

FE8.1

HIGH SPEED 4-PORT USB HUB CONTROLLER

Data Sheet

INTRODUCTION

The Terminus FE8.1 is an extremely compact High Speed 4-port USB hub controller. It is compliant to USB-IF "Universal Serial Bus Specification Revision 2.0" (USB 2.0) specification from every aspects but one – FE8.1 always reports itself as an Self-Powered hub, regardless of the actual system implementation. To achieve the absolutely minimal pin counts, there is no input signal pins left to monitor the local power status.

The FE8.1 is a highly integrated, high quality, and high performance solution for USB 2.0 4-port hub. With its tiny footprint and extremely low power consumption, it is the best choice for embedded application as well as standalone hub.

The high quality of FE8.1 is guaranteed by Design-For-Testing with comprehensive scan chains and Built-In-Self-Test modes which could exercise all High, Full, and Low Speed Analog Front End (AFE) components on the packaging and testing stages.

FEATURES

- USB 2.0 fully compliant AFE transceivers:
 - □ Upstream Facing Port supports High-

Speed (480MHz) and Full-Speed (12MHz) modes;

- 4 Downstream Facing Ports support High-Speed, Full-Speed, and Low-Speed (1.5MHz) modes;
- Integrated upstream 1.5KΩ pull-up, downstream 15KΩ pull-down, and serial resisters;
- Integrated 5V to 3.3V and 1.8V regulators;
- Integrated Power-On-Reset with power failure detection circuit;
- Integrated 12MHz Oscillator with feedback resister and crystal load capacitors;
- Integrated 12MHz-to-480MHz Phase Lock Loop (PLL);
- Single Transaction Translator (Single TT)
 - □ One TT for all downstream ports;
 - The TT could handle 64 periodic Start-Split transactions, 32 periodic Complete-Split transactions, and 6 none-periodic transactions;

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ORDER INFORMATION

P/N-Order Code	Description	Package Type	Packing	Minimum Order Quantity
TBD		16-pin SSOP (5mm x 4mm)	Tape & Reel	TBD
TBD	High Speed 4-Port USB Hub Controller	16-pin SSOP (5mm x 4mm)	Tube	TBD
TBD		16-pin WQFN (3mm x 3mm)	Tape & Reel	TBD

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BLOCK DIAGRAM

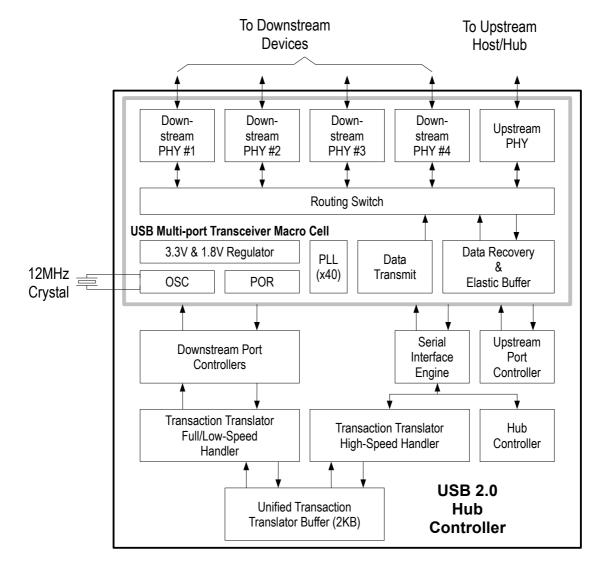


Fig. 1: Block Diagram

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PACKAGE I

16-Pin SSOP (Body Size: 5mm x 4mm, Pitch: 0.64mm)

PIN ASSIGNMENT

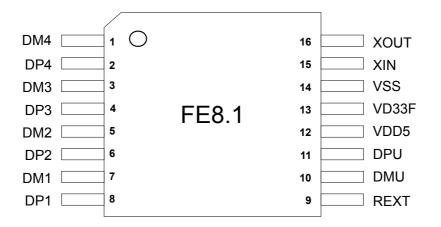


Fig. 2: 16-Pin SSOP Pin Assignment



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PACKAGE II

16-Pin WQFN (Body Size: 3mm x 3mm, Pitch: 0.5mm) (Exposed Pad: 1.7mm x 1.7mm)

PIN ASSIGNMENT

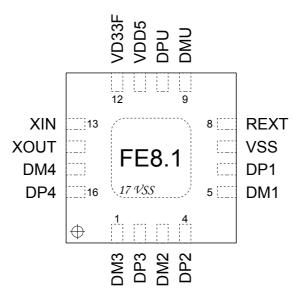


Fig. 3: 16-Pin WQFN Pin Assignment



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PIN DESCRIPTION TABLE

Pin Name Pin No.		Туре	Function		
	SSOP	QFN			
DM4	1	15	UTD	The D- pin of the 4 th Downstream Facing Port.	
DP4	2	16	UTD	The D+ pin of the 4 th Downstream Facing Port.	
DM3	3	1	UTD	The D- pin of the 3 rd Downstream Facing Port.	
DP3	4	2	UTD	The D+ pin of the 3 rd Downstream Facing Port.	
DM2	5	3	UTD	The D- pin of the 2 nd Downstream Facing Port.	
DP2	6	4	UTD	The D+ pin of the 2 nd Downstream Facing Port.	
DM1	7	5	UTD	The D- pin of the 1 st Downstream Facing Port.	
DP1	8	6	UTD	The D+ pin of the 1 st Downstream Facing Port.	
REXT	9	8		External Bias Resister A 2.7K Ω (± 1%) resister should be connected to VSS to provide nternal bias reference.	
DMU	10	9	UTU	The D- pin of the Upstream Facing Port.	
DPU	11	10	UTU	The D+ pin of the Upstream Facing Port.	
VDD5	12	11	Р	5V Power Input This is the 5V power input for integrated $5V \rightarrow 3.3V$ regulator. However, if external 3.3V source is used, this pin should be <i>Tied-To</i> <i>Ground</i> .	
VD33F	13	12	Р	3.3V output filter capacitor for embedded $5V \rightarrow 3.3V$ regulator, or 3.3V input from external source.	
VSS	14	7,17	Р	Ground (pin 17 of WQFN is the underbelly exposed pad)	
XIN	15	13	OSC	12MHz Crystal Oscillator input/External 12MHz clock input.	1
XOUT	16	14	OSC		

Type Abbreviation –

UTD:	USB Downstream Facing Port Transceiver (supporting High/Full/Low-Speed);
UTU:	USB Upstream Facing Port Transceiver (supporting High/Full-Speed);
OSC:	Crystal Oscillator (with integrated feedback resister, and crystal load capacitor);
P:	Power/Ground.

Note 1 – Crystal Requirements

- Frequency accuracy: $12MHz \pm 50ppm$
- Load capacitance: $16pF \sim 20pF$

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APPLICATION ALTERNATIVES

The *FE8.1* can be either powered by 5V or 3.3V power source. If 3.3V power source is used, then VDD5 must be tied to ground to insure proper operations.

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ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-55	+150	°C
Power Supply Voltage	VDD5	-0.5	+6.0	V
	VD33	-0.5	+4.0	
ESD Human Body Mode (MIL-STD Class 2)		-2000	+2000	V
ESD Machine Mode (JEDEC Class B)		-200	+200	V
ESD Charged Device Mode		-500	+500	V
Latch Up (Class I, Level A)		-200	+200	mA

Recommended Operating Ranges

Parameter	Symbol	Min.	Тур.	Max.	Unit
Operating Temperature	TA	0		70	°C
Operating Voltage	VDD5 VD33	4.5 3.0	5.0 3.3	5.5 3.6	V
LOW level voltage of digital input	VIL	-0.3		0.8	V
HIGH level voltage of digital input	VIH	2.0		5.5	V
Threshold voltage of digital input	VTH	1.45	1.58	1.74	V
Low-to-High level of Schmitt-trigger input	VT+	1.44	1.5	1.56	V
High-to-Low level of Schmitt-trigger input	VT-	0.89	0.94	0.99	V
LOW level voltage of digital output	VOL			0.4	V
HIGH level voltage of digital output	VOH	2.4			V
XIN input capacitance	Cin		32		pF
Internal Pull-Up Resister Range	R _{PU}	39	65	116	KΩ

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POWER CONSUMPTION

ABSOLUTE MAXIMUM RATINGS

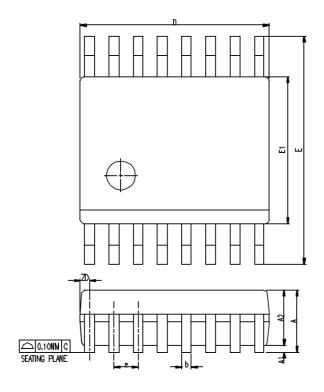
Symbol		Condition	Typical	Unit	
	Active	Active Host			
I_suspend		Suspend		740	μΑ
Icc	4	High-Speed	4 x High-Speed	86	mA
		High-Speed	4 x Full-Speed	40	mA
		Full-Speed	4 x Full-Speed	27	mA
	3	High-Speed	3 x High-Speed	74	mA
		High-Speed	3 x Full-Speed	40	mA
		Full-Speed	3 x Full-Speed	27	mA
	2	High-Speed	2 x High-Speed	62	mA
		High-Speed	2 x Full-Speed	40	mA
		Full-Speed	2 x Full-Speed	27	mA
	1	High-Speed	1 x High-Speed	51	mA
		High-Speed	1 x Full-Speed	40	mA
		Full-Speed	1 x Full-Speed	27	mA
	No Active	High-Speed	None	40	mA
		Full-Speed	None	27	mA

Note: The power consumption is measured when the bus is in IDLE state – there is no activities other than the Start-Of-Frame (SOF) and INTERRUPT-IN packets for the hub itself on the bus. The peak power consumption varies depending upon the system configuration, type of operations, and over-all bus utilization.

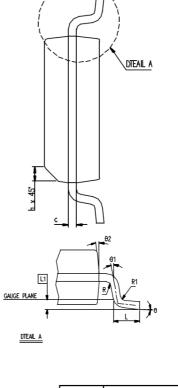
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PACKAGE I

16-pin SSOP (Body Size: 5x4 mm, Pitch: 0.64mm)



▲ *NOTES : DIMENSION D DOES NOT INCLUDE NOLD PROTRUSIONS OR GATE BURRS. MOLD PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.006 INCH PER SIDE.



OVUDAL	DIMENSION IN MM			dimension in Inch		
SYMBOL	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.35	1.63	1.75	0.053	0.064	0.069
A1	0.10	D.15	D.25	D.004	D.006	0.010
A2			1.50			0.059
b	0.20		D.30	D.008		0.012
¢	0.18		0.25	0.007		0.010
ê	0	.635 BAS	SIC	۵	.025 BAS	SIC
D	4.80	4. 9D	5.DO	D.189	D.193	0.197
E	5.79	5.99	6.20	0.228	D.236	0.244
E1	3.81	3.91	3.99	D.150	D.154	0.157
L	D.41	0.635	1.27	0.016	0.025	0.050
h	D.25		D.50	D.Q1Q		0.020
L1	0.254 BASIC 0.010 BA			.010 BAS	К	
ZD	0.229 REF			Q.DD9 REF		
R1	0.20		0.33	0.000		0.013
R	0.ZO			800.0		
e	G		8	٦		8
0 1	ď			ď		
0 2	5	10"	15"	5	10"	15
JEDEG	MO-137 (AB)					

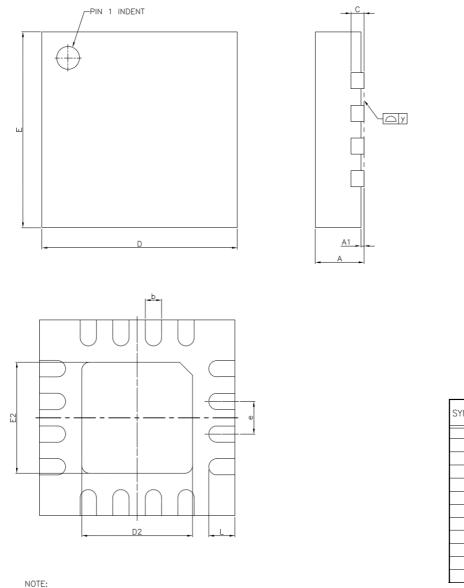


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PACKAGE II

16-pin WQFN (Body Size: 3x3 mm, Pitch: 0.5mm, Exposed Pad: 1.7x1.7mm)



SYMBOLS	DIMENSIONS IN MILLIMETERS				
SIMBULS	MIN	NOM	MAX		
A	0.70	0.75	0.80		
A1	0.00	0,02	0.05		
b	0.18	0.25	0.30		
С		0.20 REF.			
D	2.90	3.00	3.10		
D2	1.65	1.70	1.75		
E	2.90	3.00	3.10		
E2	1.65	1.70	1.75		
е		0.50			
L	0.35	0.40	0.45		
у	0.00		0.075		

1.THE TERMINAL #1 IDENTIFIER IS A LASER MARKED FEATURE

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