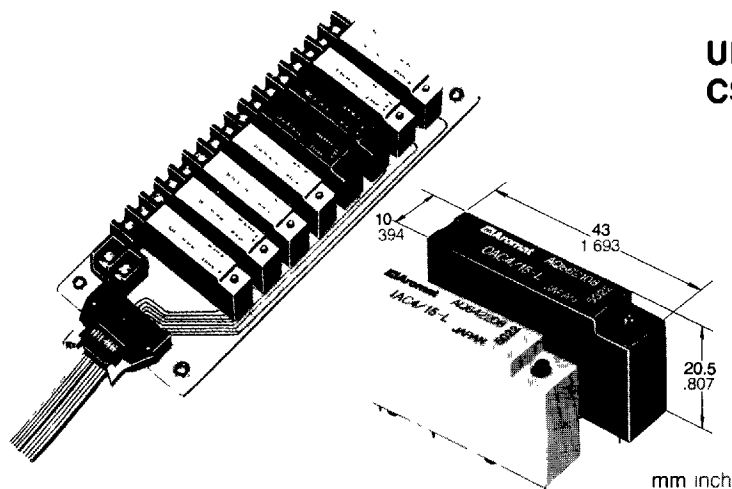


NAIS

INPUT/OUTPUT RELAYS FOR INTERFACE BETWEEN THE CPU AND THE LOAD

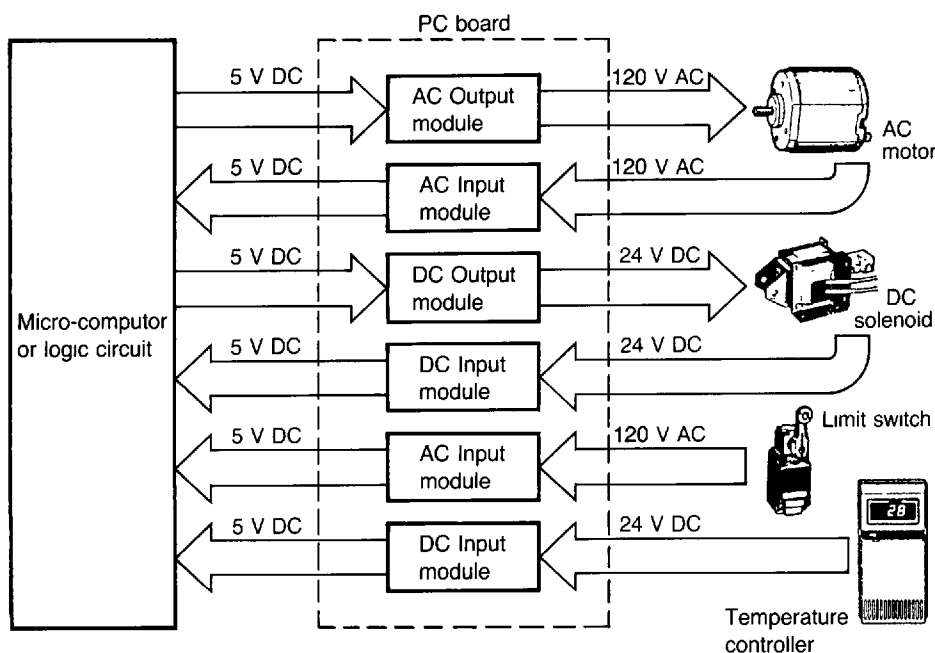
I/O-RELAYS



UL File No.: E57521
CSA File No.: LR26550

- Input and output modules for interfacing between CPU and external input devices or loads
 - IAC: AC input (yellow)
 - OAC: AC output (black)
 - IDC: DC input (white)
 - ODC: DC output (red)
- Excellent transient noise immunity
- Breakdown voltage: 4,000 V between input and output
- Zero-cross switching for reducing EMI
- LED operation indication types available

EXAMPLE OF I/O SYSTEM CONSTRUCTION



Recently, the microcomputer shown in the left has come into use, with a rapid increase in the use of feedback control for process controllers. As an input/output interface relay, it represents a fast responding interface with long life, noiseless, PC board mounting facility, making circuit design and manufacture simple, and providing simplification of maintenance with space saving. Our company's I/O relays have been grouped for use with either AC or DC devices as AC output type, AC input type, DC output type, and DC input. In addition, the I/O use relay is modularized identically, responding to the various load types for PC board mounting. Because combinations can be freely used, circuit design has been greatly facilitated. Accordingly, the above diagram of interface PC board mounting is a practical construction which can be used.

TYPICAL APPLICATIONS

1. Optimum for minicomputer and micro-computer use, and for feed back control process control systems.

Robot, NC machine, Automatic Assembling machine.

2. Programmable controllers controls for motors, solenoids and solenoid valves.

ORDERING INFORMATION

		I	AC	4/15	—	A	L		
Input or Output	AC or DC	Logic supply or control voltage		Input or Output Voltage			Operation indication		
I: Input module O: Output module	AC: AC input or AC output	3/15: 3 to 15 V DC 4/15: 4 to 15 V DC 10/32: 10 to 32 V DC			Input		Output		Nil: No operation indication L: Operation indication
	DC: DC input or DC output			Nil	80 to 140 V AC 3 to 32 V DC	75 to 125 V AC 3 to 60 V DC			
				A	160 to 280 V AC	75 to 250 V AC 10 to 200 V DC			

TYPES

Input modules

Type	Logic supply voltage	Input voltage	Part No.	
			No LED	With LED
AC	4 to 15 V DC	80 to 140 V AC	IAC4/15	IAC4/15-L
		160 to 280 V AC	IAC4/15-A	IAC4/15-AL
	10 to 32 V DC	80 to 140 V AC	IAC10/32	IAC10/32-L
		160 to 280 V AC	IAC10/32-A	IAC10/32-AL
DC	4 to 15 V DC	3 to 32 V DC	IDC4/15	IDC4/15-L
	10 to 32 V DC	3 to 32 V DC	IDC10/32	IDC10/32-L

Output modules

Type	Logic supply voltage	Output voltage	Part No.	
			No LED	With LED
AC	3 to 15 V DC or 4 to 15 V DC	75 to 125 V AC	OAC3/15	OAC4/15-L
		75 to 250 V AC	OAC3/15-A	OAC4/15-AL
	10 to 32 V DC	75 to 125 V AC	OAC10/32	OAC10/32-L
		75 to 250 V AC	OAC10/32-A	OAC10/32-AL
DC	3 to 15 V DC or 4 to 15 V DC	3 to 60 V DC	ODC3/15	ODC4/15-L
		10 to 200 V DC	ODC3/15-A	ODC4/15-AL
	10 to 32 V DC	3 to 60 V DC	ODC10/32	ODC10/32-L
		10 to 200 V DC	ODC10/32-A	ODC10/32-AL

SPECIFICATIONS

Rating (at 20°C 68°F, Voltage ripple of logic side: less than 1%)

1. Input module

		IAC 4/15	IAC 4/15-L	IAC 10/32	IAC 10/32-L	IAC 4/15-A	IAC 4/15-AL	IAC 10/32-A	IAC 10/32-AL	IDC4/15	IDC4/15-L	IDC10/32	IDC10/32-L
Input side	Input voltage	80 to 140 V AC				160 to 280 V AC				3 to 82 V DC			
	Input current, Max	5 mA (100 V)				5 mA (200 V)				20 mA (32 V)			
	Operate voltage, Max	80 V				160 V				3 V			
	Release voltage, Min	10 V				20 V				0.8 V			
Logic side	Logic supply voltage	4 to 15 V		10 to 32 V		4 to 15 V		10 to 32 V		4 to 15 V		10 to 32 V	
	Logic supply current, Max.	15 mA								15 mA			
	Breakdown voltage	30 V								30 V			
	Output current, Max.	25 mA								25 mA			
	Max OFF-state leakage current	100 µA								100 µA			
	Max ON-state voltage drop	0.4 V								0.4 V			

2. Output module

		OAC 3/15	OAC 4/15-L	OAC 10/32	OAC 10/32-L	OAC 3/15-A	OAC 4/15-AL	OAC 10/32-A	OAC 10/32-AL	ODC 3/15	ODC 4/15-L	ODC 10/32	ODC 10/32-L	ODC 3/15-A	ODC 4/15-AL	ODC 10/32-A	ODC 10/32-AL		
Logic side	Logic voltage range	3 to 15 V	4 to 15 V	10 to 32 V		3 to 15 V	4 to 15 V	10 to 32 V		3 to 15 V	4 to 15 V	10 to 32 V		3 to 15 V	4 to 15 V	10 to 32 V			
	Input impedance (Approx.)	1.6 kΩ	1.7 kΩ	6 kΩ	5 kΩ	1.6 kΩ	1.7 kΩ	6 kΩ	5 kΩ	1.6 kΩ	1.7 kΩ	6 kΩ	5 kΩ	1.6 kΩ	1.7 kΩ	6 kΩ	5 kΩ		
	Drop-out voltage, Min.	0.8 V									0.8 V								
Output side	Max. load current	2A (Ambient temperature Max 30°C)									2A (Ambient temp Max 40°C)				1A (Ambient temp Max 40°C)				
	Output voltage	75 to 125 V AC					75 to 250 V AC					3 to 60 V DC				10 to 200 V DC			
	Non-repetitive surge current	30 A (in one cycle at 60 Hz)									5 A (for 1 sec.)								
	Max. OFF-state leakage current	5 mA (100 V)					5 mA (200 V)					1 mA (60 V)				1 mA (200 V)			
	Max. ON-state voltage drop	1.6 V									1.6 V				2.3 V				
	Min. load current	50 mA									5 mA								

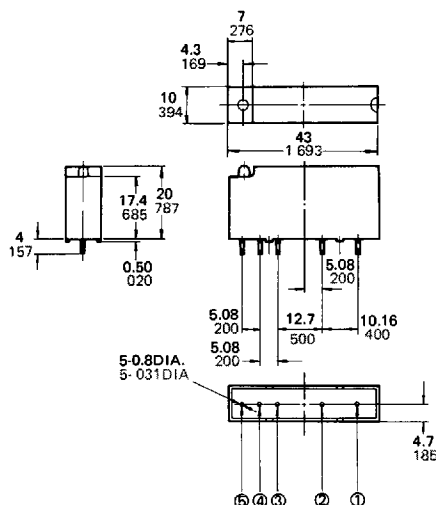
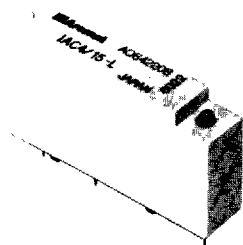
Characteristics (at 20°C 68°F, Voltage ripple of logic side: less than 1%)

		Input modules		Output modules	
		IAC	IDC	OAC	ODC
Operate time, max.		20 msec.	5 msec.	(1/2 cycle of voltage sine wave) + 1 msec.	0.5 msec.
Release time, max.		20 msec.	5 msec.	(1/2 cycle of voltage sine wave) + 1 msec.	2 msec.
Insulation resistance		10 ⁹ Ω between input and output (at 500 V DC)			
Breakdown voltage		4,000 Vrms between input and output			
Vibration resistance	Functional	12G, 10 to 55 Hz at double amplitude of 2 mm (10 minutes for X, Y, Z axis)			
	Destructive	12G, 10 to 55 Hz at double amplitude of 2 mm (1 hour for X, Y, Z axis)			
Shock resistance	Functional	100G (4 times each for X, Y, Z axis)			
	Destructive	100G (5 times each for X, Y, Z axis)			
Ambient temperature		-30°C to +80°C	-22°F to +176°F	-30°C to +80°C	-22°F to +176°F
Storage temperature		-30°C to +100°C	-22°F to +212°F	-30°C to +100°C	-22°F to +212°F
Operational method		—		Zero-cross (Turn-ON and Turn-OFF)	—

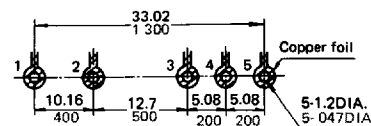
DIMENSIONS

Input modules (IAC, IDC)

mm inch

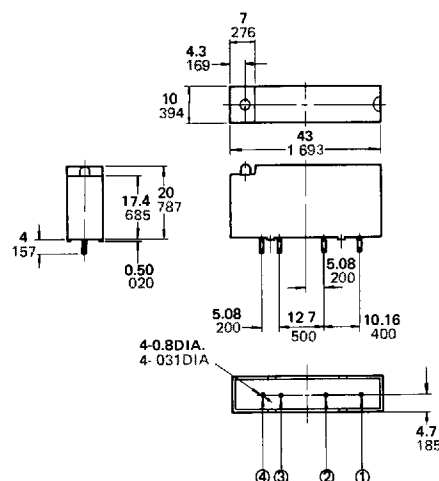
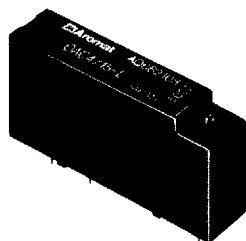


PC board pattern (Copper-side view)

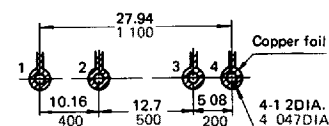


	IAC	IDC
①	Input: AC	Input: DC +
②	Input: AC	Input: DC -
③	Vcc	Vcc
④	Logic output	Logic output
⑤	Grounding	Grounding
Body color	Yellow	White

Output modules (OAC, ODC)



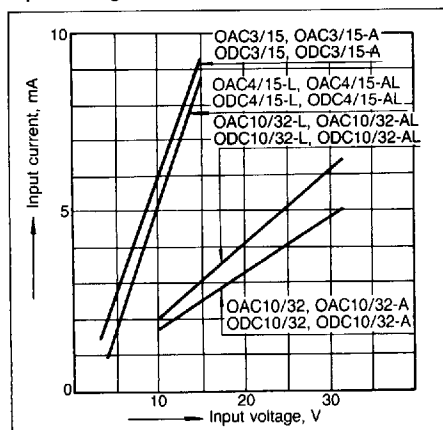
PC board pattern (Copper-side view)



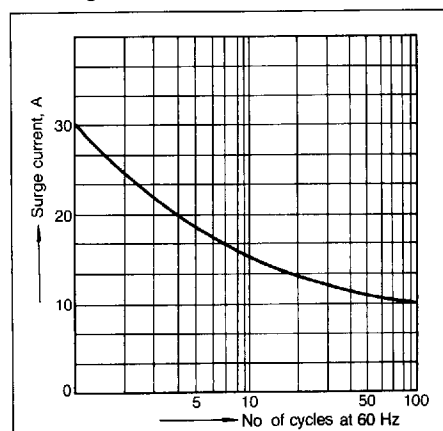
	OAC	ODC
①	Output: AC	Output: DC +
②	Output: AC	Output: DC -
③	Input: DC +	Input: DC +
④	Input: DC -	Input: DC -
Body color	Black	Red

DATA

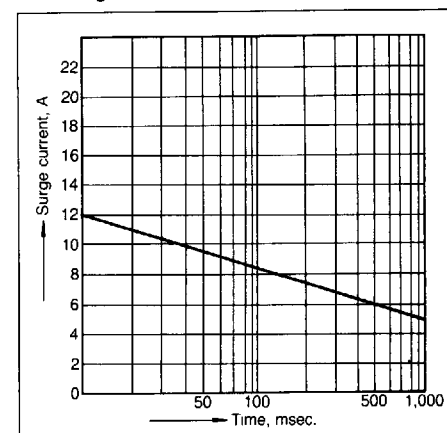
Input voltage and current (OAC, ODC)



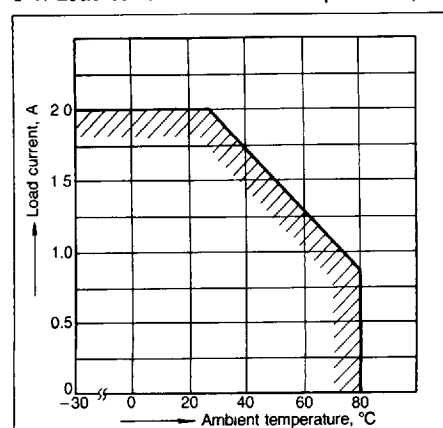
2-1. Surge current and time (OAC)



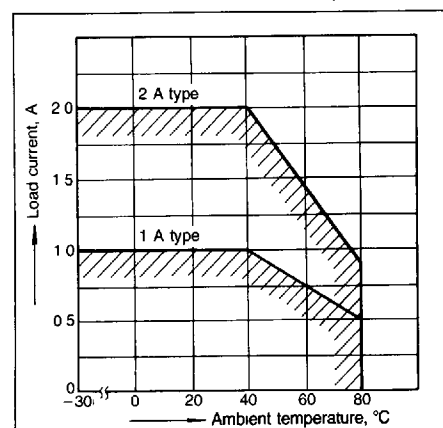
2-2. Surge current and time (IDC)



3-1. Load current vs ambient temperature (OAC)

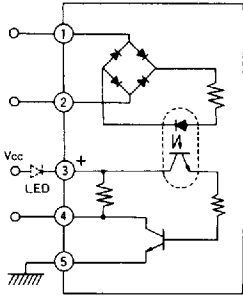


3-2. Load current vs ambient temperature (ODC)

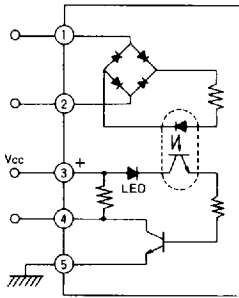


BLOCK DIAGRAM

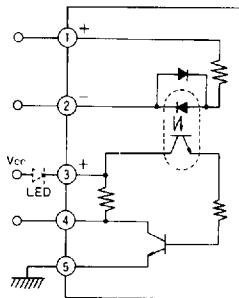
IAC without LED



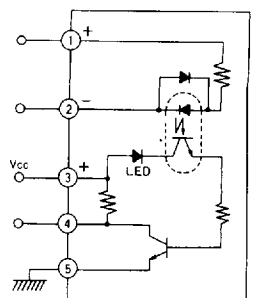
IAC with LED



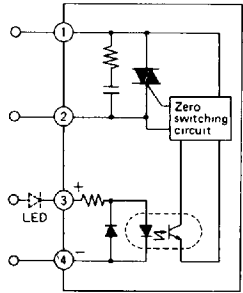
IDC without LED



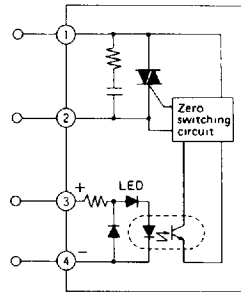
IDC with LED



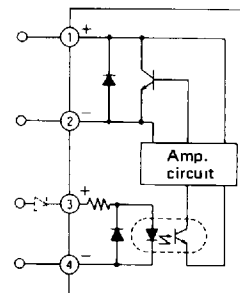
OAC without LED



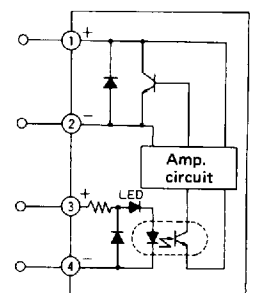
OAC with LED



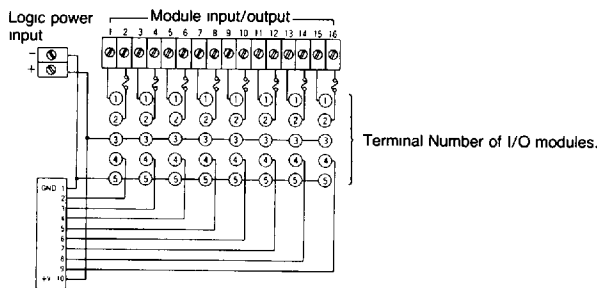
ODC without LED



ODC with LED



Wiring method (8 input/output example)
Wiring can be used commonly for Input modules and output modules. Therefore, wiring becomes simple.

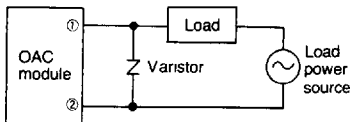


CAUTIONS REGARDING USE

1. Regarding the output side

1) AC output module

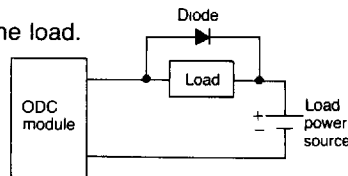
When there is a high level of noise and surge impressed on the load side, there is the possibility of erroneous operation and damage. In such a case, a varistor should be inserted in the circuit.



2) DC output module

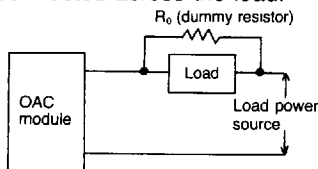
When there are inductive loads such as solenoids, motors, electromagnetic valves, etc., to prevent counter EMF, a diode should be connected at both ends

of the load.



3) When the load is less than the prescribed value

There is the possibility of erroneous operation, and a dummy resistor should be connected across the load.



Prescribed load values

Type	Prescribed value
OAC module	Min. 50 mA
ODC module	Min. 5 mA

2. Other points

1) When a heat generator component or another output module is mounted adjacently, because of the possibility of an ambient temperature rise, the output module positioning as well as air circulation should be given ample consideration.

2) Terminal soldering should be done at 260°C 500°F within 5 seconds.

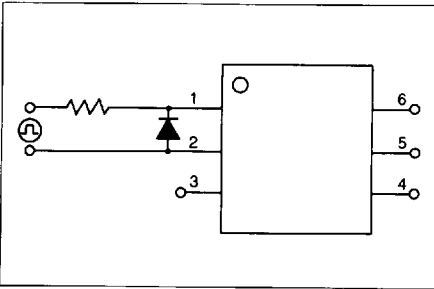
NOTES

1. Short across terminals

Do not short circuit between terminals when relay is energized, since there is possibility of breaking of the internal IC.

2. Surge voltages at the input

If reverse surge voltages are present at the input terminals, connected a diode in reverse parallel across the input terminals and keep the reverse voltages below the reverse breakdown voltage.



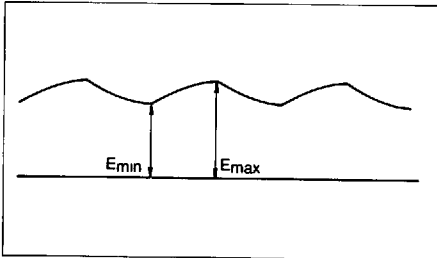
3. Ripple in the input power supply

If ripple is present in the input power supply, observe the followings:

1) For LED operate current at E_{min} , maintain as follows:

AQV220 types: Min. 5 mA

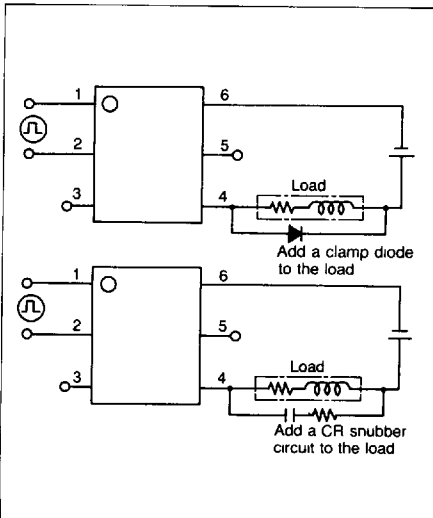
2) Keep the LED operate current at 50 mA or less at E_{max} .



4. Output spike voltages

1) If an inductive load generates spike voltages which exceed the absolute maximum rating, the spike voltages must be limited.

Typical circuits are shown below.



2) Even if spike voltages generated at the load are limited with a clamp diode by inductance if the circuit wires are long, spike voltages will be occurred. Keep wires as short as possible to minimize inductance.

5. The following shows the packaging format

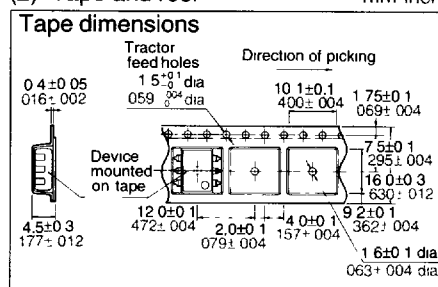
(1) Tube

Devices are packaged in a tube so pin No. 1 is on the stopper B side.

Observe correct orientation when mounting them on PC boards.



(2) Tape and reel



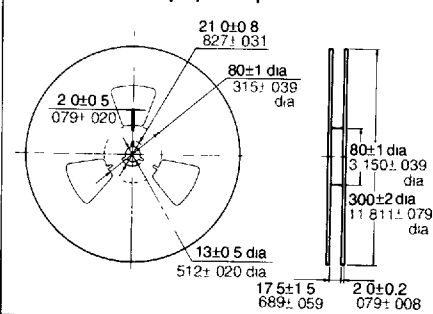
① When picked from 1/2/3-pin side:

Part No. AQV220AX

② When picked from 4/5/6-pin side:

Part No. AQV220AZ

Dimensions of paper tape reel

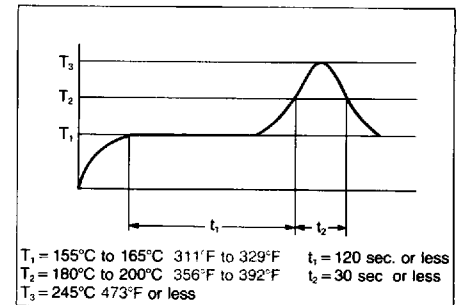


6. Soldering

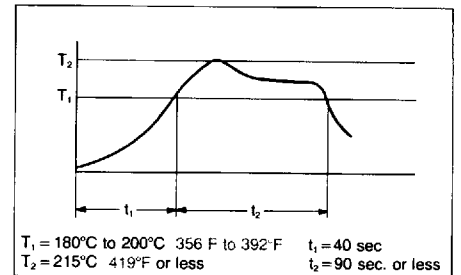
1) When soldering PC board terminals, keep soldering time to within 10 sec. at 260°C 500°F.

2) When soldering surface-mount terminals, the following conditions are recommended.

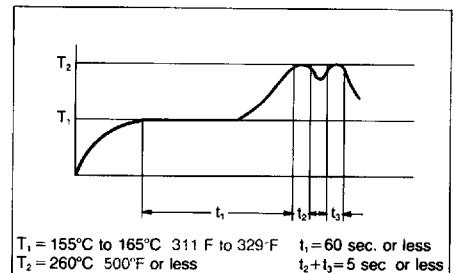
(1) IR (Infrared reflow) soldering method



(2) Vapor phase soldering method



(3) Double wave soldering method



(4) Soldering iron method

Tip temperature: 280°C to 300°C
536°F to 572°F

Wattage: 30 to 60 W

Soldering time: within 5 sec.

(5) Others

Check mounting conditions before using other soldering methods (hot-air, hot plate, pulse heater, etc.).

• The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The ambient temperature may increase excessively. Check the temperature under mounting conditions.

• The conditions for the Infrared reflow soldering apply when preheating using the VPS method.