

HT68FV02x Voice Peripheral MCU Development Board User's Guide

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1 Development Environment

1.1 Complete Environment



The development board is connected to a PC using the e-Link.

1.2 Software

Includes Voice MCU Workshop and IDE3000.

1.2.1 Voice MCU Workshop

- Load and program the voice WAV files and configure the sentence arrangement.
- Programmed files output and programming function.
- Generate user development projects in the Professional Mode.

1.2.2 IDE3000

• Edit user development projects in the Professional Mode.



1.3 Hardware

The development board is demonstrated using the HT68VV022 (HT68FV022 EV) together with the HT66F018.

1.3.1 Development Board Introduction



- 1. Power indicator.
- 2. Micro USB: USB power supply interface.
- 3. VDD & GND pin header interface.
- 4. Master MCU HT66F018.
- 5. Switch between one-wire mode/two-wire mode 1/two-wire mode 2.
- 6. Function key \times 6.
- 7. Voice peripheral MCU EV HT68VV02x
- 8. Speaker interface.
- 9. Switch between one-wire mode/two-wire mode 1.
- 10. HT68VV02x e-Link interface.
- 11. Switch between direct mode and one-wire mode/two-wire mode.
- 12. Play BUSY indicator.
- 13. Master HT66F018 ICP interface.

1.4 Development Board Operation Description

1.4.1 Operating Mode Selection

After completing the programming, the operating mode should be selected on the development board according to the Workshop settings, including direct mode, one-wire mode, two-wire mode 1 and two-wire mode 2. The mode selection method and development board operation are shown in the following table:



Operating Mode	Selection Method	Real Product
Direct Mode	 Select the direct mode in the Voice MCU Workshop Short-circuit the pin headers in columns 2 and 3 with jumpers 	
	 Select the one-wire mode in the Voice MCU Workshop Short-circuit the pin headers in columns 1 and 2 with jumpers Switch the DIP switch in the first row to 1WIRE 	
One-Wire Mode	 Select one of two-wire modes (either) in the Voice MCU Workshop Short-circuit the pin headers in columns 1 and 2 with jumpers Switch the DIP switch in the first row to 2WIRE Short-circuit the two pin headers in the MODE position with jumpers 	
Two-Wire Mode 1	 Select the two-wire mode 1 in the Voice MCU Workshop Short-circuit the pin headers in columns 1 and 2 with jumpers Switch the DIP switch in the first row to 2WIRE Switch the DIP switch in the second row to 2WIRE_MODE1 	
	 Select the one-wire mode in the Voice MCU Workshop Short-circuit the pin headers in columns 1 and 2 with jumpers Switch the DIP switch in the first row to 1WIRE Short-circuit the two pin headers in the MODE position with jumpers 	



1.4.2 e-Link Connection

The IDE3000 and Voice MCU Workshop can program and edit an IC using the e-Link. The e-Link can be directly inserted into the HT68VV02x e-Link interface as shown, which is convenient for development.

When programming the HT68VV02x, remove the jumper selected in the MODE position to avoid affecting the programming.



1.4.3 Programming and e-Link Connection Description

- 1. e-Link Connection:
- Use the Voice MCU Workshop for programming





• Use the HT-IDE3000 and HT68VV020 for simulation





2. Use the e-Socket32 of the e-Writer32 for programming by connecting the ICP



2 Voice MCU Workshop Interface Description

Download and install the latest Voice MCU Workshop from the Holtek website and then execute the "Voice Platform.exe".

^	Name	Date modified	Туре
	mcuinfo.enc	2021/9/9 下午 05:16	ENC File
	MCUResCal.dll	2021/9/9 下午 05:26	Application extension
*	MCUSL7.LT	2021/9/9 下午 05:16	LT File
*	🗟 mcuupdate.ini	2021/9/9下午 05:16	Configuration settings
	🝓 PJVParser.exe	2021/9/9下午 05:16	Application
	PrjDLL32.dll	2021/9/9 下午 05:16	Application extension
MCU	📓 prjdll32.ini	2021/9/9 下午 05:16	Configuration settings
MCU	ProgramCode.dll	2021/9/9 下午 05:25	Application extension
	🗟 ProjectPath.ini	2021/10/12 下午 03:03	Configuration settings
	🗟 recall.ini	2021/9/9下午 05:16	Configuration settings
	RecWaveGen.dll	2021/9/9下午 05:16	Application extension
	RegisterPage.htm	2021/9/9 下午 05:16	Chrome HTML Document
	RegisterPage_EN.htm	2021/9/9 下午 05:16	Chrome HTML Document
	RegisterPage_SIM.htm	2021/9/9 下午 05:16	Chrome HTML Document
	RegisterPage_TRA.htm	2021/9/9下午 05:16	Chrome HTML Document
_	ToolsParam.lang	2021/9/9下午 05:16	LANG File
	TskTrans.exe	2021/9/9 下午 05:16	Application
	Voice Platform.cnt	2021/9/9 下午 05:15	CNT File
	Voice Platform.exe	2021/9/24 上午 11:27	Application
	VOICE PLATFORM.HLP	2021/9/9 下午 05:15	Help file
	Voice Platform.ilk	2021/9/24 上午 11:27	ILK File
	Voice Platform.pdb	2021/9/24 上午 11:27	PDB File
	VoiceLoader.dll	2021/9/9 下午 05:25	Application extension
	i winusb.dll	2021/9/9 下午 05:16	Application extension
	Mritorend dll	2021/0/0 下午 05:16	Application extension

Create a new project, select the Peripheral IC mode, and determine whether to use the Peripheral mode or the Professional mode.



Project Name:	New Project Load Project Save Project Save New Project
Basic Setting Voice Program Finish	New Project X Project Name: V Untitled V Project Path: C: Select project mode: Y Select project mode: Y Professional Mode Y HT68FV022 X

2.1 Peripheral Mode

The Basic Setting is shown below, where the control mode, voice mode and MCU frequency can be selected from the communication interface and speaker driver option boxes.

The voice mode is divided into the Green Mode and the Normal Mode, both of which are PWM output mode types. For more details about this, refer to the corresponding datasheet.

The MCU frequency selection will affect the MCU operating voltage and the supported voice compression mode, thus affecting the supported voice length.

When the MCU frequency is 12MHz, the minimum operating voltage is 2.3V while it is 3.0V for 16MHz.

The MCU frequencies and the supported compression modes are listed as follows:

Basic Setting	ber VO22 heral mode Communication Inter re vss 1	ace	Speaker Driven	
Basic Setting	Communication Interf	ace	Speaker Driven	
Basic Setting	re vss 🗖 1			
C 2 Wi	re Mode 1 KFY1 7	8 BIAS 7 D PWM1	PWM Voice : Normal Mode	•
oice Program © Direc	re Mode 2 KEY2 3 tt Mode KEY3 4 3V <vdd<=5v< td=""><td>6 PWM2 5 VDD</td><td>Freq. : 12 MHz</td><td>-</td></vdd<=5v<>	6 PWM2 5 VDD	Freq. : 12 MHz	-
Einish	3050005-3.30	8 NSOP		
		Voice Source Setting		
⊕: Add	: Remove	Renew	Waveform Editor	Reset ALL
+/- Play	↑/↓ File Name	Nickname Compression Mod	le Original Voice Size En	coded Voice Size
1 - 1	Voice TEST1.wav	0_Voice TEST1 PCM(Normal Quali	ty) 89K Bytes 64k	Bytes
	Voice TEST2 .wav	1_Voice TEST2 PCM(Normal Quali	ty) 82K Bytes 61k	K Bytes
• • •	Voice TEST3.wav	2_Voice TEST3 PCM(Normal Quali	ty) 45K Bytes 33k	Bytes
<u> </u>	Voice TEST4.wav	3_Voice TEST4 PCM(Normal Quali	ty) 47K Bytes 34H	(Bytes
Total Memo	ry Size: 2048K Bytes Memo	ory Size Used: 198K Bytes I	Memory Size Left: 1850K I	Bytes



мсц	Voice		Voice Quality	
Operating Frequency	Compression Mode	High Quality Low Compression Ratio	Normal Quality Middle Compression Ratio	High Compression High Compression Ratio
	PCM	\checkmark	\checkmark	\checkmark
16MHz	uLaw	×	\checkmark	\checkmark
	ADPCM	×	\checkmark	\checkmark
	PCM	\checkmark	\checkmark	\checkmark
12MHz	uLaw	×	\checkmark	\checkmark
	ADPCM	×	\checkmark	\checkmark

In the voice setting window, select a voice source file and the mode (compression mode & voice quality), then adjust the voice order, as shown below.



When opening a project generated from old versions of the Voice MCU Workshop, press the "Renew" button in the Voice Source Settings box to update the voice coding data.

			Voice Source	Setting			
): Add	🖃: Remo	ve		Renew	Waveform Editor	Reset ALL	
+/- Play	\uparrow/\downarrow	File Name	Nickname	Compression Mode	Original Voice Size	Encoded Voice Size	
• •	$\uparrow \lor$	Voice TEST1.wav	0_Voice TEST1	PCM(Normal Quality)	89K Bytes	64K Bytes	-
91	↑ ↓	Voice TEST2 .wav	1_Voice TEST2	PCM(Normal Quality)	82K Bytes	61K Bytes	
• •	$\uparrow \lor$	Voice TEST3.wav	2_Voice TEST3	PCM(Normal Quality)	45K Bytes	33K Bytes	
01	↑ ↓	Voice TEST4.wav	3_Voice TEST4	PCM(Normal Quality)	47K Bytes	34K Bytes	
•							-
Total Mer	mory Size:	2048K Bytes Men	nory Size Used: 19	18K Bytes Men	nory Size Left: 185	0K Bytes	



The HT68FV022 supports a voice program. Multiple voices can be combined into a single sentence and a mute time can also be added, as shown below.

roject Name:	TEST			New Project	Load Project	Save Project Save	New Project
		Voice Program List					
		Trigger Source	Trigger Source	Name	Function		
		Sentence 1	Sentence 1		Play	→ (
Basic Setting					7	Reset Al I	
				+/- Order	Action	Action Parameter	_
ice Program				Image: 1	Play /oice #	✓ 0_Voice TEST1 ✓	A
				2	Play Voice #	✓ 1_Voice TEST2 ✓	
					Nute	✓ 2000 ms	
Finish					Play Voice #	V 2_Voice TEST3	
					L		
							*
					K		
		Available Trigger Source	e Available	Function			
		Sentence	x 95	Play			

Select mute in the Action bar, and fill in the mute time in the Action Parameter bar.

["			_ ~ '(
	⊡:Ad	ld O	: Remove		Reset ALL	×
I	+/-	Order	Action		Action Parameter	
Ē	Θ	1	Play Voice #	~	0_Voice TEST1 ~	
[Ξ	2	Play Voice #	~	1_Voice TEST2 🛛 🗸	
	Θ	3	Mute	~	2000 ms	
I	Ξ	4	Play Voice #	~	2_Voice TEST3 💙	
-	€			~		-



A "*.PND" file is generated by the HT68FV022 after Voice MCU Workshop editing. In the Finish page, the programming function can be selected as shown below, including directly programming the current project, loading the generated file or only generating the files without programming. In addition, the programming voltage should be selected to match the system during programming.

Voice MCU Workshop [C:\VoiceTest\T	EST] – 🗆 X
Project Name: TEST	New Project Load Project Save Project Save New Project
Basic Setting Voice Program Finish	1. Programming voltage : C 3.3v C 5v 2. Programming function : Current Project(Programing) Current Project(Programing) File Name : C:VoiceTest\TEST\TEST\PND Current Project(Programing) Current Project(Project
	Voice data verification
	Open current project
HOLTEK	

2.2 Professional Mode

The HT68FV022 provides PCM, uLaw and ADPCM voice decompression modes as well as onewire, two-wire and direct control interface libraries. The Professional Mode can also be selected for F/W writing according to user requirements. The operation methods for the Professional Mode are described as follows. Start the "Voice Platform.exe" to create a new project and select the Professional Mode as shown below:

Project Name.		1
Ontitied		
Project Path:		_
C:		
Select project mode:		
Peripheral IC mode	•	
Select program:	C Peripheral mode	
	Professional Mode	
HT68FV022	-	



In the Basic Setting page, select the desired decompression mode and library. The library selection will affect the available MCU ROM space, which should be determined according to requirements. The communication interface control mode can select one of the available options, which are the same as the Peripheral mode, or can also select none if no control interface library is used. With regard to the voice compression mode, PCM is required, while ADPCM and uLaw are optional and can choose neither or both. As shown below, the operation methods for the Voice Source Setting and Voice Program are the same as that of the Peripheral mode.

Project Name: T	ST2		New Project	Load Project	Save Project Sa	ve New Project
	IC : HT68FV0 © Professional Mo	22 de				
Basic Setting Voice Program	C none C 1 Wire C 2 Wire Mode 1 C 2 Wire Mode 2 C Direct Mode G Direct Mode G 3.3V <vdc<=< p=""> C 2.3V<vdc<=< p=""></vdc<=<></vdc<=<>	Communication Interf	8 NSOP	BIAS P PWM1 PWM2 Fr VDD J	Speaker Driven WM Voice : Green Mode req. : 16 MHz	•
Finish			Voice Source	Setting		
	PCM ADPCM CM CM	i⊽ u-Law		Renew	Waveform Editor	Reset ALL
	+/- Play ↑/↓	File Name	Nickname	Compression Mode	Original Voice Size	Encoded Voice Size
		ce TEST4.wav	0_Voice TEST4	PCM(High Quality)	47K Bytes	69K Bytes
		ice TEST1.wav	1_Voice TEST1	u-law(Normal Quality)	89K Bytes	43K Bytes
		ice TEST2 .wav	2_Voice TEST2	u-law(Normal Quality)	82K Bytes	41K Bytes
		ice TEST3.wav	3_Voice TEST3	u-law(Normal Quality)	45K Bytes	22K Bytes
	Later Difference Company 1	048K Bytes Memi	ory Size Used: 18'	1K Bytes Men	nory Size Left: 186	/K Bytes

When the programming function is selected to "Only generate files (PND)" in the Finish page, pressing the "execute" button will not perform a programming action but only generate the project files according to user requirements. Click the "open current project" which will open the corresponding project folder, as shown below.

🔊 Voice MCU Wo	rkshop [C:\VoiceTest\TEST] – –	×
Project Name:	TEST	New Project Load Project Save Project Save New Project]
		1. Programming voltage : C 3.3v G 5v	
Basic Setting		2. Programming function : Only generate files(PND)	
Voice Program		File Name : C:\VoiceTest\TEST\TEST.PND	
Finish		execute	
	_		
		Voice data verification	
		Open current project	
	L .		



Open the .pjtx file using the IDE3000 to edit the program. For the MCU functions refer to the corresponding datasheet and for the use of the library refer to the following Software Description section. After the program has been edited, a .PND file is generated as shown below. Then use the Voice MCU Workshop to load the .PND file and to program it into an IC.



3 Software Description

3.1 MCU Operating Environment

Oscillators: HIRC	V _{DD}	Low Voltage Reset	Watchdog Timer
16MHz	5V	2.55V	1s
12MHz	5V	2.2V	1s

3.2 Software Usage Instructions

This Firmware only provides the basic settings and applications for the HT68FV022 voice library controller. There are three methods to process voice files. The RAM or ROM space left after using their respective libraries is shown below.

	РСМ	PCM+uLaw	PCM+ADPCM	PCM+uLaw+ADPCM
ROM (1K×14)	499	409	333	243
RAM (64×8)	32	32	27	27

In addition, two interface libraries, namely Direct Key (ROM: 137; RAM: 8) and Interface (ROM: 109; RAM: 9), are provided for users to choose according to their requirements. The actual programmable space is calculated by deducting the space required by the interface library from the remaining memory size in the table above.

3.3 Function File Description

The voice file data with PCM, uLaw & ADPCM voice compression is programmed into the HT68FV022 via a one-wire, two-wire or direct control interface in the Professional Mode using the Voice MCU Workshop. The project files will also be generated for users to develop and compile.

These files are described as follows:

- HT68FV02x_PRJ_Voice_Library_Test.asm Main program operated according to the selected control interface
- HT68FV02x_PRJ_Def.asm
 Voice compression related variable definitions
- HT68FV02x_PRJ_Customer.asm Free compilation area - when no control interface is used



- HT68FV02x_PRJ_Body.inc Register and variable definitions.
- HT68FV02x_PRJ_Voice_library_Extern.inc Subroutine and variable declarations
- HT68FV02x_PRJ_Voice.hed Timer Interrupt count function
- HT68FV02x_PRJ_Voiceworkshop.hed Voice Library related definitions

The above files are generated in the Professional Mode using the Voice MCU Workshop.







3.4 Software Main Flow Description



Figure 2. Customer Mode Software Flowchart

 System Initialization & Customer Mode Initialization: Set the HT68FV022 communication interface to SPI.

Read the Flash information and set the MCU parameters.

Set the PWM function, LDO and Watchdog Timer.

- 2. Main Loop:
 - (1) Enable the PWM.
 - (2) Use customer code.

For voice or sentence playing, volume control and pin output control.

- (3) Check if there is voice playing.
 - Yes, return to point (2).
- (4) Disable the PWM and enter the suspend mode.
- (5) Check if there is a wake up signal.
 - Yes, return to point (1).
 - No, continue in the suspend mode.





Figure 3. Direct Mode Software Flowchart

1. System Initialization:

Set the HT68FV022 communication interface to SPI.

Read the Flash information and set the MCU parameters.

Set the PWM function, LDO and Watchdog Timer.

2. Main Loop:

(1) Enable the PWM.

- (2) Check if any key has been triggered.
 - Yes, check if the trigger time is greater than 3 seconds.
 - If it is greater than 3 seconds, the function corresponding to the triggered key will be executed as follows.
 - Key1: play the first voice; Key2: play the next sentence; Key3: decrease the volume.
 - If it is less than 3 seconds, the function corresponding to the triggered key will be executed as follows.
 - Key1: play the last played voice when there is no voice or stop when there is voice;
 Key2: play the next voice; Key3: increases the volume.



- (3) Check if there is a voice playing.
 - Yes, return to point (2).
- (4) Check if the key has reset.
 - No, return to point (2).
- (5) Disable the PWM and enter the suspend mode.
- (6) Check if there is a wake up key.
 - Yes, return to point (1).
 - No, continue in the suspend mode.



Figure 4. Interface Mode Software Flowchart

1. System Initialization:

Set the HT68FV022 communication interface to SPI.

Read the Flash information and set the MCU parameters.

Set the PWM function, LDO and Watchdog Timer.



- 2. Main Loop:
 - (1) Enable the PWM.
 - (2) Receive the signal and decode.
 - (3) Check if the signal is a valid command.
 - No, return to point (2).
 - (4) Execute the command action.
 - (5) Check if there is a voice playing.
 - Yes, return to point (2).
 - (6) Disable the PWM and enter the suspend mode.
 - (7) Check if there is a wake-up signal.
 - Yes, return to point (1).
 - No, continue in the suspend mode.

3.5 Software Subroutine Description

3.5.1 Function List

Function Name	Description	
Voice Library Subroutine		
_CLRRAM	Clear all RAM data	
_System_Initialization	 Set PA as inputs with internal pull-high and wake-up enabled Set SPI pin function Read information from the SPI Flash - verification code, MCU parameters such as HIRC, LVRC, TBC, PWMC0, etc Set the volume to default 	
Set_Suspend	Disable the Watchdog Timer, Counter, PWM and LDO functions	
Enable_WDT_LDO	Enable the Watchdog Timer, Counter and PWM functions as well as configure LDO	
Configure_LDO	Configure the LDO. When the variable bypass_LDO is set to 1, execute this function to disable the LDO.	
_Stop_Play	Disable Counter and set the PWM output to 8000H	
_Play_Voice_Sentence_Initial	Read the voice file data and set the parameters	
Decoding_CMD	Decode the received control command and execute the corresponding action	
Set_Volume_With_mvol	Set the voice volume level	

Note: 1. The library is associated with the Label in the file, therefore the Label cannot be deleted to avoid unknown errors.

2. As the HT68FV02x_PRJ_Def.asm is used to call various library files, do not change it unless necessary.



3.5.2 Function Description

CLRRAN	1
– Clear all R	AM data
Syntax:	
Call CLR	RAM
Paramete	rs:
N/A	
Return Va	lues:
N/A	
System	Initialization
1. Set PA a	as inputs with internal pull-high and wake-up enabled
 Set SPI Read in HIRC, L Set the 	pin function formation from the SPI Flash - verification code, MCU parameters such a VRC, TBC, PWMC0, etc volume to default
Syntax:	
Call _Syst	em_Initialization
Paramete	rs:
N/A	
Return Va	lues:
N/A	
Set_Susp	end
Disable the	e Watchdog Timer, Counter, PWM and LDO functions
Syntax:	
Call set su	uspend
Paramete	rs:
N/A	
Return Va	lues:
N/A	
Enable_W	/DT_LDO
Enable the	e Watchdog Timer, Counter and PWM functions as well as configure LDC
Syntax:	
Call Enabl	e_WDT_LDO
Paramete	rs:
Bypass_LI 1: Disab 0: Enabl	DO le the LDO function le the LDO function

Return Values:

N/A

N/A

Configure_LDO
Configure the LDO
Syntax:
Call Configure_LDO
Parameters:
Bypass_LDO 1: Disable the LDO function 0: Enable the LDO function
Return Values:
N/A
Stop Diav
_Stop_Flay
Disable the Counter and set PWW output to 8000H
Syntax:
Call _Stop_Play
Parameters:
N/A
Return Values:

_Play_Voice_Sentence_Initial
Read the voice file data and set the parameters
Syntax:
Call _Play_Voice_Sentence_Initial
Parameters:
Fsentence_voice 1: Play sentence 0: Play voice PlayVoiceNumL: play which voice PlaySentenNumL: play which sentence
Return Values:
N/A

Decoding_CMD
Decode the received control command and execute the corresponding action
Syntax:
Jmp Decoding_CMD Exit: check_play_voice_state
Parameters:
data_cmd Execute the corresponding action according to the command list
Return Values:
N/A



Set_Volume_With_mvol
Set the voice volume level
Syntax:
Call Set_Volume_With_mvol
Parameters:
mVol Give a value (0~15) for the desired volume
Return Values:
N/A

3.5.3 Examples

Example 1: Voice list played in a single loop

```
snz fVoiceStandBy
jmp check_play_voice_state
clr fsentence_voice
inc PlayVoiceNumL
inca max_voice_var
xor a,PlayVoiceNumL
sz voice_Z
clr PlayVoiceNumL
jmp Play_voice_senetence_with_stop
```

Example 2: Sentence list played in a single loop

- sz fSentencePlaying
- jmp check_play_voice_state
- set fsentence_voice
- inc PlaySentenNumL
- mov a,max_sentence_var
- xor a,PlaySentenNumL
- sz voice Z
- clr PlaySentenNumL
- jmp Play_voice_senetence_with_stop





4 Development Board Schematic Diagram

5 Other Information

- Do not modify the internal program of the master MCU HT66F018 in the development board as it has been setup for the HT68FV02x supported control interface.
- If the 1WIRE/2WIRE jumpers and DIP switches change and then it is powered on again, the master MCU HT66F018 can be controlled in the selected mode.



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