

# LCFC Confidential


## DS321 MB Schematics Document

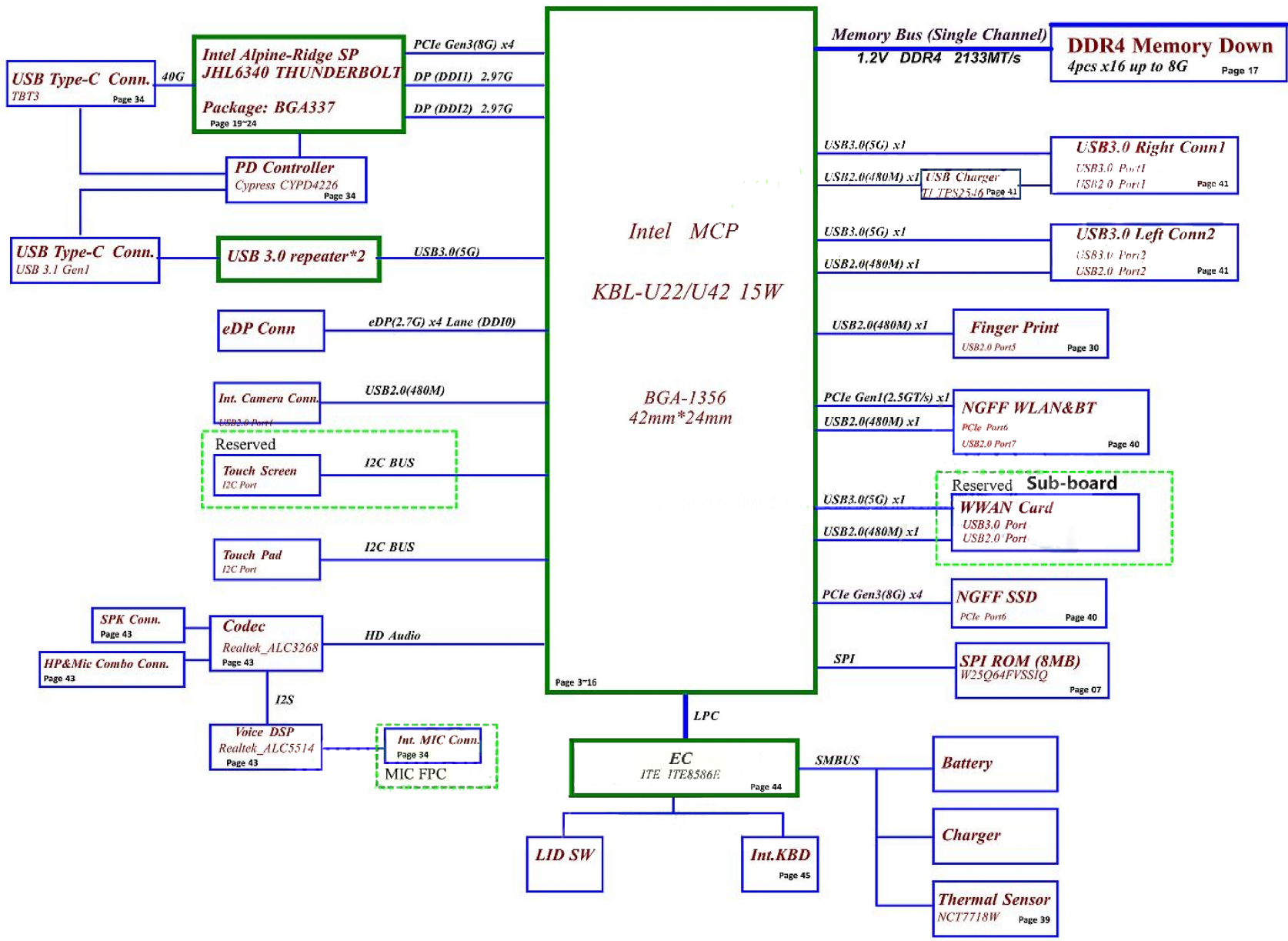
Intel Kabylake-U22&U42 with DDR4

2016-12-05

REV: 0.2

Intel Kabylake-U22&U42 with DDR4

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# Voltage Rails ( O --> Means ON , X --> Means OFF )

Power Plane / State		+3VALW +5VALW +3VALW_PCH +1.8VALW +1.0VALW	+1.2V +2.5V_DDR +VCCST	+5VS +3VS +VCCIO +VCCSTG +VCCSA +VCC_GT +CPU_CORE +0.6VS
	V20B+			
S0	O	O	O	O
S3	O	O	O	X
S3 Battery only	O	O	O	X
S5 S4 AC Only	O	O	X	X
S5 S4 Battery only	O	X	X	X
S5 S4 AC & Battery don't exist	X	X	X	X

## SMBUS Control Table

	SOURCE	BATT	Charger	DGPU	IT8586E	Memory Down	PCH	PMIC	SODIMM	Thermal Sensor	WLAN WiMAX
EC_SMB_CK1 EC_SMB_DA1	IT8586E +3VL_EC	V	V	X	V +3VL_EC	X	X	X	X	X	X
EC_SMB_CK2 EC_SMB_DA2	IT8586E +3VS	X	X	V +3VG_AON	V +3VS	X	V +3VALW_PCH	X	X	V	X
EC_SMB_CK3 EC_SMB_DA3	IT8586E +3VL_EC	X	X	X	V +3VL_EC	X	X	V	X	X	X
PCH_SMB_CLK PCH_SMB_DATA	PCH +3VALW_PCH	X	X	X	X	X	V +3VALW_PCH	X	V +3VS	X	V +3VS

## EC SMBus1 address

Device	Address
Smart Battery	need to update
Charger	0001 0010 b

## EC SMBus2 address

Device	Address
Thermal Sensor(NCT7718W)	1001_100xb
PCH	need to update
DGPU	need to update

## EC SMBus3 address

Device	Address
PMIC	need to update

## PCH SM Bus address

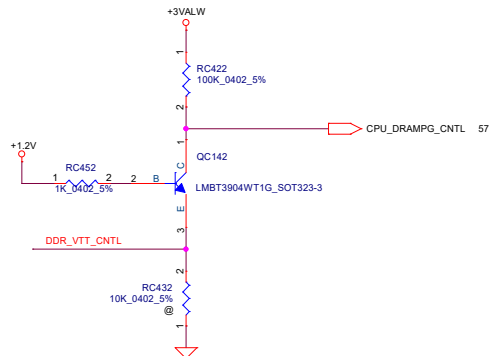
Device	Address
DDR4 SODIMM	need to update
Wlan	Reserved

STATE / SIGNAL	SLP_S3#	SLP_S4#	SLP_S5#	+VALW	+V	+VS	Clock
Full ON	HIGH	HIGH	HIGH	ON	ON	ON	ON
S3 (Suspend to RAM)	LOW	HIGH	HIGH	ON	ON	OFF	OFF
S4 (Suspend to Disk)	LOW	LOW	LOW	ON	OFF	OFF	OFF
S5 (Soft OFF)	LOW	LOW	LOW	ON	OFF	OFF	OFF

HSIO PORT	Function	BOM Structure	BTO Item
USB3.0	1 USB3.0 Conn Left	@	Not stuff
	2 USB3.0 Conn Right(optional)	14@	For 14" part
	3 3D Camera(optional)	15@	For 15" part
	4 NC	14or15@	For 14" or 15" part
	5 NC	14or17@	For 14" or 17" part
	6 NC		
USB2.0	1 USB3.0 Conn Left	Cannonlake@	For Cannonlake part
	2 USB2.0 Conn1 Right	CD@	For C cost down
	3 USB2.0 Conn2 Right	DUALMIC@	For Dual MIC part
	4 Camera	EMC@	For EMC part
	5 Cardreader	EMC_15@	For EMC 15" part
	6 Touch Panel	EMC_NS@	For EMC nu-stuff part
	7 Bluetooth	EMC_PX@	For EMC PX part
	8 TBT	EMC_PXNS@	For EMC PX nu-stuff part
	9 NC	ES@	For ES CPU
	10 NC	EXO@	For EXO GPU
PCIE	1 NC		
	2 NC		
	3 NC	ME@	For ME part
	4 NC	NTS@	For nu-touch part
	5 LAN		
	6 WLAN		
	7 used as SATA		
	8 used as SATA		
SATA	9~12 X4 PCIE	PX@	For PX part
	0 HDD	RANKA@	For VRAM rank A part
	1A ODD	RANKB@	For VRAM rank B part
	1B used as PCIE	Realtek SD@	For Realtek SD part
	2 used as PCIE	SINGLEMIC@	For single MIC part
		SINGLERANK@	For single VRAN rank part
		DUALRANK@	For dual VRAN rank part
		TS@	For touch screen part
		TPM@	For TPM part
		UMA@	For UMA part

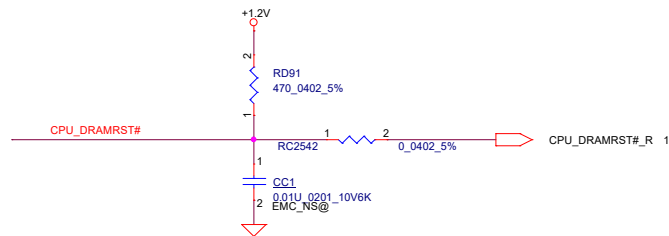
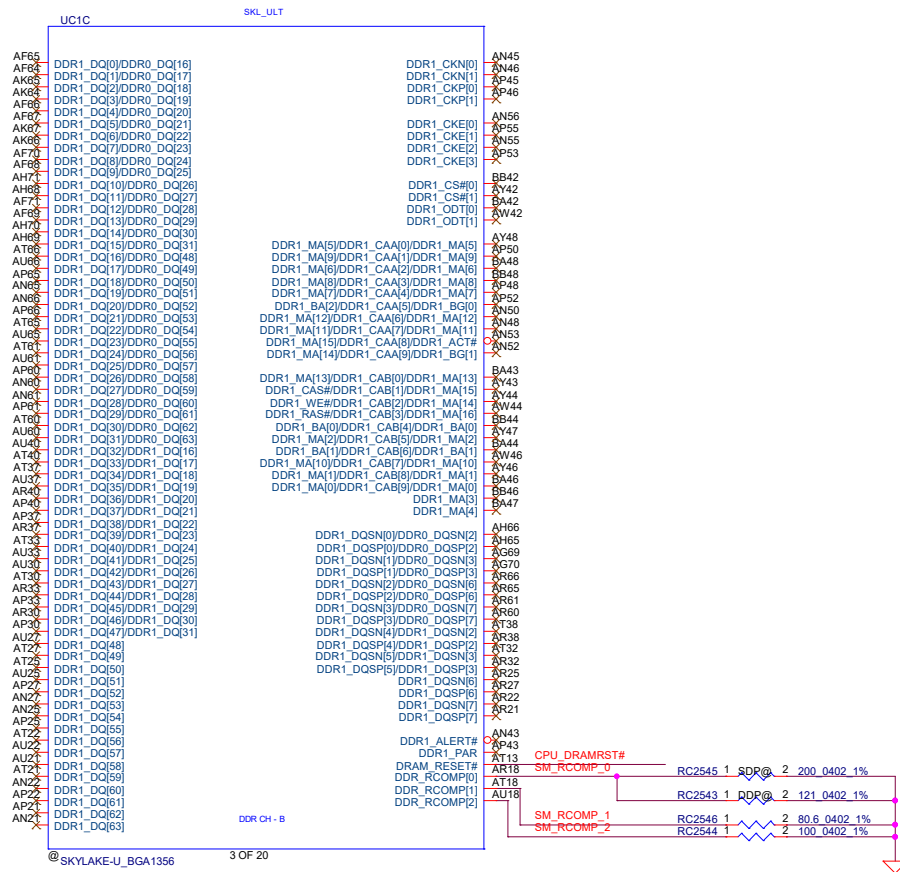


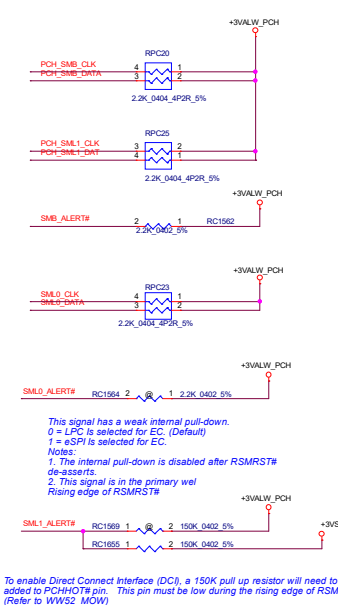





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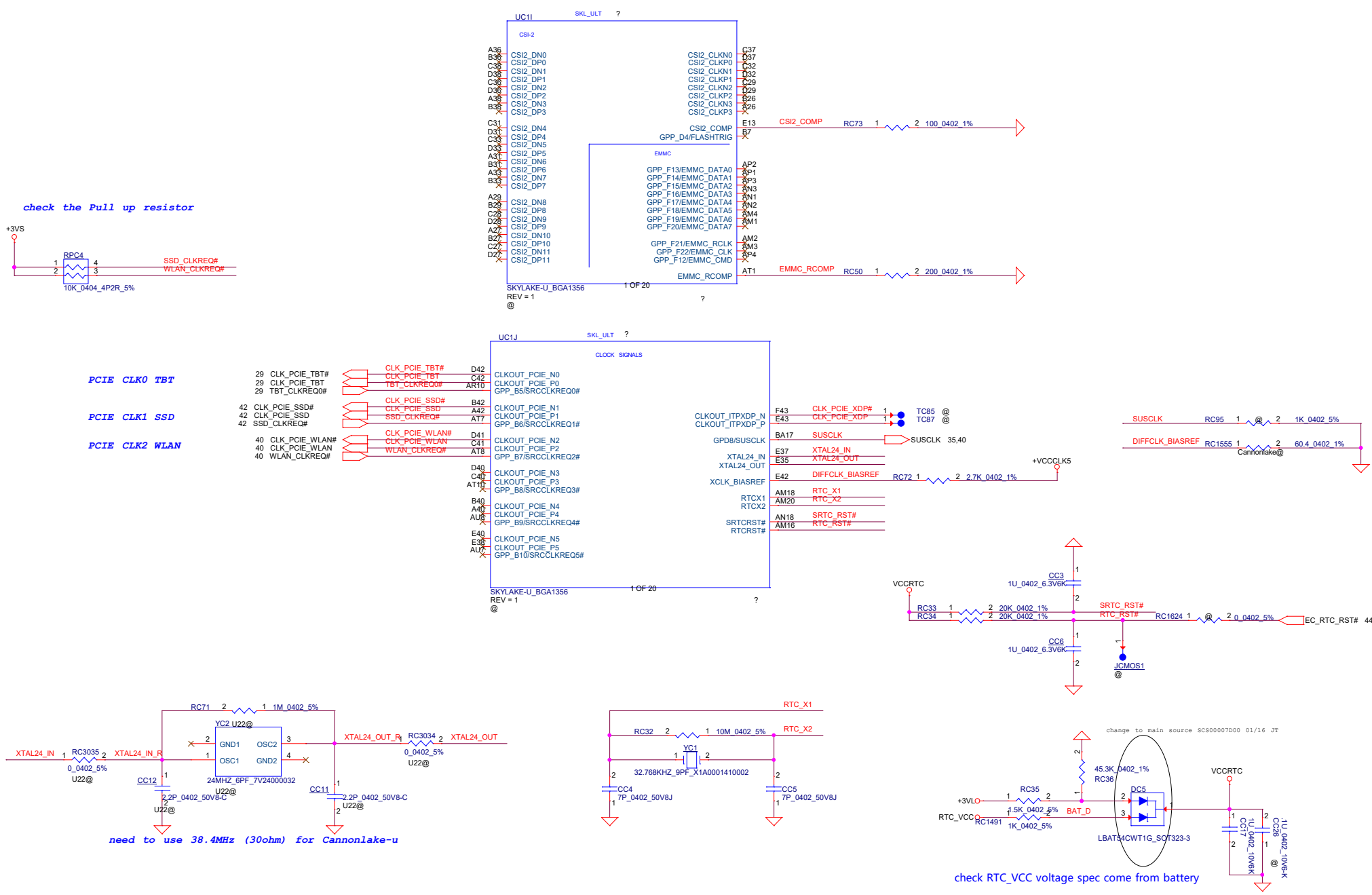




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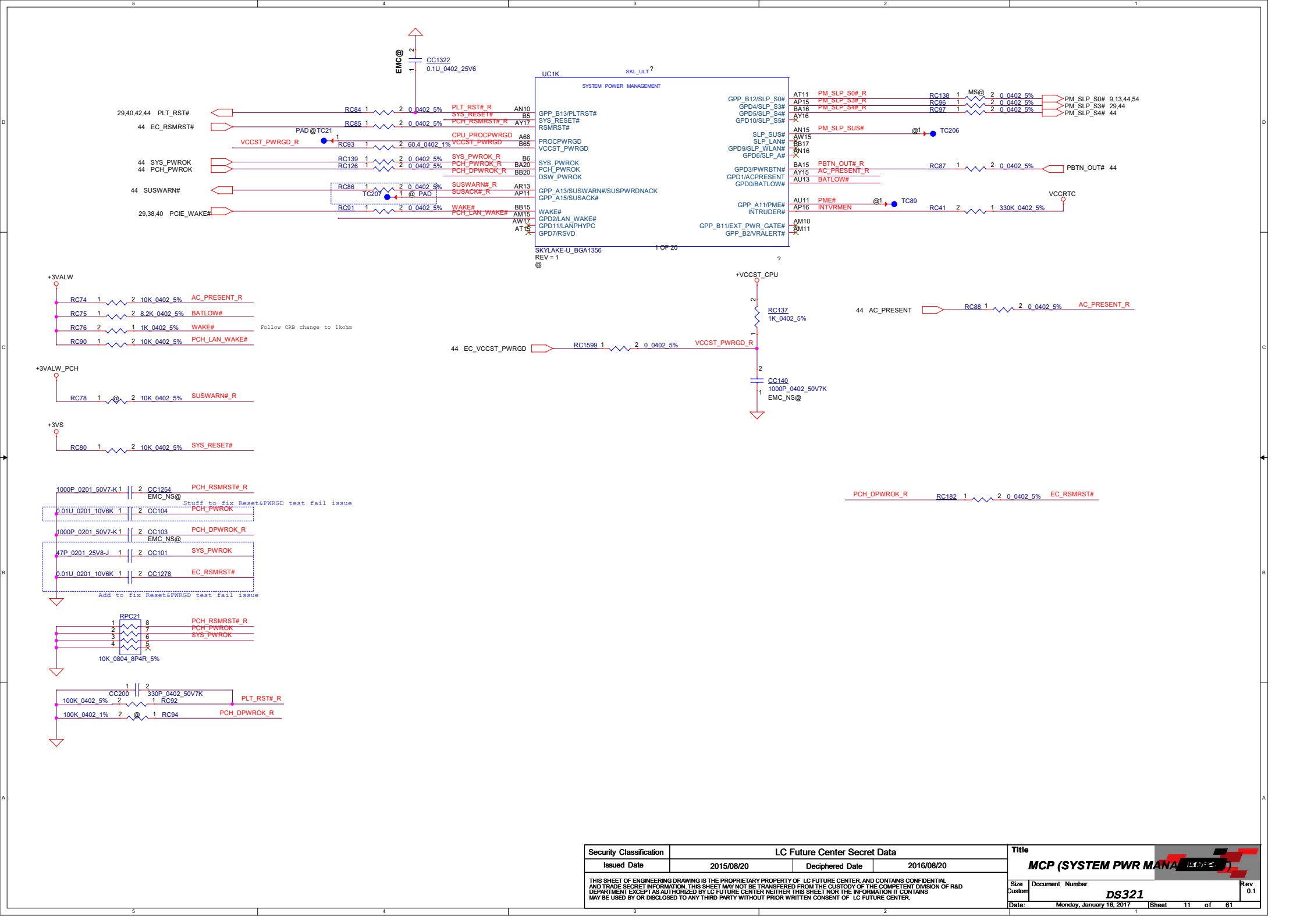


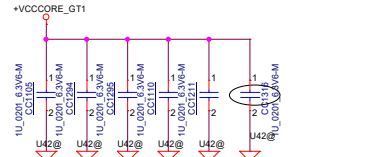
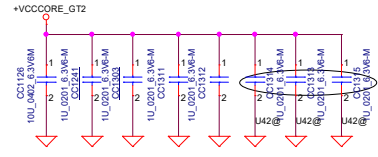
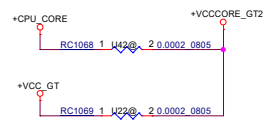
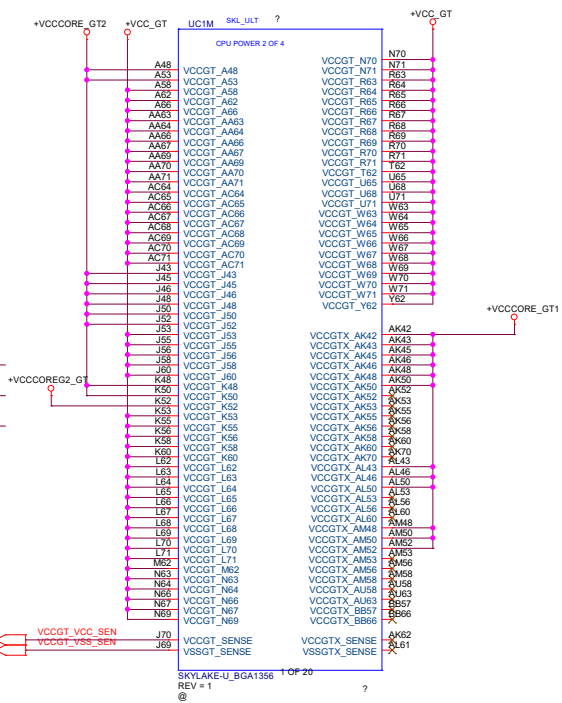
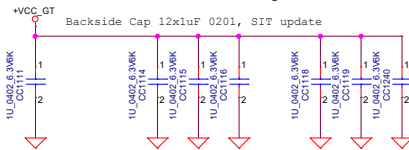
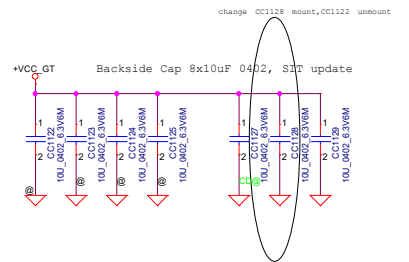
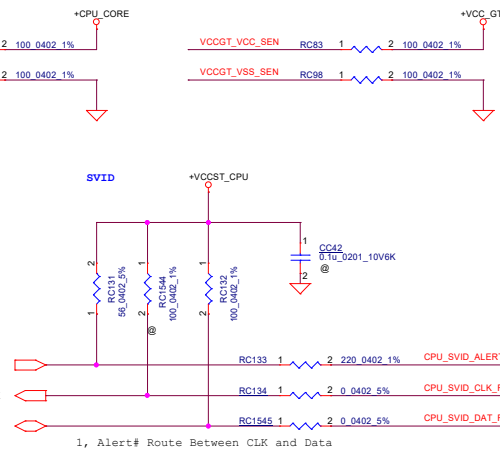
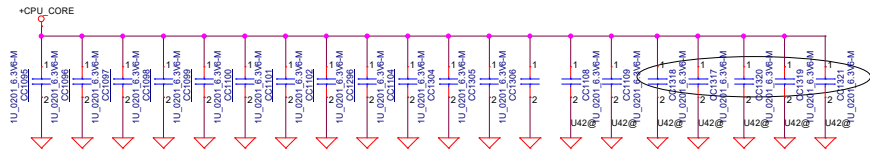
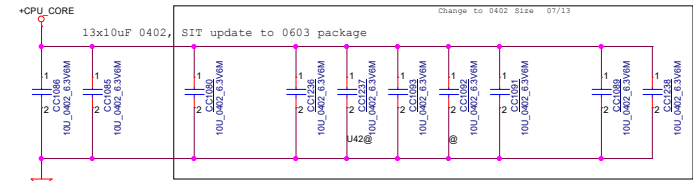
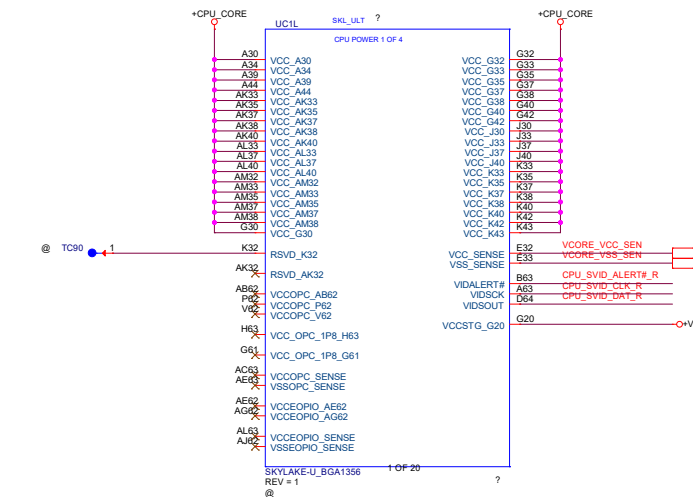




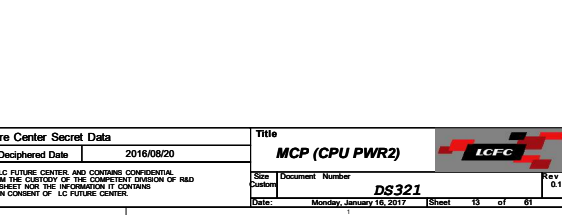
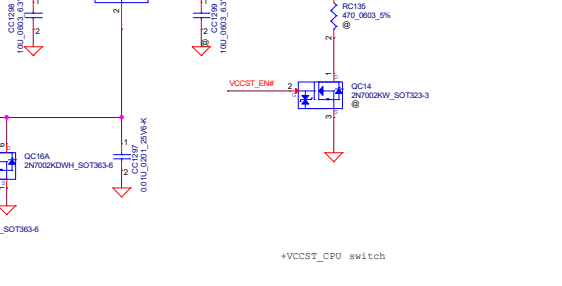
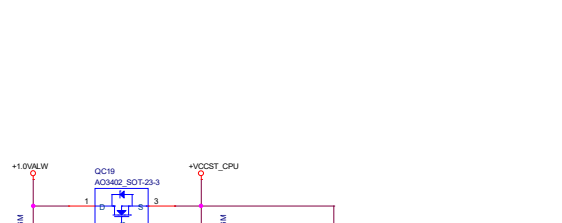
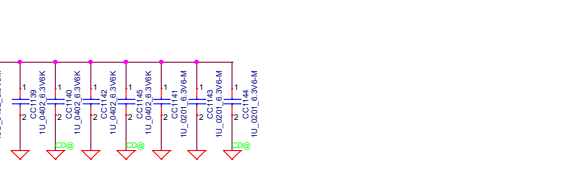
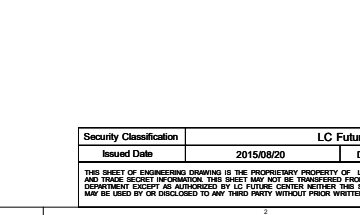
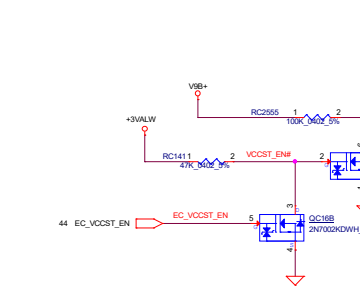
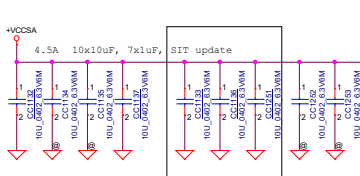
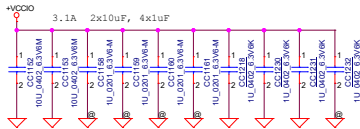
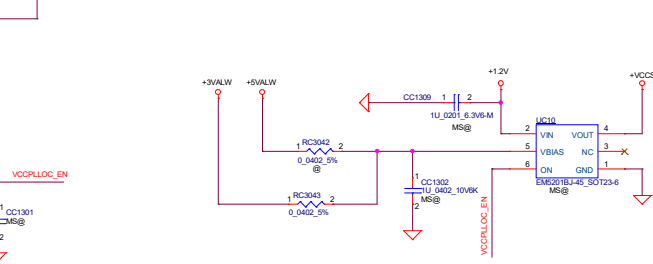
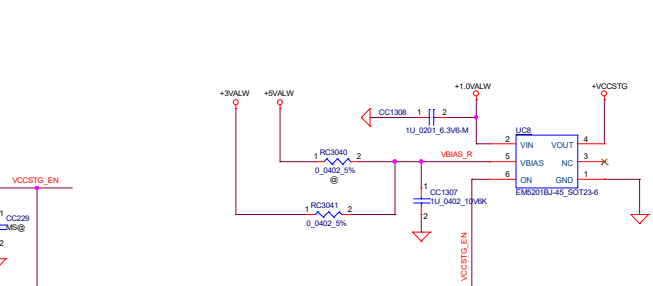
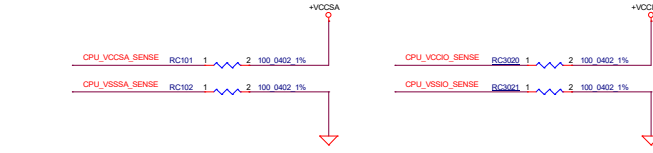
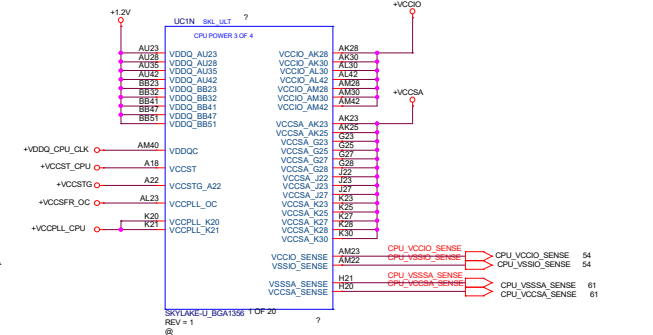
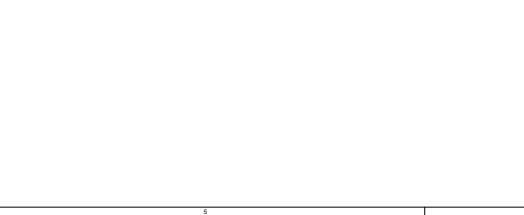
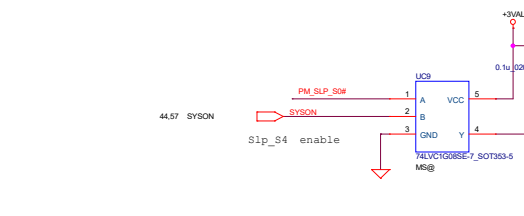
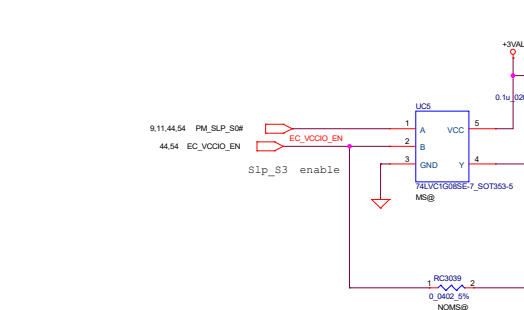
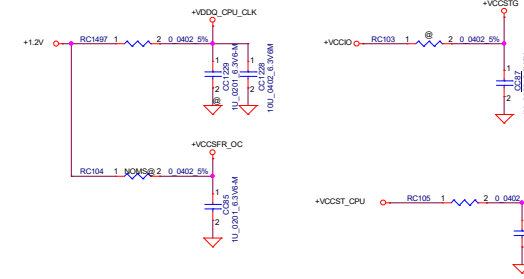
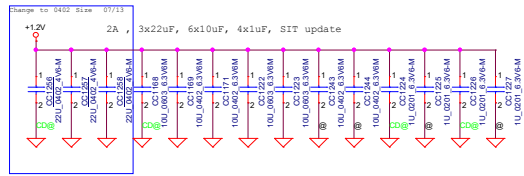
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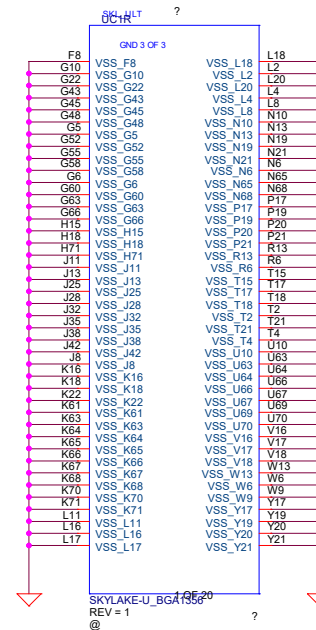
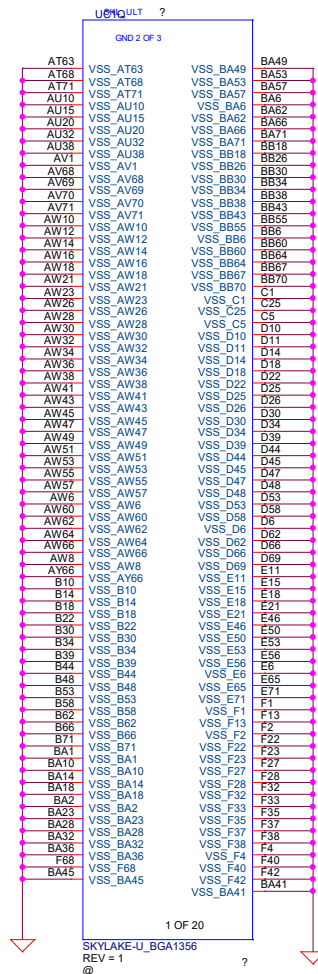
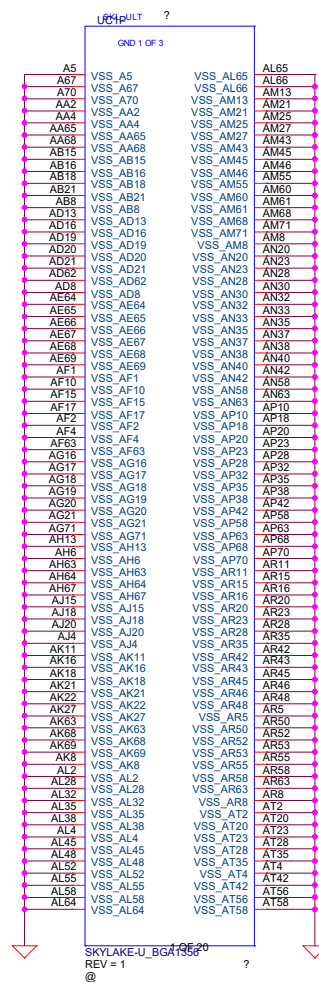


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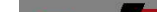


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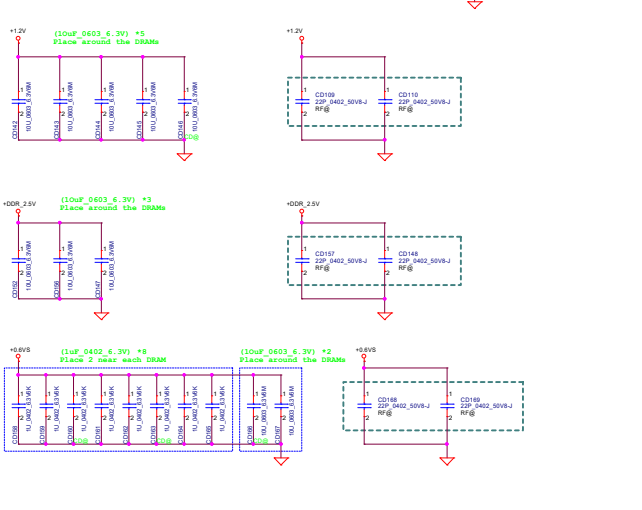
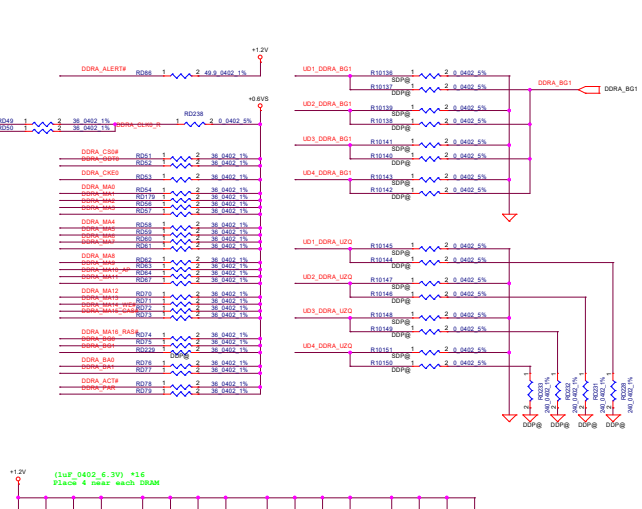


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Size	Document Number	Rev																												
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Date: Monday, January 16, 2017				Sheet 21 of 61																										
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Date: Monday, January 16, 2017				Sheet	22	of	81




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D				D																								
C				C																								
B				B																								
A				A																								
<div><table><tr><td>Security Classification</td><td colspan="3">LC Future Center Secret Data</td><td>Title</td></tr><tr><td>Issued Date</td><td>2015/08/20</td><td>Deciphered Date</td><td>2016/08/20</td><td>Blank</td></tr><tr><td colspan="4">THIS SHEET OF ENGINEERING DRAWING IS THE PROPRIETARY PROPERTY OF LC FUTURE CENTER, AND CONTAINS CONFIDENTIAL AND TRADE SECRET INFORMATION. THIS SHEET MAY NOT BE TRANSFERRED FROM THE CUSTODY OF THE COMPETENT DIVISION OF R&amp;D DEPARTMENT EXCEPT AS AUTHORIZED BY LC FUTURE CENTER. NEITHER THIS SHEET NOR THE INFORMATION IT CONTAINS MAY BE USED BY OR DISCLOSED TO ANY THIRD PARTY WITHOUT PRIOR WRITTEN CONSENT OF LC FUTURE CENTER.</td><td><table><tr><td>Size</td><td>Document Number</td><td>Rev</td></tr><tr><td>C</td><td>DS321</td><td>0.1</td></tr><tr><td colspan="3">Date: Monday, January 16, 2017 Sheet 23 of 61</td></tr></table></td></tr></table></div>					Security Classification	LC Future Center Secret Data			Title	Issued Date	2015/08/20	Deciphered Date	2016/08/20	Blank	THIS SHEET OF ENGINEERING DRAWING IS THE PROPRIETARY PROPERTY OF LC FUTURE CENTER, AND CONTAINS CONFIDENTIAL AND TRADE SECRET INFORMATION. THIS SHEET MAY NOT BE TRANSFERRED FROM THE CUSTODY OF THE COMPETENT DIVISION OF R&D DEPARTMENT EXCEPT AS AUTHORIZED BY LC FUTURE CENTER. NEITHER THIS SHEET NOR THE INFORMATION IT CONTAINS MAY BE USED BY OR DISCLOSED TO ANY THIRD PARTY WITHOUT PRIOR WRITTEN CONSENT OF LC FUTURE CENTER.				<table><tr><td>Size</td><td>Document Number</td><td>Rev</td></tr><tr><td>C</td><td>DS321</td><td>0.1</td></tr><tr><td colspan="3">Date: Monday, January 16, 2017 Sheet 23 of 61</td></tr></table>	Size	Document Number	Rev	C	DS321	0.1	Date: Monday, January 16, 2017 Sheet 23 of 61		
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Date: Monday, January 16, 2017				Sheet	26	of	81

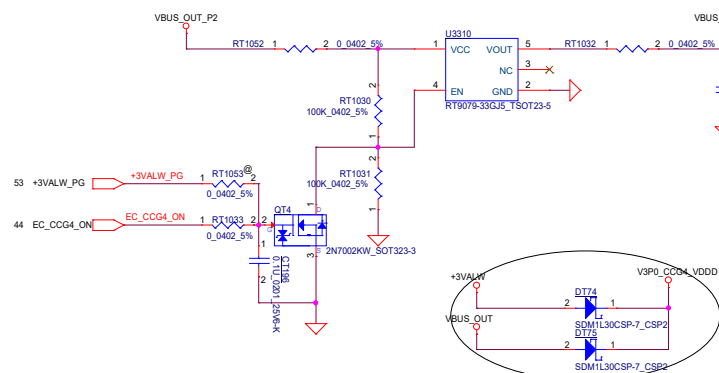
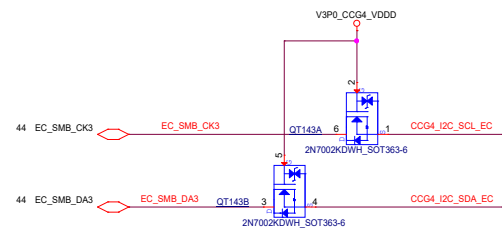


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Date: Monday, January 16, 2017				Sheet	28	of	81

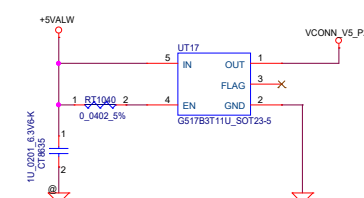
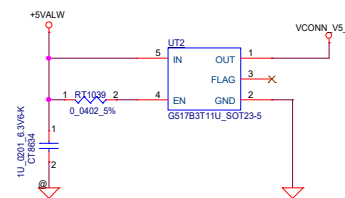
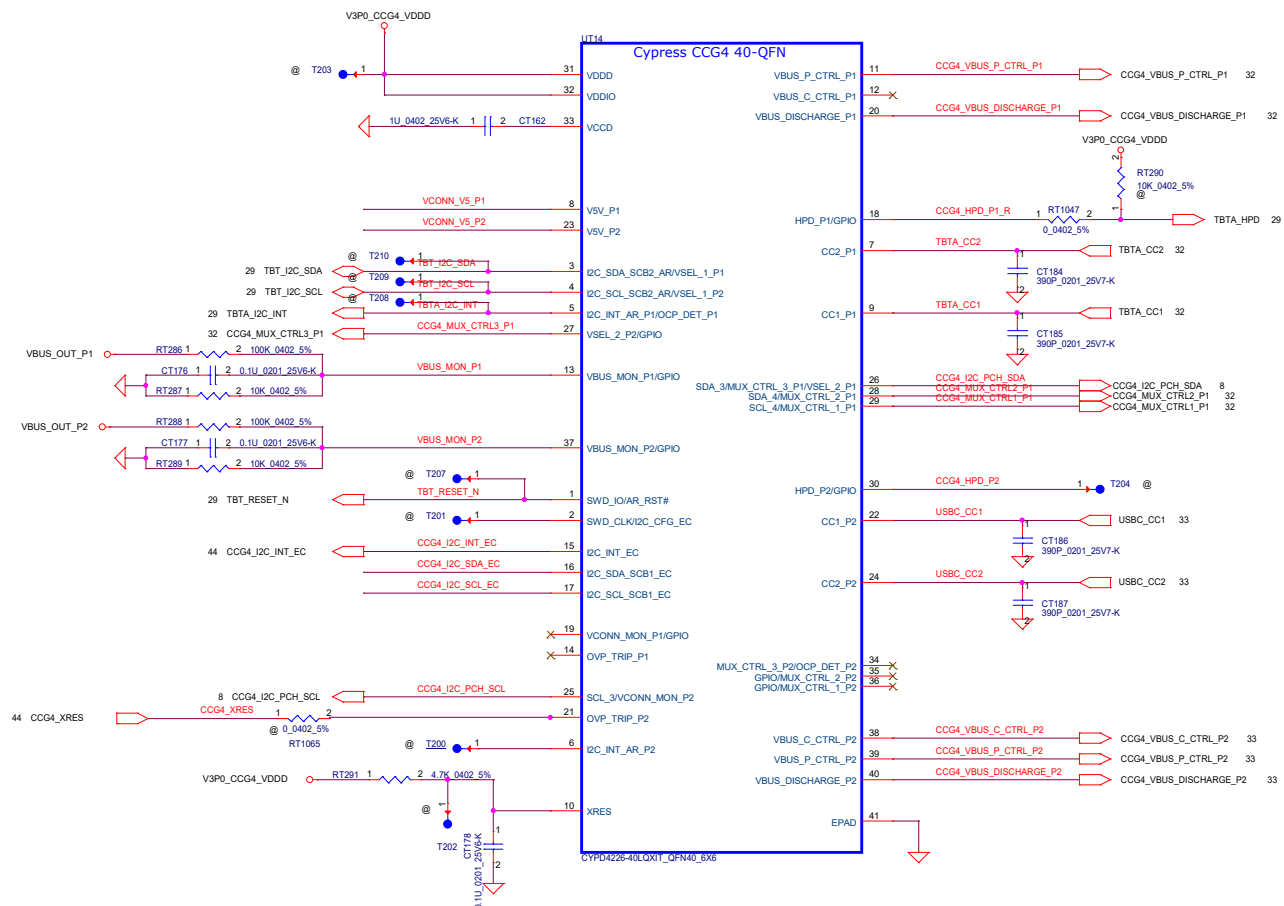




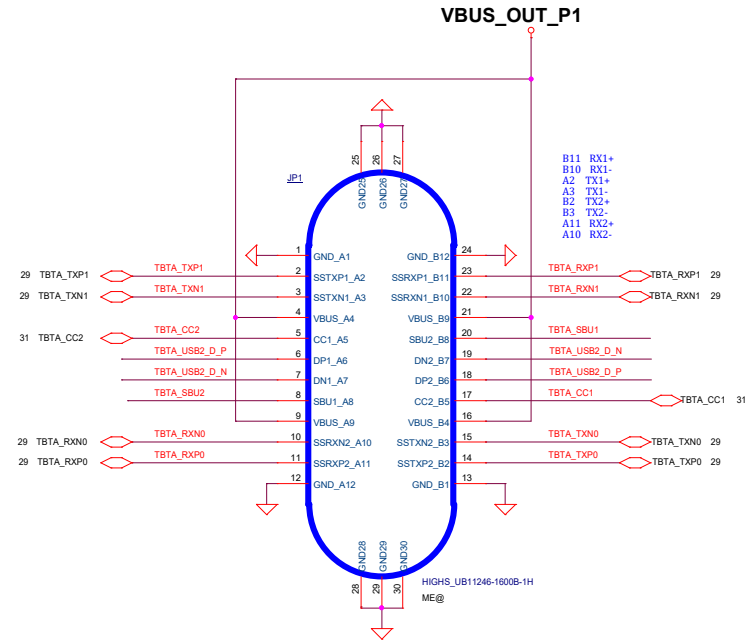
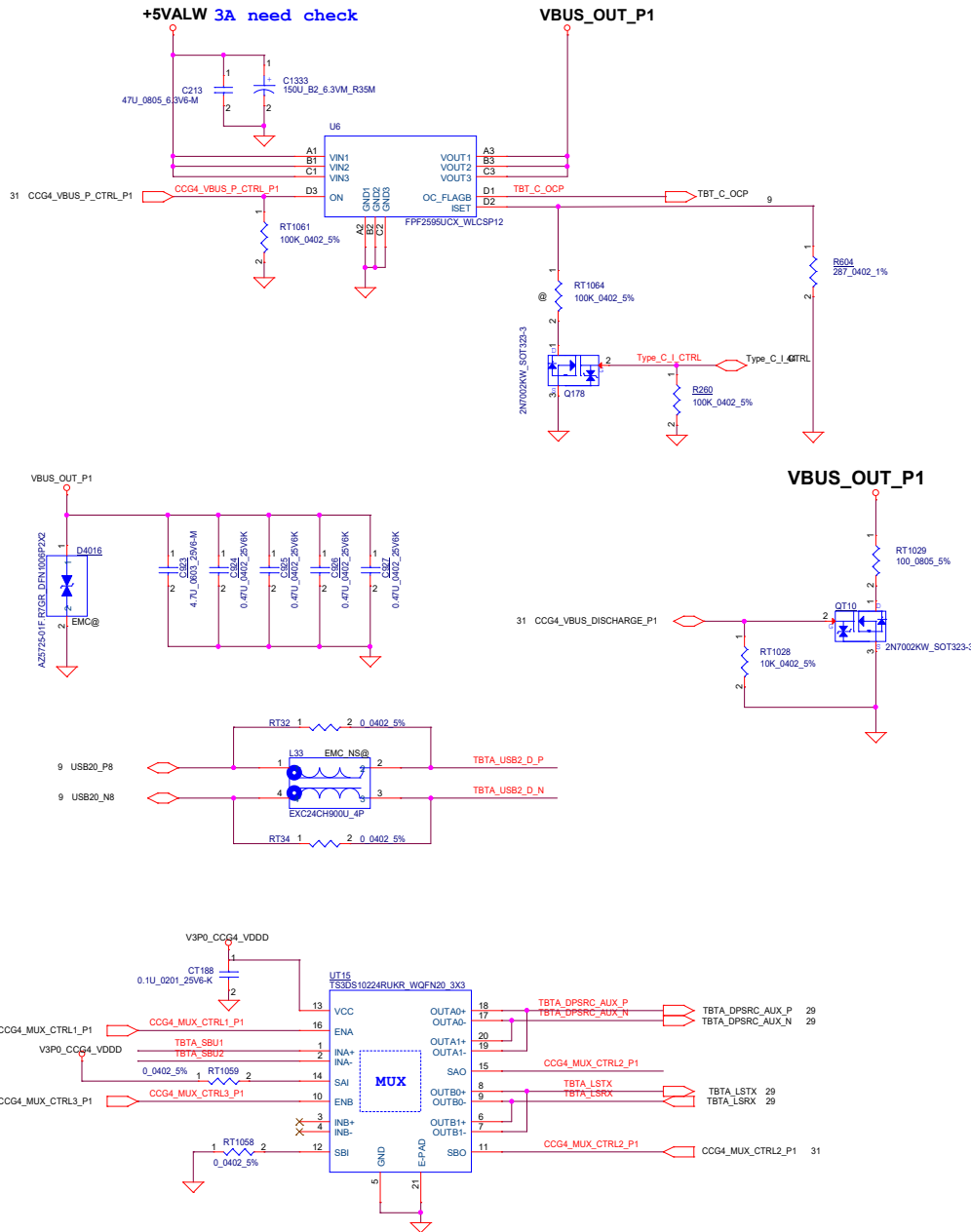




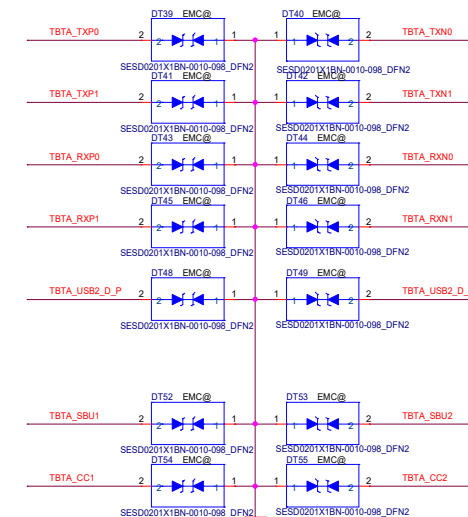
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S SCH DIO SDM20U30LP-7 DFN1006-2



TBT3 not support type-c adppter



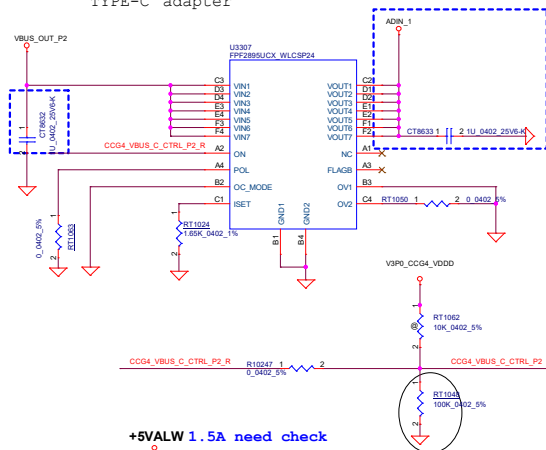
1116 update symbol



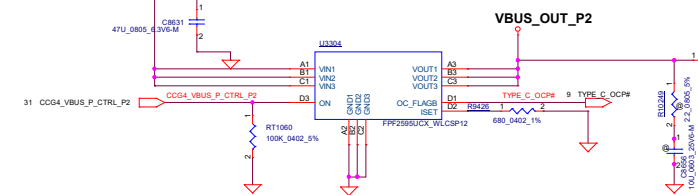
Security Classification	LC Future Center Secret Data		Title	
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				Rev 0.1 Date: Monday, January 16, 2017 Sheet 32 of 81



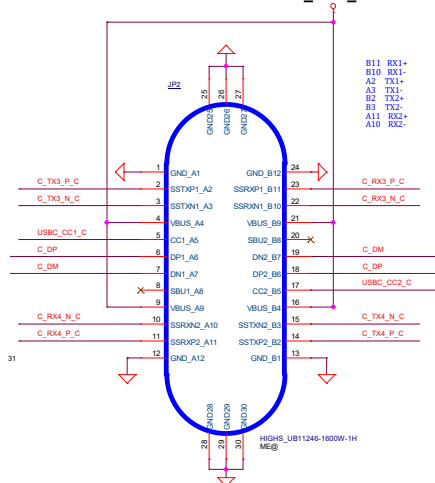
TYPE-C adapter



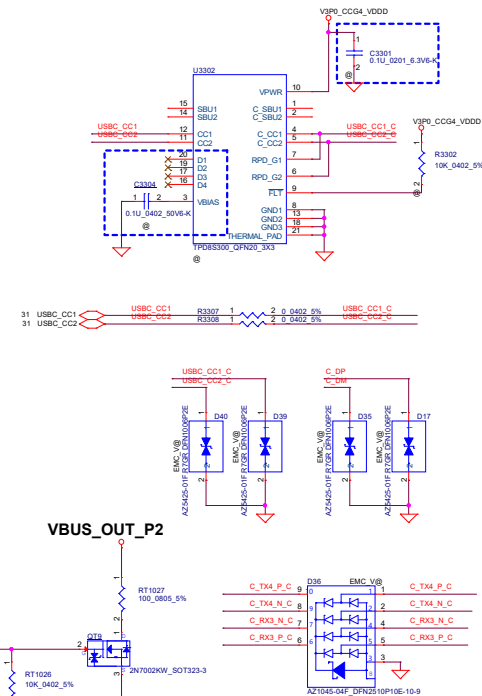
+5VALW 1.5A need check



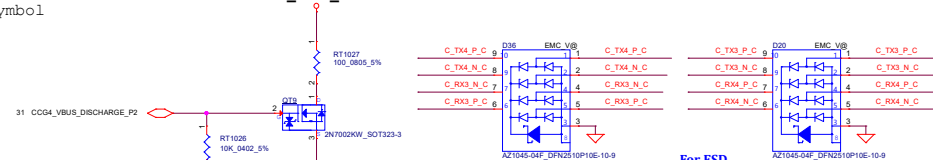
## VBUS\_OUT\_P2



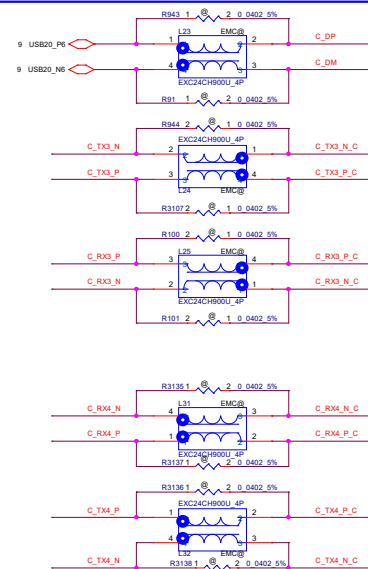
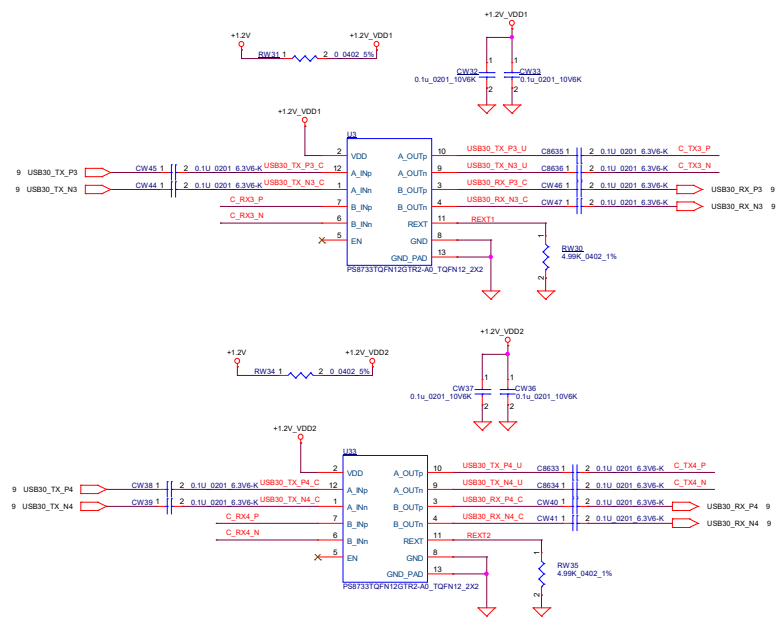
1116 update symbol




## VBUS\_OUT\_P2

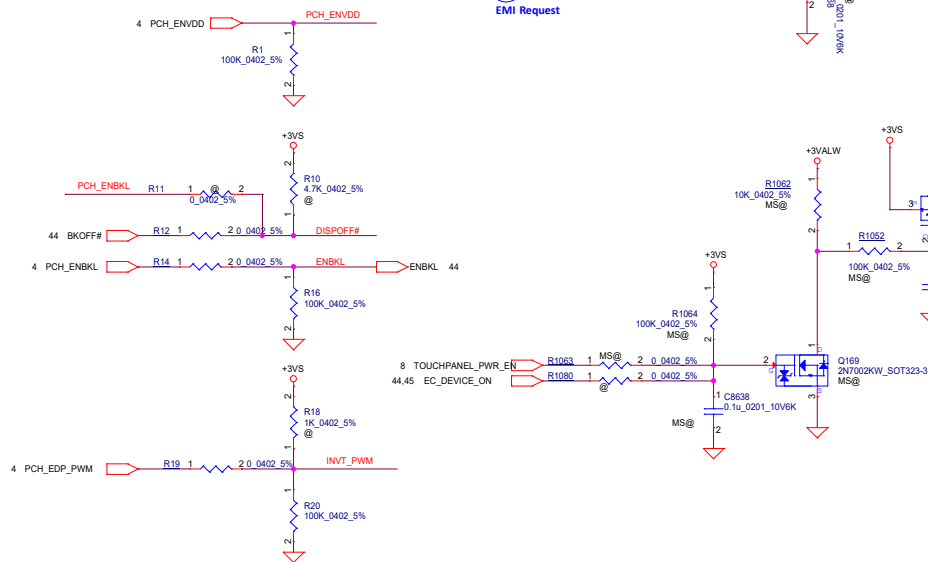
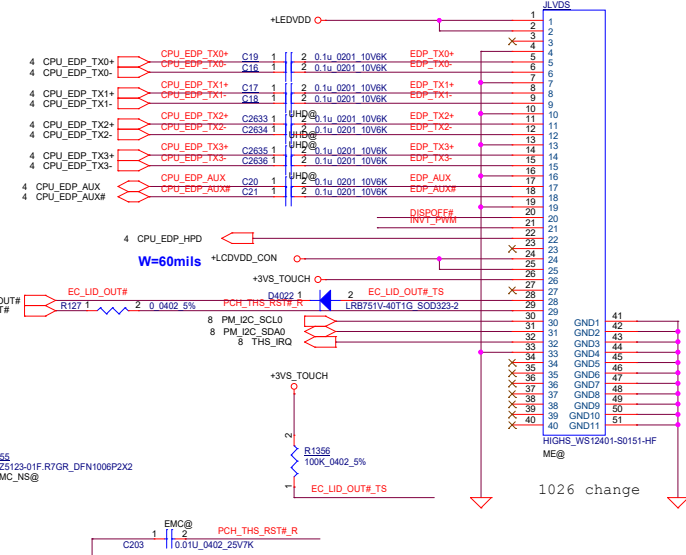
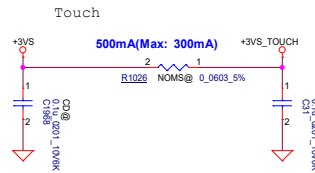
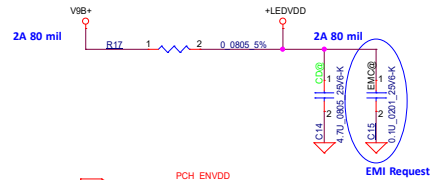
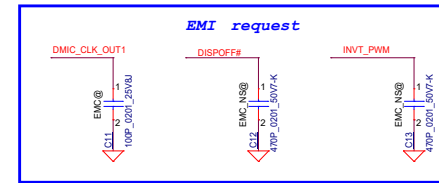
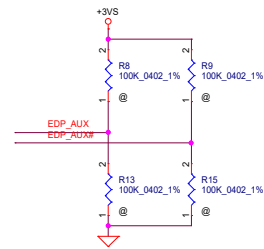
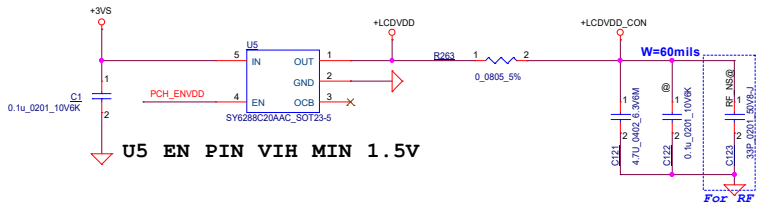


For ESD

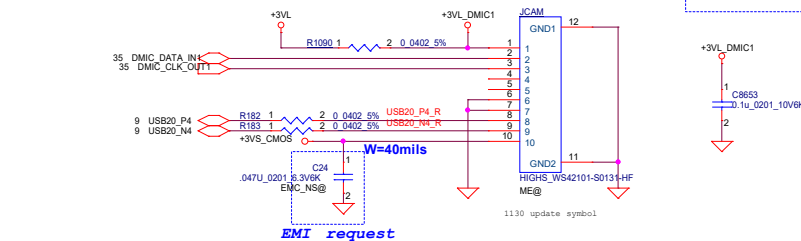
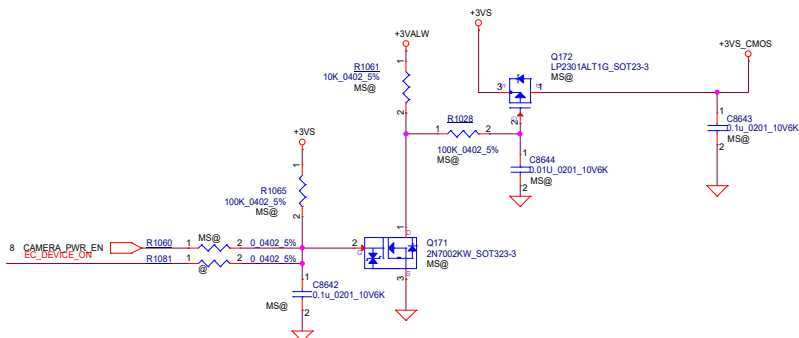
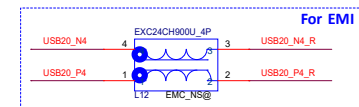
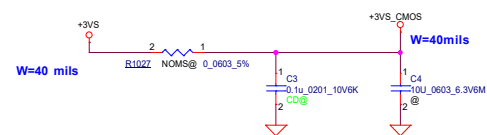



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Issued Date	2015/08/20	Deciphered Date	2016/08/20	
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Size	Document Number	Date	D5321	
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## LCD POWER CIRCUIT

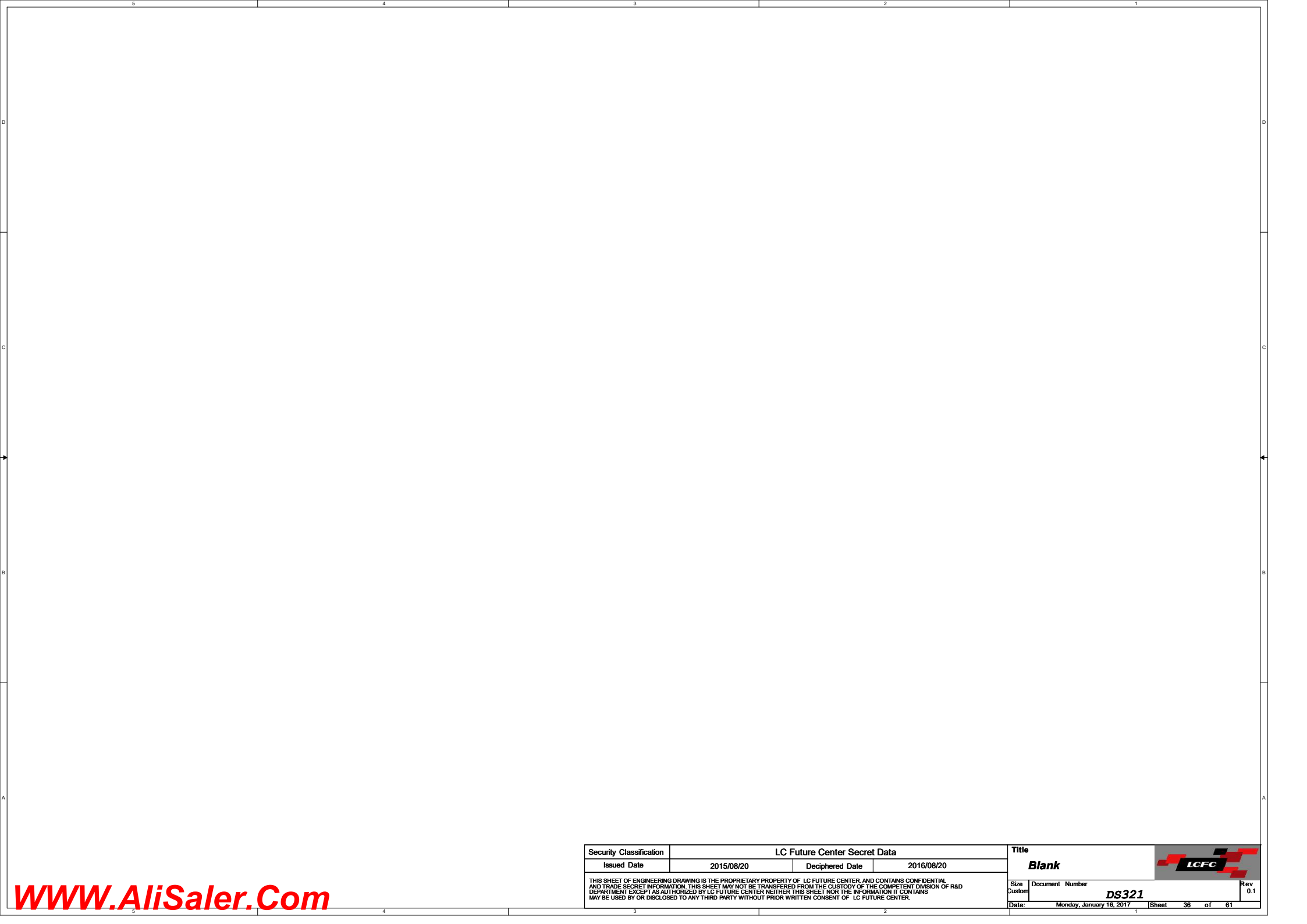



## CMOS Camera



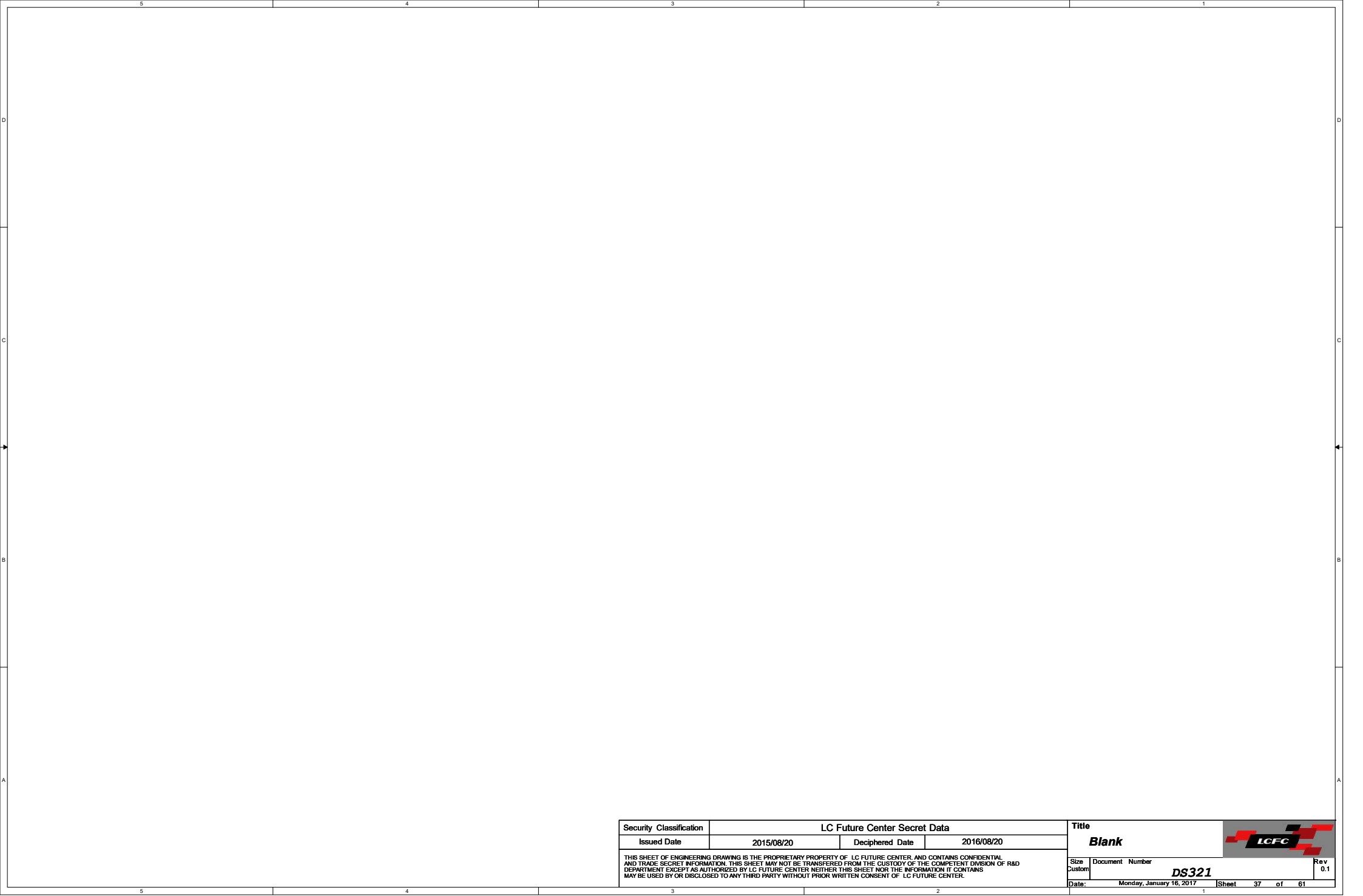
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Issued Date	2015/08/20	Deciphered Date	2016/08/20	Size	Document Number	DS321			Rev	0.1
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Issued Date	2015/08/20	Deciphered Date	2016/08/20	Blank		
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				Custom	DS321	0.1
				Date:	Monday, January 16, 2017	Sheet 36 of 61

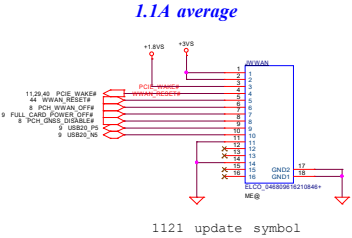




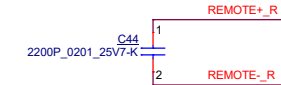
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Issued Date	2015/08/20	Deciphered Date	2016/08/20
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Title					
Blank					
Size	Document	Number			
Custom:	DS321				
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				Rev	0.1

Mini Card(WWAN)

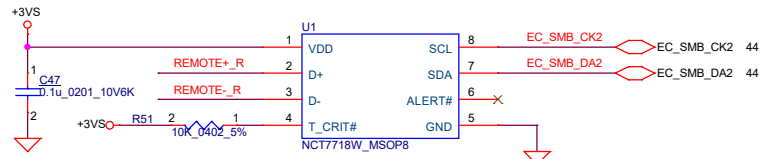


Close to U1



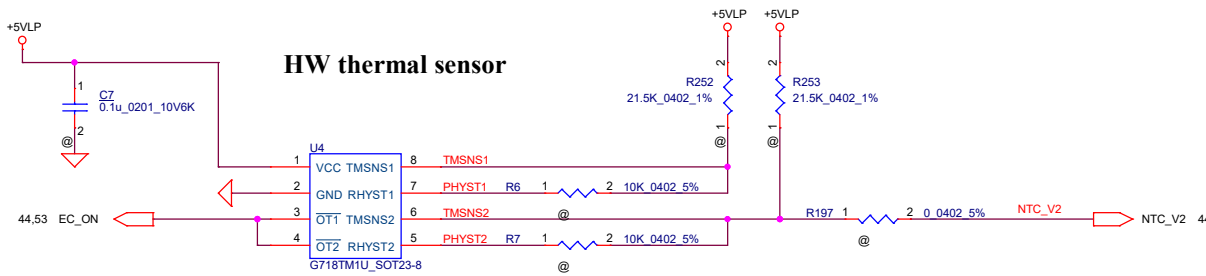
REMOTE+/-\_R, REMOTE1+/-, REMOTE2+/-:  
Trace width/space:10/10 mil  
Trace length:<8"

### SMSC thermal sensor placed near DIMM

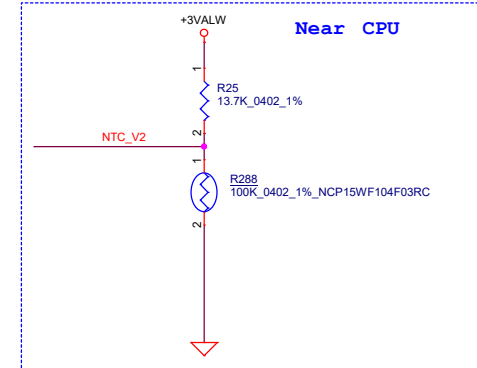
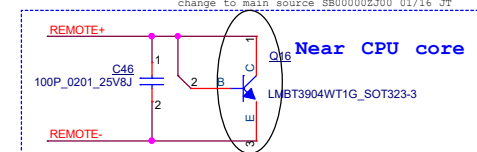


Address 1001\_101xb

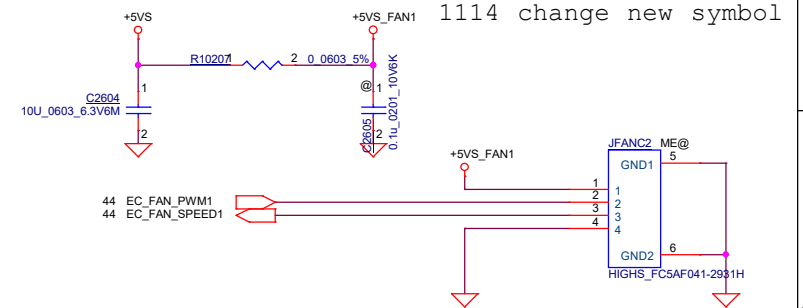
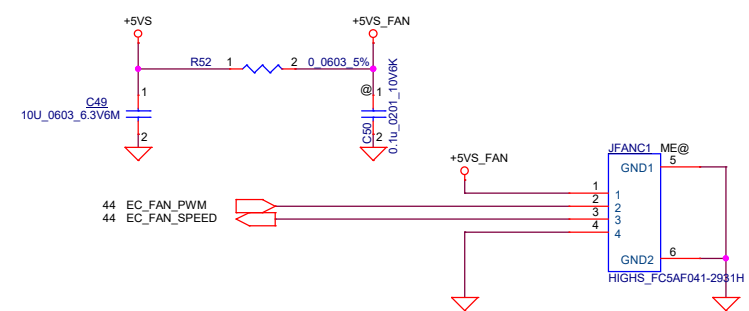
### HW thermal sensor



over temperature threshold:  
 $RSET=3*RTMH$   
 $92+/-30C$   
Hysteresis temperature threshold.  
 $RHYST=(RSET*RTML)/(3*RTML-RSET)$   
 $56+/-30C$

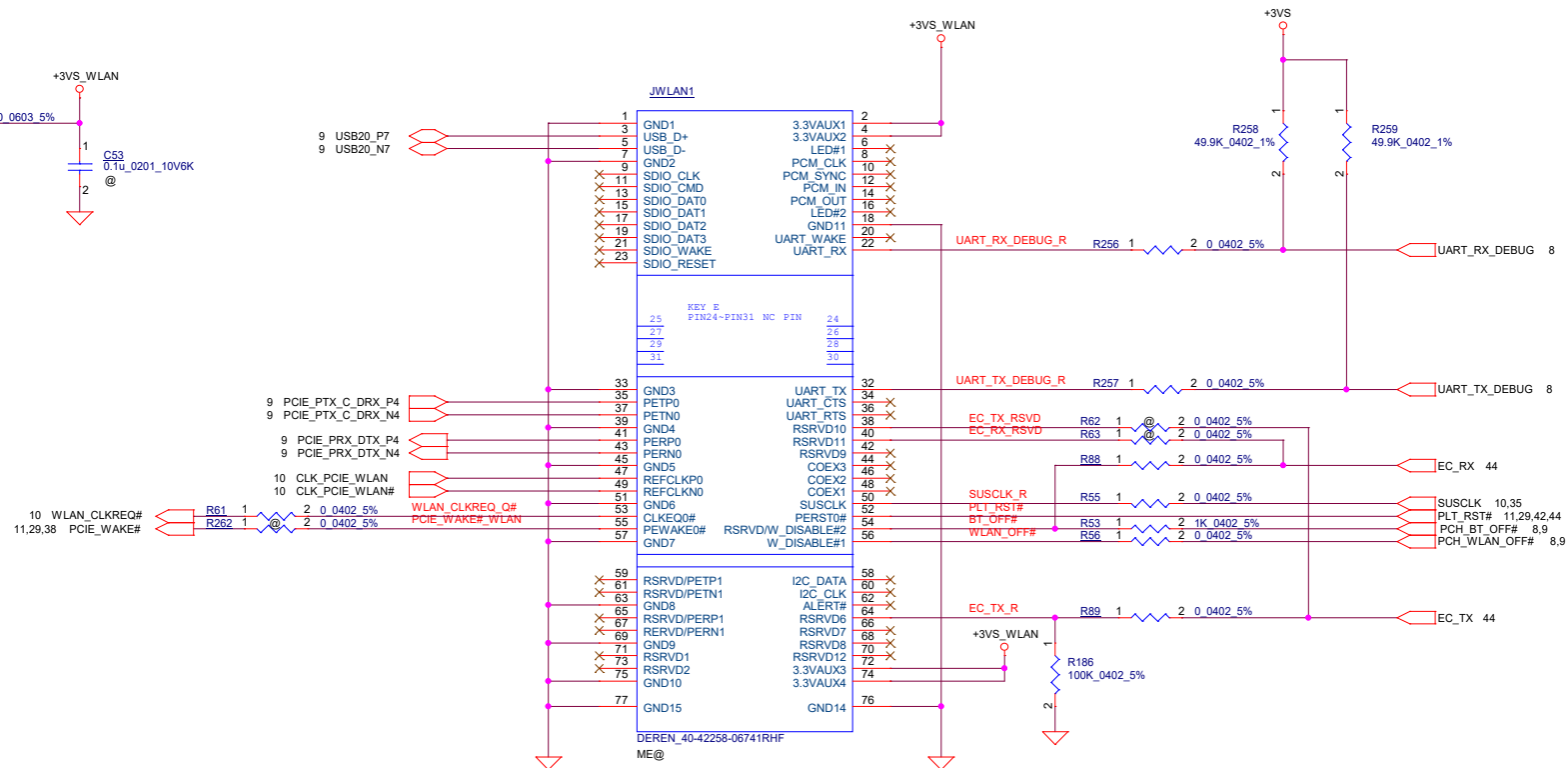


for layout optimized, change the EC\_AGND to GND



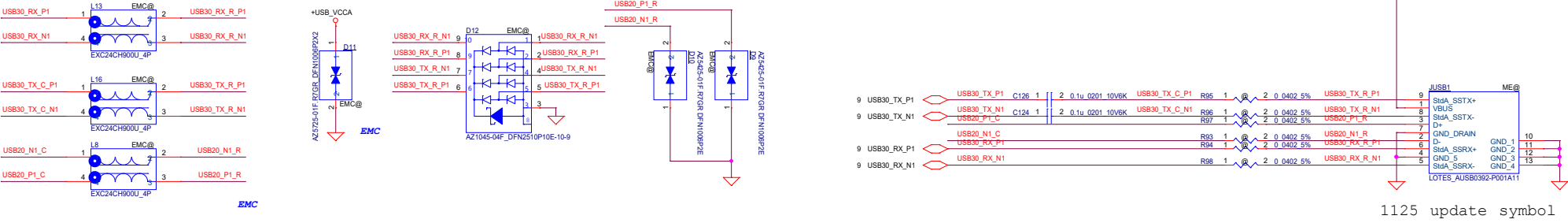
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Issued Date	2015/08/20	Deciphered Date	2016/08/20	Size	Document	Number
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				Date:	Monday, January 16, 2017	Sheet 39 of 61

### *Mini-Express Card(WLAN/WiMAX)*

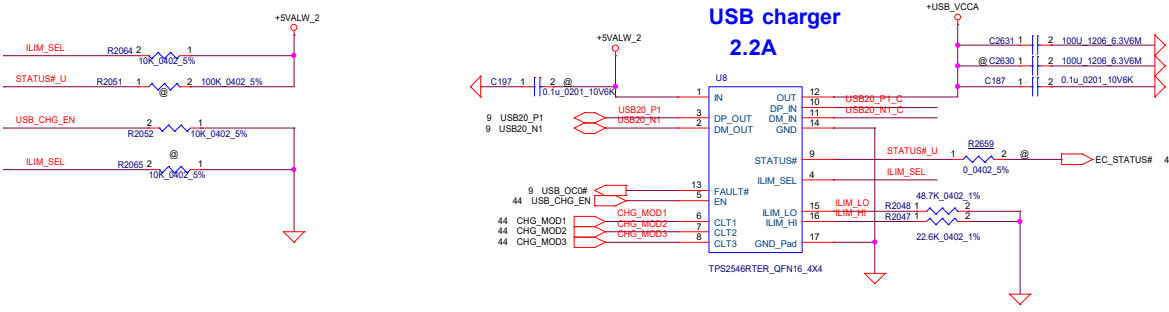


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1114 change new symbol
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RIGHT SIDE USB3.0 PORT x1

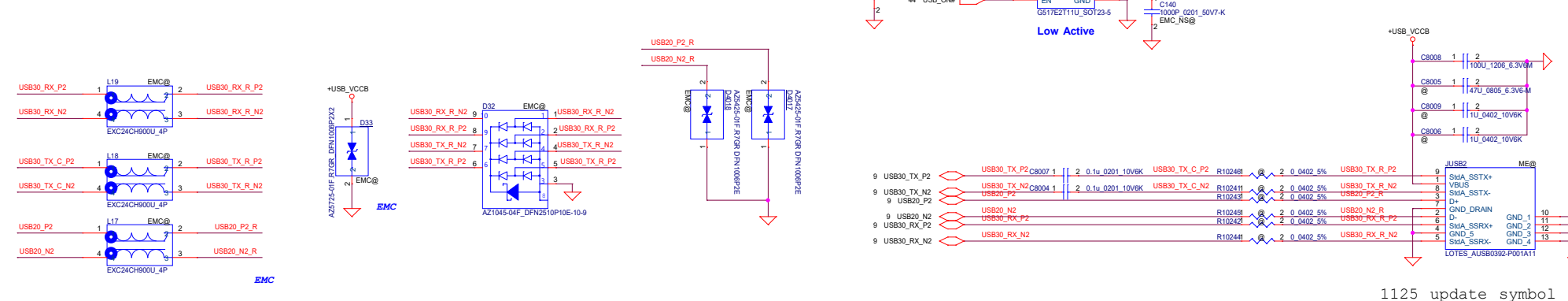


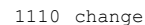
USB charger 2.2A




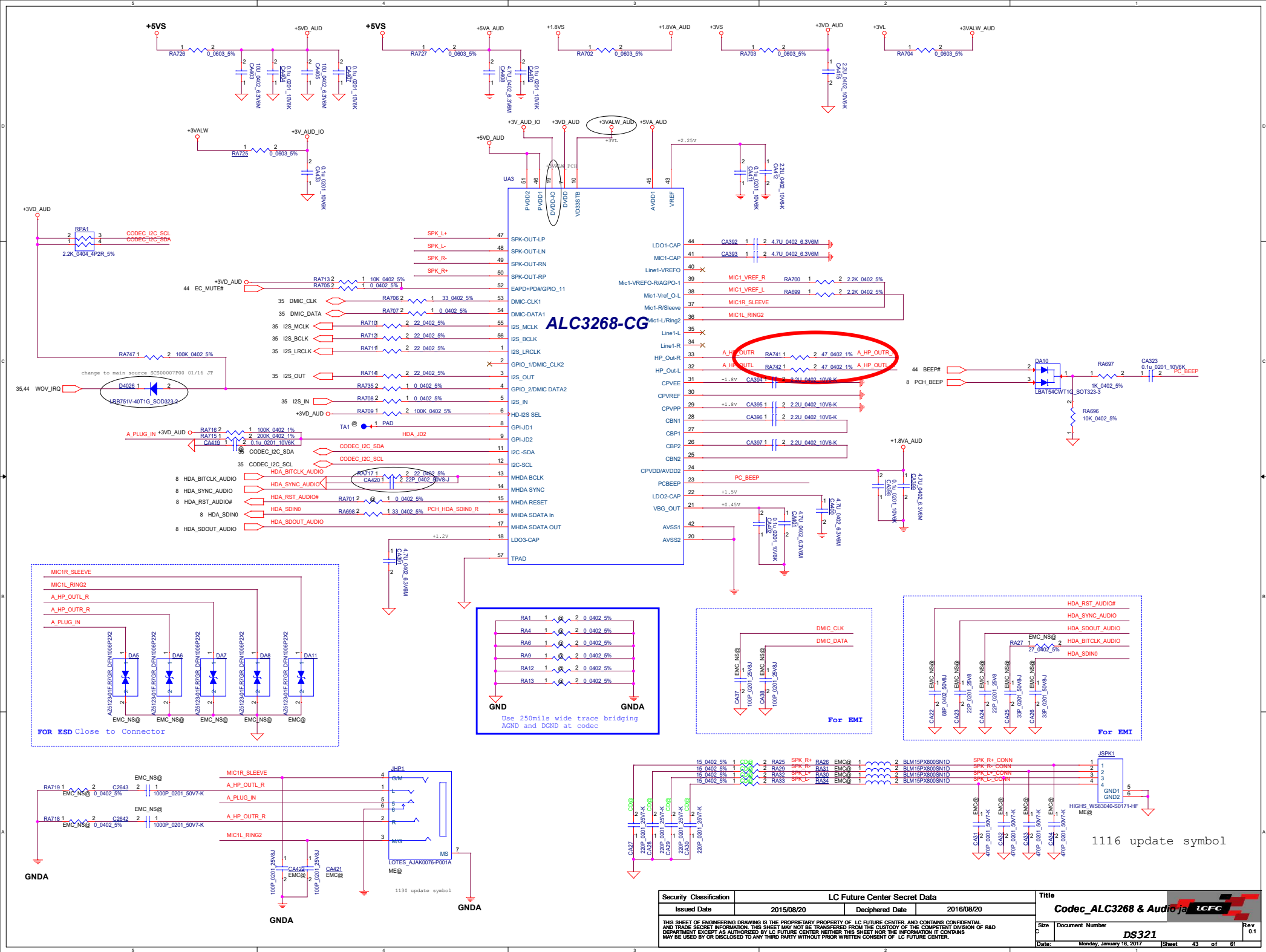
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	pin name	Ctl1	Ctl2	Ctl3	ILM_SEL
Charge port Pin5 Enable H for all	S0 CDP	1	1	1	1
	S3 DCP	0	1	1	0/1
	S4/S5 DCP	0	0	1	0/1
Normal port Pin5 Enable H for S0/S3 L for S4/S5	S0 SDP1	1	1	0	0/1
	S3 SDP1	0	1	0	0/1
	S4/S5 Disable	0	0	0	0/1

LEFT SIDE USB3.0 PORT x1





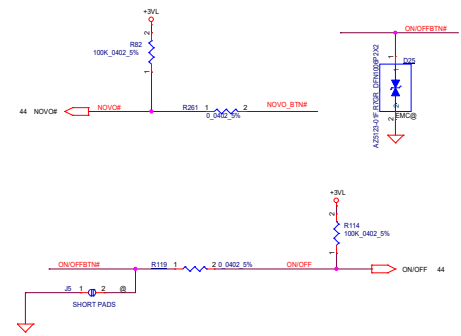
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NGFF-SSD			
Size Custom	Document Number	Rev 0.1	
DS321			
Date:	Monday, January 16, 2017	Sheet	42 of 61



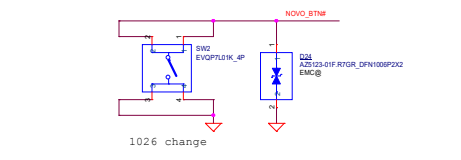




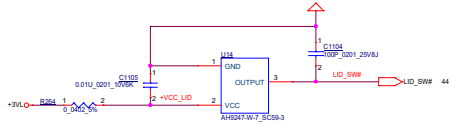
ON/OFF switch



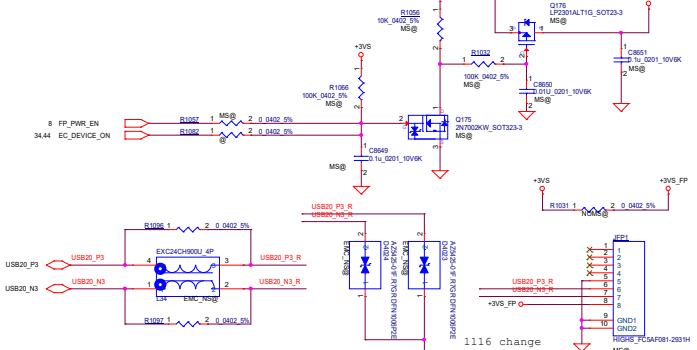
Novo button



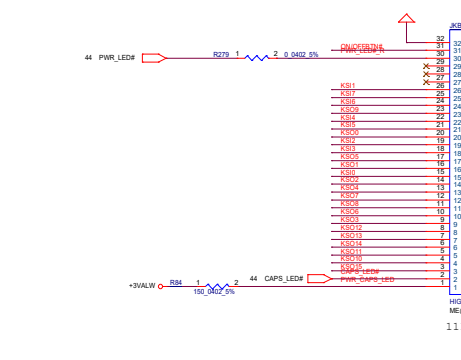
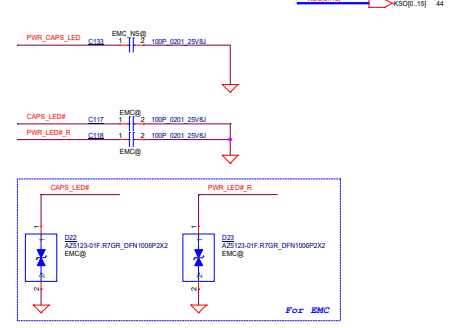
LID switch



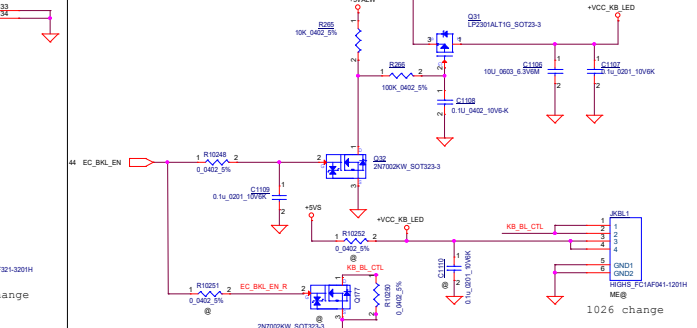
Finger Print Connector



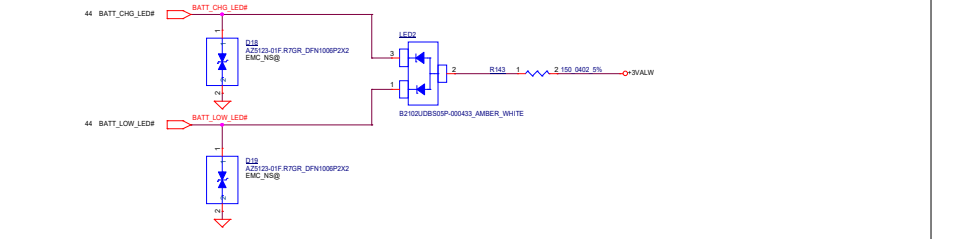
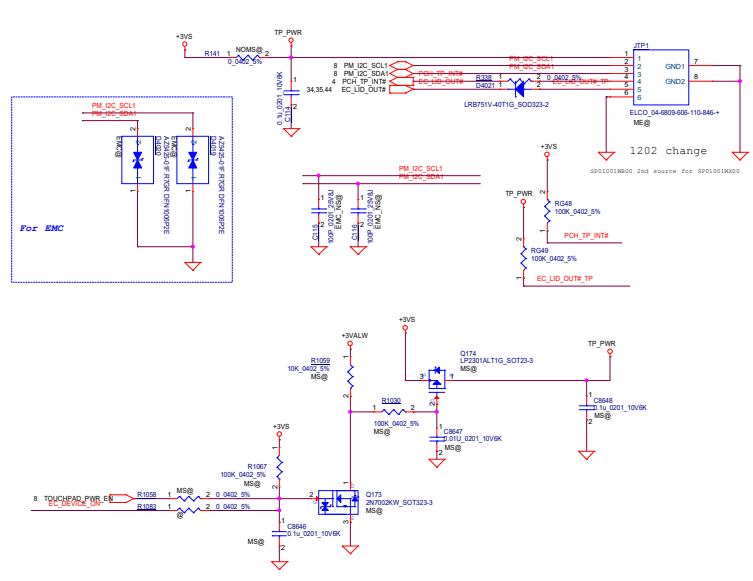
K/B Connector

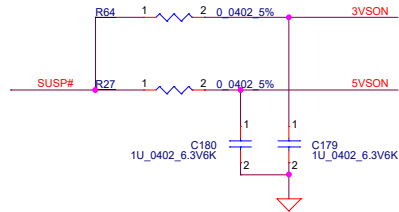


KB Backlight Connector



TP/B Connector

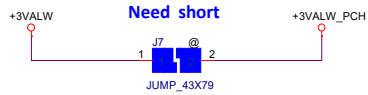
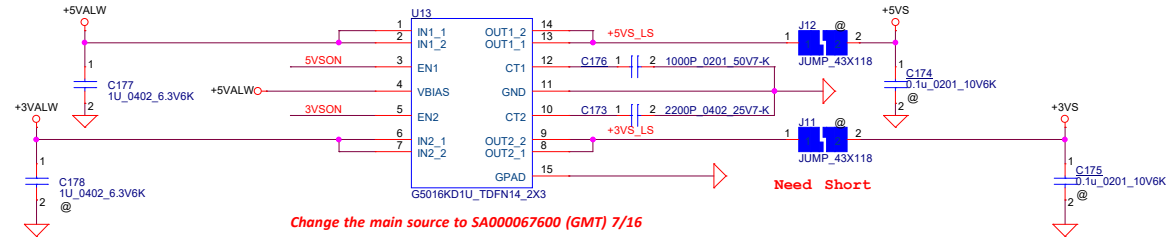




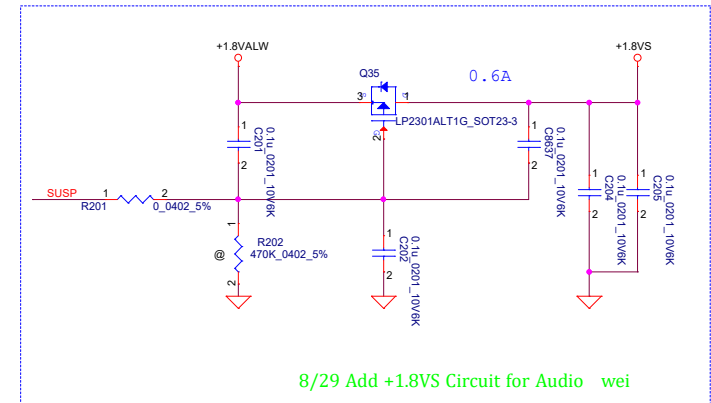
**Load Switch**  
**+5VALW To +5VS**  
**+3VALW To +3VS**

**+3VS, C173 --> 2.74ms**  
**+5VS, C176 --> 2.03ms**

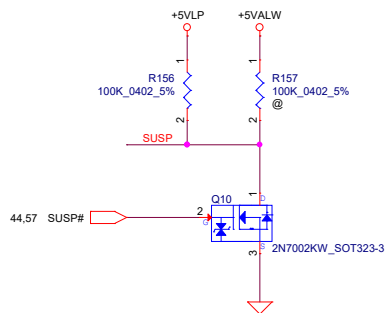
VIN 5V and 3.3V (VBIAS=5V), IMAX(per channel)=6A, Rds=16mohm



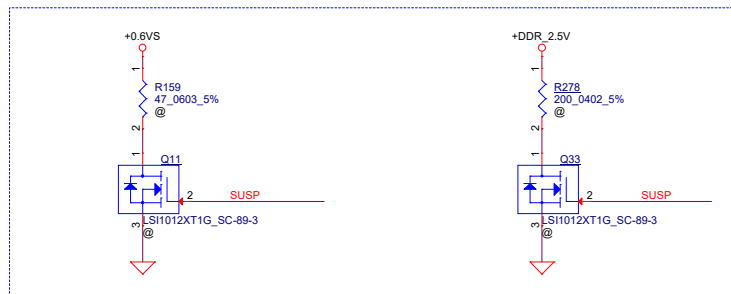
**Need short**



8/29 Add +1.8VS Circuit for Audio wei



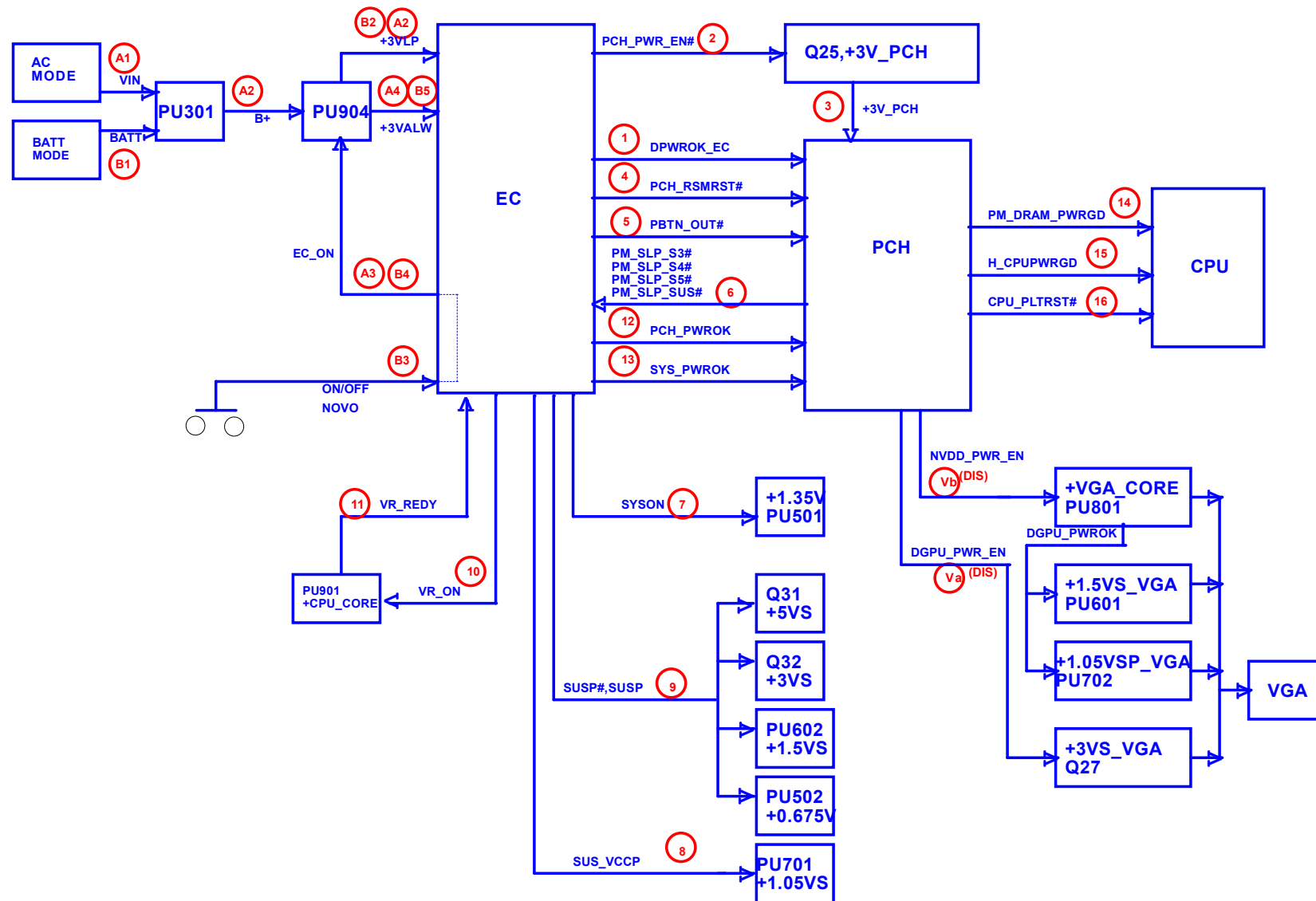
**For DisCharge**



08/29: Need double check enable signal and the resistance

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DC V TO VS INTERFACE			
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Title		Rev	
Power sequence block		0.1	
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# PCB And LOGO Config

PCB	<div> <div>ZZZ1</div> <div>DA8@</div> </div> <div> <div>PCB 149 NM-B331 REV0.MB</div> <div>ZZZ2</div> <div>17@</div> </div> <div> <div>ZZZ10</div> <div>15@</div> </div> <div> <div>ZZZ11</div> <div>13@</div> </div>	LOGO
CPU	<div> <div>Intel i7-7500U 2.7G/2C/4MH</div> <div>ZZZ10</div> <div>15@</div> </div> <div> <div>Intel i5-7200U 2.5G/2C/3MH</div> <div>ZZZ11</div> <div>13@</div> </div> <div> <div>Intel i3-7100U 2.4G/2C/3MH</div> <div>ZZZ11</div> <div>13@</div> </div>	
VRAM	<div> <div>ZZZ4</div> <div>MICRON@</div> <div>MICRON 8G</div> </div> <div> <div>ZZZ5</div> <div>MICRON@</div> <div>MICRON 4G</div> </div> <div> <div>ZZZ6</div> <div>SAM@G@</div> <div>SAMSUNG 8G</div> </div> <div> <div>ZZZ7</div> <div>SAM@G@</div> <div>SAMSUNG 4G</div> </div> <div> <div>ZZZ9</div> <div>HY@G@</div> <div>HYNIX 4G</div> </div>	

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# PCB Federal Mark PAD

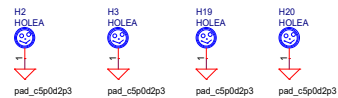


Pad\_o2p0x2p2d2p0x2p2n



Pad\_o2p0x2p2d2p0x2p2n

pad\_c5p0d2p3



pad\_c5p0d3p2



pad\_c4p5d2p3



pad\_o1p2x2p8d1p2x2p8n



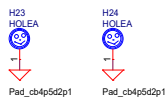
pad\_o1p2x2p8d1p2x2p8n

pad\_o4p0x2p0d4p0x2p0n



pad\_o4p0x2p0d4p0x2p0n

Pad\_cb4p5d2p1



Pad\_ct4p0b4p5d2p1



Pad\_ct4p0b4p5d2p1

Pad\_o7p0x9p0d4p0x6p0



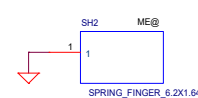
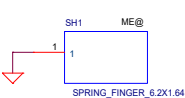
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PAD\_C2P3D2P3N

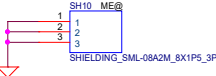
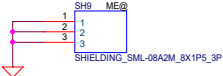
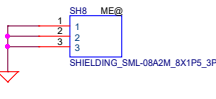
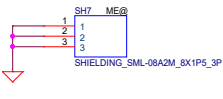
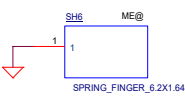
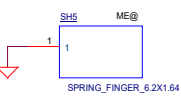
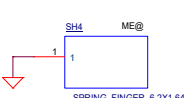
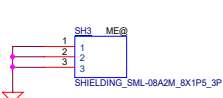


PAD\_C2P3D2P3N

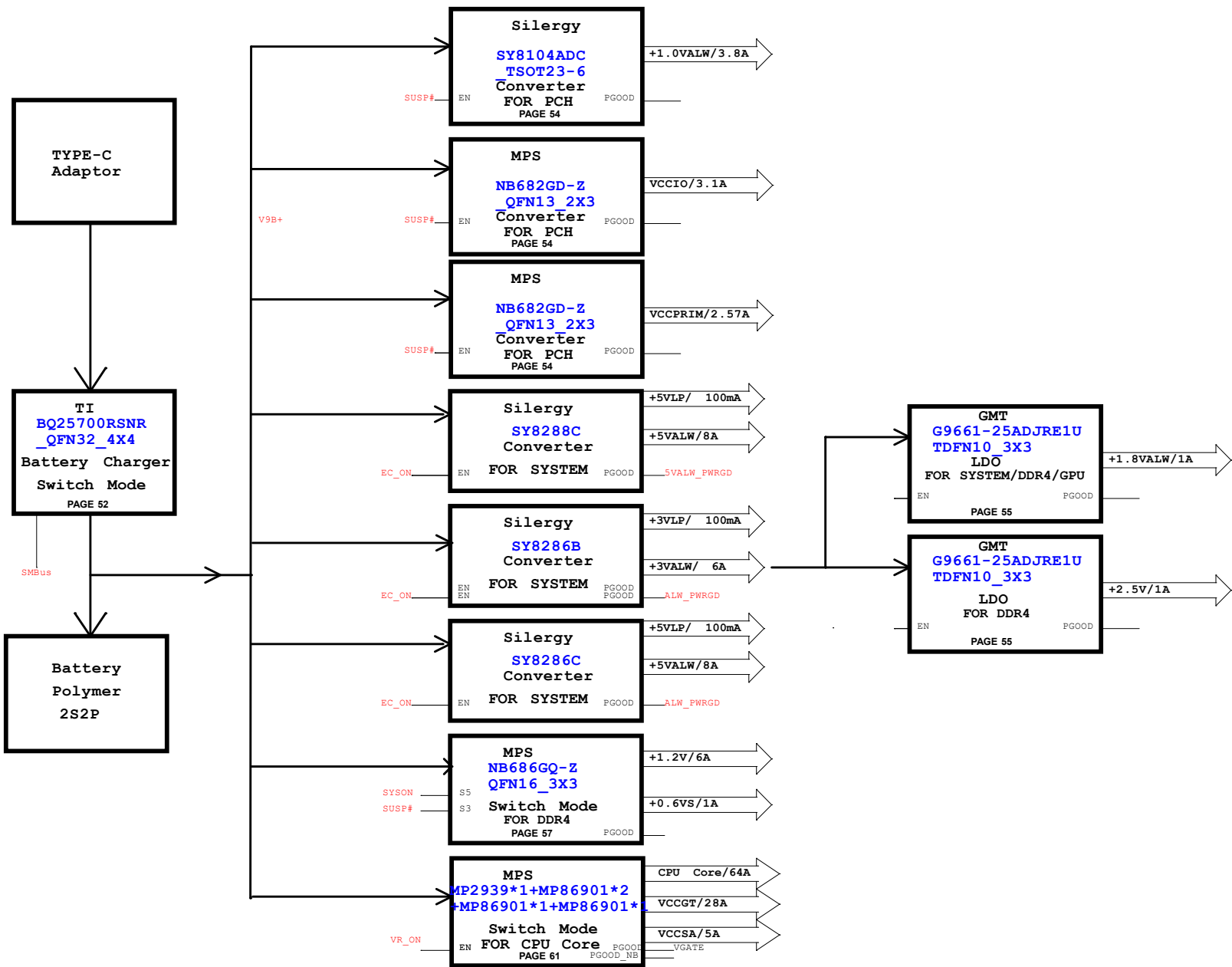
## EMI-STOP\_SUL-15A2



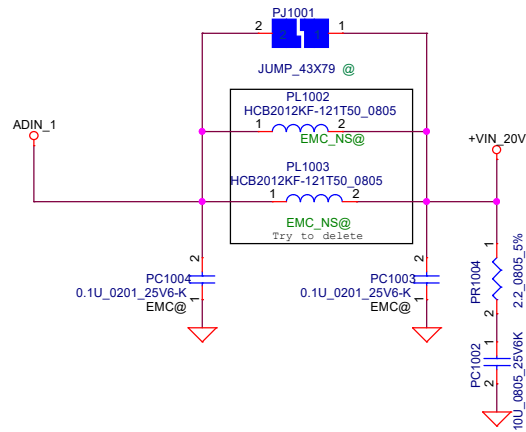
## EMI-STOP\_SML-08A2M




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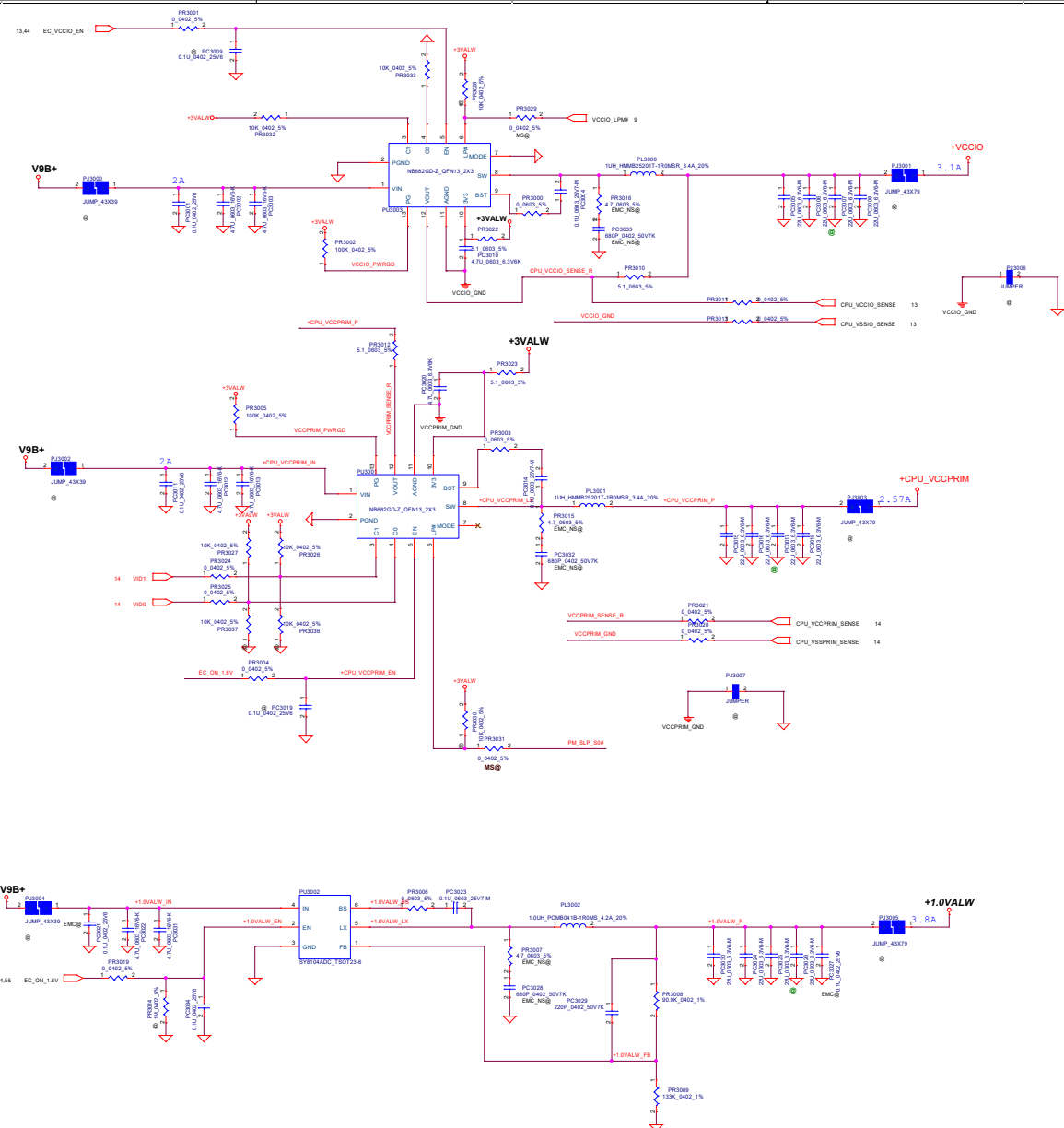


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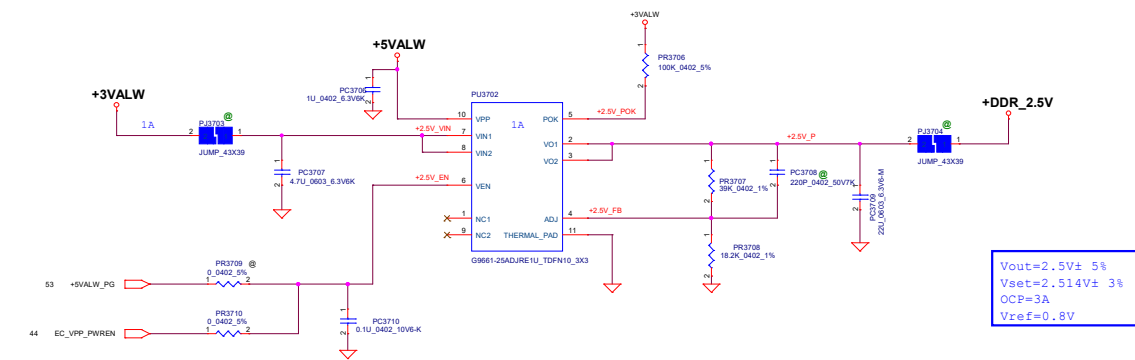
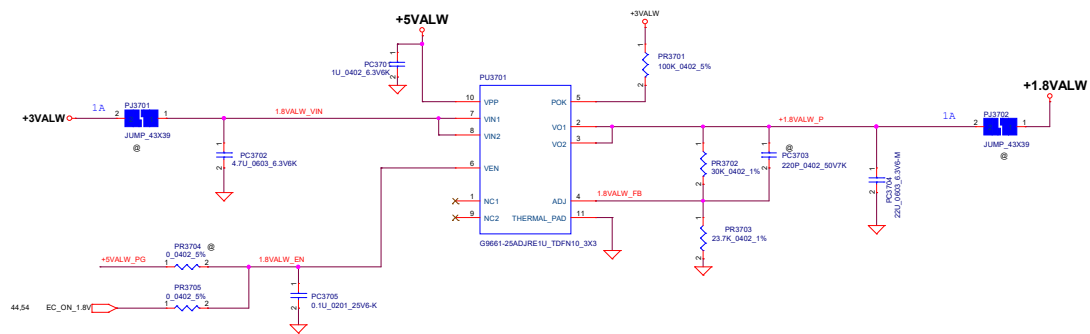





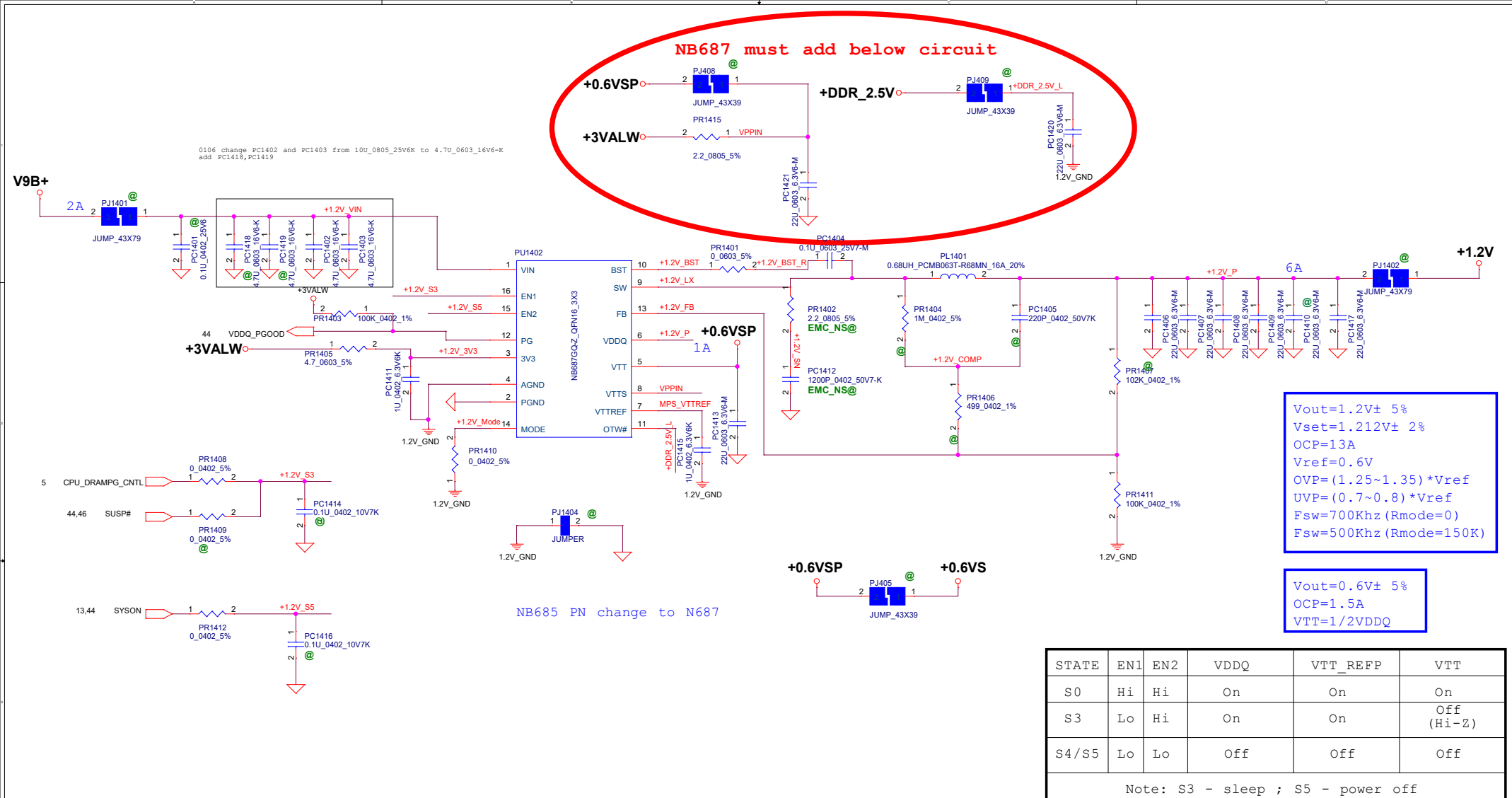



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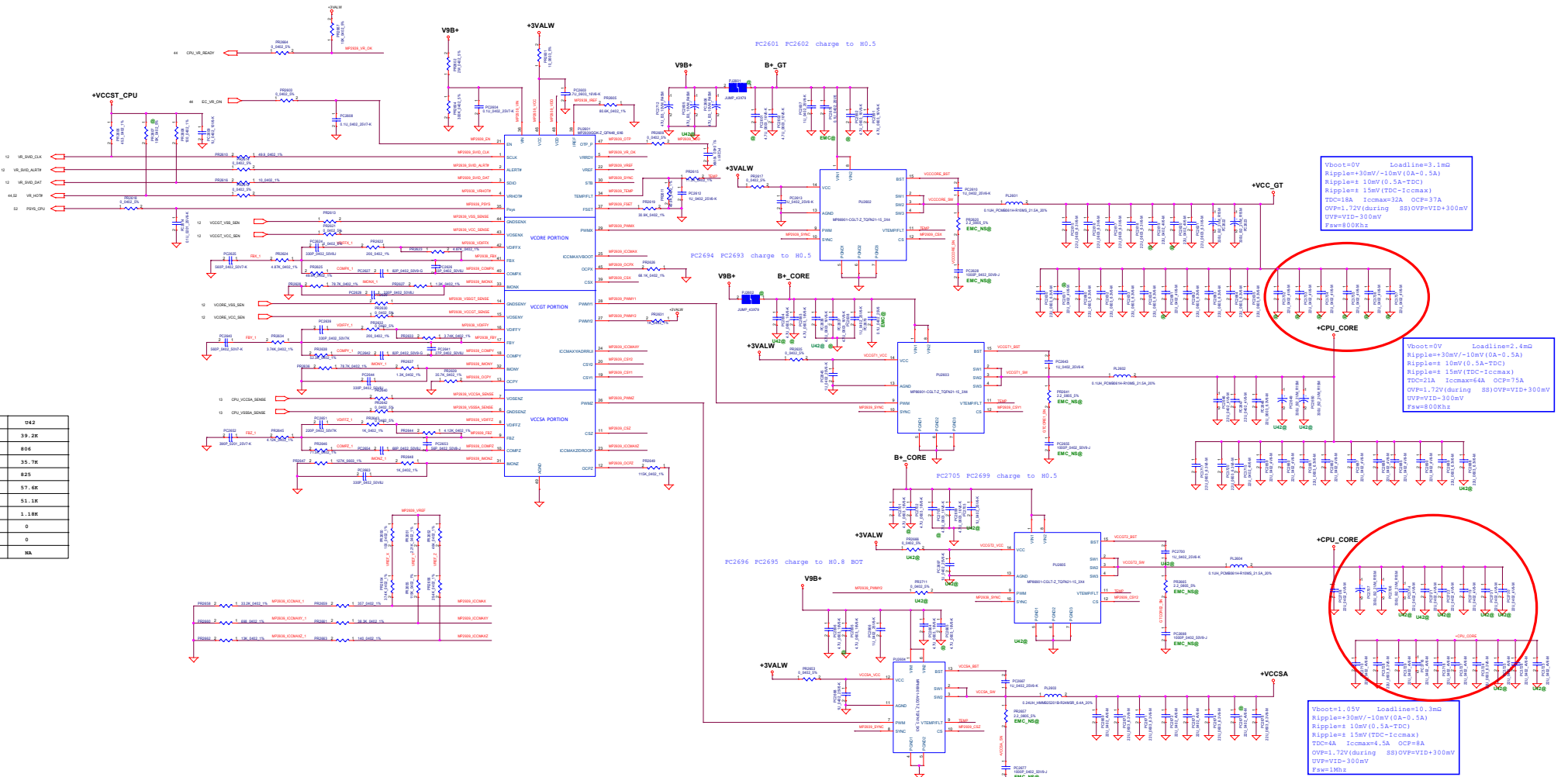
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D				D
C				C
B				B
A				A
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	Q22	Q42
PR2634	78.7K	39.2K
PR2637	1.3K	90K
PR2639	35.7K	35.7K
PR2651	182	825
PR2655	37.4K	57.6K
PR2660	12.4K	55.1K
PR2661	150	1.18K
PR2668	NA	0
PR2669	NA	0
PR2631	1K	NA



Vboot=0V Loadline=3.1mΩ  
 Ripple=±30mV/-10mV(0A-0.5A)  
 Ripple=±10mV(0.5A-TDC)  
 Ripple=±15mV(TDC-Iccmax)  
 TDC=18A Iccmax=32A OCP=37A  
 OVP=1.72V(during SS)OVP=VID+300mV  
 UV=VID-300mV  
 Fsw=800KHz

Vboot=0V Loadline=2.4mΩ  
 Ripple=±30mV/-10mV(0A-0.5A)  
 Ripple=±10mV(0.5A-TDC)  
 Ripple=±15mV(TDC-Iccmax)  
 TDC=21A Iccmax=64A OCP=75A  
 OVP=1.72V(during SS)OVP=VID+300mV  
 UV=VID-300mV  
 Fsw=800KHz

Vboot=1.05V Loadline=0.3mΩ  
 Ripple=±30mV/-10mV(0A-0.5A)  
 Ripple=±10mV(0.5A-TDC)  
 Ripple=±15mV(TDC-Iccmax)  
 TDC=4A Iccmax=4.5A OCP=8A  
 OVP=1.72V(during SS)OVP=VID+300mV  
 UV=VID-300mV  
 Fsw=1MHz