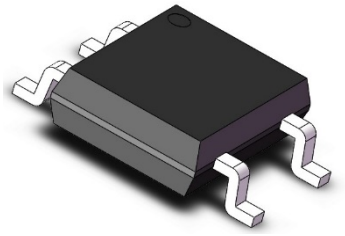
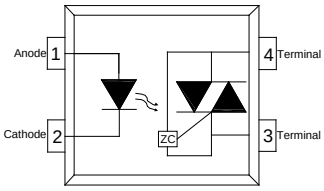
## JOC304XM4 Series

Rev.A.1.0

### DESCRIPTION:

The JOC304XM4 series combine an AIGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon zero-crossing photo triac in a plastic SOP4 package. With the robust coplanar double mold structure, JOC304XM4 series provide the most stable isolation feature. The products are widely used in solenoid/value controls, lighting controls, motor controls, temperature controls, static AC power switches, solid state relays, interfacing microprocessors up to 120 $V_{AC}$ peripherals.






### MAIN FEATURES

High isolation  3750 VRMS
DC input with zero-crossing photo triac output
Operating temperature range -55 ℃ to 100 ℃
REACH compliance
Halogen free
MSL class 1
HBM: H3A ; MM: M4
CQC approved
VDE approved
UL approved

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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Input | Forward Current | $I_F$ | 60 | mA |
| | Reverse Voltage | $V_R$ | 6 | V |
| | Junction Temperature | $T_j$ | 125 | ℃ |
| | Input Power Dissipation | $P_I$ | 100 | mW |
| | Power Dissipation Derating ($T_a \geqslant 25℃$) | $\Delta P_D/℃$ | -1.33 | mW/℃ |
| Output | Off-state Output Terminal Voltage | $V_{OFF}$ | 400 | V |
| | 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 | A |
| | Junction Temperature | $T_j$ | 125 | ℃ |
| | Output Power Dissipation | $P_O$ | 250 | mW |
| | Power Dissipation Derating ($T_a$≥25℃) | $\Delta P_D$/℃ | -3.33 | mW/℃ |
| Total Power Dissipation | | $P_{tot}$ | 350 | mW |
| Isolation Voltage | | $V_{iso}$ | 3750① | Vrms |
| Operating Temperature | | $T_{opr}$ | -55~100 | ℃ |
| Storage Temperature | | $T_{stg}$ | -55~150 | ℃ |
| Soldering Temperature | | $T_{sol}$ | 260② | ℃ |

**NOTE1**: AC for 1minute, R.H.=40~60%

**NOTE2**: For 10 seconds

## ELECTRICAL CHARACTERISTICS (Temperature=25°C)

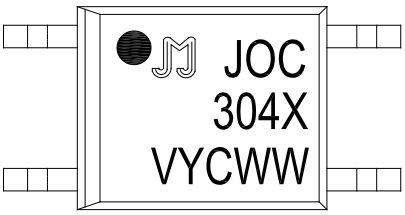
| Parameter | | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward Voltage | | $V_F$ | $I_F$=10mA | - | 1.2 | 1.4 | V |
| | Reverse Current | | $I_R$ | $V_R$=6V | - | - | 1 | μA |
| | Input Capacitance | | $C_{in}$ | V=0, f=1kHz | - | 10 | - | pF |
| Output | Peak Off-state Current, Either Direction | | $I_{OFF}$ | $V_{OFF}$=400V, $I_F$=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 | $V_{PEAK}$=400V, $I_F$=0 | 1000④ | - | - | V/μs |
| Transfer Characteristics | LED Trigger Current | JOC3041M4 | $I_{FT}$ | Terminal Voltage=3V $I_{TM}$=100mA | - | - | 15 | mA |
| | | JOC3042M4 | | | - | - | 10 | |
| | | JOC3043M4 | | | - | - | 5 | |
| | Holding Current | | $I_H$ | $I_{TM}$=2mA, $I_F$=Rated $I_{FT}$ | - | 250 | - | μA |
| | Isolation Resistance | | $R_{ISO}$ | DC500V 40~60%R.H. | $10^{12}$ | $10^{14}$ | - | Ω |
| | Floating Capacitance | | $C_{IO}$ | V=0, f=1MHz | - | 8 | - | 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 $V_{OFF}$ | - | - | 5 | mA |

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

## ORDERING AND MARKING INFORMATION

**MARKING INFORMATION**




JOC : Company Abbr.
304X : Part Number & Rank
VYCWW : LOT NO.

**ORDERING INFORMATION**

**JOC304XMX(Z)-GV**

JOC – Company Abbr.
304X – Rank
(1/2/3)
MX– SOP Package
Z – Tape and Reel Option (T1/T2)
G – Green
V – VDE Option (V or None)

**Packing Quantity**

| Option | Quantity | Quantity – Inner box | Quantity –Outer box |
|---|---|---|---|
| T1/T2 | 3000 Units/Reel | 4 Reels/Inner box | 5 Inner box/Outer box =60k Units |

## Characteristics Curves

**FIG.1:** Forward Current vs. Ambient Temperature

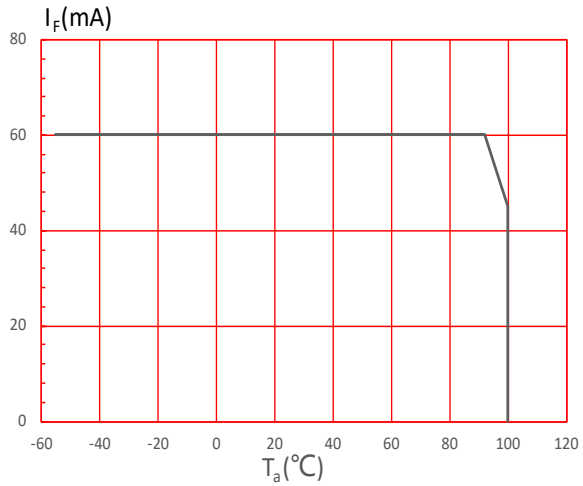



**FIG.2:** On-state Terminal Current vs. Ambient Temperature

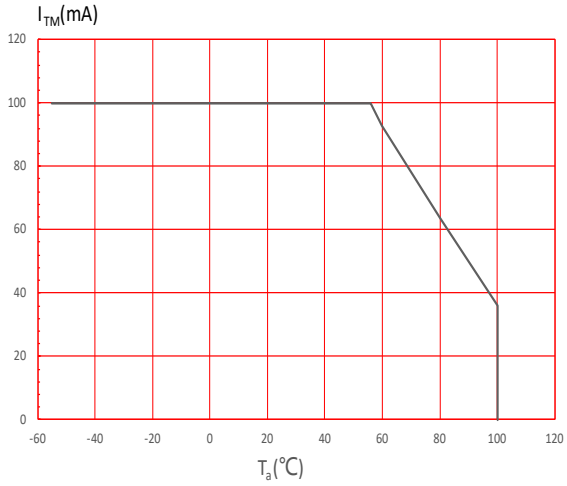



**FIG.3:** Forward Current vs. Forward Voltage

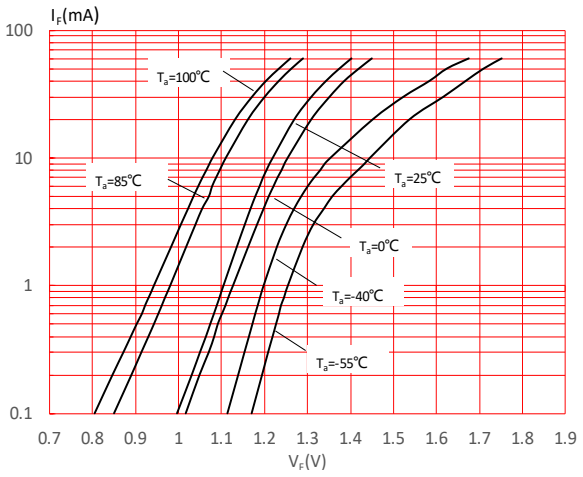



**FIG.4:** Normalized Off-state Terminal Current vs. Ambient Temperature

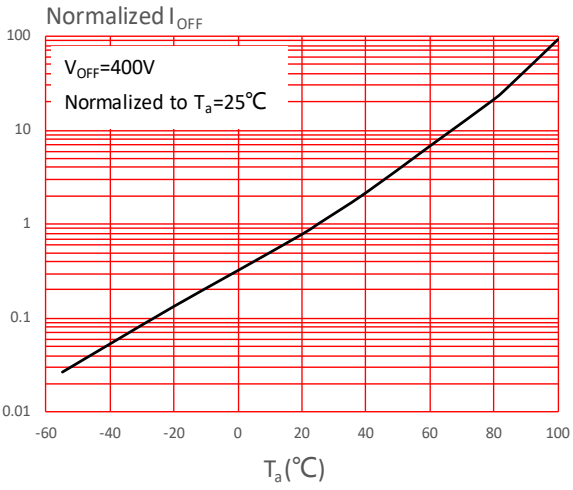



**FIG.5:** Normalized Off-state Terminal Voltage vs. Ambient Temperature

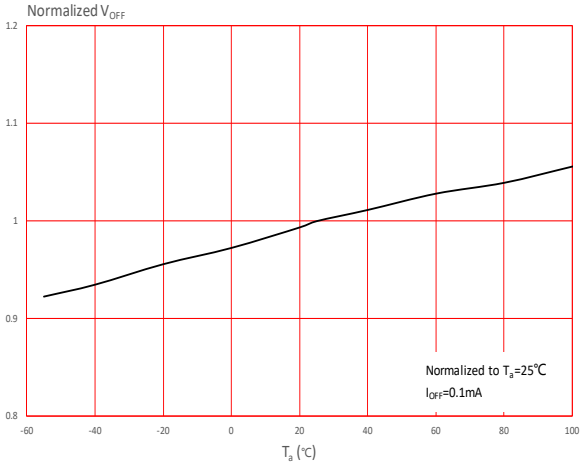



**FIG.6:** Normalized Trigger Current vs. Ambient Temperature

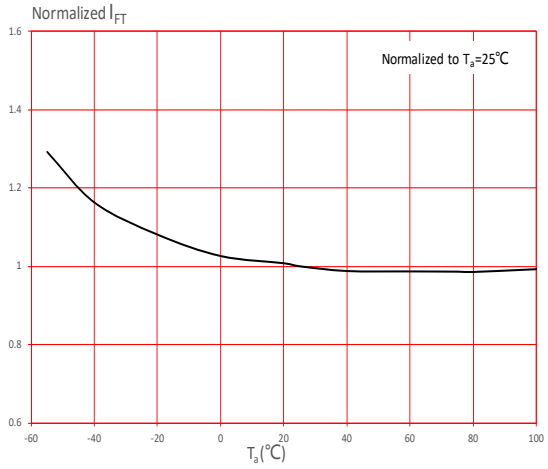


**FIG.7:** Normalized On-state Terminal Voltage vs. Ambient Temperature

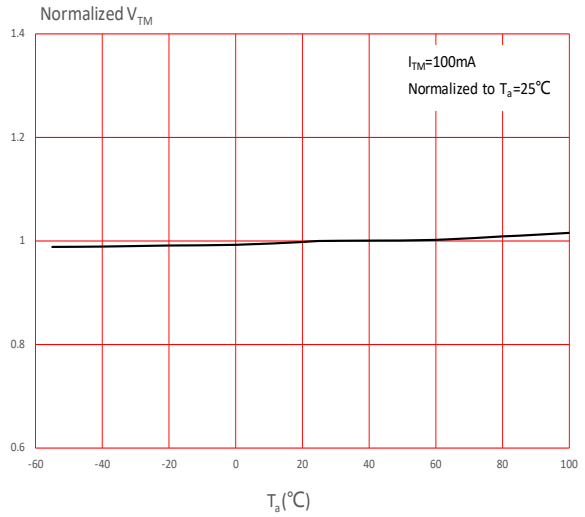



**FIG.8:** On-state Terminal Voltage vs. On-state Terminal Current

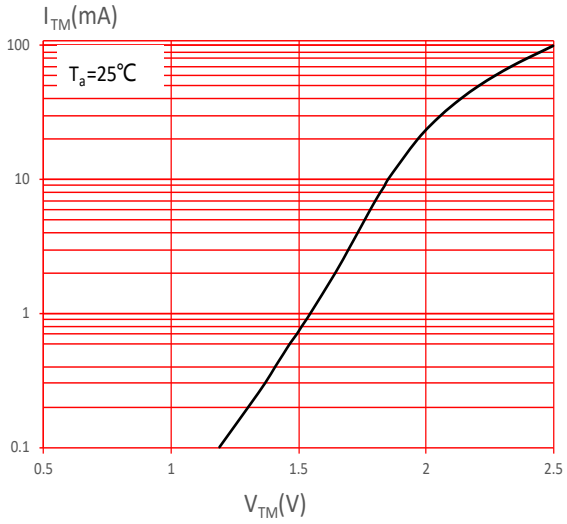



**FIG.9:** Normalized Holding Current vs. Ambient Temperature

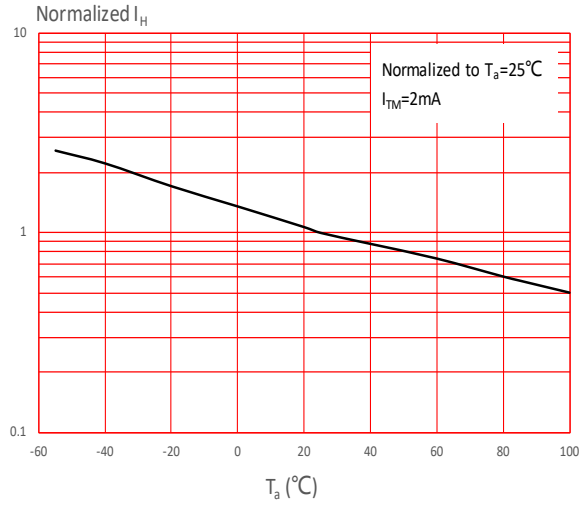



**FIG.10:** Normalized Leakage in Inhibit State vs. Ambient Temperature

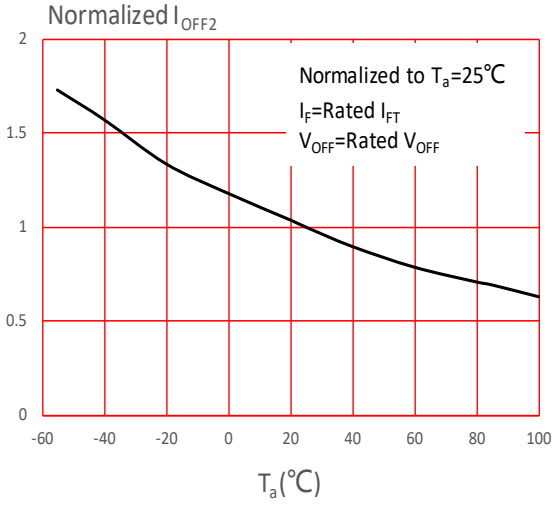
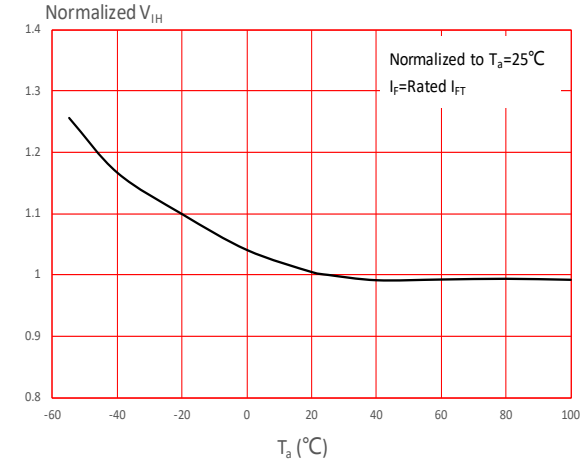



**FIG.11:** Normalized Inhibit Voltage vs. Ambient Temperature



## TEST CIRCUITS

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

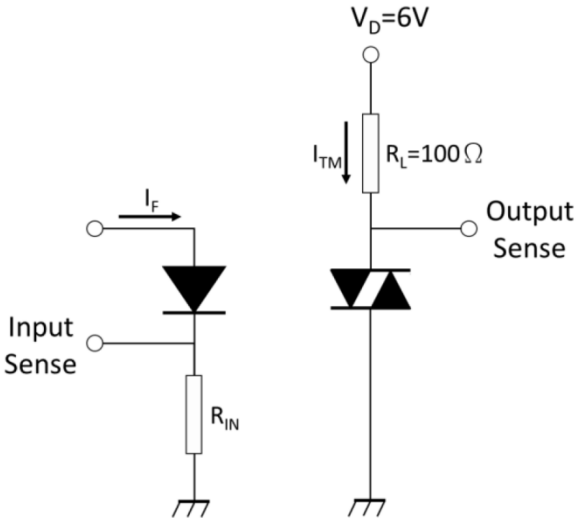



**FIG.13:** Waveforms of Turn On Time

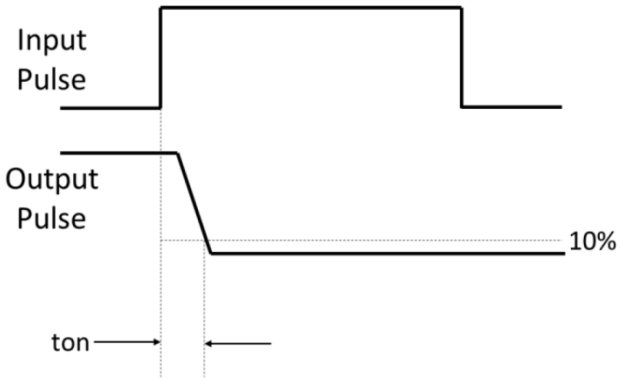



**Fig.14: Test Circuits of dV/dt**

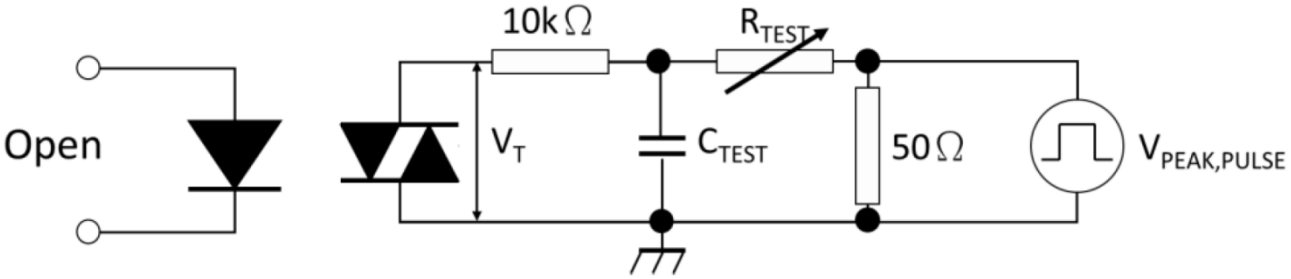
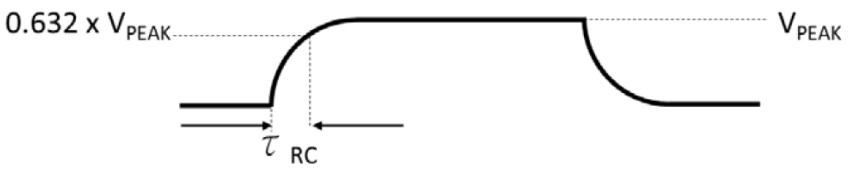
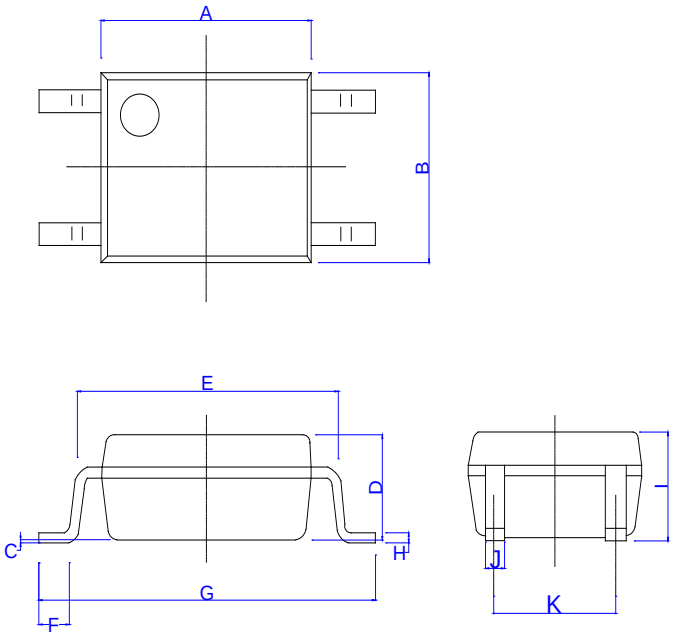



**Fig.15: Waveforms of dV/dt**



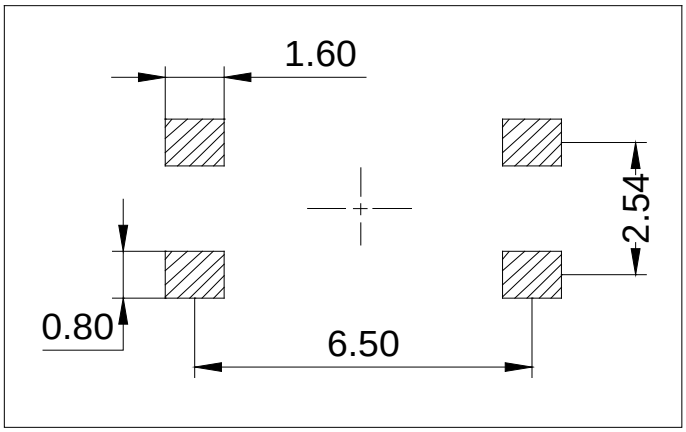

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

## Package Dimension (Unit: mm）



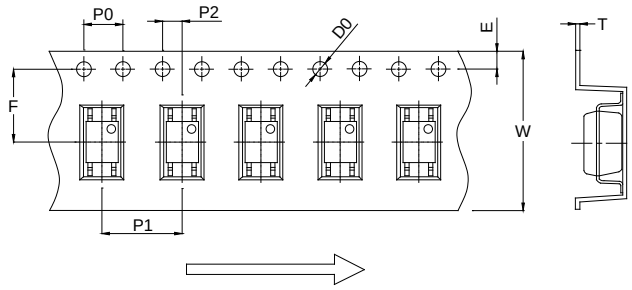

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.20 | | 4.85 | 0.165 | | 0.191 |
| B | 3.30 | | 4.40 | 0.130 | | 0.173 |
| C | 0.00 | | 0.20 | 0.000 | | 0.008 |
| D | 1.75 | | 2.80 | 0.069 | | 0.110 |
| E | 4.90 | | 5.80 | 0.193 | | 0.228 |
| F | 0.30 | | 0.90 | 0.012 | | 0.035 |
| G | 6.30 | | 7.30 | 0.248 | | 0.287 |
| H | 0.10 | | 0.30 | 0.004 | | 0.012 |
| I | 1.80 | | 2.90 | 0.071 | | 0.114 |
| J | 0.25 | | 0.55 | 0.010 | | 0.022 |
| K | 2.29 | | 2.79 | 0.090 | | 0.110 |

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



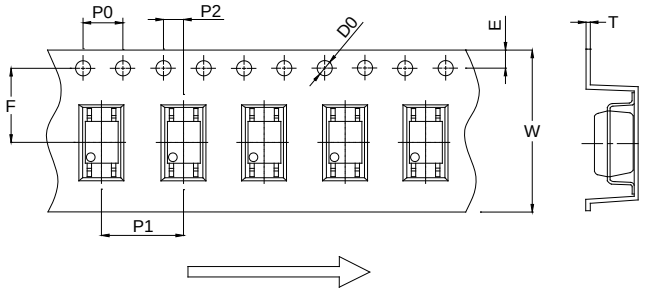
## CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

### Option T1



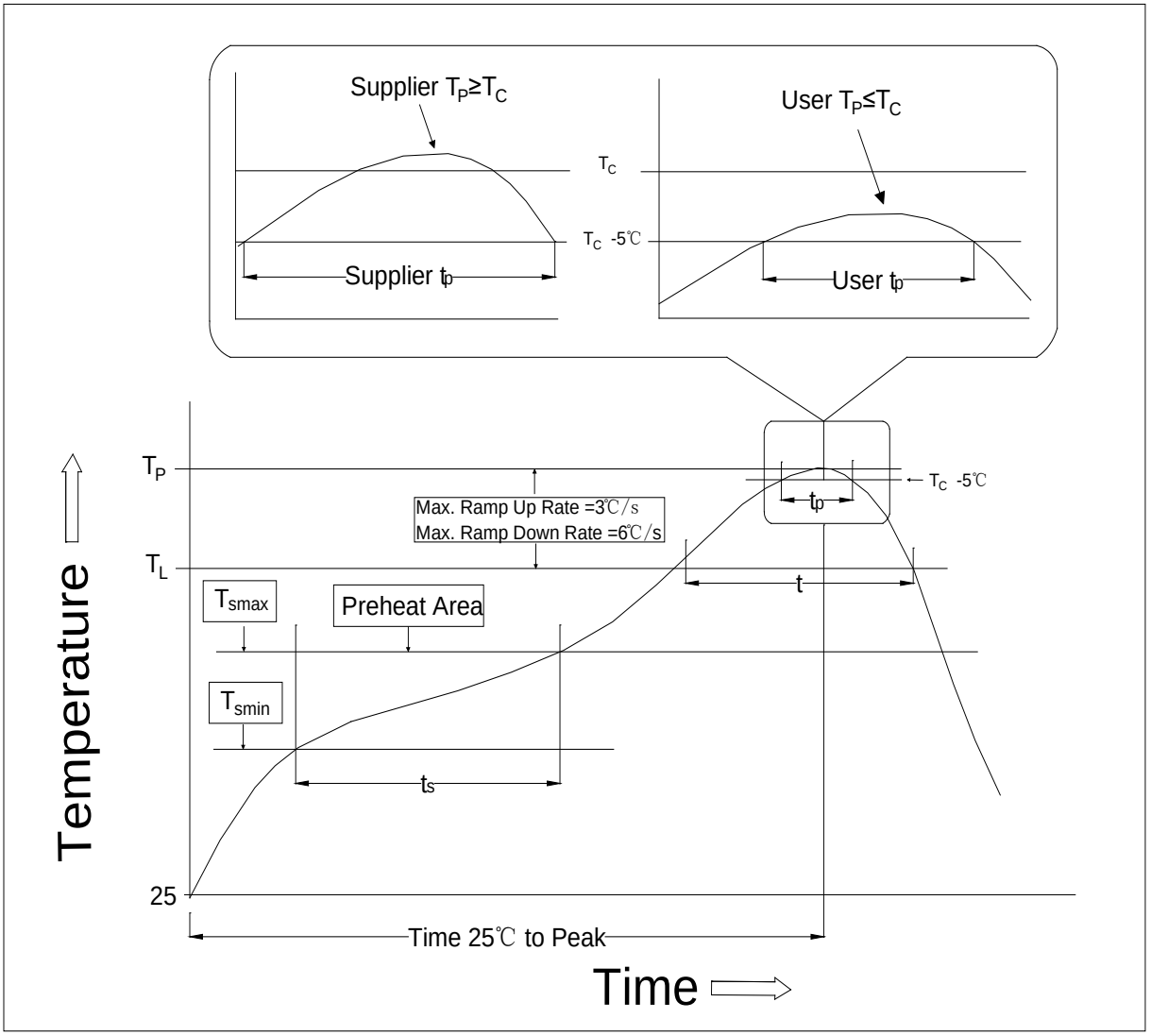

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| D0 | | 1.45 | 1.65 | | 0.057 | 0.065 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| P2 | 1.90 | 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 | 0.15 | 0.30 | 0.45 | 0.006 | 0.012 | 0.018 |
| W | 15.70 | 16.00 | 16.30 | 0.618 | 0.630 | 0.642 |

### Option T2




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| D0 | | 1.45 | 1.65 | | 0.057 | 0.065 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| 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 | 0.15 | 0.30 | 0.45 | 0.006 | 0.012 | 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. |

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