SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

ENGINEERING CLINIC – REPORT

(ANNUAL REPORT 2024- 2025)

Submitted by
Dr. D.Sivaraj
Assistant Professor
Faculty Coordinator

Preface

The Engineering Clinic of the Department of Electrical and Electronics Engineering at Sri Manakula Vinayagar Engineering College functions as a structured academic platform designed to strengthen students' technical competence through experiential and application-oriented learning. The initiative is guided by the Dean, Head of the Department, and dedicated faculty coordinators, with the active support of committed teaching staff. It provides a systematic environment where undergraduate students participate in organized technical activities and hands-on training sessions. The clinic primarily focuses on the troubleshooting and maintenance of real-time electrical and electronic appliances, allowing students to connect theoretical concepts with practical implementation.

Through these activities, students gain exposure to fault identification, component-level analysis, and system-level diagnostics. They are trained to follow structured problem-solving methodologies, use appropriate testing instruments, and adopt safe working practices. The Engineering Clinic also encourages interdisciplinary learning, technical documentation, and collaborative teamwork among students. By working on real-world problems, students improve their analytical thinking, technical accuracy, and decision-making skills.

In addition, the clinic promotes professional ethics, responsibility, and effective communication, which are essential qualities for modern engineers. Regular technical sessions, demonstrations, and guided practice help students build confidence in handling electrical and electronic systems. The initiative not only enhances practical knowledge but also prepares students to meet industry expectations. Overall, the Engineering Clinic plays a significant role in producing competent, industry-ready engineers and contributes to the academic excellence and technological development of the institution.

Dr. D. Raja
Program co-convener

Mr. G. Rajavel
Program Coordinators

HoD/ EEE
(Dr.P.Jamuna)

Dr. AA. Arivalagar
IQAC coordinator

Dean Academics
(Dr.S.Anbumalar)

Director cum Principal
(Dr.V.S.K.Venkatachalapathy)

COLLEGE VISION AND MISSION

Vision
To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission
M1: Quality Education:
To provide comprehensive academic system that amalgamates the cutting edge technologies
with best practices.
M2: Research and Innovation:
To foster value based research and innovation in collaboration with industries and institutions
globally for creating intellectuals with new avenues.
M3: Employability and Entrepreneurship:
To inculcate the employability and entrepreneurial skills through value and skill based training.
M4: Ethical Values:
To instill deep sense of human values by blending societal righteousness with academic
professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

Vision
To promote proficiency in the field of Electrical and Electronics Engineering by creating a stimulating environment for research, innovation and entrepreneurship
Mission

M1: Quality Education: To impart high quality technical education with problem solving capabilities by innovative pedagogy in emerging technologies.

M2: Industrial and Societal Needs: To cater the dynamic needs of the industry and society by strengthening industry-institute interaction.

M3: Research and Innovation: To nurture the spirit of research attitude by carrying out innovative technologies pragmatically.

M4: Placement and Entrepreneurship: To inculcate the professionalism in career by advancing synergetic skills to compete in the corporate world.

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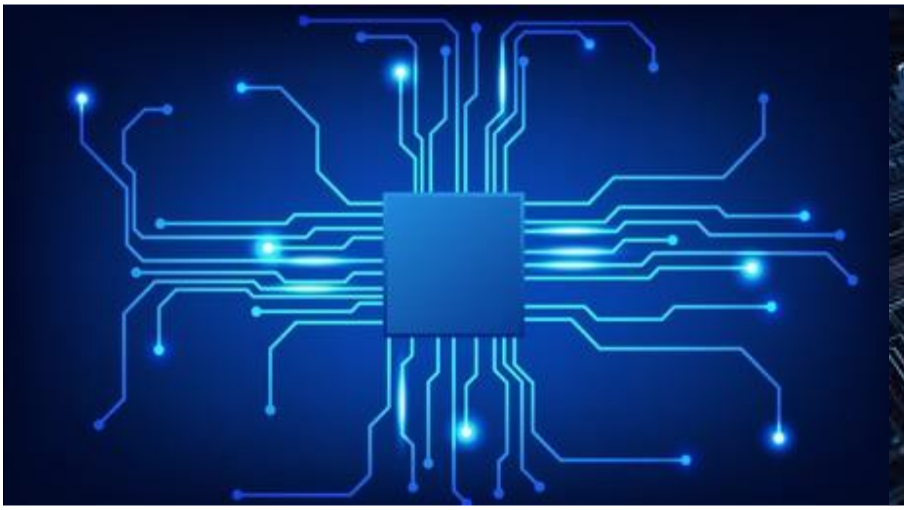


NAME OF THE CLUB: Engineering Clinic

Objective of Engineering clinic club

The objective of the "Engineering Clinic" is to form a student's forum those who are interested in handling Electronics gadgets/Home appliances and in turn to troubleshoot the Electronics gadgets/Home appliances which are not in working conditions. Also, this forum will help to enhance students' skills in multidisciplinary aspects.

Functions of Engineering Clinic

- Hands on - Students apply what they are learning about.
- Integrated - Demonstrate correlations with supporting course work.
- Multidisciplinary - Involve students as a community of problem solvers.
- Teamwork - Emphasize the advantage of effective teaming.
- Entrepreneurial - Reinforce value-based engineering.
- Contextual - Help students understand the big picture.
- Every Saturday Faculties have to explain about the troubleshooting of domestic electrical appliances.

- The faculty members have to train the students to identify the Fault in an electrical appliance.
- The Faculty members need to provide the hands on training to the students.

Student Members of the Club :

All I Year, II Year & III Year students of the Department

OFFICE BEARERS AND THEIR PORTFOLIOS

SL.NO	NAME OF THE FACULTY	DESIGNATION	POSITION
1.	Dr.S. Anbumalar	Dean Academics	Program Convener
2.	Dr. P. Jamuna	Professor / EEE	Program co-convener
3.	Dr. D. Raja	Professor / EEE	Program co-convener
4.	Mr. R. Ragupathy	AP/EEE	Program Coordinators
5.	Mr. G. Rajavel	AP/EEE	Program Coordinators
6.	Dr.S. Ganesh Kumaran	Asso.Prof	Member
7.	Dr.Sivaraj	AP/EEE	Member
8.	Mr.A. Janagiraman	AP/EEE	Member
9.	Mr.K. Thangaraj	AP/EEE	Member
10.	Mr.J.Muruganandham	AP/EEE	Member
11.	Mr.Adrien Periyanayagam	AP/EEE	Member
12.	Mr.I. Shivasankkar	AP/EEE	Member
13.	Mr.R. Vignesh	AP/EEE	Member
14.	Mrs.K.Kavinelavu	AP/EEE	Member
15.	Ms. Abinayasaraswathi	AP/EEE	Member
16.	Mr.Elanthamizh	AP/EEE	Member

Dr. D.Rajaj
Professor
Faculty Co-convener

Mr .G. Rajavel
Assistant Professor
Program Coordinator

Dr.s.Ganesh Kumaran
Associate Professor
Member

Mr.A.Janagiraman
Assistant Professor
Member

Mr.K.Thangaraj
Assistant Professor
Member

Mr.J.Muruganandham
Assistant Professor
Member

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
ENGINEERING CLINIC

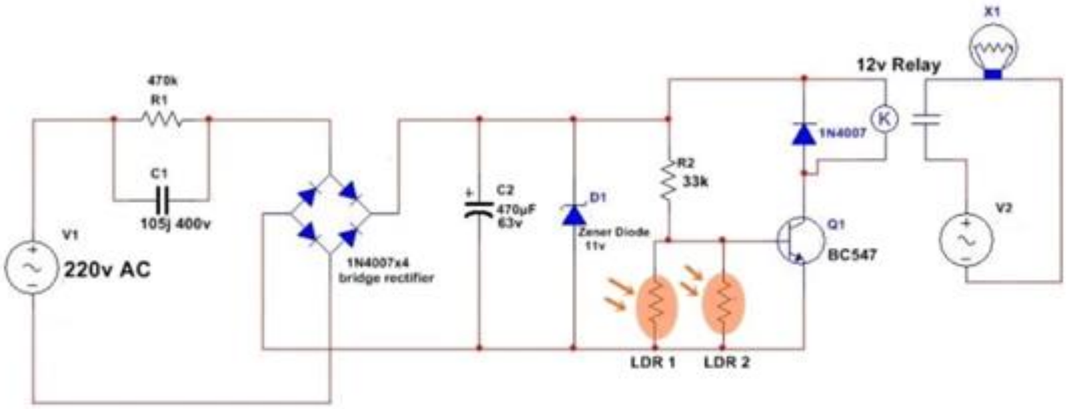
Academic Year	:	**2024 – 2025**	
Date/Day	:	**31.08.2024/Saturday**	**Year/Sem/Sec: III/V/A**
Activity	:	**TRANSFORMERLESS 230V LIGHT ACTIVATED SWITCH**	

INTRODUCTION:

- Voltage Step-Down: The circuit uses a capacitor to step down the voltage from 230V to a lower level, eliminating the need for a traditional transformer.
- Capacitor Impedance: The capacitor's impedance creates a significant voltage drop without heat dissipation, making it a more efficient solution than using a resistor.
- AC-DC Conversion: The reduced voltage is processed through a rectifier and filter circuit, converting it from AC to DC for use in the switching circuit.
- Automatic Switching: A Bipolar Junction Transistor (BJT) functions as a switch, automatically turning on the lamp when the Light Dependent Resistor (LDR) detects low light levels.
- Energy Efficiency: The circuit is widely used in applications like automatic street lighting, providing efficient and responsive illumination.

APPLICATIONS:

- Automatic street lighting
- Garden and landscape lighting
- Security lighting
- Pathway and walkway illumination
- Automated indoor lighting
- Energy-saving lighting solutions



WORKING:

- The input 230V is fed into 1micro farad Capacitor (non polarized with high voltage rating and reactance) used which will step down 230V into 12V.
- Here the property of capacitance reactance plays a vital role in step down of AC voltage as input frequency is low in nature, reactance will be high so a maximum voltage drop can be made as per design.
- Then the voltage is fed into full wave bridge rectifier to convert AC into pulsating DC.
- Then they are passed through capacitor to filter the output of rectifier.
- Then its connected to BC547's Collector through 1N4007 diode and Voltage Divider circuit(with resistor and LDR) to feed supply to Base.
- If light falls on LDR, then current pass to ground instead to base so BJT turns off and relay will not turned on.
- If no light falls on LDR, base is triggered BJT switch turns on and supply flow through coil of relay and lamp get turns ON.

SUMMARY:

If BJT conducts lamp turns on when no light falls on LDR. If light falls on LDR, BJT turns off and lamp turns off.

DESIGN CALCULATION:

CALCULATING R_1:

$$R_1 = \frac{V_{AC}}{I_{max}}$$

$$R_1 = \frac{230}{10^{-3}} = 230K\Omega$$

CALCULATING C_1:

$$C_1 = \frac{1}{2\pi X_C}$$

$$X_C = \frac{V_{rms}}{I_{rms}} = \frac{230}{I_{rms}}$$

$$I_{rms} = \frac{P}{V} = \frac{0.24}{12} = 0.02mA$$

$$X_C = \frac{230}{0.02} = 11.5K\Omega$$

$$C_1 = \frac{1}{2\pi(11000)} = 2.89uF \simeq 1uF$$

1uF is used for standardization

CALCULATING C_2:

$$C_2 = \frac{I}{2F\Delta V} = \frac{0.02}{2(50)(1)}$$

$$C_2 = 200uF$$

$C_2 \simeq 470uF$ *is used* for ensuring minimal ripple.

CALCULATING V_{dc}:

V_{dc}=V_{rms}*1.414 - V_{diode_drop}

V_{dc}= 12*1.414 - 1.4

Total voltage drop across each diode is 0.7V

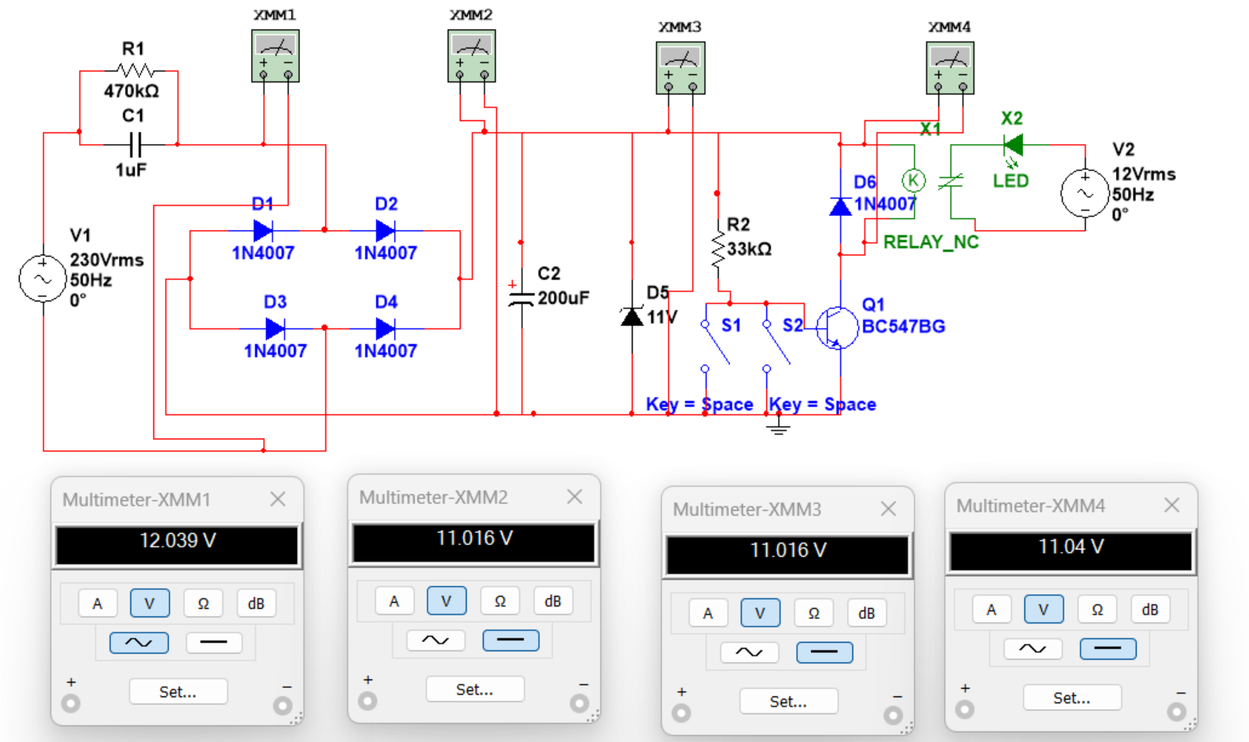
Thus, the voltage drop in each half cycle is 1.4V

V_{dc}=15.5V

COMPONENTS REQUIRED FOR CIRCUIT:

S.No:	Components	Specification	Quantity
1	1.5 sq.mm (Dual Core)	-	1 metre
2	Resistor	470KΩ,33KΩ	1 each
3	Diode	1N4007	5
4	Capacitor	105J/400V, 470µF/63V	1 each
5	Zener Diode	-	1
6	Transistor	BC547	1
7	LED	5mm (Any Colour)	1
8	2 Pin Top	-	1
9	Matrix PCB	Zero matrix	1
10	LDR	-	2
11	Single Strand Wire	-	1 metre

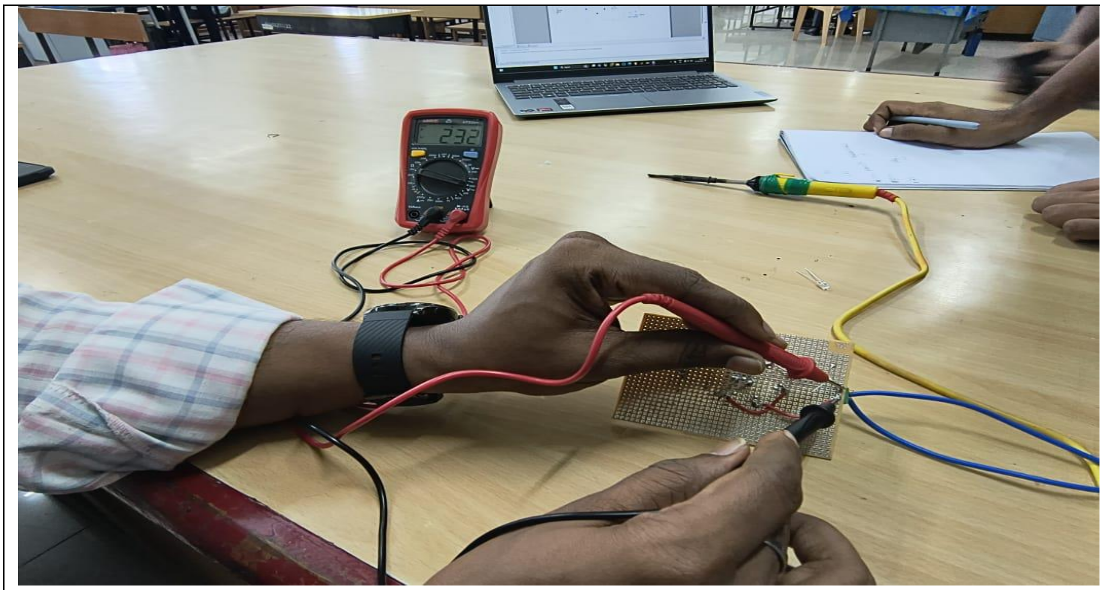
SIMULATION DIAGRAM:

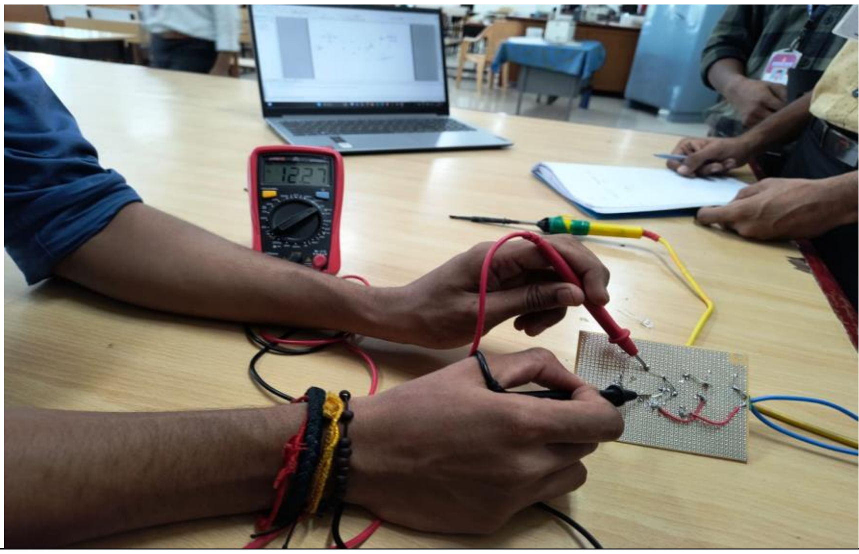


OUTPUT:

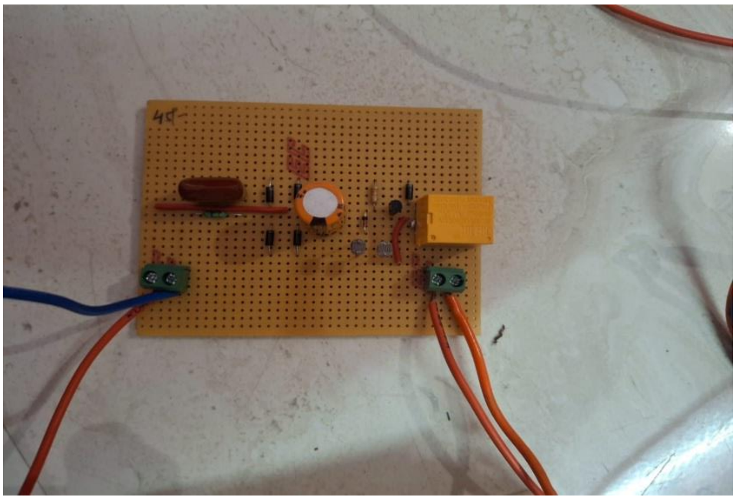
PARAMETERS	THEORETICAL	SIMULATION	PRACTICAL
Input Voltage	230V	230.169V	232V
Step down input voltage	12V	12.04V	12.1V
Voltage after rectifer without capacitor	15.5V	11.2V	14V
Voltage after rectifier with filter	10.8V	10.99V	12.1V
Voltage across Relay	12V	11.01V	12.2V
Voltage across zener diode	15V	11.01V	12.2V

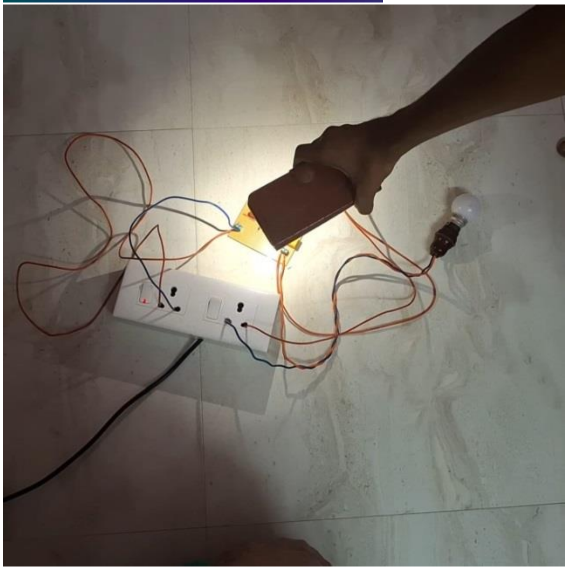
Students of EEE Department, III-year, A section are performing the construction of Transformerless 230V Light Activated Switch circuit under the guidance of Mr.G.RAJAVEL AP/EEE and Mrs.A.S.AMATHULLAH

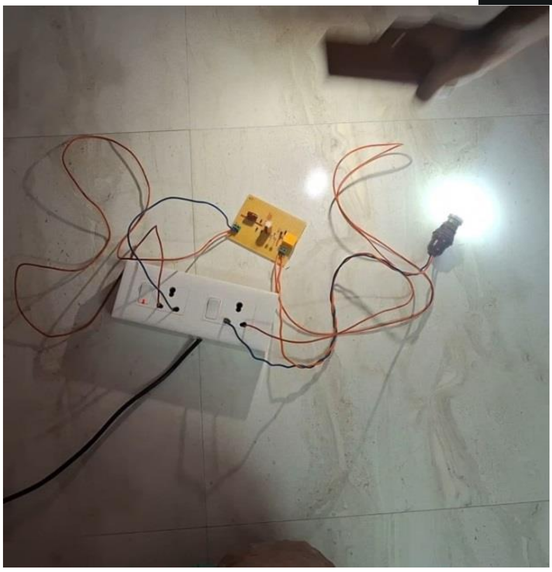

Here the circuit input is tested whether the rated 230V supply is fed as input. As the input appears here is 230V, it stepped down.
Here the voltage across the bridge rectifier is tested after the input voltage is stepped down and converted to DC from AC.



Here the voltage across the relay is nearly of 12V which is actual output required so to activate relay if no light falls on LDR.







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PANJIT SEMI CONDUCTOR

1N4001-1N4007

PLASTIC SILICON RECTIFIERS

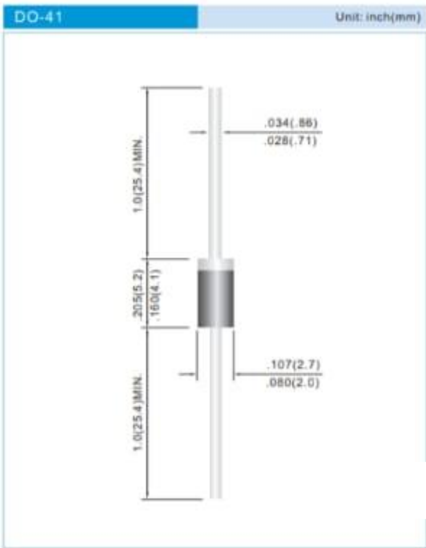
VOLTAGE 50 to 1000 Volts **CURRENT** 1.0 Ampere

FEATURES

- Low forward voltage drop
- High current capability
- High reliability
- High surge current capability
- Exceeds environmental standards of MIL-S-19500/228
- In compliance with EU RoHS 2002/95/EC directives

MECHANICAL DATA

- Case: DO-41 Molded plastic
- Epoxy: UL 94V-O rate flame retardant.
- Lead: Axial leads, solderable per MIL-STD-750,Method 2026
- Polarity: Color band denotes cathode end
- Mounting Position: Any
- Weight: 0.012 ounces, 0.30 gram



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load,derate current by 20%.

PARAMETER	SYMBOL	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	V
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	V
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	V
Maximum Average Forward Current .375"(9.5mm) lead length at T_A=75°C	$I_{F(AV)}$	1.0							A
Peak Forward Surge Current : 8.3ms single half sine-wave superimposed on rated load(JEDEC method)	I_{FSM}	30							A
Maximum Forward Voltage at 1.0A	V_F	1.1							V
Maximum DC Reverse Current at T_J=25°C Rated DC Blocking Voltage T_J=100°C	I_R	5 50							uA
Typical Junction capacitance (Note 1)	C_J	15							pF
Typical Thermal Resistance(Note 2)	$R_{\theta JA}$ $R_{\theta JL}$	50 25							°C / W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 TO +150							°C

NOTES:

1. Measured at 1 MHz and applied reverse voltage of 4.0 VDC.
2. Thermal Resistance from Junction to Ambient and from junction to lead at 0.375"(9.5mm)lead length P.C.B.mounted.

·M·C·C· ™

Micro Commercial Components

Micro Commercial Components
20736 Marilla Street Chatsworth
CA 91311
Phone: (818) 701-4933
Fax: (818) 701-4939

RoHS COMPLIANT

SMAJ4728A THRU SMAJ4764A

1 Watt Zener Diode 3.3 to 100 Volts

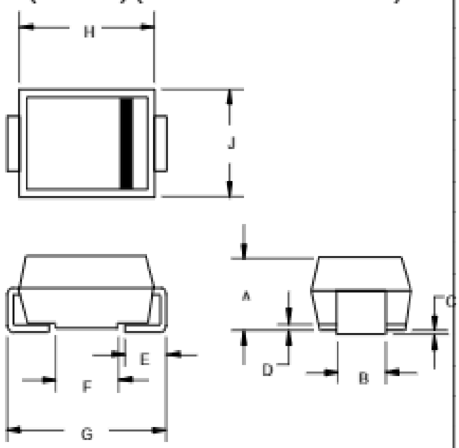
Features

- Halogen free available upon request by adding suffix "-HF"
- Low Zener Impedance
- Low Regulation Factor
- V_Z – tolerance: ±5%
- For Surface Mount Applications
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- Lead Free Finish/Rohs Compliant (Note1) ("P"Suffix designates Compliant. See ordering information)

Maximum Ratings@25℃Unless Otherwise Specified

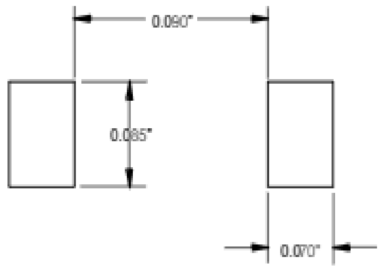
Parameters	Test Conditions	Symbol	Value	Unit
Power Dissipation	Tamb≤50℃	Pd	1	W
Z-Current		Iz	Pd/Vz	mA
Operating Junction Temperature		Tj	-65~+150	℃
Storage Temperature		Tstg	-65~+150	℃
Thermal Resistence	FR-4 Board, MCC's Suggested Solder Pad	RΘja RΘjL	100 75	K/W
Max. Forward Voltage Drop	IF=100mA	Vf	1.2	V

DO-214AC (SMA)(LEAD FRAME)



DIMENSIONS					
DIM	INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	.079	.096	2.00	2.44	
B	.050	.064	1.27	1.63	
C	.002	.008	.05	.20	
D	—	.02	—	.51	
E	.030	.060	.76	1.52	
F	.065	.091	1.65	2.32	
G	.189	.220	4.80	5.59	
H	.157	.181	4.00	4.60	
J	.090	.115	2.25	2.92	

SUGGESTED SOLDER PAD LAYOUT



Note: 1. High Temperature Solder Exemptions Applied, see EU Directive Annex 7.

ELECTRICAL CHARACTERISTICS @25°C

MCC PART NUMBER	ZENER VOLTAGE V_Z	TEST CURRENT I_{ZT}	MAXIMUM DYNAMIC IMPEDANCE Z_{ZT} @I_{ZT}	MAXIMUM REVERSE CURRENT I_R	REVERSE VOLTAGE V_R	KNEE IMPEDANCE Z_{ZK}	KNEE CURRENT I_{ZK}	DEVICE MARKING
	VOLTS	mA	OHMS	μA	VOLTS	OHMS	mA	
SMAJ4728A	3.3	76	10	100	1	400	1	728A
SMAJ4729A	3.6	69	10	100	1	400	1	729A
SMAJ4730A	3.9	64	9	50	1	400	1	730A
SMAJ4731A	4.3	58	9	10	1	400	1	731A
SMAJ4732A	4.7	53	8	10	1	500	1	732A
SMAJ4733A	5.1	49	7	10	1	550	1	733A
SMAJ4734A	5.6	45	5	10	2	600	1	734A
SMAJ4735A	6.2	41	2	10	3	700	1	735A
SMAJ4736A	6.8	37	3.5	10	4	700	1	736A
SMAJ4737A	7.5	34	4	10	5	700	0.5	737A
SMAJ4738A	8.2	31	4.5	10	6	700	0.5	738A
SMAJ4739A	9.1	28	5	10	7	700	0.5	739A
SMAJ4740A	10	25	7	10	7.6	700	0.25	740A
SMAJ4741A	11	23	8	5	8.4	700	0.25	741A
SMAJ4742A	12	21	9	5	9.1	700	0.25	742A
SMAJ4743A	13	19	10	5	9.9	700	0.25	743A
SMAJ4744A	15	17	14	5	11.4	700	0.25	744A
SMAJ4745A	16	15.5	16	5	12.2	700	0.25	745A
SMAJ4746A	18	14	20	5	13.7	750	0.25	746A
SMAJ4747A	20	12.5	22	5	15.2	750	0.25	747A
SMAJ4748A	22	11.5	23	5	16.7	750	0.25	748A
SMAJ4749A	24	10.5	25	5	18.2	750	0.25	749A
SMAJ4750A	27	9.5	35	5	20.6	750	0.25	750A
SMAJ4751A	30	8.5	40	5	22.8	1000	0.25	751A
SMAJ4752A	33	7.5	45	5	25.1	1000	0.25	752A
SMAJ4753A	36	7	50	5	27.4	1000	0.25	753A
SMAJ4754A	39	6.5	60	5	29.7	1000	0.25	754A
SMAJ4755A	43	6	70	5	32.7	1500	0.25	755A
SMAJ4756A	47	5.5	80	5	35.8	1500	0.25	756A
SMAJ4757A	51	5	95	5	38.8	1500	0.25	757A
SMAJ4758A	56	4.5	110	5	42.6	2000	0.25	758A
SMAJ4759A	62	4	125	5	47.1	2000	0.25	759A
SMAJ4760A	68	3.7	150	5	51.7	2000	0.25	760A
SMAJ4761A	75	3.3	175	5	56	2000	0.25	761A
SMAJ4762A	82	3	200	5	62.2	3000	0.25	762A
SMAJ4763A	91	2.8	250	5	69.2	3000	0.25	763A
SMAJ4764A	100	2.5	350	5	76	3000	0.25	764A

FAIRCHILD

April 2014

BC546 / BC547 / BC548 / BC549 / BC550
NPN Epitaxial Silicon Transistor

Features

- Switching and Amplifier
- High-Voltage: BC546, V_{CEO} = 65 V
- Low-Noise: BC549, BC550
- Complement to BC556, BC557, BC558, BC559, and BC560

TO-92

1. Collector 2. Base 3. Emitter

Ordering Information

Part Number	Marking	Package	Packing Method
BC546ABU	BC546A	TO-92 3L	Bulk
BC546ATA	BC546A	TO-92 3L	Ammo
BC546BTA	BC546B	TO-92 3L	Ammo
BC546BTF	BC546B	TO-92 3L	Tape and Reel
BC546CTA	BC546C	TO-92 3L	Ammo
BC547ATA	BC547A	TO-92 3L	Ammo
BC547B	BC547B	TO-92 3L	Bulk
BC547BBU	BC547B	TO-92 3L	Bulk
BC547BTA	BC547B	TO-92 3L	Ammo
BC547BTF	BC547B	TO-92 3L	Tape and Reel
BC547CBU	BC547C	TO-92 3L	Bulk
BC547CTA	BC547C	TO-92 3L	Ammo
BC547CTFR	BC547C	TO-92 3L	Tape and Reel
BC548BU	BC548	TO-92 3L	Bulk
BC548BTA	BC548B	TO-92 3L	Ammo
BC548CTA	BC548C	TO-92 3L	Ammo
BC549BTA	BC549B	TO-92 3L	Ammo
BC549BTF	BC549B	TO-92 3L	Tape and Reel
BC549CTA	BC549C	TO-92 3L	Ammo
BC550CBU	BC550C	TO-92 3L	Bulk
BC550CTA	BC550C	TO-92 3L	Ammo

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_{CBO}	Collector-Base Voltage	BC546	80	V
		BC547 / BC550	50	
		BC548 / BC549	30	
V_{CEO}	Collector-Emitter Voltage	BC546	65	V
		BC547 / BC550	45	
		BC548 / BC549	30	
V_{EBO}	Emitter-Base Voltage	BC546 / BC547	6	V
		BC548 / BC549 / BC550	5	
I_C	Collector Current (DC)		100	mA
P_C	Collector Power Dissipation		500	mW
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cut-Off Current	V_{CB} = 30 V, I_E = 0			15	nA
h_{FE}	DC Current Gain	V_{CE} = 5 V, I_C = 2 mA	110		800	
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA		90	250	mV
		I_C = 100 mA, I_B = 5 mA		250	600	
V_{BE}(sat)	Collector-Base Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA		700		mV
		I_C = 100 mA, I_B = 5 mA		900		
V_{BE}(on)	Base-Emitter On Voltage	V_{CE} = 5 V, I_C = 2 mA	580	660	700	mV
		V_{CE} = 5 V, I_C = 10 mA			720	
f_T	Current Gain Bandwidth Product	V_{CE} = 5 V, I_C = 10 mA, f = 100 MHz		300		MHz
C_{ob}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1 MHz		3.5	6.0	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		9		pF
NF	Noise Figure: BC546 / BC547 / BC548	V_{CE} = 5 V, I_C = 200 μA, f = 1 kHz, R_G = 2 kΩ		2	10	dB
	Noise Figure: BC549 / BC550			1.2	4.0	
	Noise Figure: BC549	V_{CE} = 5 V, I_C = 200 μA, R_G = 2 kΩ, f = 30 to 15000 MHz		1.4	4.0	
	Noise Figure: BC550			1.4	3.0	

h_{FE} Classification

Classification	A	B	C
h_{FE}	110 ~ 220	200 ~ 450	420 ~ 800

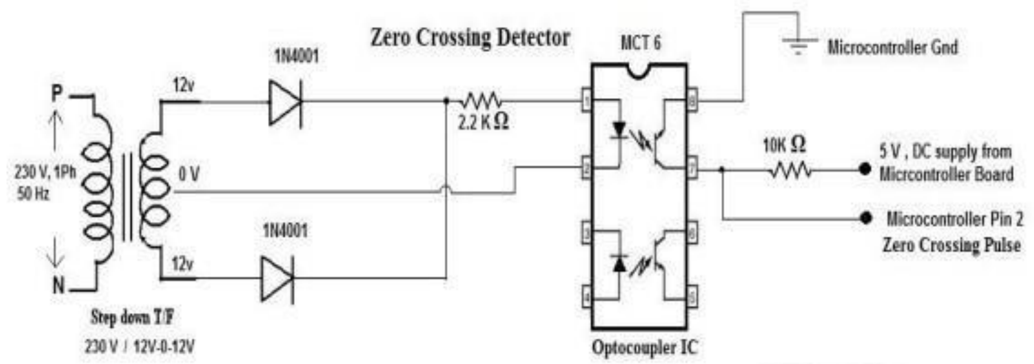
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
ENGINEERING CLINIC

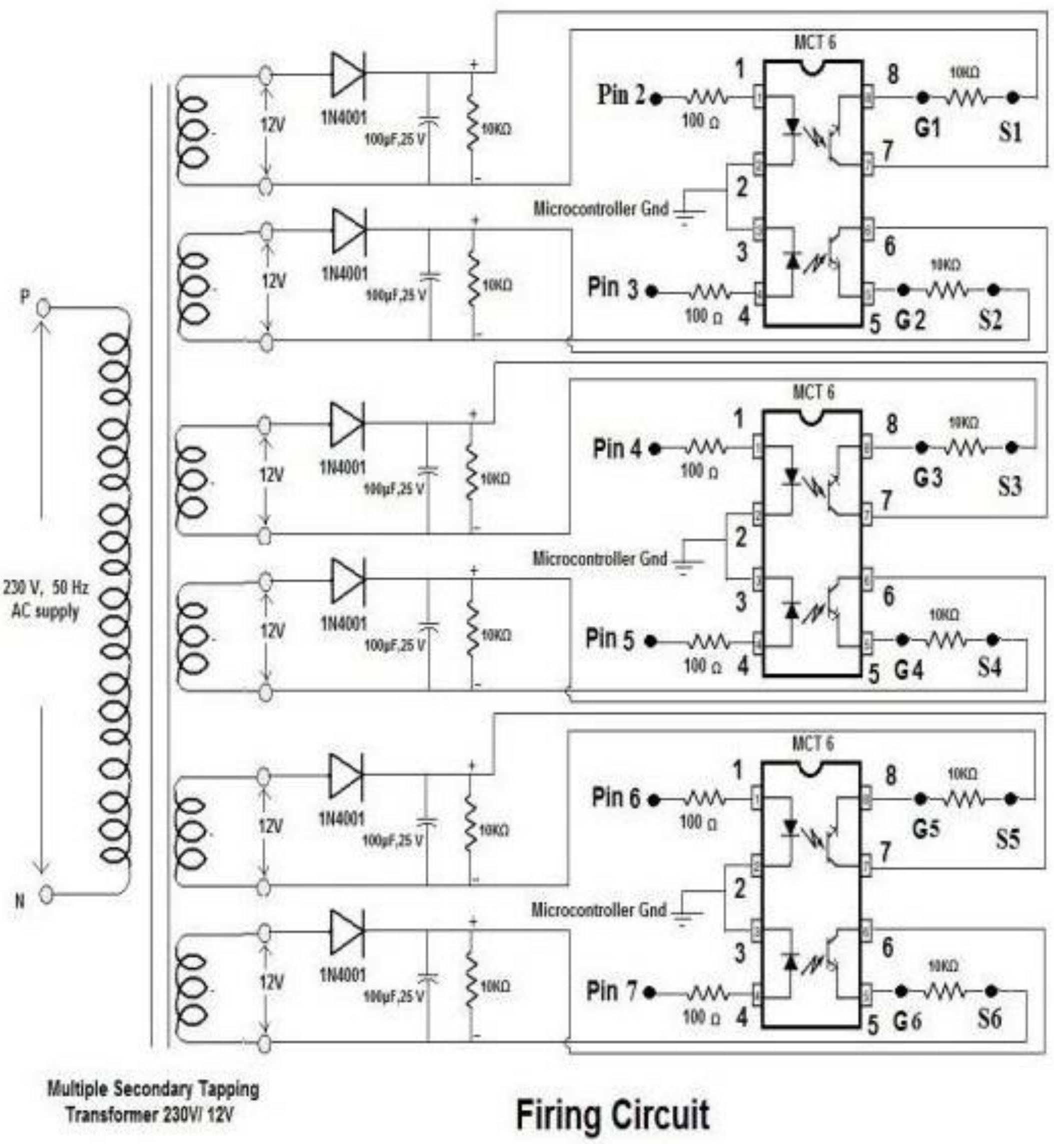
Academic Year	:	**2024 – 2025**	
Date/Day	:	**31.08.2024/Saturday**	**Year/Sem/Sec: III/V/A**
Activity	:	**DESIGNING ZERO CROSSING PULSE DETECTOR AND FIRING CIRCUIT**	

COMPONENTS REQUIRED:

S.NO:	COMPONENTS	SPECIFICATION	QUANTITY
1	Diode	1N4007	8
2	Capacitor	100uF/25V	6
3	Resistor	10KΩ	13
4	Resistor	100Ω	6
5	Resistor	2.2KΩ	1
6	IC Optocoupler (8 Pin)	MCT6	4
7	IC Base 8 Pin	-	4
8	2 Pin Screw Block Connector	300V/10A	15
9	3 Pin Screw Block Connector	300V/10A	2
10	Zero Matrix PCB	2x3, 6x4	Each 1
11	Connecting Wires	Single Strand	As required

CIRCUIT DIAGRAM:

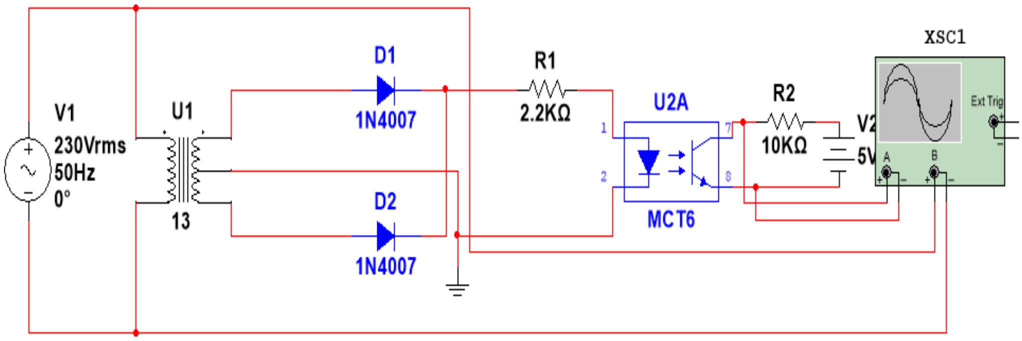


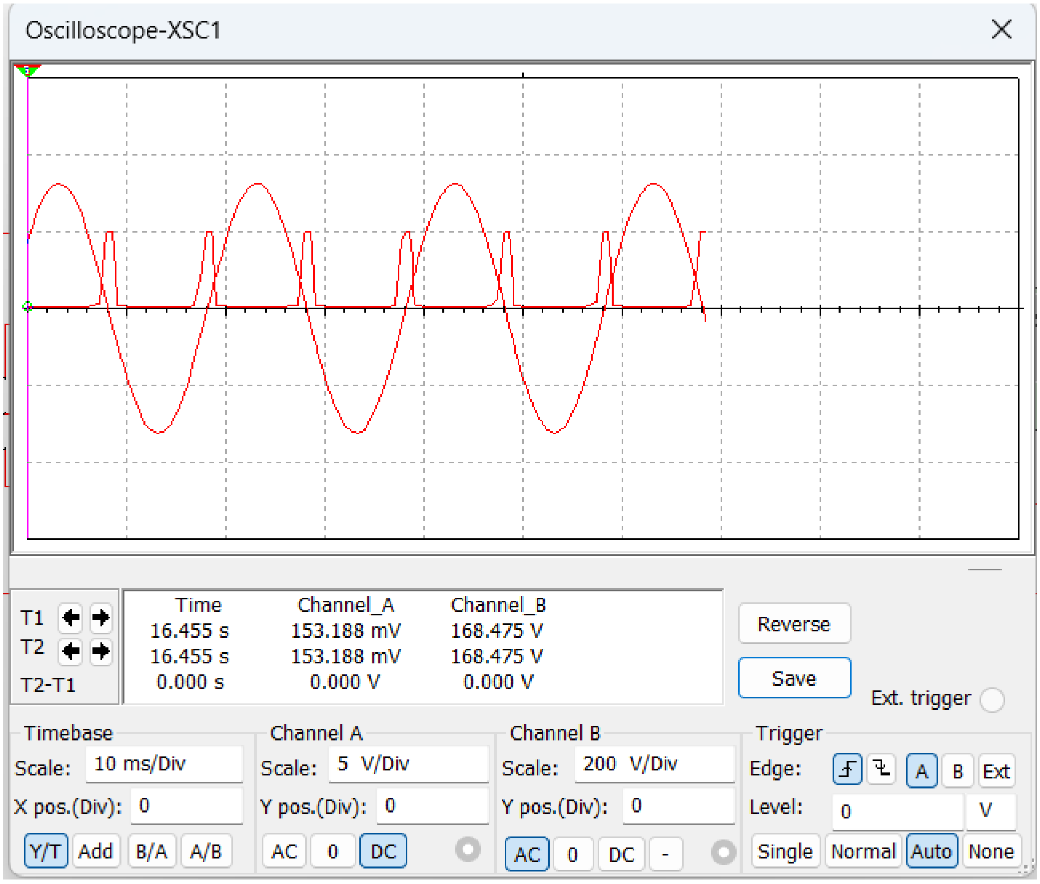


Firing Circuit

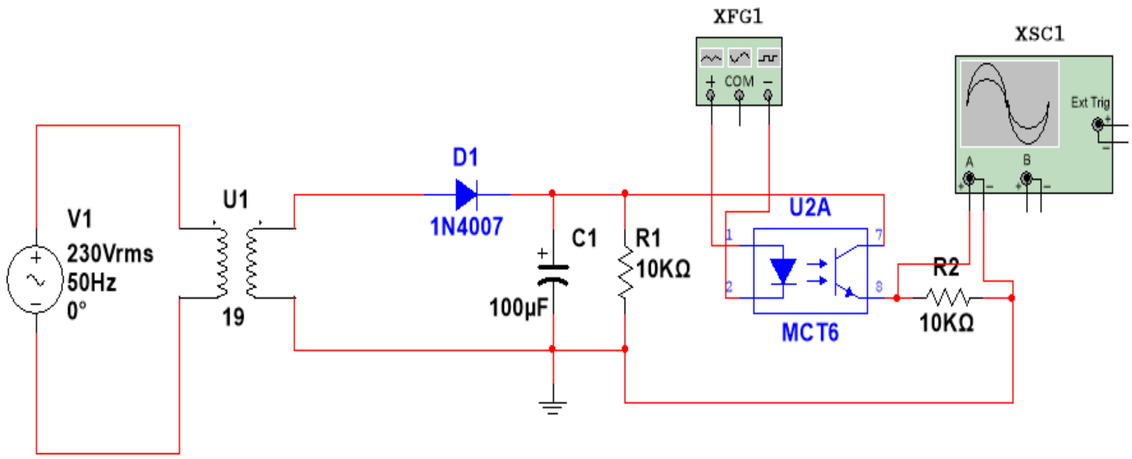
SIMULATION DIAGRAM:

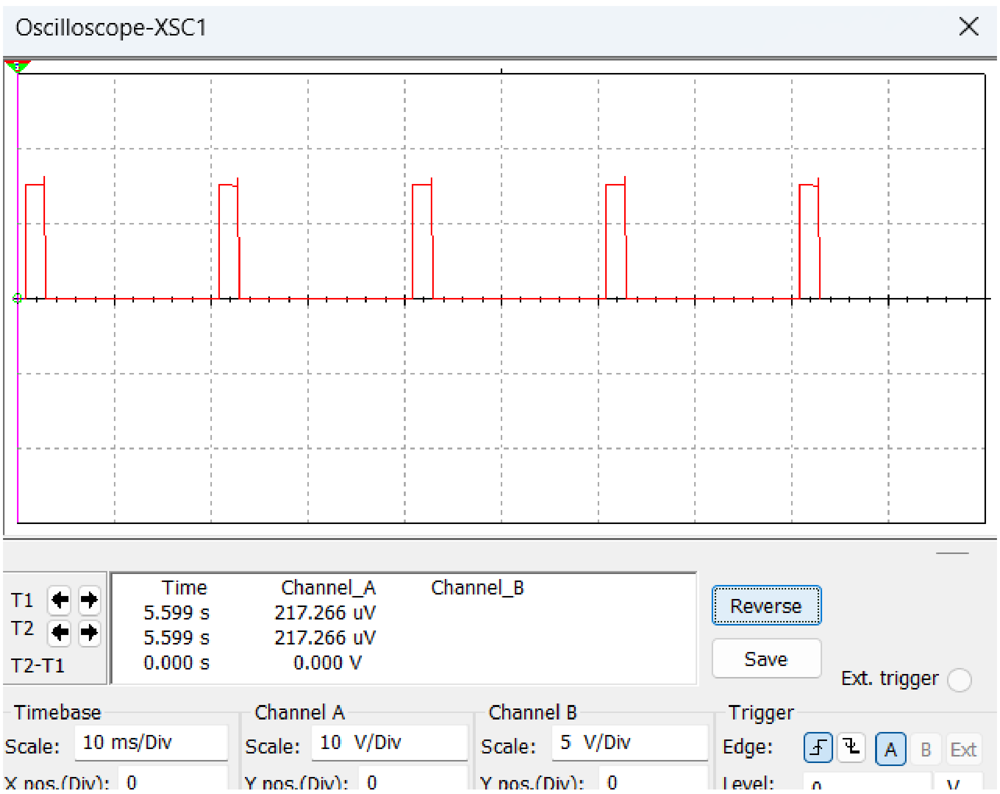
ZERO CROSSING PULSE DETECTOR





FIRING CIRCUIT





DESIGN CALCULATION:

FIRING CIRCUIT:

Calculation to find emitter resistance:

$$I_E = \frac{VCC-VBE}{VCC/I\beta} \quad , I_\beta = \frac{VCC-VBE}{1000} = \frac{12-0.1}{1000} = 0.0119mA$$

$$I_E = \frac{VCC-VBE}{VCC/IB} = \frac{12-0.1}{12/0.0119} = 0.00118M$$

$$R_E = \frac{VCC-VBE-0.1}{I_E} == \frac{11.8}{0.0011} = 10727.27 = 10K\Omega$$

Calculation to find diode side resistance :

$$R_E = \frac{M_V - V_D}{I_f} = \frac{5-0.7}{0.06} = 71.6 \approx 100\ \Omega$$

Rectifier calculations :

$V_R = V_{DC} - V_{LED}$, $V_{DC} = V_{peak} - V_f$

$V_{peak} = V_{rms} * \sqrt{2} = 12(1.414) = 16.97V$

$V_{DC} = V_{peak} - V_f = 16.97 - 0.7 = 16.27V$ $V_R = 16.27-1.2$
$= 15.07V$

$$I = \frac{V_R}{R} = \frac{15.07}{1.5mA} = 10.05K\Omega$$

$$C = \frac{I_{load}}{f * V_{ripple}} = \frac{0.01}{50*2} = 100\mu F$$

ZERO CROSSING PULSE DETECTOR:

Calculation to find emitter resistance:

$$I_E = \frac{VCC-VBE}{VCC/I\beta} \quad , I\beta = \frac{VCC-VBE}{1000} = \frac{12-0.1}{1000} = 0.0119mA$$

$$I_E = \frac{VCC-VBE}{VCC/IB} = \frac{12-0.1}{12/0.0119} = 0.00118mA$$

$$R_E = \frac{VCC - VBE - 0.1}{I_E} = = \frac{11.8}{0.0011} = 10727.27 = 10K\Omega$$

$V_R = V_{peak} - (V_{diode} + V_{led}) = 10.1V$

$R = \frac{V_R}{I} = \frac{10.1}{0.01} = 1.2\ K\Omega \approx 2.2\ K\Omega$ (standard value)

Students of EEE Department, III-year, A section are performing the construction of Zero Crossing Detector and Firing Circuit under the guidance of Mr.G.RAJAVEL AP/EEE and Mrs.A.S.AMATHULLAH

HoD/ EEE
(Dr.P.Jamuna)

Dean Academics
(Dr.S.Anbumalar)

Director cum Principal
(Dr.V.S.K,Venkatachalapathy)

PANJIT SEMI CONDUCTOR

1N4001-1N4007

PLASTIC SILICON RECTIFIERS

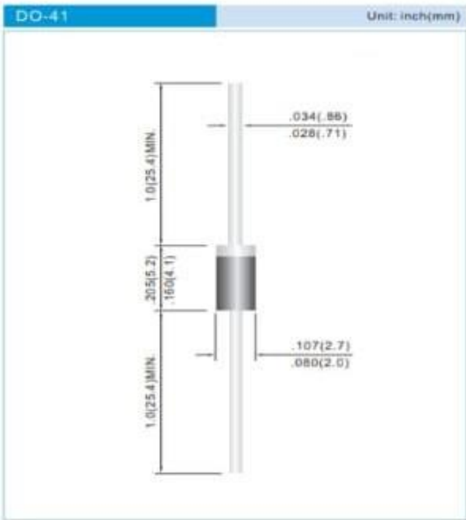
VOLTAGE	50 to 1000 Volts	CURRENT	1.0 Ampere

FEATURES

- Low forward voltage drop
- High current capability
- High reliability
- High surge current capability
- Exceeds environmental standards of MIL-S-19500/228
- In compliance with EU RoHS 2002/95/EC directives

MECHANICALDATA

- Case: DO-41 Molded plastic
- Epoxy: UL 94V-O rate flame retardant.
- Lead: Axial leads, solderable per MIL-STD-750,Method 2026
- Polarity: Color band denotes cathode end
- Mounting Position: Any
- Weight: 0.012 ounces, 0.30 gram



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load,derate current by 20%.

PARAMETER	SYMBOL	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	V
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	V
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	V
Maximum Average Forward Current .375"(9.5mm) lead length at T_A=75°C	$I_{F(AV)}$	1.0							A
Peak Forward Surge Current : 8.3ms single half sine-wave superimposed on rated load(JEDEC method)	I_{FSM}	30							A
Maximum Forward Voltage at 1.0A	V_F	1.1							V
Maximum DC Reverse Current at T_J=25°C Rated DC Blocking Voltage T_J=100°C	I_R	5 50							uA
Typical Junction capacitance (Note 1)	C_J	15							pF
Typical Thermal Resistance(Note 2)	$R_{\theta JA}$ $R_{\theta JL}$	50 25							°C / W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 TO +150							°C

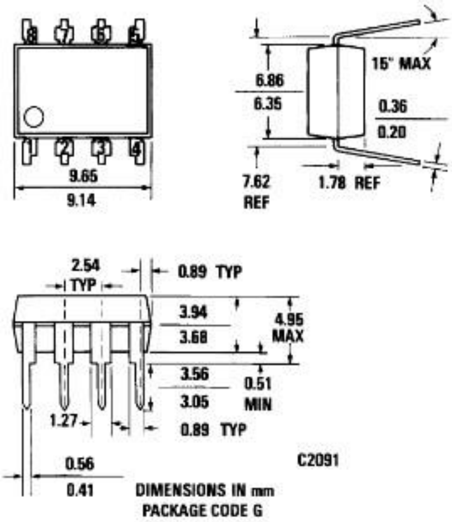
NOTES:

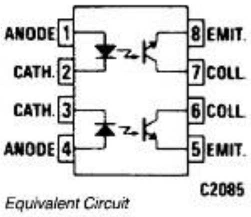
1. Measured at 1 MHz and applied reverse voltage of 4.0 VDC.
2. Thermal Resistance from Junction to Ambient and from junction to lead at 0.375"(9.5mm)lead length P.C.B.mounted.

DUAL
PHOTOTRANSISTOR OPTOCOUPLERS

MCT6 MCT62
MCT61

PACKAGE DIMENSIONS





Equivalent Circuit

DESCRIPTION

The MCT6X optoisolators have two channels for high density applications. For four channel applications, two-packages fit into a standard 16-pin DIP socket. Each channel is an NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode.

FEATURES

- Two isolated channels per package
- Two packages fit into a 16 lead DIP socket
- Choice of 3 current transfer ratios
- Underwriters Laboratory (U.L.) recognized File E50151

APPLICATIONS

- AC Line/Digital Logic—Isolate high voltage transients
- Digital Logic/Digital Logic—Eliminate spurious grounds
- Digital Logic/AC Triac Control—Isolate high voltage transients
- Twisted pair line receiver—Eliminate ground loop feedthrough
- Telephone/Telegraph line receiver—Isolate high voltage transients
- High Frequency Power Supply Feedback Control—Maintain floating ground
- Relay contact monitor—Isolate floating grounds and transients
- Power Supply Monitor—Isolate transients

ABSOLUTE MAXIMUM RATINGS

Storage temperature .... −55°C to 150°C
Operating temperature .... −55°C to 100°C
Lead temperature .... (soldering, 10 sec.) 250°C

TOTAL INPUT

Power dissipation at 25°C ambient .... 100 mW
Derate linearly from 25°C .... 1.3 mW/°C

COUPLED

Input to output breakdown voltage ... 2500 volts V_{RMS}
Total package power dissipation
@ 25°C ambient .... 400 mW
Derate linearly from 25°C .... 5.33 mW/°C

INPUT DIODE (each channel)

Forward current .... 60 mA
Reverse voltage .... 3.0 V
Peak forward current (1 μs pulse, 300 pps) ...... 3 A

OUTPUT TRANSISTOR (each channel)

Power dissipation @ 25°C ambient .... 150 mW
Derate linearly from 25°C .... 2 mW/°C
Collector current .... 30 mA

QT OPTOELECTRONICS

ELECTRO-OPTICAL CHARACTERISTICS
(25°C Free Air Temperature Unless Otherwise Specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
INPUT DIODE Rated forward voltage	V_F		1.25	1.50	V	$I_F=20$ mA
Reverse voltage	V_R	3.0	25		V	$I_R=10\ \mu A$
Reverse current	I_R		.001	10	μA	$V_R=3.0$ V
Junction capacitance	C_J		50		pF	$V_F=0$ V
OUTPUT TRANSISTOR ($I_F=0$) Breakdown voltage, collector to emitter	BV_{CEO}	30	85		V	$I_C=1.0$ mA
Breakdown voltage, emitter to collector	BV_{ECO}	6	13		V	$I_E=100\ \mu A$
Leakage current, collector to emitter	I_{CEO}		5	100	nA	$V_{CE}=10$ V
Capacitance collector to emitter	C_{CE}		8		pF	$V_{CE}=0$ V

TRANSFER CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
COUPLED DC current transfer ratio (I_C/I_F)=CTR MCT6		20			%	$V_{CE}=10$ V, $I_F=10$ mA
MCT61		50			%	$V_{CE}=5$ V, $I_F=5$ mA
MCT62		100			%	$V_{CE}=5$ V, $I_F=5$ mA
Saturation voltage—collector to emitter MCT6, 61, 62	$V_{CE\ (SAT)}$		0.2	0.4	V	$I_C=2$ mA, $I_F=16$ mA

TRANSFER CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
SWITCHING TIMES, OUTPUT TRANSISTOR Non-saturated rise time, fall time (Note 3)			2.4		μs	$I_C=2$ mA, $V_{CE}=10$ V, $R_L=100\Omega$
Non-saturated rise time, fall time (Note 3)			15		μs	$I_C=2$ mA, $V_{CE}=10$ V, $R_L=1K\Omega$
Saturated turn-on time (from 5.0V to 0.8V)			5		μs	$R_L=2K\Omega$, $I_F=40$ mA
Saturated turn-off time (from saturation to 2.0V)			25		μs	$R_L=2K\Omega$, $I_F=40$ mA
Bandwidth B_W			150		kHz	$I_C=2$ mA, $V_{CE}=10$ V, $R_L=100\Omega$

ISOLATION CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITION
Isolation voltage	BV_{I-O}	2500			V_{RMS}	t=1 minute
Isolation resistance MCT6X—	R_{I-O}	10^{11}	10^{12}		Ω	$V_{I-O}=500$ VDC
Breakdown voltage—channel-to-channel MCT6X			500		VDC	Relative humidity=40% f=1 MHz
Capacitance between channels			0.4		pF	

HoD/ EEE
(P. Jamuna)

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Engineering Clinic – Activity Report

AcademicYear	:	**2023 – 2024**
Date/Day/Time	:	**13.03.2024/Saturday / 8.45 a.m to 4.20 p.m**
Year/Sem/Batch	:	**IV / VIII / 2020-2024**
Activities	:	**Practical Demonstration of Domestic wiring and energy meter connections**

Mr.R.Ragupathy AP/EEE addressed about an Domestic wiring connections and fuse rating calculation and diameter of wiring.

Mr.A.Janagiraman AP/EEE, delivered about the Domestic wiring connections and Procedure to handling multimeter, Energy meter connections.

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