

# NTST40120CT, NTSJ40120CTG, NTSB40120CT-1G, NTSB40120CTG, NTSB40120CTT4G

## Very Low Forward Voltage Trench-based Schottky Rectifier

Exceptionally Low  $V_F = 0.43\text{ V}$  at  $I_F = 5\text{ A}$

### Features

- Fine Lithography Trench-based Schottky Technology for Very Low Forward Voltage and Low Leakage
- Fast Switching with Exceptional Temperature Stability
- Low Power Loss and Lower Operating Temperature
- Higher Efficiency for Achieving Regulatory Compliance
- Low Thermal Resistance
- High Surge Capability
- Pb-Free and Halide-Free Packages are Available

### Typical Applications

- Switching Power Supplies including Notebook/Netbook Adapters, ATX and Flat Panel Display
- High Frequency and DC-DC Converters
- Freewheeling and OR-ing Diodes
- Reverse Battery Protection
- Instrumentation

### Mechanical Characteristics

- Case: Epoxy, Molded
- Epoxy Meets Flammability Rating UL 94-0 @ 0.125 in
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Maximum for 10 sec

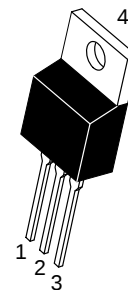
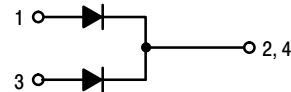


**ON Semiconductor®**

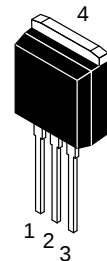
<http://onsemi.com>

**VERY LOW FORWARD  
VOLTAGE, LOW LEAKAGE  
SCHOTTKY BARRIER  
RECTIFIERS 40 AMPERES,  
120 VOLTS**

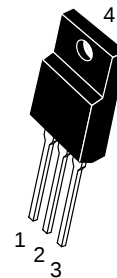
### PIN CONNECTIONS



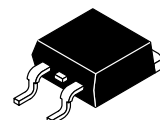
**TO-220  
CASE 221A  
STYLE 6**



**I²PAK  
CASE 418D  
STYLE 3**



**TO-220FP  
CASE 221AH**



**D²PAK  
CASE 418B**

### ORDERING INFORMATION

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

# NTST40120CT, NTSJ40120CTG, NTSB40120CT-1G, NTSB40120CTG, NTSB40120CTT4G

## MAXIMUM RATINGS

| Rating                                                                                                     | Symbol                                 | Value       | Unit             |
|------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------|------------------|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage                     | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$        | 120         | V                |
| Average Rectified Forward Current<br>(Rated $V_R$ , $T_C = 120^\circ\text{C}$ )                            | $I_{F(AV)}$<br>Per Device<br>Per Diode | 40<br>20    | A                |
| Peak Repetitive Forward Current<br>(Rated $V_R$ , Square Wave, 20 kHz, $T_C = 125^\circ\text{C}$ )         | $I_{FRM}$<br>Per Device<br>Per Diode   | 80<br>40    | A                |
| Nonrepetitive Peak Surge Current<br>(Surge applied at rated load conditions halfwave, single phase, 60 Hz) | $I_{FSM}$                              | 250         | A                |
| Operating Junction Temperature                                                                             | $T_J$                                  | -40 to +150 | $^\circ\text{C}$ |
| Storage Temperature                                                                                        | $T_{stg}$                              | -40 to +150 | $^\circ\text{C}$ |
| Voltage Rate of Change (Rated $V_R$ )                                                                      | $dv/dt$                                | 10,000      | V/ $\mu\text{s}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

| Rating                                                                          | Symbol                             | NTST40120CTG,<br>NTSB40120CT-1G | NTSB40120CTG | NTSJ40120CTG | Unit                                     |
|---------------------------------------------------------------------------------|------------------------------------|---------------------------------|--------------|--------------|------------------------------------------|
| Maximum Thermal Resistance per Diode<br>Junction-to-Case<br>Junction-to-Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 1.3<br>70                       | 0.79<br>46.3 | 4.0<br>105   | $^\circ\text{C/W}$<br>$^\circ\text{C/W}$ |

## ELECTRICAL CHARACTERISTICS (Per Leg unless otherwise noted)

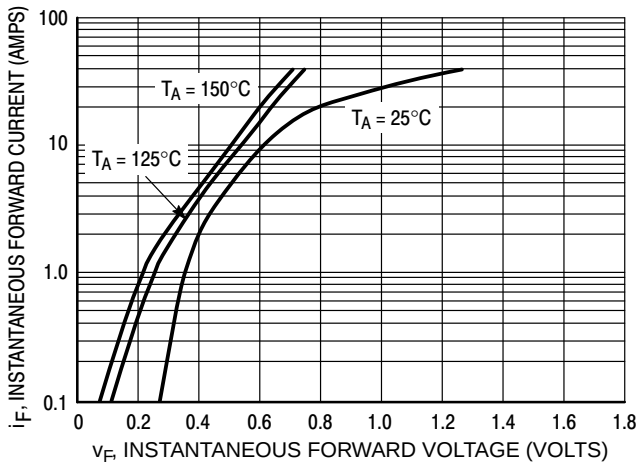
| Rating                                                                                                                                                                                                                                                                                                                                                                                  | Symbol | Typ                                              | Max                                  | Unit                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------|--------------------------------------|------------------------------------------------|
| Maximum Instantaneous Forward Voltage (Note 1)<br>( $I_F = 5\text{ A}$ , $T_J = 25^\circ\text{C}$ )<br>( $I_F = 10\text{ A}$ , $T_J = 25^\circ\text{C}$ )<br>( $I_F = 20\text{ A}$ , $T_J = 25^\circ\text{C}$ )<br><br>( $I_F = 5\text{ A}$ , $T_J = 125^\circ\text{C}$ )<br>( $I_F = 10\text{ A}$ , $T_J = 125^\circ\text{C}$ )<br>( $I_F = 20\text{ A}$ , $T_J = 125^\circ\text{C}$ ) | $V_F$  | 0.50<br>0.60<br>0.78<br><br>0.43<br>0.53<br>0.63 | –<br>–<br>0.91<br><br>–<br>–<br>0.71 | V                                              |
| Maximum Instantaneous Reverse Current (Note 1)<br>( $V_R = 90\text{ V}$ , $T_J = 25^\circ\text{C}$ )<br>( $V_R = 90\text{ V}$ , $T_J = 125^\circ\text{C}$ )<br><br>(Rated dc Voltage, $T_J = 25^\circ\text{C}$ )<br>(Rated dc Voltage, $T_J = 125^\circ\text{C}$ )                                                                                                                      | $I_R$  | 16<br>16<br><br>–<br>30                          | –<br>–<br><br>500<br>100             | $\mu\text{A}$<br>mA<br><br>$\mu\text{A}$<br>mA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

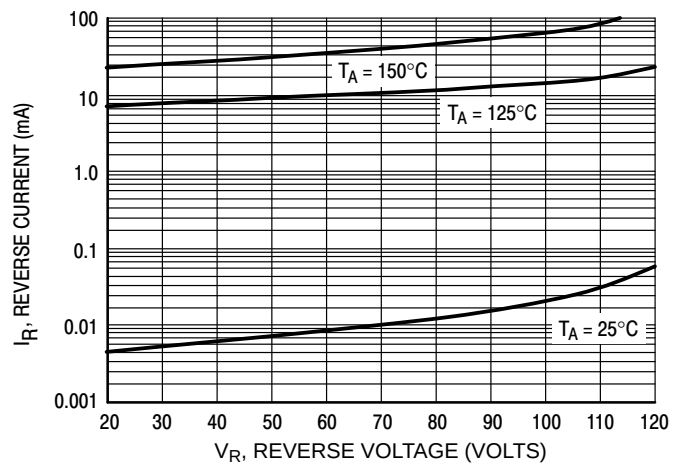
1. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

**NTST40120CT, NTSJ40120CTG, NTSB40120CT-1G, NTSB40120CTG,  
NTSB40120CTT4G**

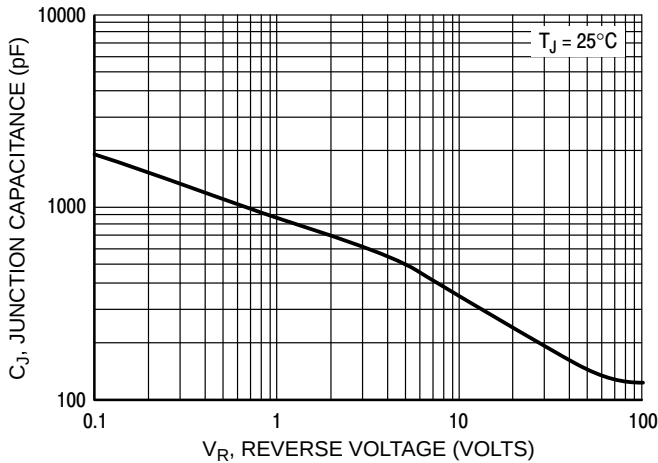
**TYPICAL CHARACTERISTICS**



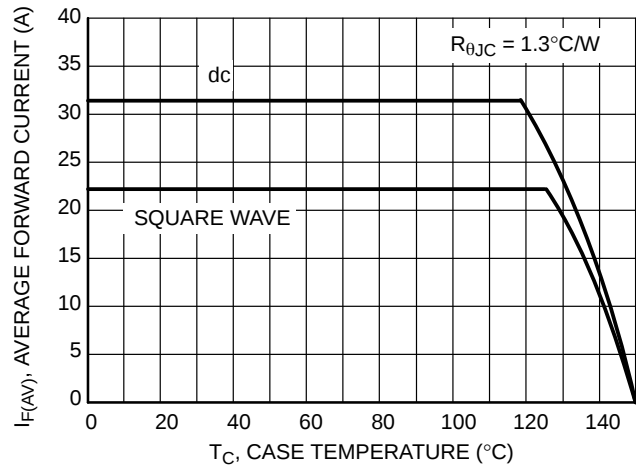
**Figure 1. Typical Forward Voltage**



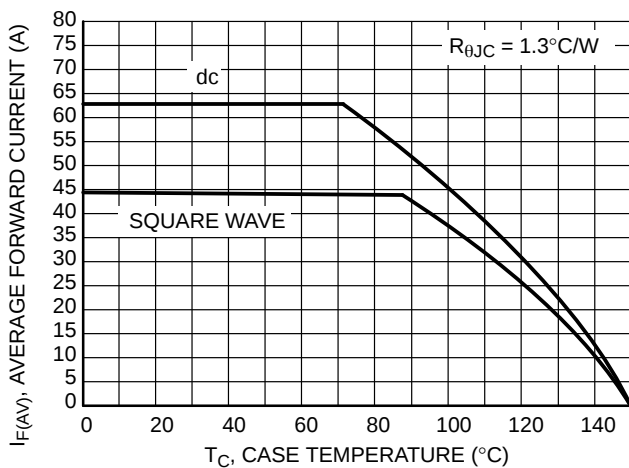
**Figure 2. Typical Reverse Current**



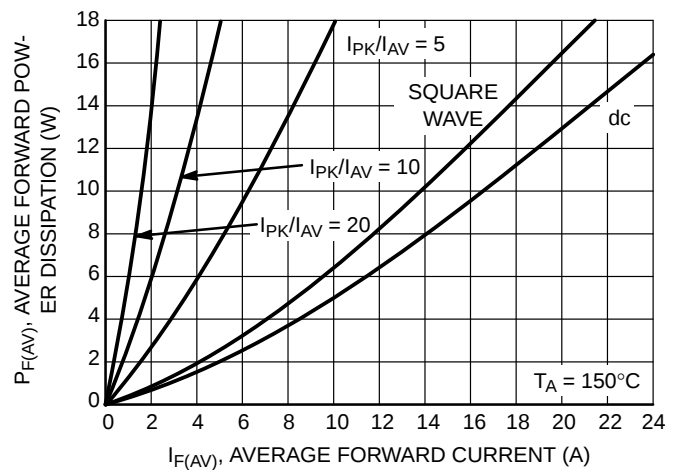
**Figure 3. Typical Junction Capacitance**



**Figure 4. Current Derating per Leg**



**Figure 5. Current Derating, Case**



**Figure 6. Forward Power Dissipation**

# NTST40120CT, NTSJ40120CTG, NTSB40120CT-1G, NTSB40120CTG, NTSB40120CTT4G

## TYPICAL CHARACTERISTICS

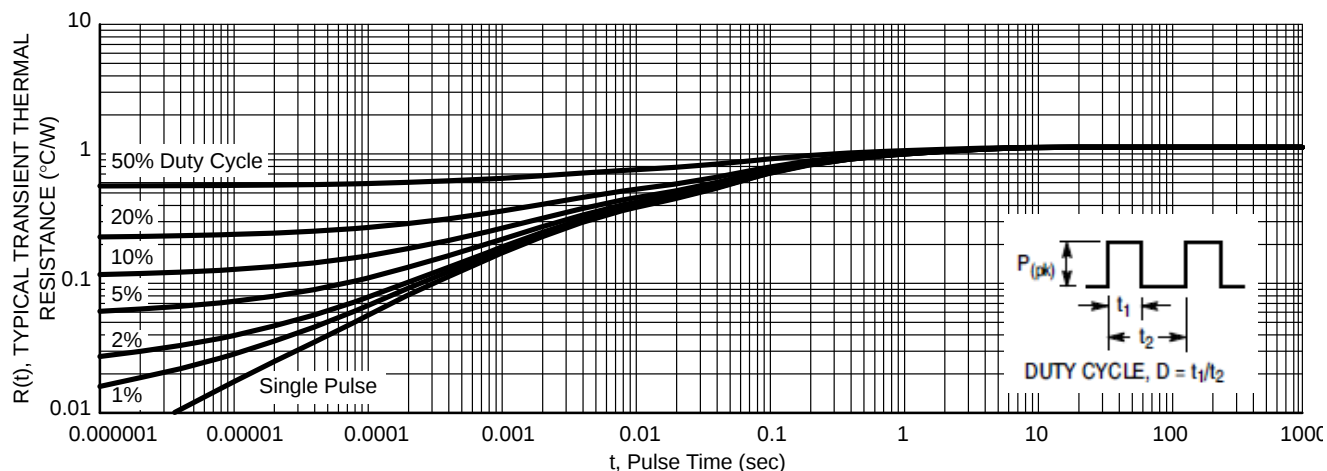


Figure 7. Typical Transient Thermal Response for NTST40120CT and NTSB40120CT-1G

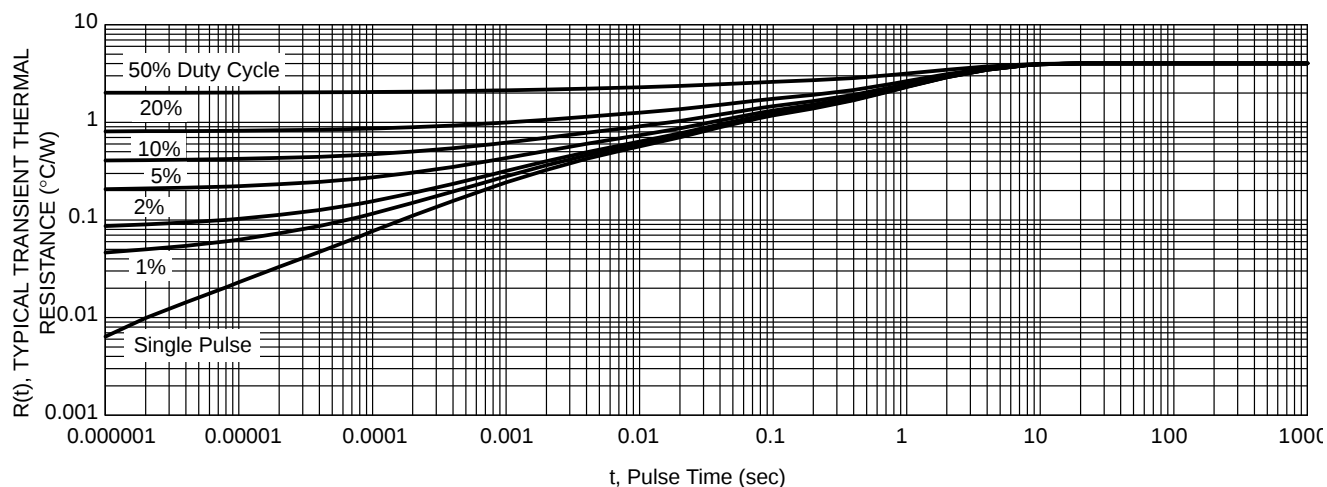


Figure 8. Typical Transient Thermal Response for NTSJ40120CTG

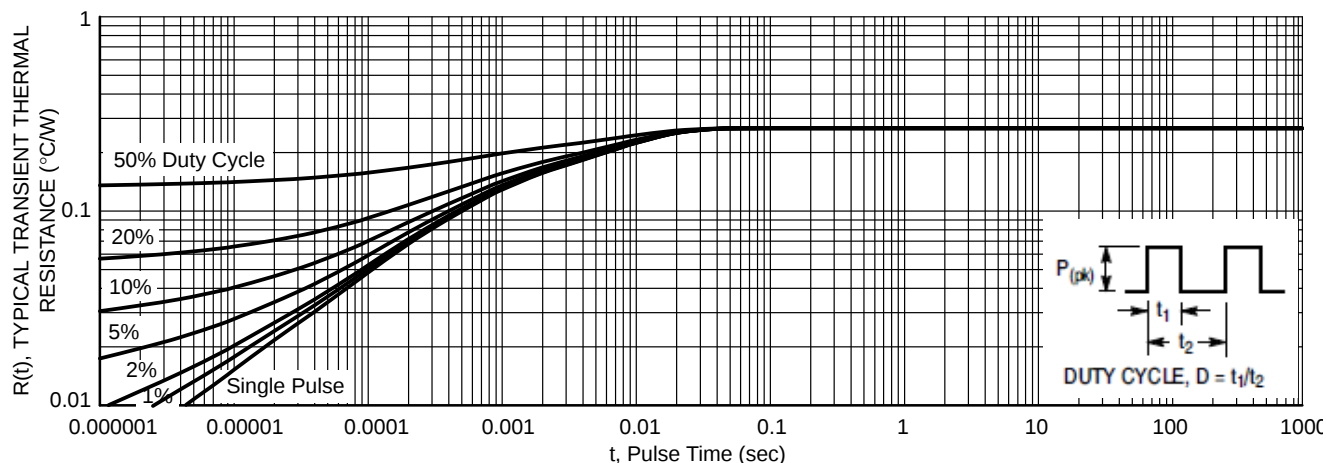


Figure 9. Typical Transient Thermal Response for NTSB40120CTG

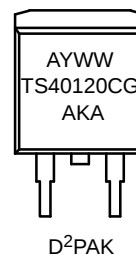
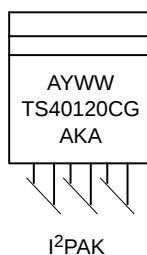
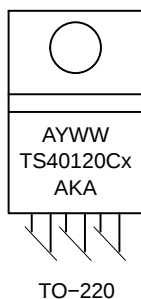
# NTST40120CT, NTSJ40120CTG, NTSB40120CT-1G, NTSB40120CTG, NTSB40120CTT4G

## ORDERING INFORMATION

| Device         | Package                               | Shipping <sup>†</sup> |
|----------------|---------------------------------------|-----------------------|
| NTST40120CTG   | TO-220<br>(Pb-Free)                   | 50 Units / Rail       |
| NTST40120CTH   | TO-220<br>(Pb-Free and Halide-Free)   | 50 Units / Rail       |
| NTSJ40120CTG   | TO-220FP<br>(Pb-Free and Halide-Free) | 50 Units / Rail       |
| NTSB40120CT-1G | I <sup>2</sup> PAK<br>(Pb-Free)       | 50 Units / Rail       |
| NTSB40120CTG   | D <sup>2</sup> PAK<br>(Pb-Free)       | 50 Units / Rail       |
| NTSB40120CTT4G | D <sup>2</sup> PAK<br>(Pb-Free)       | 800 / Tape & Reel     |

<sup>†</sup>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.

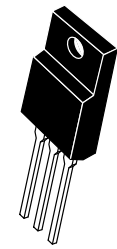
## MARKING DIAGRAMS



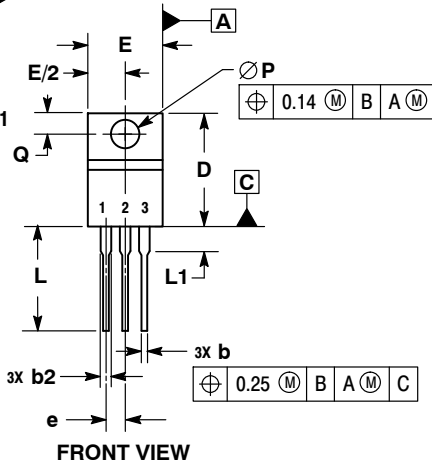
A = Assembly Location  
 Y = Year  
 WW = Work Week  
 AKA = Polarity Designator  
 x = G or H  
 G = Pb-Free Package  
 H = Halide-Free Package

TO-220 FULLPACK, 3-LEAD  
CASE 221AH  
ISSUE F

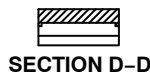
DATE 30 SEP 2014



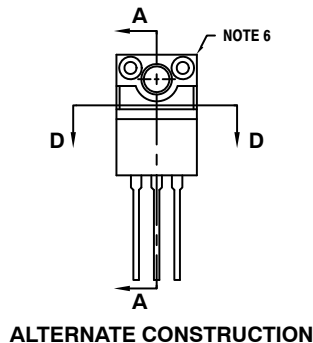
SCALE 1:1



FRONT VIEW



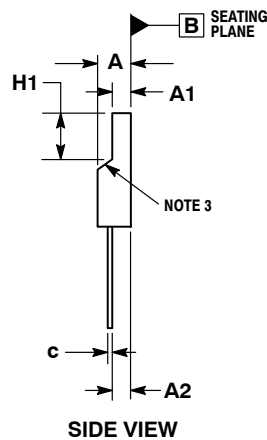
SECTION D-D



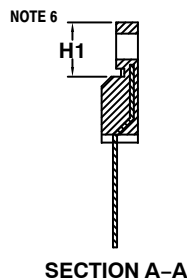
ALTERNATE CONSTRUCTION

STYLE 1:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE

STYLE 2:  
PIN 1. CATHODE  
2. ANODE  
3. GATE



SIDE VIEW



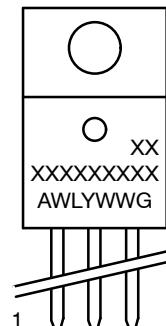
SECTION A-A

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR UNCONTROLLED IN THIS AREA.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH AND GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.00.
6. CONTOURS AND FEATURES OF THE MOLDED PACKAGE BODY MAY VARY WITHIN THE ENVELOPE DEFINED BY DIMENSIONS A1 AND H1 FOR MANUFACTURING PURPOSES.

| DIM | MIN      | MAX   |
|-----|----------|-------|
| A   | 4.30     | 4.70  |
| A1  | 2.50     | 2.90  |
| A2  | 2.50     | 2.90  |
| b   | 0.54     | 0.84  |
| b2  | 1.10     | 1.40  |
| c   | 0.49     | 0.79  |
| D   | 14.70    | 15.30 |
| E   | 9.70     | 10.30 |
| e   | 2.54 BSC |       |
| H1  | 6.60     | 7.10  |
| L   | 12.50    | 14.73 |
| L1  | ---      | 2.80  |
| P   | 3.00     | 3.40  |
| Q   | 2.80     | 3.20  |

GENERIC  
MARKING DIAGRAM\*



A = Assembly Location  
WL = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*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.

|                  |                         |                                                                                                                                                                                  |
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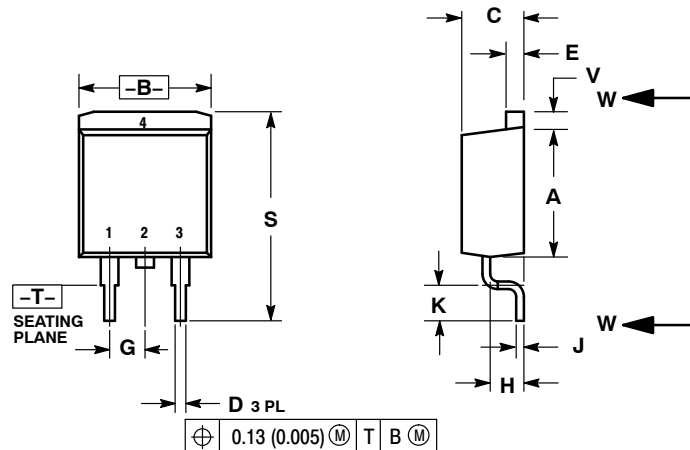
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D<sup>2</sup>PAK 3  
CASE 418B-04  
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

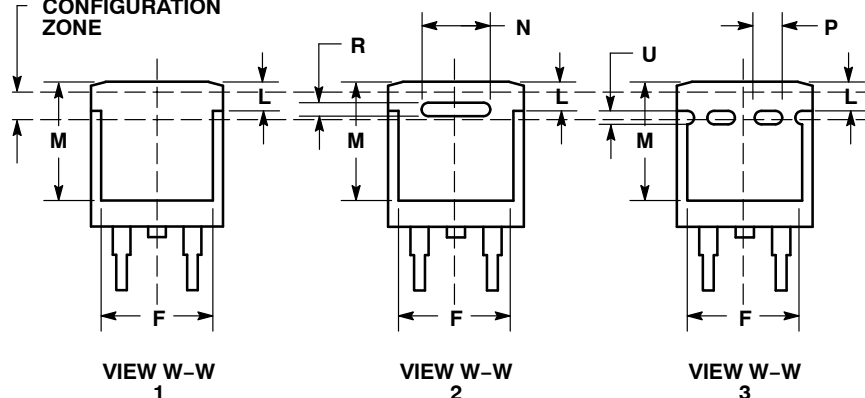


NOTES:

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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**D<sup>2</sup>PAK 3**  
CASE 418B-04  
ISSUE L

DATE 17 FEB 2015

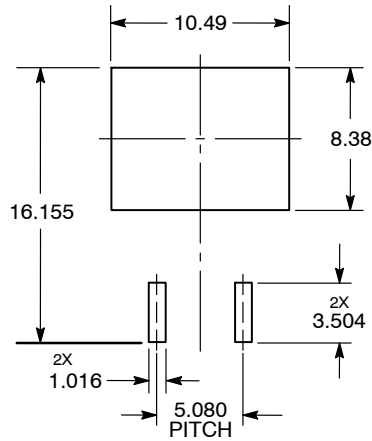
**GENERIC  
MARKING DIAGRAM\***



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. Some products may not follow the Generic Marking.

**SOLDERING FOOTPRINT\***



DIMENSIONS: MILLIMETERS

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

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