

NTB25P06

Power MOSFET

-60 V, -27.5 A, P-Channel D²PAK

Designed for low voltage, high speed switching applications and to withstand high energy in the avalanche and commutation modes.

Features

- Pb-Free Packages are Available

Typical Applications

- PWM Motor Controls
- Power Supplies
- Converters
- Bridge Circuits

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|-----------------------------------|-------------|------|
| Drain-to-Source Voltage | V _{DSS} | -60 | V |
| Gate-to-Source Voltage | V _{GS} | ± 15 | V |
| - Continuous | V _{GSM} | ± 20 | Vpk |
| - Non-Repetitive (t _p ≤ 10 ms) | | | |
| Drain Current | I _D | 27.5 | A |
| - Continuous @ T _A = 25°C | I _{DM} | 80 | Apk |
| - Single Pulse (t _p ≤ 10 μs) | | | |
| Total Power Dissipation @ T _A = 25°C | P _D | 120 | W |
| Operating and Storage Temperature Range | T _J , T _{stg} | -55 to +175 | °C |
| Single Pulse Drain-to-Source Avalanche Energy - Starting T _J = 25°C (V _{DD} = 25 V, V _{GS} = 10 V, I _{L(pk)} = 20 A, L = 3 mH, R _G = 25 Ω) | E _{AS} | 600 | mJ |
| Thermal Resistance | | | °C/W |
| - Junction-to-Case | R _{θJC} | 1.25 | |
| - Junction-to-Ambient (Note 1) | R _{θJA} | 46.8 | |
| - Junction-to-Ambient (Note 2) | R _{θJA} | 63.2 | |
| Maximum Lead Temperature for Soldering Purposes, (1/8" from case for 10 s) | T _L | 260 | °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 1" pad size (Cu Area 1.127 in²).
2. When surface mounted to an FR4 board using the minimum recommended pad size (Cu Area 0.412 in²).

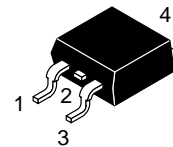
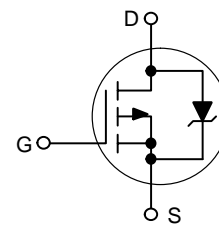


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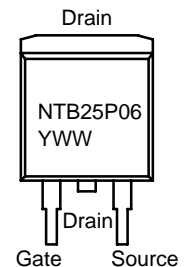
| V _{(BR)DSS} | R _{DS(on) TYP} | I _{D MAX} |
|----------------------|-------------------------|--------------------|
| -60 V | 65 mΩ @ -10 V | -27.5 A |

P-Channel



D²PAK
CASE 418B
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENT



NTB25P06 = Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|-------------|------------------------------|-----------------------|
| NTB25P06 | D ² PAK | 50 Units/Rail |
| NTB25P06G | D ² PAK (Pb-Free) | 50 Units/Rail |
| NTB25P06T4 | D ² PAK | 800/Tape & Reel |
| NTB25P06T4G | 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.

NTB25P06

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|----------------------|----------|---------|-------------|------------|
| OFF CHARACTERISTICS | | | | | |
| Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 V, I _D = -250 μA) (Positive Temperature Coefficient) | V _{(BR)DSS} | -60 - | - 64 | - - | V mV/°C |
| Zero Gate Voltage Drain Current (V _{GS} = 0 V, V _{DS} = -60 V, T _J = 25°C) (V _{GS} = 0 V, V _{DS} = -60 V, T _J = 150°C) | I _{DSS} | - - | - - | -10 -100 | μA |
| Gate-Body Leakage Current (V _{GS} = ±15 V, V _{DS} = 0 V) | I _{GSS} | - | - | ±100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | |
|---|---------------------|-----------|----------------|----------------|------------|
| Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = -250 μA) (Negative Threshold Temperature Coefficient) | V _{GS(th)} | -2.0 - | -2.8 6.2 | -4.0 - | V mV/°C |
| Static Drain-Source On-State Resistance (V _{GS} = -10 V, I _D = -12.5 A) (V _{GS} = -10 V, I _D = -25 A) | R _{DS(on)} | - - | 0.065 0.070 | 0.075 0.082 | Ω |
| Forward Transconductance (V _{DS} = -10 V, I _D = -12.5 A) | g _{FS} | - | 13 | - | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|------------------|---|------|------|----|
| Input Capacitance | (V _{DS} = -25 V, V _{GS} = 0 V, F = 1.0 MHz) | C _{iss} | - | 1200 | 1680 | pF |
| Output Capacitance | | C _{oss} | - | 345 | 480 | |
| Reverse Transfer Capacitance | | C _{rss} | - | 90 | 180 | |

SWITCHING CHARACTERISTICS (Notes 3 & 4)

| | | | | | | |
|---------------------|--|---------------------|---|-----|-----|----|
| Turn-On Delay Time | (V _{DD} = -30 V, I _D = -25 A, V _{GS} = -10 V R _G = 9.1 Ω) | t _{d(on)} | - | 14 | 24 | ns |
| Rise Time | | t _r | - | 72 | 118 | ns |
| Turn-Off Delay Time | | t _{d(off)} | - | 43 | 68 | ns |
| Fall Time | | t _f | - | 190 | 320 | ns |
| Gate Charge | (V _{DS} = -48 V, I _D = -25 A, V _{GS} = -10 V) | Q _T | - | 33 | 50 | nC |
| | | Q ₁ | - | 6.5 | - | |
| | | Q ₂ | - | 15 | - | |

BODY-DRAIN DIODE RATINGS (Note 3)

| | | | | | | |
|--------------------------------|--|-----------------|--------|--------------|-----------|----|
| Diode Forward On-Voltage | (I _S = -25 A, V _{GS} = 0 V) (I _S = -25 A, V _{GS} = 0 V, T _J = 150°C) | V _{SD} | - - | -1.8 -1.4 | -2.5 - | V |
| Reverse Recovery Time | (I _S = -25 A, V _{GS} = 0 V, di _S /dt = 100 A/μs) | t _{rr} | - | 70 | - | ns |
| | | t _a | - | 50 | - | |
| | | t _b | - | 20 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.2 | - | μC |

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

4. Switching characteristics are independent of operating junction temperatures.

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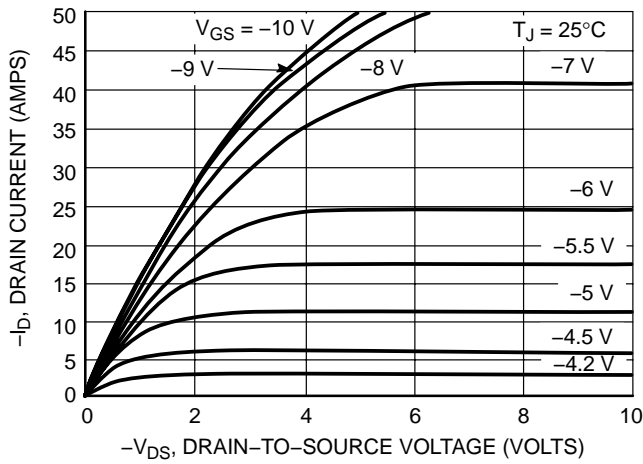


Figure 1. On-Region Characteristics

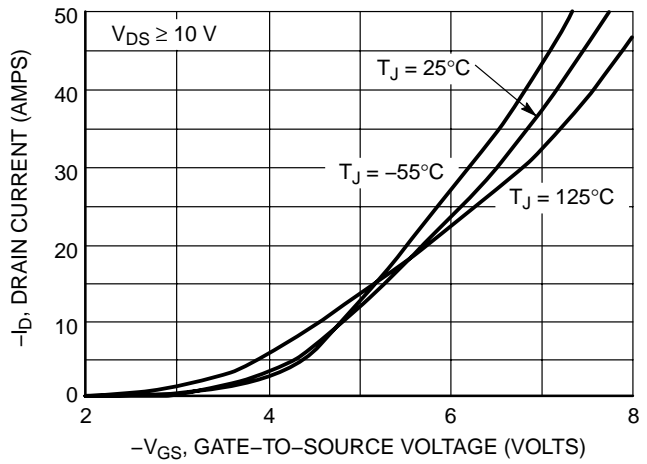


Figure 2. Transfer Characteristics

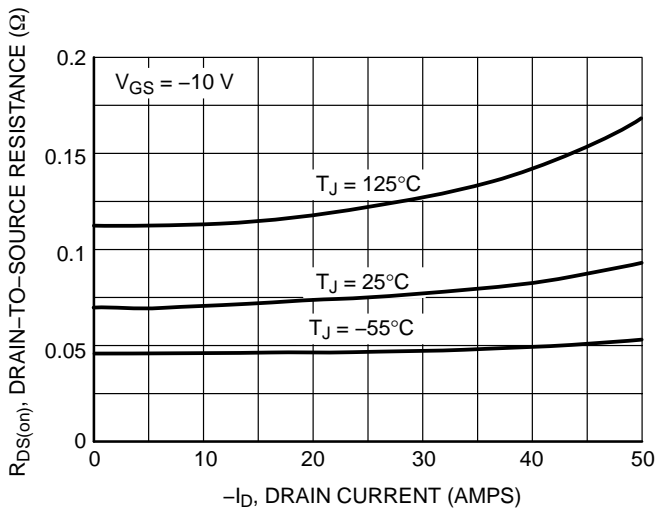


Figure 3. On-Resistance vs. Drain Current and Temperature

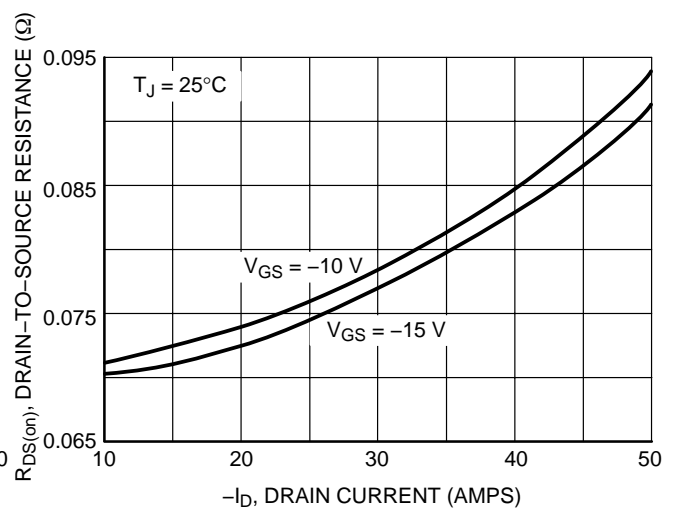


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

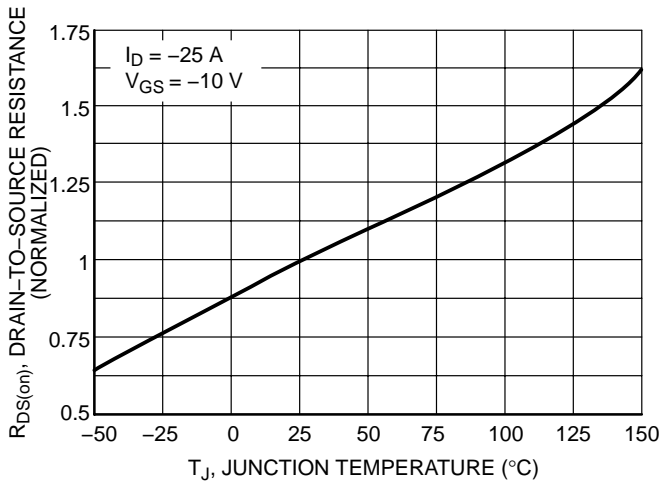


Figure 5. On-Resistance Variation with Temperature

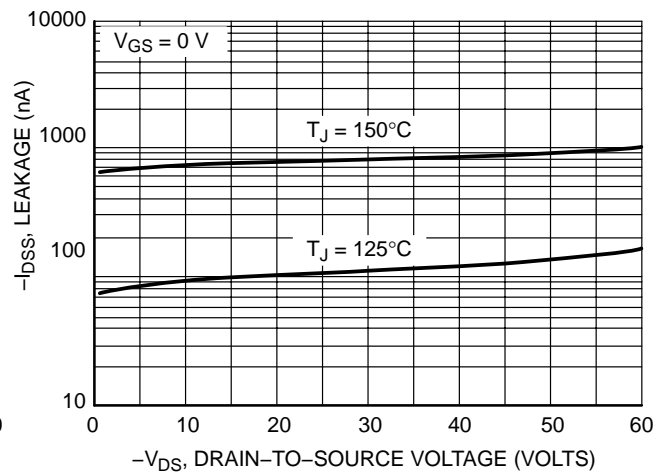


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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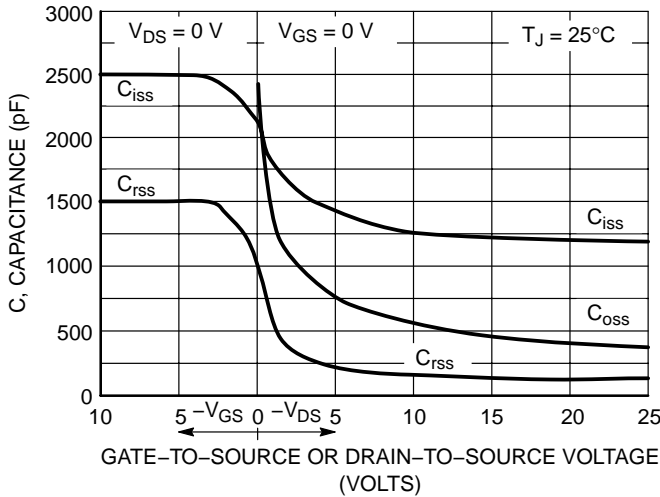


Figure 7. Capacitance Variation

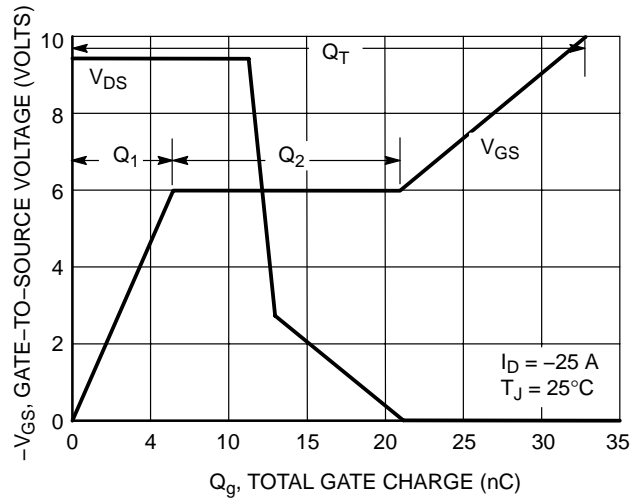


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

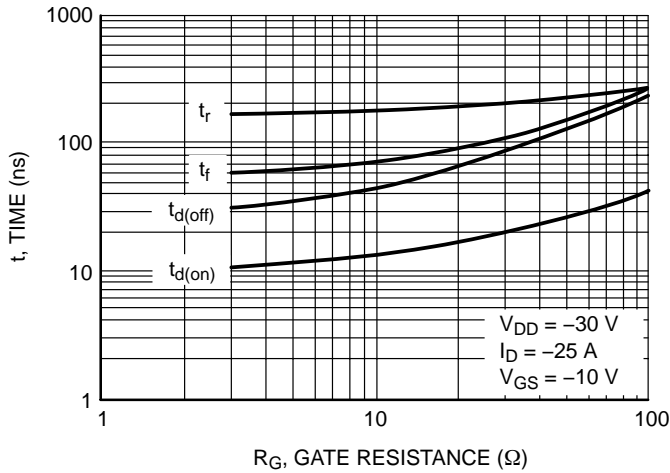


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

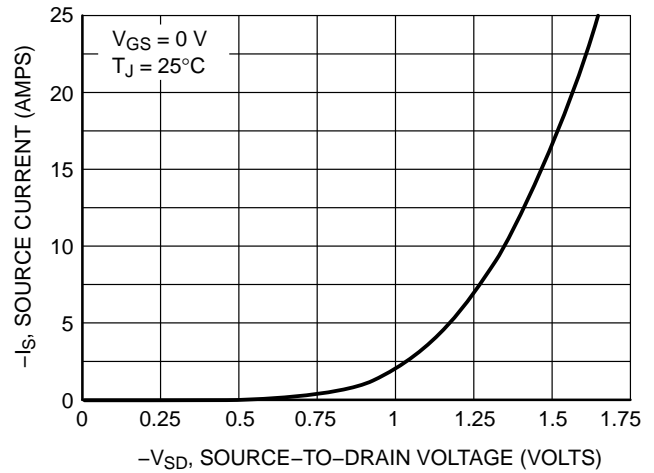


Figure 10. Diode Forward Voltage vs. Current

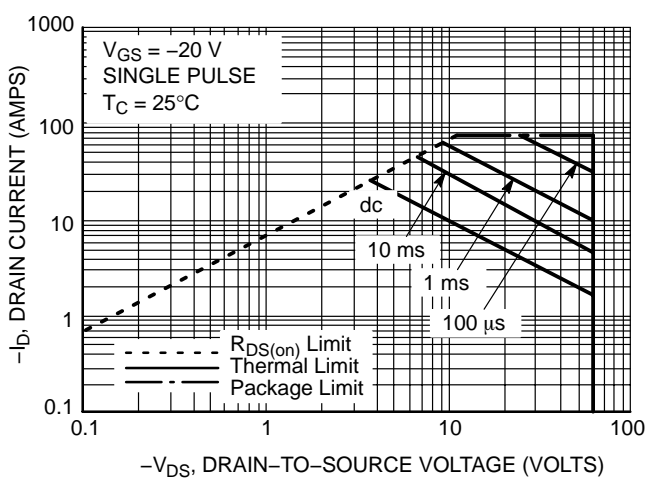


Figure 11. Maximum Rated Forward Biased Safe Operating Area

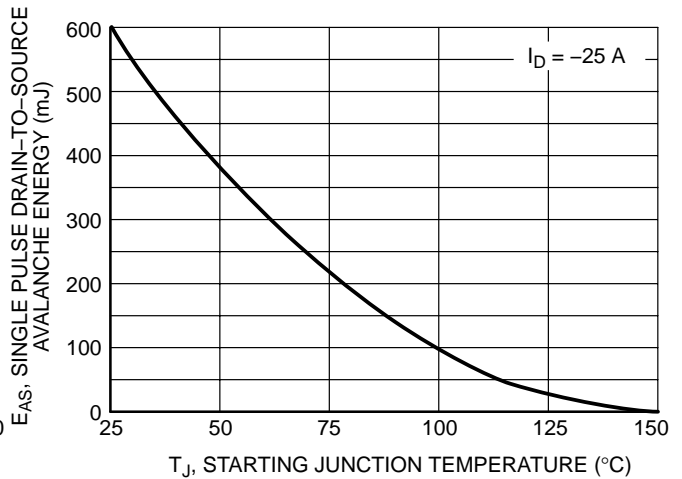
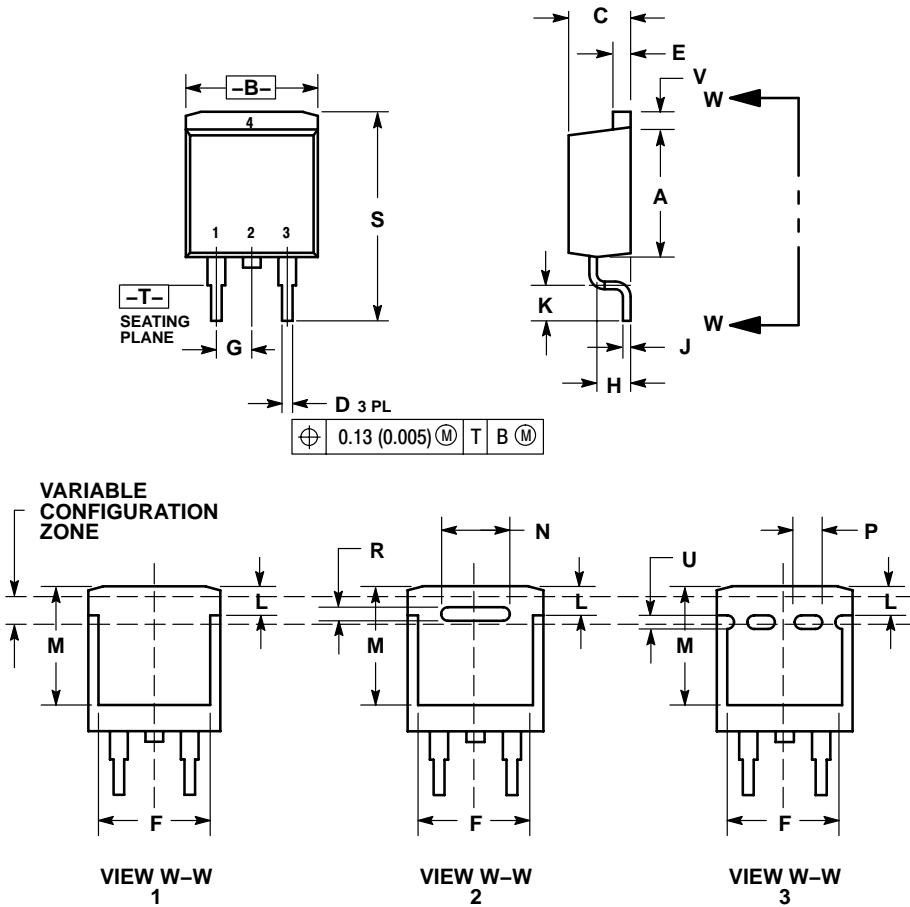


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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PACKAGE DIMENSIONS

D²PAK
CASE 418B-04
ISSUE H

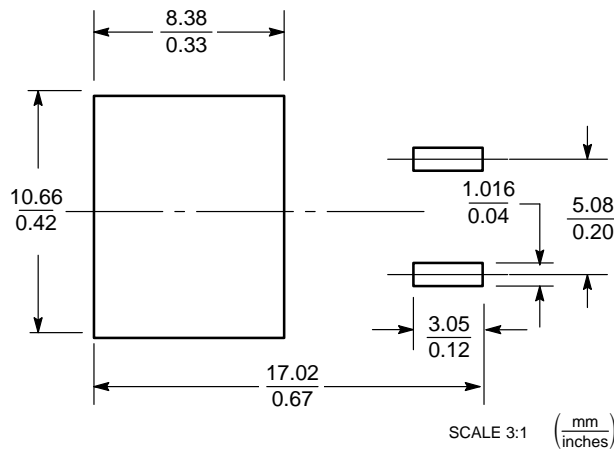


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

| 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 | 0.035 | 0.51 | 0.89 |
| E | 0.045 | 0.055 | 1.14 | 1.40 |
| F | 0.310 | 0.350 | 7.87 | 8.89 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.080 | 0.110 | 2.03 | 2.79 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| L | 0.052 | 0.072 | 1.32 | 1.83 |
| M | 0.280 | 0.320 | 7.11 | 8.13 |
| N | 0.197 REF | | 5.00 REF | |
| P | 0.079 REF | | 2.00 REF | |
| R | 0.039 REF | | 0.99 REF | |
| 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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