Мікропроцесорна техніка

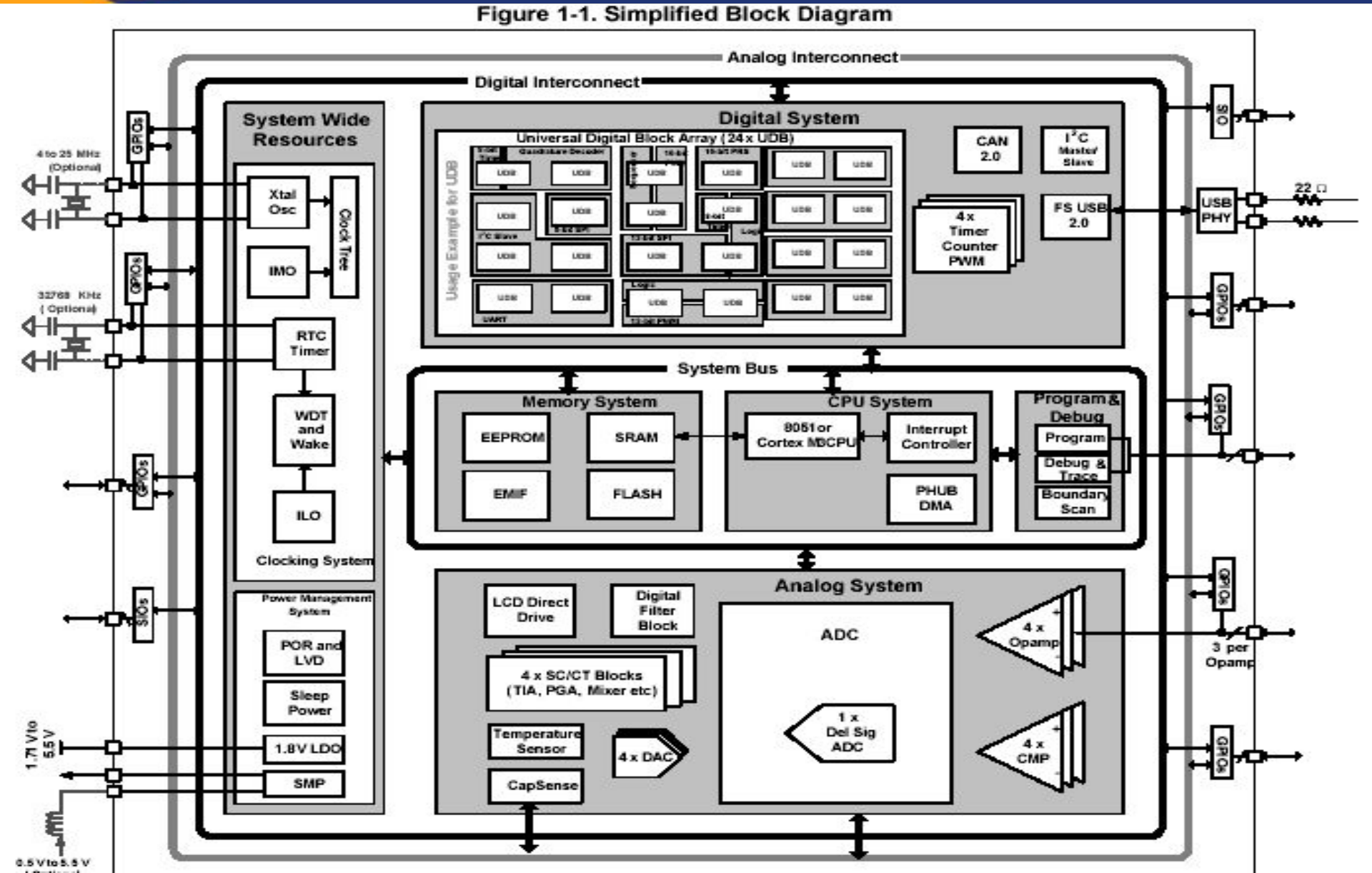
(лекція 5)
Благітко Б.Я.
2019 р.

PSoC Creator 4.2
Designing with PSoC 3/5

PSoC@3/5
IDAC8

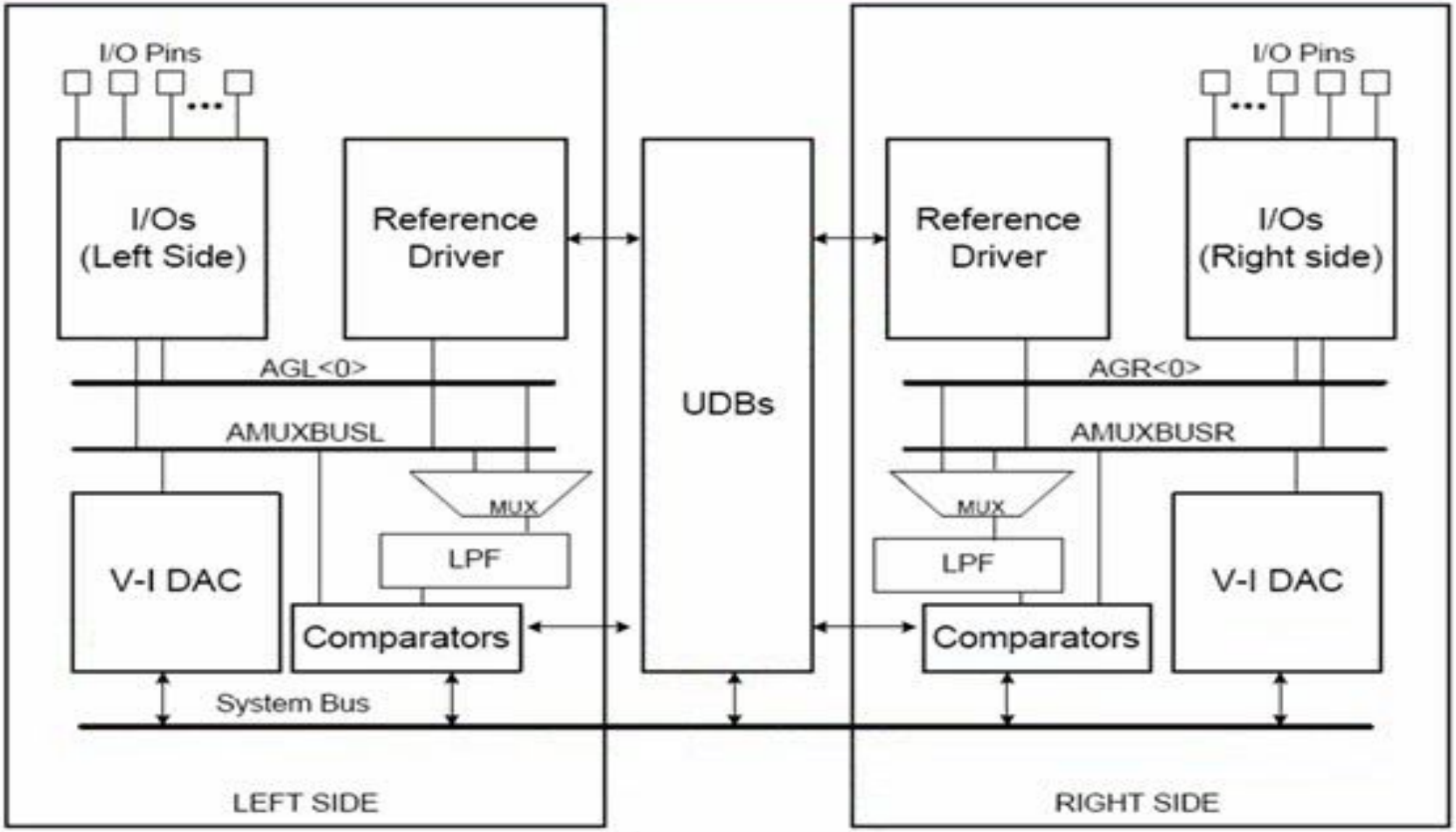
PSoC Creator 4.2
Designing with PSoC 3/5

Модулі PSoC@3/5

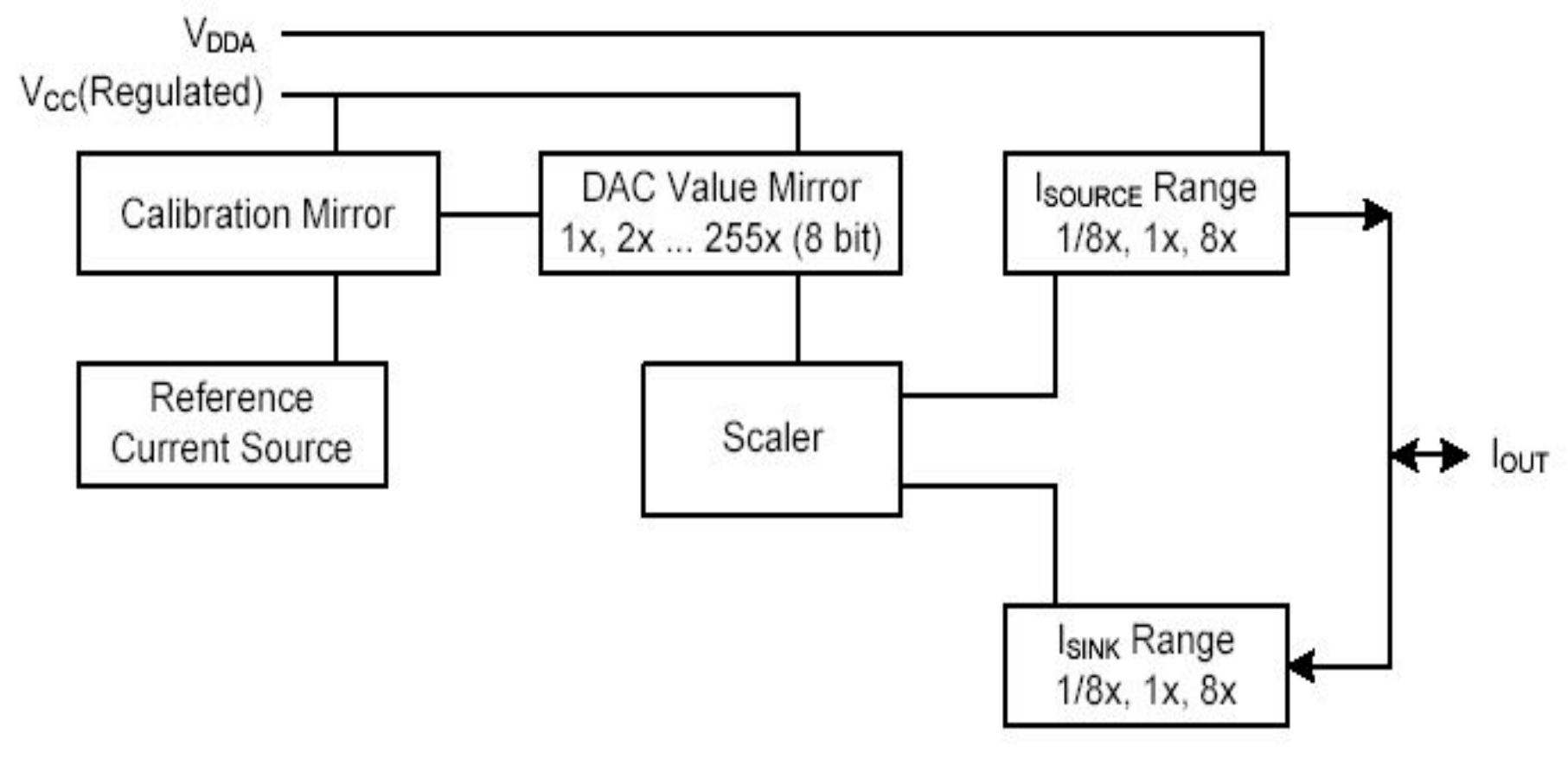


Модулі PSoC@3/5

CapSense in PSoC 3 / PSoC 5

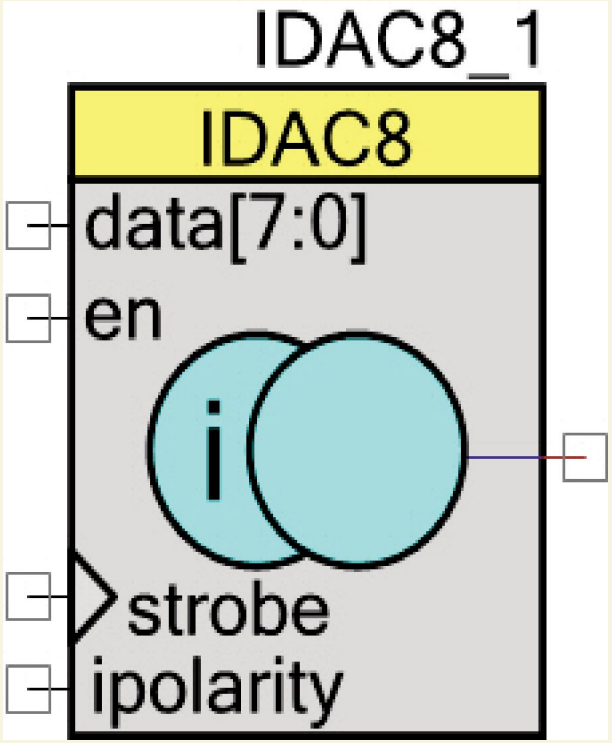


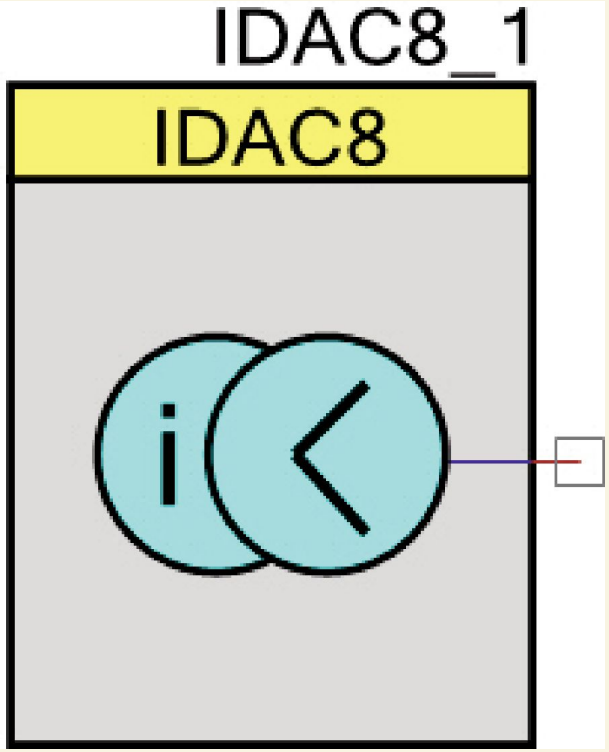
IDAC8



Block Diagram IDAC8

Lab_5 IDAC8





IDAC8

Range	Lowest Value	Highest Value	Step Size
0 – 31.875 uA	0.0 µA	31.875 µA	0.125 µA
0 – 255 uA	0.0 µA	255 µA	1 µA
0 – 2040 uA	0.0 µA	2040 µA	8 µA

IDAC8

void IDAC8_SetRange(uint8 range)

Description: Sets full-scale range for IDAC8

Parameters: uint8 range: Sets full-scale range for IDAC8. See the following table for ranges.

Option	Description
IDAC8_RANGE_32uA	Set full scale range to 31.875 µA
IDAC8_RANGE_255uA	Set full scale range to 255 µA
IDAC8_RANGE_2mA	Set full scale range to 2.040 mA

IDAC8

Parameter	Description	Conditions	Min	Typ	Max	Units
	Resolution		–	–	8	bits
I_{OUT}	Output current at code = 255	Range = 2.040 mA, code = 255, $V_{DDA} \geq 2.7$ V, $R_{LOAD} = 600\ \Omega$	–	2.040	–	mA
		Range = 2.040 mA, High mode, code = 255, $V_{DDA} \leq 2.7$ V, $R_{LOAD} = 300\ \Omega$	–	2.040	–	mA
		Range = 255 µA, code = 255, $R_{LOAD} = 600\ \Omega$	–	255	–	µA
		Range = 31.875 µA, code = 255, $R_{LOAD} = 600\ \Omega$	–	31.875	–	µA
	Monotonicity		–	–	Yes	
Ezs	Zero scale error		–	0	±1	LSB
Eg	Gain error	Range = 2.04 mA, 25 °C	–	–	±2.5	%
		Range = 255 µA, 25 °C	–	–	±2.5	%
		Range = 31.875 µA, 25 °C	–	–	±3.5	%

IDAC8 DC Characteristics

Iout – Analog

The Iout terminal, the terminal on the right side of the symbol, is the connection to the DAC.s current source/sink.

It can be routed to any analog-compatible pin on the device.

When the highest current range is selected (2040 µA) the output should only be routed to a specific set of pins that provide a direct low resistive path. These port pins are P0[6], P0[7], P3[0], or P3[1].

ipolarity – Input*

The ipolarity input is an optional signal input pin. This pin can be controlled by Digital components or control register. This is used to control the direction of the current, either source or sink to its load.

When this pin is connected to logic .0. (source), the output of the DAC sources current to a load that is connected to VSS or other voltage that is at least 1.0 V below VDDA.

If the pin is connected to logic .1. (sink), it supplies current to a load that is connected to VDD or other voltage at least 1.0 V above VSS.

IDAC8

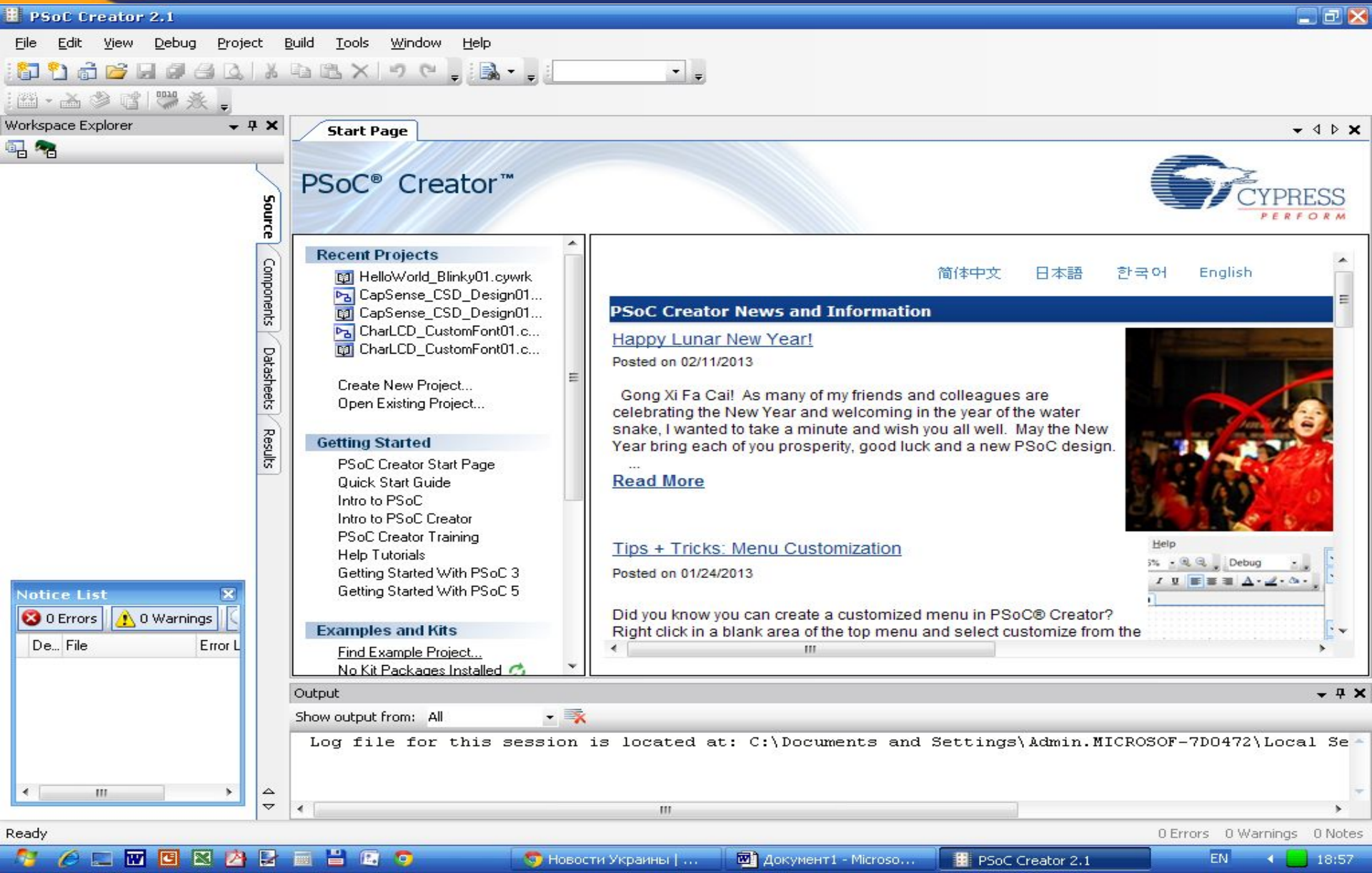
Function	Description
IDAC8_Start()	Initializes the IDAC8 with default customizer values. Enables and powers up the IDAC8.
IDAC8_Stop()	Disables the IDAC8 and sets it to the lowest power state.
IDAC8_SetSpeed()	Sets DAC speed.
IDAC8_SetPolarity()	Sets the output mode to current sink or source.
IDAC8_SetRange()	Sets full-scale range for IDAC8.
IDAC8_SetValue()	Sets value between 0 and 255 with the given range.
IDAC8_Sleep()	Stops and saves the user configuration.
IDAC8_Wakeup()	Restores and enables the user configuration.

IDAC8

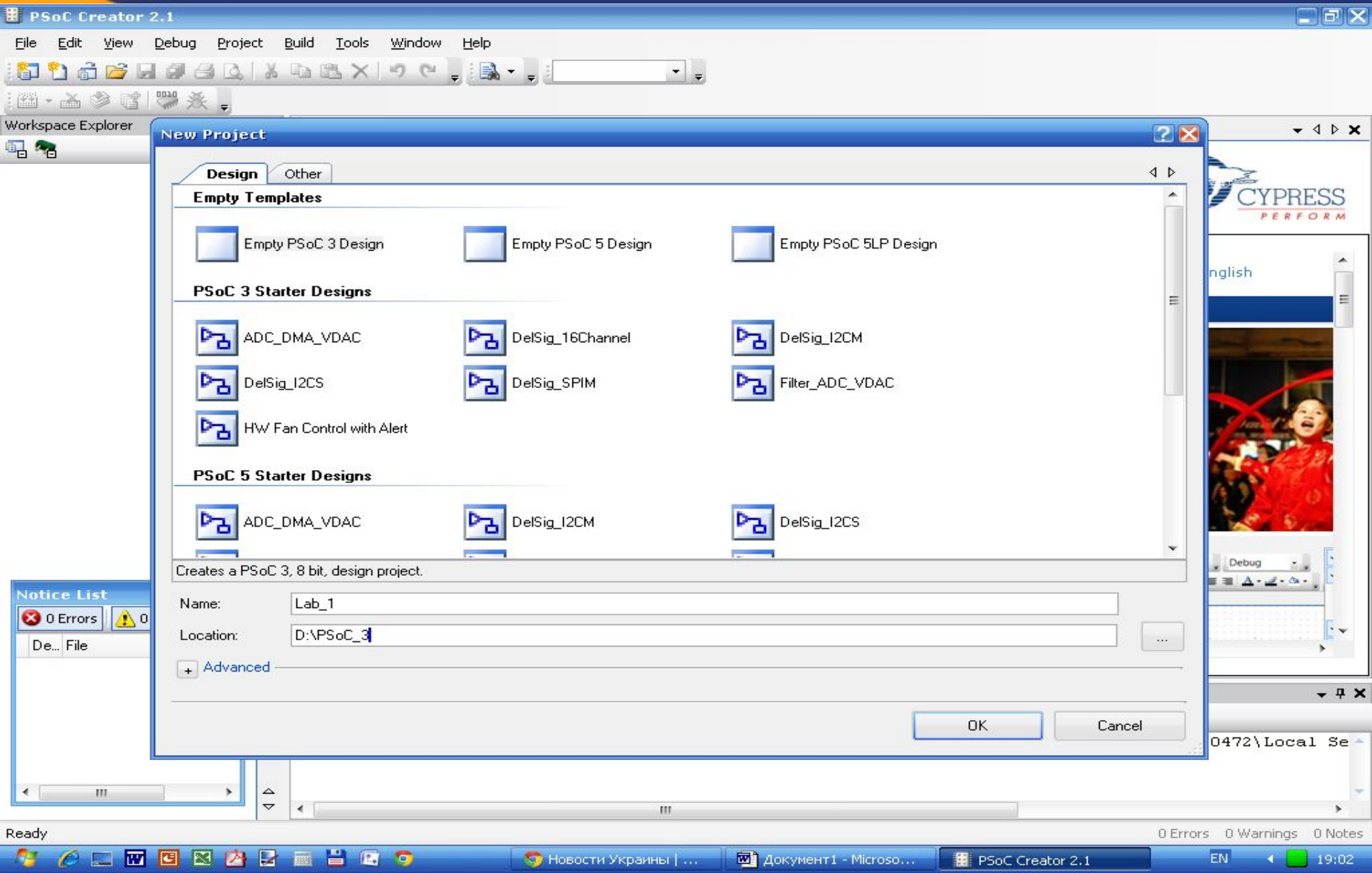
Follow the below steps to do this:

- **The Lab already has the LCD Character component installed and configured.**
- **Add a IDAC8 component from the component catalog.**
- **In the general tab, configure the IDAC8 component as in the image below**

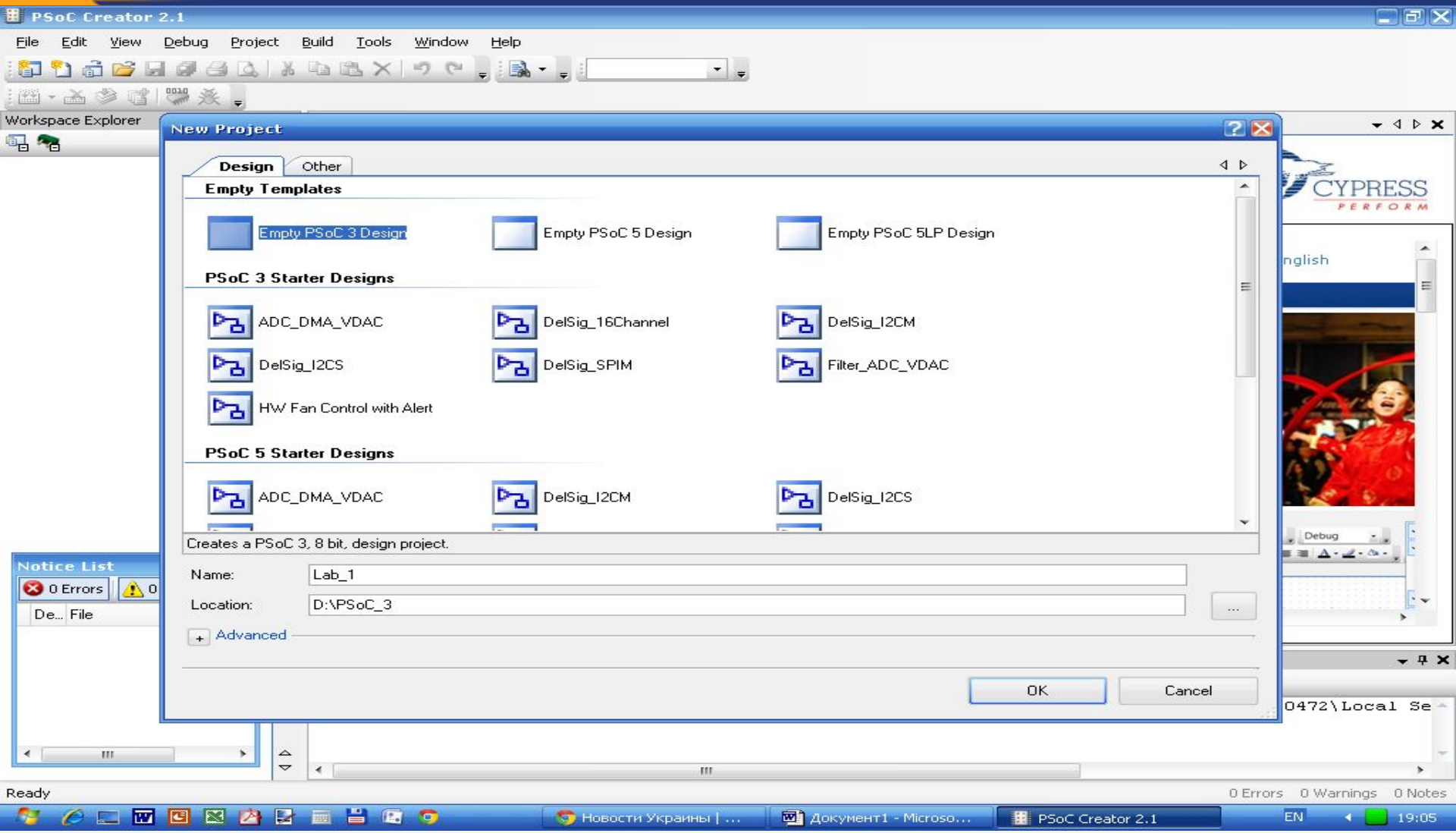
Creator


PSoC Creator 2.1
File Edit View Debug Project Build Tools Window Help
Workspace Explorer
Source
Components
Datasheets
Results
Start Page
PSoC® Creator™
CYPRESS PERFORM
Recent Projects
HelloWorld_Blinky01.cywrk
CapSense_CSD_Design01...
CapSense_CSD_Design01...
CharLCD_CustomFont01.c...
CharLCD_CustomFont01.c...
Create New Project...
Open Existing Project...
Getting Started
PSoC Creator Start Page
Quick Start Guide
Intro to PSoC
Intro to PSoC Creator
PSoC Creator Training
Help Tutorials
Getting Started With PSoC 3
Getting Started With PSoC 5
Examples and Kits
Find Example Project...
No Kit Packages Installed
简体中文 日本語 한국어 English
PSoC Creator News and Information
Happy Lunar New Year!
Posted on 02/11/2013
Gong Xi Fa Cai! As many of my friends and colleagues are celebrating the New Year and welcoming in the year of the water snake, I wanted to take a minute and wish you all well. May the New Year bring each of you prosperity, good luck and a new PSoC design.
...
Read More
Tips + Tricks: Menu Customization
Posted on 01/24/2013
Did you know you can create a customized menu in PSoC® Creator? Right click in a blank area of the top menu and select customize from the
Notice List
0 Errors
0 Warnings
De... File Error L
Output
Show output from: All
Log file for this session is located at: C:\Documents and Settings\Admin.MICROSOF-7D0472\Local Se
Ready
0 Errors 0 Warnings 0 Notes
Новости Украины | ...
Документ1 - Microso...
PSoC Creator 2.1
EN
18:57

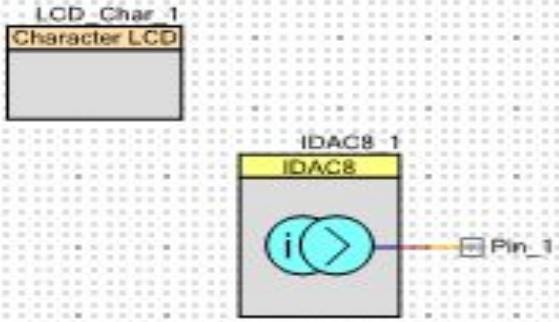
File – New - Projekt



Empty PSoC 3 Design



IDAC8



To check the IDAC8, the initial value is given using IDAC8_1_SetValue() API.

Parameter Settings:
Data_Source : CPU or DMA (Data Bus)
IDAC_Range : 0 - 255 uA (1uA/bit)
IDAC_Speed : High Speed
Value : 100
Polarity : Positive (Source)
Strobe_Mode : Register Write

Pin Mapping :

Pin_1 (P0(6) of CY8CKIT-001) : IDAC8 output

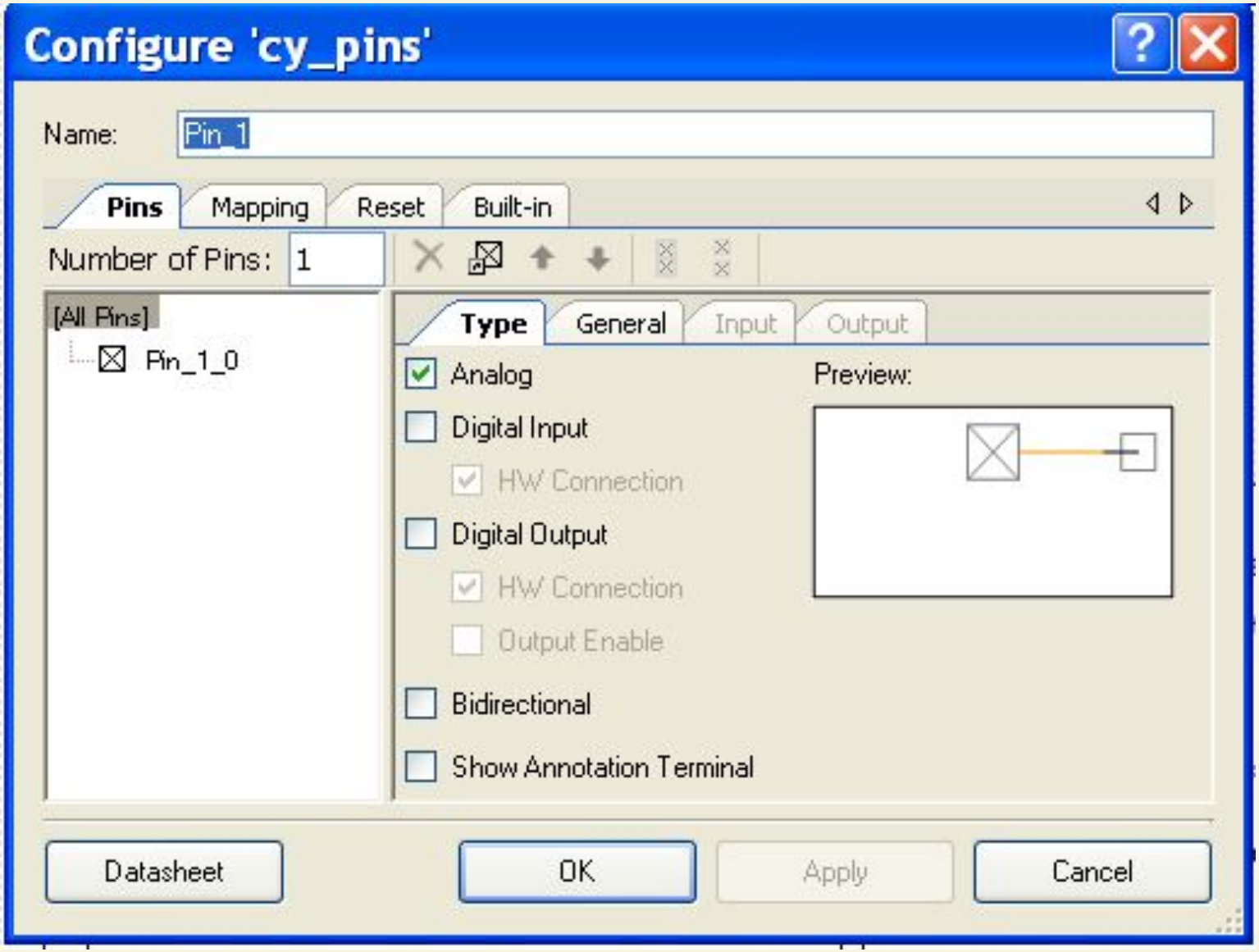
Procedure :

1. This project is written for 2X16 display as the one available on CY8CKIT-001. It will require slight modifications to run on larger displays.

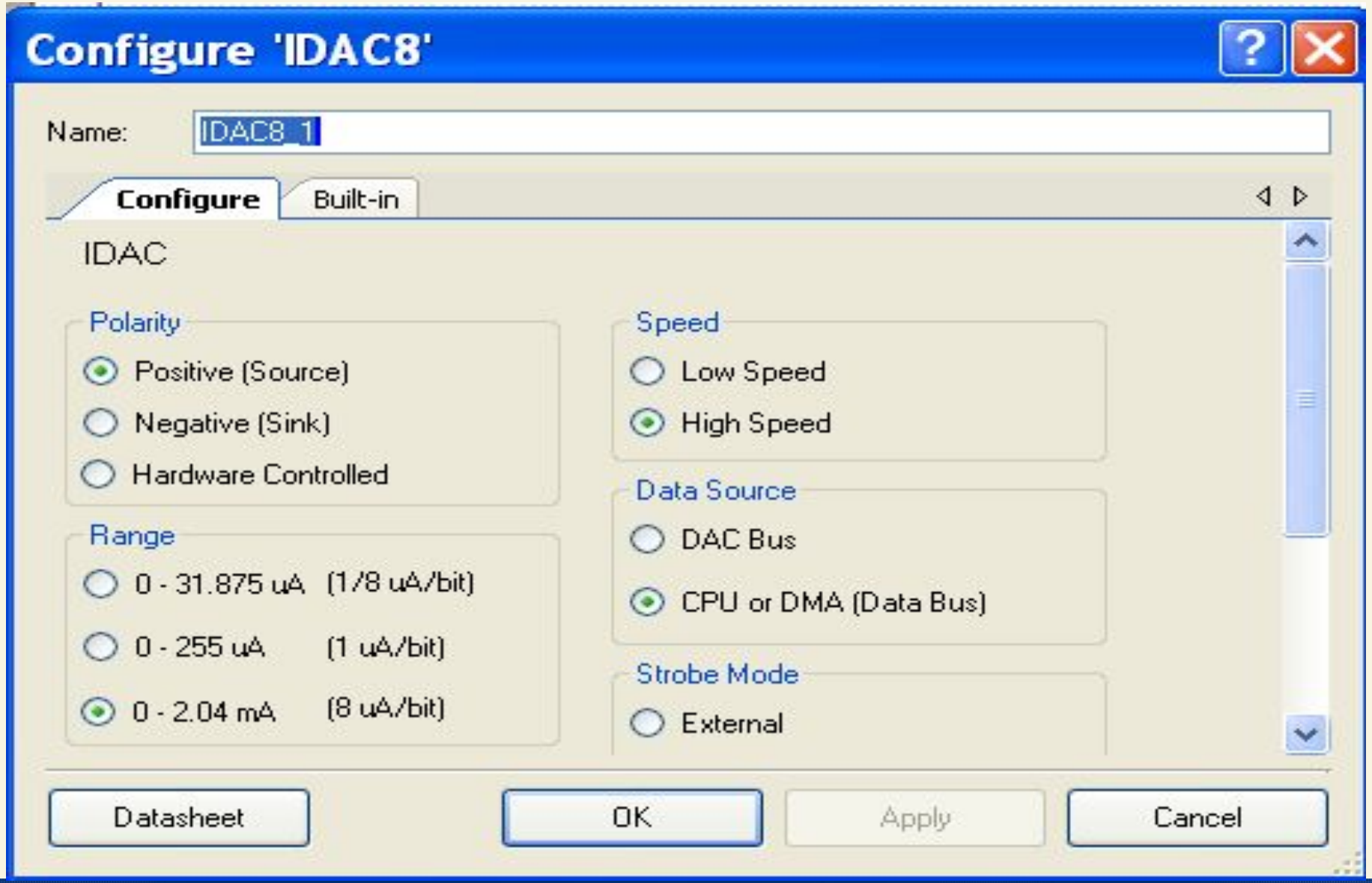
2. Build the project and program the hex file on to the target device.

3. Use a multimeter in current mode to check the output of IDAC. Expected output is 100uA.

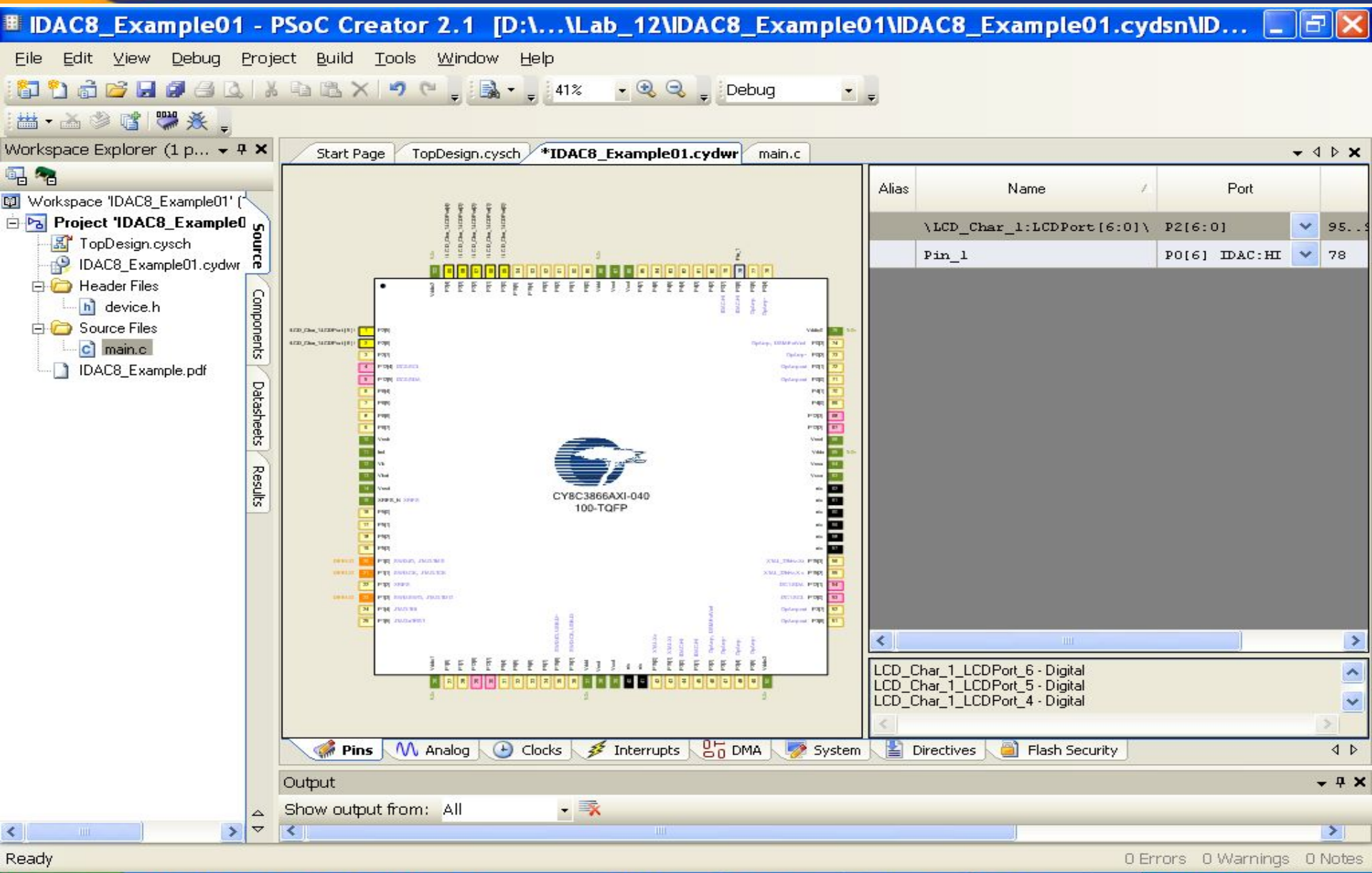
IDAC8


Configure 'cy_pins'
Name:
Pin_1
Pins
Mapping
Reset
Built-in
Number of Pins:
1
[All Pins]
Pin_1_0
Type
General
Input
Output
Analog
Digital Input
HW Connection
Digital Output
HW Connection
Output Enable
Bidirectional
Show Annotation Terminal
Preview:
Datasheet
OK
Apply
Cancel

IDAC8


Configure 'IDAC8'
Name:
IDAC8_1
Configure
Built-in
IDAC
Polarity
Positive (Source)
Negative (Sink)
Hardware Controlled
Range
0 - 31.875 uA (1/8 uA/bit)
0 - 255 uA (1 uA/bit)
0 - 2.04 mA (8 uA/bit)
Speed
Low Speed
High Speed
Data Source
DAC Bus
CPU or DMA (Data Bus)
Strobe Mode
External
Datasheet
OK
Apply
Cancel

IDAC8


IDAC8_Example01 - PSoC Creator 2.1 [D:\...\Lab_12\IDAC8_Example01\IDAC8_Example01.cydsn\ID...
File Edit View Debug Project Build Tools Window Help
41%
Debug
Workspace Explorer (1 p...
Workspace 'IDAC8_Example01' (
Project 'IDAC8_Example0
TopDesign.cysch
IDAC8_Example01.cydwr
Header Files
device.h
Source Files
main.c
IDAC8_Example.pdf
Source
Components
Datasheets
Results
Start Page
TopDesign.cysch
*IDAC8_Example01.cydwr
main.c
CY8C3866AXI-040
100-TQFP
Alias
Name
Port
\LCD_Char_1:LCDPort[6:0]\
P2[6:0]
Pin_1
P0[6] IDAC:HI
78
LCD_Char_1_LCDPort_6 - Digital
LCD_Char_1_LCDPort_5 - Digital
LCD_Char_1_LCDPort_4 - Digital
Pins
Analog
Clocks
Interrupts
DMA
System
Directives
Flash Security
Output
Show output from: All
Ready
0 Errors 0 Warnings 0 Notes

IDAC8

Start Page | TopDesign.cysch | *IDAC8_Example01.cydwr | *main.c

```
/*******************************************************************************
* File: main.c
* Version: 1.2
* Description:
*   This is a source code for basic functionality of IDAC8.
********************************************************************************
* Copyright 2012, Cypress Semiconductor Corporation. All rights reserved.
* This software is owned by Cypress Semiconductor Corporation and is protected
* by and subject to worldwide patent and copyright laws and treaties.
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* CYPRESS AND ITS SUPPLIERS MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED,
* WITH REGARD TO THIS SOFTWARE, INCLUDING, BUT NOT LIMITED TO, NONINFRINGEMENT,
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
*******************************************************************************/

#include <device.h>

/*******************************************************************************
* Function Name: main
********************************************************************************
*
* Summary:
*  Main function performs following functions:
*   1: Initializes the LCD and clears the display
*   2: Start the IDAC
*   3: IDAC range is set to 255uA and value to 100
*   4: Prints test name on LCD
*
```

IDAC8

Start Page | TopDesign.cysch | *IDAC8_Example01.cydwr | *main.c

```
27  *    3: IDAC range is set to 255uA and value to 100
28  *    4: Prints test name on LCD
29  *
30  * Parameters:
31  *  None.
32  * Return:
33  *  None.
34  *
35  *******************************************************************************/
36  void main()
37  {
38      /* Start the LCD component */
39      LCD_Char_1_Start();
40
41      /* Clear LCD Display */
42      LCD_Char_1_ClearDisplay();
43
44      /* Start the IDAC component */
45      IDAC8_1_Start();
46
47      /* Sets the IDAC full scale range to 255uA */
48      IDAC8_1_SetRange(IDAC8_1_RANGE_255uA);
49
50      /* Sets the IDAC value to 100 */
51      IDAC8_1_SetValue(100u);
52
53      LCD_Char_1_Position(0u,0u);
54      LCD_Char_1_PrintString("    IDAC8 ");
55
```

IDAC8

```
35  *******************************************************************************/
36  void main()
37  {
38      /* Start the LCD component */
39      LCD_Char_1_Start();
40
41      /* Clear LCD Display */
42      LCD_Char_1_ClearDisplay();
43
44      /* Start the IDAC component */
45      IDAC8_1_Start();
46
47      /* Sets the IDAC full scale range to 2040 uA */
48      IDAC8_1_SetRange(IDAC8_1_RANGE_2mA);
49
50      /* Sets the IDAC value to 250 */
51      IDAC8_1_SetValue(1u);
52
53      LCD_Char_1_Position(0u,0u);
54      LCD_Char_1_PrintString("  29 IDAC8 ");
55
56      for(;;)
57      {
58      }
59
60  }
```

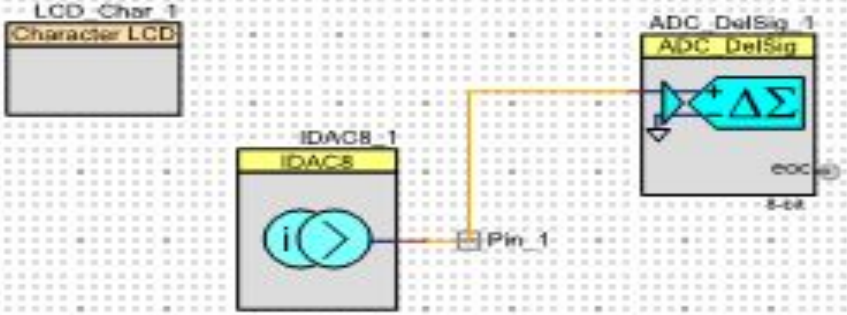
IDAC8

Overview:

Activate and use
the IDAC8 on the DVK board
and
output the results
to the LCD Character screen and Leds.

Зняти
вольт-амперну характеристику
напівпровідникового діода

IDAC8



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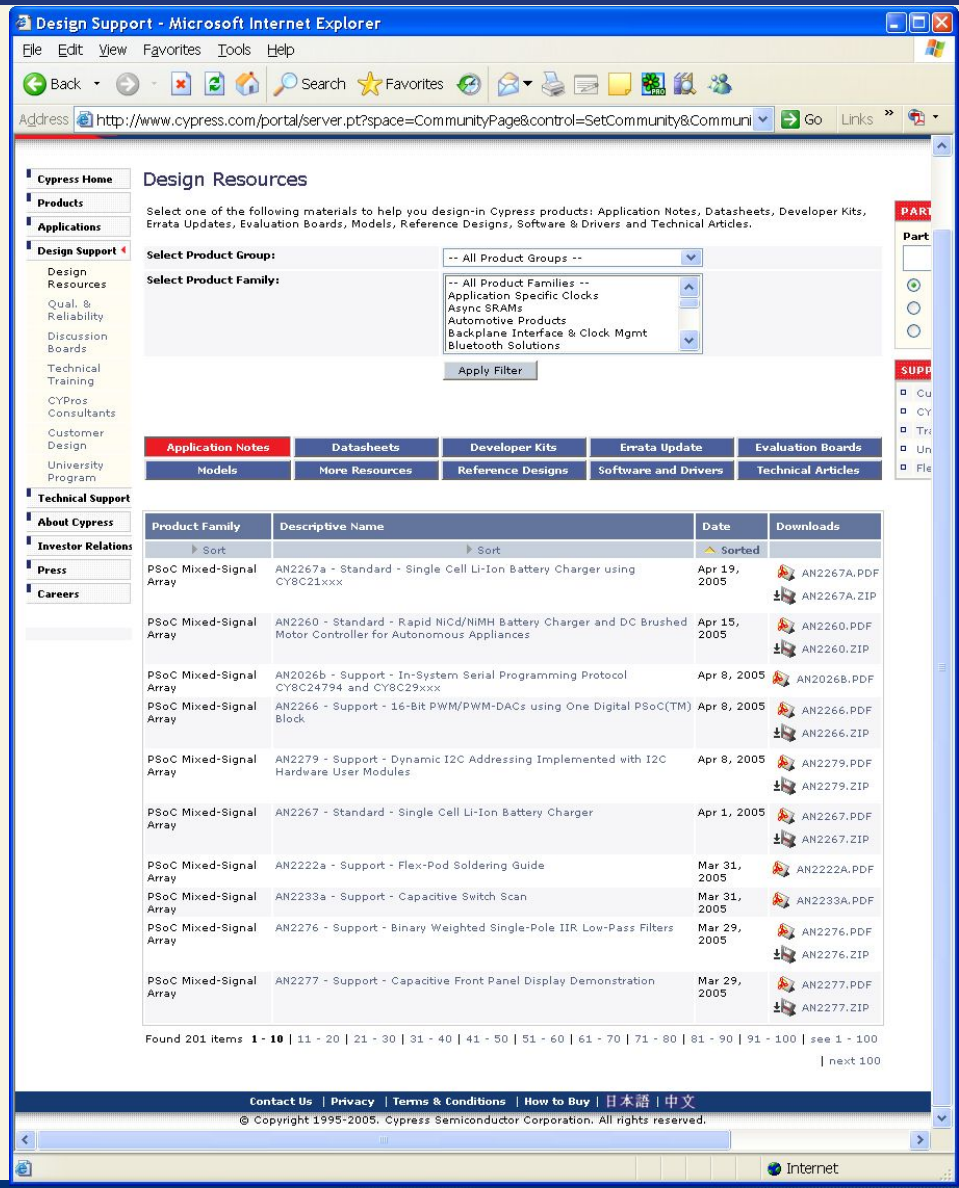
Приклади застосування МК PSOC

На сайті фірми Cypress знаходиться більше 200 Application Notes і Reference Designs, які ілюструють області застосування мікроконтролерів PSoC.



Мікропроцесорні системи

(лекція 5, кінець)

Благітко Б.Я.

2019 р.