Certificate Number: Q10561

Certificate Number: E17276

# S5KP SERIES

# TRANSIENT VOLTAGE SUPPRESSOR

**$V_{BR}$ : 5.0 - 180 Volts**
**$P_{PK}$ : 5000 Watts**

## FEATURES :

* 5000W Peak Pulse Power
* Excellent clamping capability
* Low incremental surge resistance
* Fast response time : typically less then 1.0 ps from 0 volt to $V_{BR(min.)}$
* Pb / RoHS Free

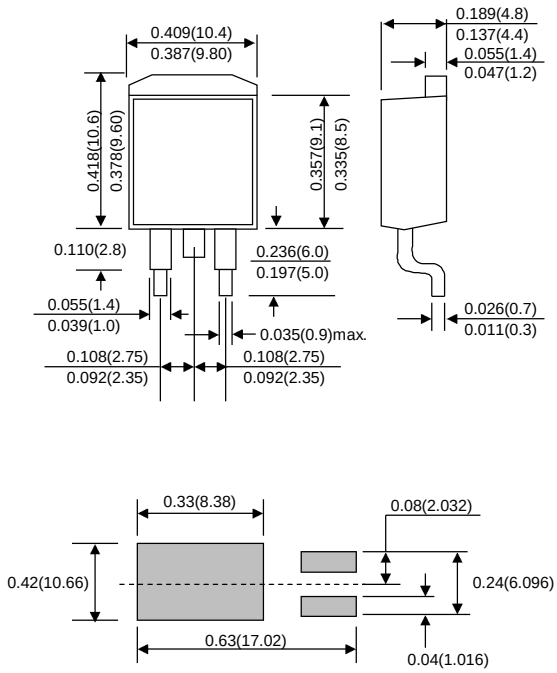
## MECHANICAL DATA

* Case : $D^2$PAK(TO-263)
* Epoxy : UL94V-O rate flame retardant
* Lead : Axial lead solderable per MIL-STD-202, Method 208 guaranteed
* Polarity : Heatsink is Anode
* Mounting position : Any
* Weight : 1.7 grams (approximately)

## DEVICES FOR BIPOLAR APPLICATIONS

For Bi-directional use C or CA Suffix
Electrical characteristics apply in both directions

**$D^2$PAK**




**Dimensions in inches and ( millimeters )**

## MAXIMUM RATINGS

Rating at 25 °C ambient temperature unless otherwise specified.

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation at tp = 1ms (Note 1, Fig. 4) | $P_{PK}$ | Minimum 5000 | W |
| Steady State Power Dissipation | $P_D$ | 8.0 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note 2) | $I_{FSM}$ | 400 | A |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | - 55 to + 150 | °C |

**Notes:**

(1) Non-repetitive Current pulse, per Fig. 5 and derated above Ta = 25 °C per Fig. 1

(2) Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minutes maximum.

## ELECTRICAL CHARACTERISTICS ( Ta = 25°C)

| TYPE | Breakdown Voltage @ $I_T$ ( Note 1 ) | | | Reverse Stand off Voltage | Maximum Reverse Leakage @ $V_{RM}$ | Maximum Peak Pulse Current (Note2) | Maximum Clamping Voltage @ $I_{PPM}$ | Maximum Temperature Coefficient of $V_{BR}$ |
|---|---|---|---|---|---|---|---|---|
| | $V_{BR}$ (V) | | $I_T$ | $V_{RM}$ | $I_R$ | $I_{PPM}$ | $V_C$ | |
| | Min. | Max. | (mA) | (V) | (μA) | (A) | (V) | (%/°C) |
| **S5KP5.0** | 6.40 | 7.30 | 50 | 5.0 | 5000 | 520 | 9.60 | 0.057 |
| **S5KP5.0A** | 6.40 | 7.00 | 50 | 5.0 | 5000 | 543 | 9.20 | 0.057 |
| **S5KP6.0** | 6.67 | 8.15 | 50 | 6.0 | 5000 | 439 | 11.4 | 0.061 |
| **S5KP6.0A** | 6.67 | 7.37 | 50 | 6.0 | 5000 | 485 | 10.3 | 0.061 |
| **S5KP6.5** | 7.22 | 8.82 | 50 | 6.5 | 2000 | 407 | 12.3 | 0.065 |
| **S5KP6.5A** | 7.22 | 7.98 | 50 | 6.5 | 2000 | 447 | 11.2 | 0.065 |
| **S5KP7.0** | 7.78 | 9.51 | 5.0 | 7.0 | 1000 | 378 | 13.3 | 0.068 |
| **S5KP7.0A** | 7.78 | 8.60 | 5.0 | 7.0 | 1000 | 417 | 12.0 | 0.068 |
| **S5KP7.5** | 8.33 | 10.2 | 5.0 | 7.5 | 250 | 350 | 14.3 | 0.073 |
| **S5KP7.5A** | 8.33 | 9.21 | 5.0 | 7.5 | 250 | 388 | 12.9 | 0.073 |
| **S5KP8.0** | 8.89 | 10.9 | 5.0 | 8.0 | 150 | 333 | 15.0 | 0.075 |
| **S5KP8.0A** | 8.89 | 9.83 | 5.0 | 8.0 | 150 | 367 | 13.6 | 0.075 |
| **S5KP8.5** | 9.44 | 11.5 | 5.0 | 8.5 | 50 | 314 | 15.9 | 0.078 |
| **S5KP8.5A** | 9.44 | 10.4 | 5.0 | 8.5 | 50 | 347 | 14.4 | 0.078 |
| **S5KP9.0** | 10.0 | 12.2 | 5.0 | 9.0 | 20 | 295 | 16.9 | 0.081 |
| **S5KP9.0A** | 10.0 | 11.1 | 5.0 | 9.0 | 20 | 325 | 15.4 | 0.081 |
| **S5KP10** | 11.1 | 13.6 | 5.0 | 10 | 15 | 266 | 18.8 | 0.084 |
| **S5KP10A** | 11.1 | 12.3 | 5.0 | 10 | 15 | 294 | 17.0 | 0.084 |
| **S5KP11** | 12.2 | 14.9 | 5.0 | 11 | 10 | 249 | 20.1 | 0.086 |
| **S5KP11A** | 12.2 | 13.5 | 5.0 | 11 | 10 | 274 | 18.2 | 0.086 |
| **S5KP12** | 13.3 | 16.3 | 5.0 | 12 | 10 | 227 | 22.0 | 0.088 |
| **S5KP12A** | 13.3 | 14.7 | 5.0 | 12 | 10 | 251 | 19.9 | 0.088 |
| **S5KP13** | 14.4 | 17.6 | 5.0 | 13 | 10 | 210 | 23.8 | 0.090 |
| **S5KP13A** | 14.4 | 15.9 | 5.0 | 13 | 10 | 232 | 21.5 | 0.090 |
| **S5KP14** | 15.6 | 19.1 | 5.0 | 14 | 10 | 194 | 25.8 | 0.092 |
| **S5KP14A** | 15.6 | 17.2 | 5.0 | 14 | 10 | 215 | 23.2 | 0.092 |
| **S5KP15** | 16.7 | 20.4 | 5.0 | 15 | 10 | 188 | 26.9 | 0.094 |
| **S5KP15A** | 16.7 | 18.5 | 5.0 | 15 | 10 | 206 | 24.4 | 0.094 |
| **S5KP16** | 17.8 | 21.8 | 5.0 | 16 | 10 | 176 | 28.8 | 0.096 |
| **S5KP16A** | 17.8 | 19.7 | 5.0 | 16 | 10 | 192 | 26.0 | 0.096 |
| **S5KP17** | 18.9 | 23.1 | 5.0 | 17 | 10 | 164 | 30.5 | 0.097 |
| **S5KP17A** | 18.9 | 20.9 | 5.0 | 17 | 10 | 181 | 27.6 | 0.097 |
| **S5KP18** | 20.0 | 24.4 | 5.0 | 18 | 10 | 155 | 32.2 | 0.098 |
| **S5KP18A** | 20.0 | 22.1 | 5.0 | 18 | 10 | 172 | 29.2 | 0.098 |
| **S5KP20** | 22.2 | 27.1 | 5.0 | 20 | 10 | 139 | 35.8 | 0.099 |
| **S5KP20A** | 22.2 | 24.5 | 5.0 | 20 | 10 | 154 | 32.4 | 0.099 |
| **S5KP22** | 24.4 | 29.8 | 5.0 | 22 | 10 | 127 | 39.4 | 0.100 |
| **S5KP22A** | 24.4 | 26.9 | 5.0 | 22 | 10 | 141 | 35.5 | 0.100 |
| **S5KP24** | 26.7 | 32.6 | 5.0 | 24 | 10 | 116 | 43.0 | 0.101 |
| **S5KP24A** | 26.7 | 29.5 | 5.0 | 24 | 10 | 128 | 38.9 | 0.101 |
| **S5KP26** | 28.9 | 35.3 | 5.0 | 26 | 10 | 107 | 46.6 | 0.101 |
| **S5KP26A** | 28.9 | 31.9 | 5.0 | 26 | 10 | 119 | 42.1 | 0.101 |
| **S5KP28** | 31.1 | 38.0 | 5.0 | 28 | 10 | 99 | 50.1 | 0.102 |
| **S5KP28A** | 31.1 | 34.4 | 5.0 | 28 | 10 | 110 | 45.4 | 0.102 |
| **S5KP30** | 33.3 | 40.7 | 5.0 | 30 | 10 | 93 | 53.5 | 0.103 |
| **S5KP30A** | 33.3 | 36.8 | 5.0 | 30 | 10 | 103 | 48.4 | 0.103 |
| **S5KP33** | 36.7 | 44.9 | 5.0 | 33 | 10 | 85 | 59.0 | 0.104 |
| **S5KP33A** | 36.7 | 40.6 | 5.0 | 33 | 10 | 94 | 53.3 | 0.104 |
| **S5KP36** | 40 | 48.9 | 5.0 | 36 | 10 | 78 | 64.3 | 0.104 |
| **S5KP36A** | 40 | 44.2 | 5.0 | 36 | 10 | 86 | 58.1 | 0.104 |

## ELECTRICAL CHARACTERISTICS ( Ta = 25°C)

| TYPE | Breakdown Voltage @ $I_T$ ( Note 1 ) | | | Reverse Stand off Voltage | Maximum Reverse Leakage @ $V_{RM}$ | Maximum Peak Pulse Current (Note2) | Maximum Clamping Voltage @ $I_{PPM}$ | Maximum Temperature Coefficient of $V_{BR}$ |
|---|---|---|---|---|---|---|---|---|
| | $V_{BR}$ (V) | | $I_T$ | $V_{RM}$ | $I_R$ | $I_{PPM}$ | $V_C$ | |
| | Min. | Max. | (mA) | (V) | (µA) | (A) | (V) | (%/°C) |
| **S5KP40** | 44.4 | 54.3 | 5.0 | 40 | 10 | 70 | 71.4 | 0.105 |
| **S5KP40A** | 44.4 | 49.1 | 5.0 | 40 | 10 | 78 | 64.5 | 0.105 |
| **S5KP43** | 47.8 | 58.4 | 5.0 | 43 | 10 | 65 | 76.7 | 0.105 |
| **S5KP43A** | 47.8 | 52.8 | 5.0 | 43 | 10 | 72 | 69.4 | 0.105 |
| **S5KP45** | 50.0 | 61.1 | 5.0 | 45 | 10 | 62 | 80.3 | 0.106 |
| **S5KP45A** | 50.0 | 55.3 | 5.0 | 45 | 10 | 69 | 72.7 | 0.106 |
| **S5KP48** | 53.3 | 65.2 | 5.0 | 48 | 10 | 58 | 85.5 | 0.106 |
| **S5KP48A** | 53.3 | 58.9 | 5.0 | 48 | 10 | 65 | 77.4 | 0.106 |
| **S5KP51** | 56.7 | 69.3 | 5.0 | 51 | 10 | 55 | 91.1 | 0.107 |
| **S5KP51A** | 56.7 | 62.7 | 5.0 | 51 | 10 | 61 | 82.4 | 0.107 |
| **S5KP54** | 60.0 | 73.3 | 5.0 | 54 | 10 | 52 | 96.3 | 0.107 |
| **S5KP54A** | 60.0 | 66.3 | 5.0 | 54 | 10 | 57 | 87.1 | 0.107 |
| **S5KP56** | 62.2 | 76.1 | 5.0 | 56 | 10 | 50 | 100 | 0.107 |
| **S5KP56A** | 62.2 | 68.8 | 5.0 | 56 | 10 | 55 | 91 | 0.107 |
| **S5KP58** | 64.4 | 78.7 | 5.0 | 58 | 10 | 49 | 103 | 0.107 |
| **S5KP58A** | 64.4 | 71.2 | 5.0 | 58 | 10 | 53 | 94 | 0.107 |
| **S5KP60** | 66.7 | 81.5 | 5.0 | 60 | 10 | 47 | 107 | 0.108 |
| **S5KP60A** | 66.7 | 73.7 | 5.0 | 60 | 10 | 52 | 97 | 0.108 |
| **S5KP64** | 71.1 | 96.9 | 5.0 | 64 | 10 | 44 | 114 | 0.108 |
| **S5KP64A** | 71.1 | 78.6 | 5.0 | 64 | 10 | 49 | 103 | 0.108 |
| **S5KP70** | 77.6 | 95.1 | 5.0 | 70 | 10 | 40 | 125 | 0.108 |
| **S5KP70A** | 77.6 | 86.0 | 5.0 | 70 | 10 | 44 | 113 | 0.108 |
| **S5KP75** | 83.3 | 102 | 5.0 | 75 | 10 | 37 | 134 | 0.108 |
| **S5KP75A** | 83.3 | 92.1 | 5.0 | 75 | 10 | 41 | 121 | 0.108 |
| **S5KP78** | 86.7 | 106 | 5.0 | 78 | 10 | 36 | 139 | 0.108 |
| **S5KP78A** | 86.7 | 95.8 | 5.0 | 78 | 10 | 40 | 126 | 0.108 |
| **S5KP85** | 94.4 | 115 | 5.0 | 85 | 10 | 33 | 151 | 0.108 |
| **S5KP85A** | 94.4 | 104 | 5.0 | 85 | 10 | 36 | 137 | 0.110 |
| **S5KP90** | 100 | 122 | 5.0 | 90 | 10 | 31 | 160 | 0.110 |
| **S5KP90A** | 100 | 111 | 5.0 | 90 | 10 | 34 | 146 | 0.110 |
| **S5KP100** | 111 | 136 | 5.0 | 100 | 10 | 28 | 179 | 0.110 |
| **S5KP100A** | 111 | 123 | 5.0 | 100 | 10 | 31 | 162 | 0.110 |
| **S5KP110** | 122 | 149 | 5.0 | 110 | 10 | 26 | 196 | 0.112 |
| **S5KP110A** | 122 | 135 | 5.0 | 110 | 10 | 28 | 177 | 0.112 |
| **S5KP120** | 133 | 163 | 5.0 | 120 | 10 | 24 | 211 | 0.112 |
| **S5KP120A** | 133 | 147 | 5.0 | 120 | 10 | 26 | 194 | 0.112 |
| **S5KP150** | 167 | 204 | 5.0 | 150 | 10 | 19 | 263 | 0.112 |
| **S5KP150A** | 167 | 184 | 5.0 | 150 | 10 | 21 | 242 | 0.112 |
| **S5KP160** | 178 | 217 | 5.0 | 160 | 10 | 18 | 281 | 0.114 |
| **S5KP160A** | 178 | 196 | 5.0 | 160 | 10 | 19 | 258 | 0.114 |
| **S5KP170** | 189 | 231 | 5.0 | 170 | 10 | 17 | 298 | 0.114 |
| **S5KP170A** | 189 | 209 | 5.0 | 170 | 10 | 18 | 274 | 0.114 |
| **S5KP180** | 200 | 244 | 5.0 | 180 | 10 | 16 | 316 | 0.114 |
| **S5KP180A** | 200 | 221 | 5.0 | 180 | 10 | 17 | 290 | 0.114 |

**Notes:**

(1) $V_{BR}$ measured after $I_T$ applied for 300 µs., $I_T$ = square wave pulse or equivalent.

(2) Surge Current waveform per Fig. 3 and Derate per Fig. 2

(3) $V_F$ = 3.5 Volts max. for devices of $V_R$ < 100 V, and $V_F$ = 5 Volts max. for devices of $V_R$ > 100 V.

(4) For Bi-directional devices having $V_R$ of 10 Volts and under the $I_R$ limit is doubled.

(5) " S5K " will be omitted in marking on the diode.

# RATING AND CHARACTERISTIC CURVES ( S5KP SERIES )

**FIG.1 - PULSE DERATING CURVE**

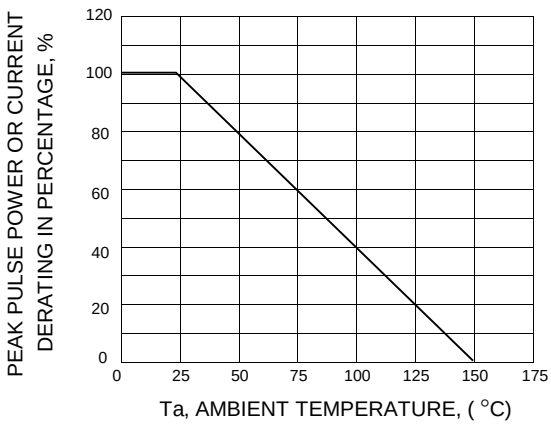



**FIG.2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT**

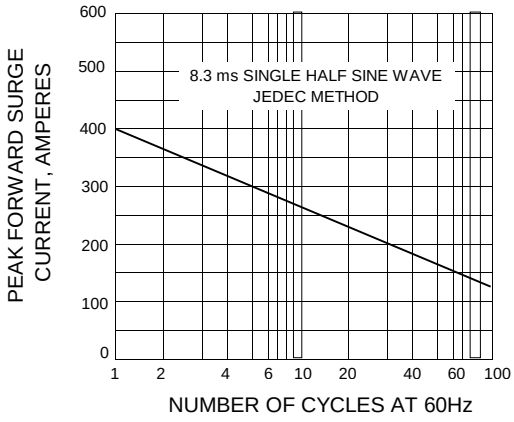



**FIG.3 - STEADY STATE POWER DERATING**

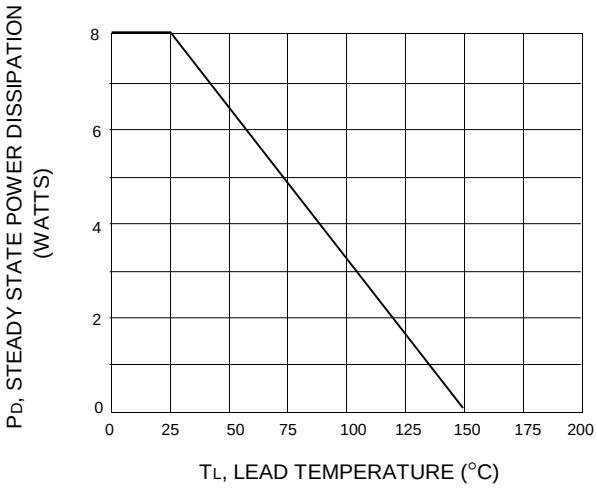



**FIG.4 - PEAK PULSE POWER RATING CURVE**

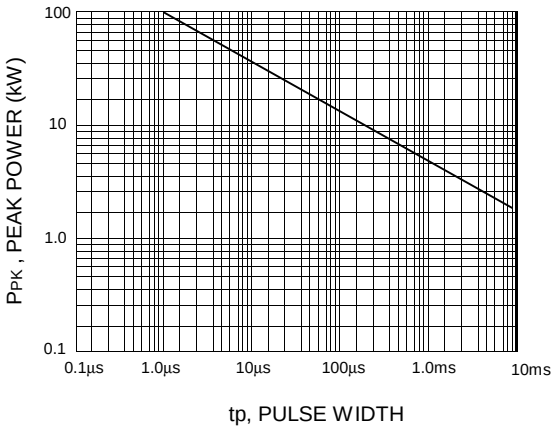



**FIG.5 - PULSE WAVEFORM**