		
Reverse Transfer Capacitance			C_{rss}		14		
Total Gate Charge	V_{DD} = 310 V, I_D = 4.0 A, V_{GS} = 10 V		Q_g		19		nC
Gate−to−Source Charge			Q_{gs}		3.9		
Gate−to−Drain (“Miller”) Charge			Q_{gd}		10		
Plateau Voltage			V_{GP}		6.4		V
Gate Resistance			R_g		4.7		Ω
RESISTIVE SWITCHING CHARACTERISTICS							
Turn−On Delay Time	V_{DD} = 310 V, I_D = 4.0 A, V_{GS} = 10 V, R_G = 5 Ω		$t_{d(on)}$		12		ns
Rise Time			t_r		13		
Turn−Off Delay Time			$t_{d(off)}$		25		
Fall Time			t_f		14		

SOURCE−DRAIN DIODE CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Diode Forward Voltage	I_S = 4.0 A, V_{GS} = 0 V	V_{SD}			1.6	V
Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 30 V, I_S = 4.0 A, di/dt = 100 A/μs	t_{rr}		285		ns
Reverse Recovery Charge		Q_{rr}		1.3		μC

4. Insertion mounted
5. Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS

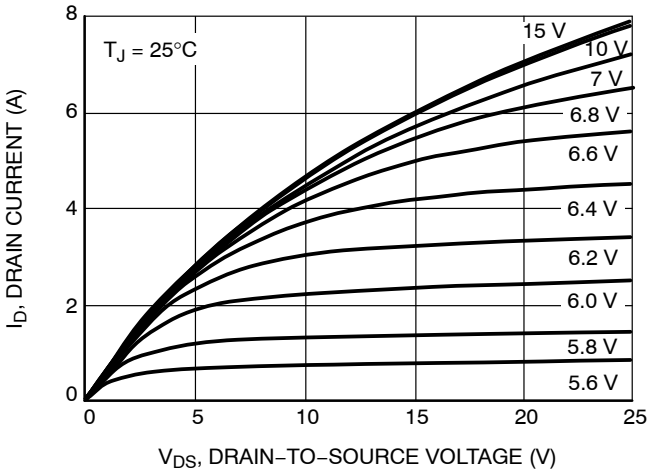


Figure 1. On−Region Characteristics

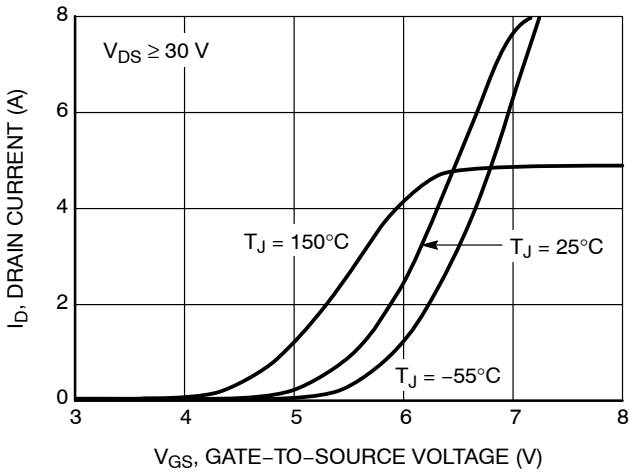


Figure 2. Transfer Characteristics

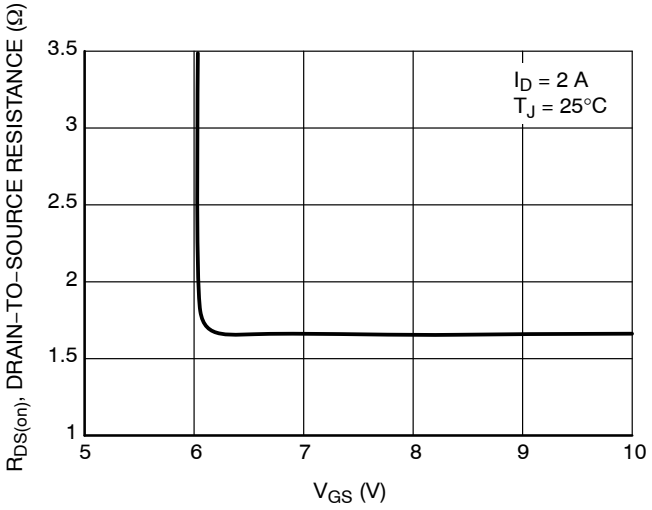


Figure 3. On−Resistance vs. Gate Voltage

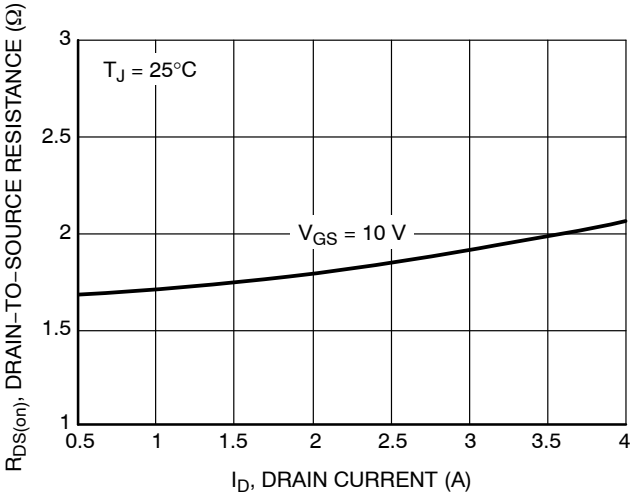


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

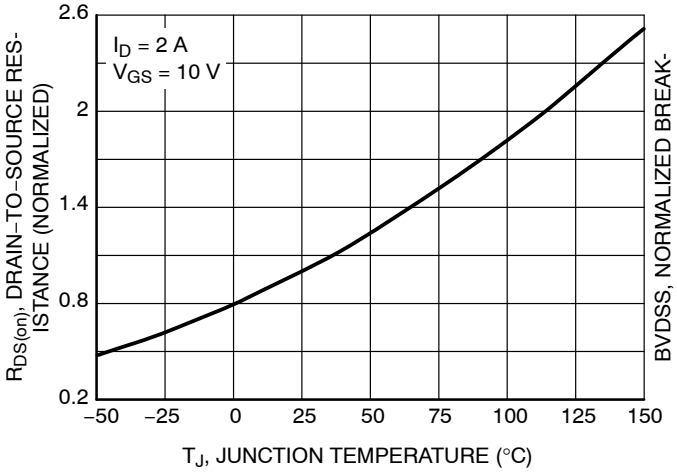


Figure 5. On−Resistance Variation with Temperature

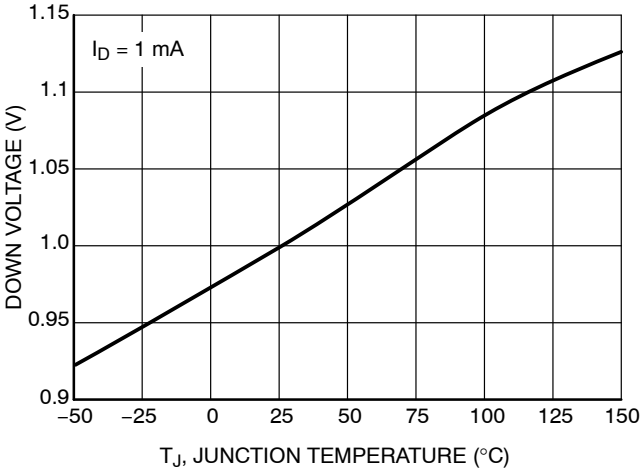


Figure 6. BVDSS Variation with Temperature

TYPICAL CHARACTERISTICS

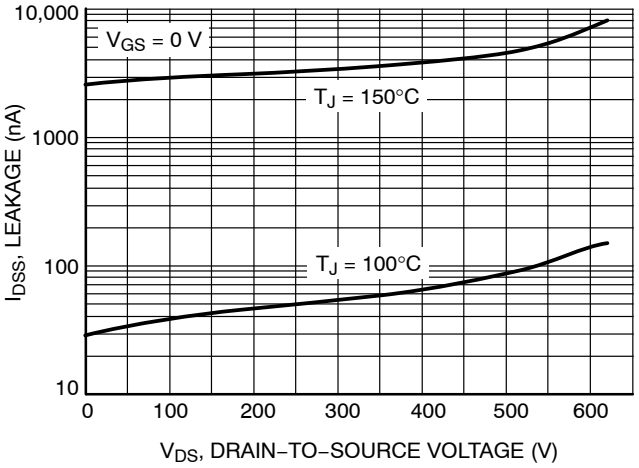


Figure 7. Drain−to−Source Leakage Current vs. Voltage

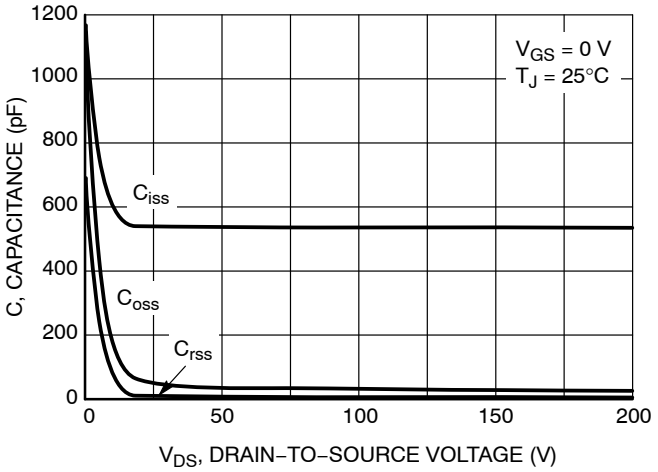


Figure 8. Capacitance Variation

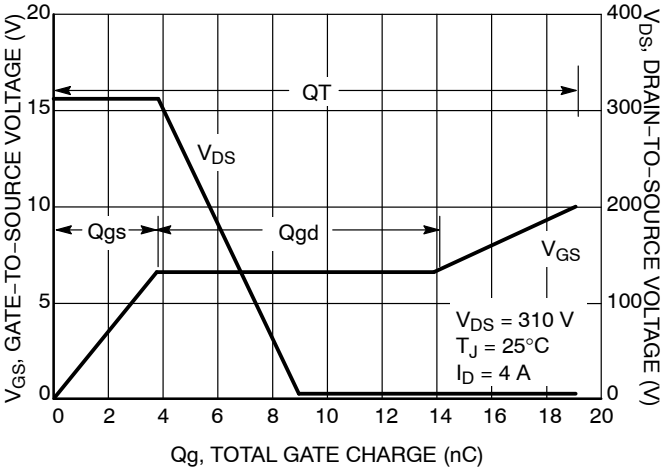


Figure 9. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

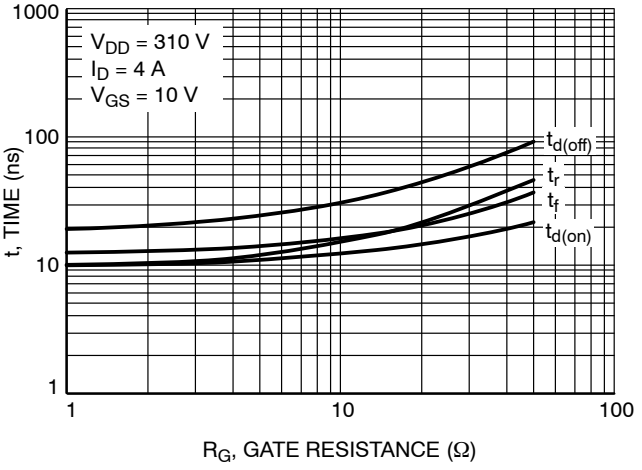


Figure 10. Resistive Switching Time Variation vs. Gate Resistance

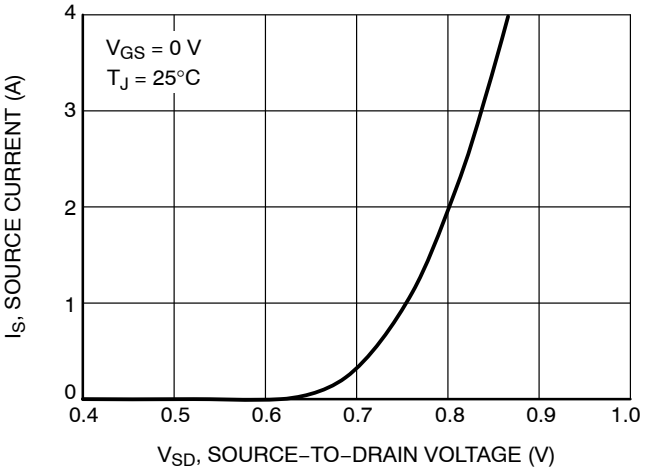


Figure 11. Diode Forward Voltage vs. Current

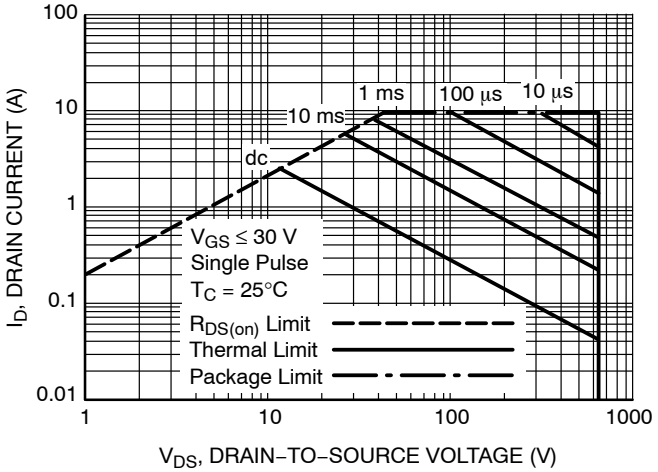


Figure 12. Maximum Rated Forward Biased Safe Operating Area for NDF04N62Z

TYPICAL CHARACTERISTICS

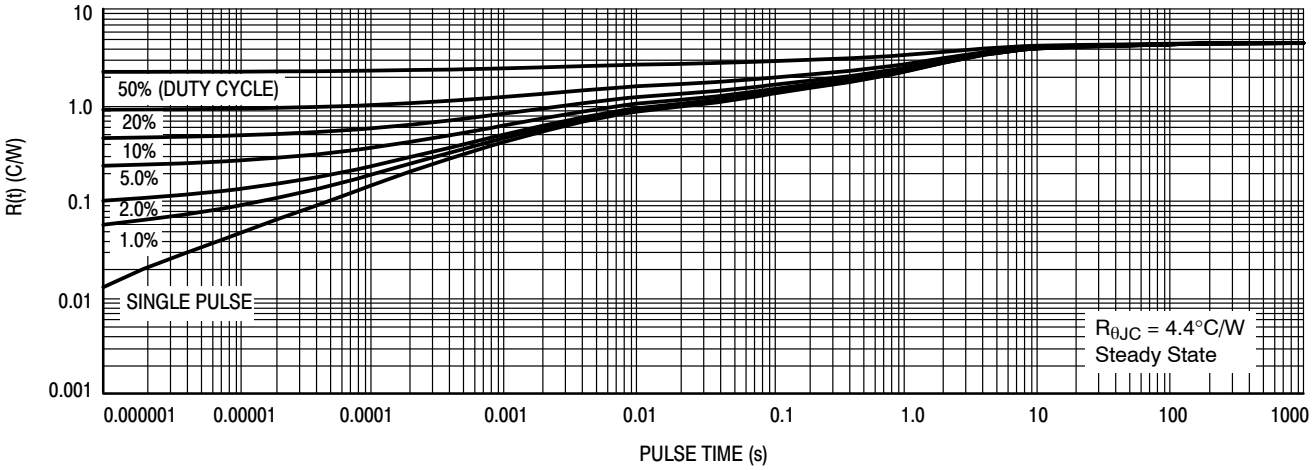


Figure 13. Thermal Impedance for NDF04N62Z

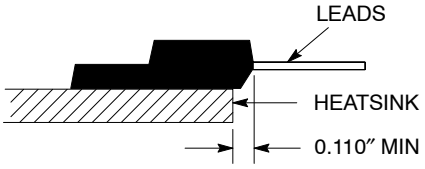


Figure 14. Isolation Test Diagram

Measurement made between leads and heatsink with all leads shorted together.

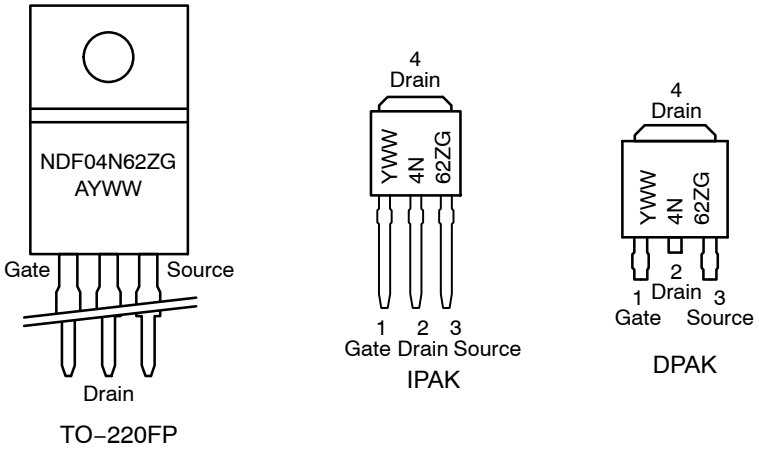
*For additional mounting information, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ORDERING INFORMATION

Order Number	Package	Shipping†
NDF04N62ZG	TO−220FP (Pb−Free, Halogen−Free)	50 Units / Rail
NDD04N62Z−1G	IPAK (Pb−Free, Halogen−Free)	75 Units / Rail (In Development)
NDD04N62ZT4G	DPAK (Pb−Free, Halogen−Free)	2500 / Tape & Reel (In Development)

†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.

MARKING DIAGRAMS



TO−220FP

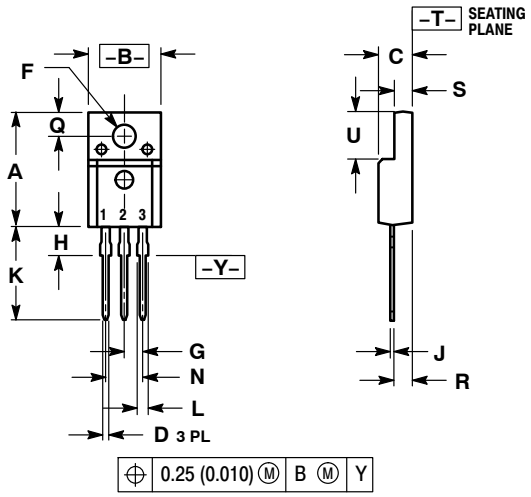
IPAK

DPAK

A = Location Code
Y = Year
WW = Work Week
G = Pb−Free, Halogen−Free Package

PACKAGE DIMENSIONS

TO−220FP
CASE 221D−03
ISSUE K

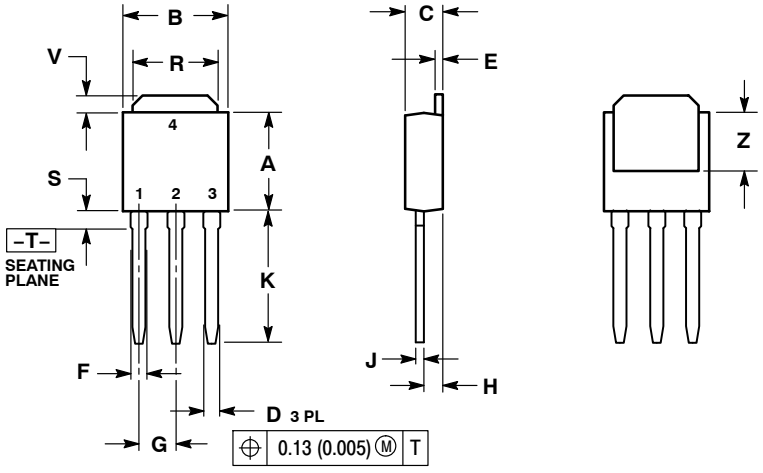


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D−01 THRU 221D−02 OBSOLETE, NEW STANDARD 221D−03.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.617	0.635	15.67	16.12
B	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54 BSC	
H	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88

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

IPAK
CASE 369D−01
ISSUE C



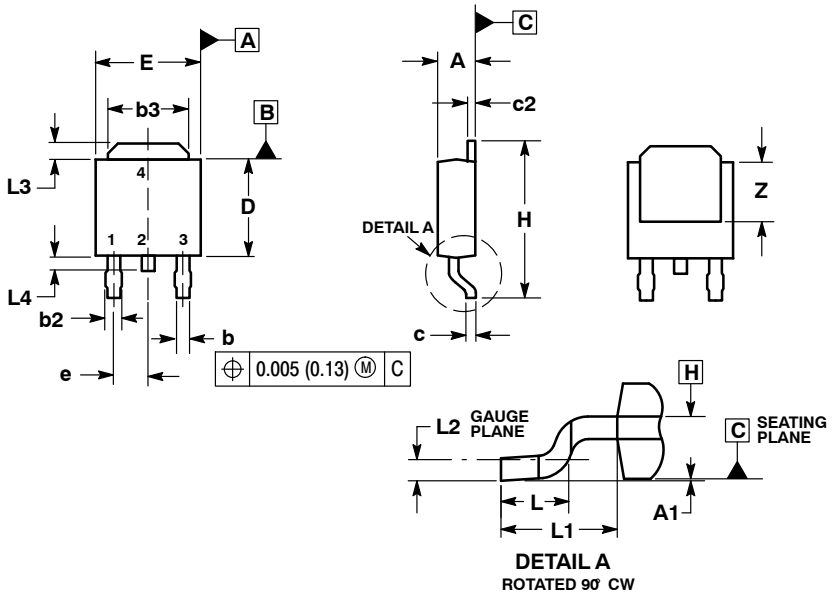
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	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

PACKAGE DIMENSIONS

DPAK (SINGLE GUAGE)
CASE 369AA−01
ISSUE B

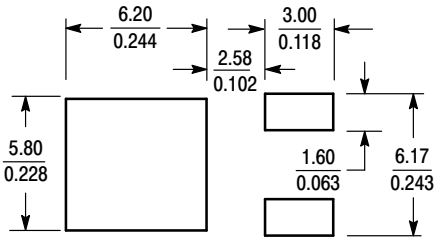


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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

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

For additional information, please contact your local Sales Representative