

HƯỚNG DẪN SỬ DỤNG BOARD NuTiny-SDK-Nano130



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1. Giới thiệu dòng Nano100Series

1.1 Nano100 Series family

Nano100 Series gồm 4 dòng:

- ✓ Nano100 Base Line : Dòng cơ bản
- ✓ Nano110 LCD Line : Ngoài tính năng cơ bản, có hỗ trợ giao tiếp LCD
- ✓ Nano120 USB Connectivity Line : Hỗ trợ giao tiếp USB
- ✓ Nano130 Advanced Line : Hỗ trợ đầy đủ các tính năng dòng Nano100 Series

Dòng Nano100 Base Line

Part No.	Flash	SRAM	Data Flash Shared AP ROM	LDROM ISP Flash	I/O	Timer	Connectivity				I2S	PWM	12-bit ADC	RTC	EBI	IRC 10KHz 12MHz	PDMA	LCD	12-bit DAC	Smart Card	Touch Key	ISP IC	Package
							UART	SPI	IC	USB													
NANO100LC2BN	32K	8K	Configurable	4K	up to 38	4x32-bit	4	3	2	-	1	6	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO100LD2BN	64K	8K	Configurable	4K	up to 38	4x32-bit	4	3	2	-	1	6	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO100LD3BN	64K	16K	Configurable	4K	up to 38	4x32-bit	4	3	2	-	1	6	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO100LE3BN	128K	16K	Configurable	4K	up to 38	4x32-bit	4	3	2	-	1	6	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO100SC2BN	32K	8K	Configurable	4K	up to 52	4x32-bit	5	3	2	-	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO100SD2BN	64K	8K	Configurable	4K	up to 52	4x32-bit	5	3	2	-	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO100SD3BN	64K	16K	Configurable	4K	up to 52	4x32-bit	5	3	2	-	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO100SE3BN	128K	16K	Configurable	4K	up to 52	4x32-bit	5	3	2	-	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO100KC2BN	32K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	-	2	3	16	V	LQFP128
NANO100KD2BN	64K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	-	2	3	16	V	LQFP128
NANO100KD3BN	64K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	-	2	3	16	V	LQFP128
NANO100KE3BN	128K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	-	2	3	16	V	LQFP128

Dòng Nano110 LCD Line

Part No.	Flash	SRAM	Data Flash Shared AP ROM	LDROM ISP Flash	I/O	Timer	Connectivity				I2S	PWM	12-bit ADC	RTC	EBI	IRC 10KHz 12MHz	PDMA	LCD	12-bit DAC	Smart Card	Touch Key	ISP IC	Package
							UART	SPI	IC	USB													
NANO110SC2BN	32K	8K	Configurable	4K	up to 51	4x32-bit	5	3	2	-	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO110SD2BN	64K	8K	Configurable	4K	up to 51	4x32-bit	5	3	2	-	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO110SD3BN	64K	16K	Configurable	4K	up to 51	4x32-bit	5	3	2	-	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO110SE3BN	128K	16K	Configurable	4K	up to 51	4x32-bit	5	3	2	-	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO110KC2BN	32K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO110KD2BN	64K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO110KD3BN	64K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO110KE3BN	128K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	-	1	8	12	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128

Dòng Nano120 USB Line

Part No.	Flash	SRAM	Data Flash Shared AP ROM	LDROM ISP Flash	I/O	Timer	Connectivity				I2S	PWM	12-bit ADC	RTC	EBI	IRC 10KHz 12MHz	PDMA	LCD	12-bit DAC	Smart Card	Touch Key	ISP IC	Package
							UART	SPI	IC	USB													
NANO120LC2BN	32K	8K	Configurable	4K	up to 34	4x32-bit	4	3	2	1	1	4	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO120LD2BN	64K	8K	Configurable	4K	up to 34	4x32-bit	4	3	2	1	1	4	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO120LD3BN	64K	16K	Configurable	4K	up to 34	4x32-bit	4	3	2	1	1	4	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO120LE3BN	128K	16K	Configurable	4K	up to 34	4x32-bit	4	3	2	1	1	4	7	V	-	V	8	-	2	2	4	V	LQFP48
NANO120SC2BN	32K	8K	Configurable	4K	up to 48	4x32-bit	5	3	2	1	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO120SD2BN	64K	8K	Configurable	4K	up to 48	4x32-bit	5	3	2	1	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO120SD3BN	64K	16K	Configurable	4K	up to 48	4x32-bit	5	3	2	1	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO120SE3BN	128K	16K	Configurable	4K	up to 48	4x32-bit	5	3	2	1	1	8	7	V	-	V	8	-	2	3	8	V	LQFP64
NANO120KC2BN	32K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	-	2	3	8	V	LQFP128
NANO120KD2BN	64K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	-	2	3	16	V	LQFP128
NANO120KD3BN	64K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	-	2	3	16	V	LQFP128
NANO120KE3BN	128K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	-	2	3	16	V	LQFP128

Dòng Nano130 Advanced Line

Part No.	Flash	SRAM	Data Flash Shared AP ROM	LDROM ISP Flash	I/O	Timer	Connectivity				I2S	PWM	12-bit ADC	RTC	EBI	IRC 10KHz 12MHz	PDMA	LCD	12-bit DAC	Smart Card	Touch Key	ISP IC	Package
							UART	SPI	IC	USB													
NANO130SC2BN	32K	8K	Configurable	4K	up to 47	4x32-bit	5	3	2	1	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO130SD2BN	64K	8K	Configurable	4K	up to 47	4x32-bit	5	3	2	1	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO130SD3BN	64K	16K	Configurable	4K	up to 47	4x32-bit	5	3	2	1	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO130SE3BN	128K	16K	Configurable	4K	up to 47	4x32-bit	5	3	2	1	1	7	7	V	-	V	8	4x31, 6x29	2	3	8	V	LQFP64
NANO130KC2BN	32K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO130KD2BN	64K	8K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO130KD3BN	64K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128
NANO130KE3BN	128K	16K	Configurable	4K	up to 86	4x32-bit	5	3	2	1	1	8	8	V	V	V	8	4x40, 6x38	2	3	16	V	LQFP128

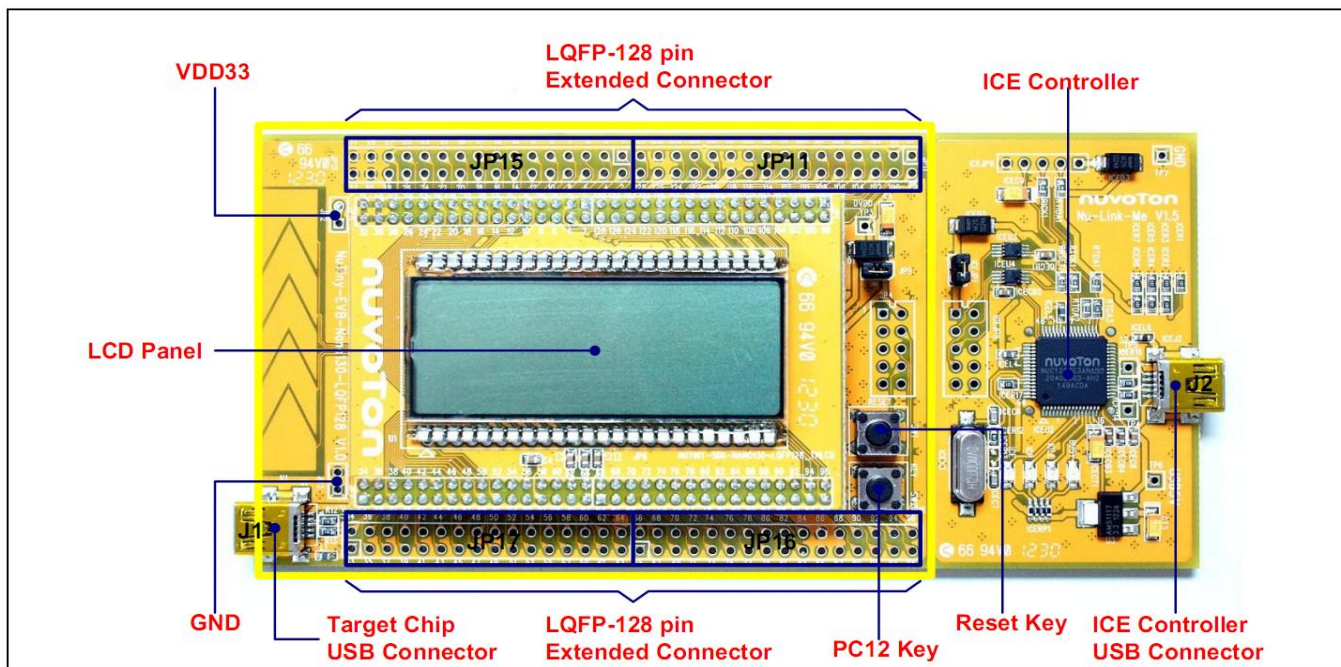
1.2 Các đặc điểm dòng Nano100 Series

Dòng Nano130 là mang đầy đủ tính năng của dòng Nano100 Series:

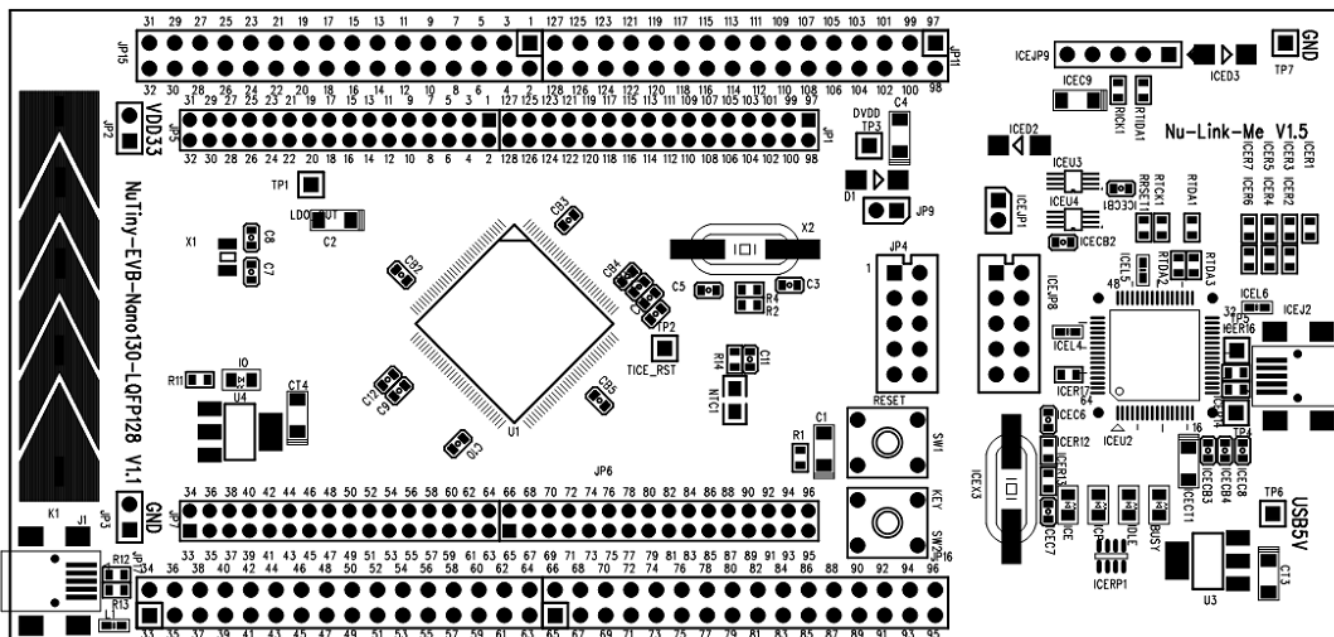
- ✓ Dải điện áp hoạt động thấp: 1.8 ~ 3.6VDC
- ✓ Tần số CPU lên tới 42Mhz
- ✓ Hỗ trợ nạp ICP/ISP
- ✓ 32/64/128K Bytes bộ nhớ Flash
- ✓ 8/16K Bytes bộ nhớ SRAM
- ✓ Nhiều chân vào ra số
- ✓ 8 kênh ADC 12 bits
- ✓ 2 kênh DAC 12 bits
- ✓ Các khối giao tiếp: 2xUART, 2xSPI, 2xI2C, I2S, USB...
- ✓ Khối điều khiển động cơ 8xPWM
- ✓ RTC
- ✓ Hỗ trợ giao tiếp LCD 4x40 hoặc 6x38
- ✓ Hỗ trợ giao tiếp cảm ứng điện dung(Touch key)
- ✓ Hỗ trợ giao tiếp Smart Card : 3xISO-7816-3

2. Board NuTiny-SDK-Nano130

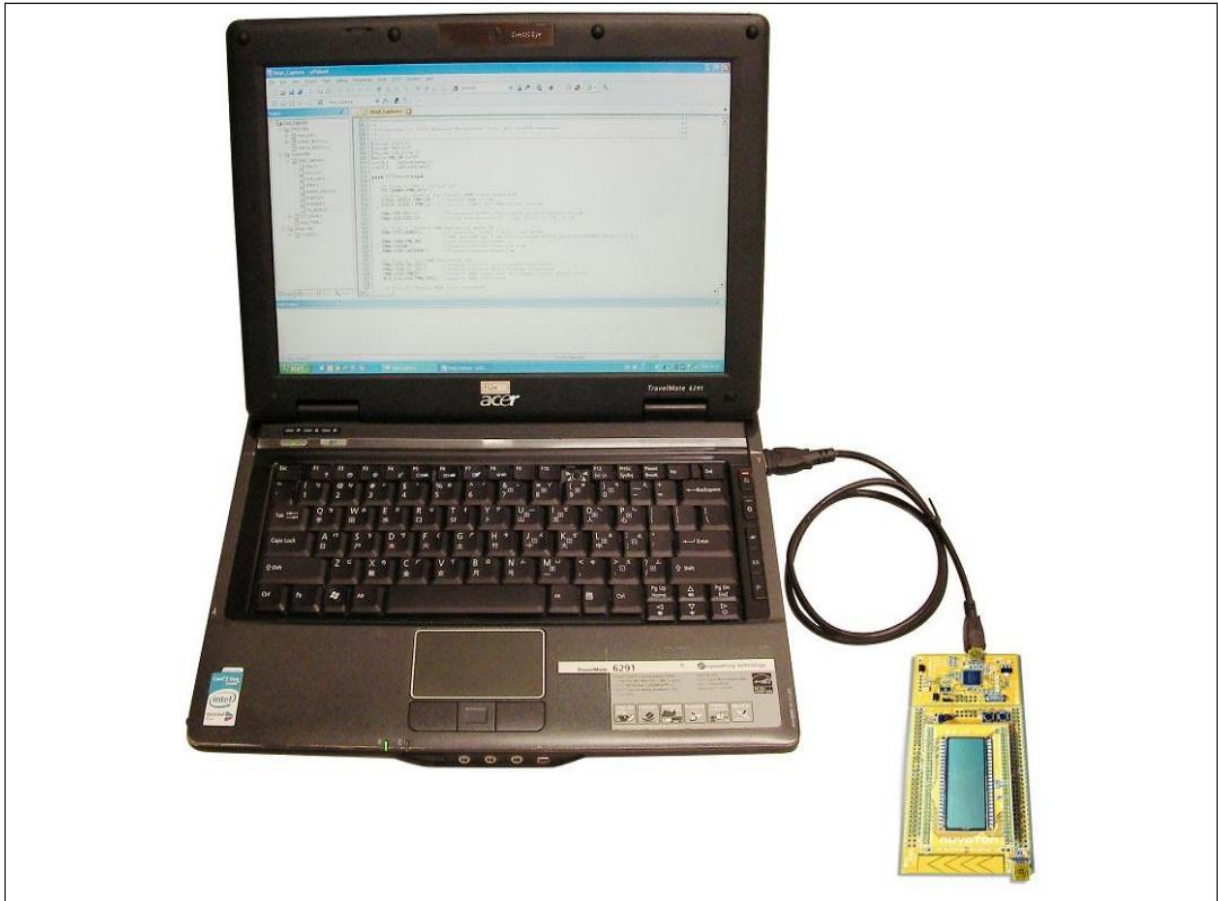
Đây là board mạch do hãng thiết kế, giúp người dùng nhanh chóng tiếp cận và nắm bắt dòng những tính năng của dòng Nano100 Series. Board đã tích hợp sẵn khối mạch nạp ICE



Hình 2.1 NuTiny-SDK-Nano130 Board



Hình 2.2 NuTiny-SDK-Nano130 PCB



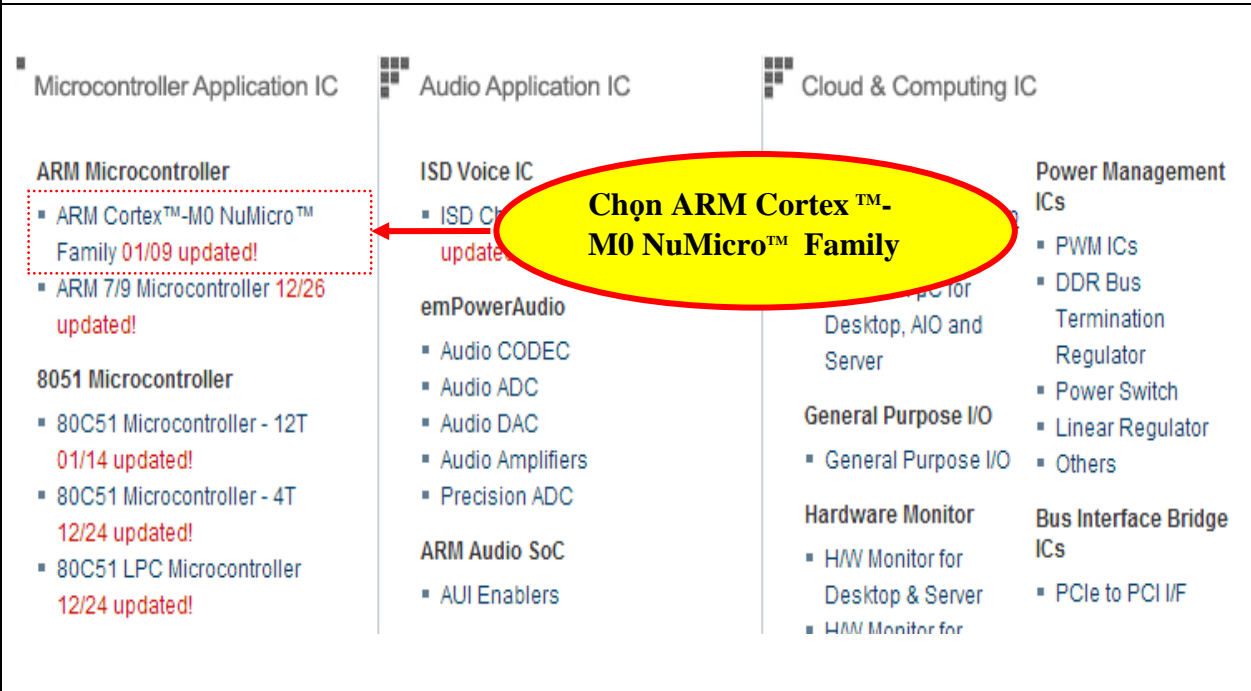
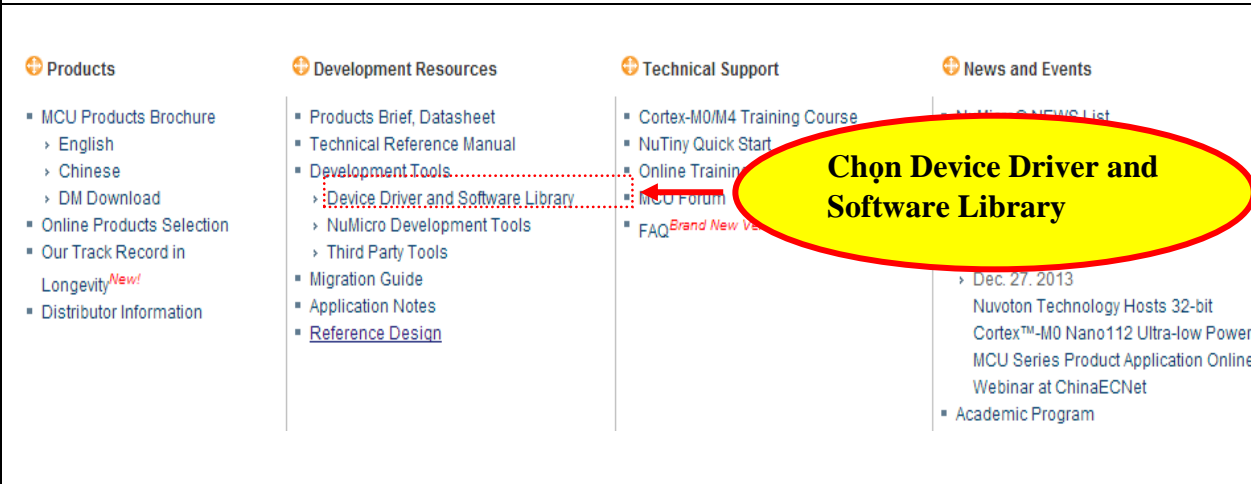
Hình 2.3 Kết nối board NuTiny-SDK-Nano130 với máy tính

3. Công cụ hỗ trợ Lập trình và Phát triển

Như các dòng ARM Cortex M0 khác của hãng Nuvoton như NUC100Series, M051, Mini51... để phát triển những ứng dụng sử dụng dòng Nano100Series(trong đó có Nano130) cần có:

- ✓ Môi trường ứng dụng phát triển(IDE): KeilC, IAR hoặc CooCox.
- ✓ Driver Nulink
- ✓ Thư viện hỗ trợ lập trình dòng Nano100 Series
- ✓ Phần mềm hỗ trợ nạp.

Tải các công cụ hỗ trợ, dựa theo hình ảnh:

<p>Bước 1</p>	<p>Kết nối với trang chủ của công ty Nuvoton Website: http://www.nuvoton.com</p>
<p>Bước 2</p>	 <p>The screenshot shows the product categories on the Nuvoton website. A red dashed box highlights the 'ARM Cortex™-M0 NuMicro™ Family 01/09 updated!' link under the 'ARM Microcontroller' section. A yellow oval with a red border contains the text 'Chọn ARM Cortex™-M0 NuMicro™ Family' with a red arrow pointing to the highlighted link.</p>
<p>Bước 3</p>	 <p>The screenshot shows the 'Development Resources' section of the Nuvoton website. A red dashed box highlights the 'Device Driver and Software Library' link. A yellow oval with a red border contains the text 'Chọn Device Driver and Software Library' with a red arrow pointing to the highlighted link.</p>

Bước 4

Programmer Software Tools Package

File name	Description	Version	Date
ICP Programming Tool V1.23.6103.zip Revision History	NuMicro ICP tool & user manual	V1.23.6103	10-28-2013
ISP Programming Tool V1.42.zip Revision History	NuMicro ISP tool & user manual	V1.42	01-20-2012
NuGang Programmer V6.19.zip Revision History	NuGang Programmer software & user manual	V6.19	11-01-2012

Phân mềm nạp chương trình

Nu-Link Driver

File name	Description	Version	Date
Nu-Link Driver for Keil RVMDK V1.23.6103.zip Revision History	This driver is to support Keil RVMDK development tool for NuMicro Family Devices.		10-28-2013
Nu-Link Driver for IAR EWARM V1.23.6103.zip Revision History	This driver is to support IAR EWARM development tool for NuMicro Family Devices.		10-28-2013

Driver hỗ trợ lập trình chip ARM Cortex M0 Nuvoton trên KeilC & IAR

Contact us: NuMicro@nuvoton.com

Bước 5







Nano100B Series CMSIS BSP_EN_V1.00.007.zip Revision History	Nano100B series software package based on CMSIS version 3.1. It supports both development and code for Nano100B and Learning Board are included. For detailed, please download it and unzip it.		11-2013
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Thư viện lập trình dòng Nano100 Series

Bước 6

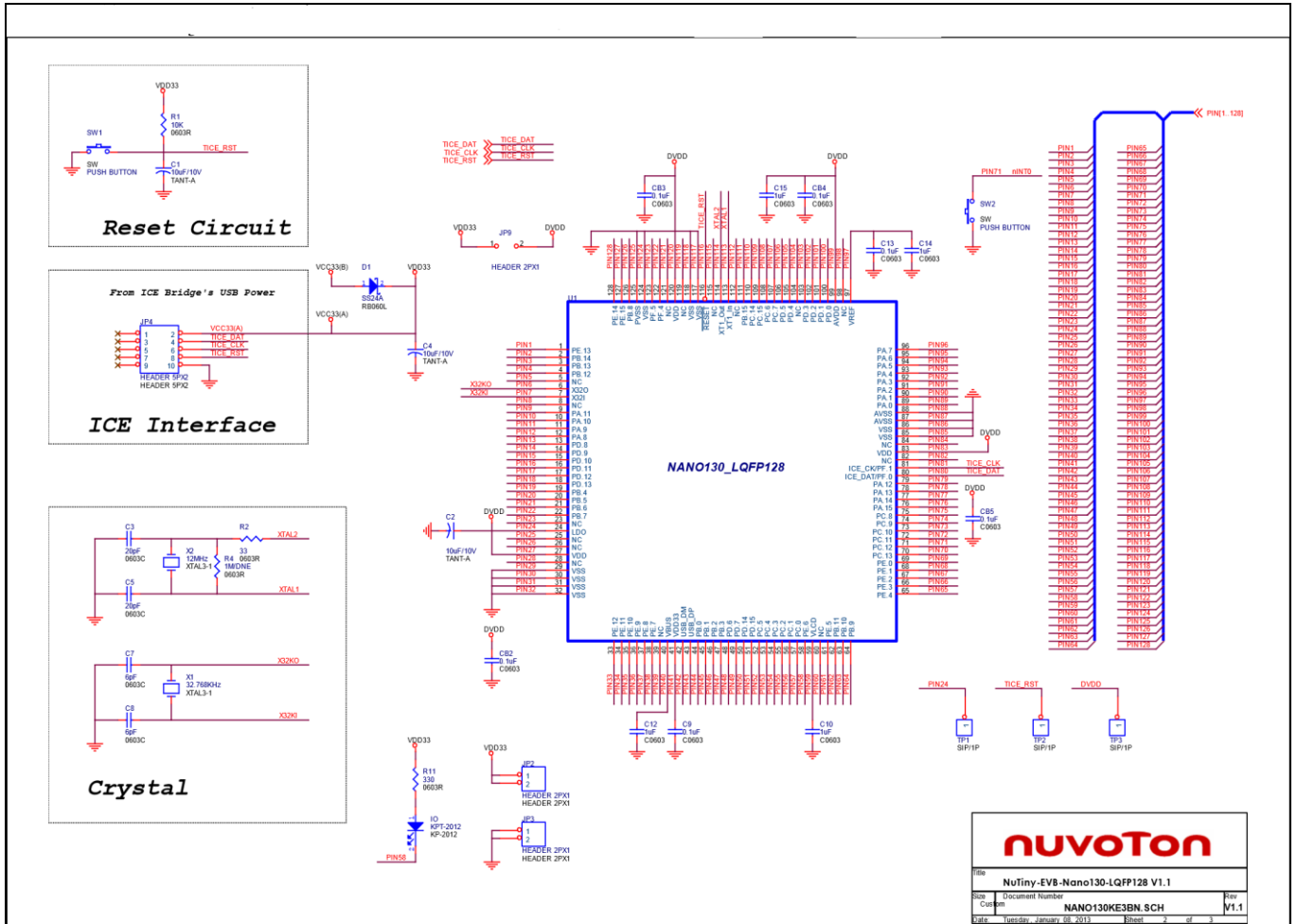
Products	Development Resources	Technical Support	News and Events
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Chọn NuMicro Development Tools

Bước 7	NuTiny-SDK-Nano120			Mạch nguyên lý Board NuTiny-SDK-Nano130
	NuTiny-SDK-Nano130			
	NuTiny-SDK-AU9110			

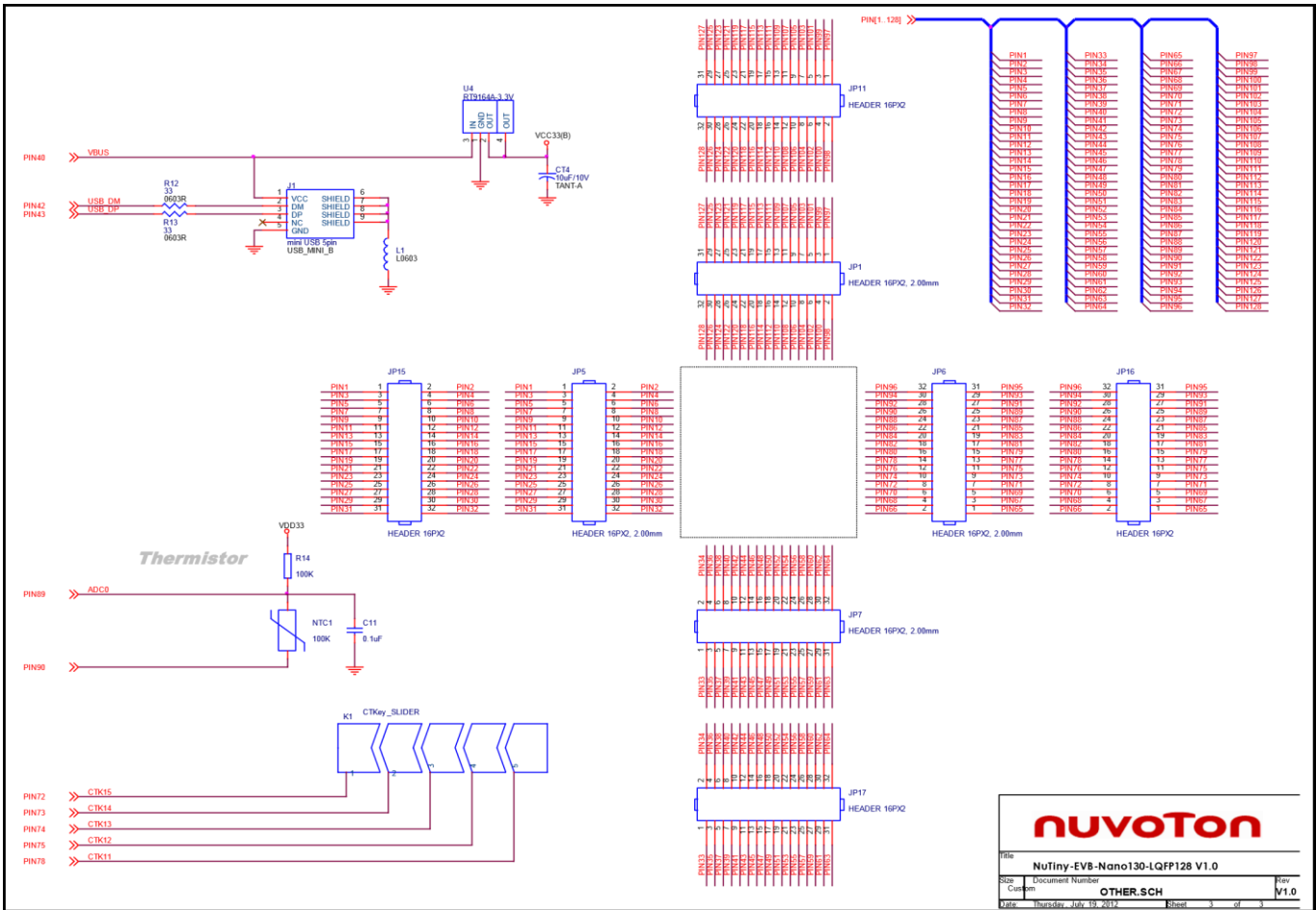
4. Sơ đồ mạch nguyên lý

4.1 Mạch nguyên lý



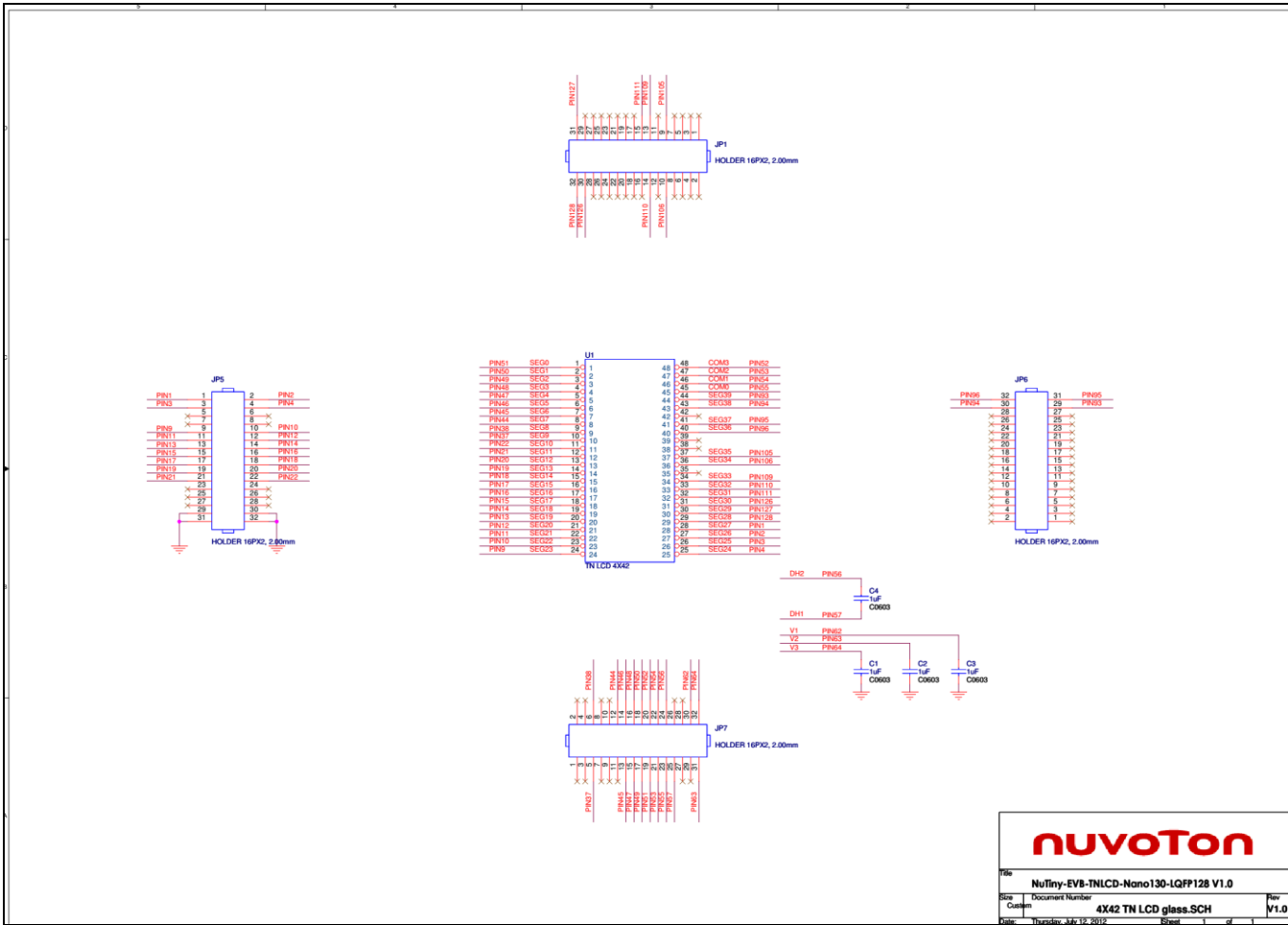
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Doc	Document Number	NANO130KE3BN SCH
Cur	Date	Tuesday, January 08, 2013 11:11
	Sheet	2 of 3



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File	NuTiny-EVB-Nano130-LQFP128 V1.0	
Size	Document Number	Rev
Custom	OTHER_SCH	V1.0
Date	Thursday, July 19, 2012	Sheet 1 of 3



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150 NuTiny-EVB-TNLCD-Nano130-IQFP128 V1.0

Doc | Document Number | Rev
 Conn | 4X42 TN LCD glass.SCH | V1.0

Date: Thursday, July 12, 2012 | Sheet: 1 of 1

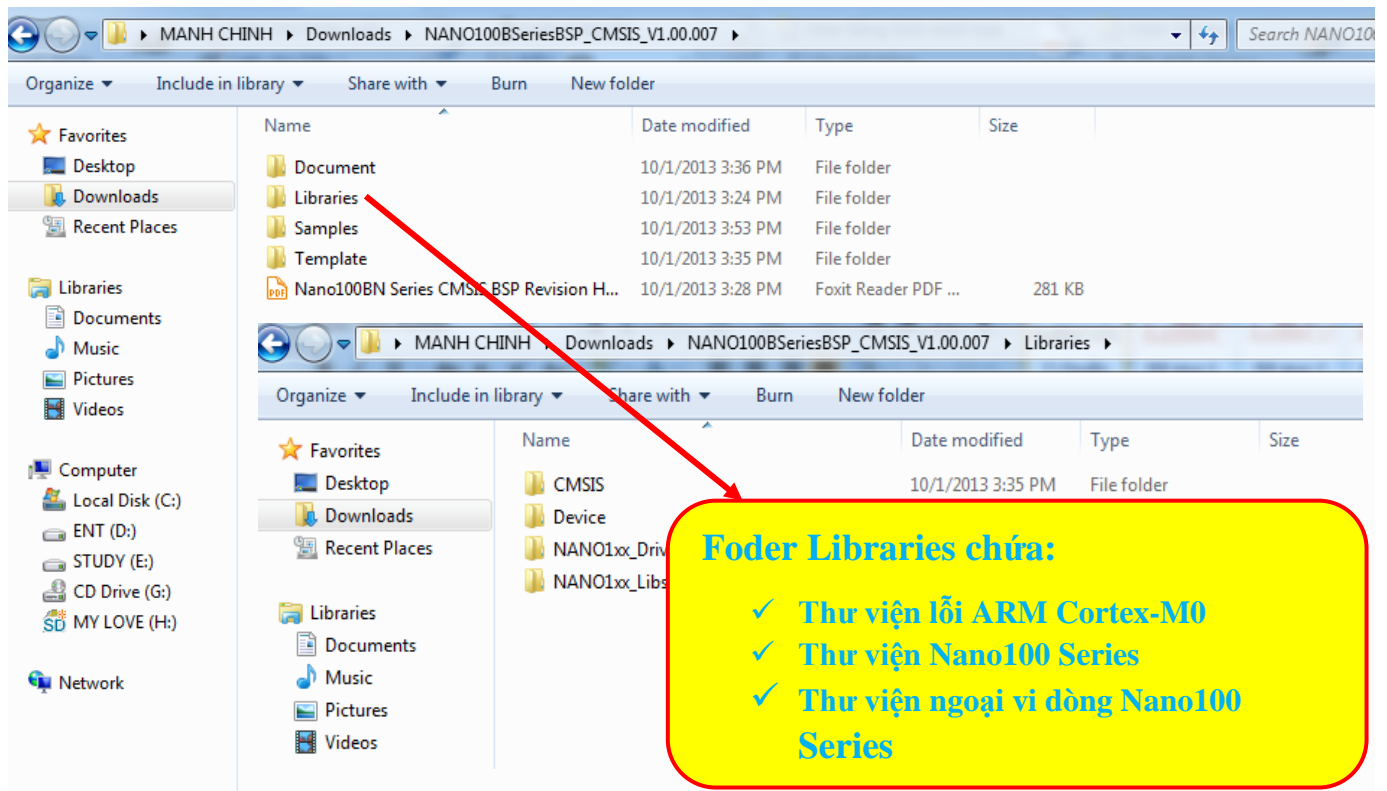
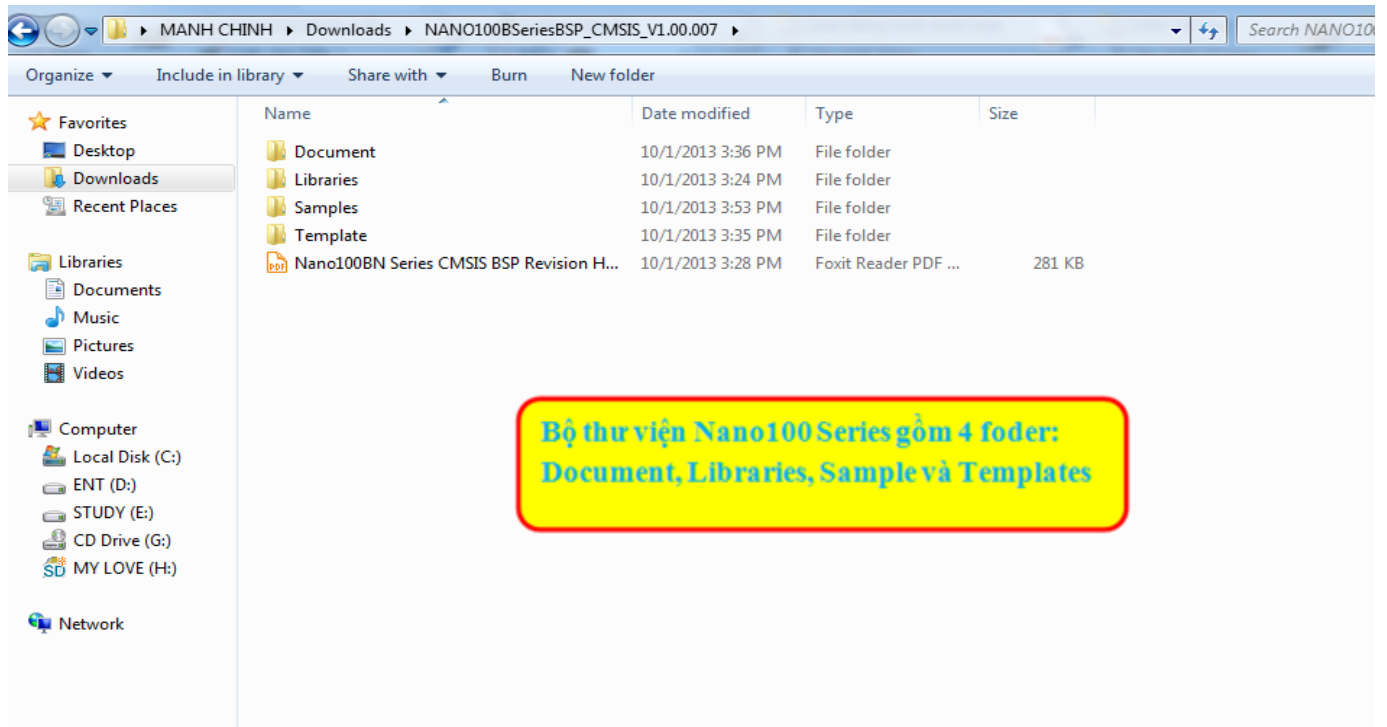
5. Bảng chân kết nối

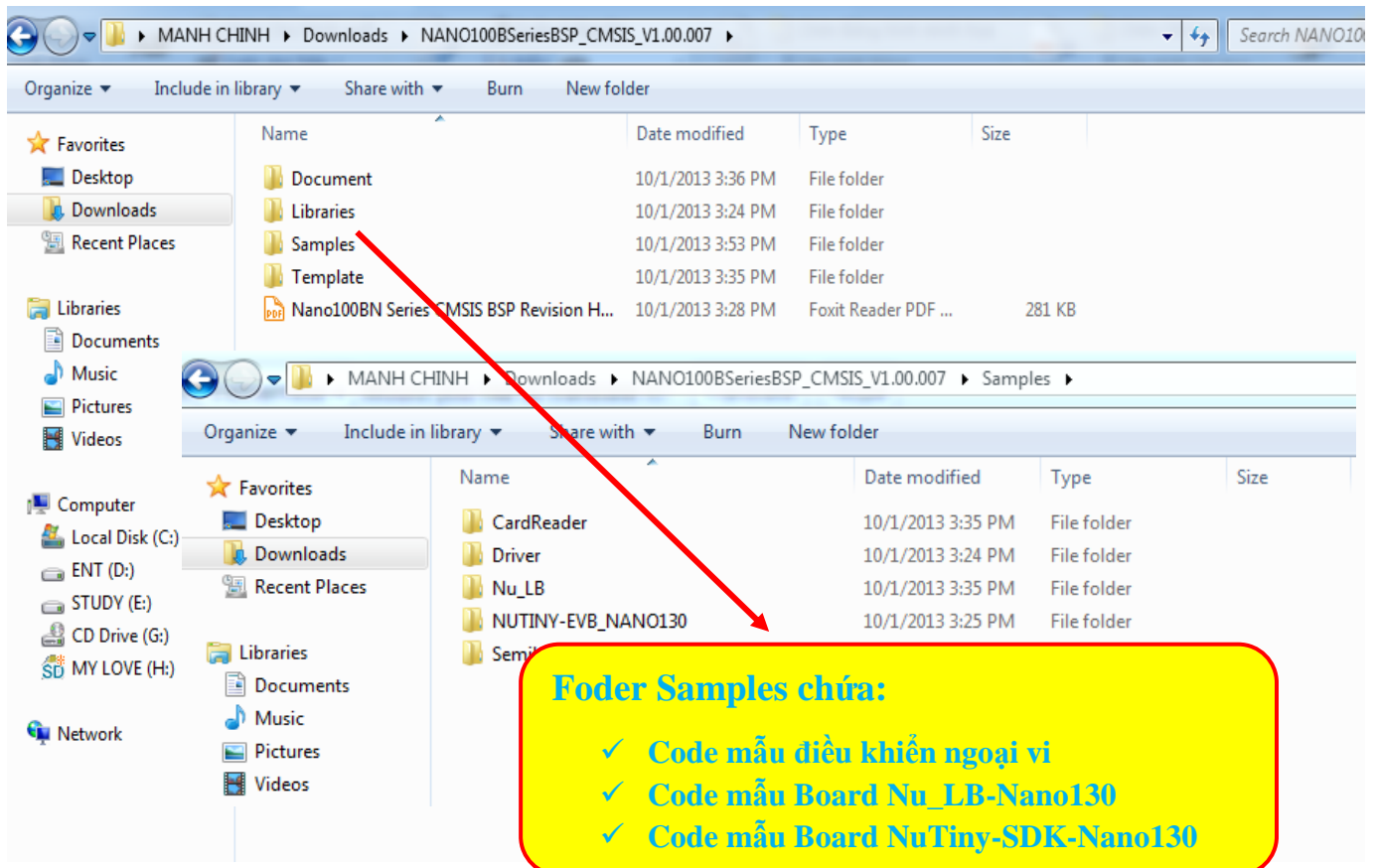
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01	PE13/LCD_SEG27	33	PE12/UART1_CTSn	65	PE4/SPI0_MOSI0	97	VREF
02	PB14/INT0/SC2_CD/ SPI2_SS1/LCD_SEG12/ LCD_SEG26	34	PE11/UART1_RTSn	66	PE3/SPI0_MISO0	98	NC
03	PB13/EBI_AD1/ LCD_SEG11/LCD_SEG25	35	PE10/UART1_TXD	67	PE2/SPI0_CLK	99	AVDD
04	PB12/EBI_AD0/ CLKO/LCD_SEG10/ LCD_SEG24	36	PE9/UART1_RXD	68	PE1/PWM1_CH3/SPI0_SS0	100	PD0/UART1_RXD/ SPI2_SS0/SC1_CLK/ CTK0/AD8
05	NC	37	PE8/LCD_SEG9	69	PE0/PWM1_CH2/ I2S_MCLK	101	PD1/UART1_TXD/ SPI2_CLK/SC1_DAT/ AD9/CTK1
06	X320	38	PE7/LCD_SEG8	70	PC13/SPI_MOSI1/ PWM1_CH1/SNOOPER/ INT0/I2C0_SCL	102	PD2/UART1_RTSn/ I2S_LRCLK/SPI2_MISO0/ SC1_PWR/AD10/CTK2
07	X321	39	NC	71	PC12/SPI1_MISO1/ PWM1_CH0/ INT0/I2C0_SDA	103	PD3/UART1_CTSn/ I2S_BCLK/SPI2_MOSI0/ SC1_RST/AD11/CTK3
08	NC	40	NC	72	PC11/SPI1_MOSI0/ UART1_TXD/ CTK15/LCD_SEG31	104	NC
09	PA11/I2C1_SCL/EBI_nRD/ SC0_RST/SPI2_MOSI0/ LCD_SEG9/LCD_SEG23	41	NC	73	PC10/SPI1_MISO0/ UART1_RXD/ CTK14/LCD_SEG30	105	PD4/I2S_DI/ SPI2_MOSI1/SC1_CD/ CTK4/LCD_SEG35
10	PA10/I2C1_SDA/EBI_nWR/ SC0_PWR/SPI2_MISO0/ LCD_SEG8/LCD_SEG22	42	NC	74	PC9/SPI1_CLK/I2C1_SCL/ CTK13/LCD_SEG29	106	PD5/I2S_DO/ SPI2_MOSI1/CTK5/ LCD_SEG34
11	PA9/I2C0_SCL/ SC0_DAT/SPI2_CLK/ LCD_SEG7/LCD_SEG21	43	NC	75	PC8/SPI1_SS0/ EBI_MCLK/I2C1_SDA/ CTK12/LCD_SEG28	107	PC7/DA1_OUT/ EBI_AD5/TC1/ PWM0_CH1/LCD_SEG17
12	PA8/I2C0_SDA/ SC0_CLK/SPI2_SS0/ LCD_SEG6/LCD_SEG20	44	PB0/UART0_RXD/ SPI1_MOSI0/ LCD_SEG1/LCD_SEG7	76	PA15/PWM0_CH3/ I2S_MCLK/TC3/SC0_PWR/ UART0_TXD/LCD_SEG27	108	PC6/DA0_OUT/ EBI_AD4/TC0/ SC1_CD/PWM0_CH0
13	PD8/LCD_SEG19	45	PB1/UART0_TXD/ SPI1_MISO0/ LCD_SEG0/LCD_SEG6	77	PA14/PWM0_CH2/ EBI_AD15/TC2/ UART0_RXD/LCD_SEG26	109	PC15/EBI_AD3/ TC0/PWM1_CH2/ LCD_SEG16/LCD_SEG33
14	PD9/LCD_SEG18	46	PB2/UART0_RTSn/ EBI_nWRL/SPI1_CLK/ LCD_COM3/LCD_SEG 5	78	PA13/PWM0_CH1/ EBI_AD14/TC1/I2C0_SCL/ CTK11/LCD_SEG25	110	PC14/EBI_AD2/ PWM1_CH3/ LCD_SEG15/LCD_SEG32
15	PD10/LCD_SEG17	47	PB3/UART0_CTSn/ EBI_nWRH/SPI1_SS0/ LCD_COM2/LCD_SEG 4	79	PA12/PWM0_CH0/ EBI_AD13/TC0/I2C0_SDA/ CTK10/LCD_SEG24	111	PB15/INT1/ SNOOPER/ LCD_SEG14/LCD_SEG31
16	PD11/LCD_SEG16	48	PD6/LCD_SEG3	80	PF0/ICE_DAT/INT0	112	NC
17	PD12/LCD_SEG15	49	PD7/LCD_SEG2	81	PF1/ICE_CLK/ CLKO/INT1	113	XT1_IN
18	PD13/LCD_SEG14	50	PD14/LCD_SEG1	82	NC	114	XT1_OUT
19	PB4/UART1_RXD/ SC0_CD/SPI2_SS0/ LCD_SEG5/LCD_SEG13	51	PD15/LCD_SEG0	83	VDD	115	NC
20	PB5/UART1_TXD/	52	PC5/SPI0_MOSI1/	84	NC	116	nRESET

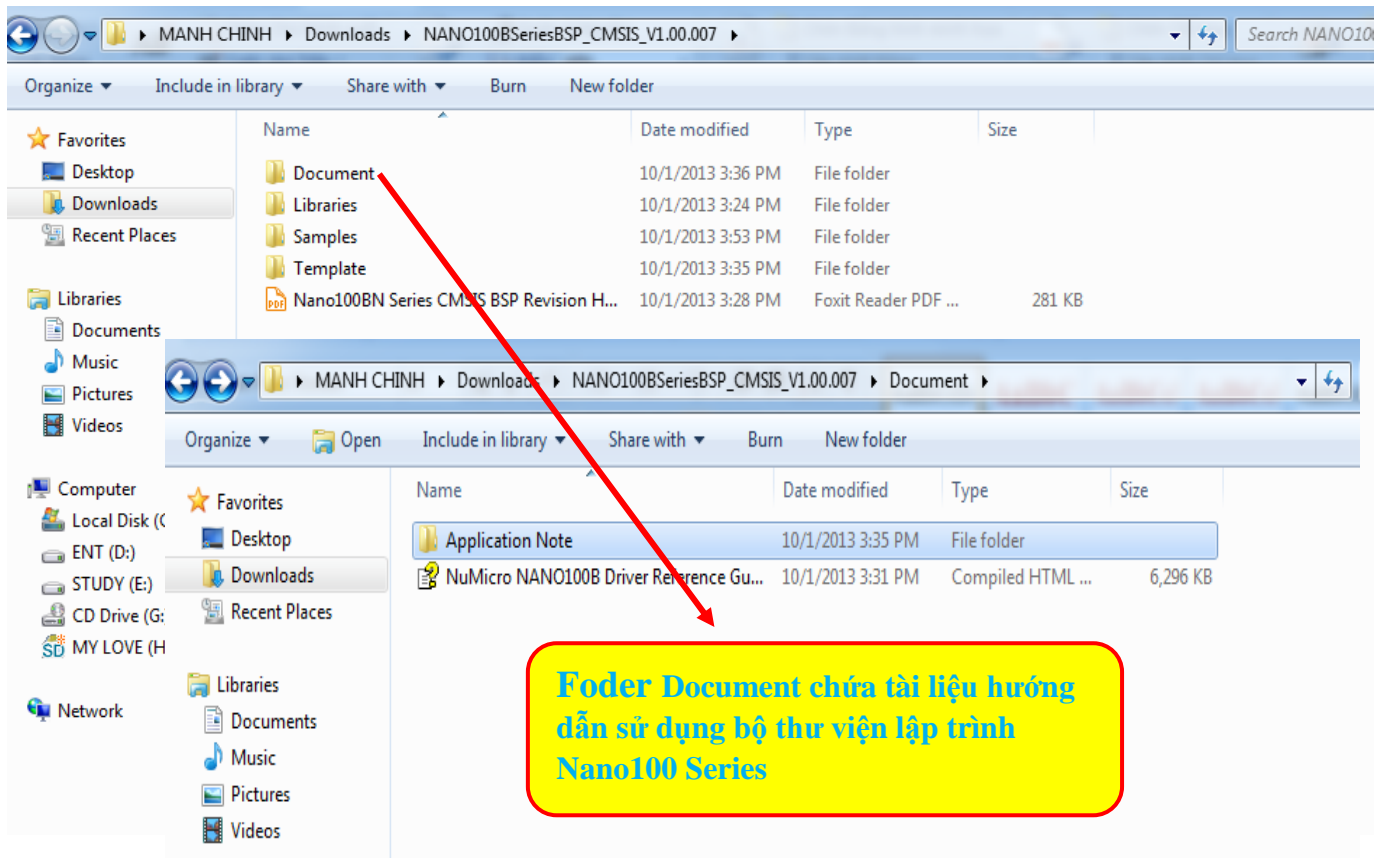
	SC0_RST/SPI2_CLK/ LCD_SEG4/LCD_SEG12		LCD_COM3				
21	PB6/UART1_RTSn/ EBI_ALE/SPI2_MISO0/ LCD_SEG3/LCD_SEG11	53	PC4/SPI0_MISO1/ LCD_COM2	85	VSS	117	VSS
22	PB7/UART1_CTSn/ EBI_nCS/SPI2_MOSI0/ LCD_SEG2/LCD_SEG10	54	PC3/SPI0_MOSI0/ I2S_DO/SC1_RST/ LCD_COM1	86	VSS	118	VSS
23	NC	55	PC2/SPI0_MISO0/ I2S_DI/SC1_PWR/ LCD_COM0	87	AVSS	119	NC
24	LDO_CAP	56	PC1/SPI0_CLK/ I2S_BCLK_SC1_DAT/ LCD_DH2	88	AVSS	120	VDD
25	NC	57	PC0/SPI0_SS0/ I2S_LRCLK/ SC1_CLK/LCD_DH1	89	PA0/AD0/ SC2_CD/CTK8	121	NC
26	NC	58	PE6	90	PA1/AD1/EBI_AD12/CTK9	122	PF4/I2C0_SDA/CTK6
27	VDD	59	LCD_VLCD	91	PA2/AD2/EBI_AD11/ UART1_RXD/LCD_SEG23	123	PF5/I2C0_SCL/CTK7
28	NC	60	LCD_VLCD	92	PA3/AD3/EBI_AD10/ UART1_TXD/LCD_SEG22	124	VSS
29	VSS	61	PE5	93	PA4/AD4/EBI_AD9/ SC2_PWR/I2C0_SDA/ LCD_SEG21/LCD_SEG39	125	PVSS
30	VSS	62	PB11/PWM1_CH0/ TM3/SC2_DAT/ SPI0_MISO0/LCD_V1	94	PA5/AD5/EBI_AD8/ SC2_RST_I2C0_SCL/ LCD_SEG20/LCD_SEG38	126	PB8/STADC/TM0/ INT0/SC2_PWR/ LCD_SEG13/LCD_SEG30
31	VSS	63	PB10/SPI0_SS1/ TM2/SC2_CLK/ SPI0_MOSI0/LCD_V2	95	PA6/AD6/EBI_AD7/ TC3/SC2_CLK/PWM0_CH3/ LCD_SEG19/LCD_SEG37	127	PE15/LCD_SEG29
32	VSS	64	PB9/SPI1_SS1/ TM1/SC2_RST/ INT0/LCD_V3	96	PA7/AD7/EBI_AD6/ TC2/SC2_DAT/ PWM0_CH2/CTK_CAP/ LCD_SEG18/LCD_SEG36	128	PE14/LCD_SEG28

6. Tài liệu hướng dẫn và bộ thư viện

6.1 Bộ thư viện dòng Nano100 Series

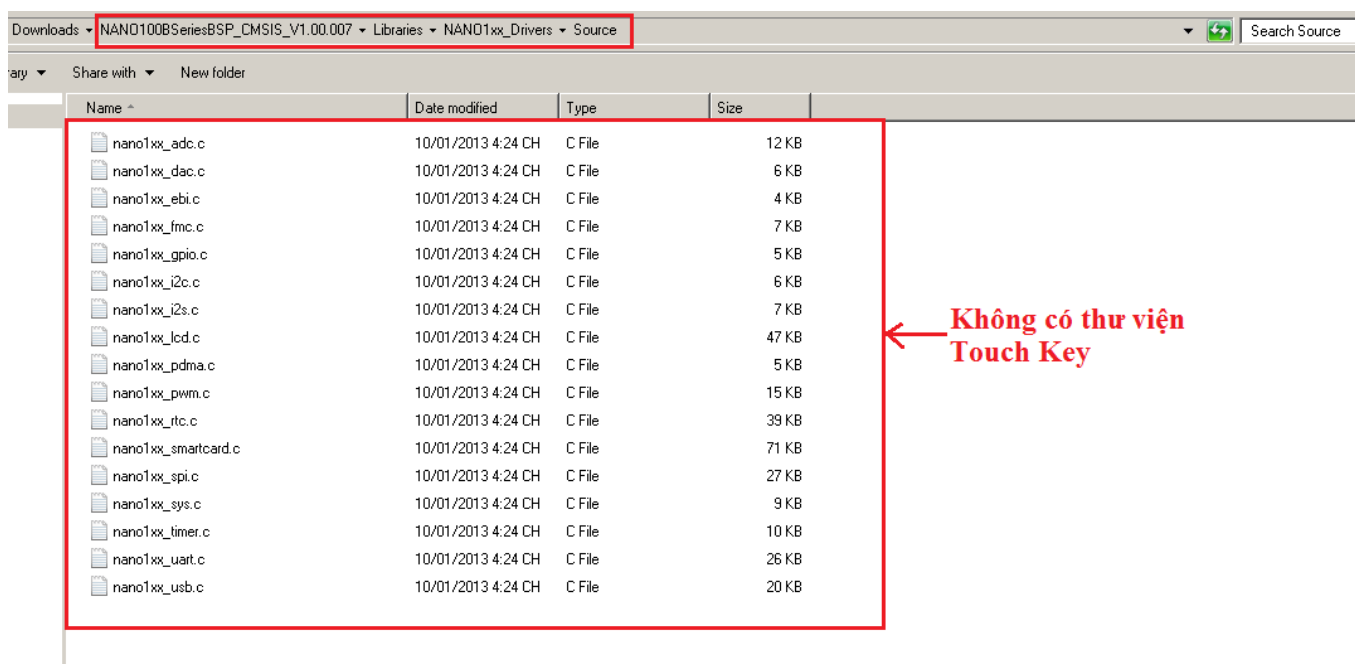
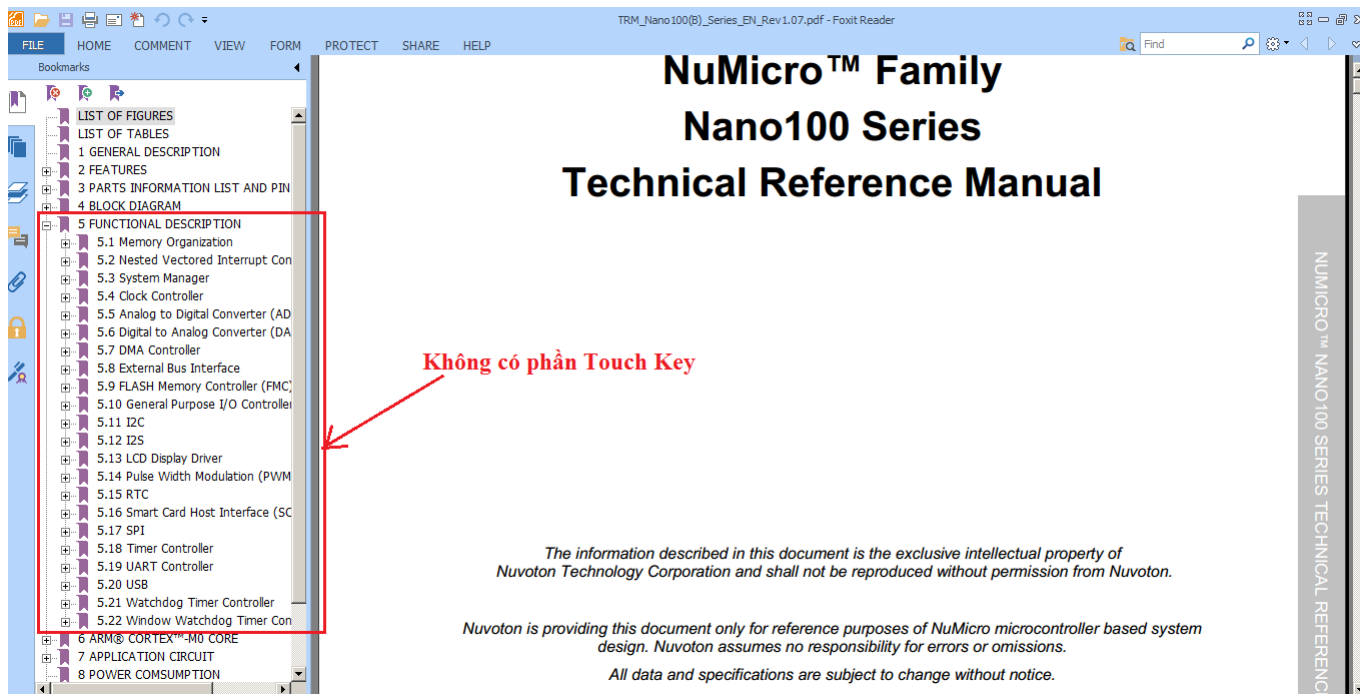






6.2 Chỉnh sửa bộ thư viện Nano100 Series

Bộ thư viện thư viện lập trình dòng Nano (NANO100BSeriesBSP_CMSIS_V1.00.007) và tài liệu Technical Reference Manual tải trên trang chủ phía trên chưa cập nhật thư viện hỗ trợ giao tiếp cảm ứng Touch Key

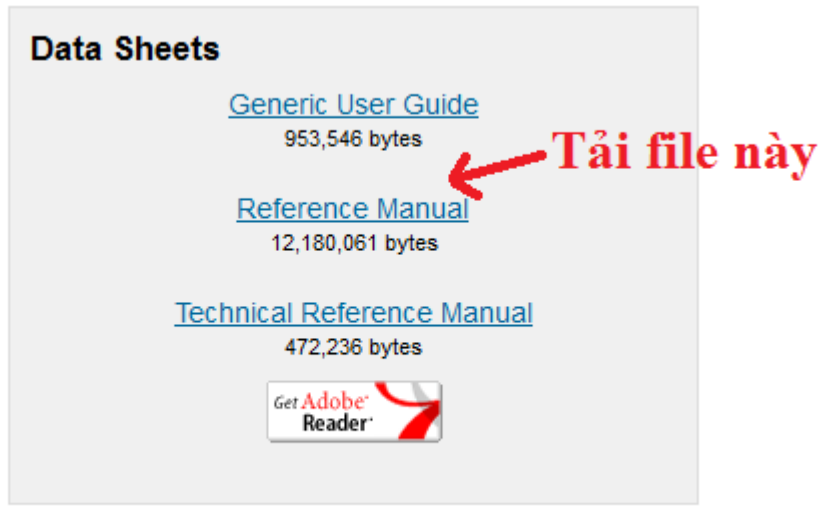


Để bổ sung thêm tính năng Touch Key làm theo các bước sau:

Bước 1: Tải tài liệu bổ sung

_ Tải tài liệu Technical Reference(có Touch Key) theo đường dẫn sau:

<http://www.keil.com/dd/chip/7148.htm>

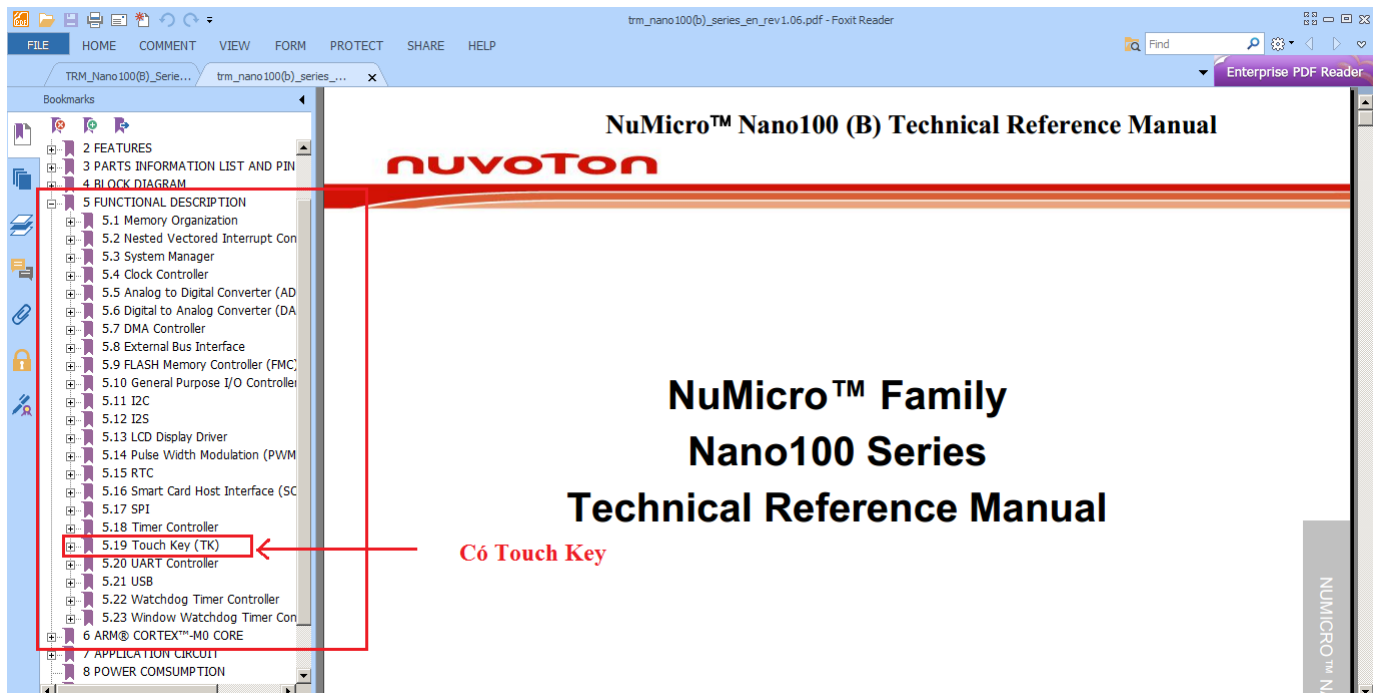


Data Sheets

- [Generic User Guide](#)
953,546 bytes
- [Reference Manual](#)
12,180,061 bytes
- [Technical Reference Manual](#)
472,236 bytes

Get Adobe Reader

Tải file này



NuMicro™ Nano100 (B) Technical Reference Manual

nuvoton

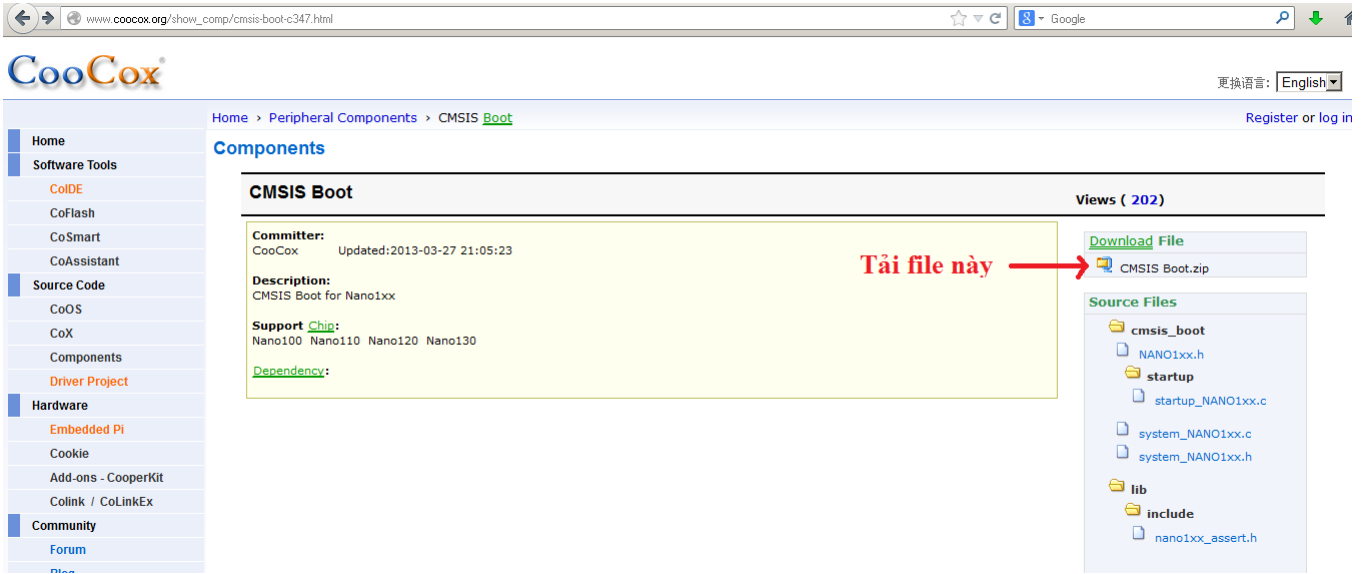
**NuMicro™ Family
Nano100 Series
Technical Reference Manual**

Có Touch Key

- 2 FEATURES
- 3 PARTS INFORMATION LIST AND PIN
- 4 BLOCK DIAGRAM
- 5 FUNCTIONAL DESCRIPTION
 - 5.1 Memory Organization
 - 5.2 Nested Vectored Interrupt Con
 - 5.3 System Manager
 - 5.4 Clock Controller
 - 5.5 Analog to Digital Converter (AD
 - 5.6 Digital to Analog Converter (DA
 - 5.7 DMA Controller
 - 5.8 External Bus Interface
 - 5.9 FLASH Memory Controller (FMC)
 - 5.10 General Purpose I/O Controller
 - 5.11 I2C
 - 5.12 I2S
 - 5.13 LCD Display Driver
 - 5.14 Pulse Width Modulation (PWM
 - 5.15 RTC
 - 5.16 Smart Card Host Interface (SC
 - 5.17 SPI
 - 5.18 Timer Controller
 - 5.19 Touch Key (TK)**
 - 5.20 UART Controller
 - 5.21 USB
 - 5.22 Watchdog Timer Controller
 - 5.23 Window Watchdog Timer Con
- 6 ARM® CORTEX™-M0 CORE
- 7 APPLICATION CIRCUIT
- 8 POWER CONSUMPTION

_ Tải thư viện Nano130 Series theo đường dẫn

http://www.cocox.org/show_comp/cmsis-boot-c347.html



Home > Peripheral Components > CMSIS **Boot** Register or log in

Components

CMSIS Boot

Views (202)

Committer:
CooCox Updated:2013-03-27 21:05:23

Description:
CMSIS Boot for Nano1xx

Support Chip:
Nano100 Nano110 Nano120 Nano130

Dependency:

Download File
CMSIS Boot.zip

Source Files

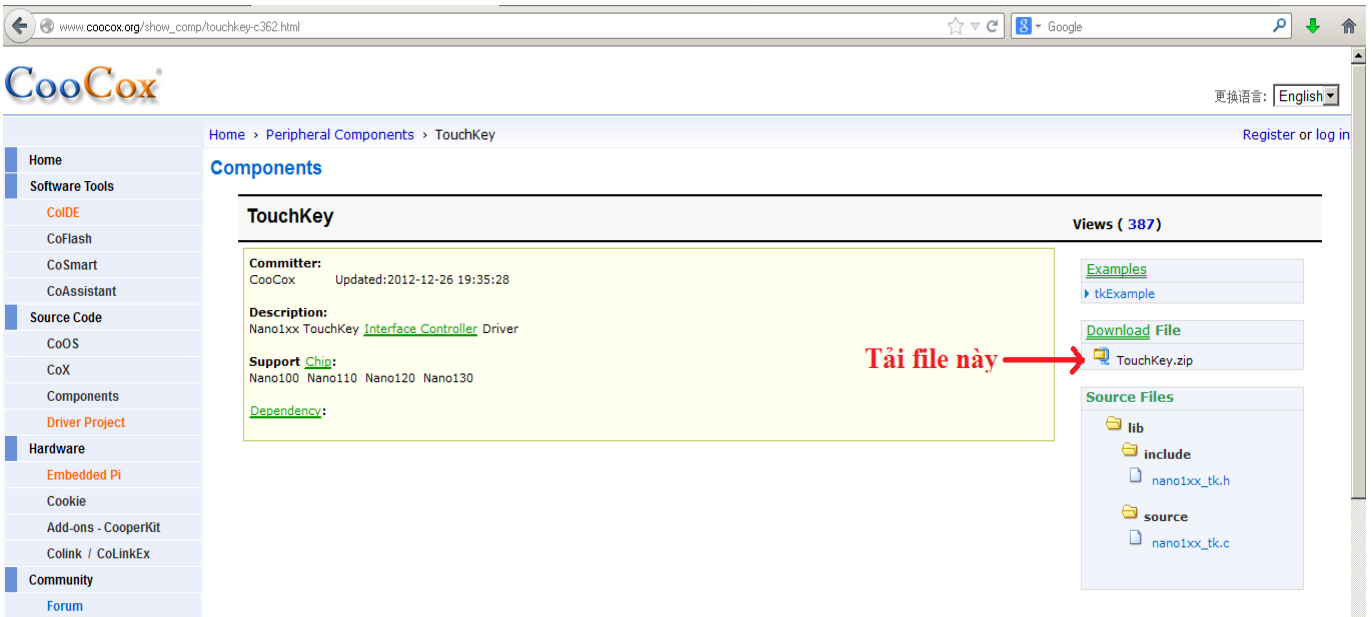
- cmsis_boot
 - NANO1xx.h
- startup
 - startup_NANO1xx.c
- system_NANO1xx.c
- system_NANO1xx.h

lib

- include
 - nano1xx_assert.h

_ Tải thư viện Touch Key theo đường dẫn

http://www.cocox.org/show_comp/touchkey-c362.html



Home > Peripheral Components > TouchKey Register or log in

Components

TouchKey

Views (387)

Committer:
CooCox Updated:2012-12-26 19:35:28

Description:
Nano1xx TouchKey [Interface Controller](#) Driver

Support Chip:
Nano100 Nano110 Nano120 Nano130

Dependency:

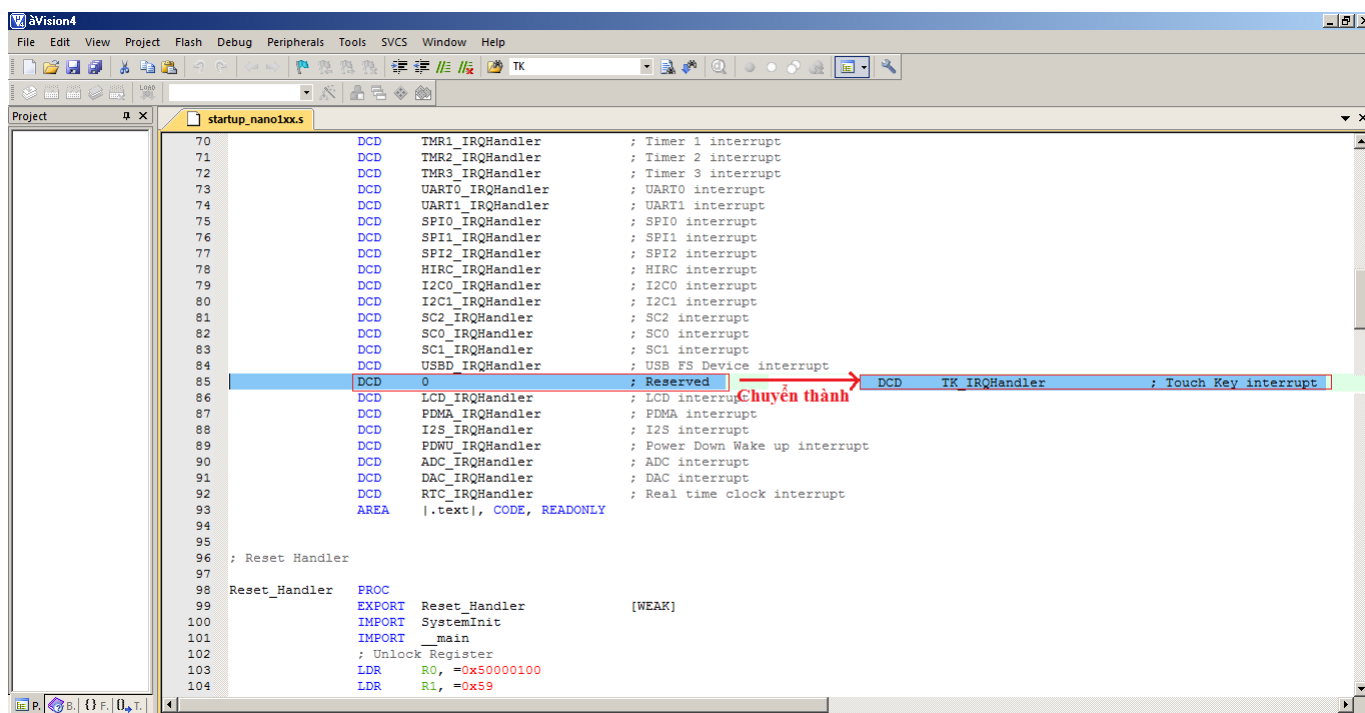
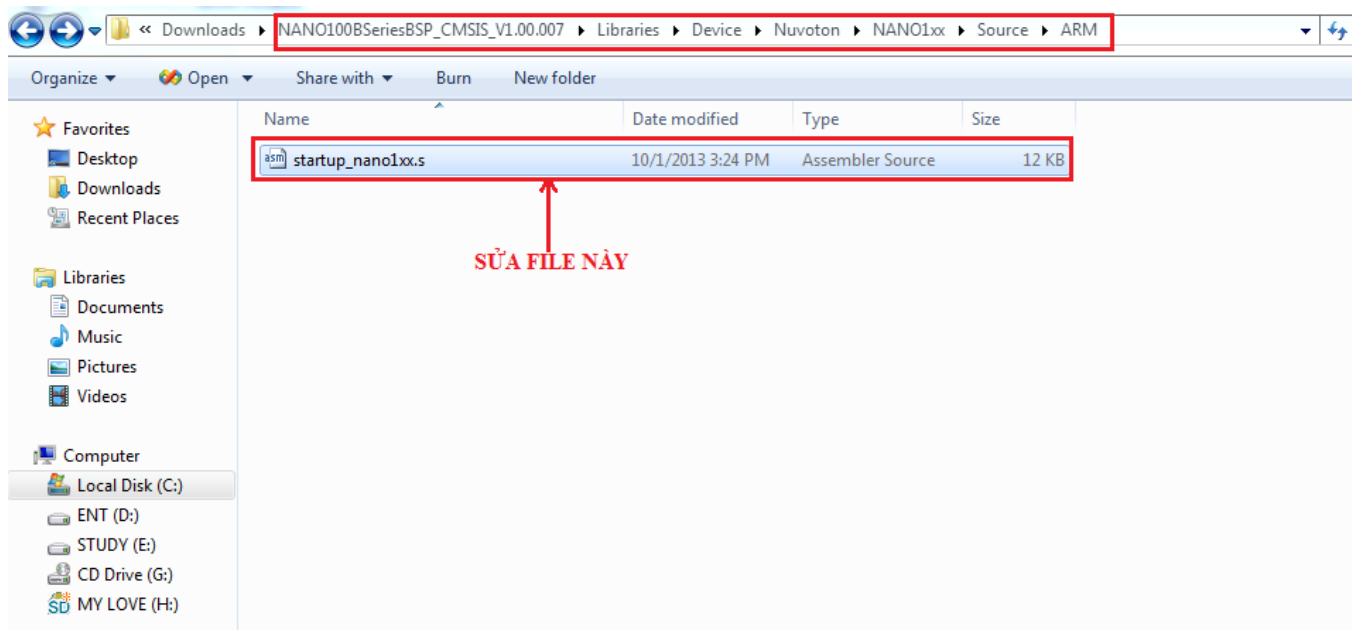
Download File
TouchKey.zip

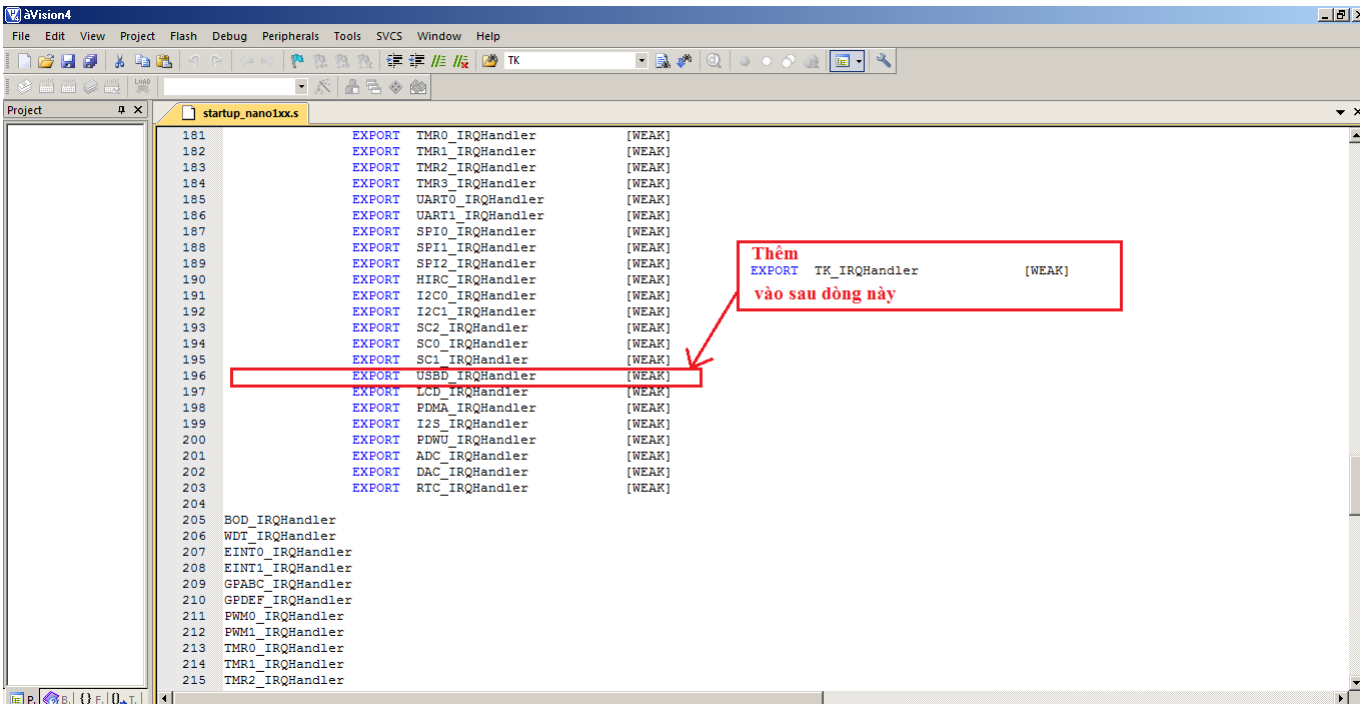
Source Files

- lib
 - include
 - nano1xxTk.h
- source
 - nano1xxTk.c

Bước 2: Sửa file `startup_nano1xx.s` trong thư viện

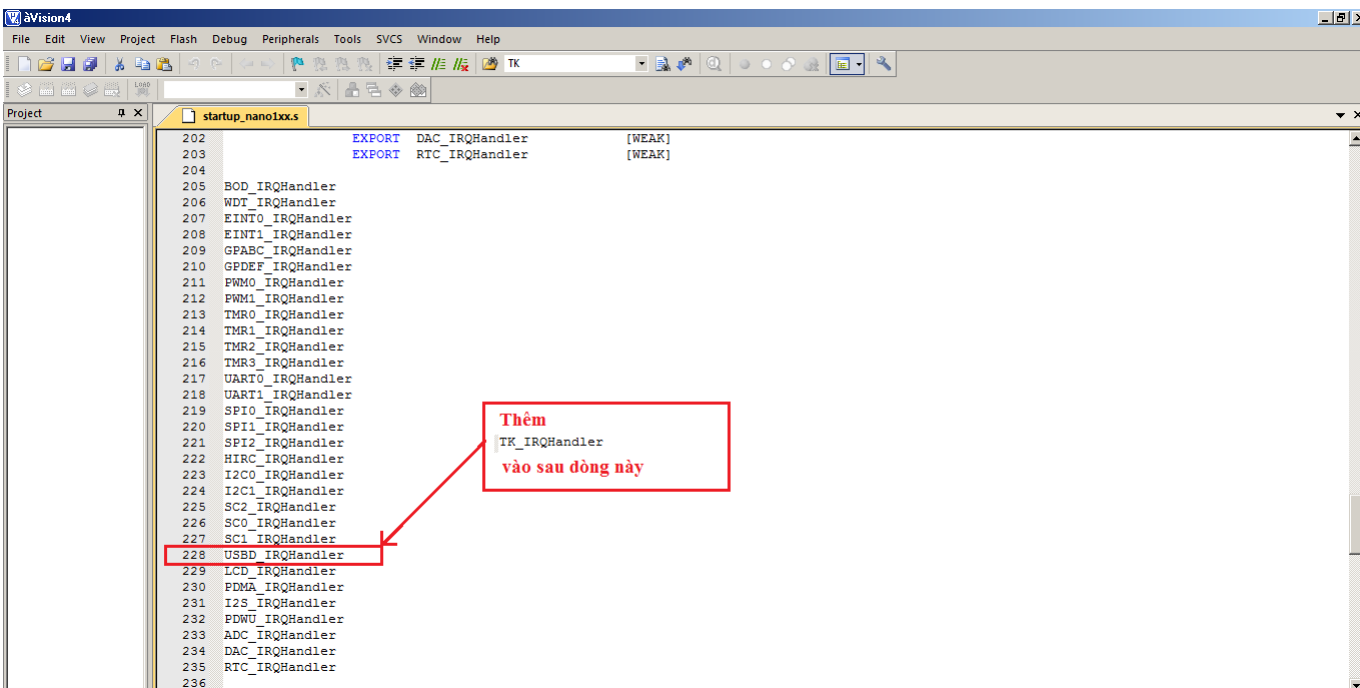
Mở file `startup_nano1xx.s` như hình dưới:





Thêm
EXPORT TK_IRQHandler [WEAK]
vào sau dòng này

```
181 EXPORT TMR0_IRQHandler [WEAK]
182 EXPORT TMR1_IRQHandler [WEAK]
183 EXPORT TMR2_IRQHandler [WEAK]
184 EXPORT TMR3_IRQHandler [WEAK]
185 EXPORT UART0_IRQHandler [WEAK]
186 EXPORT UART1_IRQHandler [WEAK]
187 EXPORT SPI0_IRQHandler [WEAK]
188 EXPORT SPI1_IRQHandler [WEAK]
189 EXPORT SPI2_IRQHandler [WEAK]
190 EXPORT HIRC_IRQHandler [WEAK]
191 EXPORT I2C0_IRQHandler [WEAK]
192 EXPORT I2C1_IRQHandler [WEAK]
193 EXPORT SC2_IRQHandler [WEAK]
194 EXPORT SC0_IRQHandler [WEAK]
195 EXPORT SC1_IRQHandler [WEAK]
196 EXPORT USBD_IRQHandler [WEAK]
197 EXPORT LCD_IRQHandler [WEAK]
198 EXPORT PDMA_IRQHandler [WEAK]
199 EXPORT I2S_IRQHandler [WEAK]
200 EXPORT PDWU_IRQHandler [WEAK]
201 EXPORT ADC_IRQHandler [WEAK]
202 EXPORT DAC_IRQHandler [WEAK]
203 EXPORT RTC_IRQHandler [WEAK]
204
205 BOD_IRQHandler
206 WDT_IRQHandler
207 EINT0_IRQHandler
208 EINT1_IRQHandler
209 GPABC_IRQHandler
210 GPDEF_IRQHandler
211 PWM0_IRQHandler
212 PWM1_IRQHandler
213 TMR0_IRQHandler
214 TMR1_IRQHandler
215 TMR2_IRQHandler
```

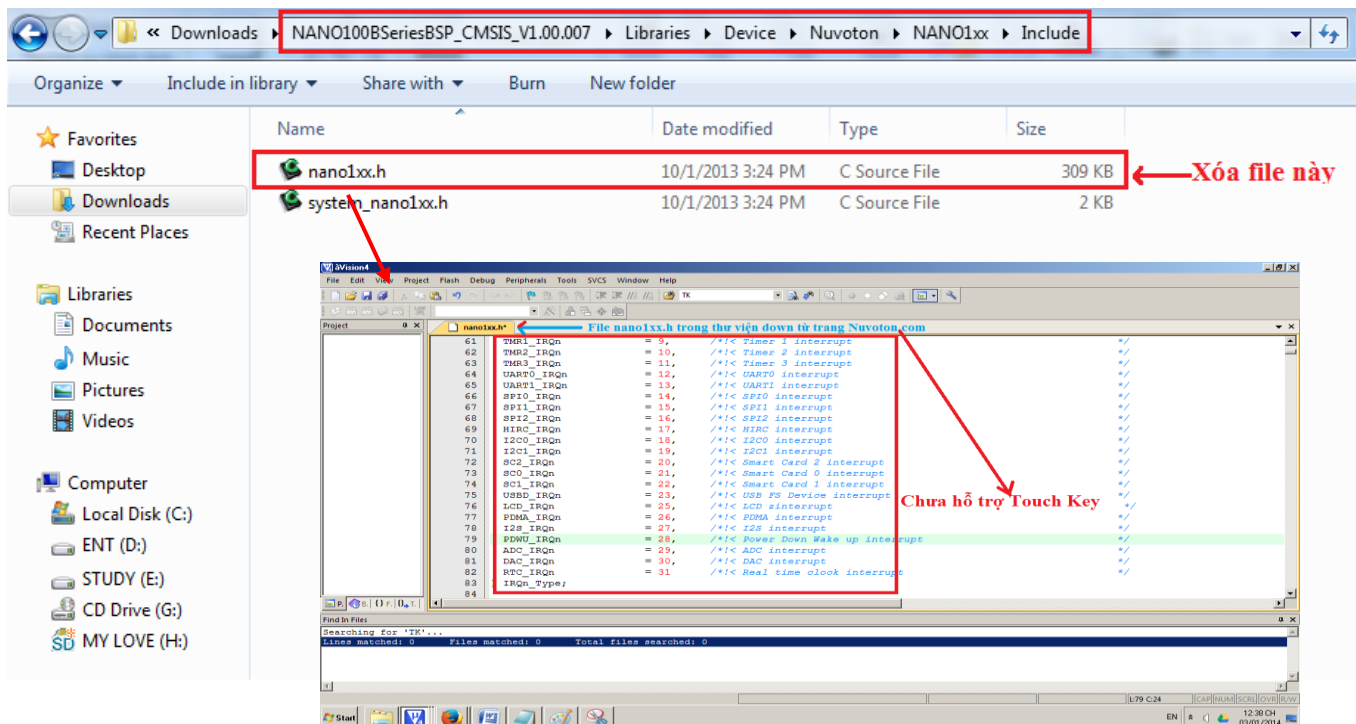


Thêm
TK_IRQHandler
vào sau dòng này

```
202 EXPORT DAC_IRQHandler [WEAK]
203 EXPORT RTC_IRQHandler [WEAK]
204
205 BOD_IRQHandler
206 WDT_IRQHandler
207 EINT0_IRQHandler
208 EINT1_IRQHandler
209 GPABC_IRQHandler
210 GPDEF_IRQHandler
211 PWM0_IRQHandler
212 PWM1_IRQHandler
213 TMR0_IRQHandler
214 TMR1_IRQHandler
215 TMR2_IRQHandler
216 TMR3_IRQHandler
217 UART0_IRQHandler
218 UART1_IRQHandler
219 SPI0_IRQHandler
220 SPI1_IRQHandler
221 SPI2_IRQHandler
222 HIRC_IRQHandler
223 I2C0_IRQHandler
224 I2C1_IRQHandler
225 SC2_IRQHandler
226 SC0_IRQHandler
227 SC1_IRQHandler
228 USBD_IRQHandler
229 LCD_IRQHandler
230 PDMA_IRQHandler
231 I2S_IRQHandler
232 PDWU_IRQHandler
233 ADC_IRQHandler
234 DAC_IRQHandler
235 RTC_IRQHandler
236
```

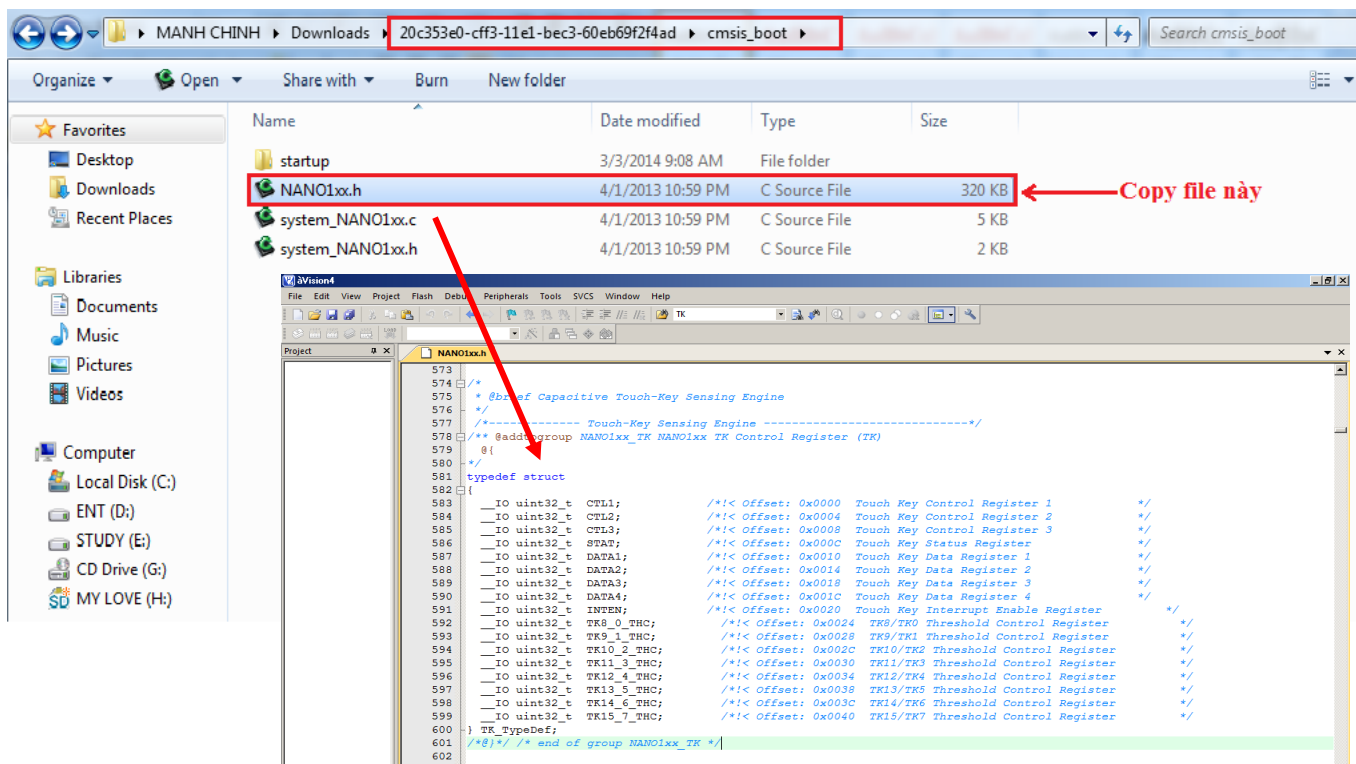
Bước 3: Sửa file *nano1xx.h* trong thư viện

Xóa file *nano1xx.h* theo đường dẫn như hình dưới đây s



The screenshot shows a Windows Explorer window with the path `NANO100BSeriesBSP_CMSIS_V1.00.007 > Libraries > Device > Nuvoton > NANO1xx > Include`. The file `nano1xx.h` (309 KB) is highlighted with a red box and an arrow pointing to it with the text "Xóa file này". Below it, the code editor shows the content of `nano1xx.h`. A red box highlights the line `/*#ifndef TOUCH_KEY_SUPPORT*/` and the following lines, with an arrow pointing to it and the text "Chưa hỗ trợ Touch Key".

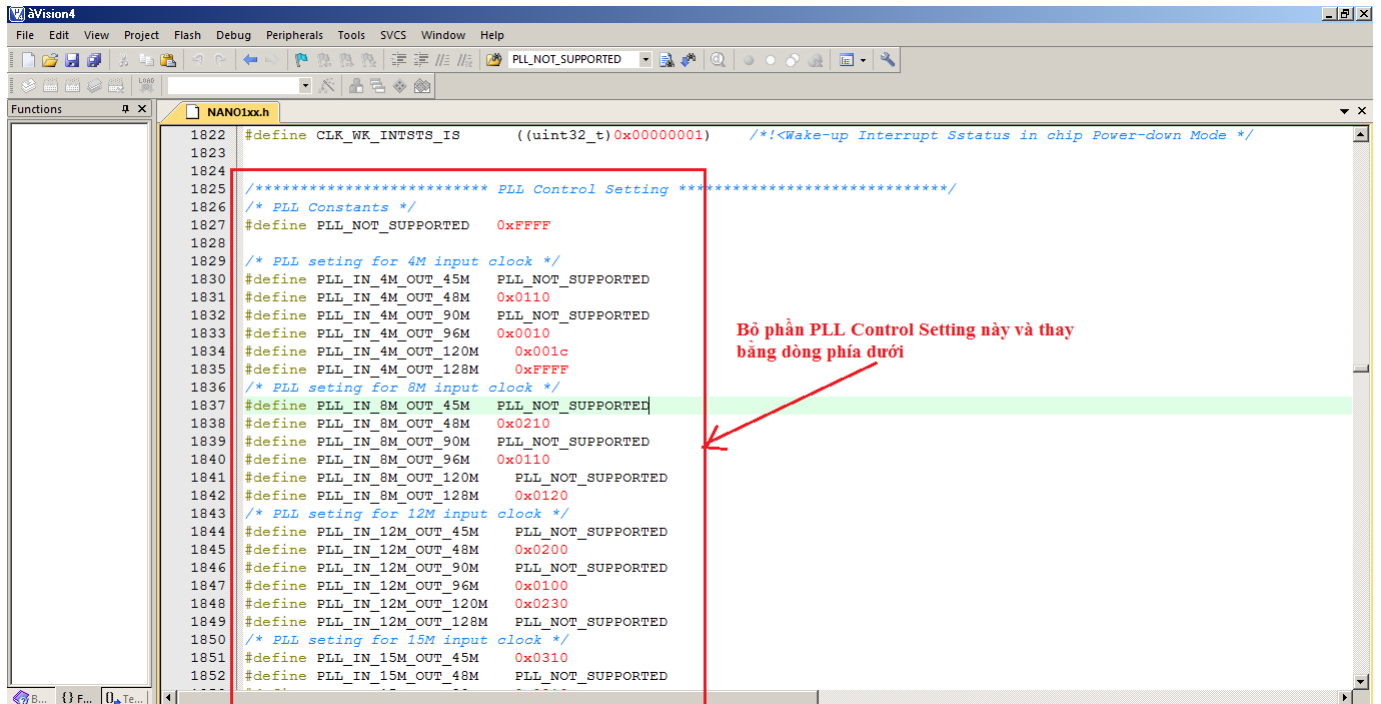
Sau đó copy file *NANO1xx.h* vừa mới tải về vào



The screenshot shows a Windows Explorer window with the path `20c353e0-cff3-11e1-bec3-60eb69f2f4ad > cmsis_boot`. The file `NANO1xx.h` (320 KB) is highlighted with a red box and an arrow pointing to it with the text "Copy file này". Below it, the code editor shows the content of `NANO1xx.h`. A red box highlights the line `/*#ifndef TOUCH_KEY_SUPPORT*/` and the following lines, with an arrow pointing to it and the text "Chưa hỗ trợ Touch Key".

Mở file NANO1xx.h vừa copy lên và chỉnh như sau:

_ Xóa phần PLL Control Setting



```

1822 #define CLK_WK_INTSTS_IS      ((uint32_t)0x00000001) /*!<Wake-up Interrupt Sstatus in chip Power-down Mode */
1823
1824
1825 /****** PLL Control Setting *****/
1826 /* PLL Constants */
1827 #define PLL_NOT_SUPPORTED     0xFFFF
1828
1829 /* PLL setting for 4M input clock */
1830 #define PLL_IN_4M_OUT_45M    PLL_NOT_SUPPORTED
1831 #define PLL_IN_4M_OUT_48M    0x0110
1832 #define PLL_IN_4M_OUT_90M    PLL_NOT_SUPPORTED
1833 #define PLL_IN_4M_OUT_96M    0x0010
1834 #define PLL_IN_4M_OUT_120M   0x001c
1835 #define PLL_IN_4M_OUT_128M   0xFFFF
1836 /* PLL setting for 8M input clock */
1837 #define PLL_IN_8M_OUT_45M    PLL_NOT_SUPPORTED
1838 #define PLL_IN_8M_OUT_48M    0x0210
1839 #define PLL_IN_8M_OUT_90M    PLL_NOT_SUPPORTED
1840 #define PLL_IN_8M_OUT_96M    0x0110
1841 #define PLL_IN_8M_OUT_120M   PLL_NOT_SUPPORTED
1842 #define PLL_IN_8M_OUT_128M   0x0120
1843 /* PLL setting for 12M input clock */
1844 #define PLL_IN_12M_OUT_45M   PLL_NOT_SUPPORTED
1845 #define PLL_IN_12M_OUT_48M   0x0200
1846 #define PLL_IN_12M_OUT_90M   PLL_NOT_SUPPORTED
1847 #define PLL_IN_12M_OUT_96M   0x0100
1848 #define PLL_IN_12M_OUT_120M  0x0230
1849 #define PLL_IN_12M_OUT_128M  PLL_NOT_SUPPORTED
1850 /* PLL setting for 15M input clock */
1851 #define PLL_IN_15M_OUT_45M   0x0310
1852 #define PLL_IN_15M_OUT_48M   PLL_NOT_SUPPORTED

```

Bộ phần PLL Control Setting này và thay bằng dòng phía dưới

Và thay bằng khối sau:

```

/***** PLL Control Setting *****/
/* PLL Constants */
#define PLL_NOT_SUPPORTED     0xFFFF

/* PLL setting for 4M input clock */
#define PLL_IN_4M_OUT_42M     0x010A
#define PLL_IN_4M_OUT_45M     PLL_NOT_SUPPORTED
#define PLL_IN_4M_OUT_48M     0x0110
#define PLL_IN_4M_OUT_84M     0x000A
#define PLL_IN_4M_OUT_90M     PLL_NOT_SUPPORTED
#define PLL_IN_4M_OUT_96M     0x0010
#define PLL_IN_4M_OUT_120M    0x001c
#define PLL_IN_4M_OUT_128M    PLL_NOT_SUPPORTED

```

```
/* PLL setting for 8M input clock */
#define PLL_IN_8M_OUT_42M      0x020A
#define PLL_IN_8M_OUT_45M      PLL_NOT_SUPPORTED
#define PLL_IN_8M_OUT_48M      0x0210
#define PLL_IN_8M_OUT_84M      0x010A
#define PLL_IN_8M_OUT_90M      PLL_NOT_SUPPORTED
#define PLL_IN_8M_OUT_96M      0x0110
#define PLL_IN_8M_OUT_120M     PLL_NOT_SUPPORTED
#define PLL_IN_8M_OUT_128M     0x0120

/* PLL setting for 12M input clock */
#define PLL_IN_12M_OUT_42M     0x0318
#define PLL_IN_12M_OUT_42M     0x0318
#define PLL_IN_12M_OUT_45M     PLL_NOT_SUPPORTED
#define PLL_IN_12M_OUT_48M     0x0320
#define PLL_IN_12M_OUT_84M     0x0218
#define PLL_IN_12M_OUT_90M     PLL_NOT_SUPPORTED
#define PLL_IN_12M_OUT_96M     0x0220
#define PLL_IN_12M_OUT_120M    0x0108
#define PLL_IN_12M_OUT_128M    PLL_NOT_SUPPORTED

/* PLL setting for 16M input clock */
#define PLL_IN_16M_OUT_42M     0x030A
#define PLL_IN_16M_OUT_45M     PLL_NOT_SUPPORTED
#define PLL_IN_16M_OUT_48M     0x0310
#define PLL_IN_16M_OUT_84M     0x020A
#define PLL_IN_16M_OUT_90M     PLL_NOT_SUPPORTED
#define PLL_IN_16M_OUT_96M     0x0210
#define PLL_IN_16M_OUT_120M    PLL_NOT_SUPPORTED
#define PLL_IN_16M_OUT_128M    0x0220

/* PLL setting for 24M input clock */
#define PLL_IN_24M_OUT_42M     PLL_NOT_SUPPORTED
```

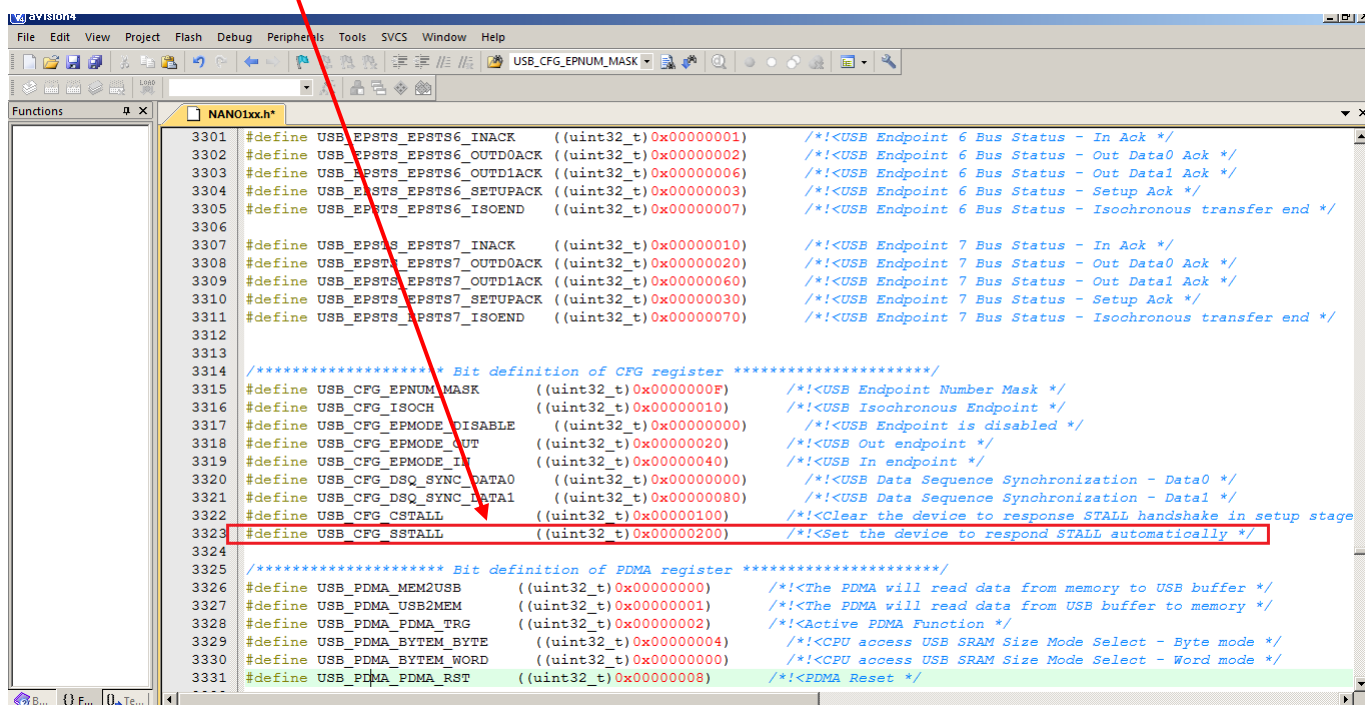


```
#define PLL_IN_24M_OUT_45M      PLL_NOT_SUPPORTED
#define PLL_IN_24M_OUT_48M      0x0300
#define PLL_IN_24M_OUT_84M      PLL_NOT_SUPPORTED
#define PLL_IN_24M_OUT_90M      PLL_NOT_SUPPORTED
#define PLL_IN_24M_OUT_96M      0x0200
#define PLL_IN_24M_OUT_120M     0x0208
#define PLL_IN_24M_OUT_128M     PLL_NOT_SUPPORTED
```

Thêm dòng

```
#define USB_CFG_CLRDRDY          ((uint32_t)0x0008000)    /*!<Clear Ready */
```

Vào sau dòng dòng này





Sửa dòng

```

3534
3535
3536 #define TK_THC_LOW_MASK      ((uint32_t)0x0000FFFF)    /*!<Low Threshold Control Data */
3537 #define TK_THC_HIGH_MASK    ((uint32_t)0xFFFF0000)    /*!<High Threshold Control Data */
3538
3539
3540
3541 /*
3542     ADC
3543 */
3544
3545
3546
3547
3548
3549
3550
3551 #define ADC_CR_ADMD_SINGEL   ((uint32_t)0x00000000)    /*!<A/D Converter Single Mode */
3552 #define ADC_CR_ADMD_S_CYCLE ((uint32_t)0x00000008)    /*!<A/D Converter Single Cycle Mode */
3553 #define ADC_CR_ADMD_CONTINUOUS ((uint32_t)0x0000000C) /*!<A/D Converter Continuous Mode */
3554 #define ADC_CR_ADMD_MASK    ((uint32_t)0x0000000C)    /*!<A/D Converter Operation Mode Mask */
3555 #define ADC_CR_TRGCOND_L_LEV ((uint32_t)0x00000000)    /*!<External Low Level Trigger */
3556 #define ADC_CR_TRGCOND_H_LEV ((uint32_t)0x00000040)    /*!<External High Level Trigger */
3557 #define ADC_CR_TRGCOND_F_EDGE ((uint32_t)0x00000080)    /*!<External Falling Edge Trigger */
3558 #define ADC_CR_TRGCOND_R_EDGE ((uint32_t)0x000000C0)    /*!<External Rising Edge Trigger */
3559 #define ADC_CR_TRGCOND_MASK ((uint32_t)0x000000C0)    /*!<External Trigger Condition Mask */
3560 #define ADC_CR_TRGEN        ((uint32_t)0x00000100)    /*!<External Trigger Enable */
3561 #define ADC_CR_PTEN         ((uint32_t)0x00000200)    /*!<PDMA Transfer Enable */
3562 #define ADC_CR_DIFF         ((uint32_t)0x00000400)    /*!<Differential mode select */
3563 #define ADC_CR_SINGLE_END   ((uint32_t)0x00000800)    /*!<Single end mode select */
3564 #define ADC_CR_ADST        ((uint32_t)0x00000800)    /*!<A/D Conversion Start */
    
```

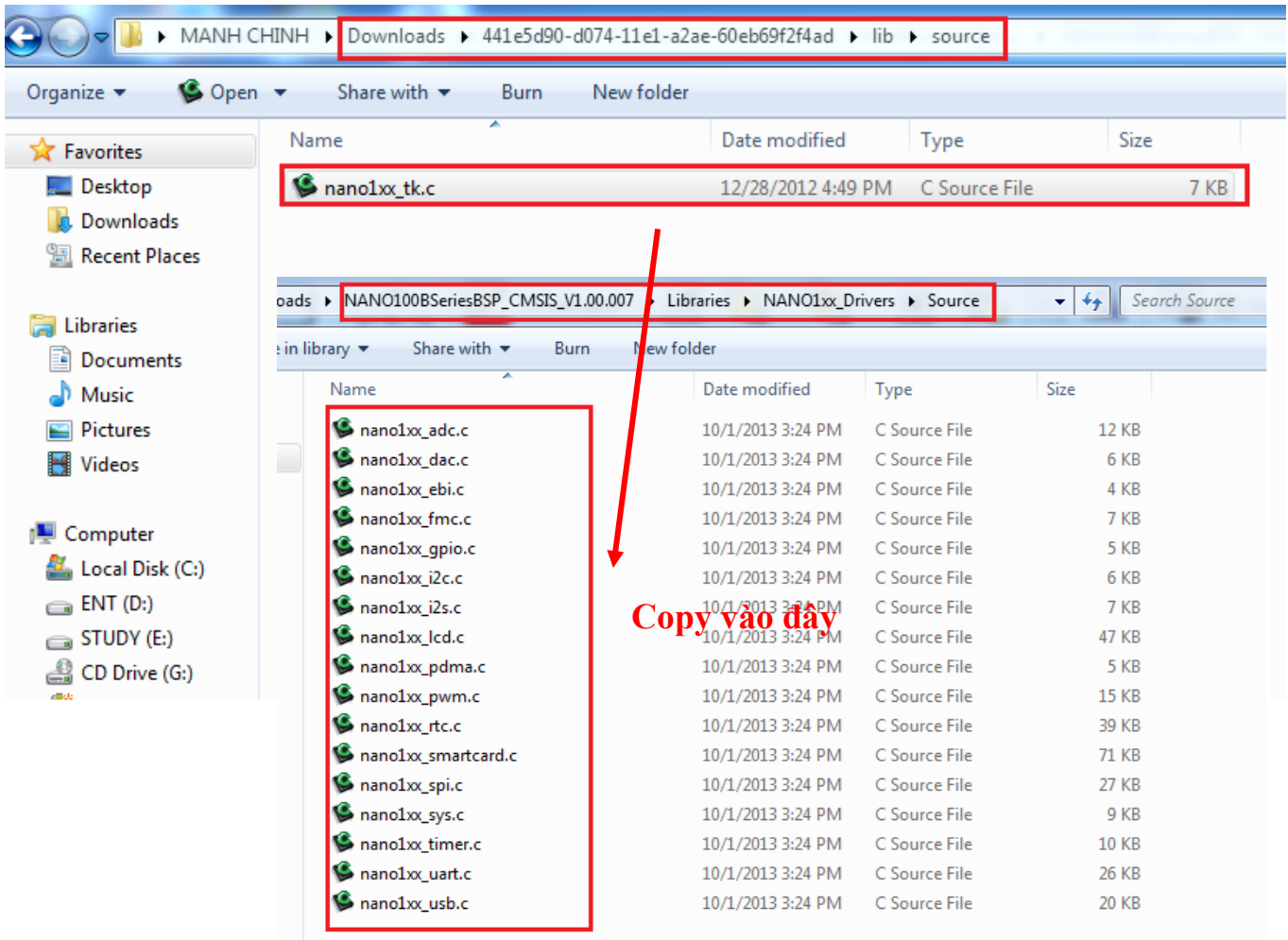
```

#define ADC_CR_ADMD_SINGLE      ((uint32_t)0x00000000)    /*!<A/D Converter Single Mode */
    
```

Bước 4: Thêm file thư viện Touch Key

Copy file `nano1xx_tk.c` tải ở trên vào thư mục:

`\\NANO100BSeriesBSP\CMSIS_V1.00.007\Libraries\NANO1xx_Drivers\Source`

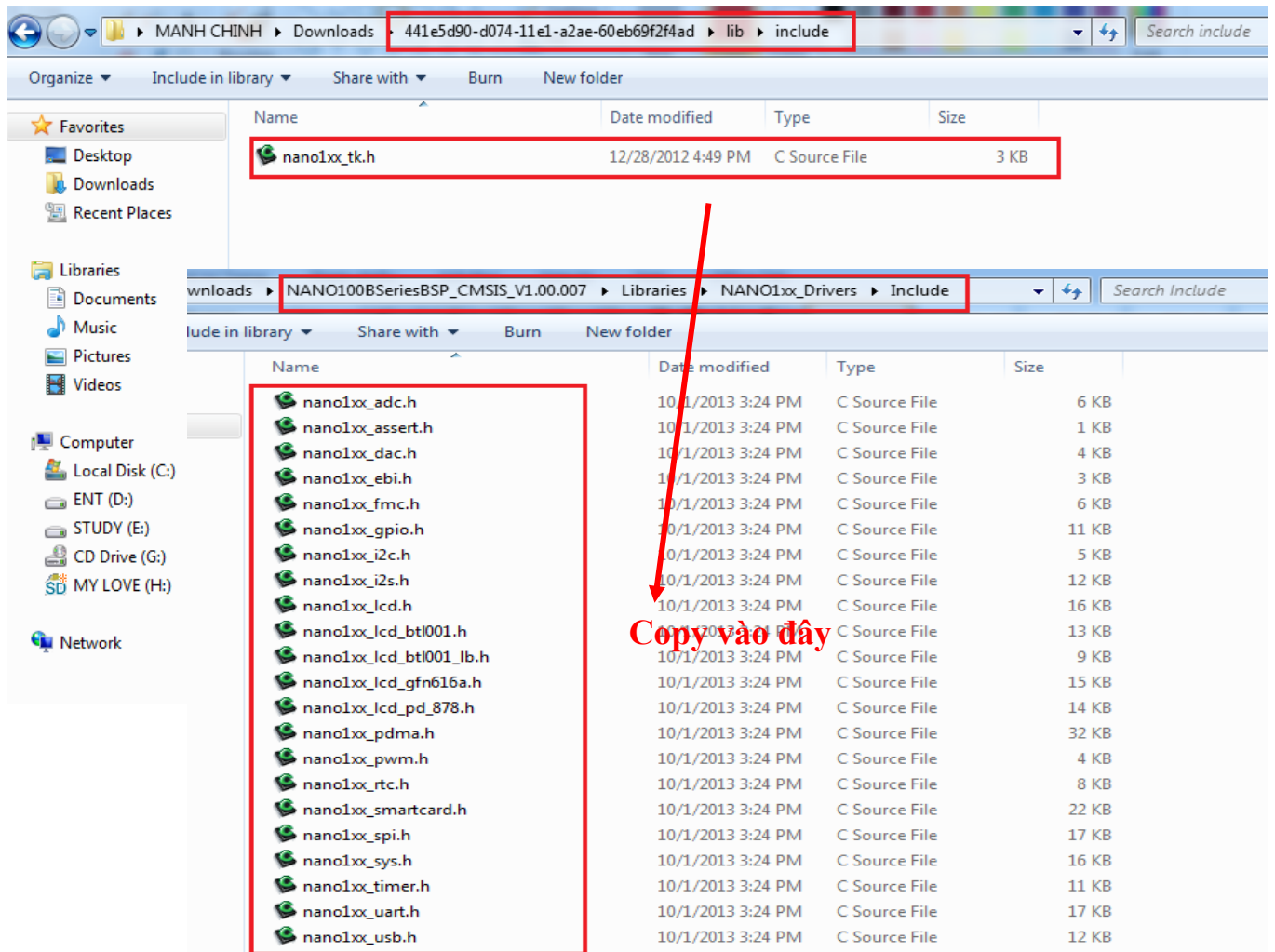


The screenshot shows two Windows Explorer windows. The top window displays the file `nano1xx_tk.c` (7 KB) in the `Downloads` folder. The bottom window displays the target directory `Source` within `Libraries\NANO1xx_Drivers`. A red arrow points from the `nano1xx_tk.c` file to the `Source` directory, with the text **Copy vào đây** (Copy here) written in red.

Name	Date modified	Type	Size
nano1xx_adc.c	10/1/2013 3:24 PM	C Source File	12 KB
nano1xx_dac.c	10/1/2013 3:24 PM	C Source File	6 KB
nano1xx_ebi.c	10/1/2013 3:24 PM	C Source File	4 KB
nano1xx_fmc.c	10/1/2013 3:24 PM	C Source File	7 KB
nano1xx_gpio.c	10/1/2013 3:24 PM	C Source File	5 KB
nano1xx_i2c.c	10/1/2013 3:24 PM	C Source File	6 KB
nano1xx_i2s.c	10/1/2013 3:24 PM	C Source File	7 KB
nano1xx_lcd.c	10/1/2013 3:24 PM	C Source File	47 KB
nano1xx_pdma.c	10/1/2013 3:24 PM	C Source File	5 KB
nano1xx_pwm.c	10/1/2013 3:24 PM	C Source File	15 KB
nano1xx_rtc.c	10/1/2013 3:24 PM	C Source File	39 KB
nano1xx_smartcard.c	10/1/2013 3:24 PM	C Source File	71 KB
nano1xx_spi.c	10/1/2013 3:24 PM	C Source File	27 KB
nano1xx_sys.c	10/1/2013 3:24 PM	C Source File	9 KB
nano1xx_timer.c	10/1/2013 3:24 PM	C Source File	10 KB
nano1xx_uart.c	10/1/2013 3:24 PM	C Source File	26 KB
nano1xx_usb.c	10/1/2013 3:24 PM	C Source File	20 KB

Copy file [nano1xx_tk.c](#) tải ở trên vào thư mục:

\\NANO100BSeriesBSP_CMSIS_V1.00.007\Libraries\NANO1xx_Drivers\Include



The screenshot shows a Windows Explorer window with the address bar set to `MANH CHINH > Downloads > 441e5d90-d074-11e1-a2ae-60eb69f2f4ad > lib > include`. The file `nano1xx_tk.h` is highlighted in the main pane. Below it, another Explorer window shows the path `Downloads > NANO100BSeriesBSP_CMSIS_V1.00.007 > Libraries > NANO1xx_Drivers > Include`. A red box highlights a list of source files in this folder, and a red arrow points from the `nano1xx_tk.h` file in the top window to this list. The text "Copy vào đây" (Copy here) is written in red next to the arrow.

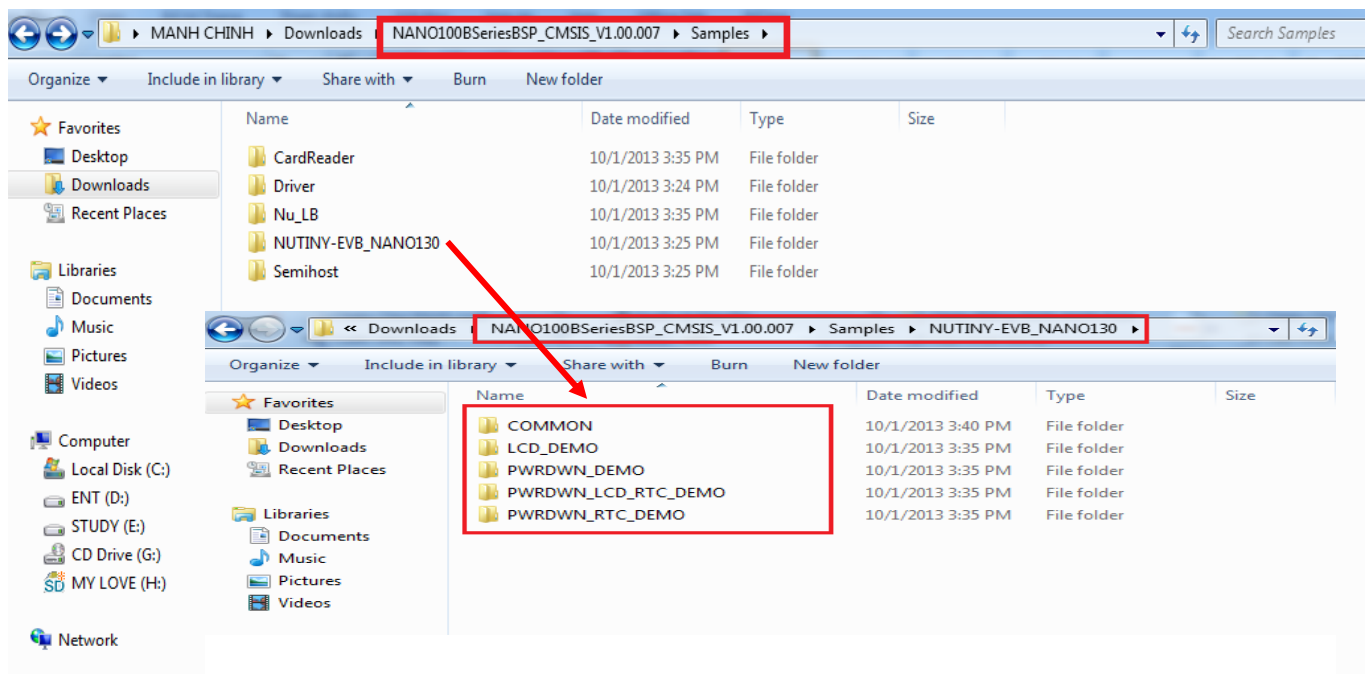
Name	Date modified	Type	Size
nano1xx_adc.h	10/1/2013 3:24 PM	C Source File	6 KB
nano1xx_assert.h	10/1/2013 3:24 PM	C Source File	1 KB
nano1xx_dac.h	10/1/2013 3:24 PM	C Source File	4 KB
nano1xx_ebi.h	10/1/2013 3:24 PM	C Source File	3 KB
nano1xx_fmc.h	10/1/2013 3:24 PM	C Source File	6 KB
nano1xx_gpio.h	10/1/2013 3:24 PM	C Source File	11 KB
nano1xx_i2c.h	10/1/2013 3:24 PM	C Source File	5 KB
nano1xx_i2s.h	10/1/2013 3:24 PM	C Source File	12 KB
nano1xx_lcd.h	10/1/2013 3:24 PM	C Source File	16 KB
nano1xx_lcd_bt1001.h	10/1/2013 3:24 PM	C Source File	13 KB
nano1xx_lcd_bt1001_lb.h	10/1/2013 3:24 PM	C Source File	9 KB
nano1xx_lcd_gfn616a.h	10/1/2013 3:24 PM	C Source File	15 KB
nano1xx_lcd_pd_878.h	10/1/2013 3:24 PM	C Source File	14 KB
nano1xx_pdma.h	10/1/2013 3:24 PM	C Source File	32 KB
nano1xx_pwm.h	10/1/2013 3:24 PM	C Source File	4 KB
nano1xx_rtc.h	10/1/2013 3:24 PM	C Source File	8 KB
nano1xx_smartcard.h	10/1/2013 3:24 PM	C Source File	22 KB
nano1xx_spi.h	10/1/2013 3:24 PM	C Source File	17 KB
nano1xx_sys.h	10/1/2013 3:24 PM	C Source File	16 KB
nano1xx_timer.h	10/1/2013 3:24 PM	C Source File	11 KB
nano1xx_uart.h	10/1/2013 3:24 PM	C Source File	17 KB
nano1xx_usb.h	10/1/2013 3:24 PM	C Source File	12 KB

7. Lập trình Nano100 Series

Trong phần này sẽ hướng dẫn lập trình trên KeilC

Cũng giống như các dòng vi điều khiển khác của Nuvoton như NUC100 Series, M051, Mini51... hay như các dòng ARM khác, cách thức tạo Project cho những ứng dụng sử dụng dòng Nano100 Series cũng tương tự. Bạn có thể tham khảo tại đây:

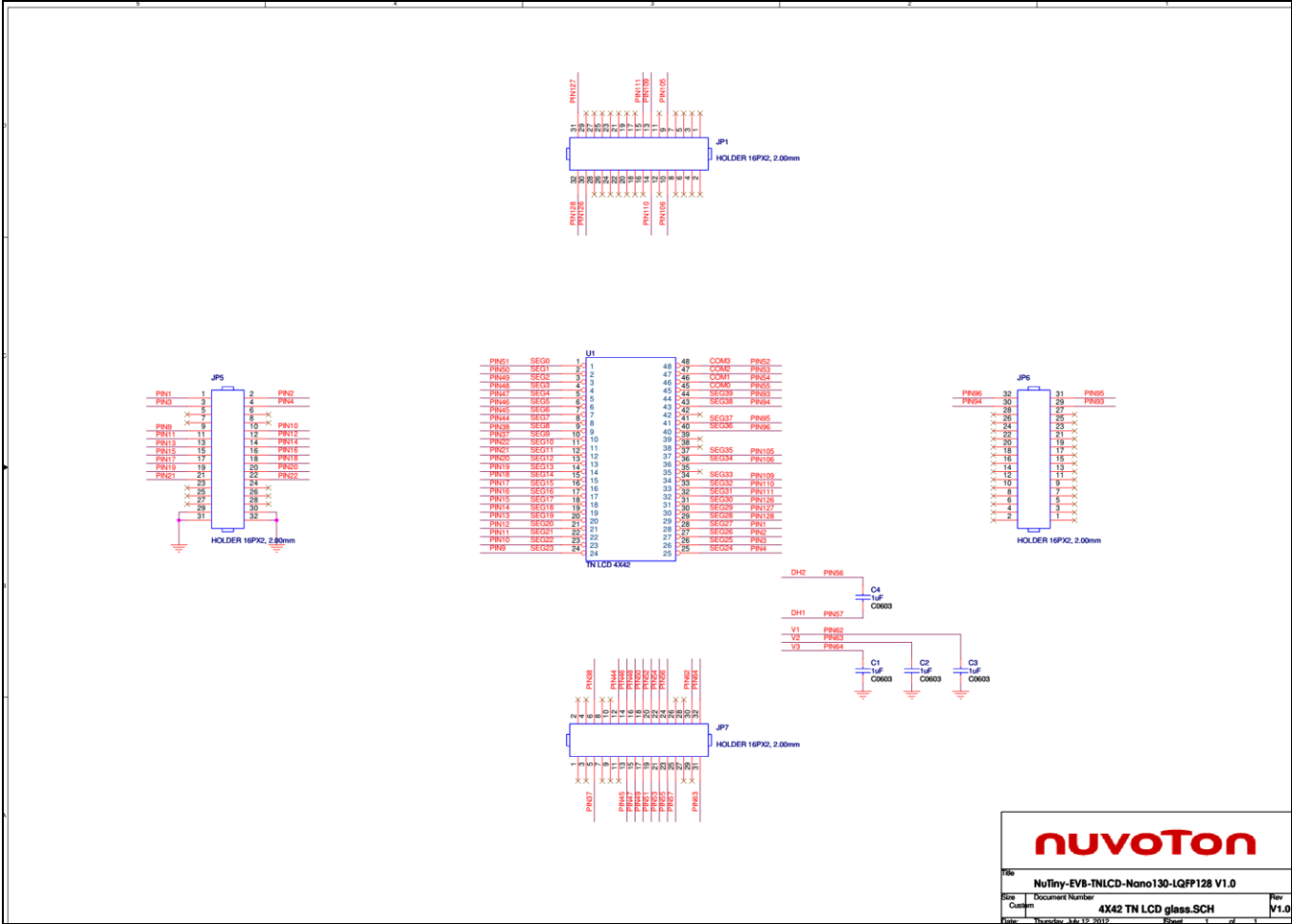
<http://tula.vn/modules.php?name=monline&file=sdtdc1&run=view&cid=84&arrange=tu5&desc=1&showcol=52735&showtype=0>





7.1 Giao tiếp LCD

a) Mạch nguyên lý



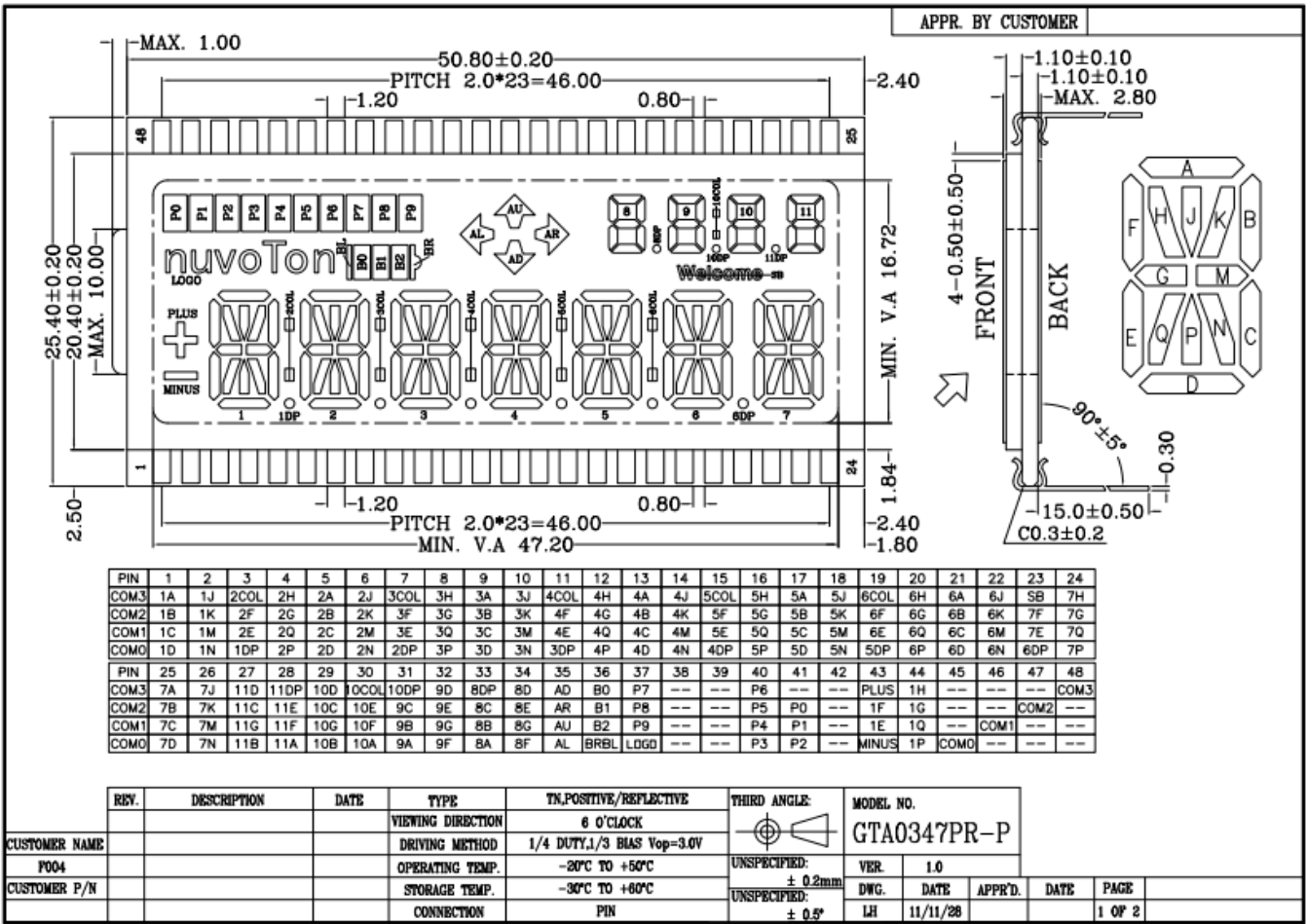
nuvoton

750 NuTiny-EVB-INLCD-Nano130-IQFP128 V1.0

Docu Document Number Rev V1.0

4x42 TN LCD glass.SCH

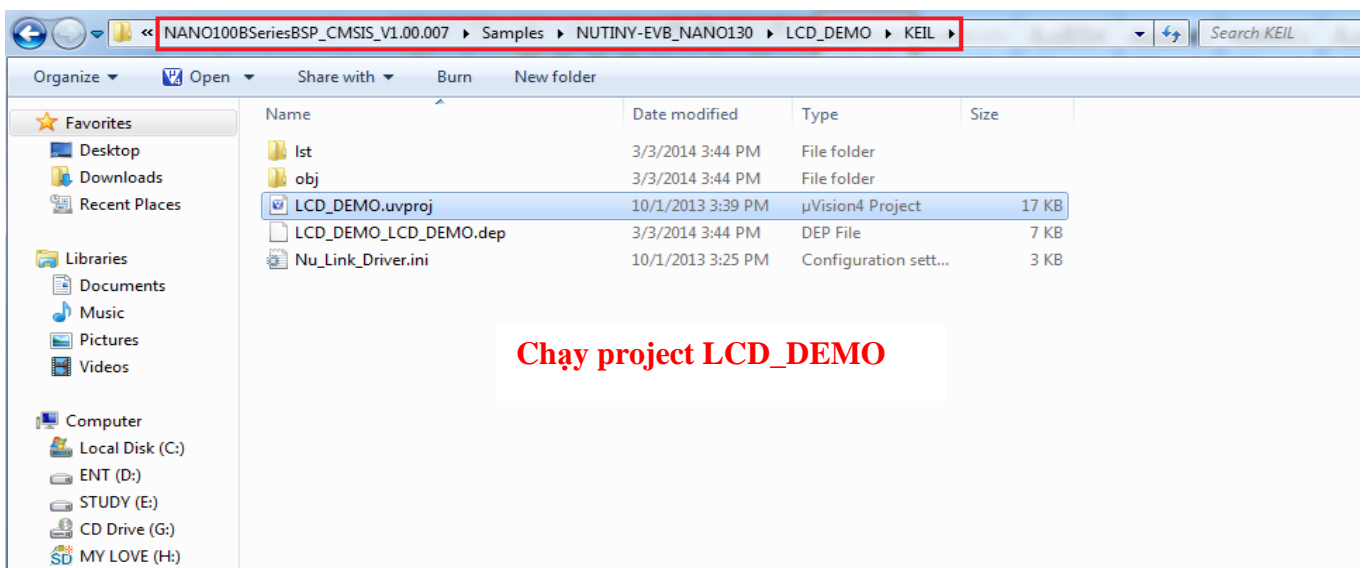
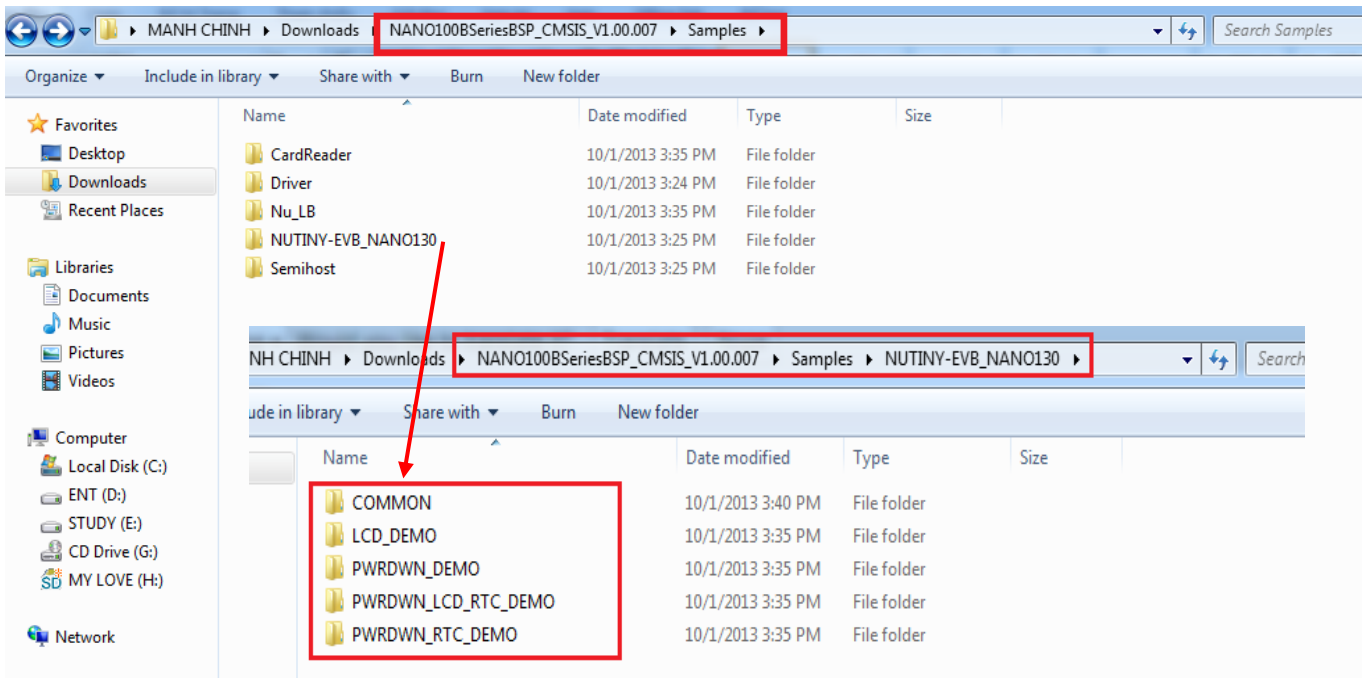
Date: Tuesday, 4/12/2012 Sheet: 1 of 1

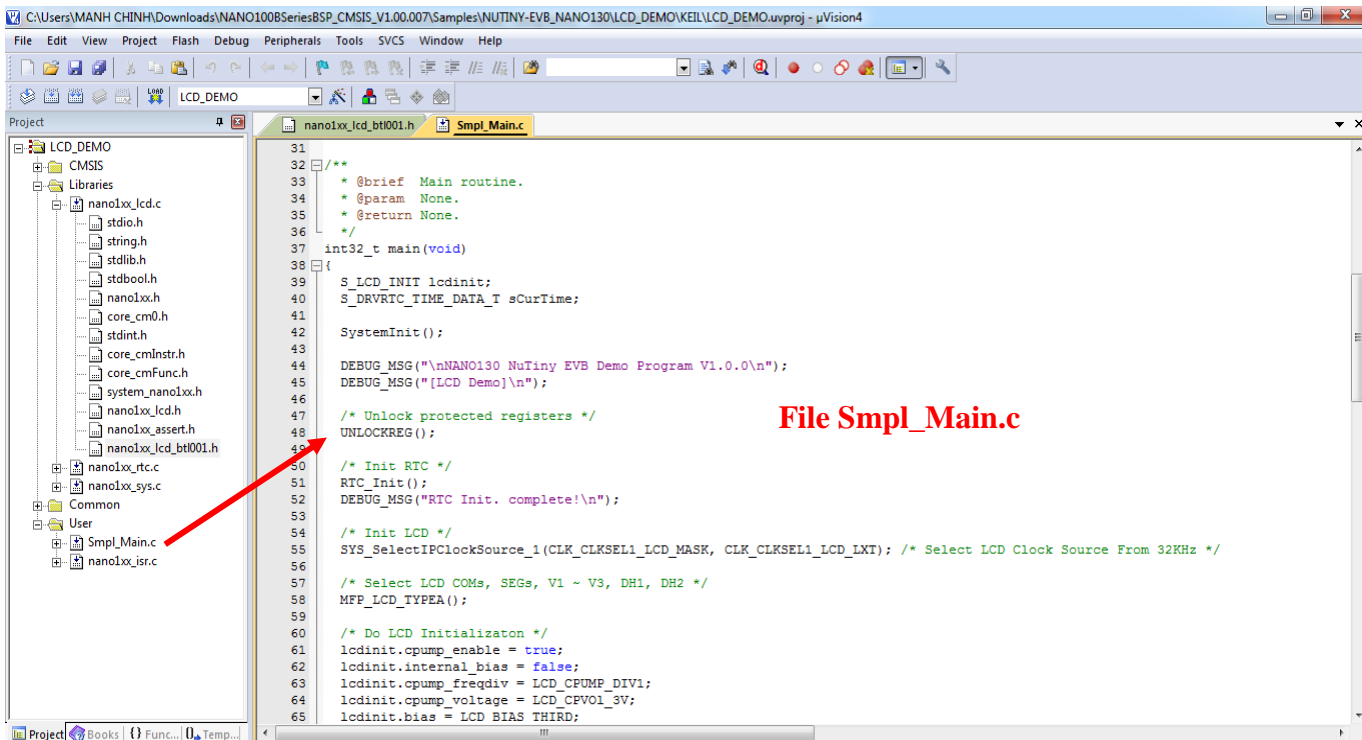


GLCD GTA0347PR

b) Code mẫu

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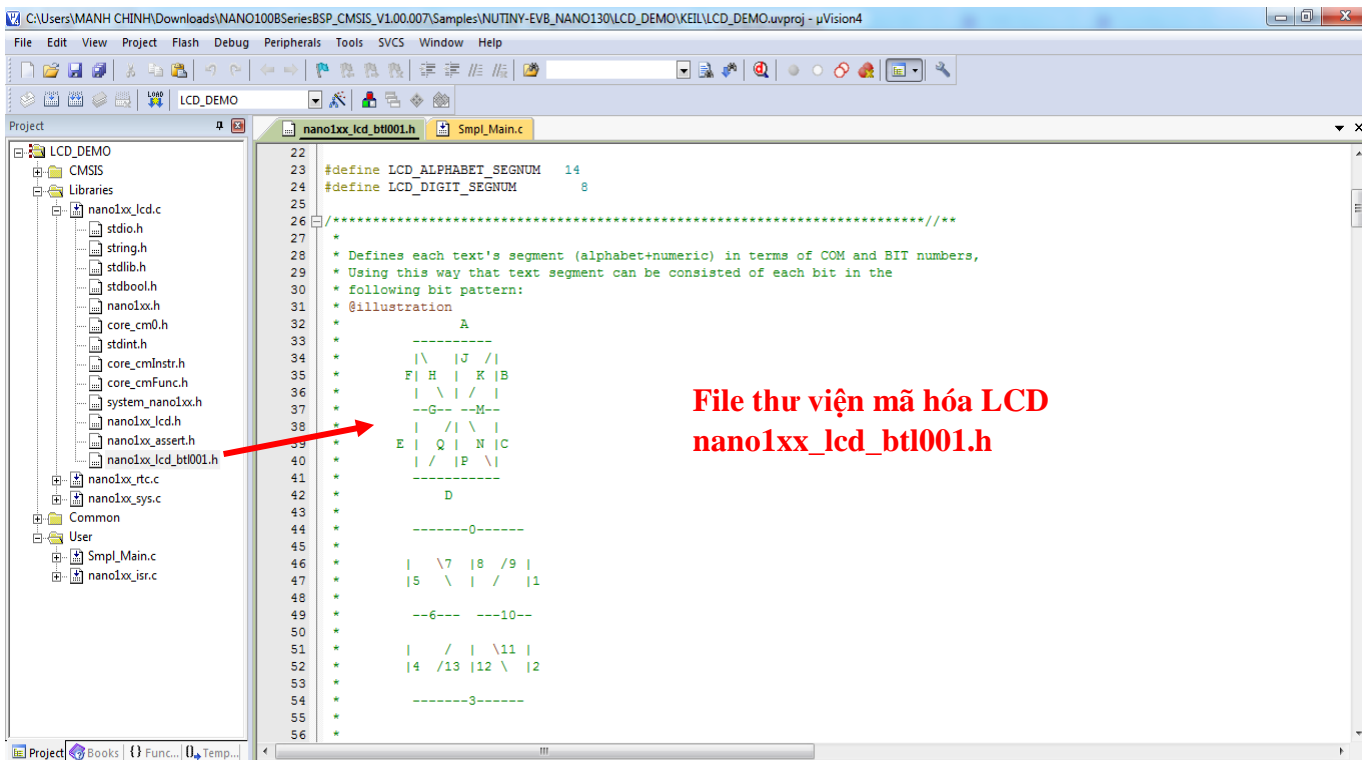




The screenshot shows the IDE interface with the project 'LCD_DEMO' open. The file explorer on the left shows the project structure, including 'User' and 'Smpl_Main.c'. The main editor window displays the code for 'Smpl_Main.c'. A red arrow points from the file explorer to the file name in the editor. A red text label 'File Smpl_Main.c' is overlaid on the code.

```

31
32 /**
33  * @brief Main routine.
34  * @param None.
35  * @return None.
36  */
37 int32_t main(void)
38 {
39     S_LCD_INIT lcdinit;
40     S_DRVRTC_TIME_DATA_T sCurTime;
41
42     SystemInit();
43
44     DEBUG_MSG("\nNANO130 NuTiny EVB Demo Program V1.0.0\n");
45     DEBUG_MSG("LCD Demo\n");
46
47     /* Unlock protected registers */
48     UNLOCKREG();
49
50     /* Init RTC */
51     RTC_Init();
52     DEBUG_MSG("RTC Init. complete!\n");
53
54     /* Init LCD */
55     SYS_SelectIPClockSource_1(CLK_CLKSEL1_LCD_MASK, CLK_CLKSEL1_LCD_LXT); /* Select LCD Clock Source From 32KHz */
56
57     /* Select LCD COMs, SEGs, V1 ~ V3, DH1, DH2 */
58     MFP_LCD_TYPEA();
59
60     /* Do LCD Initializaton */
61     lcdinit.cpump_enable = true;
62     lcdinit.internal_bias = false;
63     lcdinit.cpump_freqdiv = LCD_CPUMP_DIV1;
64     lcdinit.cpump_voltage = LCD_CPV01_3V;
65     lcdinit.bias = LCD_BIAS_THIRD;
    
```



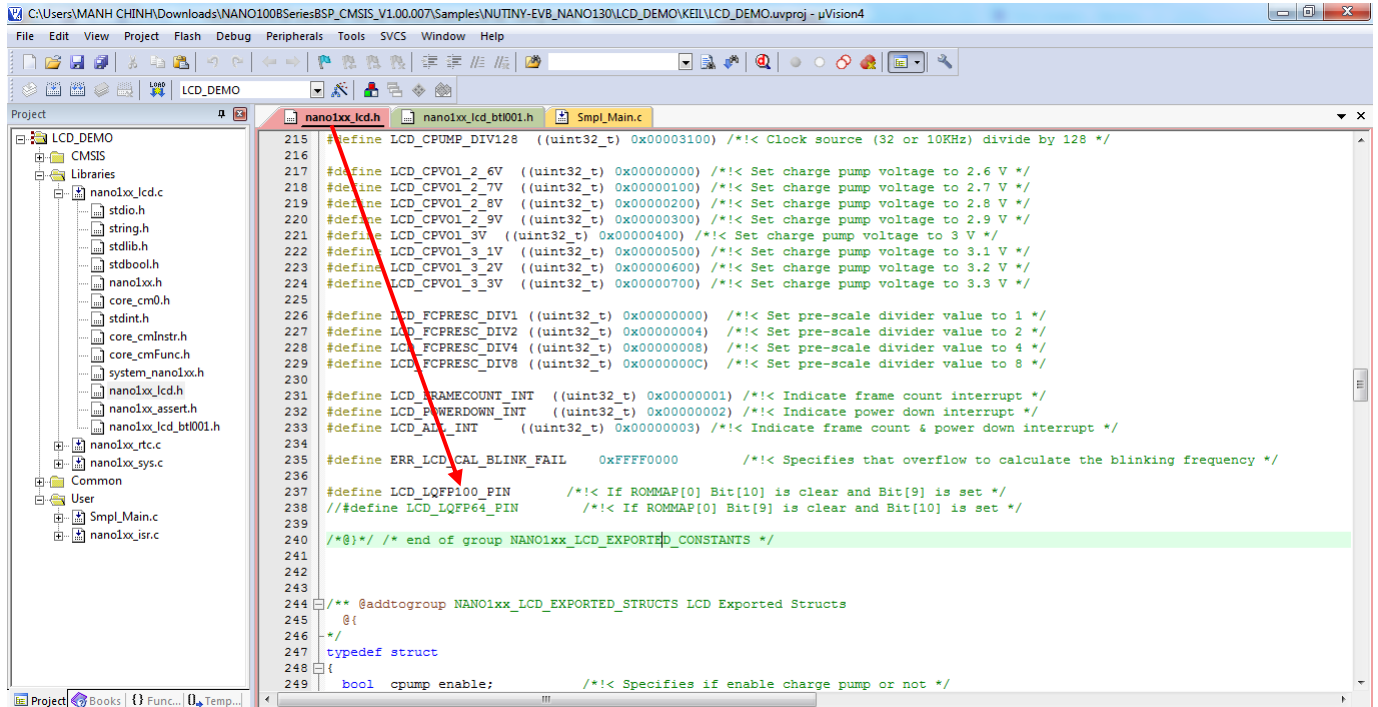
The screenshot shows the IDE interface with the project 'LCD_DEMO' open. The file explorer on the left shows the project structure, including 'User' and 'nano1xx_lcd_bt001.h'. The main editor window displays the code for 'nano1xx_lcd_bt001.h'. A red arrow points from the file explorer to the file name in the editor. A red text label 'File thư viện mã hóa LCD nano1xx_lcd_bt001.h' is overlaid on the code.

```

22
23 #define LCD_ALPHABET_SEGNUM 14
24 #define LCD_DIGIT_SEGNUM 8
25
26 /*-----*/
27 *
28 * Defines each text's segment (alphabet+numeric) in terms of COM and BIT numbers,
29 * Using this way that text segment can be consisted of each bit in the
30 * following bit pattern:
31 * @illustration
32 *
33 *
34 *   | \  | / |
35 *   F | H | K | B
36 *   | \ | / |
37 *   --G-- --M--
38 *   | / | \ |
39 *   E | Q | N | C
40 *   | / | P | \ |
41 *
42 *
43 *
44 *   -----0-----
45 *
46 *   | \ 7 | 8 / 9 |
47 *   | 5 \ | / | 11
48 *
49 *   --6--- ---10--
50 *
51 *   | / | | \ 11 |
52 *   | 4 / 13 | 12 \ | 12
53 *
54 *
55 *   -----3-----
56 *
    
```

Lưu ý:

Dòng Nano100 Series(Có hỗ trợ giao tiếp LCD) gồm 2 loại: 64 chân và 128 chân. Lựa chọn loại phù hợp trong khi viết các ứng dụng



```

215 #define LCD_CPUMP_DIV128 ((uint32_t) 0x00003100) /*!< Clock source (32 or 10KHz) divide by 128 */
216
217 #define LCD_CPVO1_2_6V ((uint32_t) 0x00000000) /*!< Set charge pump voltage to 2.6 V */
218 #define LCD_CPVO1_2_7V ((uint32_t) 0x00000100) /*!< Set charge pump voltage to 2.7 V */
219 #define LCD_CPVO1_2_8V ((uint32_t) 0x00000200) /*!< Set charge pump voltage to 2.8 V */
220 #define LCD_CPVO1_2_9V ((uint32_t) 0x00000300) /*!< Set charge pump voltage to 2.9 V */
221 #define LCD_CPVO1_3V ((uint32_t) 0x00000400) /*!< Set charge pump voltage to 3 V */
222 #define LCD_CPVO1_3_1V ((uint32_t) 0x00000500) /*!< Set charge pump voltage to 3.1 V */
223 #define LCD_CPVO1_3_2V ((uint32_t) 0x00000600) /*!< Set charge pump voltage to 3.2 V */
224 #define LCD_CPVO1_3_3V ((uint32_t) 0x00000700) /*!< Set charge pump voltage to 3.3 V */
225
226 #define LCD_FCPRESC_DIV1 ((uint32_t) 0x00000000) /*!< Set pre-scale divider value to 1 */
227 #define LCD_FCPRESC_DIV2 ((uint32_t) 0x00000004) /*!< Set pre-scale divider value to 2 */
228 #define LCD_FCPRESC_DIV4 ((uint32_t) 0x00000008) /*!< Set pre-scale divider value to 4 */
229 #define LCD_FCPRESC_DIV8 ((uint32_t) 0x0000000C) /*!< Set pre-scale divider value to 8 */
230
231 #define LCD_FRAMECOUNT_INT ((uint32_t) 0x00000001) /*!< Indicate frame count interrupt */
232 #define LCD_POWERDOWN_INT ((uint32_t) 0x00000002) /*!< Indicate power down interrupt */
233 #define LCD_ALL_INT ((uint32_t) 0x00000003) /*!< Indicate frame count & power down interrupt */
234
235 #define ERR_LCD_CAL_BLINK_FAIL 0xFFFF0000 /*!< Specifies that overflow to calculate the blinking frequency */
236
237 #define LCD_LQFP100_PIN /*!< If ROMMAP[0] Bit[10] is clear and Bit[9] is set */
238 //#define LCD_LQFP64_PIN /*!< If ROMMAP[0] Bit[9] is clear and Bit[10] is set */
239
240 /*)/* /* end of group NANO1xx_LCD_EXPORTED_CONSTANTS */
241
242
243
244 /** @addtogroup NANO1xx_LCD_EXPORTED_STRUCTS LCD Exported Structs
245  * @{
246  */
247 typedef struct
248 {
249     bool cpump enable; /*!< Specifies if enable charge pump or not */

```

Biên dịch chương trình, nạp xuống Kit NuTiny-SDK-Nano130 và xem kết quả.