







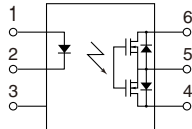
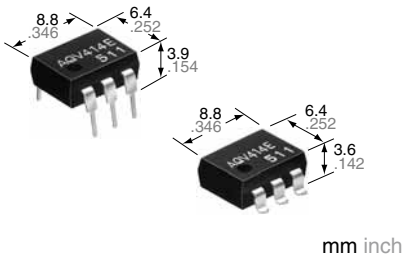
THE DATASHEET OF AQV412EHAX



Standard type:  (AQV412EH) / Reinforced type:  (AQV410EH, 414EH)   (AQV410EH, 414EH)

**Normally closed type
with reinforced insulation**

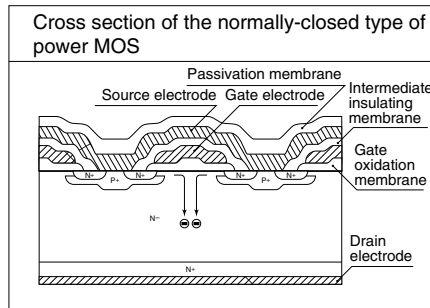
**PhotoMOS[®]
GE 1 Form B
(AQV414E, AQV410EH)**



RoHS compliant

FEATURES

- 1 Form B output type**
- 2 60V type couples high capacity (0.55A) with low on-resistance (typ. 1Ω).**
- 3 Low on-resistance**
This has been realized thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-diffused and Selective Doping) method.



- 4 Controls low-level analog signals**
PhotoMOS feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

- 5 High sensitivity and low on-resistance**

Can control max. 0.55 A load current with 5 mA input current.
Low on-resistance of typ. 1Ω (AQV412EH).

- 6 Low-level off-state leakage current of max. 1 μA (AQV414E)**
- 7 Reinforced insulation 5,000 V type also available**

More than 0.4 mm internal insulation distance between inputs and outputs.
Conforms to EN41003, EN60950 (reinforced insulation).

TYPICAL APPLICATIONS

- Power supply
- Measuring equipment
- Security equipment
- Telephone equipment
- Sensing equipment

TYPES

	I/O isolation voltage	Output rating*		Package	Part No.				Packing quantity	
					Through hole terminal	Surface-mount terminal				
		Tube packing style				Tape and reel packing style			Tube	Tape and reel
		Load voltage	Load current		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side				
AC/DC dual use	1,500 V AC (Standard)	400 V	120 mA	DIP6-pin	AQV414E	AQV414EA	AQV414EAX	AQV414EAZ	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs.
		60 V	550 mA		AQV412EH	AQV412EHA	AQV412EHAX	AQV412EHAZ		
	5,000 V AC (Reinforced)	350 V	130 mA		AQV410EH	AQV410EHA	AQV410EHAX	AQV410EHAZ		
		400 V	120 mA		AQV414EH	AQV414EHA	AQV414EHAX	AQV414EHAZ		

*Indicate the peak AC and DC values.

Note: The surface mount terminal shape indicator "A" and the packing style indicator "X" or "Z" are not marked on the device.

RATING

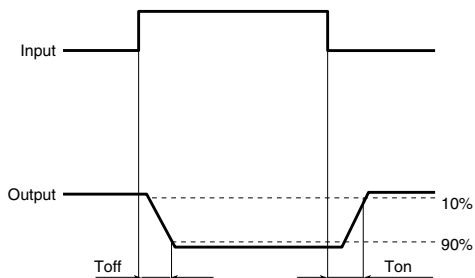
1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item	Symbol	Type of connection	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	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					
Load voltage (peak AC)	V_L		400 V	60 V	350 V	400 V		
Output	Continuous load current	I_L	A	0.12 A	0.55 A	0.13 A	0.12 A	A connection: Peak AC, DC B,C connection: DC
			B	0.13 A	0.65 A	0.15 A	0.13 A	
			C	0.15 A	0.8 A	0.17 A	0.15 A	
	Peak load current	I_{peak}		0.3 A	1.5 A	0.4 A	0.3 A	A connection: 100 ms (1 shot), $V_L = DC$
Power dissipation	P_{out}		500 mW					
Total power dissipation	P_T		550 mW					
I/O isolation voltage	V_{iso}		1,500 V AC		5,000 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	Type of connection	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Condition		
Input	LED operate (OFF) current	Typical	1.45 mA	1.9 mA			$I_L = Max.$		
		Maximum	3.0 mA						
	LED reverse (ON) current	Minimum	0.3 mA	0.4 mA			$I_L = Max.$		
		Typical	1.40 mA	1.8 mA					
LED dropout voltage	Typical	V_F	1.25 V (1.14 V at $I_F = 5 mA$)				$I_F = 50 mA$		
	Maximum		1.5 V						
Output	On resistance	Typical	R_{on}	A	26 Ω	1 Ω	18 Ω	25.2 Ω	$I_F = 0 mA$ $I_L = Max.$ Within 1 s on time
					Maximum	50 Ω	2.5 Ω	35 Ω	
		Typical	R_{on}	B	20 Ω	0.55 Ω	13 Ω	19 Ω	
					Maximum	25 Ω	1.3 Ω	17.5 Ω	
	Typical	R_{on}	C	10 Ω	0.3 Ω	6.5 Ω	10 Ω	$I_F = 0 mA$ $I_L = Max.$ Within 1 s on time	
				Maximum	12.5 Ω	0.7 Ω	8.8 Ω		12.5 Ω
Off state leakage current	Maximum	I_{Leak}	1 μA	10 μA			$I_F = 5 mA$ $V_L = Max.$		
Transfer characteristics	Operate (OFF) time*	Typical	T_{off}	—	0.7 ms	3 ms	1.5 ms	1.3 ms	$I_F = 0 mA \rightarrow 5 mA$ $I_L = Max.$
		Maximum			2.0 ms	8 ms	3.0 ms		
	Reverse (ON) time*	Typical	T_{on}	—	0.1 ms	0.3 ms			$I_F = 5 mA \rightarrow 0 mA$ $I_L = Max.$
		Maximum			1.0 ms	1.5 ms			
	I/O capacitance	Typical	C_{iso}	—	0.8 pF				f = 1 MHz $V_B = 0 V$
Maximum		1.5 pF							
Initial I/O isolation resistance	Minimum	R_{iso}	—	1,000 MΩ			500 V DC		

*Operate/Reverse time



RECOMMENDED OPERATING CONDITIONS

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

Item	Symbol	Recommended value	Unit
Input LED current	I_F	Standard type: 5 Reinforced type: 5 to 10	mA

■ These products are not designed for automotive use.

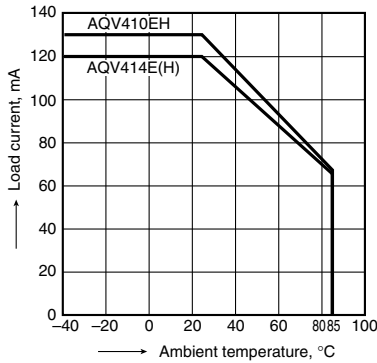
If you are considering to use these products for automotive applications, please contact your local Panasonic Corporation technical representative.

REFERENCE DATA

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

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

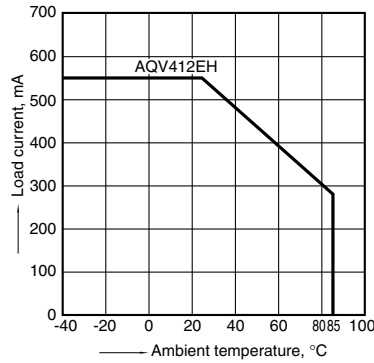
Type of connection: A



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

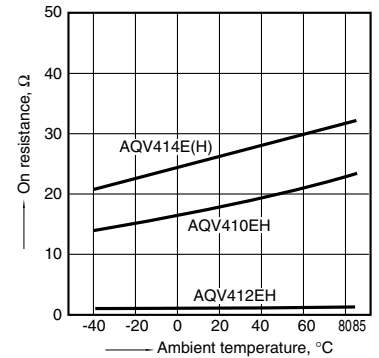
Allowable ambient temperature: -40°C to +85°C
-40°F to +185°F

Type of connection: A



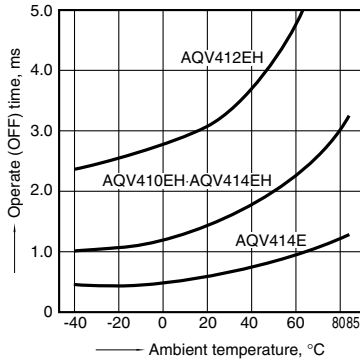
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 0 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



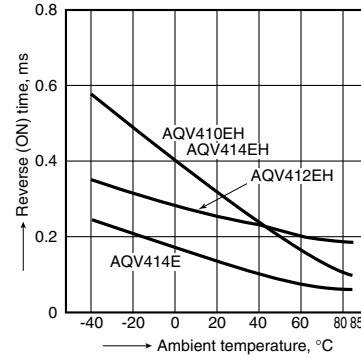
3. Operate (OFF) time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



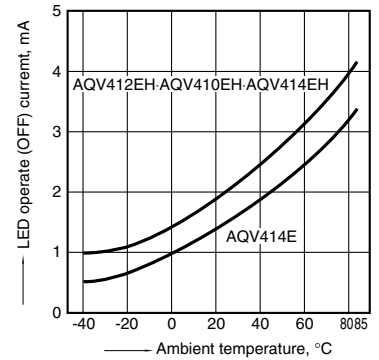
4. Reverse (ON) time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



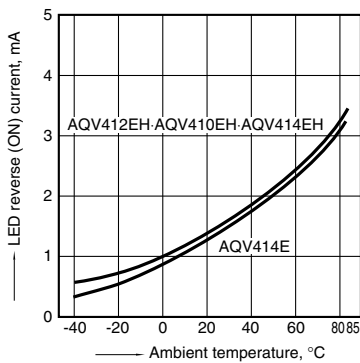
5. LED operate (OFF) current vs. ambient temperature characteristics

Load voltage: Max. (DC);
Continuous load current: Max. (DC)



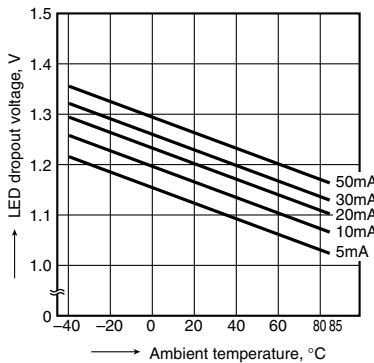
6. LED reverse (ON) current vs. ambient temperature characteristics

Load voltage: Max. (DC);
Continuous load current: Max. (DC)



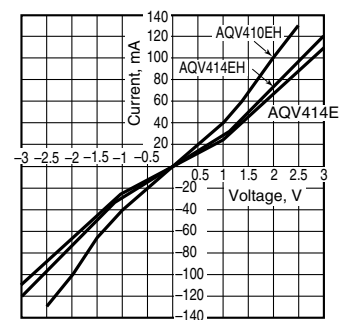
7. LED dropout voltage vs. ambient temperature characteristics

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



8-(1). Current vs. voltage characteristics of output at MOS portion

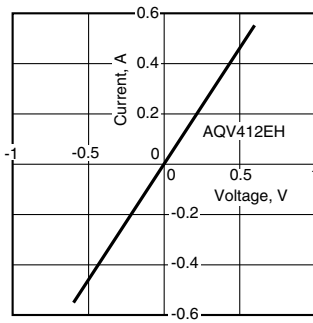
Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



GE 1 Form B (AQV414E, AQV410EH)

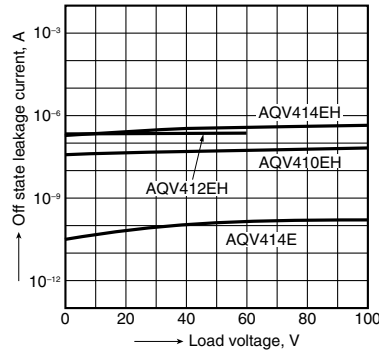
8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



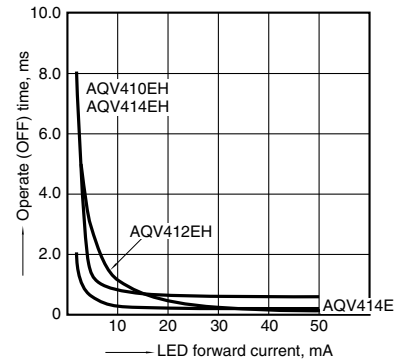
9. Off state leakage current vs. load voltage characteristics

Sample: All types;
Measured portion: between terminals 4 and 6;
LED current: 5 mA; Ambient temperature: 25°C 77°F



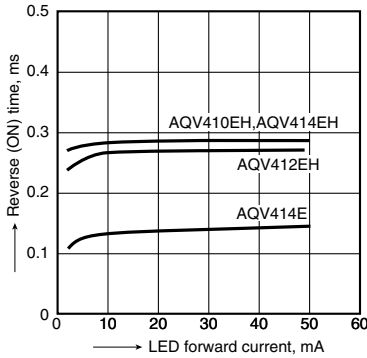
10. Operate (OFF) time vs. LED forward current characteristics

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



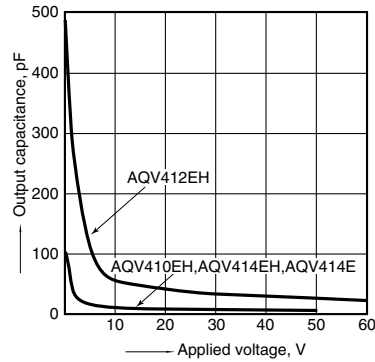
11. Reverse (ON) time vs. LED forward current characteristics

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





12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 4 and 6;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



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