

LCFC Confidential


ES322/ES323 NM-B491 MB Schematics Document

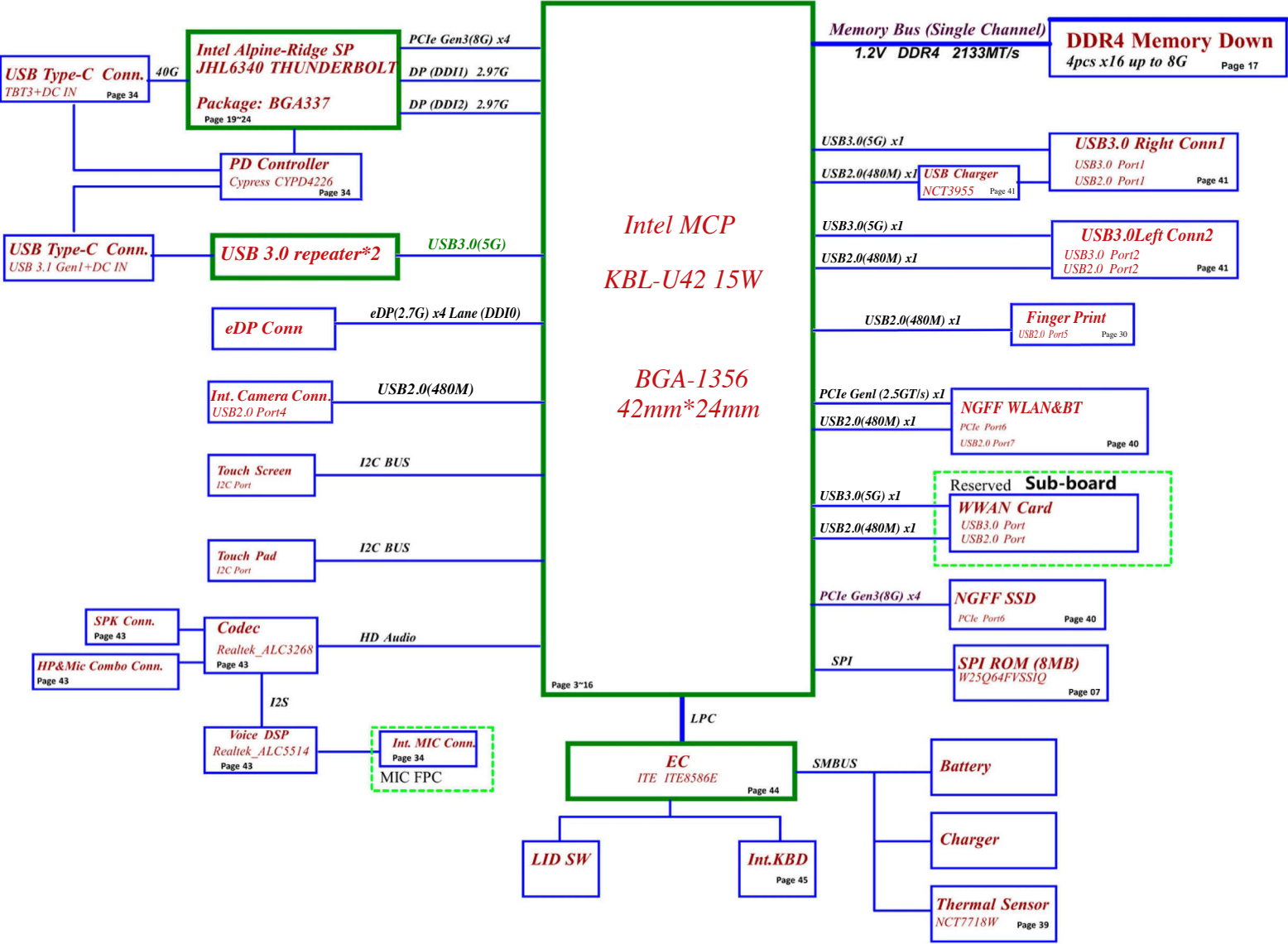
Intel Kabylake-U42 with DDR4

2017-07-27

REV : 1.0

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|--|------------------------------|-----------------|------------|------------|--------------------------|
| 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 | O |
| S3 | O | O | O | O | X |
| S3 Battery only | O | O | O | O | X |
| S5 S4 AC Only | O | O | X | X | X |
| S5 S4 Battery only | O | X | X | X | X |
| S5 S4 AC & Battery don't exist | X | X | X | X | X |

| 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 coast 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 TBT | 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 DGPU | PX@ | For PX part |
| | X4 PCIE | RANKA@ | For VRAM rank A part |
| | | RANKB@ | For VRAM rank B part |
| | | Realtek_SD@ | For Realtek SD part |
| | | SINGLEMIC@ | For single MIC part |
| | | SINGLERANK@ | For single VRAM rank part |
| | | DUALRANK@ | For dual VRAM rank part |
| | | TS@ | For touch screen part |
| | | TPM@ | For TPM part |
| | | UMA@ | For UMA part |

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

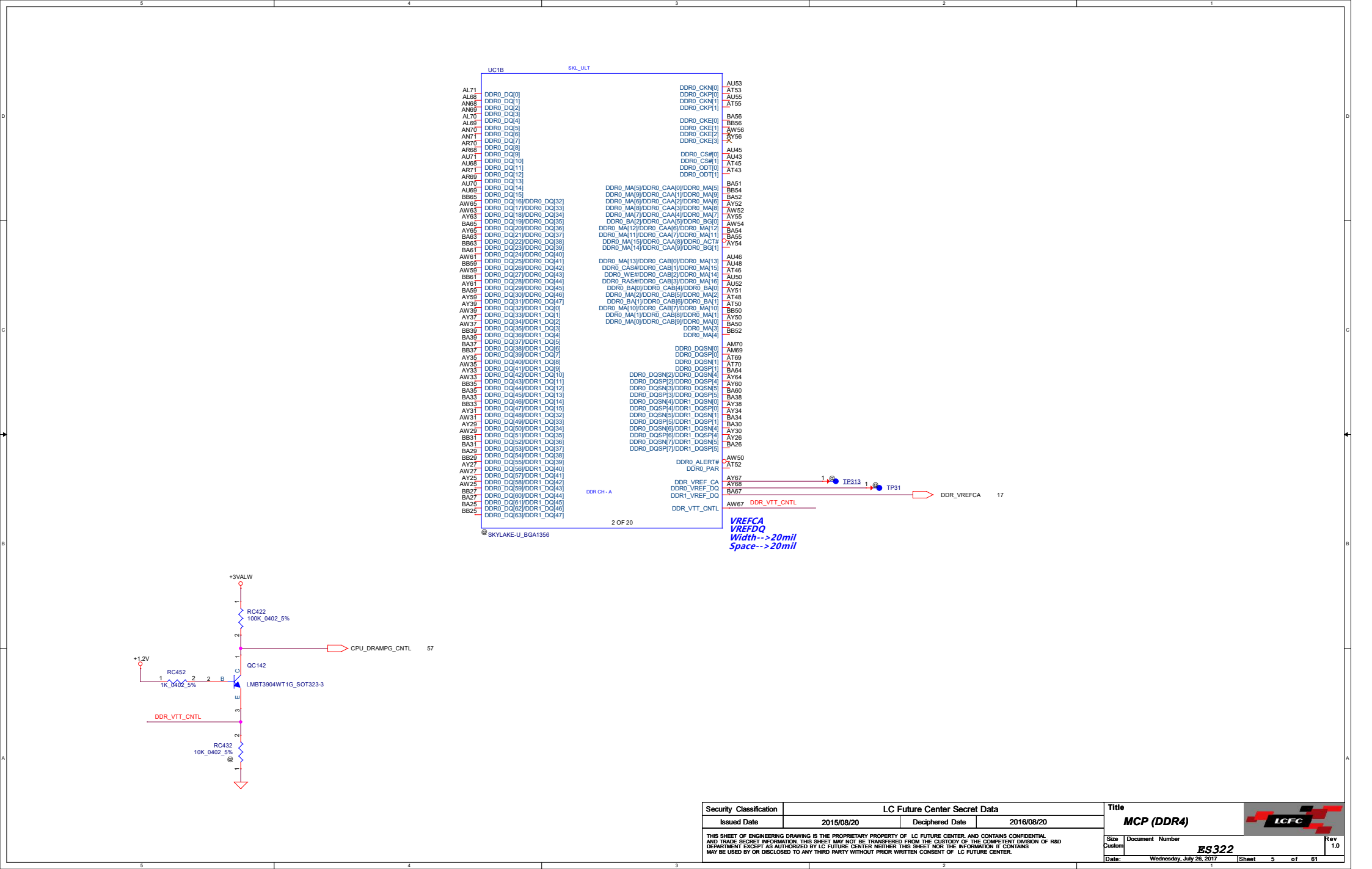
| Device | Address | Device | Address | Device | Address |
|---------------|----------------|--------------------------|----------------|--------|----------------|
| Smart Battery | need to update | Thermal Sensor(NCT7718W) | 1001_100xb | PMIC | need to update |
| Charger | 0001 0010 b | PCH | need to update | | |
| | | DGPU | need to update | | |

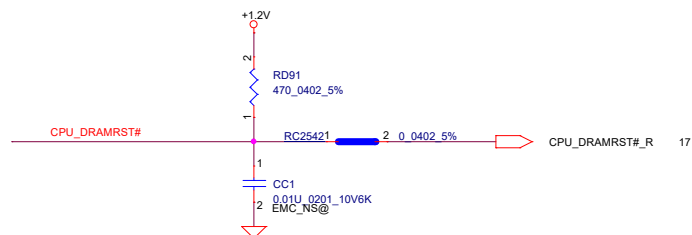
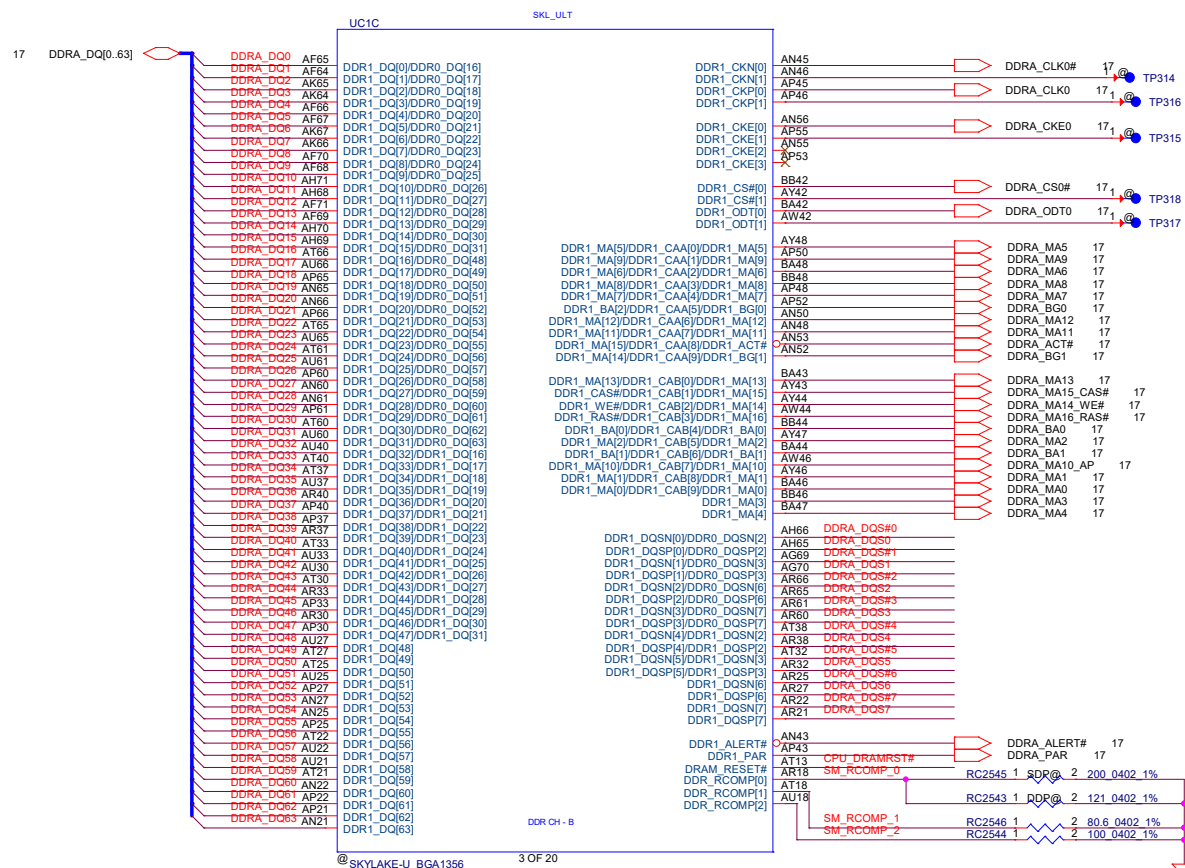
| Device | Address |
|-------------|----------------|
| DDR4 SODIMM | need to update |
| Wlan | Reserved |

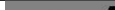
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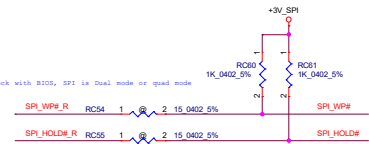
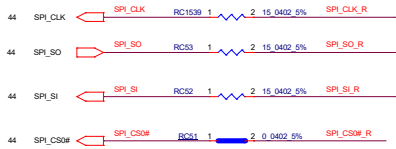


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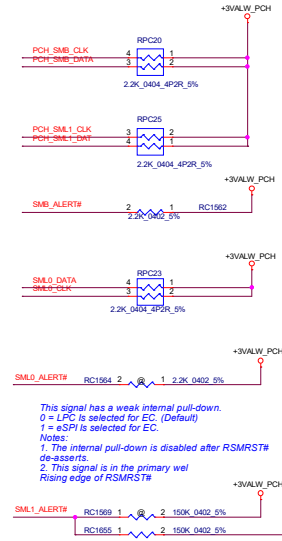
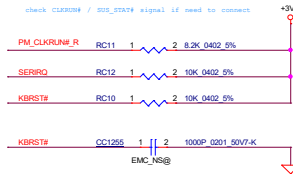
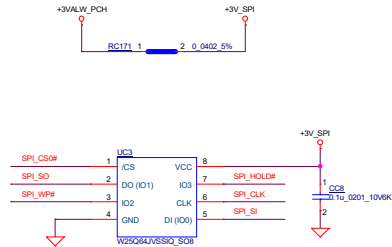
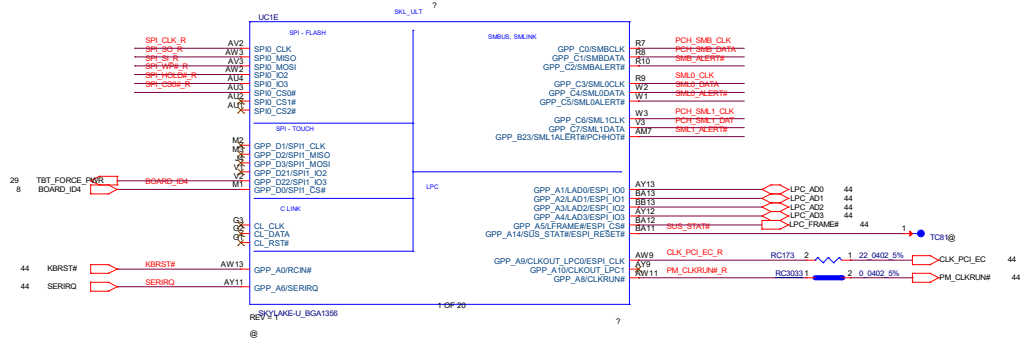




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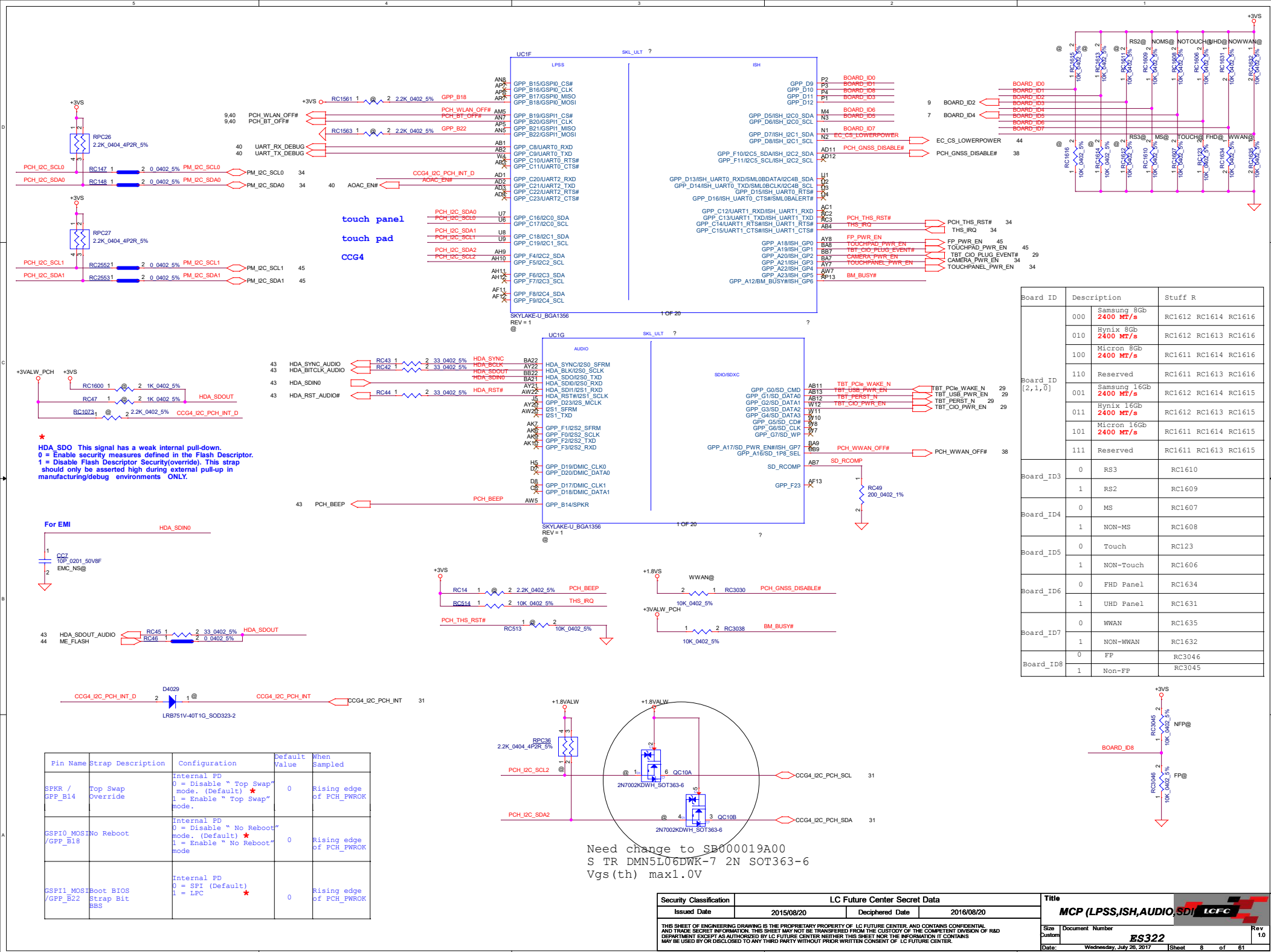
Check with BIOS, SPI is Dual mode or Quad mode




This signal has a weak internal pull-down.
0 = LPC is selected for EC. (Default)
1 = ASP is selected for EC.
Notes:
1. The internal pull-down is disabled after RSMRST# de-asserts.
2. This signal is in the primary well
Rising edge of RSMRST#

To enable Direct Connect Interface (DCI), a 150K pull up resistor will need to be added to PCHHOT# pin. This pin must be low during the rising edge of RSMRST#.
(Refer to WW52_WOW)

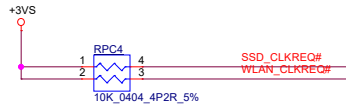
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Need change to SB000019A00
S TR DMN5L06DWK-7 2N SOT363-6
Vgs(th) max1.0V

| | | | | | | | |
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check the Pull up resistor



PCIE CLK0 TBT

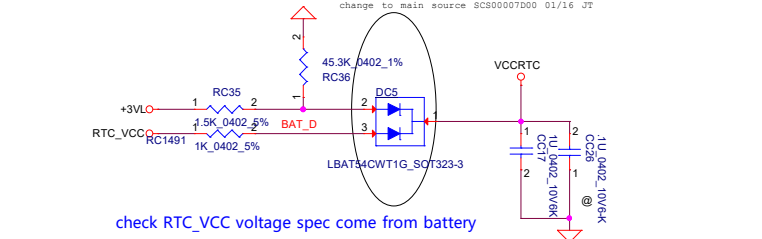
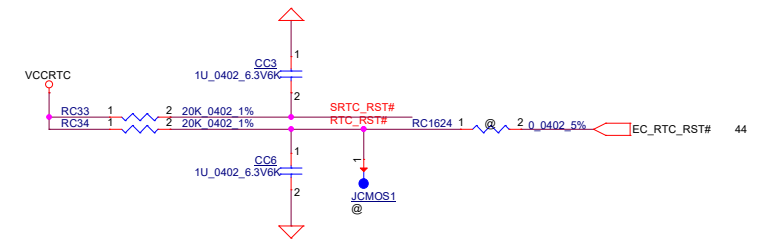
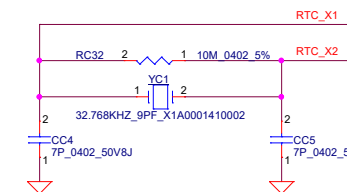
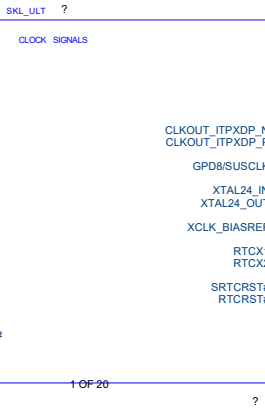
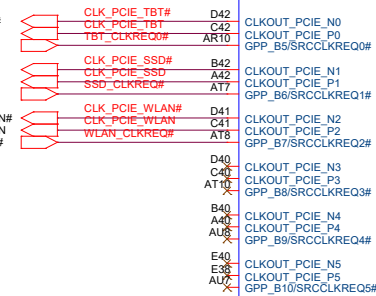
PCIE CLK1 SSD

PCIE CLK2 WLAN

29 CLK_PCIE_TBT#
29 CLK_PCIE_TBT
29 TBT_CLKREQ#

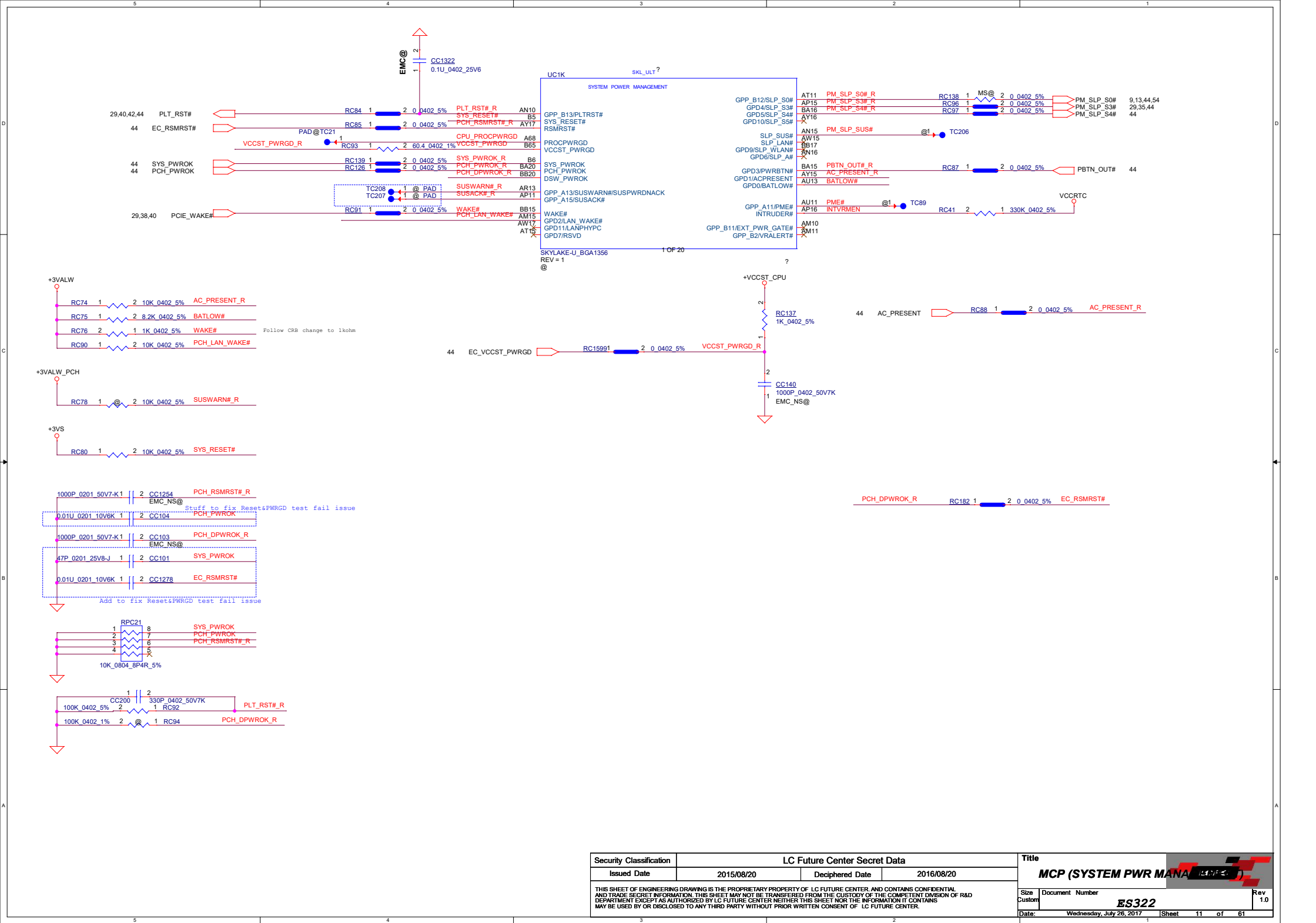
42 CLK_PCIE_SSD#
42 CLK_PCIE_SSD
42 SSD_CLKREQ#

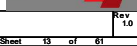
40 CLK_PCIE_WLAN#
40 CLK_PCIE_WLAN
40 WLAN_CLKREQ#

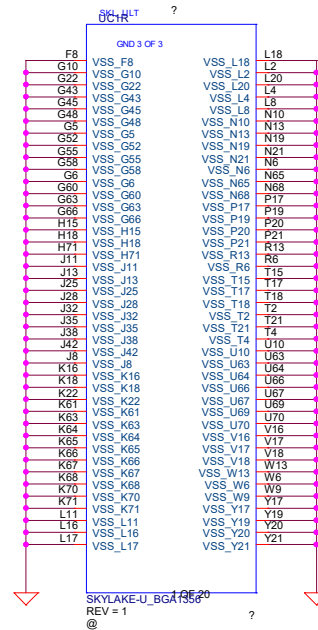
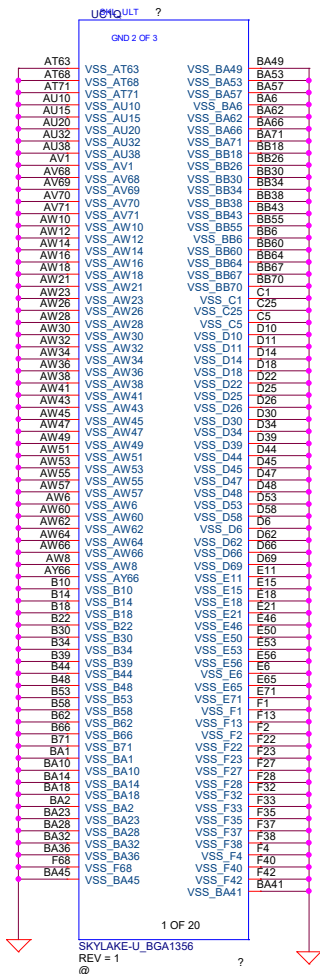
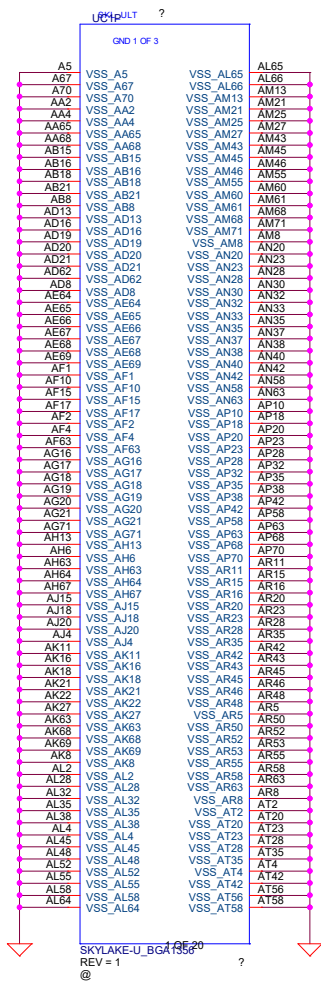


check RTC_VCC voltage spec come from battery


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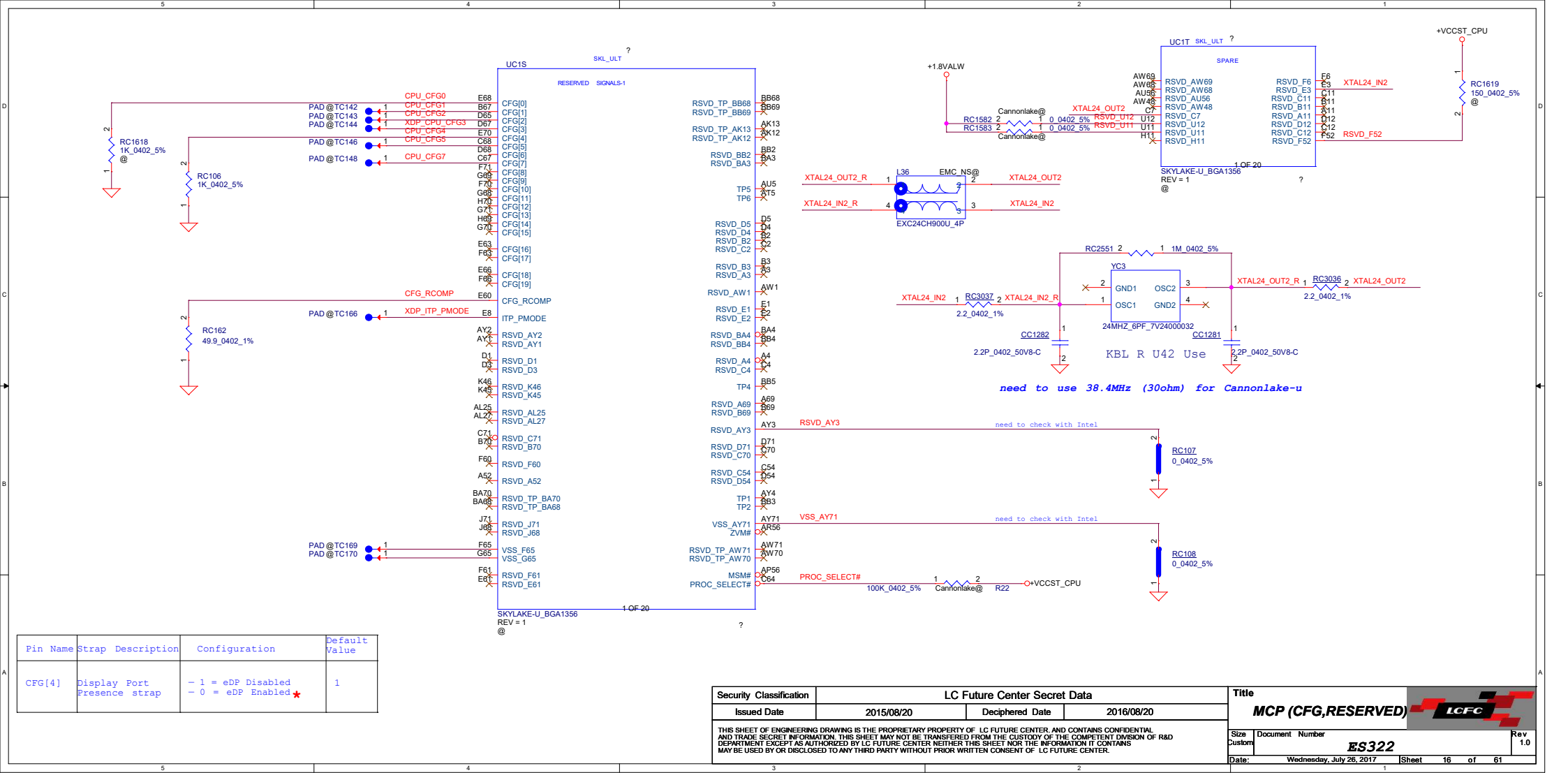




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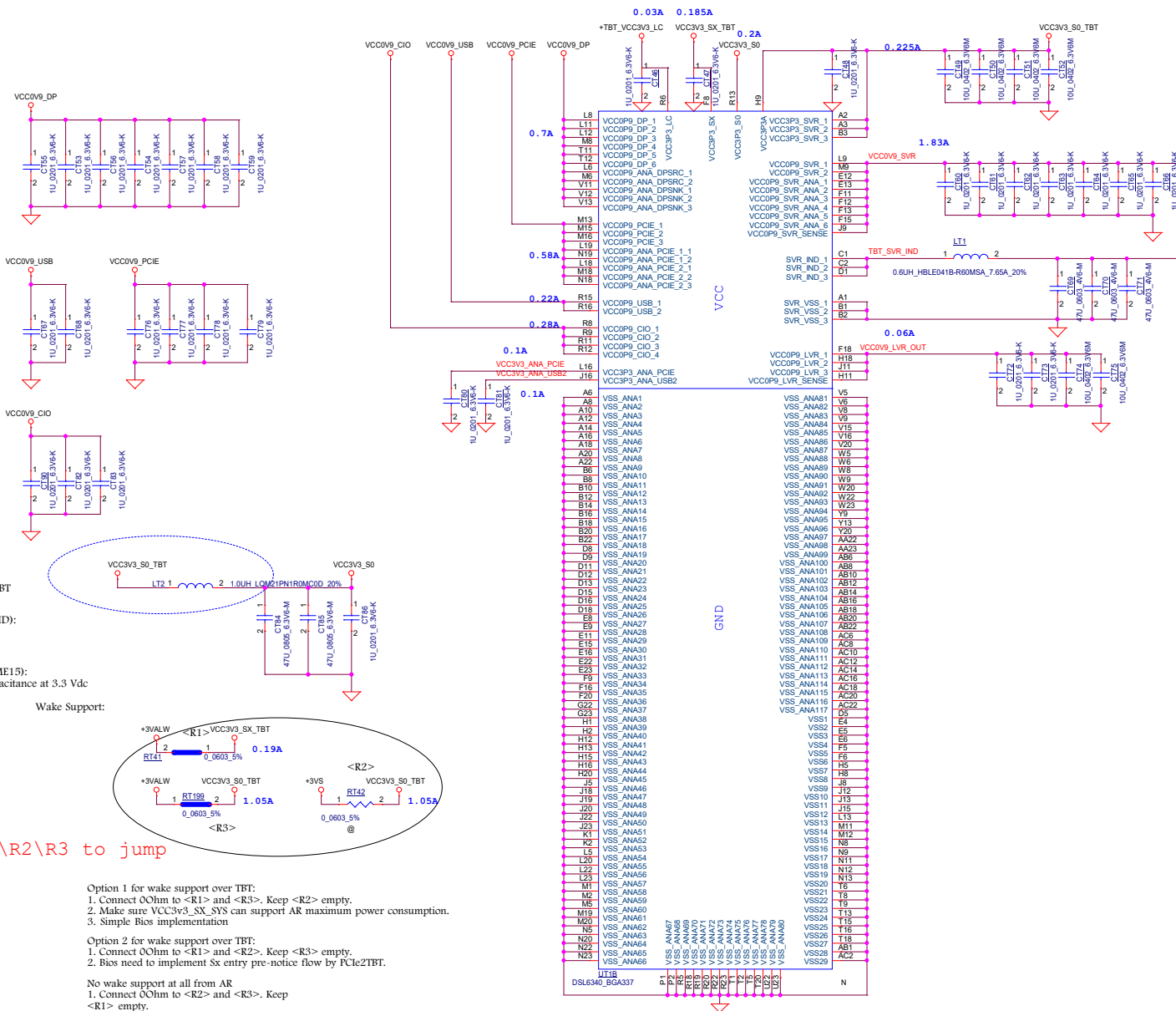
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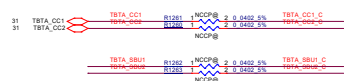
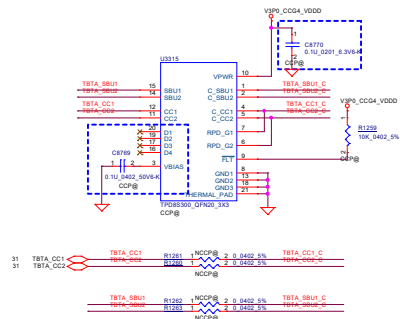
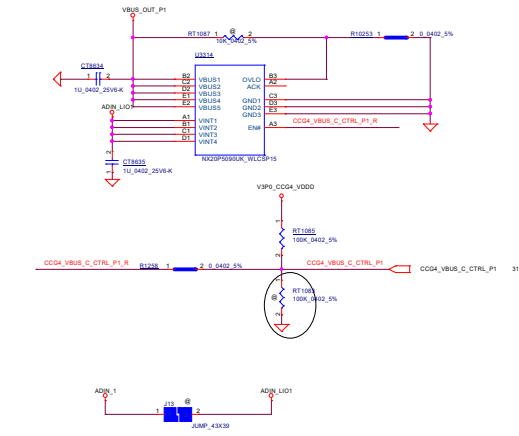
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| 5 | 4 | 3 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | | | | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | | | | C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | | | | B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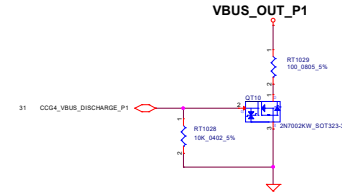
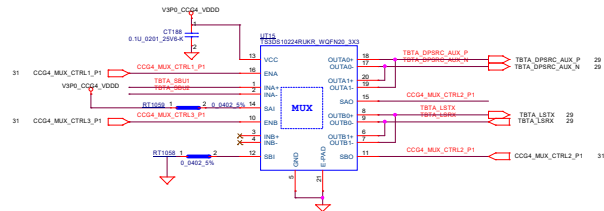
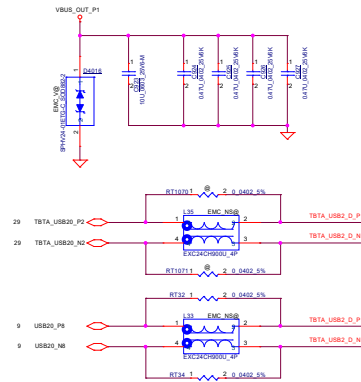
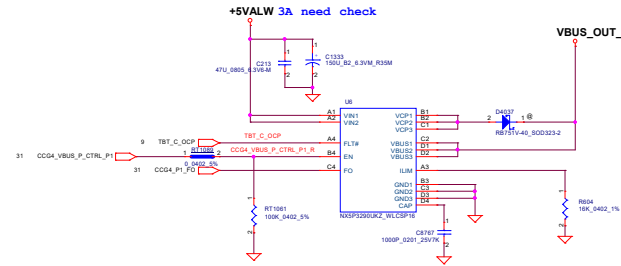


S IC JHL6340 SLLSQ C1 CONTROLLER 12 !,

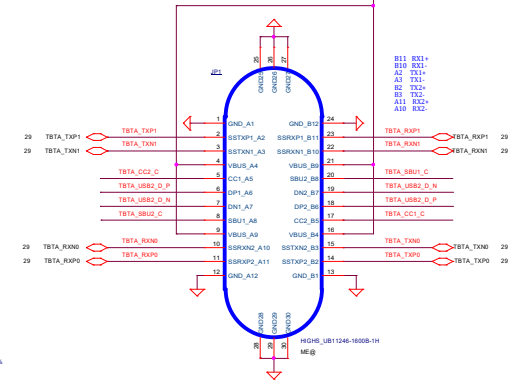
TYPE-C adapter



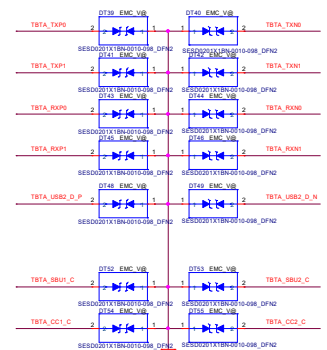
TBT3 support type-c adpter



VBUS_OUT_P1

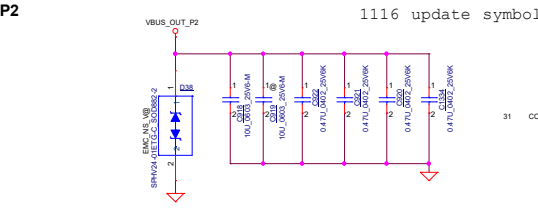
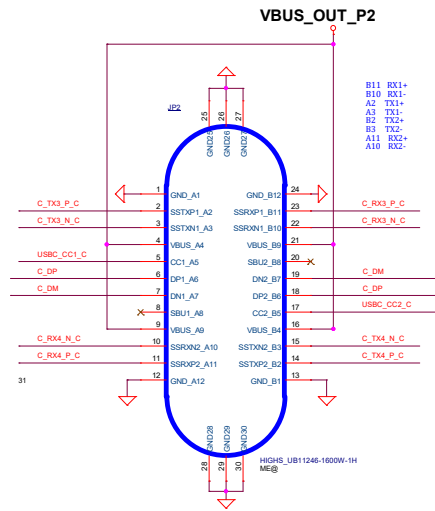
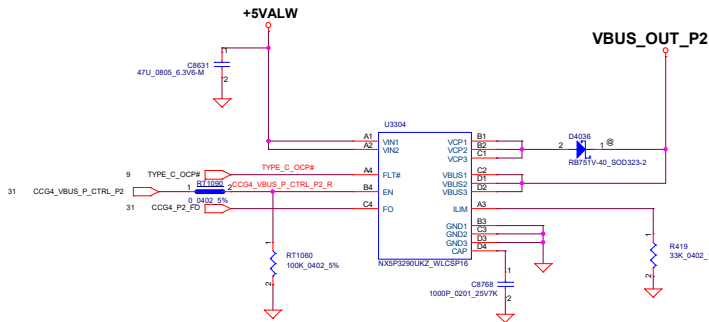
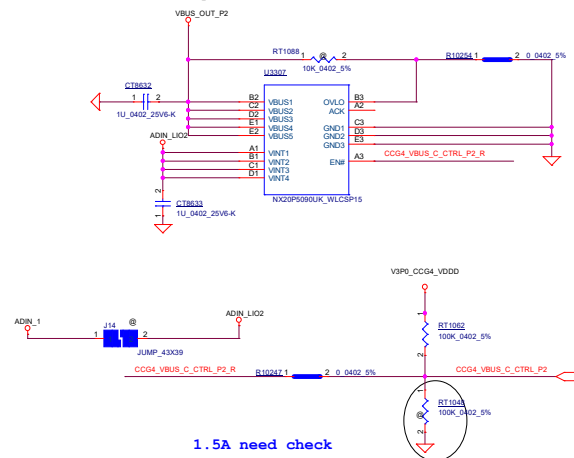


1116 update symbol



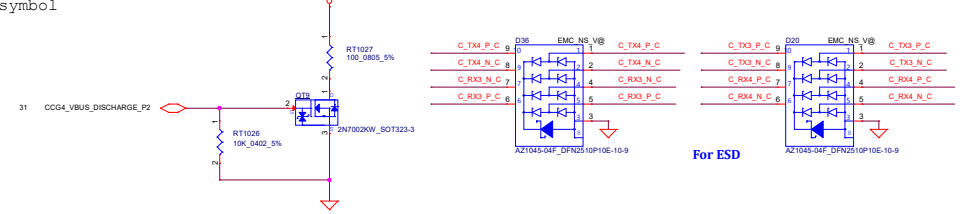
| | | | |
|---|------------------------------|-----------------|------------|
| Security Classification | LC Future Center Secret Data | | Title |
| Issued Date | 2015/08/20 | Designated Date | 2016/08/20 |
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| Rev | Document Number | ES322 | Rev 1A |
| Date | Wednesday, 25/04/2017 | Sheet | 33 of 61 |

TYPE-C adapter

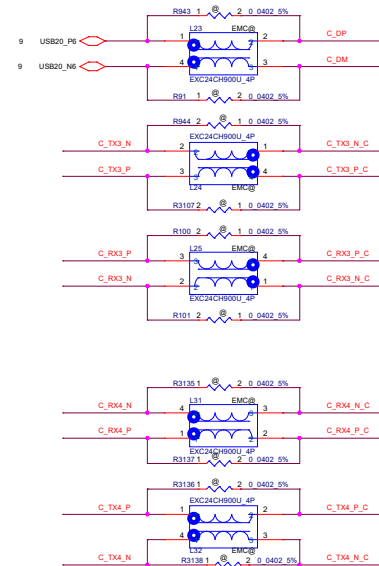
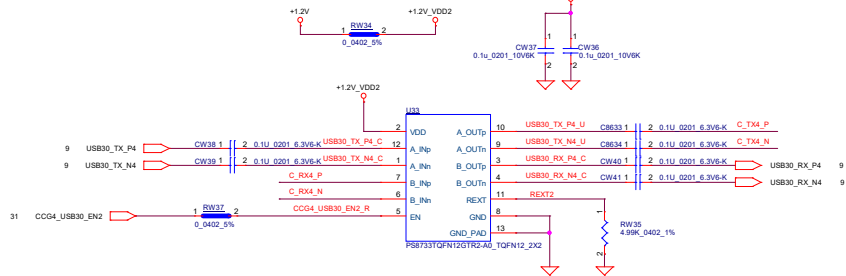
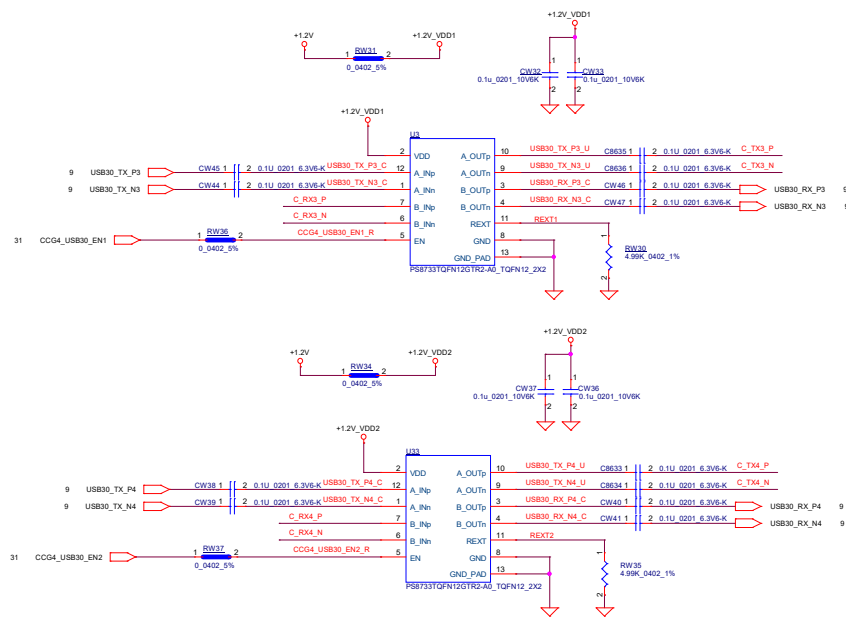


1116 update symbol

VBUS_OUT_P2

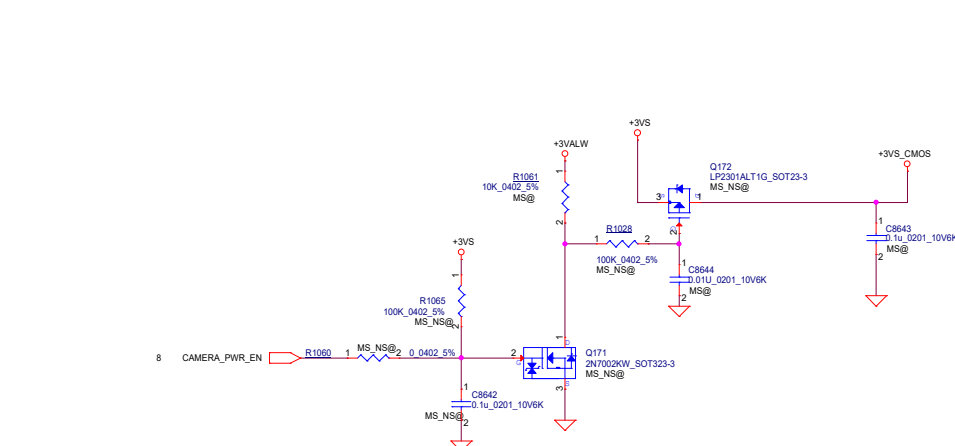
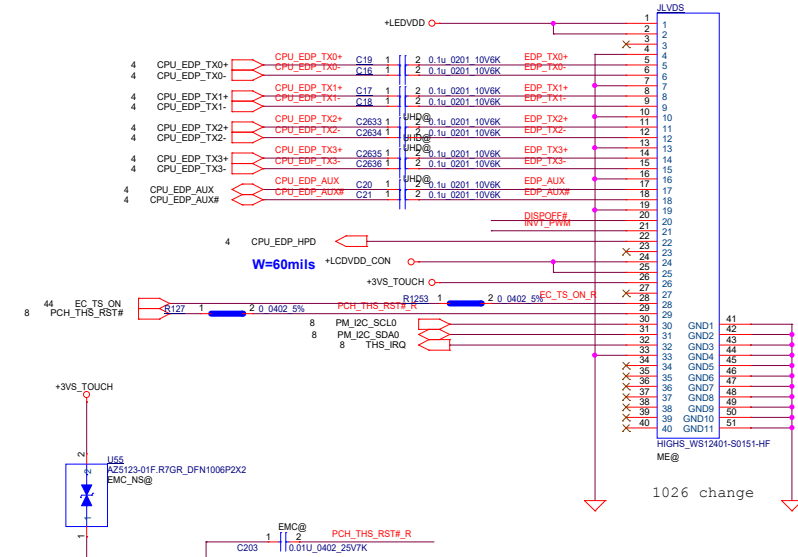
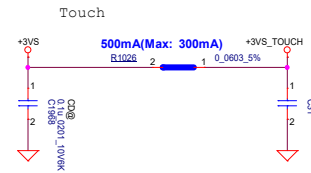
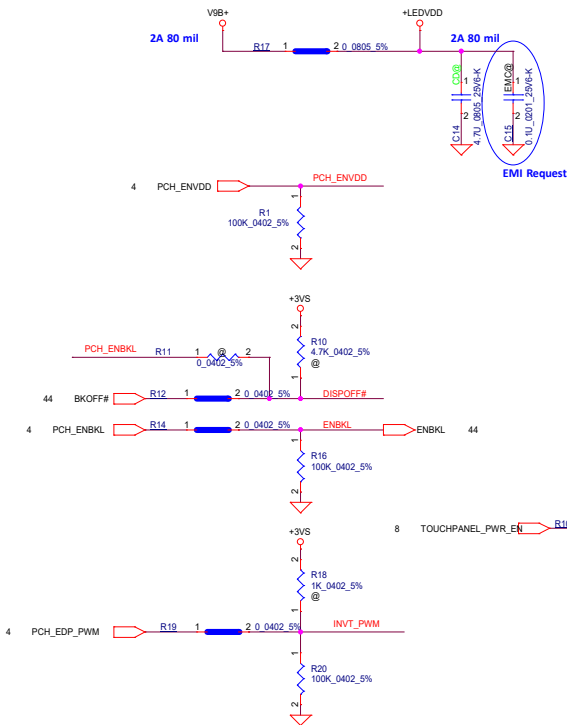
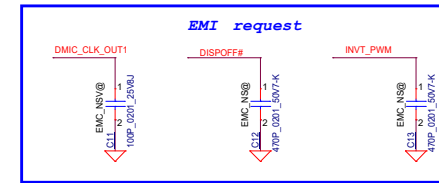
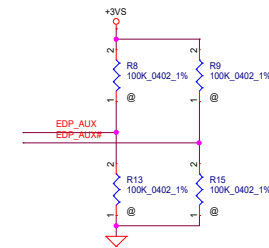
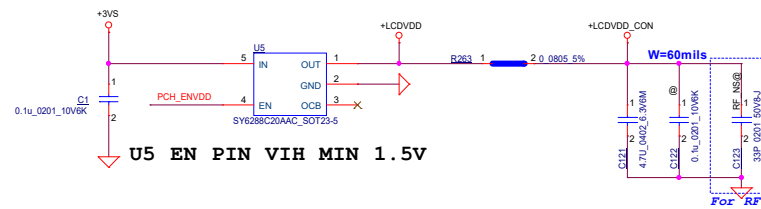


For ESD

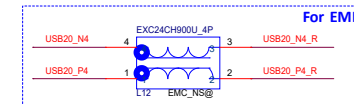
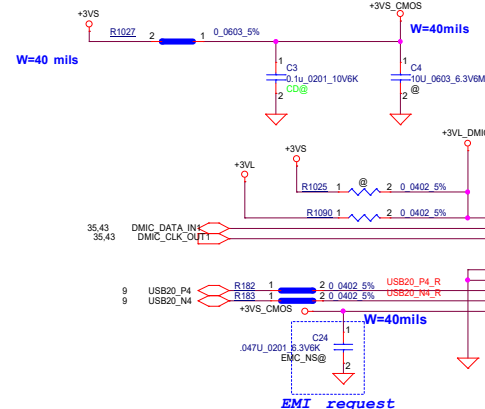


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|---|------------------------|-----------------|------------------------------|--|----------|----------|
| Issued Date | 2015/08/20 | Deciphered Date | 2016/08/20 | | TYPE-C-B | |
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| Rev | 1.0 | Document Number | ES322 | | Sheet | 33 of 61 |
| Date | Wednesday, 25/26, 2017 | Sheet | 33 of 61 | | | |

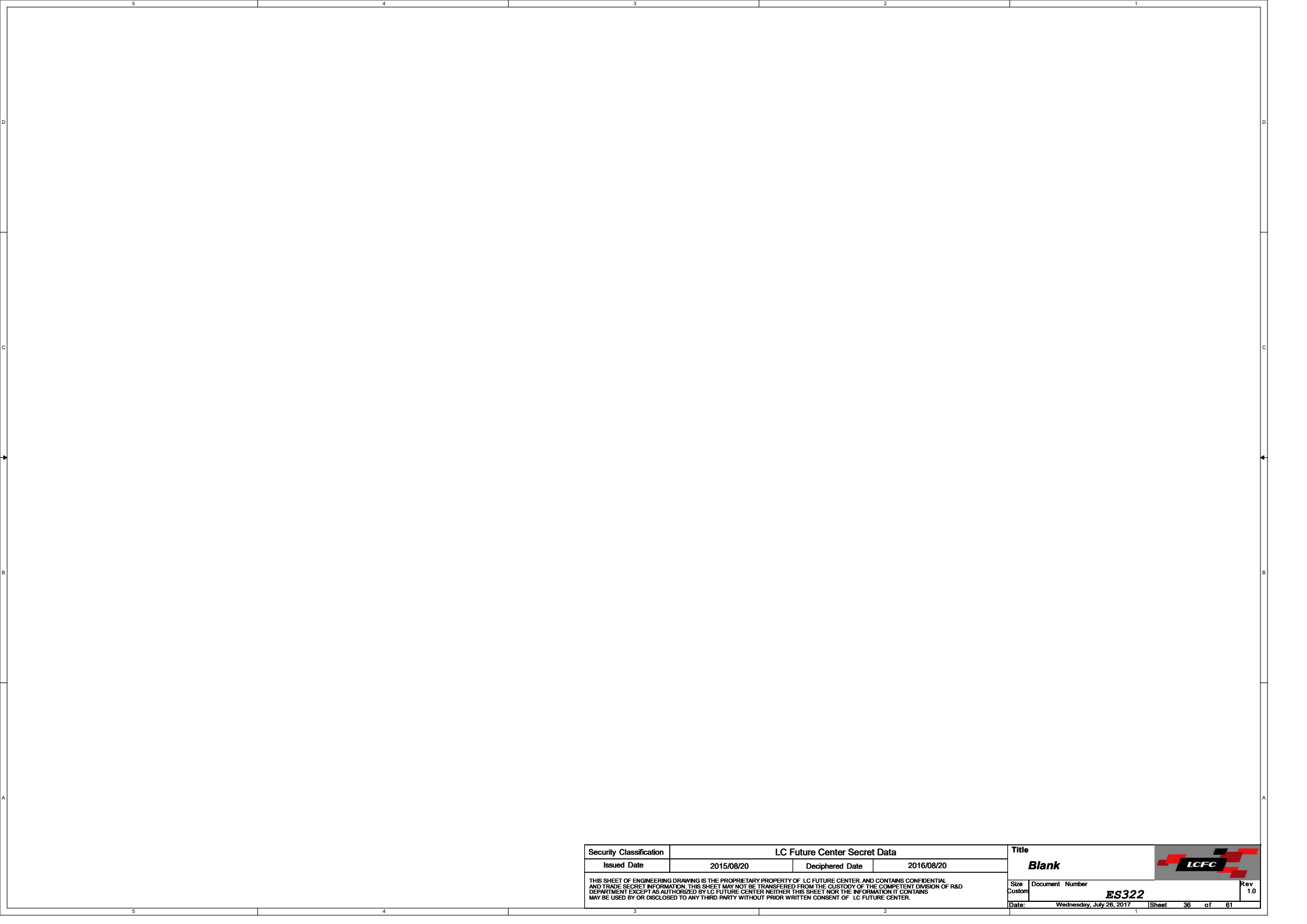
LCF POWER CIRCUIT



CMOS Camera



| | | | | |
|--|------------------------------|-----------------|------------|--------------------------|
| Security Classification | LC Future Center Secret Data | | Title | |
| Issued Date | 2015/08/20 | Deciphered Date | 2016/08/20 | eDP/CMOS/Touch screen/D |
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| Size | Document Number | ES322 | | Wednesday, July 26, 2017 |
| Date: | Sheet | 34 | of | 61 |



D

D

C



C

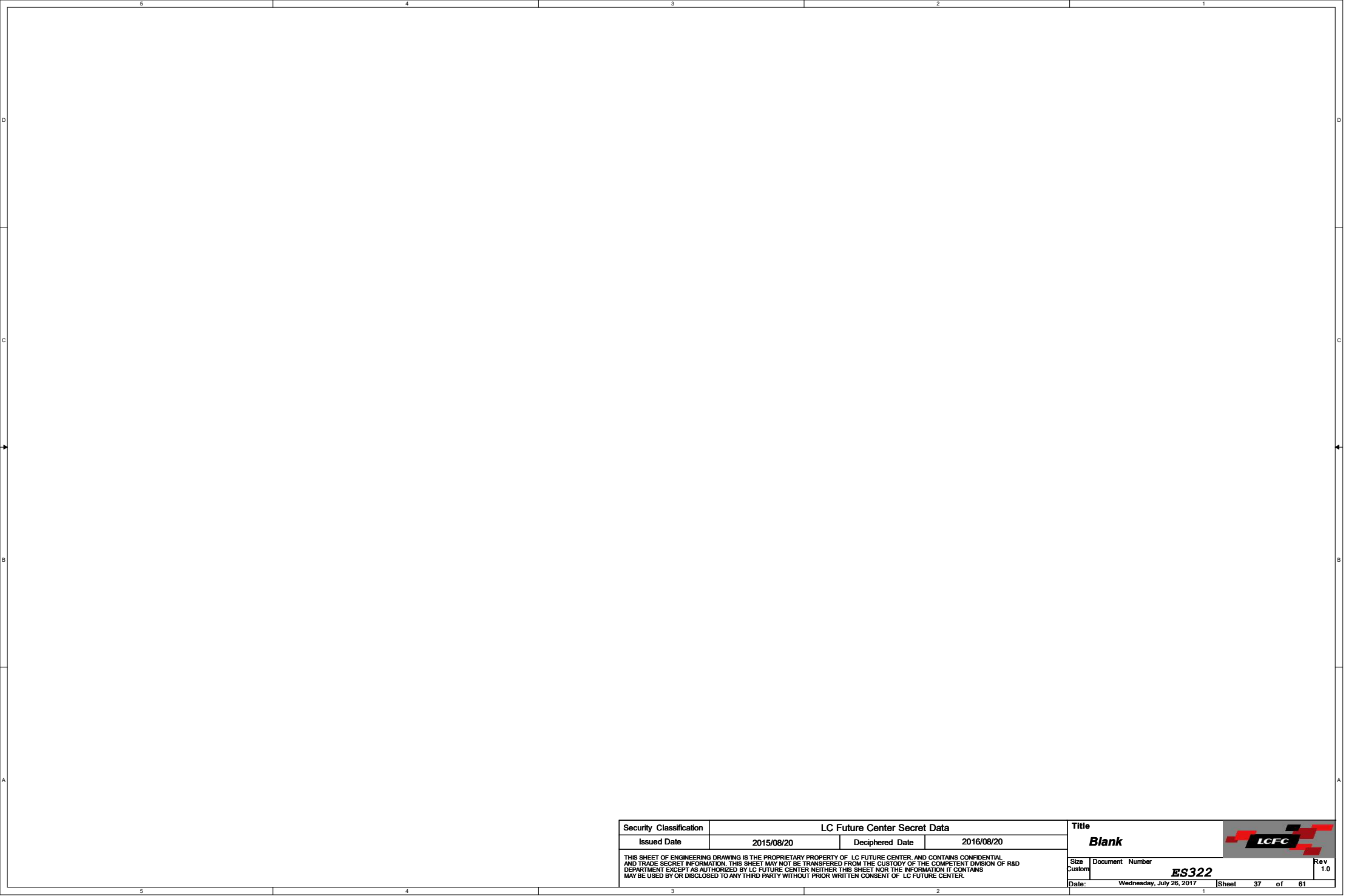
B


B

A

A

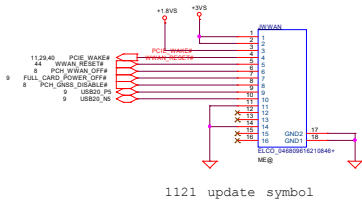
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| Issued Date | 2015/08/20 | Deciphered Date | 2016/08/20 | Blank | | | | |
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| | | | | Custom | ES322 | | | 1.0 |
| | | | | Date: | Wednesday, July 26, 2017 | | Sheet | 36 of 61 |



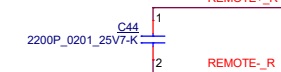
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| Security Classification | | LC Future Center Secret Data | | Title | |  | | | | | |
| Issued Date | | 2015/08/20 | | Deciphered Date | | | 2016/08/20 | | Blank | | |
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| | | | | | | Date: Wednesday, July 26, 2017 | | Sheet 37 of 61 | | | |

Mini Card(WWAN)

1.1A average

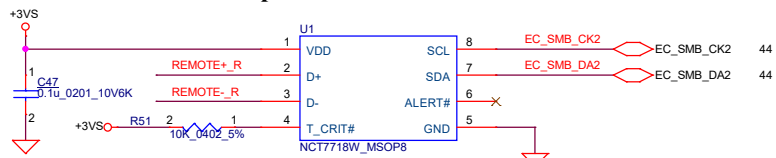


Close to U1



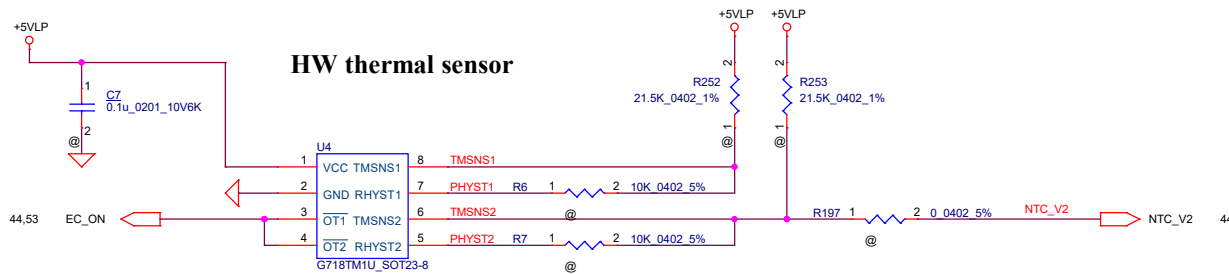
REMOTE+/-_R, REMOTE1+/-, REMOTE2+/-:
Trace width/space:10/10 mil
Trace length:<8"

SMSC thermal sensor placed near DIMM

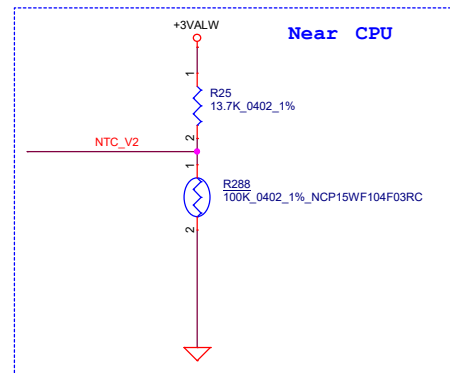
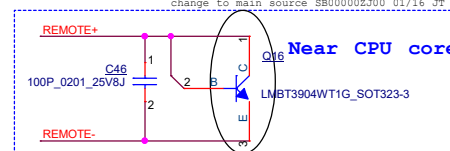


Address 1001_101xb

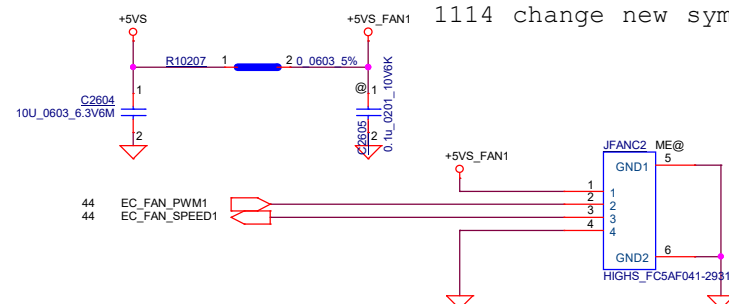
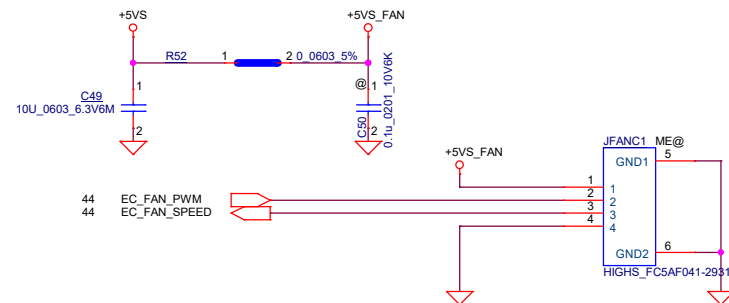
HW thermal sensor



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

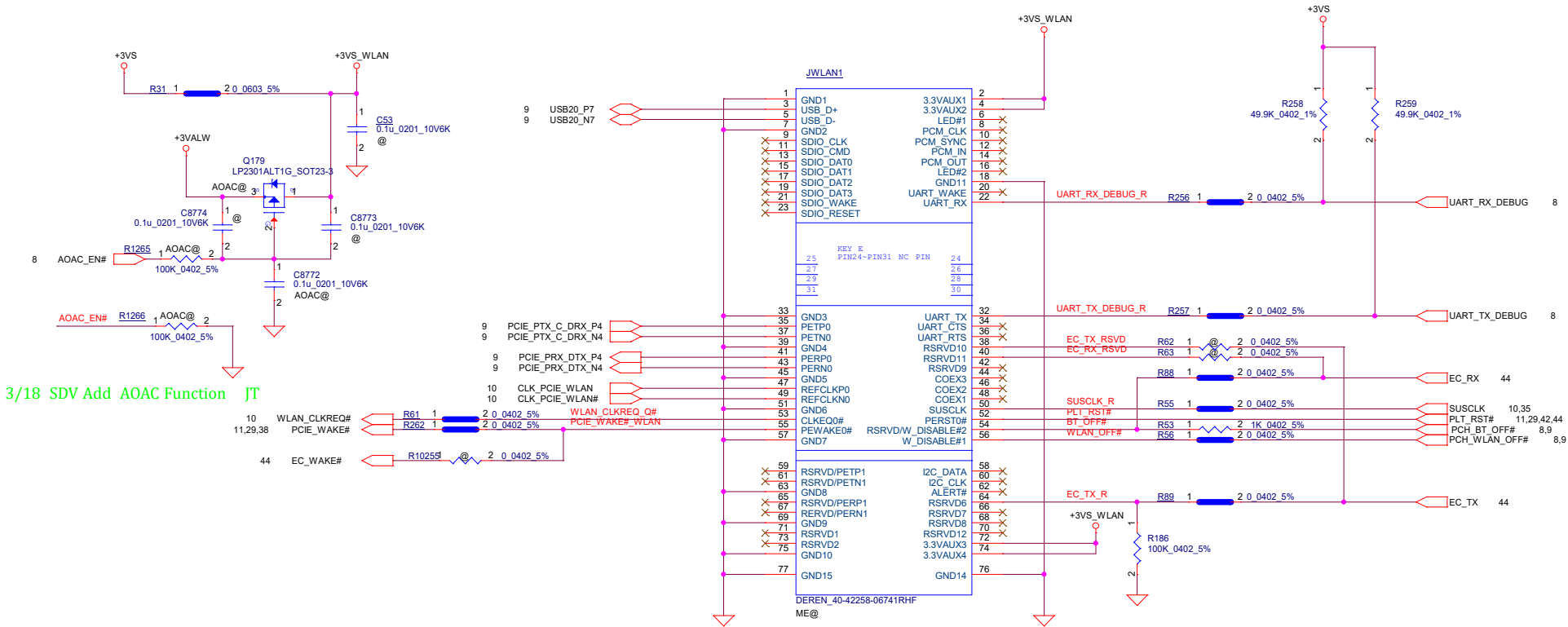


for layout optimized, change the EC_AGND to GND




| | | | | | | |
|--|------------------------------|-----------------|------------|-------|--------------------------|-----------------|
| Security Classification | LC Future Center Secret Data | | | Title | Thermal sensor/FAN CONN | |
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| | | | | Date: | Wednesday, July 26, 2017 | Sheet 39 of 61 |

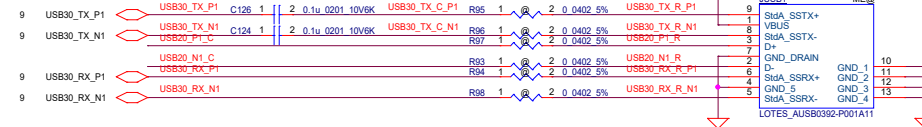
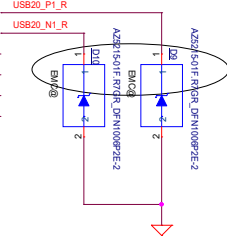
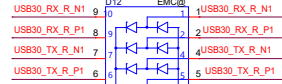
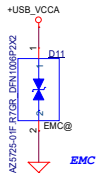
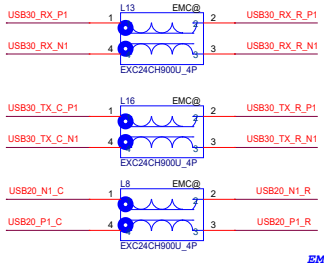
Mini-Express Card(WLAN/WiMAX)



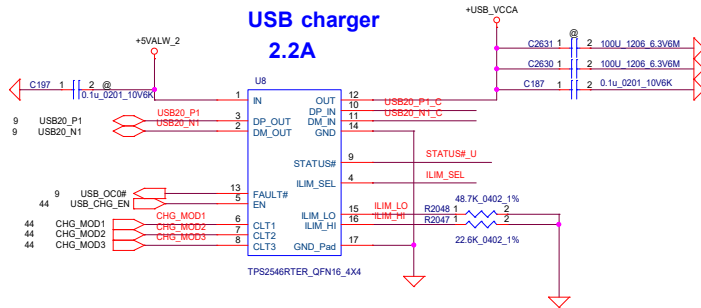
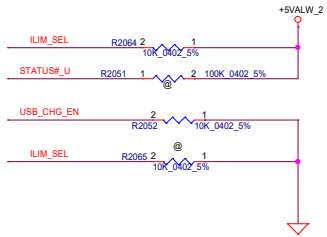
1114 change new symbol

| | | | | | | |
|---|------------|------------------------------|------------|-------------|--------------------------|---|
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| | | | | Date: | Wednesday, July 26, 2017 | Sheet 40 of 61 |

RIGHT SIDE USB3.0 PORT x1

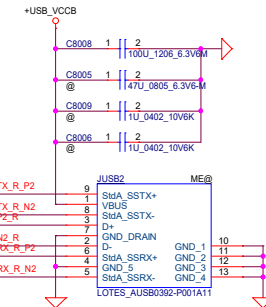
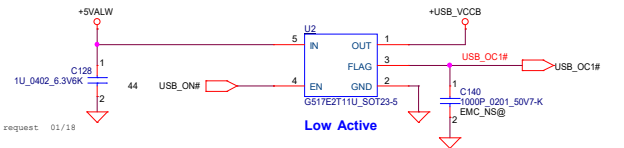
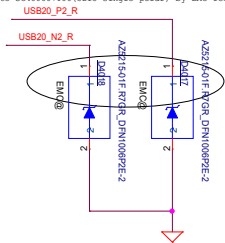
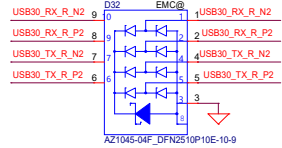
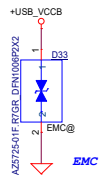
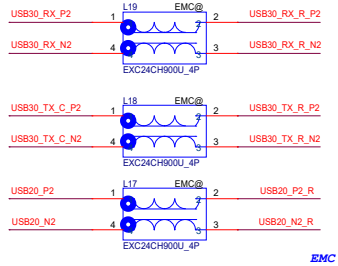


1125 update symbol






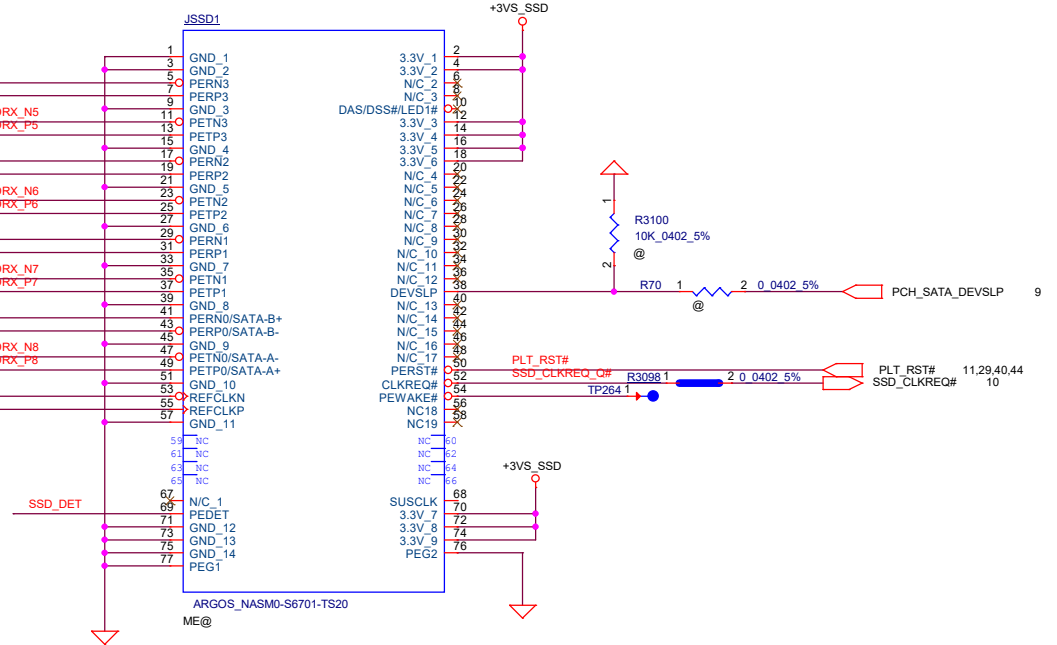
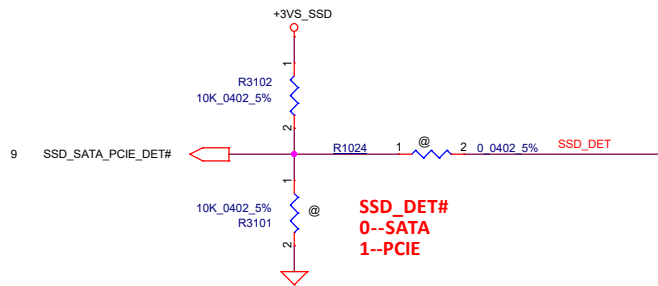
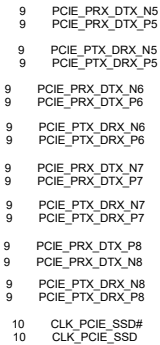
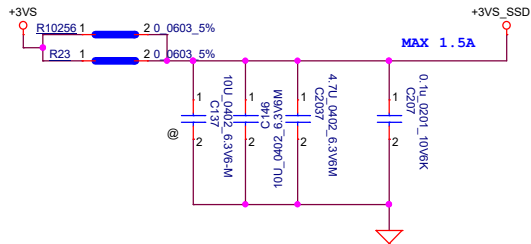
| | | | | | |
|--|---------------|------|------|------|--------|
| | pin number | 6 | 7 | 8 | 4 |
| | pin name | Ctl1 | Ctl2 | Ctl3 | ILM SE |
| Charge port Pin5 Enable H for all | S0 CDP | 1 | 1 | 1 | 1 |
| | S3 DCP | 0 | 1 | 1 | 0/1 |
| | S4/S5 DCP | 0 | 0 | 1 | 0/1 |
| Normal port Pin5 Enable H for 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




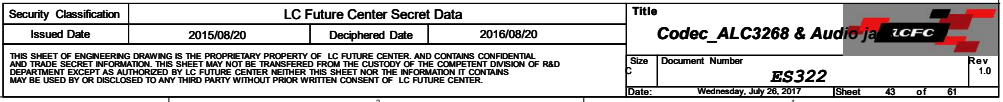
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1125 update symbol
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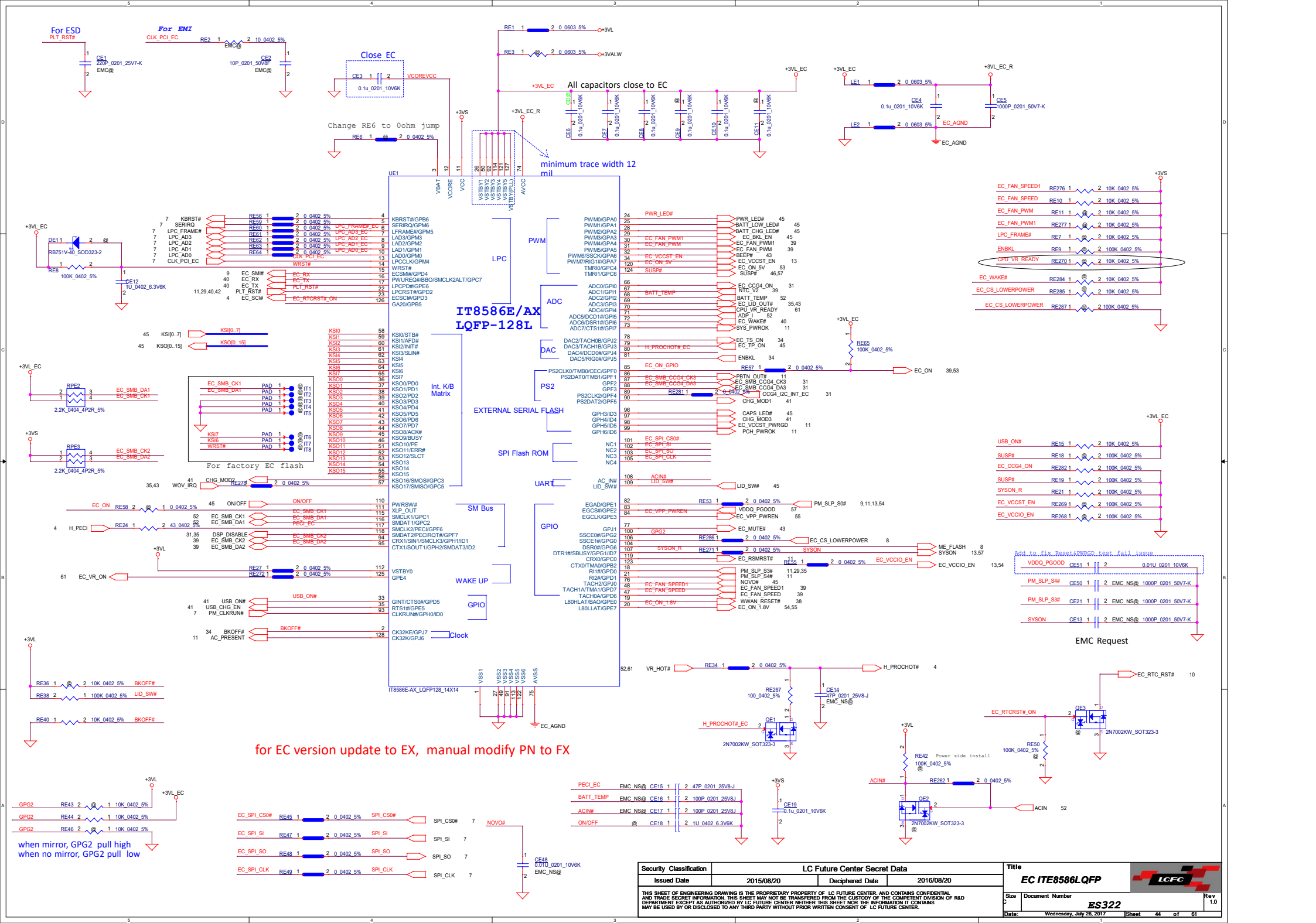
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|--|------------------------------|-----------------|------------|---|---|---|----------|
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| Issued Date | 2015/08/20 | Deciphered Date | 2016/08/20 |  | | | Rev 1.0 |
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| | | | | Date: | Wednesday, July 28, 2017 | Sheet | 41 of 61 |



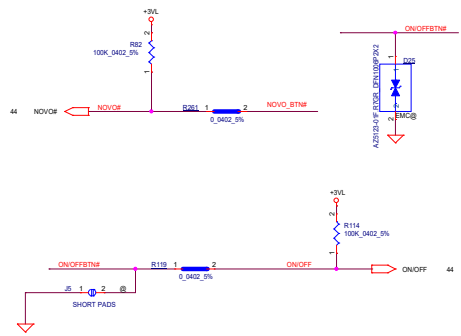
1110 change

| | | | | | | | | | | | | | | | |
|--|--|------------------------------|--|-----------------|--|------------|--|---|--|----------------|--|------------------------------|--|----------------|--|
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| | | | | | | | | | | Date: | | Wednesday, July 26, 2017 | | Sheet 42 of 61 | |
| | | | | | | | | | | | | | | | |

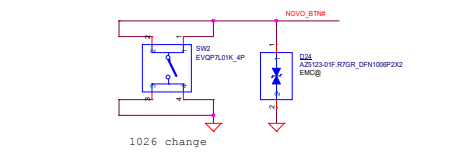




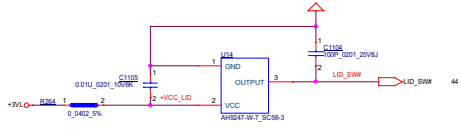
ON/OFF switch



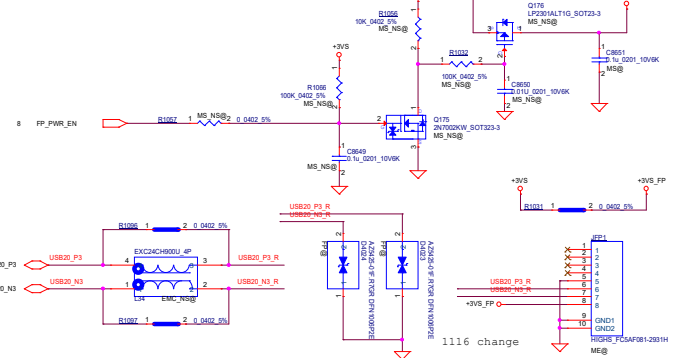
Novo button



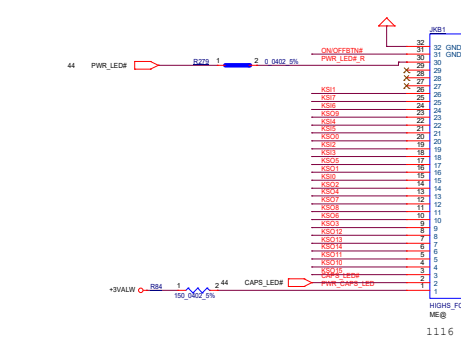
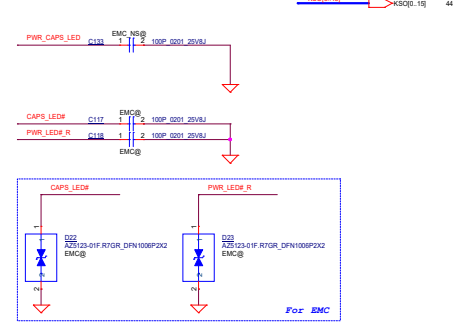
LID switch



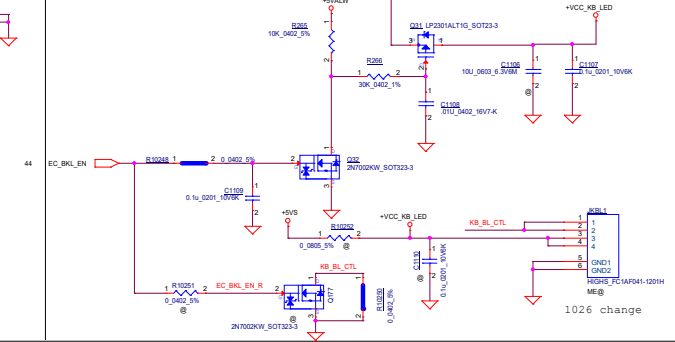
Finger Print Connector



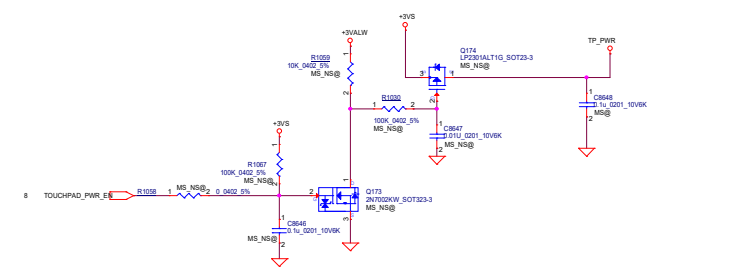
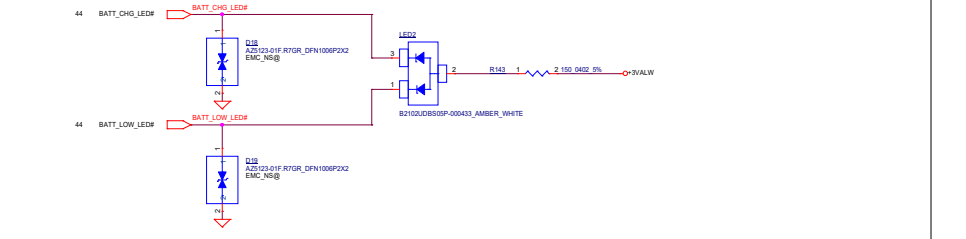
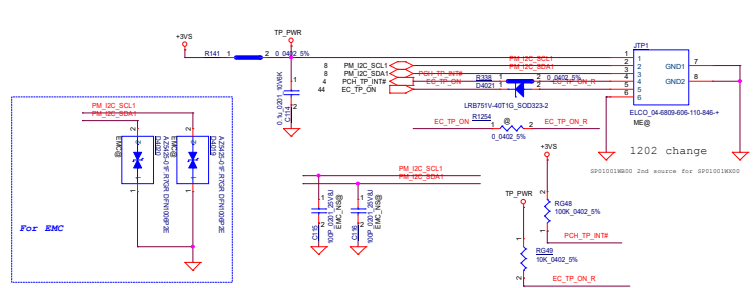
K/B Connector

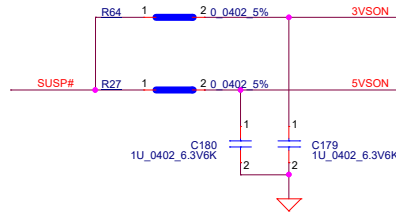


KB Backlight Connector



TP/B Connector

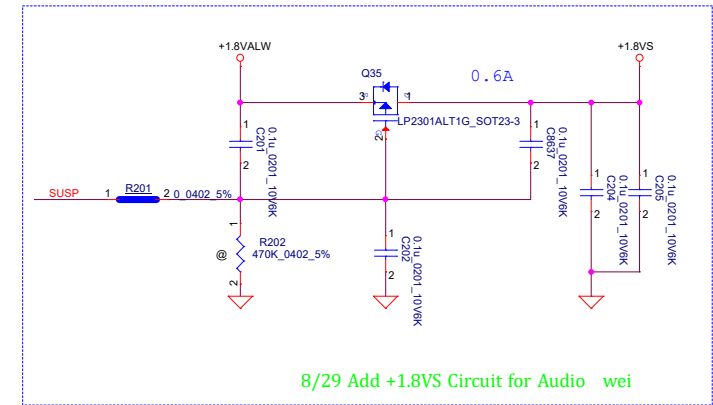
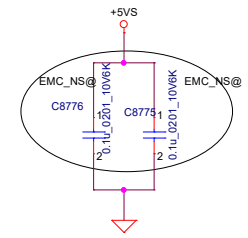
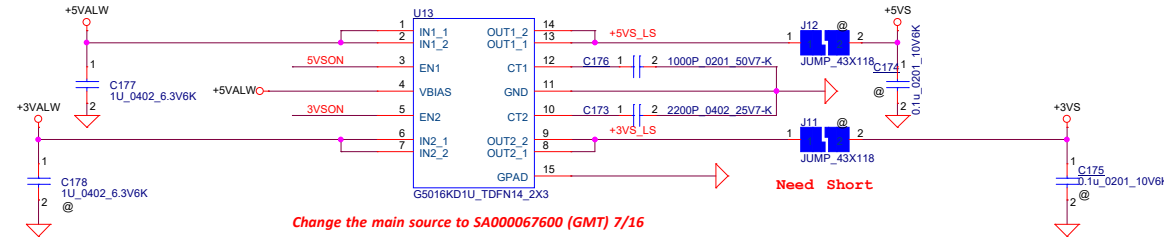




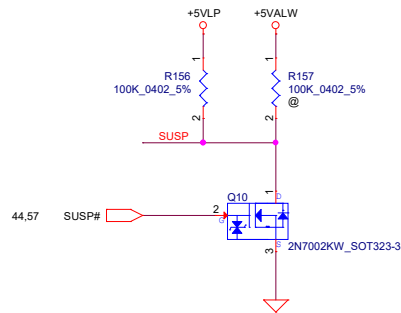
Load Switch
+5VALW To +5VS
+3VALW To +3VS

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

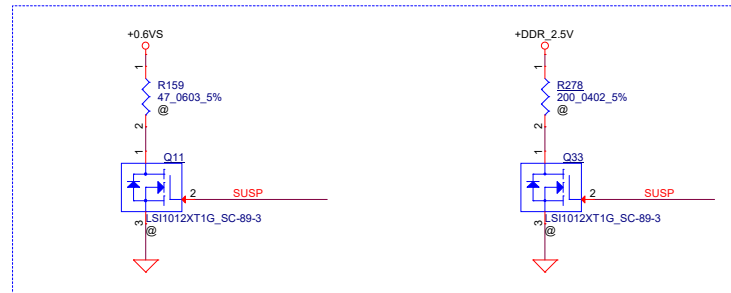
VIN 5V and 3.3V (VBIAS=5V), IMAx(per channel)=6A, Rds=16mohm



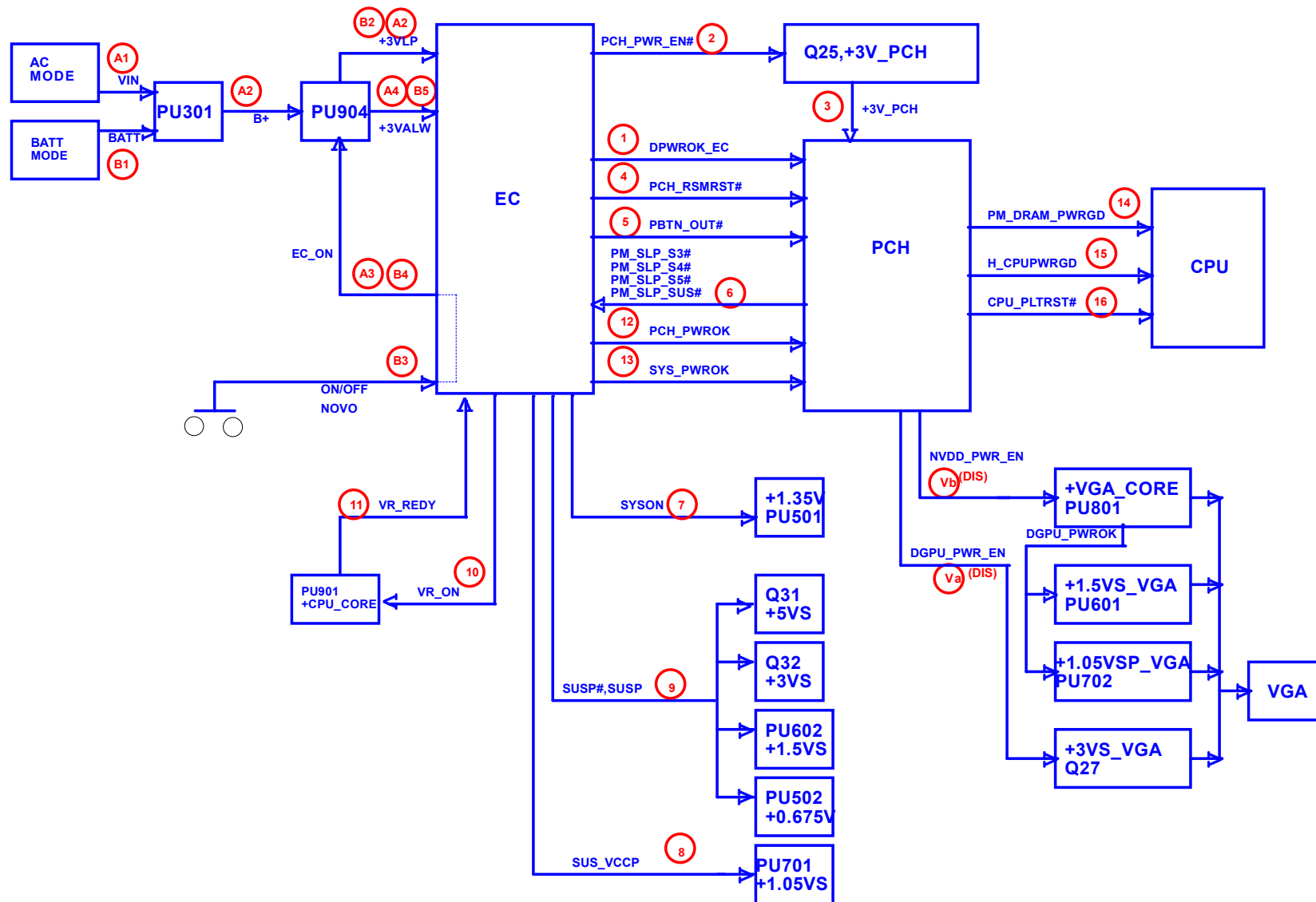
8/29 Add +1.8VS Circuit for Audio wei



For DisCharge



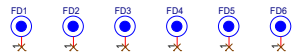
08/29: Need double check enable signal and the resistance



PCB And LOGO Config

| | | |
|------|---|------|
| PCB | <div> <div> <div>ZZZ1</div> <div>DA8@</div> </div> <div>PCB 16L NM-B491 REV0 M/B</div> </div> | LOGO |
| CPU | <div> <div> <div>ZZZ2</div> <div>I7@</div> </div> <div>S IC FJ8067703281816 QNBF Y0 1.8G BGA</div> </div> <div> <div> <div>ZZZ3</div> <div>I5@</div> </div> <div>S IC FJ8067703282221 QNEF Y0 1.6G BGA</div> </div> | |
| VRAM | <div> <div> <div>ZZZ4</div> <div>MIC8G@</div> </div> <div> <div>ZZZ5</div> <div>MIC4G@</div> </div> <div> <div>ZZZ6</div> <div>SAM8G@</div> </div> <div> <div>ZZZ7</div> <div>SAM4G@</div> </div> <div> <div>ZZZ9</div> <div>HY4G@</div> </div> <div> <div>ZZZ10</div> <div>HY8G@</div> </div> </div> <div> <div>MICRON8G</div> <div>MICRON 4G</div> <div>SAMSUNG 8G</div> <div>SAMSUNG 4G</div> <div>HYNIX 4G</div> <div>HYNIX 8G</div> </div> | |

PCB Federal Mark PAD

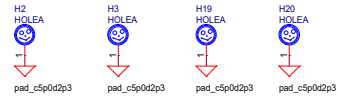


Pad_o2p0x2p2d2p0x2p2n



Pad_o2p0x2p2d2p0x2p2n

pad_c5p0d2p3



pad_c5p0d3p2



pad_c4p5d2p3



pad_o1p2x2p8d1p2x2p8n



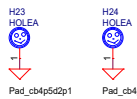
pad_o1p2x2p8d1p2x2p8n

pad_o4p0x2p0d4p0x2p0n



pad_o4p0x2p0d4p0x2p0n

Pad_cb4p5d2p1



Pad_ct4p0b4p5d2p1



Pad_ct4p0b4p5d2p1

Pad_o7p0x9p0d4p0x6p0



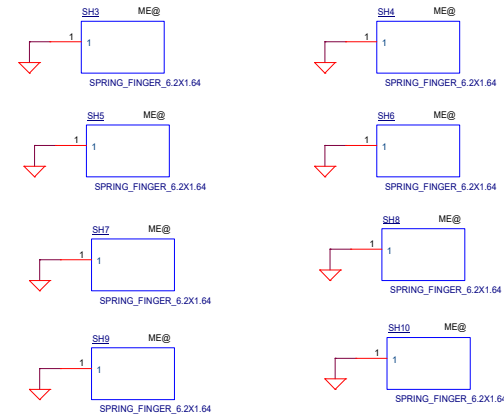
Pad_o7p0x9p0d4p0x6p0

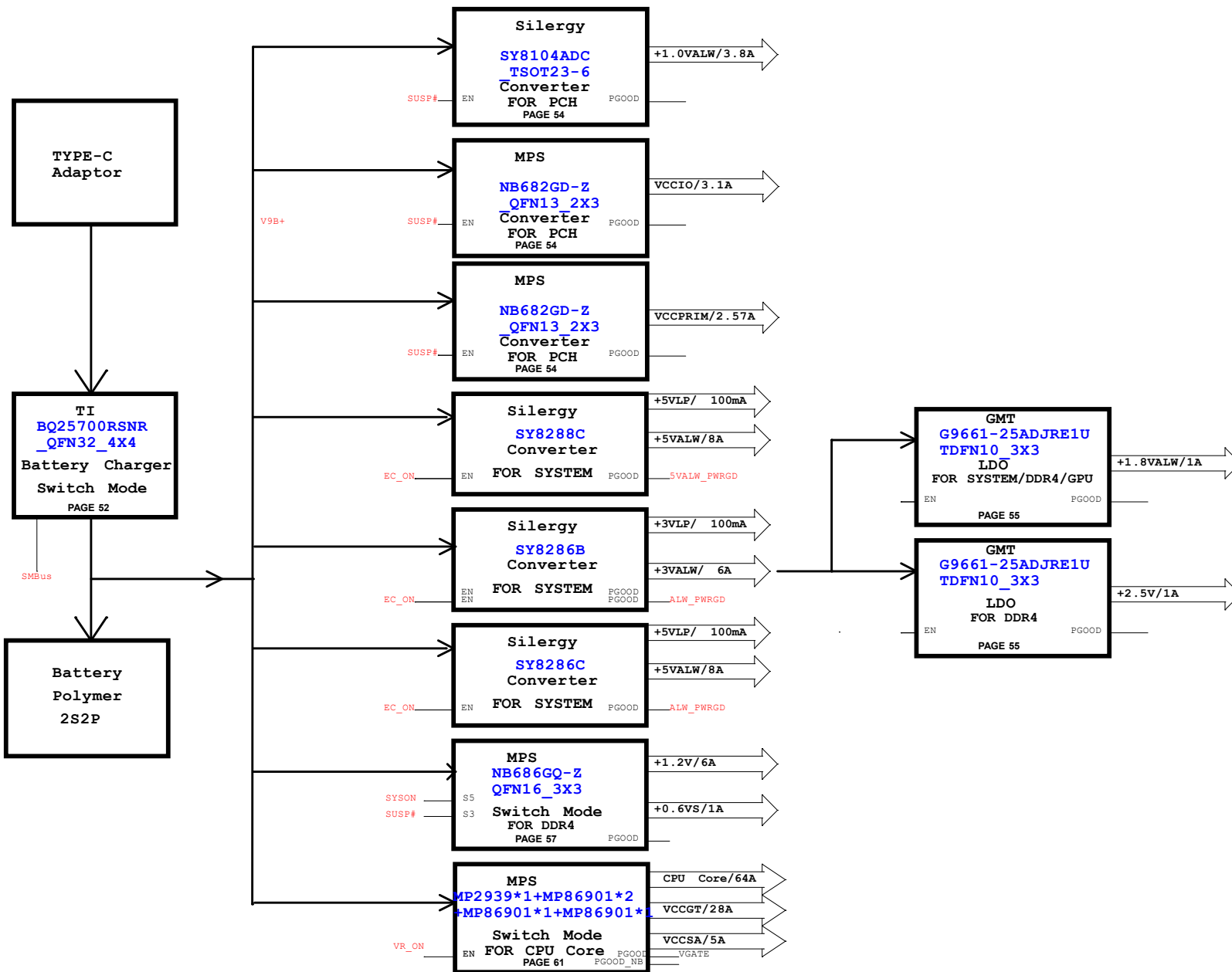
PAD_C2P3D2P3N

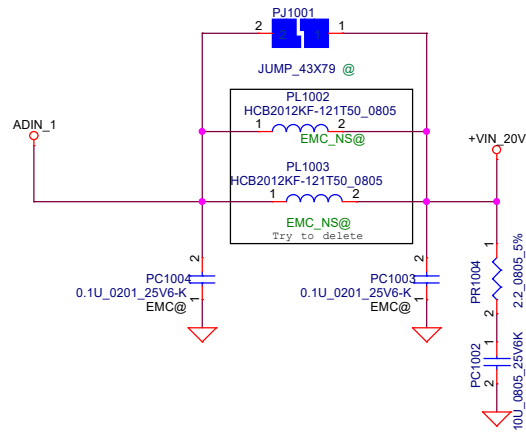
EMI-STOP_SUL-15A2




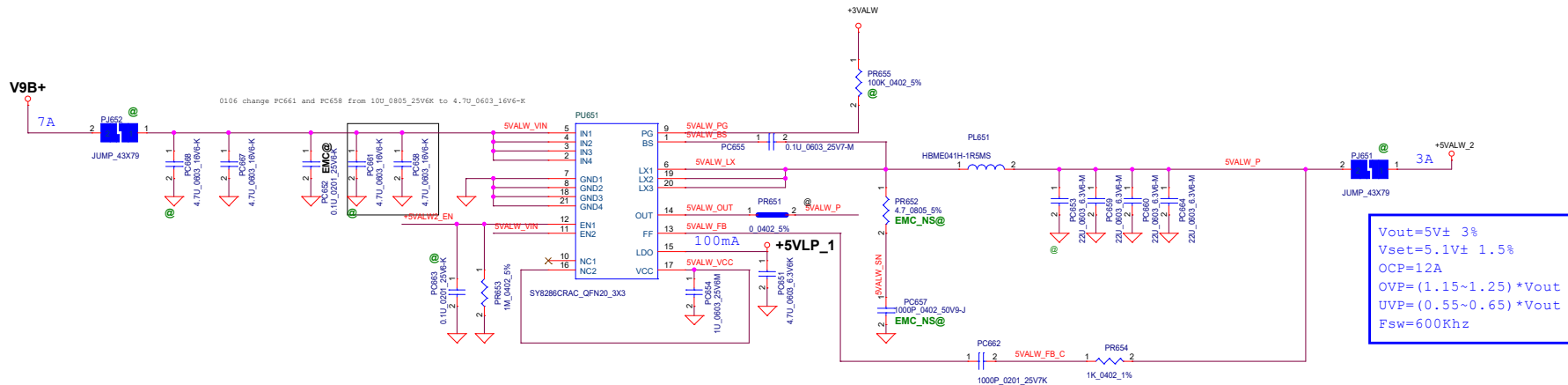
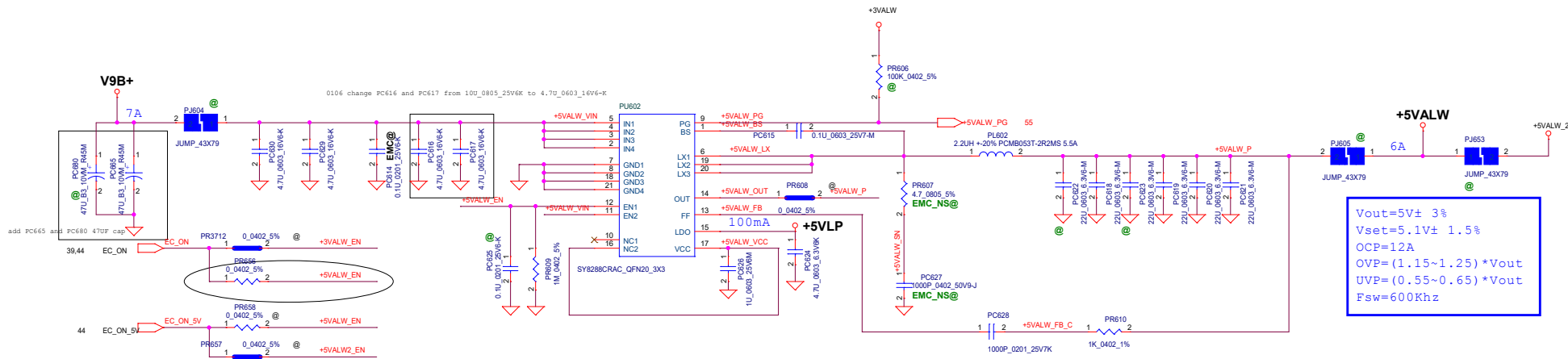
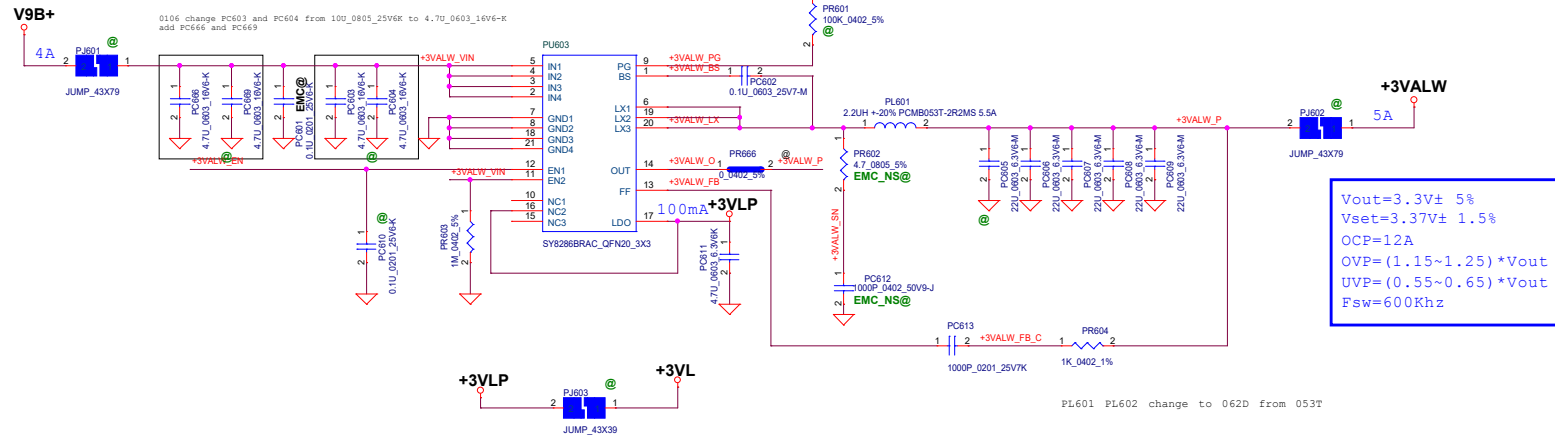
EMI-STOP_SML-08A2M

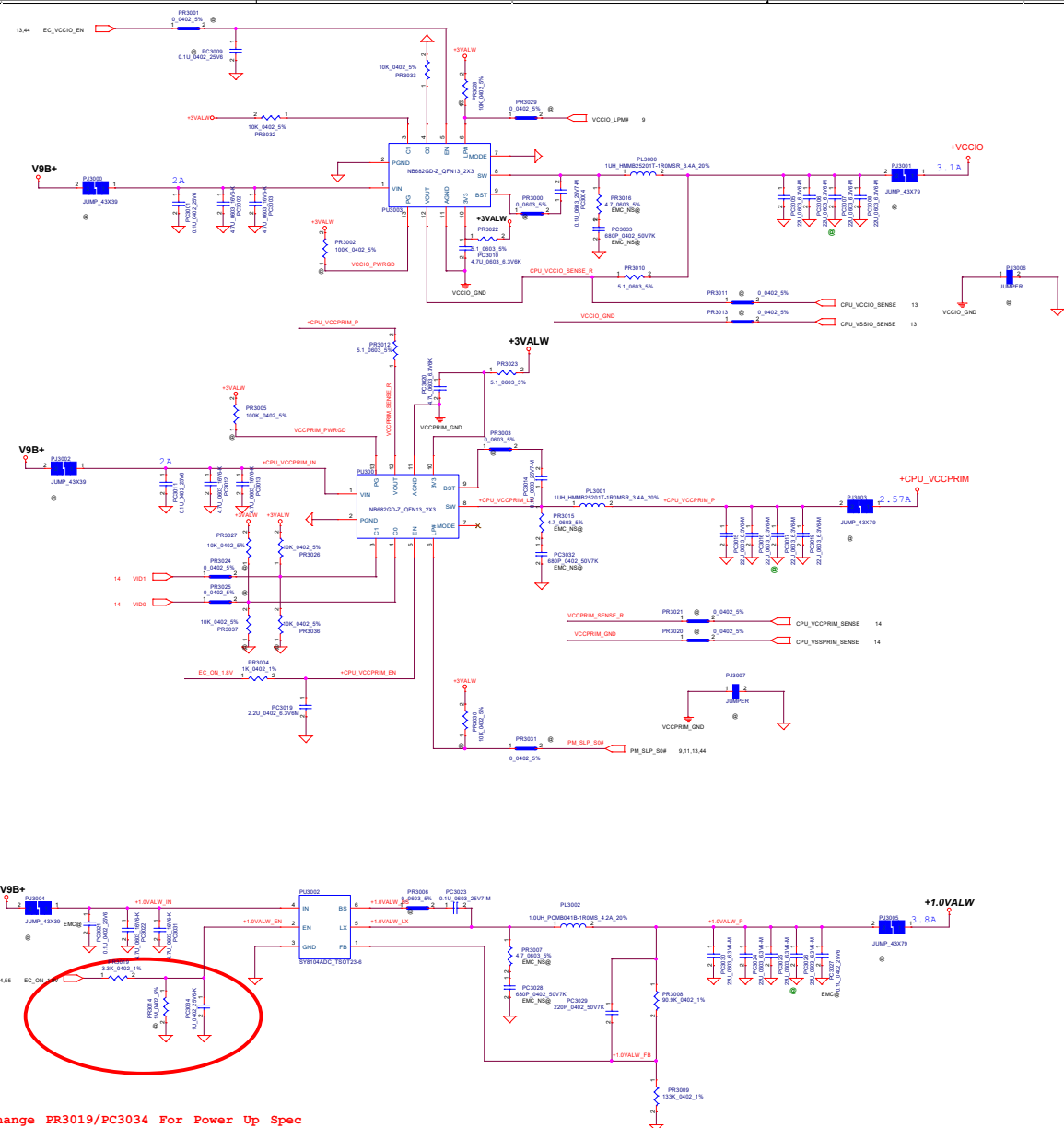


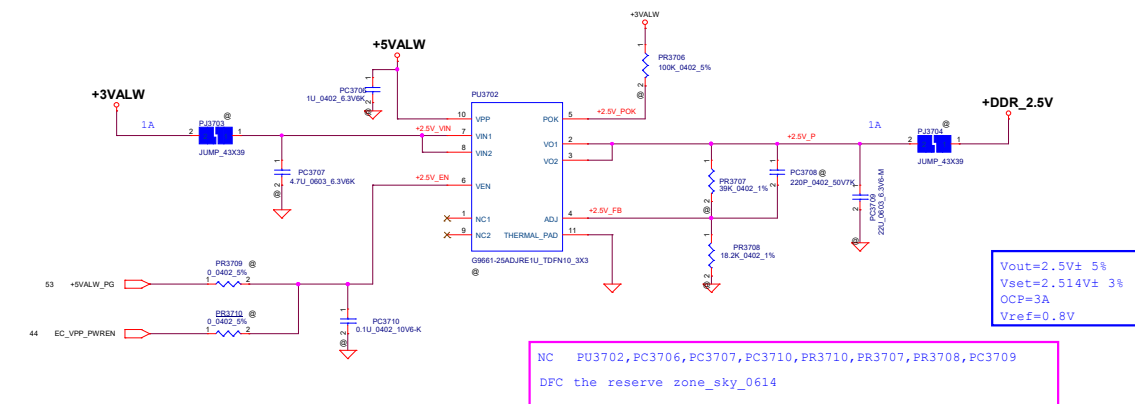
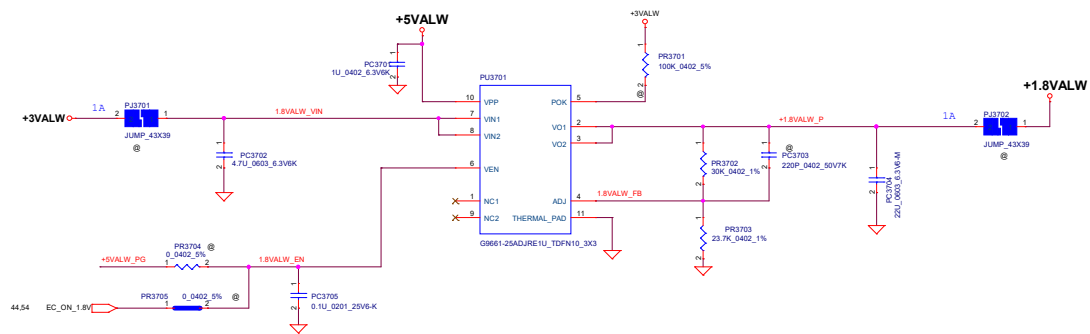




| | | | | | | |
|---|------------|------------------------------|------------|--------------------------------|-----------------------|---|
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| Issued Date | 2016/01/20 | Deciphered Date | 2016/01/20 | PWR-XXXX | | |
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| | | | | Date: Wednesday, July 26, 2017 | Sheet 51 of 61 | |

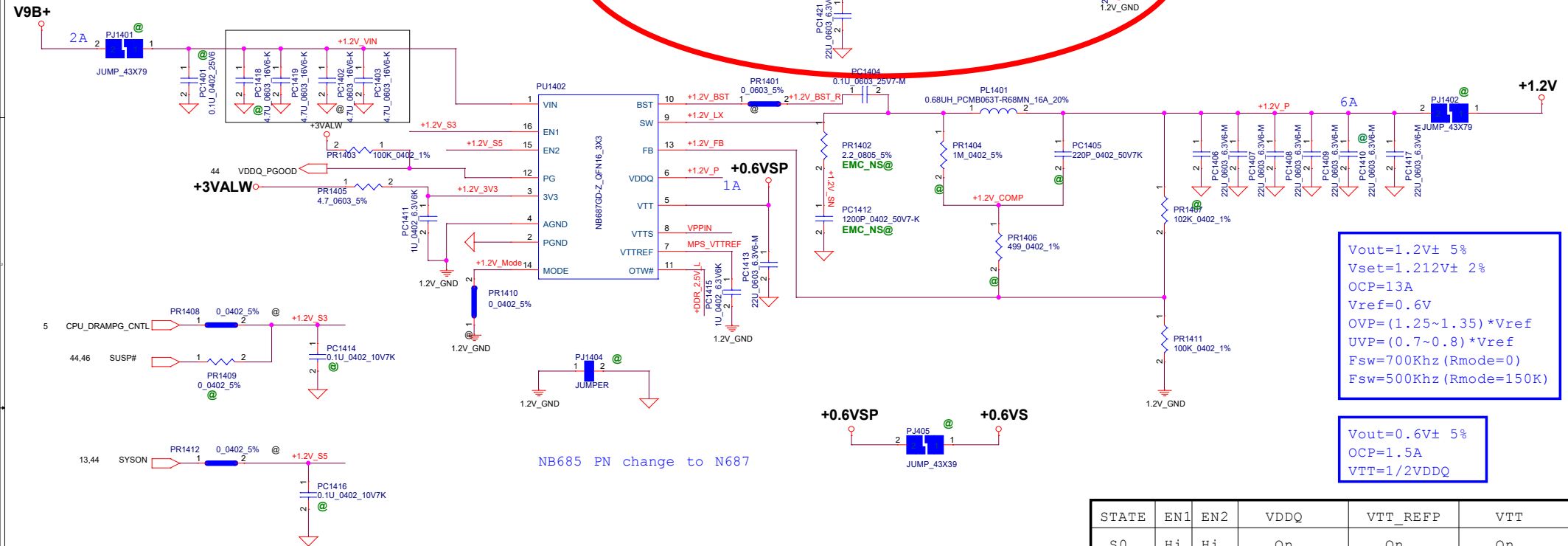
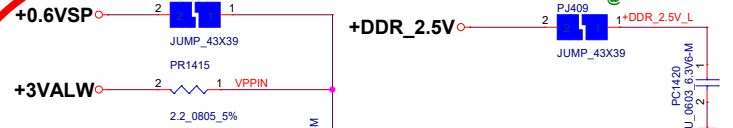






0106 change PC1402 and PC1403 from 10U_0805_25V6K to 4.7U_0603_16V6-K
add PC1418,PC1419


NB687 must add below circuit



NB685 PN change to N687

| STATE | EN1 | EN2 | VDDQ | VTT_REFP | VTT |
|-------|-----|-----|------|----------|---------------|
| S0 | Hi | Hi | On | On | On |
| S3 | Lo | Hi | On | On | Off (Hi-Z) |
| S4/S5 | Lo | Lo | Off | Off | Off |

Note: S3 - sleep ; S5 - power off

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|------------------------------|-----------------|------------|--|-------------------------|------------------------------|-----|---|-------|-------------|------------|-----------------|------------|-------|--|--|--|--|--|------|-----------------|-----|---|-------|-----|--------------------------------|--|--|--|----------------|
| 5 | 4 | 3 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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&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>ES322</td><td>1.0</td></tr></table></td></tr><tr><td colspan="4">Date: Wednesday, July 26, 2017</td><td>Sheet 58 of 61</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>ES322</td><td>1.0</td></tr></table> | Size | Document Number | Rev | C | ES322 | 1.0 | Date: Wednesday, July 26, 2017 | | | | Sheet 58 of 61 |
| Security Classification | LC Future Center Secret Data | | | Title | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Issued Date | 2015/08/20 | Deciphered Date | 2016/08/20 | Blank | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Size | Document Number | Rev | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | ES322 | 1.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date: Wednesday, July 26, 2017 | | | | Sheet 58 of 61 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 4 | 3 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | 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 | 130 | 1.18K |
| PR2668 | NA | 0 |
| PR2669 | NA | 0 |
| PR2631 | 1K | NA |

