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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°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°C	I_D	4.7 (Note 1)	4.7	A
Pulsed Drain Current, V_{GS} @ 10 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 A	E_{AS}	190		mJ
ESD (HBM) (JESD 22−A114)	V_{esd}	3500		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		V/ns
Continuous Source Current (Body Diode)	I_S	7.5		A
Maximum Temperature for Soldering Leads	T_L	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. Limited by maximum junction temperature
2. I_{SD} = 7.5 A, di/dt ≤ 100 A/μs, V_{DD} ≤ BV_{DSS}, T_J = +150°C

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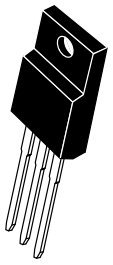
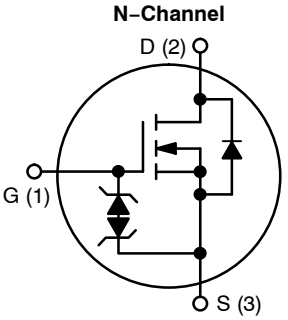
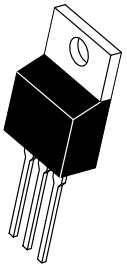
V_{DSS}	$R_{DS(ON)}$ (TYP) @ 3.6 A
500 V	0.69 Ω



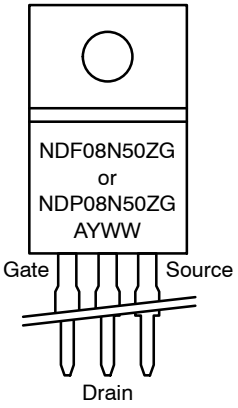
TO−220FP
CASE 221D
STYLE 1





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

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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°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}	500			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} = 500 V, V_{GS} = 0 V	25°C	I_{DSS}			1	μA
		150°C				50	
Gate−to−Source Forward Leakage	V_{GS} = ±20 V		I_{GSS}			±10	μA
ON CHARACTERISTICS (Note 4)							
Static Drain−to−Source On−Resistance	V_{GS} = 10 V, I_D = 3.6 A		$R_{DS(on)}$		0.69	0.85	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 100 μA		$V_{GS(th)}$	3.0		4.5	V
Forward Transconductance	V_{DS} = 15 V, I_D = 3.75 A		g_{FS}		6.0		S
DYNAMIC CHARACTERISTICS							
Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		C_{iss}		912		pF
Output Capacitance			C_{oss}		120		
Reverse Transfer Capacitance			C_{rss}		27		
Total Gate Charge	V_{DD} = 250 V, I_D = 7.5 A, V_{GS} = 10 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 V, I_D = 7.5 A, V_{GS} = 10 V, R_G = 5 Ω		$t_{d(on)}$		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°C unless otherwise noted)

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

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

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TYPICAL CHARACTERISTICS

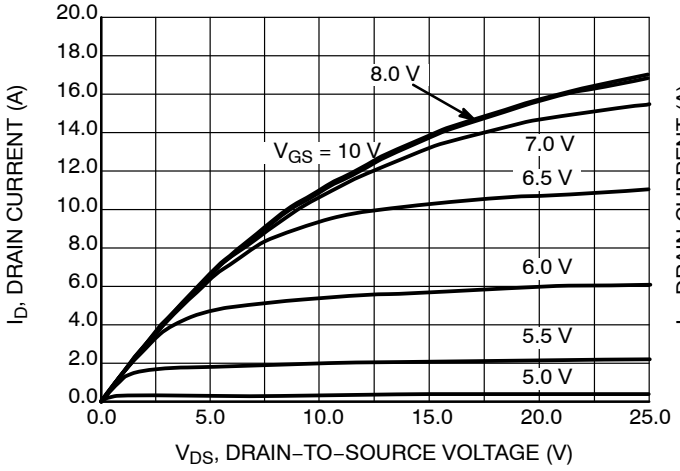

Figure 1. On−Region Characteristics

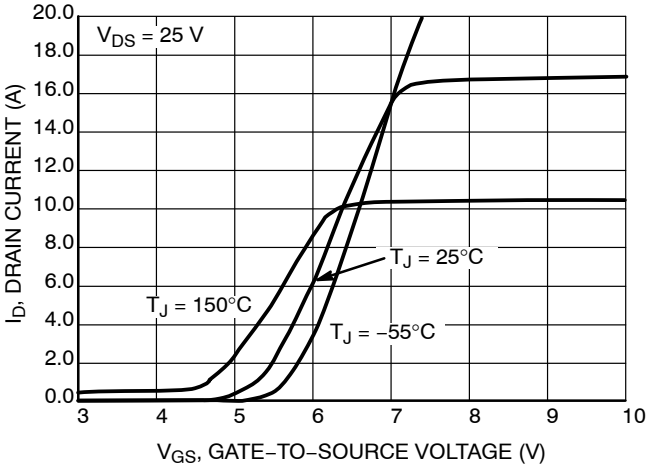

Figure 2. Transfer Characteristics

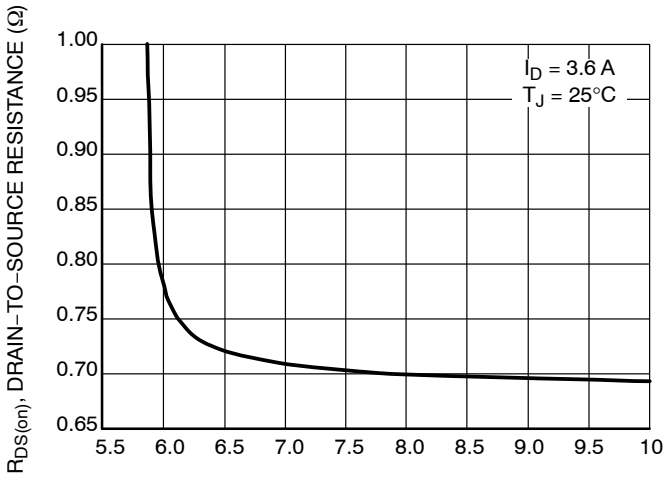

Figure 3. On−Region versus Gate−to−Source Voltage

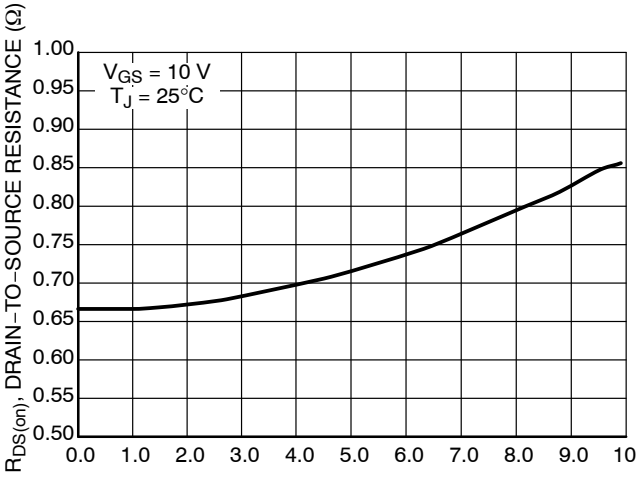

Figure 4. On−Resistance versus Drain Current and Gate Voltage

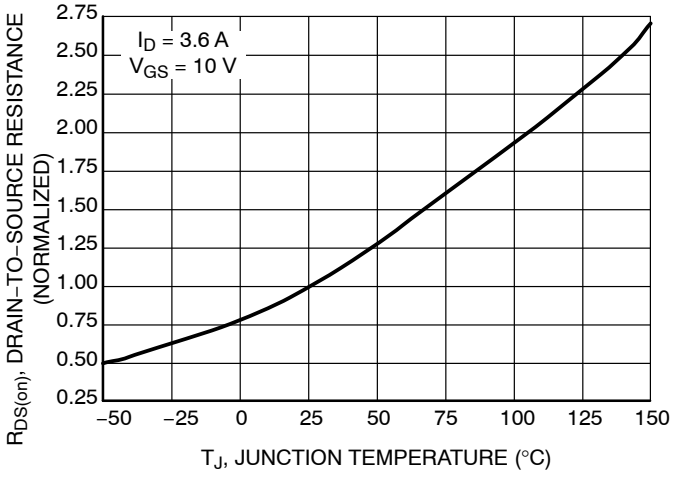

Figure 5. On−Resistance Variation with Temperature

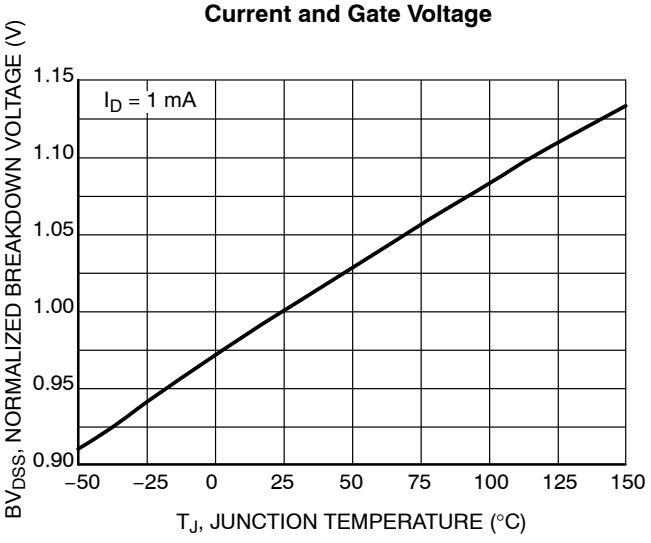

Figure 6. BV_{DSS} Variation with Temperature

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TYPICAL CHARACTERISTICS

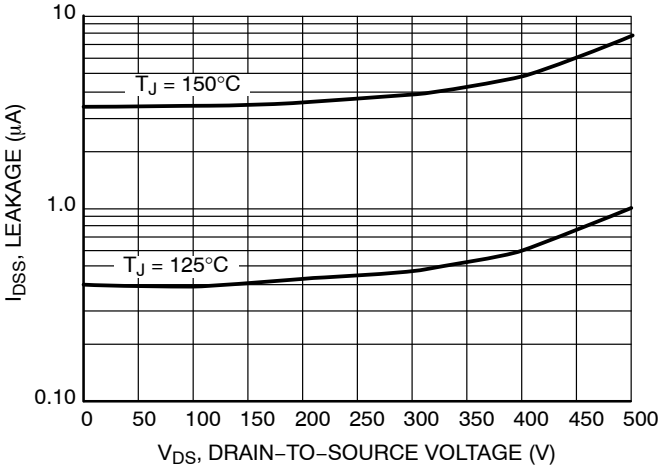

Figure 7. Drain−to−Source Leakage Current versus Voltage

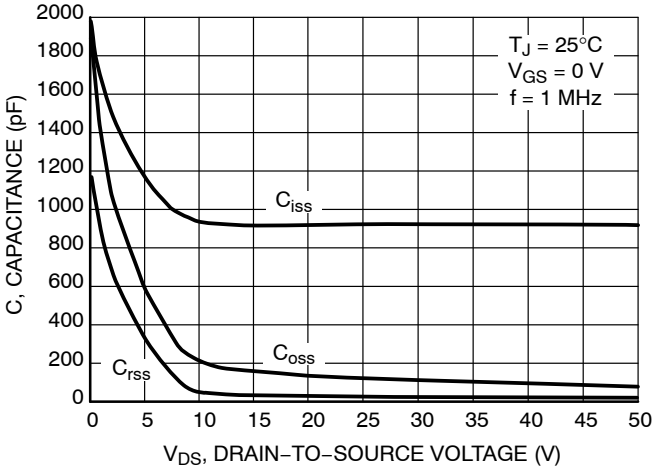

Figure 8. Capacitance Variation

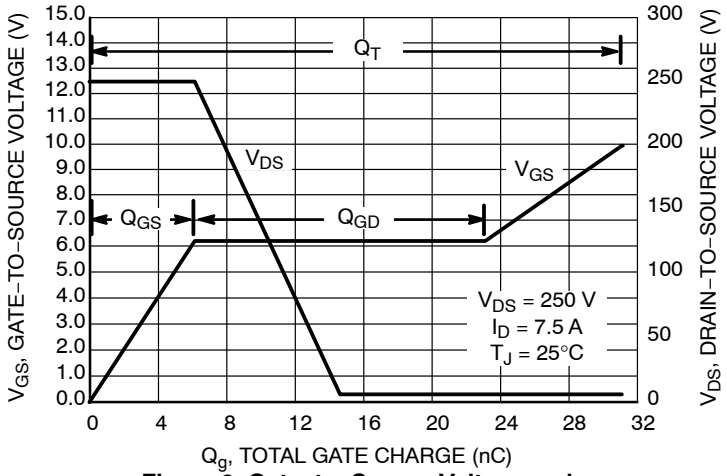

Figure 9. Gate−to−Source Voltage and Drain−to−Source Voltage versus Total Charge

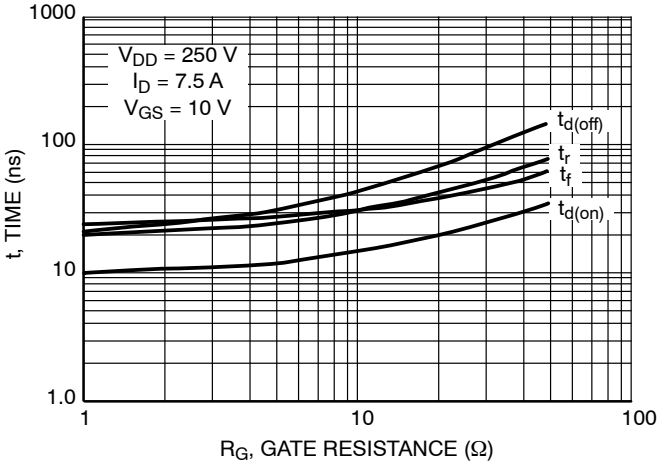

Figure 10. Resistive Switching Time Variation versus Gate Resistance

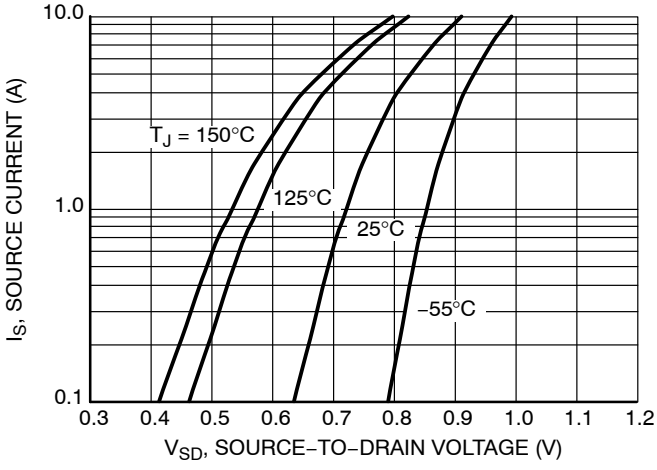

Figure 11. Diode Forward Voltage versus Current

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TYPICAL CHARACTERISTICS

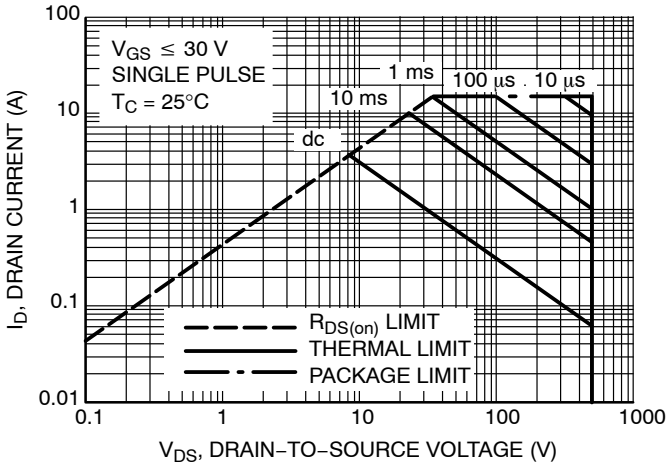

Figure 12. Maximum Rated Forward Biased Safe Operating Area NDF08N50Z

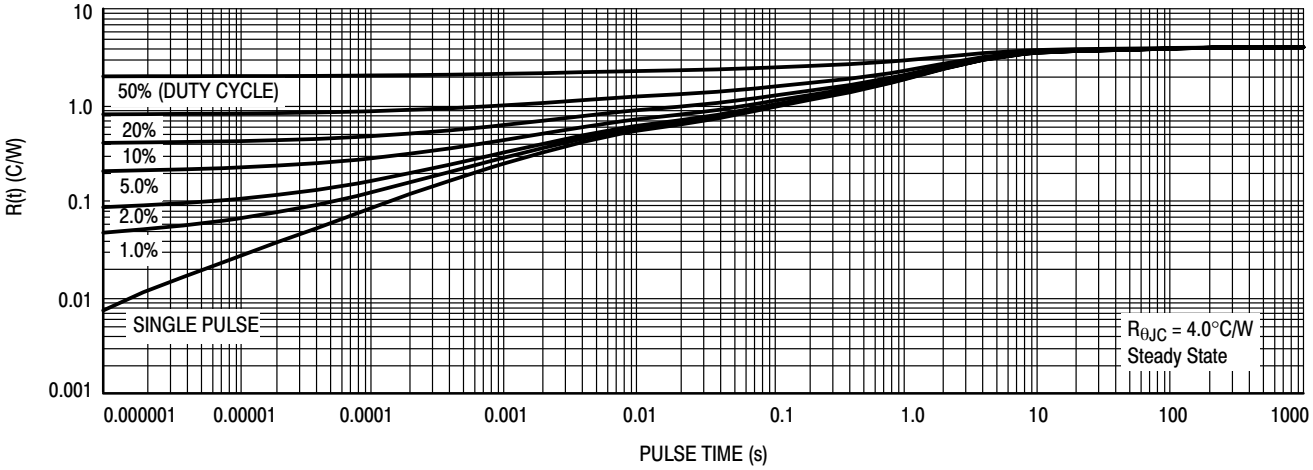

Figure 13. Thermal Impedance (Junction−to−Case) for NDF08N50Z

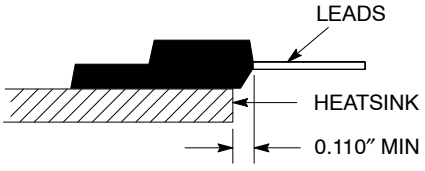

Figure 14. Isolation Test Diagram

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.

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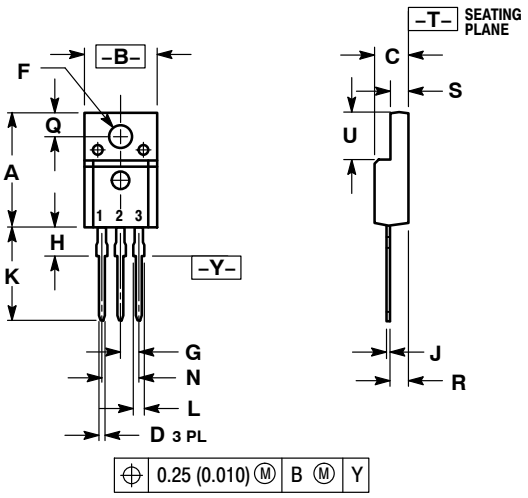
PACKAGE DIMENSIONS

TO−220 FULLPAK
CASE 221D−03
ISSUE K

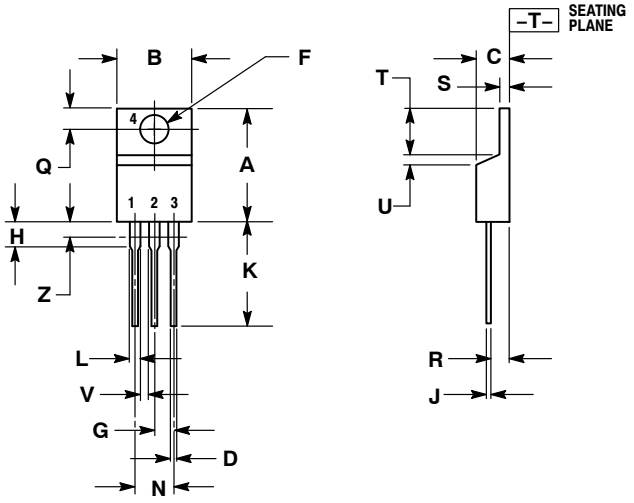


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D−01 THRU 221D−02 OBSOLETE, NEW STANDARD 221D−03.

	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

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.

	INCHES		MILLIMETERS	
DIM	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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