

## 4 PIN SOP PHOTOTRANSISTOR AC INPUT PHOTOCOUPLER

**EL354 Series**

### Features:

- AC input response
- Current transfer ratio  
(CTR: Min. 20% at  $I_F = \pm 1\text{mA}$ ,  $V_{CE} = 5\text{V}$ )
- High isolation voltage between input and output ( $V_{iso} = 3750\text{ V rms}$ )
- Compact small outline package
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved (No. 716108)
- NEMKO approved (No. P06206474)
- DEMKO approved (No. 313924)
- FIMKO approved (No. FI 22807)
- CSA approved (No. 1408633)

### Description

The EL354 series of devices each consist of two infrared emitting diode, connected in inverse parallel, optically coupled to a phototransistor detector.

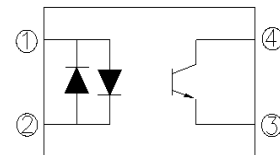
They are packaged in a 4-pin small outline package.

### Applications

- AC line monitor
- Programmable controllers
- Telephone line interface
- Unknown polarity DC sensor



Schematic



Pin Configuration

1. Anode / Cathode
2. Cathode / Anode
3. Emitter
4. Collector



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### Absolute Maximum Ratings ( $T_a=25^{\circ}\text{C}$ )

| Parameter                           |                                                                             | Symbol    | Rating   | Unit                   |
|-------------------------------------|-----------------------------------------------------------------------------|-----------|----------|------------------------|
| Input                               | Forward current                                                             | $I_F$     | $\pm 50$ | mA                     |
|                                     | Peak forward current ( $t = 10\mu\text{s}$ )                                | $I_{FM}$  | 1        | A                      |
|                                     | Power dissipation<br>No derating required up to $T_a = 100^{\circ}\text{C}$ | $P_D$     | 70       | mW                     |
|                                     |                                                                             |           |          |                        |
| Output                              | Power dissipation<br>Derating factor (above $T_a = 80^{\circ}\text{C}$ )    | $P_C$     | 150      | mW                     |
|                                     |                                                                             |           | 3.7      | mW/ $^{\circ}\text{C}$ |
|                                     | Collector-Emitter voltage                                                   | $V_{CEO}$ | 80       | V                      |
|                                     | Emitter-Collector voltage                                                   | $V_{ECO}$ | 6        | V                      |
| Total power dissipation             |                                                                             | $P_{tot}$ | 200      | mW                     |
| Isolation voltage <sup>*1</sup>     |                                                                             | $V_{iso}$ | 3750     | V rms                  |
| Operating temperature               |                                                                             | $T_{opr}$ | -55~+100 | $^{\circ}\text{C}$     |
| Storage temperature                 |                                                                             | $T_{stg}$ | -55~+125 | $^{\circ}\text{C}$     |
| Soldering temperature <sup>*2</sup> |                                                                             | $T_{sol}$ | 260      | $^{\circ}\text{C}$     |

### 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.

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### Electrical Characteristics ( $T_a=25^{\circ}\text{C}$ unless specified otherwise)

#### Input

| Parameter         | Symbol   | Min. | Typ.* | Max. | Unit          | Condition                |
|-------------------|----------|------|-------|------|---------------|--------------------------|
| Forward voltage   | $V_F$    | -    | 1.2   | 1.4  | V             | $I_F = \pm 20\text{mA}$  |
| Reverse current   | $I_R$    | -    | -     | 10   | $\mu\text{A}$ | $V_R = 4\text{V}$        |
| Input capacitance | $C_{in}$ | -    | 50    | 250  | pF            | $V = 0, f = 1\text{KHz}$ |

#### Output

| Parameter                           | Symbol     | Min. | Typ.* | Max. | Unit | Condition                               |
|-------------------------------------|------------|------|-------|------|------|-----------------------------------------|
| Collector-Emitter dark current      | $I_{CEO}$  | -    | -     | 100  | nA   | $V_{CE} = 20\text{V}, I_F = 0\text{mA}$ |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 80   | -     | -    | V    | $I_C = 0.1\text{mA}$                    |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 6    | -     | -    | V    | $I_E = 0.01\text{mA}$                   |

### Transfer Characteristics ( $T_a=25^{\circ}\text{C}$ unless specified otherwise)

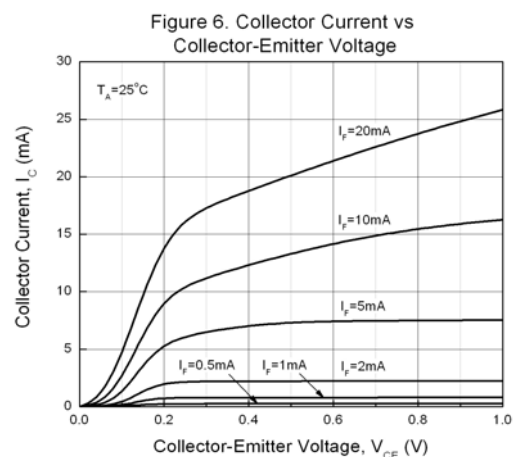
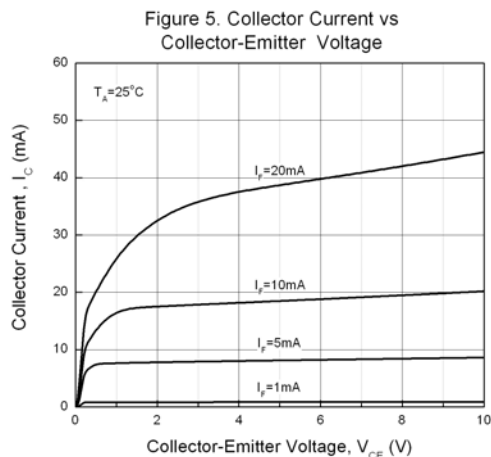
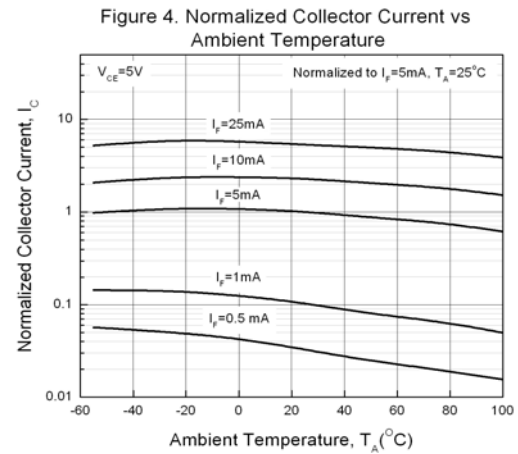
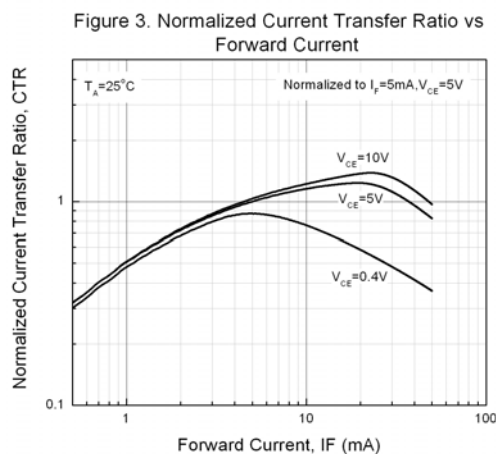
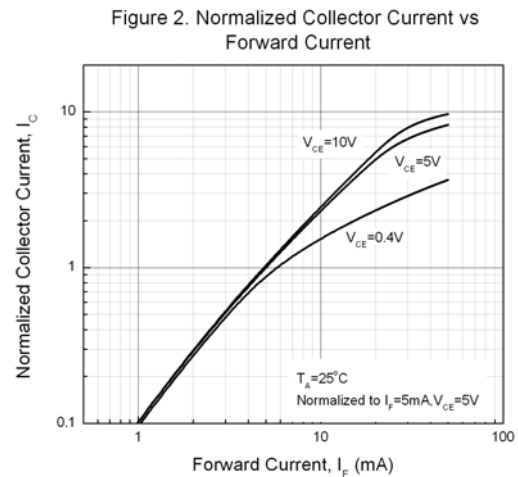
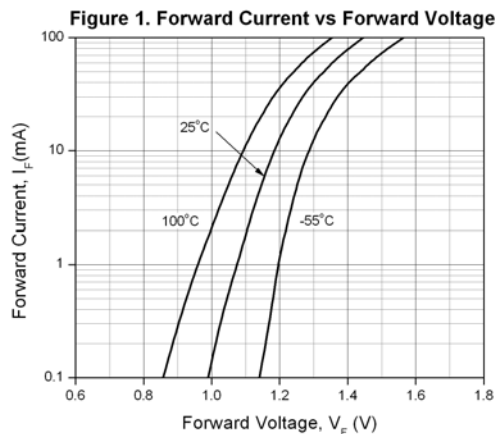
| Parameter                            | Symbol        | Min.               | Typ.*     | Max. | Unit          | Condition                                                            |
|--------------------------------------|---------------|--------------------|-----------|------|---------------|----------------------------------------------------------------------|
| Current Transfer ratio               | EL354         | 20                 | -         | 300  | %             | $I_F = \pm 1\text{mA}, V_{CE} = 5\text{V}$                           |
|                                      | EL354A        | 50                 | -         | 150  |               |                                                                      |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | -                  | 0.1       | 0.2  | V             | $I_F = \pm 20\text{mA}, I_C = 1\text{mA}$                            |
| Isolation resistance                 | $R_{IO}$      | $5 \times 10^{10}$ | $10^{11}$ | -    | $\Omega$      | $V_{IO} = 500\text{Vdc}, 40 \sim 60\% R.H$                           |
| Cut-off frequency                    | $f_c$         | -                  | 80        | -    | kHz           | $V_{CE} = 5\text{V}, I_C = 2\text{mA}, R_L = 100\Omega, -3\text{dB}$ |
| Floating capacitance                 | $C_{IO}$      | -                  | 0.6       | 1.0  | pF            | $V_{IO} = 0, f = 1\text{MHz}$                                        |
| Rise time                            | $T_r$         | -                  | 6         | 18   | $\mu\text{s}$ | $V_{CE} = 2\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$              |
| Fall time                            | $T_f$         | -                  | 8         | 18   | $\mu\text{s}$ |                                                                      |

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

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**EL354 Series**

## Typical Performance Curves



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Figure 7. Collector Dark Current vs Ambient Temperature

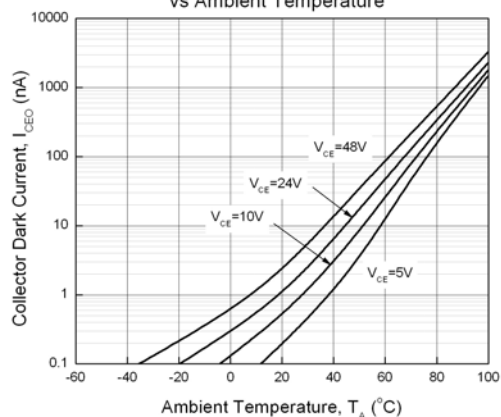


Figure 8. Switching Time vs Load Resistance

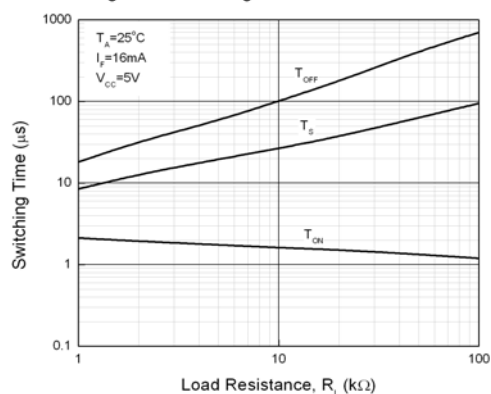


Figure 9. Collector-Emitter Saturation Voltage vs Ambient Temperature

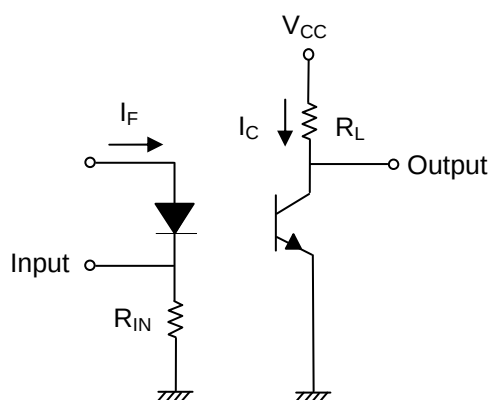
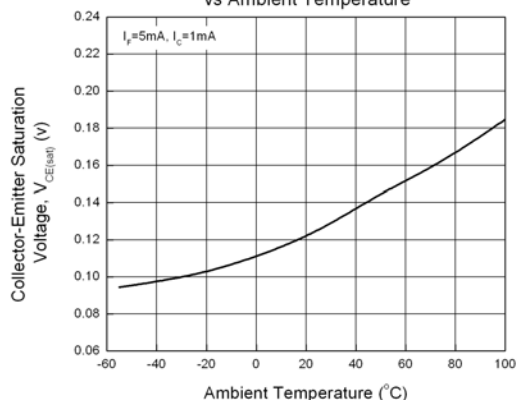


Figure 10. Switching Time Test Circuit & Waveforms



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### Order Information

#### Part Number

**EL354(X)(Y)-V**

#### Note

X = CTR Rank option (A or none)  
Y = Tape and reel option (TA, TB, or none).  
V = VDE safety option

| Option | Description                 | Packing quantity    |
|--------|-----------------------------|---------------------|
| None   | Standard SMD option         | 100 units per tube  |
| -V     | Standard SMD option + VDE   | 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 | 3000 units per reel |
| (TB)-V | TB Tape & reel option + VDE | 3000 units per reel |

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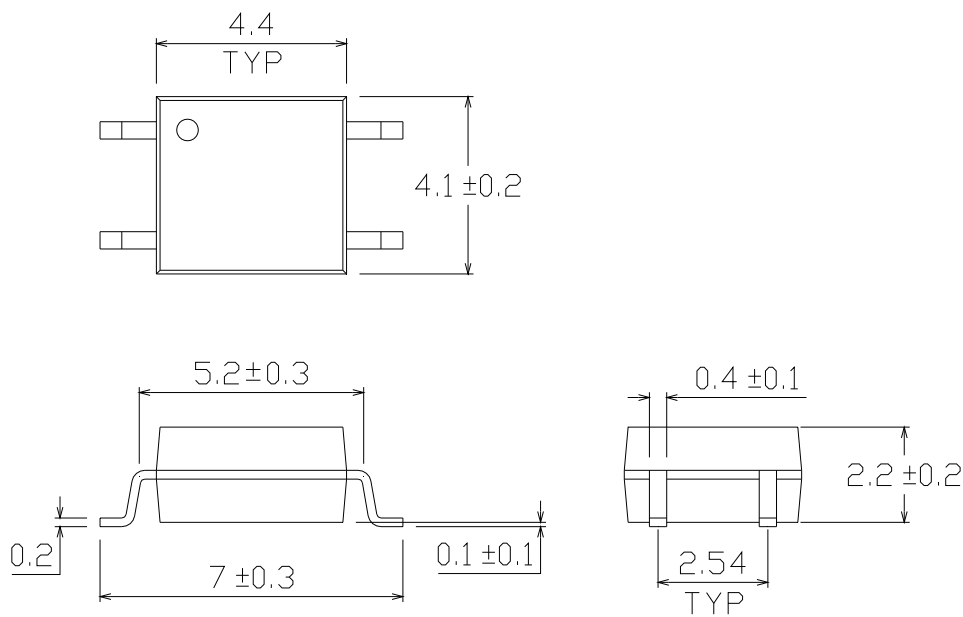
**EL354 Series**

### Package Drawings

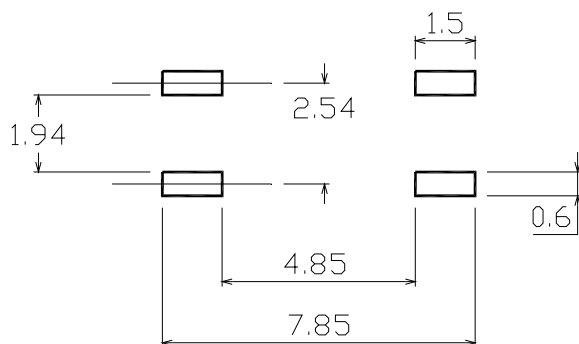
(Dimensions in mm)

#### Package Drawing

(Dimensions in mm)



#### Recommended pad layout for surface mount leadform



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### Device Marking



### Notes

|     |                                 |
|-----|---------------------------------|
| EL  | denotes Everlight               |
| 354 | denotes Device Number           |
| R   | denotes CTR Rank (A or none)    |
| Y   | denotes 1 digit Year code       |
| WW  | denotes 2 digit Week code       |
| V   | denotes VDE approved (optional) |

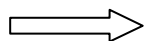
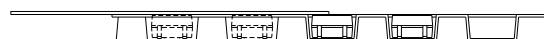
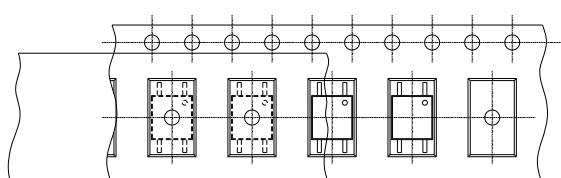


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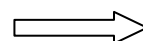
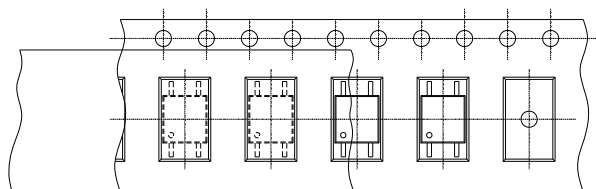
## Tape & Reel Packing Specifications

**Option TA**



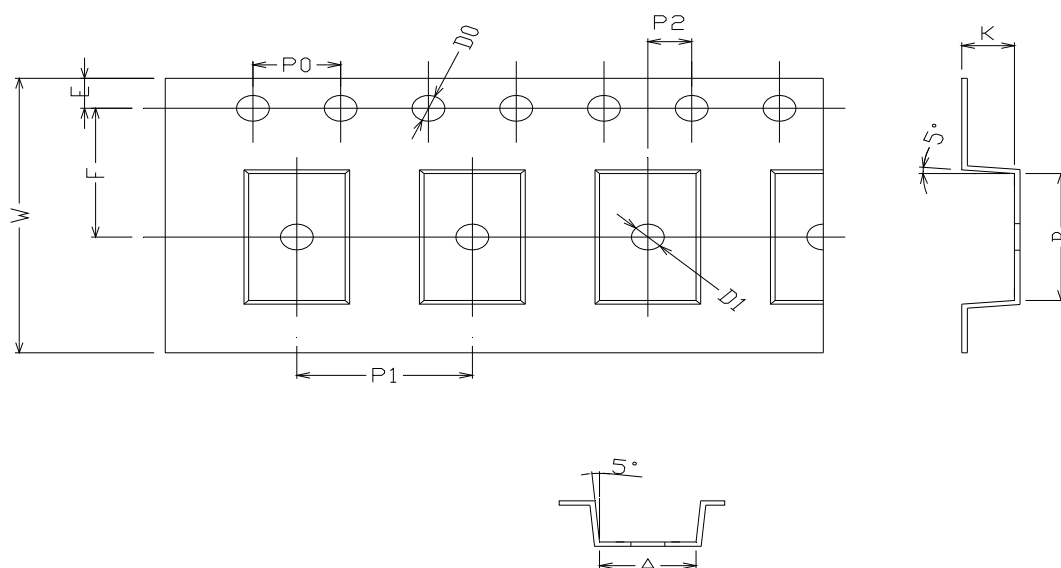
Direction of feed from reel

**Option TB**



Direction of feed from reel

## Tape dimensions



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

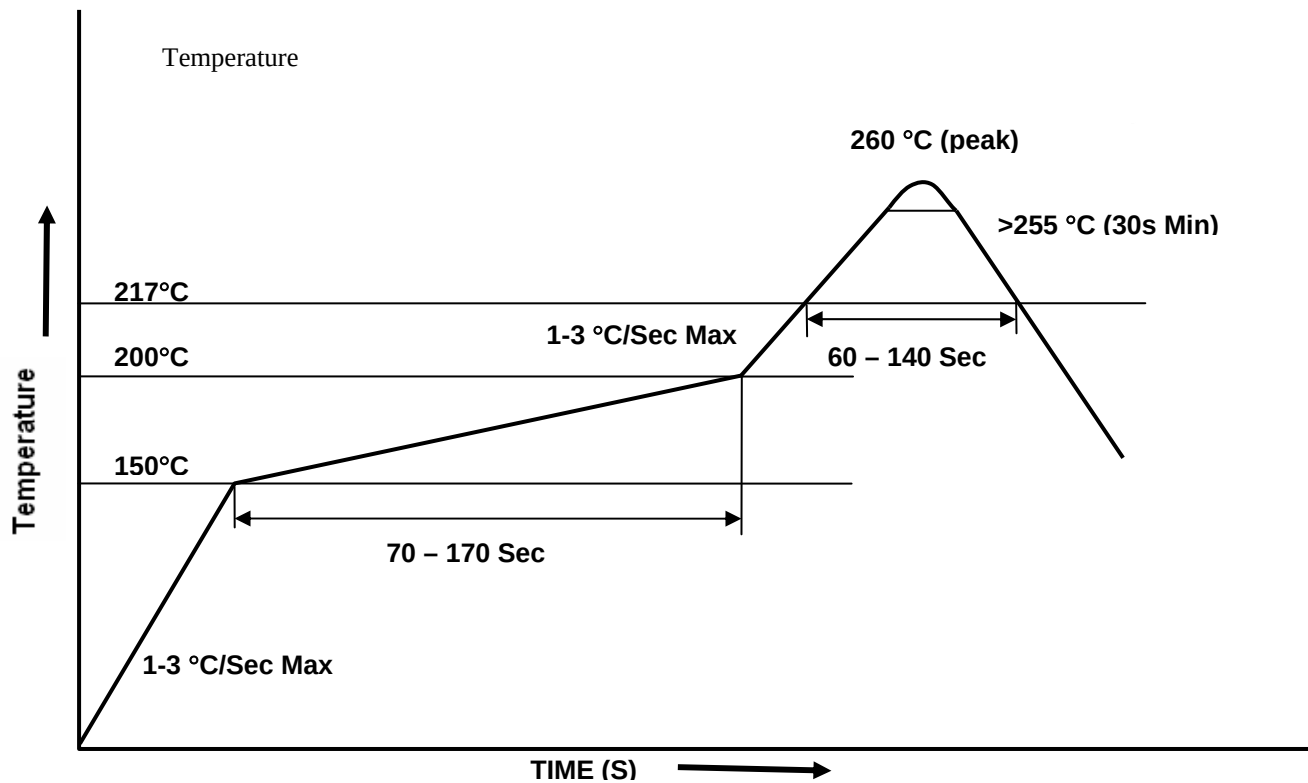
  

| Dimension No.  | Po             | P1            | P2            | t               | W              | K             |
|----------------|----------------|---------------|---------------|-----------------|----------------|---------------|
| Dimension (mm) | $4.0 \pm 0.15$ | $8.0 \pm 0.1$ | $2.0 \pm 0.1$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

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### Solder Reflow Temperature Profile



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