



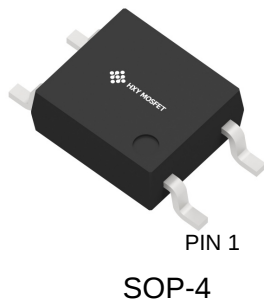
## Description

HEL1019(TA)-VG photocoupler consist of an infrared light-emitting diode and a phototransistor. The devices can realize electrical isolation and signal transmission between different circuits, the products are widely used in power supply equipment, such as mobile phone charger, home appliance product power supply device, etc.

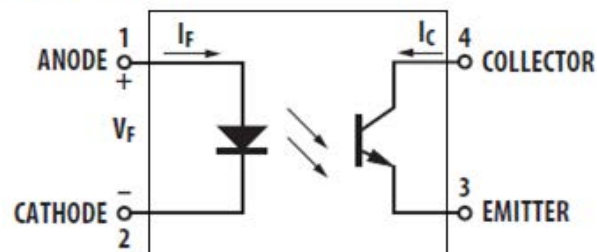
## Features

- Current transfer ratio (CTR:200%-400% @  $I_F=5\text{mA}$ ,  $V_{CE}=5\text{V}$ )
- High isolation voltage between input and output ( $V_{iso}=5,000\text{Vrms}$ )
- Creepage distance > 8mm
- Operating temperature up to +110°C
- Collector-Emitter voltage  $BV_{CEO} \geq 80\text{V}$
- The products comply with RoHS, REACH and HF;

## Pin Configuration



### Schematic



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



## Electrical Characteristics

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

| Parameter                |                           | Symbol    | Rating       | Unit |
|--------------------------|---------------------------|-----------|--------------|------|
| Input                    | Forward Current           | $I_F$     | 50           | mA   |
|                          | Reverse Voltage           | $V_R$     | 6            | V    |
|                          | Power Dissipation         | $P_D$     | 90           | mW   |
| Output                   | Collector Emitter voltage | $V_{CEO}$ | 80           | V    |
|                          | Emitter Collector voltage | $V_{ECO}$ | 6            |      |
|                          | Collector current         | $I_C$     | 50           | mA   |
|                          | Power Dissipation         | $P_C$     | 180          | mW   |
| Total Power Dissipation  |                           | $P_{tot}$ | 270          | mW   |
| *1 Isolation Voltage     |                           | $V_{iso}$ | 5,000        | Vrms |
| Operating Temperature    |                           | $T_{opr}$ | -0 to + 70   | °C   |
| Storage Temperature      |                           | $T_{stg}$ | -55 to + 125 |      |
| *2 Soldering Temperature |                           | $T_{sol}$ | 260          |      |

Note:

\*1.AC For 1 Minute, R.H. = 40 ~ 60%;

Isolation voltage shall be measured using the following method:

- (1)Short between anode and cathode on the primary side and between collector and emitter on the secondary side;
- (2)The isolation voltage tester with zero-cross circuit shall be used;
- (3)The waveform of applied voltage shall be a sine wave.

\*2. Soldering time is 10 seconds



### Electrical Characteristics (Temperature=25°C)

|                         | Parameter                            | Symbol        | Condition                                                          | Min.               | Typ. | Max. | Unit          |
|-------------------------|--------------------------------------|---------------|--------------------------------------------------------------------|--------------------|------|------|---------------|
| Input                   | Forward Voltage                      | $V_F$         | $I_F=50\text{mA}$                                                  | ---                | 1.35 | 1.6  | V             |
|                         | Reverse Current                      | $I_R$         | $V_R=4\text{V}$                                                    | ---                | ---  | 10   | $\mu\text{A}$ |
|                         | Terminal Capacitance                 | $C_t$         | $V=0, f=1\text{MHz}$                                               | ---                | 30   | 250  | pF            |
| Output                  | Collector dark current               | $I_{CEO}$     | $V_{CE}=20\text{V}, I_F=0$                                         | ---                | ---  | 100  | nA            |
|                         | Collector-Emitter breakdown voltage  | $BV_{CEO}$    | $I_C=0.1\text{mA}$<br>$I_F=0$                                      | 80                 | ---  | ---  | V             |
|                         | Emitter-Collector breakdown voltage  | $BV_{ECO}$    | $I_E=0.1\text{mA}$<br>$I_F=0$                                      | 6                  | ---  | ---  | V             |
| Transfer characteristic | Collector Current                    | $I_C$         | $I_F=5\text{mA}$<br>$V_{CE}=5\text{V}$                             | 2.5                | ---  | 30   | mA            |
|                         | *1 Current Transfer Ratio            | CTR           |                                                                    | 50                 | ---  | 600  | %             |
|                         | Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_F=20\text{mA}$<br>$I_C=1\text{mA}$                              | ---                | 0.1  | 0.2  | V             |
|                         | Isolation resistance                 | $R_{iso}$     | DC500V<br>40~60%R.H.                                               | $5 \times 10^{10}$ | ---  | ---  | $\Omega$      |
|                         | Floating Capacitance                 | $C_f$         | $V=0, f=1\text{MHz}$                                               | ---                | 0.6  | 1    | pF            |
|                         | Cut-off Frequency                    | $f_c$         | $V_{CE}=5\text{V}, I_C=2\text{mA}$<br>$R_L=100\Omega, -3\text{dB}$ | ---                | 80   | ---  | kHz           |
|                         | Rise time                            | $t_r$         | $V_{CE}=2\text{V},$<br>$I_C=2\text{mA}$                            | ---                | 4    | 18   | $\mu\text{s}$ |
|                         | Fall time                            | $t_f$         | $R_L=100\Omega$                                                    | ---                | 3    | 18   | $\mu\text{s}$ |

Note:

\*1 Current Transfer Ratio =  $I_C / I_F \times 100\%$ , Tolerance:  $\pm 3\%$ .

### Rank Table of Current Transfer Ratio(Temperature=25°C)

| CTR Rank      | Min (%) | Max (%) | C ondition                         |
|---------------|---------|---------|------------------------------------|
| EL1019(TA)-VG | 200     | 400     | $I_F=5\text{mA}, V_{CE}=5\text{V}$ |



## Characteristics Curves

Figure1. Forward Current vs. Forward Voltage

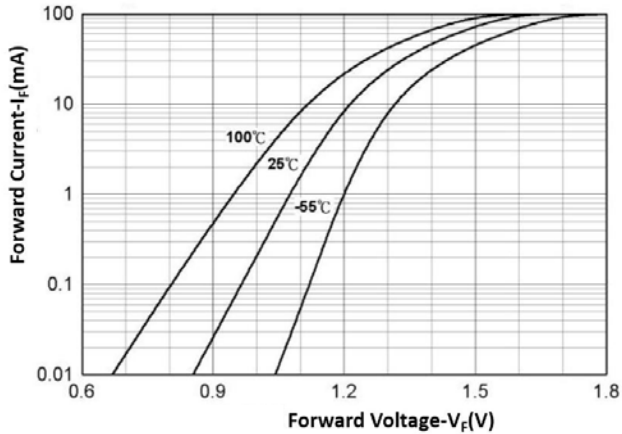


Figure2. Collector Dark Current vs. Ambient Temperature

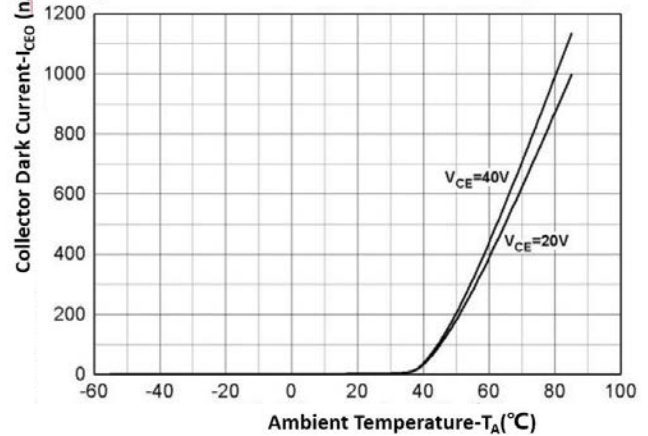


Figure3. Collector Current vs. Collector Emitter Voltage

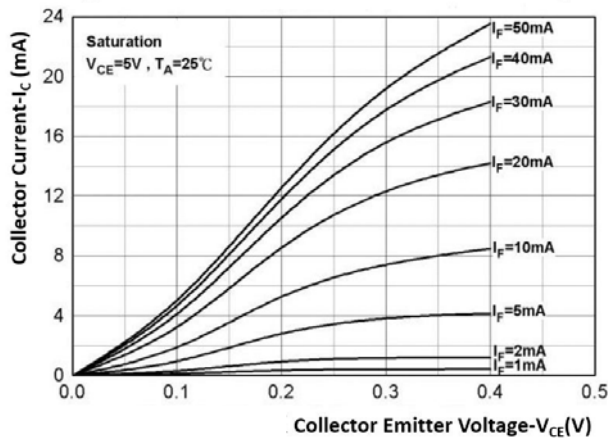


Figure4. Collector Current vs. Collector Emitter Voltage

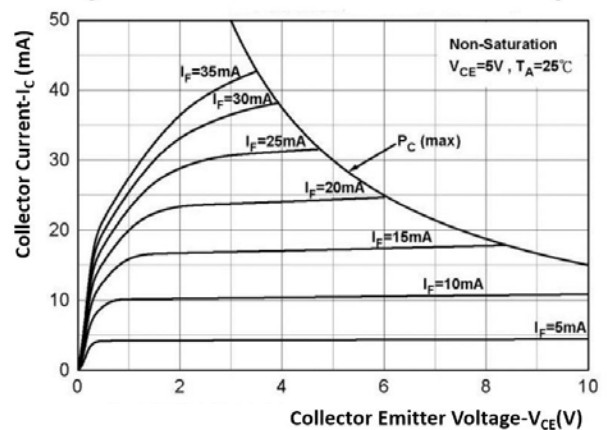


Figure5. Normalized Collector Current vs. Forward Current

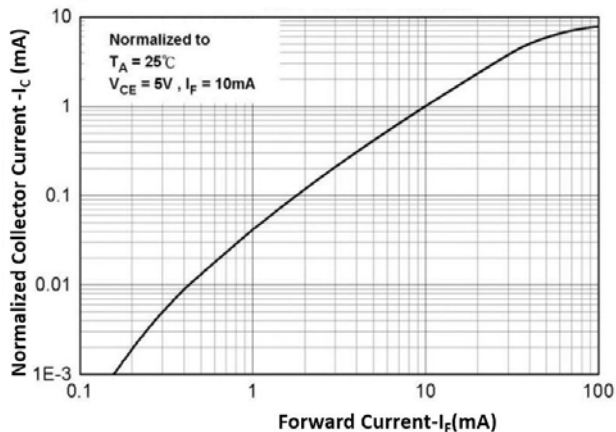


Figure6. Normalized Current Transfer Ratio vs. Forward Current

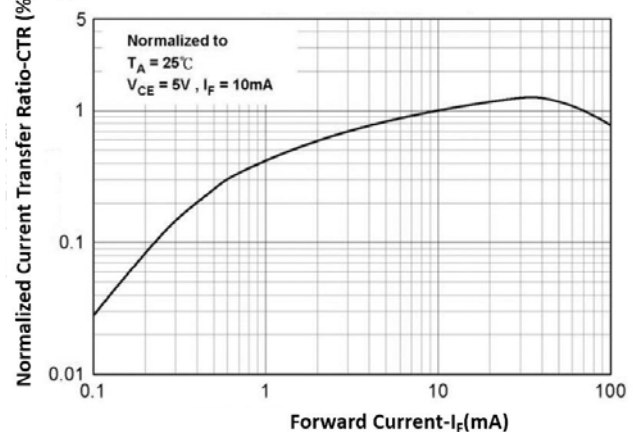




Figure7. Normalized Current Transfer Ratio vs. Ambient Temperature

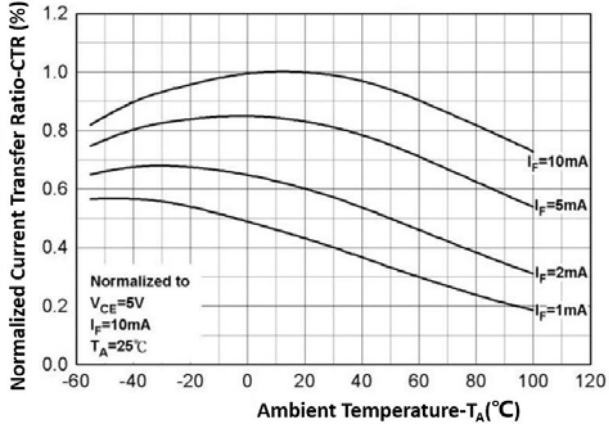


Figure8. Normalized Current Transfer Ratio vs. Ambient Temperature

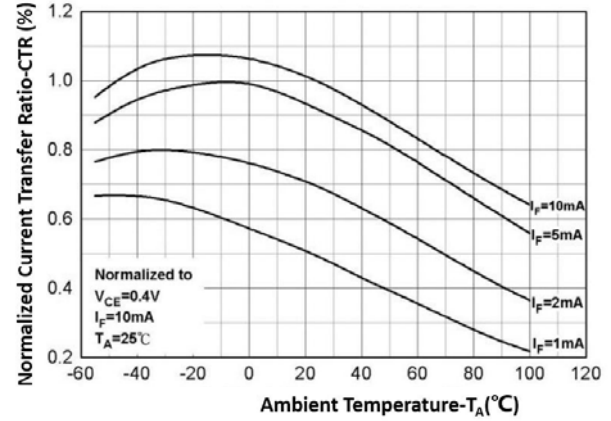


Figure9. Turn on/off Time vs. Collector Current

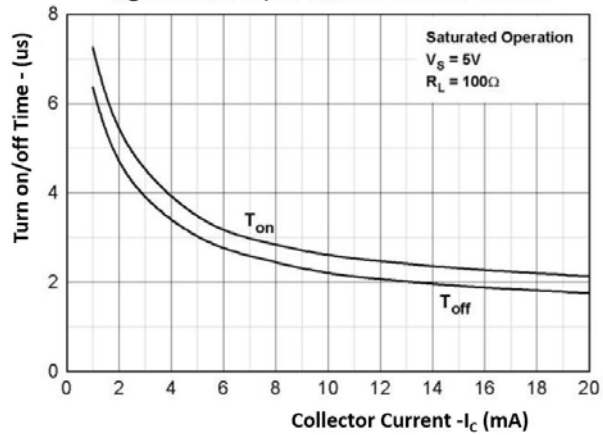


Figure10. Turn on/off Time vs. Forward Current

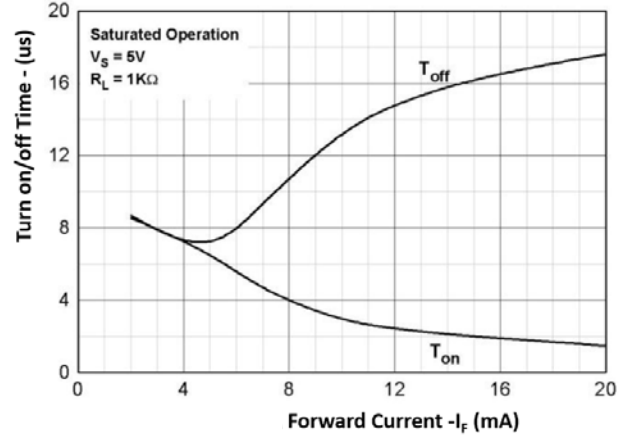
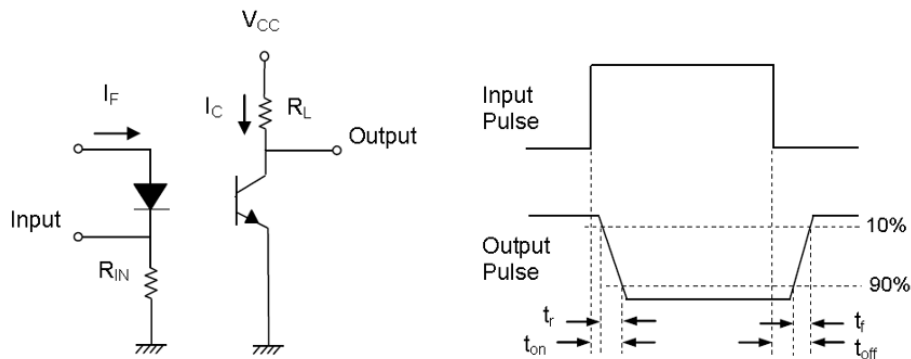


Figure11. Switching Time Test Circuit & Waveforms





## Reliability Test Items And Conditions

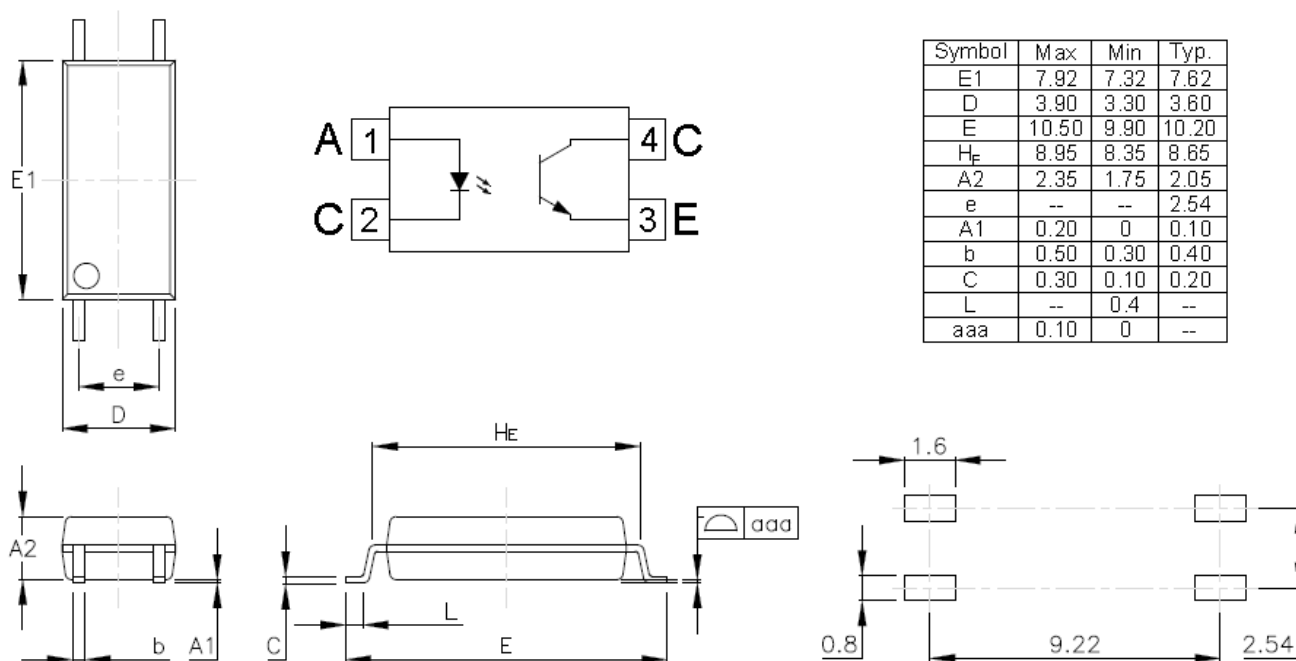
| Test Items                                  | Reference   | Test Conditions                                               | Time        | Quantity | Criterion |
|---------------------------------------------|-------------|---------------------------------------------------------------|-------------|----------|-----------|
| Solderability                               | JESD22-B102 | Tsol=(245±)5°C, t=5s;                                         | 1 times     | 22       | 0/22      |
| Resistance to Soldering Heat                | JESD22-A106 | Tsol=(260±5)°C, t=10s                                         | 3 times     | 22       | 0/22      |
| ESD-HBM                                     | JESD22-A114 | Ta=25°C, HBM (2000V)                                          | P&N 3 times | 10       | 0/10      |
| High Temperature Storage                    | JESD22-A103 | Ta=125°C                                                      | 1000h       | 22       | 0/22      |
| Low Temperature Storage                     | JESD22-A119 | Ta= -55°C                                                     | 1000h       | 22       | 0/22      |
| Thermal Shock                               | JESD22-A104 | -55°C(15min)←→125°C(15min)                                    | 300 cycles  | 22       | 0/22      |
| Lifespan Test                               | JESD22-A108 | Ta=25°C, I <sub>F</sub> =50mA, V <sub>CC</sub> =5V            | 1000h       | 22       | 0/22      |
| DC Operating Life                           | JESD22-A108 | Ta=110°C, I <sub>F</sub> =20mA, V <sub>CC</sub> =5V           | 1000h       | 76       | 0/76      |
| High Temperature High Humidity bias Voltage | JESD22-A101 | Ta =85°C, RH=85%<br>I <sub>F</sub> =0mA, V <sub>CE</sub> =64V | 1000h       | 22       | 0/22      |
| High Temperature bias Voltage               | JESD22-A108 | Ta =110°C, I <sub>F</sub> =0mA, V <sub>CE</sub> =80V          | 1000h       | 22       | 0/22      |
| High pressure steam test                    | JESD22-A102 | P=15PSIG, 121°C, 100%RH                                       | 96h         | 22       | 0/22      |

## Criteria For Judging Damage

| Test Items                           | Symbol                | Test Conditions                            | Criteria For Judging Damage              |
|--------------------------------------|-----------------------|--------------------------------------------|------------------------------------------|
| Forward Voltage                      | V <sub>F</sub> (V)    | I <sub>F</sub> =20mA                       | Initial Data±20%                         |
| Reverse Current                      | I <sub>R</sub> (uA)   | V <sub>R</sub> =4V                         | I <sub>R</sub> ≤10μA                     |
| Current Transfer Ratio               | CTR(%)                | I <sub>F</sub> =5mA, V <sub>CE</sub> =5V   | Initial Data±20%                         |
| Collector-Emitter Saturation Voltage | V <sub>CE</sub> (sat) | I <sub>F</sub> =20mA, I <sub>C</sub> =1mA  | V <sub>CE</sub> (sat) ≤0.2V              |
| Collector-Emitter breakdown voltage  | BV <sub>CEO</sub> (V) | I <sub>C</sub> =0.1mA, I <sub>F</sub> =0mA | BV <sub>CEO</sub> ≥80V& Initial Data±20% |
| Collector Current                    | I <sub>CEO</sub> (nA) | V <sub>CE</sub> =20V, I <sub>F</sub> =0    | I <sub>CEO</sub> ≤0.1μA                  |



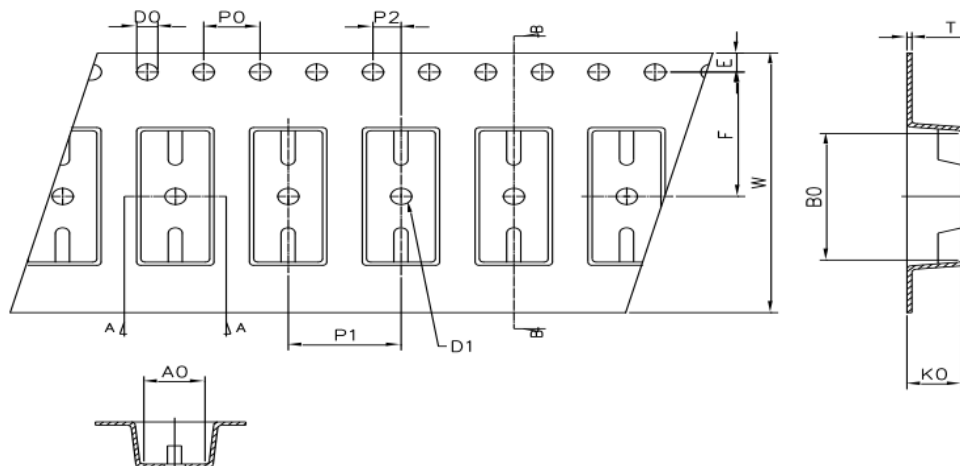
## Packaging Dimension (Unit : mm)





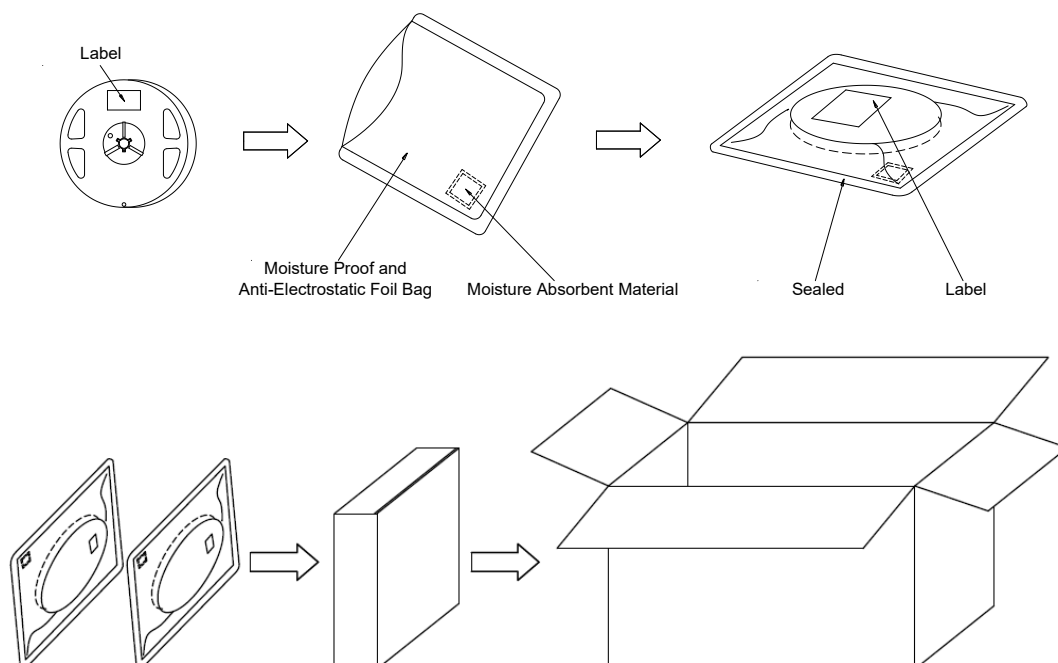
## Packaging

Standard Packing : 3000pcs/Reel



| Dimension No.  | Ao             | Bo             | Do             | D1             | Po             | P1             | P2             | E              | F              | T              | W              | Ko             |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                | +0.10<br>-0.10 | +0.10<br>-0.10 | +0.10<br>-0.00 | +0.10<br>-0.00 | +0.10<br>-0.10 | +0.10<br>-0.10 | +0.10<br>-0.10 | +0.10<br>-0.10 | +0.10<br>-0.10 | +0.05<br>-0.05 | +0.30<br>-0.10 | +0.10<br>-0.10 |
| Dimension (mm) | 5.10           | 10.50          | 1.50           | 1.50           | 4.00           | 8.00           | 2.00           | 1.75           | 7.50           | 0.40           | 16.00          | 4.20           |

## Moisture Proof and Anti-Electrostatic Foil Bag



Each inner box contains 2 packing bag, 6000pcs product per box;  
Each outer box contains 10 inner boxes, 60000pcs product per box;



## Precautions for Use

### Hand soldering Condition

Hand soldering by soldering iron, One time soldering is recommended:

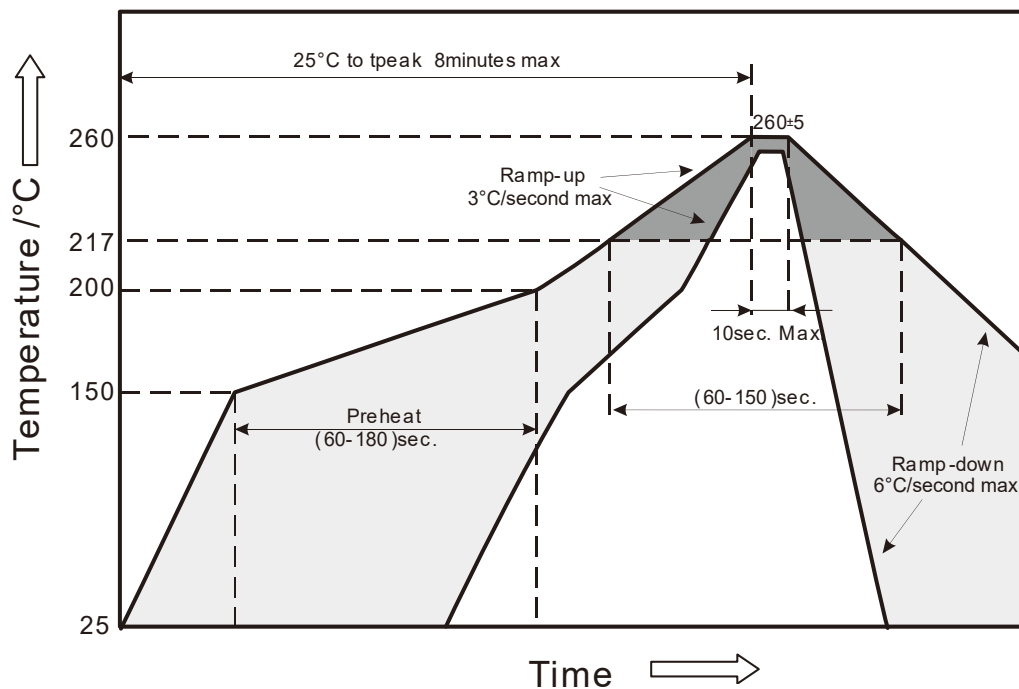
Temperature: 380

+5/-5°C Time: 3 sec max

### Reflow Soldering

Stress on the product should be avoided during heating in soldering process.

After soldering, do not deal with the product before its temperature drop down to room temperature.





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