

NTP75N03L09, NTB75N03L09

Power MOSFET 75 Amps, 30 Volts

N-Channel TO-220 and D²PAK

This Logic Level Vertical Power MOSFET is a general purpose part that provides the “best of design” available today in a low cost power package. Avalanche energy issues make this part an ideal design in. The drain-to-source diode has a ideal fast but soft recovery.

Features

- Ultra-Low $R_{DS(on)}$, Single Base, Advanced Technology
- SPICE Parameters Available
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} and $V_{DS(on)}$ Specified at Elevated Temperatures
- High Avalanche Energy Specified
- ESD JEDAC Rated HBM Class 1, MM Class B, CDM Class 0
- Pb-Free Packages are Available

Typical Applications

- Power Supplies
- Inductive Loads
- PWM Motor Controls
- Replaces MTP75N03HDL and MTB75N03HDL in Many Applications

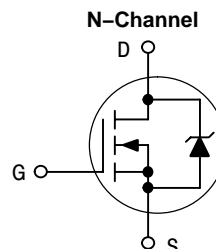


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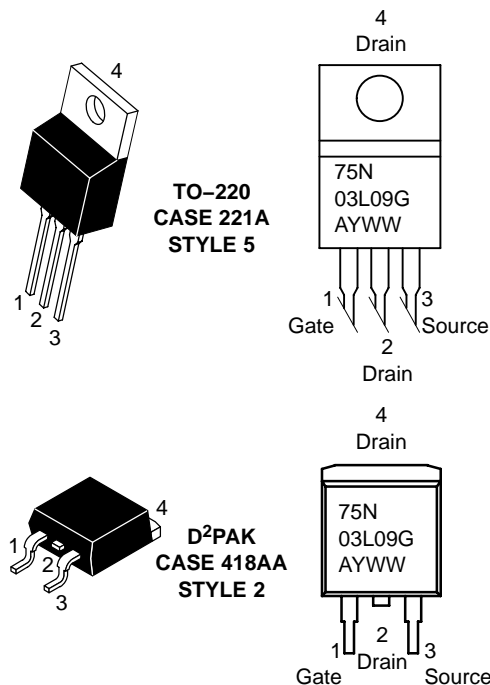
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75 AMPERES, 30 VOLTS

$R_{DS(on)} = 8 \text{ m}\Omega$



MARKING DIAGRAMS & PIN ASSIGNMENTS



75N03L09 = Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

| Rating | Symbol | Value | Unit |
|--|---|-------------------|-------------------------------|
| Drain-to-Source Voltage | V_{DSS} | 30 | Vdc |
| Drain-to-Gate Voltage (RGS = 10 M Ω) | V_{DGB} | 30 | Vdc |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 20 | Vdc |
| Non-repetitive ($t_p \leq 10$ ms) | V_{GS} | ± 24 | Vdc |
| Drain Current – Continuous @ $T_C = 25^\circ\text{C}$ – Continuous @ $T_C = 100^\circ\text{C}$ – Single Pulse ($t_p \leq 10$ μs) | I_D I_D I_{DM} | 75 59 225 | Adc Adc Apk |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) | P_D | 125 1.0 2.5 | W W/ $^\circ\text{C}$ W |
| Operating and Storage Temperature Range | T_J and T_{stg} | -55 to 150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 38$ Vdc, $V_{GS} = 10$ Vdc, $L = 1$ mH, $I_L(\text{pk}) = 55$ A, $V_{DS} = 40$ Vdc) | E_{AS} | 1500 | mJ |
| Thermal Resistance – Junction-to-Case – Junction-to-Ambient – Junction-to-Ambient (Note 1) | $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$ | 1.0 62.5 50 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using the minimum recommended pad size.

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|----------------|---------------------------------|-----------------------|
| NTP75N03L09 | TO-220 | 50 Units/Rail |
| NTP75N03L09G | TO-220 (Pb-Free) | 50 Units/Rail |
| NTB75N03L09 | D ² PAK | 50 Units/Rail |
| NTB75N03L09G | D ² PAK (Pb-Free) | 50 Units/Rail |
| NTB75N03L09T4 | D ² PAK | 800 Tape & Reel |
| NTB75N03L09T4G | D ² PAK (Pb-Free) | 800 Tape & Reel |

[†]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.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|----------------------|--------|-----------|-----------|-------------|
| Drain–Source Breakdown Voltage (Note 2) (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Negative) | V _{(BR)DSS} | 30 | 34 –57 | – – | Vdc mV°C |
| Zero Gate Voltage Drain Current (V _{DS} = 30 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 30 Vdc, V _{GS} = 0 Vdc, T _J = 150°C) | I _{DSS} | – – | – – | 1.0 10 | μAdc |
| Gate–Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | – | – | ±100 | nAdc |

ON CHARACTERISTICS (Note 2)

| | | | | | |
|---|---------------------|----------|--------------|--------------|-------------|
| Gate Threshold Voltage (Note 2) (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) | V _{GS(th)} | 1.0 – | 1.6 –6 | 2.0 – | Vdc mV°C |
| Static Drain–to–Source On–Resistance (Note 2) (V _{GS} = 5.0 Vdc, I _D = 37.5 Adc) | R _{DS(on)} | – | 6.5 | 8.0 | mΩ |
| Static Drain–to–Source On Resistance (Note 2) (V _{GS} = 10 Vdc, I _D = 75 Adc) (V _{GS} = 10 Vdc, I _D = 37.5 Adc, T _J = 125°C) | V _{DS(on)} | – – | 0.52 0.35 | 0.68 0.50 | Vdc |
| Forward Transconductance (Notes 2 & 4) (V _{DS} = 3 Vdc, I _D = 20 Adc) | g _{FS} | – | 58 | – | mΩ |

DYNAMIC CHARACTERISTICS (Note 4)

| | | | | | | |
|----------------------|---|------------------|---|------|------|----|
| Input Capacitance | (V _{DS} = 25 Vdc, V _{GS} = 0, f = 1.0 MHz) | C _{iss} | – | 4398 | 5635 | pF |
| Output Capacitance | | C _{oss} | – | 1160 | 1894 | |
| Transfer Capacitance | | C _{rss} | – | 317 | 430 | |

SWITCHING CHARACTERISTICS (Notes 3 & 4)

| | | | | | | |
|---------------------|---|---------------------|---|-----|-----|----|
| Turn–On Delay Time | (V _{GS} = 5.0 Vdc, V _{DD} = 20 Vdc, I _D = 75 Adc, R _G = 4.7 Ω) (Note 2) | t _{d(on)} | – | 16 | 30 | ns |
| Rise Time | | t _r | – | 130 | 200 | |
| Turn–Off Delay Time | | t _{d(off)} | – | 65 | 110 | |
| Fall Time | | t _f | – | 105 | 175 | |
| Gate Charge | (V _{GS} = 5.0 Vdc, I _D = 75 Adc, V _{DS} = 24 Vdc) (Note 2) | Q _T | – | 57 | 75 | nC |
| | | Q ₁ | – | 11 | 15 | |
| | | Q ₂ | – | 34 | 50 | |

SOURCE–DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|---|--|-----------------|--------|--------------|-----------|-----|
| Forward On–Voltage | (I _S = 75 Adc, V _{GS} = 0 Vdc) (I _S = 75 Adc, V _{GS} = 0 Vdc, T _J = 125°C) (Note 2) | V _{SD} | – – | 1.19 1.09 | 1.25 – | Vdc |
| Reverse Recovery Time (Note 4) | (I _S = 75 Adc, V _{GS} = 0 Vdc di _S /dt = 100 A/μs) (Note 2) | t _{rr} | – | 37 | – | ns |
| | | t _a | – | 20 | – | |
| Reverse Recovery Stored Charge (Note 4) | | t _b | – | 17 | – | μC |
| | | Q _{RR} | – | 0.023 | – | |

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.
4. From characterization test data.

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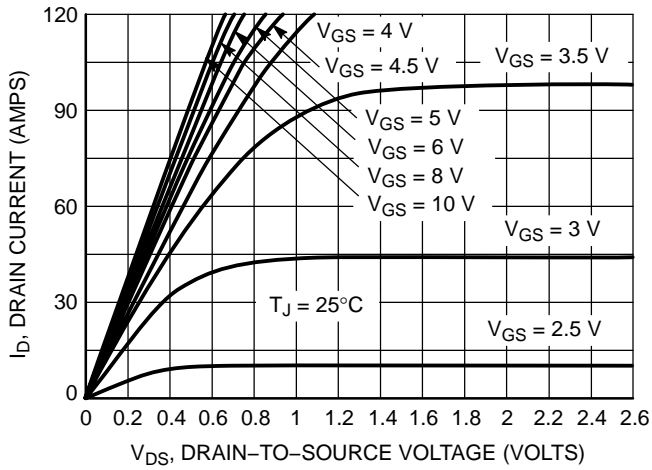


Figure 1. On-Region Characteristics

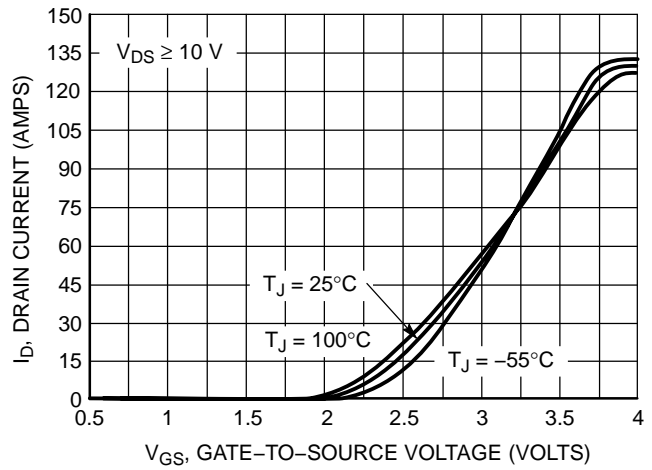


Figure 2. Transfer Characteristics

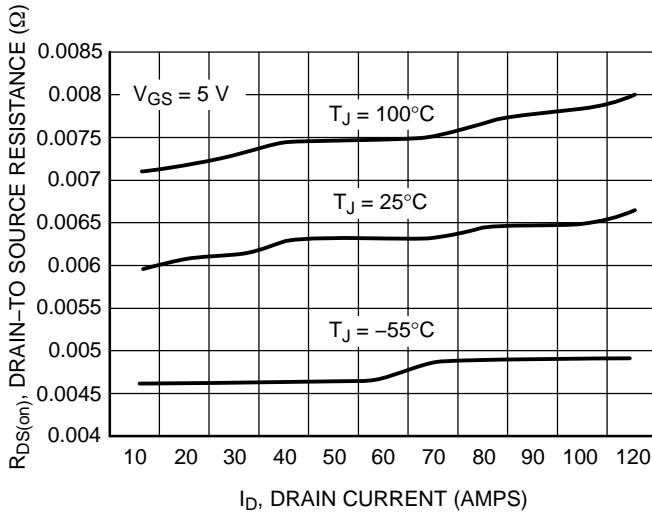


Figure 3. On-Resistance vs. Drain Current and Temperature

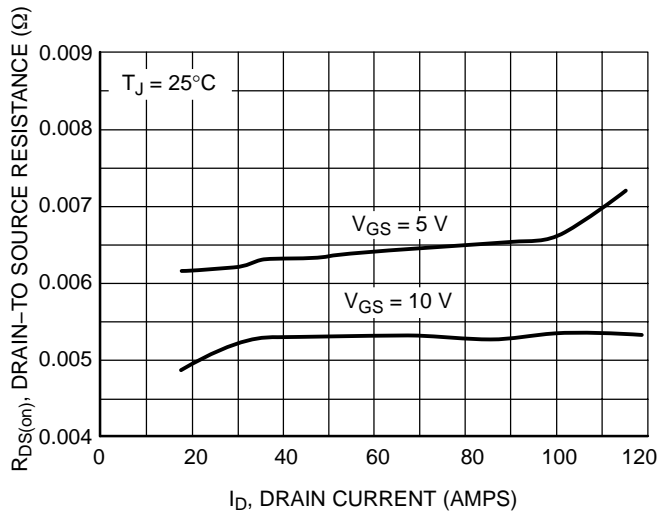


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

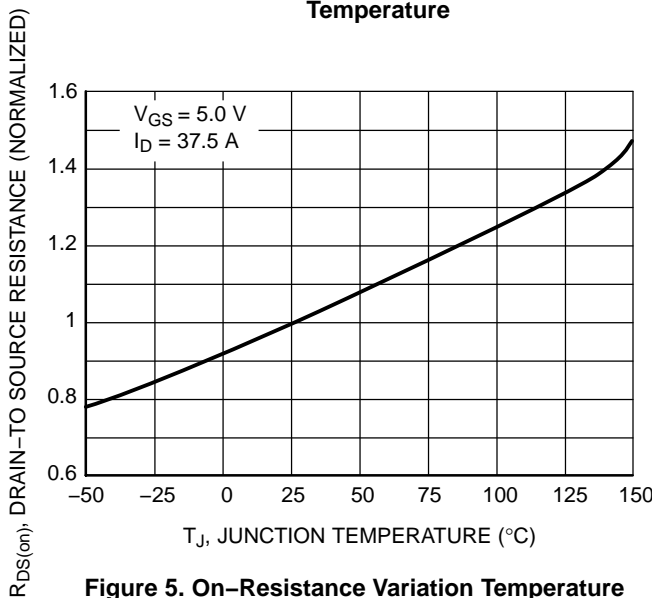


Figure 5. On-Resistance Variation Temperature

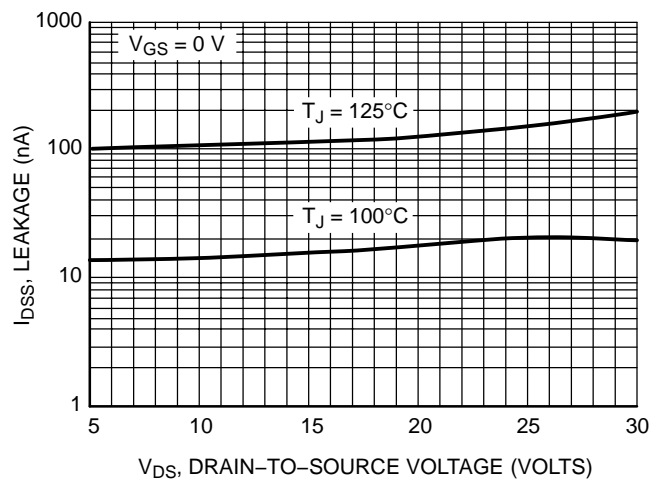


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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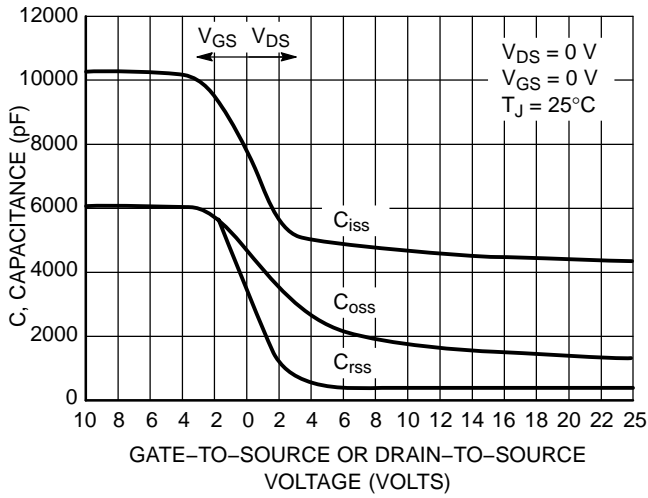


Figure 7. Capacitance Variation

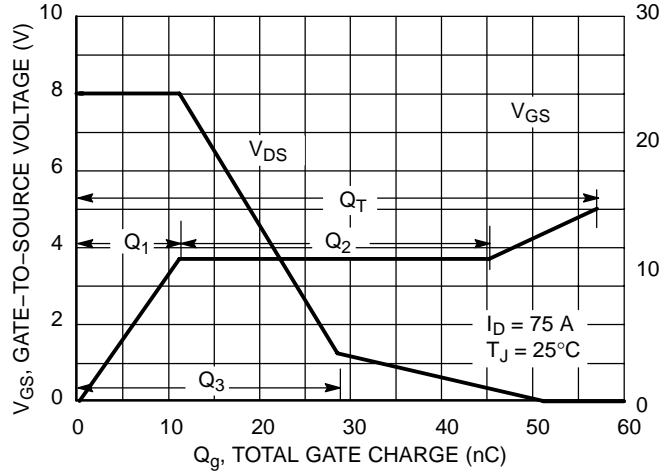


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

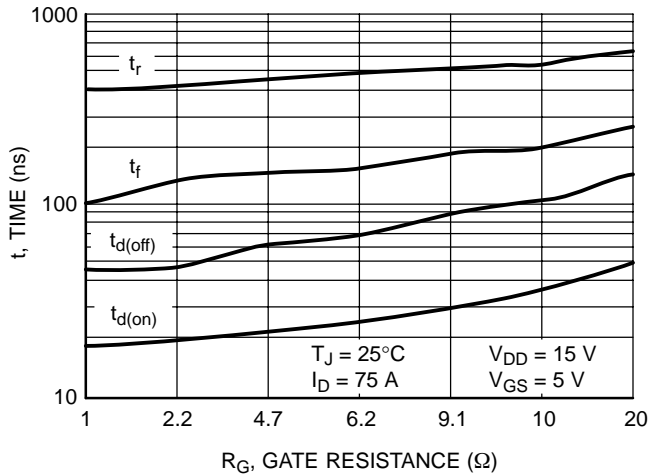


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

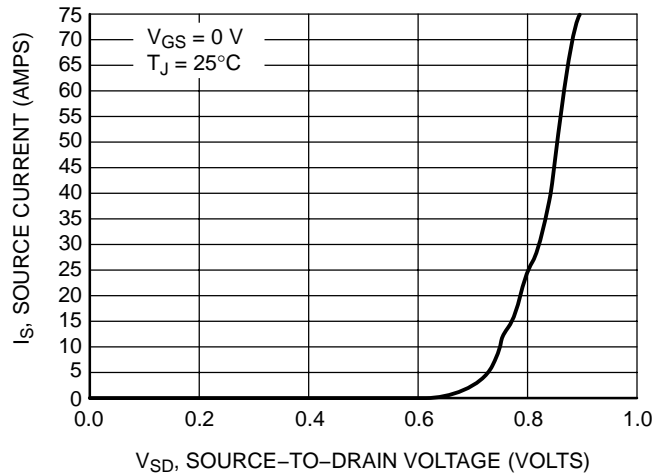


Figure 10. Diode Forward Voltage vs. Current

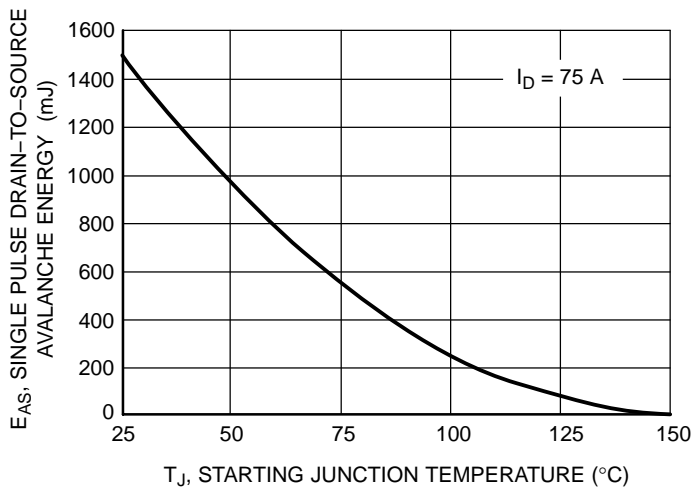
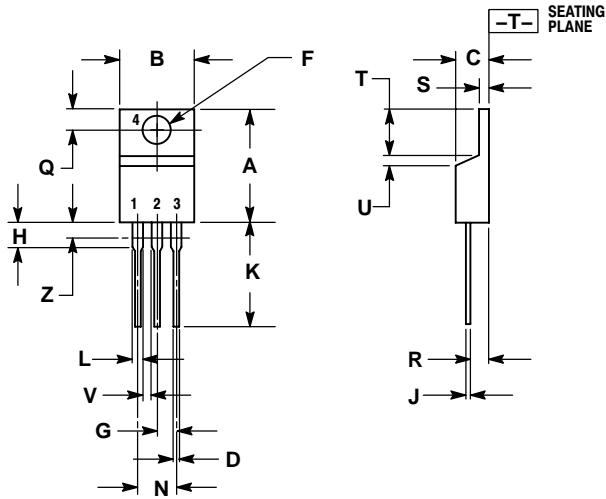


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

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PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AA



- 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.

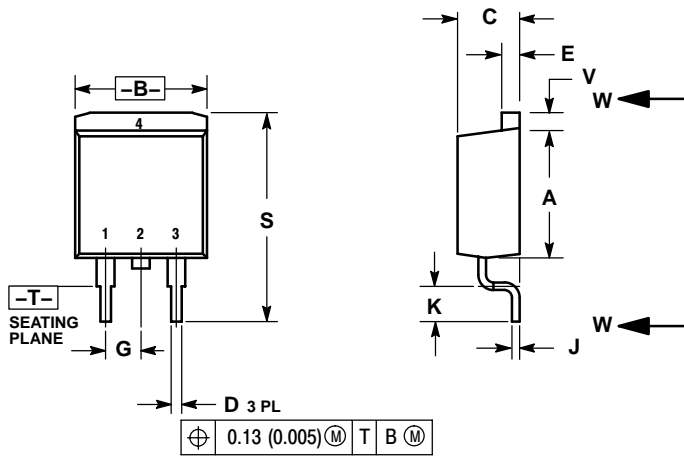
| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.018 | 0.025 | 0.46 | 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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PACKAGE DIMENSIONS

D²PAK
CASE 418AA-01
ISSUE O

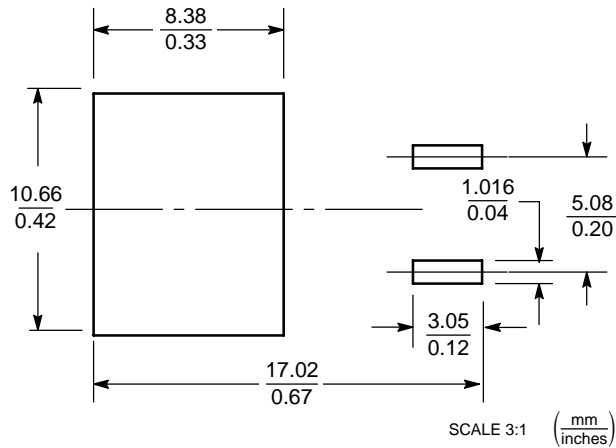


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.340 | 0.380 | 8.64 | 9.65 |
| B | 0.380 | 0.405 | 9.65 | 10.29 |
| C | 0.160 | 0.190 | 4.06 | 4.83 |
| D | 0.020 | 0.036 | 0.51 | 0.92 |
| E | 0.045 | 0.055 | 1.14 | 1.40 |
| F | 0.310 | --- | 7.87 | --- |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| M | 0.280 | --- | 7.11 | --- |
| S | 0.575 | 0.625 | 14.60 | 15.88 |
| V | 0.045 | 0.055 | 1.14 | 1.40 |

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

SOLDERING FOOTPRINT*



*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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