

NTB45N06, NTB45N06

MOSFET – N-Channel, D²PAK

45 A, 60 V, 26 mΩ

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- Higher Current Rating
- Lower $R_{DS(on)}$
- Lower $V_{DS(on)}$
- Lower Capacitances
- Lower Total Gate Charge
- Tighter V_{SD} Specification
- Lower Diode Reverse Recovery Time
- Lower Reverse Recovery Stored Charge
- AEC-Q101 Qualified and PPAP Capable – NTB45N06
- These Devices are Pb-Free and are RoHS Compliant

Typical Applications

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

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

| Rating | Symbol | Value | Unit |
|---|-----------------|-------------|---------------------------|
| Drain-to-Source Voltage | V_{DSS} | 60 | Vdc |
| Drain-to-Gate Voltage ($R_{GS} = 10\text{ M}\Omega$) | V_{DGR} | 60 | Vdc |
| Gate-to-Source Voltage | V_{GS} | ± 20 | Vdc |
| – Continuous | V_{GS} | ± 30 | |
| – Non-Repetitive ($t_p \leq 10\text{ ms}$) | | | |
| Drain Current | I_D | 45 | Adc |
| – Continuous @ $T_A = 25^\circ\text{C}$ | I_D | 30 | |
| – Continuous @ $T_A = 100^\circ\text{C}$ | I_{DM} | 150 | Apk |
| – Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$) | | | |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 125 | W |
| Derate above 25°C | | 0.83 | W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) | | 3.2 | W |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2) | | 2.4 | W |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 50\text{ Vdc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 25\text{ }\Omega$, $I_{L(pk)} = 40\text{ A}$, $L = 0.3\text{ mH}$, $V_{DS} = 60\text{ Vdc}$) | E_{AS} | 240 | mJ |
| Thermal Resistance | | | $^\circ\text{C}/\text{W}$ |
| – Junction-to-Case | $R_{\theta JC}$ | 1.2 | |
| – Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 46.8 | |
| – Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 63.2 | |
| Maximum Lead Temperature for Soldering Purposes, 1/8 in from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

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. When surface mounted to an FR4 board using 1 in pad size, (Cu Area 1.127 in²).

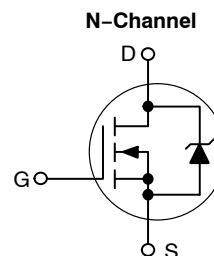


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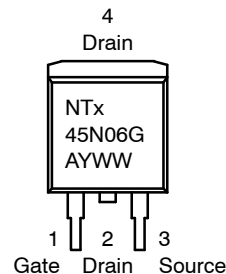
<http://onsemi.com>

45 AMPERES, 60 VOLTS

$R_{DS(on)} = 26\text{ m}\Omega$



MARKING DIAGRAMS & PIN ASSIGNMENTS



NTx45N06 = Device Code
 x = B or P
 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 3 of this data sheet.

NTB45N06, NTB45N06

2. When surface mounted to an FR4 board using the minimum recommended pad size, (Cu Area 0.412 in²).

NTB45N06, NTB45N06

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

| Characteristic | 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} | 60 - | 70 57 | - - | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = 60 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 60 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)} | 2.0 - | 2.8 7.2 | 4.0 - | Vdc mV/°C |
| Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 10 Vdc, I _D = 22.5 Adc) | R _{DS(on)} | - | 21 | 26 | mΩ |
| Static Drain-to-Source On-Voltage (Note 3) (V _{GS} = 10 Vdc, I _D = 45 Adc) (V _{GS} = 10 Vdc, I _D = 22.5 Adc, T _J = 150°C) | V _{DS(on)} | - - | 0.93 0.93 | 1.4 - | Vdc |
| Forward Transconductance (Note 3) (V _{DS} = 8.0 Vdc, I _D = 12 Adc) | g _{FS} | - | 16.6 | - | mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|---|------------------|---|------|------|----|
| Input Capacitance | (V _{DS} = 25 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz) | C _{ISS} | - | 1224 | 1725 | pF |
| Output Capacitance | | C _{OSS} | - | 345 | 485 | |
| Transfer Capacitance | | C _{RSS} | - | 76 | 160 | |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|---|---------------------|---|-----|-----|----|
| Turn-On Delay Time | (V _{DD} = 30 Vdc, I _D = 45 Adc, V _{GS} = 10 Vdc, R _G = 9.1 Ω) (Note 3) | t _{d(on)} | - | 10 | 25 | ns |
| Rise Time | | t _r | - | 101 | 200 | |
| Turn-Off Delay Time | | t _{d(off)} | - | 33 | 70 | |
| Fall Time | | t _f | - | 106 | 220 | |
| Gate Charge | (V _{DS} = 48 Vdc, I _D = 45 Adc, V _{GS} = 10 Vdc) (Note 3) | Q _T | - | 33 | 46 | nC |
| | | Q ₁ | - | 6.4 | - | |
| | | Q ₂ | - | 15 | - | |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|-----------------|--------|--------------|----------|-----|
| Forward On-Voltage | (I _S = 45 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 45 Adc, V _{GS} = 0 Vdc, T _J = 150°C) | V _{SD} | - - | 1.08 0.93 | 1.2 - | Vdc |
| Reverse Recovery Time | (I _S = 45 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 3) | t _{rr} | - | 53.1 | - | ns |
| | | t _a | - | 36 | - | |
| | | t _b | - | 16.9 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.087 | - | μC |

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

4. Switching characteristics are independent of operating junction temperatures.

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|---------------------------------|-------------------|
| NTB45N06T4G | D ² PAK (Pb-Free) | 800 / Tape & Reel |
| NTBV45N06T4G | 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.

NTB45N06, NTBV45N06

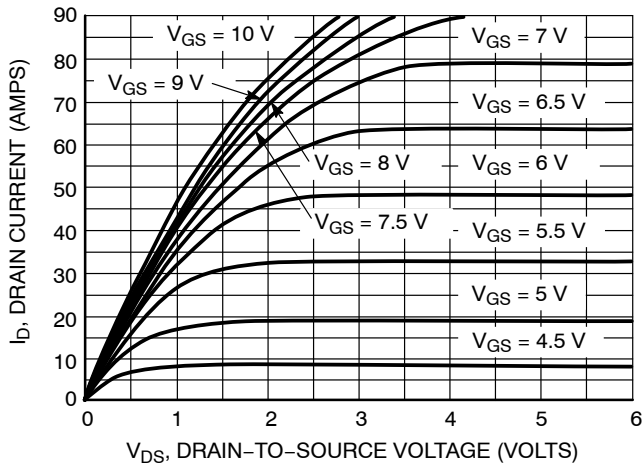


Figure 1. On-Region Characteristics

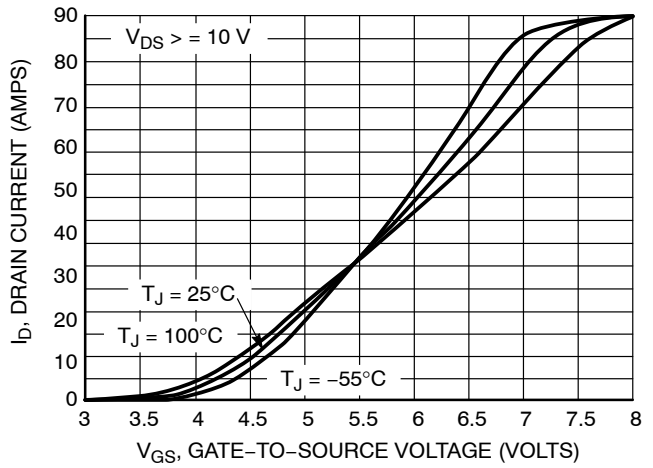


Figure 2. Transfer Characteristics

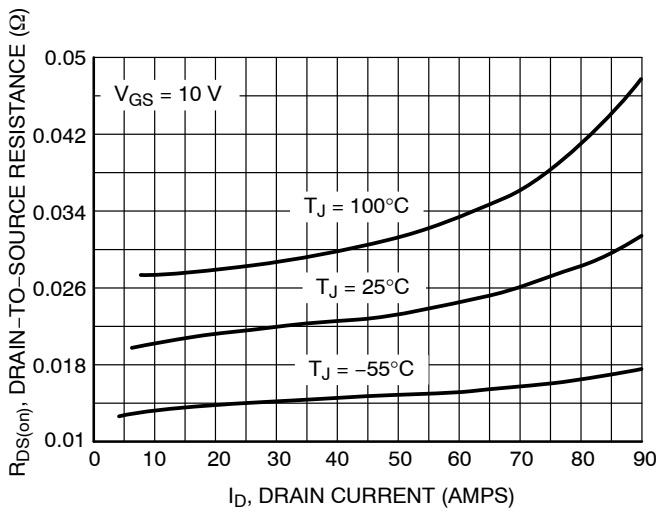


Figure 3. On-Resistance vs. Gate-to-Source Voltage

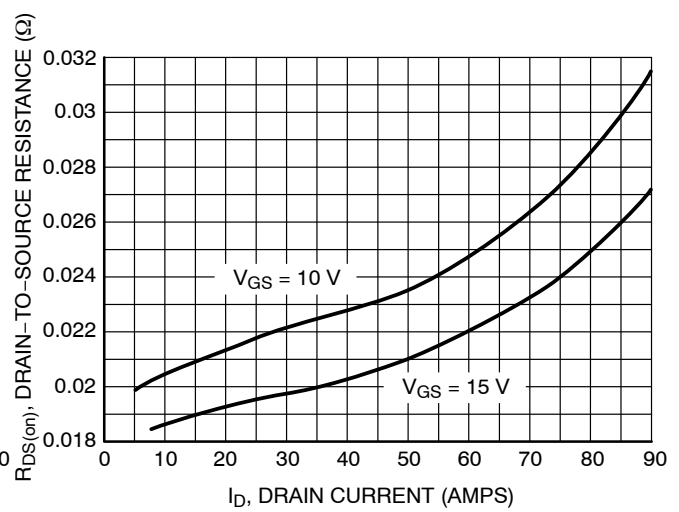


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

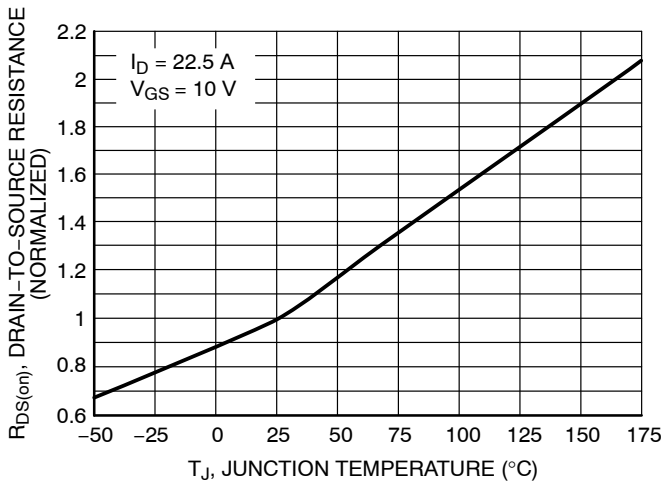


Figure 5. On-Resistance Variation with Temperature

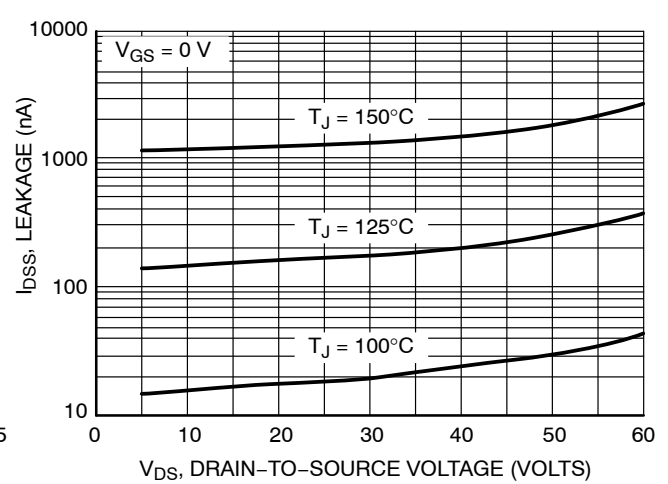


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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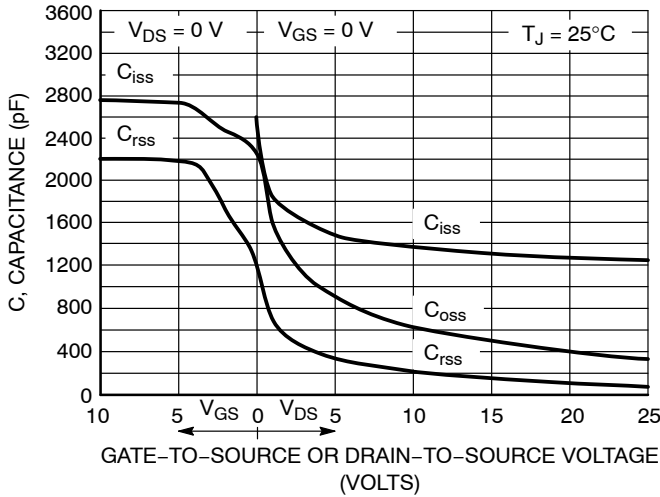


Figure 7. Capacitance Variation

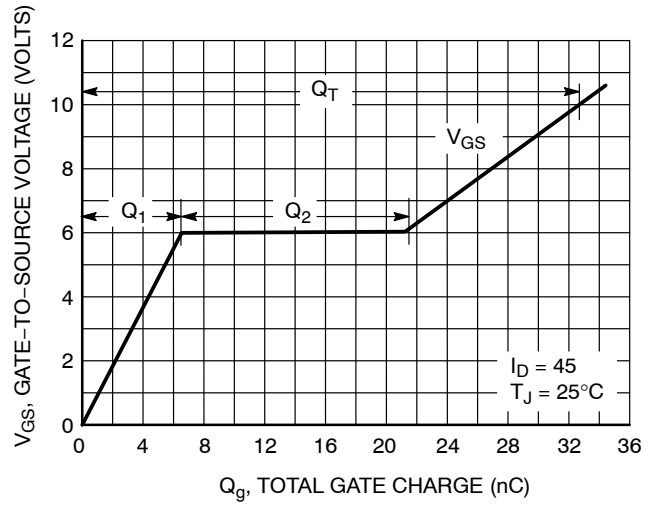


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

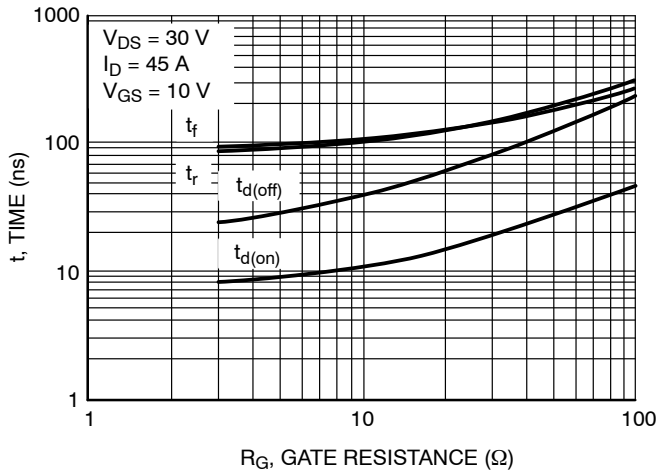


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

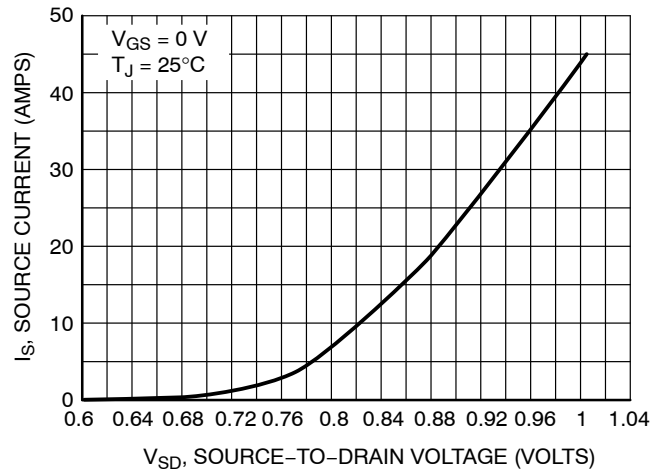


Figure 10. Diode Forward Voltage vs. Current

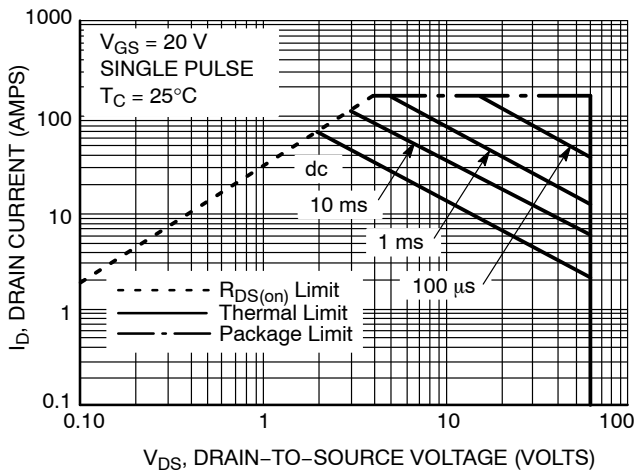


Figure 11. Maximum Rated Forward Biased Safe Operating Area

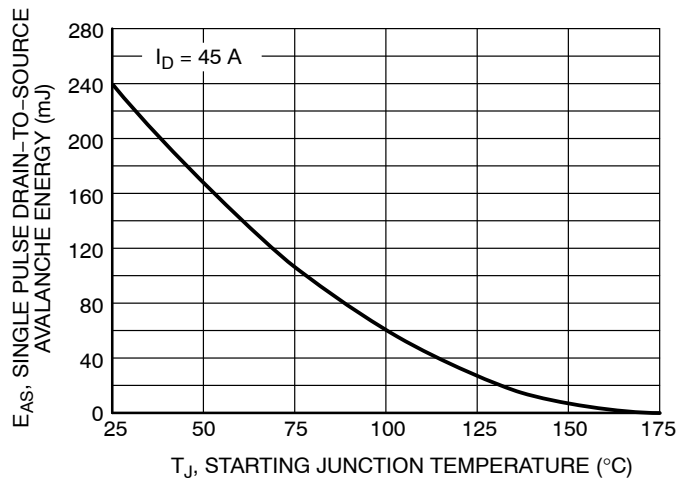


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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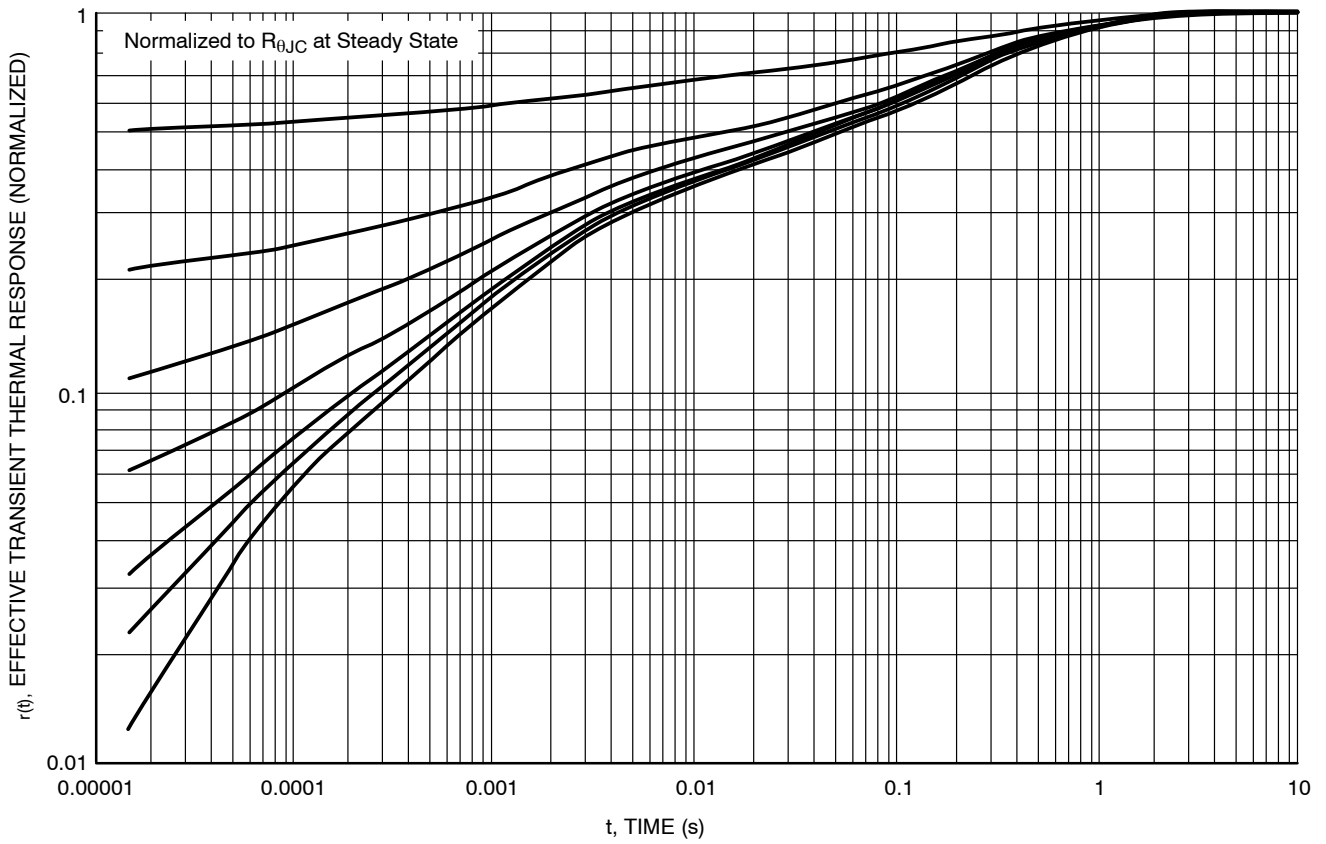


Figure 13. Thermal Response

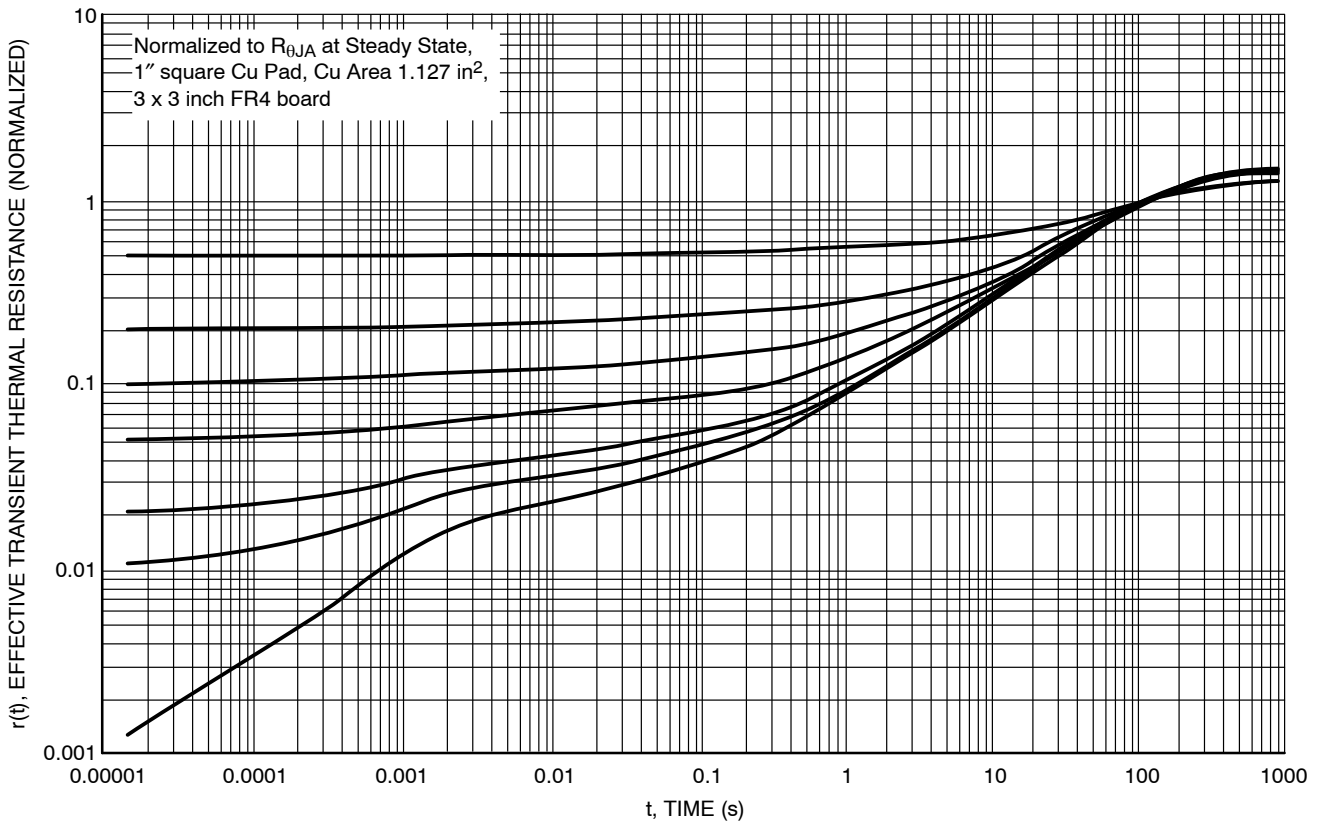
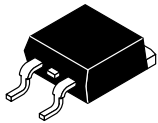


Figure 14. Thermal Response

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

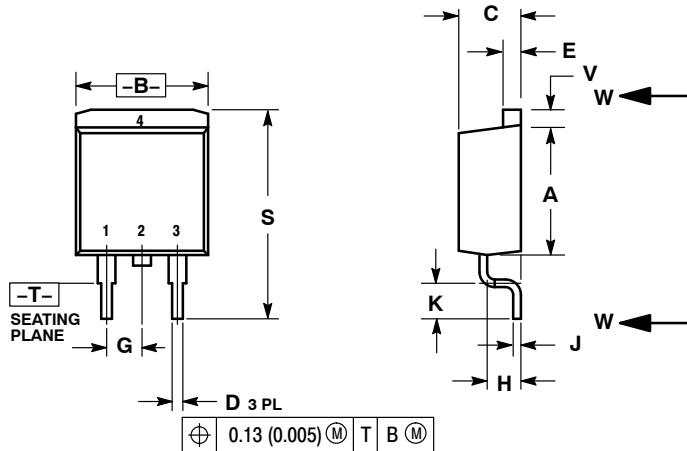
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CASE 418B-04
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

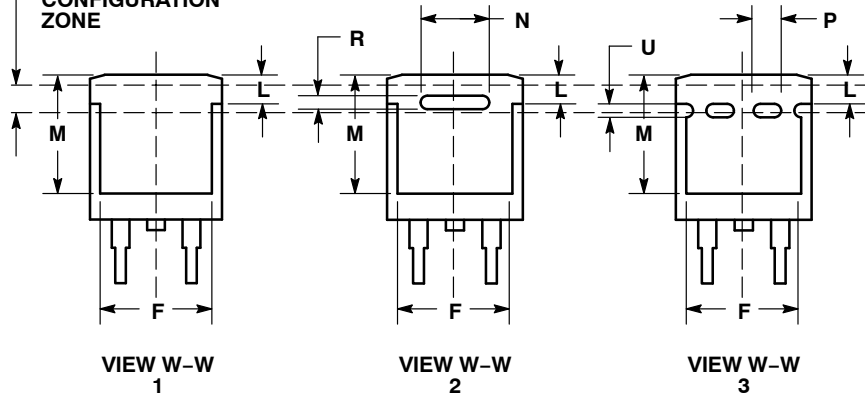


NOTES:

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 |

VARIABLE CONFIGURATION ZONE



- | | | | | | |
|--|---|---|--|---|--|
| STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR | STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN | STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE | STYLE 4: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR | STYLE 5: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. ANODE | STYLE 6: PIN 1. NO CONNECT 2. CATHODE 3. ANODE 4. CATHODE |
|--|---|---|--|---|--|

MARKING INFORMATION AND FOOTPRINT ON PAGE 2

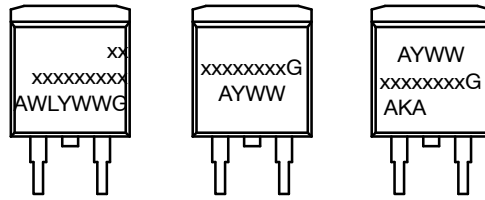
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CASE 418B-04
ISSUE L

DATE 17 FEB 2015

**GENERIC
MARKING DIAGRAM***

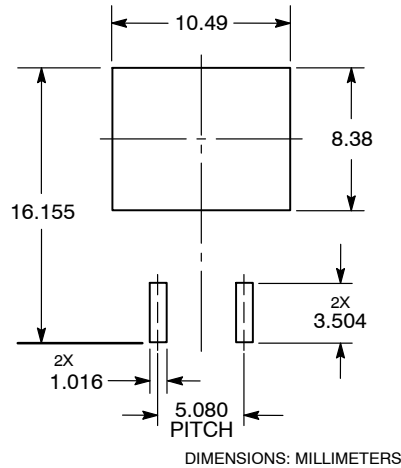


IC Standard Rectifier

- xx = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package
- AKA = Polarity Indicator

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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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