## ● Description

The KAQY212 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.

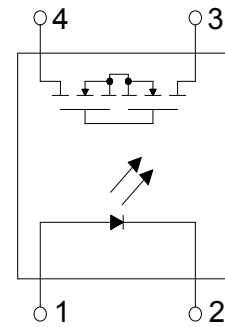## ● Schematic

1 FORM A
NORMALLY OPEN

## ● Features

1. Normally open, single pole single throw
2. Control 60V AC or DC voltage
3. Switch 400mA 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
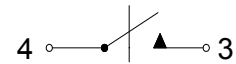    • C-UL Approved (No. E108430)
    • FIMKO Approved: EN60065, EN60950

## ● Application

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

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● **Outside Dimension**

Unit：mm

## 1. Dual-in-line type.

KAQY212
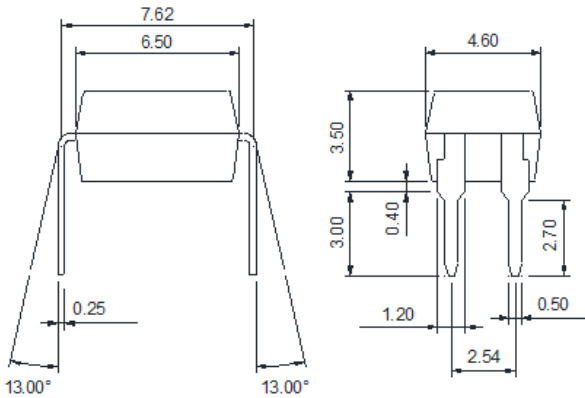
7.62
6.50
4.60
3.50
3.00
0.40
2.70
0.25
1.20
0.50
2.54
13.00°
13.00°

## 2. Surface mount type.

KAQY212A

7.62
6.50
4.60
3.50
0~10°
0.25
1.00
10.00±0.4
0.10±0.1
1.20
2.54

## 3. Small outline for surface mount type.

KAQY212S

4.40±0.5
3.90±0.5
2.0±0.5
0.10|0.10
0.50
0.40
7.00±0.4
2.54
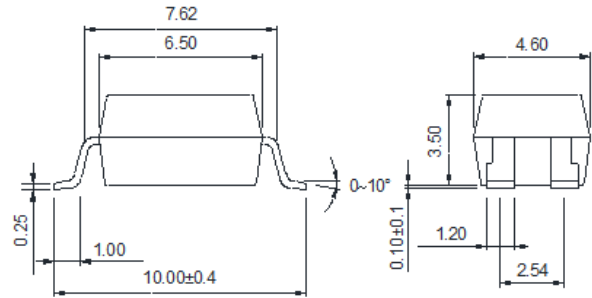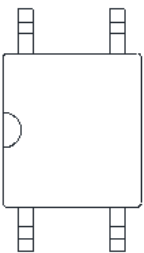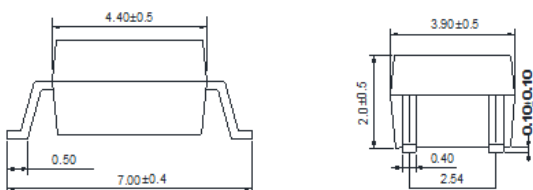
TOLERANCE：±0.2mm

● **Device Marking**

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Y212□
YWW

cosmo
Y212S
YWW

**Notes：**

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Y212□    □(Blank)：DIP or SMD
Y212S    S：SOP
YWW      Y：Year code / W：Week code

## ● 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 | $V_B$ | 60 | V |
| | Continuous load current | $I_L$ | 400 | mA |
| | Power dissipation | $P_{out}$ | 500 | mW |
| Isolation voltage | | $V_{iso}$ | **KAQY212S** | **KAQY212** |
| | | | 1500Vrms | 5000Vrms |
| Isolation resistance (Vio=500V) | | $R_{iso}$ | $\geqq 10^{10}$ | Ω |
| Total power dissipation | | $P_t$ | 550 | mW |
| Derate linearly from 25℃ | | - | 2.5 | mW/℃ |
| Operating temperature | | $T_{opr}$ | -40 to +85 | ℃ |
| Storage temperature | | $T_{stg}$ | -40 to +125 | ℃ |
| Junction temperature | | $T_j$ | 100 | ℃ |
| Soldering temperature 10 seconds | | $T_{sot}$ | 260 | ℃ |

## ● Electro-optical Characteristics

(Ta=25℃)

| | 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 \leqq$5µA | 0.2 | - | - | mA |
| Output | Breakdown voltage | $V_B$ | $I_B$=50µA | 60 | - | - | V |
| | Off-state leakage current | $I_{LEAK}$ | $V_L$=60V, $I_F$=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 | - | 0.83 | 2.5 | Ω |
| Turn-on time | | $T_{ON}$ | $I_F$=10mA, $V_L$=20V | - | 0.3 | 1.5 | ms |
| Turn-off time | | $T_{OFF}$ | $I_L$=100mA, t=10ms | - | 0.1 | 1.5 | ms |

## ● Turn-on / Turn-off Time

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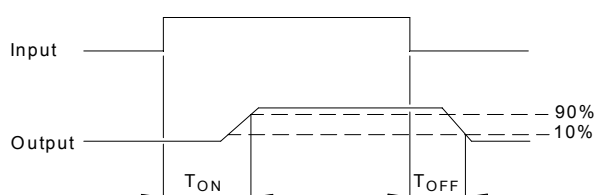
● **Schematic and Wiring Diagrams**
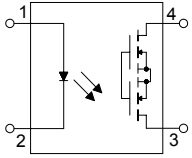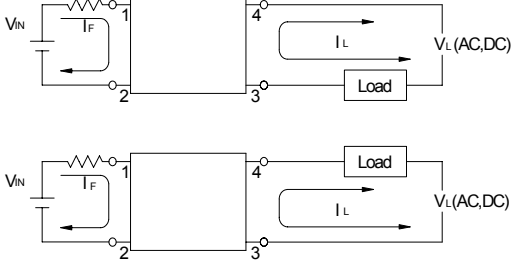
| Schematic | Output Configuration | Load | Connection | Wiring Diagrams |
|---|---|---|---|---|
|  | 1a | AC DC | - |  |

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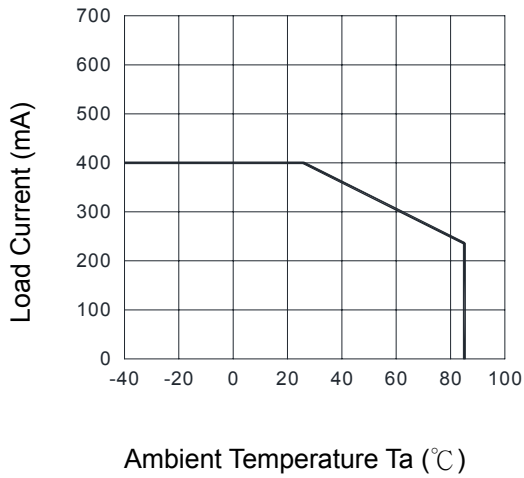vs. Ambient Temperature**

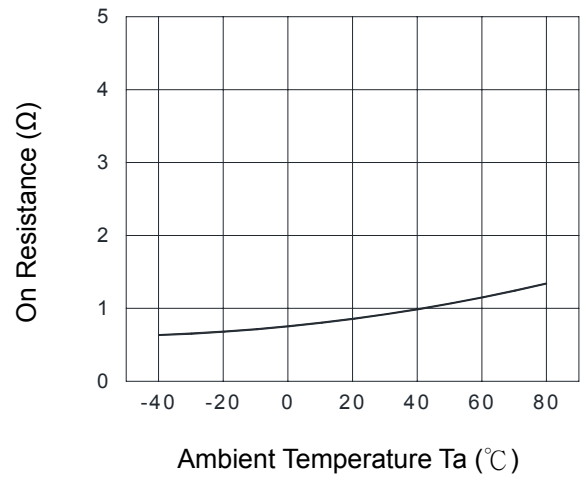**Fig.2  On Resistance
vs. Ambient Temperature**
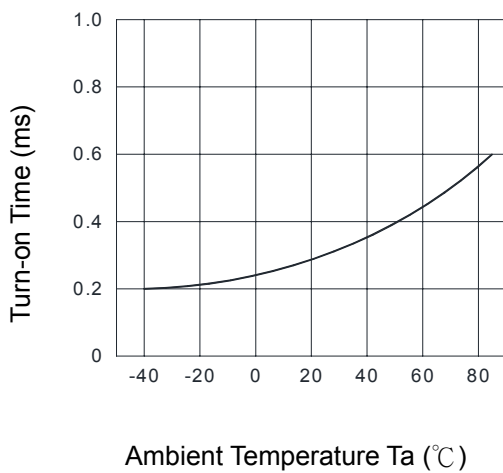
**Fig.3  Turn-on Time
vs. Ambient Temperature**
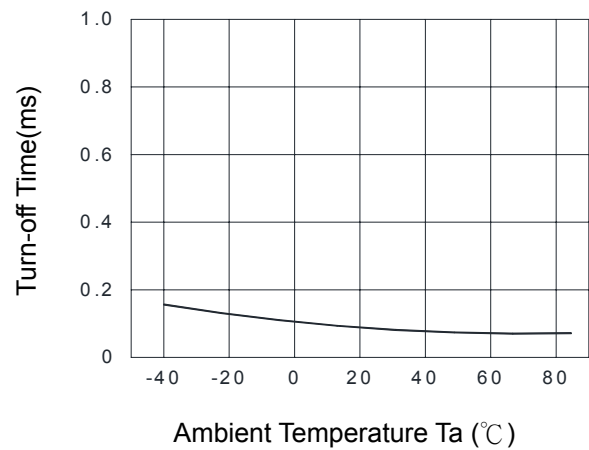
**Fig.4  Turn-off Time
vs. Ambient Temperature**
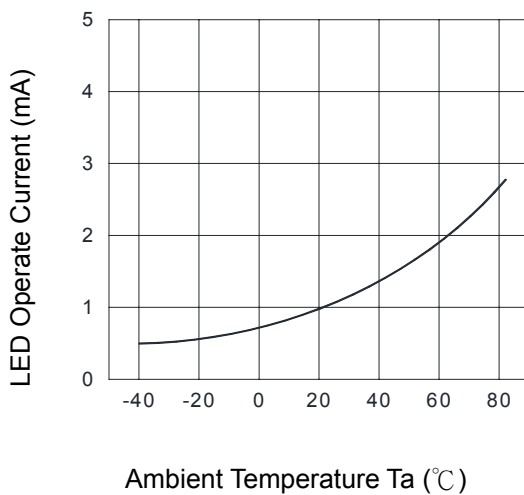
**Fig.5  LED Operate Current
vs. Ambient Temperature**

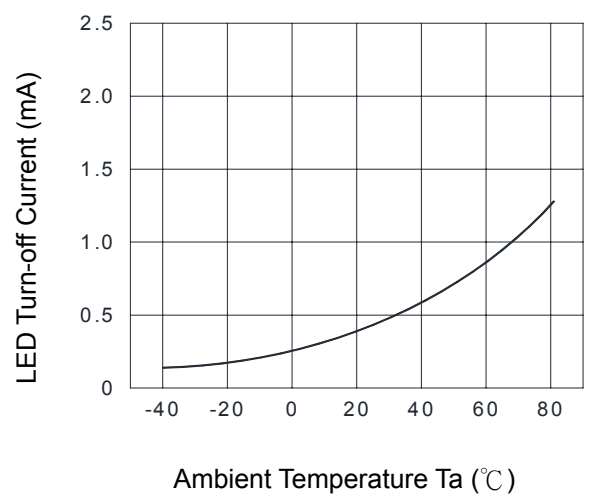**Fig.6  LED Turn-off Current
vs. Ambient Temperature**

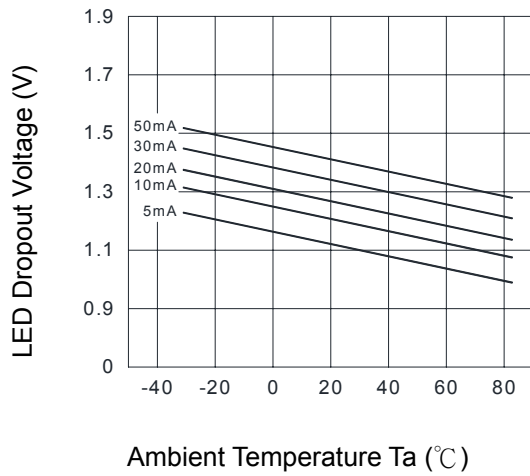**Fig.7  LED Dropout Voltage vs. Ambient Temperature**

LED Dropout Voltage (V)

50mA
30mA
20mA
10mA
5mA

Ambient Temperature Ta (℃)

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

Current (mA)
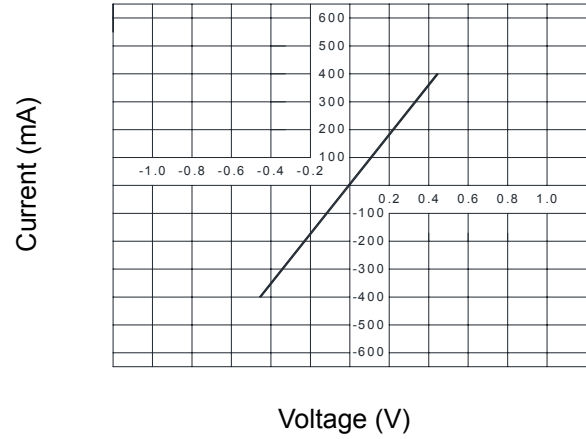
Voltage (V)

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

Turn-on Time (ms)

LED Forward Current (mA)
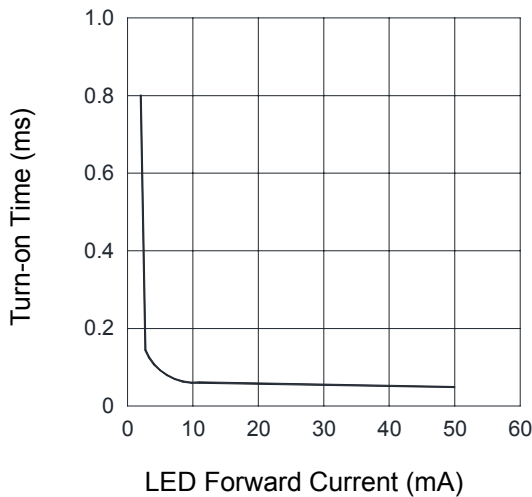
**Fig.10  Off-state Leakage Current vs. Load Voltage**

Off-state Leakage Current (A)

Load Voltage (V)

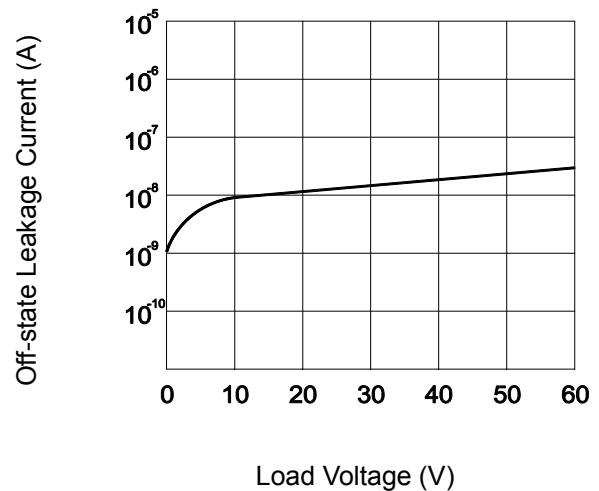**Fig.11  Turn-off Time vs. LED Forward Current**

Turn-off Time (ms)

LED Forward Current (mA)
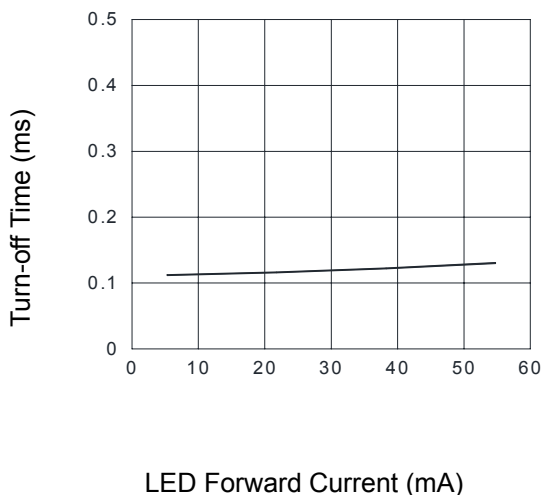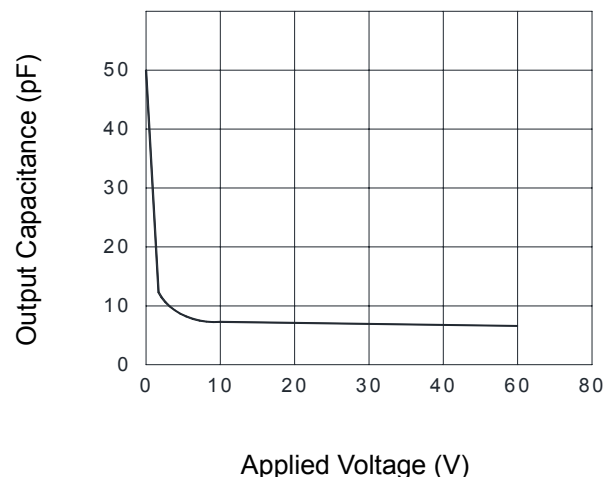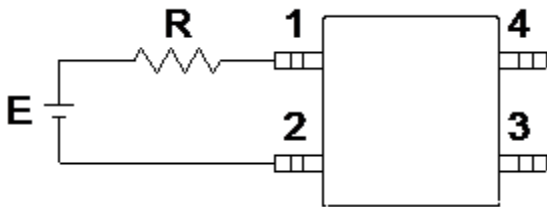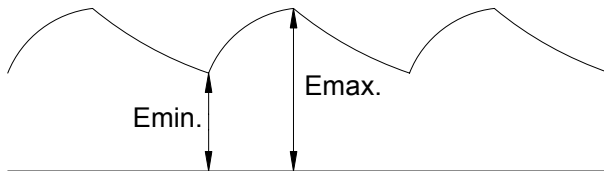
**Fig.12  Output Capacitance vs. Applied Voltage**

Output Capacitance (pF)

Applied Voltage (V)

- **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：
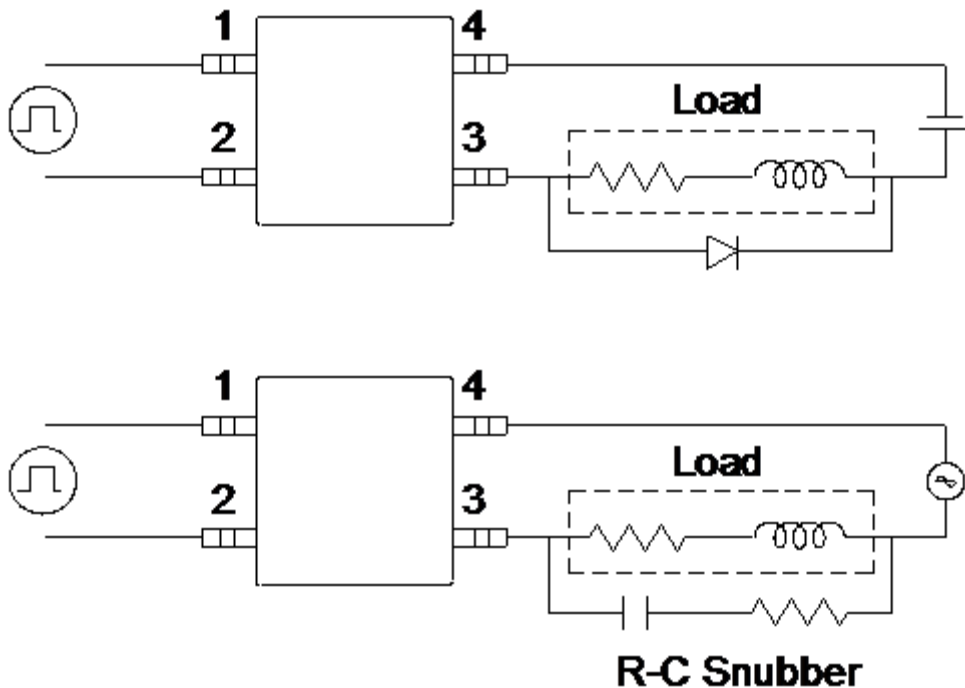
● **Recommended Soldering Conditions**

**(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      60-120 sec
    180~190℃：      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
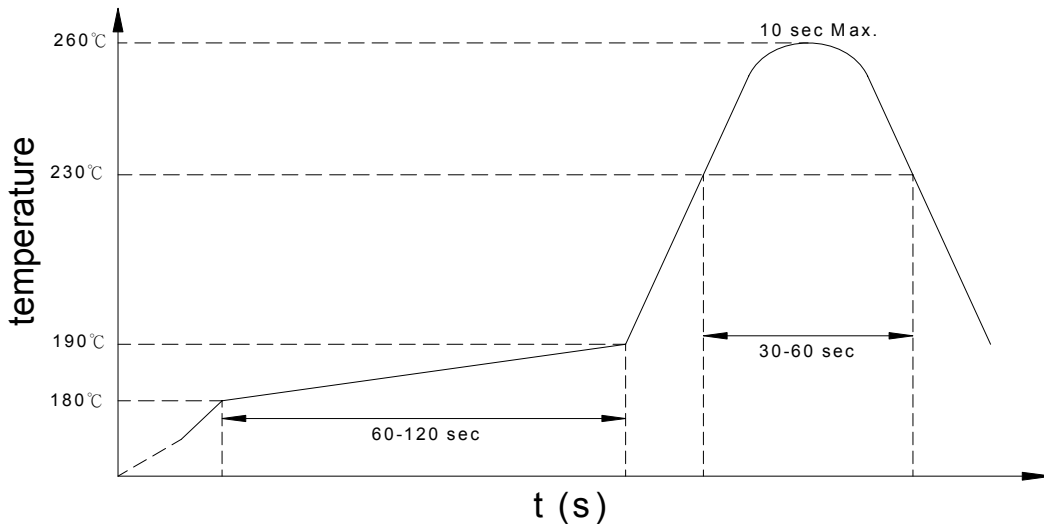


**(b) Wave soldering**：

- Temperature：      260℃ 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**

## KAQY212 <u>X</u> (Y)

### Note：

KAQY212 = 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 |

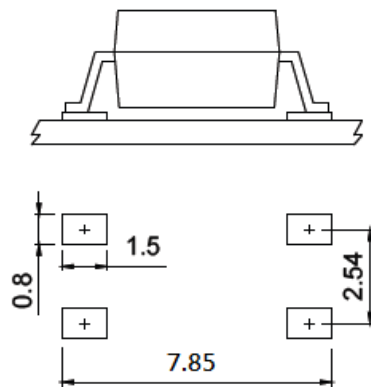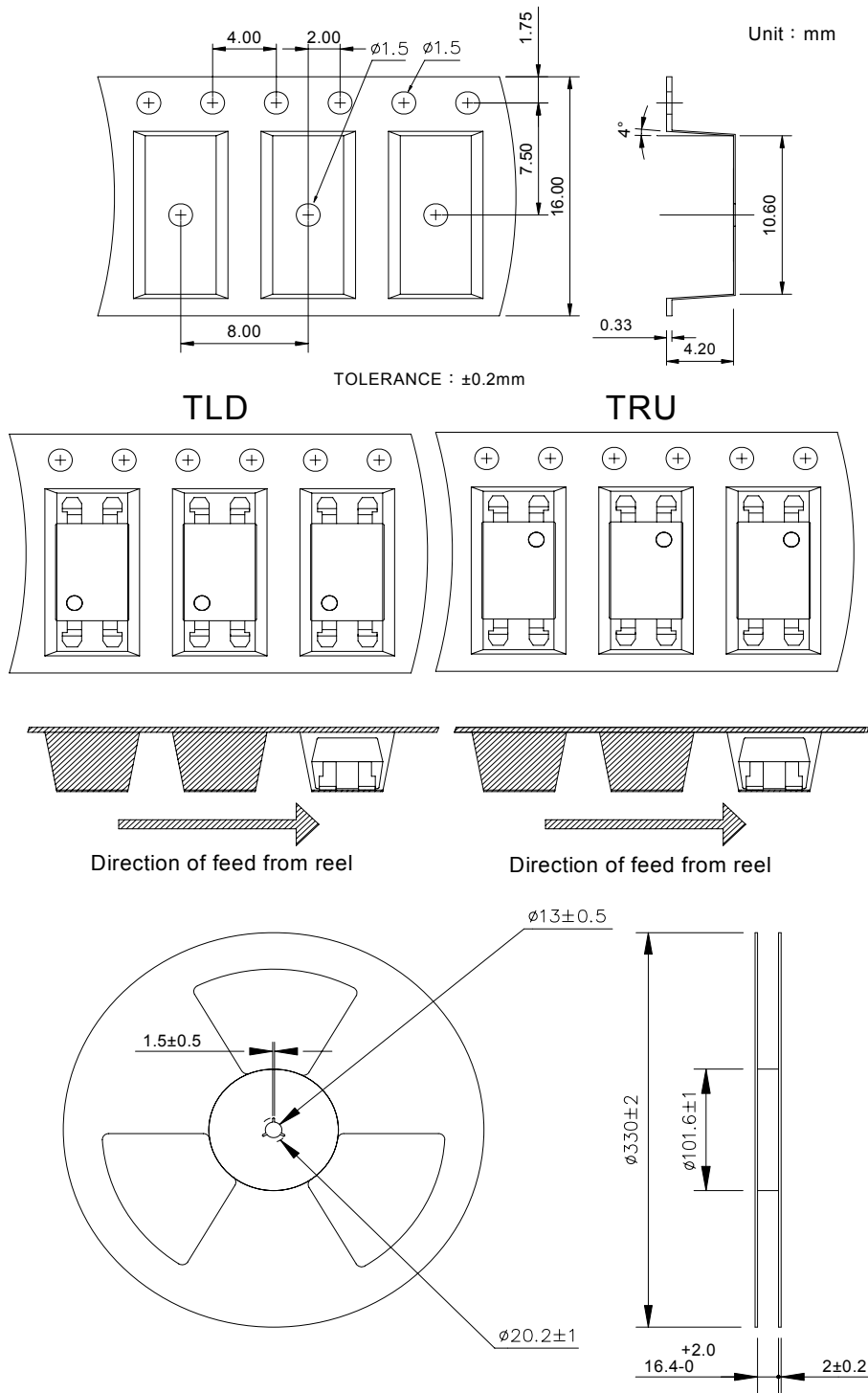● **Recommended Pad Layout for Surface Mount Lead Form**
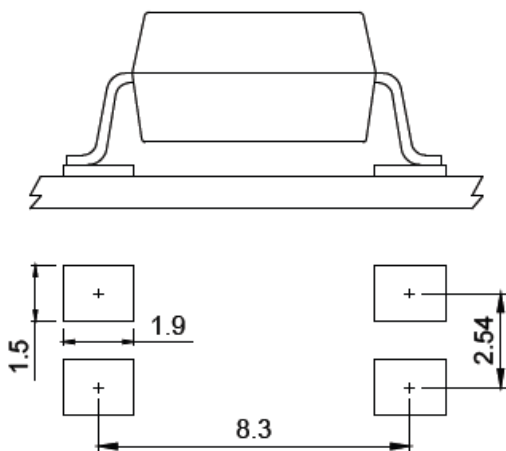


Unit：mm

● **4-pin SMD Carrier Tape & Reel**

Unit：mm

TOLERANCE：±0.2mm

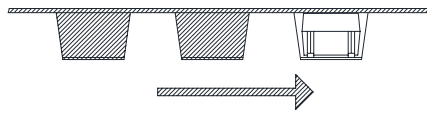TLD

TRU

Direction of feed from reel

Direction of feed from reel

● **4-pin SOP Carrier Tape & Reel**

Unit: mm

ø1.5+0.25    4.0    2.0  ø1.5    1.75

7.5

4.1

2.55

16.0 +0.30 −0.10

7.50

7.85

0.31    TOLERANCE : ±0.2mm

TLD    TRU

Direction of feed from reel    Direction of feed from reel

ø13±0.5

1.5±0.5

ø20.2±1

ø330±2    ø101.6±1

16.4 +2.0 −0    2±0.2
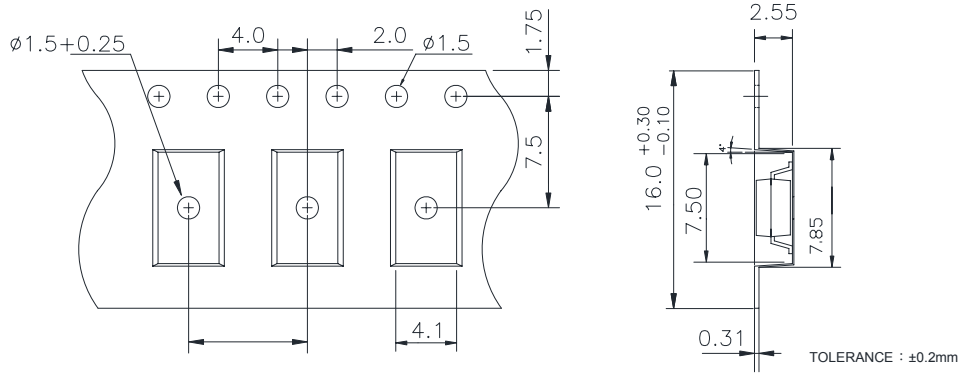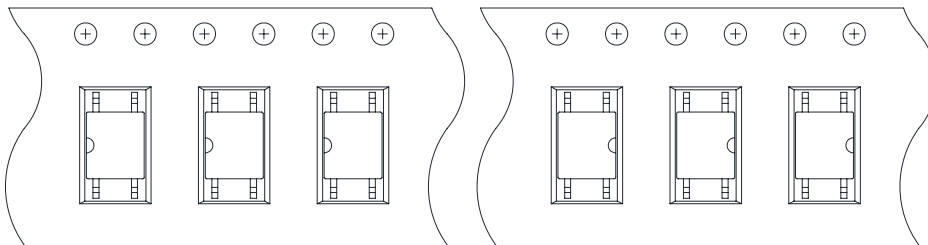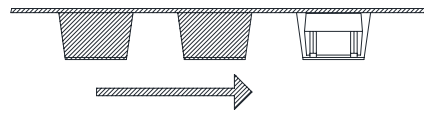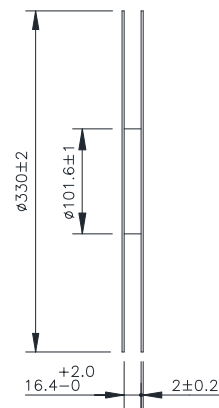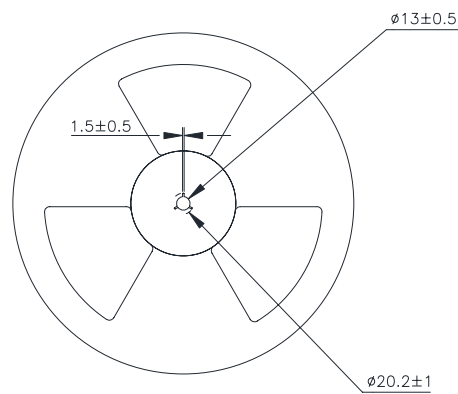
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