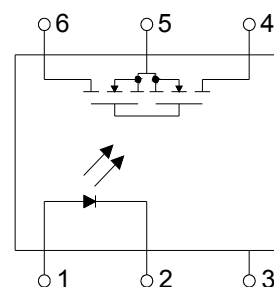


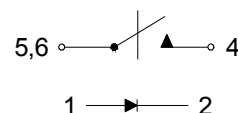
## ● Description

The KAQV210 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 350V 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

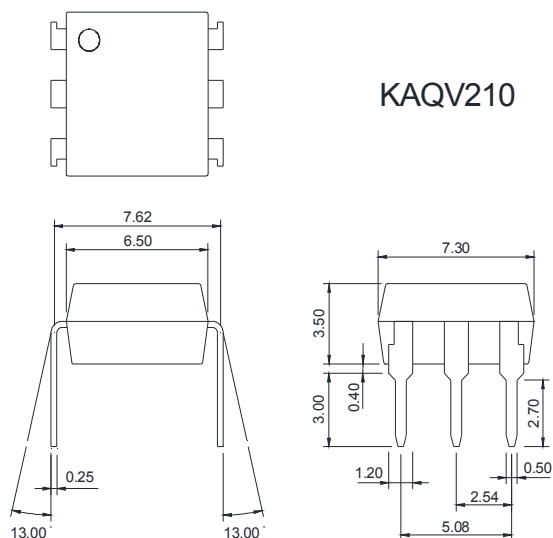
## ● Application

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

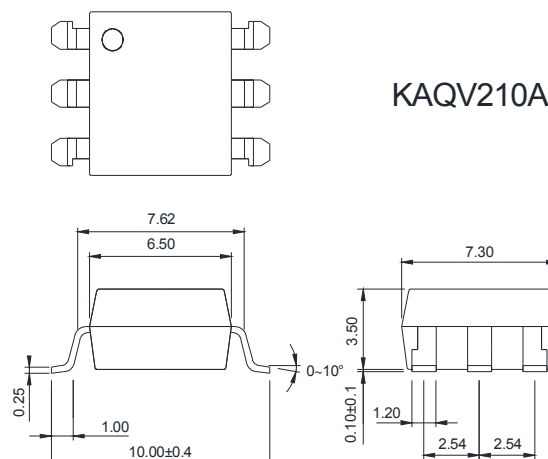
## ● Outside Dimension

Unit : mm

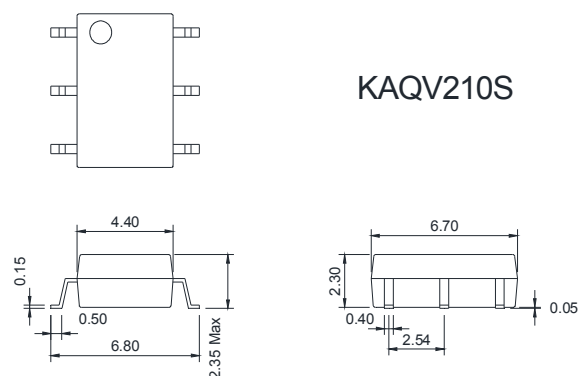
### 1. Dual-in-line type.



### 2. Surface mount type.

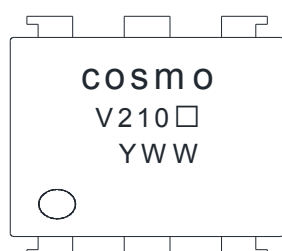


### 3. Small outline for surface mount type.



TOLERANCE : ±0.2mm

## ● Device Marking



### Notes :

cosmo

V210 □

YWW

□ : Pin forming

Y : Year code / W : Week code

## ● Absolute Maximum Ratings

(Ta=25°C)

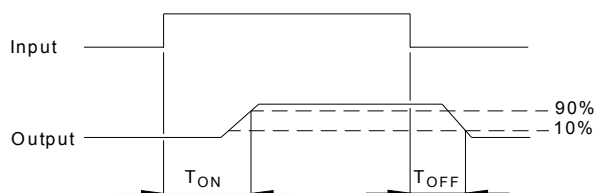
Item		Symbol	Rating	Unit
Input	Continuous forward current	$I_F$	50	mA
	Peak forward current	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Power dissipation	$P_{in}$	100	mW
	Derate linearly from 25°C	-	1.3	mW/°C
Output	Breakdown voltage	$V_B$	350	V
	Continuous load current	$I_L$	130	mA
	Power dissipation	$P_{out}$	500	mW
Isolation voltage		$V_{iso}$	<b>KAQV210S</b>	<b>KAQV210</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

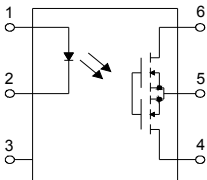
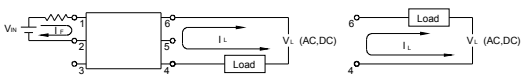
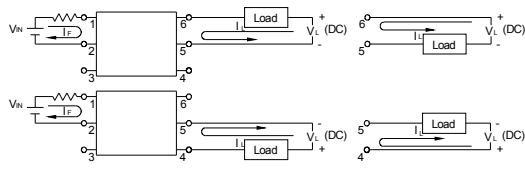
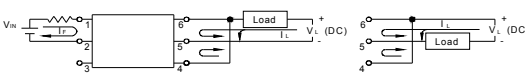
(Ta=25°C)

Parameter			Symbol	Conditions	Min.	Typ.	Max.	Unit
Input	Forward voltage		V <sub>F</sub>	I <sub>F</sub> =10mA	-	1.2	1.5	V
	Operation input current		I <sub>FON</sub>	V <sub>L</sub> =20V, I <sub>L</sub> =100mA	-	-	3.0	mA
	Recovery input current		I <sub>FOFF</sub>	V <sub>L</sub> =20V, I <sub>L</sub> ≤5μA	0.2	-	-	mA
Output	Breakdown voltage		V <sub>B</sub>	I <sub>B</sub> =50μA	350	-	-	V
	Off-state leakage current		I <sub>LEAK</sub>	V <sub>L</sub> =350V, I <sub>F</sub> =0mA	-	0.2	1.0	μA
I/O capacitance			C <sub>iso</sub>	V <sub>B</sub> =0V, f=1MHz	-	6	-	pF
ON resistance	connection	A	R <sub>ON</sub>	I <sub>F</sub> =10mA, I <sub>L</sub> =100mA	-	20	30	Ω
		B			-	10	15	
		C			-	5	7.5	
Turn-on time			T <sub>ON</sub>	I <sub>F</sub> =10mA, V <sub>L</sub> =20V	-	0.3	1.0	ms
Turn-off time			T <sub>OFF</sub>	I <sub>L</sub> =100mA, t=10ms	-	0.1	1.5	ms

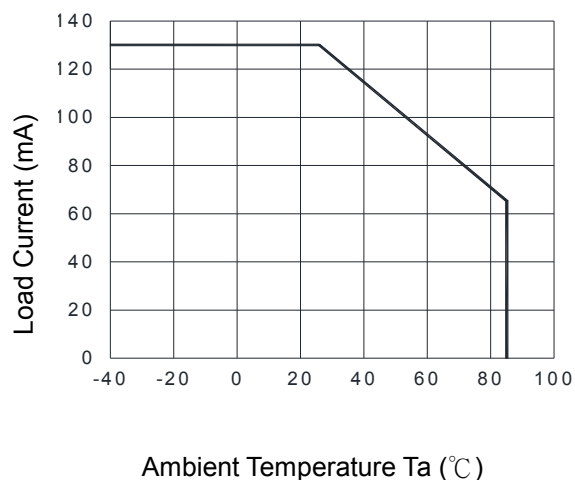
## ● Turn-on / Turn-off Time



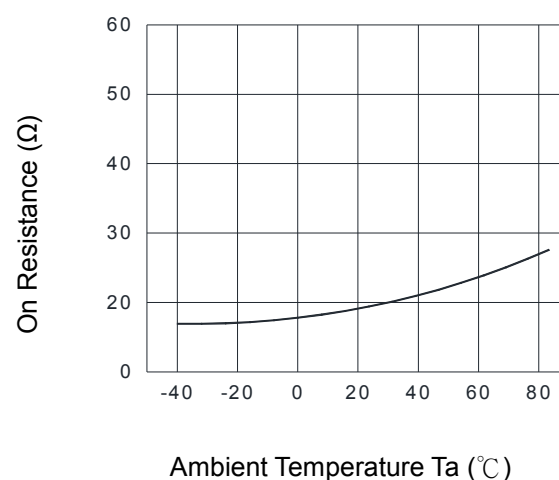
## ● Schematic and Wiring Diagrams

Schematic	Output Configuration	Load	Connection	Wiring Diagrams
	1a	AC DC	A	
		DC	B	
		DC	C	

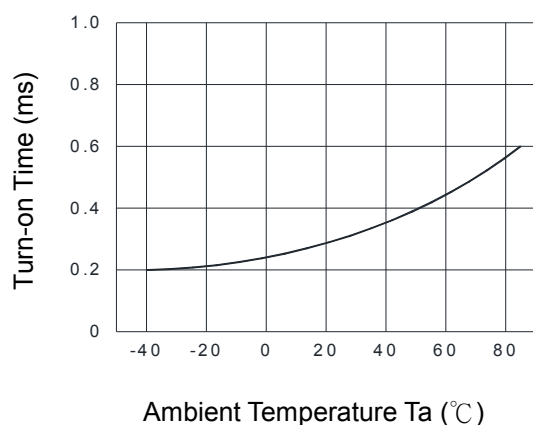
**Fig.1 Load Current vs. Ambient Temperature**



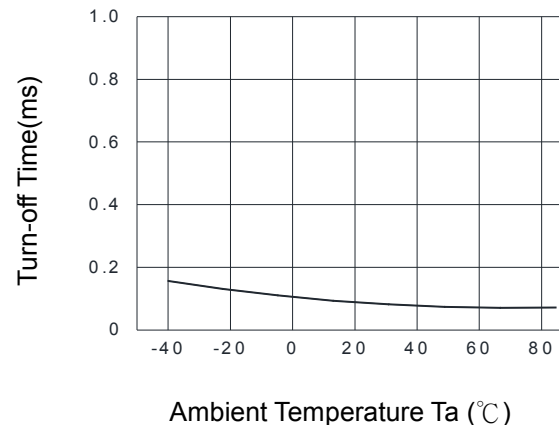
**Fig.2 On Resistance vs. Ambient Temperature**



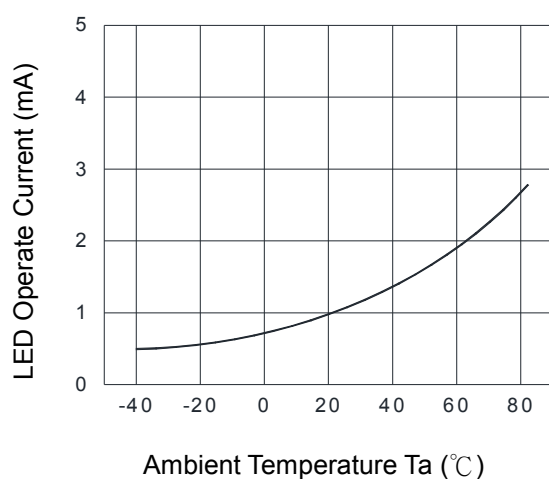
**Fig.3 Turn-on Time vs. Ambient Temperature**



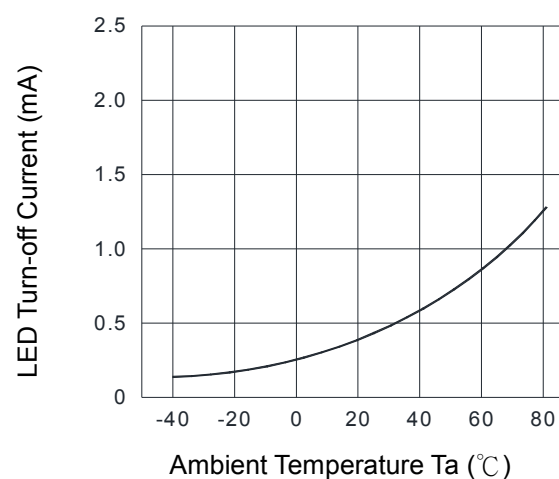
**Fig.4 Turn-off Time vs. Ambient Temperature**



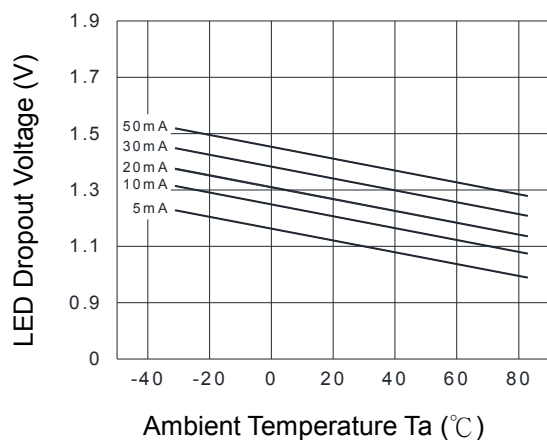
**Fig.5 LED Operate Current vs. Ambient Temperature**



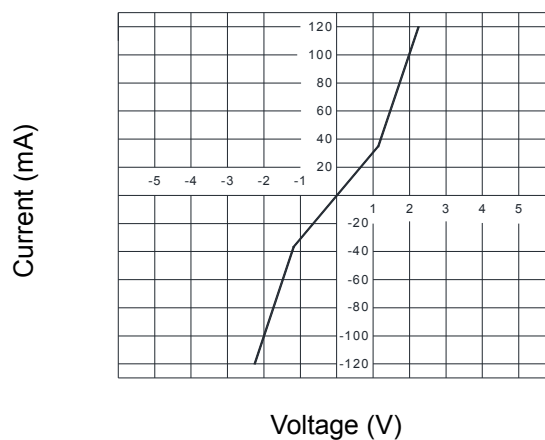
**Fig.6 LED Turn-off Current vs. Ambient Temperature**



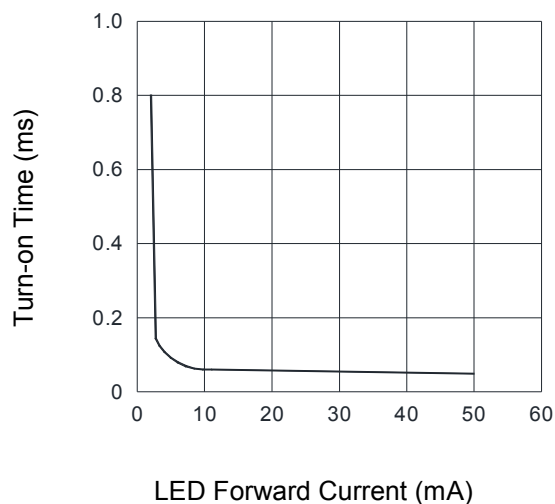
**Fig.7 LED Dropout Voltage vs. Ambient Temperature**



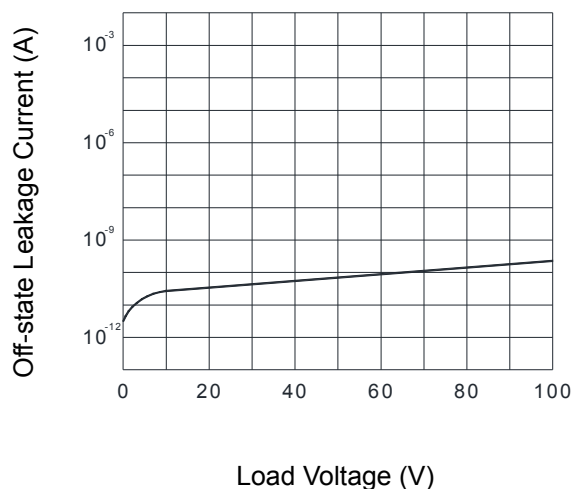
**Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion**



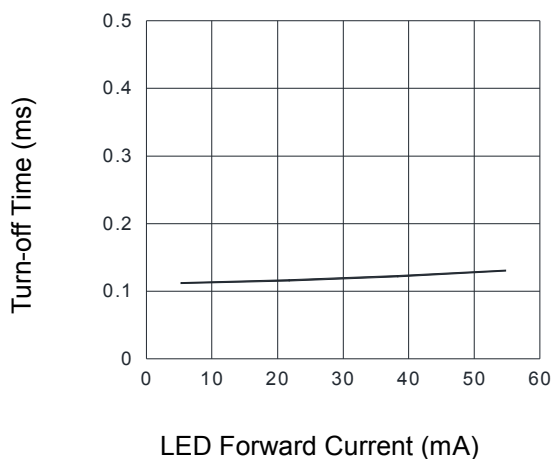
**Fig.9 Turn-on Time vs. LED Forward Current**



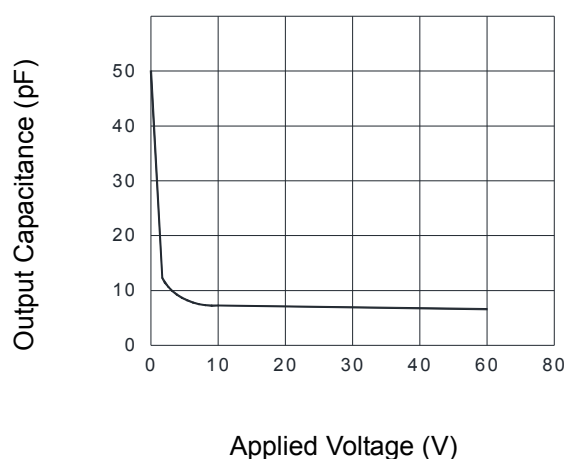
**Fig.10 Off-state Leakage Current vs. Load Voltage**



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

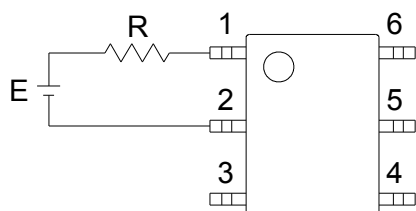


**Fig.12 Output Capacitance vs. Applied Voltage**



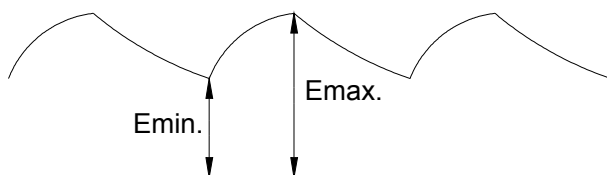
## ● Using Methods

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

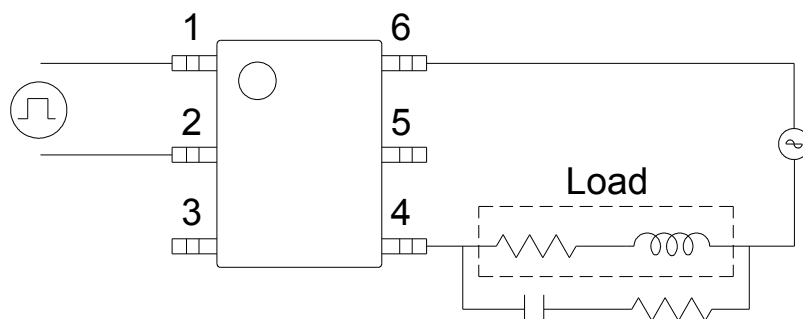
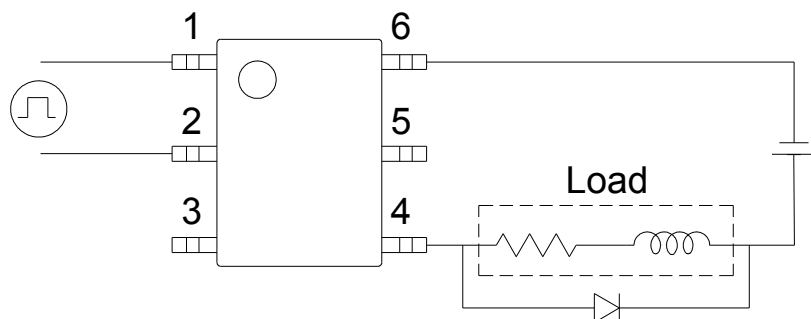


E	R
3.3V	Approx. 330 $\Omega$
5V	Approx. 640 $\Omega$
12V	Approx. 1.9K $\Omega$
15V	Approx. 2.5K $\Omega$
24V	Approx. 4.1K $\Omega$

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 :



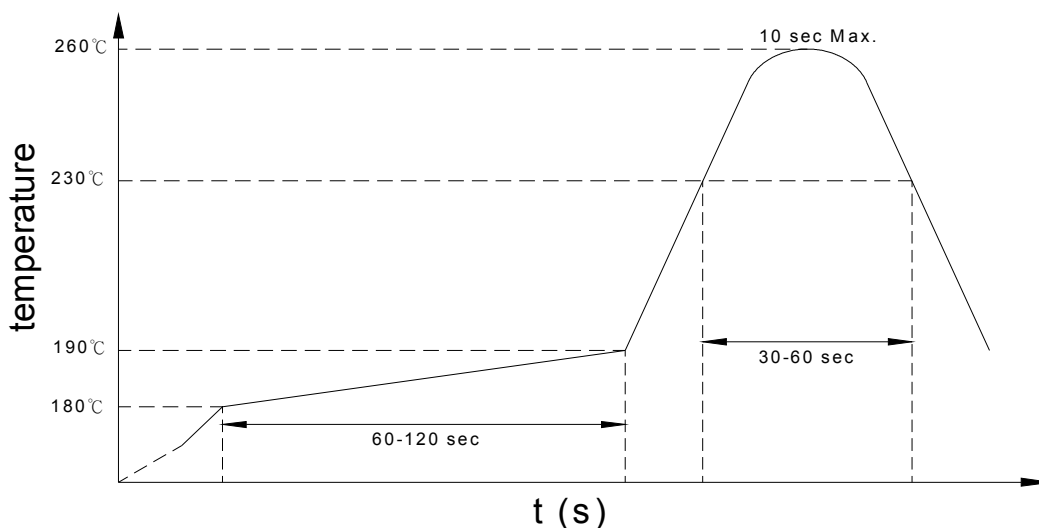
R-C Snubber

## ● 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

### KAQV210 X (Y)

#### Note :

KAQV210 = Part No.

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

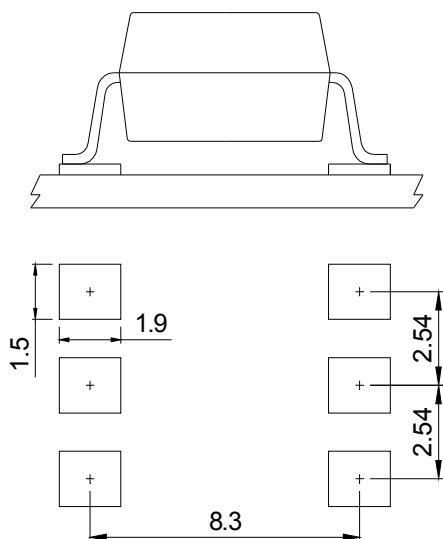
Y = Tape and reel option ( TL 、 TR )

Option	Description	Packing quantity
A (TL)	surface mount type package + TL tape & reel option	1000 units per reel
A (TR)	surface mount type package + TR tape & reel option	1000 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

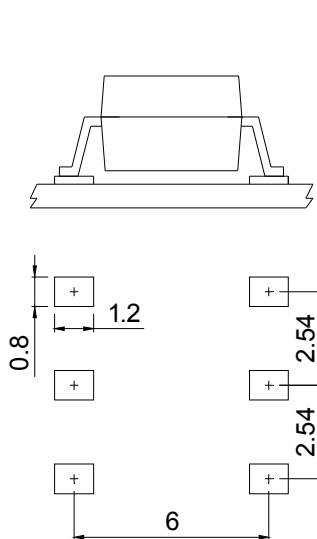
### 1. Surface mount type.

**6-pin SMD**



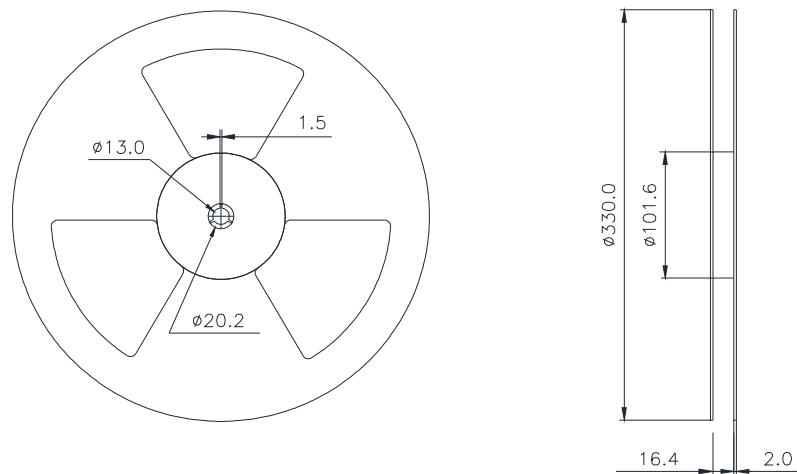
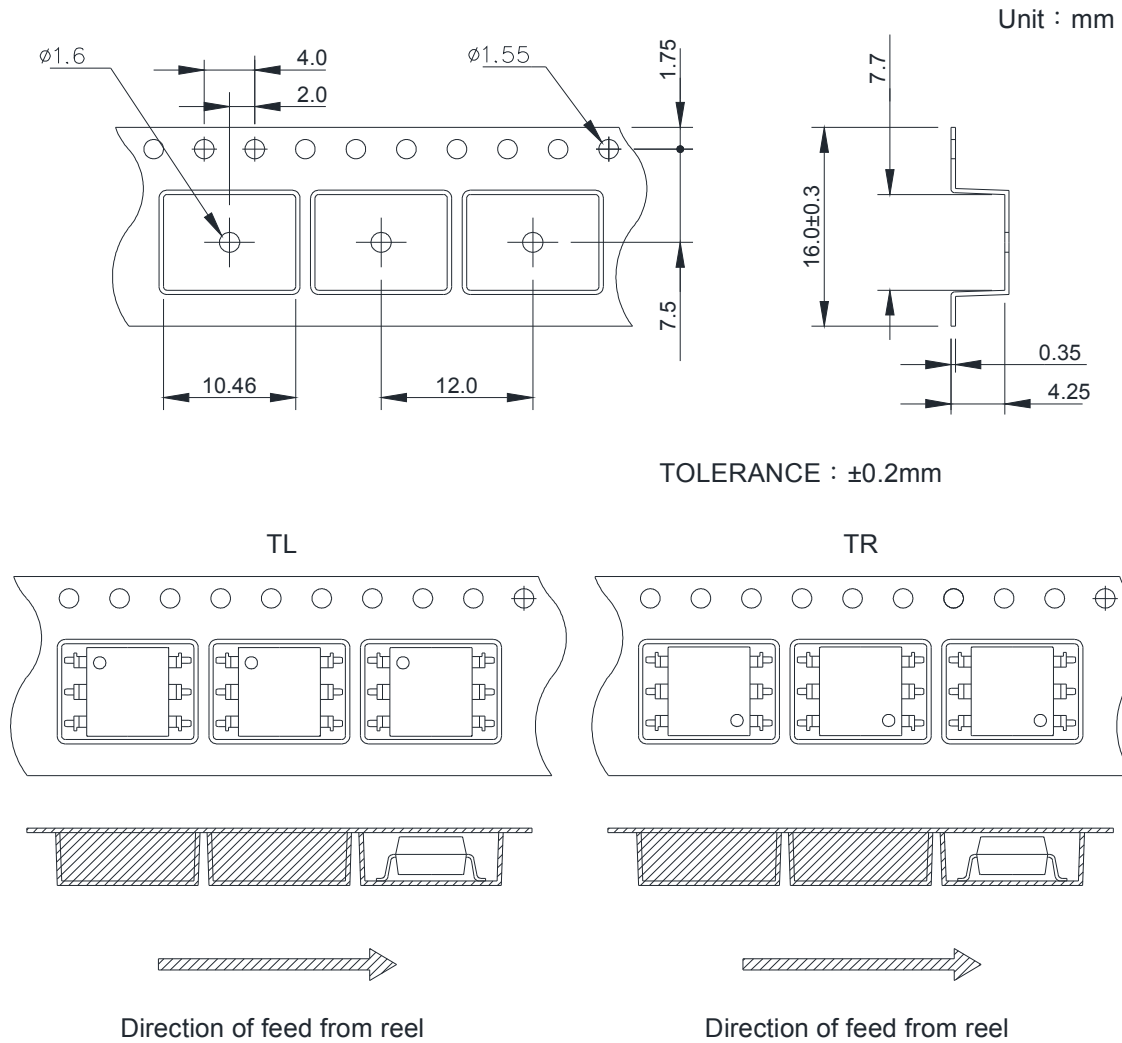
### 2. Small outline for surface mount type.

**6-pin SOP**



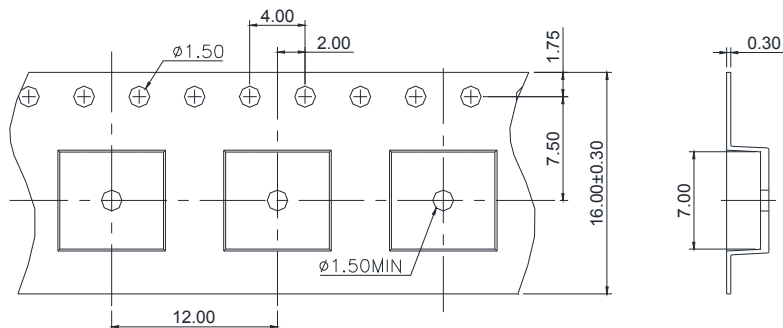
Unit : mm

● 6-pin SMD Carrier Tape & Reel



## ● 6-pin SOP Carrier Tape & Reel

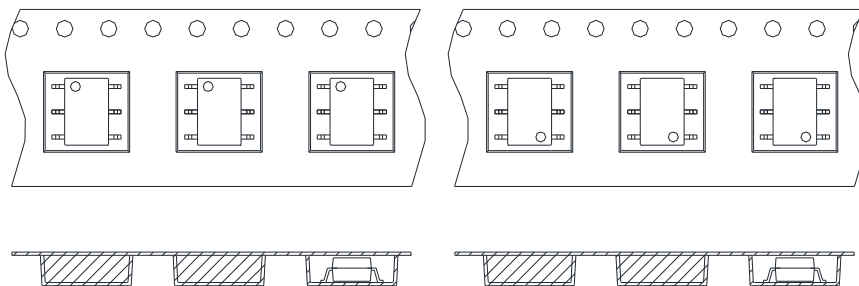
Unit : mm



TOLERANCE :  $\pm 0.2\text{mm}$

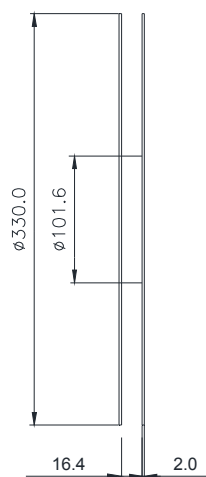
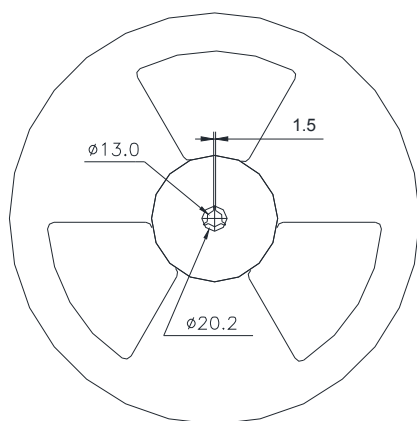
TL

TR



Direction of feed from reel

Direction of feed from reel



## ● Application Notice

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

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- d. Nuclear power control
- e. Equipment used for automotive vehicles, trains, ships...etc.

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