

Мікропроцесорна техніка

(лекція 5)
Благітко Б.Я.
2019 р.

PSoC Creator 4.2
Designing with PSoC 3/5

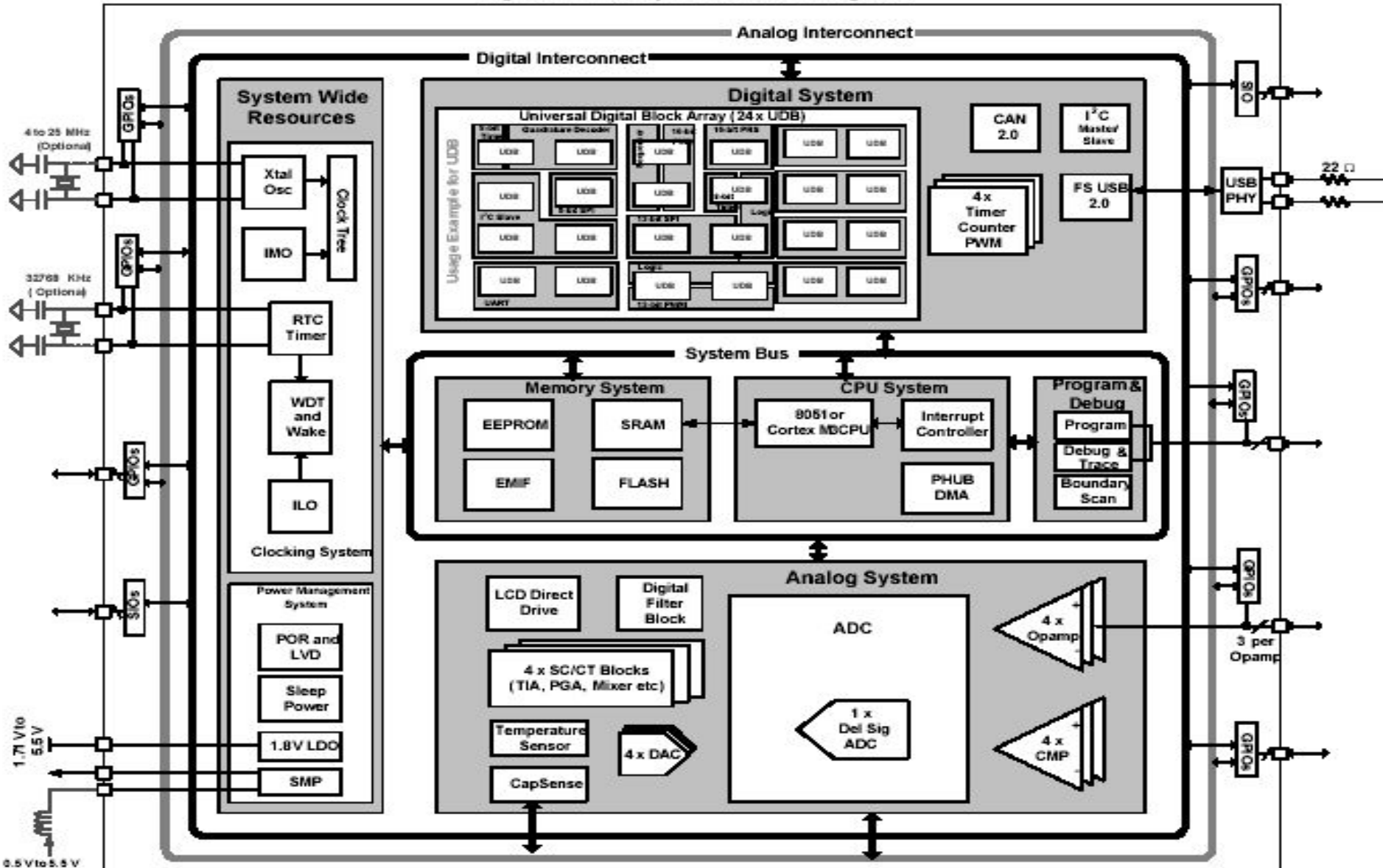


PSoC@3/5 IDAC8

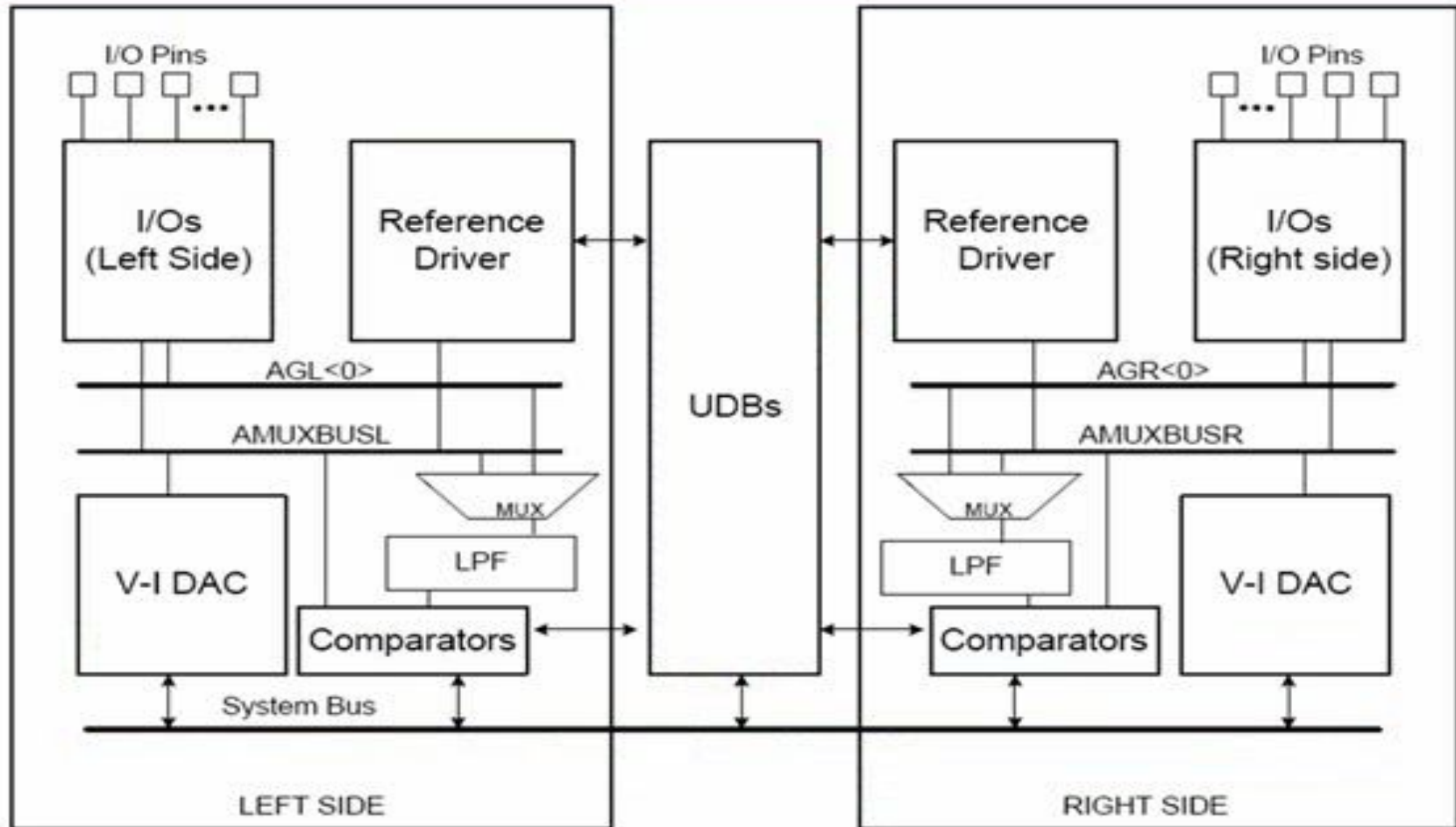
PSoC Creator 4.2
Designing with PSoC 3/5

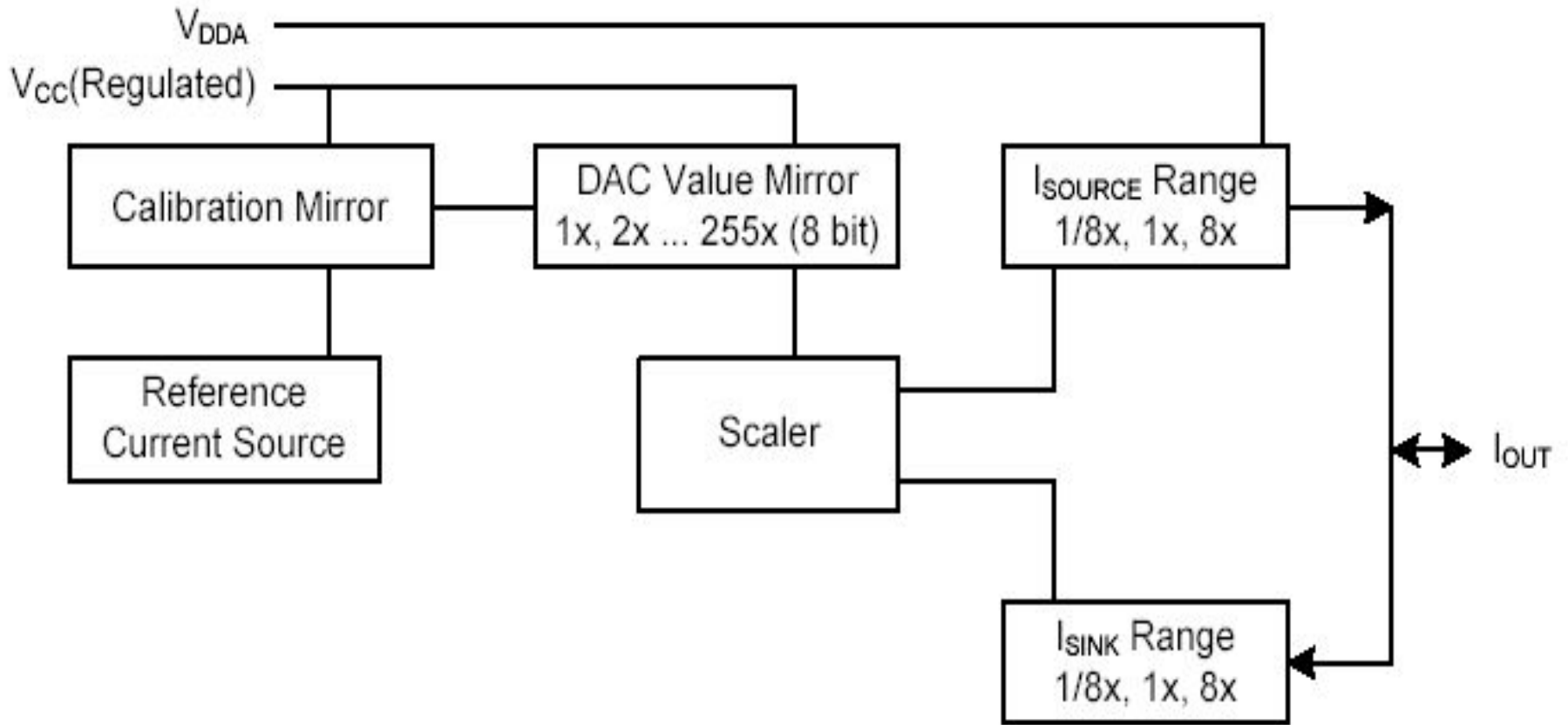


Figure 1-1. Simplified Block Diagram

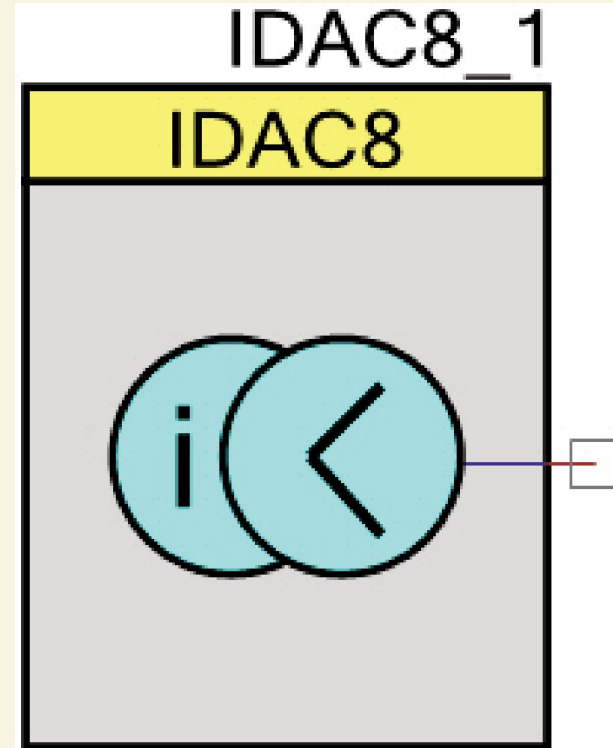
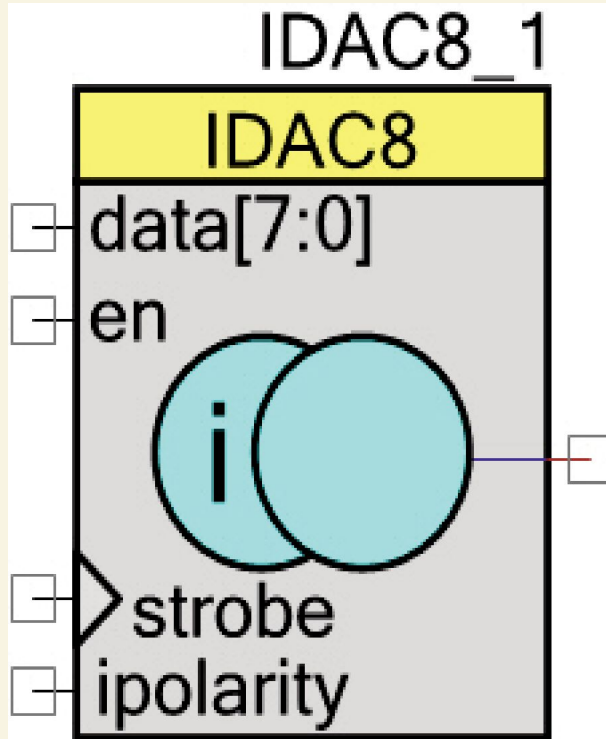


CapSense in PSoC 3 / PSoC 5





Block Diagram IDAC8



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

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 μ A
IDAC8_RANGE_255uA	Set full scale range to 255 μ A
IDAC8_RANGE_2mA	Set full scale range to 2.040 mA

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 μ A, code = 255, $R_{LOAD} = 600 \Omega$	–	255	–	μ A
		Range = 31.875 μ A, code = 255, $R_{LOAD} = 600 \Omega$	–	31.875	–	μ A
	Monotonicity		–	–	Yes	
E_{zs}	Zero scale error		–	0	± 1	LSB
E_g	Gain error	Range = 2.04 mA, 25 °C	–	–	± 2.5	%
		Range = 255 μ A, 25 °C	–	–	± 2.5	%
		Range = 31.875 μ A, 25 °C	–	–	± 2.5	%

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.

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.

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**

PSoC Creator 2.1


File Edit View Debug Project Build Tools Window Help

Workspace Explorer

Source Components Datasheets Results

Start Page

PSoC® Creator™



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



Help

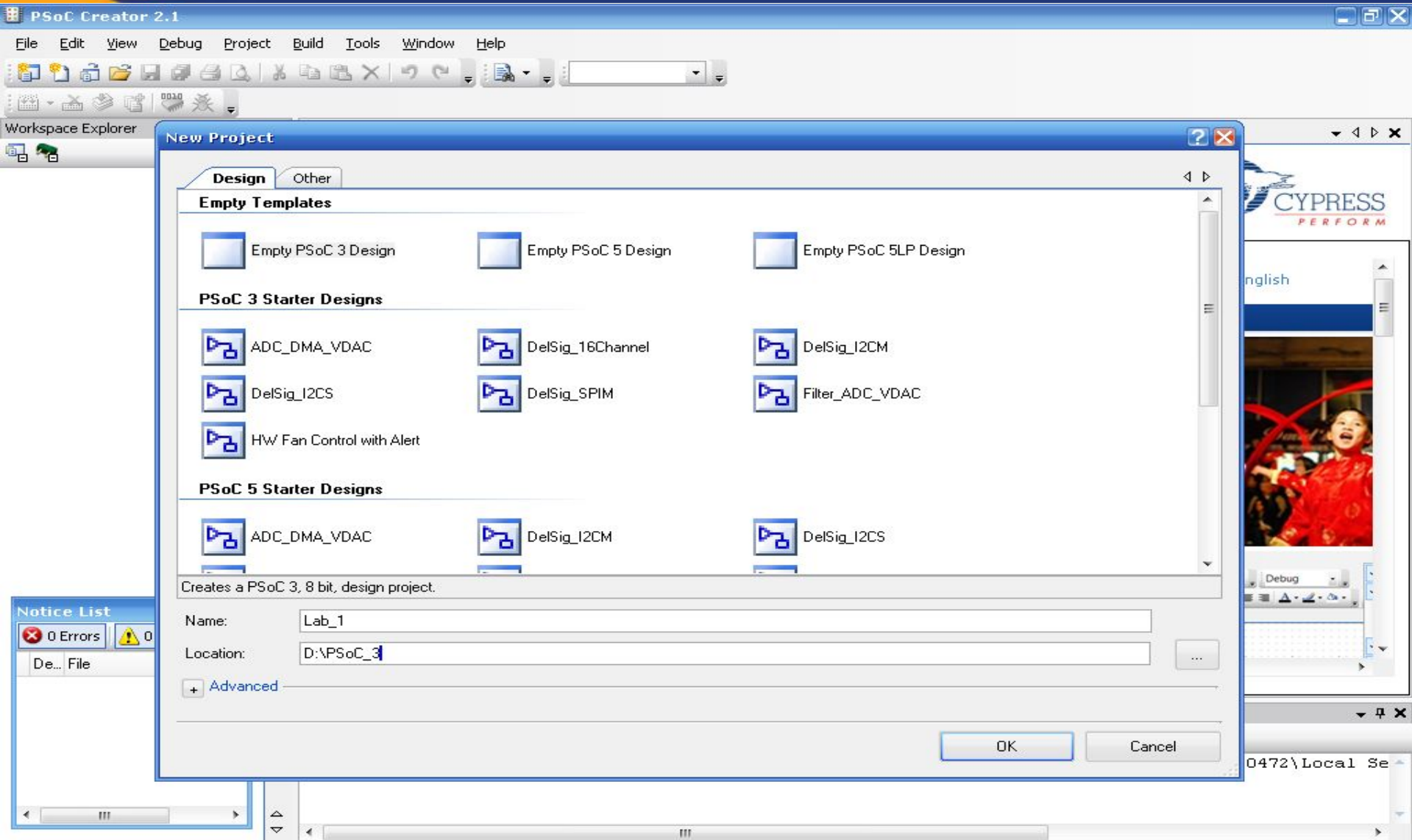
5% - Debug

Output

Show output from: All

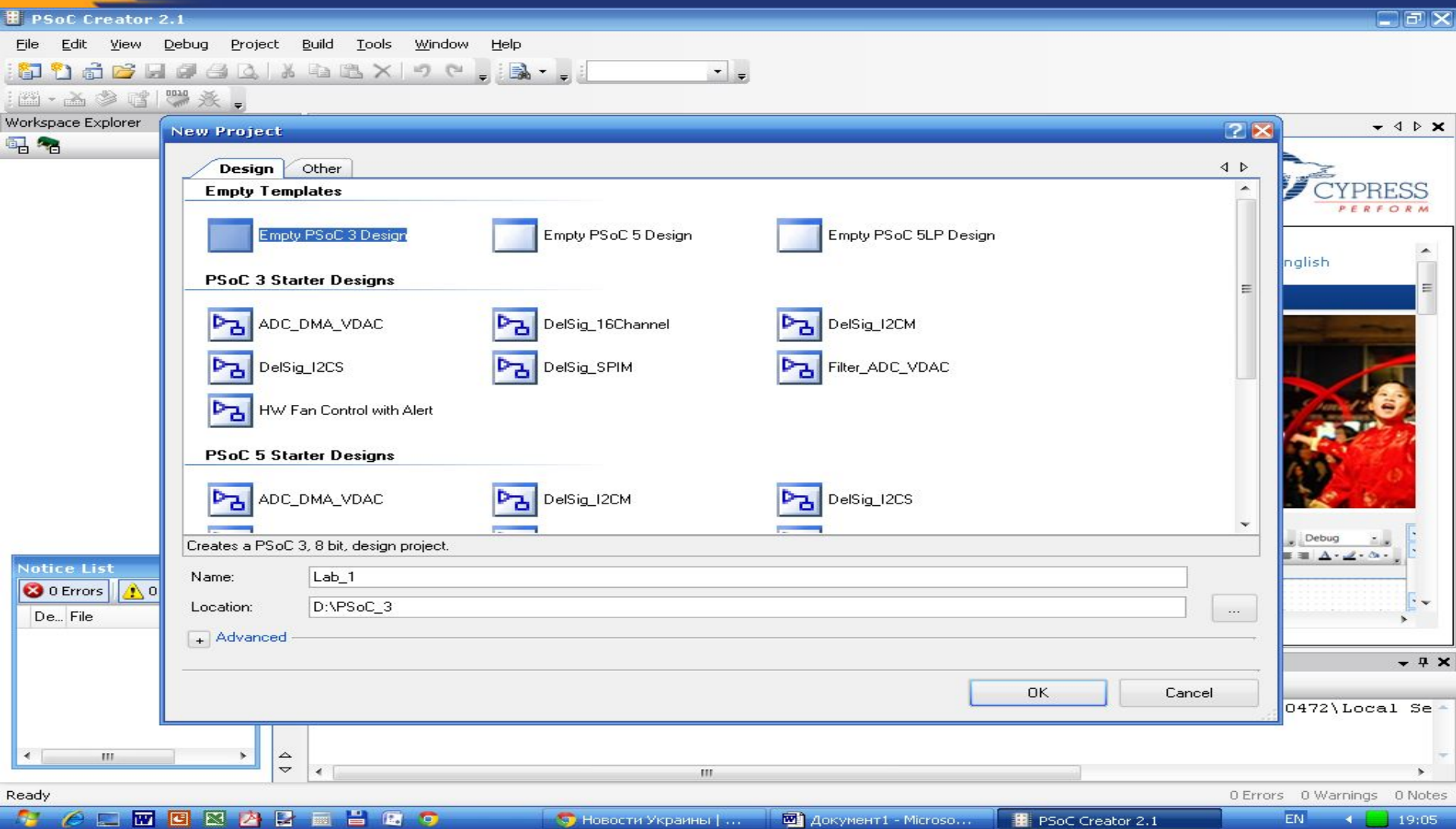
Log file for this session is located at: C:\Documents and Settings\Admin.MICROSOFT-7D0472\Local Se

File – New - Projekt



The screenshot shows the PSoC Creator 2.1 application window. The 'File' menu is open, and the 'New' option is selected, leading to the 'New Project' dialog box. The dialog box has two tabs: 'Design' and 'Other'. Under the 'Design' tab, there are three sections: 'Empty Templates', 'PSoC 3 Starter Designs', and 'PSoC 5 Starter Designs'. The 'Empty Templates' section contains three options: 'Empty PSoC 3 Design', 'Empty PSoC 5 Design', and 'Empty PSoC 5LP Design'. The 'PSoC 3 Starter Designs' section contains six options: 'ADC_DMA_VDAC', 'DelSig_16Channel', 'DelSig_I2CM', 'DelSig_I2CS', 'DelSig_SPIM', and 'Filter_ADC_VDAC'. The 'PSoC 5 Starter Designs' section contains three options: 'ADC_DMA_VDAC', 'DelSig_I2CM', and 'DelSig_I2CS'. Below these sections, there is a description: 'Creates a PSoC 3, 8 bit, design project.' The 'Name' field is set to 'Lab_1' and the 'Location' field is set to 'D:\PSoC_3'. There is an 'Advanced' button with a plus sign. At the bottom right of the dialog box are 'OK' and 'Cancel' buttons. In the background, the main application window is visible, showing the 'Workspace Explorer' on the left and a 'Notice List' at the bottom left. The status bar at the bottom of the application shows 'Ready' and '0 Errors 0 Warnings 0 Notes'.

Empty PSoC 3 Design



PSoC Creator 2.1

File Edit View Debug Project Build Tools Window Help

Workspace Explorer

New Project

Design Other

Empty Templates

- Empty PSoC 3 Design
- Empty PSoC 5 Design
- Empty PSoC 5LP Design

PSoC 3 Starter Designs

- ADC_DMA_VDAC
- DelSig_16Channel
- DelSig_I2CM
- DelSig_I2CS
- DelSig_SPIM
- Filter_ADC_VDAC
- HW Fan Control with Alert

PSoC 5 Starter Designs

- ADC_DMA_VDAC
- DelSig_I2CM
- DelSig_I2CS

Creates a PSoC 3, 8 bit, design project.

Name:

Location: ...

Advanced

OK Cancel

Notice List

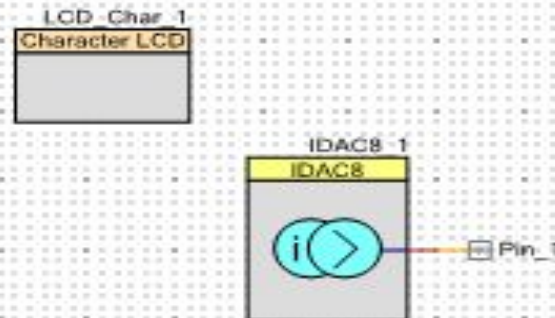
- 0 Errors
- 0 Warnings
- 0 Notes

0472\Local Se

Ready

0 Errors 0 Warnings 0 Notes

EN 19:05



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

Parameter Settings:

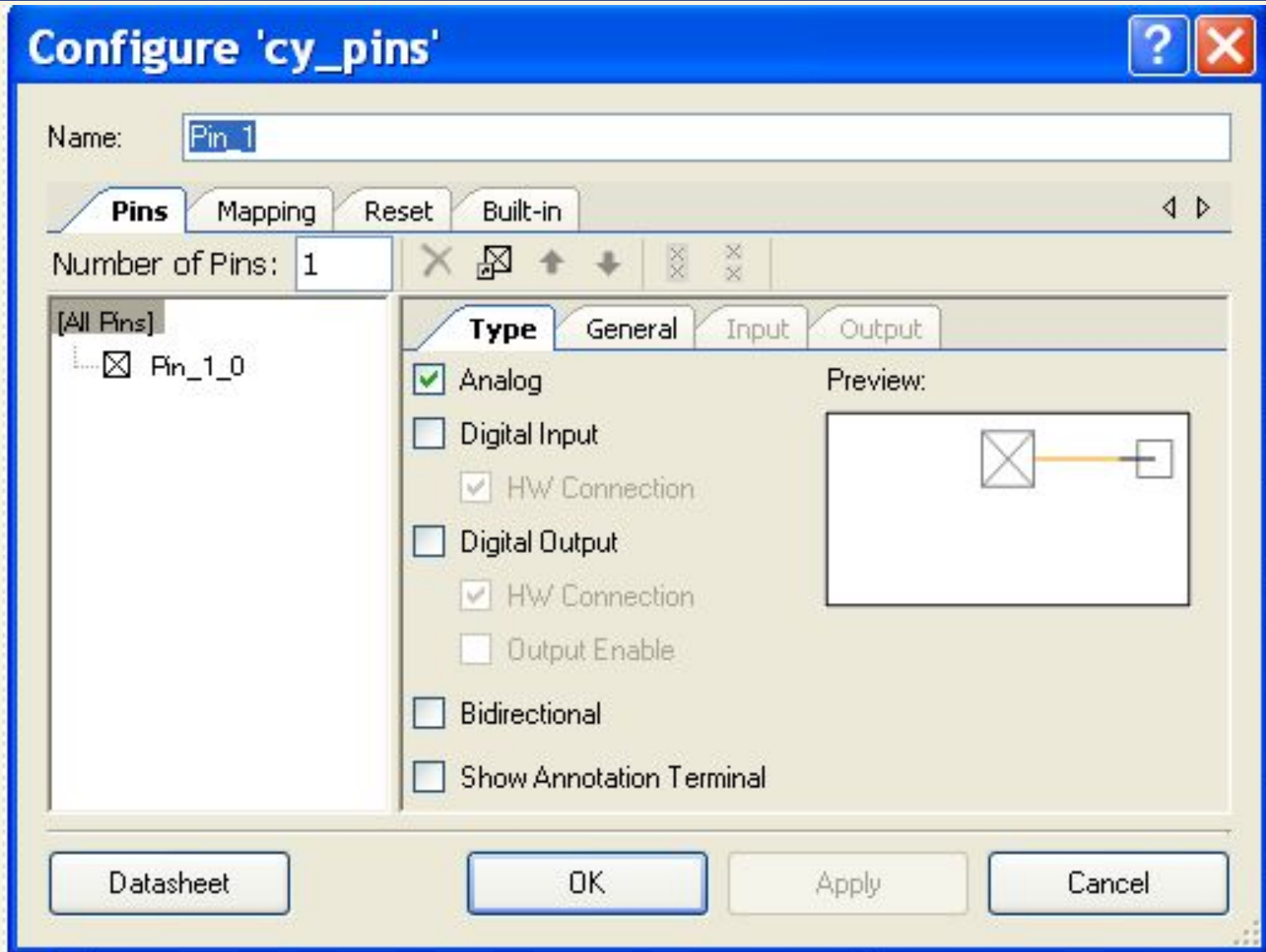
Data_Source : CPU or DMA (Data Bus)
 IDAC_Range : 0 - 255 μ A (1 μ A/bit)
 IDAC_Speed : High Speed
 Value : 100
 Polarity : Positive (Source)
 Strobe_Mode : Register Write

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 100 μ A.



Configure 'IDAC8'

Name:

IDAC8_1

Configure

Built-in

IDAC

Polarity

- Positive (Source)
- Negative (Sink)
- Hardware Controlled

Range

- 0 - 31.875 μ A (1/8 μ A/bit)
- 0 - 255 μ A (1 μ A/bit)
- 0 - 2.04 mA (8 μ A/bit)

Speed

- Low Speed
- High Speed

Data Source

- DAC Bus
- CPU or DMA (Data Bus)

Strobe Mode

- External

Datasheet

OK

Apply

Cancel

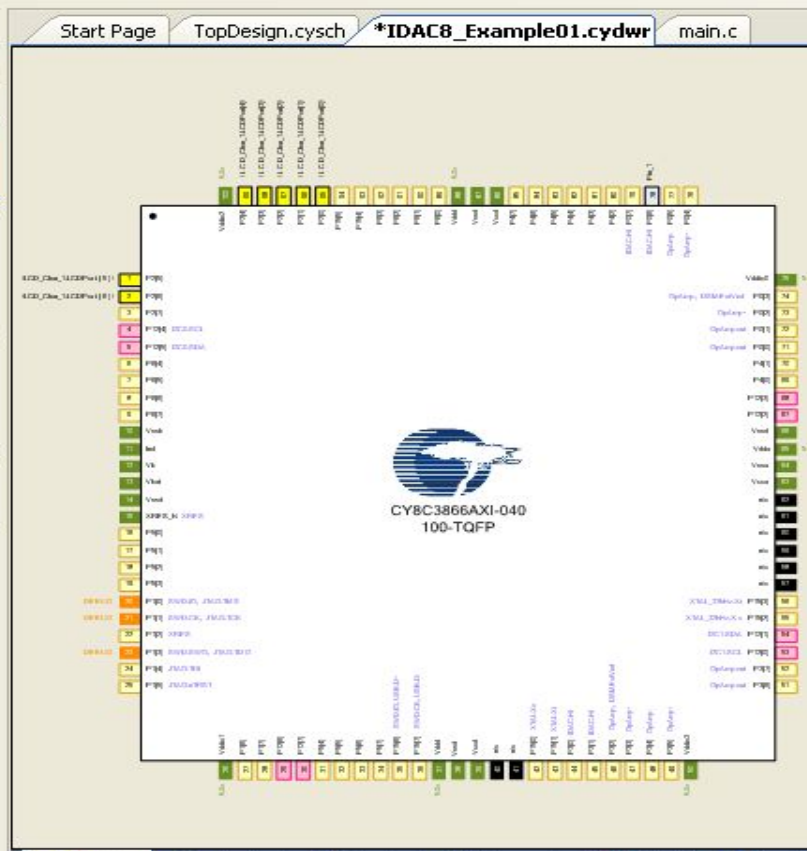
IDAC8_Example01 - PSoC Creator 2.1 [D:\...\Lab_12\IDAC8_Example01\IDAC8_Example01.cydsn\ID...

File Edit View Debug Project Build Tools Window Help

41% Debug

Workspace Explorer (1 p...)

- Workspace 'IDAC8_Example01'
 - Project 'IDAC8_Example01'
 - TopDesign.cysch
 - IDAC8_Example01.cydw
 - Header Files
 - device.h
 - Source Files
 - main.c
 - IDAC8_Example.pdf



Alias	Name	Port	Value
	\LCD_Char_1:LCDPort[6:0]	P2[6:0]	95...
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

```
1 /*****
2 * File: main.c
3 * Version: 1.2
4 * Description:
5 *   This is a source code for basic functionality of IDAC8.
6 *****/
7 * Copyright 2012, Cypress Semiconductor Corporation. All rights reserved.
8 * This software is owned by Cypress Semiconductor Corporation and is protected
9 * by and subject to worldwide patent and copyright laws and treaties.
10 * Therefore, you may use this software only as provided in the license agreement
11 * accompanying the software package from which you obtained this software.
12 * CYPRESS AND ITS SUPPLIERS MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED,
13 * WITH REGARD TO THIS SOFTWARE, INCLUDING, BUT NOT LIMITED TO, NONINFRINGEMENT,
14 * IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
15 *****/
16
17 #include <device.h>
18
19 /*****
20 * Function Name: main
21 *****/
22 *
23 * Summary:
24 *   Main function performs following functions:
25 *   1: Initializes the LCD and clears the display
26 *   2: Start the IDAC
27 *   3: IDAC range is set to 255uA and value to 100
28 *   4: Prints test name on LCD
29 *
```

Start Page

TopDesign.cysch

*IDAC8_Example01.cydwr

*main.c



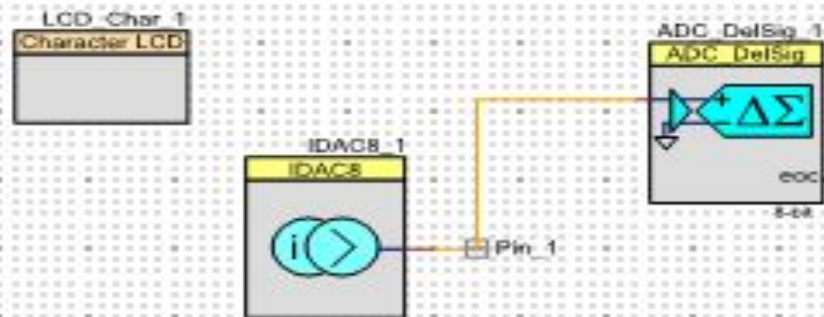
```
27 * 3: IDAC range is set to 255uA and value to 100
28 * 4: Prints test name on LCD
29
30 * Parameters:
31 * None.
32 * Return:
33 * None.
34
35 /*****
36 void main()
37 {
38     /* Start the LCD component */
39     LCD_Char_1_Start();
40
41     /* Clear LCD Display */
42     LCD_Char_1_ClearDisplay();
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
```

```
Start Page | TopDesign1.CySU1 | IDAC8_Example01.CyUWR | IDAC8.C  
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 | }
```

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



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

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

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Address: http://www.cypress.com/portal/server.pt?space=CommunityPage&control=SetCommunity&Communi

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Product Family	Descriptive Name	Date	Downloads
PSoC Mixed-Signal Array	AN2267a - Standard - Single Cell Li-Ion Battery Charger using CY8C21xxx	Apr 19, 2005	AN2267A.PDF AN2267A.ZIP
PSoC Mixed-Signal Array	AN2260 - Standard - Rapid NiCd/NiMH Battery Charger and DC Brushed Motor Controller for Autonomous Appliances	Apr 15, 2005	AN2260.PDF AN2260.ZIP
PSoC Mixed-Signal Array	AN2026b - Support - In-System Serial Programming Protocol CY8C24794 and CY8C29xxx	Apr 8, 2005	AN2026B.PDF
PSoC Mixed-Signal Array	AN2266 - Support - 16-Bit PWM/PWM-DACs using One Digital PSoC(TM) Block	Apr 8, 2005	AN2266.PDF AN2266.ZIP
PSoC Mixed-Signal Array	AN2279 - Support - Dynamic I2C Addressing Implemented with I2C Hardware User Modules	Apr 8, 2005	AN2279.PDF AN2279.ZIP
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PSoC Mixed-Signal Array	AN2233a - Support - Capacitive Switch Scan	Mar 31, 2005	AN2233A.PDF
PSoC Mixed-Signal Array	AN2276 - Support - Binary Weighted Single-Pole IIR Low-Pass Filters	Mar 29, 2005	AN2276.PDF AN2276.ZIP
PSoC Mixed-Signal Array	AN2277 - Support - Capacitive Front Panel Display Demonstration	Mar 29, 2005	AN2277.PDF AN2277.ZIP

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Мікропроцесорні системи

(лекція 5, кінець)
Благітко Б.Я.
2019 р.

