

### ● Description

The KP4010 series consist of a photodarlington optically coupled to a gallium arsenide infrared-emitting diode in a 4-pin DIP package and available in wide-lead spacing and SMD option. Collector-emitter voltage is 300V. It features a high current transfer ratio, low coupling capacitance and high isolation voltage.

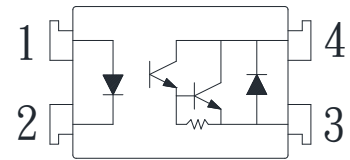
### ● Features

1. High current transfer ratio ( $V_{ce0}$ : 300V min.)  
( CTR : Min. 600% at  $I_F=1mA$   $V_{CE}=2V$  )
2. High isolation voltage between input and output  
( Viso : 5000Vrms )
3. Compact dual-in-line package
4. Pb free and RoHS compliant
5. MSL class 1
6. Agency Approvals
  - UL Approved (No. E169586): UL1577
  - c-UL Approved (No. E169586)
  - VDE Approved (No. 101347): DIN EN60747-5-5
  - FIMKO Approved: EN62368-1, EN60601-1
  - CQC Approved: GB8898-2011, GB4943.1-2011

### ● Applications

- System appliances, measuring instruments
- Industrial robots
- Copiers, automatic vending machines, facsimiles
- Signal transmission between circuits of different potentials and impedances
- Telephone sets
- Numerical control machines
- Interface with various power supply circuits, power distribution boards

### ● Schematic

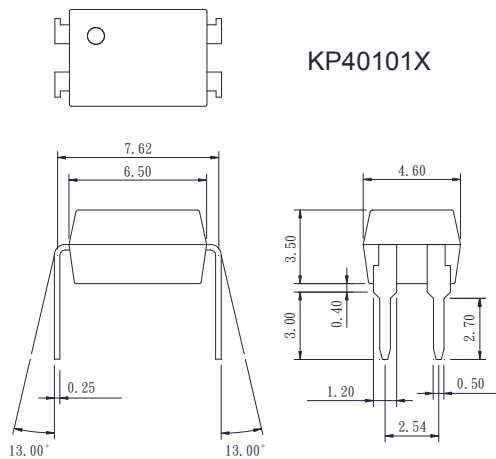


1. Anode
2. Cathode
3. Emitter
4. Collector

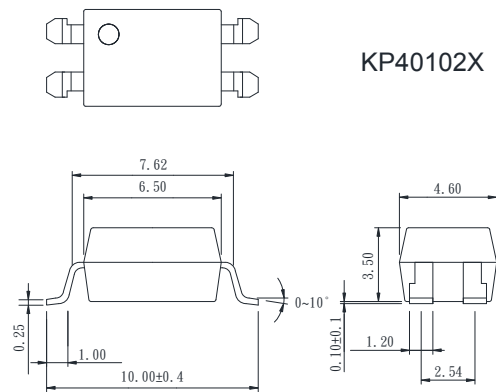
● **Outside Dimension**

Unit : mm

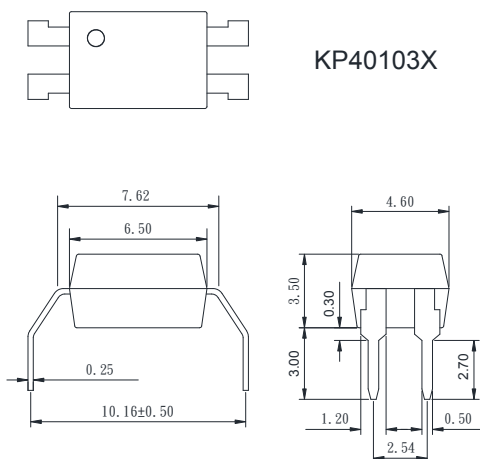
1. Dual-in-line type.



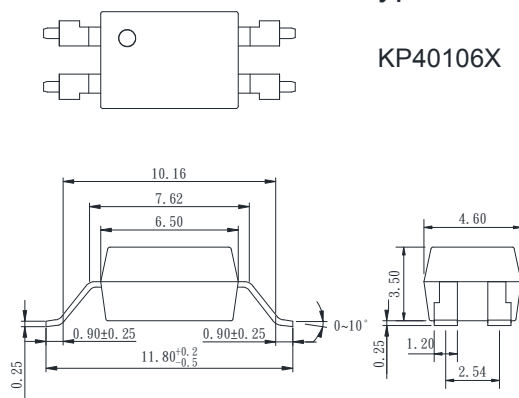
2. Surface mount type.



3. Long creepage distance type

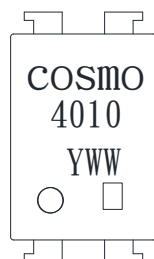


4. Long creepage distance for surface mount type.



TOLERANCE : ±0.2mm

● **Device Marking**



**Notes:**

**COSMO**  
**4010**  
**YWW**

Y: Year code / WW: Week code



□: CTR rank

● **Absolute Maximum Ratings**

(Ta=25°C)

| Parameter                        |                             | Symbol    | Rating      | Unit |
|----------------------------------|-----------------------------|-----------|-------------|------|
| Input                            | Forward current             | $I_F$     | 50          | mA   |
|                                  | Peak forward current        | $I_{FM}$  | 1           | A    |
|                                  | Reverse voltage             | $V_R$     | 6           | V    |
|                                  | Power dissipation           | $P_D$     | 70          | mW   |
| Output                           | Collector-emitter voltage   | $V_{CEO}$ | 300         | V    |
|                                  | Emitter-collector voltage   | $V_{ECO}$ | 0.1         | V    |
|                                  | Collector current           | $I_C$     | 150         | mA   |
|                                  | Collector power dissipation | $P_C$     | 200         | mW   |
| Total power dissipation          |                             | $P_{tot}$ | 200         | mW   |
| Isolation voltage 1 minute       |                             | $V_{iso}$ | 5000        | Vrms |
| Operating temperature            |                             | $T_{opr}$ | -55 to +115 | °C   |
| Storage temperature              |                             | $T_{stg}$ | -55 to +125 | °C   |
| Soldering temperature 10 seconds |                             | $T_{sol}$ | 260         | °C   |

● **Electro-optical Characteristics**

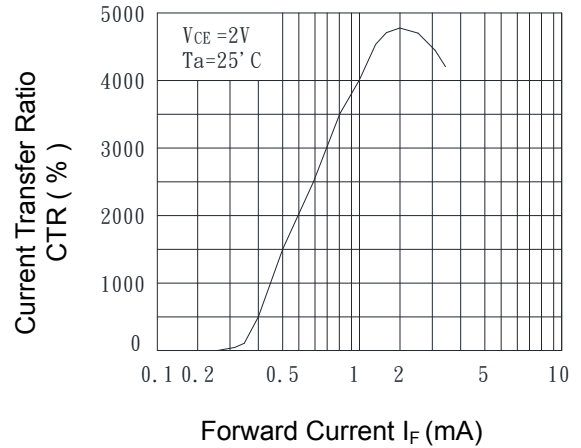
(Ta=25°C)

| Parameter                |                              | Symbol        | Conditions                           | Min.               | Typ. | Max. | Unit     |
|--------------------------|------------------------------|---------------|--------------------------------------|--------------------|------|------|----------|
| Input                    | Forward voltage              | $V_F$         | $I_F=20mA$                           | -                  | 1.2  | 1.4  | V        |
|                          | Peak forward voltage         | $V_{FM}$      | $I_{FM}=0.5A$                        | -                  | -    | 3.5  | V        |
|                          | Reverse current              | $I_R$         | $V_R=4V$                             | -                  | -    | 10   | $\mu A$  |
|                          | Terminal capacitance         | $C_t$         | $V=0, f=1KHz$                        | -                  | 30   | -    | pF       |
| Output                   | Collector dark current       | $I_{CEO}$     | $V_{CE}=200V$                        | -                  | -    | 1.0  | $\mu A$  |
| Transfer characteristics | Current transfer ratio       | CTR           | $I_F=1mA, V_{CE}=2V$                 | 600                | -    | 9000 | %        |
|                          | Collector-emitter saturation | $V_{CE(sat)}$ | $I_F=20mA, I_C=5mA$                  | -                  | -    | 1.5  | V        |
|                          | Isolation resistance         | $R_{iso}$     | DC500V                               | $5 \times 10^{10}$ | -    | -    | $\Omega$ |
|                          | Floating capacitance         | $C_f$         | $V=0, f=1MHz$                        | -                  | 0.6  | 1.0  | pF       |
|                          | Cut-off frequency            | $f_C$         | $V_{CC}=5V, I_C=2mA, R_L=100\Omega$  | -                  | 7    | -    | KHz      |
|                          | Response time (Rise)         | $t_r$         | $V_{CE}=2V, I_C=20mA, R_L=100\Omega$ | -                  | 60   | 300  | $\mu s$  |
|                          | Response time (Fall)         | $t_f$         |                                      | -                  | 50   | 250  | $\mu s$  |

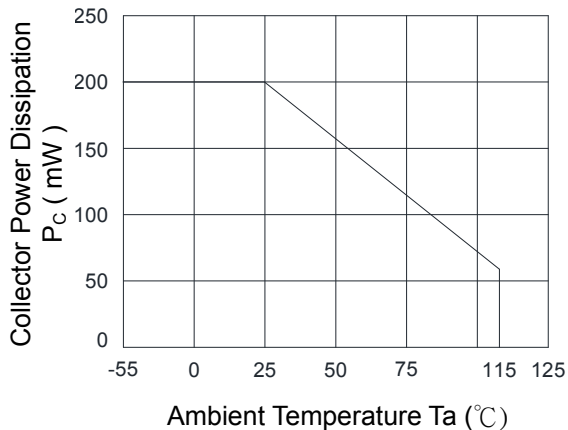
Classification table of current transfer ratio is shown below.

| KP4010 Model No. | CTR (%)     |
|------------------|-------------|
| KP4010 A         | 600 ~ 2000  |
| KP4010 B         | 1500 ~ 4000 |
| KP4010 C         | 3000 ~ 6000 |
| KP4010 D         | 5000 ~ 9000 |
| KP4010 E         | 600 ~ 9000  |

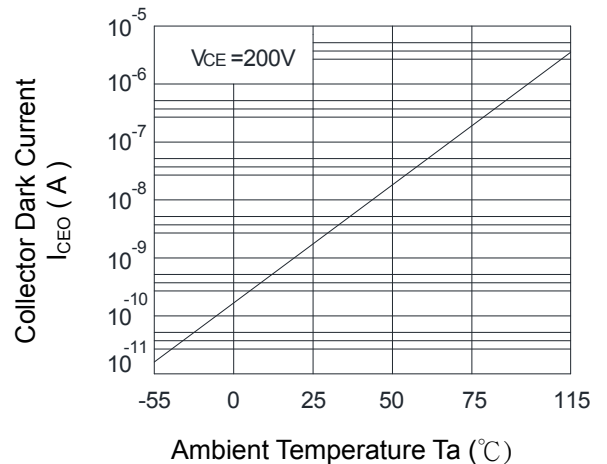
**Fig.1 Current Transfer Ratio vs. Forward Current**



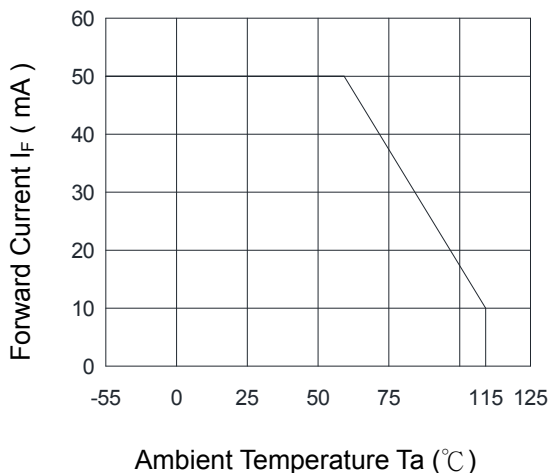
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



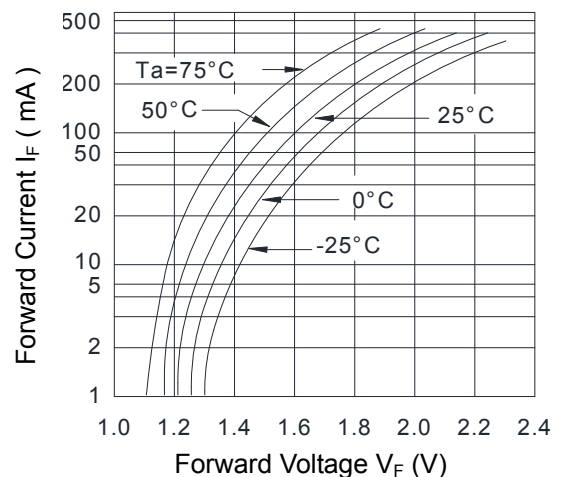
**Fig.3 Collector Dark Current vs. Ambient Temperature**



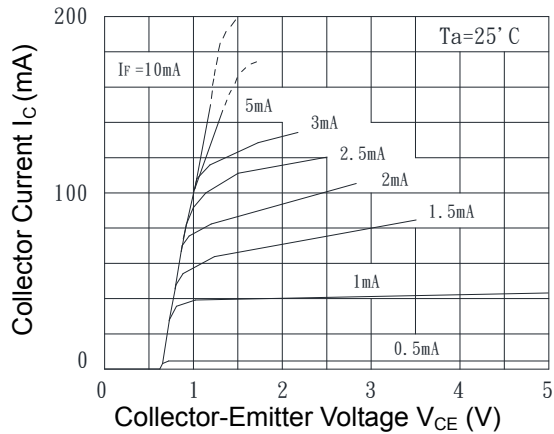
**Fig.4 Forward Current vs. Ambient Temperature**



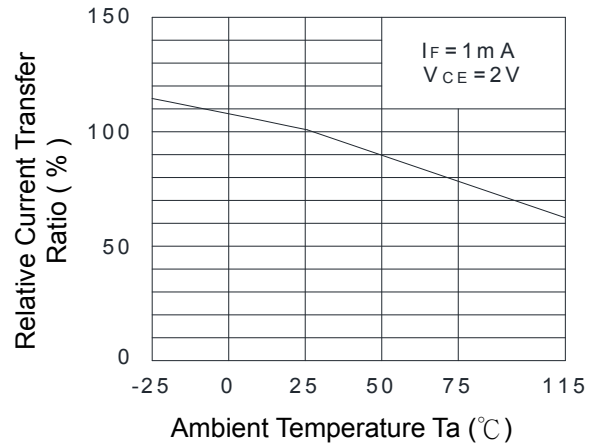
**Fig.5 Forward Current vs. Forward Voltage**



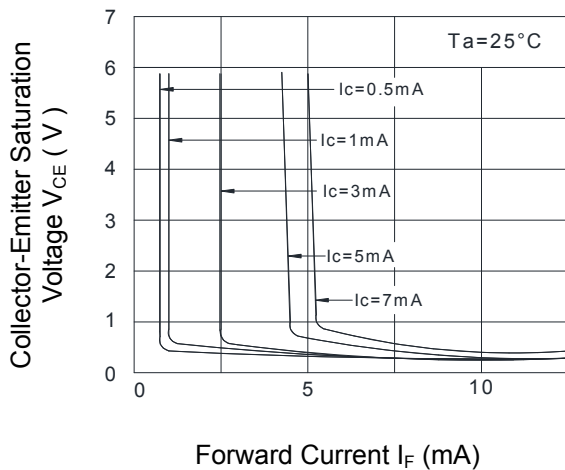
**Fig.6 Collector Current vs. Collector-Emitter Voltage**



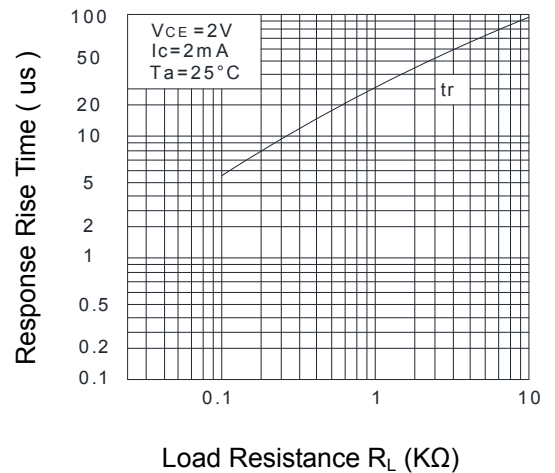
**Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature**



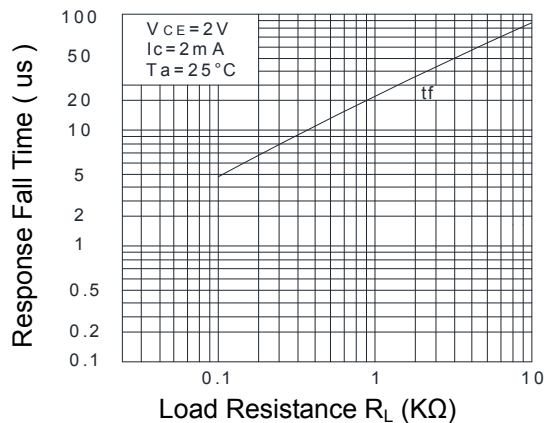
**Fig.8 Collector-Emitter Saturation Voltage vs. Forward Current**



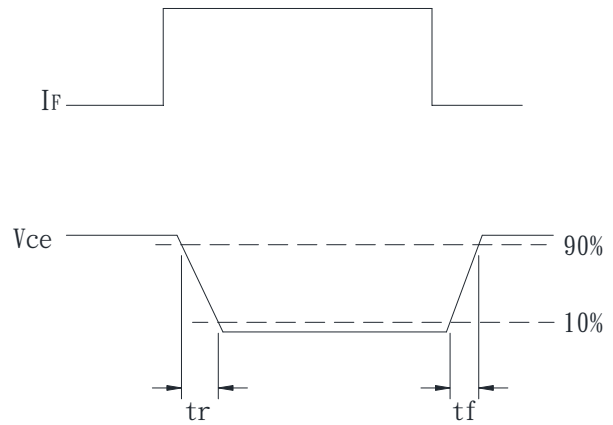
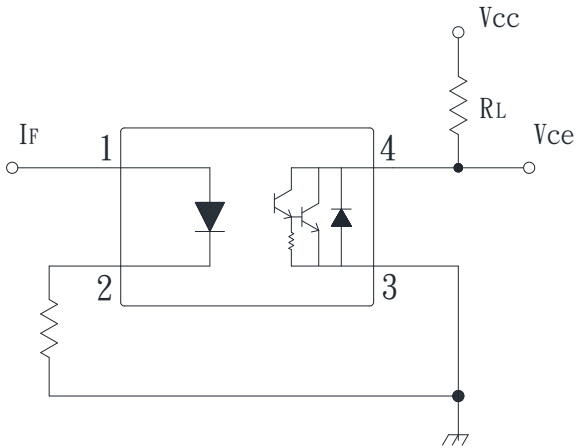
**Fig.9 Response Time (Rise) vs. Load Resistance**



**Fig.10 Response Time (Fall) vs. Load Resistance**



● **Test Circuit for Response Time**

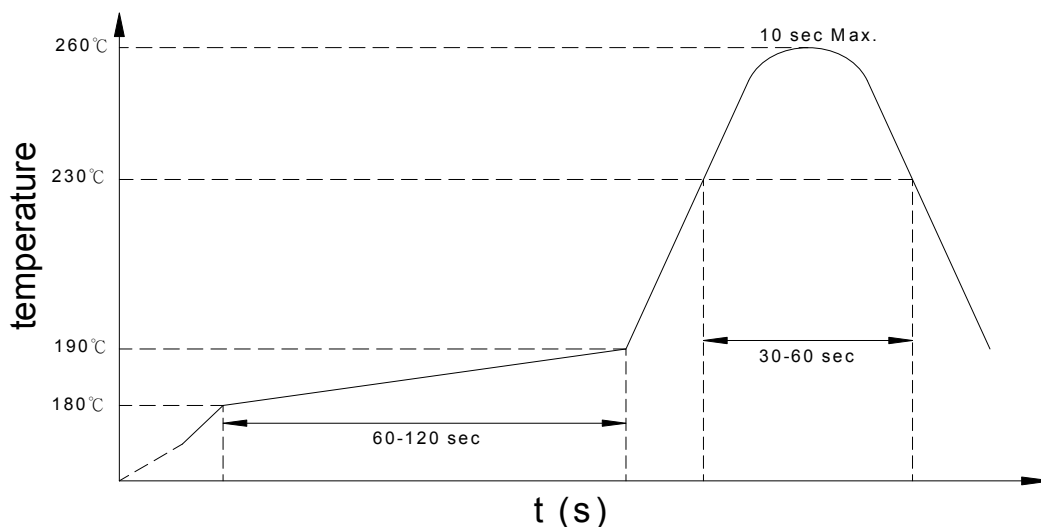


### ● Recommended Soldering Conditions

#### (a) Infrared reflow soldering :

- Peak reflow soldering : 260°C or below (package surface temperature)
- Time of peak reflow temperature : 10 sec
- Time of temperature higher than 230°C : 30-60 sec
- Time to preheat temperature from 180~190°C : 60-120 sec
- Time(s) of reflow : Two
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

#### Recommended Temperature Profile of Infrared Reflow



#### (b) Wave soldering :

- Temperature : 260°C or below (molten solder temperature)
- Time : 10 seconds or less
- Preheating conditions : 120°C or below (package surface temperature)
- Time(s) of reflow : One
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

#### (c) Cautions :

- Fluxes : Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- Avoid shorting between portion of frame and leads.

● **Numbering System**

### KP4010 X Y (Z)

**Notes:**

KP4010 = Part No.

X = Lead form option (1,2,3,6)

Y = CTR rank option (A ~ E)

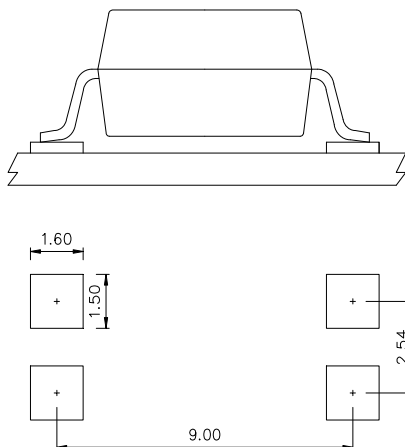
Z = Tape and reel option (TLD, TRU)

| Option  | Description                                                                    | Packing quantity    |
|---------|--------------------------------------------------------------------------------|---------------------|
| 2 (TLD) | surface mount type package + TLD tape & reel option                            | 2000 units per reel |
| 2 (TRU) | surface mount type package + TRU tape & reel option                            | 2000 units per reel |
| 6 (TLD) | long creepage distance for surface mount type package + TLD tape & reel option | 2000 units per reel |
| 6 (TRU) | long creepage distance for surface mount type package + TRU tape & reel option | 2000 units per reel |

● **Recommended Pad Layout for Surface Mount Lead Form**

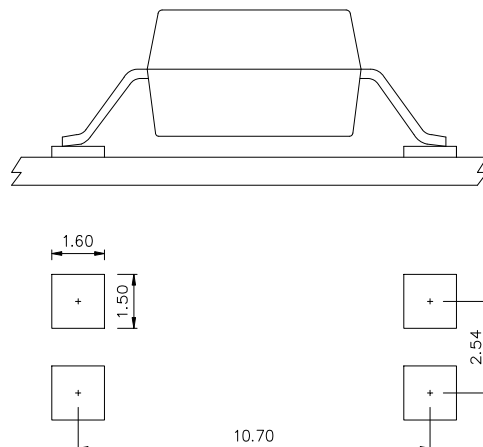
1. Surface mount type.

4 pin SMD



2. Long creepage distance for surface mount type.

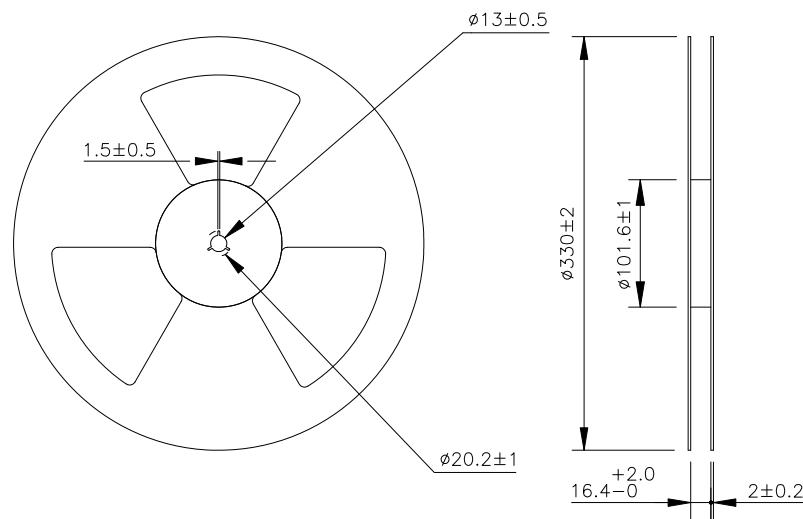
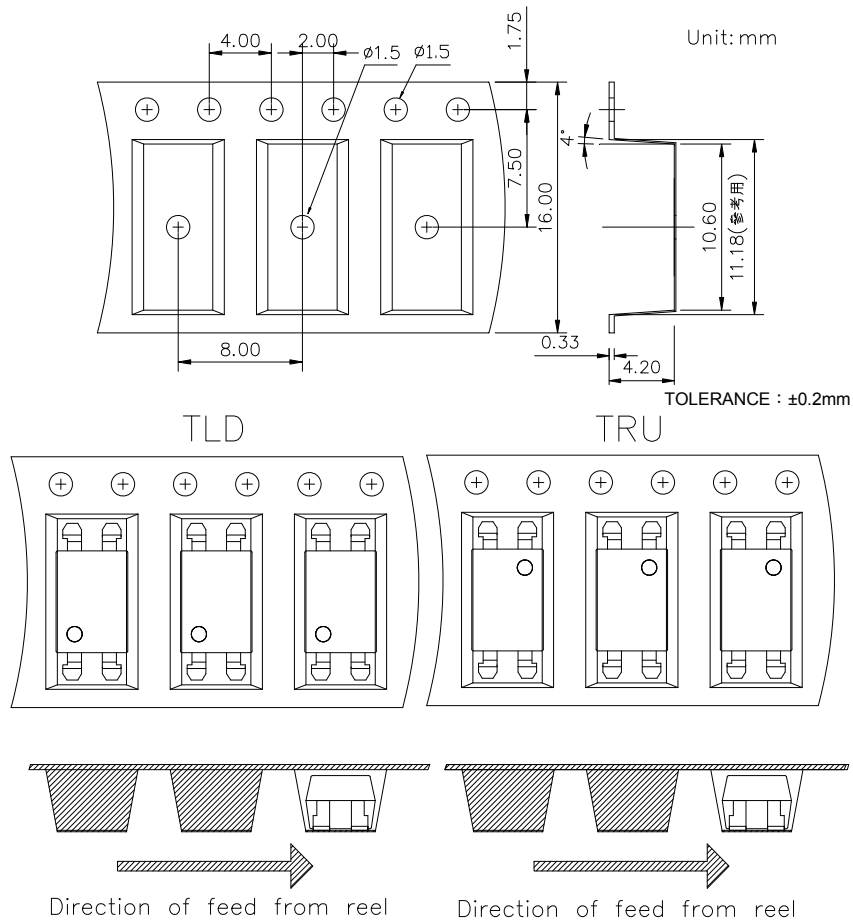
4 pin L



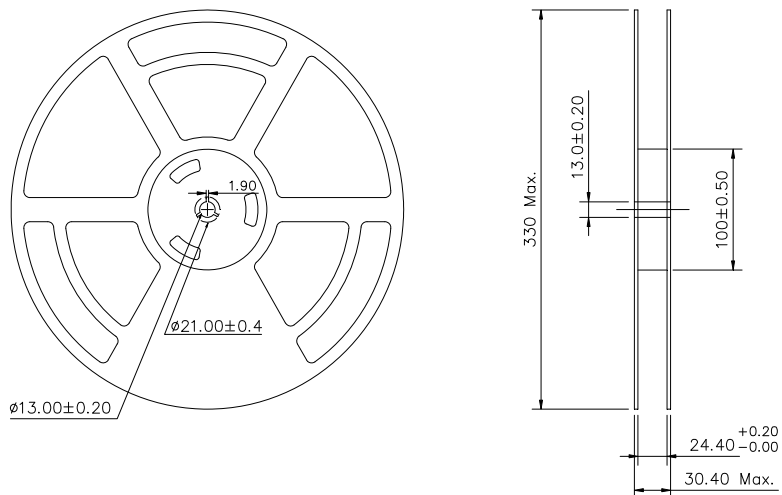
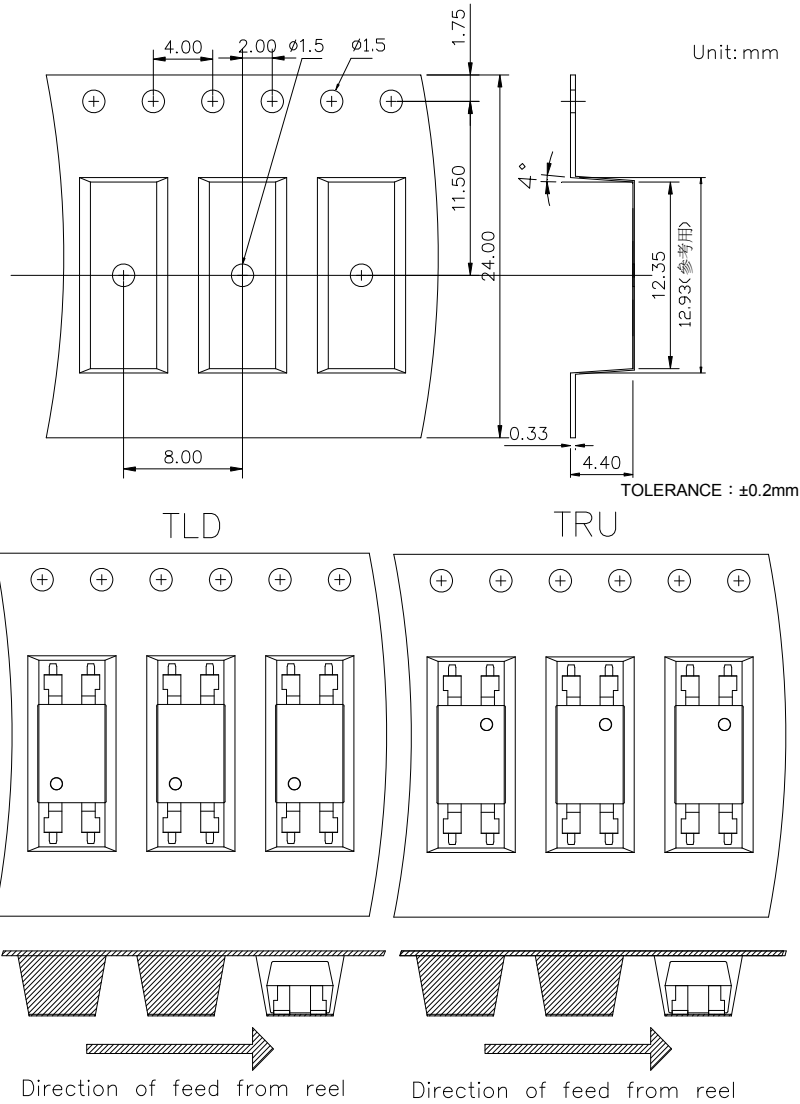
Unit : mm



● 4-pin SMD Carrier Tape & Reel



● 4-pin L Carrier Tape & Reel



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