

NDF08N50Z, NDP08N50Z

N-Channel Power MOSFET 500 V, 0.69 Ω

Features

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

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

Rating	Symbol	NDF08N50Z	NDP08N50Z	Unit
Drain-to-Source Voltage	V_{DSS}	500		V
Continuous Drain Current $R_{\theta JC}$	I_D	7.5 (Note 1)	7.5	A
Continuous Drain Current $R_{\theta JC} T_A = 100^\circ\text{C}$	I_D	4.7 (Note 1)	4.7	A
Pulsed Drain Current, $V_{GS} @ 10\text{ V}$	I_{DM}	30 (Note 1)	30	A
Power Dissipation	P_D	31	125	W
Gate-to-Source Voltage	V_{GS}	30		V
Single Pulse Avalanche Energy, $I_D = 7.5\text{ A}$	E_{AS}	190		mJ
ESD (HBM) (JESD 22-A114)	V_{esd}	3500		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		V/ns
Continuous Source Current (Body Diode)	I_S	7.5		A
Maximum Temperature for Soldering Leads	T_L	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.

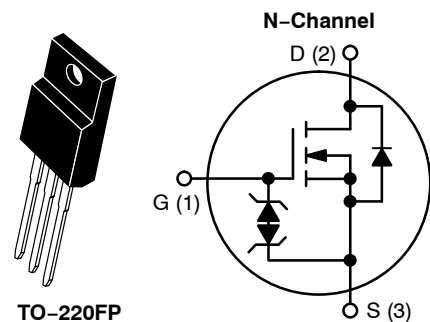
1. Limited by maximum junction temperature
2. $I_{SD} = 7.5\text{ A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J = +150^\circ\text{C}$



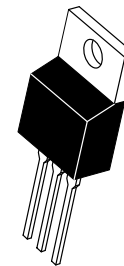
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V_{DSS}	$R_{DS(ON)}$ (TYP) @ 3.6 A
500 V	0.69 Ω

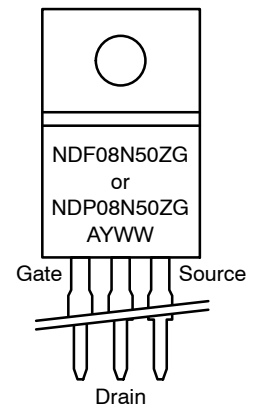


TO-220FP
CASE 221D
STYLE 1



TO-220AB
CASE 221A
STYLE 5

MARKING DIAGRAM



- A = Location Code
- Y = Year
- WW = Work Week
- G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
NDF08N50ZG	TO-220FP	50 Units/Rail
NDP08N50ZG	TO-220AB	In Development

NDF08N50Z, NDP08N50Z

THERMAL RESISTANCE

Parameter	Symbol	NDF08N50Z	NDP08N50Z	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.0	1.0	°C/W
Junction-to-Ambient Steady State (Note 3)	$R_{\theta JA}$	50	50	

3. Insertion mounted

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}	500			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	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	I_{DSS}			1	μA
					50	
Gate-to-Source Forward Leakage	$V_{GS} = \pm 20\text{ V}$	I_{GSS}			± 10	μA

ON CHARACTERISTICS (Note 4)

Static Drain-to-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 3.6\text{ A}$	$R_{DS(on)}$		0.69	0.85	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 100\ \mu\text{A}$	$V_{GS(th)}$	3.0		4.5	V
Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 3.75\text{ A}$	g_{FS}		6.0		S

DYNAMIC CHARACTERISTICS

Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	C_{iss}		912		pF
Output Capacitance		C_{oss}		120		
Reverse Transfer Capacitance		C_{rss}		27		
Total Gate Charge	$V_{DD} = 250\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}$	Q_g		31		nC
Gate-to-Source Charge		Q_{gs}		6.2		
Gate-to-Drain ("Miller") Charge		Q_{gd}		17		
Plateau Voltage		V_{GP}		6.3		V
Gate Resistance		R_g		3.0		Ω

RESISTIVE SWITCHING CHARACTERISTICS

Turn-On Delay Time	$V_{DD} = 250\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 5\ \Omega$	$t_{d(on)}$		13		ns
Rise Time		t_r		23		
Turn-Off Delay Time		$t_{d(off)}$		31		
Fall Time		t_f		29		

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

Diode Forward Voltage	$I_S = 7.5\text{ A}, V_{GS} = 0\text{ V}$	V_{SD}			1.6	V
Reverse Recovery Time	$V_{GS} = 0\text{ V}, V_{DD} = 30\text{ V}$ $I_S = 7.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	t_{rr}		295		ns
Reverse Recovery Charge		Q_{rr}		1.85		μC

4. Pulse Width $\leq 380\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

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TYPICAL CHARACTERISTICS

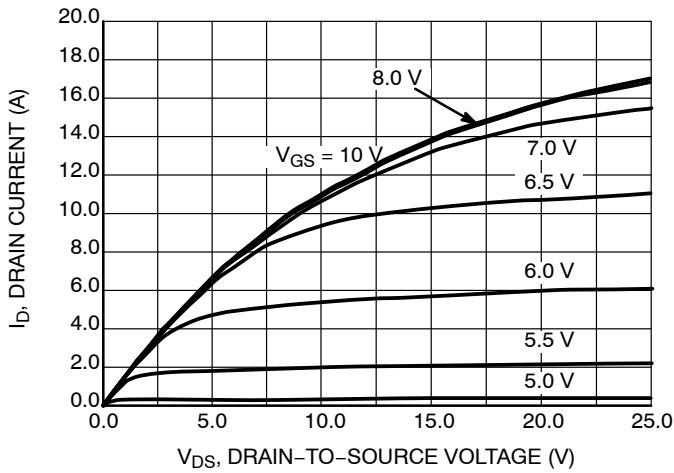


Figure 1. On-Region Characteristics

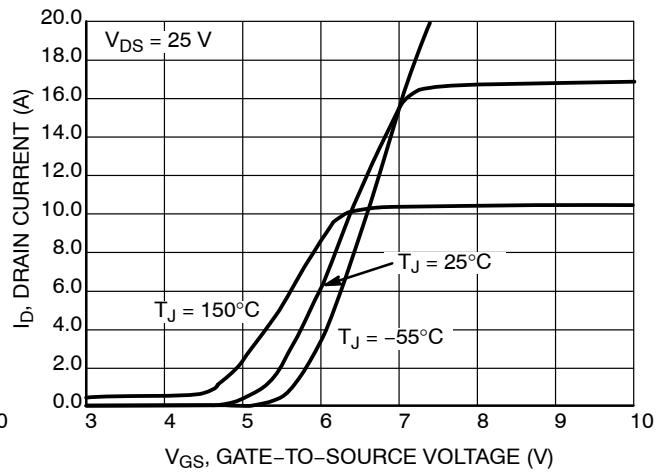


Figure 2. Transfer Characteristics

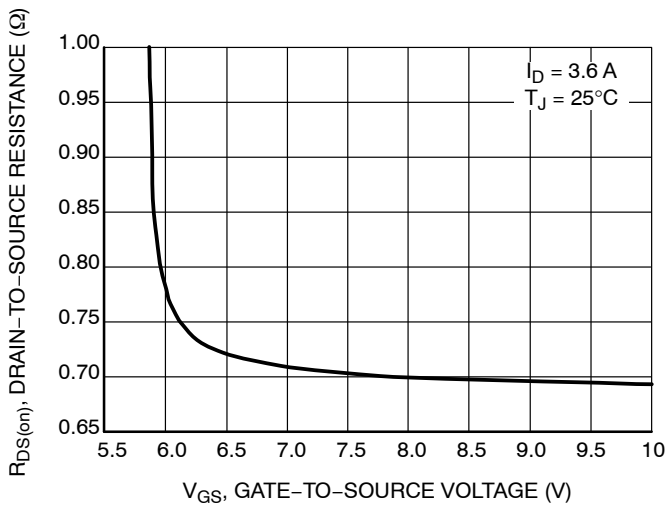


Figure 3. On-Region versus Gate-to-Source Voltage

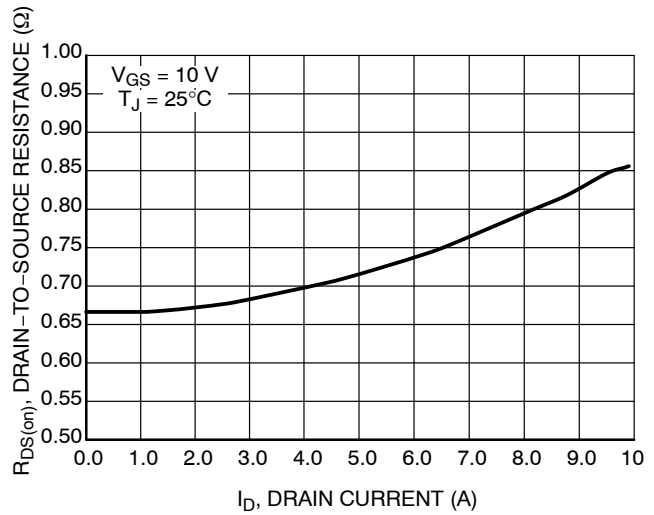


Figure 4. On-Resistance versus Drain Current and Gate Voltage

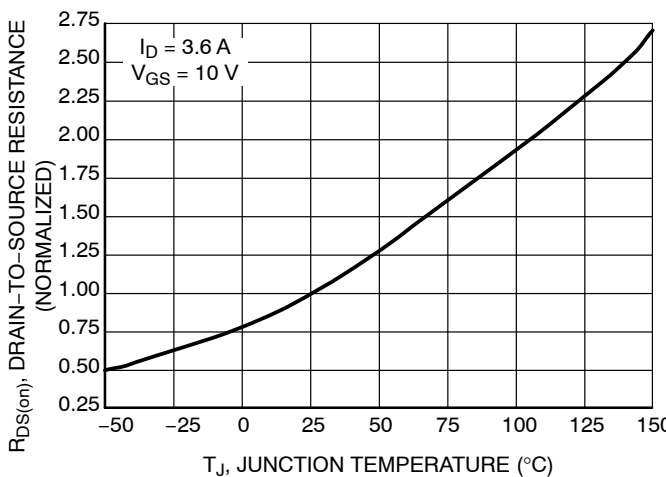


Figure 5. On-Resistance Variation with Temperature

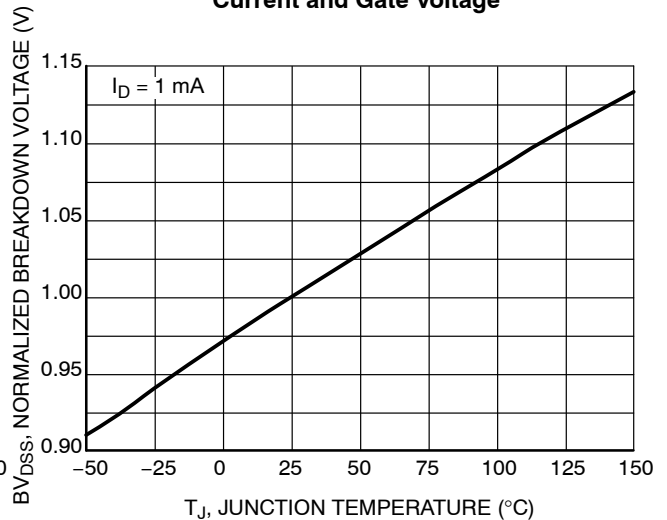


Figure 6. BV_{DSS} Variation with Temperature

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TYPICAL CHARACTERISTICS

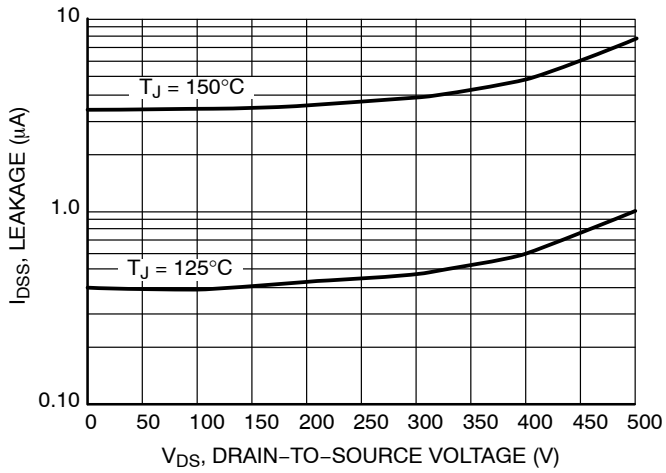


Figure 7. Drain-to-Source Leakage Current versus Voltage

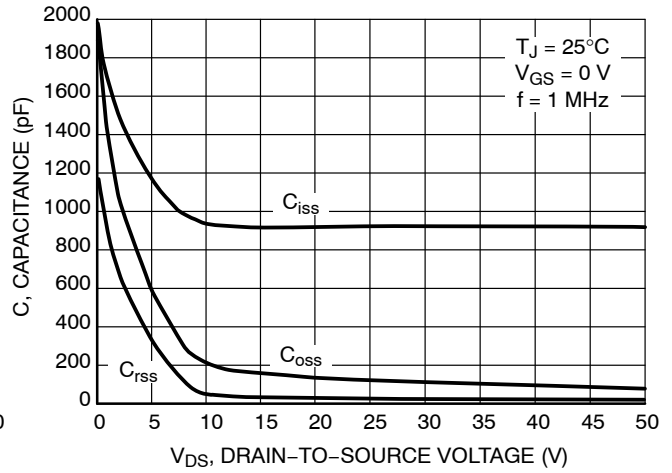


Figure 8. Capacitance Variation

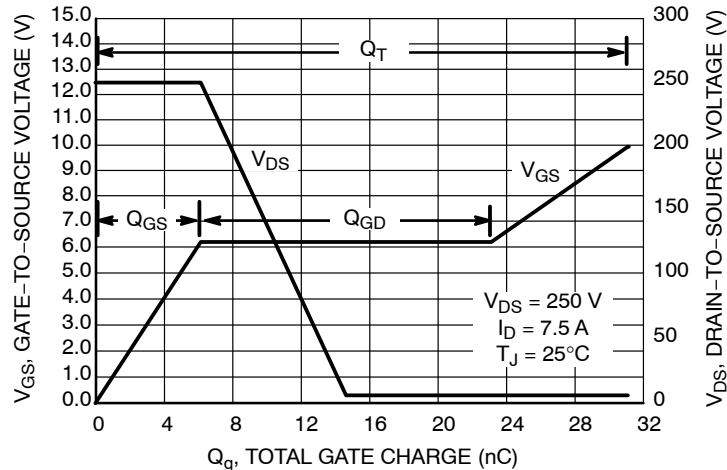


Figure 9. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

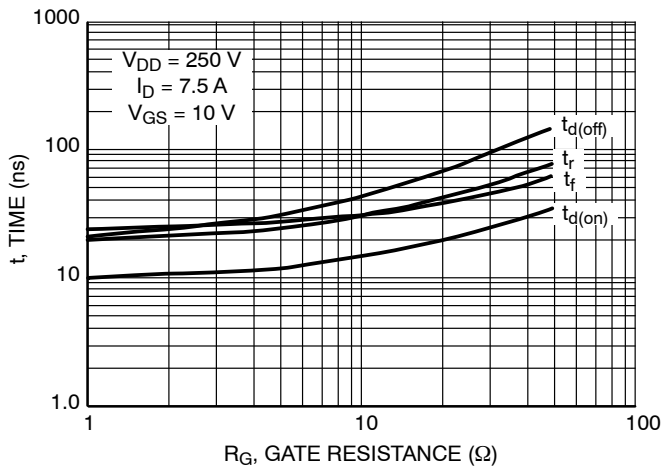


Figure 10. Resistive Switching Time Variation versus Gate Resistance

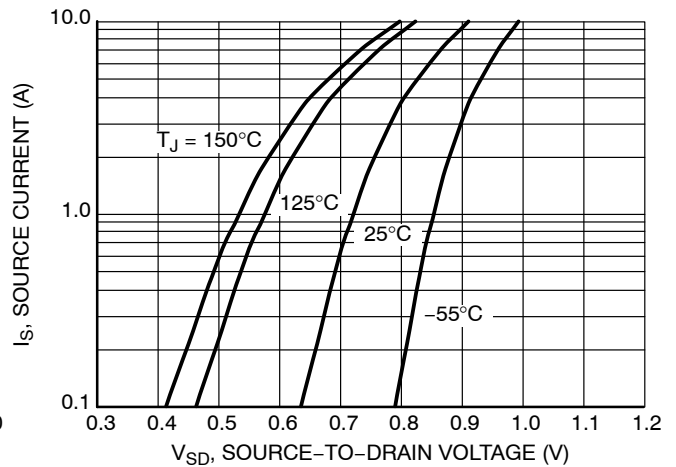


Figure 11. Diode Forward Voltage versus Current

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TYPICAL CHARACTERISTICS

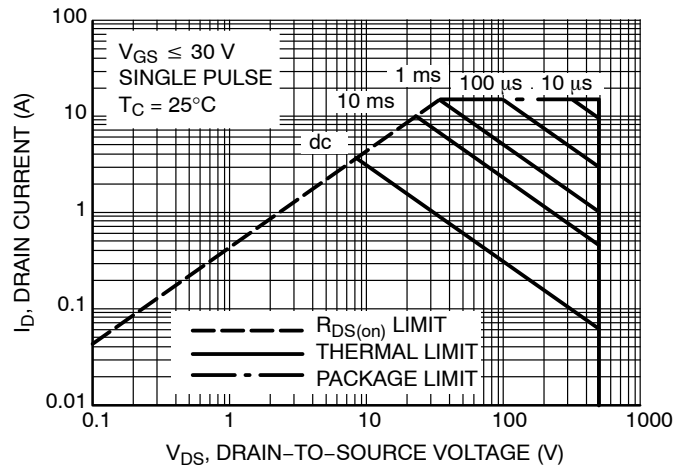


Figure 12. Maximum Rated Forward Biased Safe Operating Area NDF08N50Z

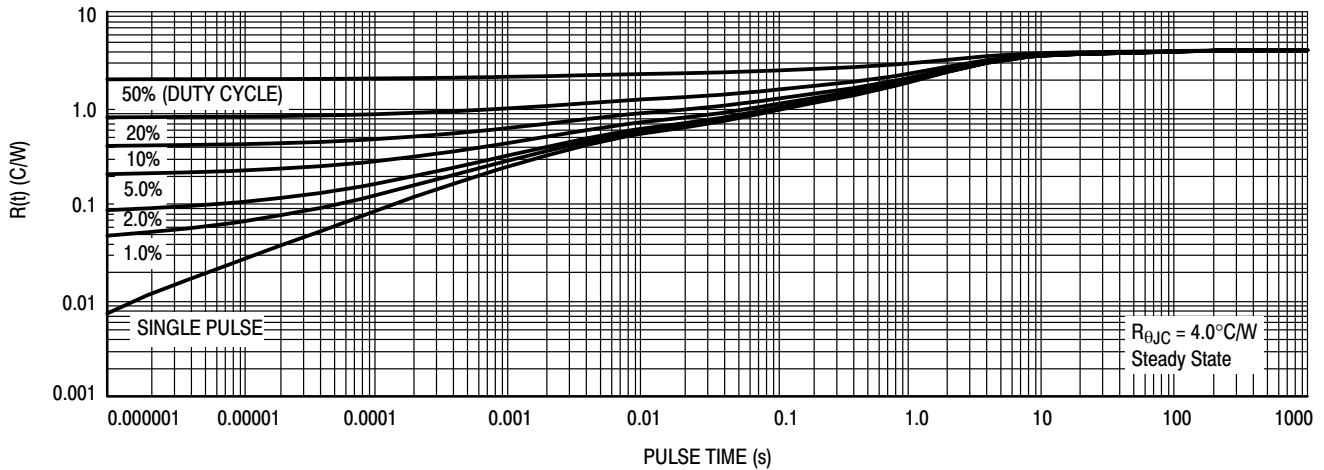


Figure 13. Thermal Impedance (Junction-to-Case) for NDF08N50Z

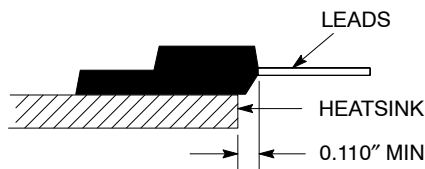


Figure 14. Isolation Test Diagram

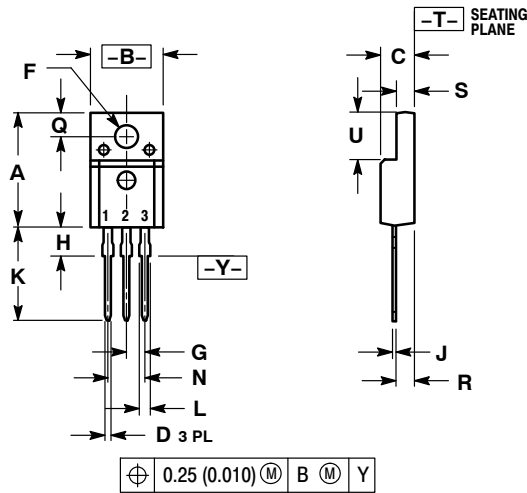
Measurement made between leads and heatsink with all leads shorted together.

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

NDF08N50Z, NDP08N50Z

PACKAGE DIMENSIONS

TO-220 FULLPAK CASE 221D-03 ISSUE K

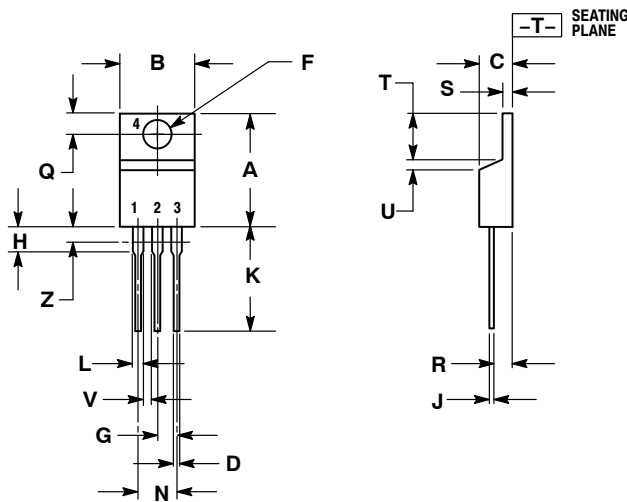


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH
 3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

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:
1. GATE
 2. DRAIN
 3. SOURCE

TO-220 CASE 221A-09 ISSUE AF



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

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