


# Nozomi-4 UMA SOVP LOGIC SCHEMATICS

**NZM4I-7**  
**VER 7.53**  
**MAR/19/2012**

BASE LOGIC :Nozomi-4 UMA SVT  
VER 7.02  
Jan/17/2012

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- 85.DC/DC VCC1R5A(VT357)
- 86.DC/DC VCC0R75B(MAX1510)
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- 88.BLANK
- 89.DC/DC VCC1R8B(BD9139)
- 90.DC/DC VCCSA(VT370)
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|   |                       |               |
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# EC HISTORY

## Nozomi-4 UMA MFVT (BASE LOGIC :Nozomi-4 SWG MFVT VER 2.06 May/31/2011)

VER.2.00 06/01/2011 APPLIED UMA MFVT\_EC001-006  
VER.2.01 06/02/2011 APPLIED UMA MFVT\_EC007-011  
VER.2.02 06/03/2011 APPLIED UMA MFVT\_EC012  
VER.2.03 06/06/2011 APPLIED UMA MFVT\_EC013-015  
VER.2.04 06/07/2011 APPLIED UMA MFVT\_EC016,019,020  
VER.2.05 06/08/2011 APPLIED UMA MFVT\_EC027  
VER.2.06 06/09/2011 APPLIED UMA MFVT\_EC030,032,033,036,037  
VER.2.07 06/14/2011 APPLIED UMA MFVT\_EC039  
VER.2.08 06/21/2011 APPLIED UMA MFVT\_EC042

## Nozomi-4 UMA FVT (BASE LOGIC :Nozomi-4 UMA MFVT VER 2.08 Jun/21/2011)

VER.3.00 06/23/2011 APPLIED UMA FVT\_EC001-003  
VER.3.01 07/01/2011 APPLIED UMA FVT\_EC007  
VER.3.02 07/04/2011 APPLIED UMA FVT\_EC004,008-010  
VER.3.03 07/05/2011 APPLIED UMA FVT\_EC011-014  
VER.3.04 07/06/2011 APPLIED UMA FVT\_EC015-021  
VER.3.05 07/08/2011 APPLIED UMA FVT\_EC024-029  
VER.3.06 07/11/2011 APPLIED UMA FVT\_EC030  
VER.3.07 07/12/2011 APPLIED UMA FVT\_EC034,036  
VER.3.08 07/13/2011 APPLIED UMA FVT\_EC037,038  
VER.3.09 07/14/2011 APPLIED UMA FVT\_EC040-043,046,047,049,050,053  
VER.3.10 07/15/2011 APPLIED UMA FVT\_EC054  
VER.3.11 07/19/2011 APPLIED UMA FVT\_EC042,055-058  
VER.3.12 07/21/2011 APPLIED UMA FVT\_EC059-062  
VER.3.13 07/22/2011 APPLIED UMA FVT\_EC063  
VER.3.14 07/26/2011 APPLIED UMA FVT\_EC064,065

## Nozomi-4 UMA SIT (BASE LOGIC :Nozomi-4 UMA FVT VER 3.14 Jul/26/2011)

VER.4.00 08/01/2011 APPLIED UMA SIT\_EC001-007  
VER.4.01 08/02/2011 APPLIED UMA SIT\_EC008-010  
VER.4.02 08/03/2011 APPLIED UMA SIT\_EC011  
VER.4.03 08/04/2011 APPLIED UMA SIT\_EC012-014  
VER.4.04 08/05/2011 APPLIED UMA SIT\_EC015-017  
VER.4.05 08/17/2011 APPLIED UMA SIT\_EC018-025,027  
VER.4.06 08/22/2011 APPLIED UMA SIT\_EC028,031-033  
VER.4.07 08/23/2011 APPLIED UMA SIT\_EC035,037  
VER.4.08 08/24/2011 APPLIED UMA SIT\_EC038-042  
VER.4.09 08/25/2011 APPLIED UMA SIT\_EC030,044-046  
VER.4.10 08/26/2011 APPLIED UMA SIT\_EC047,048  
VER.4.11 08/29/2011 APPLIED UMA SIT\_EC049  
VER.4.12 09/01/2011 APPLIED UMA SIT\_EC051-053  
VER.4.13 09/05/2011 APPLIED UMA SIT\_EC054,055  
VER.4.14 09/07/2011 APPLIED UMA SIT\_EC056,061-070  
VER.4.15 09/08/2011 APPLIED UMA SIT\_EC071-079  
VER.4.16 09/09/2011 APPLIED UMA SIT\_EC082,084,085  
VER.4.17 09/12/2011 APPLIED UMA SIT\_EC088,089  
VER.4.18 09/13/2011 APPLIED UMA SIT\_EC090  
VER.4.19 09/15/2011 APPLIED UMA SIT\_EC092,093  
VER.4.20 09/21/2011 APPLIED UMA SIT\_EC094

## Nozomi-4 UMA SIT-R1 (BASE LOGIC :Nozomi-4 UMA SIT VER 4.20 Sep/21/2011)

VER.5.00 09/27/2011 APPLIED UMA SITR\_EC001-003  
VER.5.01 10/11/2011 APPLIED UMA SITR\_EC004,005  
VER.5.02 10/28/2011 APPLIED UMA SITR\_EC006  
VER.5.03 10/31/2011 APPLIED UMA SITR\_EC007-010  
VER.5.04 11/01/2011 APPLIED UMA SITR\_EC012  
VER.5.05 11/02/2011 APPLIED UMA SITR\_EC013  
VER.5.06 11/04/2011 APPLIED UMA SITR\_EC015,016,018  
VER.5.07 11/07/2011 APPLIED UMA SITR\_EC019  
VER.5.08 11/09/2011 APPLIED UMA SITR\_EC014  
VER.5.09 11/10/2011 APPLIED UMA SITR\_EC020  
VER.5.10 11/15/2011 APPLIED UMA SITR\_EC021

## Nozomi-4 UMA SIT-R2 (BASE LOGIC :Nozomi-4 UMA SIT -R1 VER 5.10 Nov/15/2011)

VER.6.00 11/18/2011 APPLIED UMA SITR2\_EC001-003  
VER.6.01 11/22/2011 APPLIED UMA SITR2\_EC006  
VER.6.02 11/25/2011 APPLIED UMA SITR2\_EC007  
VER.6.03 11/28/2011 APPLIED UMA SITR2\_EC008  
VER.6.04 11/29/2011 APPLIED UMA SITR2\_EC009,010  
VER.6.05 11/30/2011 APPLIED UMA SITR2\_EC011,012  
VER.6.06 12/01/2011 APPLIED UMA SITR2\_EC015  
VER.6.07 12/05/2011 APPLIED UMA SITR2\_EC017

## Nozomi-4 UMA SVT (BASE LOGIC :Nozomi-4 UMA SIT-R2 VER 6.07 Dec/05/2011)

VER.7.00 12/13/2011 APPLIED UMA SVT\_EC001-005  
VER.7.01 12/15/2011 APPLIED UMA SVT\_EC006-008  
VER.7.02 01/17/2012 APPLIED UMA SVT\_EC012

## Nozomi-4 UMA SOVP (BASE LOGIC :Nozomi-4 UMA SVT VER 7.02 Jan/17/2011)

VER.7.50 02/24/2012 APPLIED UMA SOVP\_EC001-003  
VER.7.51 03/05/2012 APPLIED UMA SOVP\_EC004  
VER.7.52 03/08/2012 APPLIED UMA SOVP\_EC005  
VER.7.53 03/19/2012 APPLIED UMA SOVP\_EC006



|                                  |                   |                       |       |
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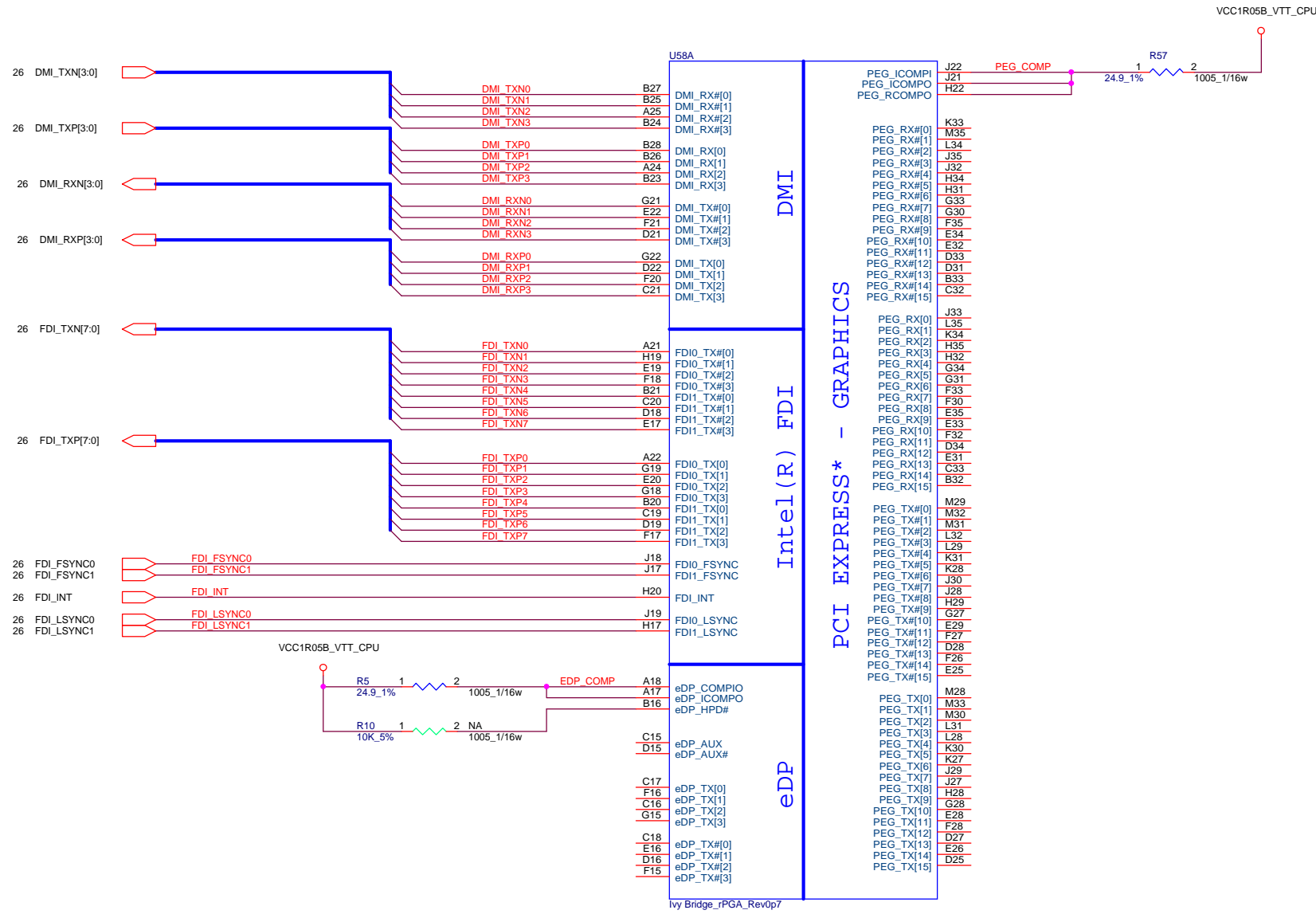
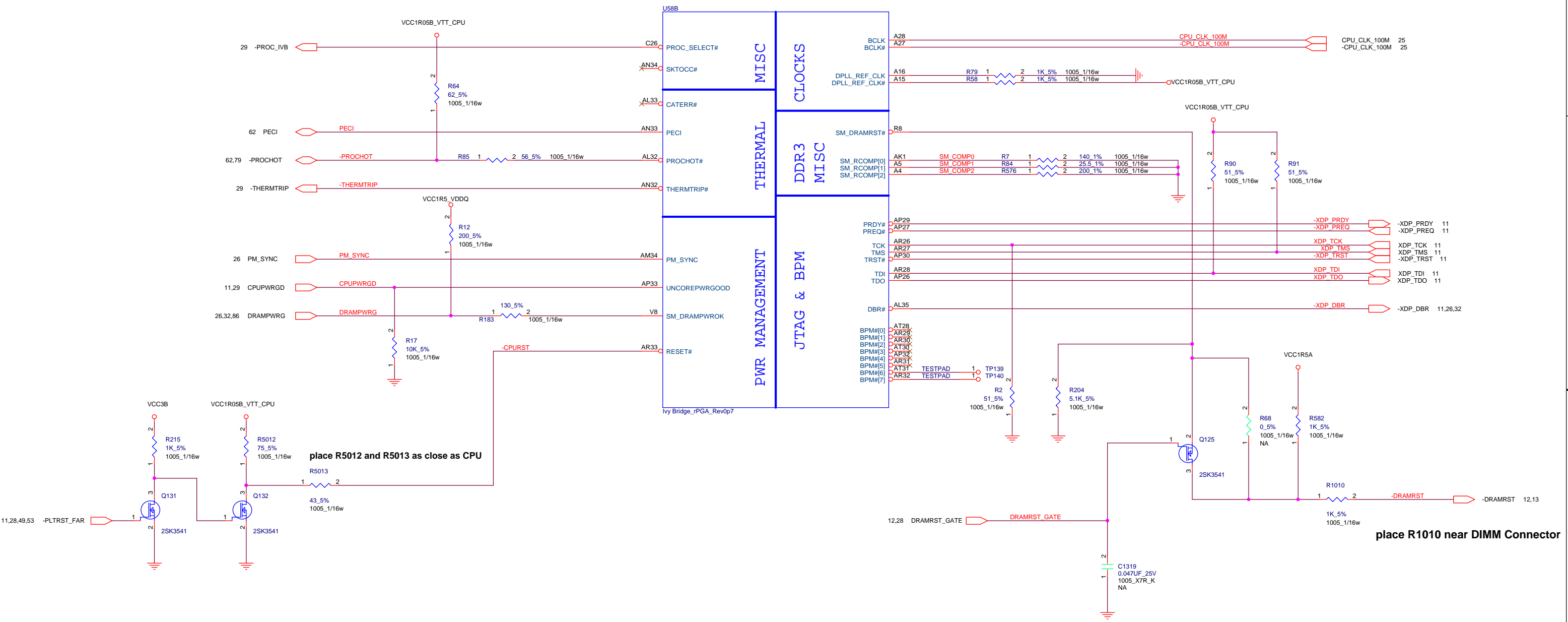


TABLE PROC\_SELECT#(-PROC\_IVB)

|              |      |
|--------------|------|
| Sandy Bridge | High |
| Ivy Bridge   | Low  |

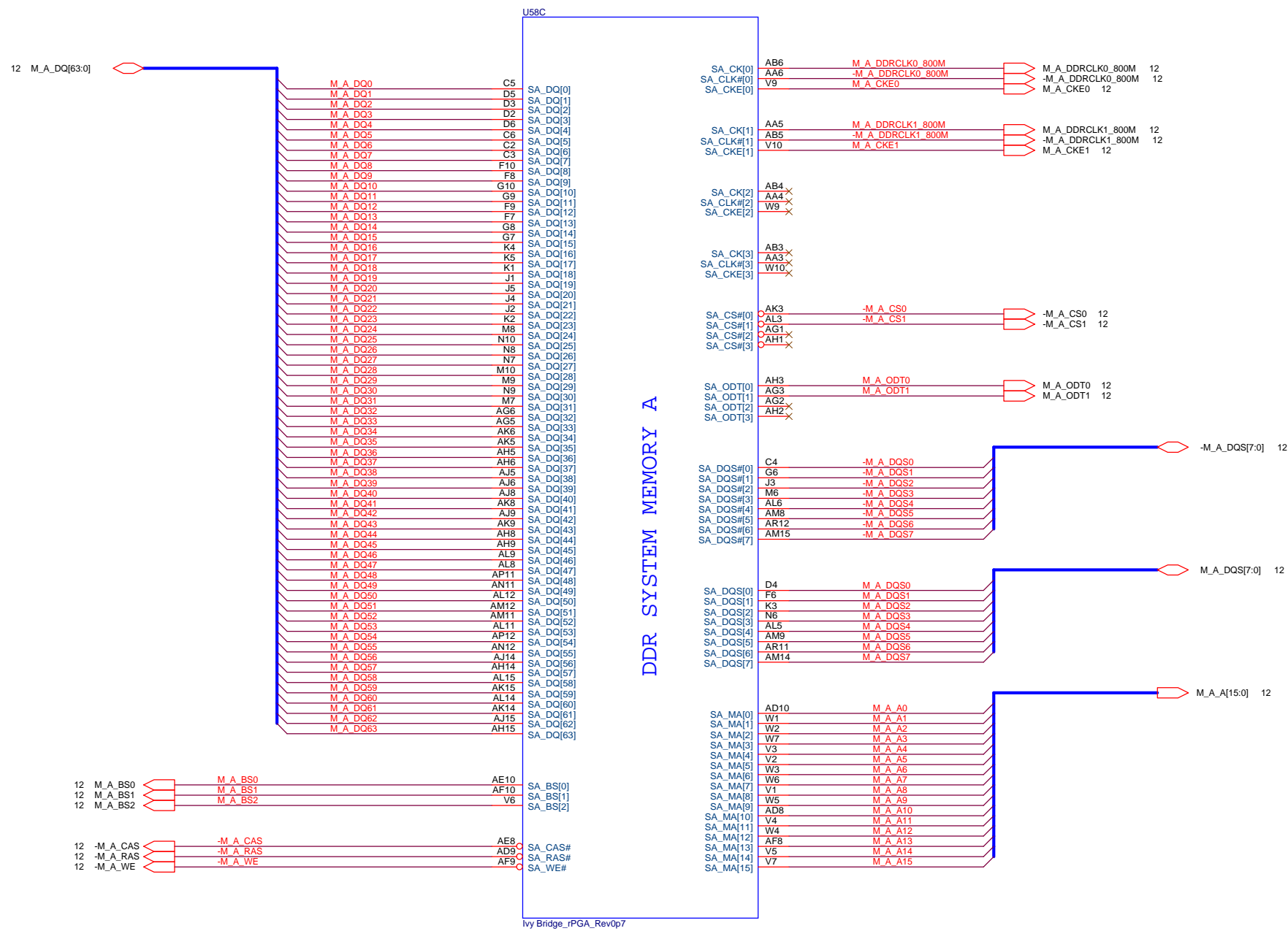


place R5012 and R5013 as close as CPU

place R1010 near DIMM Connector

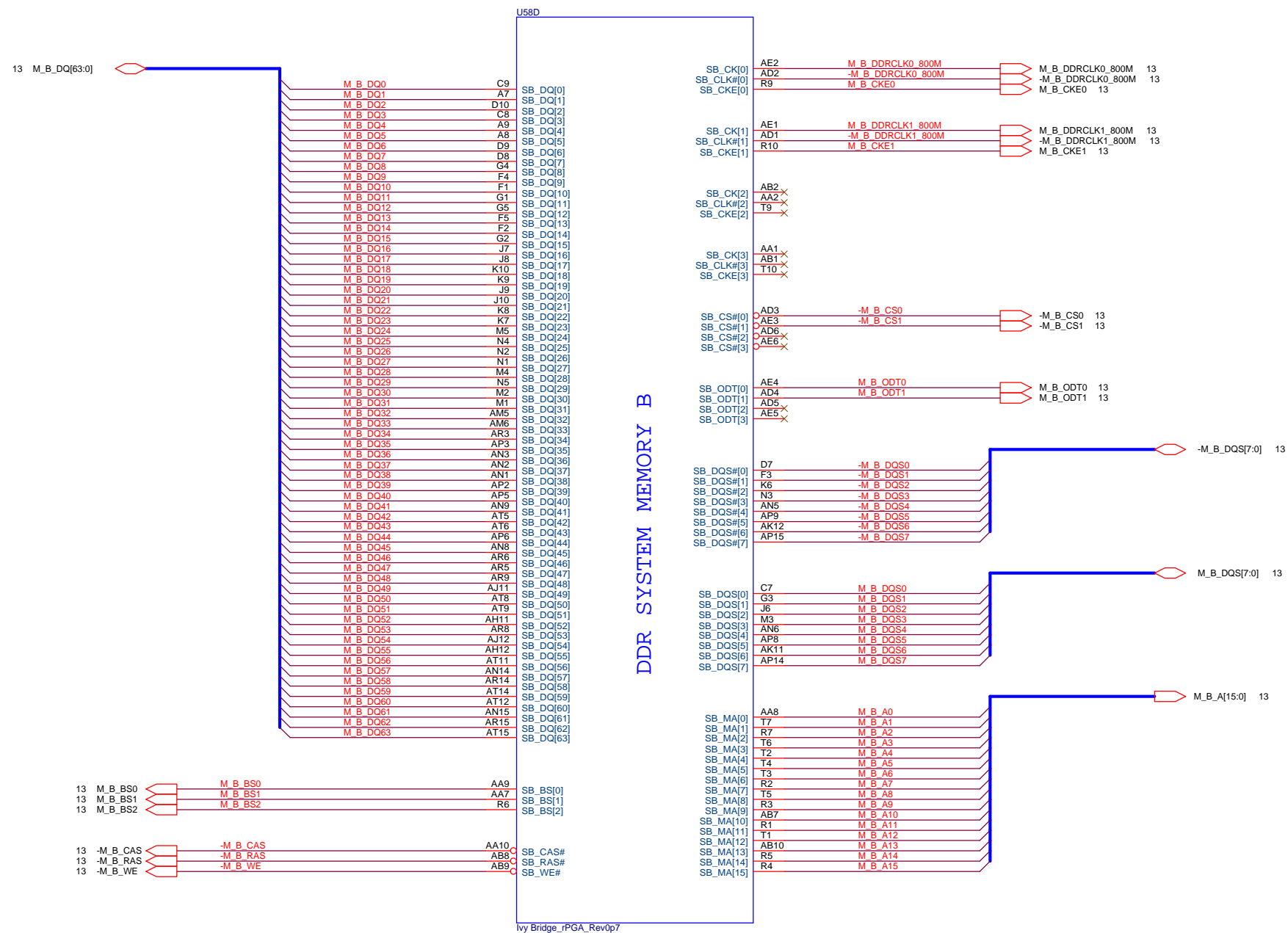
**lenovo**

|                                  |                                   |               |
|----------------------------------|-----------------------------------|---------------|
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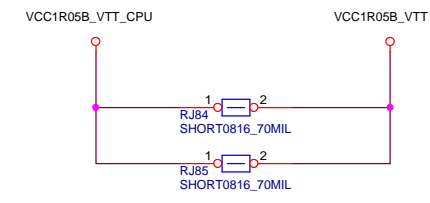
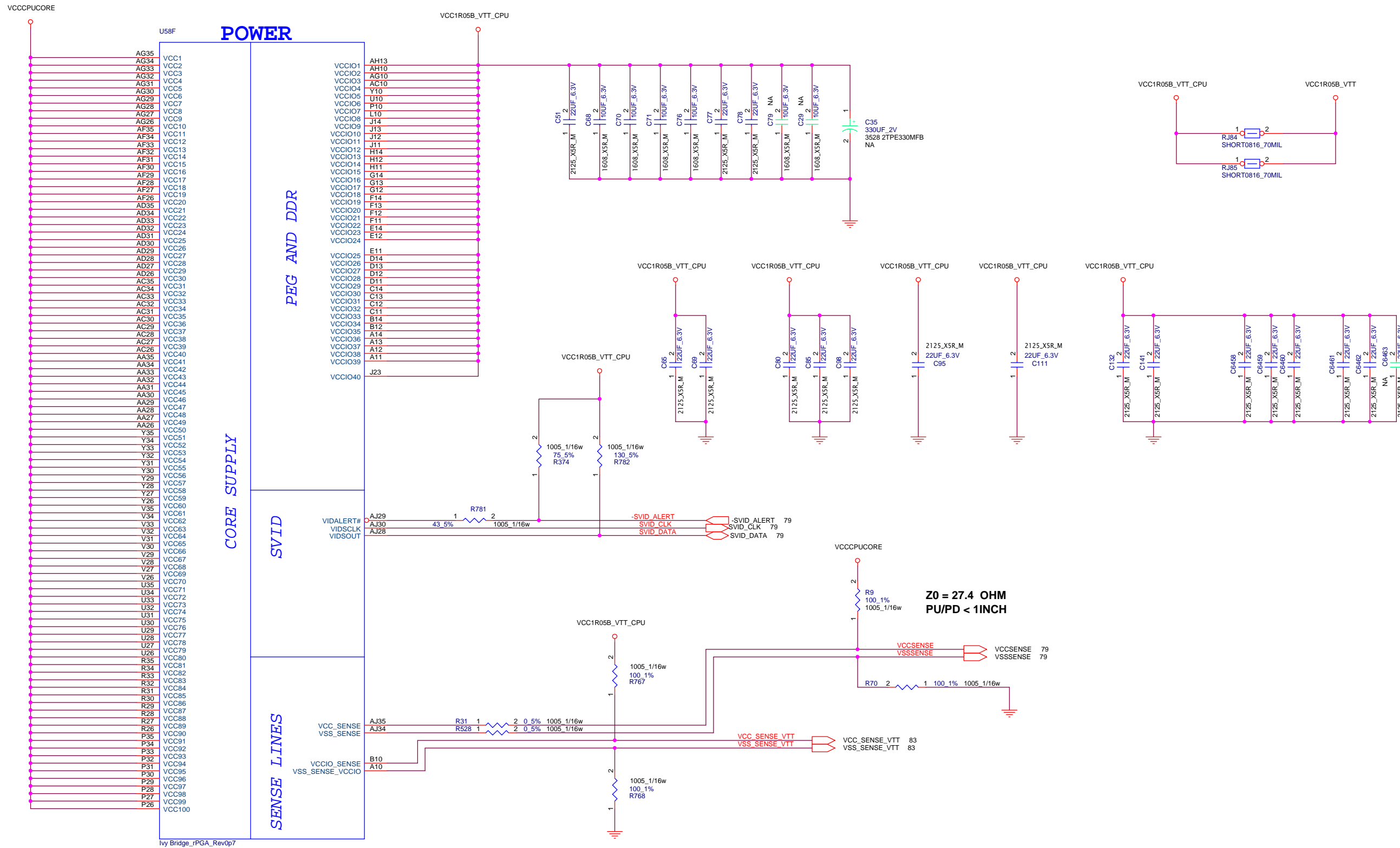


DDR SYSTEM MEMORY A

Ivy Bridge\_rPGA\_Rev0p7

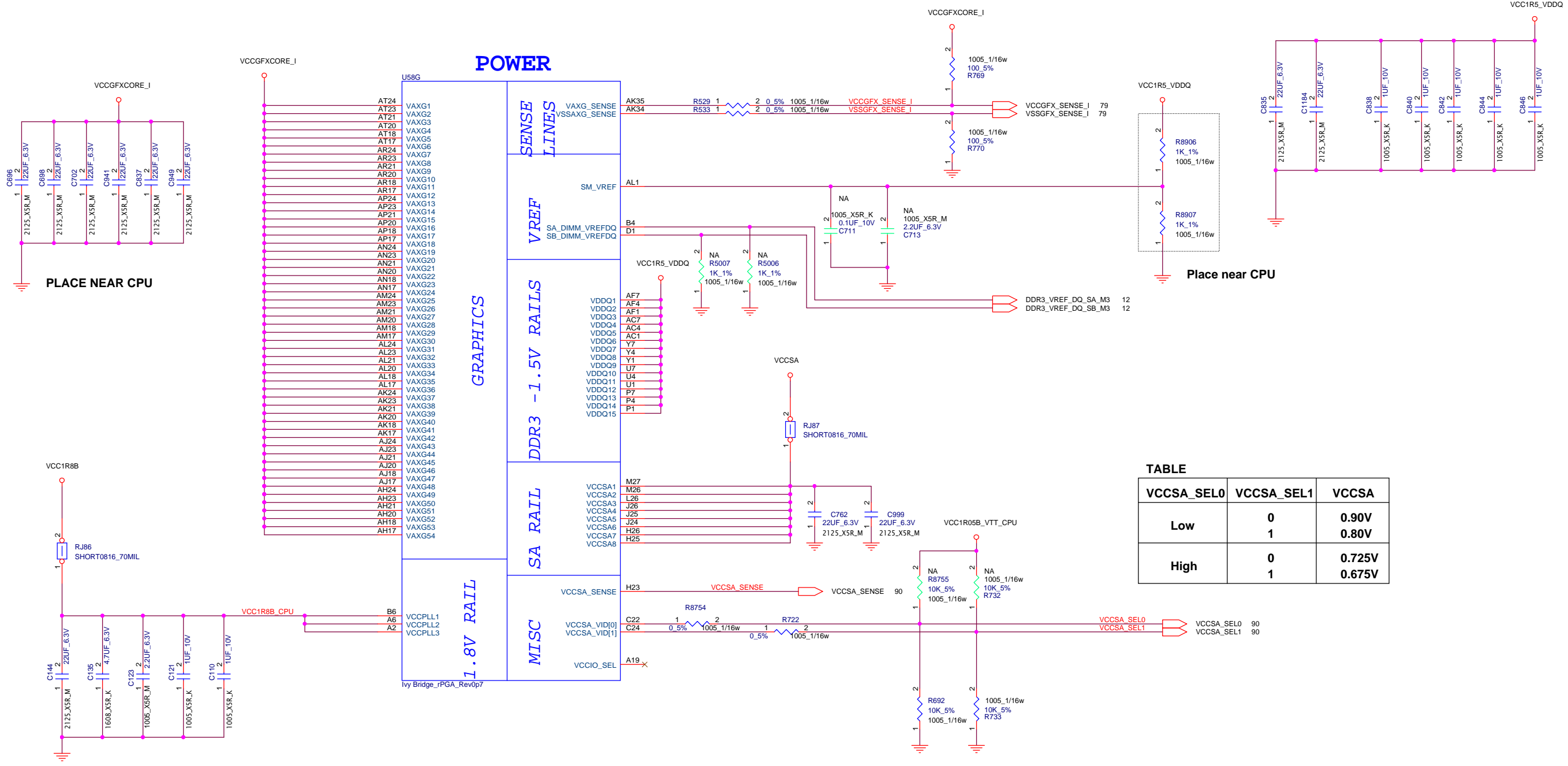






**Z0 = 27.4 OHM  
PU/PD < 1 INCH**

Ivy Bridge\_rPGA\_Rev0p7



**TABLE**

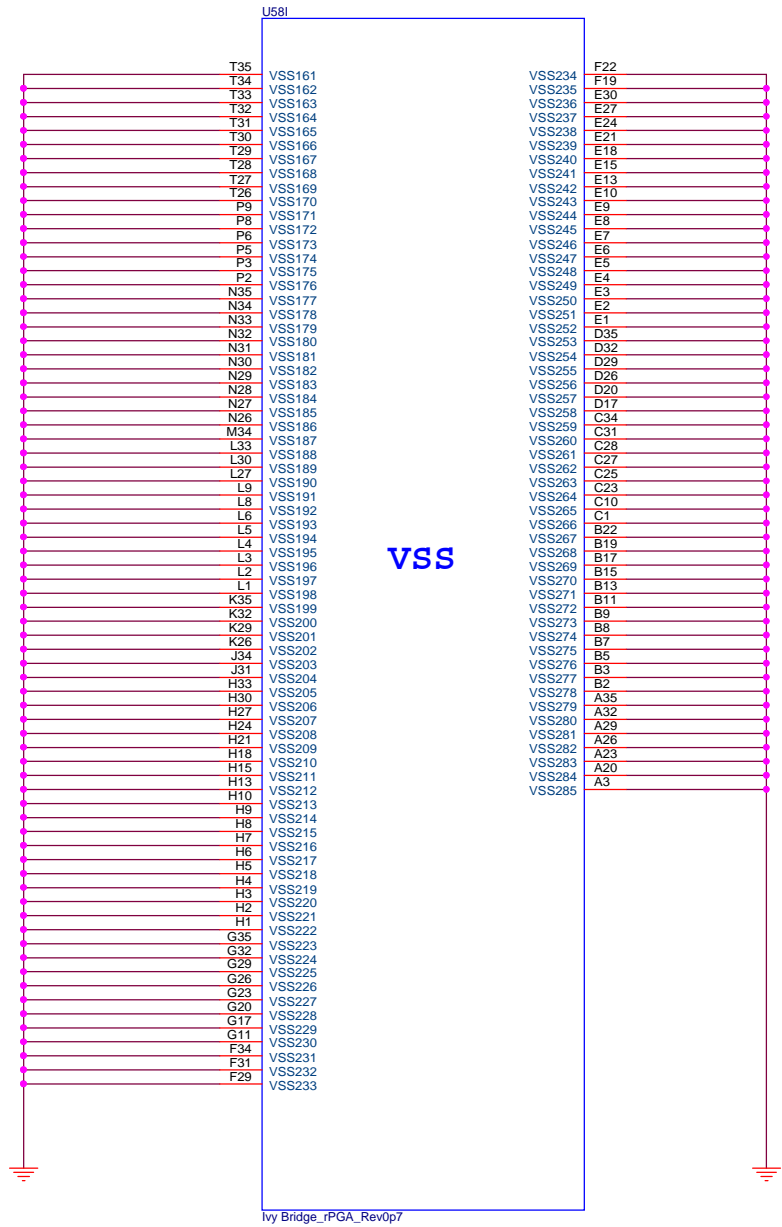
| VCCSA_SELO | VCCSA_SEL1 | VCCSA  |
|------------|------------|--------|
| Low        | 0          | 0.90V  |
|            | 1          | 0.80V  |
| High       | 0          | 0.725V |
|            | 1          | 0.675V |

- POWER**
- SENSE LINES**
- VAXG1
  - VAXG2
  - VAXG3
  - VAXG4
  - VAXG5
  - VAXG6
  - VAXG7
  - VAXG8
  - VAXG9
  - VAXG10
  - VAXG11
  - VAXG12
  - VAXG13
  - VAXG14
  - VAXG15
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  - VAXG45
  - VAXG46
  - VAXG47
  - VAXG48
  - VAXG49
  - VAXG50
  - VAXG51
  - VAXG52
  - VAXG53
  - VAXG54
- VREF**
- SA\_DIMM\_VREFDQ
  - SB\_DIMM\_VREFDQ
- DDR3 - 1.5V RAILS**
- VDDQ1
  - VDDQ2
  - VDDQ3
  - VDDQ4
  - VDDQ5
  - VDDQ6
  - VDDQ7
  - VDDQ8
  - VDDQ9
  - VDDQ10
  - VDDQ11
  - VDDQ12
  - VDDQ13
  - VDDQ14
  - VDDQ15
- SA RAIL**
- VCCSA1
  - VCCSA2
  - VCCSA3
  - VCCSA4
  - VCCSA5
  - VCCSA6
  - VCCSA7
  - VCCSA8
- MISC**
- VCCSA\_SENSE
  - VCCSA\_VID[0]
  - VCCSA\_VID[1]
  - VCCIO\_SEL
- Ivy Bridge\_rPGA\_Rev0p7

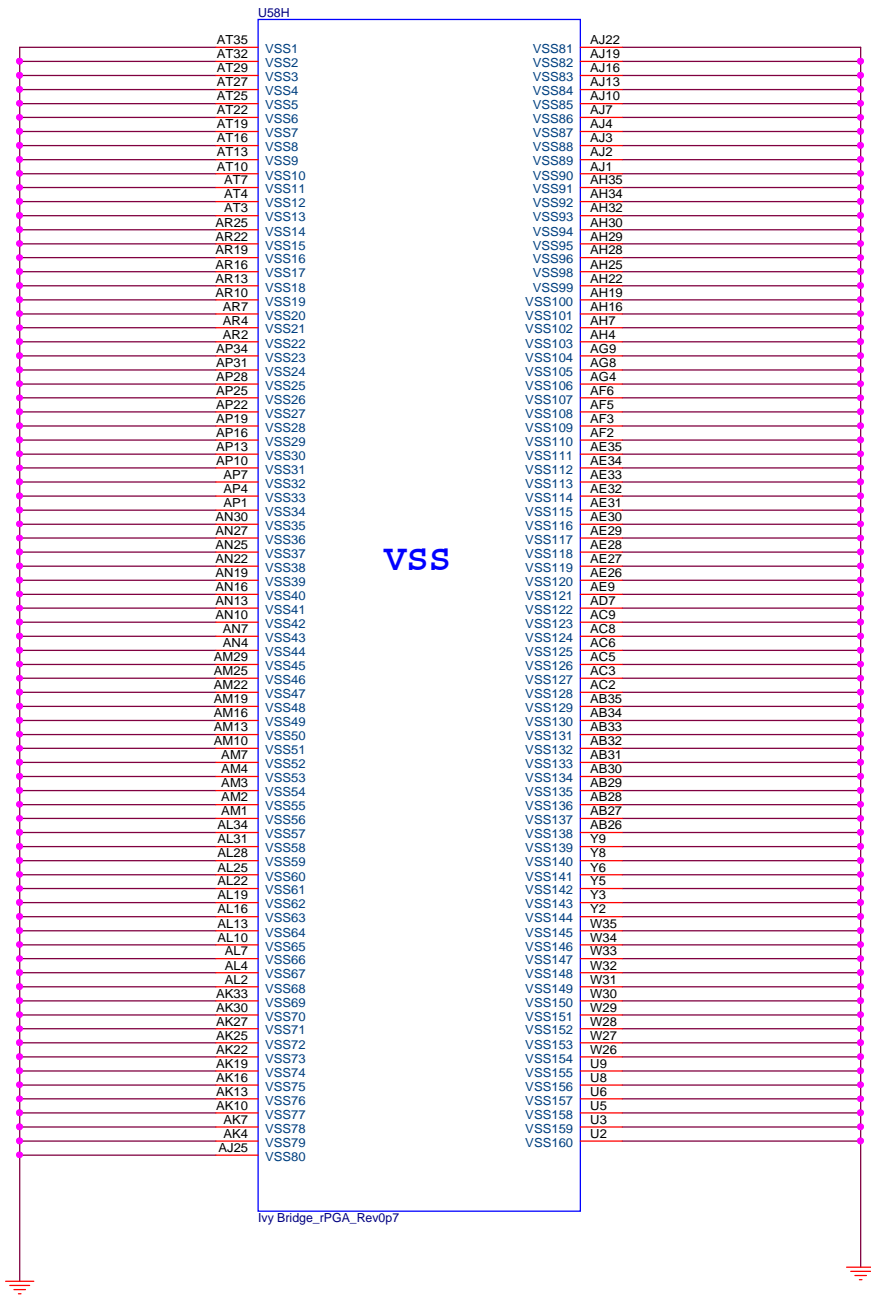
PLACE NEAR CPU

Place near CPU



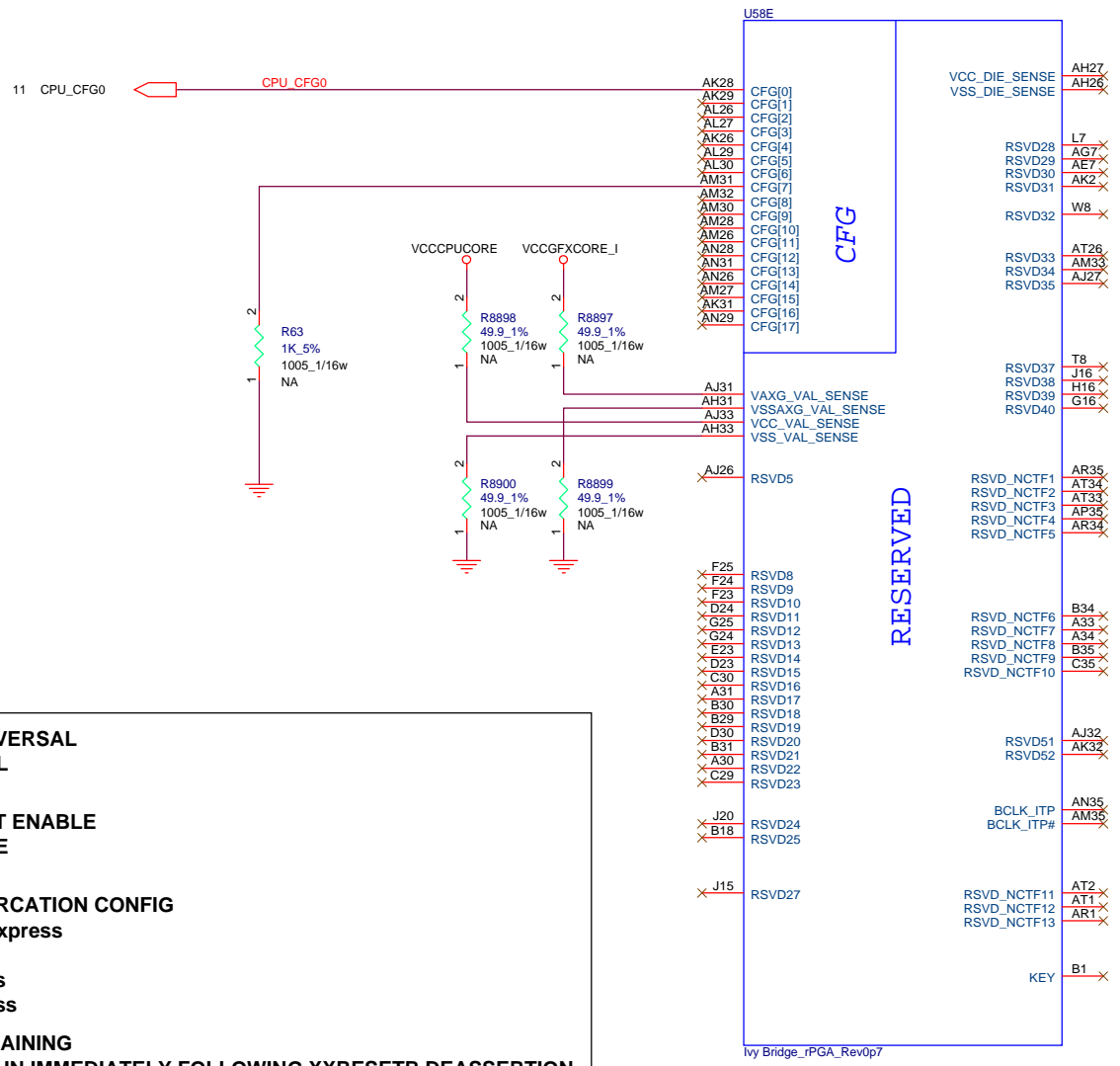


Ivy Bridge\_rPGA\_Rev0p7



Ivy Bridge\_rPGA\_Rev0p7





**TABLE**

|  |   |
|--|---|
| <b>CFG2 PEG LANE REVERSAL</b>            |   |
| 1  | -NO ASM : NORMAL  |
| 0  | -ASM : RESVERSE   |
| <b>CFG4 DISPLAY PORT ENABLE</b>          |   |
| 1  | -NO ASM : DISABLE   |
| 0  | -ASM : ENABLE   |
| <b>CFG[6 : 5] PEG BIFURCATION CONFIG</b> |   |
| 00                                       | = 1 x 8, 2 x 4 PCI Express                                    |
| 01                                       | = reserved  |
| 10                                       | = 2 x 8 PCI Express   |
| 11                                       | = 1 x 16 PCI Express  |
| <b>CFG7 PEG DEFER TRAINING</b>           |   |
| 1  | -NO ASM :PEG TRAIN IMMEDIATELY FOLLOWING XXRESETB DEASSERTION |
| 0  | -ASM : PEG WAIT FOR BIOS FOR TRAINING                         |

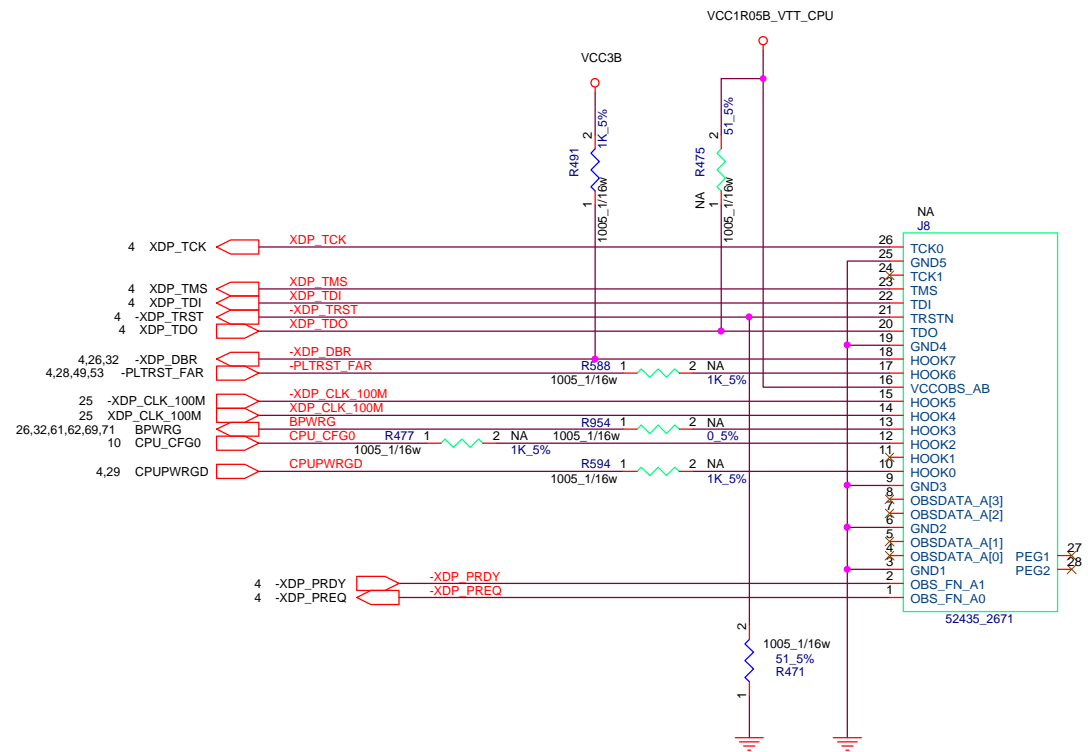


TABLE NOTE: J8 "ASM" FOR PDV/SDV ONLY.

| SIGNAL | REF DES | ENABLE | DISABLE |
|--------|---------|--------|---------|
| TDO    | R475    | ASM    | NO ASM  |
| TRST#  | R471    | ASM    | ASM     |
| DBRST# | R491    | ASM    | ASM     |
| RESET# | R588    | ASM    | NO ASM  |
| CFG0   | R477    | ASM    | NO ASM  |
| PWRGD  | R594    | ASM    | NO ASM  |
| BPWRG  | R954    | ASM    | NO ASM  |
|        | J8      | ASM    | NO ASM  |

LOGIC

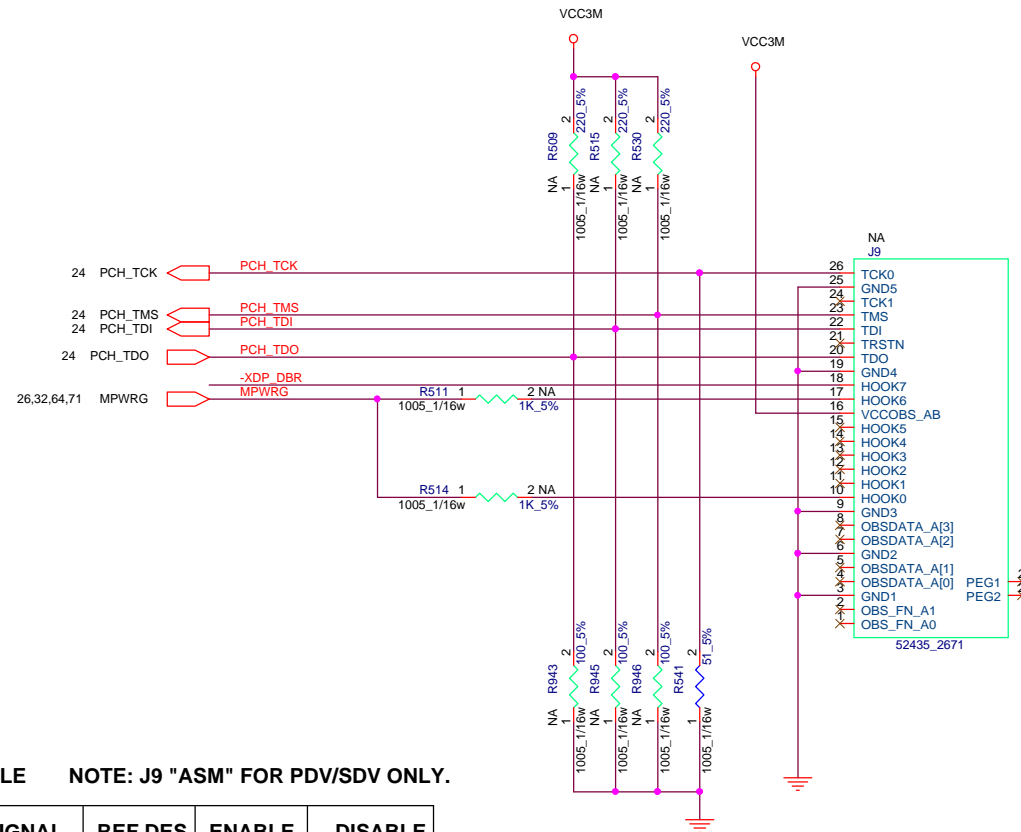
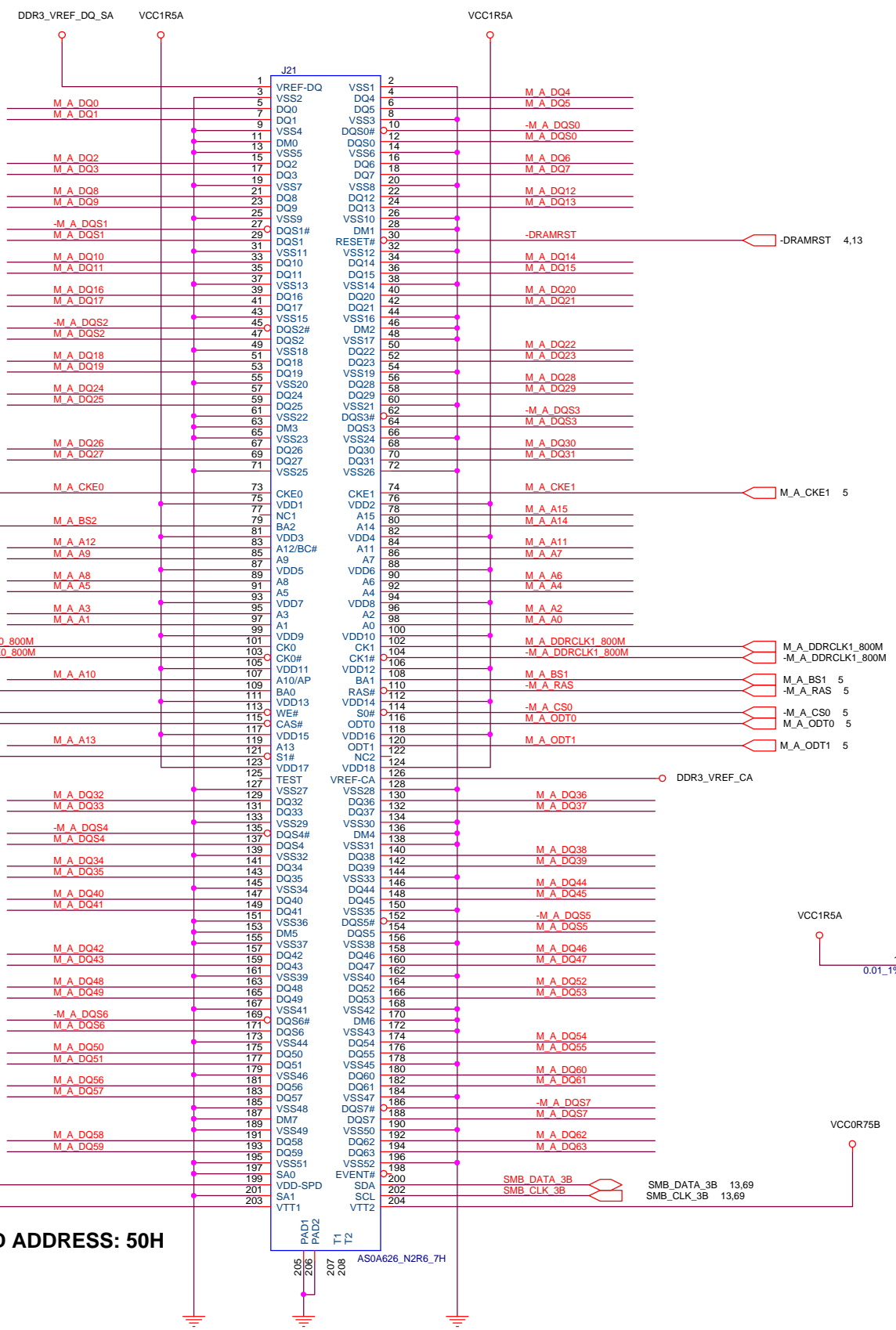
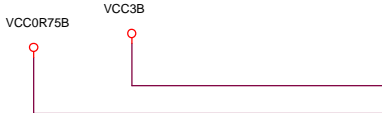
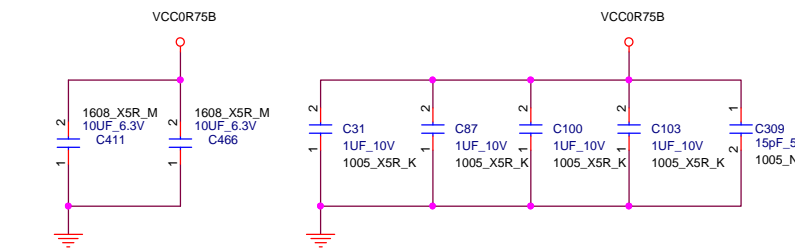
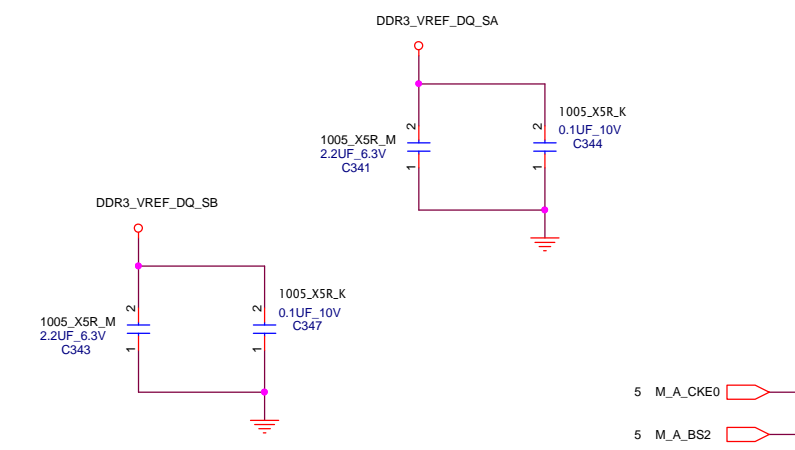
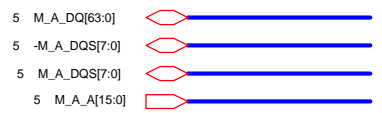


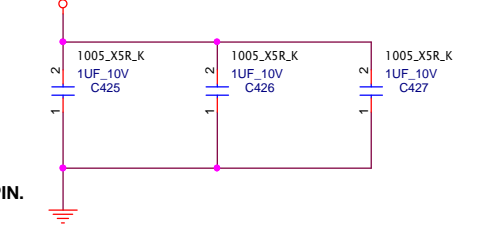
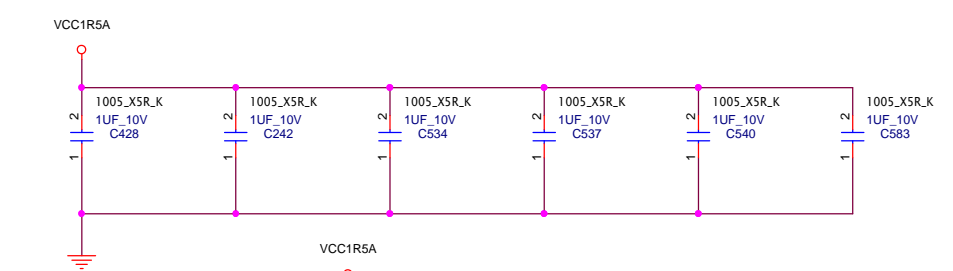
TABLE NOTE: J9 "ASM" FOR PDV/SDV ONLY.

| SIGNAL | REF DES | ENABLE | DISABLE |
|--------|---------|--------|---------|
| TDO    | R509    | 220    | NO ASM  |
|        | R943    | 100    | NO ASM  |
| TMS    | R530    | 220    | NO ASM  |
|        | R946    | 100    | NO ASM  |
| TDI    | R515    | 220    | NO ASM  |
|        | R945    | 100    | NO ASM  |
| TCK    | R541    | 51     | 51      |
| MPWRG  | R511    | ASM    | NO ASM  |
|        | R514    | ASM    | NO ASM  |
|        | J9      | ASM    | NO ASM  |

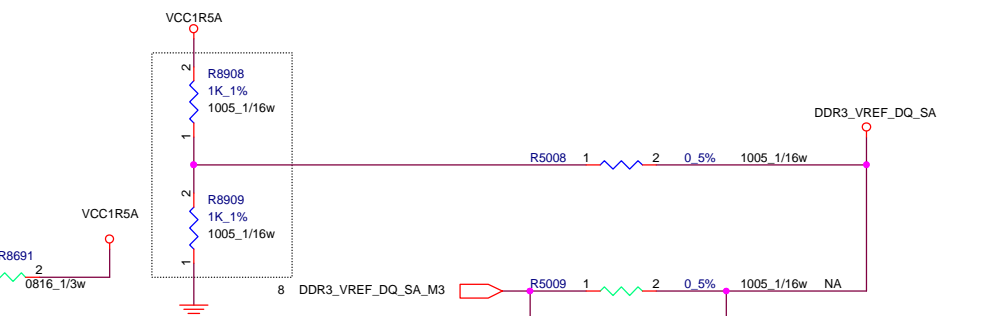
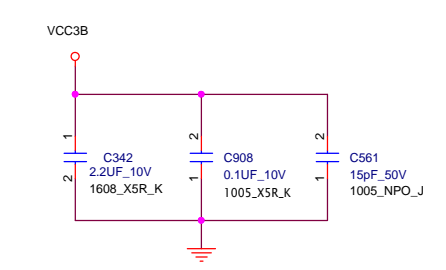
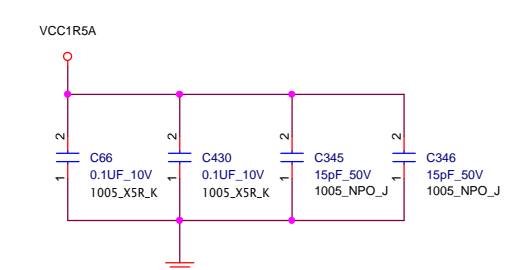
LOGIC



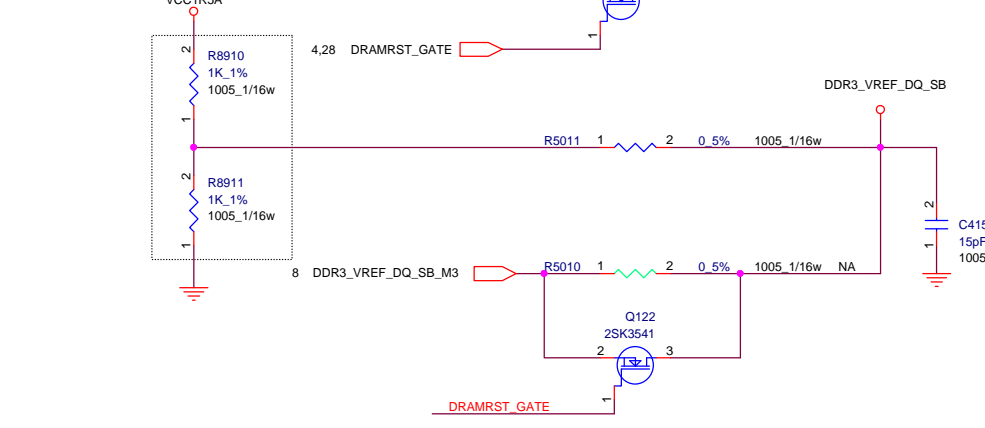
SPD ADDRESS: 50H

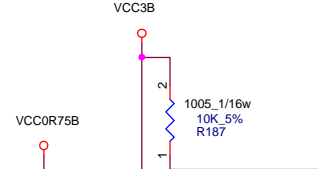
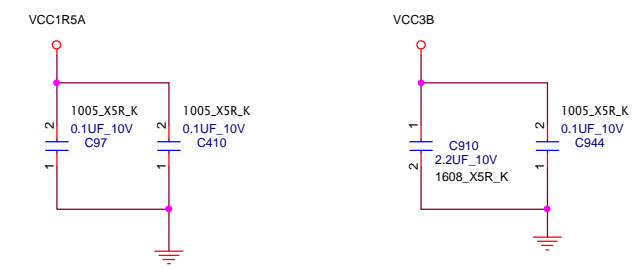
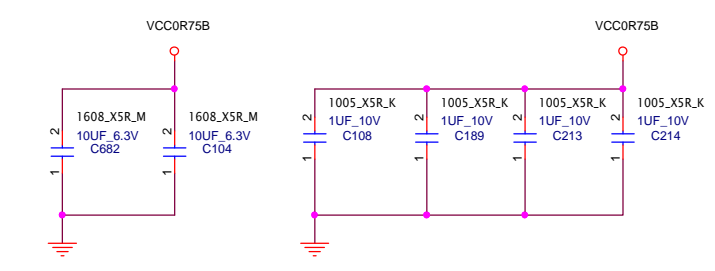
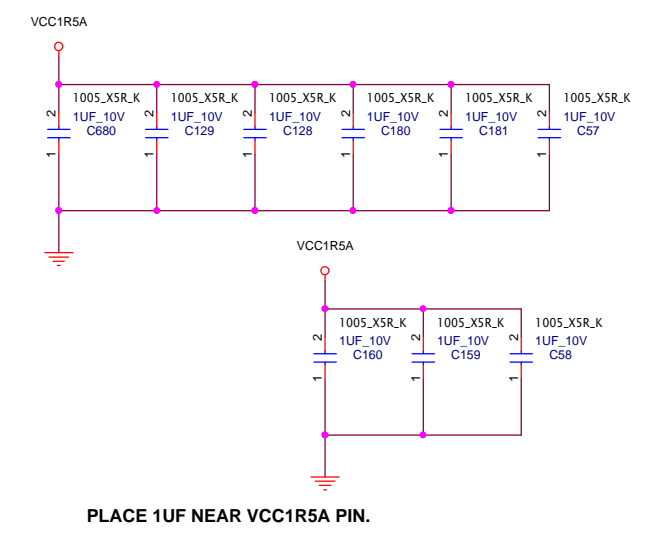
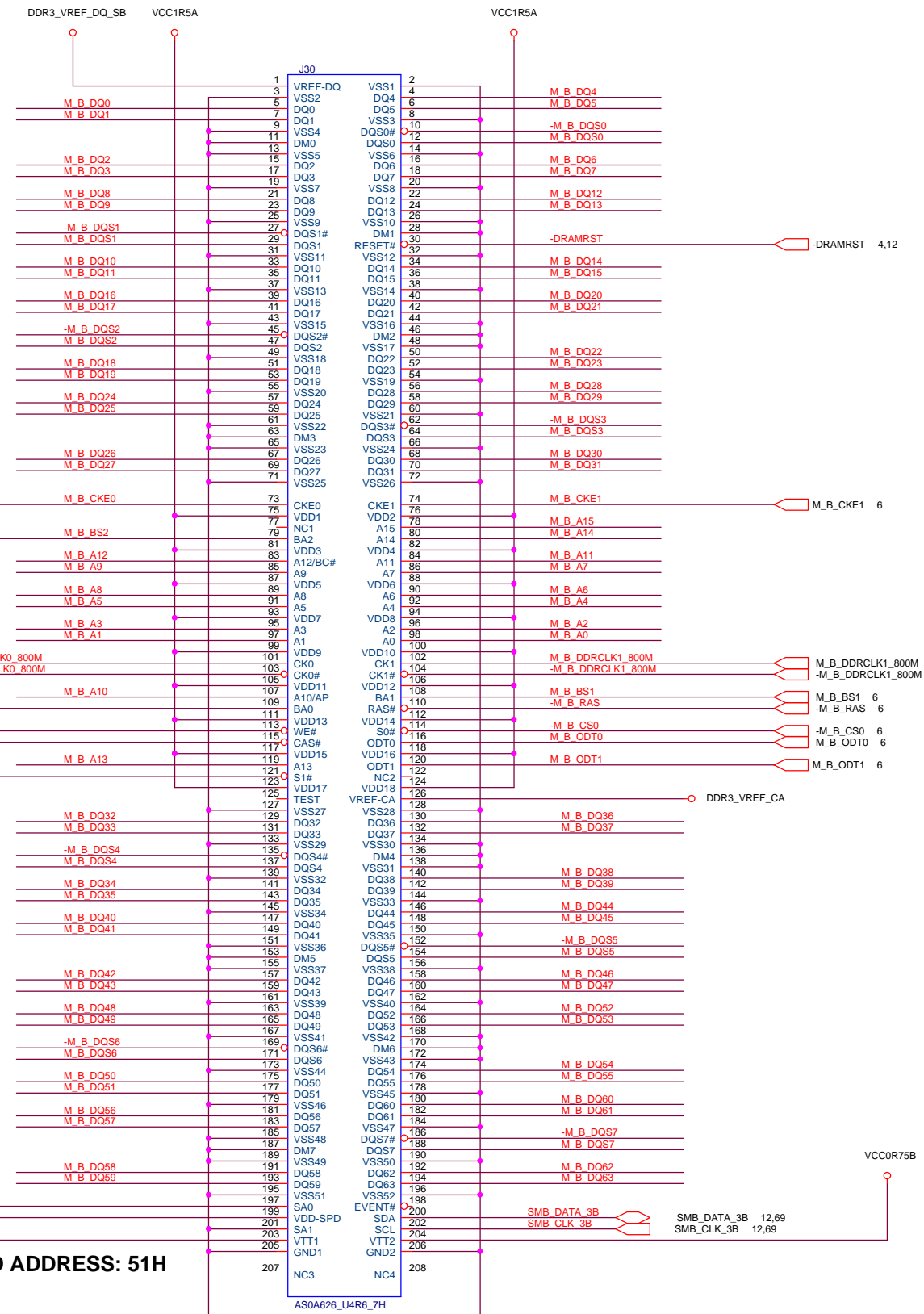
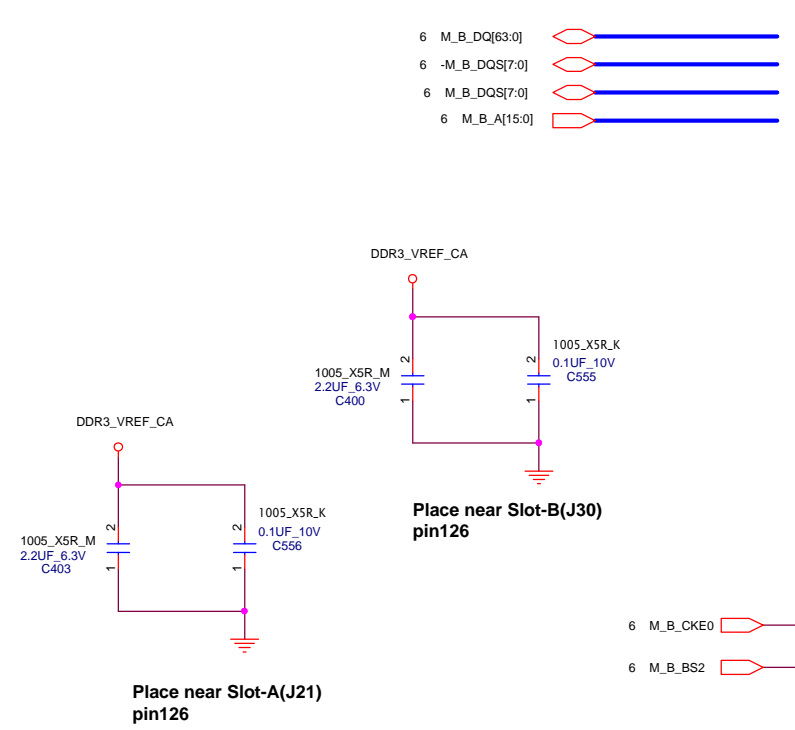


PLACE 1UF NEAR VCC1R5A PIN.

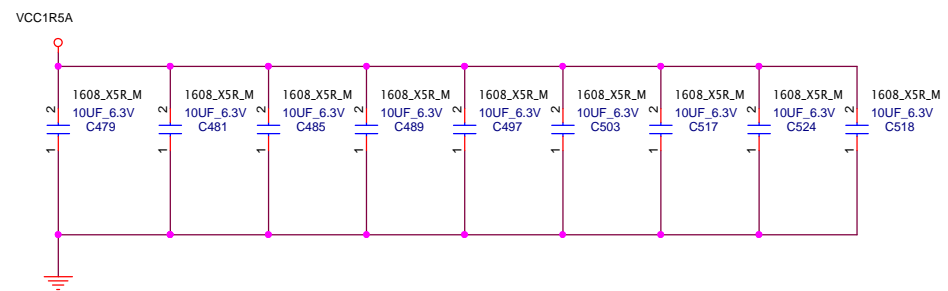
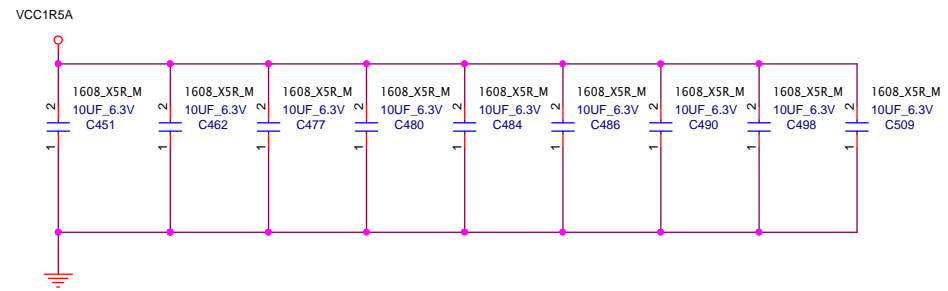
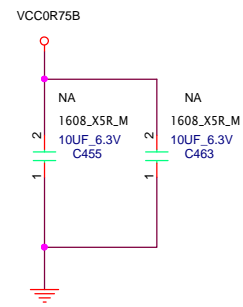


PLACE NEAR DIMM Slot





SPD ADDRESS: 51H





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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 16 of 97  |

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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 17 of 97  |


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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 18 of 97  |

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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 19 of 97  |

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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 20 of 97  |




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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 21 of 97  |

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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 22 of 97  |

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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 23 of 97  |

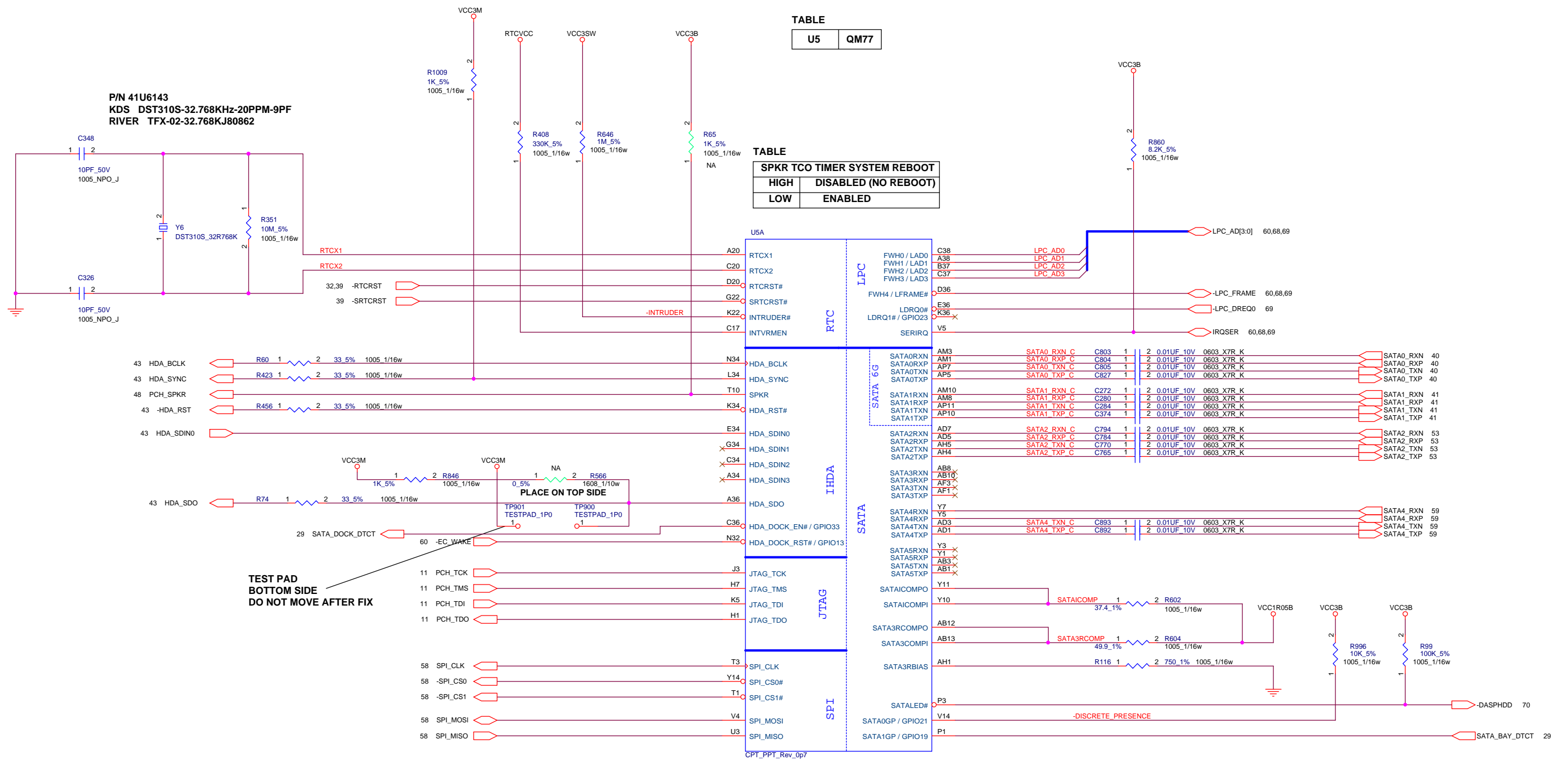
P/N 41U6143  
KDS DST310S-32.768KHz-20PPM-9PF  
RIVER TFX-02-32.768KJ80862

TABLE

|    |      |
|----|------|
| U5 | QM77 |
|----|------|

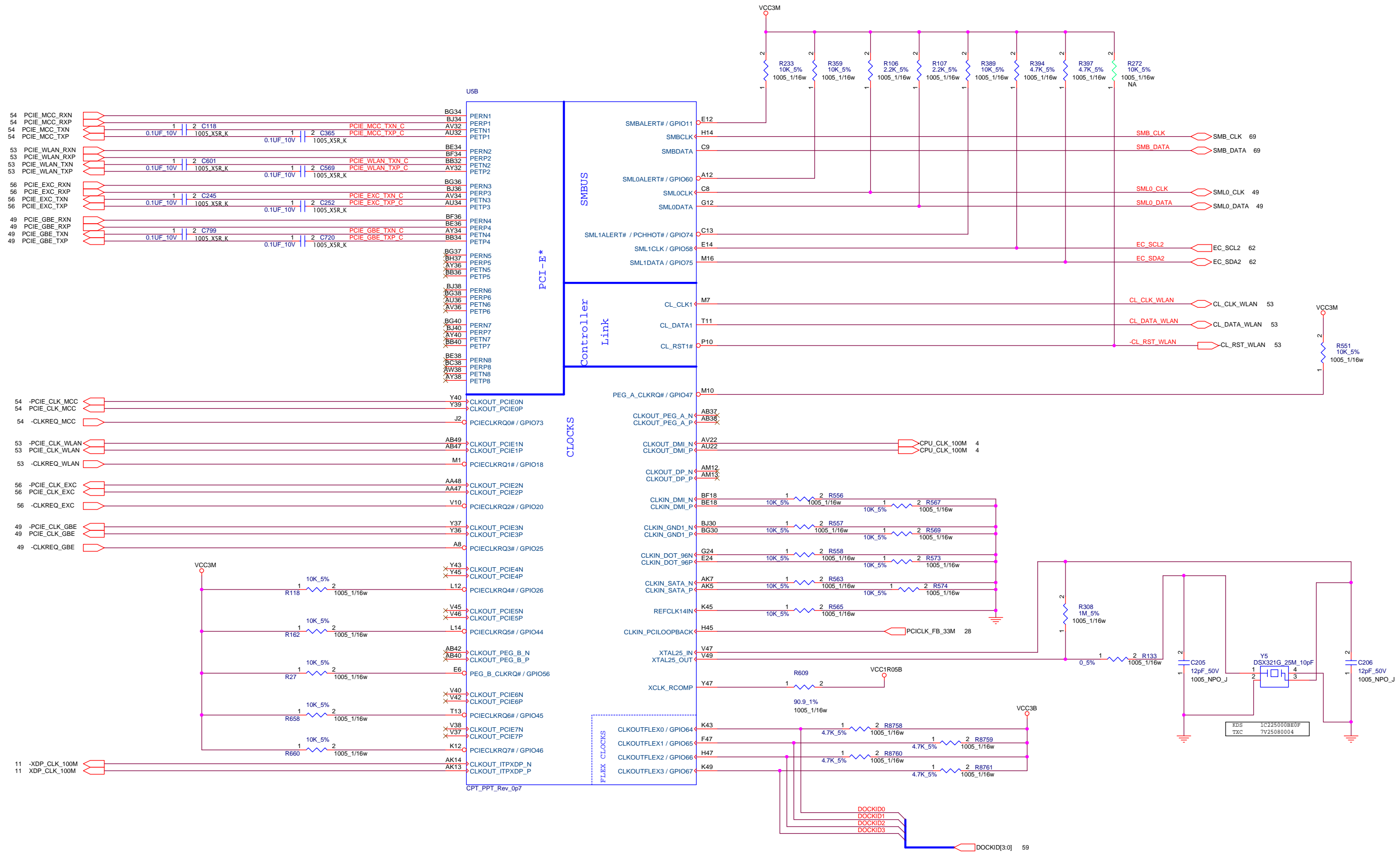
TABLE

| SPKR TCO TIMER SYSTEM REBOOT |                      |
|------------------------------|----------------------|
| HIGH                         | DISABLED (NO REBOOT) |
| LOW                          | ENABLED              |



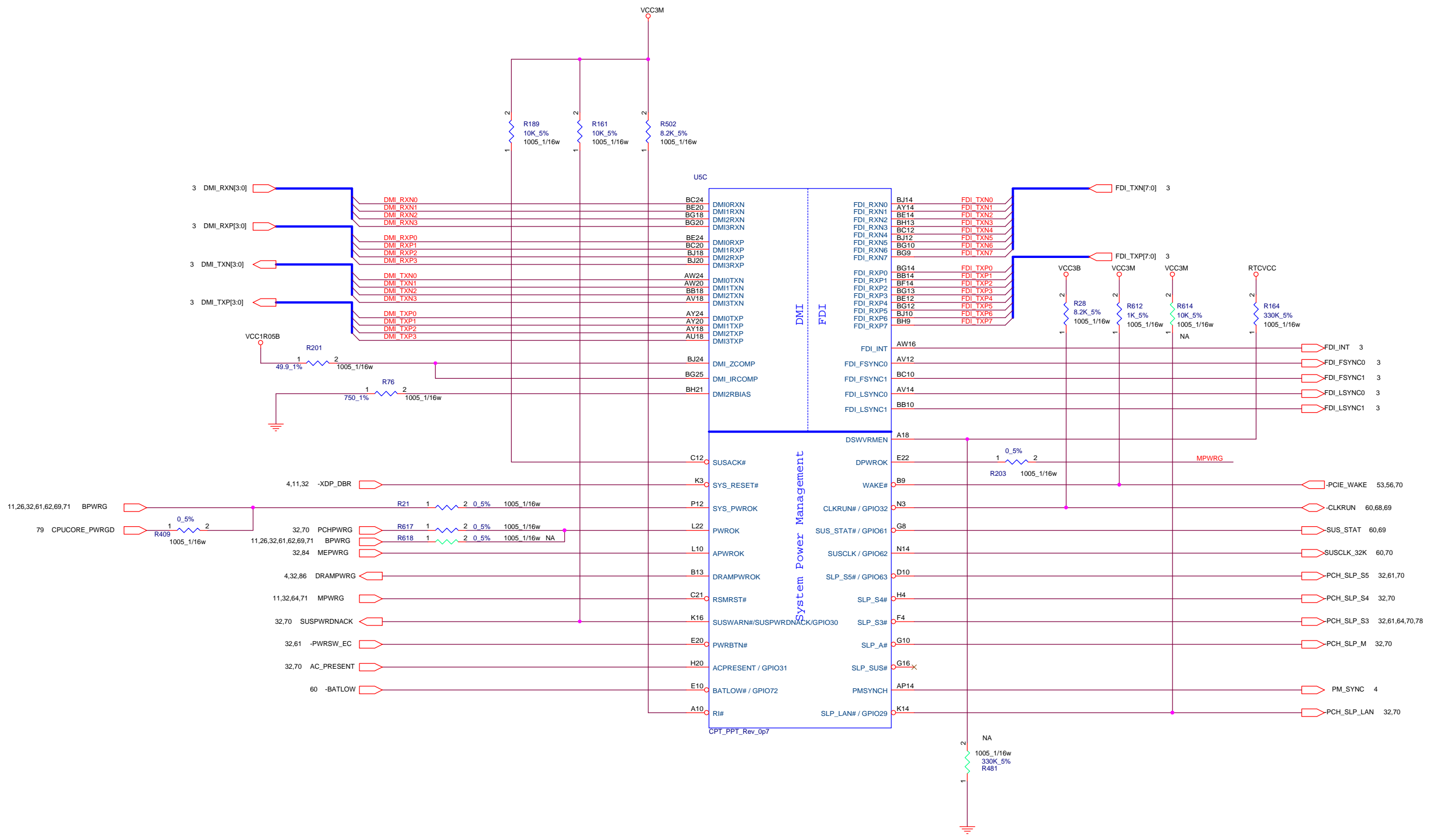
TEST PAD  
BOTTOM SIDE  
DO NOT MOVE AFTER FIX

PLACE ON TOP SIDE



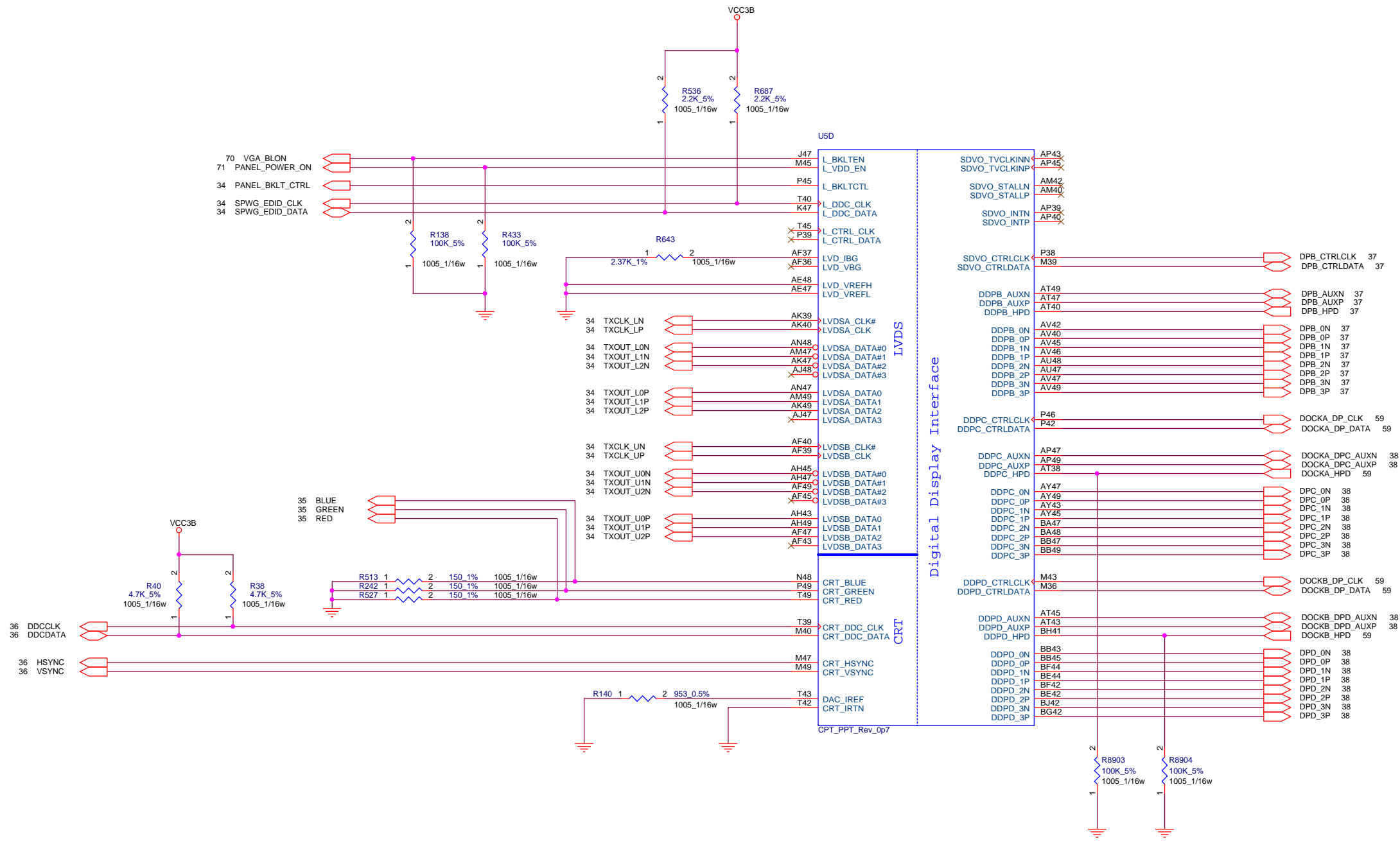
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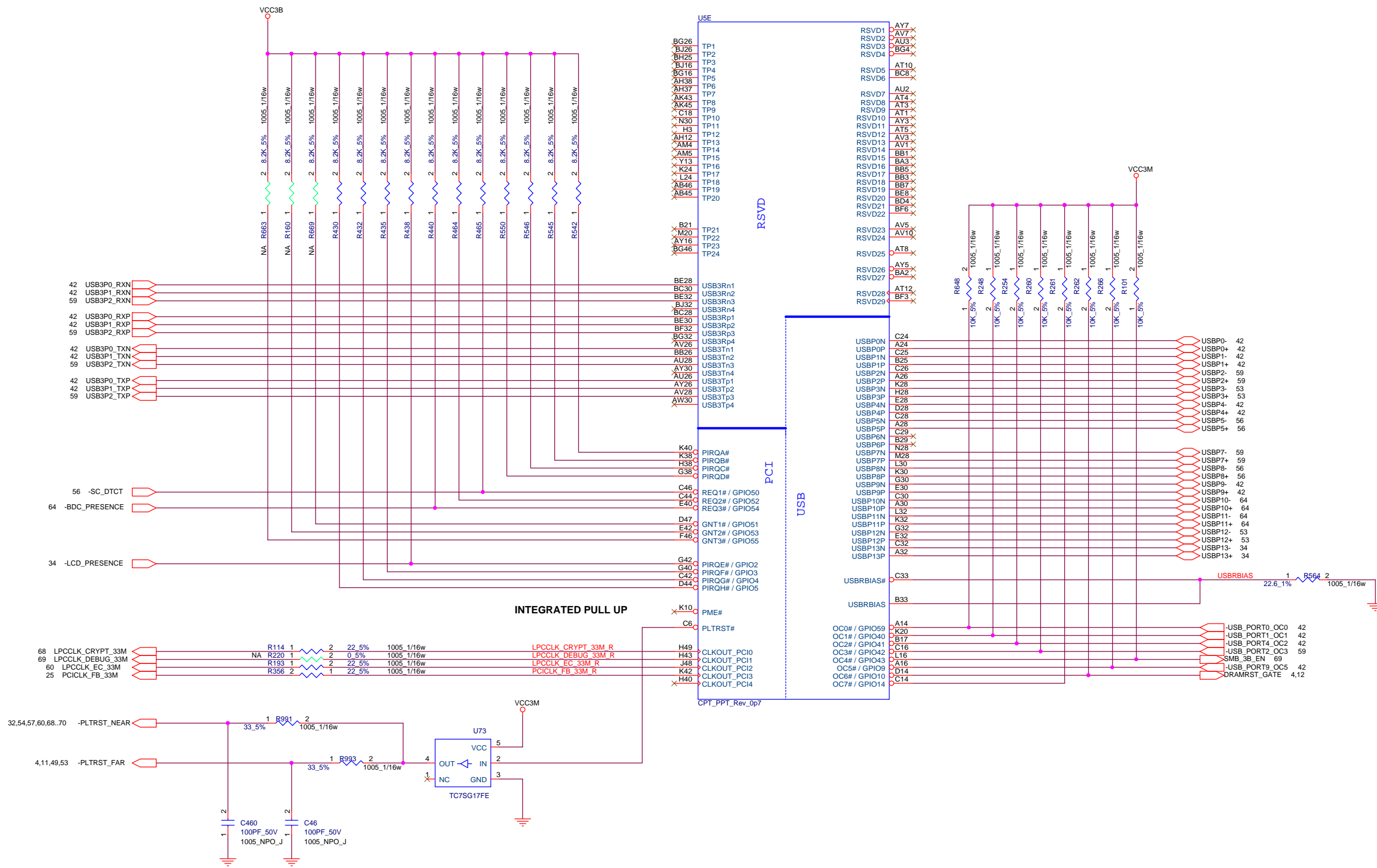
|                                 |                                   |
|---------------------------------|-----------------------------------|
| <b>lenovo</b>                   |                                   |
| Project Name:<br>NZM-4 UMA SOVP | Title:<br>PCH(29):PCI-E/SMBUS/CLK |
| Size:<br>C                      | Document Number:<br>Rev:<br>7.53  |
| Date: Monday, March 19, 2012    | Sheet: 25 of 97                   |



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| USB PORT TO |                             |
|-------------|-----------------------------|
| 0           | USB 3.0 SYSTEM PORT 0       |
| 1           | USB 3.0 SYSTEM PORT 1       |
| 2           | USB 3.0 DOCKING             |
| 3           | FULL MINICARD (WWAN)        |
| 4           | USB 2.0 SYSTEM PORT (AOU)   |
| 5           | EXPRESS CARD SLOT           |
| 6           | RESERVED                    |
| 7           | USB 2.0 DOCKING             |
| 8           | SMART CARD SLOT             |
| 9           | USB 2.0 SYSTEM PORT (DEBUG) |
| 10          | FPR (TOUCH PAD)             |
| 11          | BLUETOOTH (TOUCH PAD)       |
| 12          | HALF MINICARD (WLAN)        |
| 13          | USB CAMERA (LCD)            |



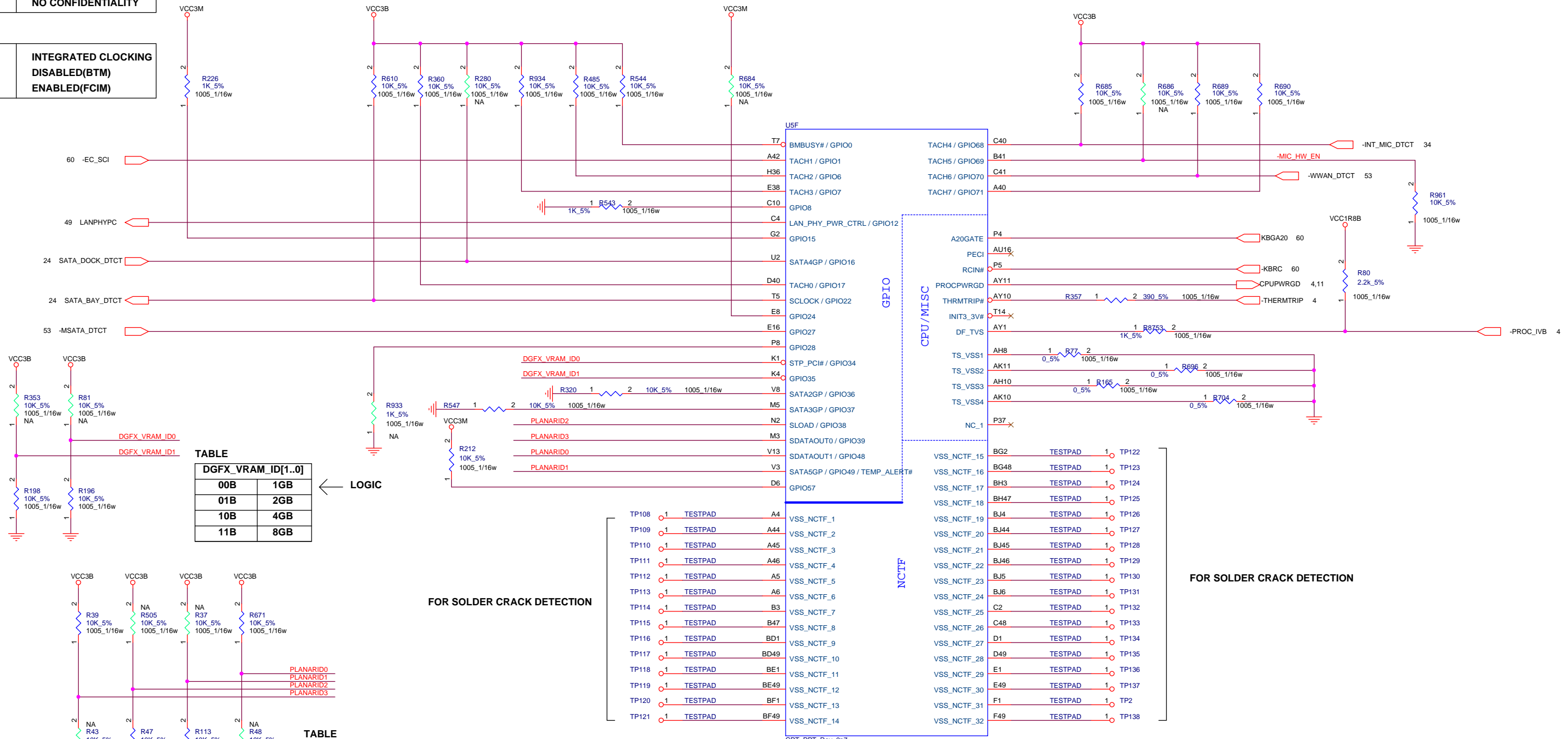
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TABLE

|        |                      |
|--------|----------------------|
| GPIO15 | ME CRYPTO STRAP      |
| HIGH   | WITH CONFIDENTIALITY |
| LOW    | NO CONFIDENTIALITY   |

TABLE

|       |                     |
|-------|---------------------|
| GPIO8 | INTEGRATED CLOCKING |
| HIGH  | DISABLED(BTM)       |
| LOW   | ENABLED(FCIM)       |



TABLE

| DGFX_VRAM_ID[1..0] |     |
|--------------------|-----|
| 00B                | 1GB |
| 01B                | 2GB |
| 10B                | 4GB |
| 11B                | 8GB |

← LOGIC

TABLE

| LEVEL | PLANAR ID |      |      |      |
|-------|-----------|------|------|------|
|       | 3         | 2    | 1    | 0    |
| 1     | R39       | R505 | R37  | R671 |
| 0     | R43       | R47  | R113 | R48  |

TABLE

| LEVEL    | PLANARID[3..0] |
|----------|----------------|
| PDV      | 0000B          |
| SDV      | 0001B          |
| MFVT     | 0010B          |
| FVT      | 0011B          |
| SW SIT-1 | 0100B          |
| SIT      | 0101B          |
| SIT-R1   | 0110B          |
| SIT-R2   | 0111B          |
| SVT      | 1000B          |
| SOVP     | 1001B          |

FOR SOLDER CRACK DETECTION

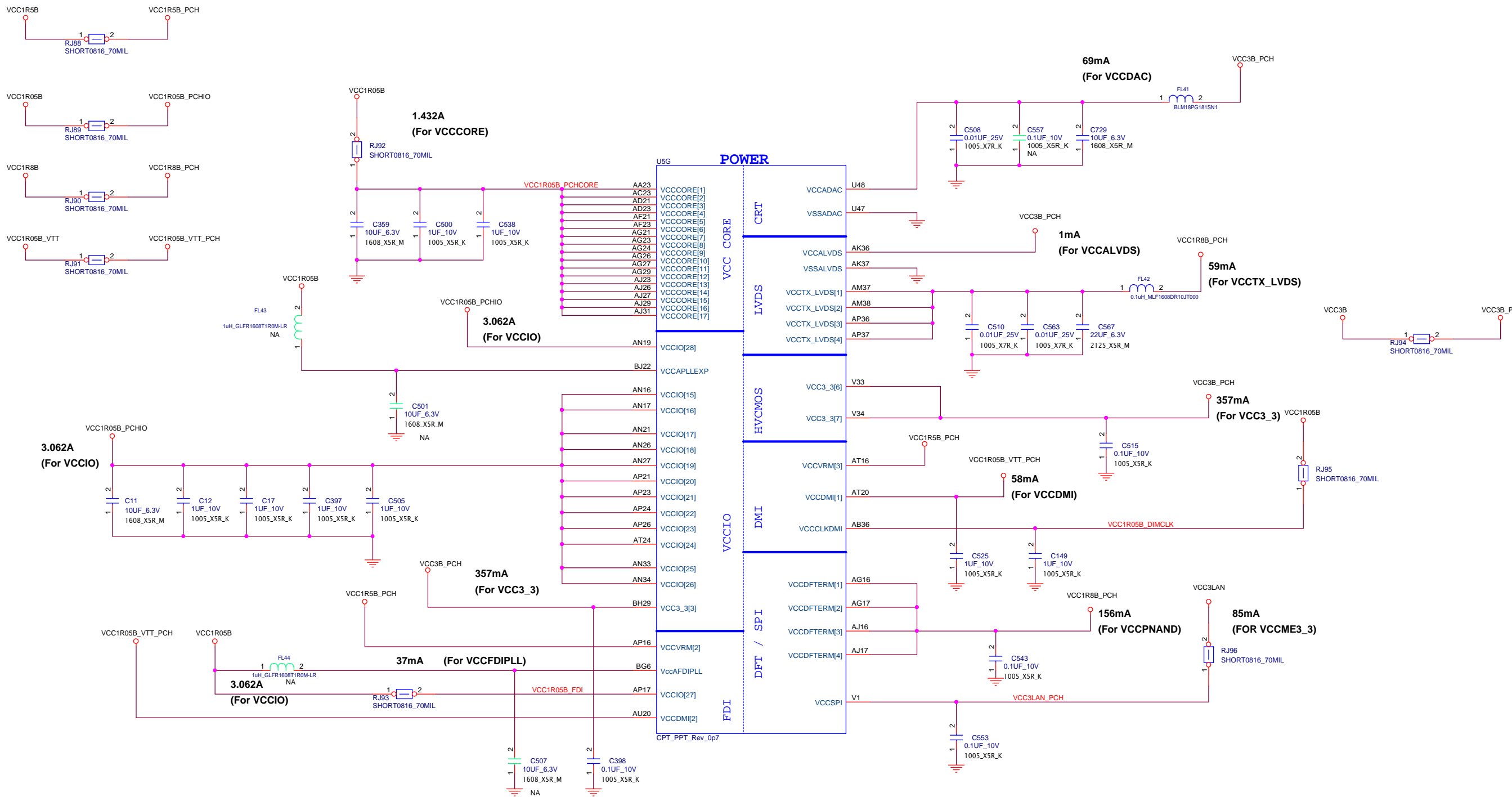
FOR SOLDER CRACK DETECTION

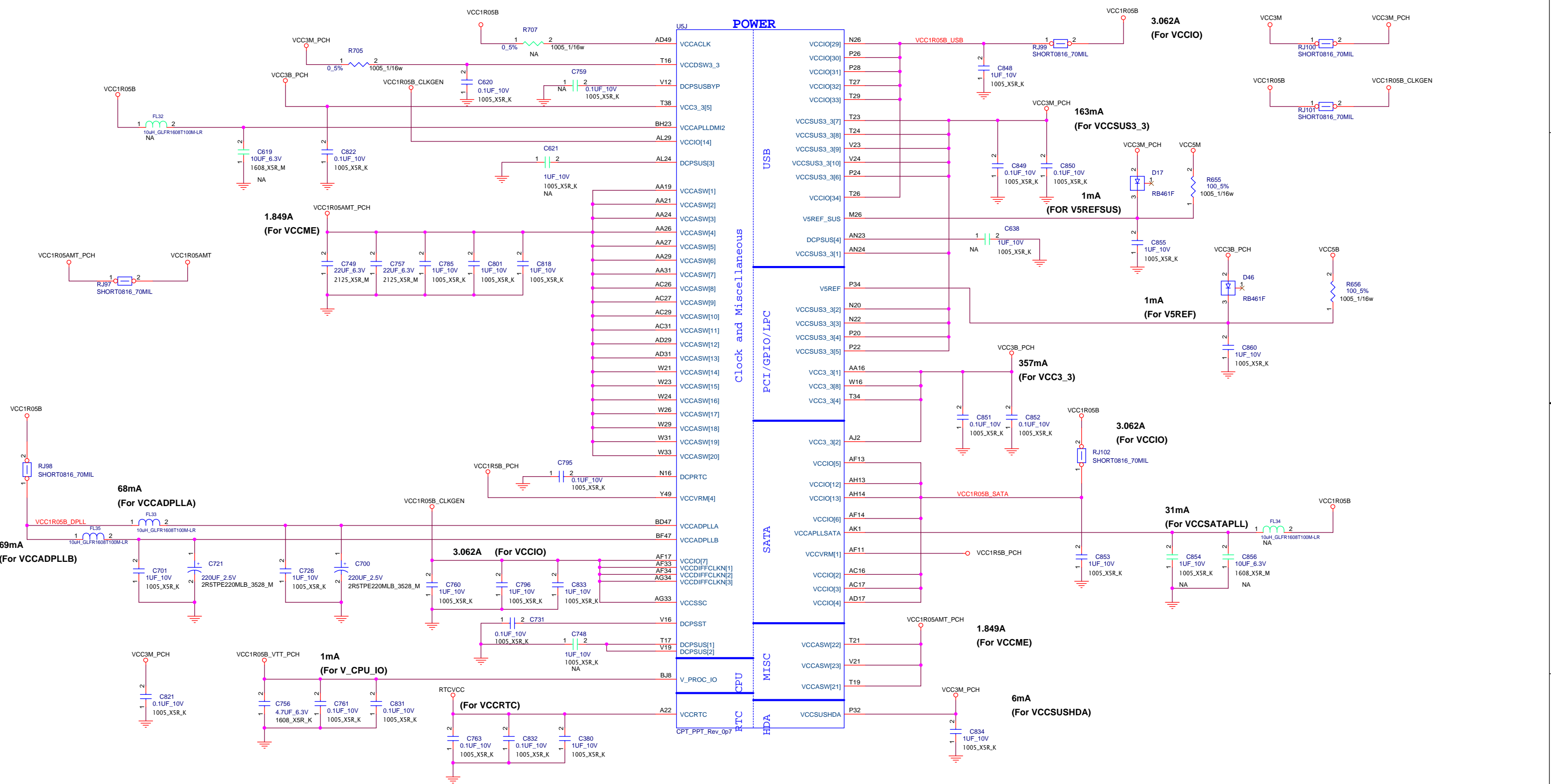
**lenovo**

Project Name : N2M-4 UMA SOVP Title : PCH(8/9):GPIO/NCTF/RSVD

Size : C Document Number : Rev : 7.53

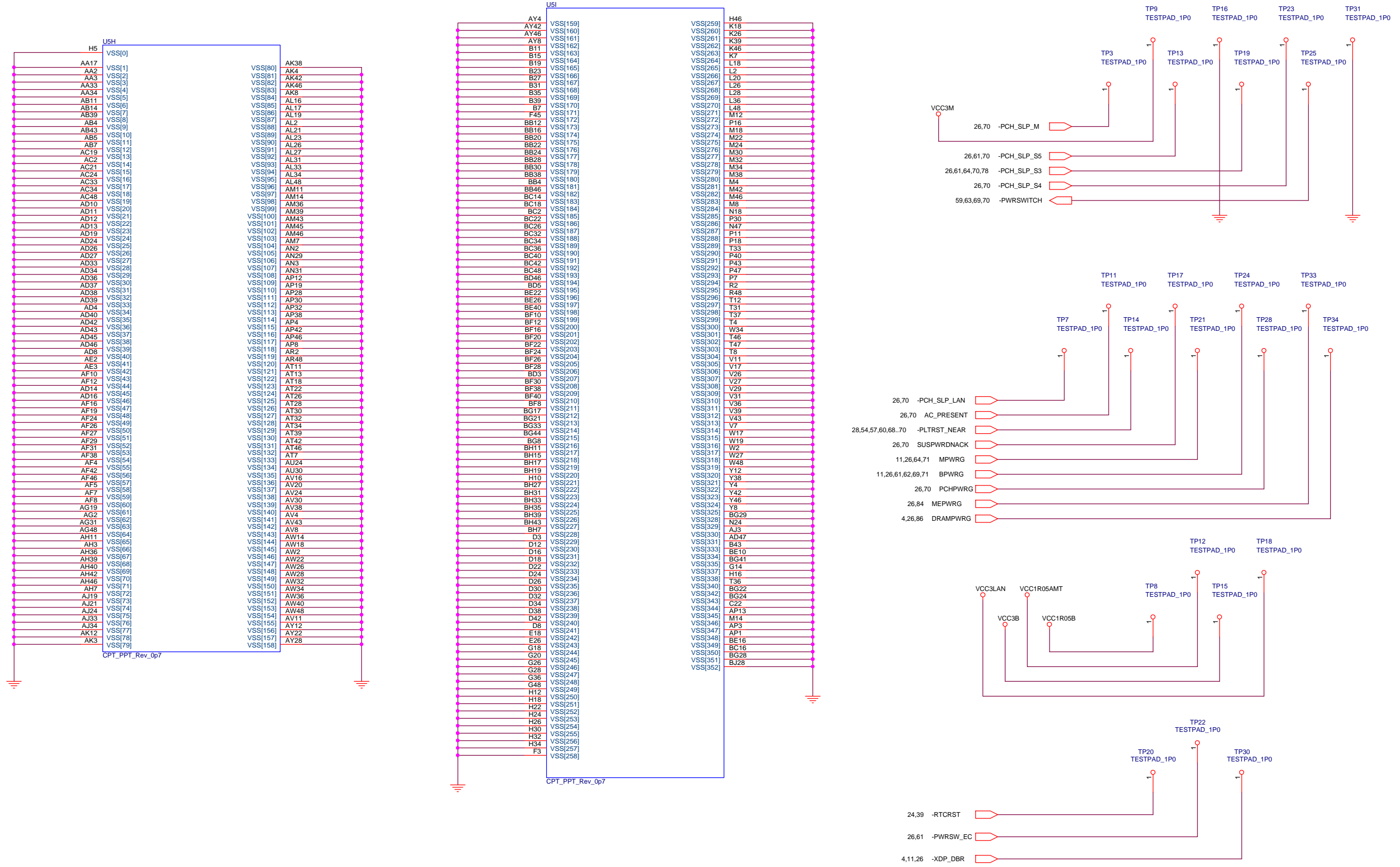
Date: Monday, March 19, 2012 Sheet: 29 of 97






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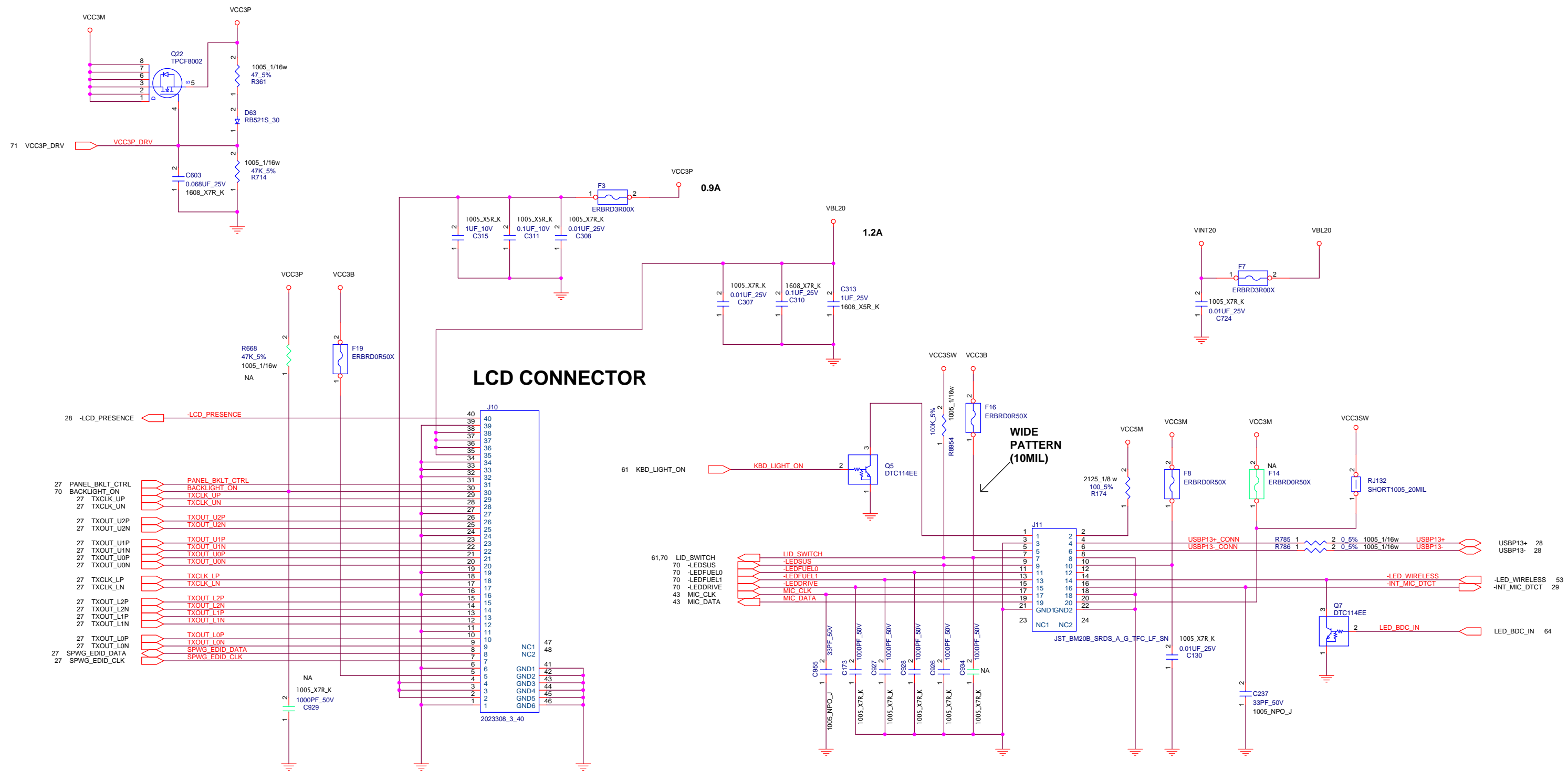
# TEST PAD FOR METS/APS





BLANK

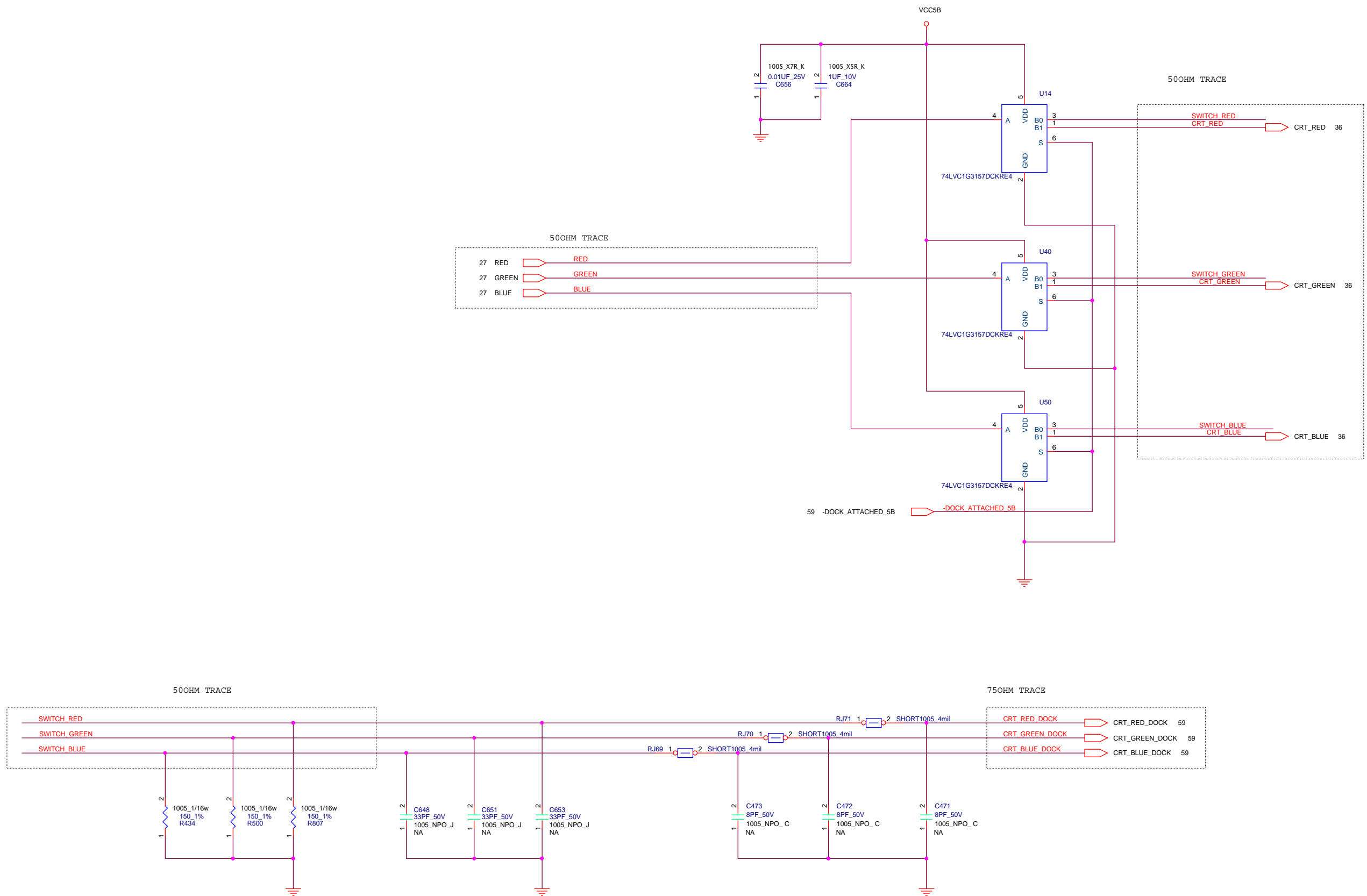
|   |                   |                  |
|---|-------------------|------------------|
|  |                   |                  |
| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
| Date: Monday, March 19, 2012  |                   | Sheet: 33 of 97  |

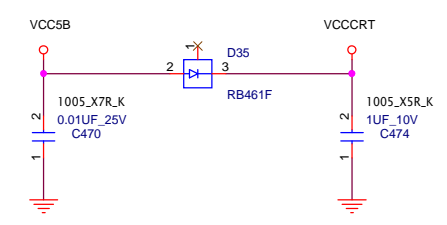
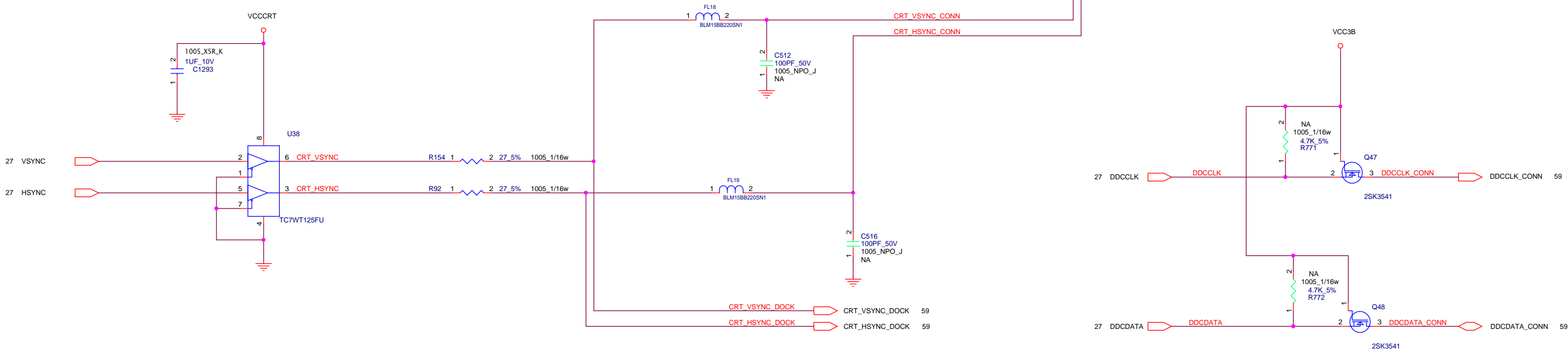
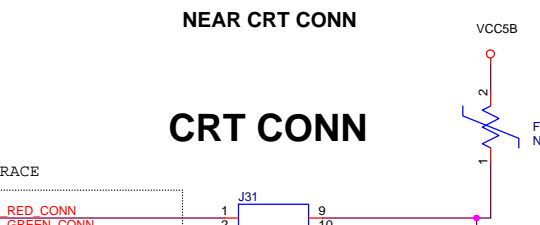
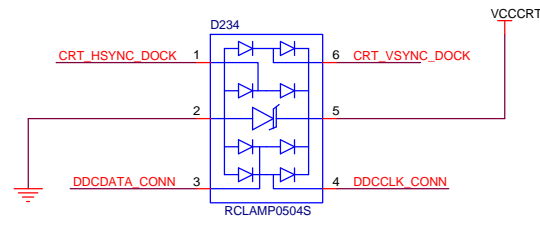
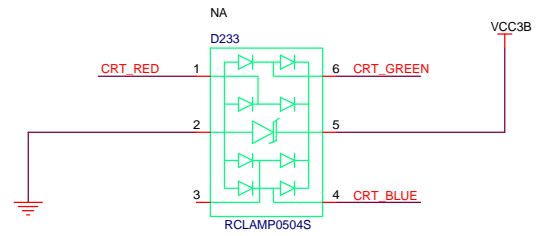
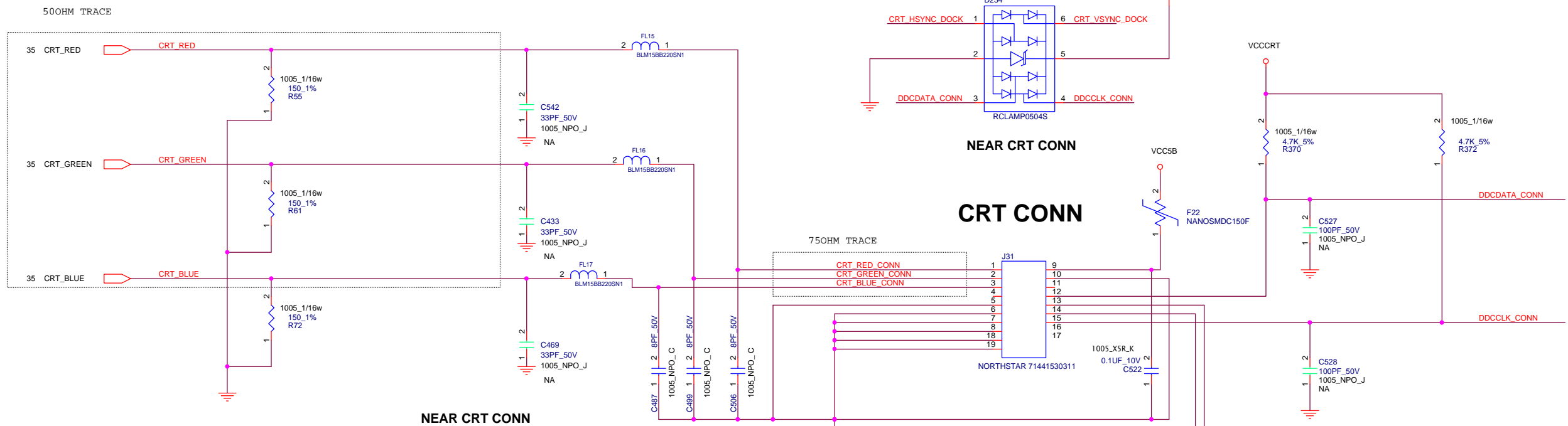


**LCD CONNECTOR**

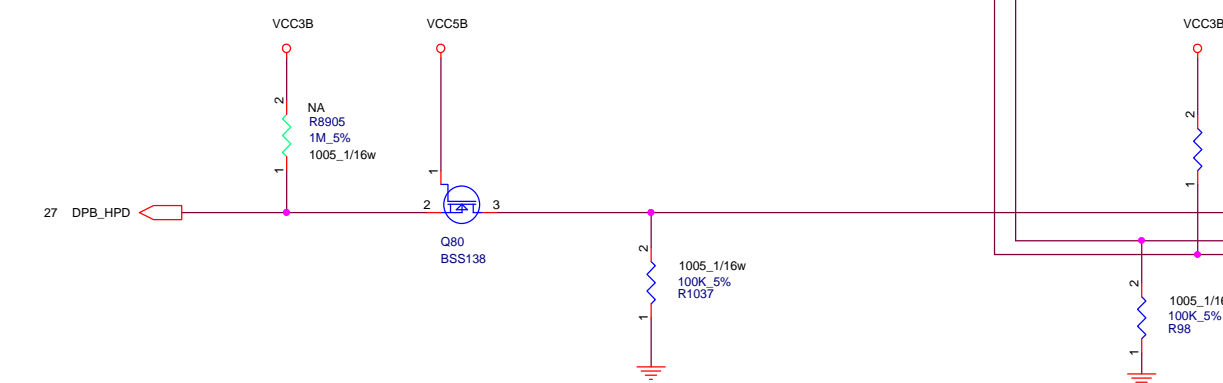
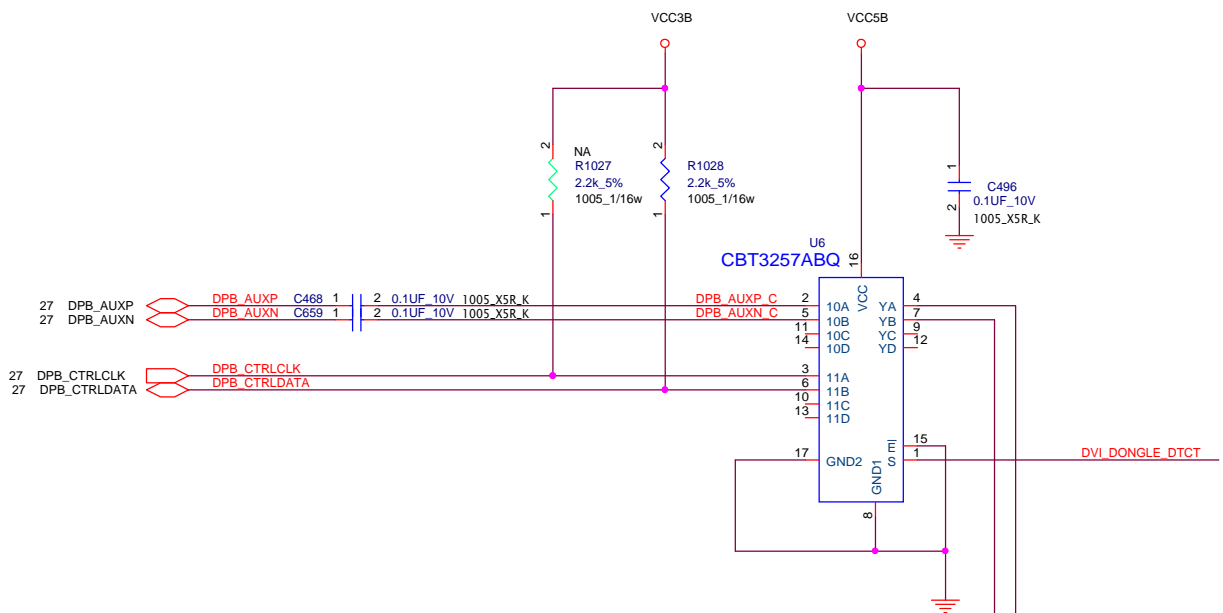
**WIDE PATTERN (10MIL)**

|                                  |                                    |
|----------------------------------|------------------------------------|
| <b>lenovo</b>                    |                                    |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>LCD CONNECTOR           |
| Size :<br>C                      | Document Number :<br>Rev :<br>7.53 |
| Date: Monday, March 19, 2012     | Sheet: 34 of 97                    |



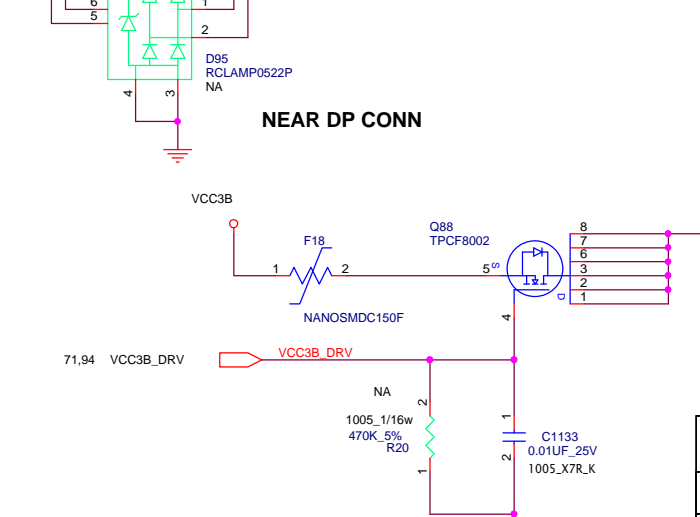
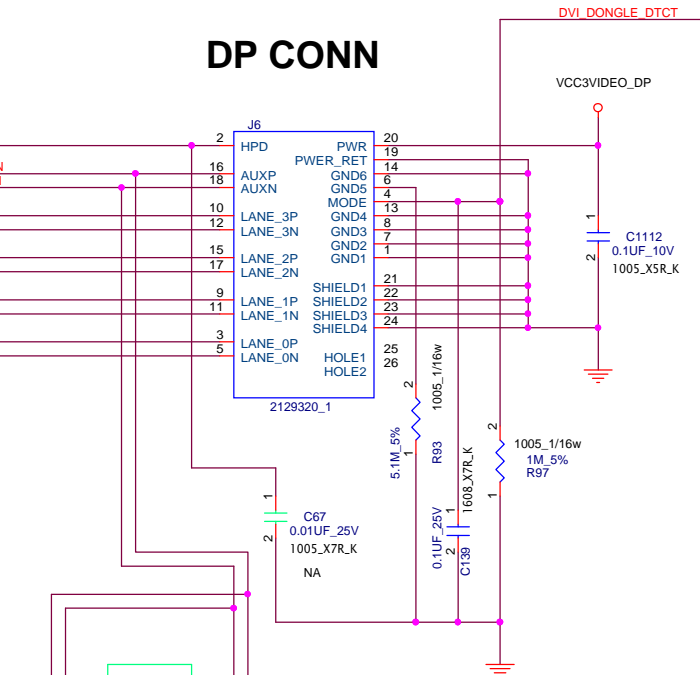
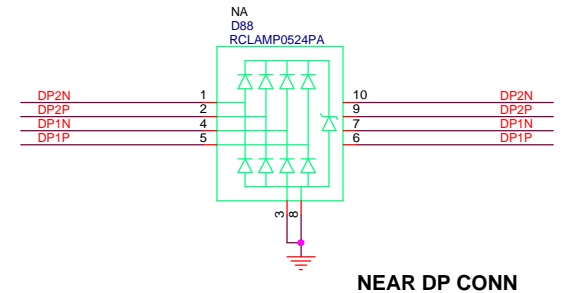
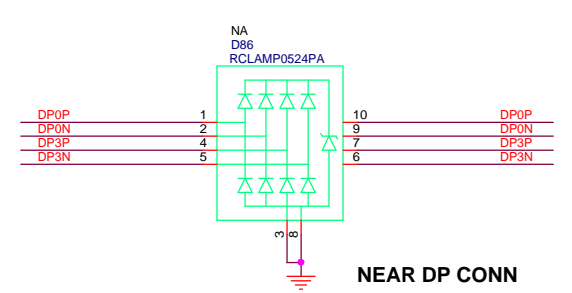
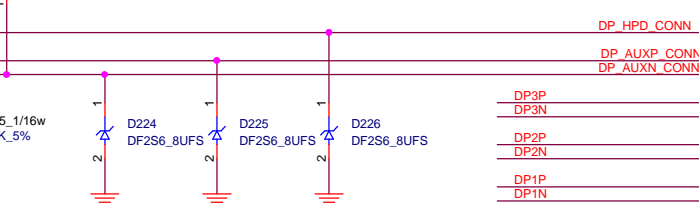


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FOR SYSTEM DP NEAR DP CONN

|    |        |      |   |   |           |            |      |
|----|--------|------|---|---|-----------|------------|------|
| 27 | DPB_3N | C339 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP3N |
| 27 | DPB_3P | C323 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP3P |
| 27 | DPB_2N | C312 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP2N |
| 27 | DPB_2P | C317 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP2P |
| 27 | DPB_1N | C277 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP1N |
| 27 | DPB_1P | C276 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP1P |
| 27 | DPB_0N | C218 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP0N |
| 27 | DPB_0P | C226 | 2 | 1 | 0.1UF_10V | 1005_X5R_K | DP0P |



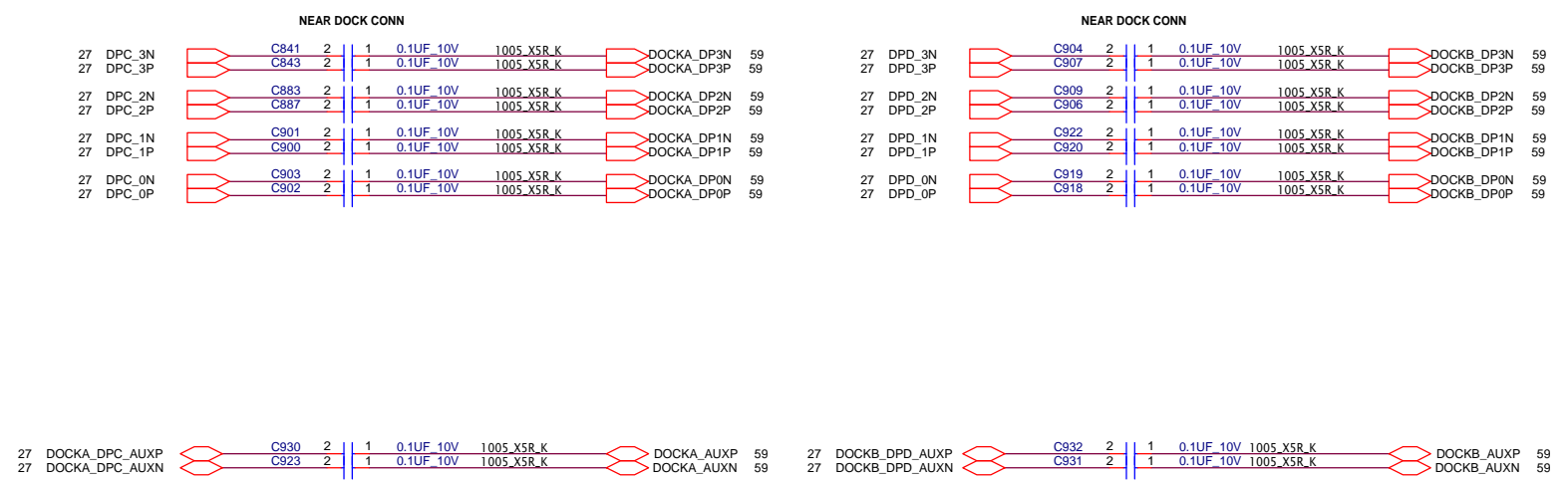
**lenovo**

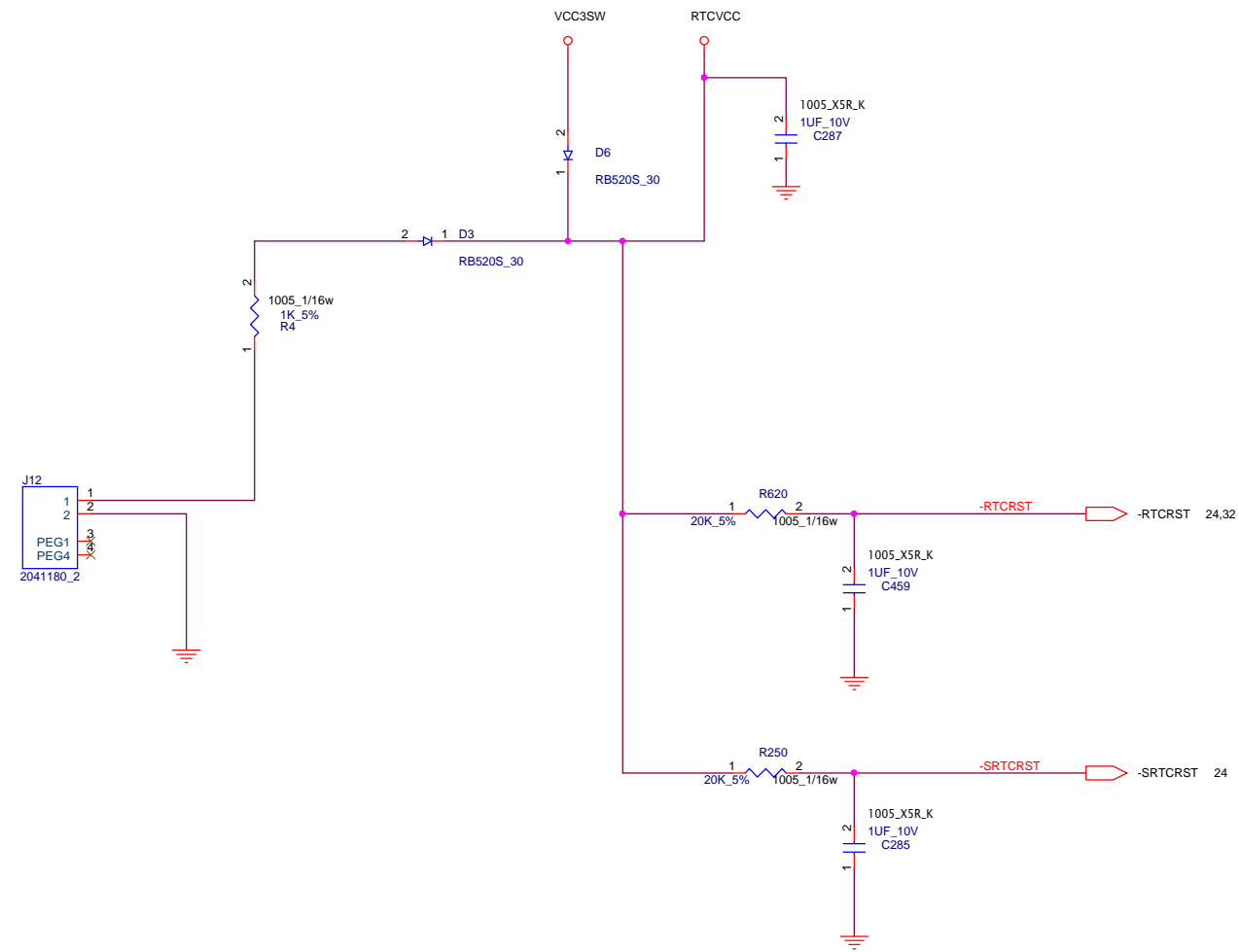
Project Name: NZM-4 UMA SOVP Title: DISPLAY PORT CONN

Size: C Document Number: Rev: 7.53

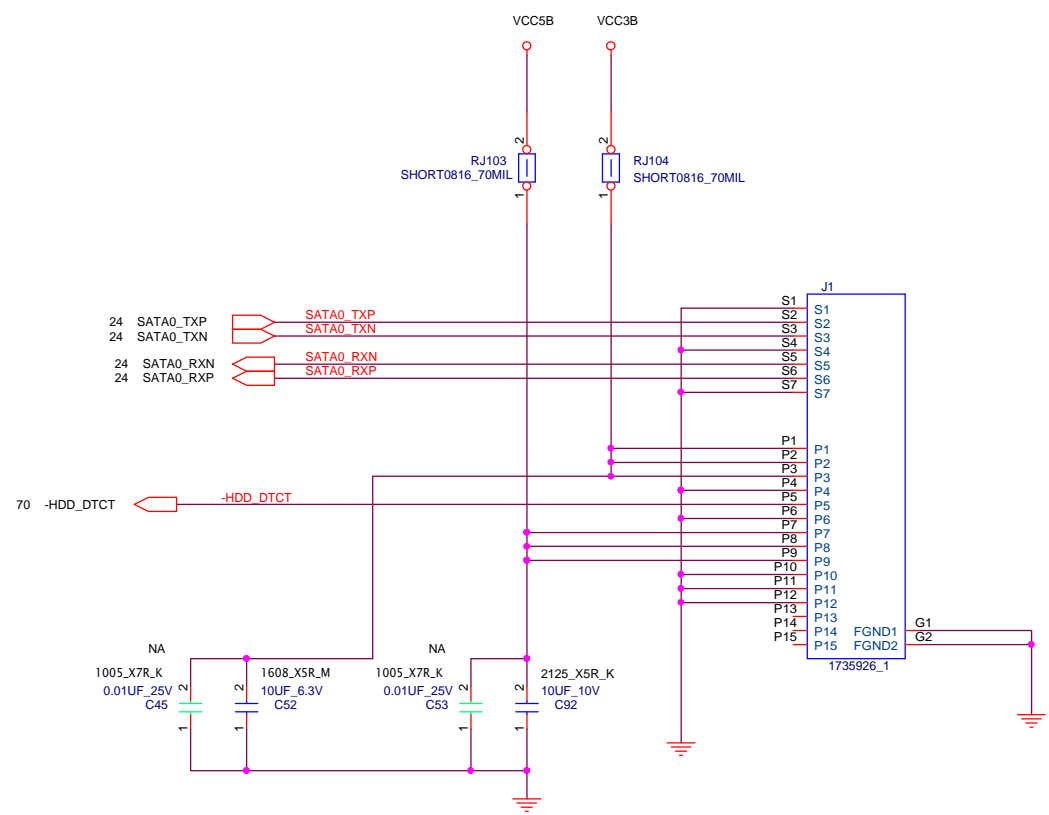
Date: Monday, March 19, 2012 Sheet: 37 of 97

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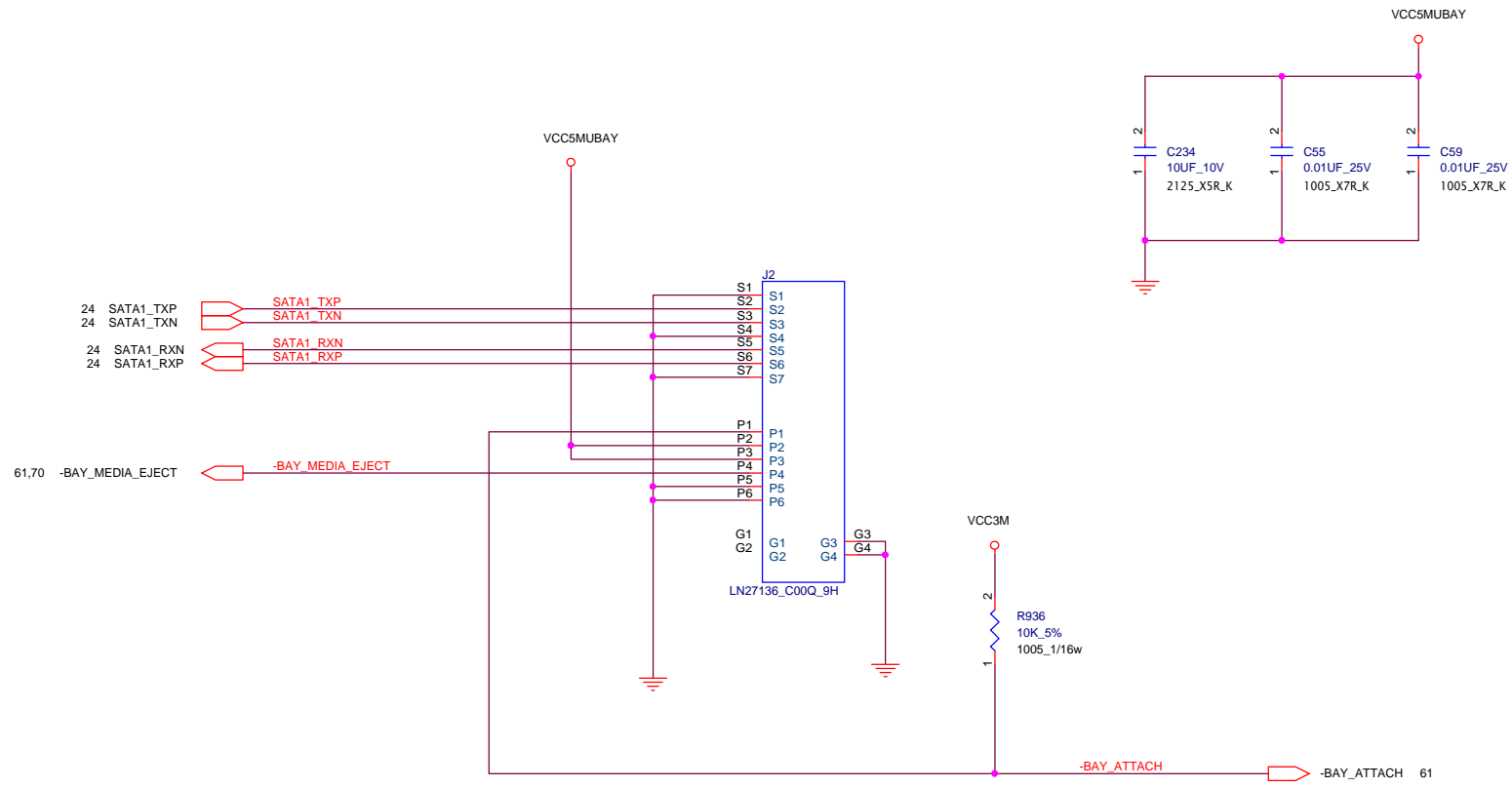


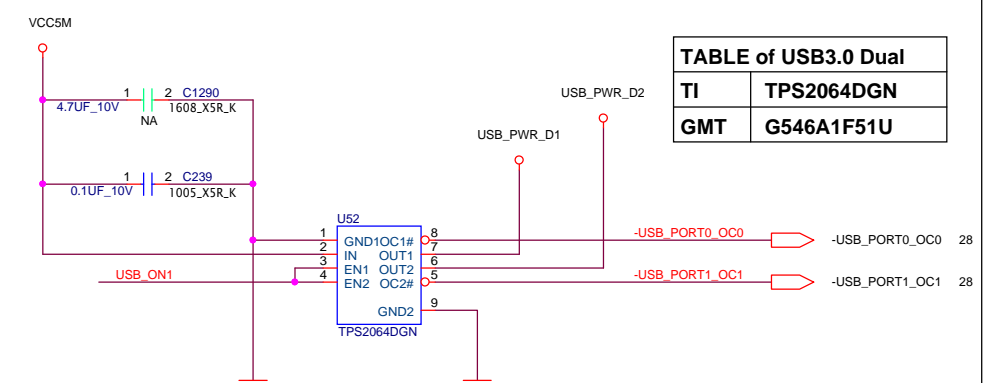
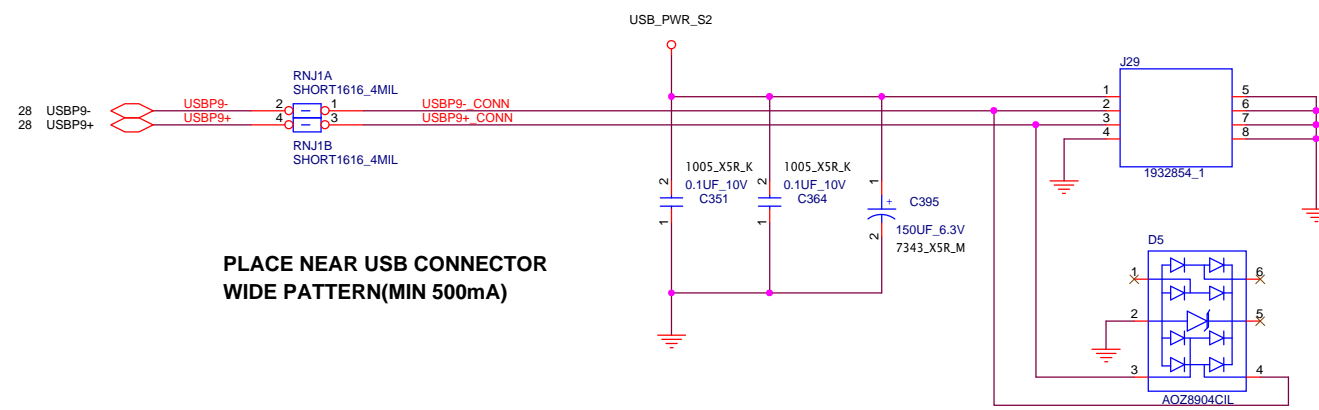
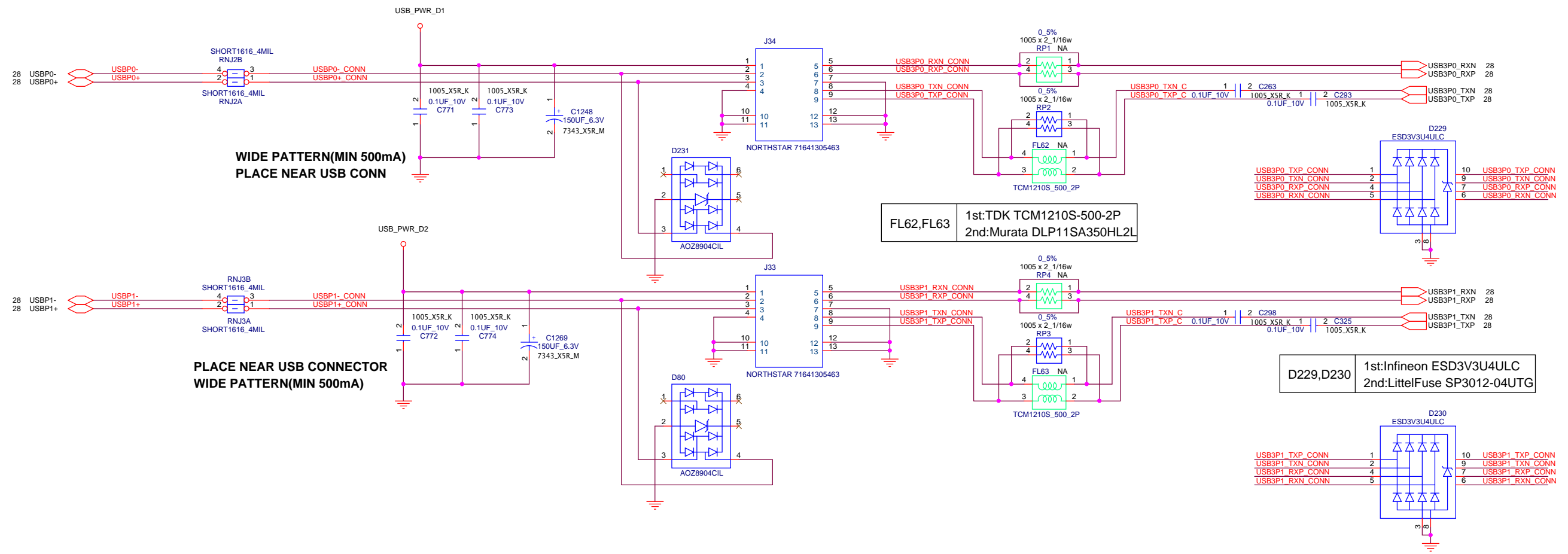
|                                 |                       |
|---------------------------------|-----------------------|
| <b>lenovo</b>                   |                       |
| Project Name:<br>NZM-4 UMA SOVP | Title:<br>RTC BATTERY |
| Size:<br>C                      | Document Number:      |
| Date: Monday, March 19, 2012    | Rev:<br>7.53          |
| Sheet: 39                       | of 97                 |



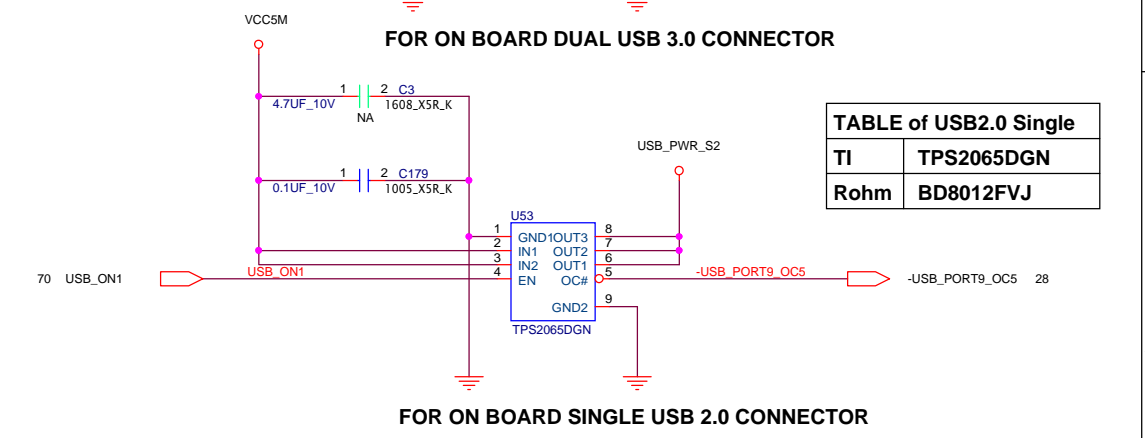
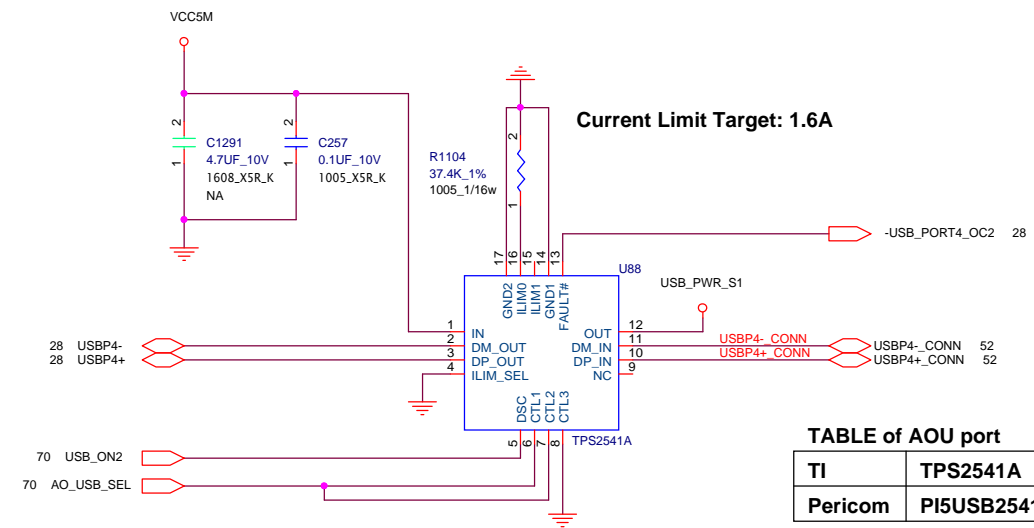
|                                  |                   |                          |
|----------------------------------|-------------------|--------------------------|
| <b>lenovo</b>                    |                   |                          |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>SATA HDD CONN |
| Size :<br>C                      | Document Number : | Rev :<br>7.53            |
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| TABLE of USB3.0 Dual |            |
|----------------------|------------|
| TI                   | TPS2064DGN |
| GMT                  | G546A1F51U |



| TABLE of USB2.0 Single |            |
|------------------------|------------|
| TI                     | TPS2065DGN |
| Rohm                   | BD8012FVJ  |

**lenovo**

Project Name : NZM-4 UMA SOVP Title : USB POWER/CONN

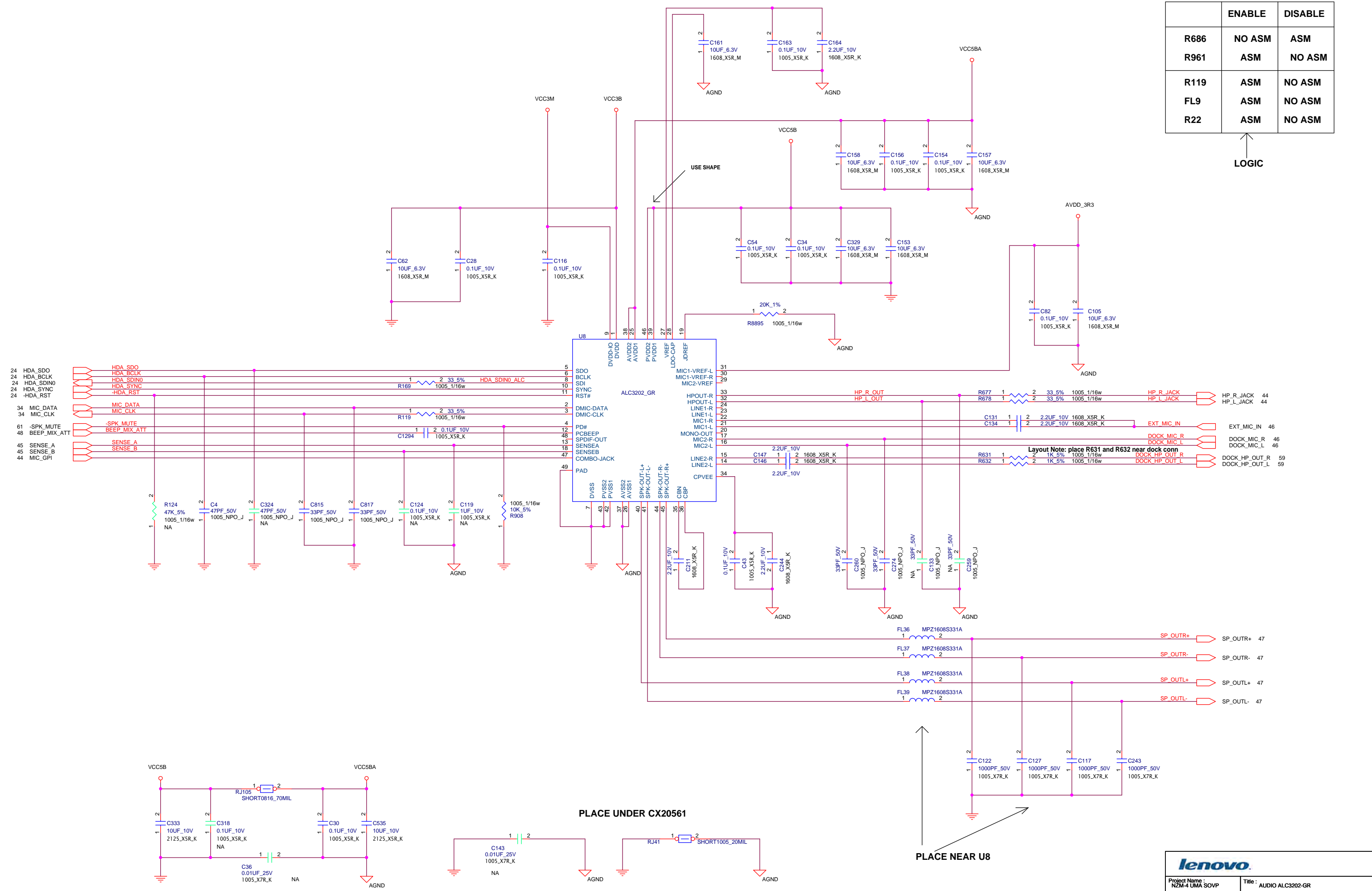
Size : C Document Number : Rev : 7.53

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TABLE MIC HW ENABLE/DISABLE

|      | ENABLE | DISABLE |
|------|--------|---------|
| R686 | NO ASM | ASM     |
| R961 | ASM    | NO ASM  |
| R119 | ASM    | NO ASM  |
| FL9  | ASM    | NO ASM  |
| R22  | ASM    | NO ASM  |

LOGIC



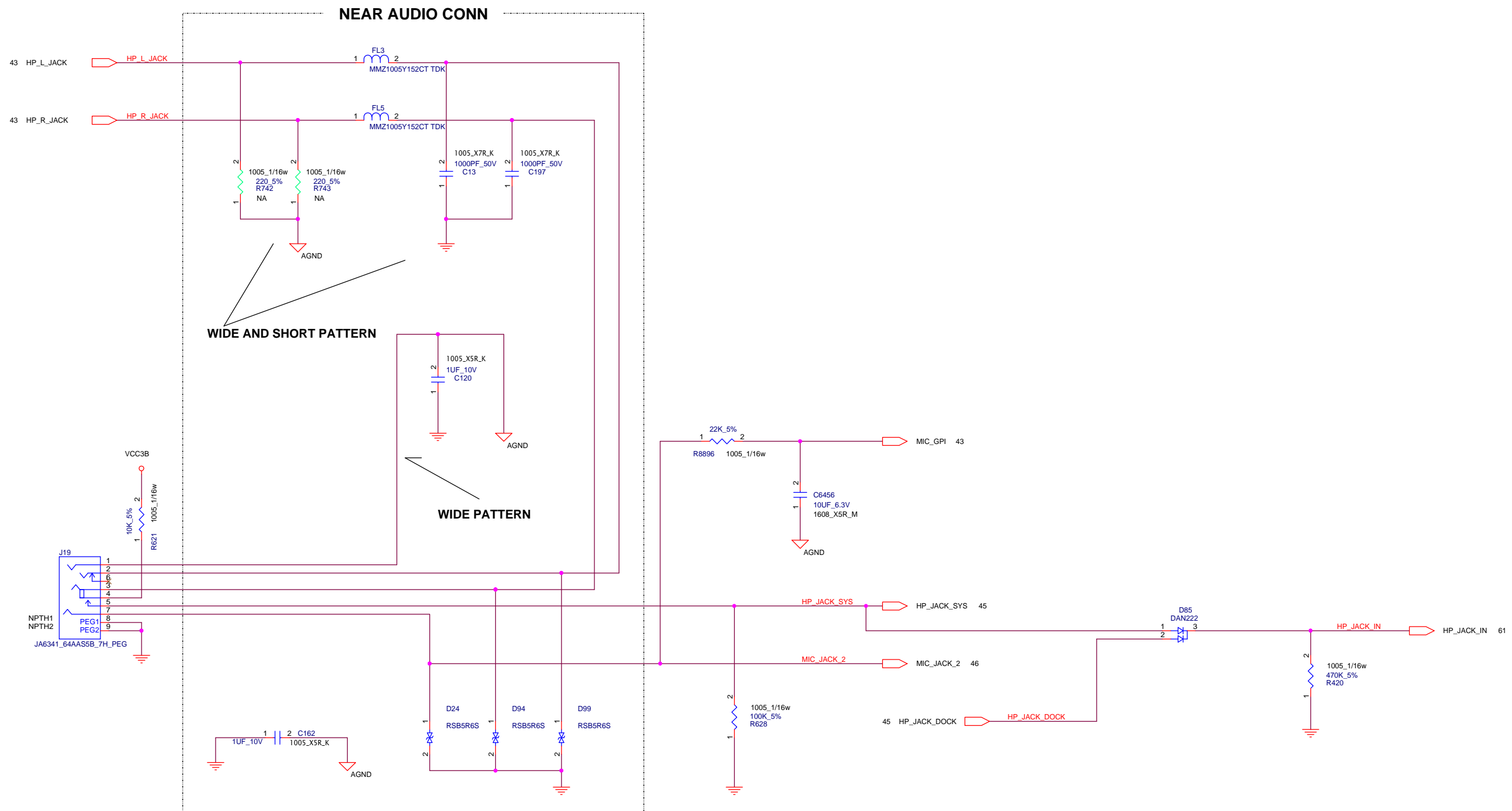
**lenovo**

Project Name : NZM-4 UMA SOVP Title : AUDIO ALC3202-GR

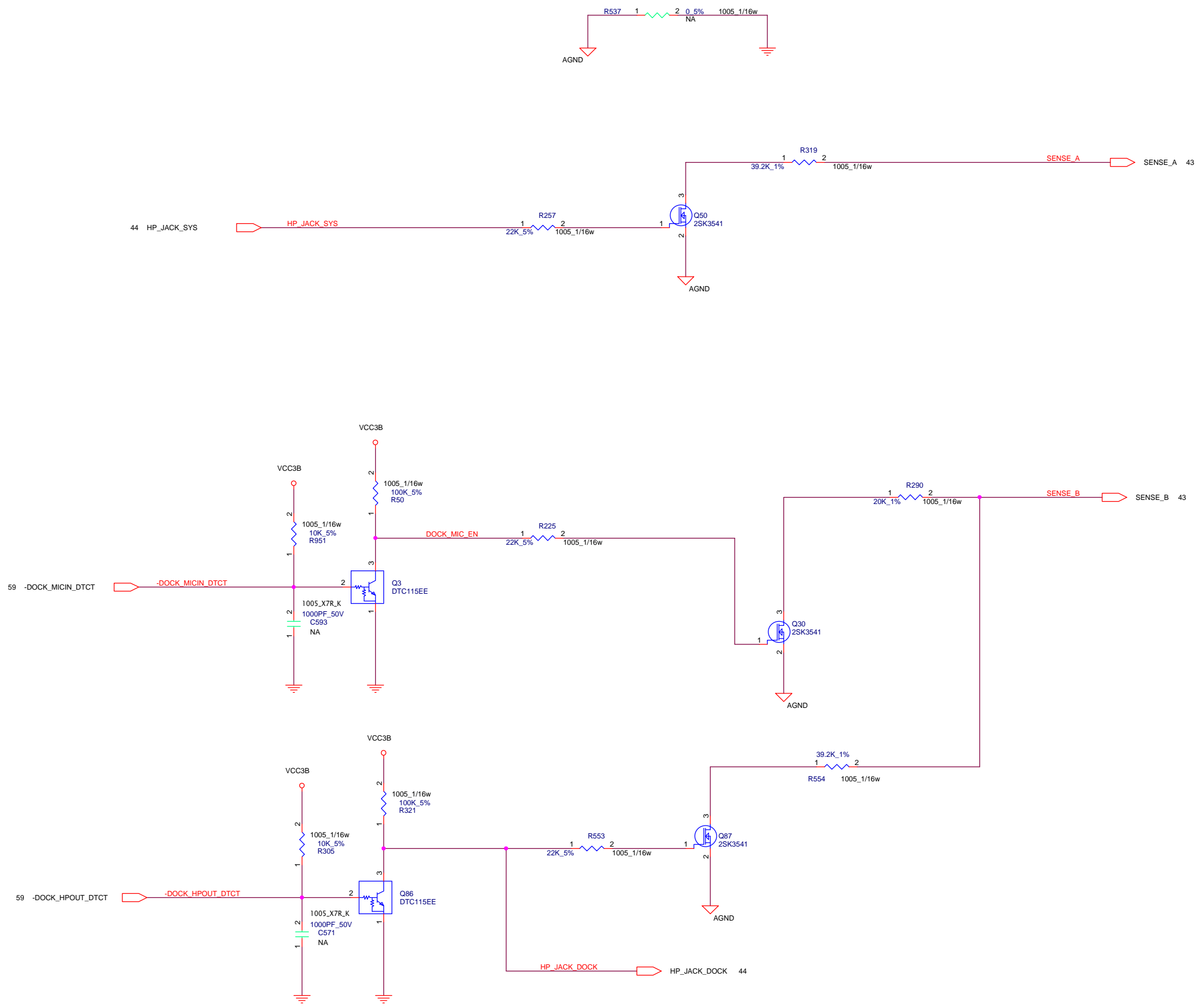
Size : C Document Number : Rev : 7.53

Date : Monday, March 19, 2012 Sheet : 43 of 97

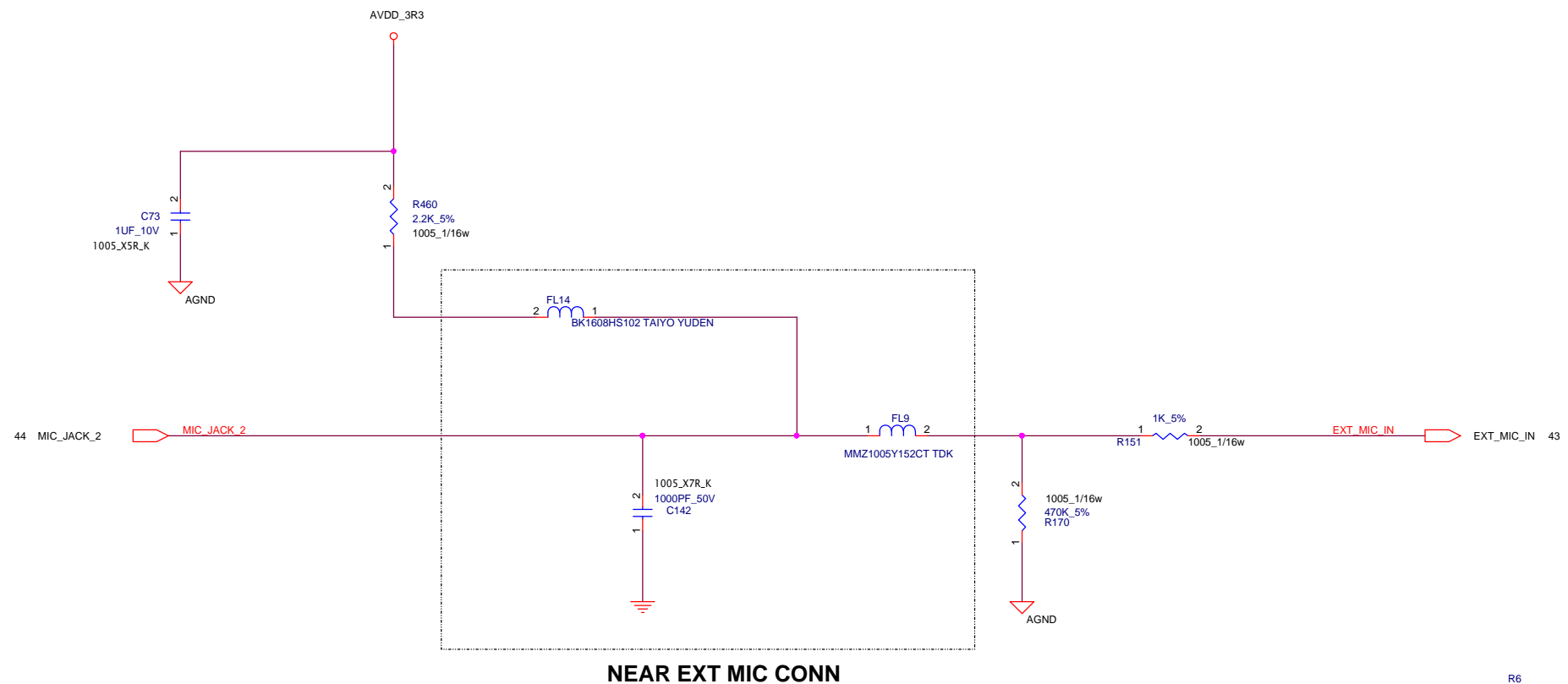
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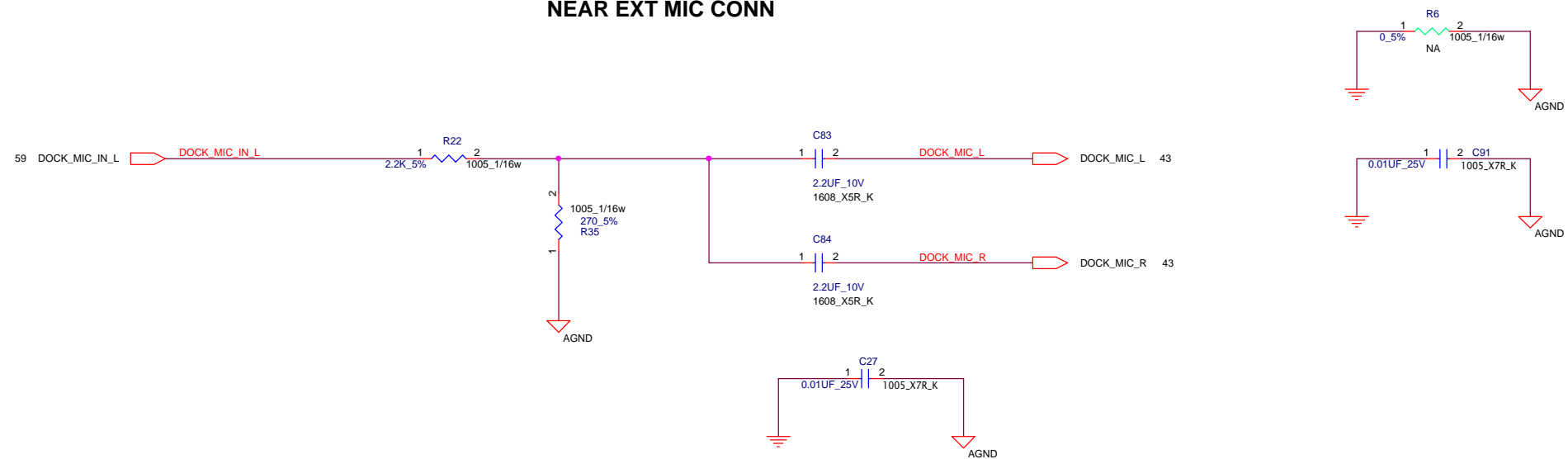
|                                  |                       |
|----------------------------------|-----------------------|
| <b>lenovo</b>                    |                       |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>AUDIO CONN |
| Size :<br>C                      | Document Number :     |
| Date :<br>Monday, March 19, 2012 | Rev :<br>7.53         |
| Sheet :<br>44                    | of<br>97              |



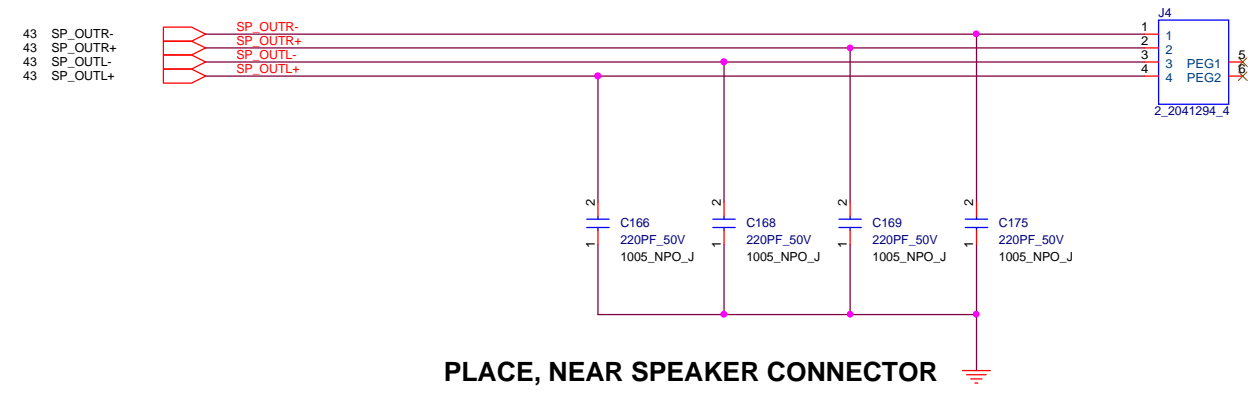
|                                 |                                  |
|---------------------------------|----------------------------------|
| <b>lenovo</b>                   |                                  |
| Project Name:<br>N2M-4 UMA SOVP | Title:<br>AUDIO JACK SENSE       |
| Size:<br>C                      | Document Number:<br>Rev:<br>7.53 |
| Date: Monday, March 19, 2012    | Sheet: 45 of 97                  |



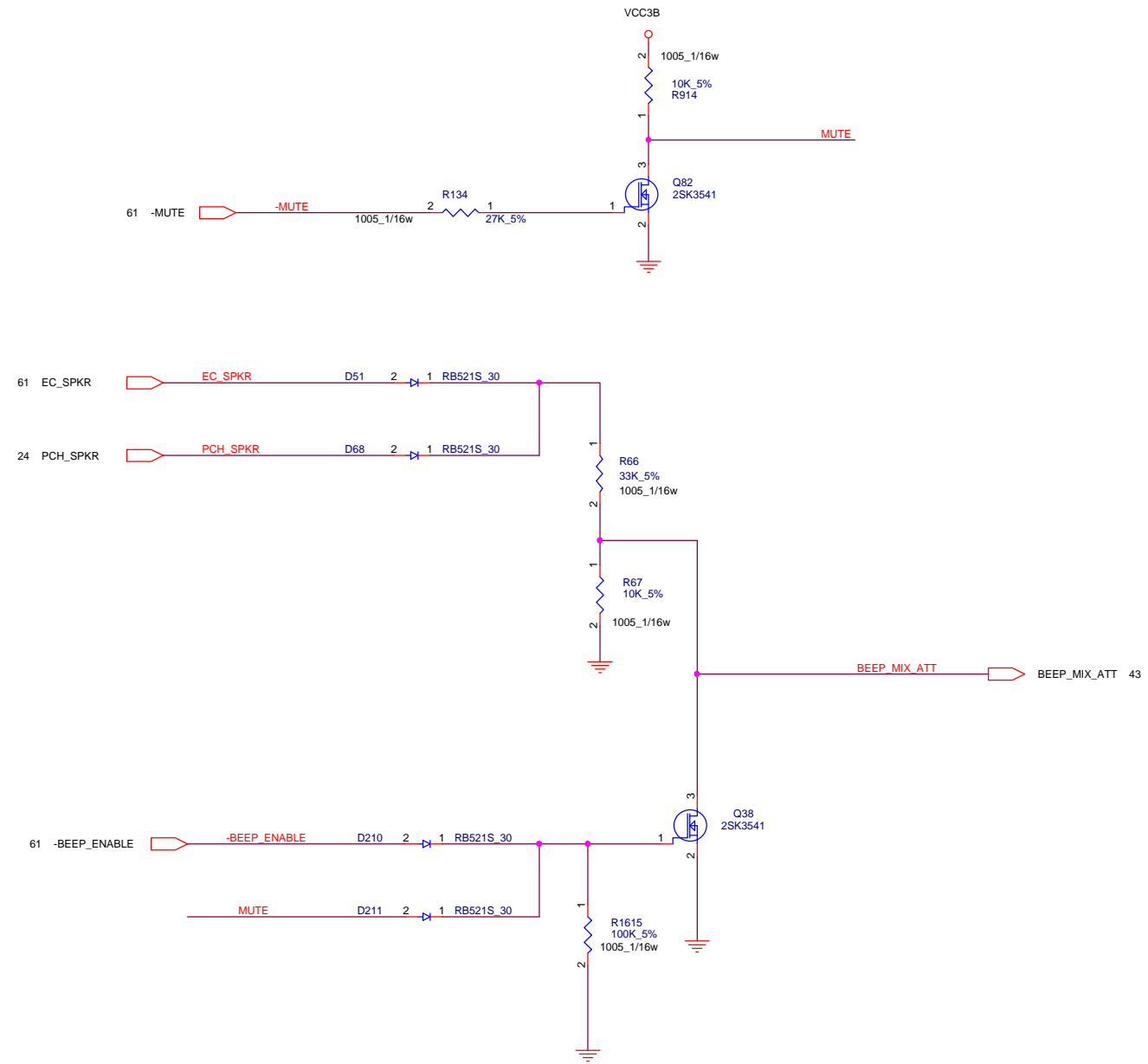
**NEAR EXT MIC CONN**



|                                 |                                  |
|---------------------------------|----------------------------------|
| <b>lenovo</b>                   |                                  |
| Project Name:<br>N2M-4 UMA SOVP | Title:<br>AUDIO EXT MIC I/F      |
| Size:<br>C                      | Document Number:<br>Rev:<br>7.53 |
| Date: Monday, March 19, 2012    | Sheet: 46 of 97                  |

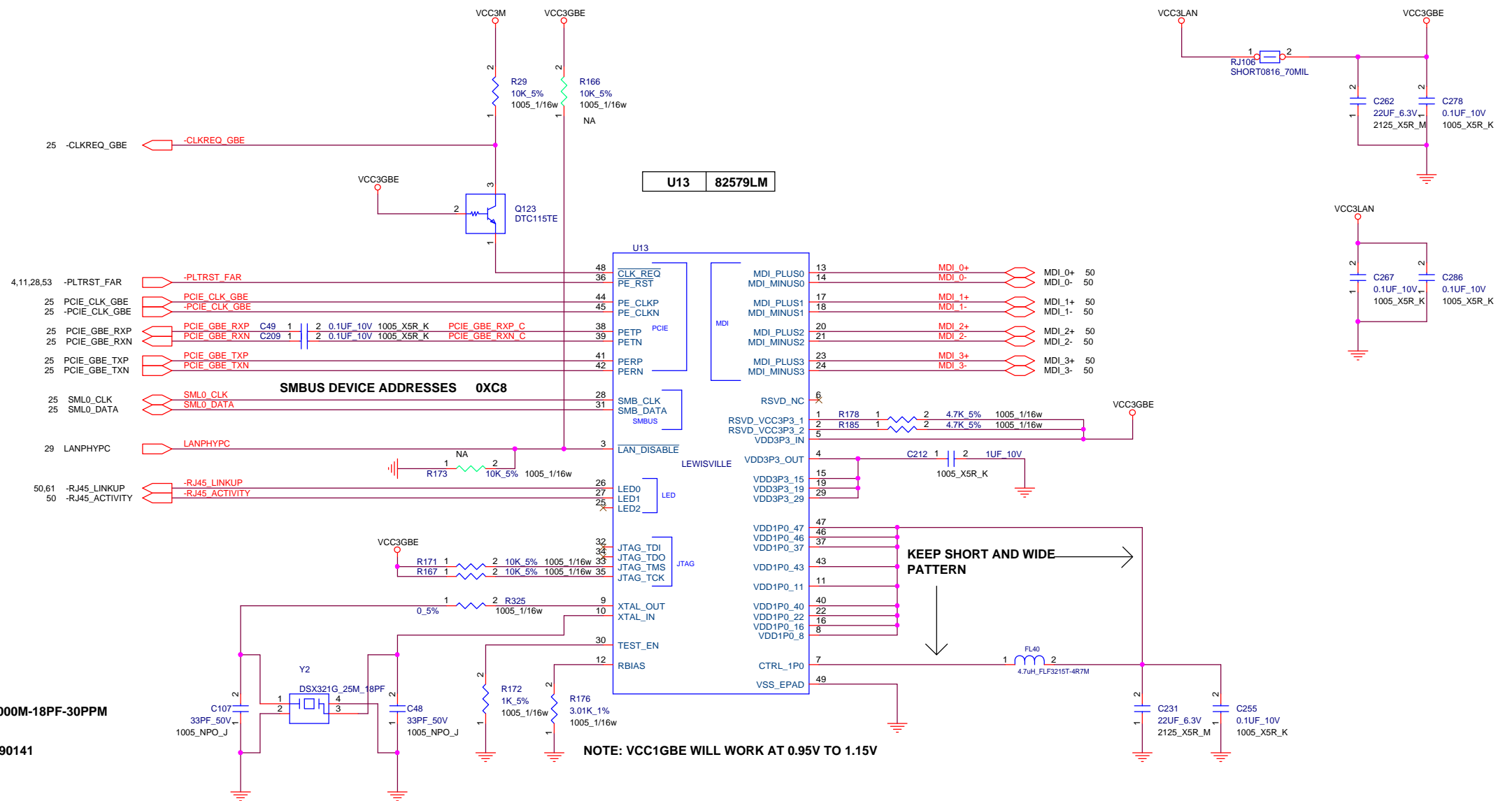


|                                  |                   |                          |
|----------------------------------|-------------------|--------------------------|
| <b>lenovo</b>                    |                   |                          |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>AUDIO SPEAKER |
| Size :<br>C                      | Document Number : | Rev :<br>7.53            |
| Date: Monday, March 19, 2012     |                   | Sheet : 47 of 97         |



|                                 |                                  |
|---------------------------------|----------------------------------|
| <b>lenovo</b>                   |                                  |
| Project Name:<br>N2M-4 UMA SOVP | Title:<br>AUDIO BEEP             |
| Size:<br>C                      | Document Number:<br>Rev:<br>7.53 |
| Date: Monday, March 19, 2012    | Sheet: 48 of 97                  |

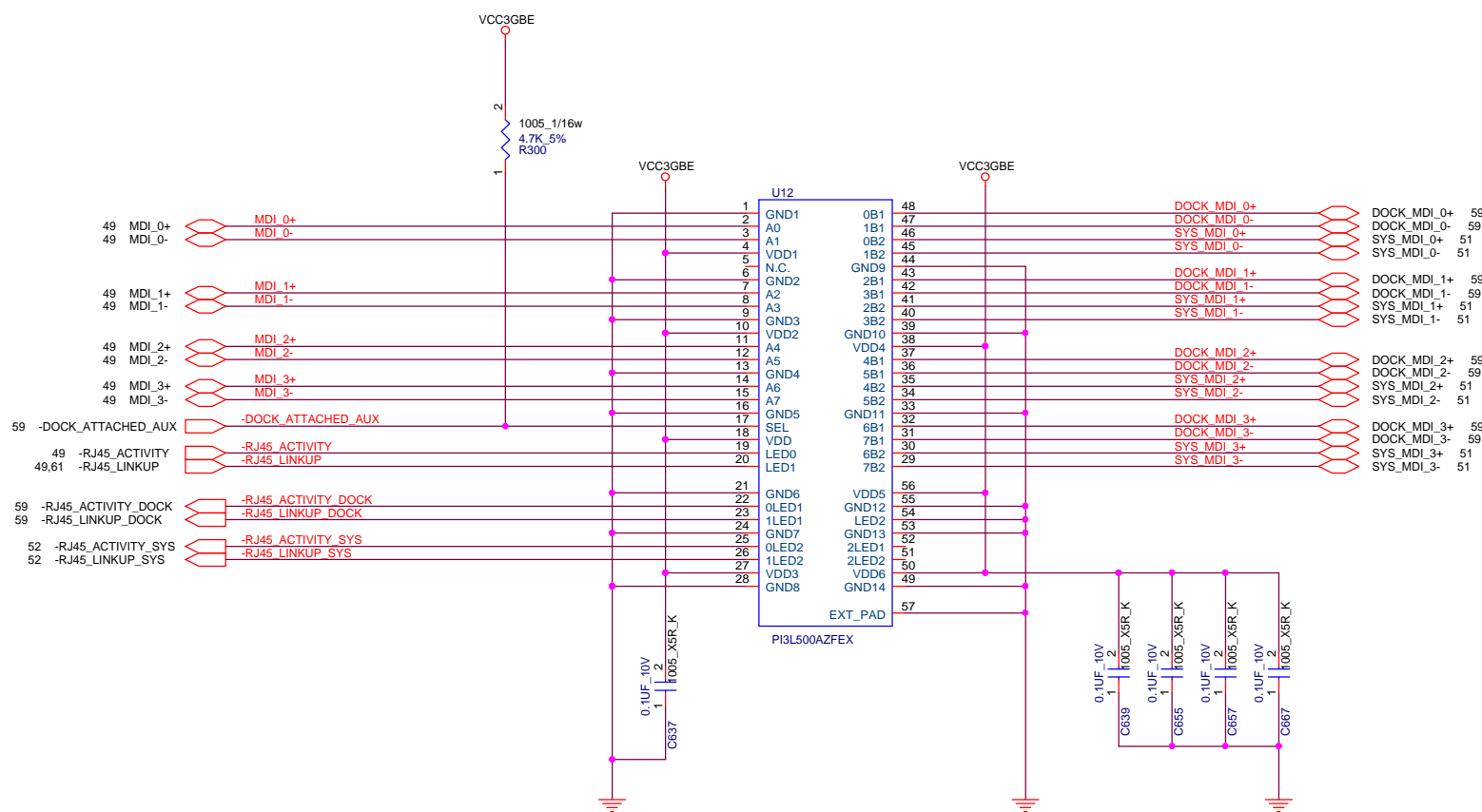




P/N 41U6141  
 KDS DSX321G-25.000M-18PF-30PPM  
 TXC 7V25020001  
 RIVER FCX-04-25MJ90141

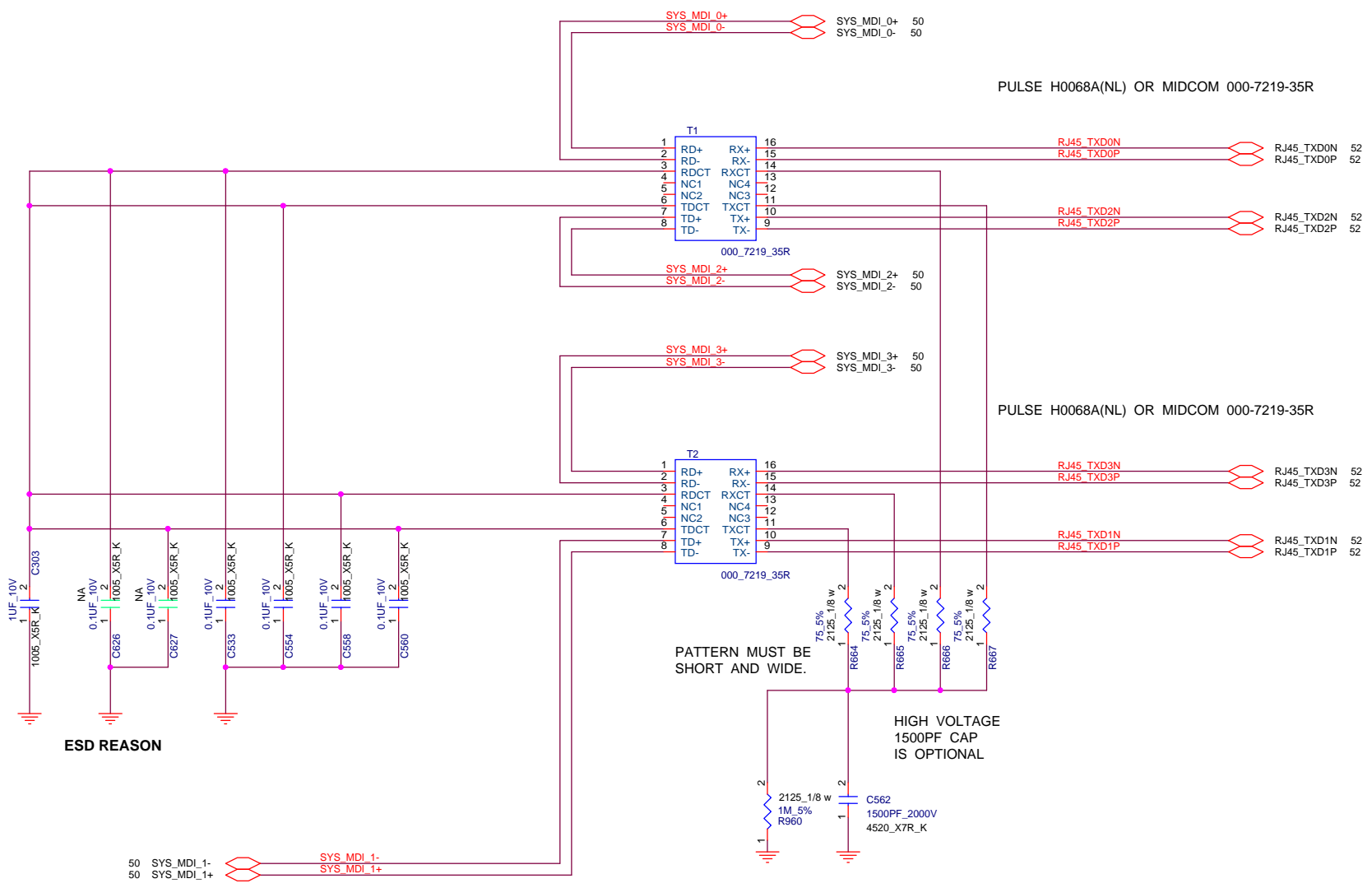
NOTE: VCC1GBE WILL WORK AT 0.95V TO 1.15V

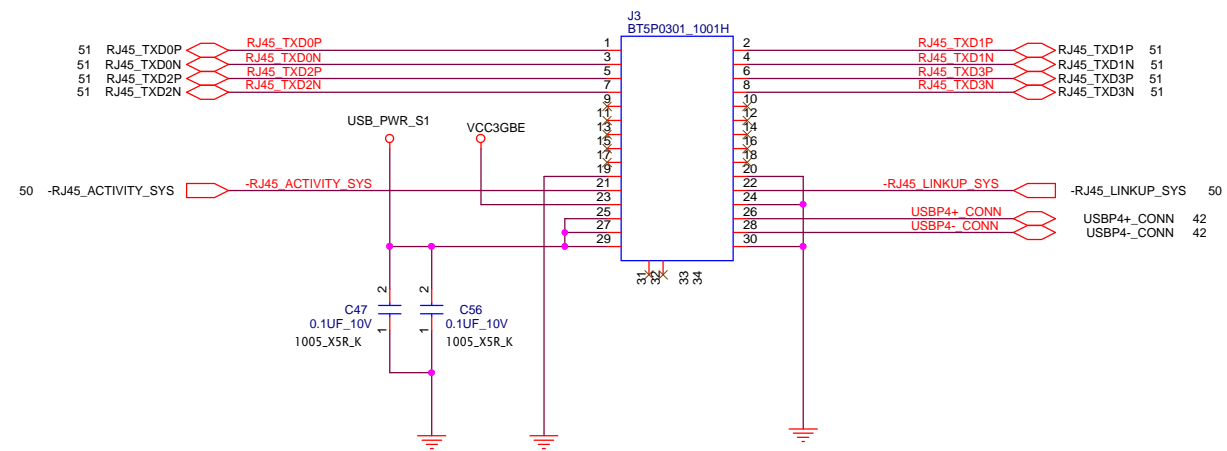
KEEP SHORT AND WIDE PATTERN



THE WIDTH OF THESE TRACE SHOULD BE WIDER THAN 35MIL TO PREVENT VOLTAGE DROP.

C303 SHOULD BE PLACED AS CLOSE TO MAGNETICS AS POSSIBLE.

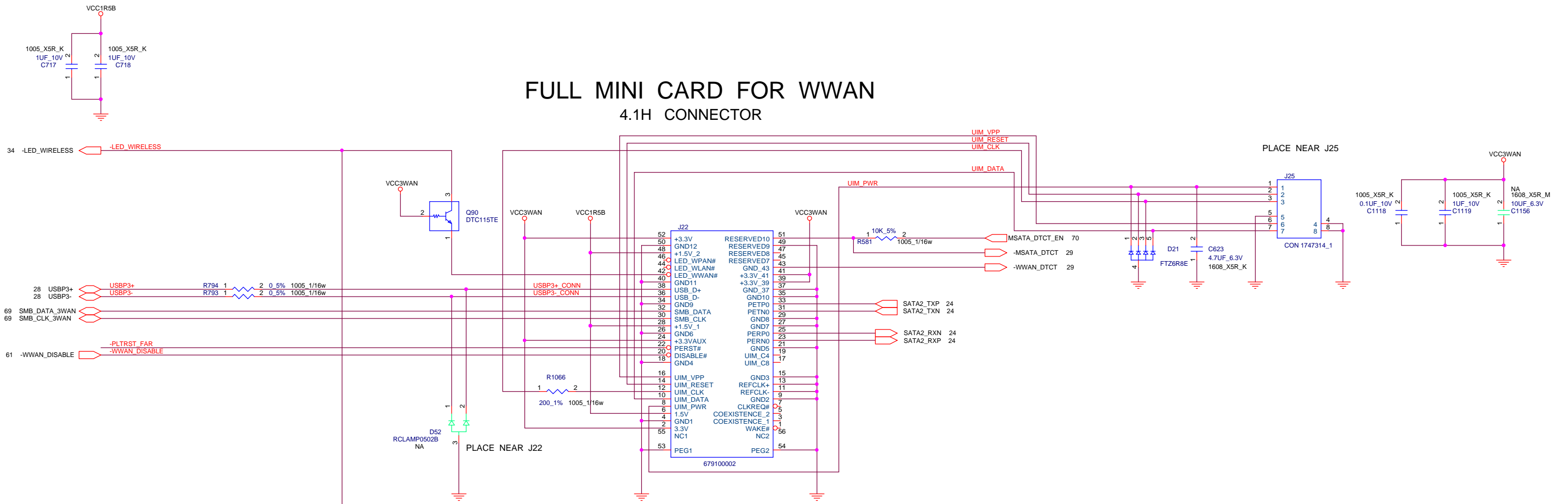




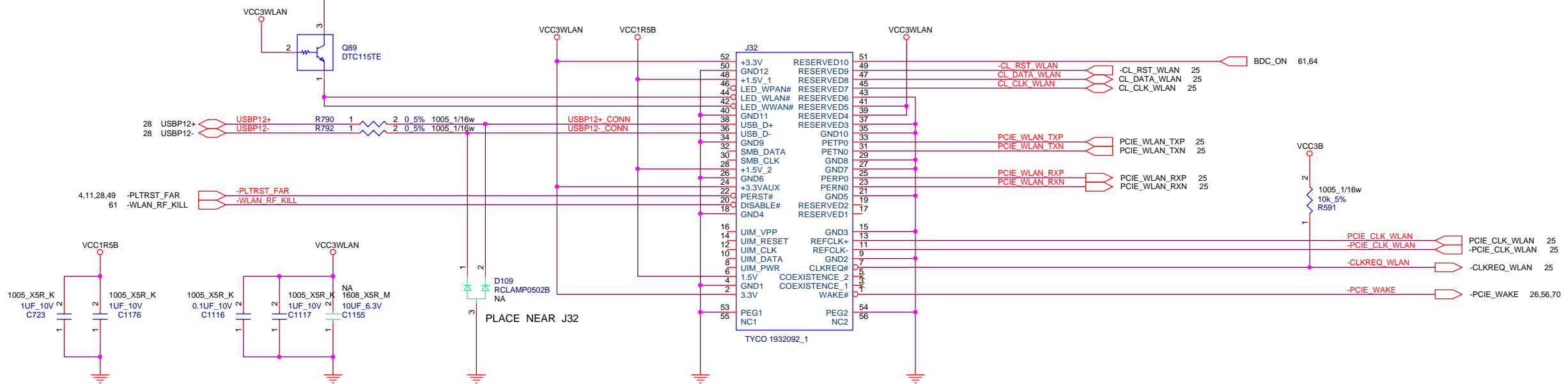
PLACE NEAR SUB CARD CONNECTOR  
WIDE PATTERN(MIN 500mA)

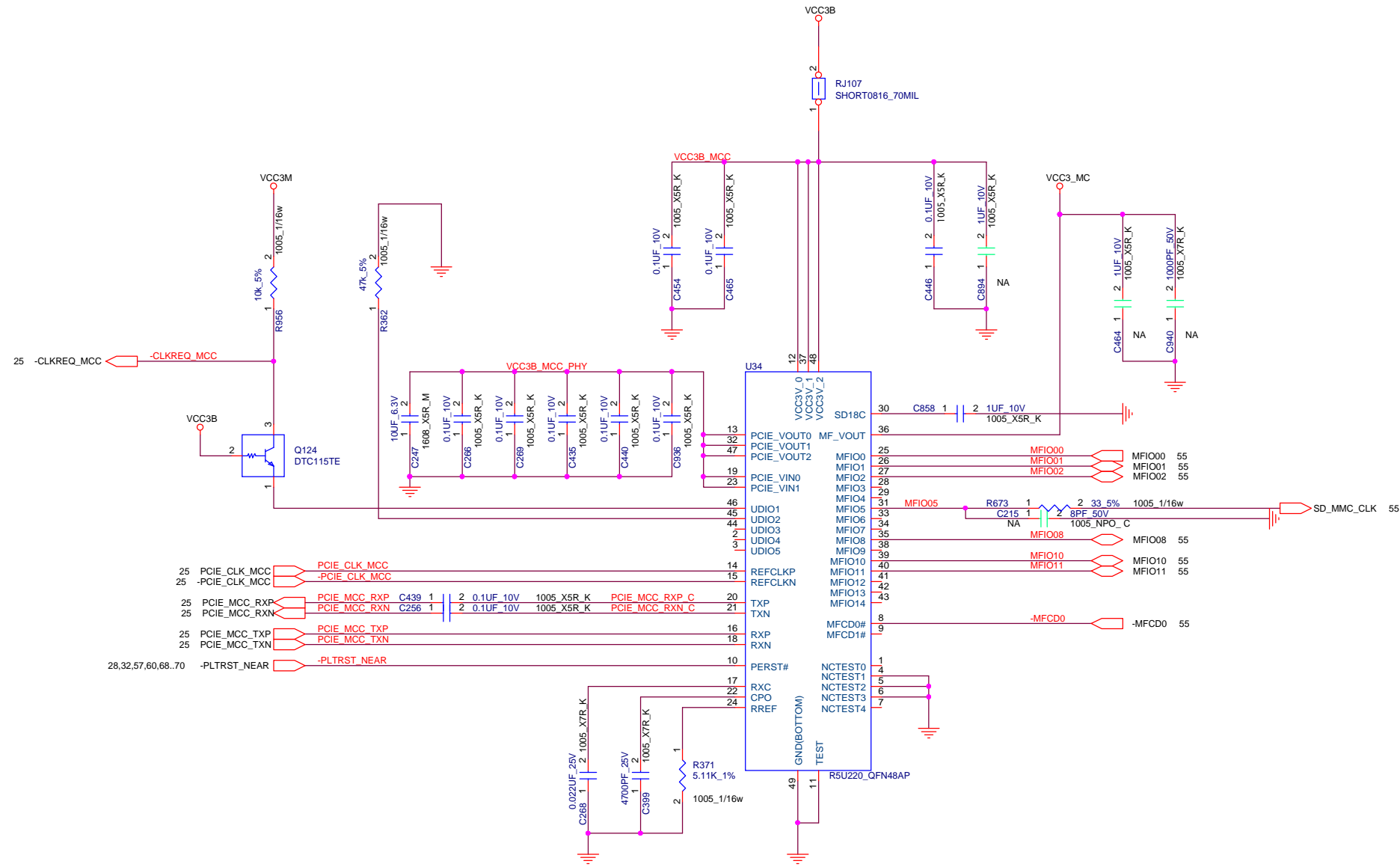
|                                  |                   |                             |
|----------------------------------|-------------------|-----------------------------|
| <b>lenovo</b>                    |                   |                             |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>I/O SUB CARD I/F |
| Size :<br>C                      | Document Number : | Rev :<br>7.53               |
| Date: Monday, March 19, 2012     | Sheet : 52        | of 97                       |

# FULL MINI CARD FOR WWAN 4.1H CONNECTOR



# HALF MINI CARD FOR WLAN 7.0H CONNECTOR





TABLE

| MEDIA I/F | SD/MMC  | MEMORSTICK | XD     |
|-----------|---------|------------|--------|
| MFI00     | SDWP#   | MSBS       | XD_D7  |
| MFI01     | SD_D1   | XD_D6      | XD_D6  |
| MFI02     | SD_D0   | MS_D1      | XD_D5  |
| MFI03     | (SD_D7) | (MS_D5)    | XD_D4  |
| MFI04     | (SD_D6) | (MS_D5)    | XD_D3  |
| MFI05     | SD_CLK  | MS_D0      | XD_D2  |
| MFI06     |         |            | XD_D1  |
| MFI07     | (SD_D5) | (MS_D4)    | XD_D0  |
| MFI08     | SD_CMD  | MS_D2      | XD_WP# |
| MFI09     | (SD_D4) | (MS_D6)    | XD_WE# |
| MFI10     | SD_D3   | MS_D3      | XD_ALE |
| MFI11     | SD_D2   |            | XD_CLE |
| MFI12     |         |            | XD_CE# |
| MFI13     |         | (MS_D7)    | XD_RE# |
| MFI14     |         | MS_CLK     | XD_RB# |
| MFCDO#    | SDCD#   |            | XDCD0# |
| MFCD1#    |         | MSINS#     | XDCD1# |

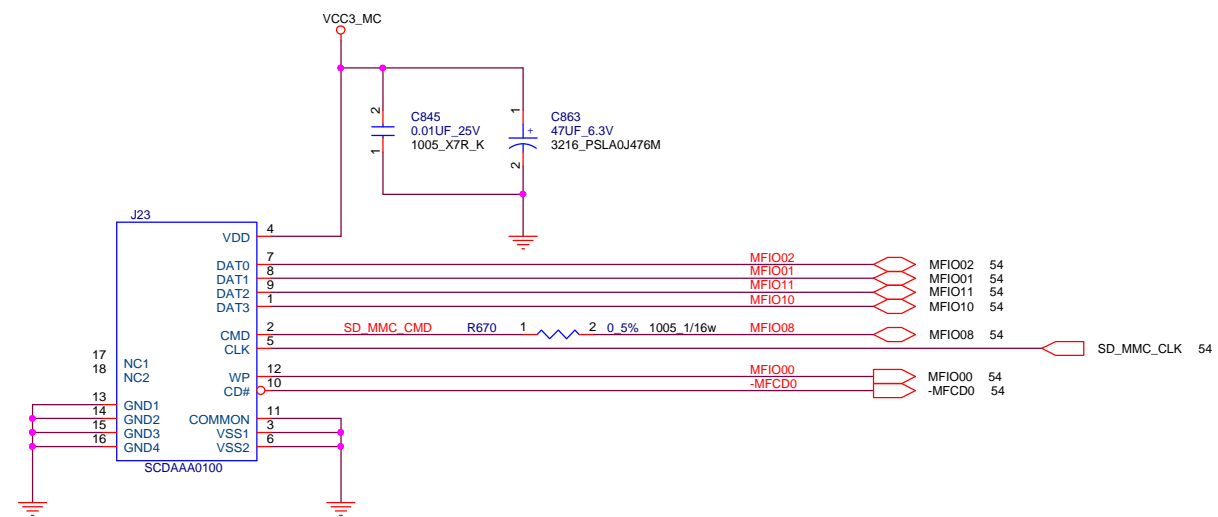
UDIO Pin Assignment Table

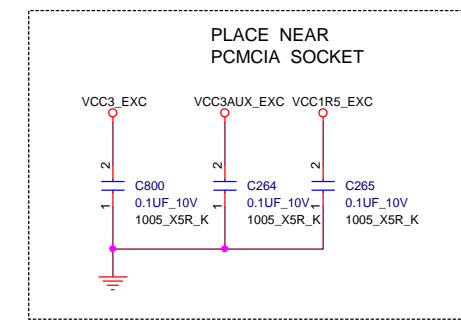
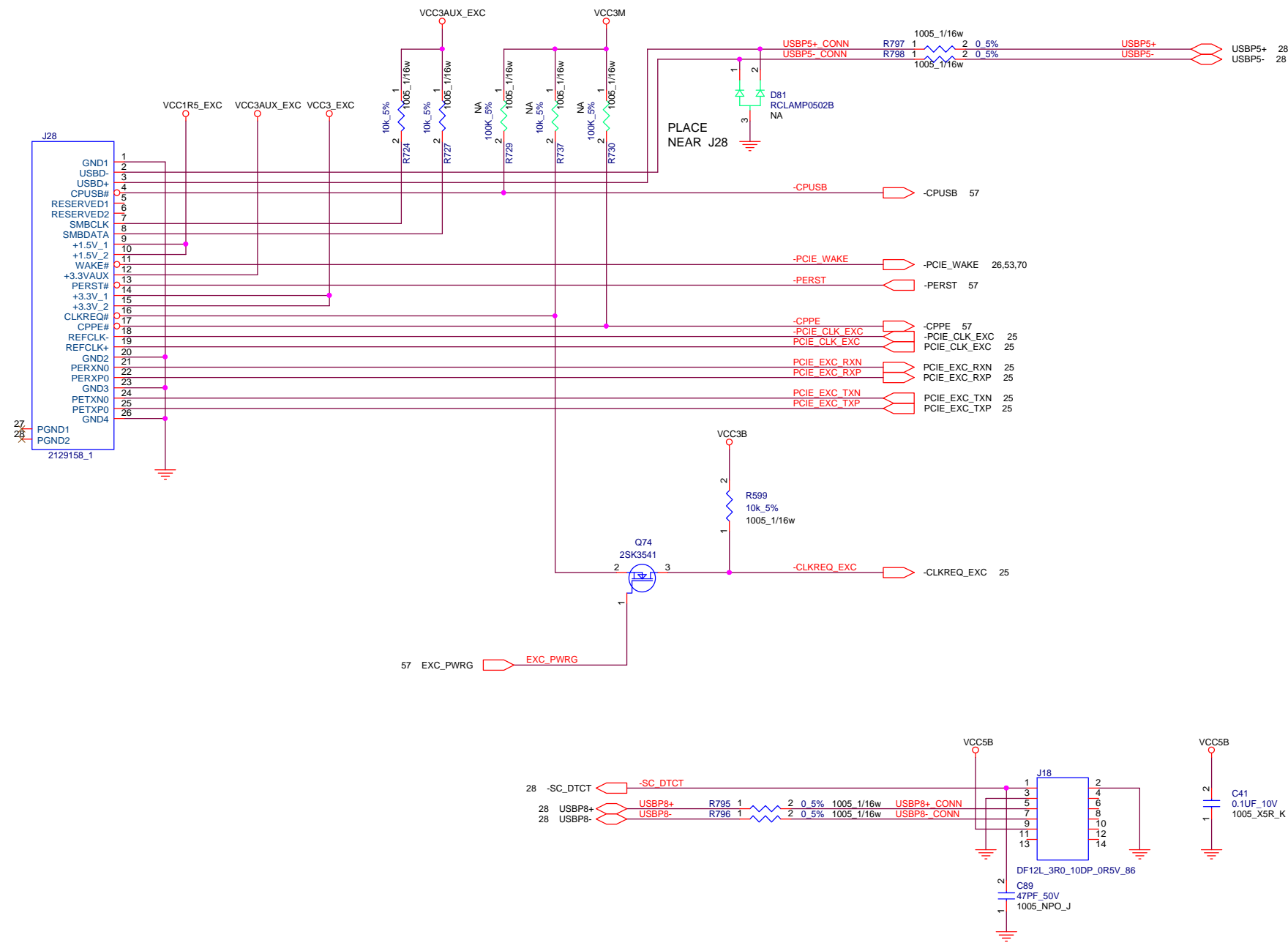
| UDIO | Default     |
|------|-------------|
| 01   | CLKREQ#     |
| 02   | SCL/SROM_EN |
| 03   | SDA         |

MFCdN Detection Table

| MFCdN | Card Type |             |
|-------|-----------|-------------|
| 1     | 0         | (No Card)   |
| H     | H         | SD Card/MMC |
| L     | H         | MemoryStick |
| L     | L         | XD Card     |

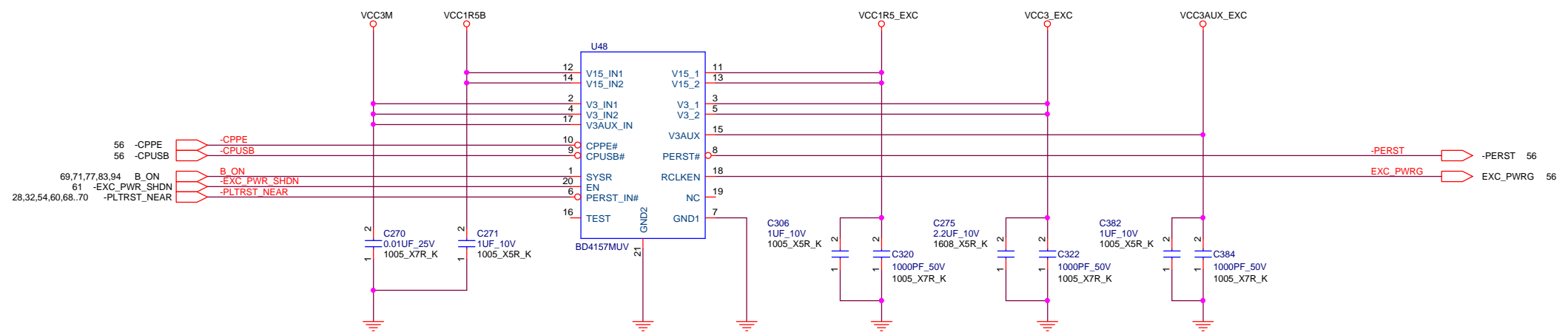


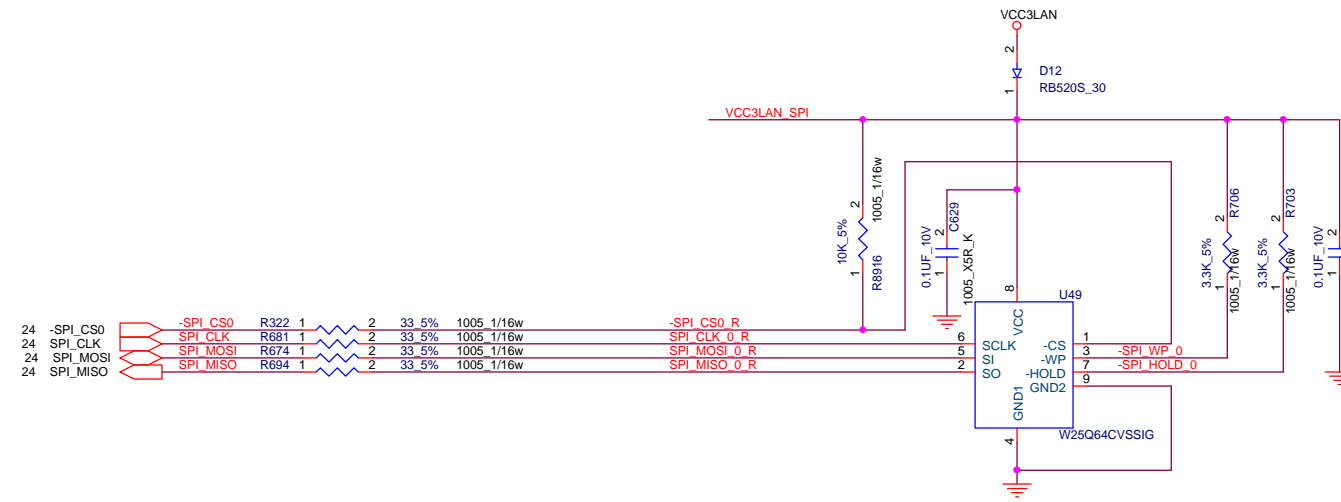




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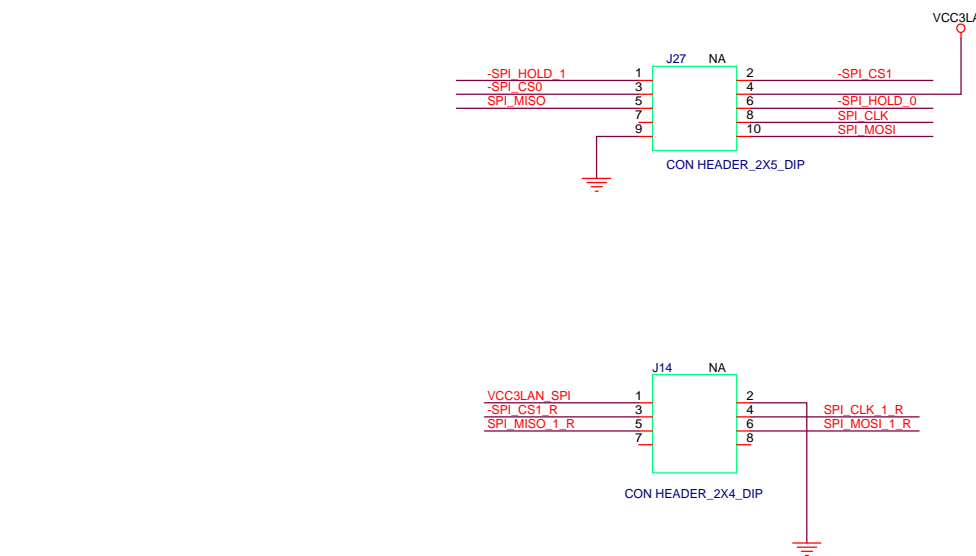






8MB SOIC8  
 MACRONIX MX25L6406EM2I-12G  
 WINBOND W25Q64CVSSIG

16MB WSON8  
 MACRONIX MX25L12835EZNI-10G  
 WINBOND W25Q128BVEIG



TABLE

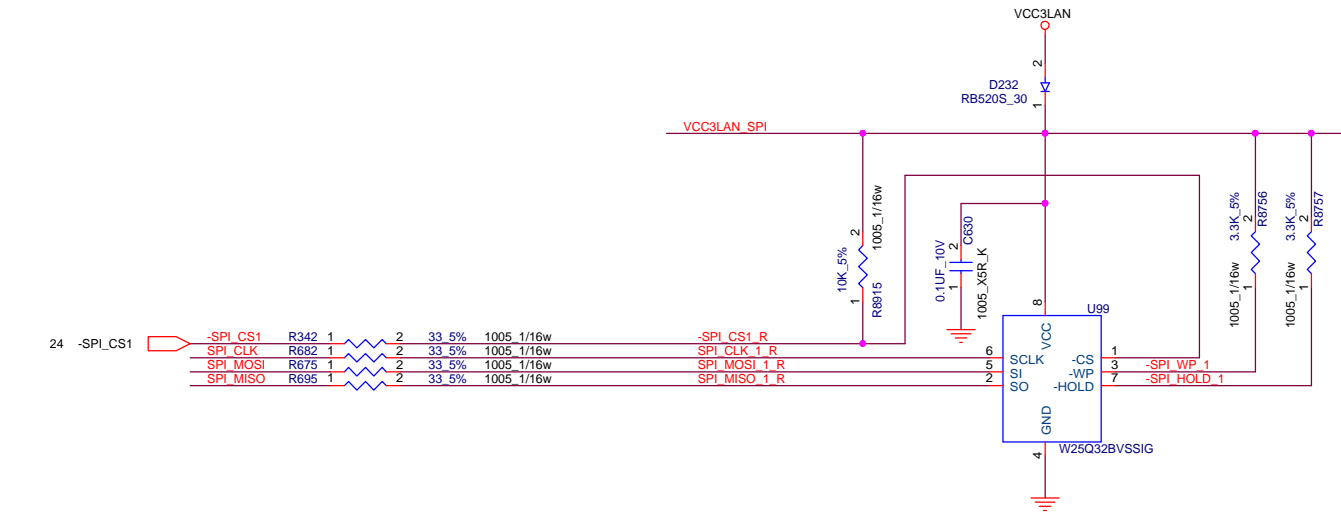
| EM100 PIN HEADER INTERFACE (TOP VIEW) |          |        |    |
|---------------------------------------|----------|--------|----|
| 1                                     | (HOLD1#) | (CS1#) | 2  |
| 3                                     | CS0#     | VCC    | 4  |
| 5                                     | MISO     | HOLD0# | 6  |
| 7                                     | WP0#     | CLK    | 8  |
| 9                                     | GND      | MOSI   | 10 |

TABLE

| SF100 PIN HEADER INTERFACE (TOP VIEW) |       |        |         |
|---------------------------------------|-------|--------|---------|
| 1                                     | VCC   | D232.1 | GND     |
| 3                                     | CS#   | R342.2 | GND     |
| 5                                     | MISO  | R695.2 | CLK     |
| 7                                     | (KEY) | N/A    | MOSI    |
|                                       |       |        | (RESET) |

TABLE

|   | CONFIG-1<br>16MB   | CONFIG-2<br>12MB                       | CONFIG-3<br>8MB  |
|---|--|--|--|
| U49<br>U99                                      | 16MB<br>NO_ASM   | 8MB<br>4MB                             | 8MB<br>NO_ASM  |
| D232<br>R8756<br>R8757<br>R8915<br>C432<br>C630 | NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM | ASM<br>ASM<br>ASM<br>ASM<br>ASM<br>ASM | NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM |
| R342<br>R682<br>R675<br>R695                    | NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM                     | ASM<br>ASM<br>ASM<br>ASM               | NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM                     |



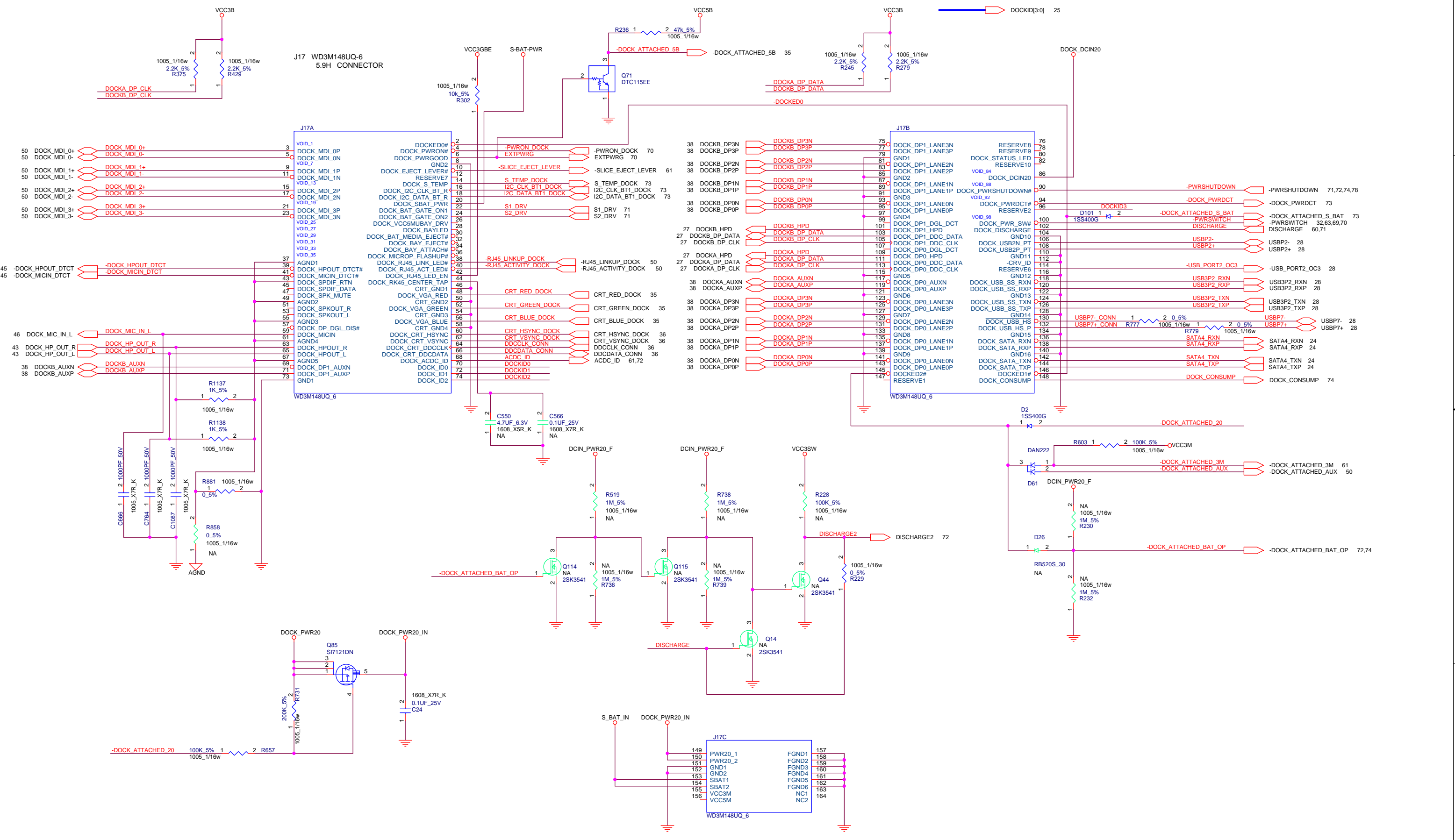
4MB SOIC8  
 MACRONIX MX25L3206EM2I-12G  
 WINBOND W25Q32BVSSIG

**lenovo**

Project Name : NZM-4 UMA SOVP Title : SPI FLASH

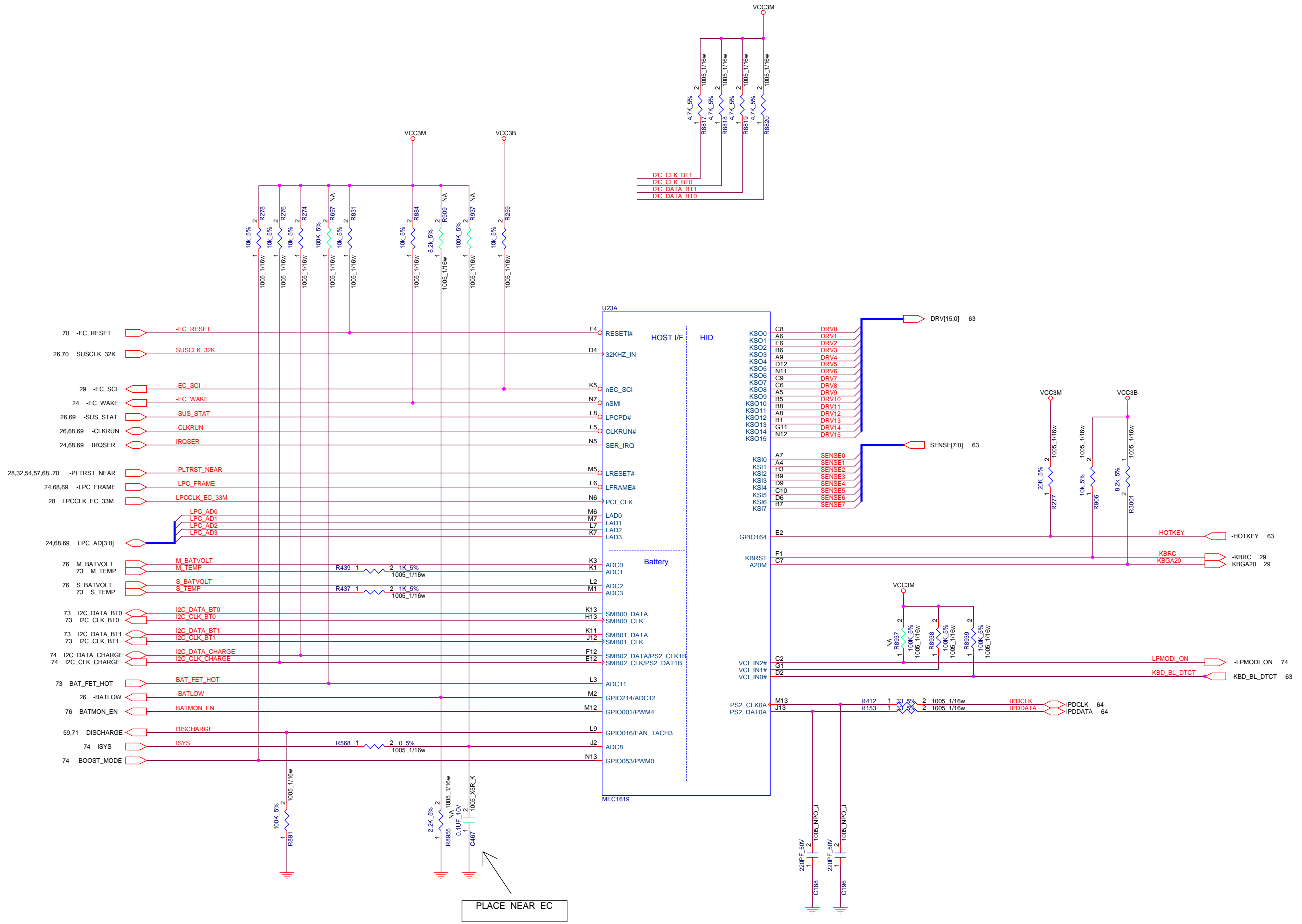
Size : C Document Number : Rev : 7.53

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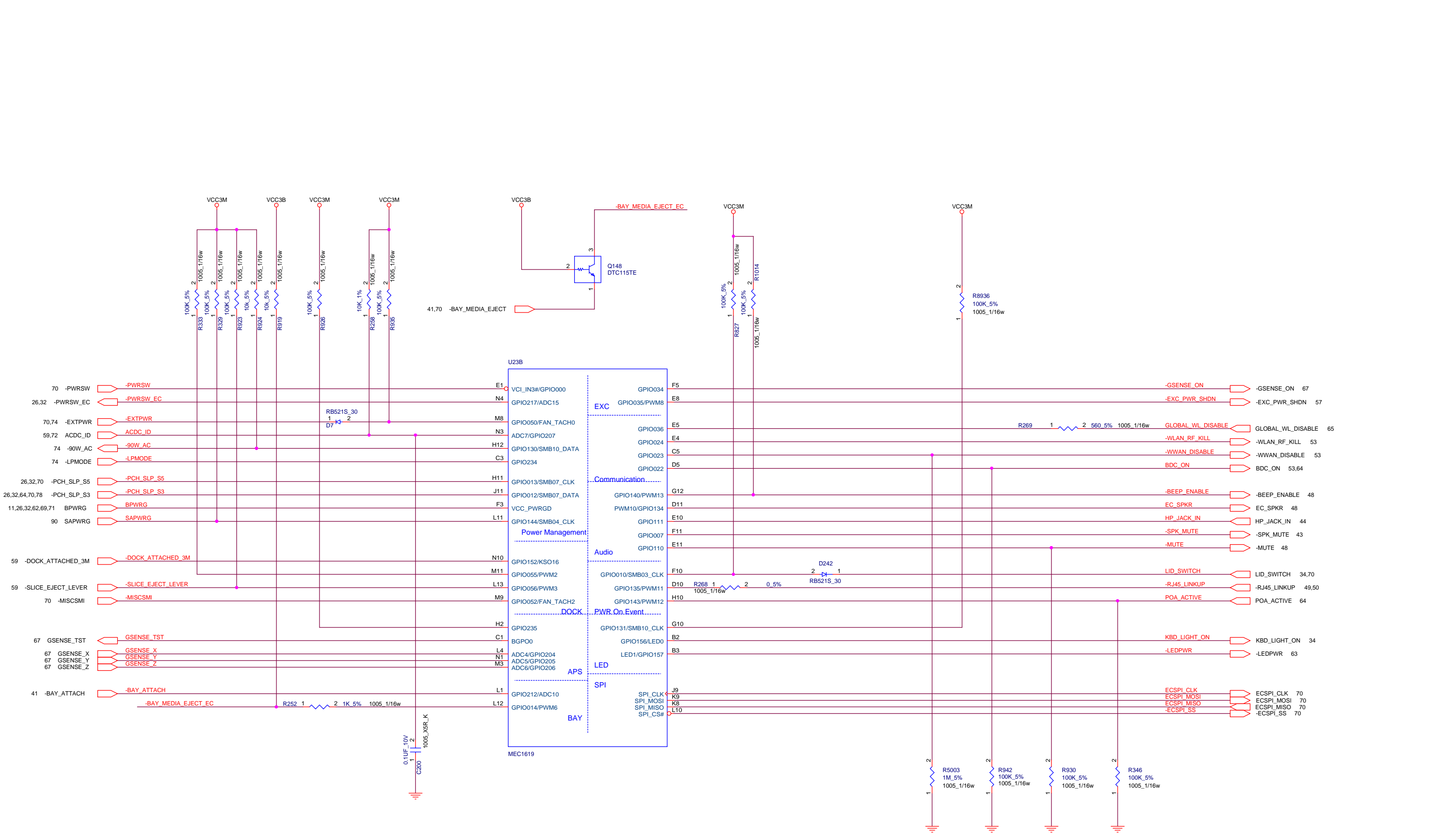


|                                  |                                    |
|----------------------------------|------------------------------------|
| <b>lenovo</b>                    |                                    |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>DOCKING CONNECTOR       |
| Size :<br>C                      | Document Number :<br>Rev :<br>7.53 |
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PLACE NEAR EC



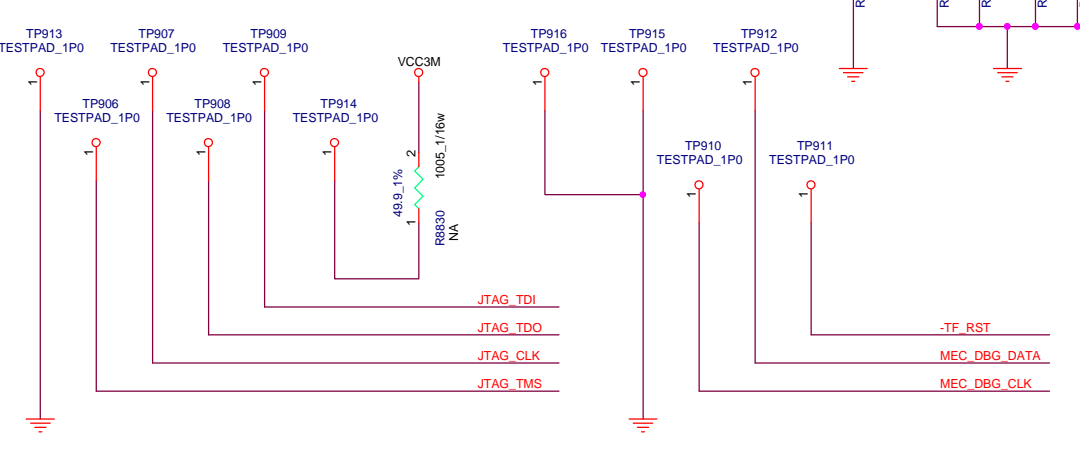
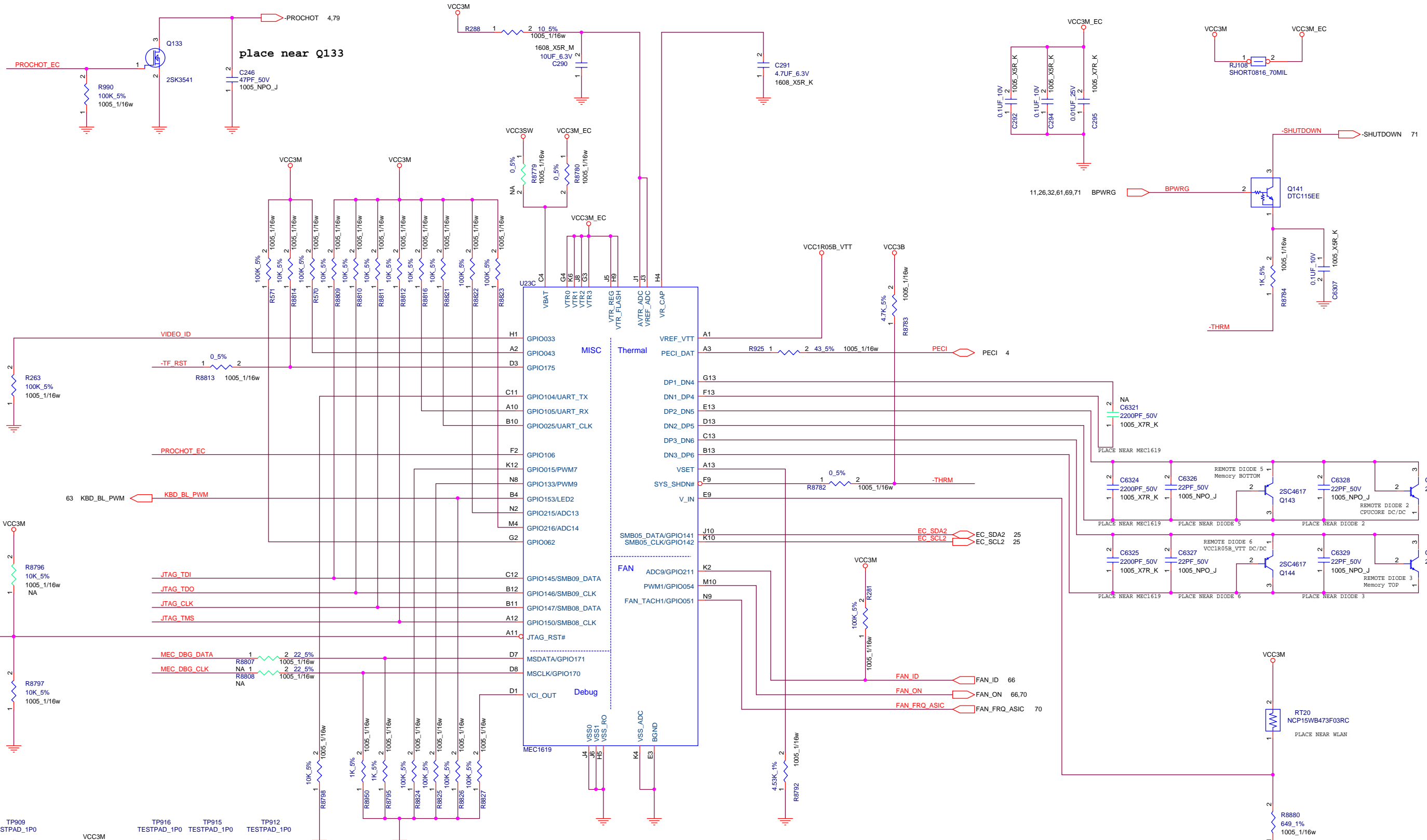


TABLE  
JTAG debug port

|       | Enable | Disable |
|-------|--------|---------|
| R8796 | ASM    | NO-ASM  |
| R8797 | NO-ASM | ASM     |
| R8830 | ASM    | NO-ASM  |

↑  
LOGIC

TABLE  
trace FIFO debug port

|       | Enable | Disable |
|-------|--------|---------|
| R8807 | ASM    | NO-ASM  |
| R8808 | ASM    | NO-ASM  |
| R8950 | NO-ASM | ASM     |

↑  
LOGIC

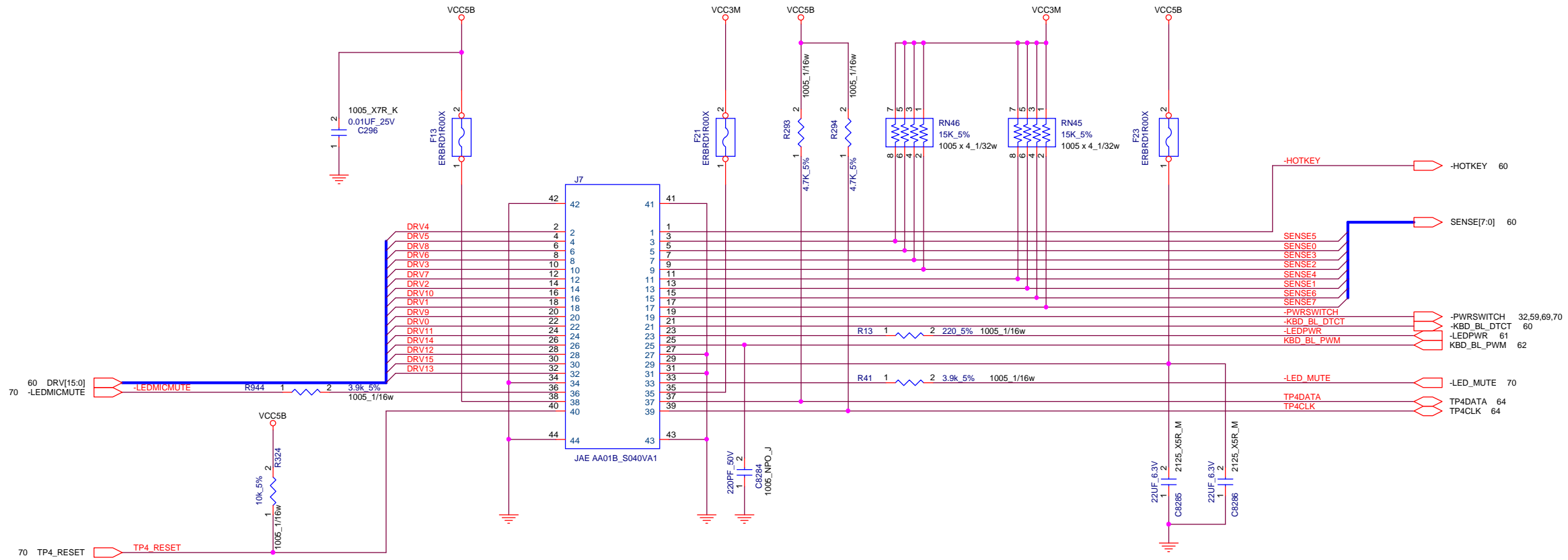
**lenovo**

Project Name: NZM-4 UMA SOVP Title: MEC1619(3/3)

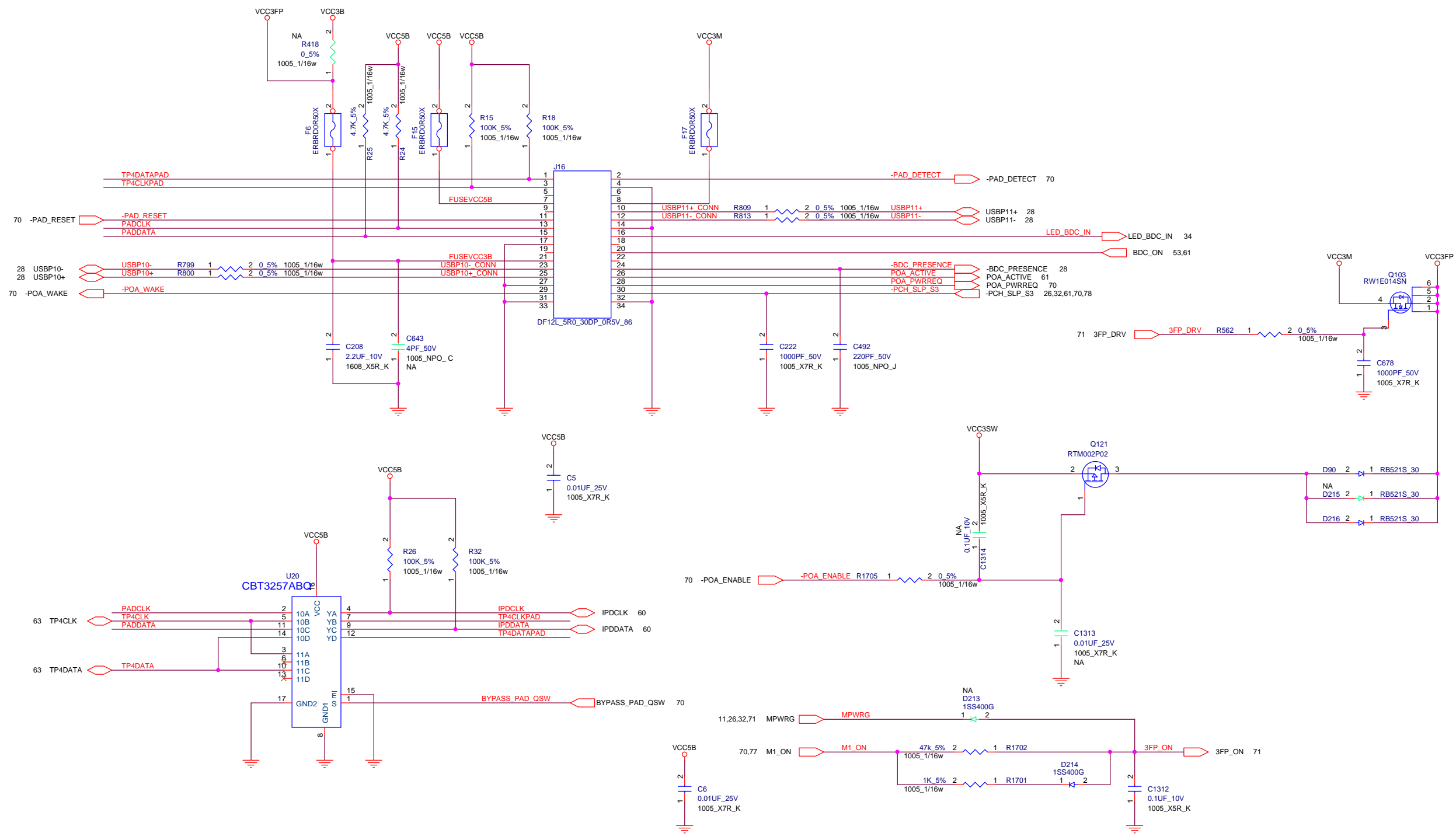
Size: C Document Number: Rev: 7.53

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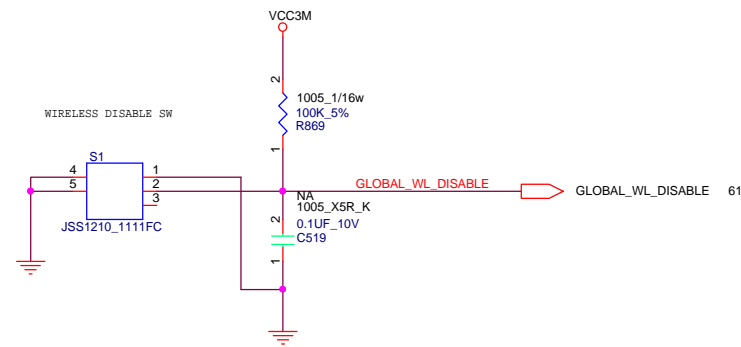


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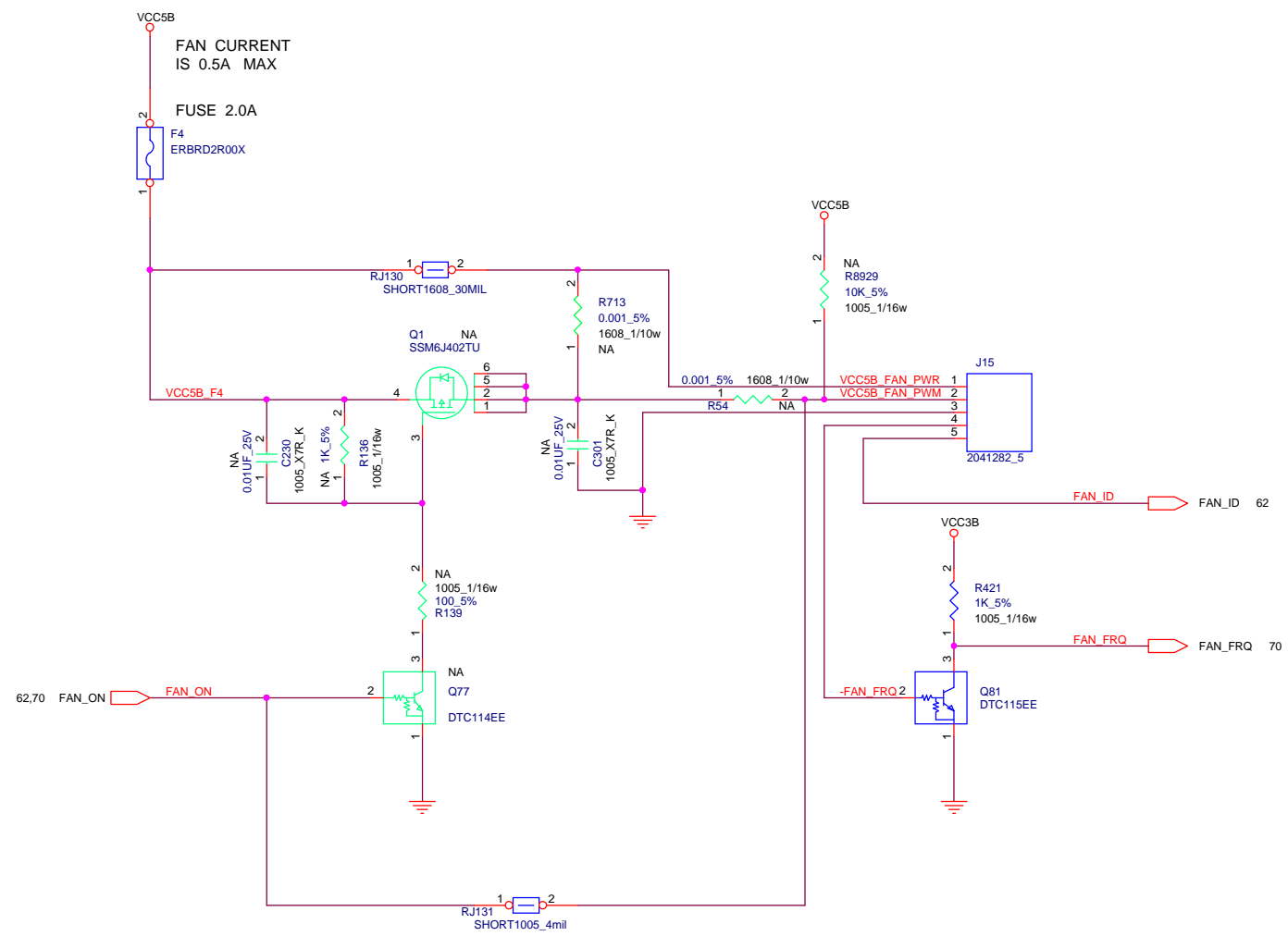


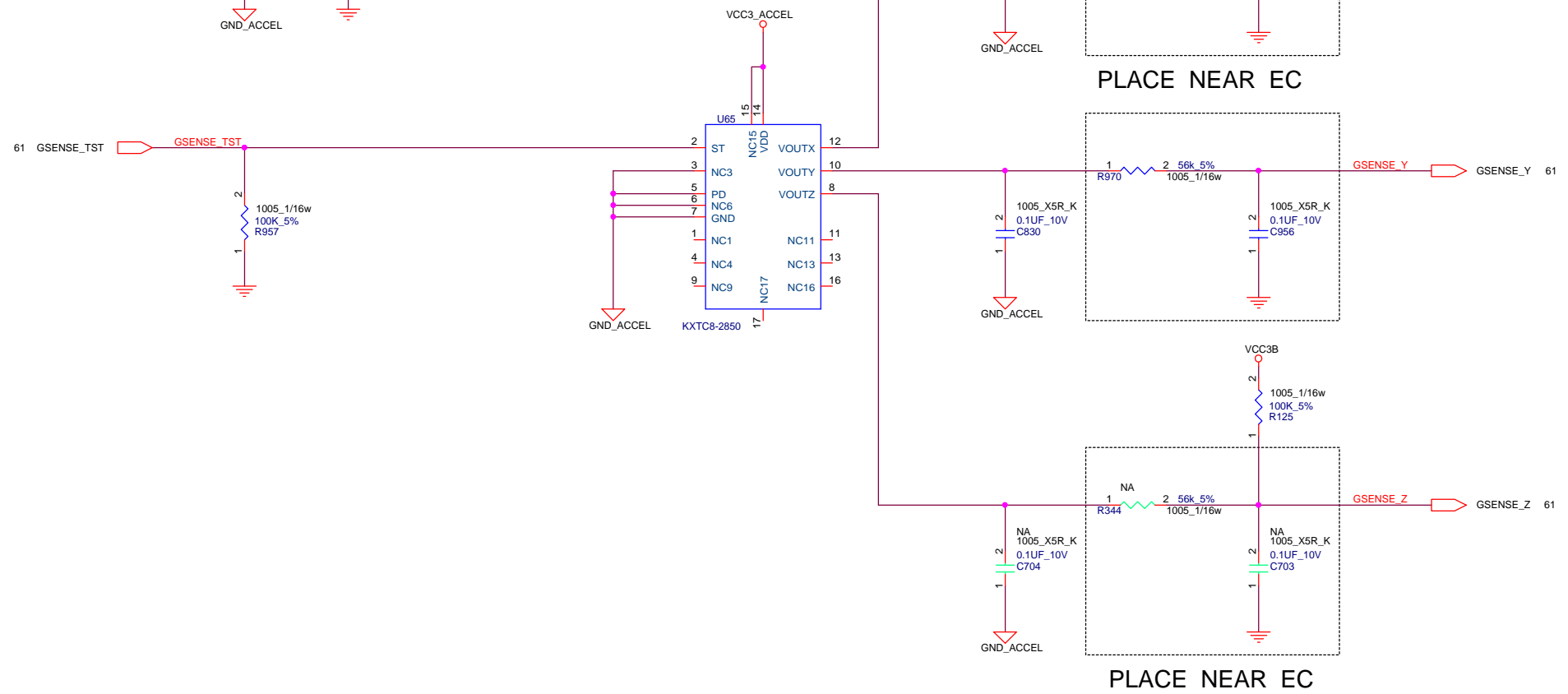
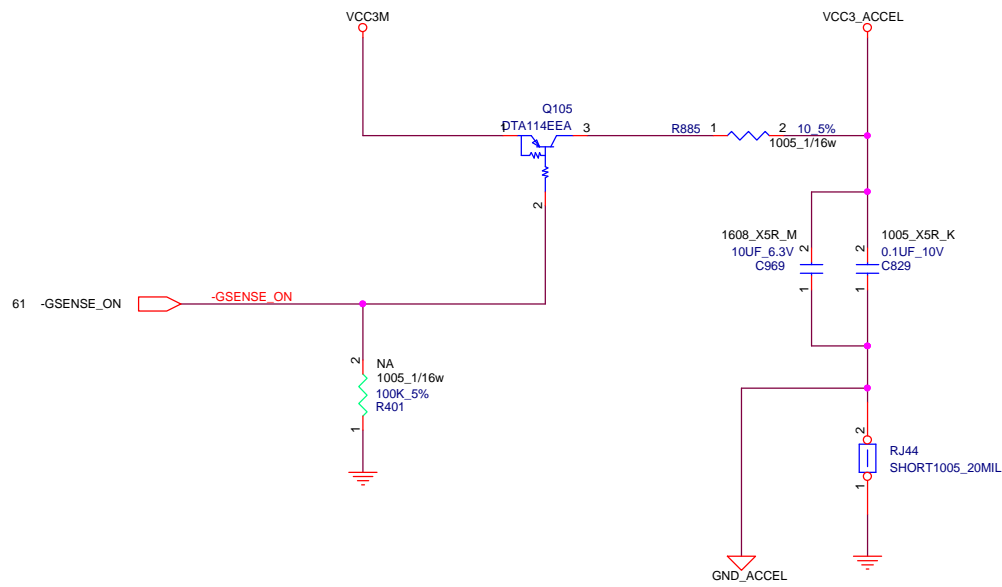
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|                                 |                  |                               |
|---------------------------------|------------------|-------------------------------|
| <b>lenovo</b>                   |                  |                               |
| Project Name:<br>NZM-4 UMA SOVP |                  | Title:<br>WIRELESS DISABLE SW |
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LOGIC  
↓

TABLE

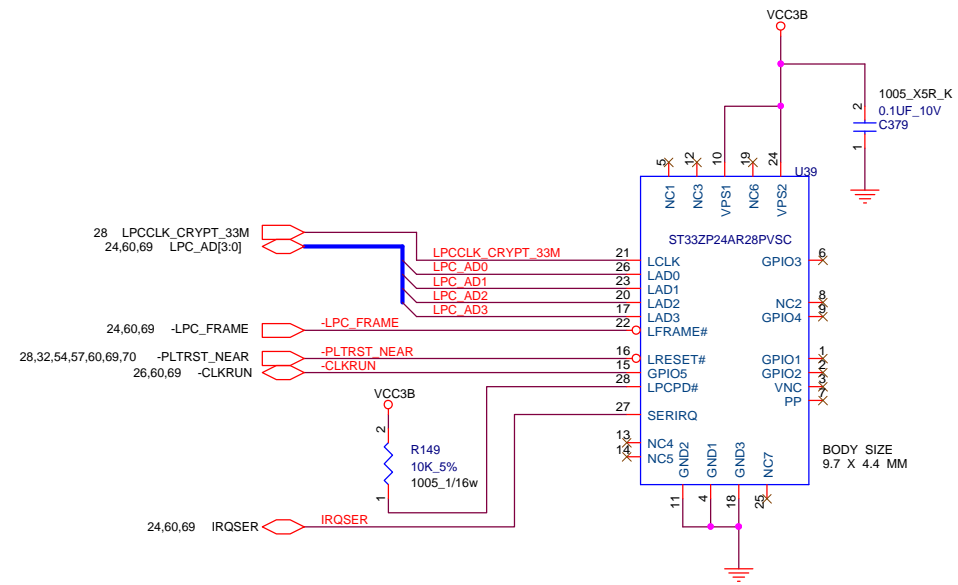
|                              | LIS34AL<br>KXTC8-2850      | NO_ACC.                              |
|------------------------------|----------------------------|--------------------------------------|
| R401<br>R957                 | NO_ASM<br>ASM              | ASM<br>ASM                           |
| U65<br>Q105                  | ASM<br>ASM                 | NO_ASM<br>NO_ASM                     |
| R885<br>C829<br>C969         | 10-OHM<br>ASM<br>ASM       | NO_ASM<br>NO_ASM<br>NO_ASM           |
| C830<br>C847                 | ASM<br>ASM                 | NO_ASM<br>NO_ASM                     |
| R969<br>C938<br>R970<br>C956 | 56K<br>ASM<br>56K<br>ASM   | NO_ASM<br>NO_ASM<br>NO_ASM<br>NO_ASM |
| C704<br>R344<br>C703         | NO_ASM<br>NO_ASM<br>NO_ASM | NO_ASM<br>NO_ASM<br>NO_ASM           |
| R125                         | ASM                        | ASM                                  |

**lenovo**

Project Name : NZM-4 UMA SOVP Title : G-SENSOR

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TABLE

|                             |                        |                                     |
|-----------------------------|------------------------|-------------------------------------|
| SDV and Mech FVT            | ST19NP18ER28PVMO       | 1.2.8.20                            |
| FVT                         | ST33ZP24AR28PVOG       | 1.2.A.C                             |
| SW SIT-1,SIT,<br>and SIT-R1 | ST33ZP24AR28PVRC       | 1.2.C.0                             |
| SIT-R2 and SVT              | ST33ZP24AR28PVSC Rev.1 | 1.2.D.0                             |
| SOVP                        | ST33ZP24AR28PVSC Rev.J | ( 1.2.D.0 )<br>1.2.D.8 by FW Update |
| MP                          | ST33ZP24AR28PVSH       | 1.2.D.8                             |

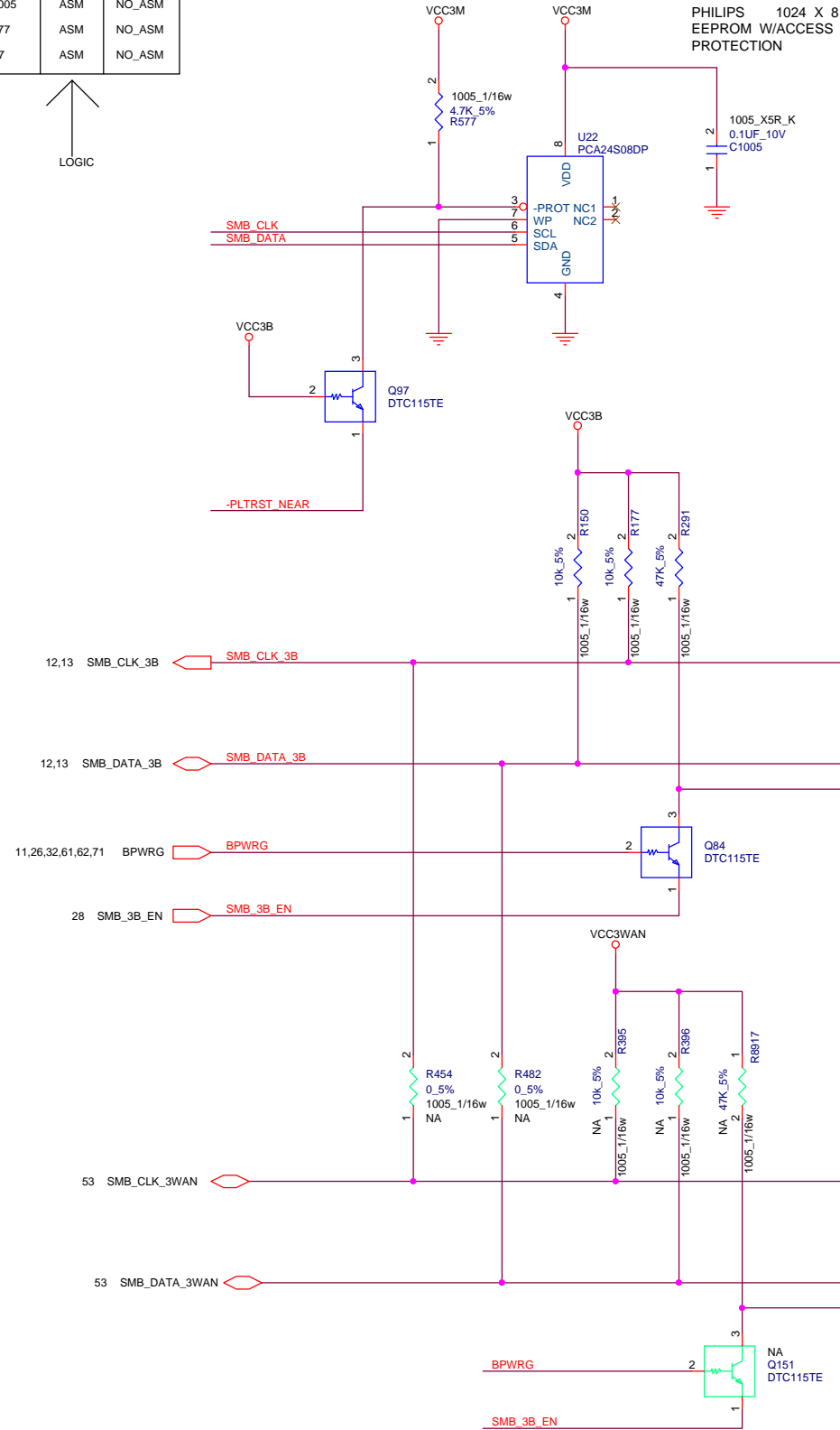
**lenovo**

|                                  |                   |                 |
|----------------------------------|-------------------|-----------------|
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>TPM  |
| Size :<br>C                      | Document Number : | Rev :<br>7.53   |
| Date: Monday, March 19, 2012     |                   | Sheet: 68 of 97 |

TABLE

| EEPROM | U22 | U23    |
|--------|-----|--------|
| U22    | ASM | NO_ASM |
| C1005  | ASM | NO_ASM |
| R577   | ASM | NO_ASM |
| Q97    | ASM | NO_ASM |

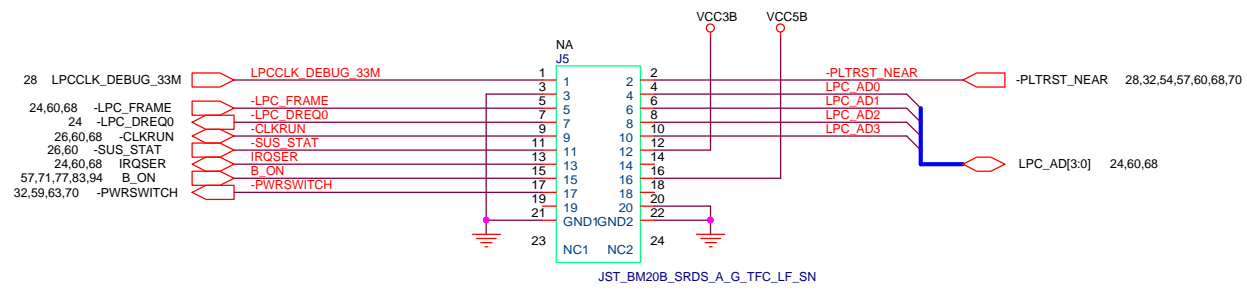
LOGIC



TABLE

| REF DES | ENABLE | DISABLE |
|---------|--------|---------|
| J5      | ASM    | NO_ASM  |
| R220    | ASM    | NO_ASM  |

LOGIC



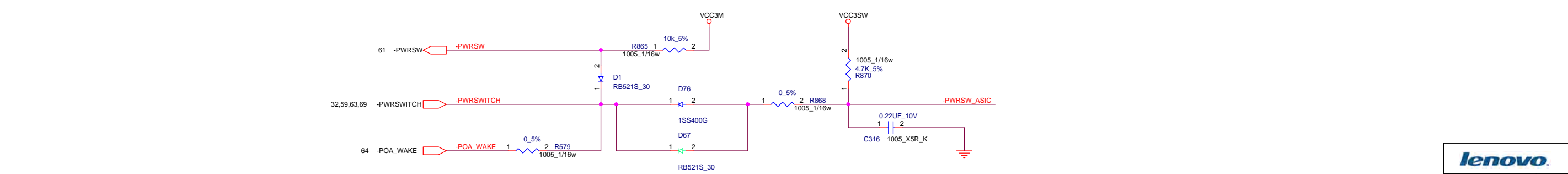
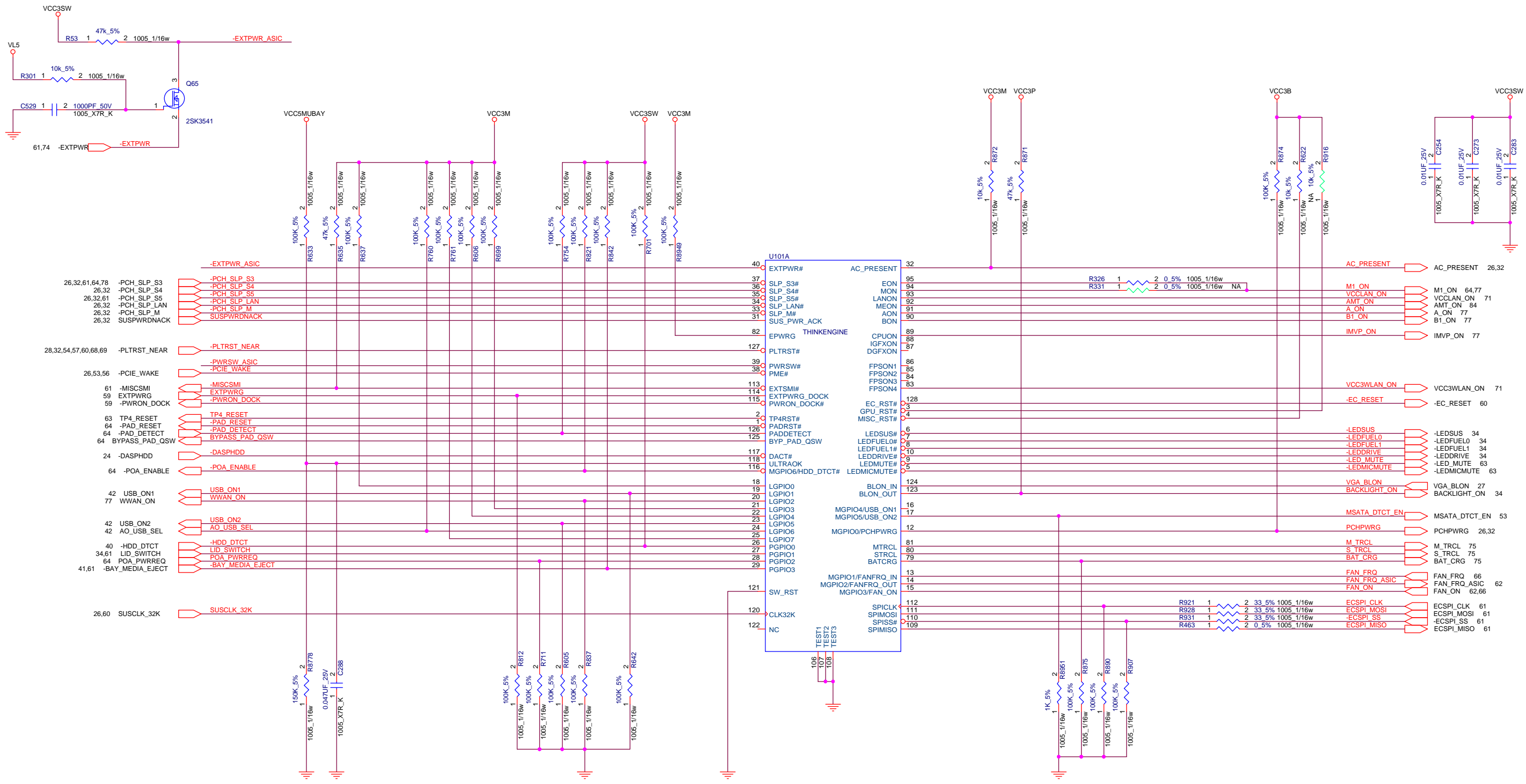
TABLE

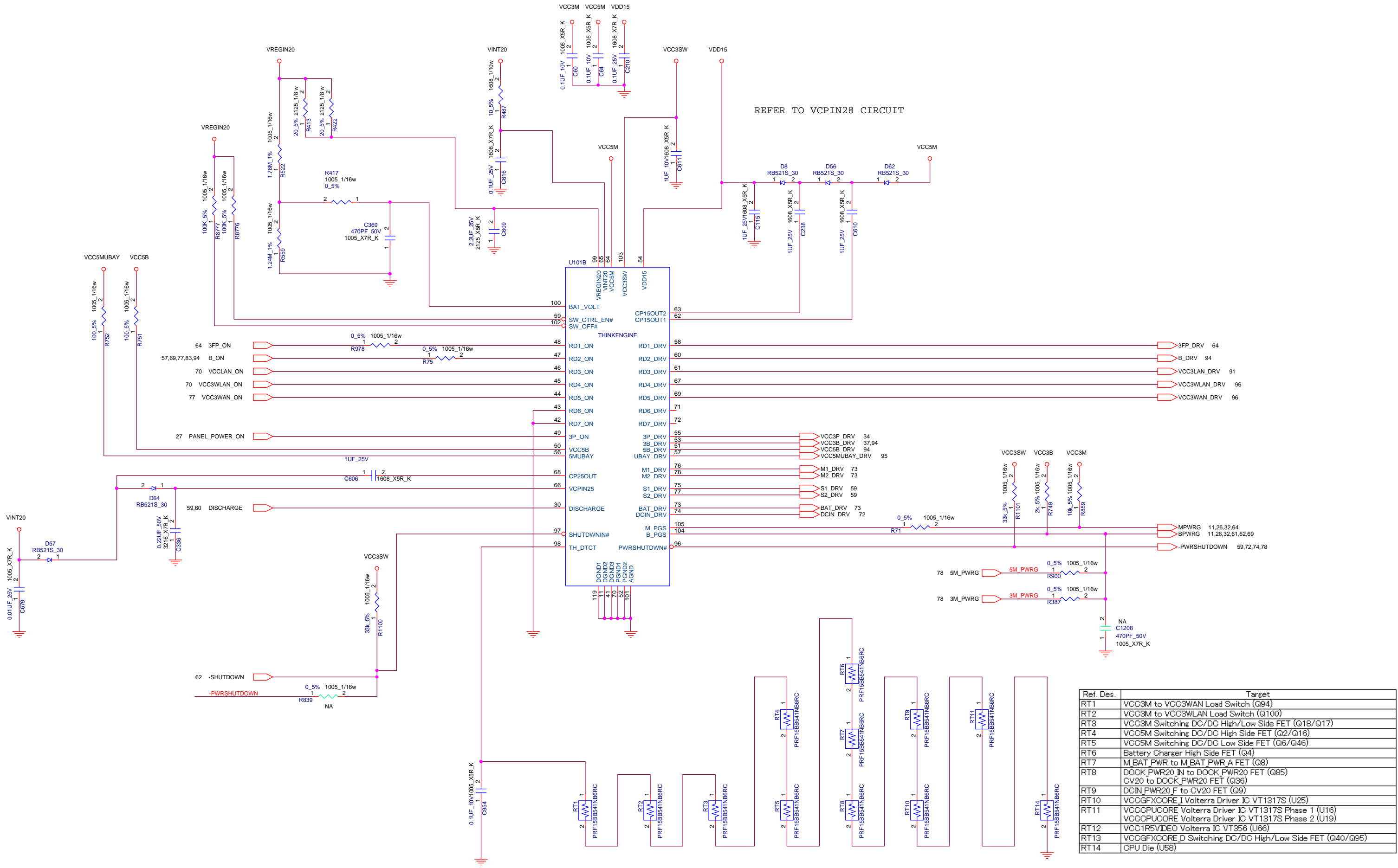
| AGAC       | YES    | YES    | YES    | YES    | NO     | NO     | NO     | NO     |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Anti Theft | YES    | YES    | NO     | NO     | YES    | YES    | NO     | NO     |
| EEPROM     | U22    | U23    | U22    | U23    | U22    | U23    | U22    | U23    |
| U27        | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| U33        | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| C297       | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| R395       | ASM    | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| R396       | ASM    | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| R8917      | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| Q151       | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| U21        | ASM    | ASM    | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| U31        | ASM    | ASM    | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| C25        | ASM    | ASM    | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| R291       | ASM    | ASM    | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| Q84        | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| R454       | NO_ASM | NO_ASM | NO_ASM | NO_ASM | ASM    | ASM    | NO_ASM | NO_ASM |
| R482       | NO_ASM | NO_ASM | NO_ASM | NO_ASM | ASM    | ASM    | NO_ASM | NO_ASM |
| R8943      | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| R8942      | NO_ASM | ASM    | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM | NO_ASM |
| R8941      | NO_ASM | NO_ASM | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM | ASM    |
| R8940      | NO_ASM | NO_ASM | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM | ASM    |
| R30        | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |
| R45        | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM | ASM    | NO_ASM |

LOGIC



|                               |                   |                         |  |
|-------------------------------|-------------------|-------------------------|--|
| Project Name : NZM-4 UMA SOVP |                   | Title : EEPROM/SMBUS SW |  |
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REFER TO VCPIN28 CIRCUIT

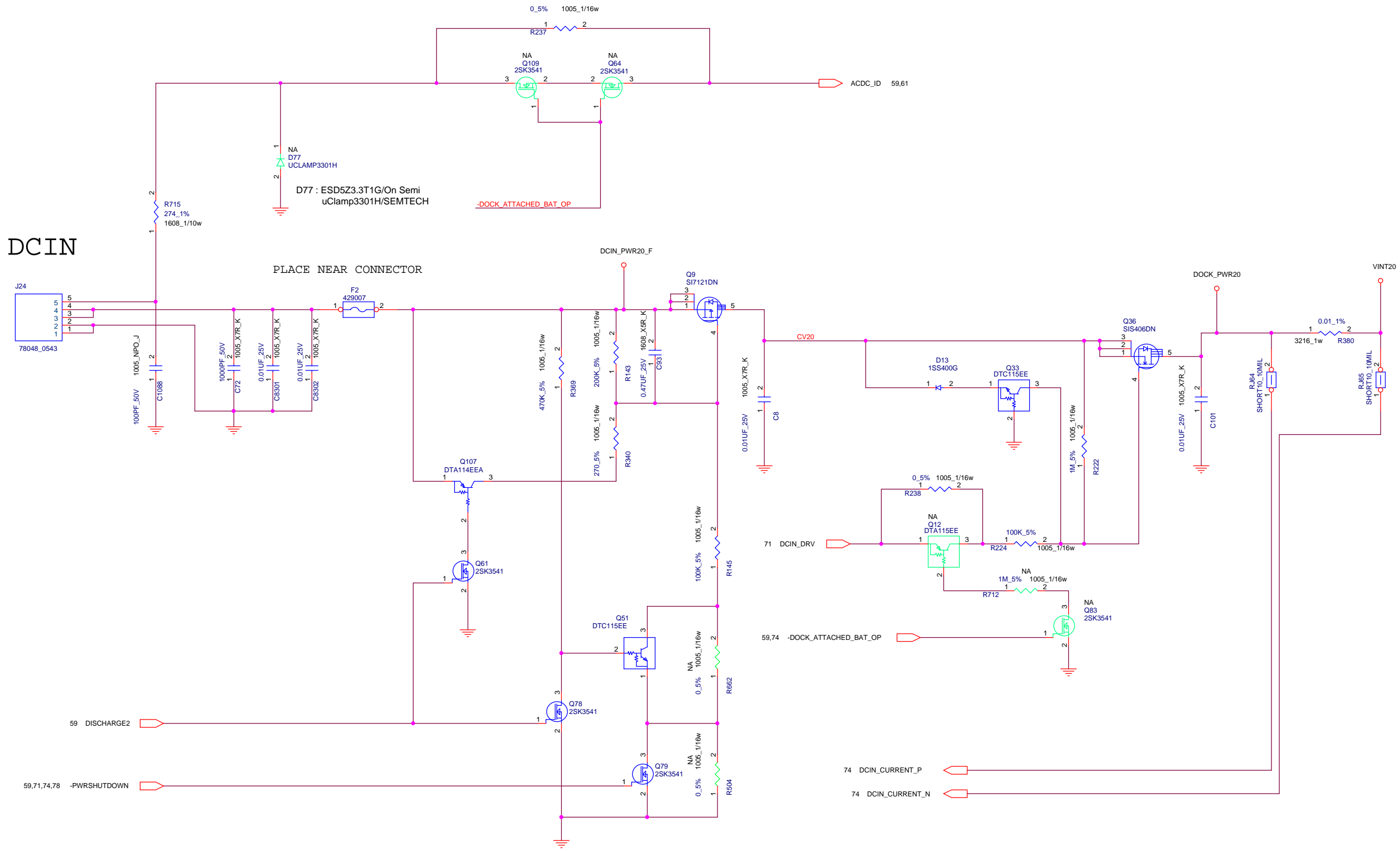
| Ref. Des. | Target   |
|-----------|--|
| RT1       | VCC3M to VCC3WAN Load Switch (Q94)   |
| RT2       | VCC3M to VCC3WLAN Load Switch (Q100)   |
| RT3       | VCC3M Switching DC/DC High/Low Side FET (Q18/Q17)  |
| RT4       | VCC5M Switching DC/DC High Side FET (Q2/Q16)   |
| RT5       | VCC5M Switching DC/DC Low Side FET (Q6/Q46)  |
| RT6       | Battery Charger High Side FET (Q4)   |
| RT7       | M.BAT PWR to M.BAT PWR A FET (Q8)  |
| RT8       | DOCK_PWR20_IN to DOCK_PWR20 FET (Q85)<br>CV20 to DOCK_PWR20 FET (Q36)                                      |
| RT9       | DCIN_PWR20_F to CV20 FET (Q9)  |
| RT10      | VCCGFXCORE_I Volterra Driver IC VT1317S (U25)  |
| RT11      | VCCCPUCORE Volterra Driver IC VT1317S Phase 1 (U16)<br>VCCCPUCORE Volterra Driver IC VT1317S Phase 2 (U19) |
| RT12      | VCC1R5VIDEO Volterra IC VT356 (U66)  |
| RT13      | VCCGFXCORE_D Switching DC/DC High/Low Side FET (Q40/Q95)   |
| RT14      | CPU Die (U58)  |

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Project Name : NZM-4 UMA SOVP Title : THINK ENGINE(Z22)

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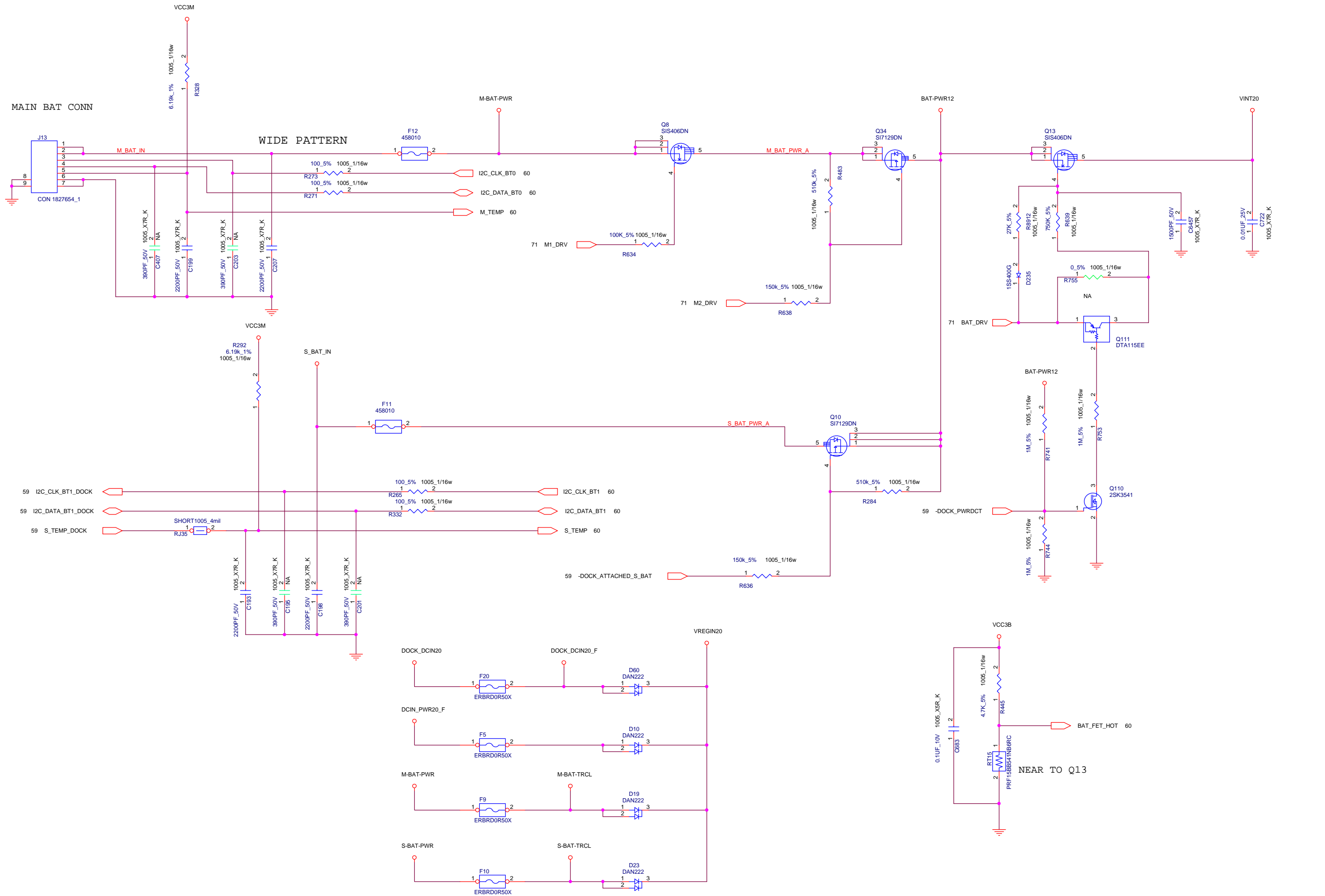


TABLE

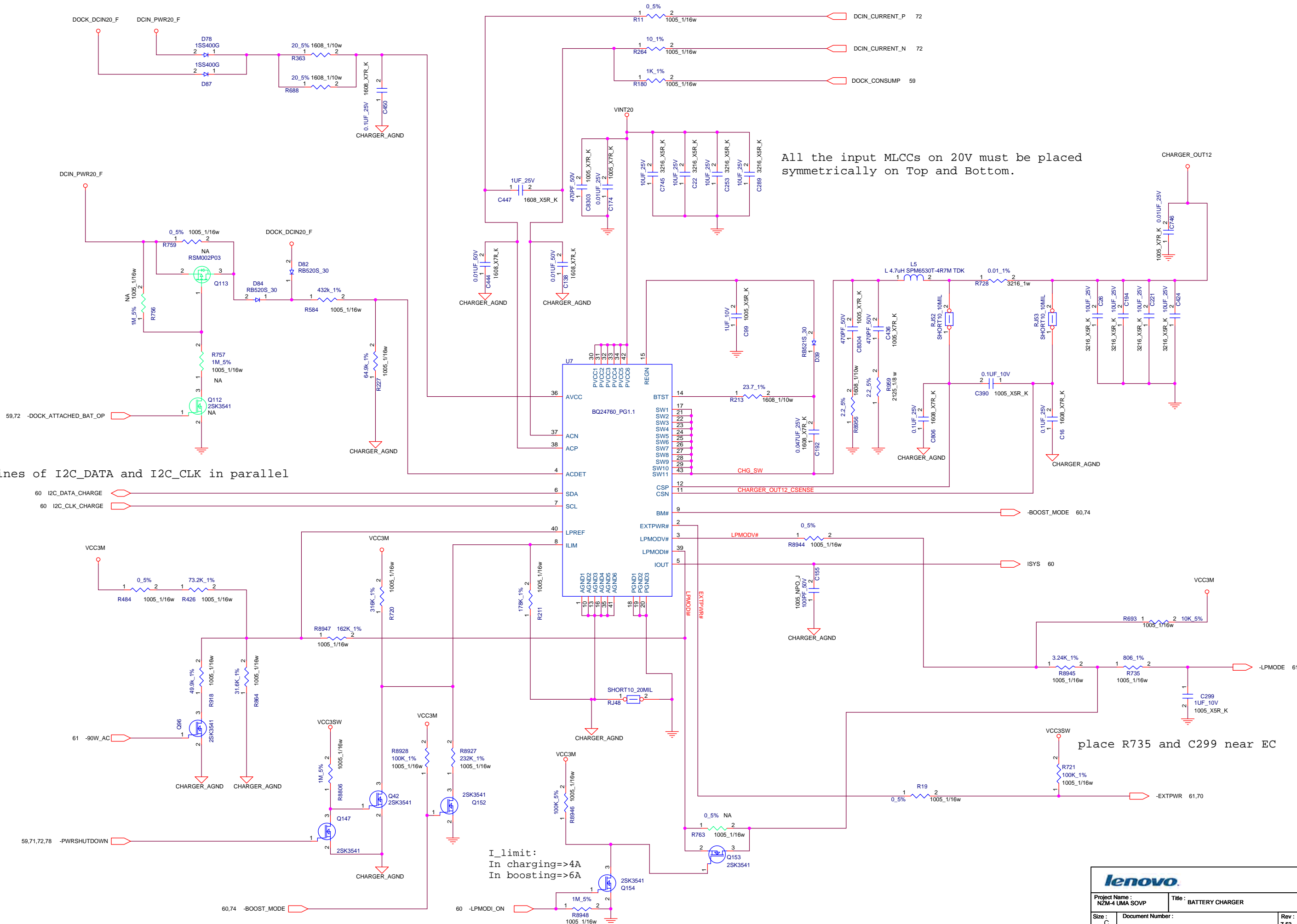
| PEAK SHIFT | YES    | NO     |
|------------|--------|--------|
| R662       | NO-ASM | ASM    |
| R369       | ASM    | NO-ASM |
| Q78        | ASM    | NO-ASM |
| Q51        | ASM    | NO-ASM |

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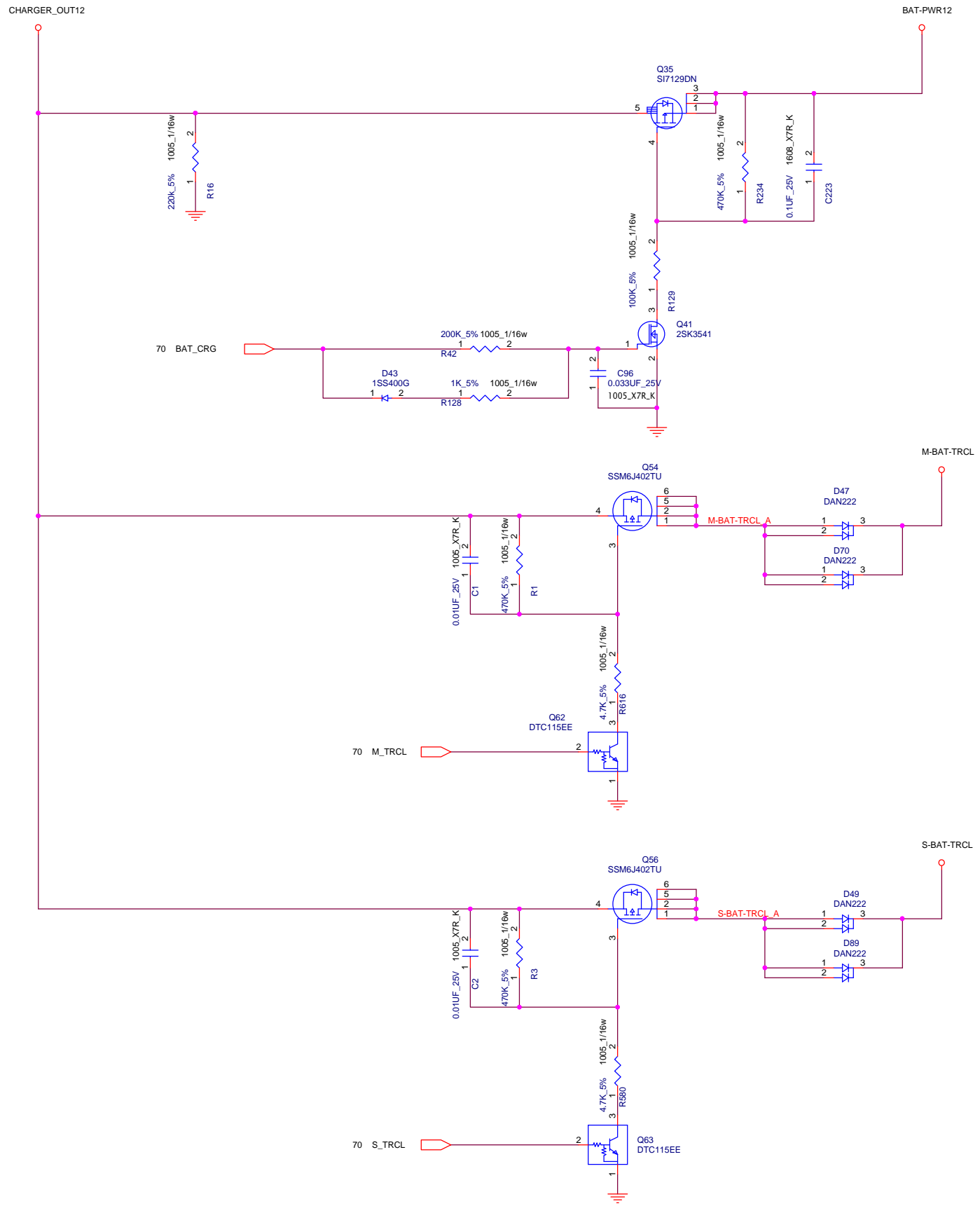
to connect lines of I2C\_DATA and I2C\_CLK in parallel

All the input MLCCs on 20V must be placed symmetrically on Top and Bottom.

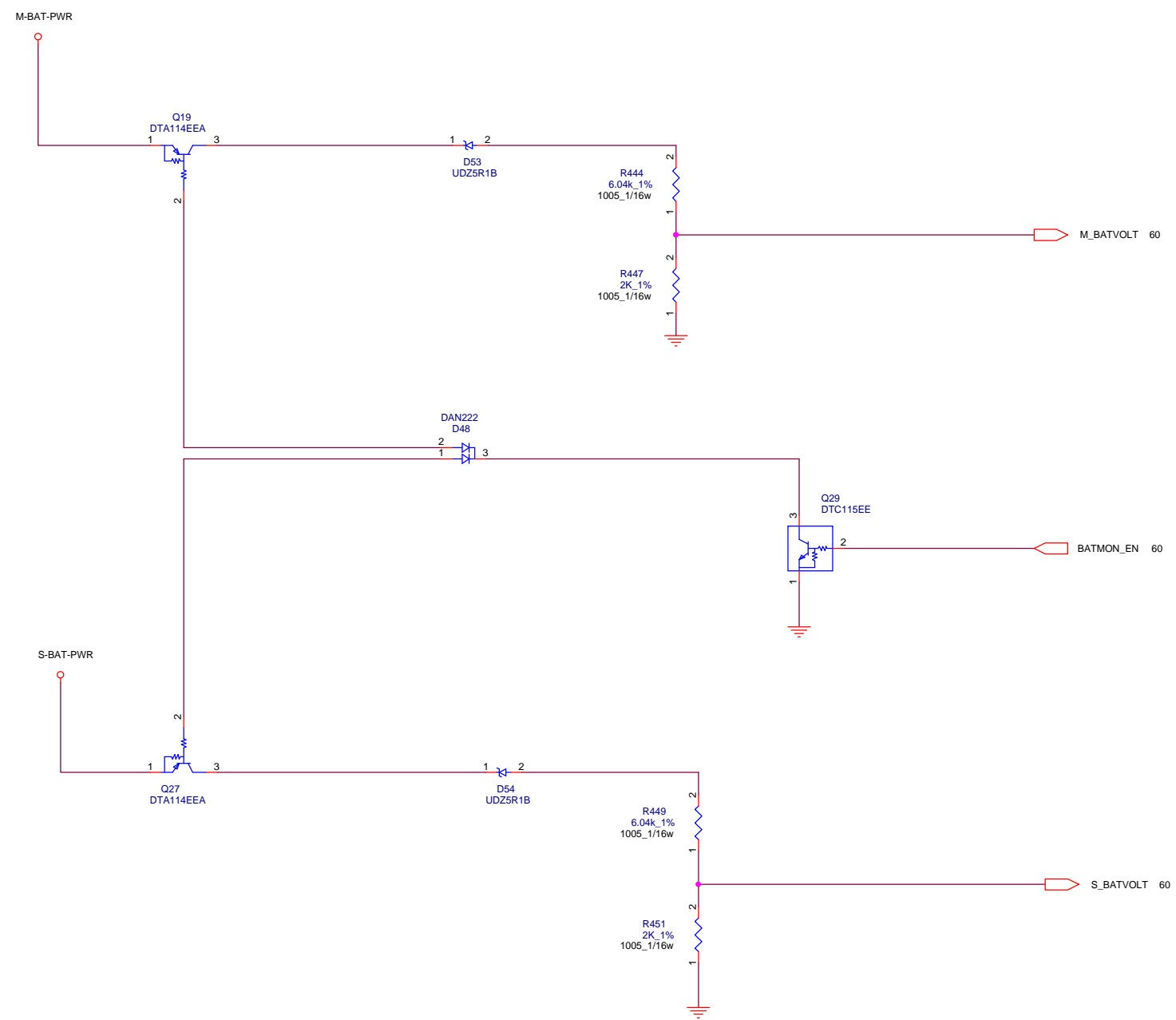
place R735 and C299 near EC

I\_limit:  
In charging=>4A  
In boosting=>6A

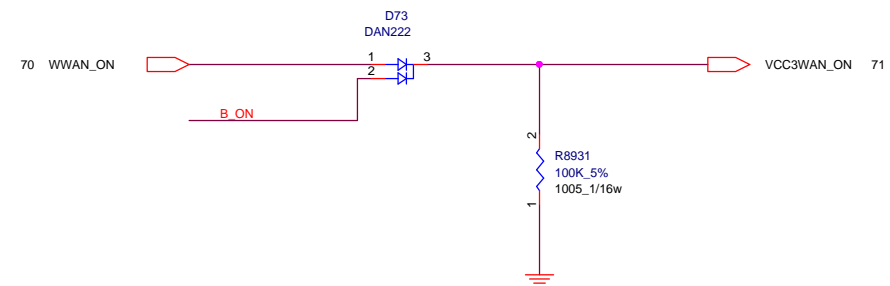
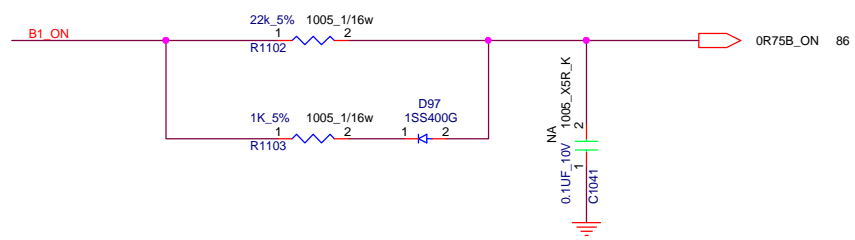
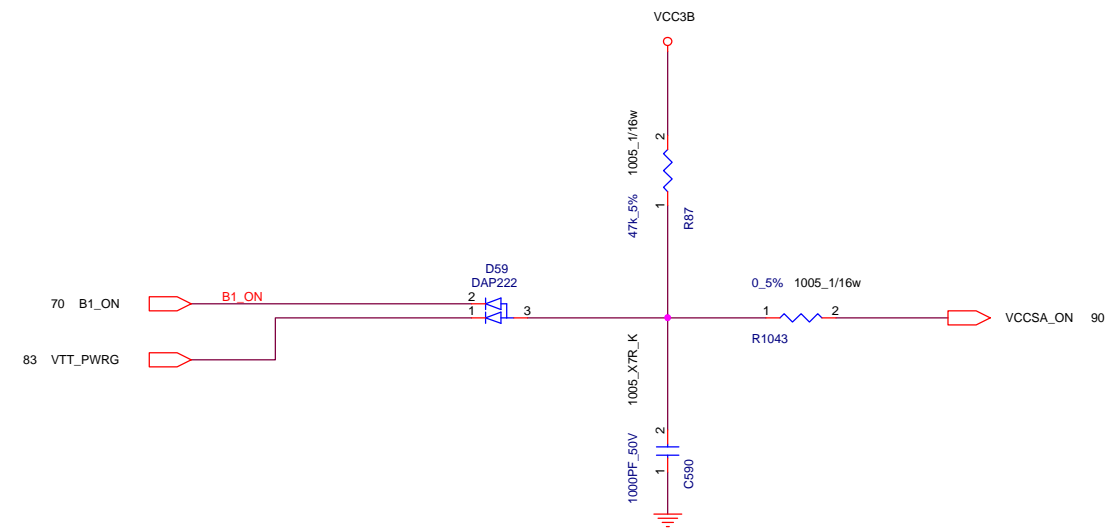
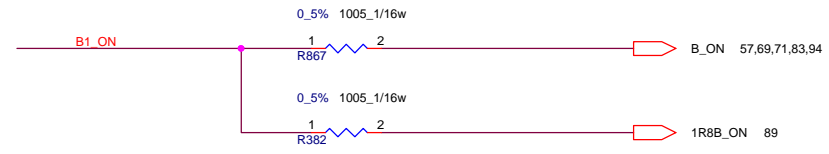
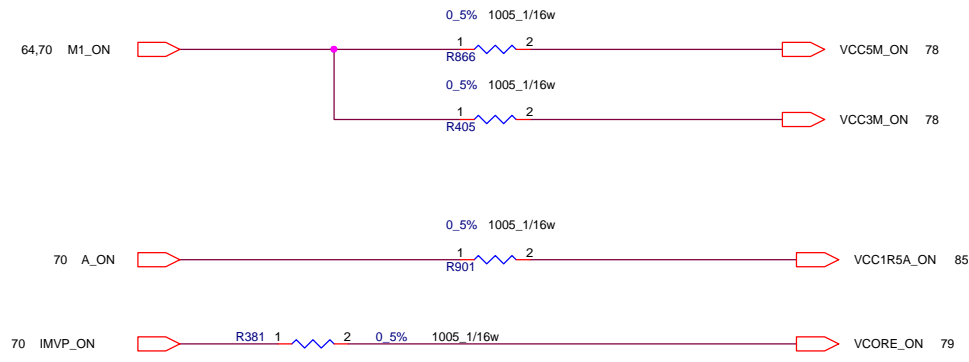
|                                  |                                    |
|----------------------------------|------------------------------------|
| <b>lenovo</b>                    |                                    |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>BATTERY CHARGER         |
| Size :<br>C                      | Document Number :<br>Rev :<br>7.53 |
| Date: Monday, March 19, 2012     | Sheet: 74 of 97                    |



|                                 |                            |
|---------------------------------|----------------------------|
| <b>lenovo</b>                   |                            |
| Project Name:<br>NZM-4 UMA SOVP | Title:<br>CHARGER SELECTOR |
| Size:<br>C                      | Document Number:           |
| Date: Monday, March 19, 2012    | Rev:<br>7.53               |
| Sheet: 75                       | of 97                      |



|                                 |                  |                           |
|---------------------------------|------------------|---------------------------|
| <b>lenovo</b>                   |                  |                           |
| Project Name:<br>NZM-4 UMA SOVP |                  | Title:<br>BATTERY MONITOR |
| Size:<br>C                      | Document Number: | Rev:<br>7.53              |
| Date: Monday, March 19, 2012    |                  | Sheet: 76 of 97           |



TABLE

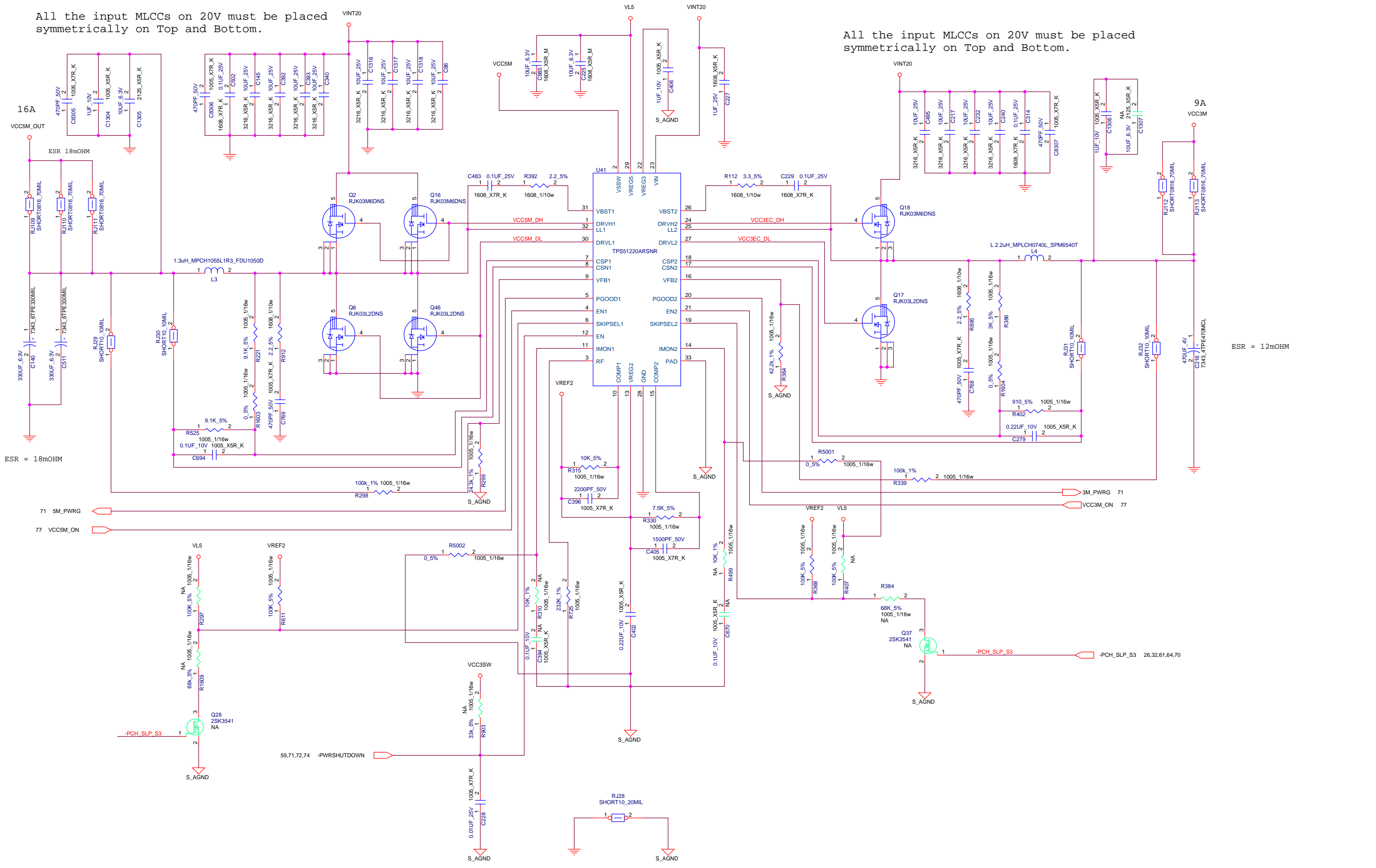
| AOAC  | YES             | NO           |
|-------|-----------------|--------------|
| D73   | ASM             | NO-ASM       |
| R8931 | ASM<br>100K-ohm | ASM<br>0-ohm |

↑  
LOGIC



All the input MLCCs on 20V must be placed symmetrically on Top and Bottom.

All the input MLCCs on 20V must be placed symmetrically on Top and Bottom.

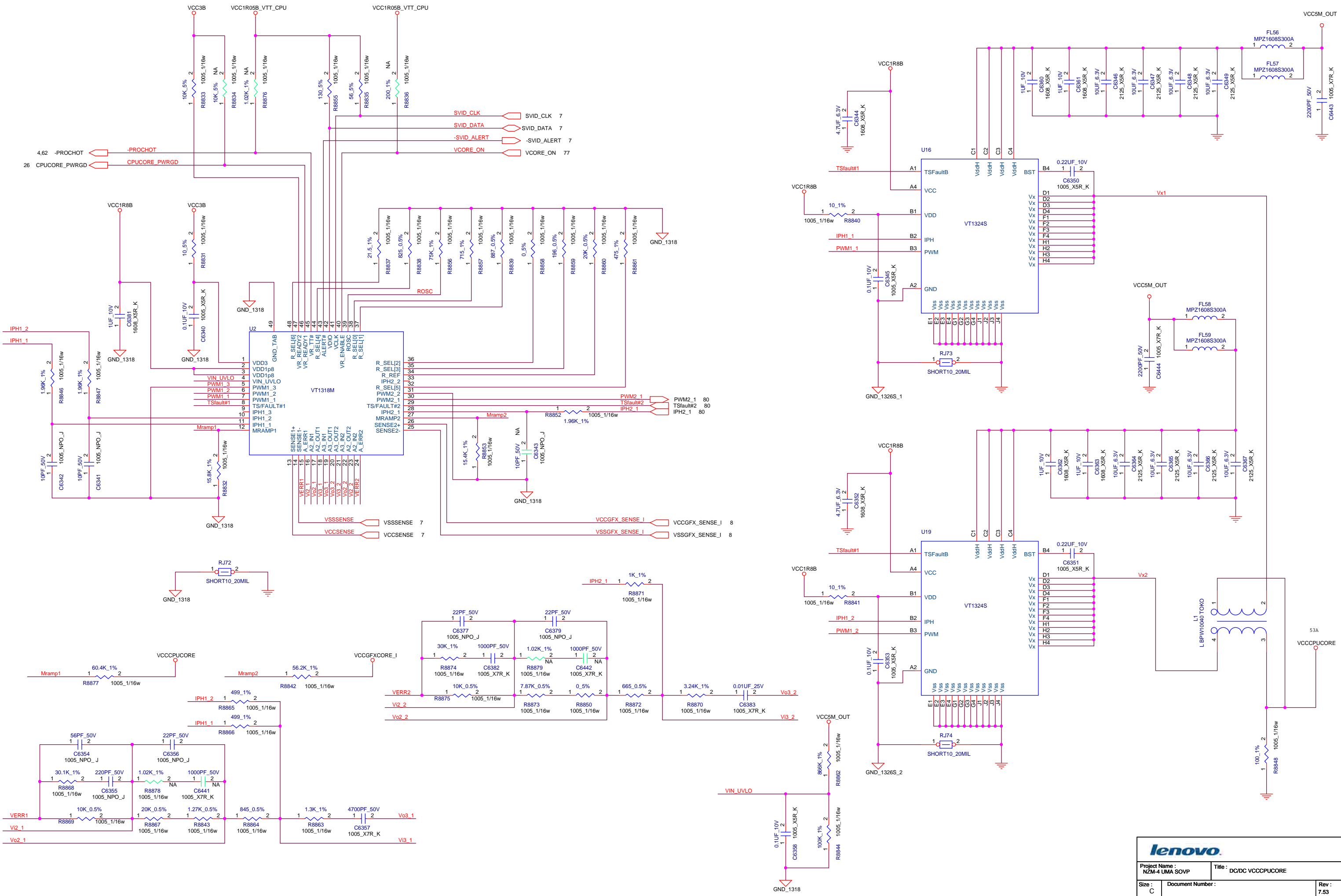


ESR = 18mOHM

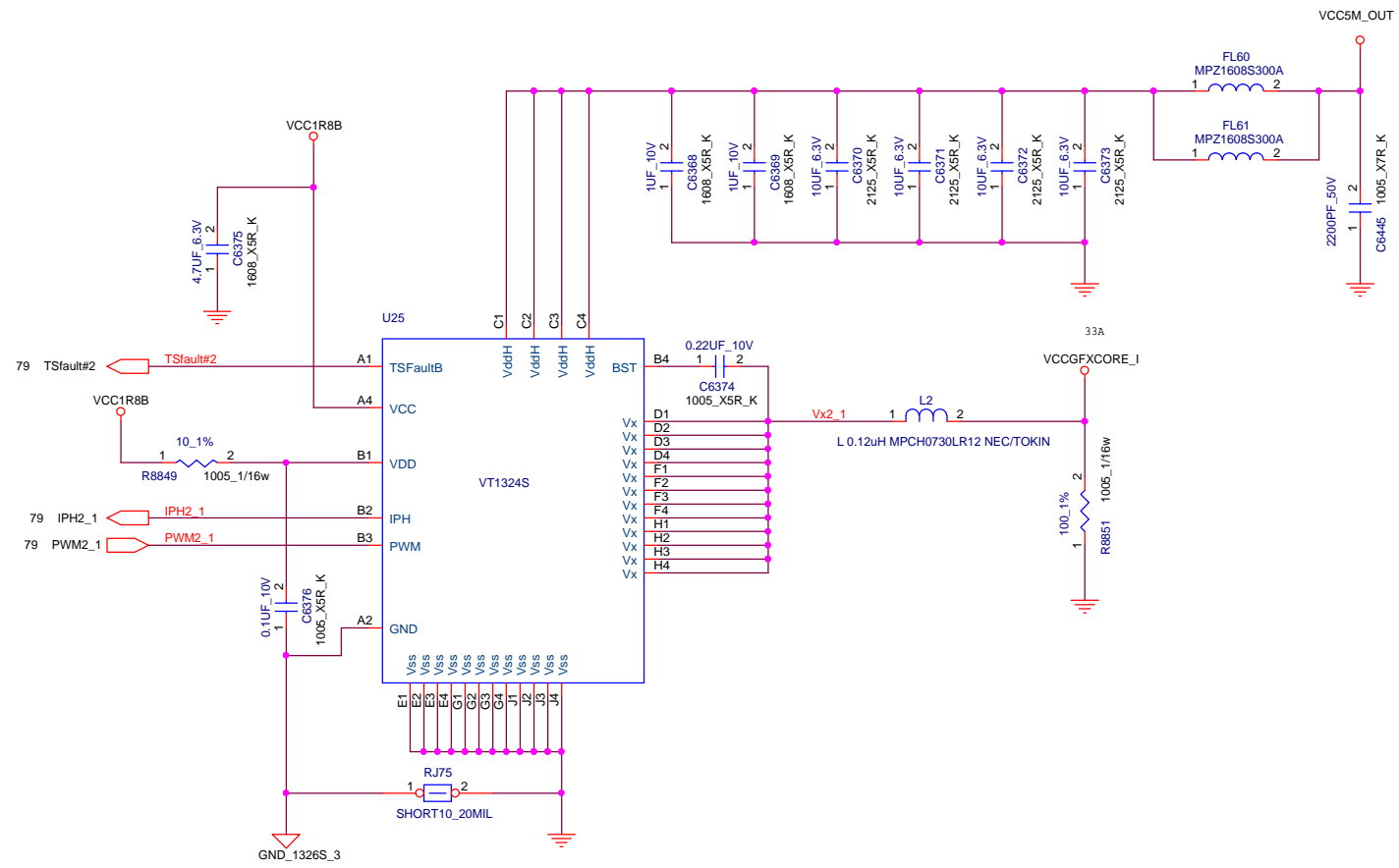
ESR = 12mOHM

|                                  |                                    |
|----------------------------------|------------------------------------|
| <b>lenovo</b>                    |                                    |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>DC/DC VCC5M/VCC3M       |
| Size :<br>C                      | Document Number :<br>Rev :<br>7.53 |
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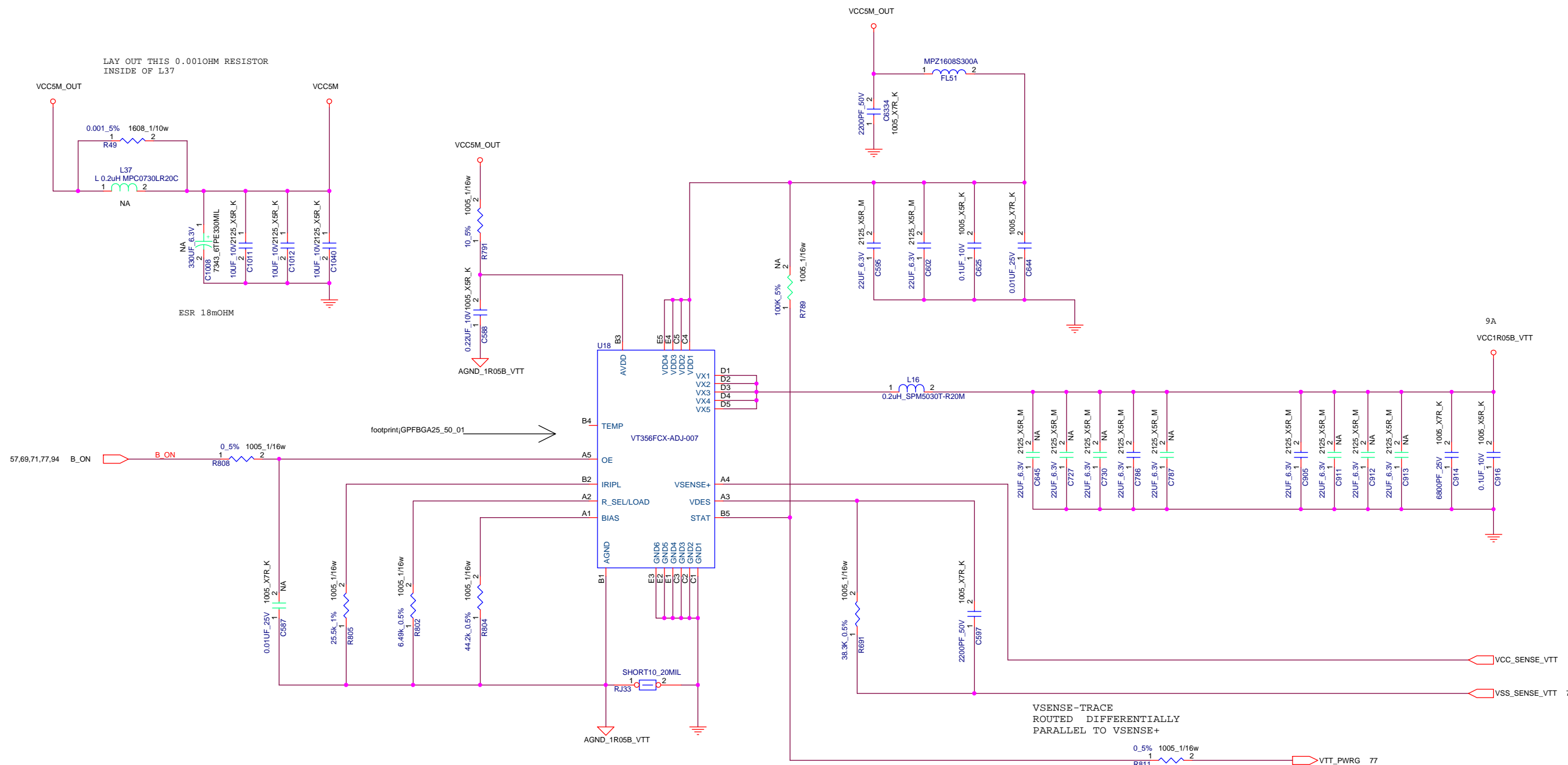
|                                  |                   |                               |
|----------------------------------|-------------------|-------------------------------|
|                                  |                   |                               |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>DC/DC VCCGFXCORE_I |
| Size :<br>C                      | Document Number : | Rev :<br>7.53                 |
| Date: Monday, March 19, 2012     |                   | Sheet : 80 of 97              |





BLANK

|   |                   |                  |
|---|-------------------|------------------|
|  |                   |                  |
| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
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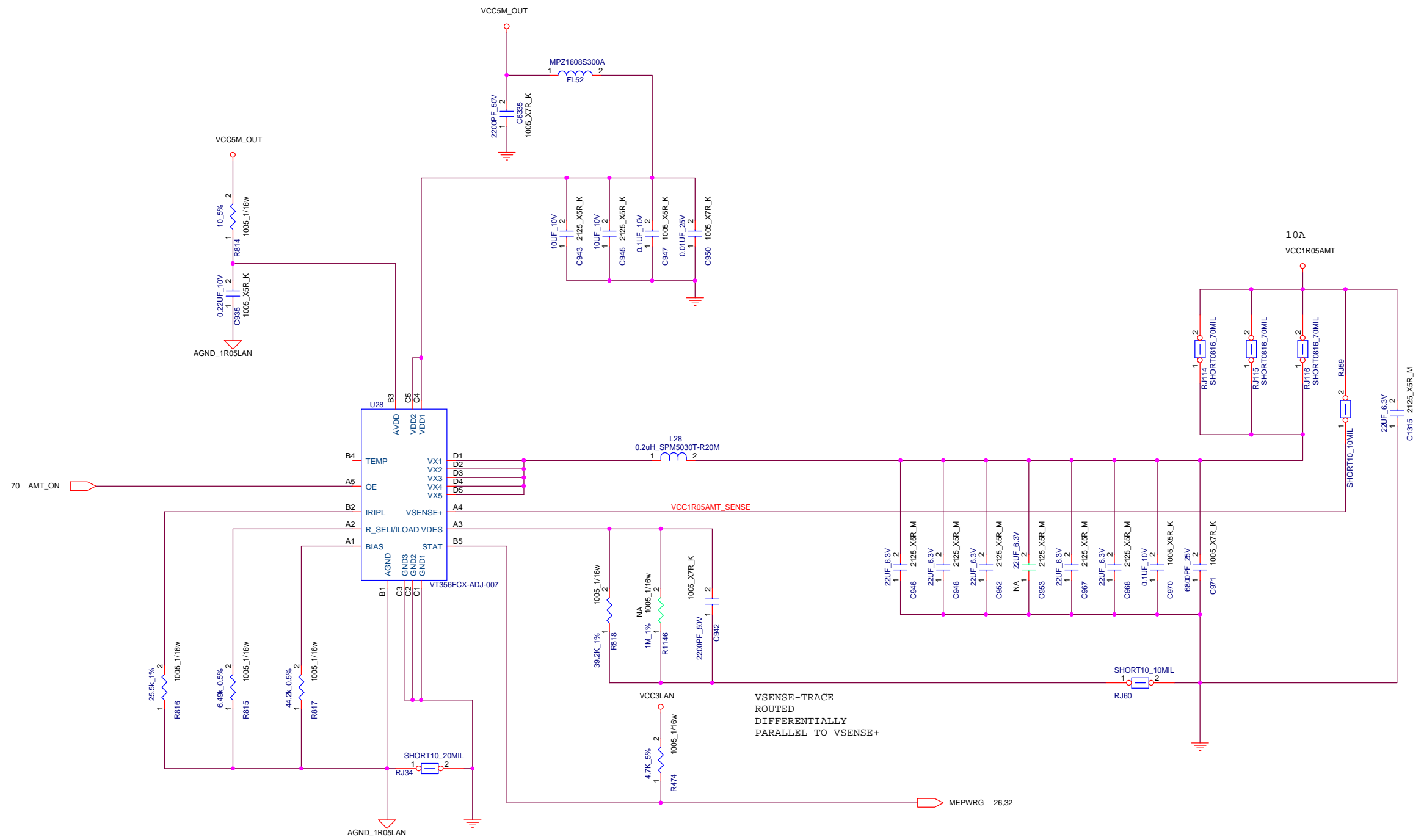


TO ASSIGN VT356 IN BOM

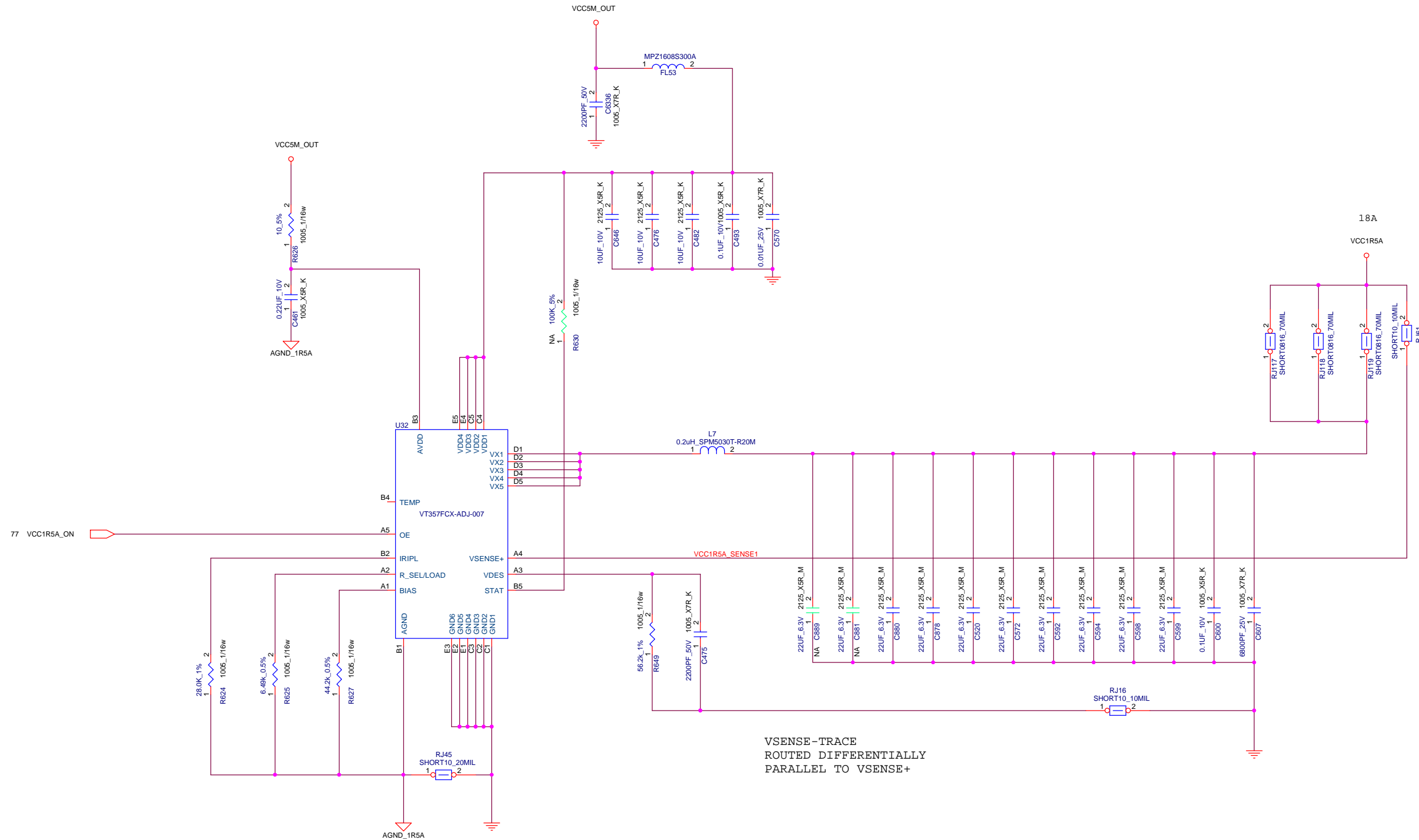
1.10V R691 = 40.2K  
 1.05V R691 = 38.3K  
 1.00V R691 = 36.5K  
 $V_{OUT} = 1.212 * R_{691} / 44.2K$

TABLE

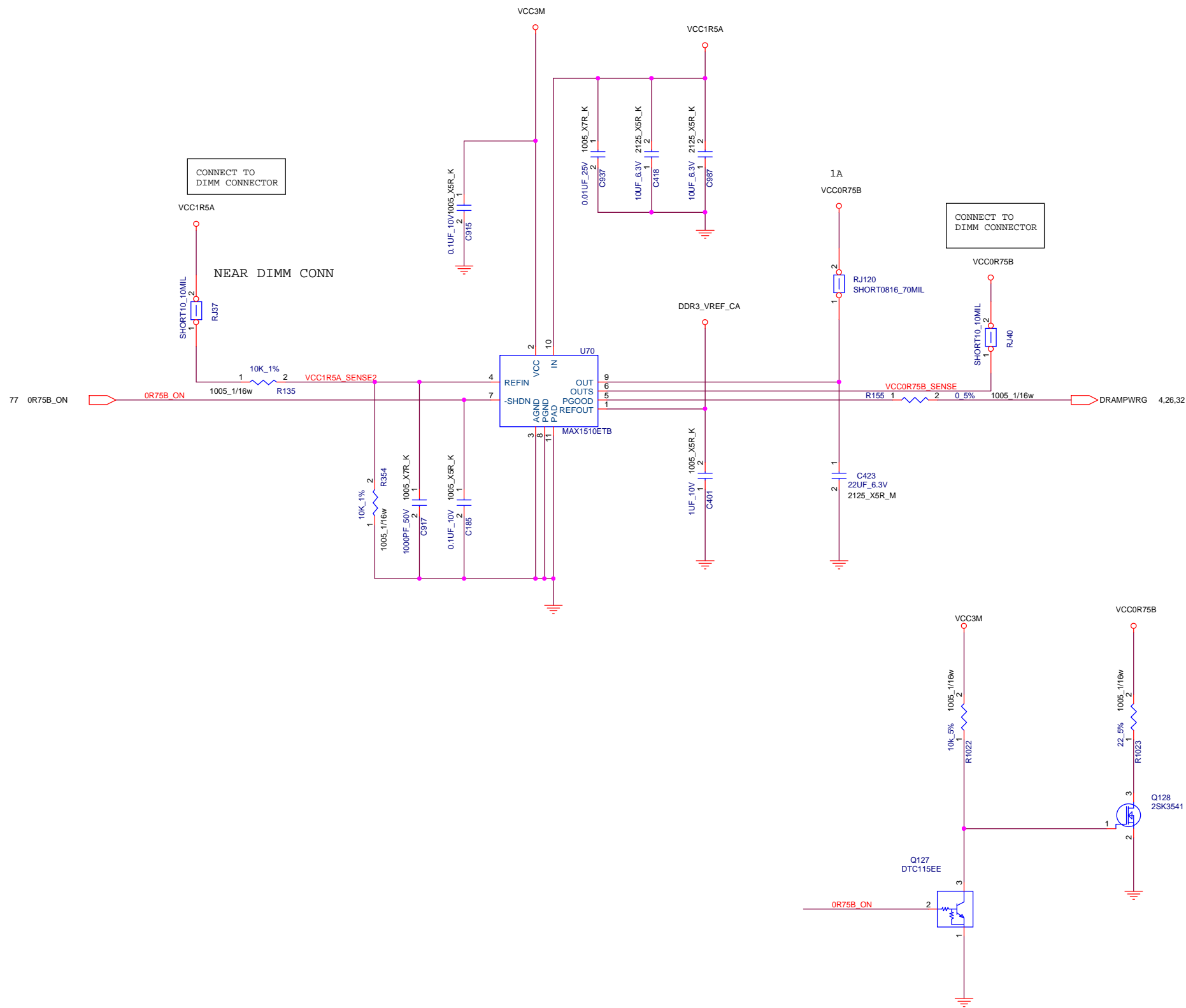
| Processor      | VCC1R05B_VTT |
|----------------|--------------|
| Sandy Bridge   | 1.05V        |
| Ivy Bridge ES2 | 1.05V        |
| Ivy Bridge ES1 | 1.00V        |



|                                  |                             |
|----------------------------------|-----------------------------|
| <b>lenovo</b>                    |                             |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>DC/DC VCC1R05AMT |
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VSENSE-TRACE  
ROUTED DIFFERENTIALLY  
PARALLEL TO VSENSE+




|                                  |                   |                           |
|----------------------------------|-------------------|---------------------------|
| <b>lenovo</b>                    |                   |                           |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>DC/DC VCC0R75B |
| Size :<br>C                      | Document Number : | Rev :<br>7.53             |
| Date: Monday, March 19, 2012     |                   | Sheet: 86 of 97           |

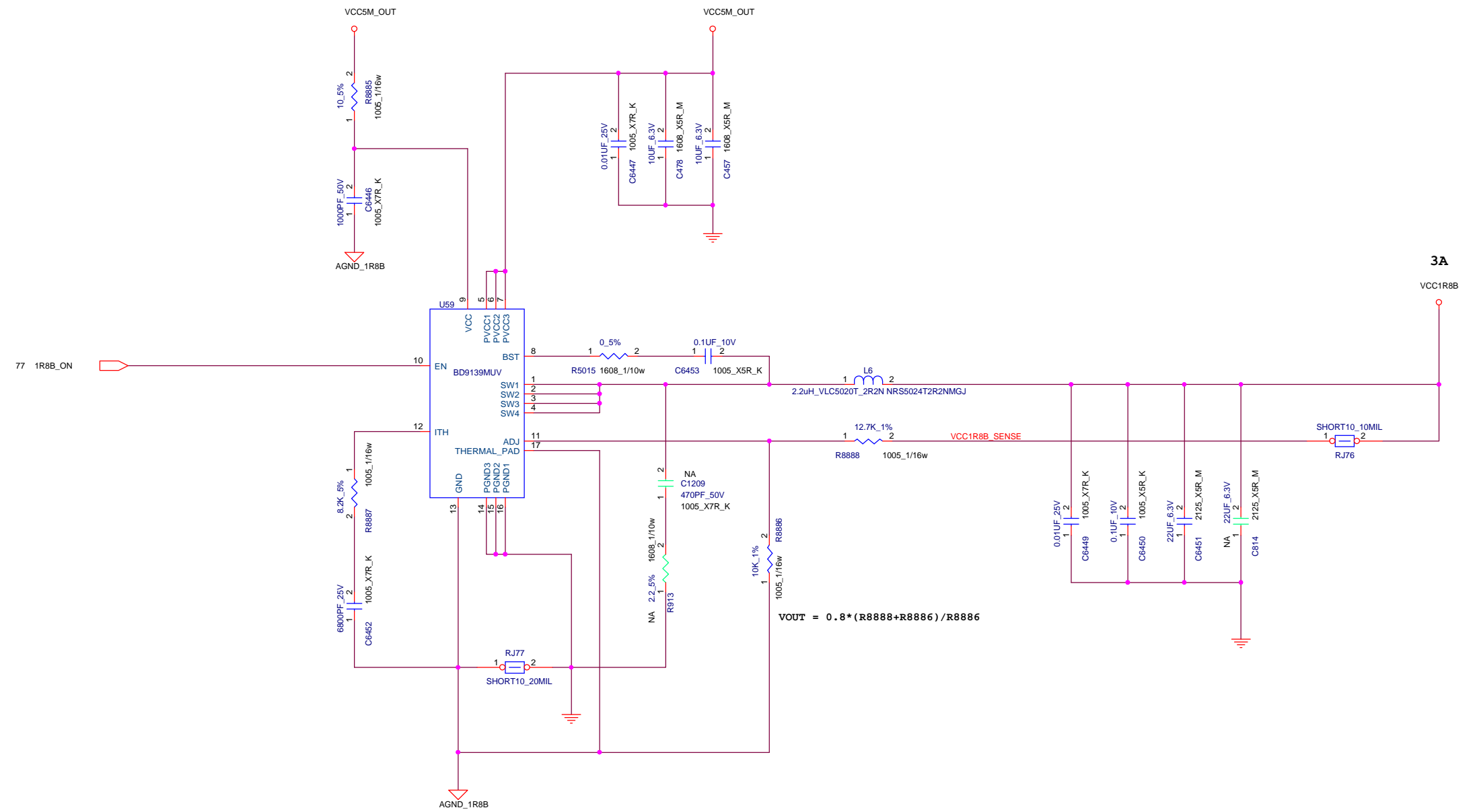
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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title : BLANK   |
| Size :<br>C   | Document Number : | Rev :<br>7.53   |
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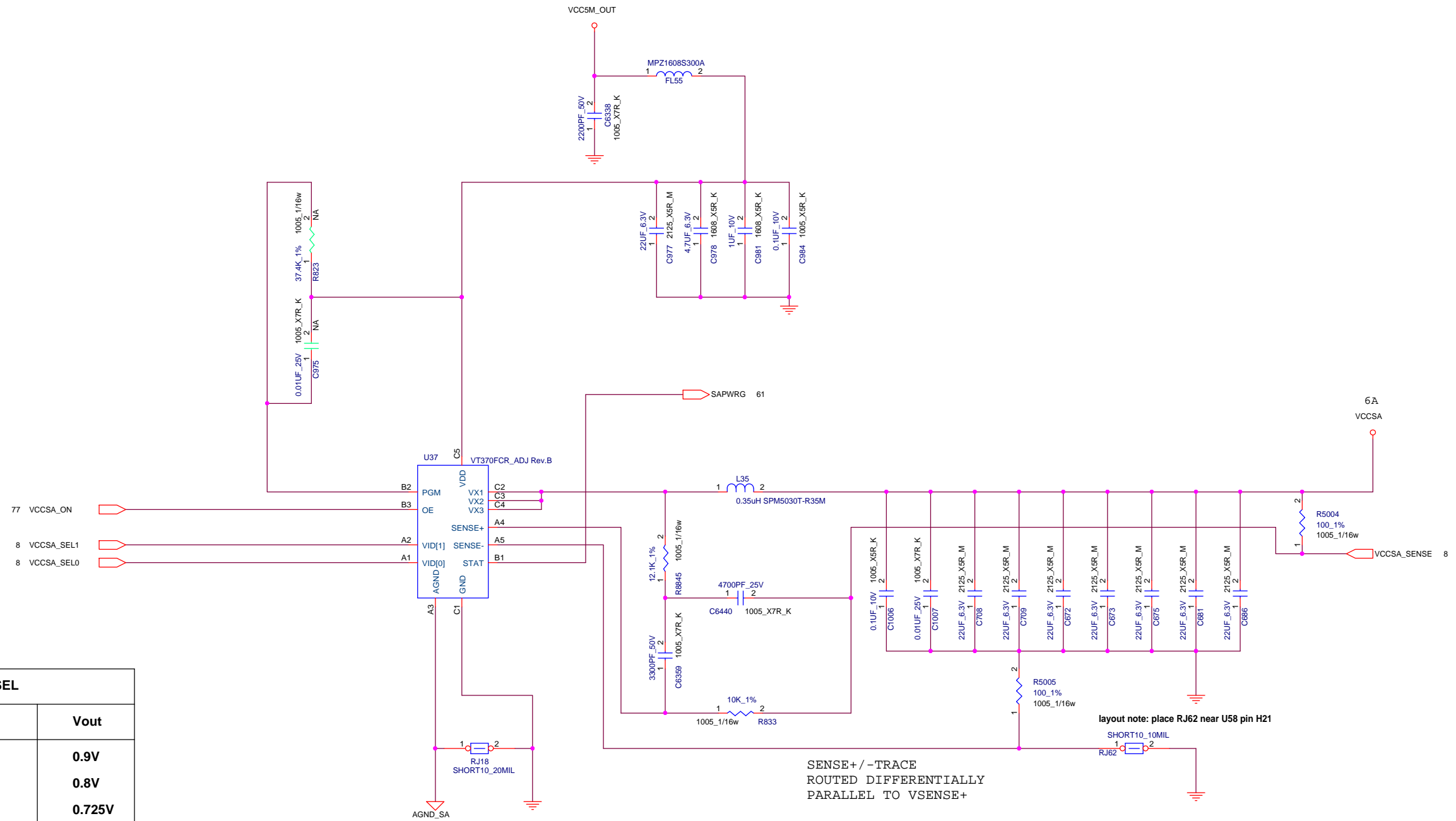
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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title : BLANK   |
| Size :<br>C   | Document Number : | Rev :<br>7.53   |
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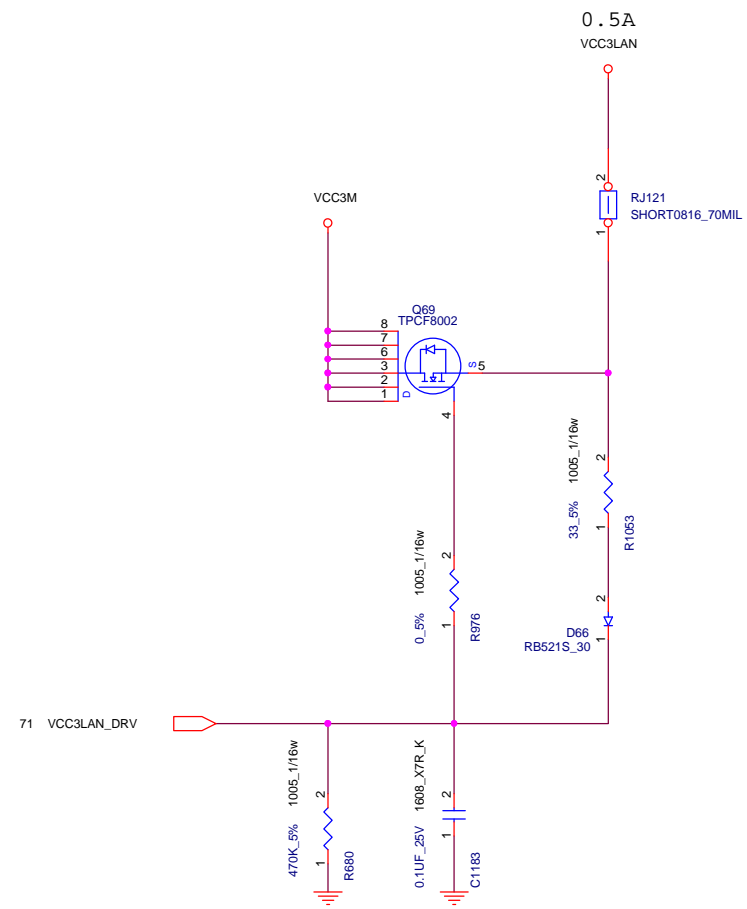





|                                  |                          |
|----------------------------------|--------------------------|
| <b>lenovo</b>                    |                          |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>DC/DC VCC1R8B |
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| VCCSA_SEL |      |        |
|-----------|------|--------|
| VID0      | VID1 | Vout   |
| L         | L    | 0.9V   |
| L         | H    | 0.8V   |
| H         | L    | 0.725V |
| H         | H    | 0.675V |




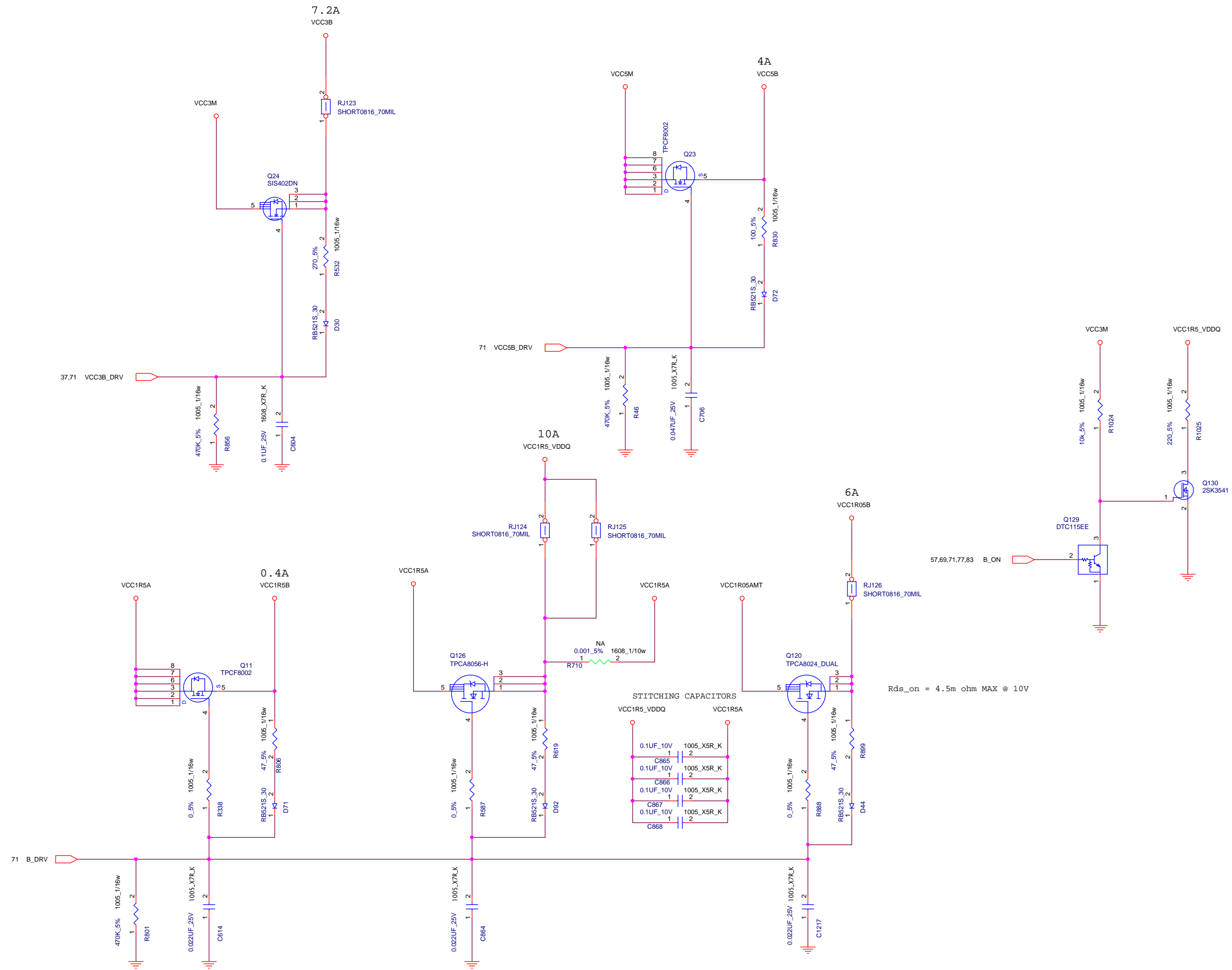


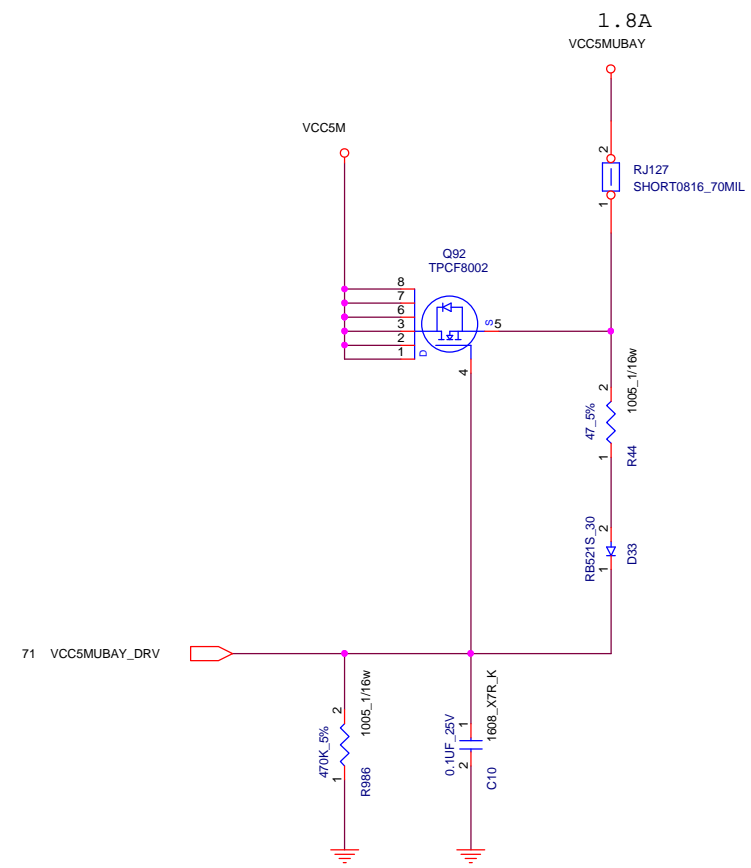
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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
| Size :<br>C   | Document Number : | Rev :<br>7.53    |
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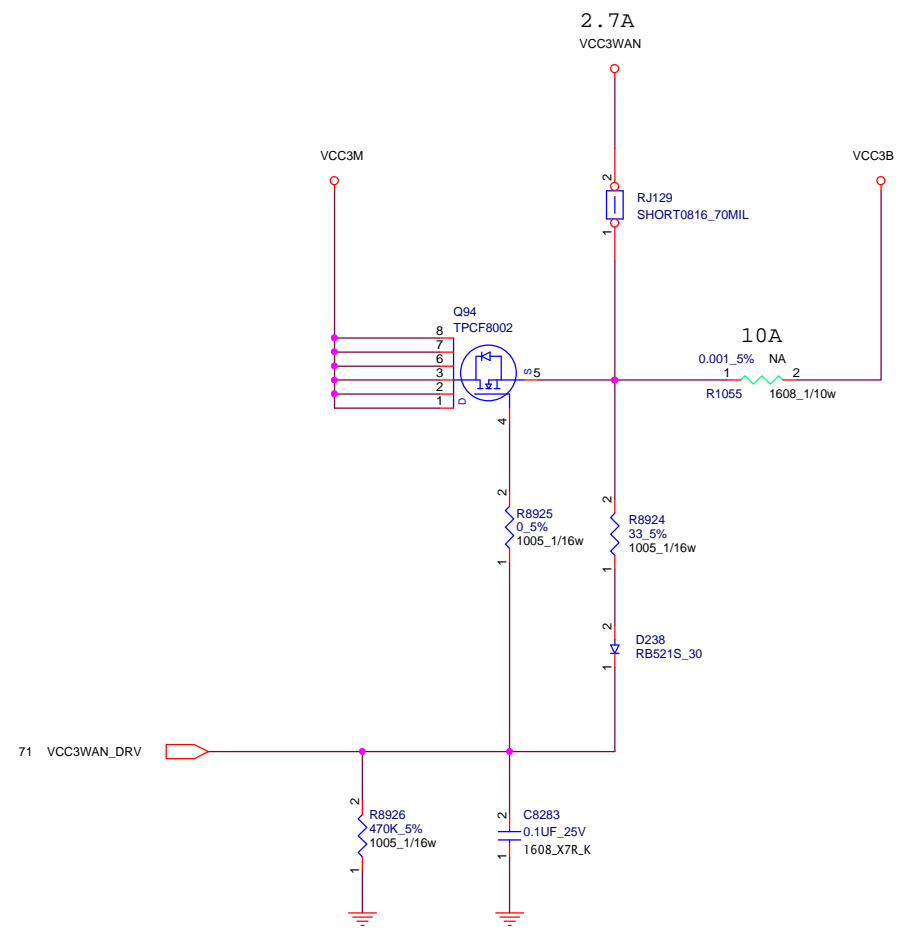
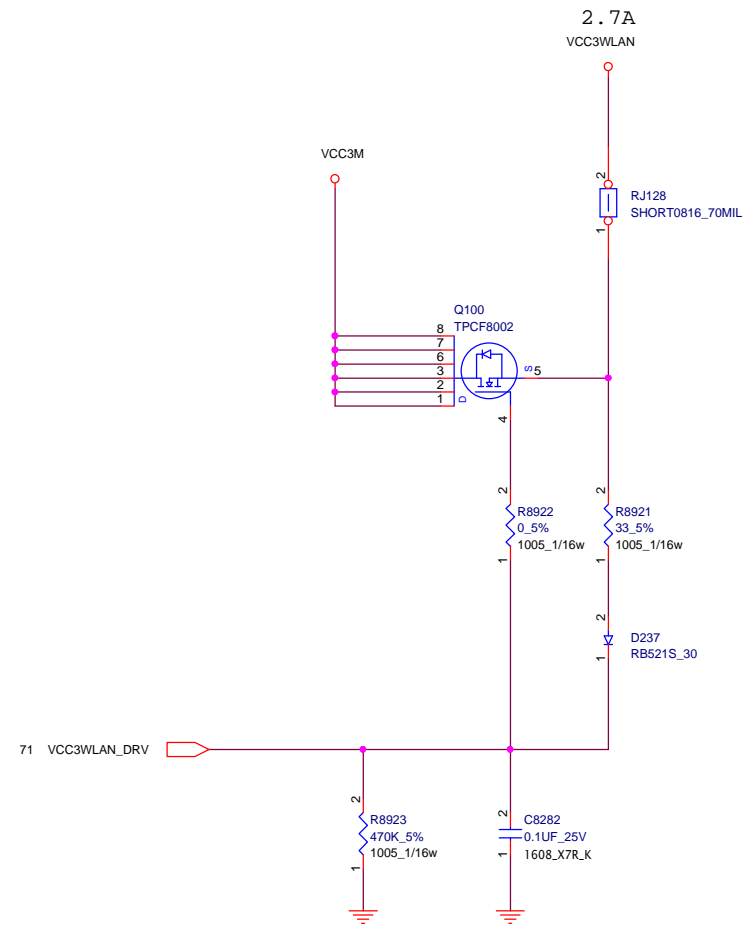
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| Project Name :<br>NZM-4 UMA SOVP  |                   | Title :<br>BLANK |
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|                                  |                   |                              |
|----------------------------------|-------------------|------------------------------|
| <b>lenovo</b>                    |                   |                              |
| Project Name :<br>NZM-4 UMA SOVP |                   | Title :<br>LOAD SW VCC5MUBAY |
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TABLE

| AOAC  | YES    | NO     |
|-------|--------|--------|
| R1055 | NO-ASM | ASM    |
| Q94   | ASM    | NO-ASM |
| R8924 | ASM    | NO-ASM |
| R8925 | ASM    | NO-ASM |
| R8926 | ASM    | NO-ASM |
| C8283 | ASM    | NO-ASM |
| D238  | ASM    | NO-ASM |

↑  
LOGIC

**lenovo**

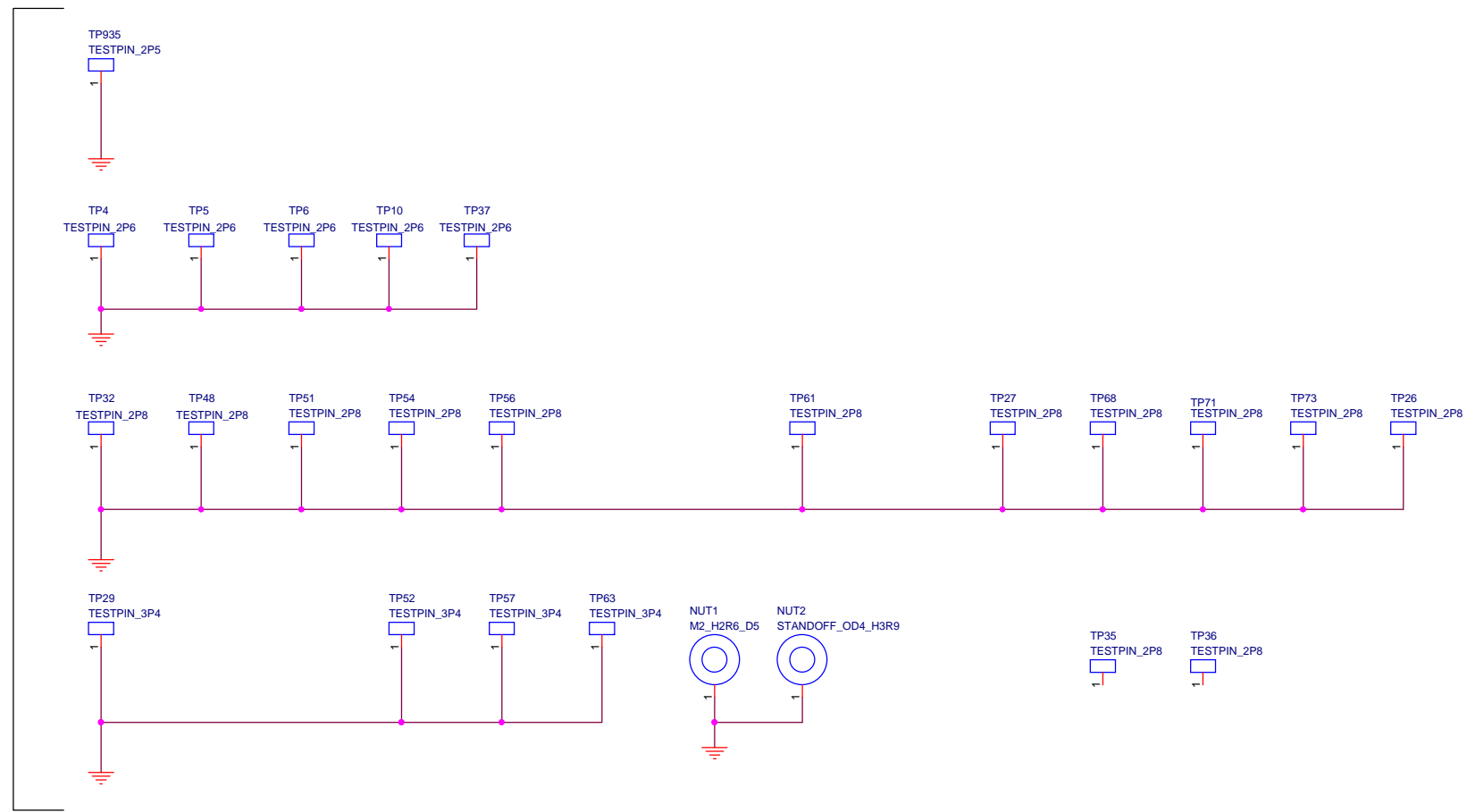
Project Name : NZM-4 UMA SOVP Title : LOAD SW WAN & WLAN

Size : C Document Number : Rev : 7.53

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PTH FOR SCREW HOLE



NPTH



FID Board Area

- FD1 NC, NO CONNECT TO ANY.
- FD2 NC, NO CONNECT TO ANY.
- FD3 NC, NO CONNECT TO ANY.

- FD4 NC, NO CONNECT TO ANY.
- FD5 NC, NO CONNECT TO ANY.
- FD6 NC, NO CONNECT TO ANY.

- CF25 NC, NO CONNECT TO ANY.
- CF26 NC, NO CONNECT TO ANY.

FID Component Area

- CF1 NC, NO CONNECT TO ANY.
- CF2 NC, NO CONNECT TO ANY.
- CF3 NC, NO CONNECT TO ANY.

- CF4 NC, NO CONNECT TO ANY.
- CF5 NC, NO CONNECT TO ANY.
- CF6 NC, NO CONNECT TO ANY.

- CF7 NC, NO CONNECT TO ANY.
- CF8 NC, NO CONNECT TO ANY.
- CF9 NC, NO CONNECT TO ANY.

- CF10 NC, NO CONNECT TO ANY.

- CF15 NC, NO CONNECT TO ANY.

- CF16 NC, NO CONNECT TO ANY.

- CF17 NC, NO CONNECT TO ANY.

- CF18 NC, NO CONNECT TO ANY.

- CF19 NC, NO CONNECT TO ANY.

- CF20 NC, NO CONNECT TO ANY.

- CF21 NC, NO CONNECT TO ANY.

- CF22 NC, NO CONNECT TO ANY.

- CF23 NC, NO CONNECT TO ANY.

- CF24 NC, NO CONNECT TO ANY.

|                                  |                                |
|----------------------------------|--------------------------------|
|                                  |                                |
| Project Name :<br>NZM-4 UMA SOVP | Title :<br>PTH FOR SCREW HOLES |
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