# 3KP SERIES

## List

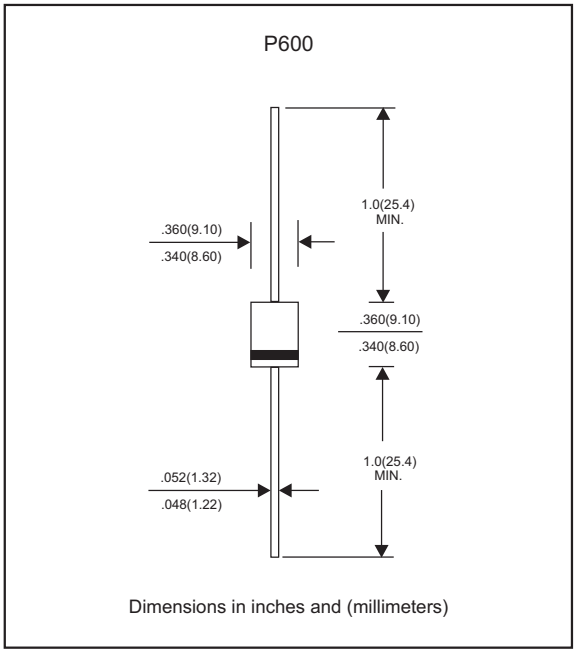
# 3KP SERIES

## 3000W Axial Leaded Transient Voltage Suppressors - 5.0V-220V

### Features

- Axial lead type devices for through hole design.
- 3kW peak pulse power capability with a 10/1000us waveform, repetition rate (duty cycle): 0.01%.
- Excellent clamping capability.
- Low incremental surge resistance.
- Fast response time from 0V to $V_{BR}$, typically less than 1 ps for uni-directional & 5 ns for bi-directional types.
- Glass passivated chip junction.
- Lead-free parts meet environmental standards of MIL-STD-19500 /228
- Suffix "-H" indicates Halogen-free part, ex.3KP5.0A-H.

### Package outline




Dimensions in inches and (millimeters)

### Mechanical data

- 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
- Weight : Approximated 2.10 gram

### Maximum ratings (AT $T_A$=25°C unless otherwise noted)

| PARAMETER | CONDITIONS | Symbol | 3KP SERIES | UNIT |
|---|---|---|---|---|
| Peak power dissipation | with a 10/1000us waveform, Note 1 & Fig. 1 | $P_{PPM}$ | 3000 | W |
| Peak pulse current | with a 10/1000us waveform | $I_{PPM}$ | See table 1 | A |
| Steady state power dissipation | at $T_L$=75°C lead length 0.375" (9.5 mm) | $P_{M(AV)}$ | 6.5 | W |
| Peak forward surge current | 8.3mS single half sine-wave (JEDEC Method), note 2 | $I_{FSM}$ | 300 | A |
| Maximum instantaneours forward voltage | at 100A for uni-directional types only, note 3 | $V_F$ | 3.5 / 5.0 | V |
| Operating junction temperature range | | $T_J$ | -55to+150 | °C |
| Storage temperature range | | $T_{STG}$ | -55to+150 | °C |

Note 1. Non-repetitive current pulse, per Fig. 3 and derated above $T_A$=25°C per Fig. 2
2. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum
3. $V_F$<3.5V. for devices of $V_{BR}$<= 220V, and $V_F$<5.0V. for devices of $V_{BR}$>=201V

## Electrical characteristics (at $T_A$=25°C unless otherwise noted) Table 1

| Part No. | Reverse Stand-off Voltage | Breakdown Voltage @$I_T$ | | Test Current | Maximum Clamping Voltage @$I_{PP}$ | | Maximum Reverse Leakage Current |
|---|---|---|---|---|---|---|---|
| | $V_{RWM}$ | $V_{BR\ Min}$ | $V_{BR\ Max}$ | $I_T$ | $V_c$ | $I_{PP}$ | $I_R$@$V_{RWM}$ |
| | Volts | Volts | Volts | mA | Volts | A | μA |
| 3KP5.0(C)A | 5.0 | 6.40 | 7.00 | 50 | 9.2 | 326 | 5000 |
| 3KP6.0(C)A | 6.0 | 6.67 | 7.37 | 50 | 10.3 | 291.3 | 5000 |
| 3KP6.5(C)A | 6.5 | 7.22 | 7.98 | 50 | 11.2 | 267.9 | 2000 |
| 3KP7.0(C)A | 7.0 | 7.78 | 8.60 | 50 | 12.0 | 250 | 1000 |
| 3KP7.5(C)A | 7.5 | 8.33 | 9.21 | 5.0 | 12.9 | 232.6 | 250 |
| 3KP8.0(C)A | 8.0 | 8.89 | 9.83 | 5.0 | 13.6 | 220.6 | 150 |
| 3KP8.5(C)A | 8.5 | 9.44 | 10.4 | 5.0 | 14.4 | 208.3 | 50 |
| 3KP9.0(C)A | 9.0 | 10.0 | 11.1 | 5.0 | 15.4 | 194.8 | 20 |
| 3KP10(C)A | 10.0 | 11.1 | 12.3 | 5.0 | 17.0 | 176.4 | 10 |
| 3KP11(C)A | 11.0 | 12.2 | 13.5 | 5.0 | 18.2 | 164.8 | 10 |
| 3KP12(C)A | 12.0 | 13.3 | 14.7 | 5.0 | 19.9 | 150.6 | 10 |
| 3KP13(C)A | 13.0 | 14.4 | 15.9 | 5.0 | 21.5 | 139.4 | 10 |
| 3KP14(C)A | 14.0 | 15.6 | 17.2 | 5.0 | 23.2 | 129.4 | 10 |
| 3KP15(C)A | 15.0 | 16.7 | 18.5 | 5.0 | 24.4 | 123 | 10 |
| 3KP16(C)A | 16.0 | 17.8 | 19.7 | 5.0 | 26.0 | 115.4 | 10 |
| 3KP17(C)A | 17.0 | 18.9 | 20.9 | 5.0 | 27.6 | 108.7 | 10 |
| 3KP18(C)A | 18.0 | 20.0 | 22.1 | 5.0 | 29.2 | 102.8 | 10 |
| 3KP20(C)A | 20.0 | 22.2 | 24.5 | 5.0 | 32.4 | 92.6 | 10 |
| 3KP22(C)A | 22.0 | 24.4 | 26.9 | 5.0 | 35.5 | 84.4 | 10 |
| 3KP24(C)A | 24.0 | 26.7 | 29.5 | 5.0 | 38.9 | 77.2 | 10 |
| 3KP26(C)A | 26.0 | 28.9 | 31.9 | 5.0 | 42.1 | 71.2 | 10 |
| 3KP28(C)A | 28.0 | 31.1 | 34.4 | 5.0 | 45.4 | 66.0 | 10 |
| 3KP30(C)A | 30.0 | 33.3 | 36.8 | 5.0 | 48.4 | 62.0 | 10 |
| 3KP33(C)A | 33.0 | 36.7 | 40.6 | 5.0 | 53.3 | 56.2 | 10 |
| 3KP36(C)A | 36.0 | 40.0 | 44.2 | 5.0 | 58.1 | 51.6 | 10 |
| 3KP40(C)A | 40.0 | 44.4 | 49.1 | 5.0 | 64.5 | 46.4 | 10 |
| 3KP43(C)A | 43.0 | 47.8 | 52.8 | 5.0 | 69.4 | 43.2 | 10 |
| 3KP45(C)A | 45.0 | 50.0 | 55.3 | 5.0 | 72.7 | 41.3 | 10 |
| 3KP48(C)A | 48.0 | 53.3 | 58.9 | 5.0 | 77.4 | 38.8 | 10 |
| 3KP51(C)A | 51.0 | 56.7 | 62.7 | 5.0 | 82.4 | 36.4 | 10 |
| 3KP54(C)A | 54.0 | 60.0 | 66.3 | 5.0 | 87.1 | 34.4 | 10 |
| 3KP58(C)A | 58.0 | 64.4 | 71.2 | 5.0 | 93.6 | 32.1 | 10 |
| 3KP60(C)A | 60.0 | 66.7 | 73.7 | 5.0 | 96.8 | 31.0 | 10 |
| 3KP64(C)A | 64.0 | 71.1 | 78.6 | 5.0 | 103.0 | 29.1 | 10 |
| 3KP70(C)A | 70.0 | 77.8 | 86.0 | 5.0 | 113.0 | 26.5 | 10 |
| 3KP75(C)A | 75.0 | 83.3 | 92.1 | 5.0 | 121.0 | 24.8 | 10 |
| 3KP78(C)A | 78.0 | 86.7 | 95.8 | 5.0 | 126.0 | 23.8 | 10 |
| 3KP85(C)A | 85.0 | 94.4 | 104.0 | 5.0 | 137.0 | 21.9 | 10 |
| 3KP90(C)A | 90.0 | 100.0 | 111.0 | 5.0 | 146 | 20.5 | 10 |
| 3KP100(C)A | 100.0 | 111.0 | 123.0 | 5.0 | 162 | 18.5 | 10 |
| 3KP110(C)A | 110.0 | 122.0 | 135.0 | 5.0 | 177 | 16.9 | 10 |
| 3KP120(C)A | 120.0 | 133.0 | 147.0 | 5.0 | 193 | 15.5 | 10 |

Note 1. $V_{BR}$ measured after $I_T$ applied for 300us, $I_T$=square wave pulse or equivalent
2. Surge current waveform per Fig. 3 and derated per Fig. 2
3. For bi-directional types having $V_{RWM}$ of 10 volts and less, the $I_R$ limit is doubled
4. Suffix 'C' denotes bi-directional devices. Suffix 'A' denotes 5% tolerance devices, no suffix denotes 10% tolerance devices.
5. All terms and symbols are consistent with ANS/IEEE C62.35

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## Electrical characteristics (at $T_A$=25°C unless otherwise noted) Table 1

| Part No. | Reverse Stand-off Voltage | Breakdown Voltage @$I_T$ | | Test Current | Maximum Clamping Voltage @$I_{PP}$ | | Maximum Reverse Leakage Current |
|---|---|---|---|---|---|---|---|
| | $V_{RWM}$ | $V_{BR\ Min}$ | $V_{BR\ Max}$ | $I_T$ | $V_C$@$I_{PP}$ | | $I_R$@$V_{RWM}$ |
| | Volts | Volts | Volts | mA | Volts | $I_{PP}$(A) | $I_R$(uA) |
| 3KP130(C)A | 130 | 144 | 159 | 5.0 | 209 | 14.4 | 10 |
| 3KP150(C)A | 150 | 167 | 185 | 5.0 | 243 | 12.3 | 10 |
| 3KP160(C)A | 160 | 178 | 197 | 5.0 | 259 | 11.6 | 10 |
| 3KP170(C)A | 170 | 189 | 209 | 5.0 | 275 | 10.9 | 10 |
| 3KP180(C)A | 180 | 201 | 222 | 5.0 | 292 | 10.4 | 10 |
| 3KP190(C)A | 190 | 211 | 233 | 5.0 | 308 | 9.7 | 10 |
| 3KP200(C)A | 200 | 224 | 247 | 5.0 | 324 | 9.1 | 10 |
| 3KP210(C)A | 210 | 237 | 263 | 5.0 | 340 | 8.6 | 10 |
| 3KP220(C)A | 220 | 246 | 272 | 5.0 | 356 | 8.1 | 10 |

Note 1. $V_{BR}$ measured after $I_T$ applied for 300us, $I_T$=square wave pulse or equivalent
2. Surge current waveform per Fig. 5 and derated per Fig. 1
3. For bi-directional types having $V_{RWM}$ of 10 volts and less, the $I_R$ limit is doubled
4. Suffix 'C' denotes bi-directional devices. Suffix 'A' denotes 5% tolerance devices, no suffix denotes 10% tolerance devices.
5. All terms and symbols are consistent with ANS/IEEE C62.35

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

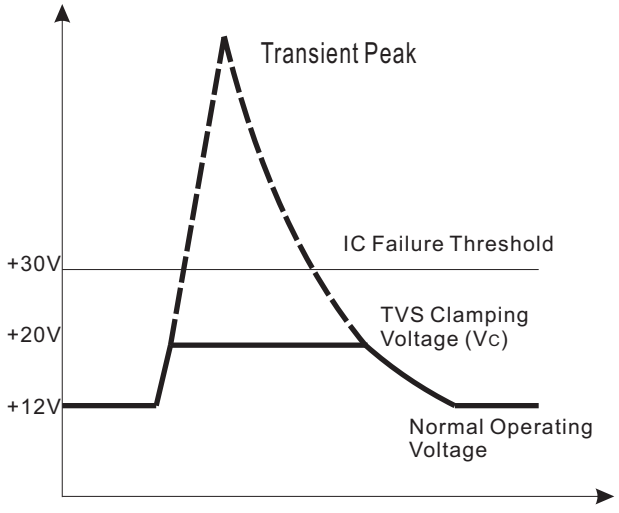
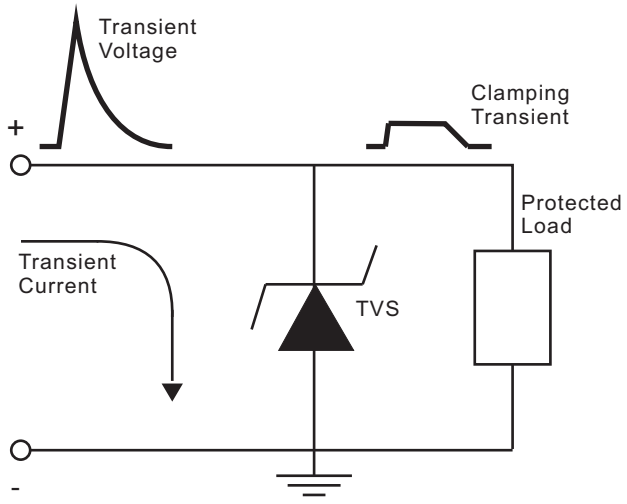



Fig. B - Transient current is divered to ground thru TVS; the voltage seen by the protected load is limited to the clamping voltage level



## Rating and characteristic curves (3KP SERIES)

Fig.1 - Pulse Derating Curve

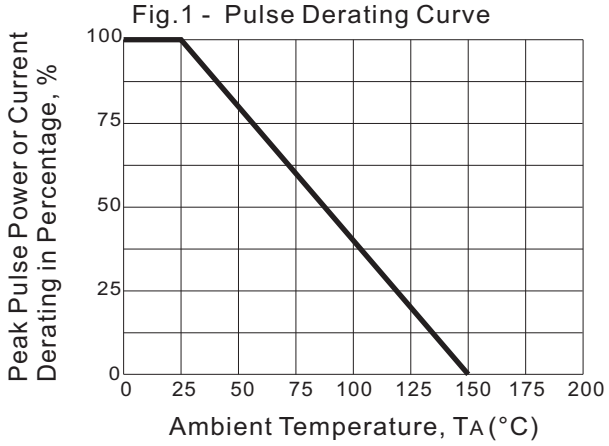



Fig.2 - Maximum Non-Repetitive Forward Surge Current

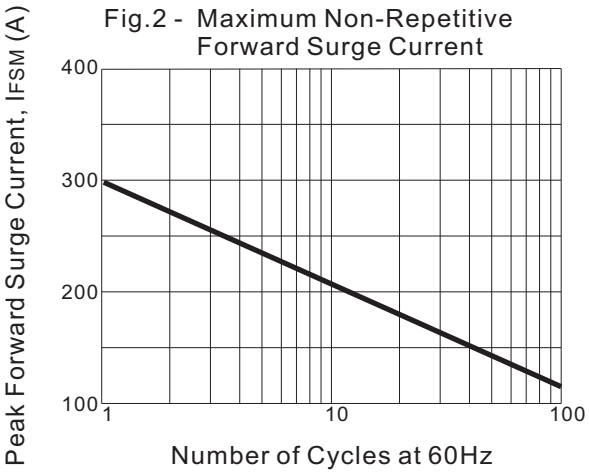



Fig.3 - Steady State Power Derating Curve

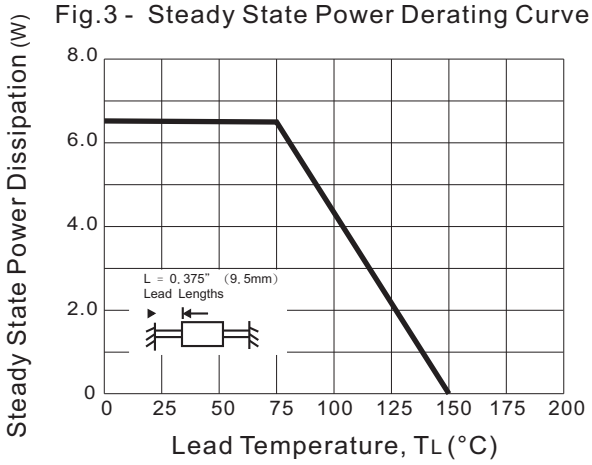



Fig.4 - Pealk Pulse Power Rating Curve

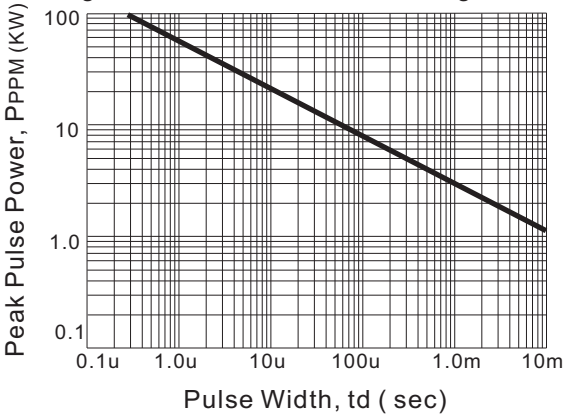



Fig.5 - Pulse Waveform

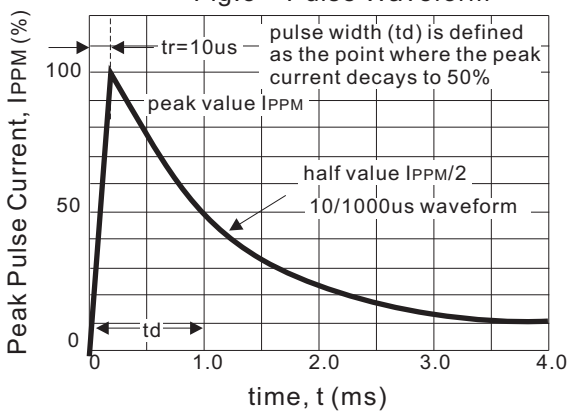
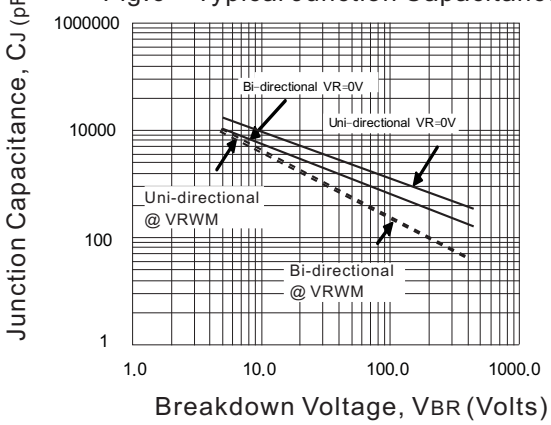
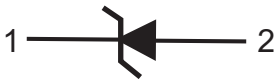



Fig.6 - Typical Junction Capacitance

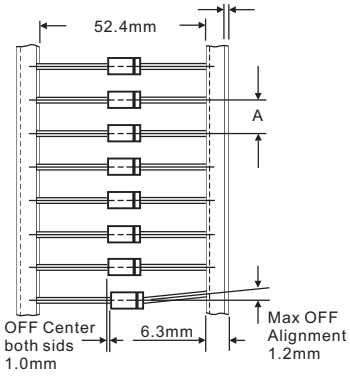


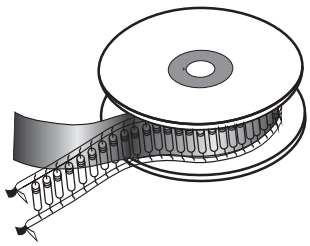
# 3KP SERIES

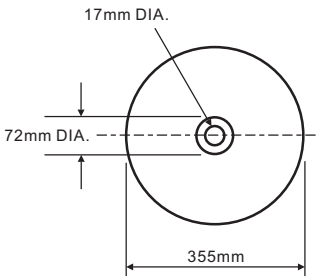
## Pinning information

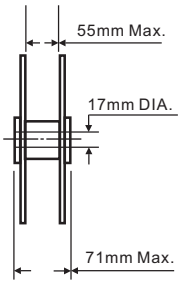
| Pin | Simplified outline | Symbol |
|---|---|---|
| Uni-Directional<br>Pin1 cathode<br>Pin2 anode |  |  |
| Bi-Directional |  |  |

## Taping & bulk specifications for AXIAL devices






REEL PACKING

| DEVICE CASE TYPE | Q'TY 1 (PCS / REEL) | COMPONENT SPACING "A" in FIG. A | CARTON SIZE (m/m) | Q'TY 2 (PCS / CARTON) | APPROX. CROSS WEIGHT(kg) |
|---|---|---|---|---|---|
| P600 | 1000 | 10 mm | 360 * 340 * 370 | 4,000 | 9.5 |

AMMO PACKING

| DEVICE CASE TYPE | Q'TY 1 (PCS / BOX) | INNER BOX SIZE (m/m) | CARTON SIZE (m/m) | Q'TY 2 (PCS / CARTON) | APPROX. CROSS WEIGHT(kg) |
|---|---|---|---|---|---|
| P600 | 400 | 255 * 75 * 150 | 339 * 276 * 330 | 3,200 | 9.2 |

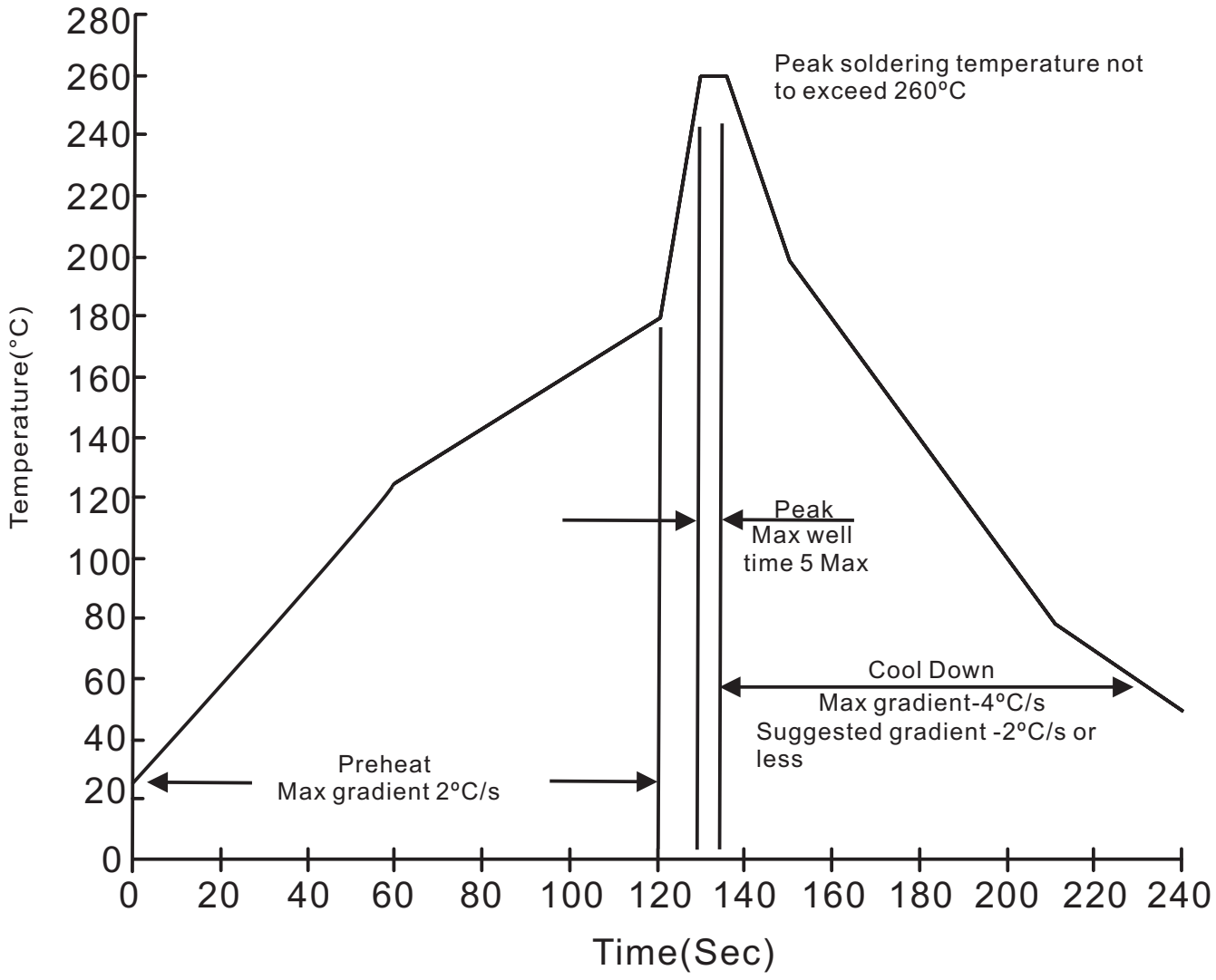
# 3KP SERIES

BULK PACKING

| DEVICE CASE TYPE | Q'TY 1 (PCS / BOX) | INNER BOX SIZE (m/m) | CARTON SIZE (m/m) | Q'TY 2 (PCS / CARTON) | APPROX. CROSS WEIGHT(kg) |
|---|---|---|---|---|---|
| P600 | 250 | 194 * 84 * 20 | 355 * 320 * 280 | 6,000 | 14.5 |

**Suggested thermal profiles for soldering processes**

1.Lead free temperature profile wave-soldering



# 3KP SERIES

## High reliability test capabilities

| Item Test | Conditions | Reference |
|---|---|---|
| 1. Solder Resistance | at 260±5°C for 10±2sec.<br>immerse body into solder 1/16"±1/32" | MIL-STD-750D<br>METHOD-2031 |
| 2. Solderability | at 245±5°C for 5 sec. | MIL-STD-202F<br>METHOD-208 |
| 3. Pull Test | 2.0kg in axial lead direction for 10 sec. | MIL-STD-750D<br>METHOD-2036 |
| 4. Bend Lead | 2.0kg weight applied to each lead bending<br>arc 90°±5° for 3 times. | MIL-STD-750D<br>METHOD-2036 |
| 5. High Temperature Reverse Bias | $V_{RWM}$=80% rate at $T_J$=150°C for 168 hrs. | MIL-STD-750D<br>METHOD-1038 |
| 6. Pressure Cooker | 15$P_{SIG}$ at $T_A$=121°C for 4 hrs. | JESD22-A102 |
| 7. Temperature Cycling | -55°C to +125°C dwelled for 30 min.<br>and transferred for 5min. total 10 cycles. | MIL-STD-750D<br>METHOD-1051 |
| 8. Humidity | at $T_A$=85°C, RH=85% for 1000hrs. | MIL-STD-750D<br>METHOD-1021 |
| 9. High Temperature Storage Life | at 175°C for 1000 hrs. | MIL-STD-750D<br>METHOD-1031 |