

ISD2100
Digital ChipCoder
With
Embedded Flash for Stand-alone Playback of Audio



MỤC LỤC

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1. Giới thiệu chip ISD2100

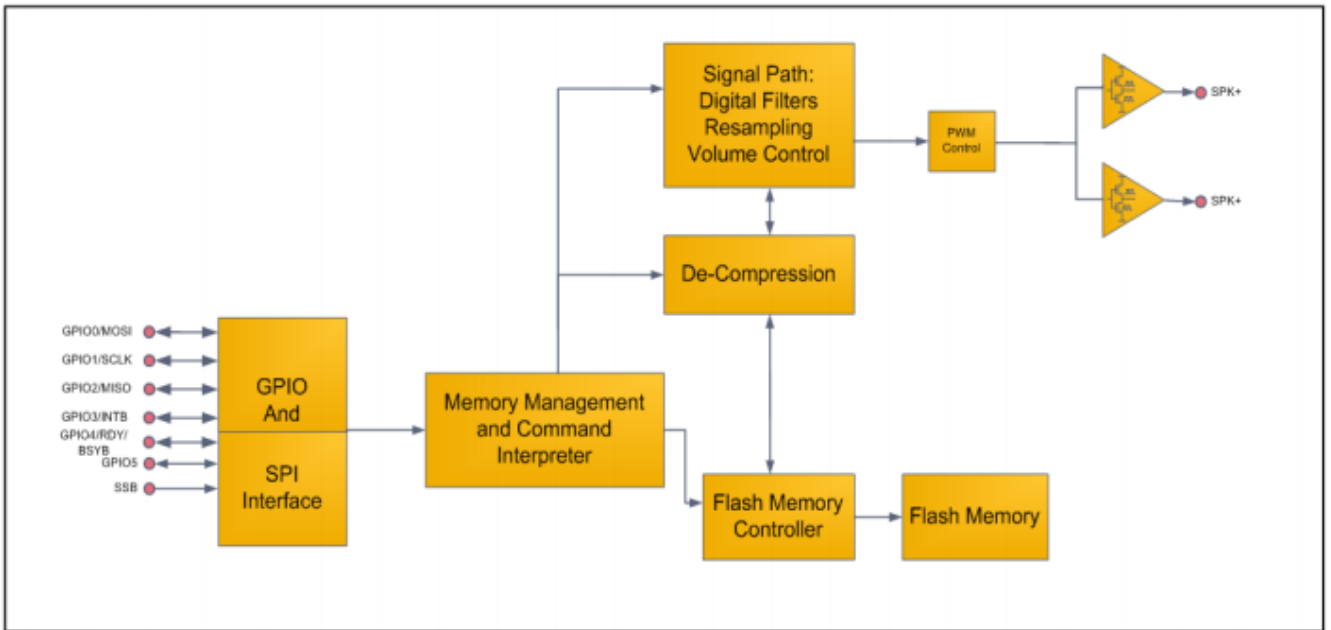
ISD2100 là dòng chip lưu trữ và phát nhạc chất lượng cao của hãng Nuvoton. ISD2100 Series gồm

Tên chip	Dung lượng bộ nhớ	Thời gian phát(giây)*
ISD2130	1M-bit	30
ISD2115	512K-bit	15
ISD2110	352K-bit	10

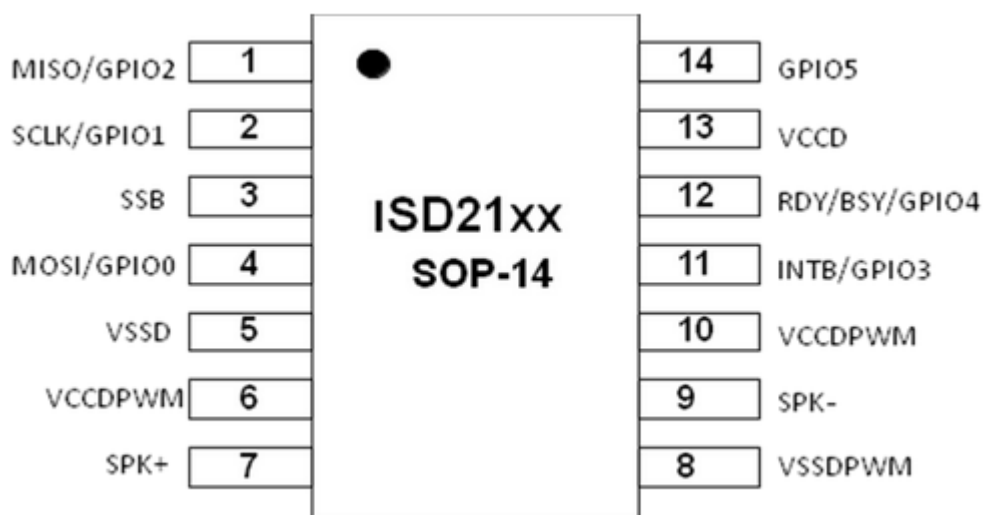
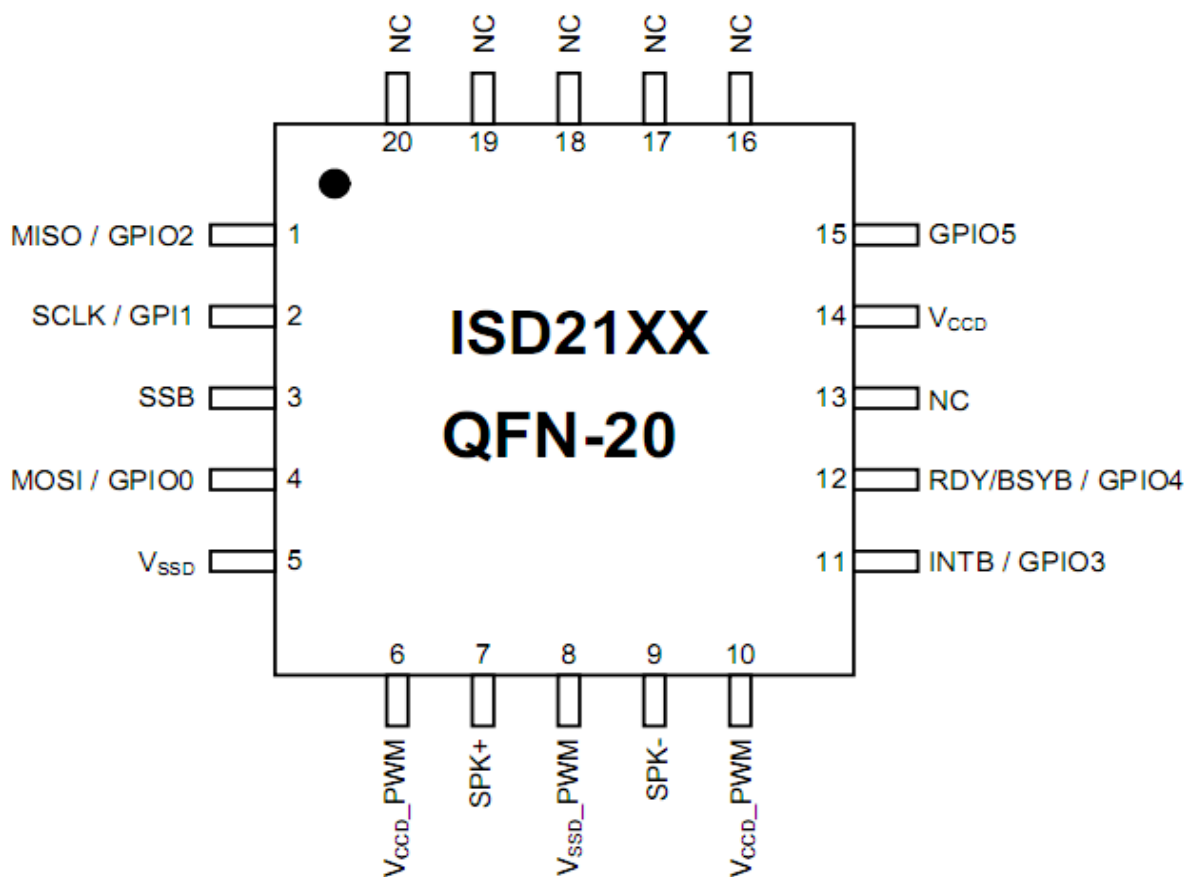
* Tần số 8Khz / 4 bit ADPCM

Đặc tính ISD2100 Series:

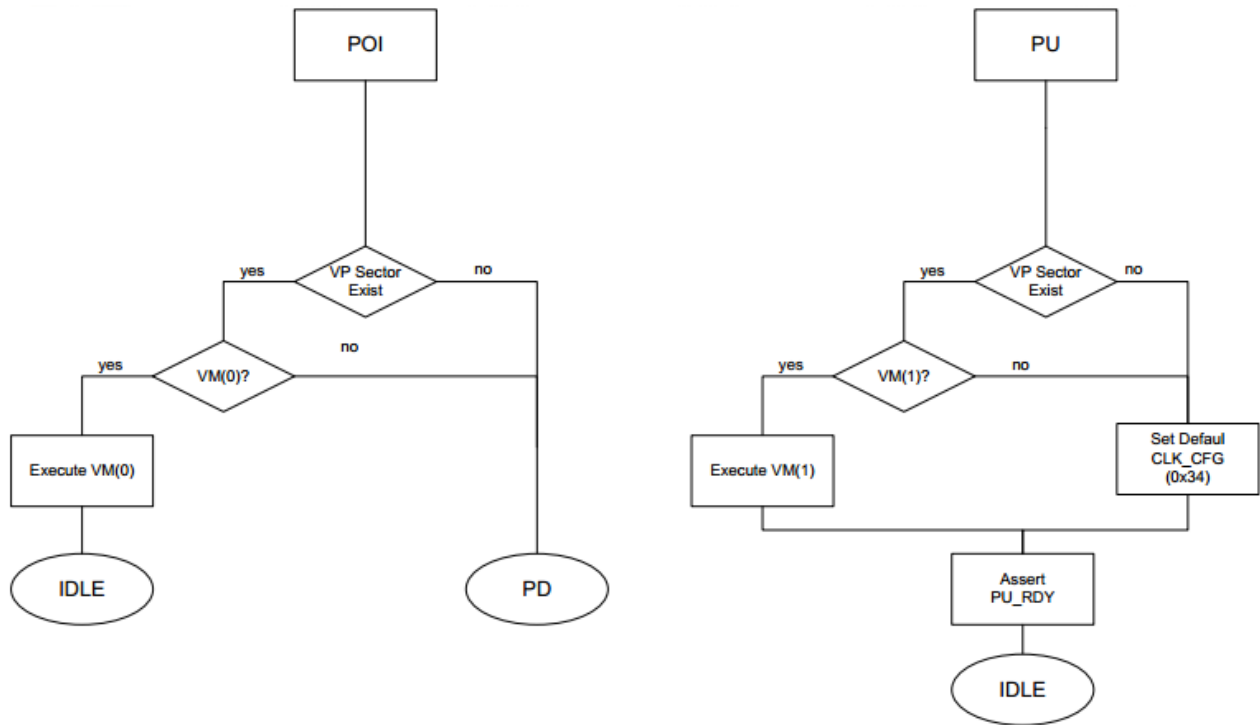
- Dải điện áp hoạt động thấp: 2.7~3.6VDC
- Quản lý file nhạc
 - o Lưu trữ các file nhạc(Voice Prompts) với độ nén cao
 - o Lưu trữ các file nhạc theo vị trí(index) giúp điều khiển phát nhạc đơn giản(không cần biết địa chỉ cụ thể trong bộ nhớ Flash)
 - o Hỗ trợ Voice Macros : có thể phát lại tuần tự nhiều Voice Prompts theo mong muốn của người sử dụng
- Điều khiển:
 - o Điều khiển phát nhạc qua giao tiếp SPI
 - o Điều khiển qua GPIO trigger
- Tần số lấy mẫu:
 - o Tần số lấy mẫu có thể = 4, 5.3, 6.4, 8, 16 và 32 kHz
 - o Mỗi Voice Prompts có tần số lấy mẫu độc lập
- ✓ Thuật toán nén:
 - o μ -Law: 6, 7 hoặc 8 bit mỗi lần lấy mẫu
 - o Differential μ -Law: 6, 7 hoặc 8 bit mỗi lần lấy mẫu
 - o PCM: 8, 10 hoặc 12 bit mỗi lần lấy mẫu
 - o Enhanced ADPCM: 2, 3, 4 hoặc 5 bit mỗi lần lấy mẫu
- ✓ Oscillator: sử dụng bộ dao động nội
- ✓ Đầu ra Output:
 - o PWM: Class D speaker có thể điều khiển trực tiếp loa 8 Ω
- ✓ I/O
 - o Hỗ trợ giao tiếp SPI: MISO, M \bar{O} I, SCLK, SSB
 - o 6 chân I/O đa chức năng



Hình 1.1: Sơ đồ khối ISD2100 Series



Hình 1.2: ISD21XX



Hình 1.3: Sơ đồ khởi nguyên lý hoạt động của ISD21XX

Table 5-1 Alternate Function Bit Decoding

AF1,AF0	Configuration
00	GPIO
01	Alternate Function
10	GPIO, falling edge trigger
11	GPIO, falling and rising edge trigger

Table 5-2 GPIO Alternate Configurations and effect on DOUT and OE.

GPIO	Alternate Function	DOUT	OE
GPIO0	MOSI	X	L
GPIO1	SCLK	X	L ¹
GPIO2	MISO	MISO	SS²
GPIO3	INTB	L	INT³
GPIO4	RDY/BSY	RDY	H
GPIO5	REXT	L	L

Instructions	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4 ... Byte n	Description
<u>PLAY VP</u>	0xA6	INX[15:8]	INX[7:0]			Play Voice Prompt Index INX
<u>PLAY VP@Rn</u>	0xAE	$n = 0 \dots 7$				Play Voice Prompt; Index is value in register Rn.
<u>PLAY VP LP</u>	0xA4	INX[15:8]	INX[7:0]	CNT[15:8]	CNT[7:0]	Loop Play Voice Prompt Index INX, CNT times.
<u>PLAY VP LP@Rn</u>	0xB2	$n = 0 \dots 7$	CNT[15:8]	CNT[7:0]		Loop Play Voice Prompt; Index in register Rn, CNT times.
<u>STOP LP</u>	0x2E					Stop Loop Play Voice Prompt
<u>EXE VM</u>	0xB0	Index[15:8]	Index[7:0]			Execute voice macro Index
<u>EXE VM@Rn</u>	0xBC	$n = 0 \dots 7$				Execute voice macro; Index contained in register Rn
<u>PLAY SIL</u>	0xA8	LEN[7:0]				Play silence for LEN*32ms
<u>STOP</u>	0x2A					STOP current playback operation.
<u>SPI PCM READ</u>	0xAC	D0[7:0]	D0[15:8]	D1[7:0]	D1[15:8] ... Dn[7:0] Dn[15:8]	Receive 16 bit PCM audio data [low-byte, high-byte] from ISD2100 via SPI interface.
<u>SPI SND DEC</u>	0xC0	D0[7:0]	D1[7:0]	D2[7:0]	D3[7:0] ... Dn[7:0]	Send compressed audio data to ISD2100 via SPI interface for decoding.
<u>READ STATUS</u>	0x40	XX	XX	XX	...	Query status of ISD2100.
<u>READ INT</u>	0x46	XX	XX	XX	...	Query status and clear interrupt flags of ISD2100.
<u>READ ID</u>	0x48	XX	XX	XX	XX	Read device ID of ISD2100.
<u>DIG READ</u>	0xA2	A[23:16]	A[15:8]	A[7:0]	XX, ... XX	Read digital data from address A.
<u>DIG WRITE</u>	0xA0	A[23:16]	A[15:8]	A[7:0],	D0[7:0], ... Dn[7:0]	Write digital data from address A.
<u>ERASE MEM</u>	0x24	SA[23:16]	SA[15:8]	SA[7:0]		Erase 1kByte sector of memory containing start address SA.
<u>CHIP ERASE</u>	0x26	0x01				Initiate a mass erase of memory.
<u>CHECKSUM</u>	0xF2	EA[23:16]	EA[15:8]	EA[7:0]		Calculate checksum from 0x0000 to the specified end address EA.
<u>PWR UP</u>	0x10					Power up ISD2100
<u>PWR DN</u>	0x12					Power down ISD2100
<u>SET CLK CFG</u>	0xB4	CFG_CLK[7:0]				Set clock configuration register.
<u>RD CLK CFG</u>	0xB6	XX				Read clock configuration register.
<u>WR CFG REG</u>	0xB8	REG[7:0]			D0[7:0], ... Dn[7:0]	Write data D0...Dn to configuration register(s) starting at configuration register REG.
<u>RD CFG REG</u>	0xBA	REG[7:0]			XX, ...XX	Read configuration register(s) starting at configuration register REG.

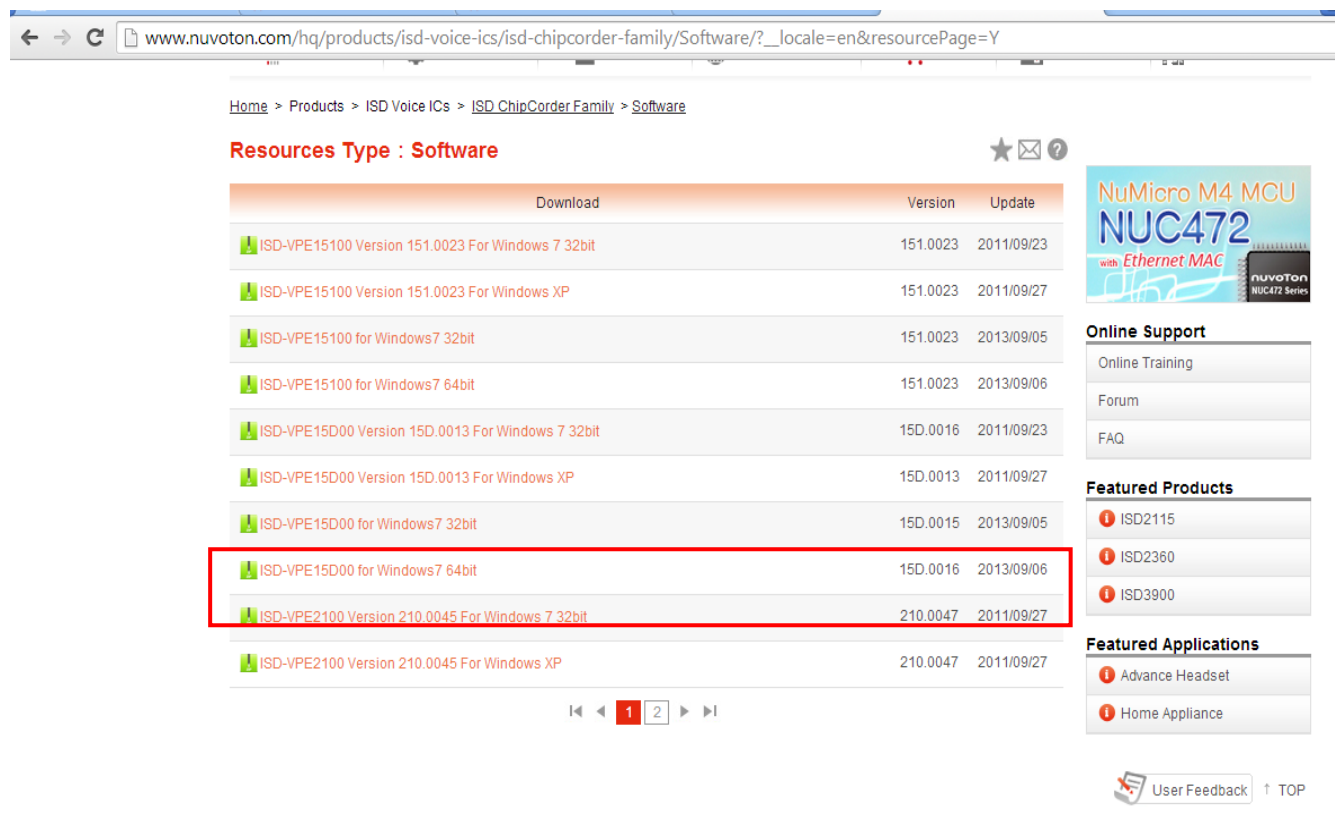
Hình 1.4: Bảng các lệnh giao tiếp SPI với ISD21XX

2. Công cụ hỗ trợ phát triển











Công cụ hỗ trợ phát triển dòng chip nhạc ISD2100 bao gồm:

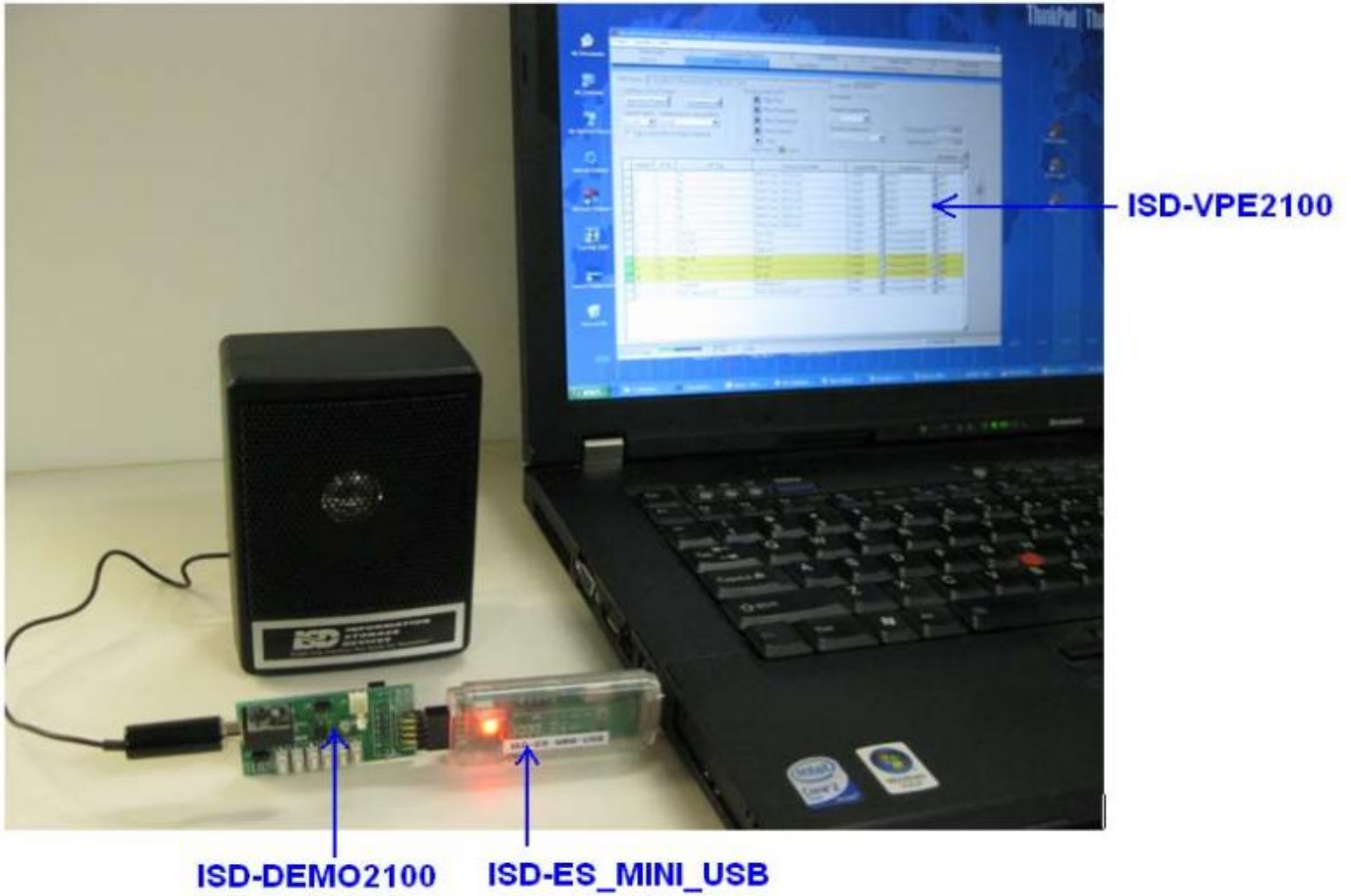
- ✓ Phần mềm ISD-VPE2100
- ✓ Mạch ISD-ES-MINI-USB

Tải phần mềm ISD-VPE2100 trên trang chủ của Nuvoton tại [đây](#)



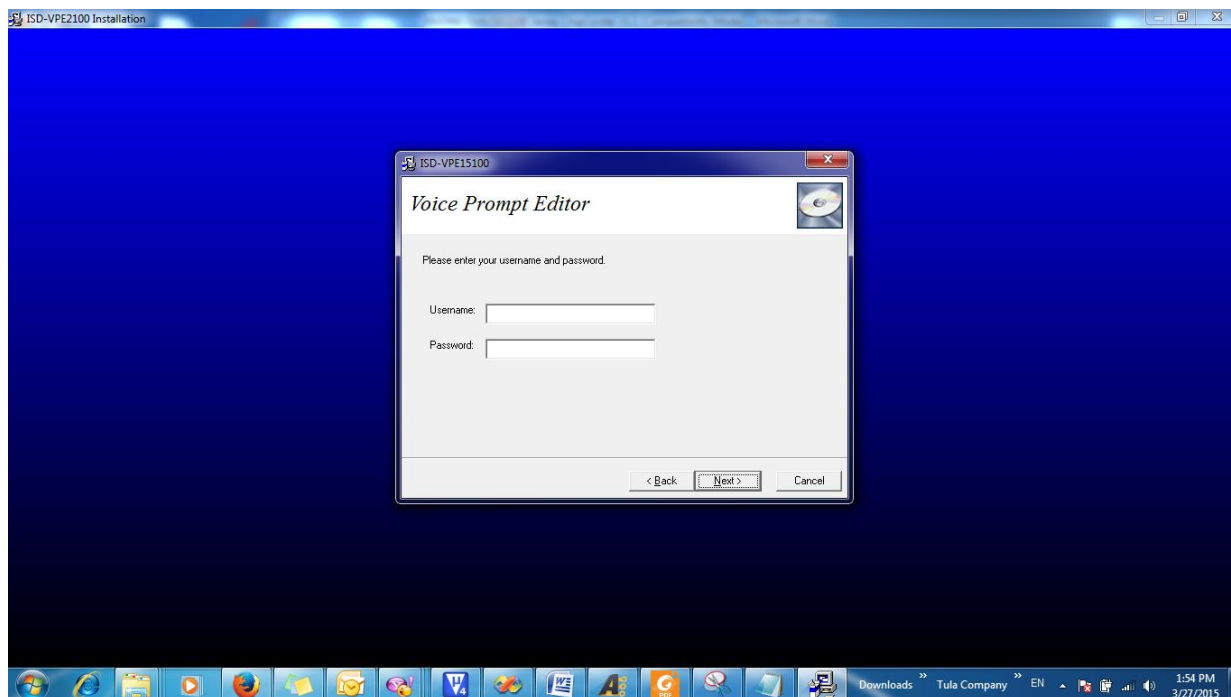
The screenshot shows a web browser window with the URL www.nuvoton.com/hq/products/isd-voice-ics/isd-chipcorder-family/Software/?_locale=en&resourcePage=Y. The page title is "Resources Type : Software". It features a table of software downloads with columns for "Download", "Version", and "Update". The table lists various software versions for ISD-VPE15100, ISD-VPE15D00, and ISD-VPE2100. The row for "ISD-VPE15D00 for Windows7 64bit" is highlighted with a red border. To the right of the table, there are sections for "Online Support" (Online Training, Forum, FAQ), "Featured Products" (ISD2115, ISD2360, ISD3900), and "Featured Applications" (Advance Headset, Home Appliance). At the bottom right, there is a "User Feedback" button and a "TOP" link.

Download	Version	Update
 ISD-VPE15100 Version 151.0023 For Windows 7 32bit	151.0023	2011/09/23
 ISD-VPE15100 Version 151.0023 For Windows XP	151.0023	2011/09/27
 ISD-VPE15100 for Windows7 32bit	151.0023	2013/09/05
 ISD-VPE15100 for Windows7 64bit	151.0023	2013/09/06
 ISD-VPE15D00 Version 15D.0013 For Windows 7 32bit	15D.0016	2011/09/23
 ISD-VPE15D00 Version 15D.0013 For Windows XP	15D.0013	2011/09/27
 ISD-VPE15D00 for Windows7 32bit	15D.0015	2013/09/05
 ISD-VPE15D00 for Windows7 64bit	15D.0016	2013/09/06
 ISD-VPE2100 Version 210.0045 For Windows 7 32bit	210.0047	2011/09/27
 ISD-VPE2100 Version 210.0045 For Windows XP	210.0047	2011/09/27



2.1 Hướng dẫn cài đặt và sử dụng phần mềm ISD-VPE2100

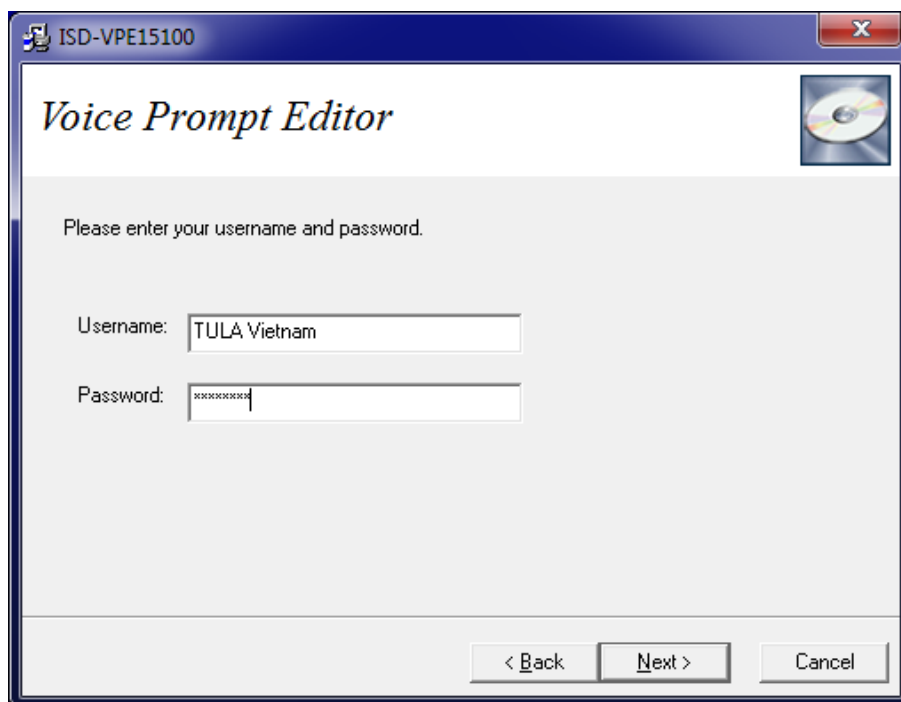
_ Chạy phần mềm VPE2100  VPE2100_Win7-32bit_210.0046.EXE



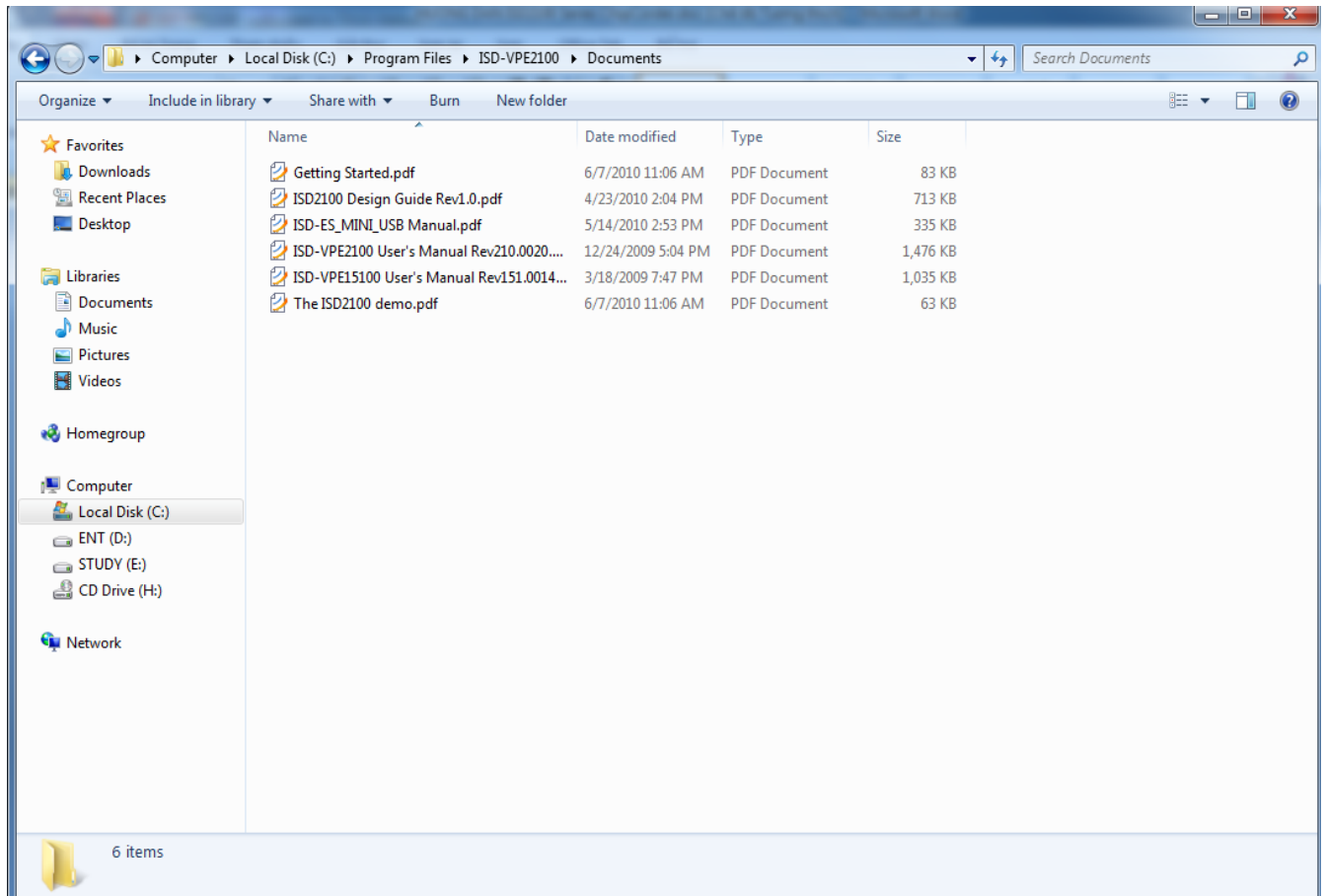
Điền thông tin vào bảng Username và Password

User name: TULA Vietnam

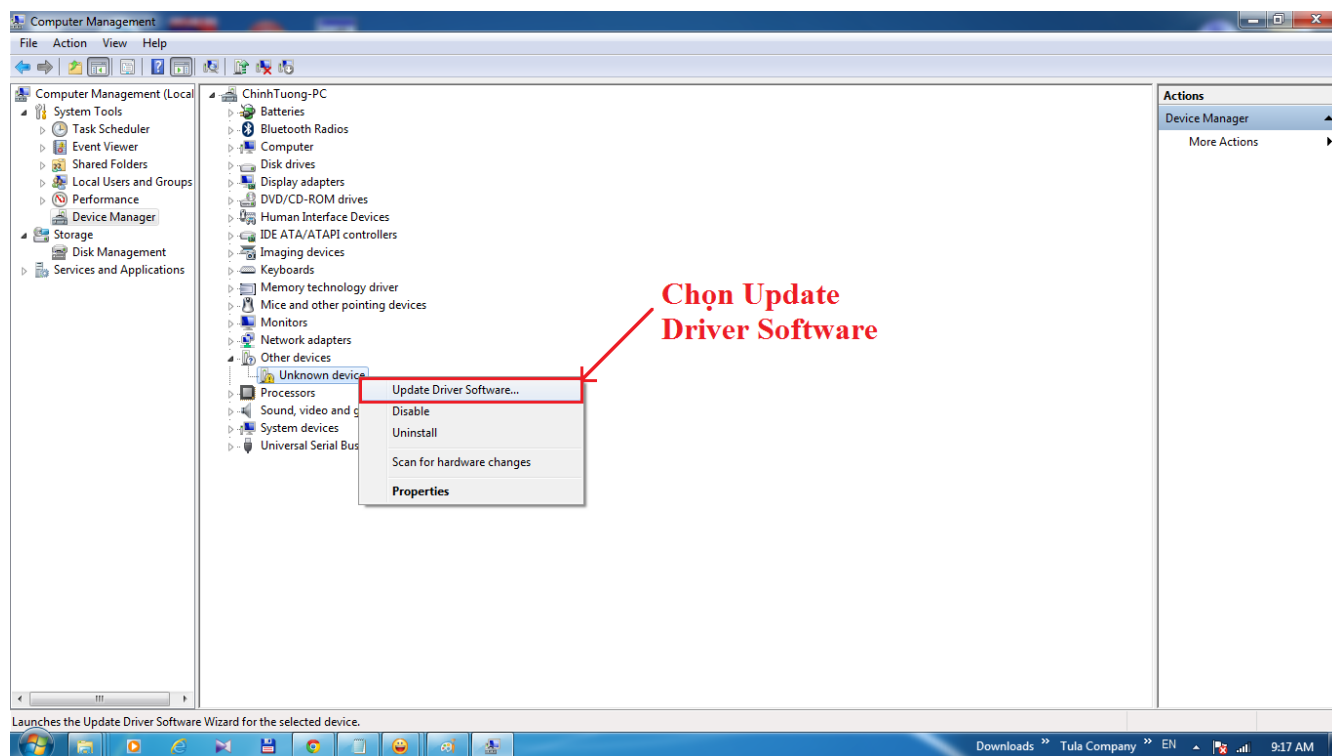
Password : 71967184



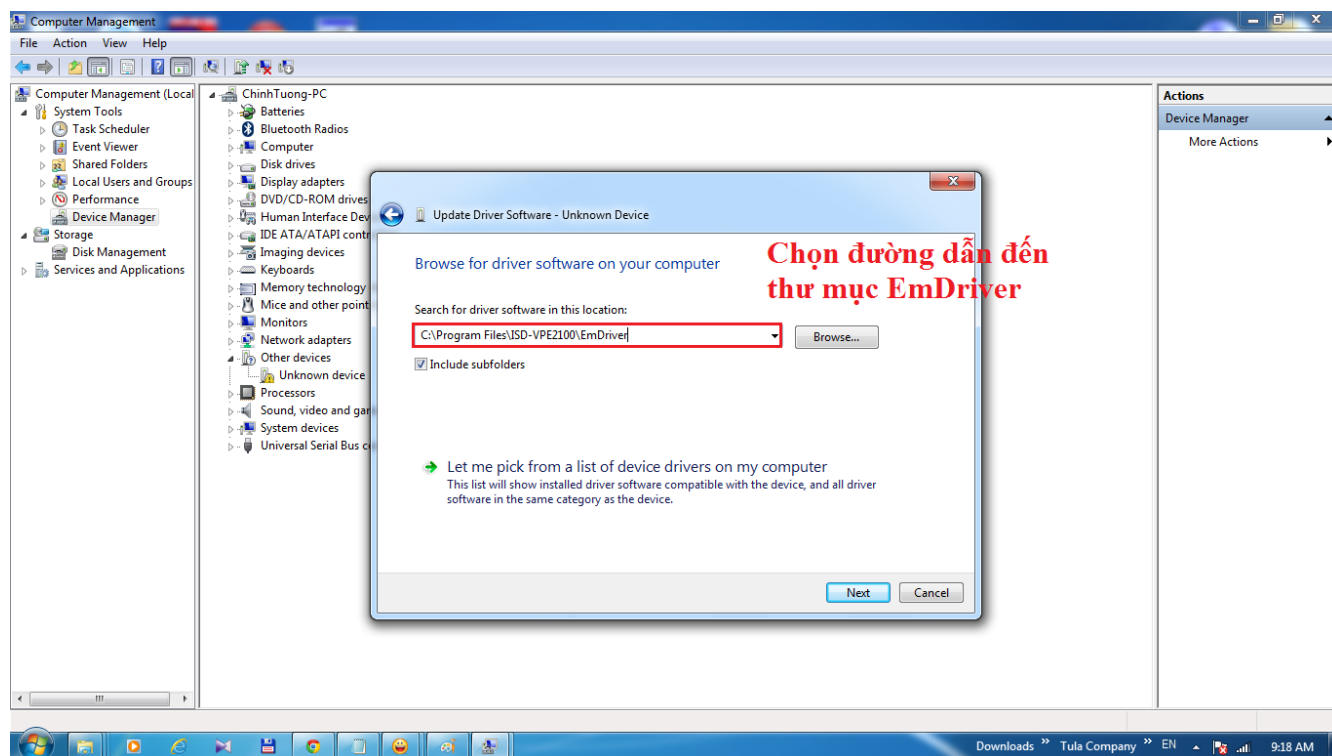
Trong folder Documents tại thư mục cài đặt có chứa tài liệu chi tiết về ISD21XX Series và hướng dẫn sử dụng phần mềm ISD-VPE2100



Cắm mạch ISD-ES-MINI-USB. Vào Computer Manager

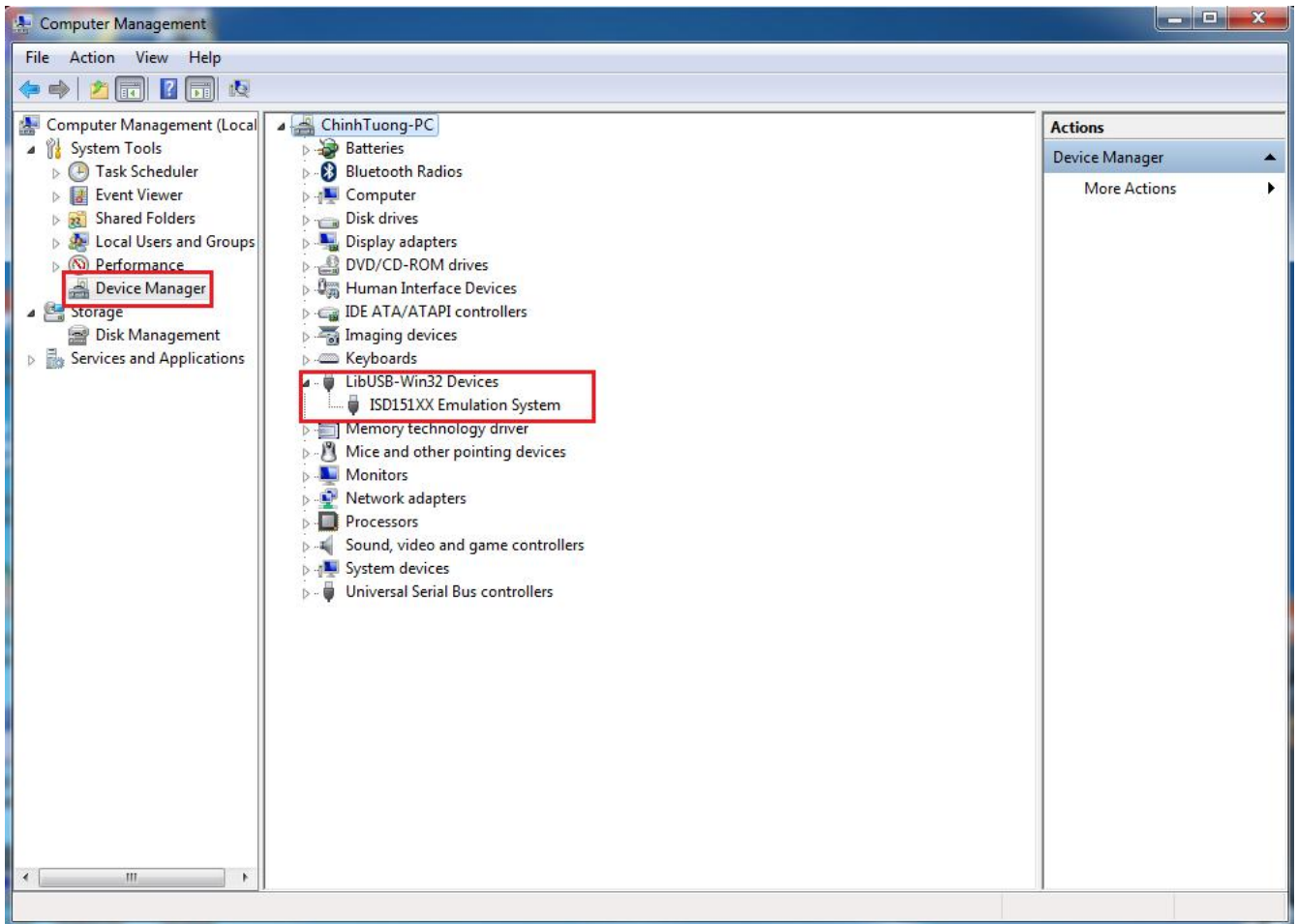


Chọn đường dẫn đến thư mục *EmDriver* trong thư mục cài đặt



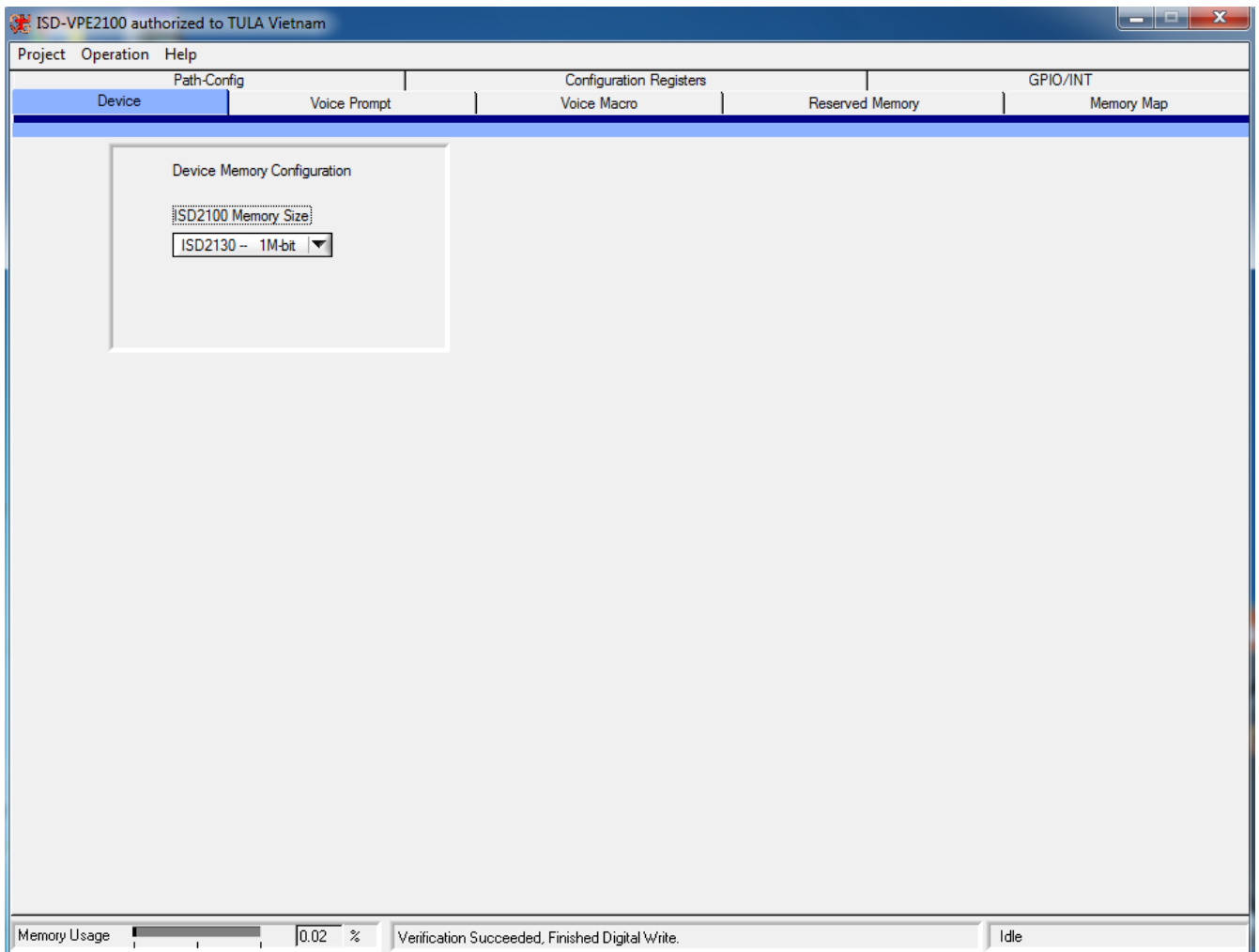
Chọn Next

Sau khi cài đặt thành công

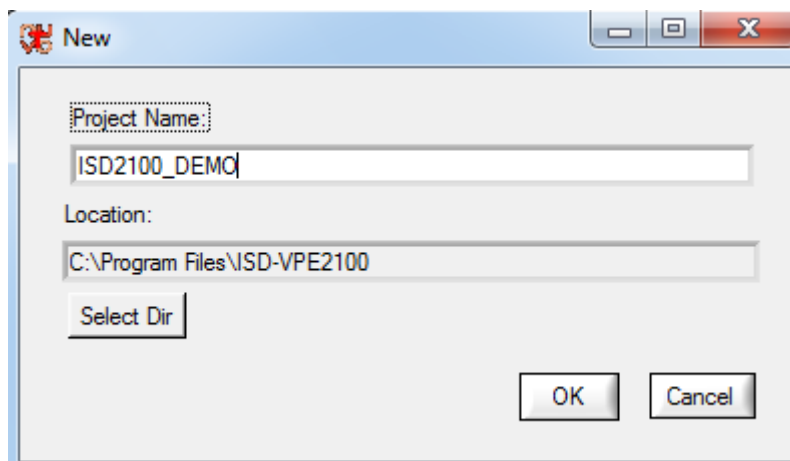


2.2 Hướng dẫn tạo project mới

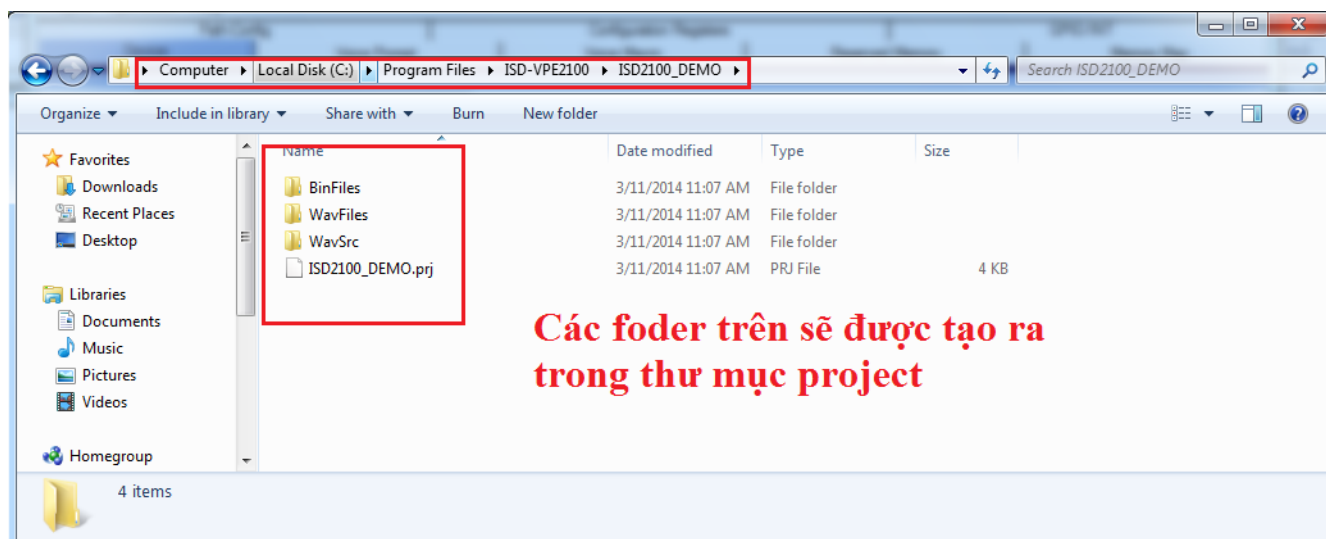
Chọn *Project* -> *New*



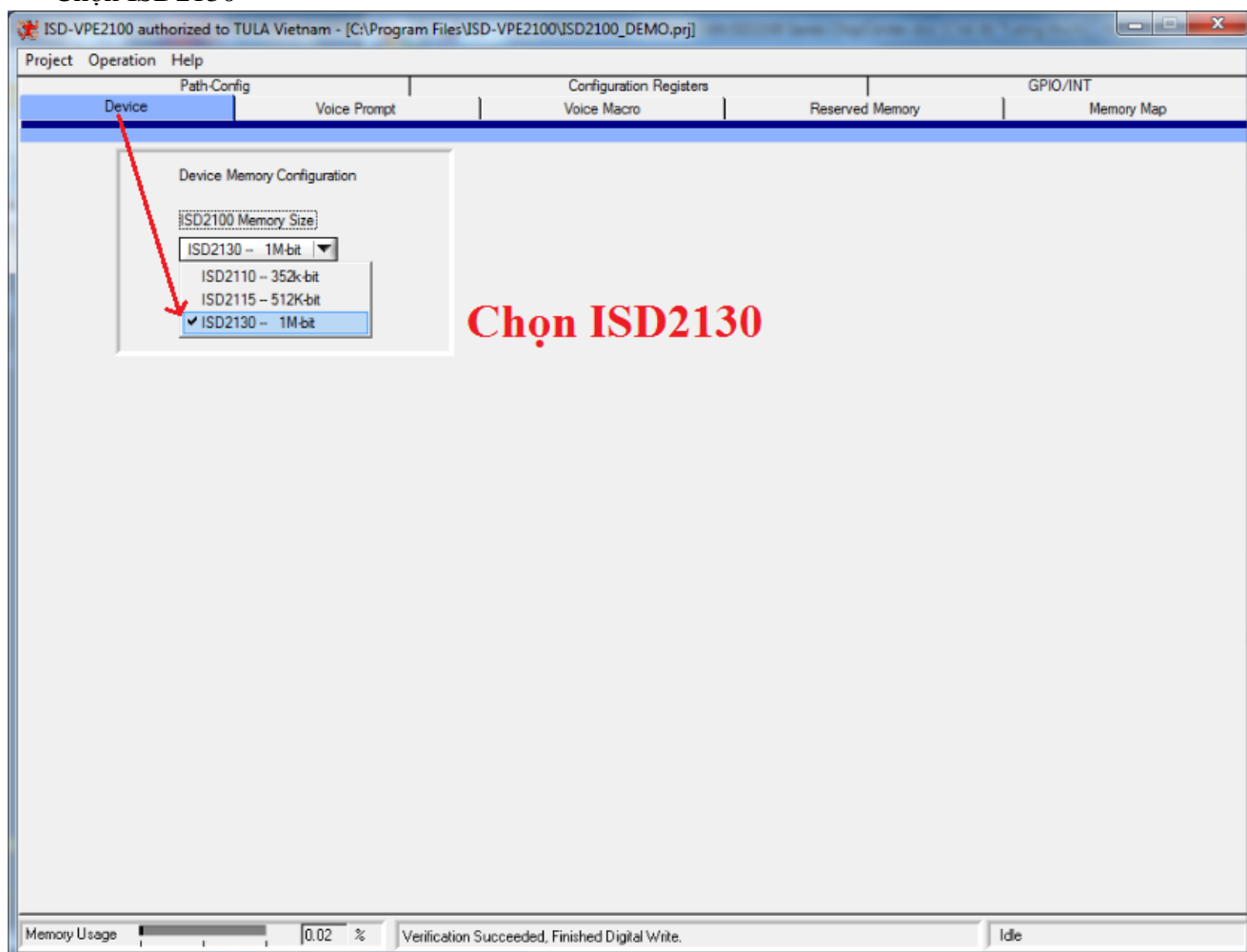
Đặt tên project



Sau khi lưu project mới, trong thư cài đặt sẽ tự động tạo ra các folder sau:

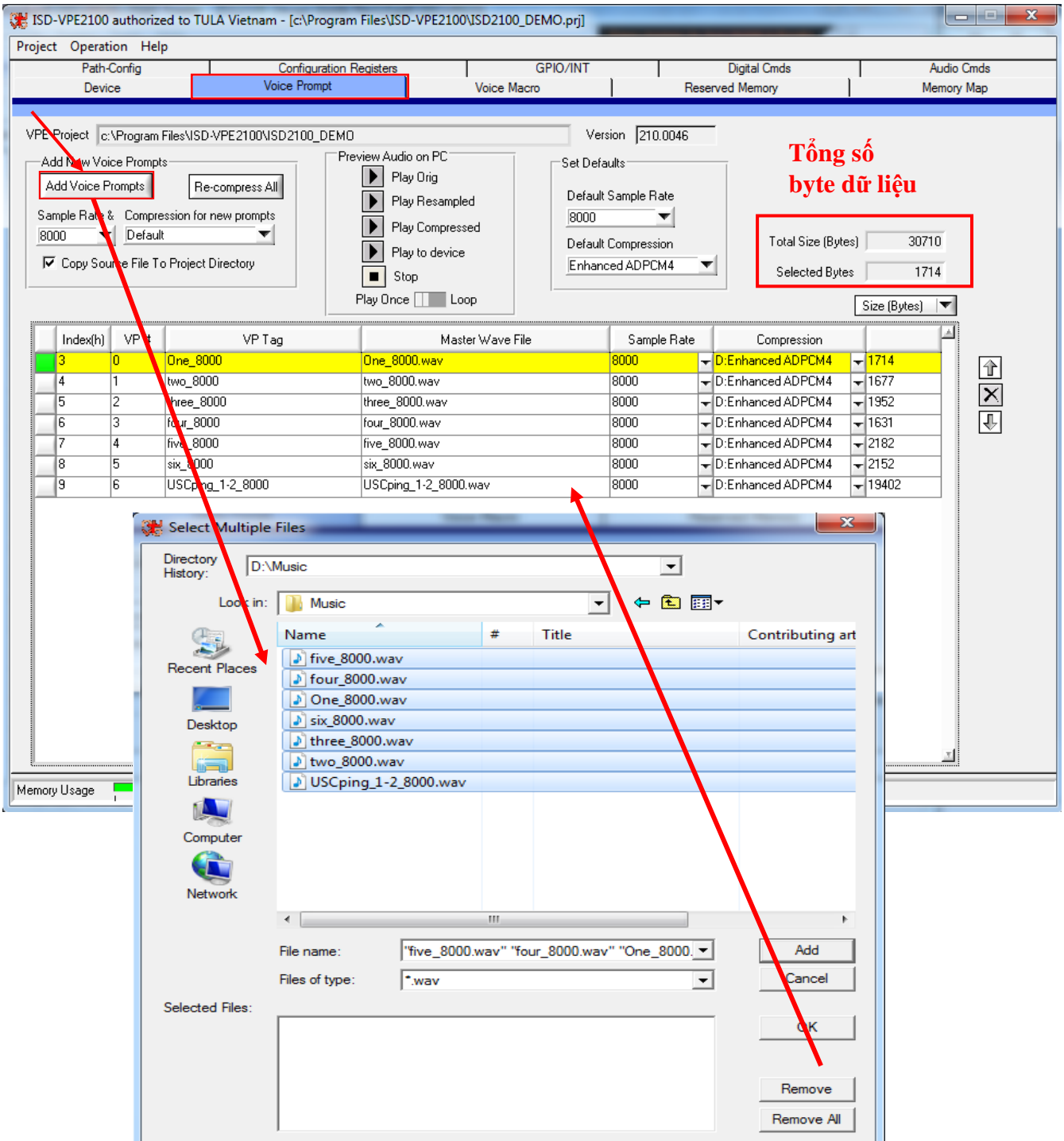


Chọn ISD2130



Trên tab **Voice Prompt**

- Click vào nút **Add Voice Prompts** để thêm file nhạc
- Lựa chọn tần số lấy mẫu và thuật toán nén



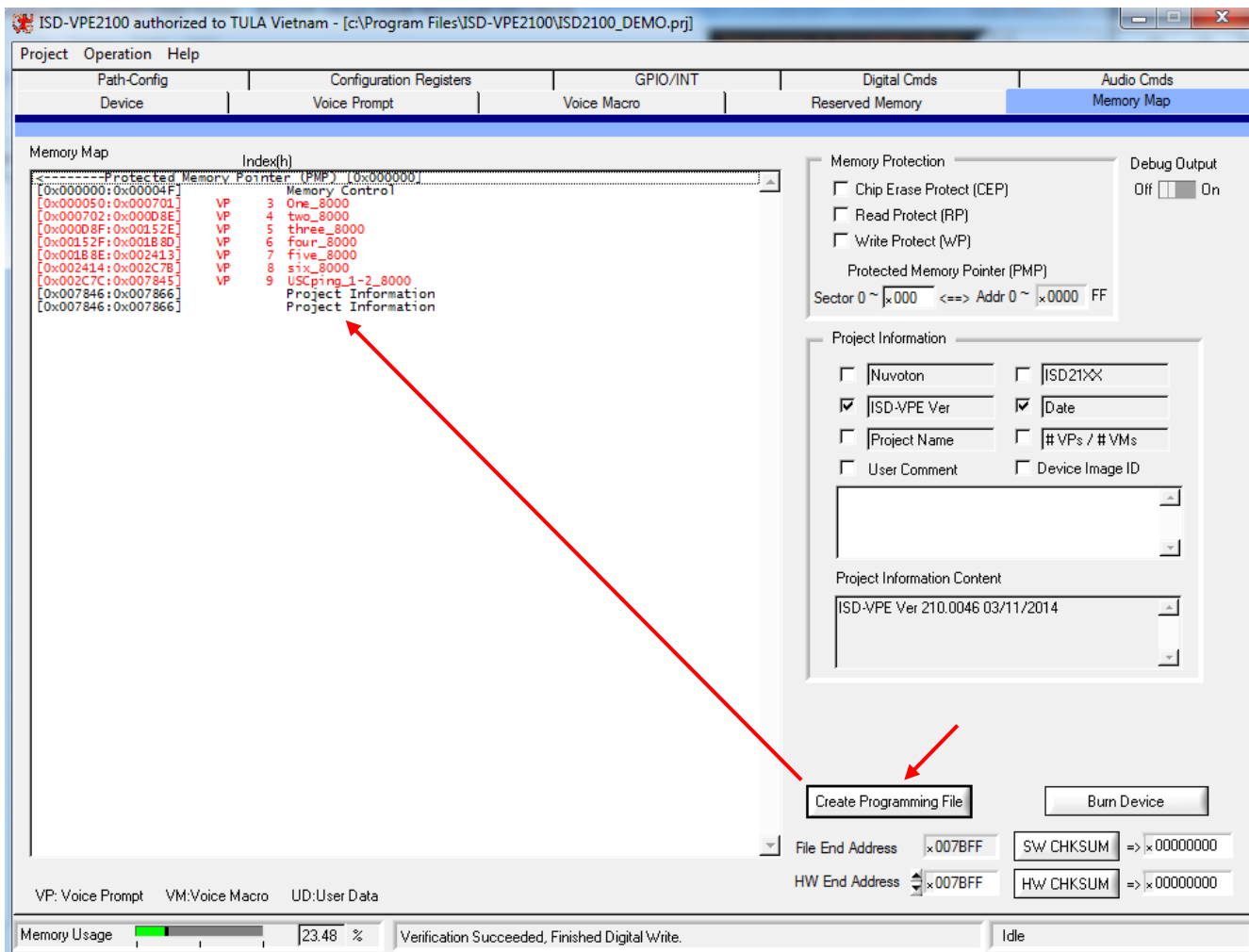
Tổng số byte dữ liệu

Index(h)	VP #	VP Tag	Master Wave File	Sample Rate	Compression	Size (Bytes)
3	0	One_8000	One_8000.wav	8000	D:Enhanced ADPCM4	1714
4	1	two_8000	two_8000.wav	8000	D:Enhanced ADPCM4	1677
5	2	three_8000	three_8000.wav	8000	D:Enhanced ADPCM4	1952
6	3	four_8000	four_8000.wav	8000	D:Enhanced ADPCM4	1631
7	4	five_8000	five_8000.wav	8000	D:Enhanced ADPCM4	2182
8	5	six_8000	six_8000.wav	8000	D:Enhanced ADPCM4	2152
9	6	USCping_1-2_8000	USCping_1-2_8000.wav	8000	D:Enhanced ADPCM4	19402

File name: "five_8000.wav" "four_8000.wav" "One_8000..."
Files of type: *.wav

Chuyển qua tab Memory Map

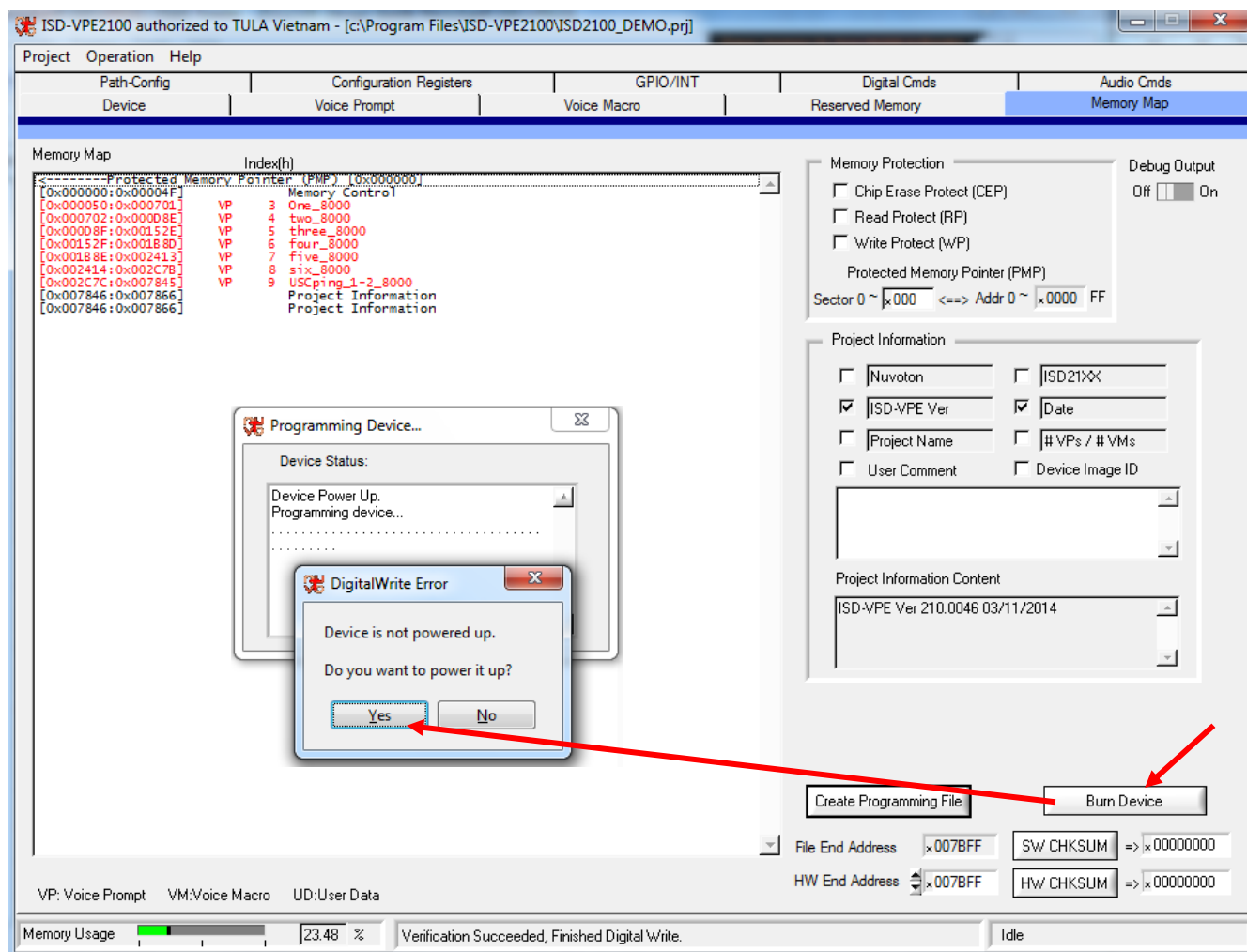
- Click vào nút **Create Programming File** để tạo file dữ liệu nạp xuống chip



The screenshot shows the ISD2100 programming software interface. The 'Memory Map' tab is selected, displaying a list of memory addresses and their corresponding indices. A red arrow points from the 'Create Programming File' button in the bottom right corner to the 'Project Information' section of the Memory Map. The 'Project Information' section includes fields for 'Nuvoton', 'ISD21XX', 'ISD-VPE Ver', 'Date', 'Project Name', '# VPs / # VMs', 'User Comment', and 'Device Image ID'. The 'Create Programming File' button is highlighted with a red arrow.

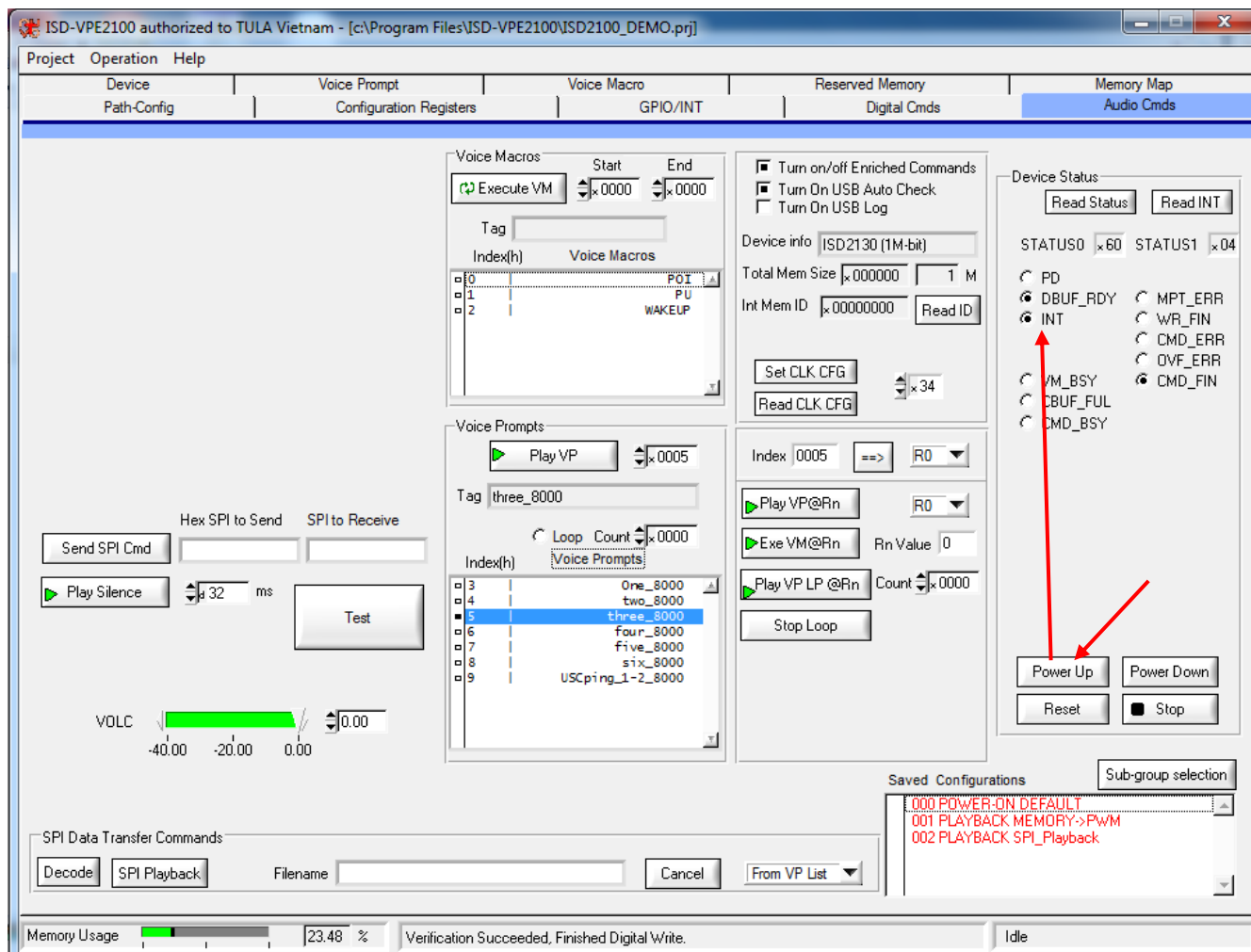
Address	Index(h)	Label
[0x000000:0x00004F]		Protected Memory Pointer (PMP) [0x000000]
[0x000050:0x00004F]		Memory Control
[0x000050:0x000701]	3	one_8000
[0x000702:0x00008E]	4	two_8000
[0x00008F:0x00152E]	5	three_8000
[0x00152F:0x00188D]	6	four_8000
[0x00188E:0x002413]	7	five_8000
[0x002414:0x002C7B]	8	six_8000
[0x002C7C:0x007845]	9	USCping_1~2_8000
[0x007846:0x007866]		Project Information
[0x007846:0x007866]		Project Information

- Click vào nút **Burn Device** để nạp xuống chip ISD21XX



Sau khi nạp dữ liệu xuống chip. Có thể điều khiển phát các Voice Prompts và Voice Macro trực tiếp từ phần mềm ISD-VPE2100 theo các bước sau:

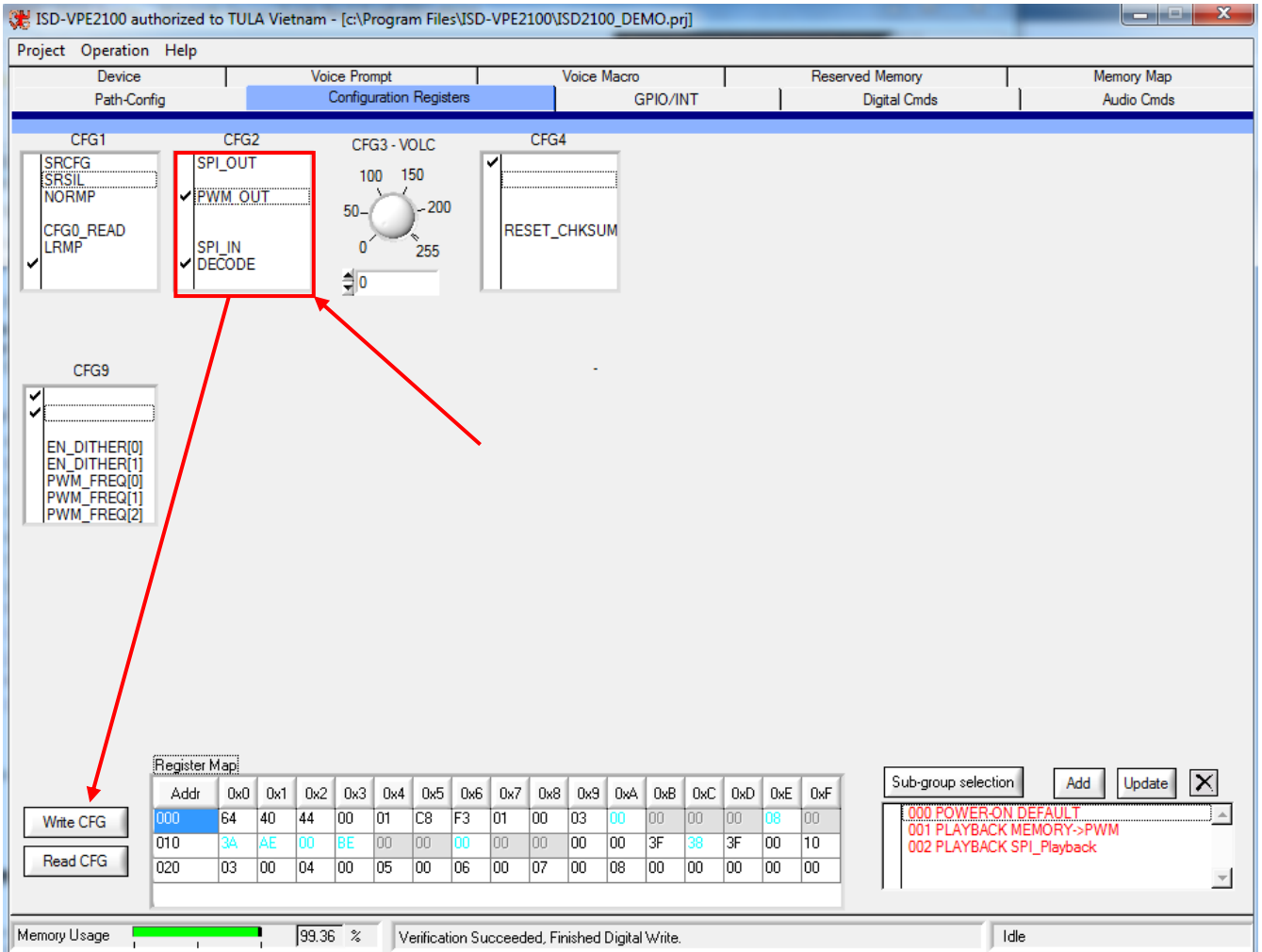
_ Tại tab **Audio Cmds**, nhấn nút **Power Up** để ISD2130 chuyển sang chế độ hoạt động



The screenshot shows the ISD-VPE2100 software interface with the 'Audio Cmds' tab selected. The interface is divided into several sections:

- Project Operation Help:** Includes tabs for Device, Voice Prompt, Voice Macro, Reserved Memory, and Memory Map. The 'Audio Cmds' sub-tab is active.
- Voice Macros:** Contains an 'Execute VM' button, 'Start' and 'End' fields (both set to x0000), a 'Tag' field, and a table of Voice Macros with columns for Index(h) and Voice Macros.
- Voice Prompts:** Features a 'Play VP' button, 'Tag' field (set to 'three_8000'), 'Loop Count' (x0000), and a table of Voice Prompts with columns for Index(h) and Voice Prompts.
- Device Status:** Includes 'Read Status' and 'Read INT' buttons, 'STATUS0' (x60) and 'STATUS1' (x04) fields, and a list of status indicators: PD, DBUF_RDY, INT, VM_BSY, CBUF_FUL, CMD_BSY, MPT_ERR, WR_FIN, CMD_ERR, OVF_ERR, and CMD_FIN. A red arrow points to the 'Power Up' button below this section.
- Saved Configurations:** A list of configurations including '000 POWER-ON DEFAULT', '001 PLAYBACK MEMORY->PWM', and '002 PLAYBACK SPI_Playback'.
- Bottom Bar:** Shows 'Memory Usage' at 23.48%, 'Verification Succeeded, Finished Digital Write.', and 'Idle'.

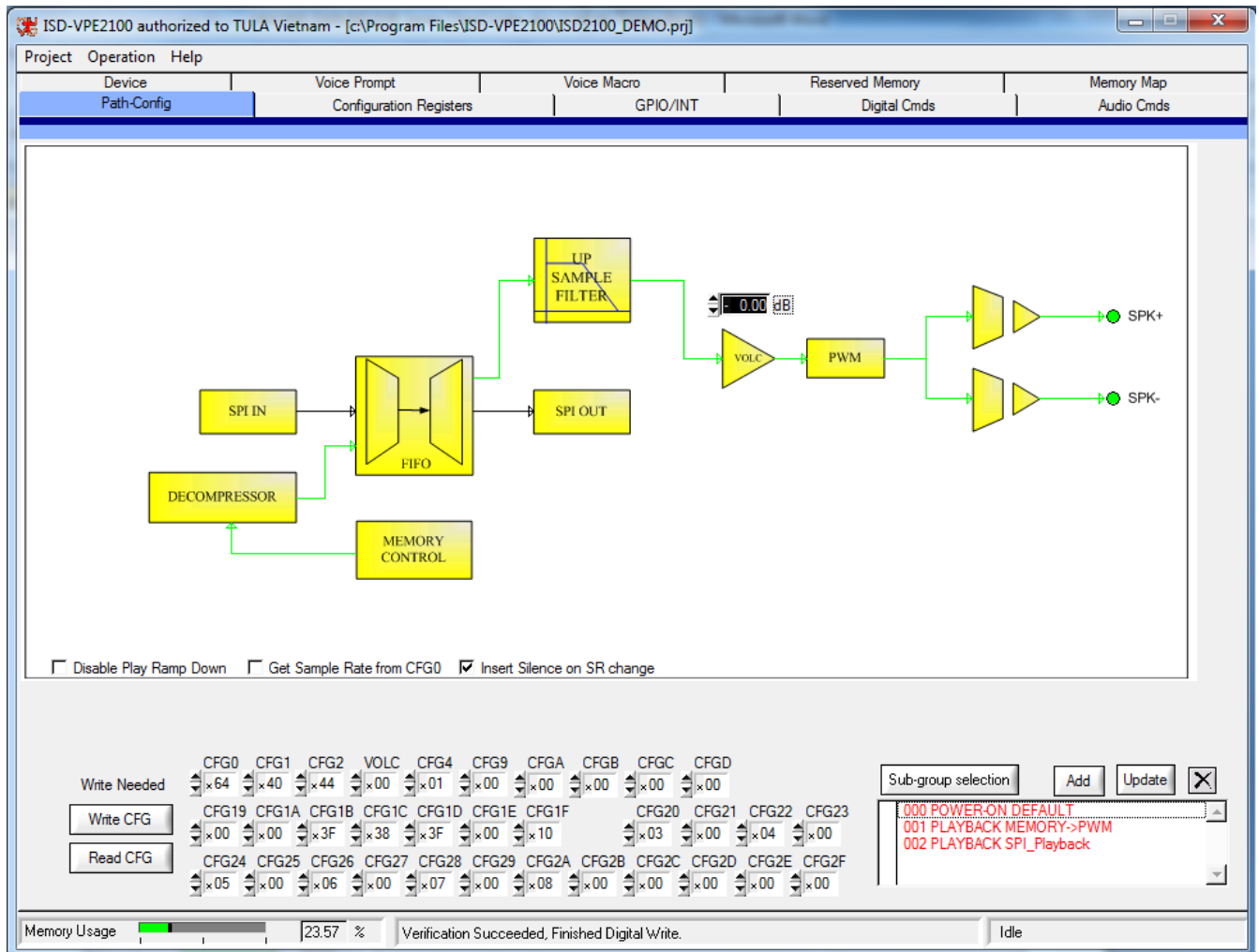
_ Chuyển qua tab **Configuration Registers**, cấu hình như hình dưới sau chọn **Write CFG**



The screenshot shows the 'Configuration Registers' tab in the ISD-VPE2100 software. The 'CFG2' register is selected and highlighted with a red box. A red arrow points from this box to the 'Write CFG' button. The 'Register Map' table is visible at the bottom, and the status bar shows 'Verification Succeeded, Finished Digital Write.'

Addr	0x0	0x1	0x2	0x3	0x4	0x5	0x6	0x7	0x8	0x9	0xA	0xB	0xC	0xD	0xE	0xF
000	64	40	44	00	01	C8	F3	01	00	03	00	00	00	00	08	00
010	3A	AE	00	BE	00	00	00	00	00	00	00	3F	38	3F	00	10
020	03	00	04	00	05	00	06	00	07	00	08	00	00	00	00	00

_ Chuyển qua tab **Path-Config** sẽ thấy trực quan đường tín hiệu nhạc



ISD-VPE2100 authorized to TULA Vietnam - [c:\Program Files\ISD-VPE2100\ISD2100_DEMO.prj]

Project Operation Help

Device Path-Config Voice Prompt Configuration Registers Voice Macro GPIO/INT Reserved Memory Digital Cmds Memory Map Audio Cmds

Diagram components: SPI IN, DECOMPRESSOR, MEMORY CONTROL, FIFO, SPI OUT, UP SAMPLE FILTER, VOLC (0.00 dB), PWM, SPK+, SPK-

Disable Play Ramp Down
 Get Sample Rate from CFG0
 Insert Silence on SR change

Write Needed	CFG0	CFG1	CFG2	VOLC	CFG4	CFG9	CFGA	CFGB	CFGC	CFGD		
	x64	x40	x44	x00	x01	x00	x00	x00	x00	x00		
Write CFG	CFG19	CFG1A	CFG1B	CFG1C	CFG1D	CFG1E	CFG1F	CFG20	CFG21	CFG22	CFG23	
	x00	x00	x3F	x38	x3F	x00	x10	x03	x00	x04	x00	
Read CFG	CFG24	CFG25	CFG26	CFG27	CFG28	CFG29	CFG2A	CFG2B	CFG2C	CFG2D	CFG2E	CFG2F
	x05	x00	x06	x00	x07	x00	x08	x00	x00	x00	x00	x00

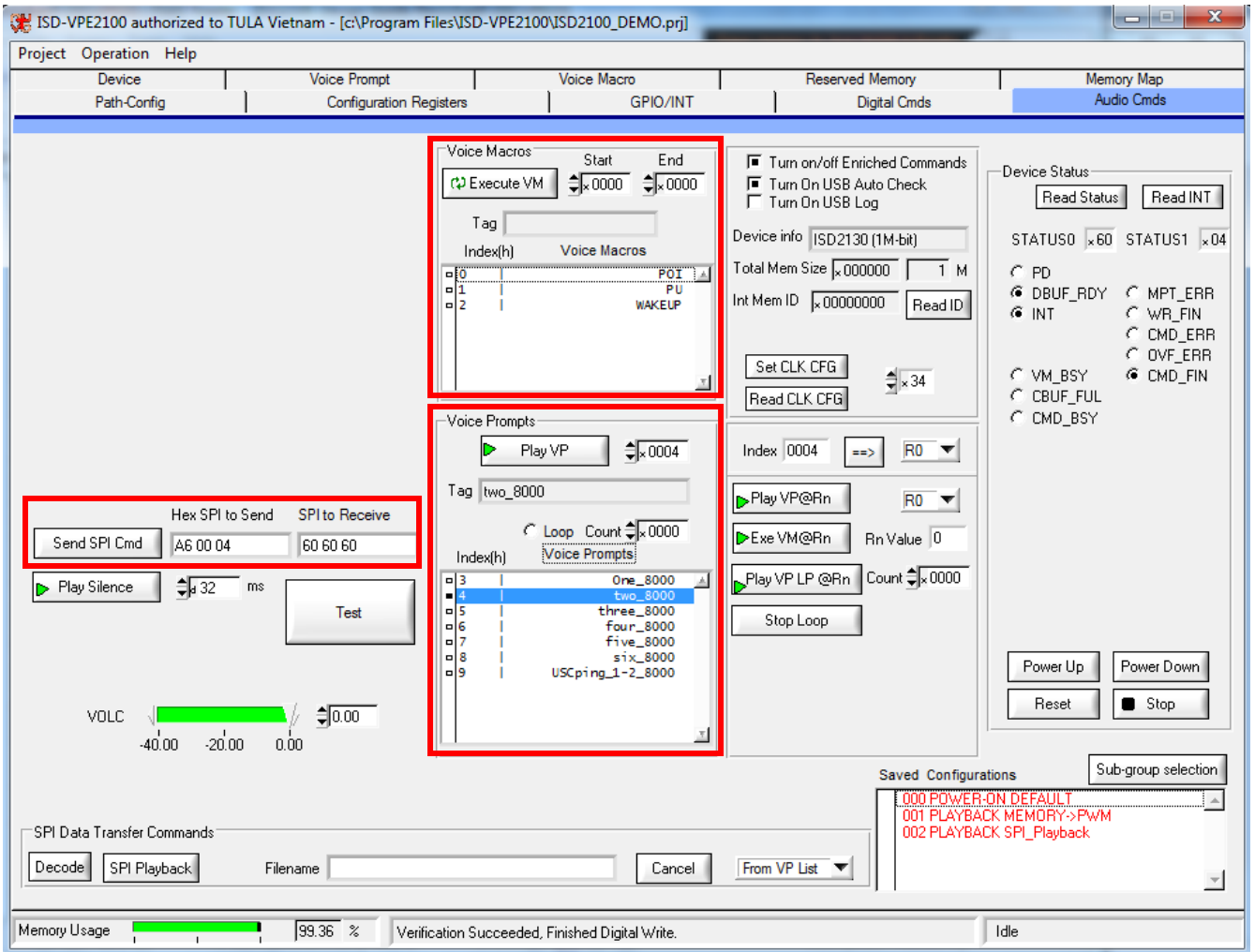
Sub-group selection: Add Update X

- 000 POWER-ON DEFAULT
- 001 PLAYBACK MEMORY->PWM
- 002 PLAYBACK SPI_Playback

Memory Usage: 23.57% Verification Succeeded, Finished Digital Write. Idle

Chuyển qua tab **Audio Cmds**

Tại đây, có thể điều khiển phát các Voice Macros, Voice Prompts hoặc gửi lệnh SPI(các lệnh như trong bảng giao tiếp SPI của ISD21XX)... để phát dữ liệu nhạc vừa nạp xuống ISD2130.




The screenshot shows the ISD-VPE2100 software interface with the 'Audio Cmds' tab selected. Key features include:

- Voice Macros:** A table with columns for Index(h), Voice Macros, and Start/End. A red box highlights the 'Execute VM' button and the table.
- Voice Prompts:** A list of prompts with a red box highlighting the list and the 'Play VP' button.
- SPI Data Transfer Commands:** A section with 'Send SPI Cmd' and 'SPI to Receive' fields, highlighted with a red box.
- Device Status:** A section with 'Read Status' and 'Read INT' buttons, and a list of status indicators.
- Memory Usage:** A bar chart showing 99.36% usage.

Tạo các Voice Macros

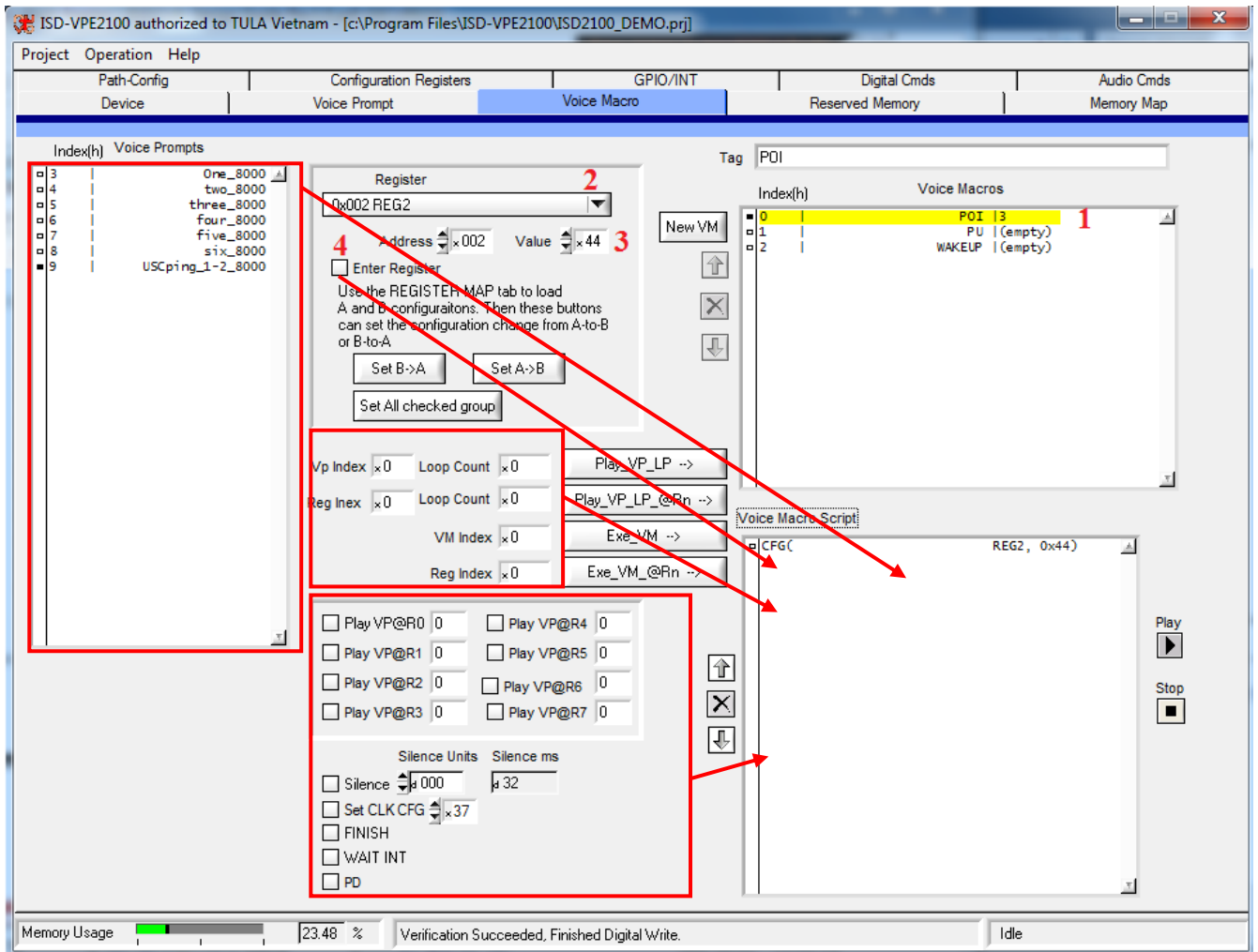
ISD2100 Series có 3 Voice Macros mặc định:

- Index 0: Power-On Initialization (POI)
- Index 1: Power-Up (PU)
- Index 1: GPIO-Wakeup (WAKEUP)

Muốn thêm các Voice Macro mới, nhấn nút **New VM** 

Để tạo Voice Macro Script cho mỗi Voice Macro. Thực hiện theo các bước sau

1. Lựa chọn Voice Macro muốn thêm Macro Script
2. Lựa chọn Register
3. Đặt giá trị Value
4. Nhấn nút Enter Register để thêm vào Voice Macro Script ..
5. Thêm các Voice Prompts, Voice Macros...
6. Thêm các lệnh Silence, FINISH, WAIT INT, PD....



The screenshot shows the 'Voice Macro' configuration window. On the left, a list of 'Voice Prompts' is shown. In the center, the 'Register' dropdown is set to '0x002 REG2', and the 'Value' is set to '44'. The 'Enter Register' button is highlighted with a red box and arrow. On the right, the 'Voice Macros' list shows 'POI 3' selected. Below the register settings, there are buttons for 'Play VP_LP', 'Play VP_LP_@Rn', 'Exe_VM', and 'Exe_VM_@Rn'. At the bottom, there are checkboxes for 'Play VP@R0' through 'Play VP@R7', and a 'Silence' section with 'Silence Units' set to 1000 and 'Silence ms' set to 32. The 'Voice Macro Script' area at the bottom right shows the command 'CFG(REG2, 0x44)'. The status bar at the bottom indicates 'Memory Usage 23.48 %' and 'Verification Succeeded, Finished Digital Write. Idle'.



Chuyển qua tab Memory Map

- Click vào nút **Create Programming File** để tạo file dữ liệu mới

The screenshot shows the ISD2100 software interface with the 'Memory Map' tab selected. The interface includes a menu bar (Project, Operation, Help), a toolbar (Path-Config, Configuration Registers, GPIO/INT, Digital Cmds, Audio Cmds), and a main workspace. The workspace is divided into a 'Memory Map' table and a 'Project Information' panel. The 'Memory Map' table lists memory addresses and their corresponding indices (Index(h)). The 'Project Information' panel contains various settings and a 'Create Programming File' button. A red arrow points from the 'Create Programming File' button to the 'Project Information' panel.

Memory Map	Index(h)
[0x000000:0x000073]	Memory Control
[0x000074:0x000725]	VP 9 One_8000
[0x000726:0x000D82]	VP A two_8000
[0x000D83:0x001552]	VP B three_8000
[0x001553:0x0018B1]	VP C four_8000
[0x0018B2:0x002437]	VP D five_8000
[0x002438:0x002C9F]	VP E six_8000
[0x002CA0:0x007869]	VP F USCPing_1-2_8000
[0x00786A:0x00788B]	VM 0 PO1
[0x00788C:0x007892]	VM 2 WAKEUP
[0x007893:0x007896]	VM 3 VM3
[0x007897:0x00789A]	VM 4 VM4
[0x00789B:0x00789E]	VM 5 VM5
[0x00789F:0x0078A2]	VM 6 VM6
[0x0078A3:0x0078A6]	VM 7 VM7
[0x0078A7:0x0078AA]	VM 8 VM8
[0x0078AB:0x0078CB]	Project Information
[0x0078AC:0x0078CB]	Project Information

Project Information

Nuvoton ISD21XX

ISD-VPE Ver Date

Project Name # VPs / # VMs

User Comment Device Image ID

Project Information Content

ISD-VPE Ver 210.0046 03/11/2014

Create Programming File Burn Device

File End Address x007BFF SW CHKSUM => x00000000

HW End Address x01FFFF HW CHKSUM => x00000000

VP: Voice Prompt VM: Voice Macro UD: User Data

Memory Usage [Progress Bar] 99.36 % Verification Succeeded, Finished Digital Write. Idle

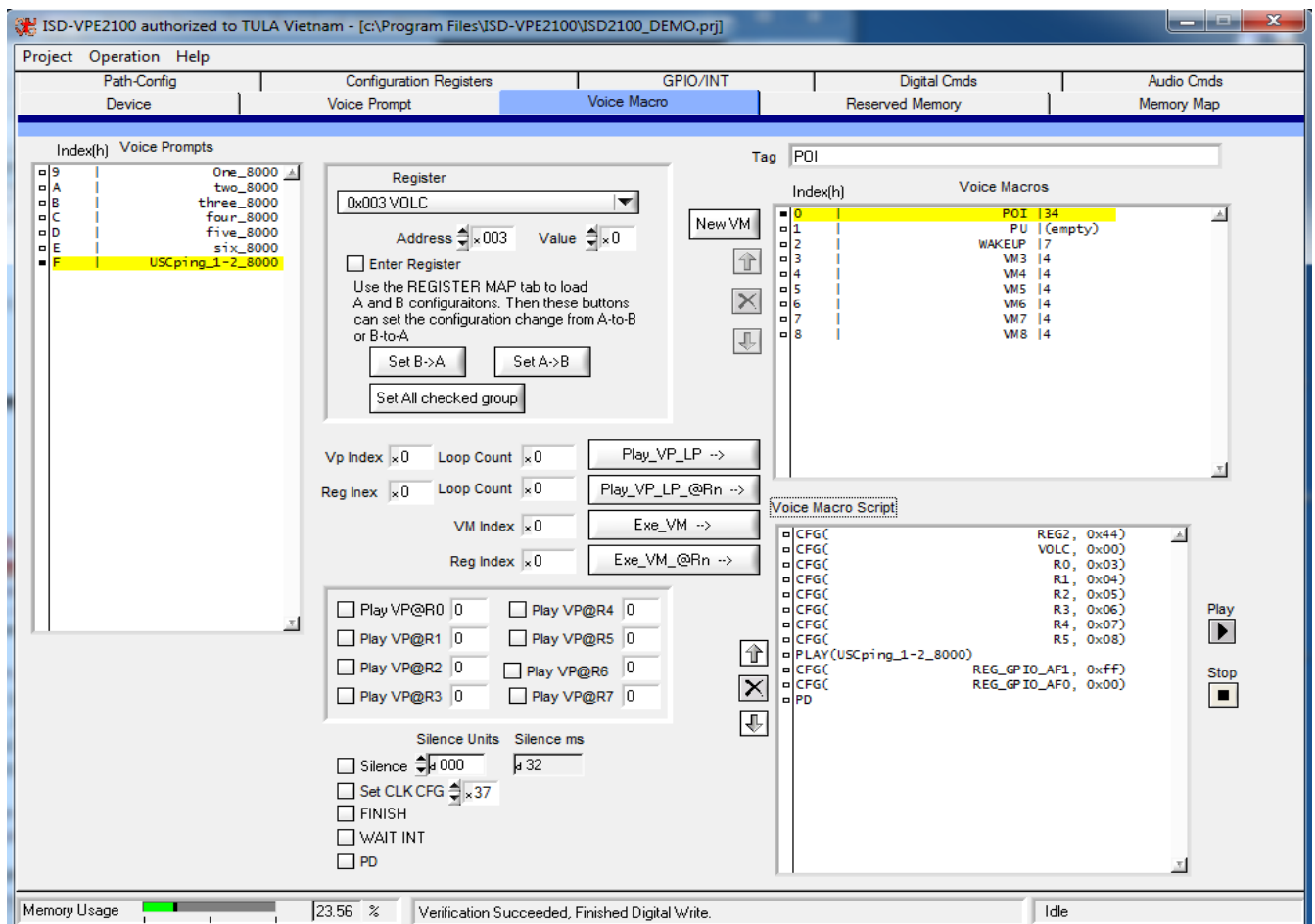
3. Các ví dụ mẫu

3.1 Ví dụ 1 (Mỗi GPIO điều khiển 1 macro script, điều khiển theo sườn)

Cấu hình các nút nhấn GPIO. Mỗi nút điều khiển một macro script. Nhấn nhà để hoạt kích hoạt.
Như hướng dẫn ở trên. Cấu hình các Voice macro như sau:

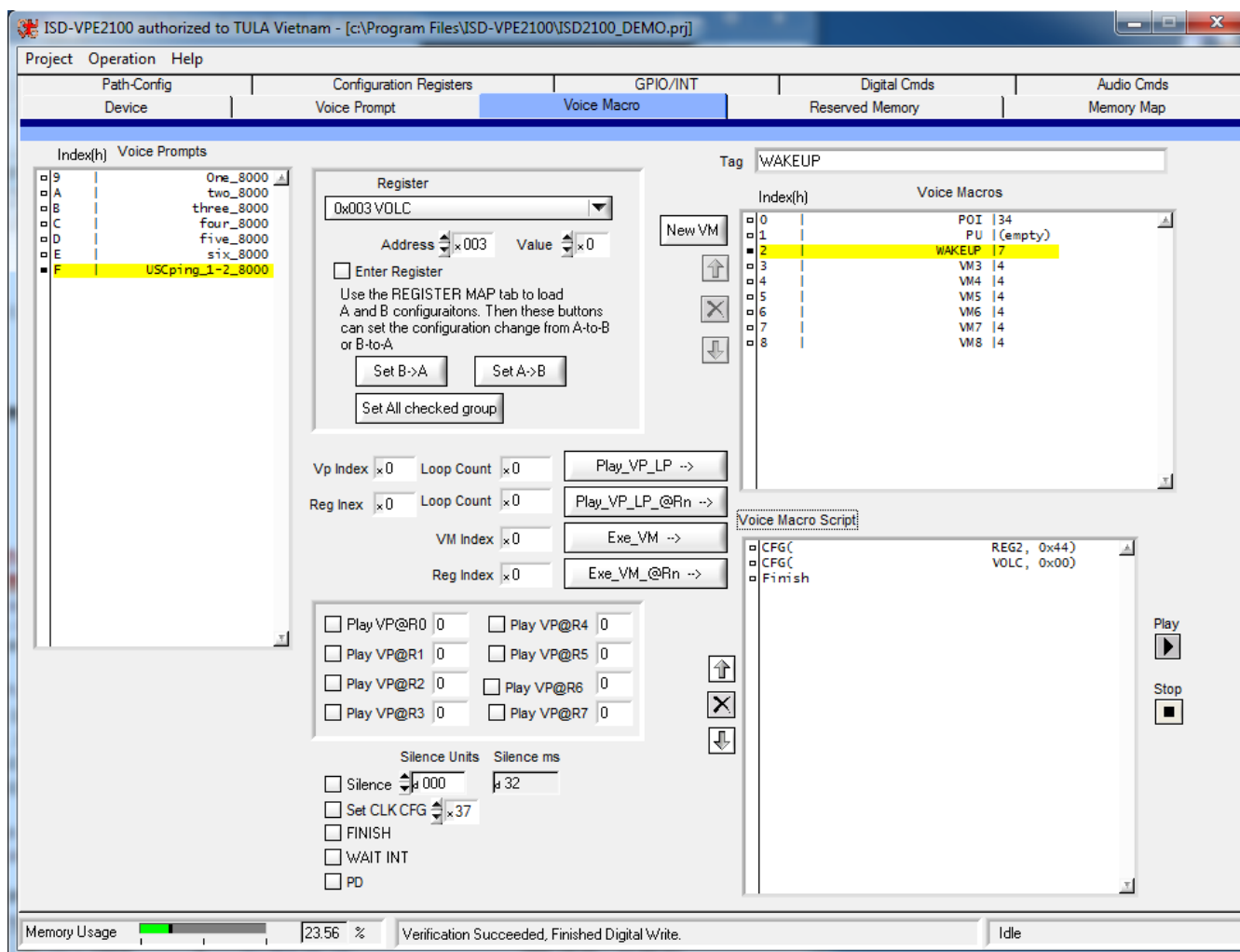
POI Voice macro

- CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- CFG(R0, 0x03) ; GPIO0 trigger Voice macro 3
- CFG(R1, 0x04) ; GPIO1 trigger Voice macro 4
- CFG(R2, 0x05) ; GPIO2 trigger Voice macro 5
- CFG(R3, 0x06) ; GPIO3 trigger Voice macro 6
- CFG(R4, 0x07) ; GPIO4 trigger Voice macro 7
- CFG(R5, 0x08) ; GPIO5 trigger Voice macro 8
- PLAY(USCping_1-2_8000) ; Play Voice Prompt
- CFG(REG_GPIO_AF1, 0xff) ; Cấu hình các chân GPIO là chân vào/ra, trigger sườn lên
- CFG(REG_GPIO_AF0, 0x00)
- PD ; Power Down



WAKEUP Voice macro

- CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- Finish





VM3 Voice macro

- a. PLAY(One_8000) ; Play Voice Prompt
- b. PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing a list of macros (Index(h) and Voice Macros) and a script editor. The script contains the following commands:

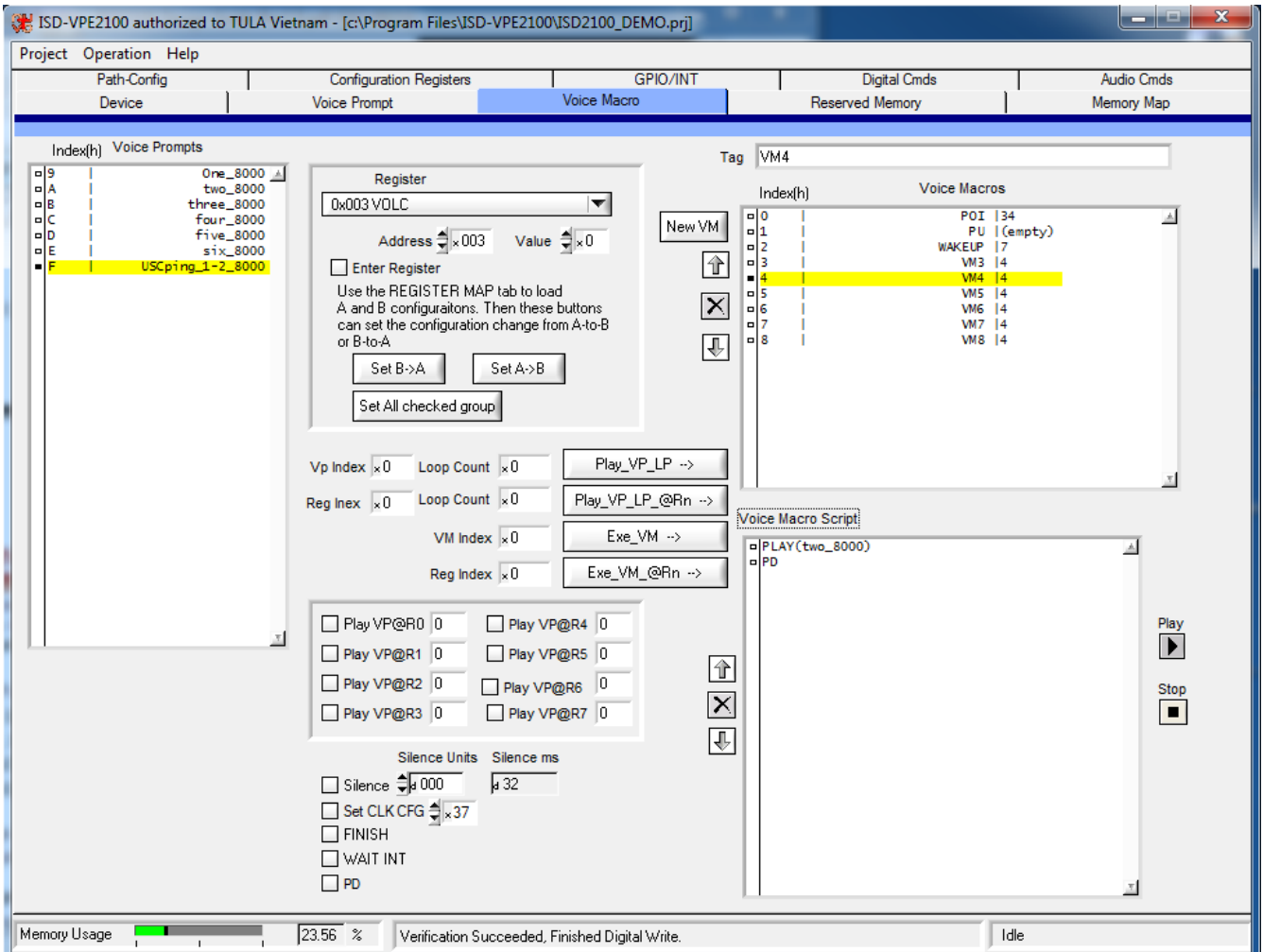
```

PLAY(One_8000)
PD
    
```

The status bar at the bottom indicates: Memory Usage 23.56 %, Verification Succeeded, Finished Digital Write. Idle

VM4 Voice macro

- PLAY(two_8000) ; Play Voice Prompt
- PD



ISD-VPE2100 authorized to TULA Vietnam - [c:\Program Files\USD-VPE2100\USD2100_DEMO.prj]

Project Operation Help

Path-Config Configuration Registers GPIO/INT Digital Cmds Audio Cmds
Device Voice Prompt Voice Macro Reserved Memory Memory Map

Index(h) Voice Prompts

9	One_8000
A	two_8000
B	three_8000
C	four_8000
D	five_8000
E	six_8000
F	USCping_1-2_8000

Register: 0x003 VOLC
Address: x003 Value: x0
 Enter Register
Use the REGISTER MAP tab to load A and B configurations. Then these buttons can set the configuration change from A-to-B or B-to-A
Set B->A Set A->B
Set All checked group

Vp Index: x0 Loop Count: x0 Play_VP_LP -->
Reg Inex: x0 Loop Count: x0 Play_VP_LP_@Rn -->
VM Index: x0 Exe_VM -->
Reg Index: x0 Exe_VM_@Rn -->

Play VP@R0 0 Play VP@R4 0
 Play VP@R1 0 Play VP@R5 0
 Play VP@R2 0 Play VP@R6 0
 Play VP@R3 0 Play VP@R7 0

Silence Units: 000 Silence ms: 32
 Set CLK CFG: x37
 FINISH
 WAIT INT
 PD

Tag: VM4

Index(h) Voice Macros

0	POI	34
1	PU	(empty)
2	WAKEUP	17
3	VM3	14
4	VM4	14
5	VM5	14
6	VM6	14
7	VM7	14
8	VM8	14

Voice Macro Script:

```
PLAY(two_8000)
PD
```

Play Stop

Memory Usage: 23.56 % Verification Succeeded, Finished Digital Write. Idle



VM5 Voice macro

- a. PLAY(three_8000) ; Play Voice Prompt
- b. PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing the configuration for VM5. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000'. The 'Voice Macros' list on the right shows VM5 with a value of 14. The 'Voice Macro Script' area contains the following commands:

```

PLAY(three_8000)
PD
    
```

The status bar at the bottom indicates 'Memory Usage 23.56 %' and 'Verification Succeeded, Finished Digital Write. Idle'.



VM6 Voice macro

- a. PLAY(four_8000) ; Play Voice Prompt
- b. PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, and the 'VM6' tag is active. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000'. The 'Voice Macros' list on the right shows 'VM6' at index 6. The 'Voice Macro Script' area contains the following commands:

```

PLAY(four_8000)
PD
    
```

The status bar at the bottom indicates 'Memory Usage 23.56 %' and 'Verification Succeeded, Finished Digital Write. Idle'.



VM7 Voice macro

- a. PLAY(five_8000) ; Play Voice Prompt
- b. PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing a list of voice prompts on the left and a list of voice macros on the right. The 'Voice Macro Script' area contains the following commands:

```

PLAY(five_8000)
PD
    
```

The status bar at the bottom indicates 'Verification Succeeded, Finished Digital Write.' and 'Idle'.

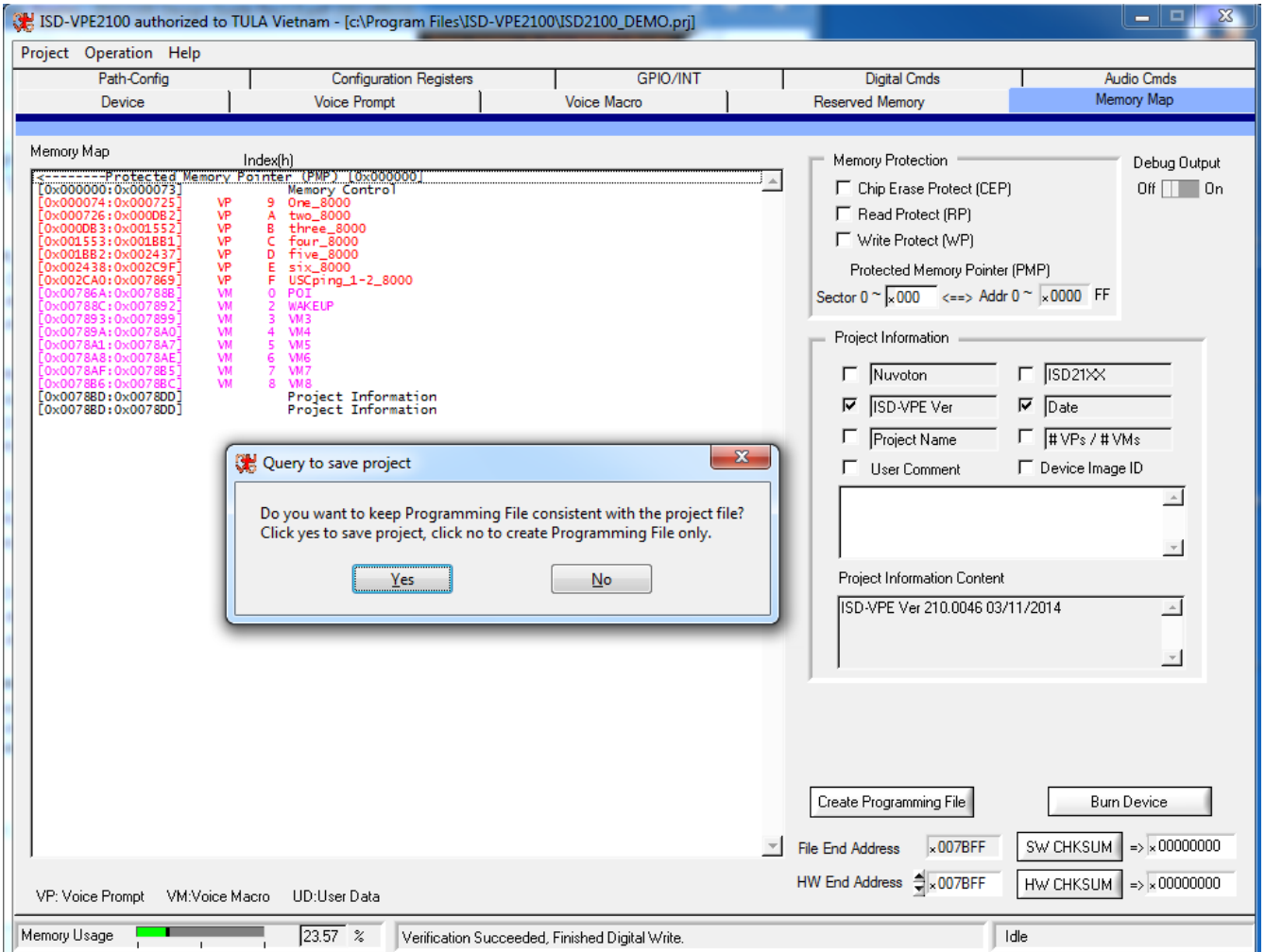


VM8 Voice macro

- a. PLAY(six_8000) ; Play Voice Prompt
- b. PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is active, displaying the configuration for VM8. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000'. The 'Register' section shows '0x003 VOLC' with 'Address' x003 and 'Value' x0. The 'Voice Macros' list on the right shows VM8 at index 8 with a POI of 14. The 'Voice Macro Script' area contains the commands 'PLAY(six_8000)' and 'PD'. The status bar at the bottom indicates 'Verification Succeeded, Finished Digital Write.' and 'Idle'.

Nhấn nút **Create Programming File**.
Sau đó nhấn **Burn Device** để nạp xuống ISD2130



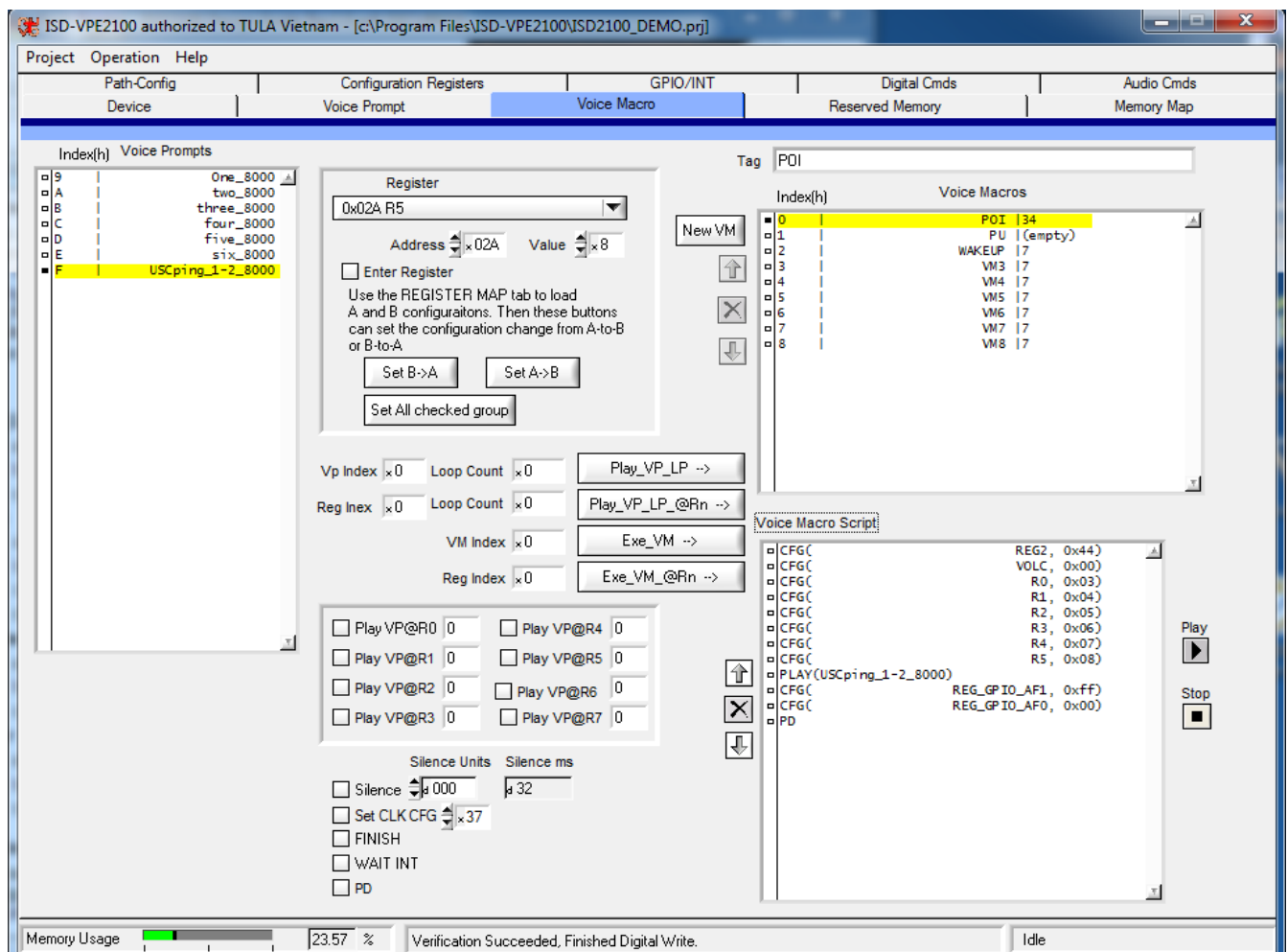
The screenshot displays the ISD-VPE2100 software interface. The main window shows the Memory Map section with a list of memory addresses and their corresponding labels (e.g., VP 9 One_8000, VM 0 POI). A dialog box titled "Query to save project" is overlaid on the screen, asking: "Do you want to keep Programming File consistent with the project file? Click yes to save project, click no to create Programming File only." The dialog has "Yes" and "No" buttons. The background interface includes tabs for Path-Config, Configuration Registers, GPIO/INT, Digital Cmds, and Audio Cmds. The Memory Map tab is active, showing a list of memory addresses and their corresponding labels. The Project Information section on the right includes checkboxes for Nuvoton, ISD21XX, ISD-VPE Ver, Date, Project Name, # VPs / # VMs, User Comment, and Device Image ID. The ISD-VPE Ver and Date checkboxes are checked. The Project Information Content field shows "ISD-VPE Ver 210.0046 03/11/2014". The File End Address and HW End Address fields are both set to x007BFF. The SW CHKSUM and HW CHKSUM fields are both set to => x00000000. The bottom status bar shows "Memory Usage" at 23.57%, "Verification Succeeded, Finished Digital Write.", and "Idle".

3.2 Ví dụ 2 (Một GPIO điều khiển nhiều macro script)

Sử dụng 1 phím GPIO5 điều khiển nhiều tuần tự nhiều Voice macro
Cấu hình các Voice macro như sau:

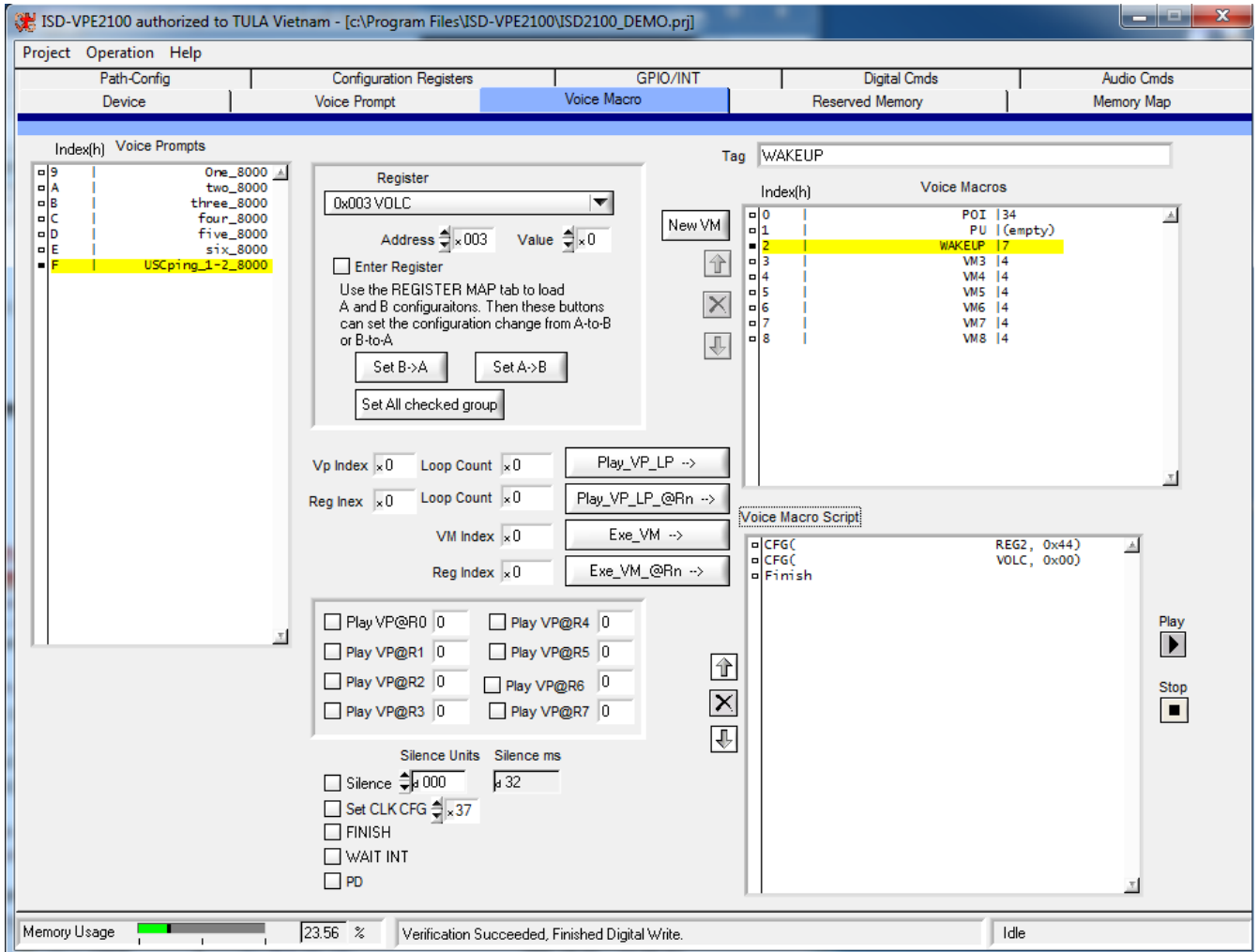
POI Voice macro

- a. CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- b. CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- c. CFG(R0, 0x03) ; GPIO0 trigger Voice macro 3
- d. CFG(R1, 0x04) ; GPIO1 trigger Voice macro 4
- e. CFG(R2, 0x05) ; GPIO2 trigger Voice macro 5
- f. CFG(R3, 0x06) ; GPIO3 trigger Voice macro 6
- g. CFG(R4, 0x07) ; GPIO4 trigger Voice macro 7
- h. CFG(R5, 0x08) ; GPIO5 trigger Voice macro 8
- i. PLAY(USCping_1-2_8000) ; Play Voice Prompt
- j. CFG(REG_GPIO_AF1, 0xff) ; Cấu hình các chân GPIO là chân vào/ra, trigger sườn lên
- k. CFG(REG_GPIO_AF0, 0x00)
- l. PD ; Power Down



WAKEUP Voice macro

- CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- Finish



The screenshot shows the ISD-VPE2100 software interface with the 'Voice Macro' tab selected. The 'Tag' is set to 'WAKEUP'. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000'. The 'Register' section shows '0x003 VOLC' with 'Address' x003 and 'Value' x0. The 'Voice Macros' list on the right shows the macro configuration:

Index(h)	Macro Name	Value
0	POI	34
1	PU	(empty)
2	WAKEUP	17
3	VM3	14
4	VM4	14
5	VM5	14
6	VM6	14
7	VM7	14
8	VM8	14

The 'Voice Macro Script' section shows the following configuration:

- CFG(REG2, 0x44)
- CFG(VOLC, 0x00)
- Finish

At the bottom, the status bar indicates 'Memory Usage 23.56 %' and 'Verification Succeeded, Finished Digital Write. Idle'.



VM3 Voice macro

- CFG(R5, 0x04) ; GPIO5 trigger Voice macro 4
- PLAY(One_8000) ; Play Voice Prompt
- PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing a list of macros on the right and a script editor at the bottom. The script for VM3 is as follows:

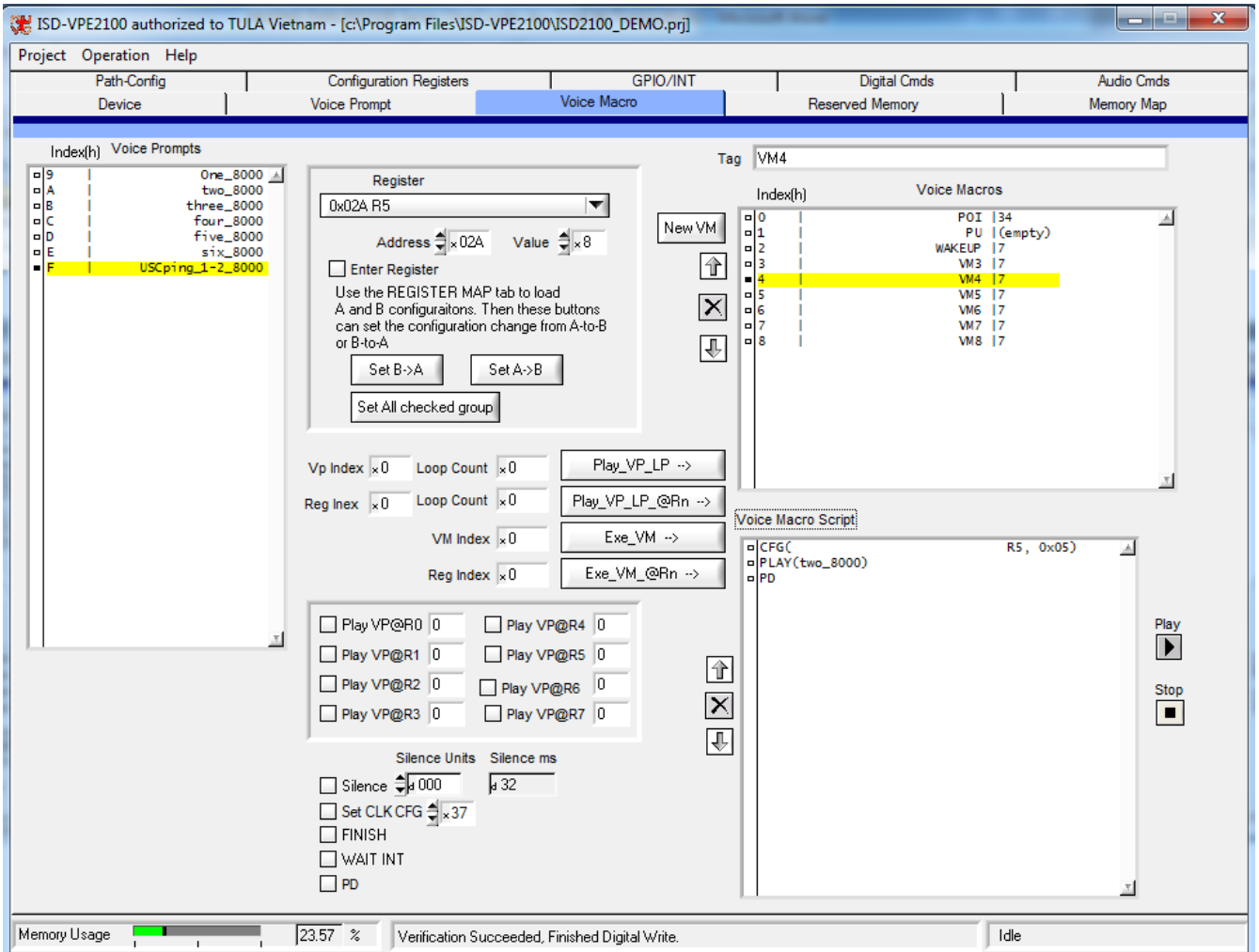
```

CFG(R5, 0x04)
PLAY(One_8000)
PD
    
```

The interface also includes a 'Register' section with a dropdown menu set to '0x02A R5', and various control buttons like 'Play_VP_LP -->', 'Exe_VM -->', and 'Play'.

VM4 Voice macro

- CFG(R5, 0x05) ; GPIO5 trigger Voice macro 5
- PLAY(two_8000) ; Play Voice Prompt
- PD



The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, and the 'VM4' tag is active. The 'Voice Macros' list on the right shows VM4 at index 4. The 'Voice Macro Script' editor contains the following commands:

```
CFG(R5, 0x05)
PLAY(two_8000)
PD
```

The 'Register' section shows the address 0x02A R5. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000' at index F. The 'Play' button is visible on the right side of the script editor.



VM5 Voice macro

- CFG(R5, 0x06) ; GPIO5 trigger Voice macro 6
- PLAY(three_8000) ; Play Voice Prompt
- PD

The screenshot shows the ISD-VPE2100 software interface with the 'Voice Macro' tab selected. The 'Register' dropdown is set to '0x02A R5'. The 'Voice Prompts' list on the left has 'USCping_1-2_8000' selected. The 'Voice Macros' list on the right shows VM5 at index 5. The 'Voice Macro Script' window contains the following code:

```
CFG(R5, 0x06)
PLAY(three_8000)
PD
```

At the bottom of the interface, the status bar shows 'Memory Usage 23.57 %' and 'Verification Succeeded, Finished Digital Write. Idle'.



VM6 Voice macro

- CFG(R5, 0x07) ; GPIO5 trigger Voice macro 7
- PLAY(four_8000) ; Play Voice Prompt
- PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing a list of macros on the right and configuration options on the left. The 'Voice Macro Script' window displays the following sequence:

```

CFG(R5, 0x07)
PLAY(four_8000)
PD
    
```

The status bar at the bottom indicates 'Memory Usage' at 23.57%, 'Verification Succeeded, Finished Digital Write.', and 'Idle'.



VM7 Voice macro

- CFG(R5, 0x08) ; GPIO5 trigger Voice macro 7
- PLAY(five_8000) ; Play Voice Prompt
- PD

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, showing a list of macros on the right and a configuration panel on the left. The macro list shows VM7 at index 7 with a POI of 17. The configuration panel shows the register set to 0x02A R5 and the macro script containing CFG(R5, 0x08), PLAY(five_8000), and PD.

Index(h)	Macro Name	POI	PU
0	POI	34	
1	PU	(empty)	
2	WAKEUP	17	
3	VM3	17	
4	VM4	17	
5	VM5	17	
6	VM6	17	
7	VM7	17	
8	VM8	17	

Register: 0x02A R5
 Address: x02A Value: x8
 Enter Register
 Use the REGISTER MAP tab to load A and B configurations. Then these buttons can set the configuration change from A-to-B or B-to-A.
 Set B->A Set A->B
 Set All checked group

Vp Index: x0 Loop Count: x0 Play_VP_LP -->
 Reg Inex: x0 Loop Count: x0 Play_VP_LP_@Rn -->
 VM Index: x0 Exe_VM -->
 Reg Index: x0 Exe_VM_@Rn -->

Play VP@R0 0 Play VP@R4 0
 Play VP@R1 0 Play VP@R5 0
 Play VP@R2 0 Play VP@R6 0
 Play VP@R3 0 Play VP@R7 0

Silence Units: 000 Silence ms: 32
 Silence
 Set CLK CFG x37
 FINISH
 WAIT INT
 PD

Voice Macro Script:
 CFG(R5, 0x08)
 PLAY(five_8000)
 PD

Memory Usage: 23.57 % Verification Succeeded, Finished Digital Write. Idle



VM8 Voice macro

- CFG(R5, 0x03) ; GPIO5 trigger Voice macro 3
- PLAY(six_8000) ; Play Voice Prompt
- PD

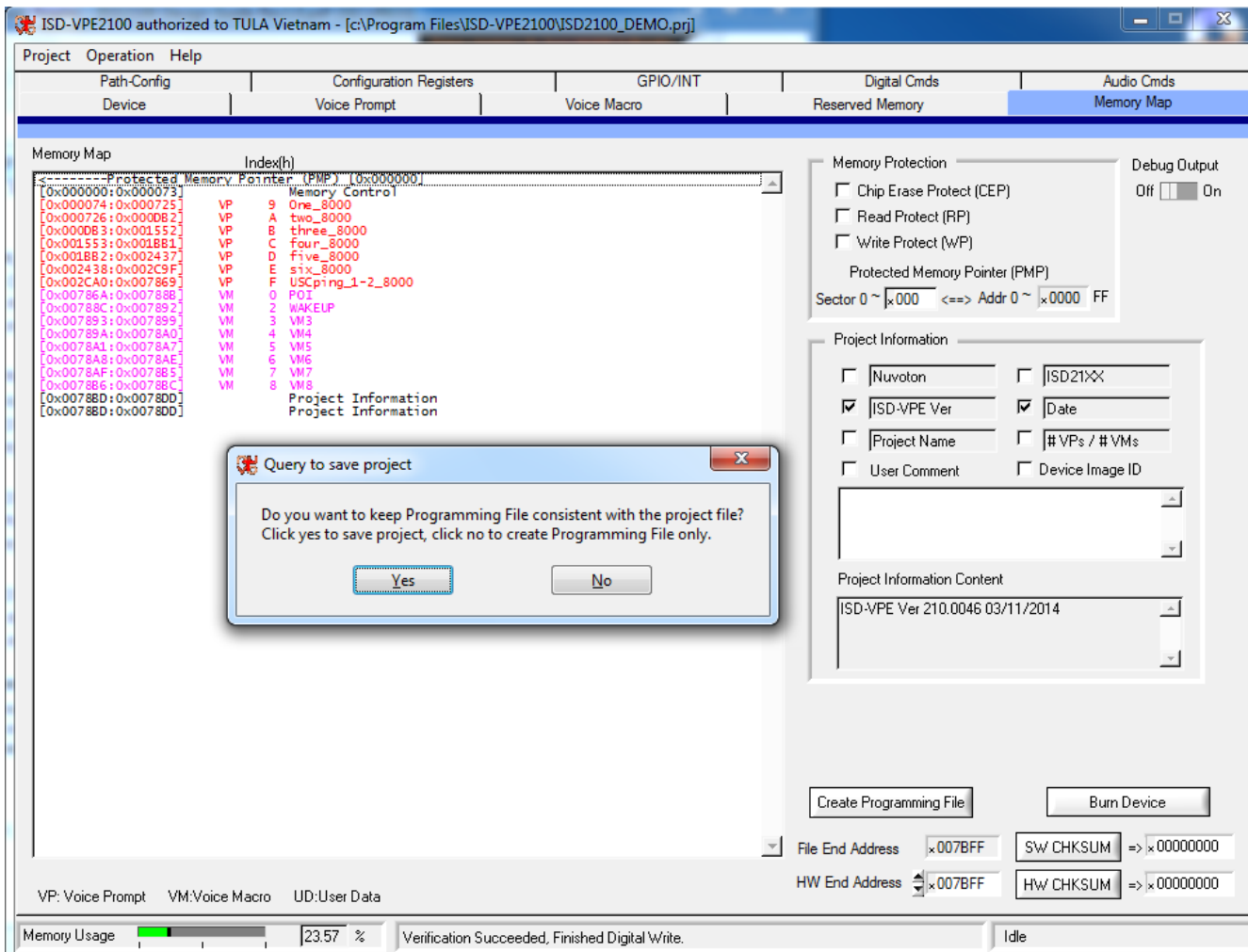
The screenshot shows the ISD-VPE2100 software interface. The 'Voice Macro' tab is selected, and the configuration for VM8 is displayed. The 'Voice Prompts' list on the left includes 'USCping_1-2_8000'. The configuration panel for VM8 shows the Register set to '0x02A R5', Address set to 'x02A', and Value set to 'x8'. The 'Voice Macro Script' window contains the following code:

```
CFG(R5, 0x03)
PLAY(six_8000)
PD
```

The status bar at the bottom indicates 'Memory Usage' at 23.57%, 'Verification Succeeded, Finished Digital Write.', and 'Idle'.

Chuyển qua tab Memory Map

- _ Nhấn nút **Create Programming File**.
- _ Nhấn **Burn Device** để nạp xuống ISD2130



The screenshot shows the ISD-VPE2100 software interface. The main window is titled "ISD-VPE2100 authorized to TULA Vietnam - [c:\Program Files\ISD-VPE2100\ISD2100_DEMO.prj]". The "Memory Map" tab is selected, displaying a list of memory regions with their addresses and indices. A dialog box titled "Query to save project" is overlaid on the screen, asking: "Do you want to keep Programming File consistent with the project file? Click yes to save project, click no to create Programming File only." The dialog has "Yes" and "No" buttons. The background interface includes a menu bar (Project, Operation, Help), a toolbar (Path-Config, Configuration Registers, GPIO/INT, Digital Cmds, Audio Cmds), and a main area with a "Memory Map" list, "Memory Protection" settings, "Project Information" fields, and "Create Programming File" and "Burn Device" buttons. The status bar at the bottom shows "Memory Usage" at 23.57% and "Verification Succeeded, Finished Digital Write.".



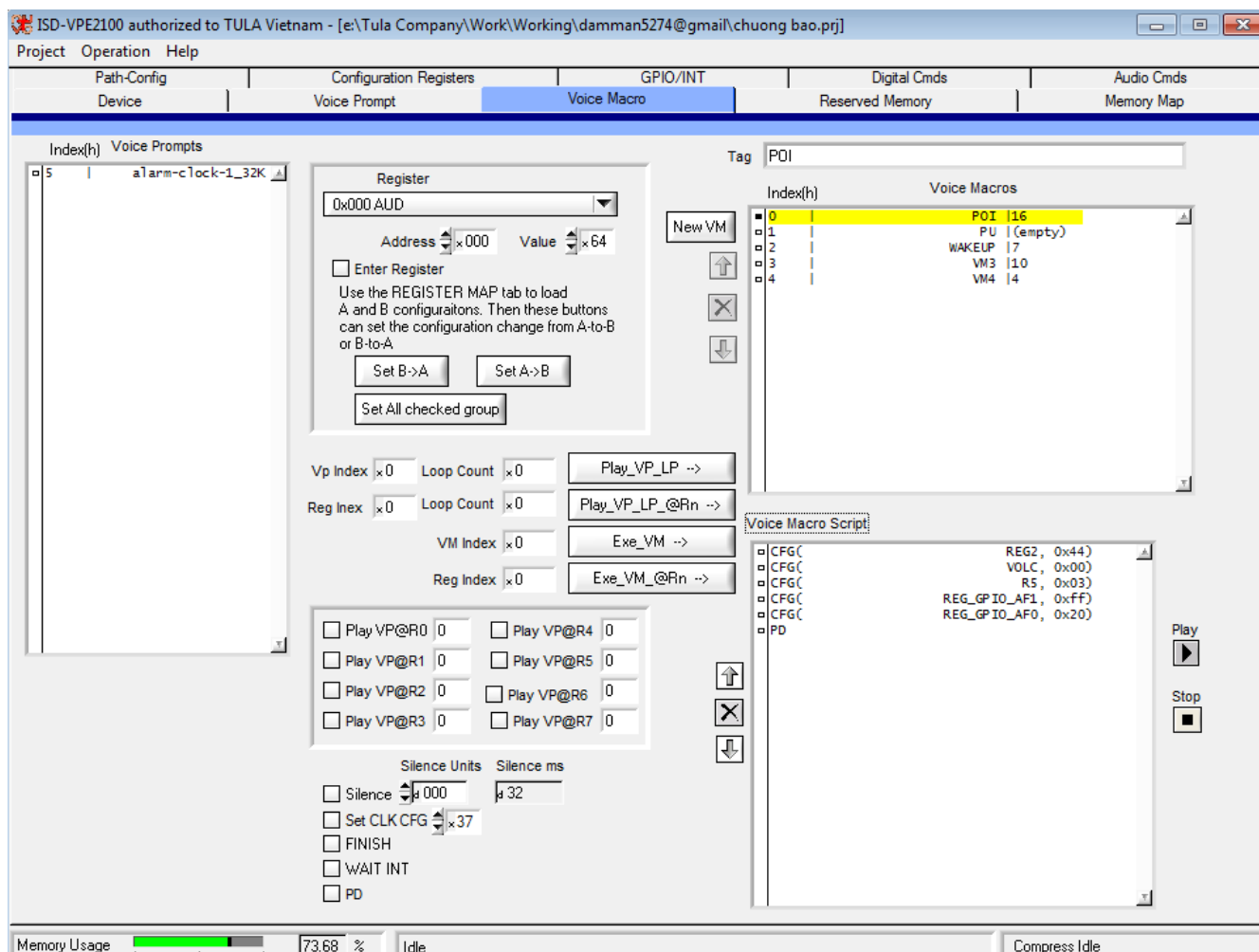
3.3 Ví dụ điều khiển phát nhạc theo mức

Khi nhấn giữ thì phát nhạc, khi nhả thì dừng phát nhạc

The screenshot shows the ISD-VPE2100 software interface. The 'Voice Prompt' tab is selected. The project path is 'e:\Tula Company\Work\Working\damman5274@gmail\chuong bao.prj'. The version is 210.0046. The interface includes sections for 'Add New Voice Prompts', 'Preview Audio on PC', and 'Set Defaults'. A table lists the voice prompts:

Index(h)	VP #	VP Tag	Master Wave File	Sample Rate	Compression	Size (Bytes)
5	0	alarm-clock-1_32K	alarm-clock-1_32K.wav	16000	Enhanced ADPCM5	96491

At the bottom, the status bar shows 'Memory Usage' at 73.68% and 'Idle'.



Sử dụng 1 phím GPIO5 điều khiển nhiều tuần tự nhiều Voice macro

Cấu hình các Voice macro như sau:

POI Voice macro

- CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- CFG(R5, 0x03) ; GPIO5 trigger Voice macro 3
- CFG(REG_GPIO_AF1, 0xff) ;
- CFG(REG_GPIO_AF0, 0x20); Cấu hình chân GPIO5 chân trigger cả ở sườn lên và sườn xuống
- PD ; Power Down

WAKEUP Voice macro

- CFG(REG2, 0x44) ; cấu hình đường tín hiệu phát nhạc tới đầu ra PWM
- CFG(VOLC, 0x00) ; cài âm lượng = 0dB
- Finish



VM3 Voice macro

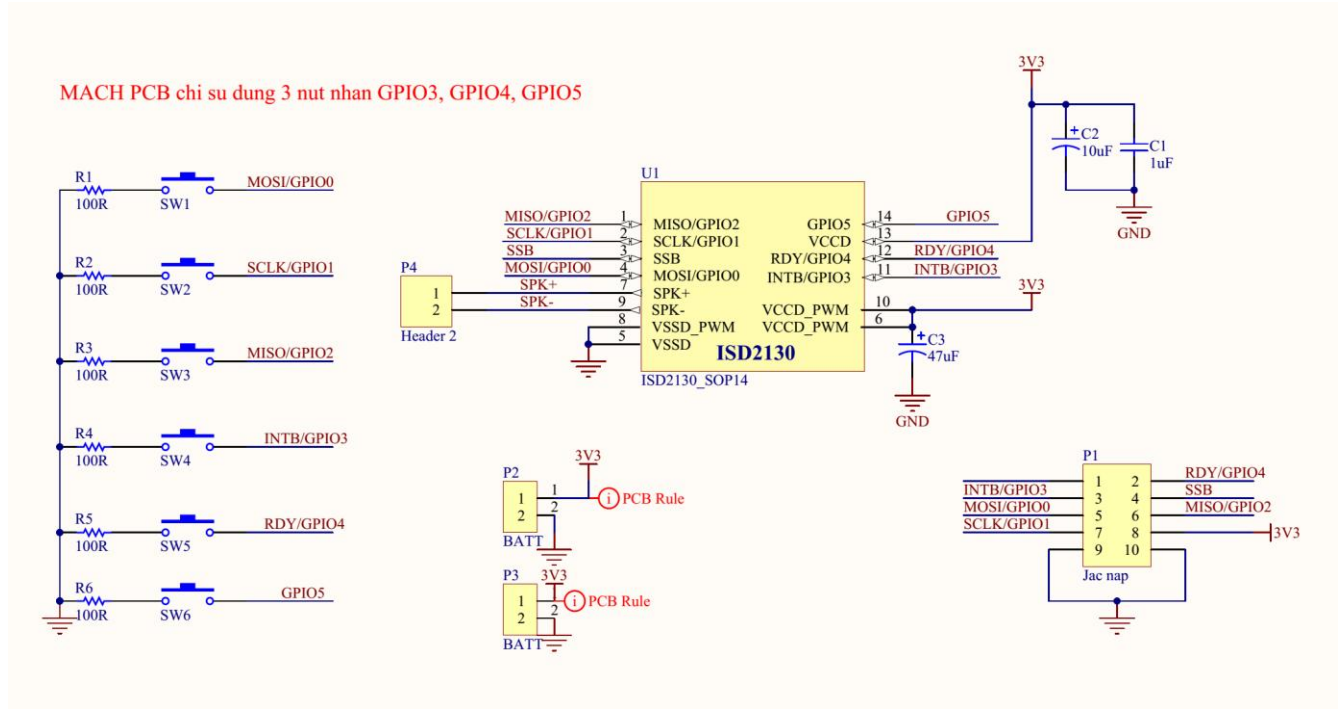
- a. CFG(R5, 0x04) ; GPIO5 trigger Voice macro 4
- b. PLAY(alarm-clock-1_32K) ; Play Voice Prompt
- c. PLAY VM # 3 ; phát lại Voice macro 3
- d. Finish

VM4 Voice macro

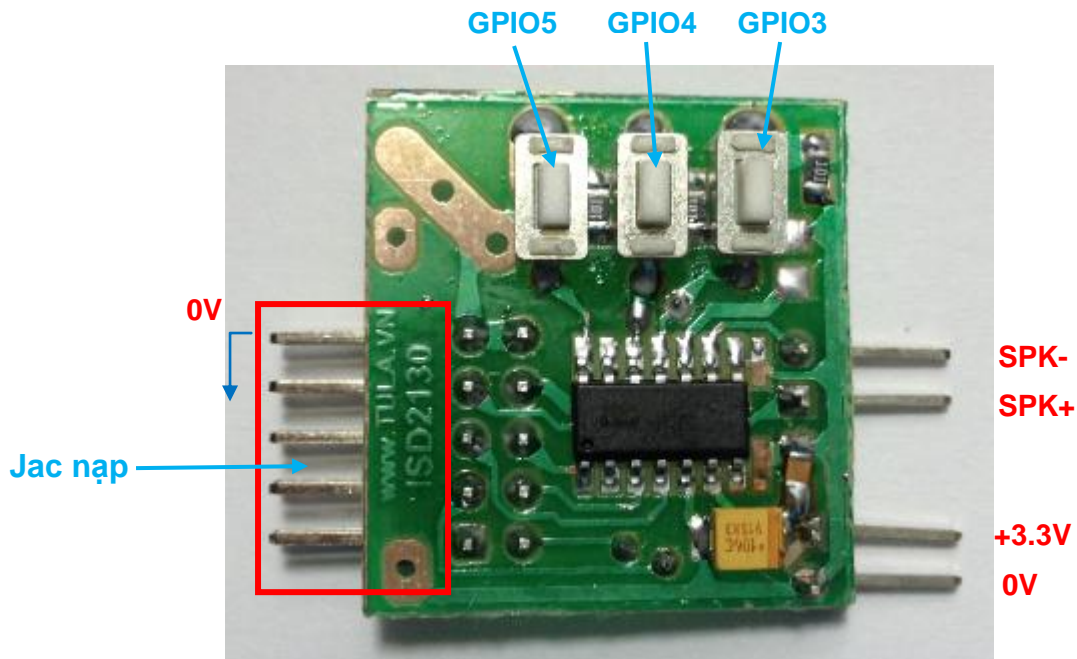
- a. CFG(R5, 0x03) ; GPIO5 trigger Voice macro 3
- b. PD

4. Mạch Demo-ISD2130

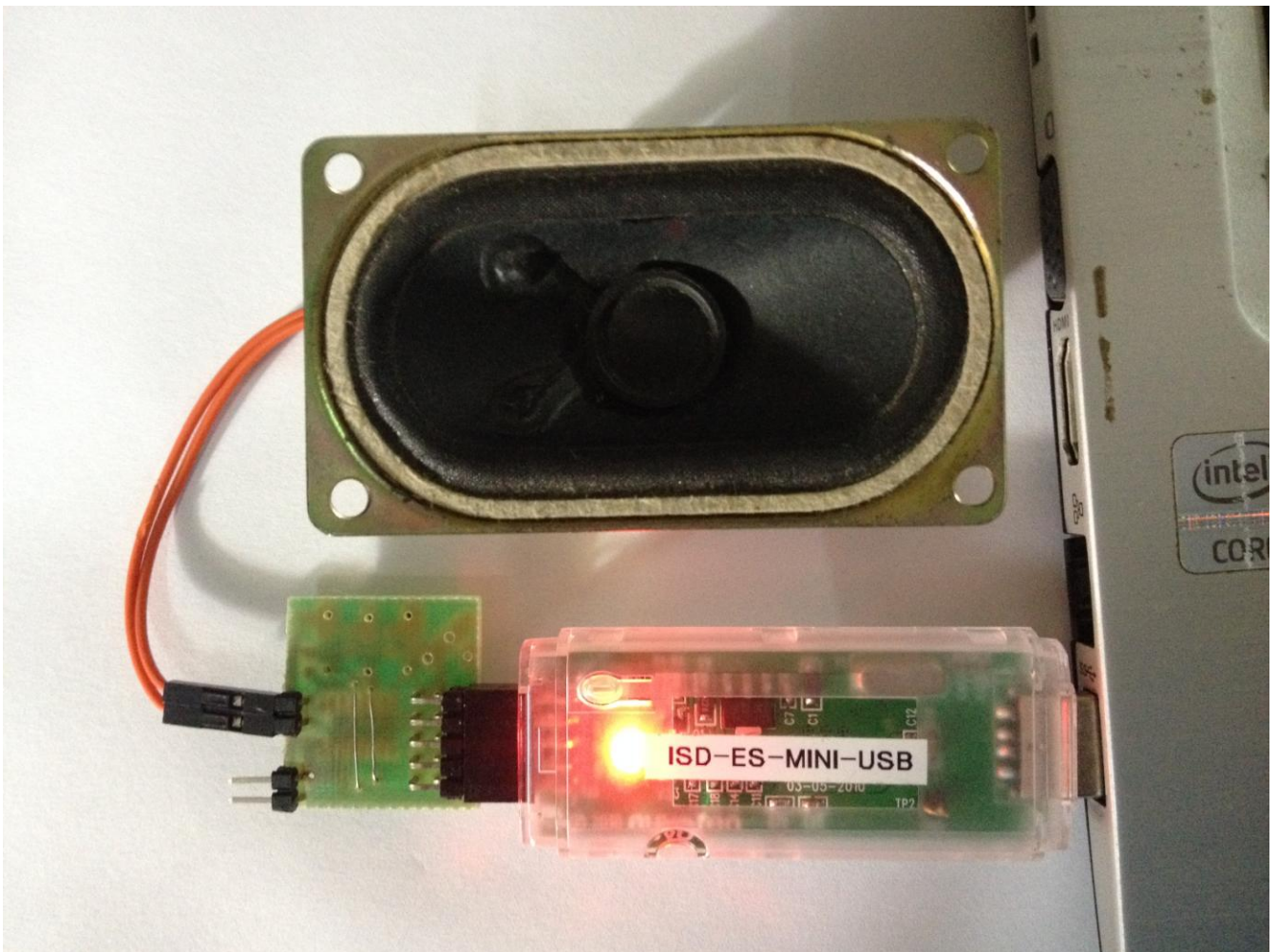
4.1 Sơ đồ nguyên lý & PCB



Hình 4.2 ISD2130 kiểu chân SOP14



Hình 4.3 Mạch Demo- ISD2130



Hình 4.4 Kết nối với mạch nạp và phần mềm trên PC

4.2 Project ví dụ demo

Tải project mẫu tại:

http://www.mediafire.com/download/3y82apr2juch4t3/ISD2130_Demo.rar

POI Voice macro

- a. CFG(REG2, 0x44)
- b. CFG(VOLC, 0x00)
- c. CFG(R3, 0x03) ; GPIO3 trigger Voice macro 3
- d. CFG(R4, 0x04) ; GPIO4 trigger Voice macro 4
- e. CFG(R5, 0x05) ; GPIO5 trigger Voice macro 5
- f. CFG(REG_GPIO_AF1, 0xff)
- g. CFG(REG_GPIO_AF0, 0x00)
- h. PD



WAKEUP Voice macro

- a. CFG(REG2, 0x44)
- b. CFG(VOLC, 0x00)
- c. Finish

VM3 Voice macro

- a. PLAY(LemonTree)
- b. PD

VM4 Voice macro

- a. PLAY(LemonTree)
- b. PD

VM5 Voice macro

- a. PLAY(Chuong)
- b. PD