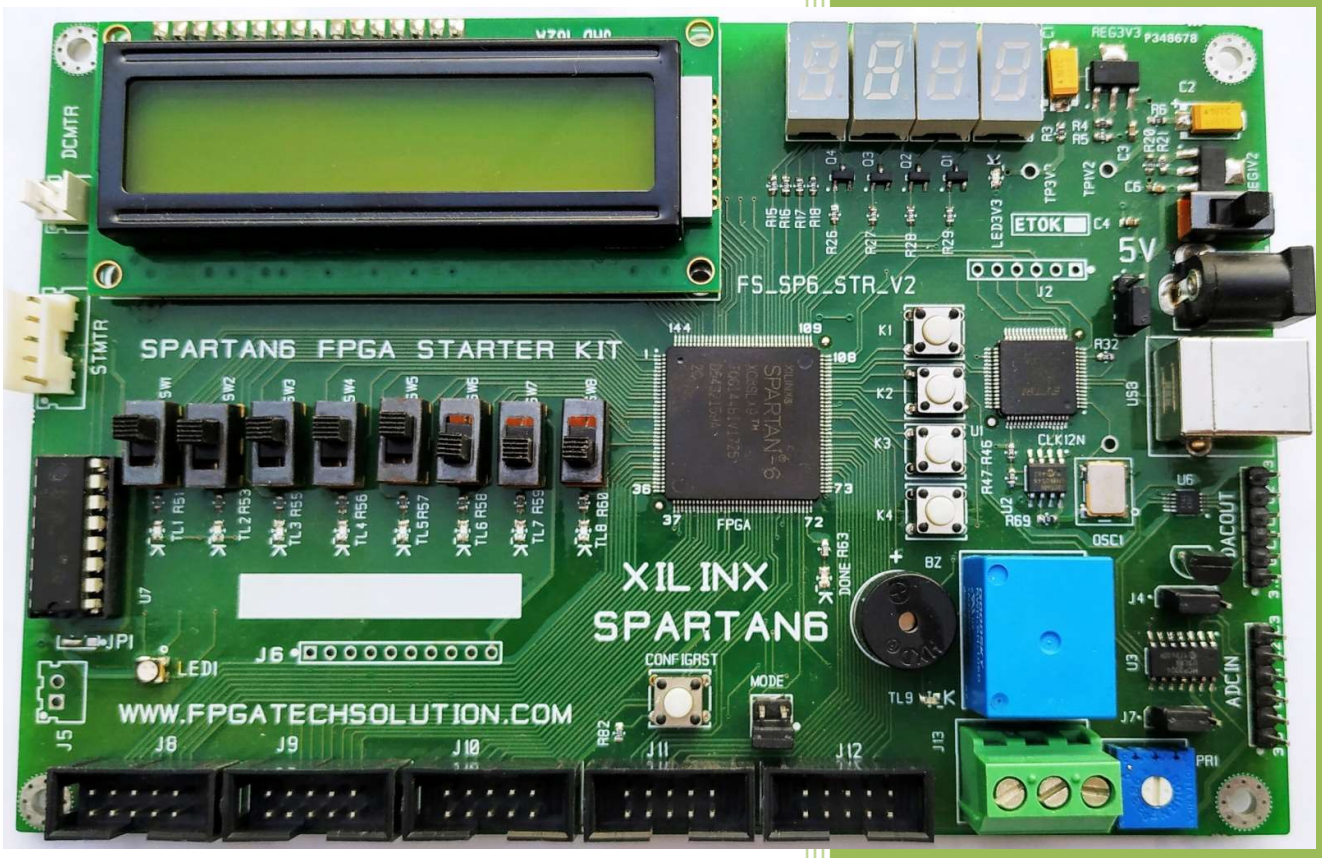
FPGA TECH SOLUTION

SOLUTION AHEAD

SPARTAN6 STARTER KIT

Spartan6 Starter Kit User Manual



Download all Source code from following link

https://github.com/fpgatechsolution/Spartan6-starter-kit

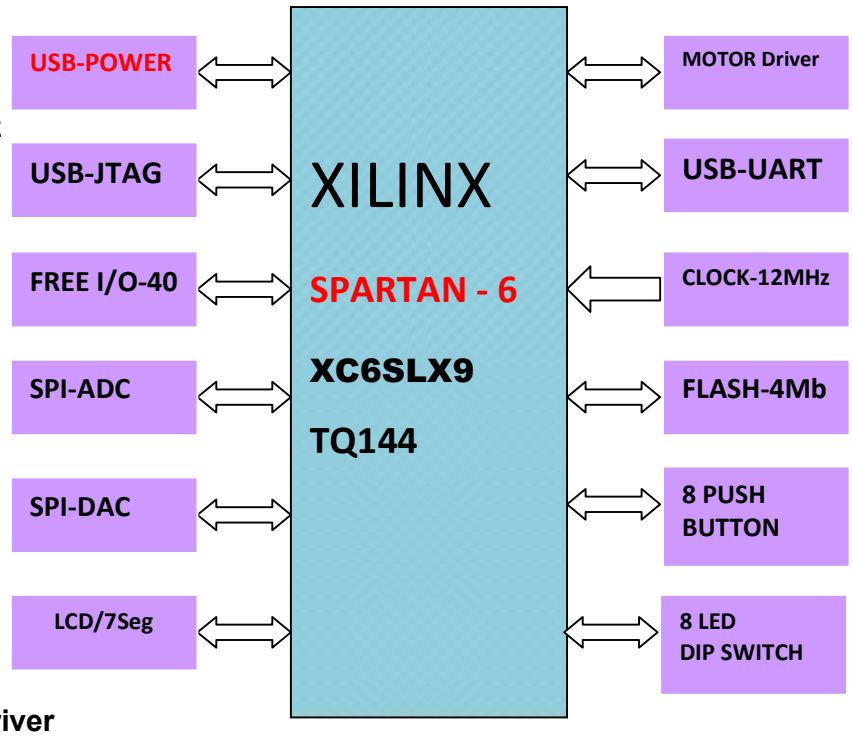
info@fpgasolution.com,
Mobile: 9665889991
WWW.FPGASOLUTION.COM

Key Features:

- Spartan6-XC6SLX9_TQ144FPGA
  - Up to 102 user-I/O pins
  - TQ-144 package

Key components:

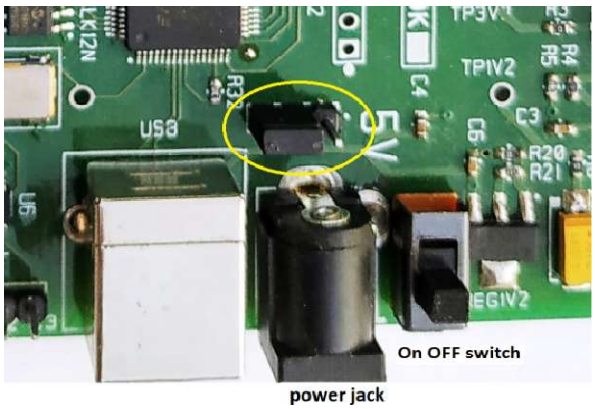
- XC6SLX9_TQ144
- OSCILLATOR – 12MHz
- FLASH – M25P40
- USB Power
- On board USB Jtag
- USB to serial
- 10bit SPI ADC
- 8bit SPI DAC
- 8 LED
- 8 DIP SWITCHS
- 8 PUSH BUTTONS
- 40 user I/O
- LCD 16By2
- 7-Seg
- RELAY
- Steeper & DC motor driver
- BUZZER
- RGB - LED



BOARD POWERING

The **SPARTAN6 STARTER KIT** can work on USB power you can also connect external 5VDc. supply. When **JP2** jumper is placed in 2 & 3 power is used from USB connector. When **JP2** jumper is placed in 1 & 2 power is used from external power adaptor

Use external 5V/2A supply whenever you are using steeper or dc motor.



LED's and DIP Switches Interface

The **SPARTAN6 STARTER KIT** board has 8 individual LED & 8 slide switches. A LED is assigned to each I/O to indicate its data status when I/O is configured as output. DIP switch is used to provide digital input (i.e. logic 0 and logic 1).

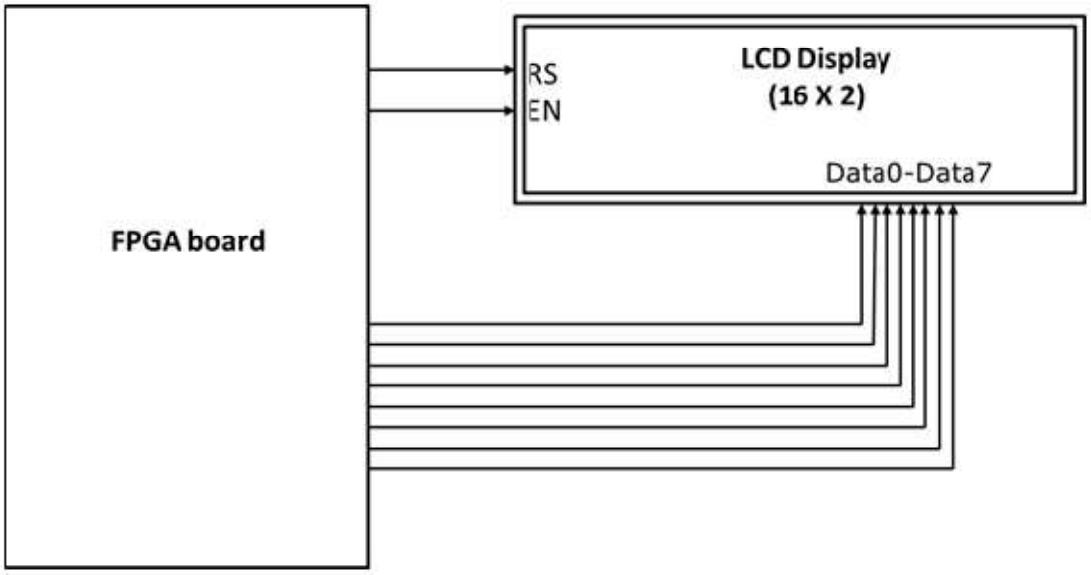
Pin Assignment (UCF Location) for IOs:

Slide Switch	XC6SLX9	Active
SW0	P5	LOW
SW1	P9	LOW
SW2	P11	LOW
SW3	P14	LOW
SW4	P16	LOW
SW5	P17	LOW
SW6	P23	LOW
SW7	P24	LOW

LED	XC6SLX9	Active
TL1	P26	HIGH
TL2	P22	HIGH
TL3	P21	HIGH
TL4	P15	HIGH
TL5	P12	HIGH
TL6	P10	HIGH
TL7	P8	HIGH
TL8	P2	HIGH

LCD Interface

The **SPARTAN6 STARTER KIT** includes 2 lines by 16 characters LCD (liquid crystal display) Module. The dot matrix LCD displays alphanumeric characters, numbers and symbols. For displaying characters, numbers and symbol, user needs to send 8-bit ASCII value on data pins (Data0-Data8). The user can control the LCD display by controlling control lines (RS, EN) and sending command codes on data pins. All the functions required for controlling LCD backlight are provided internally on board. Internal refresh is provided by the controller. The Interface details of the LCD display are as shown in following figure



LCD	XC6SLX9
LCD_D1	P137
LCD_D2	P134
LCD_D3	P133
LCD_D4	P132
LCD_D5	P131
LCD_D6	P127
LCD_D7	P126
LCD_RS	P140
LCD_EN	P139

Seven segments Interface

The **SPARTAN6 STARTER KIT** board includes 4common anode seven segment display

seven segments	XC6SLX9
SIG_A	P119
SIG_B	P118
SIG_C	P117
SIG_D	P120
SIG_E	P121
SIG_F	P124
SIG_G	P123
SIG_PD	P116
SEL_DISP1	P114
SEL_DISP2	P111
SEL_DISP3	P115
SEL_DISP4	P112

Pushbuttons Interface

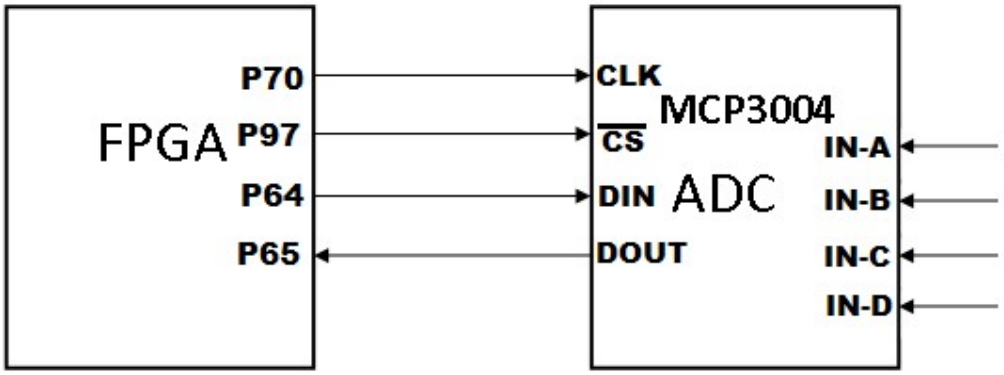
The **SPARTAN6 STARTER KIT** board has 4 individual pushbuttons for input purpose. The pushbuttons are read as 0 when pushed. They are read as 1 in normal (Unpressed) condition. Pushbuttons are labeled as SW1 TO SW4.

Pin Assignment (UCF Location) for Pushbuttons:

Signal Name	XC6SLX9	Active
SW1	P105	**LOW**
SW2	P101	**LOW**
SW3	P98	**LOW**
SW4	P39	**LOW**

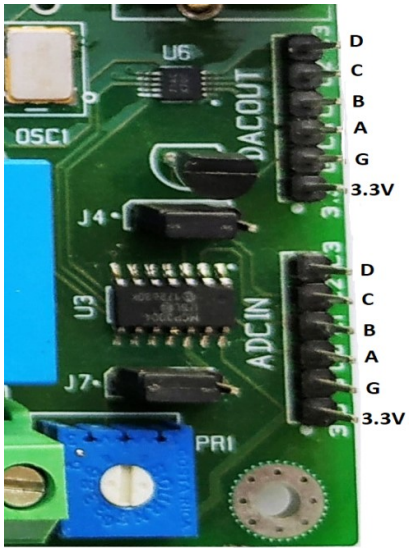
ADC Interface

The **SPARTAN6 STARTER KIT** board includes an ADC MCP3004. The ADC has 4 analog input channels. The channels are selected by setting the address pins of ADC. The analog input to all channels is given by external circuit through relimate pins. The other controlling signals of ADC are interfaced with FPGA board as shown in following figure. VREF is connected to 3.3V, so analog voltage input rang of all channel is 0 to 3.3V.



Interfacing of ADC with FPGA

Pin assignment (UCF Location) for ADC:



Signal Name	XC6SLX9
CLK	P70
CS	P99
DIN	P65
DOUT	P64

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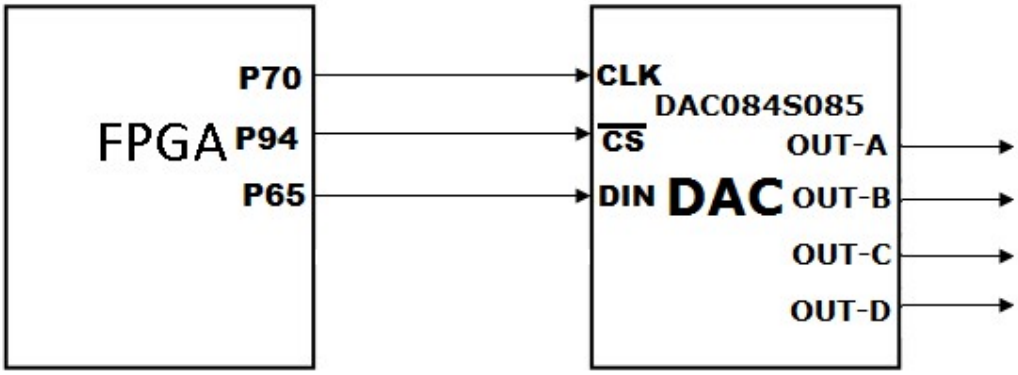
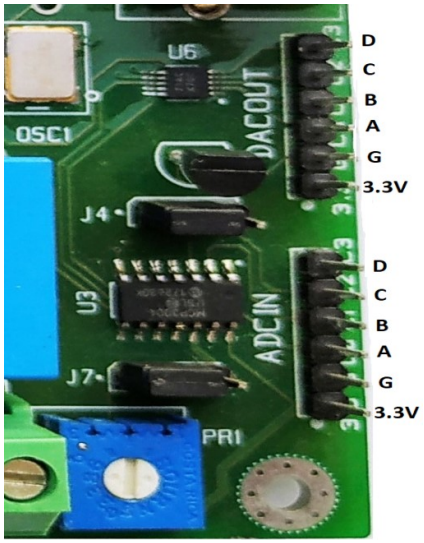
DAC Interface

The **SPARTAN6 STARTER KIT** board includes 8-bit 4 channels, digital-to-analog converter (DACs) DAC084S085. DAC allows easy interface to most popular microprocessor buses and output ports. DAC works on 3.3V. The following figure shows the interfacing diagram of DAC with FPGA Board. VREF is connected to 3.3V, so analog voltage output rang of all channel is 0 to 3.3V.



Interfacing of DAC with FPGA

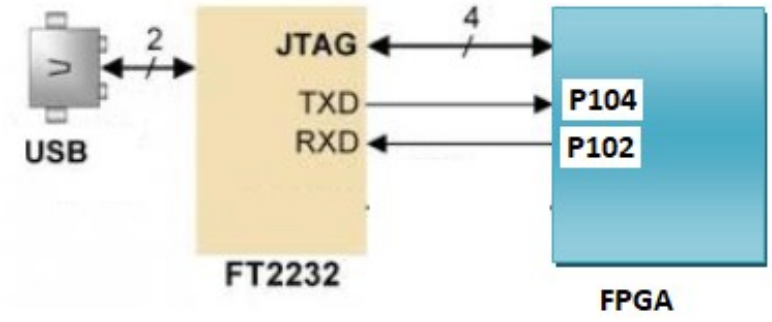
Pin Assignment (UCF Location) DAC084S085:



Signal Name	XC6SLX9
CS	P100
CLK	P70
DIN	P65

USB Interface

The **SPARTAN6 STARTER KIT** board have USB interface using device FT2232HL from FTDI. This act as USB to UART converter so that Communication with FPGA can accomplished by USB port.



Pin Assignment (UCF Location) for USB interface:

Signal Name	XC6SLX9
USB_Rx	P102
USB_TX	P104

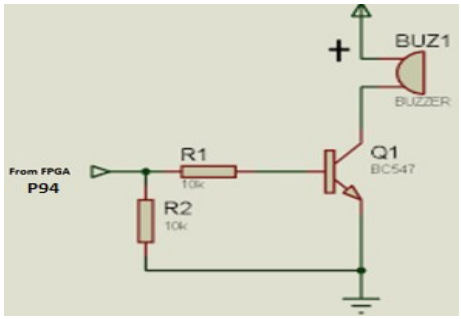
Clock Sources

The **SPARTAN6 STARTER KIT** supports clock input sources which are listed below.
The board includes an on-board 12 MHz clock oscillator

Signal Name	XC6SLX9
Clock 12Mhz	P95

Buzzer

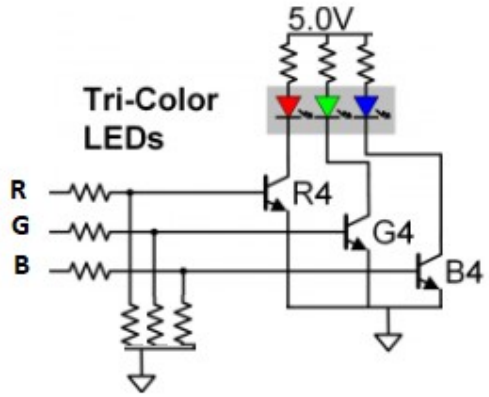
The **SPARTAN6 STARTER KIT has a buzzer interface**



Signal Name	XC6SLX9
Buzzer	P94

RGB-LED

The **SPARTAN6 STARTER KIT has a RGB LED**



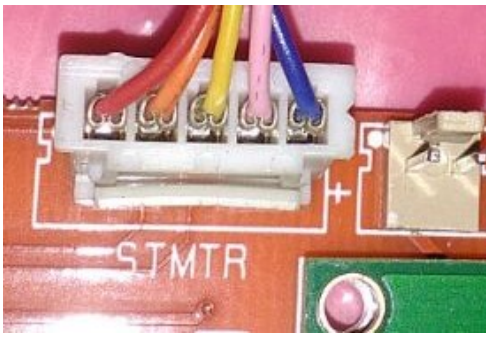
Signal Name	XC6SLX9
R	P1
G	P6
B	P7

Motor control

On this board you can control either steeper motor or Dc motor at a time

Use external 5V/2A supply whenever you are using steeper or dc motor.

Connect steeper motor as shown in following fig



Signal Name	XC6SLX9
M0	P143
M1	P444
M2	P141
M3	P142

FREE INPUT OUTPUT

The **SPARTAN6 STARTER KIT** board has seven free input output connectors. Each connector have 8 input output pins, 3.3V Dc pin and GND pin.

Name	Signal Name	XCS6LX9-TQG144		Name	Signal Name	XCS6LX9-TQG144
J9	J9_1	P43		J11	J11_1	P67
	J9_2	P41			J11_2	P66
	J9_3	P45			J11_3	P75
	J9_4	P44			J11_4	P74
	J9_5	P47			J11_5	P79
	J9_6	P46			J11_6	P78
	J9_7	P50			J11_7	P81
	J9_8	P45			J11_8	P80
	J9_9	**GND**			J11_9	**GND**
	J9_10	**+3.3V**			J11_10	**+3.3V**
J10	J10_1	P55		J12	J12_1	P82
	J10_2	P51			J12_2	P83
	J10_3	P57			J12_3	P84
	J10_4	P56			J12_4	P85
	J10_5	P59			J12_5	P88
	J10_6	P58			J12_6	P87
	J10_7	P62			J12_7	P93
	J10_8	P61			J12_8	P92
	J10_9	**GND**			J12_9	**GND**
	J10_10	**+3.3V**			J12_10	**+3.3V**

Name	Signal Name	Signal Name	XCS6LX9-TQG144
J8 & J6	J8_1	J6_1	P29
	J8_2	J6_2	P27
	J8_3	J6_3	P32
	J8_4	J6_4	P30
	J8_5	J6_5	P34
	J8_6	J6_6	P33
	J8_7	J6_7	P40
	J8_8	J6_8	P35
	J8_9	J6_9	**GND**
	J8_10	J6_10	**+3.3V**