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MS-7816

Intel -SharkBay plamform Z87

ATX

Ver: 10(243.84x304.8)

CPU:

System Chipset:

Haswell LGA1150

Lynx Point Z87

Onboard Chip:

HD Audio Codec:ALC892

LAN-RTL8111E

SIO:Nuvoton 6779D

Flash ROM: SPI 64 MB & SPI 128 MB (H87&B85)

Main Memory:

DDRIII (1066/1333/1600MHz) * 4 (Dual Channel)

ACPI:

PWM:

UPI

UP1649 6 Phase

Expansion Slots:

Other:

PCI Express (X16) Slot * 1

PCI Express (X1) Slot * 2

PCI Express (X4) Slot * 1

PCI Slot * 3

SATA3.0 x6(PCH)

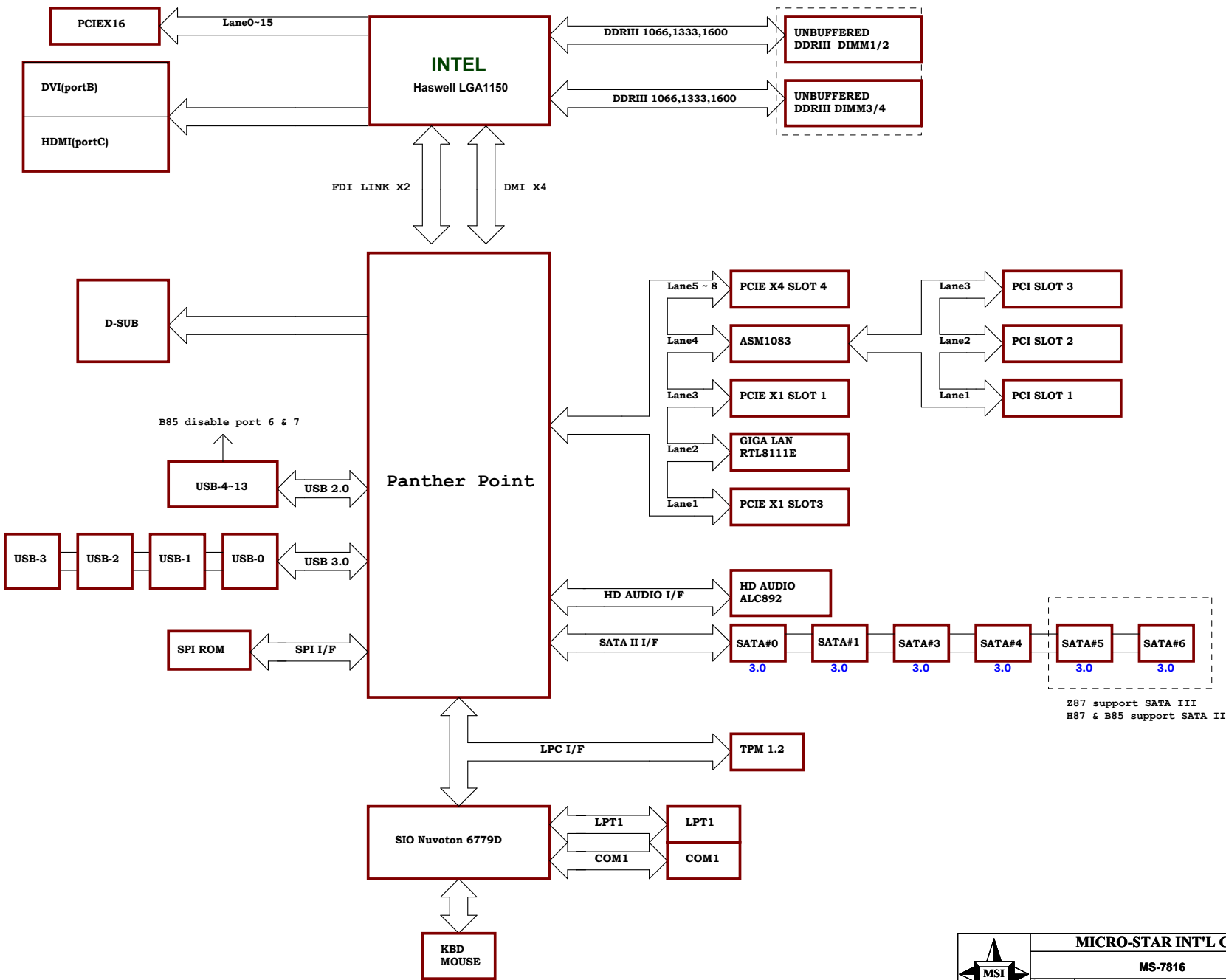
REAL USB2.0 *6

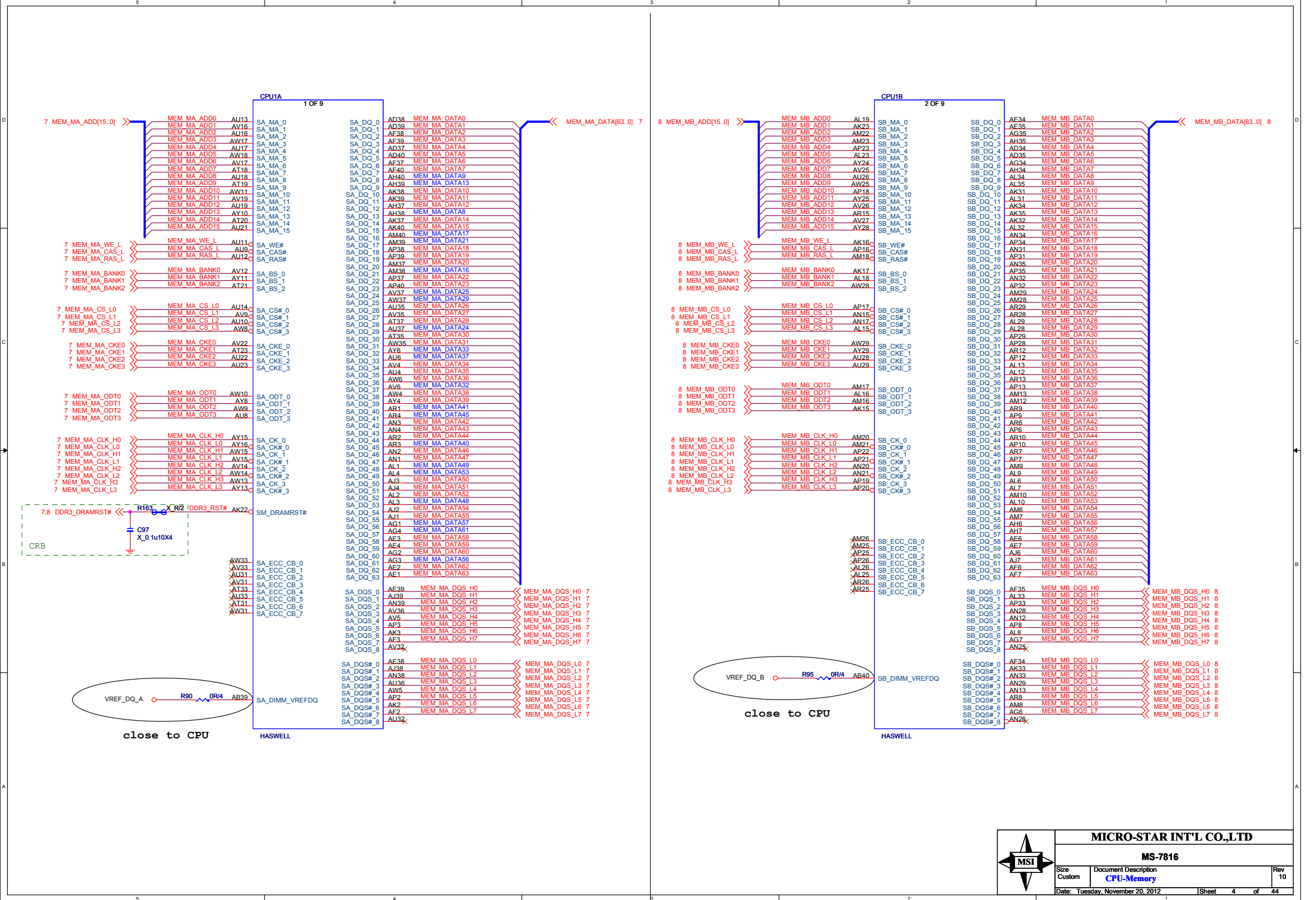
FRONT USB2.0 *4(B85 Disable 2 port)

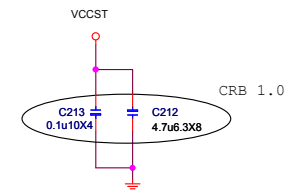
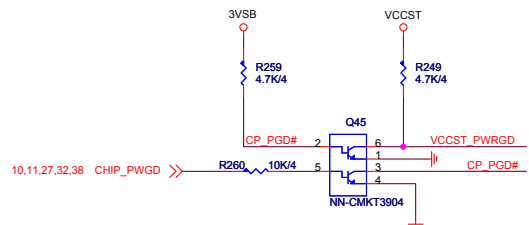
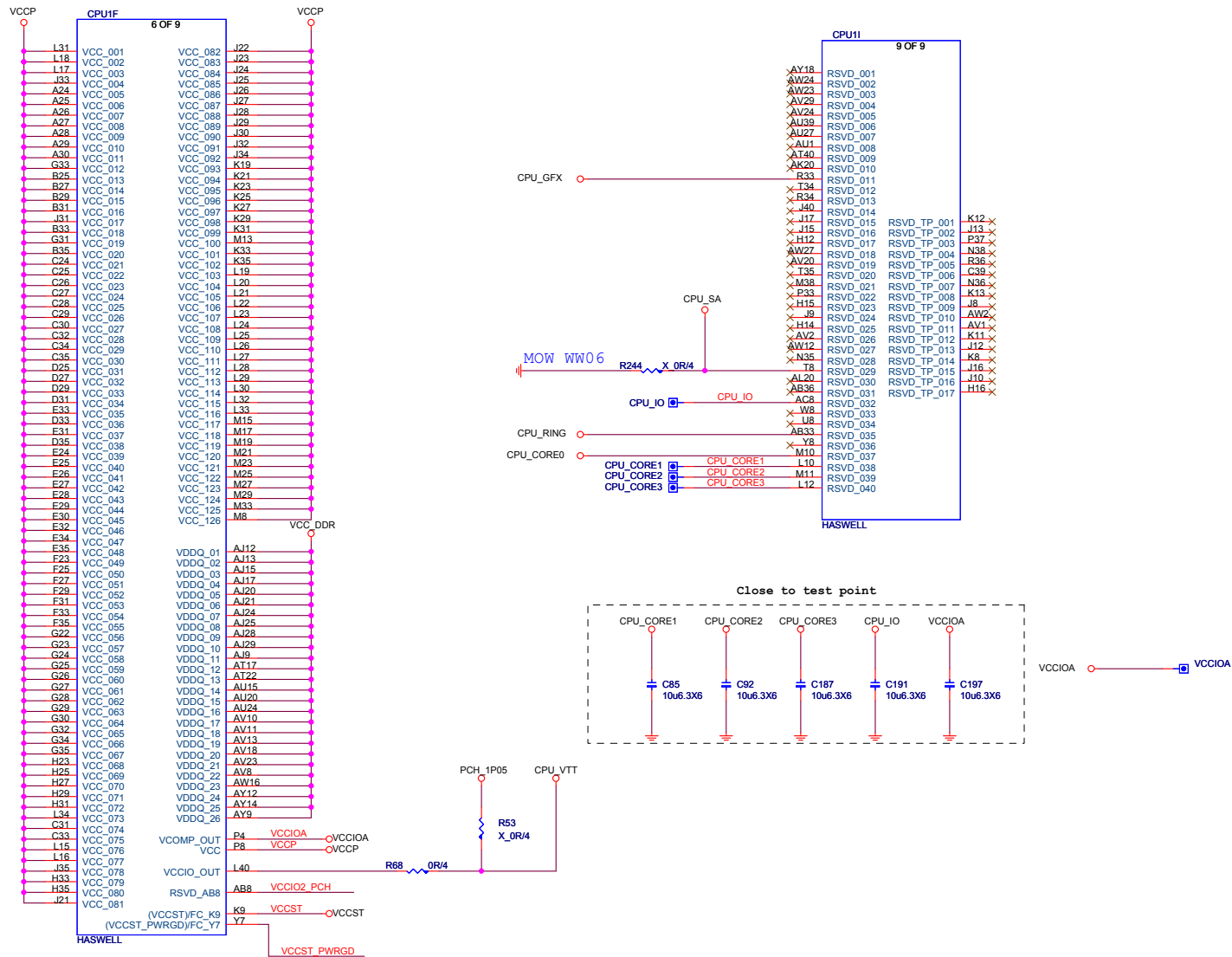
REAL USB3.0 *2

FRONT USB3.0 *2

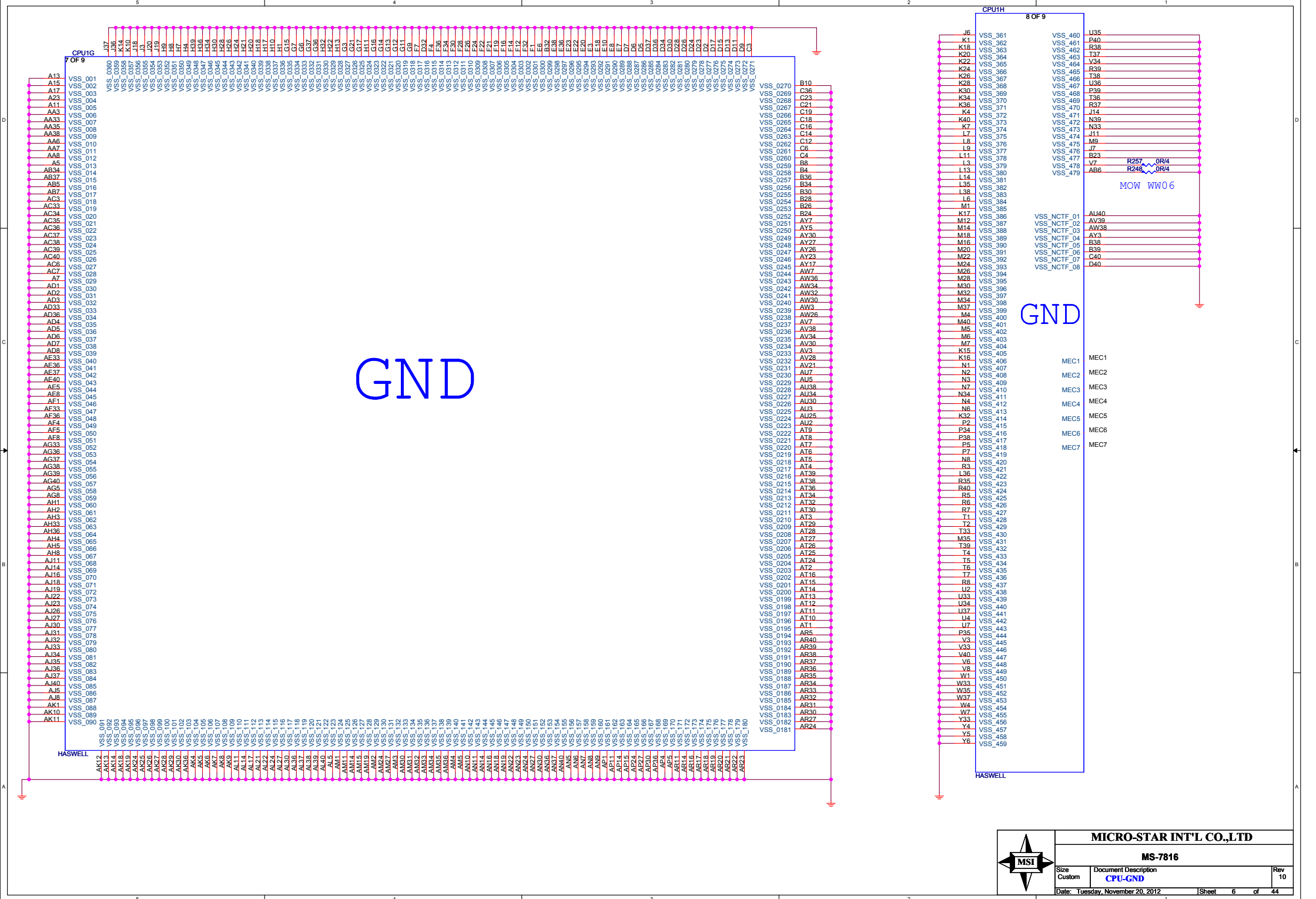
MS-7816 Block Diagram





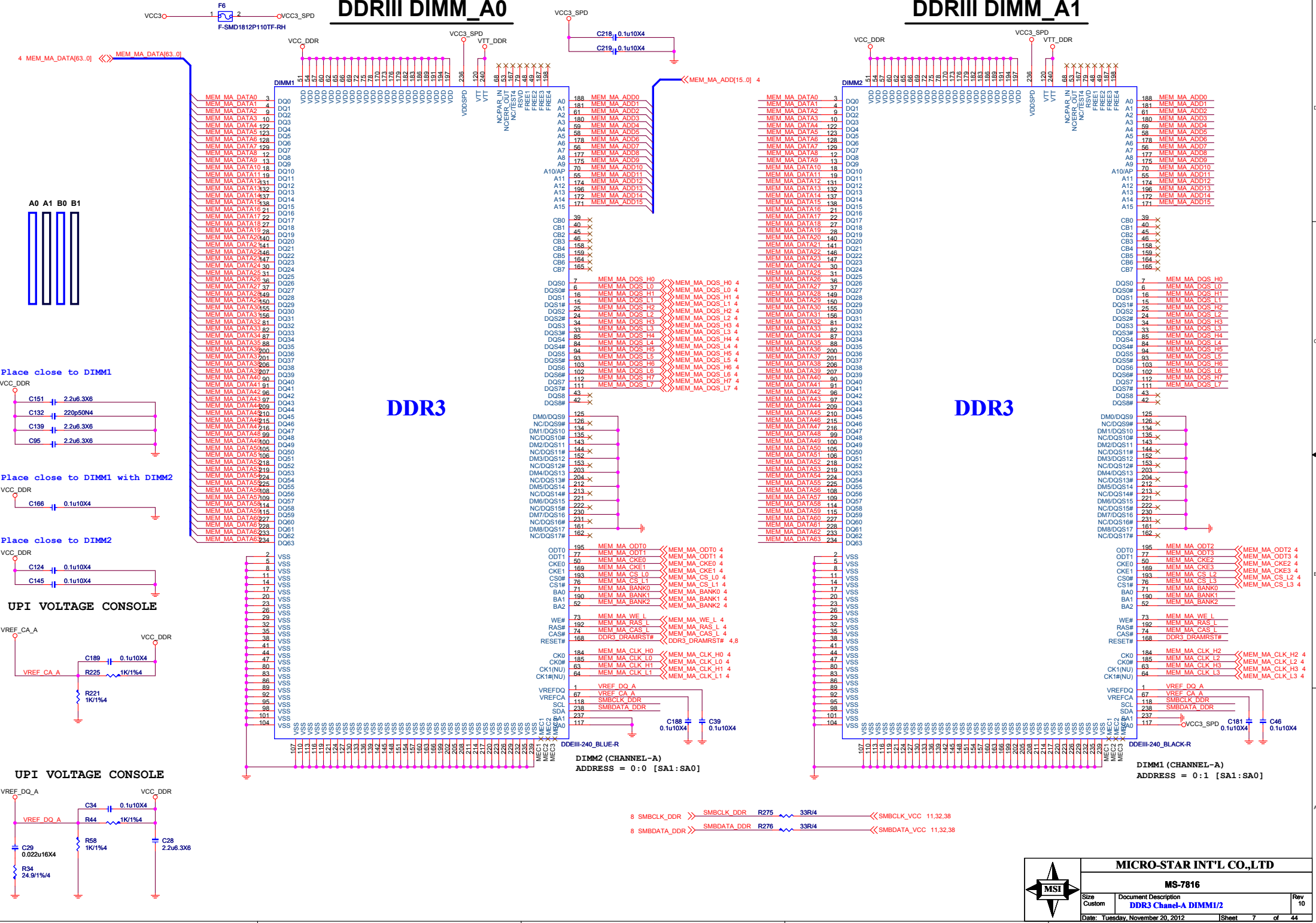


| MICRO-STAR INT'L CO.,LTD | | |
|----------------------------------|----------------------|-----|
| MS-7816 | | |
| Size | Document Description | Rev |
| Custom | CPU-Power | 10 |
| Date: Tuesday, November 20, 2012 | Sheet 5 of 44 | |

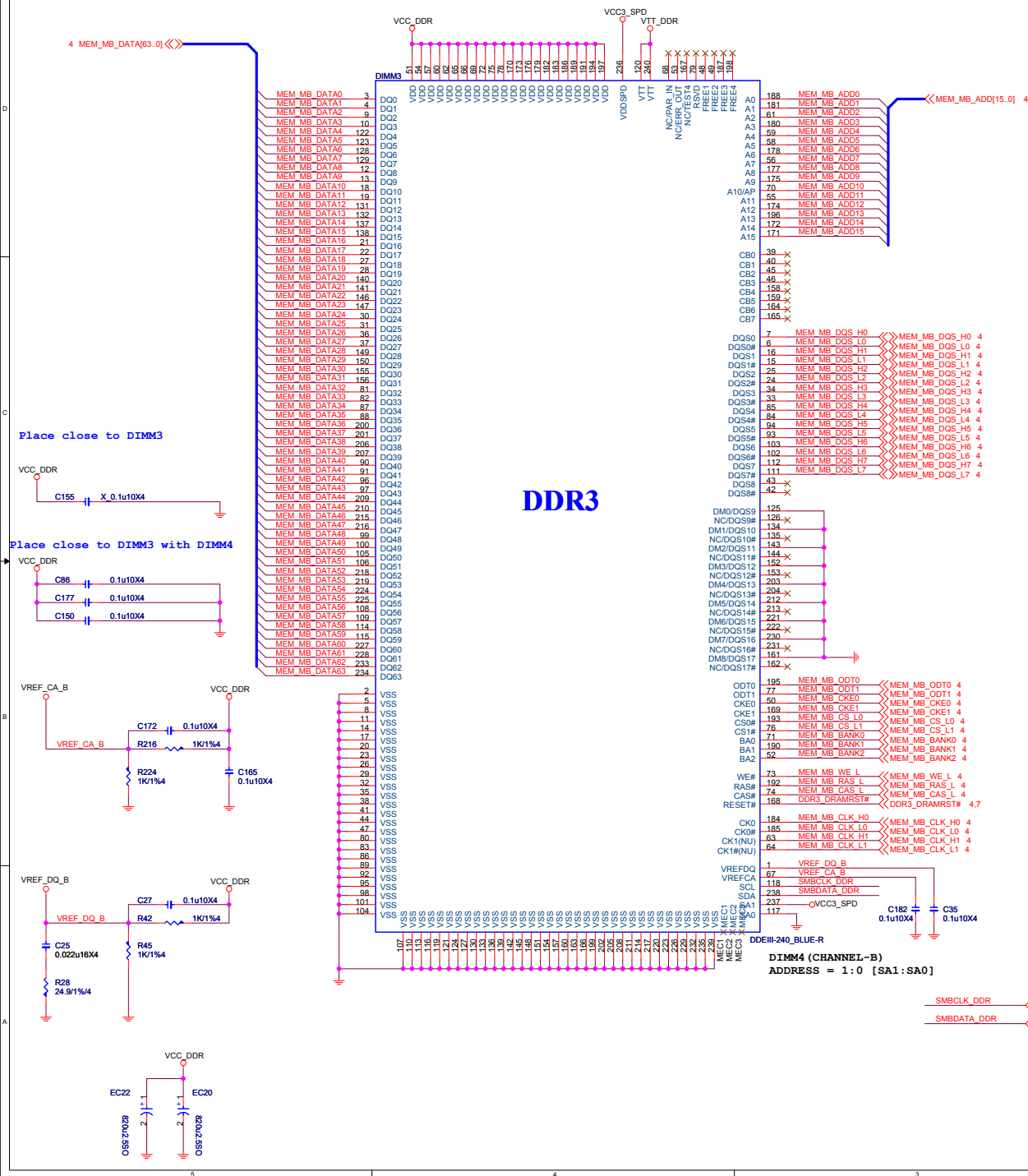


DDR3 DIMM_A0

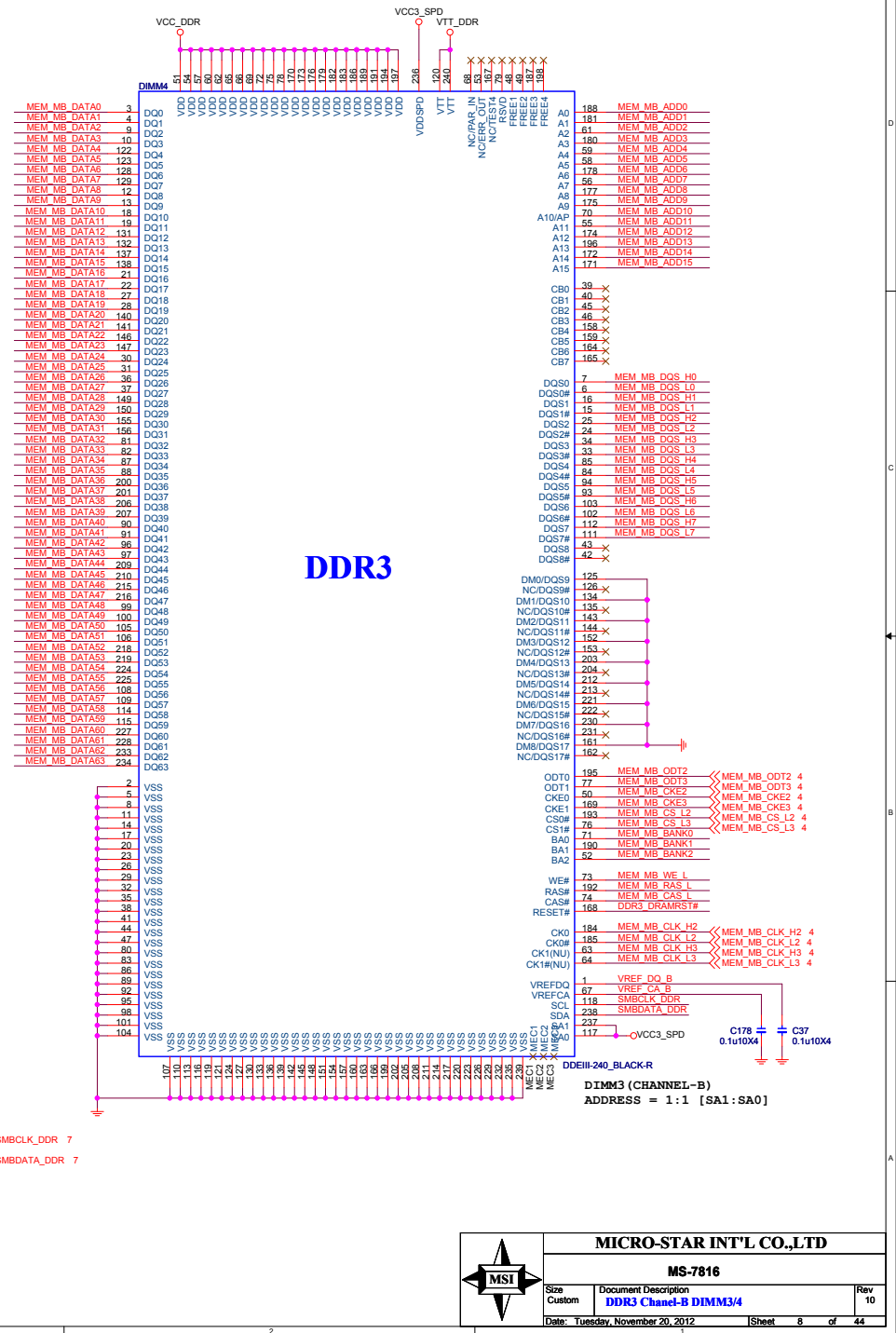
DDR3 DIMM_A1



DDRIII DIMM_B0



DDRIII DIMM_B1

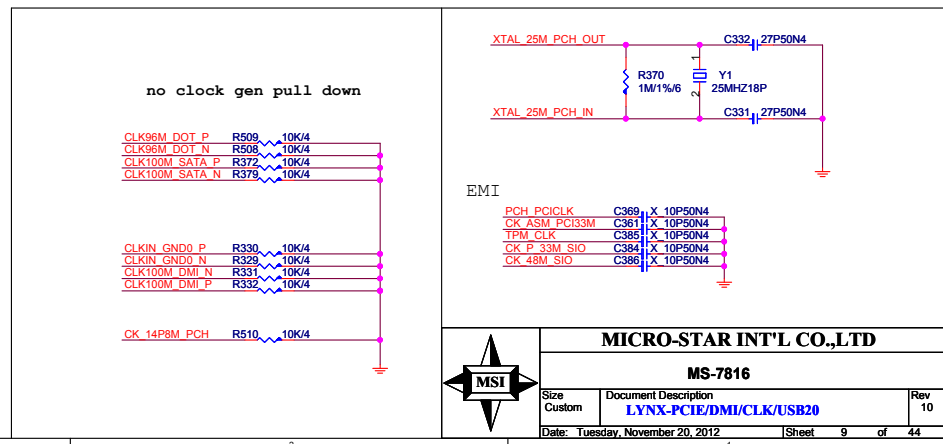
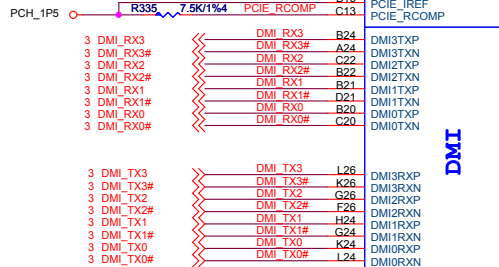


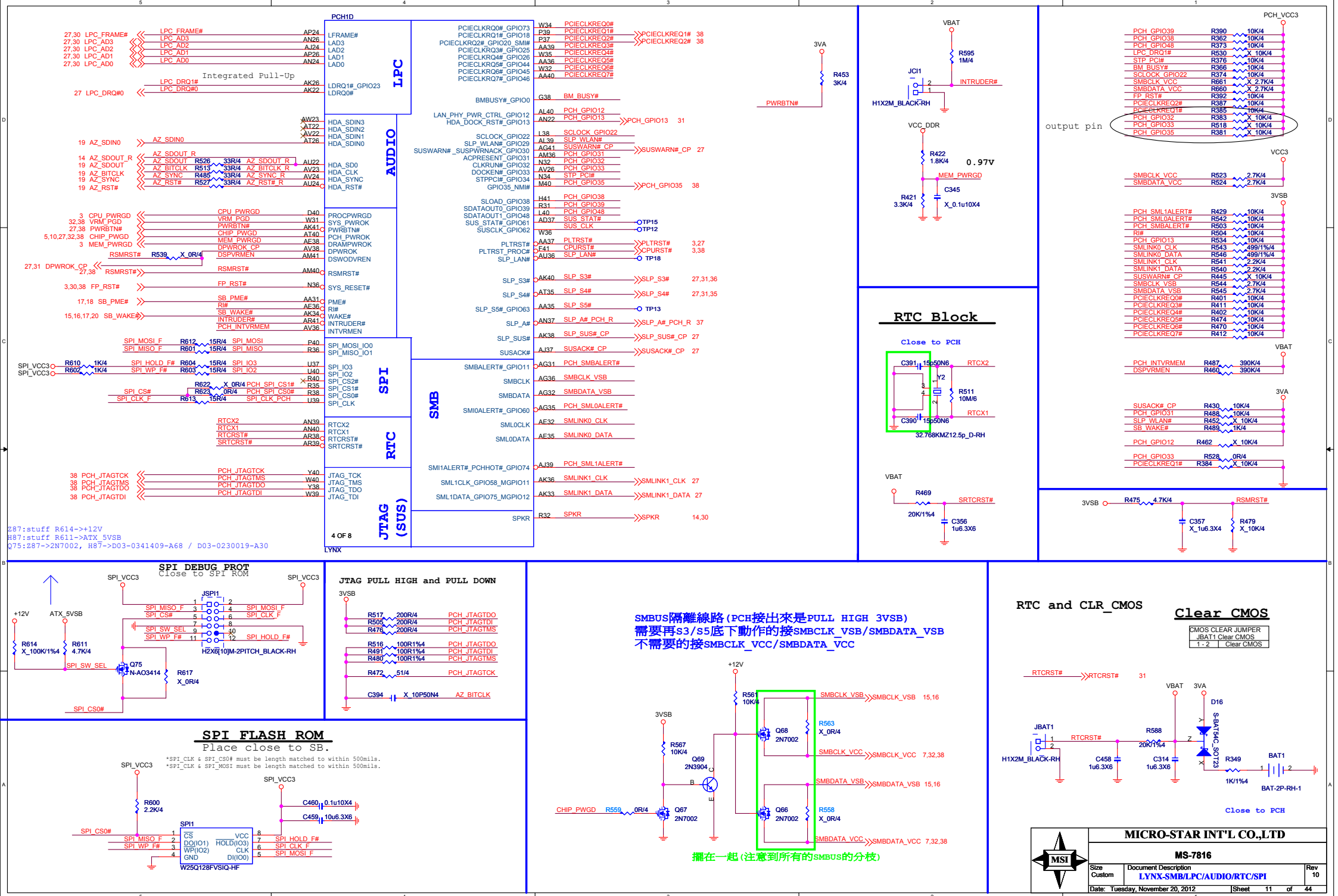
MICRO-STAR INT'L CO.,LTD

MS-7816

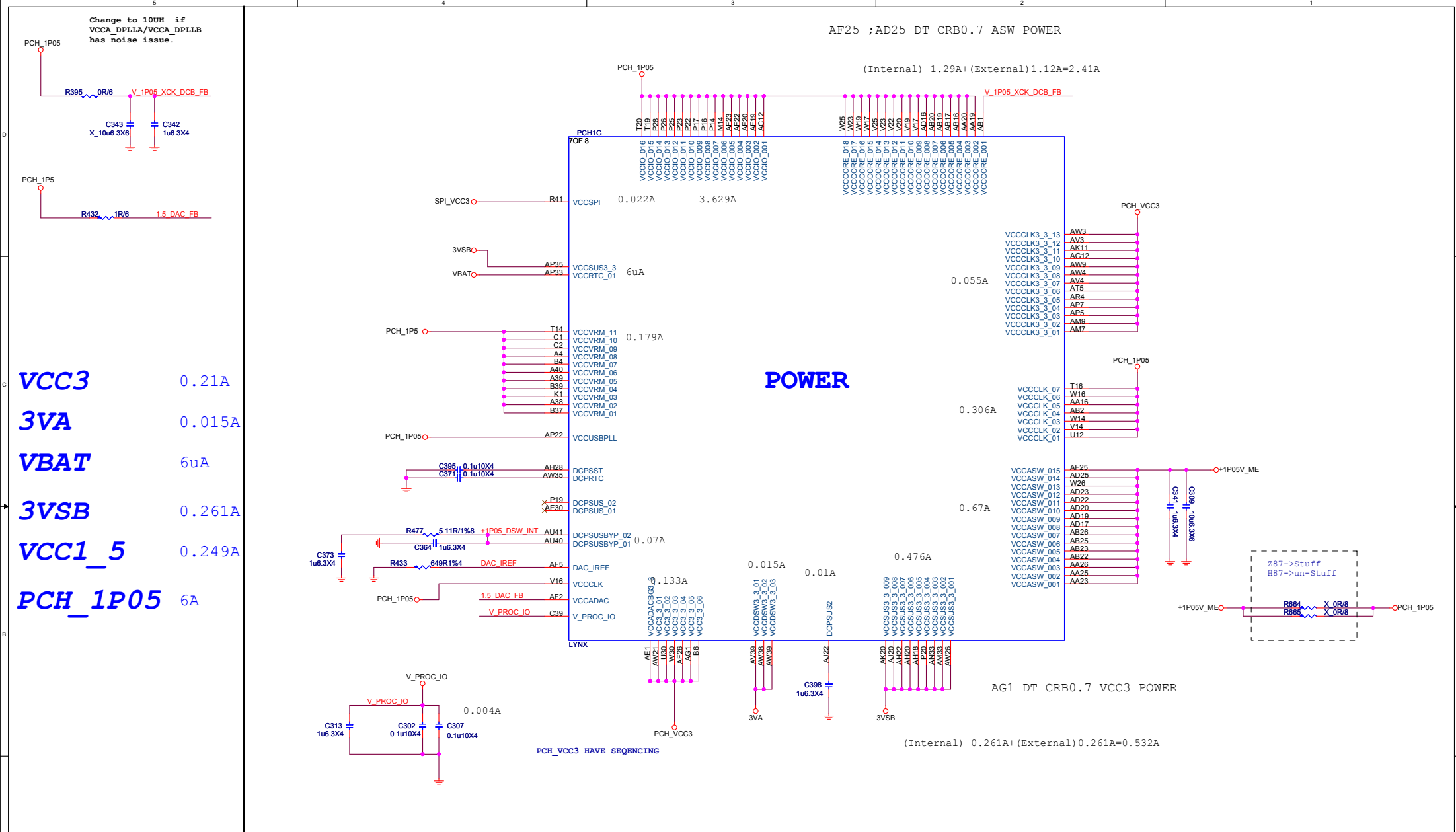
| | | |
|----------------------------------|---|---------------|
| Size Custom | Document Description DDR3 Chancel-B DIMM3/4 | Rev 10 |
| Date: Tuesday, November 20, 2012 | | Sheet 8 of 44 |

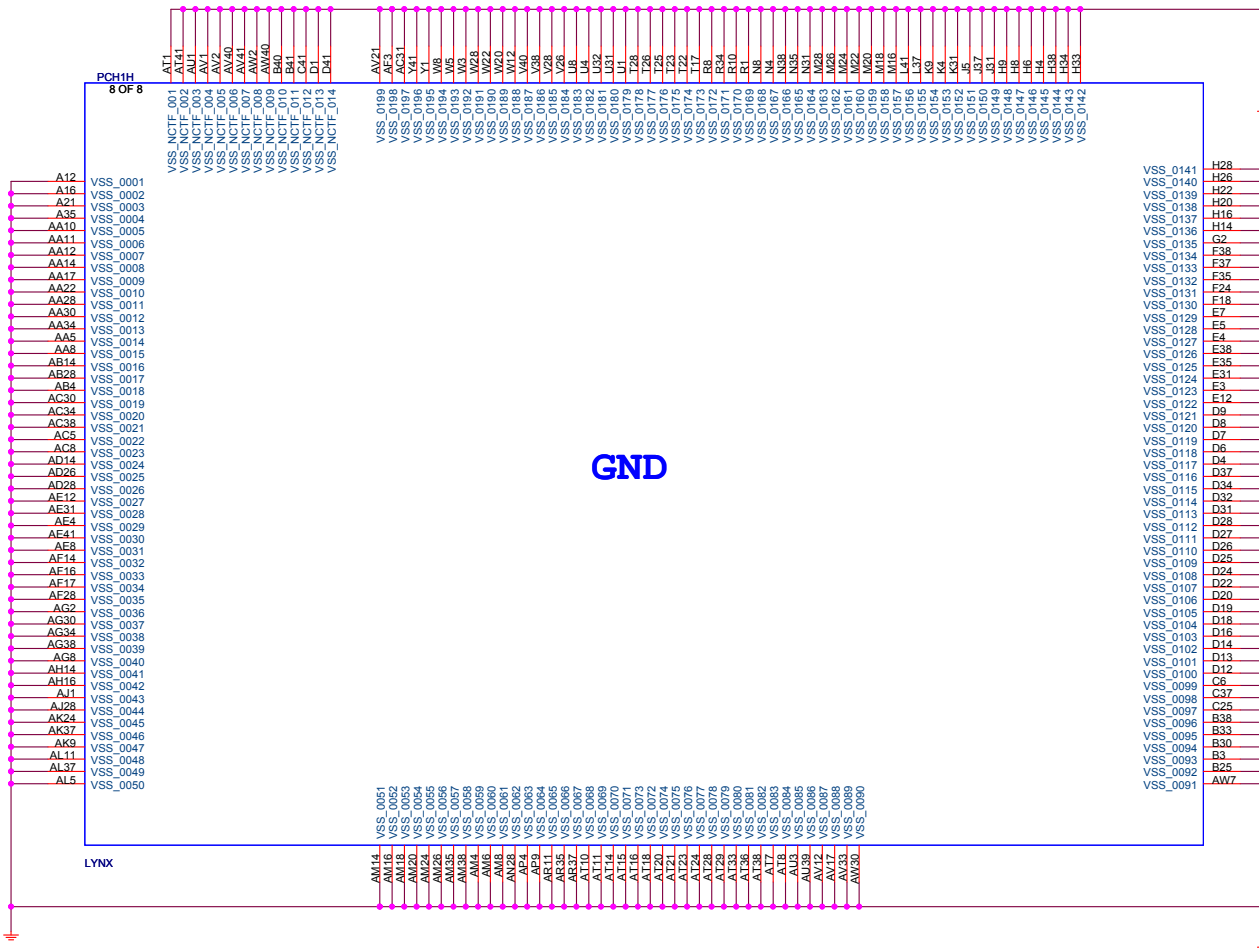
| | | PCH1B | | 2 OF 8 | |
|----|---------------|-------|---------------|--------|-----|
| 16 | PE8_SLOT4_TX | H1 | PETP8 | | US1 |
| 16 | PE8_SLOT4_TX# | H2 | PETN8 | | US1 |
| 16 | PE7_SLOT4_TX | G5 | PETP7 | | US1 |
| 16 | PE7_SLOT4_TX# | G3 | PETN7 | | US1 |
| 16 | PE6_SLOT4_TX | D2 | PETP6 | | US1 |
| 16 | PE6_SLOT4_TX# | E1 | PETN6 | | US1 |
| 16 | PE5_SLOT4_TX | A7 | PETP5 | | US1 |
| 16 | PE5_SLOT4_TX# | B7 | PETN5 | | US1 |
| 16 | PE4_ASM_TX | C8 | PETP4 | | US1 |
| 17 | PE4_ASM_TX# | B8 | PETN4 | | US1 |
| 15 | PE3_SLOT1_TX | B9 | PETP3 | | US1 |
| 15 | PE3_SLOT1_TX# | D11 | PETN3 | | US1 |
| 20 | PE2_LAN_TX | C11 | PETP2_USB3TP3 | | US1 |
| 20 | PE2_LAN_TX# | D11 | PETN2_USB3TN3 | | US1 |
| 16 | PE1_SLOT3_TX | B11 | PETP1_USB3TP2 | | US1 |
| 16 | PE1_SLOT3_TX# | B12 | PETN1_USB3TN2 | | US1 |





(Internal) 1.29A+(External)1.12A=2.41A



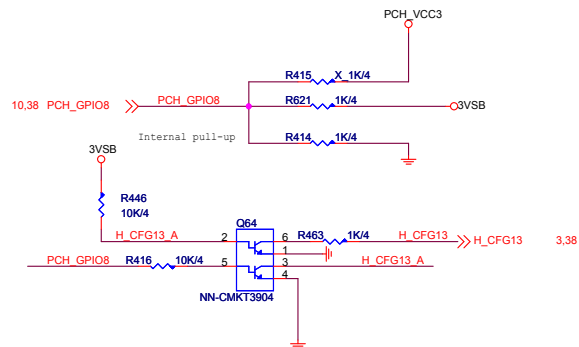
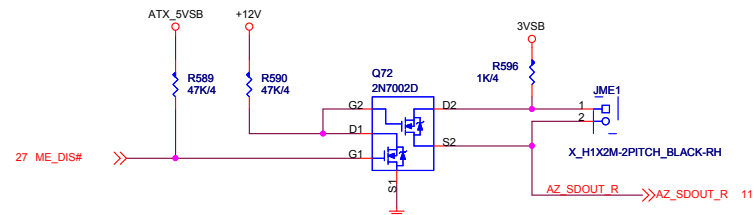


11,30 SPKR << SPKR R391 X 8.2K/4

Internal pull-DOWN

SPKR
Default Mode:
Internal weak Pull-down.

No Reboot Mode with TCO Disabled:
Connect to Vcc3_3 with 8.2k-10k Ohm weak pullup resistor.



10 PCH_GPIO55 >> PCH_GPIO55 R461 X 4.7K/4

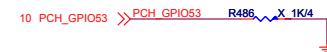
Internal pull-up

GPIO55
Default Mode:
Internal pull-up.

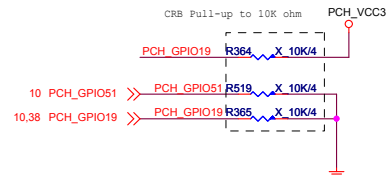
Top Block Swap Mode:
Connect to ground with 4.7k Ohm weak pulldown resistor.



For Sx power Cycling May Fail Due to SVID Logic Race Condition Within the Processor



GPIO53
Connect to ground with 1k Ohm pull-down resistor.



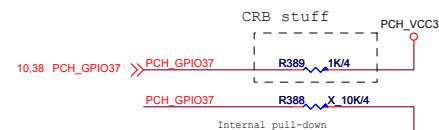
Default (SPI):
Left both SATA1GP/GPIO19 and GPIO51 floating.
No pull up required.

Boot from PCI:
Connect SATA1GP/GPIO19 to ground with 1k Ohm pull-down resistor.
Leave GPIO51 Floating.

Boot from LPC:
Connect both SATA1GP/GPIO19 and GPIO51 to ground with 1k Ohm pull-down resistor.

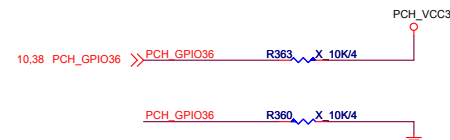
| BOOT DEVICE | GPIO51 | GPIO19 |
|-------------|--------|--------|
| LPC | 0 | 0 |
| SPI | 1 | 1 |

Default



Enable TLS:
Pull up with 1k Ohm to VccSus3.3.

Default (Disable TLS):
Leave NC. Internal pull down.

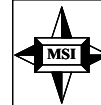
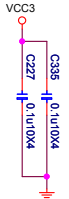
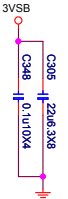
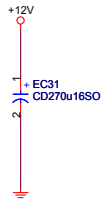
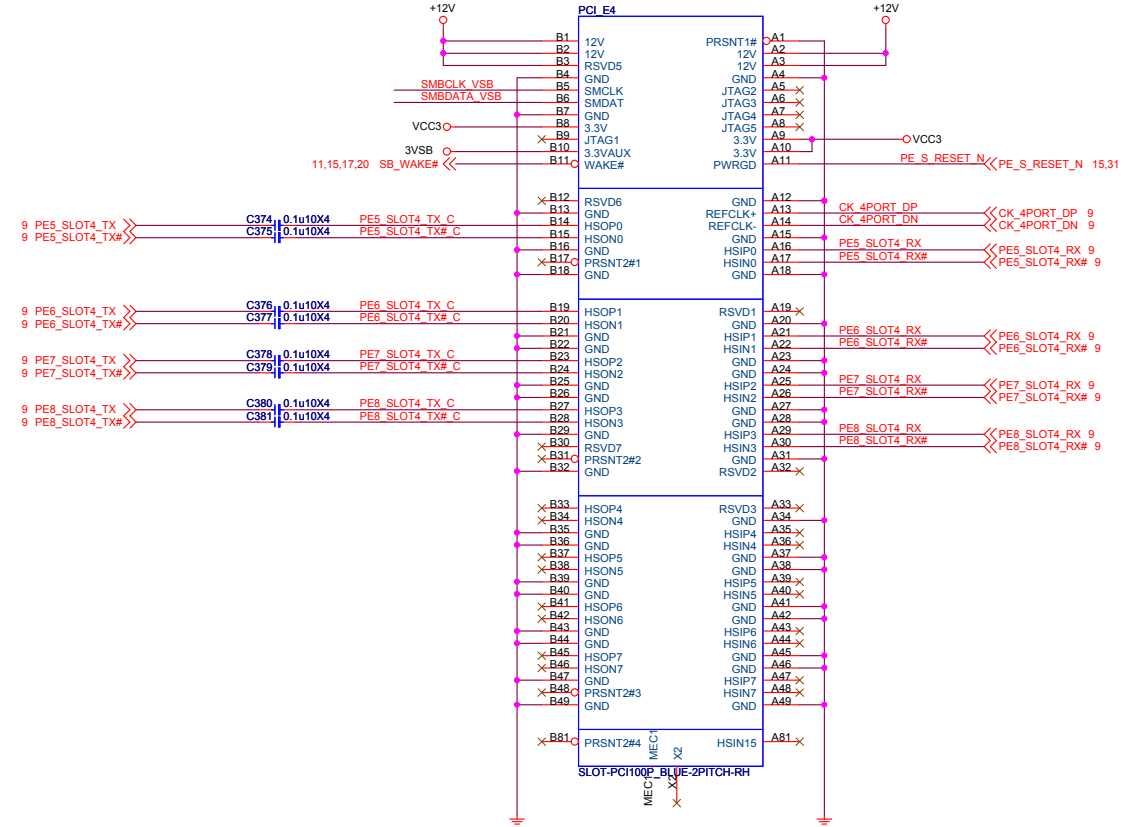
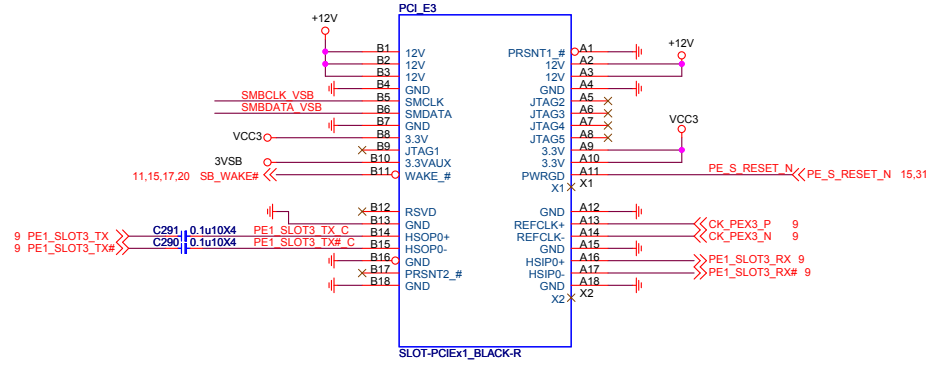


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|----------------------------------|---------------------------------|--------|
| MS-7816 | | |
| Size Custom | Document Description LYNX-Strap | Rev 10 |
| Date: Tuesday, November 20, 2012 | Sheet 14 | of 44 |

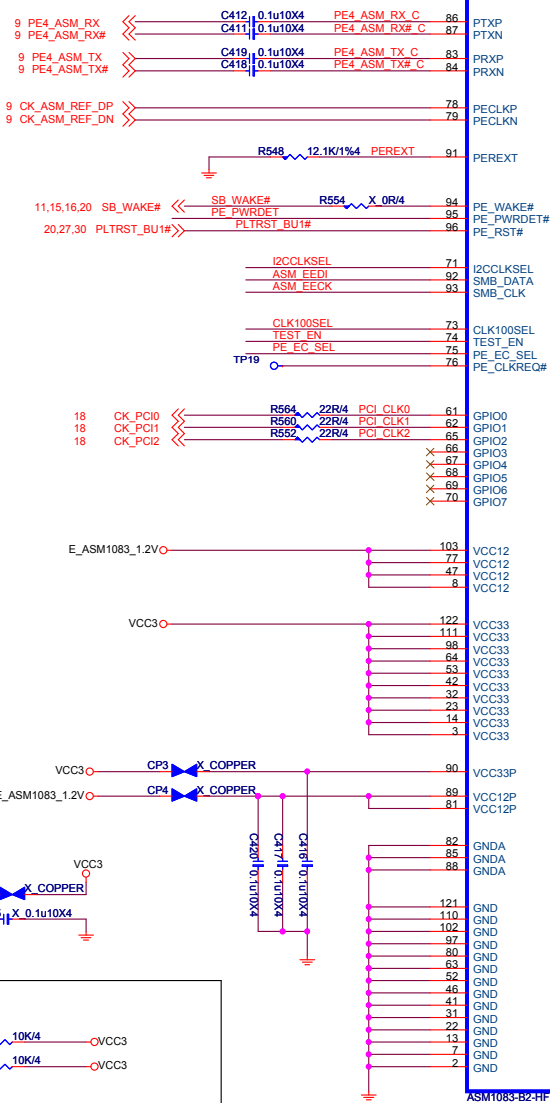
11,15 SMBCLK_VSB
11,15 SMBDATA_VSB

SMBCLK_VSB
SMBDATA_VSB

PCI Express X4 Slot

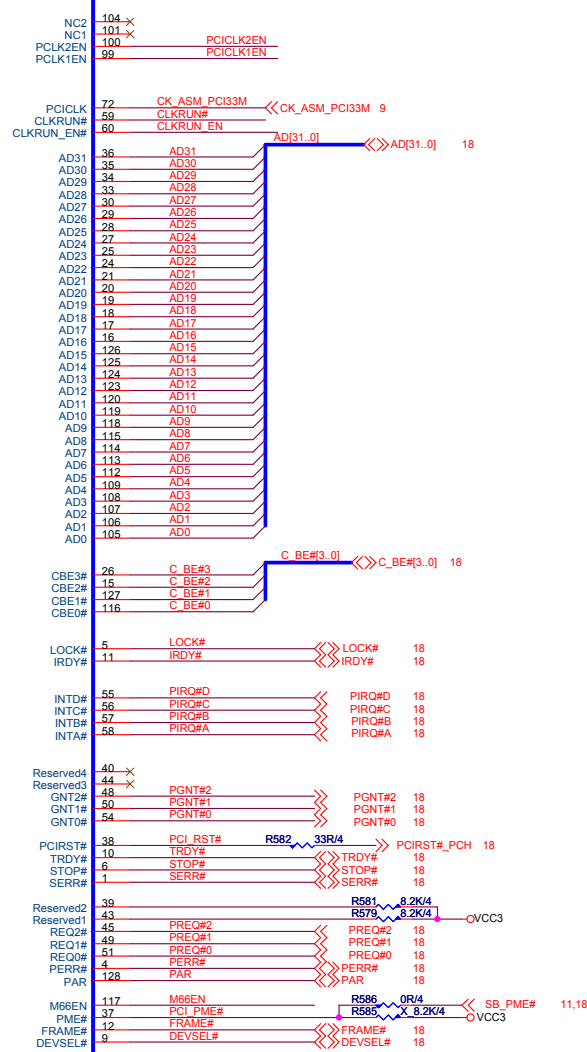


| MICRO-STAR INT'L CO.,LTD | | |
|----------------------------------|-----------------------------|----------------|
| MS-7816 | | |
| Size | Document Description | Rev |
| Custom | PCIE3(X1) & PCIE4(X4) Slots | 10 |
| Date: Tuesday, November 20, 2012 | | Sheet 16 of 44 |



ASM1083

ASM1083-B2-HF



H/W Strapping

PE_EC_SEL-
 "H" for Express Card mode
 "L" for PCIe Riser Card mode

CLK100SEL-
 "H" for PECLK input only
 "L" for PECLK & PCICLK input

TEST_EN-
 "H" for Test Mode Enable
 "L" for Test Mode Disable

CLKRUN_EN-
 "H" for CLKRUN Mode Disable
 "L" for CLKRUN Mode Enable

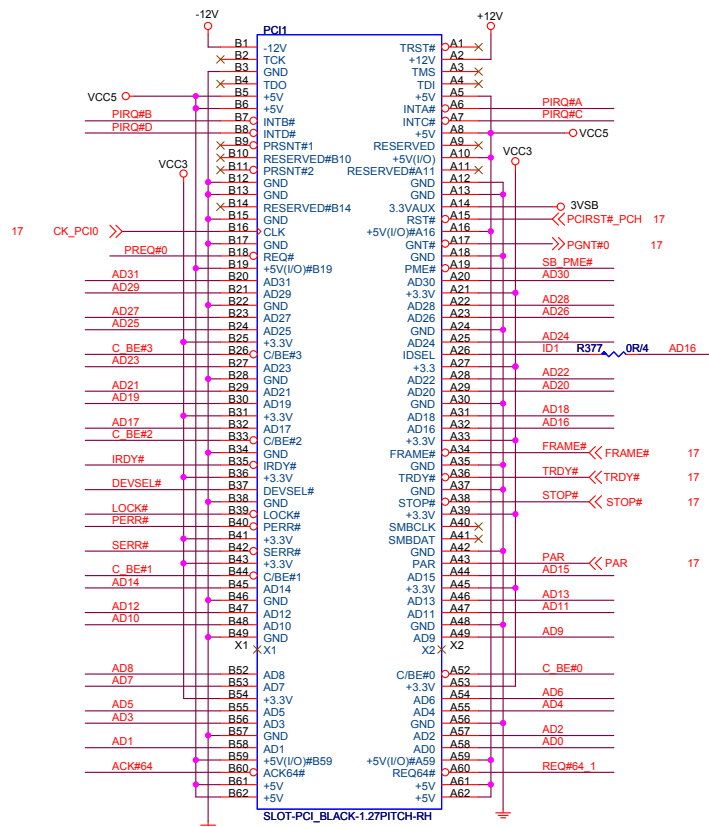
I2CCLKSEL-
 "H" is 135KHz I2CCLK
 "L" is 67.5KHz I2CCLK



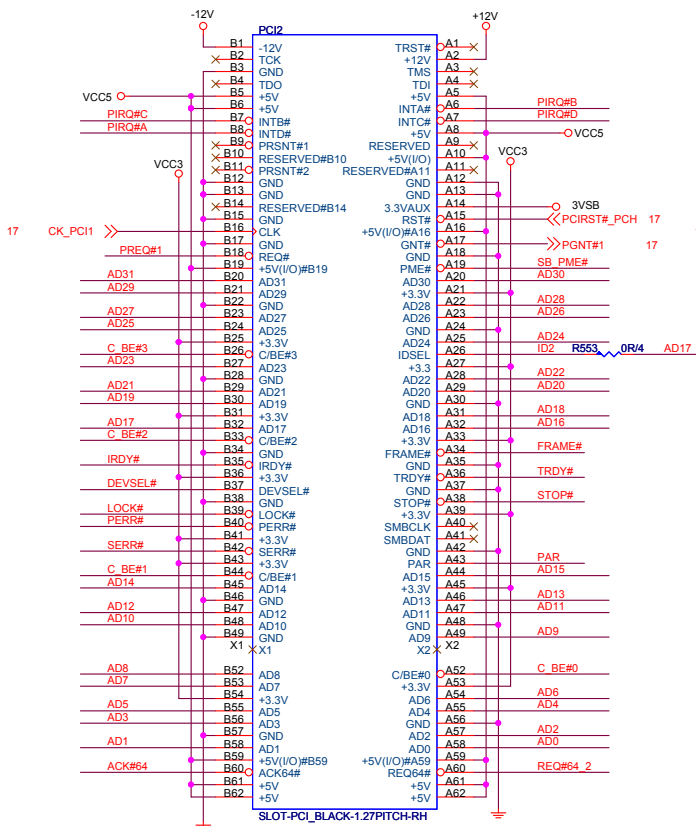
MICRO-STAR INT'L CO.,LTD

MS-7816

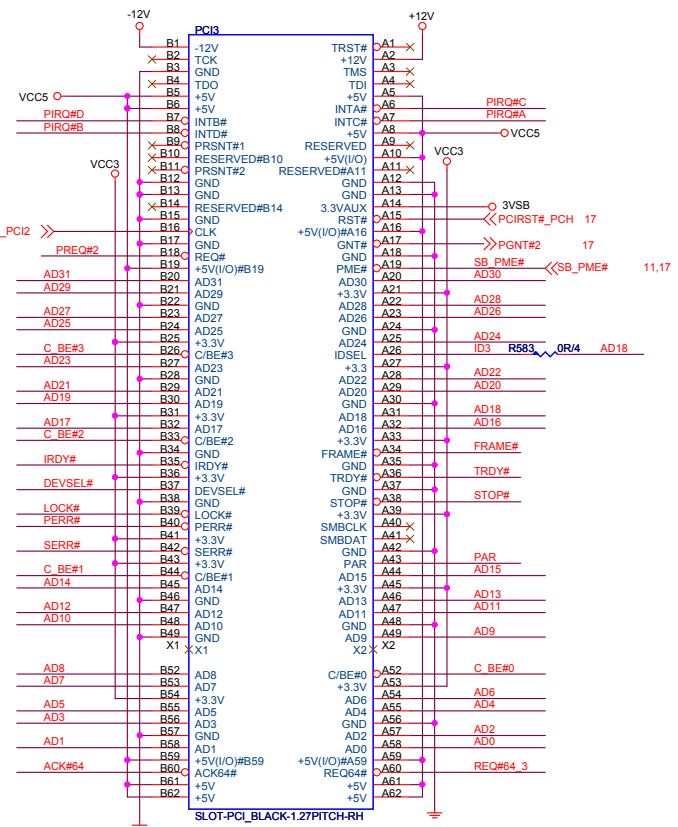
| Size | Document Description | Rev |
|----------------------------------|----------------------|-----|
| Custom | ASM1083 PCI Bri. | 10 |
| Date: Tuesday, November 20, 2012 | Sheet 17 of 44 | |



IDSEL = AD16
MASTER = PREQ#0
PIRQ#A

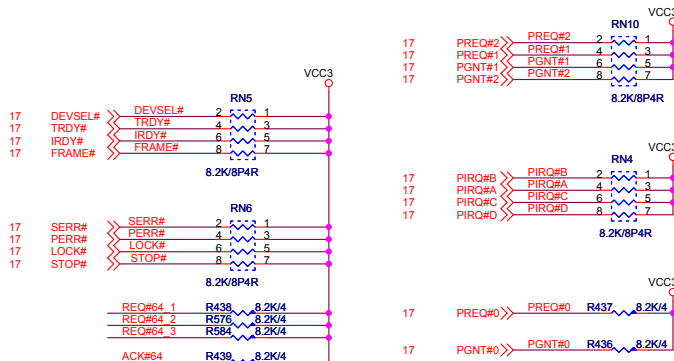
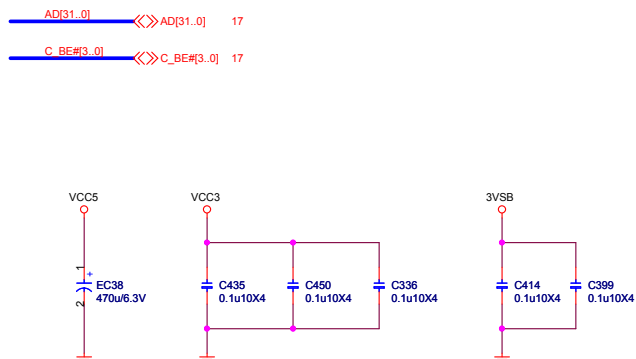


IDSEL = AD17
MASTER = PREQ#1
PIRQ#B



IDSEL = AD18
MASTER = PREQ#2
PIRQ#C

PCI PULL-UP / DOWN RESISTORS

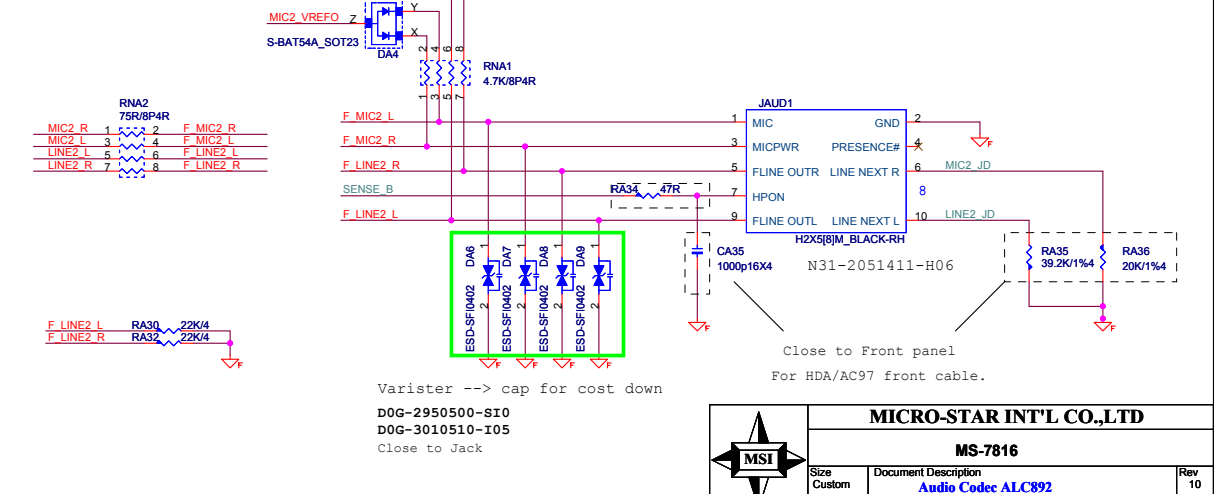
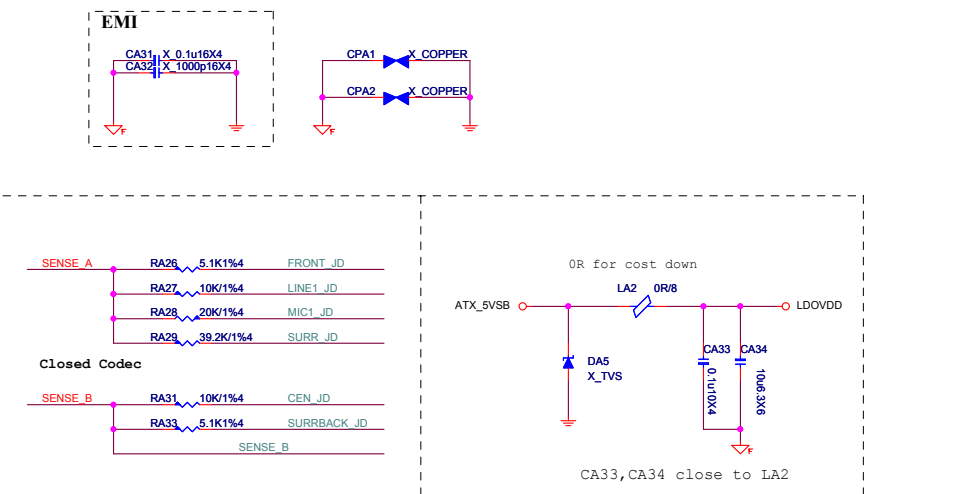
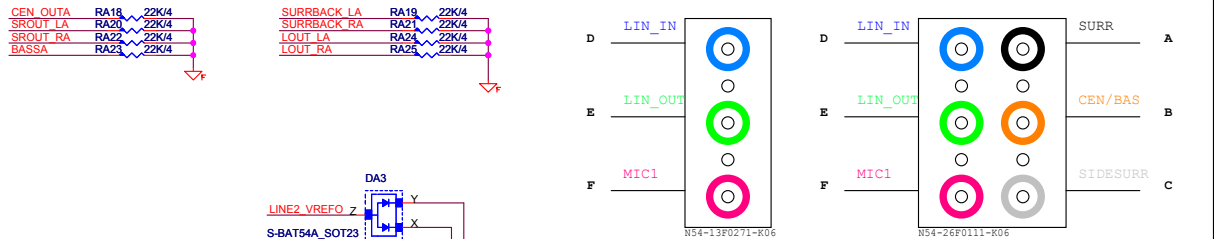
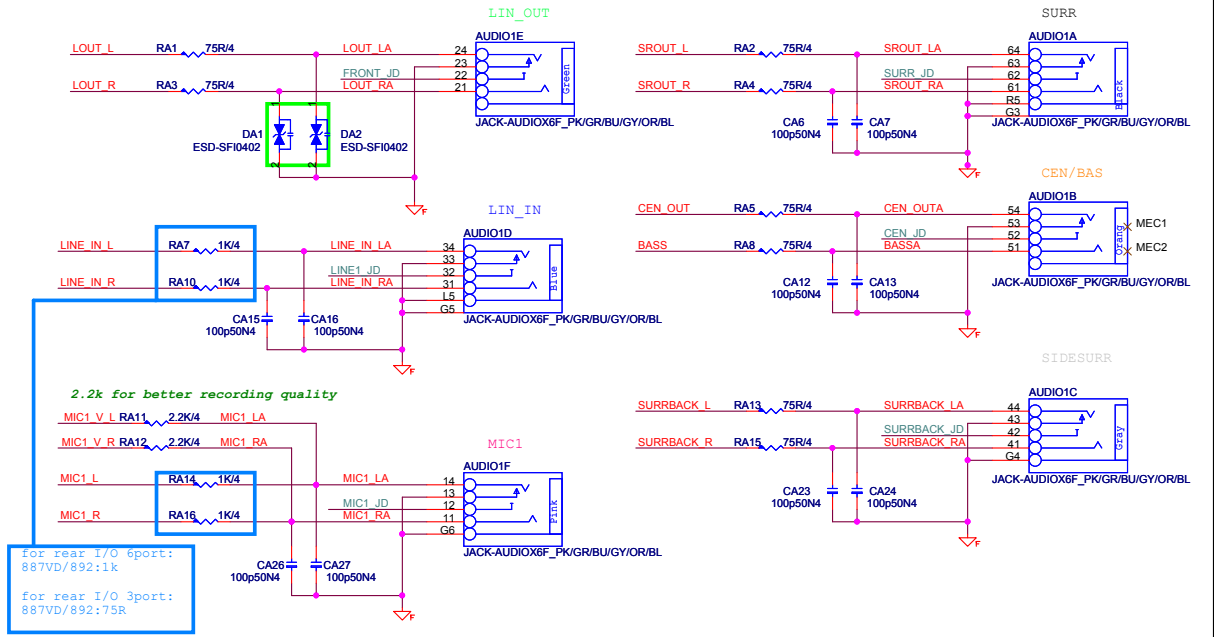
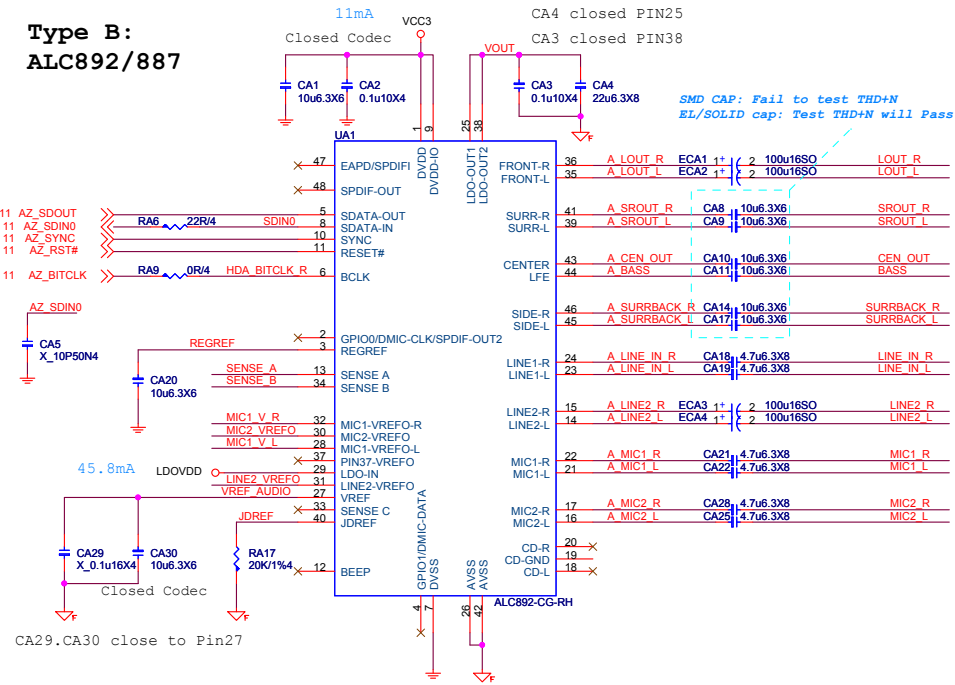


| PCI slot (X3) | | |
|--------------------|---|--------|
| +3.3Vaux (wake) | - | 1125mA |
| +3.3Vaux (no wake) | - | 60mA |
| +3.3V | - | 7.6A |
| +5V | - | 15A |
| +12V | - | 1.5A |



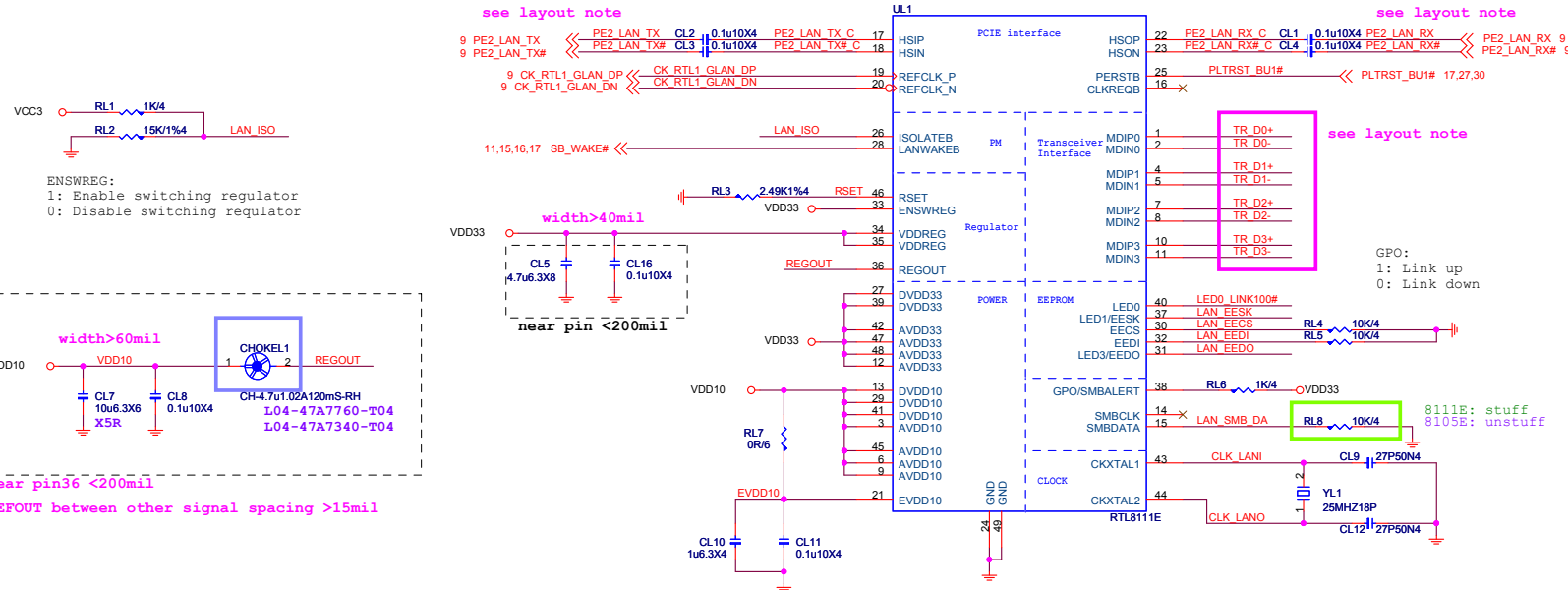
| MICRO-STAR INT'L CO.,LTD | | |
|----------------------------------|----------------------|-----|
| MS-7816 | | |
| Size | Document Description | Rev |
| Custom | PCI slot | 10 |
| Date: Tuesday, November 20, 2012 | Sheet 18 of 44 | |

Type B: ALC892/887



RTL8111E Giga LAN

RTL8105E 10/100M LAN



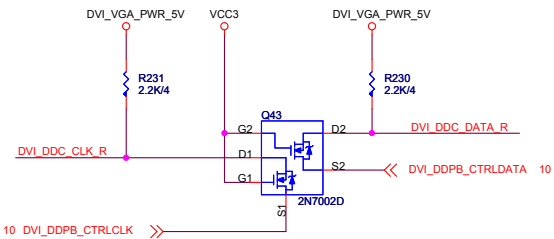
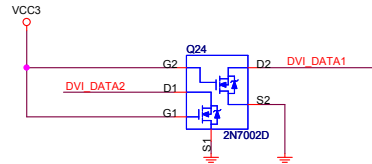
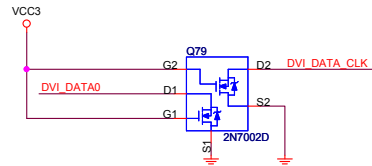
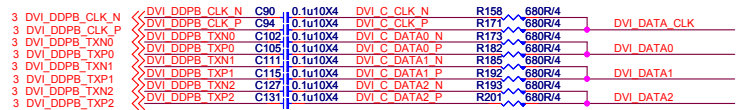
8111E POWER Consumption

| | 3.3V | mW |
|-----------------|---------|---------|
| 10 M Idle/TxRx | 12/66 | 40/218 |
| 100 M Idle/TxRx | 31/44 | 102/145 |
| Giga Idle/TxRx | 135/163 | 452/538 |
| ALDPS | 4 | 13 |

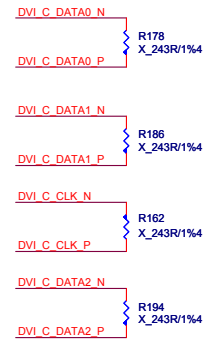
LAN Connector

| Giga-Lan | 10/100-Lan |
|--------------------|--------------------|
| N58-22F0731 | N58-22F0771 |
| Link Yellow | Link Yellow |
| Active Blinking | Active Blinking |
| 1000 Orange | 1000 Green |
| 100 Green | 100 None |
| 10 None | 10 None |
| 19 | 19 |
| 20 | 20 |
| 21 | 21 |
| 22 | 22 |

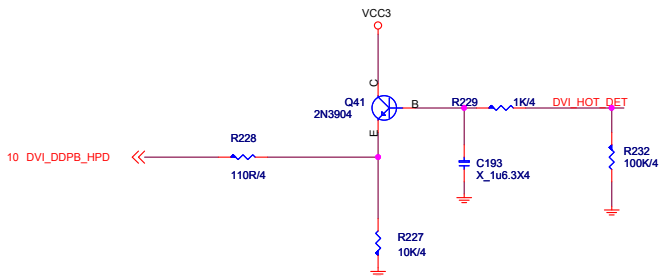
VGA: resolution of 2048x1536 pixels with 32-bit color at 75 Hz (4:3 QXGA)



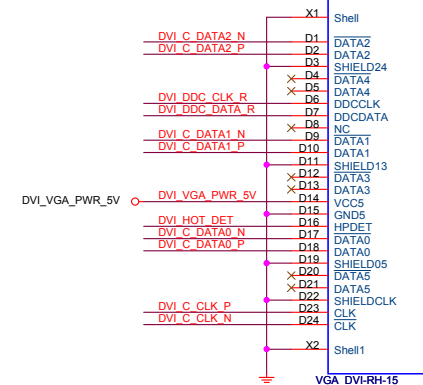
For EMI



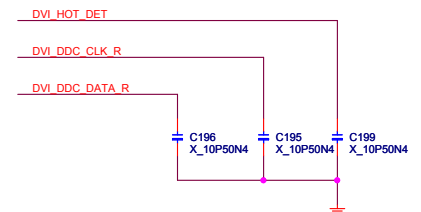
HPD



VGA_DVI18



EMI



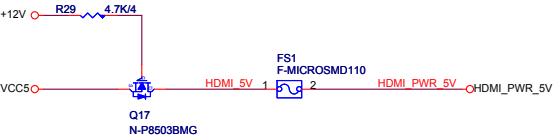
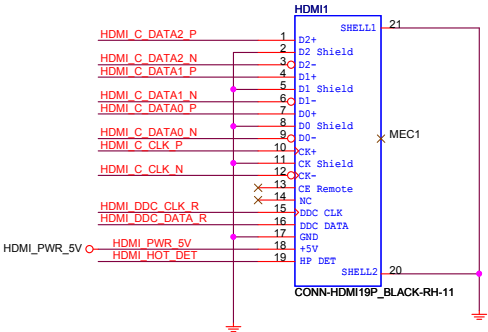
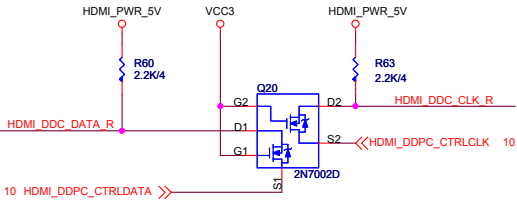
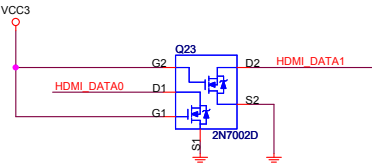
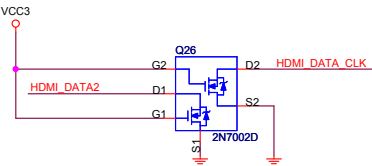
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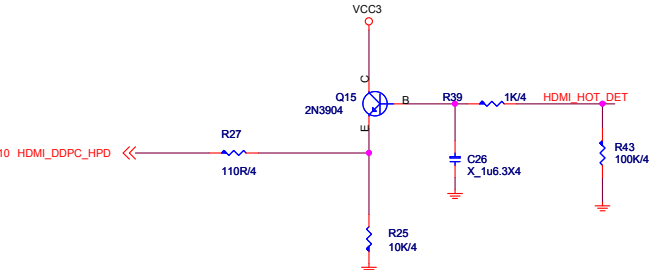
| Size | Document Description | Rev |
|----------------------------------|----------------------|-----|
| Custom | DVI Connector | 10 |
| Date: Tuesday, November 20, 2012 | Sheet 21 of 44 | |

HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)

| | | | | | | | | |
|---|-----------------|-----------------|-----|----------|----------------|------|--------|---------------|
| 3 | HDMI_DDPC_CLK_P | HDMI_DDPC_CLK_P | C64 | 0.1u10X4 | HDMI_C_CLK_P | R111 | 560R/4 | HDMI_DATA_CLK |
| 3 | HDMI_DDPC_CLK_N | HDMI_DDPC_CLK_N | C66 | 0.1u10X4 | HDMI_C_CLK_N | R115 | 560R/4 | |
| 3 | HDMI_DDPC_TX2_P | HDMI_DDPC_TX2_P | C60 | 0.1u10X4 | HDMI_C_DATA2_P | R109 | 560R/4 | HDMI_DATA2 |
| 3 | HDMI_DDPC_TX2_N | HDMI_DDPC_TX2_N | C58 | 0.1u10X4 | HDMI_C_DATA2_N | R104 | 560R/4 | |
| 3 | HDMI_DDPC_TX1_P | HDMI_DDPC_TX1_P | C65 | 0.1u10X4 | HDMI_C_DATA1_P | R112 | 560R/4 | HDMI_DATA1 |
| 3 | HDMI_DDPC_TX1_N | HDMI_DDPC_TX1_N | C67 | 0.1u10X4 | HDMI_C_DATA1_N | R116 | 560R/4 | |
| 3 | HDMI_DDPC_TX0_P | HDMI_DDPC_TX0_P | C61 | 0.1u10X4 | HDMI_C_DATA0_P | R110 | 560R/4 | HDMI_DATA0 |
| 3 | HDMI_DDPC_TX0_N | HDMI_DDPC_TX0_N | C59 | 0.1u10X4 | HDMI_C_DATA0_N | R105 | 560R/4 | |

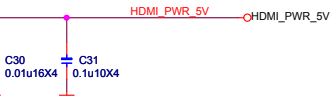


HPD



For EMI

| | | |
|----------------|------|------------|
| HDMI_C_CLK_N | R113 | X_180R/1%4 |
| HDMI_C_CLK_P | | |
| HDMI_C_DATA0_N | R106 | X_180R/1%4 |
| HDMI_C_DATA0_P | | |
| HDMI_C_DATA1_N | R114 | X_180R/1%4 |
| HDMI_C_DATA1_P | | |
| HDMI_C_DATA2_N | R108 | X_180R/1%4 |
| HDMI_C_DATA2_P | | |



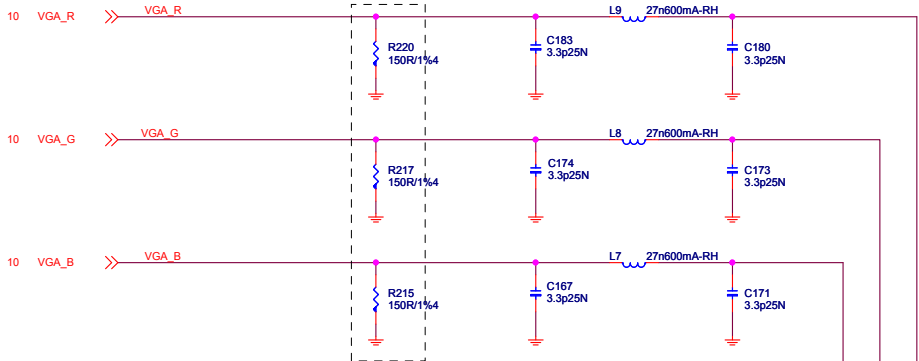
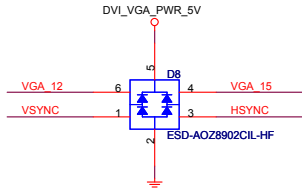
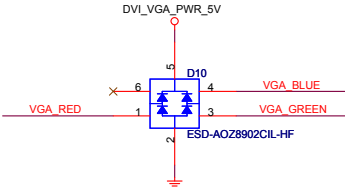
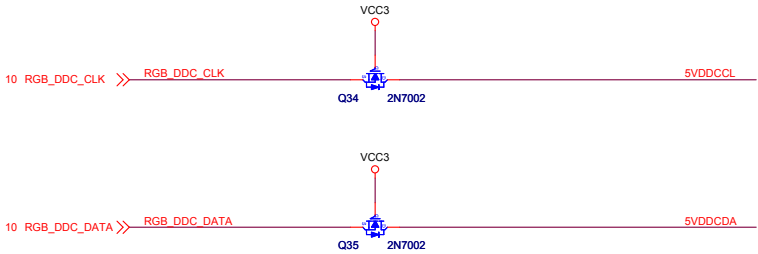
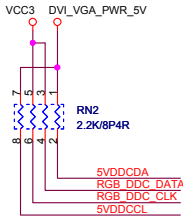
EMI

| | | |
|--------------------|-----|------------|
| HDMI_DDPC_CTRLCLK | C47 | X 0.1u10X4 |
| HDMI_DDPC_CTRLDATA | C42 | X 0.1u10X4 |
| HDMI_HOT_DET | C38 | X 0.1u10X4 |

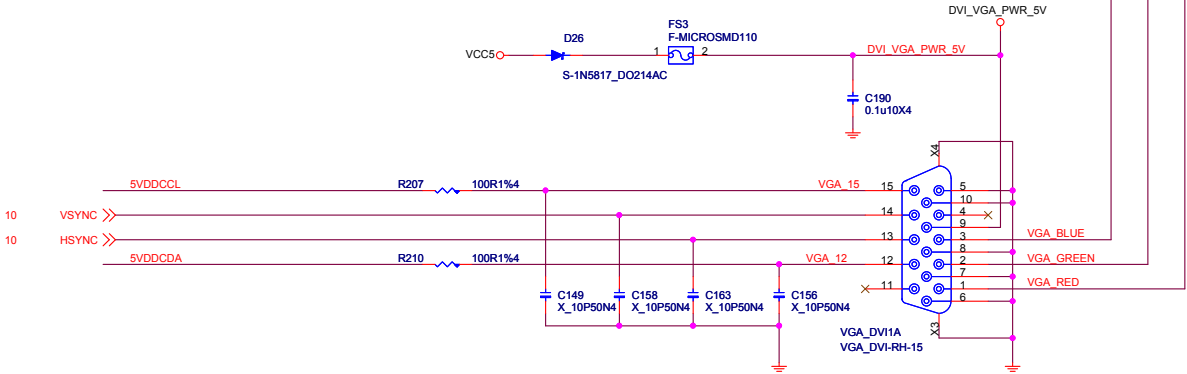
D-Sub

VGA: resolution of 2048x1536 pixels with 32-bit color at 75 Hz (4:3 QXGA)

Level shift



PLACE CLOSE TO VGA CONNECTOR,
WITHIN 750 MIL OF PIN



| | | |
|----------------------------------|---------------------------------------|-----------|
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| Size Custom | Document Description VGA Connector | Rev 10 |
| Date: Tuesday, November 20, 2012 | Sheet 23 of 44 | |

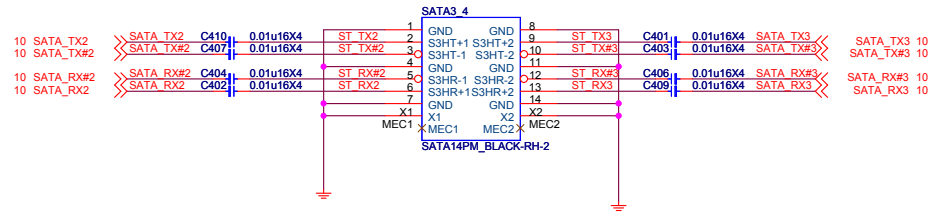
SATA 6G PORT 0,1

3.0



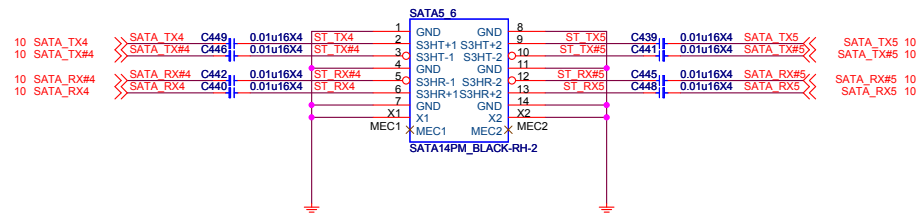
SATA 3G PORT 2,3

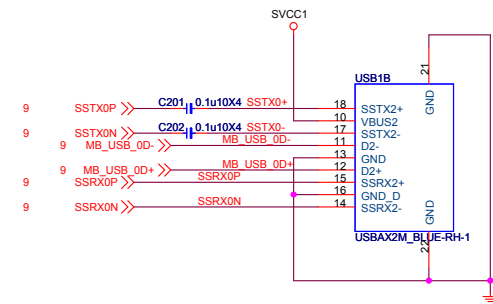
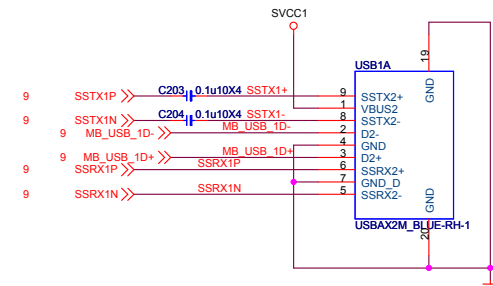
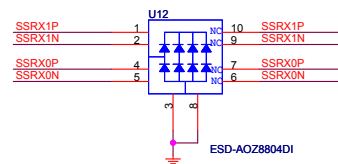
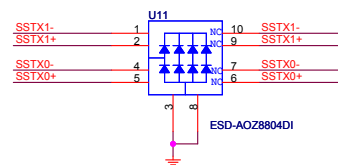
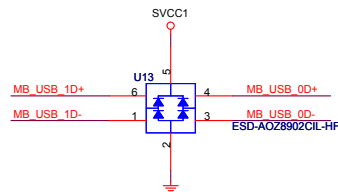
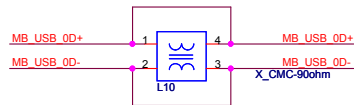
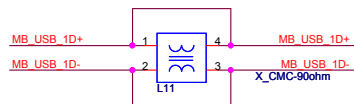
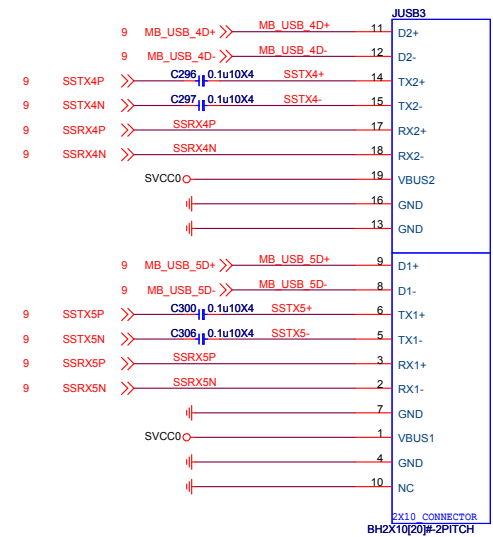
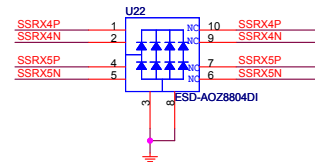
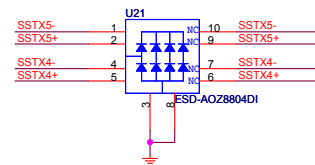
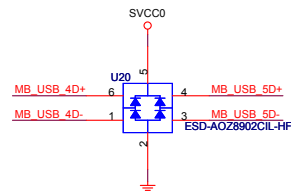
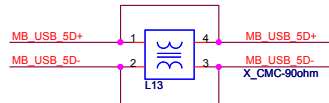
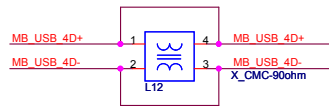
3.0

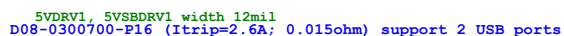


SATA 3G PORT 4,5

Z87,H87 chip support SATA3.0
B85 chip support SATA2.0

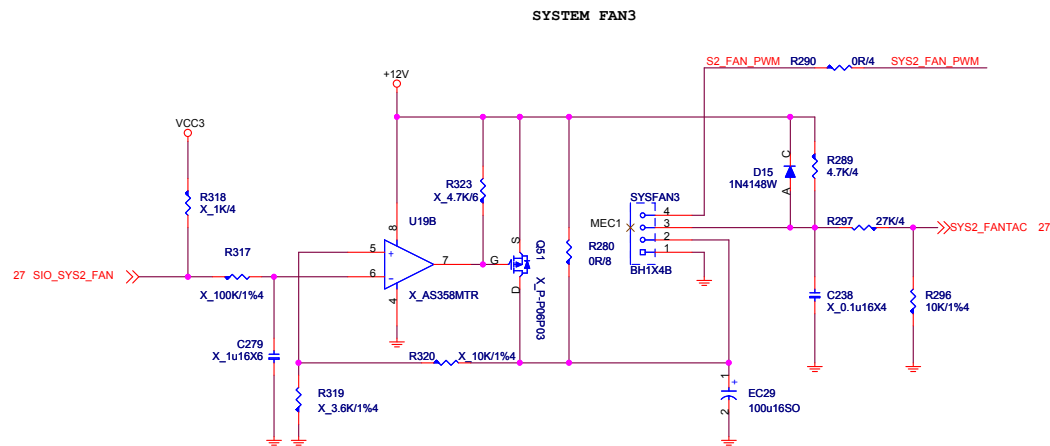
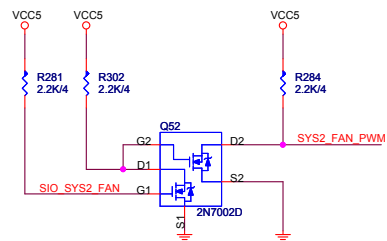
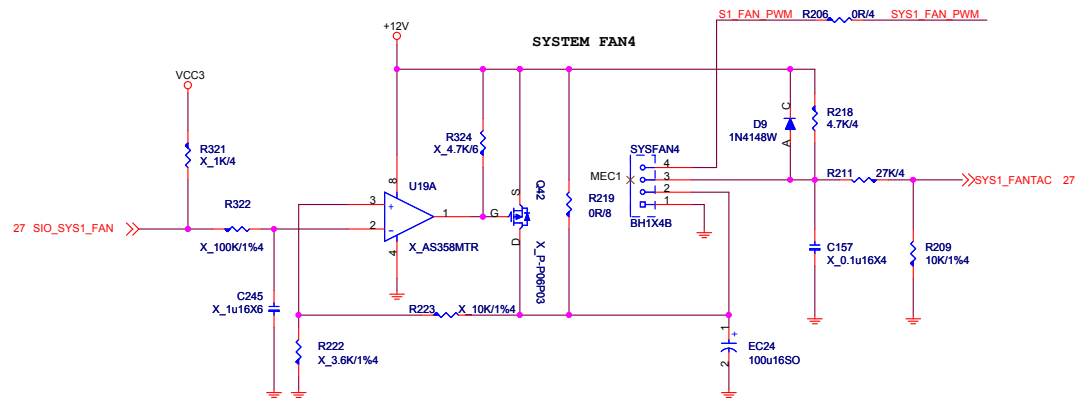
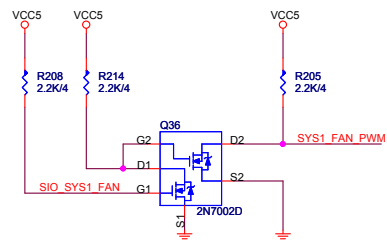
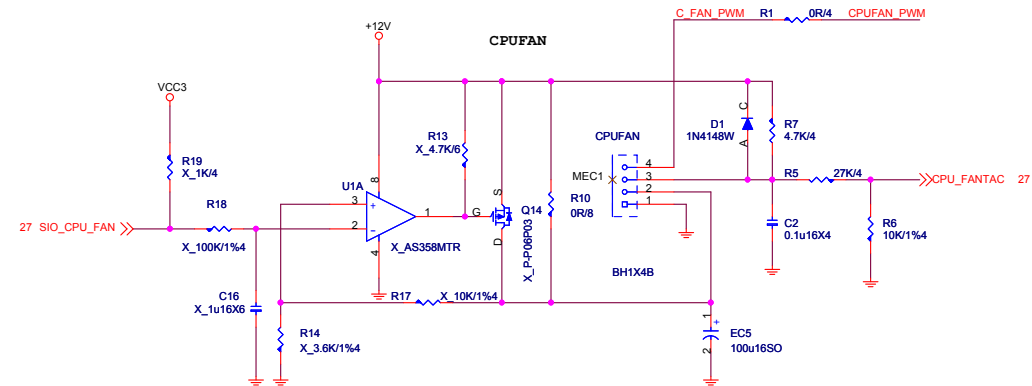
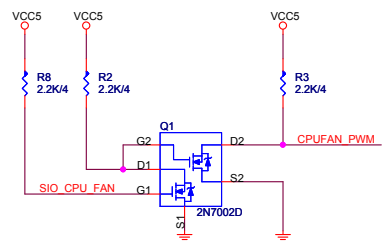




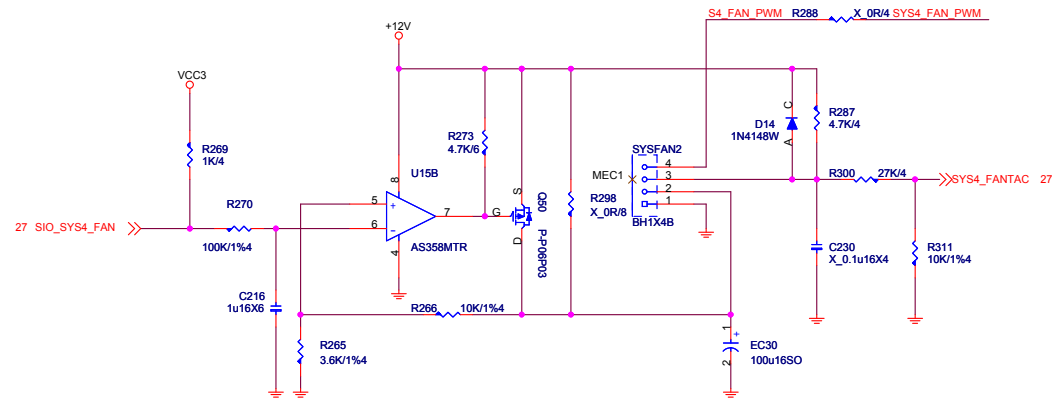
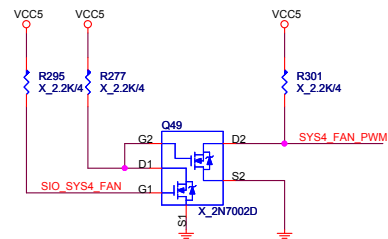
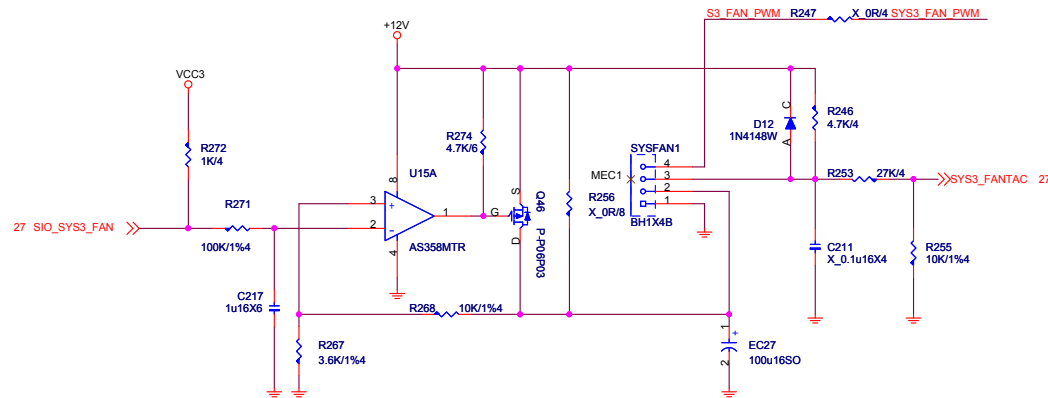
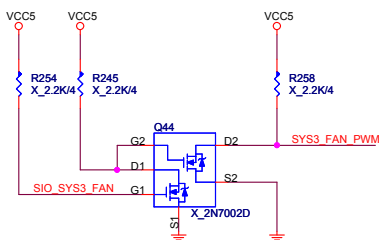


| | | |
|----------------------------------|--|----------------|
| Size Custom | Document Description Rear I/O & USB2.0 Connector | Rev 10 |
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FAN-COUNTROL CIRCUIT

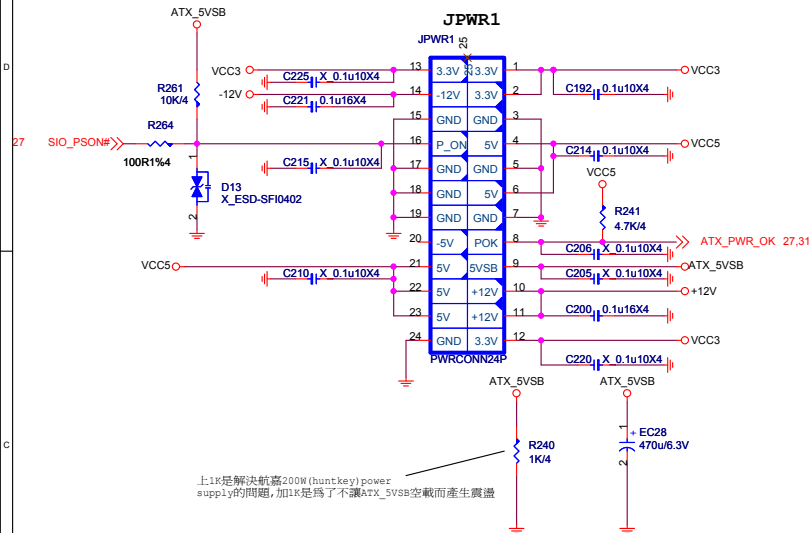


| | | | |
|----------------------------------|--|----------|-----------|
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| MS-7816 | | | |
| Size Custom | Document Description FAN Control | | Rev 10 |
| Date: Tuesday, November 20, 2012 | | Sheet 28 | of 44 |

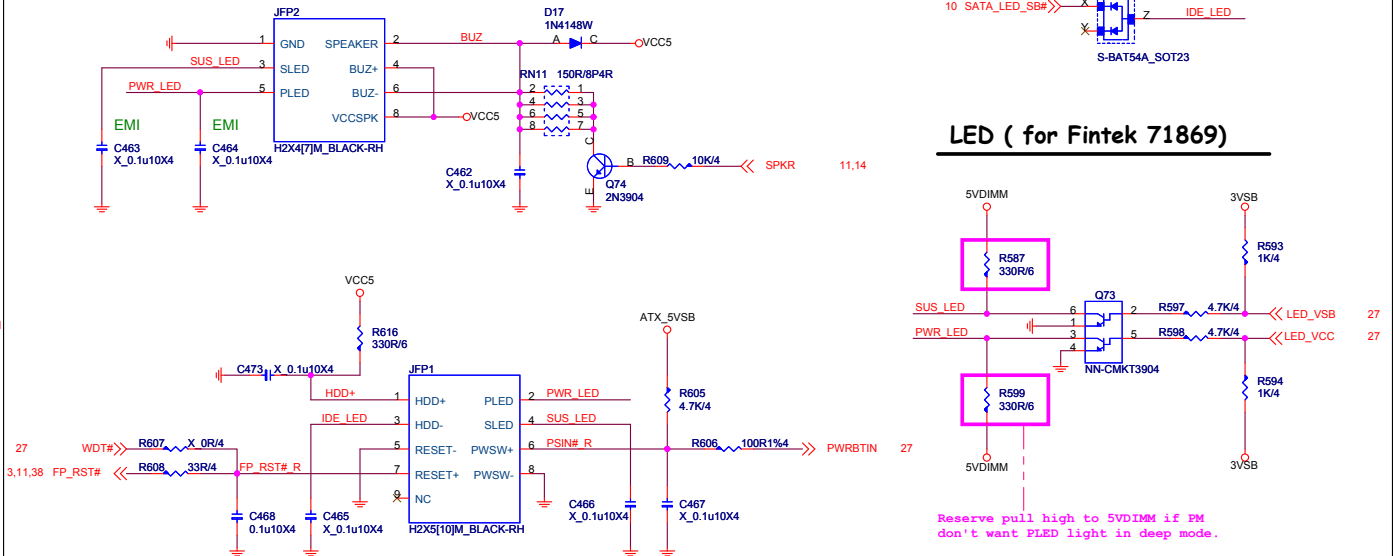


| MICRO-STAR INT'L CO.,LTD | | |
|----------------------------------|---|-----------|
| MS-7816 | | |
| Size Custom | Document Description FAN Control2 | Rev 10 |
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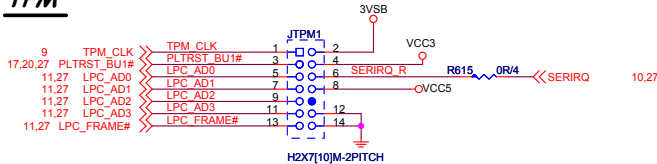
ATX POWER CONNECTOR



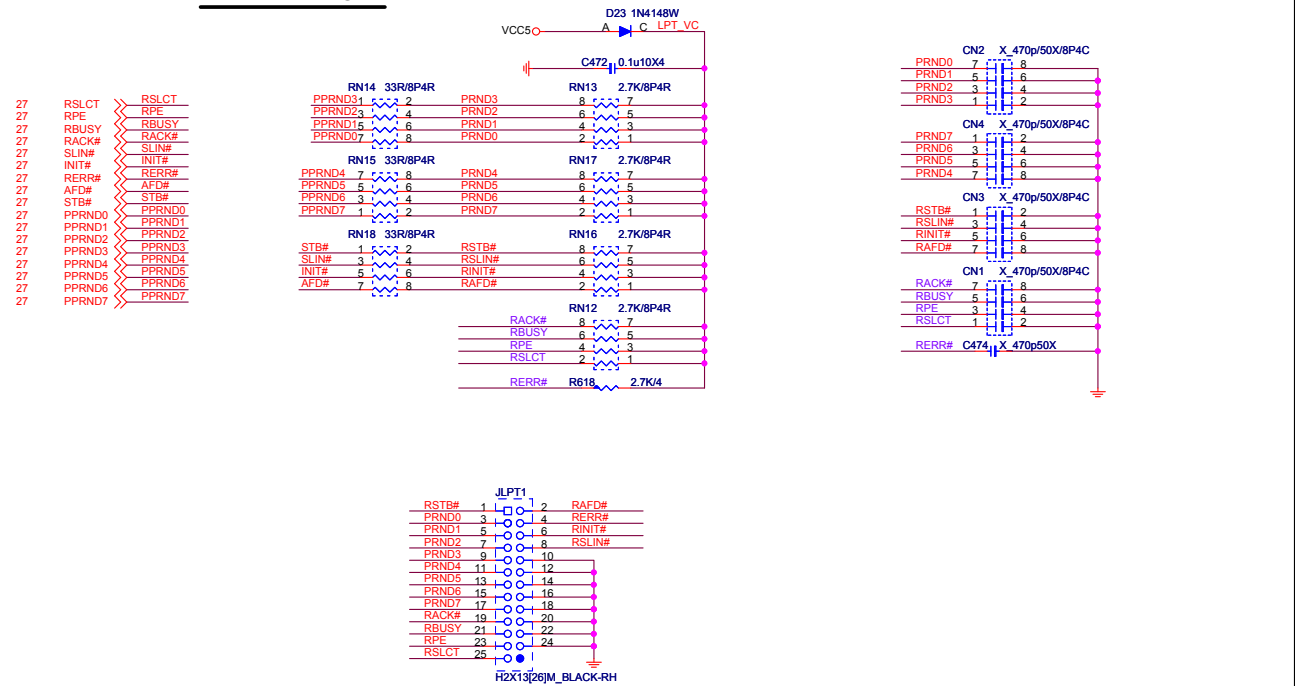
FRONT PANNEL



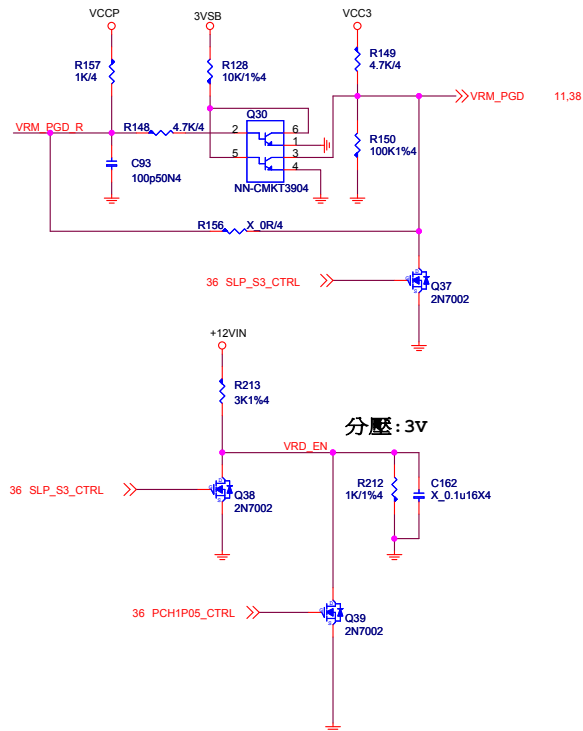
TPM



PARALLAL PORT

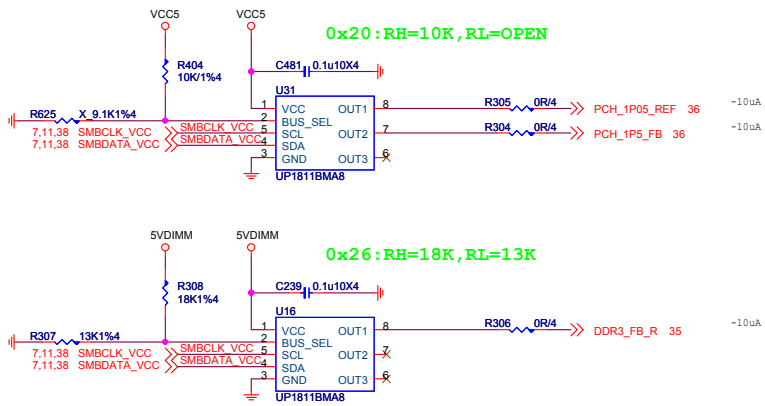


N31-2131151-H06 : 2.0mm
N31-2131131-H06 : 2.54mm



UPI VOLTAGE CONSOLE

| | U16 | | | | | U31 | |
|-----------|------|------|------|------|------|------|--|
| ADDRESS | 0x2A | 0x28 | 0x26 | 0x24 | 0x22 | 0x20 | |
| RH (Kohm) | OPEN | 3.9 | 3 | 2.2 | 1.3 | 10 | |
| RL (Kohm) | 10 | 1.3 | 2.3 | 3 | 3.9 | OPEN | |
| BUS_SEL | 0% | 25% | 40% | 60% | 75% | 100% | |

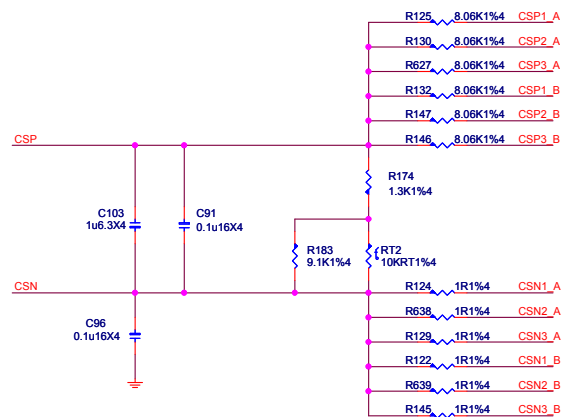
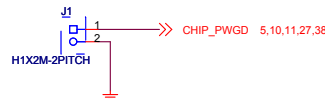


Internal option : 5/32*VCC

3 CPU_VSS_SENSE << CPU_VSS_SENSE

3 CPU_VCC_SENSE << CPU_VCC_SENSE_R

CPU_VSS_SENSE_R R199 0R/4 C130 0.01u16X4



0.1~1 inch

H_VIDSOUT R176 110/1%
H_VIDSClk R169 64.9R1%
H_VIDALERT# R177 X 90.9/1%
CPU_VTT C36 0.1u10X4

3 H_PROCHOT# << R180 0R/4 VR_HOT#
UP1649_VCC R181 10K/1% VR_SHDN#

3 H_VIDALERT# << H_VIDALERT#
3 H_VIDSClk << H_VIDSClk
3 H_VIDSOUT << H_VIDSOUT

VRD_EN 0.8V EN
ENABLE
VBOOT: 1.7V
VBOOT

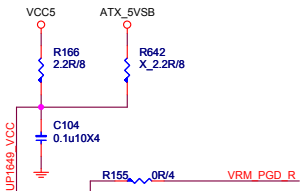
3 CPU_VSS_SENSE << CPU_VSS_SENSE R203 X 0R/4 CPU_VSS_SENSE_R
3 CPU_VCC_SENSE << R204 X 0R/4 CPU_VCC_SENSE_R R198 1K/1% FB
C141 0.01u16X4 R197 0R/4
C118 X 33p/50N4

R191 1K/1% R188 2K/1%
C119 X 0.1u16X4

CPU_VSS_SENSE_R R199 0R/4 C130 0.01u16X4
R190 X 0R/4

R195 33KR1%
C117 100p50N4

CSN R184 360R1% CSN_R
CSP R179 0R/4 CSP_R



UP1649_VCC
VCC
VR_READY
VRHOT#
VR_SHDN#

PWM1 << PWM1
PWM2 << PWM2
PWM3 << PWM3
PWM4 << PWM4

CSP1 << R632 X 12K/1%
R126 12K/1%
R133 X 0R/4 C78 0.1u16X4
C82 0.1u16X4

CSN1 << R139 1K/1%
R634 X 12K/1%
R137 12K/1%
R136 X 0R/4 C77 0.1u16X4
C81 0.1u16X4

CSN2 << R135 1K/1%
R636 X 12K/1%
R138 12K/1%
R123 X 0R/4 C75 0.1u16X4
C76 0.1u16X4

CSN3 << R131 1K/1%
R637 X 0R/4

CSP4 << R154 X 0R/4

CSN4 << R160 X 0R/4 UP1649_VCC

TONSET << R196 30K/1%
VINSEN << R187 18K/1%
R628 2K/1%
C128 0.1u16X4

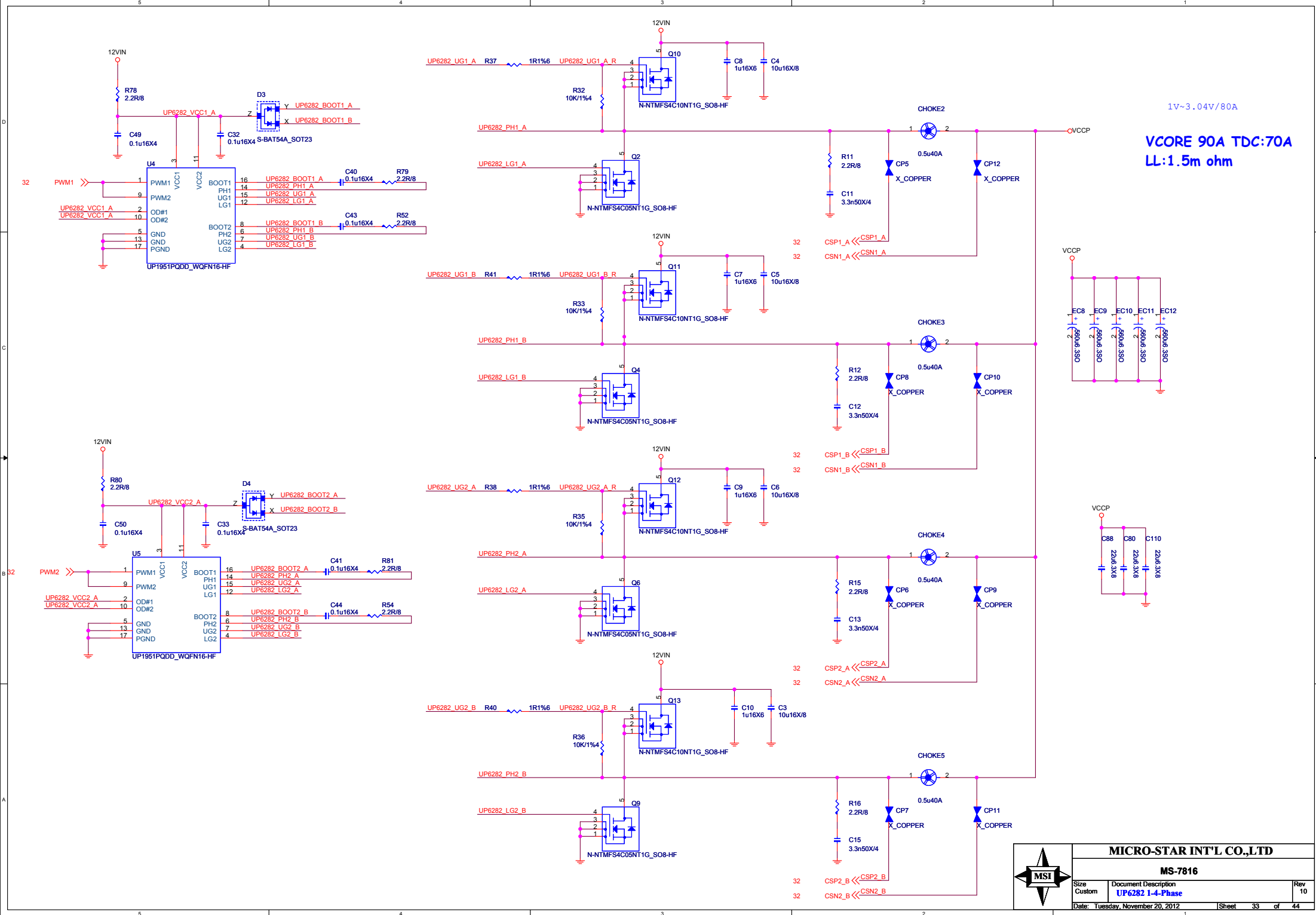
TM << RT1 10KRT1%
R141 6.49K/1%
C79 0.1u16X4

ICCMAX << R153 10K/1%
R175 30K/1%
C101 0.1u16X4

OC# << R134 10K/1%
R127 4.22K/1%
R140 3.74K/1%

SM_ADDR << SMBDATA_1649 R170 0R/4 SMBDATA_VCC << SMBDATA_VCC 7,11,38
SM_SDA << SMBCLK_1649 R161 0R/4 SMBCLK_VCC << SMBCLK_VCC 7,11,38
SM_SCL << SMBCLK_1649 R161 0R/4 SMBCLK_VCC << SMBCLK_VCC 7,11,38

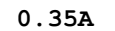
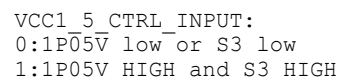
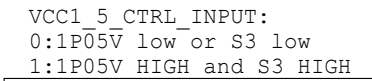
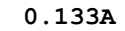
UP1649PGQ_VQFN40-HF
NC SET
VCC
GND



R641=12.4K ohm



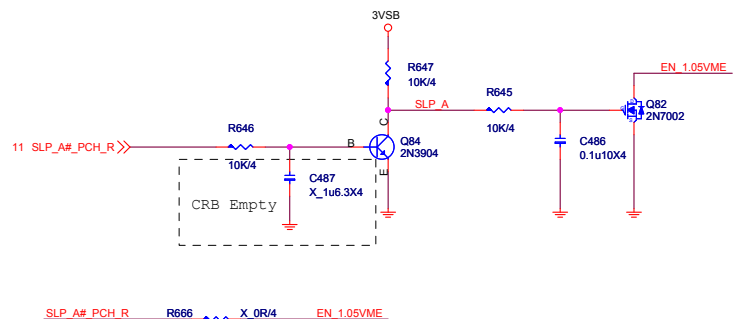
PCH Core 6A



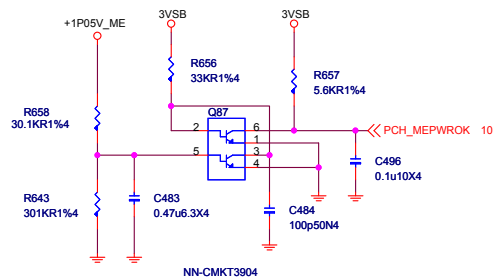
C318,C323,R378,C313,C314,C333,R366 for H87 un stuff
Z87 only stuff R354

SLP_A

ME Power Control

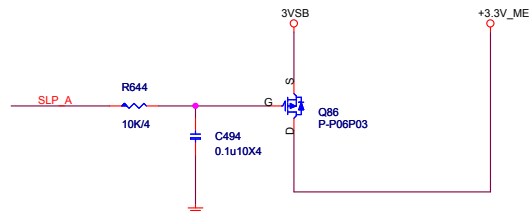


PCH_MEPWROK

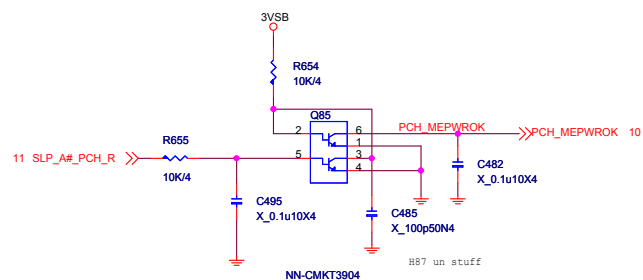
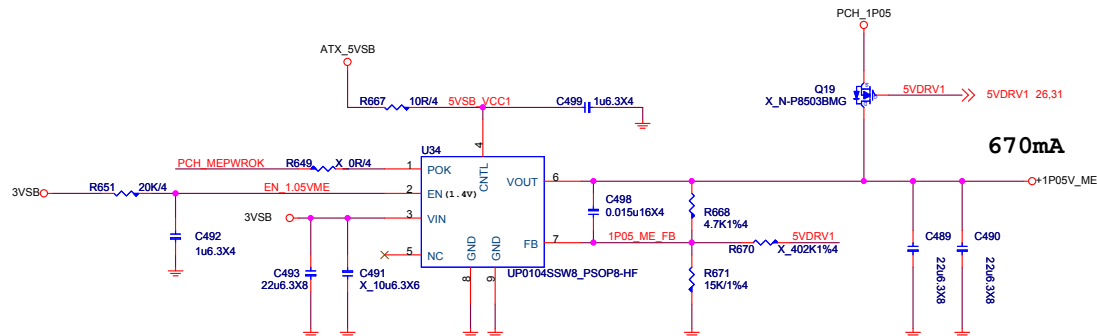


VccASW active to APWROK high 1ms

+3.3V_ME



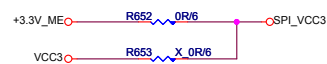
+1.05V_ME(VCCIO_ME)



APWROK falling to VccASW falling 40ns

For INTEL ME BUG

```
Z87->Stuff R366
H87->Stuff R354
```

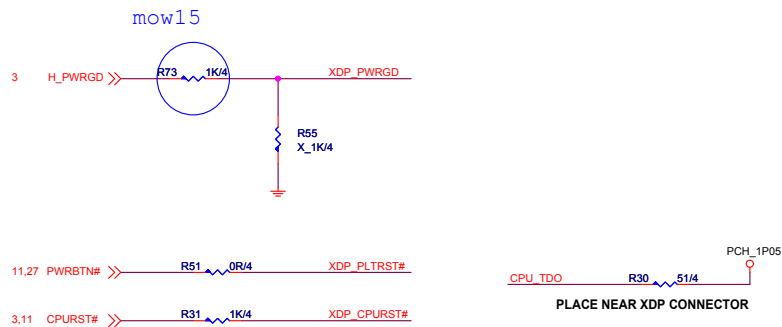
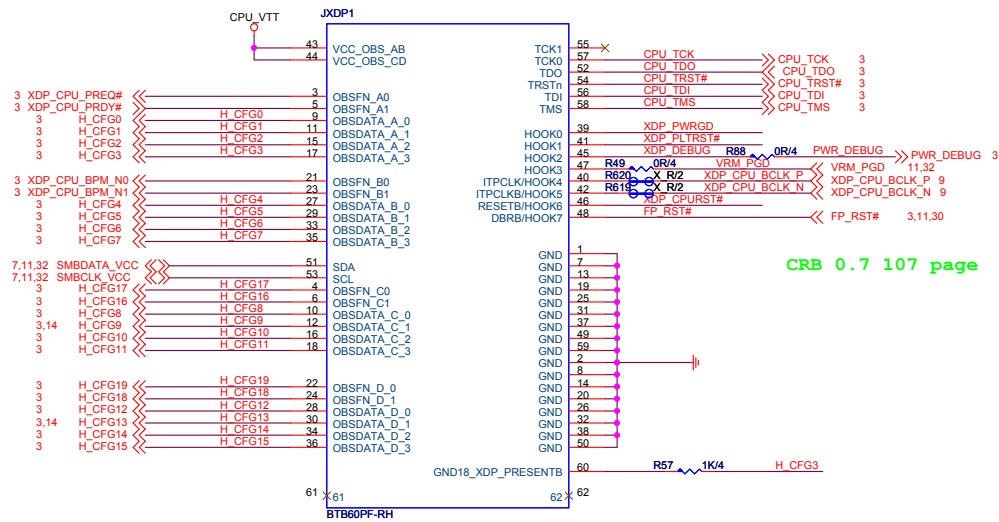


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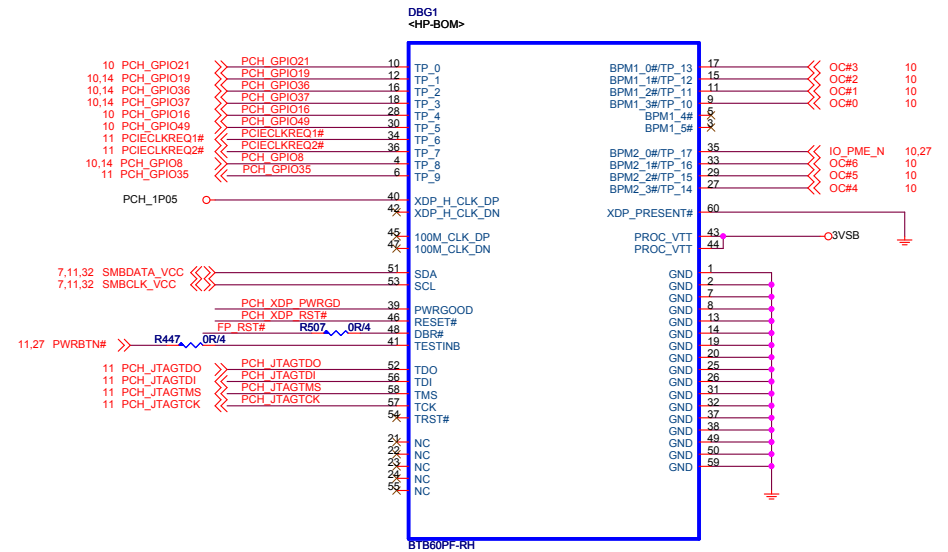
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| | | |
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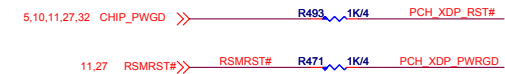
Reserve debug port 5020



PCH XDP



PCH XDP PWRGD/RESET



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7816_10

2012/11/162012/11/23PK0-0781610-G37, 精成, 23, 寶安恩斯邁廠 (MSIS) 4, Coffee
2012/11/162012/11/23PK0-0781610-G37, 精成, 27, 寶安恩斯邁廠 (MSIS) 4, Coffee
2012/11/162012/11/23PK0-0781610-E48, 競華, 23, 寶安恩斯邁廠 (MSIS) 4, Coffee
2012/11/162012/11/23PK0-0781610-E48, 競華, 27, 寶安恩斯邁廠 (MSIS) 4, Coffee



HDMI_RLA



HDMI LABEL



BIOS_LABEL

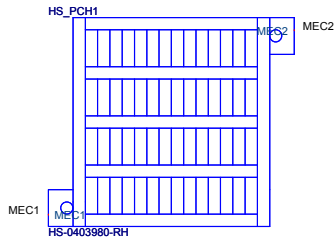


CPU_H1



BAT-BCR2032P-RH

HEATSINK

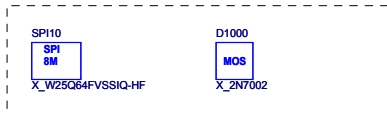


H87 OPT.



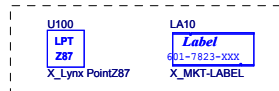
601-7823-XXX
X_MKT-LABEL

SPI OPT.



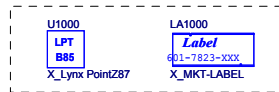
X_W25Q64FVSSIQ-HF
X_2N7002

Z87 OPT.



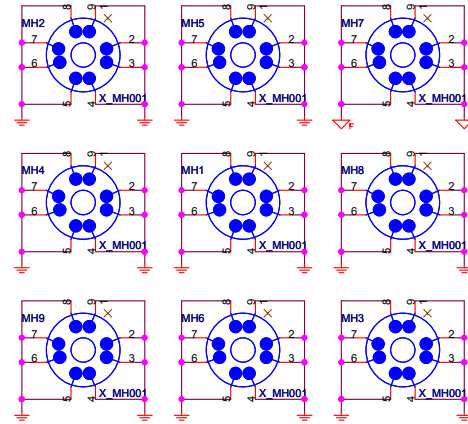
X_Lynx PointZ87
X_MKT-LABEL

B85 OPT.



X_Lynx PointZ87
X_MKT-LABEL

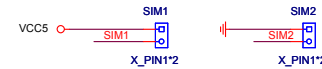
Mounting Holes



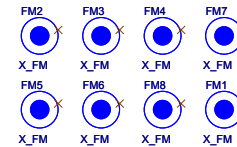
Test point

| | | |
|----------|--|----------|
| VCCP | | VCCP |
| VCC_DDR | | VCC_DDR |
| VTT_DDR | | VTT_DDR |
| PCH_1P05 | | PCH_1P05 |
| PCH_1P5 | | PCH_1P5 |
| 5VDIMM | | 5VDIMM |
| 3VSB | | 3VSB |
| VBAT | | VBAT |
| 3VA | | 3VA |
| PCH_VCC3 | | PCH_VCC3 |
| CPU_VTT | | CPU_VTT |

Simulation



Optical Fiducial Marks-120



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