RAMAKRISHNA MISSION SHILPAMANDIRA

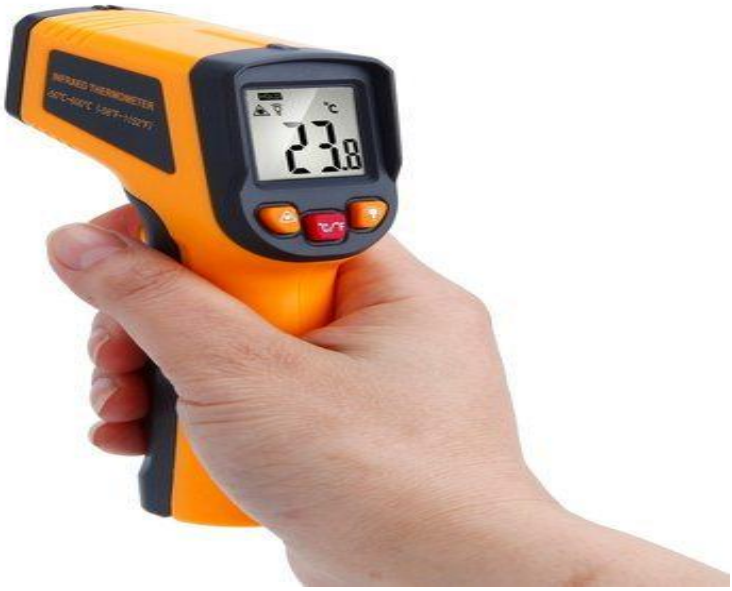
(A SELF-FINANCED POLYTECHNIC)

BELUR MATH, HOWRAH-711202

FINAL YEAR PROJECT REPORT ON:

TEMPERATURE GUN

BY – DETCE(GROUP-8)



GROUP MEMBERS

SERIAL NO.	ROLL NO.	STUDENTS NAME
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3	45	SUMAN MANNA
4	49	SAIKAT NASKAR
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INTRODUCTION

An infrared thermometer is a thermometer which infers temperature from a portion of the thermal radiation sometimes called black-body radiation emitted by the object being measured. They are sometimes called laser thermometers as a laser is used to help aim the thermometer, or non-contact thermometers or temperature guns, to describe the device's ability to measure temperature from a distance. By knowing the amount of infrared energy emitted by the object and its emissivity, the object's temperature can often be determined within a certain range of its actual temperature.

The design essentially consists of a lens to focus the infrared thermal radiation on to a detector, which converts the radiant power to an electrical signal that can be displayed in units of temperature after being compensated for ambient temperature. This permits temperature measurement from a distance without contact with the object to be measured. A non-contact infrared thermometer is useful for measuring temperature under circumstances where thermocouples or other probe-type sensors cannot be used or do not produce accurate data for a variety of reasons.

COMPONENT LIST

SERIAL NO.	COMPONENTS	SPECIFICATION
1	ARDUINO BOARD	NANO(ATMEGA328)
2	LCD	16X2
3	IR MDULE	4649
4	BUZZER	9V
5	TEMPERATURE SENSOR	MLX90614
6	CHARGABLE BATTERY	PANASONIC-NCR18650B
7	CHARGING MODULE	TP4056

BLOCK DIAGRAM

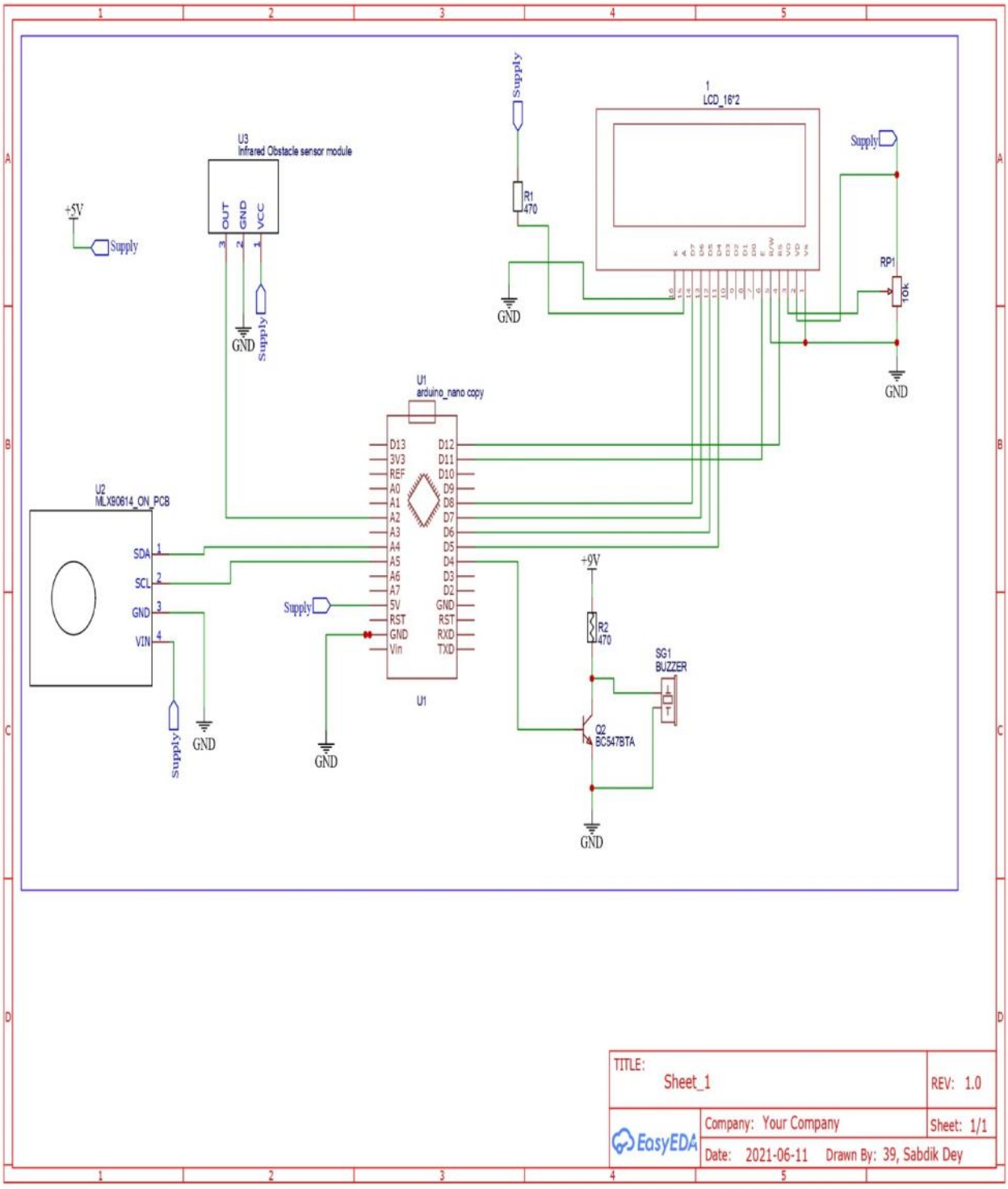
IR TEMPERTAURE SENSOR

ATMEGA 328(ARDUINO NANO)

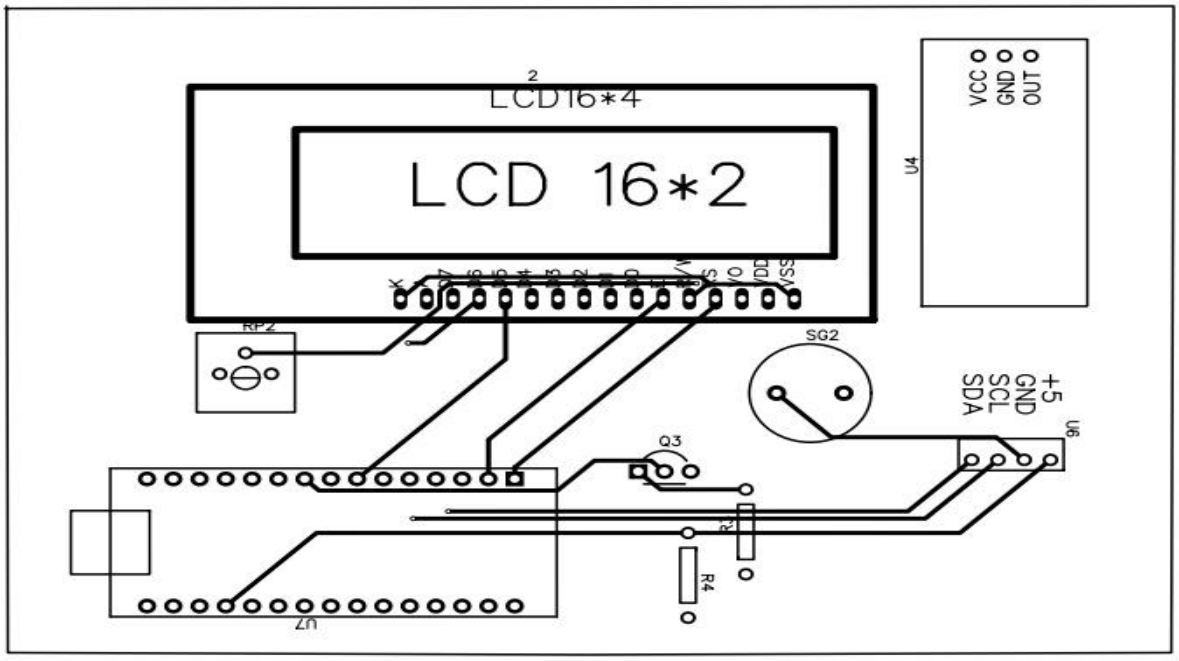
DISPLAY

SOUND FROM BUZZER

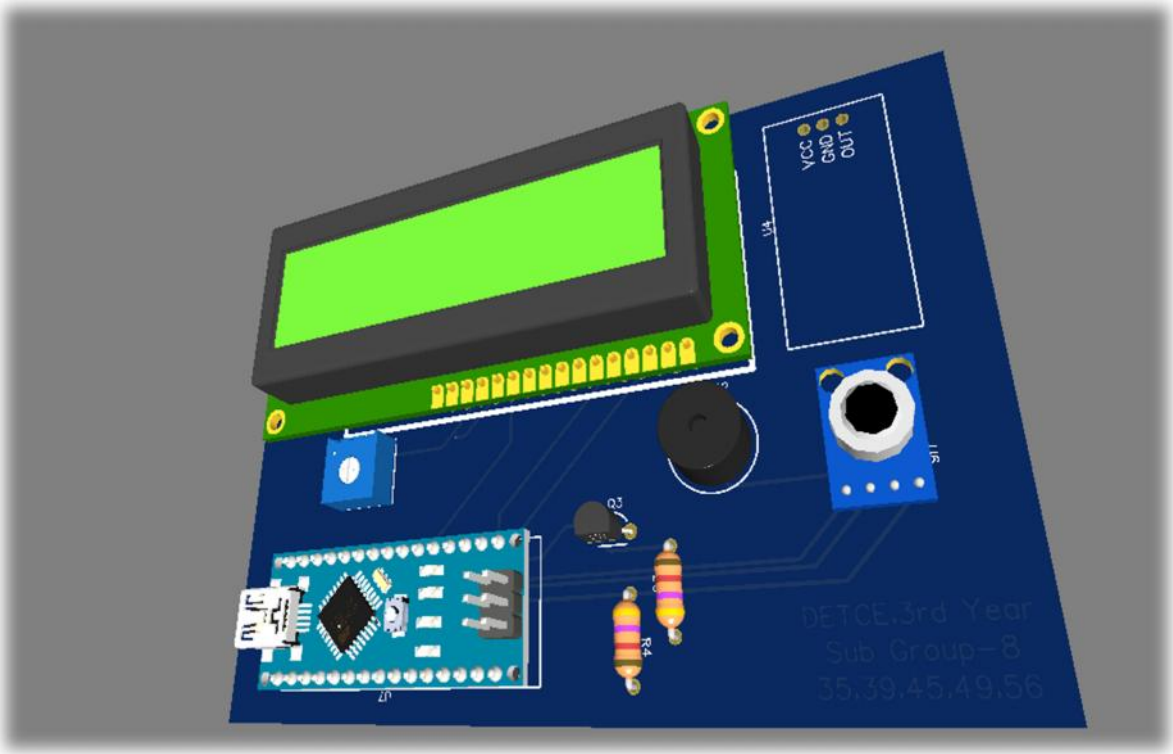
CIRCUIT DIAGRAM



PCB DIAGRAM



3D VIEW



METHODOLOGY

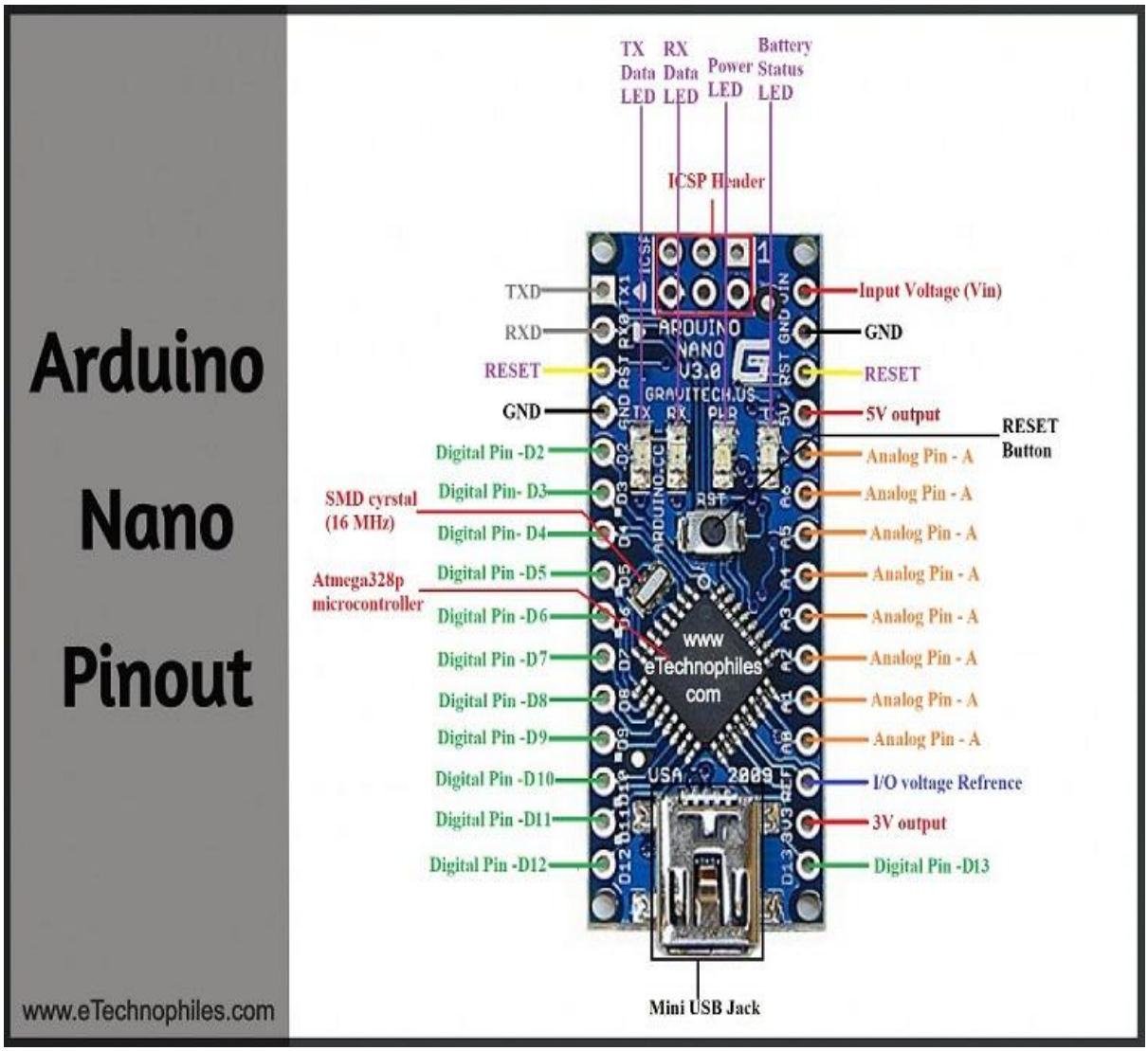
The methodology for the temperature gun is step by step:-

1. At first, we will write the program in the Arduino software and the burn into the Arduino nano (ATMEGA 328).
2. Then interface the IR temperature sensor, LCD and buzzer with the Arduino nano.
3. Then the circuit is added to a power supply.
4. It is also interface with a motor which is attached to a sliding door

COMPONENT DESCRIPTION

1) ARDUINO NANO (ATMEGA 328) :

The A000005 Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328.The Arduino Nano is a surface mount breadboard embedded version with integrated USB. It has everything that Decimal has electrically with more analog input pins and onboard +5V AREF jumper. Physically, it is missing power jack and power select jumper. Since the Nano is automatically sense and switch to the higher potential source of power, there is no need for the power select jumper.

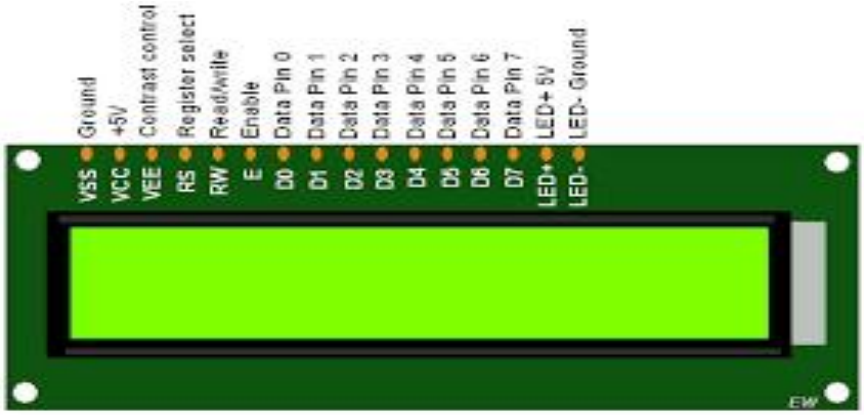


FEATURES OF ARDUINO NANO :

- Microcontroller: ATmega328 (Arduino Nano Version 3.0) or Atmel ATmega168 (older versions, Arduino Nano Version 2.x).
- Operating Voltage (logic level): 5 V.
- Input Voltage (recommended): 7-12 V.
- Input Voltage (limits): 6-20 V.
- Digital I/O Pins: 14 (of which 6 provide PWM output).
- Analog Input Pins: 8.
- DC Current per I/O Pin: 40 mA.
- Flash Memory: 32 KB (ATmega328) or 16 KB (ATmega168) of which 2 KB used by bootloader.
- SRAM: 2 KB (ATmega328) or 1 KB (ATmega168).
- EEPROM: 1 KB (ATmega328) or 512 bytes (ATmega168).
- Clock Speed: 16 MHz
- Dimensions: 0.73" x 1.70".

2) LCD 16X2 :

LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

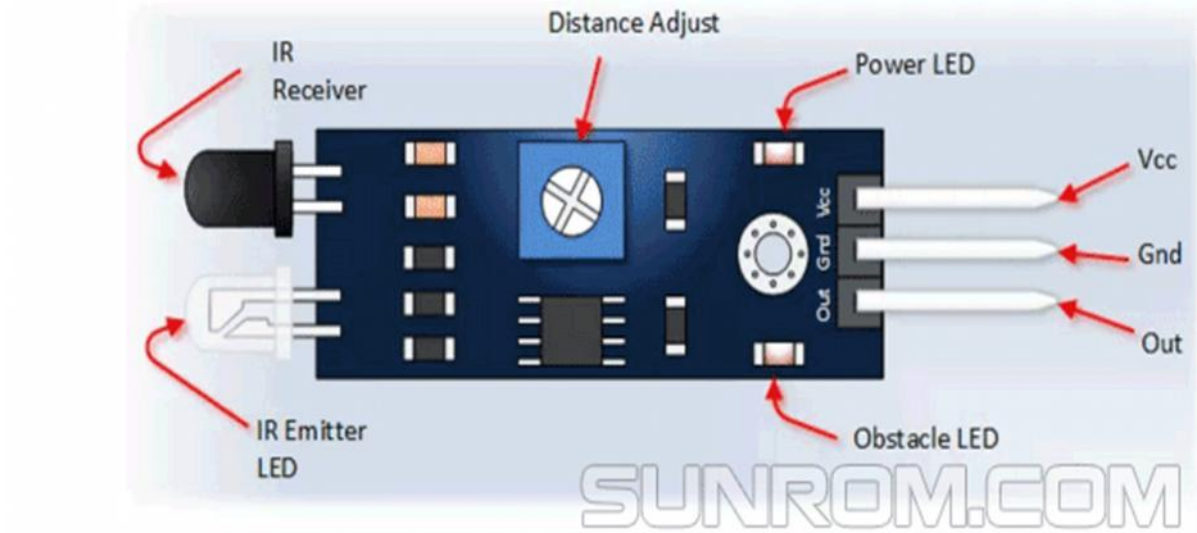


FEATURES OF LCD :

- Operating Voltage is 4.7V to 5.3V.
- Current consumption is 1mA without backlight.
- Alphanumeric LCD display module, meaning can display alphabets and numbers.
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box.
- Can work on both 8-bit and 4-bit mode.
- It can also display any custom generated characters.
- Available in Green and Blue Backlight.

3) IR MODULE (4649) :

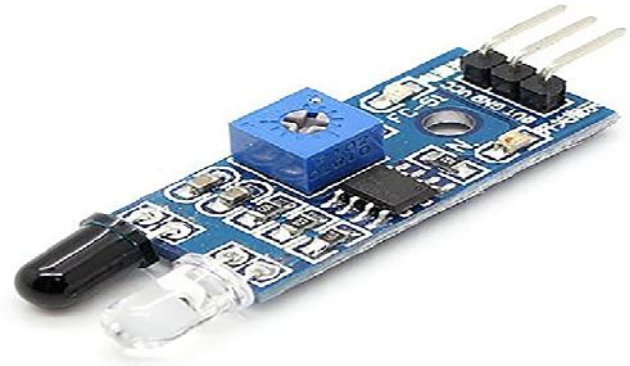
Proximity Sensor are used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.



Pin, Control Indicator	Description
Vcc	3.3 to 5 Vdc Supply Input
Gnd	Ground Input
Out	Output that goes low when obstacle is in range
Power LED	Illuminates when power is applied
Obstacle LED	Illuminates when obstacle is detected
Distance Adjust	Adjust detection distance. CCW decreases distance. CW increases distance.
IR Emitter	Infrared emitter LED
IR Receiver	Infrared receiver that receives signal transmitted by Infrared emitter.

FEATURES OF IR MODULE :

- IR transmitter.
- Ambient light protected IR receiver.



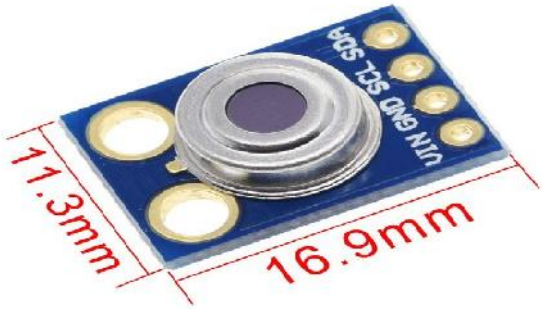
- 3 pin easy interface connectors.
- Indicator LED & Power LED.
- Distance 2cm to 30cm.
- Can differentiate between dark and light colours.
- Active Low on object detection.
- 3.3 to 5V operating VOLTAGE

4) TEMPERATURE SENSOR (MLX90614) :

The MLX90614 is an infrared thermometer for non-contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASIC are integrated in the same TO-39 can. Integrated into the MLX90614 are a low noise amplifier, 17-bit ADC and powerful DSP unit thus achieving high accuracy and resolution of the thermometer.

FEATURES OF TEMPERATURE SENSOR :

- Small size and low cost.



- Easy to integrate.
- Factory calibrated in wide temperature range: -40 to 125°C for sensor temperature and -70 to 380°C for object temperature.

5) BUZZER :

A buzzer or beeper is an audio signalling device,[1] which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

FEATURES OF BUZZER:

- Rated Voltage: 6V DC.
- Operating Voltage: 4-8V DC.
- Rated current: <30Ma.
- Sound Type: Continuous Beep.
- Resonant Frequency: ~2300 Hz
- Small and neat sealed packag

CHARGABLE BATTERY:

DESCRIPTION: Brand: Panasonic (Panasonic) Model: NCR18650B (Panasonic 3100mAh is NCR18650A) Life: 1000 times Voltage: 3.6-3.7V standard, 4.35V full, 2.75V Internal resistance: within 90 milliohms (without 40 milliohm protection board) Capacity: 3400mah (full capacity, not false) Dimensions: 18.2mm in diameter and 69.5mm in length (18mm without protective plate and 65mm in length) Uses: laptop battery replacement core, strong light flashlight, mobile equipment backup power supply, can also make a variety of rechargeable battery packs, widely used.

Product Description:

Voltage: 4.2v

Battery Type: Lithium-Ion

Battery Capacity: 3400mAh

Weight (g): 48

Battery Shape: Cylindrical

Battery Dimension: 18mm*70mm

Storage Temperature(C): 20-50

CHARGING MODULE (TP4056):

DESCRIPTION: The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries. Its SOP package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 can work within USB and wall adapter.

FEATURES:

·Input Supply Voltage (VCC) ：-0.3V～8V

· TEMP：-0.3V～10V

· CE：-0.3V～10V

· BAT Short-Circuit Duration：Continuous

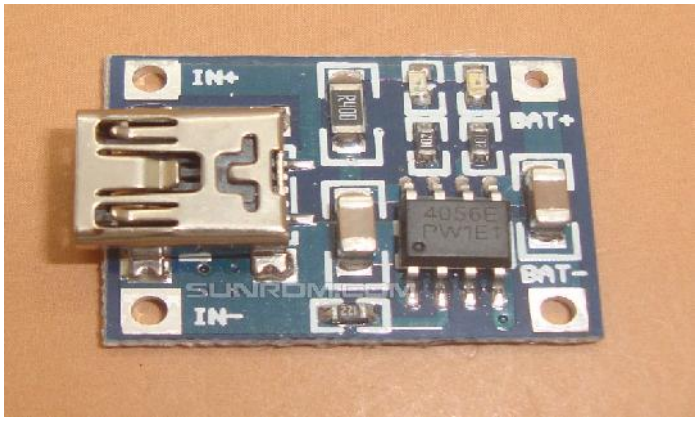
· BAT Pin Current：1200mA

· PROG Pin Current：1200uA

· Maximum Junction Temperature：145

· Operating Ambient Temperature Range：-40 ～85

· Lead Temp. (Soldering, 10sec)：260



RESULT & ANALYSIS

After completing the circuit and packaging we make the device switch as on condition and check into our forehead, its showing our temperature properly and working good .when it is switched on, it sense the temperature and display it.

COMPONENTS COST

SERIAL NO.	COMPONENT NAME	PRICE (Rs)
1	ARDUINO NANO	120
2	LCD	40
3	IR MODULE	40
4	TEMPERATURE SENSOR	808
5	BUZZER	10
6	Chargeable Battery	60
7	Charging Module	30

TOTAL COST	1108(Rs)

conclusion

Physiological parameter of body temperature is the most important and basic human life indicator, a temperature gun is a new type of non-contact device which act as a thermometer. It has fast response ,safety and other features are added for commercial ,medical, market place, anywhere uses .At the same time ,the over temperature alarm ,LCD display and other function are designed to make it more perfect. It is low cost , practical , Eco-friendly and the safest way to save energy .It clearly tackles the two problem in this COVID situation the first one is the non-contacting features and the second one is temperature detection with alarm .The project has scope in various other application and future scope.

MLX90614 family

Single and Dual Zone
Infra Red Thermometer in TO-39

Features and Benefits

- Small size, low cost
- Easy to integrate
- Factory calibrated in wide temperature range:
  -40 to 125 ˚C for sensor temperature and
  -70 to 380 ˚C for object temperature.
- High accuracy of 0.5°C over wide temperature range (0..+50°C for both Ta and To)
- High (medical) accuracy calibration
- Measurement resolution of 0.02°C
- Single and dual zone versions
- SMBus compatible digital interface
- Customizable PWM output for continuous reading
- Available in 3V and 5V versions
- Simple adaptation for 8 to 16V applications
- Power saving mode
- Different package options for applications and measurements versatility
- Automotive grade

Applications Examples

- High precision non-contact temperature measurements;
- Thermal Comfort sensor for Mobile Air Conditioning control system;
- Temperature sensing element for residential, commercial and industrial building air conditioning;
- Windshield defogging;
- Automotive blind angle detection;
- Industrial temperature control of moving parts;
- Temperature control in printers and copiers;
- Home appliances with temperature control;
- Healthcare;
- Livestock monitoring;
- Movement detection;
- Multiple zone temperature control – up to 100 sensors can be read via common 2 wires
- Thermal relay/alert
- Body temperature measurement

Ordering Information

Part No.	**Temperature Code**	**Package Code**	**- Option Code**
MLX90614	E (-40°C to 85°C) K (-40°C to 125°C)	SF (TO-39)	- X X X (1) (2) (3)

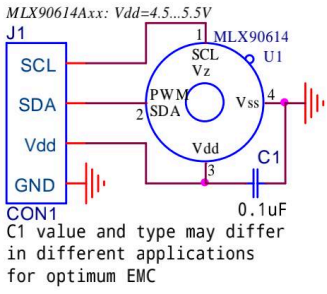
(1) Supply Voltage/ Acccuracy
- A - 5V
- B - 3V
- C - Reserved
- D - 3V medical accuracy

(2) Number of thermopiles:
- A – single zone
- B – dual zone

(3) Package options:
- A – Standard package
- B – Reserved
- C – 35° FOV

Example:
MLX90614ESF-BAA

1 Functional diagram



MLX90614 connection to SMBus

Figure 1 Typical application schematics

2 General Description

The MLX90614 is an Infra Red thermometer for non contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASSP are integrated in the same TO-39 can.

Thanks to its low noise amplifier, 17-bit ADC and powerful DSP unit, a high accuracy and resolution of the thermometer is achieved.

The thermometer comes factory calibrated with a digital PWM and SMBus (System Management Bus) output.

As a standard, the 10-bit PWM is configured to continuously transmit the measured temperature in range of -20 to 120 ˚C, with an output resolution of 0.14 ˚C and the POR default is SMBus.

4 Glossary of Terms

PTAT	Proportional To Absolute Temperature sensor (package temperature)
PTC	Positive Temperature Coefficient sensor (package temperature)
POR	Power On Reset
HFO	High Frequency Oscillator (RC)
DSP	Digital Signal Processing
FIR	Finite Impulse Response. Digital filter
IIR	Infinite Impulse Response. Digital filter
IR	Infra-Red
PWM	Pulse With Modulation
DC	Duty Cycle (of the PWM) ; Direct Current (for settled conditions specifications)
FOV	Field Of View
SDA,SCL	Serial DAta, Serial CLock – SMBus compatible communication pins
Ta	Ambient Temperature measured from the chip – (the package temperature)
To	Object Temperature, 'seen' from IR sensor
ESD	Electro-Static Discharge
EMC	Electro-Magnetic Compatibility
TBD	To Be Defined

Note: sometimes the MLX90614xxx is referred to as "the module".

5 Maximum ratings

Parameter	MLX90614ESF-Axx	MLX90614ESF-Bxx MLX90614ESF-Dxx	MLX90614KSF-Axx
Supply Voltage, V_{DD} (over voltage)	7V	5V	7V
Supply Voltage, V_{DD} (operating)	5.5 V	3.6V	5.5V
Reverse Voltage	0.4 V		
Operating Temperature Range, T_A	-40…+85°C		-40…+125°C
Storage Temperature Range, T_S	-40…+125°C		-40…+125°C
ESD Sensitivity (AEC Q100 002)	2kV		
DC current into SCL/Vz (Vz mode)	2 mA		
DC sink current, SDA /PWM pin	25 mA		
DC source current, SDA/PWM pin	25 mA		
DC clamp current, SDA/PWM pin	25 mA		
DC clamp current, SCL pin	25 mA		

Table 1: Absolute maximum ratings for MLX90614

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6 Pin definitions and descriptions

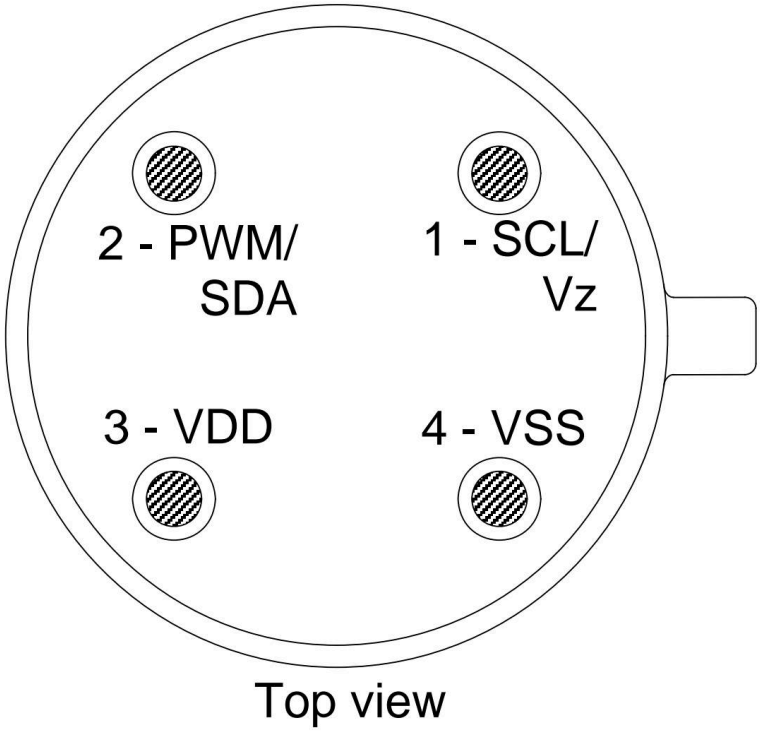


Figure 2: Pin description

Pin Name	Function
VSS	Ground. The metal can is also connected to this pin.
SCL / Vz	Serial clock input for 2 wire communications protocol. 5.7V zener is available at this pin for connection of external bipolar transistor to MLX90614A to supply the device from external 8 -16V source.
PWM / SDA	Digital input / output. In normal mode the measured object temperature is available at this pin Pulse Width Modulated. In SMBus compatible mode automatically configured as open drain NMOS.
VDD	External supply voltage.

Table 2: Pin description MLX90614

Note: for +12V (+8…+16V) powered operation refer to the Application information section. For EMC and isothermal conditions reasons it is highly recommended not to use any electrical connection to the metal can except by the Vss pin.
With the SCL/Vz and PWM/SDA pins operated in 2-wire interface mode, the input Schmidt trigger function is automatically enabled.

TP4056 1A Standalone Linear Li-Ion Battery Charger with Thermal Regulation in SOP-8

DESCRIPTION

The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries. Its SOP package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 can work within USB and wall adapter.

No blocking diode is required due to the internal PMOSFET architecture and have prevent to negative Charge Current Circuit. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. The TP4056 automatically terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached.

TP4056 Other features include current monitor, under voltage lockout, automatic recharge and two status pin to indicate charge termination and the presence of an input voltage.

FEATURES

- Programmable Charge Current Up to 1000mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger in SOP-8 Package for Single Cell Lithium-Ion Batteries
- Constant-Current/Constant-Voltage
- Charges Single Cell Li-Ion Batteries Directly from USB Port
- Preset 4.2V Charge Voltage with 1.5% Accuracy
- Automatic Recharge
- two Charge Status Output Pins
- C/10 Charge Termination
- 2.9V Trickle Charge Threshold (TP4056)
- Soft-Start Limits Inrush Current
- Available Radiator in 8-Lead SOP Package, the Radiator need connect GND or impending

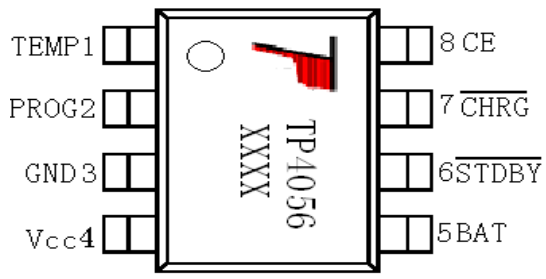
ABSOLUTE MAXIMUM RATINGS

- Input Supply Voltage(V_{CC})：-0.3V～8V
- TEMP：**-0.3V**～10V
- CE：**-0.3V**～10V
- BAT Short-Circuit Duration：Continuous
- BAT Pin Current：1200mA
- PROG Pin Current：1200uA
- Maximum Junction Temperature：145℃
- Operating Ambient Temperature Range：-40℃～85℃
- Lead Temp.(Soldering, 10sec)：260℃

APPLICATIONS

- Cellular Telephones, PDAs, GPS
- Charging Docks and Cradles
- Digital Still Cameras, Portable Devices
- USB Bus-Powered Chargers,Chargers

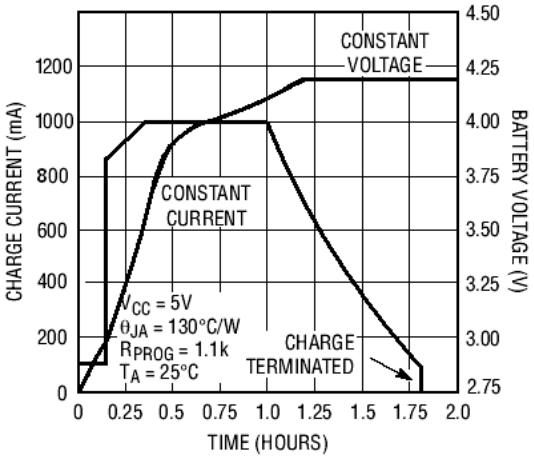
PACKAGE/ORDER INFORMATION



SOP－8

photo	ORDER PART NUMBER
	TP4056-42-SOP8-PP
	PART MARKING TP4056

Complete Charge Cycle (1000mAh Battery)



TEMP(Pin 1) :Temperature Sense Input Connecting TEMP pin to NTC thermistor's output in Lithium ion battery pack. If TEMP pin's voltage is below 45% or above 80% of supply voltage V_{IN} for more than 0.15S, this means that battery's temperature is too high or too low, charging is suspended. The temperature sense function can be disabled by grounding the TEMP pin.

PROG(Pin 2): Constant Charge Current Setting and Charge Current Monitor Pin charge current is set by connecting a resistor R_{ISET} from this pin to GND. When in precharge mode, the ISET pin's voltage is regulated to 0.2V. When in constant charge current mode, the ISET pin's voltage is regulated to 2V.In all modes during charging, the voltage on ISET pin can be used to measure the charge current as follows:

$$I_{BAT} = \frac{V_{PROG}}{R_{PROG}} \times 1200 \quad (V_{PROG}=1V)$$

GND(Pin3): Ground Terminal

Vcc(Pin 4): Positive Input Supply Voltage V_{IN} is the power supply to the internal circuit. When V_{IN} drops to within 30mv of the BAT pin voltage, TP4056 enters low power sleep mode, dropping BAT pin's current to less than 2uA.

BAT(Pin5): Battery Connection Pin. Connect the positive terminal of the battery to BAT pin. BAT pin draws less than 2uA current in chip disable mode or in sleep mode. BAT pin provides charge current to the battery and provides regulation voltage of 4.2V.

$\overline{\text{STDBY}}$(Pin6): Open Drain Charge Status Output When the battery Charge Termination, the $\overline{\text{STDBY}}$ pin is pulled low by an internal switch, otherwise $\overline{\text{STDBY}}$ pin is in high impedance state.

$\overline{\text{CHRG}}$ (Pin7): Open Drain Charge Status Output When the battery is being charged, the $\overline{\text{CHRG}}$ pin is pulled low by an internal switch, otherwise $\overline{\text{CHRG}}$ pin is in high impedance state.

CE(Pin8): Chip Enable Input. A high input will put the device in the normal operating mode. Pulling the CE pin to low level will put the YP4056 into disable mode. The CE pin can be driven by TTL or CMOS logic level.

ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at **T_A=25℃， V_{CC}=5V**， unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{CC}	Input Supply Voltage		●	4.0	5	8.0	V
I_{CC}	Input Supply Current	Charge Mode, R_{PROG} = 1.2k	●		150	500	μA
		StandbyMode(Charge	●		55	100	μA
		Terminated)	●		55	100	μA
		Shutdown Mode (R_{PROG} Not Connected,V_{CC} < V_{BAT}, or V_{CC} < V_{UV})					
V_{FLOAL}	Regulated Output (Float) Voltage	0℃≤T_A≤85℃， I_{BAT}=40mA		4.137	4.2	4.263	V
I_{BAT}	BAT Pin Current	R_{PROG} = 2.4k, Current Mode	●	450	500	550	mA
	Text condition:VBAT=4.0V	R_{PROG} = 1.2k, Current Mode	●	950	1000	1050	mA
		Standby Mode, V_{BAT} = 4.2V	●	0	−2.5	−6	μA
I_{TRIKL}	Trickle Charge Current	V_{BAT}<V_{TRIKL}, R_{PROG}=1.2K	●	120	130	140	mA
V_{TRIKL}	Trickle Charge Threshold Voltage	R_{PROG}=1.2K, V_{BAT} Rising		2.8	2.9	3.0	V
V_{TRHYS}	Trickle Charge Hysteresis Voltage	R_{PROG}=1.2K		60	80	100	mV
T_{LIM}	Junction Temperature in Constant Temperature Mode				145		℃

indicator light state

Charge state	Red LED $\overline{CHRG}$	Greed LED $\overline{STDBY}$
charging	bright	extinguish
Charge Termination	extinguish	bright
Vin too low; Temperature of battery too low or too high; no battery	extinguish	extinguish
BAT PIN Connect 10u Capacitance; No battery	Greed LED bright，Red LED Coruscate T=1-4 S	

Rprog Current Setting

R_{PROG} (k)	I_{BAT} (mA)
10	130
5	250
4	300
3	400
2	580
1.66	690
1.5	780
1.33	900
1.2	1000

TYPICAL APPLICATIONS