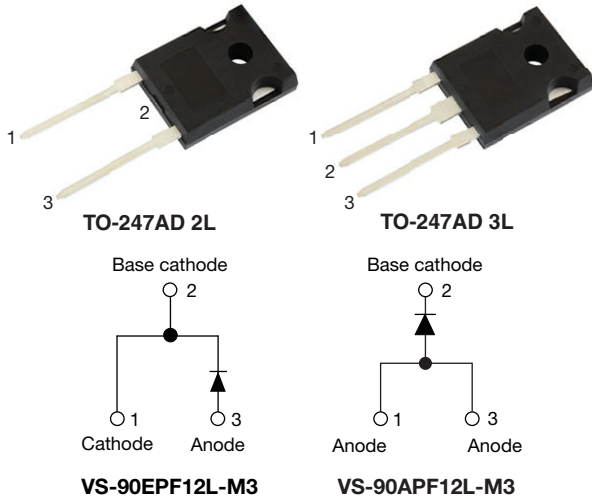


Fast Soft Recovery Rectifier Diode, 90 A



FEATURES

- Glass passivated pellet chip junction
- Low forward voltage drop and short reverse recovery time
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
 COMPLIANT
 HALOGEN
FREE

APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

DESCRIPTION

The VS-90EPF12L-M3, VS-90APF12L-M3 soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

| PRIMARY CHARACTERISTICS | |
|-------------------------|--------------------------|
| $I_{F(AV)}$ | 90 A |
| V_R | 1200 V |
| V_F at I_F | 1.38 V |
| I_{FSM} | 1000 A |
| t_{rr} | 90 ns |
| T_J max. | 150 °C |
| Package | TO-247AD 2L, TO-247AD 3L |
| Circuit configuration | Single |
| Snap factor | 0.5 |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|-----------------------------------|---------------------|-------------|-------|
| SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| V_{RRM} | | 1200 | V |
| $I_{F(AV)}$ | Sinusoidal waveform | 90 | A |
| I_{FSM} | | 100 | |
| t_{rr} | 1 A, - 100 A/μs | 90 | ns |
| V_F | 40 A, $T_J = 25$ °C | 1.2 | V |
| T_J | | -40 to +150 | °C |

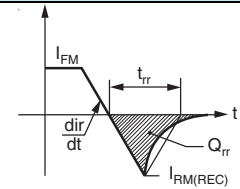
| VOLTAGE RATINGS | | | |
|-----------------|---|--|---------------------------|
| PART NUMBER | V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V | V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | I_{RRM} AT 150 °C mA |
| VS-90EPF12L-M3 | 1200 | 1300 | 17 |
| VS-90APF12L-M3 | 1200 | 1300 | 17 |



| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---------------|--|--------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum average forward current | $I_{F(AV)}$ | $T_C = 106\text{ }^\circ\text{C}$, 180° conduction half sine wave | 90 | A |
| Maximum peak one cycle non-repetitive surge current | I_{FSM} | 10 ms sine pulse, rated V_{RRM} applied | 850 | |
| | | 10 ms sine pulse, no voltage reapplied | 1000 | |
| Maximum I^2t for fusing | I^2t | 10 ms sine pulse, rated V_{RRM} applied | 3610 | A^2s |
| | | 10 ms sine pulse, no voltage reapplied | 5100 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | $t = 0.1\text{ ms to }10\text{ ms}$, no voltage reapplied | 51 000 | $A^2\sqrt{s}$ |

| ELECTRICAL SPECIFICATIONS | | | | |
|---------------------------------|-------------|--|--------|-----------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum forward voltage drop | V_{FM} | 90 A, $T_J = 25\text{ }^\circ\text{C}$ | 1.38 | V |
| Forward slope resistance | r_t | $T_J = 150\text{ }^\circ\text{C}$ | 4.03 | $m\Omega$ |
| Threshold voltage | $V_{F(TO)}$ | | 0.87 | V |
| Maximum reverse leakage current | I_{RM} | $T_J = 25\text{ }^\circ\text{C}$ | 0.1 | mA |
| | | $T_J = 150\text{ }^\circ\text{C}$ | 17 | |

| RECOVERY CHARACTERISTICS | | | | |
|--------------------------|----------|---|--------|---------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Reverse recovery time | t_{rr} | I_F at 80 A _{pk} 25 A/ μ s 25 °C | 480 | ns |
| Reverse recovery current | I_{rr} | | 7.1 | A |
| Reverse recovery charge | Q_{rr} | | 2.1 | μ C |
| Snap factor | S | | 0.5 | |



| 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 | 0.2 | $^\circ\text{C/W}$ |
| Maximum thermal resistance, junction to ambient | R_{thJA} | | 40 | |
| Typical thermal resistance, case to heatsink | R_{thCS} | Mounting surface, smooth and greased | 0.25 | |
| Approximate weight | | | 6 | g |
| | | | 0.21 | oz. |
| Mounting torque | minimum | | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | 12 (10) | |
| Marking device | | Case style TO-247AD 2L | 90EPF12L | |
| | | Case style TO-247AD 3L | 90APF12L | |

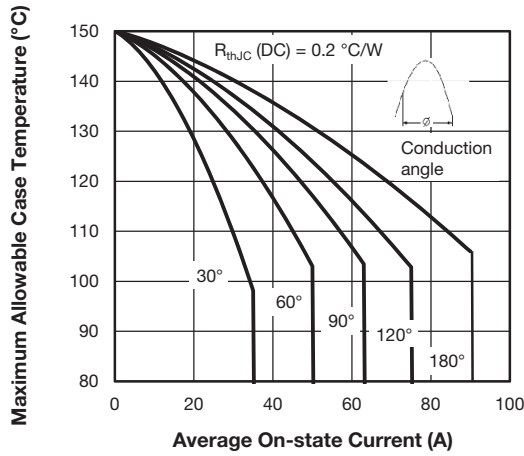


Fig. 1 - Current Rating Characteristics

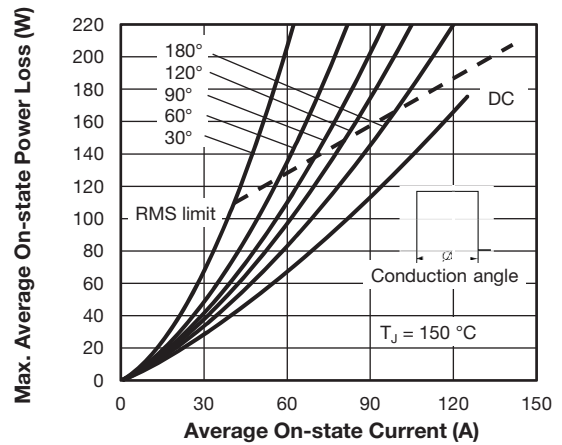


Fig. 4 - Forward Power Loss Characteristics

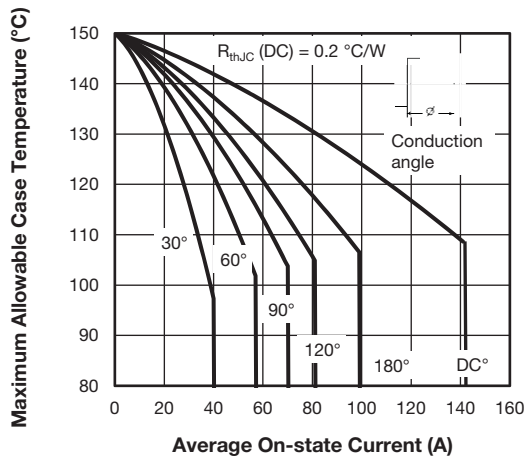


Fig. 2 - Current Rating Characteristics

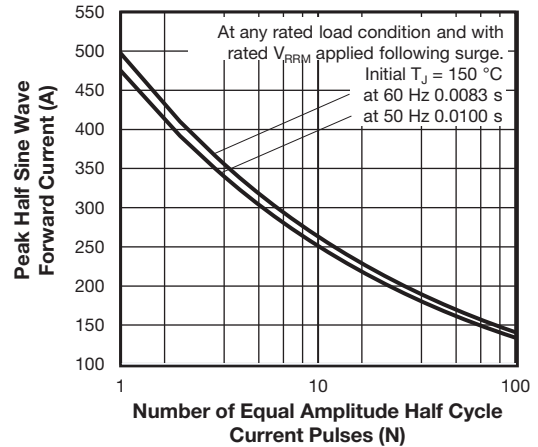


Fig. 5 - Maximum Non-Repetitive Surge Current

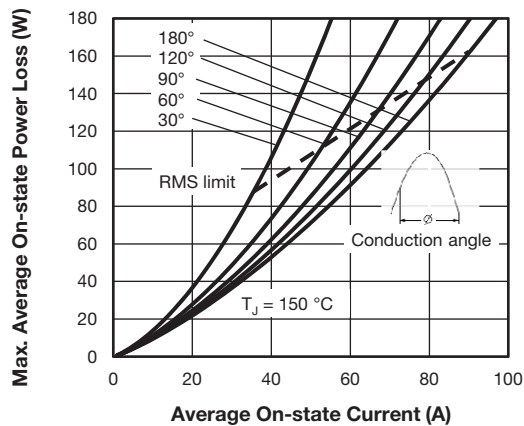


Fig. 3 - Forward Power Loss Characteristics

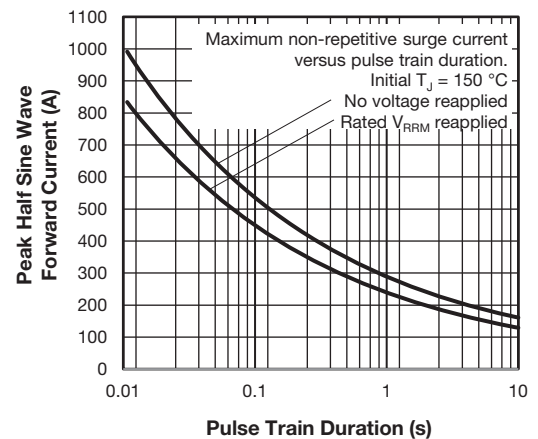


Fig. 6 - Maximum Non-Repetitive Surge Current

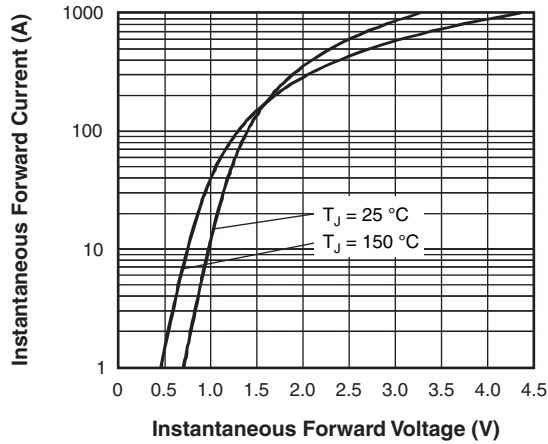


Fig. 7 - Forward Voltage Drop Characteristics

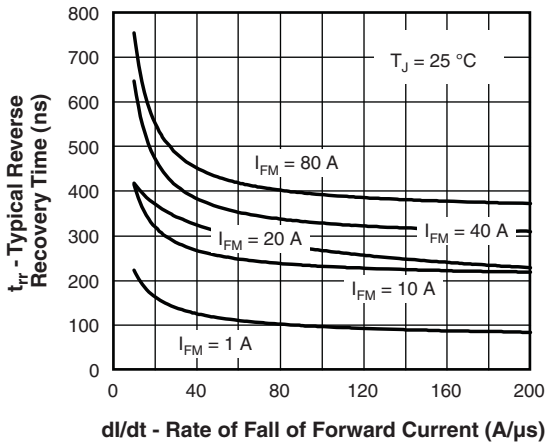


Fig. 8 - Recovery Time Characteristics, $T_J = 25\text{ }^\circ\text{C}$

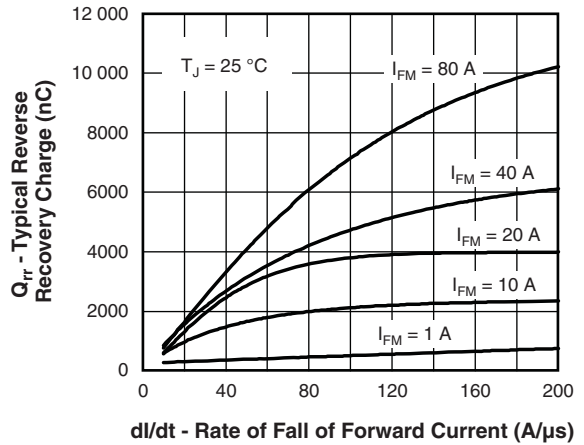


Fig. 10 - Recovery Charge Characteristics, $T_J = 25\text{ }^\circ\text{C}$

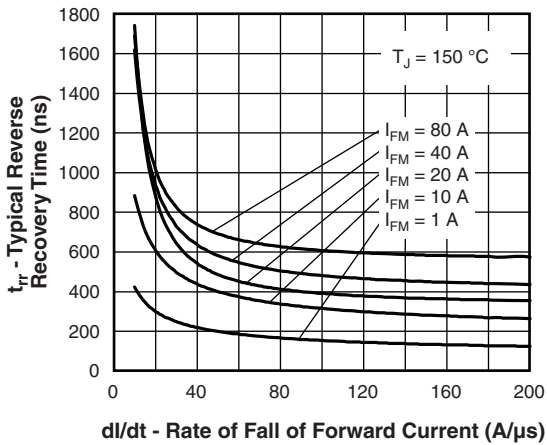


Fig. 9 - Recovery Time Characteristics, $T_J = 150\text{ }^\circ\text{C}$

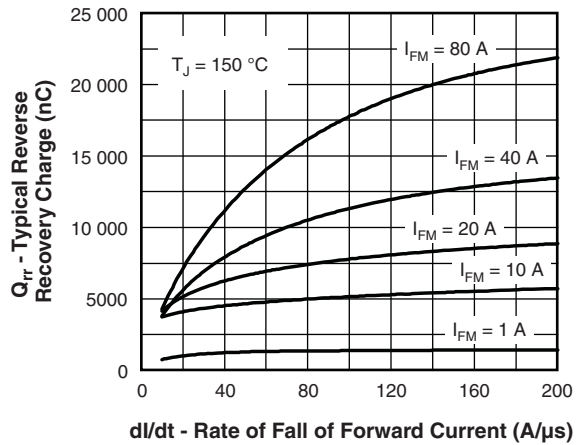


Fig. 11 - Recovery Charge Characteristics, $T_J = 150\text{ }^\circ\text{C}$

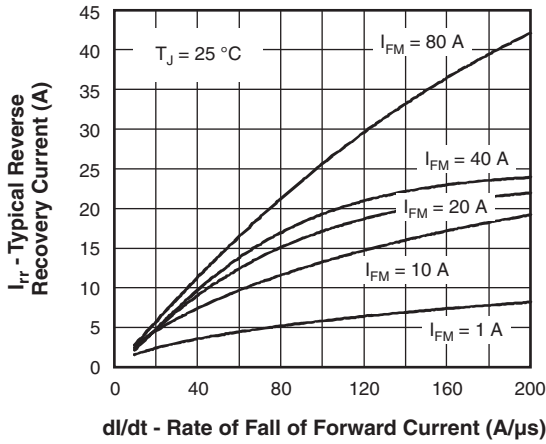


Fig. 12 - Recovery Current Characteristics, $T_J = 25\text{ }^\circ\text{C}$

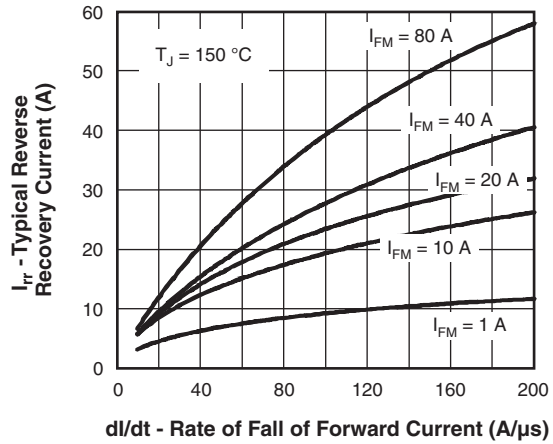


Fig. 13 - Recovery Current Characteristics, $T_J = 150\text{ }^\circ\text{C}$

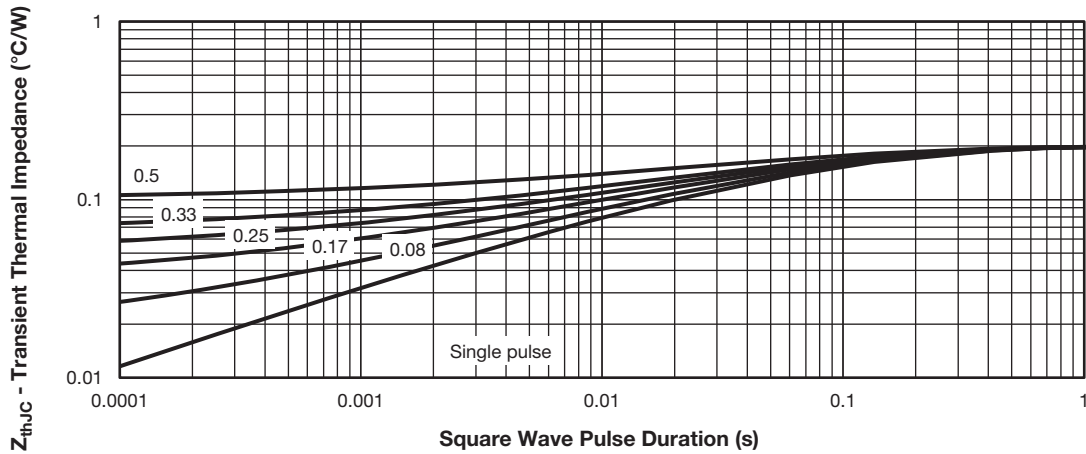
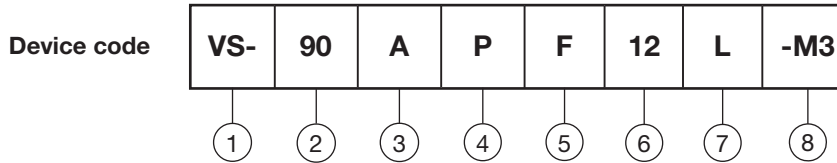


Fig. 14 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE



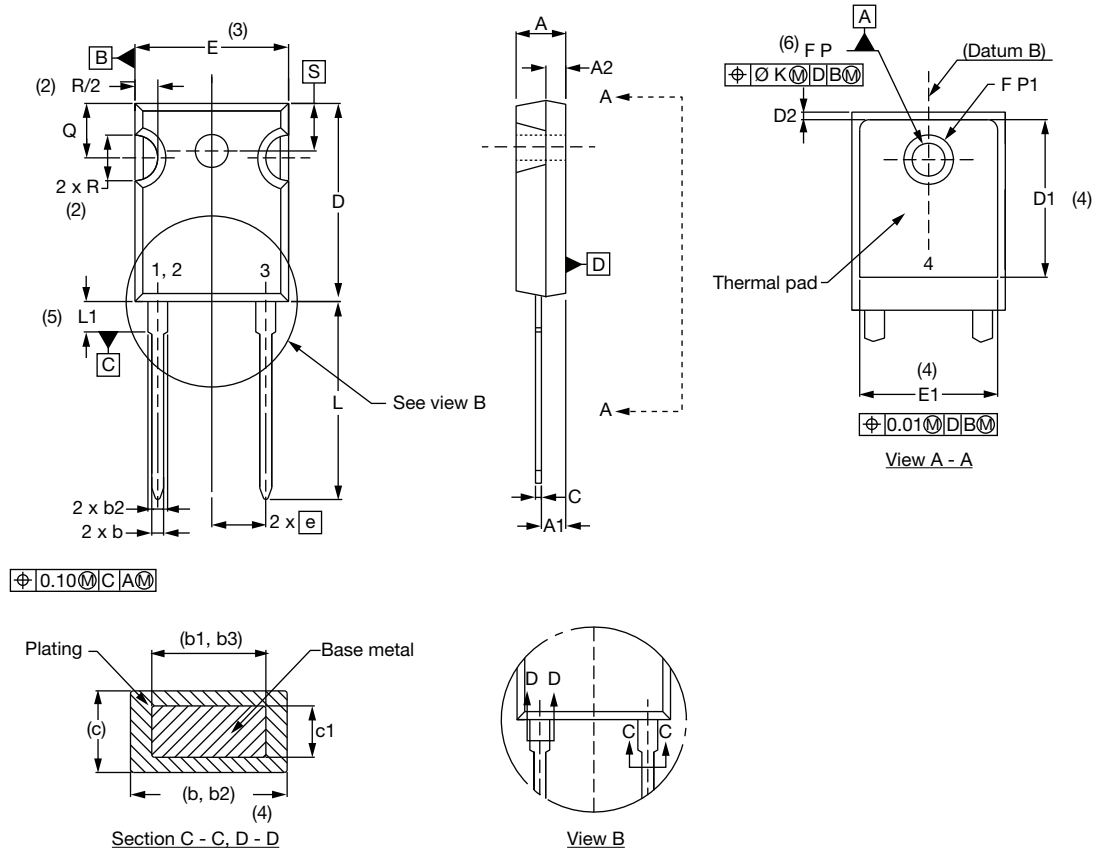
- 1** - Vishay Semiconductors product
- 2** - Current rating (90 = 90 A)
- 3** - Circuit configuration:
E = single, 2 pins
A = single, 3 pins
- 4** - Package:
P = TO-247AD
- 5** - Type of silicon:
F = fast recovery
- 6** - Voltage code x 100 = V_{RRM} 12 = 1200 V
- 7** - L = long lead
- 8** - Environmental digit:
• -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|--------------------|------------------------|--------------------------|
| PREFERRED P/N | QUANTITY PER TUBES | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-90EPF12L-M3 | 25 | 500 | Antistatic plastic tubes |
| VS-90APF12L-M3 | 25 | 500 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | | |
|----------------------------|-------------|--|
| Dimensions | TO-247AD 2L | www.vishay.com/doc?95536 |
| | TO-247AD 3L | www.vishay.com/doc?95626 |
| Part marking information | TO-247AD 2L | www.vishay.com/doc?95648 |
| | TO-247AD 3L | www.vishay.com/doc?95007 |

TO-247AD 2L

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|-----------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | MIN. | MAX. | MIN. | MAX. | |
| A | 4.65 | 5.31 | 0.183 | 0.209 | | E | 15.29 | 15.87 | 0.602 | 0.625 | 3 |
| A1 | 2.21 | 2.59 | 0.087 | 0.102 | | E1 | 13.46 | - | 0.53 | - | |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 | | e | 5.46 BSC | | 0.215 BSC | | |
| b | 0.99 | 1.40 | 0.039 | 0.055 | | Ø K | 0.254 | | 0.010 | | |
| b1 | 0.99 | 1.35 | 0.039 | 0.053 | | L | 19.81 | 20.32 | 0.780 | 0.800 | |
| b2 | 1.65 | 2.39 | 0.065 | 0.094 | | L1 | 3.71 | 4.29 | 0.146 | 0.169 | |
| b3 | 1.65 | 2.34 | 0.065 | 0.092 | | Ø P | 3.56 | 3.66 | 0.14 | 0.144 | |
| c | 0.38 | 0.89 | 0.015 | 0.035 | | Ø P1 | - | 6.98 | - | 0.275 | |
| c1 | 0.38 | 0.84 | 0.015 | 0.033 | | Q | 5.31 | 5.69 | 0.209 | 0.224 | |
| D | 19.71 | 20.70 | 0.776 | 0.815 | 3 | R | 4.52 | 5.49 | 0.178 | 0.216 | |
| D1 | 13.08 | - | 0.515 | - | 4 | S | 5.51 BSC | | 0.217 BSC | | |
| D2 | 0.51 | 1.35 | 0.020 | 0.053 | | | | | | | |

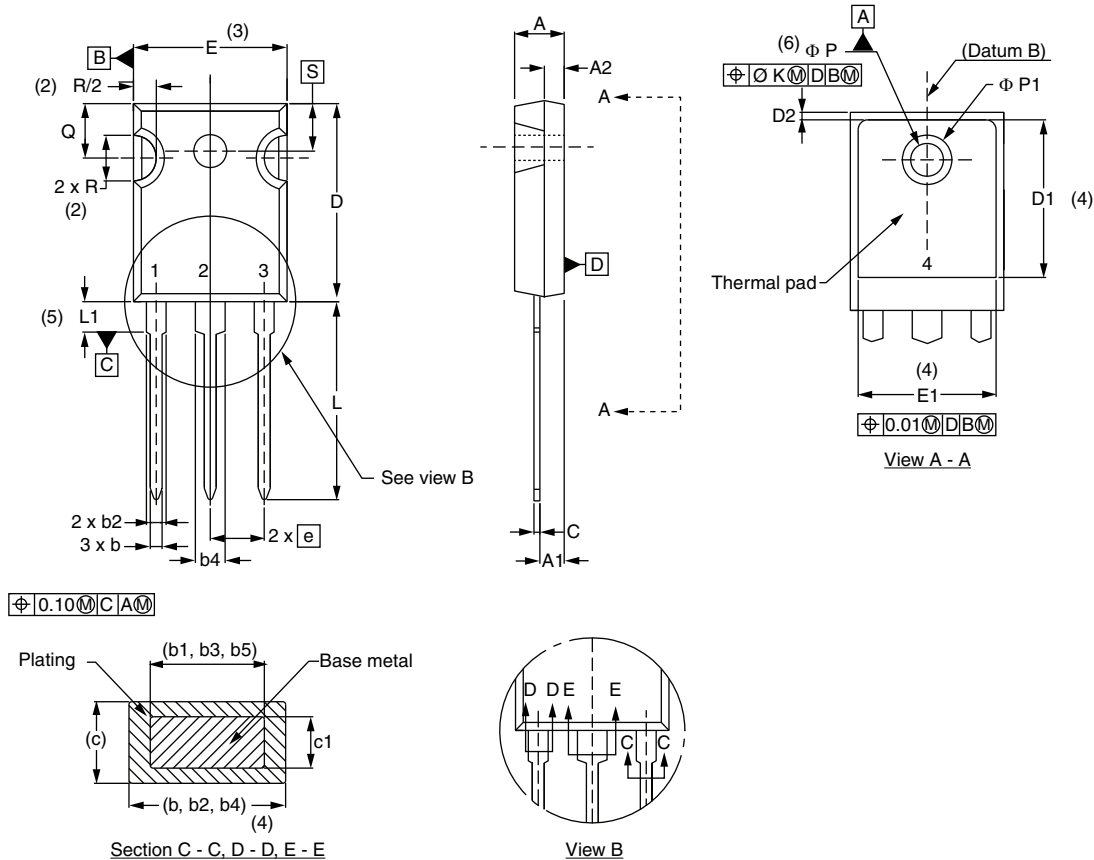
Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



TO-247AD 3L

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|-----------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | MIN. | MAX. | MIN. | MAX. | |
| A | 4.65 | 5.31 | 0.183 | 0.209 | | D2 | 0.51 | 1.30 | 0.020 | 0.051 | |
| A1 | 2.21 | 2.59 | 0.087 | 0.102 | | E | 15.29 | 15.87 | 0.602 | 0.625 | 3 |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 | | E1 | 13.46 | - | 0.53 | - | |
| b | 0.99 | 1.40 | 0.039 | 0.055 | | e | 5.46 BSC | | 0.215 BSC | | |
| b1 | 0.99 | 1.35 | 0.039 | 0.053 | | Ø K | 0.254 | | 0.010 | | |
| b2 | 1.65 | 2.39 | 0.065 | 0.094 | | L | 19.81 | 20.32 | 0.780 | 0.800 | |
| b3 | 1.65 | 2.34 | 0.065 | 0.092 | | L1 | 3.71 | 4.29 | 0.146 | 0.169 | |
| b4 | 2.59 | 3.43 | 0.102 | 0.135 | | Ø P | 3.56 | 3.66 | 0.14 | 0.144 | |
| b5 | 2.59 | 3.38 | 0.102 | 0.133 | | Ø P1 | - | 6.98 | - | 0.275 | |
| c | 0.38 | 0.89 | 0.015 | 0.035 | | Q | 5.31 | 5.69 | 0.209 | 0.224 | |
| c1 | 0.38 | 0.84 | 0.015 | 0.033 | | R | 4.52 | 5.49 | 0.178 | 0.216 | |
| D | 19.71 | 20.70 | 0.776 | 0.815 | 3 | S | 5.51 BSC | | 0.217 BSC | | |
| D1 | 13.08 | - | 0.515 | - | 4 | | | | | | |

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
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- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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