

NTD40N03R

Power MOSFET 45 Amps, 25 Volts N-Channel DPAK

Features

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{iss} to Minimize Driver Loss
- Low Gate Charge
- Optimized for High Side Switching Requirements in High-Efficiency DC-DC Converters
- Pb-Free Packages are Available

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

| Parameter | Symbol | Value | Unit |
|--|--------------------------|------------|-------------------------|
| Drain-to-Source Voltage | V_{DS} | 25 | Vdc |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 20 | Vdc |
| Thermal Resistance – Junction-to-Case Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Drain Current | $R_{\theta JC}$ P_D | 3.0 50 | $^\circ\text{C/W}$ W |
| – Continuous @ $T_C = 25^\circ\text{C}$, Chip | I_D | 45 | A |
| – Continuous @ $T_A = 25^\circ\text{C}$, Limited by Wires | I_D | 32 | A |
| – Single Pulse ($t_p \leq 10 \mu\text{s}$) | I_D | 100 | A |
| Thermal Resistance – Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 2.1 | W |
| Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ | I_D | 9.2 | A |
| Thermal Resistance – Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 100 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 1.5 | W |
| Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ | I_D | 7.8 | A |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to 175 | $^\circ\text{C}$ |
| 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.

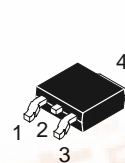
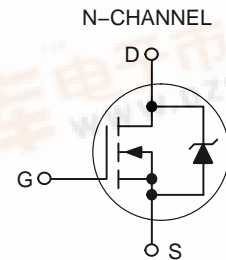
1. When surface mounted to an FR4 board using 0.5 sq. in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.



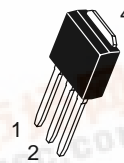
ON Semiconductor®

<http://onsemi.com>

45 AMPERES, 25 VOLTS
 $R_{DS(on)} = 12.6 \text{ m}\Omega$ (Typ)

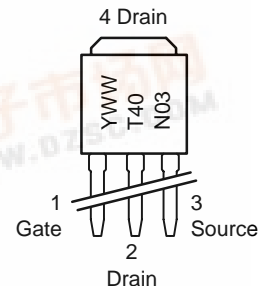
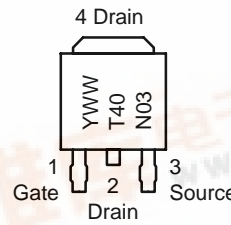


**CASE 369AA
DPAK
(Surface Mount)
STYLE 2**



**CASE 369D
DPAK
(Straight Lead)
STYLE 2**

MARKING DIAGRAM & PIN ASSIGNMENTS



40N03= Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

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

NTD40N03R

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|-----------------|--------|-----|-----|-----|------|
|-----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|----------------------------------|---------|---------|-----------|--------------|
| Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive) | V ^(br) _{DSS} | 25 – | 28 – | – – | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 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 3)

| | | | | | |
|--|---------------------|----------|--------------|------------|--------------|
| Gate Threshold Voltage (Note 3) (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) | V _{GS(th)} | 1.0 – | 1.7 – | 2.0 – | Vdc mV/°C |
| Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 4.5 Vdc, I _D = 10 Adc) (V _{GS} = 10 Vdc, I _D = 10 Adc) | R _{DS(on)} | – – | 18.6 12.6 | 23 16.5 | mΩ |
| Forward Transconductance (Note 3) (V _{DS} = 10 Vdc, I _D = 10 Adc) | g _{FS} | – | 20 | – | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|--|------------------|---|-----|---|----|
| Input Capacitance | (V _{DS} = 20 Vdc, V _{GS} = 0 V, f = 1 MHz) | C _{iss} | – | 584 | – | pF |
| Output Capacitance | | C _{oss} | – | 254 | – | |
| Transfer Capacitance | | C _{rss} | – | 99 | – | |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|--|---------------------|---|------|---|----|
| Turn-On Delay Time | (V _{GS} = 10 Vdc, V _{DD} = 10 Vdc, I _D = 10 Adc, R _G = 3 Ω) | t _{d(on)} | – | 4.5 | – | ns |
| Rise Time | | t _r | – | 19.5 | – | |
| Turn-Off Delay Time | | t _{d(off)} | – | 16.7 | – | |
| Fall Time | | t _f | – | 3.5 | – | |
| Gate Charge | (V _{GS} = 4.5 Vdc, I _D = 10 Adc, V _{DS} = 10 Vdc) (Note 3) | Q _T | – | 5.78 | – | nC |
| | | Q ₁ | – | 2.1 | – | |
| | | Q ₂ | – | 2.5 | – | |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|-----------------|--------|--------------|----------|-----|
| Forward On-Voltage | (I _S = 10 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 10 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | – – | 0.85 0.71 | 1.2 – | Vdc |
| Reverse Recovery Time | (I _S = 10 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 3) | t _{rr} | – | 20.4 | – | ns |
| | | t _a | – | 8.25 | – | |
| | | t _b | – | 12.1 | – | |
| Reverse Recovery Stored Charge | | Q _{RR} | – | 0.007 | – | μC |

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

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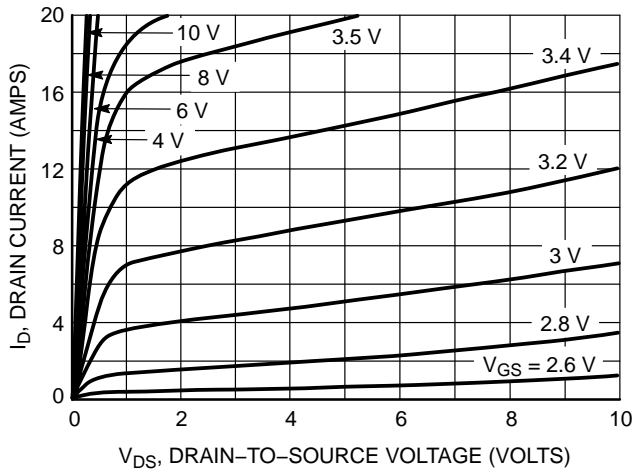


Figure 1. On-Region Characteristics

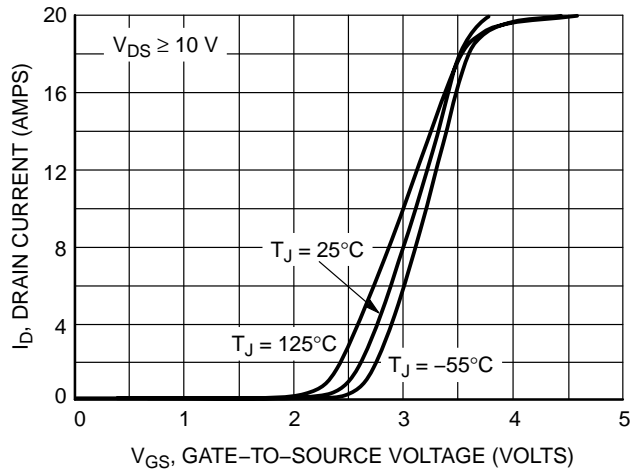


Figure 2. Transfer Characteristics

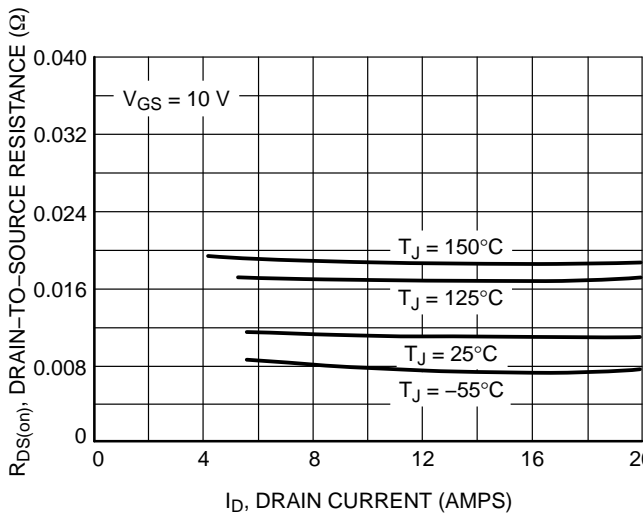


Figure 3. On-Resistance versus Drain Current and Temperature

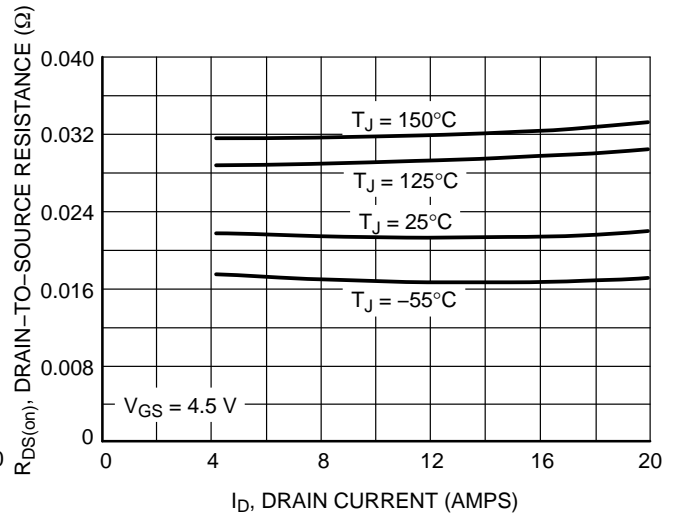


Figure 4. On-Resistance versus Drain Current and Temperature

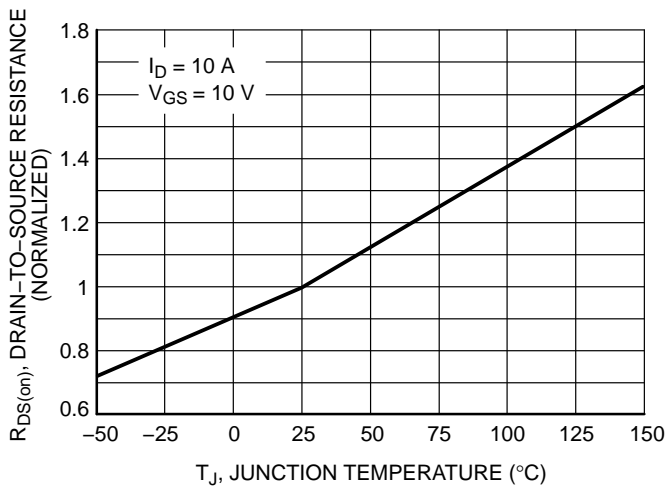


Figure 5. On-Resistance Variation with Temperature

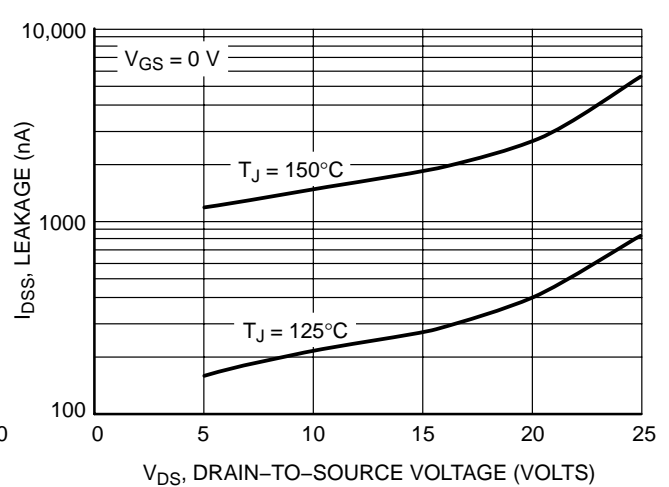


Figure 6. Drain-to-Source Leakage Current versus Voltage

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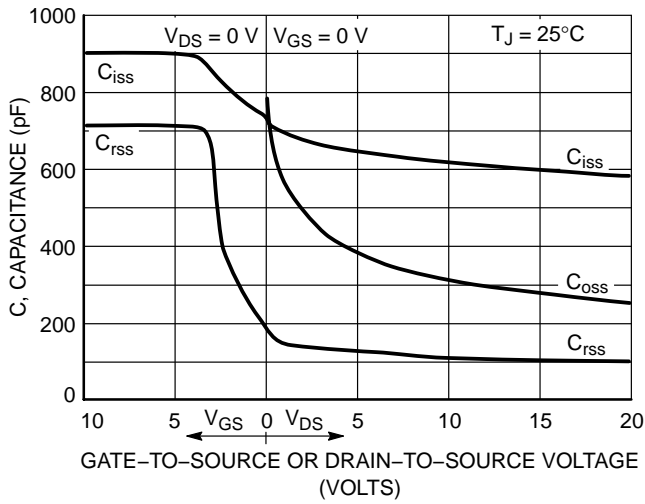


Figure 7. Capacitance Variation

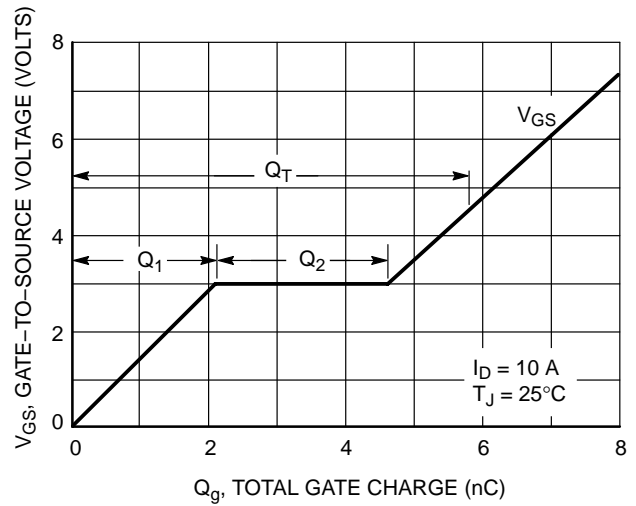


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

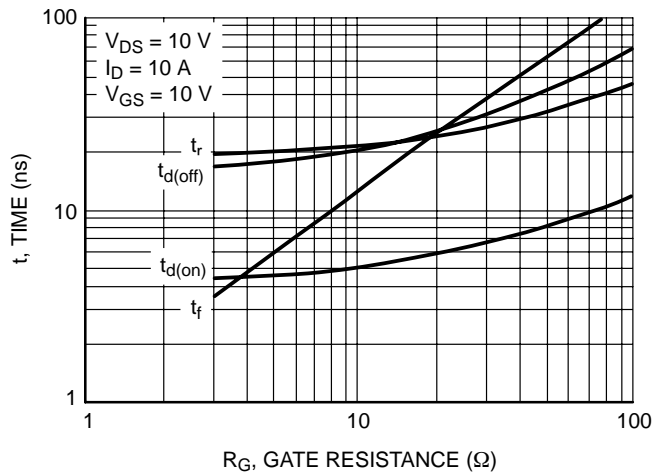


Figure 9. Resistive Switching Time Variation versus Gate Resistance

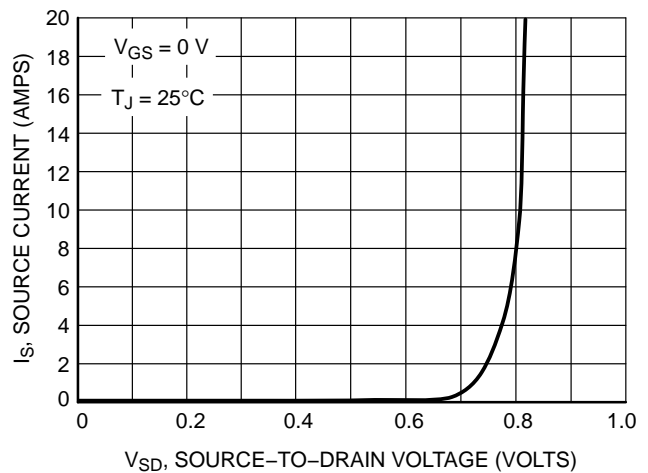


Figure 10. Diode Forward Voltage versus Current

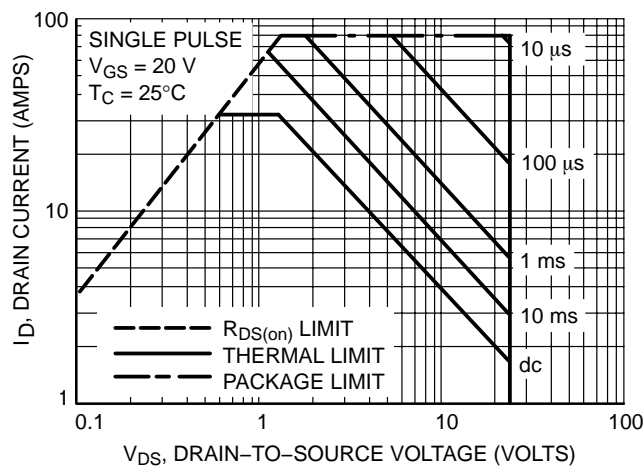


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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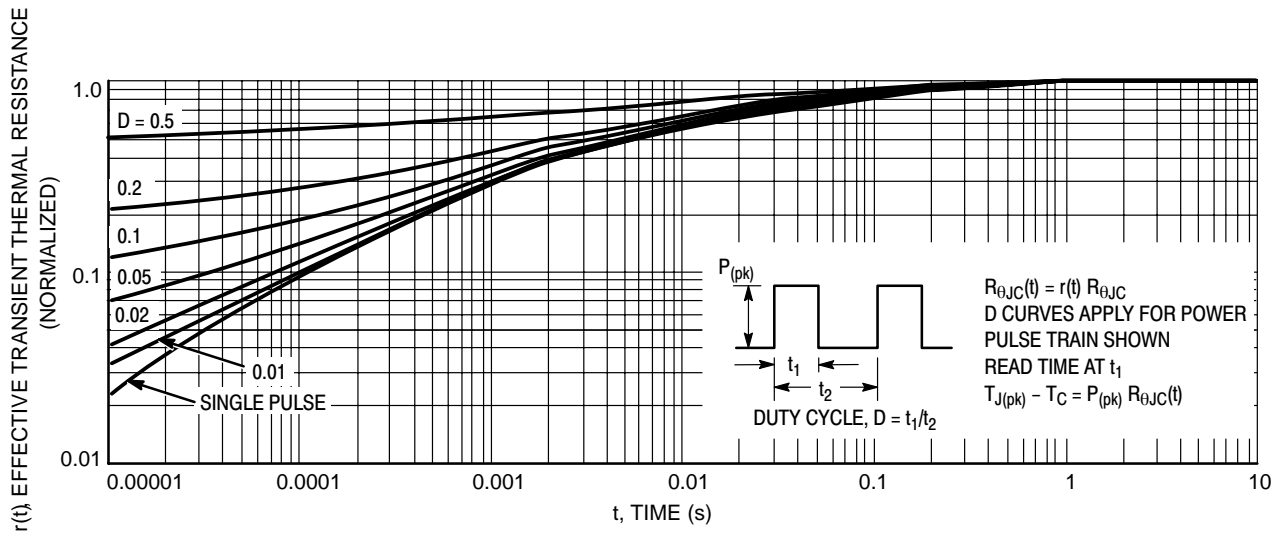


Figure 12. Thermal Response

NTD40N03R

ORDERING INFORMATION

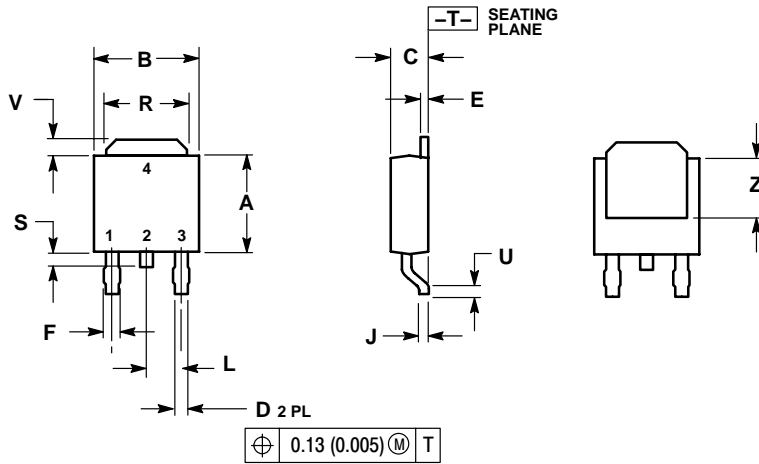
| Device | Package | Shipping† |
|--------------|-------------------------------|------------------|
| NTD40N03R | DPAK | 75 Units/Rail |
| NTD40N03RG | DPAK (Pb-Free) | 75 Units/Rail |
| NTD40N03R-1 | DPAK (Straight Lead) | 75 Units/Rail |
| NTD40N03R-1G | DPAK (Straight Lead, Pb-Free) | 75 Units/Rail |
| NTD40N03RT4 | DPAK | 2500 Tape & Reel |
| NTD40N03RT4G | DPAK (Pb-Free) | 2500 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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PACKAGE DIMENSIONS

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

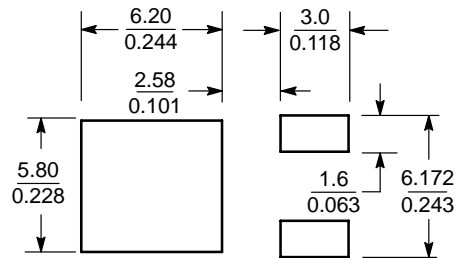


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.22 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.025 | 0.035 | 0.63 | 0.88 |
| E | 0.018 | 0.024 | 0.46 | 0.61 |
| F | 0.033 | 0.045 | 0.83 | 1.14 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.180 | 0.215 | 4.57 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| U | 0.020 | --- | 0.51 | --- |
| 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

SOLDERING FOOTPRINT*



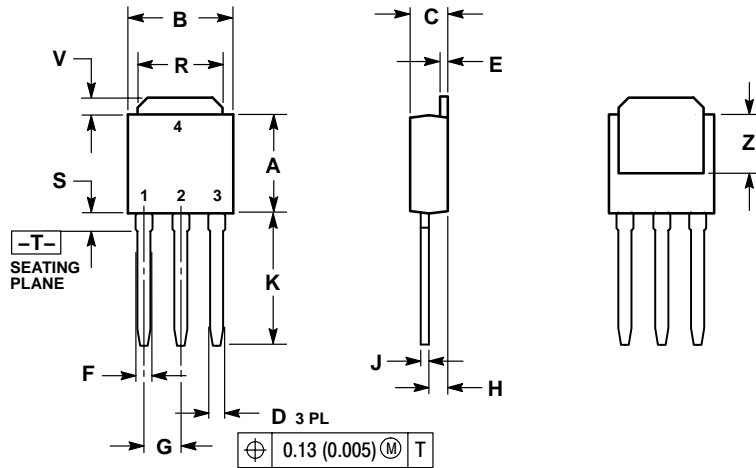
SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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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PACKAGE DIMENSIONS

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




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
- DRAIN
- SOURCE
- DRAIN

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