



## JOC305XD4 Series

Rev.A.1.1

### DESCRIPTION:

The JOC305XD4 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon random-phase photo triac in a plastic DIP4 package with different lead forming options. With the robust coplanar double mold structure, JOC305XD4 series provide the most stable isolation feature. 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<sub>AC</sub> peripherals.

### MAIN FEATURES

High isolation 5000 VRMS

DC input with random-phase photo triac output

Operating temperature range -55 °C to 100 °C

REACH compliance

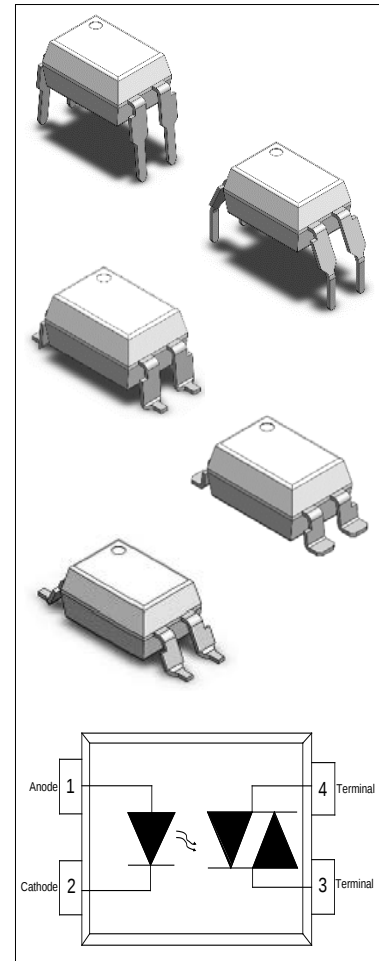
Halogen free

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   | °C    |
|           | Input Power Dissipation                                    | $P_I$                       | 100   | mW    |
|           | Power Dissipation Derating ( $T_a \geq 25^\circ\text{C}$ ) | $\Delta P_D/^\circ\text{C}$ | -1.33 | mW/°C |
| Output    | Off-state Output Terminal Voltage                          | $V_{OFF}$                   | 600   | 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               | °C               |
|                         | Output Power Dissipation                                      | $P_O$                       | 250               | mW               |
|                         | Power Dissipation Derating<br>( $T_a \geq 25^\circ\text{C}$ ) | $\Delta P_D/^\circ\text{C}$ | -3.33             | mW/°C            |
| Total Power Dissipation |                                                               | $P_{\text{tot}}$            | 350               | mW               |
| Isolation Voltage       |                                                               | $V_{\text{iso}}$            | 5000 <sup>①</sup> | V <sub>rms</sub> |
| Operating Temperature   |                                                               | $T_{\text{opr}}$            | -55~100           | °C               |
| Storage Temperature     |                                                               | $T_{\text{stg}}$            | -55~125           | °C               |
| Soldering Temperature   |                                                               | $T_{\text{sol}}$            | 260 <sup>②</sup>  | °C               |

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

**NOTE2:** For 10 seconds

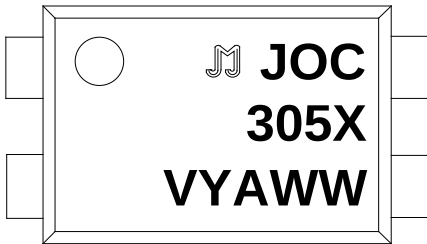
### ELECTRICAL CHARACTERISTICS (Temperature=25°C)

| Parameter                |                                            |           | Symbol           | Condition                                                   | Min.              | Typ.      | Max.             | Unit |
|--------------------------|--------------------------------------------|-----------|------------------|-------------------------------------------------------------|-------------------|-----------|------------------|------|
| Input                    | Forward Voltage                            |           | $V_F$            | $I_F=10\text{mA}$                                           | -                 | 1.24      | 1.4              | V    |
|                          | Reverse Current                            |           | $I_R$            | $V_R=6\text{V}$                                             | -                 | -         | 1                | μA   |
|                          | Input Capacitance                          |           | $C_{\text{in}}$  | $V=0, f=1\text{kHz}$                                        | -                 | 10        | -                | pF   |
| Output                   | Peak Off-state Current, Either Direction   |           | $I_{\text{OFF}}$ | $V_{\text{OFF}}=600\text{V}, I_F=0$                         | -                 | -         | 100 <sup>③</sup> | nA   |
|                          | Peak On-state Voltage, Either Direction    |           | $V_{\text{TM}}$  | $I_{\text{TM}}=100\text{mA}$                                | -                 | 1.8       | 2.5              | V    |
|                          | Critical Rate of Rise of Off-state voltage |           | $dV/dt$          | $V_{\text{PEAK}}=600\text{V}, I_F=0$                        | 1000 <sup>④</sup> | -         | -                | V/μs |
| Transfer Characteristics | LED Trigger Current                        | JOC3051D4 | $I_{\text{FT}}$  | Terminal Voltage=3V<br>$I_{\text{TM}}=100\text{mA}$         | -                 | -         | 15               | mA   |
|                          |                                            | JOC3052D4 |                  |                                                             | -                 | -         | 10               |      |
|                          |                                            | JOC3053D4 |                  |                                                             | -                 | -         | 5                |      |
|                          | Holding Current                            |           | $I_H$            | $I_{\text{TM}}=2\text{mA}, I_F=\text{Rated } I_{\text{FT}}$ | -                 | 250       | -                | μA   |
|                          | Isolation Resistance                       |           | $R_{\text{ISO}}$ | DC500V<br>40~60%R.H.                                        | $10^{12}$         | $10^{14}$ | -                | Ω    |
|                          | Floating Capacitance                       |           | $C_{\text{IO}}$  | $V=0, f=1\text{MHz}$                                        | -                 | 5         | -                | pF   |
|                          | Response Time                              |           | $t_{\text{on}}$  | $V_D=6\text{V}, R_L=100\Omega, I_F=20\text{mA}$             | -                 | 15        | 50               | μs   |

**NOTE3:** Test voltage must be applied within  $dV/dt$  ratings.

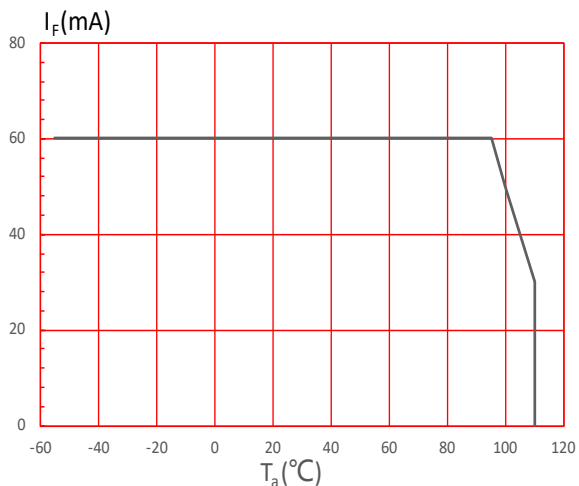
**NOTE4:** Refer to Fig.14 & Fig.15

## ORDERING AND MARKING INFORMATION

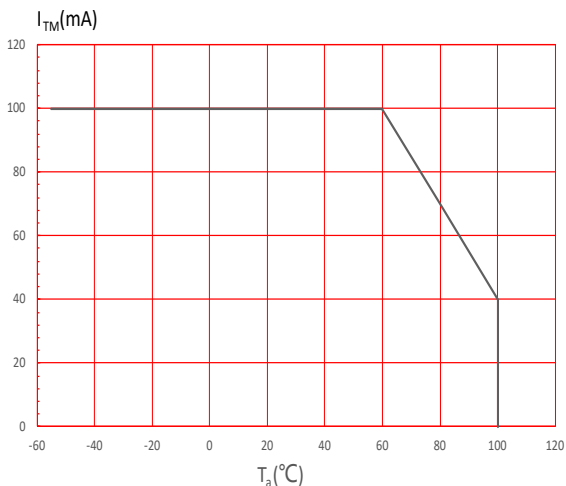
| MARKING INFORMATION                                                                                                                                                                                                                                        |                 |                                                                                                                                                                                          |                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
|                                                                                                                                                                           |                 | <div>JOC : Company Abbr.</div> <div>305X : Part Number &amp; Rank</div> <div>V : VDE Option</div> <div>Y : Fiscal Year</div> <div>A : Manufacturing Code</div> <div>WW : Work Week</div> |                                    |
| ORDERING INFORMATION                                                                                                                                                                                                                                       |                 |                                                                                                                                                                                          |                                    |
| JOC305XD4(Y)(Z)-GV                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                          |                                    |
| <div>JOC – Company Abbr.</div> <div>305X – Part Number (1/2/3)</div> <div>D4 – DIP4 Package</div> <div>Y – Lead Form Option (M/S/SL/SLM/None)</div> <div>Z – Tape and Reel Option (T1/T3)</div> <div>G – Green</div> <div>V – VDE Option (V or None)</div> |                 |                                                                                                                                                                                          |                                    |
| Packing Quantity                                                                                                                                                                                                                                           |                 |                                                                                                                                                                                          |                                    |
| Option                                                                                                                                                                                                                                                     | Quantity        | Quantity – Inner box                                                                                                                                                                     | Quantity –Outer box                |
| None                                                                                                                                                                                                                                                       | 100 Units/Tube  | 32 Tubes/Inner box                                                                                                                                                                       | 10 Inner box/Outer box =32k Units  |
| M                                                                                                                                                                                                                                                          | 100 Units/Tube  | 32 Tubes/Inner box                                                                                                                                                                       | 10 Inner box/Outer box =32k Units  |
| S(T1)                                                                                                                                                                                                                                                      | 1500 Units/Reel | 3 Reels/Inner box                                                                                                                                                                        | 5 Inner box/Outer box =22.5k Units |
| S(T3)                                                                                                                                                                                                                                                      | 1000 Units/Reel | 3 Reels/Inner box                                                                                                                                                                        | 5 Inner box/Outer box =15k Units   |
| SL(T1)                                                                                                                                                                                                                                                     | 1500 Units/Reel | 3 Reels/Inner box                                                                                                                                                                        | 5 Inner box/Outer box =22.5k Units |
| SL(T3)                                                                                                                                                                                                                                                     | 1000 Units/Reel | 3 Reels/Inner box                                                                                                                                                                        | 5 Inner box/Outer box =15k Units   |
| SLM(T1)                                                                                                                                                                                                                                                    | 1500 Units/Reel | 3 Reels/Inner box                                                                                                                                                                        | 5 Inner box/Outer box =22.5k Units |

## Characteristics Curves

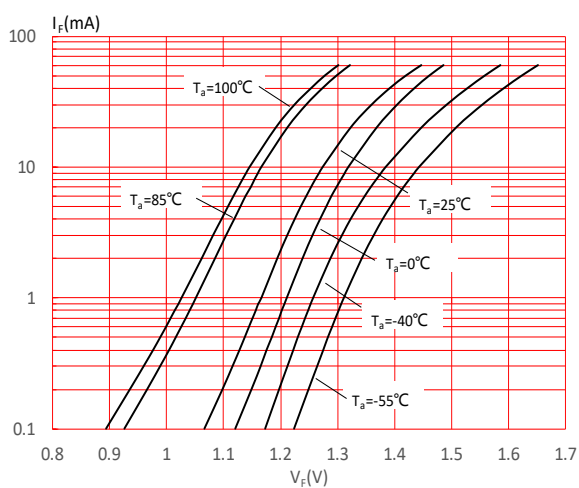
**FIG.1:** Forward Current vs. Ambient Temperature



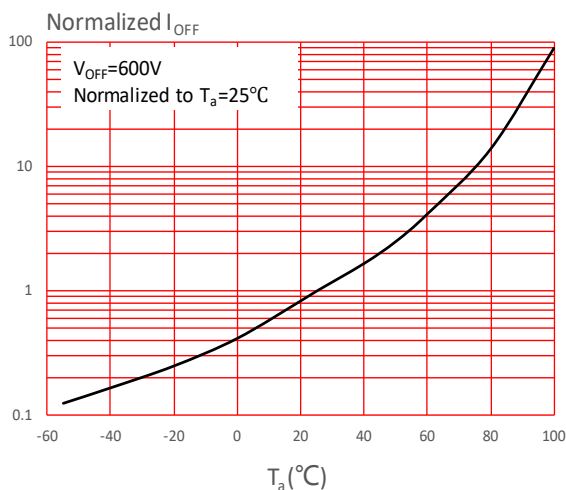
**FIG.2:** On-state Terminal Current vs. Ambient Temperature



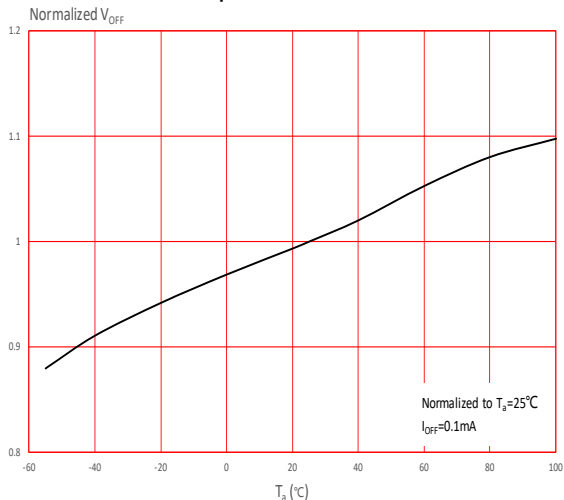
**FIG.3:** Forward Current vs. Forward Voltage



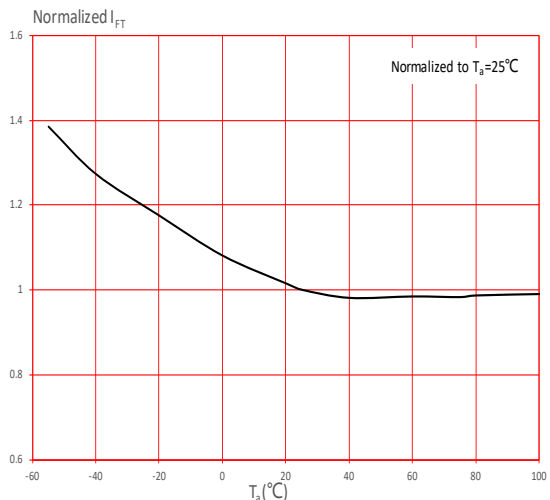
**FIG.4:** Normalized Off-state Terminal Current vs. Ambient Temperature

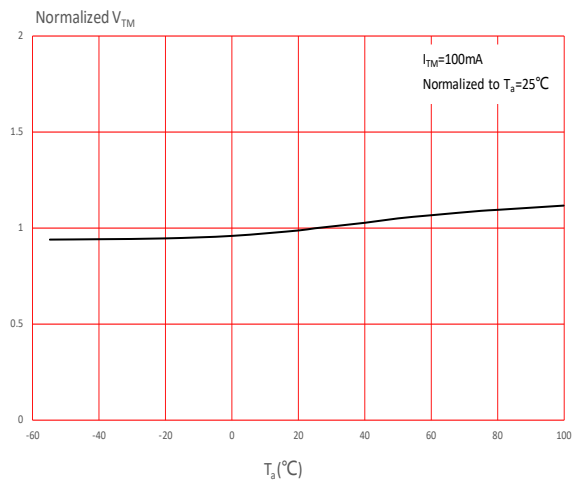
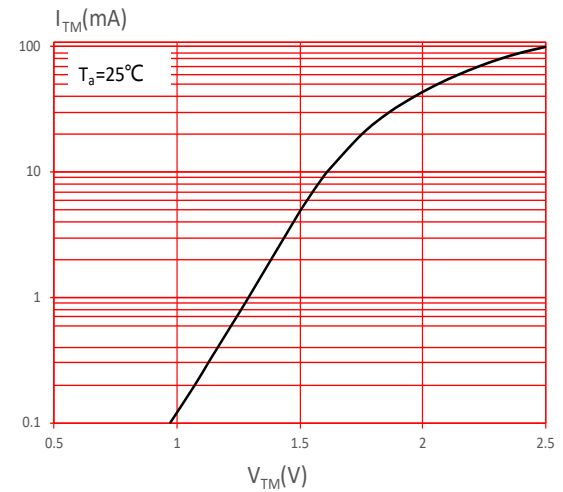
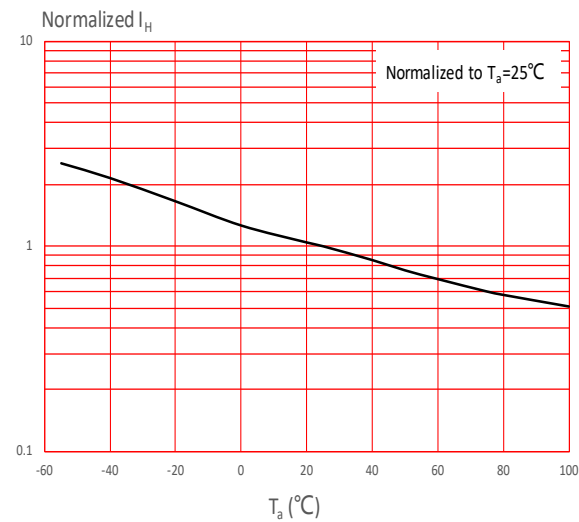
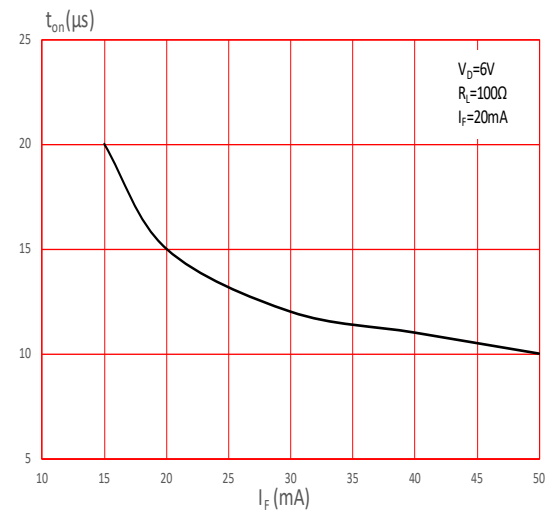
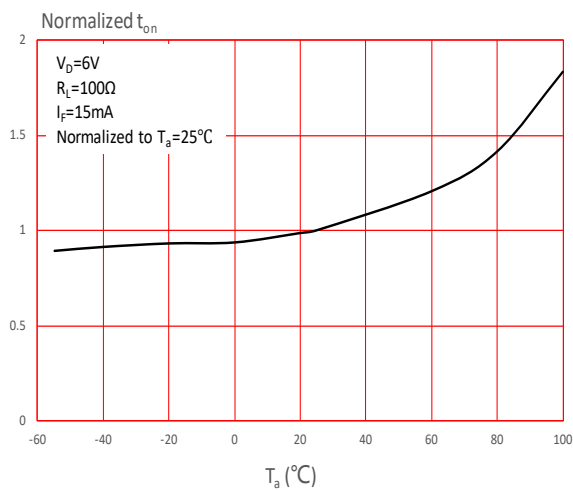


**FIG.5:** Normalized Off-state Terminal Voltage vs. Ambient Temperature



**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:** Turn On Time vs. Forward Current

**FIG.11:** Normalized Turn On Time vs. Ambient Temperature


## TEST CIRCUITS

FIG.12: Test Circuits of Turn On Time

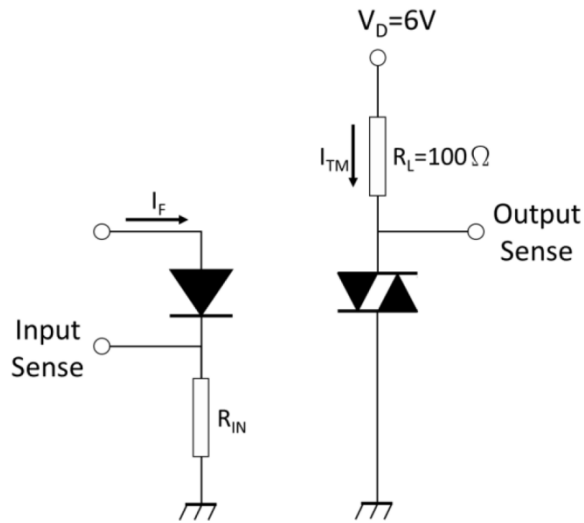
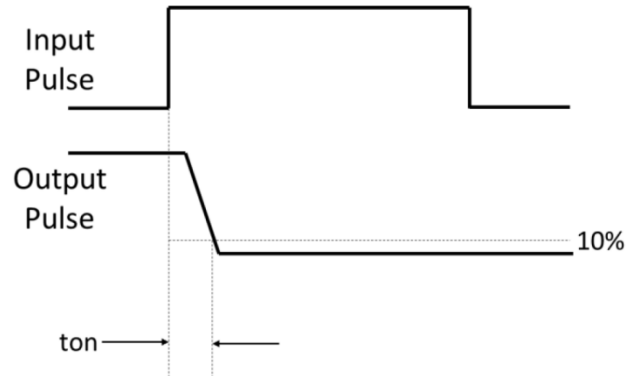
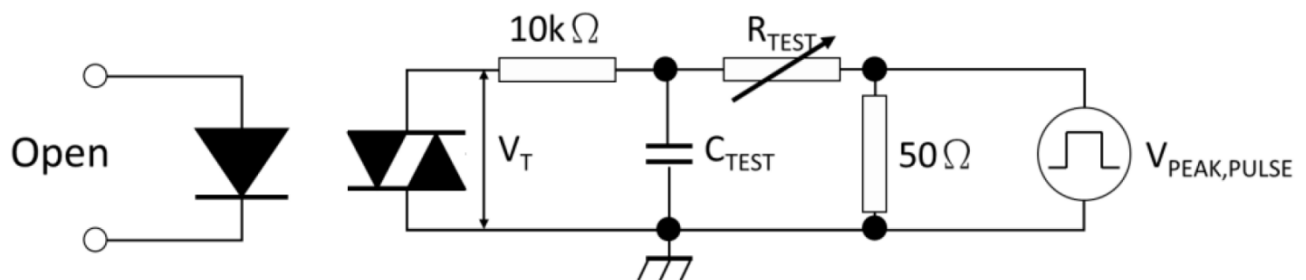
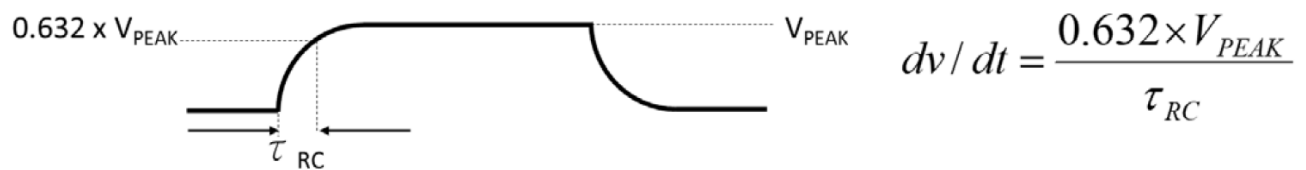
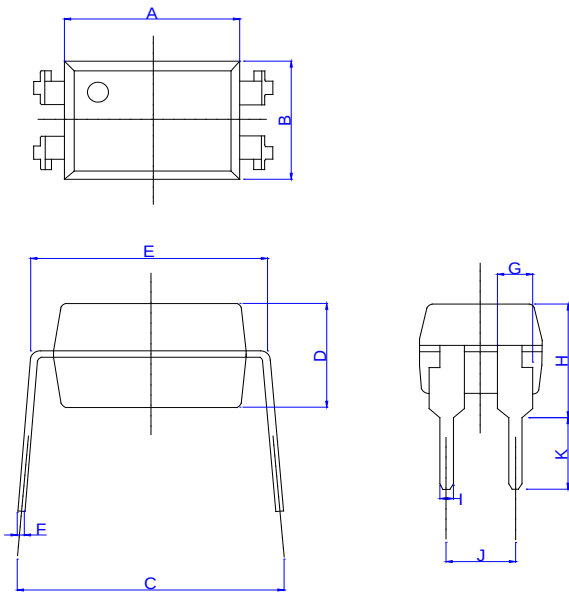


FIG.13: Waveforms of Turn On Time

Fig.14: Test Circuits of  $dV/dt$ Fig.15: Waveforms of  $dV/dt$ 

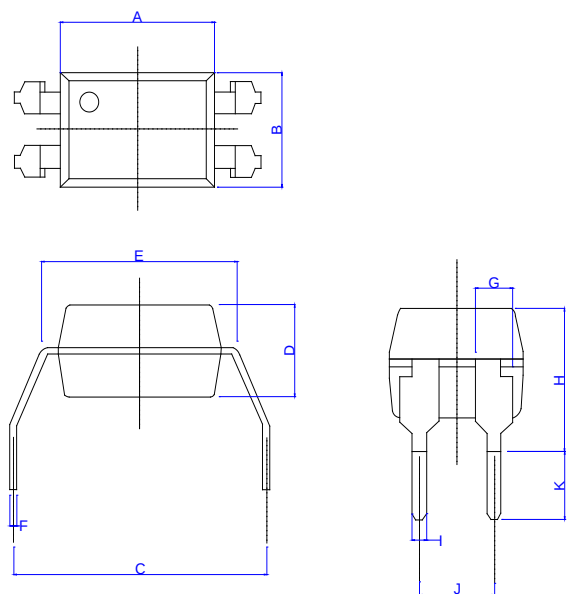
## Package Dimension (Unit: mm)

### Standard DIP Type:



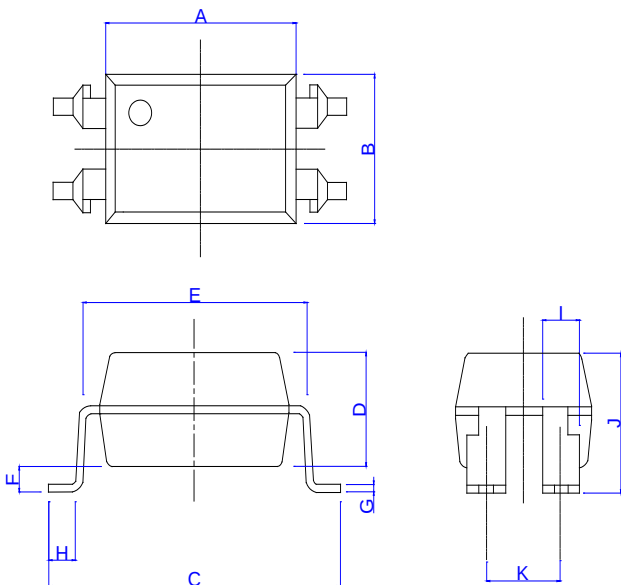
| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 6.30        |      | 6.70 | 0.249  |       | 0.265 |
| B    | 4.38        |      | 4.78 | 0.173  |       | 0.189 |
| C    | 7.62        |      | 9.50 | 0.301  |       | 0.375 |
| D    | 3.30        |      | 3.70 | 0.130  |       | 0.146 |
| E    | 7.32        |      | 7.92 | 0.289  |       | 0.313 |
| F    |             | 0.25 |      |        | 0.010 |       |
| G    | 1.20        |      | 1.40 | 0.047  |       | 0.055 |
| H    | 4.20        |      | 4.80 | 0.166  |       | 0.190 |
| I    |             | 0.50 |      |        | 0.020 |       |
| J    |             | 2.54 |      |        | 0.100 |       |
| K    |             | 2.80 |      |        | 0.111 |       |

### Option M Type:



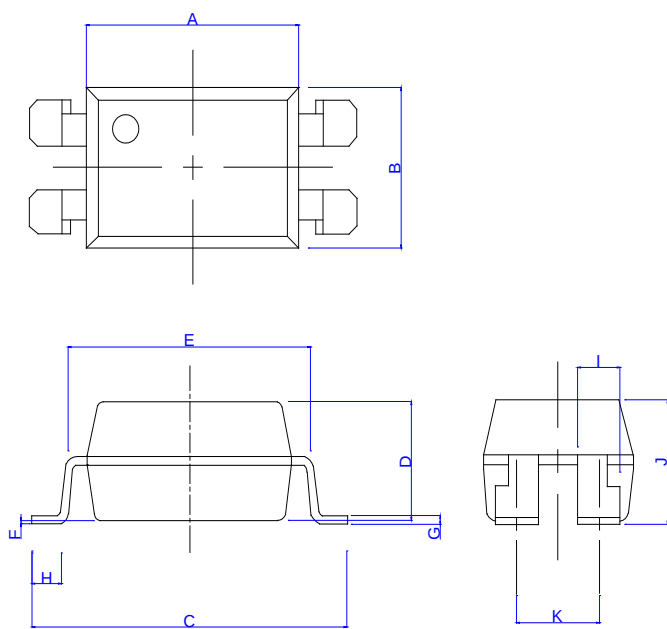
| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 6.30        |      | 6.70  | 0.249  |       | 0.265 |
| B    | 4.38        |      | 4.78  | 0.173  |       | 0.189 |
| C    | 9.86        |      | 10.46 | 0.390  |       | 0.413 |
| D    | 3.30        |      | 3.70  | 0.130  |       | 0.146 |
| E    | 7.32        |      | 7.92  | 0.289  |       | 0.313 |
| F    |             | 0.25 |       |        | 0.010 |       |
| G    | 1.20        |      | 1.40  | 0.047  |       | 0.055 |
| H    | 4.28        |      | 4.88  | 0.169  |       | 0.193 |
| I    |             | 0.50 |       |        | 0.020 |       |
| J    |             | 2.54 |       |        | 0.100 |       |
| K    |             | 2.20 |       |        | 0.087 |       |

Option S Type:



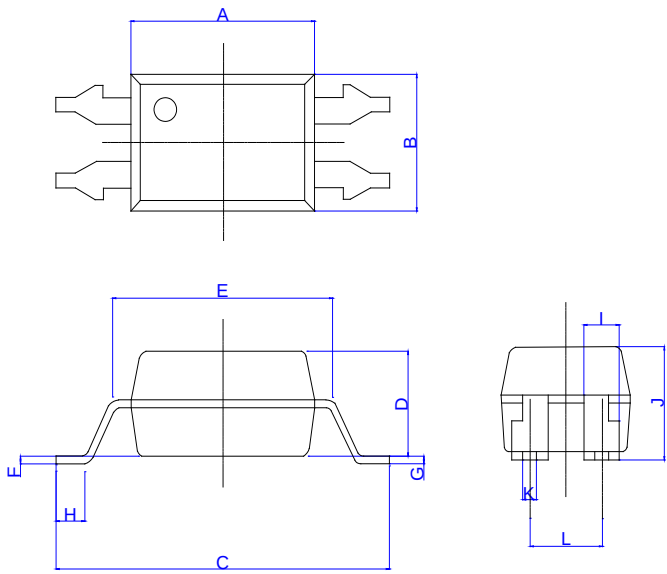
| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 6.30        |      | 6.70  | 0.249  |       | 0.265 |
| B    | 4.38        |      | 4.78  | 0.173  |       | 0.189 |
| C    | 9.85        |      | 10.45 | 0.389  |       | 0.413 |
| D    | 3.30        |      | 3.70  | 0.130  |       | 0.146 |
| E    | 7.32        |      | 7.92  | 0.289  |       | 0.313 |
| F    |             | 0.80 |       |        | 0.032 |       |
| G    |             | 0.25 |       |        | 0.010 |       |
| H    |             | 0.80 |       |        | 0.032 |       |
| I    | 1.20        |      | 1.40  | 0.047  |       | 0.055 |
| J    | 4.00        |      | 4.60  | 0.158  |       | 0.182 |
| K    |             | 2.54 |       |        | 0.100 |       |

Option SL Type:



| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 6.30        |      | 6.70  | 0.249  |       | 0.265 |
| B    | 4.38        |      | 4.78  | 0.274  |       | 0.289 |
| C    | 9.85        |      | 10.45 | 0.389  |       | 0.413 |
| D    | 3.30        |      | 3.70  | 0.130  |       | 0.146 |
| E    | 7.32        |      | 7.92  | 0.289  |       | 0.313 |
| F    |             | 0.10 |       |        | 0.004 |       |
| G    |             | 0.25 |       |        | 0.010 |       |
| H    |             | 0.80 |       |        | 0.032 |       |
| I    | 1.20        |      | 1.40  | 0.047  |       | 0.055 |
| J    | 3.30        |      | 3.90  | 0.130  |       | 0.154 |
| K    |             | 2.54 |       |        | 0.100 |       |

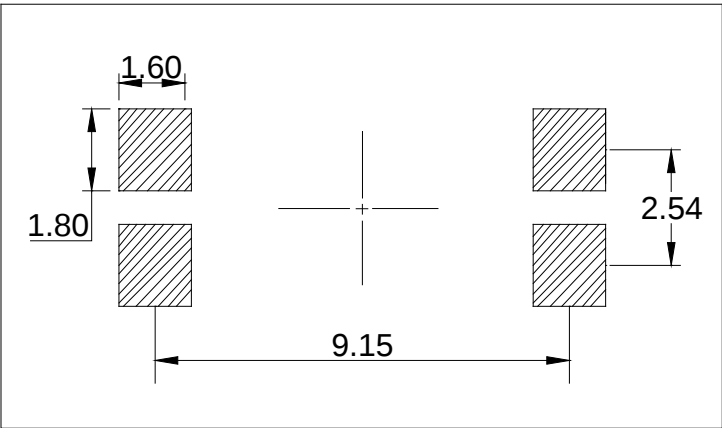
Option SLM Type:



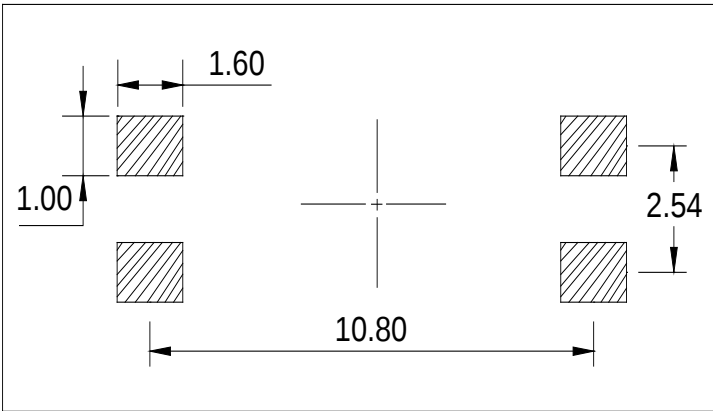
| Ref. | Dimensions  |      |       |        |      |       |
|------|-------------|------|-------|--------|------|-------|
|      | Millimeters |      |       | Inches |      |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ. | Max.  |
| A    | 6.30        |      | 6.70  | 0.248  |      | 0.264 |
| B    | 4.38        |      | 4.78  | 0.172  |      | 0.188 |
| C    | 11.50       |      | 12.10 | 0.453  |      | 0.476 |
| D    | 3.30        |      | 3.70  | 0.130  |      | 0.146 |
| E    | 7.32        |      | 7.92  | 0.288  |      | 0.312 |
| F    | 0.05        |      | 0.45  | 0.002  |      | 0.018 |
| G    | 0.05        |      | 0.45  | 0.002  |      | 0.018 |
| H    | 0.40        |      | 0.80  | 0.016  |      | 0.031 |
| I    | 1.20        |      | 1.40  | 0.047  |      | 0.055 |
| J    | 3.45        |      | 4.05  | 0.136  |      | 0.159 |
| K    | 0.30        |      | 0.70  | 0.012  |      | 0.028 |
| L    | 2.24        |      | 2.84  | 0.088  |      | 0.112 |

RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Option S/SL

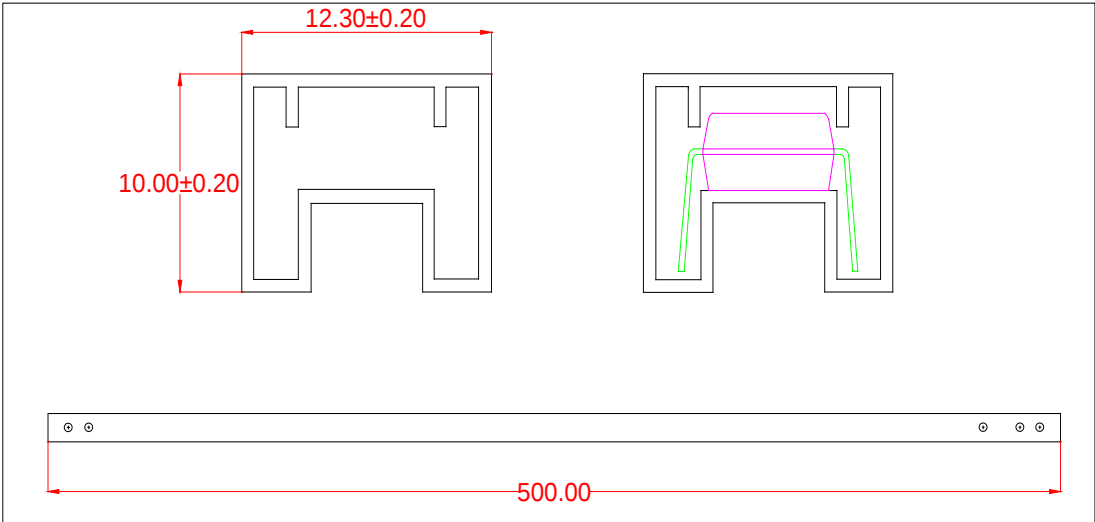


Option SLM

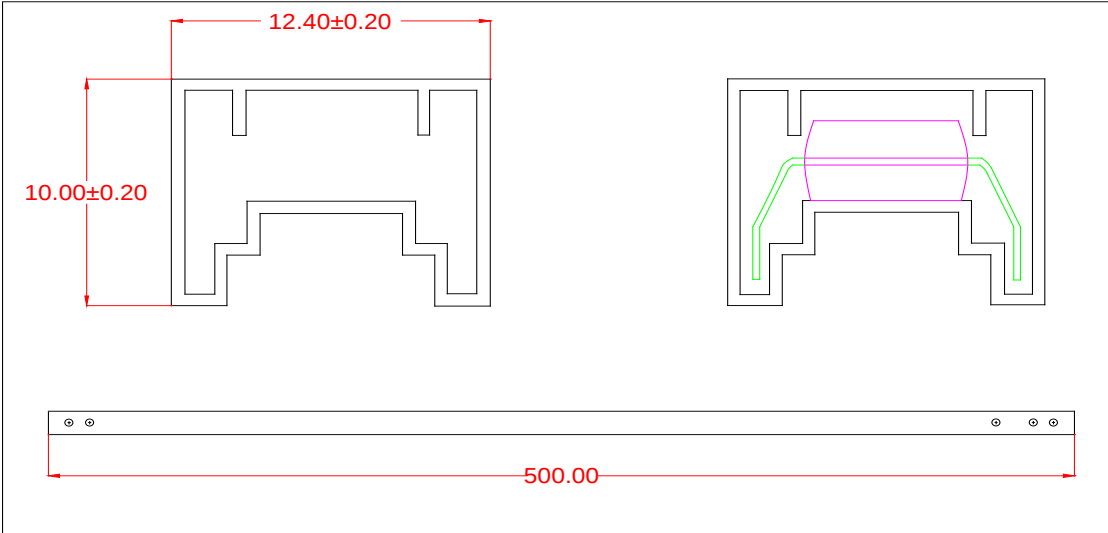


**TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Standard DIP**

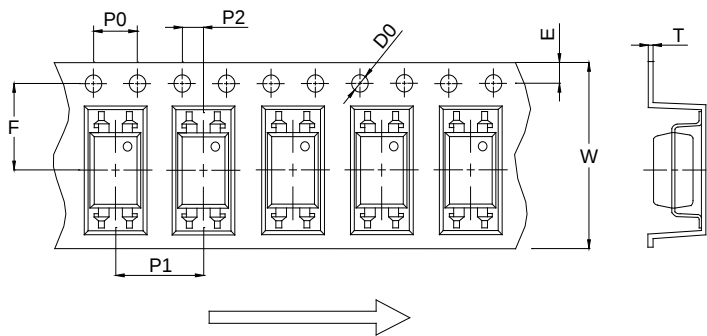


**Option M**



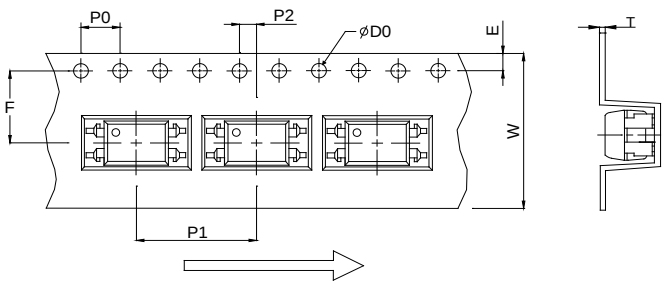
CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option S(T1)



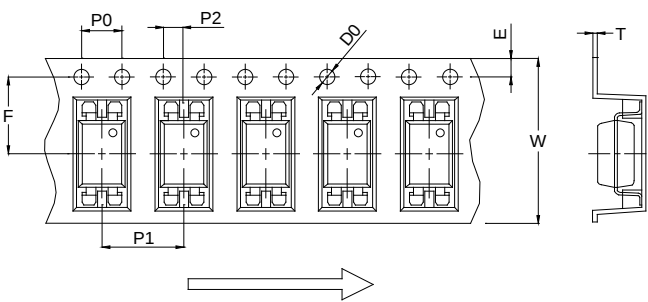
| Ref. | Dimensions  |       |      |        |       |      |
|------|-------------|-------|------|--------|-------|------|
|      | Millimeters |       |      | Inches |       |      |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max. |
| D0   |             | 1.50  |      |        | 0.059 |      |
| P0   |             | 4.00  |      |        | 0.157 |      |
| P1   |             | 8.00  |      |        | 0.315 |      |
| P2   |             | 2.00  |      |        | 0.079 |      |
| E    |             | 1.75  |      |        | 0.069 |      |
| F    |             | 7.50  |      |        | 0.295 |      |
| T    |             | 0.40  |      |        | 0.016 |      |
| W    |             | 16.00 |      |        | 0.630 |      |

Option S(T3)



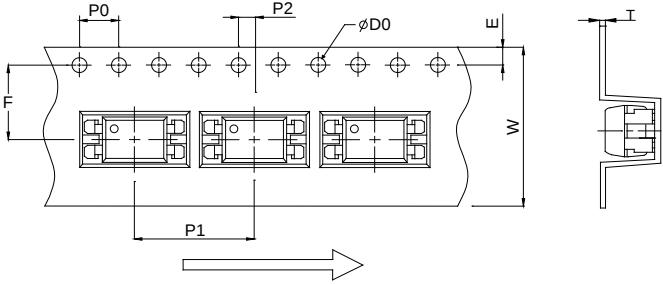
| Ref. | Dimensions  |       |      |        |       |      |
|------|-------------|-------|------|--------|-------|------|
|      | Millimeters |       |      | Inches |       |      |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max. |
| D0   |             | 1.50  |      |        | 0.059 |      |
| P0   |             | 4.00  |      |        | 0.157 |      |
| P1   |             | 12.00 |      |        | 0.472 |      |
| P2   |             | 2.00  |      |        | 0.079 |      |
| E    |             | 1.75  |      |        | 0.069 |      |
| F    |             | 7.50  |      |        | 0.295 |      |
| T    |             | 0.40  |      |        | 0.016 |      |
| W    |             | 16.00 |      |        | 0.630 |      |

Option SL(T1)



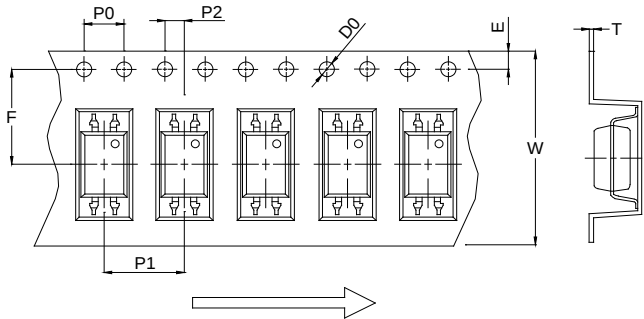
| Ref. | Dimensions  |       |      |        |       |      |
|------|-------------|-------|------|--------|-------|------|
|      | Millimeters |       |      | Inches |       |      |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max. |
| D0   |             | 1.50  |      |        | 0.059 |      |
| P0   |             | 4.00  |      |        | 0.157 |      |
| P1   |             | 8.00  |      |        | 0.315 |      |
| P2   |             | 2.00  |      |        | 0.079 |      |
| E    |             | 1.75  |      |        | 0.069 |      |
| F    |             | 7.50  |      |        | 0.295 |      |
| T    |             | 0.40  |      |        | 0.016 |      |
| W    |             | 16.00 |      |        | 0.630 |      |

Option SL(T3)



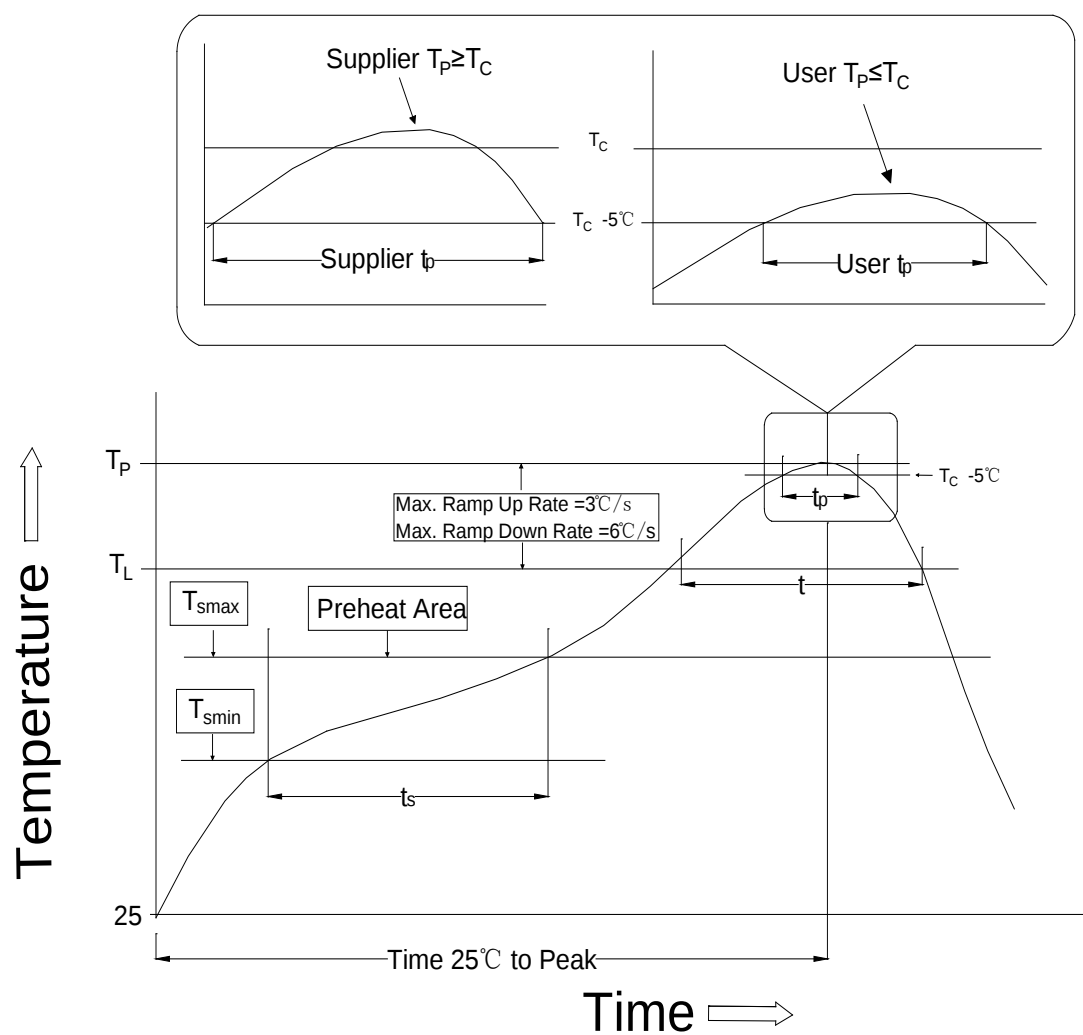
| Ref. | Dimensions  |       |      |        |       |      |
|------|-------------|-------|------|--------|-------|------|
|      | Millimeters |       |      | Inches |       |      |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max. |
| D0   |             | 1.50  |      |        | 0.059 |      |
| P0   |             | 4.00  |      |        | 0.157 |      |
| P1   |             | 12.00 |      |        | 0.472 |      |
| P2   |             | 2.00  |      |        | 0.079 |      |
| E    |             | 1.75  |      |        | 0.069 |      |
| F    |             | 7.50  |      |        | 0.295 |      |
| T    |             | 0.40  |      |        | 0.016 |      |
| W    |             | 16.00 |      |        | 0.630 |      |

Option SLM(T1)



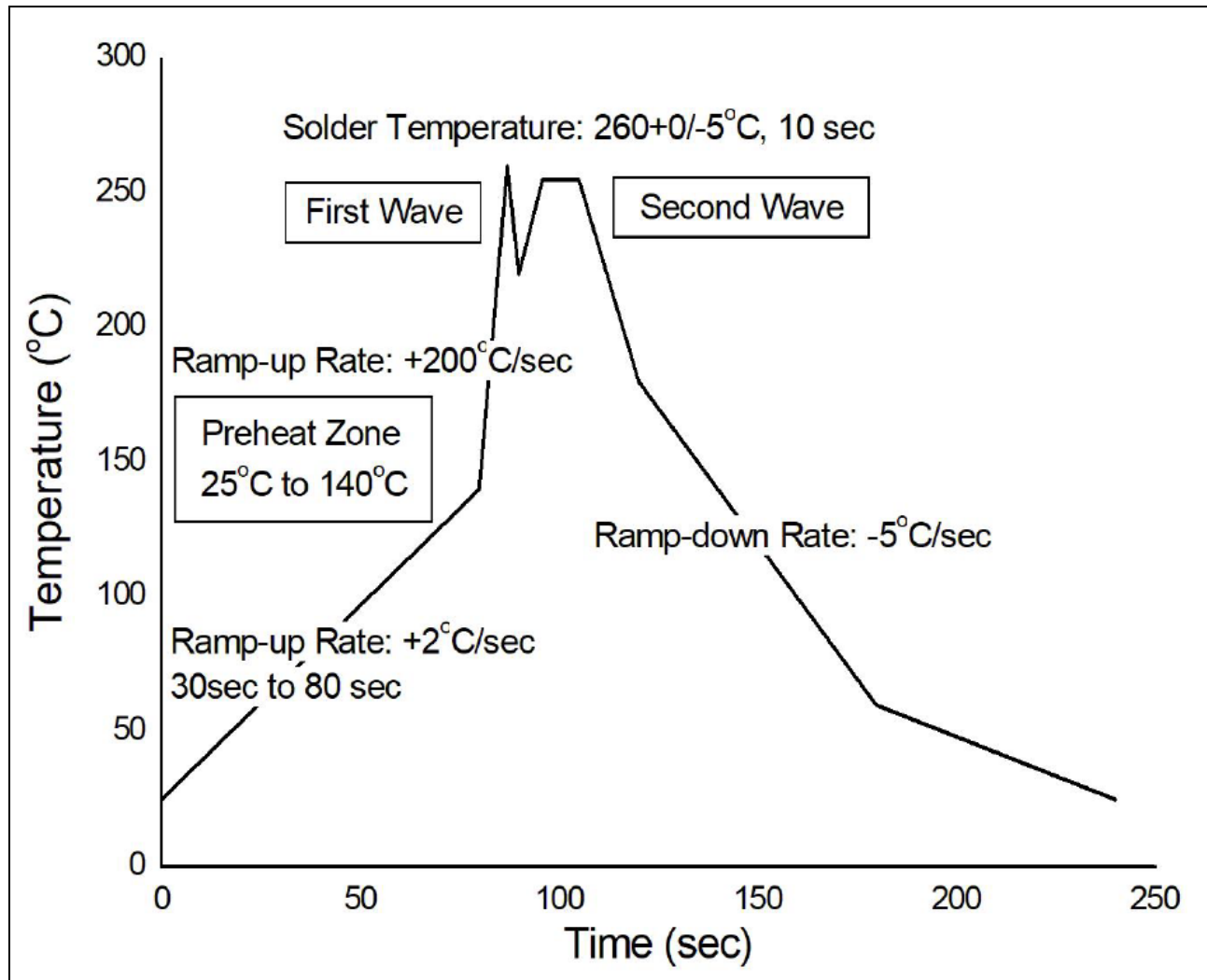
| Ref. | Dimensions  |       |      |        |       |      |
|------|-------------|-------|------|--------|-------|------|
|      | Millimeters |       |      | Inches |       |      |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max. |
| D0   |             | 1.50  |      |        | 0.059 |      |
| P0   |             | 4.00  |      |        | 0.157 |      |
| P1   |             | 8.00  |      |        | 0.315 |      |
| P2   |             | 2.00  |      |        | 0.079 |      |
| E    |             | 1.75  |      |        | 0.069 |      |
| F    |             | 11.50 |      |        | 0.453 |      |
| T    |             | 0.25  |      |        | 0.010 |      |
| W    |             | 24.00 |      |        | 0.945 |      |

## REFLOW INFORMATION



| Profile Feature                                  | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|--------------------------------------------------|------------------------|--------------------------|
| Temperature Min. ( $T_{smin}$ )                  | 100                    | 150°C                    |
| Temperature Max. ( $T_{smax}$ )                  | 150                    | 200°C                    |
| Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ ) | 60-120 seconds         | 60-120 seconds           |
| Ramp-up Rate ( $t_L$ to $t_P$ )                  | 3°C/second max.        | 3°C/second max.          |
| Liquidus Temperature ( $T_L$ )                   | 183°C                  | 217°C                    |
| Time ( $t_L$ ) Maintained Above ( $T_L$ )        | 60-150 seconds         | 60-150 seconds           |
| Peak Body Package Temperature                    | 235°C+0°C/-5°C         | 260°C+0°C/-5°C           |
| Time ( $t_P$ ) within 5°C of 260°C               | 20 seconds             | 30 seconds               |
| Ramp-down Rate ( $T_P$ to $T_L$ )                | 6°C/second max.        | 6°C/second max.          |
| Time 25°C to Peak Temperature                    | 6 minutes max.         | 8 minutes max.           |

## WAVE SOLDERING



## HAND SOLDERING BY SOLDERING IRON

|                       |         |
|-----------------------|---------|
| Soldering Temperature | 360±5°C |
| Soldering Time        | 3s max. |

## Document Revision History

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| Apr.2, 2025 | A.1.0    | Last update     |
| Nov.5, 2025 | A.1.1    | Add SLM package |

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