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MS-7984

ATX
Ver: 1.1

Intel -Skylake plamform Z170

CPU:

System Chipset:

Skylake-S

Z170

Onboard Chip:

HD Audio Codec:ALC1150
LAN:Intel I219V
SIO:Nuvoton 6793D
Flash ROM: SPI 64MB /128MB(For H170/B150)

Main Memory:

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

ACPI:

PWM:

NIKO/UIP

IMVP8-ISL95856

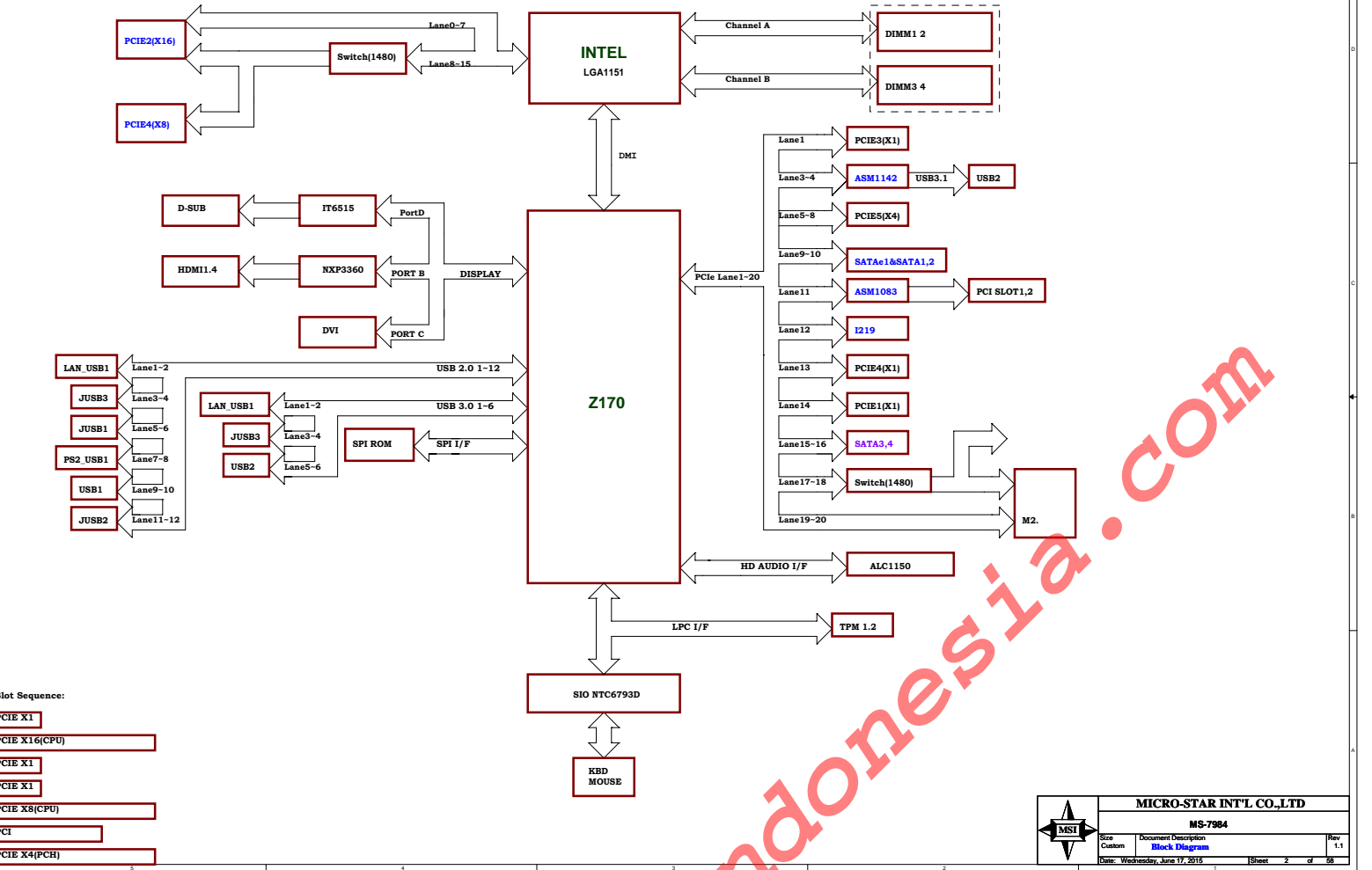
Expansion Slots:

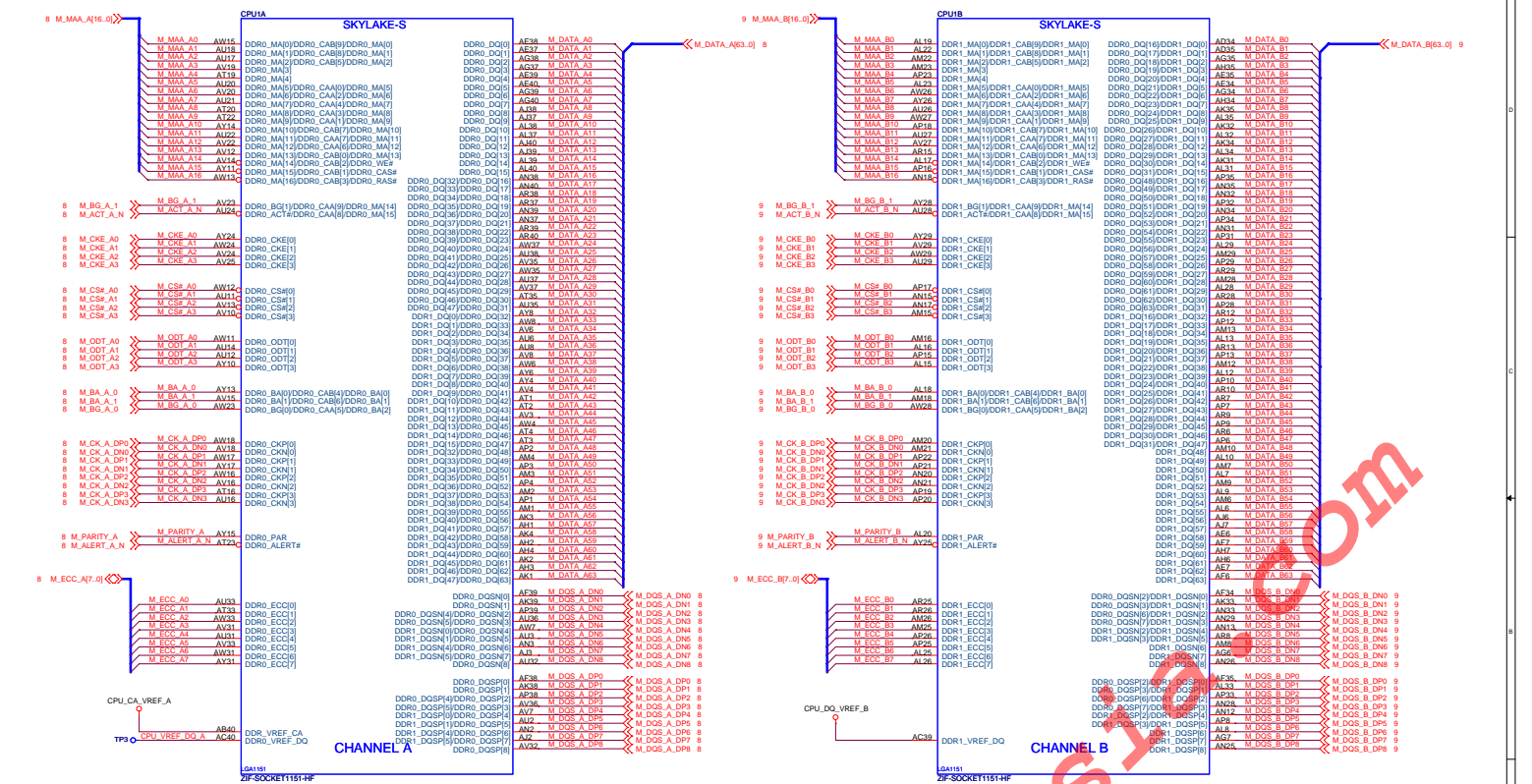
Other:

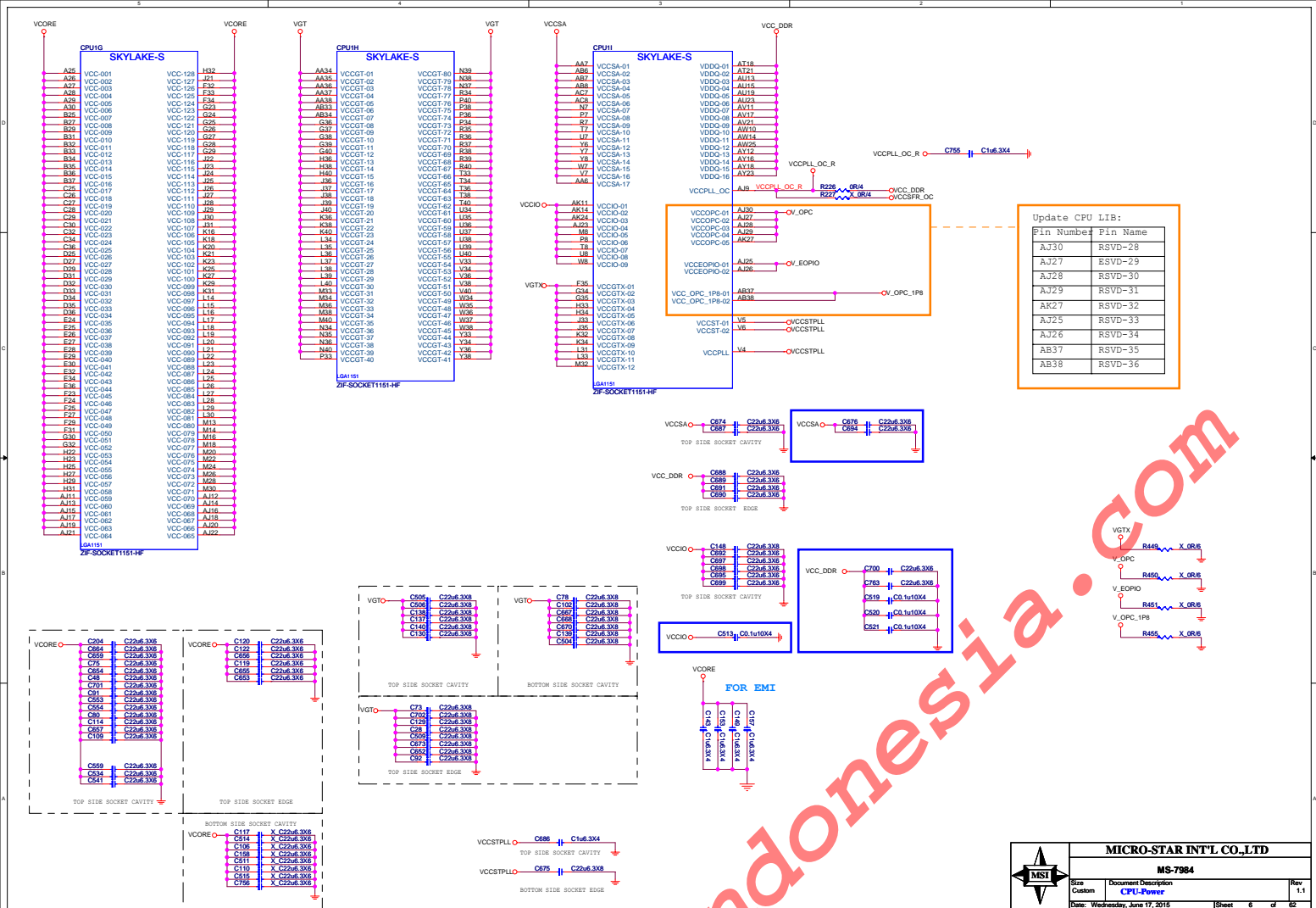
PCI Express (X16) Slot *1
PCI Express (X8) Slot * 1
PCI Express (X4) Slot * 1
PCI Express (X1) Slot * 3
PCI Slot * 1
M2 * 1
SATAe* 1
SATA3.0 x6

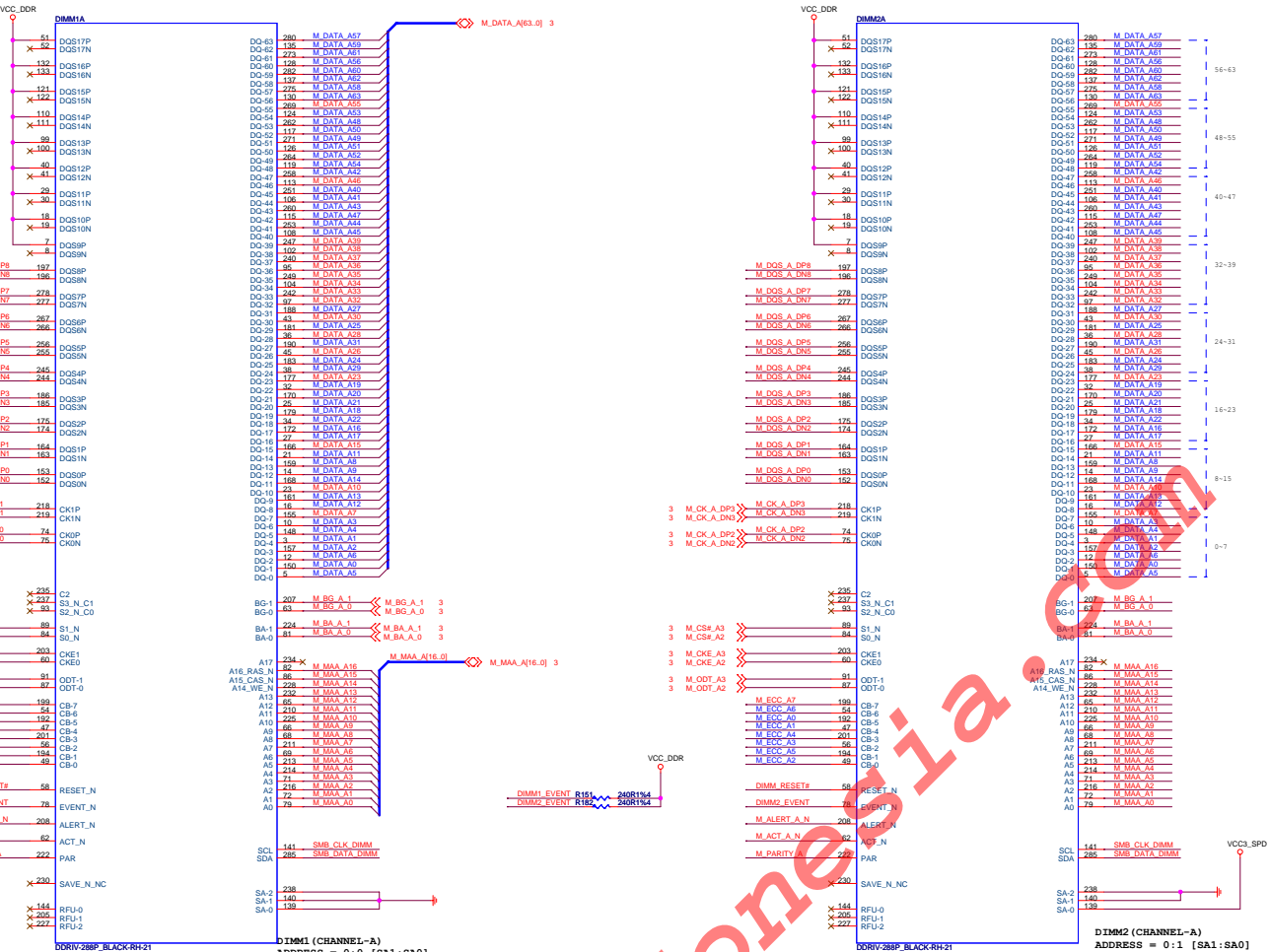
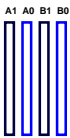
REAR USB2.0 *2
REAR USB3.0 *4
REAR USB3.1 *2
FRONT USB2.0 *4
FRONTUSB3.0 *2

MS-7922 Block Diagram



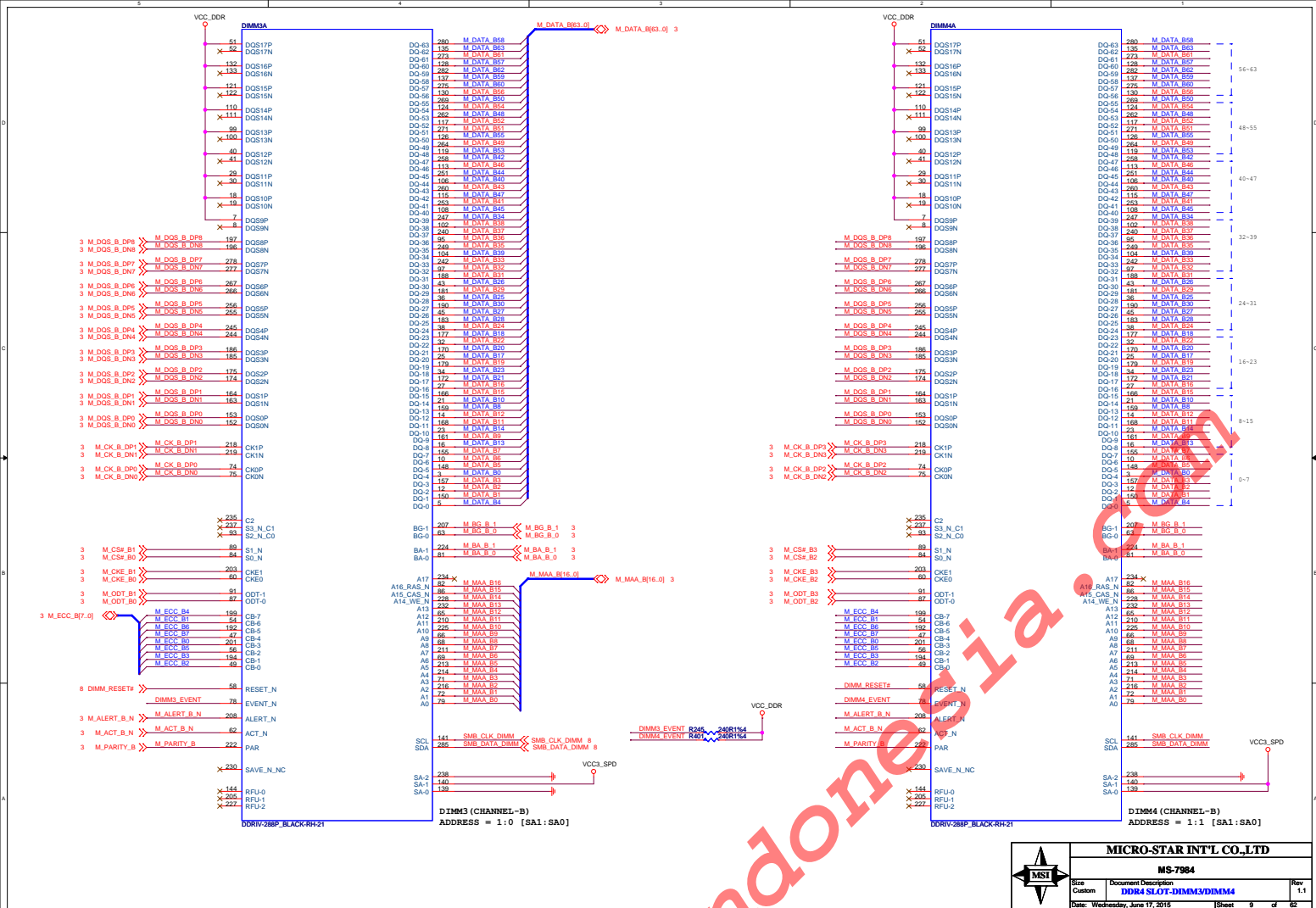


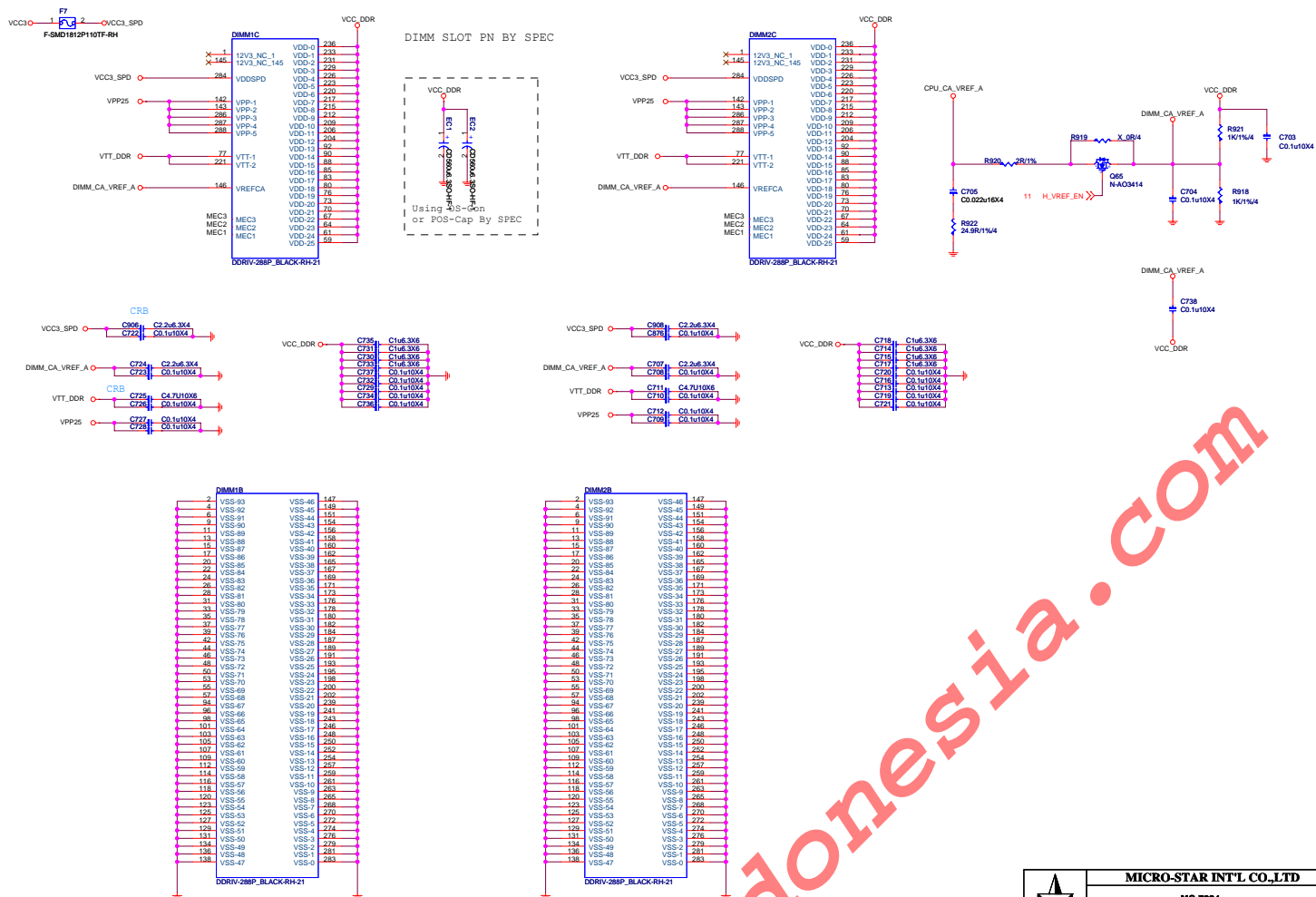




15,25,38,47	SMBCLK_VCC	SMBCLK_VCC	R78	0R4	SMB_CLK_DIMM	SMB_CLK_DIMM 9
15,25,38,47	SMBDATA_VCC	SMBDATA_VCC	R80	0R4	SMB_DATA_DIMM	SMB_DATA_DIMM 9

MICRO-STAR INT'L CO.,LTD
MS-7984
Size: Custom Document Description: **DDR4 SLOT-DIMM1/DIMM2** Rev: 1.1
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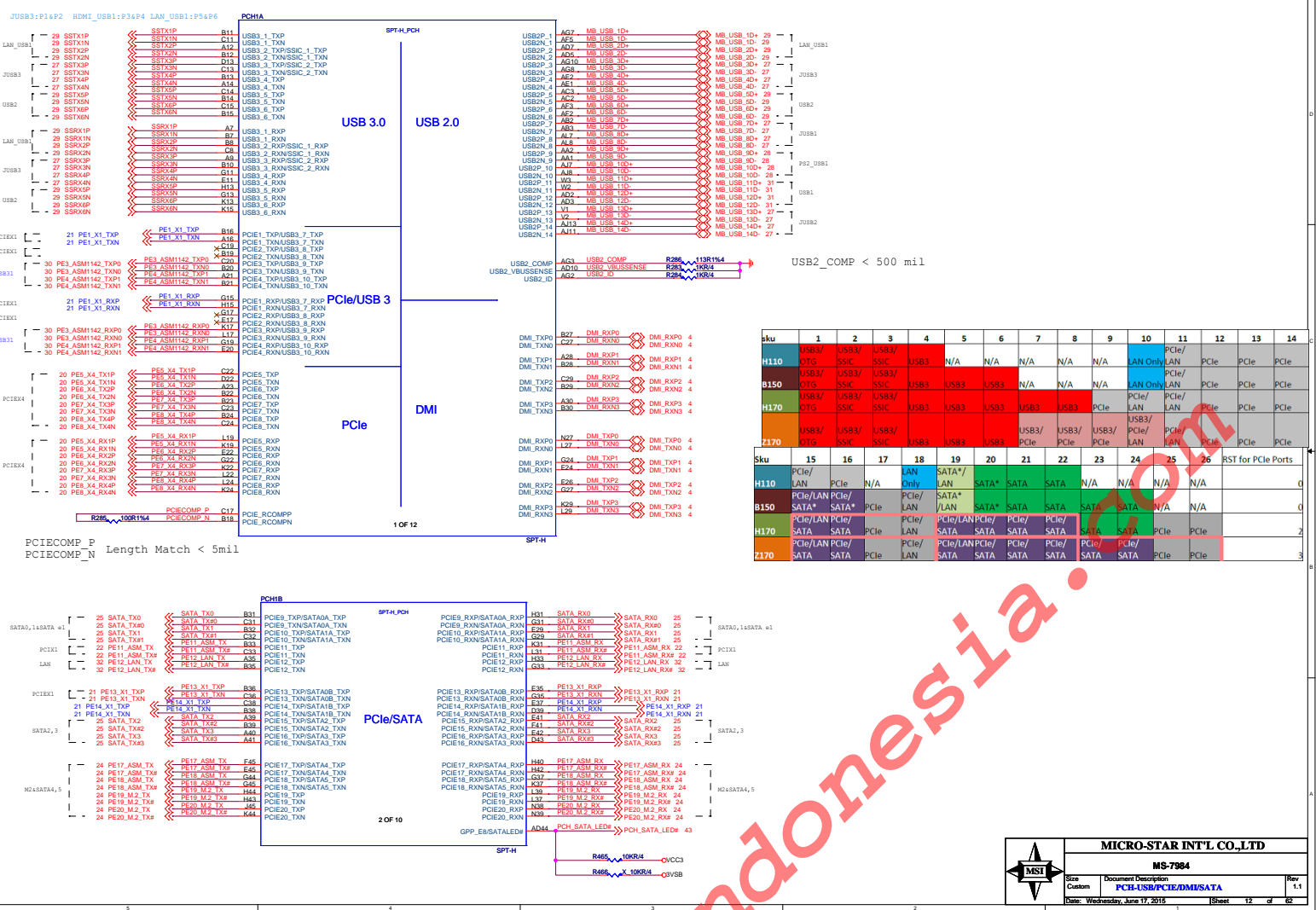
MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size Custom	Document Description DDR4-POWER/GND-1		Rev 1.1
Date: Wednesday, June 17, 2015		Sheet: 10 of 62	

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DDRIV-288P_BLACK-RH-21


DDRIV-288P_BLACK-RH-21

MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	DDR4-POWER/GND-2	1.1	
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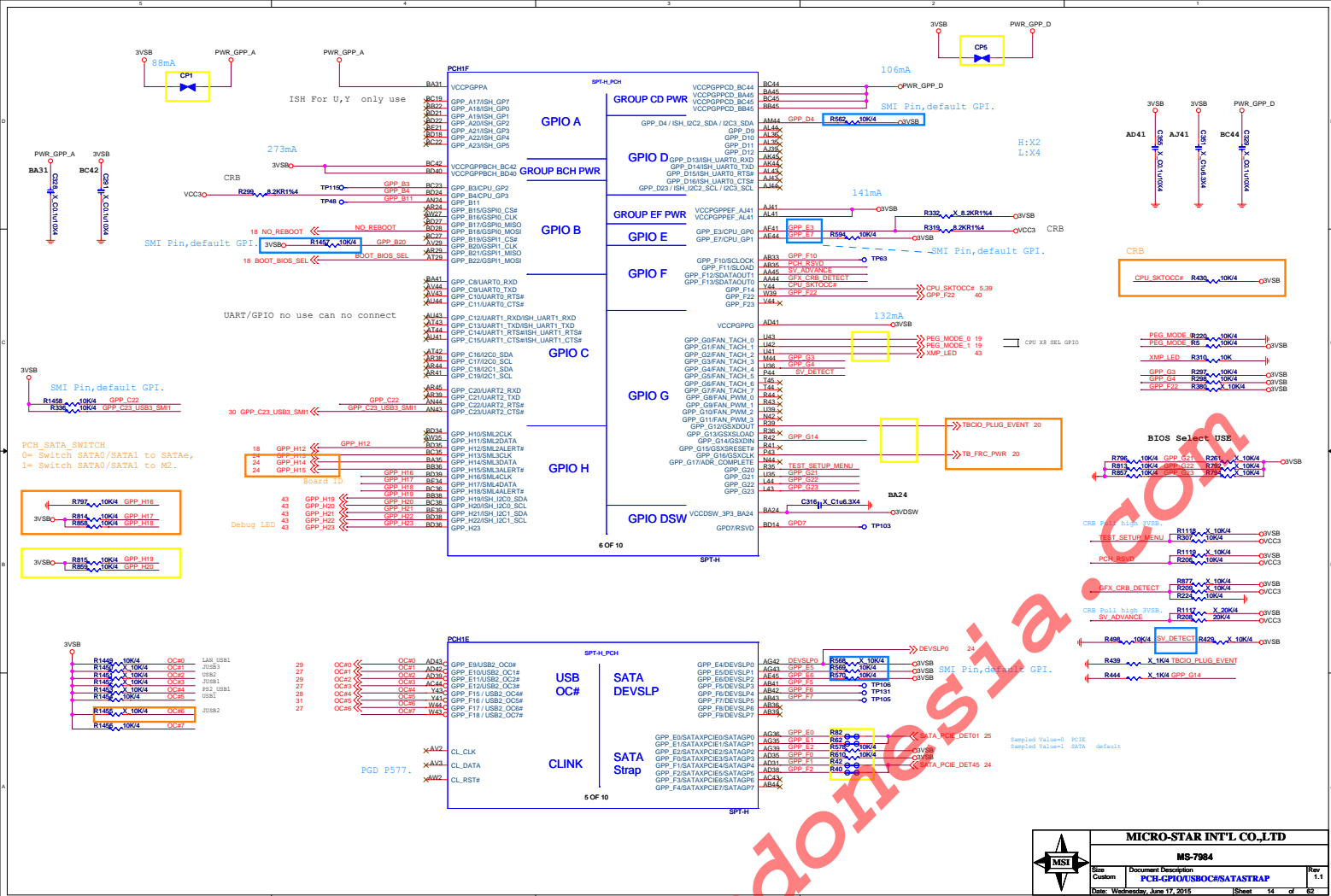
sku	1	2	3	4	5	6	7	8	9	10	11	12	13	14
H110	USB3/OTG	USB3/SSIC	USB3/SSIC	USB3	N/A	N/A	N/A	N/A	N/A	LAN Only	PCle/LAN	PCle	PCle	PCle
B150	OTG	SSIC	SSIC	USB3	USB3	USB3	N/A	N/A	N/A	LAN Only	PCle/LAN	PCle	PCle	PCle
H170	USB3/OTG	USB3/SSIC	USB3/SSIC	USB3	USB3	USB3	USB3	USB3	PCle	LAN	SSIC/USB3/PCle/LAN	PCle	PCle	PCle
Z170	USB3/OTG	USB3/SSIC	USB3/SSIC	USB3	USB3	USB3	USB3/PCle	USB3/PCle	USB3/PCle	USB3/PCle	PCle/LAN	PCle	PCle	PCle

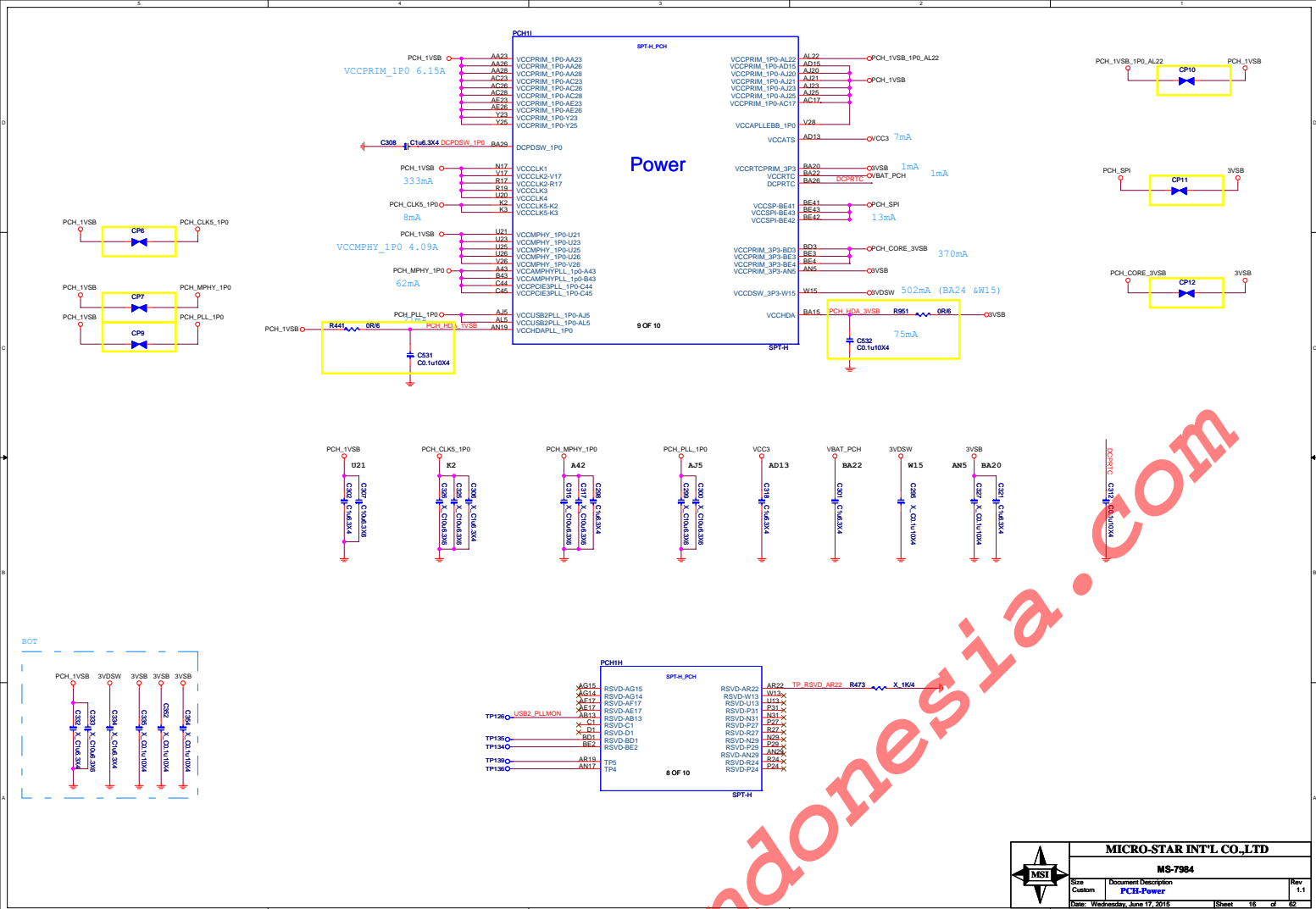
SKU	15	16	17	18	19	20	21	22	23	24	25	26	RST for PCIe Ports	
H110	PCle/LAN	PCle	N/A	LAN	SATA*/SSIC	SATA*	SATA	SATA	N/A	N/A	N/A	N/A		
B150	PCle/LAN	SATA*	PCle	LAN	SATA*	SATA*	SATA	SATA	SATA	SATA	N/A	N/A		
H170	SATA	SATA	PCle	PCle	LAN	SATA	SATA	SATA	SATA	SATA	PCle	PCle		
Z170	PCle/LAN	PCle	PCle	PCle	LAN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



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MS-7984

Size	Document Description	Rev
Custom	PCB-USB/PCIE/DMI/SATA	1.1
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GND

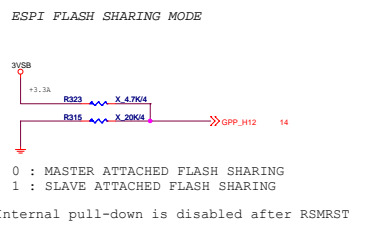
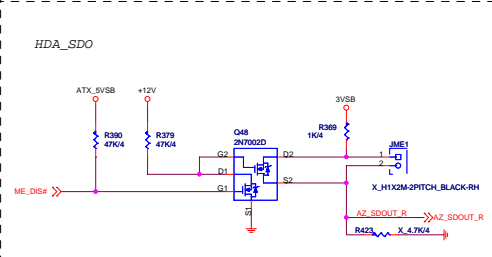
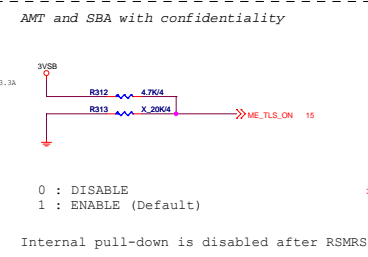
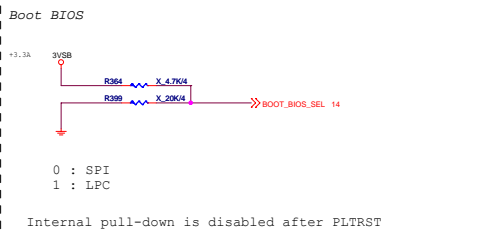
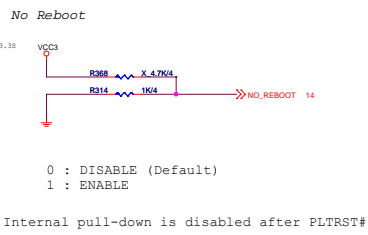
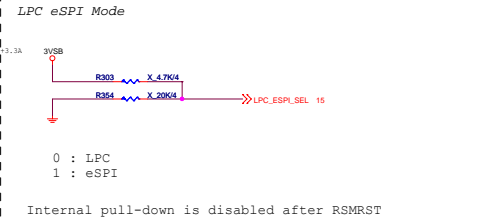
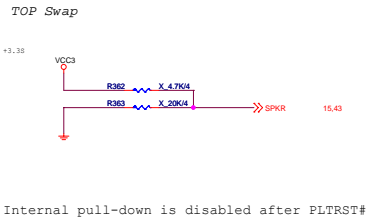
10 OF 10



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MS-7984

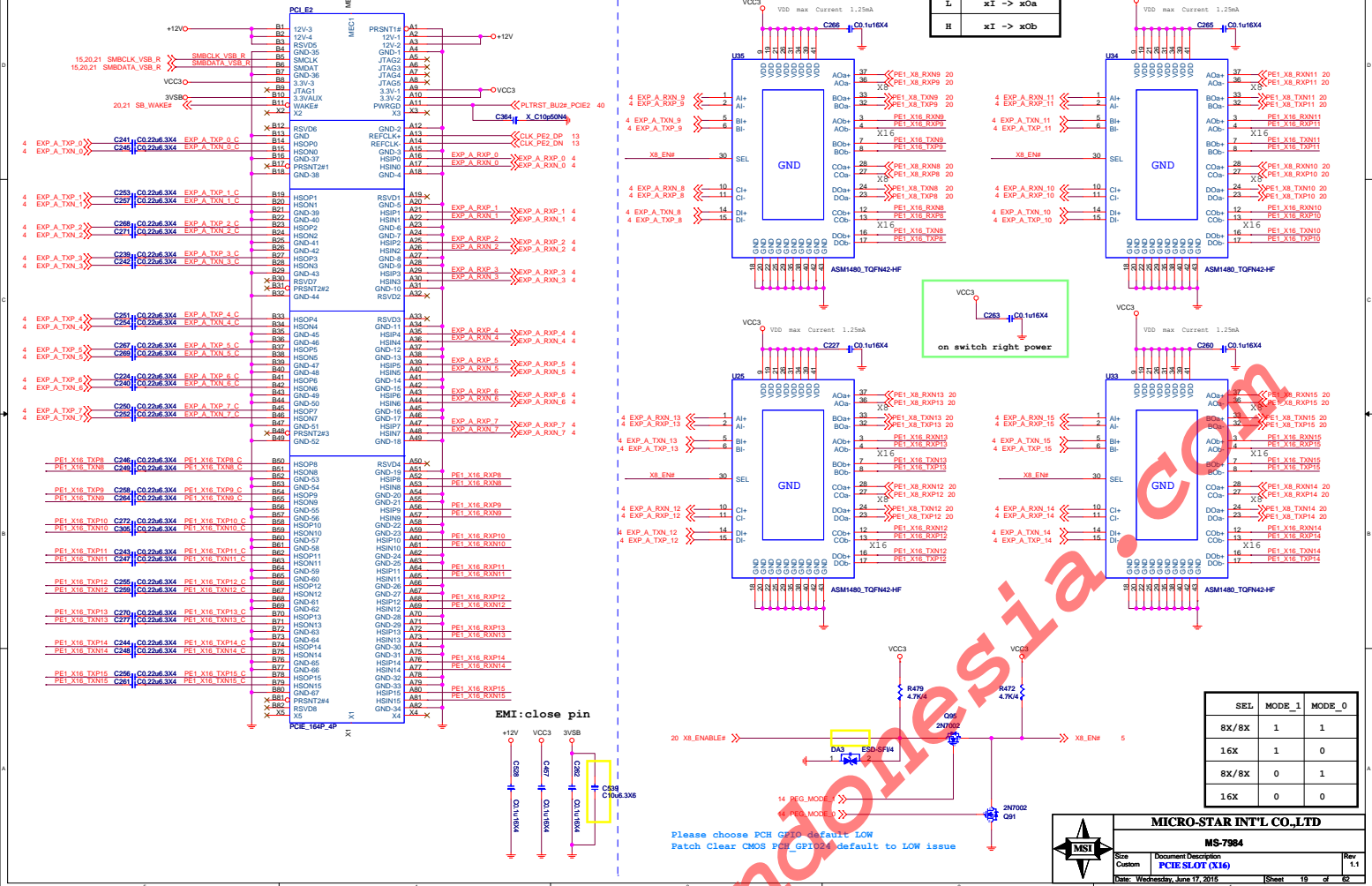
Size	Document Description	Rev
Custom	PCB-GND	1.1
Date: Wednesday, June 17, 2015		Sheet 17 of 62



PCI Express X16 Slot

support max speed GEN3 Black

SEL	Function
L	x1 -> x0a
H	x1 -> x0b



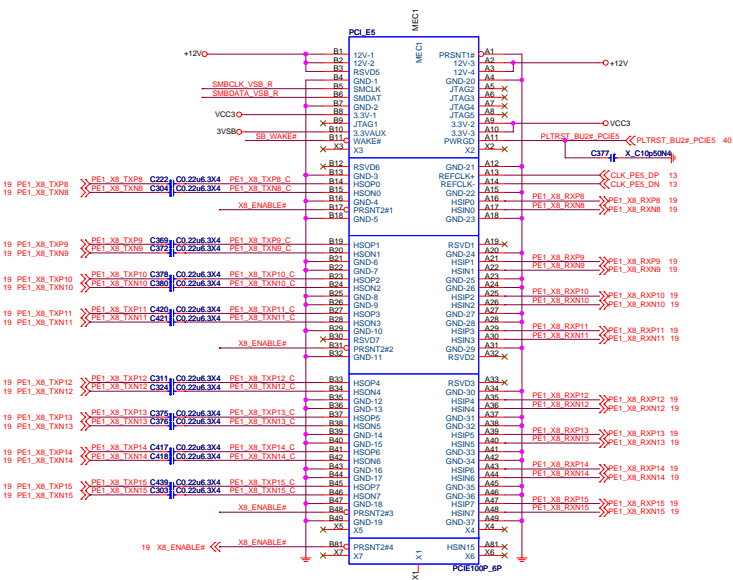
MICRO-STAR INT'L CO.,LTD	
MS-7984	
Size	Document Description
Custom	PCIE SLOT (X16)
Date: Wednesday, June 17, 2015	Sheet 19 of 62

15.19.21 SB_WAKE# SB_WAKE#
15.19.21 SB_WAKE# SB_WAKE#
15.19.21 SB_WAKE# SB_WAKE#

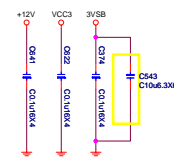
PCI Express X8 Slot

support max speed GEN3

Black



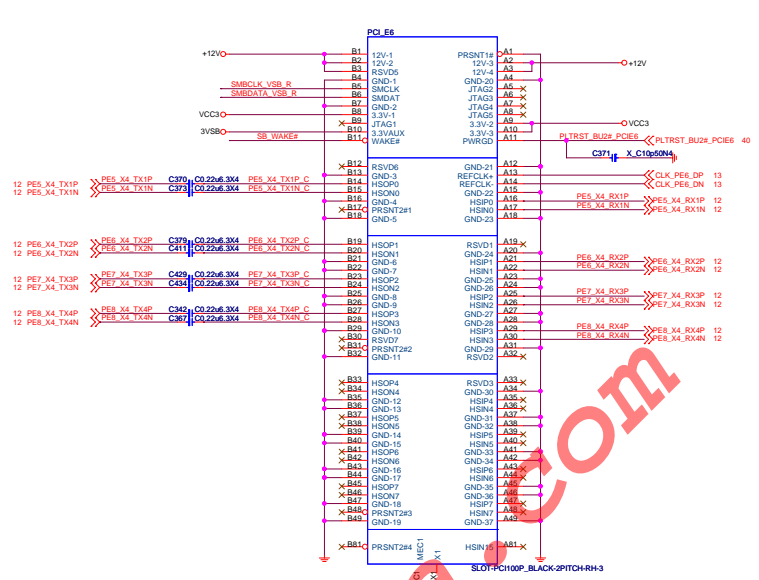
EMI:close pin



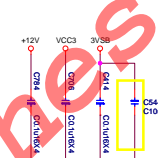
PCI Express X4 Slot

support max speed GEN3

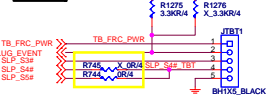
Black



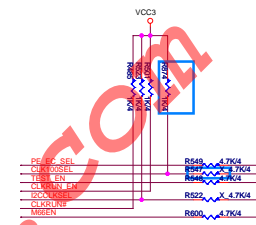
EMI:close pin



JTBT



MICRO-STAR INT'L CO.,LTD		
MS-7984		
Size	Document Description	Rev
Custom	PCIE SLOT (X4)	1.1
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```

FF SCSEL-
"H" for Express Card mode
"L" for PCIe Riser Card mode

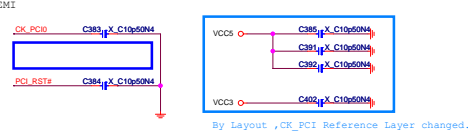
CLK100SEL-
"H" for PCLK1 input only
"L" for PCLK1 & PCLK1A input

TEST EN-
"H" for Test Mode Enable
"L" for Test Mode Disable

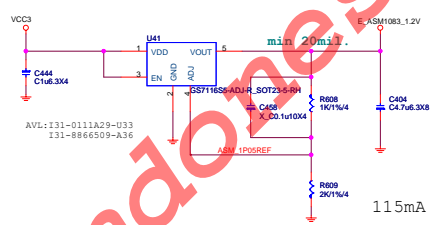
CLKRUN EN-
"H" for CLKRUN Mode Disable
"L" for CLKRUN Mode Enable


I2CCCLKSEL-
"H" is 135KHz I2CCCLK
"L" is 67.5KHz I2CCCLK

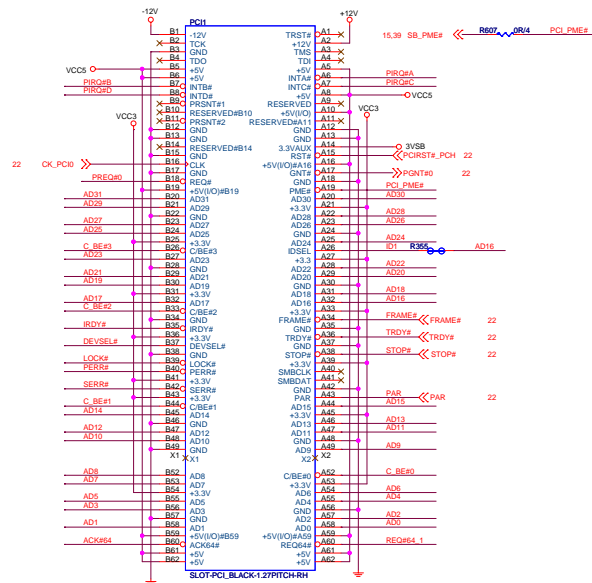
```



VCC3
90mA+115mA



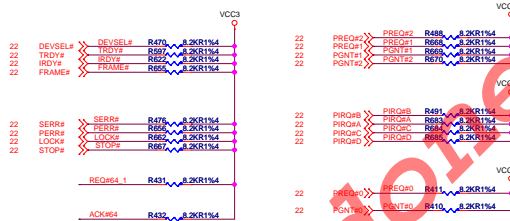
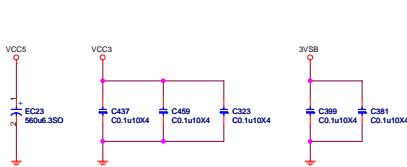
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	MS-7984		
	Size Custom	Document Description PCIE to PCI-ASM1083	Rev 1.1
	Date: Wednesday, June 17, 2015		Sheet 22 of 62



IDSEL = AD16
 MASTER = PREQ#0
 PIRQ#A



PCI PULL-UP / DOWN RESISTORS



PCI slot (X3)

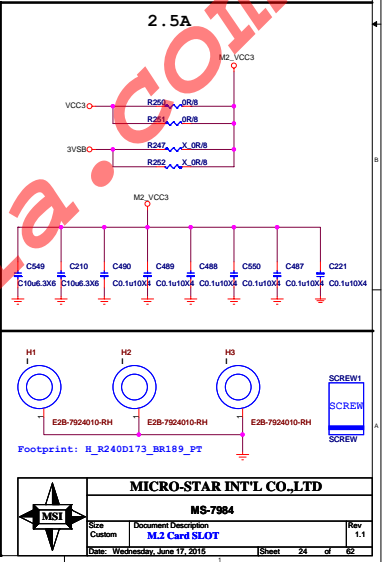
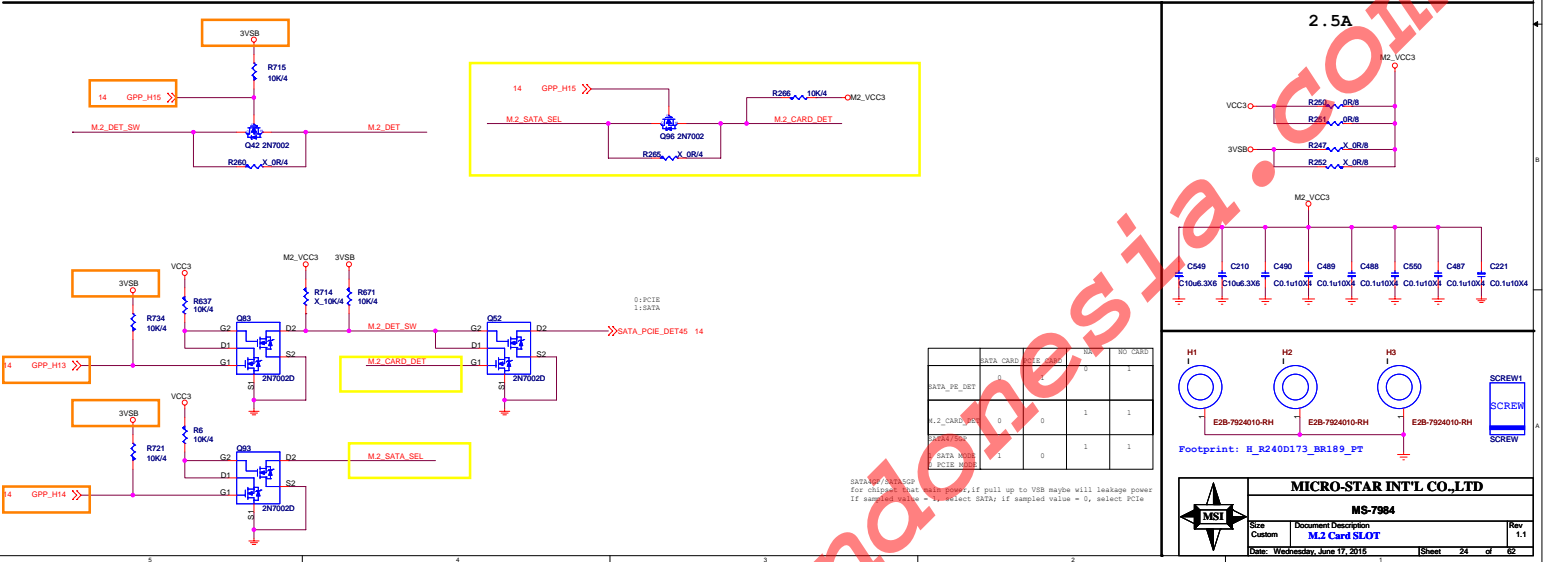
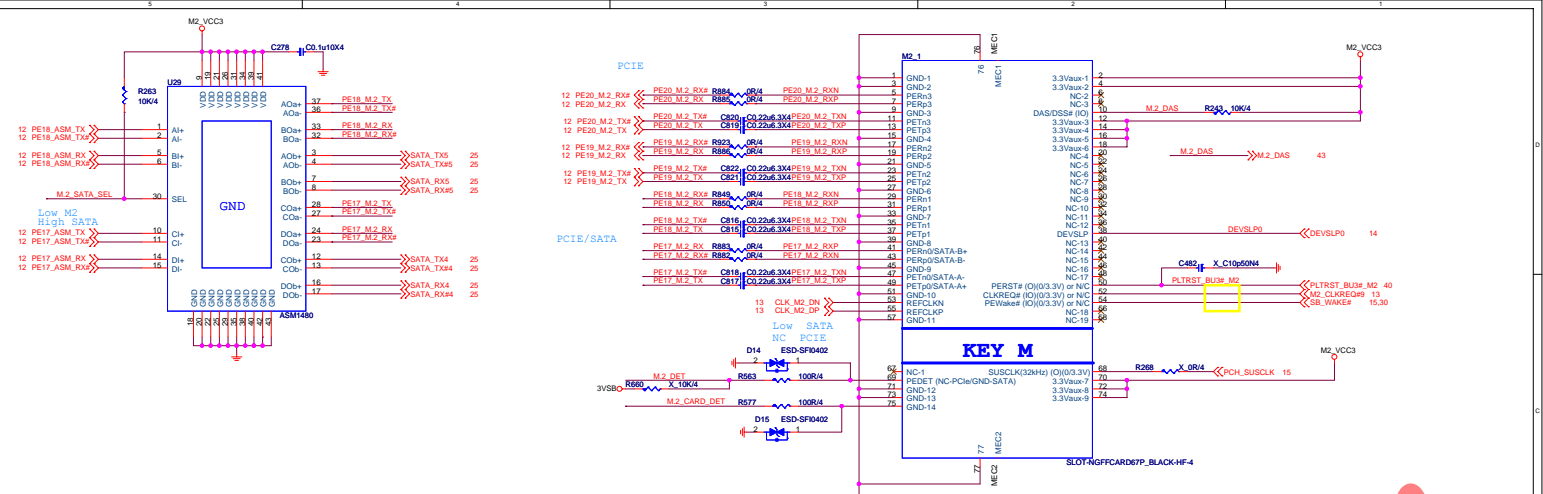
+3.3Vaux (wake)	- 1125mA
+3.3Vaux (no wake)	- 60mA
+3.3V	- 7.6A
+5V	- 15A
+12V	- 1.5A

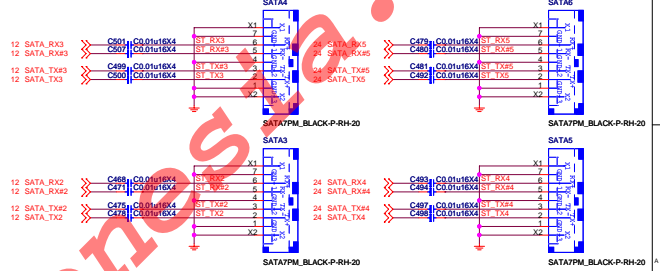
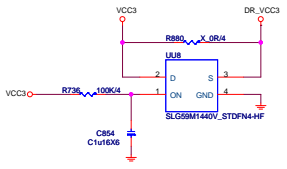
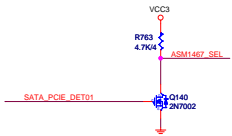
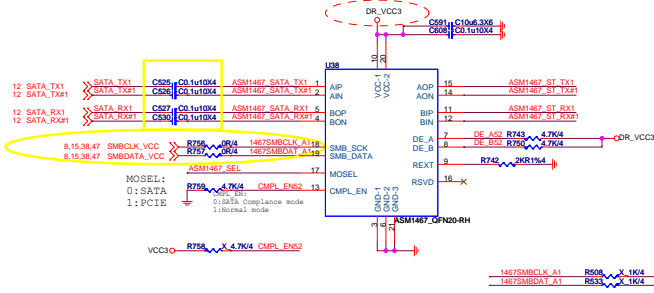
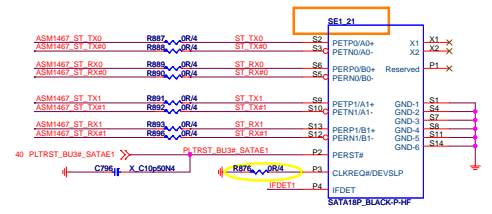
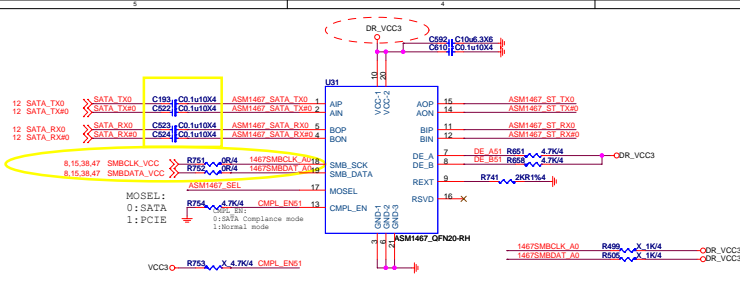


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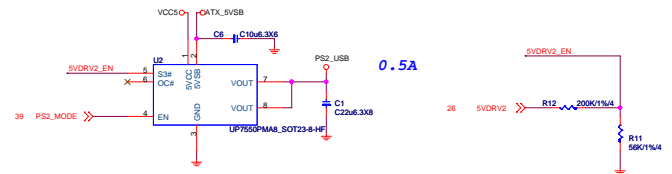
Size	Document Description	Rev
Custom	PCI SLOT	1.1
Date: Wednesday, June 17, 2015	Sheet 23 of 62	



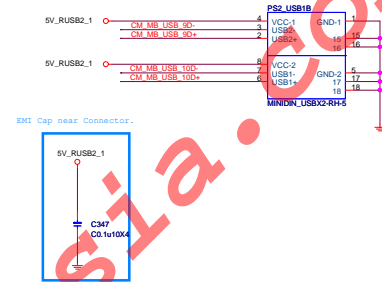



MICRO-STAR INT'L CO.,LTD		
MS-7984		
Size	Document Description	Rev
Custom	SATA Express/SATA Connector	1.1
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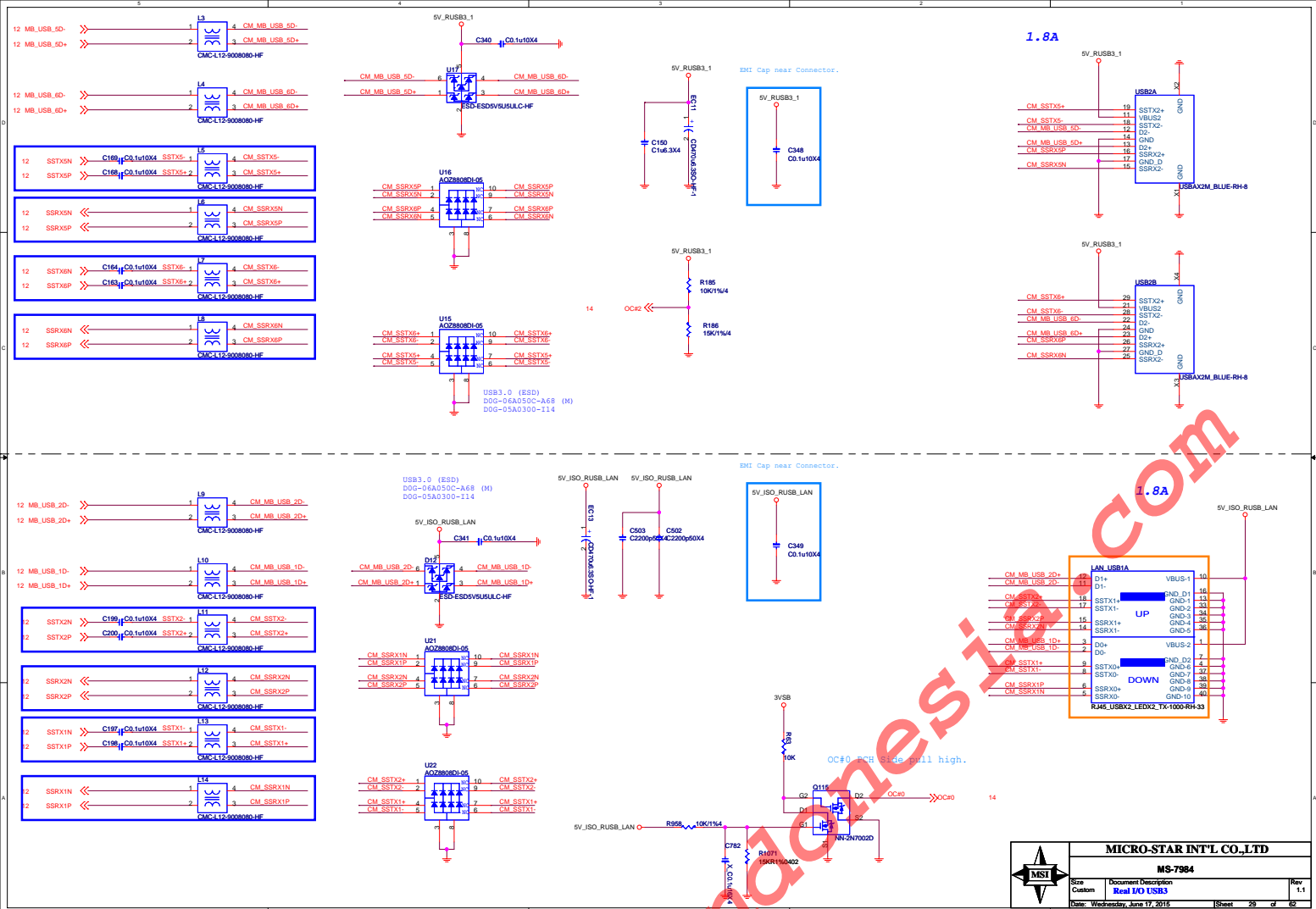
USB MODE

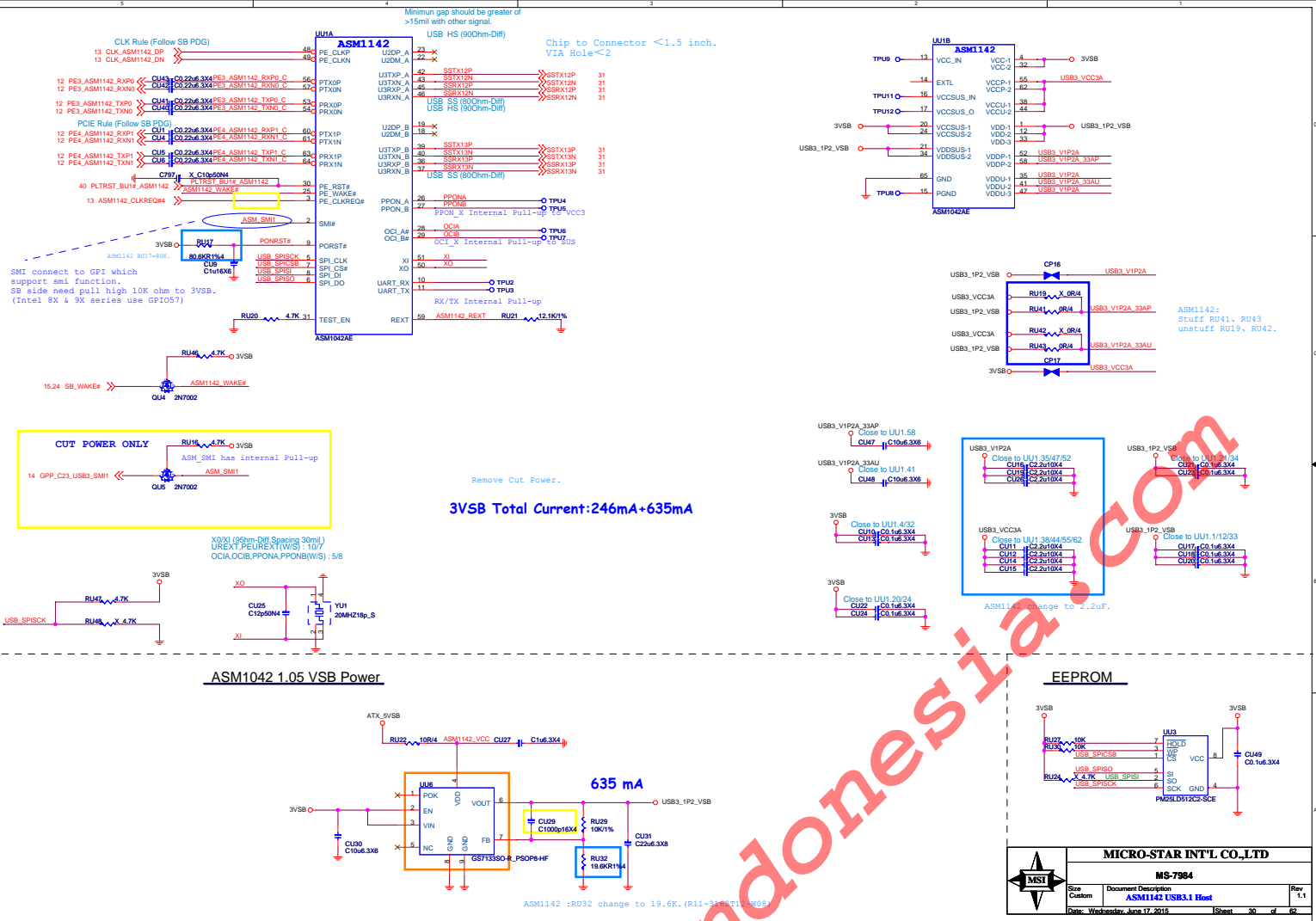


1.0A



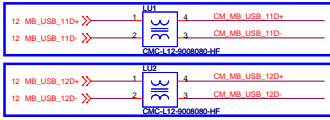
	MICRO-STAR INT'L CO.,LTD		
	MS-7984		
	Size Custom	Document Description Rear I/O P52/USB2	Rev 1.1
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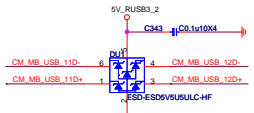


Rear USB3 CONN

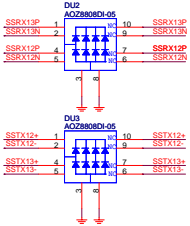
Important--
If USB3.0 signal connect to front pin header,
please must less than 1.5 inch, short trace
has better eye diagram with some bad fly cable by SI customer.



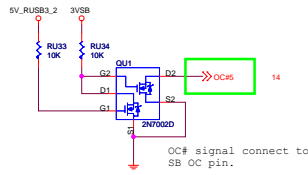
USB2.0
DOG-0200529-A68 Main
DOG-0100619-105 AVL



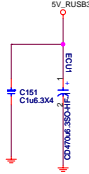
ESD Protection NEAR CONNECTOR



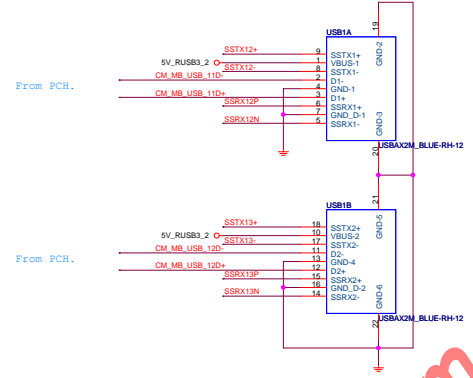
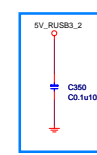
USB3.0
DOG-06A050C-A68 Main
DOG-05A0300-114 AVL



min 80mil.
1.8 A

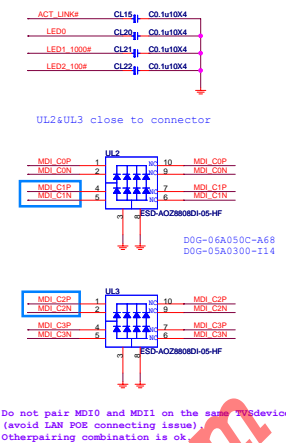


EMI Cap near Connector.

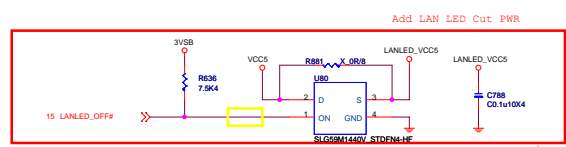


MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	Rear USB3.1 Connector	1.1	
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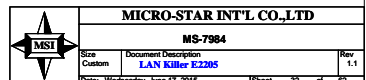
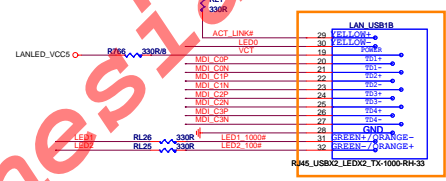
For EMI



Do not pair MDI0 and MDI1 on the same TVSdevice
(avoid LAN POE connecting issue).
Otherpairing combination is ok.



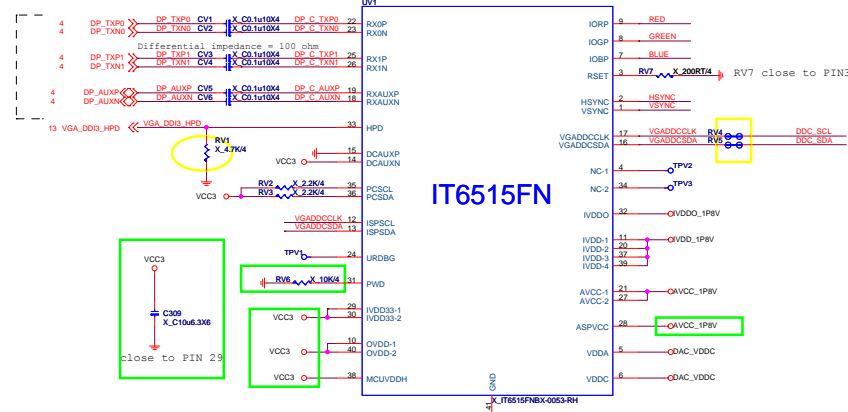
+3.3



Note: These caps closed to PHY

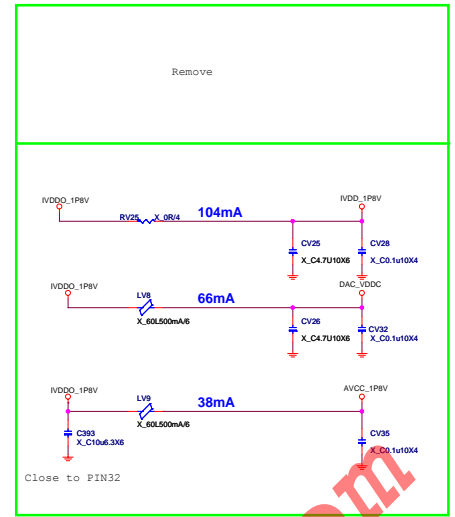
Note:

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

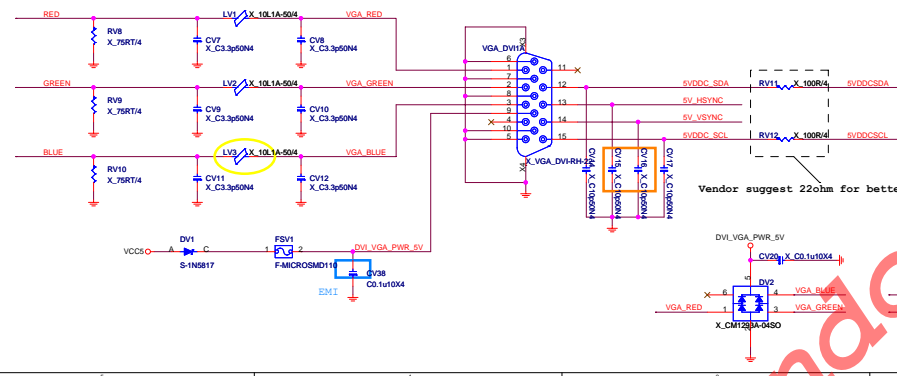
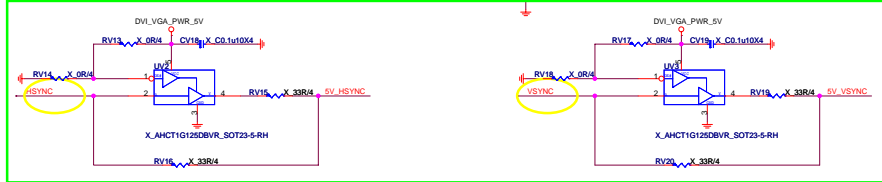


IT6515FN

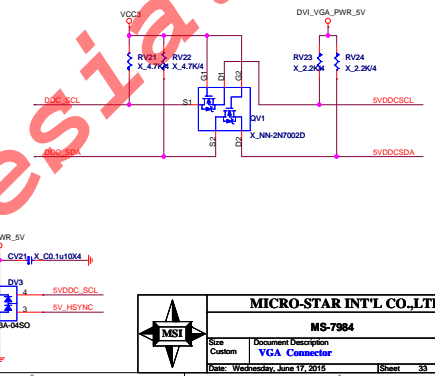
IT6515FNEX-0053-RH



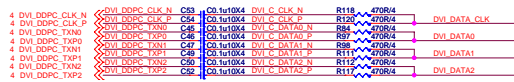
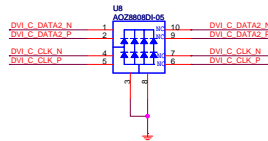
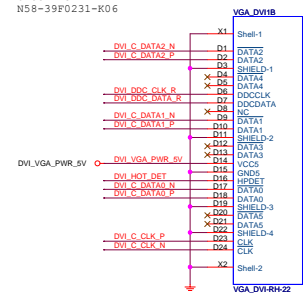
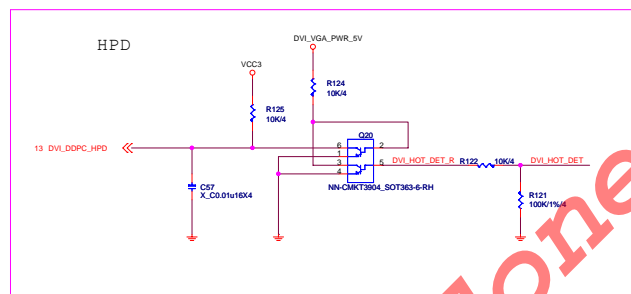
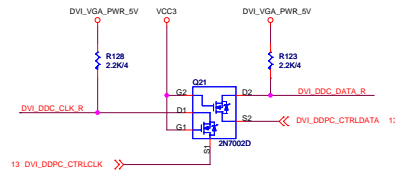
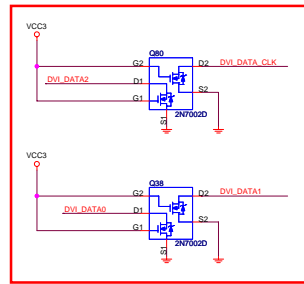
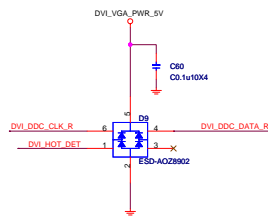
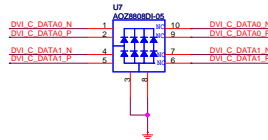
Close to PIN32



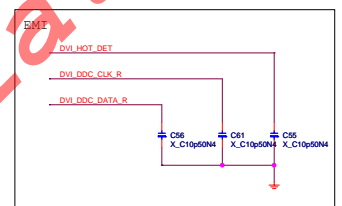
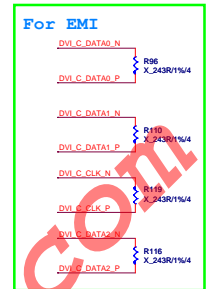
Vendor suggest 22ohm for better I2C quality



MICRO-STAR INT'L CO.,LTD			
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Size	Document Description	Rev	
Custom	VGA Connector	1.1	
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U26 AVL:D0G-05A050C-005
D0G-06A050C-A68U27 AVL:D0G-05A050C-005
D0G-06A050C-A68

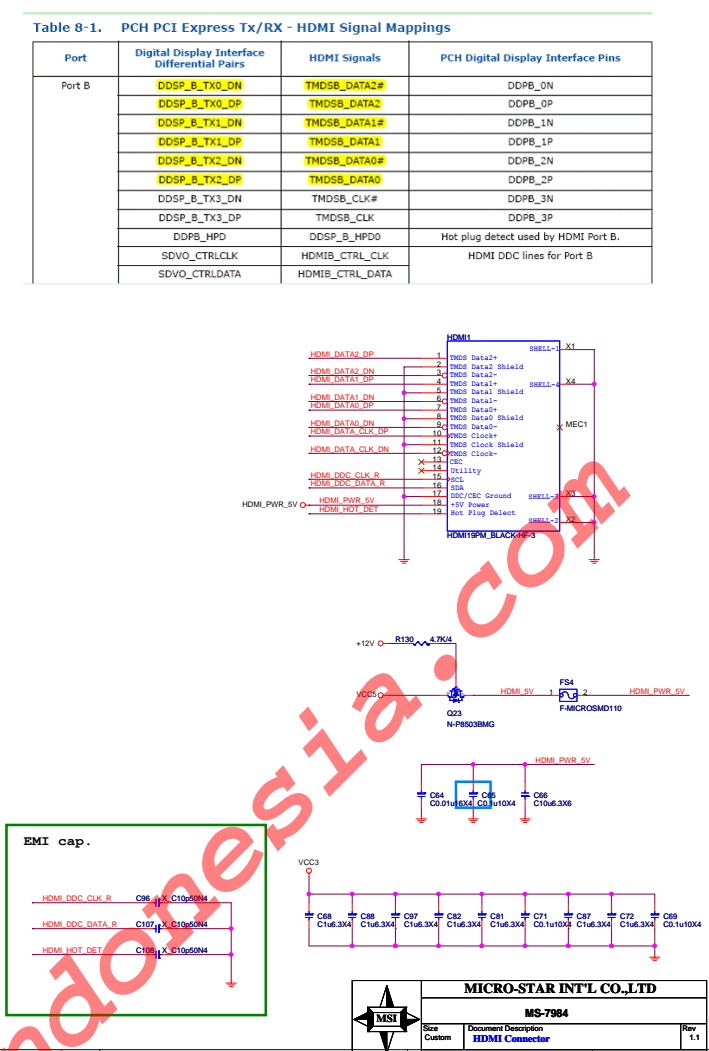
DVI_VGA_PWR_SV



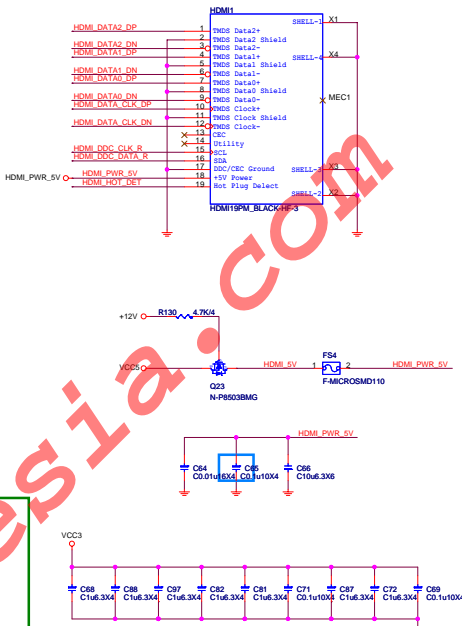
MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	DVI Connector	1.1	
Date: Wednesday, June 17, 2015		Sheet	34 of 62


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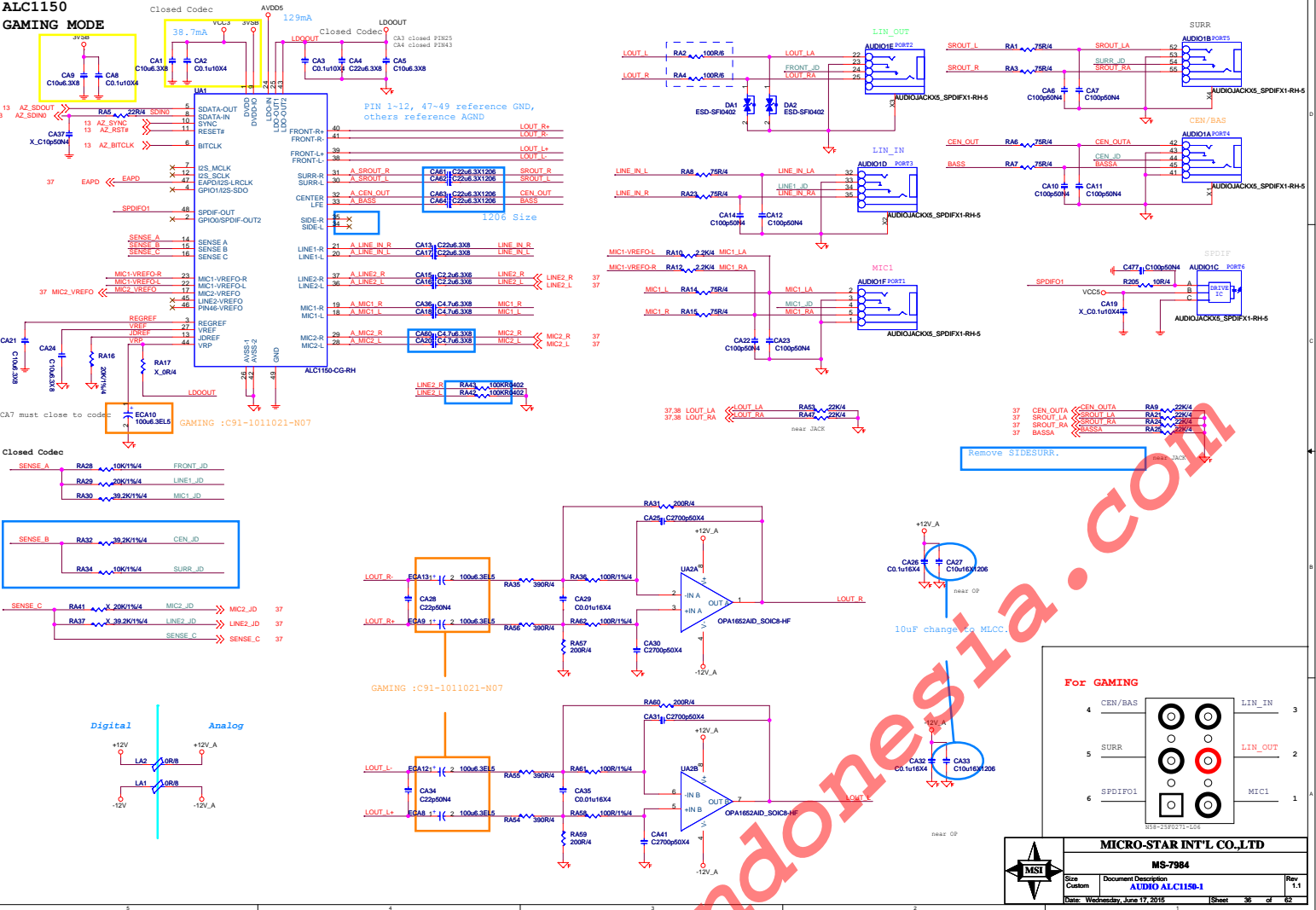
0	X _c	X _e	11	0 dB	3	2	V	Custion	HDMI Connector	1.1
5								Date: Wednesday, June 17, 2016	Sheet 35 of 62	



Port	Digital Display Interface Differential Pairs	HDMI Signals	PCH Digital Display Interface Pins
Port B	DDSP_B_TX0_DN	TMDSB_DATA2#	DDPB_0N
	DDSP_B_TX0_DP	TMDSB_DATA2	DDPB_0P
	DDSP_B_TX1_DN	TMDSB_DATA1#	DDPB_1N
	DDSP_B_TX1_DP	TMDSB_DATA1	DDPB_1P
	DDSP_B_TX2_DN	TMDSB_DATA0#	DDPB_2N
	DDSP_B_TX2_DP	TMDSB_DATA0	DDPB_2P
	DDSP_B_TX3_DN	TMDSB_CLK#	DDPB_3N
	DDSP_B_TX3_DP	TMDSB_CLK	DDPB_3P
	DDPB_HPD	DDSP_B_HPD0	Hot plug detect used by HDMI Port B.
	SDVO_CTRL_CLK	HDMI_B_CTRL_CLK	HDMI DDC lines for Port B
SDVO_CTRL_DATA	HDMI_B_CTRL_DATA		

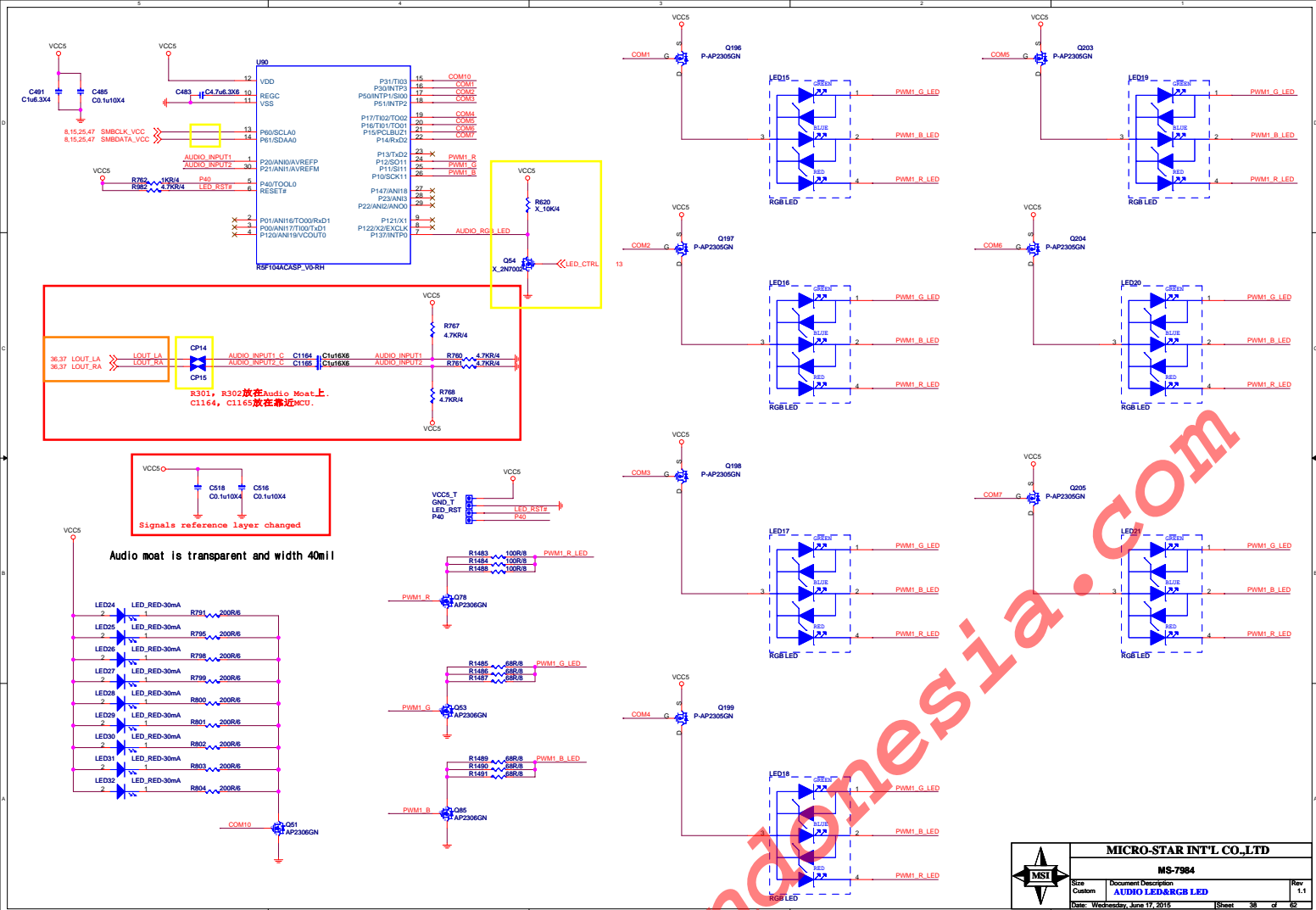


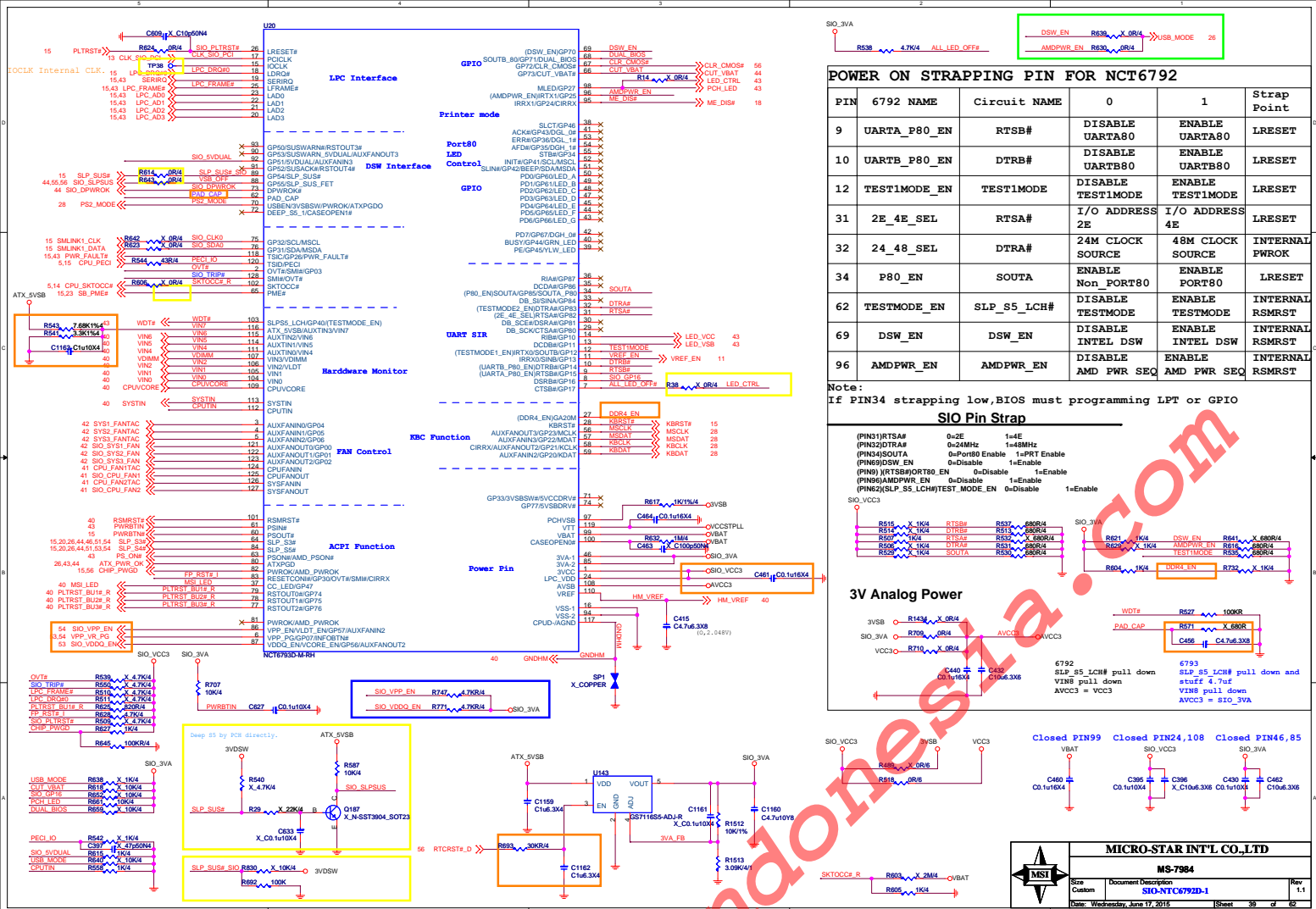
	MICRO-STAR INT'L CO.,LTD			
	MS-7984			
	Size Custom	Document Description HDMI Connector		Rev 1.1
	Date: Wednesday, June 17, 2016	1	Sheet 3/6 of 62	



For GAMING			LIN_IN		3
4	CEN/BAS				
5	SURR				2
6	SPDIF01				1
			LIN_OUT		2
			MIC1		1

MSI MICRO-STAR INT'L CO., LTD
MS-7984
Rev 1.1
Date: Wednesday, June 17, 2015
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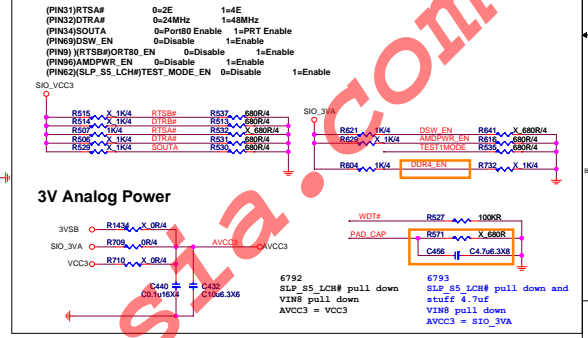


POWER ON STRAPPING PIN FOR NCT6792

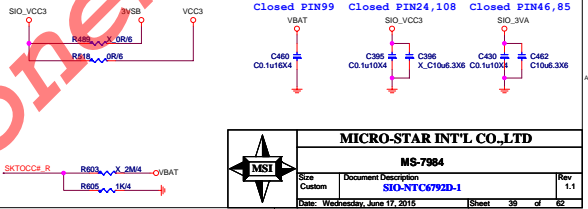
PIN	6792 NAME	Circuit NAME	0	1	Strap Point
9	UARTA_P80_EN	RTSB#	DISABLE UARTA80	ENABLE UARTA80	RESET
10	UARTB_P80_EN	DTRB#	DISABLE UARTB80	ENABLE UARTB80	RESET
12	TESTMODE_EN	TEST1MODE	DISABLE TEST1MODE	ENABLE TEST1MODE	RESET
31	2E_4E_SEL	RTSA#	I/O ADDRESS 2E	I/O ADDRESS 4E	RESET
32	24_48_SEL	DTRA#	24M CLOCK SOURCE	48M CLOCK SOURCE	INTERNAL PWROK
34	P80_EN	SOUTA	ENABLE Non_PORT80	ENABLE PORT80	RESET
62	TESTMODE_EN	SLP_S5_LCH#	DISABLE TESTMODE	ENABLE TESTMODE	INTERNAL RSMRST
69	DSW_EN	DSW_EN	DISABLE INTEL DSW	ENABLE INTEL DSW	INTERNAL RSMRST
96	AMDPWR_EN	AMDPWR_EN	DISABLE AMD PWR SEQ	ENABLE AMD PWR SEQ	INTERNAL RSMRST

Note:
If PIN34 strapping low, BIOS must programming LPT or GPIO

SIO Pin Strap



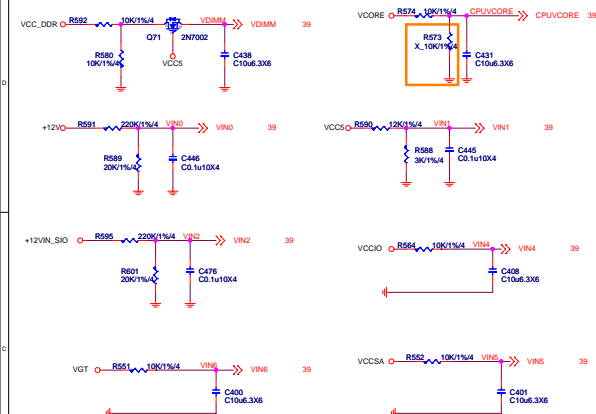
3V Analog Power



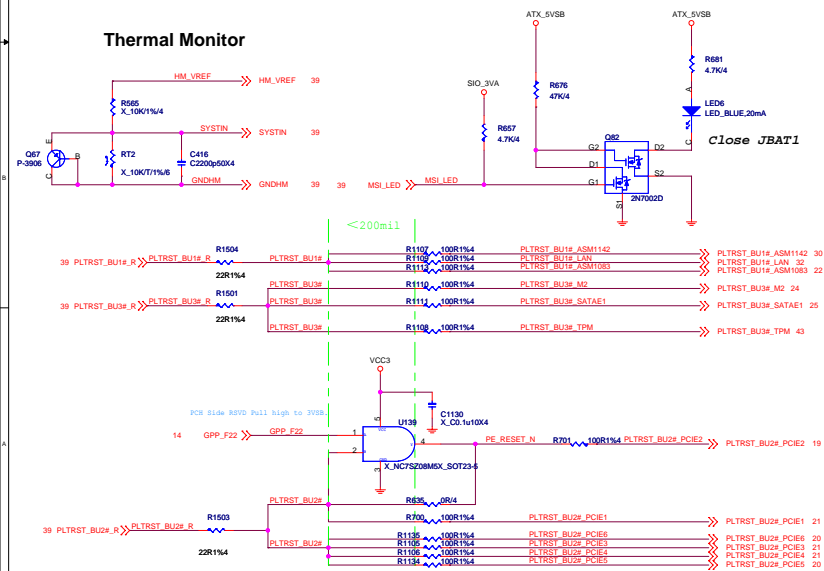
MICRO-STAR INT'L CO., LTD
MS-7984
Size: Custom
Document Description: SIO-NTC6792D-1
Date: Wednesday, June 17, 2015
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HW Monitor - Voltage

SIO BM Voltage voor 2V will not detect

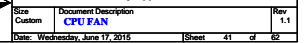
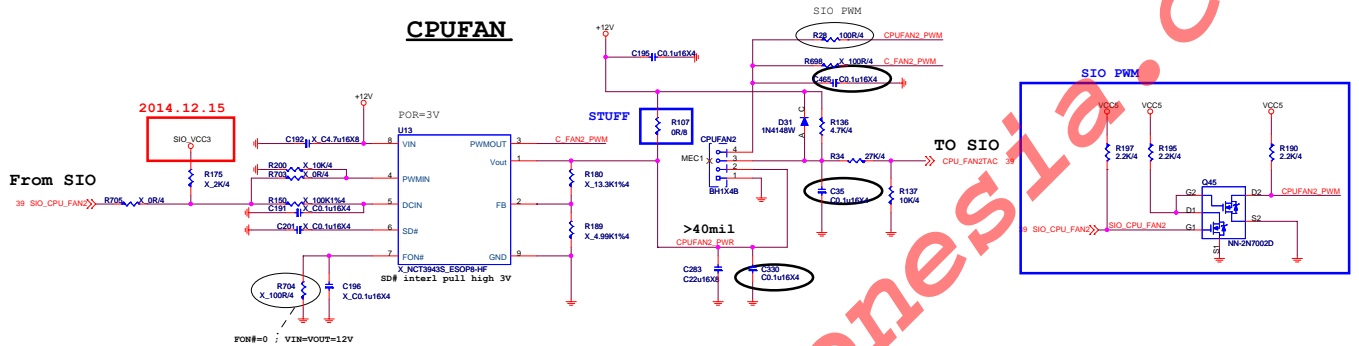
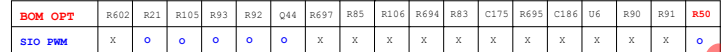


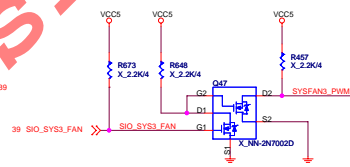
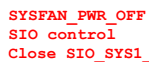
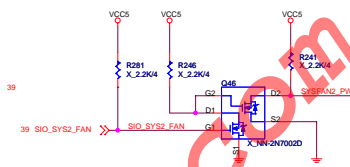
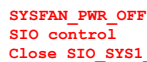
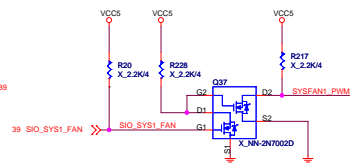
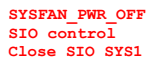
Thermal Monitor



MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	SIO-NTC6792D-2	1.1	
Date: Wednesday, June 17, 2015		Sheet 40 of 62	

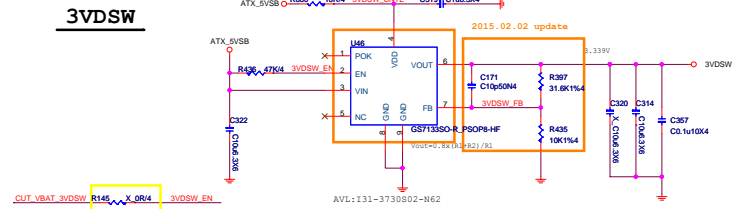
Type G : 4 PIN CPU FAN USE SIO PWM (Reserve NCT3943S & WITHOUT CUT POWER)





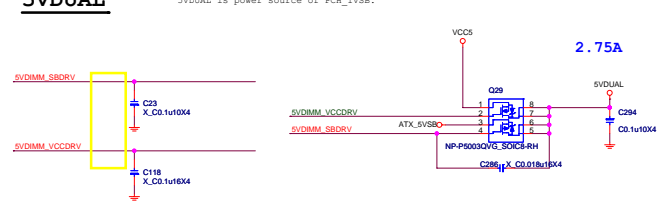
MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size Custom	Document Description SYSTEM FAN		Rev 1.1
Date: Wednesday, June 17, 2015		Sheet 42 of 62	

3VDSW

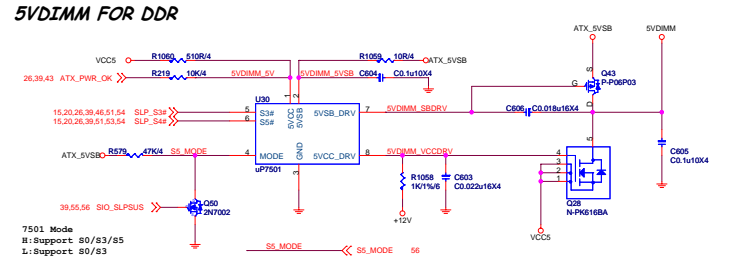


5VDUAL

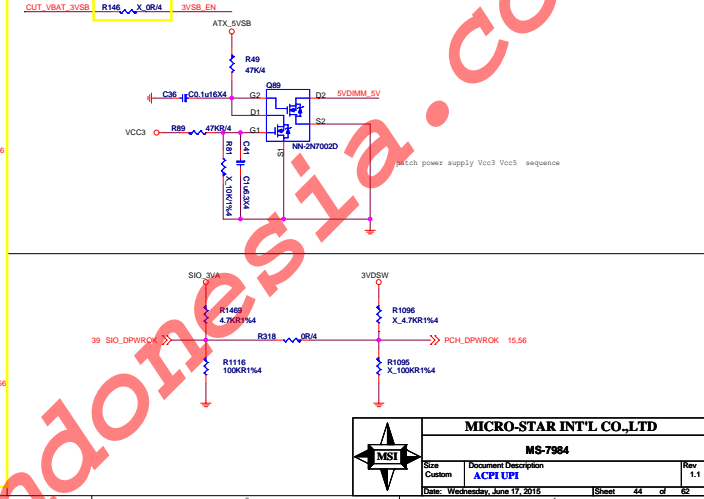
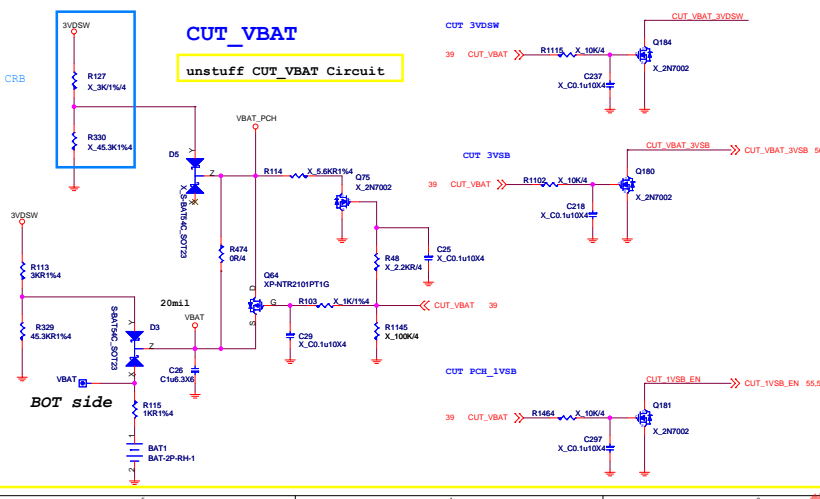
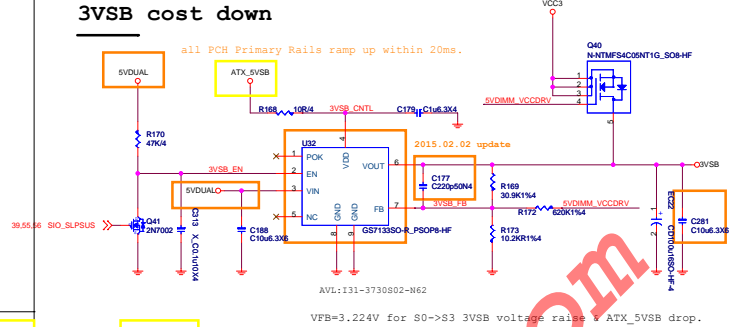
5VDUAL is power source of PCB_1VSB.



5VDIMM FOR DDR



3VSB cost down

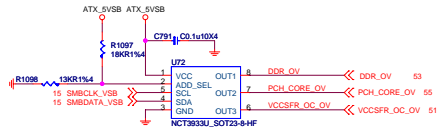


MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	ACPI UPI	1.1	
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Remove Cut Power.

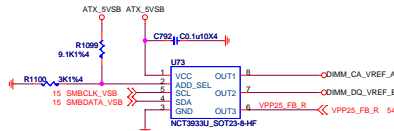
UPI VOLTAGE CONSOLE

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



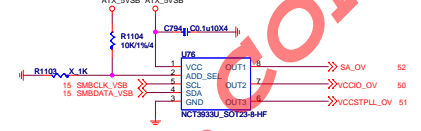
UPI VOLTAGE CONSOLE

0x28: RH=9.1K, RL=3K



UPI VOLTAGE CONSOLE

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%

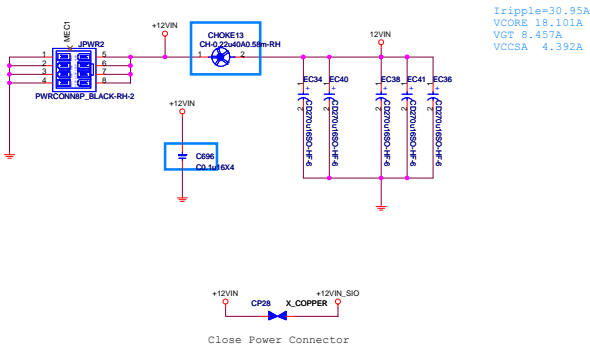


MICRO-STAR INT'L CO.,LTD

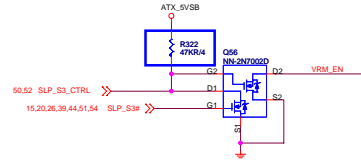
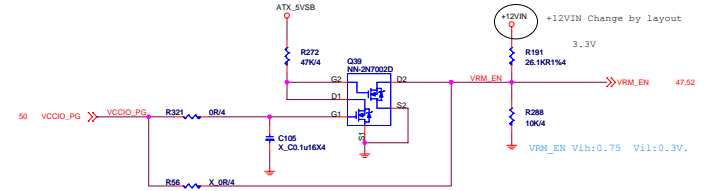
MS-7984

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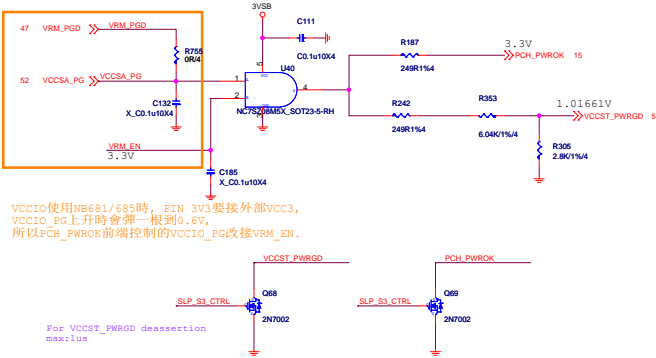


VRM_EN Control from VCCIO_PG



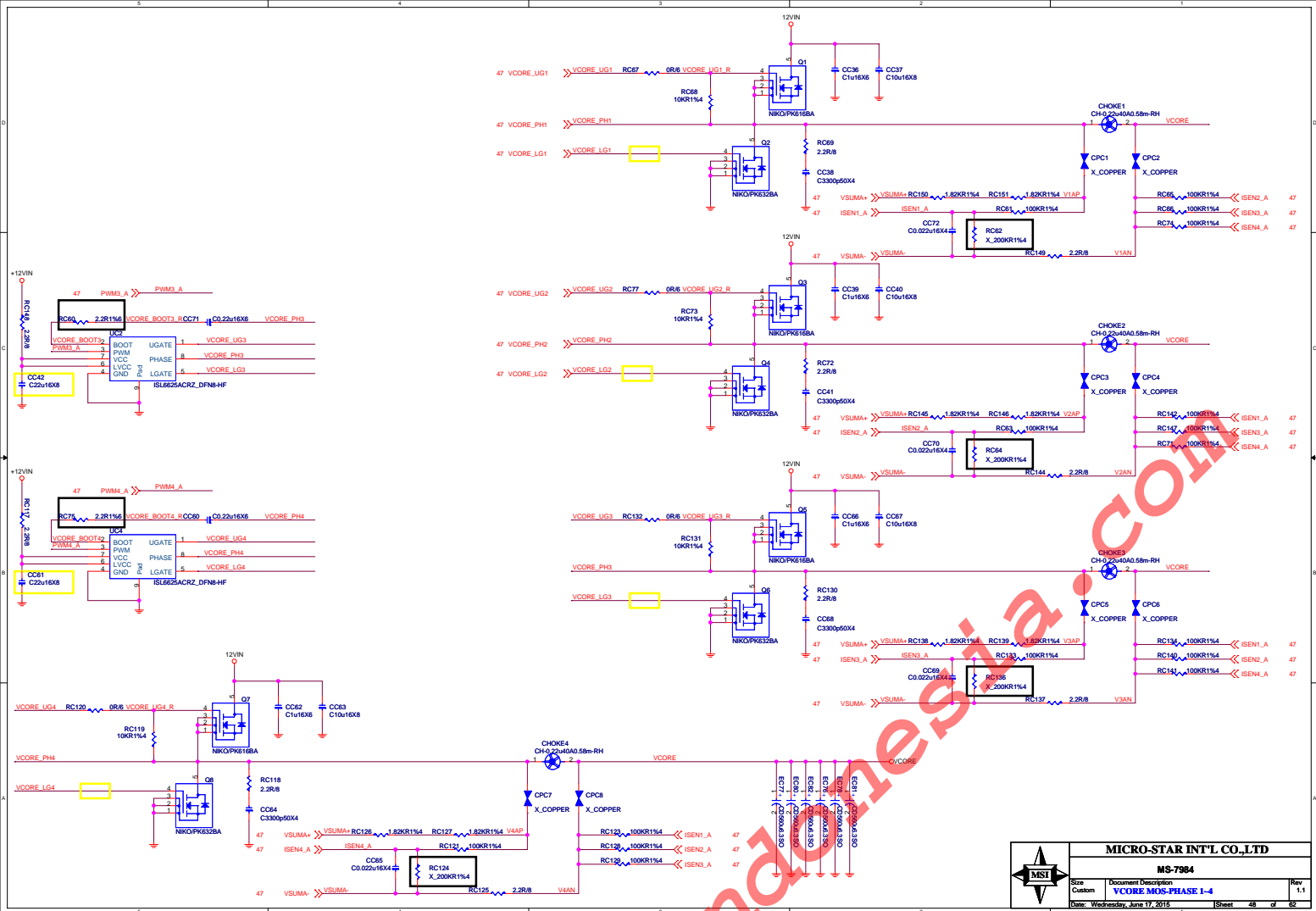
PCH_PWR0K Control from VCCIO_PG&VCCSA VCCST_PWRGD Control from VRM_PGD

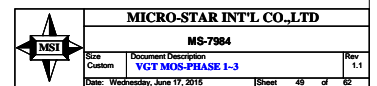
VCCSA&Voore use same PWM IC, pull up VCC3
VCCSA&Voore use different PWM IC, pull up VCCSA
VCCST_PWRGD can assert before or equal to PCH_PWR0K, but must never lag it.



MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size	Document Description	Rev	
Custom	+12VIN/VRM_EN&PGD	1.1	
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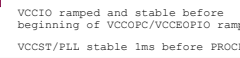
Constraint: 5/10/15





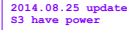
for Gaming3/5, Classic, ECO
and H110

For Cost down VCCST&VCCPLL merge




VCCPLL OC

1.2V; 110mA (0.1A)



MS-7984

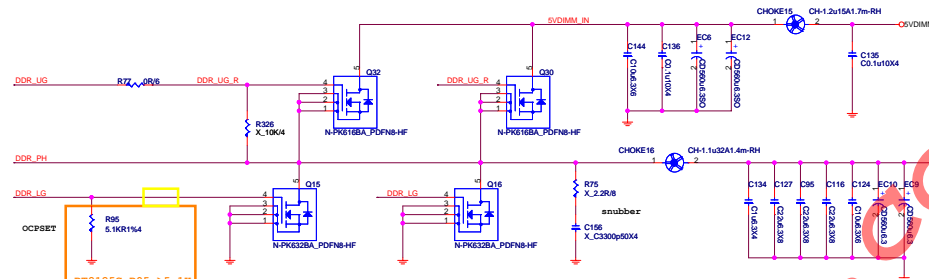
Size Custom	Document Description CPU PWR_ST/PLL	Rev 1.1
Date: Wednesday, June 17, 2015	Sheet 51 of 62	

	MICRO-STAR INT'L CO.,LTD		
	MS-7984		
	Size Custom	Document Description SA POWER-RT8125C-1PHASE	Rev 1.1
	Date: Wednesday, June 17, 2015	Sheet 52 of 62	

Pull up change by layout

$$\begin{aligned} OCP &= 13.2A * 1.5 = 19.8A \\ R_{ocs}(R95) &= OCP * R_{ds(on)}[(Low\ side)/2]/10uA \\ &= 19.8A * (4.6/2)m\Omega / 10uA \\ &= 4.95K\Omega \approx 5K \end{aligned}$$

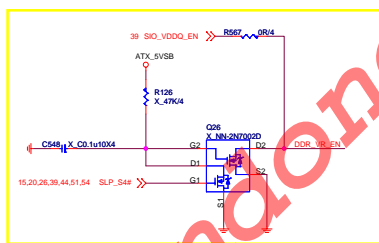
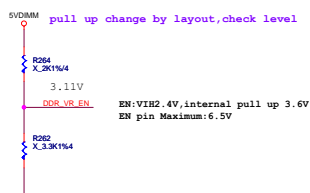
```
Irms = Iout * SQRT((Vout/Vin) * [1 - (Vout/Vin)])
      = 13.2* 0.427
      = 5.636A
(OS-CON CAP)
```



Datasheet 参考値

$$I_{min} = ((V_{in} - 1.2V) / (F_{sw} * k * I_{out_max})) * (V_{out} / V_{in})$$
$$= 0.7677\mu H \quad (K = 30\%)$$

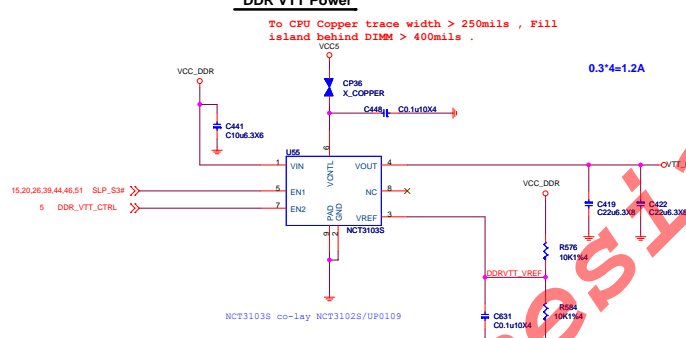
環胺 CAP ESR 環銜, 0.2432uH ~~2.12~~ 1.2897uH



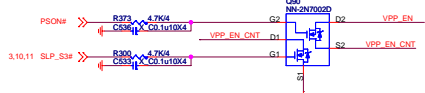
MICRO-STAR INT'L CO.,LTD			
MS-7984			
Size Custom	Document Description DDR POWER-RT8125C-1PHASE	Rev 1.1	
Date: Wednesday, June 17, 2015		Sheet 03 of 02	



To CPU Copper trace width > 250mils , Fill island behind DIMM > 400mils .



IF PCH & DDR power share with the same UP7501,
add circuit to keep DDR power OFF when G3 to S5



	MICRO-STAR INT'L CO.,LTD		
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	Size Custom	Document Description DDR4 Power-VFP25	Rev 1.1
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PCH 1VSB

1.0V: 11A (11.334A)

6.54+0.74+0.132+0.154+0.054+0.132+0.102+0.044+0.1334A

OCp = 11.334*1.5=17.001A

Rocset = 1.5 * I_{max} * R_{dson}(low) / I_{ocset}
= 1.5 * 11.334 * 4.6mohm / 10uA
= 7.821K

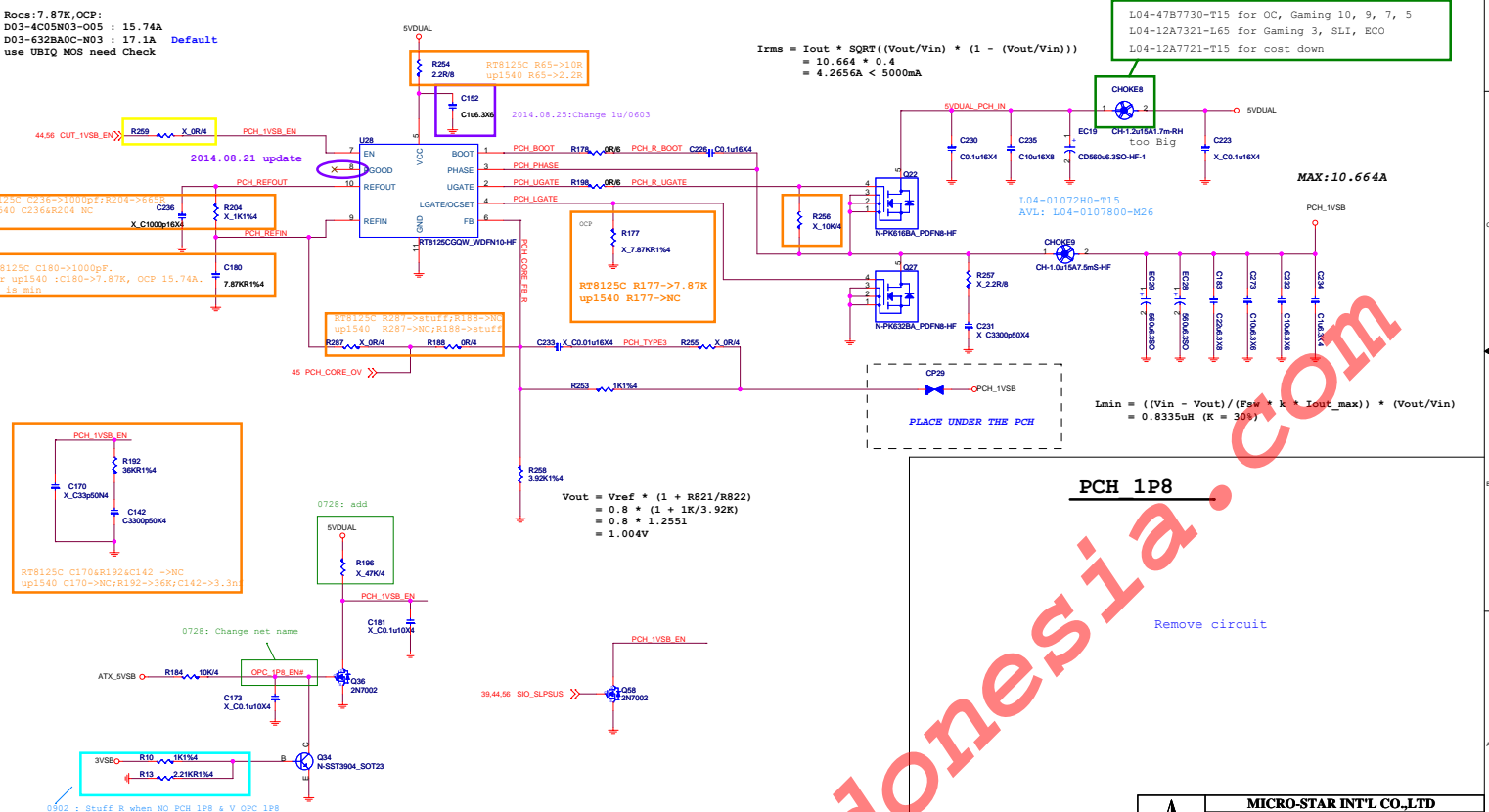
R_{dson}(low) 4.5V

D03-4C05N03-O05 : 5 mohm

D03-632BA0C-N03 : 4.6mohm

D03-3056M00-U47 : 6.2mohm

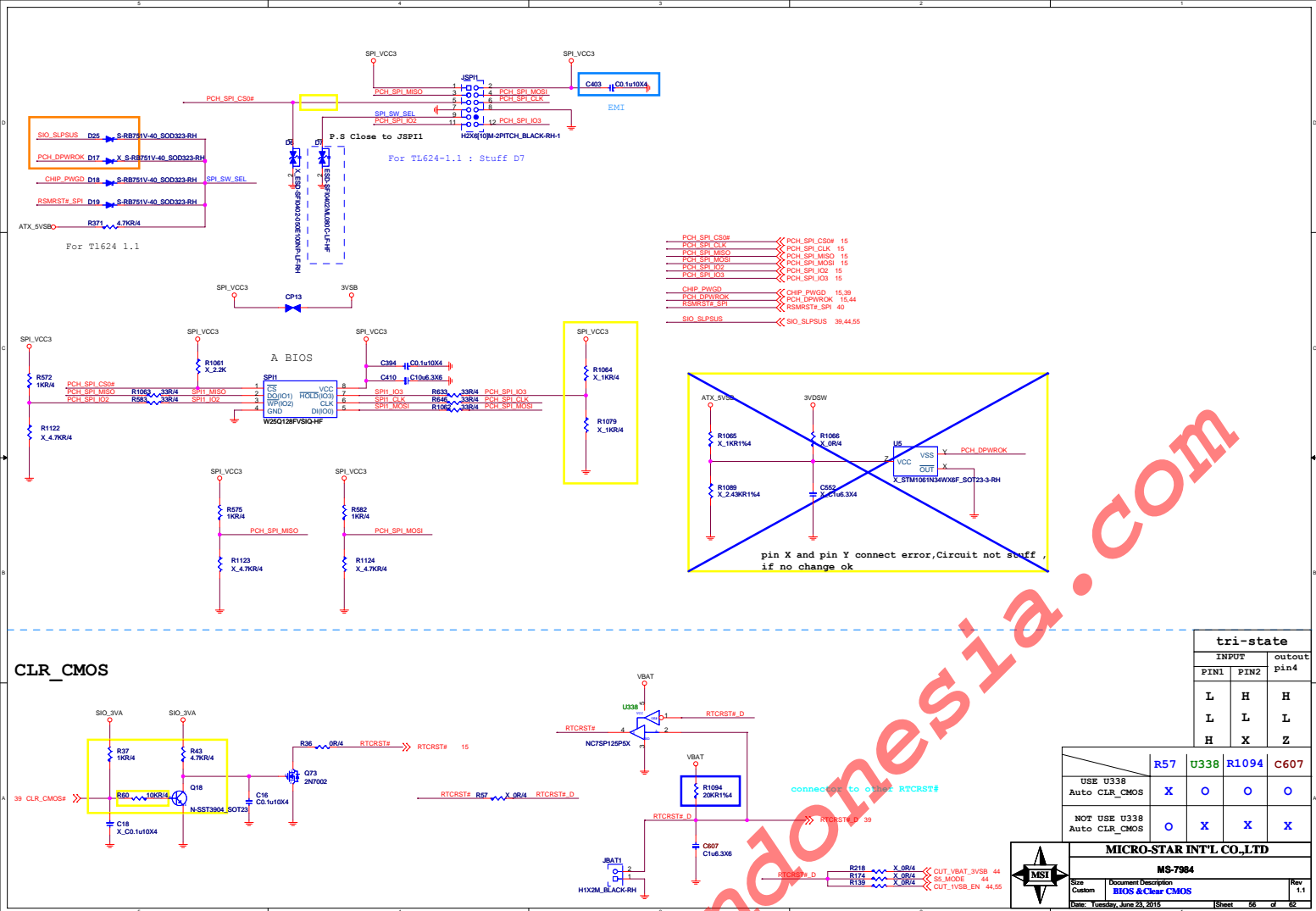
Roccs: 7.87K, OCp:
D03-4C05N03-O05 : 15.74A
D03-632BA0C-N03 : 17.1A Default
use UBIQ MOS need Check



MICRO-STAR INT'L CO.,LTD

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Size: Custom Document Description: PCH Core Power-RT8125C Rev: 1.1
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CPU Socket



Battery



Audio Small Cover



LAN Cover



Gaming Network Manager

NET_LA1
Label
for GAMING Pro sku+Krait sku
Y52-ML0017D-CFO

SBC Label



HDMI Label



BIOS Label



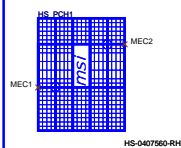
Marketing Label



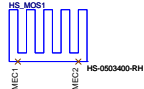
USB3.1 Label



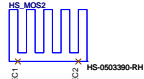
PCH Heatsink



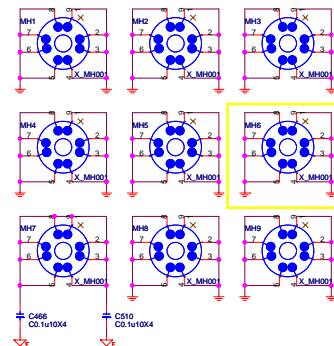
MOS1 Heatsink



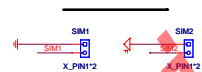
MOS2 Heatsink



Mounting Holes



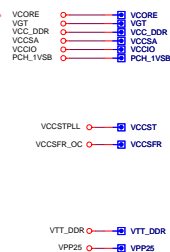
Simulation



Optical Fiducial Marks-120




Test point



MICRO-STAR INT'L CO.,LTD	
MS-7984	
Size	Document Description
Custom	Manual parts
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		MICRO-STAR INT'L CO.,LTD	
		MS-7984	
Size	Document Description	Rev	
Custom	XDP&EMI CAP	1.1	
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