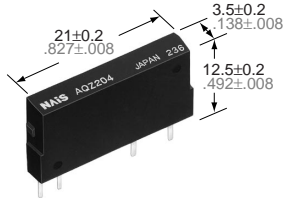


# NAIS

## POWER PhotoMOS RELAYS 1-channel (Form A) Type

# PhotoMOS RELAYS



mm inch

### FEATURES

1. High capacity PhotoMOS Relay in a compact and slim 4-pin SIL
2. Extremely low ON resistance
3. Control low-level signal  
Power Photo MOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
4. Low-level off state leakage current
5. High I/O isolation voltage 2,500 V
6. Eliminates the need for a counter electromotive protection diode in the drive circuit on the input side
7. Eliminate the need for a power supply to drive the power MOSFET

8. PC board layout is simplified
9. No restriction on mounting direction
10. Varistor incorporated type is also available.

### TYPICAL APPLICATIONS

- High-speed inspection machines
- IC checker
- NC machine, Robots
- Office machines
- Telecommunication
- Automotive
- Industrial control

### TYPES

#### 1. AC/DC type

Output rating		Part No.	Packing quantity	
Load voltage	Load current		Inner carton	Outer carton
60 V	3.0 A	AQZ202	25 pcs.	500 pcs.
100 V	2.0 A	AQZ205		
200 V	1.0 A	AQZ207		
400 V	0.5 A	AQZ204		

#### 2. DC type

Output rating		Part No.	Packing quantity	
Load voltage	Load current		Inner carton	Outer carton
60 V	4.0 A	AQZ102	25 pcs.	500 pcs.
100 V	2.6 A	AQZ105		
200 V	1.3 A	AQZ107		
400 V	0.7 A	AQZ104		

Notes: Load voltage and current of AC/DC type: Peak AC/DC.  
Load voltage and current of DC type: DC

# AQZ10○, 20○

## RATING

### 1. AC/DC type

1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

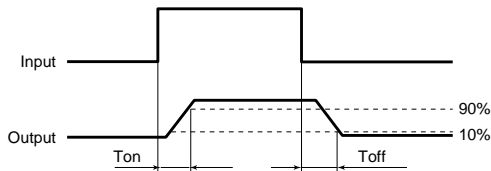
Item		Symbol	AQZ202	AQZ205	AQZ207	AQZ204	Remarks
Input	LED forward current	$I_F$	50 mA				
	LED reverse voltage	$V_R$	3 V				
	Peak forward current	$I_{FP}$	1 A				$f = 100 \text{ Hz}$ , Duty factor = 0.1%
	Power dissipation	$P_{in}$	75 mW				
Output	Load voltage (Peak AC)	$V_L$	60 V	100 V	200 V	400 V	
	Continuous load current	$I_L$	3.0 A	2.0 A	1.0 A	0.5 A	
	Peak load current	$I_{peak}$	9.0 A	6.0 A	3.0 A	1.5 A	100 ms (1 shot), $V_L = \text{DC}$
	Power dissipation	$P_{out}$	1.6 W				
Total power dissipation		$P_T$	1.6 W				
I/O isolation voltage		$V_{iso}$	2,500 V AC				
Temperature limits	Operating	$T_{opr}$	-40°C to +85°C -40°F to +185°F				Non-condensing at low temperatures
	Storage	$T_{stg}$	-40°C to +100°C -40°F to +212°F				

2) Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQZ202	AQZ205	AQZ207	AQZ204	Condition	
Input	LED operate current	Typical	$I_{Fon}$	1.0 mA				$I_L = 100 \text{ mA}$ $V_L = 10 \text{ V}$	
		Maximum		3.0 mA					
	LED turn off current	Minimum	$I_{Foff}$	0.4 mA				$I_L = 100 \text{ mA}$ $V_L = 10 \text{ V}$	
		Typical		0.9 mA					
	LED dropout voltage	Typical	$V_F$	1.25 V (1.16 V at $I_F = 10 \text{ mA}$ )				$I_F = 50 \text{ mA}$	
		Maximum		1.5 V					
Output	On resistance	Typical	$R_{on}$	0.11 $\Omega$	0.23 $\Omega$	0.7 $\Omega$	2.1 $\Omega$	$I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time	
		Maximum		0.18 $\Omega$	0.34 $\Omega$	1.1 $\Omega$	3.2 $\Omega$		
	Off state leakage current	Maximum	—	10 $\mu\text{A}$				$I_F = 0$ $V_L = \text{Max.}$	
Transfer characteristics	Switching speed	Turn on time*	$T_{on}$	Typical	2.46 ms	2.40 ms	1.12 ms	1.65 ms	$I_F = 10 \text{ mA}$ $I_L = 100 \text{ mA}$ $V_L = 10 \text{ V}$
				Maximum	5.0 ms				
		Turn off time*		Typical	5.64 ms	5.65 ms	2.57 ms	3.88 ms	$I_F = 5 \text{ mA}$ $I_L = 100 \text{ mA}$ $V_L = 10 \text{ V}$
				Maximum	10.0 ms				
	I/O capacitance	Typical	$C_{iso}$	0.8 pF				$f = 1 \text{ MHz}$ $V_B = 0$	
		Maximum		1.5 pF					
	Initial I/O isolation resistance	Minimum	$R_{iso}$	1,000 M $\Omega$				500 V DC	
	Maximum operating speed	Maximum	—	0.5 cps				$I_F = 10 \text{ mA}$ Duty factor = 50% $I_L = \text{Max.}$ , $V_L = \text{Max.}$	
	Vibration resistance	Minimum	—	10 to 55 Hz at double amplitude of 3 mm				2 hours for 3 axes	
	Shock resistance	Minimum	—	4,900 m/s <sup>2</sup> {500 G} 1 ms				3 times for 3 axes	

Note: Recommendable LED forward current  $I_F = 5$  to 10 mA.

\*Turn on/off time



2. DC type

1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

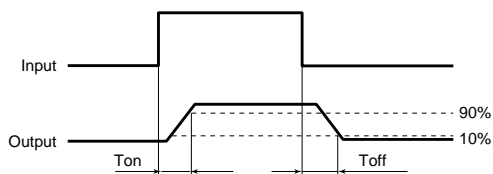
Item		Symbol	AQZ102	AQZ105	AQZ107	AQZ104	Remarks
Input	LED forward current	I <sub>F</sub>	50 mA				
	LED reverse voltage	V <sub>R</sub>	3 V				
	Peak forward current	I <sub>FP</sub>	1 A				f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P <sub>in</sub>	75 mW				
Output	Load voltage (DC)	V <sub>L</sub>	60 V	100 V	200 V	400 V	
	Continuous load current (DC)	I <sub>L</sub>	4.0 A	2.6 A	1.3 A	0.7 A	
	Peak load current	I <sub>peak</sub>	9.0 A	6.0 A	3.0 A	1.5 A	100 ms (1 shot), V <sub>L</sub> = DC
	Power dissipation	P <sub>out</sub>	1.35 W				
Total power dissipation		P <sub>T</sub>	1.35 W				
I/O isolation voltage		V <sub>iso</sub>	2,500 V AC				
Temperature limits	Operating	T <sub>opr</sub>	-40°C to +85°C -40°F to +185°F				Non-condensing at low temperatures
	Storage	T <sub>stg</sub>	-40°C to +100°C -40°F to +212°F				

2) Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQZ102	AQZ105	AQZ107	AQZ104	Condition		
Input	LED operate current	Typical	I <sub>Fon</sub>	1.0 mA				I <sub>L</sub> = 100 mA V <sub>L</sub> = 10 V		
		Maximum		3.0 mA						
	LED turn off current	Minimum	I <sub>Foff</sub>	0.4 mA				I <sub>L</sub> = 100 mA V <sub>L</sub> = 10 V		
		Typical		0.9 mA						
	LED dropout voltage	Typical	V <sub>F</sub>	1.25 V (1.16 V at I <sub>F</sub> = 10 mA)				I <sub>F</sub> = 50 mA		
Maximum		1.5 V								
Output	On resistance	Typical	R <sub>on</sub>	0.05 Ω	0.081 Ω	0.34 Ω	1.06 Ω	I <sub>F</sub> = 10 mA I <sub>L</sub> = Max. Within 1 s on time		
		Maximum		0.09 Ω	0.17 Ω	0.55 Ω	1.6 Ω			
	Off state leakage current	Maximum	—	10 μA				I <sub>F</sub> = 0 V <sub>L</sub> = Max.		
Transfer characteristics	Switching speed	Turn on time*	T <sub>on</sub>	Typical	1.66 ms	1.89 ms	0.83 ms	1.01 ms	I <sub>F</sub> = 10 mA I <sub>L</sub> = 100 mA V <sub>L</sub> = 10 V	
				Maximum	5.0 ms					
		Turn off time*		T <sub>off</sub>	Typical	3.79 ms	4.50 ms	1.75 ms	2.34 ms	I <sub>F</sub> = 5 mA I <sub>L</sub> = 100 mA V <sub>L</sub> = 10 V
					Maximum	10.0 ms				
	I/O capacitance	C <sub>iso</sub>	Typical	0.8 pF				f = 1 MHz V <sub>B</sub> = 0		
			Maximum	1.5 pF						
	Initial I/O isolation resistance	Minimum	R <sub>iso</sub>	1,000 MΩ				500 V DC		
	Maximum operating speed	Maximum	—	0.5 cps				I <sub>F</sub> = 10 mA Duty factor = 50% I <sub>L</sub> × V <sub>L</sub> = 200 (VA)		
	Vibration resistance	Minimum	—	10 to 55 Hz at double amplitude of 3 mm				2 hours for 3 axes		
	Shock resistance	Minimum	—	4,900 m/s <sup>2</sup> {500 G} 1 ms				3 times for 3 axes		

Note: Recommendable LED forward current I<sub>F</sub> = 5 to 10 mA.

\*Turn on/off time

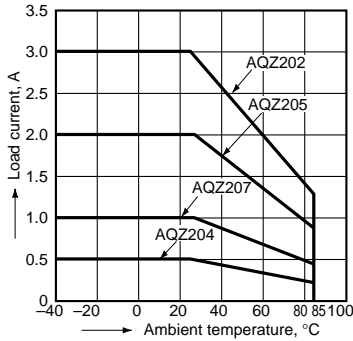


- For Dimensions, see Page 442.
- For Schematic and Wiring Diagrams, see Page 448.
- For Cautions for Use, see Page 453.

## REFERENCE DATA

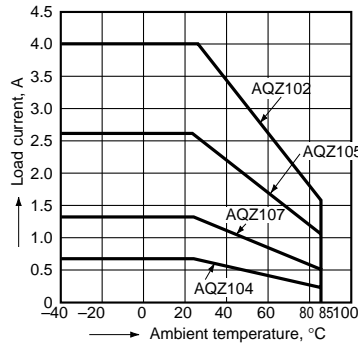
1.-(1) Load current vs. ambient temperature characteristics (AC/DC type)

Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$



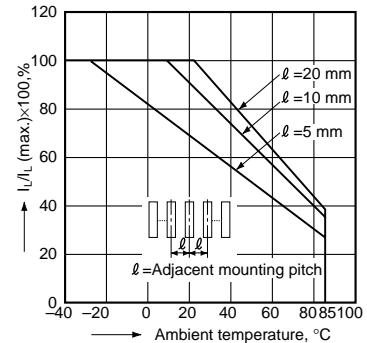
1.-(2) Load current vs. ambient temperature characteristics (DC type)

Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$



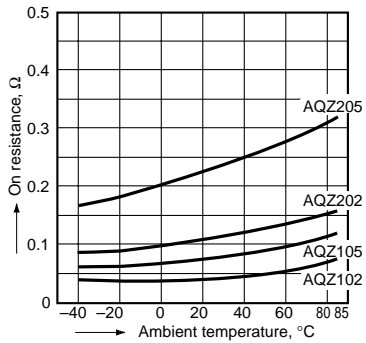
2. Load current vs. ambient temperature characteristics in adjacent mounting

$I_L$ : Load current;  
 $I_L(\text{max.})$ : Maximum continuous load current



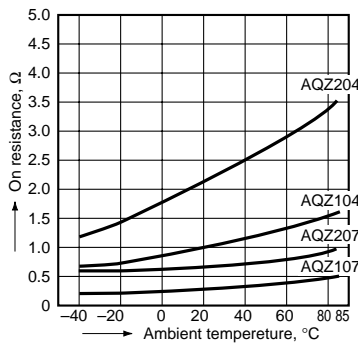
3.-(1) On resistance vs. ambient temperature characteristics

LED current: 10 mA;  
 Continuous load current: 1.2 A (DC) (AQZ202),  
 0.8 A (DC) (AQZ205),  
 1.6 A (DC) (AQZ102),  
 1.04 A (DC) (AQZ105)



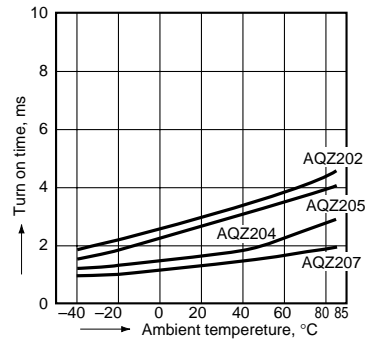
3.-(2) On resistance vs. ambient temperature characteristics

LED current: 10 mA;  
 Continuous load current: 0.4 A (DC) (AQZ207),  
 0.2 A (DC) (AQZ204),  
 0.52 A (DC) (AQZ107),  
 0.28 A (DC) (AQZ104)



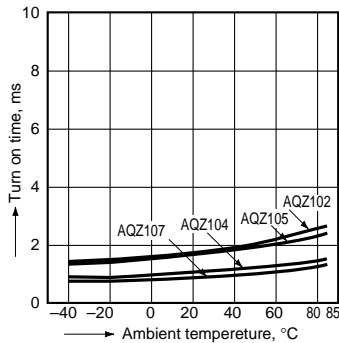
4.-(1) Turn on time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



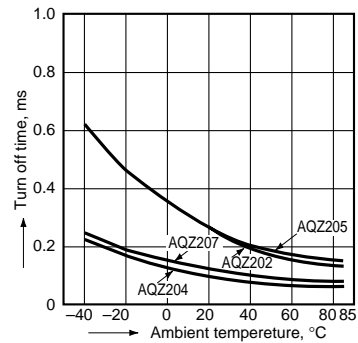
4.-(2) Turn on time vs. ambient temperature characteristics (DC type)

LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



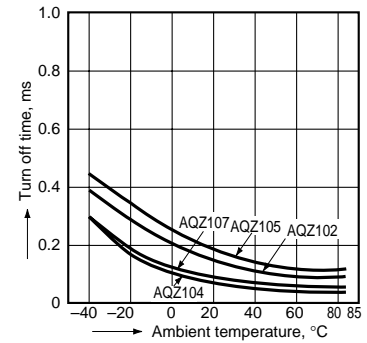
5.-(1) Turn off time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



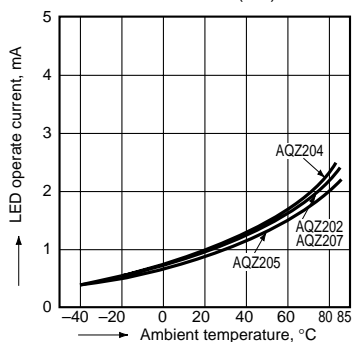
5.-(2) Turn off time vs. ambient temperature characteristics (DC type)

LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



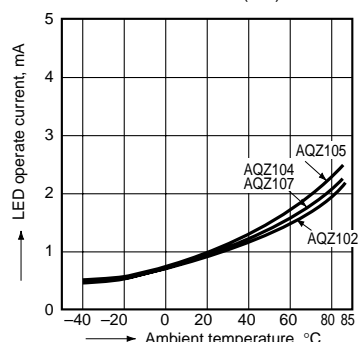
6.-(1) LED operate vs. ambient temperature characteristics (AC/DC type)

Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



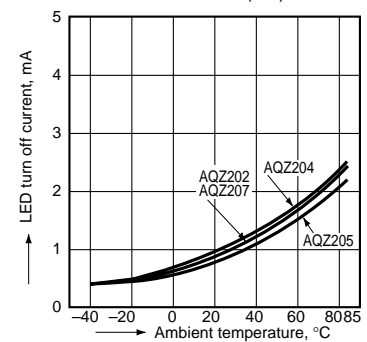
6.-(2) LED operate vs. ambient temperature characteristics (DC type)

Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



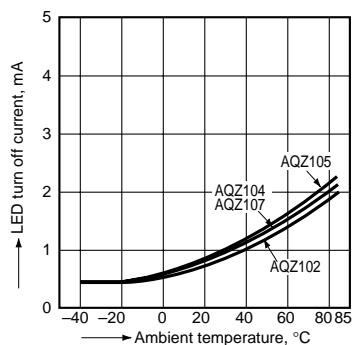
7.-(1) LED turn off current vs. ambient temperature characteristics (AC/DC type)

Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



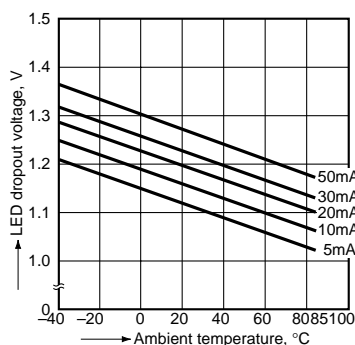
7.-(2) LED turn off current vs. ambient temperature characteristics (DC type)

Load voltage: 10 V (DC);  
Continuous load current: 100 mA (DC)



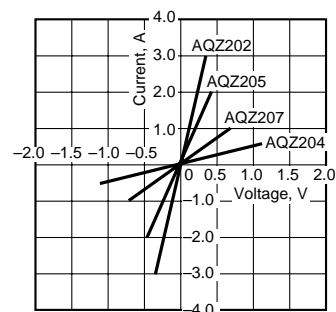
8. LED dropout voltage vs. ambient temperature characteristics

Sample: all types; LED current: 5 to 50 mA



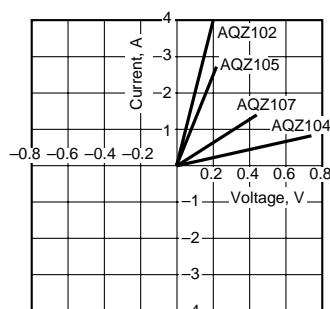
9.-(1) Voltage vs. current characteristics of output at MOS portion (AC/DC type)

Ambient temperature: 25°C 77°F



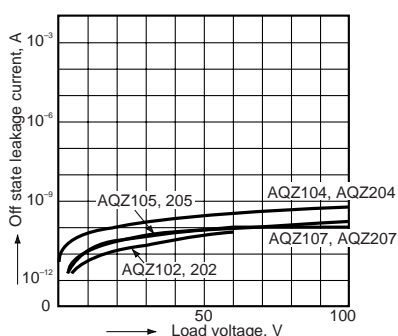
9.-(2) Voltage vs. current characteristics of output at MOS portion (DC type)

Ambient temperature: 25°C 77°F



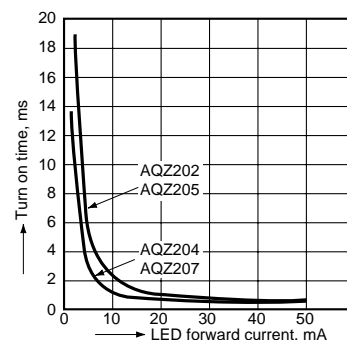
10. Off state leakage current

Ambient temperature: 25°C 77°F



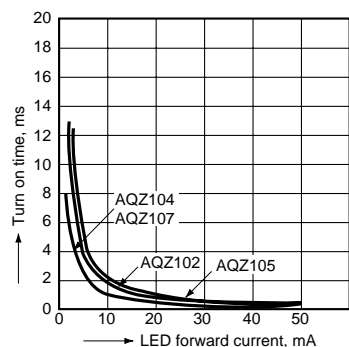
11.-(1) LED forward current vs. turn on time characteristics (AC/DC type)

Load voltage: 10 V (DC);  
Continuous load current: 100 mA (DC);  
Ambient temperature: 25°C 77°F



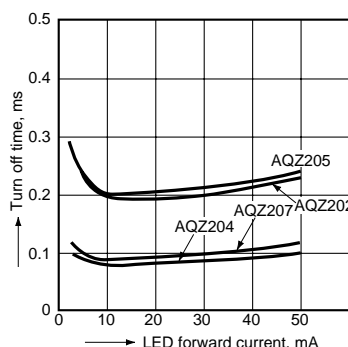
11.-(2) LED forward current vs. turn on time characteristics (DC type)

Load voltage: 10 V (DC);  
Continuous load current: 100 mA (DC);  
Ambient temperature: 25°C 77°F



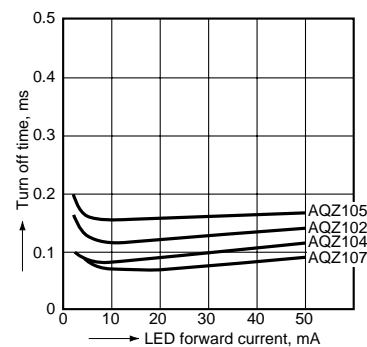
12.-(1) LED forward current vs. turn off time characteristics (AC/DC type)

Load voltage: 10 V (DC);  
Continuous load current: 100 mA (DC);  
Ambient temperature: 25°C 77°F



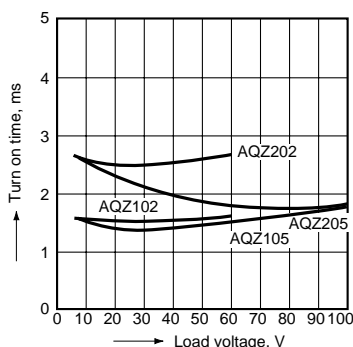
12.-(2) LED forward current vs. turn off time characteristics (DC type)

Measured portion: between terminals 4 and 6;  
Load voltage: 10 V (DC);  
Continuous load current: 100 mA (DC);  
Ambient temperature: 25°C 77°F



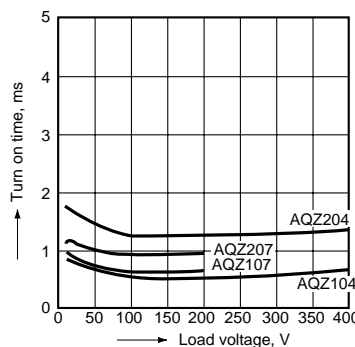
13.-(1) Load voltage vs. turn on time characteristics (Load voltage: 60, 100 V type)

LED current: 10 mA;  
Continuous load current: 100 mA;  
Ambient temperature: 25°C 77°F



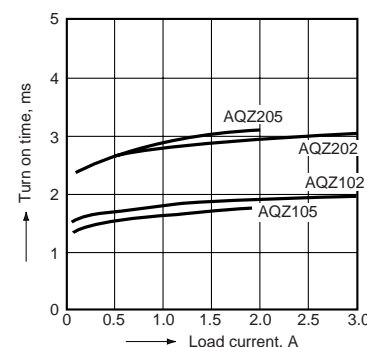
13.-(2) Load voltage vs. turn on time characteristics (Load voltage: 200, 400 V type)

LED current: 10 mA;  
Continuous load current: 100 mA;  
Ambient temperature: 25°C 77°F



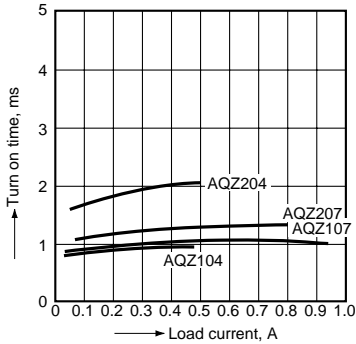
14.-(1) Load current vs. turn on time characteristics (Load voltage: 60, 100 V type)

LED current: 10 mA;  
Load voltage: 10 V (DC);  
Ambient temperature: 25°C 77°F

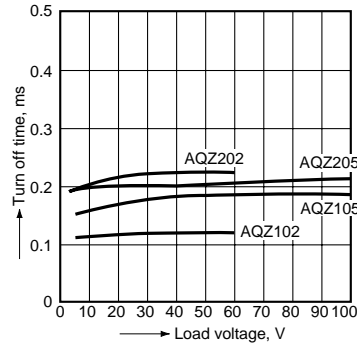


# AQZ100, 200

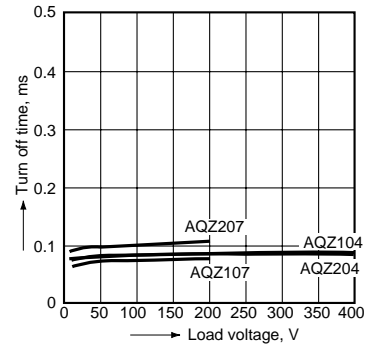
14.-(2) Load current vs. turn on time characteristics (Load voltage: 200, 400 V type)  
 LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Ambient temperature: 25°C 77°F



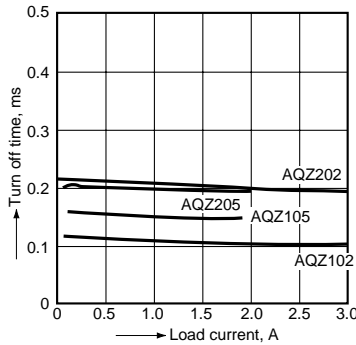
15.-(1) Load voltage vs. turn off time characteristics (Load voltage: 60, 100 V type)  
 LED current: 10 mA;  
 Continuous load current: 100 mA;  
 Ambient temperature: 25°C 77°F



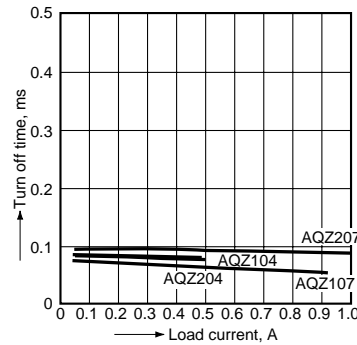
15.-(2) Load voltage vs. turn off time characteristics (Load voltage: 200, 400 V type)  
 LED current: 10 mA;  
 Continuous load current: 100 mA;  
 Ambient temperature: 25°C 77°F



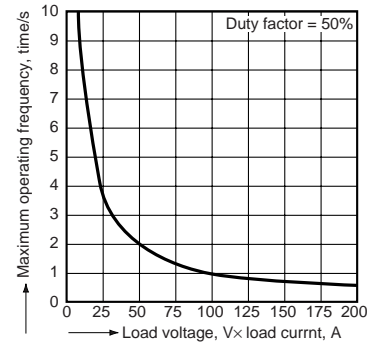
16.-(1) Load current vs. turn off time characteristics (Load voltage: 60, 100 V type)  
 LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Ambient temperature: 25°C 77°F



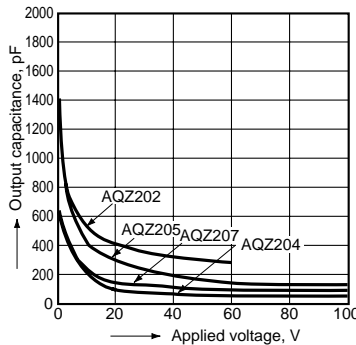
16.-(2) Load current vs. turn off time characteristics (Load voltage: 200, 400 V type)  
 LED current: 10 mA;  
 Load voltage: 10 V (DC);  
 Ambient temperature: 25°C 77°F



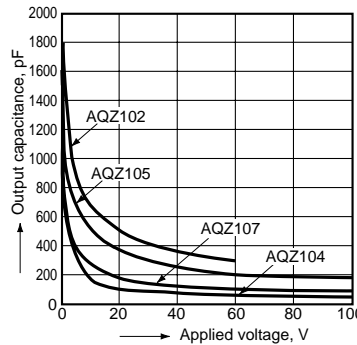
17. Maximum operating frequency vs. load voltage/current characteristics  
 LED current: 10 mA;  
 Ambient temperature: 25°C 77°F



18.-(1) Applied voltage vs. output capacitance characteristics (AC/DC type)  
 Frequency: 1 MHz;  
 Ambient temperature: 25°C 77°F

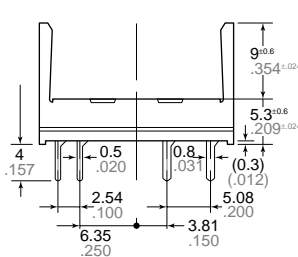
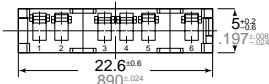


18.-(2) Applied voltage vs. output capacitance characteristics (DC type)  
 Frequency: 1 MHz;  
 Ambient temperature: 25°C 77°F

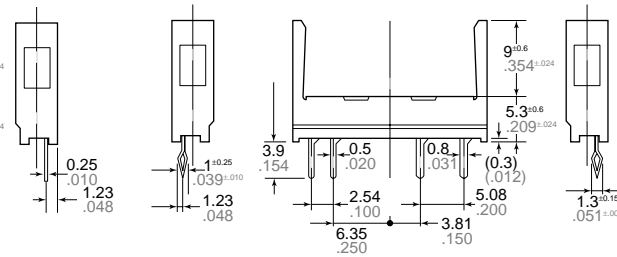
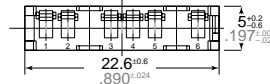


## ACCESSORY

### Socket



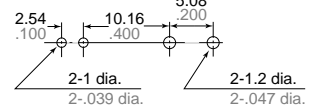
PA1a-PS



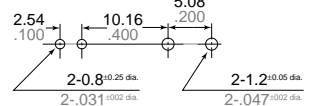
PA1a-PS-H

mm inch

### PC board pattern (BOTTOM VIEW) Standard type



### Self clinching type



Tolerance:  $\pm 0.1 \pm 0.04$

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