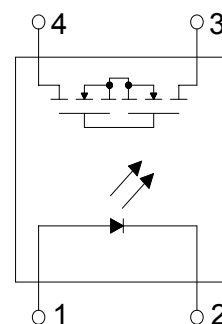


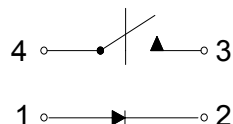
## ● Description

The **NAQY216** 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 600V AC or DC voltage
3. Switch 120mA 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): UL1577
  - c-UL Approved (No. E169586)
  - VDE Approved (No. 40020973): DIN 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

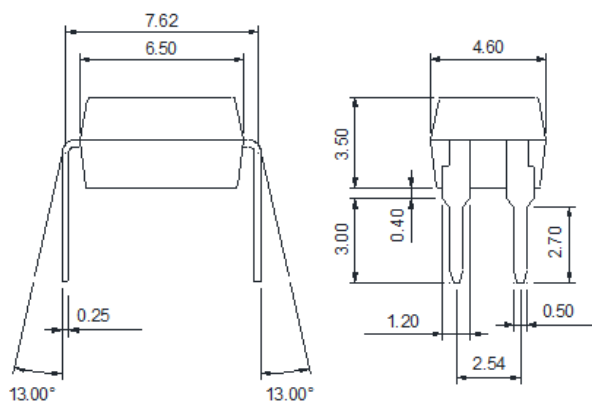
## ● Outside Dimension

Unit : mm

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



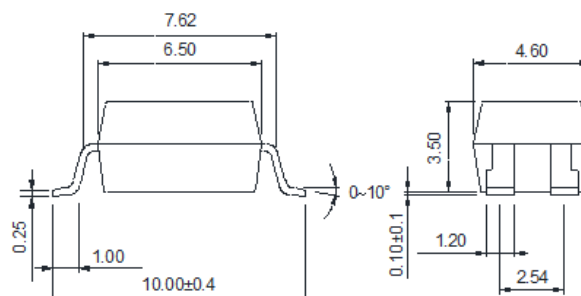
NAQY216



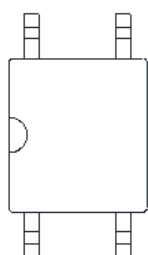
### 2. Surface mount type.



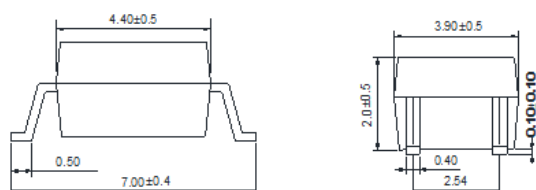
NAQY216A



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

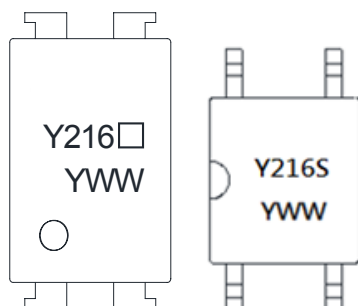


NAQY216S



TOLERANCE : ±0.2mm

## ● Device Marking



## Notes :

- Y216□ □(Blank) : DIP or SMD
- Y216S S : SOP
- YWW Y : Year code / W : Week code

## ● Absolute Maximum Ratings

(Ta=25°C)

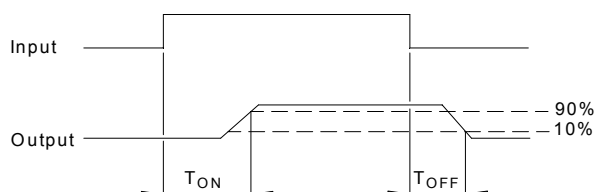
| Item                                   |                            | Symbol    | Rating          | Unit           |
|----------------------------------------|----------------------------|-----------|-----------------|----------------|
| Input                                  | Continuous forward current | $I_F$     | 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          | $V_B$     | 600             | V              |
|                                        | Continuous load current    | $I_L$     | 120             | mA             |
|                                        | Power dissipation          | $P_{out}$ | 500             | mW             |
| Isolation voltage                      |                            | $V_{iso}$ | <b>NAQY216S</b> | <b>NAQY216</b> |
|                                        |                            |           | 1500Vrms        | 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

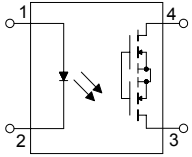
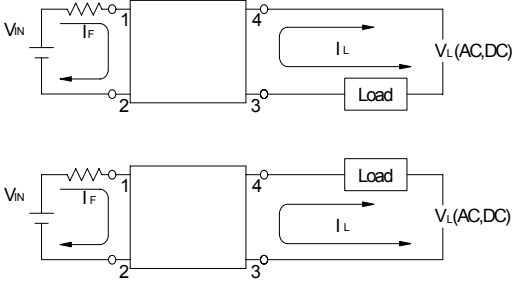
(Ta=25°C)

| 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         | $V_B$      | $I_B=50\mu A$              | 600  | -    | -    | V        |
|                 | Off-state leakage current | $I_{LEAK}$ | $V_L=600V, I_F=0mA$        | -    | 0.2  | 1.0  | $\mu A$  |
| I/O capacitance |                           | $C_{iso}$  | $V_B=0V, f=1MHz$           | -    | 6    | -    | pF       |
| ON resistance   |                           | $R_{ON}$   | $I_F=10mA, I_L=100mA$      | -    | 35   | 80   | $\Omega$ |
| 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  | 1.5  | ms       |

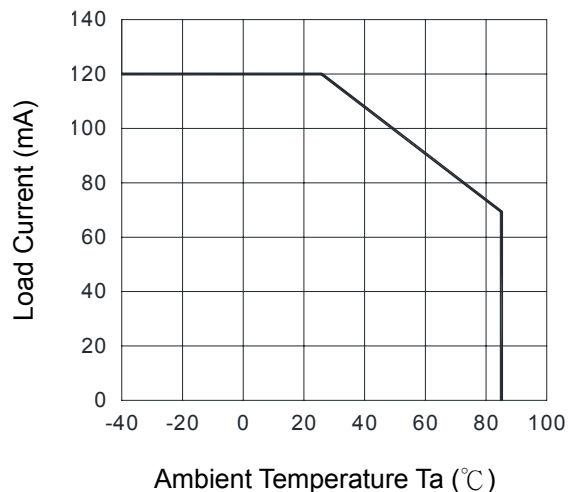
## ● Turn-on / Turn-off Time



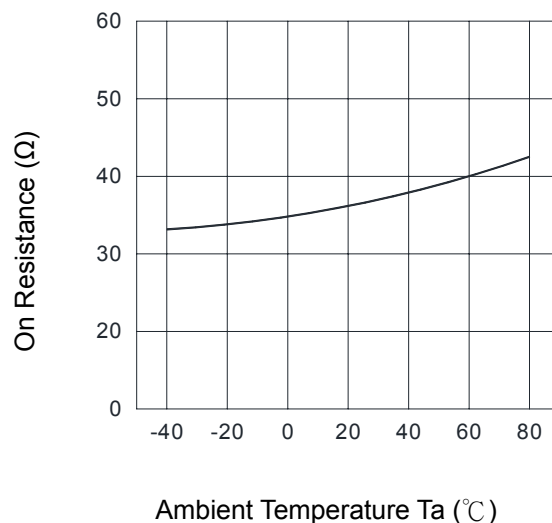
● Schematic and Wiring Diagrams

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

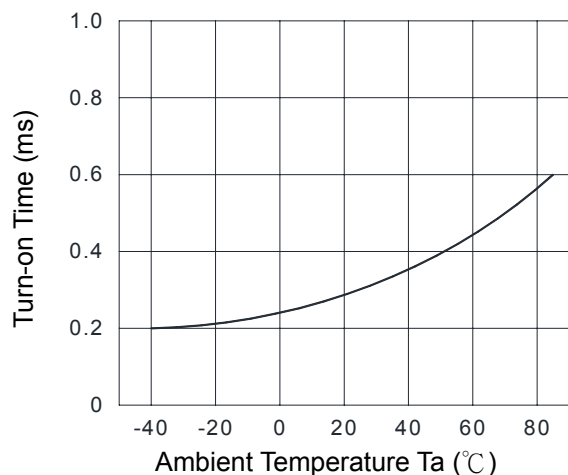
**Fig.1 Load Current vs. Ambient Temperature**



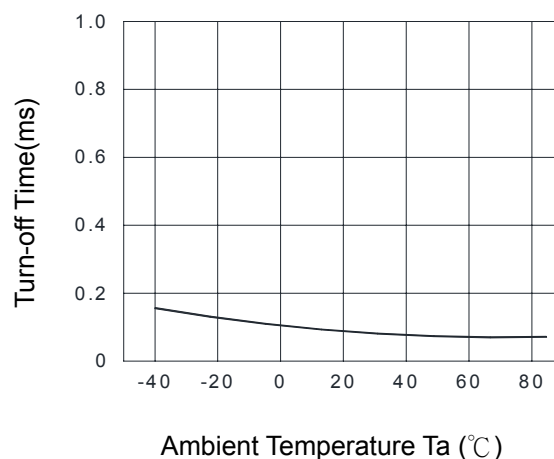
**Fig.2 On Resistance vs. Ambient Temperature**



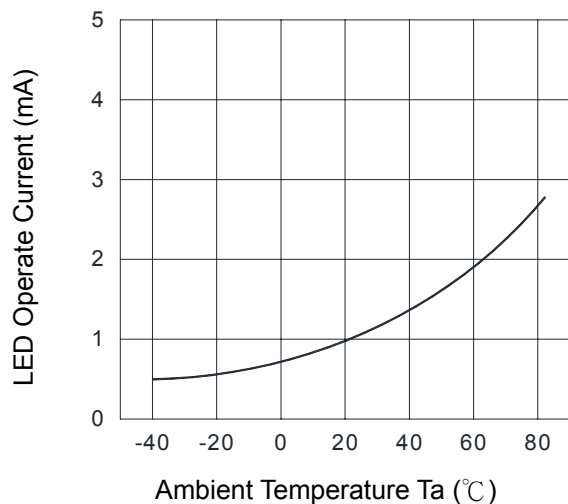
**Fig.3 Turn-on Time vs. Ambient Temperature**



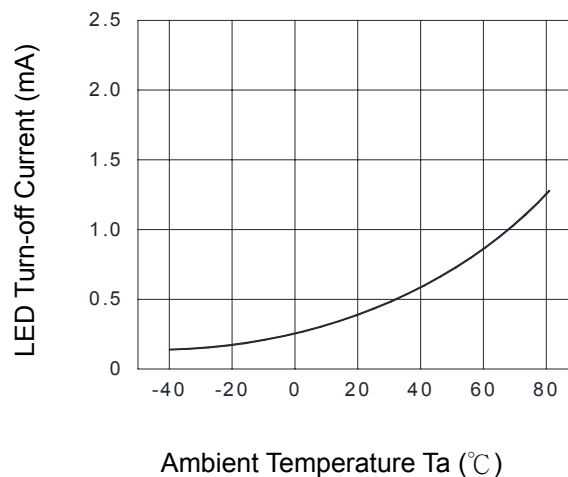
**Fig.4 Turn-off Time vs. Ambient Temperature**



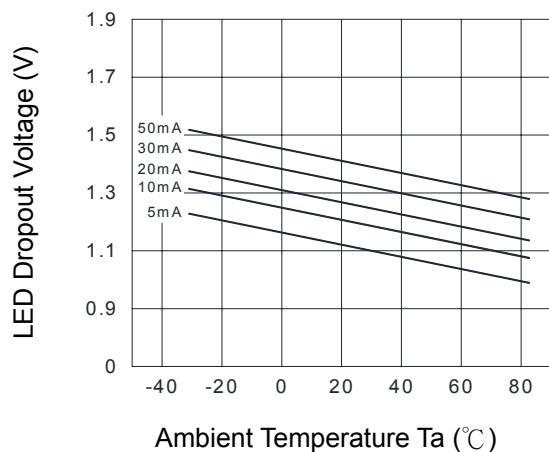
**Fig.5 LED Operate Current vs. Ambient Temperature**



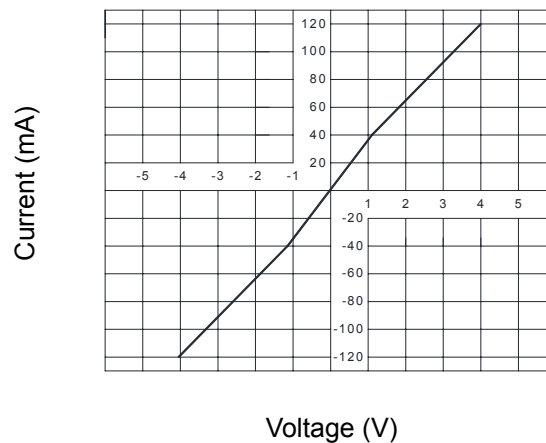
**Fig.6 LED Turn-off Current vs. Ambient Temperature**



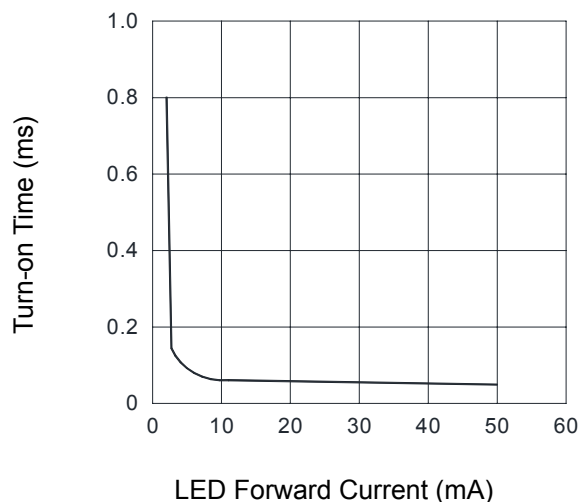
**Fig.7 LED Dropout Voltage vs. Ambient Temperature**



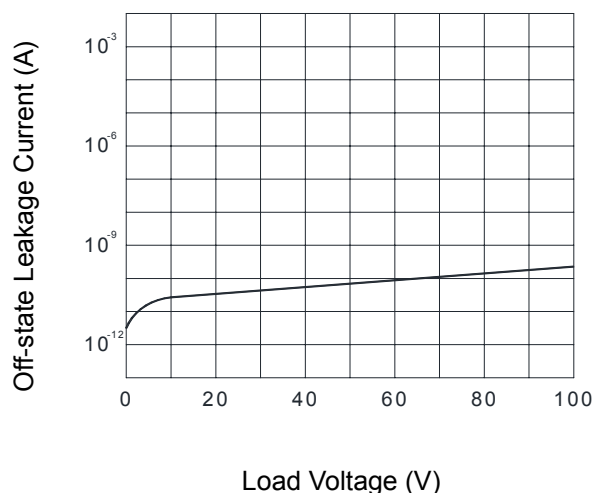
**Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion**



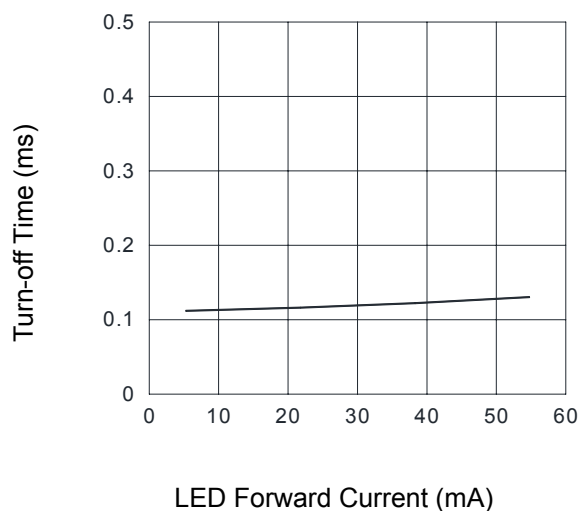
**Fig.9 Turn-on Time vs. LED Forward Current**



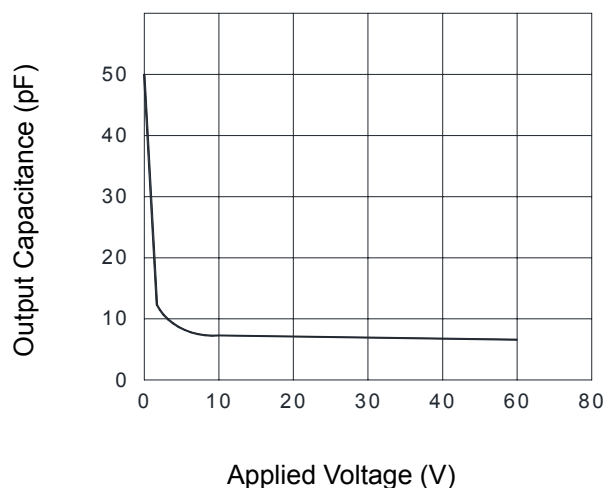
**Fig.10 Off-state Leakage Current vs. Load Voltage**



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

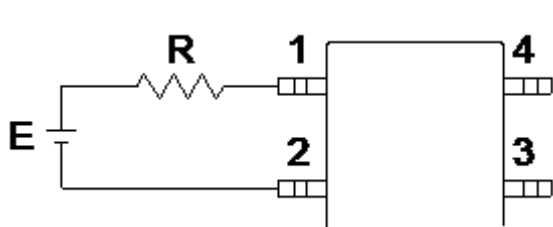


**Fig.12 Output Capacitance vs. Applied Voltage**



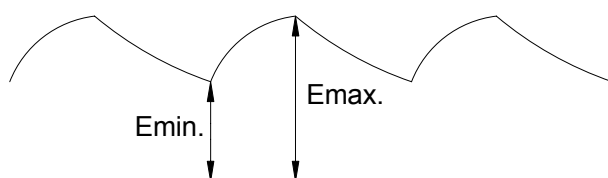
## ● Using Methods

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

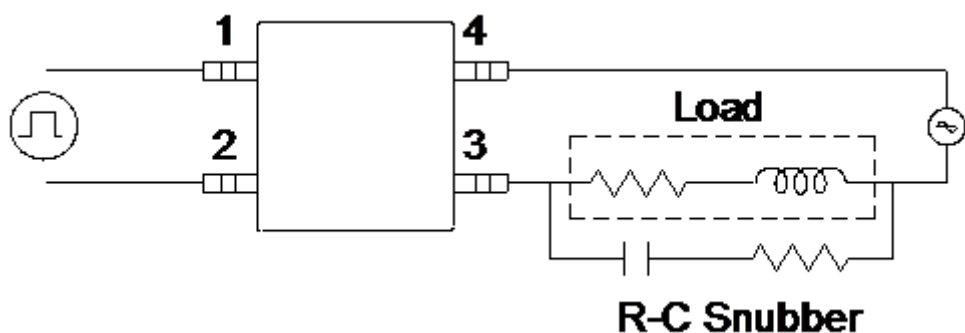
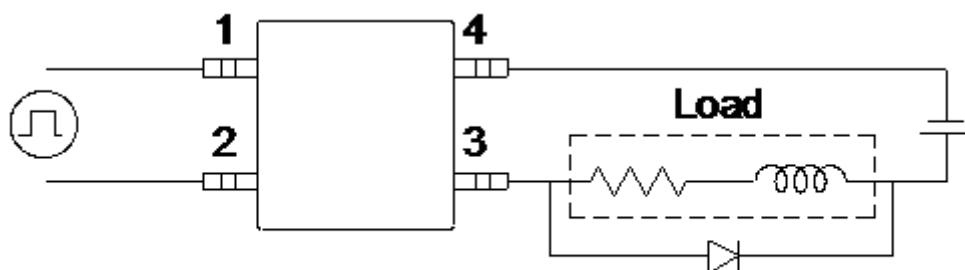


| E    | R                     |
|------|-----------------------|
| 3.3V | Approx. 330 $\Omega$  |
| 5V   | Approx. 640 $\Omega$  |
| 12V  | Approx. 1.9K $\Omega$ |
| 15V  | Approx. 2.5K $\Omega$ |
| 24V  | Approx. 4.1K $\Omega$ |

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 :

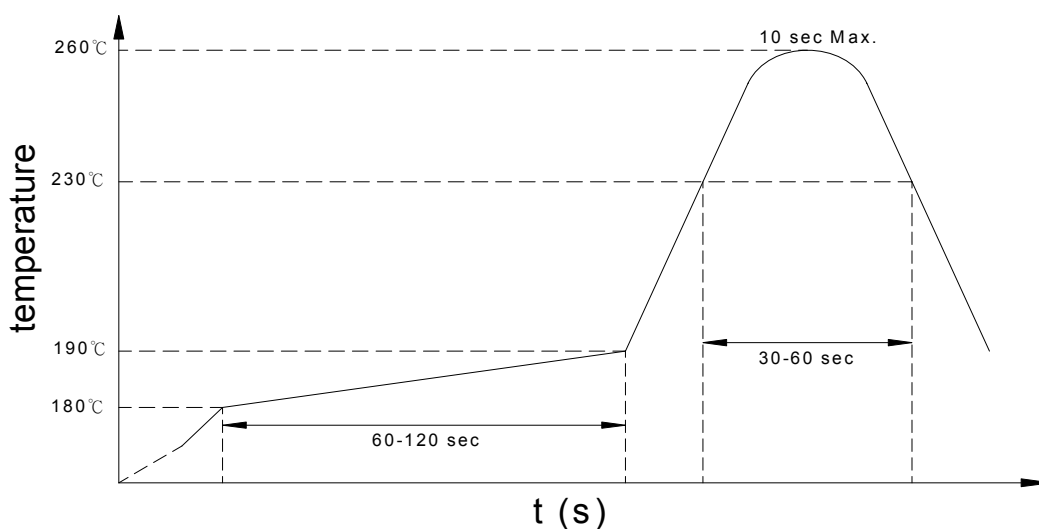


● **Recommended Soldering Conditions**

**(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 : | 60-120 sec                                                                                                              |
| ■ Number of reflows :                          | Two                                                                                                                     |
| ■ Flux :                                       | Rosin flux containing small amount of chlorine<br>(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

### NAQY216 X (Y)

#### Note :

NAQY216 = Part No.

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

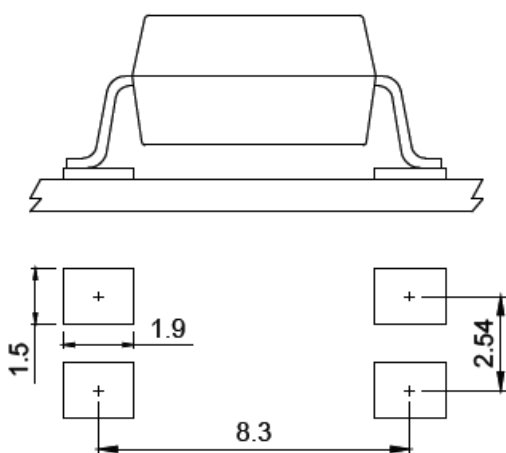
Y = Tape and reel option ( TLD 、 TRU )

| 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

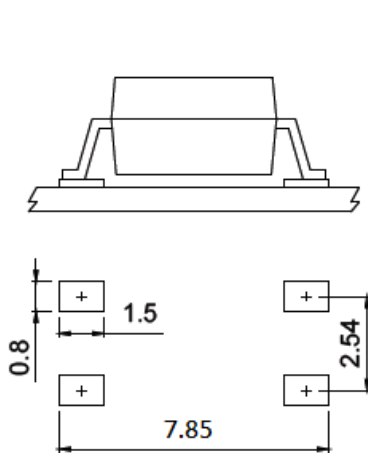
### 1. Surface mount type.

#### 4-pin SMD



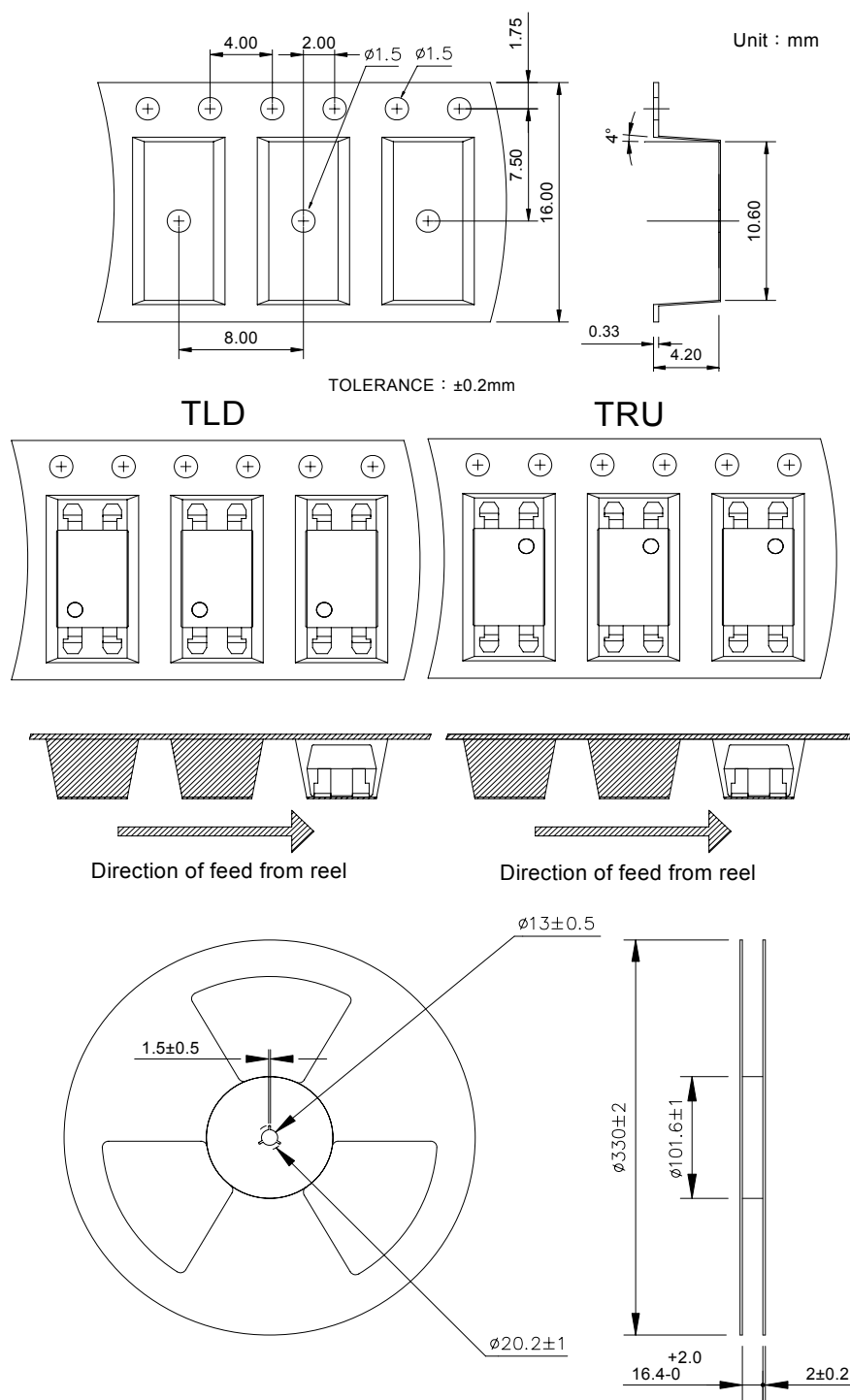
### 2. Small outline for surface mount type.

#### 4-pin SOP



Unit : mm

● 4-pin SMD Carrier Tape & Reel



● 4-pin SOP Carrier Tape & Reel

