USER'S MANUAL

FOR

8051 DEVELOPEMENT BOARD

Manufactured By

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1. INTRODUCTION

Logsun's DEVELOPMENT board has 8-bit 89E51RD2. A Microcontroller based evaluation module. DEVELOPMENT is a general-purpose development board for RD2 microcontroller. PR51-V4can is used extensively to test and validate Programs. At the heart of the development board is 89E51RD2P; this provides advance features like ISP, I2C and IAP. The microcontroller has 64KB internal flash memory and 1KB on-chip RAM. The development board comes with RS-232 interface to allow user to program the microcontroller directly from PC. .DEVELOPMENT board and related software routines help the system designers to rapidly design and prototype their Designs based on RD2 Core. It provides a complete development platform with different modules interface that accelerates the task of designers to run application software on target RD2 Controller hardware, thus providing a platform to benchmark their system, save time & expense of building their own application test board and enabling them to get their designs to market quickly. DEVELOPMENT board is a unique hardware and software combination providing designers, the tools to develop most advanced .DEVELOPMENT board series Microcontroller applications. The DEVELOPMENT board hardware reference and software application programs also simplify RD2 based hardware and software development.

2. SPECIFICATION

1. 89E516RD2 Central Processing Unit
2. On-chip Flash Program Memory with In-System Programming (ISP) and In-application Programming (IAP) capability
3. Flash EPROM for downloading hex files via UART
4. All ports pins brought on 10 PIN FRC (User selection is possible)
5. Supplied with companion CD includes working sample programs, ISP programming
6. Software, Assembler, disassembles, +12 V supply, USB cable and quick start manual.

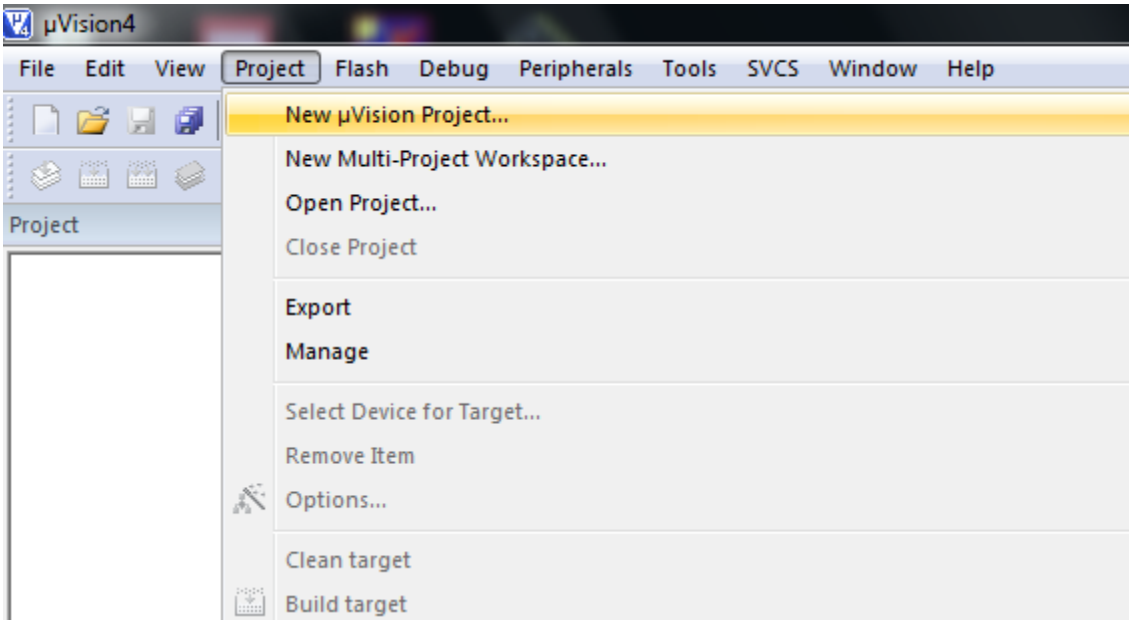
3. SETTING FOR 8051 DEVELOPMENT BOARD (DVK) :

1. Connect the 12V power supply to the Kit.
2. Switch on the board.
3. To fit the MAX232 & CH340T module on board.
4. Connect **USB A-B cable** to the board and PC.
5. Open SST software on PC
6. Select the com port
7. Select the IC (89E51RD2).
8. Download the HEX file.
9. Connect 10 pin FRCs
10. Jumpers Settings on board.
11. JP1, JP9, JP10, P1, P0 – 1& 2 short.

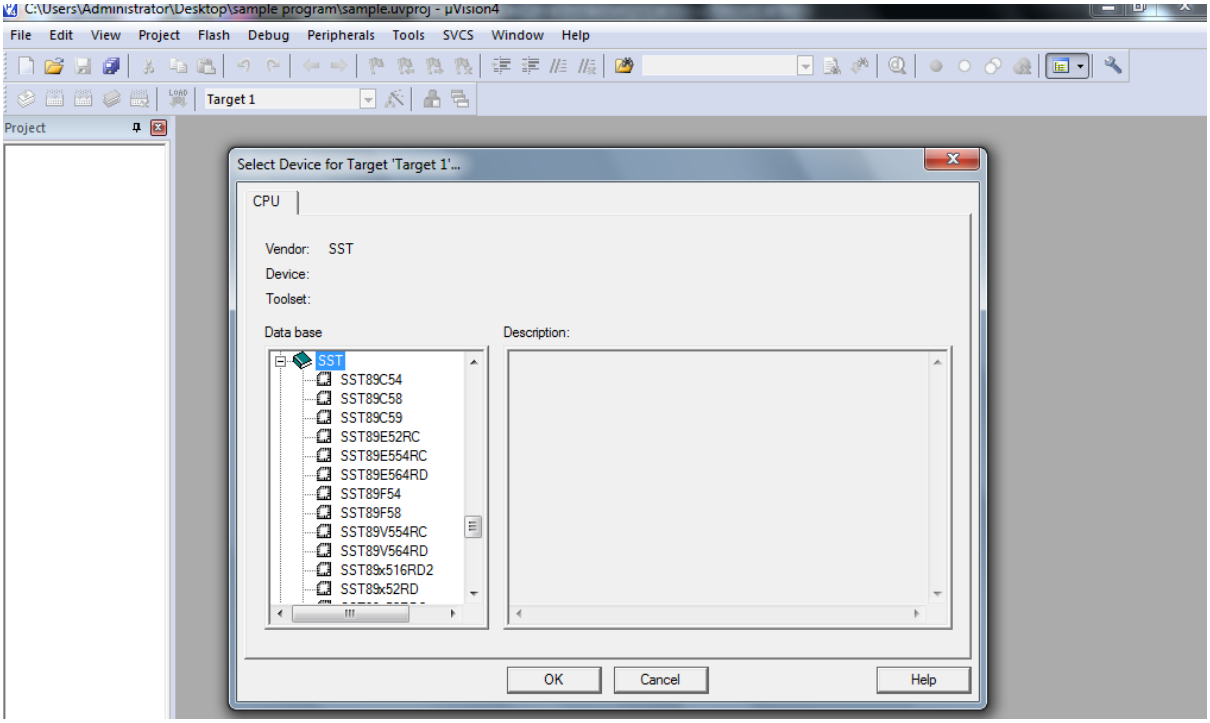
4. HOW TO CREATE PROJECT:

SOFTWARE USED**: KEIL**

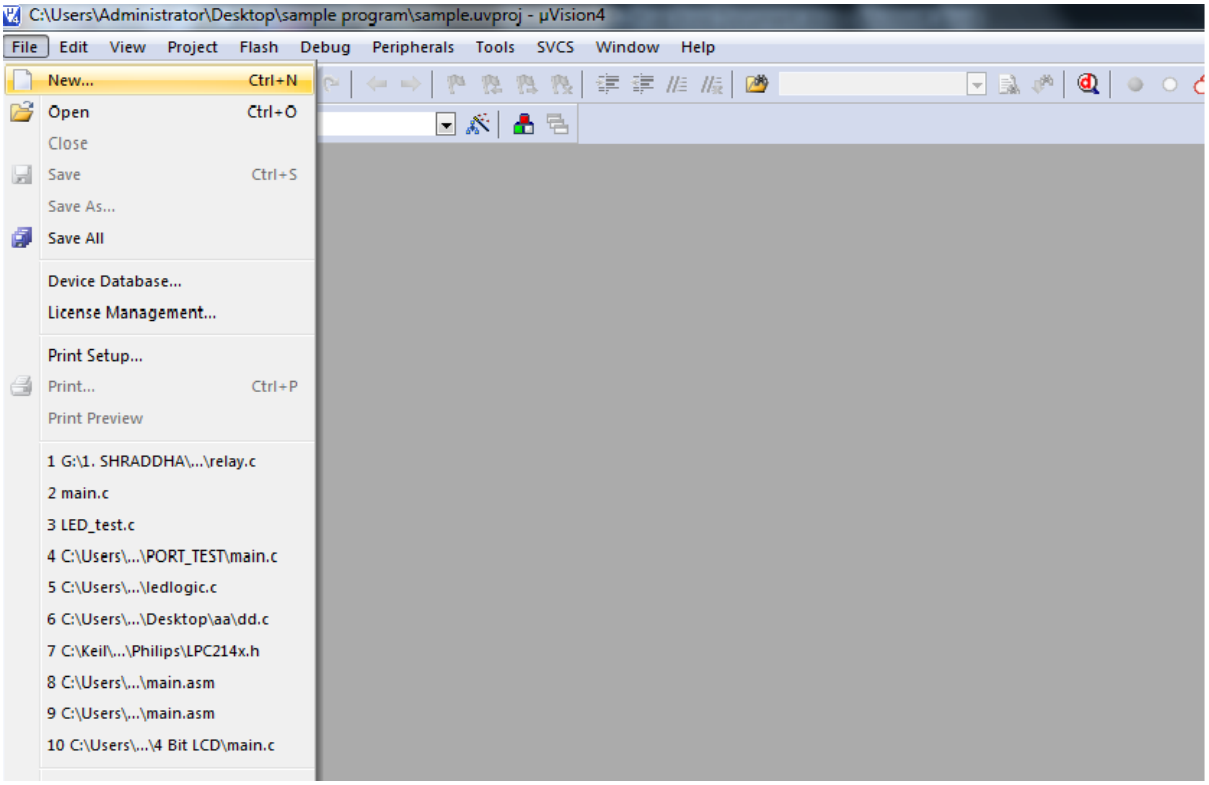
Open Keil software ➔ go to project menu ➔ click on new microVision project ➔ create new folder in that you enter project name and click on ok.



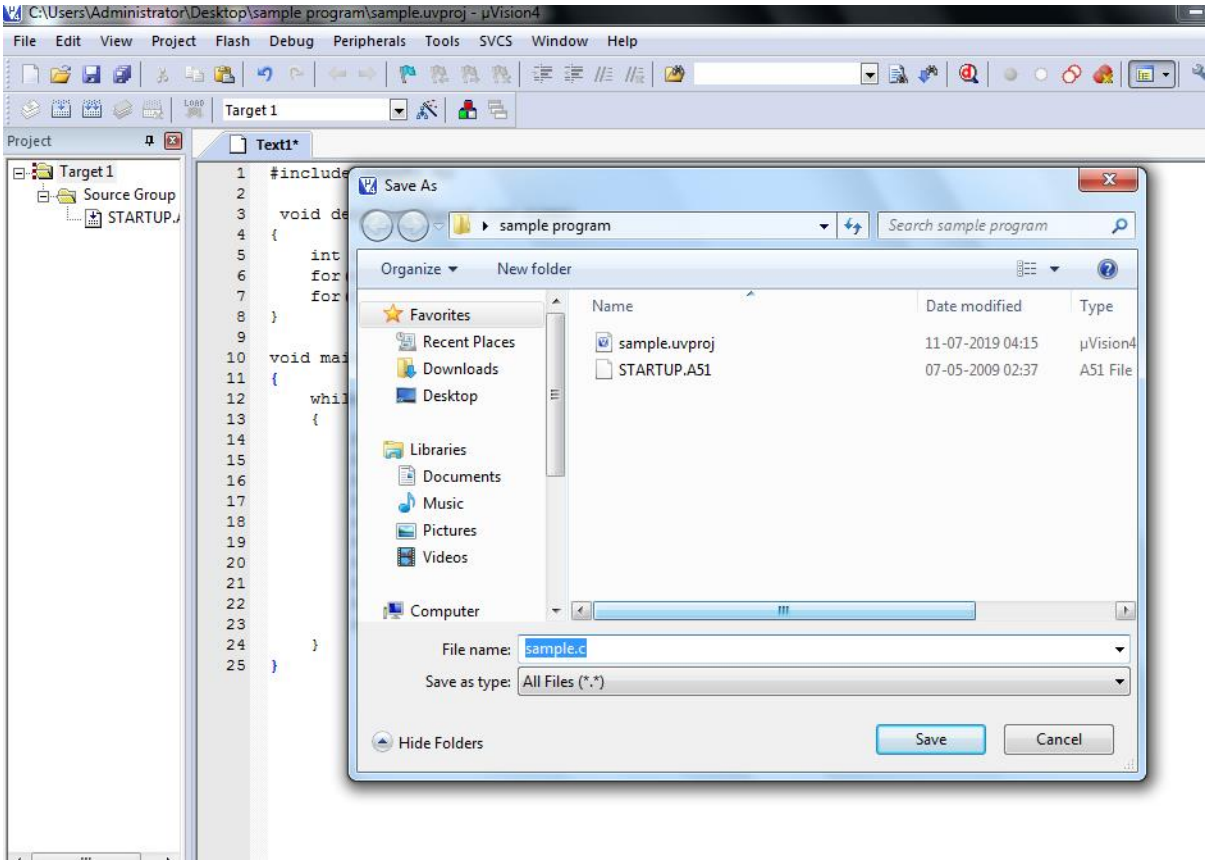
Now select IC ➔ SST ➔ SST89x516RD2 ➔ Click on ok.



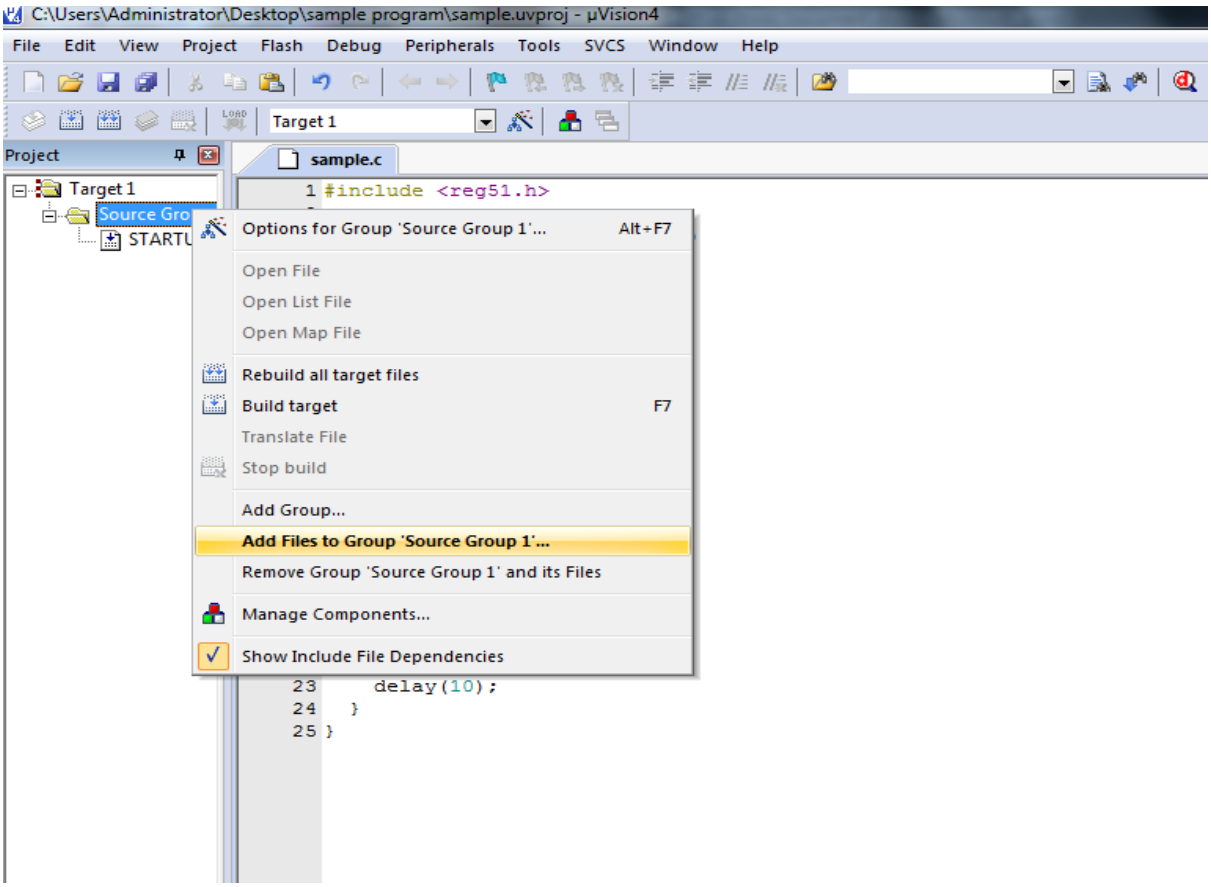
Click on File menu ➔ click on New



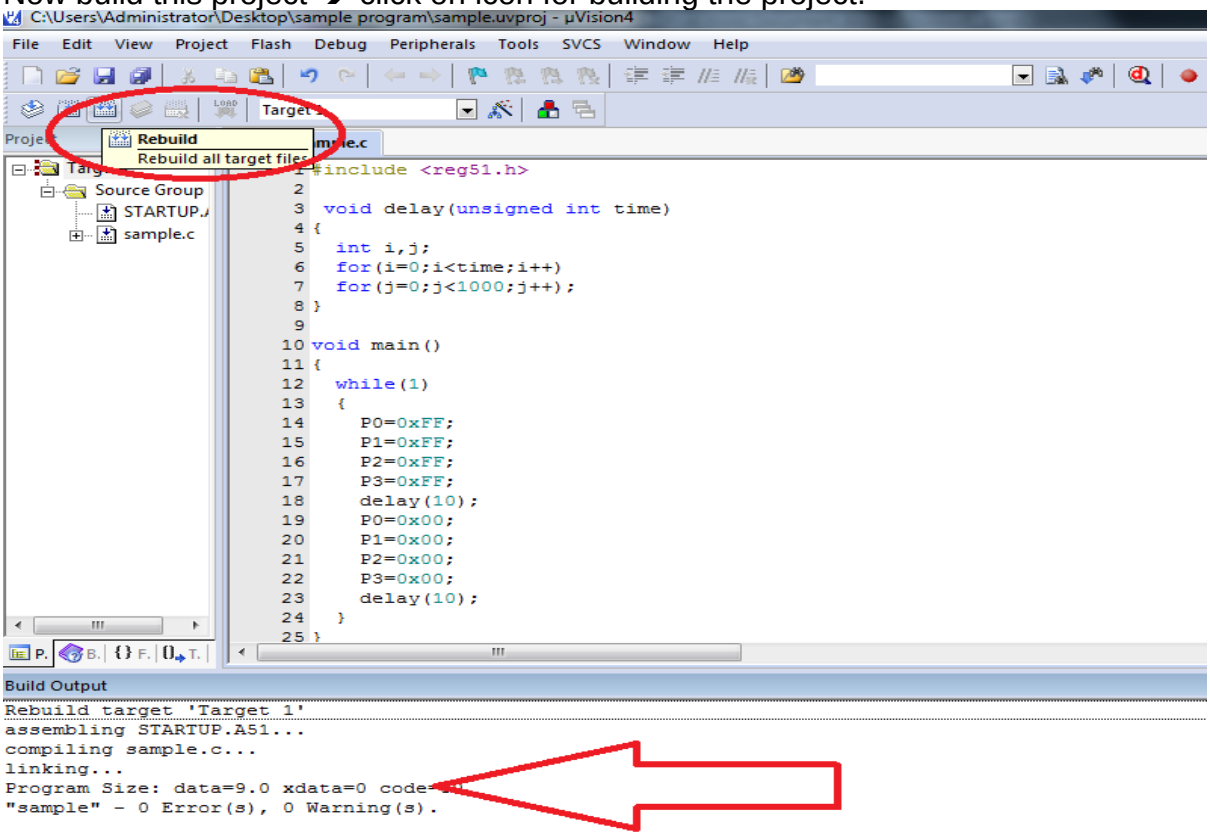
Now write your code ➔ and save your code .c extension.



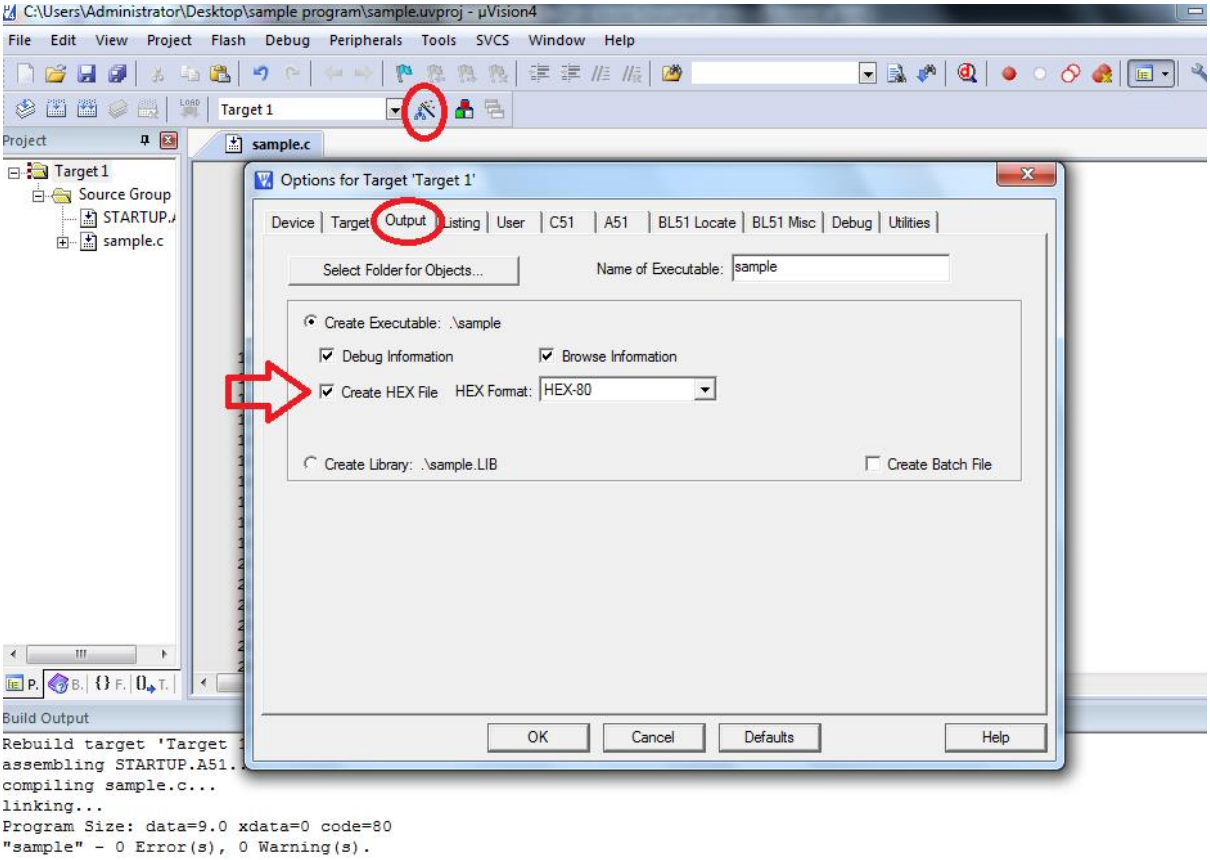
Now add this file on source code ➔ right click on Source code ➔ and click on Add Files to Group ‘source Group 1’ and select sample and add and close this window.



Now build this project ➔ click on icon for building the project.



For creating hex file ➔ click on Target option ➔new window will open ➔ click on Output and select Create HEX file

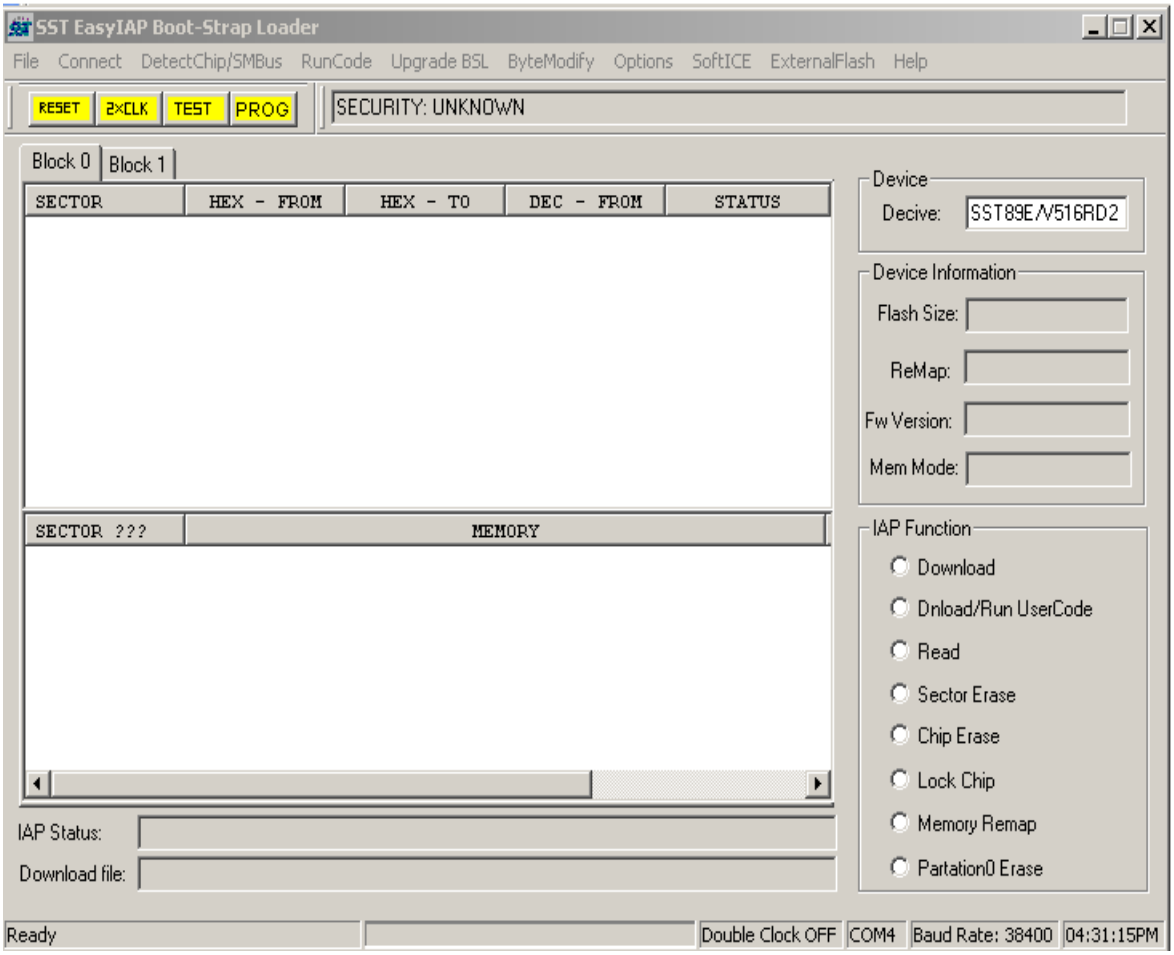


5. ISP PROGRAMMING USING SST

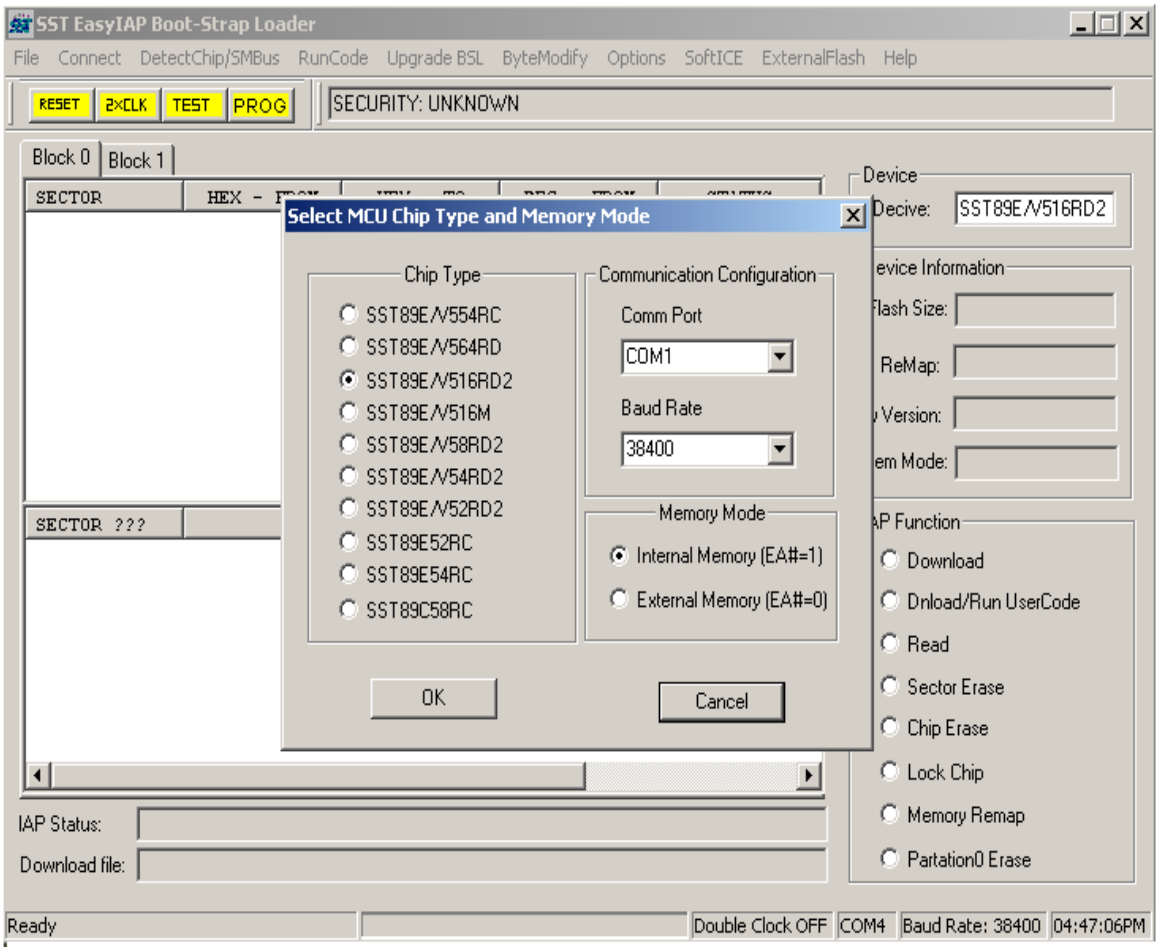
The different settings on SST software for downloading the program are as follows,

1. Keep Switch in up position for serial download and **down position for USB** downloading on the RD2 board

2. Open SST software.



3. Click on Options.



4. Set Com port selection as per user
5. Baud Rate (9600, **38400**)
6. Select the device
7. Click OK and Click on connect option then press RESET on board simultaneously.
8. Click on download /run user code.
9. Now browse * .Hex File that is to be download.
10. Click on ‘OK for down loading the program.
11. Switch ON the power supply through switch. Wait until window shows the ‘Done’ Message.
12. Reset the controller by pressing **SW (S2)**. Your program will be executed.

EXPERIMENT No 1

LED Logic

AIM: To study the interfacing of LED Logic with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 pin FRC cable, Serial or USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to (RD2) board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) The CD supplied to you consists of program to run LED Logic Section for DVK Kit.

7) Download the file (.hex) from the PC to kit.

8) Now if downloading of the program is completed, connect 10 pin FRC cables to the LED logic section of the DVK kit

9) You will observe that LED will flashes with some delay

Note: FRC port connection must be proper to run the program.

EXPERIMENT No 2.

LCD DISPLAY

AIM: To study the interfacing of LCD with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 pin FRC cable, Serial or USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Download the file (.hex) from the PC to kit.

7) Now if downloading of the program is completed, connect 10 pin FRC cables to the LCD section of the DVK kit

8) You will observe that LCD will Display LOGSUN SYSTEMS.

THEORY:

Liquid crystal display:

LCD can be connected to the Microcontroller through the port 0. LCD is connected in the 4-bit mode or 8-bit mode. And the standard subroutine is given with the development board. So that the application can be easily demonstrated and also for further implementation the subroutine can be easily embedded for which one has to do very few changes. Wide range of instruction functions: Clear displays, cursor home, display ON/OFF, cursor ON/OFF, cursor shift, display shift.

4-bit mode

RS, RW, EN are 1&2 are short.

8-bit mode

RS, RW, EN are 2&3 are short

EXPERIMENT No 3.

LCD WITH KEYPAD INTERFACING

AIM: To study the interfacing of LCD and Keypad with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 pin FRC cable, Serial or USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Download the file (.hex) from the PC to kit.

7) Now if downloading of the program is completed, connect 10 pin FRC cables to the LCD and Keypad section of the DVK kit

THEORY:

Liquid crystal display:

LCD can be connected to the Microcontroller through the port 0. LCD is connected in the 4-bit mode or 8-bit mode. And the standard subroutine is given with the development board. So that the application can be easily demonstrated and also for further implementation the subroutine
can be easily embedded for which one has to do very few changes. Wide range of instruction functions: Clear displays, cursor home, display ON/OFF, cursor ON/OFF, cursor shift, display shift.

4-bit mode

RS, RW, EN are 1&2 are short.

8-bit mode

RS, RW, EN are 2&3 are short

EXPERIMENT NO 4.

SEVEN SEGMENT DISPLAY

AIM: To study the interfacing of SEVEN SEGMENT with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 pin FRC cable, serial or USB, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run SEVEN SEGMENT Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the Seven segment section of the DVK kit.

10) You will observe that Seven segment will Display (0000 To FFFF).

EXPERIMENT NO 5.

SEVEN SEGMENT + KEYBOARD DISPLAY

AIM: To study the interfacing of SEVEN SEGMENT + KEYBOARD with 89E516RD2 DEVELOPMENT BOARD.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 pin FRC cable, Serial or USB cable, 12V power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run SEVEN SEGMENT + KEYBOARD Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the SEVEN SEGMENT + KEYBOARD section of the DVK kit.

10) You will observe that SEVEN SEGMENT + KEYBOARD will Display.

EXPERIMENT NO 6.

8 BIT DAC

AIM: To study the interfacing of DAC with Embedded Trainer board.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 Pin FRC cable, Serial or USB cable, 12V Power supply.

THEORY:

D/A converters: Digital to analog converters are broadly classified in three categories: Current output, voltage output and multiplying type.

The current output DAC, as the name suggests, provides current as the output DAC is slower than the current output DAC because of the delay in converting the current signal into the voltage signal. However, in many applications, it is necessary to convert current into voltage by using an external operational amplifier. The multiplying DAC is similar to the other two types except its output represent the product of the input signal and the reference source, and the product is linear over a broad range. Conceptually, there is not much difference between these three types; any DAC can be viewed as a multiplying DAC.

D/A converters are available as integrated circuits. Some are specially designed to be compatible with the micro controller. Typical applications include digital voltmeters, peak detectors, panel meters, and programmable gain and attenuation, and stepping motor drive.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run 8 Bit DAC Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the 8 Bit DAC section of the DVK kit.

10) Connect CRO/DSO probe on DAC O/P and GND turret.

11) Observe the output on CRO/DSO.

EXPERIMENT NO 7.

8 BIT ADC 0804

AIM: To study & observe the theoretical knowledge of ADC IC-0804.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 Pin FRC cable, Serial or USB Cable, 12V Power supply.

THEORY:

In the ADC section the IC- 0804 is used to convert the input signal in digital. Here we have discussed about the process of A/D and D/A conversion techniques used by these ICs.

A/D conversion: The A/D conversion is quantizing process whereby an analog signal is represented by equivalent binary states; this is opposite to the D/A conversion process. Analog to Digital converters can be classified into two general group based on the conversion technique. One technique involves comparing the given analog signal with internally generated equivalent signal. This group involves successive –approximation, counters, and flash type converters. The second technique involves changing an analog signal into time or frequency and comparing these new parameters to known values. This group involves integrator converters and voltage to frequency converters. ‘The tradeoff between the two techniques is based on accuracy vs. speed. The successive – approximation and flash type are faster but generally less accurate than the integrator and the voltage to frequency converters. Furthermore, the flash type is expensive and difficult to design for high accuracy.

The successive – approximation A/D converter are used in applications, such as data loggers and instrumentation, where conversion speed is important. On the other hand, integrating – type converters are used in applications such as digital meters, panel meters and monitoring systems, where the conversion accuracy is critical. The most commonly used A/D converters- successive approximation is discussed in this section with several interfacing examples.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run 8 Bit ADC Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the 8 Bit ADC section of the DVK kit.

10) observe the output of LEDs (00 to ff) through the POT (0 to 5 V).

Note: Keep link at SL4 between 1 &2.

EXPERIMENT NO 8.

DC MOTOR

AIM: To study DC motor speed control using PWM

REQUIREMENTS RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, Serial or USB Cable, 10 Pin FRC cable, 12V power supply, DC motor card.

APPLICATION: In Industries DC motors are using. In some application speed control is required. Here we have assembly of small DC motor with speed control.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run DC motor Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the DC motor section of the DVK kit.

10) You can change the direction of motor by pressing the FWR or REV keys for keyboard.
(FW for forward direction & RW for reverse direction)

11) You can start or stop the motor by pressing the START or STOP keys.

- Jumpers Settings For DC motor :
  JP6, JP7 – 1& 2 short.

EXPERIMENT NO 9.

STEPPER MOTOR

AIM: To study Stepper motor.

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD it, Serial or USB Cable, 10 Pin FRC cable, 12V power supply, Stepper motor card.

INTRODUCTION:

Basically the stepper motor is an electromagnetic device, which converts digital pulses in to discrete mechanical rotational movements.

In rotary step motor, the output shaft of the motor rotates in equal increments, in response to a train of input pulses.

CONSTRUCTION:

The stepping motor is basically a motor with two phases, eight silent poles, toothed iron rotor and a permanent magnet. This rotor is known is hybrid rotor.

The rotor is suspended in the stator by means of sealed ball bearings.

WORKING OF STEPPING MOTOR:

Sequential switching of supply to the two phases of motor causes the stepping action. The stepping motor can be run in two modes,

a) Full Step Mode: In this mode out of the four coils, two coils are energized at each time when we apply the pulses. The step angle in this case is 7.5 degree +/- 0.1. The speed of the motor can vary by varying the time duration between the two pulses.

Applying the pulses sequence in the reverse can change the direction of the motor Direction, that is from BOTTOM to TOP.

b) Half step Mode: In this mode, we get the step angle of 3.75 degree, hence better resolution.

PROCEDURE FOR STEPPER MOTOR:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK.

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run stepper motor Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the Stepper motor section of the DVK kit.

- Jumpers Settings For Stepper motor :
  JP6,JP7 – 2& 3 short.

EXPERIMENT NO 10.

RELAY AND BUZZER INTERFACE

AIM: Relay & Buzzer Interface to embedded development board

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 Pin FRC cable, serial or USB cable, 12V Power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run Relay & Buzzer Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the Relay section of the DVK kit.

10) Observe the output Relay ON/OFF.

EXPERIMENT NO 11.

EEPROM INTERFACE

AIM: EEPROM Interface to embedded development board

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 Pin FRC cable, serial or USB cable, 12V Power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run EEPROM Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

9) Now if downloading of the program is completed, connect 10 pin FRC cables to the EEPROM section of the DVK kit.

10) Observe the output of EEPROM on LCD display.

EXPERIMENT NO 12.

RTC INTERFACE

AIM: RTC Interface to embedded development board

REQUIREMENTS: RD2 Project Board on 89E516RD2 DEVELOPMENT BOARD, 10 Pin FRC cable, serial or USB cable, 12V Power supply.

PROCEDURE:

1) Connect +12V supply to board.

2) Connect the USB or Serial Cable of the micro controller Kit and select COM port of the PC.

3) Switch ON the power supply.

4) Execute the software “SST” to establish the serial or USB Communication.

5) Click to option for SST software and select the COM port & IC & click OK

6) Execute the software “SST” to establish the serial or USB Communication.

7) The CD supplied to you consists of program to run RTC Section for DVK Kit.

8) Download the file (.hex) from the PC to kit.

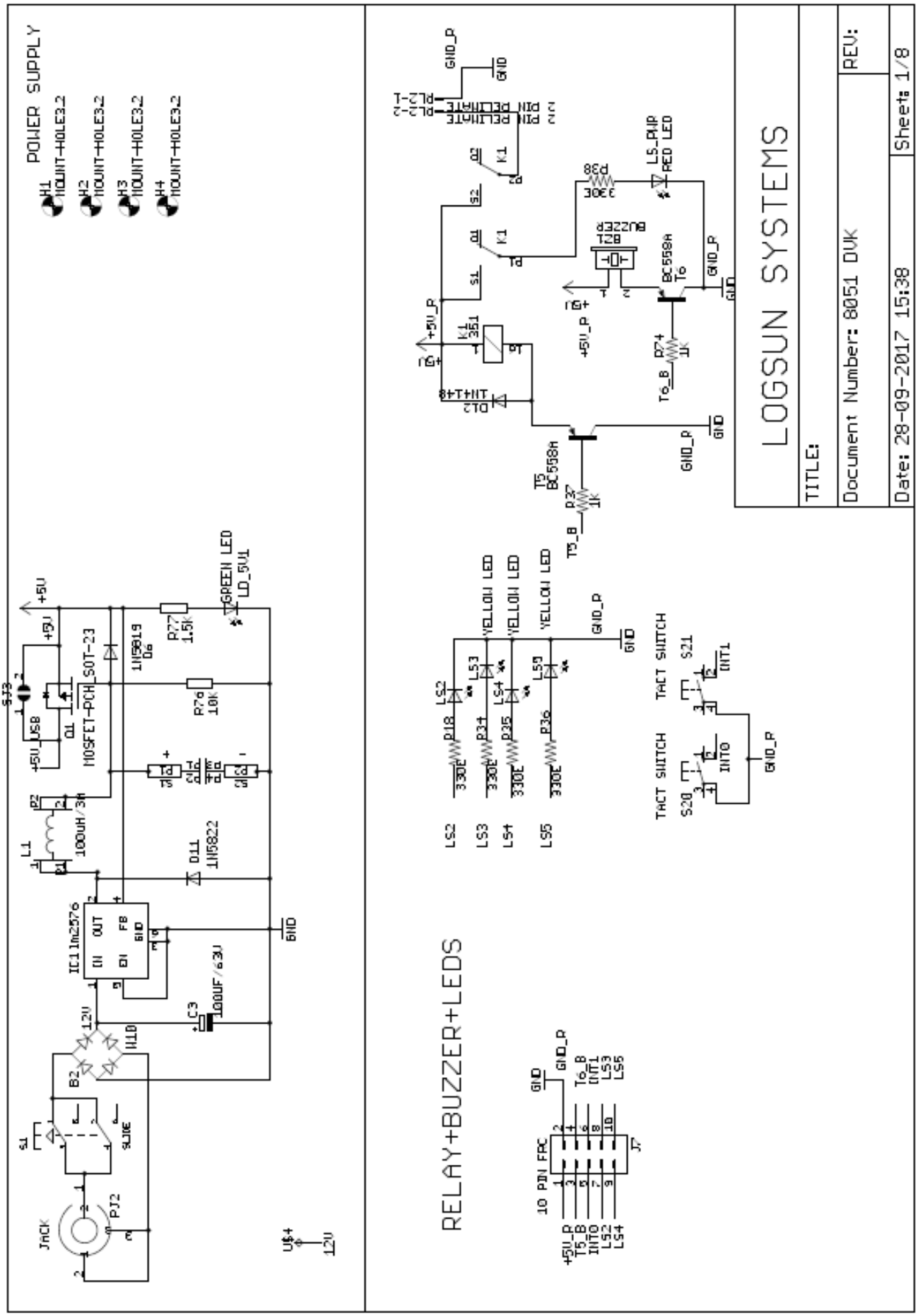
9) Now if downloading of the program is completed, connect 10 pin FRC cables to the Relay section of the DVK kit.

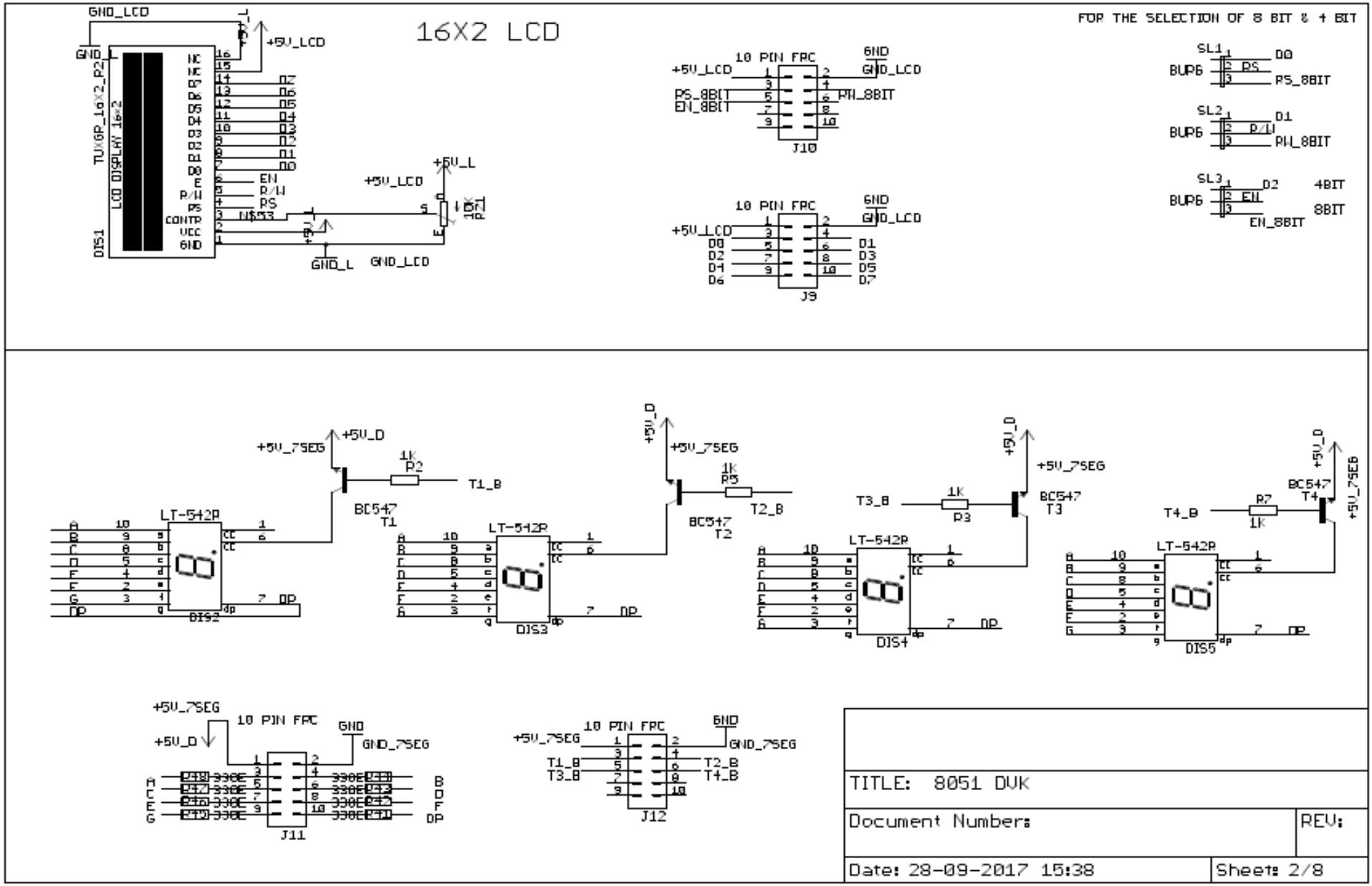
10) Observe the output of RTC on LCD display.

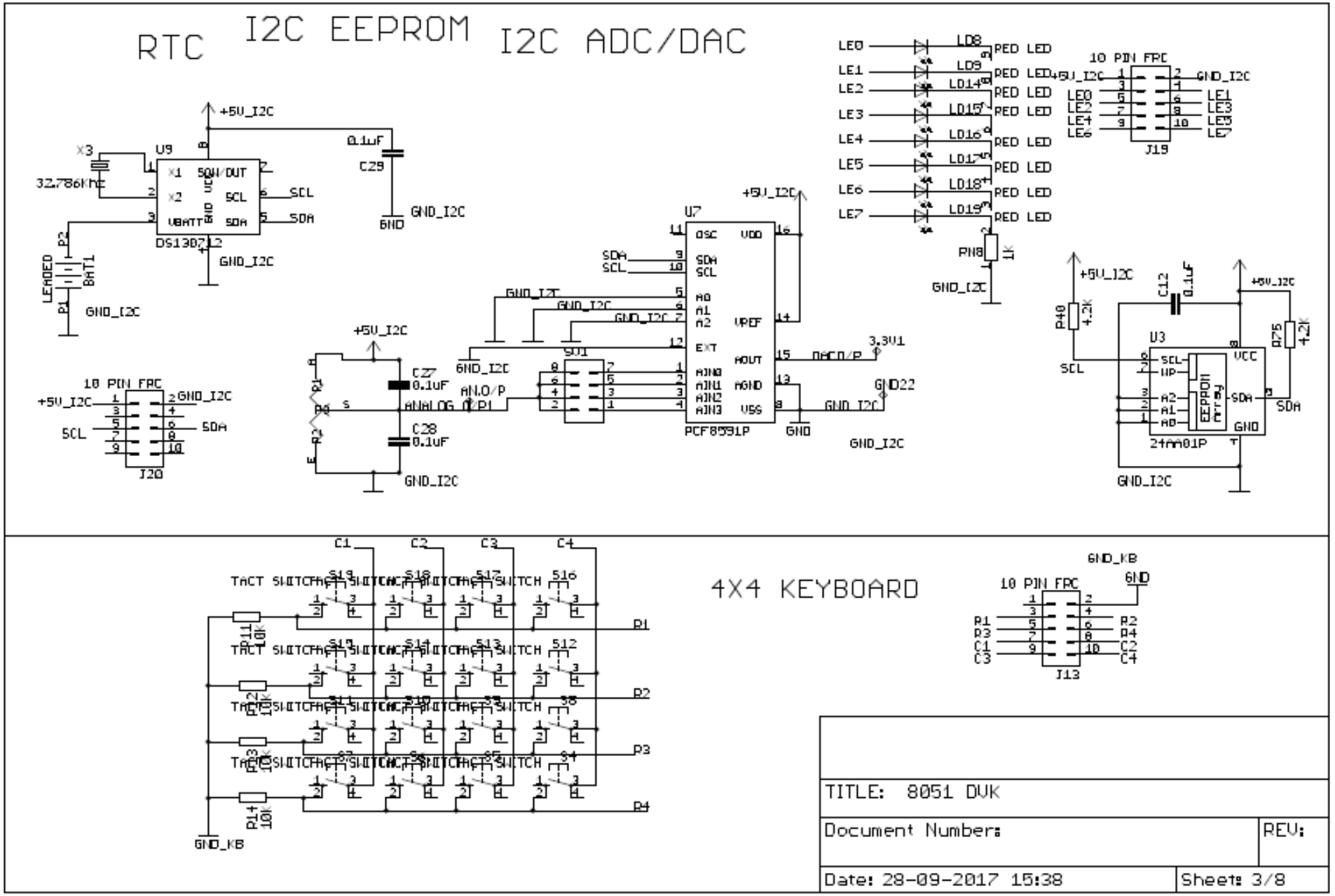
FRC CONNECTION DETAILS:

Sr. No.	Experiments	8051 DVK Port No.	Port No.
1	8 Bit ADC	PORT 2	J17 (8-Bit ADC)
2	8 Bit ADC + 8 Bit LCD	PORT 0 PORT 1 PORT 2 PORT 3	J9 (LCD) J10 (LCD) J16 (8-Bit ADC) J17 (8-Bit ADC)
3	8 Bit DAC	PORT 1	J18(8-bit DAC)
4	LCD(4 bit)	PORT 0	J9 (LCD)
5	LCD(8 bit)	PORT 0 PORT 1	J9 (LCD) J10 (LCD)
6	EEPROM	PORT 0 PORT 1 UEXT	J9 (LCD) J10(LCD) J20 (EEPROM)
7	RTC	PORT 0 PORT 1 UEXT	J9 (LCD) J10 (LCD) J20 (RTC)
8	LCD + Keypad	PORT 0 PORT 1 PORT 2	J9 (LCD) J10 (LCD) J13 (Keypad)
9	7 Segment	PORT 0 PORT 1	J11 (7 segment) J12 (7 segment)
10	7 Segment + Keypad	PORT 0 PORT 1 PORT 2	J11 (7 segment) J12 (7 segment) J13 (Keypad)
11	LED LOGIC	PORT 0 PORT 1	J21 (Digital I/O) J22(Digital I/O)
12	LED sequence+ Relay buzzer	PORT 3	J7 (LED sequence)
13	DC motor	PORT 1 PORT 2	J14 (DC Motor) J15
14	Stepper motor	PORT 1 PORT2	J14 (Stepper Motor) J15
15	Serial Rx-Tx	Connect A-B USB Cable or M-F Straight Serial Cable Between DVK and PC/Laptop.	

SCHEMATIC:


POWER SUPPLY
MOUNT-HOLE3.2
RELAY+BUZZER+LEDS
LOGSUN SYSTEMS
TITLE:
Document Number: 8051 DVK
REV:
Date: 28-09-2017 15:38
Sheet: 1/8
GREEN LED
YELLOW LED
TACT SWITCH
BUZZER
BC558
10 PIN FRC
MOSFET-PCH_SOT-23
IC LM2576
100UH/3A
100UF/63V
SLIDE
JACK


16X2 LCD
FOR THE SELECTION OF 8 BIT & 4 BIT
GND_LCD
+5V_LCD
TUXGP_16X2_P2
LCD DISPLAY 16x2
DIS1
NC
D7
D6
D5
D4
D3
D2
D1
D0
EN
R/W
RS
CONTR
VCC
GND
U$53
GND_L
10 PIN FPC
J10
J9
GND
PS_8BIT
EN_8BIT
SL1
SL2
SL3
BUP6
DB
4BIT
8BIT
+5V_D
+5V_7SEG
1K
P2
P3
P5
P7
T1_B
T2_B
T3_B
T4_B
BC547
T1
T2
T3
T4
LT-542P
DIS2
DIS3
DIS4
DIS5
DP
J11
J12
GND_7SEG
TITLE: 8051 DVK
Document Number:
REV:
Date: 28-09-2017 15:38
Sheet: 2/8


RTC
I2C EEPROM
I2C ADC/DAC
+5V_I2C
GND_I2C
SCL
SDA
DS1307
PCF8591P
24AA01P
10 PIN FRC
I20
J19
U9
U7
U3
X3
32.786KHZ
BAT1
LEADED
0.1uF
C29
C27
C28
C12
P40
P75
4.2K
1K
LED0
LED1
LED2
LED3
LED4
LED5
LED6
LED7
LD8
LD9
LD14
LD15
LD16
LD17
LD18
LD19
RED LED
P18
SW1
AN.O/P
3.3V1
GND22
4X4 KEYBOARD
GND_KB
J13
TACT SWITCH
R1
R2
R3
R4
C1
C2
C3
C4
R11
R12
R13
R14
10K
TITLE: 8051 DVK
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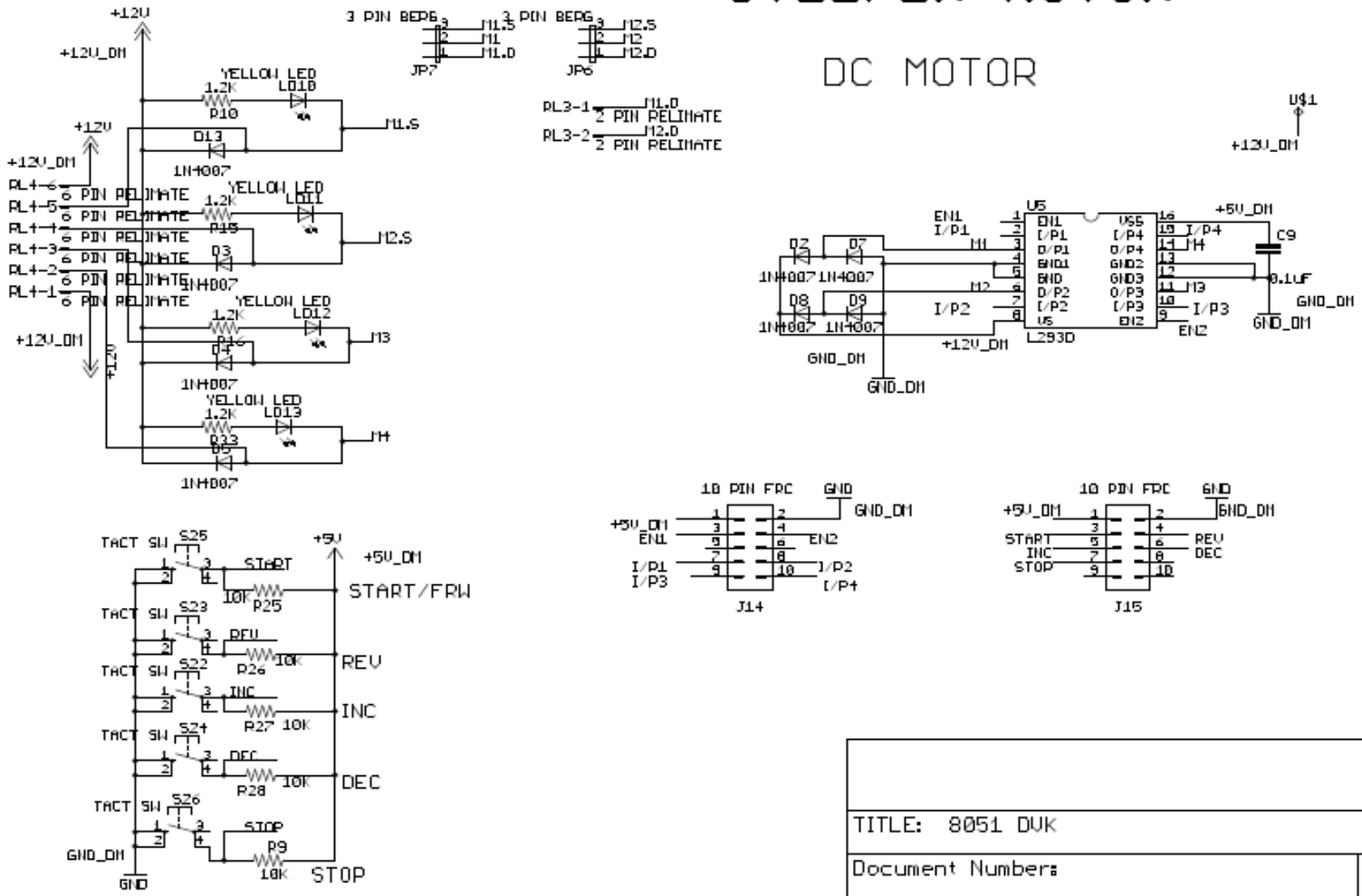
STEEPER MOTOR

DC MOTOR



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Document Number:	REV:
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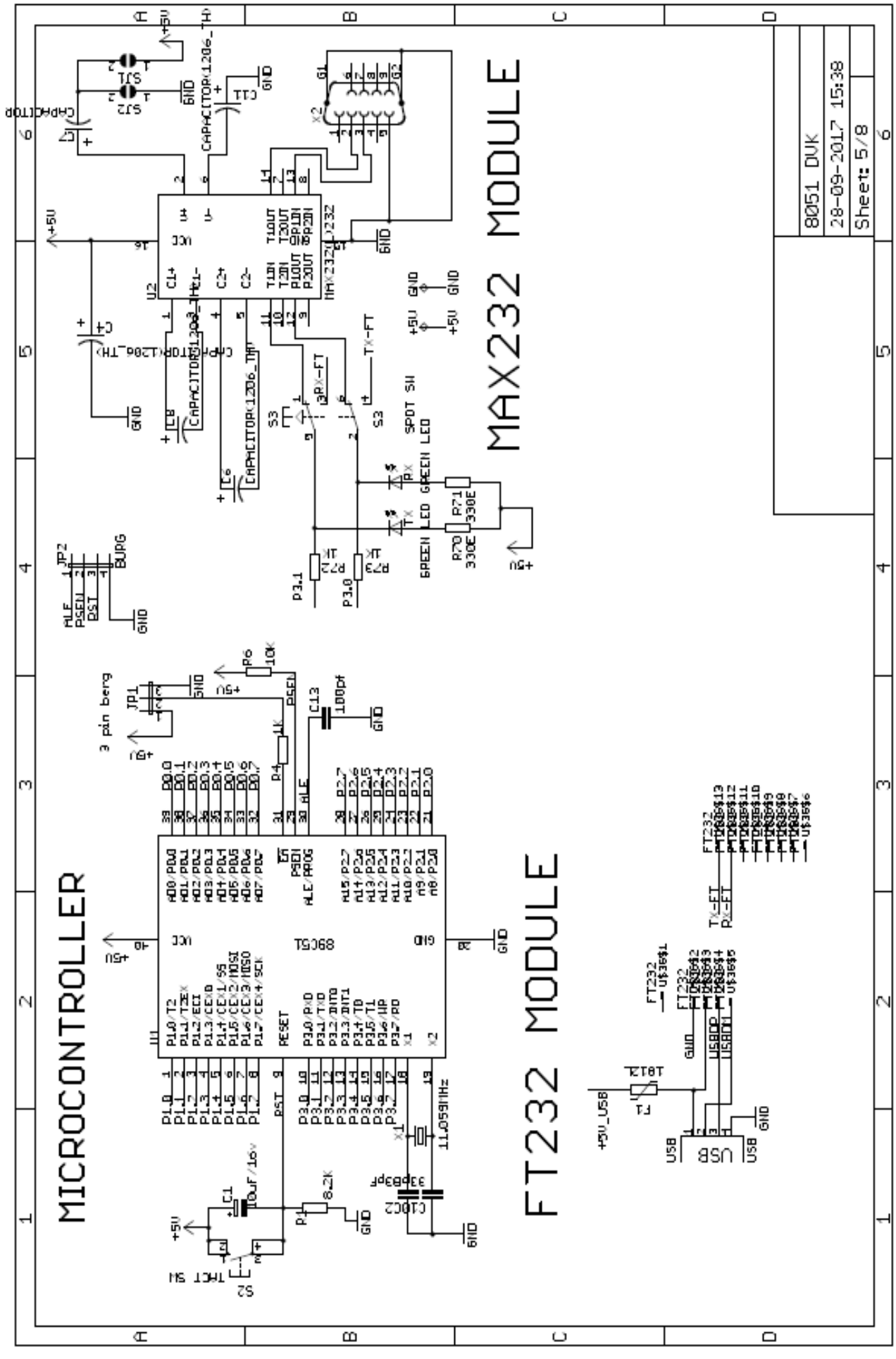
MAX232 MODULE
MICROCONTROLLER
FT232 MODULE
8051 DUK
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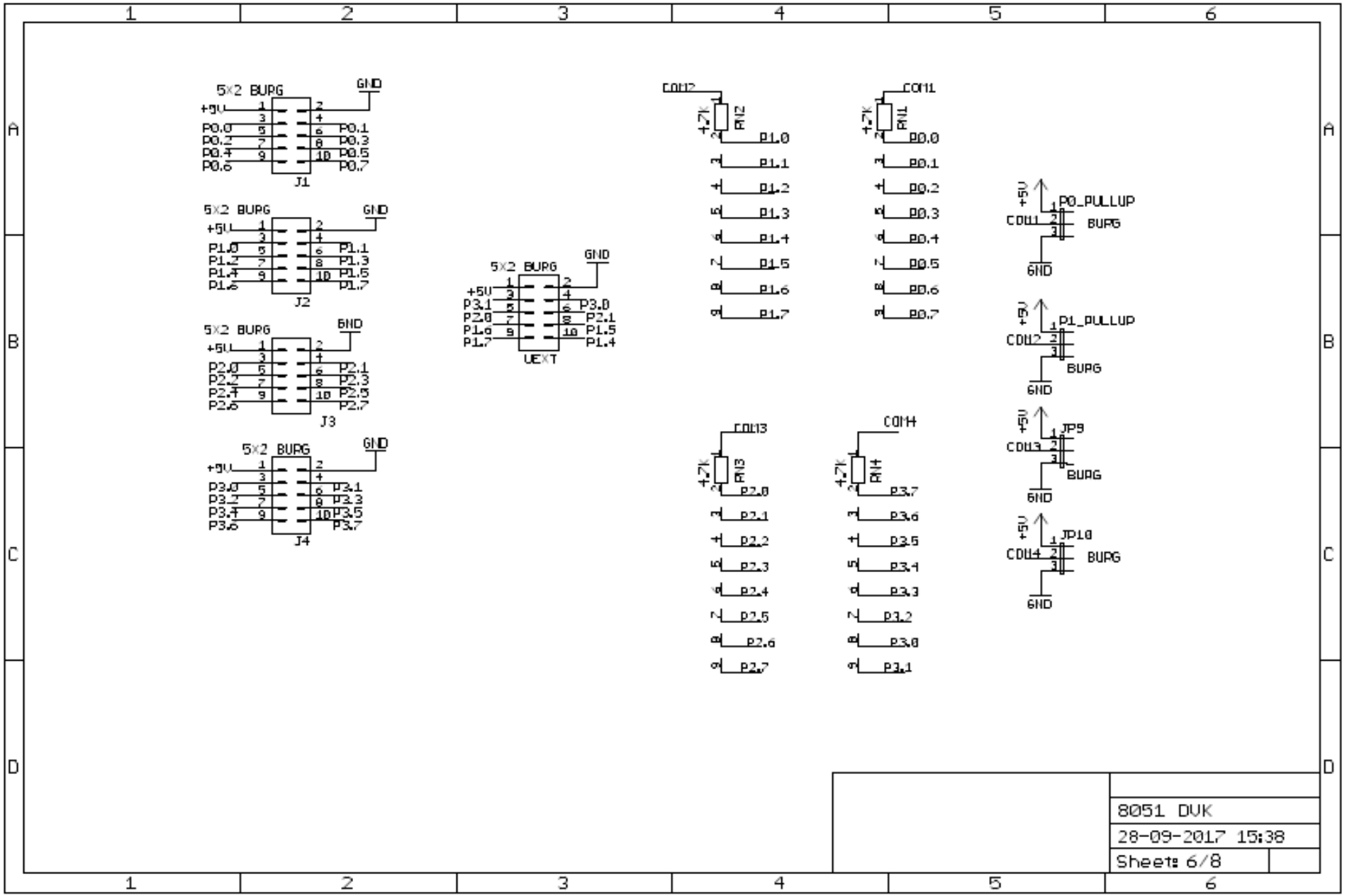
MAX232
89C51
FT232
USB
TACT SW
3 pin berg
SPOT SW
GREEN LED
11.0592MHz
+5V
GND


1
2
3
4
5
6
A
B
C
D
5X2 BUPG
J1
J2
J3
J4
UEXT
GND
+5V
P0.0
P0.1
P0.2
P0.3
P0.4
P0.5
P0.6
P0.7
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P2.0
P2.1
P2.2
P2.3
P2.4
P2.5
P2.6
P2.7
P3.0
P3.1
P3.2
P3.3
P3.4
P3.5
P3.6
P3.7
COM1
COM2
COM3
COM4
4.7K
RN1
RN2
RN3
RN4
P0_PULLUP
P1_PULLUP
JP9
JP10
BUPG
8051 DVK
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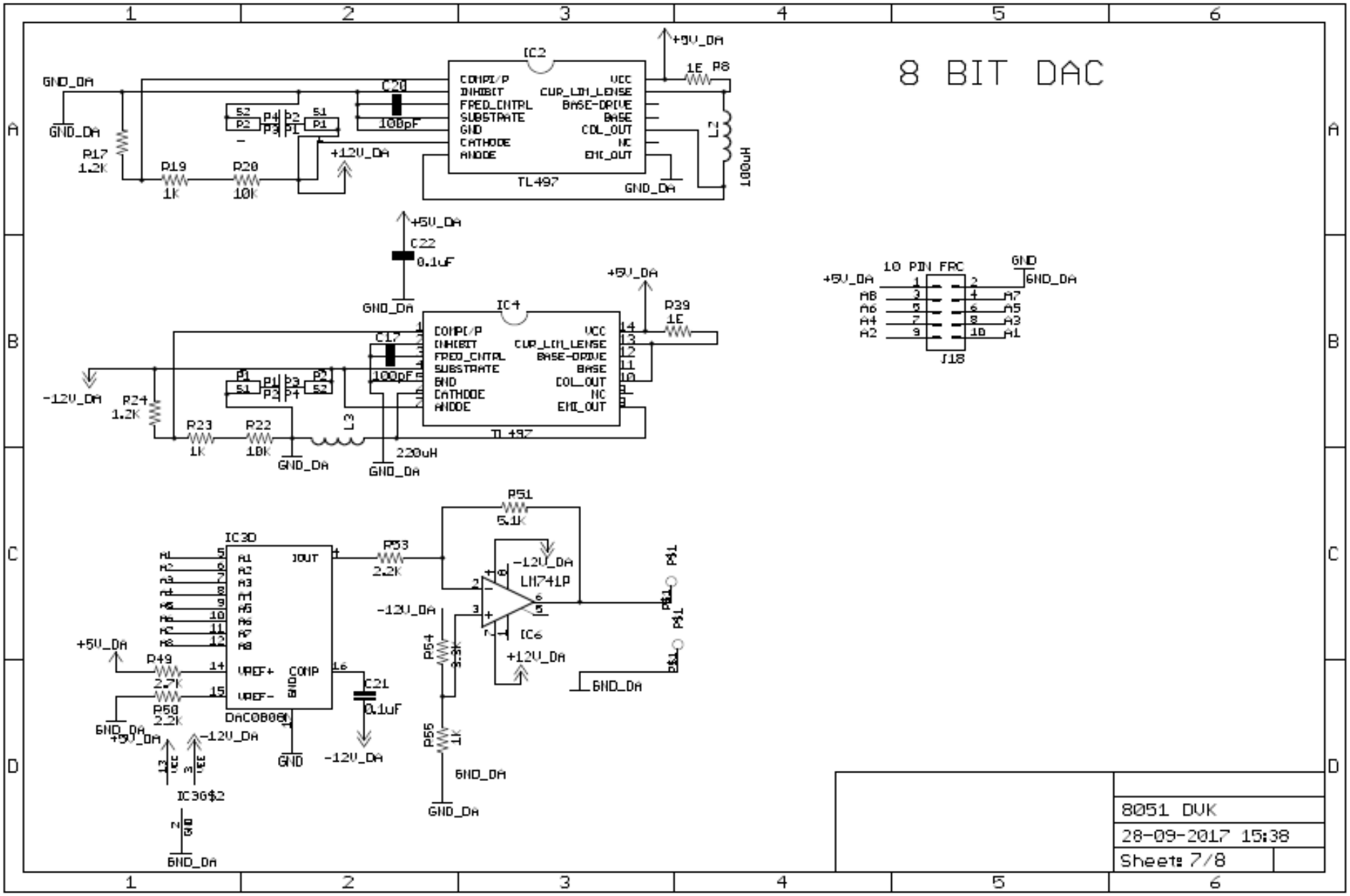
8 BIT DAC
IC2
TL497
C20
100pF
P17
1.2K
P19
1K
P20
10K
L2
100uH
+5V_DA
GND_DA
-12V_DA
+12V_DA
C22
0.1uF
IC4
C17
P24
1.2K
P23
1K
P22
10K
L3
220uH
P39
1E
P8
1E
10 PIN FRC
J18
P51
5.1K
IC3D
DAC0808
P53
2.2K
LM741P
IC6
P54
3.3K
P55
1K
P49
2.7K
P50
2.2K
C21
0.1uF
IC3@2
8051 DVK
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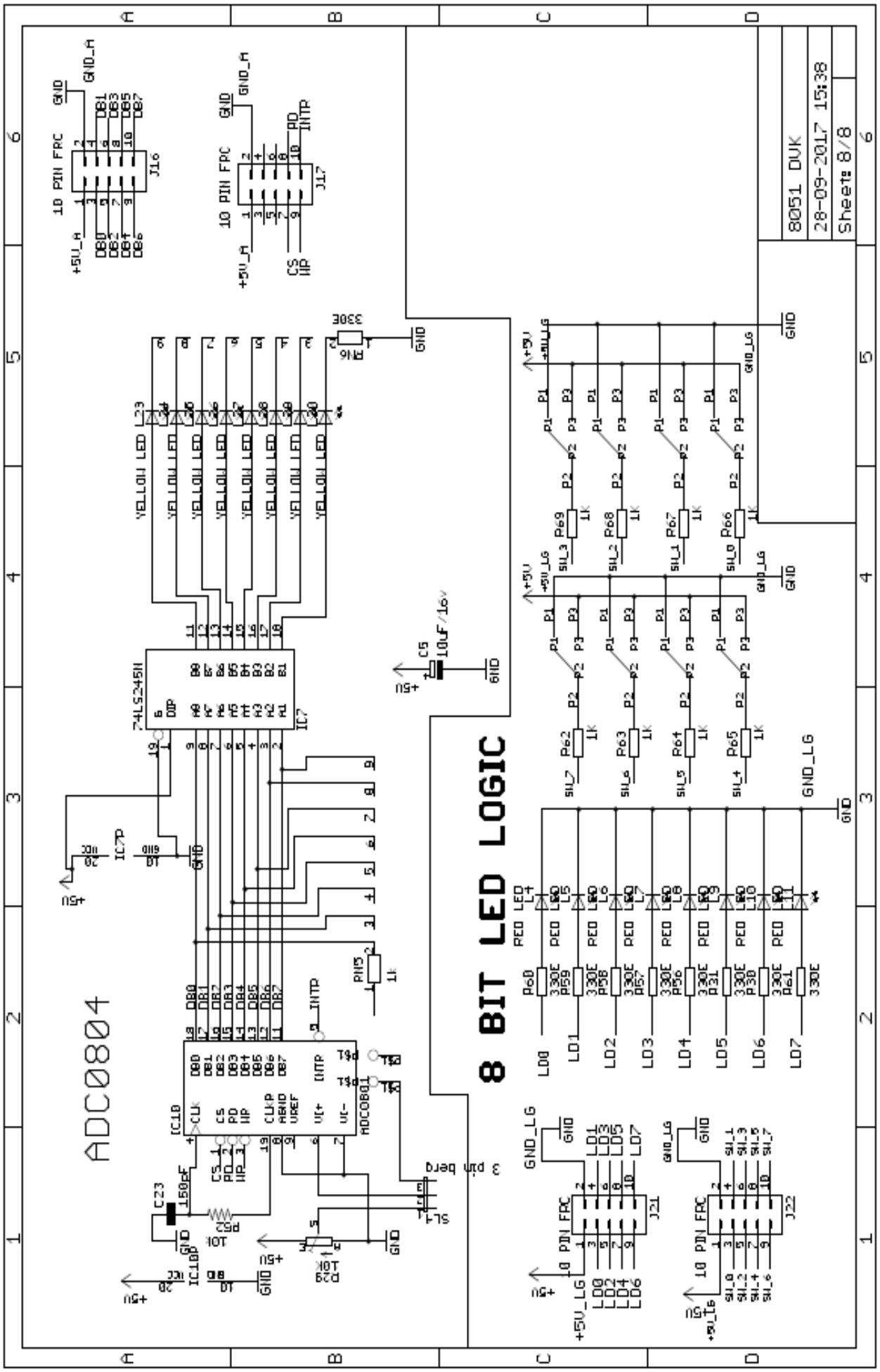
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ADC0804
74LS245N
8051 DUK
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