



INDIAN INSTITUTE OF INFORMATION TECHNOLOGY,  
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## **DSP System design practice LAB-1**

### **Report**

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**ESD19i008**

**Aim:** To Know about TMS320C6748 DSP board and to program TMS320C6748 DSP board using C.

### **Apparatus Required:**

Code Composer Studio, TMS320C6748 DSP board, XDS100v3 Emulator.

# Procedure:

## 1. Create a new CCS project:

- Open the CCS IDE and click on the "File" menu.
- Select "New" and then "CCS Project."
- Fill out the project details such as project name, device type, and location.
- Select the proper device and click "Finish."

## 2. Find the respective pin mux register info:

- Each GPIO pin on the board has a corresponding pin mux register.
- To find the register information, refer to the device datasheet. The pin mux information can be found in the device's technical reference manual (TRM).

## 3. Set the function of the pin as GPIO:

- Once the pin mux register information is found, modify the register to set the function of the pin as GPIO.
- This can be done by writing the proper value to the register using C code.

## 4. Enable the pin using the SYSCFG register:

- The SYSCFG register is used to configure the system parameters of the device.
- To enable the GPIO pin, set the appropriate bit in the SYSCFG register.

## 5. Write C-code to control the LED:

- In the C code, configure the GPIO pin as an output.
- Write conditional statements to turn the LED on and off.
- Add a delay between each LED state change to observe the LED blinking.

## 6. Run the project and observe the LED blinking:

- Build the project and download the code to the target board.
- Observe the LED blinking. If the LED is not blinking, check the code and debug any issues.

## Code Blinking Led:

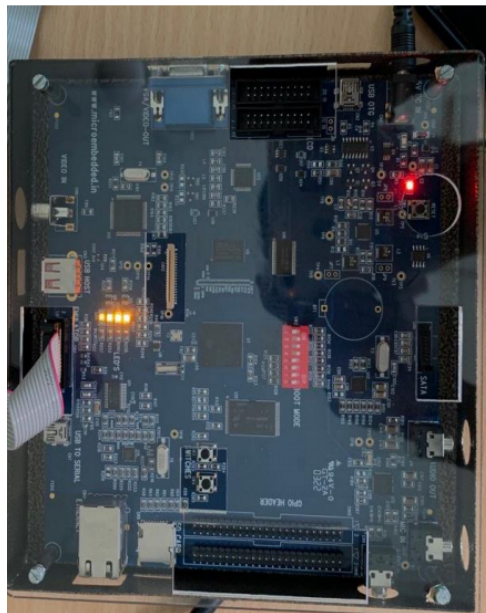
```
#include "hw_types.h"
#include "gpio.h"
#include "psc.h"
#include "soc_C6748.h"
#include "hw_syscfg0_C6748.h"
#define SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 (0x000000008u)
// #define SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT (0x00000000Du)
#define PINMUX13_GPIO6_12_ENABLE
(SYSCFG_PINMUX13_PINMUX13_15_12_GPIO6_12 <<
SYSCFG_PINMUX13_PINMUX13_15_12_SHIFT)
#define PINMUX13_GPIO6_13_ENABLE
(SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 <<
SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT)
#define PINMUX0_GPIO0_9_ENABLE (SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9
<<
SYSCFG_PINMUX0_PINMUX0_27_24_SHIFT)
#define PINMUX5_GPIO2_12_ENABLE (SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12
<<
SYSCFG_PINMUX5_PINMUX5_15_12_SHIFT)
void Delay(volatile unsigned int delay)
{
    while(delay--);
}
int main(void)
{
    unsigned int savePinmux = 0;
    /* The Local PSC number for GPIO is 3. GPIO belongs to PSC1 module.*/
    PSCModuleControl(SOC_PSC_1_REGS,
HW_PSC_GPIO, PSC_POWERDOMAIN_ALWAYS_ON, PSC_MDCTL_NEXT_ENABLE);
    /* Setting the pins corresponding to GP6[12] in PINMUX13 register.*/
    savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_15_12));
    HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) =
(PINMUX13_GPIO6_12_ENABLE | savePinmux);
    /* Setting the pins corresponding to GP6[13] in PINMUX13 register.*/
    savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_11_8));
    HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) =
(PINMUX13_GPIO6_13_ENABLE | savePinmux);
```

```

/* Setting the pins corresponding to GP0[9] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(0)) &
~(SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9));
HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(0)) = (PINMUX0_GPIO0_9_ENABLE | savePinmux);
/* Setting the pins corresponding to GP0[9] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(5)) &
~(SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12));
HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(5)) = (PINMUX5_GPIO2_12_ENABLE |
savePinmux);
/* Sets the led pins as output .*/
GPIODirModeSet(SOC_GPIO_0_REGS, 45, GPIO_DIR_OUTPUT); //gpio2[12]
GPIODirModeSet(SOC_GPIO_0_REGS, 10, GPIO_DIR_OUTPUT); //gpio0[9]
GPIODirModeSet(SOC_GPIO_0_REGS, 110, GPIO_DIR_OUTPUT); //gpio6[13]
GPIODirModeSet(SOC_GPIO_0_REGS, 109, GPIO_DIR_OUTPUT); //gpio6[12]
while(1)
{
GPIOPinWrite(SOC_GPIO_0_REGS, 45, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 10, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 110, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 109, GPIO_PIN_LOW);
Delay(1000000);
GPIOPinWrite(SOC_GPIO_0_REGS, 45, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 10, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 110, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 109, GPIO_PIN_HIGH);
Delay(1000000);
}\

```

## Output:



## Code Binary Counter:

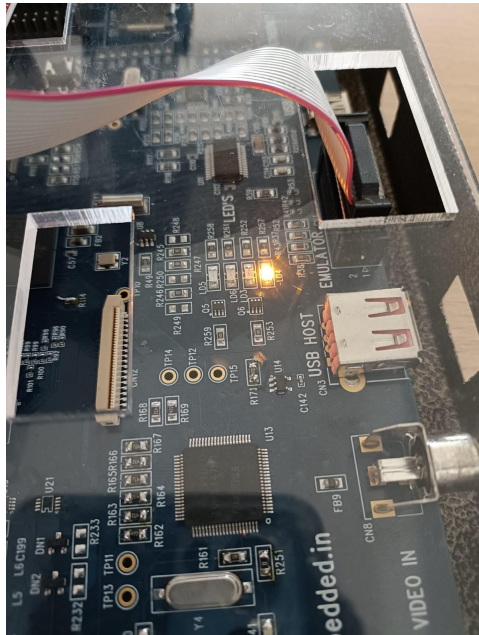
```
#include "hw_types.h" #include "gpio.h" #include "psc.h" #include
"soc_C6748.h" #include "hw_syscfg0_C6748.h" #define
SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 (0x00000008u) //define
SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT (0x0000000Du) #define
PINMUX13_GPIO6_12_ENABLE (SYSCFG_PINMUX13_PINMUX13_15_12_GPIO6_12 <<
SYSCFG_PINMUX13_PINMUX13_15_12_SHIFT) #define PINMUX13_GPIO6_13_ENABLE
(SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 <<
SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT) #define PINMUX0_GPIO0_9_ENABLE
(SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9 <<
SYSCFG_PINMUX0_PINMUX0_27_24_SHIFT) #define PINMUX5_GPIO2_12_ENABLE
(SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12 <<
SYSCFG_PINMUX5_PINMUX5_15_12_SHIFT) void Delay(volatile unsigned int
delay) { while(delay--); } int main(void) { unsigned int savePinmux =
0; /* The Local PSC number for GPIO is 3. GPIO belongs to PSC1
module.*/ PSCModuleControl(SOC_PSC_1_REGS,
HW_PSC_GPIO,PSC_POWERDOMAIN_ALWAYS_ON,PSC_MDCTL_NEXT_ENABLE); /*
Setting the pins corresponding to GP6[12] in PINMUX13 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_15_12)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(13)) = (PINMUX13_GPIO6_12_ENABLE | savePinmux); /*
Setting the pins corresponding to GP6[13] in PINMUX13 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_11_8)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(13)) = (PINMUX13_GPIO6_13_ENABLE | savePinmux); /*
Setting the pins corresponding to GP0[9] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(0)) &
~(SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(0)) = (PINMUX0_GPIO0_9_ENABLE | savePinmux); /* Setting
the pins corresponding to GP0[9] in PINMUX0 register.*/ savePinmux =
(HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(5)) &
~(SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(5)) = (PINMUX5_GPIO2_12_ENABLE | savePinmux); /* Sets
the led pins as output .*/ GPIODirModeSet(SOC_GPIO_0_REGS, 45,
GPIO_DIR_OUTPUT); //gpio2[12] GPIODirModeSet(SOC_GPIO_0_REGS, 10,
GPIO_DIR_OUTPUT); //gpio0[9] GPIODirModeSet(SOC_GPIO_0_REGS, 110,
GPIO_DIR_OUTPUT); //gpio6[13] GPIODirModeSet(SOC_GPIO_0_REGS, 109,
GPIO_DIR_OUTPUT); //gpio6[12] while(1) { GPIOPinWrite(SOC_GPIO_0_REGS,
45, GPIO_PIN_LOW); GPIOPinWrite(SOC_GPIO_0_REGS, 10, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 110, GPIO_PIN_LOW);
```

[illegible]



**Output:**

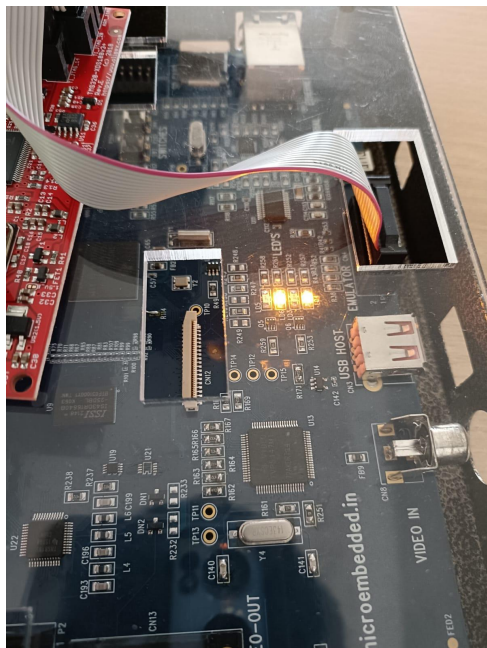
**Binary-1(0001)**



**Binary-6(0110)**



**Binary-5(0101)**



**Binary-7(0111)**



## Code GPIO 16 pin:

```
#include "hw_types.h" #include "gpio.h" #include "psc.h" #include
"soc_C6748.h" #include "hw_syscfg0_C6748.h" #define
SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 (0x00000008u) //define
SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT (0x0000000Du) #define
PINMUX13_GPIO6_12_ENABLE (SYSCFG_PINMUX13_PINMUX13_15_12_GPIO6_12 <<
SYSCFG_PINMUX13_PINMUX13_15_12_SHIFT) #define PINMUX13_GPIO6_13_ENABLE
(SYSCFG_PINMUX13_PINMUX13_11_8_GPIO6_13 <<
SYSCFG_PINMUX13_PINMUX13_11_8_SHIFT) #define PINMUX0_GPIO0_9_ENABLE
(SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9 <<
SYSCFG_PINMUX0_PINMUX0_27_24_SHIFT) #define PINMUX5_GPIO2_12_ENABLE
(SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12 <<
SYSCFG_PINMUX5_PINMUX5_15_12_SHIFT) #define PINMUX18_GPIO8_10_ENABLE
(SYSCFG_PINMUX18_PINMUX18_31_28_GPIO8_10 <<
SYSCFG_PINMUX18_PINMUX18_31_28_SHIFT) #define PINMUX18_GPIO8_12_ENABLE
(SYSCFG_PINMUX18_PINMUX18_23_20_GPIO8_12 <<
SYSCFG_PINMUX18_PINMUX18_23_20_SHIFT) void Delay(volatile unsigned int
delay) { while(delay--); } int main(void) { unsigned int savePinmux =
0; /* The Local PSC number for GPIO is 3. GPIO belongs to PSC1
module.*/ PSCModuleControl(SOC_PSC_1_REGS,
HW_PSC_GPIO,PSC_POWERDOMAIN_ALWAYS_ON,PSC_MDCTL_NEXT_ENABLE); /*
Setting the pins corresponding to GP6[12] in PINMUX13 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_15_12)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(13)) = (PINMUX13_GPIO6_12_ENABLE | savePinmux); /*
Setting the pins corresponding to GP6[13] in PINMUX13 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(13)) &
~(SYSCFG_PINMUX13_PINMUX13_11_8)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(13)) = (PINMUX13_GPIO6_13_ENABLE | savePinmux); /*
Setting the pins corresponding to GP0[9] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(0)) &
~(SYSCFG_PINMUX0_PINMUX0_27_24_GPIO0_9)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(0)) = (PINMUX0_GPIO0_9_ENABLE | savePinmux); /* Setting
the pins corresponding to GP0[9] in PINMUX0 register.*/ savePinmux =
(HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(5)) &
~(SYSCFG_PINMUX5_PINMUX5_15_12_GPIO2_12)); HWREG(SOC_SYSCFG_0_REGS +
```

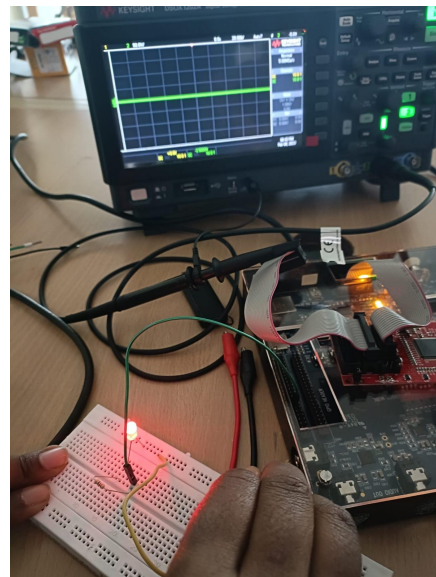


```

SYSCFG0_PINMUX(5)) = (PINMUX5_GPIO2_12_ENABLE | savePinmux); /*
Setting the pins corresponding to GP8[12] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(18)) &
~(SYSCFG_PINMUX18_PINMUX18_23_20_GPIO8_12)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(18)) = (PINMUX18_GPIO8_12_ENABLE | savePinmux); /*
Setting the pins corresponding to GP8[12] in PINMUX0 register.*/
savePinmux = (HWREG(SOC_SYSCFG_0_REGS + SYSCFG0_PINMUX(18)) &
~(SYSCFG_PINMUX18_PINMUX18_31_28_GPIO8_10)); HWREG(SOC_SYSCFG_0_REGS +
SYSCFG0_PINMUX(18)) = (PINMUX18_GPIO8_10_ENABLE | savePinmux); /* Sets
the led pins as output .*/ GPIODirModeSet(SOC_GPIO_0_REGS, 45,
GPIO_DIR_OUTPUT); //gpio2[12] GPIODirModeSet(SOC_GPIO_0_REGS, 10,
GPIO_DIR_OUTPUT); //gpio0[9] GPIODirModeSet(SOC_GPIO_0_REGS, 110,
GPIO_DIR_OUTPUT); //gpio6[13] GPIODirModeSet(SOC_GPIO_0_REGS, 109,
GPIO_DIR_OUTPUT); //gpio6[12] GPIODirModeSet(SOC_GPIO_0_REGS, 141,
GPIO_DIR_OUTPUT); //gpio8[12] GPIODirModeSet(SOC_GPIO_0_REGS, 139,
GPIO_DIR_OUTPUT); //gpio8[10] while(1) { GPIOPinWrite(SOC_GPIO_0_REGS,
45, GPIO_PIN_LOW); GPIOPinWrite(SOC_GPIO_0_REGS, 10, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 110, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 109, GPIO_PIN_LOW);
GPIOPinWrite(SOC_GPIO_0_REGS, 141, GPIO_PIN_LOW); Delay(9000000);
GPIOPinWrite(SOC_GPIO_0_REGS, 45, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 10, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 110, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 109, GPIO_PIN_HIGH);
GPIOPinWrite(SOC_GPIO_0_REGS, 141, GPIO_PIN_HIGH); Delay(9000000); } }

```

## Output:



## **Results:**

Connected the DSP board to power supply , then with emulator dumped the C-code to the processor.

Code containing sufficient condition and proper delay makes the LED's to blink rhythmically.

Binary LED counter was implemented using  
MicroDSP6748 DSP Board

Configured the Pin16 (GPIO8\_12) and showed the blinking of the external LED on pin16.