# NDF10N62Z, NDP10N62Z

# N-Channel Power MOSFET 620 V, 0.65 Ω

**Features**

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

**ON Semiconductor®**

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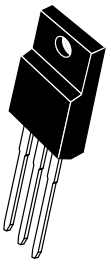
| $V_{DSS}$ | $R_{DS(ON)}$ (TYP) @ 5 A |
|---|---|
| 620 V | 0.65 Ω |

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

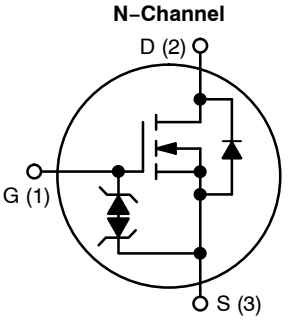
| Rating | Symbol | NDF10N62Z | NDP10N62Z | Unit |
|---|---|---|---|---|
| Drain−to−Source Voltage | $V_{DSS}$ | 620 (Note 1) | | V |
| Continuous Drain Current, $R_{\theta JC}$ | $I_D$ | 10 (Note 2) | | A |
| Continuous Drain Current $R_{\theta JC}$, $T_A$ = 100°C | $I_D$ | 5.7 (Note 2) | | A |
| Pulsed Drain Current, $V_{GS}$ @ 10 V | $I_{DM}$ | 36 (Note 2) | | A |
| Power Dissipation, $R_{\theta JC}$ (Note 1) | $P_D$ | 36 | 125 | W |
| Gate−to−Source Voltage | $V_{GS}$ | ±30 | | V |
| Single Pulse Avalanche Energy, $I_D$ = 10 A | $E_{AS}$ | 300 | | mJ |
| ESD (HBM) (JESD22−A114) | $V_{esd}$ | 3900 | | 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) | $I_S$ | 10 | | A |
| Maximum Temperature for Soldering Leads | $T_L$ | 260 | | °C |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | −55 to 150 | | °C |

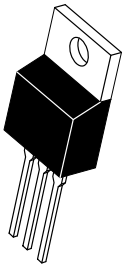
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 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. $I_S$ ≤ 10 A, di/dt ≤ 200 A/μs, $V_{DD}$ = 80% $BV_{DSS}$



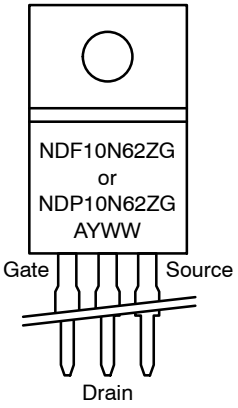
**TO−220FP**
**CASE 221D**
**STYLE 1**



**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 |
|---|---|---|
| NDF10N62ZG | TO−220FP | 50 Units/Rail |
| NDP10N62ZG | TO−220AB | In Development |

## THERMAL RESISTANCE

| Parameter | Symbol | NDF10N62Z | NDP10N62Z | Unit |
|---|---|---|---|---|
| Junction−to−Case (Drain) | $R_{\theta JC}$ | 3.4 | 1.0 | °C/W |
| Junction−to−Ambient Steady State (Note 4) | $R_{\theta JA}$ | 50 | 50 | |

## 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, $I_D$ = 5.0 A | | $R_{DS(on)}$ | | 0.65 | 0.75 | 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, $I_D$ = 10 A | | $g_{FS}$ | | 7.9 | | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | | |
| Input Capacitance | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1.0 MHz | | $C_{iss}$ | | 1425 | | pF |
| Output Capacitance | | | $C_{oss}$ | | 150 | | |
| Reverse Transfer Capacitance | | | $C_{rss}$ | | 35 | | |
| Total Gate Charge | $V_{DD}$ = 310 V, $I_D$ = 10 A, $V_{GS}$ = 10 V | | $Q_g$ | | 47 | | nC |
| Gate−to−Source Charge | | | $Q_{gs}$ | | 9.3 | | |
| Gate−to−Drain (“Miller”) Charge | | | $Q_{gd}$ | | 25 | | |
| Plateau Voltage | | | $V_{gp}$ | | 6.4 | | V |
| Gate Resistance | | | $R_g$ | | 1.5 | | Ω |
| **RESISTIVE SWITCHING CHARACTERISTICS** | | | | | | | |
| Turn−On Delay Time | $V_{DD}$ = 310 V, $I_D$ = 10 A, $V_{GS}$ = 10 V, $R_G$ = 5 Ω | | $t_{d(on)}$ | | 15 | | ns |
| Rise Time | | | $t_r$ | | 31 | | |
| Turn−Off Delay Time | | | $t_{d(off)}$ | | 40 | | |
| Fall Time | | | $t_f$ | | 21 | | |
| **SOURCE−DRAIN DIODE CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted) | | | | | | | |
| Diode Forward Voltage | $I_S$ = 10 A, $V_{GS}$ = 0 V | | $V_{SD}$ | | | 1.6 | V |
| Reverse Recovery Time | $V_{GS}$ = 0 V, $V_{DD}$ = 30 V, $I_S$ = 10 A, di/dt = 100 A/μs | | $t_{rr}$ | | 395 | | ns |
| Reverse Recovery Charge | | | $Q_{rr}$ | | 3.0 | | μC |

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

## TYPICAL CHARACTERISTICS

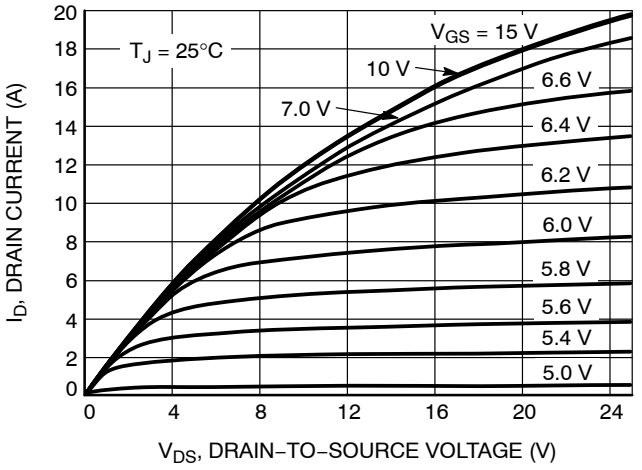



**Figure 1. On−Region Characteristics**

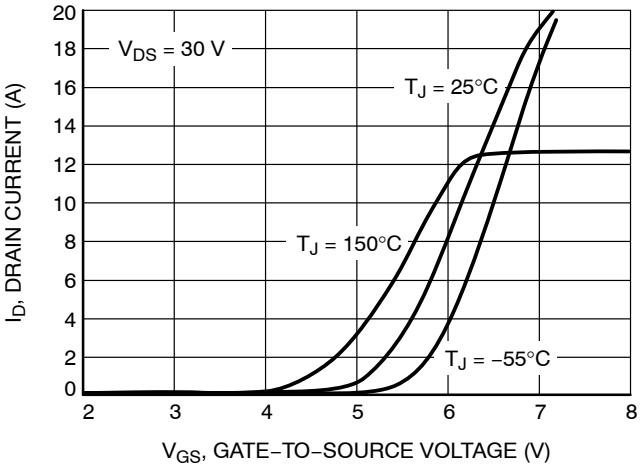



**Figure 2. Transfer Characteristics**

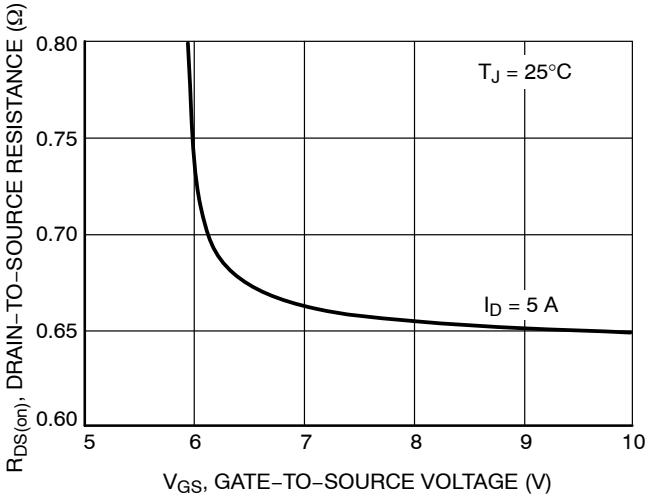



**Figure 3. On−Resistance vs. Gate Voltage**

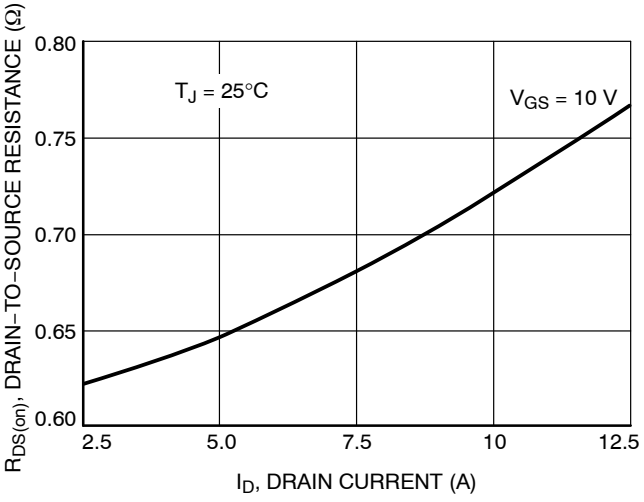



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

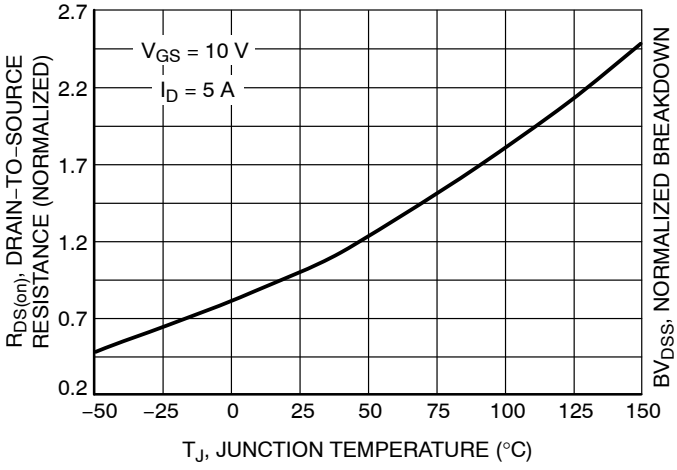



**Figure 5. On−Resistance Variation with Temperature**

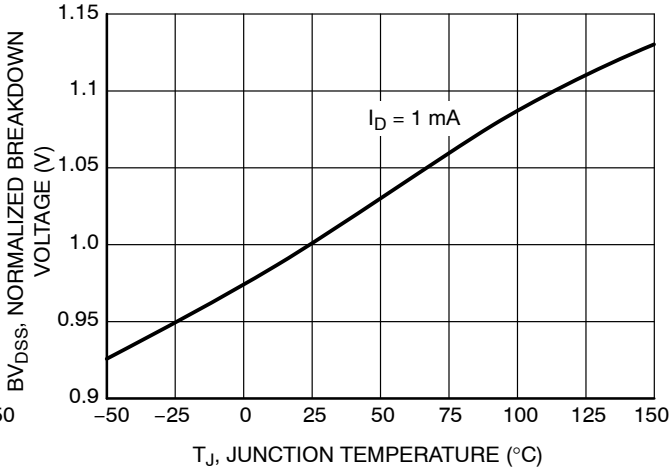



**Figure 6. BVDSS Variation with Temperature**

## TYPICAL CHARACTERISTICS

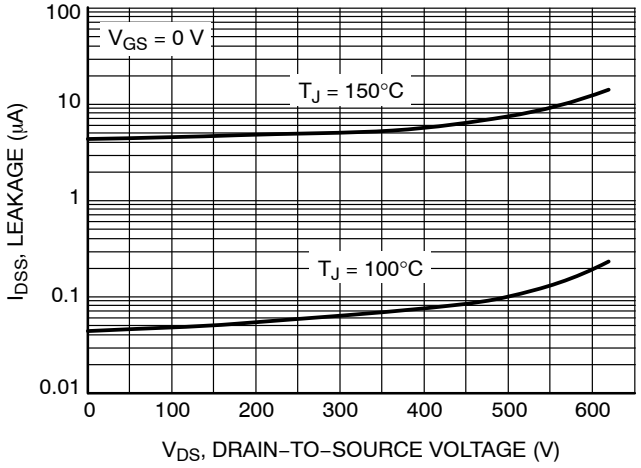



**Figure 7. Drain−to−Source Leakage Current vs. Voltage**

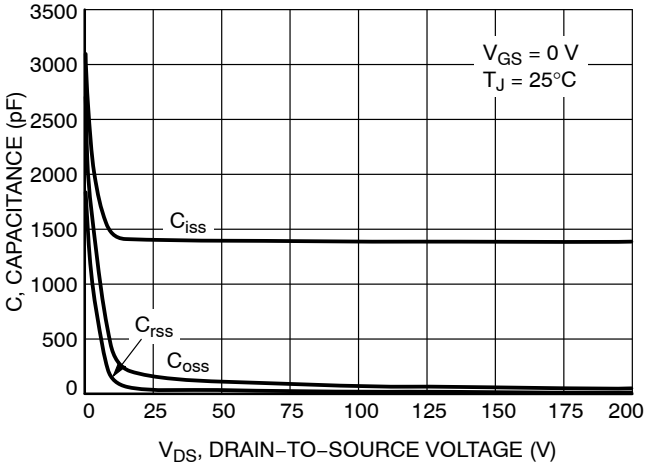



**Figure 8. Capacitance Variation**

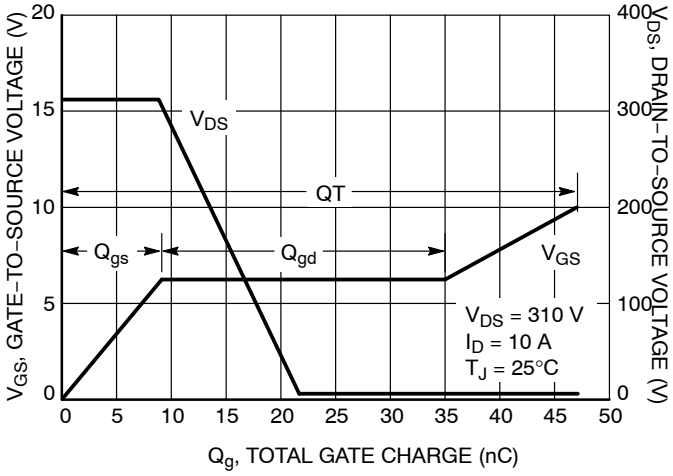



**Figure 9. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge**

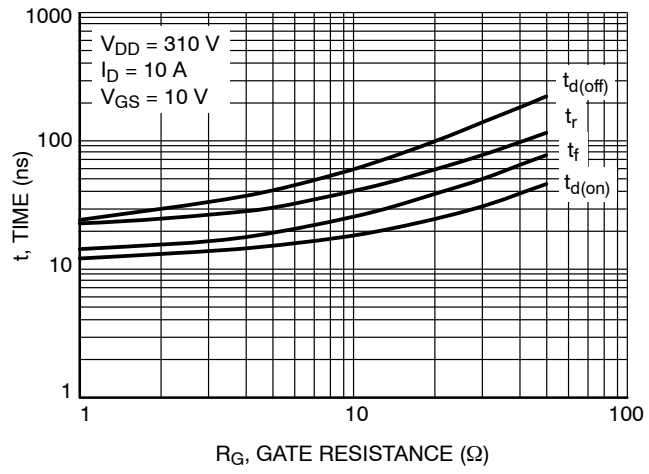



**Figure 10. Resistive Switching Time Variation vs. Gate Resistance**

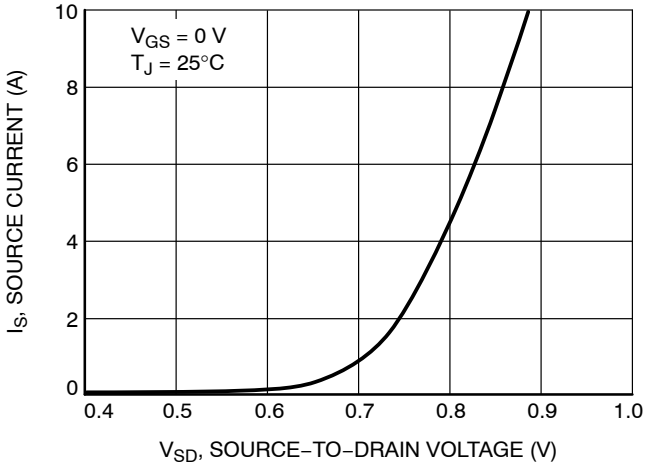



**Figure 11. Diode Source Current vs. Forward Voltage**

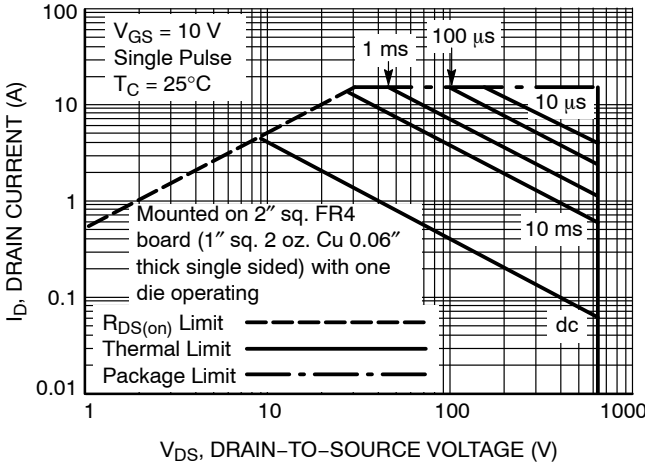



**Figure 12. Maximum Rated Forward Biased Safe Operating Area for NDF10N62Z**

## TYPICAL CHARACTERISTICS

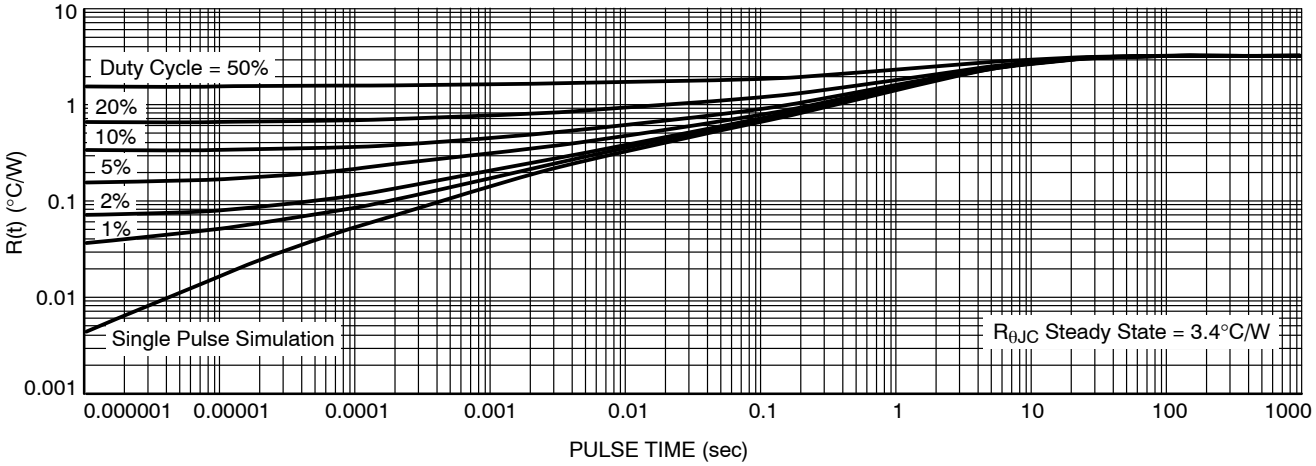



**Figure 13. Thermal Impedance for NDF10N62Z**

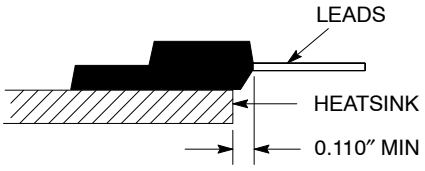


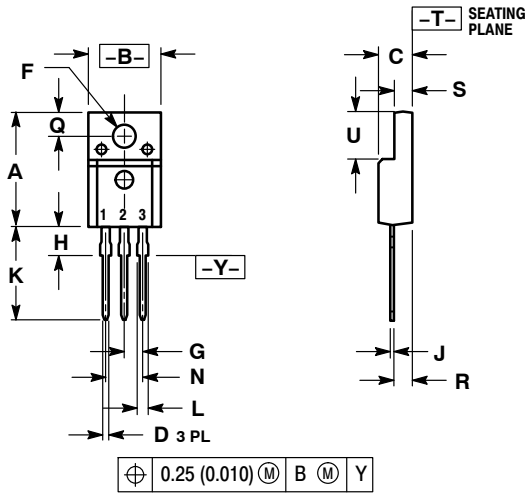

**Figure 14. Isolation Test Diagram**

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.

## PACKAGE DIMENSIONS

**TO−220FP**
CASE 221D−03
ISSUE K

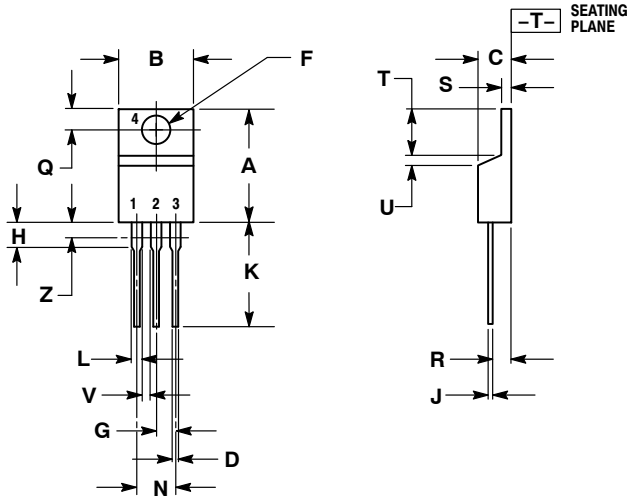



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D−01 THRU 221D−02 OBSOLETE, NEW STANDARD 221D−03.

| | 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

**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.

| | 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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