NIRMA UNIVERSITY

INSTITUTE OF TECHNOLOGY

Microprocessor & Microcontroller (**2EC404**)

ULTRASONIC DISTANCE INDICATOR

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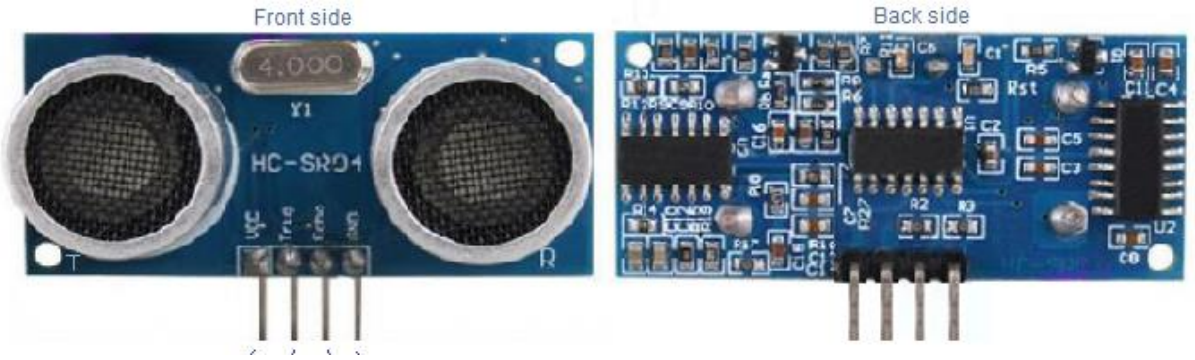
1. Introduction :

Ultrasonic applied to sound means that anything above frequencies of audioble sound. (Generally over to 20,000Hz). Now a days, Ultrasonic applied with greatful success in varies field of engineering. It has generally use in light industry and power engineering. In fact it is not possible to find a field of industrial endeavor for which is ultrasonic energy has not been tried of suggested, if not put in actual use. Ultrasonic transducers are mostly used in a different types of applications and in technological areas with significant differences in performance characteristics. Ultrasonic sensors which are capable of measuring range in nevigation. Ultrasonic instrumentation and measurement systems can be found in applications different from underwater or industrial systems, like finding flaws in materials, to medical imaging, burglar alarms, ultrasonic cleaners (like lenses or other optical parts, and jewelry cleaners), carrying audio messages, sonic weaponry and robotics. If there is an object in the path of this pulse, part or all of the pulse will be reflected back to the sender as an echo and can be detected. With the help of measuring the diff. in time between the pulse being transmitted and the echo being received, So it's possible to determine how far away the object is.

2. Problem statement :

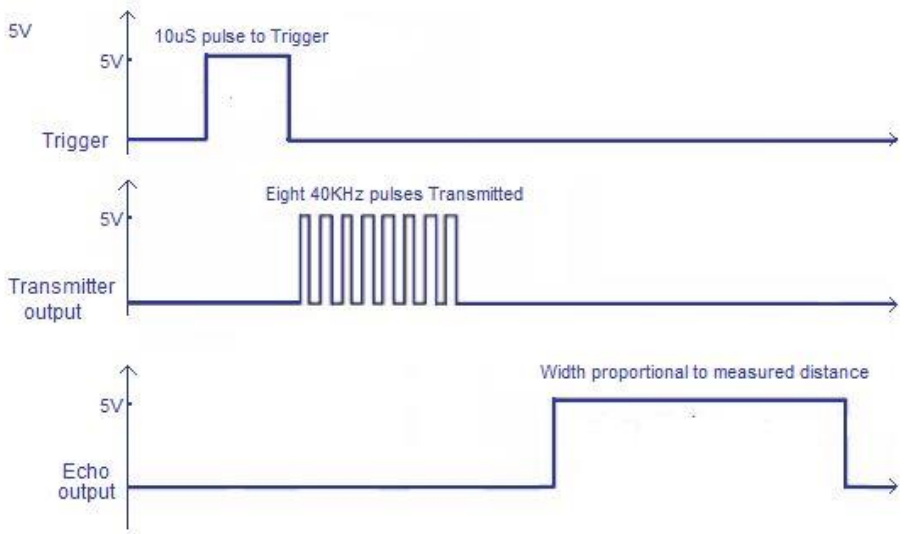
Most of car accidents has been done lately happen when the driver loses his concentration. So that a device measuring the distances from the surrounding cars and alert the driver when a dangerous situation has been done was a strong motivation for the invention. When construction over dangereous places like mountains, rivers, velly and it is not possible with the help of measuretap. Humans are limited in accuracy so sometime measurement issues are come and this types problem resolved by ultrasonic distance indicator. The main aim of this project is to implement the measurement instrument by using ultrasonic sensor and a microcontroller.

3. HC-SR04 ultrasonic module.

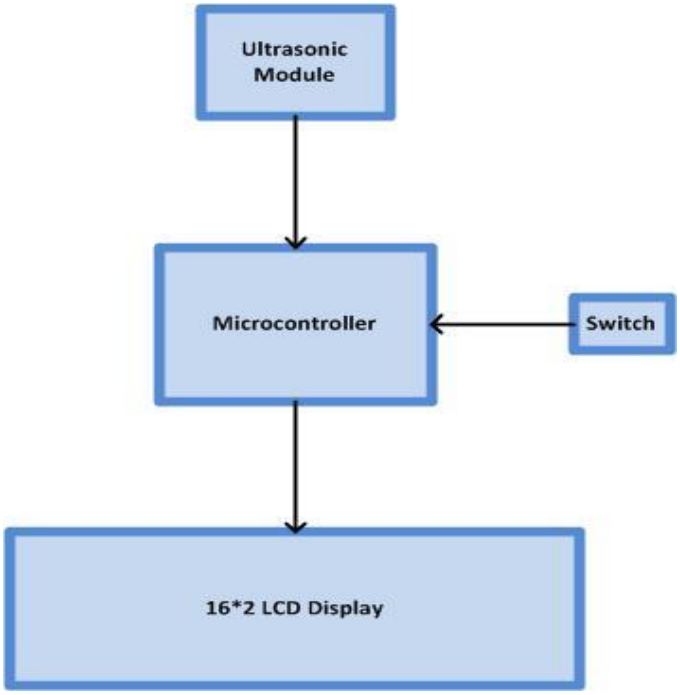


HC-SR04 is an ultrasonic ranging module designed for embedded system like application for distance measurent . It has a resolution of 0.3cm and the ranging distance range is 2cm to 500cm. It start woking from a 5V DC supply. The module transmits an ultrasonic signal, picks up its echo, measures the time elapsed between the two intrupt and outputs a waveform whose high time is modulated by the measured time which is proportional to the distance.

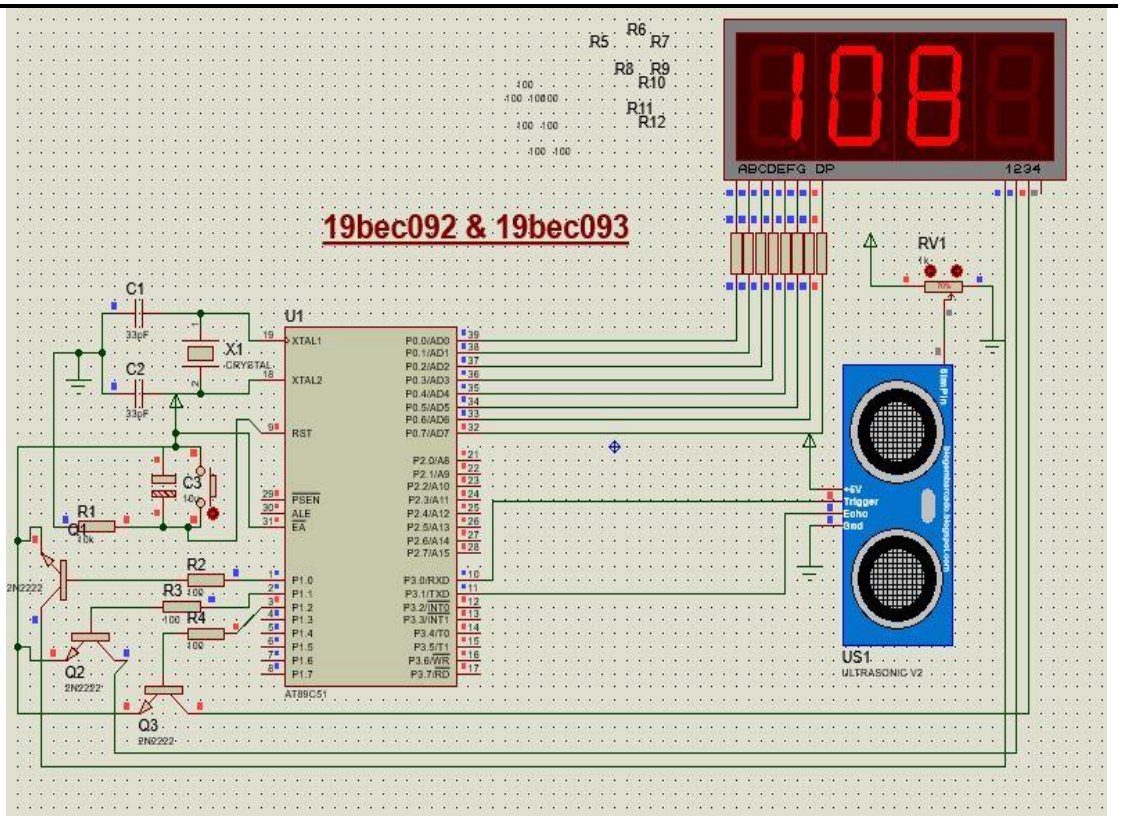
HC-SR04 timing diagram.

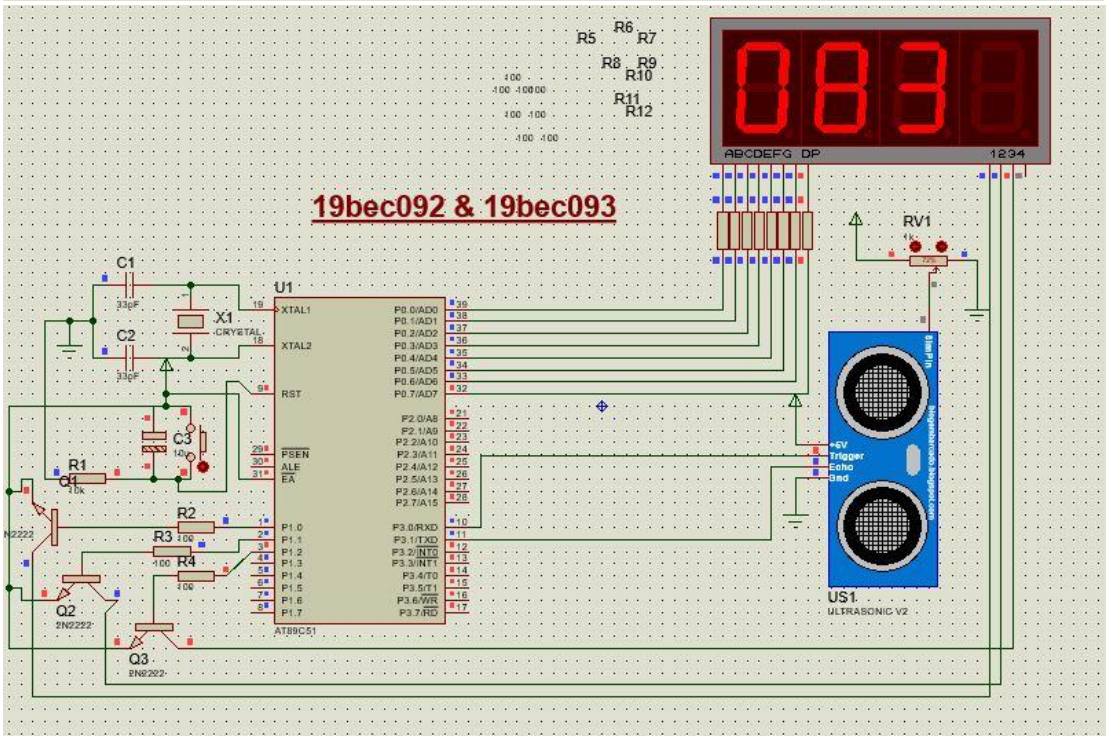


4. Block Diagram :-



5. Circuit :-


19bec092 & 19bec093
ABCDEFG DP
1234
U1
AT89C51
X1
CRYSTAL
C1
C2
C3
R1
R2
R3
R4
Q1
Q2
Q3
2N2222
RV1
US1
ULTRASONIC V2
+5V
Trigger
Echo
Gnd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R4
Q1
Q2
Q3
2N2222
RV1
US1
ULTRASONIC V2
+5V
Trigger
Echo
Gnd

6. Expected Output :

If rv value gets low as a limit display get bigger value .
From above ckt. Noted that we get 71% as o/p 108& another hand we get 75% 83 will come out
It come until 59% .
And that's way we get the expetcet o/p.

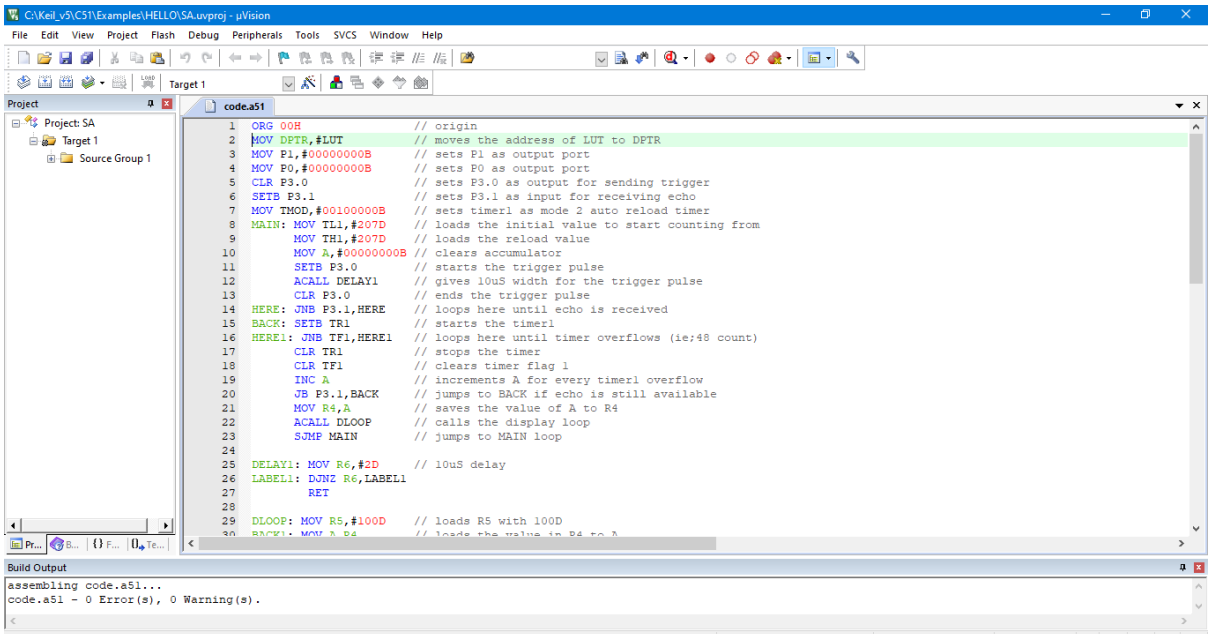
7. ADAVNTAGES :-

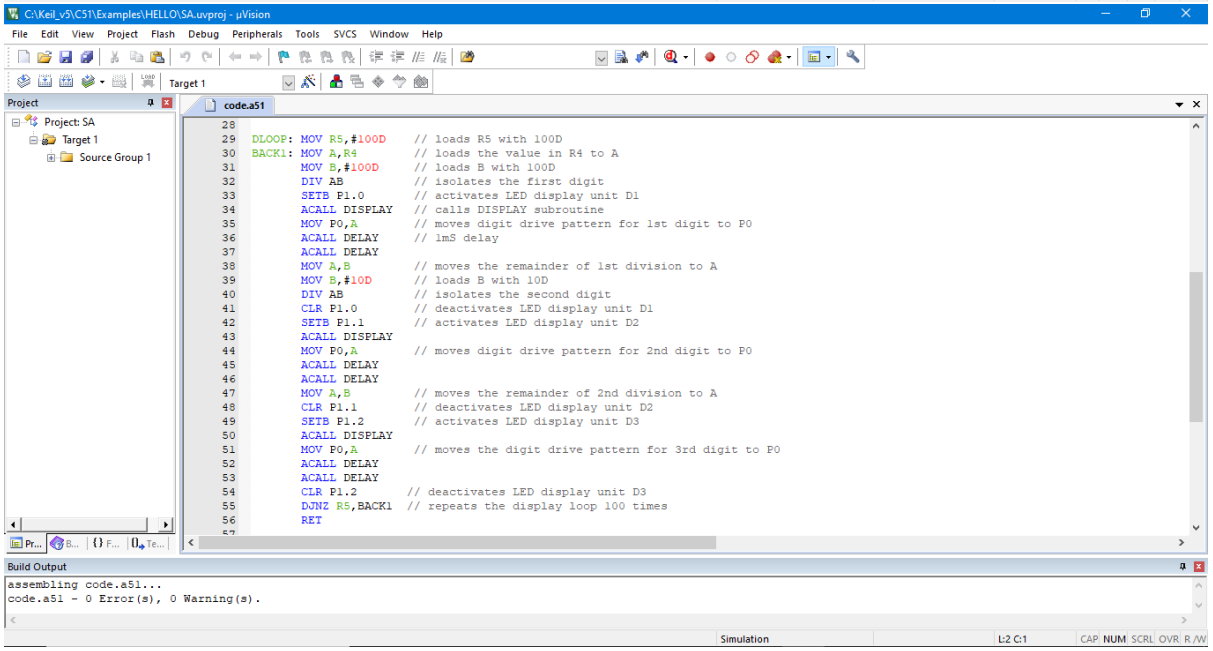
the ultrasonic method has unique advantages:

- Discrete distances to moving objects can be detected and measured.
- Less affected by target materials and surfaces, and not affected by color. Solid-state units
- have virtually unlimited, maintenance free life. Can detect small objects over long
- operating distances.
- Resistance to external disturbances such as vibration, infrared radiation, ambient noise,

8.CONCLUSION:-

The minimum distance that this system can measure is 2 centimeters. This distance is decided by ultrasonic transducer dead zone
The maximum distance that can be measured with acceptable accuracy is 3.6 meters. The amplitude of the echo depends on the reflecting material, shape, and size. With the help of additional circuit this project can be applicable at practical level. To reduse noise and prevent problems. This project successfully done on the platform proteus.


C:\Keil_v5\C51\Examples\HELLO\SA.uvproj - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
Project
Project: SA
Target 1
Source Group 1
code.a51
1 ORG 00H // origin
2 MOV DPTR,#LUT // moves the address of LUT to DPTR
3 MOV P1,#00000000B // sets P1 as output port
4 MOV P0,#00000000B // sets P0 as output port
5 CLR P3.0 // sets P3.0 as output for sending trigger
6 SETB P3.1 // sets P3.1 as input for receiving echo
7 MOV TMOD,#00100000B // sets timer1 as mode 2 auto reload timer
8 MAIN: MOV TL1,#207D // loads the initial value to start counting from
9 MOV TH1,#207D // loads the reload value
10 MOV A,#00000000B // clears accumulator
11 SETB P3.0 // starts the trigger pulse
12 ACALL DELAY1 // gives 10uS width for the trigger pulse
13 CLR P3.0 // ends the trigger pulse
14 HERE: JNB P3.1,HERE // loops here until echo is received
15 BACK: SETB TR1 // starts the timer1
16 HERE1: JNB TF1,HERE1 // loops here until timer overflows (ie;48 count)
17 CLR TR1 // stops the timer
18 CLR TF1 // clears timer flag 1
19 INC A // increments A for every timer1 overflow
20 JB P3.1,BACK // jumps to BACK if echo is still available
21 MOV R4,A // saves the value of A to R4
22 ACALL DLOOP // calls the display loop
23 SJMP MAIN // jumps to MAIN loop
24
25 DELAY1: MOV R6,#2D // 10uS delay
26 LABEL1: DJNZ R6,LABEL1
27 RET
28
29 DLOOP: MOV R5,#100D // loads R5 with 100D
Build Output
assembling code.a51...
code.a51 - 0 Error(s), 0 Warning(s).
Simulation
L:2 C:1
CAP NUM SCRL OVR R /W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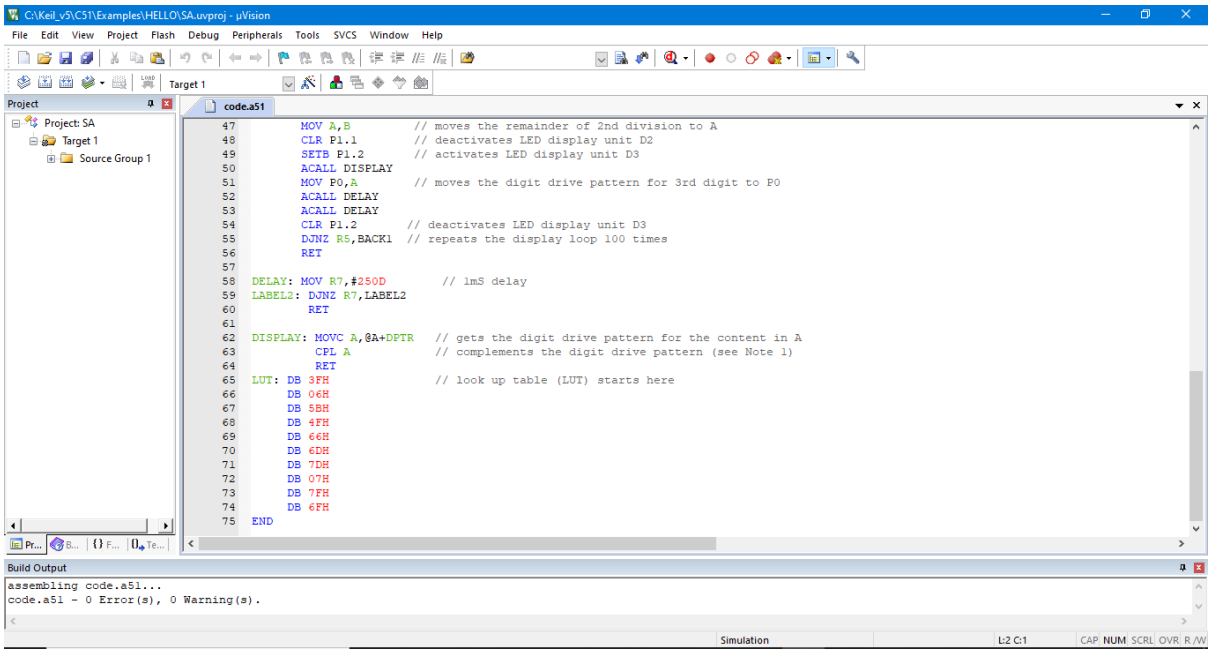
Target 1
Project
Project: SA
Target 1
Source Group 1
code.a51
28
29 DLOOP: MOV R5,#100D // loads R5 with 100D
30 BACK1: MOV A,R4 // loads the value in R4 to A
31 MOV B,#100D // loads B with 100D
32 DIV AB // isolates the first digit
33 SETB P1.0 // activates LED display unit D1
34 ACALL DISPLAY // calls DISPLAY subroutine
35 MOV P0,A // moves digit drive pattern for 1st digit to P0
36 ACALL DELAY // 1mS delay
37 ACALL DELAY
38 MOV A,B // moves the remainder of 1st division to A
39 MOV B,#10D // loads B with 10D
40 DIV AB // isolates the second digit
41 CLR P1.0 // deactivates LED display unit D1
42 SETB P1.1 // activates LED display unit D2
43 ACALL DISPLAY
44 MOV P0,A // moves digit drive pattern for 2nd digit to P0
45 ACALL DELAY
46 ACALL DELAY
47 MOV A,B // moves the remainder of 2nd division to A
48 CLR P1.1 // deactivates LED display unit D2
49 SETB P1.2 // activates LED display unit D3
50 ACALL DISPLAY
51 MOV P0,A // moves the digit drive pattern for 3rd digit to P0
52 ACALL DELAY
53 ACALL DELAY
54 CLR P1.2 // deactivates LED display unit D3
55 DJNZ R5,BACK1 // repeats the display loop 100 times
56 RET
Build Output
assembling code.a51...
code.a51 - 0 Error(s), 0 Warning(s).
Simulation
L:2 C:1
CAP NUM SCRL OVR R /W


C:\Keil_v5\C51\Examples\HELLO\SA.uvproj - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
Project
Project: SA
Target 1
Source Group 1
code.a51
47 MOV A,B // moves the remainder of 2nd division to A
48 CLR P1.1 // deactivates LED display unit D2
49 SETB P1.2 // activates LED display unit D3
50 ACALL DISPLAY
51 MOV P0,A // moves the digit drive pattern for 3rd digit to P0
52 ACALL DELAY
53 ACALL DELAY
54 CLR P1.2 // deactivates LED display unit D3
55 DJNZ R5,BACK1 // repeats the display loop 100 times
56 RET
57
58 DELAY: MOV R7,#250D // 1mS delay
59 LABEL2: DJNZ R7,LABEL2
60 RET
61
62 DISPLAY: MOVC A,@A+DPTR // gets the digit drive pattern for the content in A
63 CPL A // complements the digit drive pattern (see Note 1)
64 RET
65 LUT: DB 3FH // look up table (LUT) starts here
66 DB 06H
67 DB 5BH
68 DB 4FH
69 DB 66H
70 DB 6DH
71 DB 7DH
72 DB 07H
73 DB 7FH
74 DB 6FH
75 END
Build Output
assembling code.a51...
code.a51 - 0 Error(s), 0 Warning(s).
Simulation
L:2 C:1
CAP NUM SCRL OVR R /W

10. REFERENCES

- kupdf.net_the-8051-microcontroller-kenneth-j-ayala
- Datasheet of ultrasonic sensor HC-SR04
- Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C,
- Second Edition
- B. Kreczmer, "Gestures recognition by using ultrasonic range-finders", Proc. 16th IEEE Int. Conf. MMAR 2011, pp. 361-368, Aug. 201
- https://www.engineersgarage.com
- https://www.circuitstoday.com/ultrasonic-range-finder-using-8051