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Spec Title: CONFIGURING HX2VL PARAMETERS -  
AN73052

Sunset Owner: Prajith Cheerakkoda (prji)

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# AN73052

## Configuring HX2VL Parameters

**Author:** Karnik Shah

**Associated Project:** No

**Associated Part Family:** CY7C65632/34/42

**Software Version:** N/A

**Related Application Notes:** N/A

### Abstract

AN73052 describes how to set parameters of HX2VL using I2C/SPI EEPROM and/or pin strapping. Parameters include vendor ID, product ID, vendor string, product string, serial number string, maximum power, number of active ports, and removable/non-removable ports. It describes in what conditions an EEPROM is not required.

## Introduction

HX2VL is Cypress's next generation family of high performance, very lower power USB 2.0 hub controllers. The hub comes in different flavors. 48-pin parts have full functionality where, features such as green/amber LED indicators, pin strapping, and gang/individual modes are supported on top of bare 28-pin parts which support self or bus power. There are four-port and two-port hubs. This application note describes what parameters are

configurable, and how they are configured in a particular package.

The configurable parameters of HX2VL are VID, PID, vendor string, product string, serial number, maximum power reported to host, number of active ports and removable/non-removable port setting. Table 1 indicates how each parameter can be configured using methods in a particular chip. For more details on pin map and alternate pin configurations, refer HX2VL datasheets.

Table 1. Compatibility Matrix

Device	No of Ports	EEPROM ACCESS		Method of Configuring Parameters			
		I2C	SPI	Fixed Port 1 Fixed Port 2	Fixed Port 3 Fixed Port 4	Select Number of Ports	VID/PID, Strings, Maximum Power
CY7C65632-48	4	R/W	R	EEPROM/Pin Strap	EEPROM/Pin Strap	EEPROM/Pin Strap	EEPROM
CY7C65642-48	4	R/W	R	EEPROM/Pin Strap	EEPROM/Pin Strap	EEPROM/Pin Strap	EEPROM
CY7C65632-28	4	R/W	N/A	EEPROM	EEPROM	EEPROM	EEPROM
CY7C65642-28	4	R/W	N/A	EEPROM	EEPROM	EEPROM	EEPROM
CY7C65634-48	2	R/W	R	EEPROM/Pin Strap	N/A	EEPROM	EEPROM
CY7C65634-28	2	R/W	N/A	EEPROM	N/A	EEPROM	EEPROM

Table 2. Default Configurations

Parameter	Default Value
VID	04B4h
PID	6572h (for CY7C65642) 6570h (for CY7C65632/34)
Number of ports	4 (2 for 2 port hubs CY7C65634-xx)
Port 1	Removable
Port 2	Removable
Port 3	Removable (N/A for 2 port hubs)
Port 4	Removable (N/A for 2 port hubs)
Maximum power	100 mA (32h)

## Configuring using Pin Strapping

The removable/fixed port attribute of an active port and the number of active ports can only be set using this method and only in 48-pin packages. 28-pin packages do not support pin strapping. In two port hubs, only the removable/fixed port attribute can be set using pin strapping; changing number of active ports is not supported. Table 3 indicates which pins can be used for pin strapping.

Table 3. Pins used for Pin Strapping in 48-pin Packages

Pin Name	Pin no.	Function at POR (if at POR logic is..)
Fixed Port 1	45	0: Port 1 is removable 1: Port 1 is fixed <sup>1</sup>
Fixed Port 2	35	0: Port 2 is removable 1: Port 2 is fixed <sup>1</sup>
Fixed Port 3 (NC in 2 port hub)	32	0: Port 3 is removable 1: Port 3 is fixed
Fixed Port 4 (NC in 2 port hub)	23	0: Port 4 is removable 1: Port 4 is fixed
Set port num2	33	Refer Table 4 for details.
Set port num1	24	

<sup>1</sup> Pin strapping pins 45 and 35 enables proprietary function that may affect the normal functionality of HX2VL. Configuring port 1 and port 2 as non-removable by pin-strapping should be avoided.

Table 4. Number of Active Ports using Pin Strapping

POR Logic State of Pins		Active Ports
Set port num2	Set port num1	
1	1	Port 1
1	0	Ports 1, 2
0	1	Ports 1, 2, 3
0	0	Ports 1, 2, 3, 4

To pin strap a particular pin to logic high, connect the pin with a 10 K resistor to V<sub>CC</sub> (3.3 V). To pin strap a particular pin to logic low, connect the pin with a 10 K resistor to GND.

**Note** The alternate function of these pins as LED indicator is not available if the pins are strapped to logic high, unless a separate circuit is designed to support logic high disconnect after 60 ms of power-on reset(POR), when these pins are reconfigured as outputs.

## Configuring using EEPROM

HX2VL family of hubs supports booting from SPI and I2C EEPROMs for loading these parameters. EEPROM contents, if validated, have higher priority over the pin strapping configuration. HX2VL first checks for SPI EEPROM and then for I2C EEPROM if it does not find valid configuration on SPI interface. Figure 1 shows the boot sequence.

SPI EEPROMs are supported only in the 48-pin packages. HX2VL has only read access to these EEPROMs; hence an external programmer is needed for loading the EEPROM with the parameters. ATME/AT93C46DN-SH-T is an example SPI EEPROM supported by HX2VL. To prevent the configuration contents of SPI EEPROM from being overwritten, amber LED functionality is disabled when SPI EEPROM is present.

Table 5. SPI EEPROM Connection

SPI EEPROM Pin	HX2VL Pin
CS	AMBER[1], pin 46
SK	GREEN[1], pin 45
MOSI	AMBER[2], pin 36
MISO	GREEN[2], pin 35

I2C EEPROMs are supported in all packages. HX2VL has read and write access to I2C EEPROMs. Thus, I2C EEPROMs are field-programmable through USB interface. ATMEL 24C02N\_SU27 D, MICROCHIP 4LC028 SN0509, and SEIKO S24CS02AVH9 are examples of I2C EEPROMs supported by HX2VL. I2C EEPROM programming utility (Blaster) is released with the HX2VL DVK.

Table 6. I<sup>2</sup>C EEPROM Connection

I2C EEPROM Pin	HX2VL Pin	
	48-pin hub	28-pin hub
A0	GND	GND
A1	GND	GND
A2	GND	GND
SCL	TEST, pin 27	TEST, pin 18
SDA	PWR, pin 43	SDA, pin 26
WP <sup>2</sup>	V <sub>DD</sub> /GND <sup>2</sup>	V <sub>DD</sub> /GND <sup>2</sup>

EEPROM content structure is shown in Table 7.

Table 7. EEPROM Contents

Byte Address	Value
00h	VID_LSB
01h	VID_MSB
02h	PID_LSB
03h	PID_MSB
04h	Check Sum
05h	Reserved - FEh
06h	Removable ports
07h	Number of ports
08h	Maximum power
09h - 0Fh	Reserved – FFh (except 0Bh which is FEh)
10h	Vendor string length
11h - 3Fh	Vendor string (ASCII code)
40h	Product string length
41h - 6Fh	Product string (ASCII code)
70h	Serial number length
71h - 7Fh	Serial number string (ASCII code)

<sup>2</sup> WP should be tied high if the I2C EEPROM will not be programmed in the field. It should be tied low or left floating if I2C EEPROM needs to be programmed in the field by BLASTER or other means.

**Vendor ID/Product ID:** Least significant byte of vendor ID is stored in byte 0, most significant byte of vendor ID is stored in byte 1, least significant byte of product ID is stored in byte 2, and most significant byte of product ID is stored in byte 3. For applications where the USB host is an embedded host like an ASIC or SoC, there is no need for reporting a different VID/PID than the default Cypress VID/PID. In all other use cases, it is recommended for users to have user specific VID/PID. Users can obtain VID from USB-IF (<http://www.usb.org/developers/vendor/>). Users maintain their own PID list.

**Check Sum:** HX2VL checks for the condition "Check Sum = VID\_LSB + VID\_MSB + PID\_LSB + PID\_MSB + 1" on power cycle. If true, HX2VL loads the parameters from the EEPROM, else it ignores the EEPROM and loads default parameters or as defined by pin strapping.

**Removable ports:** Choose HX2VL to report any downstream ports as removable or fixed port if active. If bit x (x is 1, 2, 3, or 4) is set, port x is fixed port otherwise it is removable port. Bits 0, 5, 6, and 7 are set to 0.

**Number of ports:** Choose HX2VL to report and activate a subset of downstream ports if needed. A value of y (y is 1, 2, 3, or 4) means downstream ports 1, 2, ..., y are active. Other values of y will result in undefined behavior.

**Maximum power:** Value of max power required by the hubs is reported in the Configuration Descriptor: bMax-Power field. A value of z (z is 00h to FAh) reports a max power field value of 2\*z. In bus-powered mode, HX2VL has to provide up to 100mA per port. So its descriptor will limit the number of ports HX2VL can support. In self powered mode, the power to the hub should be limited to 100 mA.

**Strings:** The vendor, product and serial number strings must comply with the USB specification where the first byte of the string is the length of the string the string itself in ASCII. HX2VL by default reports Language ID as 0409 (English). Language ID is not configurable. Therefore, the strings are decoded by host accordingly.

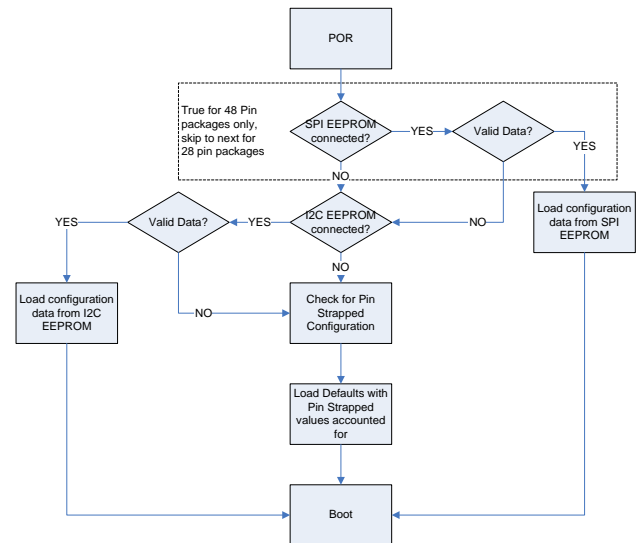
## Example

Table 8 shows EEPROM contents for Cypress VID/PID, port 2 removable, ports 1 and 3 fixed, total 3 ports active, max power 200mA, and strings "Cypress" "HX2VL" and "001E0007006D" for Vendor, Product and Serial.

Table 8. EEPROM Contents Example

Byte Address	Value
00h	B4h
01h	04h
02h	60h
03h	65h
04h	7Eh
05h	FEh
06h	0Ah
07h	03h
08h	64h
09h - 0Fh	Reserved - FFh (except 0Bh which is FEh)
10h	07h
11h - 17h	43h, 79h, 70h, 72h, 65h, 73h, 73h
18h - 3Fh	Don't care (FFh)
40h	05h
41h - 45h	48h, 58h, 32h, 56h, 4Ch
46h - 6Fh	Don't care (FFh)
70h	0Ch
71h - 7Ch	30h, 30h, 31h, 45h, 30h, 30h, 30h, 37h, 30h, 30h, 36h, 44h
7Dh - 7Fh	Don't care (FFh)

Figure 1. HX2VL Boot Sequence



## Summary

The EEPROM is required to change the VID, PID, and vendor/product/serial number strings in most applications. Some applications involving embedded hosts may not need to modify any parameter. For a bus powered hub changing maximum reported power requires an EEPROM. Pin strapping can be used till certain extent but should be avoided in cases where it can enable proprietary function.

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	3474252	SHAH	12/23/11	New application note.
*A	4620695	PRJI	1/12/15	This AN has been merged with AN72332. Hence obsolescing this AN.

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