


# LCFC Confidential

## CG413/CG513 MB Schematics Document

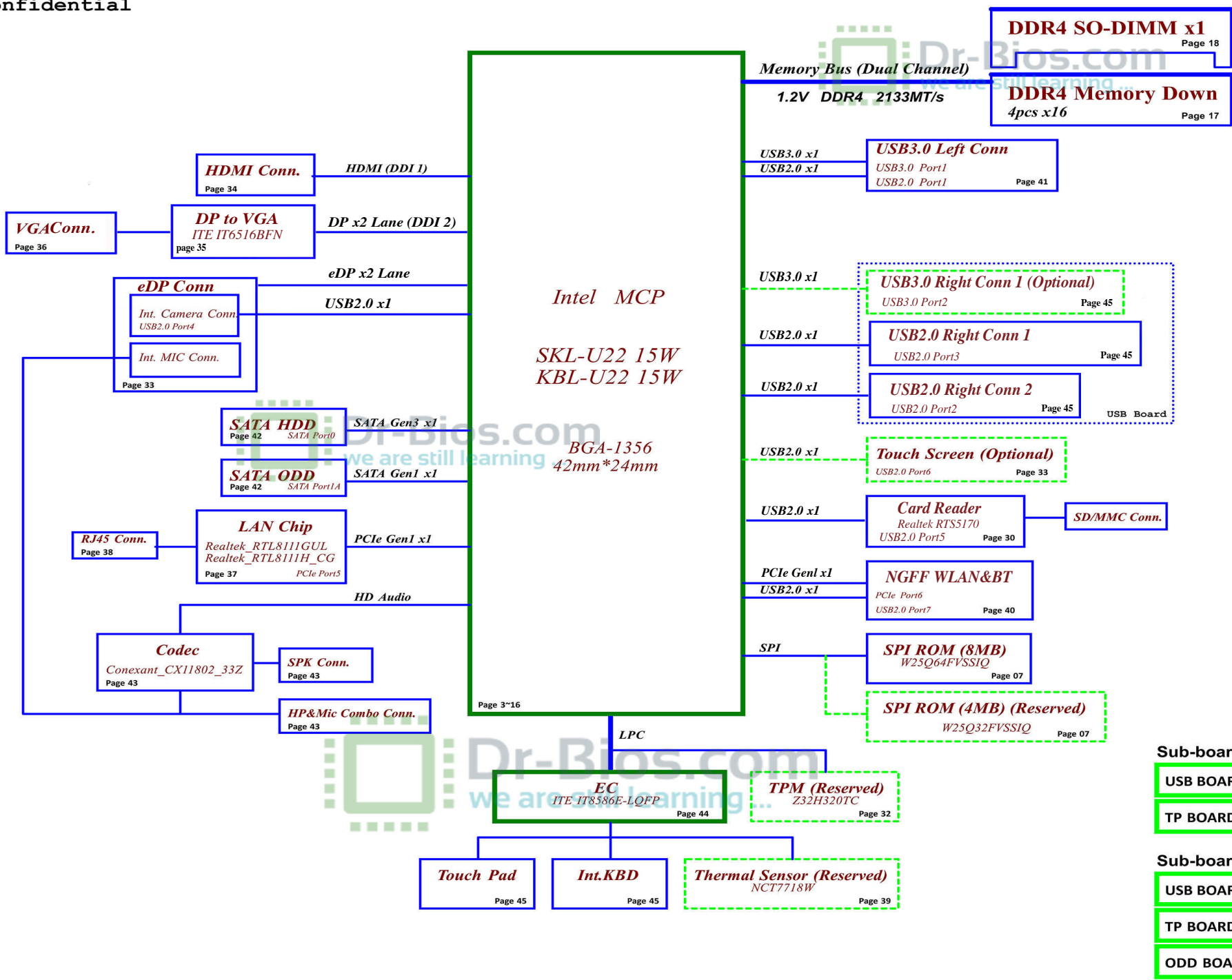
Intel Skylake-U22&U23/Kabylake-U22&U23 with DDR4

2016-06-12

REV:1.0

Security Classification		LC Future Center Secret Data		Title						
Issued Date		2015/08/20		Deciphered Date			2016/08/20		Cover Page	
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Voltage Rails ( O --> Means ON , X --> Means OFF )

Power Plane / State	V20B+	+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
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

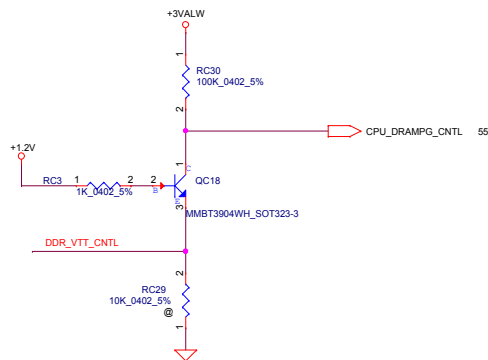
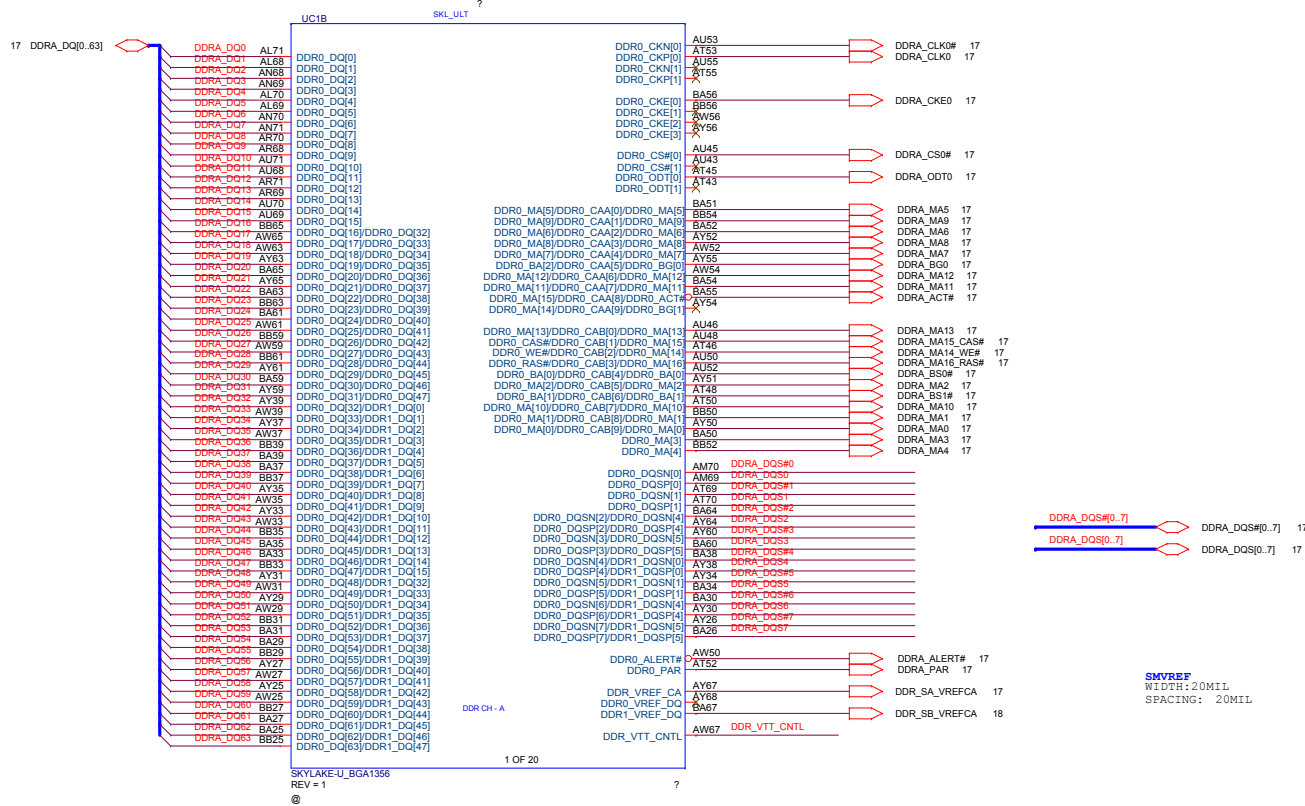
EC SMBus1 address      EC SMBus2 address      EC SMBus3 address      PCH SM Bus address


Device	Address	Device	Address	Device	Address	Device	Address
Smart Battery	need to update	Thermal Sensor(NCT7718W)	1001_100xb	DDR4 SODIMM	need to update	Wlan	Reserved
Charger	0001 0010 b	PCH	need to update				
		DGPU	need to update				

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		
	2 USB2.0 Conn1 Right	Cannonlake@	For Cannonlake part
	3 USB2.0 Conn2 Right	CD@	For C cost down
	4 Camera	DUALMIC@	For Dual MIC part
	5 Cardreader	EMC@	For EMC part
	6 Touch Panel	EMC_15@	For EMC 15" part
	7 Bluetooth	EMC_NS@	For EMC nu-stuff part
	8 NC	EMC_PX@	For EMC PX part
	9 NC	EMC_PXNS@	For EMC PX nu-stuff part
	10 NC	ES@	For ES CPU
PCIE	1 NC	EXO@	For EXO GPU
	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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LAN

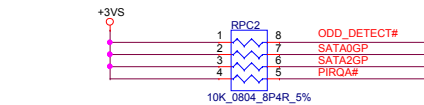
WLAN

SATA HDD

SATA ODD

DGPU

PCIE\_RCOMP and PCIE\_RCOMP#  
Trace Width: 12-15mil  
Differential between RCOMP/RCOMP#



UC1H

SKI\_ULT ?

PCIE/USB3/SATA

SSIC / USB3

H13 PCIE1\_RXN/USB3\_5\_RXN  
G12 PCIE1\_RXP/USB3\_5\_RXP  
B12 PCIE1\_TXN/USB3\_5\_TXN  
A12 PCIE1\_TXP/USB3\_5\_TXP

G11 PCIE2\_RXN/USB3\_6\_RXN  
F10 PCIE2\_RXP/USB3\_6\_RXP  
D10 PCIE2\_TXN/USB3\_6\_TXN  
C10 PCIE2\_TXP/USB3\_6\_TXP

H16 PCIE3\_RXN  
G16 PCIE3\_RXP  
D17 PCIE3\_TXN  
C17 PCIE3\_TXP

G15 PCIE4\_RXN  
F16 PCIE4\_RXP  
B19 PCIE4\_TXN  
A19 PCIE4\_TXP

F16 PCIE5\_RXN  
E16 PCIE5\_RXP  
C19 PCIE5\_TXN  
B19 PCIE5\_TXP

G18 PCIE6\_RXN  
F18 PCIE6\_RXP  
D20 PCIE6\_TXN  
C20 PCIE6\_TXP

F20 PCIE7\_RXN/SATA0\_RXN  
E20 PCIE7\_RXP/SATA0\_RXP  
B21 PCIE7\_TXN/SATA0\_TXN  
A21 PCIE7\_TXP/SATA0\_TXP

C21 PCIE8\_RXN/SATA1A\_RXN  
F21 PCIE8\_RXP/SATA1A\_RXP  
D21 PCIE8\_TXN/SATA1A\_TXN  
C21 PCIE8\_TXP/SATA1A\_TXP

E22 PCIE9\_RXN  
D22 PCIE9\_RXP  
B23 PCIE9\_TXN  
A23 PCIE9\_TXP

F25 PCIE10\_RXN  
E25 PCIE10\_RXP  
D25 PCIE10\_TXN  
C25 PCIE10\_TXP

F5 PCIE\_RCOMP  
E5 PCIE\_RCOMP#

D56 XDP\_PRDY#  
D61 XDP\_FREQ#  
B61 PIRQA#

E28 PCIE11\_RXN/SATA1B\_RXN  
E27 PCIE11\_RXP/SATA1B\_RXP  
D24 PCIE11\_TXN/SATA1B\_TXN  
C24 PCIE11\_TXP/SATA1B\_TXP  
E30 PCIE12\_RXN/SATA2\_RXN  
F30 PCIE12\_RXP/SATA2\_RXP  
A25 PCIE12\_TXN/SATA2\_TXN  
B25 PCIE12\_TXP/SATA2\_TXP

SKYLAKE-U\_BGA1356  
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USB2

USB3\_1\_RXN  
USB3\_1\_RXP  
USB3\_1\_TXN  
USB3\_1\_TXP

USB3\_2\_RXN/SSIC\_1\_RXN  
USB3\_2\_RXP/SSIC\_1\_RXP  
USB3\_2\_TXN/SSIC\_1\_TXN  
USB3\_2\_TXP/SSIC\_1\_TXP

USB3\_3\_RXN/SSIC\_2\_RXN  
USB3\_3\_RXP/SSIC\_2\_RXP  
USB3\_3\_TXN/SSIC\_2\_TXN  
USB3\_3\_TXP/SSIC\_2\_TXP

USB3\_4\_RXN  
USB3\_4\_RXP  
USB3\_4\_TXN  
USB3\_4\_TXP

USB2N\_1  
USB2P\_1

USB2N\_2  
USB2P\_2

USB2N\_3  
USB2P\_3

USB2N\_4  
USB2P\_4

USB2N\_5  
USB2P\_5

USB2N\_6  
USB2P\_6

USB2N\_7  
USB2P\_7

USB2N\_8  
USB2P\_8

USB2N\_9  
USB2P\_9

USB2N\_10  
USB2P\_10

USB2\_COMP  
USB2\_ID  
USB2\_VBUSSENSE

GPP\_E9/USB2\_OC0#  
GPP\_E10/USB2\_OC1#  
GPP\_E11/USB2\_OC2#  
GPP\_E12/USB2\_OC3#

GPP\_E4/DEVSLP0  
GPP\_E5/DEVSLP1  
GPP\_E6/DEVSLP2

GPP\_E0/SATAXP/PCIE0/SATAGP0  
GPP\_E1/SATAXP/PCIE1/SATAGP1  
GPP\_E2/SATAXP/PCIE2/SATAGP2

GPP\_E8/SATALED#

H8 USB30\_RX\_N1  
G8 USB30\_RX\_P1  
C13 USB30\_TX\_N1  
D13 USB30\_TX\_P1

J6 USB30\_RX\_N2  
H6 USB30\_RX\_P2  
B13 USB30\_TX\_N2  
A13 USB30\_TX\_P2

J10  
H10  
G15  
B15  
A15

E10  
C10  
D15

AB9 USB20\_N1  
AB10 USB20\_P1

AD6 USB20\_N2  
AD7 USB20\_P2

AH3 USB20\_N3  
AJ3 USB20\_P3

AD9 USB20\_N4  
AD10 USB20\_P4

AJ1 USB20\_N5  
AJ2 USB20\_P5

AF6 USB20\_N6  
AF7 USB20\_P6

AH1 USB20\_N7  
AH2 USB20\_P7

AF8  
AF9

AG1  
AG2

AH7  
AH8

AB6 USB2\_COMP  
AG3 USB2\_ID  
AG4 USB2\_VBUSSENSE

A9 USB\_OC0#  
C9 USB\_OC1#  
D9 USB\_OC2#  
B9 USB\_OC3#

J1 GPP\_E4  
J2 GPP\_E5

H2 SATAAGP  
H3 ODD\_DETECT#  
G4 SATA2GP

H1 BOARD\_ID2

LEFT USB (3.0)

Right USB (3.0) (Optional)

LEFT USB (3.0)

RIGHT USB (2.0)

RIGHT USB (2.0)

Camera


Card reader

Touch panel

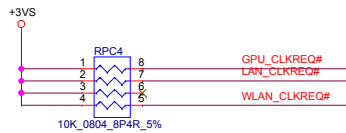
BT

USBRBIAS  
Width 20Mil  
Space 15Mil  
Length 500Mil

2016/05/03: Implement as Power Button  
function for Windows RedStone support

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check the Pull up resistor

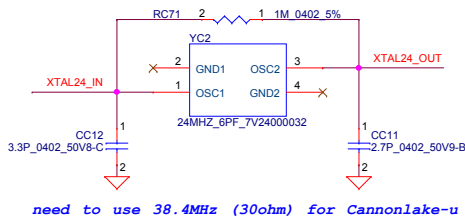
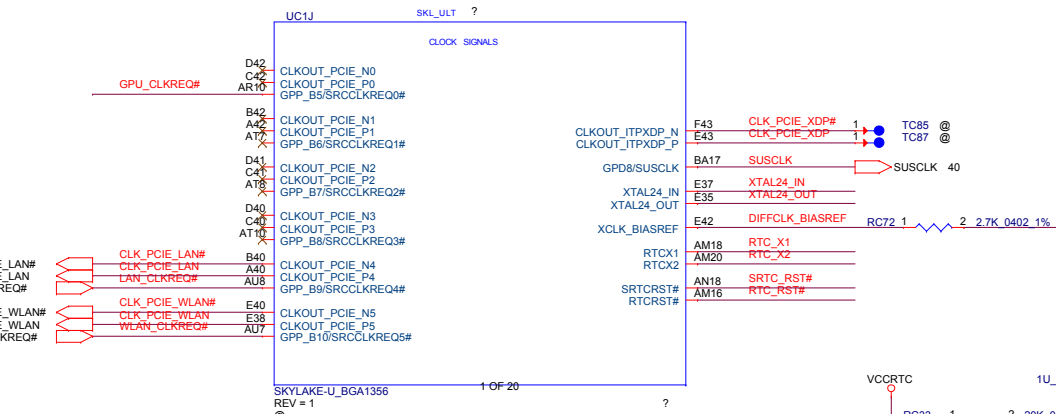
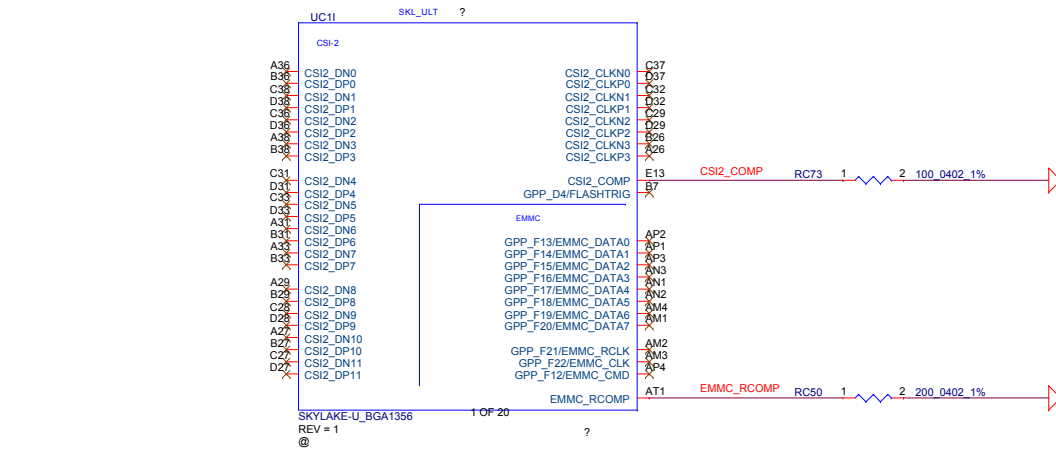


PCIE CLK0 DGPU

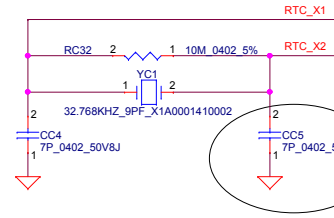
PCIE CLK4 LAN

PCIE CLK5 WLAN

37 CLK\_PCIE\_LAN#  
37 CLK\_PCIE\_LAN  
37 LAN\_CLKREQ#  
40 CLK\_PCIE\_WLAN#  
40 CLK\_PCIE\_WLAN  
40 WLAN\_CLKREQ#

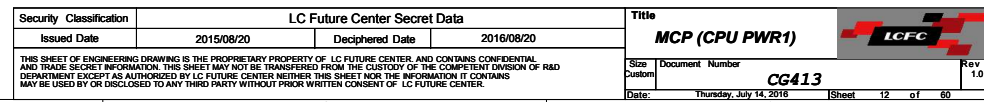


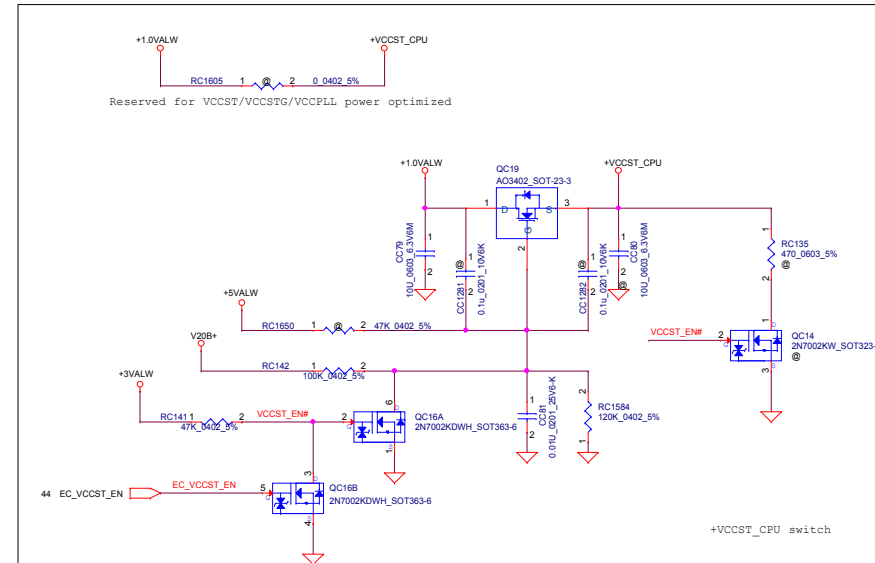
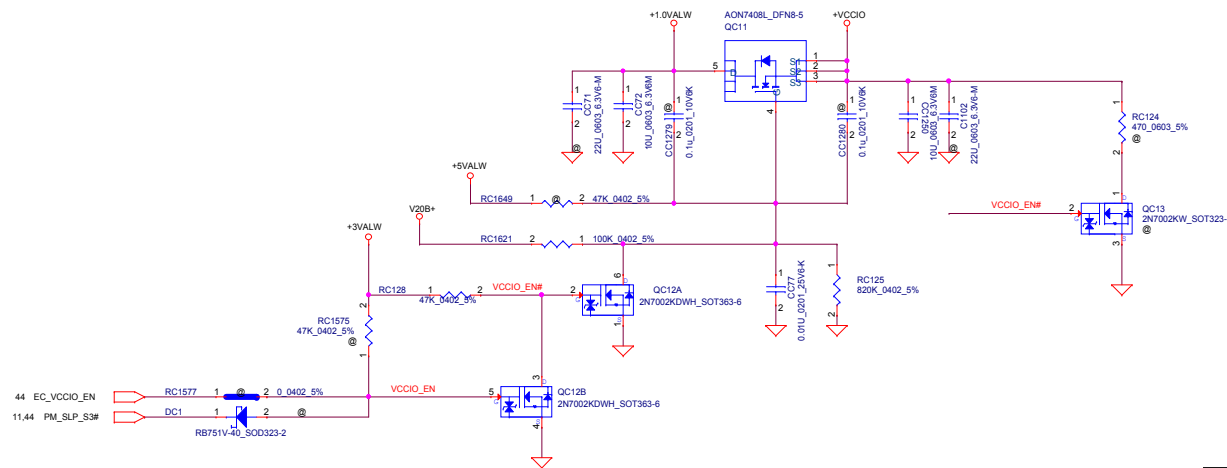
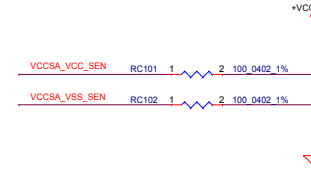
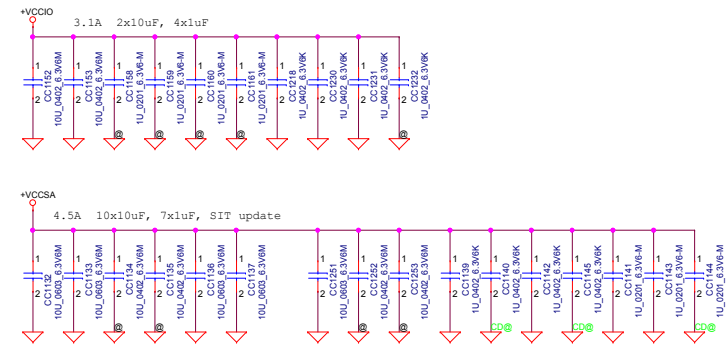
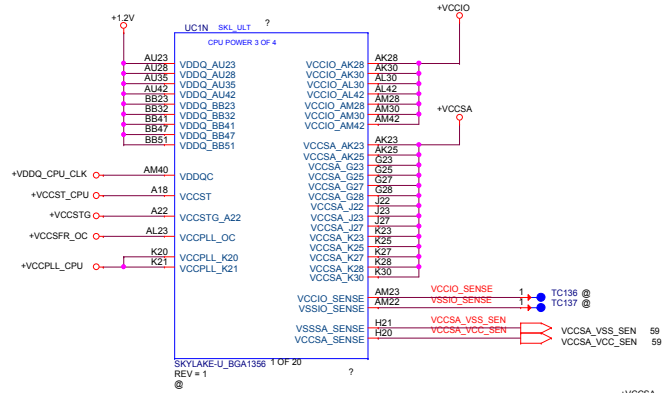
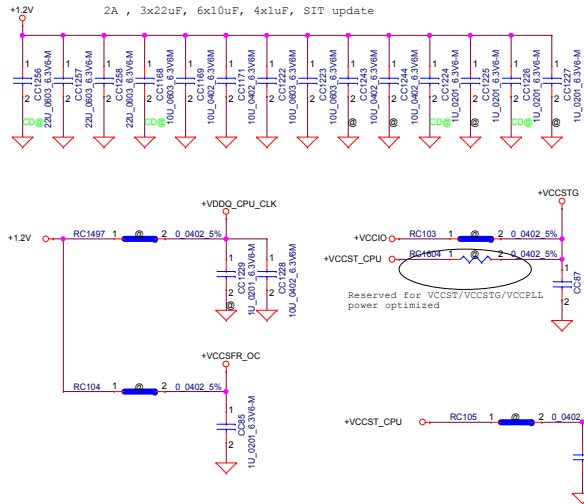
need to use 38.4MHz (30ohm) for Cannonlake-u




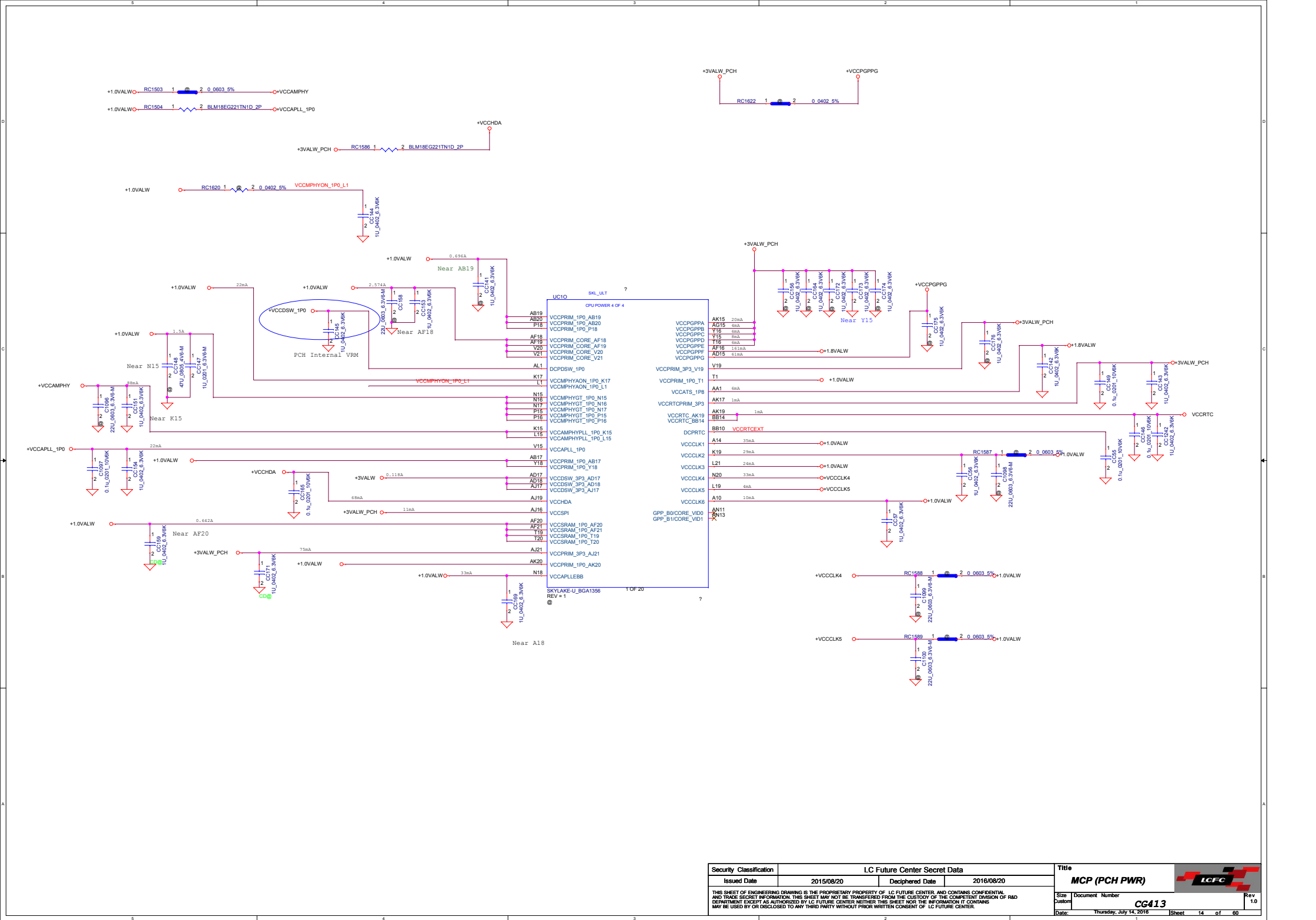
when single end external clock generator used, this pin should be grounded

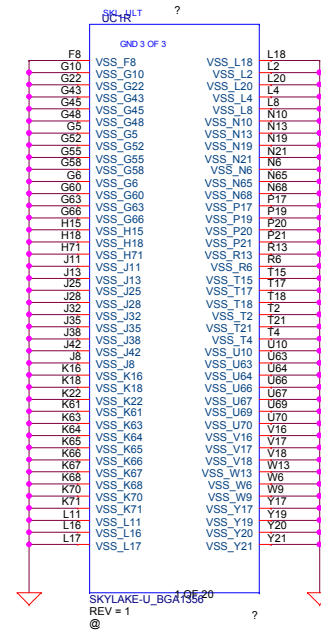
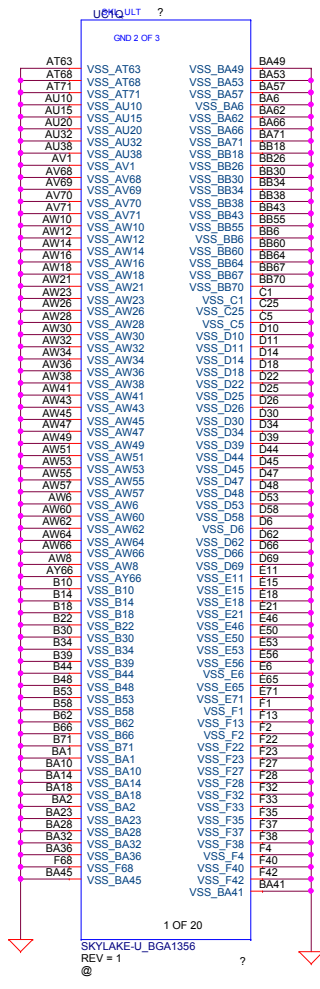
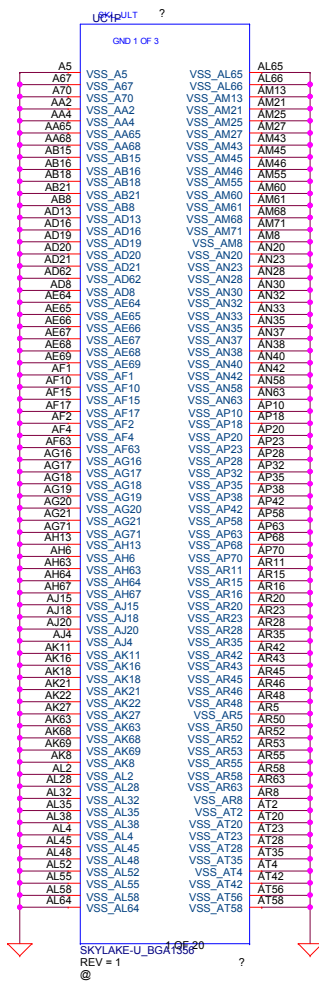


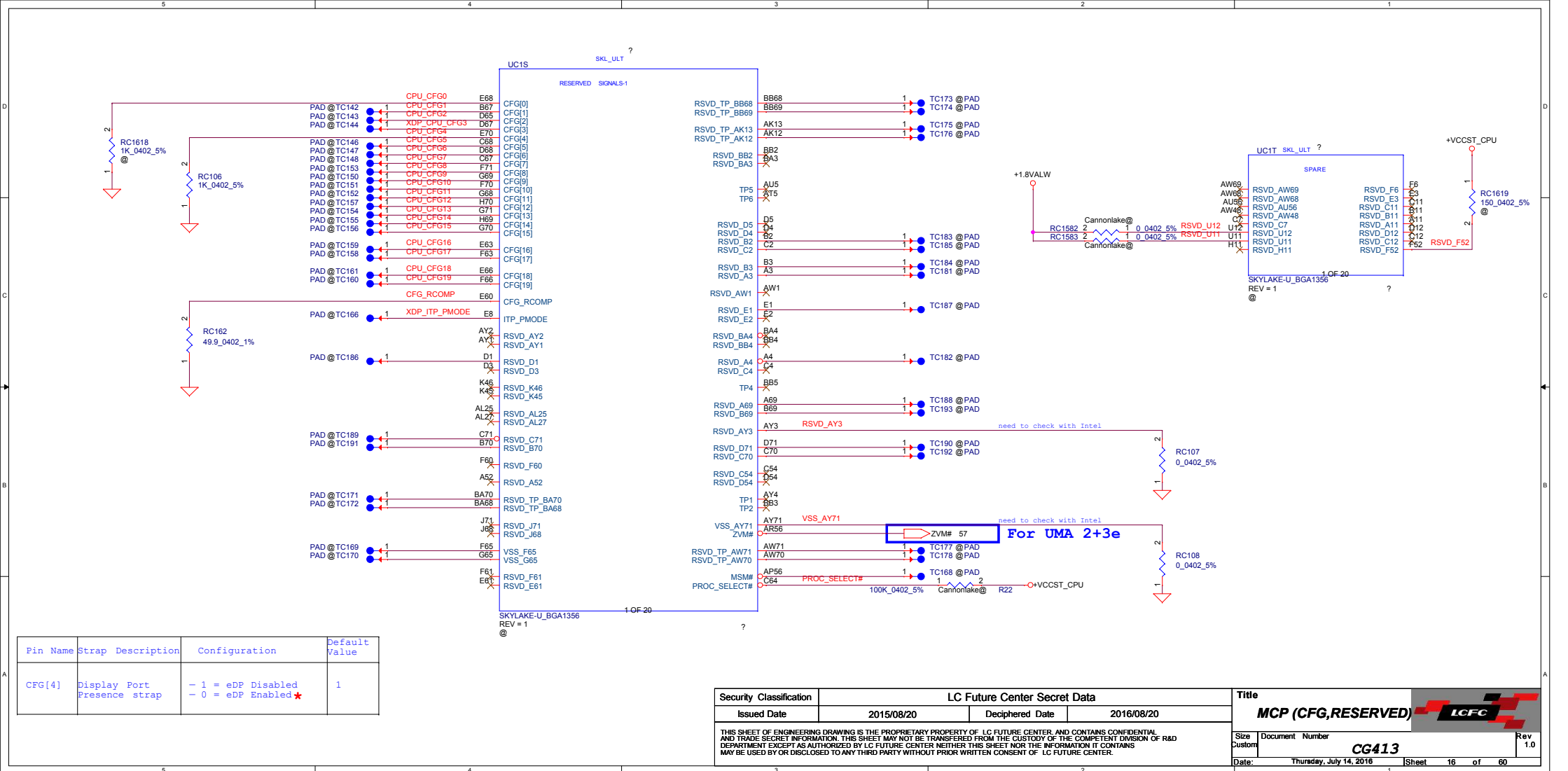




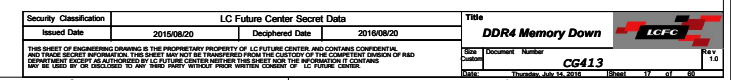
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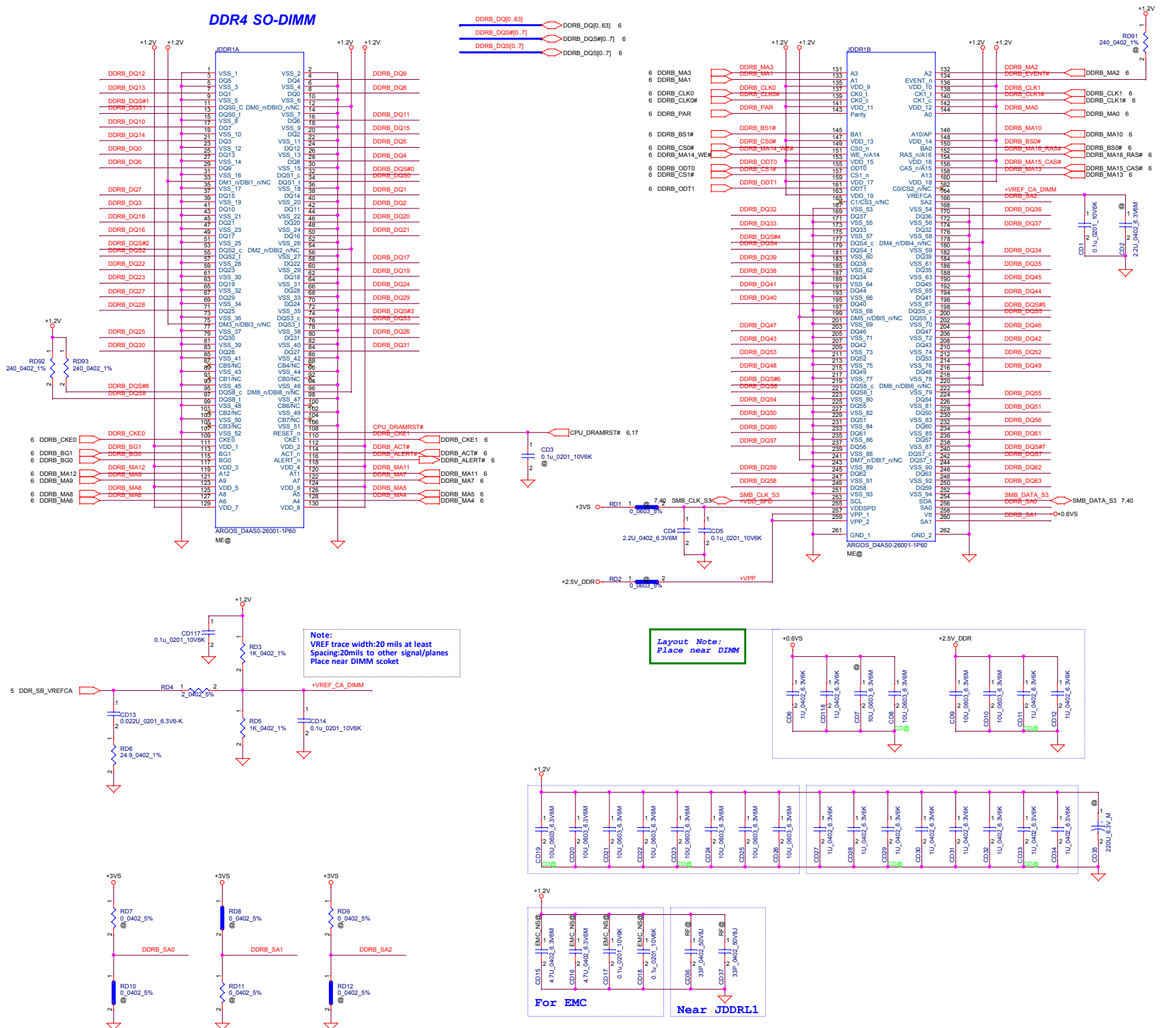









# DDR4 SO-DIMM




SPD Address = 2H




5	4	3	2	1																														
D				D																														
C				C																														
B				B																														
A				A																														
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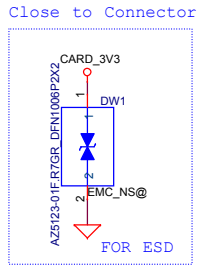
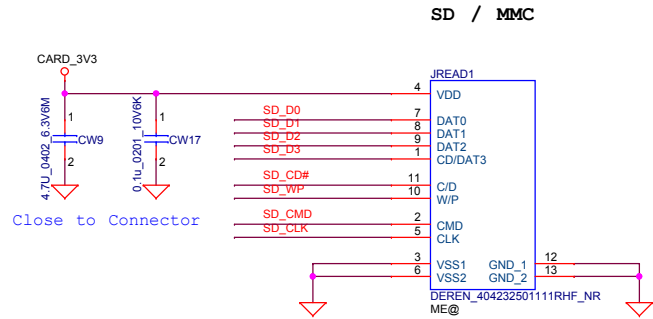
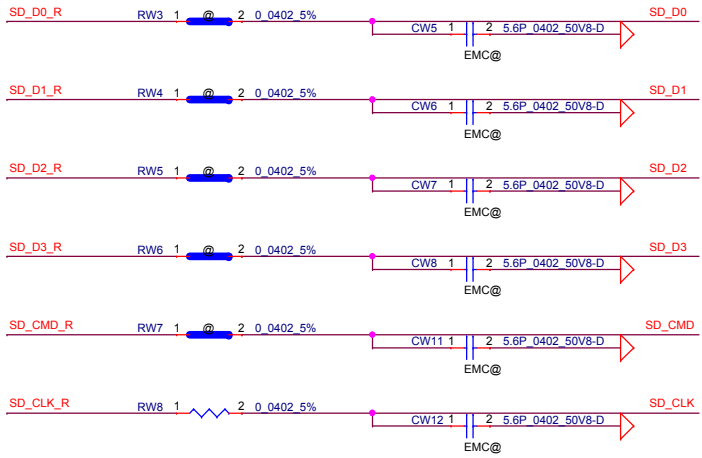
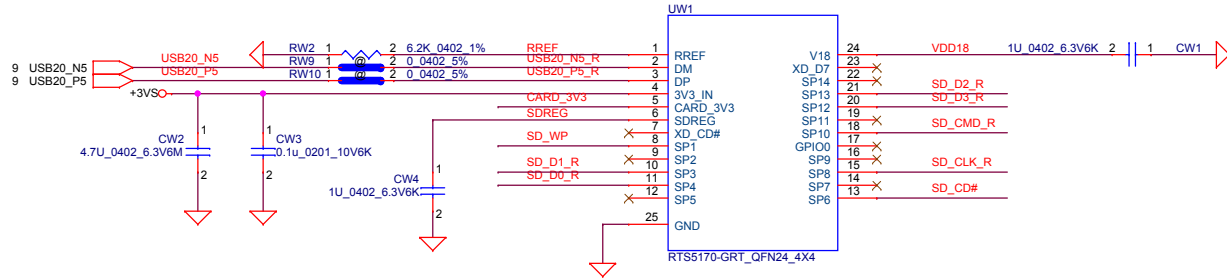
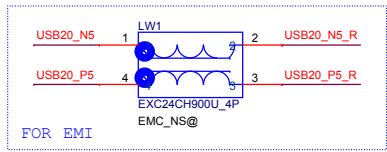
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Issued Date					2015/08/20					Deciphered Date					2016/08/20										Blank										
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																				C		CG413												1.0	
Date:										Thursday, July 14, 2016										Sheet		27		of		60									
5					4					3					2					1															

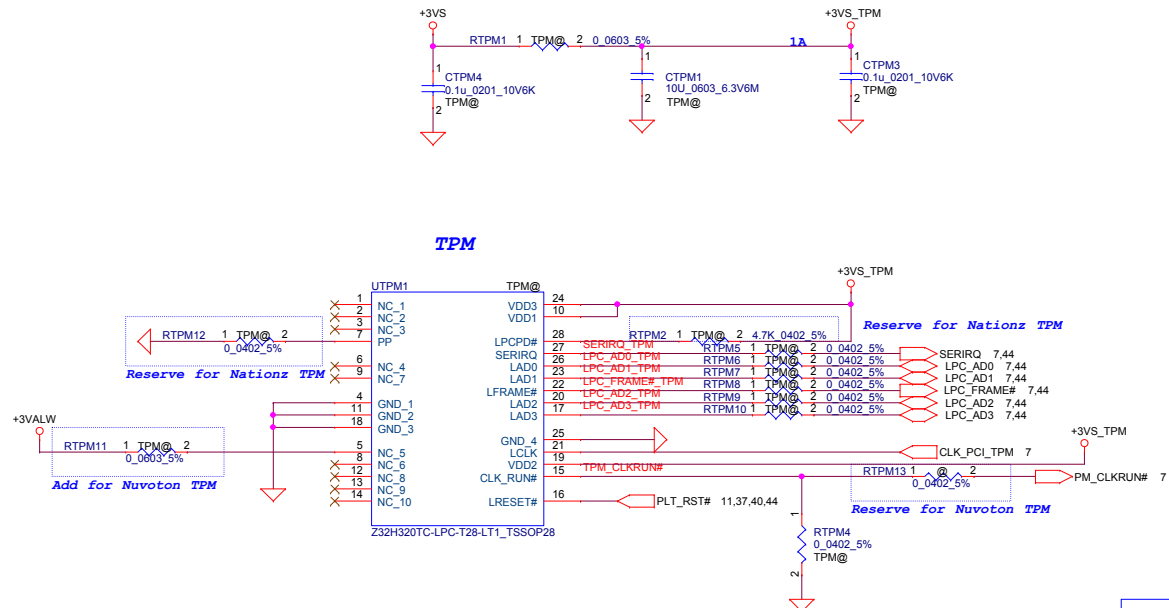


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																				C					CG413					1.0				
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	Nationz TPM	Nuvoton TPM
RTPM2	Stuff	NC
RTPM12	Stuff	NC
RTPM11	NC	Stuff

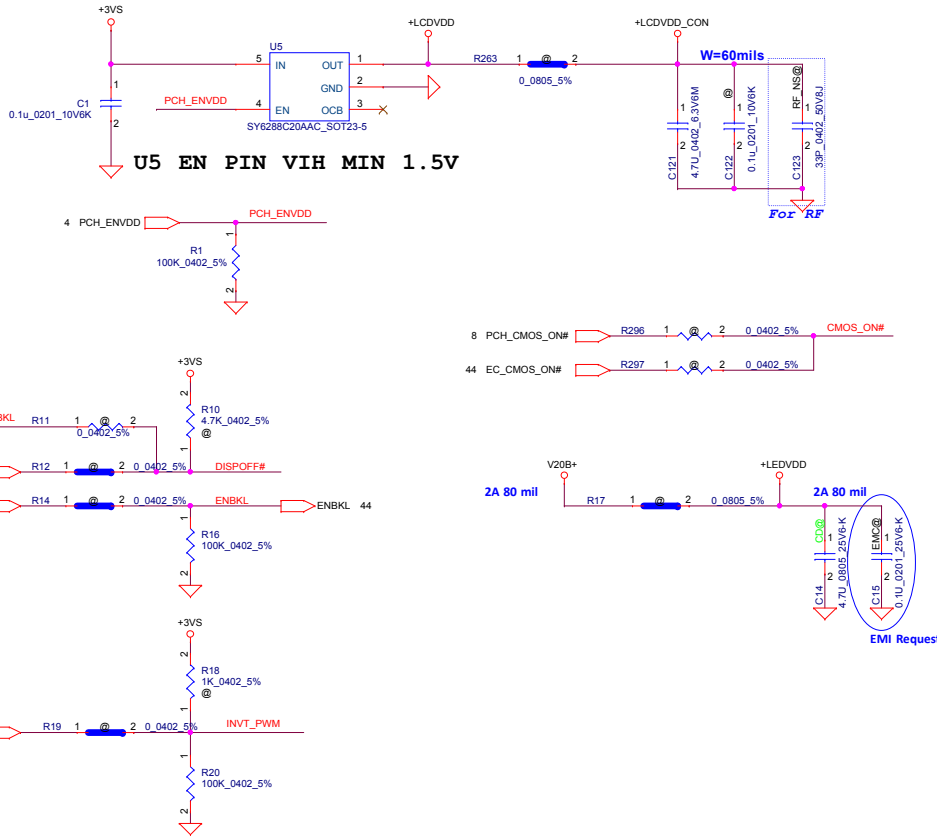
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Issued Date	2015/08/20	Deciphered Date	2016/08/20
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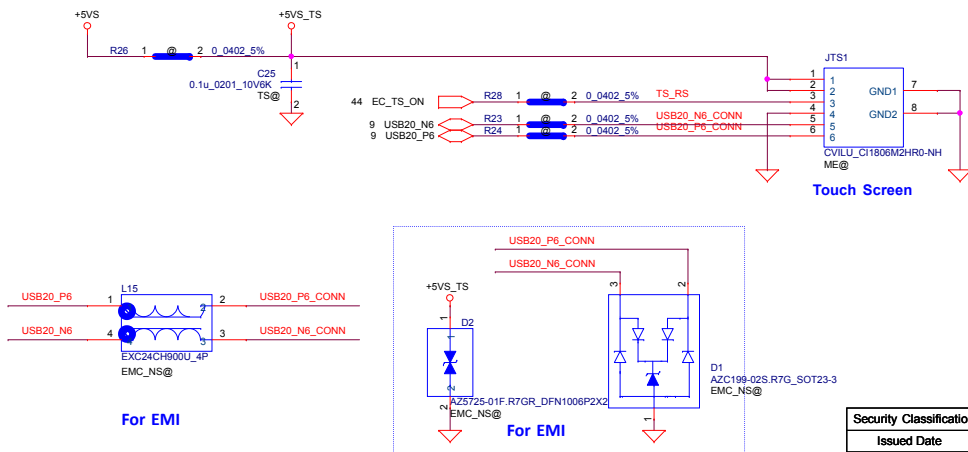




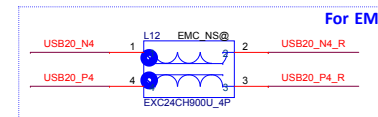
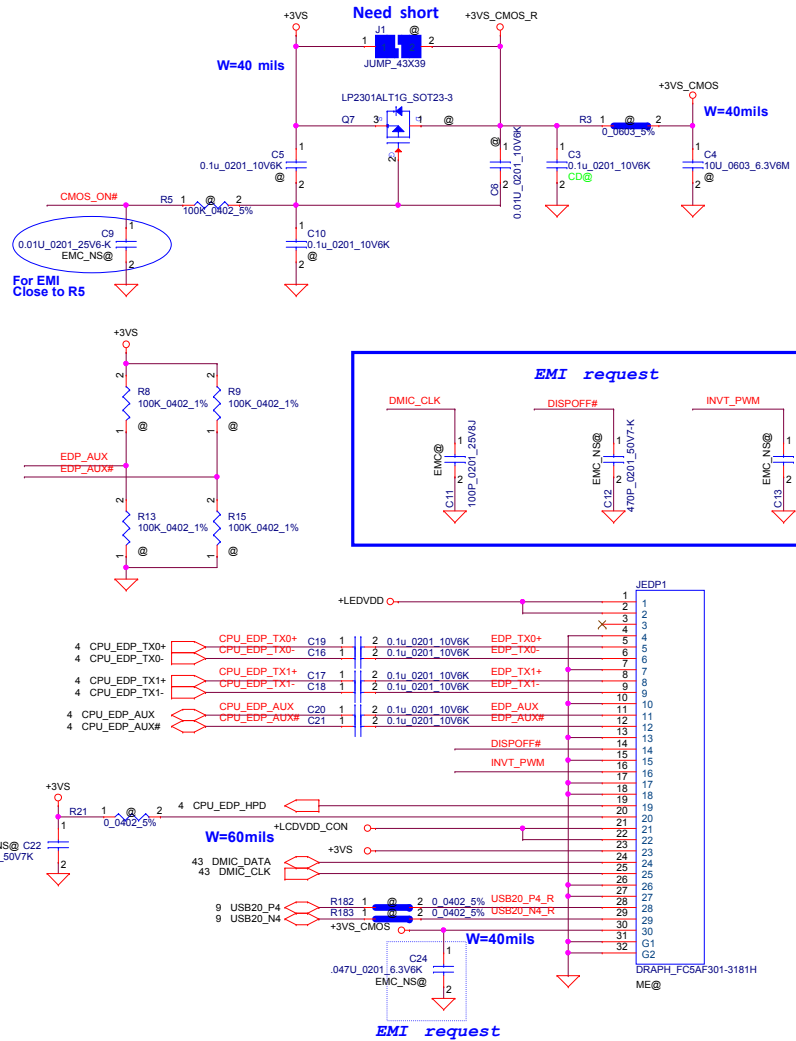
## LCD POWER CIRCUIT



## Touch Screen




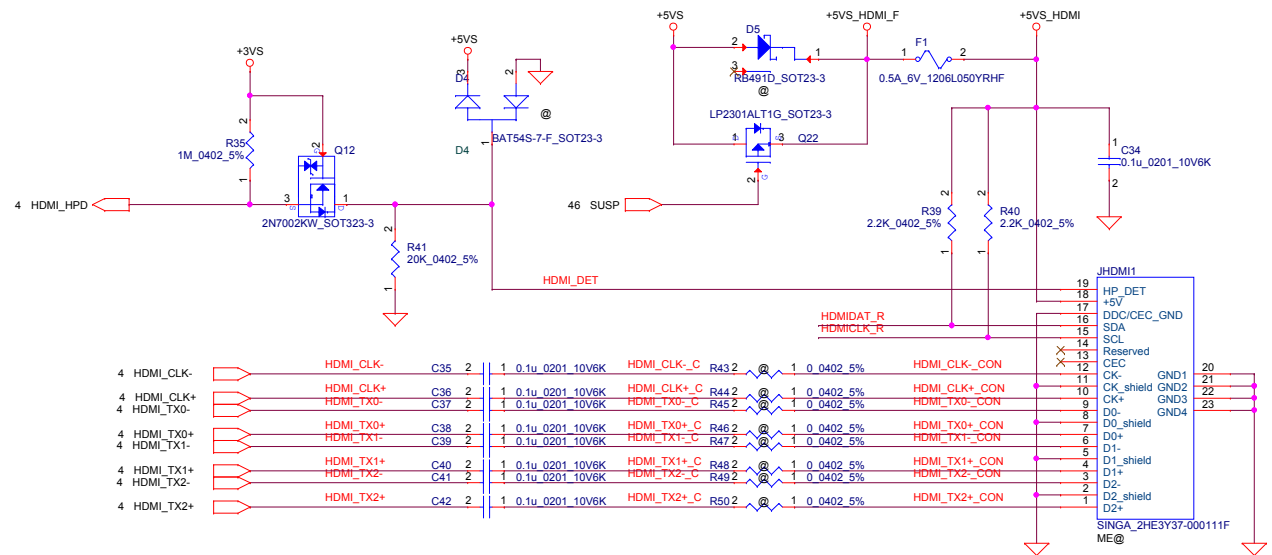
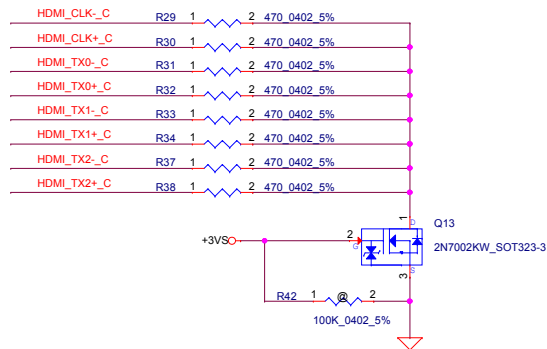
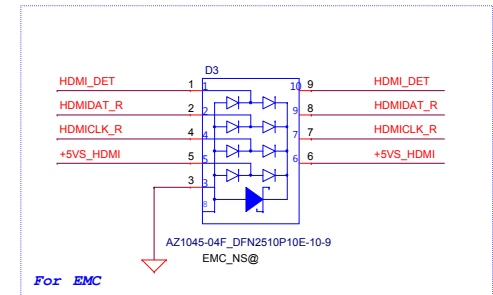
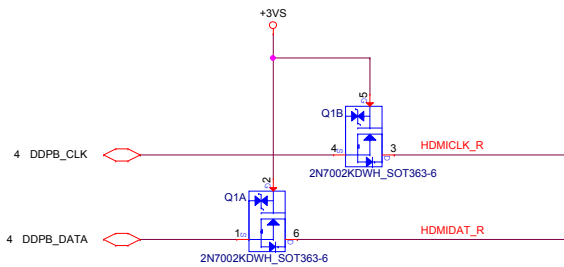
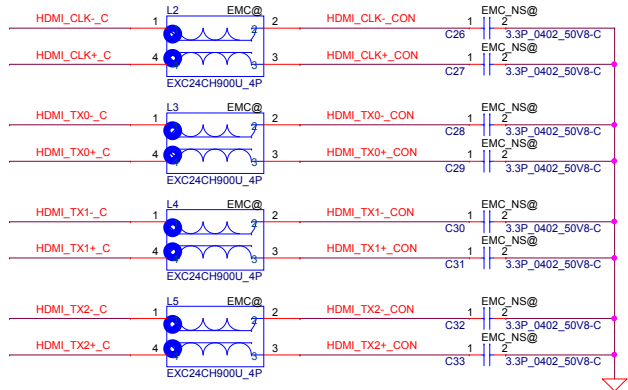
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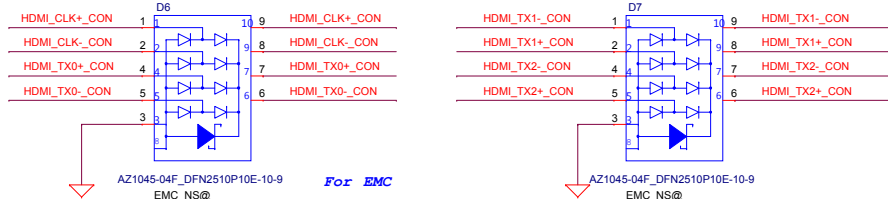
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Issued Date	2015/08/20	Deciphered Date	2016/08/20


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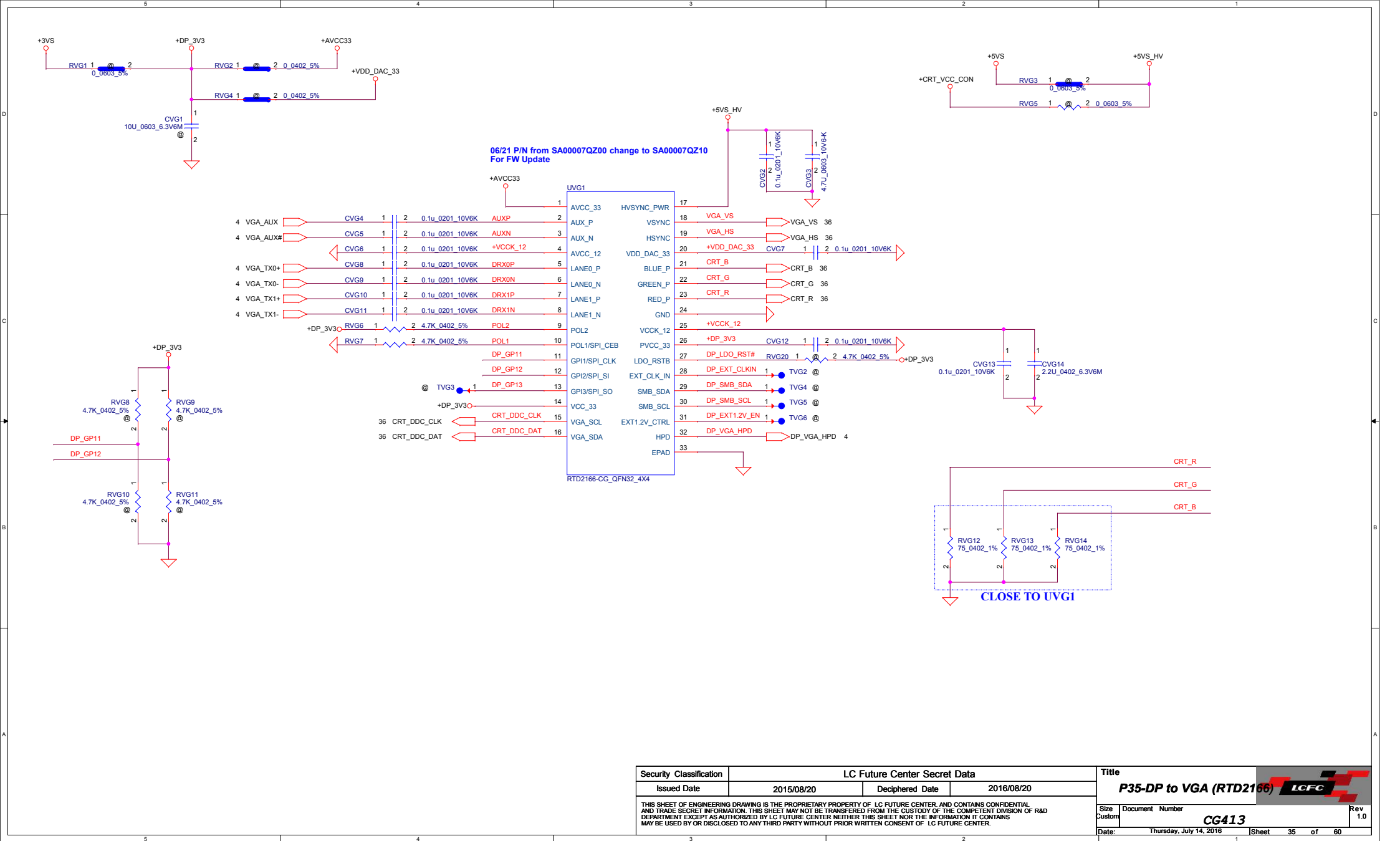
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Close to JHDMI1

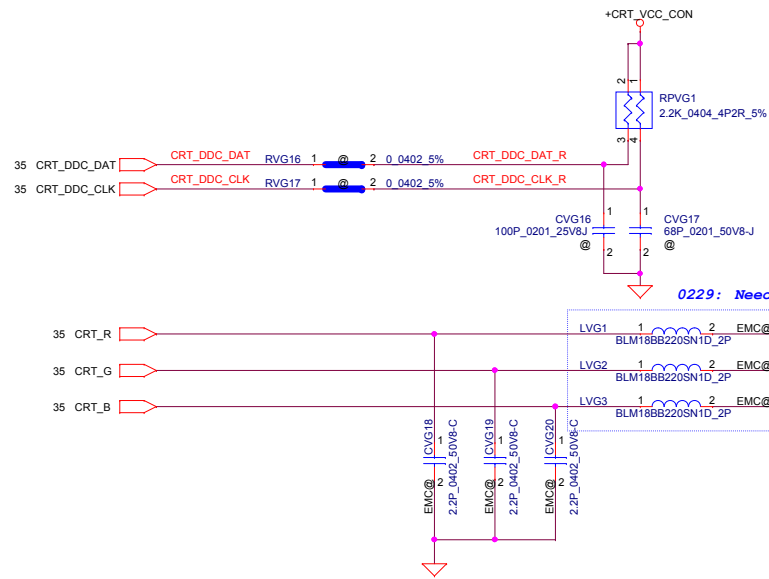


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Issued Date	2015/08/20	Deciphered Date	2016/08/20	HDMI_CONN		
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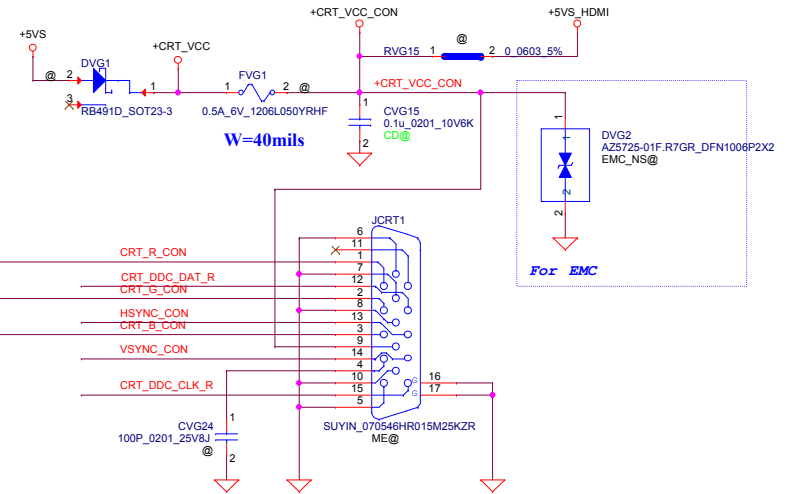


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### ***CRT Connector***

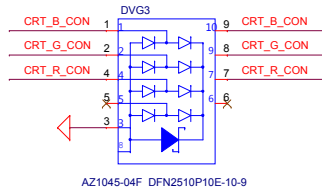
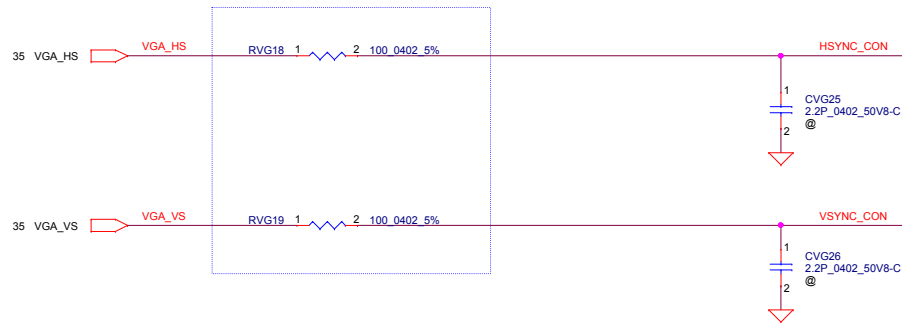


0229: Need update symbols in SIT phase

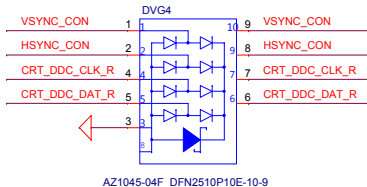


For  $M$

0714: SVT For VGA 20m cable test issue change to 100ohm




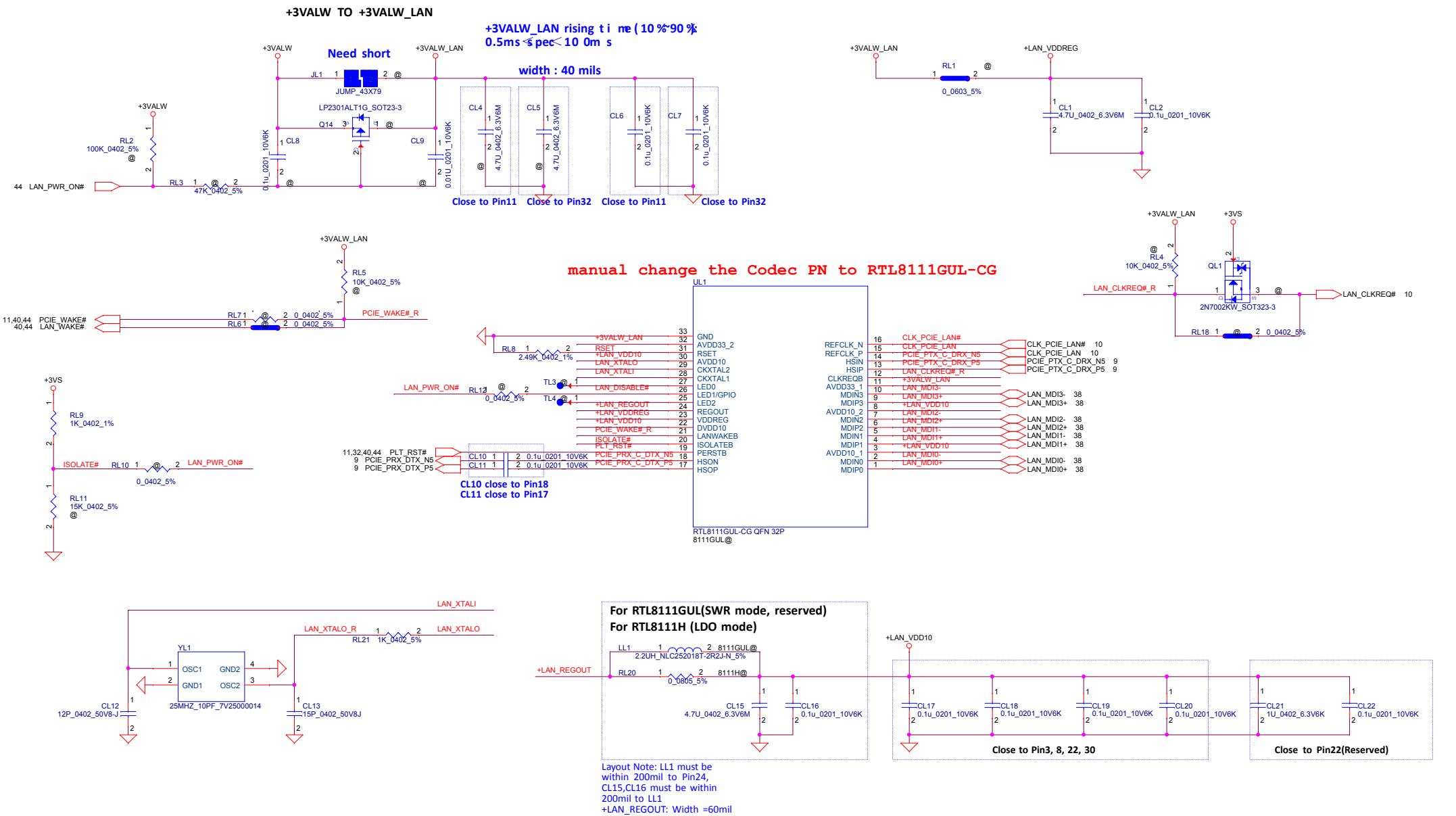
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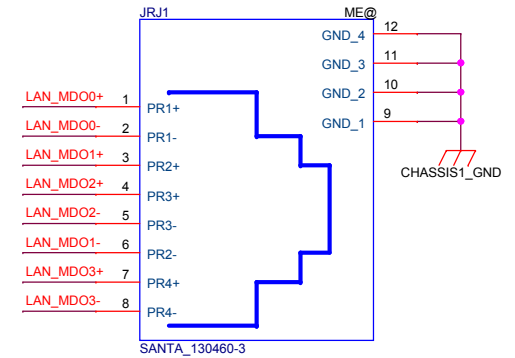
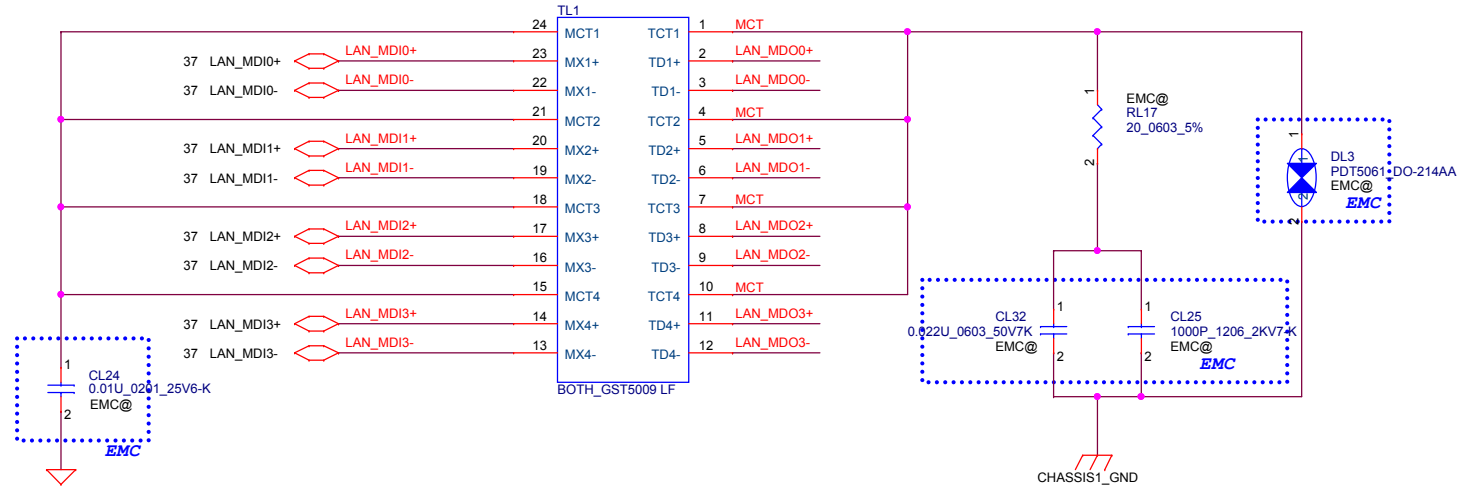
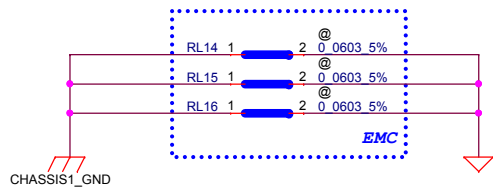
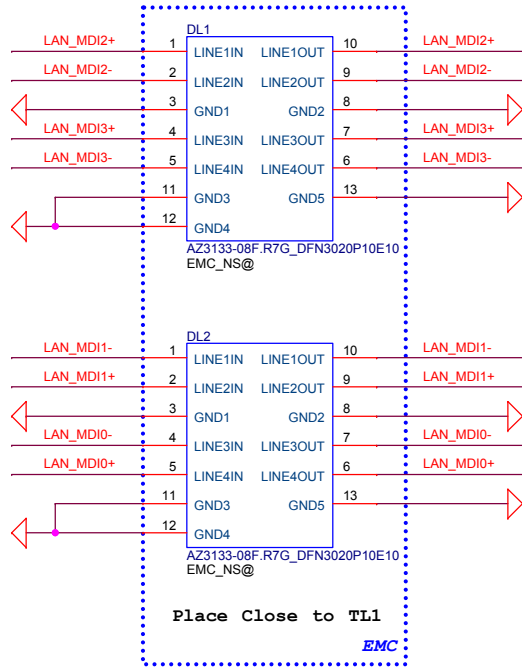
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EMC\_NS@

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Issued Date	2015/08/20	Deciphered Date	2016/08/20
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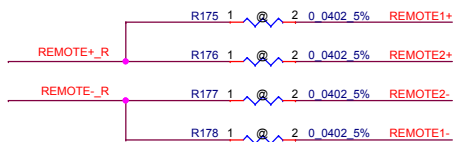
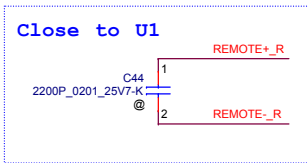
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CRT_CONN			
Size Custom	Document Number	Rev	
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# DL1/DL2 1'S PN:SC300003M00

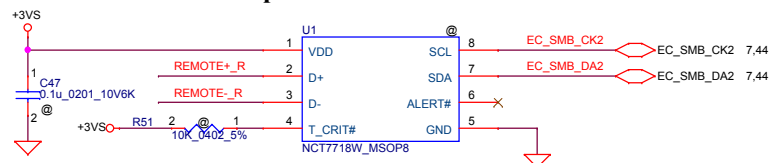


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Issued Date	2015/08/20	Deciphered Date	2016/08/20	LAN_Transformer	
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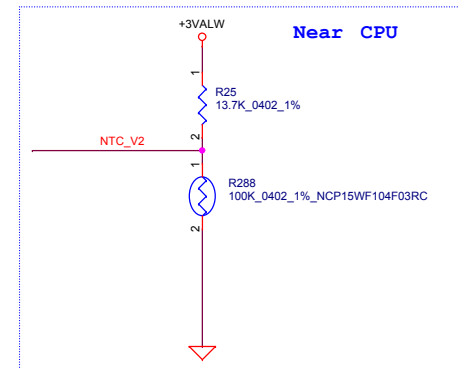
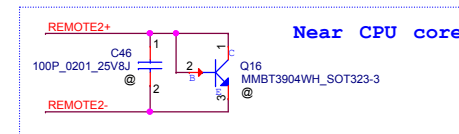
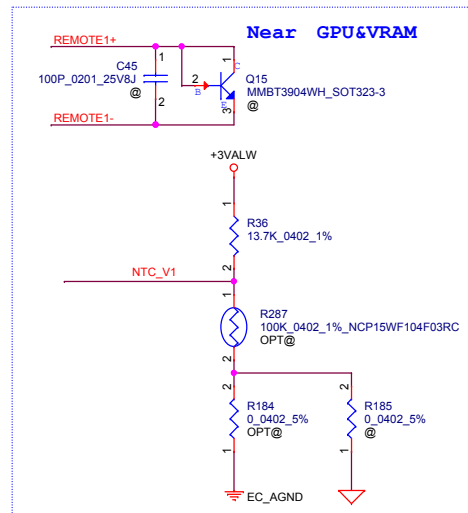


REMOTE+/-\_R, REMOTE1+/-, REMOTE2+/-:  
Trace width/space:10/10 mil  
Trace length:<8"

### SMSC thermal sensor placed near DIMM

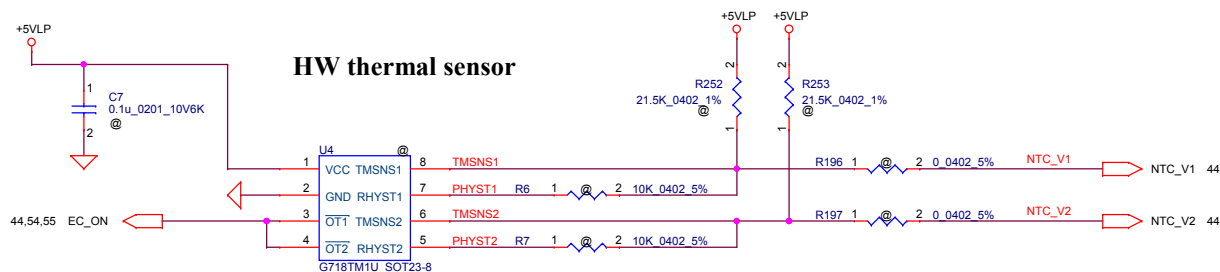


Address 1001\_101xb

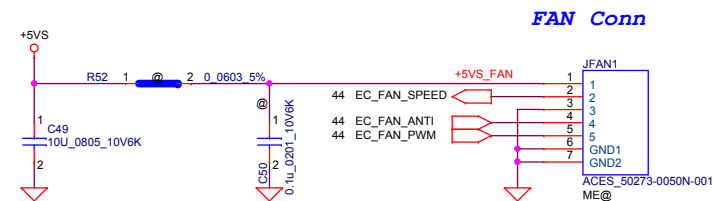


for layout optimized, change the EC\_AGND to GND

### HW thermal sensor

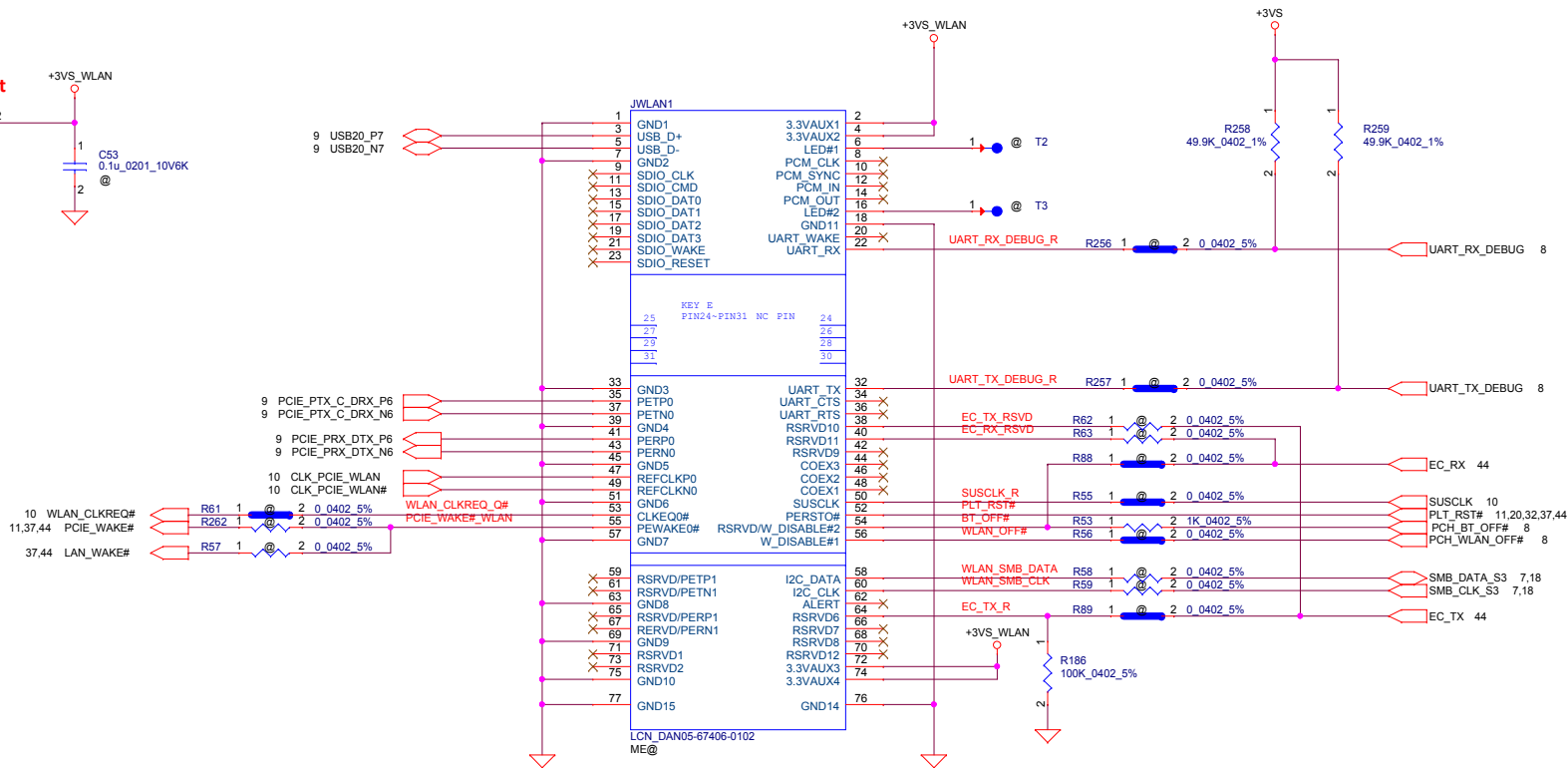


over temperature threshold:  
 $RSET=3*RTMH$   
 $92+/-30C$   
Hysteresis temperature threshold.  
 $RHYST=(RSET*RTML)/(3*RTML-RSET)$   
 $56+/-30C$



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# Mini-Express Card(WLAN/WiMAX)



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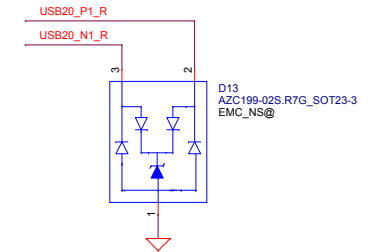
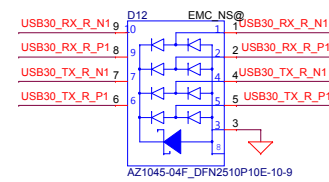
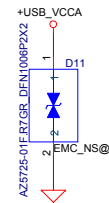
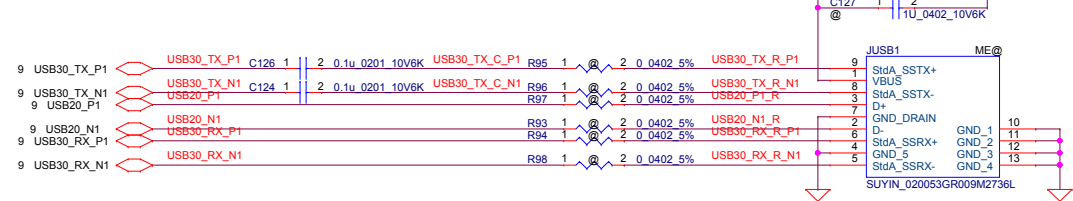
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Size	Custom	Document Number	CG413
Date:	Thursday, July 14, 2016	Sheet	40 of 60




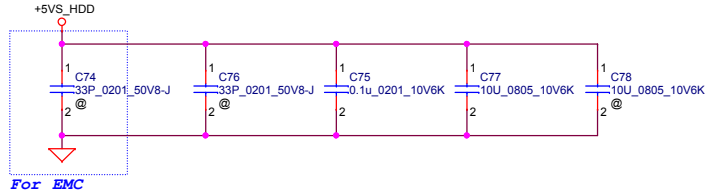
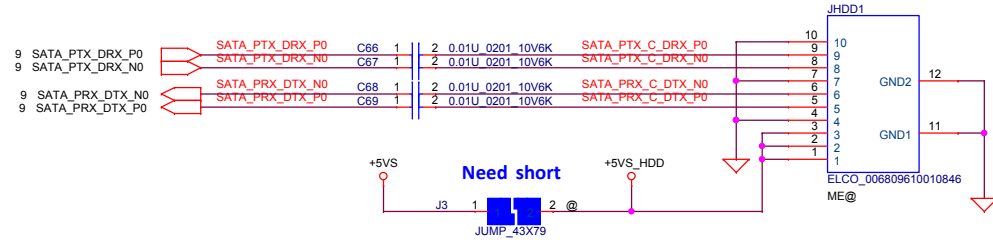
Rev 1.0



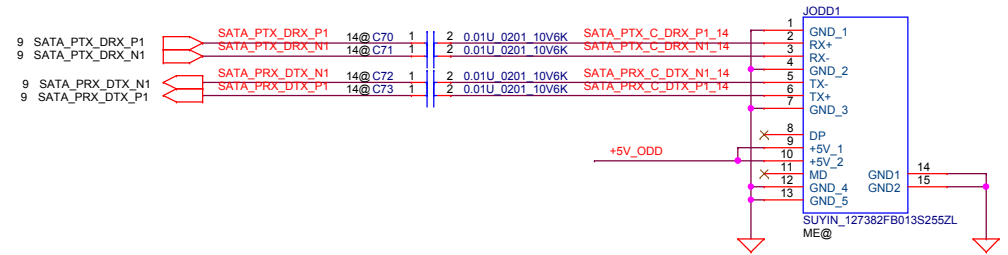
Low Active 2A



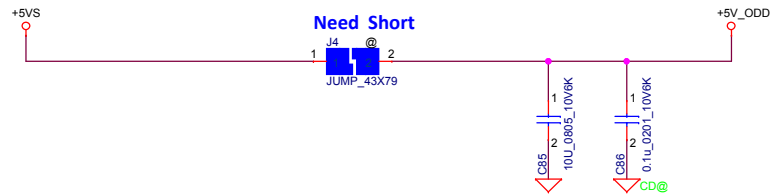
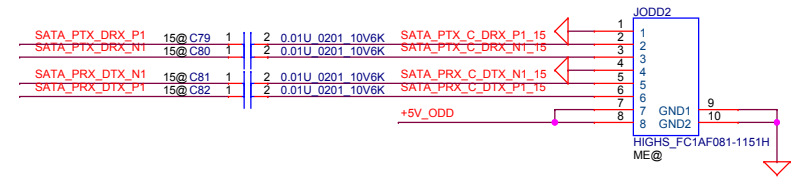
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Issued Date	2015/08/20	Deciphered Date	2016/08/20	<b>USB3.0 PORT (LEFT)</b>		
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**SATA HDD Conn.**

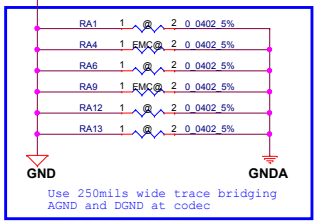
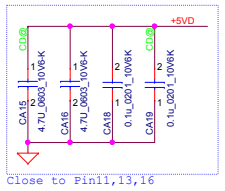
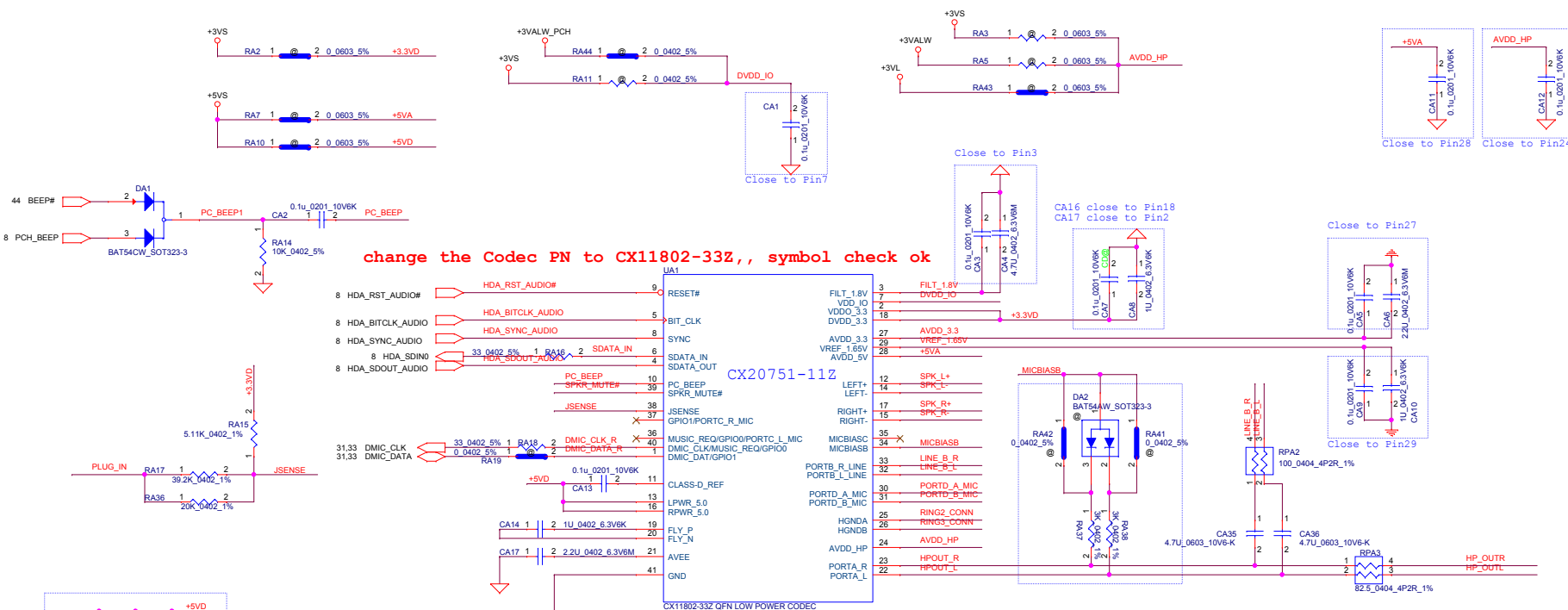
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**SATA ODD Conn.**



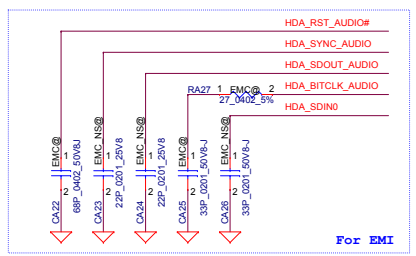
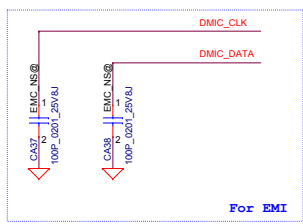
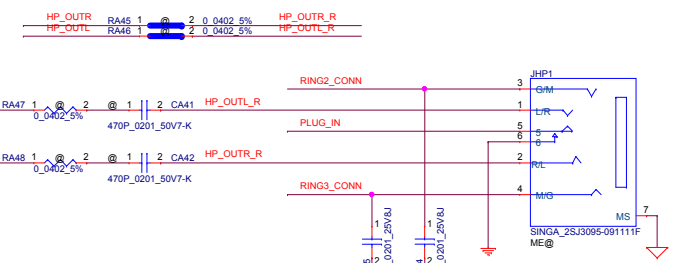
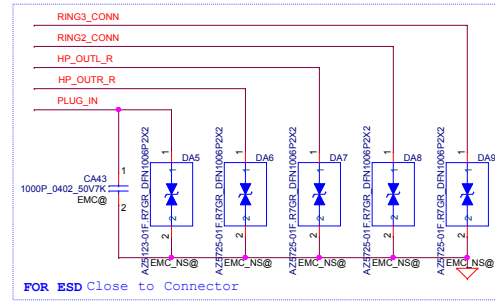
**FOR 15"**  
**SATA ODD FFC Conn**



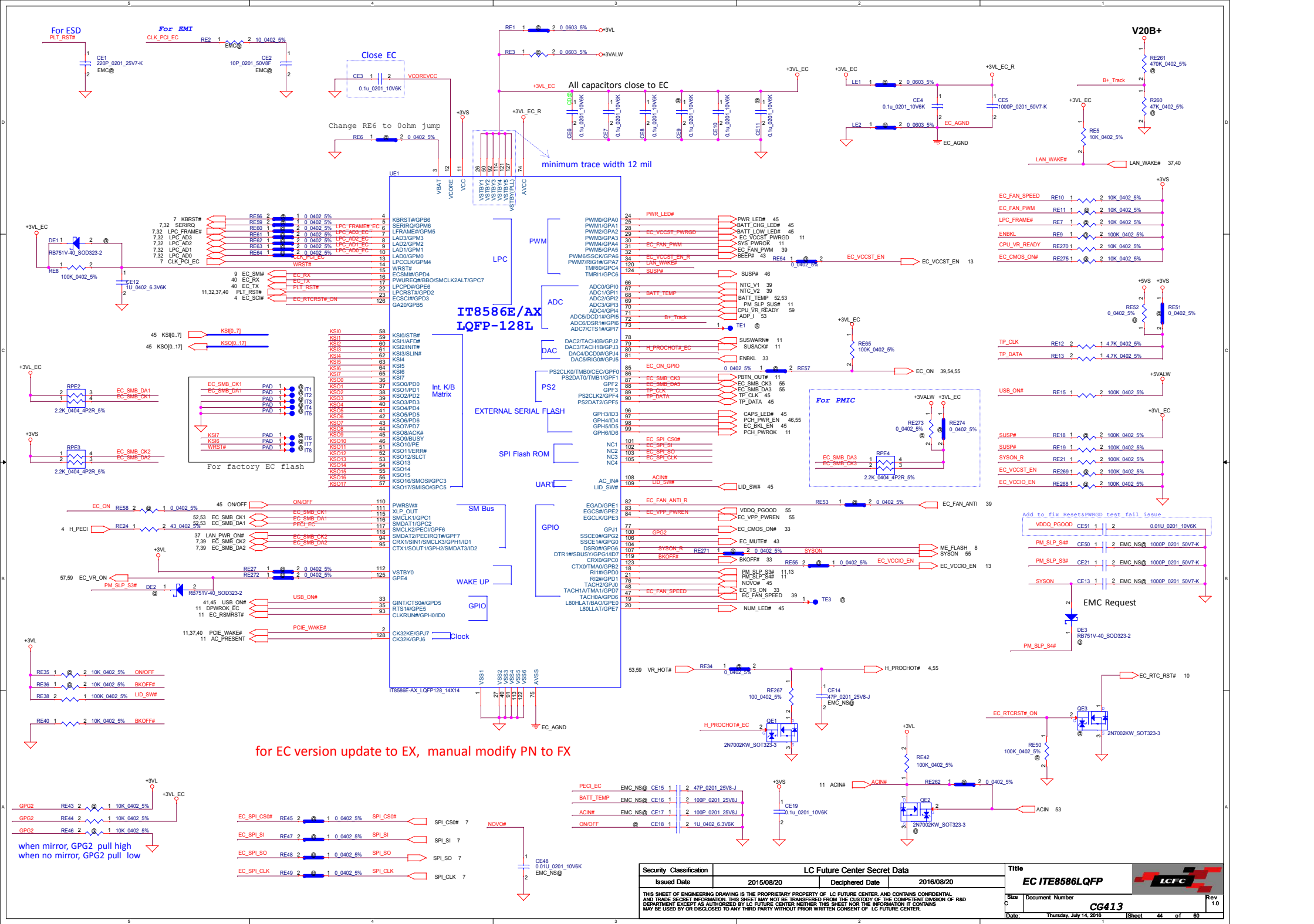
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Issued Date		2015/08/20		Deciphered Date		2016/08/20						HDD/ODD CONN			
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### Audio Jack



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Issued Date	2015/08/20	Deciphered Date	2016/08/20	Codec_CX11802 & Audio Jack	
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Size	Document	Number	CG413		Rev
Custom					1.0
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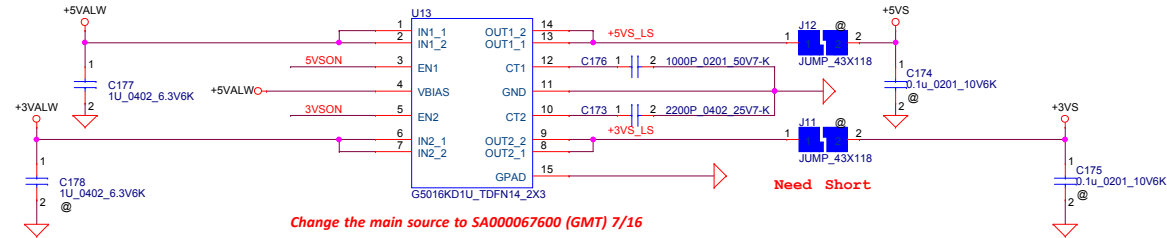
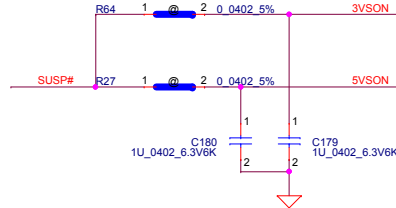


# **Load Switch** **+5VALW To +5VS** **+3VALW To +3VS**

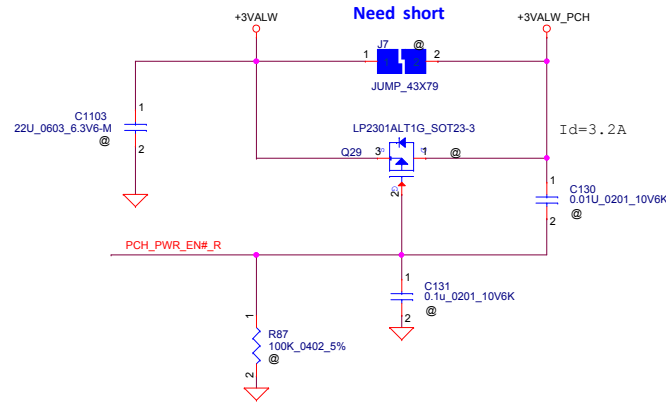
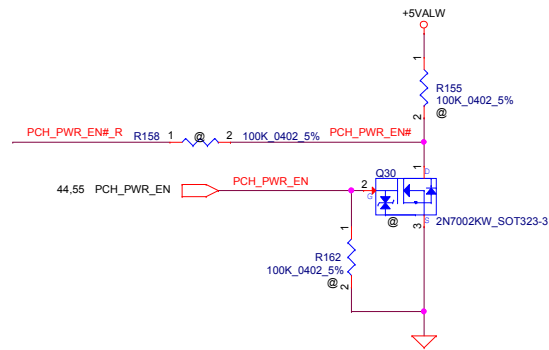
**+3VS, C173 --> 2.74ms**  
**+5VS, C176 --> 2.03ms**

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

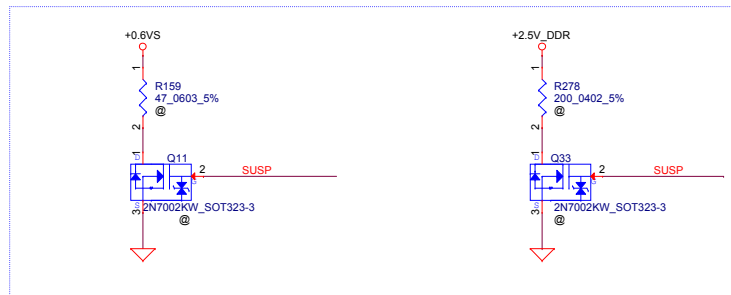
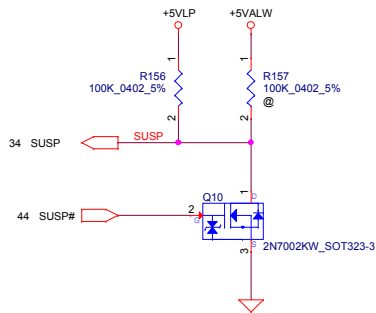
**Need Short**



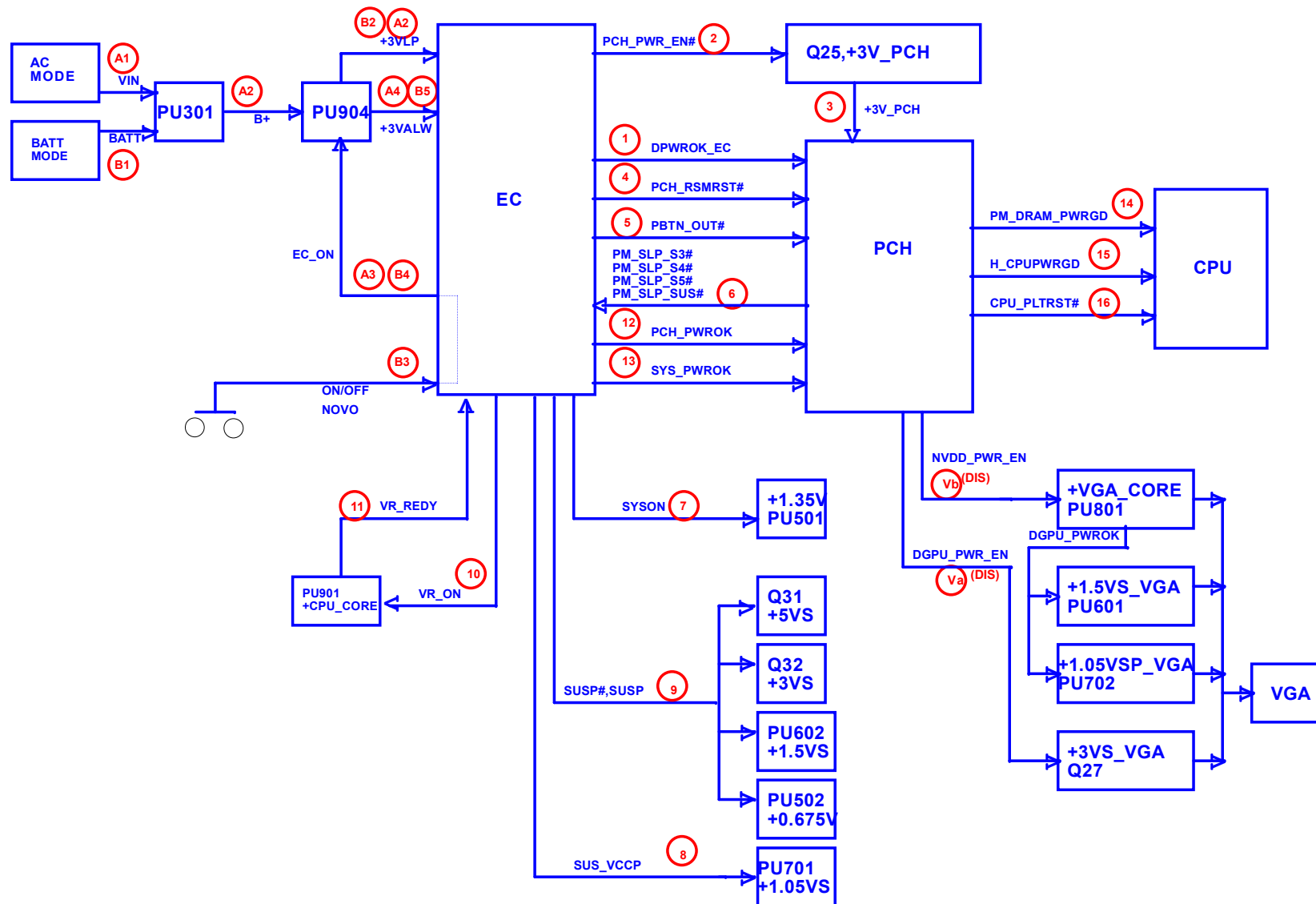
**Change the main source to SA000067600 (GMT) 7/16**

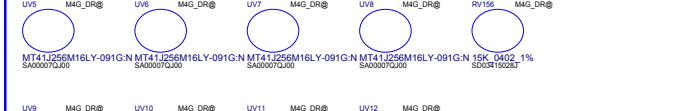
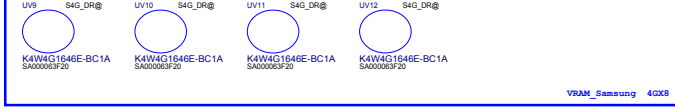
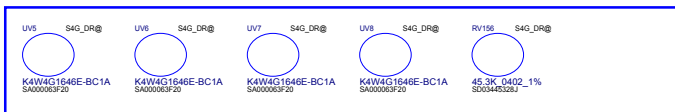
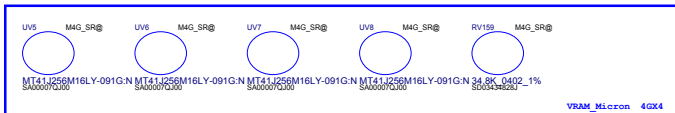
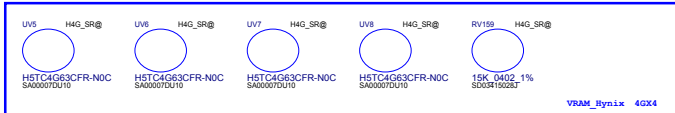
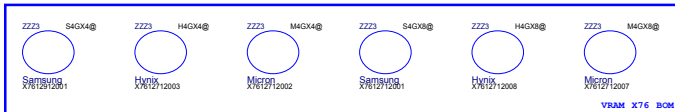
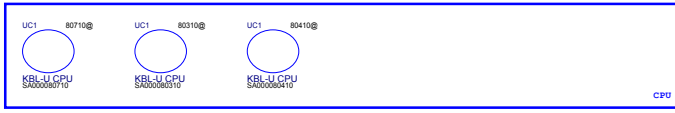
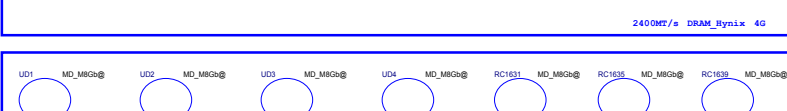
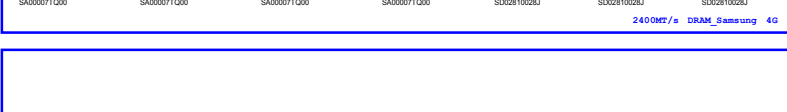
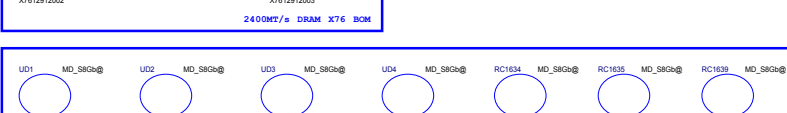
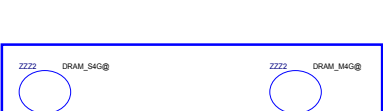
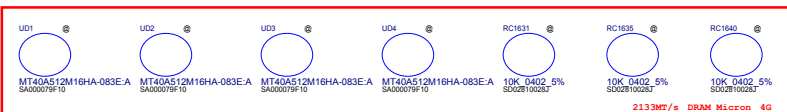
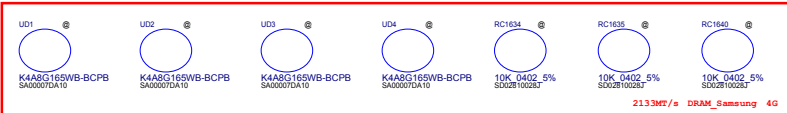
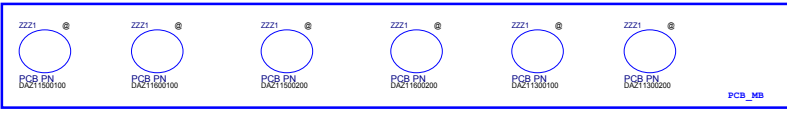


## **For DisCharge**

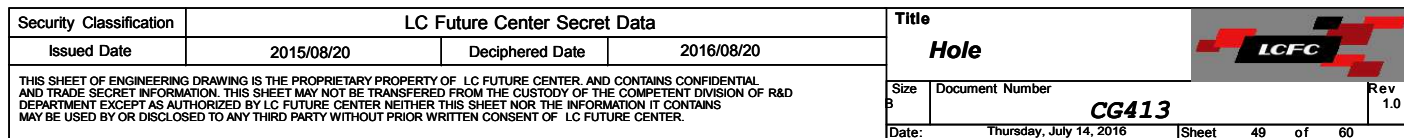
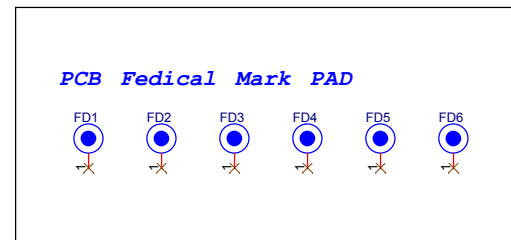


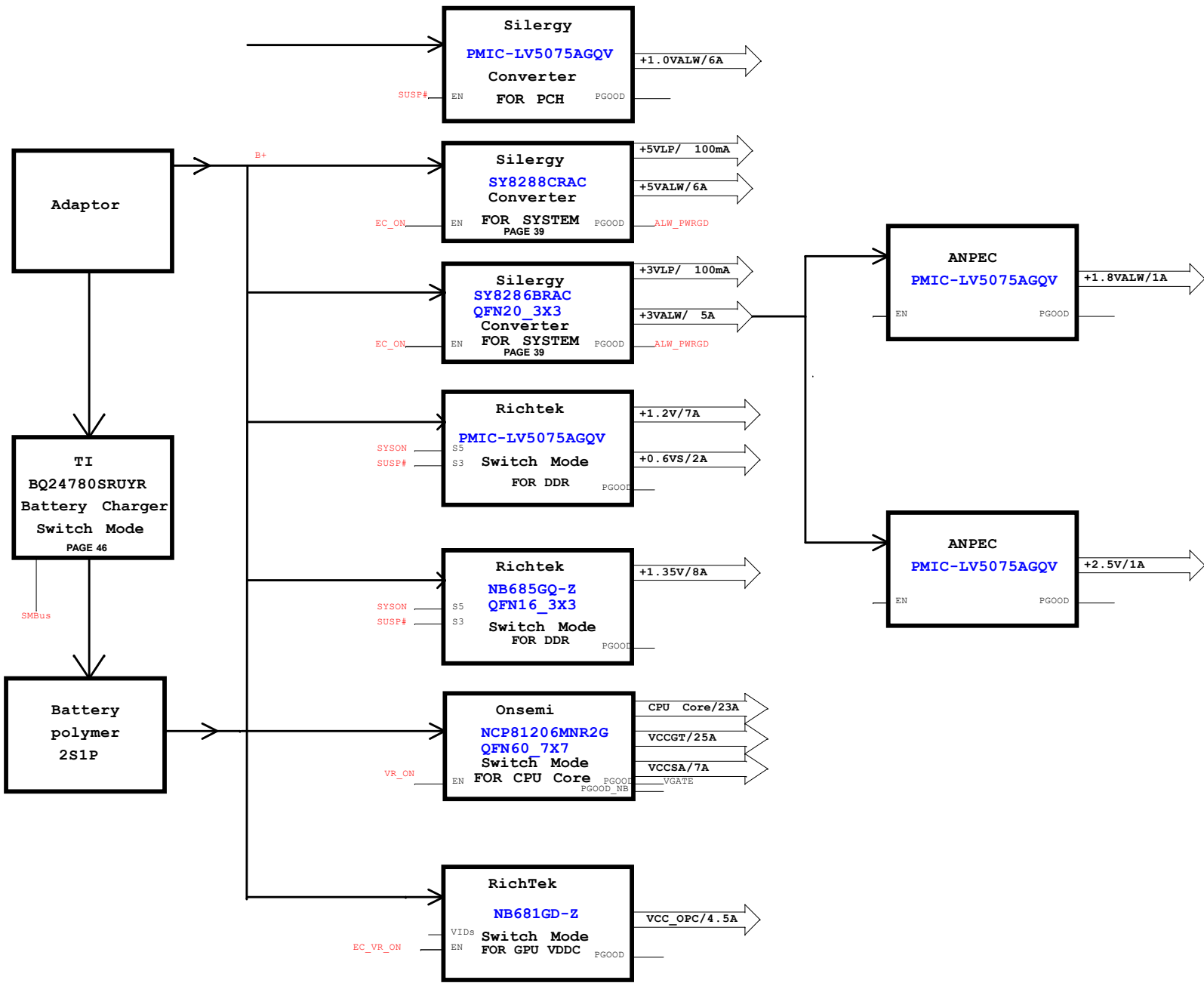
**08/29: Need double check enable signal and the resistance**

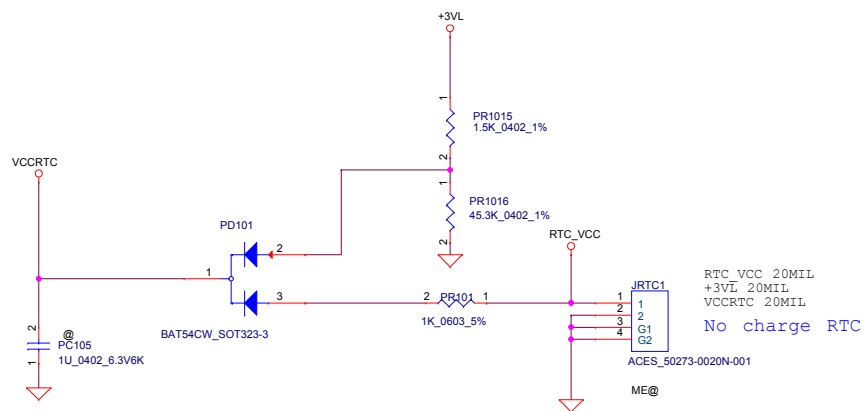
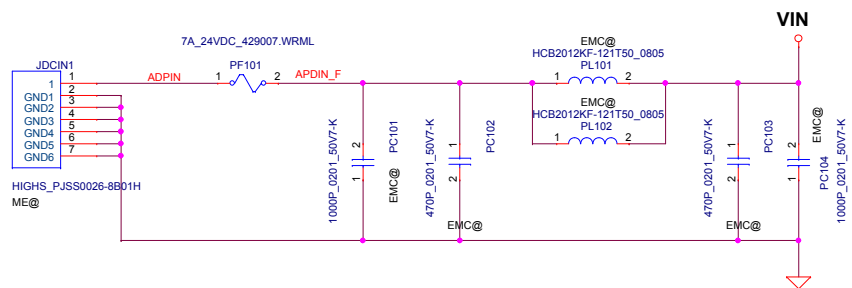




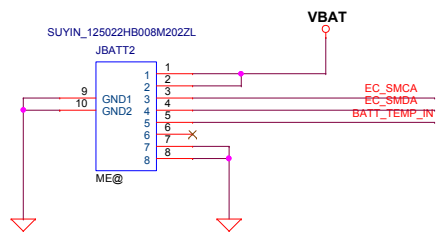
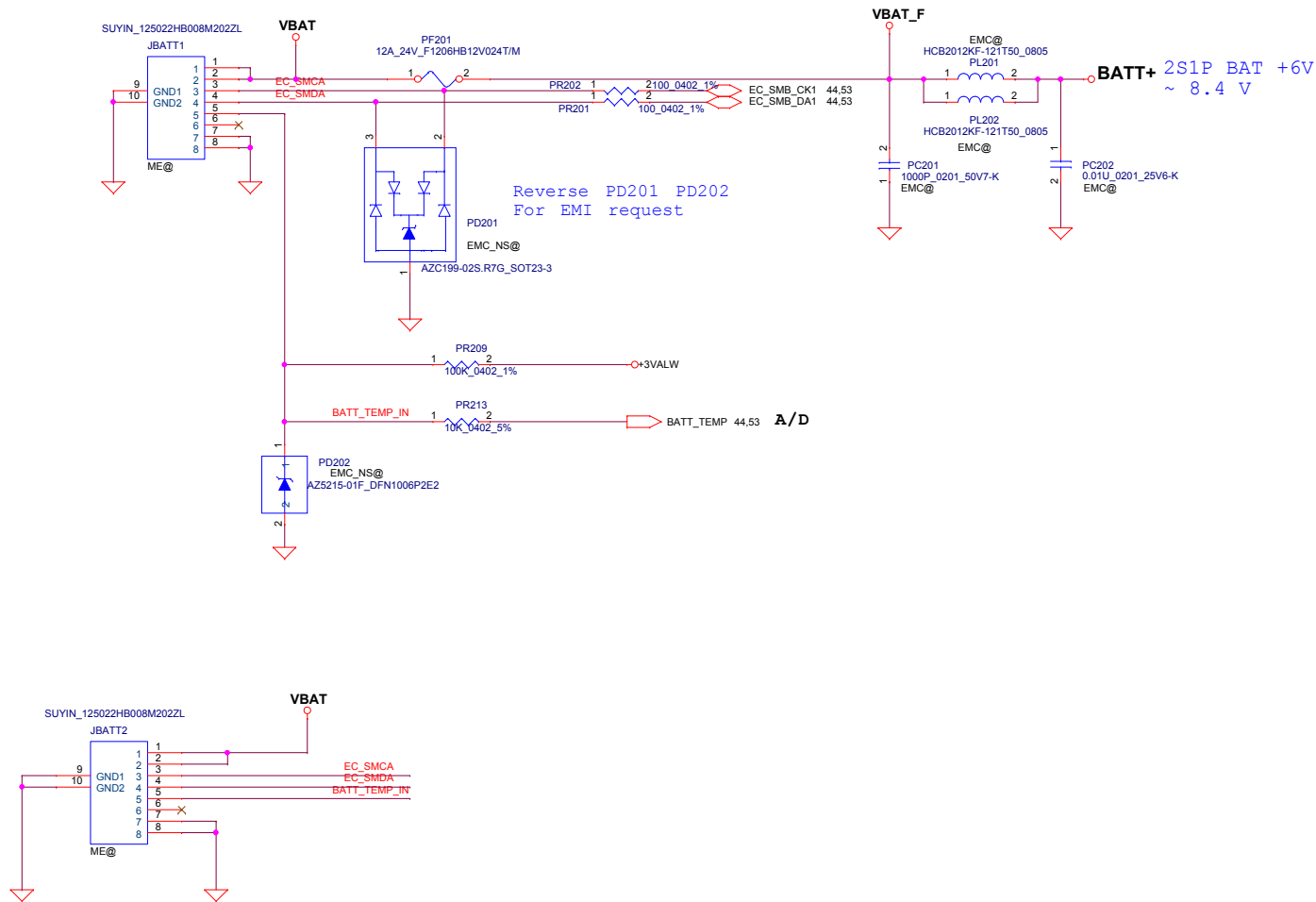




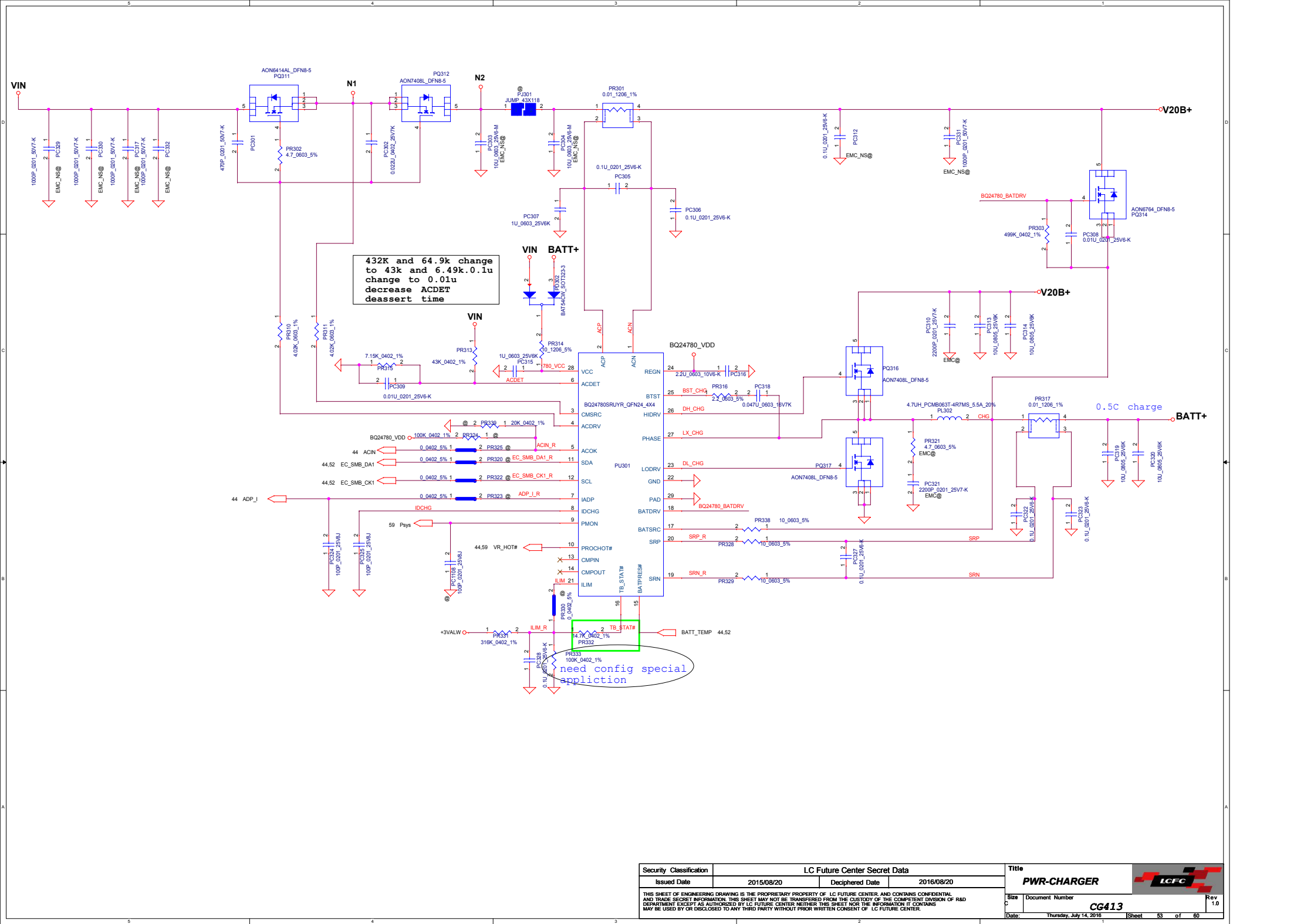


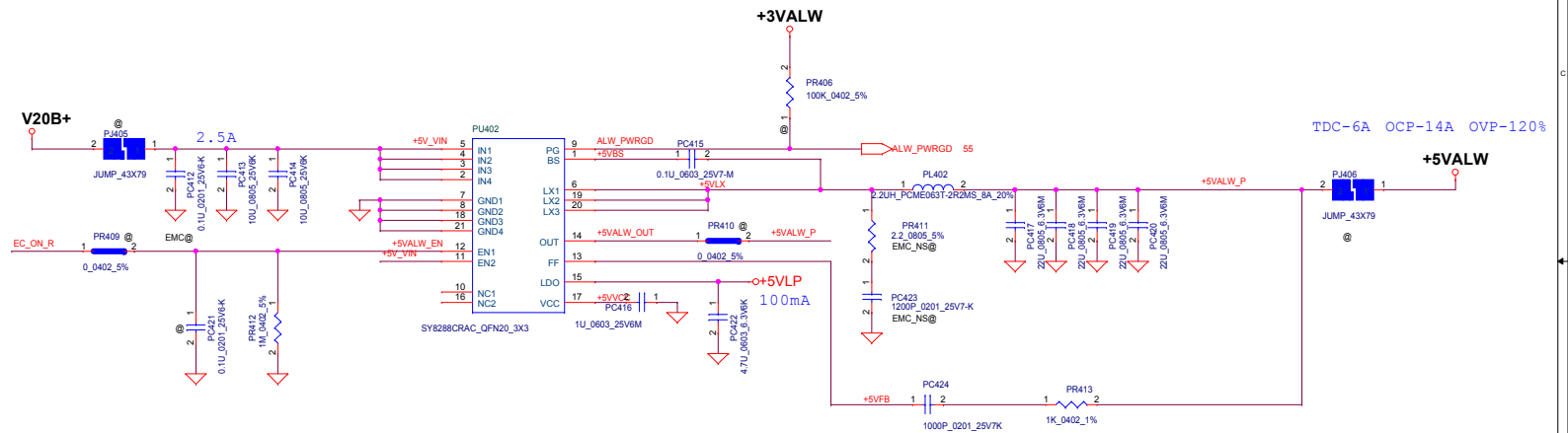
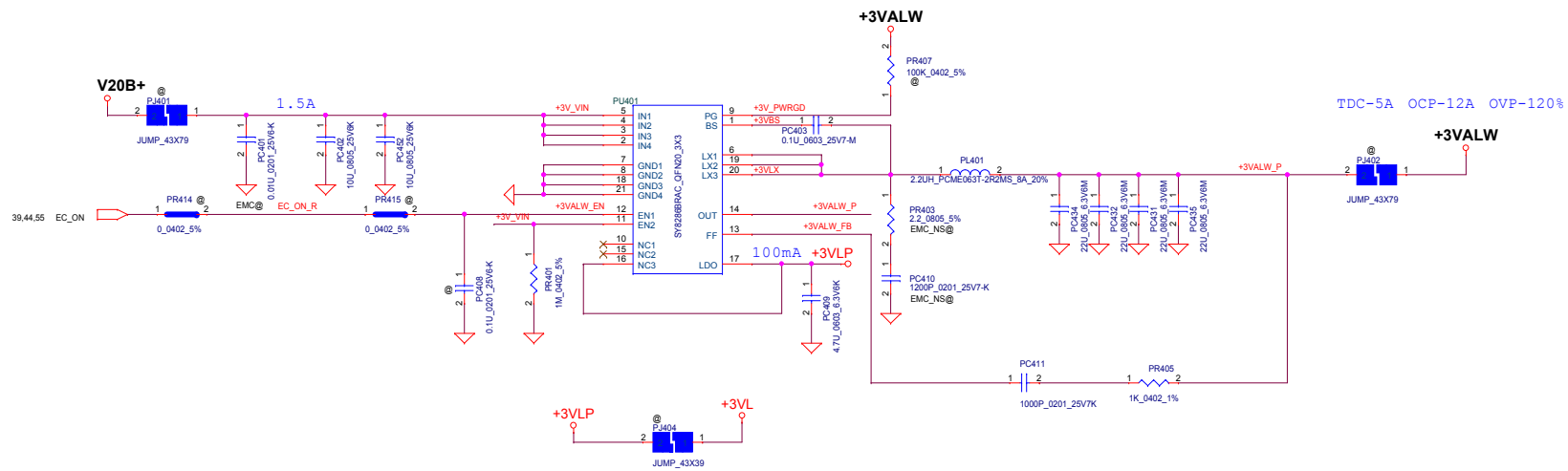


RTC VCC 20MIL  
+3VL 20MIL  
VCCRTC 20MIL  
No charge RTC




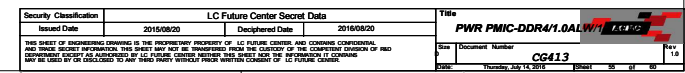
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Issued Date	2015/08/20	Deciphered Date	2016/08/20	PWR-BATTERY CONN/OTF ICFC	
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6800pf soft start 2ms  
47nf soft start 7ms

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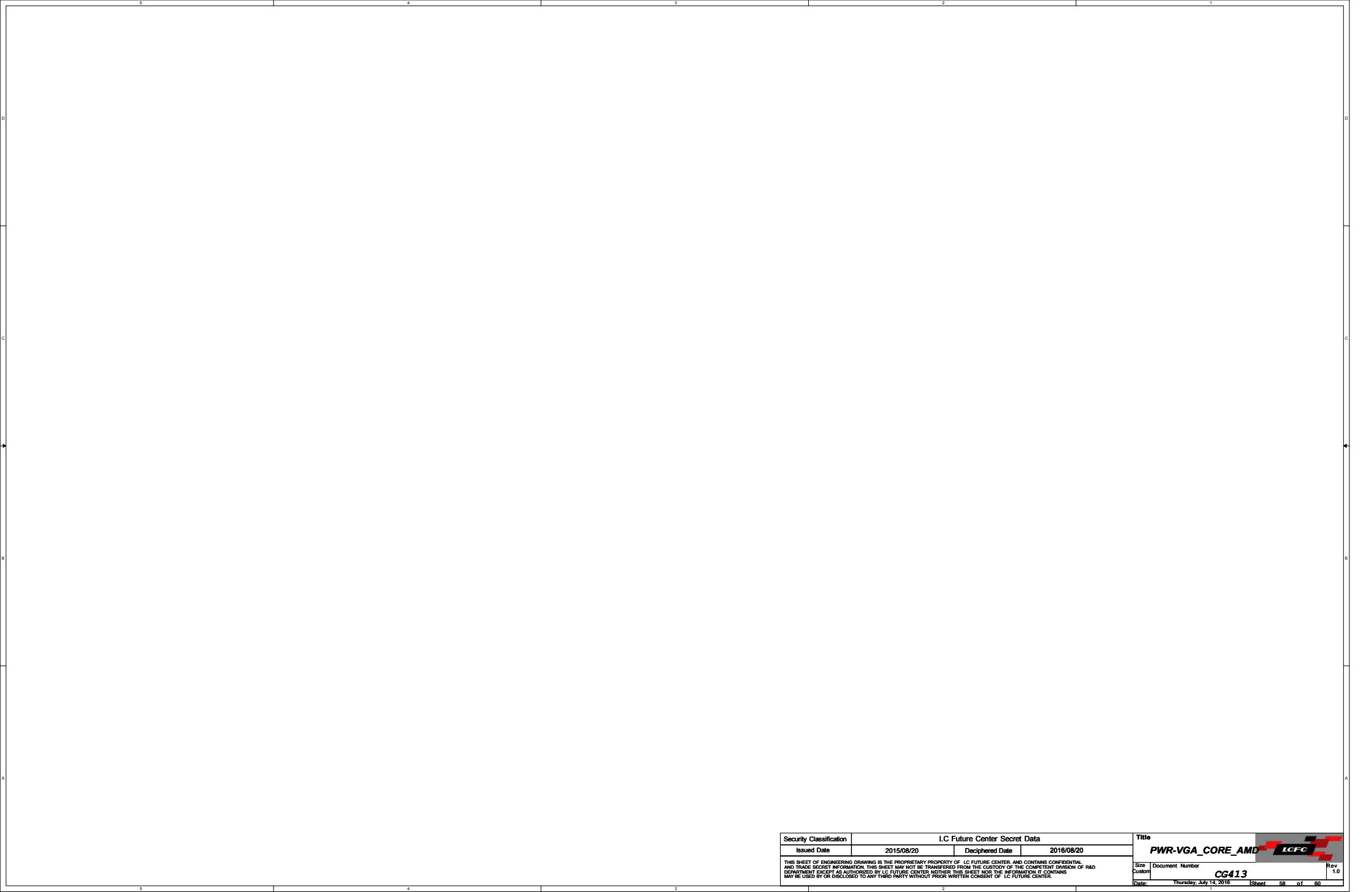



	5		4		3		2		1	
D										D
C										C
B										B
A										A
	5		4		3		2		1	

Security Classification		LC Future Center Secret Data				Title					
Issued Date		2015/08/20		Deciphered Date		2016/08/20					
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								CG413			
						Date:		Thursday, July 14, 2016		Sheet 56 of 60	







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Issued Date	2015/08/20	Deciphered Date	2016/08/20	Size	Document Number
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			Date	Thursday, July 14, 2016	Sheet 58 of 60

