

## ● Description

The KAQY214 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.

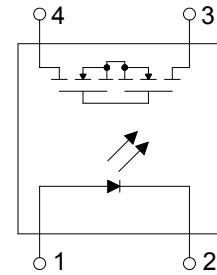
## ● Features

1. Normally open, single pole single throw
2. Control 400V AC or DC voltage
3. Switch 130mA 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. E108430): UL508
  - c-UL Approved (No. E108430)
  - FIMKO Approved: EN60950

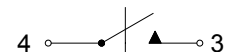
## ● Application

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

## ● Schematic



1 FORM A  
NORMALLY OPEN



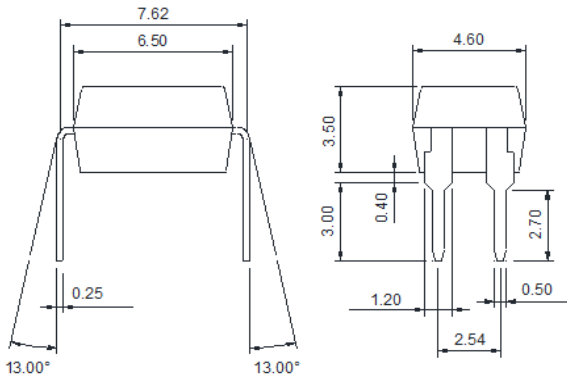
● **Outside Dimension**

Unit : mm

1. Dual-in-line type.



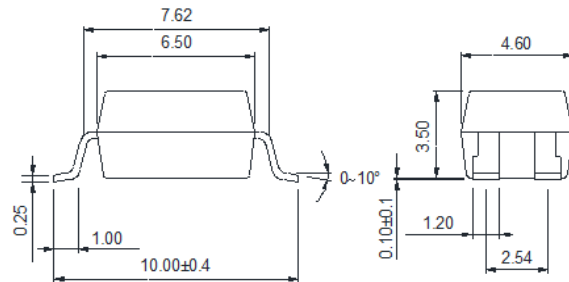
KAQY214



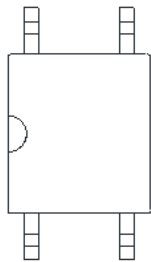
2. Surface mount type.



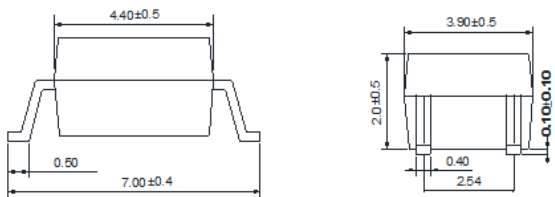
KAQY214A



3. Small outline for surface mount type.

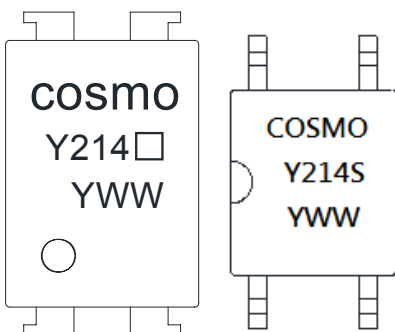


KAQY214S



TOLERANCE : ±0.2mm

● **Device Marking**



**Notes :**

**cosmo**

Y214□

□ : Blank or A

Y214S

S : SOP

YWW

Y : Year code / W : Week code

● **Absolute Maximum Ratings**

(Ta=25°C)

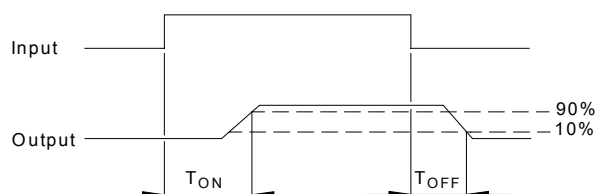
| Item                             |                            | Symbol    | Rating          | Unit           |
|----------------------------------|----------------------------|-----------|-----------------|----------------|
| Input                            | Continuous forward current | $I_F$     | 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          | $V_B$     | 400             | V              |
|                                  | Continuous load current    | $I_L$     | 130             | mA             |
|                                  | Power dissipation          | $P_{out}$ | 500             | mW             |
| Isolation voltage                |                            | $V_{iso}$ | <b>KAQY214S</b> | <b>KAQY214</b> |
|                                  |                            |           | 1500Vrms        | 5000Vrms       |
| Isolation resistance (Vio=500V)  |                            | $R_{iso}$ | $\geq 10^{10}$  | $\Omega$       |
| Total power dissipation          |                            | $P_t$     | 550             | mW             |
| Derate linearly from 25°C        |                            | -         | 2.5             | mW/°C          |
| Operating temperature            |                            | $T_{opr}$ | -40 to +85      | °C             |
| Storage temperature              |                            | $T_{stg}$ | -40 to +125     | °C             |
| Junction temperature             |                            | $T_j$     | 100             | °C             |
| Soldering temperature 10 seconds |                            | $T_{sot}$ | 260             | °C             |

● **Electro-optical Characteristics**

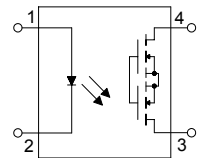
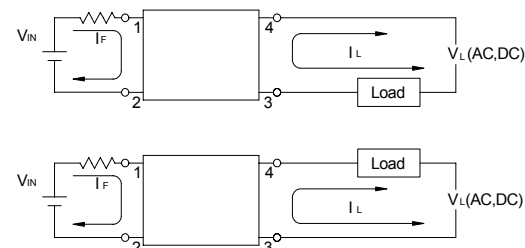
(Ta=25°C)

| Parameter       |                           | Symbol     | Conditions                 | Min. | Typ. | 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         | $V_B$      | $I_B=50\mu A$              | 400  | -    | -    | V        |
|                 | Off-state leakage current | $I_{LEAK}$ | $V_L=400V, I_F=0mA$        | -    | 0.2  | 1.0  | $\mu A$  |
| I/O capacitance |                           | $C_{iso}$  | $V_B=0V, f=1MHz$           | -    | 6    | -    | pF       |
| ON resistance   |                           | $R_{ON}$   | $I_F=10mA, I_L=100mA$      | -    | 20   | 30   | $\Omega$ |
| 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  | 1.0  | ms       |

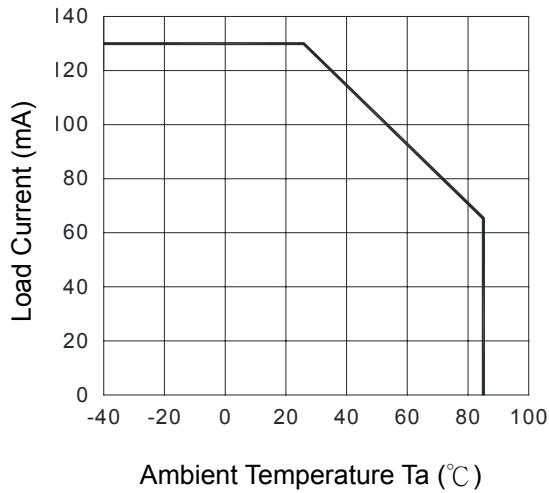
● **Turn-on / Turn-off Time**



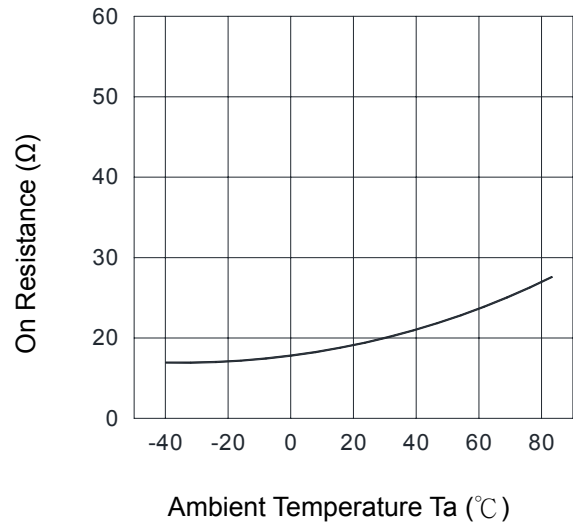
● Schematic and Wiring Diagrams

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

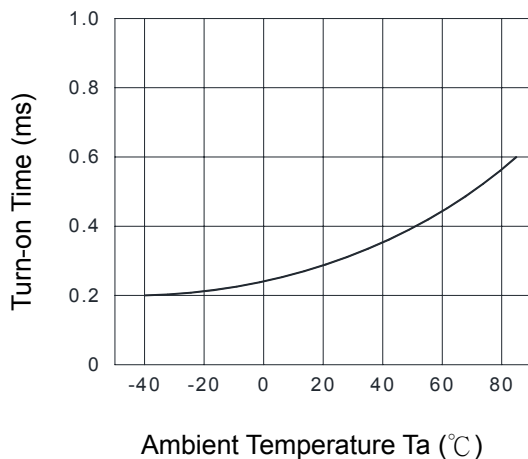
**Fig.1 Load Current vs. Ambient Temperature**



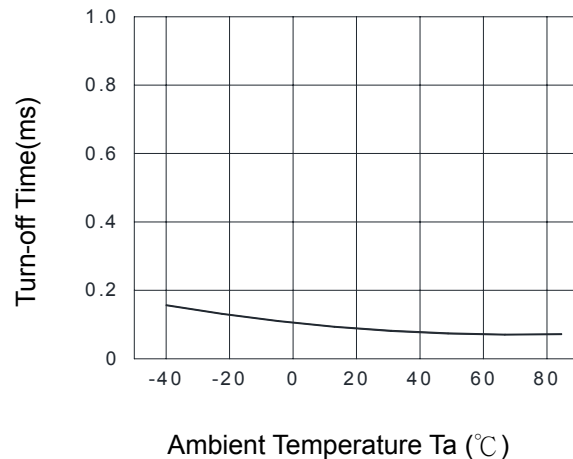
**Fig.2 On Resistance vs. Ambient Temperature**



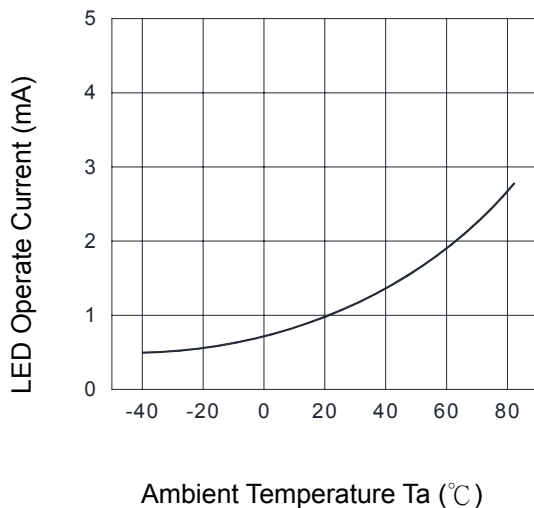
**Fig.3 Turn-on Time vs. Ambient Temperature**



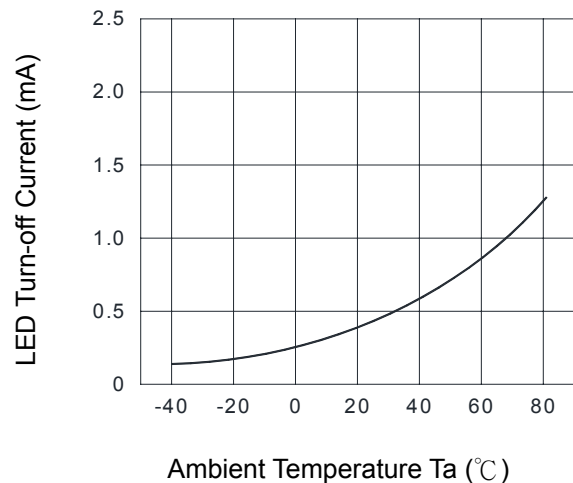
**Fig.4 Turn-off Time vs. Ambient Temperature**



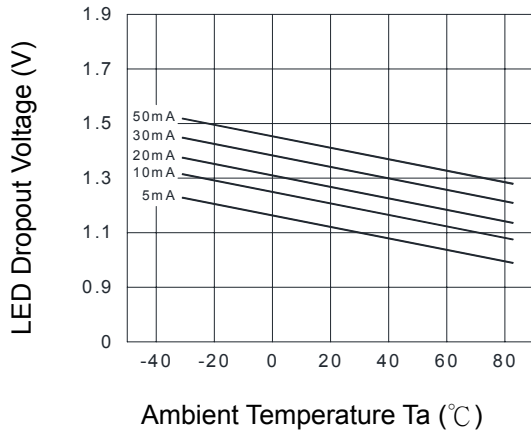
**Fig.5 LED Operate Current vs. Ambient Temperature**



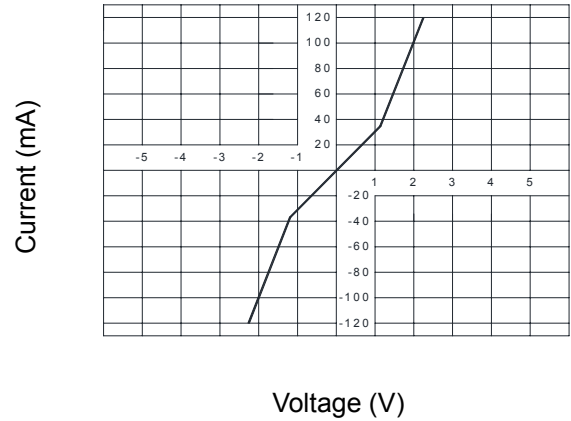
**Fig.6 LED Turn-off Current vs. Ambient Temperature**



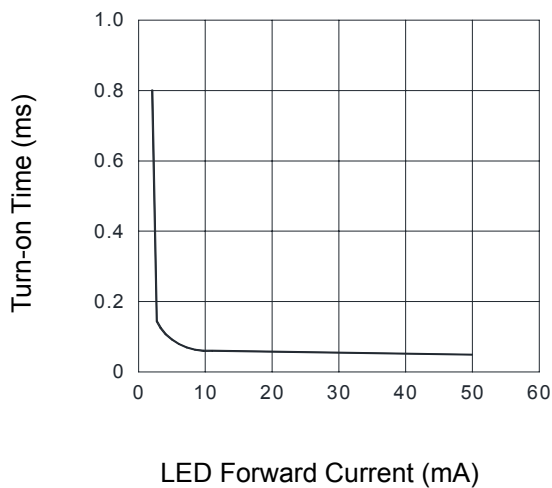
**Fig.7 LED Dropout Voltage vs. Ambient Temperature**



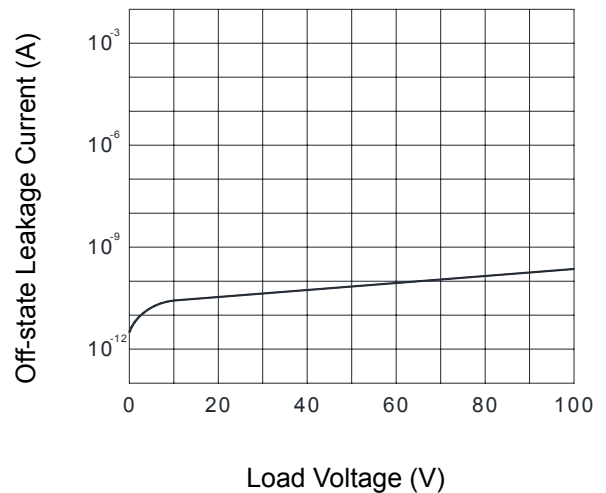
**Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion**



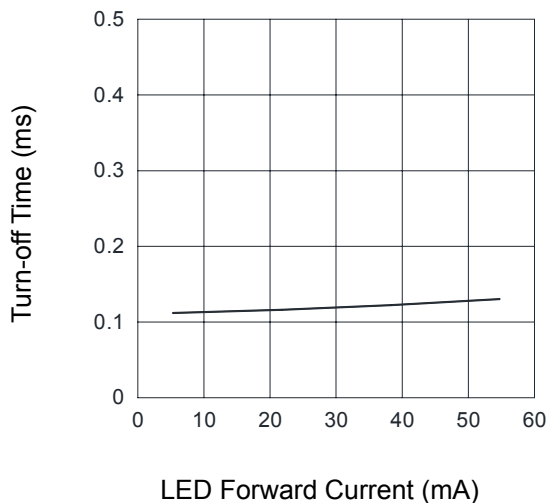
**Fig.9 Turn-on Time vs. LED Forward Current**



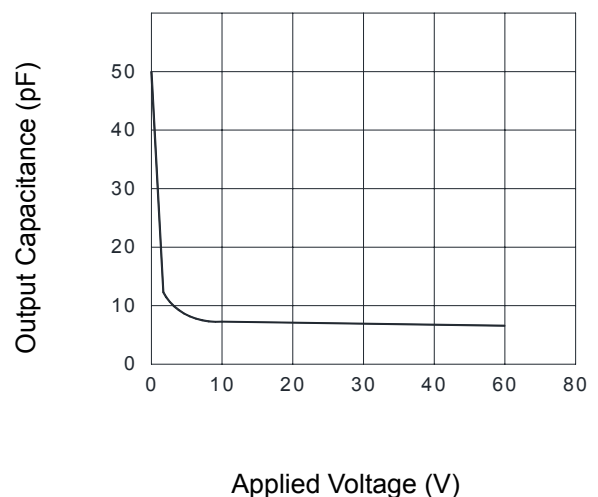
**Fig.10 Off-state Leakage Current vs. Load Voltage**



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

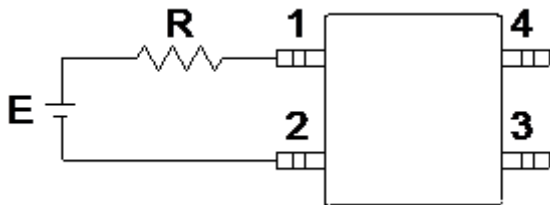


**Fig.12 Output Capacitance vs. Applied Voltage**



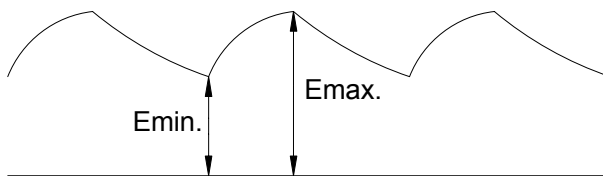
## ● Using Methods

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

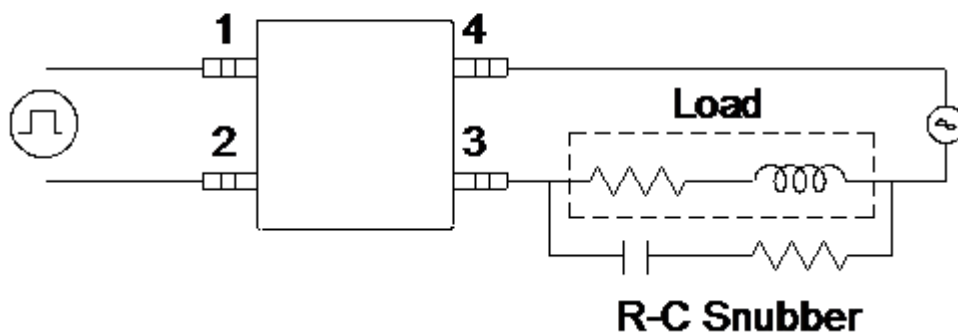
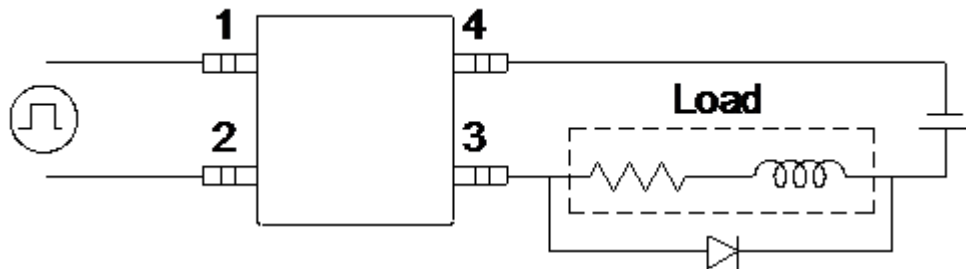


| E    | R                     |
|------|-----------------------|
| 3.3V | Approx. 330 $\Omega$  |
| 5V   | Approx. 640 $\Omega$  |
| 12V  | Approx. 1.9K $\Omega$ |
| 15V  | Approx. 2.5K $\Omega$ |
| 24V  | Approx. 4.1K $\Omega$ |

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 :

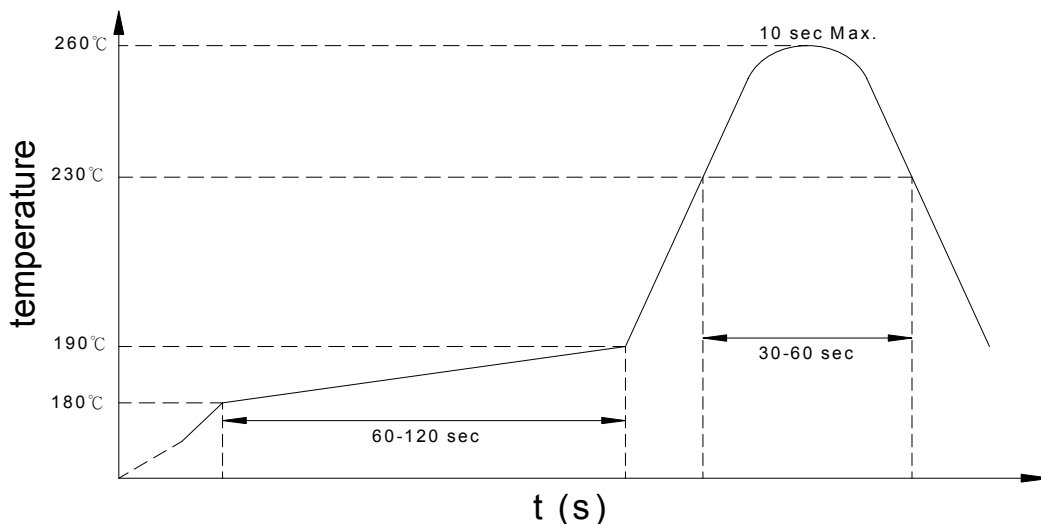


● **Recommended Soldering Conditions**

**(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 : Two
- Number of reflows : Rosin flux containing small amount of chlorine
- Flux : (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**

## KAQY214 X (Y)

**Note :**

KAQY214 = Part No.

X = Lead form option ( blank · S or A)

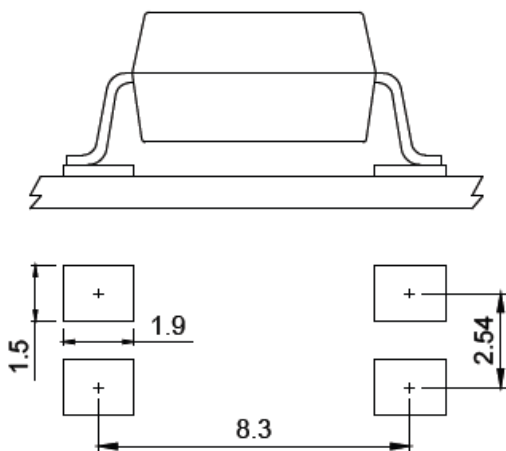
Y = Tape and reel option ( TLD · TRU)

| 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 (TLD) | small outline for surface mount type package + TLD tape & reel option | 3000 units per reel |
| S (TRU) | small outline for surface mount type package + TRU tape & reel option | 3000 units per reel |

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

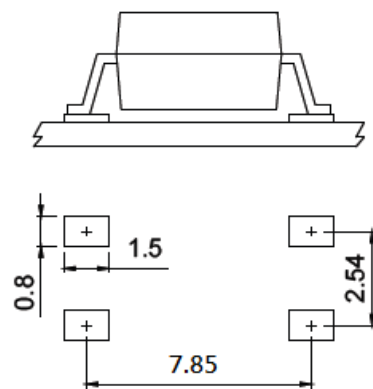
**1. Surface mount type.**

**4-pin SMD**



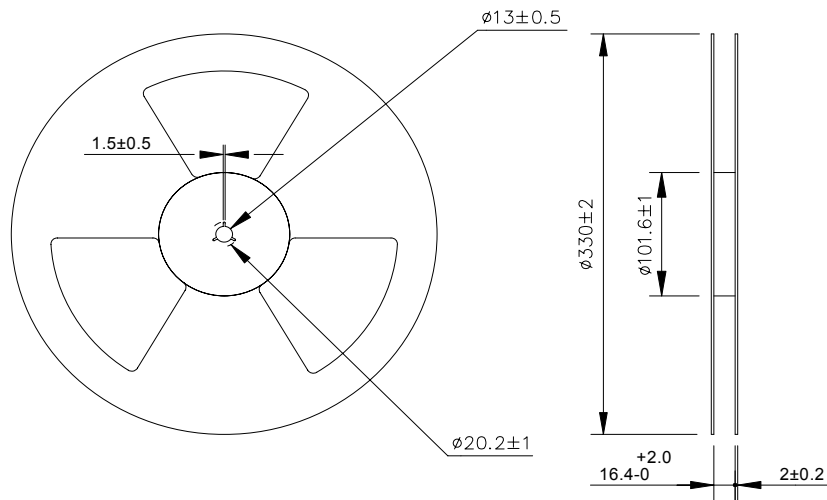
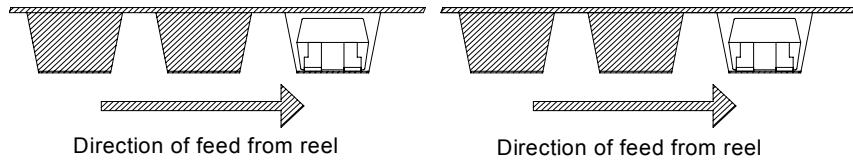
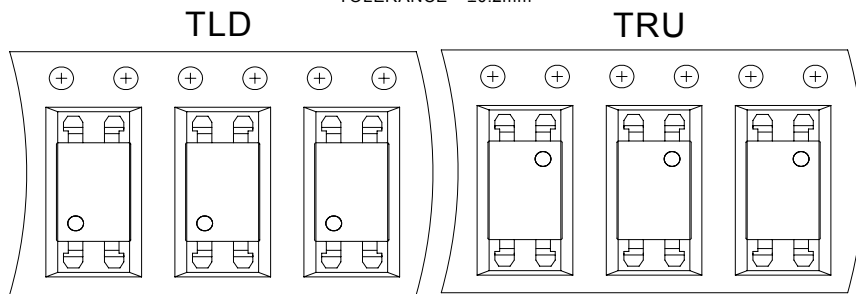
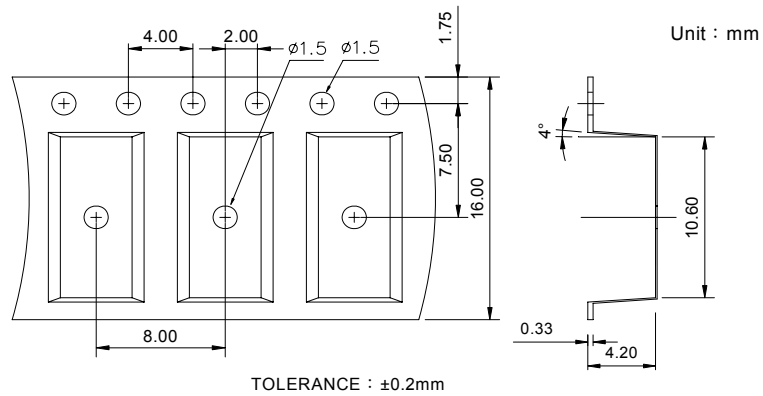
**2. Small outline for surface mount type.**

**4-pin SOP**



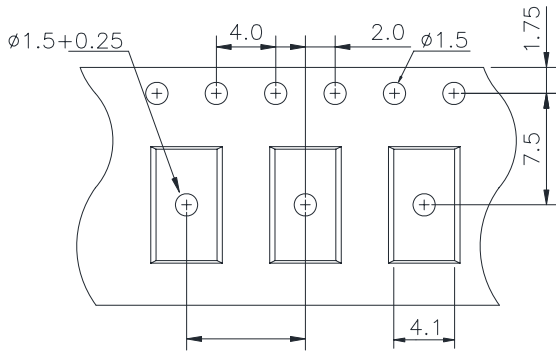
Unit : mm

● 4-pin SMD Carrier Tape & Reel

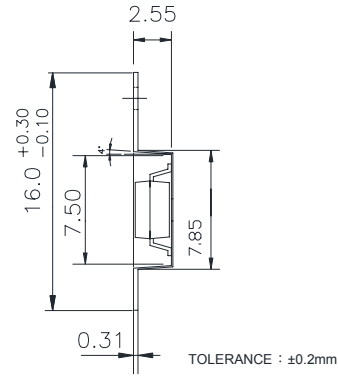


● 4-pin SOP Carrier Tape & Reel

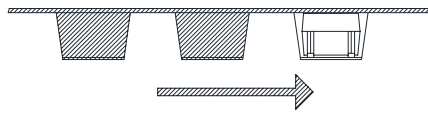
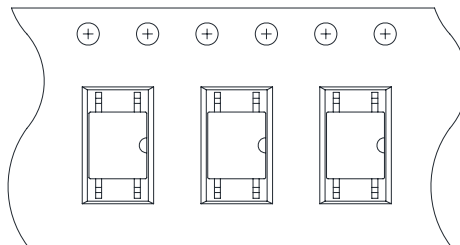
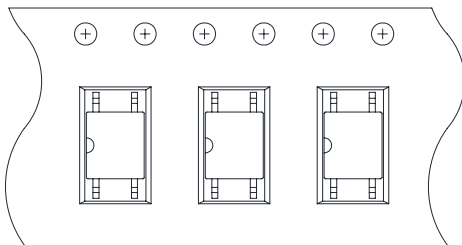
Unit: mm



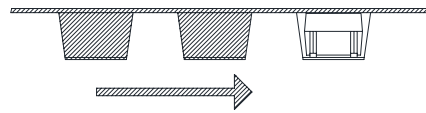
TLD



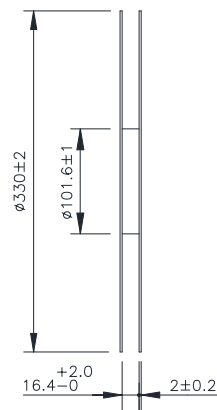
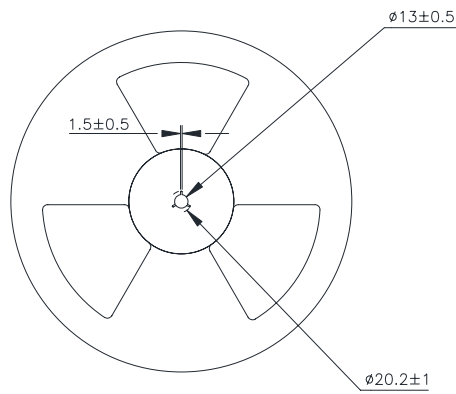
TRU



Direction of feed from reel



Direction of feed from reel



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