MA8601

USB 2.0 High Speed 4-Port Hub Controller

Product Datasheet

Document Revision: 1.02
Document Release: October, 2013

Prolific Technology Inc.

Table of Contents

1. Description

The MA8601 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.

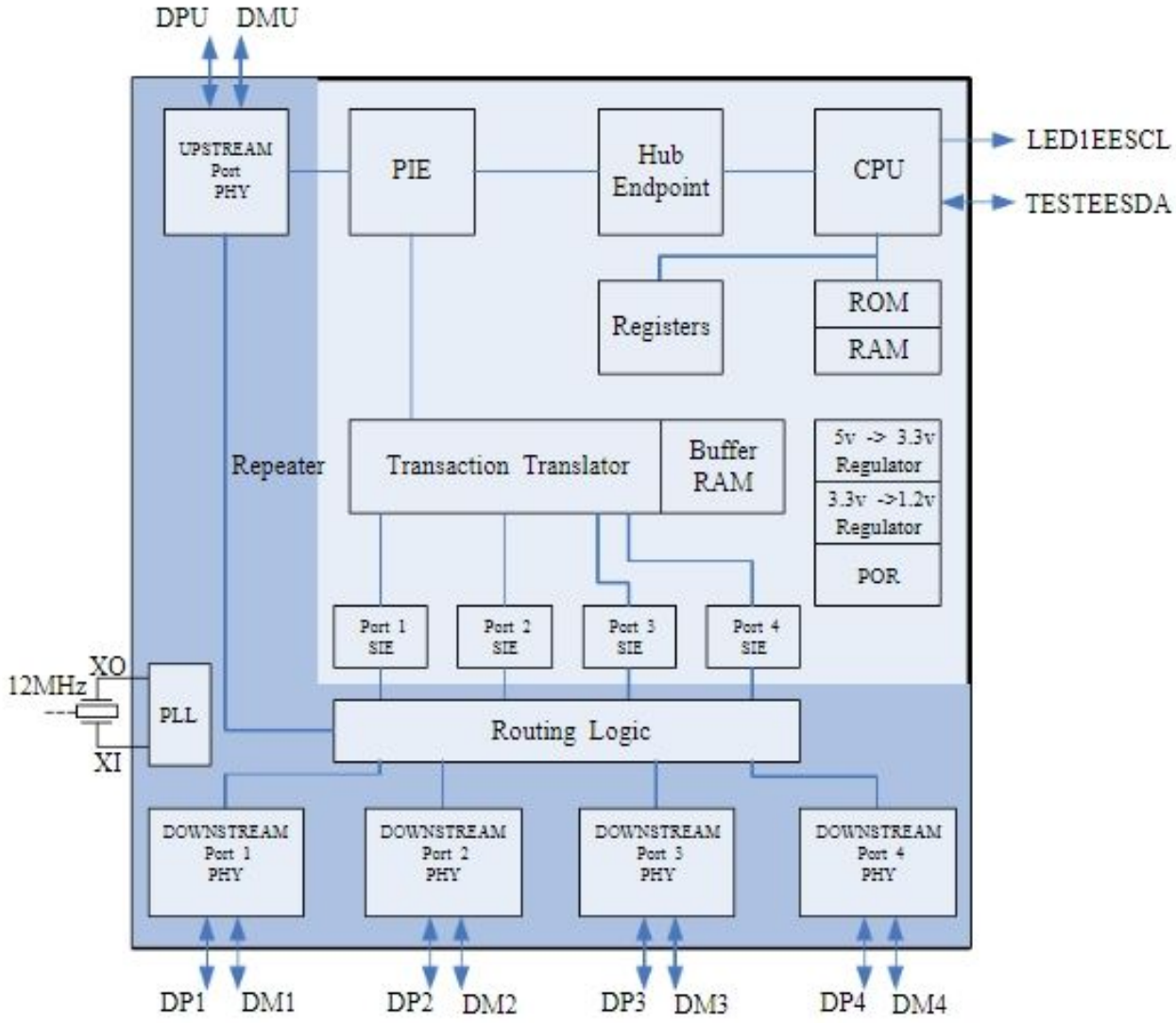
MA8601 adapt Single Transaction Translator (STT) and Ganged power management to achieve cost effective purpose. Users can also implement multiple Hub configuration options through external EEPROM.

MA8601 supports SSOP28 package targets at mainstream stand along 4 ports Hub market.

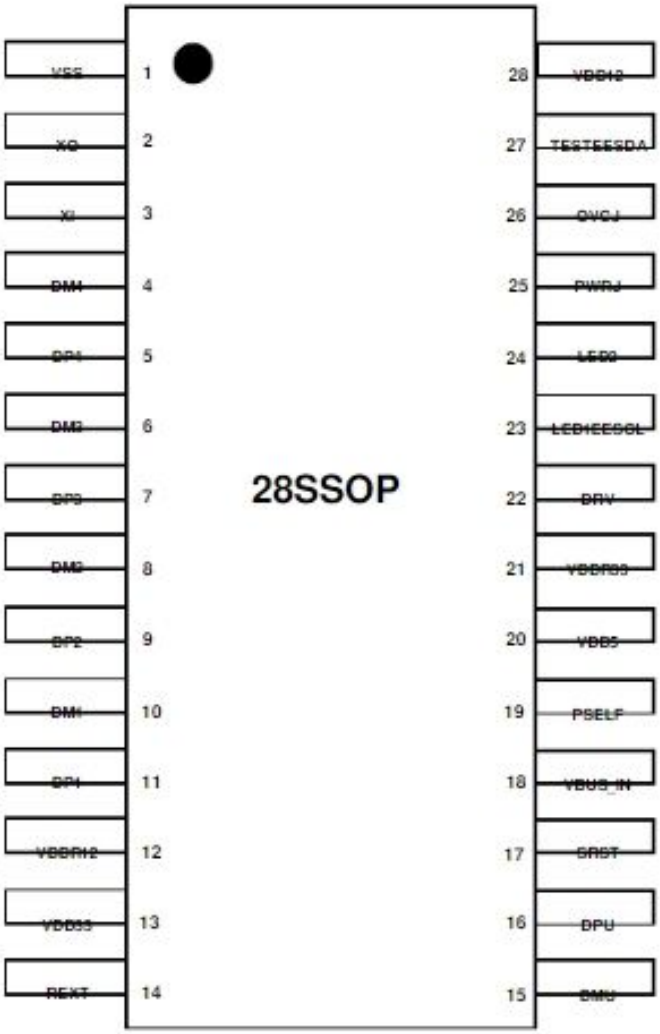
2. Features

- 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 1.5KΩ pullup downstream 15KΩ pulldown resisters
- 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/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 package
  - 28SSOP

3. Bock Diagram



4. Pin Assignment (28SSOP)



4.1 28SSOP Pin Description

Pin #	Pin Name	I/O	Description
1	VSS	P	Ground
2	XO	P	12MHz Crystal Oscillator output
3	XI	P	12MHz Crystal Oscillator input
4	DM4	B	USB D- pin for the 4th Downstream Port
5	DP4	B	USB D+ pin for the 4th Downstream Port
6	DM3	B	USB D- pin for the 3rd Downstream Port
7	DP3	B	USB D+ pin for the 3rd Downstream Port
8	DM2	B	USB D- pin for the 2nd Downstream Port
9	DP2	B	USB D+ pin for the 2nd Downstream Port
10	DM1	B	USB D- pin for the 1st Downstream Port
11	DP1	B	USB D+ pin for the 1st Downstream Port
12	VDDR12	P	1.2V output from 3.3V to 1.2V LDO
13	VDD33	P	3.3V input for 3.3V to 1.2VLDO
14	REXT	I	USB PHY bias reference
15	DMU	B	USB D- pin for the Upstream Port
16	DPU	B	USB D- pin for the Upstream Port
17	SRST	I	System reset pin (pull up)
18	VBUS_IN	I	USB Vbus facing port. Used to monitor the power state of Vbus. When Vbus_in = 1, the chip starts function.
19	PSELF	B	a. Bus power monitor. Distinguish the power source is Self-powered or Bus-powered. (High level indicates Self-Powered; Low level indicates Bus-Powered)
20	VDD5	P	5V input for LDO
21	VDDR33	P	3.3V output from 5V LDO
22	DRV	B	LED control / Charging Hub Enable a. When chip normal function, this DRV pin is responsible for indicating the Hub active/suspends status, tie to GND. (refer to schematic)
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)

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)
25	PWRJ	B	Power switch enable power for 4 DSP devices in Ganged powered mode, active low.
26	OVCJ	B	Global over current detection indicator for 4 DSP, active low.
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.
28	VDD12	P	1.2V power input

I/O Type Definition

O : Output
I : Input
B : Bi-directional
P : Power

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

Parameter	Value
Supply Voltage	-0.5V to +6.0V
Operating Temperature Range	0°C to +70°C

5.2 DC Characteristics and Operating Conditions

Symbol.	Parameter	Rating			Unit
		Min.	Typ.	Max.	
Vbus	5V Power Supply Voltage	**4.5**		**5.5**	V
V_{IH}	High level input voltage	**2.0**			V
V_{IL}	Low level input voltage			**0.8**	V
V_{OH}	High level output voltage	**3.0**			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

6. Power consumption

6.1 Measurement with the total device consumption

MA8601 Power Consumption					
Symbol	Condition			Typ.	Unit
	Active ports	Host	Device		
Isusp	Suspend			1	mA
Icc	4	H	H	98.2	mA
		H	F	96.7	mA
		H	L	85.3	mA
		F	F	104.1	mA
		F	L	83	mA
	3	H	H	98.1	mA
		H	F	97.8	mA
		H	L	85.8	mA
		F	F	97.8	mA
		F	L	82.4	mA
	2	H	H	96.7	mA
		H	F	97.5	mA
		H	L	85.3	mA
		F	F	101.9	mA
		F	L	82.7	mA
	1	H	H	98.1	mA
		H	F	100.7	mA
		H	L	85.3	mA
		F	F	99.3	mA
		F	L	82.1	mA
	No Active	H	n/a	50.5	mA
		F	n/a	47.6	mA
F: Full-Speed, H: High-Speed					
H : Mass Storage_TOSHIBA 16GB_1W-7					
F : Logitech V-UAP42_Camera_IF-19					
L : Logietch M-BQ85_MOUSE_IF-18					
PC : C98011,MB : ASUS P5KPL-CM					

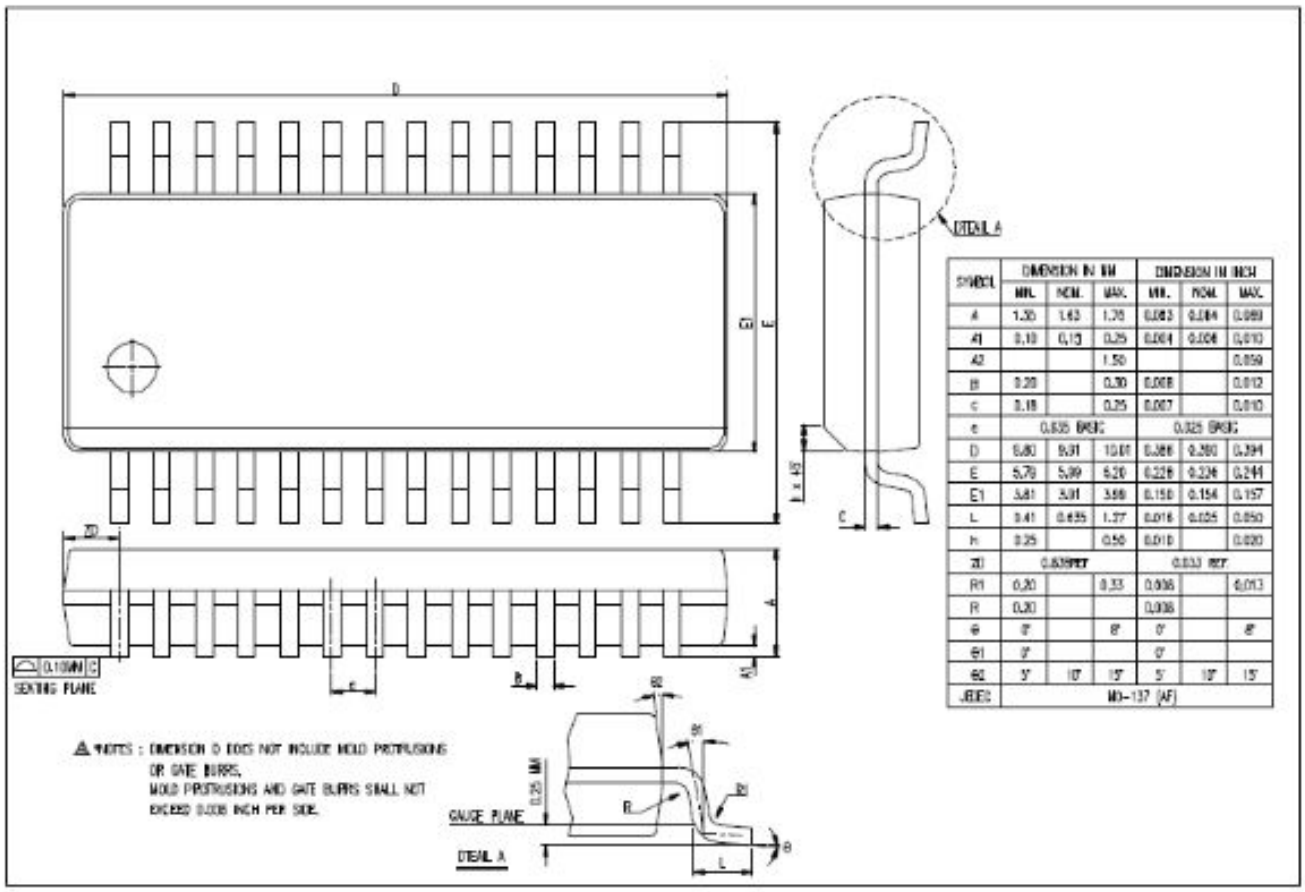
6.2 Measurement of MA8601 without counting the connected device power consumption

MA8601 Power Consumption					
Symbol	Condition			Typ.	Unit
	Active ports	Host	Device		
Isusp	Suspend			1.7	mA
Icc	4	H	H	57.1	mA
		H	F	53.4	mA
		H	L	53.7	mA
		F	F	53.9	mA
		F	L	51	mA
	3	H	H	57.3	mA
		H	F	53.5	mA
		H	L	54	mA
		F	F	54	mA
		F	L	51.1	mA
	2	H	H	57.2	mA
		H	F	53.5	mA
		H	L	53.8	mA
		F	F	53.9	mA
		F	L	51	mA
	1	H	H	57.1	mA
		H	F	53.5	mA
		H	L	53.8	mA
		F	F	53.9	mA
		F	L	51	mA
	No Active	H	n/a	50.5	mA
		F	n/a	47.6	mA
F: Full-Speed, H: High-Speed					
H : Mass Storage_TOSHIBA 16GB_1W-7					
F : Logitech V-UAP42_Camera_IF-19					
L : Logietch M-BQ85_MOUSE_IF-18					
PC : C98011,MB : ASUS P5KPL-CM					

* MA8601 provides the lowest IC power consumption on market.

7. Package

7.1 SSOP28 Outline



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.30	1.63	1.75	0.063	0.064	0.069
A1	0.10	0.15	0.25	0.004	0.006	0.010
A2			1.50			0.059
B	0.20		0.30	0.008		0.012
C	0.18		0.25	0.007		0.010
e	0.635 BASIC			0.025 BASIC		
D	9.80	9.91	10.01	0.386	0.390	0.394
E	5.79	5.99	6.20	0.228	0.236	0.244
E1	3.81	3.91	3.99	0.150	0.154	0.157
L	0.41	0.635	1.27	0.016	0.025	0.050
h	0.25		0.50	0.010		0.020
ZD	0.635REF			0.033 REF		
R1	0.20		0.33	0.008		0.013
R	0.20			0.008		
θ	0°		8°	0°		8°
θ1	0°			0°		
θ2	5°	10°	15°	5°	10°	15°
JEDEC	MO-137 (AF)					

Disclaimer

All the information in this document is subject to change without prior notice. Prolific Technology Inc. does not make any representations or any warranties (implied or otherwise) regarding the accuracy and completeness of this document and shall in no event be liable for any loss of profit or any other commercial damage, including but not limited to special, incidental, consequential, or other damages.

Trademarks

The Prolific logo is a registered trademark of Prolific Technology Inc. All brand names and product names used in this document are trademarks or registered trademarks of their respective holders.

Copyrights