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NDF04N62Z, NDD04N62Z

N-Channel Power MOSFET 620 V, 2.0 Ω

Features

- Low ON Resistance
- Low Gate Charge
- ESD Diode-Protected Gate
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Parameter | Symbol | NDF | NDD | Unit |
|--|------------------------------------|-----------------|-----|------|
| Drain-to-Source Voltage | V _{DSS} | 620 | | V |
| Continuous Drain Current R _{θJC} | I _D | 4.4 (Note 2) | 4.1 | A |
| Continuous Drain Current R _{θJC} , T _A = 100°C | I _D | 2.8 (Note 2) | 2.6 | A |
| Pulsed Drain Current, V _{GS} @ 10V | I _{DM} | 18 (Note 2) | 16 | A |
| Power Dissipation R _{θJC} (Note 1) | P _D | 28 | 83 | W |
| Gate-to-Source Voltage | V _{GS} | ±30 | | V |
| Single Pulse Avalanche Energy, I _D = 4.0 A | E _{AS} | 120 | | mJ |
| ESD (HBM) (JESD22-A114) | V _{esd} | 3000 | | 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 | 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 | | °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_{SD} = 4.0 A, di/dt ≤ 100 A/μs, V_{DD} ≤ BV_{DSS}, T_J = +150°C

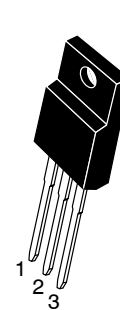
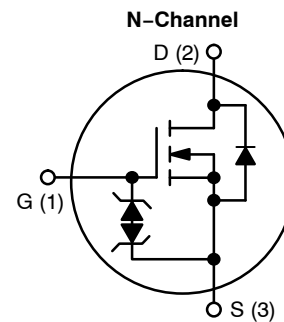
This document contains information on some products that are still under development. ON Semiconductor reserves the right to change or discontinue these products without notice.



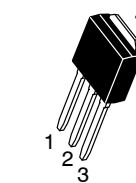
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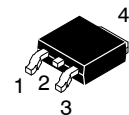
| V _{DSS} | R _{DS(ON)} (MAX) @ 2 A |
|------------------|---------------------------------|
| 620 V | 2.0 Ω |



NDF04N62ZG
TO-220FP
CASE 221D



NDD04N62Z-1G
IPAK
CASE 369D



NDD04N62ZT4G
DPAK
CASE 369AA

ORDERING INFORMATION

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

NDF04N62Z, NDD04N62Z

THERMAL RESISTANCE

| Parameter | Symbol | Value | Unit |
|----------------------------------|----------------------|-------|------|
| Junction-to-Case (Drain) | NDF04N62Z | 4.4 | °C/W |
| | NDD04N62Z | 1.5 | |
| Junction-to-Ambient Steady State | (Note 4) NDF04N62Z | 50 | |
| | (Note 1) NDD04N62Z | 38 | |
| | (Note 4) NDD04N62Z-1 | 80 | |

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 | ΔBV _{DSS} /ΔT _J | | 0.6 | | V/°C |
| Drain-to-Source Leakage Current | V _{DS} = 620 V, V _{GS} = 0 V | I _{DSS} | 25°C | | 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 = 2.0 A | R _{DS(on)} | | 1.8 | 2.0 | Ω |
| Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 50 μA | V _{GS(th)} | 3.0 | | 4.5 | V |
| Forward Transconductance | V _{DS} = 15 V, I _D = 2.0 A | g _{FS} | | 3.3 | | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|---------------------------------|---|------------------|--|-----|--|----|
| Input Capacitance | V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz | C _{iss} | | 535 | | pF |
| Output Capacitance | | C _{oss} | | 62 | | |
| Reverse Transfer Capacitance | | C _{rss} | | 14 | | |
| Total Gate Charge | V _{DD} = 310 V, I _D = 4.0 A, V _{GS} = 10 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 V, I _D = 4.0 A, V _{GS} = 10 V, R _G = 5 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°C unless otherwise noted)

| | | | | | | |
|-------------------------|---|-----------------|--|-----|-----|----|
| Diode Forward Voltage | I _S = 4.0 A, V _{GS} = 0 V | V _{SD} | | | 1.6 | V |
| Reverse Recovery Time | V _{GS} = 0 V, V _{DD} = 30 V, I _S = 4.0 A, di/dt = 100 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%.

NDF04N62Z, NDD04N62Z

TYPICAL CHARACTERISTICS

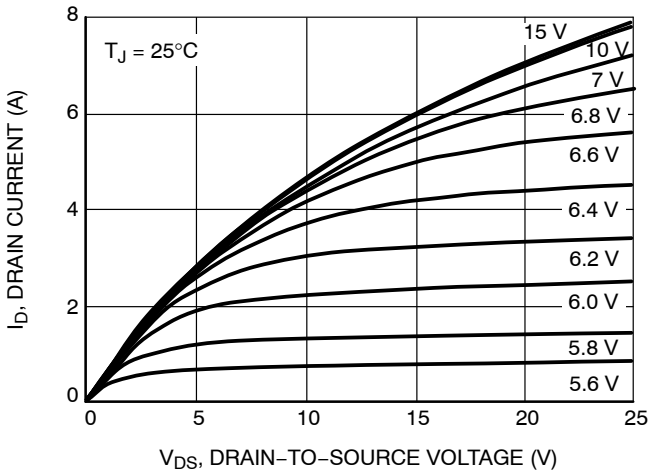


Figure 1. On-Region Characteristics

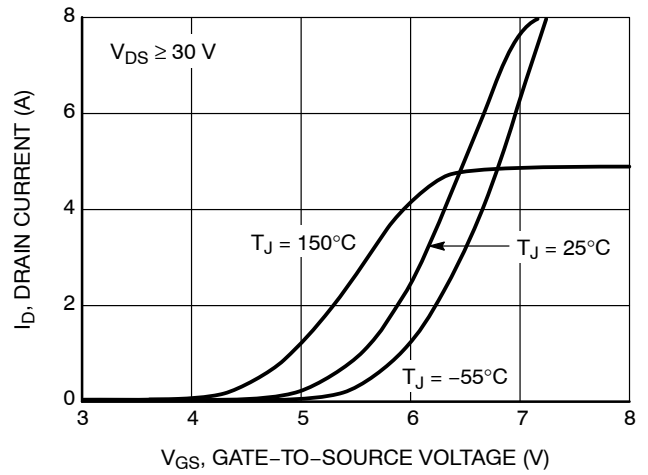


Figure 2. Transfer Characteristics

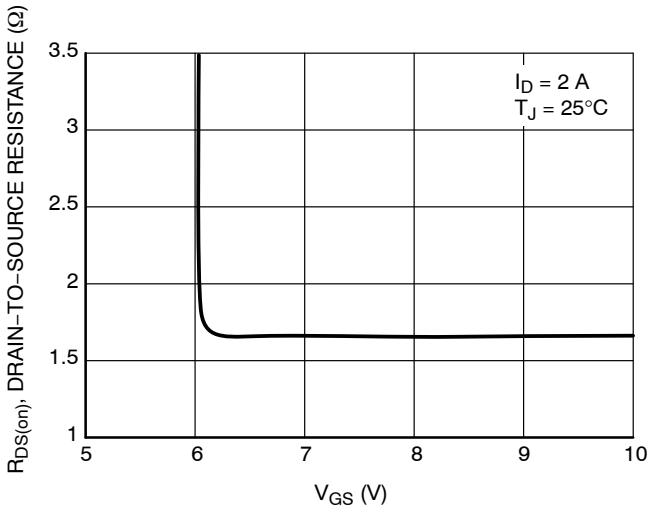


Figure 3. On-Resistance vs. Gate Voltage

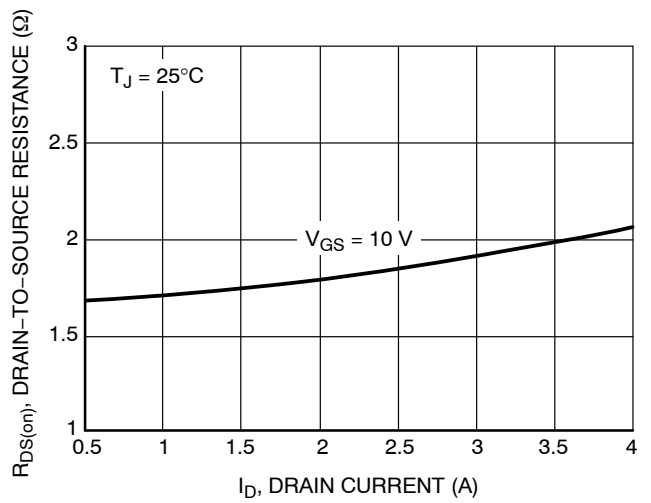


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

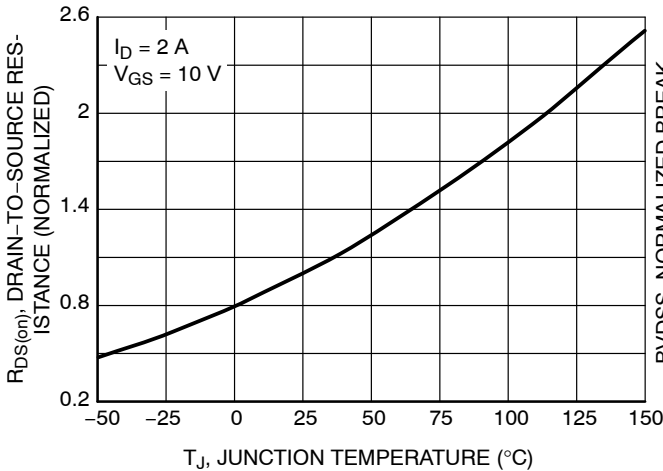


Figure 5. On-Resistance Variation with Temperature

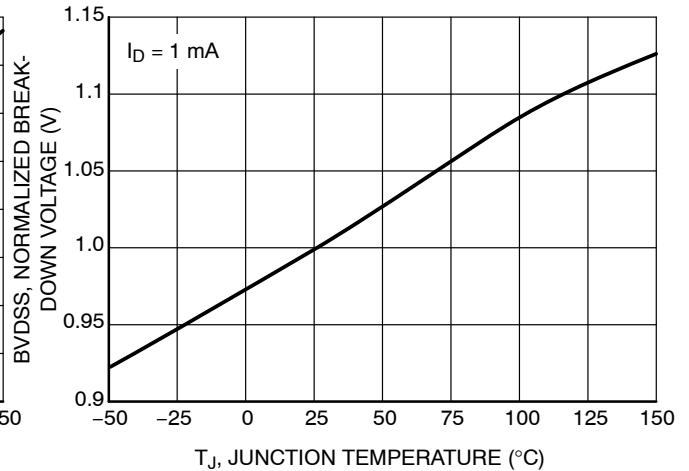


Figure 6. BVDSS Variation with Temperature

NDF04N62Z, NDD04N62Z

TYPICAL CHARACTERISTICS

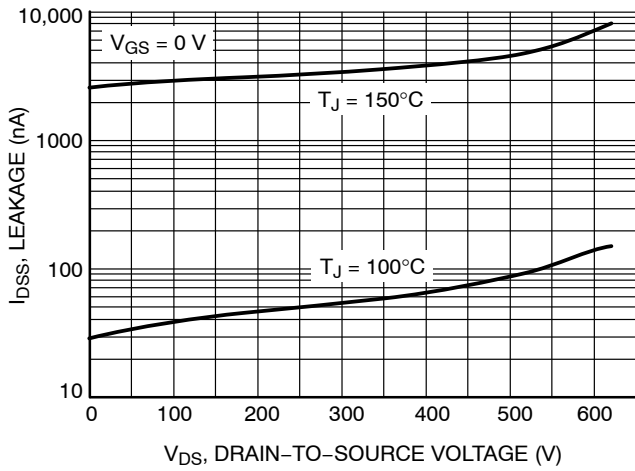


Figure 7. Drain-to-Source Leakage Current vs. Voltage

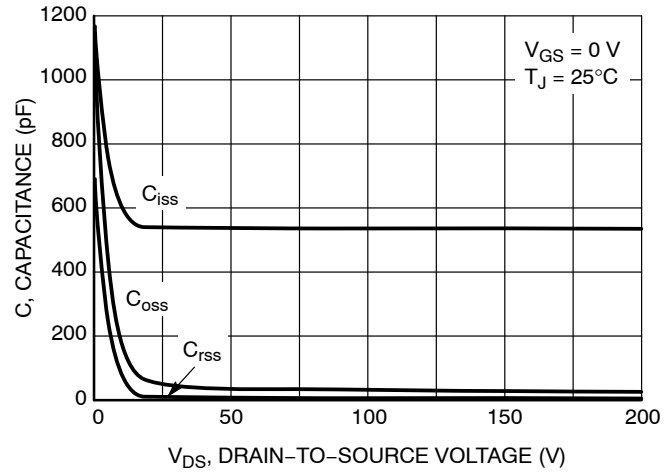


Figure 8. Capacitance Variation

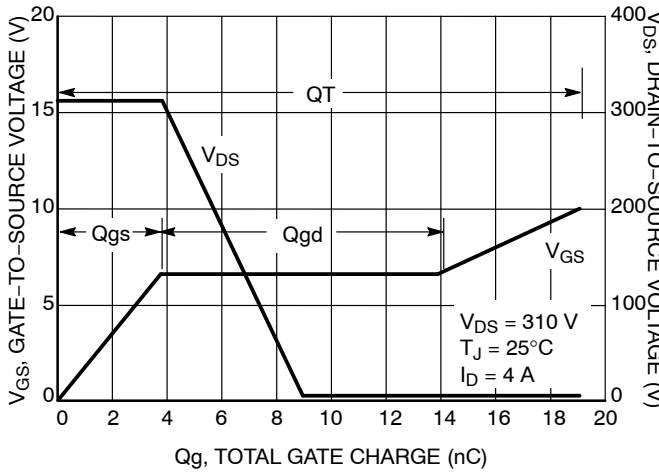


Figure 9. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

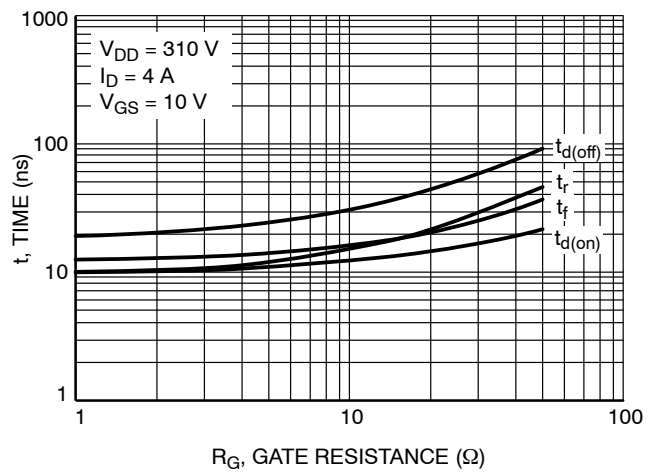


Figure 10. Resistive Switching Time Variation vs. Gate Resistance

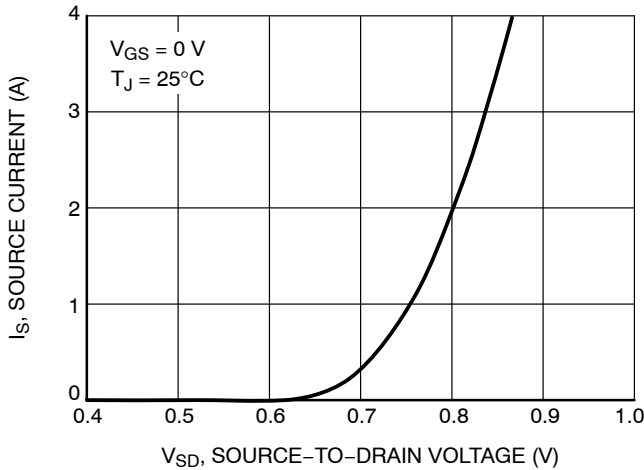


Figure 11. Diode Forward Voltage vs. Current

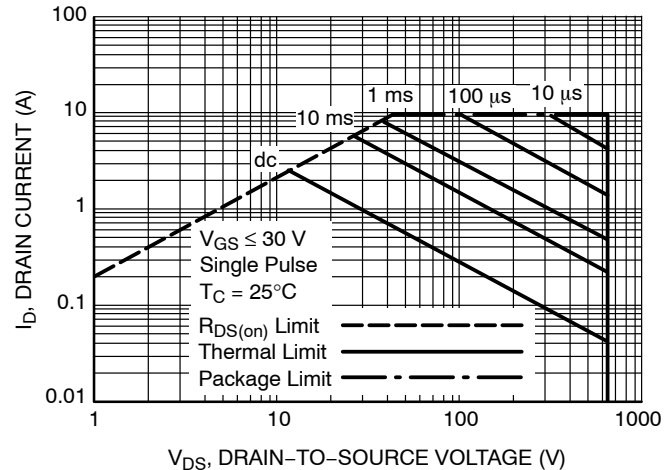


Figure 12. Maximum Rated Forward Biased Safe Operating Area for NDF04N62Z

NDF04N62Z, NDD04N62Z

TYPICAL CHARACTERISTICS

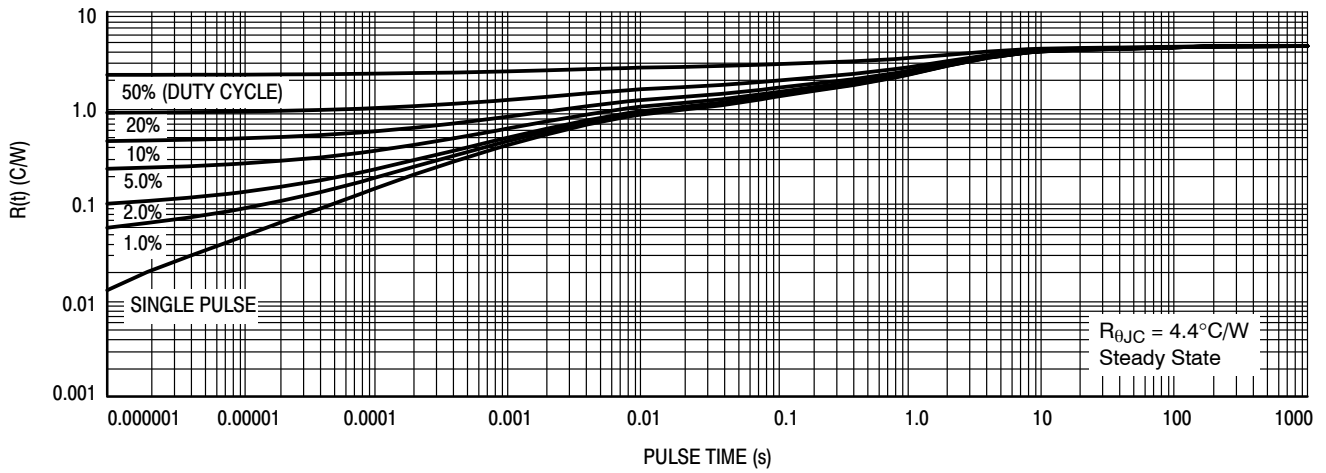


Figure 13. Thermal Impedance for NDF04N62Z

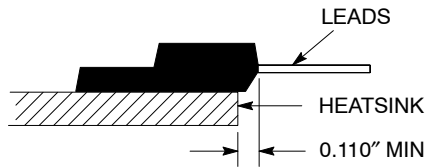


Figure 14. Isolation Test Diagram

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.

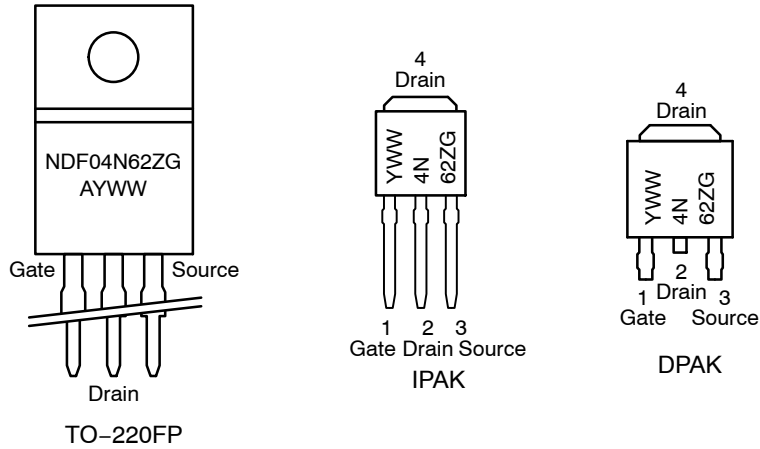
NDF04N62Z, NDD04N62Z

ORDERING INFORMATION

| Order Number | Package | Shipping† |
|--------------|-------------------------------------|--|
| NDF04N62ZG | TO-220FP (Pb-Free, Halogen-Free) | 50 Units / Rail |
| NDD04N62Z-1G | IPAK (Pb-Free, Halogen-Free) | 75 Units / Rail (In Development) |
| NDD04N62ZT4G | DPAK (Pb-Free, Halogen-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

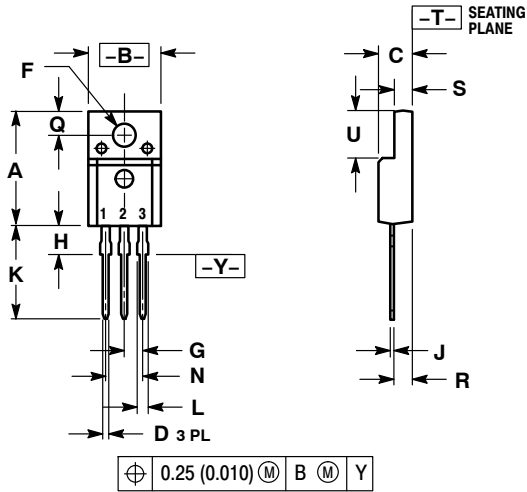


A = Location Code
 Y = Year
 WW = Work Week
 G = Pb-Free, Halogen-Free Package

NDF04N62Z, NDD04N62Z

PACKAGE DIMENSIONS

TO-220FP CASE 221D-03 ISSUE K

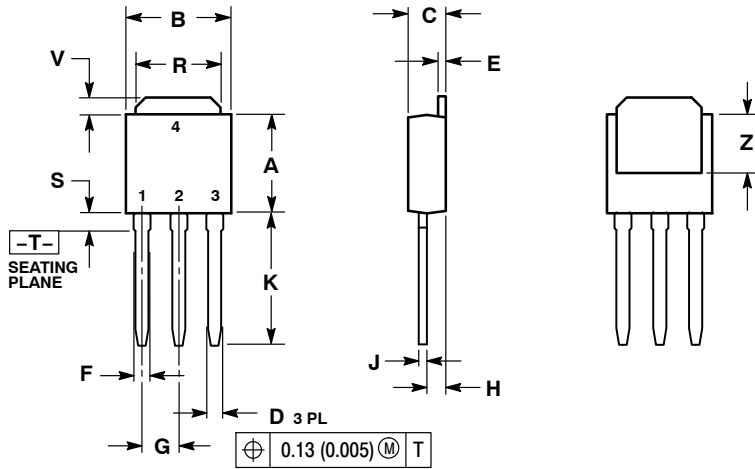


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH
 3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

| 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

IPAK CASE 369D-01 ISSUE C



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

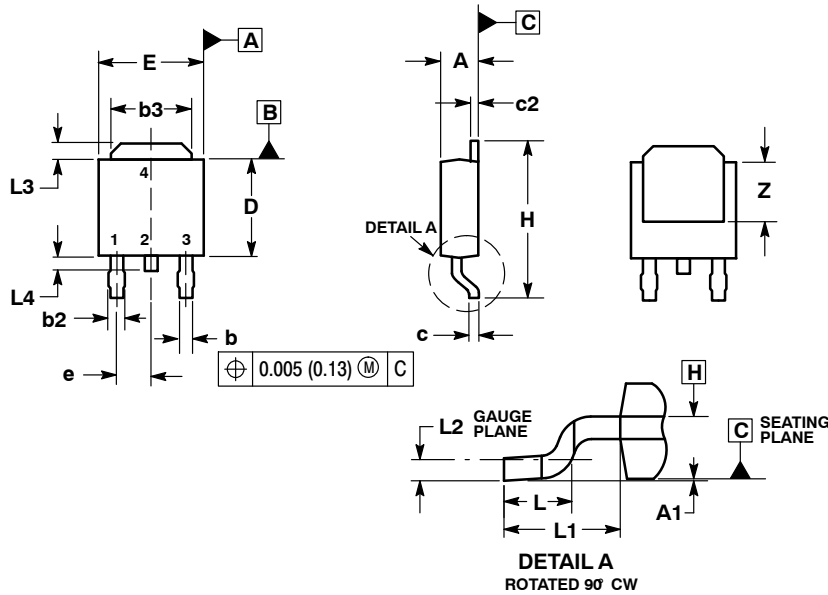
| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.35 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 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, NDD04N62Z

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE) CASE 369AA-01 ISSUE B



NOTES:

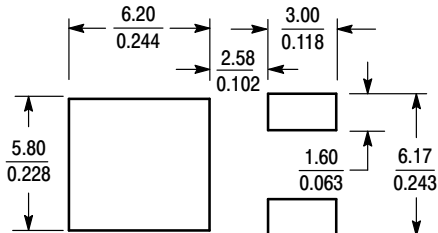
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.086 | 0.094 | 2.18 | 2.38 |
| A1 | 0.000 | 0.005 | 0.00 | 0.13 |
| b | 0.025 | 0.035 | 0.63 | 0.89 |
| b2 | 0.030 | 0.045 | 0.76 | 1.14 |
| b3 | 0.180 | 0.215 | 4.57 | 5.46 |
| c | 0.018 | 0.024 | 0.46 | 0.61 |
| c2 | 0.018 | 0.024 | 0.46 | 0.61 |
| D | 0.235 | 0.245 | 5.97 | 6.22 |
| E | 0.250 | 0.265 | 6.35 | 6.73 |
| e | 0.090 BSC | | 2.29 BSC | |
| H | 0.370 | 0.410 | 9.40 | 10.41 |
| L | 0.055 | 0.070 | 1.40 | 1.78 |
| L1 | 0.108 REF | | 2.74 REF | |
| L2 | 0.020 BSC | | 0.51 BSC | |
| L3 | 0.035 | 0.050 | 0.89 | 1.27 |
| L4 | --- | 0.040 | --- | 1.01 |
| Z | 0.155 | --- | 3.93 | --- |

STYLE 2:

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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