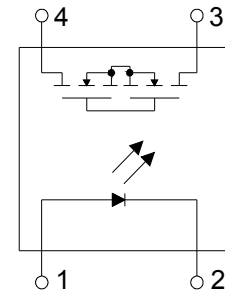


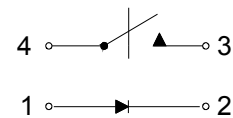
● Description

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



1 FORM A
NORMALLY OPEN



● 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 5KV (DIP / SMD)
8. Pb free and RoHS compliant
9. MSL class 1
10. Agency Approvals :
 - UL Approved (No. E169586, E108430): UL1577, UL508
 - c-UL Approved (No. E169586, E108430)
 - VDE Approved (No. 40020973): DIN EN60747-5-5

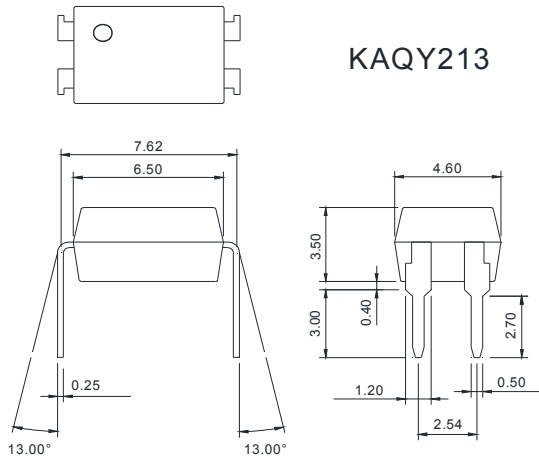
● Application

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

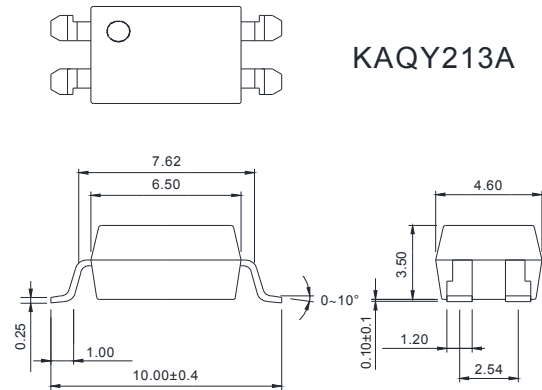
● **Outside Dimension**

Unit : mm

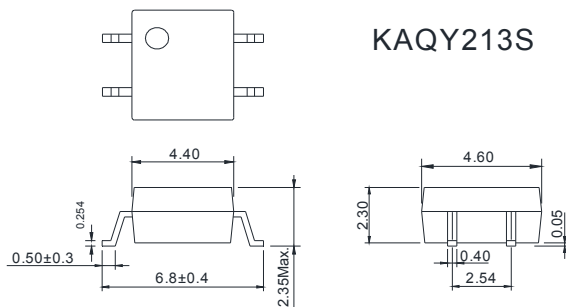
1. Dual-in-line type.



2. Surface mount type.

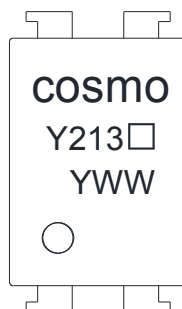


3. Small outline for surface mount type.



TOLERANCE : ±0.2mm

● **Device Marking**



Notes :

cosmo

Y213 □ □ : Pin forming

YWW Y : Year code / W : Week code

● Absolute Maximum Ratings

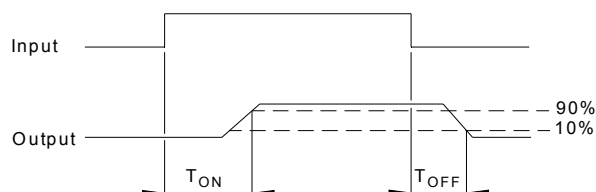
(Ta=25°C)

| 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°C | - | 1.3 | mW/°C |
| 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 |
| | | | 1500Vrms | 5000Vrms |
| Isolation resistance ($V_{io}=500V$) | | R_{iso} | $\geq 10^{10}$ | Ω |
| Total power dissipation | | P_t | 550 | mW |
| Derate linearly from 25°C | | - | 2.5 | mW/°C |
| Storage temperature | | T_{stg} | -40 to +125 | °C |
| Operating temperature | | T_{opr} | -40 to +85 | °C |
| Junction temperature | | T_j | 100 | °C |
| Soldering temperature 10 seconds | | T_{sot} | 260 | °C |

● Electro-optical Characteristics

(Ta=25°C)

| 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} | $V_L=20V, I_L \leq 5\mu A$ | 0.2 | - | - | mA |
| Output | Breakdown voltage | V_B | $I_B=50\mu A$ | 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

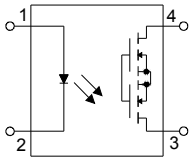
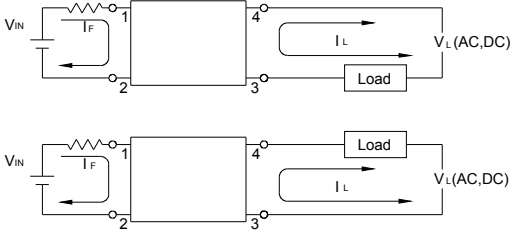
| Schematic | Output Configuration | Load | Connection | Wiring Diagrams |
|---|----------------------|----------|------------|--|
|  | 1a | AC DC | - |  |

Fig.1 Load Current vs. Ambient Temperature

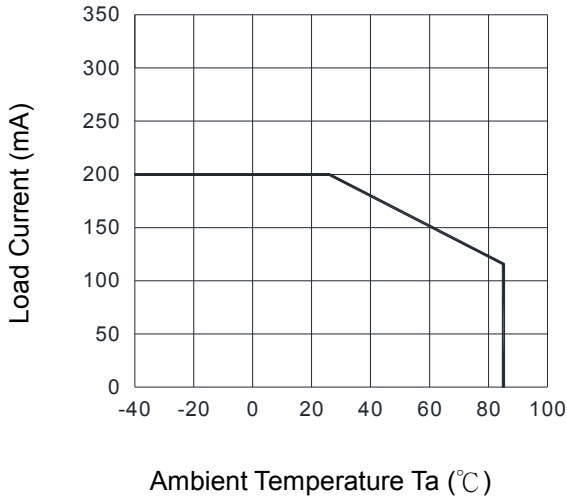


Fig.2 On Resistance vs. Ambient Temperature

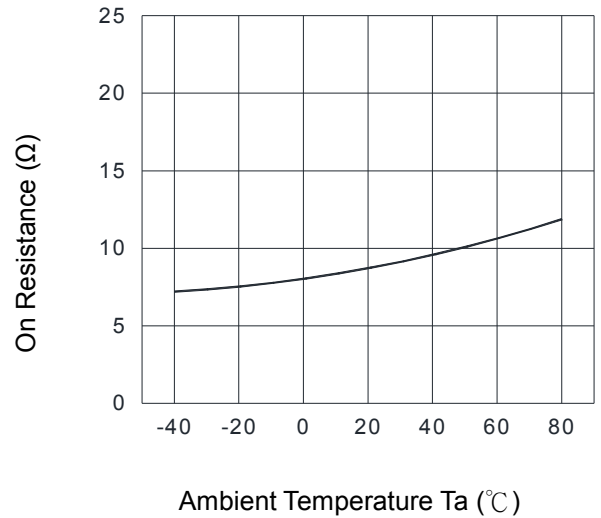


Fig.3 Turn-on Time vs. Ambient Temperature

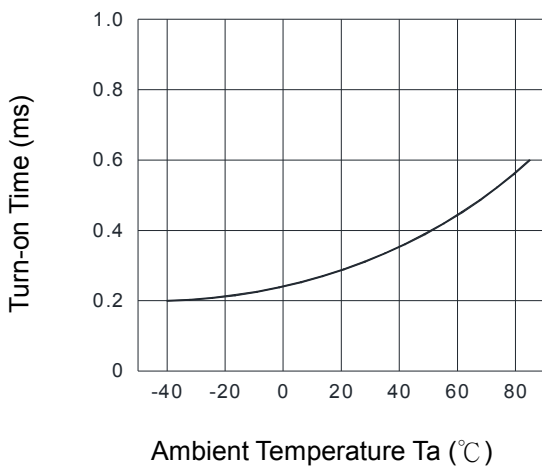


Fig.4 Turn-off Time vs. Ambient Temperature

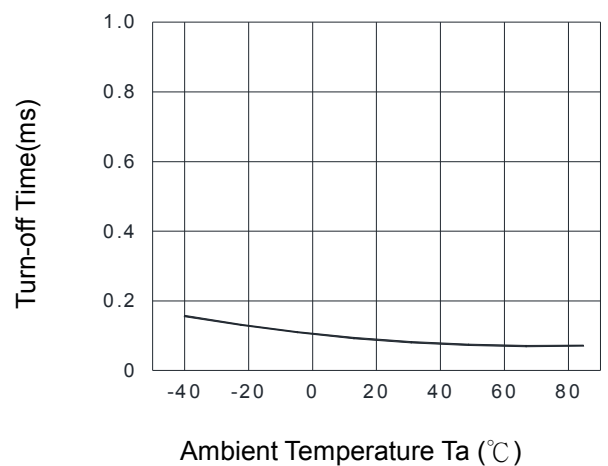


Fig.5 LED Operate Current vs. Ambient Temperature

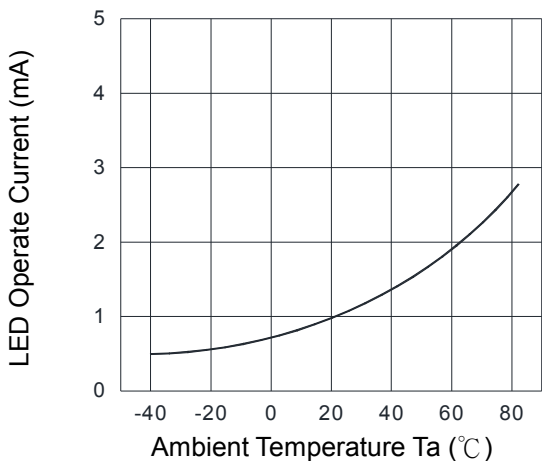


Fig.6 LED Turn-off Current vs. Ambient Temperature

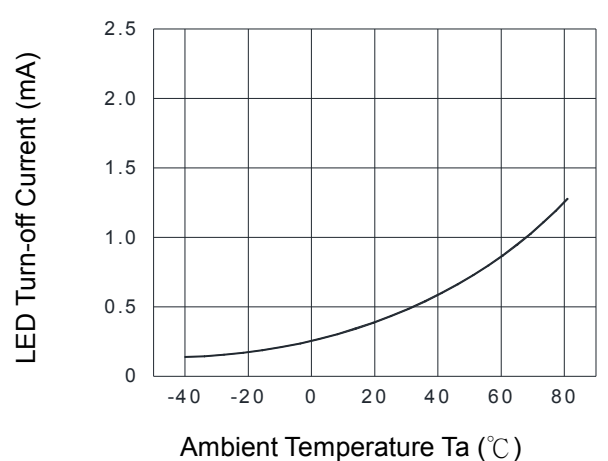


Fig.7 LED Dropout Voltage vs. Ambient Temperature

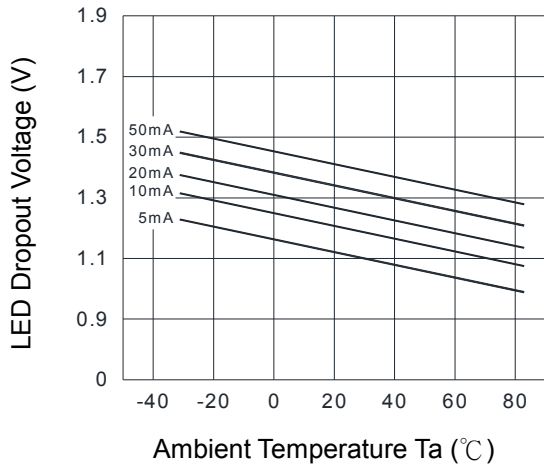


Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion

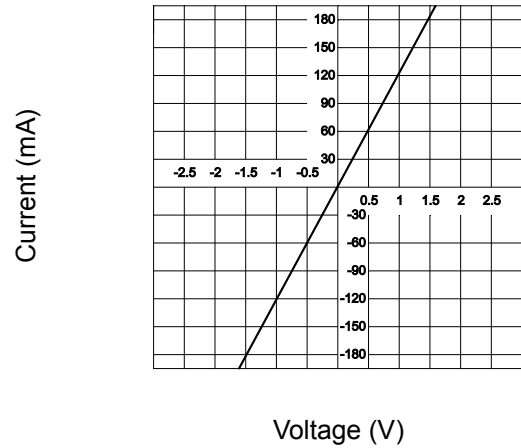


Fig.9 Turn-on Time vs. LED Forward Current

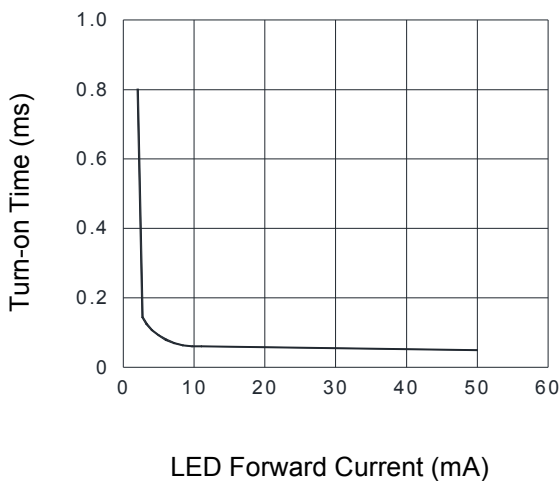


Fig.10 Off-state Leakage Current vs. Load Voltage

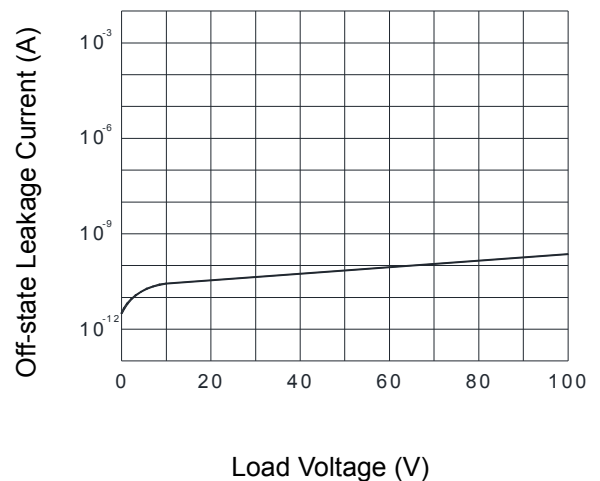


Fig.11 Turn-off Time vs. LED Forward Current

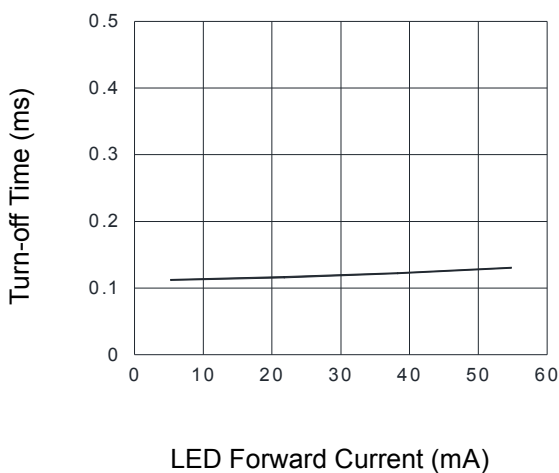
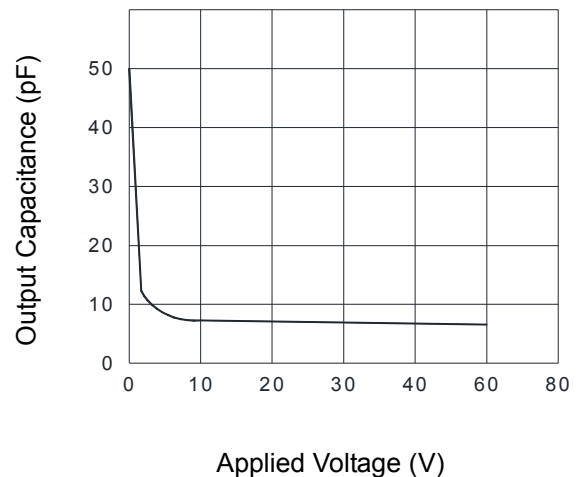
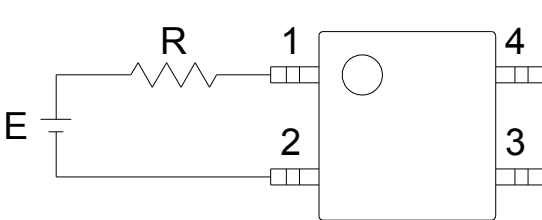


Fig.12 Output Capacitance vs. Applied Voltage



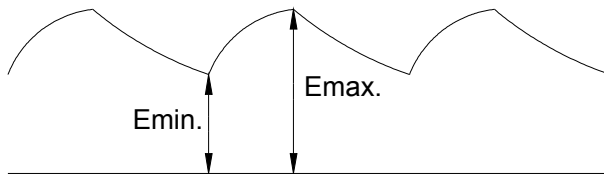
● **Using Methods**

Examples of resistance value to control LED forward current ($I_F=5\text{mA}$)

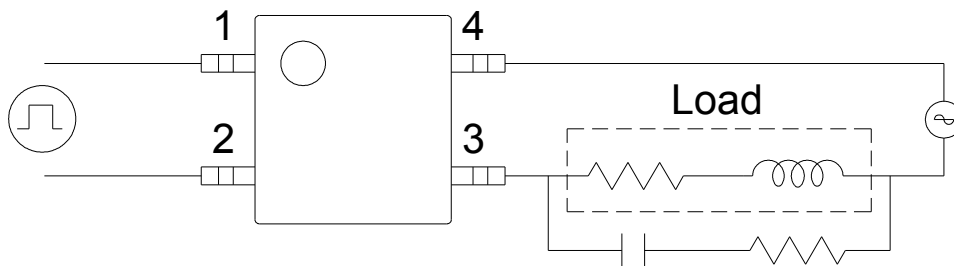
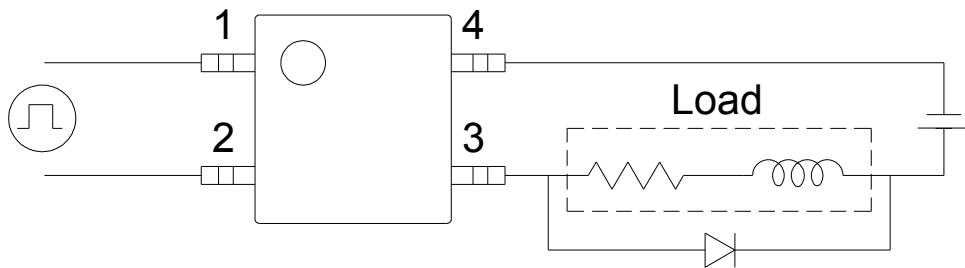


| E | R |
|------|-----------------------|
| 3.3V | Approx. 330 Ω |
| 5V | Approx. 640 Ω |
| 12V | Approx. 1.9K Ω |
| 15V | Approx. 2.5K Ω |
| 24V | Approx. 4.1K Ω |

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 :



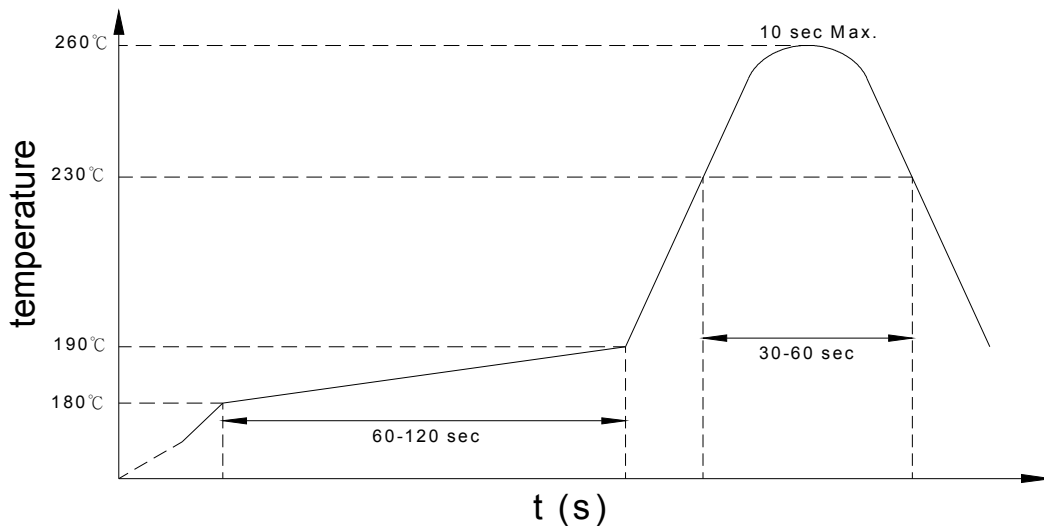
R-C Snubber

● **Recommended Soldering Conditions**

(a) Infrared reflow soldering :

- Peak reflow soldering : 260°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
- 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°C or below (molten solder temperature)
- Time : 10 seconds or less
- Preheating conditions: 120°C 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 or A)

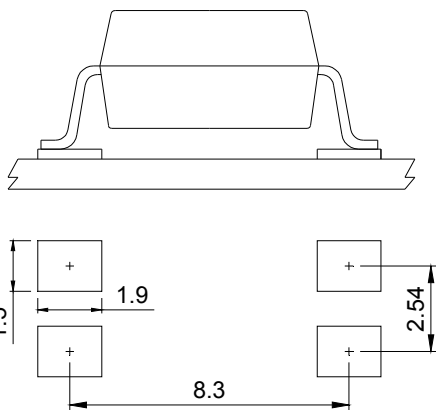
Y = Tape and reel option (TLD 、 TRU 、 TL 、 TR)

| 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 |
| 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**

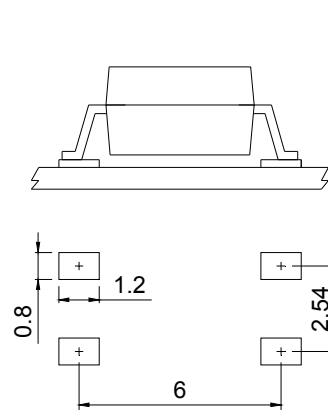
1. Surface mount type.

4-pin SMD



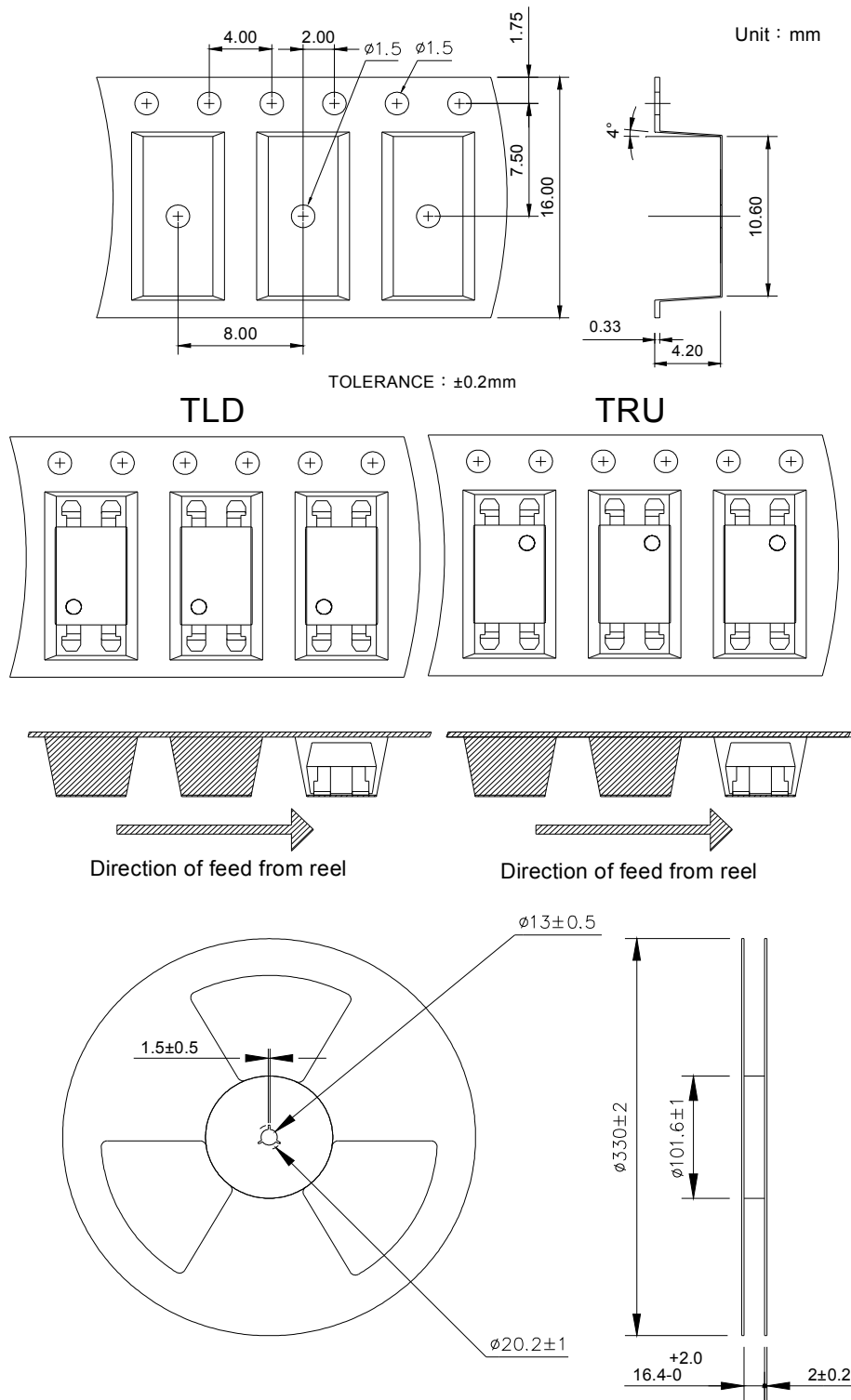
2. Small outline for surface mount type.

4-pin SOP

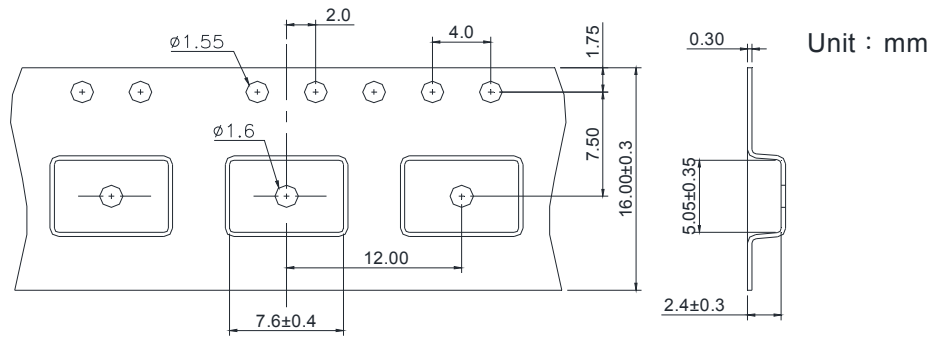


Unit : mm

● 4-pin SMD Carrier Tape & Reel



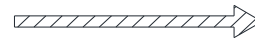
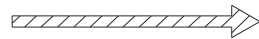
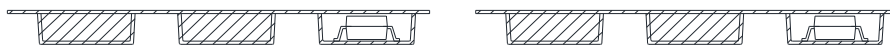
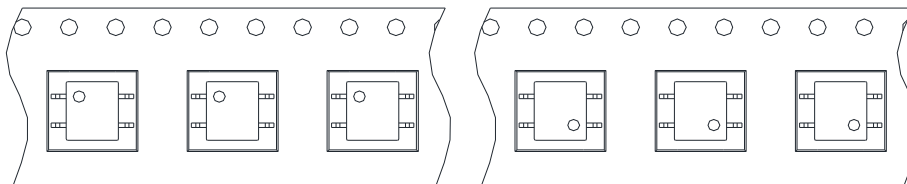
● 4-pin SOP Carrier Tape & Reel



TOLERANCE : ±0.2mm

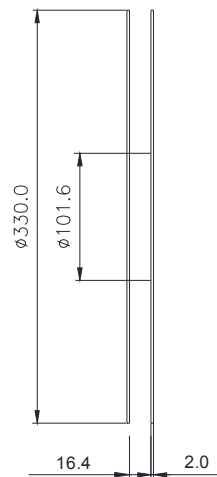
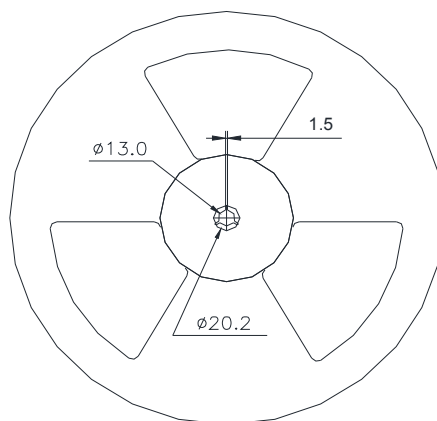
TL

TR



Direction of feed from reel

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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- e. Equipment used for automotive vehicles, trains, ships...etc.

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