

NDF08N60Z, NDP08N60Z

N-Channel Power MOSFET 600 V, 0.95 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	NDF08N60Z	NDP08N60Z	Unit
Drain-to-Source Voltage	V_{DS}	600		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	4.8 (Note 1)	4.8	A
Pulsed Drain Current, $V_{GS} @ 10\text{ V}$	I_{DM}	30 (Note 1)	30	A
Power Dissipation	P_D	35	139	W
Gate-to-Source Voltage	V_{GS}	30		V
Single Pulse Avalanche Energy, $I_D = 7.5\text{ A}$	E_{AS}	235		mJ
ESD (HBM) (JESD 22-A114)	V_{esd}	4000		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.

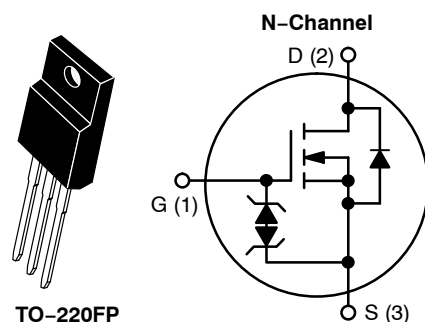
1. Limited by maximum junction temperature
2. $I_D \leq 7.5\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, $T_J \leq 150^\circ\text{C}$.



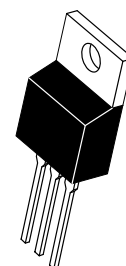
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V_{DS}	$R_{DS(ON)} (MAX) @ 3.5\text{ A}$
600 V	0.95 Ω

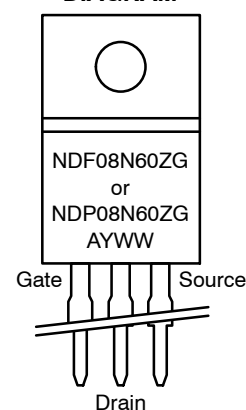


**TO-220FP
CASE 221D
STYLE 1**



**TO-220
CASE 221A
STYLE 5**

MARKING DIAGRAM



A = Location Code
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.

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THERMAL RESISTANCE

Parameter	Symbol	NDF08N60Z	NDP08N60Z	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.6	0.9	$^{\circ}\text{C}/\text{W}$
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}	600			V
Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D = 1\text{ mA}$	$\Delta BV_{DSS}/\Delta T_J$		0.6		$\text{V}/^{\circ}\text{C}$
Drain-to-Source Leakage Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	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	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$	$R_{DS(on)}$		0.82	0.95	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$	$V_{GS(th)}$	3.0		4.5	V
Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 3.5\text{ A}$	g_{FS}		6.3		S

DYNAMIC CHARACTERISTICS

Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	C_{iss}		1140		pF
Output Capacitance		C_{oss}		129		
Reverse Transfer Capacitance		C_{rss}		30		
Total Gate Charge	$V_{DD} = 300\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}$	Q_g		39		nC
Gate-to-Source Charge		Q_{gs}		7.5		
Gate-to-Drain ("Miller") Charge		Q_{gd}		21		
Plateau Voltage		V_{GP}		6.2		V
Gate Resistance		R_g		1.6		Ω

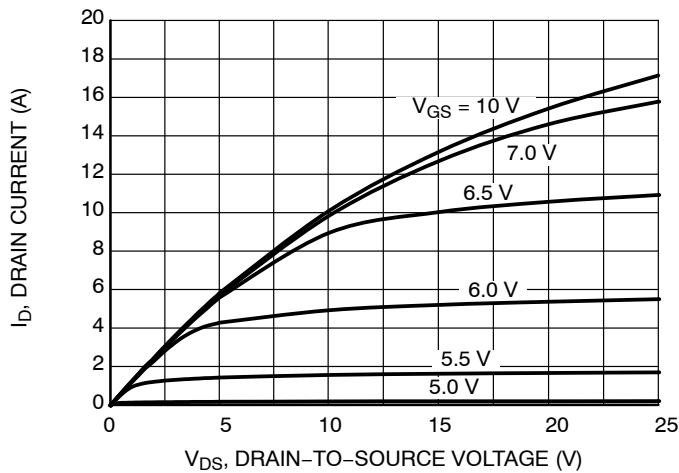
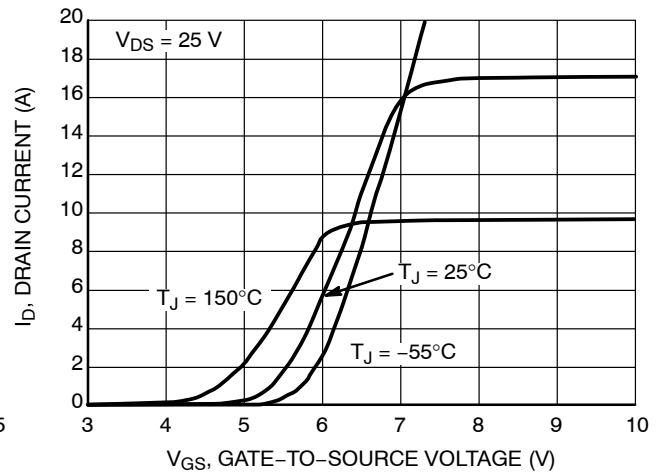
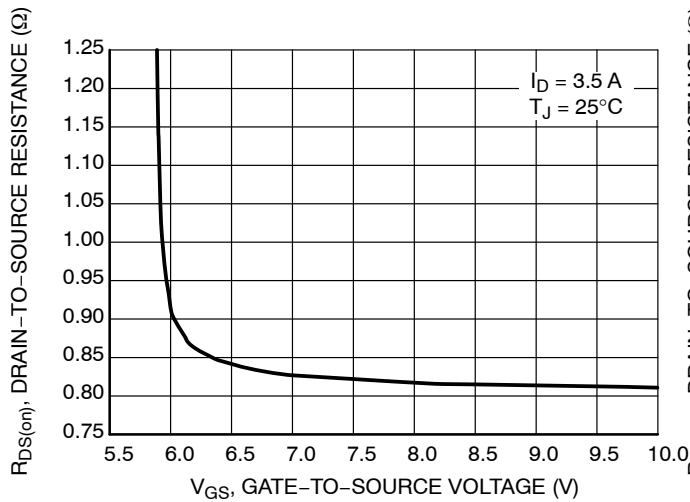
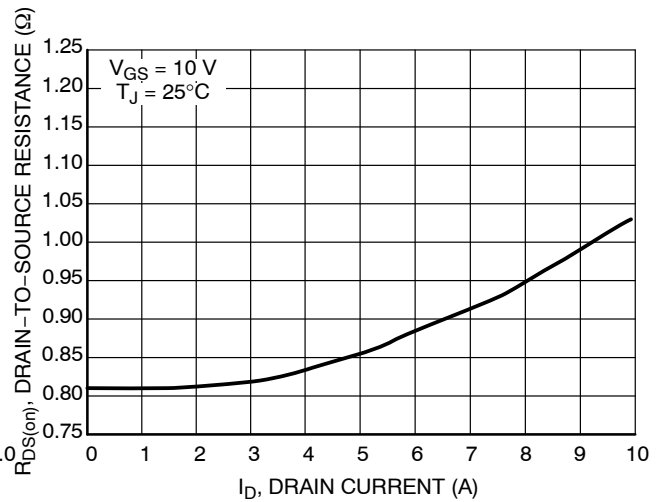
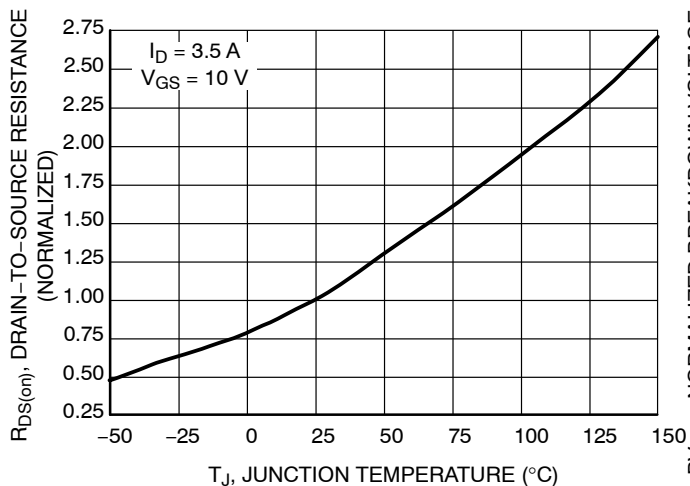
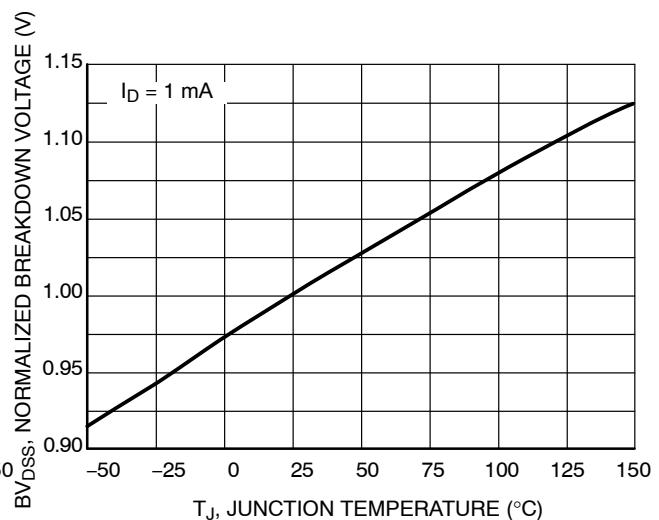
RESISTIVE SWITCHING CHARACTERISTICS

Turn-On Delay Time	$V_{DD} = 300\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 5\text{ }\Omega$	$t_{d(on)}$		14		ns
Rise Time		t_r		22		
Turn-Off Delay Time		$t_{d(off)}$		36		
Fall Time		t_f		15		

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}		320		ns
Reverse Recovery Charge		Q_{rr}		2.2		μC

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

NDF08N60Z, NDP08N60Z**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**

NDF08N60Z, NDP08N60Z

TYPICAL CHARACTERISTICS

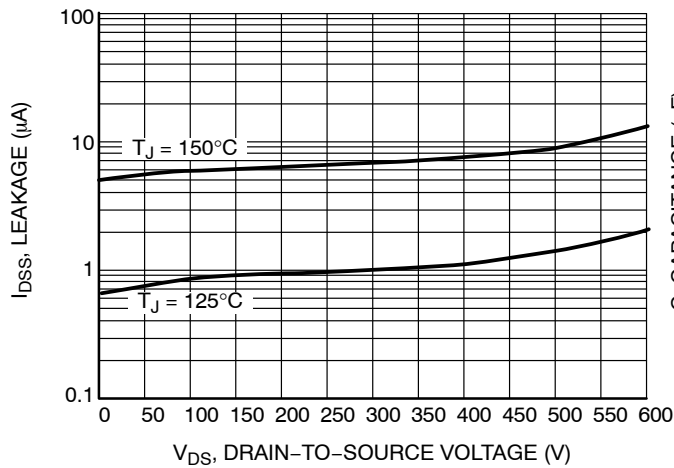


Figure 7. Drain-to-Source Leakage Current versus Voltage

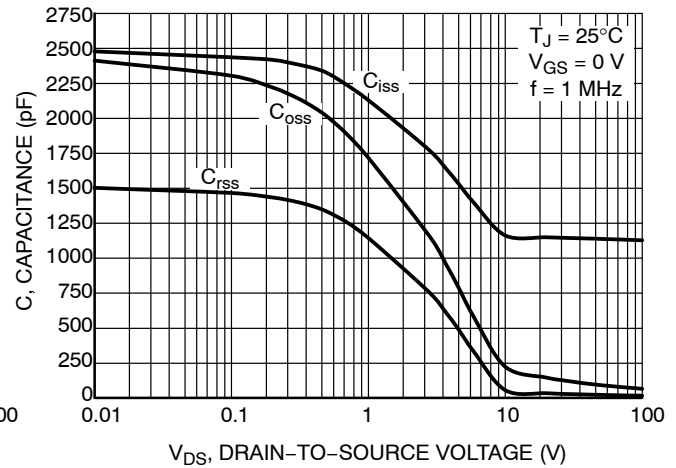


Figure 8. Capacitance Variation

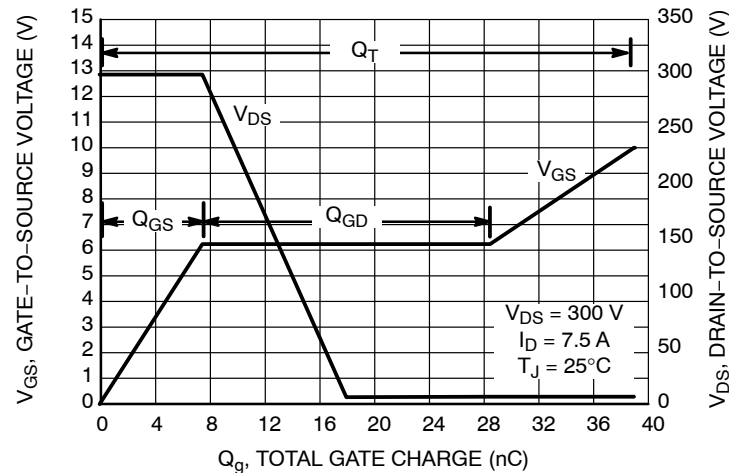


Figure 9. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

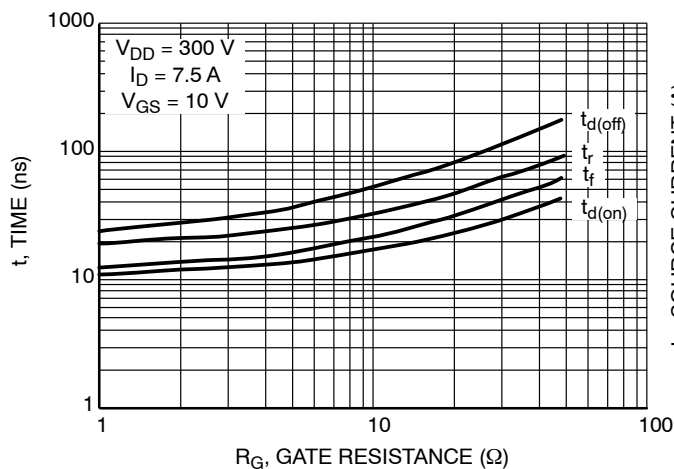


Figure 10. Resistive Switching Time Variation versus Gate Resistance

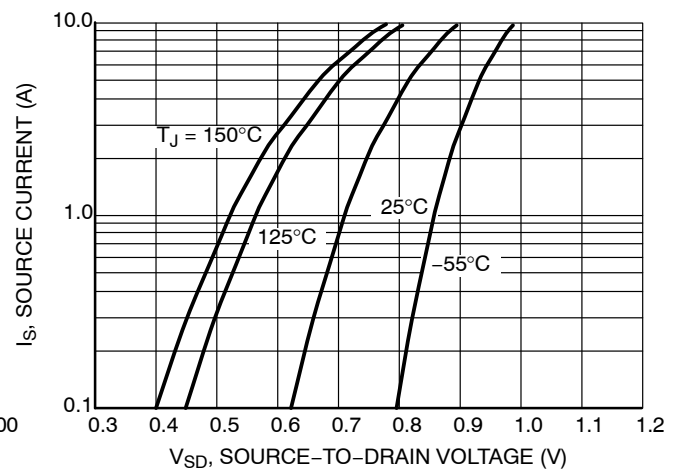


Figure 11. Diode Forward Voltage versus Current

NDF08N60Z, NDP08N60Z

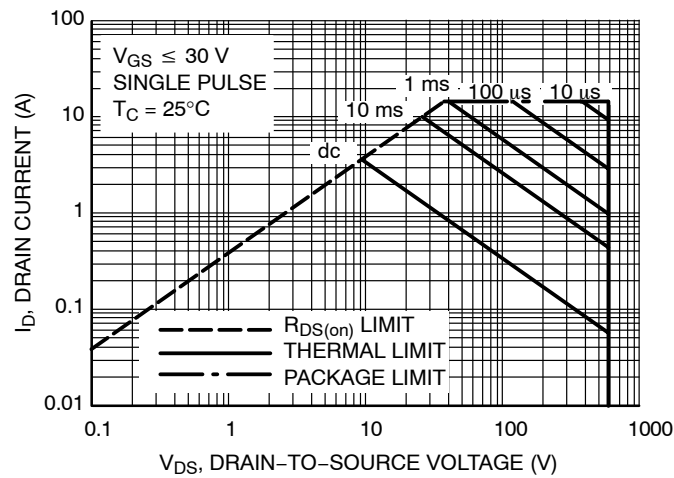


Figure 12. Maximum Rated Forward Biased Safe Operating Area NDF08N60Z

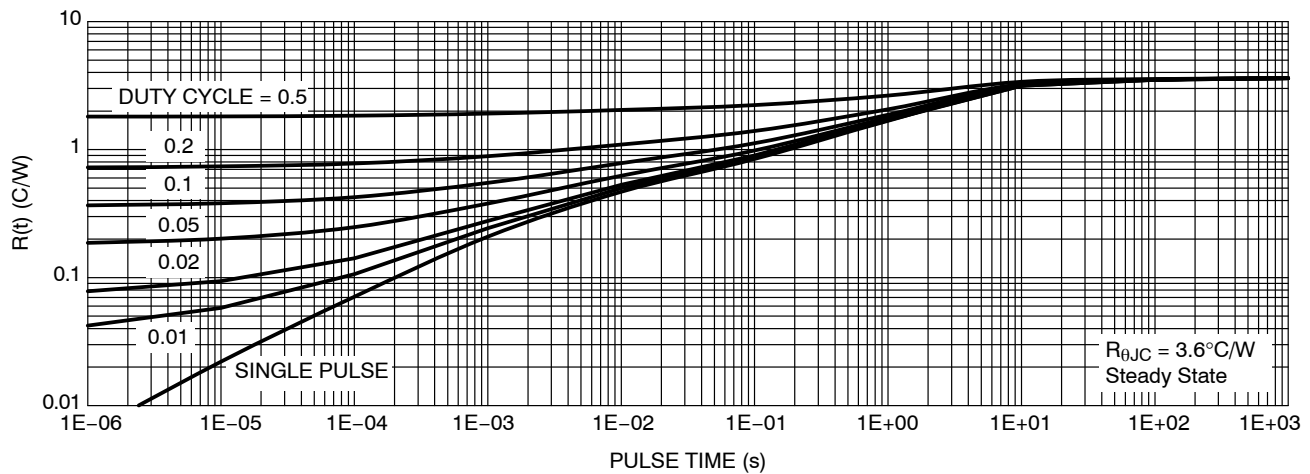


Figure 13. Thermal Impedance (Junction-to-Case) for NDF08N60Z

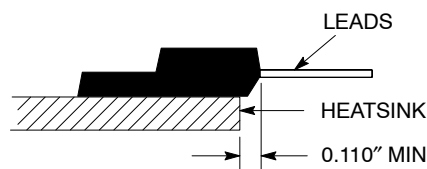


Figure 14. Isolation Test Diagram

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.

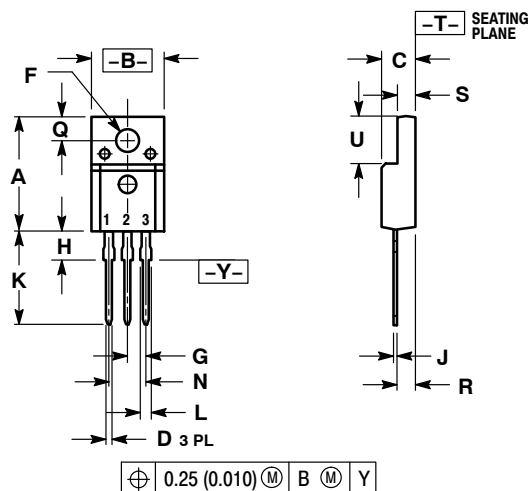
ORDERING INFORMATION

Order Number	Package	Shipping
NDF08N60ZG	TO-220FP (Pb-Free)	50 Units / Rail
NDP08N60ZG	TO-220AB (Pb-Free)	50 Units / Rail (In Development)

NDF08N60Z, NDP08N60Z

PACKAGE DIMENSIONS

TO-220 FULLPAK CASE 221D-03 ISSUE K



NOTES:

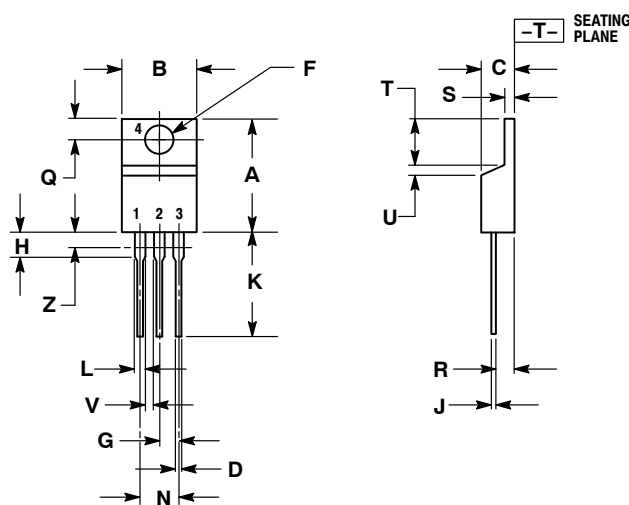
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

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:

- PIN 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:

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

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