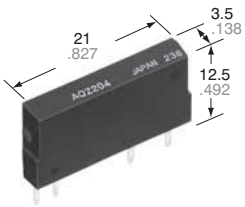
Panasonic
ideas for life

**Slim type with high capacity up to 4A DC load type also available**

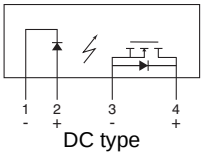
PhotoMOS Relays
# Power 1 Form A
(AQZ10❍, 20❍)



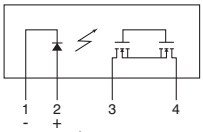

(Height includes standoff)

CAD Data

mm inch




DC type




AC/DC type

## FEATURES

**1. Slim SIL4-pin package**
(W) 3.5 × (D) 21.0 × (H) 12.5 mm
(W) .138 × (D) .827 × (H) .492 inch
The compact size of the 4-pin SIL package allows high density mounting.
**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 of max. 10 μA**
**5. High I/O isolation voltage of 2,500 V**
**6. Eliminates the need for a counter electromotive protection diode in the drive circuit on the input side**
**7. Eliminates the need for a power supply to drive the power MOSFET**
**8. No restriction on mounting direction**
**9. Low thermoelectromotive force**
**10. Neither noise nor arc at contact**
**11. Sockets are also available**
(PA1a-PS, PA1a-PS-H)
**12. Can be installed on the RT-3 relay terminal (Power PhotoMOS relay type)**

## TYPICAL APPLICATIONS

- Traffic signals
- Measuring instruments
- Industrial machines

## TYPES

### 1. DC type

| | Output rating* | | Package | Part No. | Packing quantity | |
|---|---|---|---|---|---|---|
| | Load voltage | Load current | | | Inner carton | Outer carton |
| DC only | 60 V | 4.0 A | SIL4-pin | AQZ102 | 25 pcs. | 500 pcs. |
| | 100 V | 2.6 A | | AQZ105 | | |
| | 200 V | 1.3 A | | AQZ107 | | |
| | 400 V | 0.7 A | | AQZ104 | | |

* Load voltage and current of DC type: DC

### 2. AC/DC type

| | Output rating* | | Package | Part No. | Packing quantity | |
|---|---|---|---|---|---|---|
| | Load voltage | Load current | | | Inner carton | Outer carton |
| AC/DC dual use | 60 V | 3.0 A | SIL4-pin | AQZ202 | 25 pcs. | 500 pcs. |
| | 100 V | 2.0 A | | AQZ205 | | |
| | 200 V | 1.0 A | | AQZ207 | | |
| | 400 V | 0.5 A | | AQZ204 | | |

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

# Power 1 Form A (AQZ10❍, 20❍)

## RATING

### 1. DC type

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

| Item | | Symbol | AQZ102 | AQZ105 | AQZ107 | AQZ104 | Remarks |
|---|---|---|---|---|---|---|---|
| Input | LED forward current | $I_F$ | 50 mA | | | | |
| | LED reverse voltage | $V_R$ | 5 V | | | | |
| | Peak forward current | $I_{FP}$ | 1 A | | | | f = 100 Hz, Duty factor = 0.1% |
| | Power dissipation | $P_{in}$ | 75 mW | | | | |
| Output | Load voltage (DC) | $V_L$ | 60 V | 100 V | 200 V | 400 V | |
| | Continuous load current (DC) | $I_L$ | 4.0 A | 2.6 A | 1.3 A | 0.7 A | |
| | Peak load current | $I_{peak}$ | 9.0 A | 6.0 A | 3.0 A | 1.5 A | 100 ms (1 shot), $V_L$ = DC |
| | Power dissipation | $P_{out}$ | 1.35 W | | | | |
| Total power dissipation | | $P_T$ | 1.35 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 | AQZ102 | AQZ105 | AQZ107 | AQZ104 | Condition |
|---|---|---|---|---|---|---|---|---|
| Input | LED operate current | Typical | $I_{Fon}$ | 1.0 mA | | | | $I_L$= 100 mA<br>$V_L$= 10 V |
| | | Maximum | | 3.0 mA | | | | |
| | LED turn off current | Minimum | $I_{Foff}$ | 0.4 mA | | | | $I_L$= 100 mA<br>$V_L$= 10 V |
| | | Typical | | 0.9 mA | | | | |
| | LED dropout voltage | Typical | $V_F$ | 1.25 V (1.16 V at $I_F$ = 10 mA) | | | | $I_F$ = 50 mA |
| | | Maximum | | 1.5 V | | | | |
| Output | On resistance | Typical | $R_{on}$ | 0.05 Ω | 0.081 Ω | 0.34 Ω | 1.06 Ω | $I_F$ = 10 mA<br>$I_L$ =Max.<br>Within 1 s on time |
| | | Maximum | | 0.09 Ω | 0.17 Ω | 0.55 Ω | 1.6 Ω | |
| | Off state leakage current | Maximum | $I_{Leak}$ | 10 μA | | | | $I_F$ = 0 mA<br>$V_L$ = Max. |
| Transfer characteristics | Turn on time* | Typical | $T_{on}$ | 1.66 ms | 1.89 ms | 0.83 ms | 1.01 ms | $I_F$ = 10 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 5.0 ms | | | | |
| | | Typical | | 3.79 ms | 4.50 ms | 1.75 ms | 2.34 ms | $I_F$ = 5 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 10.0 ms | | | | |
| | Turn off time* | Typical | $T_{off}$ | 0.15 ms | 0.19 ms | 0.08 ms | 0.08 ms | $I_F$ = 5 mA or 10 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 3.0 ms | | | | |
| | I/O capacitance | Typical | $C_{iso}$ | 0.8 pF | | | | f = 1 MHz<br>$V_B$ = 0 V |
| | | Maximum | | 1.5 pF | | | | |
| | Initial I/O isolation resistance | Minimum | $R_{iso}$ | 1,000 MΩ | | | | 500 V DC |
| | Maximum operating speed | Maximum | — | 0.5 cps | | | | $I_F$ = 10 mA<br>Duty factor = 50%<br>$I_L \times V_L$= 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/s² {500 G} 1 ms | | | | 3 times for 3 axes |

**2. AC/DC type**

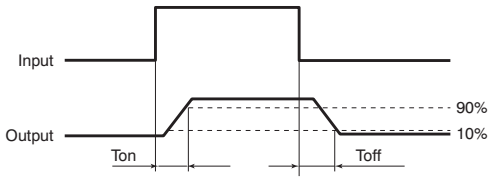
1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

| Item | | Symbol | AQZ202 | AQZ205 | AQZ207 | AQZ204 | Remarks |
|---|---|---|---|---|---|---|---|
| Input | LED forward current | $I_F$ | 50 mA | | | | |
| | LED reverse voltage | $V_R$ | 5 V | | | | |
| | Peak forward current | $I_{FP}$ | 1 A | | | | f = 100 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 AC, DC |
| | Peak load current | $I_{peak}$ | 9.0 A | 6.0 A | 3.0 A | 1.5 A | 100 ms (1 shot), $V_L$ = 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 mA<br>$V_L$= 10 V |
| | | Maximum | | 3.0 mA | | | | |
| | LED turn off current | Minimum | $I_{Foff}$ | 0.4 mA | | | | $I_L$= 100 mA<br>$V_L$= 10 V |
| | | Typical | | 0.9 mA | | | | |
| | LED dropout voltage | Typical | $V_F$ | 1.25 V (1.16 V at $I_F$ = 10 mA) | | | | $I_F$ = 50 mA |
| | | Maximum | | 1.5 V | | | | |
| Output | On resistance | Typical | $R_{on}$ | 0.11 Ω | 0.23 Ω | 0.7 Ω | 2.1 Ω | $I_F$ = 10 mA<br>$I_L$ =Max.<br>Within 1 s on time |
| | | Maximum | | 0.18 Ω | 0.34 Ω | 1.1 Ω | 3.2 Ω | |
| | Off state leakage current | Maximum | $I_{Leak}$ | 10 μA | | | | $I_F$ = 0 mA<br>$V_L$ = Max. |
| Transfer characteristics | Turn on time* | Typical | $T_{on}$ | 2.46 ms | 2.40 ms | 1.12 ms | 1.65 ms | $I_F$ = 10 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 5.0 ms | | | | |
| | | Typical | | 5.64 ms | 5.65 ms | 2.57 ms | 3.88 ms | $I_F$ = 5 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 10.0 ms | | | | |
| | Turn off time* | Typical | $T_{off}$ | 0.22 ms | 0.21 ms | 0.10 ms | 0.08 ms | $I_F$ = 5 mA or 10 mA<br>$I_L$ = 100 mA<br>$V_L$ = 10 V |
| | | Maximum | | 3.0 ms | | | | |
| | I/O capacitance | Typical | $C_{iso}$ | 0.8 pF | | | | f = 1 MHz<br>$V_B$ = 0 V |
| | | Maximum | | 1.5 pF | | | | |
| | Initial I/O isolation resistance | Minimum | $R_{iso}$ | 1,000 MΩ | | | | 500 V DC |
| | Maximum operating speed | Maximum | — | 0.5 cps | | | | $I_F$ = 10 mA<br>Duty factor = 50%<br>$I_L$ = Max., $V_L$ = 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/s² {500 G}1 ms | | | | 3 times for 3 axes |

*Turn on/off time




# RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

| Item | Symbol | Recommended value | Unit |
|---|---|---|---|
| Input LED current | $I_F$ | 5 to 10 | mA |

## ■ Dimensions

## ■ Schematic and Wiring Diagrams

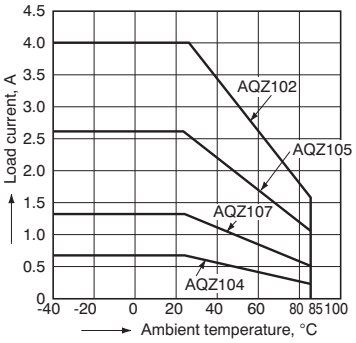
## ■ Cautions for Use

**■ These products are not designed for automotive use.**
**If you are considering to use these products for automotive applications, please contact your local Panasonic Electric Works technical representative.**
**Please refer to our information on PhotoMOS Relays for Automotive Applications.**

## REFERENCE DATA

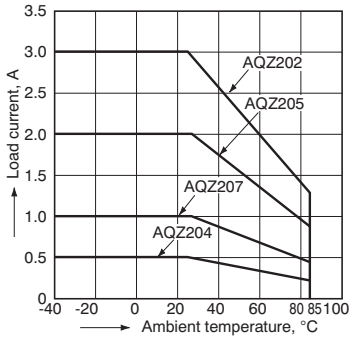
1-(1) Load current vs. ambient temperature characteristics (DC type)

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



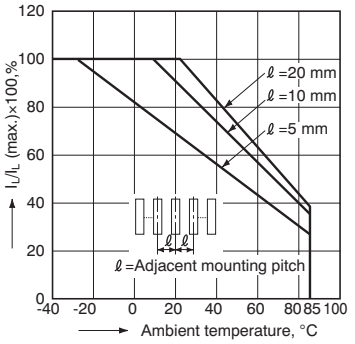

1.-(2) Load current vs. ambient temperature characteristics (AC/DC type)

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



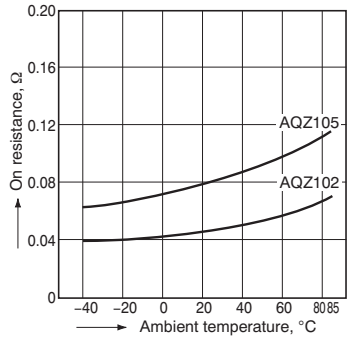

2. Load current vs. ambient temperature characteristics in adjacent mounting

$I_L$ : Load current;
$I_L$ (max.): Maximum continuous load current



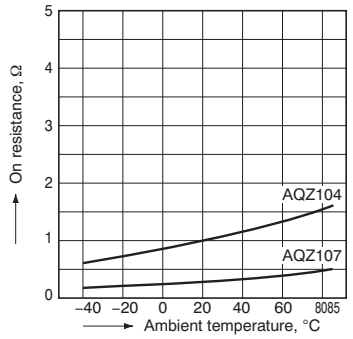

3-(1) On resistance vs. ambient temperature characteristics (DC type)

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



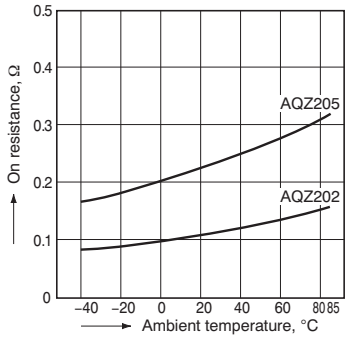

3.-(2) On resistance vs. ambient temperature characteristics (DC type)

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



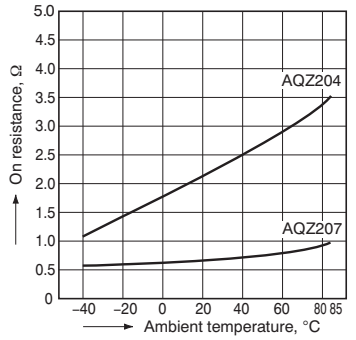

3.-(3) On resistance vs. ambient temperature characteristics (AC/DC type)

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



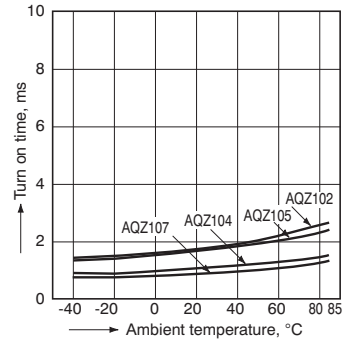

3.-(4) On resistance vs. ambient temperature characteristics (AC/DC type)

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



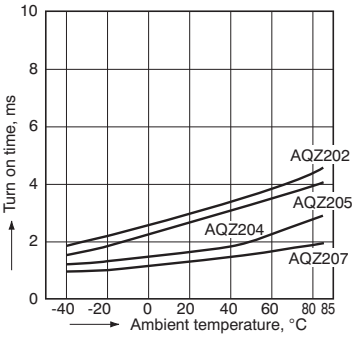

4-(1) Turn on time vs. ambient temperature characteristics (DC type)

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



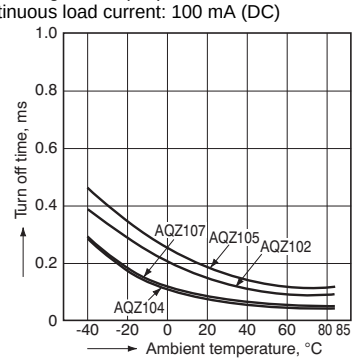

4.-(2) Turn on time vs. ambient temperature characteristics (AC/DC type)

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



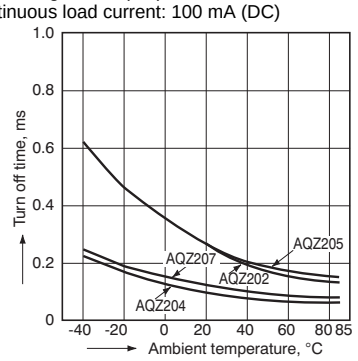

5-(1) Turn off time vs. ambient temperature characteristics (DC type)

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



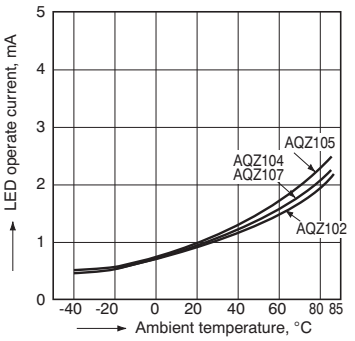

5.-(2) Turn off time vs. ambient temperature characteristics (AC/DC type)

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



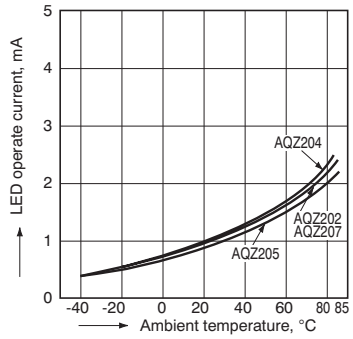

6-(1) LED operate vs. ambient temperature characteristics (DC type)

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



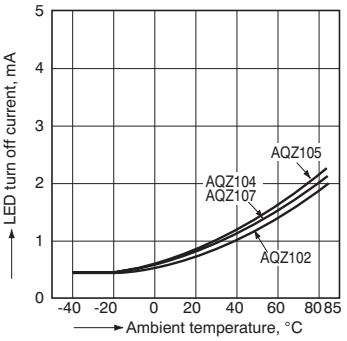
6.-(2) LED operate vs. ambient temperature characteristics (AC/DC type)

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



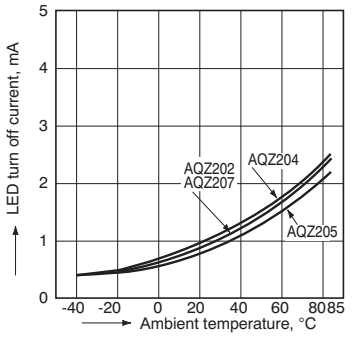

7-(1) LED turn off current vs. ambient temperature characteristics (DC type)

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



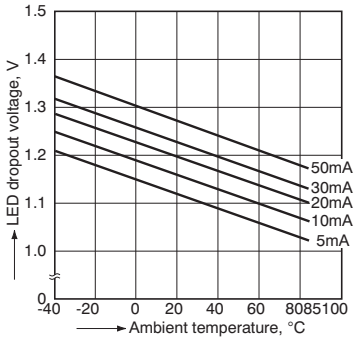

7.-(2) LED turn off current vs. ambient temperature characteristics (AC/DC type)

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



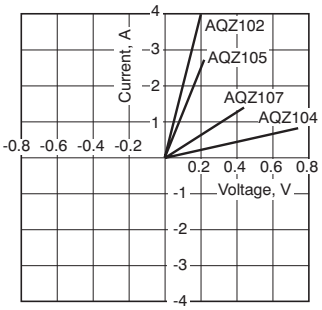

8. LED dropout voltage vs. ambient temperature characteristics

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



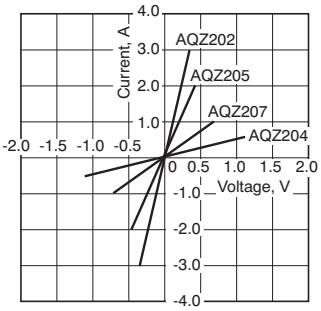

9-(1) Current vs. voltage characteristics of output at MOS portion (DC type)

Ambient temperature: 25°C 77°F



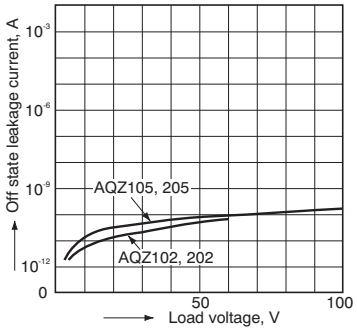

9.-(2) Current vs. voltage characteristics of output at MOS portion (AC/DC type)

Ambient temperature: 25°C 77°F



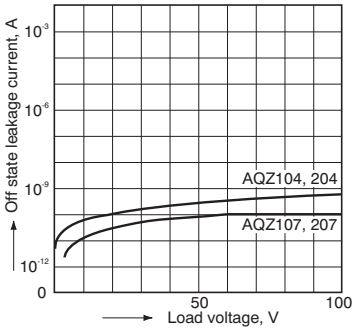

10-(1) Off state leakage current vs. load voltage characteristics

Ambient temperature: 25°C 77°F



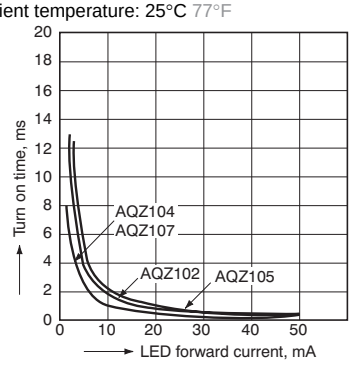

10.-(2) Off state leakage current vs. load voltage characteristics

Ambient temperature: 25°C 77°F



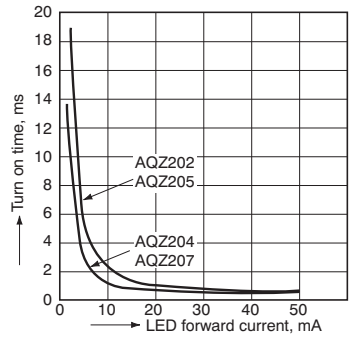

11-(1) Turn on time vs. LED forward current characteristics (DC type)

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



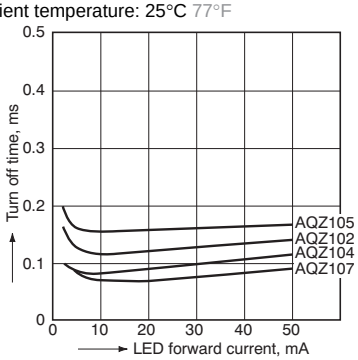

11.-(2) Turn on time vs. LED forward current characteristics (AC/DC type)

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



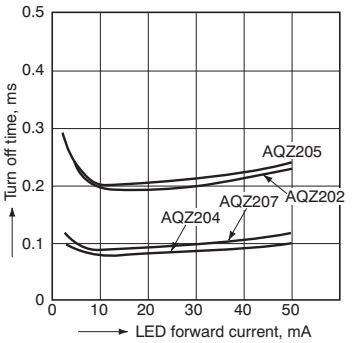

12-(1) Turn off time vs. LED forward current characteristics (DC type)

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



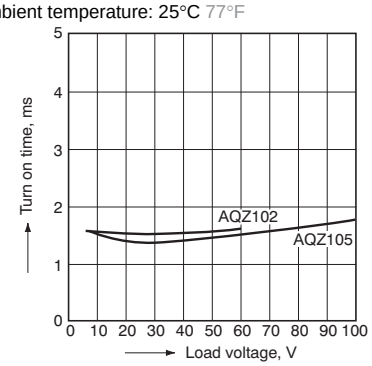

12.-(2) Turn off time vs. LED forward current characteristics (AC/DC type)

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

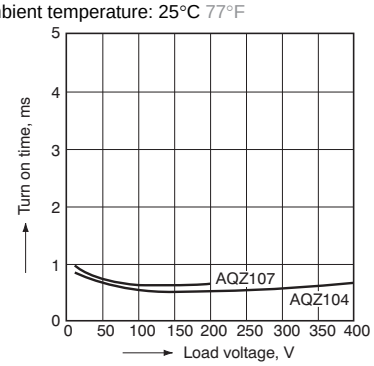


# Power 1 Form A (AQZ10❍, 20❍)

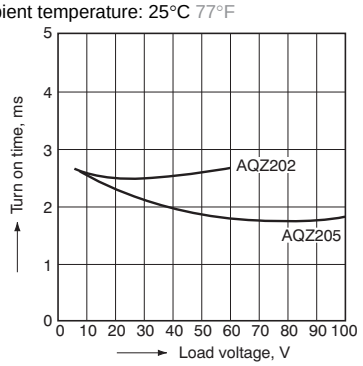
13-(1) Turn on time vs. load voltage characteristics (DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



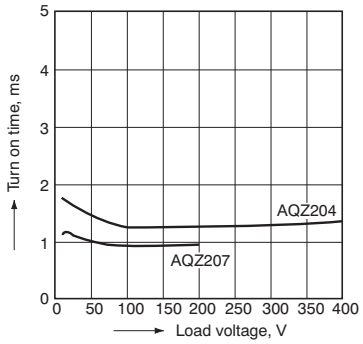

13.-(2) Turn on time vs. load voltage characteristics (DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



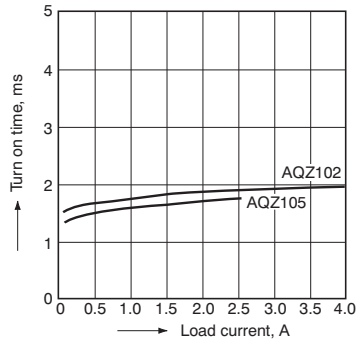

13.-(3) Turn on time vs. load voltage characteristics (AC/DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



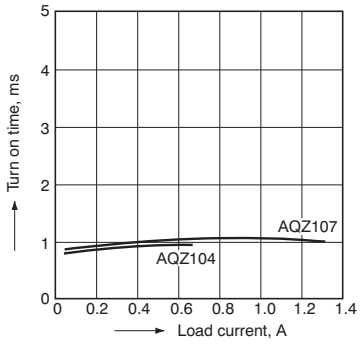

13.-(4) Turn on time vs. load voltage characteristics (AC/DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



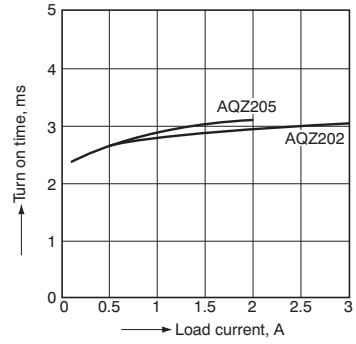

14-(1) Turn on time vs. load current characteristics (DC type)
LED current: 10 mA;
Load voltage: 10 V (DC);
Ambient temperature: 25°C 77°F



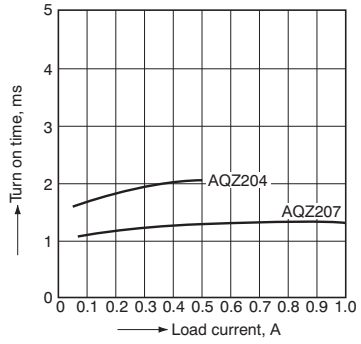

14.-(2) Turn on time vs. load current characteristics (DC type)
LED current: 10 mA;
Load voltage: 10 V (DC);
Ambient temperature: 25°C 77°F



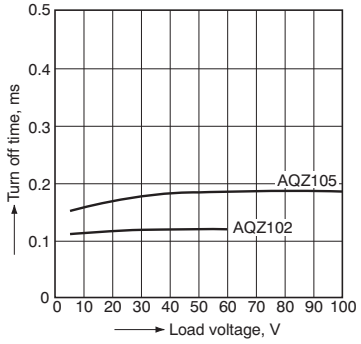

14.-(3) Turn on time vs. load current characteristics (AC/DC type)
LED current: 10 mA;
Load voltage: 10 V (DC);
Ambient temperature: 25°C 77°F



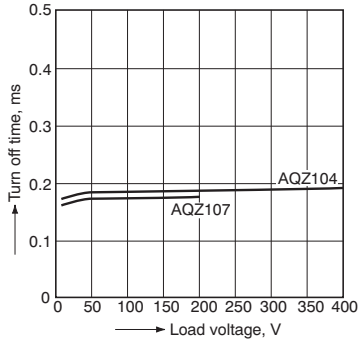

14.-(4) Turn on time vs. load current characteristics (AC/DC type)
LED current: 10 mA;
Load voltage: 10 V (DC);
Ambient temperature: 25°C 77°F



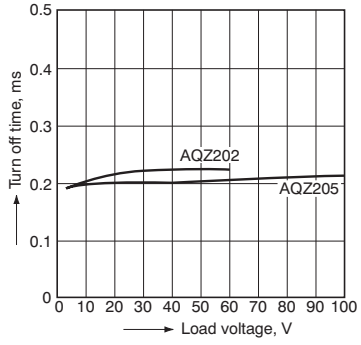

15-(1) Turn off time vs. load voltage characteristics (DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



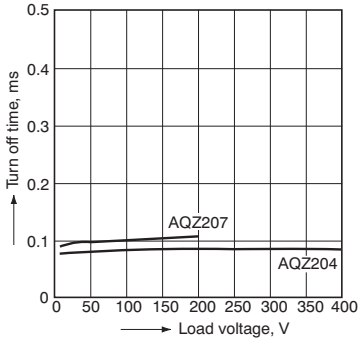

15.-(2) Turn off time vs. load voltage characteristics (DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F




15.-(3) Turn off time vs. load voltage characteristics (AC/DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F

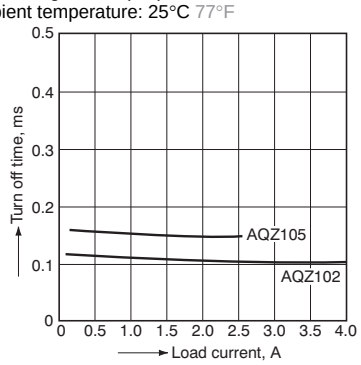



15.-(4) Turn off time vs. load voltage characteristics (AC/DC type)
LED current: 10 mA;
Continuous load current: 100 mA;
Ambient temperature: 25°C 77°F



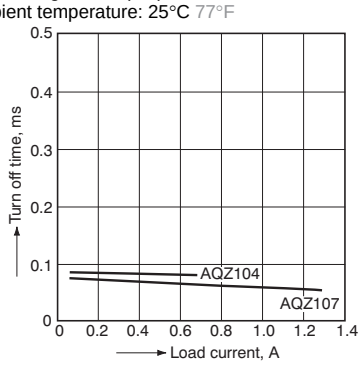
16-(1) Turn off time vs. load current characteristics (DC type)

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



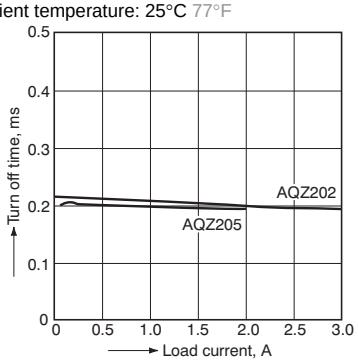

16.-(2) Turn off time vs. load current characteristics (DC type)

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



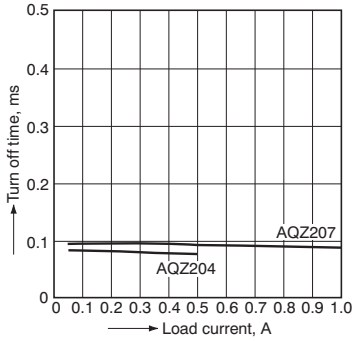

16.-(3) Turn off time vs. load current characteristics (AC/DC type)

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



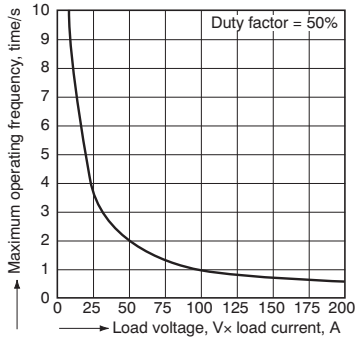

16.-(4) Turn off time vs. load current characteristics (AC/DC type)

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



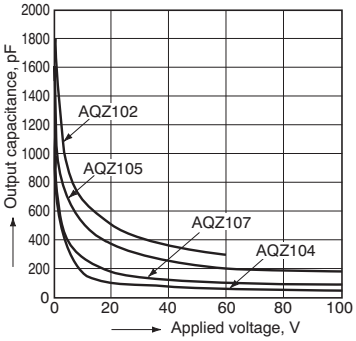

17.Maximum operating frequency vs. load voltage/current characteristics

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



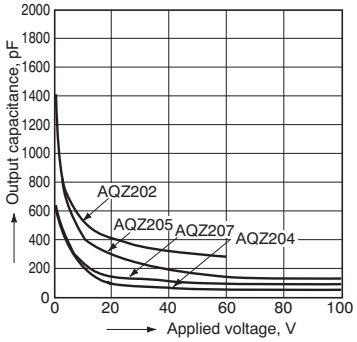

18-(1) Output capacitance vs. applied voltage characteristics (DC type)

Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



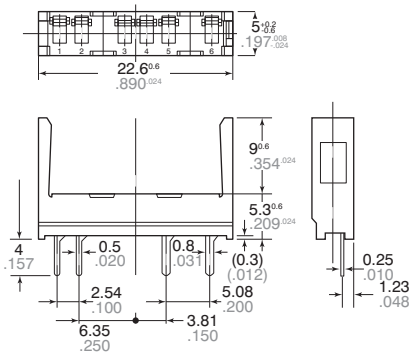

18.-(2) Output capacitance vs. applied voltage characteristics (AC/DC type)

Frequency: 1 MHz;
Ambient temperature: 25°C 77°F

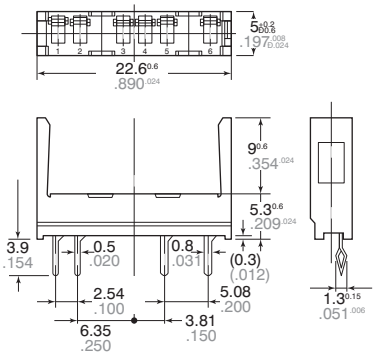



# ACCESSORY (mm inch)

**Socket**

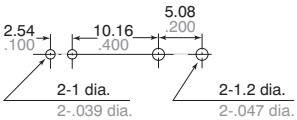



PA1a-PS

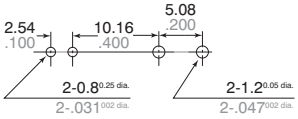



PA1a-PS-H

PC board pattern
(BOTTOM VIEW)
Standard type




Self clinching type




Tolerance: ±0.1 ±.004