AC Voltage Zero Cross Detector

This project provides AC voltage zero-cross timing detection and a DC voltage after diode rectification with high accuracy. Possible applications for such circuits are AC motor controllers, AC lamp controllers, AC Dimmer Controllers, Home Appliances. The circuit outputs a zero-cross signal from 90 Vac to 264 Vac input. The project is based on BM1Z102FJ chip which outputs a high precision zero-cross timing of targeted AC voltage and a DC voltage after diode rectification of high accuracy. The project also includes high voltage offline AC to DC converter chip BM2P129TF.

AC Voltage Zero Cross Detection

By monitoring the voltage between the VH_AC1 and VH_AC2 pins, this IC outputs the zero-cross point of AC voltage from the ACOUT pin. These pins have a built-in monitor circuit that tolerates 600 V and they realize high reliability and low power consumption. The ACOUT pin performs an n channel open drain output and this makes it possible to support various applications. It is necessary for the VH_AC1 pin to be connected to the N side of the AC input and for the VH_AC2 pin to be connected to the L side of the AC input

Note: The circuit operates with potentially lethal voltages, it is advisable to use an isolated probe for measurement using an oscilloscope

Output Delay Setting (DSET Pin Setting) -Resistor R7

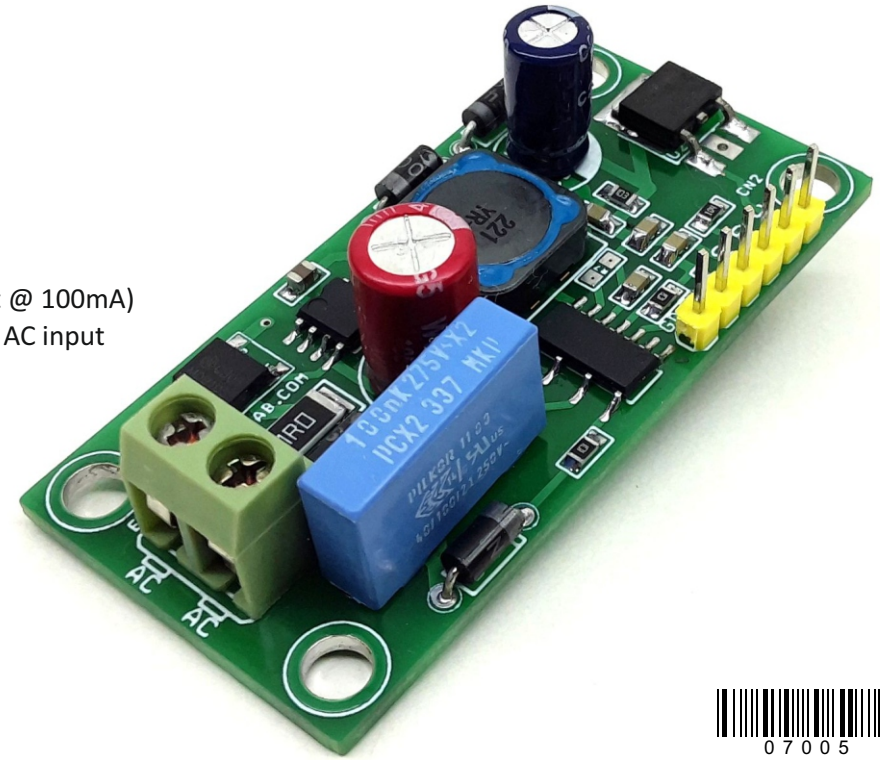
- R7 OPEN DELAY 0uS
- R7 330K 200uS
- R7 68K -200uS
- R7 0 OHMS -480uS

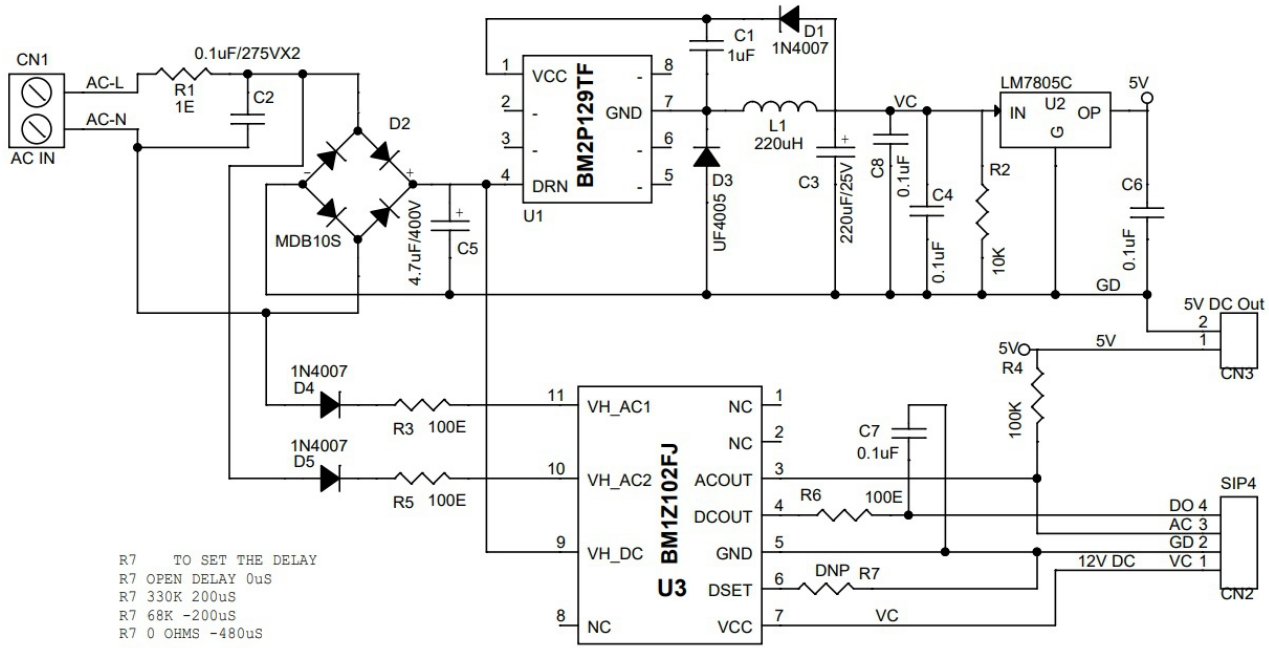
DC Out (DO) CN4 Pin 4

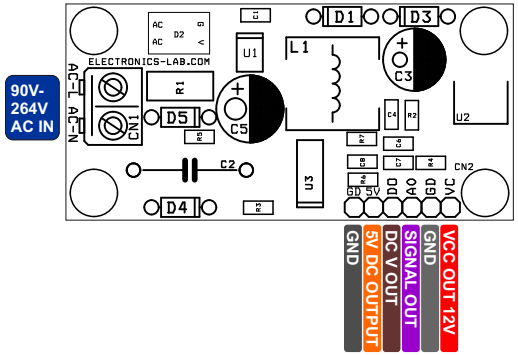
- 110V AC Outputs 1.1V DC
- 230V AC Outputs 3.3V DC

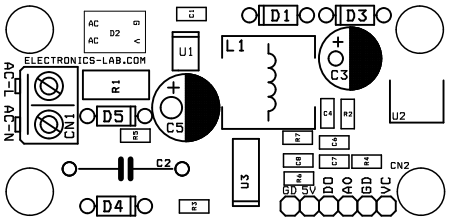
Features

- Supply Input 90V AC to 264V AC
- On Board AC to DC Offline Converter (90VAC-264V AC input, 12V DC Output @ 100mA)
- DC Output about 1/100 voltage Approx. 1.1V with 110V AC, 3.3V with 230V AC input
- Input Frequency Response 47Hz to 63Hz
- Provides Accurate 50Hz Square wave with 230V/50Hz AC Input
- Default Output Pulse Delay time = 0uS (Can be Adjust Using R7)
- Aux DC Supply Output VCC-12V and 5V DC @ Maximum Load 100mA
- PCB Dimensions 58.90MM X 28.73MM

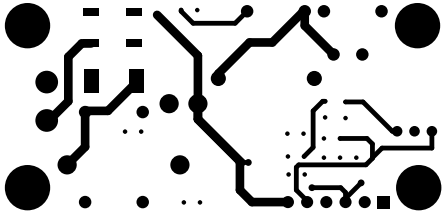


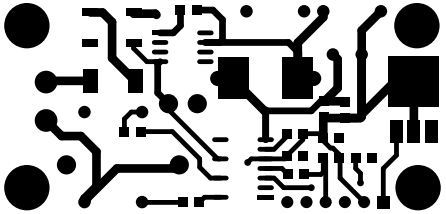

CN1
AC IN
AC-L
AC-N
0.1uF/275VX2
R1
1E
C2
D2
MDB10S
4.7uF/400V
C5
U1
BM2P129TF
VCC
GND
DRN
C1
1uF
D1
1N4007
D3
UF4005
L1
220uH
C3
220uF/25V
VC
C8
0.1uF
C4
0.1uF
LM7805C
U2
IN
OP
GD
5V
R2
10K
C6
0.1uF
5V DC Out
CN3
5VO
R4
100K
1N4007
D4
R3
100E
1N4007
D5
R5
100E
U3
BM1Z102FJ
VH_AC1
VH_AC2
VH_DC
NC
ACOUT
DCOUT
GND
DSET
VCC
C7
0.1uF
R6
100E
DNP
R7
12V DC
SIP4
DO 4
AC 3
GD 2
VC 1
CN2
R7 TO SET THE DELAY
R7 OPEN DELAY 0uS
R7 330K 200uS
R7 68K -200uS
R7 0 OHMS -480uS


90V-
264V
AC IN
ELECTRONICS-LAB.COM
AC_L
AC_N
CN1
R1
D5
C5
C2
D4
U1
L1
D1
D3
C3
U2
U3
CN2
5V
GND
DO
AO
GD
VC
GND
5V DC OUTPUT
DC V OUT
SIGNAL OUT
GND
VCC OUT 12V



SILK SCREEN TOP


BOTTOM LAYER


TOP LAYER

PCB DIMENSIONS 58.90MM X 28.73MM

BOM						
NO	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL	PHOENIX	DIGIKEY	277-1247-ND
2	1	CN2	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
3	1	CN3	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
4	1	C1	1uF/25V SMD SIZE 0895	MURATA/YAGEO	DIGIKEY	
5	1	C2	0.1uF/275VX2	KEMET	DIGIKEY	399-9651-ND
6	1	C3	220uF/25V	UNITED CHEMIC	DIGIKEY	565-3447-ND
7	4	C4,C6,C7,C8	0.1uF/50V SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
8	1	C5	4.7uF/400V	WURTH	DIGIKEY	732-8886-1-ND
9	3	D1,D4,D5	1N4007	MICRO-COM	DIGIKEY	1N4007MSTR-ND
10	1	D2	MDB10S	ONSEMI	DIGIKEY	MDB10SFSCT-ND
11	1	D3	UF4005	VISHAY	DIGIKEY	UF4005-M3/54GICT-ND
12	1	L1	220uH	WURTH	DIGIKEY	732-2995-1-ND
13	1	R1	1E 5% 2W SMD SIZE 2512	MURATA/YAGEO	DIGIKEY	
14	1	R2	10K 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
15	3	R3,R5,R6	100E 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
16	1	R4	100K 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
17	1	R7	OPEN/DNP			
18	1	U1	BM2P129TF	ROHM	DIGIKEY	BM2P129TF-E2CT-ND
19	1	U2	LM7805 OR MC78M05	ONSEMI	DIGIKEY	MC78M05CDTGOS-ND
20	1	U3	BM1Z102FJ	ROHM	DIGIKEY	846-BM1Z102FJ-E2CT-ND