

● 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.

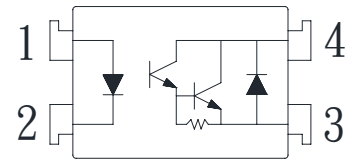
● Features

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: EN60065, EN60950, EN60335
 - SEMKO Approved: EN60065, EN60950, EN60335
 - 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

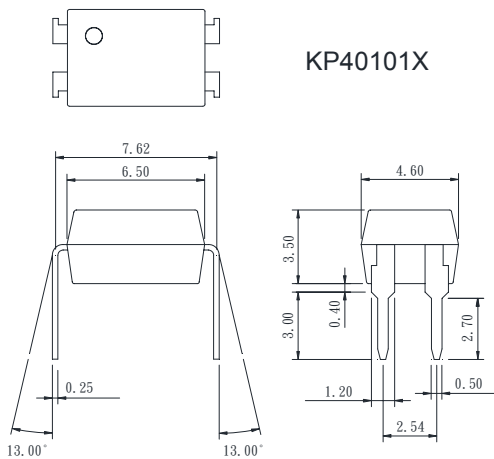


1. Anode
2. Cathode
3. Emitter
4. Collector

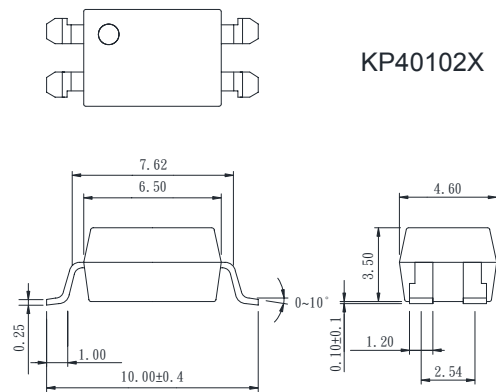
● **Outside Dimension**

Unit : mm

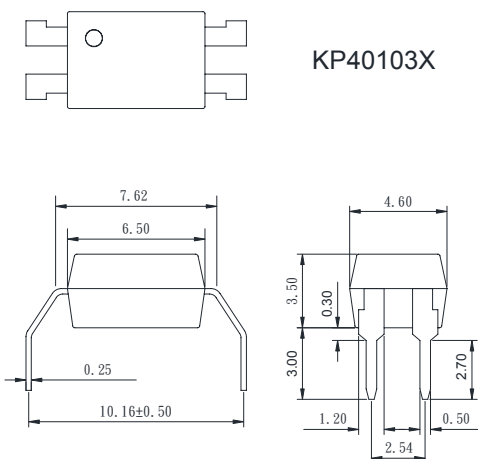
1. Dual-in-line type.



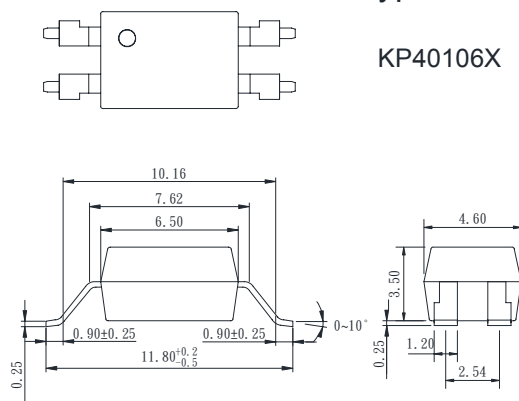
2. Surface mount type.



3. Long creepage distance type

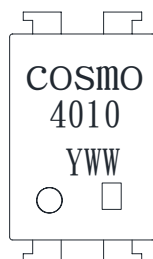


4. Long creepage distance for surface mount type.



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

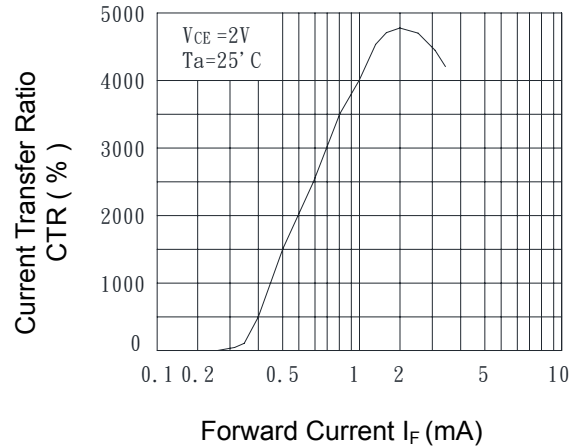
(Ta=25°C)

| 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 | μA |
| | Terminal capacitance | C_t | $V=0, f=1KHz$ | - | 30 | - | pF |
| Output | Collector dark current | I_{CEO} | $V_{CE}=200V$ | - | - | 1.0 | μA |
| 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 | 5×10^{10} | - | - | Ω |
| | 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 | μs |
| | Response time (Fall) | t_f | | - | 50 | 250 | μs |

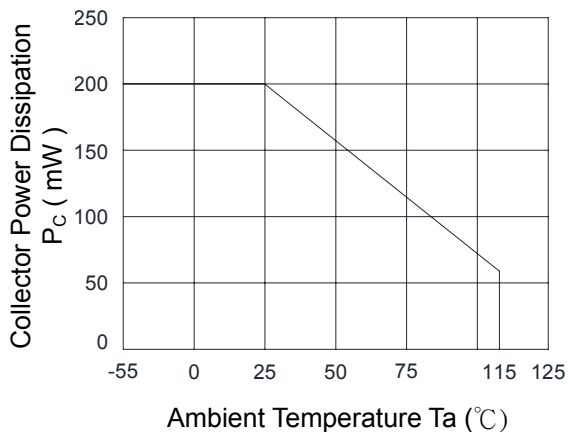
Classification table of current transfer ratio is shown below.

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

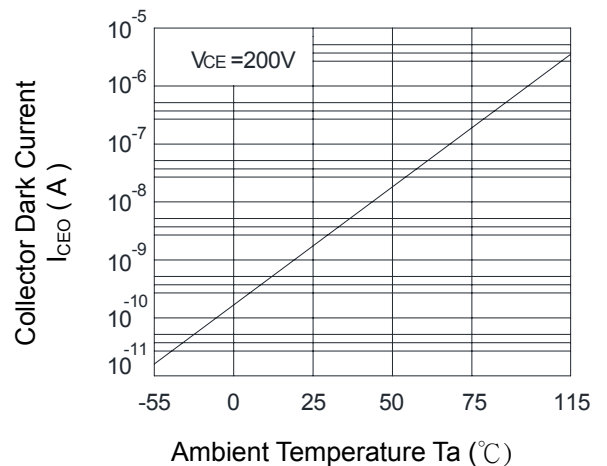
**Fig.1 Current Transfer Ratio
vs. Forward Current**



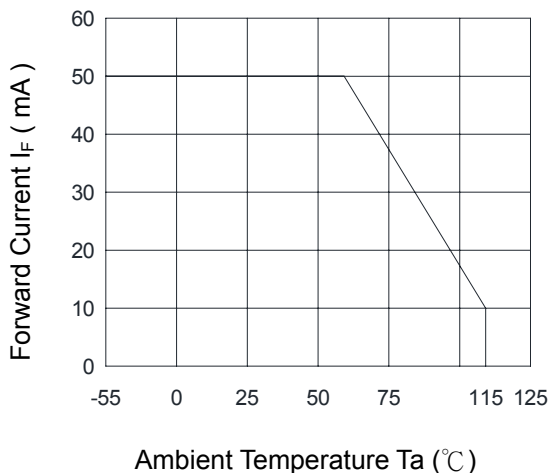
**Fig.2 Collector Power Dissipation
vs. Ambient Temperature**



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



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



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

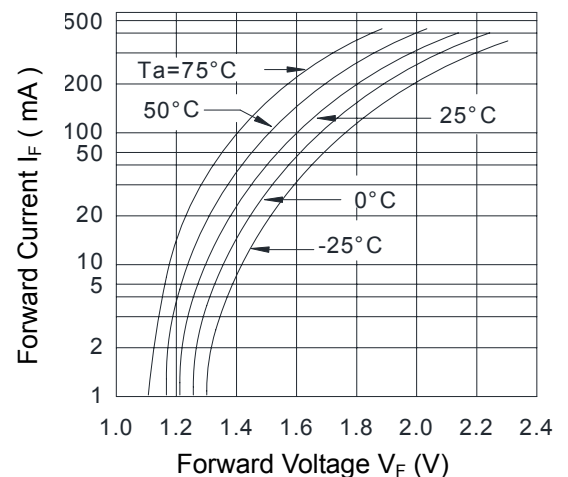


Fig.6 Collector Current vs. Collector-Emitter Voltage

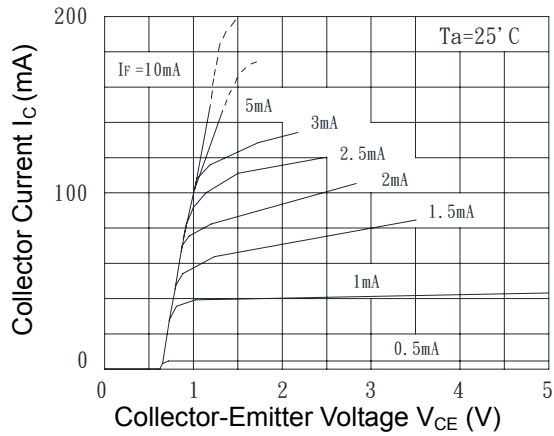


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

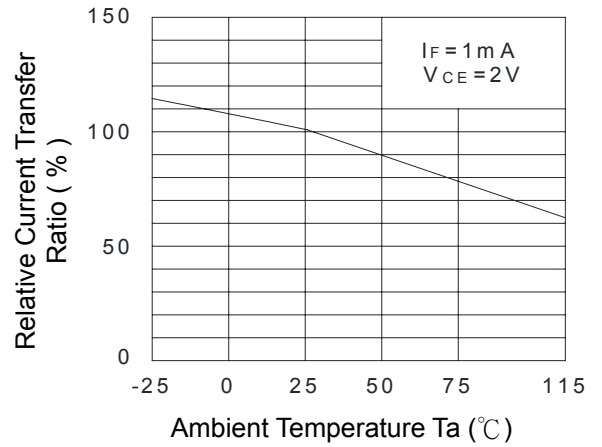


Fig.8 Collector-Emitter Saturation Voltage vs. Forward Current

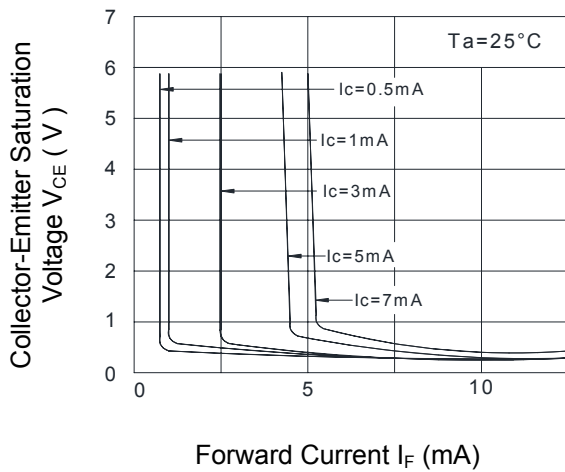


Fig.9 Response Time (Rise) vs. Load Resistance

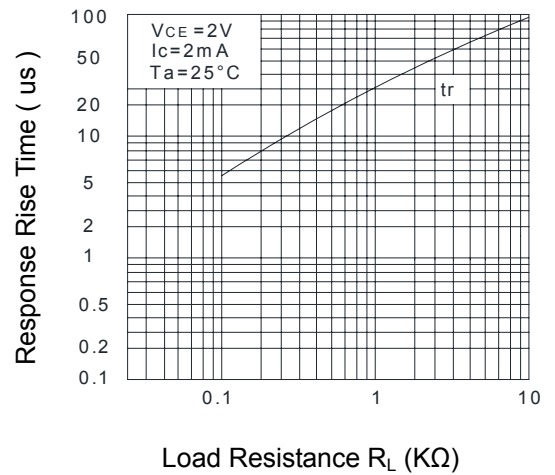
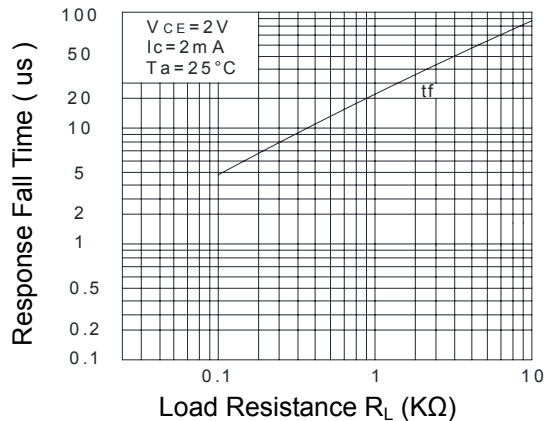
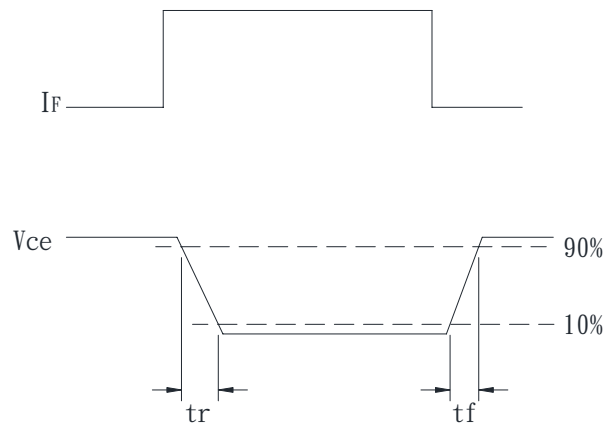
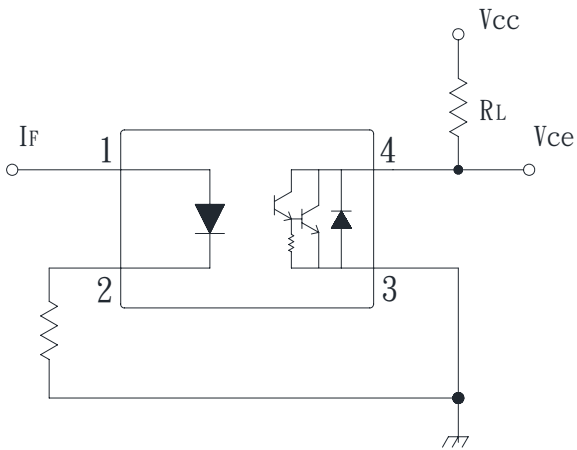


Fig.10 Response Time (Fall) vs. Load Resistance



- **Test Circuit for Response Time**

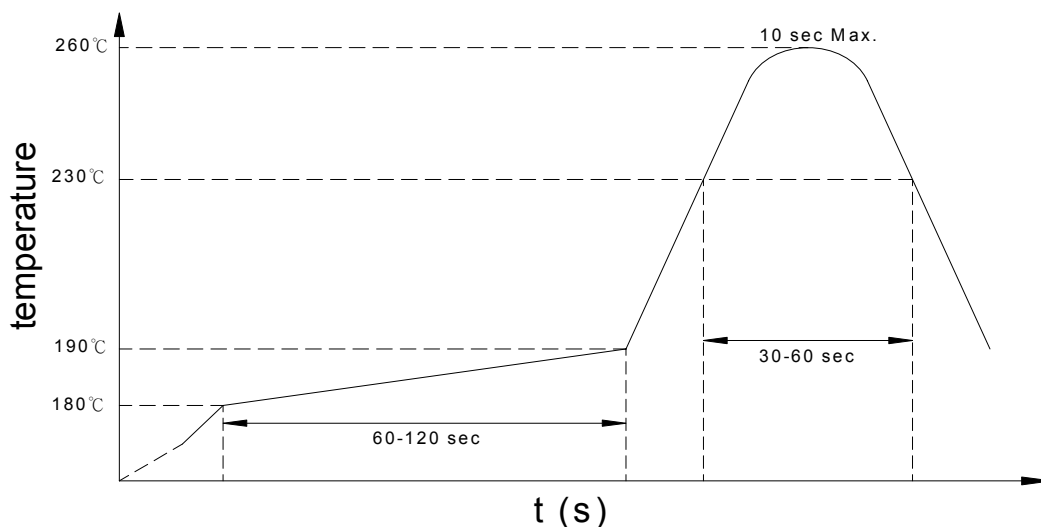


● **Recommended Soldering Conditions**

(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)

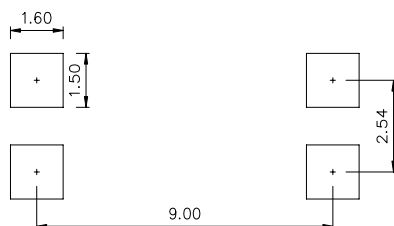
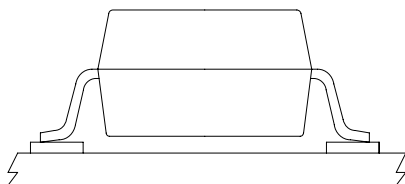
Z = Tape and reel option (TLD, TRU)

| 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**

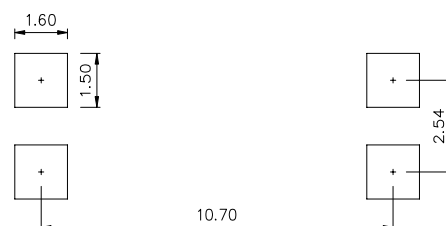
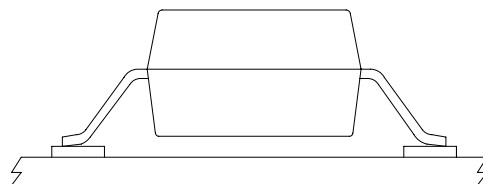
1. Surface mount type.

4 pin SMD



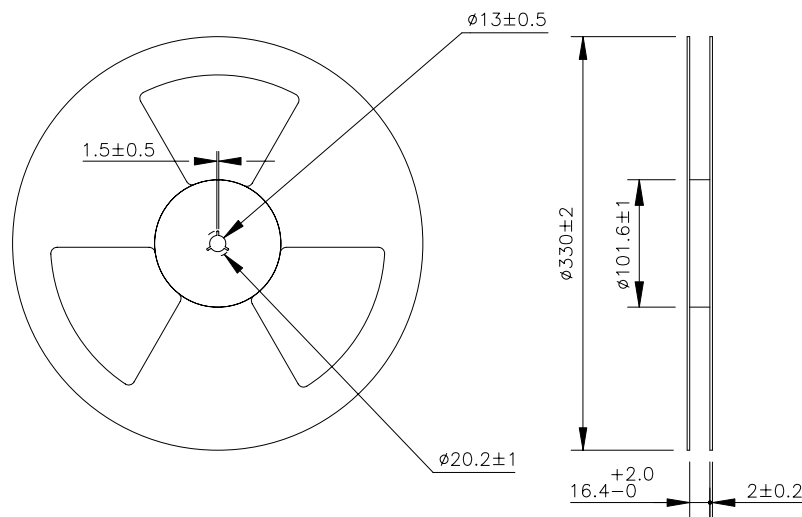
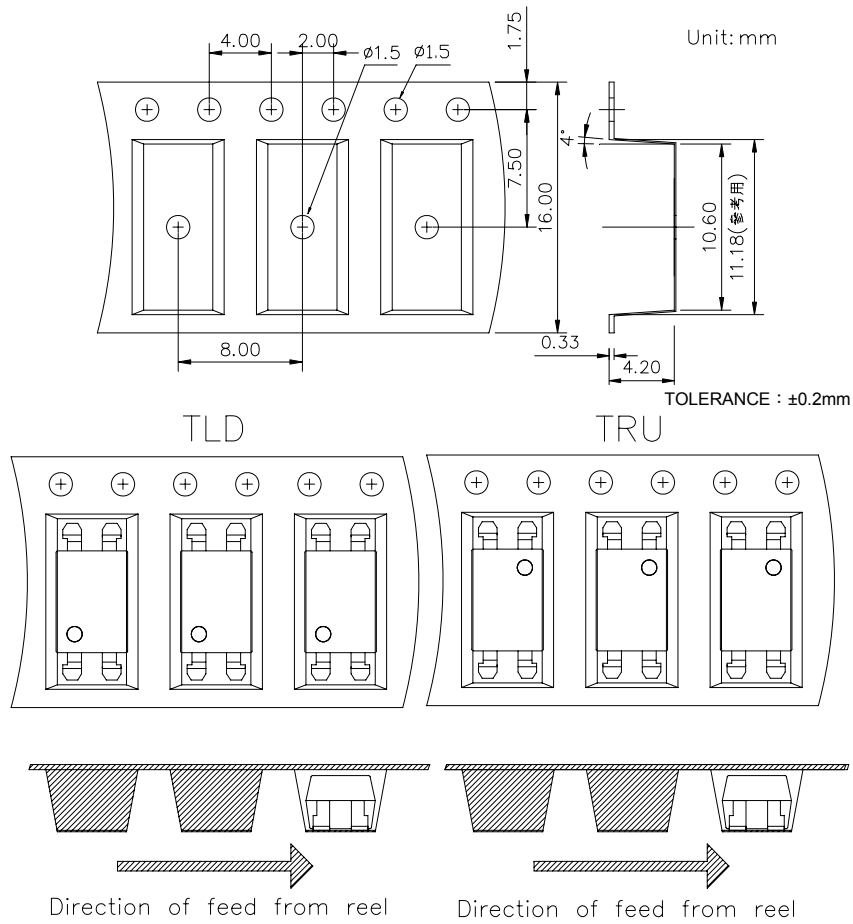
2. Long creepage distance for surface mount type.

4 pin L

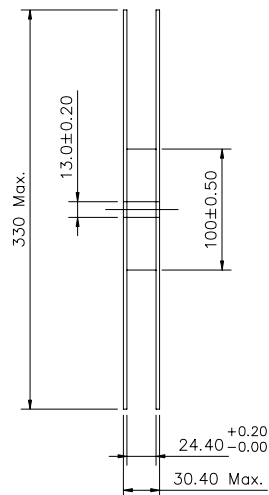
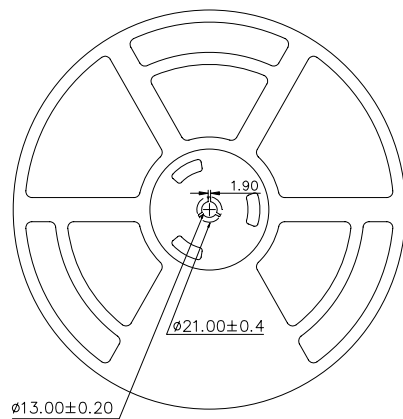
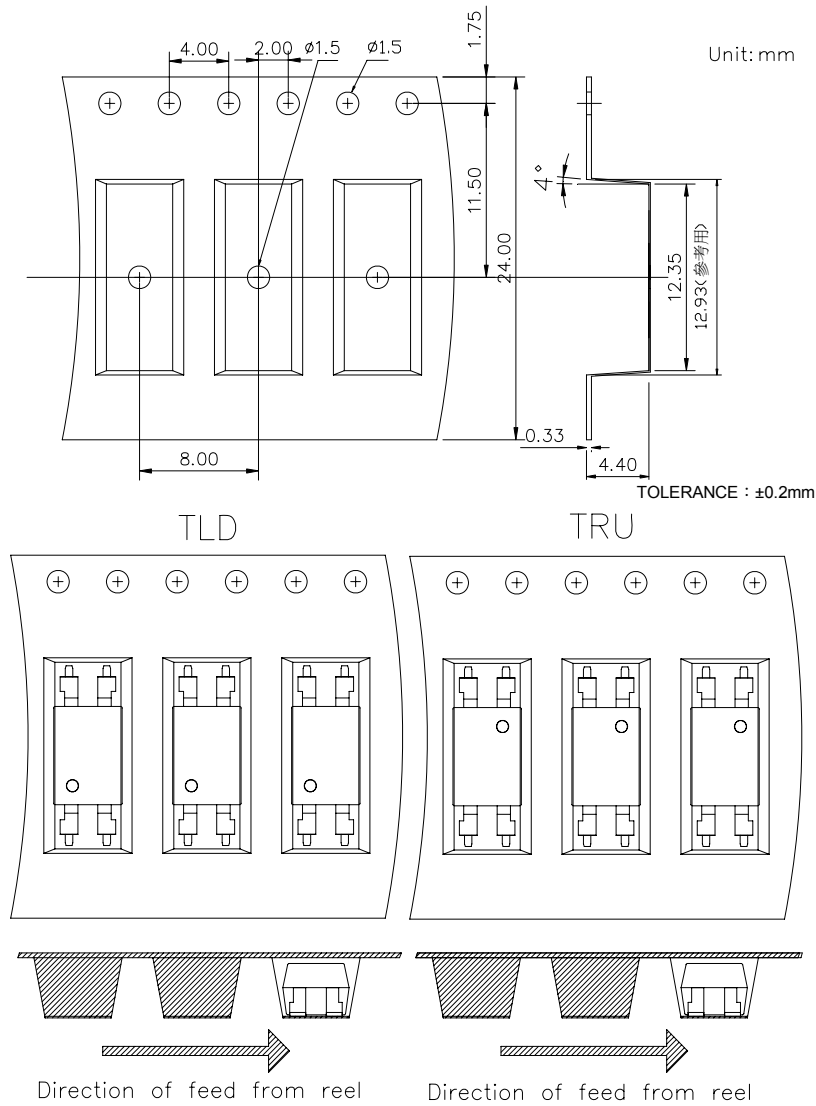


Unit : mm

● 4-pin SMD Carrier Tape & Reel



● 4-pin L Carrier Tape & Reel



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