MS-7B23

ATX:243.8mm*243.8mm

Ver: 1.1

Intel -CoffeeLake-S plamform

CPU:

LGA1151

*CPU POWER PAK *4Phase*

*GT POWER PAK *2 Phase*

Onboard Chip:

SIO: NCT5567D colay NCT5565D

HD Audio Codec: ALC887

LAN: RTL8111H

Flash ROM: SPI 64 MB

DP to VGA: RTD2167

CUT VBAT:SLG4B41231

Main Memory:

*DDR4 * 4 (Dual Channel)*

ACPI:

5VDAUL:uP7501

5VDIMM:uP7501

3VSB:GS7133+N MOS

1P8_VSB:GS7133

3VDSW:GS7116

VCCSTPLL:GS7133

System Chipset:

Cannon Lake B360

PWM:

VCORE - RT3606

DDR - RT8125E

DDR VPP25- MP2147

PCH(1.05V) - RT8125E

VCCSA - RT8125E

VCCIO - SY8288

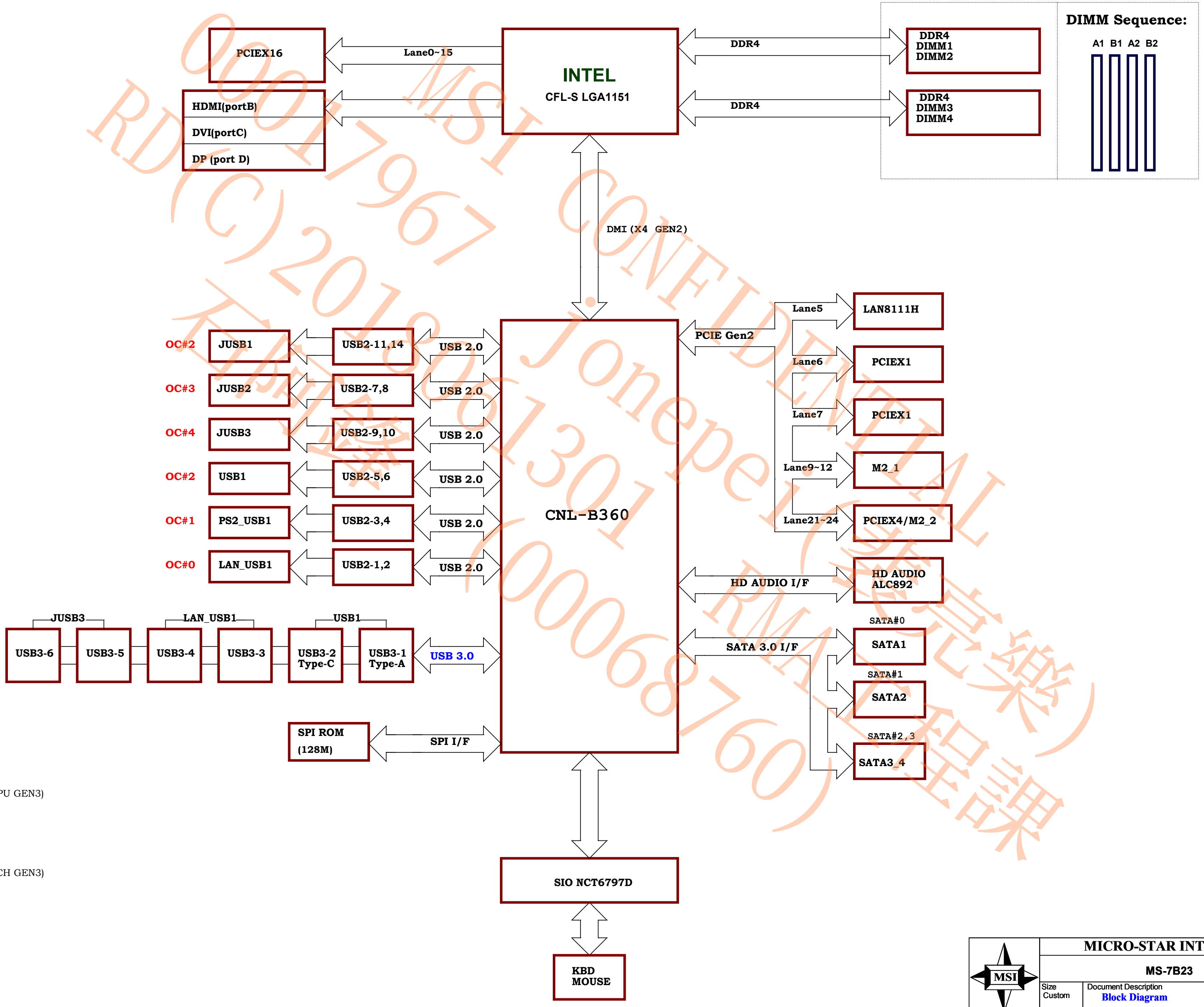
Expansion Slots:

*PCI Express (X16) Slot * 1*

*PCI Express (X1) Slot * 2*

*M.2 Slot * 2*

MS-7B23 Block Diagram



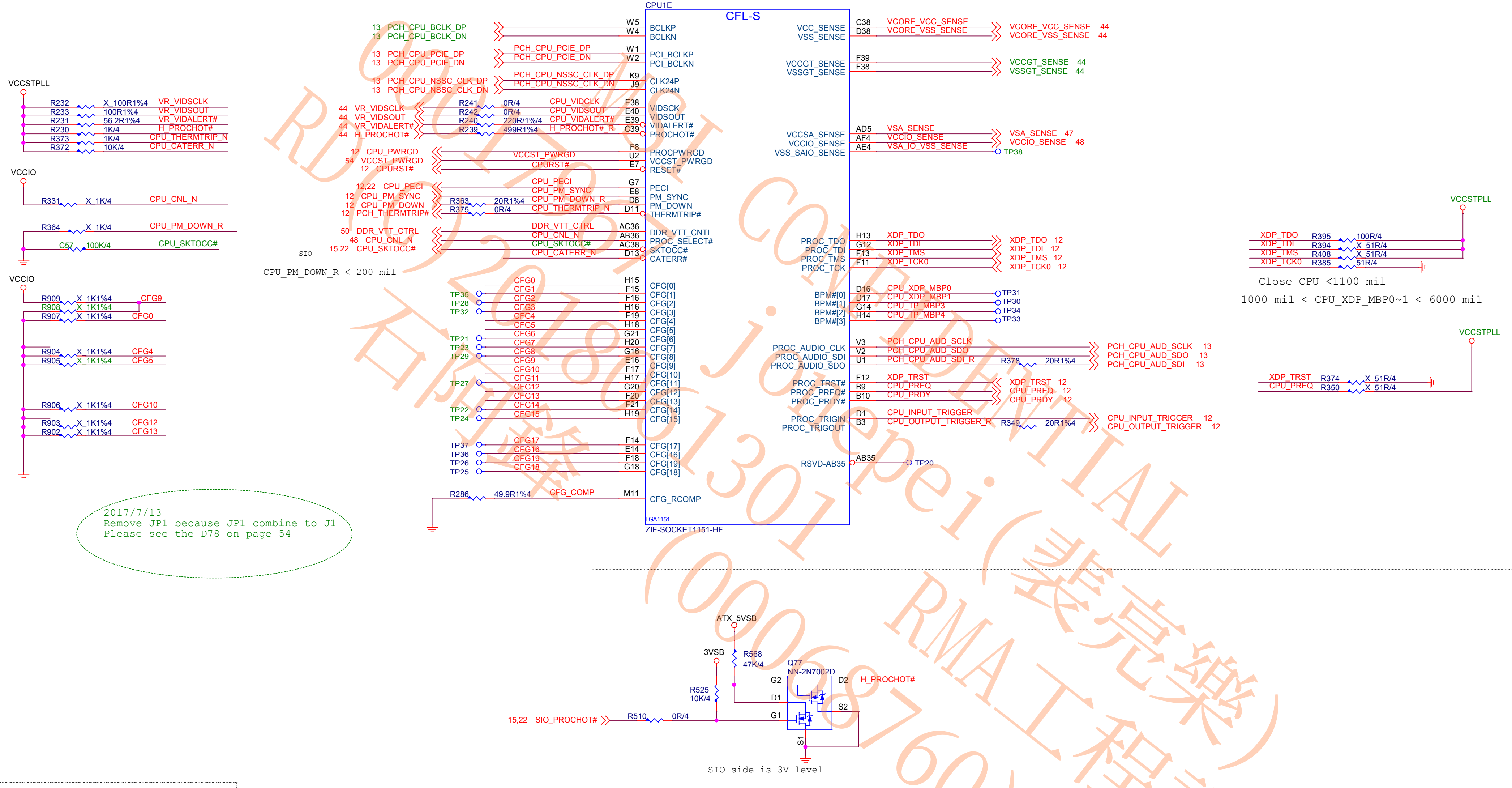
Slot Sequence:

PCIE X16	(By CPU GEN3)
PCIE X1	(By PCH GEN3)
PCIE X1	(By PCH GEN3)
PCIE X4	(By PCH GEN3)
M2_1	(By PCH GEN3)
M2_2	(By PCH GEN3)

MICRO-STAR INT'L CO.,LTD
MS-7B23

Size	Document Description	Rev
Custom	Block Diagram	1.1

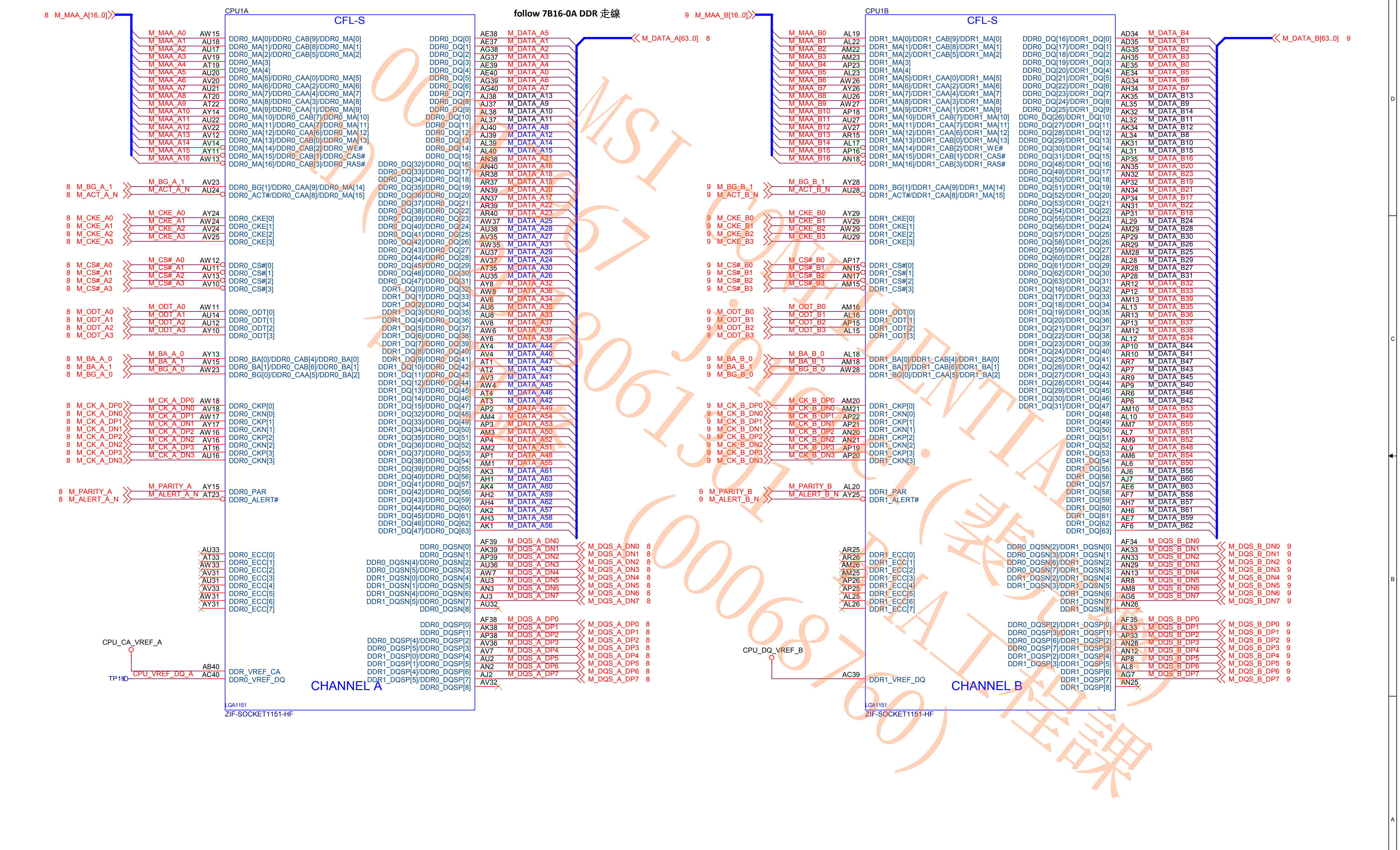
Date: Monday, February 12, 2018 Sheet 2 of 63



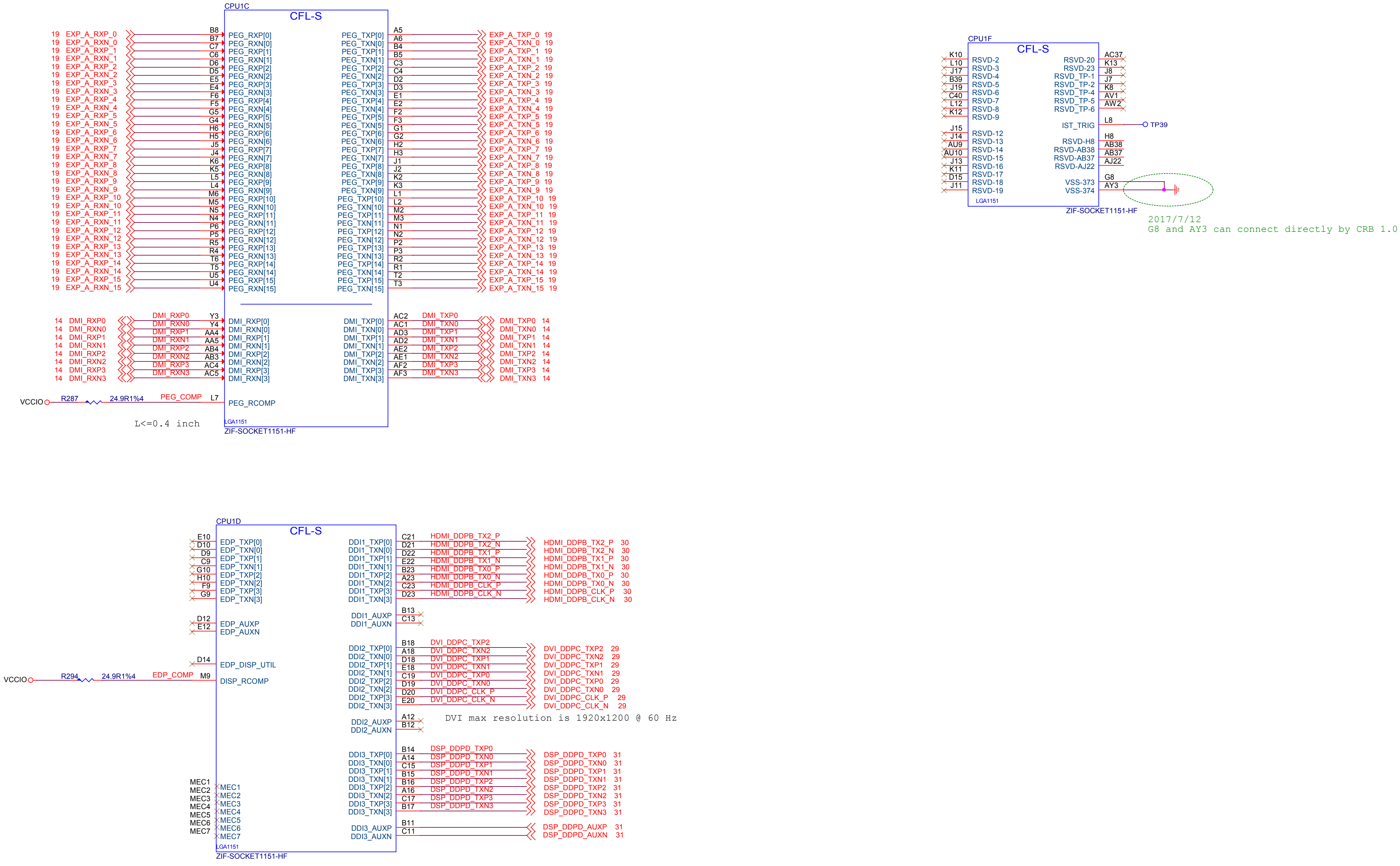
CFG Strap

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	PRESENT	NO PRESENT	SVID PRESENT
10			RSVD
11			RSVD
12			RSVD
13			RSVD
14			RSVD
15			RSVD
16			RSVD
17			RSVD
18			RSVD
19			RSVD

SOCKET PN N12-151A010-L06



MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: CPU-Memory	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 4 of 63	



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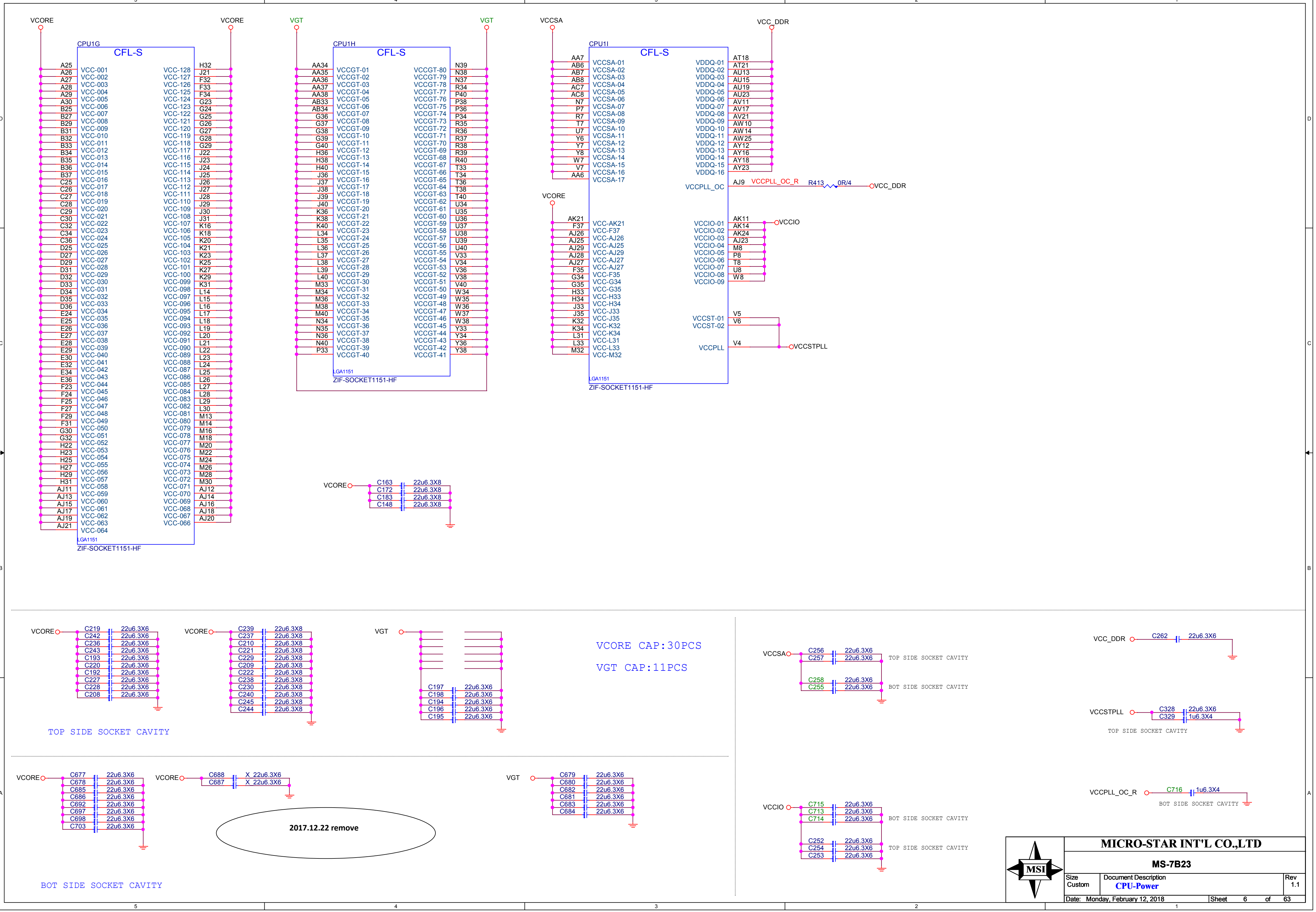
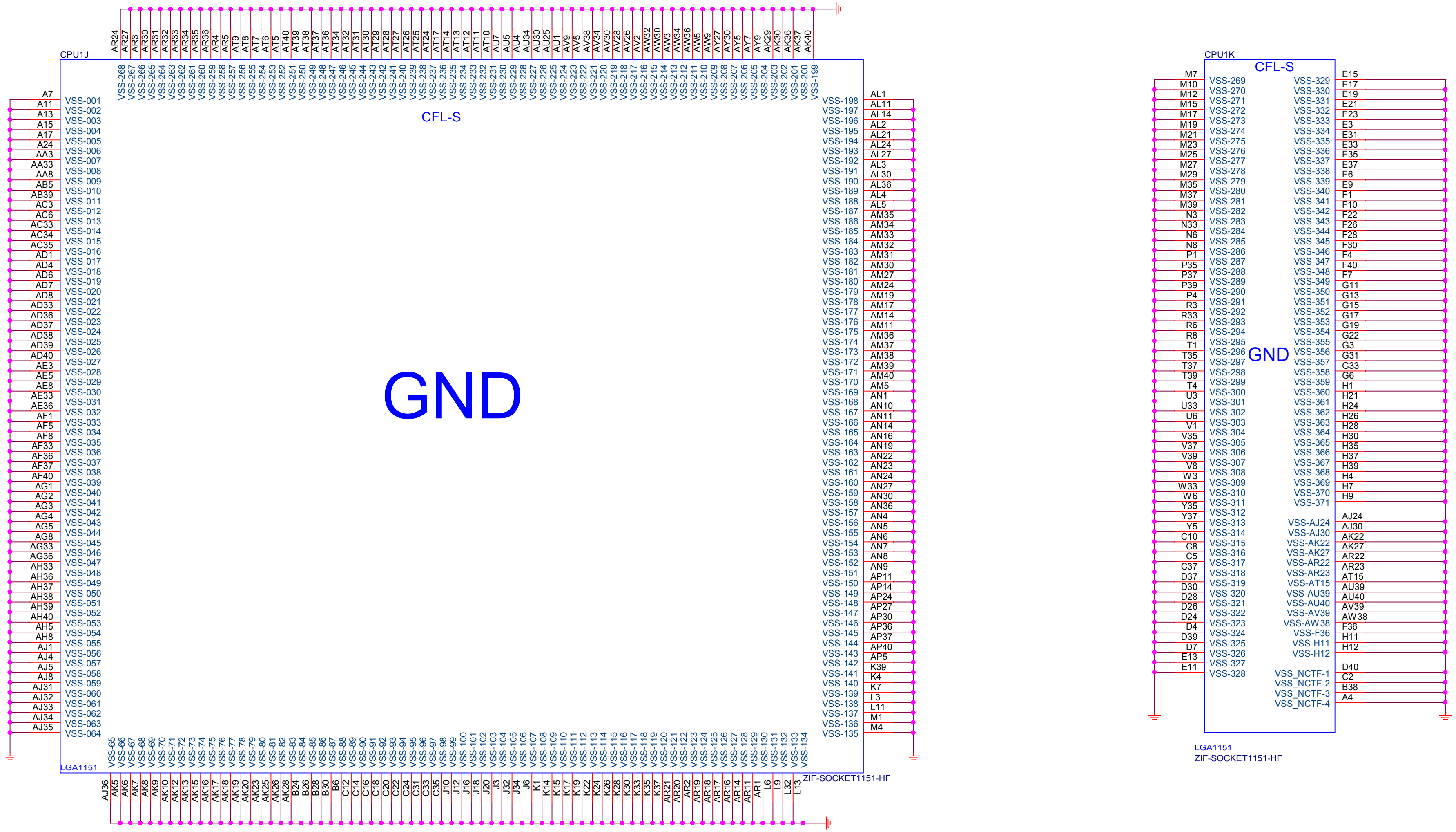
MS-7B23

Size	Document Description	Rev
Custom	CPU-PEG/Display	1.1

Date: Monday, February 12, 2018 | Sheet 5 of 63



VCORE
CPU1G
CFL-S
VCC-001 … VCC-128
ZIF-SOCKET1151-HF
LGA1151
VGT
CPU1H
VCCGT-01 … VCCGT-80
VCCSA
VCC_DDR
CPU1I
VCCSA-01 … VCCSA-17
VDDQ-01 … VDDQ-16
VCCPLL_OC
VCCPLL_OC_R
R413
0R/4
VCCIO
VCCIO-01 … VCCIO-09
VCCST-01
VCCST-02
VCCPLL
VCCSTPLL
22u6.3X8
22u6.3X6
1u6.3X4
X_22u6.3X6
VCORE CAP:30PCS
VGT CAP:11PCS
TOP SIDE SOCKET CAVITY
BOT SIDE SOCKET CAVITY
2017.12.22 remove
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size
Custom
Document Description
CPU-Power
Rev
1.1
Date: Monday, February 12, 2018
Sheet 6 of 63

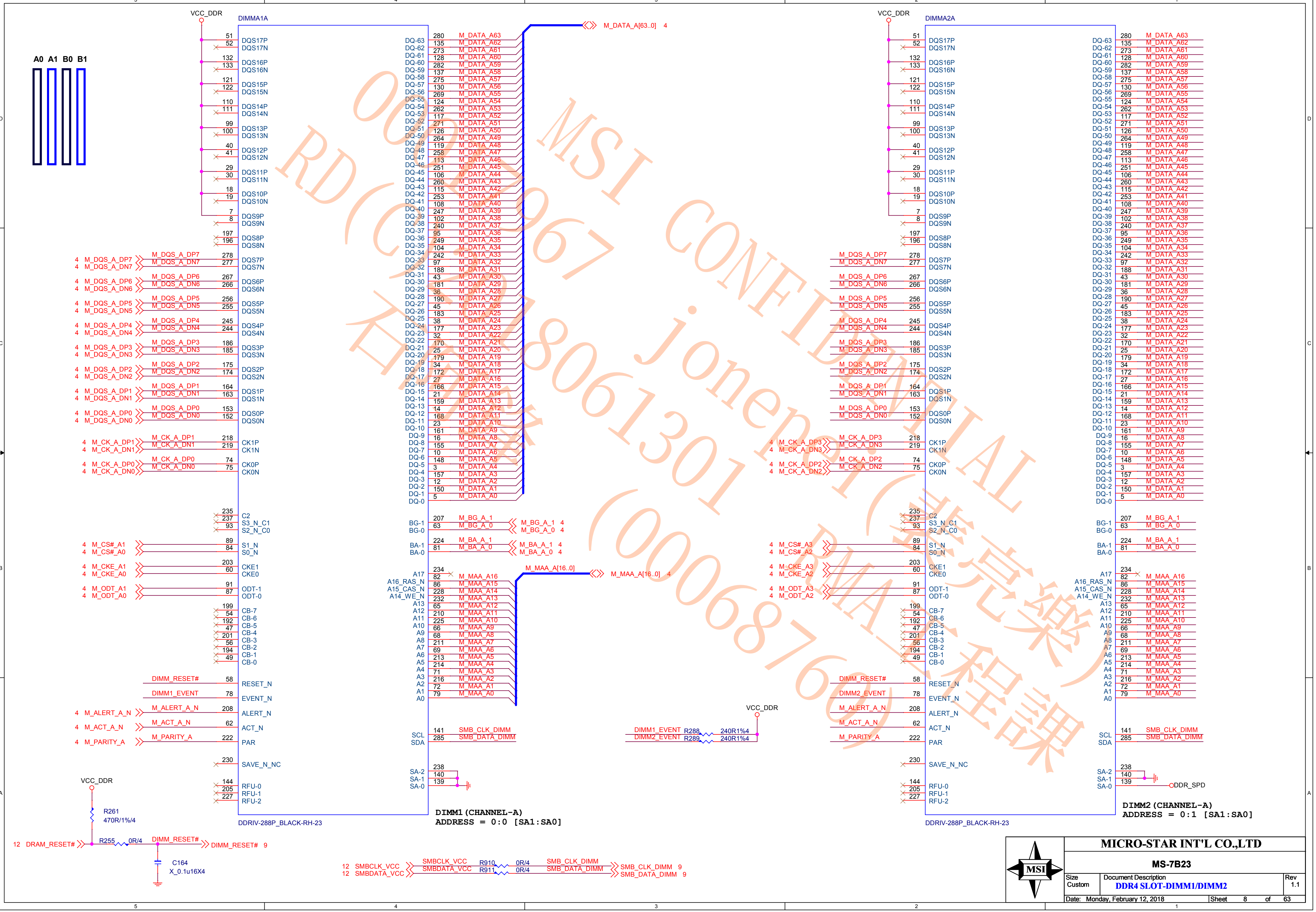


MICRO-STAR INT'L CO.,LTD

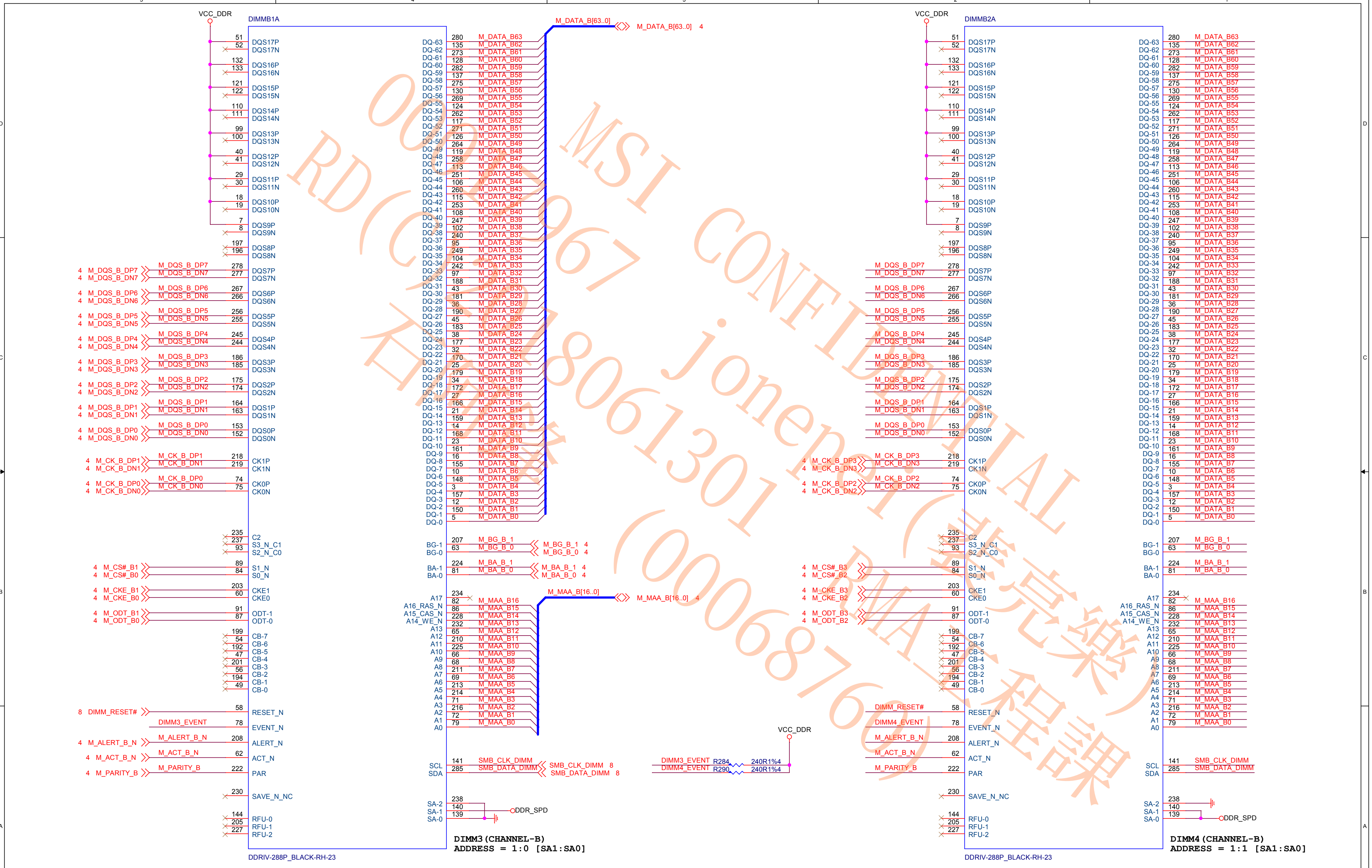
MS-7B23

Size	Document Description	Rev
Custom	CPU-GND	1.1

Date: Monday, February 12, 2018 Sheet 7 of 63



A0 A1 B0 B1
VCC_DDR
DIMMA1A
DIMMA2A
M_DATA_A[63..0] 4
M_MAA_A[16..0]
M_MAA_A[16..0] 4
DQS17P DQS17N DQS16P DQS16N DQS15P DQS15N DQS14P DQS14N DQS13P DQS13N DQS12P DQS12N DQS11P DQS11N DQS10P DQS10N DQS9P DQS9N DQS8P DQS8N
DQS7P DQS7N DQS6P DQS6N DQS5P DQS5N DQS4P DQS4N DQS3P DQS3N DQS2P DQS2N DQS1P DQS1N DQS0P DQS0N
CK1P CK1N CK0P CK0N
C2 S3_N_C1 S2_N_C0 S1_N S0_N CKE1 CKE0 ODT-1 ODT-0
CB-7 CB-6 CB-5 CB-4 CB-3 CB-2 CB-1 CB-0
RESET_N EVENT_N ALERT_N ACT_N PAR SAVE_N_NC RFU-0 RFU-1 RFU-2
BG-1 BG-0 BA-1 BA-0
A17 A16_RAS_N A15_CAS_N A14_WE_N A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1 A0
SCL SDA SA-2 SA-1 SA-0
4 M_DQS_A_DP7
4 M_DQS_A_DN7
4 M_DQS_A_DP6
4 M_DQS_A_DN6
4 M_DQS_A_DP5
4 M_DQS_A_DN5
4 M_DQS_A_DP4
4 M_DQS_A_DN4
4 M_DQS_A_DP3
4 M_DQS_A_DN3
4 M_DQS_A_DP2
4 M_DQS_A_DN2
4 M_DQS_A_DP1
4 M_DQS_A_DN1
4 M_DQS_A_DP0
4 M_DQS_A_DN0
4 M_CK_A_DP1
4 M_CK_A_DN1
4 M_CK_A_DP0
4 M_CK_A_DN0
4 M_CK_A_DP3
4 M_CK_A_DN3
4 M_CK_A_DP2
4 M_CK_A_DN2
4 M_CS#_A1
4 M_CS#_A0
4 M_CS#_A3
4 M_CS#_A2
4 M_CKE_A1
4 M_CKE_A0
4 M_CKE_A3
4 M_CKE_A2
4 M_ODT_A1
4 M_ODT_A0
4 M_ODT_A3
4 M_ODT_A2
M_BG_A_1 4
M_BG_A_0 4
M_BA_A_1 4
M_BA_A_0 4
DIMM_RESET#
DIMM1_EVENT
DIMM2_EVENT
4 M_ALERT_A_N
4 M_ACT_A_N
4 M_PARITY_A
SMB_CLK_DIMM
SMB_DATA_DIMM
DIMM1_EVENT R288 240R1%4
DIMM2_EVENT R289 240R1%4
DDR_SPD
DDRIV-288P_BLACK-RH-23
DIMM1(CHANNEL-A)
ADDRESS = 0:0 [SA1:SA0]
DIMM2(CHANNEL-A)
ADDRESS = 0:1 [SA1:SA0]
R261
470R/1%/4
12 DRAM_RESET#
R255 0R/4
DIMM_RESET# 9
C164
X_0.1u16X4
12 SMBCLK_VCC
12 SMBDATA_VCC
SMBCLK_VCC
SMBDATA_VCC
R910 0R/4
R911 0R/4
SMB_CLK_DIMM 9
SMB_DATA_DIMM 9
MSI
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size Custom
Document Description
DDR4 SLOT-DIMM1/DIMM2
Rev 1.1
Date: Monday, February 12, 2018
Sheet 8 of 63



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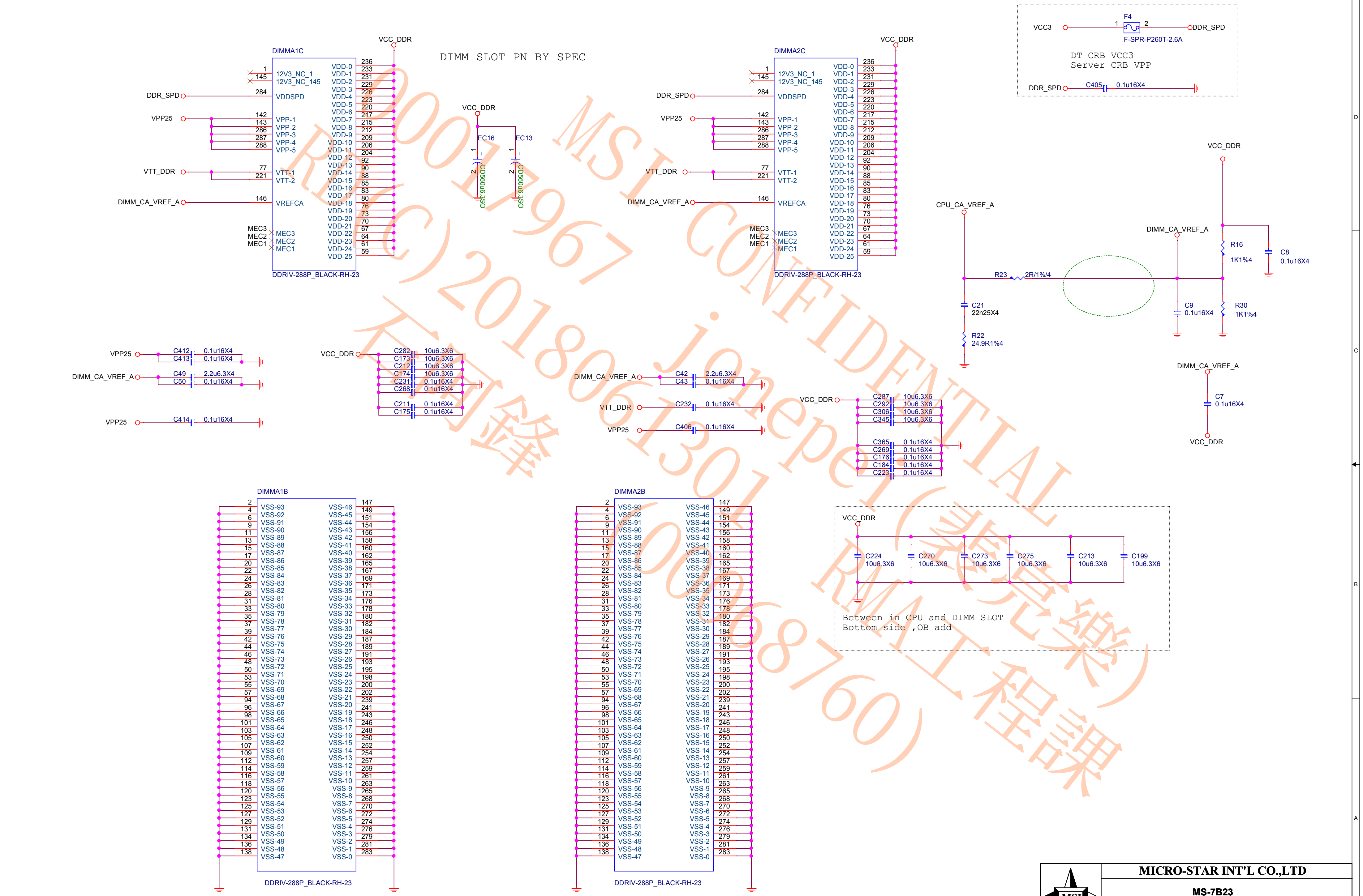
MS-7B23

Size	Document Description	Rev
Custom	DDR4 DIMM 2	1.1

Date: Monday, February 12, 2018 Sheet 9 of 63



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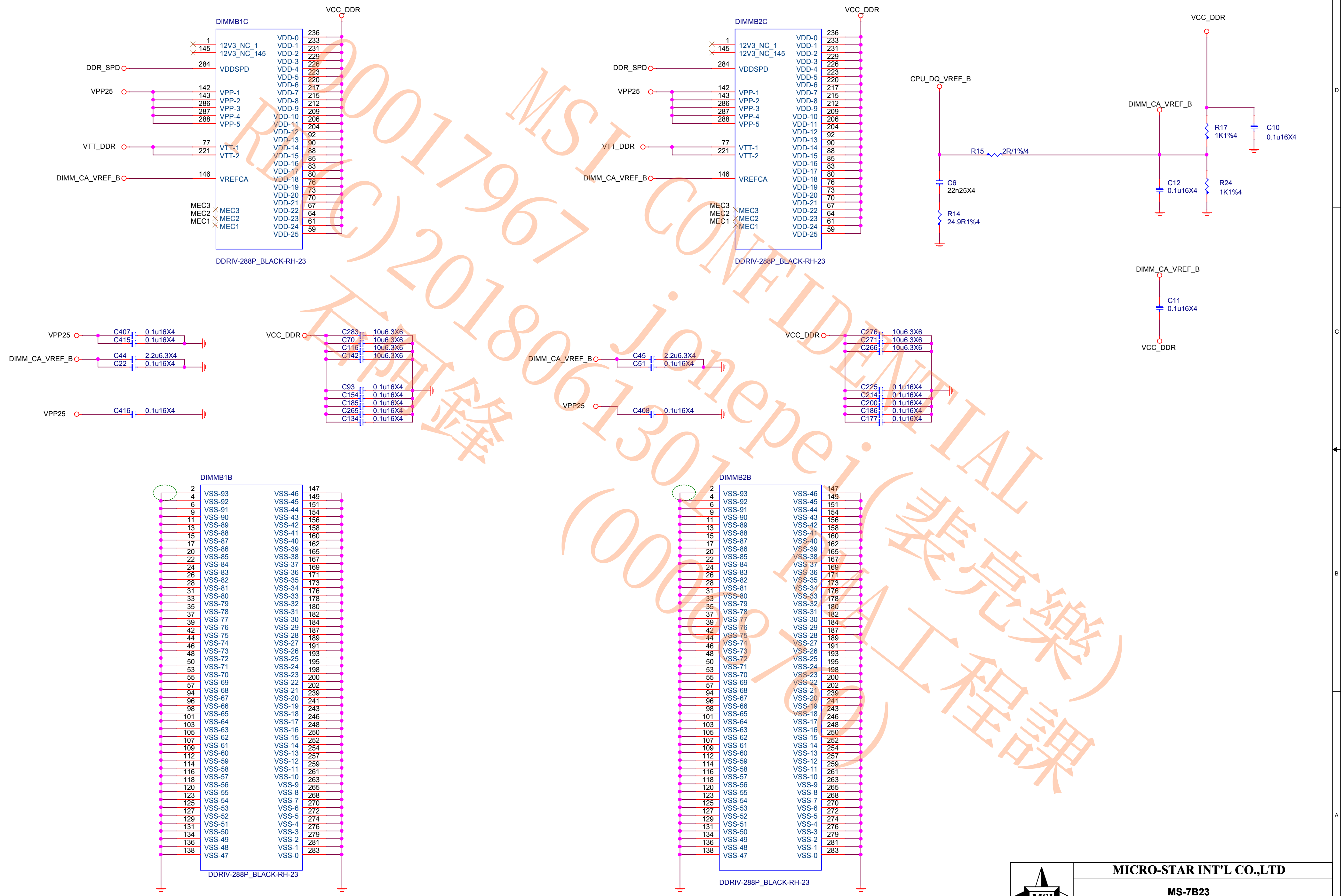
MS-7B23

Size	Document Description	Rev
Custom	DDR4-POWER/GND-1	1.1

Date: Monday, February 12, 2018 | Sheet 10 of 63



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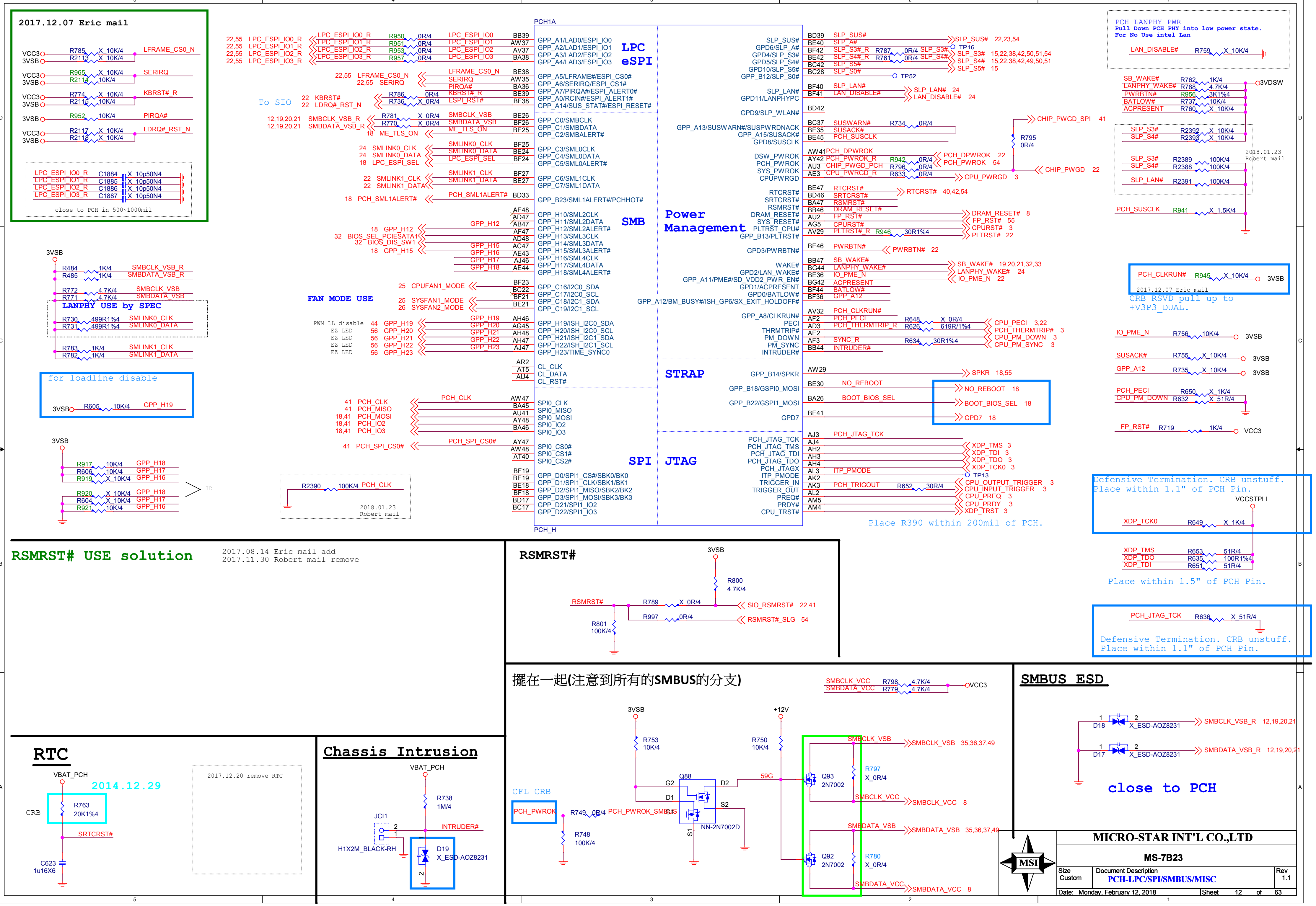
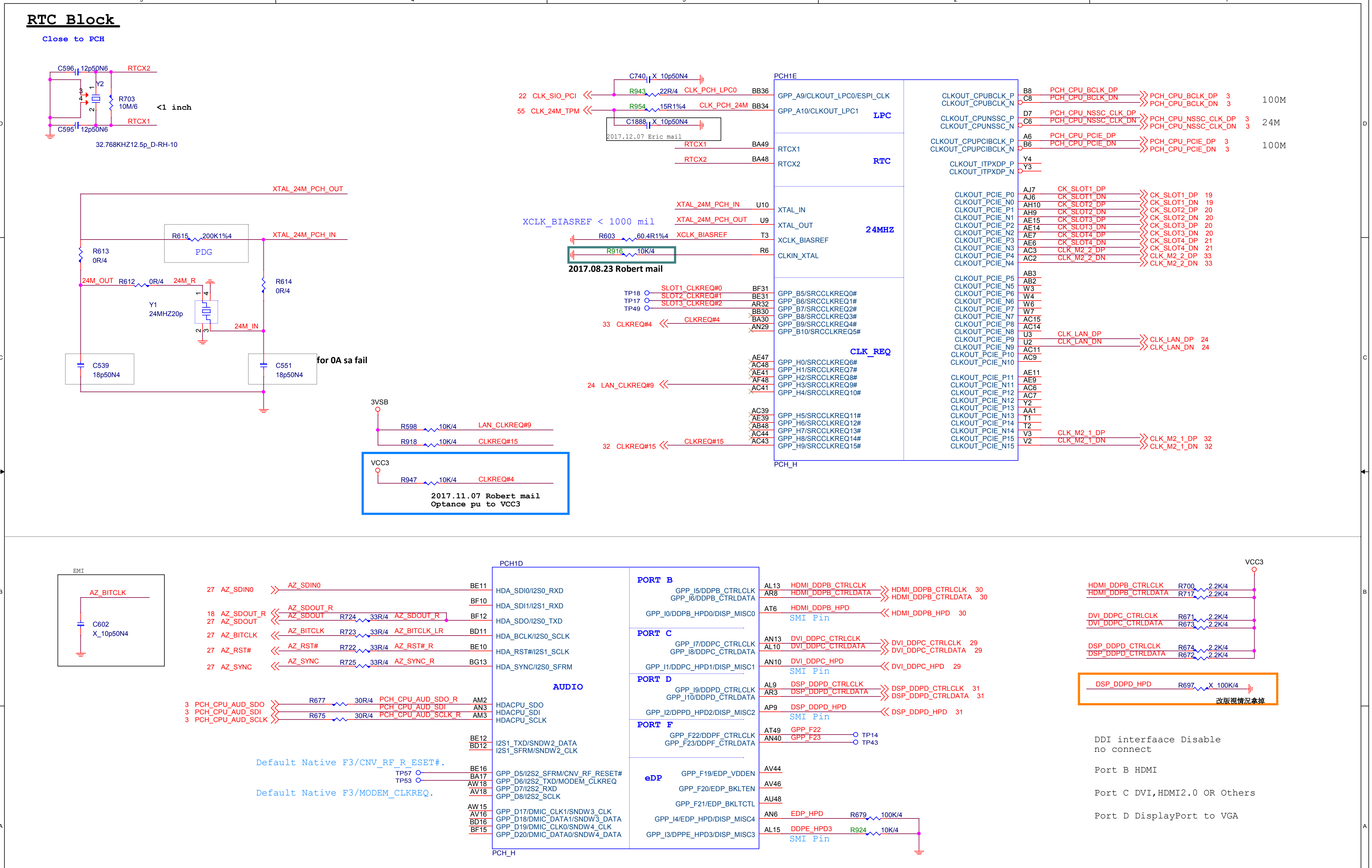
MS-7B23

Size	Document Description	Rev
Custom	DDR4-POWER/GND-2	1.1

Date: Monday, February 12, 2018 Sheet 11 of 63


2017.12.07 Eric mail
close to PCH in 500~1000mil
To SIO
FAN MODE USE
LANPHY USE by SPEC
for loadline disable
PCH1A
LPC
eSPI
SMB
SPI
Power Management
STRAP
JTAG
PCH_H
PCH LANPHY PWR
Pull Down PCH PHY into low power state.
For No Use intel Lan
2018.01.23 Robert mail
2017.12.07 Eric mail
CRB RSVD pull up to +V3P3_DUAL.
Defensive Termination. CRB unstuff.
Place within 1.1" of PCH Pin.
Place R390 within 200mil of PCH.
Place within 1.5" of PCH Pin.
Defensive Termination. CRB unstuff.
Place within 1.1" of PCH Pin.
RSMRST# USE solution
2017.08.14 Eric mail add
2017.11.30 Robert mail remove
RSMRST#
擺在一起(注意到所有的SMBUS的分支)
SMBUS ESD
close to PCH
CFL CRB
RTC
2014.12.29
CRB
2017.12.20 remove RTC
Chassis Intrusion
INTRUDER#
H1X2M_BLACK-RH
X_ESD-AOZ8231
NN-2N7002D
2N7002
MICRO-STAR INT'L CO.,LTD
MS-7B23
Document Description
PCH-LPC/SPI/SMBUS/MISC
Size Custom
Rev 1.1
Date: Monday, February 12, 2018
Sheet 12 of 63

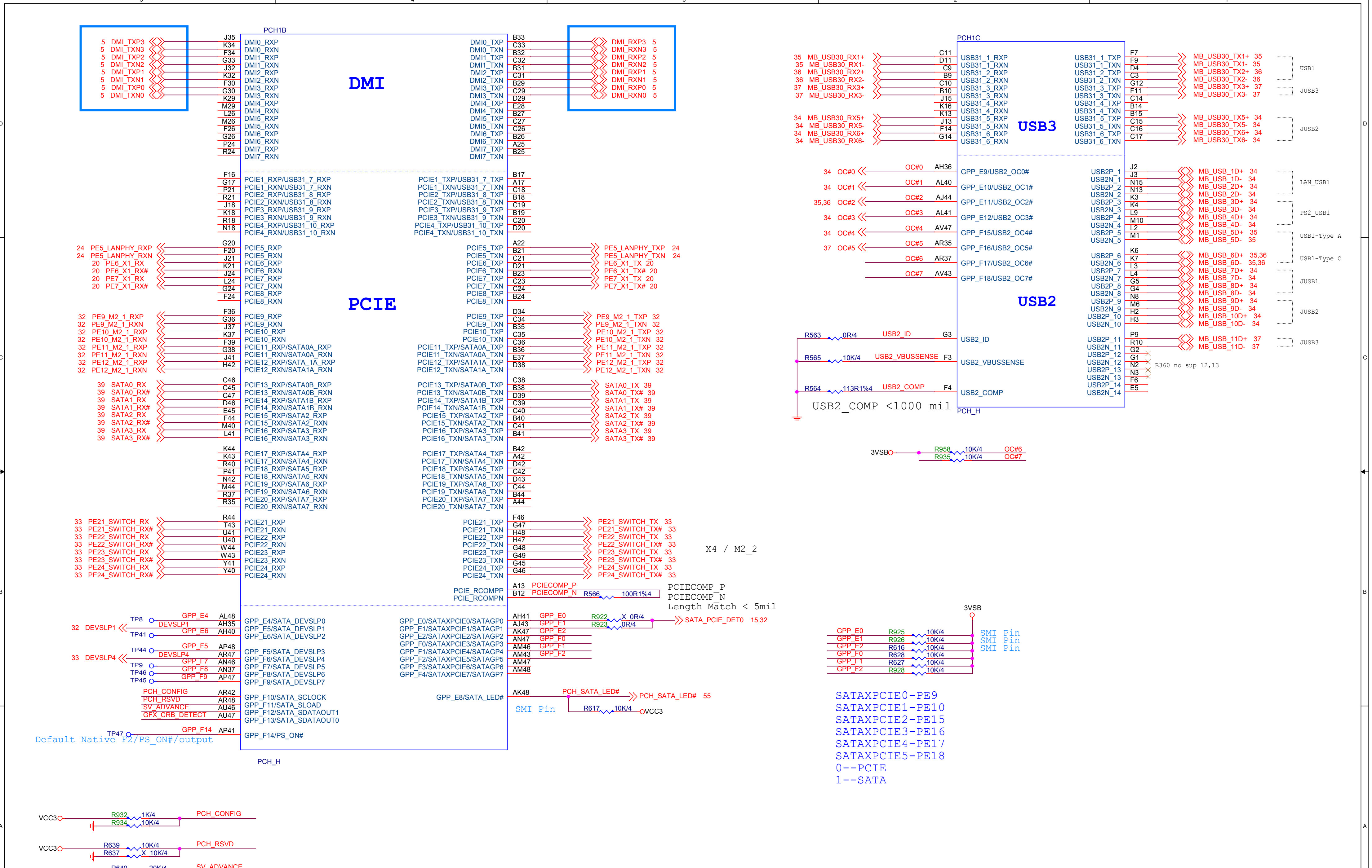


MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	PCH-Audio/Display/Clock	1.1

Date: Monday, February 12, 2018 Sheet 13 of 63



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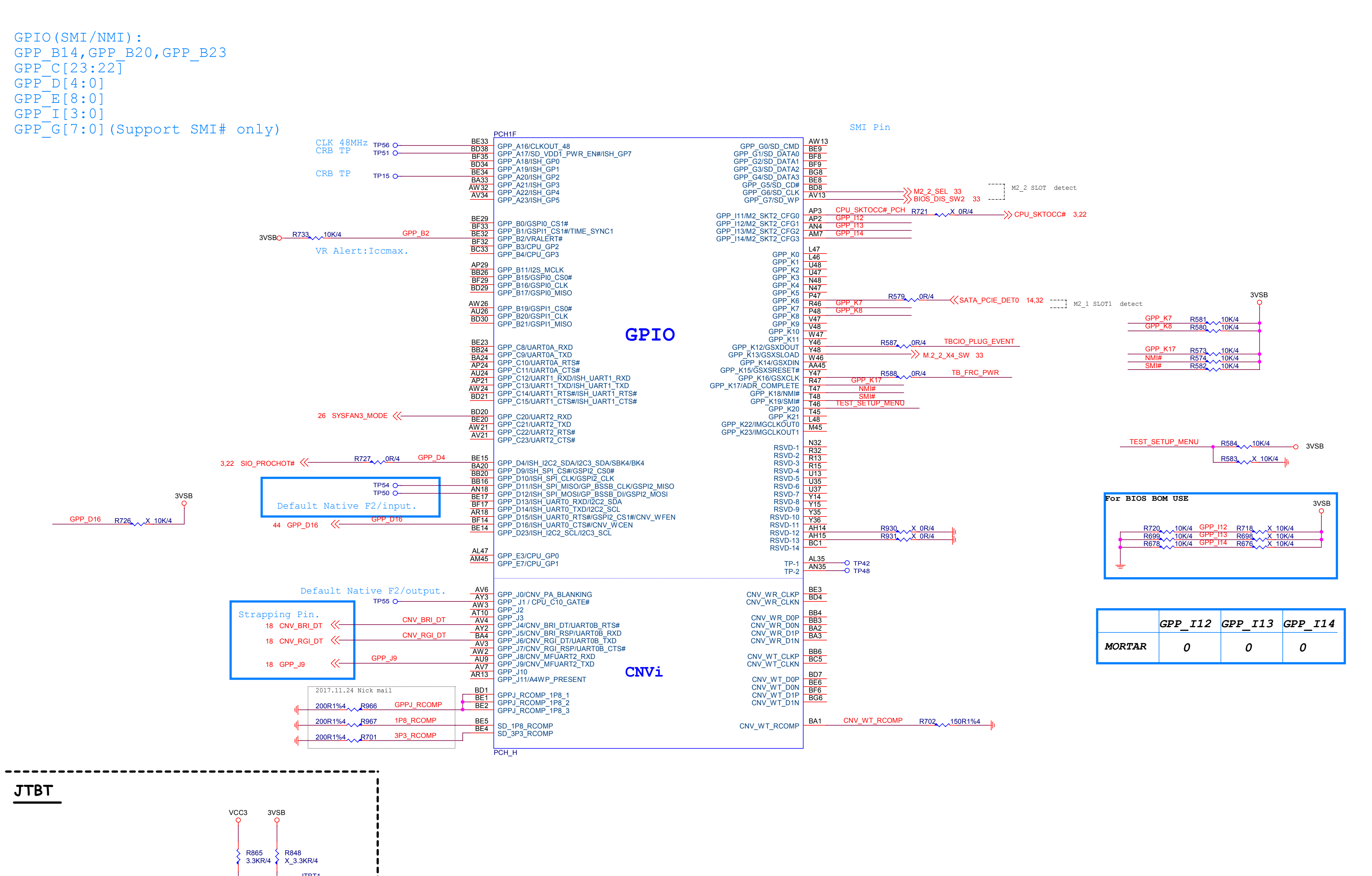
MS-7B23

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

Date: Monday, February 12, 2018 Sheet 14 of 63



	GPP_I12	GPP_I13	GPP_I14
MORTAR	0	0	0

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MS-7B23

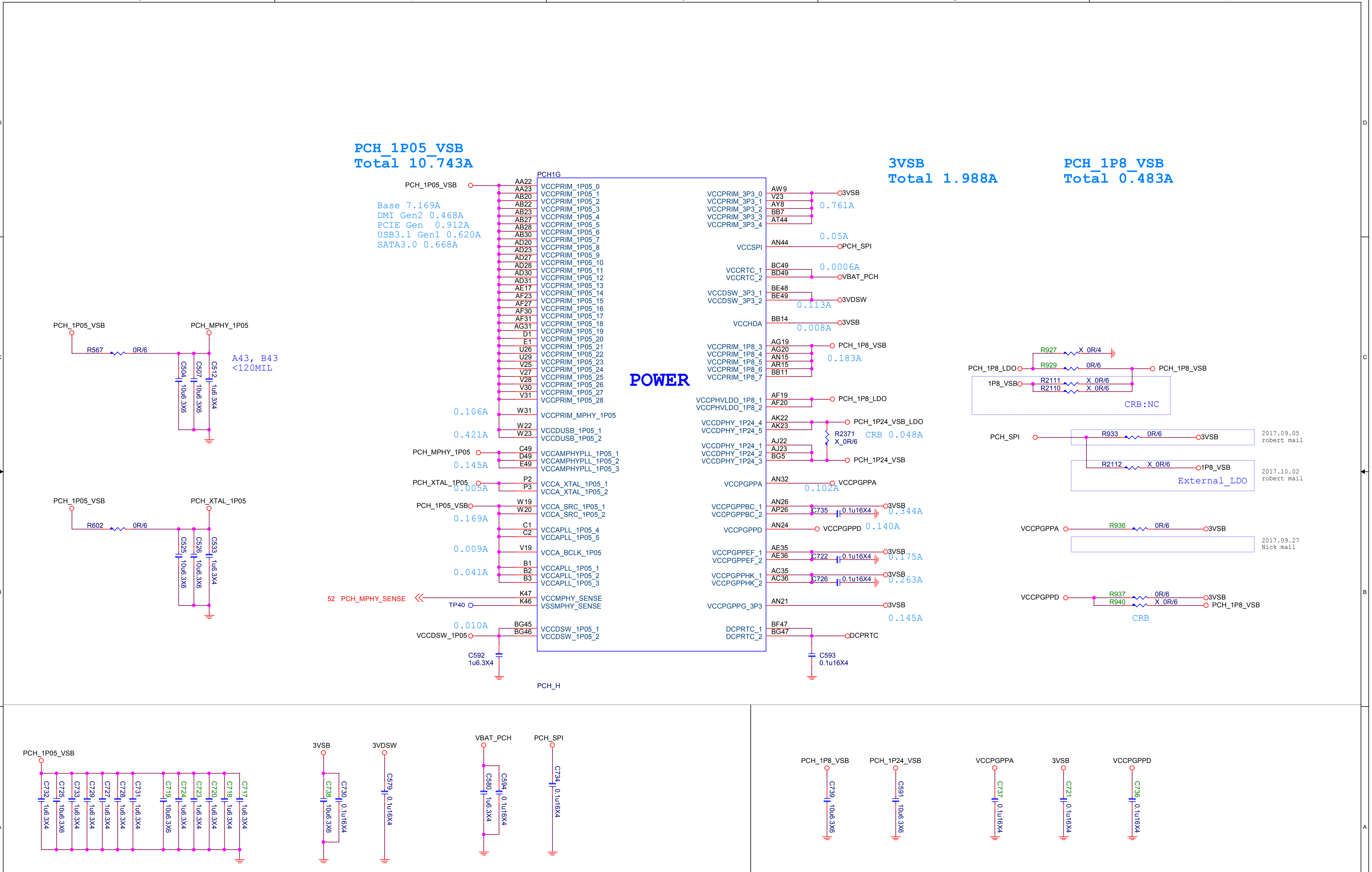
Size: Custom

Document Description: PCH-GPIO/USBOC#/SATASTRAP

Rev 1.1

Date: Monday, February 12, 2018

Sheet 15 of 63

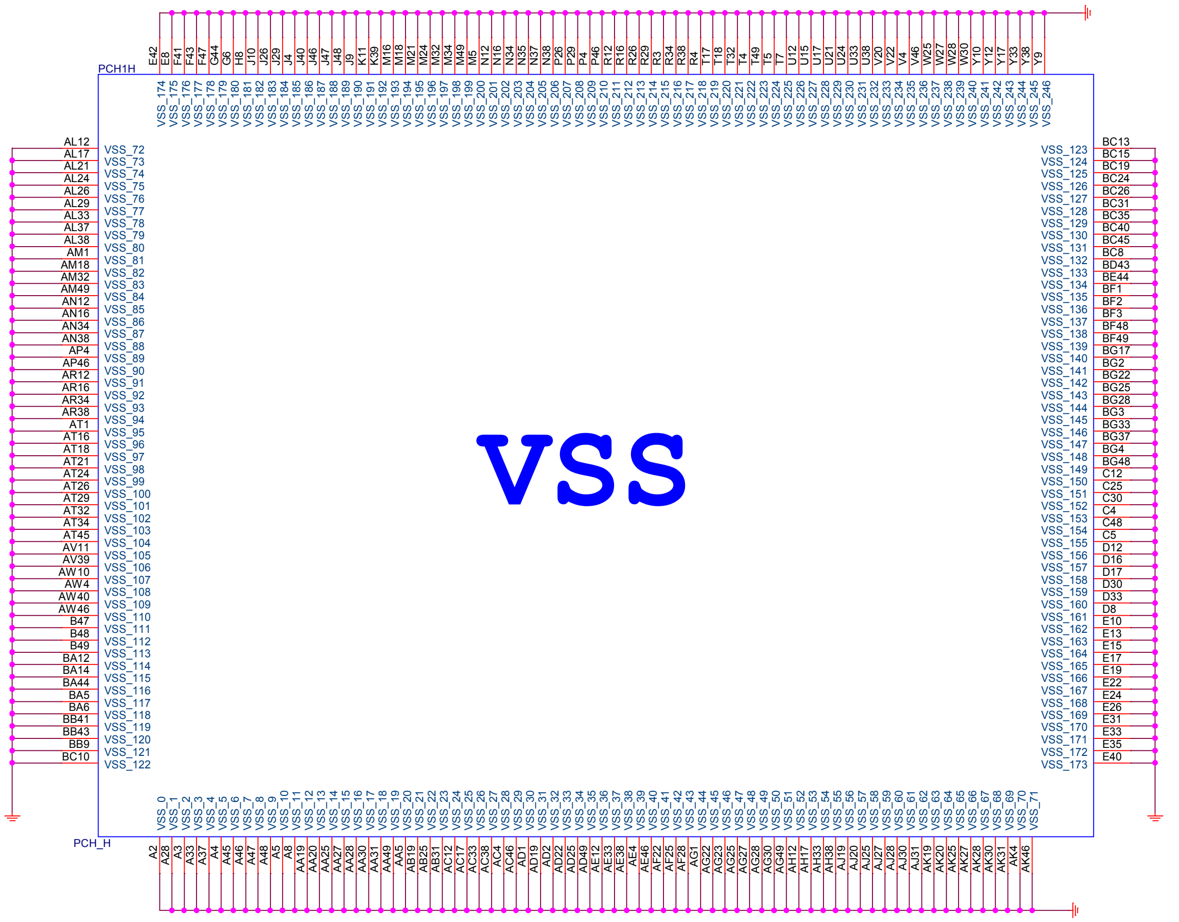


MICRO-STAR INT'L CO.,LTD

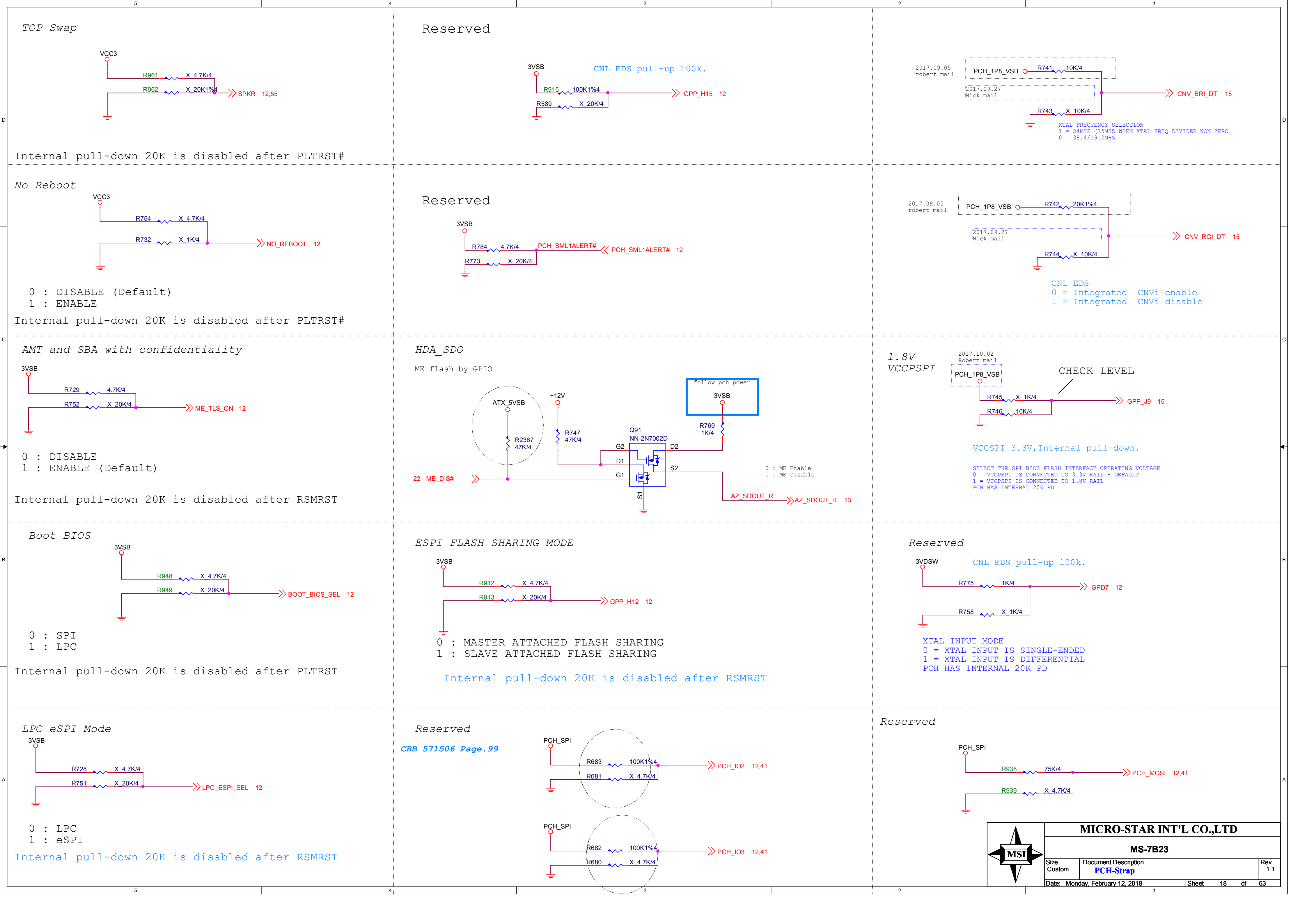
MS-7B23

Size	Document Description	Rev
Custom	PCH-Power	1.1

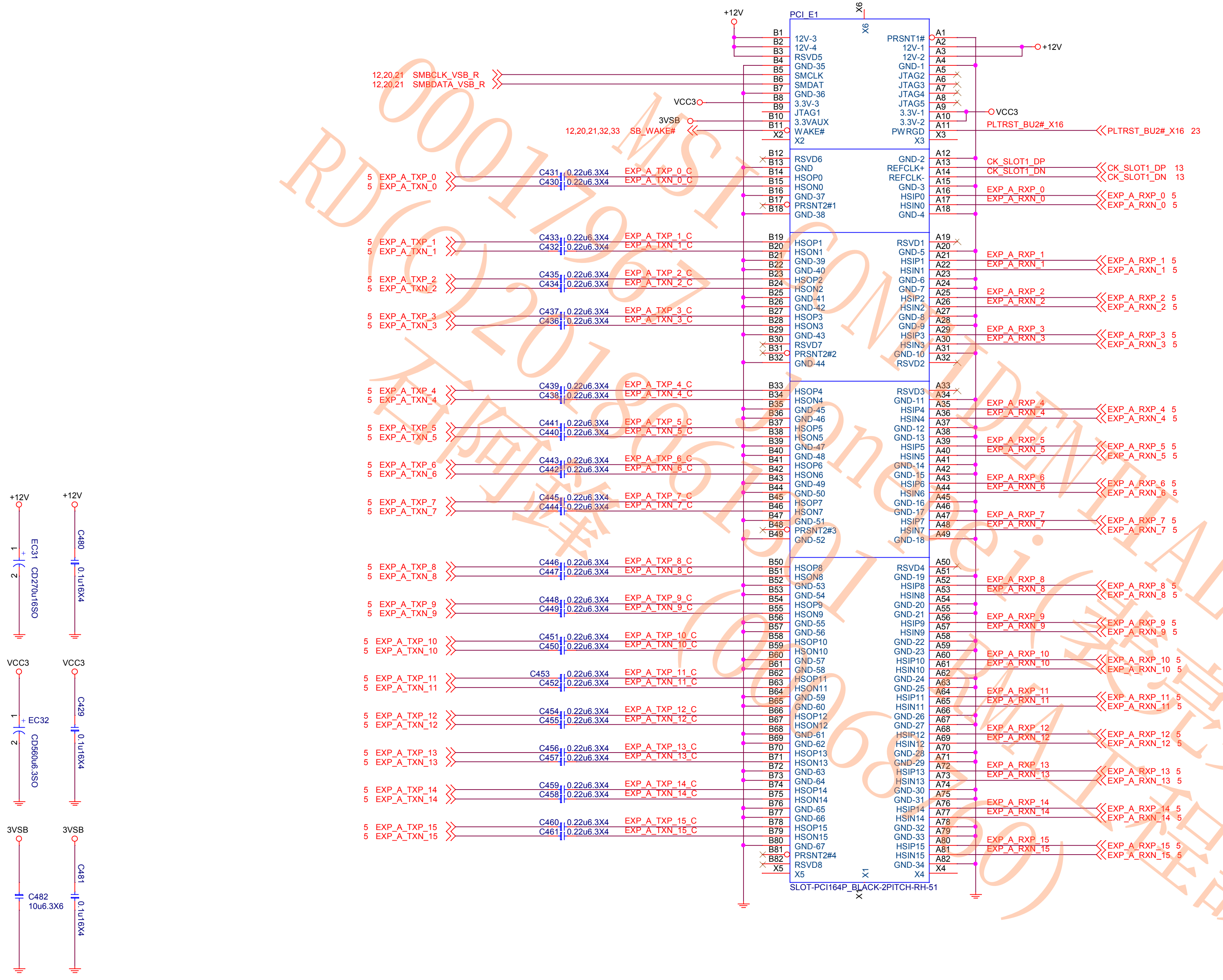
Date: Monday, February 12, 2018 Sheet 16 of 63



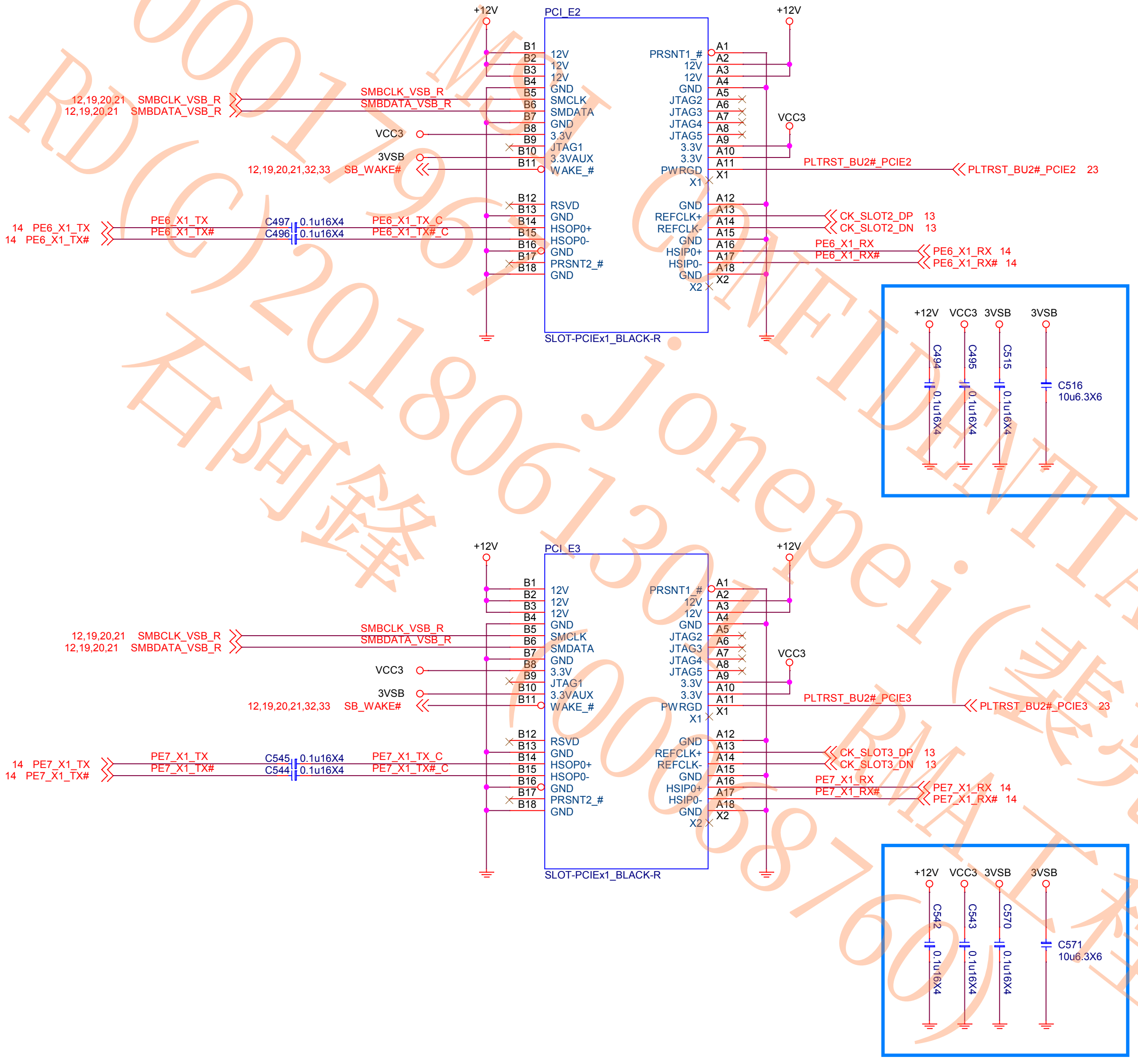
MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: **PCH-GND**	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 17 of 63	



TOP Swap
VCC3
R961 X 4.7K/4
R962 X 20K1%4
SPKR 12,55
Internal pull-down 20K is disabled after PLTRST#
Reserved
3VSB
CNL EDS pull-up 100k.
R915 100K1%4
R589 X 20K/4
GPP_H15 12
2017.09.05
robert mail
PCH_1P8_VSB
R741 10K/4
2017.09.27
Nick mail
CNV_BRI_DT 15
R743 X 10K/4
XTAL FREQUENCY SELECTION
1 = 24MHZ (25MHZ WHEN XTAL FREQ DIVIDER NON ZERO
0 = 38.4/19.2MHZ
No Reboot
VCC3
R754 X 4.7K/4
R732 X 1K/4
NO_REBOOT 12
0 : DISABLE (Default)
1 : ENABLE
Internal pull-down 20K is disabled after PLTRST#
Reserved
3VSB
R784 4.7K/4
PCH_SML1ALERT#
R773 X 20K/4
PCH_SML1ALERT# 12
2017.09.05
robert mail
PCH_1P8_VSB
R742 20K1%4
2017.09.27
Nick mail
CNV_RGI_DT 15
R744 X 10K/4
CNL EDS
0 = Integrated CNVi enable
1 = Integrated CNVi disable
AMT and SBA with confidentiality
3VSB
R729 4.7K/4
R752 X 20K/4
ME_TLS_ON 12
0 : DISABLE
1 : ENABLE (Default)
Internal pull-down 20K is disabled after RSMRST
HDA_SDO
ME flash by GPIO
ATX_5VSB
R2387 47K/4
+12V
R747 47K/4
follow pch power
3VSB
R769 1K/4
Q91
NN-2N7002D
G2 D2
D1
G1 S2
S1
22 ME_DIS#
0 : ME Enable
1 : ME Disable
AZ_SDOUT_R
AZ_SDOUT_R 13
1.8V
VCCPSPI
2017.10.02
Robert mail
PCH_1P8_VSB
CHECK LEVEL
R745 X 1K/4
R746 10K/4
GPP_J9 15
VCCSPI 3.3V,Internal pull-down.
SELECT THE SPI BIOS FLASH INTERFACE OPERATING VOLTAGE
0 = VCCPSPI IS CONNECTED TO 3.3V RAIL - DEFAULT
1 = VCCPSPI IS CONNECTED TO 1.8V RAIL
PCH HAS INTERNAL 20K PD
Boot BIOS
3VSB
R948 X 4.7K/4
R949 X 20K/4
BOOT_BIOS_SEL 12
0 : SPI
1 : LPC
Internal pull-down 20K is disabled after PLTRST
ESPI FLASH SHARING MODE
3VSB
R912 X 4.7K/4
R913 X 20K/4
GPP_H12 12
0 : MASTER ATTACHED FLASH SHARING
1 : SLAVE ATTACHED FLASH SHARING
Internal pull-down 20K is disabled after RSMRST
Reserved
3VDSW
CNL EDS pull-up 100k.
R775 1K/4
R758 X 1K/4
GPD7 12
XTAL INPUT MODE
0 = XTAL INPUT IS SINGLE-ENDED
1 = XTAL INPUT IS DIFFERENTIAL
PCH HAS INTERNAL 20K PD
LPC eSPI Mode
3VSB
R728 X 4.7K/4
R751 X 20K/4
LPC_ESPI_SEL 12
0 : LPC
1 : eSPI
Internal pull-down 20K is disabled after RSMRST
Reserved
CRB 571506 Page.99
PCH_SPI
R683 100K1%4
R681 X 4.7K/4
PCH_IO2 12,41
PCH_SPI
R682 100K1%4
R680 X 4.7K/4
PCH_IO3 12,41
Reserved
PCH_SPI
R938 75K/4
R939 X 4.7K/4
PCH_MOSI 12,41
MSI
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size Custom
Document Description PCH-Strap
Rev 1.1
Date: Monday, February 12, 2018
Sheet 18 of 63



MICRO-STAR INT'L CO.,LTD			
MS-7B23			
Size Custom	Document Description PCIE SLOT-CPU(X16)		Rev 1.1
Date: Monday, February 12, 2018		Sheet 19 of 63	



MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	PCIE SLOT-PCH(X1)	1.1

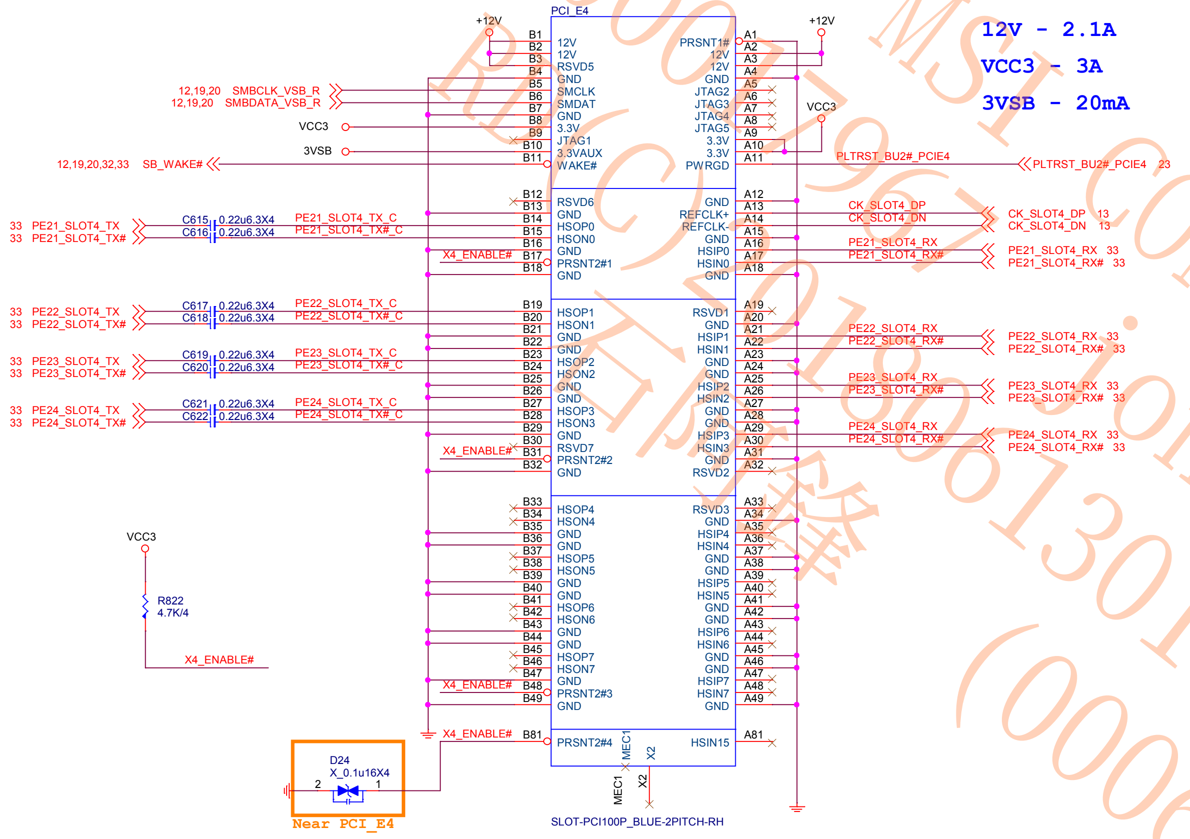
Date: Monday, February 12, 2018 Sheet 20 of 63

PCI Express X4 Slot

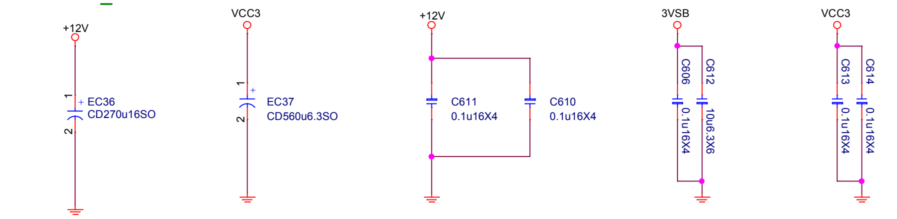
12V - 2.1A

VCC3 - 3A

3VSB - 20mA



Near PCI_E4

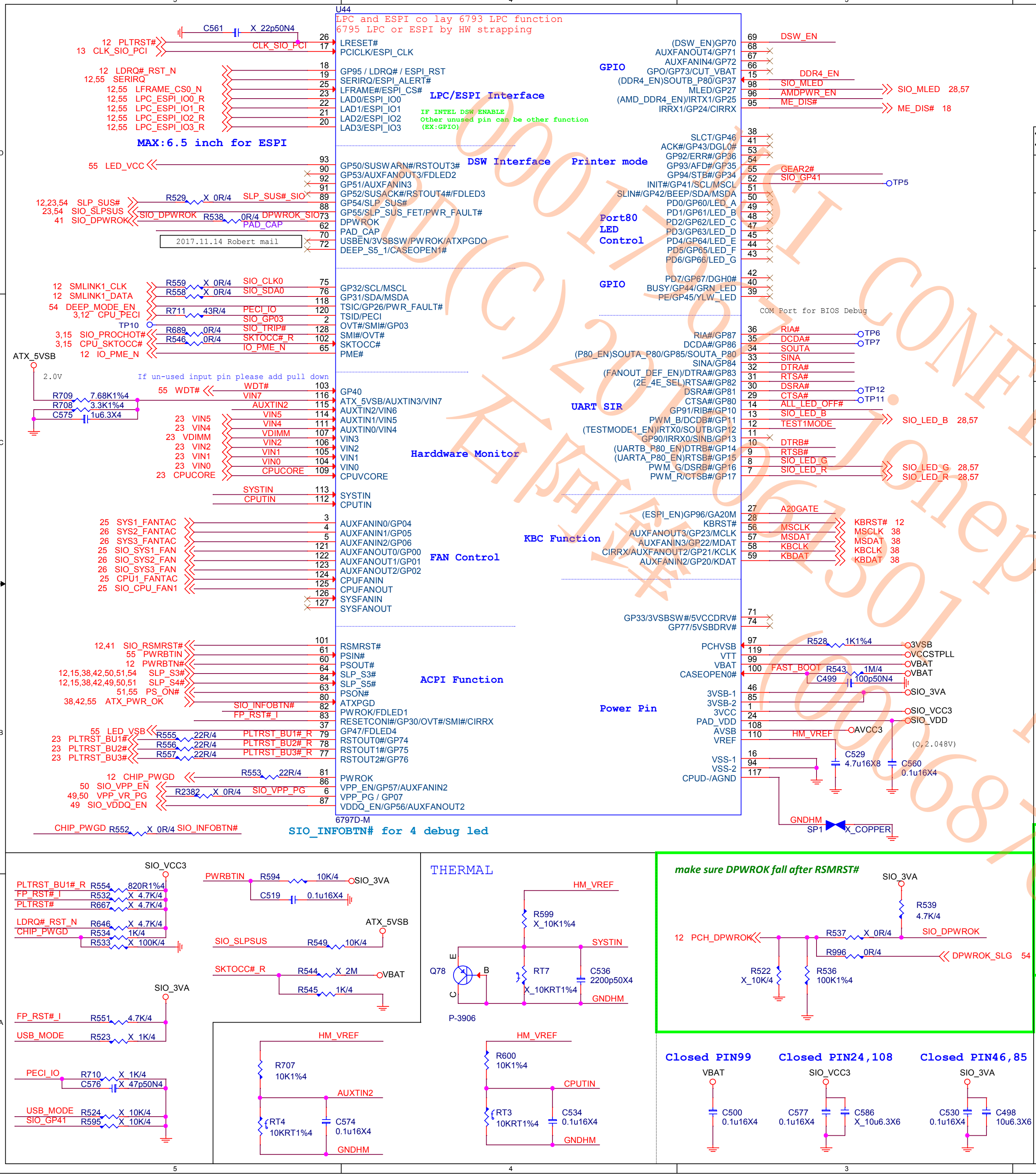


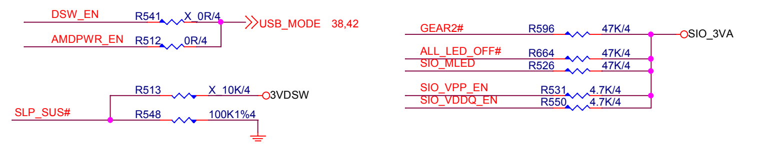
MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	PCIE SLOT-PCH(X4)	1.1

Date: Monday, February 12, 2018 Sheet 21 of 63

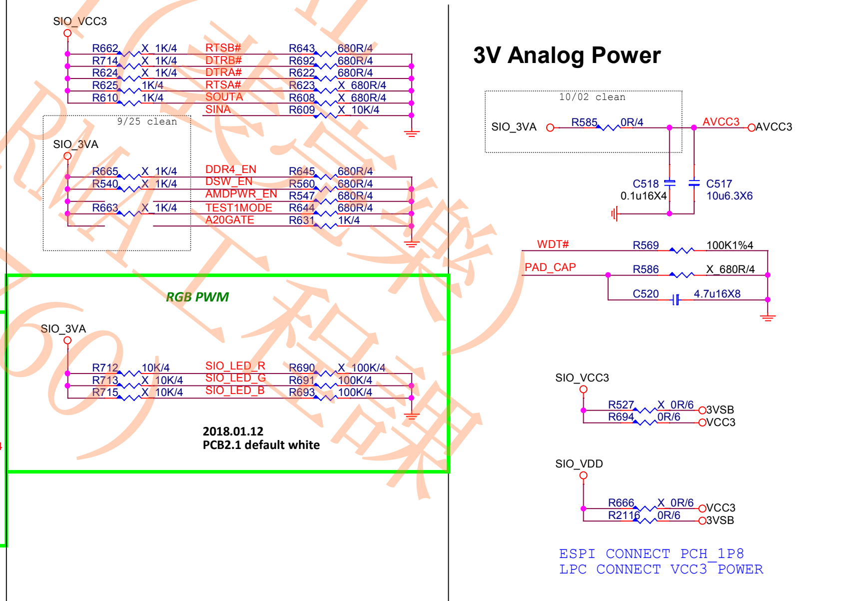




POWER ON STRAPPING PIN FOR NCT6797

PIN	NAME	Circuit NAME	0	1	Strap Point
9	UARTA_P80_EN	RTSB#	DISABLE UARTA80	ENABLE UARTA80	LRESET
10	UARTB_P80_EN	DTRB#	DISABLE UARTB80	ENABLE UARTB80	LRESET
12	TEST1MODE_EN	TEST1MODE	DISABLE TEST1MODE	ENABLE TEST1MODE	LRESET
15	DDR4_EN	DDR4_EN	Disable	Enable	
27	ESPI_EN	A20GATE	LPC	ESPI	
31	2E_4E_SEL	RTSA#	I/O ADDRESS 2E	I/O ADDRESS 4E	LRESET
32	FANOUT_DEF_EN	DTRA#	default 50%	default 100%	INTERNAL PWROK
34	P80_EN	SOUTA	ENABLE Non_PORT80	ENABLE PORT80	LRESET
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



MICRO-STAR INT'L CO.,LTD

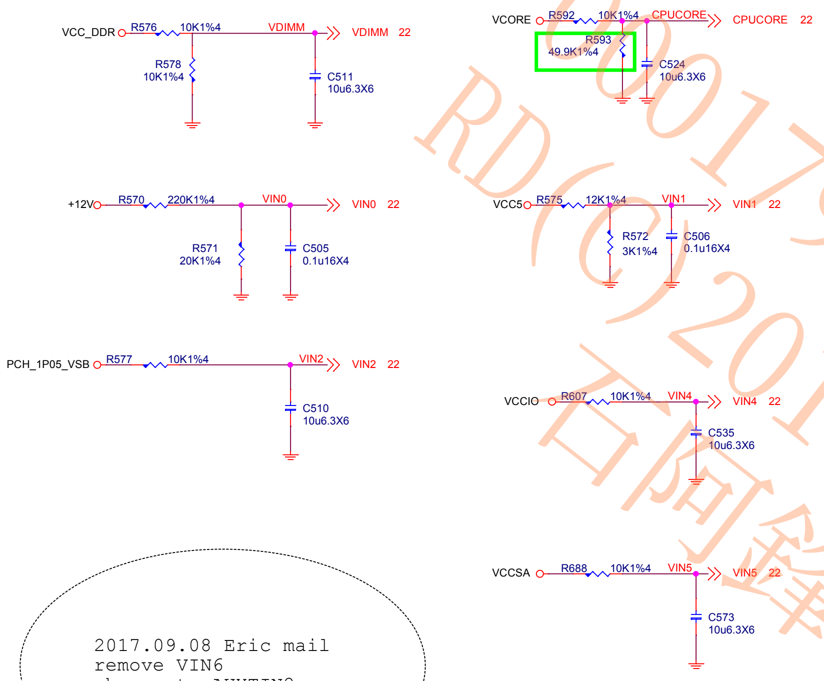
MS-7B23

Size	Document Description	Rev
Custom	SIO-NCT6793D-1	1.1

Date: Monday, February 12, 2018 Sheet 22 of 63

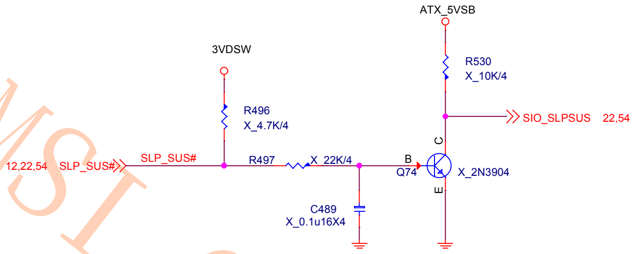
HW Monitor - Voltage

SIO HM Voltage voer 2V will not detect



2017.09.08 Eric mail
remove VIN6
change to AUXTIN2

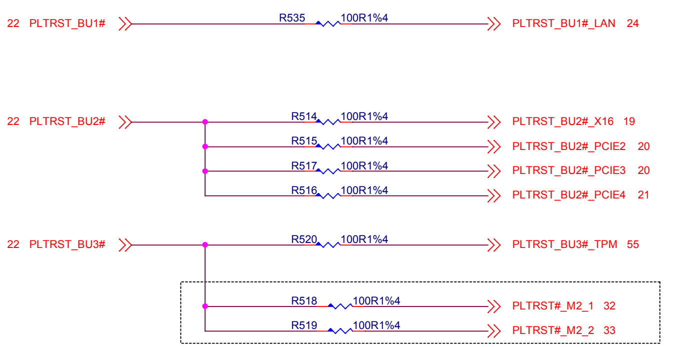
SLP_SUS Co-lay circuit



2017.09.25
remove for space

PLTRST#

oper drain for onboard chip



push pull for slots

SERIAL PORT 1

2017.09.25
remove JCOM1

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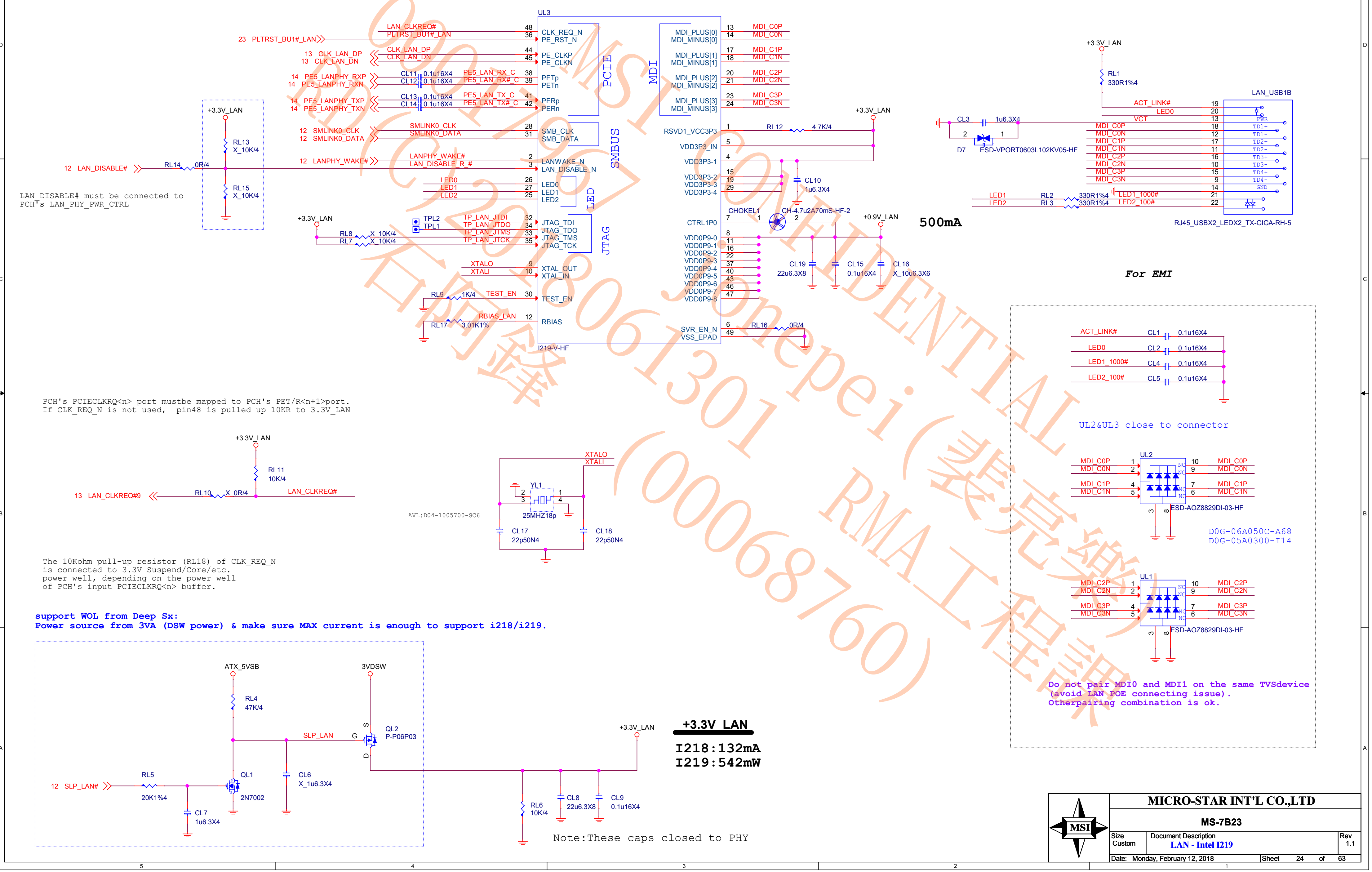
MS-7B23

Size	Document Description	Rev
Custom	SIO-NCT6793D-2	1.1

Date: Monday, February 12, 2018 Sheet 23 of 63

Intel Lan- i219



LAN_DISABLE# must be connected to PCH's LAN_PHY_PWR_CTRL

PCH's PCIECLKRQ<n> port mustbe mapped to PCH's PET/R<n+1>port.
If CLK_REQ_N is not used, pin48 is pulled up 10KR to 3.3V_LAN

The 10Kohm pull-up resistor (RL18) of CLK_REQ_N is connected to 3.3V Suspend/Core/etc. power well, depending on the power well of PCH's input PCIECLKRQ<n> buffer.

support WOL from Deep Sx:
Power source from 3VA (DSW power) & make sure MAX current is enough to support i218/i219.

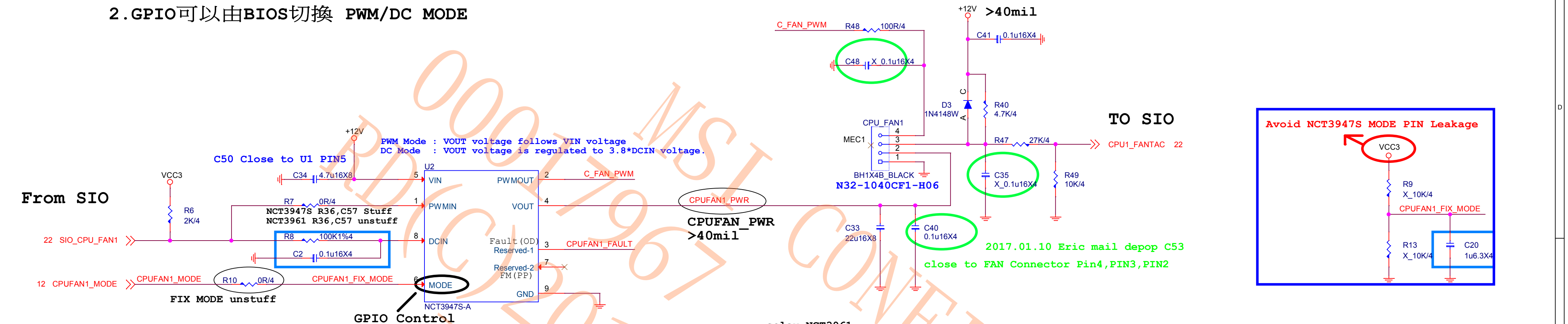
Note:These caps closed to PHY

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

MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: LAN - Intel I219	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 24 of 63	

TYPE K : 4 PIN CPU FAN USE NCT3947S USE PCH GPIO CONTROL FAN MODE

2.GPIO可以由BIOS切換 PWM/DC MODE



	MODE(PIN7)
PWM MODE	HIGH
DC MODE	LOW
AUTO MODE	GPI(Floating)

Default

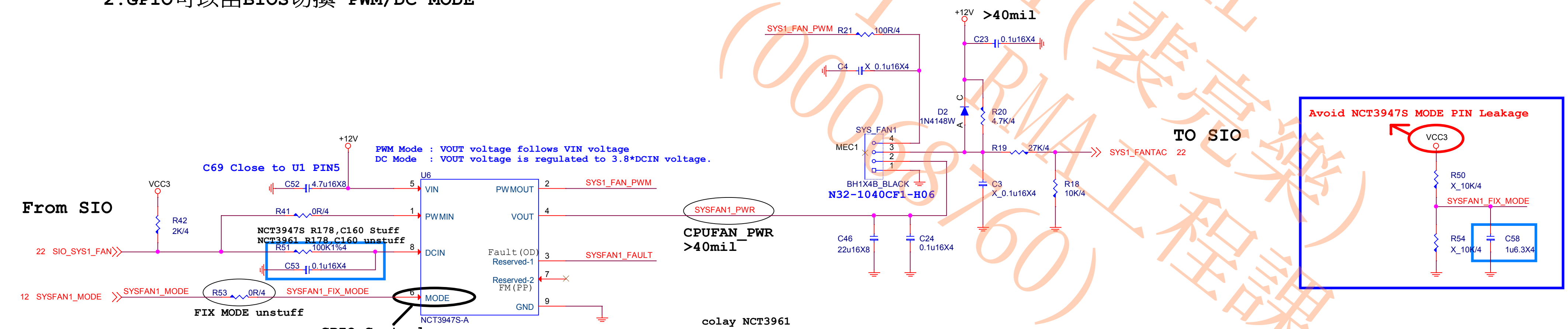
Internall pull up 1.65V

colay NCT3961

OCSET	R1	
1.2~1.8A	100K	default
2.2~2.8A	49.9K	OC SET By PM SPEC
3.2~3.8A	10K	20170428

TYPE K : 4 PIN CPU FAN USE NCT3947S USE PCH GPIO CONTROL FAN MODE

2.GPIO可以由BIOS切換 PWM/DC MODE



	MODE(PIN6)
PWM MODE	HIGH
DC MODE	LOW
AUTO MODE	GPI(Floating)

Default

Internal pull up 1.65V

colay NCT3961

OCSET	R1	
1.2~1.8A	100K	default
2.2~2.8A	49.9K	OC SET By PM SPEC
3.2~3.8A	10K	20170428

MICRO-STAR INT'L CO.,LTD

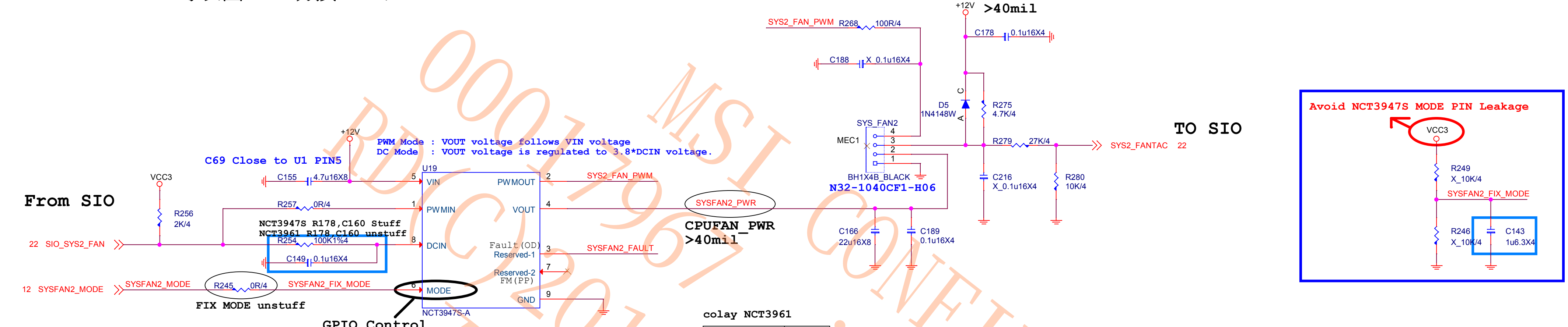
MS-7B23

Size	Document Description	Rev
Custom	FAN CONTROLLOR	1.1

Date: Monday, February 12, 2018 Sheet 25 of 63

TYPE K : 4 PIN CPU FAN USE NCT3947S USE PCH GPIO CONTROL FAN MODE

2.GPIO可以由BIOS切換 PWM/DC MODE



	MODE(PIN6)
PWM MODE	HIGH
DC MODE	LOW
AUTO MODE	GPI(Floating)

Default

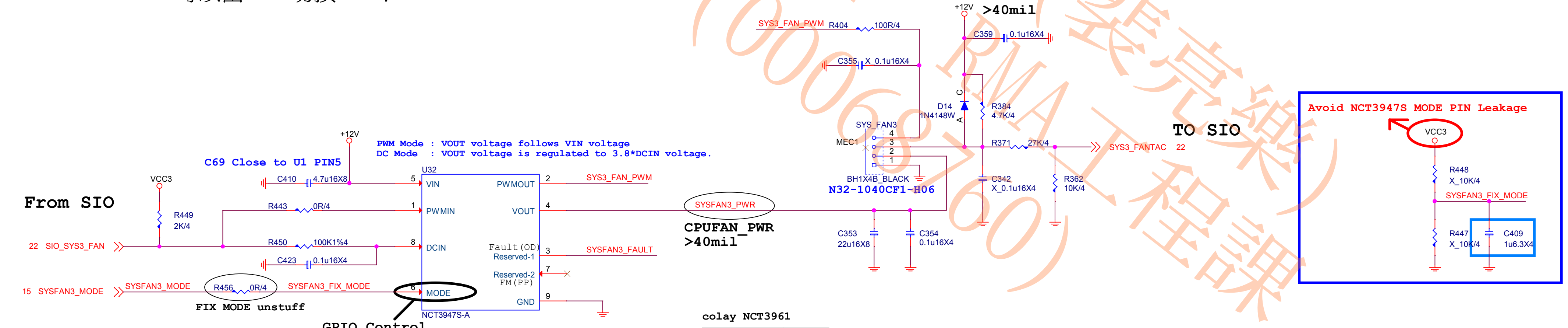
Internal pull up 1.65V

colay NCT3961

OCSET	R1	
1.2~1.8A	100K	default
2.2~2.8A	49.9K	OC SET By PM SPEC
3.2~3.8A	10K	20170428

TYPE K : 4 PIN CPU FAN USE NCT3947S USE PCH GPIO CONTROL FAN MODE

2.GPIO可以由BIOS切換 PWM/DC MODE



	MODE(PIN6)
PWM MODE	HIGH
DC MODE	LOW
AUTO MODE	GPI(Floating)

Default

Internal pull up 1.65V

colay NCT3961

OCSET	R1	
1.2~1.8A	100K	default
2.2~2.8A	49.9K	OC SET By PM SPEC
3.2~3.8A	10K	20170428

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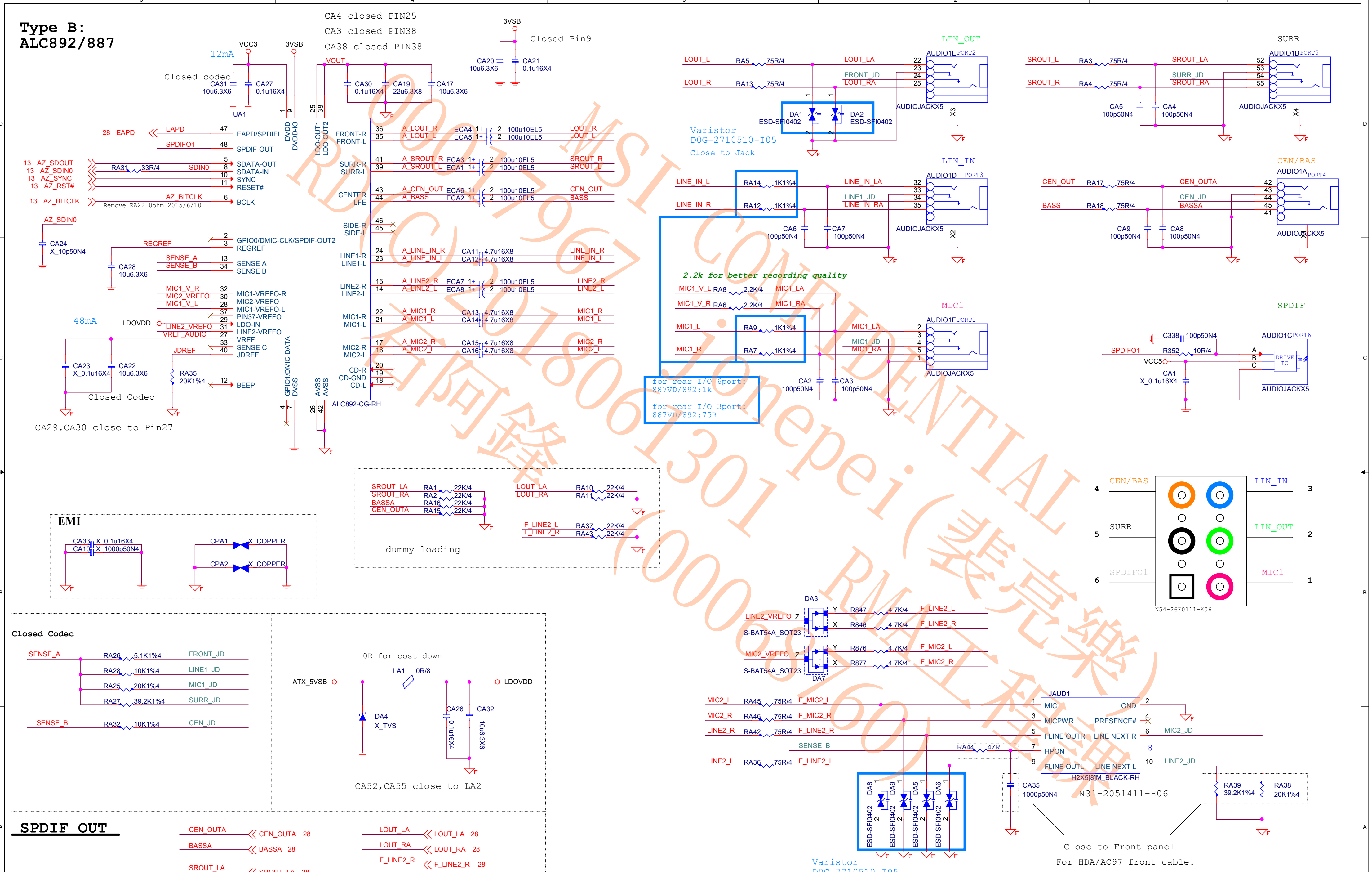
MS-7B23

Size: Custom | Document Description: FAN CONTROLLOR | Rev 1.1

Date: Monday, February 12, 2018 | Sheet 26 of 63



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MS-7B23

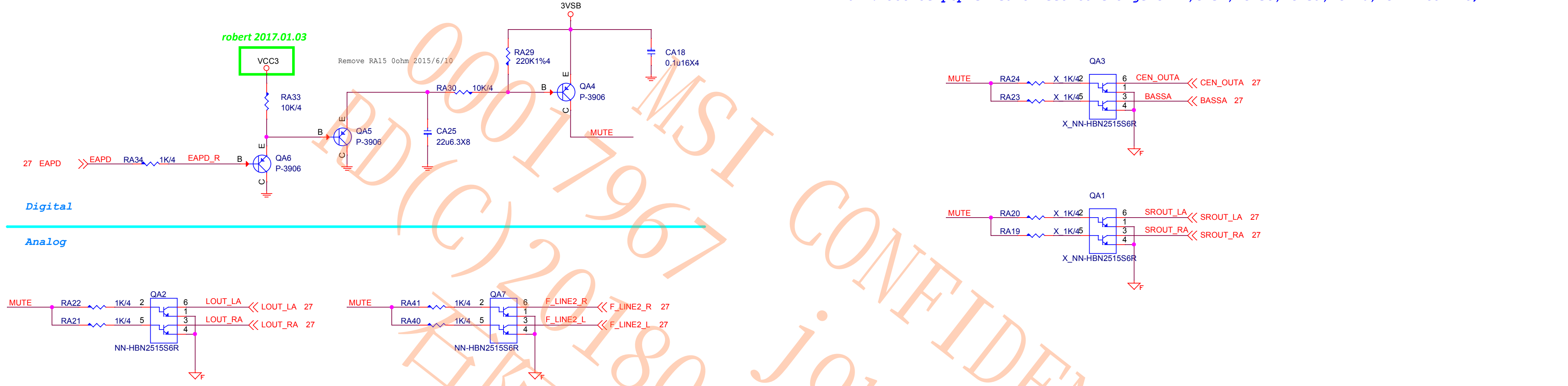
Size	Document Description	Rev
Custom	AUDIO - ALC892/887	1.1

Date: Monday, February 12, 2018 Sheet 27 of 63

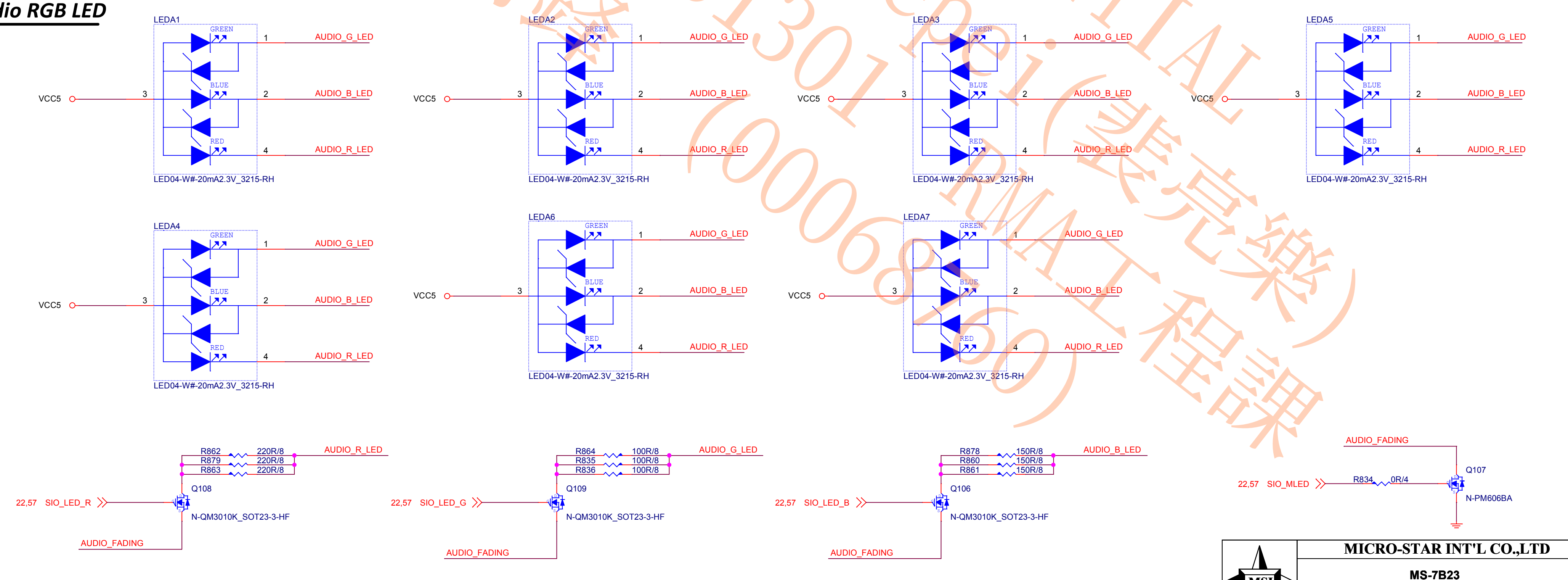
Rear Line OUT De-POP circuit

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

(add de-pop circuit by PM spec or customer request,
NOTE: add de-pop circuit need to change CA21,CA37, CA38, CA39, CA40, CA41 to TVS)



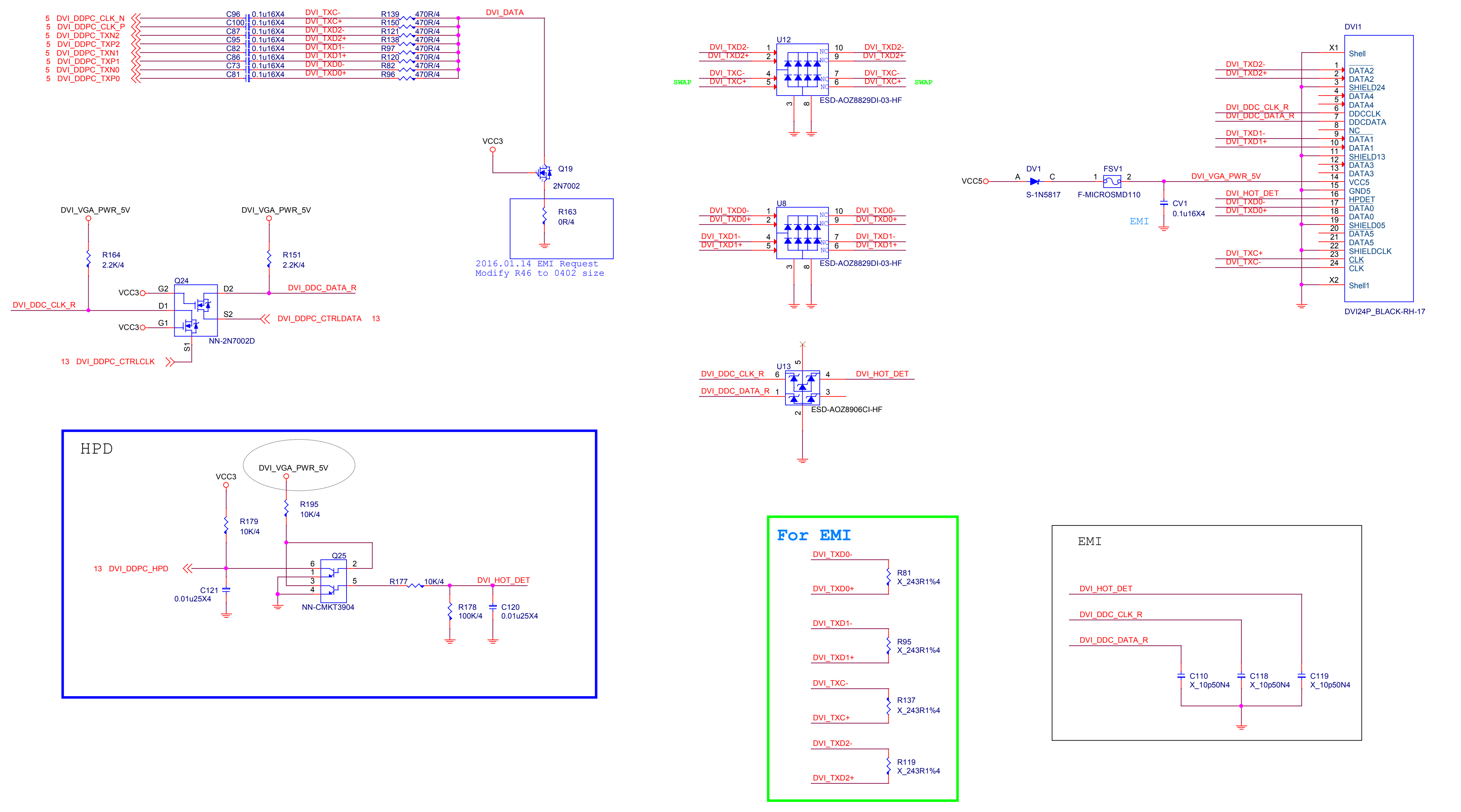
Audio RGB LED



MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size Custom	Document Description AUDIO - depop circuit	Rev 1.1
Date: Monday, February 12, 2018	Sheet 28 of 63	

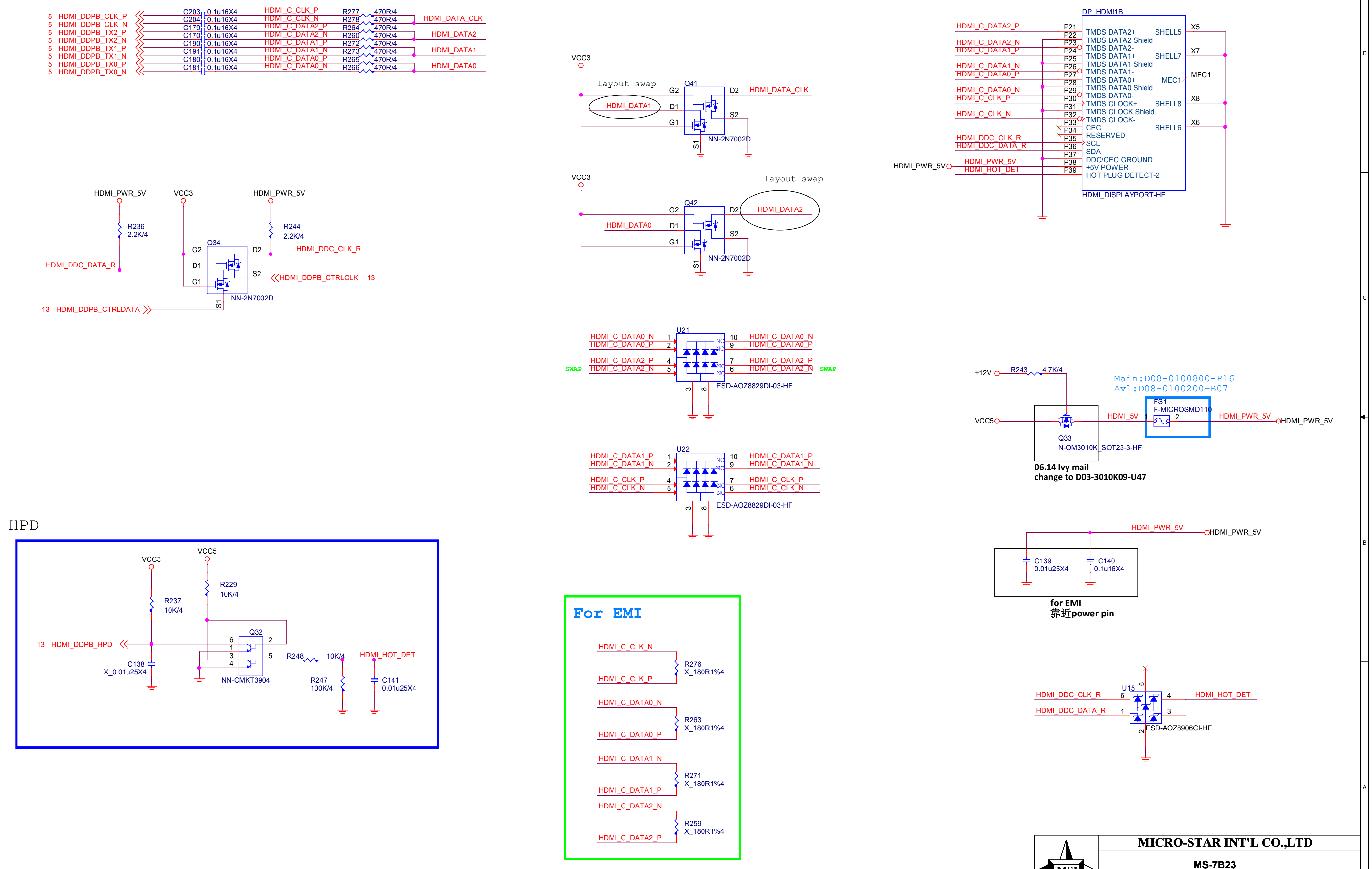
DVI level shifter

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

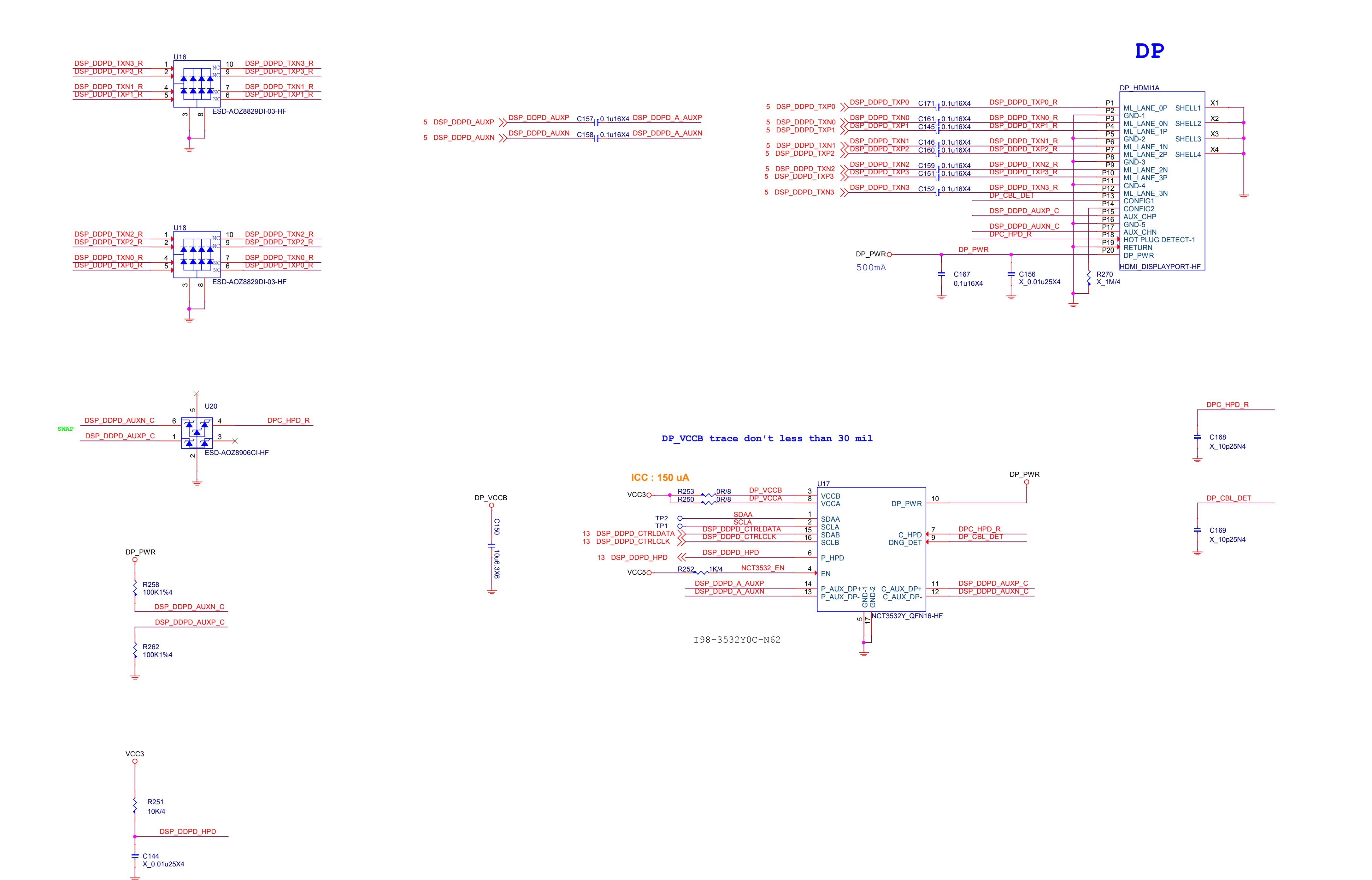


MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: DVI	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 29 of 63	

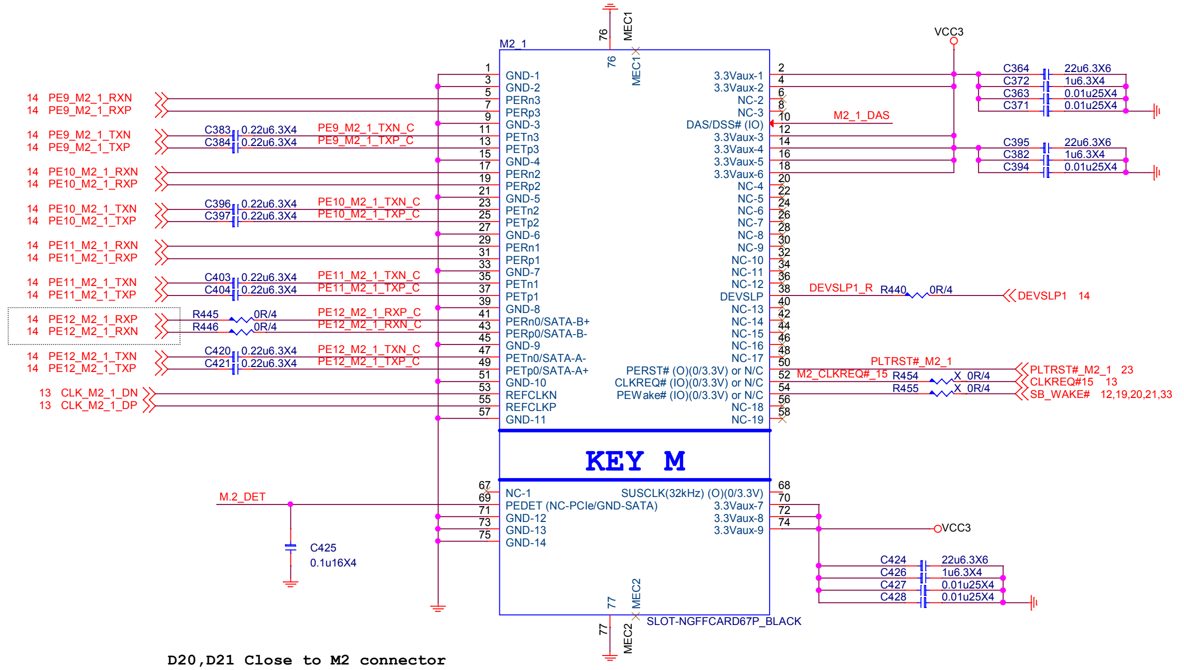
HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)



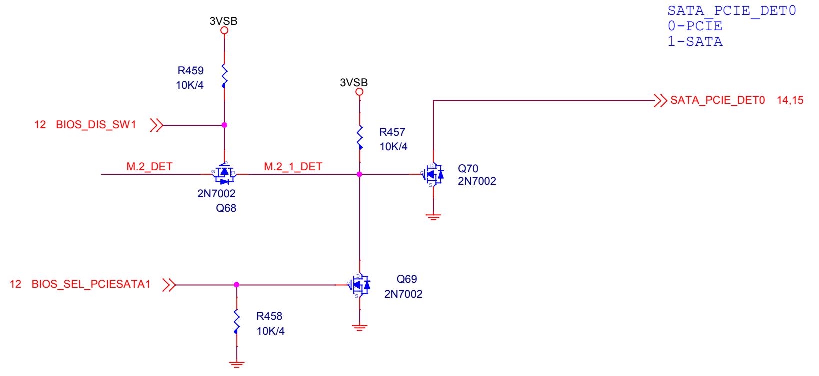
MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: HDMI Connector	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 30 of 63	



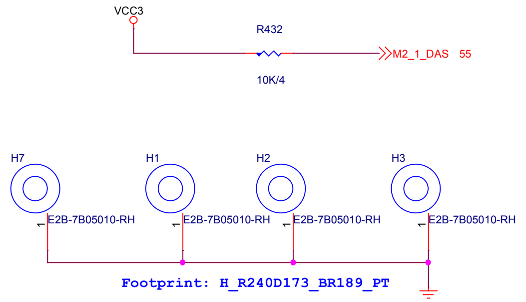
MICRO-STAR INT'L CO.,LTD			
MS-7B23			
Size: Custom	Document Description: DisplayPort Connector		Rev: 1.1
Date: Monday, February 12, 2018	Sheet 31	of 63	



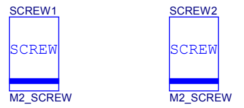
D20,D21 Close to M2 connector



SATA_PCIE_DET0
0-PCIE
1-SATA



Footprint: H_R240D173_BR189_PT



BIOS_MODE

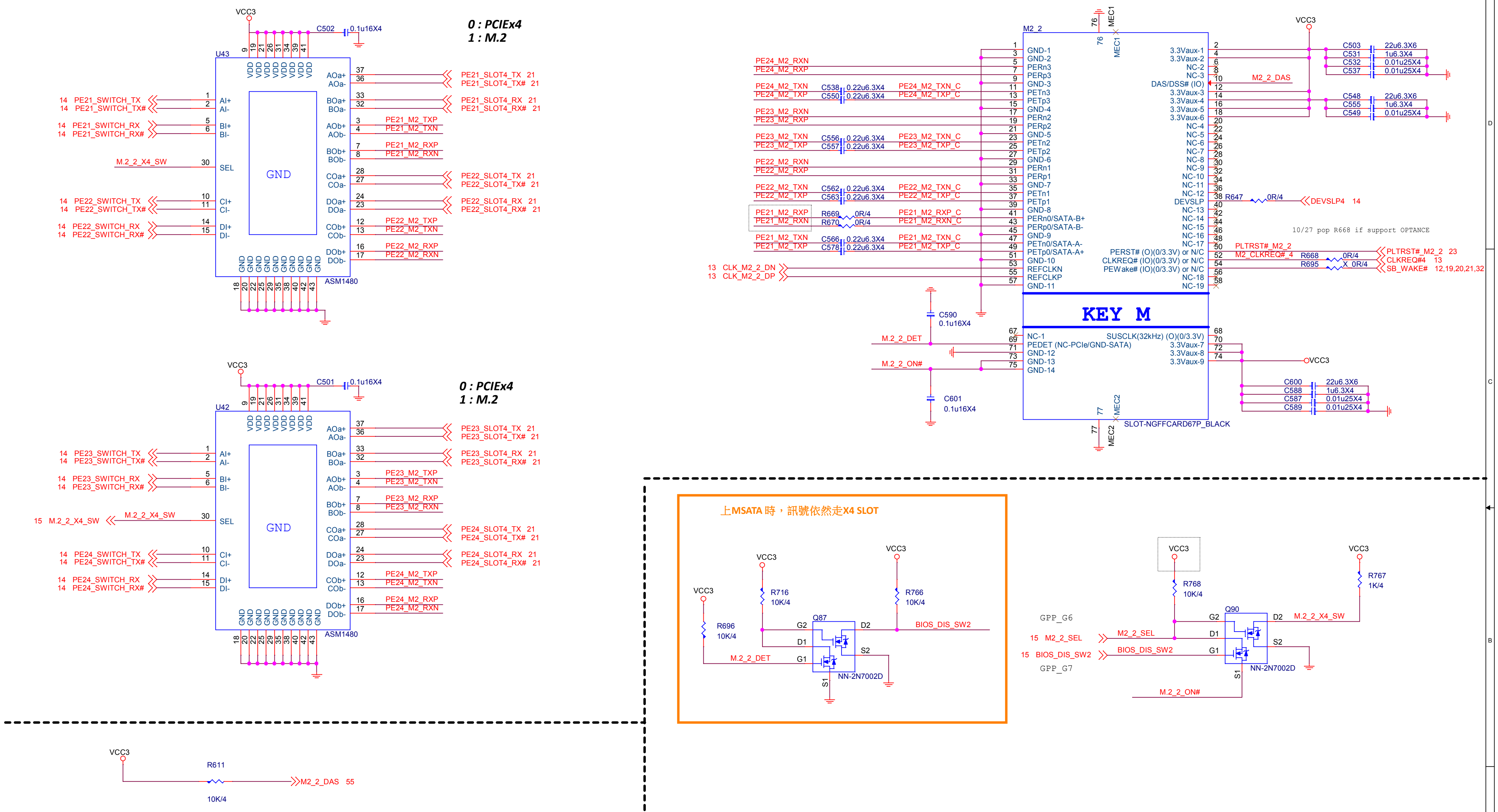
DIS_SW	M1_SEL_PCIESATA	Mode
0	1	M2-SATA
0	0	M2-PCIE
GPI	GPI	AUTO

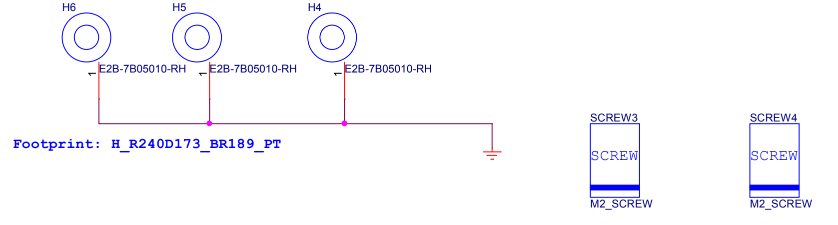
MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	M.2-SLOT1	1.1

Date: Monday, February 12, 2018 Sheet 32 of 63





BIOS_MODE

GPP_G7 GPP_G6

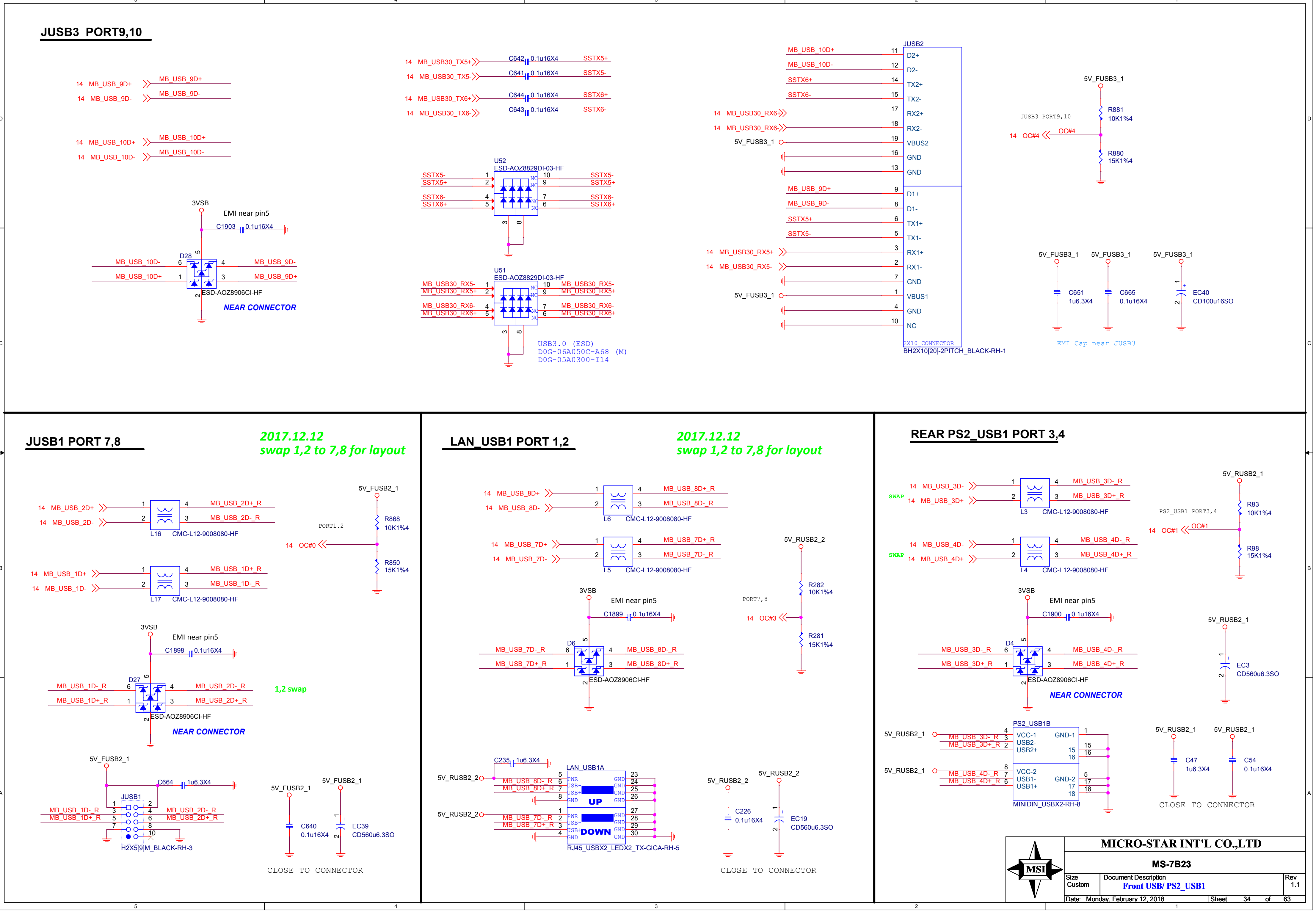
BIOS_DIS_SW2	M2_2_SEL	Mode
0	0	M2 SLOT-PCIE
0	1	X4 SLOT-PCIE
GPI	GPI	GPI

MICRO-STAR INT'L CO.,LTD

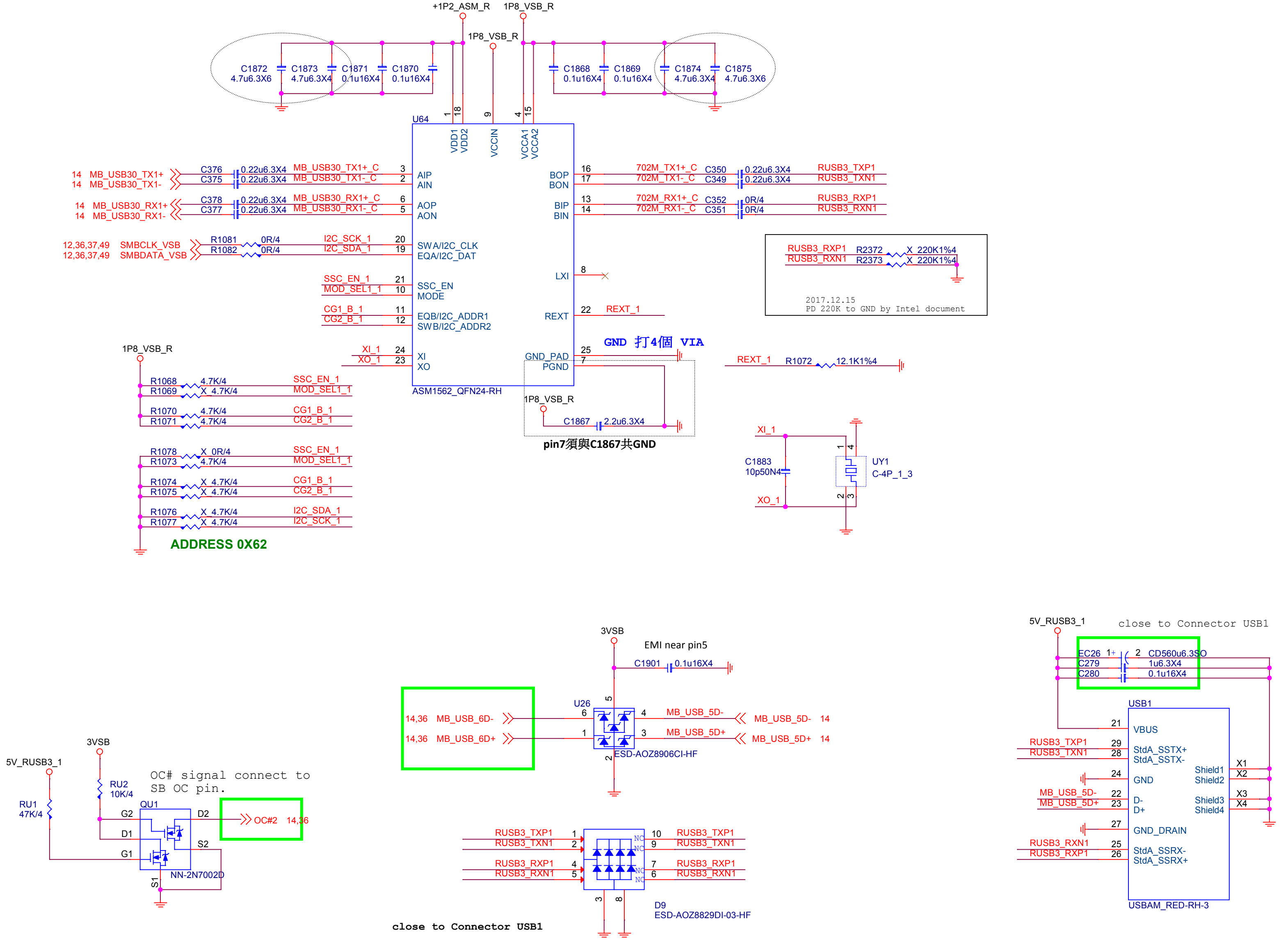
MS-7B23

Size: Custom | Document Description: M.2-SLOT2 | Rev 1.1

Date: Monday, February 12, 2018 | Sheet 33 of 63


JUSB3 PORT9,10
14 MB_USB_9D+
14 MB_USB_9D-
MB_USB_9D+
MB_USB_9D-
14 MB_USB_10D+
14 MB_USB_10D-
MB_USB_10D+
MB_USB_10D-
3VSB
EMI near pin5
C1903 0.1u16X4
D28
MB_USB_10D-
MB_USB_10D+
MB_USB_9D-
MB_USB_9D+
ESD-AOZ8906CI-HF
NEAR CONNECTOR
14 MB_USB30_TX5+
14 MB_USB30_TX5-
14 MB_USB30_TX6+
14 MB_USB30_TX6-
C642 0.1u16X4 SSTX5+
C641 0.1u16X4 SSTX5-
C644 0.1u16X4 SSTX6+
C643 0.1u16X4 SSTX6-
U52
ESD-AOZ8829DI-03-HF
SSTX5-
SSTX5+
SSTX6-
SSTX6+
U51
ESD-AOZ8829DI-03-HF
MB_USB30_RX5-
MB_USB30_RX5+
MB_USB30_RX6-
MB_USB30_RX6+
USB3.0 (ESD)
D0G-06A050C-A68 (M)
D0G-05A0300-I14
JUSB2
MB_USB_10D+ 11 D2+
MB_USB_10D- 12 D2-
SSTX6+ 14 TX2+
SSTX6- 15 TX2-
14 MB_USB30_RX6+ 17 RX2+
14 MB_USB30_RX6- 18 RX2-
5V_FUSB3_1 19 VBUS2
16 GND
13 GND
MB_USB_9D+ 9 D1+
MB_USB_9D- 8 D1-
SSTX5+ 6 TX1+
SSTX5- 5 TX1-
14 MB_USB30_RX5+ 3 RX1+
14 MB_USB30_RX5- 2 RX1-
7 GND
5V_FUSB3_1 1 VBUS1
4 GND
10 NC
2X10_CONNECTOR
BH2X10[20]-2PITCH_BLACK-RH-1
5V_FUSB3_1
R881 10K1%4
JUSB3 PORT9,10
14 OC#4
R880 15K1%4
5V_FUSB3_1
C651 1u6.3X4
C665 0.1u16X4
EC40 CD100u16SO
EMI Cap near JUSB3
JUSB1 PORT 7,8
2017.12.12
swap 1,2 to 7,8 for layout
14 MB_USB_2D+
14 MB_USB_2D-
MB_USB_2D+_R
MB_USB_2D-_R
L16 CMC-L12-9008080-HF
14 MB_USB_1D+
14 MB_USB_1D-
MB_USB_1D+_R
MB_USB_1D-_R
L17 CMC-L12-9008080-HF
5V_FUSB2_1
R868 10K1%4
PORT1,2
14 OC#0
R850 15K1%4
3VSB
EMI near pin5
C1898 0.1u16X4
D27
MB_USB_1D-_R
MB_USB_1D+_R
MB_USB_2D-_R
MB_USB_2D+_R
ESD-AOZ8906CI-HF
1,2 swap
NEAR CONNECTOR
5V_FUSB2_1
C664 1u6.3X4
JUSB1
MB_USB_1D-_R
MB_USB_1D+_R
MB_USB_2D-_R
MB_USB_2D+_R
H2X5[9]M_BLACK-RH-3
5V_FUSB2_1
C640 0.1u16X4
EC39 CD560u6.3SO
CLOSE TO CONNECTOR
LAN_USB1 PORT 1,2
2017.12.12
swap 1,2 to 7,8 for layout
14 MB_USB_8D+
14 MB_USB_8D-
MB_USB_8D+_R
MB_USB_8D-_R
L6 CMC-L12-9008080-HF
14 MB_USB_7D+
14 MB_USB_7D-
MB_USB_7D+_R
MB_USB_7D-_R
L5 CMC-L12-9008080-HF
3VSB
EMI near pin5
C1899 0.1u16X4
D6
MB_USB_7D-_R
MB_USB_7D+_R
MB_USB_8D-_R
MB_USB_8D+_R
ESD-AOZ8906CI-HF
5V_RUSB2_2
R282 10K1%4
PORT7,8
14 OC#3
R281 15K1%4
C235 1u6.3X4
LAN_USB1A
5V_RUSB2_2
MB_USB_8D-_R
MB_USB_8D+_R
UP
MB_USB_7D-_R
MB_USB_7D+_R
DOWN
RJ45_USBX2_LEDX2_TX-GIGA-RH-5
5V_RUSB2_2
C226 0.1u16X4
EC19 CD560u6.3SO
CLOSE TO CONNECTOR
REAR PS2_USB1 PORT 3,4
SWAP
14 MB_USB_3D-
14 MB_USB_3D+
MB_USB_3D-_R
MB_USB_3D+_R
L3 CMC-L12-9008080-HF
SWAP
14 MB_USB_4D-
14 MB_USB_4D+
MB_USB_4D-_R
MB_USB_4D+_R
L4 CMC-L12-9008080-HF
5V_RUSB2_1
R83 10K1%4
PS2_USB1 PORT3,4
14 OC#1
R98 15K1%4
3VSB
EMI near pin5
C1900 0.1u16X4
D4
MB_USB_3D-_R
MB_USB_3D+_R
MB_USB_4D-_R
MB_USB_4D+_R
ESD-AOZ8906CI-HF
NEAR CONNECTOR
5V_RUSB2_1
EC3 CD560u6.3SO
PS2_USB1B
5V_RUSB2_1
MB_USB_3D-_R
MB_USB_3D+_R
VCC-1 USB2- USB2+ GND-1
5V_RUSB2_1
MB_USB_4D-_R
MB_USB_4D+_R
VCC-2 USB1- USB1+ GND-2
MINIDIN_USBX2-RH-8
5V_RUSB2_1
C47 1u6.3X4
C54 0.1u16X4
CLOSE TO CONNECTOR
MSI
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size Custom
Document Description
Front USB/ PS2_USB1
Rev 1.1
Date: Monday, February 12, 2018
Sheet 34 of 63

Rear TYPE-A USB3.1 Re-Timer

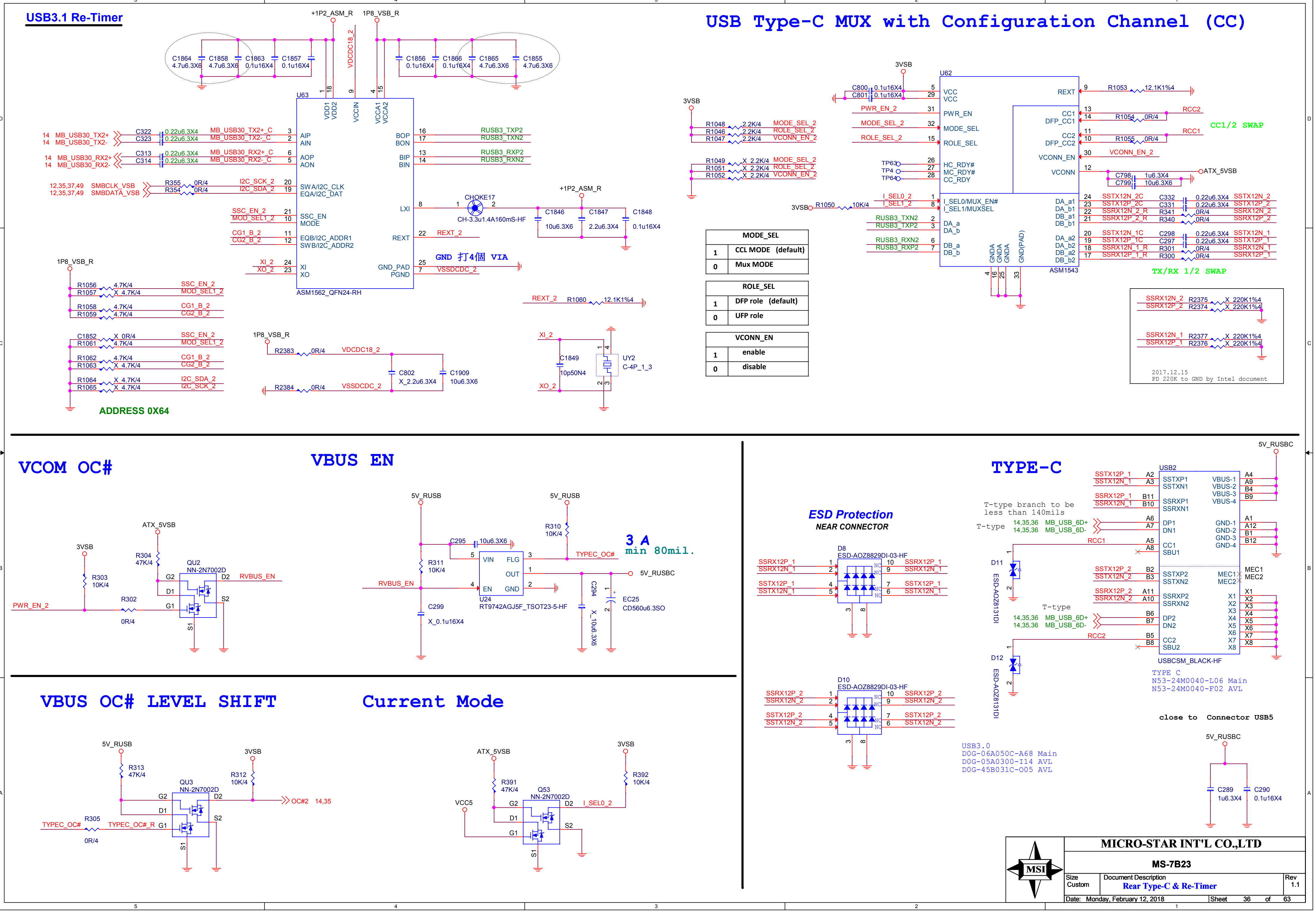


MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	Type-A & Re_driver	1.1

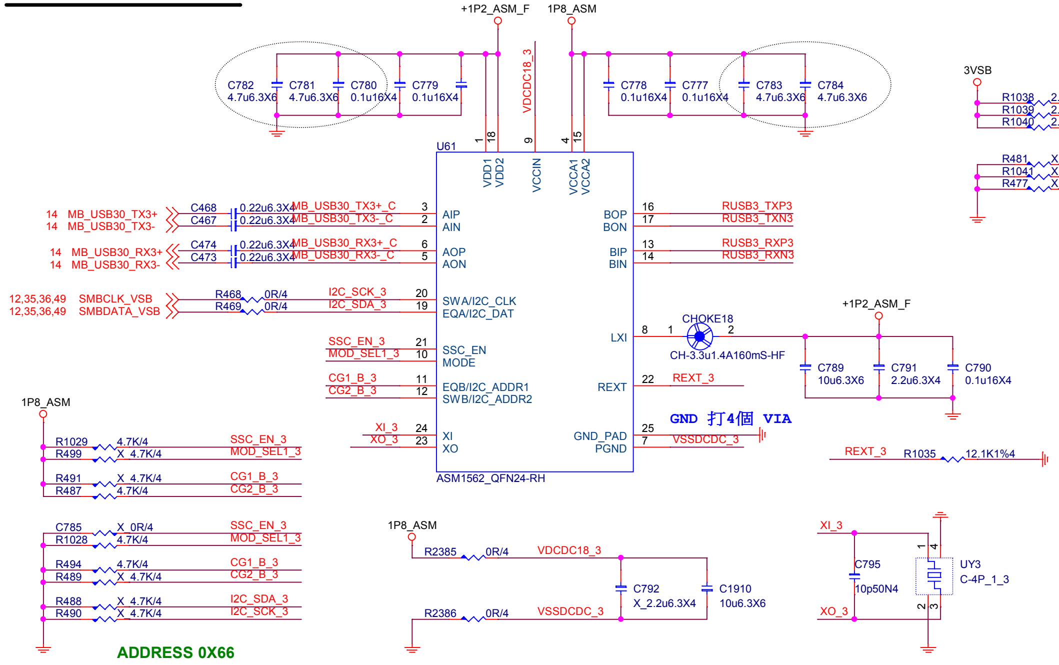
Date: Monday, February 12, 2018 Sheet 35 of 63

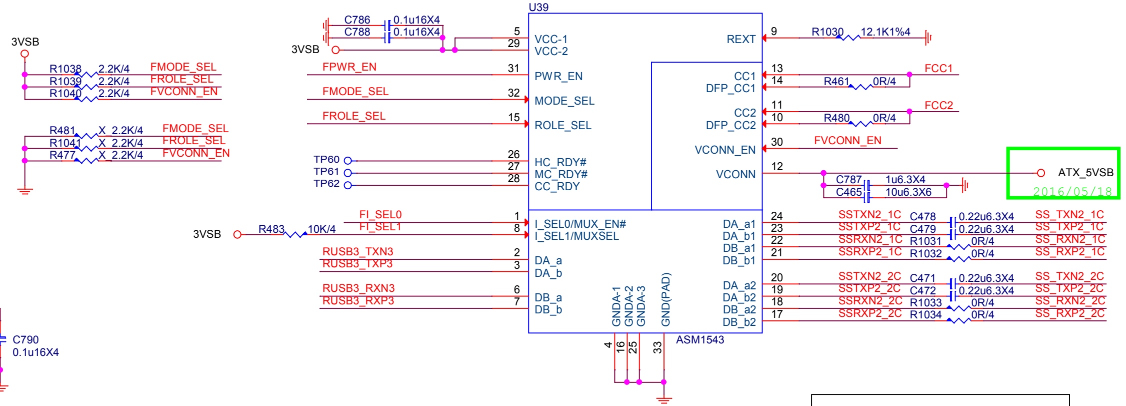

USB3.1 Re-Timer
USB Type-C MUX with Configuration Channel (CC)
U63
ASM1562_QFN24-RH
U62
ASM1543
CC1/2 SWAP
TX/RX 1/2 SWAP
MODE_SEL
1 CCL MODE (default)
0 Mux MODE
ROLE_SEL
1 DFP role (default)
0 UFP role
VCONN_EN
1 enable
0 disable
2017.12.15
PD 220K to GND by Intel document
ADDRESS 0X64
GND 打4個 VIA
VCOM OC#
VBUS EN
3 A
min 80mil.
U24
RT9742AGJ5F_TSOT23-5-HF
ESD Protection
NEAR CONNECTOR
D8
ESD-AOZ8829DI-03-HF
D10
ESD-AOZ8829DI-03-HF
TYPE-C
T-type branch to be
less than 140mils
T-type
USB2
USBCSM_BLACK-HF
TYPE C
N53-24M0040-L06 Main
N53-24M0040-F02 AVL
close to Connector USB5
USB3.0
D0G-06A050C-A68 Main
D0G-05A0300-I14 AVL
D0G-45B031C-005 AVL
VBUS OC# LEVEL SHIFT
Current Mode
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size: Custom
Document Description: Rear Type-C & Re-Timer
Rev 1.1
Date: Monday, February 12, 2018
Sheet 36 of 63

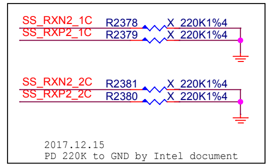
USB3.1 Gen2 Re-Timer

USB Type-C MUX with Configuration Channel (CC)

USB 3.1-Type-C



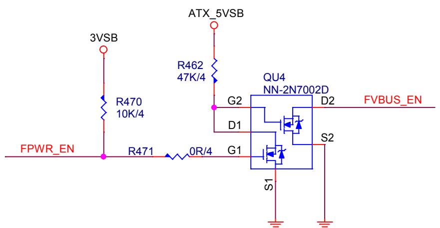




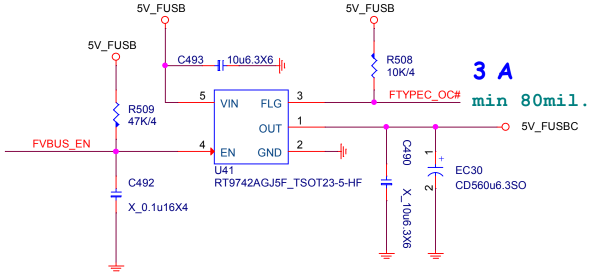
ASM1562 USB3.1 re-timer

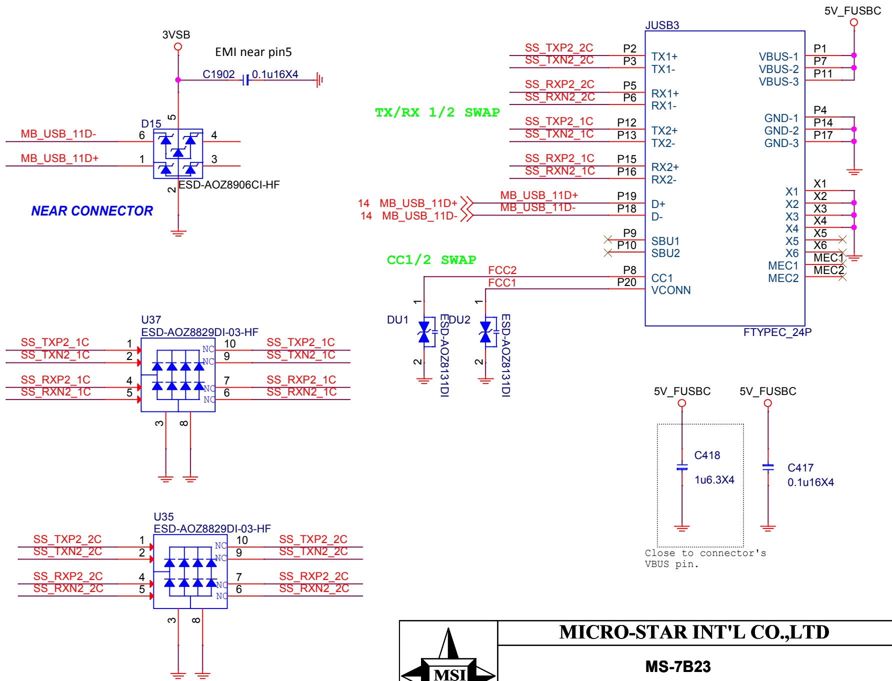
ADDRESS	0x62	0x64	0x66	0x68	0x70	0x72	0x74	0x76	0x78
PIN11 RH (KOhm)	4.7K	4.7K	N/A	4.7K	4.7K	N/A	4.7K	4.7K	N/A
PIN11 RL (KOhm)	N/A	4.7K	4.7K	N/A	4.7K	4.7K	N/A	4.7K	4.7K
PIN12 RH (KOhm)	4.7K	4.7K	4.7K	4.7K	4.7K	4.7K	N/A	N/A	N/A
PIN12 RL (KOhm)	N/A	N/A	N/A	4.7K	4.7K	4.7K	4.7K	4.7K	4.7K

VCOM OC#

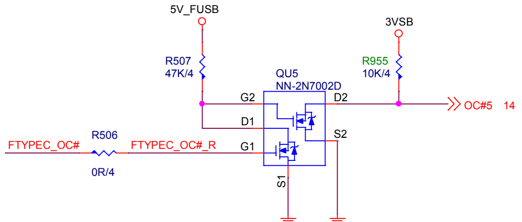


VBUS EN

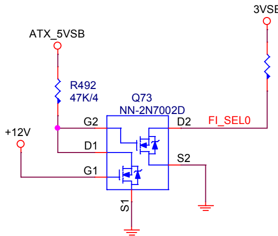




VBUS OC# LEVEL SHIFT



Current Mode



I_SEL0 : I_SEL1
X 0 Default for 900mA
0 1 1.5A @5V
1 1 3A @5V

1.5A under S3 mode
3A under S0 mode

MICRO-STAR INT'L CO.,LTD

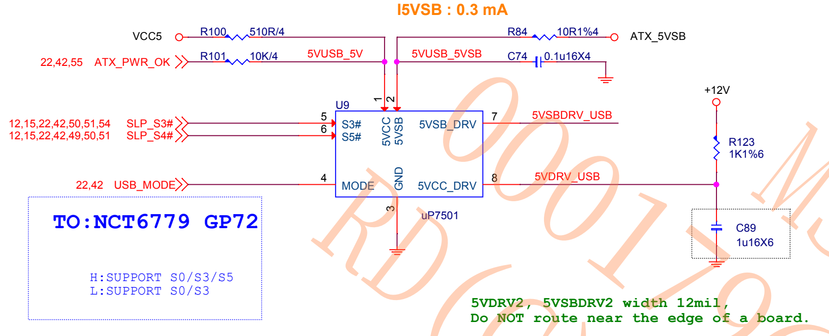
MS-7B23

Size: Custom | Document Description: Front Type-C & Re-driver | Rev 1.1

Date: Monday, February 12, 2018 | Sheet 37 of 63

USB POWER

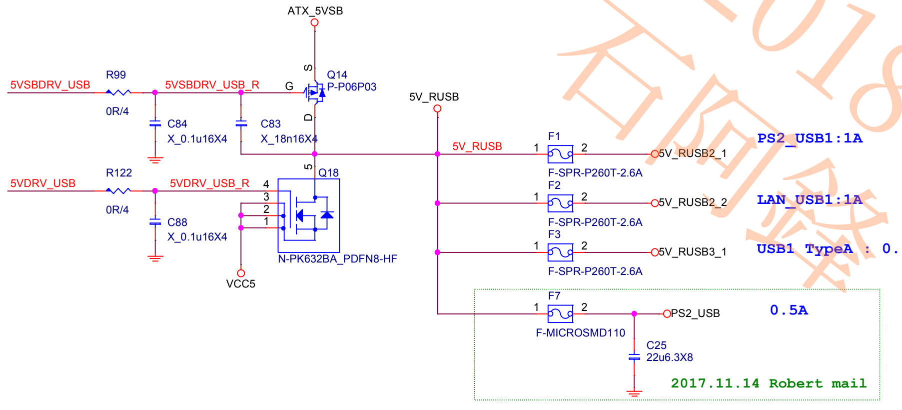
USB MODE



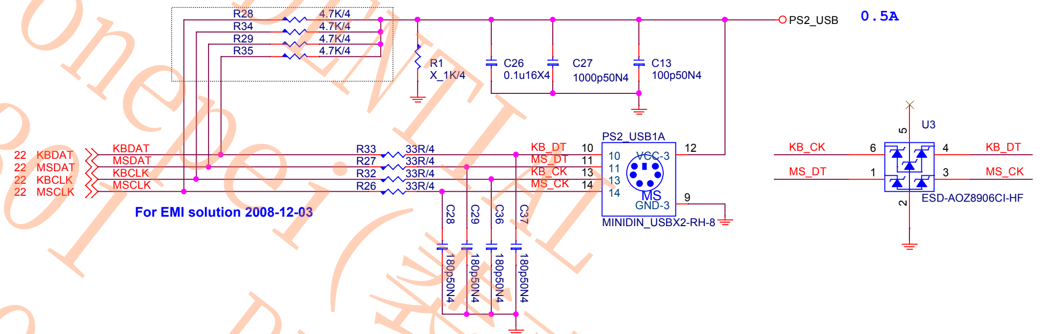
PS2 POWER

0.5A

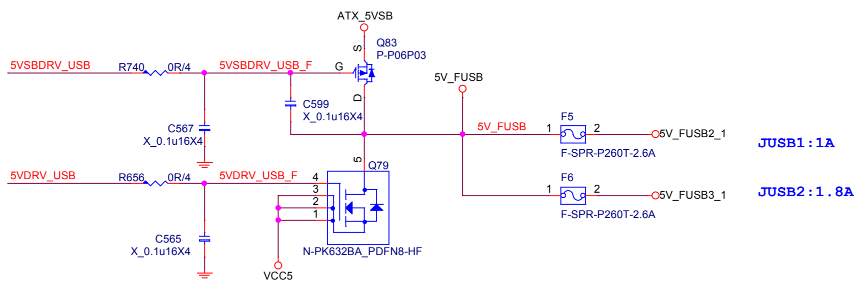
REAR USB PORT POWER



PS2 KEYBOARD & MOUSE CONNECTOR



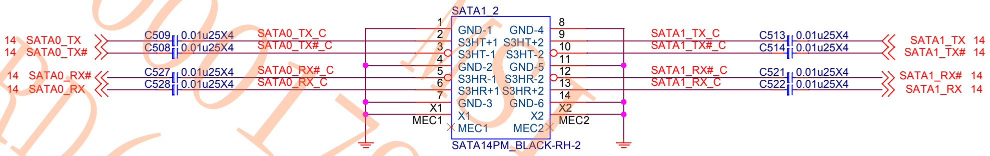
FRONT USB PORT POWER



USB CONN	USB POWER	PCH PORT	OC# SIGNAL
LAN_USB1	5V_FUSB2_1	Port5,6	OC#0
PS2_USB1	5V_RUSB2_2	Port9,10	OC#1
USB1	5V_FUSB3_1	Port1,2	OC#2
JUSB3	5V_RUSB3_1	Port3,4	OC#3
JUSB2	5V_RUSB2_1	Port7,8	OC#4

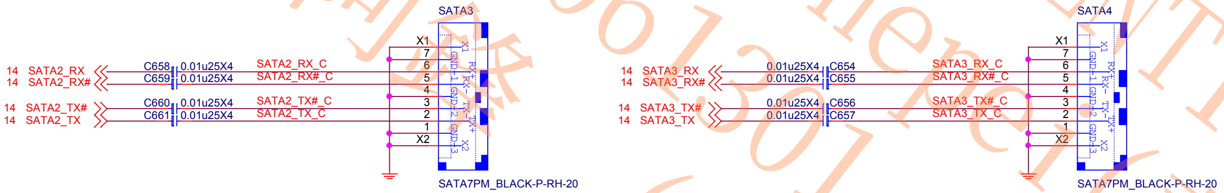
SATA PORT 0,1

Black 90 degree



SATA PORT 2,3

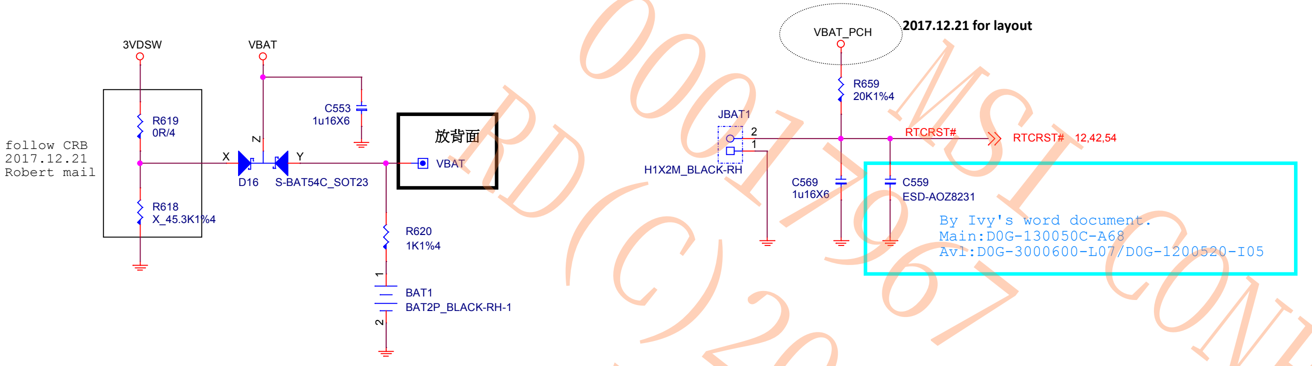
Black 180 degree

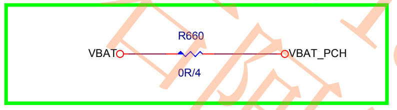


MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: SATA connector	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 39 of 63	

VBAT

Cut VBAT





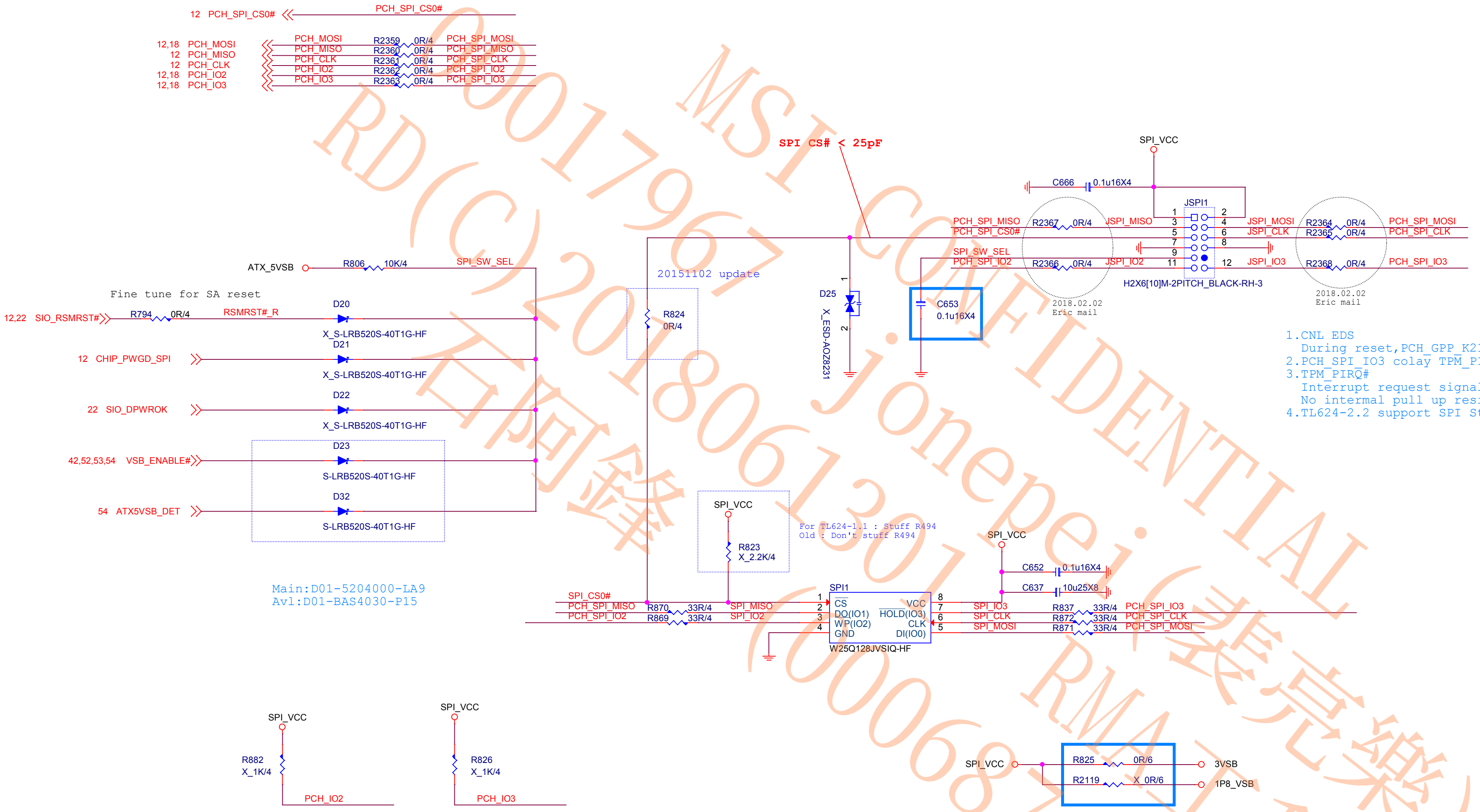
Function 1

IN		OUT	
INPUT1	INPUT2	OUTPUT1	
0	1	1	Default
1	0	0	
1	1	0	
0	0	0	

Function 2

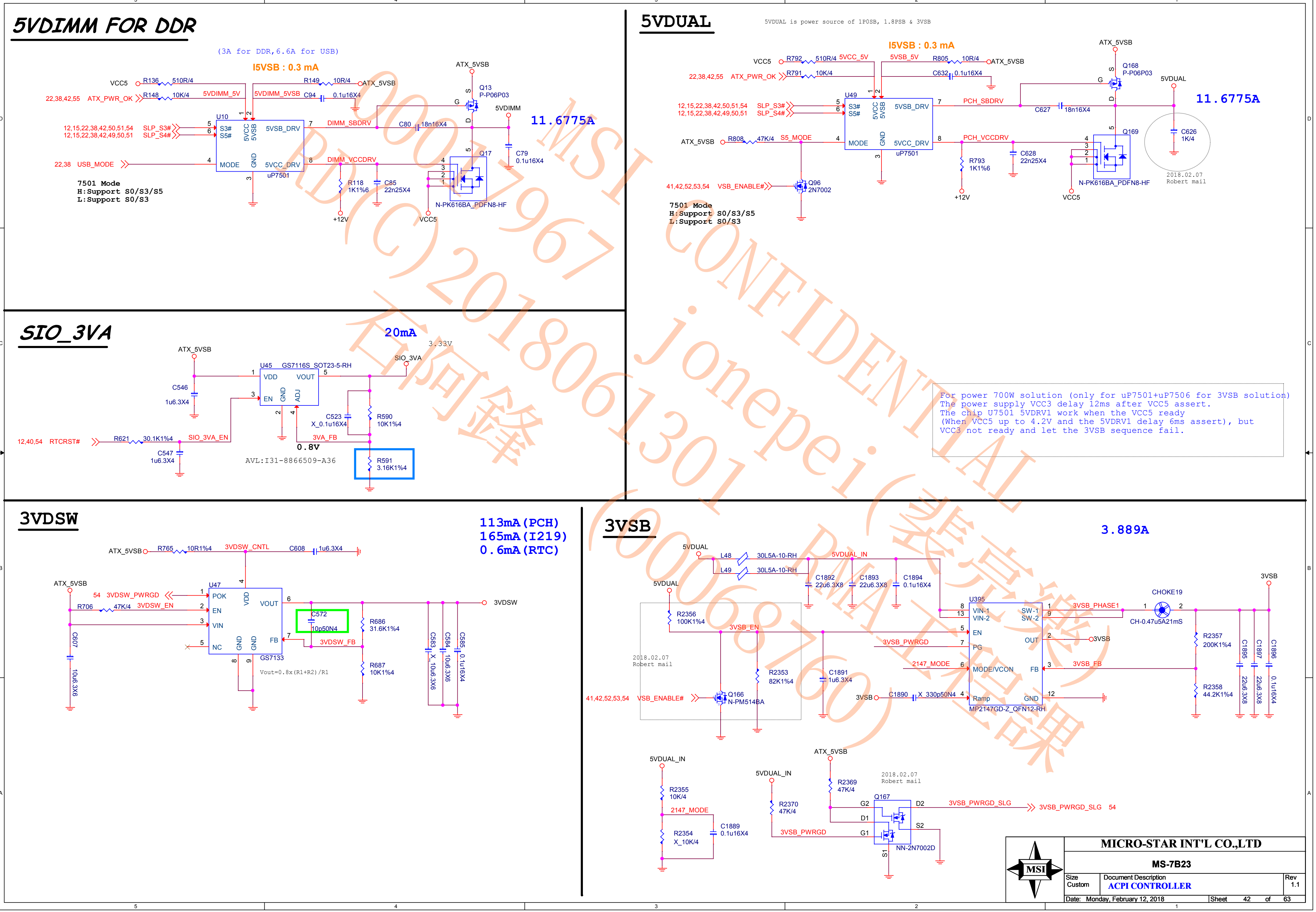
IN		OUT			
INPUT3 & lowswitch EN	INPUT4	OUTPUT2	OUTPUT3	VOUT	
0	0	0	1	1	Default
1	0	1	1	0 (discharge)	
0	1	1	0	0 (discharge)	
1	1	1	0	0 (discharge)	

MSI	MICRO-STAR INT'L CO.,LTD	
	MS-7B23	
Size: Custom	Document Description: CUT VBAT circuit	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 40 of 63	

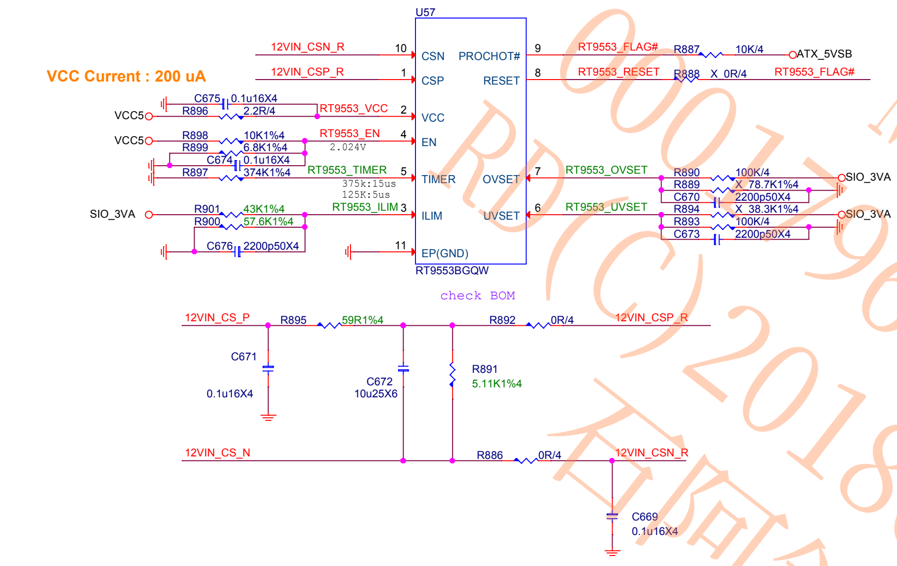


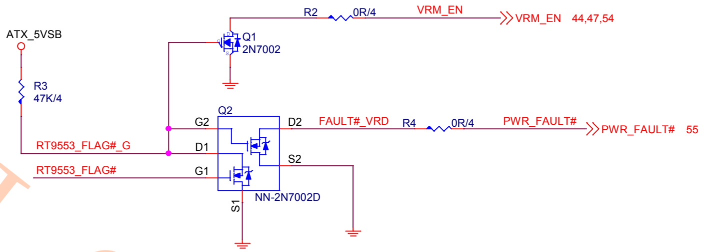
1.CNL EDS
During reset,PCH_GPP_K21 via 20k pull up to 3.3V.
2.PCH_SPI_IO3 colay TPM_PIRQ#(1.8V or 3.3V,OD)
3.TPM_PIRQ#
Interrupt request signal to the host.
No internal pull up resistor.Active low.
4.TL624-2.2 support SPI Standard Mode.

MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: BIOS ROM	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 41 of 63	


5VDIMM FOR DDR
(3A for DDR,6.6A for USB)
I5VSB : 0.3 mA
11.6775A
VCC5
R136 510R/4
R149 10R/4
ATX_5VSB
22,38,42,55 ATX_PWR_OK
R148 10K/4
5VDIMM_5V
5VDIMM_5VSB
C94 0.1u16X4
Q13 P-P06P03
5VDIMM
12,15,22,38,42,50,51,54 SLP_S3#
12,15,22,38,42,49,50,51 SLP_S4#
U10
S3#
S5#
5VCC
5VSB
5VSB_DRV
DIMM_SBDRV
C80 18n16X4
22,38 USB_MODE
MODE
GND
5VCC_DRV
uP7501
DIMM_VCCDRV
Q17
C79 0.1u16X4
R118 1K1%6
C85 22n25X4
N-PK616BA_PDFN8-HF
+12V
VCC5
7501 Mode
H:Support S0/S3/S5
L:Support S0/S3
5VDUAL
5VDUAL is power source of 1P0SB, 1.8PSB & 3VSB
I5VSB : 0.3 mA
11.6775A
VCC5
R792 510R/4 5VCC_5V
5VSB_5V
R805 10R/4
ATX_5VSB
22,38,42,55 ATX_PWR_OK
R791 10K/4
C632 0.1u16X4
Q168 P-P06P03
5VDUAL
U49
12,15,22,38,42,50,51,54 SLP_S3#
12,15,22,38,42,49,50,51 SLP_S4#
PCH_SBDRV
C627 18n16X4
ATX_5VSB
R808 47K/4 S5_MODE
PCH_VCCDRV
Q169
C626 1K/4
R793 1K1%6
C628 22n25X4
41,42,52,53,54 VSB_ENABLE#
Q96 2N7002
+12V
VCC5
N-PK616BA_PDFN8-HF
2018.02.07 Robert mail
7501 Mode
H:Support S0/S3/S5
L:Support S0/S3
SIO_3VA
20mA
3.33V
ATX_5VSB
U45 GS7116S_SOT23-5-RH
VDD
VOUT
EN
GND
ADJ
SIO_3VA
C546 1u6.3X4
C523 X_0.1u16X4
R590 10K1%4
3VA_FB
0.8V
12,40,54 RTCRST#
R621 30.1K1%4
SIO_3VA_EN
C547 1u6.3X4
AVL:I31-8866509-A36
R591 3.16K1%4
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.
3VDSW
113mA(PCH)
165mA(I219)
0.6mA(RTC)
ATX_5VSB
R765 10R1%4
3VDSW_CNTL
C608 1u6.3X4
ATX_5VSB
54 3VDSW_PWRGD
U47
POK
VDD
VOUT
R706 47K/4 3VDSW_EN
EN
VIN
NC
GND
FB
C572 10p50N4
3VDSW_FB
R686 31.6K1%4
R687 10K1%4
GS7133
Vout=0.8x(R1+R2)/R1
C607 10u6.3X6
C583 X_10u6.3X6
C584 10u6.3X6
C585 0.1u16X4
3VDSW
3VSB
3.889A
5VDUAL
L48 30L5A-10-RH
L49 30L5A-10-RH
5VDUAL_IN
C1892 22u6.3X8
C1893 22u6.3X8
C1894 0.1u16X4
3VSB
CHOKE19
CH-0.47u5A21mS
3VSB_PHASE1
5VDUAL
U395
VIN-1
VIN-2
SW-1
SW-2
R2356 100K1%4
3VSB_EN
EN
3VSB_PWRGD
PG
OUT
3VSB
2147_MODE
MODE/VCON
FB
3VSB_FB
R2357 200K1%4
R2358 44.2K1%4
C1895 22u6.3X8
C1897 22u6.3X8
C1896 0.1u16X4
2018.02.07 Robert mail
R2353 82K1%4
C1891 1u6.3X4
41,42,52,53,54 VSB_ENABLE#
Q166 N-PM514BA
3VSB
C1890 X_330p50N4
Ramp
GND
MP2147GD-Z_QFN12-RH
5VDUAL_IN
R2355 10K/4
2147_MODE
R2354 X_10K/4
C1889 0.1u16X4
5VDUAL_IN
R2370 47K/4
3VSB_PWRGD
ATX_5VSB
R2369 47K/4
2018.02.07 Robert mail
Q167
3VSB_PWRGD_SLG
3VSB_PWRGD_SLG 54
NN-2N7002D
MICRO-STAR INT'L CO.,LTD
MSI
MS-7B23
Size Custom
Document Description
ACPI CONTROLLER
Rev 1.1
Date: Monday, February 12, 2018
Sheet 42 of 63

VCC Current : 200 uA

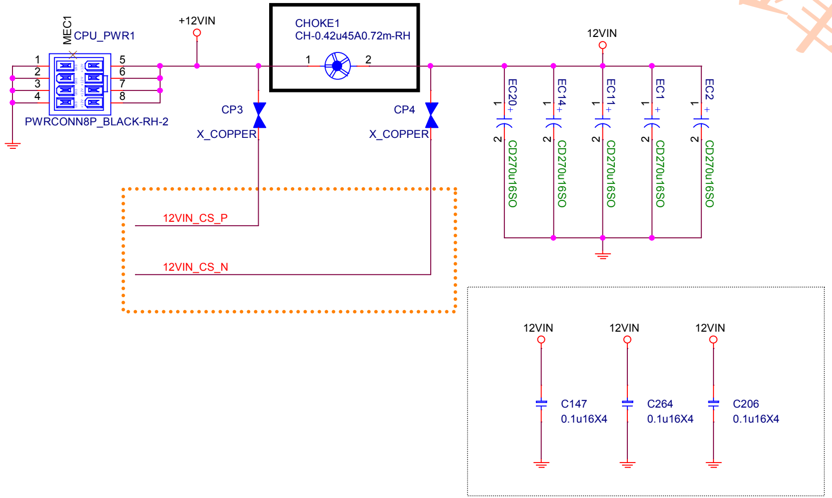




OCP:30A
Real OCP:30.05A
R17+R18>100k   Vsio_3va= 3.38V   Rdcr= 0.5 mohm

I3933_imon*[R17*R18/(R17+R18)]= Istep* Rdcr*100
I3933_imon= 10uA/step
Istep=4.968A

2017.12.01 Ivy mail
0.22uH->0.42uH



D=Vout/Vin			
Vin	=	12	> input voltage
Vout	=	1.52	> output Vcore
D	=	0.126667	
I o = Icore(max)*0.8			
I core(max)	=	138	> Vcore current
I avg.	=	110.4	A
I ripple={ Io*√D*√(1-D)} / Phase			
Phase	=	4	phase
I ripple	=	9.179738	A
How many pcs. Of Cap.			
I ripple(cap)	=	5000	m A
COE TEMP	=	1	
Input Cap.	=	2	pcs.

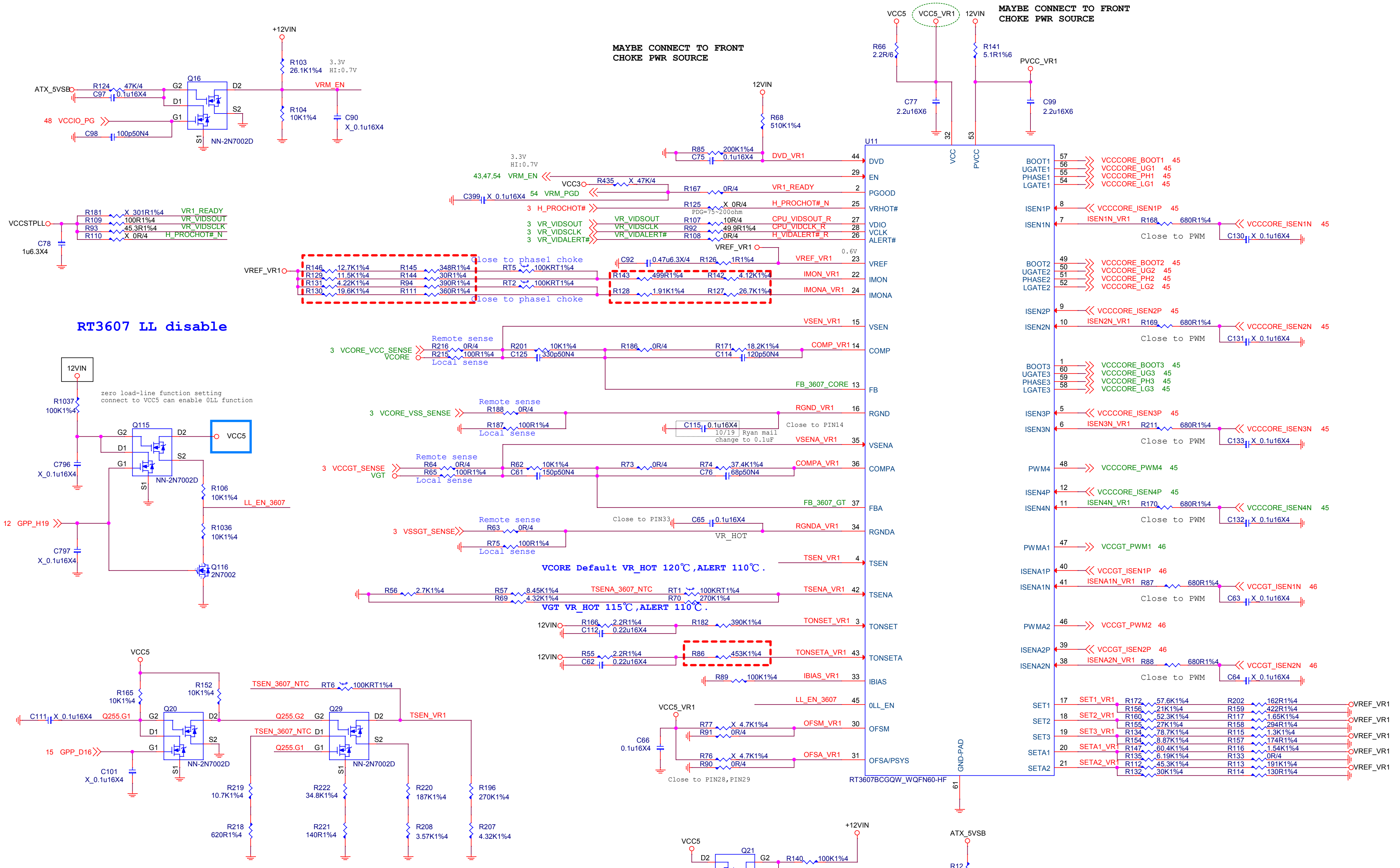
D=Vout/Vin			
Vin	=	12	> input voltage
Vout	=	1.52	> output Vcore
D	=	0.126667	
I o = Icore(max)*0.8			
I core(max)	=	45	> Vcore current
I avg.	=	36	A
I ripple={ Io*√D*√(1-D)} / Phase			
Phase	=	2	phase
I ripple	=	5.986785	A
How many pcs. Of Cap.			
I ripple(cap)	=	5000	m A
COE TEMP	=	1	
Input Cap.	=	2	pcs.

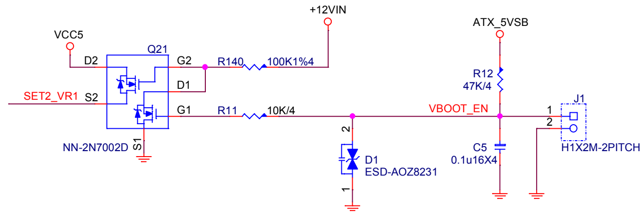
D=Vout/Vin			
Vin	=	12	> input voltage
Vout	=	0.95	> output Vcore
D	=	0.079167	
I o = Icore(max)*0.8			
I core(max)	=	6.4	> Vcore current
I avg.	=	5.12	A
I ripple={ Io*√D*√(1-D)} / Phase			
Phase	=	1	phase
I ripple	=	1.382393	A
How many pcs. Of Cap.			
I ripple(cap)	=	5000	m A
COE TEMP	=	1	
Input Cap.	=	1	pcs.

VCCIO:
D = Vout/Vin
= 0.95/12
= 0.079167
N = 1
Irms = Iout * [D/N - (D)^2]^(1/2)
= 6.4* (0.079167 - 0.006267)^(1/2)
= 1.728A

CORE:
D = Vout/Vin
= 1.52/12
= 0.126667
N = 4
Irms = Iout * [D/N - (D)^2]^(1/2)
= 138* (0.031667 - 0.016044)^(1/2)
= 17.2489A

GT:
D = Vout/Vin
= 1.52/12
= 0.126667
N = 2
Irms = Iout * [D/N - (D)^2]^(1/2)
= 45* (0.063333 - 0.016044)^(1/2)
= 9.7857A





VCORE Thermal Protection Table

GPP_D16	R1	R2	Thermal Alert#	VR_HOT#	Thermal Alert#/VR_HOT#
GPI(1) Default	190.57K	11.32K	97℃	115℃	84.35%
GPI(0)	274.32K	34.94K	106℃	115℃	92.17%

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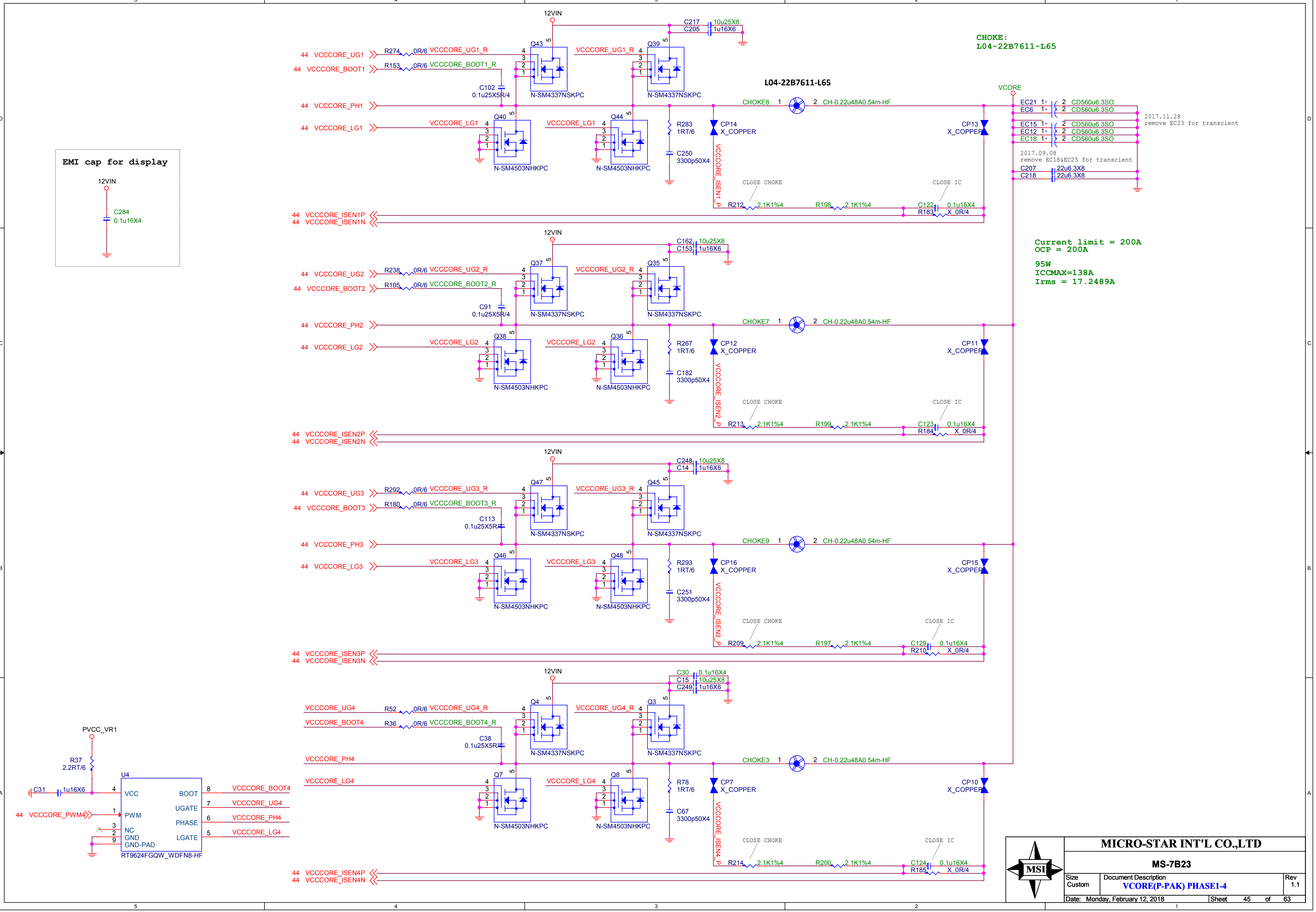
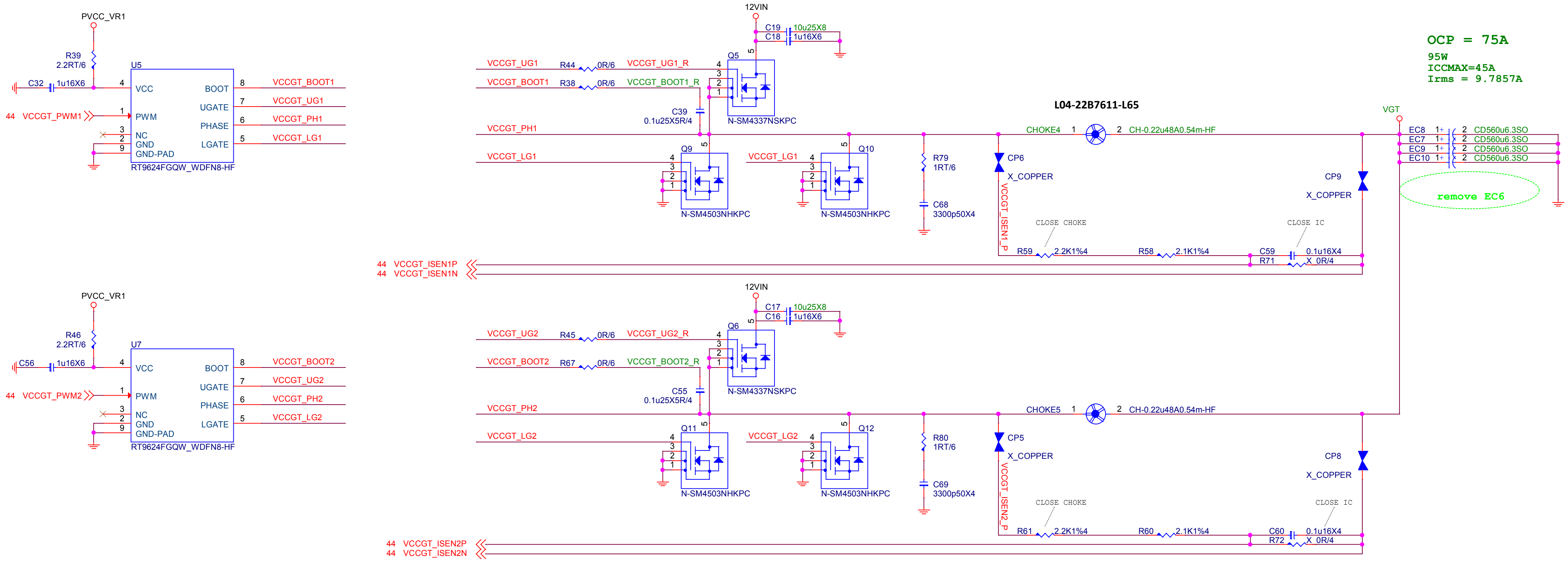
MS-7B23

Size	Document Description	Rev
Custom	PWM-RT3607BC	1.1

Date: Monday, February 12, 2018 Sheet 44 of 63


CHOKE:
L04-22B7611-L65
L04-22B7611-L65
EMI cap for display
12VIN
C284
0.1u16X4
Current limit = 200A
OCP = 200A
95W
ICCMAX=138A
Irms = 17.2489A
2017.11.28
remove EC23 for transcient
2017.09.08
remove EC18&EC25 for transcient
VCORE
CLOSE CHOKE
CLOSE IC
44 VCCCORE_UG1
44 VCCCORE_BOOT1
44 VCCCORE_PH1
44 VCCCORE_LG1
44 VCCCORE_ISEN1P
44 VCCCORE_ISEN1N
44 VCCCORE_UG2
44 VCCCORE_BOOT2
44 VCCCORE_PH2
44 VCCCORE_LG2
44 VCCCORE_ISEN2P
44 VCCCORE_ISEN2N
44 VCCCORE_UG3
44 VCCCORE_BOOT3
44 VCCCORE_PH3
44 VCCCORE_LG3
44 VCCCORE_ISEN3P
44 VCCCORE_ISEN3N
44 VCCCORE_ISEN4P
44 VCCCORE_ISEN4N
44 VCCCORE_PWM4
PVCC_VR1
R37
2.2RT/6
C31
1u16X6
U4
VCC
PWM
NC
GND
GND-PAD
BOOT
UGATE
PHASE
LGATE
RT9624FGQW_WDFN8-HF
VCCCORE_BOOT4
VCCCORE_UG4
VCCCORE_PH4
VCCCORE_LG4
N-SM4337NSKPC
N-SM4503NHKPC
CH-0.22u48A0.54m-HF
X_COPPER
CD560u6.3SO
22u6.3X8
MICRO-STAR INT'L CO.,LTD
MS-7B23
Size
Custom
Document Description
VCORE(P-PAK) PHASE1-4
Rev
1.1
Date: Monday, February 12, 2018
Sheet 45 of 63



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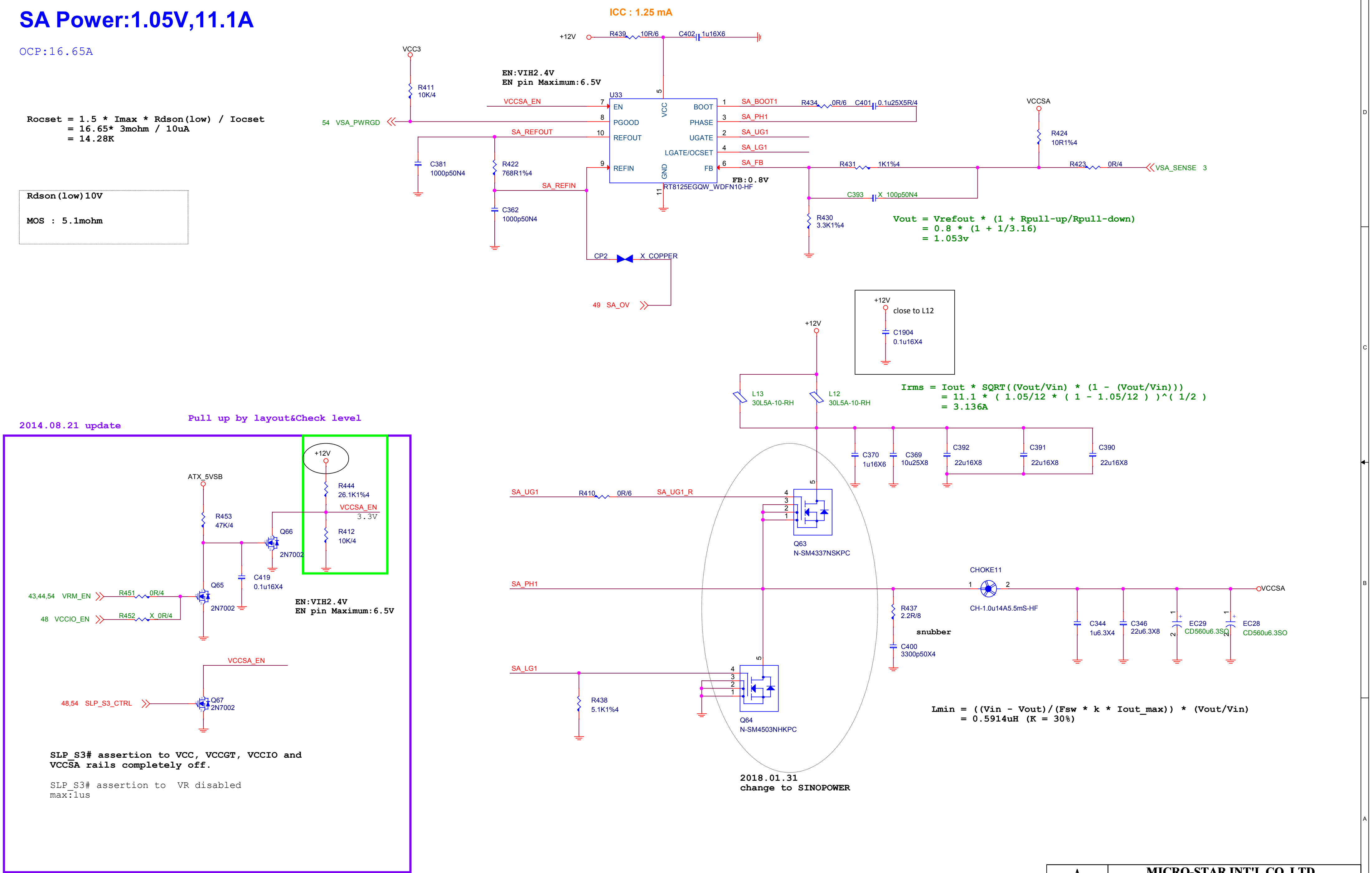
MS-7B23

Size	Document Description	Rev
Custom	VGT(P-PAK) PHASE1-2	1.1

Date: Monday, February 12, 2018 Sheet 46 of 63

SA Power:1.05V,11.1A

OCP:16.65A

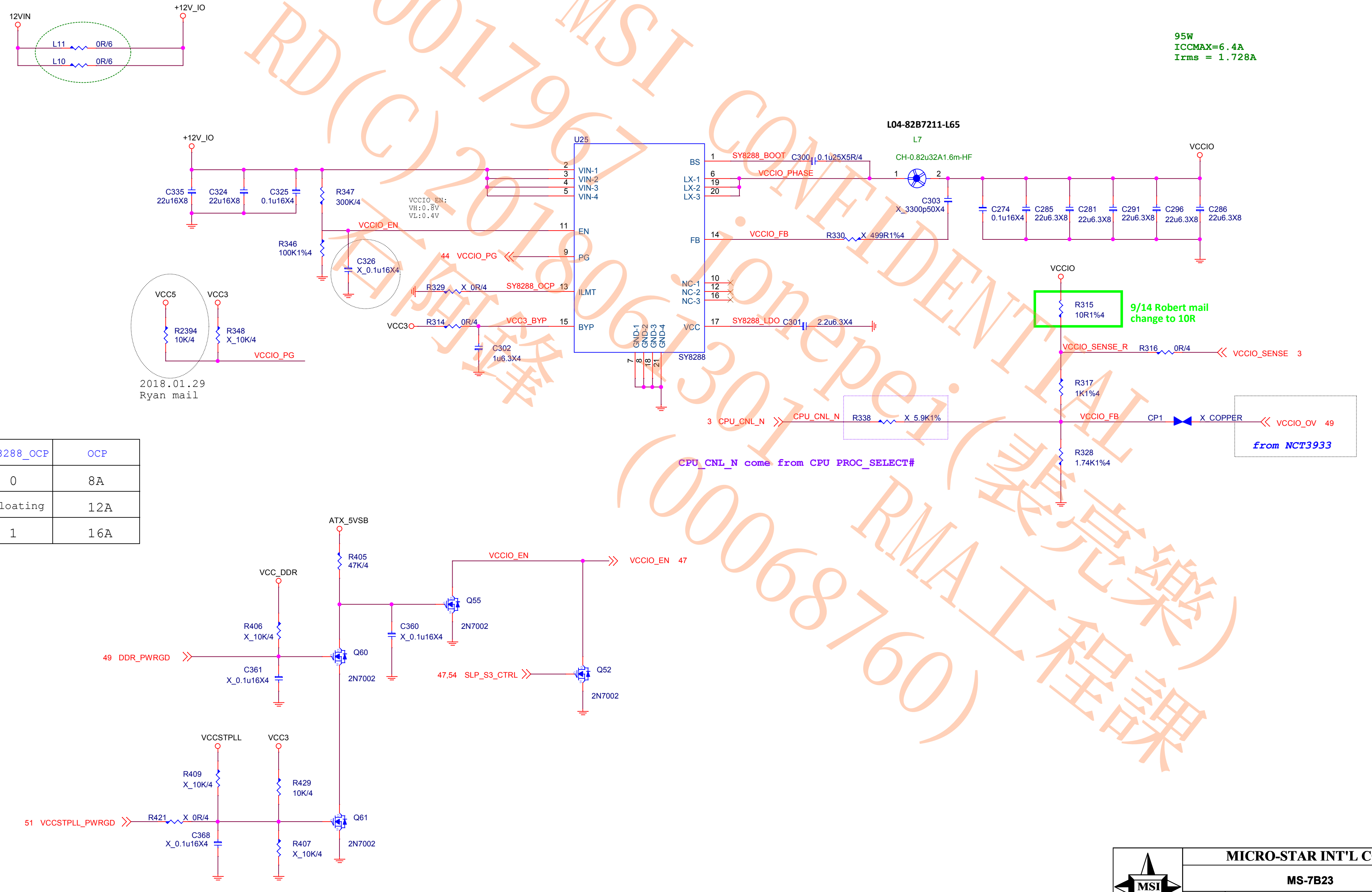


MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: VCCSA - POWER RT8125E	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 47 of 63	

IO Power:0.95V,6.4A

IMAX 10A
ILIMIT=10A~12A
*IOC=ILIMIT+40%*IMAX/2=12A~14A.*

95W
ICCMAX=6.4A
Irms = 1.728A



SY8288_OCP	OCP
0	8A
floating	12A
1	16A

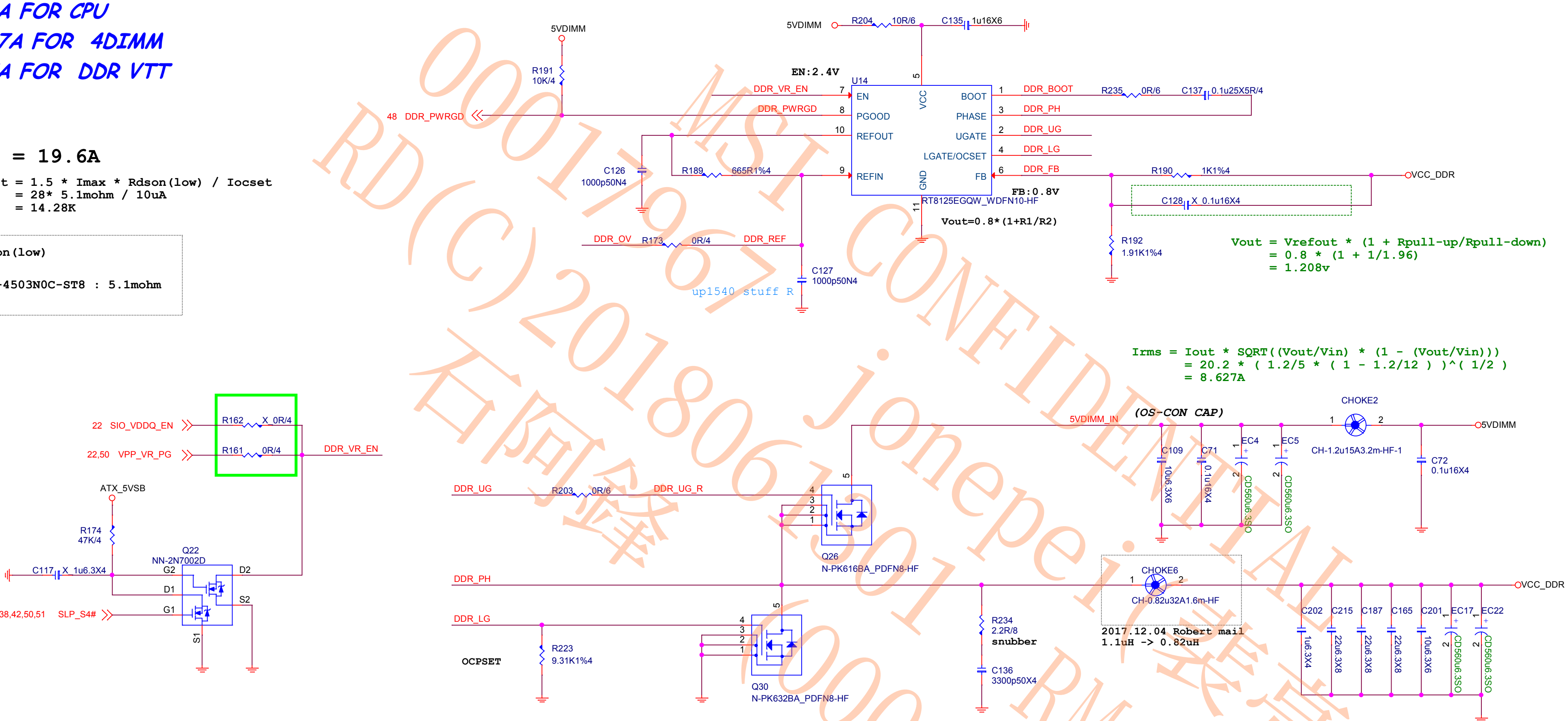
DDR4 Power:1.2V,19.8A *OCP:28A*

3.3A FOR CPU
15.7A FOR 4DIMM
0.7A FOR DDR VTT

OCP = 19.6A

Rocset = 1.5 * Imax * Rdson(low) / Iocset
= 28* 5.1mohm / 10uA
= 14.28K

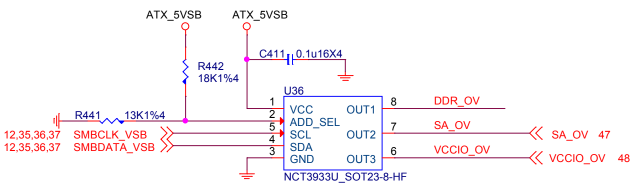
Rdson(low)
D03-4503N0C-ST8 : 5.1mohm



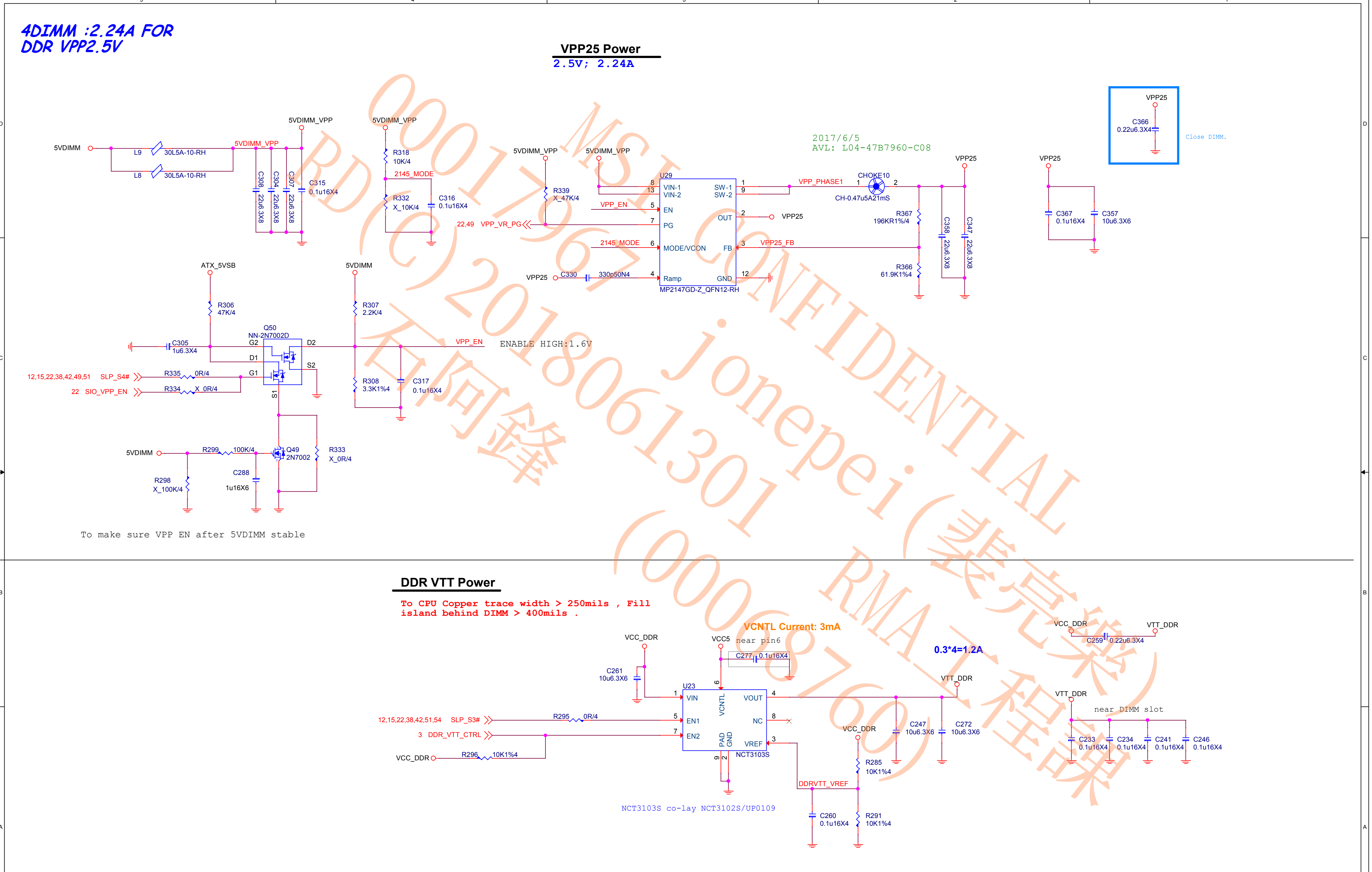
Datasheet公式計算
Lmin = ((Vin - 1.2V)/(Fsw * k * Iout_max)) * (Vout/Vin)
= 0.7677uH (K = 30%)
若帶入CAP ESR計算,0.2432uH<L<1.2897uH

UPI VOLTAGE CONSOLE

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



MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: DDR - RT8125E	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 49 of 63	



MICRO-STAR INT'L CO.,LTD

MS-7B23

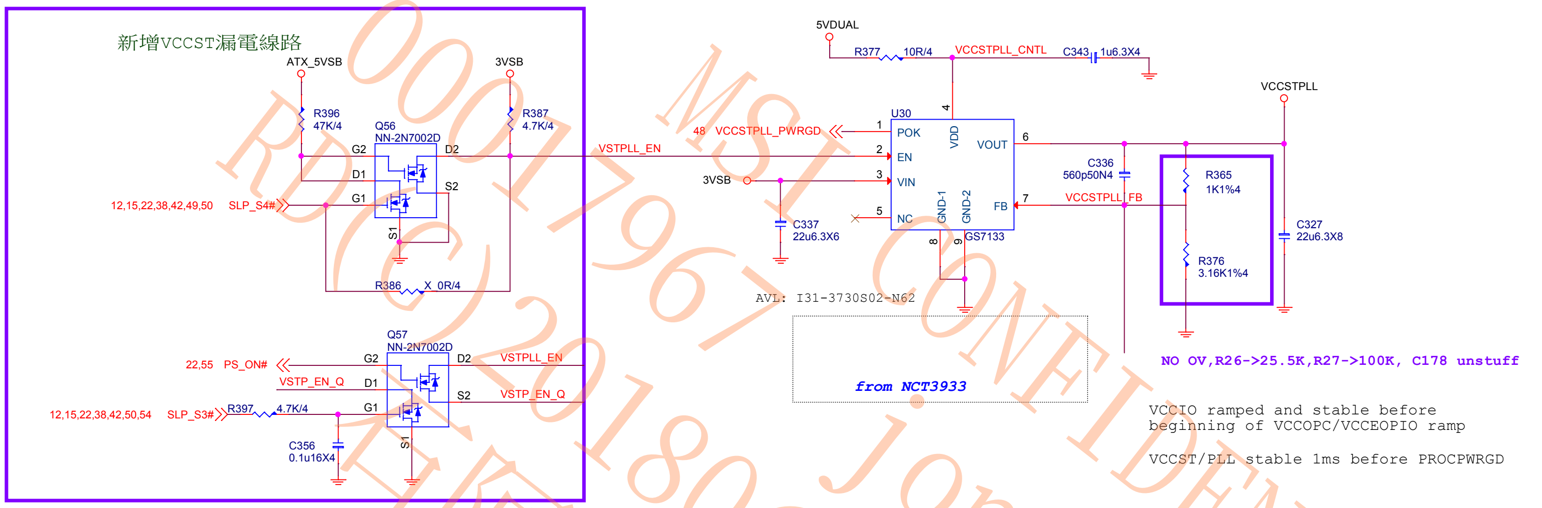
Size	Document Description	Rev
Custom	VPP-2147 / VTT-3103	1.1

Date: Monday, February 12, 2018 Sheet 50 of 63

VCCSTPLL

1.05V; 230mA

For Cost down VCCST&VCCPLL merge



VCCPLL_OC

1.2V; 130mA

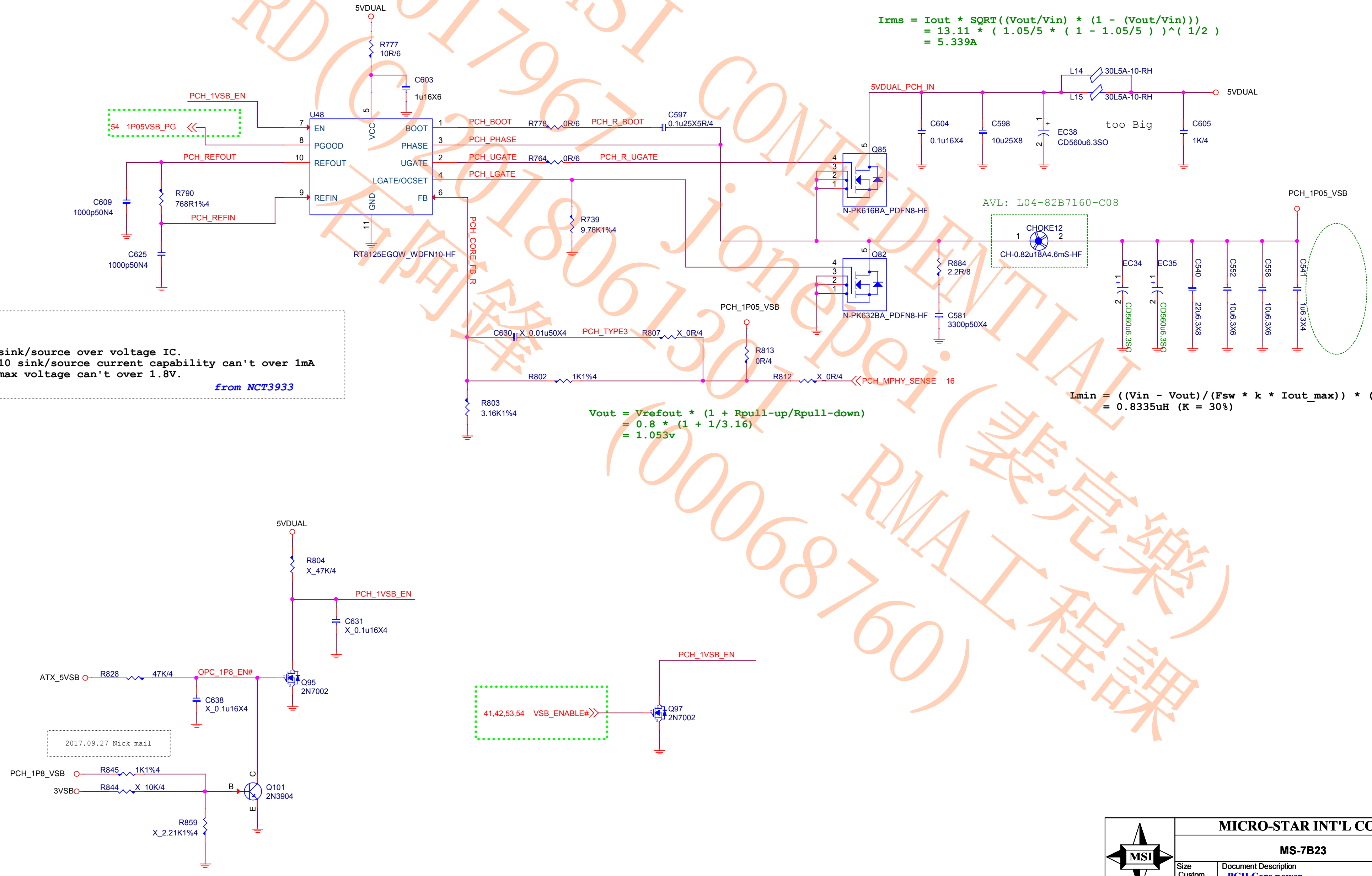
MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: CPU PWR_ST/PLL_OC	Rev: 1.1
Date: Monday, February 12, 2018	Sheet 51 of 63	

PCH_1VSB

1.05V; 13.1A

OCP=Rocset x Iocset / Rlgds(on)
=9.76K x 10u / 3.3m
= 21.21A

Irms = Iout * SQRT((Vout/Vin) * (1 - (Vout/Vin)))
= 13.11 * (1.05/5 * (1 - 1.05/5))^(1/2)
= 5.339A



Lmin = ((Vin - Vout)/(Fsw * k * Iout_max)) * (Vout/Vin)
= 0.8335uH (K = 30%)

Vout = Vrefout * (1 + Rpull-up/Rpull-down)
= 0.8 * (1 + 1/3.16)
= 1.053v

to sink/source over voltage IC.
pin10 sink/source current capability can't over 1mA
So max voltage can't over 1.8V.
from NCT3933

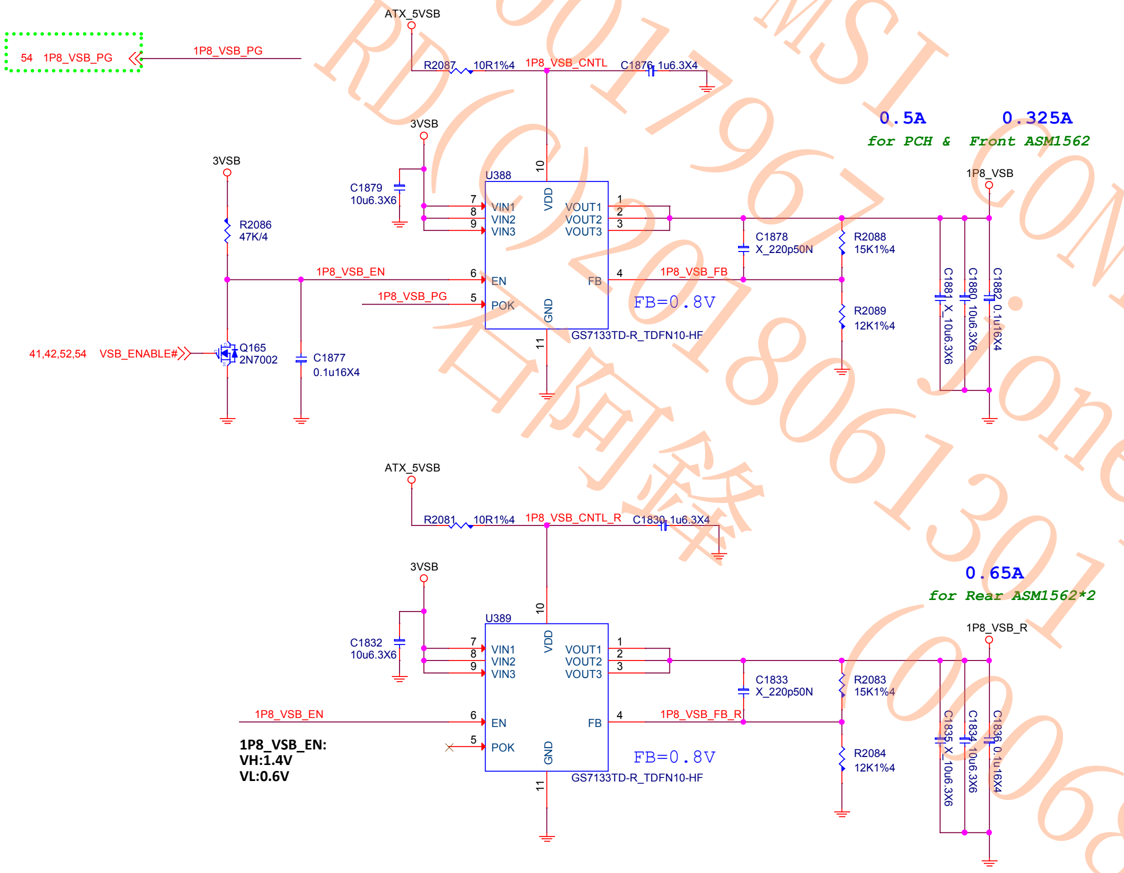
MICRO-STAR INT'L CO.,LTD		
MS-7B23		
Size: Custom	Document Description: PCH Core power	Rev 1.1
Date: Monday, February 12, 2018		Sheet 52 of 63

1P8_VSB

1.8V; 500mA

Current Limit: 3.8A

2017.12.07
GS7133 down size to I31-S71330C-N03.



The power consumption with Internal LDO

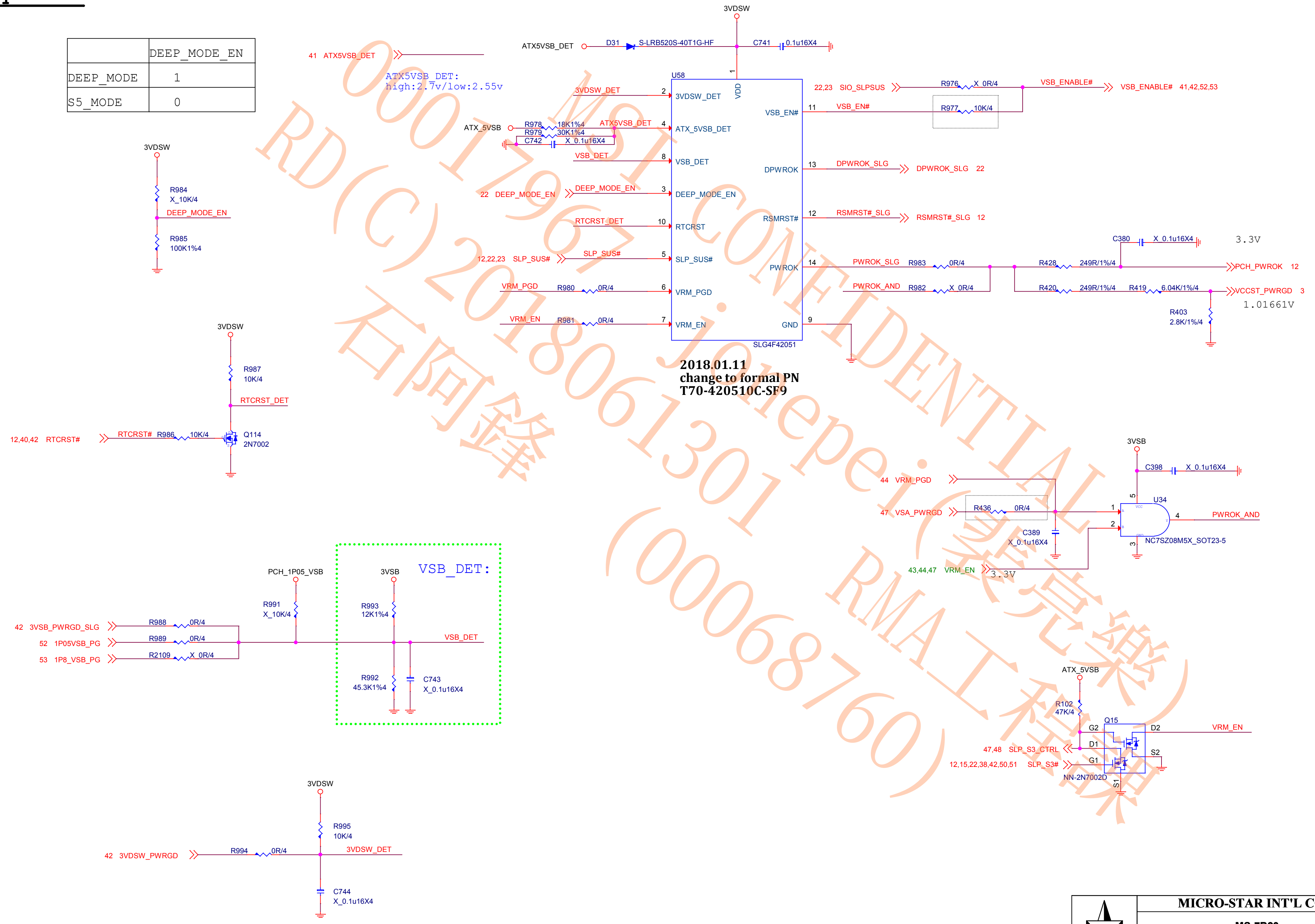
item	Power state	VCCA 1.8V (mA)	Total power (mW)
Without device plug in.	Power on	25.82	46.47
USB3.1 Gen2 device is plugged in	Burning state	324.60	584.29
USB3.1 Gen2 device is plugged in	In idle	50.58	91.05
USB3.1 Gen2 device is plugged in	S3(D3) state	50.59	91.06

The power consumption with External LDO

item	Power state	VCCA 1.8V (mA)	VDD 1.2V (mA)	Total power (mW)
Without device plug in.	Power on	10.46	17.47	39.79
USB3.1 Gen2 device is plugged in	Burning state	95.34	226.37	443.25
USB3.1 Gen2 device is plugged in	In idle	17.18	52.10	93.44
USB3.1 Gen2 device is plugged in	S3(D3) state	17.17	52.10	93.42

Sequence

	DEEP_MODE_EN
DEEP_MODE	1
S5_MODE	0

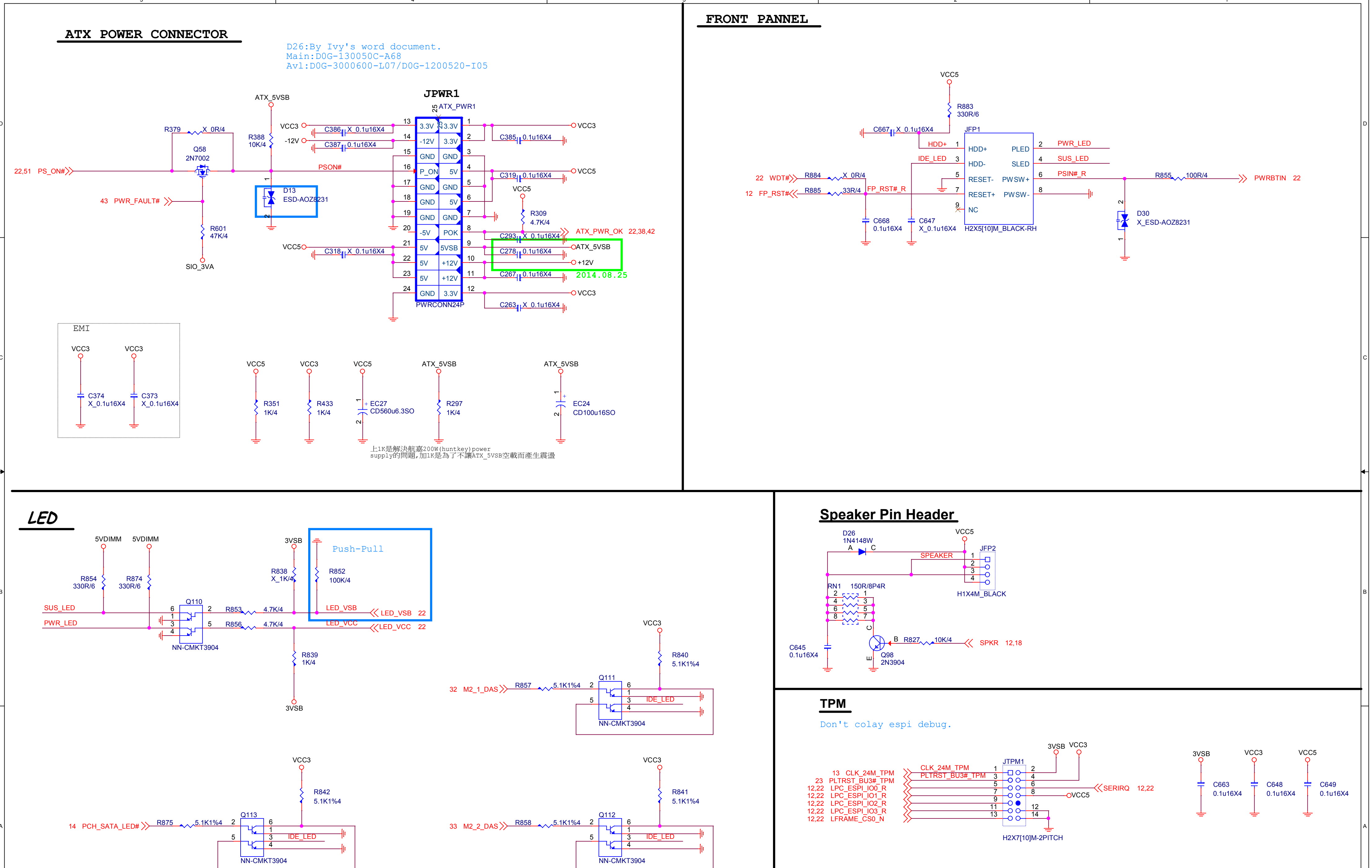


MICRO-STAR INT'L CO.,LTD

MS-7B23

Size	Document Description	Rev
Custom	CPU PWR-VRM-Seqence	1.1

Date: Monday, February 12, 2018 Sheet 54 of 63



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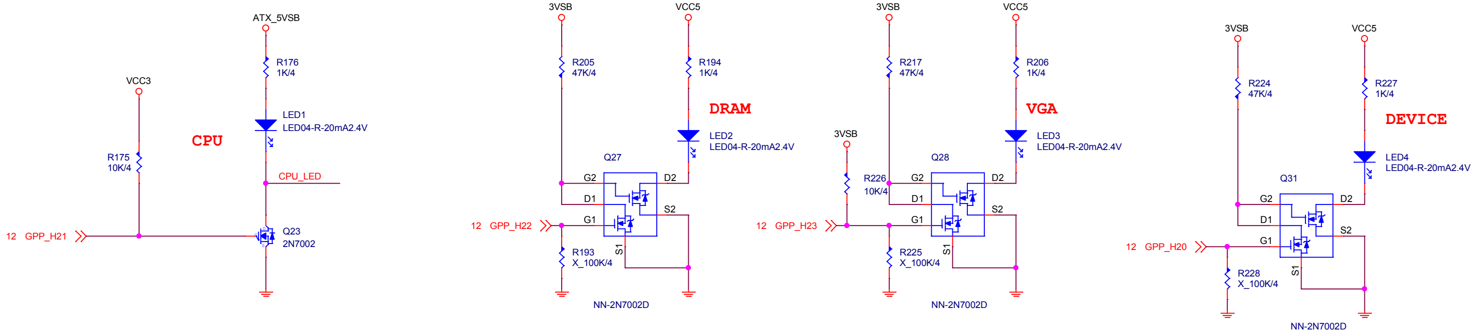
MS-7B23

Size	Document Description	Rev
Custom	ATX F_Panel/TPM/MSI_LED	1.1

Date: Monday, February 12, 2018 Sheet 55 of 63

DEBUG LED



RED
PN:D0C-040P100-H91
AVL:D0C-040S500-E07

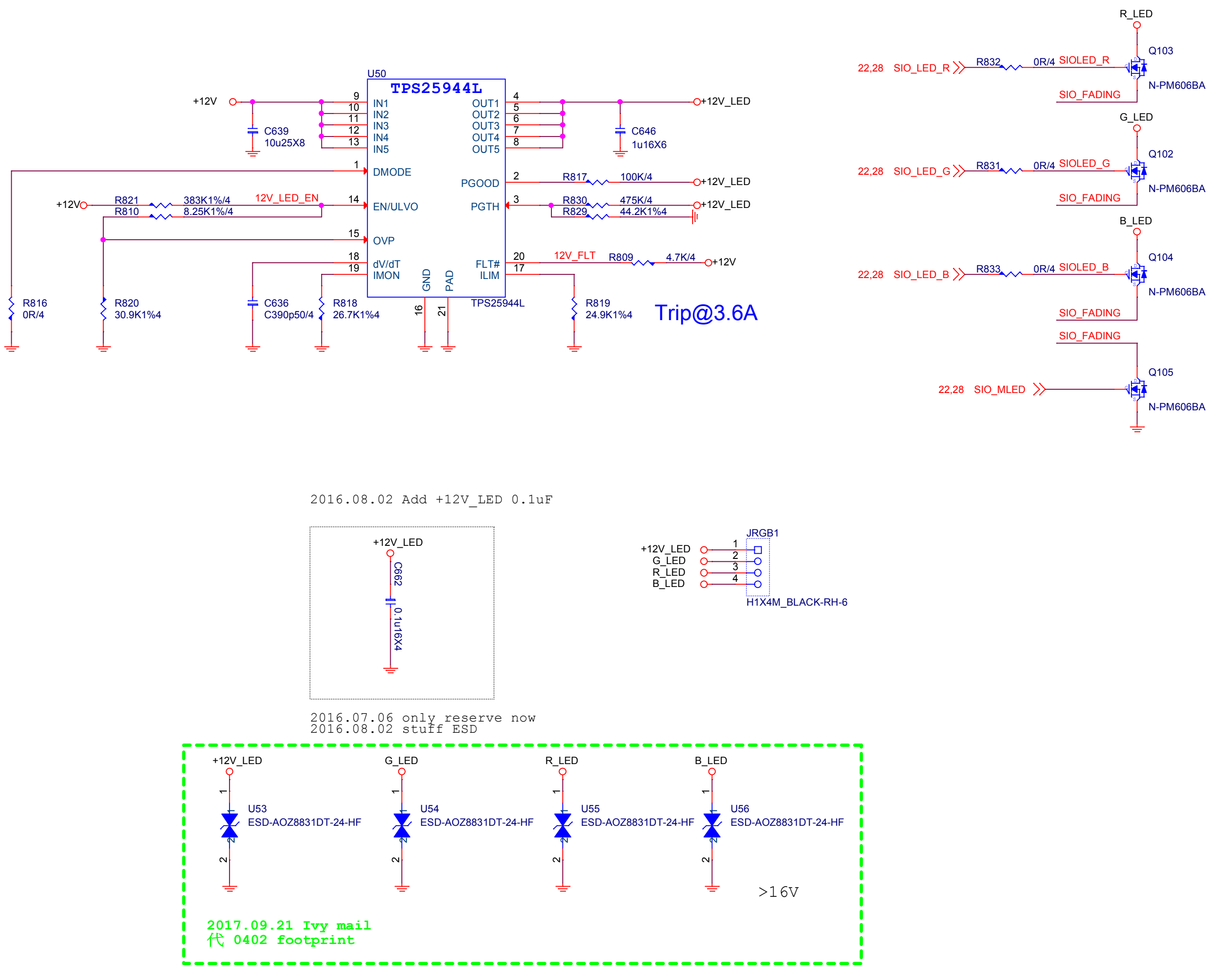
2018.01.12
PCB2.1 default white LED

WHITE
PN:D0C-040T200-H91
AVL:D0C-040S200-E07

GPIO / LED	PCH_GP20	PCH_GP21	PCH_GP22	PCH_GP23
亮	NATIVE PULL HIGH	GPO PULL HIGH	GPO PULL HIGH	NATIVE PULL HIGH
滅	NATIVE LOW	GPO LOW (default LOW)	GPO LOW (default LOW)	GPO LOW (default LOW)

關機斷電狀態下，3個LED先維持default全暗，開機通電後：
1. 首先進行CPU checkCPU LED 亮，check PASS後則CPU LED滅掉。
2. 接著依序進行Memory /memory LED亮check PASS後則memory LED滅掉。
3. VGA的check/VGA LED亮，check PASS後則VGA LED滅掉。
4. 因此最後正常順利開機後，三個LED燈都是滅掉的。（系統重啟或其他原因造成系統重開機，則LED仍按上述行為動作）

LED STRIPLINE



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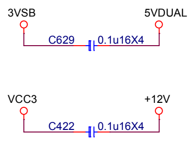
MS-7B23

Size	Document Description	Rev
Custom	LED STRIP	1.1

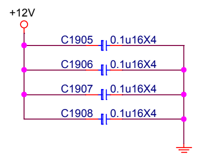
Date: Monday, February 12, 2018 Sheet 57 of 63

EMI CAP

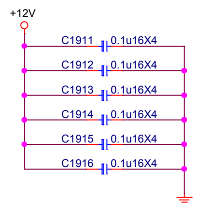
2017.10.13 moat cap



2017.12.21 SA_PH decouple cap



2018.02.02 SA_PH decouple cap



Optical Fiducial Marks-120

FM3 X_FM
FM2 X_FM
FM5 X_FM
FM8 X_FM
FM1 X_FM
FM4 X_FM
FM6 X_FM
FM7 X_FM

Simulation

SIM2 SIM4 X_PIN1*2
SIM1 SIM3 X_PIN1*2

Mounting Holes

MH1 X_MH001
MH3 X_MH001
MH5 X_MH001
MH2 X_MH001
MH7 X_MH001
MH4 X_MH001
MH6 X_MH001
MH8 X_MH001

CA34 0.1u16X4
CA29 0.1u16X4

C485 X_100p50N4

Audio layout guide

VCC_DDR — VCC_DDR
VTT_DDR — VTT_DDR
5VDIMM — 5VDIMM
3VSB — 3VSB
3VDSW — 3VDSW
PCH_1P05_VSB — PCH_1P05_VSB
PCH_1P8_VSB — PCH_1P8_VSB
VCORE — VCORE
VGT — VGT
VCCSA — VCCSA
VCCSTPLL — VCCSTPLL
VCCIO — VCCIO

BAT1_X1 BAT-BCR2032P-RH

CPU_H1 CPU 鐵座 CPU_H1

BIOS_LA1 AMI AMI

HDMI_LA1 HDMI VIRTUAL HDMI LABEL

CFOS_LA1 CFOS CFOS

DDR_COVER1 DDR COVER X_E21-7A63010-RH
X1 X2 X3 X4 X5

CPU_PWR2 Silver 8 pin X_PWRCONN8P_GRAY-RH

PCB1 7B23_11 PD0-07B2310-G37

PCB_WHITE1 PCB 2.2 (Silver) X_7B23_22

PS0-07B2320-G37

Marketing Name

LA10 B360 MORTAR MKT_0A

LA11 B360 MORTAR ARCTIC X_MKT_20

HEATSINK

1.0

PCH_HS1 PCH E31-0409500-A87
MOS_HS1 West MOS E31-0505490-A87
MOS_HS2 North MOS E31-0505500-A87

2.1

PCH_HS2 PCH X_E31-0409560-A87
MOS_HS3 West MOS X_E31-0505540-A87
MOS_HS4 North MOS X_E31-0505560-A87

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MS-7B23		
Size: Custom	Document Description: Manual Parts	Rev 1.1
Date: Monday, February 12, 2018	Sheet 59 of 63	