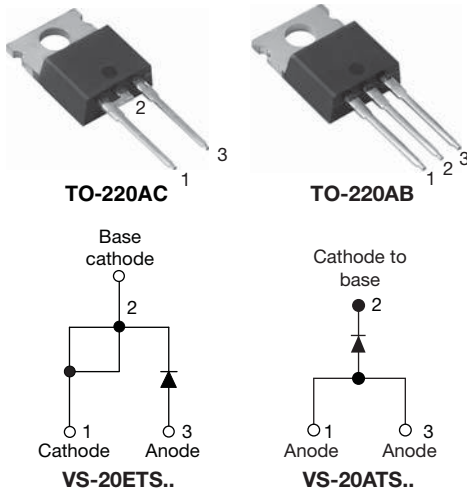




High Voltage, Input Rectifier Diode, 20 A



FEATURES

- Very low forward voltage drop
- 150 °C max. operating junction temperature
- Designed and qualified according to JEDEC-JESD47
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS COMPLIANT HALOGEN FREE

APPLICATIONS

- Input rectification
- Vishay Semiconductors switches and output rectifiers which are available in identical package outlines

DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage.

These devices are intended for use in main rectification (single or three phase bridge).

| PRODUCT SUMMARY | |
|-----------------|--------------------------|
| Package | TO-220AC, TO-220AB |
| $I_{F(AV)}$ | 20 A |
| V_R | 800 V to 1200 V |
| V_F at I_F | 1.1 V |
| I_{FSM} | 300 A |
| T_J max. | 150 °C |
| Diode variation | Single die, common anode |

| OUTPUT CURRENT IN TYPICAL APPLICATIONS | | | |
|---|---------------------|--------------------|-------|
| APPLICATIONS | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
| Capacitive input filter $T_A = 55$ °C, $T_J = 125$ °C common heatsink of 1 °C/W | 16.3 | 21 | A |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|-----------------------------------|---------------------|-------------|-------|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{F(AV)}$ | Sinusoidal waveform | 20 | A |
| V_{RRM} | | 800/1200 | V |
| I_{FSM} | | 300 | A |
| V_F | 10 A, $T_J = 25$ °C | 1.0 | V |
| T_J | | - 40 to 150 | °C |

| VOLTAGE RATINGS | | | |
|--|---|--|---------------------------|
| PART NUMBER | V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V | V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | I_{RRM} AT 150 °C mA |
| VS-20ETS08PbF, VS-20ETS08-M3 VS-20ATS08PbF, VS-20ATS08-M3 | 800 | 900 | 1 |
| VS-20ETS12PbF, VS-20ETS12-M3 VS-20ATS12PbF, VS-20ATS12-M3 | 1200 | 1300 | |



| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---------------|--|--------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum average forward current | $I_{F(AV)}$ | $T_C = 105\text{ }^\circ\text{C}$, 180° conduction half sine wave | 20 | A |
| Maximum peak one cycle non-repetitive surge current | I_{FSM} | 10 ms sine pulse, rated V_{RRM} applied | 250 | |
| | | 10 ms sine pulse, no voltage reapplied | 300 | |
| Maximum I^2t for fusing | I^2t | 10 ms sine pulse, rated V_{RRM} applied | 316 | A^2s |
| | | 10 ms sine pulse, no voltage reapplied | 442 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | $t = 0.1\text{ ms to }10\text{ ms}$, no voltage reapplied | 4420 | $A^2\sqrt{s}$ |

| ELECTRICAL SPECIFICATIONS | | | | |
|----------------------------------|-------------|--|--------|-----------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum forward voltage drop | V_{FM} | 20 A, $T_J = 25\text{ }^\circ\text{C}$ | 1.1 | V |
| Forward slope resistance | r_t | $T_J = 150\text{ }^\circ\text{C}$ | 10.4 | $m\Omega$ |
| Threshold voltage | $V_{F(TO)}$ | | 0.85 | V |
| Maximum reverse leakage current | I_{RM} | $T_J = 25\text{ }^\circ\text{C}$ | 0.1 | mA |
| | | $T_J = 150\text{ }^\circ\text{C}$ | | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | |
|--|----------------|--------------------------------------|-------------|--|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum junction and storage temperature range | T_J, T_{Stg} | | - 40 to 150 | $^\circ\text{C}$ |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation | 1.3 | $^\circ\text{C/W}$ |
| Typical thermal resistance, case to heatsink | R_{thCS} | Mounting surface, smooth and greased | 0.5 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Mounting torque | minimum | | 6 (5) | $\text{kgf} \cdot \text{cm}$ $(\text{lbf} \cdot \text{in})$ |
| | maximum | | 12 (10) | |
| Marking device | | Case style TO-220AC | 20ETS08 | |
| | | | 20ETS12 | |
| | | Case style TO-220AB | 20ATS08 | |
| | | | 20ATS12 | |

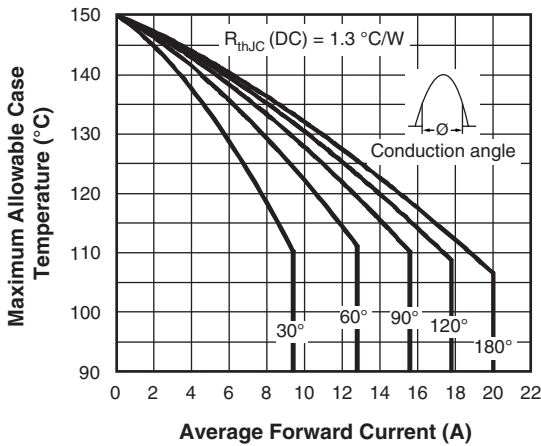


Fig. 1 - Current Rating Characteristics

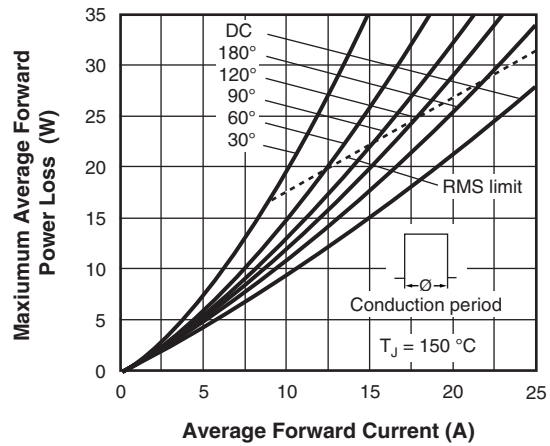


Fig. 4 - Forward Power Loss Characteristics

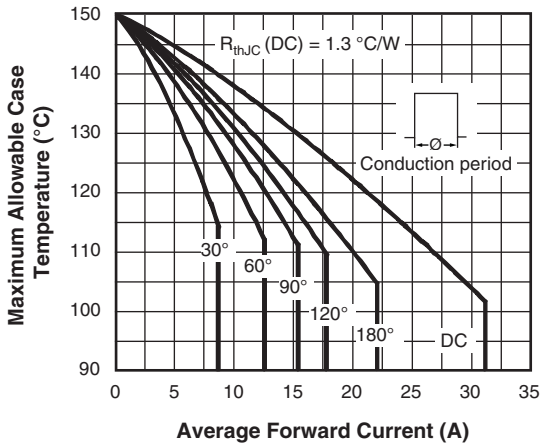


Fig. 2 - Current Rating Characteristics

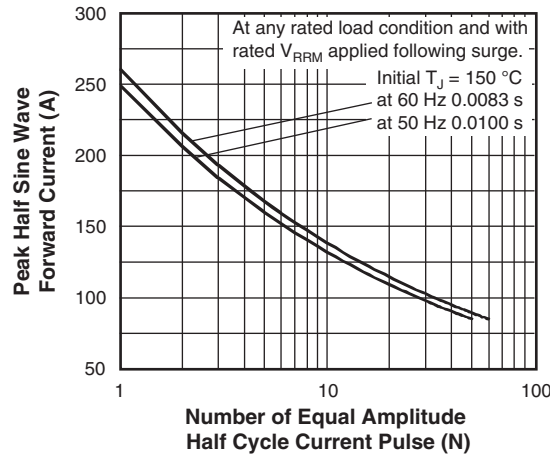


Fig. 5 - Maximum Non-Repetitive Surge Current

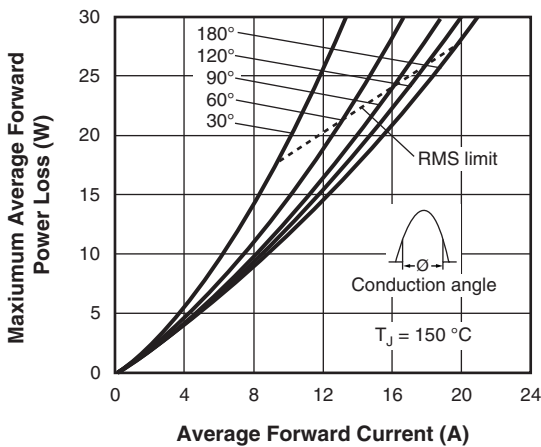


Fig. 3 - Forward Power Loss Characteristics

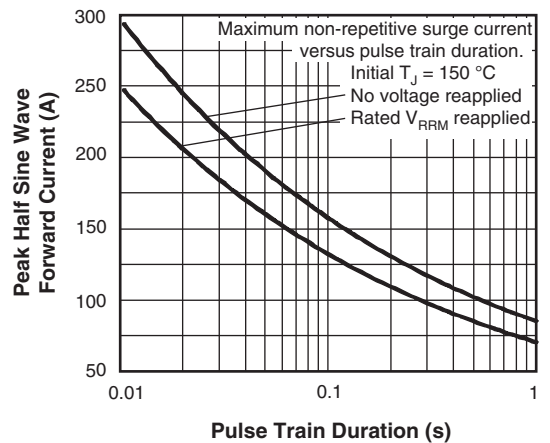


Fig. 6 - Maximum Non-Repetitive Surge Current

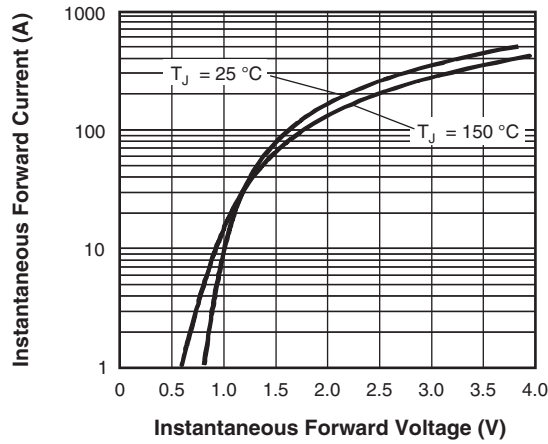


Fig. 7 - Forward Voltage Drop Characteristics

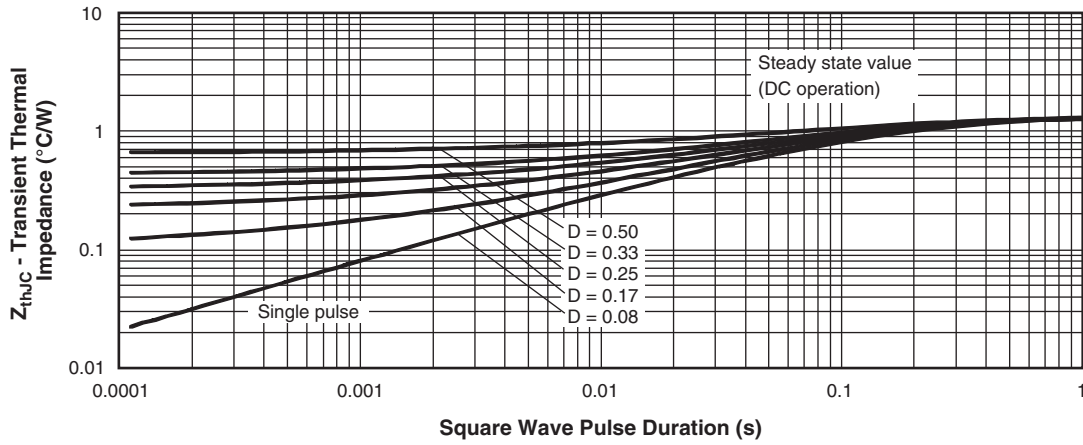
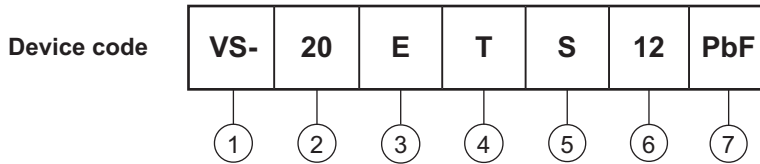


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE



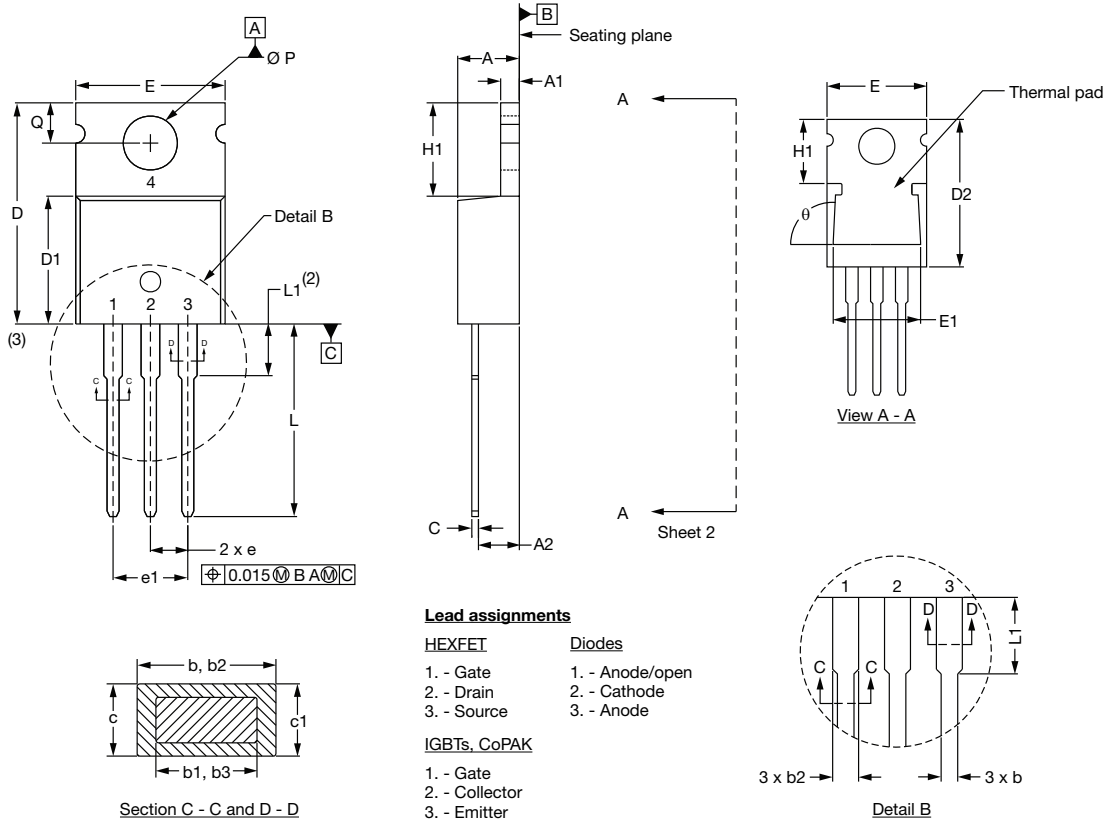
- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:
E = TO-220AC
A = TO-220AB
- 4** - Package:
T = TO-220
- 5** - Type of silicon:
S = Standard recovery rectifier
- 6** - Voltage code x 100 = V_{RRM} 08 = 800 V
12 = 1200 V
- 7** - Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|---------------------------------------|-------------------------|-------------------------------|------------------------------|
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-20ETS08PbF | 50 | 1000 | Antistatic plastic tubes |
| VS-20ETS08-M3 | 50 | 1000 | Antistatic plastic tubes |
| VS-20ATS08PbF | 50 | 1000 | Antistatic plastic tubes |
| VS-20ATS08-M3 | 50 | 1000 | Antistatic plastic tubes |
| VS-20ETS12PbF | 50 | 1000 | Antistatic plastic tubes |
| VS-20ETS12-M3 | 50 | 1000 | Antistatic plastic tubes |
| VS-20ATS12PbF | 50 | 1000 | Antistatic plastic tubes |
| VS-20ATS12-M3 | 50 | 1000 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | | |
|-----------------------------------|--------------|--|
| Dimensions | TO-220AC | www.vishay.com/doc?95221 |
| | TO-220AB | www.vishay.com/doc?95222 |
| Part marking information | TO-220AC PbF | www.vishay.com/doc?95224 |
| | TO-220AB PbF | www.vishay.com/doc?95225 |
| | TO-220AC -M3 | www.vishay.com/doc?95068 |
| | TO-220AB -M3 | www.vishay.com/doc?95028 |

TO-220AB, TO-220AC

DIMENSIONS FOR TO-220AB in millimeters and inches

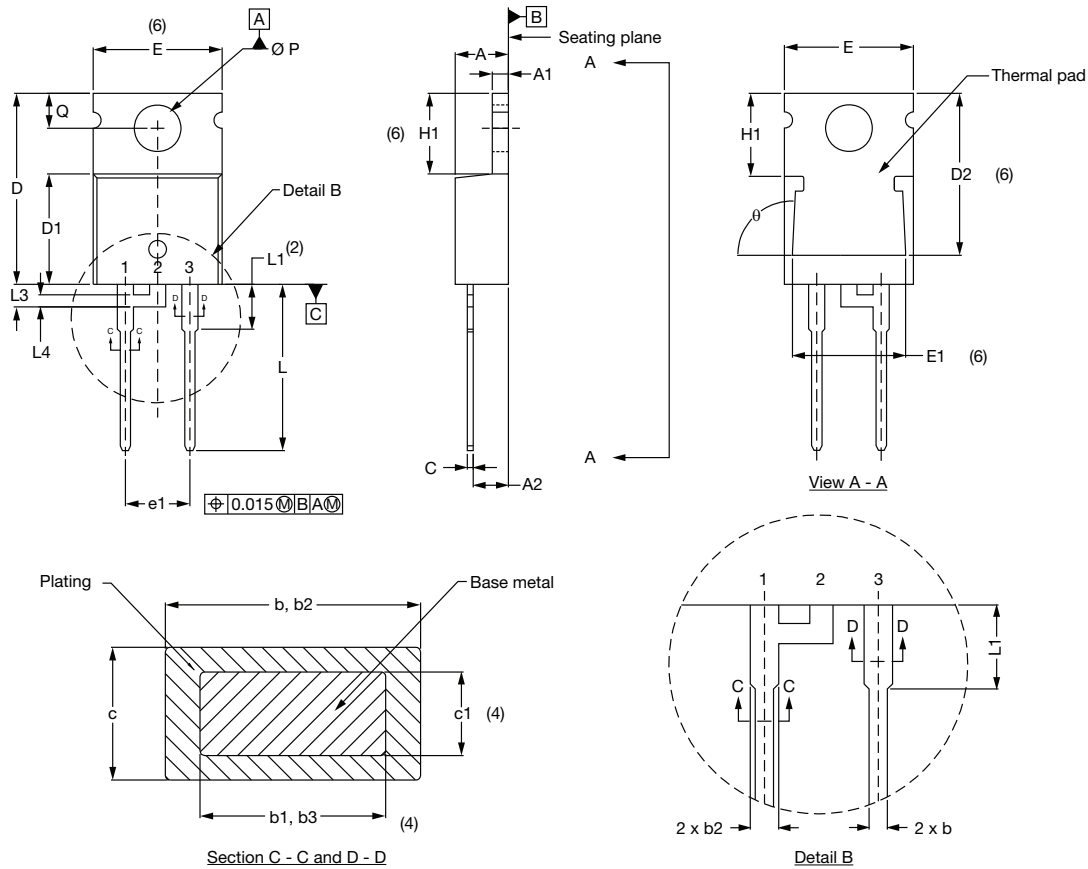


| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | |
| b1 | 0.38 | 0.96 | 0.015 | 0.038 | 4 |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | |
| b3 | 1.15 | 1.73 | 0.045 | 0.068 | |
| c | 0.36 | 0.61 | 0.014 | 0.024 | |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 |
| c2 | 0.31 | 1.14 | 0.012 | 0.045 | |
| D | 14.85 | 15.25 | 0.585 | 0.600 | 3 |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | |
| D2 | 12.19 | 12.88 | 0.480 | 0.507 | |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3 |
| E1 | 8.38 | 8.89 | 0.330 | 0.350 | |
| e | 2.41 | 2.67 | 0.095 | 0.105 | |
| e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| H1 | 6.09 | 6.48 | 0.240 | 0.255 | |
| L | 13.52 | 14.02 | 0.532 | 0.552 | |
| L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| θ | 90° to 93° | | 90° to 93° | | |

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimensions: inches

DIMENSIONS FOR TO-220AC in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | |
| b1 | 0.38 | 0.96 | 0.015 | 0.038 | 4 |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | |
| b3 | 1.15 | 1.73 | 0.045 | 0.068 | 4 |
| c | 0.36 | 0.61 | 0.014 | 0.024 | |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 |
| D | 14.85 | 15.25 | 0.585 | 0.600 | 3 |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | |
| D2 | 12.19 | 12.88 | 0.480 | 0.507 | 6 |

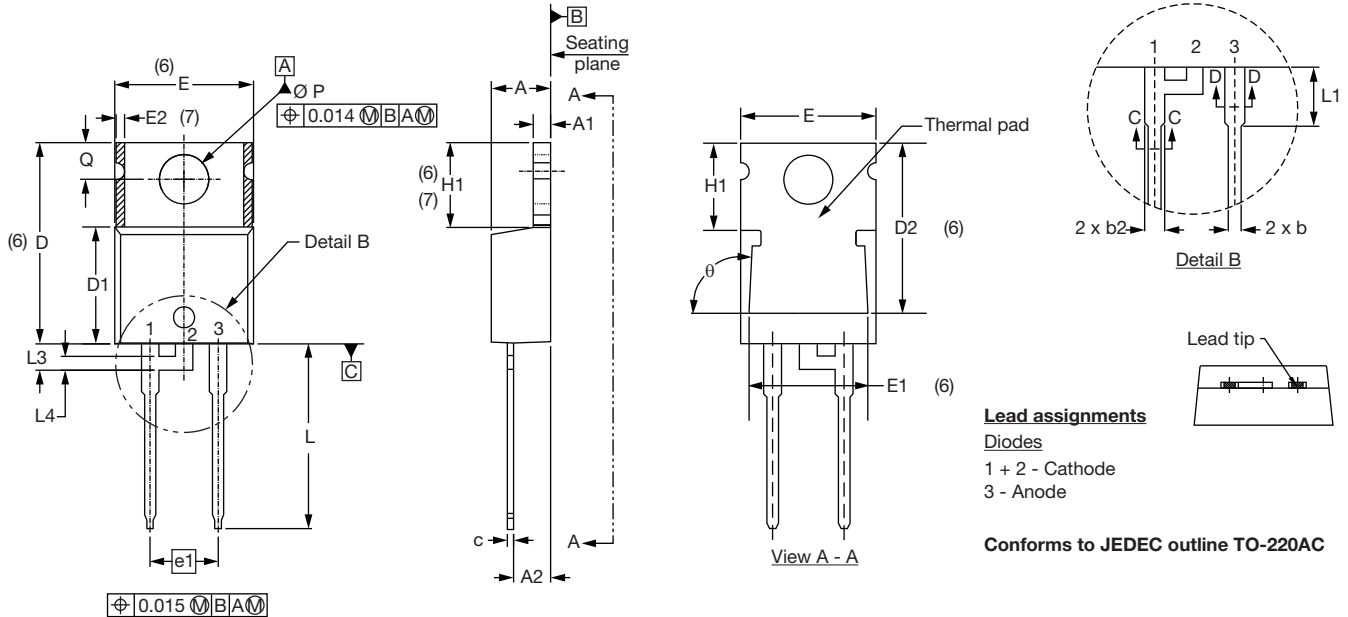
| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 |
| E1 | 8.38 | 8.89 | 0.330 | 0.350 | 6 |
| e | 2.41 | 2.67 | 0.095 | 0.105 | |
| e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6 |
| L | 13.52 | 14.02 | 0.532 | 0.552 | |
| L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| L3 | 1.78 | 2.13 | 0.070 | 0.084 | |
| L4 | 0.76 | 1.27 | 0.030 | 0.050 | |
| Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| Q | 2.60 | 3.00 | 0.102 | 0.188 | |
| θ | 90° to 93° | | 90° to 93° | | |

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Outline conforms are derived from the actual package outline

TO-220AC

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | | E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | | E2 | - | 0.76 | - | 0.030 | 7 |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | | e | 2.41 | 2.67 | 0.095 | 0.105 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | | e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| b1 | 0.38 | 0.97 | 0.015 | 0.038 | 4 | H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6, 7 |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | | L | 13.52 | 14.02 | 0.532 | 0.552 | |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 | L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| c | 0.36 | 0.61 | 0.014 | 0.024 | | L3 | 1.78 | 2.13 | 0.070 | 0.084 | |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 | L4 | 0.76 | 1.27 | 0.030 | 0.050 | 2 |
| D | 14.85 | 15.25 | 0.585 | 0.600 | 3 | Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | | Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| D2 | 11.68 | 12.88 | 0.460 | 0.507 | 6 | θ | 90° to 93° | | 90° to 93° | | |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 | | | | | | |

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline



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