

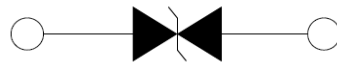
## AXIAL LEADED TRANSIENT VOLTAGE SUPPRESSION DIODES



### 15000W Axial Leaded Transient Voltage Suppressors – 17V-280V

The 15KPA Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

#### Bidirectional



#### Uni-directional



#### FEATURES:

- Axial lead type devices for through hole design.
- 15kW peak pulse capability with at 10/1000μs waveform, repetition rate (duty cycles): 0.01%.
- Excellent clamping capability.
- Repetition rate(uty cycle): 0.05%.
- Low incremental surge resistance.
- Fast response time: typically less than 1.0ps from 0 Volts to BV. Bidirectional less than 10ns.
- Glass passivated chip junction in P600 package.
- Lead-free parts meet environmental standards of MIL-STD-19500 /228.
- Suffix “-H” indicates Halogen-free part, ex. ALP15KPA17A-H.

#### APPLICATIONS:

TVS devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

#### MECHANICAL CHARACTERISTICS

- Epoxy: UL94-V0 rated flame retardant.
- Case: Molded plastic, P600.
- Lead: Axial leads, solderable per MIL-STD-202, method 208 guaranteed
- Polarity: Color band denotes cathode end.
- Mounting Position: Any.
- Approximate Weight: 2.10 grams.

## TYPICAL DEVICE CHARACTERISTICS

| MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                                                |             |             |                  |
|-------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------------|
| PARAMETER                                                                                                         | SYMBOL      | VALUE       | UNIT             |
| Operating Temperature                                                                                             | $T_J$       | -55 to +150 | $^\circ\text{C}$ |
| Storage Temperature                                                                                               | $T_{STG}$   | -55 to 150  | $^\circ\text{C}$ |
| Peak Pulse Power Dissipation by 10/1000 $\mu\text{s}$ Test Waveform (Fig.1) (Note 1)                              | $P_{PPM}$   | 15000       | W                |
| Peak Pulse current with a 10/1000 $\mu\text{s}$ Waveform                                                          | $I_{PPM}$   | See Table 1 | A                |
| Steady State Power Dissipation on Infinite Heat Sink at $T_L=75^\circ\text{C}$ lead length 0.375" (9.5mm), Fig. 5 | $P_{M(AV)}$ | 8.0         | W                |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2)                              | $I_{FSM}$   | 400         | A                |

Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above  $T_J$  (initial) =  $25^\circ\text{C}$  per Fig. 2.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

**TYPICAL DEVICE CHARACTERISTICS - (TABLE 1)**

| ELECTRICAL CHARACTERISTICS PER LINE @ T <sub>A</sub> =25°C Unless Otherwise Specified |                                                          |                                                                   |       |                                           |                                                                 |                     |                                                                       |       |
|---------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------|-------|-------------------------------------------|-----------------------------------------------------------------|---------------------|-----------------------------------------------------------------------|-------|
| PART<br>NUMBER<br>(Note 1)                                                            | RATED STAND-<br>OFF VOLTAGE<br>V <sub>RWM</sub><br>VOLTS | BREAKDOWN<br>VOLTAGE V <sub>BR</sub><br>@ I <sub>T</sub><br>VOLTS |       | TEST<br>CURRENT<br>@ I <sub>T</sub><br>mA | MAXIMUM CLAMPING<br>VOLTAGE<br>V <sub>C</sub> @ I <sub>PP</sub> |                     | MAXIMUM<br>REVERSE LEAKAGE<br>I <sub>R</sub> @ V <sub>R</sub><br>(μA) |       |
|                                                                                       |                                                          | MIN                                                               | MAX   |                                           | VOLTS                                                           | I <sub>PP</sub> (A) | UNI                                                                   | BI    |
| ALP15KPA17A / CA                                                                      | 17.0                                                     | 18.99                                                             | 20.79 | 50                                        | 29.3                                                            | 515.4               | 5000                                                                  | 10000 |
| ALP15KPA18A / CA                                                                      | 18.0                                                     | 20.11                                                             | 22.01 | 50                                        | 30.9                                                            | 488.7               | 5000                                                                  | 10000 |
| ALP15KPA20A / CA                                                                      | 20.0                                                     | 22.34                                                             | 24.46 | 20                                        | 34.3                                                            | 440.2               | 1500                                                                  | 3000  |
| ALP15KPA22A / CA                                                                      | 22.0                                                     | 24.57                                                             | 26.91 | 10                                        | 37.1                                                            | 407.0               | 500                                                                   | 1000  |
| ALP15KPA24A / CA                                                                      | 24.0                                                     | 26.81                                                             | 29.35 | 5                                         | 40.7                                                            | 371.0               | 150                                                                   | 300   |
| ALP15KPA26A / CA                                                                      | 26.0                                                     | 29.04                                                             | 31.80 | 5                                         | 44.0                                                            | 343.2               | 50                                                                    | 100   |
| ALP15KPA28A / CA                                                                      | 28.0                                                     | 31.28                                                             | 34.24 | 5                                         | 47.5                                                            | 317.9               | 25                                                                    | 50    |
| ALP15KPA30A / CA                                                                      | 30.0                                                     | 33.51                                                             | 36.7  | 5                                         | 50.7                                                            | 297.8               | 15                                                                    | 30    |
| ALP15KPA33A / CA                                                                      | 33.0                                                     | 36.9                                                              | 40.4  | 5                                         | 54.7                                                            | 276.1               | 2                                                                     | 2     |
| ALP15KPA36A / CA                                                                      | 36.0                                                     | 40.2                                                              | 44.0  | 5                                         | 59.8                                                            | 252.5               | 2                                                                     | 2     |
| ALP15KPA40A / CA                                                                      | 40.0                                                     | 44.7                                                              | 48.9  | 5                                         | 65.8                                                            | 229.5               | 2                                                                     | 2     |
| ALP15KPA43A / CA                                                                      | 43.0                                                     | 48.0                                                              | 52.6  | 5                                         | 69.8                                                            | 216.3               | 2                                                                     | 2     |
| ALP15KPA45A / CA                                                                      | 45.0                                                     | 50.3                                                              | 55    | 5                                         | 72.8                                                            | 207.4               | 2                                                                     | 2     |
| ALP15KPA48A / CA                                                                      | 48.0                                                     | 53.6                                                              | 58.7  | 5                                         | 77.7                                                            | 194.3               | 2                                                                     | 2     |
| ALP15KPA51A / CA                                                                      | 51.0                                                     | 57.0                                                              | 62.4  | 5                                         | 82.9                                                            | 182.1               | 2                                                                     | 2     |
| ALP15KPA54A / CA                                                                      | 54.0                                                     | 60.3                                                              | 66.0  | 5                                         | 87.7                                                            | 172.2               | 2                                                                     | 2     |
| ALP15KPA58A / CA                                                                      | 58.0                                                     | 64.8                                                              | 70.9  | 5                                         | 93.8                                                            | 161.0               | 2                                                                     | 2     |
| ALP15KPA60A / CA                                                                      | 60.0                                                     | 67.0                                                              | 73.4  | 5                                         | 97.4                                                            | 155.0               | 2                                                                     | 2     |
| ALP15KPA64A / CA                                                                      | 64.0                                                     | 71.5                                                              | 78.3  | 5                                         | 104.2                                                           | 144.9               | 2                                                                     | 2     |
| ALP15KPA70A / CA                                                                      | 70.0                                                     | 78.2                                                              | 85.6  | 5                                         | 113.6                                                           | 132.9               | 2                                                                     | 2     |
| ALP15KPA75A / CA                                                                      | 75.0                                                     | 83.8                                                              | 91.7  | 5                                         | 122                                                             | 123.8               | 2                                                                     | 2     |
| ALP15KPA78A / CA                                                                      | 78.0                                                     | 87.1                                                              | 95.4  | 5                                         | 126.1                                                           | 119.7               | 2                                                                     | 2     |
| ALP15KPA85A / CA                                                                      | 85.0                                                     | 94.9                                                              | 104.0 | 5                                         | 137.6                                                           | 109.7               | 2                                                                     | 2     |
| ALP15KPA90A / CA                                                                      | 90.0                                                     | 100.5                                                             | 110.1 | 5                                         | 145.6                                                           | 103.7               | 2                                                                     | 2     |
| ALP15KPA100A / CA                                                                     | 100.0                                                    | 111.7                                                             | 122.3 | 5                                         | 161.3                                                           | 93.6                | 2                                                                     | 2     |
| ALP15KPA110A / CA                                                                     | 110.0                                                    | 122.9                                                             | 134.5 | 5                                         | 178.6                                                           | 84.5                | 2                                                                     | 2     |
| ALP15KPA120A / CA                                                                     | 120.0                                                    | 134.0                                                             | 146.8 | 5                                         | 192.3                                                           | 78.5                | 2                                                                     | 2     |
| ALP15KPA130A / CA                                                                     | 130.0                                                    | 145.2                                                             | 159.0 | 5                                         | 208.3                                                           | 72.5                | 2                                                                     | 2     |
| ALP15KPA150A / CA                                                                     | 150.0                                                    | 167.6                                                             | 183.5 | 5                                         | 241.9                                                           | 62.4                | 2                                                                     | 2     |

|                   |       |       |       |   |       |      |   |   |
|-------------------|-------|-------|-------|---|-------|------|---|---|
| ALP15KPA160A / CA | 160.0 | 178.7 | 195.7 | 5 | 258.6 | 58.4 | 2 | 2 |
| ALP15KPA170A / CA | 170.0 | 189.9 | 207.9 | 5 | 272.7 | 55.4 | 2 | 2 |
| ALP15KPA180A / CA | 180.0 | 201.1 | 220.1 | 5 | 288.5 | 52.3 | 2 | 2 |
| ALP15KPA200A / CA | 200.0 | 223.4 | 244.6 | 5 | 319.1 | 47.3 | 2 | 2 |
| ALP15KPA220A / CA | 220.0 | 245.7 | 269.1 | 5 | 356   | 42.4 | 2 | 2 |
| ALP15KPA240A / CA | 240.0 | 268.1 | 293.5 | 5 | 384.6 | 39.3 | 2 | 2 |
| ALP15KPA260A / CA | 260.0 | 290.4 | 318.0 | 5 | 416.7 | 36.2 | 2 | 2 |
| ALP15KPA280A / CA | 280.0 | 312.8 | 342.4 | 5 | 454.5 | 33.2 | 2 | 2 |

**NOTE**

1.  $V_{BR}$  measured after  $I_T$  applied for 300 $\mu$ s,  $I_T$ =square wave pulse or equivalent
2. Surge current waveform per Fig. 3 and derated per Fig. 2
3. Part numbers with "CA" suffix are bidirectional devices, i.e., ALP15KPA17CA
4. For bidirectional type having  $V_{RWM}$  of 30 volts and less, the  $I_R$  limit is double.
5. All term and symbols are consistent with ANS/IEEE C62.35

TYPICAL DEVICE CHARACTERISTICS

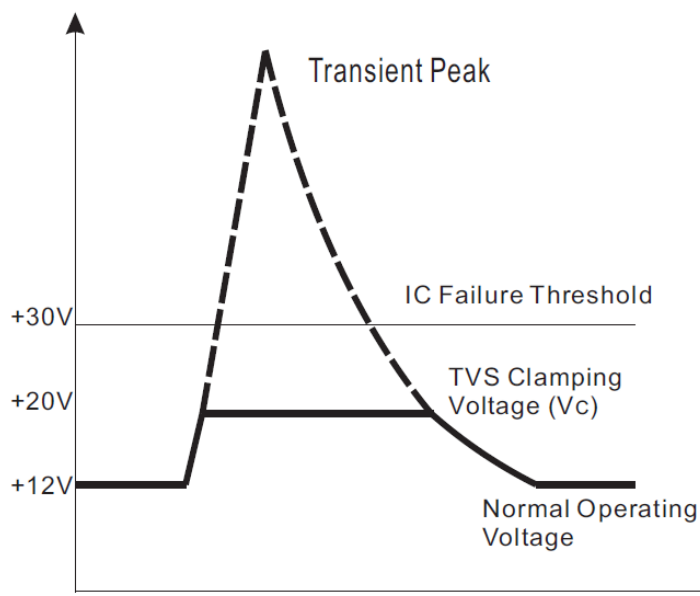


Fig. A – Transients of several thousand volts can be clamped to a safe level by the TVS

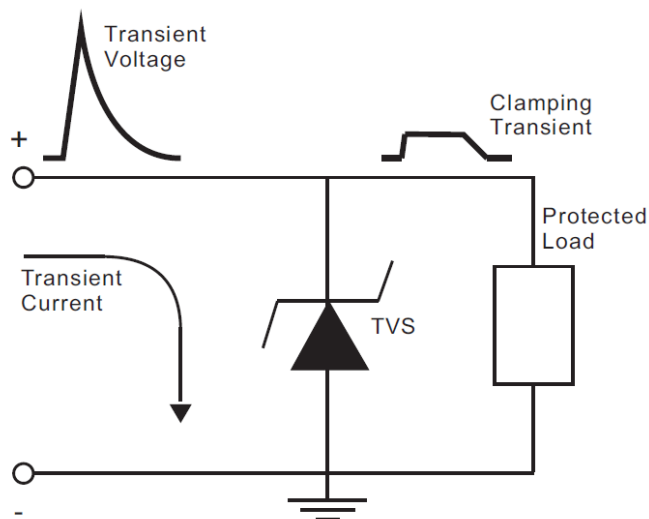


Fig. B – Transient current is diverted to ground thru TVS; the voltage seen by the protected load is limited to the clamping voltage level

## RATING AND CHARACTERISTIC CURVES

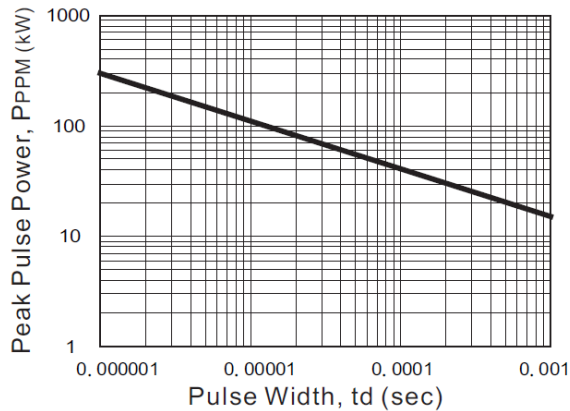


Fig1. PEAK PULSE POWER RATING CURVE

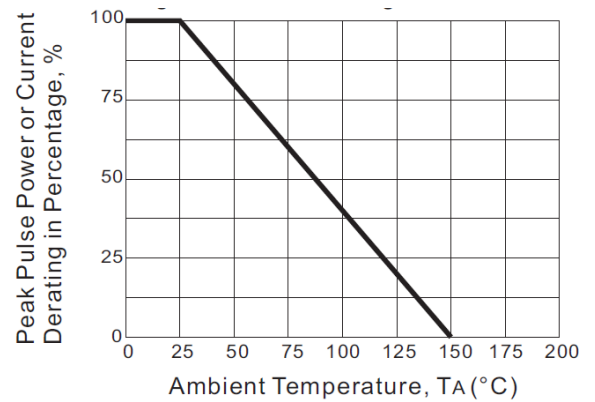


Fig2. PULSE DERATING CURVE

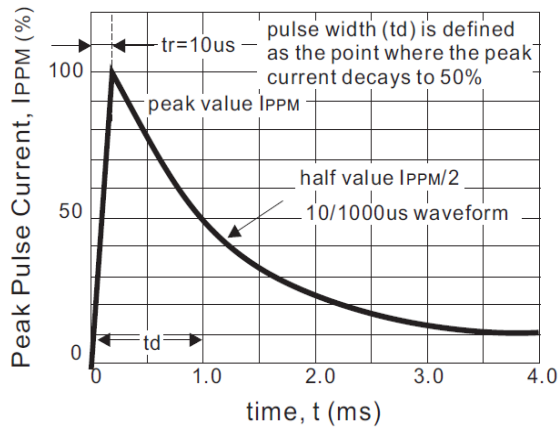


Fig3. PULSE WAVEFORM

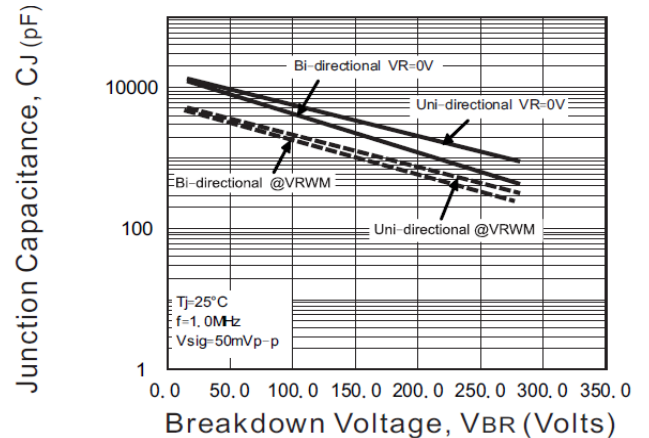


Fig4. TYPICAL JUNCTION CAPACITANCE

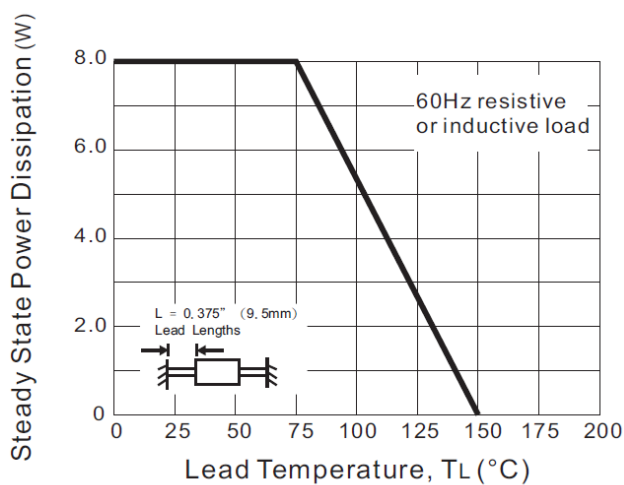


Fig5. STEADY STATE POWER DERATING CURVE

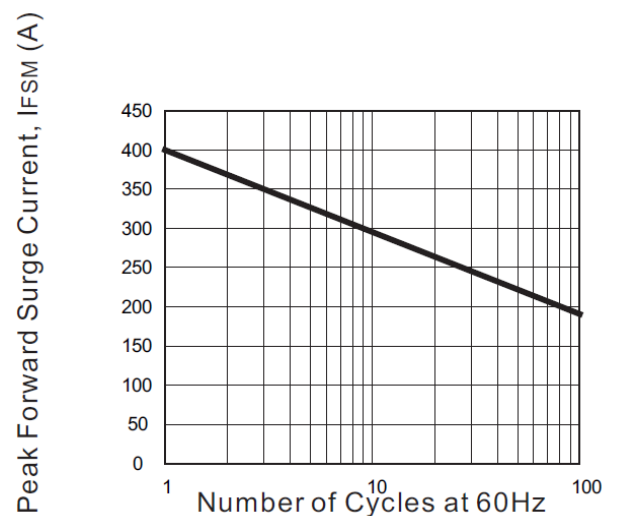
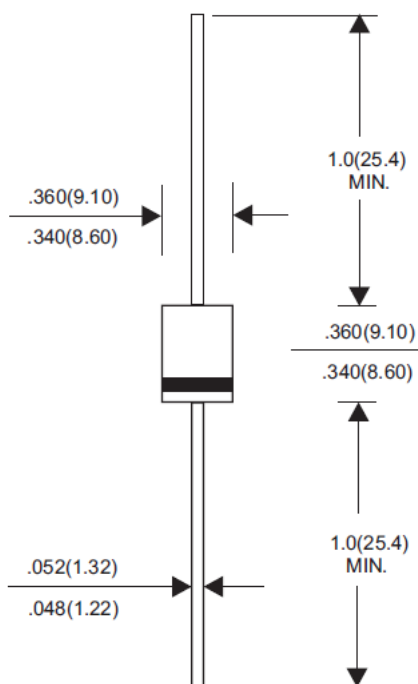


Fig6. MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

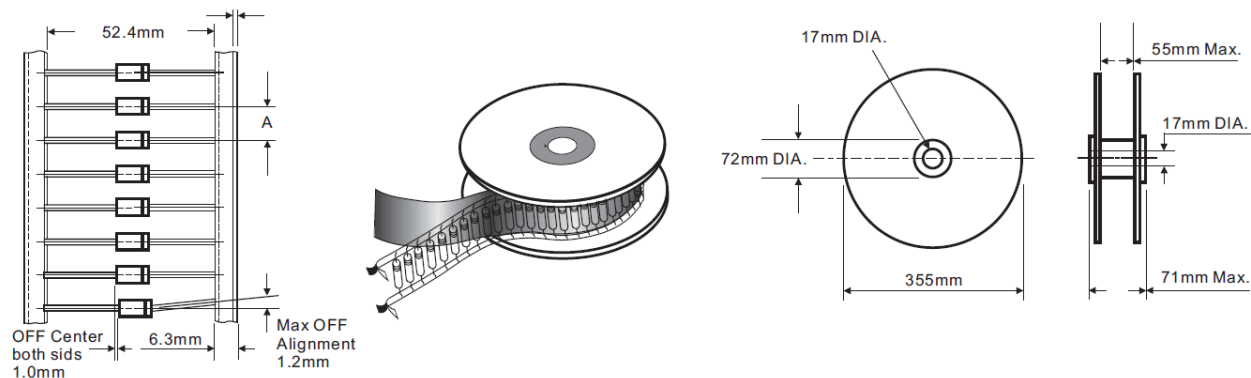
**PACKAGE INFORMATION**
**PACKAGE OUTLINE**


Dimensions in inches and (millimeters)

**PINNING INFORMATION**

| PIN                                           | SIMPLIFIED OUTLINE                                                                      | SYMBOL                                                                                    |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Uni-Directional<br>Pin1 Cathode<br>Pin2 Anode | 1  2 | 1  2 |
| Bi-Directional                                |      |      |

## TAPING & BULK SPECIFICATIONS FOR AXIAL DEVICES



## REEL PACKING

| DEVICE CASE TYPE | QTY 1 (PCS / REEL) | COMPONENT SPACING "A" in FIG. A | CARTON SIZE (m/m) | QTY 2 (PCS / CARTON) | APROX. CROSS WEIGHT (kg) |
|------------------|--------------------|---------------------------------|-------------------|----------------------|--------------------------|
| P600             | 1000               | 10 mm                           | 360 * 340 * 370   | 4000                 | 9.5                      |

## AMMO PACKING

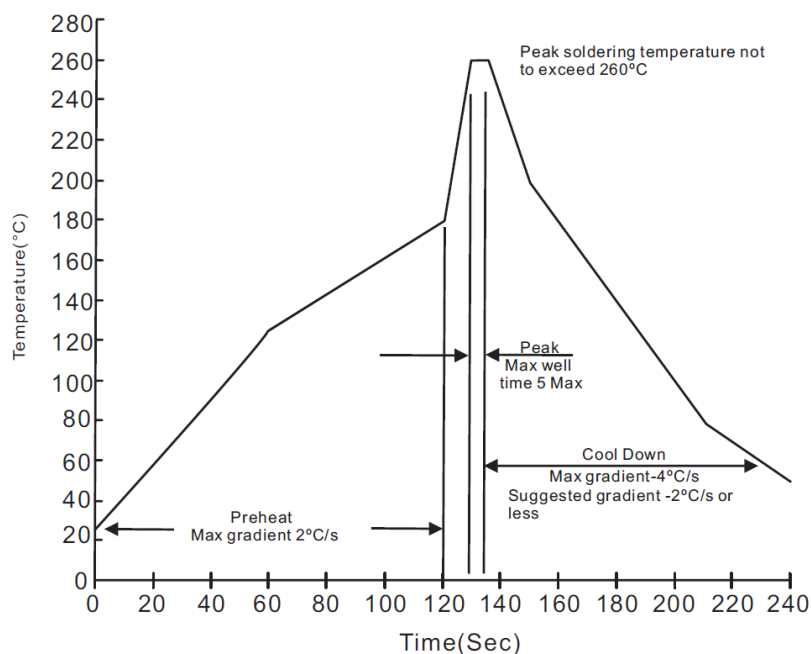
| DEVICE CASE TYPE | QTY 1 (PCS / BOX) | INNER BOX SIZE (m/m) | CARTON SIZE (m/m) | QTY 2 (PCS / CARTON) | APROX. CROSS WEIGHT (kg) |
|------------------|-------------------|----------------------|-------------------|----------------------|--------------------------|
| P600             | 400               | 255 * 75 * 150       | 339 * 276 * 330   | 3200                 | 9.2                      |

## BULK PACKING

| DEVICE CASE TYPE | QTY 1 (PCS / BOX) | INNER BOX SIZE (m/m) | CARTON SIZE (m/m) | QTY 2 (PCS / CARTON) | APROX. CROSS WEIGHT (kg) |
|------------------|-------------------|----------------------|-------------------|----------------------|--------------------------|
| P600             | 250               | 194 * 84 * 20        | 355 * 320 * 280   | 6000                 | 14.5                     |

## SOLDERING PARAMETERS

### Lead Free temperature Profile wave-soldering



## PRODUCT HIGH RELIABILITY TEST CAPABILITIES

| ITEM                          | TEST CONDITIONS                                                                 | STANDARD                    |
|-------------------------------|---------------------------------------------------------------------------------|-----------------------------|
| Solder Resistance             | At 260±5°C for 10±Sec,<br>Immerse body into solder 1/16"±1/32"                  | MIL-STD-750D<br>METHOD-2031 |
| Solderability                 | At 245±5°C for 5 sec.                                                           | MIL-STD-202F<br>METHOD-208  |
| Pull Test                     | 2.0kg in axial lead direction for 10 sec.                                       | MIL-STD-750D<br>METHOD-2036 |
| Bend Lead                     | 2.0kg weight applied to each lead bending<br>arc 90°±5° for 3 times             | MIL-STD-750D<br>METHOD-2036 |
| High Temperature Reverse Bias | V <sub>RWM</sub> =80% rate at T <sub>J</sub> =150° for 168 hrs.                 | MIL-STD-750D<br>METHOD-1038 |
| Pressure Cooker               | 15P <sub>SIG</sub> at T <sub>A</sub> =121°C for 4Hrs                            | JESD22-A102                 |
| Temperature Cycling           | -55°C to +125°C dwelled for 30min and<br>transferred for 5min. total 10 cycles. | MIL-STD-750D<br>METHOD-1051 |
| Humidity                      | At T <sub>A</sub> =85°C, RH=85% for 1000hrs.                                    | MIL-STD-750D<br>METHOD-1021 |
| High Temperature Storage Life | At 175°C for 1000hrs.                                                           | MIL-STD-750D<br>METHOD-1031 |



*beyond boundaries...*

## ALP15KPAXXA/CA SERIES

### CUSTOMER NOTE:

#### DISCLAIMER

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1. ALPINESEMI™ Semiconductor Devices are RoHS compliant and hence customers are requested to dispose as per the prevailing Environmental Legislation put forth in their specific country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).



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