

### 4 PIN SOP ZERO-CROSS TRIAC PHOTOCOUPLER ELM304X, ELM306X, ELM308X Series



#### Features:

- Peak breakdown voltage
  - 400V: ELM304X
  - 600V: ELM306X
  - 800V: ELM308X
- High isolation voltage between input and output (Viso=3750 V rms)
- Zero voltage crossing
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No.132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

#### Description

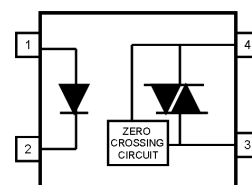
The ELM304X, ELM306X and ELM308X devices consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 110 to 240 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

#### Applications

- Solenoid/valve controls
- Light controls
- Static power switch
- AC motor drivers
- E.M. contactors
- Temperature controls
- AC Motor starters
- Solid state relays

#### Schematic



#### Pin Configuration

1. Anode
2. Cathode
3. Terminal
4. Terminal

### Absolute Maximum Ratings (Ta=25°C)

| Parameter                           |                                          | Symbol       | Rating   | Unit    |
|-------------------------------------|------------------------------------------|--------------|----------|---------|
| Input                               | Forward current                          | $I_F$        | 60       | mA      |
|                                     | Peak forward current (1us pulse, 300pps) | $I_{F(PK)}$  | 1        | A       |
|                                     | Reverse voltage                          | $V_R$        | 6        | V       |
|                                     | Power Dissipation                        | $P_D$        | 100      | mW      |
| Output                              | ELM304X                                  |              | 400      |         |
|                                     | Off-state Output Terminal Voltage        | $V_{DRM}$    | 600      | V       |
|                                     | ELM306X                                  |              | 800      |         |
|                                     | ELM308X                                  |              |          |         |
|                                     | On state RMS current                     | $I_{T(RMS)}$ | 70       | mA(RMS) |
|                                     | Power dissipation                        | $P_C$        | 300      | mW      |
| Isolation voltage <sup>*1</sup>     |                                          | $V_{ISO}$    | 3750     | Vrms    |
| Operating temperature               |                                          | $T_{OPR}$    | -40~+110 | °C      |
| Storage temperature                 |                                          | $T_{STG}$    | -55~+150 | °C      |
| Soldering Temperature <sup>*2</sup> |                                          | $T_{SOL}$    | 260      | °C      |

#### Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 are shorted together, and pins 3, 4 are shorted together.

\*2 For 10 seconds

## Electro-Optical Characteristics (Ta=25°C unless specified otherwise)

### Input

| Parameter               | Symbol | Min. | Typ.* | Max. | Unit          | Condition           |
|-------------------------|--------|------|-------|------|---------------|---------------------|
| Forward Voltage         | $V_F$  | -    | -     | 1.5  | V             | $I_F = 30\text{mA}$ |
| Reverse Leakage current | $I_R$  | -    | -     | 10   | $\mu\text{A}$ | $V_R = 6\text{V}$   |

### Output

| Parameter                                                             | Symbol            | Min. | Typ.* | Max. | Unit             | Condition                                                                                               |
|-----------------------------------------------------------------------|-------------------|------|-------|------|------------------|---------------------------------------------------------------------------------------------------------|
| Peak Blocking Current                                                 | $I_{\text{DRM1}}$ | -    | -     | 100  | nA               | $V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$<br>$I_F = 0\text{mA}$                                   |
| Peak On-state Voltage                                                 | $V_{\text{TM}}$   | -    | -     | 3    | V                | $I_{\text{TM}} = 100\text{mA peak}$                                                                     |
| Critical Rate of Rise off-state Voltage                               | $dv/dt$           | 1000 | -     | -    | V/ $\mu\text{s}$ |                                                                                                         |
| Inhibit Voltage (MT1-MT2 voltage above which device will not trigger) | $V_{\text{INH}}$  | -    | -     | 20   | V                | $I_F = \text{Rated } I_{\text{FT}}$                                                                     |
| Leakage in Inhibited State                                            | $I_{\text{DRM2}}$ | -    | -     | 1000 | $\mu\text{A}$    | $I_F = \text{Rated } I_{\text{FT}}$ ,<br>$V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$ ,<br>off state |

### Transfer Characteristics

| Parameter           | Symbol         | Min. | Typ.* | Max. | Unit | Condition                |
|---------------------|----------------|------|-------|------|------|--------------------------|
| LED Trigger Current | 3042           | -    | -     | 10   | mA   | Main terminal Voltage=3V |
|                     | 3062           |      |       |      |      |                          |
|                     | 3082           |      |       |      |      |                          |
|                     | 3043           | -    | -     | 5    |      |                          |
|                     | 3063           |      |       |      |      |                          |
|                     | 3083           |      |       |      |      |                          |
|                     | 3044           | -    | -     | 3    |      |                          |
|                     | 3064           |      |       |      |      |                          |
| 3084                |                |      |       |      |      |                          |
| Holding Current     | I <sub>H</sub> | -    | 280   | -    | μA   |                          |

\* Typical values at  $T_a = 25^\circ\text{C}$

## Typical Electro-Optical Characteristics Curves

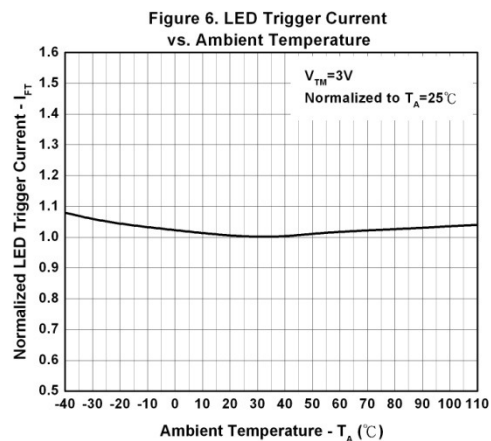
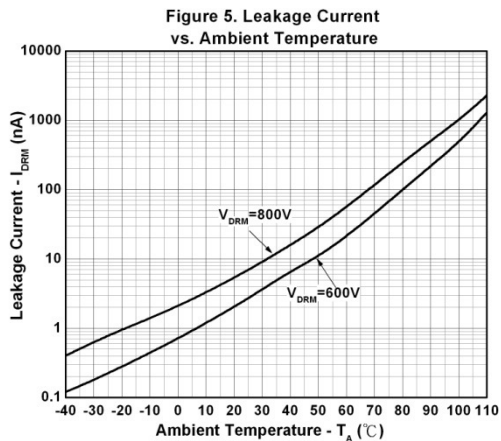
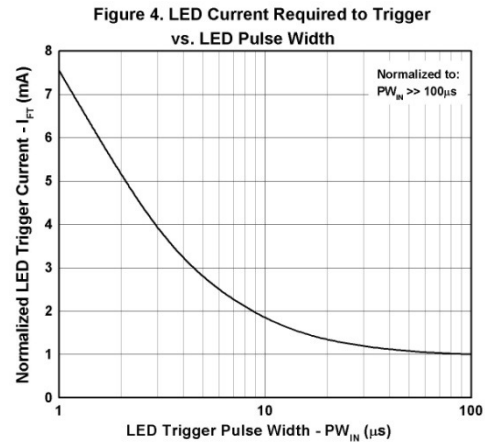
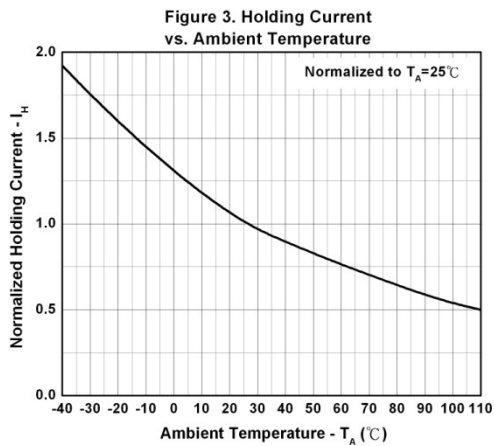
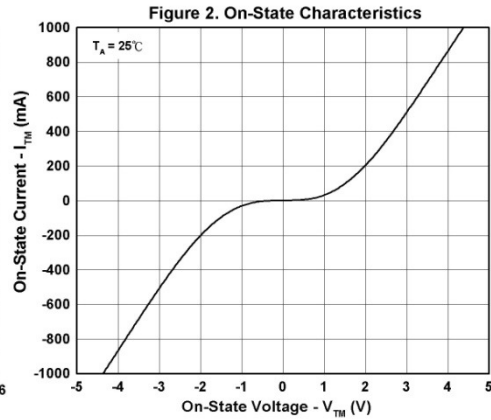
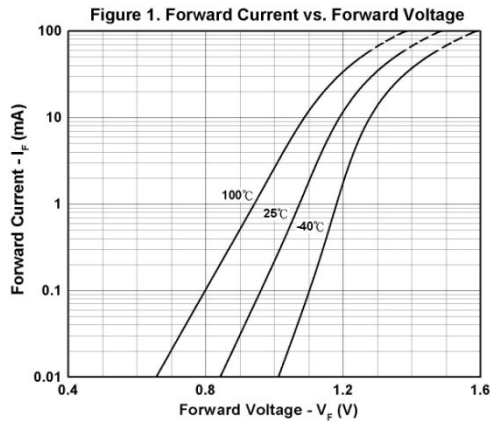


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

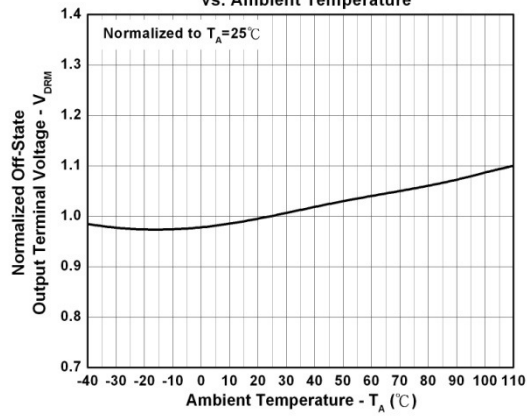


Figure 8. Leakage in Inhibit State vs. Ambient Temperature

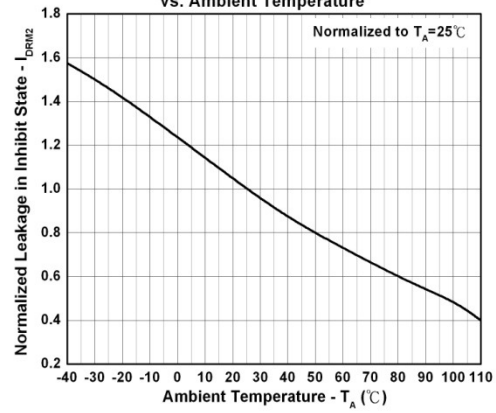


Figure 9. Inhibit Voltage vs. Ambient Temperature

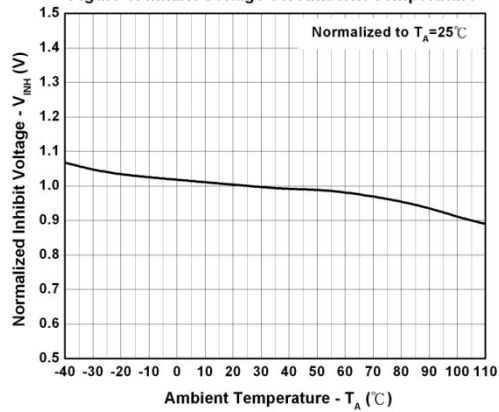
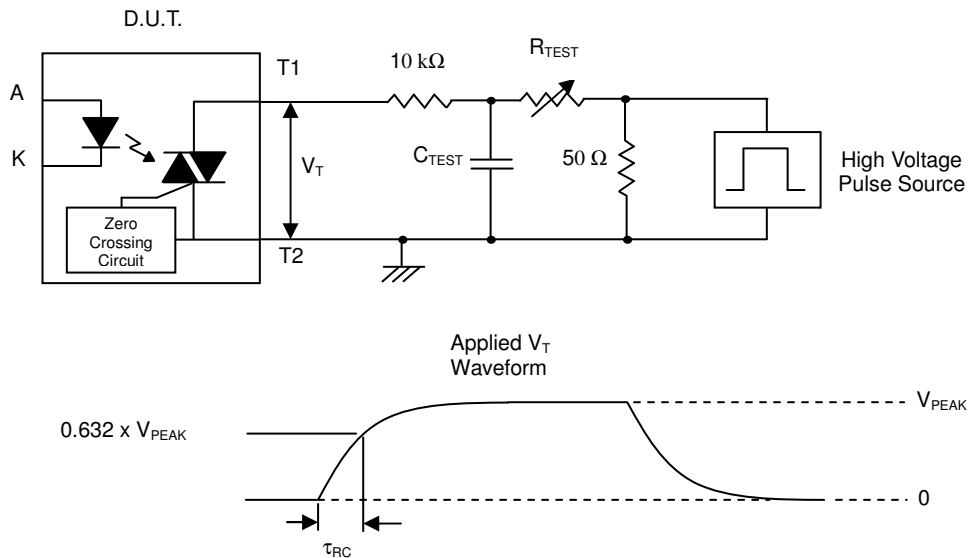


Figure 10. Static dv/dt Test Circuit & Waveform



### Measurement Method

The high voltage pulse is set to the required  $V_{PEAK}$  value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform  $V_T$  is monitored using a x100 scope probe. By varying  $R_{TEST}$ , the dv/dt (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The dv/dt is then decreased until the D.U.T. stops triggering. At this point,  $\tau_{RC}$  is recorded and the dv/dt calculated.

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

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For example,  $V_{PEAK} = 600V$  for EL306X series. The dv/dt value is calculated as follows:

$$dv/dt = \frac{0.63 \times 600}{\tau_{RC}} = \frac{378}{\tau_{RC}}$$

## Order Information

### Part Number

**ELM304X(Z)-V**  
or **ELM306X(Z)-V**  
or **ELM308X(Z)-V**

### Note

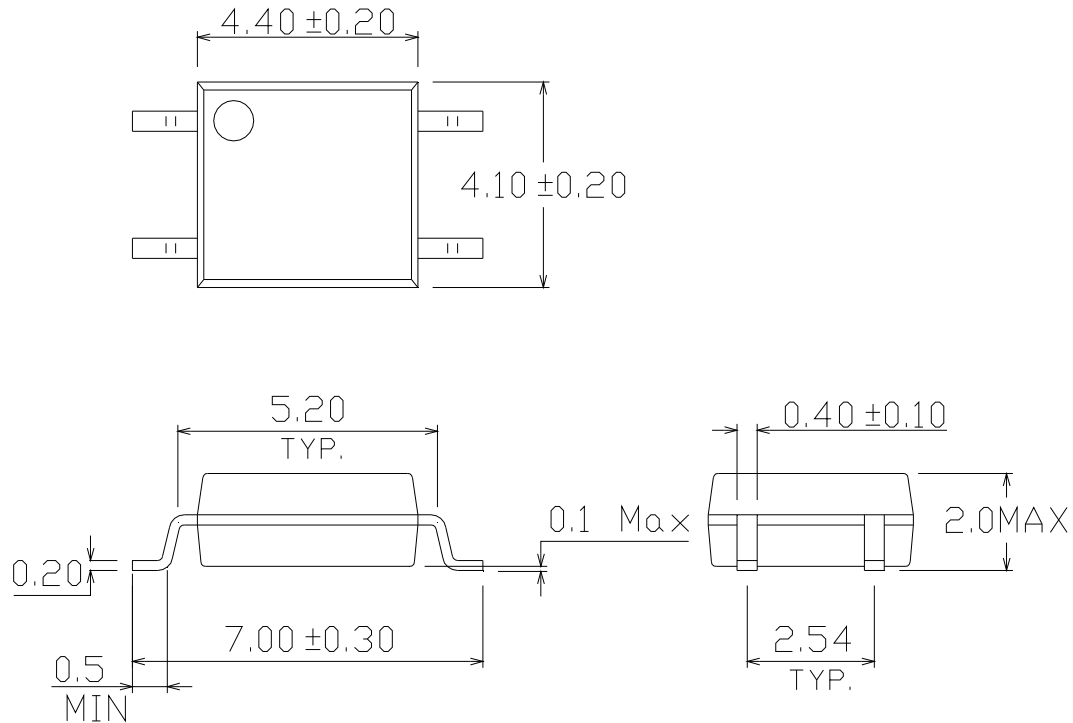
X = Part No. (2 for  $I_{FT}=10mA$ , 3 for  $I_{FT}=5mA$ , 4 for  $I_{FT}=3mA$ )

Z = Tape and reel option (TA, TB or none).

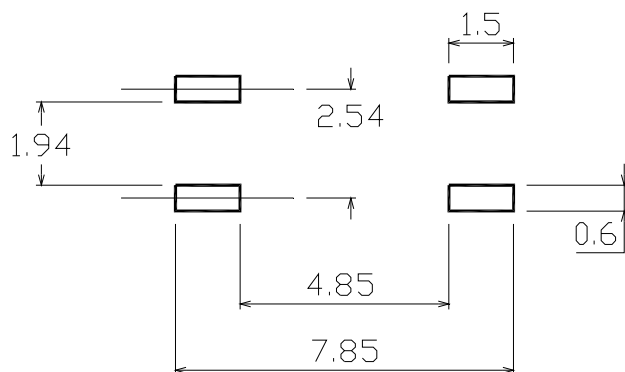
V = VDE safety approved optional

| Option | Description                                 | Packing quantity    |
|--------|---------------------------------------------|---------------------|
| None   | Standard                                    | 100 units per tube  |
| None   | Standard + VDE safety optional              | 100 units per tube  |
| (TA)   | TA tape & reel option                       | 3000 units per reel |
| (TB)   | TB tape & reel option                       | 3000 units per reel |
| (TA)-V | TA tape & reel option + VDE safety optional | 3000 units per reel |
| (TB)-V | TB tape & reel option + VDE safety optional | 3000 units per reel |

**Package Dimension (Dimensions in mm)**



**Recommended pad layout for surface mount leadform**





## Device Marking

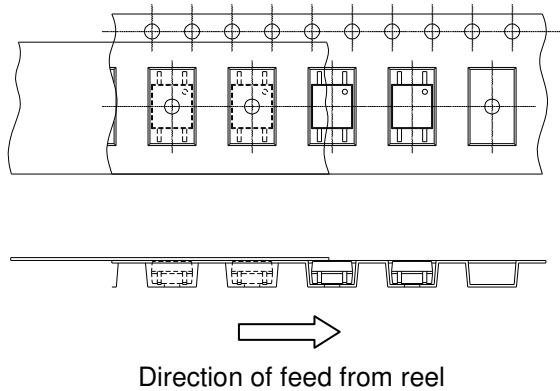


## Notes

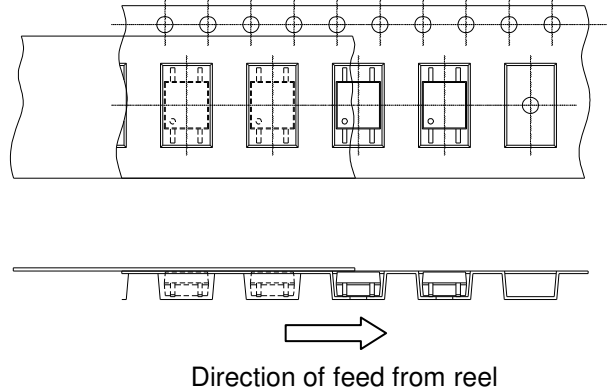
|       |                                      |
|-------|--------------------------------------|
| EL    | denotes Everlight                    |
| M3063 | denotes Device Number                |
| Y     | denotes 1 digit Year code            |
| WW    | denotes 2 digit Week code            |
| V     | denotes VDE safety option (optional) |

## Tape & Reel Packing Specifications

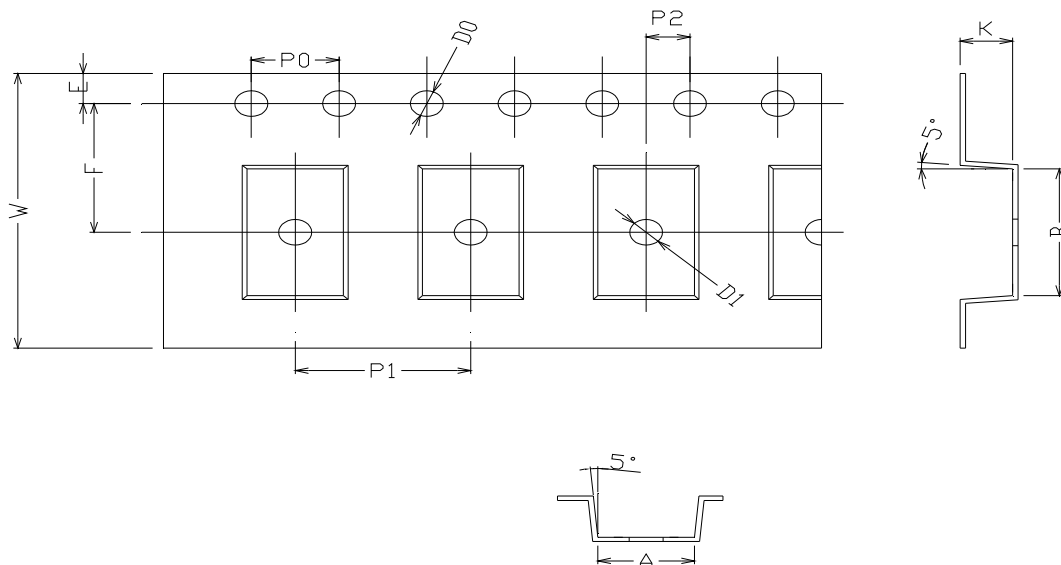
**Option TA**



**Option TB**



## Tape dimensions



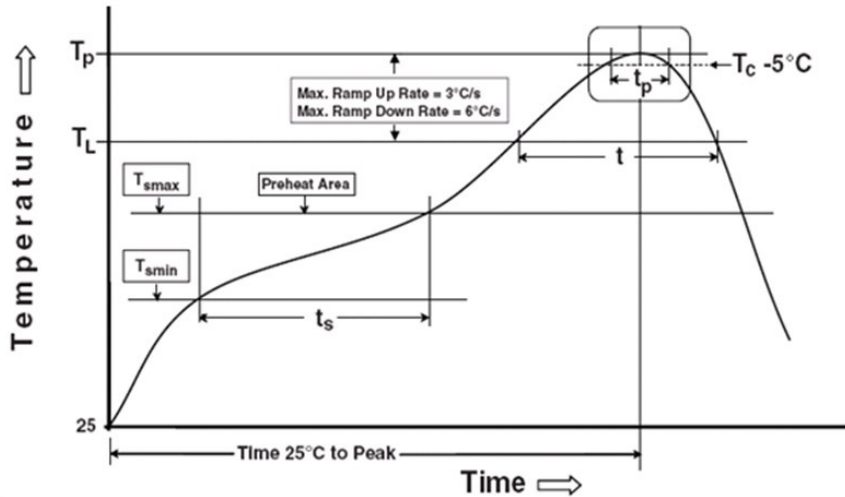
| Dimension No.  | A             | B             | Do             | D1            | E              | F             |
|----------------|---------------|---------------|----------------|---------------|----------------|---------------|
| Dimension (mm) | $4.4 \pm 0.1$ | $7.4 \pm 0.1$ | $1.5 + 0.1/-0$ | $1.5 \pm 0.1$ | $1.75 \pm 0.1$ | $7.5 \pm 0.1$ |

| Dimension No.  | Po             | P1            | P2            | t               | W              | K             |
|----------------|----------------|---------------|---------------|-----------------|----------------|---------------|
| Dimension (mm) | $4.0 \pm 0.15$ | $8.0 \pm 0.1$ | $2.0 \pm 0.1$ | $0.25 \pm 0.03$ | $16.0 \pm 0.2$ | $2.4 \pm 0.1$ |

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

#### Preheat

|                                              |                 |
|----------------------------------------------|-----------------|
| Temperature min ( $T_{smin}$ )               | 150 °C          |
| Temperature max ( $T_{smax}$ )               | 200 °C          |
| Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )  | 60-120 seconds  |
| Average ramp-up rate ( $T_{smax}$ to $T_P$ ) | 3 °C/second max |

#### Other

|                                                                      |                   |
|----------------------------------------------------------------------|-------------------|
| Liquidus Temperature ( $T_L$ )                                       | 217 °C            |
| Time above Liquidus Temperature ( $t_L$ )                            | 60-100 sec        |
| Peak Temperature ( $T_P$ )                                           | 260 °C            |
| Time within 5 °C of Actual Peak Temperature: $T_P - 5^\circ\text{C}$ | 30 s              |
| Ramp- Down Rate from Peak Temperature                                | 6 °C /second max. |
| Time 25 °C to peak temperature                                       | 8 minutes max.    |
| Reflow times                                                         | 3 times           |

## **DISCLAIMER**

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