

TITLE	Page
Cover Sheet	1
Block Diagram	2
CPU-Memory ,CPU-PEG/Display	3,4
O5 CPU-Control/MISC/CFG/Audio	5
CPU-Power/CPU-GND	6,7
DDR III DIMM1	8
DDR III DIMM2	9
PCH-USB/PCIE/DMI/SATA	10
PCH-Audio/Display/Clock	11
PCH-GPIO/USBOC#/SATASTRAP	12
PCH-LPC/SPI/SMBUS/MISC	13
PCH-Power,PCH-GND,PCH-Strap	14,15,16
PCIE SLOT-CPU(X16),PCIE SLOT-PCH(X1)	17,18
ASM1083 PCI Bri.,PCI x1 Slots	19,20
BIOS ROM/TPM/Debug LED	21
AUDIO 887, AUDIO de-pop circuit	22,23
LAN - Intel I219V	24
DVI,HDMI,VGA Connector	25,26,27
USB2.0 & USB3.0 & SATA Connector	28,29,30
SIO-NCT6793D,CLR COMS&CUT VBAT	31,32,33
CPU FAN & SYS FAN Controllor	34,35
ATX F_Panel/EMI/ECO/ACPI Controllor UPI	36,37
PWM-RT3606BC/VCORE 3PHASE/VGT 2PHASE	38,39,40
DDR-RT8231	41
VCCSA POWR-UP1540Q/VCCIO POWER-NB681	42,43
VCCSTPLL & PCH_1P8/PCH Core power_RT8125	44,45
Clock Gen_IDT6V41532/Manual parts	46,47
Power Map/Power Sequence/GPIO MAP	48,49,50
Revision History	51

MS-7979

Intel -Skylake plamform B150

mATX

Ver: 1.0A (210 x 243)

CPU:
SKL-S LGA1151

System Chipset:
SPT-H B150

Onboard Chipset:
HD Audio Codec: ALC1150
LAN: Intel I219V
SIO: Nuvoton 5563D
Flash ROM: SPI 8MB
DP to VGA: ITE6515

Main Memory:
DDR4 * 4

Expansion Slots:
PCI Express (X16) Slot *
1 PCI Express (X1) Slot
*** 1 PCI Express (X1)**
Slot * 1 PCI Express
(X4) Slot * 1

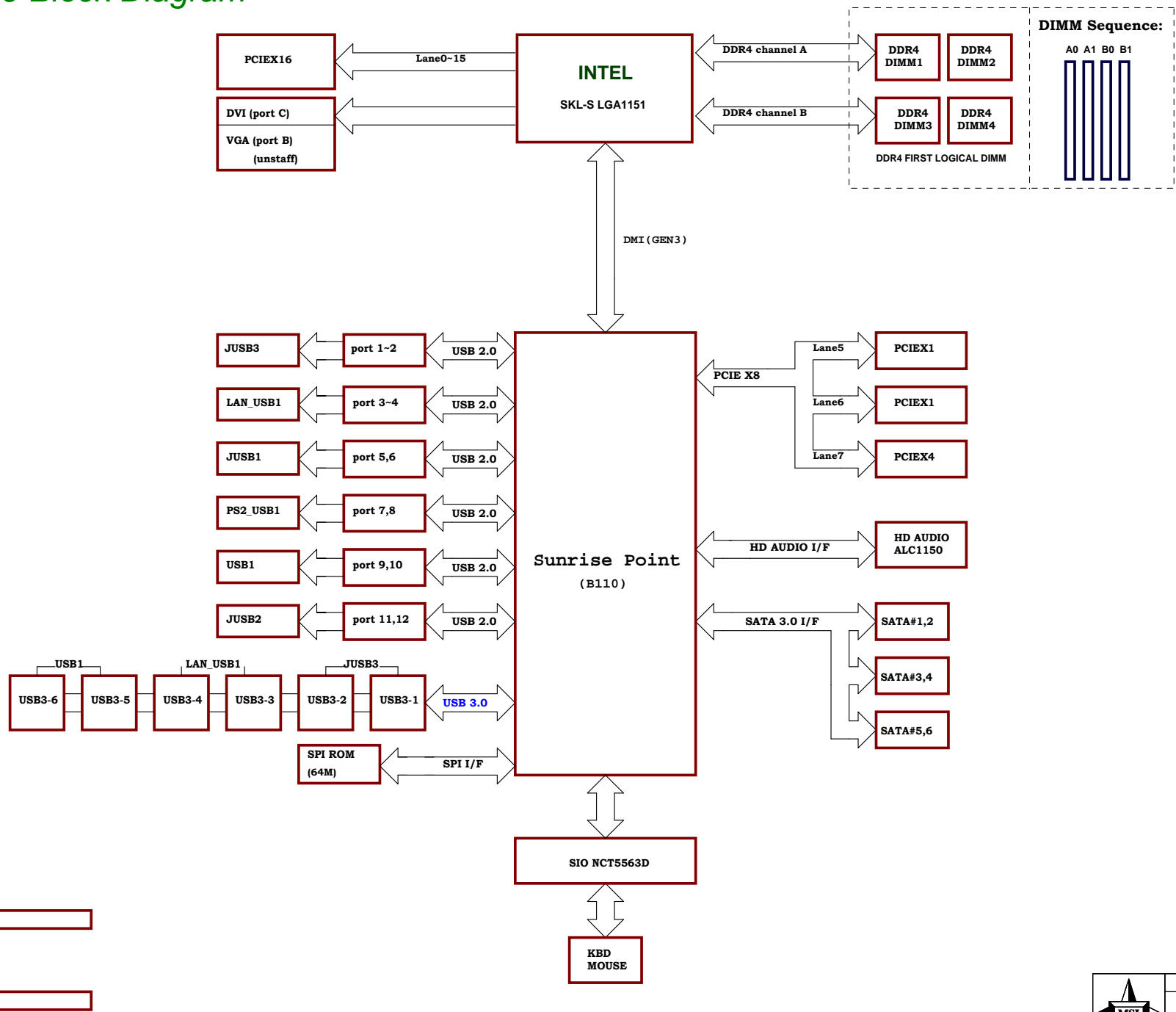
PWM:
VCORE - RT3606
DDR - RT8125
PCH - UP1540Q
VCCSA - RT8125
VCCIO - NB681(Converter)

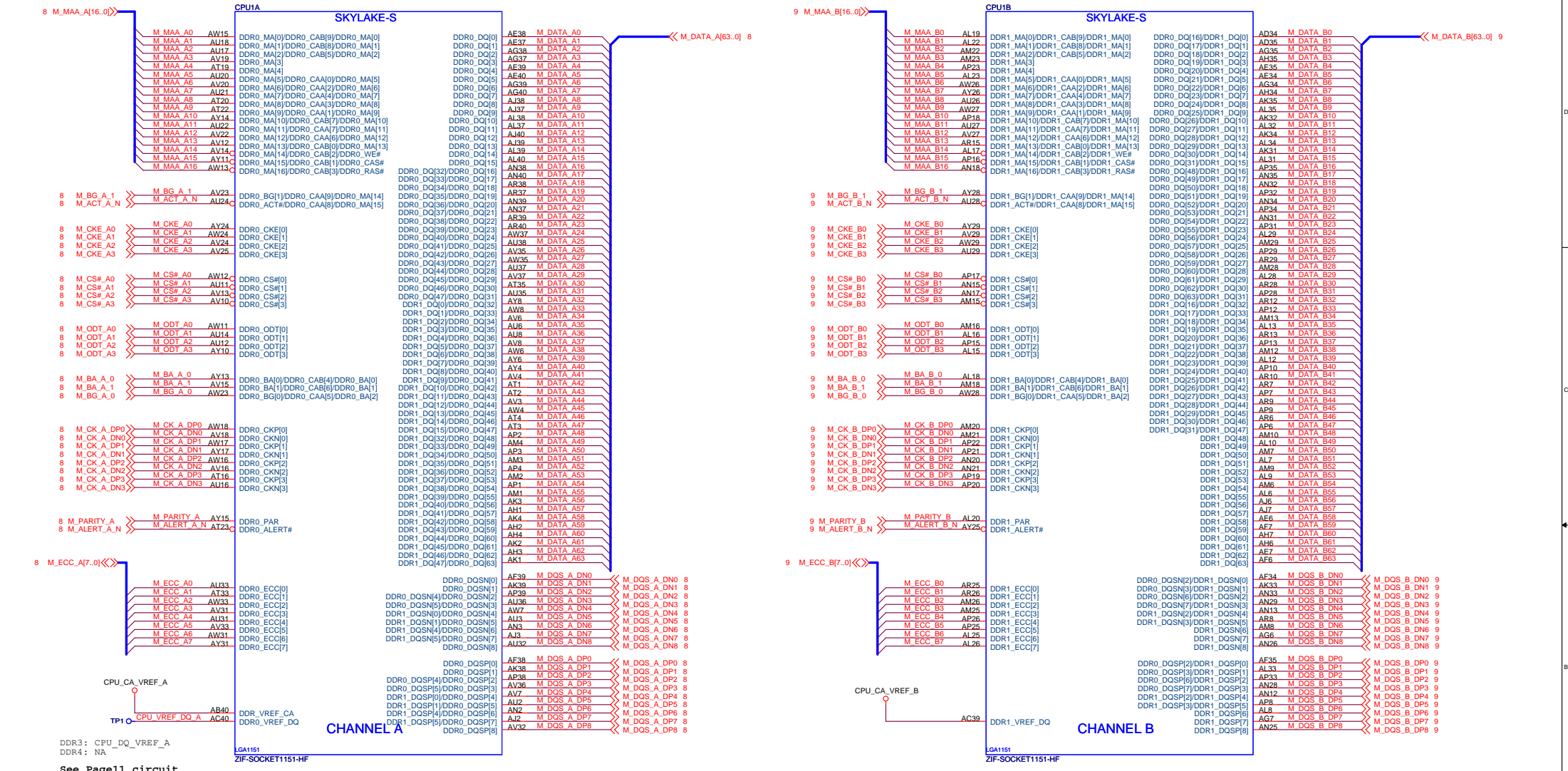
Other:
SATA3.0 * 6
FRONT USB2.0 * 4
FRONT USB3.0 * 2
REAL USB2.0 * 4 REAL
USB3.0 * 4

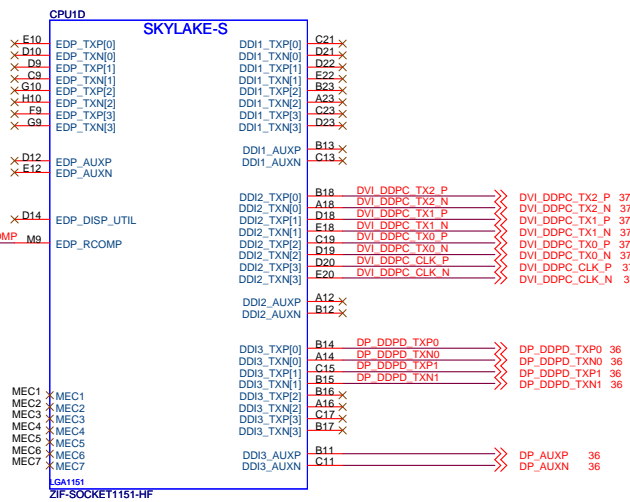
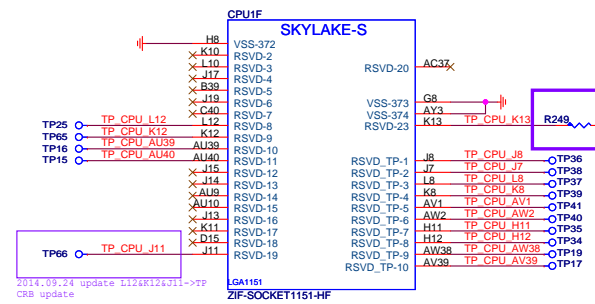
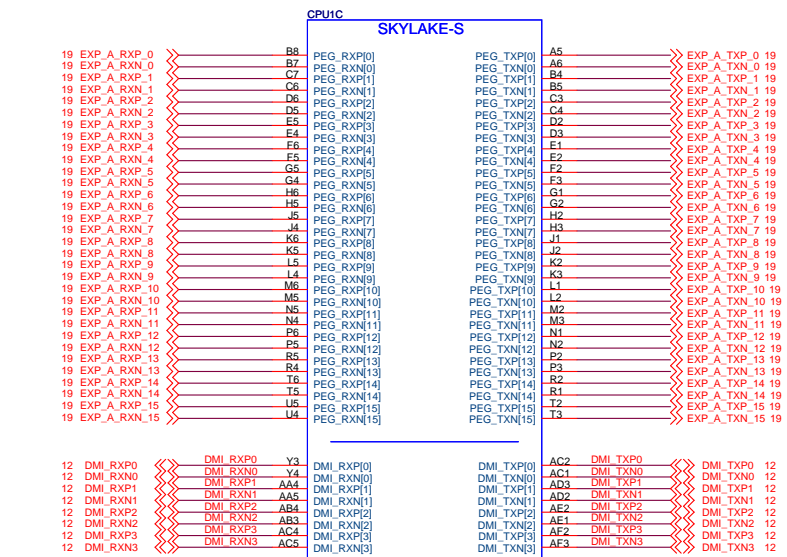
LDO:

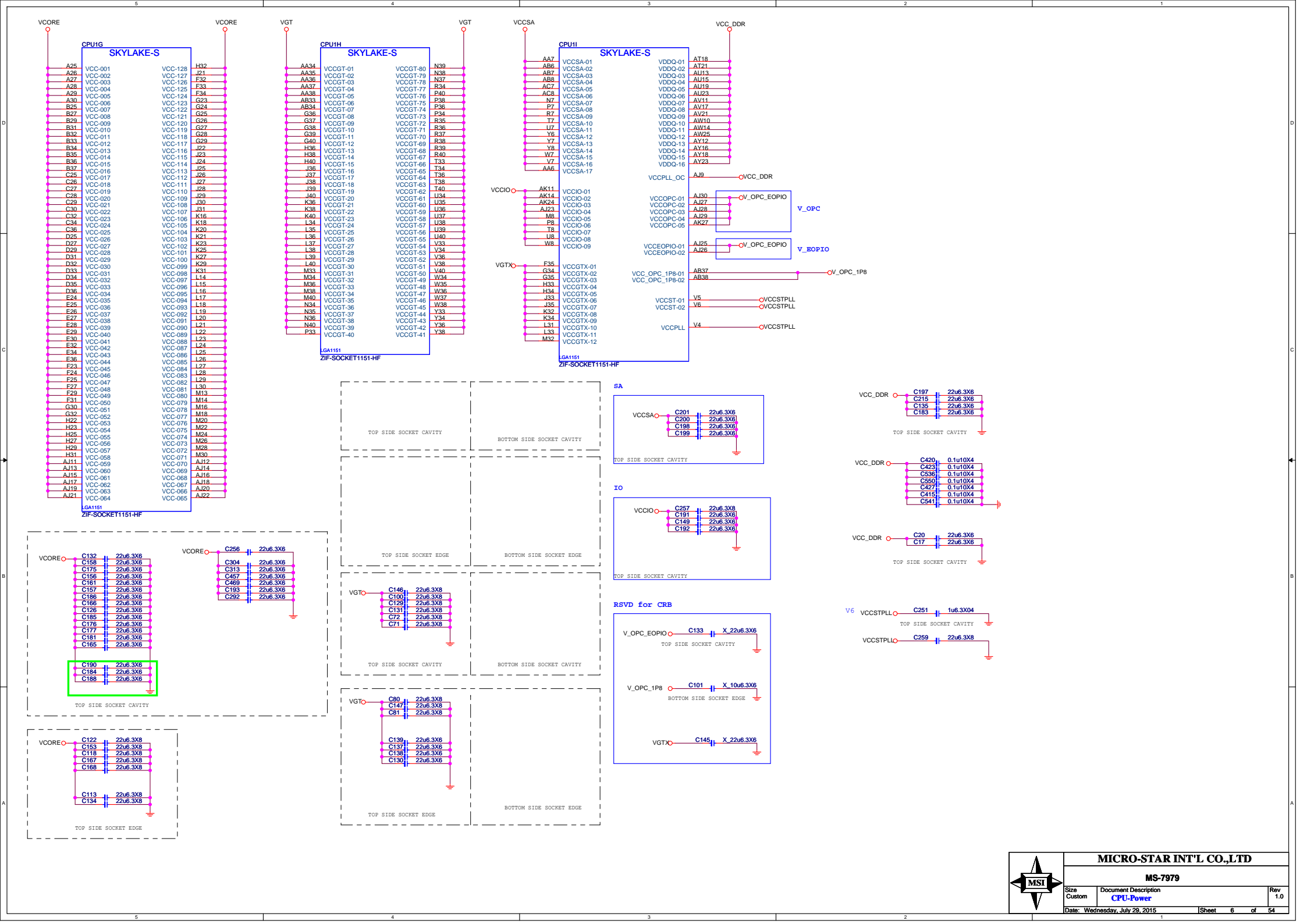
ACPI:
5VDAUL:uP7501
5VDIMM:uP7501
3VSB:GS7166+N MOS
3VDSW:GS7166

MS-7979 Block Diagram





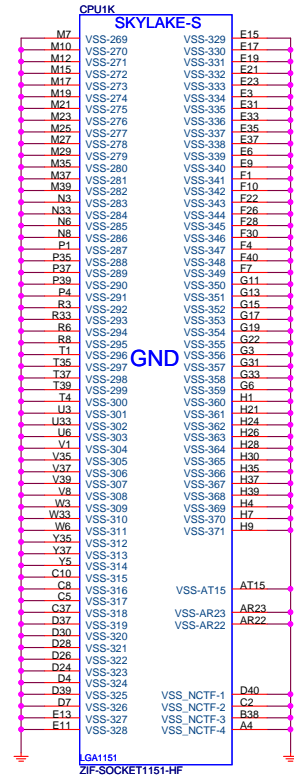
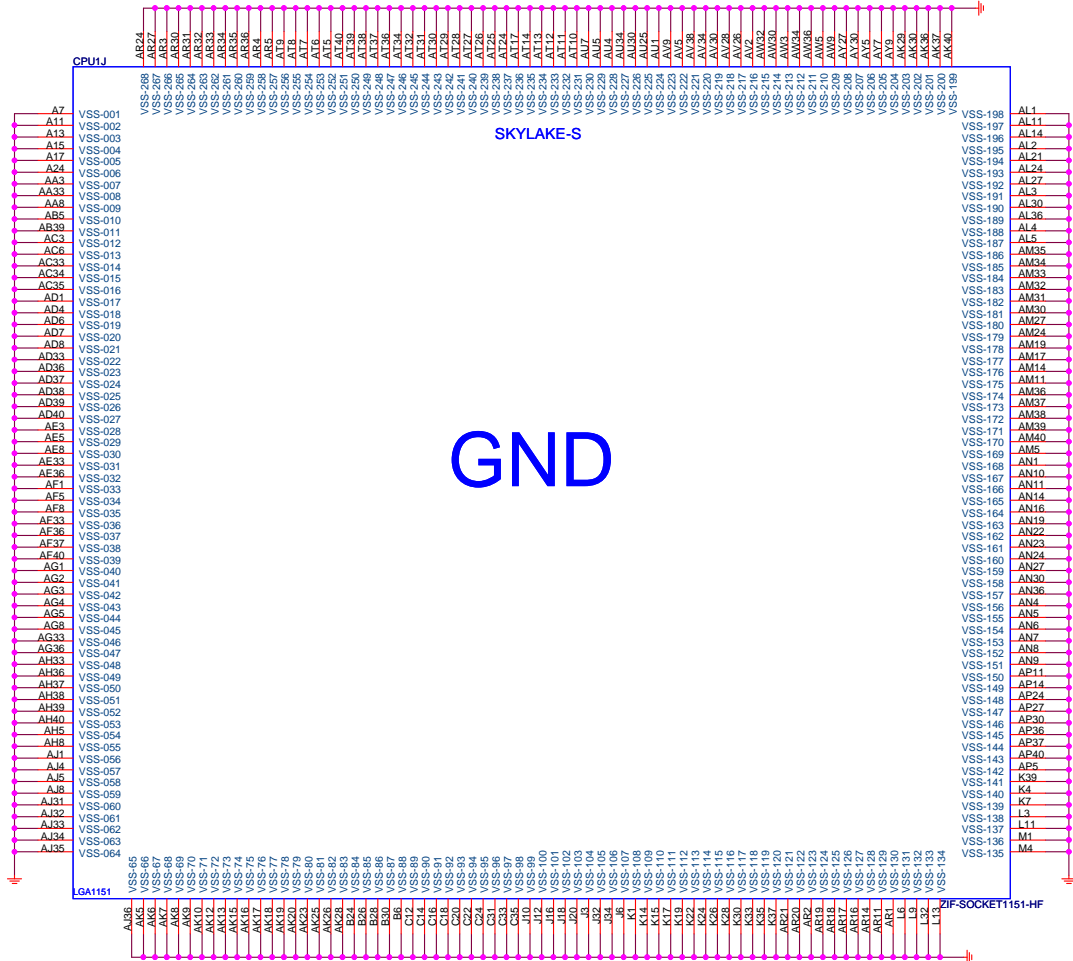


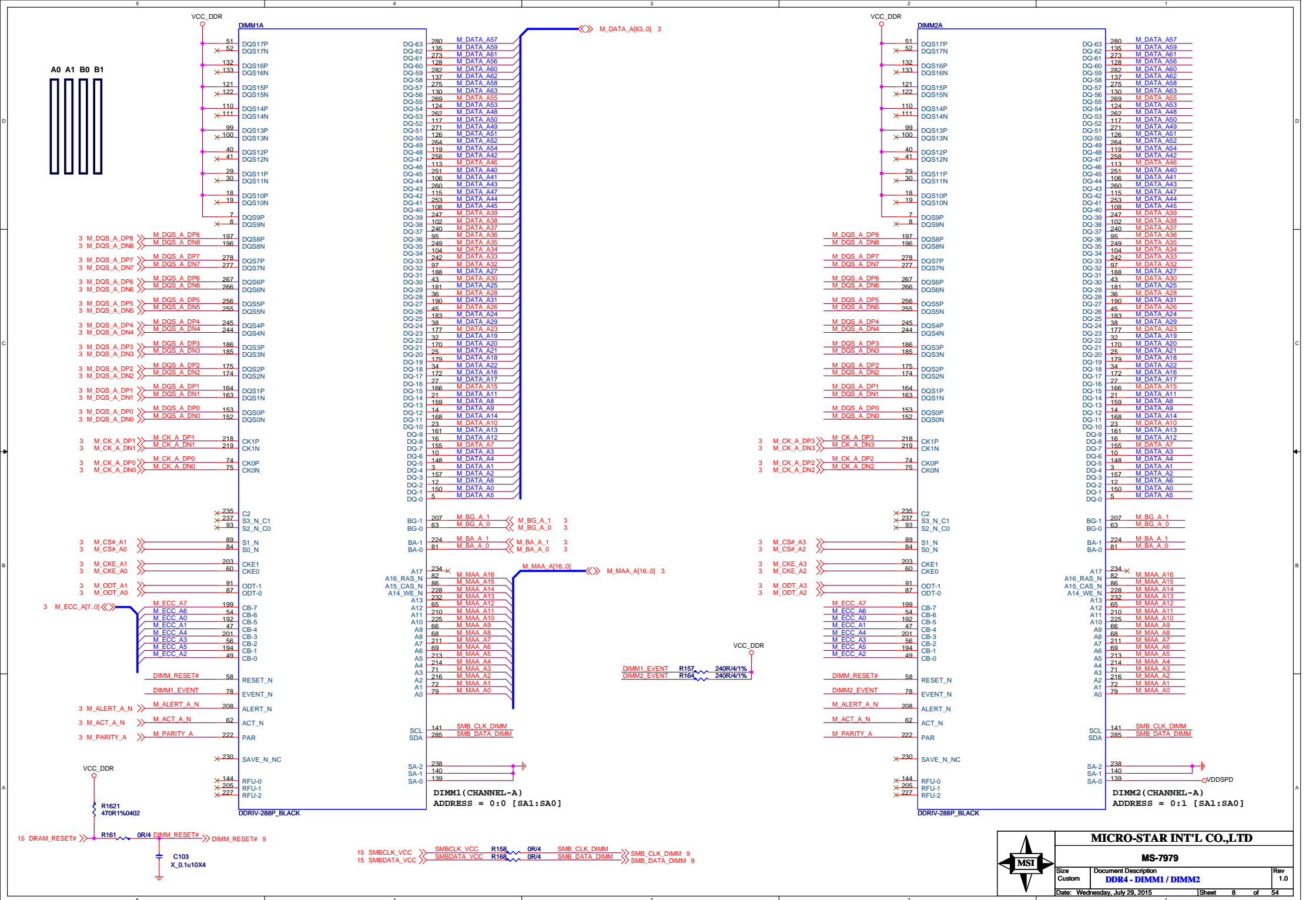


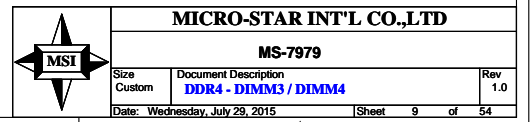
MICRO-STAR INT'L CO.,LTD

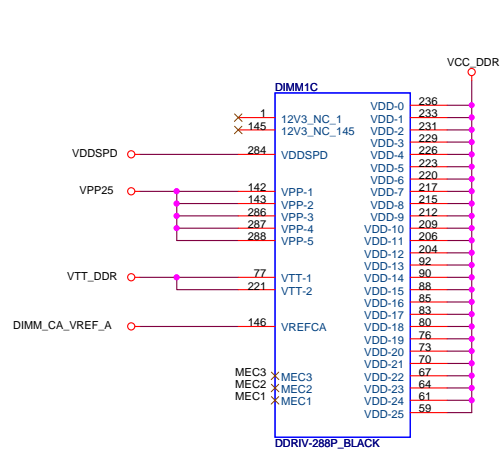
MS-7979

Size Custom	Document Description CPU-Power	Rev 1.0
Date: Wednesday, July 29, 2015	Sheet 6 of 54	

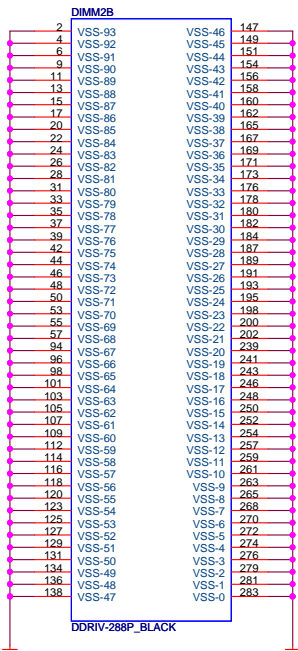
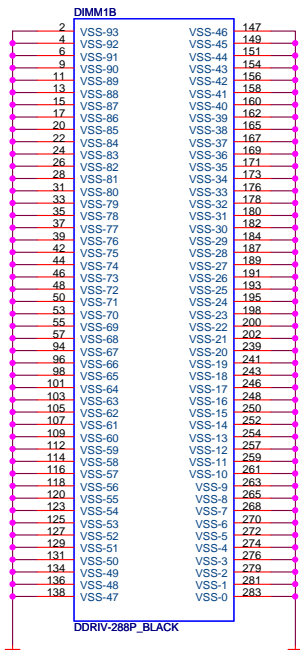
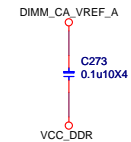
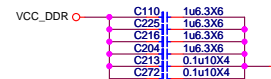
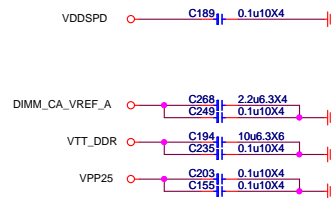
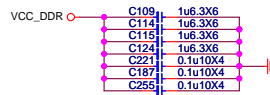
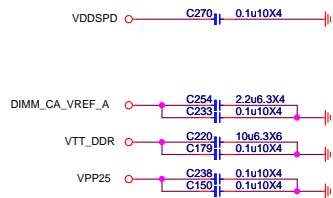
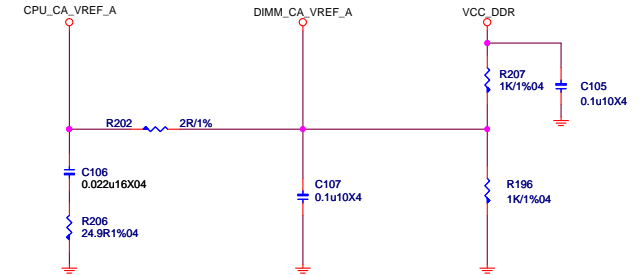
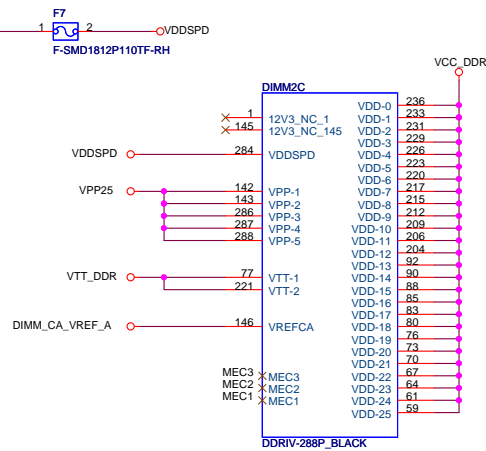
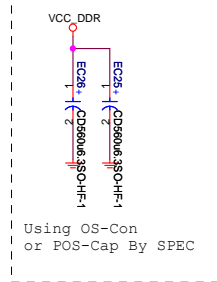


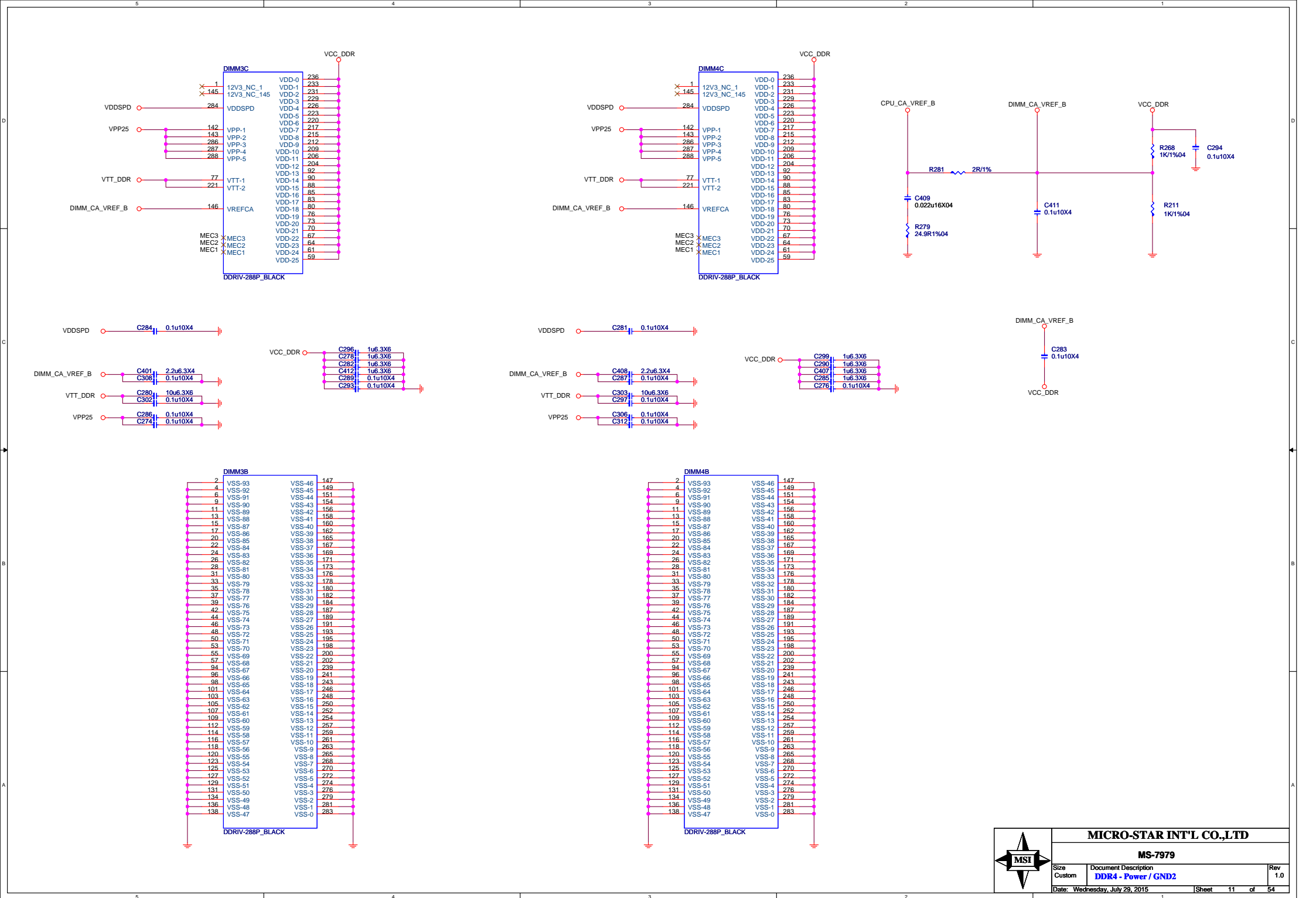


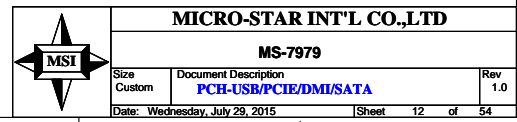
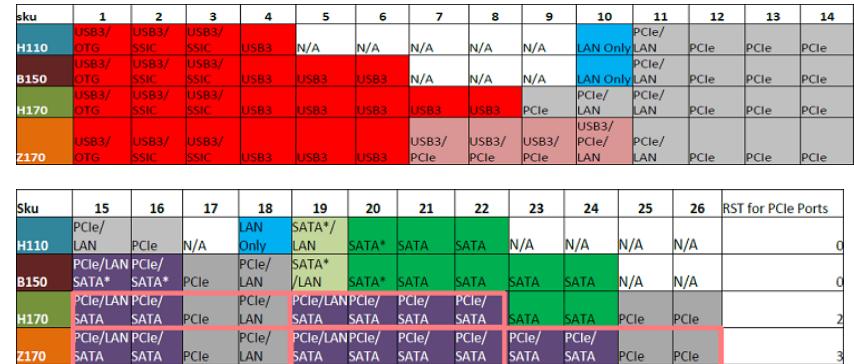


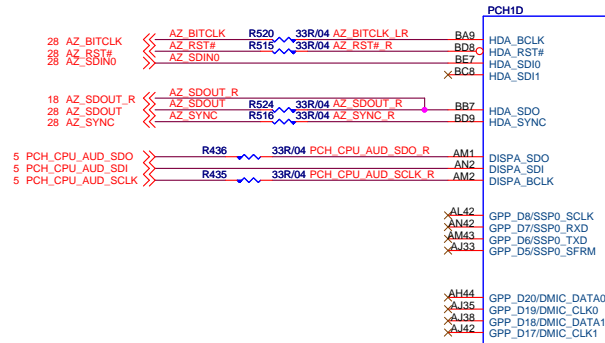
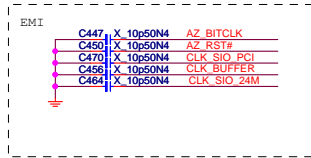


DIMM SLOT PN BY SPEC







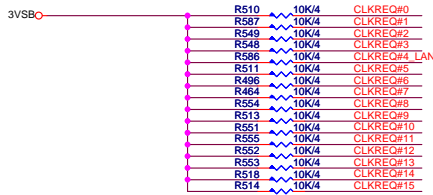
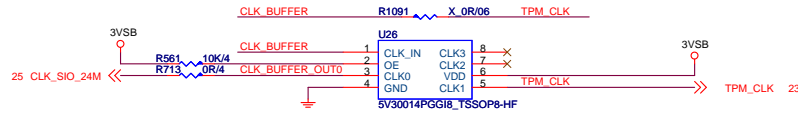


AUDIO

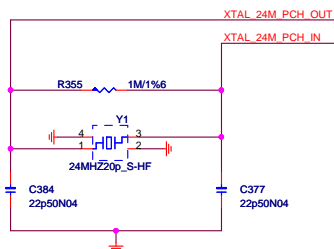
4 OF 10

SPT-H

24M CLOCK BUFFER



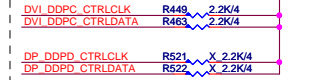
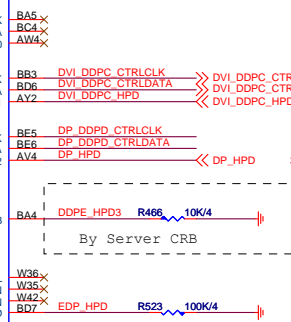
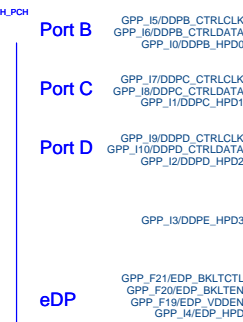
Contact to SLOT Pin B12
for support L1 PM Substates
MR also can disable this function.



Clock

3 OF 10

SPT-H



DDI interface Disable no connect
By PDG V0.7 page115
MAX Length to PCH:1"

Port B HDMI

Port C DVI,HDMI2.0 OR Others

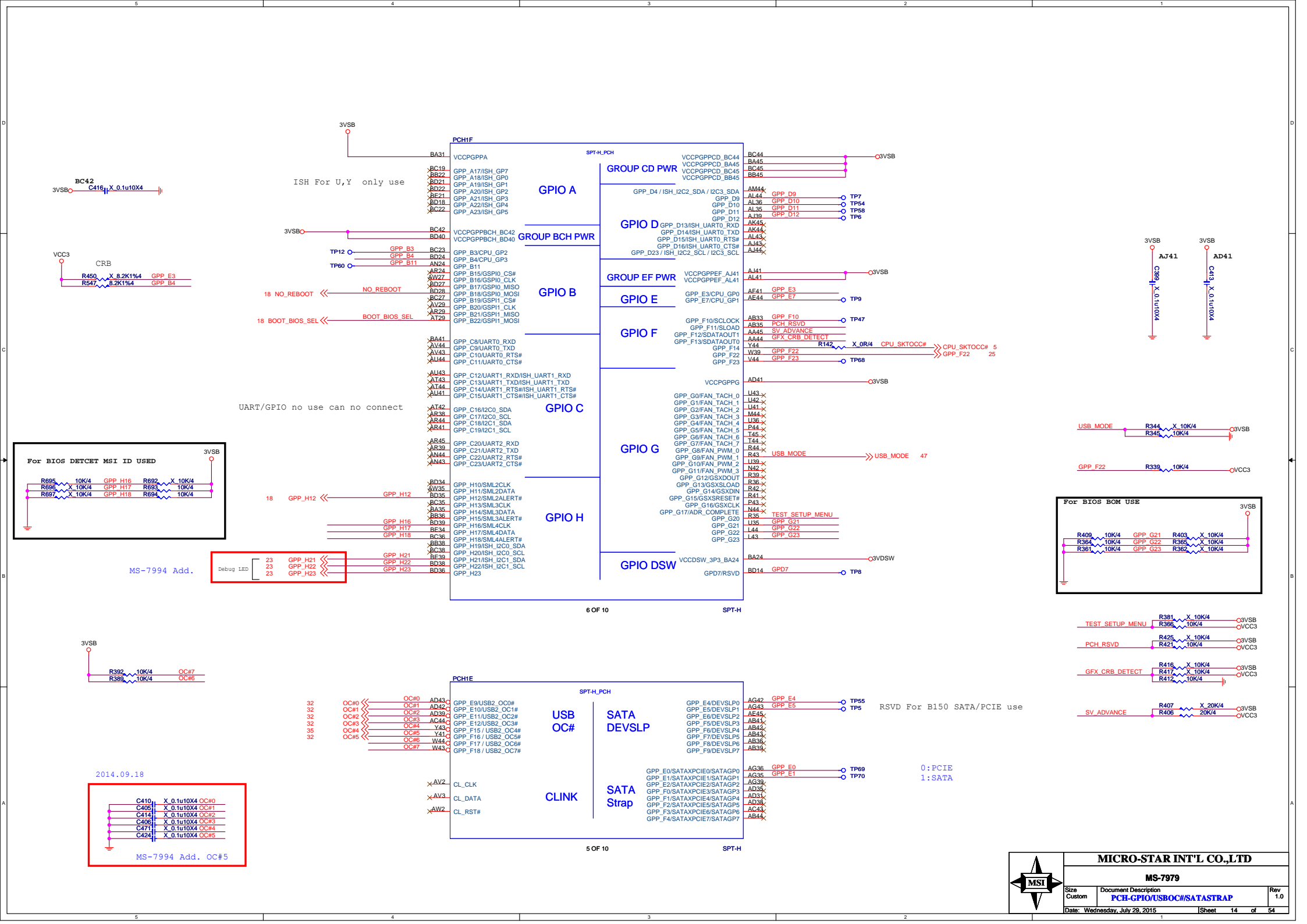
Port D DisplayPort

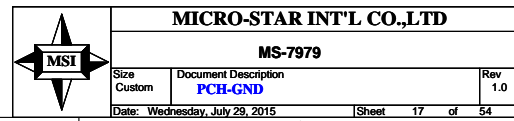


MICRO-STAR INT'L CO.,LTD

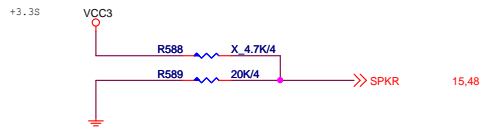
MS-7979

Size	Document Description	Rev
Custom	PCH-Audio/Display/Clock	1.0
Date: Thursday, July 30, 2015	Sheet 13 of 54	





TOP Swap



Internal pull-down is disabled after PLTRST#

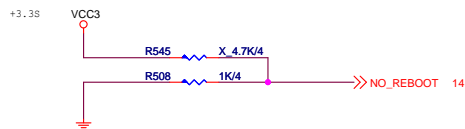
LPC eSPI Mode



0 : LPC
1 : eSPI

Internal pull-down is disabled after RSMRST

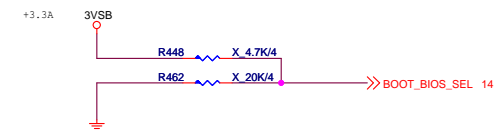
No Reboot



0 : DISABLE (Default)
1 : ENABLE

Internal pull-down is disabled after PLTRST#

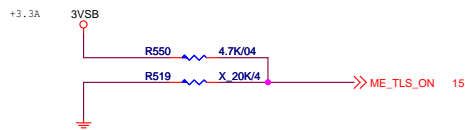
Boot BIOS



0 : SPI
1 : LPC

Internal pull-down is disabled after PLTRST

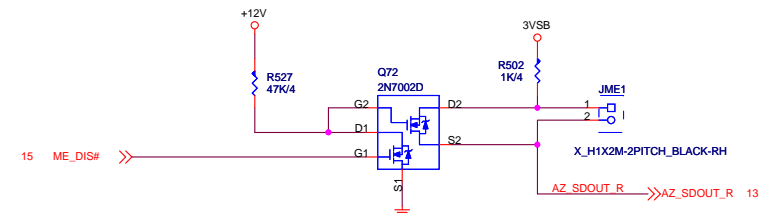
AMT and SBA with confidentiality



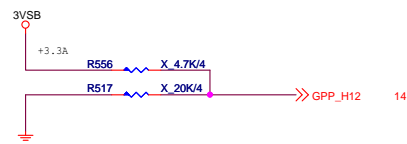
0 : DISABLE
1 : ENABLE (Default)

Internal pull-down is disabled after RSMRST

HDA_SDO



ESPI FLASH SHARING MODE

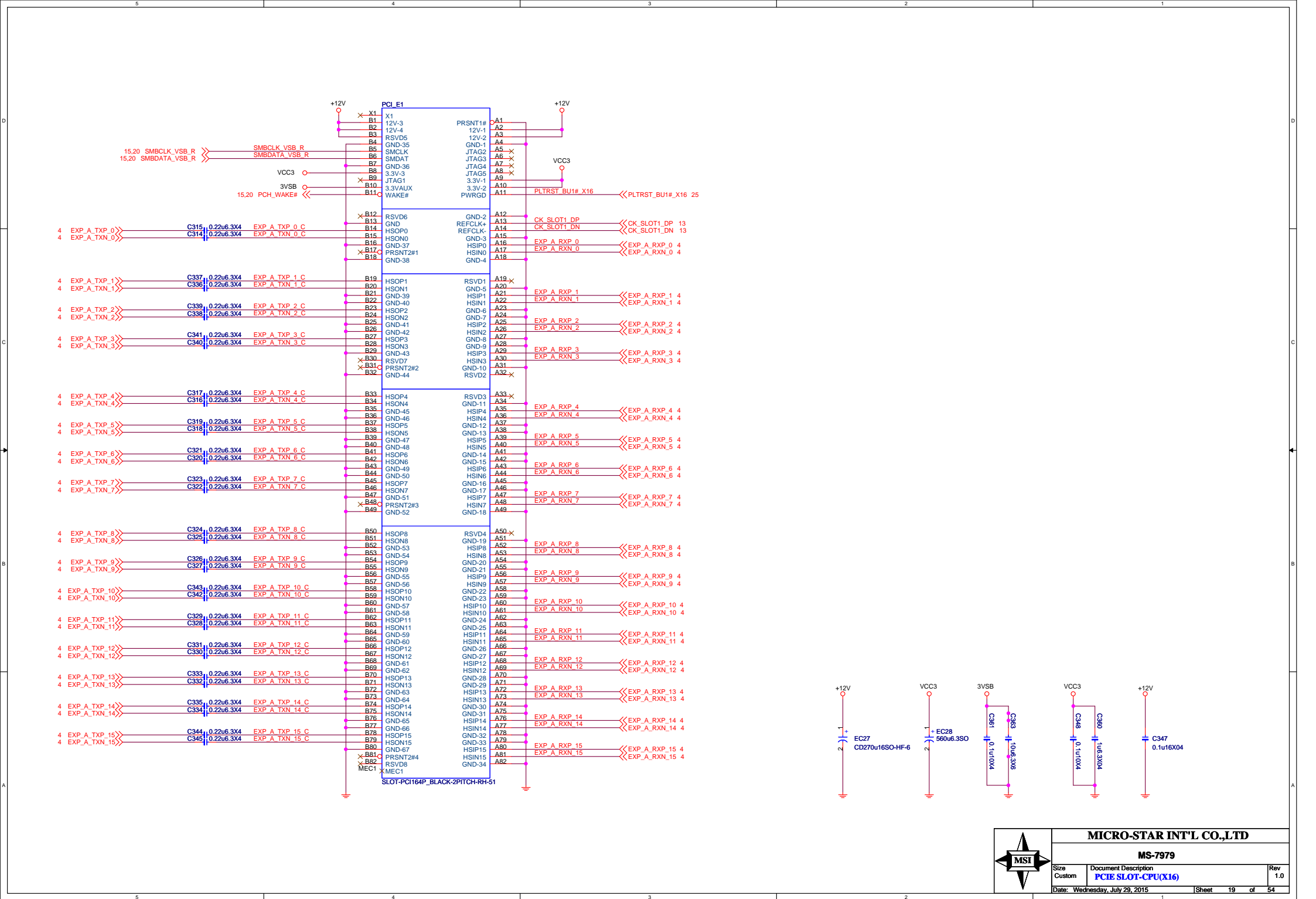


0 : MASTER ATTACHED FLASH SHARING
1 : SLAVE ATTACHED FLASH SHARING

Internal pull-down is disabled after RSMRST

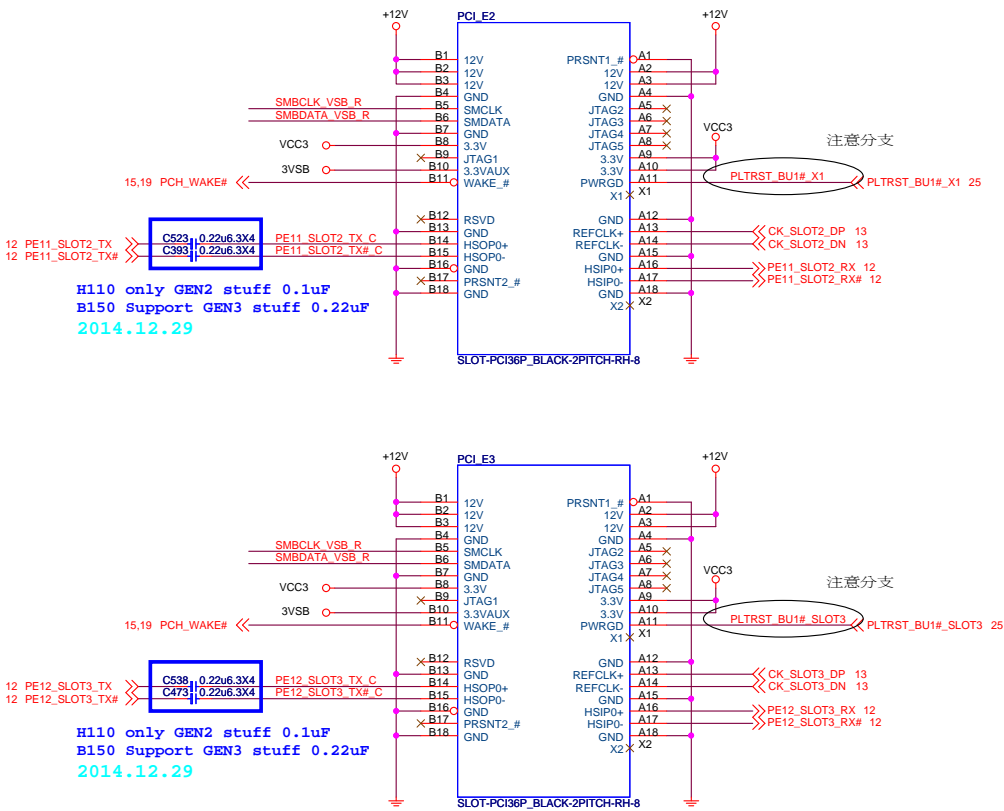


MICRO-STAR INT'L CO.,LTD		
MS-7979		
Size	Document Description	Rev
Custom	PCH-Strap	1.0
Date: Wednesday, July 29, 2015	Sheet 18 of 54	



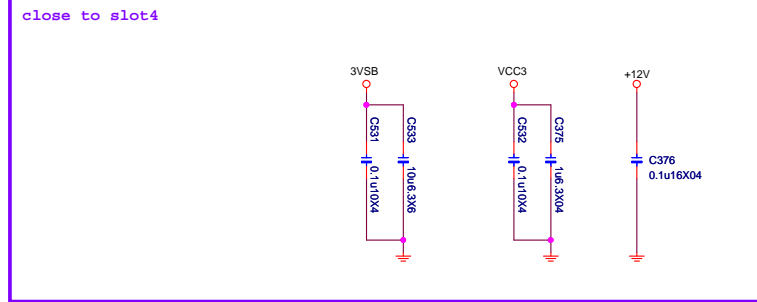
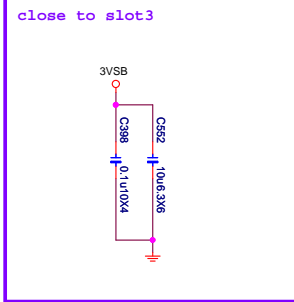
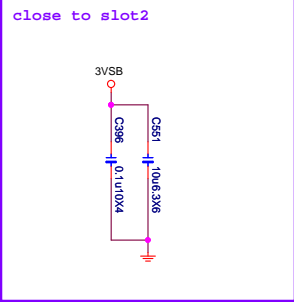
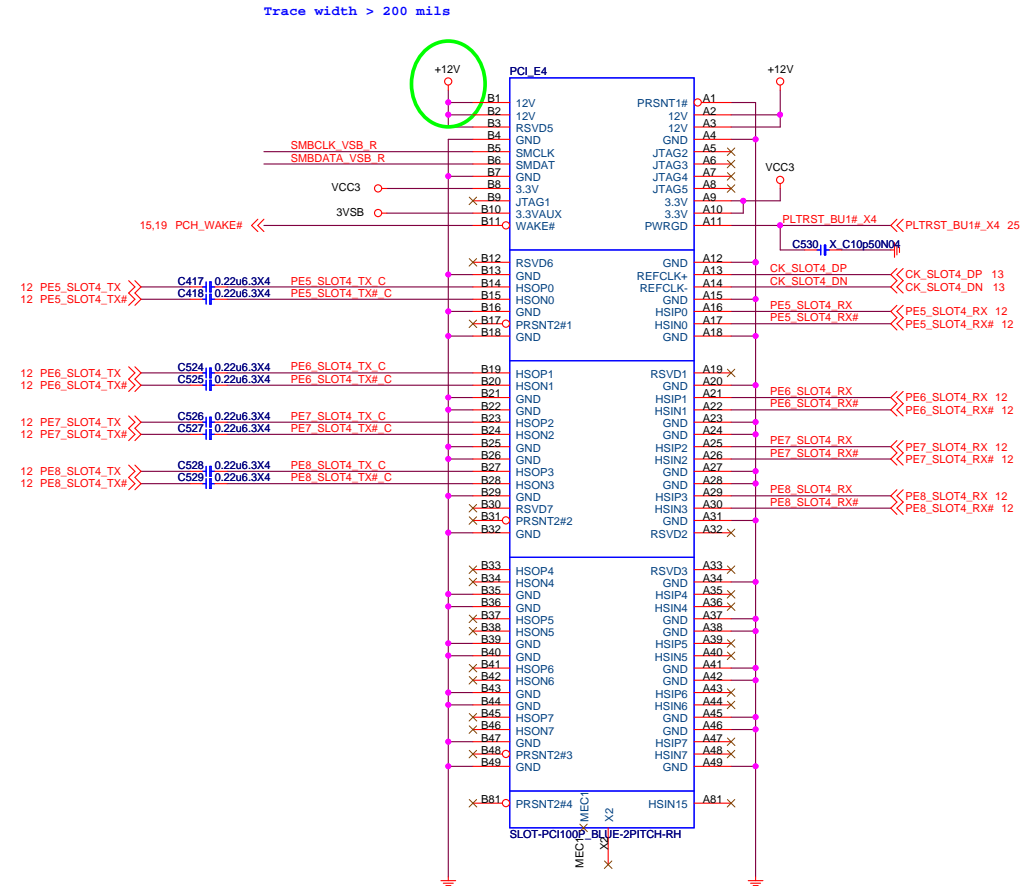
PCI Express X1 Slot

15,19 SMBCLK_VSB_R >> SMBCLK_VSB_R
15,19 SMBDATA_VSB_R >> SMBDATA_VSB_R



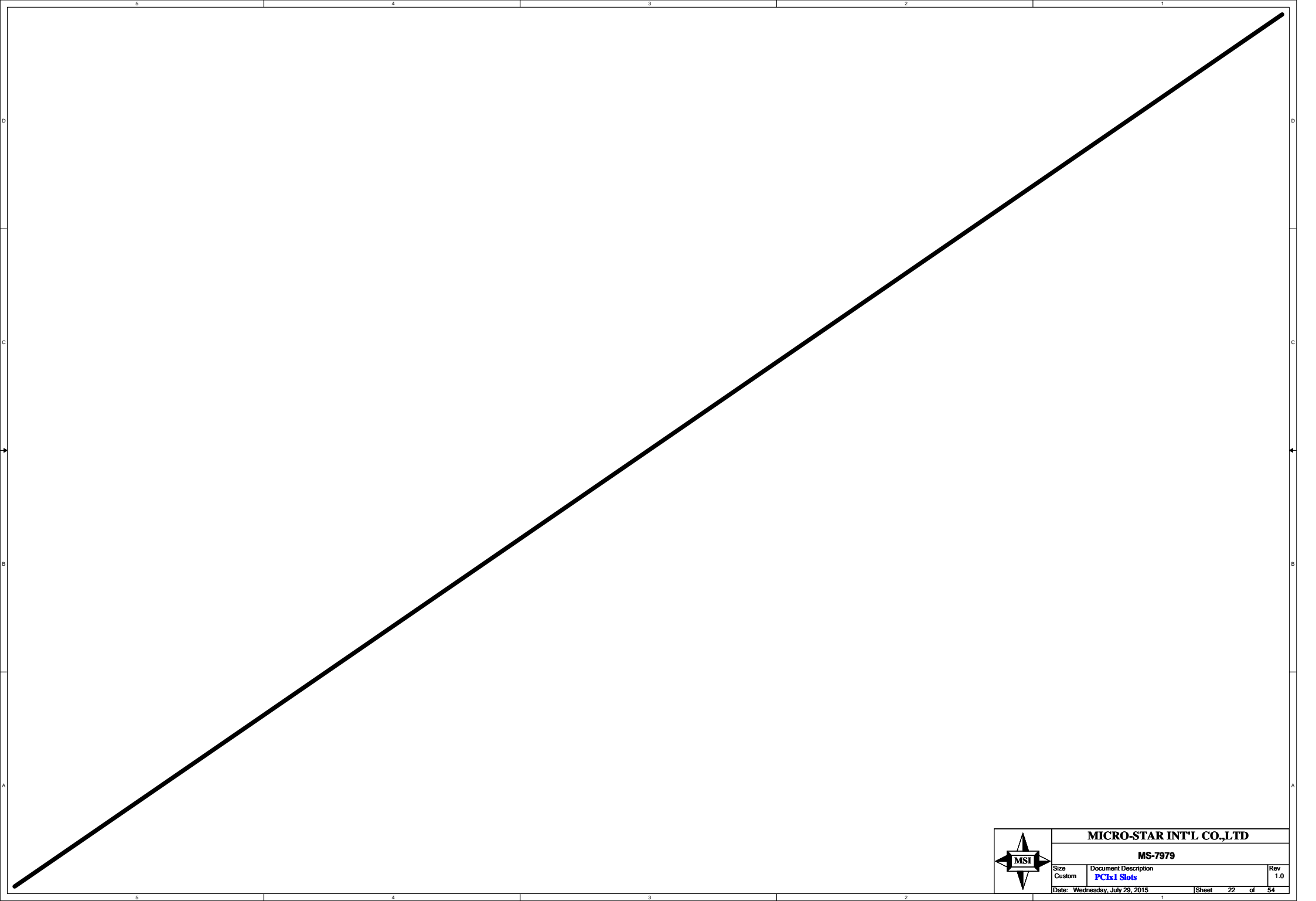
PCI Express X4 Slot


12V - 2.1A
VCC3 - 3A
3VSBV - 375mA





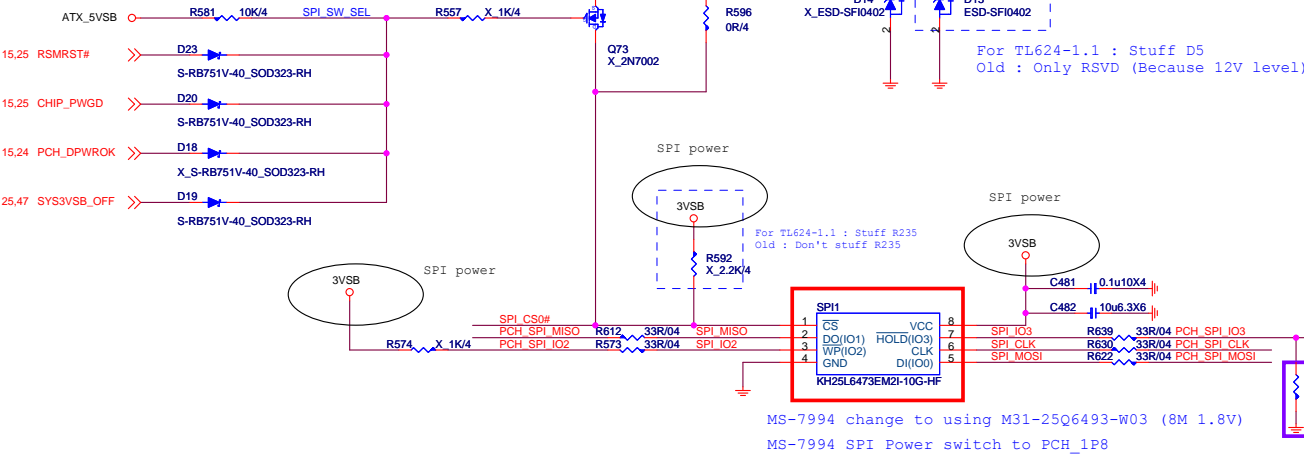
MICRO-STAR INT'L CO.,LTD		
MS-7979		
Size Custom	Document Description ASM1083 PCI Brl.	Rev 1.0
Date: Wednesday, July 29, 2015	Sheet 21 of 54	





MICRO-STAR INT'L CO.,LTD		
MS-7979		
Size Custom	Document Description PCx1 Slots	Rev 1.0
Date: Wednesday, July 29, 2015		Sheet 22 of 54

BIOS ROM

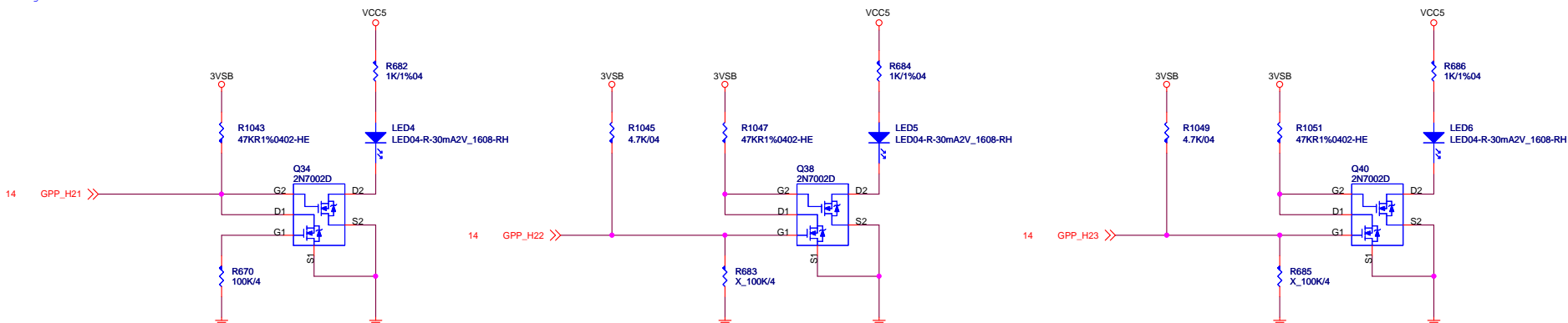


* if you support Standby power in S5 Status(Ex; PCH is B75 Chipset) , component Q23.G Pull-high to ATX_5VSB , Q23 must select "Vth" under lV (Component Suggestion as below)

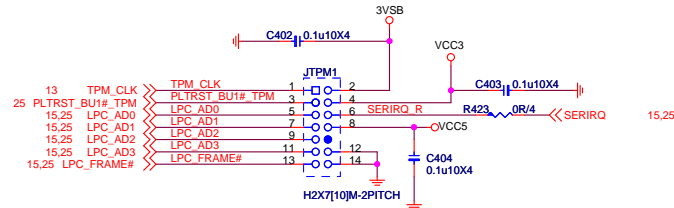
D03-0341409-A68 / D03-0230019-A30

Debug LED

MS-7994 Add. Debug LED circuit



TPM

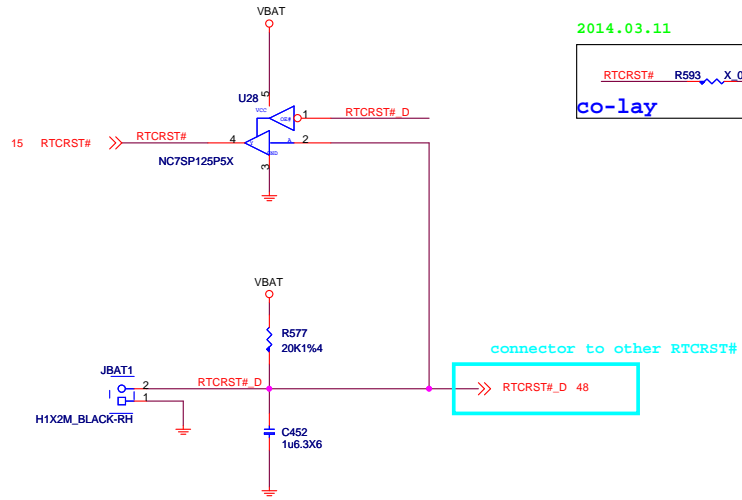
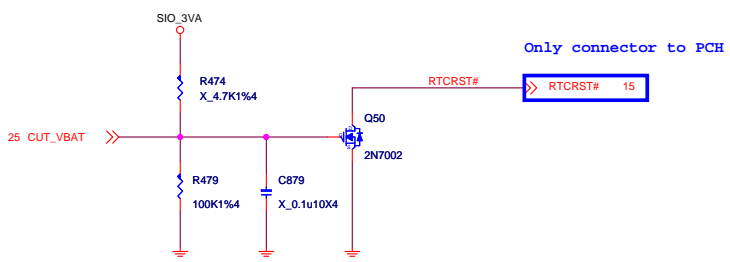
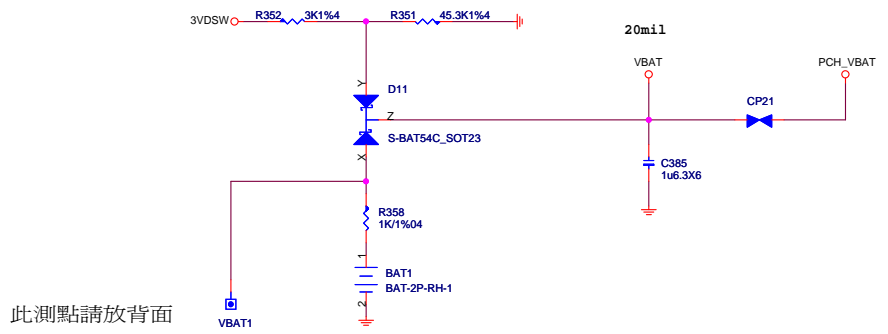


MICRO-STAR INT'L CO.,LTD

MS-7979

Size Custom	Document Description BIOS ROM/TPM/Debug LED	Rev 1.0
Date: Friday, July 31, 2015		Sheet 23 of 54

BIOS MODE

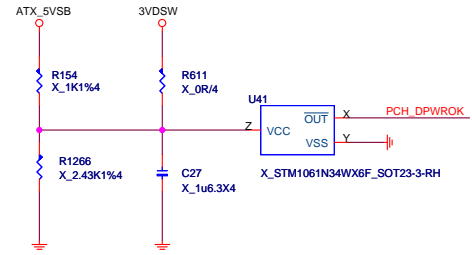
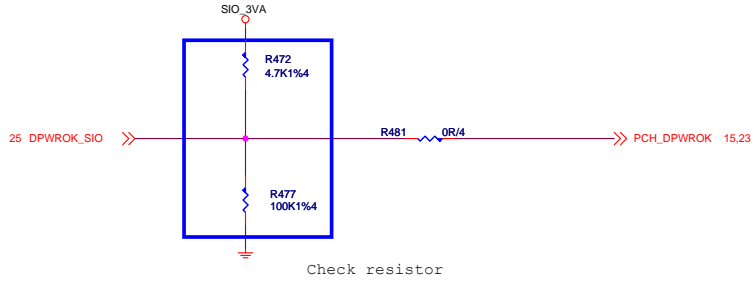


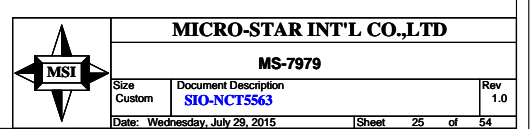
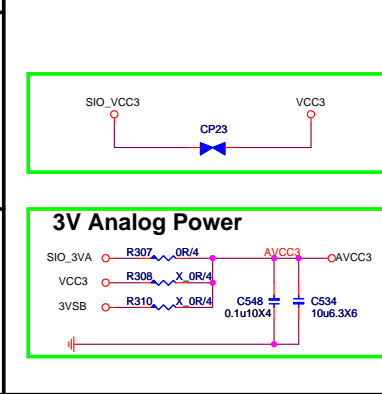
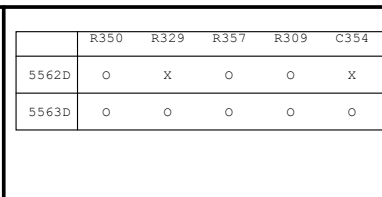
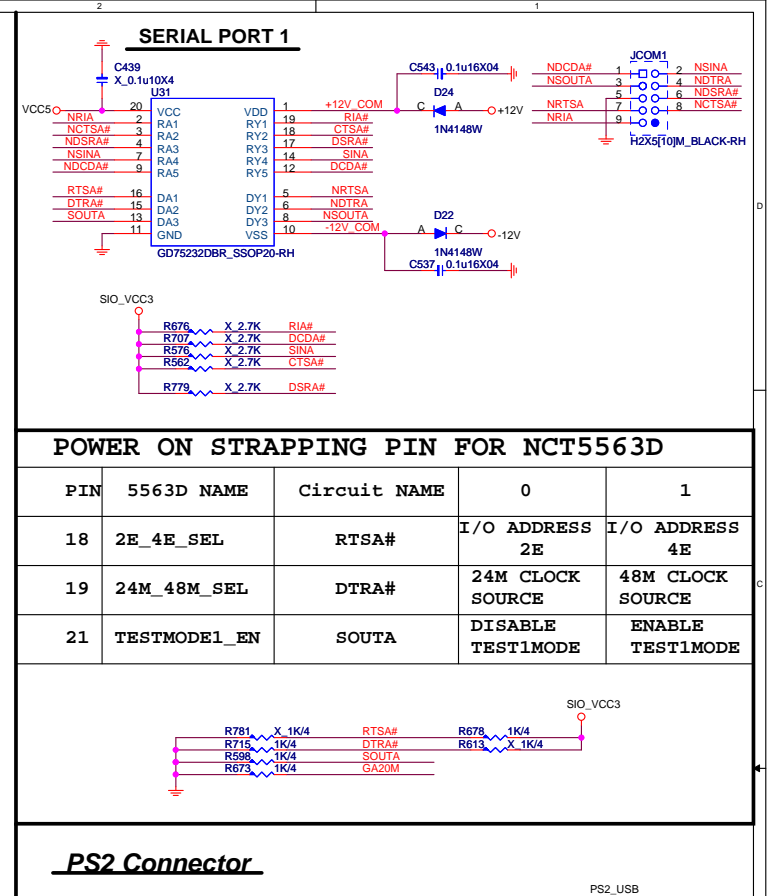
2014.03.11

RTCRST# R593 X_0R/4 RTCRST#_D

co-lay

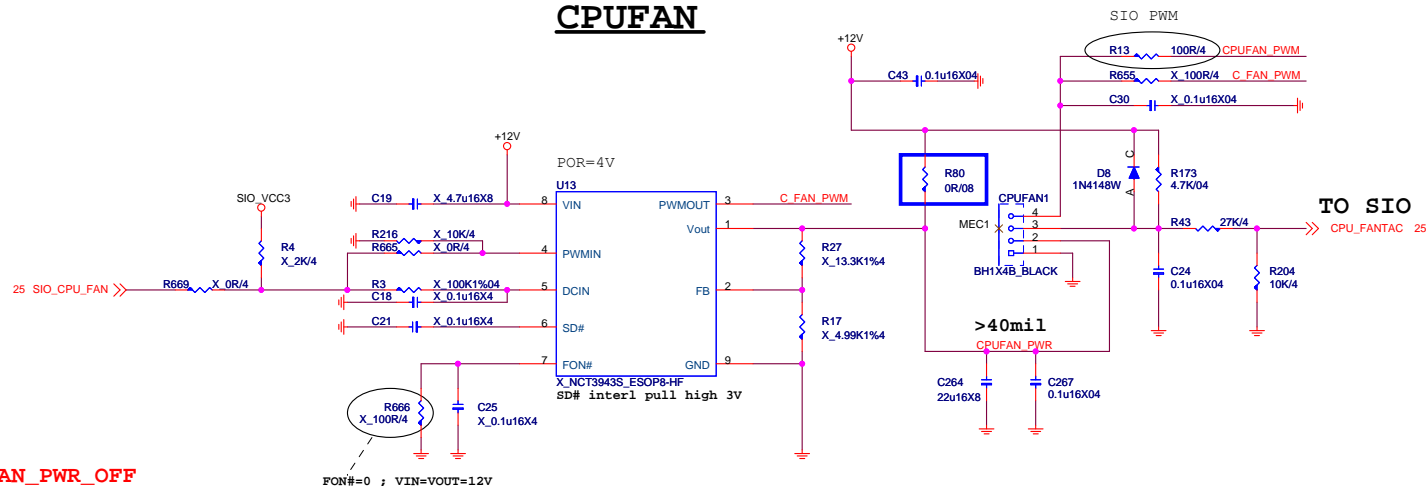
tri-state		
INPUT		outout
PIN1	PIN2	pin4
L	H	H
L	L	L
H	X	Z





Type G : 4 PIN CPU FAN USE SIO PWM (Reserve NCT3943S & WITHOUT CUT POWER)

CPUFAN



CPUFAN_PWR_OFF

GPIO Control

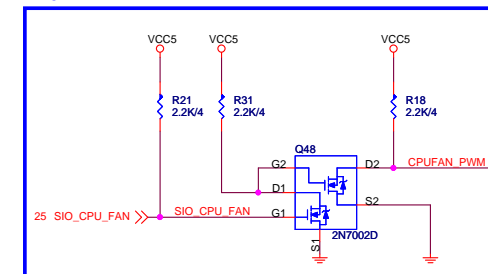
Deafult GPI

If USE CUT POWER

1.OPEN DRAIN LOW:SD# LOW Active , CPUFAN(PIN2)= 0V

2.OPEN DRAIN : SD# Internal Pull high , CPUFAN(PIN2)=12V

SIO PWM

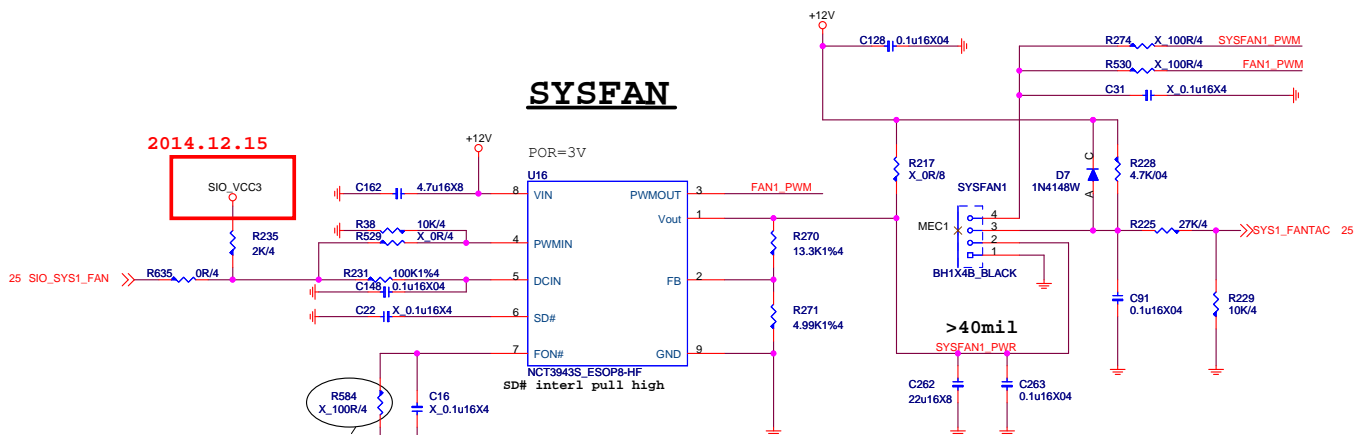


MICRO-STAR INT'L CO.,LTD

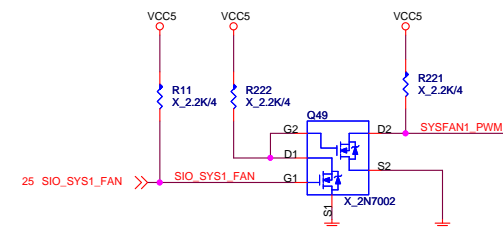
MS-7979

Size	Document Description	Rev
Custom	CPU FAN Controller	1.0
Date: Wednesday, July 29, 2015	Sheet 26 of 54	

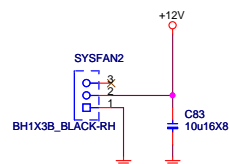
Type H : 4/3 PIN SYS FAN FROM NCT3943S(USE SIO CUT POWER)



SYSFAN_PWR_OFF
SIO control
Close SIO_SYS1_FAN Vout=0



Type C : 3 PIN SYSTEM FAN (Full Speed)

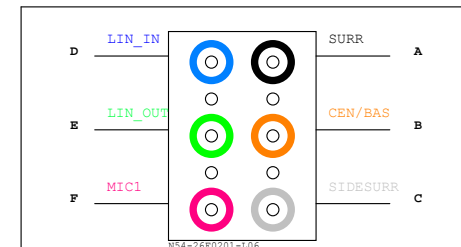
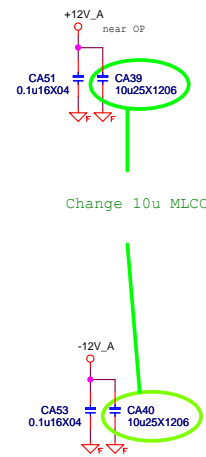
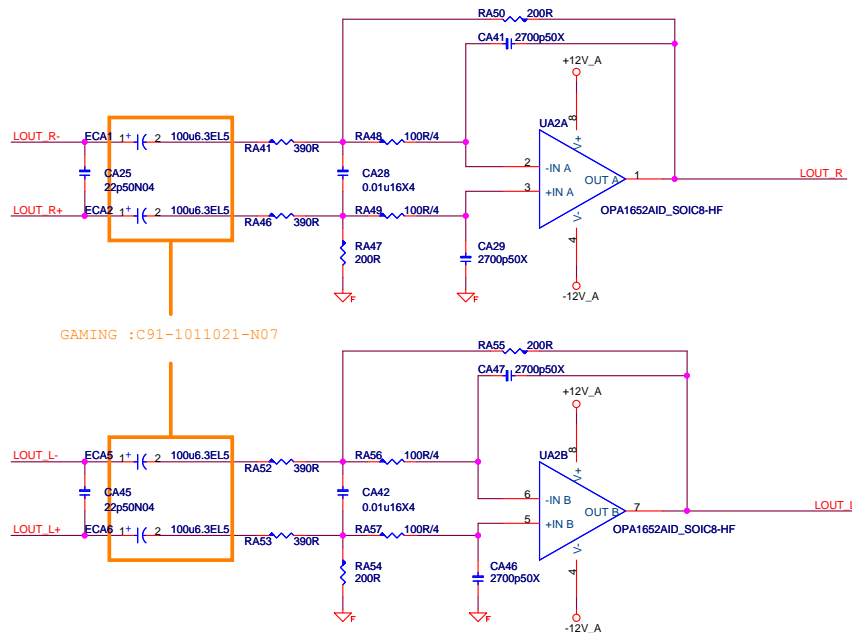
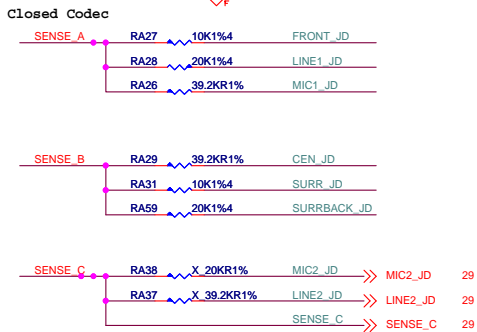
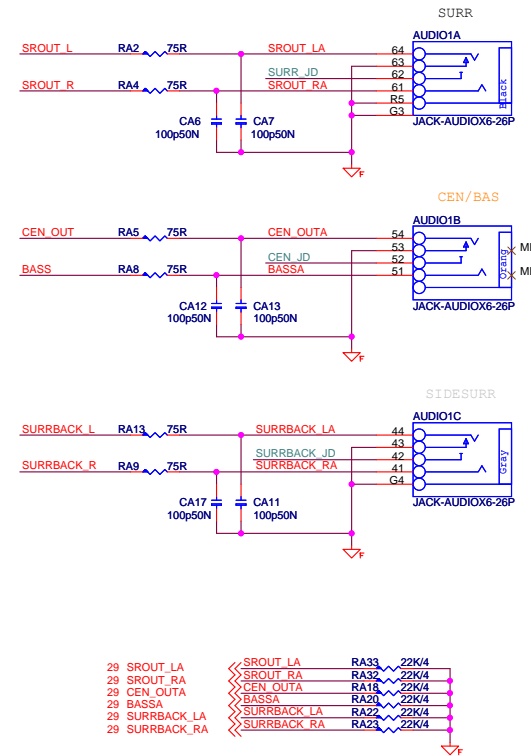
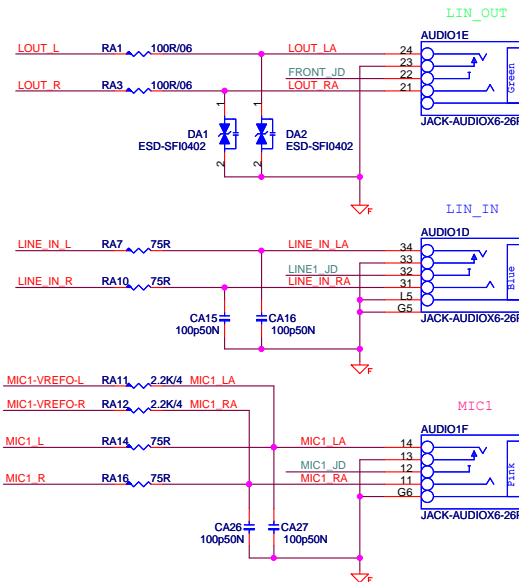
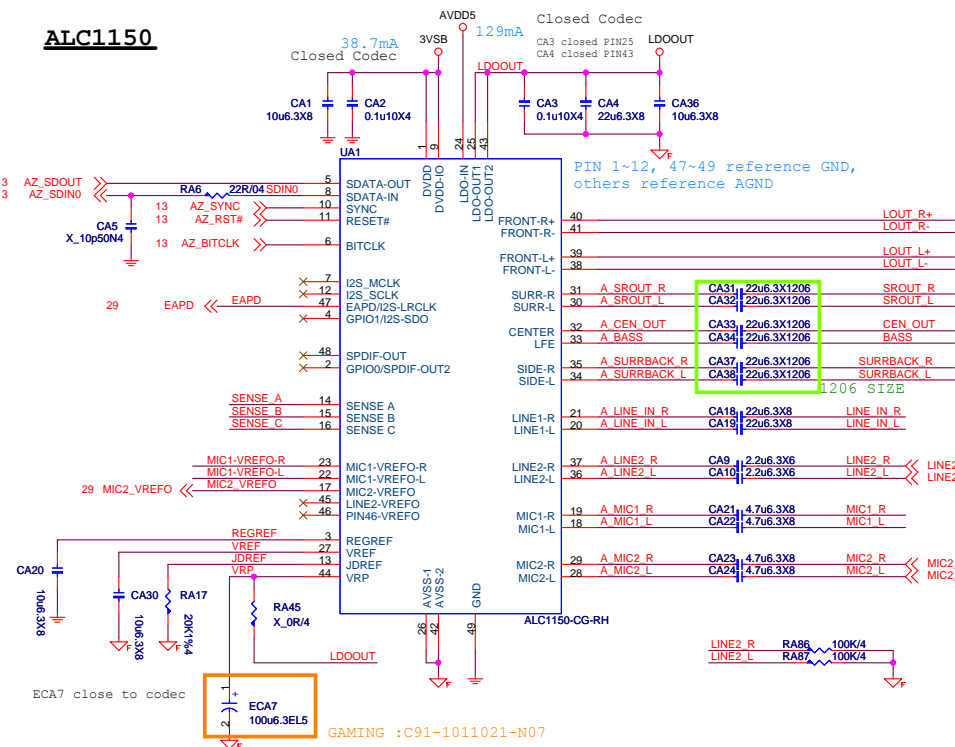


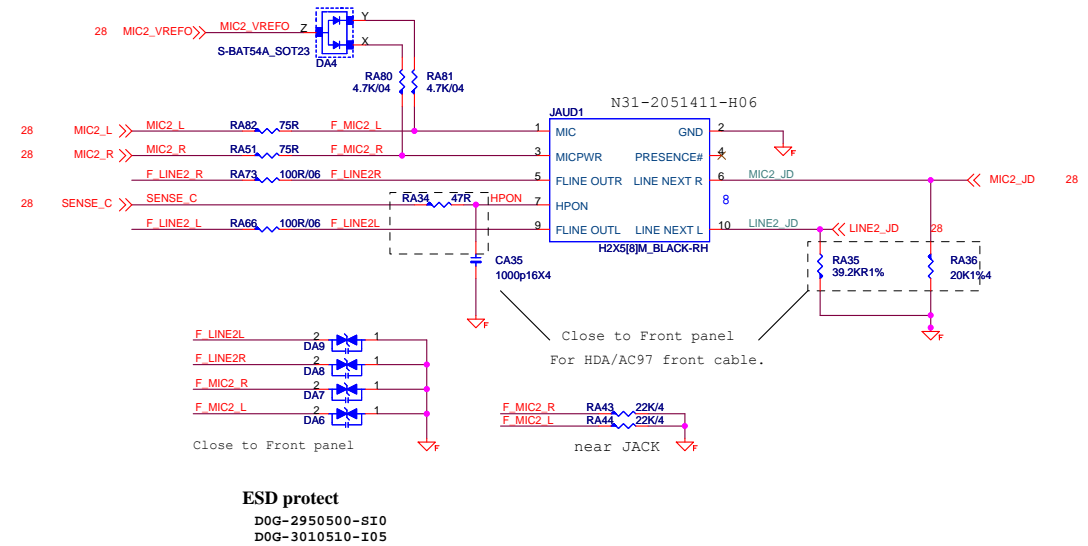
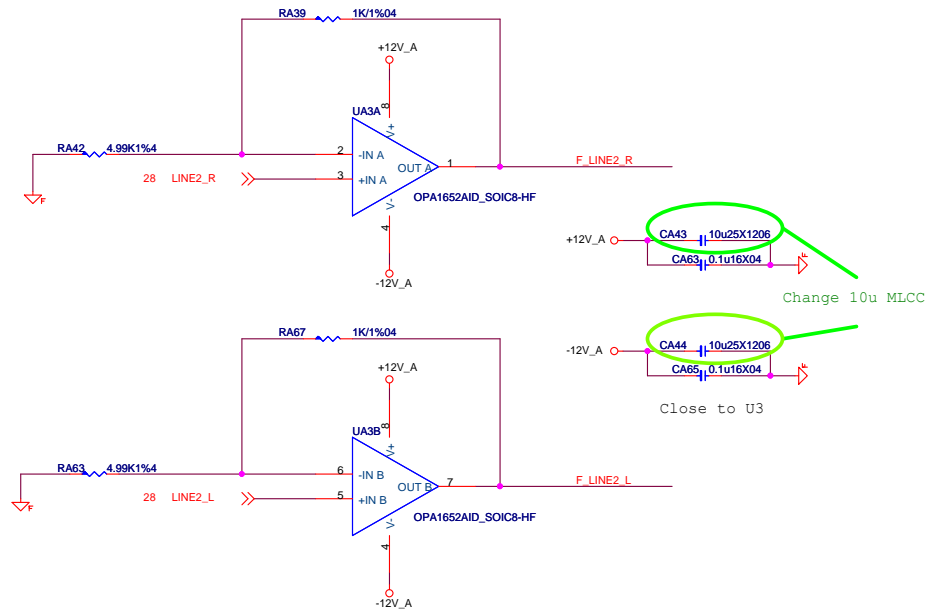
MICRO-STAR INT'L CO.,LTD

MS-7979

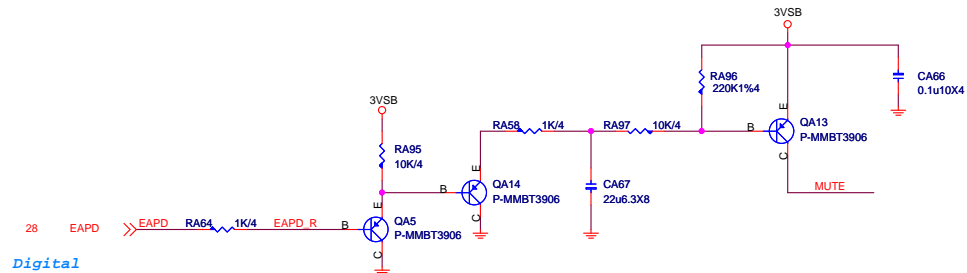
Size	Document Description	Rev
Custom	SYSTEM FAN Controller	1.0
Date: Wednesday, July 29, 2015	Sheet 27 of 54	

ALC1150



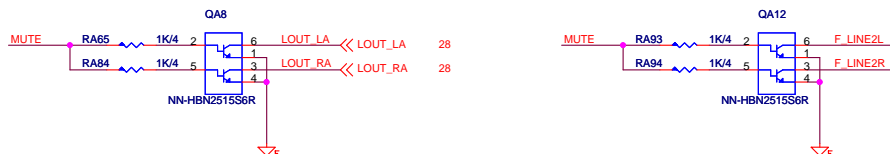


Rear Line OUT De-POP circuit (De-pop circuit for Rear Line out & Front Headphone out)

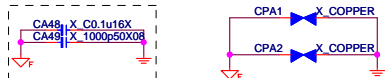


Digital

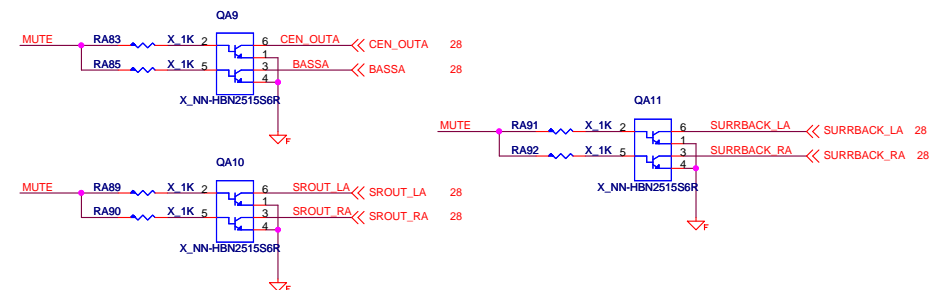
Analog



EMI

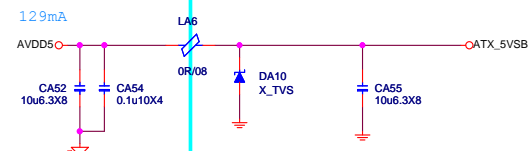


(add de-pop circuit by PM spec or customer request,
NOTE: add de-pop circuit need to change CA6, CA7, CA12, CA13, CA23, CA24 to TVS)

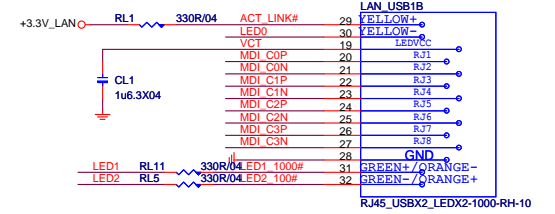


Analog

Digital



MS-7994 change to using I219



+3.3V_{LAN}

For EMI

CL20
X_{1u6.3X}

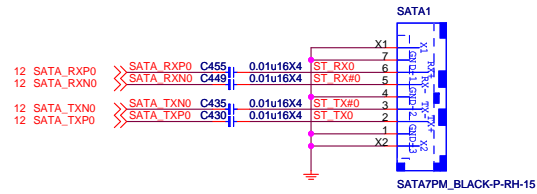
CL20 close to UL1



Size Custom	Document Description LAN - Intel I219V	Rev 1.0
Date: Wednesday, July 29, 2015		Sheet 30 of 54

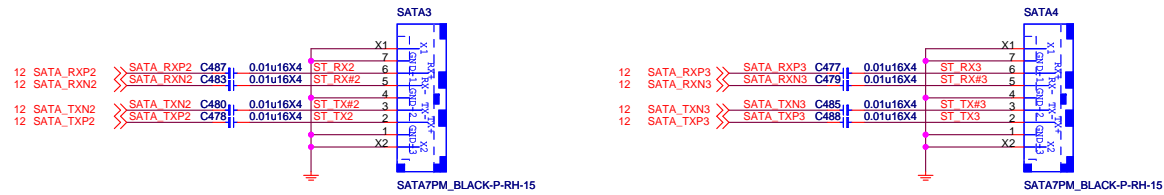
SATA 6G PORT 0,1

3.0 white 180 degree



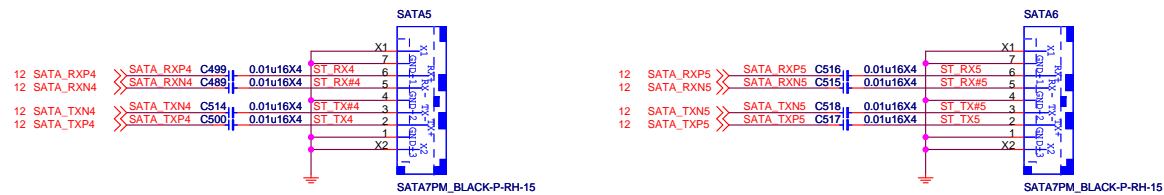
SATA 6G PORT 2,3

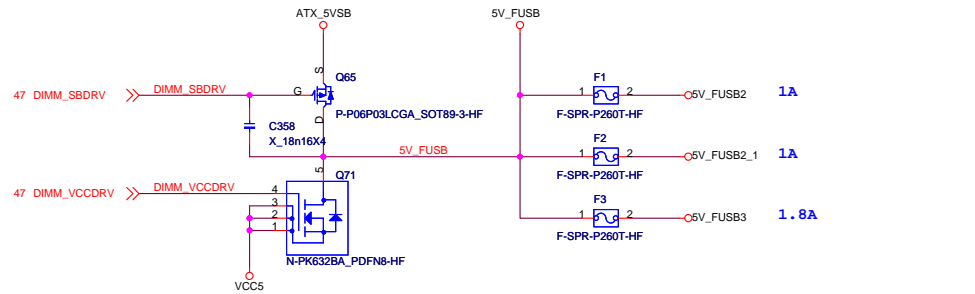
3.0 white 180 degree



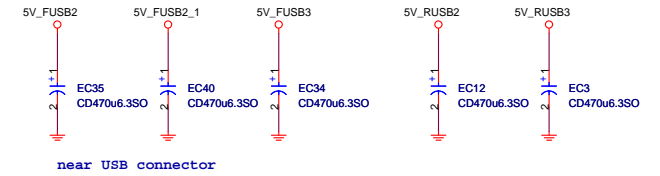
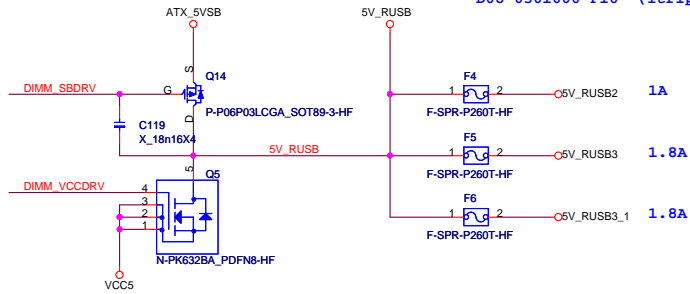
SATA 6G PORT 4,5

3.0 white 180 degree





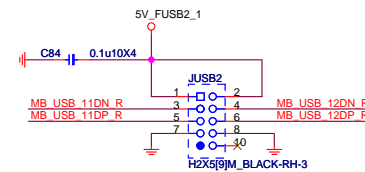
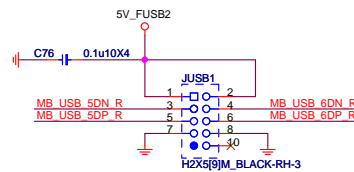
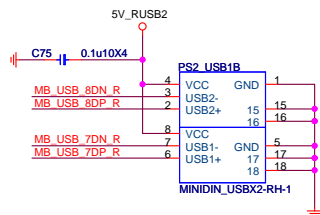
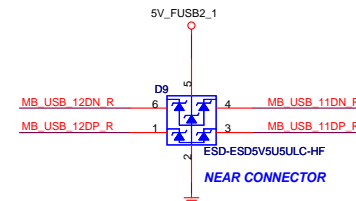
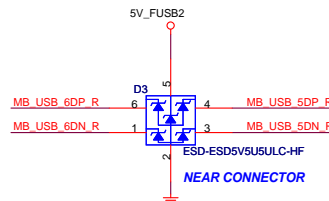
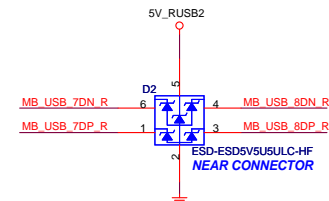
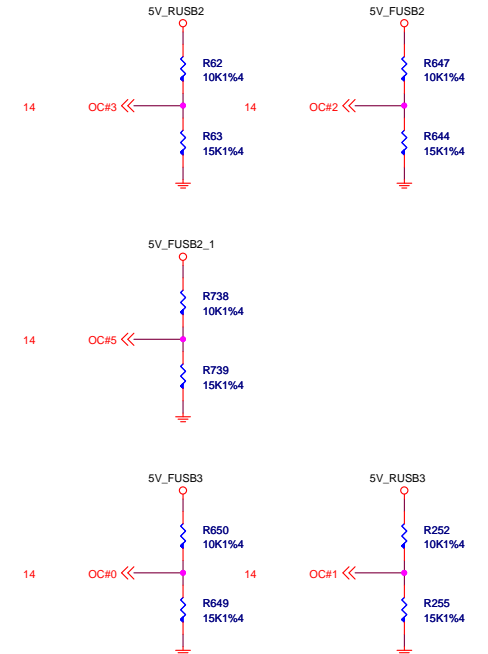
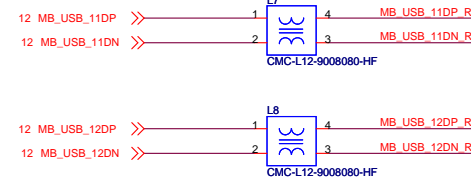
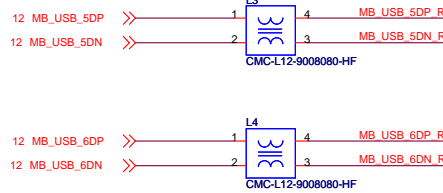
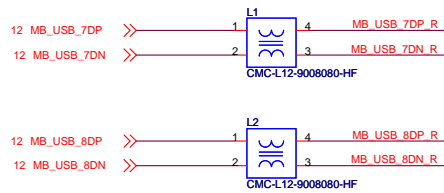
D08-2000400-P16 (Itrip=3.5A; 0.003ohm)
D08-0301000-P16 (Itrip=2.6A; 0.01ohm)



REAR USB PORT 7,8 (OC3#)

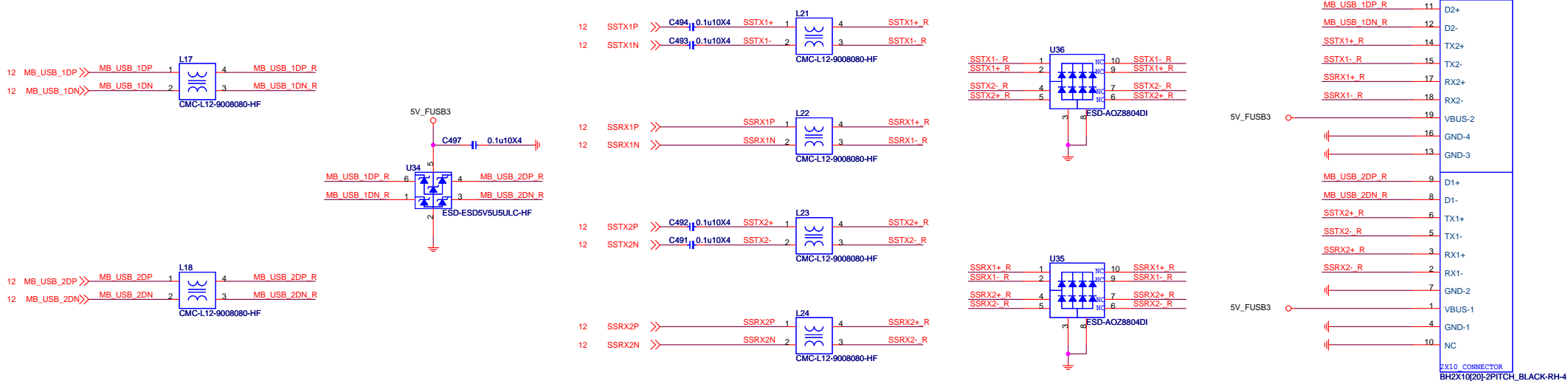
FRONT USB PORT 5,6 (OC2#)

FRONT USB PORT 11,12 (OC5#)

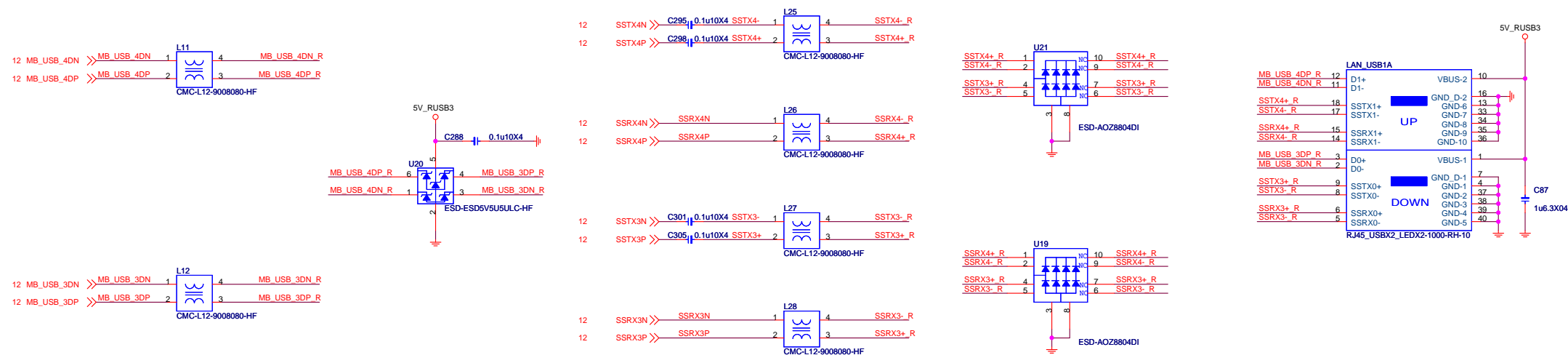


MICRO-STAR INT'L CO.,LTD			
MS-7979			
Size	Document Description	Rev	
Custom	USB2.0 Connector	1.0	
Date:	Thursday, July 30, 2015	Sheet	32 of 54

FRONT USB3.0 (OC0#)



REAR USB3.0 (OC1#)



MICRO-STAR INT'L CO.,LTD

MS-7979

Size	Document Description	Rev
Custom	USB3.0 Connector	1.0
Date: Wednesday, July 29, 2015	Sheet 33 of 54	

Power

Consumption	3.3V	1.2V	3.3VSUS	1.05VSUS(1.2VSUS)	Total Power
ASM1142	245mA	634mA	1mA	1mA	1572.8(mW)

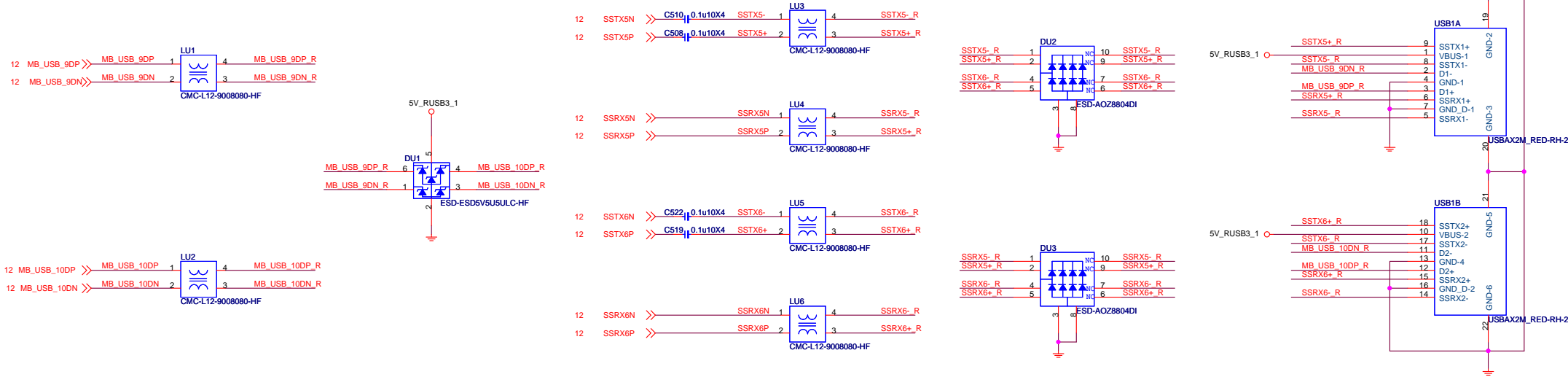
ASM1042 1.05 VSB Power

EEPROM



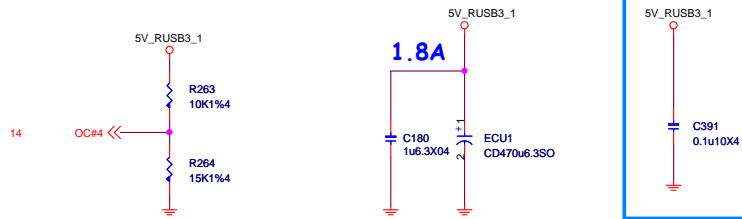
MICRO-STAR INT'L CO.,LTD		
MS-7979		
Size Custom	Document Description ASM1142 USB3.1 Host	Rev 1.0
Date: Wednesday, July 29, 2015		Sheet 34 of 54

REAR USB3.1 (OC7#)

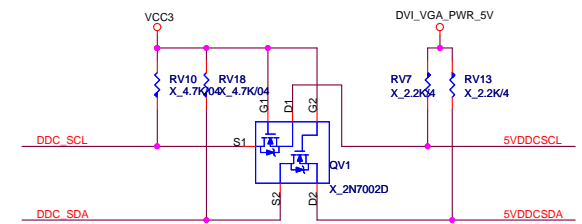
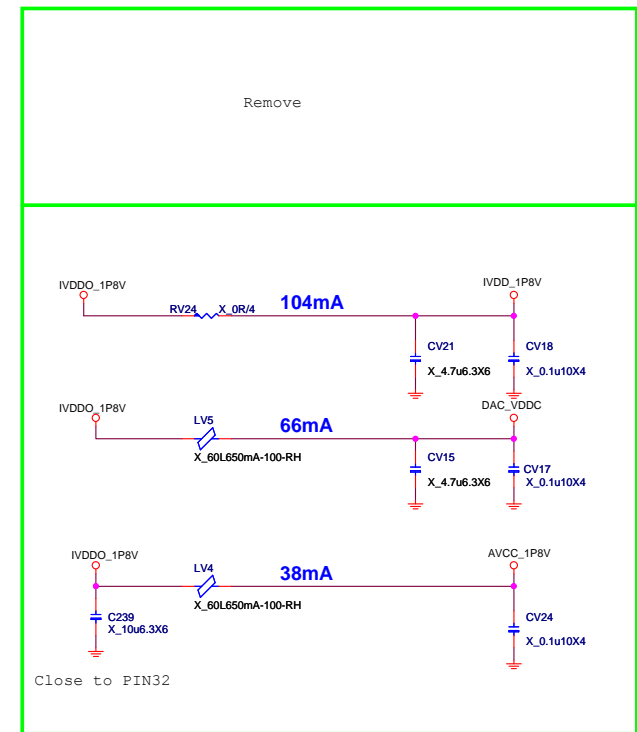
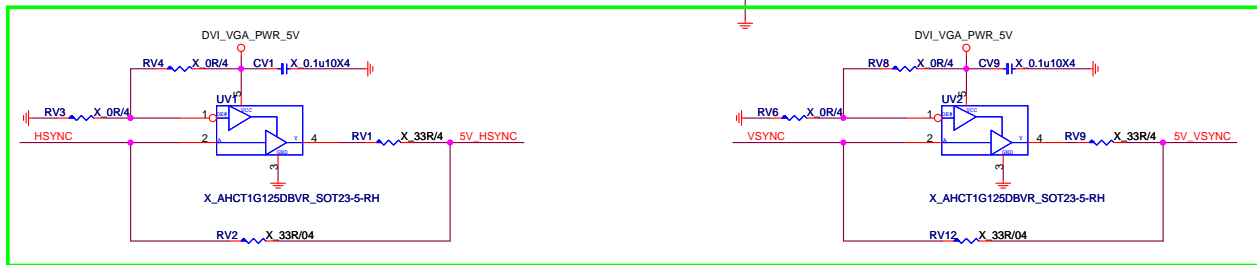


min 80mil.

EMI Cap near Connector.



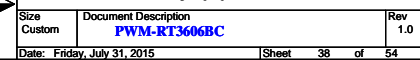
If connect to eDP port,must confirm whether it support hot plug detection HPD and re-auxtraining

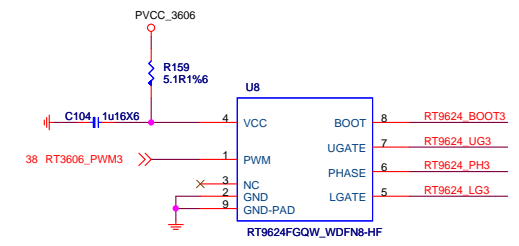
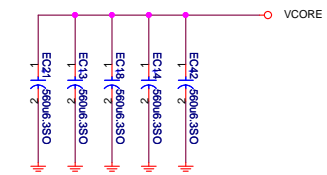
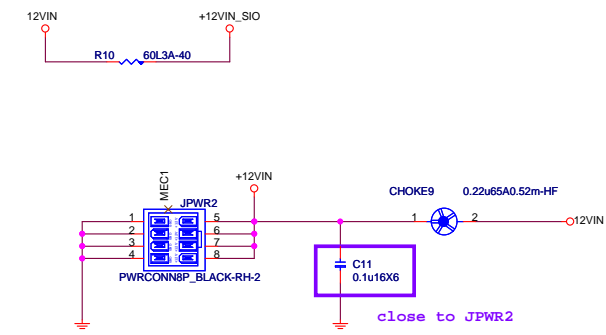
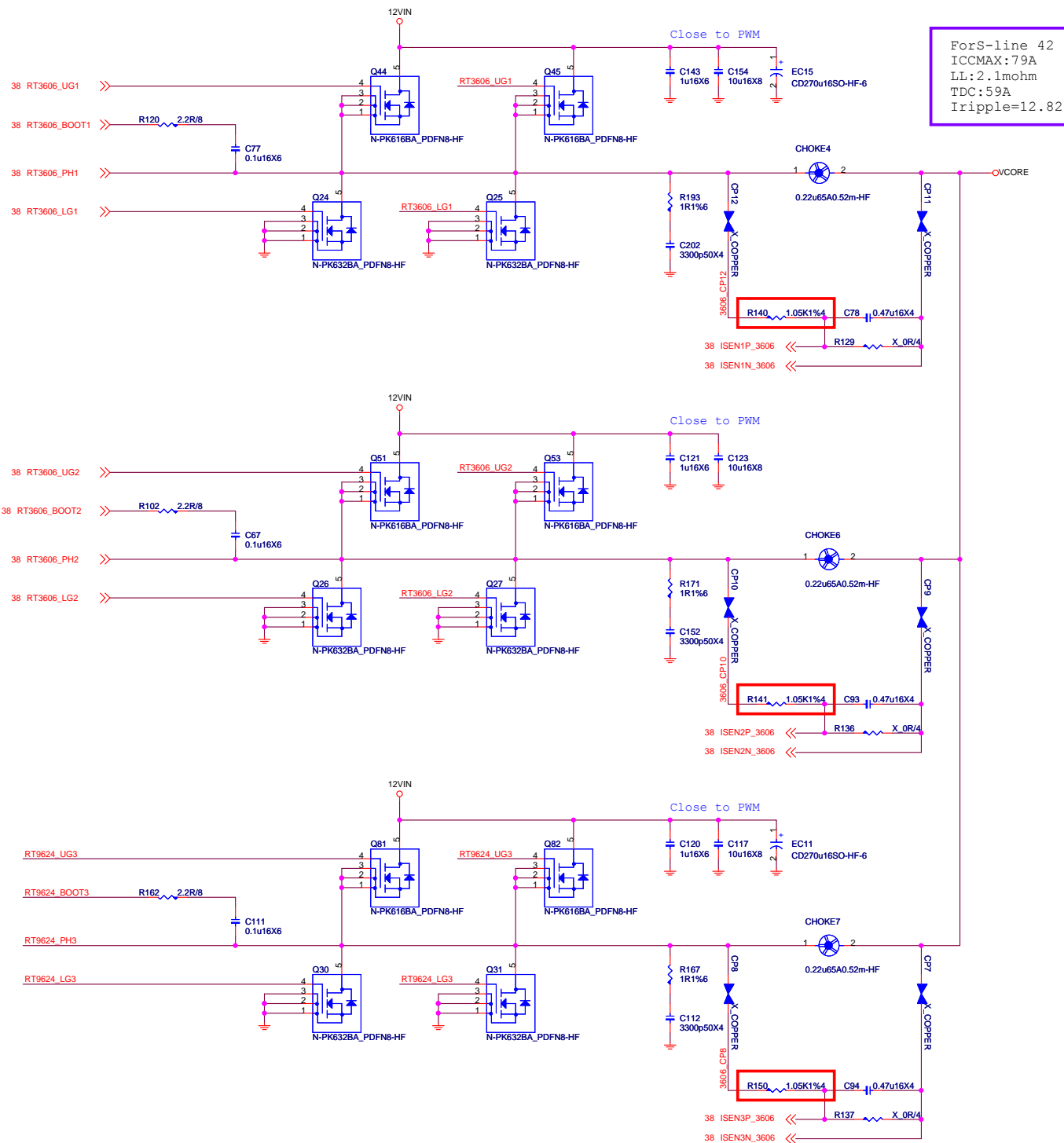


MICRO-STAR INT'L CO.,LTD

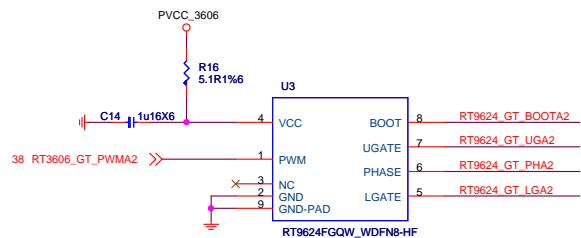
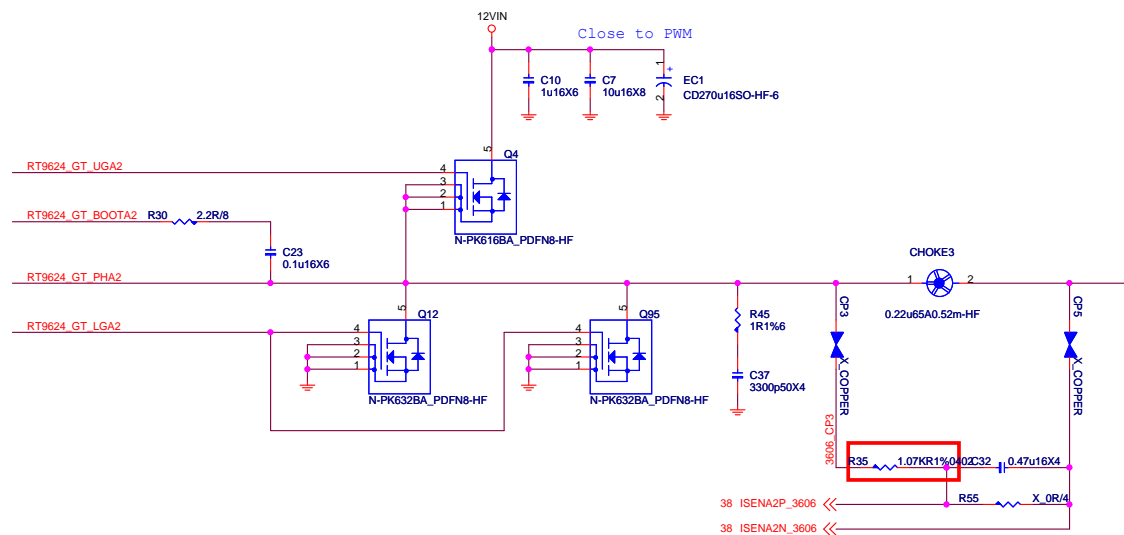
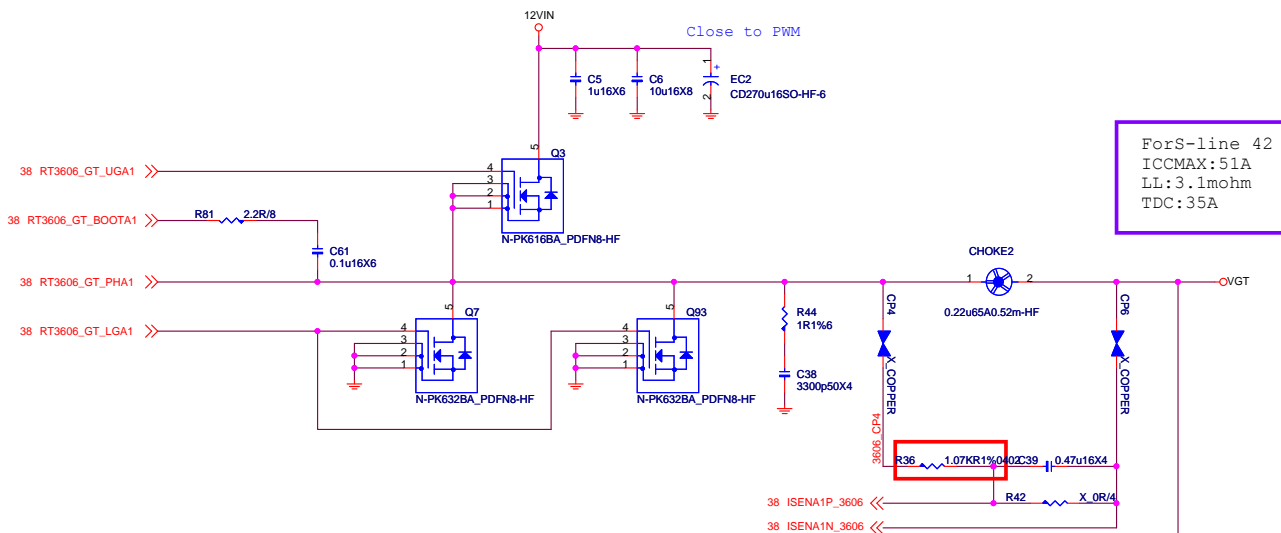
MS-7979

Size Custom	Document Description VGA Connector	Rev 1.0
Date: Friday, July 31, 2015		Sheet 36 of 54





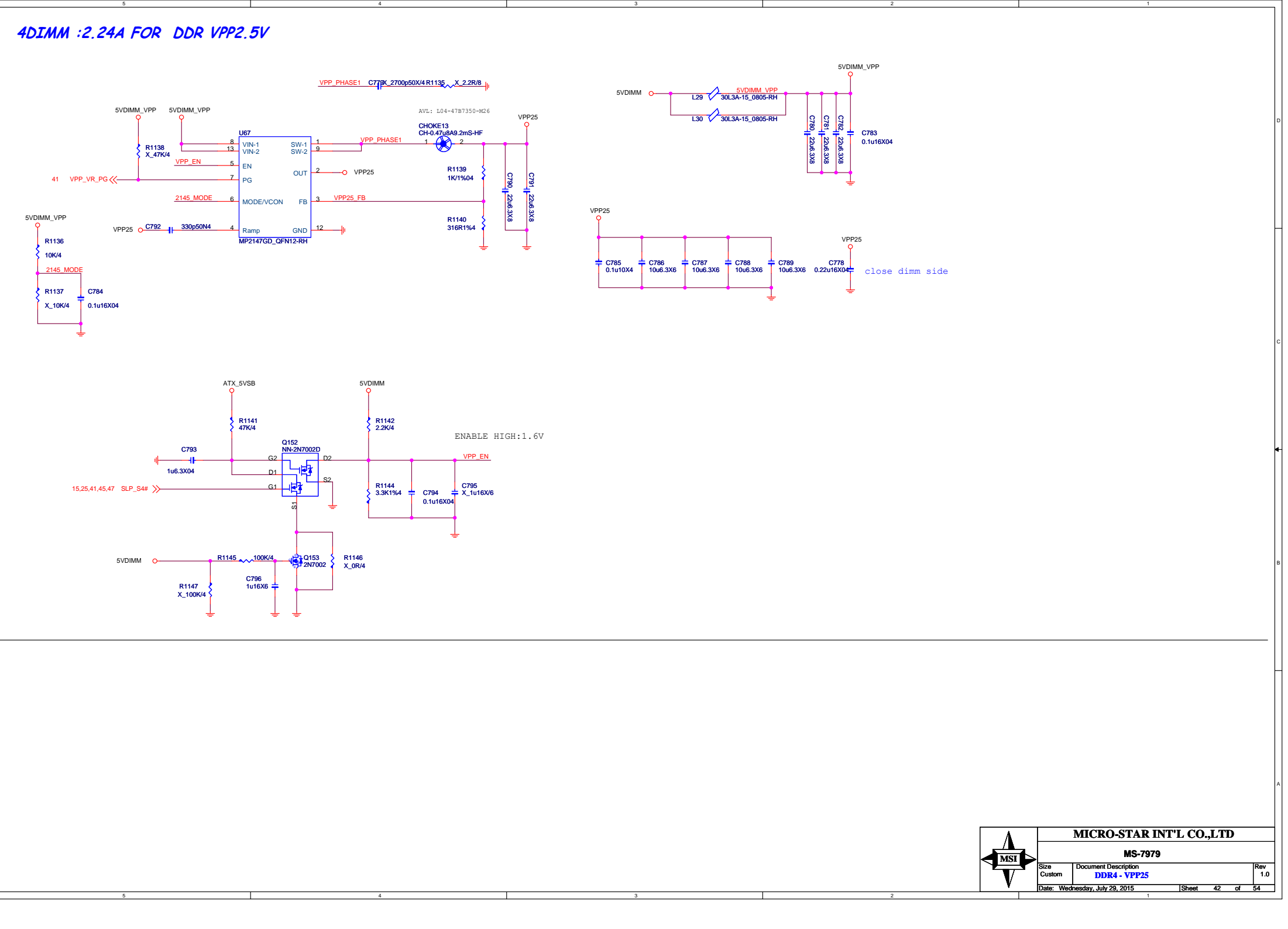
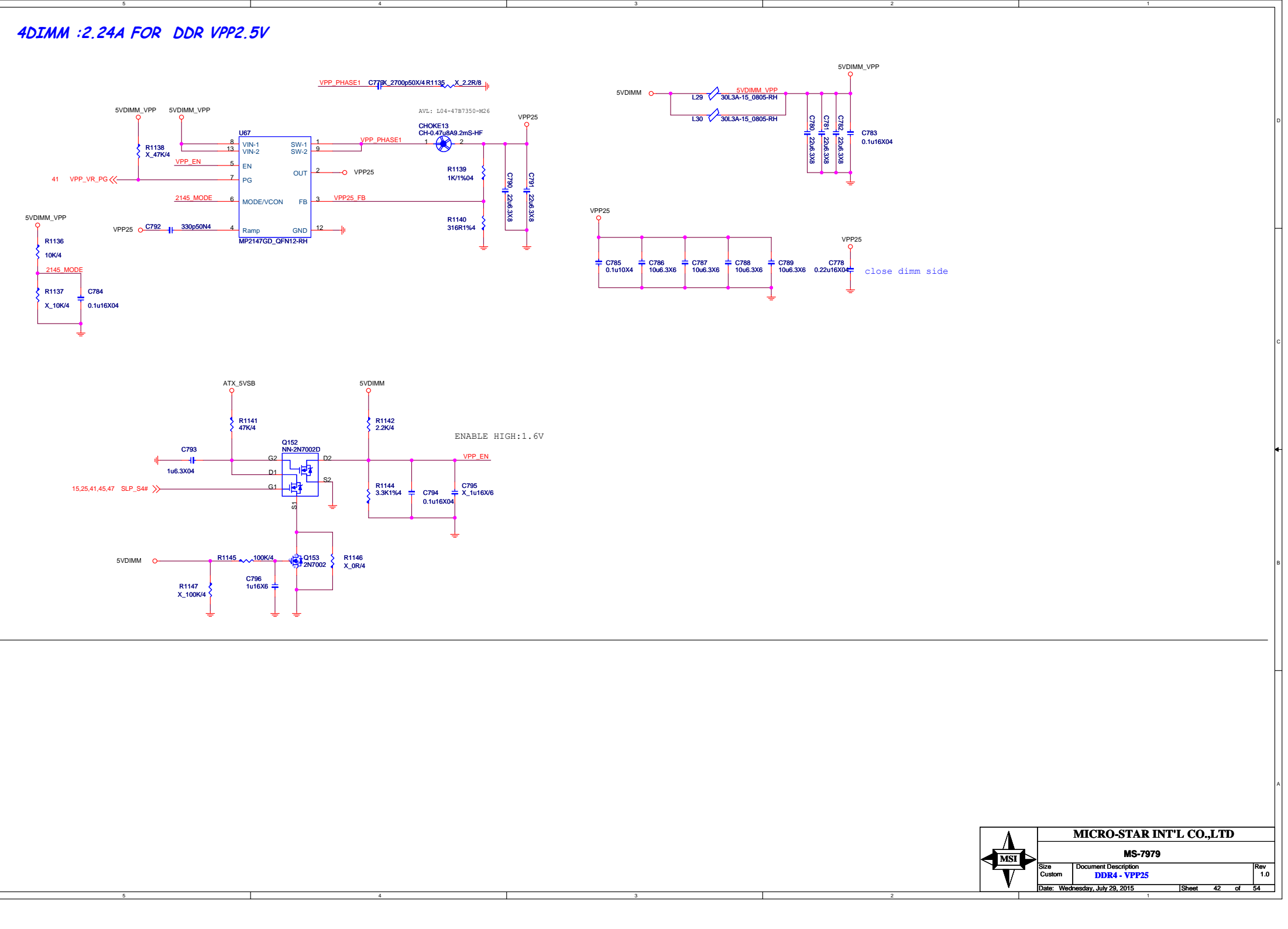
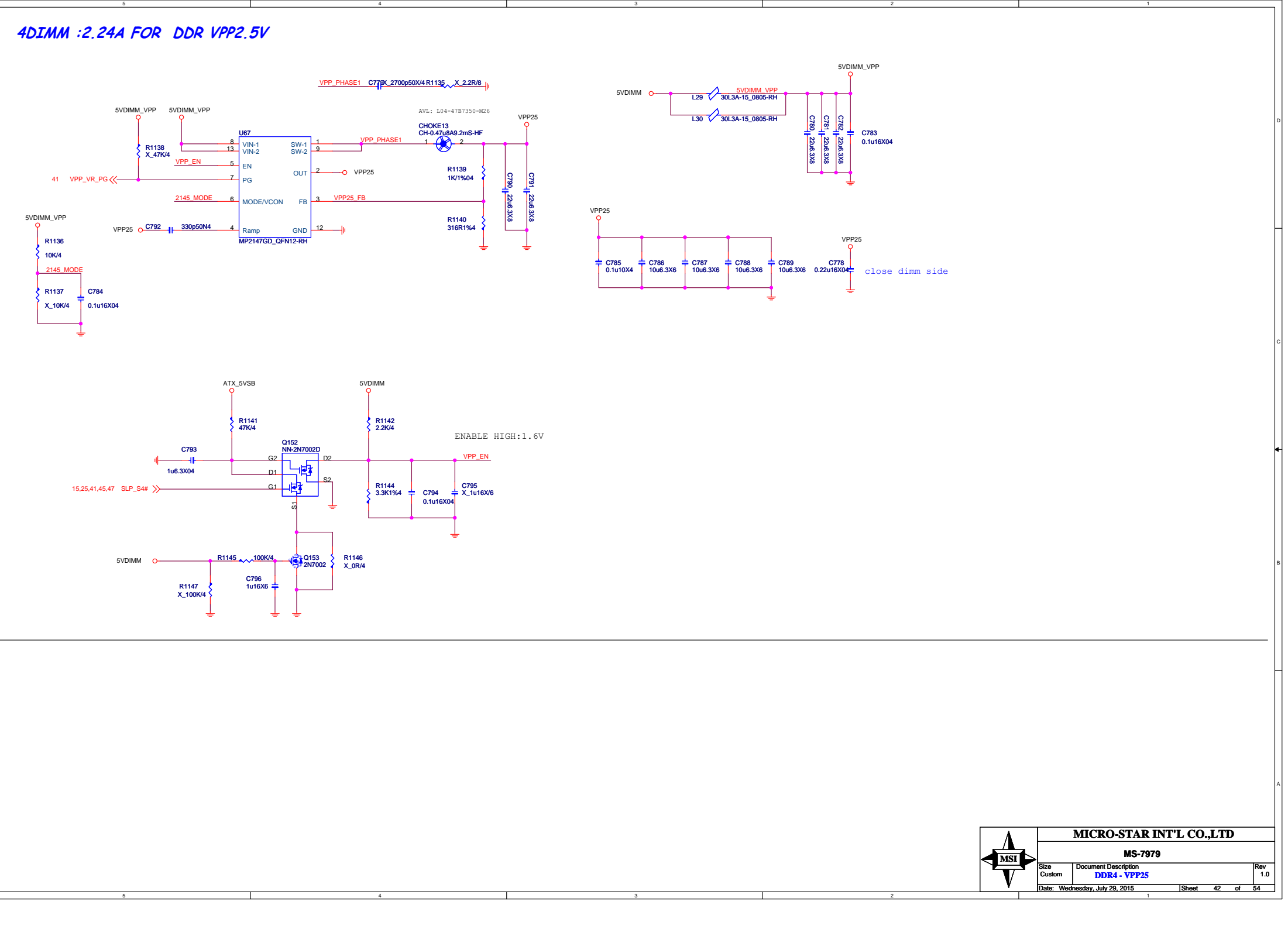
ForS-line 44e
ICCMAX:116A
LL:2.1mohm
TDC:56A



MICRO-STAR INT'L CO.,LTD

MS-7979

Size	Document Description	Rev
Custom	VCCGT(P-PAK) PHASE1-2	1.0
Date: Wednesday, July 29, 2015		Sheet 40 of 54

[illegible]

4DIMM :2.24A FOR DDR VPP2.5V

VPP_PHASE1 C779K 2700p50X/4 R1135 X 2.2R/8

AVL: L04-47B7350-M26

U67 VIN-1 VIN-2 SW-1 SW-2 OUT EN FB Ramp GND

MP2147GD_QFN12-RH

5V DIMM_VPP

R1138 X_47K/4

VPP_EN

2145_MODE

41 VPP_VR_PG

VPP25 C792 330p50N/4

C790 22u6.3X/8

R1139 1K/1%0/4

R1140 316R1%4

VPP25

5V DIMM_VPP

R1136 10K/4

2145_MODE

R1137 X_10K/4

C784 0.1u16X0/4

5V DIMM

L29 30L3A-15_0805-RH

L30 30L3A-15_0805-RH

5V DIMM_VPP

C781 22u6.3X/8

C782 22u6.3X/8

C783 0.1u16X0/4

VPP25

C785 0.1u10X/4

C786 10u6.3X/6

C787 10u6.3X/6

C788 10u6.3X/6

C789 10u6.3X/6

C790 0.22u16X0/4

close dimm side

ATX_5VSB

R1141 47K/4

C793 1u6.3X0/4

15,25,41,45,47 SLP_S4#

Q152 NN-2N7002D

D2

5V DIMM

R1142 2.2K/4

R1144 3.3K1%4

C794 0.1u16X0/4

C795 X_1u16X0/6

VPP_EN

ENABLE HIGH:1.6V

5V DIMM

R1145 100K/4

R1146 X_OR/4

R1147 X_100K/4

C796 1u16X6

Q153 2N7002

S2

5V DIMM_VPP

MSI

MICRO-STAR INT'L CO.,LTD

MS-7979

Size Custom

Document Description

DDR4 - VPP25

Rev 1.0

Date: Wednesday, July 29, 2015

Sheet 42 of 54

SA Power:1.05V,12.3A

$$OCP = 12.3A * 1.4 = 17.22A$$

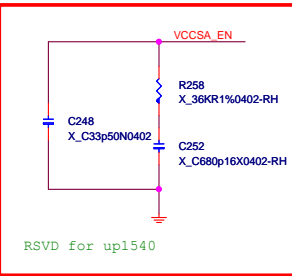
$$R_{ocs}(R15) = OCP * R_{dson}(Low\ side) 3.4m\Omega / 10\mu A$$

$$= 17.22 * (3.4m\Omega / 10\mu A)$$

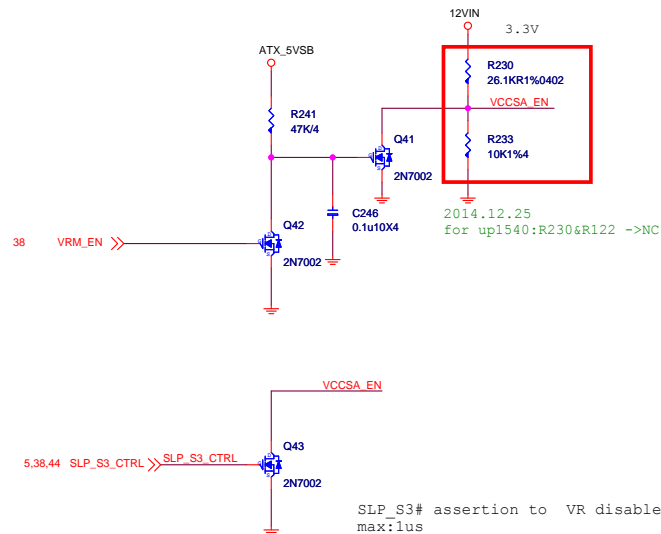
$$= 5.854K\Omega$$

Rocs: 5.76K, OCP:
D03-4C05N03-O05 : 16.94A
D03-632BA0C-N03 : 17.45A
use UBIQ MOS need Check

Rdson(10V)
D03-4C05N03-O05 : 3.4mohm
D03-632BA0C-N03 : 3.3mohm
D03-3056M00-U47 : 4.2mohm



2015.01.22
for up1540:stuff R258->36K,
C248->33p,C252->680p
for RT8125:R258.C248.C252->NC



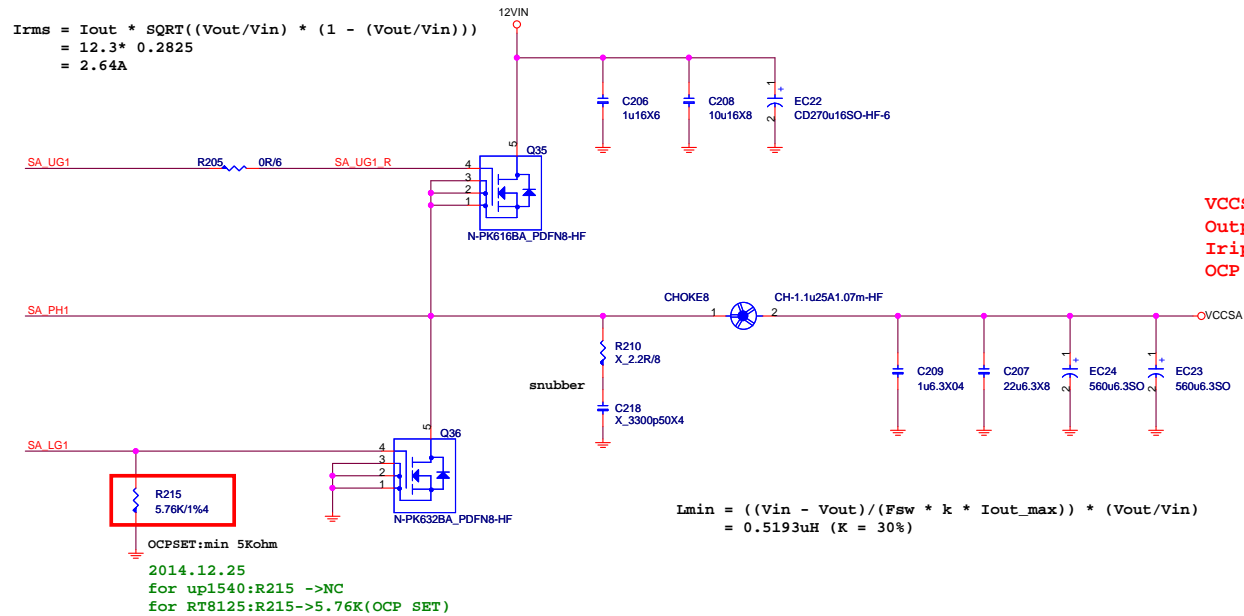
2014.12.25
for up1540:C242&R234 ->NC
for RT8125 C242:1000p,R234->1K

2014.12.25
for up1540:R1039 is OCP set min:5K ohm
stuff 5.36K OCP SET:15.76A
for RT8125:R1039->1000p

$$I_{rms} = I_{out} * \sqrt{(V_{out}/V_{in}) * (1 - (V_{out}/V_{in}))}$$

$$= 12.3 * 0.2825$$

$$= 2.64A$$



VCCSA:
Output = 11.1A
Iripple = A
OCP = 15.54A

VCCIO

0.95V; 5.5A

IMAX 10A

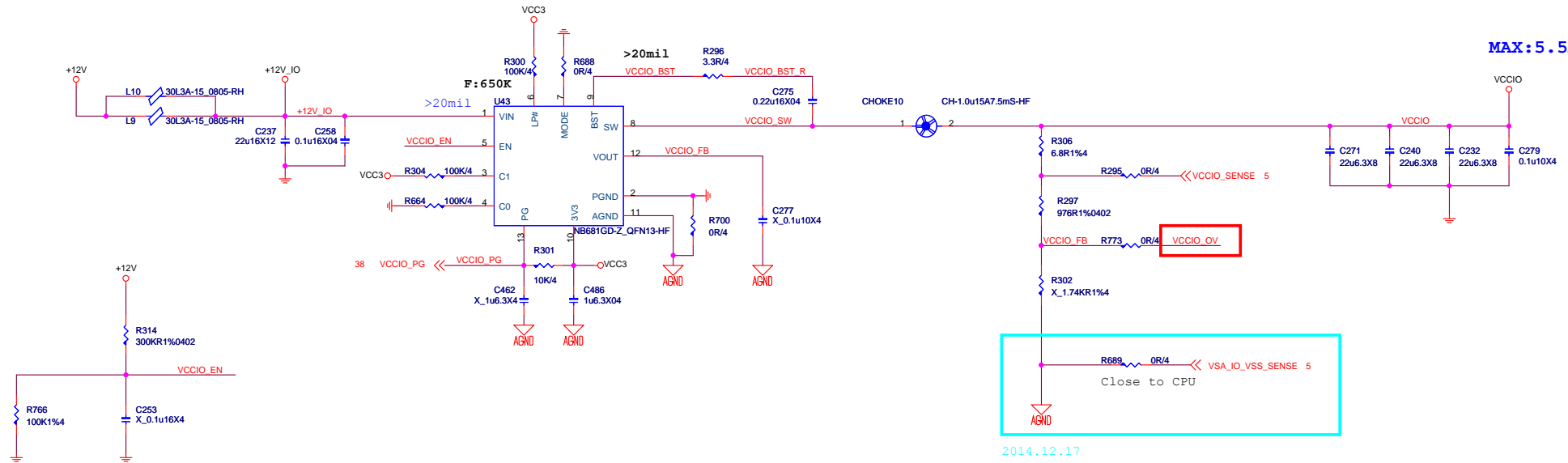
ILIMIT=10A~12A

IOC=ILIMIT*40%*IMAX/2=12A~14A.

0.7776uH<L<1.1664uH

I9C-6816DOC-M03

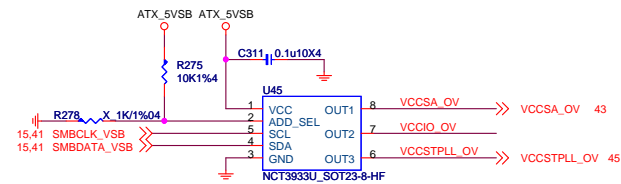
MAX:5.5A



	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

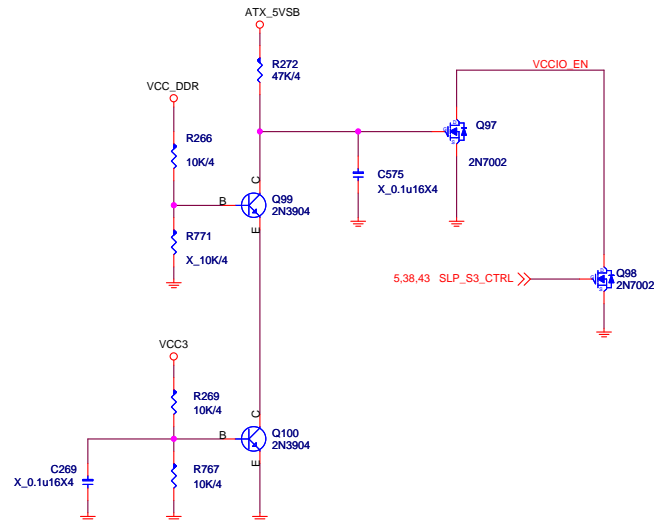
UPI VOLTAGE CONSOLE

0x20:RL=OPEN,RH=10K



SLP_S3# assertion to VCCIO VR disabled <1uS.

SLP_S3# assertion to VCC, VCCGT, VCCIO and VCCSA rails completely off. <500ms



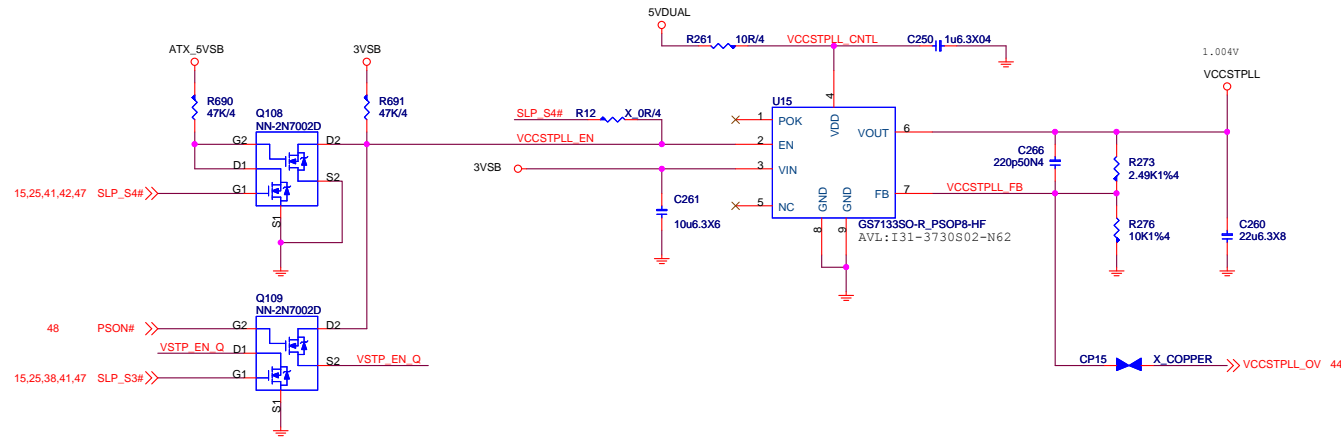
1.0V; 120mA

```
VCCIO ramped and stable before
beginning of VCCOPC/VCCEOPIO ramp
VCCST/PLL stable 1ms before PROCPWRGD
```

For Cost down VCCST&VCCPLL merge

VCCPLL_OC

1.2V; 100mA



MICRO-STAR INT'L CO.,LTD

MS-7979

Size Custom	Document Description VCCSTPLL & PCH_IP8	Rev 1.0
Date: Thursday, July 30, 2015		Sheet 45 of 54

PCH_1VSB

1.0V; 7.11A~7.858A

Rdson(1ow)4.5V

D03-4C05N03-005 : 5 mohm
D03-632BA0C-N03 : 4.6mohm
D03-3056M00-U47 : 6.2mohm

OCP = 15.996A

Rocset = $1.5 * I_{max} * R_{dson(1ow)} / I_{ocset}$
= $1.5 * 10.664 * 5mohm / 10uA$
= 7.998K

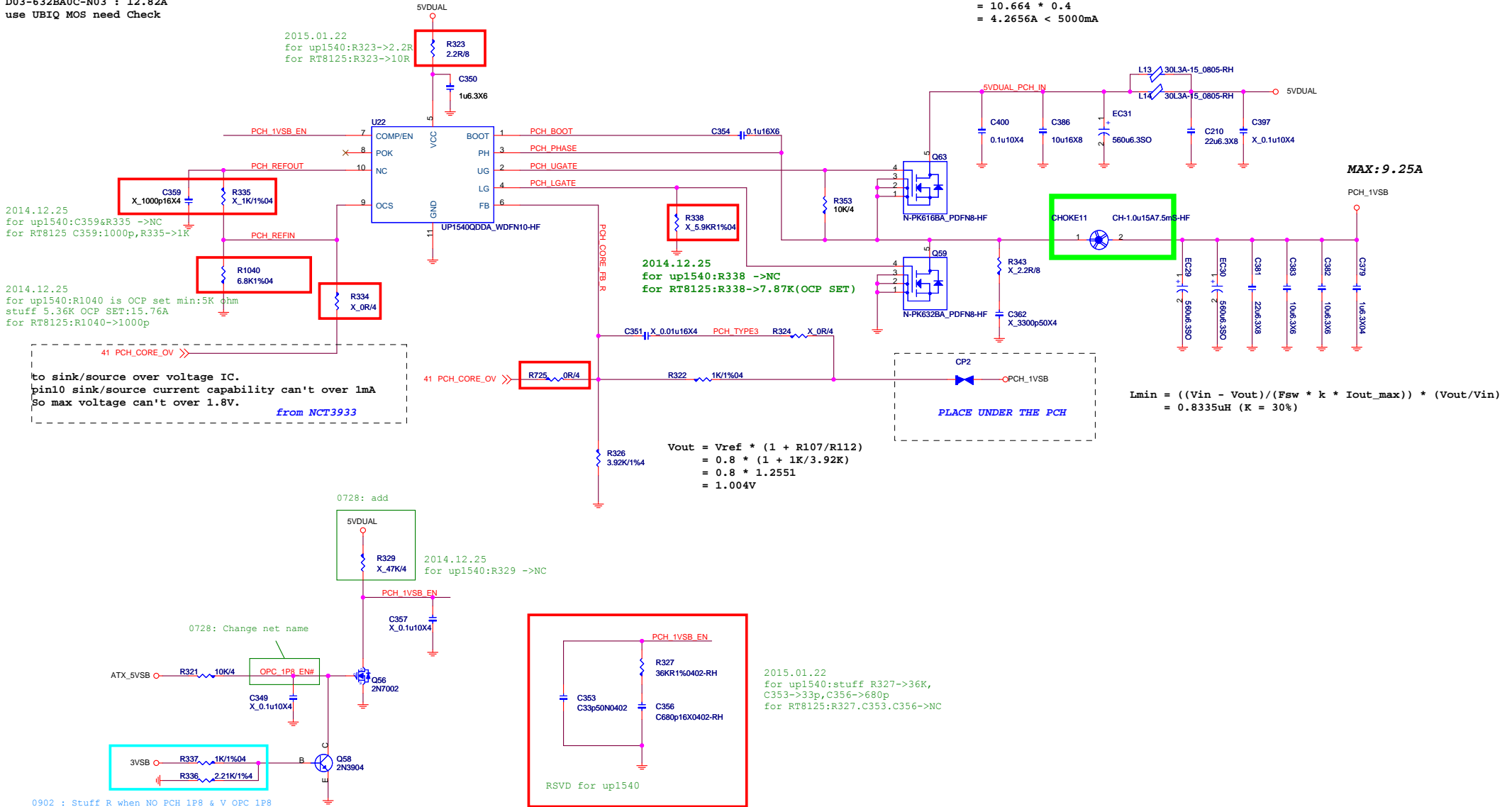
Rocs:5.9K,OCP:

D03-4C05N03-005 : 11.8A
D03-632BA0C-N03 : 12.82A
use UBIQ MOS need Check

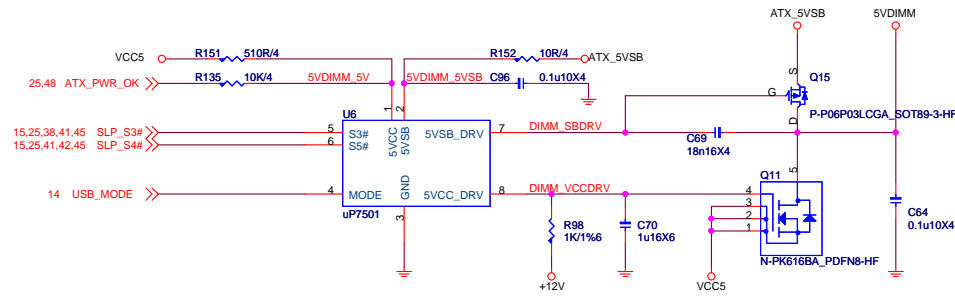
$$I_{rms} = I_{out} * \sqrt{(V_{out}/V_{in}) * (1 - (V_{out}/V_{in}))}$$

$$= 10.664 * 0.4$$

$$= 4.2656A < 5000mA$$



5VDIMM FOR DDR

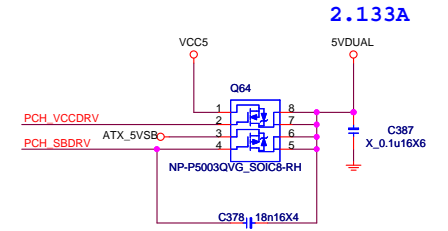
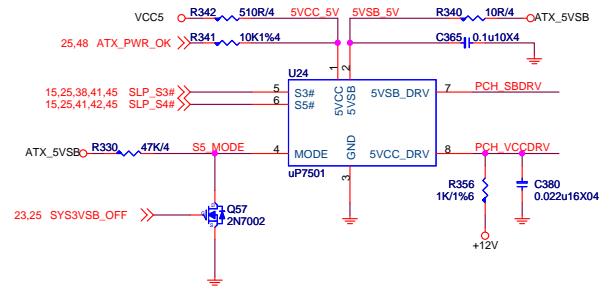


7501 Mode
H:Support S0/S3/S5
L:Support S0/S3

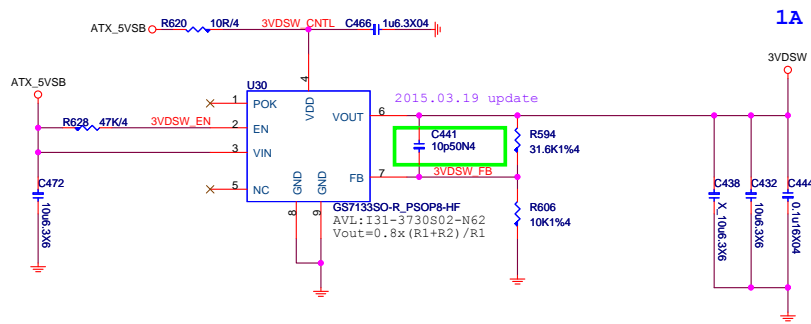
DIMM_VCCDRV >> DIMM_VCCDRV 32
DIMM_SBDRV >> DIMM_SBDRV 32

5VDUAL

5VDUAL is power source of LP0SB

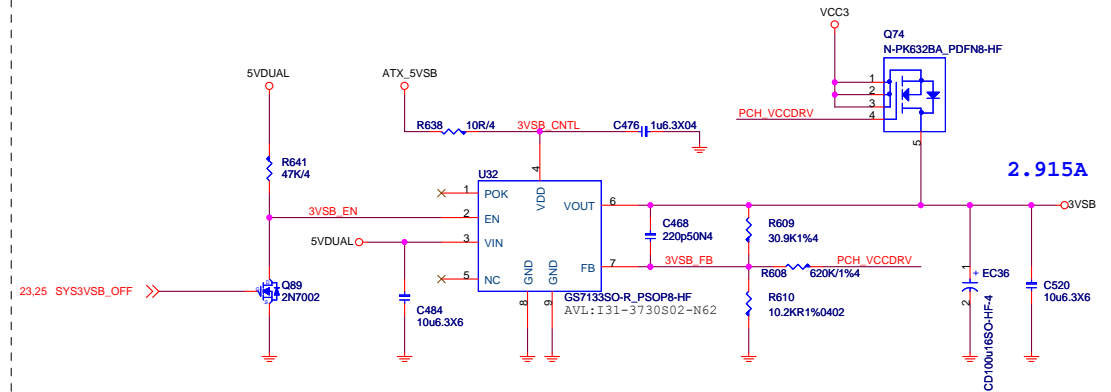


3VDSW



1A

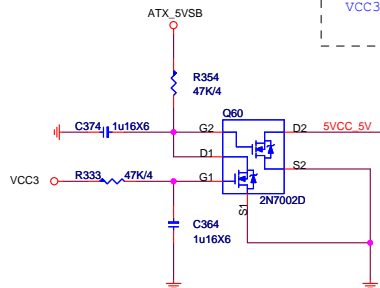
3VSB cost down



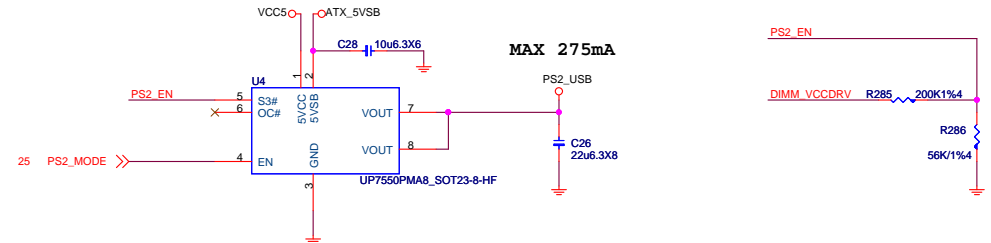
2.915A

VFB=3.224V for S0->S3 3VSB voltage raise & ATX_5VSB drop.

For power 700W solution (only for uP7501+uP7506 for 3VSB solution)
The power supply VCC3 delay 12ms after VCC5 assert.
The chip U7501 5VDRV1 work when the VCC5 ready
(When VCC5 up to 4.2V and the 5VDRV1 delay 6ms assert), but
VCC3 not ready and let the 3VSB sequence fail.



PS2 Power



MAX 275mA

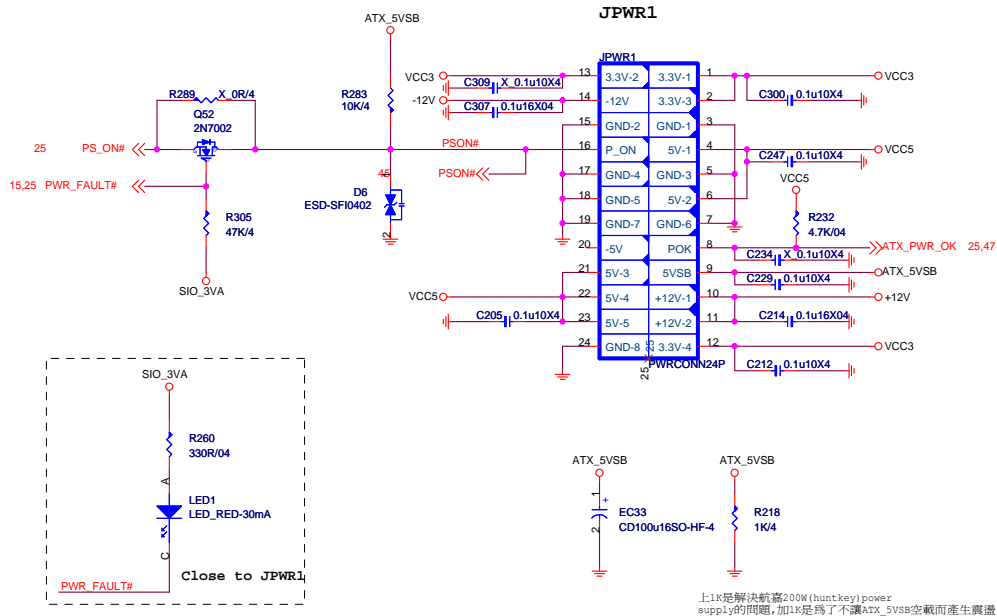


MICRO-STAR INT'L CO.,LTD

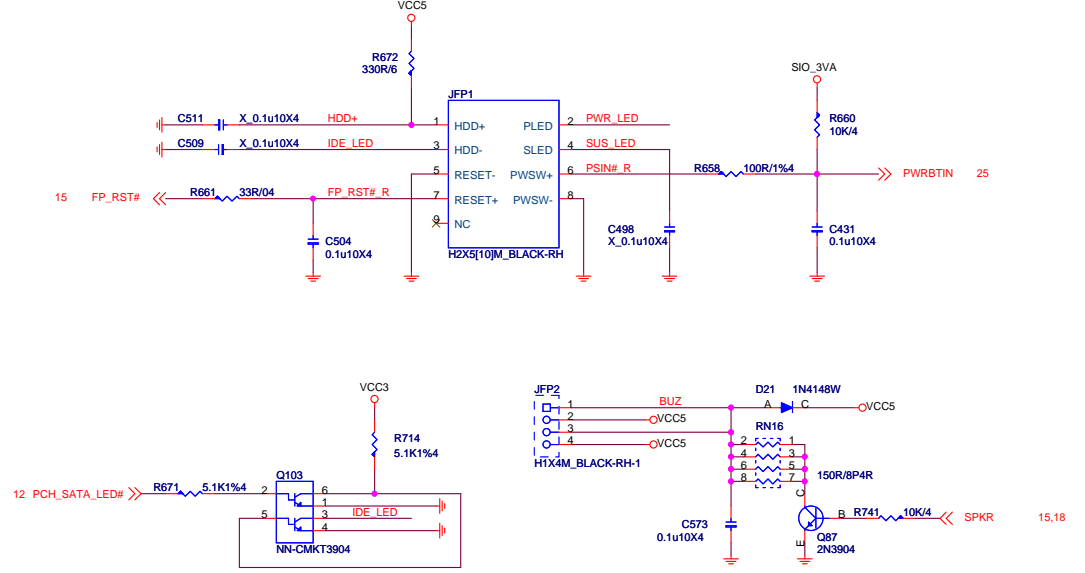
MS-7979

Size	Document Description	Rev
Custom	ACPI Controller	1.0
Date: Wednesday, July 29, 2015	Sheet 47 of 54	

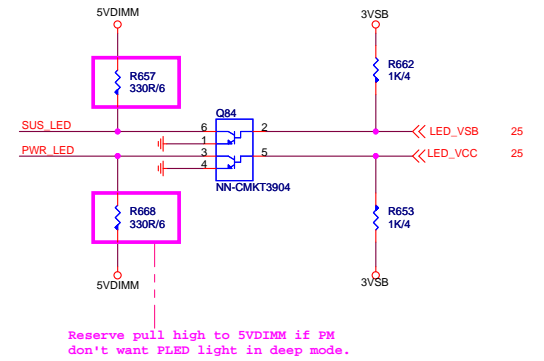
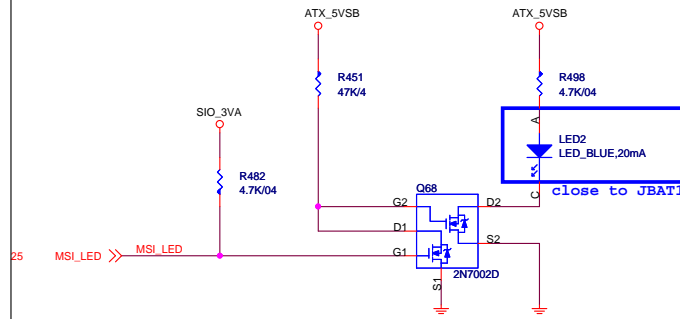
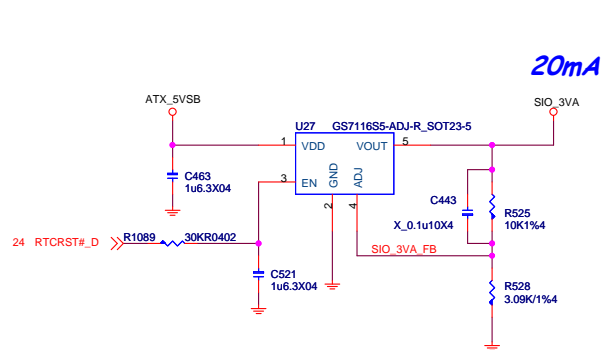
ATX POWER CONNECTOR

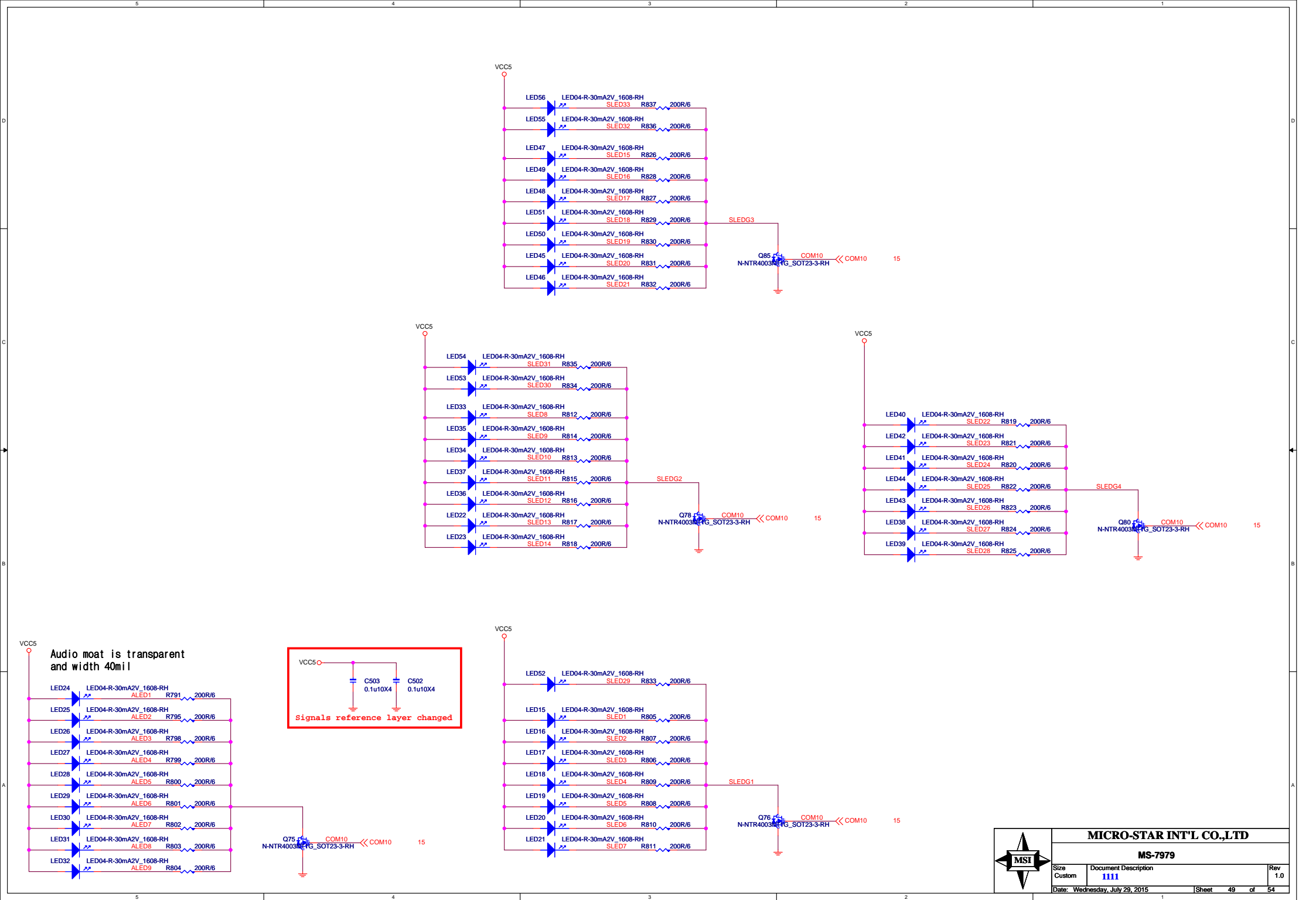


FRONT PANNEL

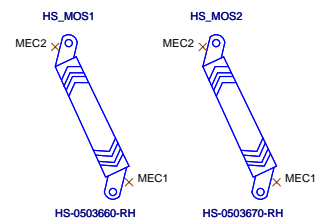
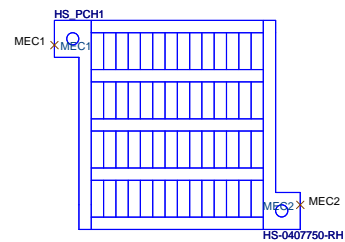


MSI_LED



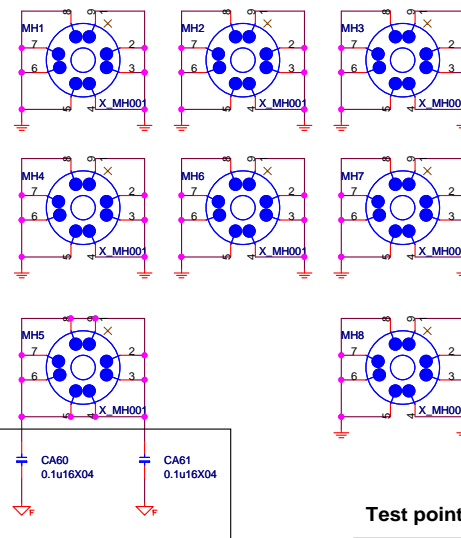


HEATSINK

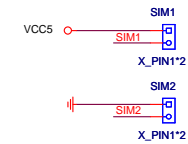


7979_10
PD0-0797910-G37
PD0-0797910-G37, 精成, 23, 寶安恩斯邁廠 (MSIS)
PD0-0797910-E48, 競華, 23, 寶安恩斯邁廠 (MSIS)

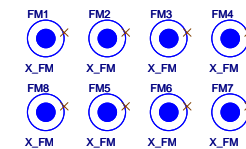
Mounting Holes



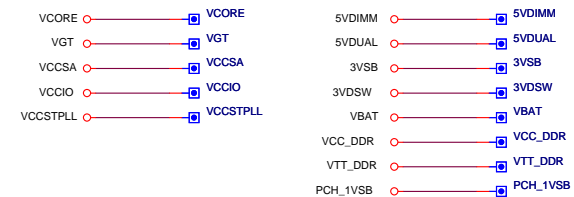
Simulation



Optical Fiducial Marks-120




Test point



MS-7979-0A 主BOM爲B150

OPT	Configure	BOM	Function
	B150-COMBO	601-7979-A10	MS-7983 0A,B150,LGA1151, 2DDR3,2DDR4,1PCI-Ex16,2PCI-Ex1,4SATA3,6USB3, HD Audio,Gb LAN,DSUB,DVI,HDMI



MICRO-STAR IN

MS-7979



MICRO-STAR INT'L CO.,LTD

MS-7979

Size Custom	Document Description Manual parts	Rev 1.0
Date: Friday, July 31, 2015		Sheet 50 of 54