KAQY213 Series

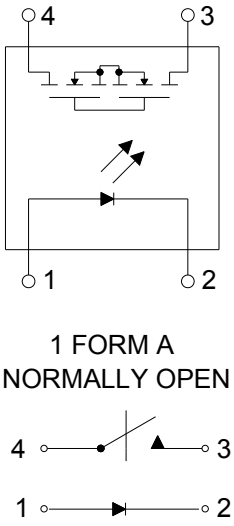
4PIN 250V N.O TYPE

SOLID STATE RELAY-MOSFET Output

Description

The KAQY213 series is robust, ideal for telecom and ground fault applications. It is a SPST normally open switch (1 Form A) that replaces electromechanical relays in many applications. It is constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry and MOSFET switches.

Schematic



Features

1. Normally Open, Single Pole Single Throw
2. Control 250V AC or DC Voltage
3. Switch 200mA Loads
4. Controls low-level analog signals
5. High sensitivity, low ON resistance
6. Low-level off-state leakage current
7. High Isolation Voltage
8. Pb free and RoHS compliant
9. Agency Approvals：
   - UL1577 / CUL C22.2 No.1 & NTC No.5, File No. E169586
   - UL 508 / CUL C22.2 No.14-M91 , File No. E108430
   - VDE EN60747-5-2 , File No. 40020973

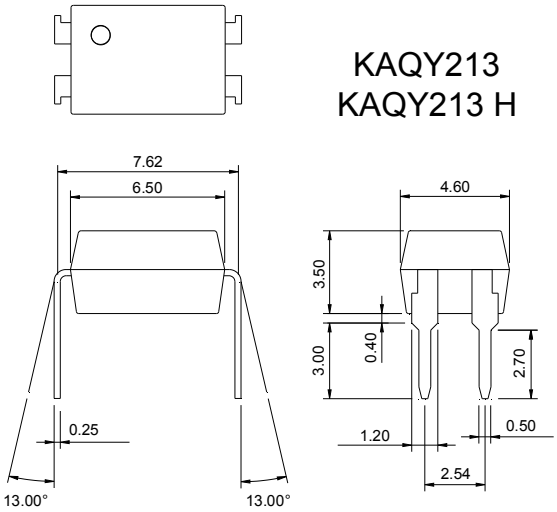
Application

- Telecommunications (PC, electronic notepad)
- Modem
- Telephone equipment
- Security equipment
- Sensors
- Measuring and testing equipment
- Factory automation equipment
- High speed inspection machines

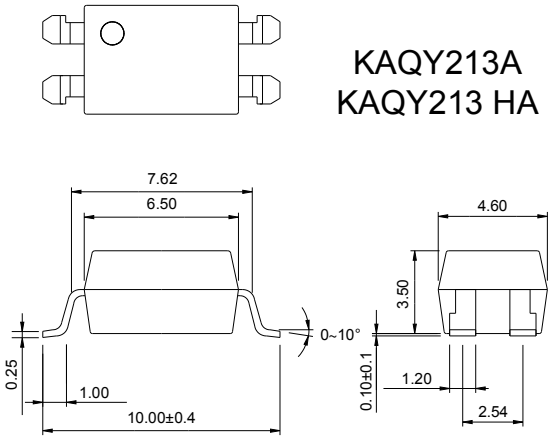
● Outside Dimension

Unit：mm

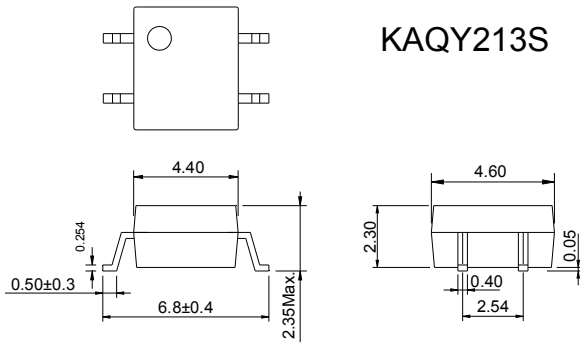
1. Dual-in-line type.



2. Surface mount type.

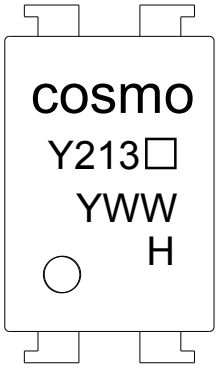


3. Small outline for surface mount type.



TOLERANCE：±0.2mm

● Device Marking



Notes：

cosmo

Y213□ □：Pin forming

YWW Y：Year code / W：Week code

H High isolation voltage series only

● Absolute Maximum Ratings

(Ta=25℃)

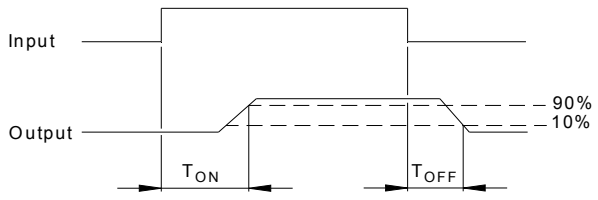
Item		Symbol	Rating		Unit
Input	Continuous forward current	I_F	50		mA
	Peak forward current	I_{FP}	1		A
	Reverse voltage	V_R	5		V
	Power dissipation	P_{in}	100		mW
	Derate linearly from 25℃	-	1.3		mW/℃
Output	Breakdown voltage	V_B	250		V
	Continuous load current	I_L	200		mA
	Power dissipation	P_{out}	500		mW
Isolation voltage		V_{iso}	**KAQY213S**	**KAQY213**	**KAQY213H**
			1500Vrms	3750Vrms	5000Vrms
Isolation resistance (Vio=500V)		R_{iso}	≧10^{10}		Ω
Total power dissipation		P_t	550		mW
Derate linearly from 25℃		-	2.5		mW/℃
Storage temperature		T_{stg}	-40 to +125		℃
Operating temperature		T_{opr}	-40 to +85		℃
Junction temperature		T_j	100		℃
Soldering temperature 10 seconds		T_{sot}	260		℃

● Electro-optical Characteristics

(Ta=25℃)

Parameter		Symbol	Conditions	Min.	Avg.	Max.	Unit
Input	Forward voltage	V_F	I_F=10mA	-	1.2	1.5	V
	Operation input current	I_{FON}	V_L=20V, I_L=100mA	-	-	3.0	mA
	Recovery input current	I_{FOFF}	V_L=20V, I_L≦5μA	0.2	-	-	mA
Output	Breakdown voltage	V_B	I_B=50μA	250	-	-	V
	Off-state leakage current	I_{LEAK}	V_L=250V, I_F=0mA	-	0.2	1.0	μA
I/O capacitance		C_{iso}	V_B=0V, f=1MHz	-	6	-	pF
ON resistance		R_{ON}	I_F=10mA, I_L=100mA	-	8	16	Ω
Turn-on time		T_{ON}	I_F=10mA, V_L=20V	-	0.3	1.0	ms
Turn-off time		T_{OFF}	I_L=100mA, t=10ms	-	0.1	1.5	ms

● Turn-on / Turn-off Time



Schematic and Wiring Diagrams

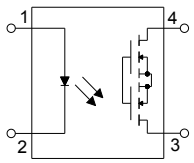
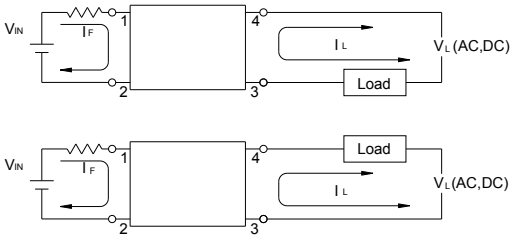
Schematic	Output Configuration	Load	Connection	Wiring Diagrams
	1a	AC DC	-	

Fig.1 Load Current vs. Ambient Temperature

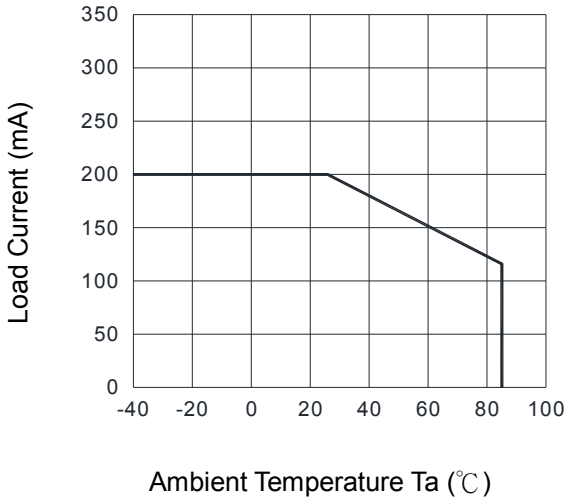


Fig.2 On Resistance vs. Ambient Temperature

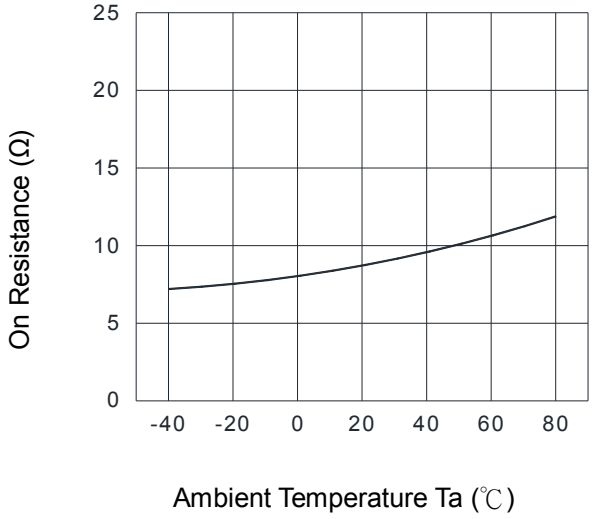


Fig.3 Turn-on Time vs. Ambient Temperature

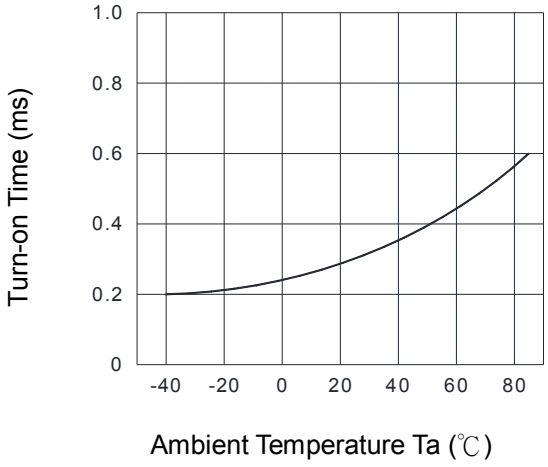


Fig.4 Turn-off Time vs. Ambient Temperature

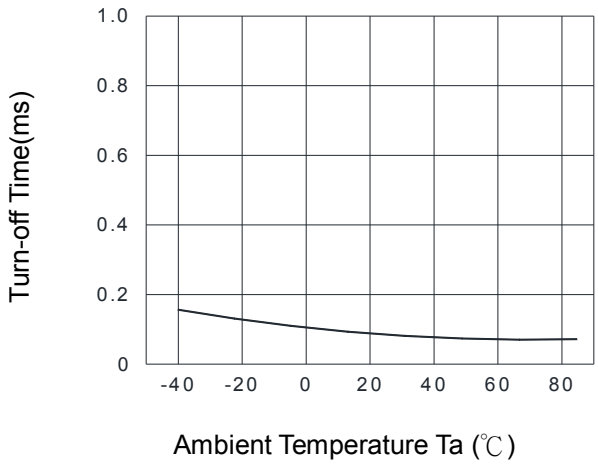


Fig.5 LED Operate Current vs. Ambient Temperature

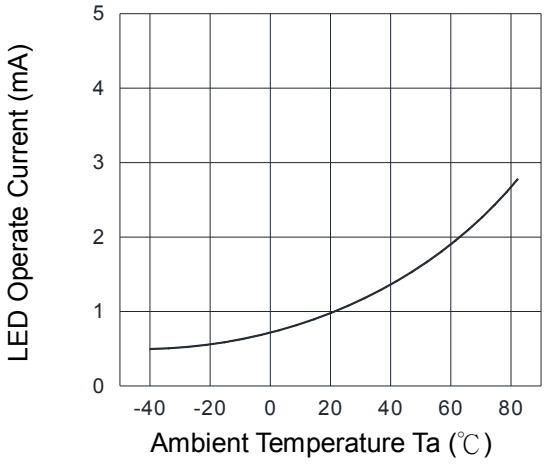


Fig.6 LED Turn-off Current vs. Ambient Temperature

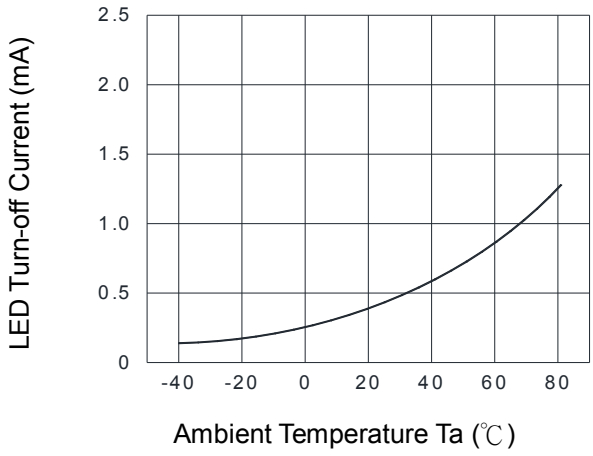


Fig.7 LED Dropout Voltage vs. Ambient Temperature

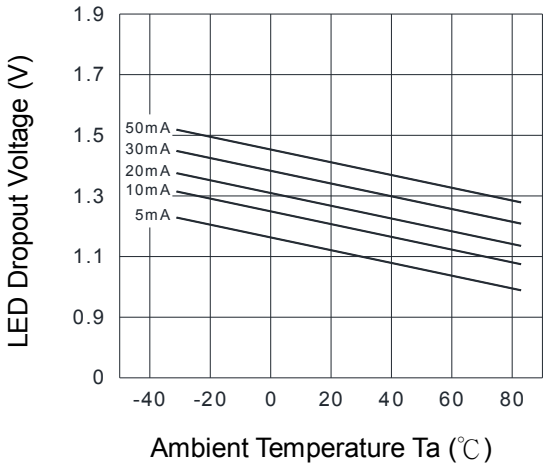


Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion

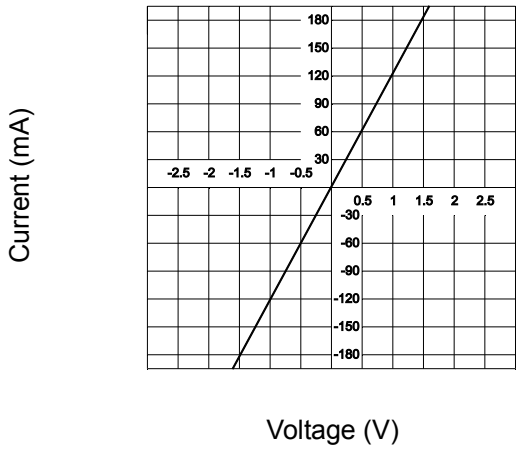


Fig.9 Turn-on Time vs. LED Forward Current

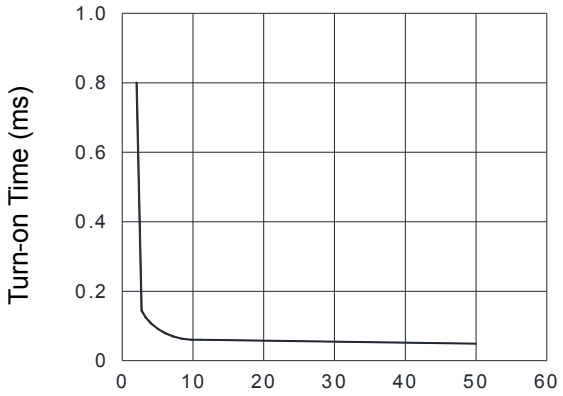


Fig.10 Off-state Leakage Current vs. Load Voltage

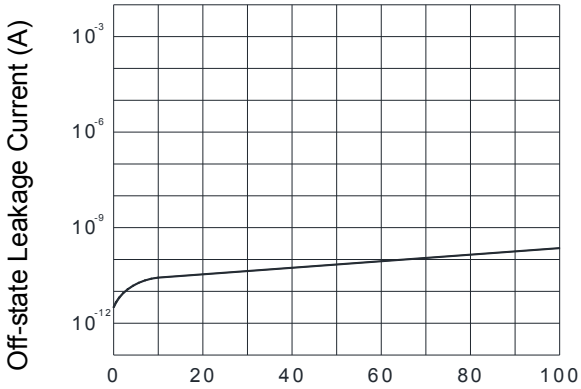


Fig.11 Turn-off Time vs. LED Forward Current

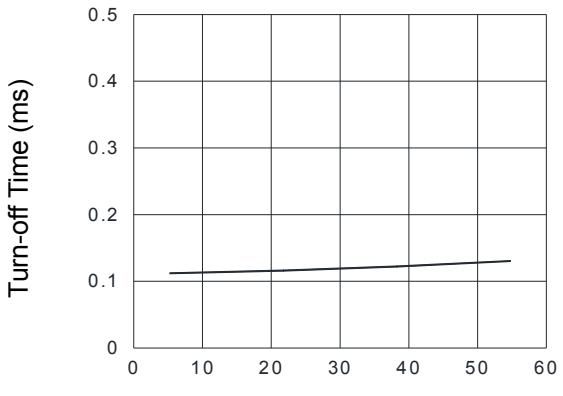
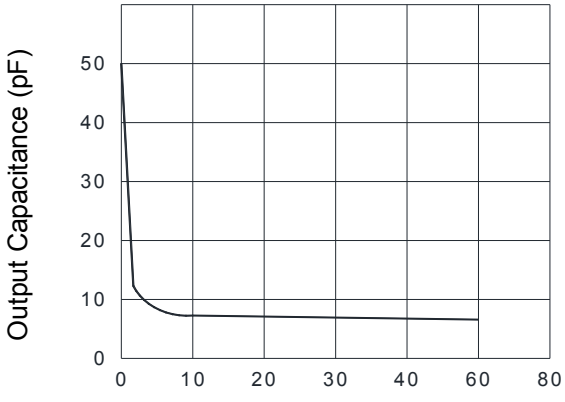
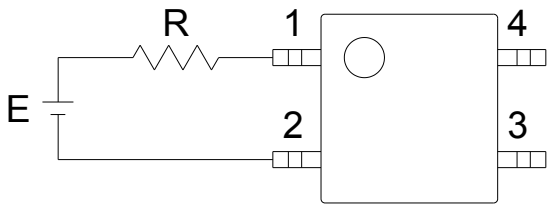


Fig.12 Output Capacitance vs. Applied Voltage



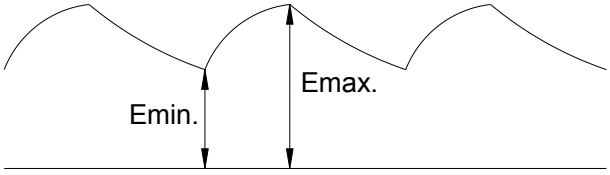
Using Methods

Examples of resistance value to control LED forward current (I_F=5mA)

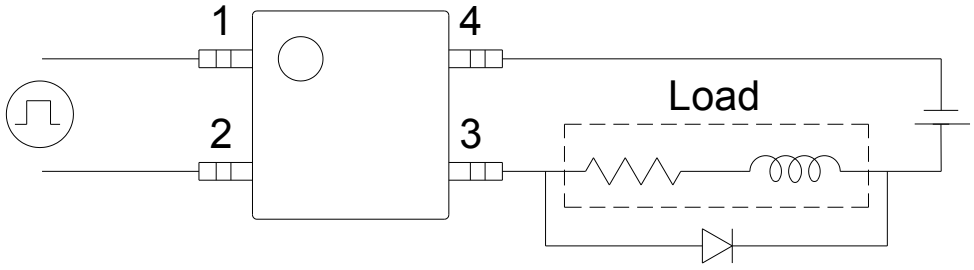


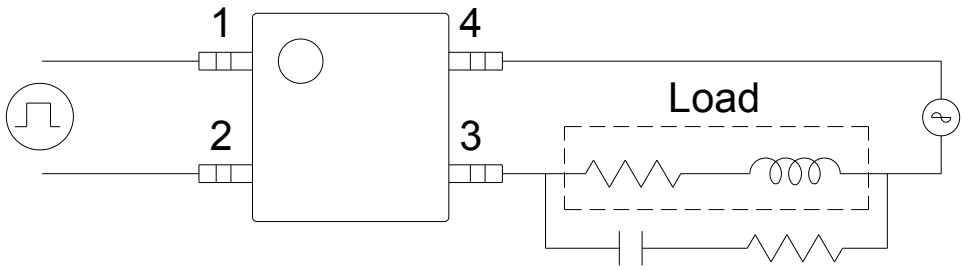
E	R
3.3V	Approx. 330 Ω
5V	Approx. 640 Ω
12V	Approx. 1.9K Ω
15V	Approx. 2.5K Ω
24V	Approx. 4.1K Ω

1. LED forward current must be more than 5mA，at E min.
2. LED forward current must be less than 50mA，at E max.



Regulate the spike voltage generated on the inductive load as follows：





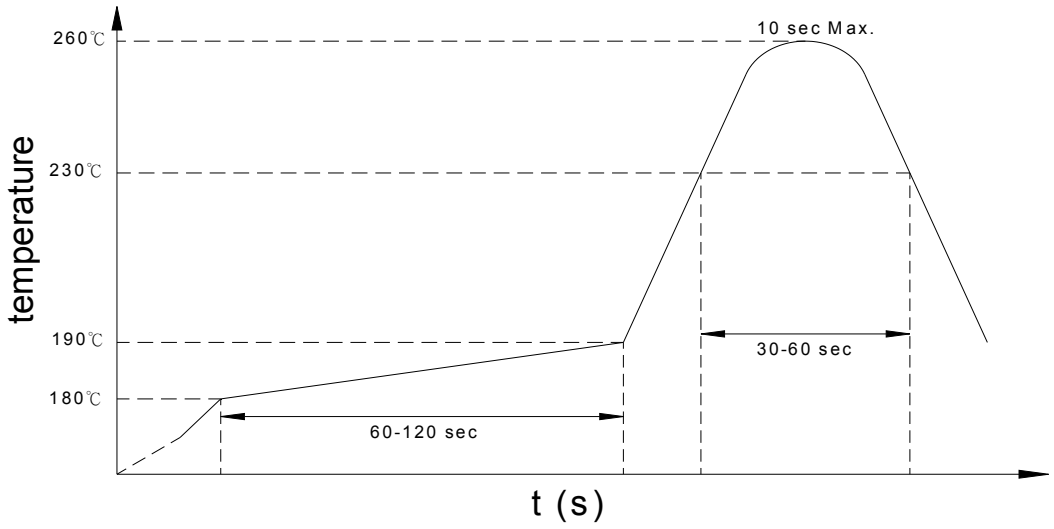
R-C Snubber

Recommended Soldering Conditions

(a) Infrared reflow soldering：

- Peak reflow soldering： 260℃ or below (package surface temperature)
- Time of peak reflow temperature: 10 sec
- Time of temperature higher than 230℃： 30-60 sec
- Time to preheat temperature from 180~190℃： 60-120 sec
- Number of reflows： 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℃ or below (molten solder temperature)
- Time： 10 seconds or less
- Preheating conditions: 120℃ or below (package surface temperature)
- Number of times： 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**

KAQY213 X (Y)

Note：

KAQY213 = Part No.

X = Lead form option (blank、S、A、H or HA)

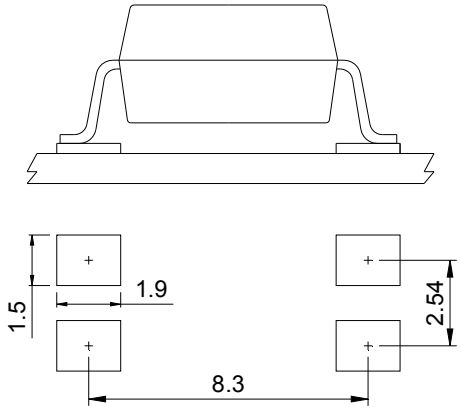
Y = Tape and reel option (TLD、TRU、TL、TR)

Option	Description	Packing quantity
A (TLD)	surface mount type package + TLD tape & reel option	2000 units per reel
A (TRU)	surface mount type package + TRU tape & reel option	2000 units per reel
HA (TLD)	surface mount type package + TLD tape & reel option	2000 units per reel
HA (TRU)	surface mount type package + TRU tape & reel option	2000 units per reel
S (TL)	small outline for surface mount type package + TL tape & reel option	2000 units per reel
S (TR)	small outline for surface mount type package + TR tape & reel option	2000 units per reel

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

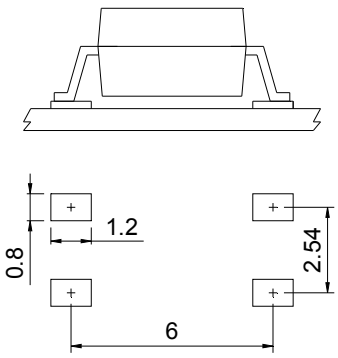
1. Surface mount type.

4-pin SMD



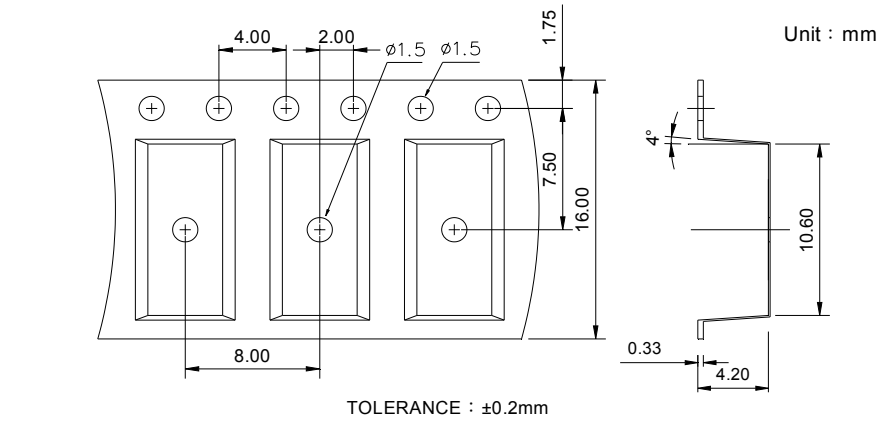
2. Small outline for surface mount type.

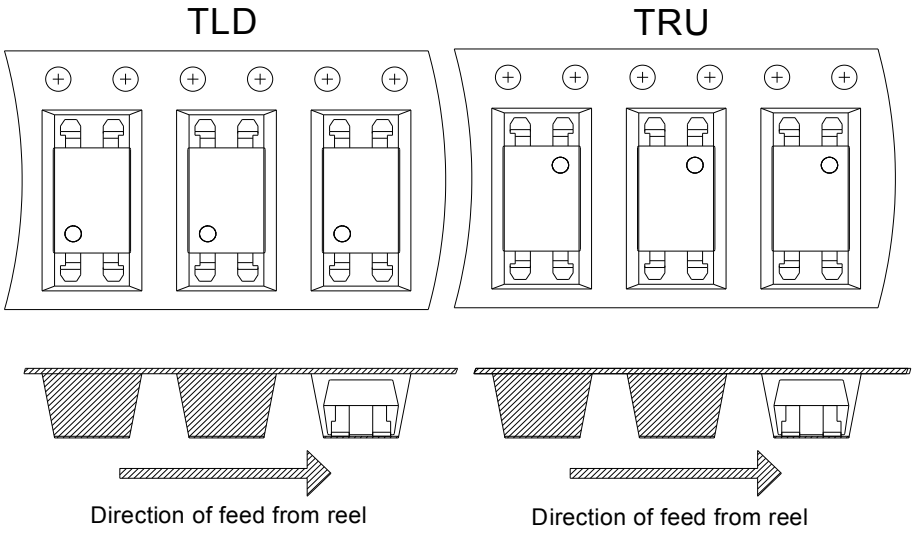
4-pin SOP

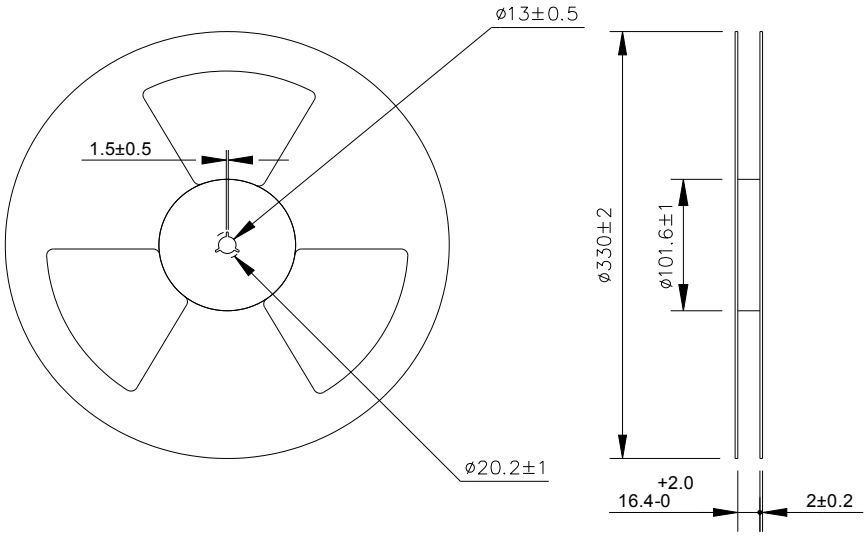


Unit：mm

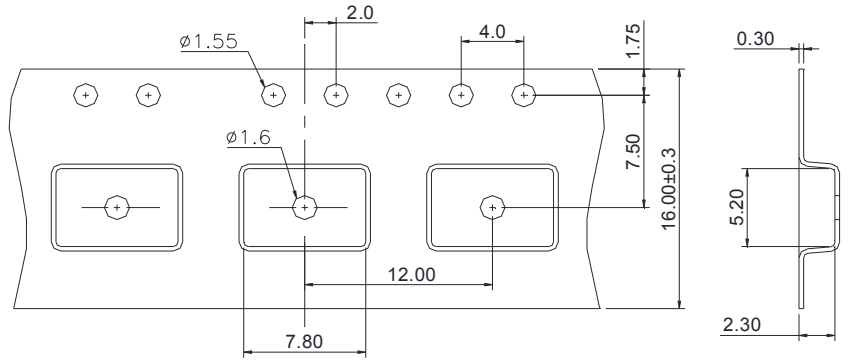
● 4-pin SMD Carrier Tape & Reel





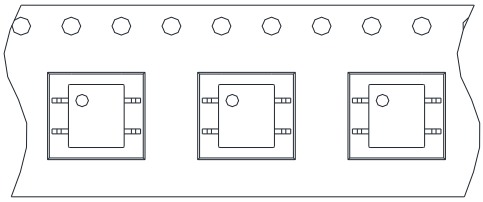


● 4-pin SOP Carrier Tape & Reel



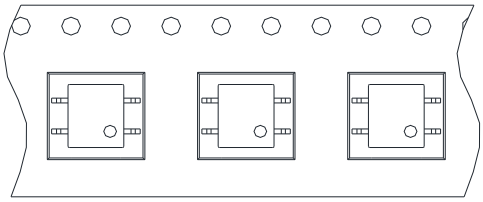
TOLERANCE：±0.2mm

TL

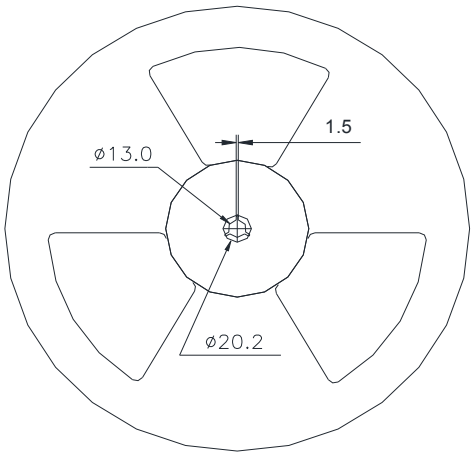


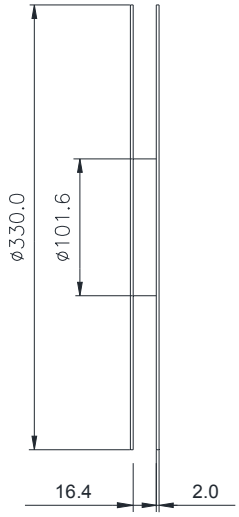
Direction of feed from reel

TR



Direction of feed from reel





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c. Audio / Video
d. Instrumentation
e. Electrical application
f. Measurement equipment
g. Consumer electronics
h. Telecommunication

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b. Space application
c. Telecommunication equipment (trunk lines)
d. Nuclear power control
e. Equipment used for automotive vehicles, trains, ships...etc.

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