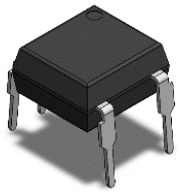
## JOCSZ21X,JOCSZ31X-D5P/S Series

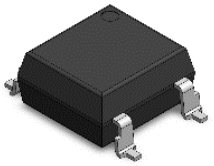
Rev.A.1.0

### DESCRIPTION:

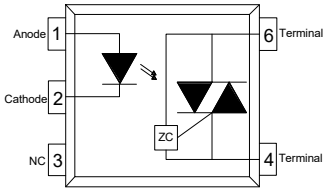
The products are 5-pin thyristor opto-couplers. The device combines an AlGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon zero-crossing photo triac in a plastic DIP5 package with different lead forming options. The products are widely used in solenoid/valve controls, lighting controls, motor controls, temperature controls, static AC power switches, solid state relays, interfacing microprocessors up to 265 $V_{AC}$ peripherals.



JOCSZX1X-D5P



JOCSZX1X-D5S




### MAIN FEATURES

High isolation 5000 VRMS
DC input with zero-crossing photo triac output
Operating temperature range -55 ℃ to 110 ℃
REACH & RoHS compliance
HBM: H3A; MM: M4; CDM: C3
CQC approved
VDE approved
UL approved

### ABSOLUTE MAXIMUM RATINGS (Temperature=25°C)

| Parameter | | Symbol | | Value | Unit |
|---|---|---|---|---|---|
| Input | Forward Current | $I_F$ | | 50 | mA |
| | Peak Forward Current | $I_{FP}$ | | 1① | A |
| | Reverse Voltage | $V_R$ | | 6 | V |
| | Power Dissipation | $P_D$ | | 75 | mW |
| Output | Off-state Output Terminal Voltage | $V_{OFF}$ | JOCSZ21X | 600 | V |
| | | | JOCSZ31X | 800 | |
| | Peak On−state Current (100μs pulse, 120 pps) | $I_{TP}$ | | 2 | A |
| | On-state RMS Current | $I_{T(RMS)}$ | | 100 | mA |
| | Peak Repetitive Surge Current ($P_W$=10 ms) | $I_{TSM}$ | | 1.2 | A |
| | Output Power Dissipation | $P_O$ | | 250 | mW |
| Total Power Dissipation | | $P_{tot}$ | | 325 | mW |
| Isolation Voltage | | $V_{iso}$ | | 5000② | Vrms |

| | | | |
|---|---|---|---|
| Operating Temperature | $T_{opr}$ | -55~110 | ℃ |
| Junction Temperature | $T_j$ | 125 | ℃ |
| Storage Temperature | $T_{stg}$ | -55~125 | ℃ |
| Soldering Temperature | $T_{sol}$ | 260 | ℃ |
| Peak pulse voltage ($T_j$=25℃; non-repetitive,off-state) | $V_{pp}$ | 1 | kV |

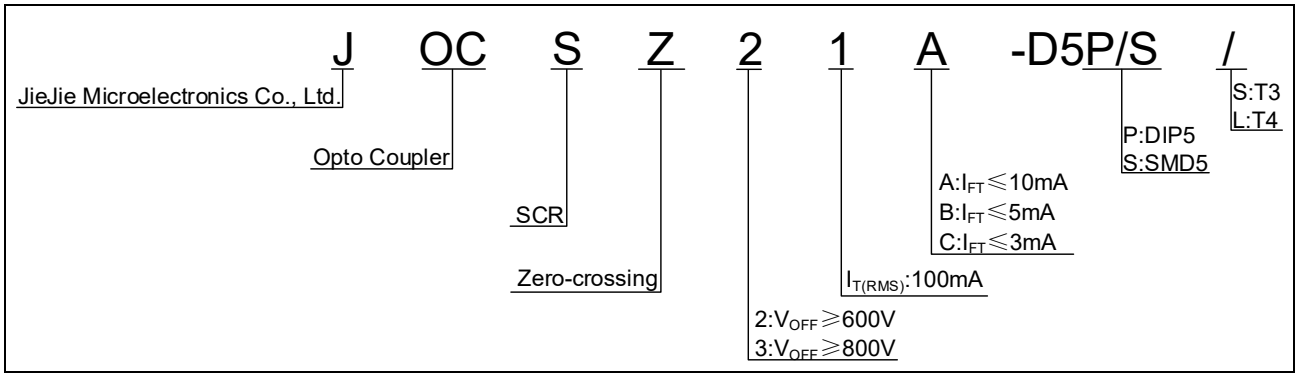
**NOTE1**: 100μs pulse, 100Hz frequency **NOTE2**: AC for 1minute, R.H.=40~60%

## ELECTRICAL CHARACTERISTICS (Temperature=25°C)

| Parameter | | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward Voltage | | $V_F$ | $I_F$=10mA | - | 1.2 | 1.5 | V |
| | Reverse Current | | $I_R$ | $V_R$=6V | - | - | 1 | μA |
| | Input Capacitance | | $C_{in}$ | V=0, f=1kHz | - | 10 | - | pF |
| Output | Peak Off-state Current, Either Direction | | $I_{OFF}$ | $V_{OFF}$=Rated $V_{OFF}$ $I_F$=0 | - | - | 100③ | nA |
| | Peak On-state Voltage, Either Direction | | $V_{TM}$ | $I_{TM}$=100mA | - | 1.7 | 2.5 | V |
| | Critical Rate of Rise of Off-state voltage | | dV/dt | $V_{PEAK}$= Rated $V_{PEAK}$ $I_F$=0 | 2000④ | - | - | V/μs |
| Transfer Characteristics | LED Trigger Current | JOCSZ21A JOCSZ31A | $I_{FT}$ | Terminal Voltage=3V $I_{TM}$=100mA | - | - | 10 | mA |
| | | JOCSZ21B JOCSZ31B | | | - | - | 5 | |
| | | JOCSZ21C JOCSZ31C | | | - | - | 3 | |
| | Holding Current | | $I_H$ | $I_{TM}$=2mA, $I_F$=Rated $I_{FT}$ | - | 500 | - | μA |
| | Isolation Resistance | | $R_{ISO}$ | DC500V 40~60%R.H. | $10^{12}$ | $10^{14}$ | - | Ω |
| | Floating Capacitance | | $C_{IO}$ | V=0, f=1MHz | - | 10 | - | pF |
| | Response Time | | $t_{on}$ | $V_D$=6V, $R_L$=100Ω, $I_F$=20mA | - | 15 | 50 | μs |
| Zero-crossing Characteristics | Inhibit Voltage | | $V_{IH}$ | $I_F$=Rated $I_{FT}$ | - | - | 20 | V |
| | Leakage in Inhibited State | | $I_{OFF2}$ | $I_F$=Rated $I_{FT}$, $V_{OFF}$=Rated $V_{OFF}$ | - | - | 1.5 | mA |

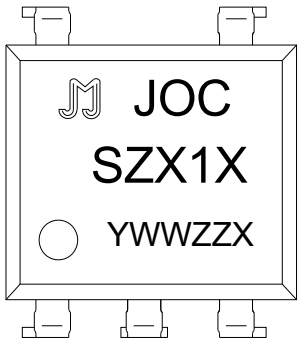
**NOTE3**: Test voltage must be applied within dV/dt ratings. **NOTE4**: Refer to Fig.14 & Fig.15

## ORDERING INFORMATION




| Packing Quantity | |
|---|---|
| **Option** | **Quantity** |
| DIP | 60 Units/Tube |
| SMD | 1200 Units/Reel |

## MARKING




## Characteristics Curves

**FIG.1:** Max. Allowable LED Forward Current vs. Ambient Temperature

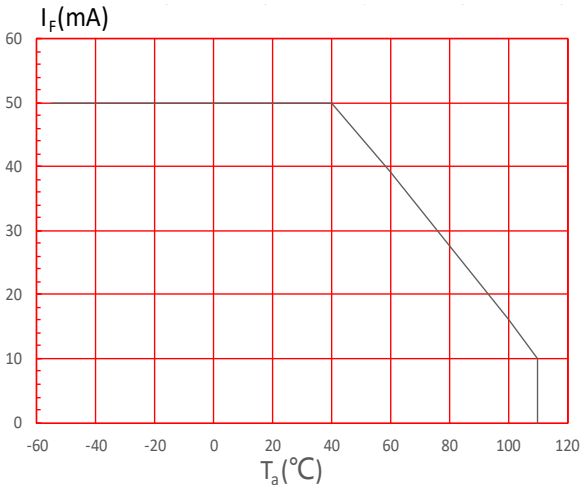



**FIG.2:** On-state Terminal Current vs. Ambient Temperature

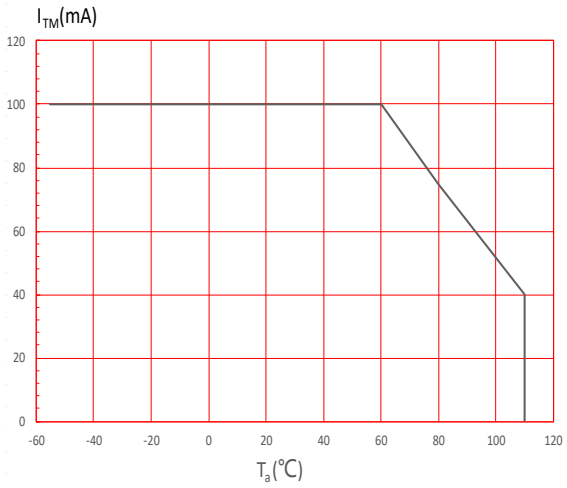



**FIG.3:** Forward Current vs. Forward Voltage

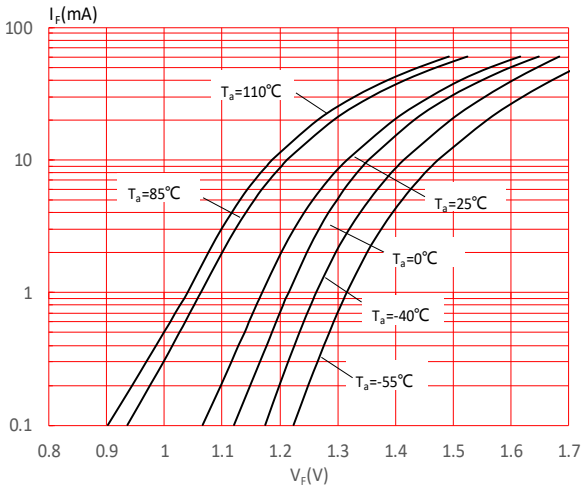



**FIG.4:** Normalized Off-state Terminal Current vs. Ambient Temperature

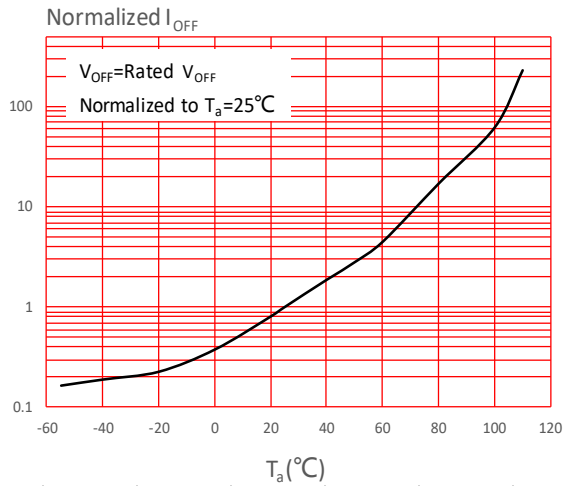



**FIG.5:** Normalized Off-state Terminal Voltage vs. Ambient Temperature

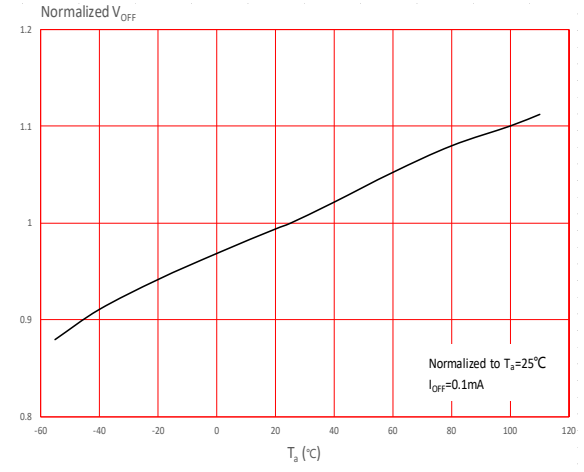



**FIG.6:** Normalized Trigger Current vs. Ambient Temperature

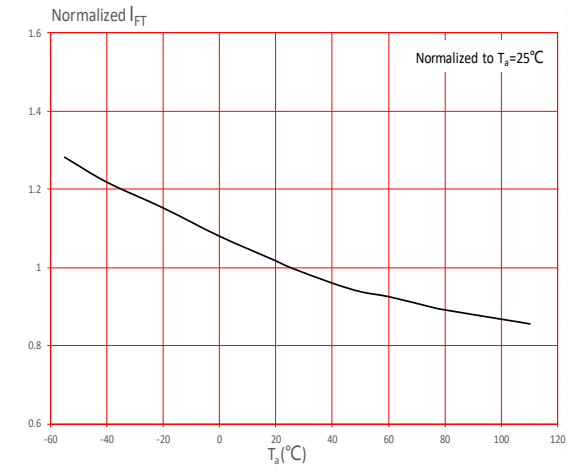


**FIG.7:** Normalized On-state Terminal Voltage vs. Ambient Temperature

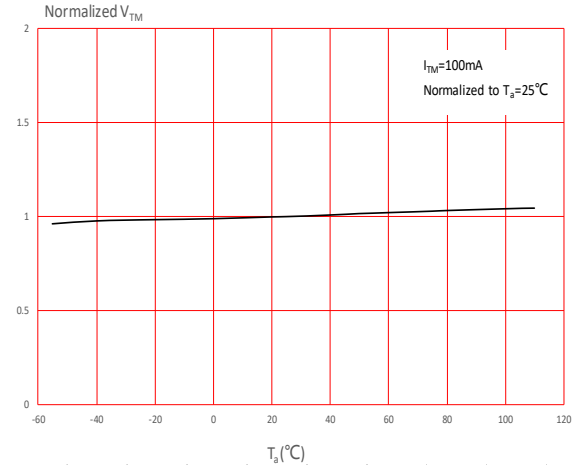



**FIG.8:** On-state Terminal Voltage vs. On-state Terminal Current

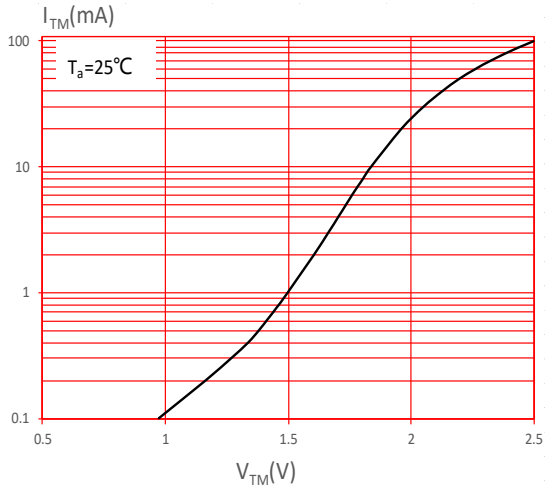



**FIG.9:** Normalized Holding Current vs. Ambient Temperature

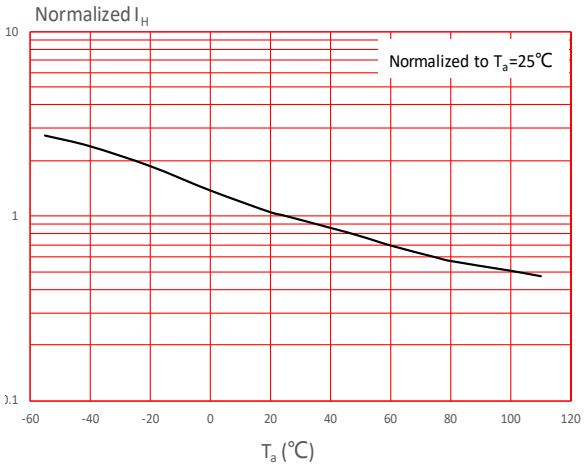



**FIG.10:** Normalized Leakage in Inhibit State vs. Ambient Temperature

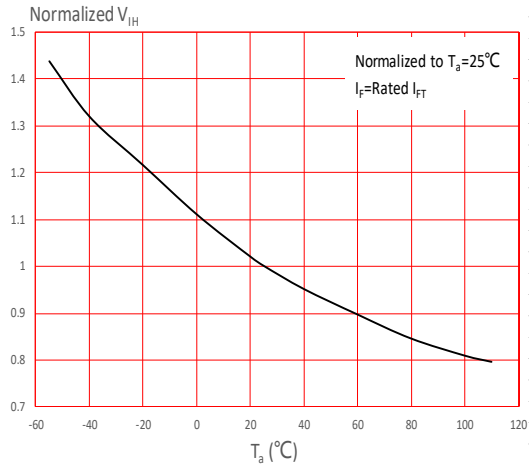
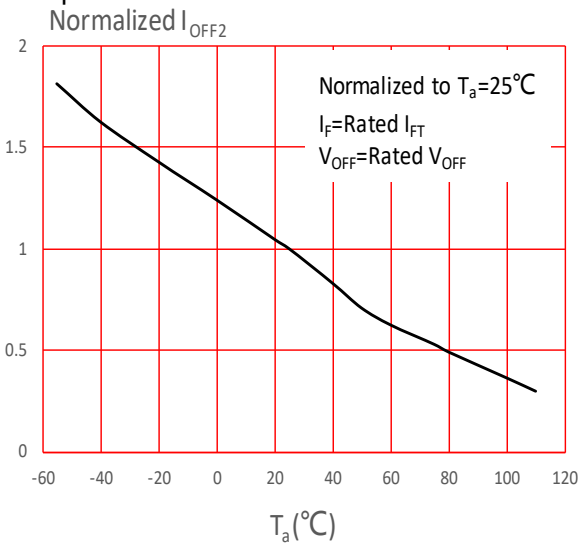



**FIG.11:** Normalized Inhibit Voltage vs. Ambient Temperature



## TEST CIRCUITS

**FIG.12:** Test Circuits of Turn On Time

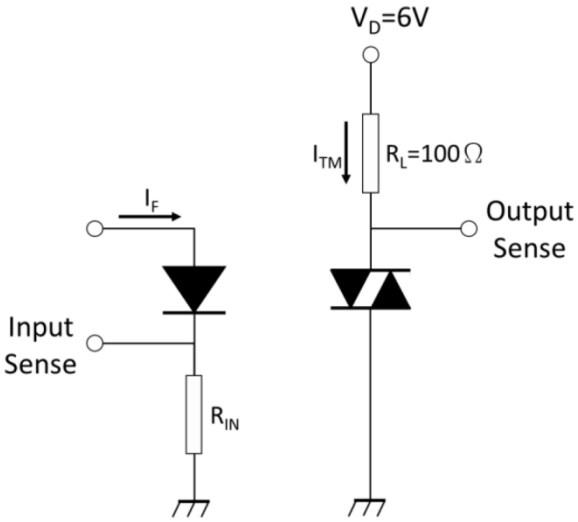



**FIG.13:** Waveforms of Turn On Time

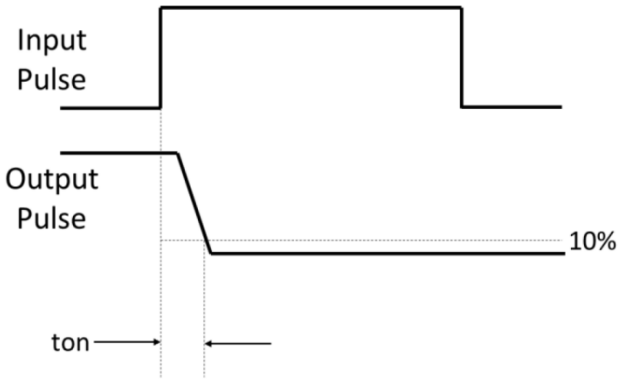



**Fig.14: Test Circuits of dV/dt**

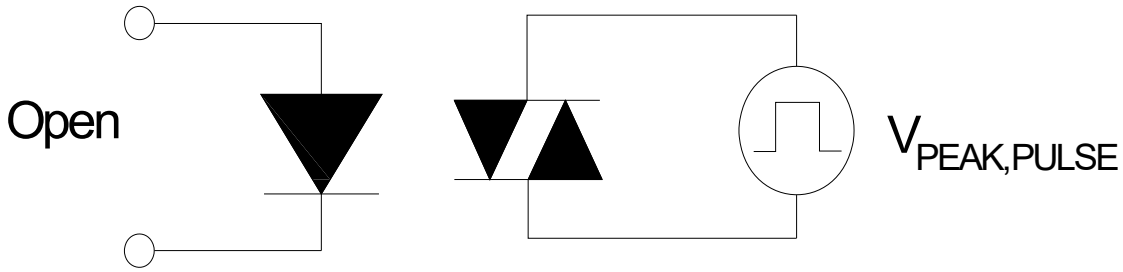
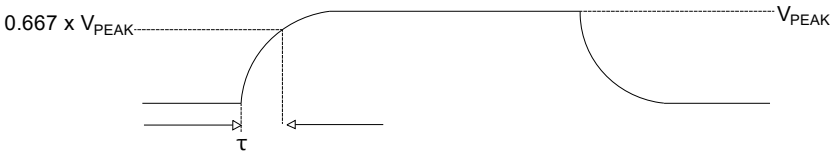
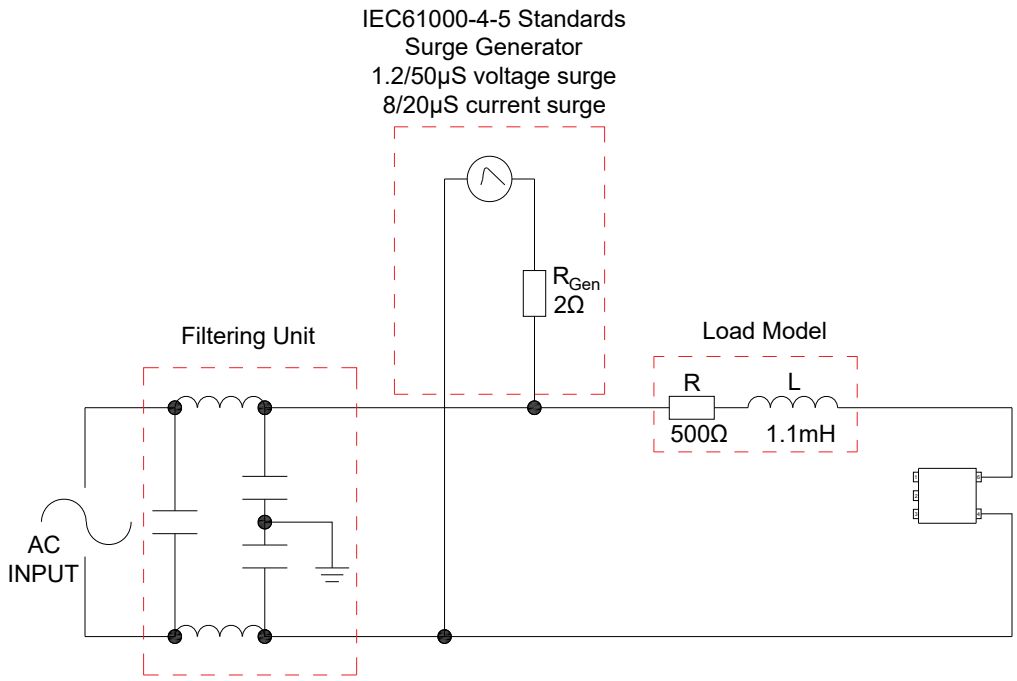



**Fig.15: Waveforms of dV/dt**



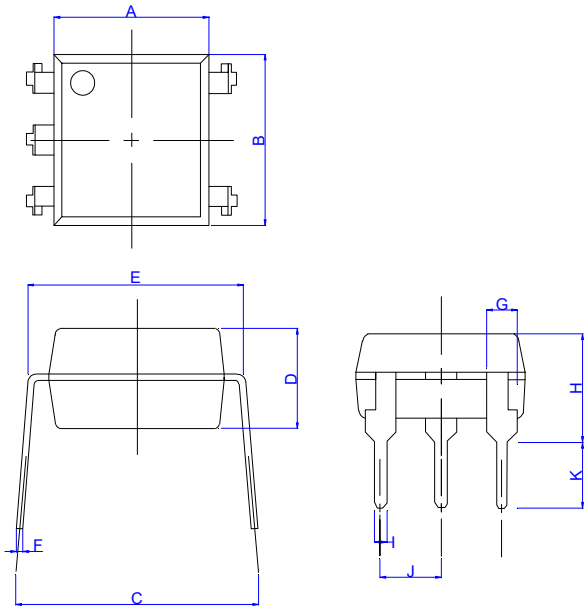

$$dV/dt=\frac{0.667 \times V_{PEAK}}{\tau}$$

**FIG.16:** Test circuit for inductive and resistive loads to IEC-61000-4-5 standards



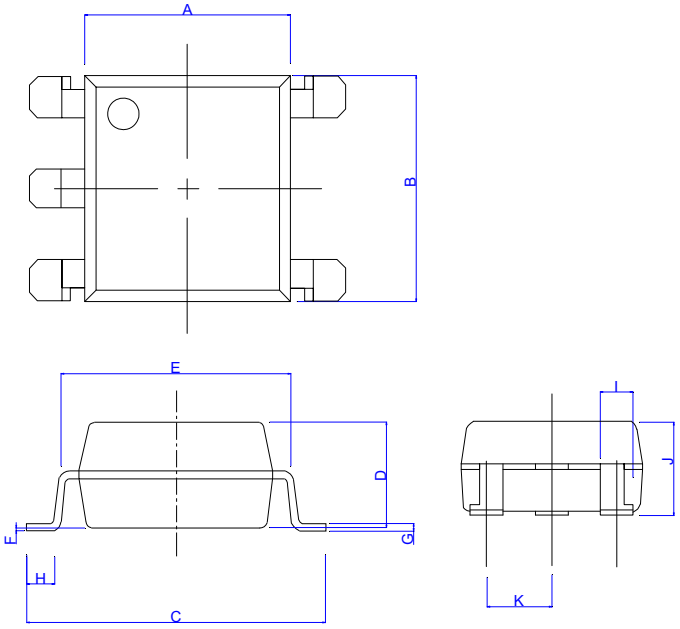

## Package Dimension (Unit: mm)

### Standard DIP Type:




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 6.20 | | 6.60 | 0.244 | | 0.260 |
| B | 6.92 | | 7.32 | 0.272 | | 0.288 |
| C | 7.15 | | 8.95 | 0.281 | | 0.352 |
| D | 3.20 | | 3.60 | 0.126 | | 0.142 |
| E | 7.32 | | 7.92 | 0.288 | | 0.312 |
| F | 0.15 | | 0.35 | 0.006 | | 0.014 |
| G | 1.15 | | 1.35 | 0.045 | | 0.053 |
| H | 3.90 | | 4.50 | 0.154 | | 0.177 |
| I | 0.40 | | 0.60 | 0.016 | | 0.024 |
| J | 2.29 | | 2.79 | 0.090 | | 0.110 |
| K | 2.24 | | 3.24 | 0.088 | | 0.128 |

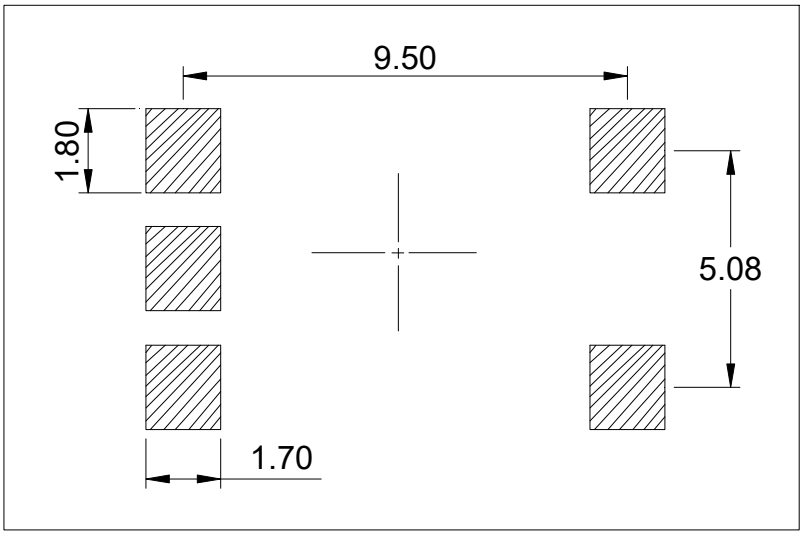
**Option SMD Type:**




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 6.20 | | 6.60 | 0.244 | | 0.260 |
| B | 6.92 | | 7.32 | 0.272 | | 0.288 |
| C | 9.50 | | 10.50 | 0.375 | | 0.413 |
| D | 3.20 | | 3.60 | 0.126 | | 0.142 |
| E | 7.32 | | 7.92 | 0.288 | | 0.312 |
| F | 0.05 | | 0.35 | 0.002 | | 0.014 |
| G | 0.16 | | 0.36 | 0.006 | | 0.014 |
| H | 0.60 | | 1.40 | 0.024 | | 0.055 |
| I | 0.90 | | 1.50 | 0.035 | | 0.059 |
| J | 3.30 | | 3.90 | 0.130 | | 0.154 |
| K | 2.29 | | 2.79 | 0.090 | | 0.110 |

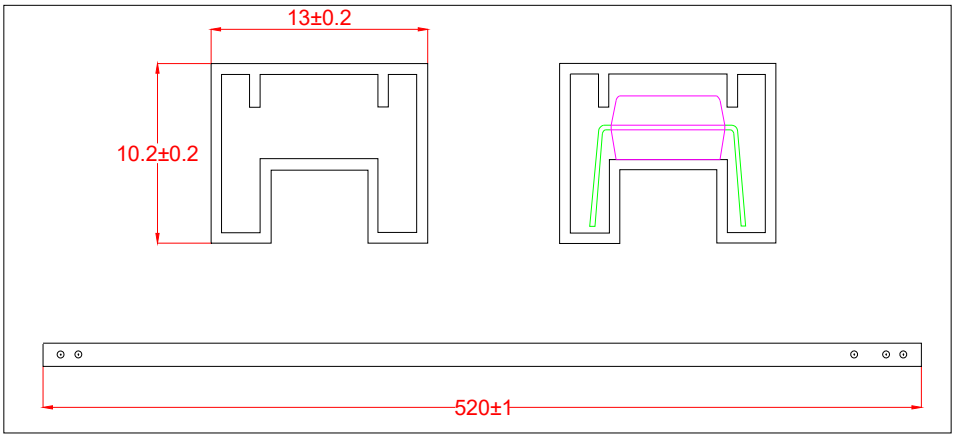
## RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

**Option SMD**



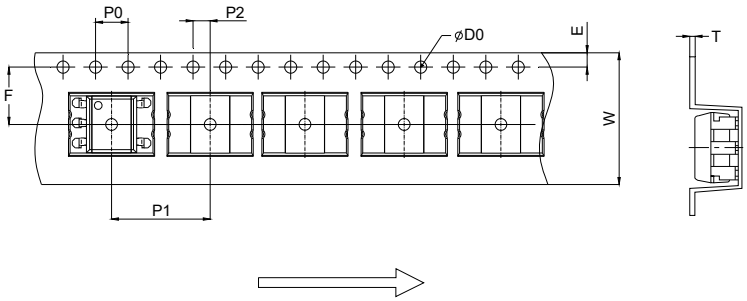
## TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

### Standard DIP



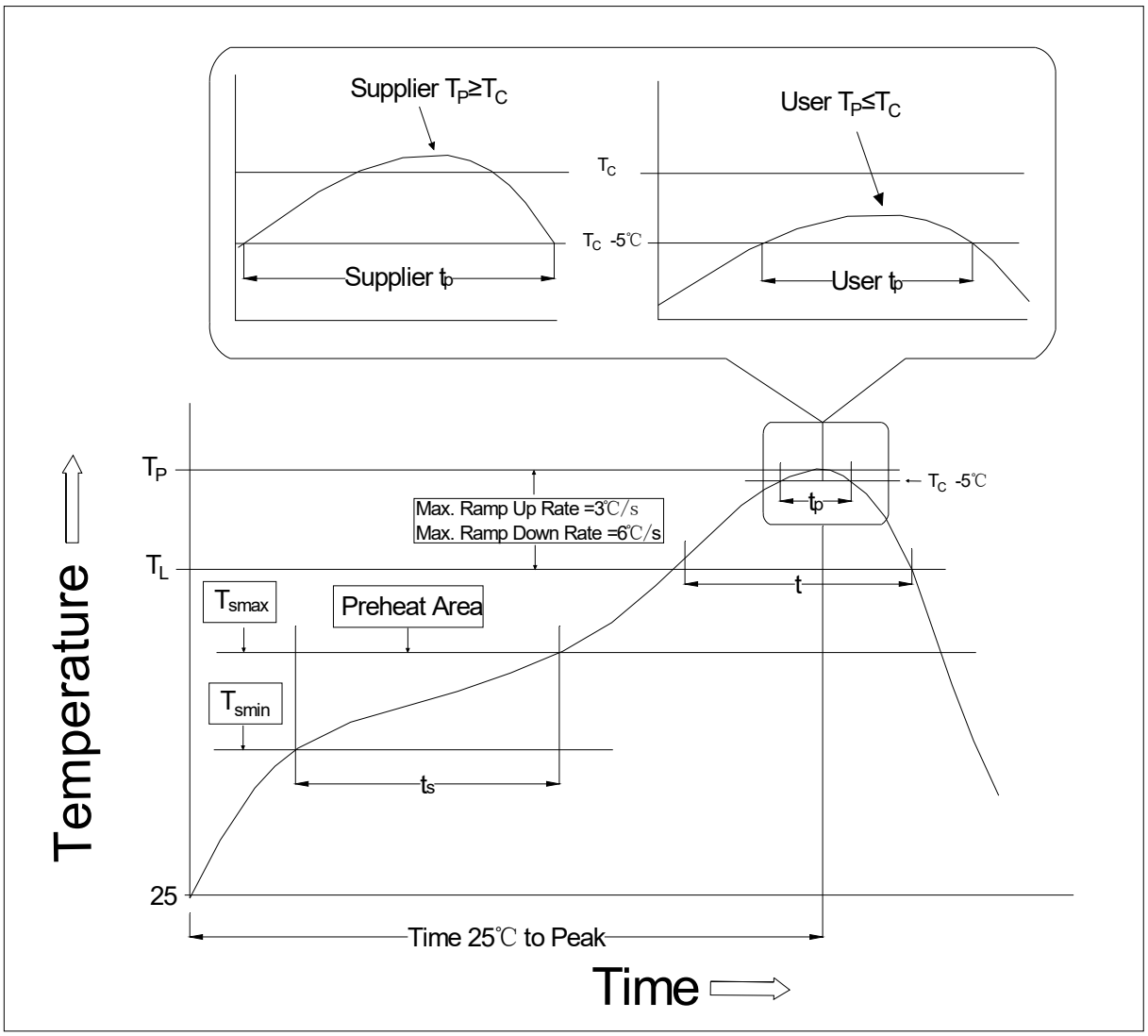

## CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

**Option S/L**



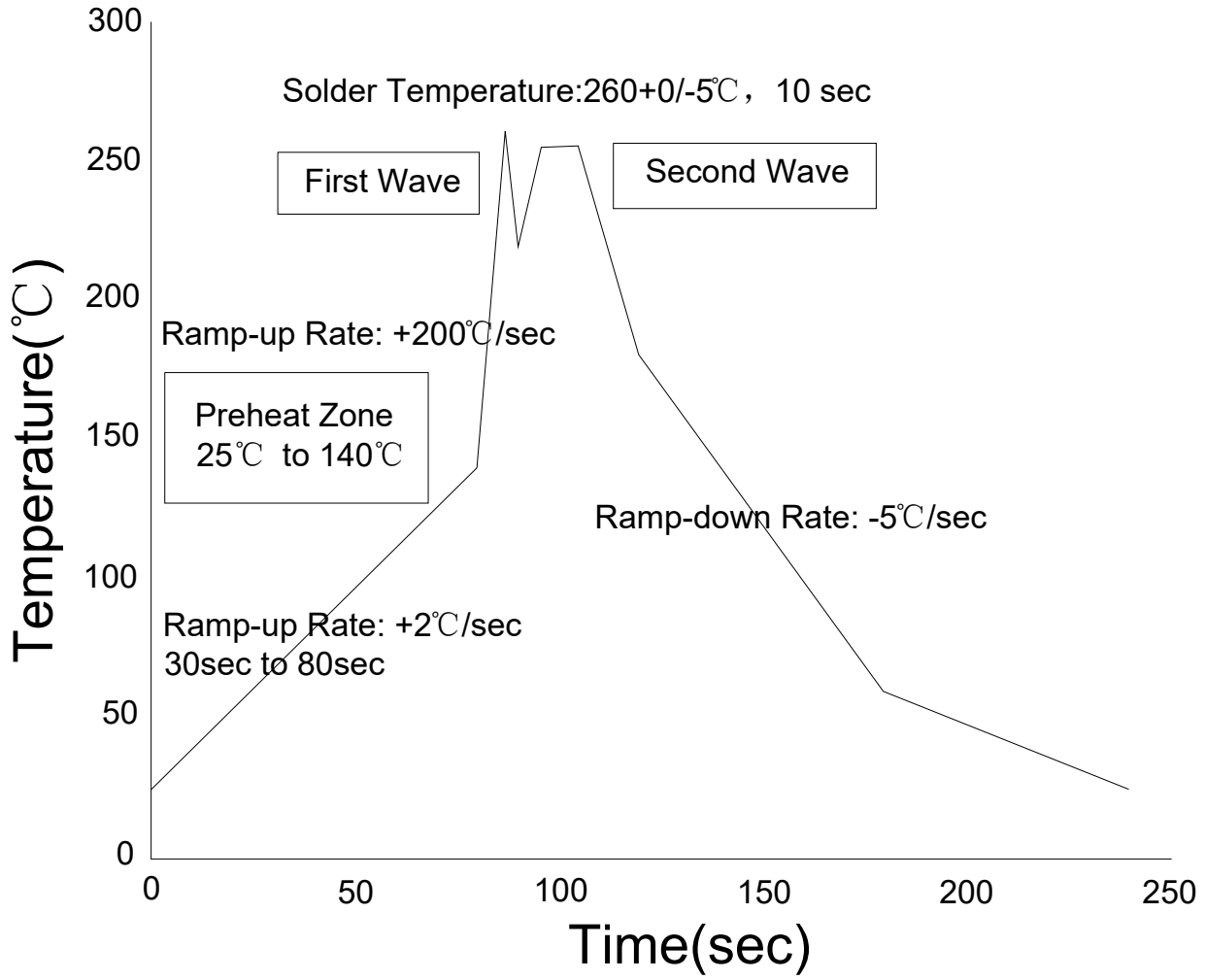

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| D0 | | 1.50 | 1.60 | | 0.059 | 0.063 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 11.90 | 12.00 | 12.10 | 0.469 | 0.472 | 0.476 |
| P2 | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| E | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| F | 7.40 | 7.50 | 7.60 | 0.291 | 0.295 | 0.299 |
| T | 0.35 | 0.40 | 0.45 | 0.014 | 0.016 | 0.018 |
| W | 15.70 | 16.00 | 16.30 | 0.618 | 0.630 | 0.642 |

## REFLOW INFORMATION




| Profile Feature | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|---|---|---|
| Temperature Min. (Tsmin) | 100 | 150℃ |
| Temperature Max. (Tsmax) | 150 | 200℃ |
| Time (ts) from (Tsmin to Tsmax) | 60-120 seconds | 60-120 seconds |
| Ramp-up Rate (tL to tP) | 3℃/second max. | 3℃/second max. |
| Liquidus Temperature (TL) | 183℃ | 217℃ |
| Time (tL) Maintained Above (TL) | 60-150 seconds | 60-150 seconds |
| Peak Body Package Temperature | 235℃+0℃/-5℃ | 260℃+0℃/-5℃ |
| Time (tP) within 5℃ of 260℃ | 20 seconds | 30 seconds |
| Ramp-down Rate (TP to TL) | 6℃/second max. | 6℃/second max. |
| Time 25℃ to Peak Temperature | 6 minutes max. | 8 minutes max. |

## WAVE SOLDERING




| HAND SOLDERING BY SOLDERING IRON | |
|---|---|
| Soldering Temperature | 360±5℃ |
| Soldering Time | 3s max. |

Note:

1. Reflow soldering is recommended at the temperatures and times shown, no more than three times.

2. Avoid direct contact between the epoxy body and any tools or surfaces exceeding its maximum storage temperature.

3. Application of pressure on the epoxy body is prohibited at elevated temperatures. In specific scenarios, any applied force must not exceed 2.5N.

4. Ensure the component has cooled to ambient temperature before proceeding with any subsequent manufacturing steps.

5. The component has a shelf life of one year when stored under standard conditions.

6. Recommend storage Temp.: 0~40°C;

Recommend storage humidity: <60%;

MSL level: MSL 1