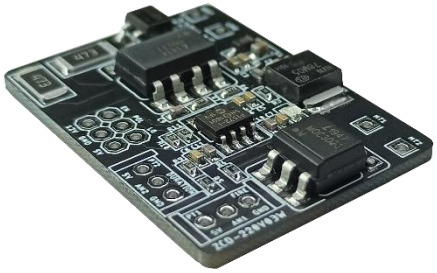
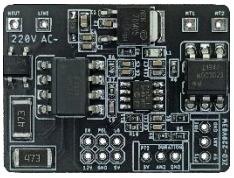
ZERO-CROSS DETECTOR

ZCD-220V03W-IFS

FEATURES



- High Voltage AC Main Input: 110V/220V
- Programmable Firing Features:
  - Firing Starting Point.
  - Firing Duration.
- Firing Tracking Logic Output (DC): LO
- High Power Triac Output (AC): 300 mW
- Adjustable Output Polarity: POL
- Active-Inactive Control: EN
- Wide DC Input Range: 5V-24V
- Isolated Input and Output:
  - 5000 RMS Voltage @[t:1min, R.H.:%50max, 25°C].
  - 1 µA Leakage Current @[3kV, t:5sec, R.H.:%45, 25°C].



APPLICATIONS

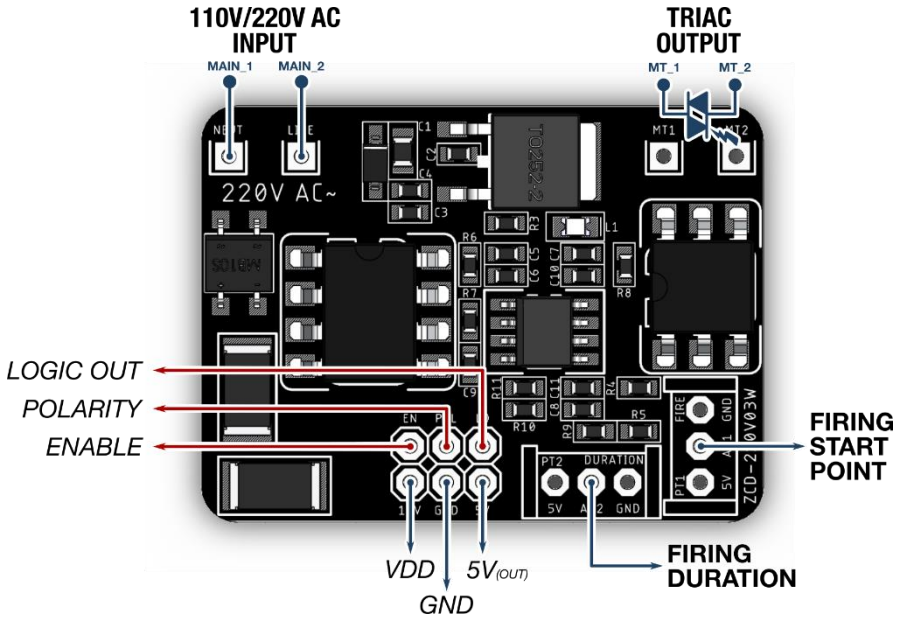
- Light Intensity Dimmer Applications.
- Micro Controller Interface Applications.
- Motor Control.
- Solid-State Relays.
- Solenoid/Valve Control.
- Temperature Control.
- AC Power Switching.

GENERAL DESCRIPTION

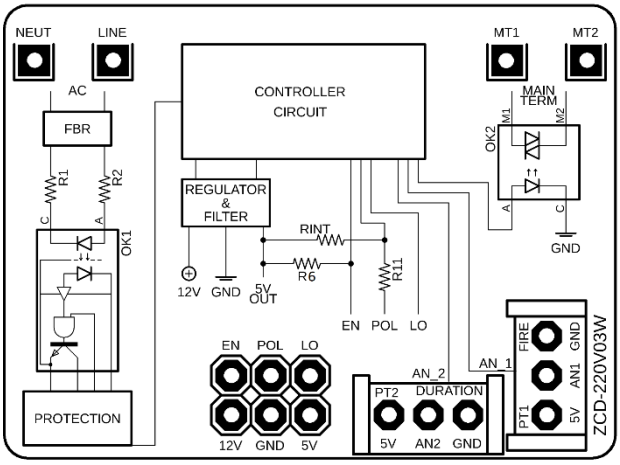
ZCD-220V03W-IFS is a 110V/220V RMS AC voltage zero crossing sensor where you can configure multiple signal features. It detects the zero-crossing point where the AC voltage applied as input does not make a potential difference and fire the Triac at its output at the determined firing start point. Firing duration is also one of the adjustable signal features. You can find the details of how the firing features are configured at **Figure 1**.

All features related to the firing can be controlled by circuit elements such as trimpot as well as an external MCU. The firing process can be followed logically from the LO output. Two low leakage current and high voltage opto-isolators are used at the input and output of the module to ensure the safety of the applications.

DESCRIPTION WITH IMAGE



PIN CONFIGURATION

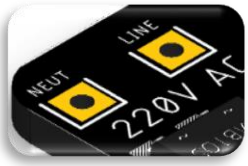


OK1 - 6N137 OPTOISO 5KV SMD8 LITEON | **OK2** - MOC3023S-TA1 OPTOC. TRIAC OUTPUT 400V 6SMD LITEON | **R1**, **R2** - 47K Ohms 1% 1W AUTOMOTIV 100PPM 2512 | **R6, RINT** - 4.7K Ohms 5% 1/10W-S 100PPM 0603 | **R11** - 220 Ohms 1% 1/10W AUTOMOTIV 0603

Pin		*Descriptions*	*Notes*
INPUTS	N, L	110V/220V RMS AC Main Input.	-
	$12V$	5V-24 DC Signal Input.	Nominal operating voltage is 12V.
	GND	DC Signal Reference Input.	-
	EN	5V: Enable, 0V: Disable	If not used, may be left without connection.
	POL	5V: Active-High, 0V: Active-Low	
	$AN1$	Firing Starting Point Analog Input.	A trimpot may be connected to PT1 and PT2, or an external MCU's DAC output may be used.
	$AN2$	Firing Duration Analog Input.	
OUTPUT	$5V$	Linear 5V Output.	Max. 200mA continuous current can be sink.
	LO	Logic Output.	Firing process can be followed from this output.
	$MT1,2$	Main Terminals Of Output Optocouplor.	Triac Terminals.

Table 1: *Pin Configurations.*

Detailed Descriptions of Inputs and Outputs



Neut, Line: It is 110V / 220V RMS AC signal input. Neutral (Neut) and Hot (Line) separation of inputs is purely for security purposes. It is important to pay attention to this to minimize the risk when accidental hand contact occurs after applying the high voltage to the module.

R1 and R2 resistors (1W and 2512 SMD Package) are selected according to the 220V AC Signal level. These resistors can be changed according to the different voltage levels in Table 2 below. Or 0Ω is selected as R1 and R2 resistors, and resistors can be connected in series to the signal input of the module.

AC RMS Signal	*R1, R2 Resistance Value*	*Power Dis. (Max)*	*Peak Current (Max.)*
220V	47 KΩ	0.51 W	3.2 mA
120V	22 KΩ	0.32 W	4.0 mA
48V	4.7 KΩ	0.25 W	7.0 mA
24V	2.2 KΩ	0.12 W	7.0 mA
12V	1.0 KΩ	0.05 W	7.0 mA
5 V	0.3 KΩ	0.02 W	7.0 mA

Table 2: *R1 and R2 Resistance Values According to Different AC RMS Signal Inputs.*

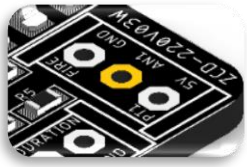
Note: When applying different AC RMS signal levels or different signal forms, resistance calculation should be done so that the peak current level does not exceed 7 mA.

Note: If the input signal will be provided by a transformer, it should be noted that the transformer material has the best linear magnetization feature according to the operating frequency and ambient conditions. In this way, as much sinusoidal AC current signal can be obtained at the output of the transformer as possible. However, it should be remembered that there will be a phase difference between current and voltage at the output of the transformer.

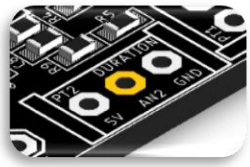
12V: It is a supply input that can apply DC voltage between 5V and 24V. Nominal operating voltage is 12V level.

EN: It is the input reserved to put the module into active / passive state. Controlled at the TTL threshold level. When 2.7V (minimum) - 5V (maximum) voltage is applied, the module becomes active, when 0 - 0.5V is applied, the module becomes passive. Internal pull-up resistance is available. If the EN input is not used, it can be left without any connection. However, it is recommended to realize 5V connection in order to best protect from noise.

POL: It is the input of the module that is reserved to control the output polarity. Controlled at the TTL threshold level. Active voltage level is selected as 5V when 2.7V (minimum) - 5V (maximum) voltage is applied, and active output level is chosen as 0V when 0 - 0.5V is applied. Internal pull-up resistance is available. If the POL input is not used, it can be left without any connection. However, it is recommended to perform 5V connection in order to be protected from noise in the best way.



AN1: It is the input reserved for the control of the firing start point. It is controlled as analog. This input is kept internally at 0V with weak current. At this level the start of firing is selected as the zero crossing point. You can change the value at this input by placing the set resistor (Max 2 KΩ) on the circuit board as specified as PT1 or by using the DAC output (common GND connection forgotten) of an external MCU.



AN2: It is the input reserved for the control of the firing duration. It is controlled as analog. This input is kept internally at 0V with weak current. At this level, the firing duration is chosen as 0. Firing time at 2.5V level is chosen as half of the firing period (50%). You can change the value at this input by placing the resistor (Max 2 KΩ) set in the location indicated as PT2 on the circuit board or by using the DAC output (common GND connection forgotten) of an external MCU.

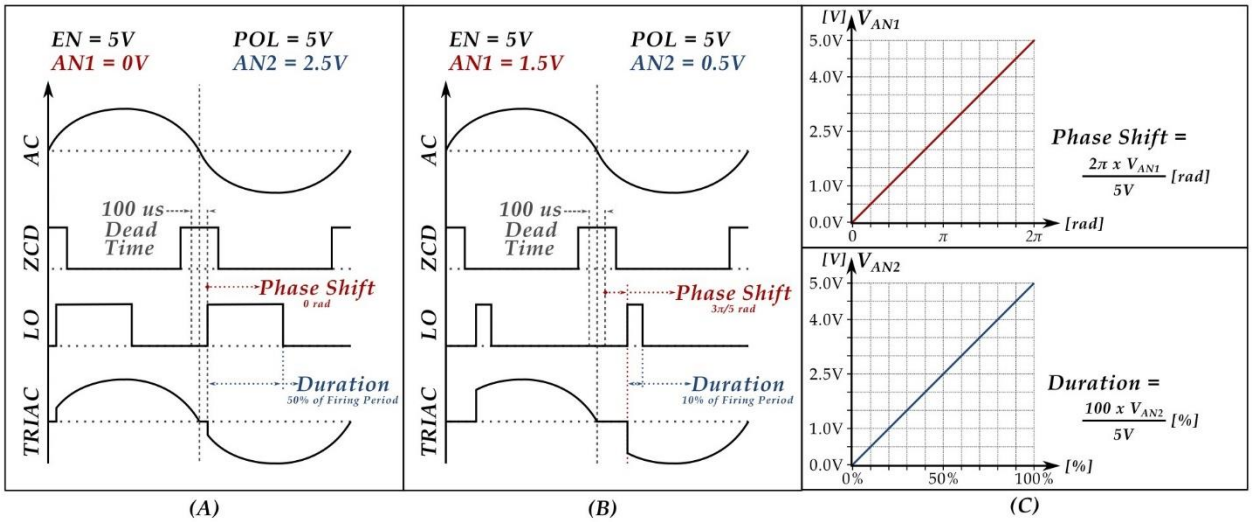
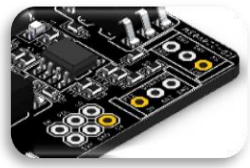
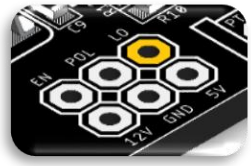


Figure 1: ***(A)*** *LO and Triac Outputs when AN1 and AN2 are at 0V and 2.5V.* ***(B)*** *LO and Triac Outputs when AN1 and AN2 are at 1.5V and 0.5V.* ***(C)*** *Indication of Firing Phase Angle and Firing Duration Duration Changes According to AN1 and AN2 Voltage Levels.*



5V: The output from the regulator module on the circuit board. It should be noted that the sum of continuously drawn currents at all points indicated on the card as 5V should not exceed 200 mA. The 5V outputs are installed so that they can be used to control the EN and POL inputs, use adjustable resistors at the AN1 and AN2 inputs, and can be used to supply MCU that if control is to be provided by an external MCU.



LO: It is the output that is reserved to track the firing point and its duration. LO output logically indicates the firing process.

MT1, MT2: Main Terminals Of Output Optocouplor.

Example Connection Schemes

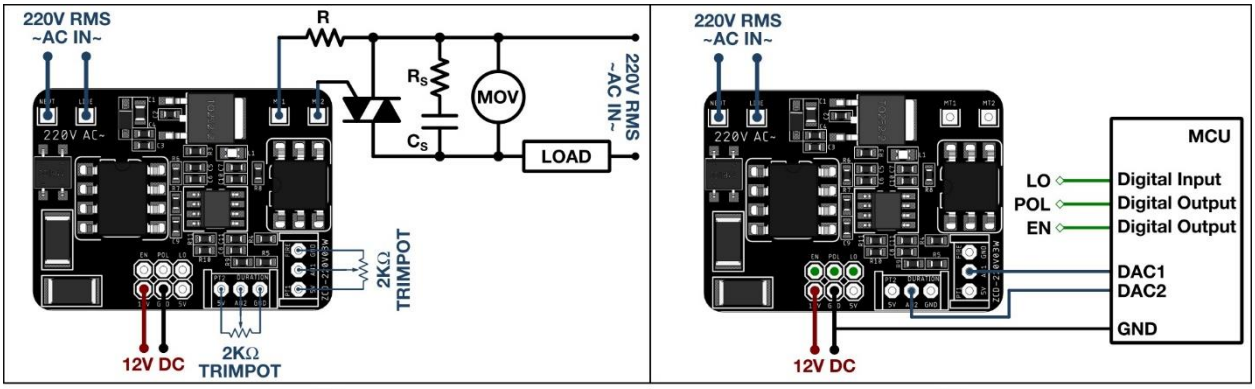


Figure 2: ***(A)*** *Operating the Module Using Adjustable Resistor.* ***(B)*** *Using the Module by an External MCU.*

ELECTRICAL SPECIFICATIONS

∏ Pushing the device to operate above the "Max." listed in the table below may cause the device to overheat and to take up permanent damage. It is inconclusive that the device will function beyond the operating limits as set out in this technical document. Prolonged exposure to work under "maximum" rating conditions may affect device reliability.

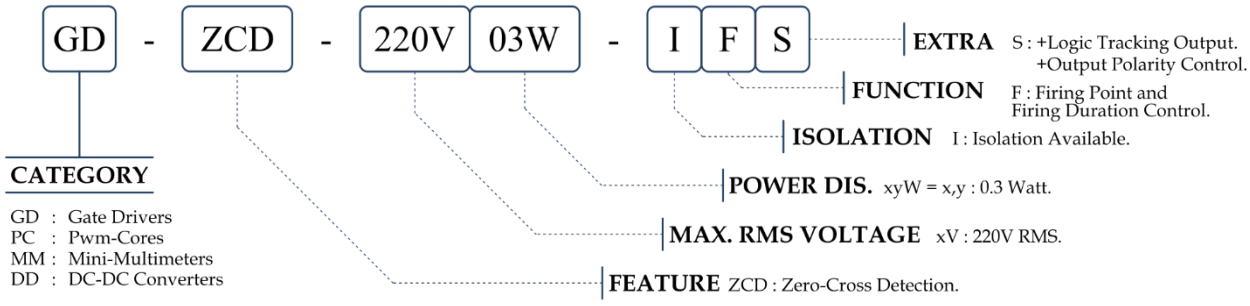
Table 3: *Electrical Characteristics.*

Conditions: Unless Otherwise Noted, $T_O = +25^oC$, $V_{supply} = 12V$, V_{rms} = 220V AC and R_1 & $R_2 = 47\ K\Omega$.								
Parameters		**Sym**	**Min**	**Typ**	**Max**	**Units**	**Condition**	
Input								
AC RMS Main Input		L, N	5	–	220	V	see **Table 2**	
AC Input Peak Current		$I_{AC,peak}$	3	7	20	mA		
DC Supply Voltage		V_{supply}	5	12	24	V		DC
Continuous Input Current (NC)		$I_{C,supply,idle}$	–	16,2	–	mA	No AC IN	
Input Current (3ms Crossing)		$I_{C,supply}$	–	32,7	–	mA	@%50 Duty	
Logic Input Threshold Volt., High	EN	V_{THH-EN}	2,7	–	5	V		
	POL	$V_{THH-POL}$						
Logic Input Threshold Volt., Low	EN	V_{THL-EN}	0	–	0,5	V		
	POL	$V_{THL-POL}$						
Analog Inputs, AN1 & AN2		V_{AN1} , V_{AN2}	0	–	5	V		
Output								
5V Output Current Capability		$I_{T,5V}$	–	–	200	mA	**Note 1**	
Logic Output, LO		V_{LO}	0	–	5	V	Polarity Active-High	
Off−State Output Terminal V.		V_{DRM}	–	–	600	V		
Peak On−State Voltage		V_{TM}	–	–	2.5	V	$I_{TM,peak}$: $100mA$	
Peak Non−Repetitive Surge C.		I_{TSM}	–	–	1	A	100µs@120Hz	
Peak Blocking Current		I_{DRM}	–	–	100	nA	$V_{DRM} = 600V$	
Power Dissipation, MT1 & MT2		$P_{D,MT1,2}$	–	–	330	mW	**Note 2**	
Switching								
Input Frequency		$f_{L,N}$	–	50/60	1000	Hz	Sine wave	

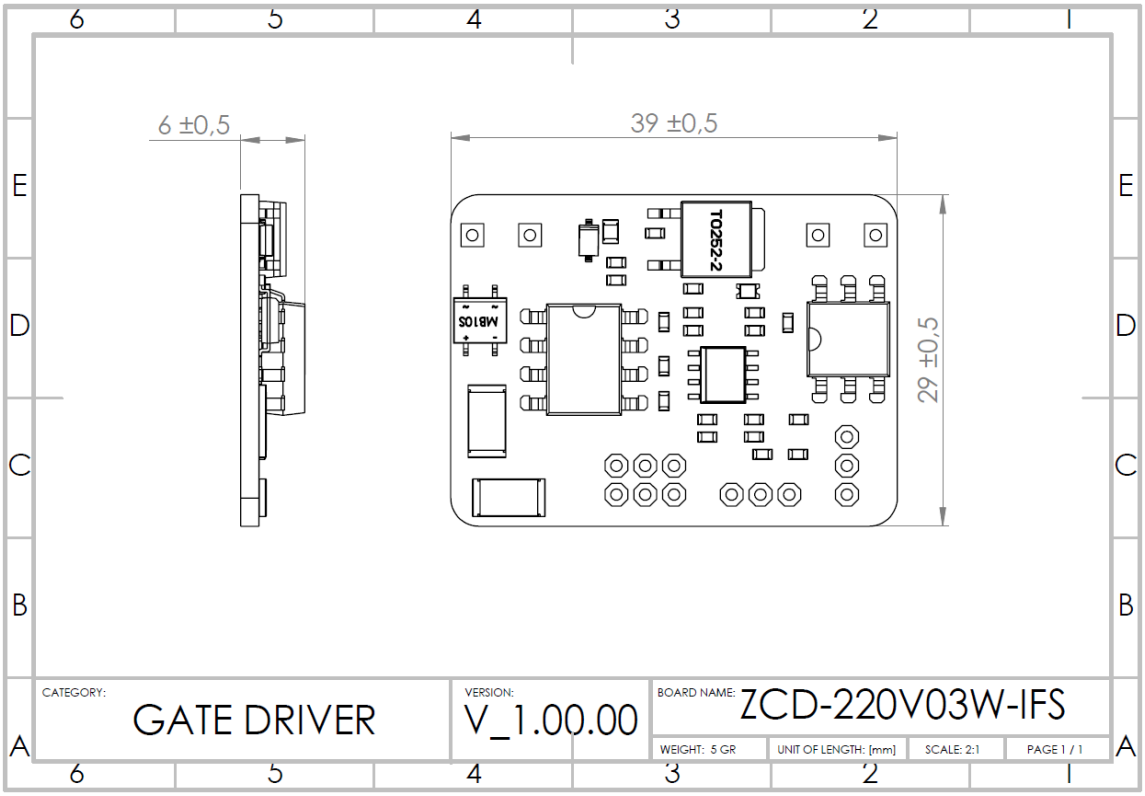
Note1 **:** It expresses the continuous current value that can be sinked from all 5V signal outputs.

Note2 **:** It refers to the total power that can be spent on the triac.

PRODUCT CODE



TECHNICAL DRAWING



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