

NDF04N62Z, NDP04N62Z, NDD04N62Z

N-Channel Power MOSFET 620 V, 1.8 Ω

Features

- Low ON Resistance
- Low Gate Charge
- 100% Avalanche Tested
- These Devices are Pb-Free and RoHS Compliant

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	NDF	NDP	NDD	Unit
Drain-to-Source Voltage	V_{DS}	620			V
Continuous Drain Current $R_{\theta JC}$	I_D	4.4 (Note 2)	4.4	4.1	A
Continuous Drain Current $R_{\theta JC}$, $T_A = 100^\circ\text{C}$	I_D	2.8 (Note 2)	2.8	2.6	A
Pulsed Drain Current, $V_{GS} @ 10\text{V}$	I_{DM}	18 (Note 2)	18	16	A
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	28	96	83	W
Gate-to-Source Voltage	V_{GS}	± 30			V
Single Pulse Avalanche Energy, $I_D = 4.0\text{ A}$	E_{AS}	120			mJ
ESD (HBM) (JEDEC22-A114)	V_{ESD}	3000			V
RMS Isolation Voltage ($t = 0.3\text{ sec.}$, R.H. $\leq 30\%$, $T_A = 25^\circ\text{C}$) (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			$^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J , T_{stg}	-55 to 150			$^\circ\text{C}$

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. $I_{SD} = 4.0\text{ A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J = +150^\circ\text{C}$

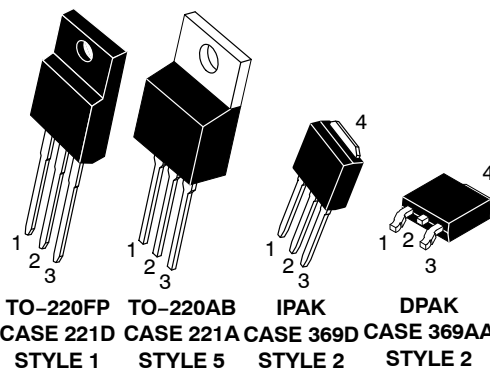
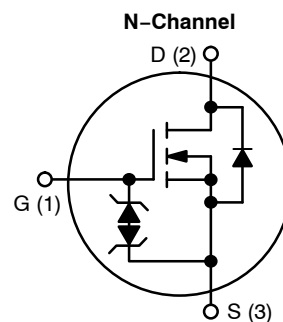
This document contains information on some products that are still under development. ON Semiconductor reserves the right to change or discontinue these products without notice.



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V_{DSS}	$R_{DS(ON)}$ (TYP) @ 2 A
620 V	1.8 Ω



ORDERING INFORMATION

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

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THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.3 4.4 1.5	°C/W
Junction-to-Ambient Steady State	$R_{\theta JA}$	50 50 38 80	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	BV_{DSS}	620			V
Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D = 1\text{ mA}$	$\Delta BV_{DSS} / \Delta T_J$		0.6		V/°C
Drain-to-Source Leakage Current	$V_{DS} = 620\text{ V}, V_{GS} = 0\text{ V}$	I_{DSS}			1	μA
					50	
Gate-to-Source Forward Leakage	$V_{GS} = \pm 20\text{ V}$	I_{GSS}			±10	μA

ON CHARACTERISTICS (Note 5)

Static Drain-to-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 2.0\text{ A}$	$R_{DS(on)}$		1.8	2.0	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 50\text{ μA}$	$V_{GS(th)}$	3.0		4.5	V
Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 2.0\text{ A}$	g_{FS}		3.3		S

DYNAMIC CHARACTERISTICS

Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	C_{iss}		535		pF
Output Capacitance		C_{oss}		62		
Reverse Transfer Capacitance		C_{rss}		14		
Total Gate Charge	$V_{DD} = 310\text{ V}, I_D = 4.0\text{ A},$ $V_{GS} = 10\text{ V}$	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	$V_{DD} = 310\text{ V}, I_D = 4.0\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 5\text{ Ω}$	$t_{d(on)}$		12		ns
Rise Time		t_r		13		
Turn-Off Delay Time		$t_{d(off)}$		25		
Fall Time		t_f		14		

SOURCE-DRAIN DIODE CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Diode Forward Voltage	$I_S = 4.0\text{ A}, V_{GS} = 0\text{ V}$	V_{SD}			1.6	V
Reverse Recovery Time	$V_{GS} = 0\text{ V}, V_{DD} = 30\text{ V}$ $I_S = 4.0\text{ A}, di/dt = 100\text{ A/μs}$	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

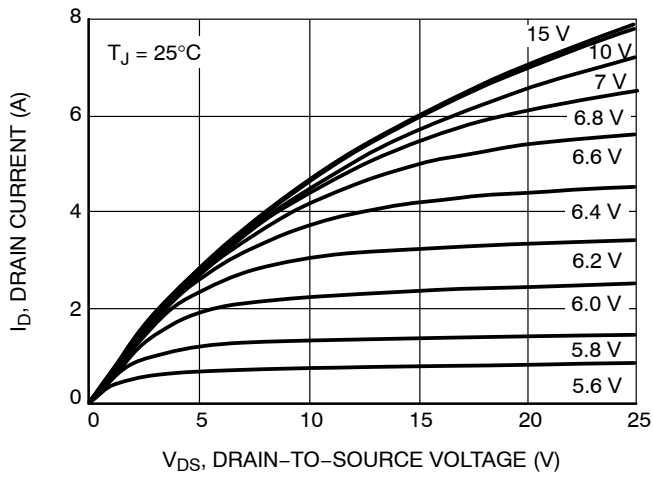


Figure 1. On-Region Characteristics

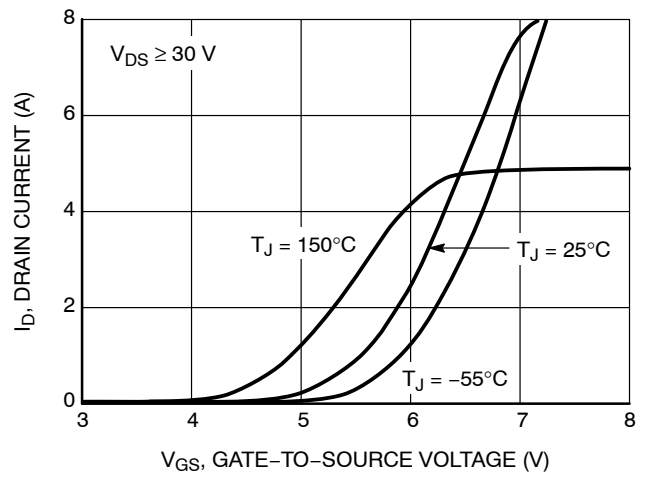


Figure 2. Transfer Characteristics

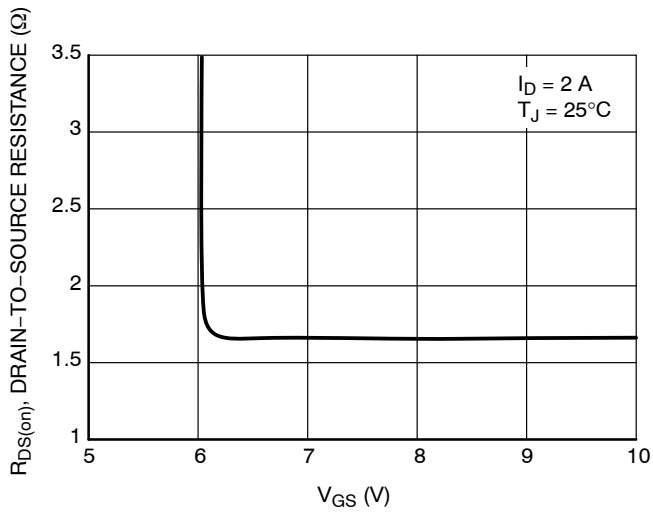


Figure 3. On-Resistance vs. Gate Voltage

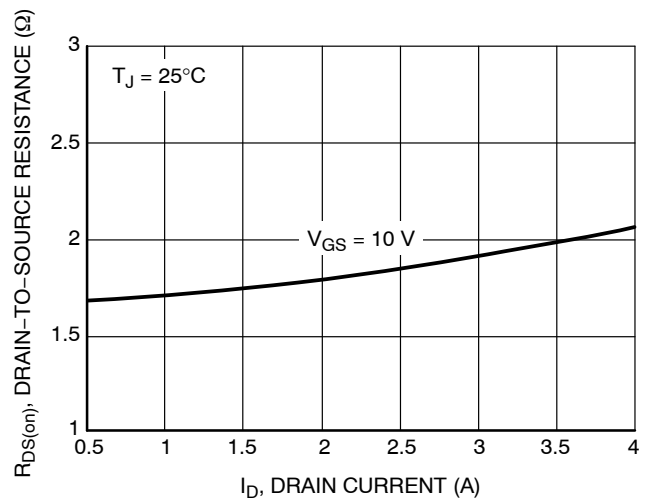


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

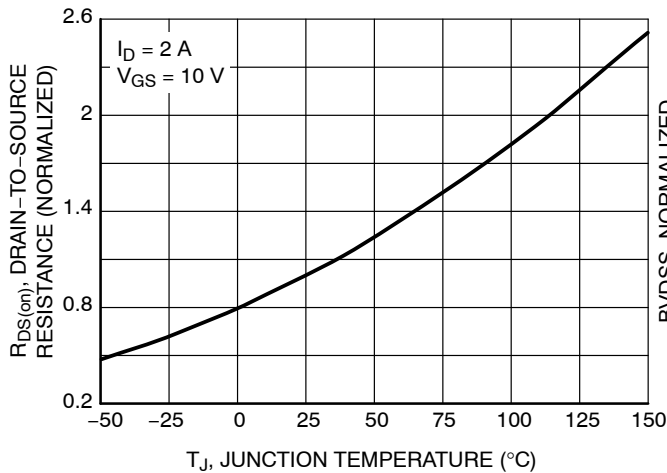


Figure 5. On-Resistance Variation with Temperature

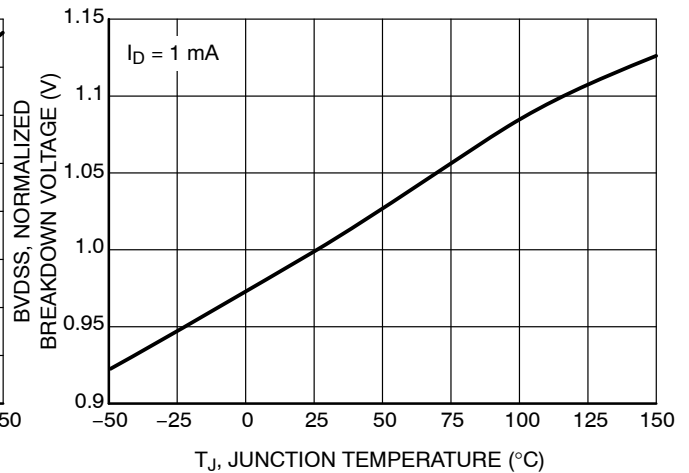


Figure 6. BVDSS Variation with Temperature

TYPICAL CHARACTERISTICS

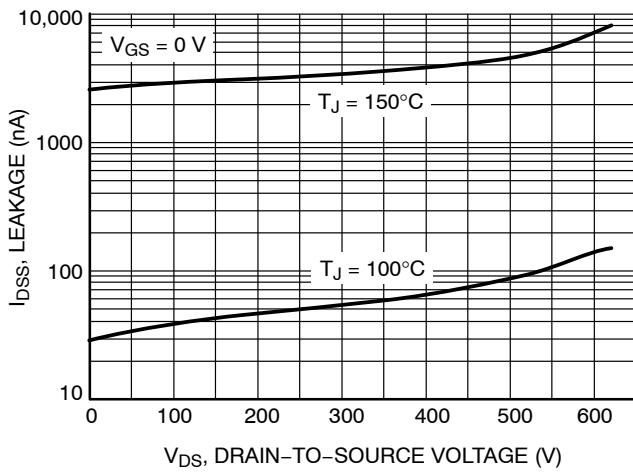


Figure 7. Drain-to-Source Leakage Current vs. Voltage

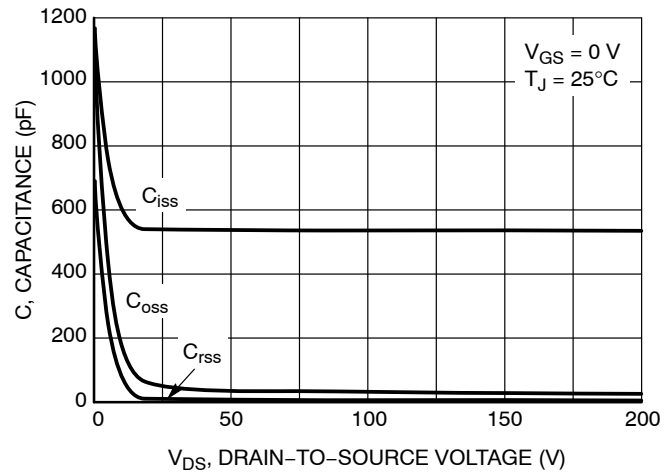


Figure 8. Capacitance Variation

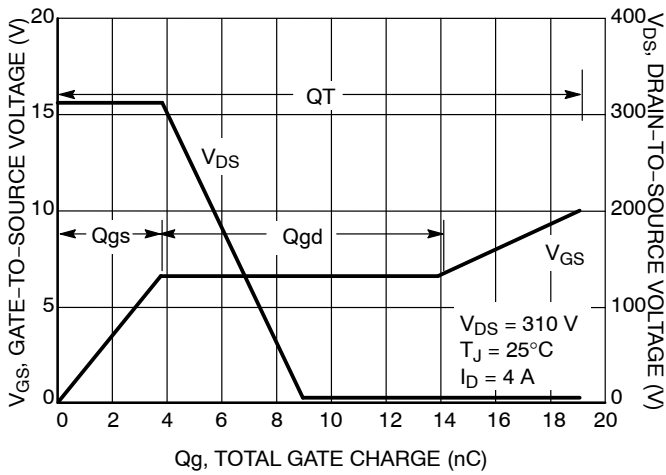


Figure 9. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

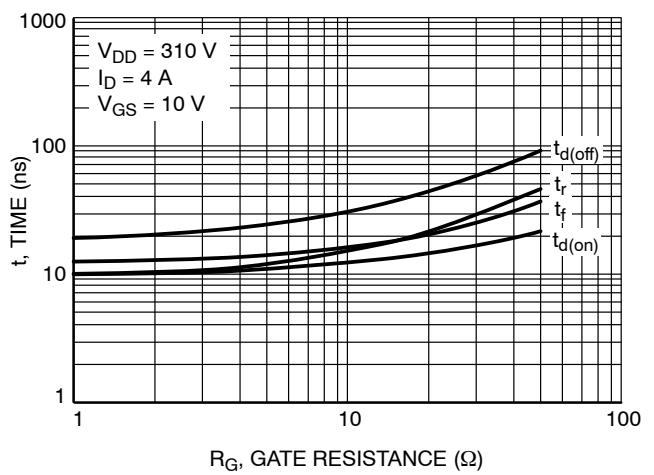


Figure 10. Resistive Switching Time Variation vs. Gate Resistance

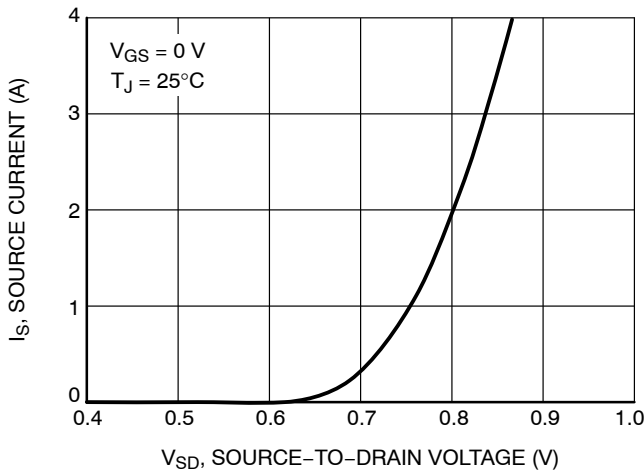


Figure 11. Diode Forward Voltage vs. Current

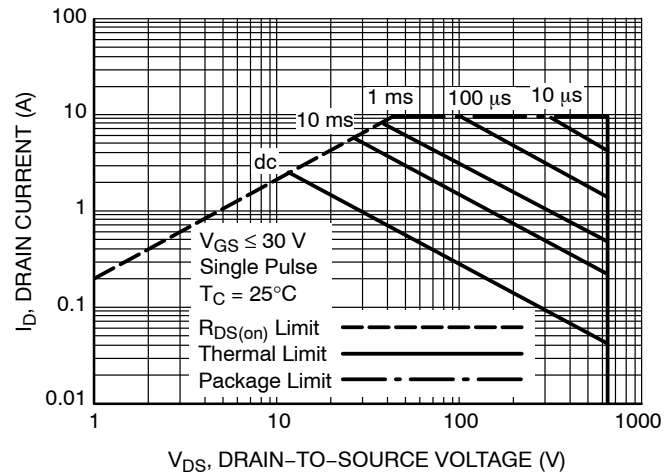


Figure 12. Maximum Rated Forward Biased Safe Operating Area for NDF04N62Z

NDF04N62Z, NDP04N62Z, NDD04N62Z

TYPICAL CHARACTERISTICS

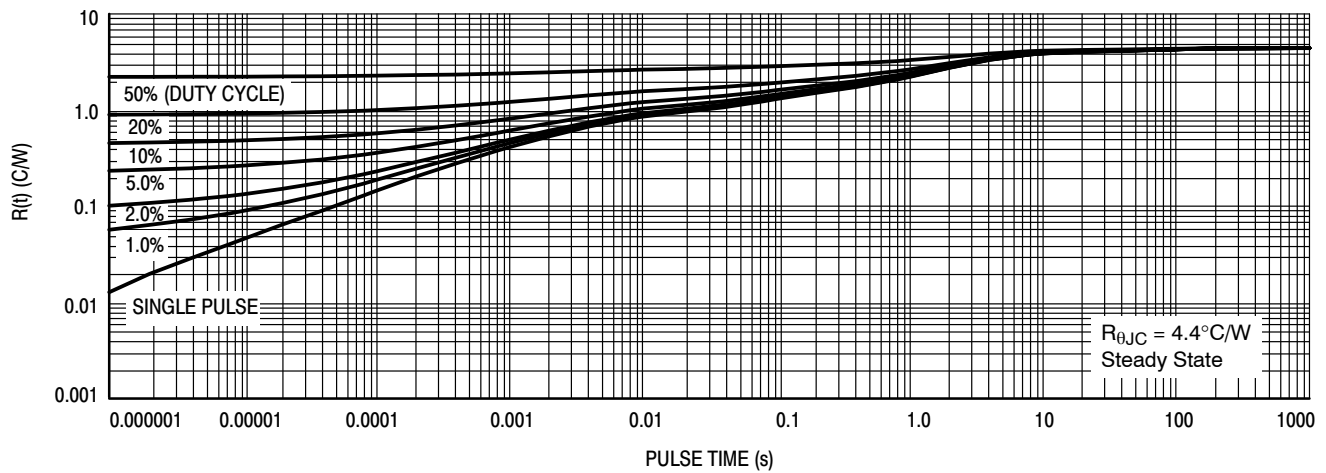


Figure 13. Thermal Impedance for NDF04N62Z

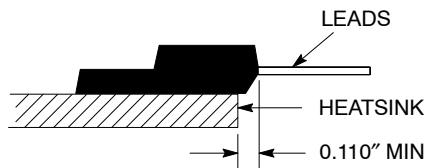


Figure 14. Isolation Test Diagram

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.

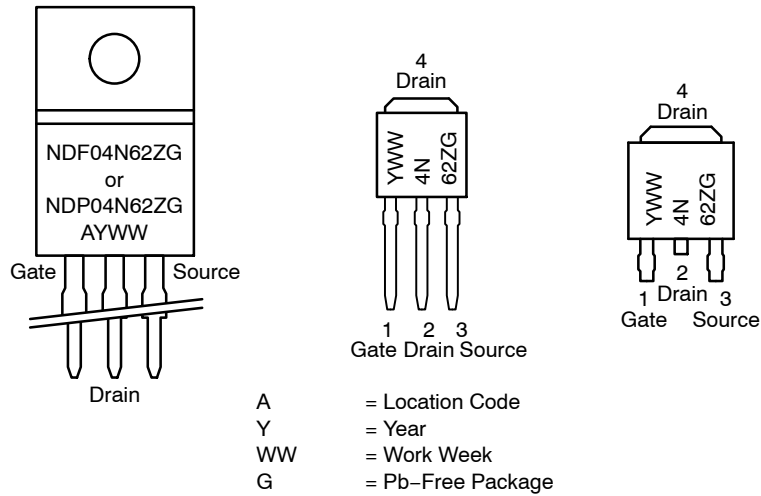
NDF04N62Z, NDP04N62Z, NDD04N62Z

ORDERING INFORMATION

Order Number	Package	Shipping [†]
NDF04N62ZG	TO-220FP (Pb-Free)	50 Units / Rail
NDP04N62ZG	TO-220AB (Pb-Free)	50 Units / Rail (In Development)
NDD04N62Z-1G	IPAK (Pb-Free)	75 Units / Rail (In Development)
NDD04N62ZT4G	DPAK (Pb-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.

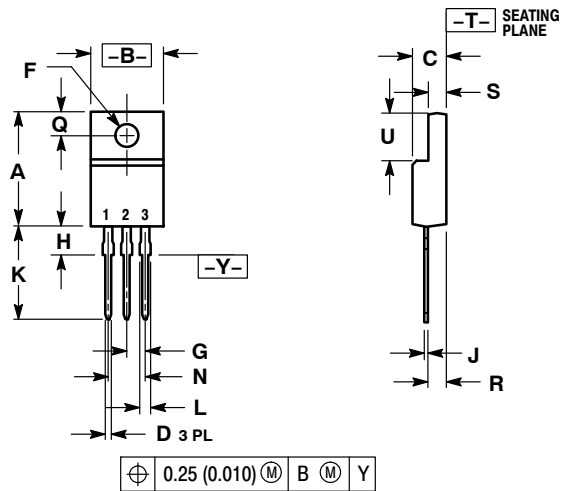
MARKING DIAGRAMS



NDF04N62Z, NDP04N62Z, NDD04N62Z

PACKAGE DIMENSIONS

TO-220 FULLPAK CASE 221D-03 ISSUE J

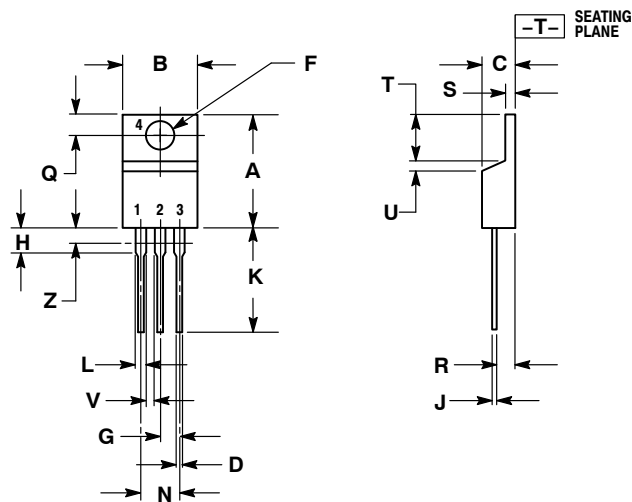


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH
 3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

DIM	INCHES		MILLIMETERS	
	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

TO-220AB CASE 221A-09 ISSUE AE



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

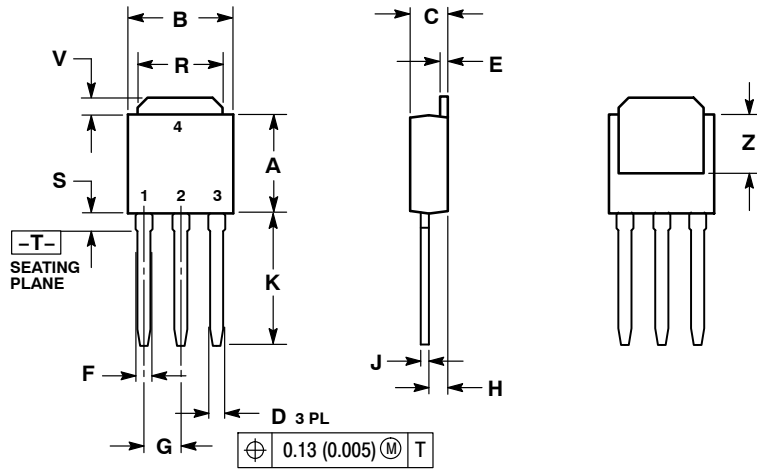
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
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

NDF04N62Z, NDP04N62Z, NDD04N62Z

PACKAGE DIMENSIONS

IPAK
CASE 369D-01
ISSUE B



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

DIM	INCHES		MILLIMETERS	
	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	---

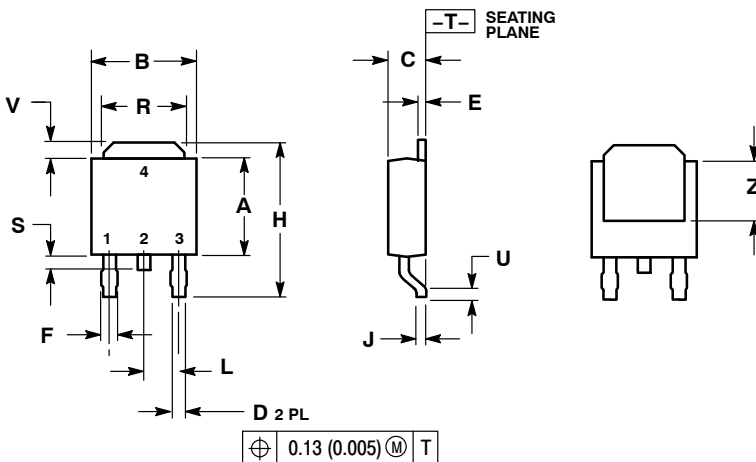
STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

NDF04N62Z, NDP04N62Z, NDD04N62Z

PACKAGE DIMENSIONS

DPAK CASE 369AA-01 ISSUE A

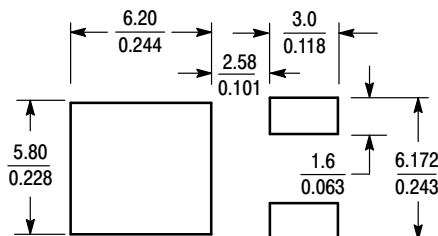


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

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	0.025	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 (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.

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