

NTD6416AN

N-Channel Power MOSFET 100 V, 17 A, 81 mΩ

Features

- Low $R_{DS(on)}$
- High Current Capability
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Parameter | Symbol | Value | Unit |
|---|------------------------|---------------------------|------------------|
| Drain-to-Source Voltage | V_{DSS} | 100 | V |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 20 | V |
| Continuous Drain Current | I_D | $T_C = 25^\circ\text{C}$ | 17 |
| | | $T_C = 100^\circ\text{C}$ | 11 |
| Power Dissipation | P_D | 71 | W |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | 62 |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Source Current (Body Diode) | I_S | 17 | A |
| Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 50 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, $I_{L(pk)} = 17 \text{ A}$, $L = 0.3 \text{ mH}$, $R_G = 25 \Omega$) | E_{AS} | 43 | mJ |
| Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds | T_L | 260 | $^\circ\text{C}$ |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---------------------------------------|-----------------|-----|--------------------|
| Junction-to-Case (Drain) Steady State | $R_{\theta JC}$ | 2.1 | $^\circ\text{C/W}$ |
| Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 40 | |

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.

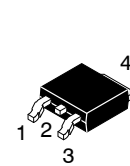
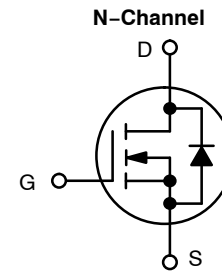
1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).



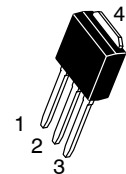
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| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | I_D MAX (Note 1) |
|---------------|------------------|--------------------|
| 100 V | 81 mΩ @ 10 V | 17 A |

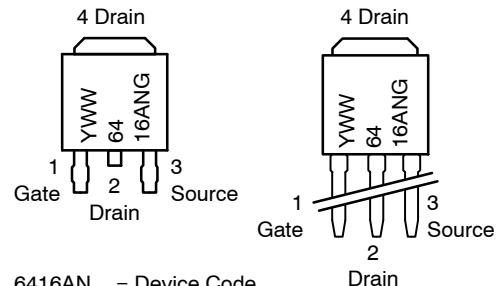


DPAK
CASE 369AA
STYLE 2



IPAK
CASE 369D
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENTS



6416AN = Device Code
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTD6416AN

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

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | | |
|---|--------------------------------------|---|------------------------|-----|------|-------|----|
| Drain-to-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = 250 μA | 100 | | | V | |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 112 | | mV/°C | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = 100 V | T _J = 25°C | | | 1.0 | μA |
| | | | T _J = 125°C | | | 100 | |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA | |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|--|-------------------------------------|---|-----|-----|-----|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 250 μA | 2.0 | | 4.0 | V |
| Negative Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | 7.7 | | mV/°C |
| Drain-to-Source On-Resistance | R _{DS(on)} | V _{GS} = 10 V, I _D = 17 A | | 73 | 81 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} = 5 V, I _D = 10 A | | 12 | | S |

CHARGES, CAPACITANCES AND GATE RESISTANCE

| | | | | | | |
|------------------------------|---------------------|---|--|-----|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V | | 620 | | pF |
| Output Capacitance | C _{OSS} | | | 110 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 50 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 10 V, V _{DS} = 80 V, I _D = 17 A | | 20 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 1.0 | | |
| Gate-to-Source Charge | Q _{GS} | | | 3.6 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 10 | | |
| Plateau Voltage | V _{GP} | | | 5.8 | | |
| Gate Resistance | R _G | | | 2.4 | | Ω |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|---------------------|--|--|-----|--|----|
| Turn-On Delay Time | t _{d(on)} | V _{GS} = 10 V, V _{DD} = 80 V, I _D = 17 A, R _G = 6.1 Ω | | 9.2 | | ns |
| Rise Time | t _r | | | 22 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 24 | | |
| Fall Time | t _f | | | 20 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|-----------------|---|------------------------|------|-----|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = 17 A | T _J = 25°C | 0.85 | 1.2 | V |
| | | | T _J = 125°C | 0.7 | | |
| Reverse Recovery Time | t _{rr} | V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 17 A | | 56 | | ns |
| Charge Time | t _a | | | 41 | | |
| Discharge Time | t _b | | | 15 | | |
| Reverse Recovery Charge | Q _{RR} | | | 135 | | |

2. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

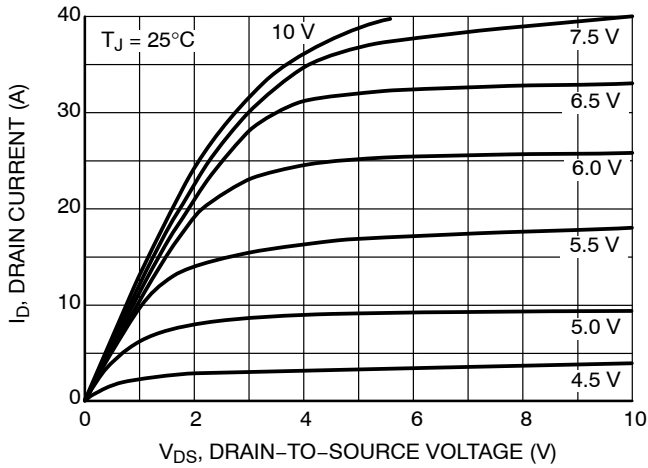


Figure 1. On-Region Characteristics

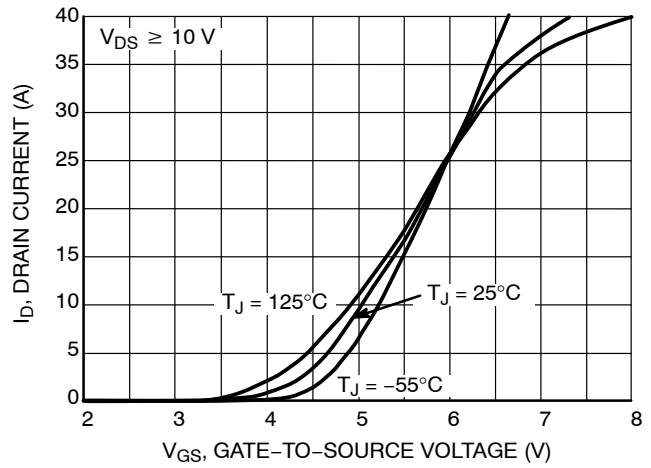


Figure 2. Transfer Characteristics

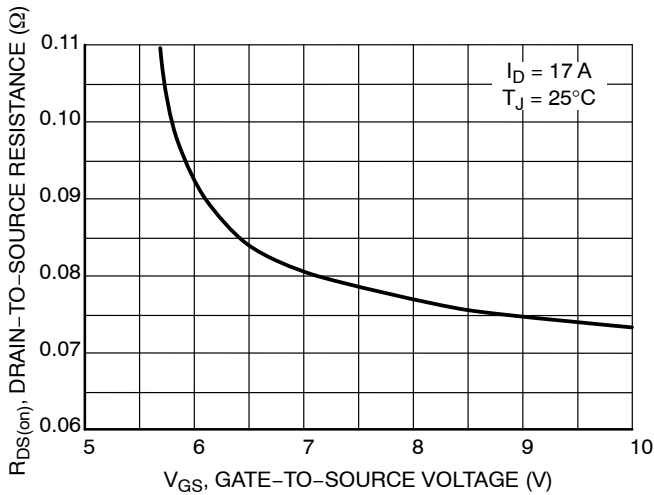


Figure 3. On-Region versus Gate Voltage

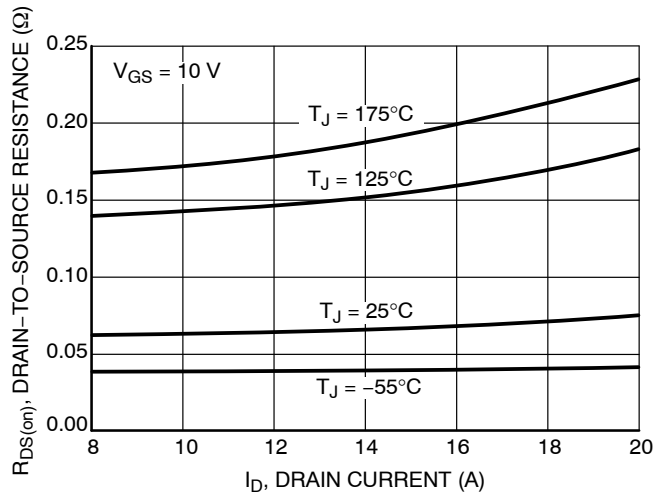


Figure 4. On-Resistance versus Drain Current and Gate Voltage

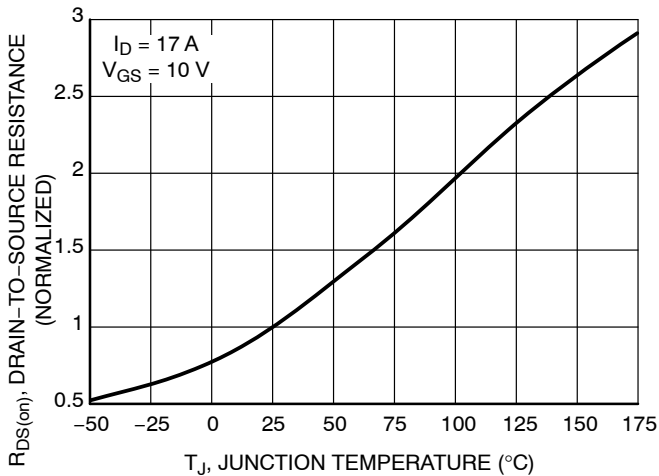


Figure 5. On-Resistance Variation with Temperature

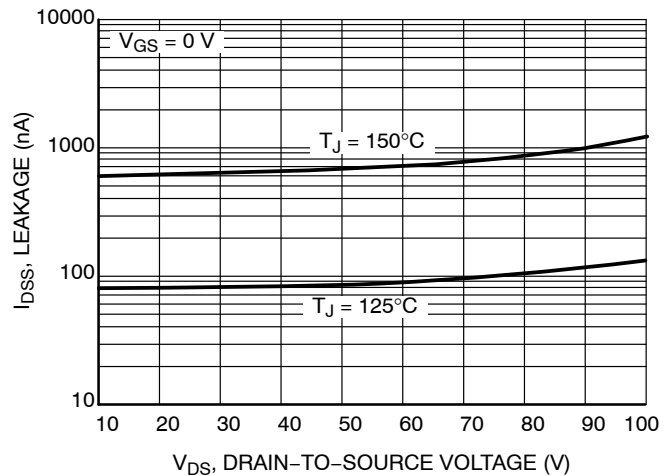


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL CHARACTERISTICS

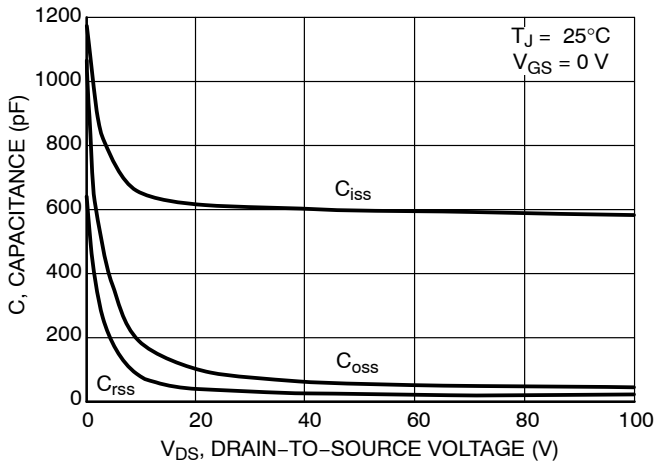


Figure 7. Capacitance Variation

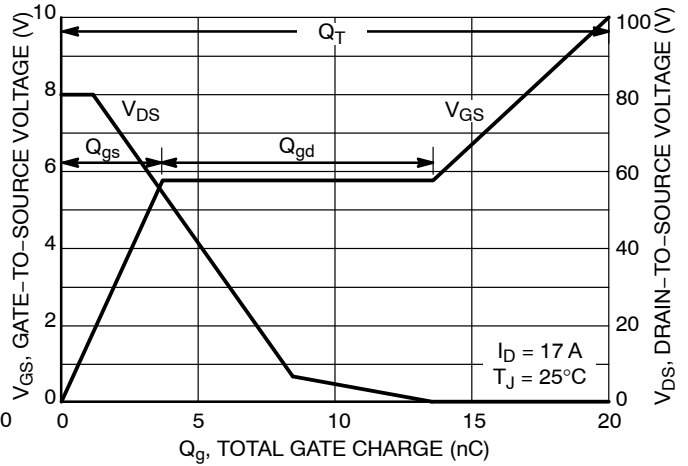


Figure 8. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

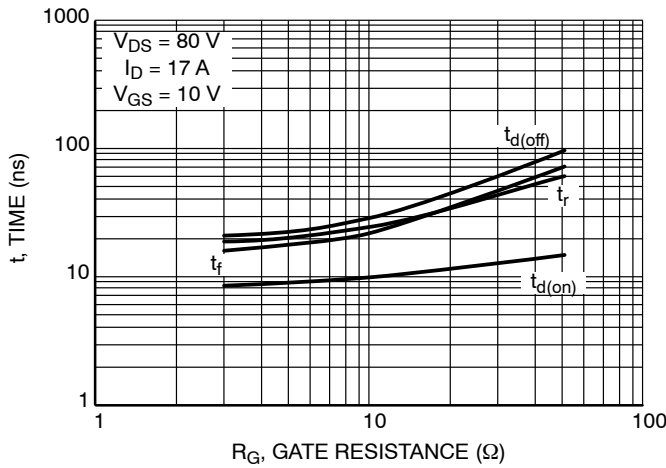


Figure 9. Resistive Switching Time Variation versus Gate Resistance

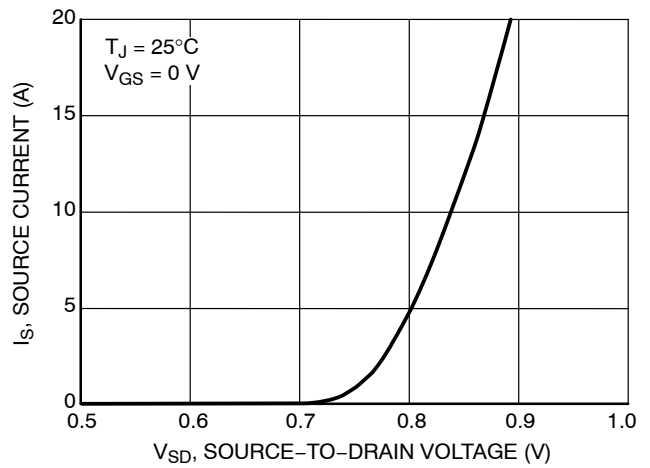


Figure 10. Diode Forward Voltage versus Current

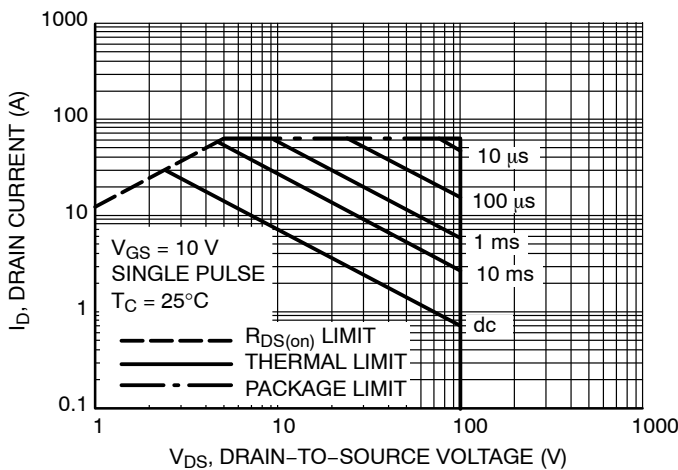


Figure 11. Maximum Rated Forward Biased Safe Operating Area

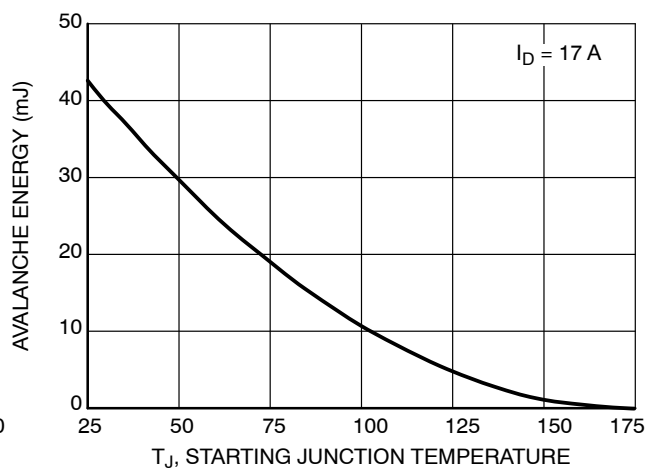


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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TYPICAL CHARACTERISTICS

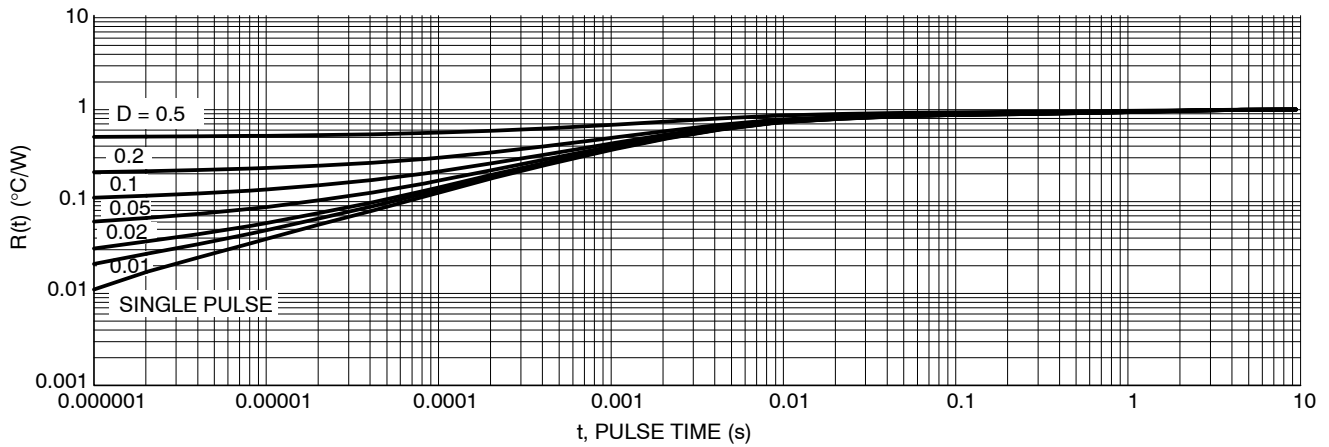


Figure 13. Thermal Response

ORDERING INFORMATION

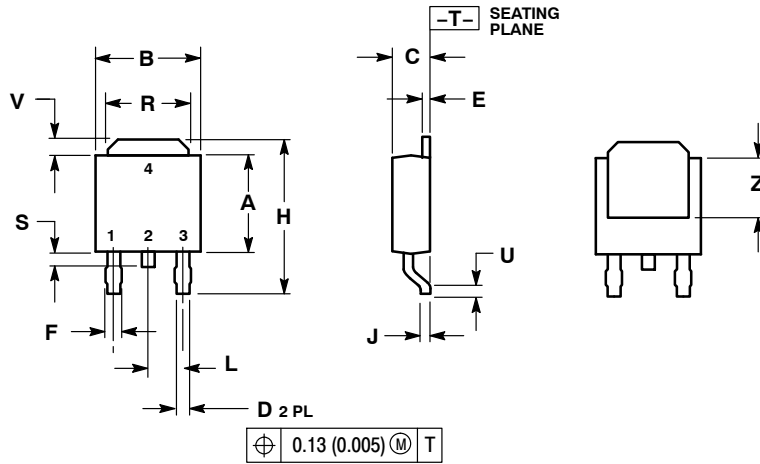
| Device | Package | Shipping† |
|--------------|-------------------|--------------------|
| NTD6416ANT4G | DPAK (Pb-Free) | 2500 / Tape & Reel |
| NTD6416AN-1G | IPAK (Pb-Free) | 75 Units / Rail |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

NTD6416AN

PACKAGE DIMENSIONS

DPAK
CASE 369AA-01
ISSUE A

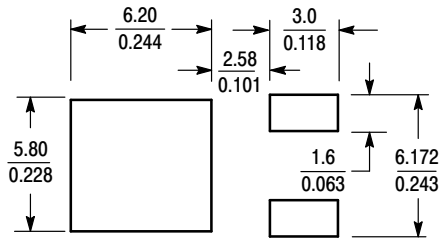


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| 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 | 0.89 |
| E | 0.018 | 0.024 | 0.46 | 0.61 |
| F | 0.030 | 0.045 | 0.77 | 1.14 |
| H | 0.386 | 0.410 | 9.80 | 10.40 |
| 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 | 0.024 | 0.040 | 0.60 | 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*



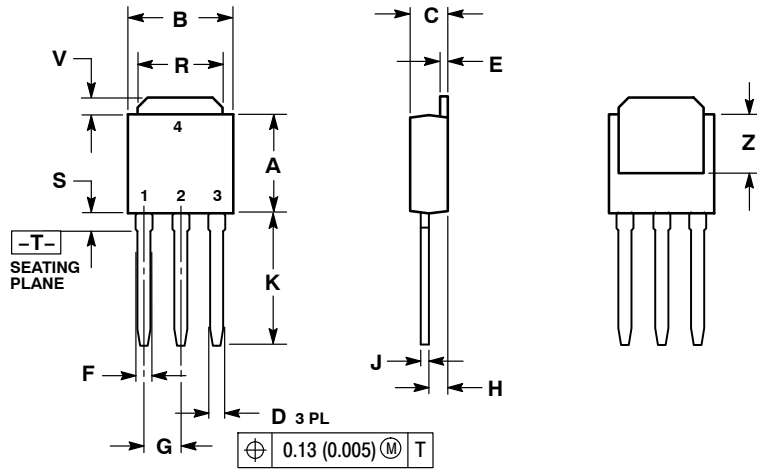
SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NTD6416AN

PACKAGE DIMENSIONS

DPAK 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:
1. GATE
 2. DRAIN
 3. SOURCE
 4. DRAIN

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