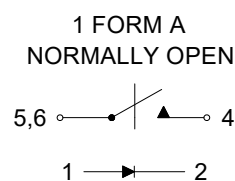
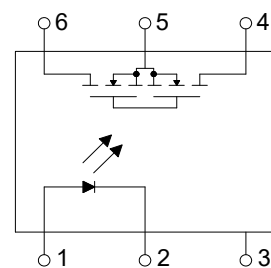


● Description

The KAQV213 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



● 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. 40053989): EN60747-5-5

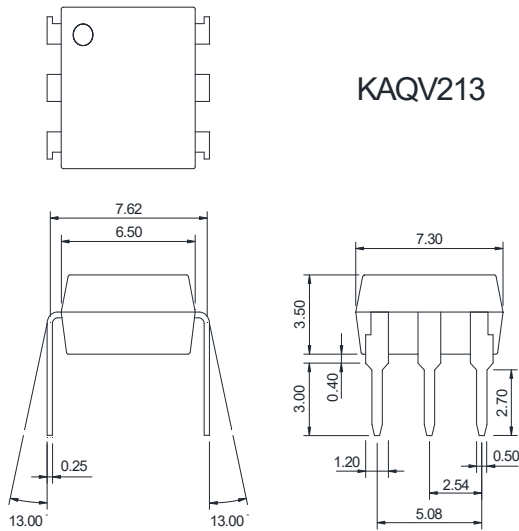
● Application

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

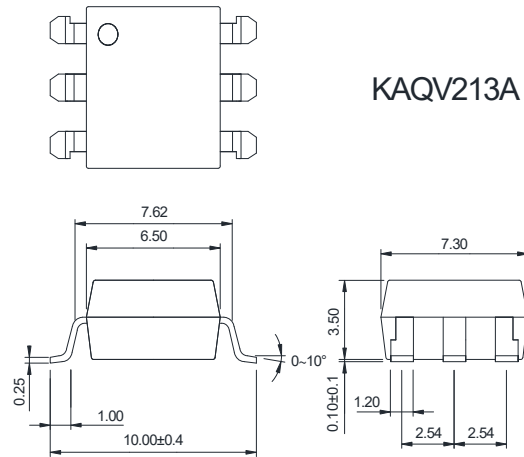
● **Outside Dimension**

Unit : mm

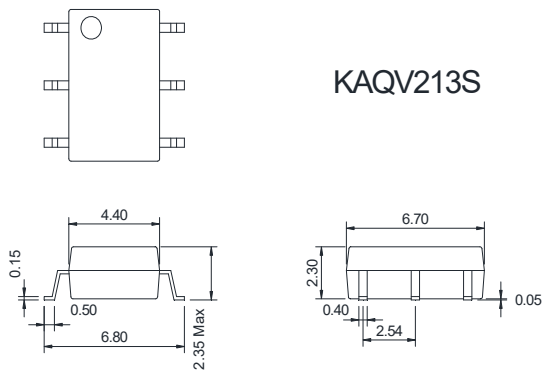
1. Dual-in-line type.



2. Surface mount type.

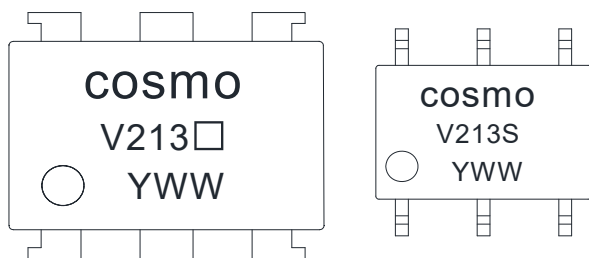


3. Small outline for surface mount type.



TOLERANCE : ±0.2mm

● **Device Marking**



Notes :

- cosmo
V213 □ □(Blank): DIP or SMD
V213S S : SOP
YWW Y : Year code / W : Week code

● **Absolute Maximum Ratings**

(Ta=25°C)

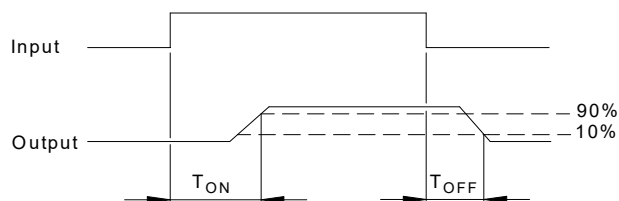
Item		Symbol	Rating	Unit
Input	Continuous forward current	I_F	50	mA
	Peak forward current	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P_{in}	100	mW
	Derate linearly from 25°C	-	1.3	mW/°C
Output	Breakdown voltage	V_B	250	V
	Continuous load current	I_L	200	mA
	Power dissipation	P_{out}	500	mW
Isolation voltage		V_{iso}	KAQV213S 1500Vrms	KAQV213 5000Vrms
Isolation resistance (Vio=500V)			R_{iso}	$\geq 10^{10}$
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	$I_B=50\mu A$	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	Connection	A	R_{ON}	$I_F=10mA, I_L=100mA$	-	8	16	Ω
		B			-	4	8	
		C			-	2	4	
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

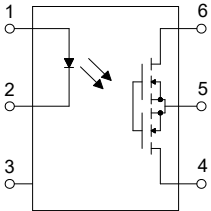
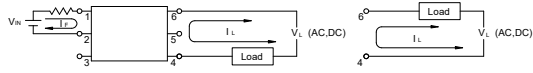
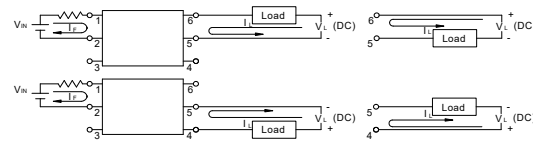
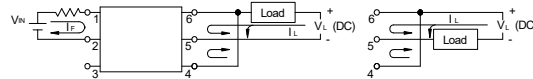
Schematic	Output Configuration	Load	Connection	Wiring Diagrams
	1a	AC DC	A	
		DC	B	
		DC	C	

Fig.1 Load Current vs. Ambient Temperature

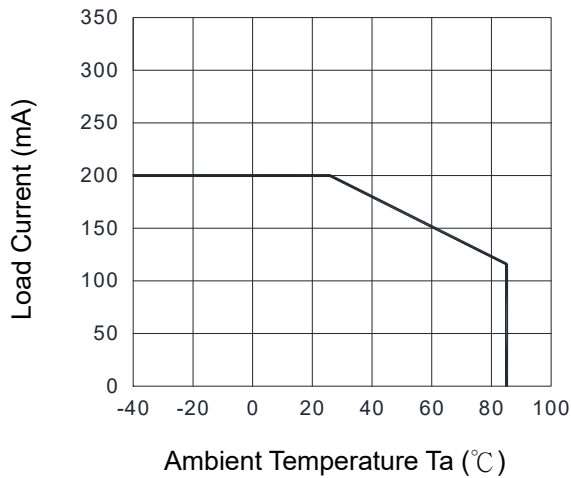


Fig.2 On Resistance vs. Ambient Temperature

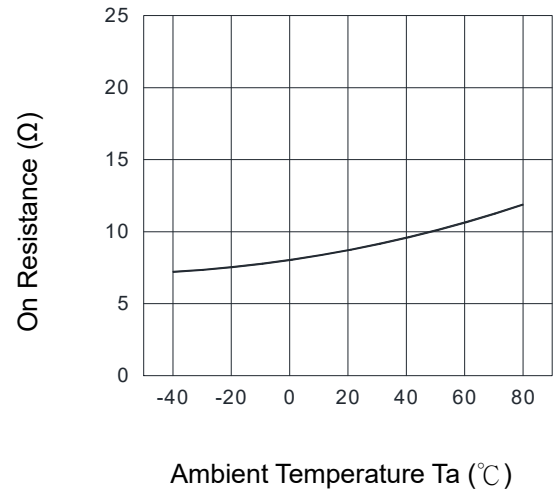


Fig.3 Turn-on Time vs. Ambient Temperature

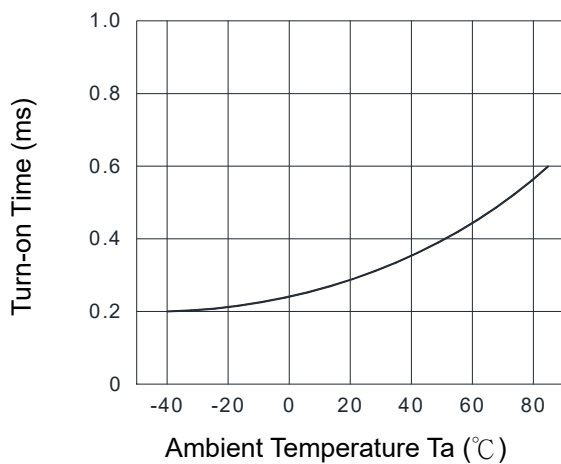


Fig.4 Turn-off Time vs. Ambient Temperature

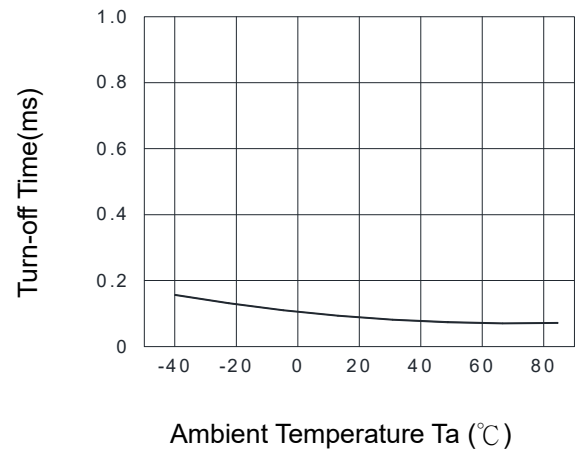


Fig.5 LED Operate Current vs. Ambient Temperature

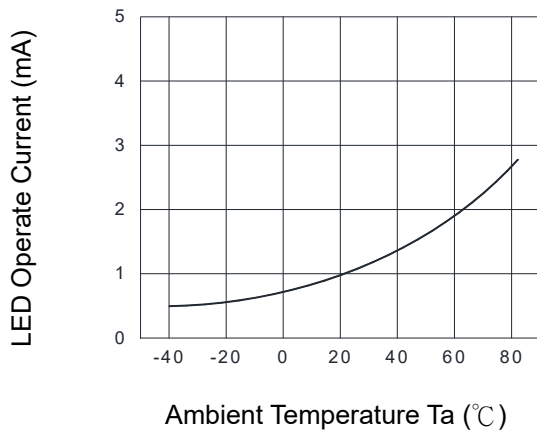


Fig.6 LED Turn-off Current vs. Ambient Temperature

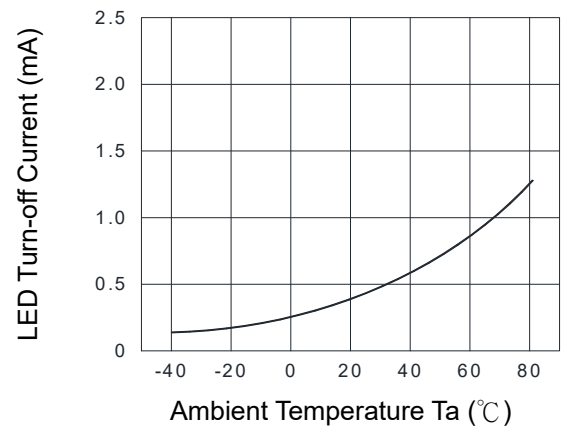


Fig.7 LED Dropout Voltage vs. Ambient Temperature

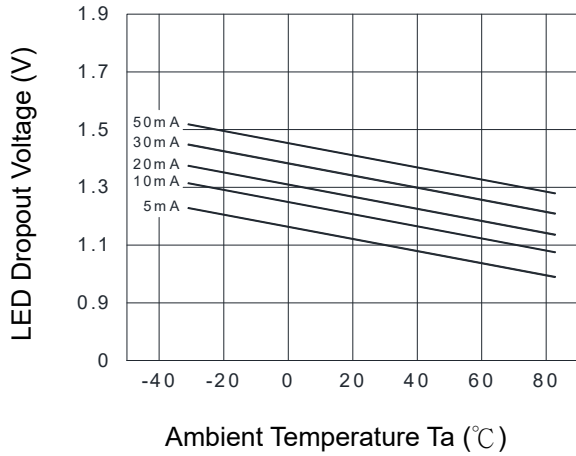


Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion

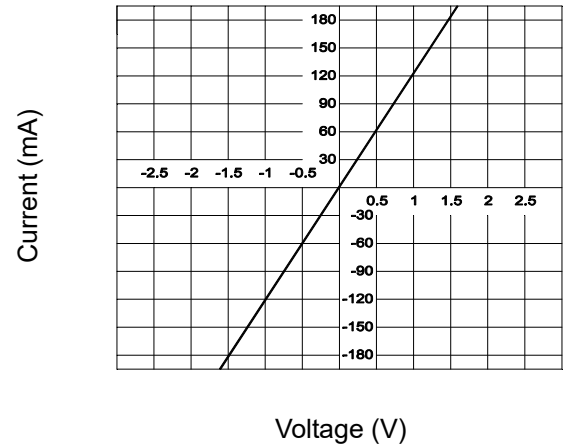


Fig.9 Turn-on Time vs. LED Forward Current

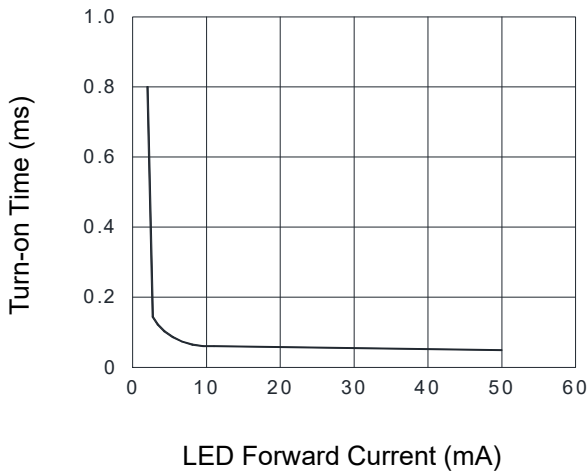


Fig.10 Off-state Leakage Current vs. Load Voltage

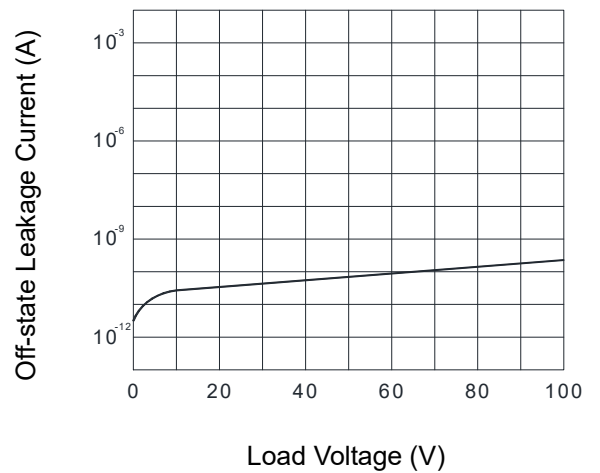


Fig.11 Turn-off Time vs. LED Forward Current

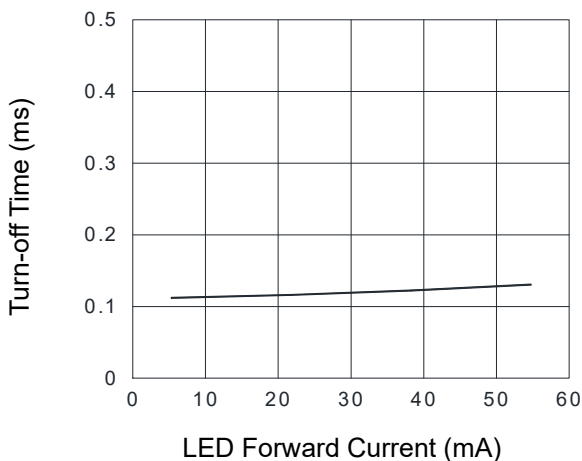
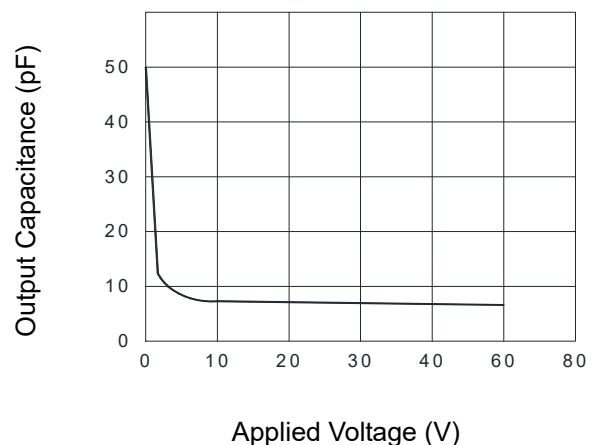
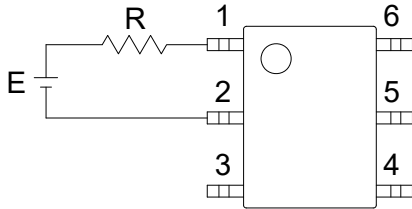


Fig.12 Output Capacitance vs. Applied Voltage



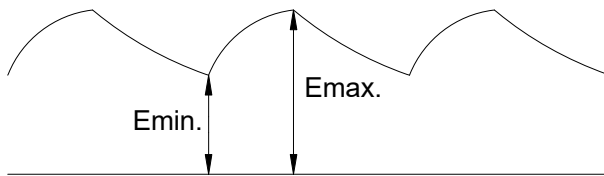
● Using Methods

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

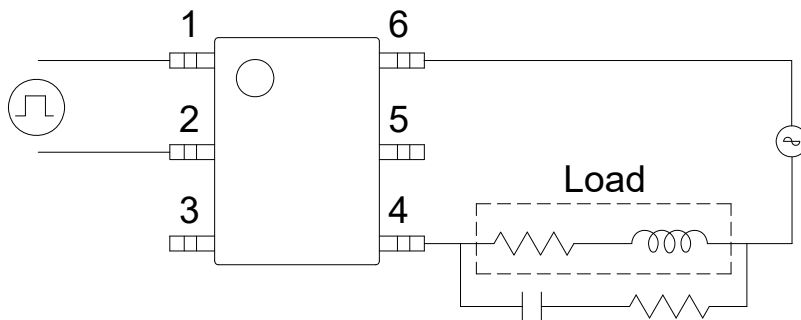
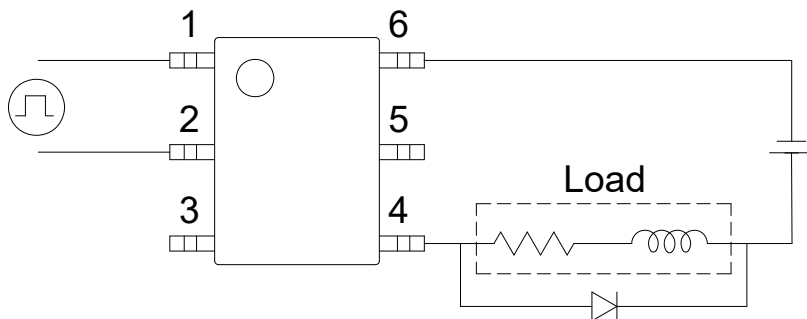


E	R
3.3V	Approx. 330 Ω
5V	Approx. 640 Ω
12V	Approx. 1.9K Ω
15V	Approx. 2.5K Ω
24V	Approx. 4.1K Ω

1. LED forward current must be more than 5mA \cdot at E min.
2. LED forward current must be less than 50mA \cdot at E max.



Regulate the spike voltage generated on the inductive load as follows :



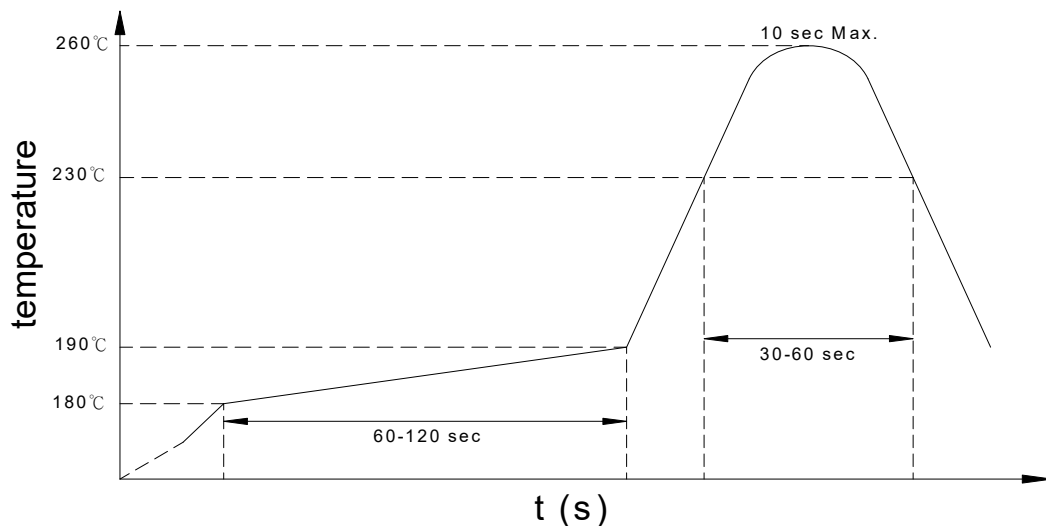
R-C Snubber

● **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**

KAQV213 X (Y)

Note :

KAQV213 = Part No.

X = Lead form option (blank 、 S or A)

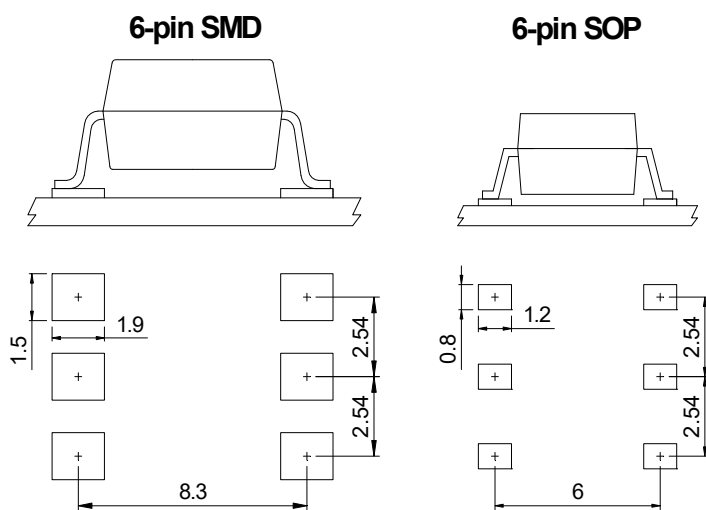
Y = Tape and reel option (TL 、 TR)

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**

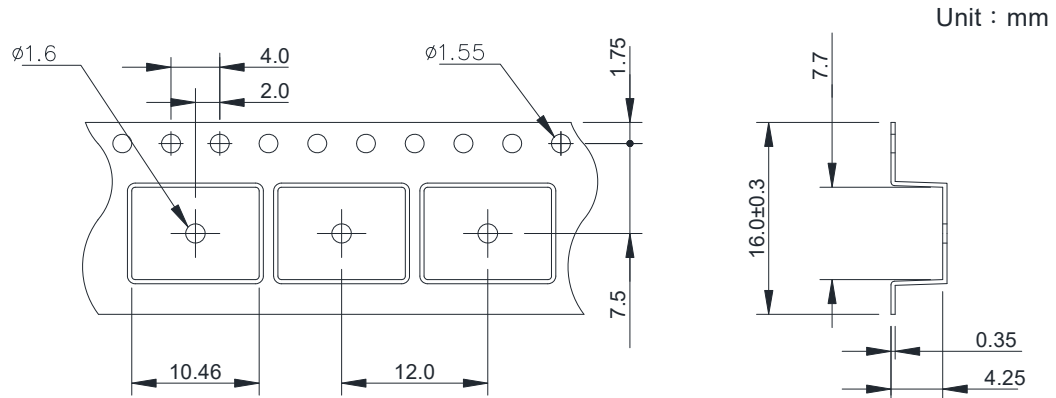
1. Surface mount type.

2. Small outline for surface mount type.

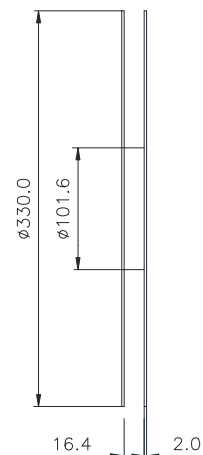
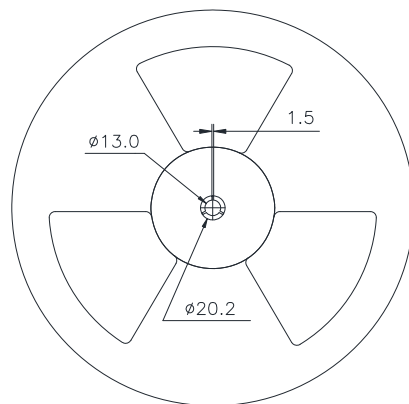
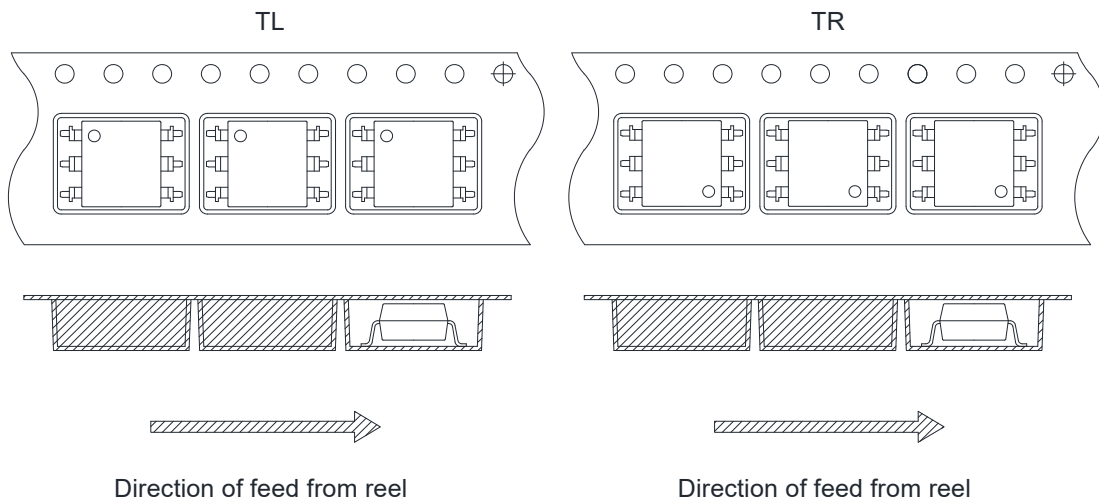


Unit : mm

● 6-pin SMD Carrier Tape & Reel

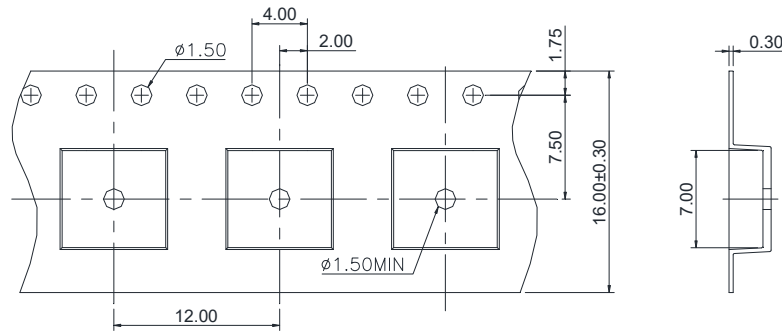


TOLERANCE : $\pm 0.2\text{mm}$



● 6-pin SOP Carrier Tape & Reel

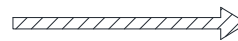
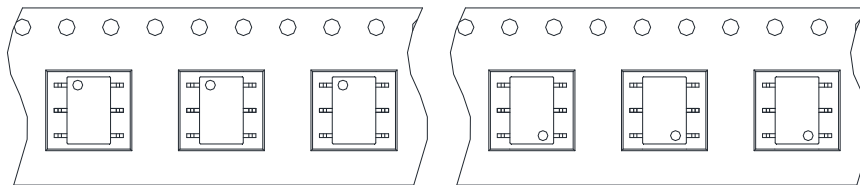
Unit : mm



TOLERANCE : ±0.2mm

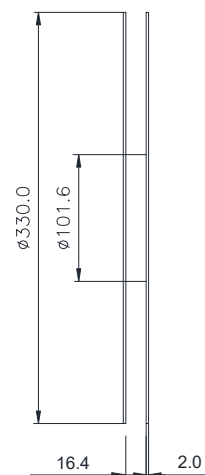
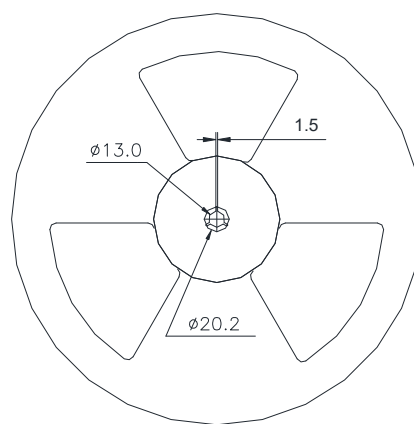
TL

TR



Direction of feed from reel

Direction of feed from reel



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