

KAQY212 Series

4PIN 60V N.O TYPE

SOLID STATE RELAY-MOSFET OUTPUT

● 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.

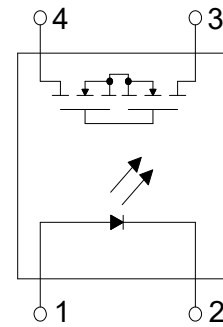
● Features

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: EN62368-1, EN60601-1
 - VDE Approved (No. 40053989): EN60747-5-5

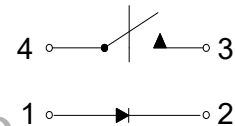
● Application

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

● Schematic



1 FORM A
NORMALLY OPEN



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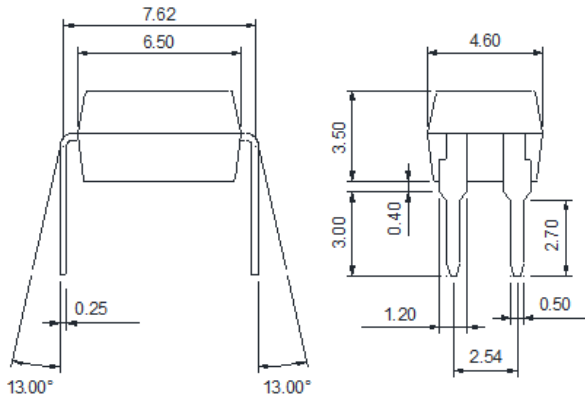
● Outside Dimension

Unit : mm

1. Dual-in-line type.



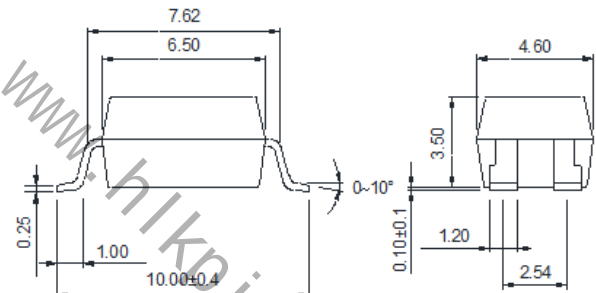
KAQY212



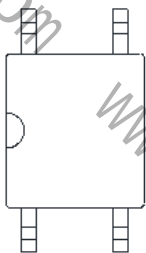
2. Surface mount type.



KAQY212A



3. Small outline for surface mount type.

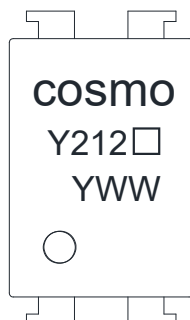


KAQY212S



TOLERANCE : ±0.2mm

● Device Marking



Notes :

cosmo

Y212□ □ (Blank) : DIP or SMD

Y212S S : SOP

YWW Y : Year code / W : Week code

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● Absolute Maximum Ratings

(Ta=25°C)

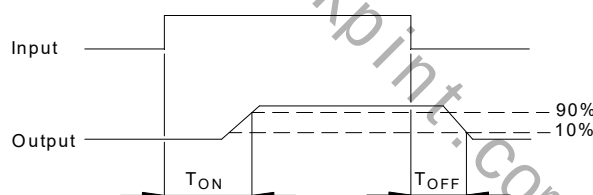
Item	Symbol	Rating	Unit
Input	Continuous forward current	I_F	50 mA
	Peak forward current	I_{FP}	1 A
	Reverse voltage	V_R	5 V
	Power dissipation	P_{in}	100 mW
	Derate linearly from 25°C	-	1.3 mW/°C
Output	Breakdown voltage	V_B	60 V
	Continuous load current	I_L	400 mA
	Power dissipation	P_{out}	500 mW
Isolation voltage		V_{iso}	KAQY212S 1500Vrms
			KAQY212 5000Vrms
Isolation resistance ($V_{io}=500V$)		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	$I_B=50\mu A$	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

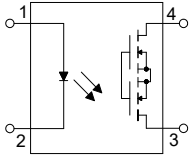
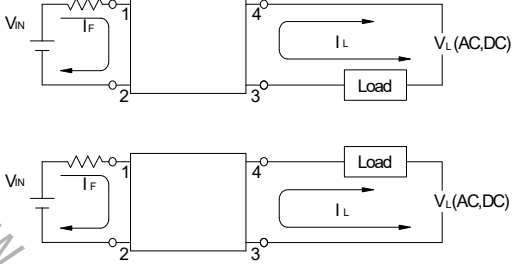


KAQY212 Series

4PIN 60V N.O TYPE

SOLID STATE RELAY-MOSFET OUTPUT

● Schematic and Wiring Diagrams

Schematic	Output Configuration	Load	Connection	Wiring Diagrams
	1a	AC DC		

KAQY212 Series

4PIN 60V N.O TYPE

SOLID STATE RELAY-MOSFET OUTPUT

Fig.1 Load Current vs. Ambient Temperature

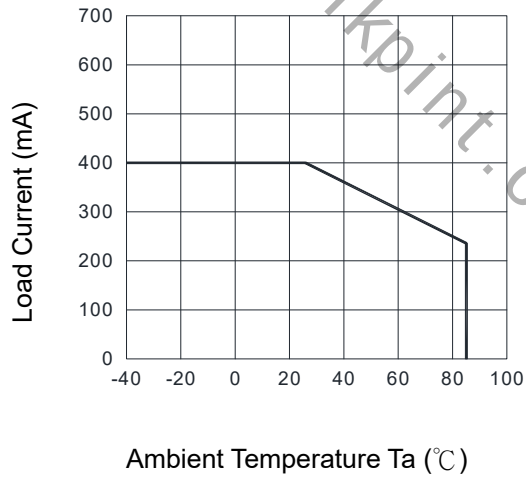


Fig.2 On Resistance vs. Ambient Temperature

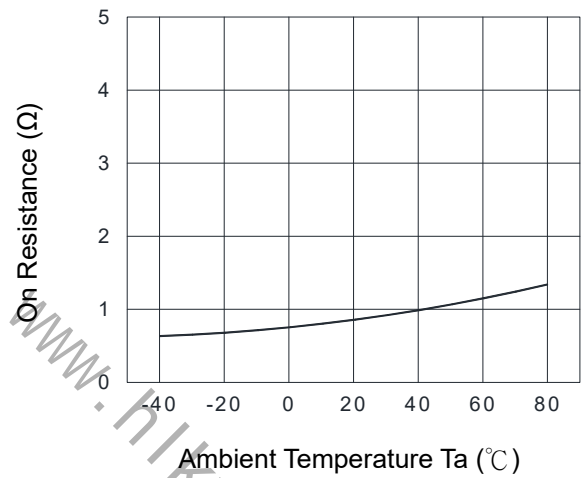


Fig.3 Turn-on Time vs. Ambient Temperature

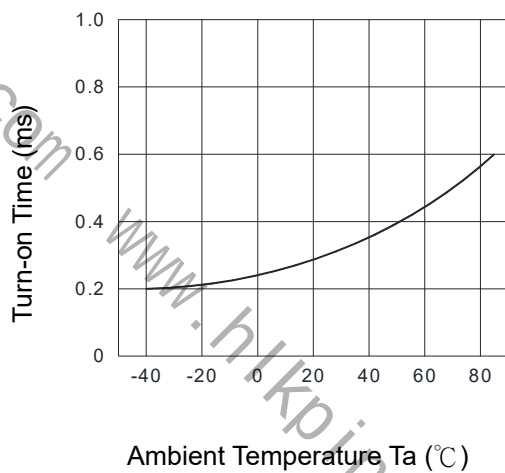


Fig.4 Turn-off Time vs. Ambient Temperature

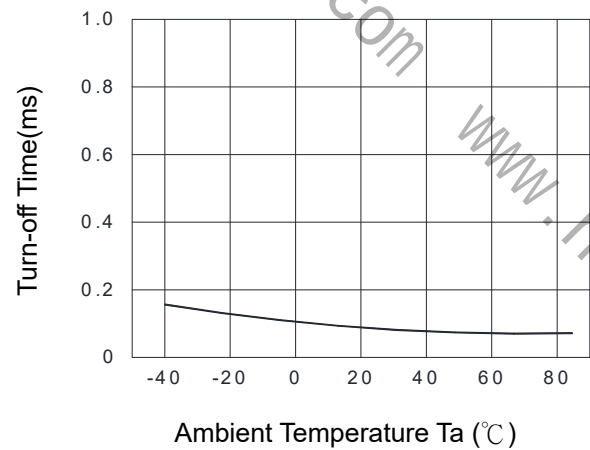


Fig.5 LED Operate Current vs. Ambient Temperature

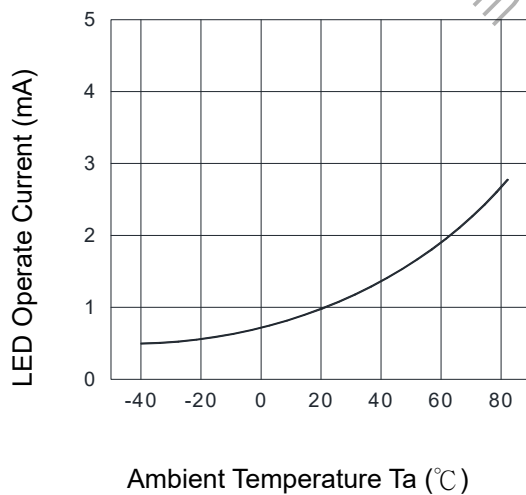
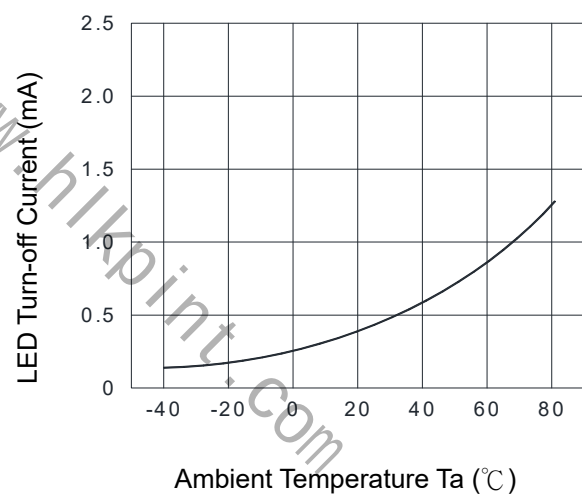


Fig.6 LED Turn-off Current vs. Ambient Temperature



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4PIN 60V N.O TYPE

SOLID STATE RELAY-MOSFET OUTPUT

Fig.7 LED Dropout Voltage vs. Ambient Temperature

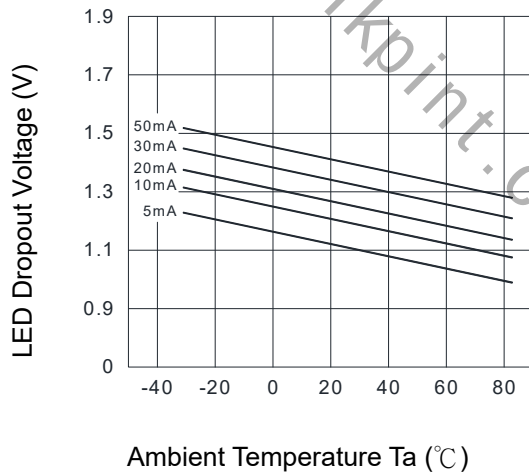


Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion

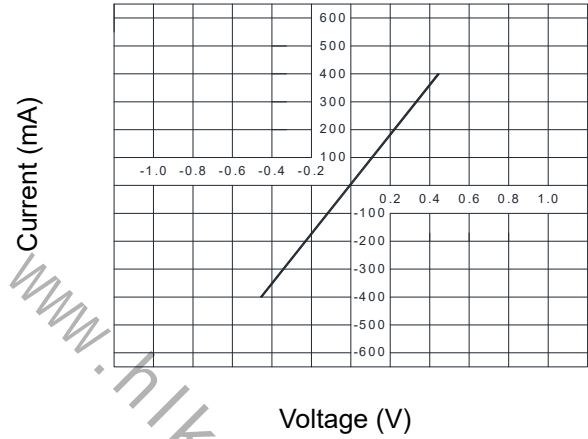


Fig.9 Turn-on Time vs. LED Forward Current

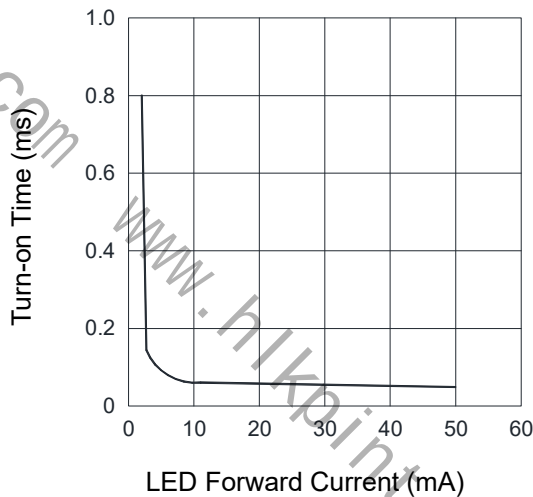


Fig.10 Off-state Leakage Current vs. Load Voltage

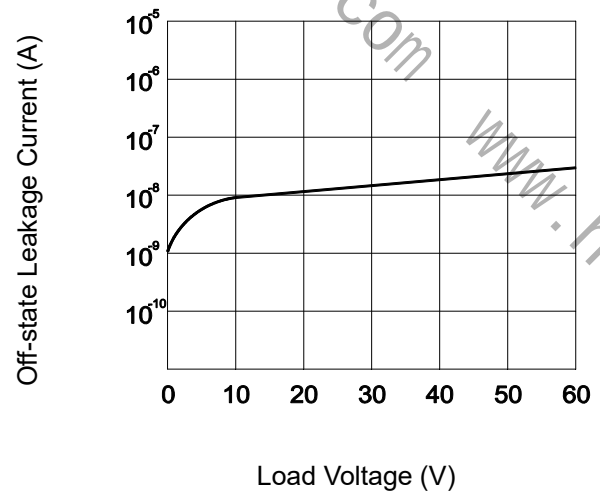


Fig.11 Turn-off Time vs. LED Forward Current

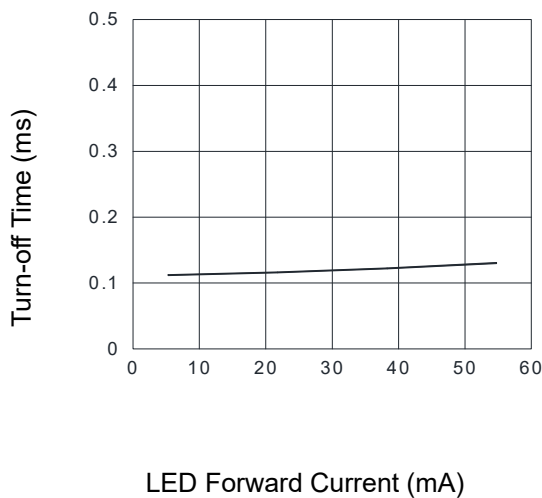
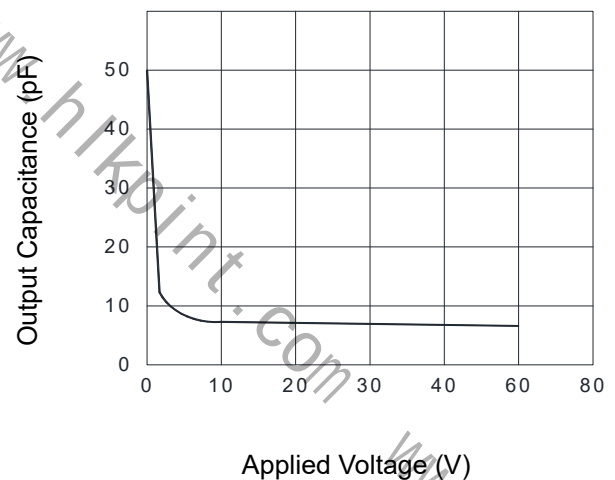


Fig.12 Output Capacitance vs. Applied Voltage



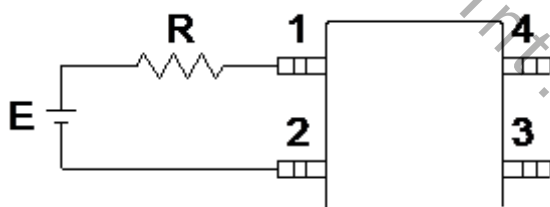
KAQY212 Series

4PIN 60V N.O TYPE

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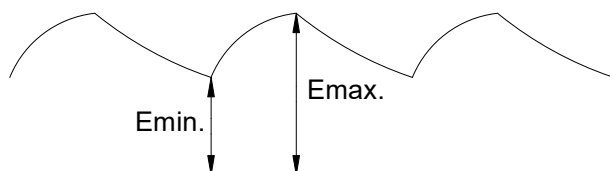
● Using Methods

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

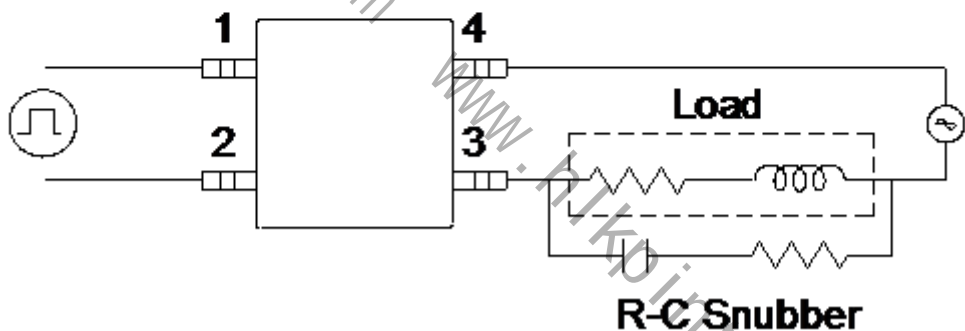
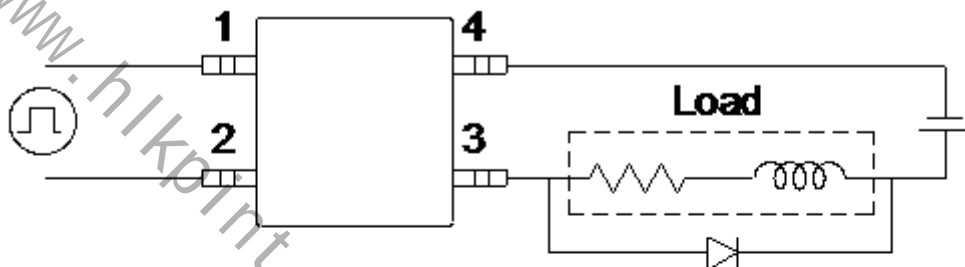


E	R
3.3V	Approx. 330 Ω
5V	Approx. 640 Ω
12V	Approx. 1.9K Ω
15V	Approx. 2.5K Ω
24V	Approx. 4.1K Ω

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 :

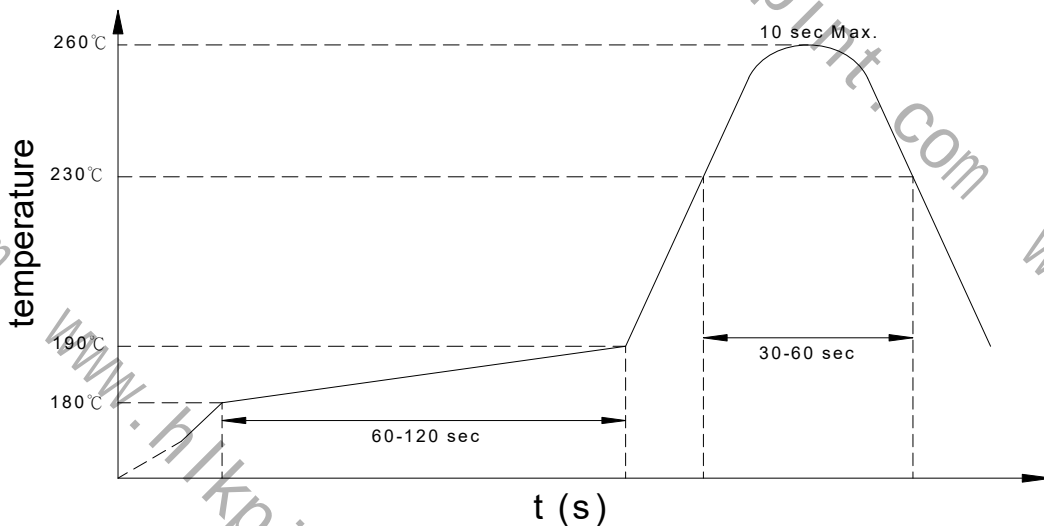


● **Recommended Soldering Conditions**

(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. |

KAQY212 Series

4PIN 60V N.O TYPE
SOLID STATE RELAY-MOSFET OUTPUT

● Numbering System

KAQY212 X (Y)

Note :

KAQY212 = Part No.

X = Lead form option (blank 、 S or A)

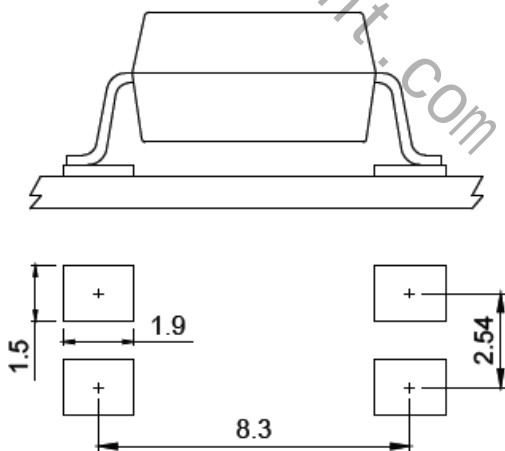
Y = Tape and reel option (TLD 、 TRU)

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

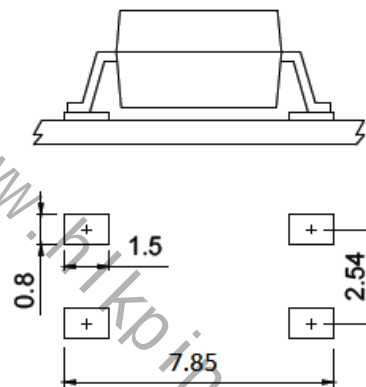
1. Surface mount type.

4-pin SMD



2. Small outline for surface mount type.

4-pin SOP



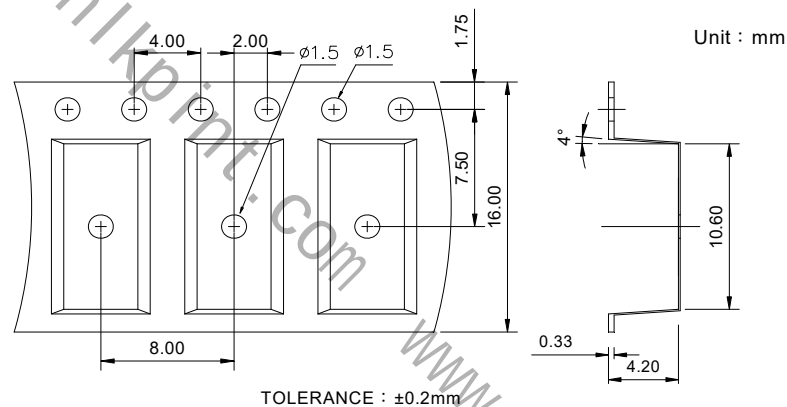
Unit : mm

KAQY212 Series

4PIN 60V N.O TYPE

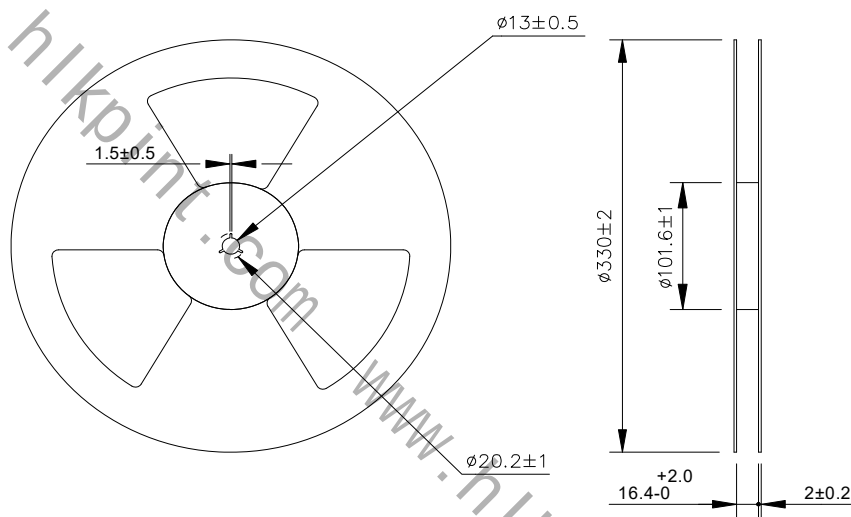
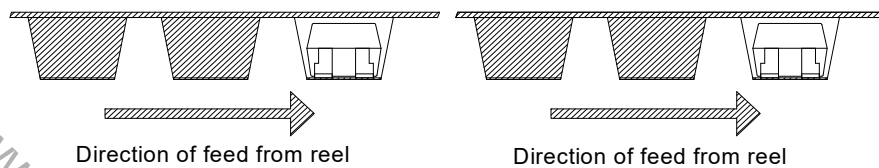
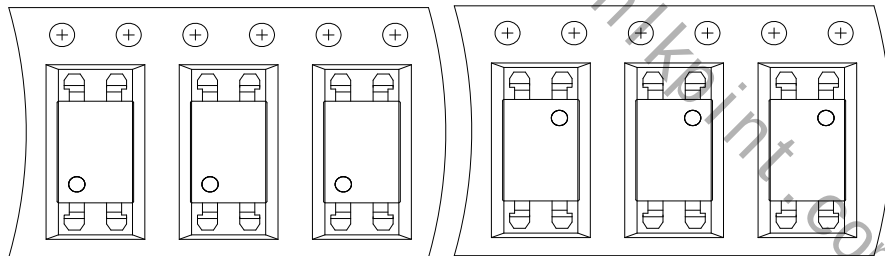
SOLID STATE RELAY-MOSFET OUTPUT

● 4-pin SMD Carrier Tape & Reel



TLD

TRU



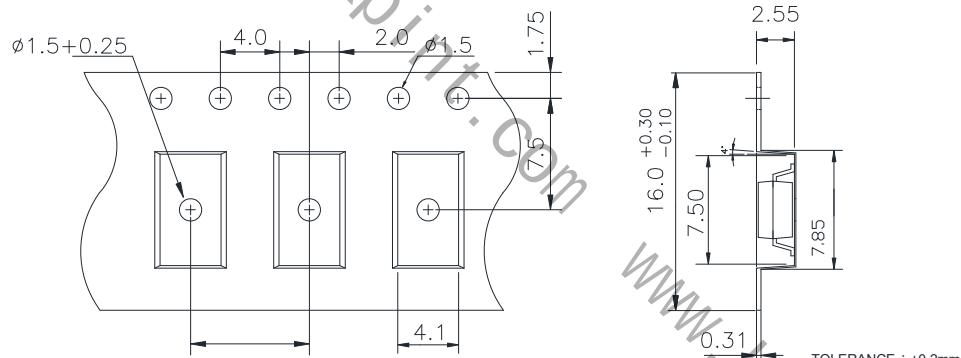
KAQY212 Series

4PIN 60V N.O TYPE

SOLID STATE RELAY-MOSFET OUTPUT

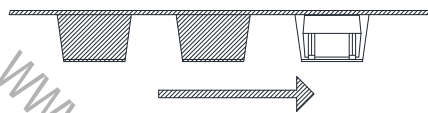
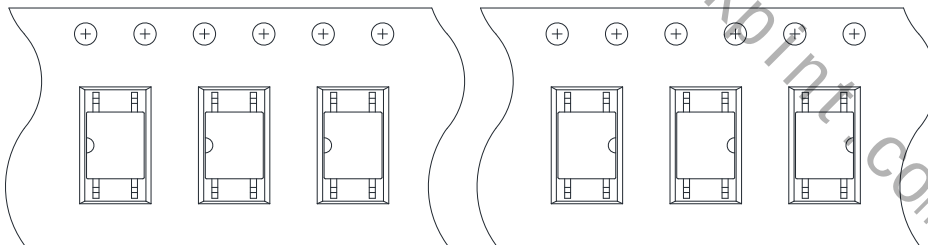
● 4-pin SOP Carrier Tape & Reel

Unit: mm

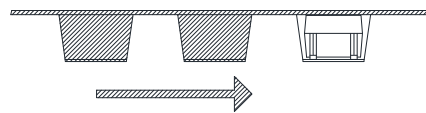


TLD

TRU



Direction of feed from reel



Direction of feed from reel

