

### ● 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.

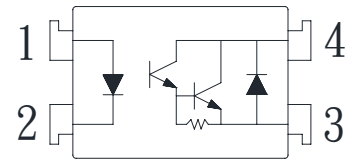
### ● Features

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

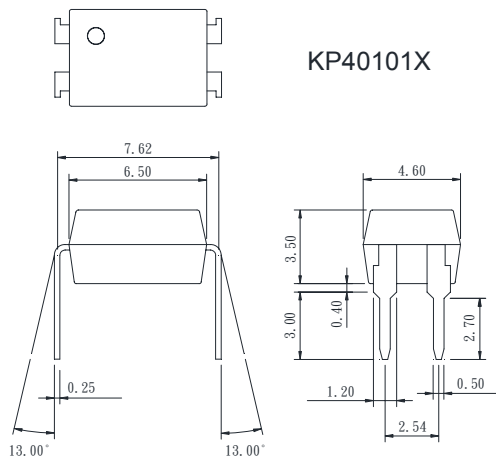


1. Anode
2. Cathode
3. Emitter
4. Collector

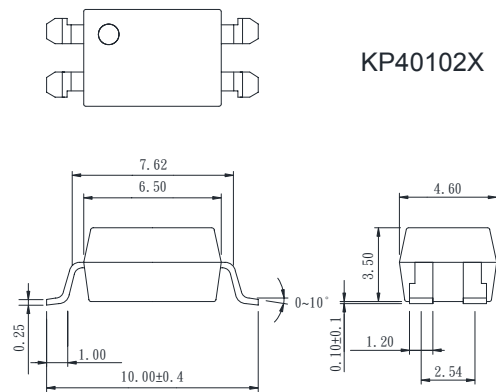
● **Outside Dimension**

Unit : mm

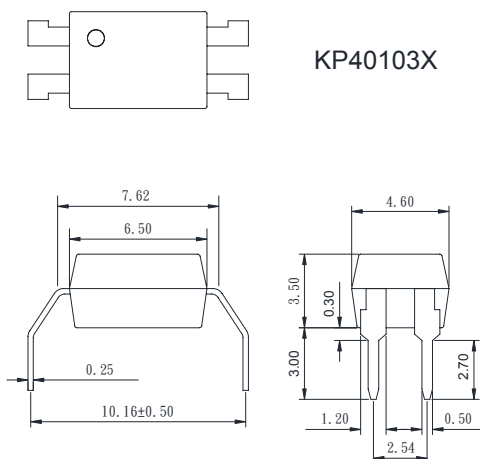
1. Dual-in-line type.



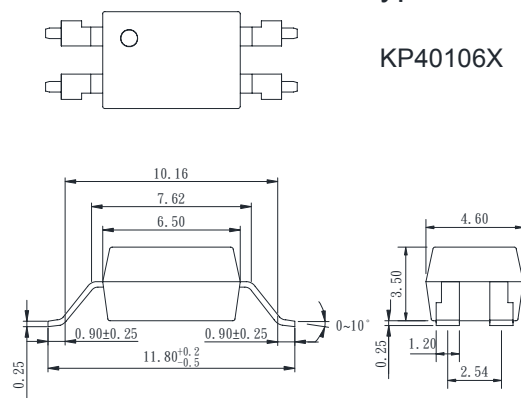
2. Surface mount type.



3. Long creepage distance type

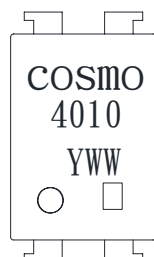


4. Long creepage distance for surface mount type.



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**

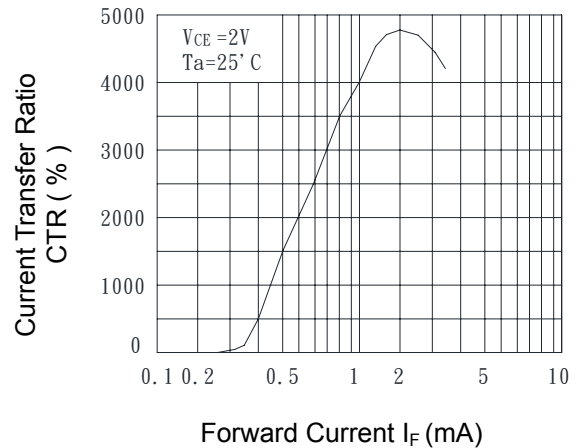
(Ta=25°C)

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	$\mu A$
	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	$\mu s$

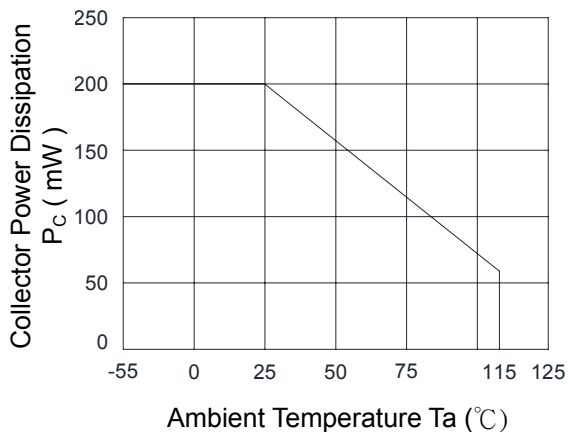
Classification table of current transfer ratio is shown below.

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

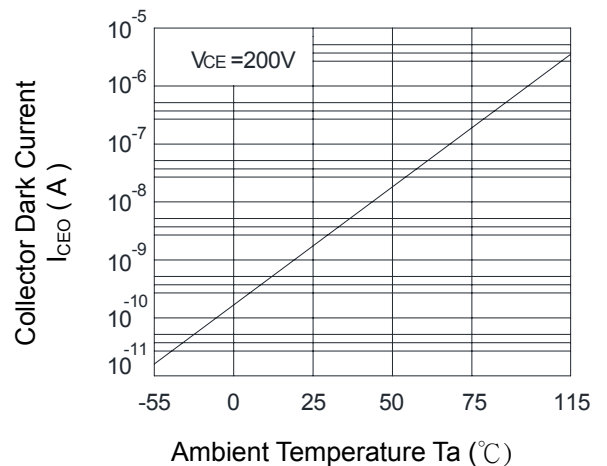
**Fig.1 Current Transfer Ratio  
vs. Forward Current**



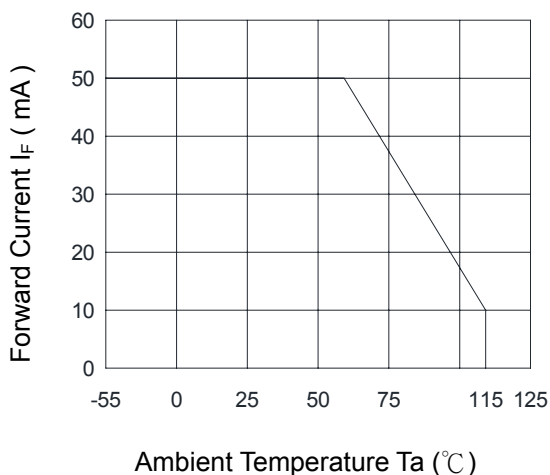
**Fig.2 Collector Power Dissipation  
vs. Ambient Temperature**



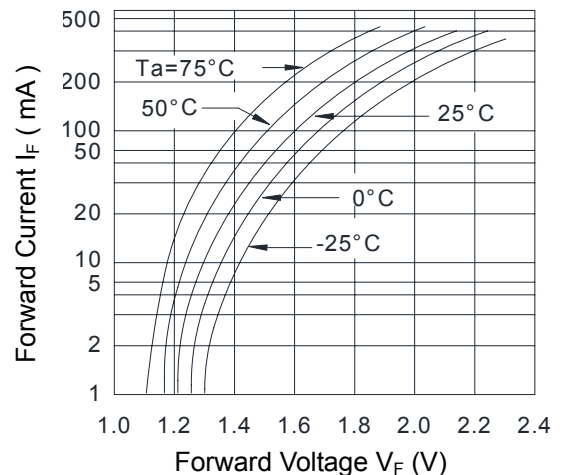
**Fig.3 Collector Dark Current  
vs. Ambient Temperature**



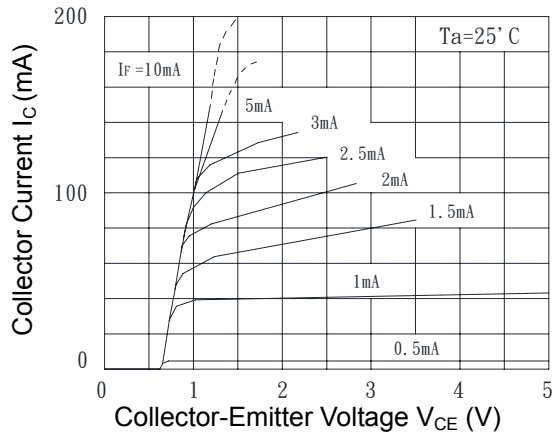
**Fig.4 Forward Current  
vs. Ambient Temperature**



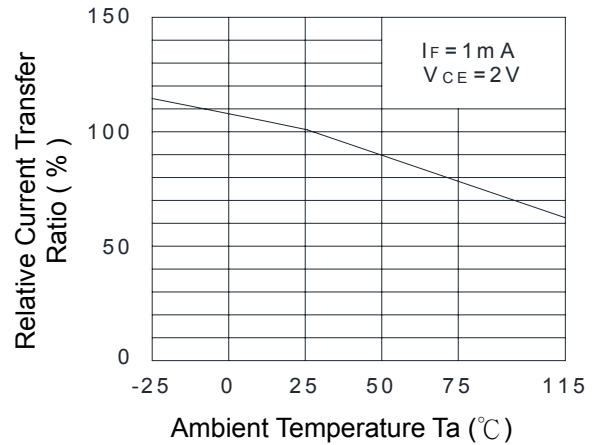
**Fig.5 Forward Current  
vs. Forward Voltage**



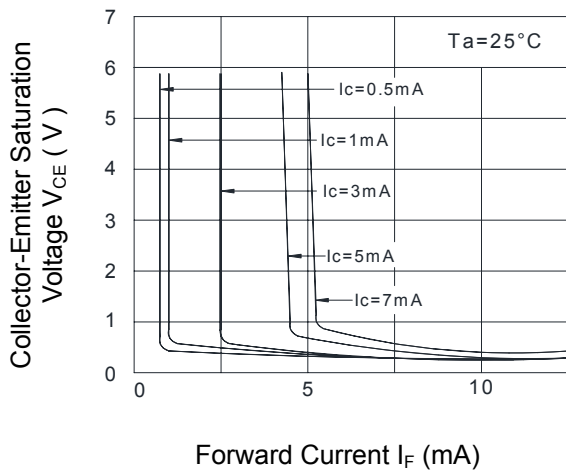
**Fig.6 Collector Current vs. Collector-Emitter Voltage**



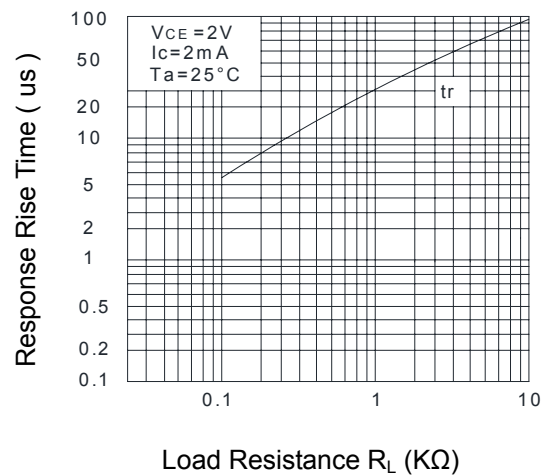
**Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature**



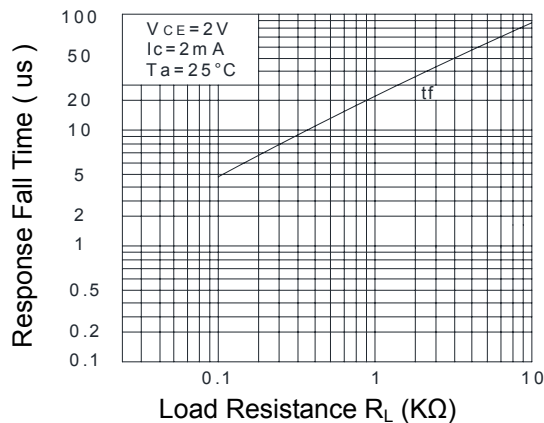
**Fig.8 Collector-Emitter Saturation Voltage vs. Forward Current**



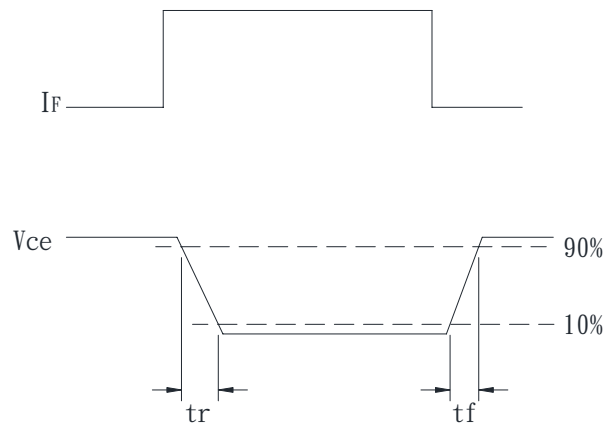
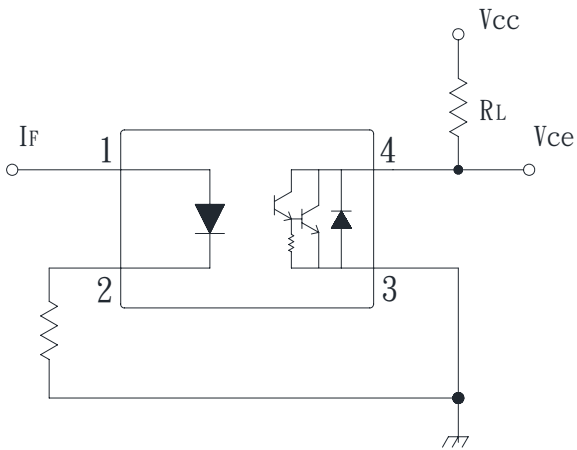
**Fig.9 Response Time (Rise) vs. Load Resistance**



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



- **Test Circuit for Response Time**

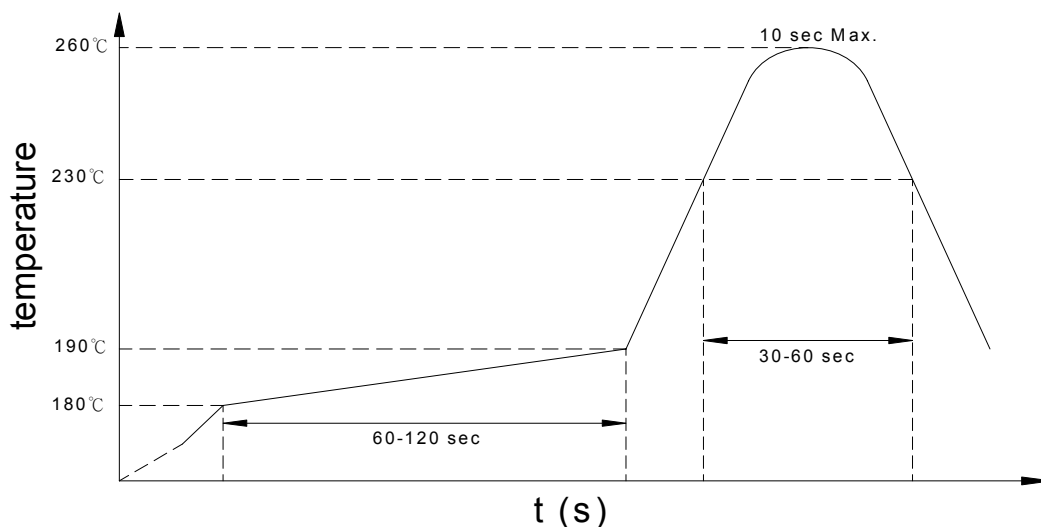


● **Recommended Soldering Conditions**

**(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)

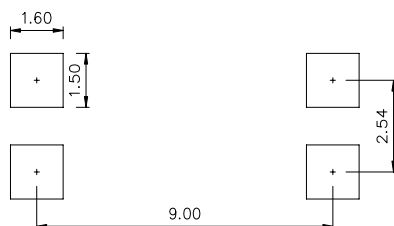
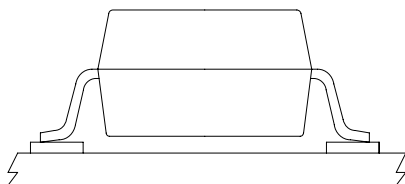
Z = Tape and reel option (TLD, TRU)

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**

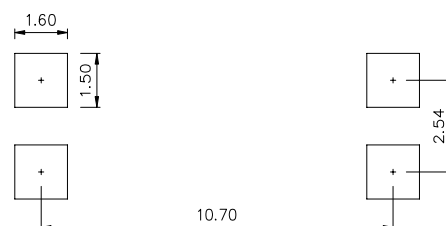
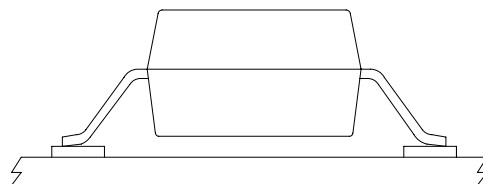
1. Surface mount type.

4 pin SMD



2. Long creepage distance for surface mount type.

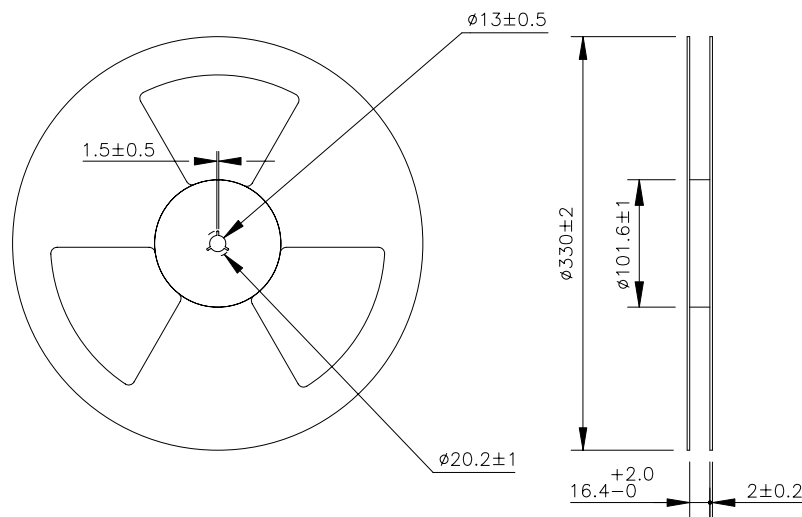
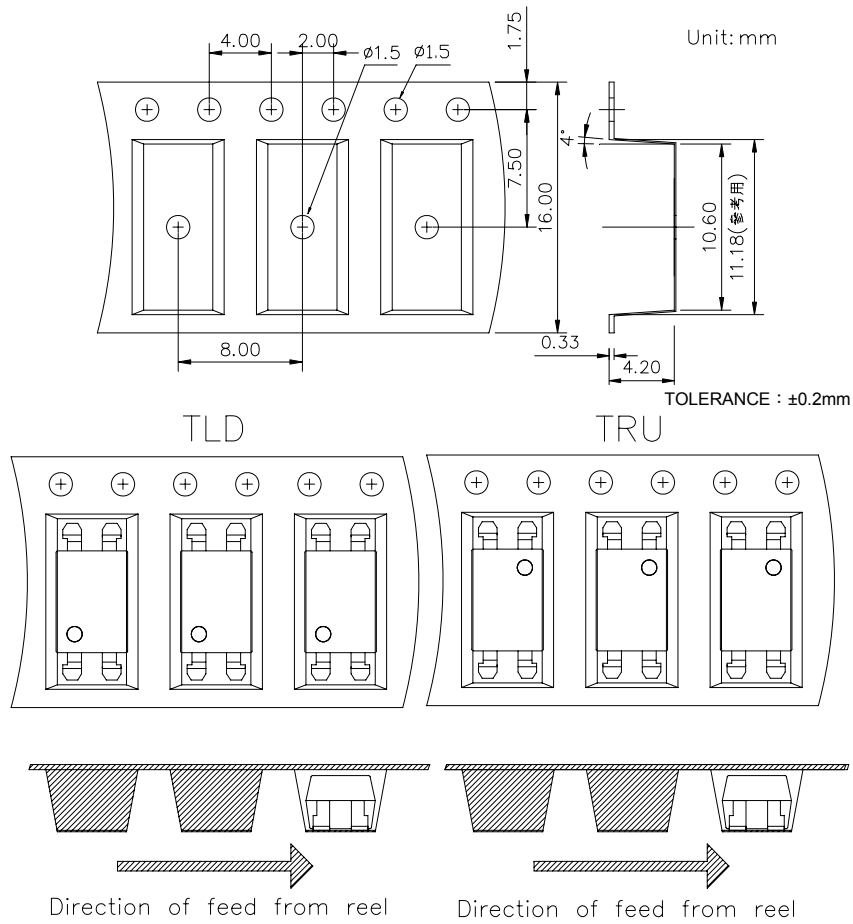
4 pin L



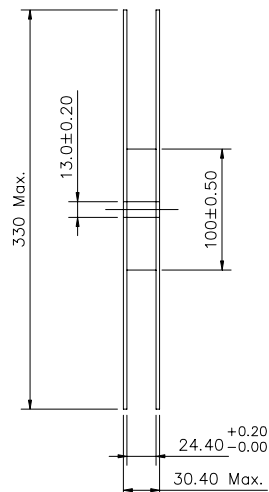
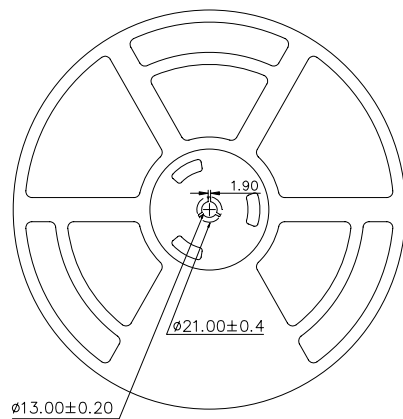
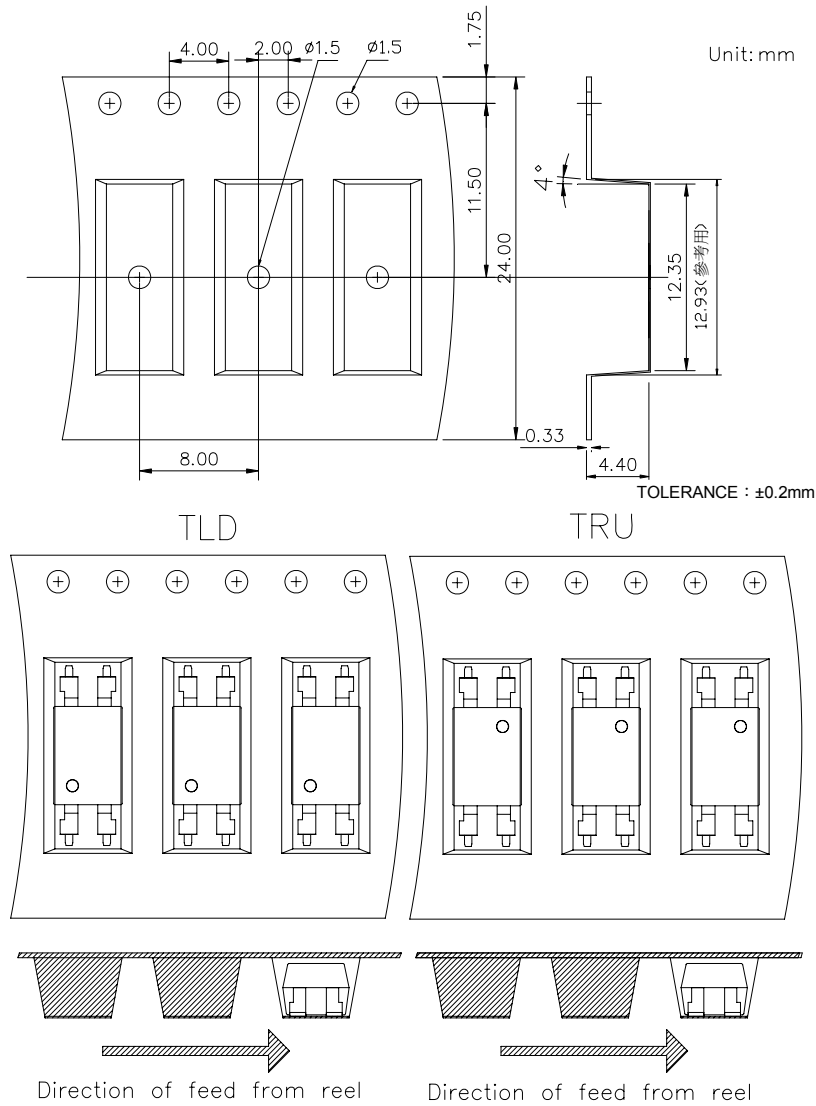
Unit : mm



● 4-pin SMD Carrier Tape & Reel



● 4-pin L Carrier Tape & Reel



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- **Application Notice**

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