

## FEATURES

- **Two types available: Non zero-cross type and Zero-cross type**  
Non zero-cross type permits phase control and Zero-cross type suppresses occurrence of noise.
- **Vertical type**  
The small-sized vertical type (43 mm long × 9 mm wide × 24 mm high) (1.693×.354×.945 inch) permits high density mounting to PC board.
- **High dielectric strength: 1,500 V AC (between input and output)**  
**4,000 V AC (between input and output)**

## TYPICAL APPLICATIONS

- Copying equipment
- NC machines, sequencers, robots
- Air conditioners

## TYPES

Type	Load voltage	Input voltage	Standard type (1,500 V AC)	Reinforced type (4,000 V AC)
			Part No.	Part No.
Zero-cross 1 A	75 to 125 V AC	3 to 6 V DC	AQB1A1-ZT3/6VDC	—
		7 to 14 V DC	AQB1A1-ZT7/14VDC	—
		10 to 18 V DC	AQB1A1-ZT10/18VDC	—
		18 to 30 V DC	AQB1A1-ZT18/30VDC	—
	75 to 250 V AC	3 to 6 V DC	AQB1A2-ZT3/6VDC	AQB1A2-ZV3/6VDC
		7 to 14 V DC	AQB1A2-ZT7/14VDC	AQB1A2-ZV7/14VDC
		10 to 18 V DC	AQB1A2-ZT10/18VDC	AQB1A2-ZV10/18VDC
		18 to 30 V DC	AQB1A2-ZT18/30VDC	AQB1A2-ZV18/30VDC
Zero-cross 2 A	75 to 125 V AC	3 to 6 V DC	AQB2A1-ZT3/6VDC	—
		7 to 14 V DC	AQB2A1-ZT7/14VDC	—
		10 to 18 V DC	AQB2A1-ZT10/18VDC	—
		18 to 30 V DC	AQB2A1-ZT18/30VDC	—
	75 to 250 V AC	3 to 6 V DC	AQB2A2-ZT3/6VDC	AQB2A2-ZV3/6VDC
		7 to 14 V DC	AQB2A2-ZT7/14VDC	AQB2A2-ZV7/14VDC
		10 to 18 V DC	AQB2A2-ZT10/18VDC	AQB2A2-ZV10/18VDC
		18 to 30 V DC	AQB2A2-ZT18/30VDC	AQB2A2-ZV18/30VDC
Non zero-cross 1 A	75 to 125 V AC	3 to 6 V DC	AQB1A1-T3/6VDC	—
		7 to 14 V DC	AQB1A1-T7/14VDC	—
		10 to 18 V DC	AQB1A1-T10/18VDC	—
		18 to 30 V DC	AQB1A1-T18/30VDC	—
	75 to 250 V AC	3 to 6 V DC	AQB1A2-T3/6VDC	AQB1A2-V3/6VDC
		7 to 14 V DC	AQB1A2-T7/14VDC	AQB1A2-V7/14VDC
		10 to 18 V DC	AQB1A2-T10/18VDC	AQB1A2-V10/18VDC
		18 to 30 V DC	AQB1A2-T18/30VDC	AQB1A2-V18/30VDC
Non zero-cross 2 A	75 to 125 V AC	3 to 6 V DC	AQB2A1-T3/6VDC	—
		7 to 14 V DC	AQB2A1-T7/14VDC	—
		10 to 18 V DC	AQB2A1-T10/18VDC	—
		18 to 30 V DC	AQB2A1-T18/30VDC	—
	75 to 250 V AC	3 to 6 V DC	AQB2A2-T3/6VDC	AQB2A2-V3/6VDC
		7 to 14 V DC	AQB2A2-T7/14VDC	AQB2A2-V7/14VDC
		10 to 18 V DC	AQB2A2-T10/18VDC	AQB2A2-V10/18VDC
		18 to 30 V DC	AQB2A2-T18/30VDC	AQB2A2-V18/30VDC

## ORDERING INFORMATION

Ex. AQB 1A 1 — ZT 3/6VDC

Load current	Load voltage	Type		Input voltage
1A 2A	1: 75 to 125 V AC 2: 75 to 250 V AC	ZT: Zero-cross type: 1,500 V T: Non zero-cross type: 1,500 V	ZV: Zero-cross type: 4,000 V V: Non zero-cross type: 4,000 V	3/6, 7/14, 10/18, 18/30 V DC

## SPECIFICATIONS

**Ratings** (at 20°C 68°F, Input voltage ripple: 1% or less)

1. Zero-cross type

1 A type

Item	Part No.	1 A type				2 A type				Remarks	
		AQB1A1-ZT 3/6VDC	AQB1A1-ZT 7/14VDC	AQB1A1-ZT 10/18VDC	AQB1A1-ZT 18/30VDC	AQB2A2-ZT 3/6VDC	AQB2A2-ZT 7/14VDC	AQB2A2-ZT 10/18VDC	AQB2A2-ZT 18/30VDC		
Input side	Input voltage	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC		
	Input impedance	Approx. 0.18 kΩ	Approx. 0.75 kΩ	Approx. 1.2 kΩ	Approx. 2.15 kΩ	Approx. 0.18 kΩ	Approx. 0.75 kΩ	Approx. 1.2 kΩ	Approx. 2.15 kΩ		
	Drop-out voltage, min.	1 V									
Load side	Max. load current	1 A				2 A				See "DATA 1"	
	Load voltage	75 to 125 V AC				75 to 250 V AC					
	Frequency	45 to 65 Hz									
	Repetitive peak voltage, max.	400 V				600 V					
	Non-repetitive surge current	10A									In one cycle at 60 Hz
	"OFF-state" leakage current	0.6 mA/100 V applied				1.1 mA/200 V applied				at 60 Hz	
	Max. "ON-state" voltage drop	1.6 V									at max. carrying current
	Min. load current	10 mA				20 mA					
	OFF state dV/dt	100 V/μs									

2 A type

Item	Part No.	1 A type				2 A type				Remarks	
		AQB2A1-ZT 3/6VDC	AQB2A1-ZT 7/14VDC	AQB2A1-ZT 10/18VDC	AQB2A1-ZT 18/30VDC	AQB1A1-ZT 3/6VDC	AQB1A1-ZT 7/14VDC	AQB1A1-ZT 10/18VDC	AQB1A1-ZT 18/30VDC		
Input side	Input voltage	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC		
	Input impedance	Approx. 0.18 kΩ	Approx. 0.75 kΩ	Approx. 1.2 kΩ	Approx. 2.15 kΩ	Approx. 0.18 kΩ	Approx. 0.75 kΩ	Approx. 1.2 kΩ	Approx. 2.15 kΩ		
	Drop-out voltage, min.	1 V									
Load side	Max. load current	2 A				1 A				See "DATA 1"	
	Load voltage	75 to 125 V AC				75 to 250 V AC					
	Frequency	45 to 65 Hz									
	Repetitive peak voltage, max.	400 V				600 V					
	Non-repetitive surge current	20A									In one cycle at 60 Hz
	"OFF-state" leakage current	0.6 mA/100 V applied				1.1 mA/200 V applied				at 60 Hz	
	Max. "ON-state" voltage drop	1.6 V									at max. carrying current
	Min. load current	10 mA				20 mA					
	OFF state dV/dt	100 V/μs									

## 2. Non zero-cross type

## 1 A type

Part No.		AQB1A1-T 3/6VDC	AQB1A1-T 7/14VDC	AQB1A1-T 10/18VDC	AQB1A1-T 18/30VDC	AQB1A2-T 3/6VDC AQB1A2-V 3/6VDC	AQB1A2-T 7/14VDC AQB1A2-V 7/14VDC	AQB1A2-T 10/18VDC AQB1A2-V 10/18VDC	AQB1A2-T 18/30VDC AQB1A2-V 18/30VDC	Remarks
Input side	Input voltage	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	
	Input impedance	Approx. 0.18 k $\Omega$	Approx. 0.75 k $\Omega$	Approx. 1.2 k $\Omega$	Approx. 2.15 k $\Omega$	Approx. 0.18 k $\Omega$	Approx. 0.75 k $\Omega$	Approx. 1.2 k $\Omega$	Approx. 2.15 k $\Omega$	
	Drop-out voltage, min.	1 V								
Load side	Max. load current	1 A								See "DATA 1"
	Load voltage	75 to 125 V AC				75 to 250 V AC				
	Frequency	45 to 65 Hz								
	Repetitive peak voltage, max.	400 V				600 V				
	Non-repetitive surge current	10A								In one cycle at 60 Hz
	"OFF-state" leakage current	0.6 mA/100 V applied				1.1 mA/200 V applied				at 60 Hz
	Max. "ON-state" voltage drop	1.6 V								at max. car- rying current
	Min. load current	10 mA				20 mA				
	OFF state dV/dt	100 V/ $\mu$ s								

## 2 A type

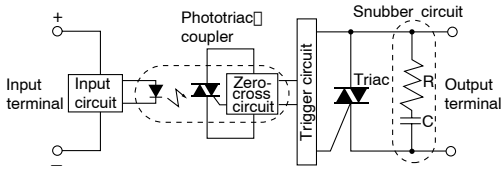
Part No.		AQB2A1-T 3/6VDC	AQB2A1-T 7/14VDC	AQB2A1-T 10/18VDC	AQB2A1-T 18/30VDC	AQB2A2-T 3/6VDC AQB2A2-V 3/6VDC	AQB2A2-T 7/14VDC AQB2A2-V 7/14VDC	AQB2A2-T 10/18VDC AQB2A2-V 10/18VDC	AQB2A2-T 18/30VDC AQB2A2-V 18/30VDC	Remarks
Input side	Input voltage	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	3 to 6 V DC	7 to 14 V DC	10 to 18 V DC	18 to 30 V DC	
	Input impedance	Approx. 0.18 k $\Omega$	Approx. 0.75 k $\Omega$	Approx. 1.2 k $\Omega$	Approx. 2.15 k $\Omega$	Approx. 0.18 k $\Omega$	Approx. 0.75 k $\Omega$	Approx. 1.2 k $\Omega$	Approx. 2.15 k $\Omega$	
	Drop-out voltage, min.	1 V								
Load side	Max. load current	2 A								See "DATA 1"
	Load voltage	75 to 125 V AC				75 to 250 V AC				
	Frequency	45 to 65 Hz								
	Repetitive peak voltage, max.	400 V				600 V				
	Non-repetitive surge current	20A								In one cycle at 60 Hz
	"OFF-state" leakage current	0.6 mA/100 V applied				1.1 mA/200 V applied				at 60 Hz
	Max. "ON-state" voltage drop	1.6 V								at max. car- rying current
	Min. load current	10 mA				20 mA				
	OFF state dV/dt	100 V/ $\mu$ s								

**Characteristics** (at 20°C 68°F, Input voltage ripple: less than 1%)

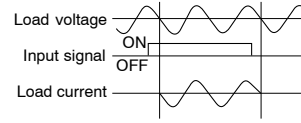
Item	Zero-cross type		Non zero-cross type		Remarks
	Standard type	Reinforced type	Standard type	Reinforced type	
Operate time, max.	(1/2 cycle of voltage sine wave) +1 ms		0.5 ms		
Release time, max.	(1/2 cycle of voltage sine wave) +1 ms				
Insulation resistance, min.	10 <sup>9</sup> $\Omega$ between input and output				
Breakdown voltage	1,500 V AC between input and output	4,000 V AC between input and output	1,500 V AC between input and output	4,000 V AC between input and output	For 1 minute
Vibration resistance	Functional	10 to 55 Hz at double amplitude of 3 mm			10 minutes for X, Y, Z axes
	Destructive	10 to 55 Hz at double amplitude of 3 mm			1 hour for X, Y, Z axes
Shock resistance	Functional	Min. 980 m/s <sup>2</sup> {100 G}			4 times for X, Y, Z axes
	Destructive	Min. 980 m/s <sup>2</sup> {100 G}			5 times for X, Y, Z axes
Ambient temperature	-20°C to +80°C -4°F to +176°F				
Storage temperature	-25°C to +85°C -13°F to +185°F				
Operational method	Zero-cross Turn-ON Zero-cross Turn-OFF		Non zero-cross Turn-ON Zero-cross Turn-OFF		

# OPERATING PRINCIPLE

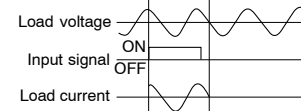
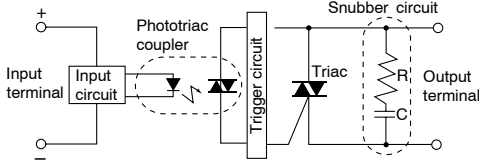
Internal circuit  
Zero-cross type



Wave form of input and output (Resistive load)



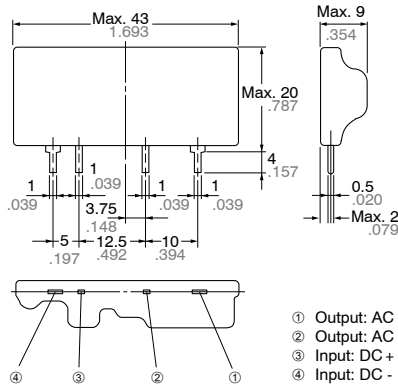
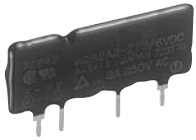
Non zero-cross type



# DIMENSIONS

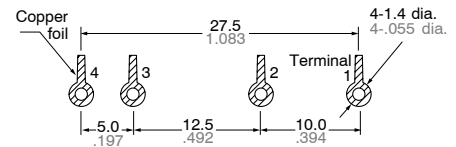
mm inch

(Common for zero-cross and  
Non zero-cross type)

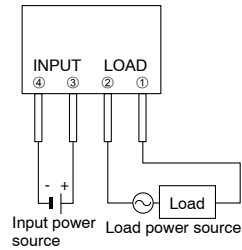


General tolerance:  $\pm 0.5 \pm .020$

PC board pattern (BOTTOM VIEW)

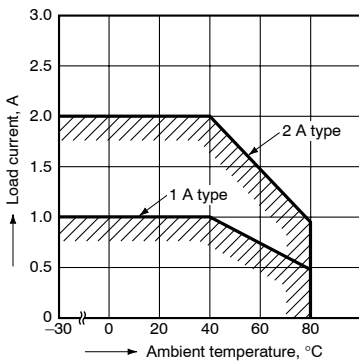


Terminal connection diagram

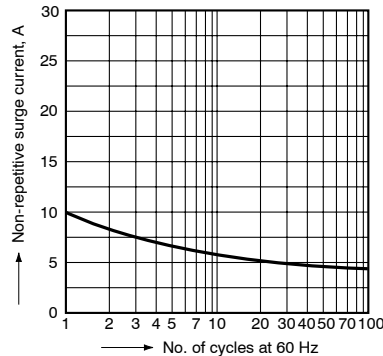


# REFERENCE DATA

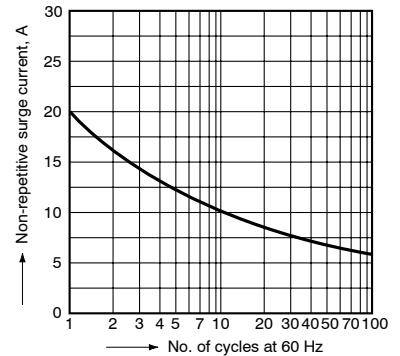
1. Load current vs. ambient temperature



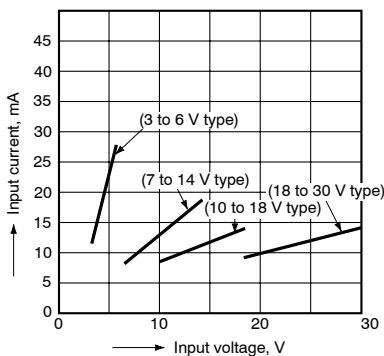
2-1. Non-repetitive surge current vs. carrying time (1 A type)



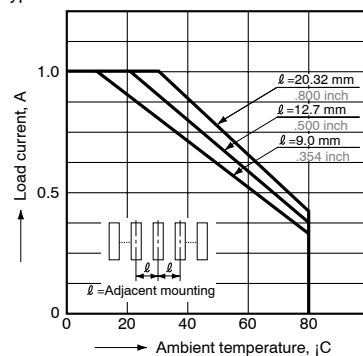
2-2. Non-repetitive surge current vs. carrying time (2 A type)



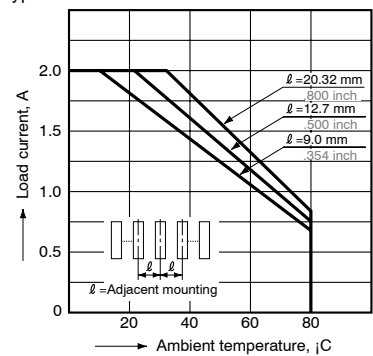
3. Input current vs. input voltage



4. Load current vs. ambient temperature for adjacent mounting  
1 A type



2 A type



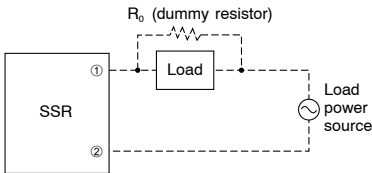
**NOTE**

**When used for the load less than rated**

In case of the load current less than rated, malfunction may result from the residual voltage across the both ends of the load even if the solid state relay is turned off.

Use a dummy resistor as a countermeasure.

The total of the current through the resistor and the load current must exceed the min. rated load current.

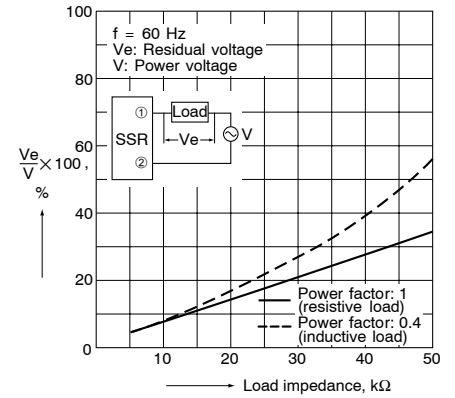


In case the dummy resistor is not used, keep in mind that the residual voltage becomes as follows:

Example:

For the inductive load by the 5 mA load current and the 200 V AC load voltage, the load impedance becomes 40 kΩ and  $V_e/V = 16\%$  is estimated from the right above graph. Accordingly, the 32 V voltage remains across the both ends of the load when the solid state relay is turned off.

• Characteristics of residual voltage vs. load impedance



**Cautions for Use**