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CAD Note:

Property: BUILD-OPT

ALL = Installed Part.

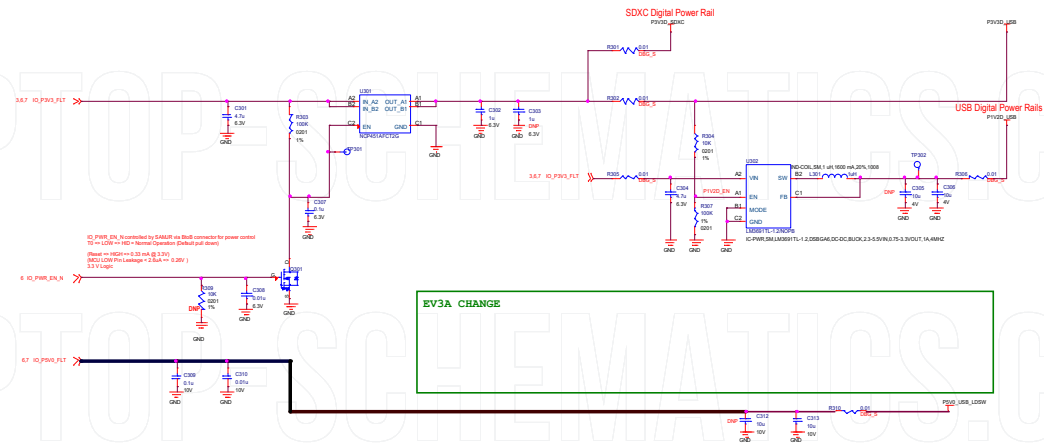
DNP = Not Installed Part.

DBG_D = EV/DV phase only

DBG_S = Short after design fixed

			Unit: mil					
Stack up 6L 0.7mm+/-0.075mm: 1-4-1+			impedance control	Single-end, 50Ω±10%	Single-end, 45Ω±10%	Differential, 100Ω±10%	Differential, 90Ω±10%	Differential, 85Ω±10%
Layer	material							
Top Surface		0.8						
L1	1/3 Oz copper+plating	1.2	L1(refer L2)	4.491	5.531	3.162/4.34	4.282/4.82	5.152/5.85
	EM285B 1080	2.71						
L2	1/3 Oz copper+plating	1.1						
	EM285B 1080	2.41						
L3	1/2OZ	0.6	L3(refer L2and L4)	3.271	4.051	3.002/7.84	3.682/6.92	3.952/5.55
	EM285 10mil core	10.0						
L4	1/2OZ	0.6	L4(refer L3 and L5)	3.271	4.051	3.002/7.84	3.682/6.92	3.952/5.55
	EM285B 1080	2.41						
L5	1/3 Oz copper+plating	1.1	L5(refer L4 and L6)					
	EM285B 1080	2.71						
L6	1/3 Oz copper+plating	1.2	L6(refer L5)	4.491	5.531	3.162/4.34	4.282/4.82	5.152/5.85
Bottom Surface		0.8						
Total		mil 27.64						
		um 0.70						

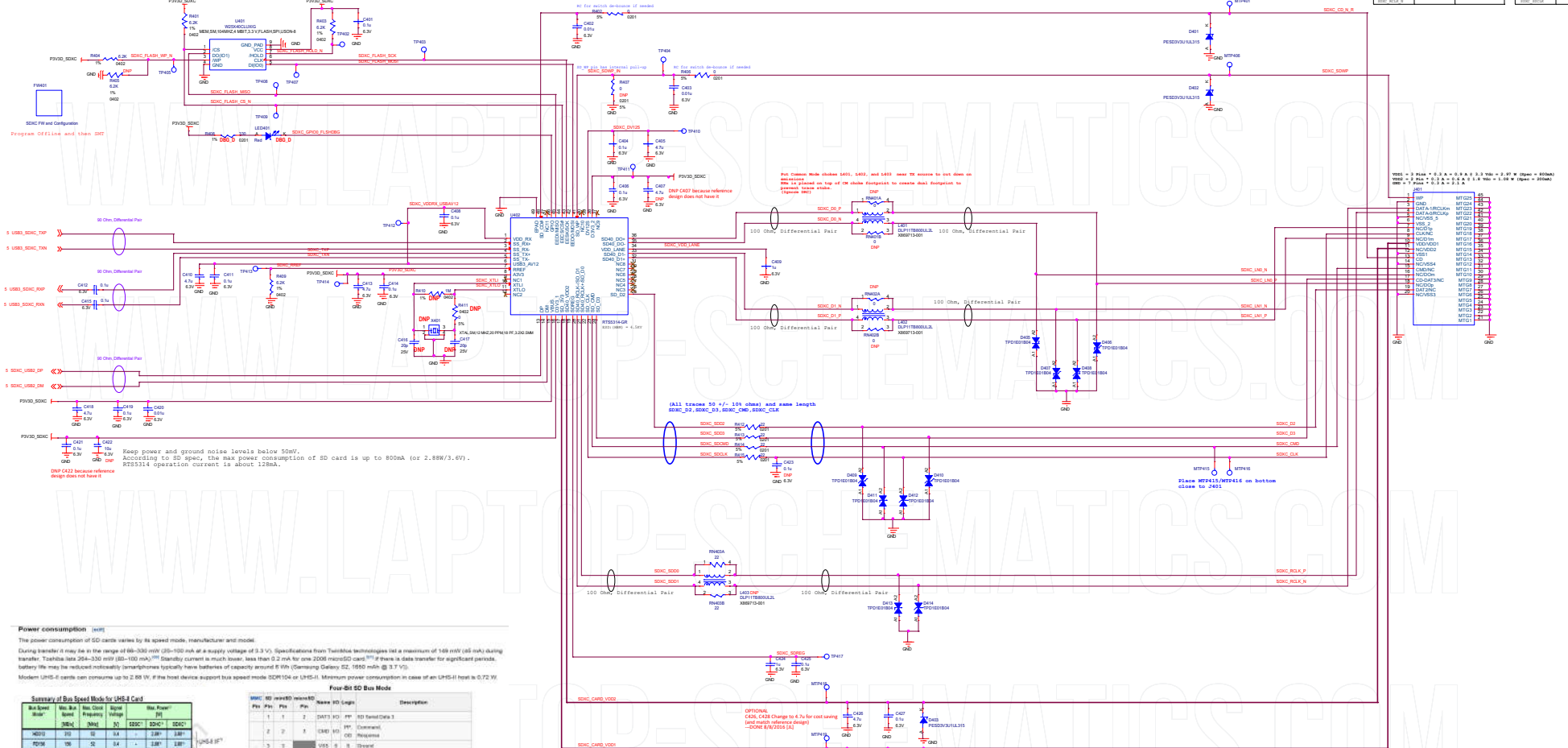
IO Power Tree



SDXC Card Reader RTS5314

Pin	Signal	Function	Pin	Signal	Function
1	NC		18	NC	
2	NC		19	NC	
3	NC		20	NC	
4	NC		21	NC	
5	NC		22	NC	
6	NC		23	NC	
7	NC		24	NC	
8	NC		25	NC	
9	NC		26	NC	
10	NC		27	NC	
11	NC		28	NC	
12	NC		29	NC	
13	NC		30	NC	

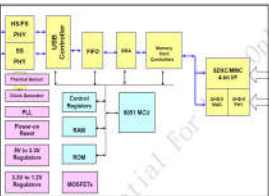
Place SCK, MOSI, MISO, CS_N test points on Bottomside



Power consumption: ⁽¹⁾⁽²⁾
The power consumption of SD cards varies by its speed mode, manufacturer and model.
During transfer it may be in the range of 60-300 mW (30-100 mA at a supply voltage of 3.3 V). Specifications from Toshiba technologies list a maximum of 160 mW (all pins) during transfer. Toshiba lists 260-330 mW (100-100 mA) ⁽³⁾ Standby current is much lower, less than 0.2 mW for some 2008 microSD cards ⁽⁴⁾ If there is data transfer for significant periods, battery life may be reduced noticeably (transmitters typically have batteries of capacity around 800 (charging battery) 1000 mAh @ 3.7 V).
Modern UHS-I cards can consume up to 2.00 W, if the host device support support bus speed mode (SDR104 or UHS-I). Minimum power consumption in case of an UHS-I host is 0.72 W.

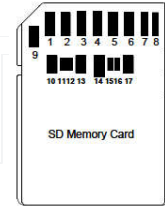
Summary of Bus Speed Mode for UHS-I Card						
Bus Speed Mode	Min. Bus Speed (MHz)	Max. Bus Speed (MHz)	Signal Voltage (V)	Max. Power (W)		
	(MHz)	(MHz)		SDSC ¹	SDHC ²	SDXC ³
HSB100	210	52	0.4	~ 2.88 ⁴	3.88 ⁴	~
HSB106	156	52	0.4	~ 2.88 ⁴	3.88 ⁴	~
HSB104	164	104	1.8	~ 2.88 ⁴	3.88 ⁴	~
HSB100	210	52	0.4	~ 1.64 ⁴	1.64 ⁴	~
HSB100	156	52	0.4	~ 1.64 ⁴	1.64 ⁴	~
HSB100	210	52	1.8	~ 0.72 ⁴	0.72 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
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HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0.36 ⁴	~
HSB100	156	52	1.8	~ 0.36 ⁴	0	

Four-bit SD Bus Mode				
Pin	Pin	Pin	Pin	Description
1	1	2	DATA0 I/O	SD Serial Data 0
2	2	3	DATA1 I/O	SD Serial Data 1
3	3	4	DATA2 I/O	SD Serial Data 2
4	4	5	DATA3 I/O	SD Serial Data 3
5	5	6	CLK I/O	Serial Clock
6	6	7	VSS	Ground
7	7	8	VDD	Power
8	8	9	CS_N I/O	Serial Chip Select
9	9	10	VSS	Ground
10	10	11	DATA0 I/O	SD Serial Data 0
11	11	12	DATA1 I/O	SD Serial Data 1
12	12	13	DATA2 I/O	SD Serial Data 2
13	13	14	DATA3 I/O	SD Serial Data 3
14	14	15	CLK I/O	Serial Clock
15	15	16	CS_N I/O	Serial Chip Select
16	16	17	VSS	Ground
17	17	18	VDD	Power



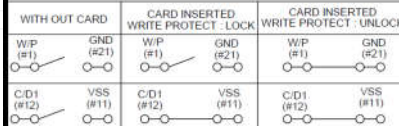
UHS-II Interface Pad Assignment

Pin #	Name	Type	Description
1	VDD1	Supply voltage	2.7V to 3.6V
2	CLK	Differential Signaling Input	Clock Input
3	CLK	Differential Signaling Input	Clock Input
4	VSS1	Ground	
5	DATA0	Differential Signaling Input (PD) / Bidirectional (HD)	Input in default
6	DATA1	Differential Signaling Input (PD) / Bidirectional (HD)	Input in default
7	VSS2	Ground	
8	VDD2	Supply voltage 2	1.7V to 1.9V
9	DATA2	Differential Signaling Output (PD) / Bidirectional (HD)	Output in default
10	DATA3	Differential Signaling Output (PD) / Bidirectional (HD)	Output in default
11	VSS3	Ground	



UHS-II Card Shape and Interface (Top View)

SD CARD CIRCUIT :



Frequency	12 MHz
Frequency Tolerance	±30 ppm
Effective Series Resistance	60Ωmax
Drive level	100uW
Load Capacitance(CL)	16-22pF

UHS-II Card Operation Modes

SD Bus Interface Modes

- DS - Default Speed up to 25MHz 3.3V signaling
- HS - High Speed up to 50MHz 3.3V signaling
- SDR12 - SDR up to 25MHz 1.8V signaling
- SDR25 - SDR up to 50MHz 1.8V signaling
- SDR50 - SDR up to 100MHz 1.8V signaling
- SDR104 - SDR up to 208MHz 1.8V signaling (Optional)
- DDR50 - DDR up to 50MHz 1.8V signaling (Optional for Standard Size Card)

UHS-II Interface Modes

- FD150 - Full Duplex mode up to 150MB/s at 52MHz in Range B
- HD312 - Half Duplex with 2 Lanes mode up to 312MB/s at 52MHz in Range B (Optional)

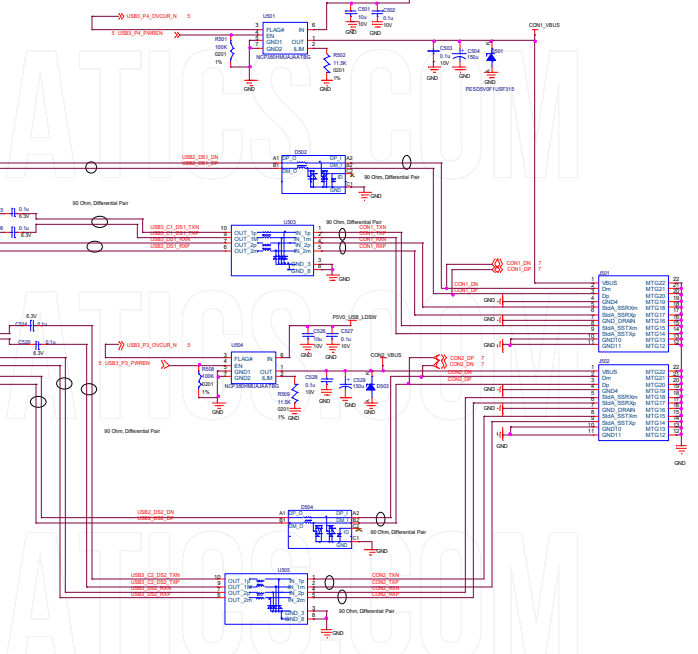
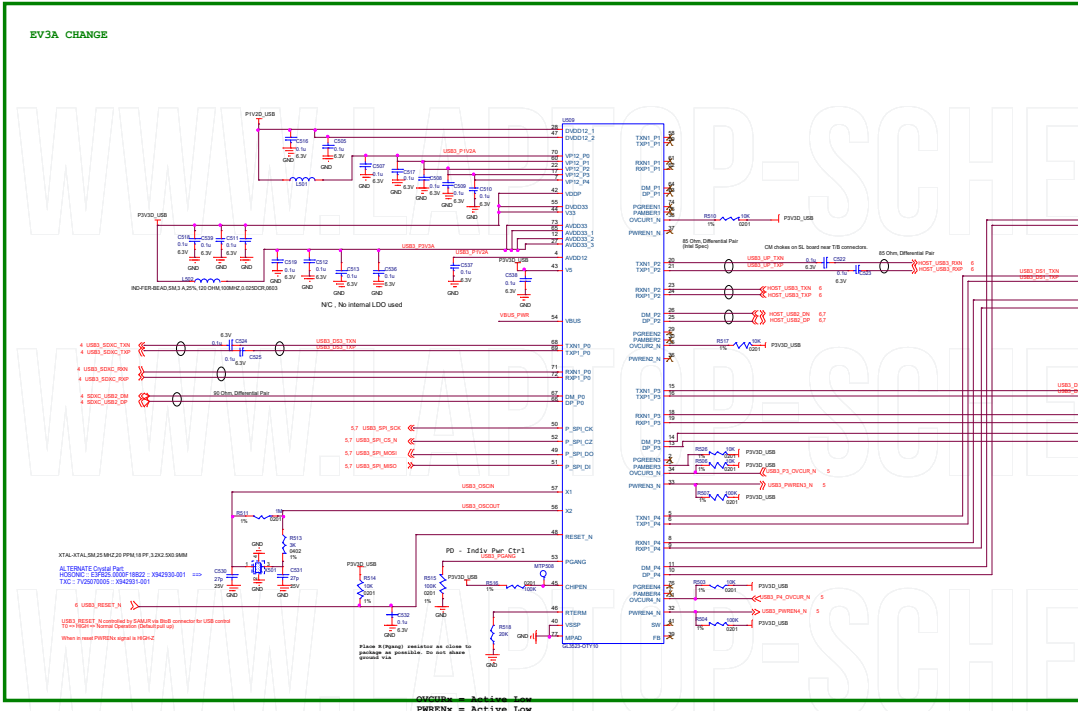
USB 3.0 Hub GL3523

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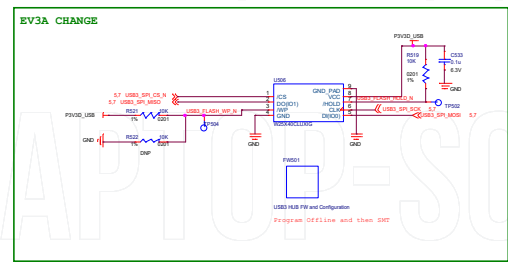
01: More than the width of the micro-USB is equal to the width of the micro-USB. The recommended board trace for intra-pair skew is no more than 5 mils (0.127 mm). Ideally, all signal pairs should be of equal length to ensure zero time difference. DisplayPort, however, allows for a maximum inter-pair skew. The time difference between signal pairs, of 2 D+. The UI for high bit rates (2.70Gbps/line), is 370 ps (nominal).

201 = 2*370ps = 740ps skew
PR4 (Inner Layer) => 180ps/in
PR4 (Outer Layer) => 150ps/in

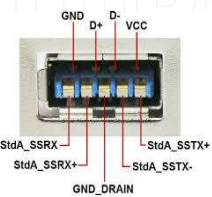
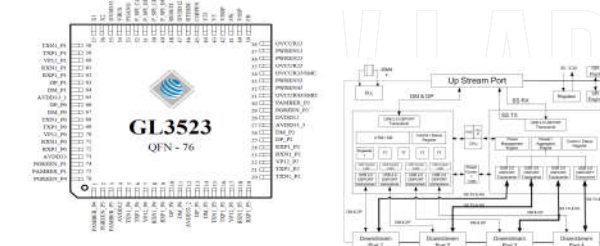
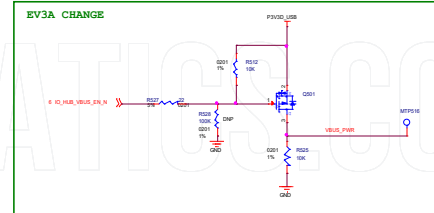
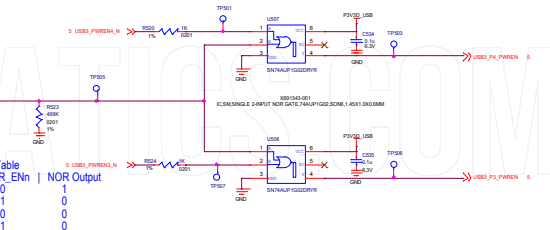
WCH380 Load Switch:
Active Discharge built in.
FMS20: Active-low open-drain output, asserted during overcurrent, over-temperature, or reverse-voltage conditions.
EN: Active-SE0 enable.
Place 0.1uF and 10uF caps close to switch.
R = 11.5 K
I(Max) = 2.05 A
I(Typ) = 1.78 A
I(Min) = 1.5 A



Pin	Color	Signal name ("A" Connector)	Signal name ("B" Connector)	Description
1	Red	VBUS		Power
2	White	D-		USB 2.0 differential pair
3	Green	D+		
4	Black	GND		Ground for power return
5	Blue	StdA_SSRX-	StdB_SSTX-	SuperSpeed transmitter differential pair
6	Yellow	StdA_SSRX+	StdB_SSTX+	
7	Purple	GND_DRAIN		Ground for signal return
8	Purple	StdA_SSTX-	StdB_SSRX-	SuperSpeed receiver differential pair
9	Orange	StdA_SSTX+	StdB_SSRX+	



USB_LDSW_ENn	PWRn	NOR Output
0	0	1
0	1	0
1	0	0
1	1	1



IO to SL Board to Board Connector

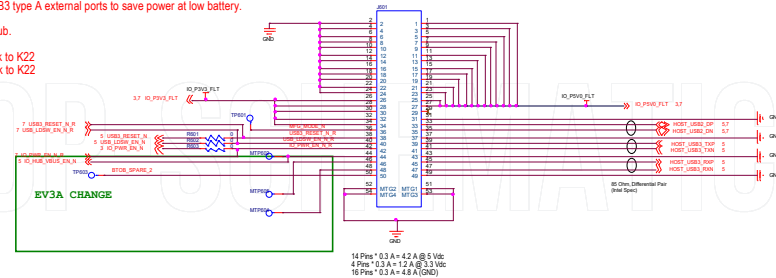
IO_PWR_EN_N = SAM JR signal to disable all IO board functionality (removes all power)

USB_LDSW_EN_N = Power down both USB3 type A external ports to save power at low battery.

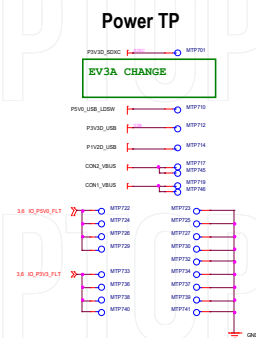
USB3_RESET_N = Reset USB 3.0 4 port hub.

HID_USB2_DP = USB signal from Hub back to K22

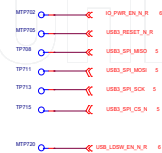
HID_USB2_DN = USB signal from Hub back to K22



Bottom Side System Test Points

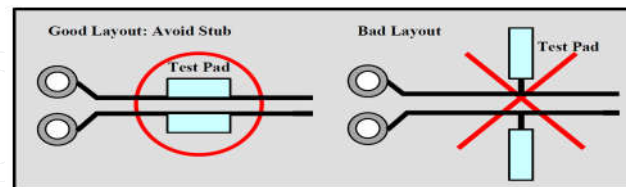
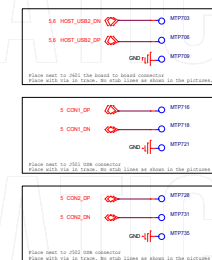


Debug/MTE TP



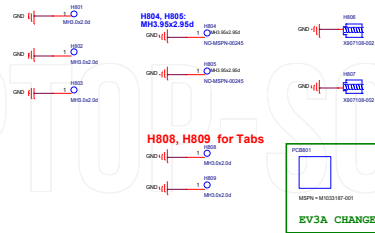
Note: Some test points are on the respective pages of the signal

USB2.0 TP



Mechanical Holes and Shielding

Holes updated: 4x 2.0mm PTH, 2x 2.95mm PTH, 2x 2.5mm PEM



Shield Removed for EV1
--EV1 will use FOAM