VIA Labs, Inc.

Data Sheet

VL810
Super-Speed USB Hub Controller

November 20, 2009
Revision 0.80

Revision History

Rev	Date	Initial	Note
0.8	11/20/2009	DH	Initial external release

Table of Contents

List of Figures

List of Tables

Product Features

VL810
Super-Speed USB Hub Controller

- **Compliant to USB 3.0 aka. Super-speed USB**
  - Compliant to Universal Serial Bus 3.0 Specification Revision 1.0
  - Compliant to Universal Serial Bus Specification Revision 2.0
  - One up-stream port supports Super-speed(SS), high-speed (HS) and full-speed (FS) traffic
  - Four down-stream ports support Super-speed(SS), high-speed (HS), full-speed (FS), and low-speed (LS) traffic
  - In-house USB PHY employing advanced CMOS process to consume less power
- **Support full functions of sideband signal**
  - Support both individual and gang mode for power enable and over current detection on each down-stream port
  - Support green and amber LED status indicator with automatic and manual mode control on each down-stream port
- **Misc**
  - 3.3 V and 1.0 V power supply
  - PLL embedded with external 25MHz crystal
  - Support external SPI flash for firmware upgrade
- **Software**
  - Support Microsoft Windows 7, Vista, XP, 2003, 2000, and ME
  - Support Mac OS 10.X
  - Support various Linux kernels
- **Physical**
  - QFN 88L green package (10x10x0.85 mm)
- **Certification**
  - TBD.
- **Applications**
  - Standalone Super-speed USB hub
  - Desktop/Notebook motherboard on-board hub
  - Desktop front panel hub
  - Docking system
  - USB hub compound device with keyboard, mouse, display, and printer …

VL810 System Overview

VIA Lab's VL810 is a low-power single chip USB 3.0 Hub controller designed for connecting four more USB devices from a host computer or another hub. Employing advanced CMOS process, its integrated in-house USB PHY enables VL810 to run in USB Super-Speed, High-Speed, and Full-Speed modes while consuming less power. VL810 based hub devices can work on Windows 7, Vista, XP, 2003/2000/ME, Mac OS X and various Linux kernels without additional driver. It is suitable for stand alone USB hub, desktop PC front panel hub, motherboard on-board hub, docking systems, and USB hub compound device with mouse, keyboard, display, or printer, etc.

With well-planned pinout and advanced process, VL810 based devices can enjoy easy layout and low working temperature in a very small housing. Full sideband signal pins are available for showing power enable, over current, and LED status control. The SPI interface can support external EEPROM/Flash for firmware upgrades or additional software enhancements. VL810 is available in QFN 88L green package (10x10x0.85 mm) to fit small form-factor design.

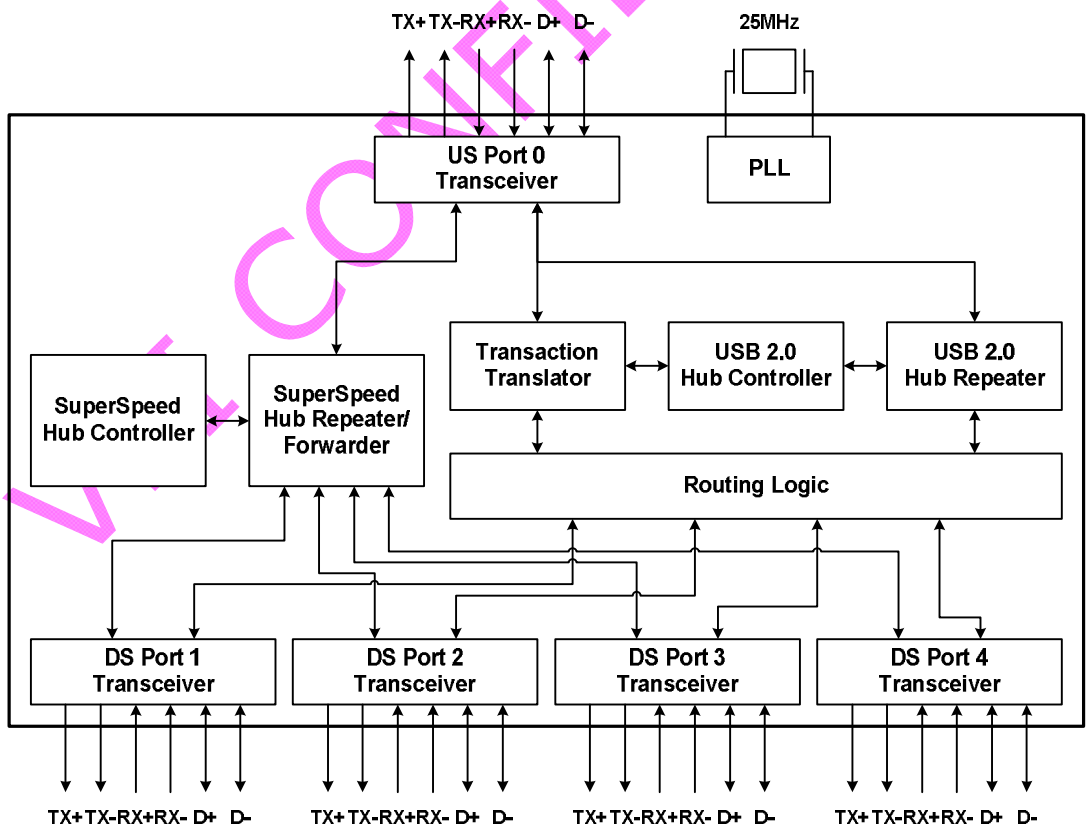


Figure 1 – VL810 Block Diagram

Pinout

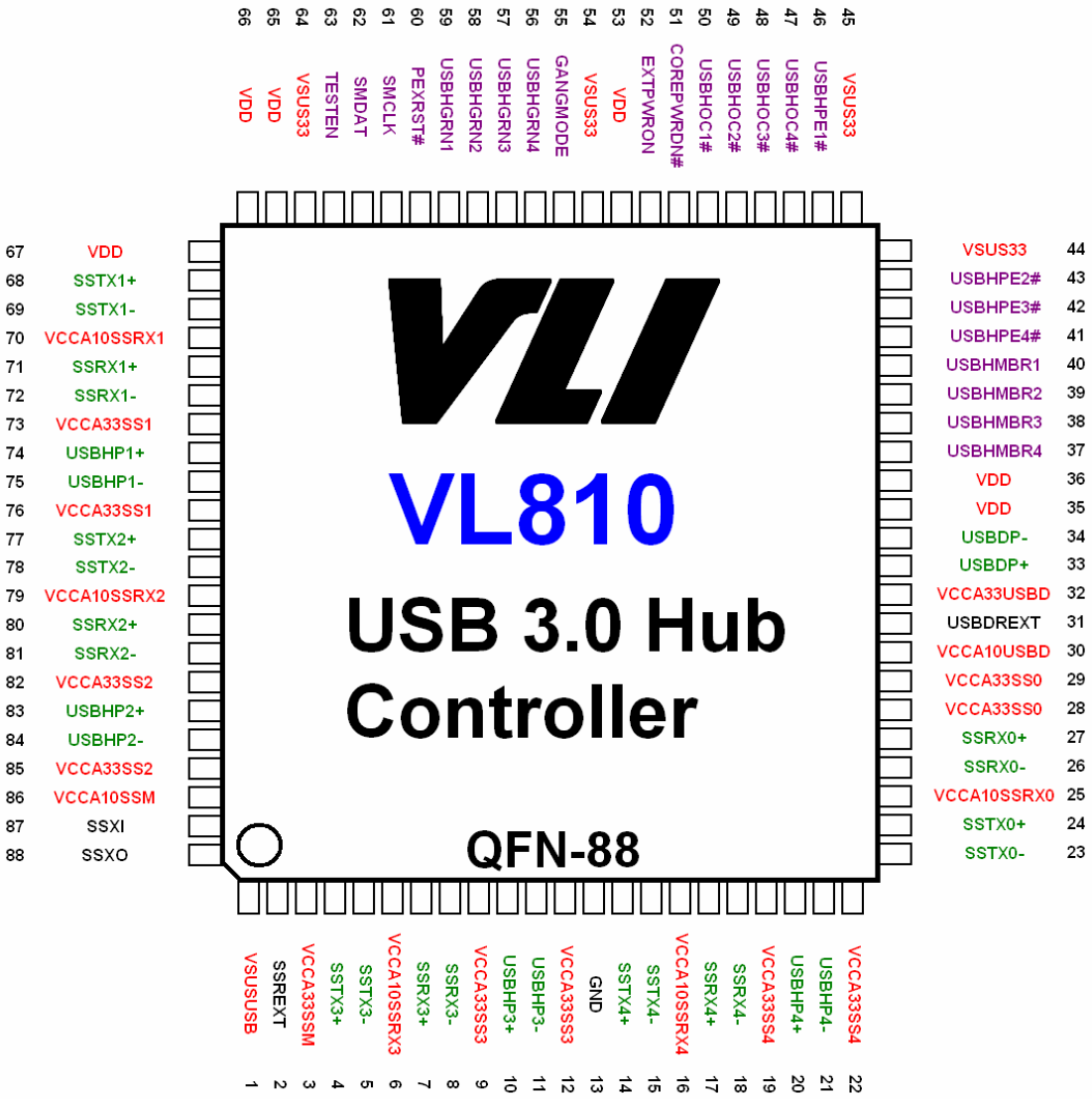


Figure 2 – VL810 Pin Diagram

Pin List

Table 1 – VL810 Pin List

Pin	Pin Name	Pin	Pin Name
1	VSUSUSB	45	VSUS33
2	SSREXT	46	USBHPE1#
3	VCCA33SSM	47	USBHOC4#
4	SSTX3+	48	USBHOC3#
5	SSTX3-	49	USBHOC2#
6	VCCA10SSRX3	50	USBHOC1#
7	SSRX3+	51	COREPWRDN#
8	SSRX3-	52	EXTPWRON
9	VCCA33SS3	53	VDD
10	USBHP3+	54	VSUS33
11	USBHP3-	55	GANGMODE
12	VCCA33SS3	56	USBHGRN4
13	GND	57	USBHGRN3
14	SSTX4+	58	USBHGRN2
15	SSTX4-	59	USBHGRN1
16	VCCA10SSRX4	60	PEXRST#
17	SSRX4+	61	SMCLK
18	SSRX4-	62	SMDAT
19	VCCA33SS4	63	TESTEN
20	USBHP4+	64	VSUS33
21	USBHP4-	65	VDD
22	VCCA33SS4	66	VDD
23	SSTX0-	67	VDD
24	SSTX0+	68	SSTX1+
25	VCCA10SSRX0	69	SSTX1-
26	SSRX0-	70	VCCA10SSRX1
27	SSRX0+	71	SSRX1+
28	VCCA33SS0	72	SSRX1-
29	VCCA33SS0	73	VCCA33SS1
30	VCCA10USBD	74	USBHP1+
31	USBDREXT	75	USBHP1-
32	VCCA33USBD	76	VCCA33SS1
33	USBDP+	77	SSTX2+
34	USBDP-	78	SSTX2-
35	VDD	79	VCCA10SSRX2
36	VDD	80	SSRX2+
37	USBHMBR4	81	SSRX2-
38	USBHMBR3	82	VCCA33SS2
39	USBHMBR2	83	USBHP2+
40	USBHMBR1	84	USBHP2-
41	USBHPE4#	85	VCCA33SS2

42	USBHPE3#	86	VCCA10SSM
43	USBHPE2#	87	SSXI
44	VSUS33	88	SSXO

Pin Descriptions

Signal Type Definition

Name	Type	Signal Description
Input	I	A standard input-only signal
Output	O	A standard active driver
Input/Output	I/O	A bi-directional signal
Analog bias	A_{BIAS}	Analog bias or reference signal. Must be tied to external resistor and/or capacitor bias network
Power	PWR	A power pin
Ground	GND	A ground pin

USB 3.0 Interface

Pin Name	Pin #	I/O	Signal Description
SSTX0+	24	O	USB 3.0 UP Port Differential Transmit Data +
SSTX0-	23	O	USB 3.0 UP Port Differential Transmit Data -
SSRX0+	27	I	USB 3.0 UP Port Differential Receive Data +
SSRX0-	26	I	USB 3.0 UP Port Differential Receive Data -
VCCA10SSRX0	25	PWR	Analog 1.0V
VCCA33SS0	28,29	PWR	Analog 3.3V
SSTX1+	68	O	USB 3.0 DP1 Port Differential Transmit Data +
SSTX1-	69	O	USB 3.0 DP1 Port Differential Transmit Data -
SSRX1+	71	I	USB 3.0 DP1 Port Differential Receive Data +
SSRX1-	72	I	USB 3.0 DP1 Port Differential Receive Data -
VCCA10SSRX1	70	PWR	Analog 1.0V
VCCA33SS1	73	PWR	Analog 3.3V
SSTX2+	77	O	USB 3.0 DP2 Port Differential Transmit Data +
SSTX2-	78	O	USB 3.0 DP2 Port Differential Transmit Data -
SSRX2+	80	I	USB 3.0 DP2 Port Differential Receive Data +
SSRX2-	81	I	USB 3.0 DP2 Port Differential Receive Data -
VCCA10SSRX2	79	PWR	Analog 1.0V
VCCA33SS2	82,85	PWR	Analog 3.3V
SSTX3+	4	O	USB 3.0 DP3 Port Differential Transmit Data +
SSTX3-	5	O	USB 3.0 DP3 Port Differential Transmit Data -
SSRX3+	7	I	USB 3.0 DP3 Port Differential Receive Data +
SSRX3-	8	I	USB 3.0 DP3 Port Differential Receive Data -
VCCA10SSRX3	6	PWR	Analog 1.0V
VCCA33SS3	9,12	PWR	Analog 3.3V
SSTX4+	14	O	USB 3.0 DP4 Port Differential Transmit Data +
SSTX4-	15	O	USB 3.0 DP4 Port Differential Transmit Data -
SSRX4+	17	I	USB 3.0 DP4 Port Differential Receive Data +
SSRX4-	18	I	USB 3.0 DP4 Port Differential Receive Data -
VCCA10SSRX4	16	PWR	Analog 1.0V
VCCA33SS4	19,22	PWR	Analog 3.3V
VCCA33SSM	3	PWR	USB 3.0 Master Block Analog 3.3V

USB 2.0 Interface

Pin Name	Pin #	I/O	Signal Description
USBDP+	33	I/O	USB 2.0 UP Bus Data Plus (D+)
USBDP-	34	I/O	USB 2.0 UP Bus Data Minus (D–)
VCCA33USBD	32	PWR	Analog 3.3V
VCCA10USBD	30	PWR	Analog 1.0V
USBHP1+	74	I/O	USB 2.0 DP1 Bus Data Plus (D+)
USBHP1-	75	I/O	USB 2.0 DP1 Bus Data Minus (D–)
USBHP2+	83	I/O	USB 2.0 DP2 Bus Data Plus (D+)
USBHP2-	84	I/O	USB 2.0 DP2 Bus Data Minus (D–)
USBHP3+	10	I/O	USB 2.0 DP3 Bus Data Plus (D+)
USBHP3-	11	I/O	USB 2.0 DP3 Bus Data Minus (D–)
USBHP4+	20	I/O	USB 2.0 DP4 Bus Data Plus (D+)
USBHP4-	21	I/O	USB 2.0 DP4 Bus Data Minus (D–)

Analog Command Block

Pin Name	Pin #	I/O	Signal Description
SSXI	87	I	25M crystal input
SSXO	88	O	25M crystal output
VCCA10SSM	86	PWR	1.0V OSC VDDA
SSREXT	2	A_{BIAS}	Super speed connect to external resistor
USBDREXT	31	A_{BIAS}	High speed connect to external resistor

Side Band signal and Miscellaneous

Pin Name	Pin #	I/O	Signal Description
USBHMBR1	40	O	DP1 Amber LED Indicator
USBHMBR2	39	O	DP2 Amber LED Indicator
USBHMBR3	38	O	DP3 Amber LED Indicator
USBHMBR4	37	O	DP4 Amber LED Indicator
USBHGRN1	59	O	DP1 Green LED Indicator
USBHGRN2	58	O	DP2 Green LED Indicator
USBHGRN3	57	O	DP3 Green LED Indicator
USBHGRN4	56	O	DP4 Green LED Indicator
USBHPE1#	46	O	DP1 Power Enable
USBHPE2#	43	O	DP2 Power Enable
USBHPE3#	42	O	DP3 Power Enable
USBHPE4#	41	O	DP4 Power Enable
USBHOC1#	50	I	DP1 Over Current Indicator
USBHOC2#	49	I	DP2 Over Current Indicator
USBHOC3#	48	I	DP3 Over Current Indicator
USBHOC4#	47	I	DP4 Over Current Indicator
EXTPWRON	52	I	External power on
COREPWRDN#	51	O	Core power down
GANGMODE	55	I	Gang mode
SMCLK	61	OD	SM bus clock
SMDAT	62	OD	SM bus data
PEXRST#	60	I	System reset

Test Pin

Pin Name	Pin #	I/O	Signal Description
TESTEN	63	I	Test Mode Enable Do not connect for normal operation. Internal pull down.

Power and Ground

Pin Name	Pin #	I/O	Signal Description
GND	13	GND	Ground
VDD	35,36,53, 65,66,67,	PWR	1.0V Core power
VSUS33	44,45,54, 64,	PWR	3.3V suspend power
VSUSUSB	1	PWR	1.0V suspend power

Electrical Specification

Absolute Maximum Rating

Symbol	Parameter	Min	Max	Unit	Note
T_{STG}	Storage Temperature	-55	125	°C	—
T_A	Ambient Temperature	0	70	°C	—
V_{Sus33}	3.3V Power Supply Voltage	-0.5	3.69	V	—
V_{DD}	Input Voltage	-0.5	1.1	V	—
V_{SUSUSB}	Input Voltage	-0.5	1.1	V	—
V_{ESD}	Electrostatic Discharge	—	2	kV	Human Body Model

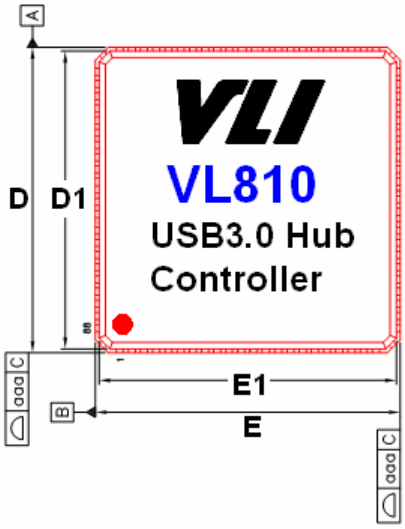
Note: Stress above conditions may cause permanent damage to the device.
Functional operation of this device should be restricted to the conditions described.

DC Characteristics

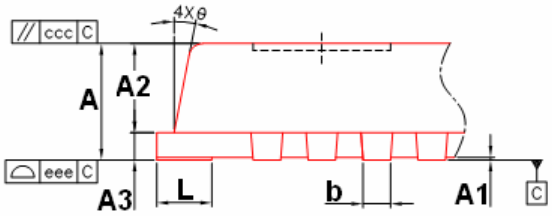
Operating Conditions:
T_C = 0~+55°C
V_{DD} = 1.0 V±10%
V_{SUSUSB} = 1.0 V±10%
V_{SUS33} = 3.3V±10%
GND = 0V

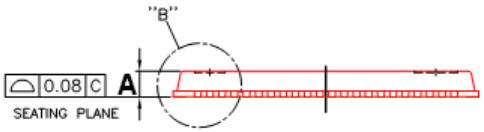
Symbol	Parameter	Min	Max	Unit	Note
V_{IL}	Input Low Voltage	-0.50	0.8	V	—
V_{IH}	Input High Voltage	2.0	VCC+0.5	V	—
V_{OL}	Output Low Voltage	—	0.4	V	IOL=4.0mA
V_{OH}	Output High Voltage	2.4	—	V	IOH=-1.0mA
I_{IL}	Input Leakage Current	—	+/-10	µA	0<VIN<VCC
I_{OZ}	Tristate Leakage Current	—	+/-20	µA	0<VOUT<VCC

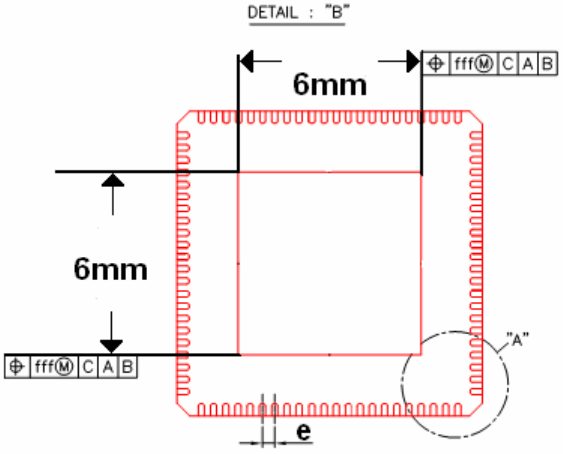
Package Mechanical Specifications



Symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.85	0.90	0.031	0.033	0.035
A1	0.00	0.02	0.05	0.000	0.001	0.002
A2	0.60	0.65	0.70	0.024	0.026	0.028
A3	0.20 REF			0.008 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D/E	10.00 BSC			0.394 BSC		
D1/E1	9.75 BSC			0.384 BSC		
e	0.40 BSC			0.016 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020
θ	0°	---	14°	0°	---	14°
R	0.075	---	---	0.003	---	---
K	0.20	---	---	0.008	---	---
aaa	0.10			0.004		
bbb	0.07			0.003		
ccc	0.10			0.004		
ddd	0.05			0.002		
eee	0.08			0.003		
fff	0.10			0.004		







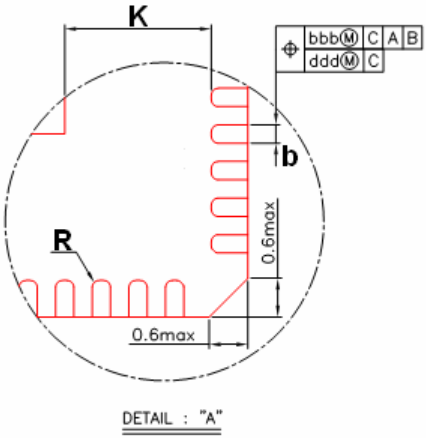


Figure 3 – Mechanical Specification – QFN 88L 10x10x0.85 mm Package

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