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# MS-7971

## Intel -Skylake plamform Z170 / H170 / B150

ATX

Ver: 20

CPU:

System Chipset:

Skylake-S

Z170 Colay H170 and B150

Onboard Chip:

HD Audio Codec:ALC892

LAN:RTL8111H

SIO:Nuvoton 6793D

Flash ROM: SPI 128MB / 64MB(For H170/B150)

Main Memory:

DDRIV (800/1066/1333/1600/2133MHz) \* 4 (Dual Channel)

ACPI:

PWM:

NIKO/UPI

RT3606BC

Expansion Slots:

Other:

PCI Express (X16) Slot \*1

PCI Express (X4) Slot \* 1

PCI Express (X1 ) Slot \* 3

PCI Slot \* 2

M2 \* 1

SATAe\* 1

SATA3.0 x6 (PCH)

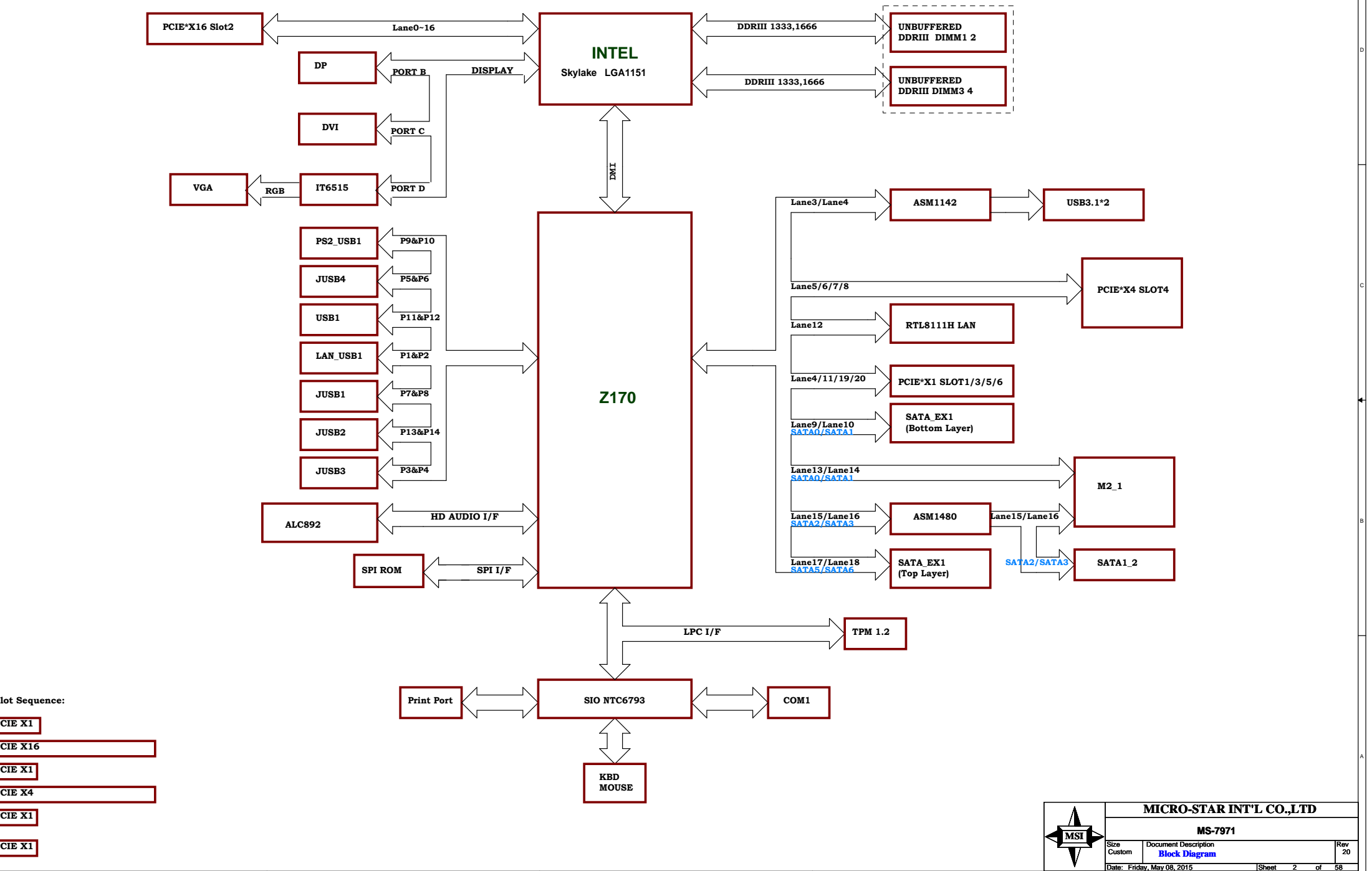
FRONT USB2.0 \*4

FRONTUSB3.0 \*2

REAR USB3.0 \*4

REAR USB3.1 \*2

MS-7971 Block Diagram



- Slot Sequence:
- PCIE X1
  - PCIE X16
  - PCIE X1
  - PCIE X4
  - PCIE X1
  - PCIE X1

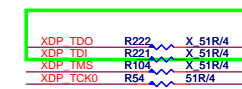


## CFG Strap

CFG Table

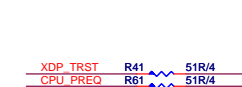
	HIGH	LOW	DESCRIPTION
0	No Lock	Lock	PCU PLL lock
1			RSVD
2	NORM	REVERSE	PEG_LANE_REVERSAL
3			RSVD
4	DISABLE	ENABLE	eDP
5	DISABLE	ENABLE	PEG0CFGSEL[0]
6	DISABLE	ENABLE	PEG0CFGSEL[1]
7	RESET#	BIOS REQ	PEG_DEFER_TRAINING
8			RSVD
9			RSVD
10			RSVD
11			RSVD
12			RSVD
13			RSVD
14	RSVD		RSVD
15	RSVD		RSVD

2014.09.29 remove

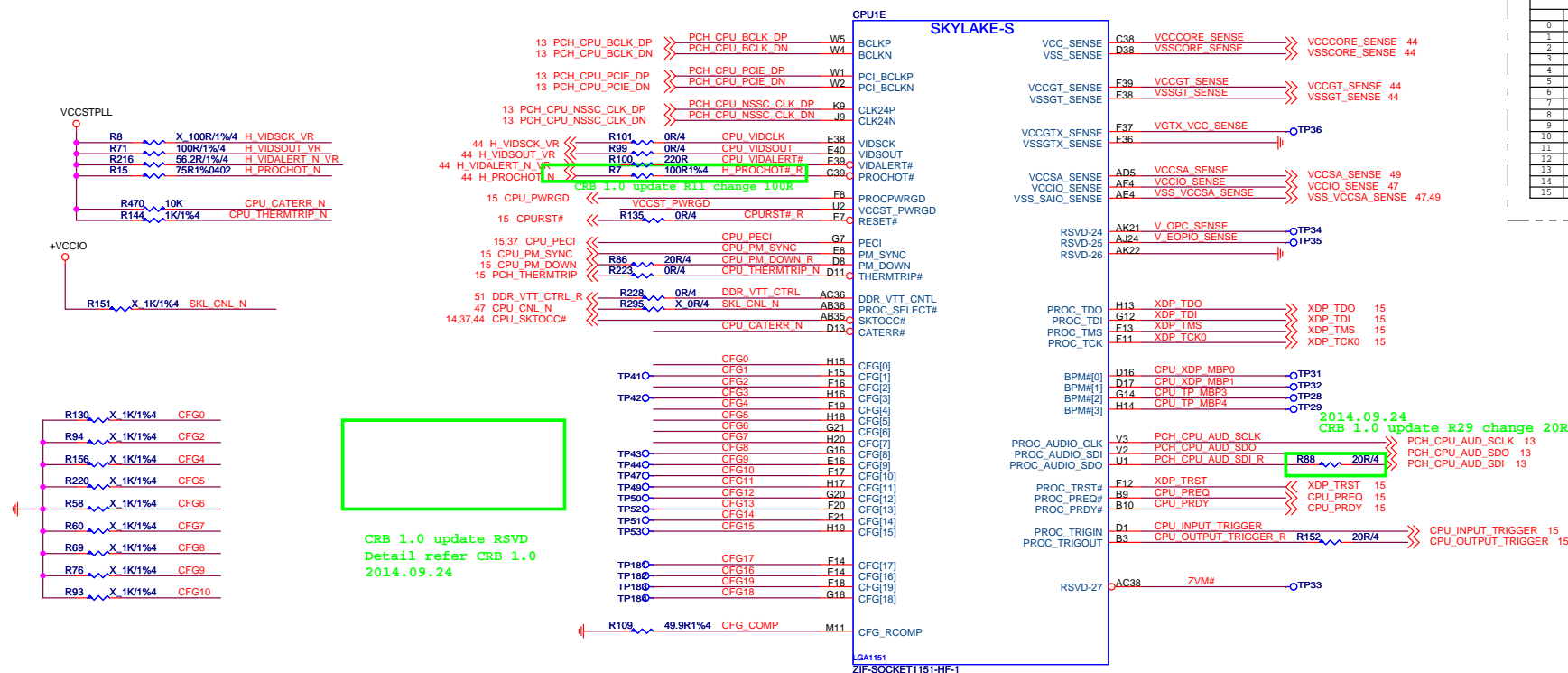
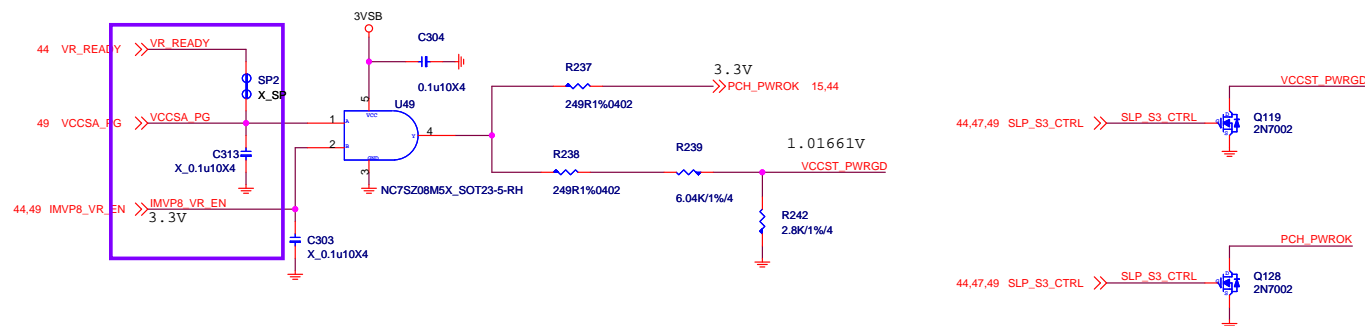


Close CPU &lt;1100 mil

1000 mil &lt; CPU\_XDP\_MBP0~1 &lt; 6000 mil



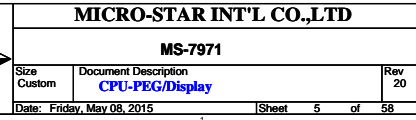
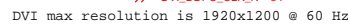
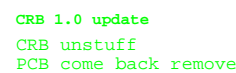
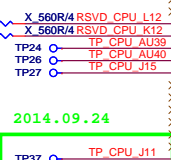
## SKYLAKE-S

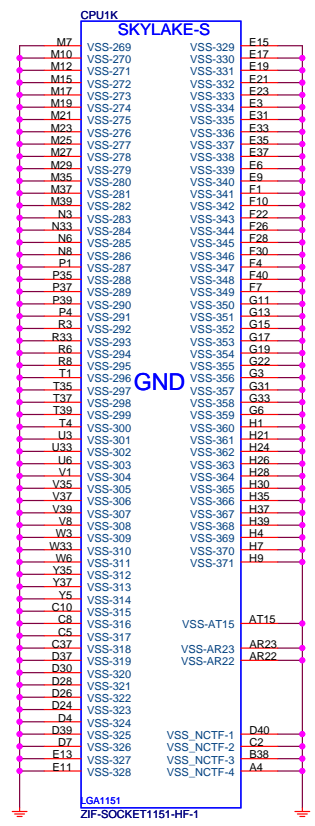
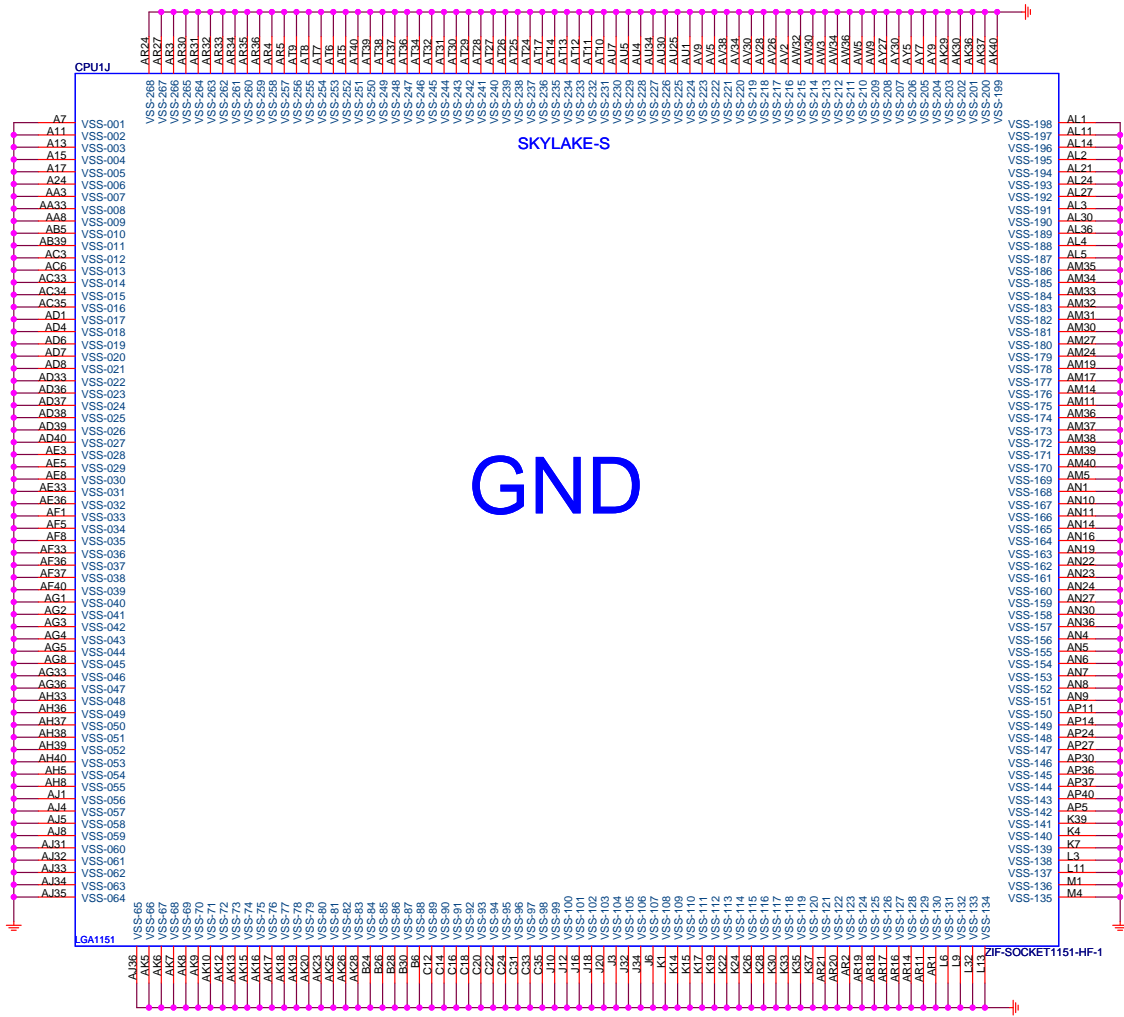
CRB 1.0 update RSVD  
Detail refer CRB 1.0  
2014.09.24

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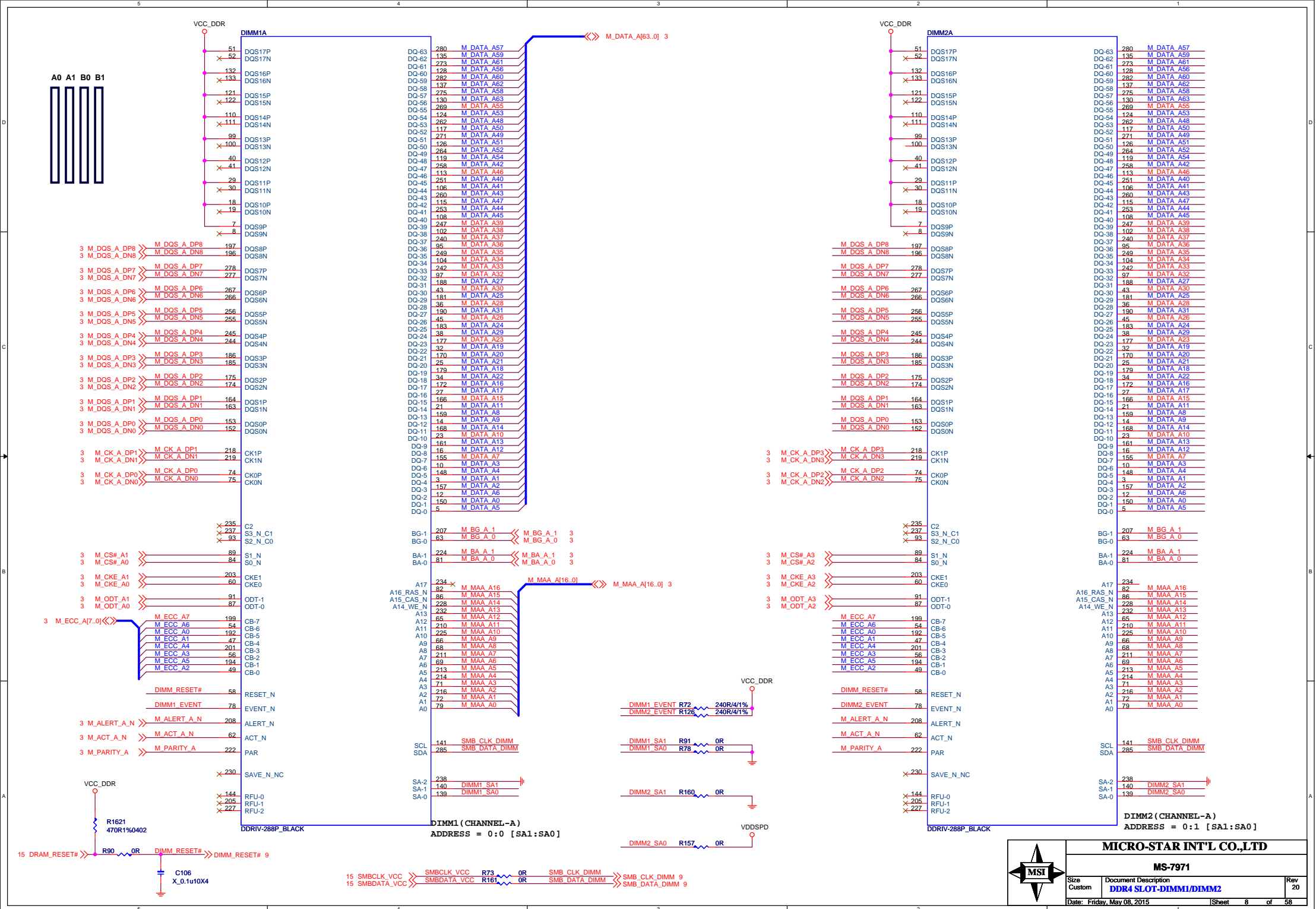
MS-7971

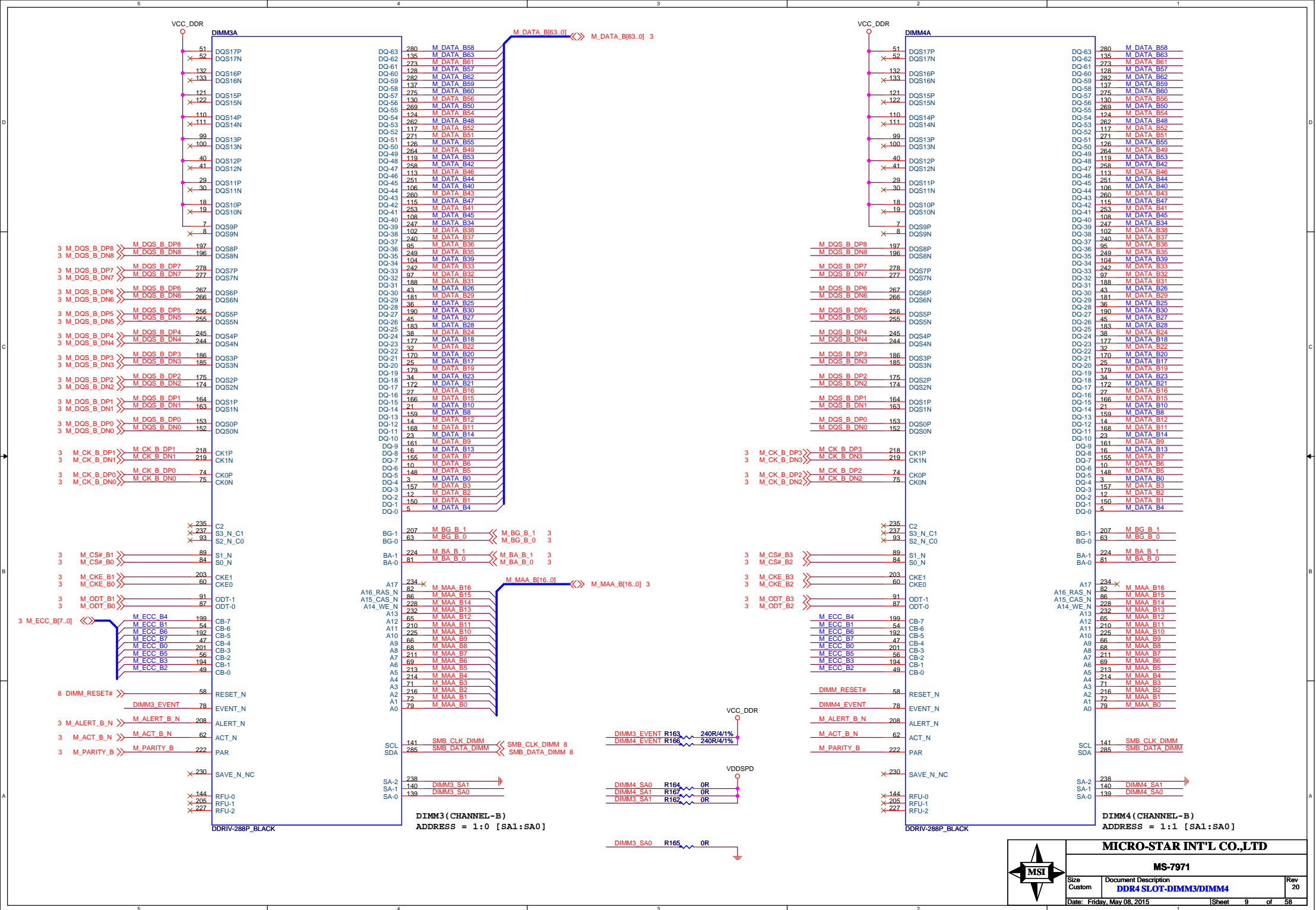
Size	Document Description	Rev
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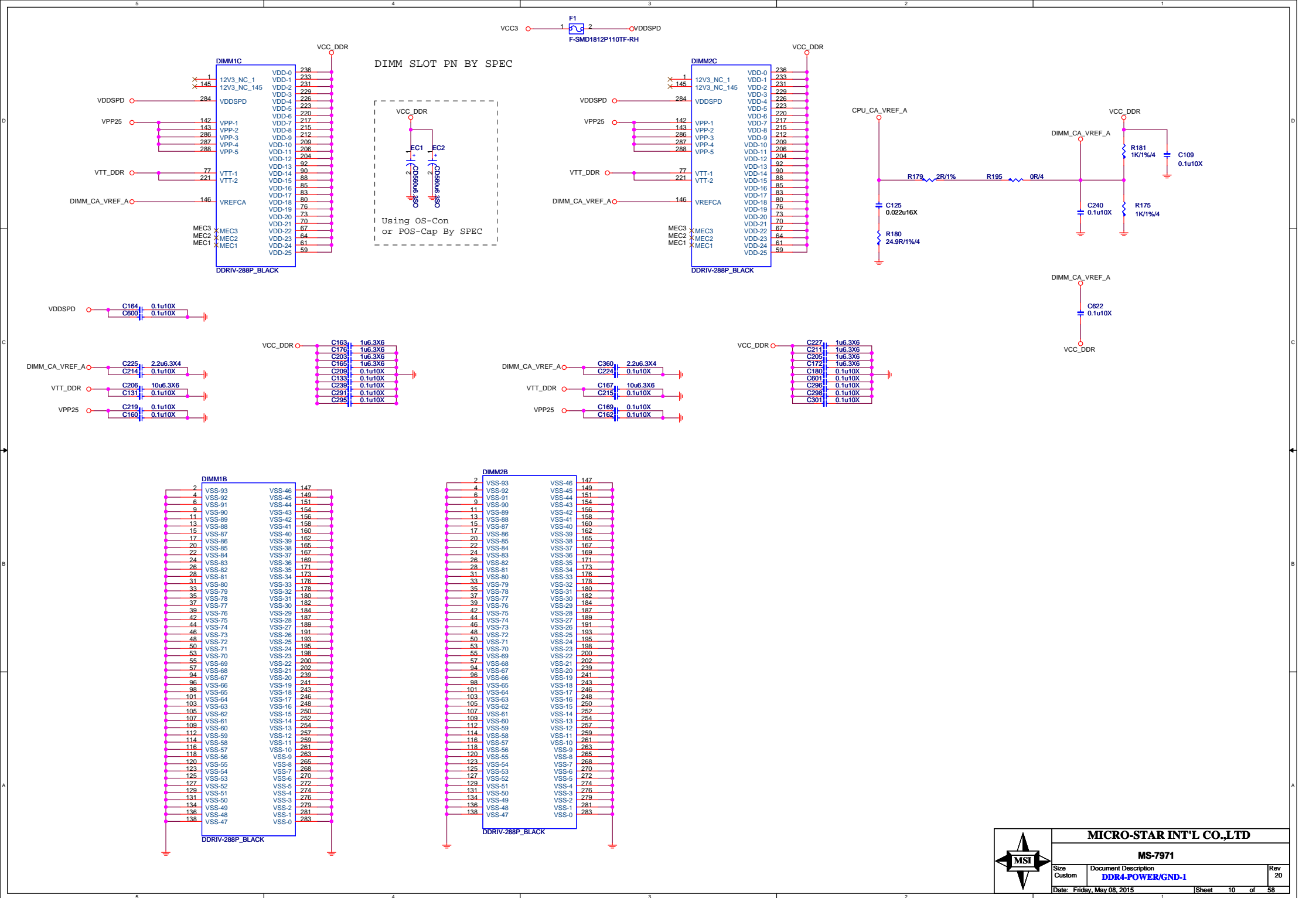


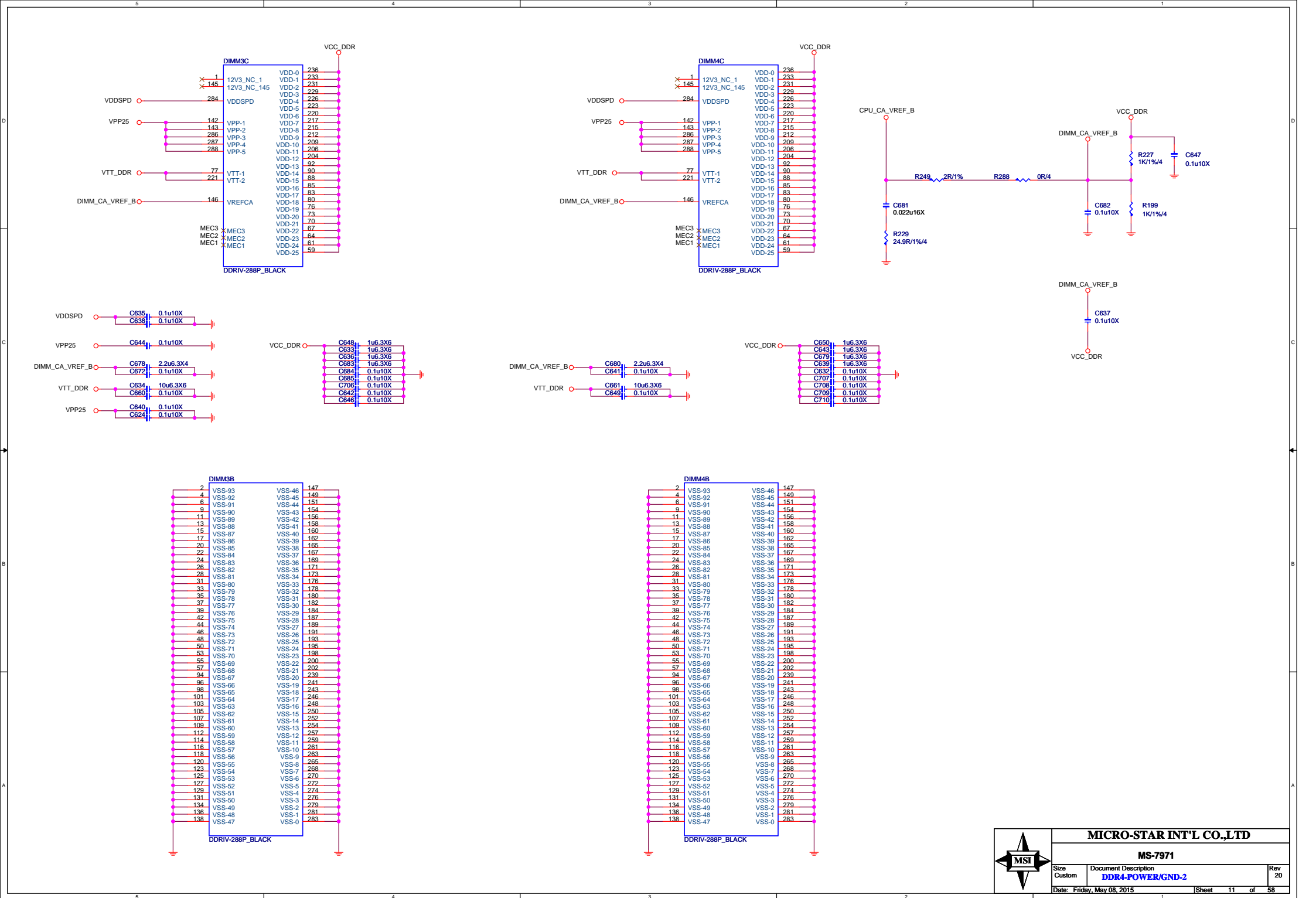


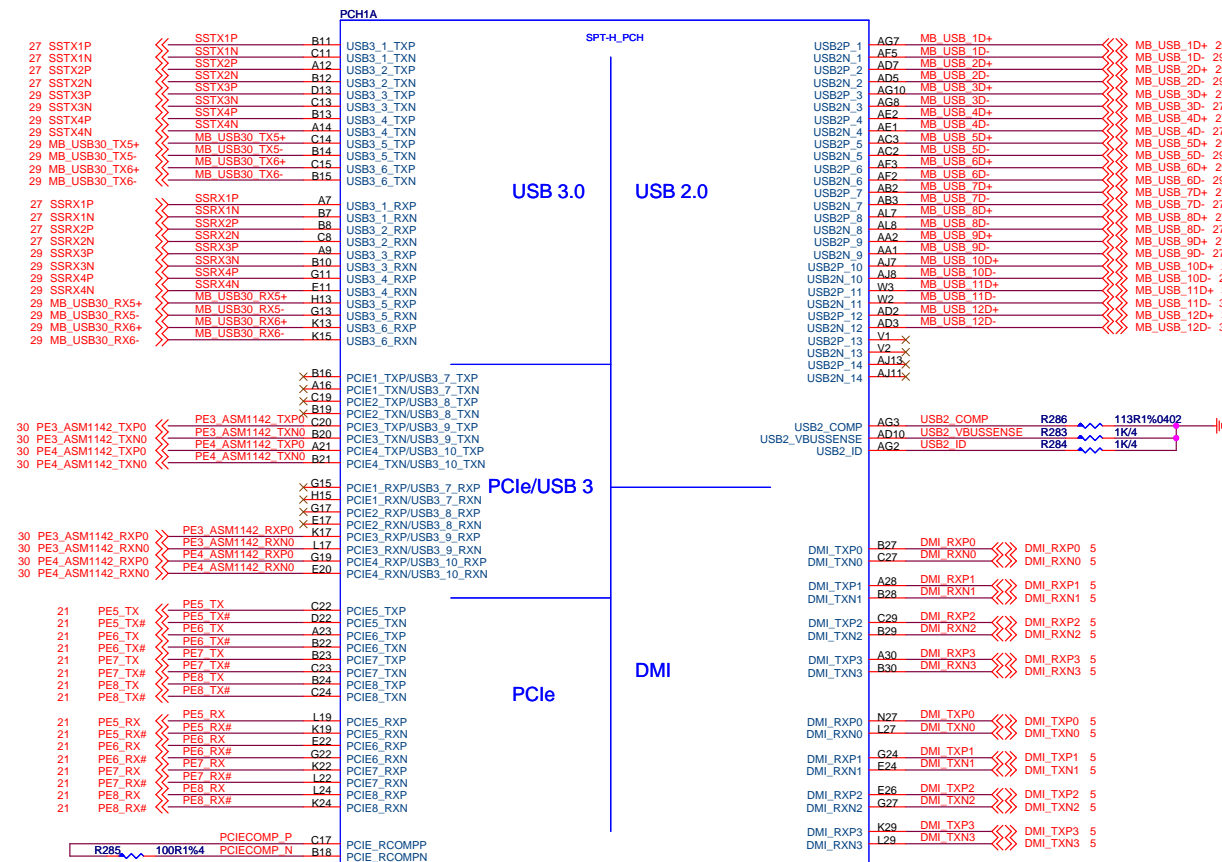




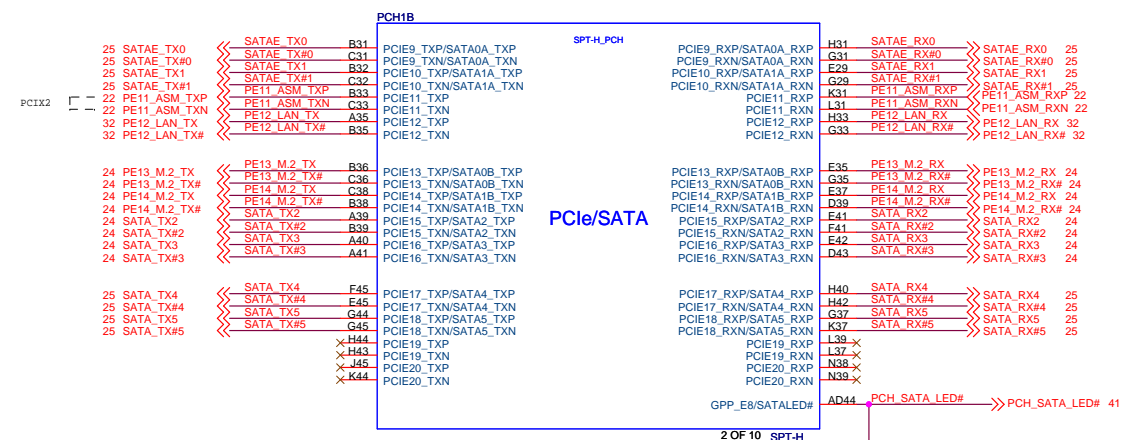








PCIECOMP\_P Length Match < 5mil  
PCIECOMP\_N



sku	1	2	3	4	5	6	7	8	9	10	11	12	13	14
H110	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	N/A	N/A	N/A	N/A	N/A	LAN Only	PCle/ LAN	PCle	PCle	PCle
	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	USB3	USB3	N/A	N/A	N/A	LAN Only	PCle/ LAN	PCle	PCle	PCle
B150	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	USB3	USB3	N/A	N/A	N/A	PCle/ LAN	PCle/ LAN	PCle	PCle	PCle
	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	USB3	USB3	USB3	USB3	PCle	USB3/ PCle/ LAN	PCle/ LAN	PCle	PCle	PCle
H170	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	USB3	USB3	USB3/ PCle	USB3/ PCle	USB3/ PCle	PCle/ LAN	PCle/ LAN	PCle	PCle	PCle
Z170	USB3/ OTG	USB3/ SSIC	USB3/ SSIC	USB3	USB3	USB3	USB3/ PCle	USB3/ PCle	USB3/ PCle	PCle/ LAN	PCle/ LAN	PCle	PCle	PCle

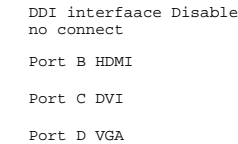
Sku	15	16	17	18	19	20	21	22	23	24	25	26	RST for PCIe Ports	
H110	PCle/ LAN	PCle	N/A	LAN Only	SATA*/ LAN	SATA*	SATA	SATA	N/A	N/A	N/A	N/A		
B150	PCle/LAN	PCle/ SATA*	PCle/ SATA*	PCle/ LAN	SATA*/ LAN	SATA*	SATA	SATA	SATA	SATA	N/A	N/A		
	PCle/LAN	PCle/ SATA	PCle/ SATA	PCle/ LAN	PCle/LAN	PCle/ SATA	PCle/ SATA	PCle/ SATA	SATA	SATA	PCle	PCle		
H170	SATA	SATA	PCle	PCle/ LAN	SATA	SATA	SATA	SATA	SATA	SATA	PCle	PCle		
Z170	PCle/LAN	PCle/ SATA	PCle/ SATA	PCle/ LAN	PCle/LAN	PCle/ SATA	PCle/ SATA	PCle/ SATA	PCle/ SATA	PCle/ SATA	PCle	PCle		
	SATA	SATA	PCle	PCle/ LAN	SATA	SATA	SATA	SATA	SATA	SATA	PCle	PCle		



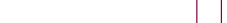
MICRO-STAR INT'L CO.,LTD

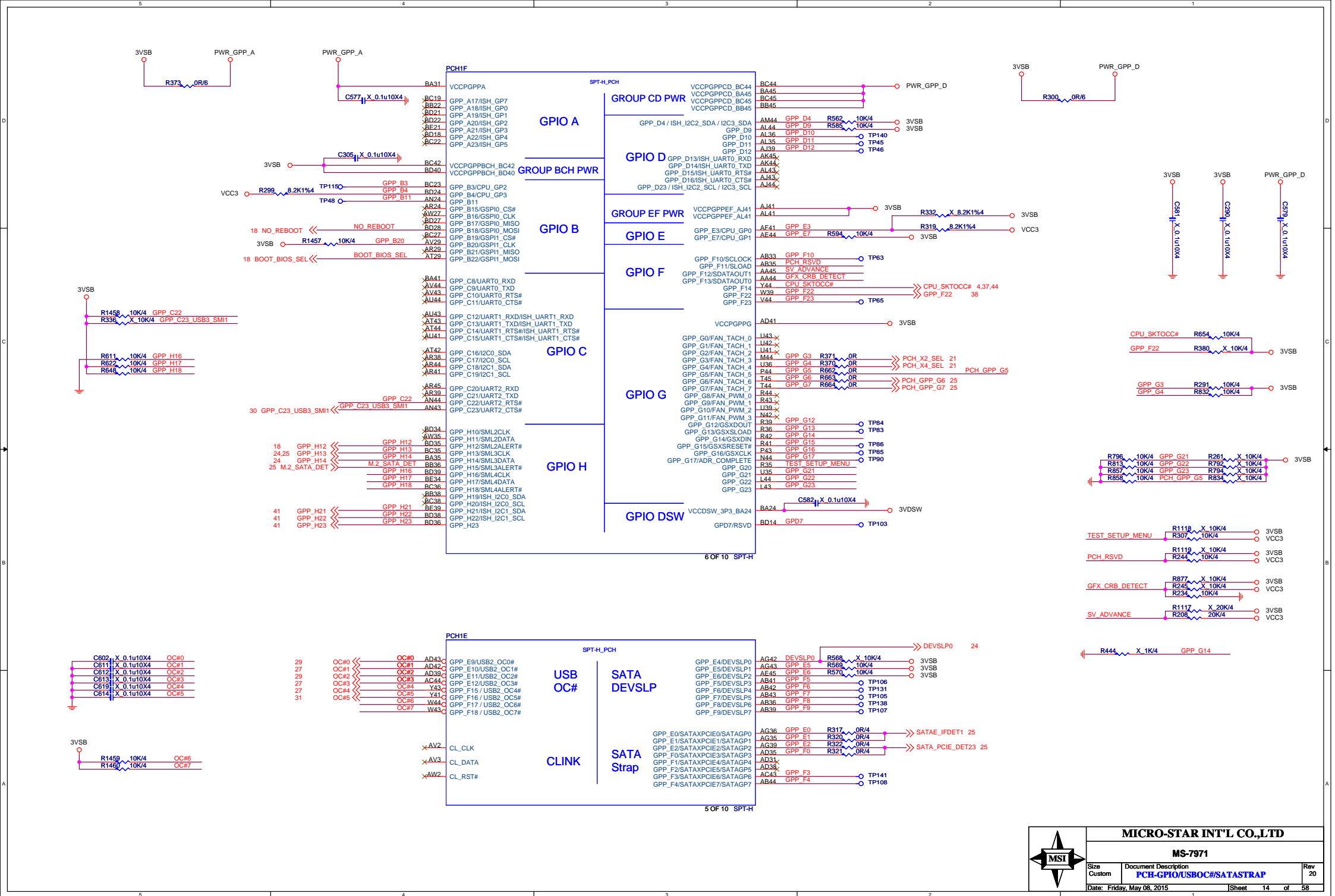
MS-7971

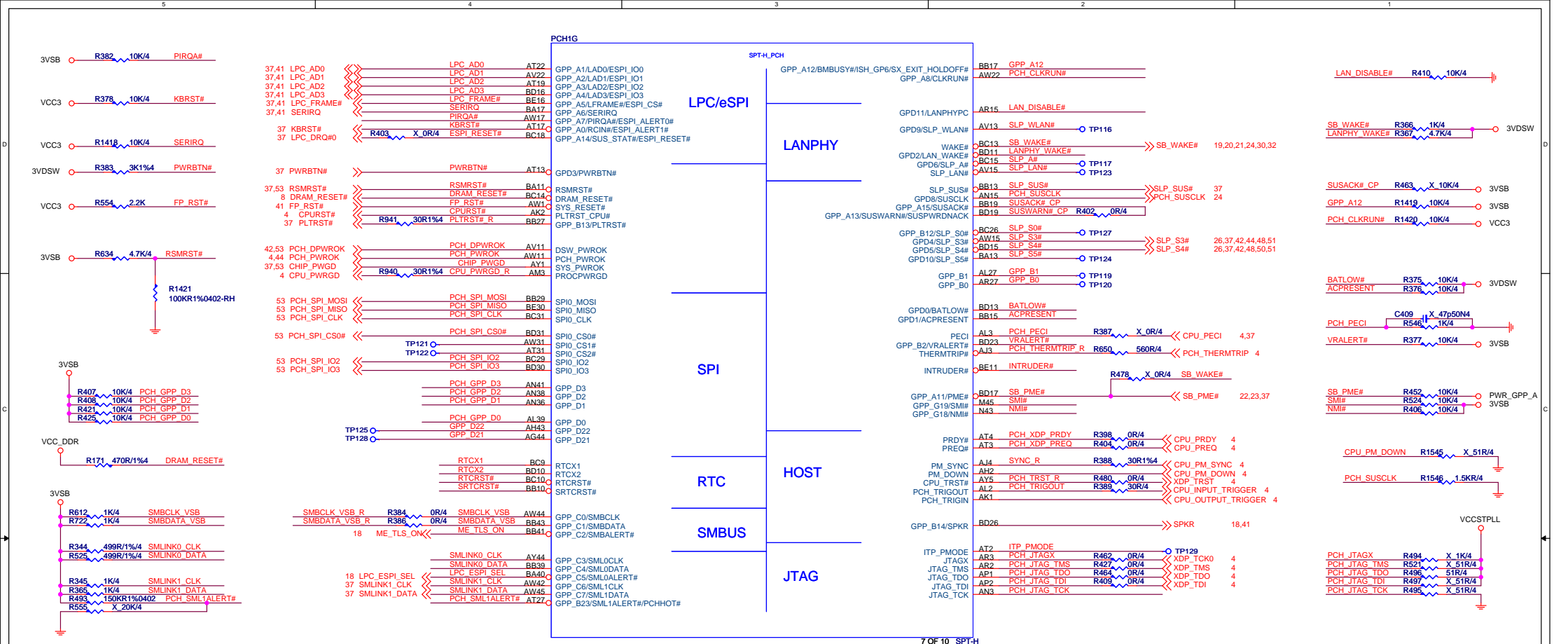
Size	Document Description	Rev
Custom	PCB-USB/PCIE/DMI/SATA	20
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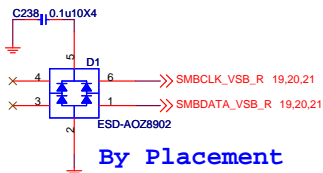
## U5



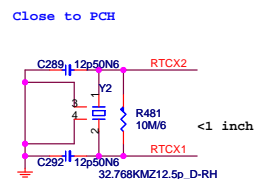




## SMBUS ESD

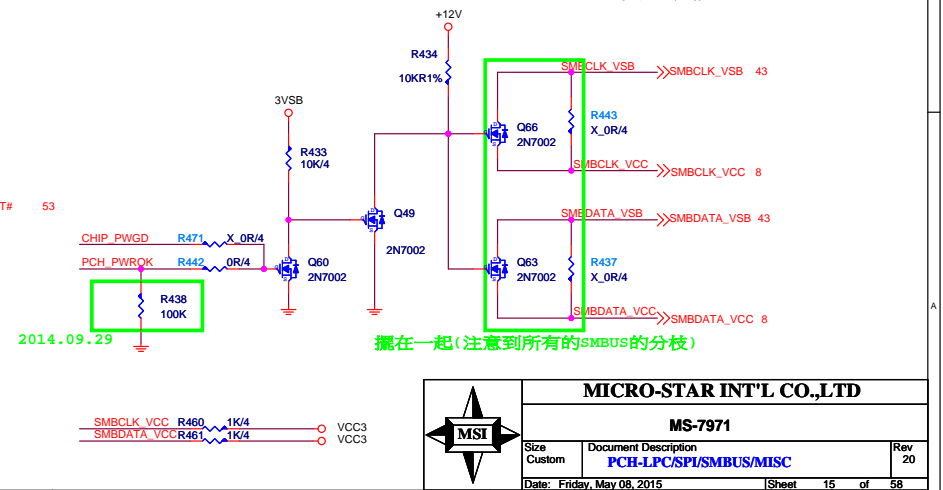


## RTC Block



SMBUS隔離線路(PCH接出來是PULL HIGH 3VSB)  
需要再S3/S5底下動作的接SMBCLK\_VSB/SMBDATA\_VSB  
不需要的接SMBCLK\_VCC/SMBDATA\_VCC

基本上PCIE的SLOT要接  
3VSB的CPU的PWM IC/DDR  
要接VCC3的其他的請注意  
要怎麼接





GND

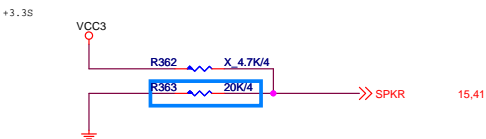


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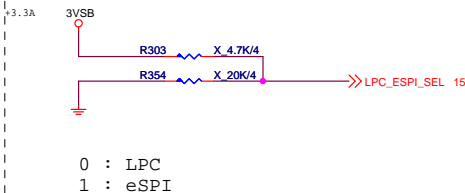
Size	Document Description	Rev
Custom	PCH-GND	20
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# TOP Swap



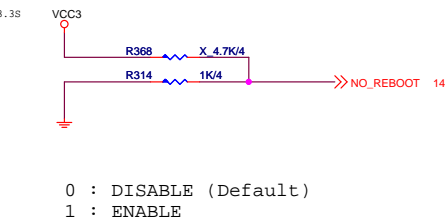
Internal pull-down is disabled after PLTRST#

# LPC eSPI Mode



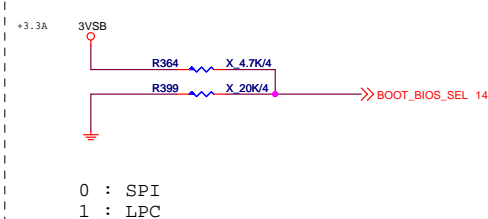
Internal pull-down is disabled after RSMRST

# No Reboot



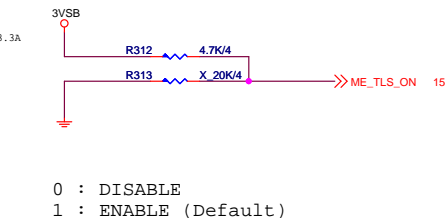
Internal pull-down is disabled after PLTRST#

# Boot BIOS



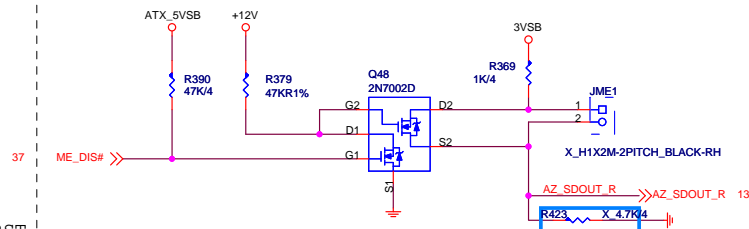
Internal pull-down is disabled after PLTRST

# AMT and SBA with confidentiality

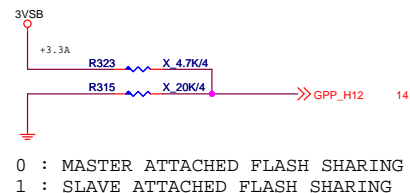


Internal pull-down is disabled after RSMRST

# HDA\_SDO



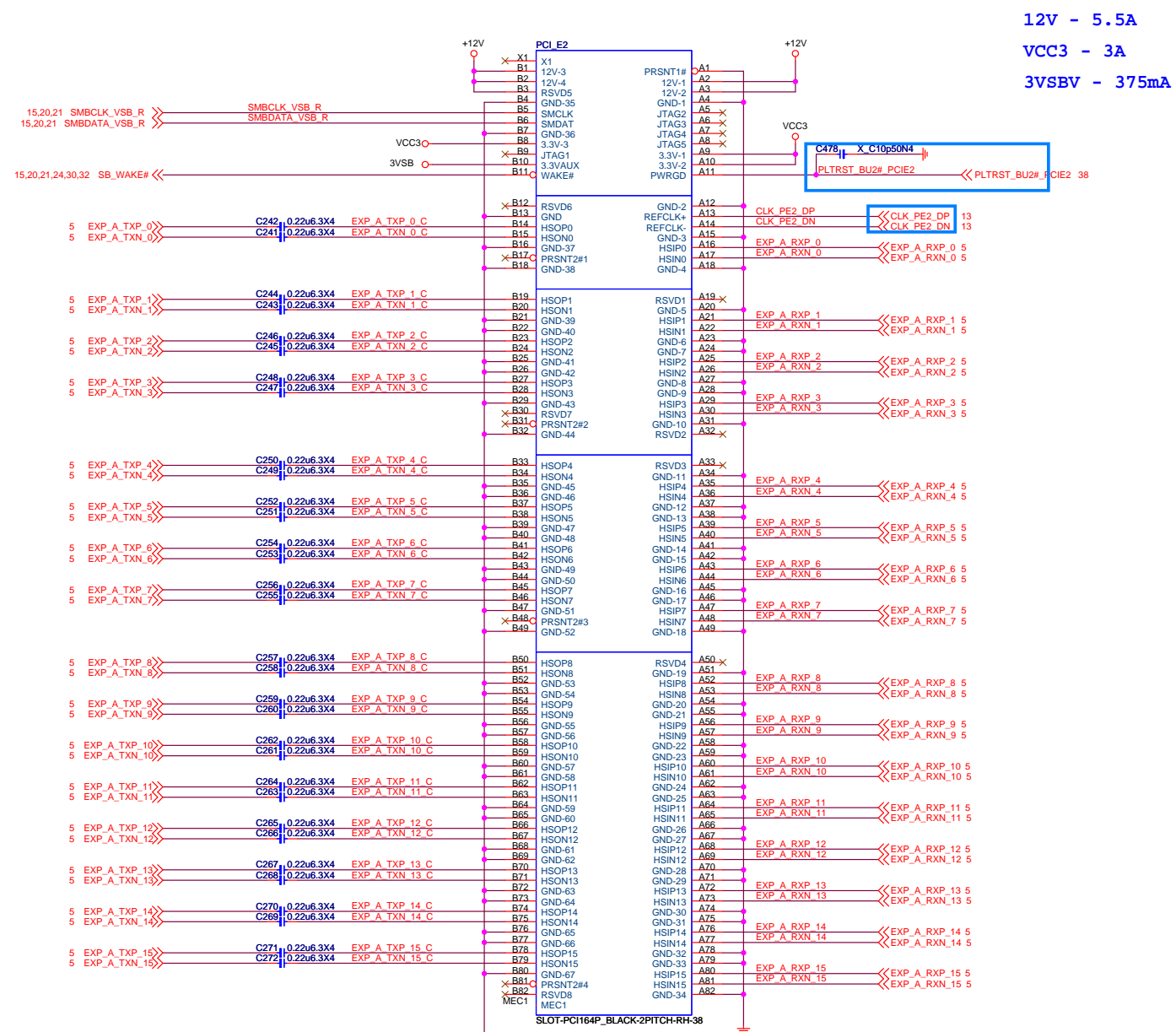
# ESPI FLASH SHARING MODE



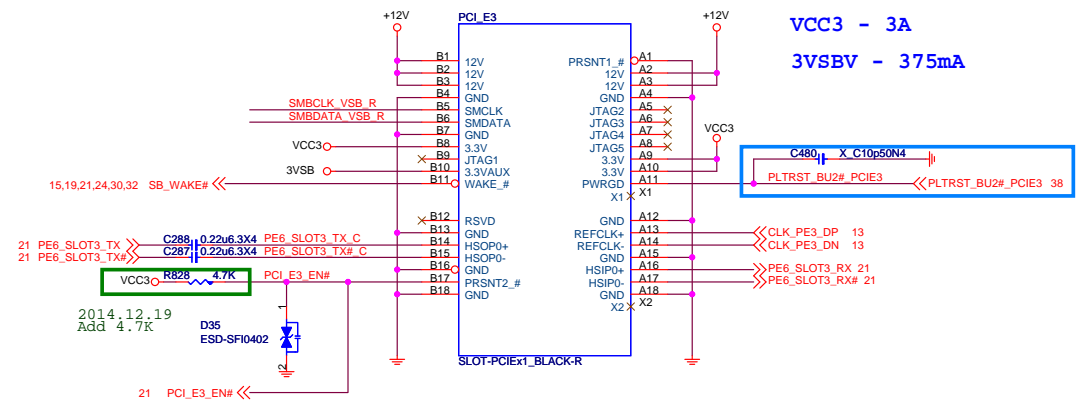
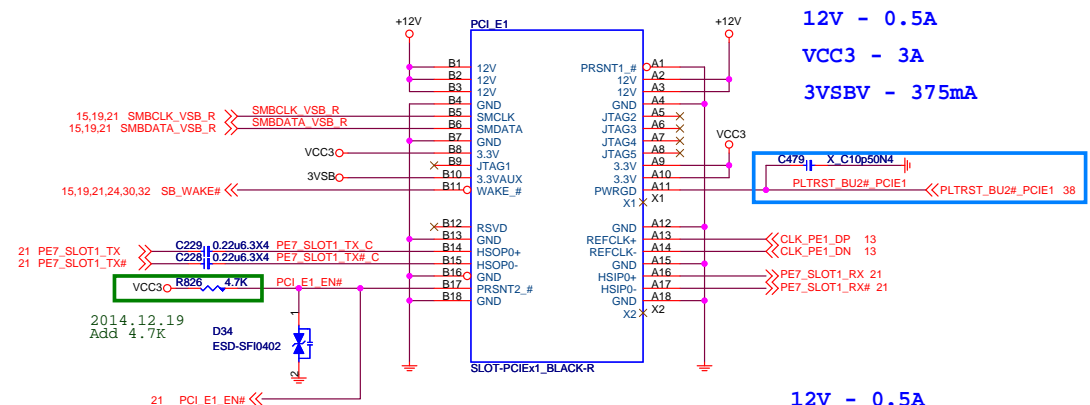
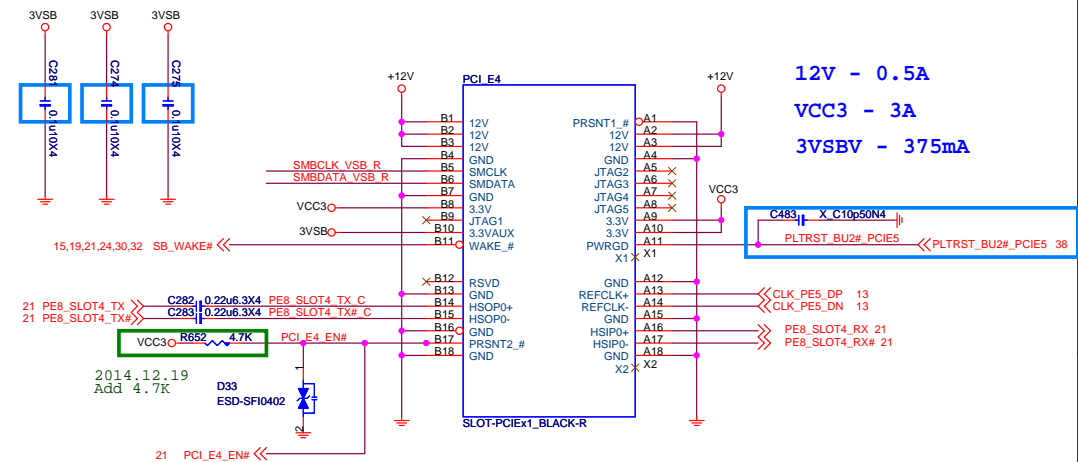
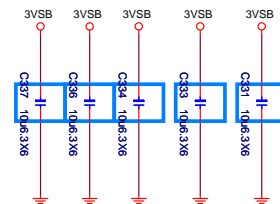
Internal pull-down is disabled after RSMRST



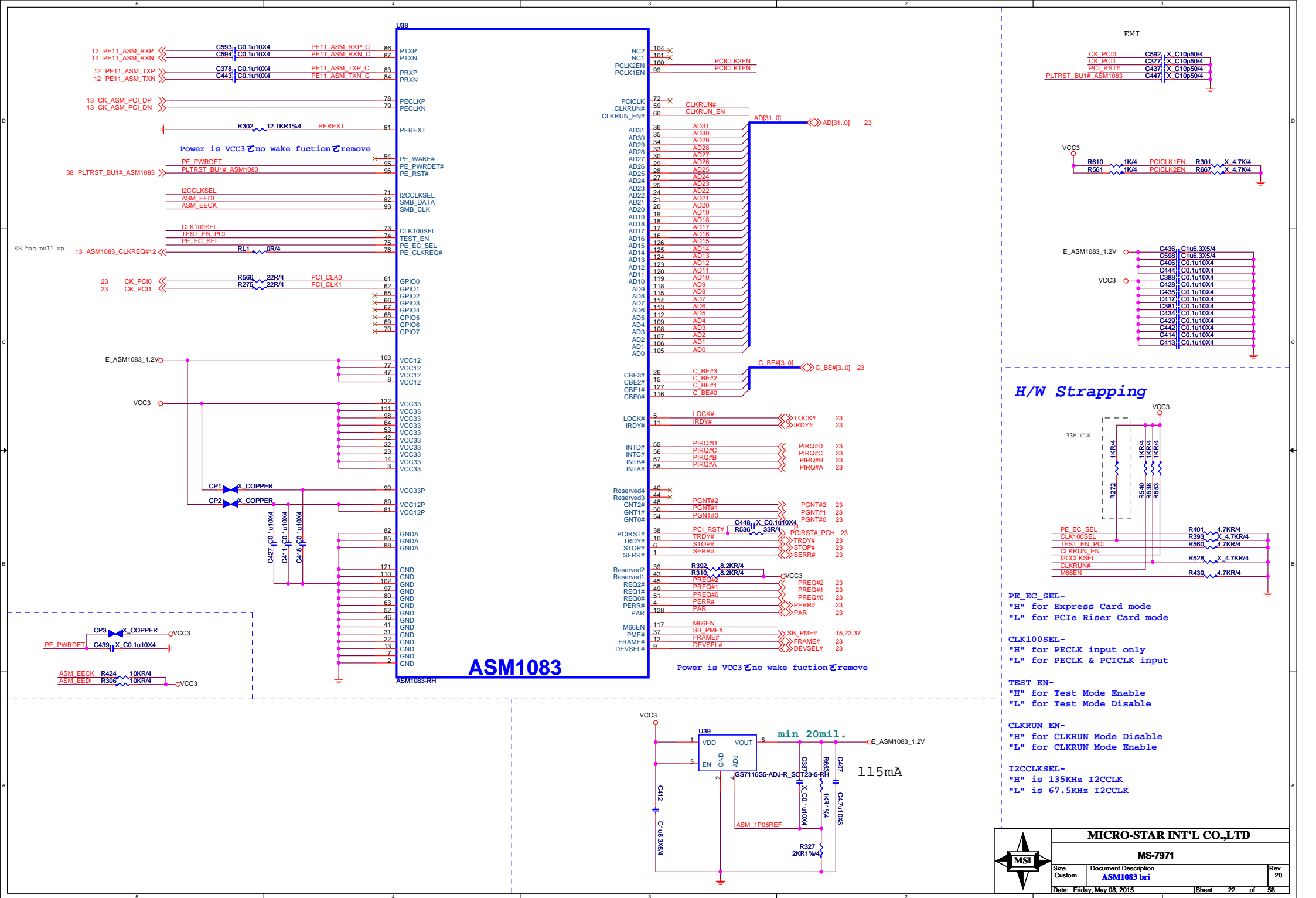
MICRO-STAR INT'L CO.,LTD		
MS-7971		
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12V - 5.5A  
VCC3 - 3A  
3VSBV - 375mA







## 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

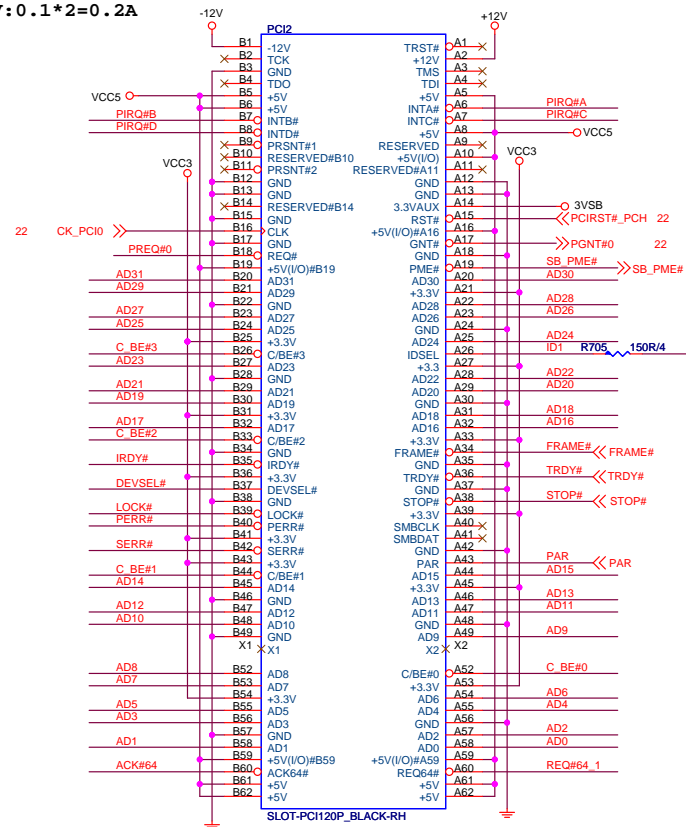
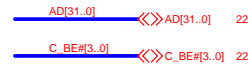
TEST\_EN-  
"H" for Test Mode Enable  
"L" for Test Mode Disable

CLKRUN\_EN-  
"H" for CLKRUN Mode Disable  
"L" for CLKRUN Mode Enable

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

PCI x2

3.3Vaux:  $0.375 \times 2 = 0.75A$  (wake)  
 $0.02 \times 2 = 0.04A$  (no wake)  
VCC3 :  $7.6 \times 2 = 15.2A$   
VCC5:  $5 \times 2 = 10A$   
+12V:  $0.5 \times 2 = 1A$   
-12V:  $0.1 \times 2 = 0.2A$  -12V

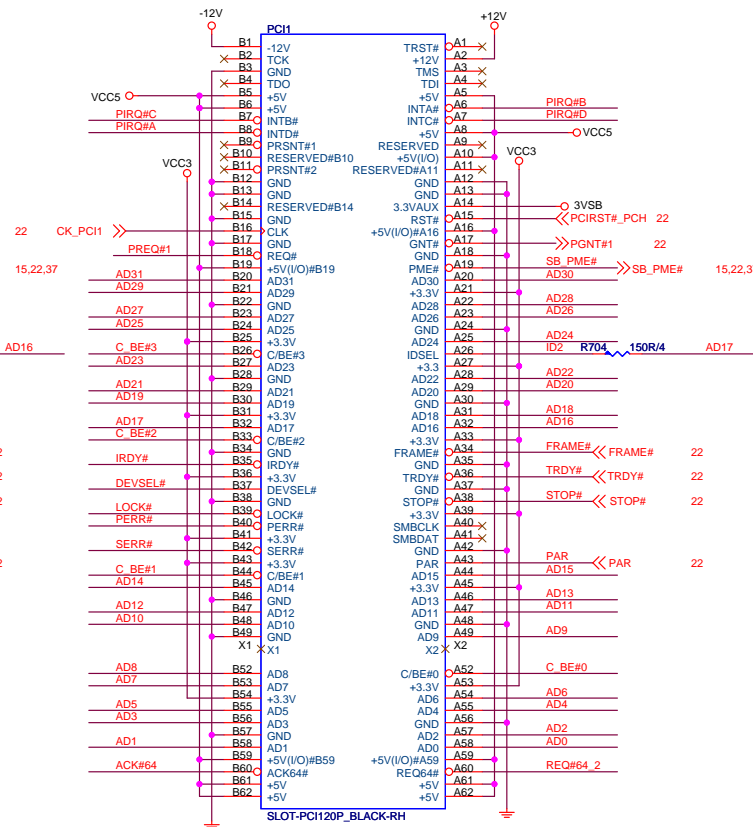
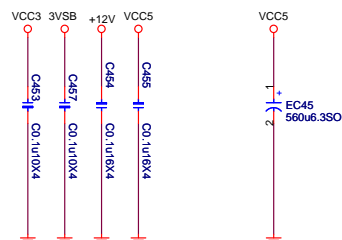


```

IDSEL = AD16
MASTER = PREQ#0
PIRQ#A

```

```
EMI:close pin
```

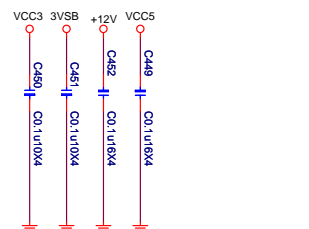


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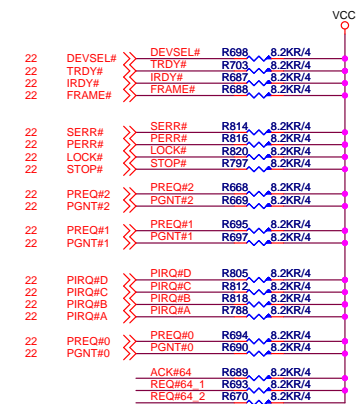
IDSEL = AD17
MASTER = PREQ#1
PIRQ#B

```

EMI:close pin



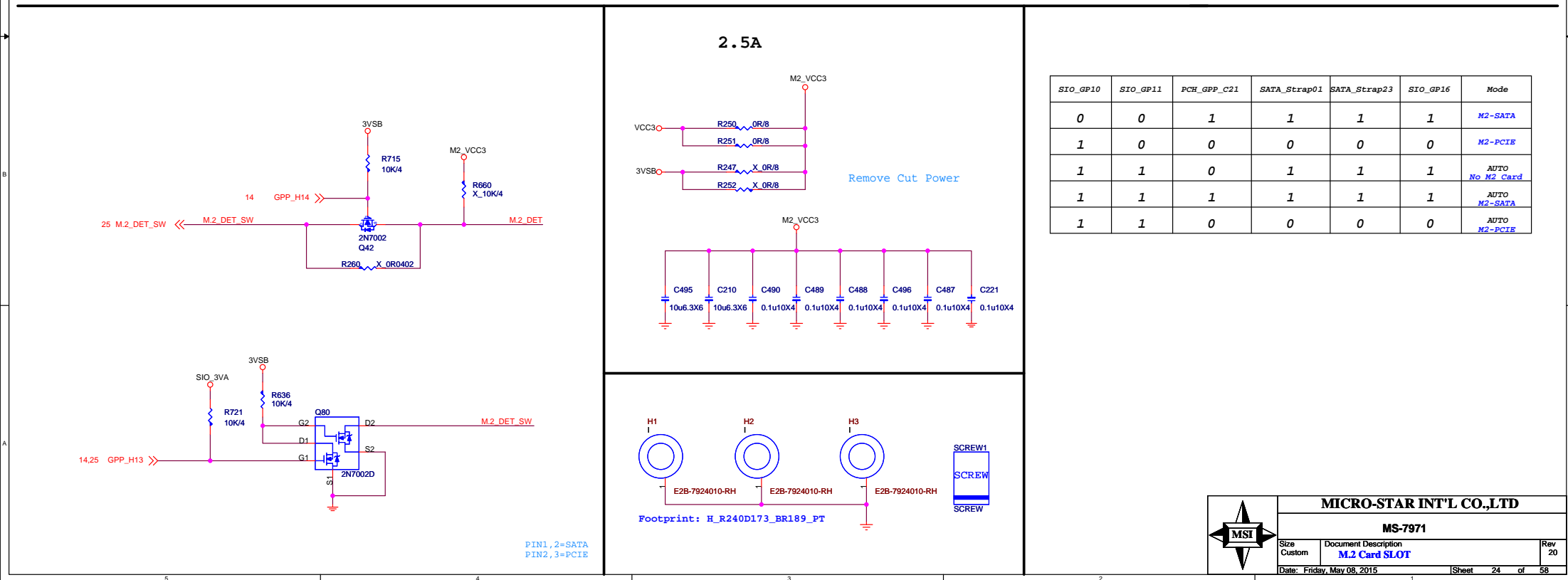
## PCI PULL-UP / DOWN RESISTORS



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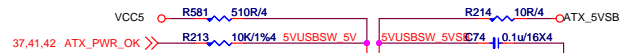
MS-7971

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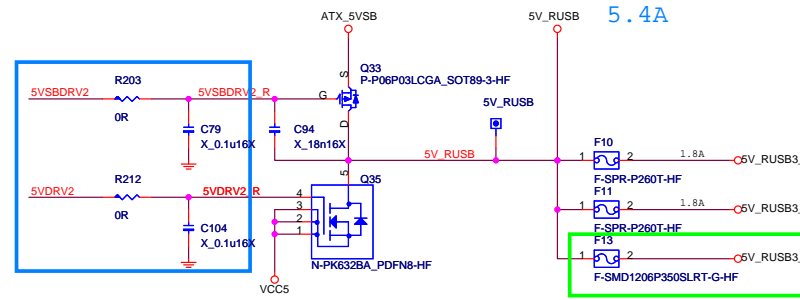
# REAR USB PORT POWER



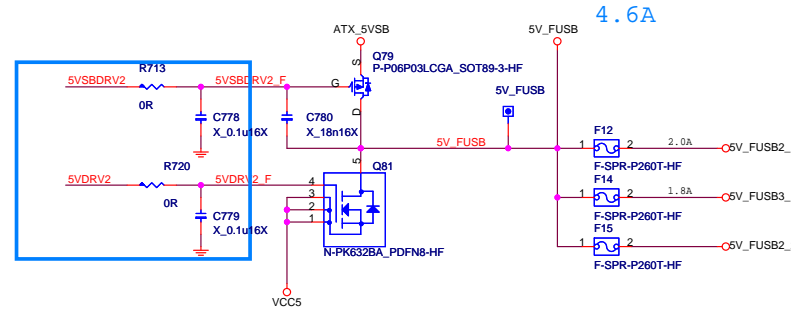
TO:NCT6779 GP72

H:SUPPORT S0/S3/S5  
L:SUPPORT S0/S3

5VDRV2, 5VSBDRV2 width 12mil,  
Do NOT route near the edge of a board.



need confirm C780 value



P-MOS  
D03-06P0319-N03

N-MOS  
D03-510BA0C-N03  
D03-3056M00-U47  
D03-4C05N03-Q05  
D03-3830D09-N47  
D03-632BA0C-N03

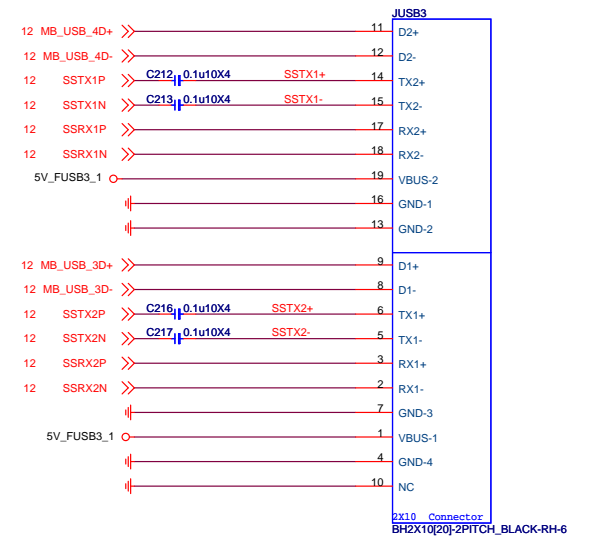
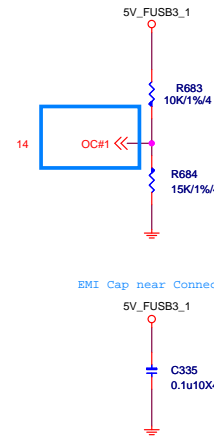
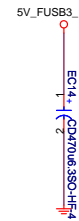
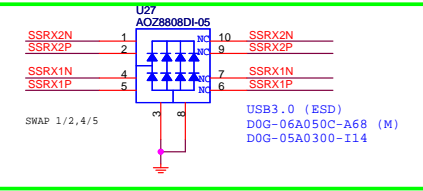
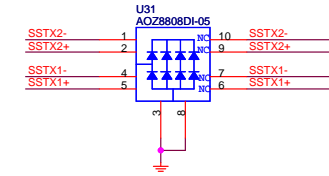
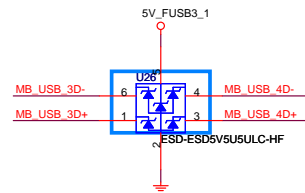
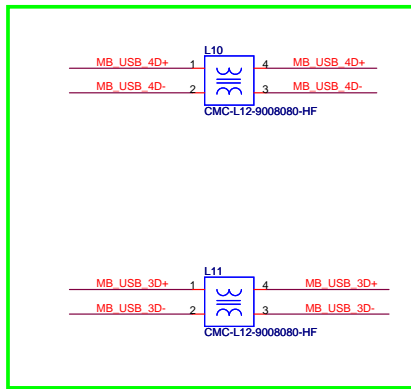
D08-2000400-P16 (Itrip=3.5A; 0.003ohm)  
D08-0301000-P16 (Itrip=2.6A; 0.015ohm)



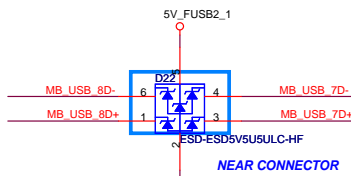
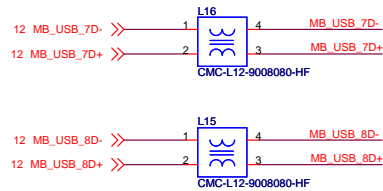
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MS-7971

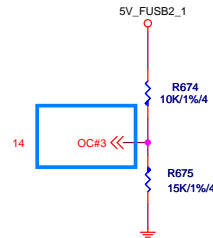
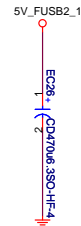
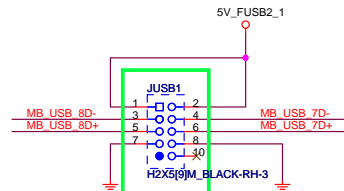
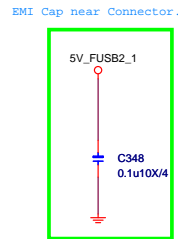
Size	Document Description	Rev
Custom	USB POWER-MP1495/UP7501	20
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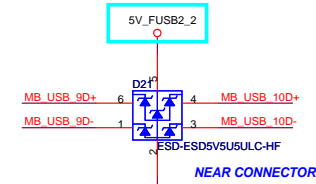
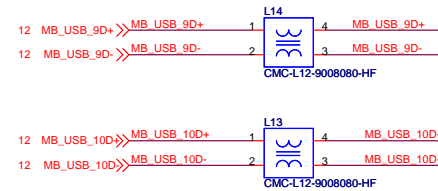
### FRONT USB PORT 3,4



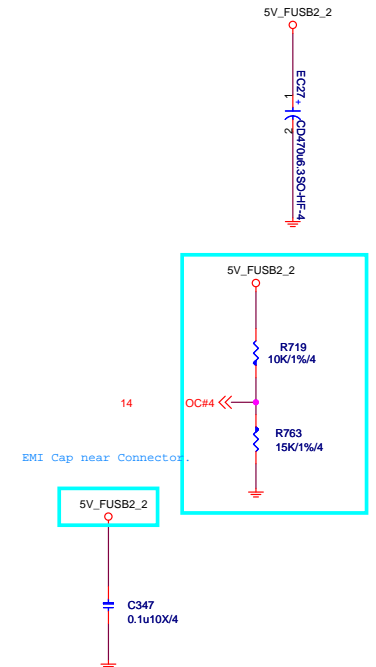
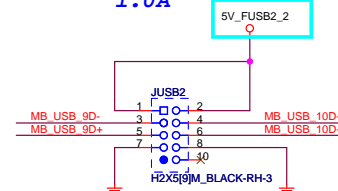
1.0A



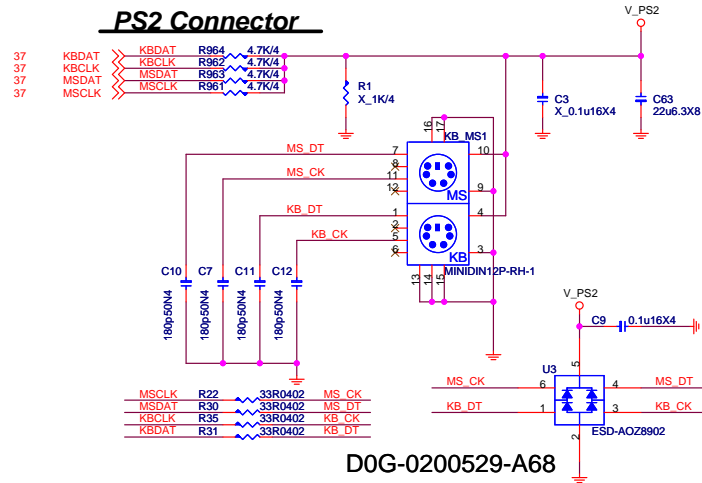
### FRONT USB PORT 7,8



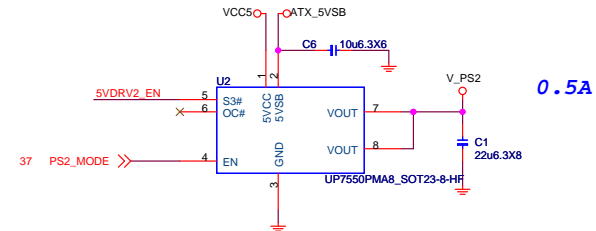
1.0A



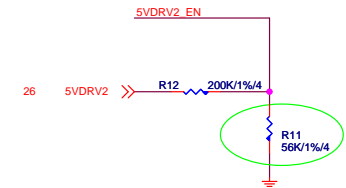
## PS2 KEYBOARD & MOUSE CONNECTOR



## PS2 Power



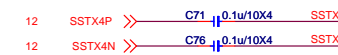
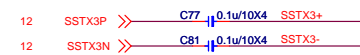
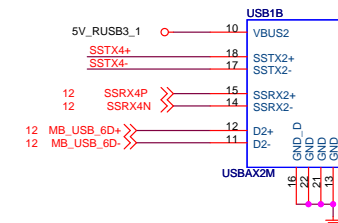
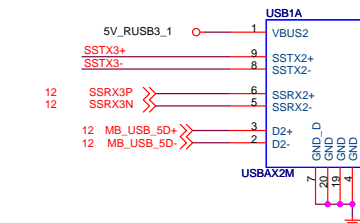
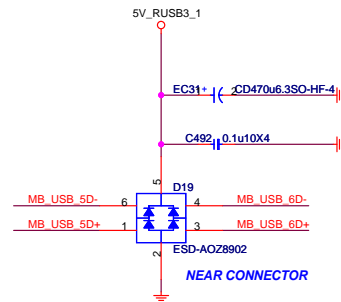
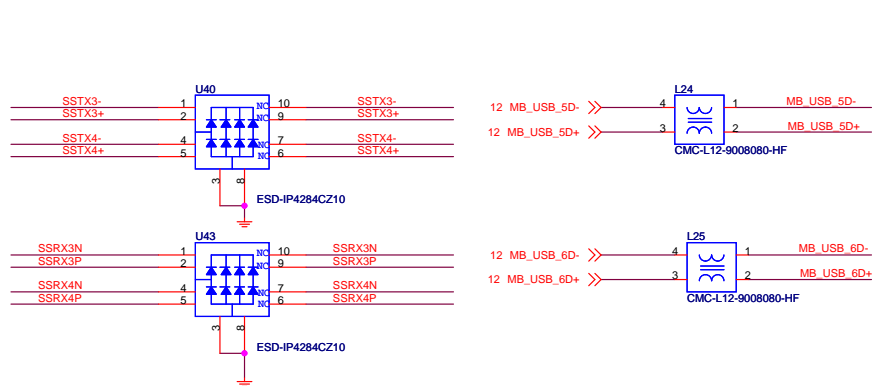
## USB MODE



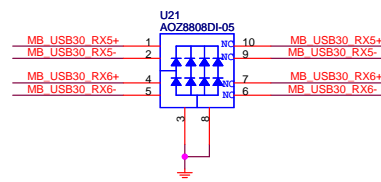
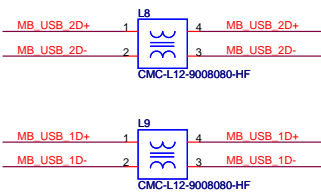
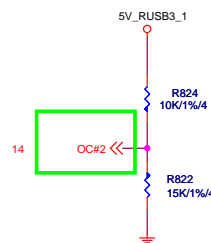
MICRO-STAR INT'L CO.,LTD

MS-7971

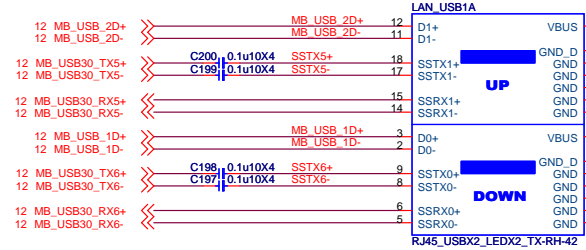
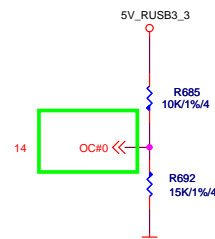
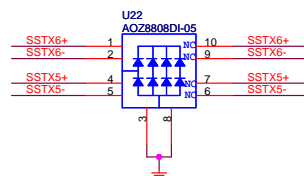
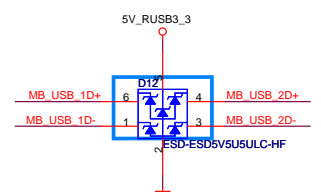
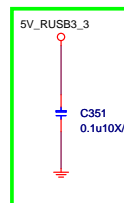
Size Custom	Document Description Rear I/O PS2	Rev 20
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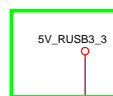
D0G-0200529-A68



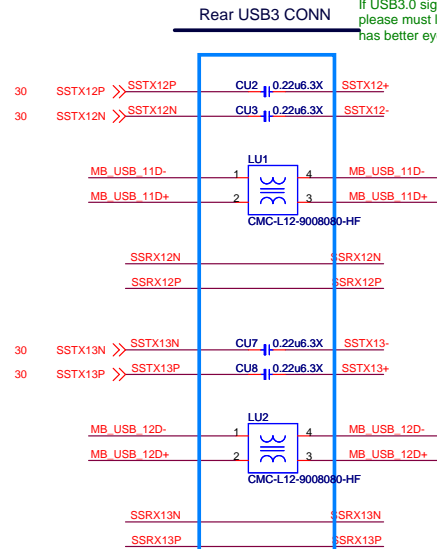
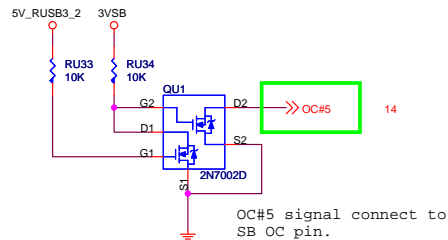
USB3.0 (ESD)  
D0G-06A050C-A68 (M)  
D0G-05A0300-I14



1.8A

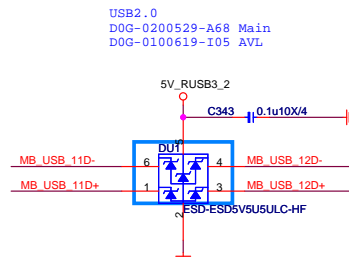
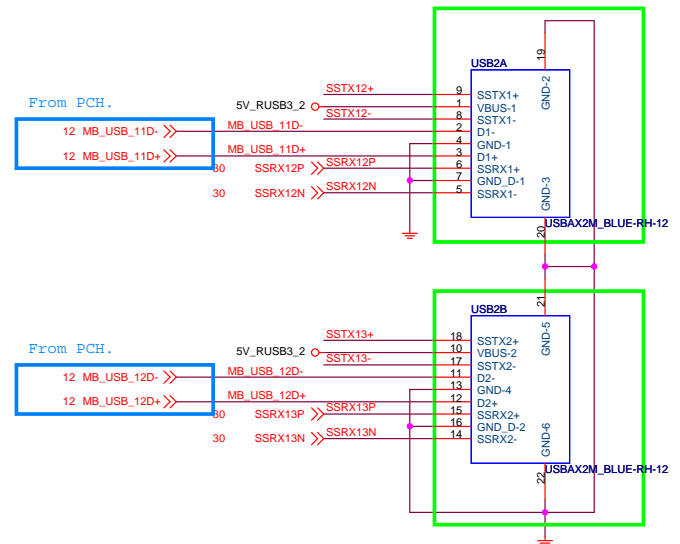




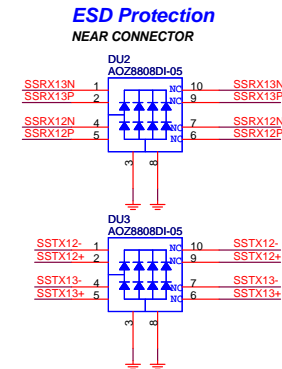
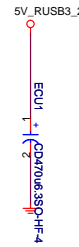


若layout空間不足可不預留此部分choke

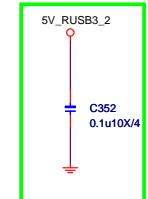
Important--  
If USB3.0 signal connect to front pin header,  
please must less than 1.5 inch, short trace  
has better eye diagram with some bad fly cable by SI customer.



min 80mil.  
1.8 A



USB3.0  
D0G-06A050C-A68 Main  
D0G-05A0300-I14 AVL

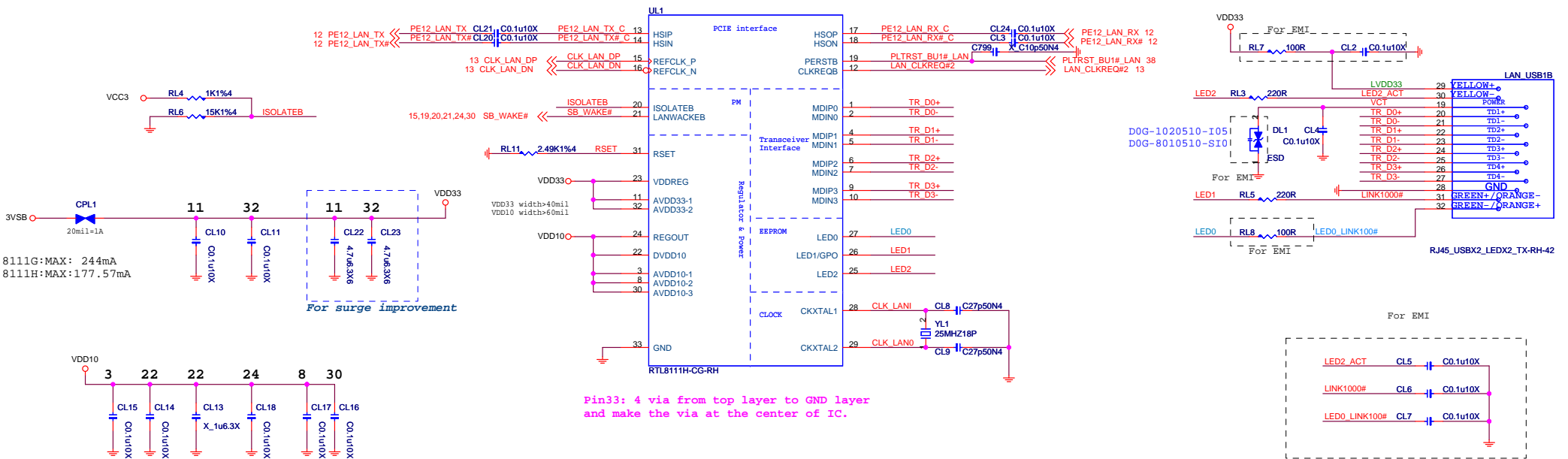


EMI Cap near Connector.

# RTL8111G/RTL8111H Giga LAN

8111H:B06-08111CC-R09  
8111G:B06-081116C-R09

## LAN Connector



### 8111G POWER Consumption

	3.3V @ mA	mW
10 M Idle/TxRx	17.15/116.7	56.6/385.1
100 M Idle/TxRx	71.45/129.5	235.8/427.4
Giga Idle/TxRx	179.1/243.9	591/804.9
ALDPS	6.41	21.15

### 8111H POWER Consumption

	3.3V @ mA	mW
10 M Idle/TxRx	9.9/84.69	32.67/279.48
100 M Idle/TxRx	48.11/92.44	158.76/305.05
Giga Idle/TxRx	124.5/177.57	410.85/585.98
ALDPS	5.50	18.15

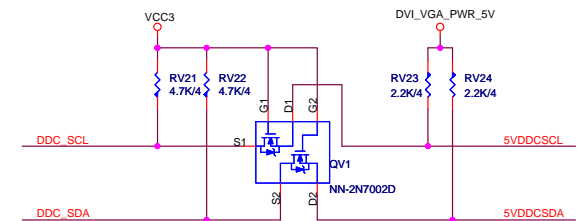
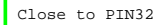
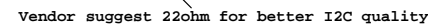


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Custom	LAN RTL8111H	20
Date: Friday, May 08, 2015	Sheet 32 of 58	

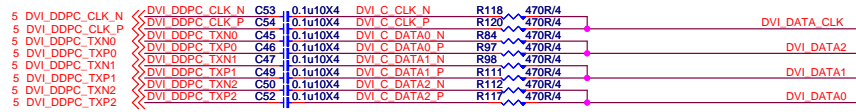
If connect to eDP port,must confirm whether it support hot plug detection HPD and re-auxtraining



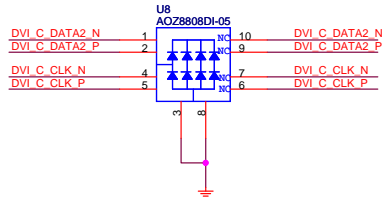
MS-7971

Size Custom	Document Description <b>VGA Connector</b>	Rev 20
Date: Friday, May 08, 2015		Sheet 33 of 58

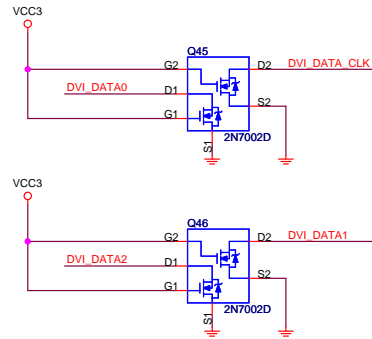
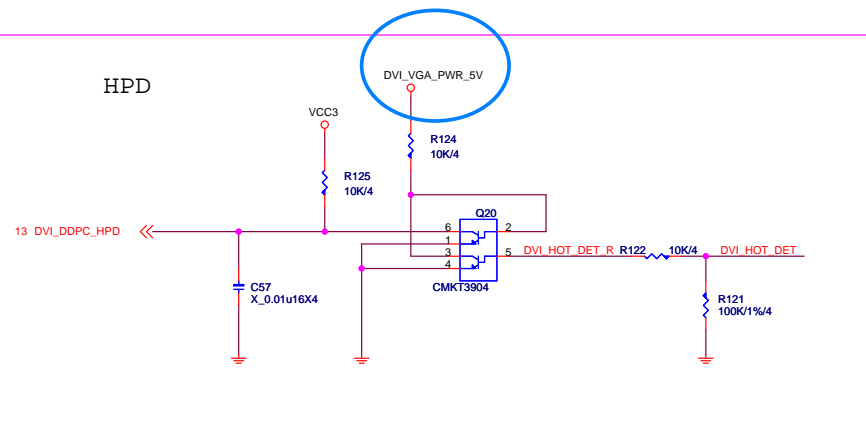
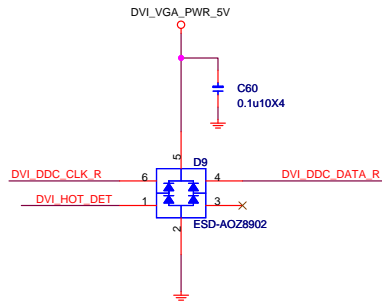
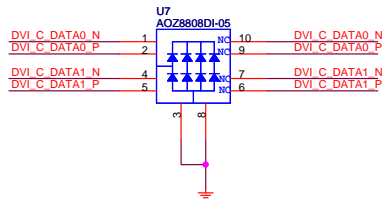
# VGA: resolution of 2048x1536 pixels with 32-bit color at 75 Hz (4:3 QXGA)



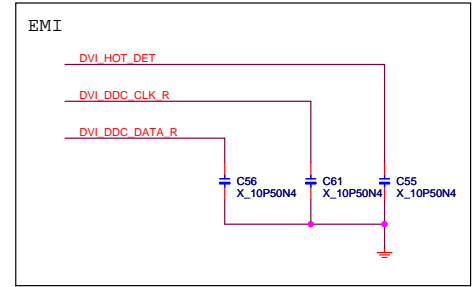
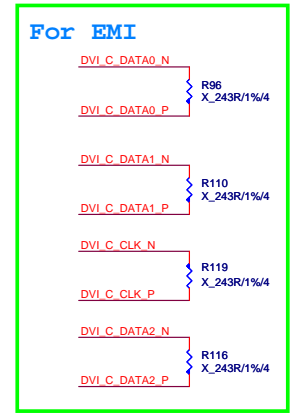
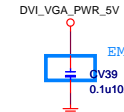
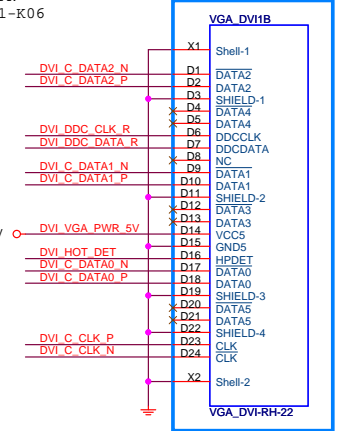
U26 AVL:D0G-05A050C-005  
 D0G-06A050C-A68



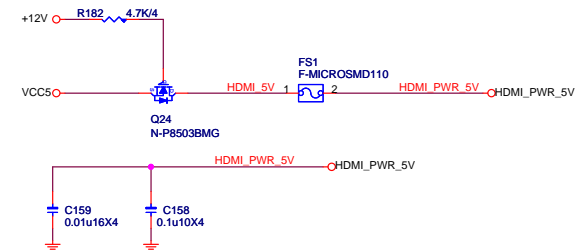
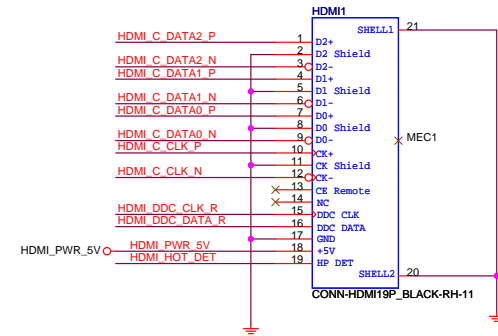
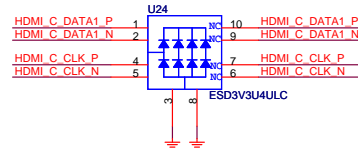
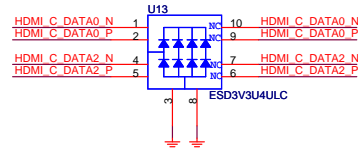
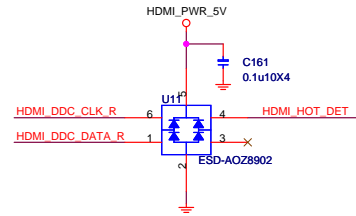
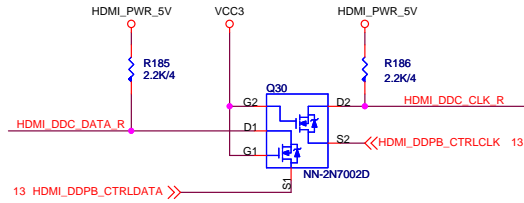
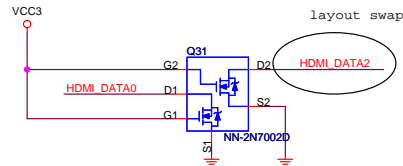
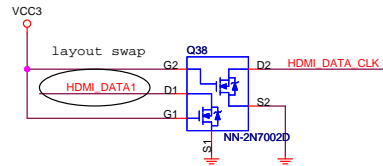
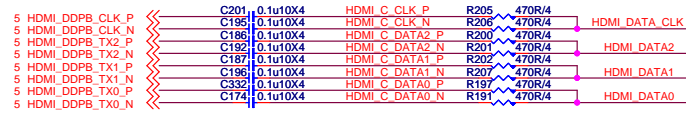
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 D0G-06A050C-A68



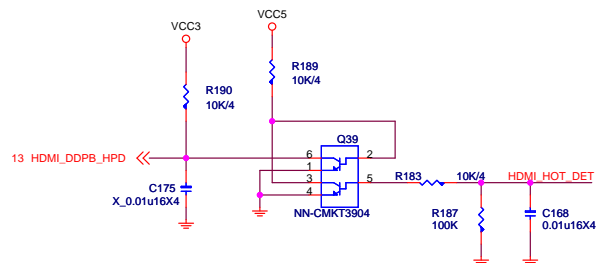
Check MSI PN  
 N58-39F0231-K06



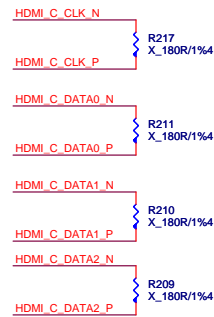
# HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)



## HPD



## For EMI

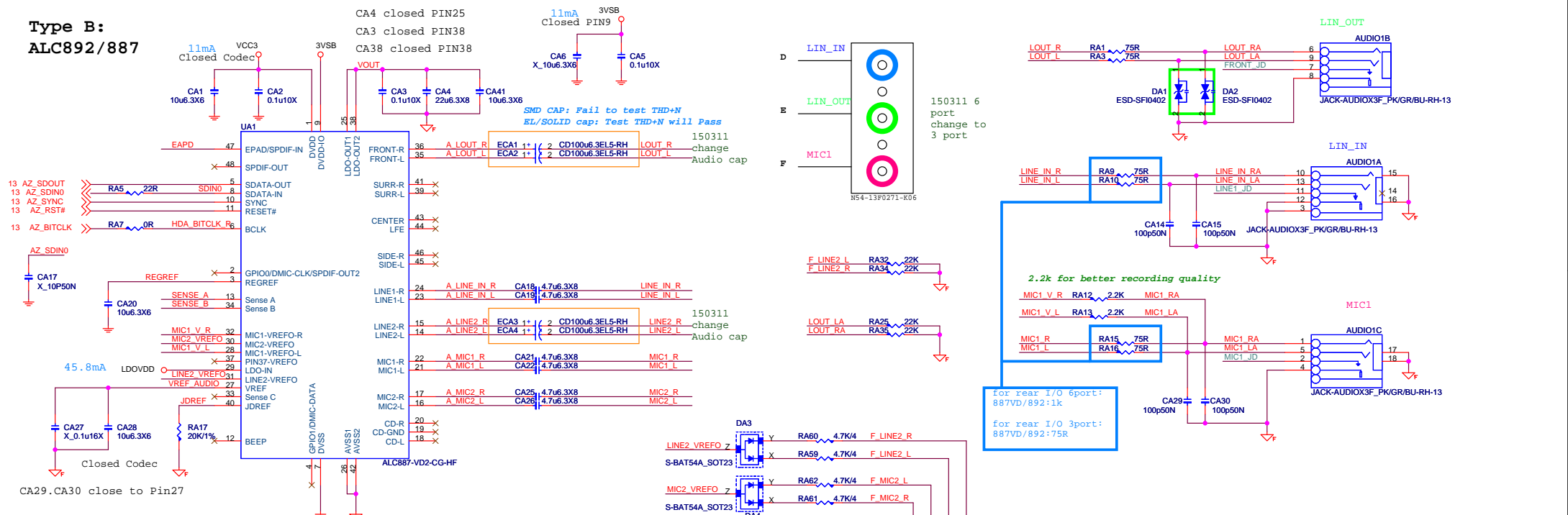


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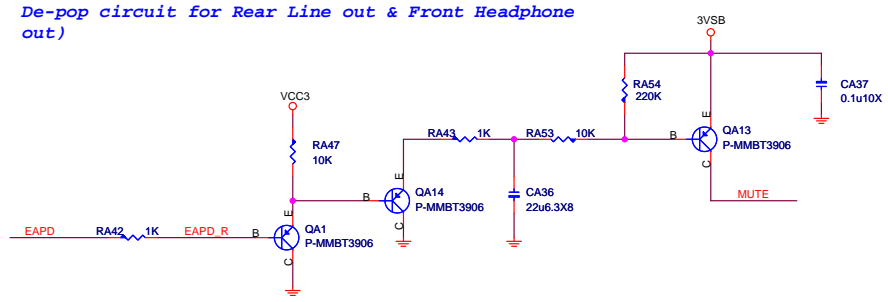
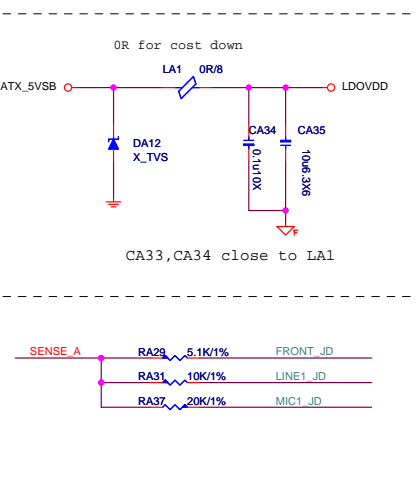
Size	Document Description	Rev
Custom	HDMI Connector	20
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Type B:  
ALC892/887



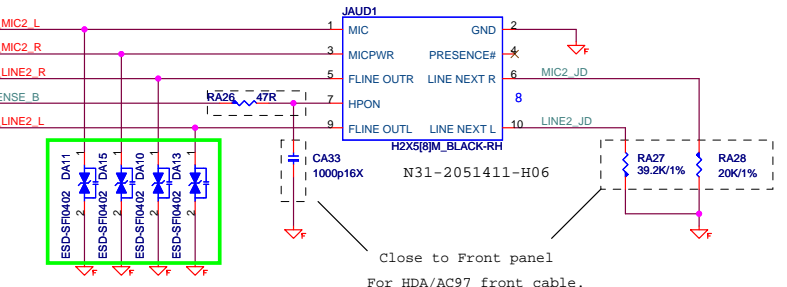
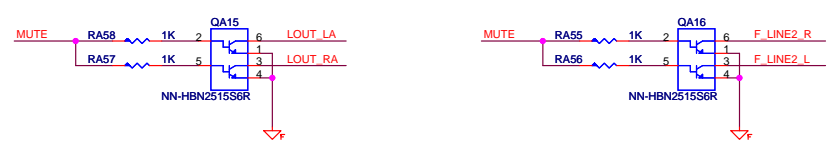
### Rear Line OUT De-POP circuit

De-pop circuit for Rear Line out & Front Headphone out)



## Digital

### Analog



Varister --> cap for cost down

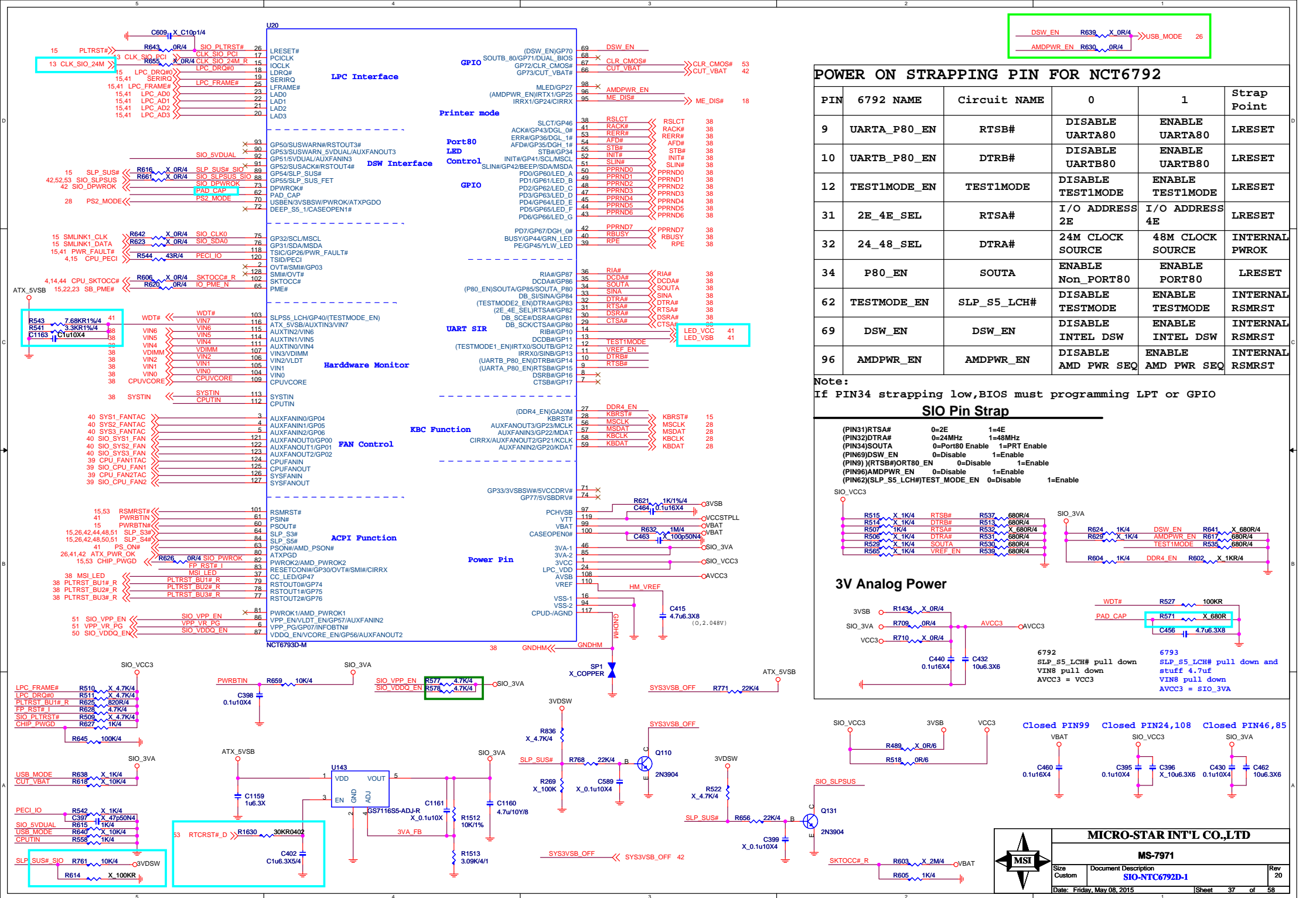
D0G-2950500-SI0  
D0G-3010510-I05  
Close to Jack



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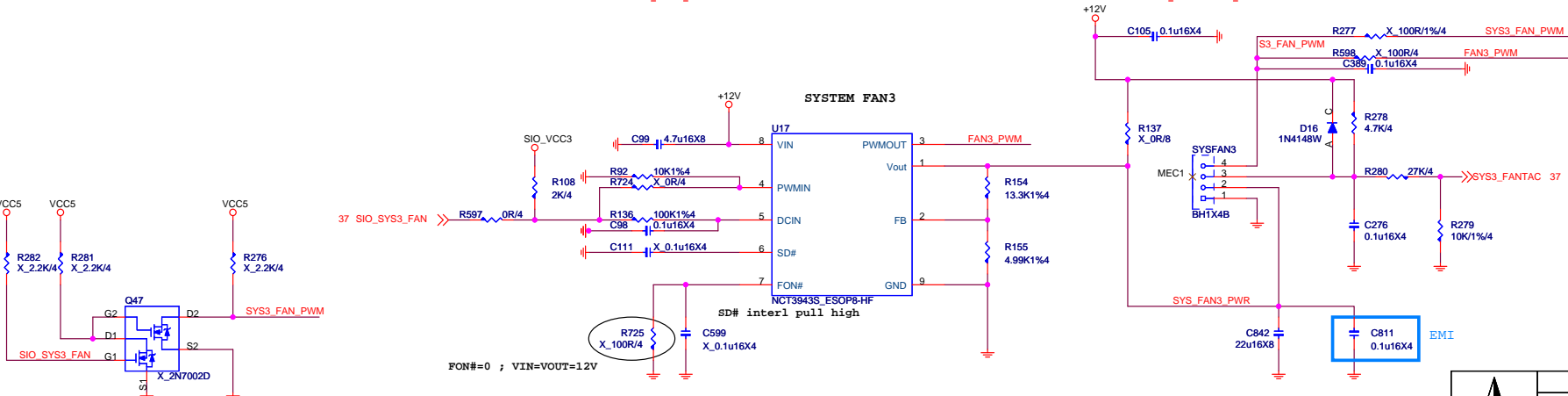
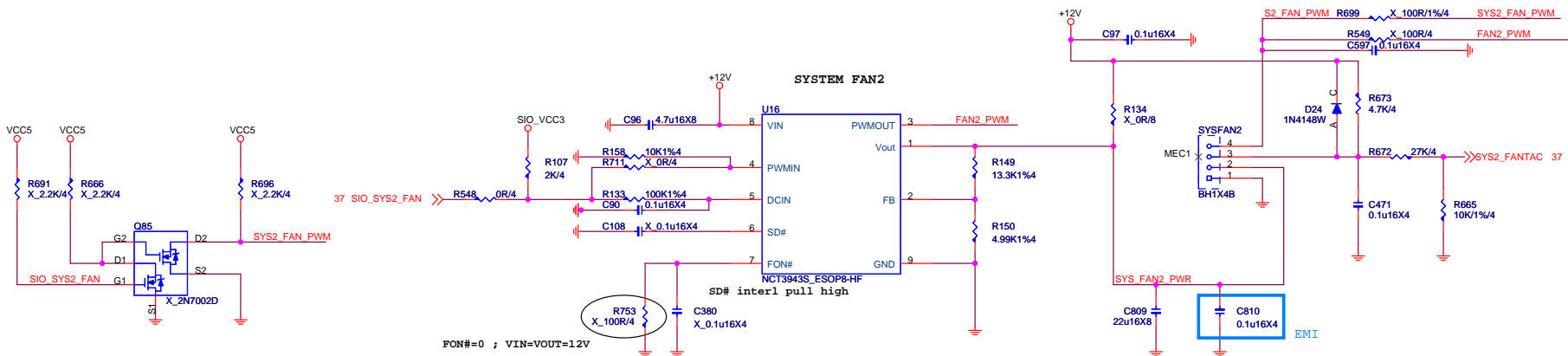
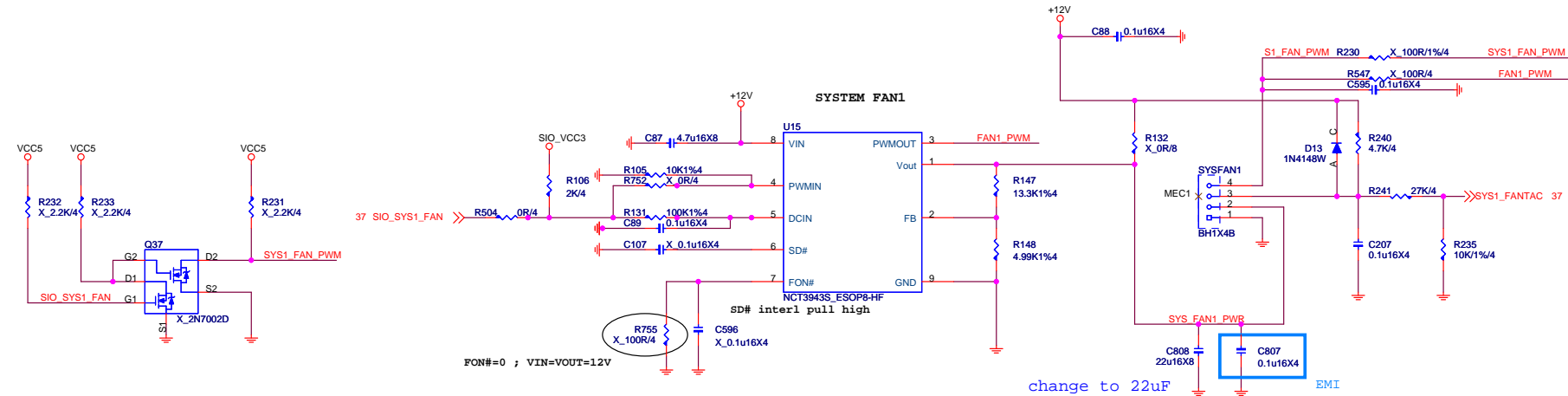
Size Custom	Document Description <b>AUDIO ALC887</b>	Rev 20
Date: Friday, May 08, 2015		Sheet 36 of 58







**Type H : 4 PIN SYSTEM FAN FROM SIO (Smart Fan/PWM MODE )(FOR NCT6776/5533)**

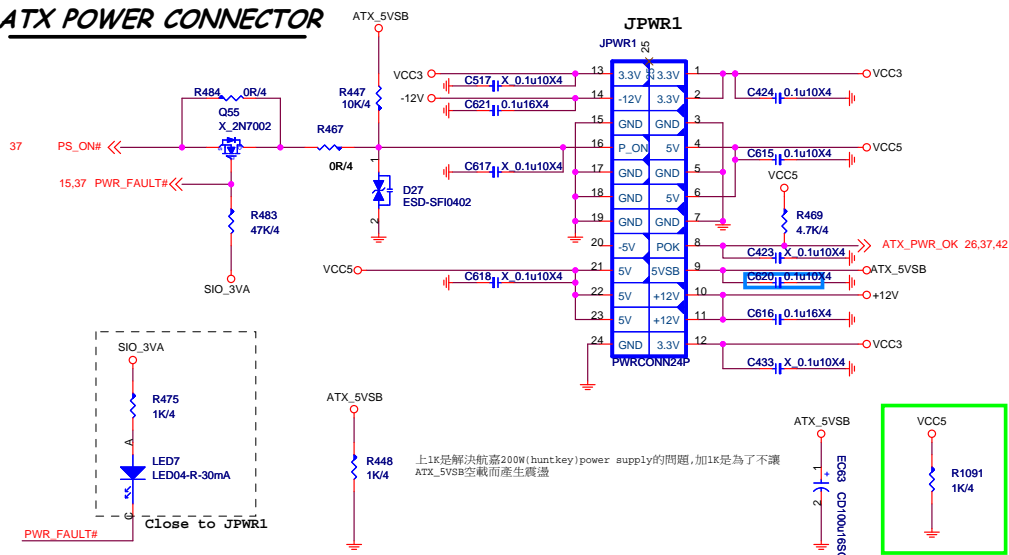


**MICRO-STAR INT'L CO.,LTD**

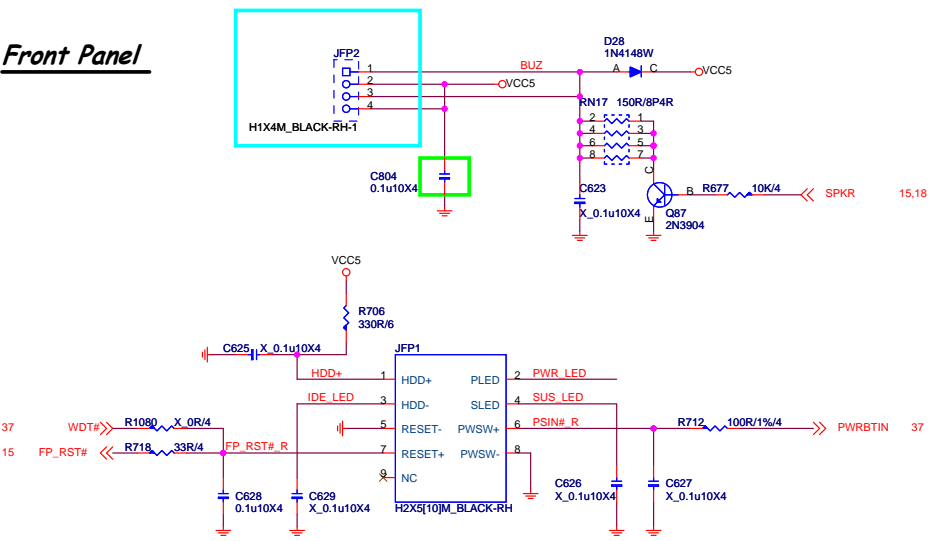
MS-7971

Size Custom	Document Description <b>SYSTEM FAN</b>	Rev 20
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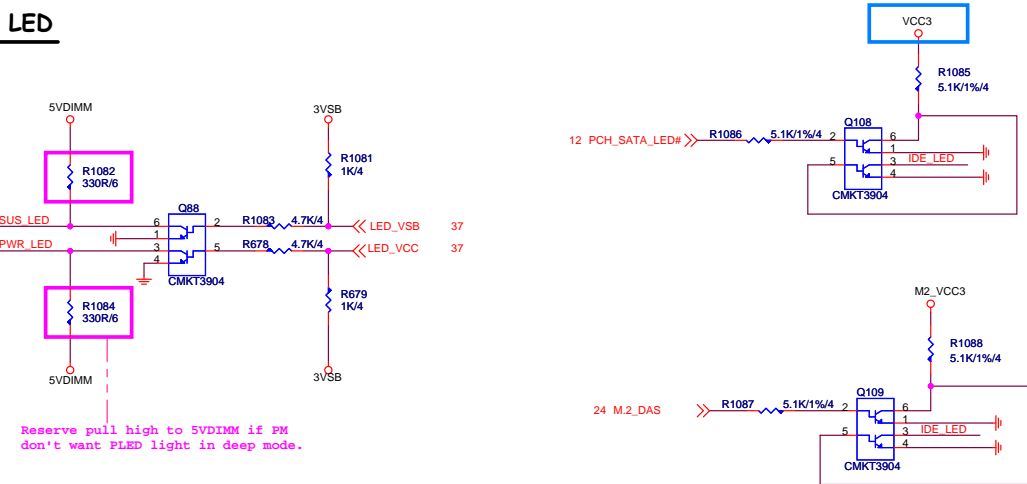
ATX POWER CONNECTOR



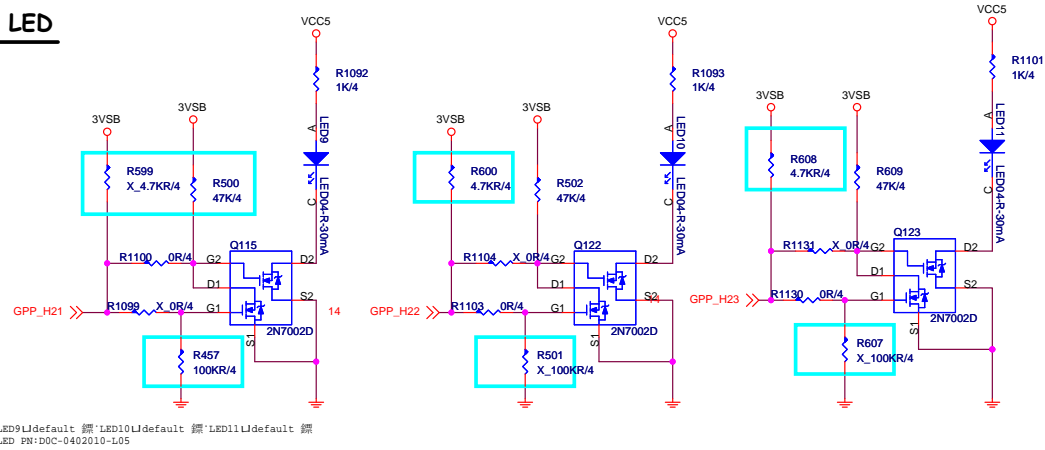
Front Panel



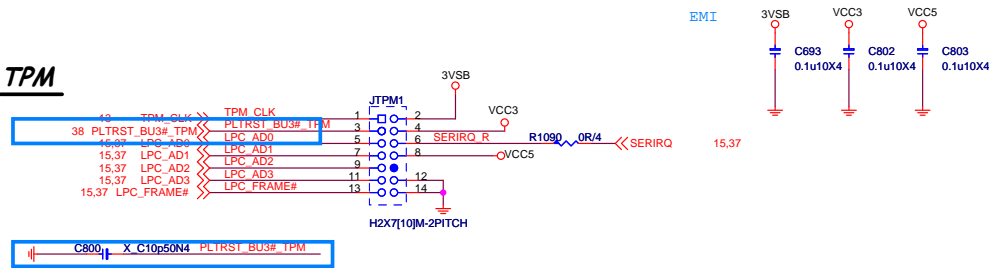
LED



LED



TPM

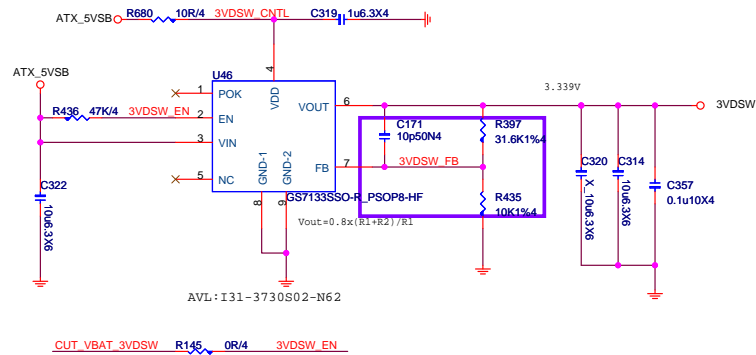


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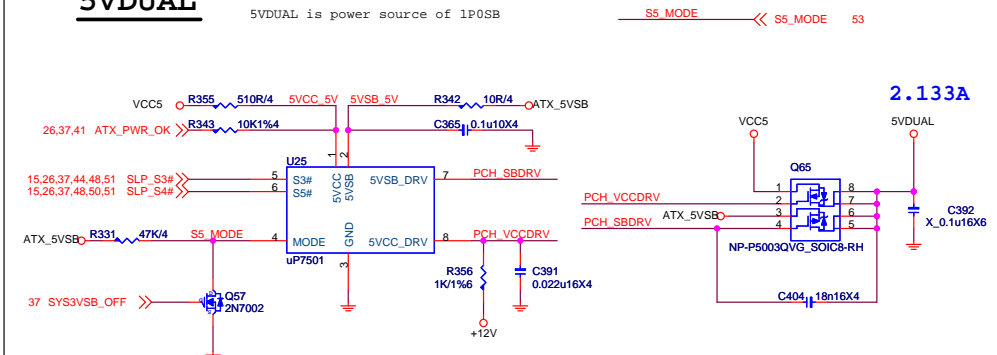
Size	Document Description	Rev
Custom	ATX Power/F_Panel	20
Date: Friday, May 08, 2015	Sheet 41 of 58	

## 3VDSW

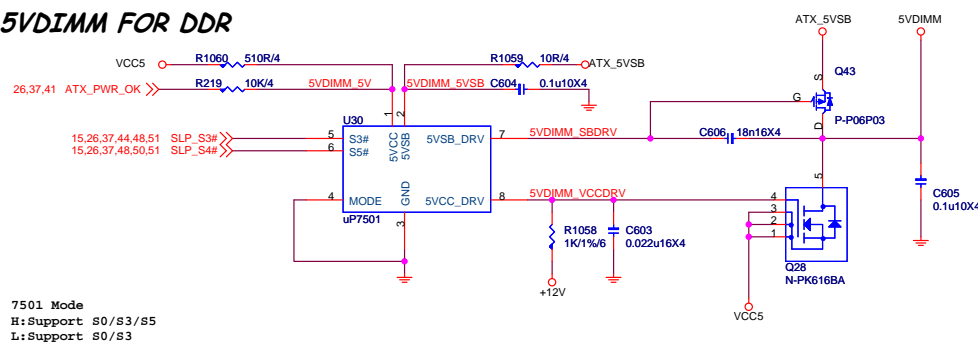


## 5VDUAL

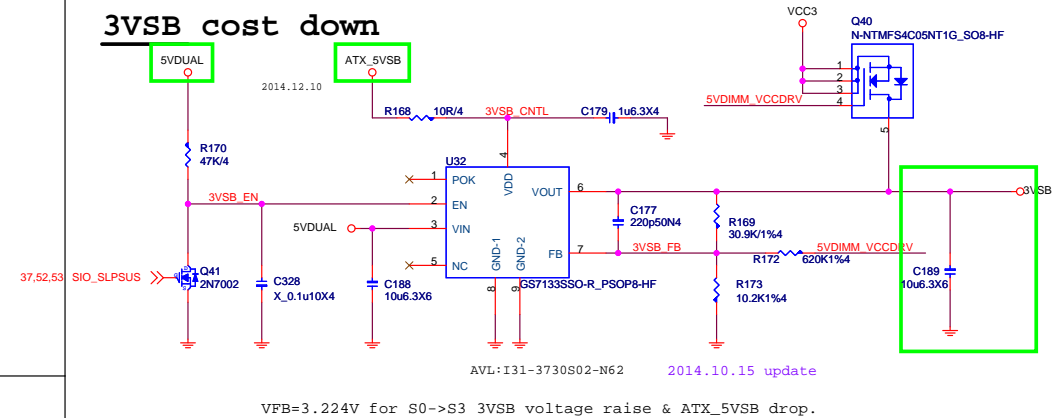
5VDUAL is power source of 1P0SB



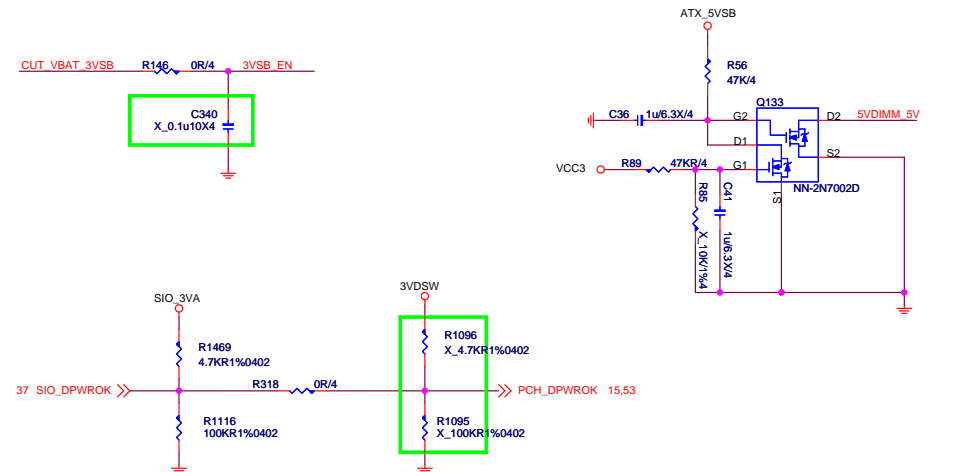
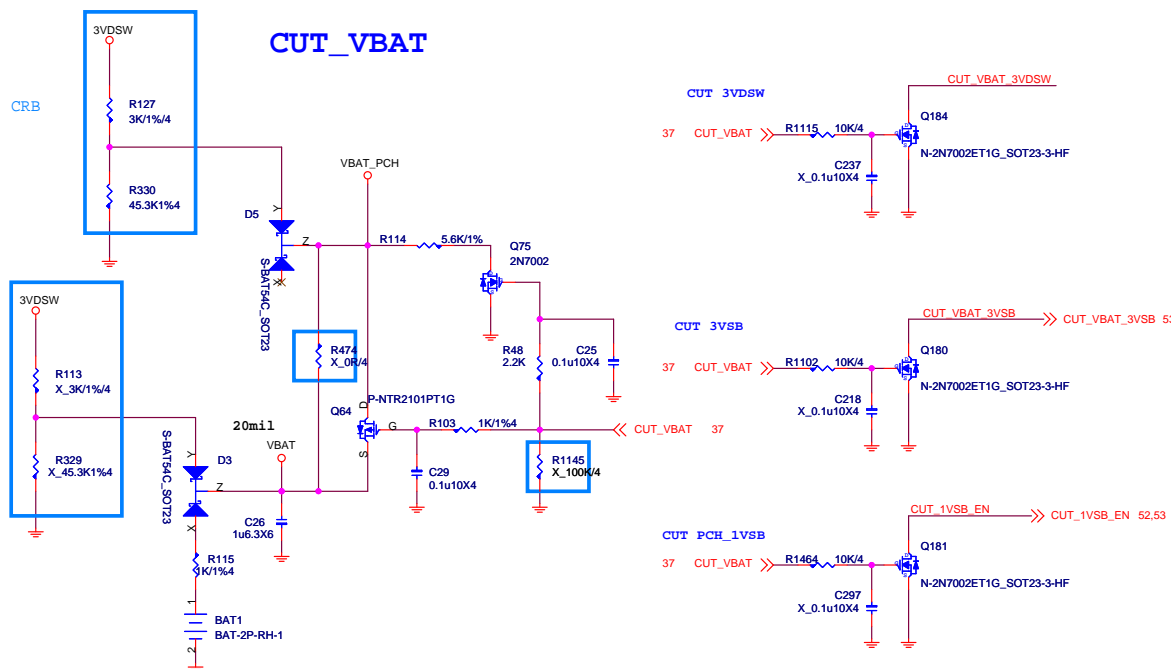
## 5VDIMM FOR DDR



## 3VSB cost down



## CUT\_VBAT



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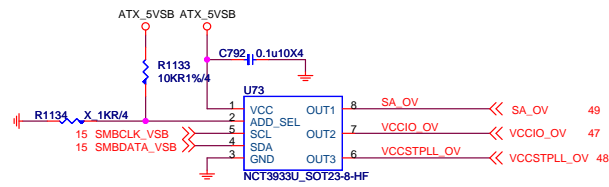
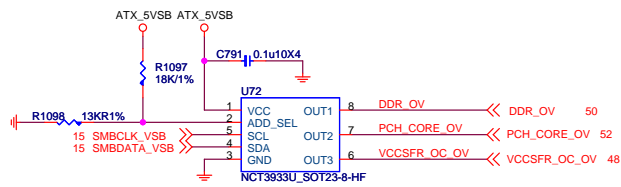
Size	Document Description	Rev
Custom	ACPI UPI	20
Date: Friday, May 08, 2015	Sheet 42 of 58	

Remove Cut Power.

### UPI VOLTAGE CONSOLE

0x26:RH=18K,RL=13K

0x20:RH=10K,RL=OPEN



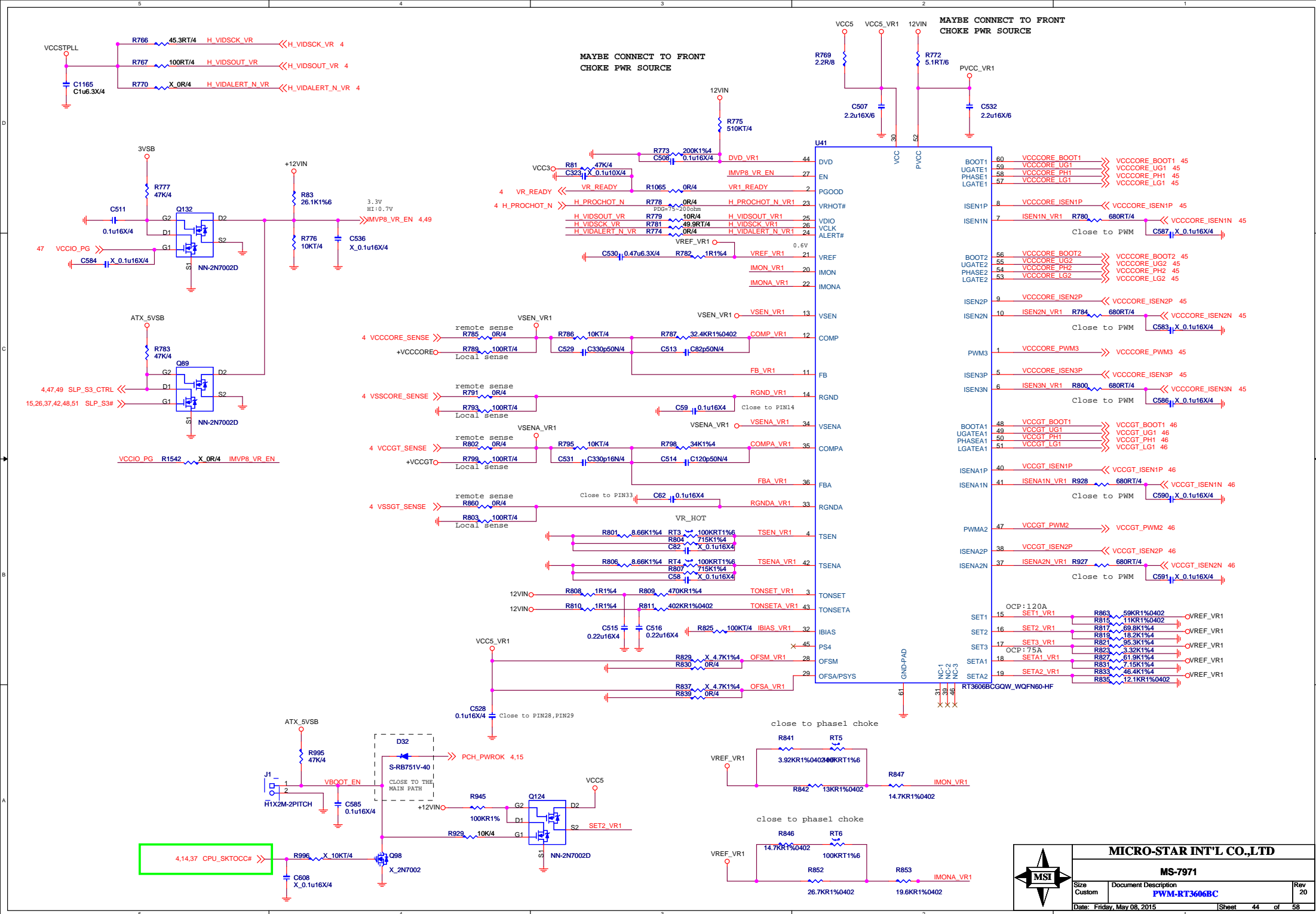
ADDRESS	0x2A	0x28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%

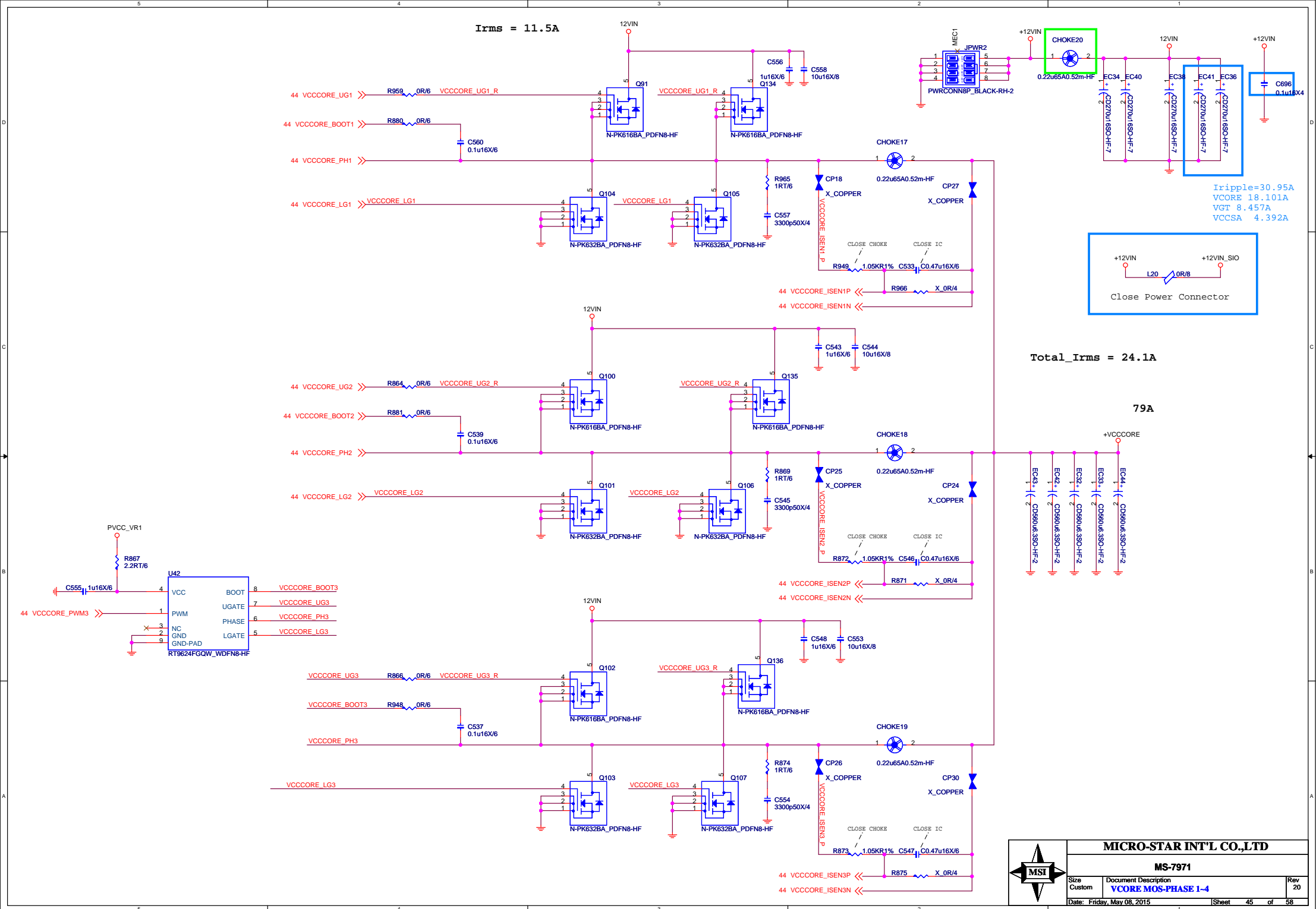


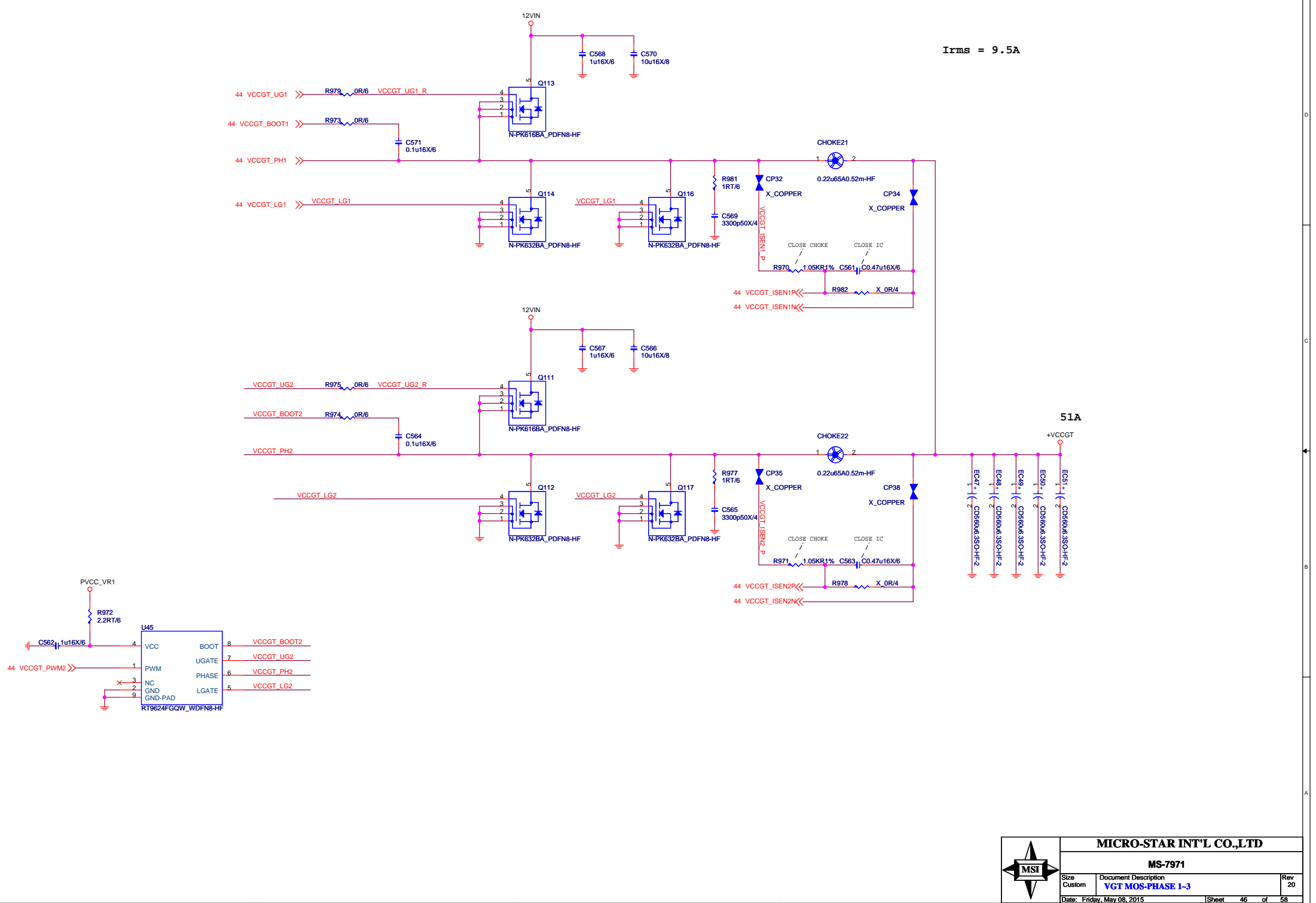
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Size	Document Description	Rev
Custom	OV-NCT3933/GPIO-NCT5605	20
Date: Friday, May 08, 2015 Sheet 43 of 58		



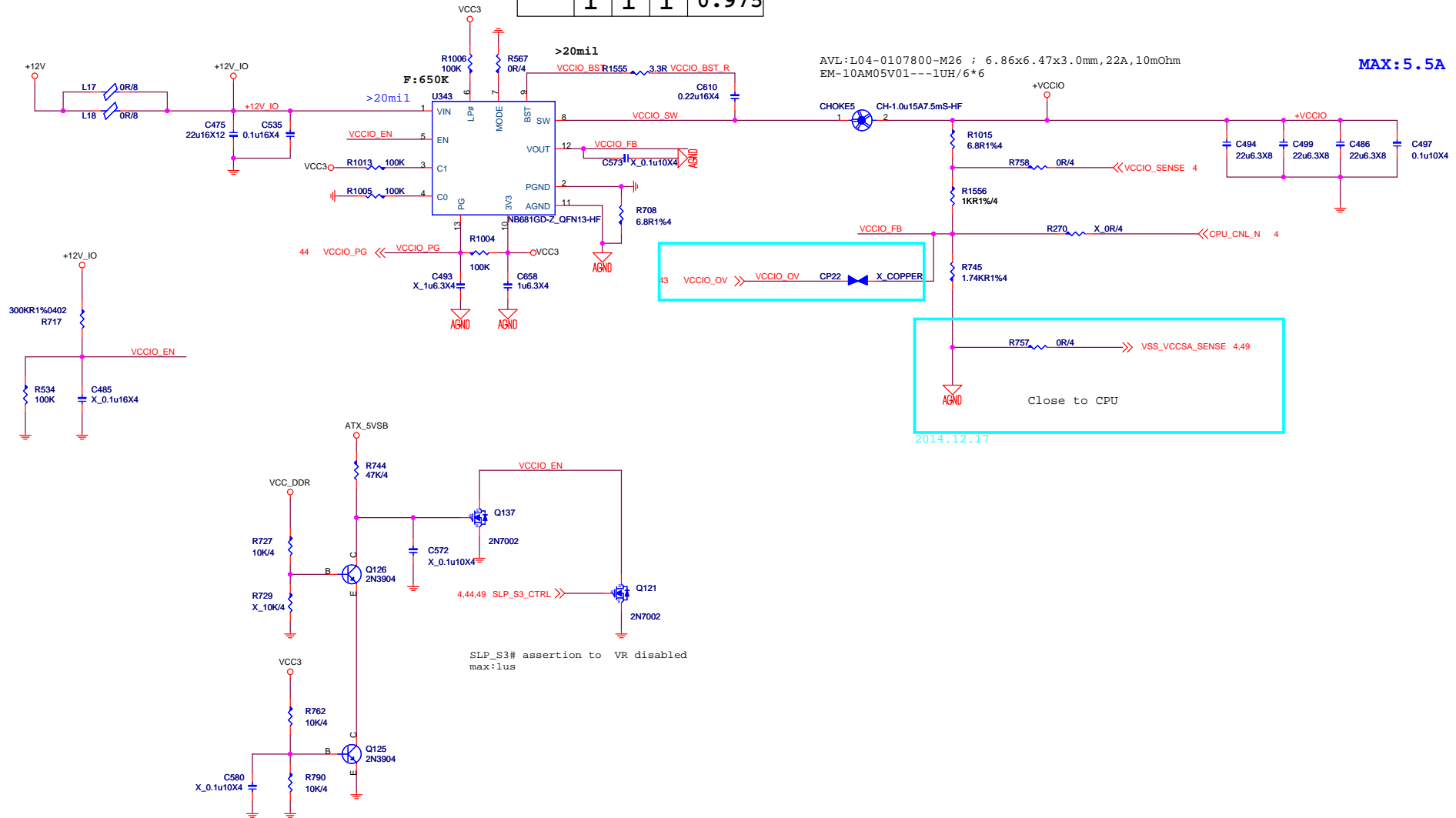




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MS-7971		
Size Custom	Document Description <b>VGT MOS-PHASE 1-3</b>	Rev 20
Date: Friday, May 08, 2015		
Sheet 46 of 58		

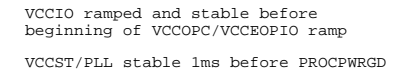
**VCCIO**  
0.95V; 5.5A  
IMAX 6A  
ILIMIT=8.5~9A

	LP#	C1	C0	VOUT(V)
VCCIO	0	X	X	0
	1	0	0	0.85
	1	0	1	0.875
	1	1	0	0.95
	1	1	1	0.975



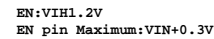
for Gaming3/5, Classic, ECO  
and H110

For Cost down VCCST&VCCPLL merge

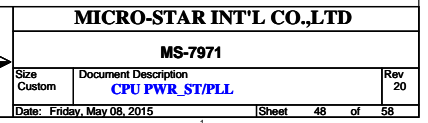
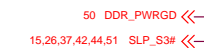


1.2V; 110mA

1.2V; 110mA



2014.08.25 update  
S3 have power

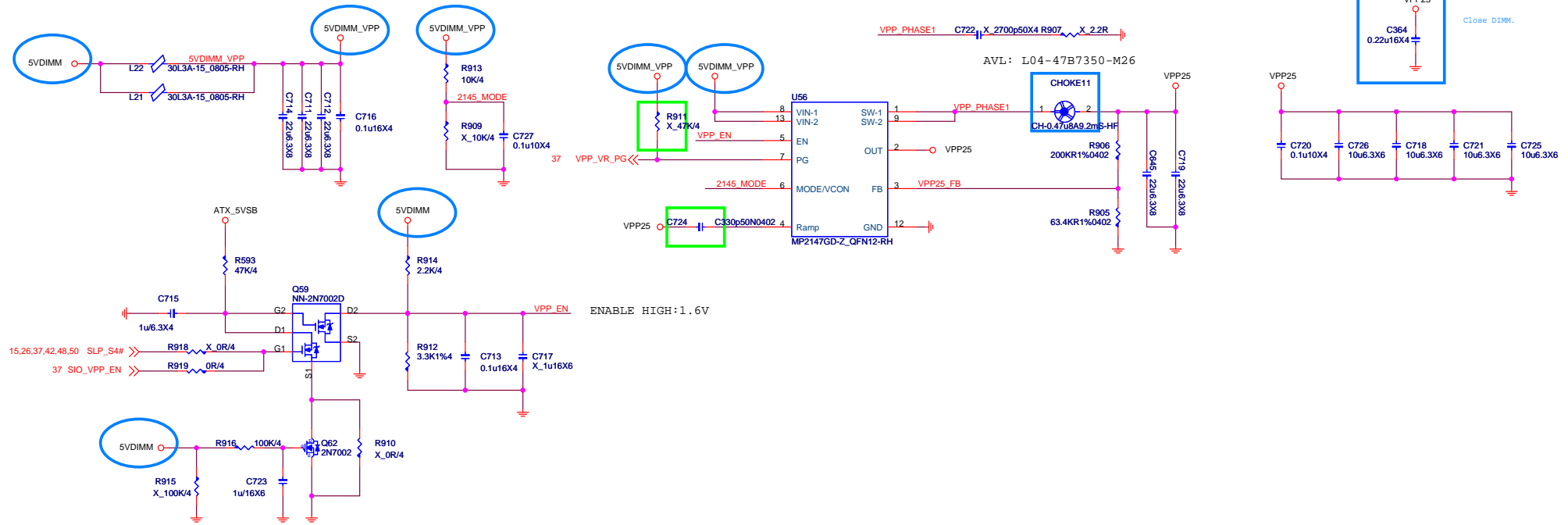


Size Custom	Document Description <b>CPU PWR_SA-RT8125C</b>	Rev 20
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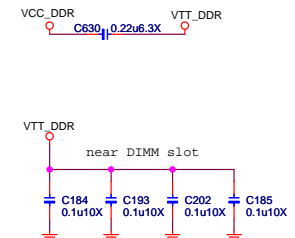
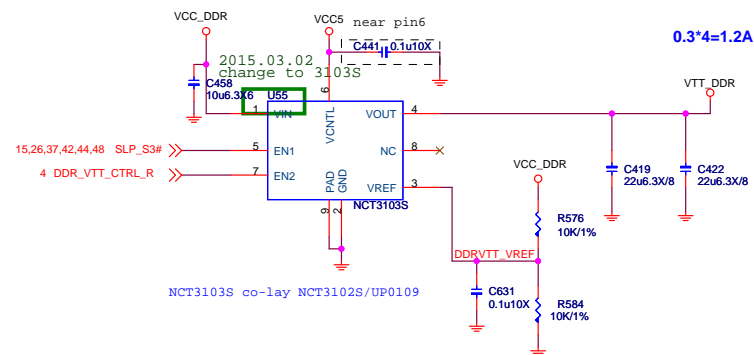
4DIMM :2.24A FOR DDR VPP2.5V

**VPP25 Power**  
**2.5V; 2.24A**



To make sure VPP EN after 5VDIMM stable

### DDR VTT Power



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PCB



PD0-0791810-G37, 精成, 23, 寶安恩斯邁廠 (MSIS)  
PD0-0791810-G37, 精成, 77, 寶安恩斯邁廠 (MSIS)  
PD0-0791810-E48, 競華, 23, 寶安恩斯邁廠 (MSIS)  
PD0-0791810-E48, 競華, 77, 寶安恩斯邁廠 (MSIS)

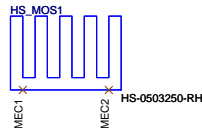
CPU Socket



Battery



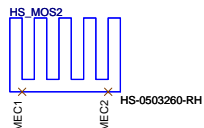
MOS1 Heatsink



BIOS Label



MOS2 Heatsink



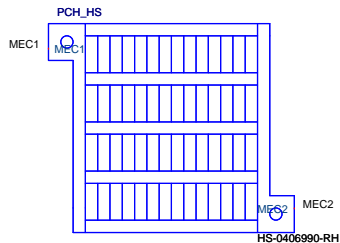
PCH\_H170



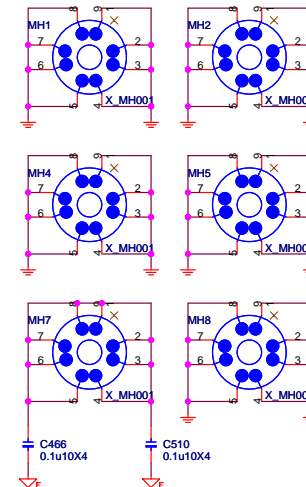
PCH\_B150



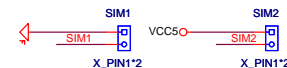
SPL\_BH



Mounting Holes



Simulation



Test point



Optical Fiducial Marks-120

