



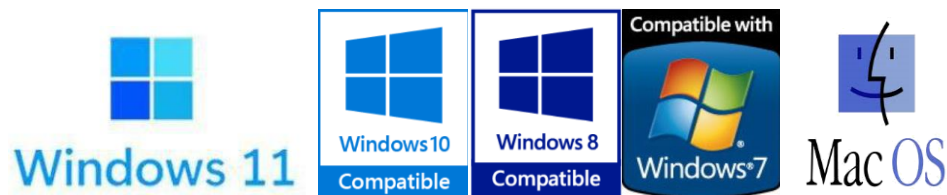
CS8.1

USB 2.0 High Speed 4-Port Hub Controller

Product Datasheet

Document Revision: 1.1 www.angerei.com TEL:18520874087 QQ:1659747718

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Product Data Sheet

CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)



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REVISION HISTORY

Revision	Description	Date
1.1	➤ Added SSOP16 package Ordering information ➤ Added IC Bottom PAD information of pin assignment ➤ Added package outline	2022/2/16
1.0	➤ Modified chip version of ordering information from A1 to A2 ➤ Added TID of USB Compliance test	2022/2/9
0.1	➤ Initial Version	2021/5/18

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1. Description

The CS8.1 is a high performance solution for USB 2.0 High Speed 4-port hub controller with fully compliant with Universal Serial Bus Specification 2.0. The controller inherits advanced serial interface technology to consume the least power when 4 DS (downstream) ports function simultaneously.

The CS8.1 is an innovation that integrates function to comply with USB-IF “Battery Charging Specification Revision 1.2”, which supports fast charging function for portable devices. This feature turns CS8.1 into a USB Charging Hub for “Universal Charging Solution”, (UCS) compliant battery based portable devices, promoted by GSMA. The dedicated port in CS8.1 can handle the charging request when B.C. compliant portable device is detected on the downstream port. And, after the handshake has been completed, CS8.1 allows portable devices to draw up to 900mA (High speed); 1.5A (Low/Full speed) from charging downstream ports (CDP) or 1.5A from dedicated charging port (DCP).

CS8.1 adapts Single Transaction Translator (STT) and Gated power management to achieve cost effective purpose. Users can also implement multiple Hub configuration options through external EEPROM.

CS8.1 supports QFN24 and SSOP28 packages targeting mainstream stand-alone 4 ports Hub market.

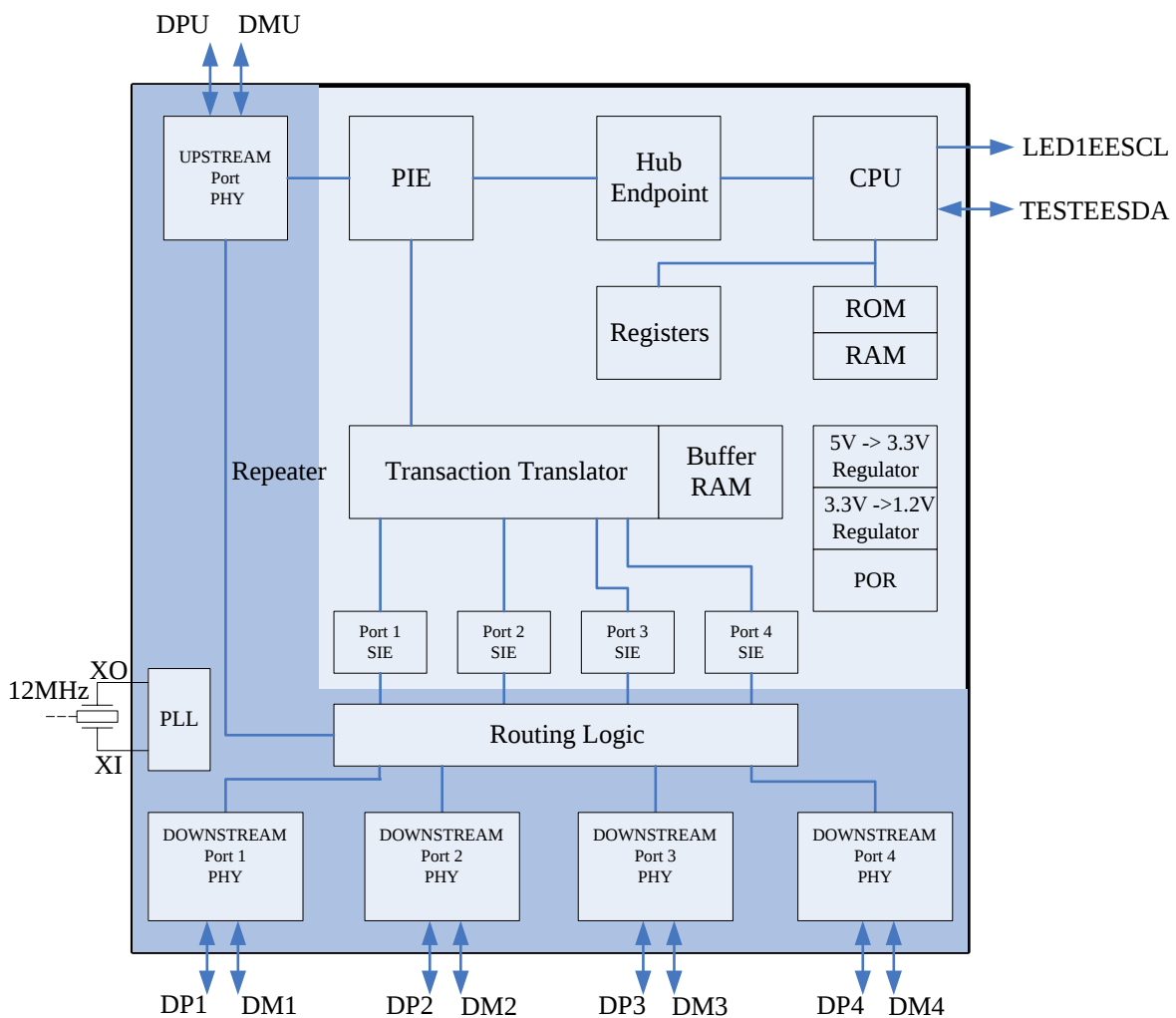
2. Features

- Compliant with USB Specification Revision 2.0
 - Upstream Port supports high-speed (480MHz) and full-speed (12MHz) traffic
 - Configurable 4/3/2 downstream ports support high-speed, full-speed, and low-speed
 - Backward compatible to USB Specification Revision 1.1
- Compliant with USB Battery Charging Specification Revision 1.2
- Integrated Fast 8051 microprocessor
- 12MHz Oscillator clock input
- Integrated upstream 1.5K Ω pull-up downstream 15K Ω pull-down resistors
- Single Transaction Translator (Single TT)
- Ganged Power Control and Global Over Current detection for downstream ports
- Leading small power consumption USB2.0 Hub
- On chip 5V to 3.3V and 3.3V to 1.2V regulator
- Automatic re-enumeration for switching between self-powered and bus-powered modes
- External EEPROM interface for customized information storage
 - Customized VID, PID
 - Number of downstream port
 - Product ID
 - Serial number
- Two LED port indicator mode
 - 4 Downstream port LED (enable green) and one Active/Suspend LED (Red)
 - One joint Downstream port LED for 4 ports (enable green) and one Active/Suspend LED(Red)
- Type of packages
 - QFN24 / SSOP28 / SSOP16

3. Ordering Information

Chip Product Name	Package Type	Ordering Part Number	MPQ
CS8.1	28-pin SSOP	PL2586A2ZJG7P1	50 pcs / tube
		PL2586A2ZJG8P1	2500pcs / reel
	24-pin QFN	PL2586A2FIG8P1	4000 pcs / reel
	16-pin TSSOP	PL2586A2ZGG7P1	100 pcs / tube
		PL2586A2ZGG8P1	3000pcs / reel

4. Block Diagram



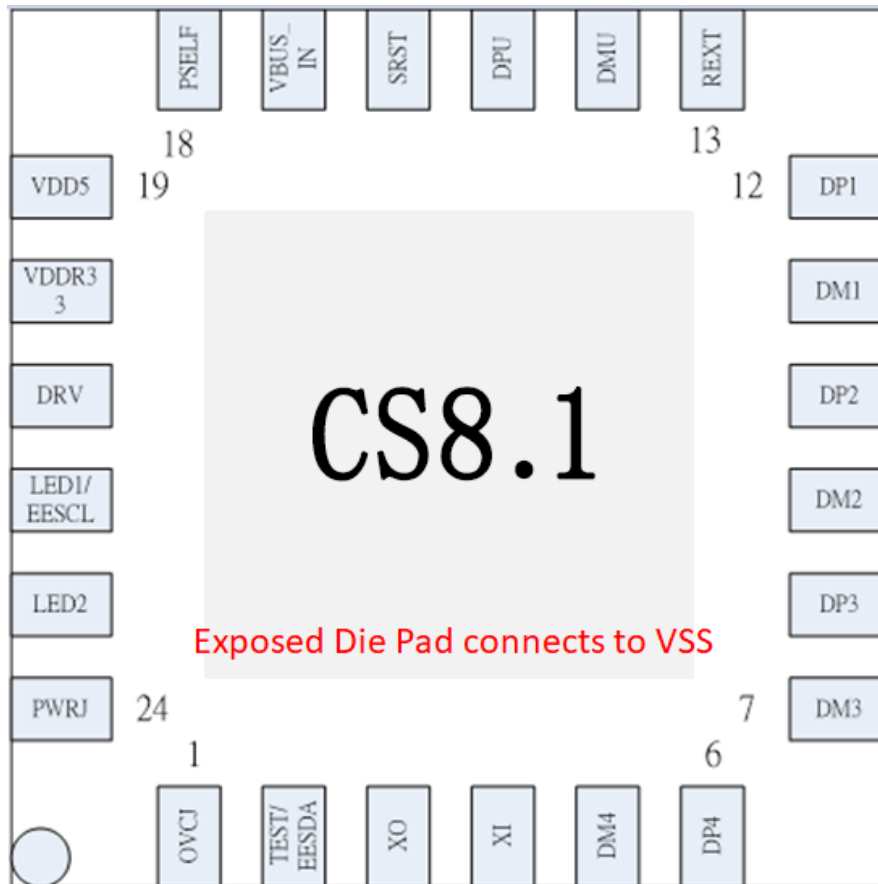
5. USB Logo Certification

The CS8.1IC has been certified by the USB-IF organization with TID 6701 to be fully compliant with the USB 2.0 specification.

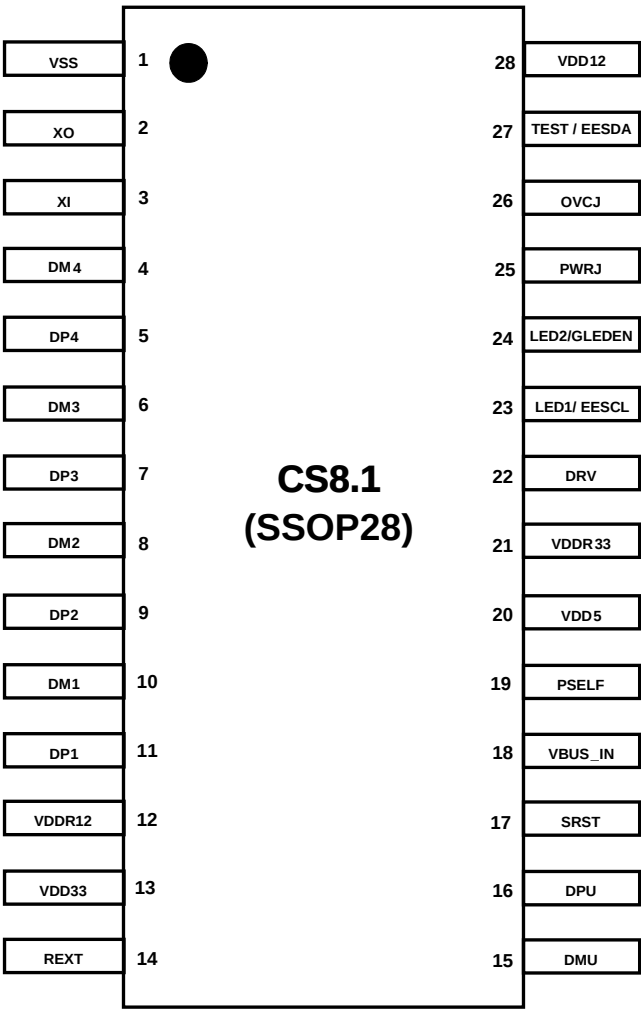


6. Pin Assignment

6.1 QFN24 Pin Diagram



6.2 SSOP28 Pin Diagram



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6.3 Pin Description (QFN24 & SSOP28)

QFN24 Pin #	SSOP28 Pin #	SSOP16 Pin #	Pin Name	I/O	Description
1	26	-	OVCJ	B	Global over current detection indicator for 4 DSP, active low.
2	27	-	TEST / EESDA	B	Test mode enable, (pull up) / EEPROM data pin. For normal usage this EESDA pin should left as No-Connection or connect to EEPROM SDA pin. Active low.
3	2	15	XO	P	12MHz Crystal Oscillator output
4	3	16	XI	P	12MHz Crystal Oscillator input
5	4	1	DM4	B	USB D- pin for the 4 th Downstream Port
6	5	2	DP4	B	USB D+ pin for the 4 th Downstream Port
7	6	3	DM3	B	USB D- pin for the 3 rd Downstream Port
8	7	4	DP3	B	USB D+ pin for the 3 rd Downstream Port
9	8	5	DM2	B	USB D- pin for the 2 nd Downstream Port
10	9	6	DP2	B	USB D+ pin for the 2 nd Downstream Port
11	10	7	DM1	B	USB D- pin for the 1 st Downstream Port
12	11	8	DP1	B	USB D+ pin for the 1 st Downstream Port
13	14	9	REXT	I	USB PHY bias reference
14	15	10	DMU	B	USB D- pin for the Upstream Port
15	16	11	DPU	B	USB D- pin for the Upstream Port
16	17	-	SRST	I	System reset pin (pull up)
17	18	-	VBUS_IN	I	USB Vbus facing port. Used to monitor the power state of Vbus. When Vbus_in = 1, the chip starts function.
18	19	-	PSELF	B	a. Bus power monitor. Distinguish

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					the power source is Self-powered or Bus-powered. (High level indicates Self-Powered; Low level indicates Bus-Powered; default with in-chip pull- low resistor) b. pin can support DCP mode with Vbus connected. c. When charge function enabled (DRV pull-high), and PSELF pull to low, DP1/DM1 resume to only data transfer mode.
19	20	12	VDD5	P	5V input for LDO
20	21	-	VDDR33	P	3.3V output from 5V LDO
21	22	-	DRV	B	LED control / Charging Hub Enable a. When chip normal function(without enabling the charging mode), this DRV pin is responsible for indicating the Hub active/suspends status, tie to GND. (refer to schematic) b. When enabling charge function, (DRV pull high to VCC), 4 downstream ports will support BC1.2 (SDP/CDP/DCP) fast charge with power adaptor connected b1. CS8.1auto-detect device is BC1.2 b2. In CDP mode with Vbus connected, CS8.1 supports data communication and fast charge. (900mA for HS device) b3. In DCP mode with Vbus disconnected, CS8.1 supports fast charge with up to 1.5A , similar to

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					wall adaptor (refer to schematic)
22	23	-	LED1/ EESCL	B	DSP 1 and DSP 3 LED control / EEPROM clock a. When using 4LED for each downstream port, this LED1 pin is responsible for port1 and port3 control. (refer to schematic) b. When LED2 is pull high during initiate, LED1 act as the LED indicator for all 4ports. c. Clock of EEPROM (SCL)
23	24	-	LED2/ GLEDEN	B	DSP 2 and DSP 4 LED control/Group LED Indicator Enable a. When using 4LED for each downstream port, this LED2 pin is responsible for port2 and port4 control. (refer to schematic) b. When using 1LED for 4 downstream port, this LED2 pin is responsible for enable Group LED indicator (GLEDEN), with it pull high to 3.3V (refer to schematic)
24	25	-	PWRJ	B	Power switch enable power for 4 DSP devices in Ganged powered mode, active low.
EPAD	1	14	VSS	P	Ground
-	12	-	VDDR12	P	1.2V output from 3.3V to 1.2VLDO
-	13	13	VDD33	P	3.3V input for 3.3V to 1.2VLDO
-	28	-	VDD12	P	1.2V power input
IC Bottom PAD		-	VSS	P	Connects to VSS

I/O Type Definition

O : Output

I : Input

B : Bi-directional

P : Power

7. Data Format Defined in EEPROM

This controller supports in-system customization to fulfill wide range of applications without controller re-spin. This is achieved via non-volatile memory of low density two-wire serial EEPROM. This type of memory is widely-used industrial standard hence make it the cost-efficient solution for customization and vastly ease time-to-market curve.

Table 7-1 of EEPROM array.

Offset (Hex)	Size (Dec)	Description
0x00	1	Validation byte 0. There are 7 validation bytes across EEPROM array to check possibly corruption of valid data. These validation bytes are generated dynamically according to content of EEPROM array. Any value other than generated will invalidate the EEPROM content and the controller will not load value from EEPROM during initialization.
0x01	1	Validation byte 1.
0x02	1	idVendor of USB Standard Device Descriptor. Big-endian.
0x03	1	idVendor of USB Standard Device Descriptor. Big-endian.
0x04	1	idProduct of USB Standard Device Descriptor. Big-endian.
0x05	1	idProduct of USB Standard Device Descriptor. Big-endian.
0x06	1	bcdDevice of USB Standard Device Descriptor. Big-endian.
0x07	1	bcdDevice of USB Standard Device Descriptor. Big-endian.
0x08 ~ 0x19	18	Reserved. Fill 0x00
0x1A	1	Number of downstream facing ports in Hub Descriptor. 0x1: 1 downstream facing port is supported by this hub. 0x2: 2 downstream facing ports are supported by this hub. 0x3: 3 downstream facing ports are supported by this hub. 0x4: 4 downstream facing ports are supported by this hub. Other value: invalid
0x1B ~	14	Reserved. Fill 0x00

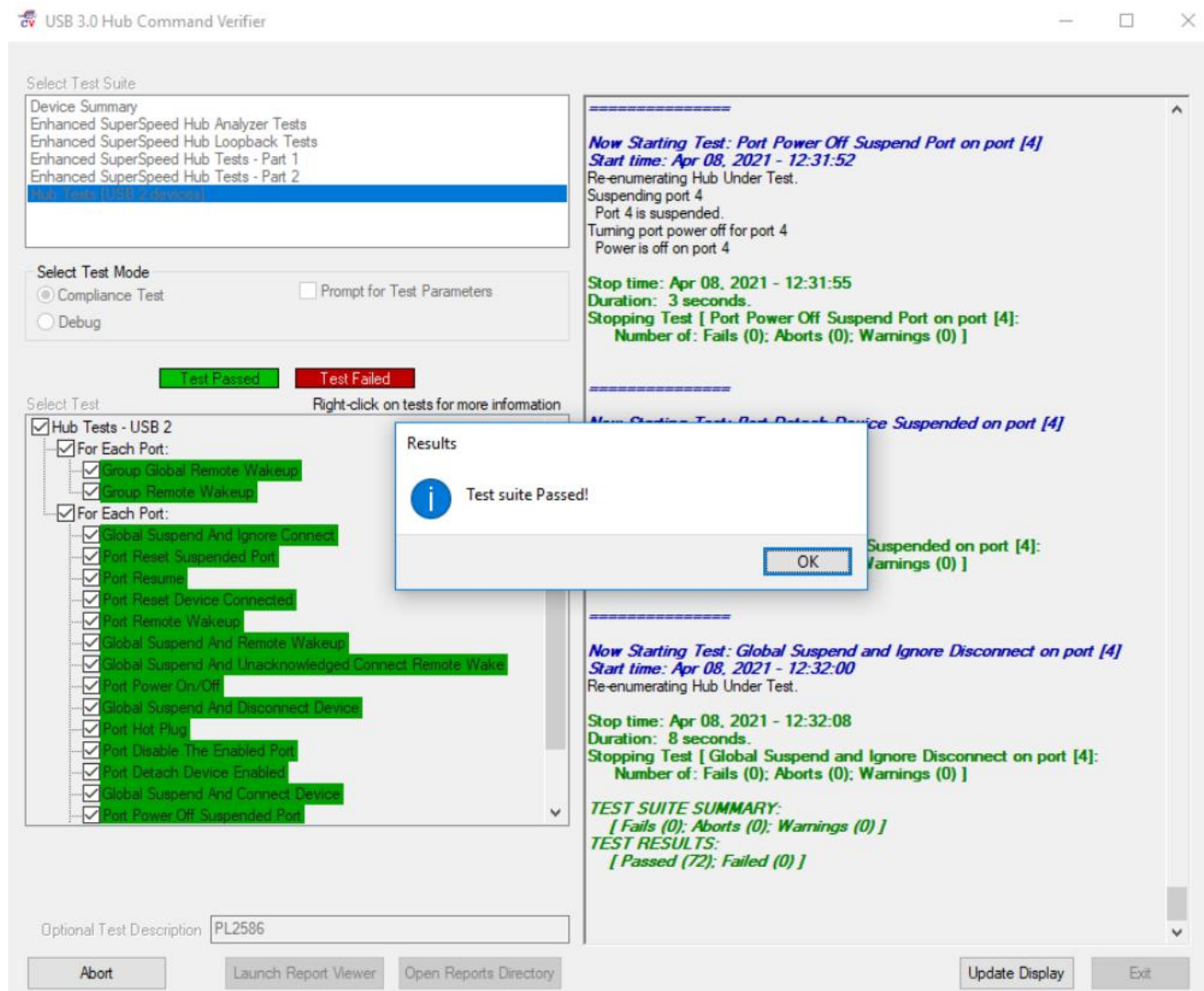
Rev.1.1

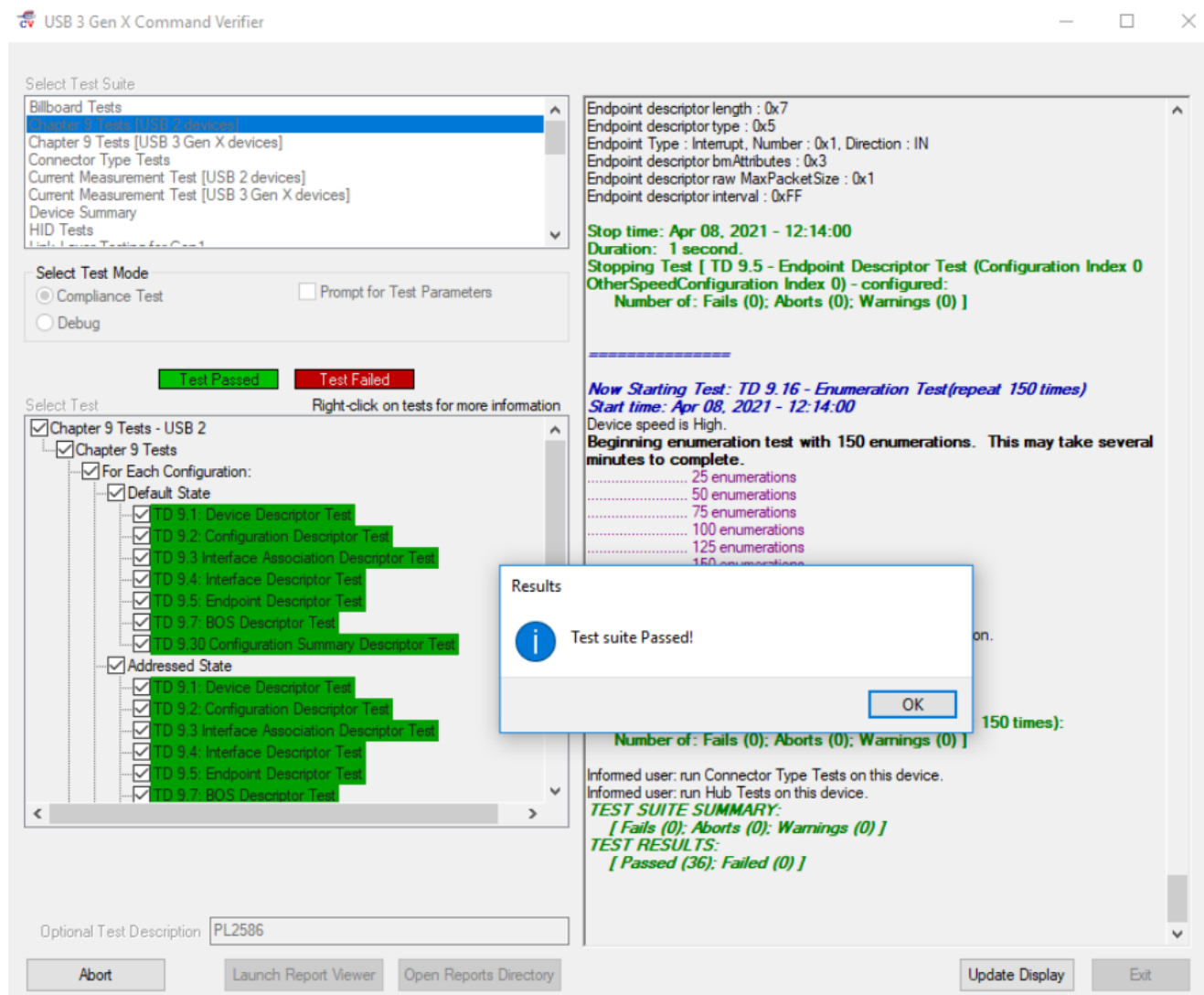
		''', '''
0x48	1	Length of string descriptor describing serial number (offset 0x49~0x54). This field represents length of characters and will be automatically converted to bLength format of String Descriptor. Maximum value of this field is 12. If this byte is 0x00 or 0xFF then no serial number string will be reported.
0x49 ~ 0x54	12	ASCII coded data of string descriptor describing serial number, indicated by iSerialNumber of USB Standard Device Descriptor. The array here is ASCII coded and will be automatically converted to Unicode coded in forming String Descriptor. Example: '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B'
0x55	1	Bit[7:4]: reserved, do not use bit[3] : DeviceRemovable indicator of downstream facing port 4 of Hub Descriptor 0b: device is removable 1b: device is non-removable bit[2] : DeviceRemovable indicator of downstream facing port 3 of Hub Descriptor 0b: device is removable 1b: device is non-removable bit[1] : DeviceRemovable indicator of downstream facing port 2 of Hub Descriptor 0b: device is removable 1b: device is non-removable bit[0] : DeviceRemovable indicator of downstream facing port 1 of Hub Descriptor 0b: device is removable 1b: device is non-removable
0x56	1	Validation byte 5.
0x57	1	Validation byte 6.
Other offset	-	Reserved for future use.

Note: Contact Prolific representative for EEPROM tooling.

8. USB3 & USB2 HUB Command Verifier

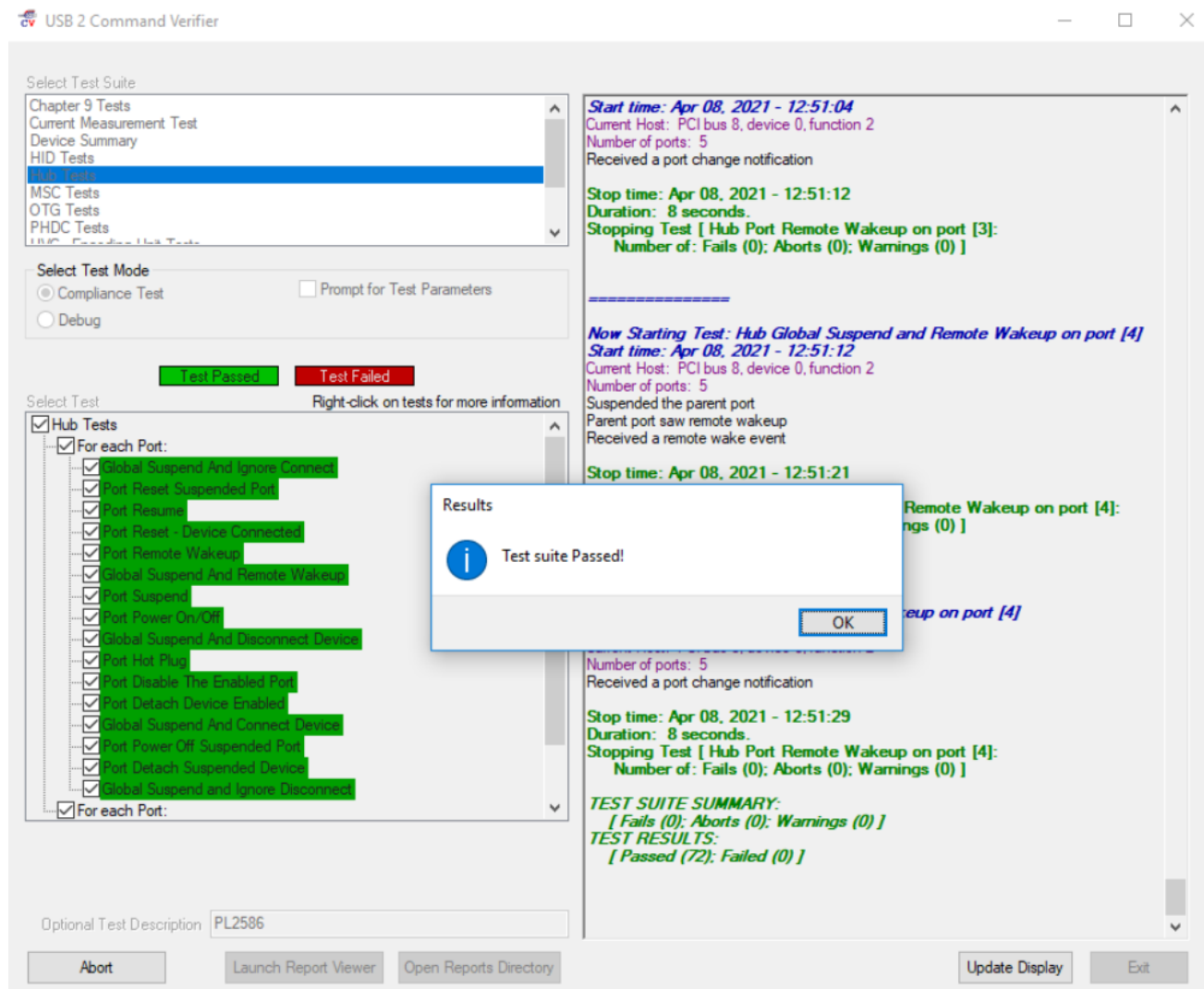
8.1 USB3 HUB Command Verifier





CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)

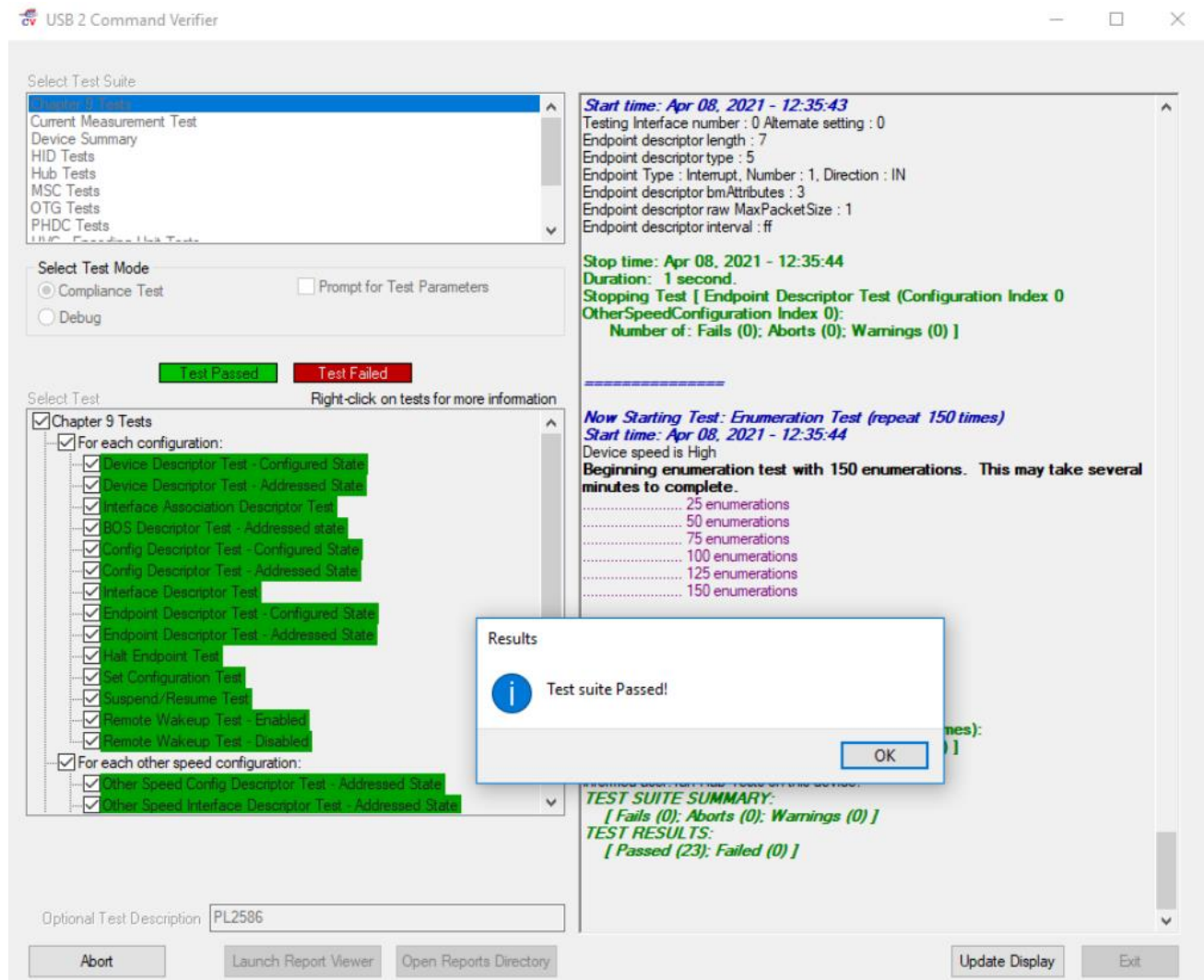
8.2 USB2 HUB Command Verifier



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9. Electrical Characteristics

9.1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
VBUS	5V Power Supply Voltage	-0.3	5.5	V
VDD33	3.3V Power Supply Voltage	-0.3	3.8	V
VDD12	1.2V Power Supply Voltage	-0.3	1.6	V
Ts	Storage Temperature	-55	150	°C

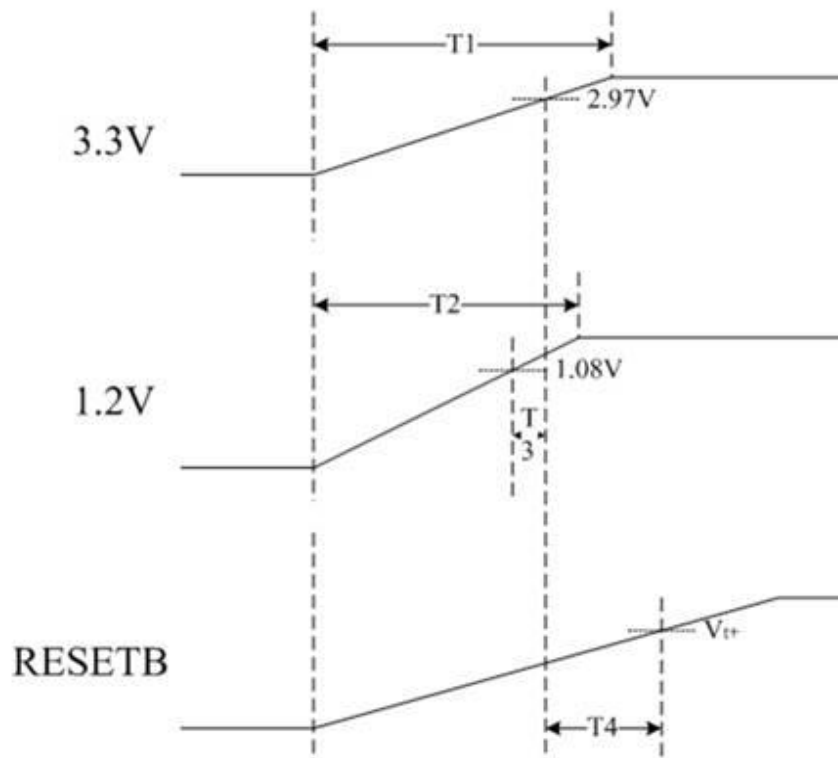
9.2 Operating Conditions

Symbol.	Parameter	Rating			Unit
		Min.	Typ.	Max.	
VBUS	5V Power Supply Voltage	3.0	5	5.5	V
VDD33	3.3V Power Supply Voltage	3.0	3.3	3.6	V
VDD12	1.2V Power Supply Voltage	1.08	1.2	1.32	V
T _A	Operating Temperature	-40	-	85	°C
T _J	Junction Temperature	-40	-	125	°C
θ _{Jc}	Thermal Characteristics SSOP28		22		°C/W
θ _{Jc}	Thermal Characteristics QFN24		20		°C/W

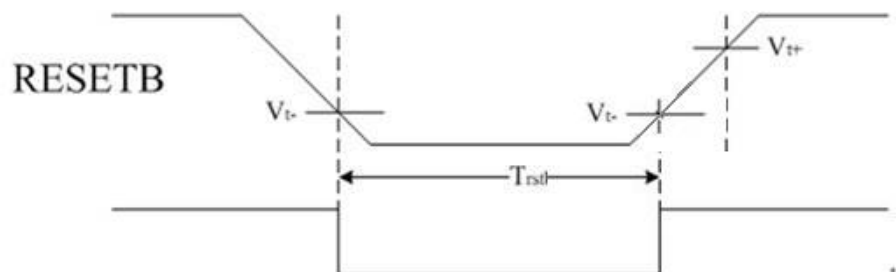
9.3 DC Characteristics

Symbol.	Parameter	Rating			Unit
		Min.	Typ.	Max.	
V _{IH}	High level input voltage	2.0	-	-	V
V _{IL}	Low level input voltage	-	-	0.8	V
V _{t-}	Schmitt-trigger negative to threshold voltage	-	-	1.6	V
V _{t+}	Schmitt-trigger positive to threshold voltage	1.8	-	-	V
V _{OH}	High level output voltage	2.5	-	-	V
V _{OL}	Low level output voltage	-	-	0.4	V
I _{OH}	High level output current	-	6	-	mA
I _{OL}	Low level output current (V _{OL} =0.4V)	-	6	-	mA

9.4 Power on Sequence



Reset Timing



SYMBOL	MIN	TYP	MAX	UNIT
T1	-	70	-	us
T2	-	60	-	us
T3	-	12	-	us
T4	-	400	-	us
T _{rstb}	2000	-	-	us

Note: For V_{tr} and V_{tr}, refer to 9.3

CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)

10. Power consumption

10.1 Measurement with the total device consumption

CS8.1 Power Consumption						
Symbol	Condition			Idle	R/W	Unit
	Active ports	Host	Device			
Icc	4	H	H	55.3	135.6	mA
		H	F	53.0	58.6	mA
		H	L	49.3	49.6	mA
		F	H	45.7	54.9	mA
		F	F	52.7	58.4	mA
		F	L	46.8	47.1	mA
	3	H	H	53.6	122.1	mA
		H	F	51.2	55.3	mA
		H	L	48.5	48.8	mA
		F	H	45.2	51.8	mA
		F	F	51.0	55.2	mA
		F	L	46	49	mA
	2	H	H	51.8	98.1	mA
		H	F	49.5	52.1	mA
		H	L	47.8	48.1	mA
		F	H	44.7	49.8	mA
		F	F	49.4	52.0	mA
		F	L	45.2	45.5	mA
	1	H	H	50.1	64.7	mA
		H	F	47.9	49.2	mA
		H	L	47.2	47.5	mA
		F	H	44.4	48.3	mA
		F	F	47.6	49.0	mA
		F	L	44.6	44.9	mA
		No Active	H	n/a	0.538	
	No Active	F	n/a	0.631		mA
Isusp	Suspend			0.538		mA
F: Full-Speed, H: High-Speed						
H: USB Mass storage Device, Port1:SP 16G, Port2:Toshiba USB3.0 16G,						

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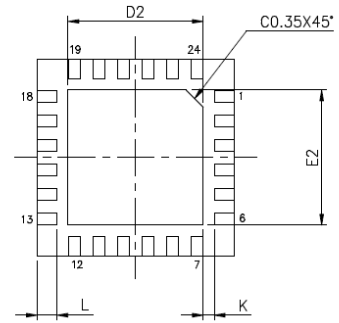
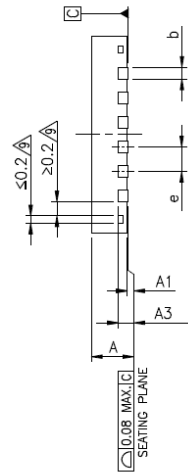
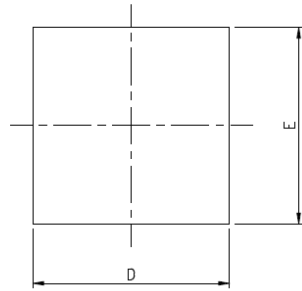
Port3:Supersonic 32G, Port4:Transcent USB3.1 32G
F : PL2303HxD, Baud Rate:115200bps
L : Low Speed Mouse

*** CS8.1 provides the lowest IC power consumption on market.**

CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)

11. Package Outline

11.1 QFN24 Outline



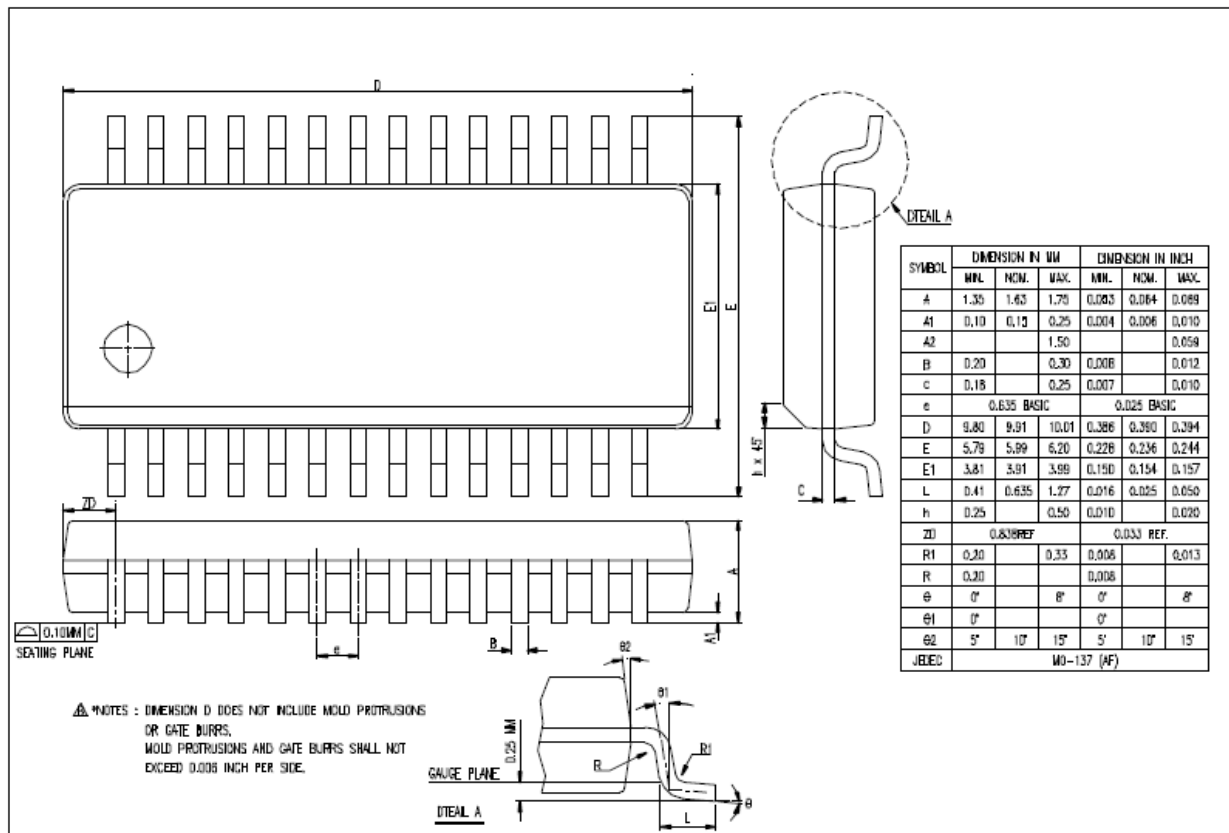
JEDEC OUTLINE	PACKAGE TYPE					
	MO-220			MO-220		
PKG CODE	WQFN(X424)			VQFN(Y424)		
SYMBOLS	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.80	0.85	0.90
A1	0.00	0.02	0.05	0.00	0.02	0.05
A3	0.20	REF.		0.20	REF.	
b	0.18	0.25	0.30	0.18	0.25	0.30
D	4.00	BSC		4.00	BSC	
E	4.00	BSC		4.00	BSC	
e	0.50	BSC		0.50	BSC	
K	0.20	—	—	0.20	—	—

PAD SIZE	E2			D2			L			LEAD FINISH		JEDEC CODE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	Pure Tin	PPF	
112x112 MIL	2.15	2.25	2.30	2.15	2.25	2.30	0.35	0.40	0.45	V	X	W(V)GGD-8
113x113 MIL	2.50	2.60	2.65	2.50	2.60	2.65	0.35	0.40	0.45	X	V	W(V)GGD-6
114x114 MIL	2.60	2.70	2.75	2.60	2.70	2.75	0.35	0.40	0.45	V	X	W(V)GGD-6
115x115 MIL	2.40	2.50	2.55	2.40	2.50	2.55	0.35	0.40	0.45	V	X	W(V)GGD-8
120x120 MIL	2.50	2.60	2.65	2.50	2.60	2.65	0.275	0.325	0.375	V	X	W(V)GGD-8

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15mm AND 0.30mm FROM THE TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
3. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

11.2 SSOP28 Outline



11.3 TSSOP16 Outline

Table 12-2 TSSOP16 Package Dimension

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETERS)

SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
D	4.90	5.00	5.10
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
b	0.20	—	0.28
b1	0.19	0.22	0.25
C	0.13	—	0.17
C1	0.12	0.13	0.14
L	0.45	0.60	0.75
L1	1.00BSC		
Θ	0°	—	8°

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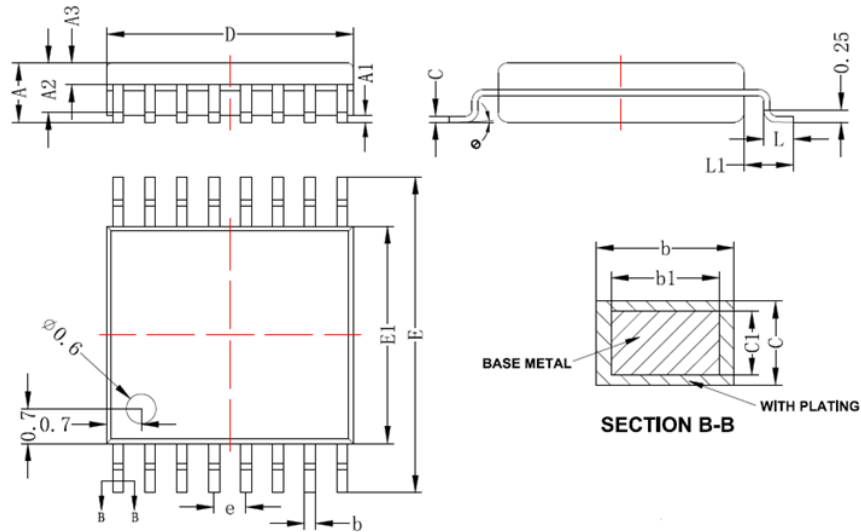
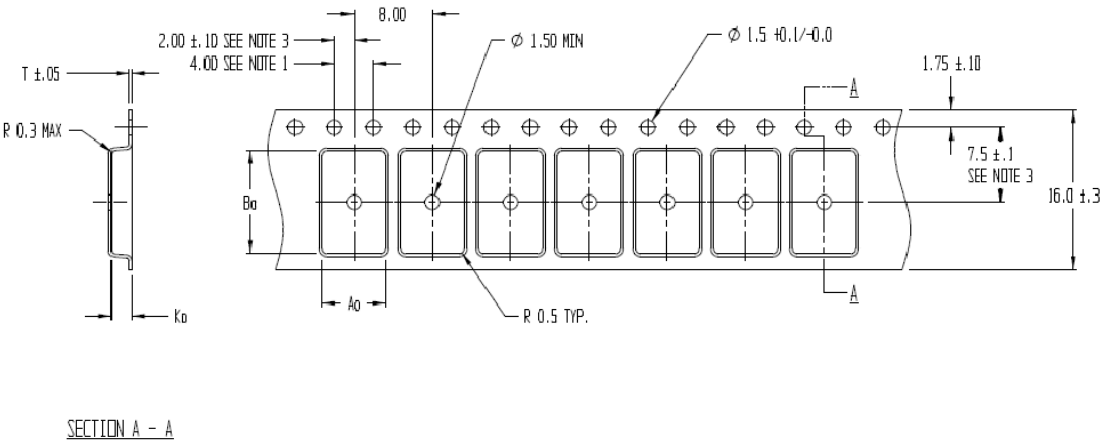


Figure 12-2 CS8.1 Outline Diagram (TSSOP16)

CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)

12. Package Information

12.1 Carrier Tape (SSOP-28)



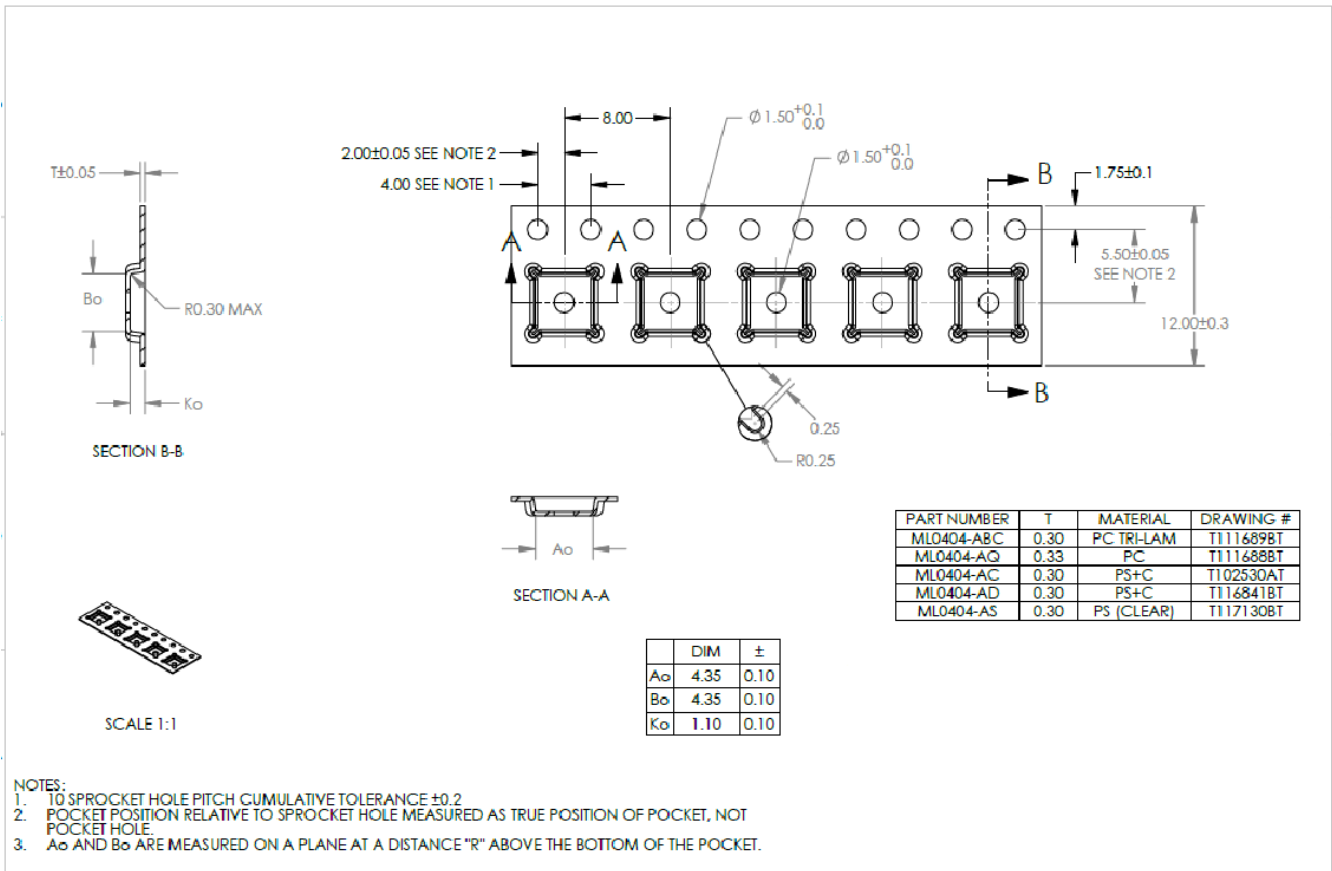
A₀ = 6.50
B₀ = 10.30
K₀ = 2.10

- NOTES:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
 2. CAMBER IN COMPLIANCE WITH EIA 481
 3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

PART#	T	MATERIAL	DRAWING NO.
SDIC16-AC	0.30	PS+C	A0103-B9-14(2)
SDIC16-AD	0.30	PS+C	T108794BT

CS8.1 (USB 2.0 High Speed 4-Port Hub Controller)

12.2 Carrier Tape (QFN24)



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