MS-7B28

ATX:234mm*185mm

Intel -CoffeeLake-S plamform

CPU:

LGA1151

*CPU POWER PAK *4Phase*

*GT POWER PAK *2 Phase*

Onboard Chip:

SIO: NUVOTON 5567
HD Audio Codec: ALC887
LAN: INTEL I219V
Flash ROM: SPI 64 MB
CUT VBAT:SLG4B41231

Main Memory:

*DDR4 * 2 (Dual Channel)*

ACPI:

5VDAUL:uP7501

5VDIMM:uP7501

3VSB:GS7133+N MOS

1P8_VSB:GS7166

3VDSW:L11831

VCCSTPLL:GS7133

Expansion Slots:

*PCI Express (X16) Slot * 1*

*PCI Express (X1) Slot * 2*

System Chipset:

H310

PWM:

VCORE - RT3607	*138A*
VGT- RT3607	*45A*
DDR - RT8231	*11.525A*
DDR VPP25- MP2143	*1.12A*
PCH(1.05V) - RT8125E	*10.743A*
VCCSA - RT8125E	*11.1A*
VCCIO - SY8288	*6.4A*

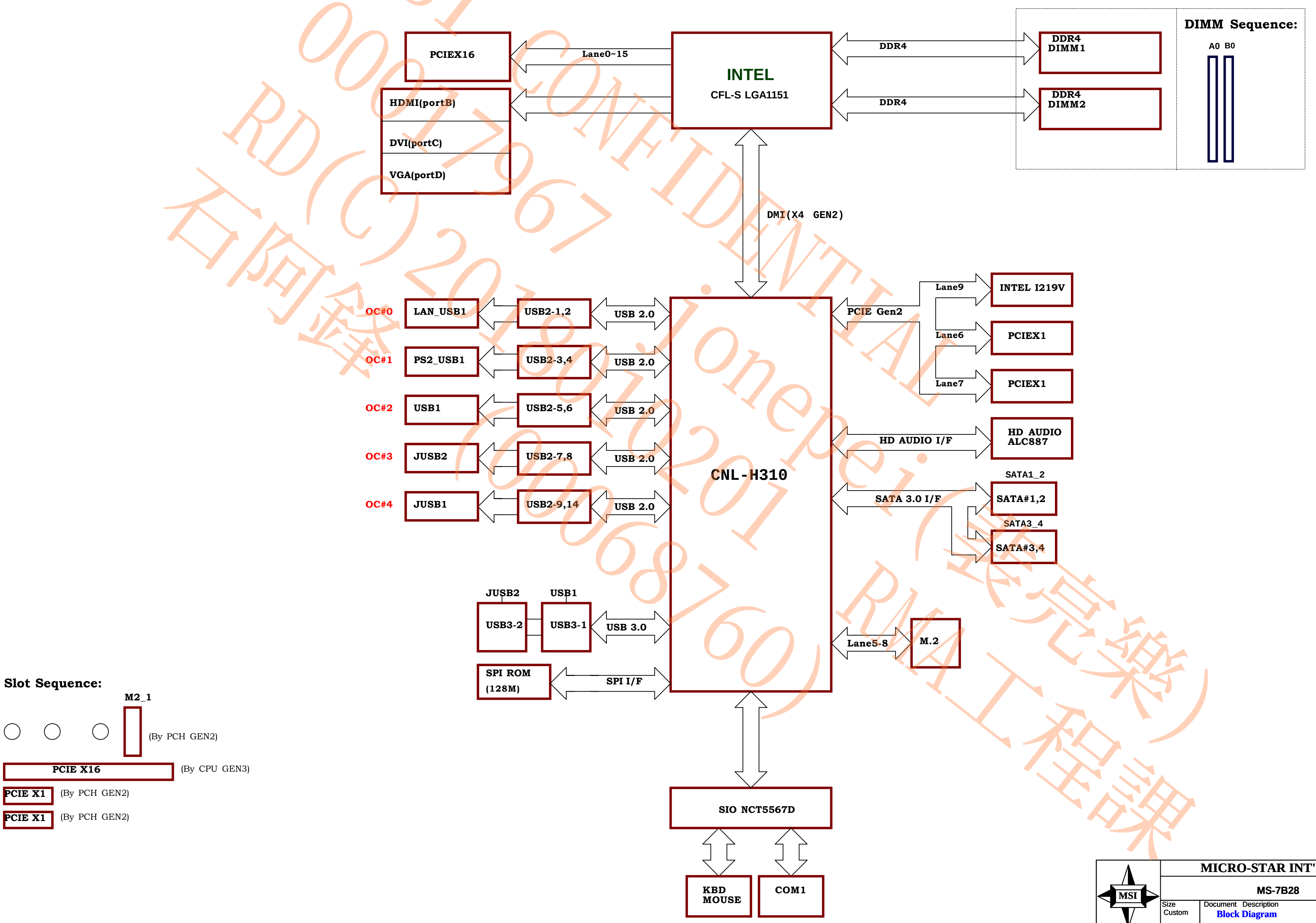
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: Cover Sheet | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 1 of 53

Block Diagram

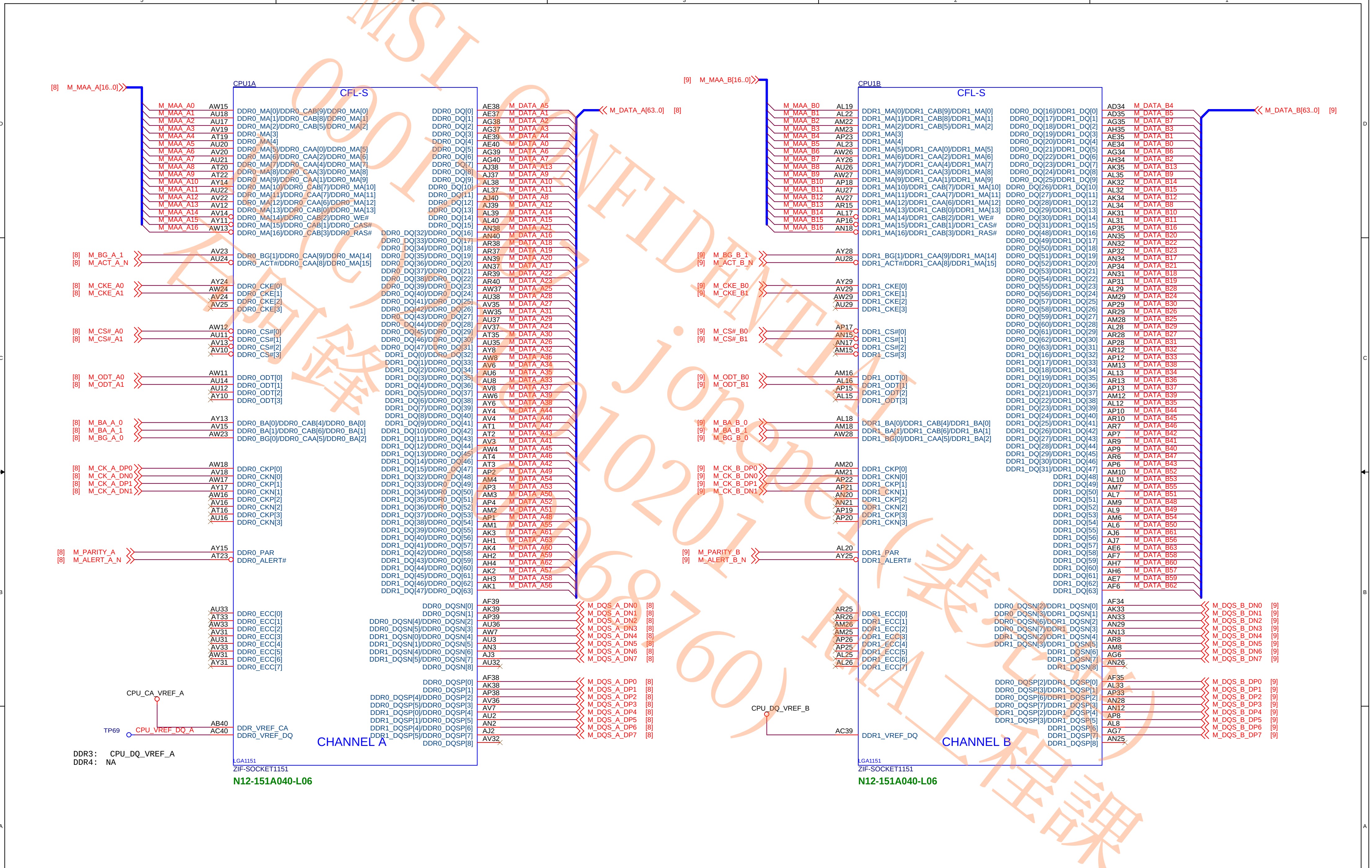


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	Block Diagram	10/20/30

Date: Tuesday, December 12, 2017 Sheet 2 of 53

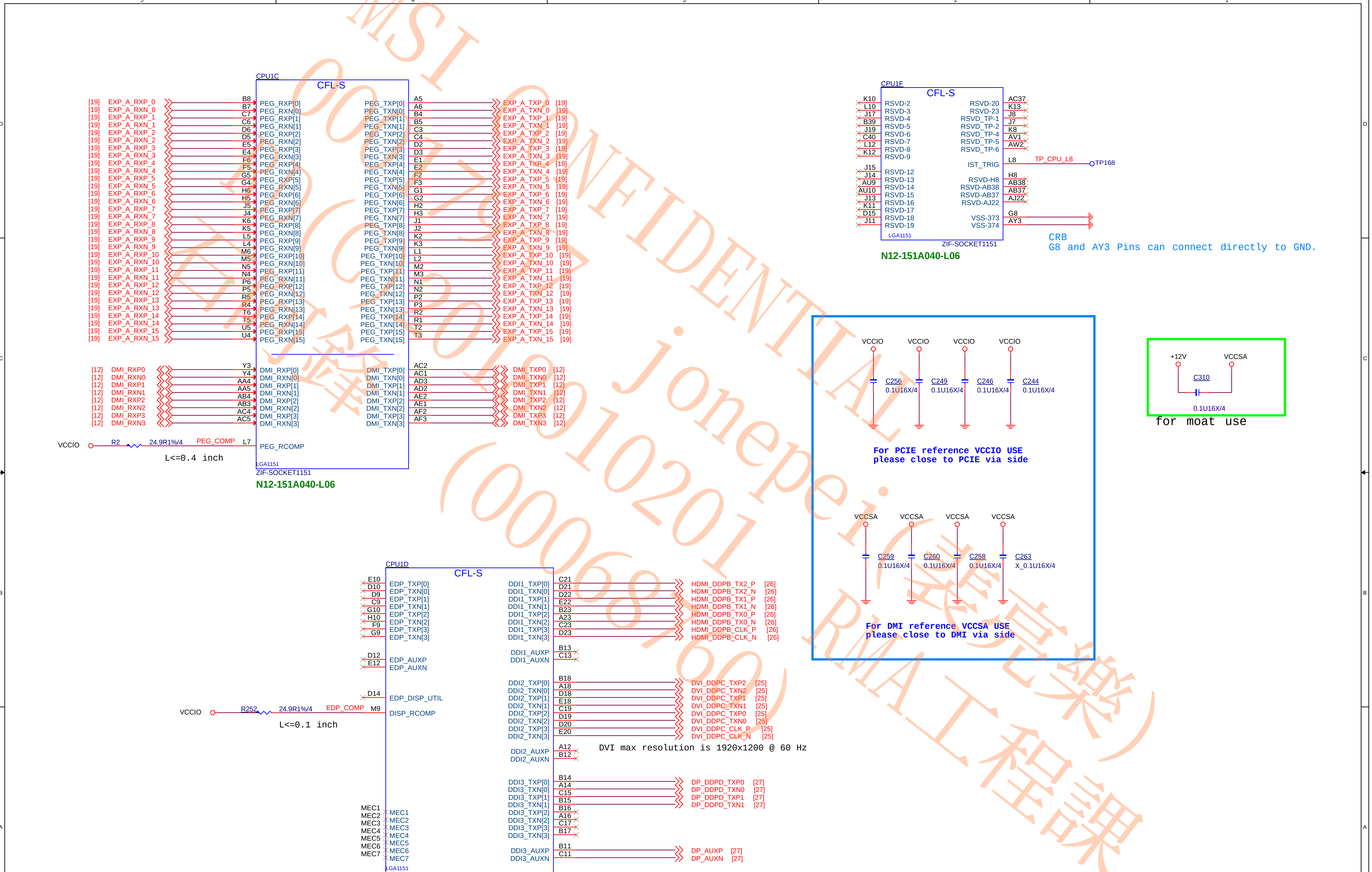


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	CPU-Memory	10/20/30

Date: Tuesday, December 12, 2017 Sheet 3 of 53



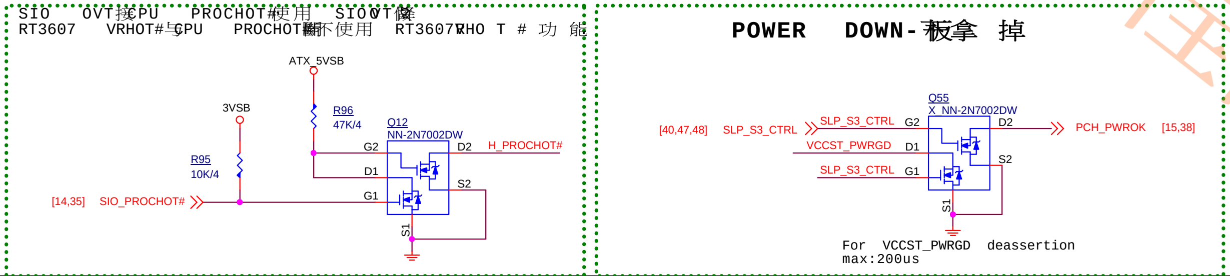
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	CPU-PEG/Display	10/20/30

Date: Tuesday, December 12, 2017 Sheet 4 of 53

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

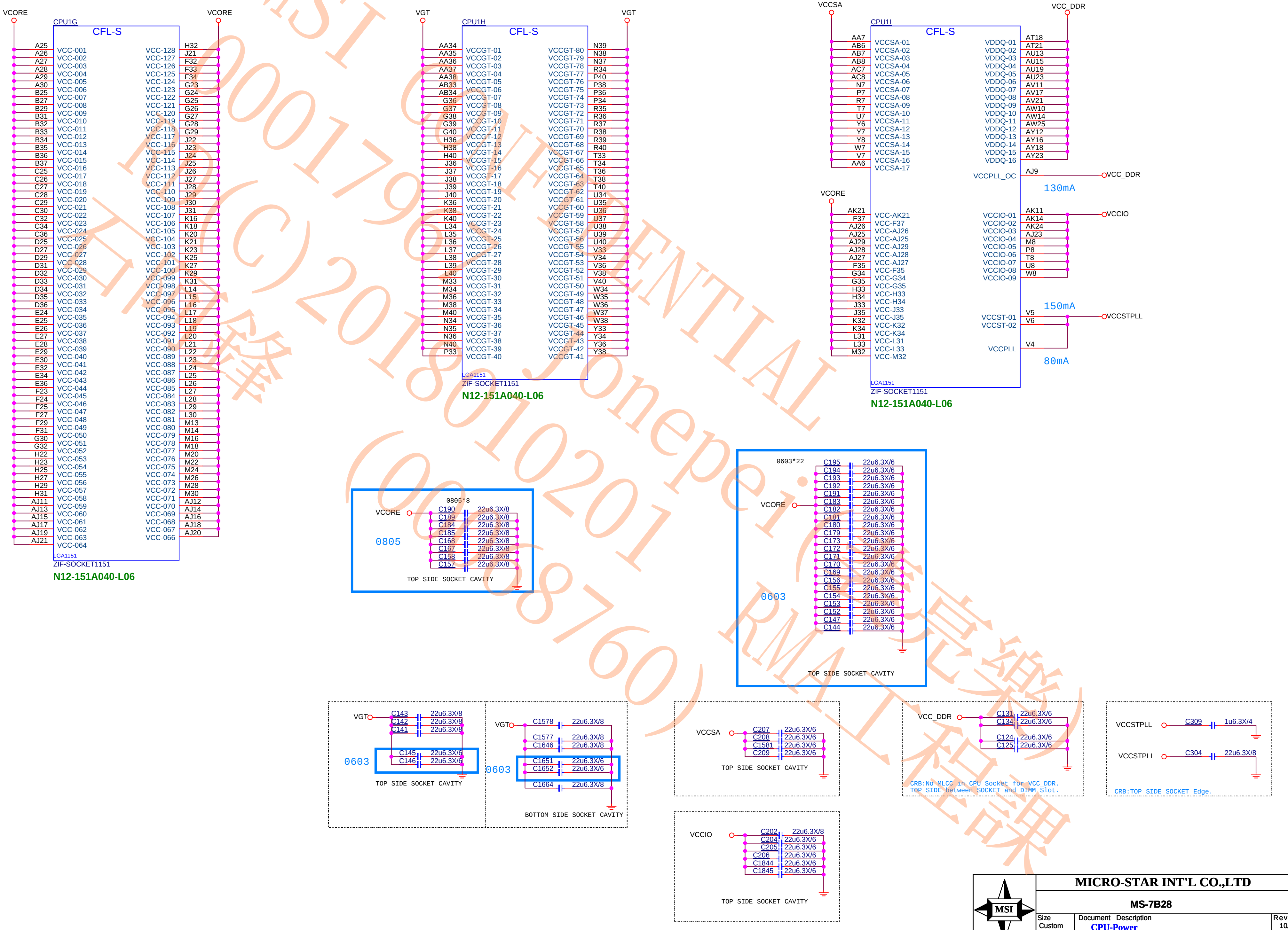


MICRO-STAR INT'L CO.,LTD

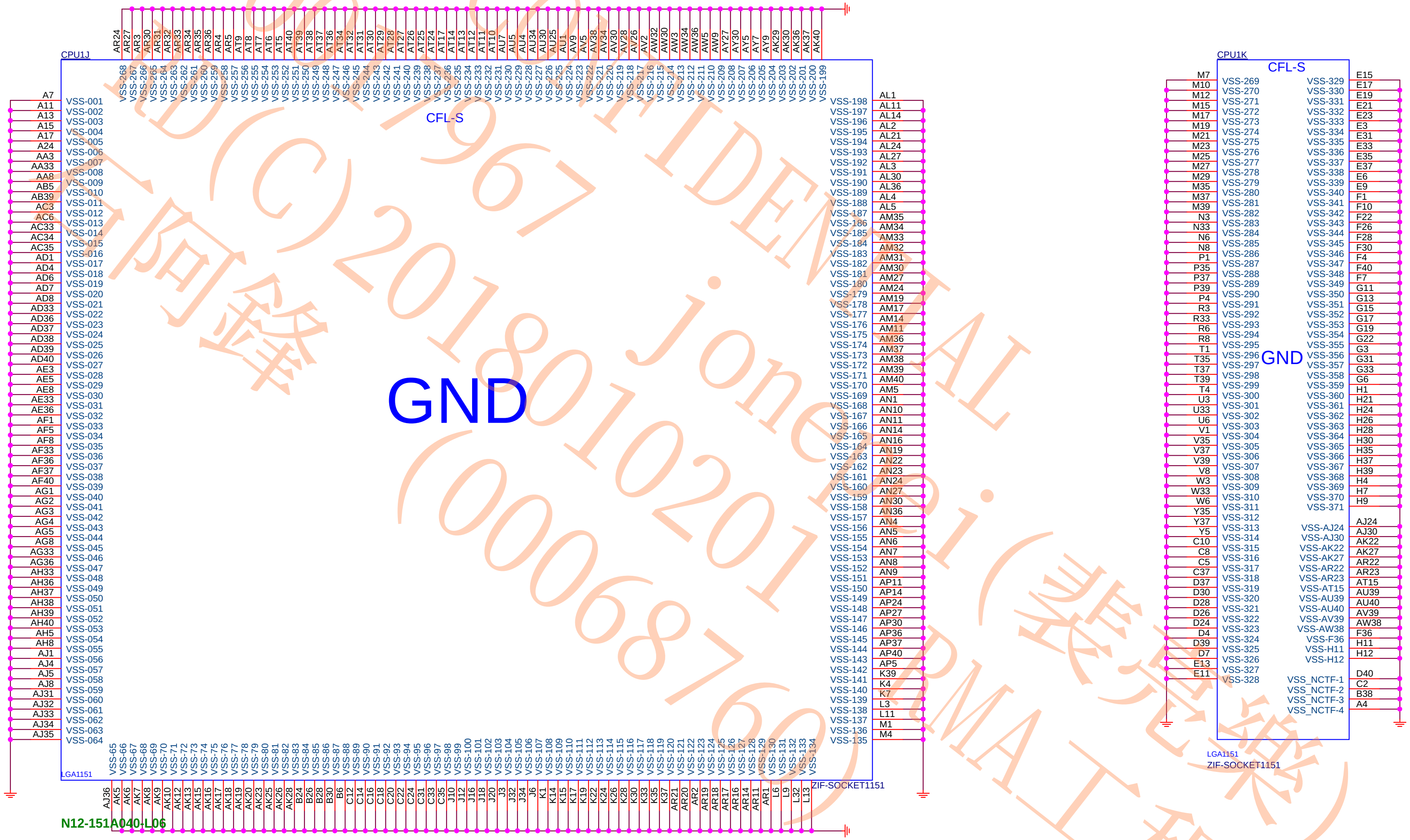
MS-7B28

Size: Custom | Document Description: CPU-Control/MISC/CFG/Audio | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 5 of 53



MICRO-STAR INT'L CO.,LTD			
MS-7B28			
Size: Custom	Document Description: CPU-Power		Rev: 10/20/30
Date: Tuesday, December 12, 2017		Sheet 6 of 53	

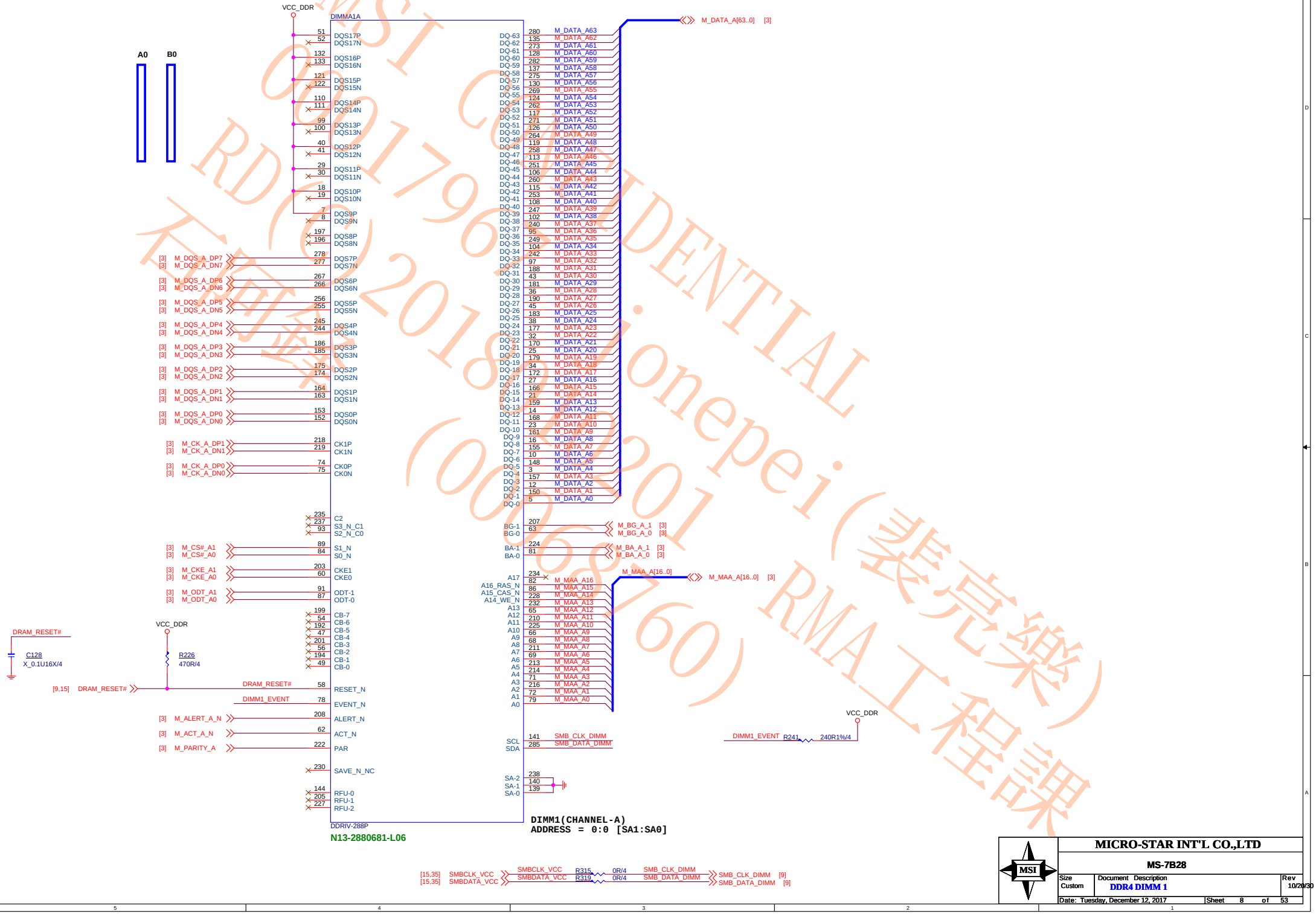


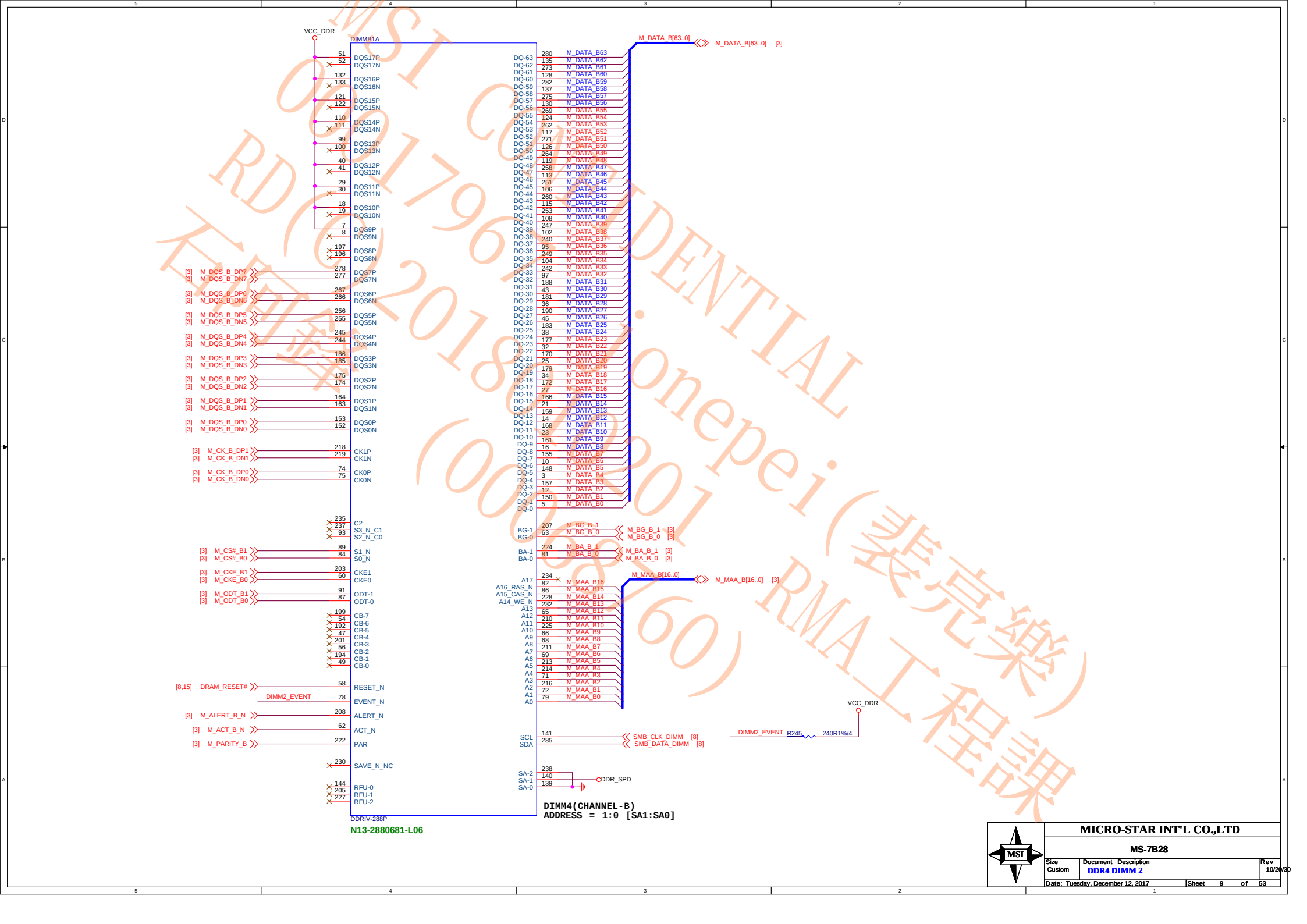
MICRO-STAR INT'L CO.,LTD

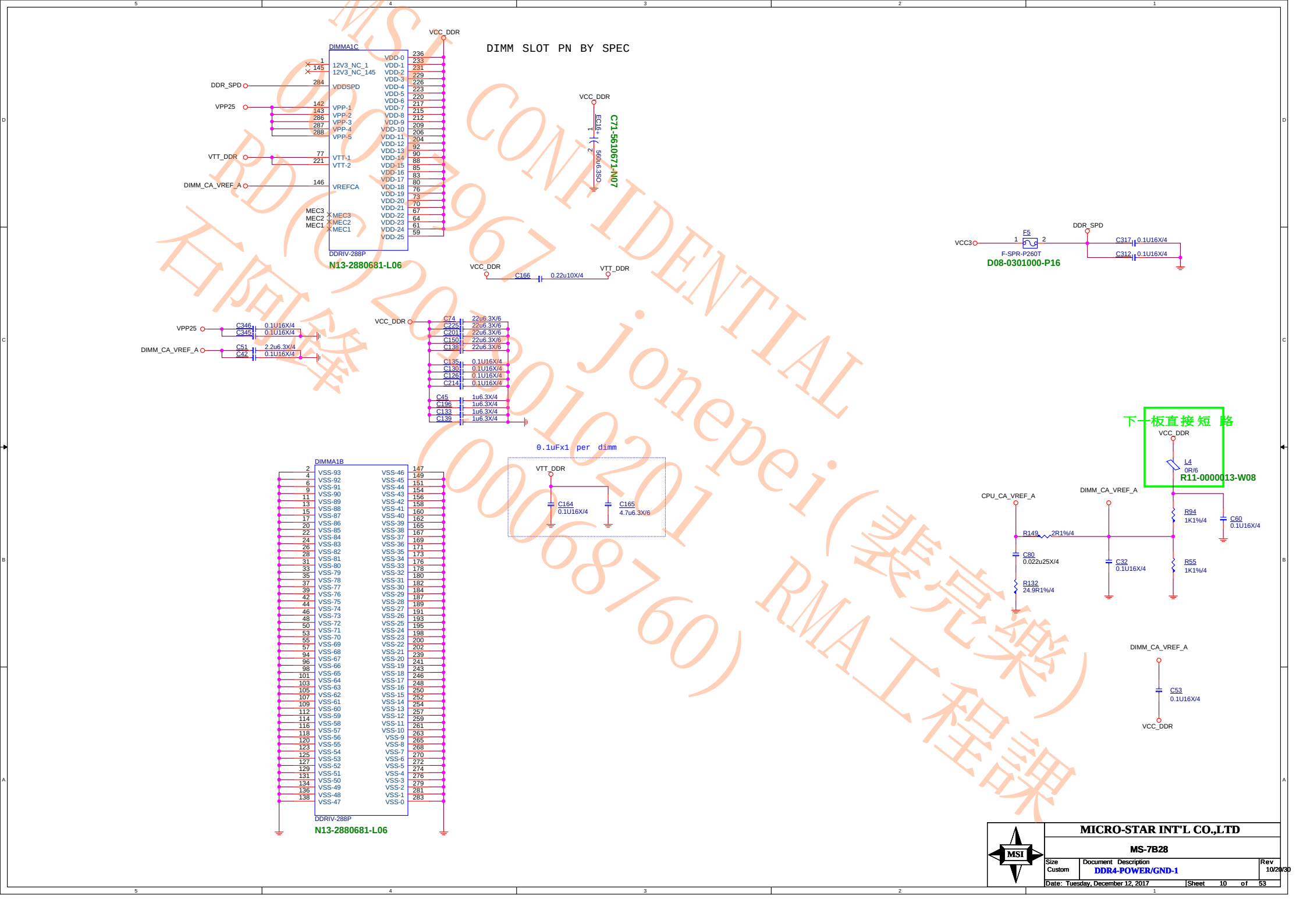
MS-7B28

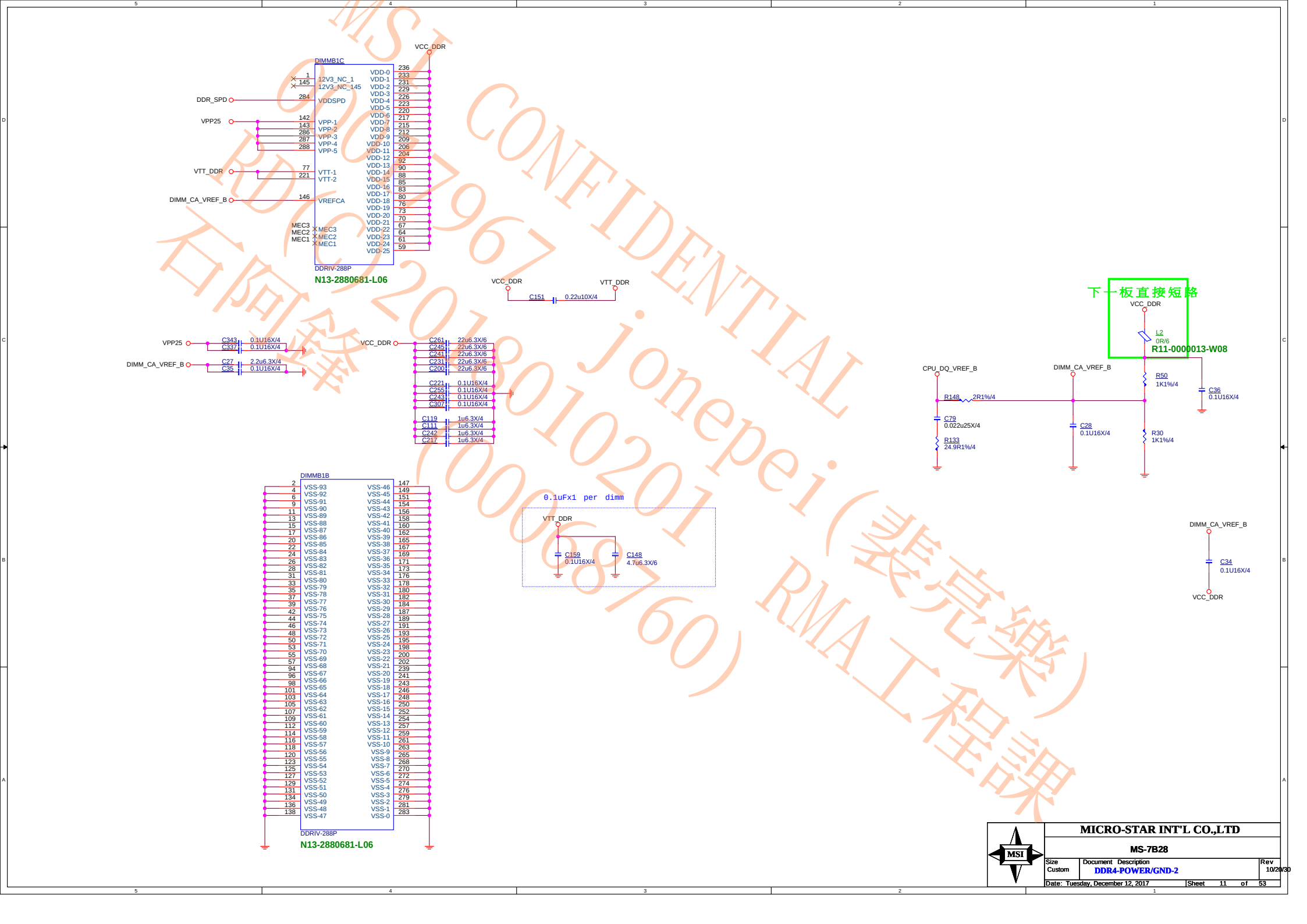
Size	Document Description	Rev
Custom	CPU-GND	10/20/30

Date: Tuesday, December 12, 2017 | Sheet 7 of 53

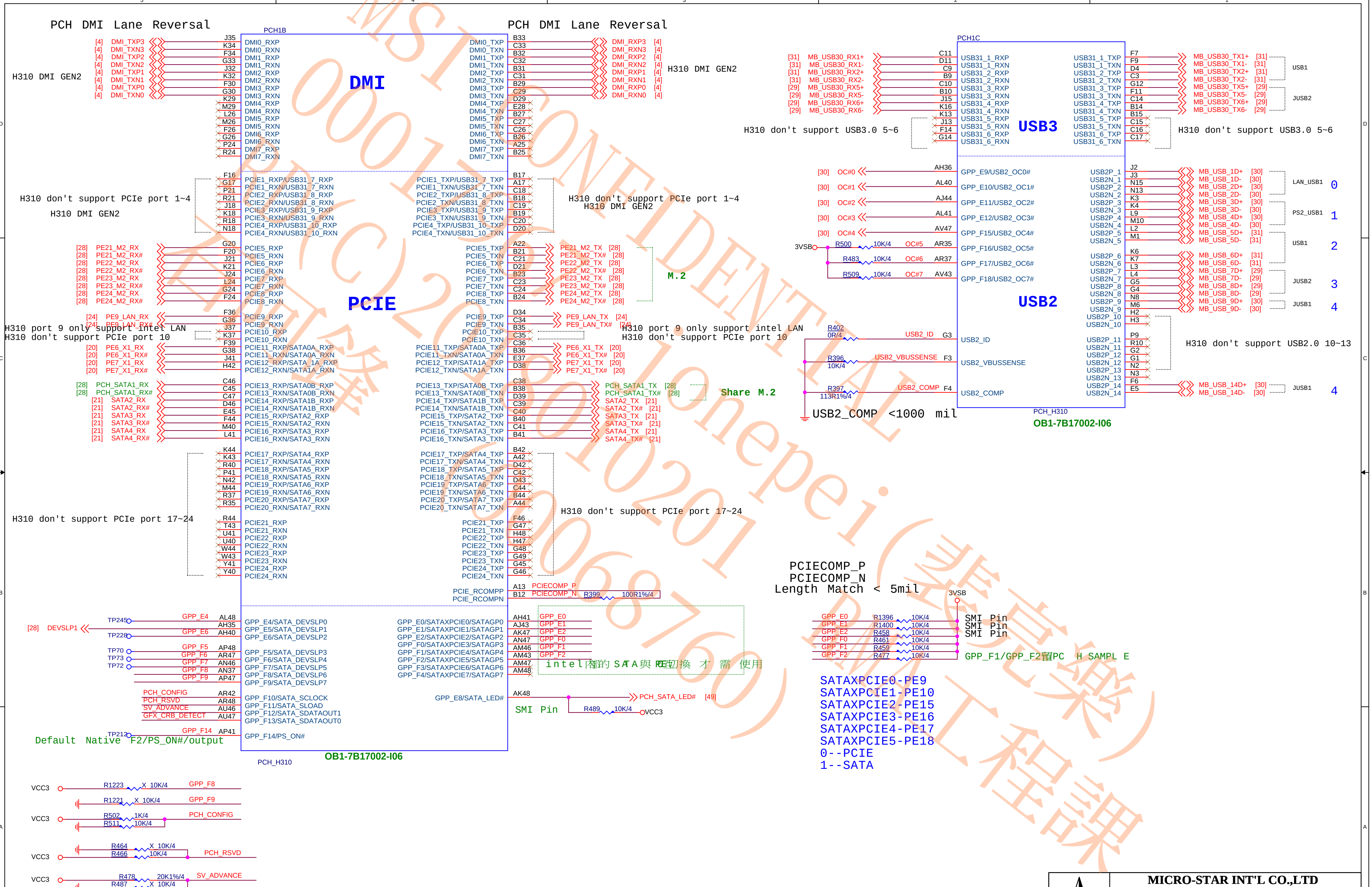

VCC_DDR
DIMMA1A
A0
B0
DQS17P
DQS17N
DQS16P
DQS16N
DQS15P
DQS15N
DQS14P
DQS14N
DQS13P
DQS13N
DQS12P
DQS12N
DQS11P
DQS11N
DQS10P
DQS10N
DQS9P
DQS9N
DQS8P
DQS8N
DQS7P
DQS7N
DQS6P
DQS6N
DQS5P
DQS5N
DQS4P
DQS4N
DQS3P
DQS3N
DQS2P
DQS2N
DQS1P
DQS1N
DQS0P
DQS0N
CK1P
CK1N
CK0P
CK0N
C2
S3_N_C1
S2_N_C0
S1_N
S0_N
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
DDRIV-288P
M_DATA_A[63..0]
M_BG_A_1
M_BG_A_0
M_BA_A_1
M_BA_A_0
M_MAA_A[16..0]
SMB_CLK_DIMM
SMB_DATA_DIMM
SA-2
SA-1
SA-0
DRAM_RESET#
C128
X_0.1U16X/4
R226
470R/4
DIMM1_EVENT
R241
240R1%/4
SMBCLK_VCC
SMBDATA_VCC
R315
R319
0R/4
DIMM1(CHANNEL-A)
ADDRESS = 0:0 [SA1:SA0]
N13-2880681-L06
MICRO-STAR INT'L CO.,LTD
MS-7B28
Size
Custom
Document Description
DDR4 DIMM 1
Rev
10/20/30
Date: Tuesday, December 12, 2017
Sheet 8 of 53


VCC_DDR
DIMMB1A
M_DATA_B[63..0]
M_DATA_B[63..0] [3]
DQS17P
DQS17N
DQS16P
DQS16N
DQS15P
DQS15N
DQS14P
DQS14N
DQS13P
DQS13N
DQS12P
DQS12N
DQS11P
DQS11N
DQS10P
DQS10N
DQS9P
DQS9N
DQS8P
DQS8N
M_DQS_B_DP7 [3]
M_DQS_B_DN7 [3]
DQS7P
DQS7N
M_DQS_B_DP6 [3]
M_DQS_B_DN6 [3]
DQS6P
DQS6N
M_DQS_B_DP5 [3]
M_DQS_B_DN5 [3]
DQS5P
DQS5N
M_DQS_B_DP4 [3]
M_DQS_B_DN4 [3]
DQS4P
DQS4N
M_DQS_B_DP3 [3]
M_DQS_B_DN3 [3]
DQS3P
DQS3N
M_DQS_B_DP2 [3]
M_DQS_B_DN2 [3]
DQS2P
DQS2N
M_DQS_B_DP1 [3]
M_DQS_B_DN1 [3]
DQS1P
DQS1N
M_DQS_B_DP0 [3]
M_DQS_B_DN0 [3]
DQS0P
DQS0N
M_CK_B_DP1 [3]
M_CK_B_DN1 [3]
CK1P
CK1N
M_CK_B_DP0 [3]
M_CK_B_DN0 [3]
CK0P
CK0N
C2
S3_N_C1
S2_N_C0
M_CS#_B1 [3]
M_CS#_B0 [3]
S1_N
S0_N
M_CKE_B1 [3]
M_CKE_B0 [3]
CKE1
CKE0
M_ODT_B1 [3]
M_ODT_B0 [3]
ODT-1
ODT-0
CB-7
CB-6
CB-5
CB-4
CB-3
CB-2
CB-1
CB-0
[8,15] DRAM_RESET#
RESET_N
DIMM2_EVENT
EVENT_N
M_ALERT_B_N [3]
ALERT_N
M_ACT_B_N [3]
ACT_N
M_PARITY_B [3]
PAR
SAVE_N_NC
RFU-0
RFU-1
RFU-2
DDRIV-288P
N13-2880681-L06
DQ-63 M_DATA_B63
DQ-62 M_DATA_B62
DQ-61 M_DATA_B61
DQ-60 M_DATA_B60
DQ-59 M_DATA_B59
DQ-58 M_DATA_B58
DQ-57 M_DATA_B57
DQ-56 M_DATA_B56
DQ-55 M_DATA_B55
DQ-54 M_DATA_B54
DQ-53 M_DATA_B53
DQ-52 M_DATA_B52
DQ-51 M_DATA_B51
DQ-50 M_DATA_B50
DQ-49 M_DATA_B49
DQ-48 M_DATA_B48
DQ-47 M_DATA_B47
DQ-46 M_DATA_B46
DQ-45 M_DATA_B45
DQ-44 M_DATA_B44
DQ-43 M_DATA_B43
DQ-42 M_DATA_B42
DQ-41 M_DATA_B41
DQ-40 M_DATA_B40
DQ-39 M_DATA_B39
DQ-38 M_DATA_B38
DQ-37 M_DATA_B37
DQ-36 M_DATA_B36
DQ-35 M_DATA_B35
DQ-34 M_DATA_B34
DQ-33 M_DATA_B33
DQ-32 M_DATA_B32
DQ-31 M_DATA_B31
DQ-30 M_DATA_B30
DQ-29 M_DATA_B29
DQ-28 M_DATA_B28
DQ-27 M_DATA_B27
DQ-26 M_DATA_B26
DQ-25 M_DATA_B25
DQ-24 M_DATA_B24
DQ-23 M_DATA_B23
DQ-22 M_DATA_B22
DQ-21 M_DATA_B21
DQ-20 M_DATA_B20
DQ-19 M_DATA_B19
DQ-18 M_DATA_B18
DQ-17 M_DATA_B17
DQ-16 M_DATA_B16
DQ-15 M_DATA_B15
DQ-14 M_DATA_B14
DQ-13 M_DATA_B13
DQ-12 M_DATA_B12
DQ-11 M_DATA_B11
DQ-10 M_DATA_B10
DQ-9 M_DATA_B9
DQ-8 M_DATA_B8
DQ-7 M_DATA_B7
DQ-6 M_DATA_B6
DQ-5 M_DATA_B5
DQ-4 M_DATA_B4
DQ-3 M_DATA_B3
DQ-2 M_DATA_B2
DQ-1 M_DATA_B1
DQ-0 M_DATA_B0
BG-1 M_BG_B_1
BG-0 M_BG_B_0
M_BG_B_1 [3]
M_BG_B_0 [3]
BA-1 M_BA_B_1
BA-0 M_BA_B_0
M_BA_B_1 [3]
M_BA_B_0 [3]
A17
A16_RAS_N
A15_CAS_N
A14_WE_N
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
M_MAA_B16
M_MAA_B15
M_MAA_B14
M_MAA_B13
M_MAA_B12
M_MAA_B11
M_MAA_B10
M_MAA_B9
M_MAA_B8
M_MAA_B7
M_MAA_B6
M_MAA_B5
M_MAA_B4
M_MAA_B3
M_MAA_B2
M_MAA_B1
M_MAA_B0
M_MAA_B[16..0]
M_MAA_B[16..0] [3]
SCL
SDA
SMB_CLK_DIMM [8]
SMB_DATA_DIMM [8]
SA-2
SA-1
SA-0
DDR_SPD
VCC_DDR
DIMM2_EVENT
R245
240R1%/4
DIMM4(CHANNEL-B)
ADDRESS = 1:0 [SA1:SA0]
MICRO-STAR INT'L CO.,LTD
MS-7B28
Size
Custom
Document Description
DDR4 DIMM 2
Rev
10/20/30
Date: Tuesday, December 12, 2017
Sheet 9 of 53


DIMM SLOT PN BY SPEC
DIMMA1C
DDRIV-288P
N13-2880681-L06
VCC_DDR
VTT_DDR
DDR_SPD
VPP25
DIMM_CA_VREF_A
C71-5610671-N07
C166 0.22u10X/4
0.1uFx1 per dimm
C164 0.1U16X/4
C165 4.7u6.3X/6
DIMMA1B
DDRIV-288P
N13-2880681-L06
D08-0301000-P16
F-SPR-P260T
下一板直接短路
L4 0R/6
R11-0000013-W08
CPU_CA_VREF_A
R149 2R1%/4
C80 0.022u25X/4
R132 24.9R1%/4
C32 0.1U16X/4
R94 1K1%/4
R55 1K1%/4
C60 0.1U16X/4
C53 0.1U16X/4
MICRO-STAR INT'L CO.,LTD
MS-7B28
DDR4-POWER/GND-1
Date: Tuesday, December 12, 2017
Sheet 10 of 53



MICRO-STAR INT'L CO.,LTD			
MS-7B28			
Size: Custom	Document Description: DDR4-POWER/GND-2		Rev: 10/20/30
Date: Tuesday, December 12, 2017		Sheet 11 of 53	



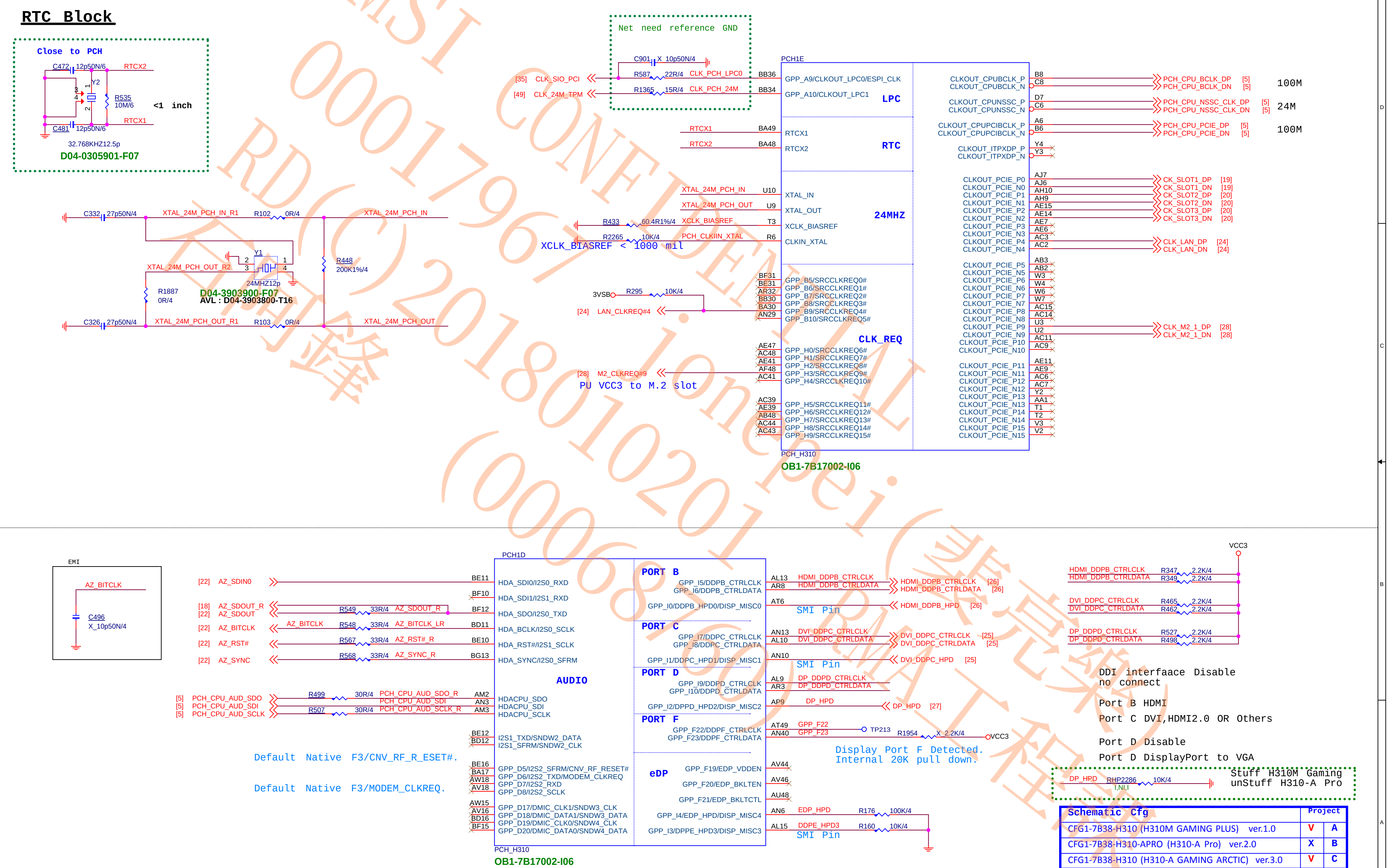
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	PCH-USB/PCIE/DMI/SATA	10/20/30

Date: Tuesday, December 12, 2017 Sheet 12 of 53

RTC Block



Schematic Cfg		Project
CFG1-7B38-H310 (H310M GAMING PLUS) ver.1.0	V	A
CFG1-7B38-H310-APRO (H310-A Pro) ver.2.0	X	B
CFG1-7B38-H310 (H310-A GAMING ARCTIC) ver.3.0	V	C

MICRO-STAR INT'L CO.,LTD

MSI

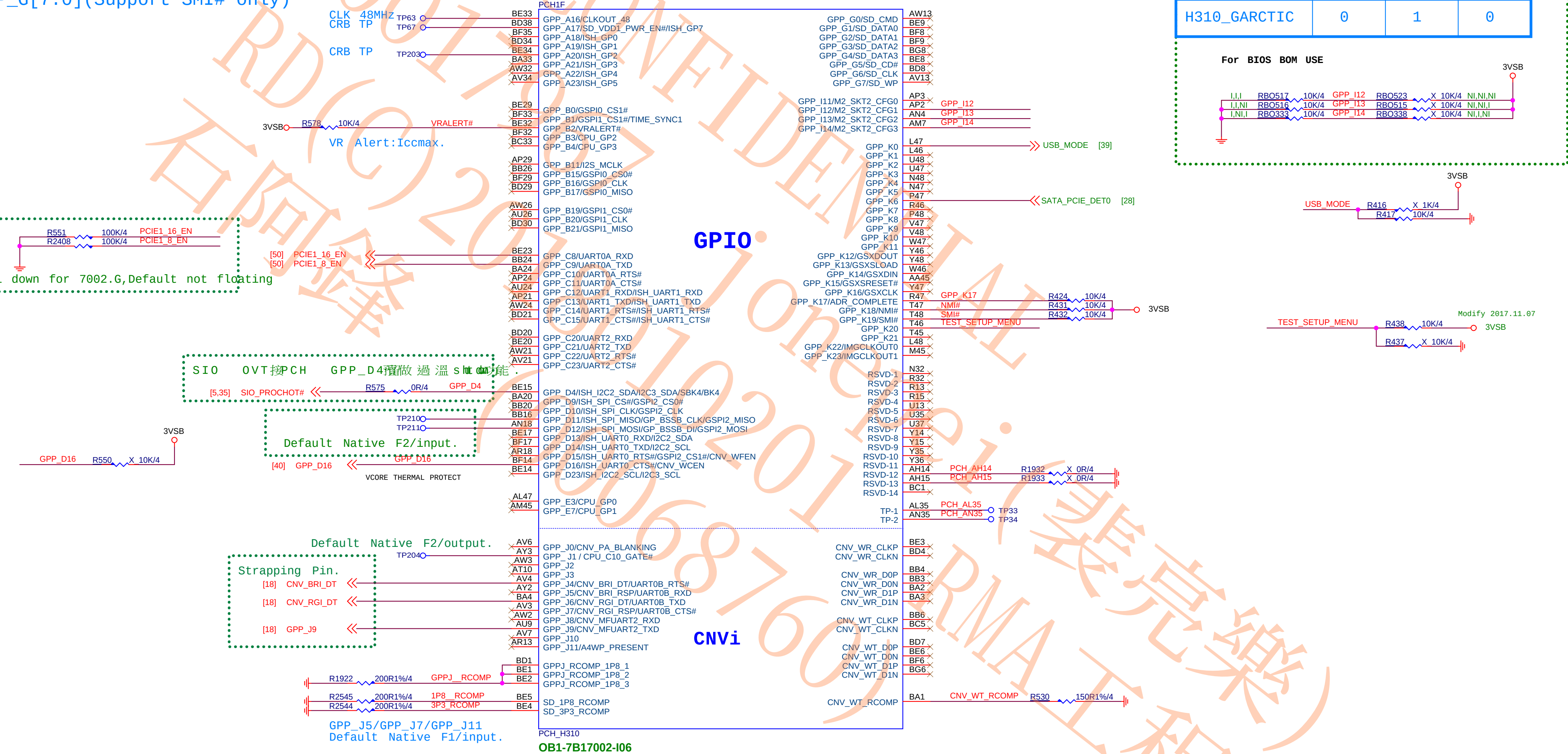
MS-7B28

Size: Custom
Document Description: PCH-Audio/Display/Clock
Rev: 10/20/30

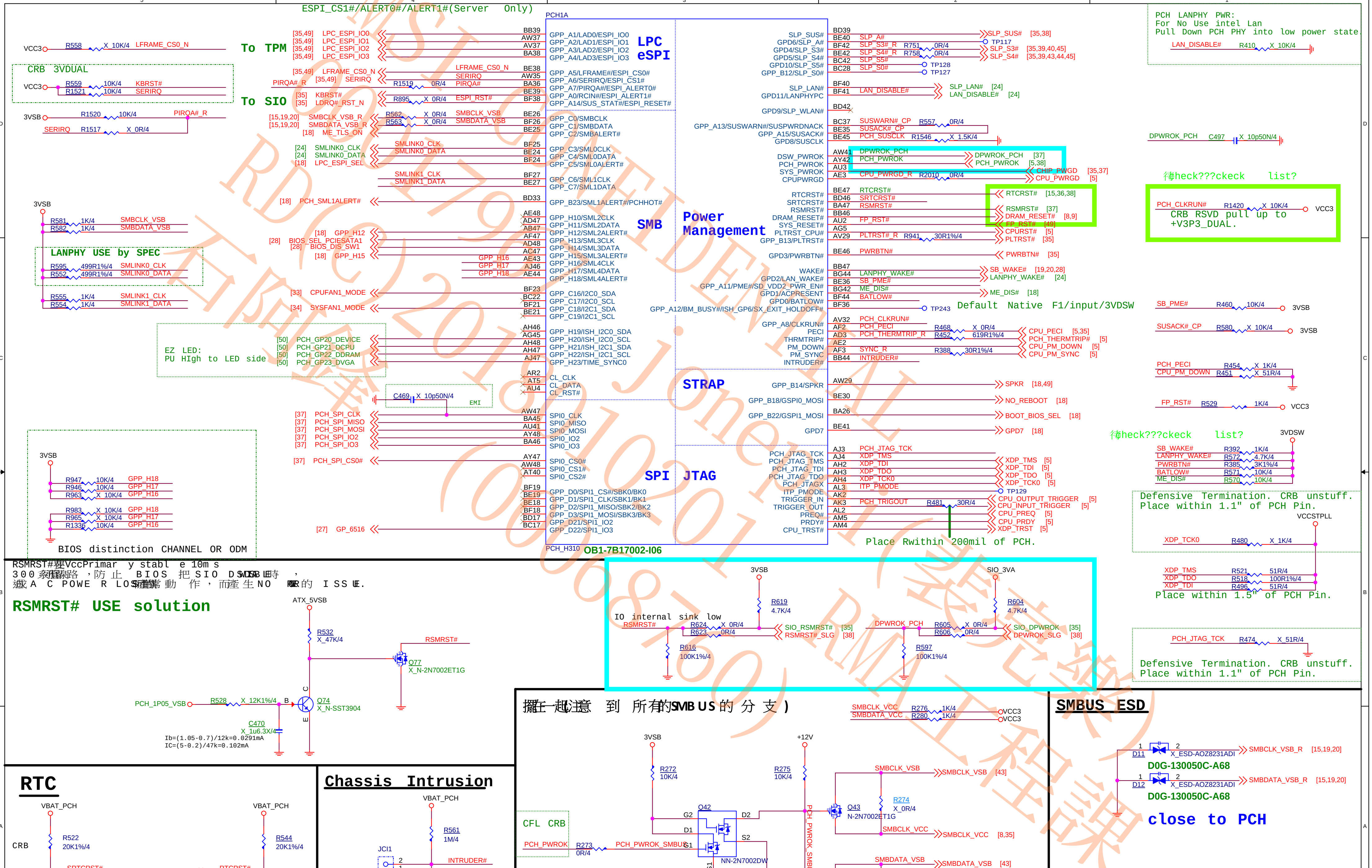
GPIO(SMI/NMI):
GPP_B14,GPP_B20,GPP_B23
GPP_C[23:22]
GPP_D[4:0]
GPP_E[8:0]
GPP_I[3:0]
GPP_G[7:0](Support SMI# only)

	GPP_I12	GPP_I13	GPP_I14
H310_GPLUS	0	0	0
H310_APRO	0	0	1
H310_GARCTIC	0	1	0

For BIOS BOM USE



MICRO-STAR INT'L CO.,LTD
MS-7B28
Size: Custom
Document Description: PCH-GPIO/USBOC#/SATASTRAP
Rev: 10/20/30
Date: Tuesday, December 12, 2017 Sheet 14 of 53

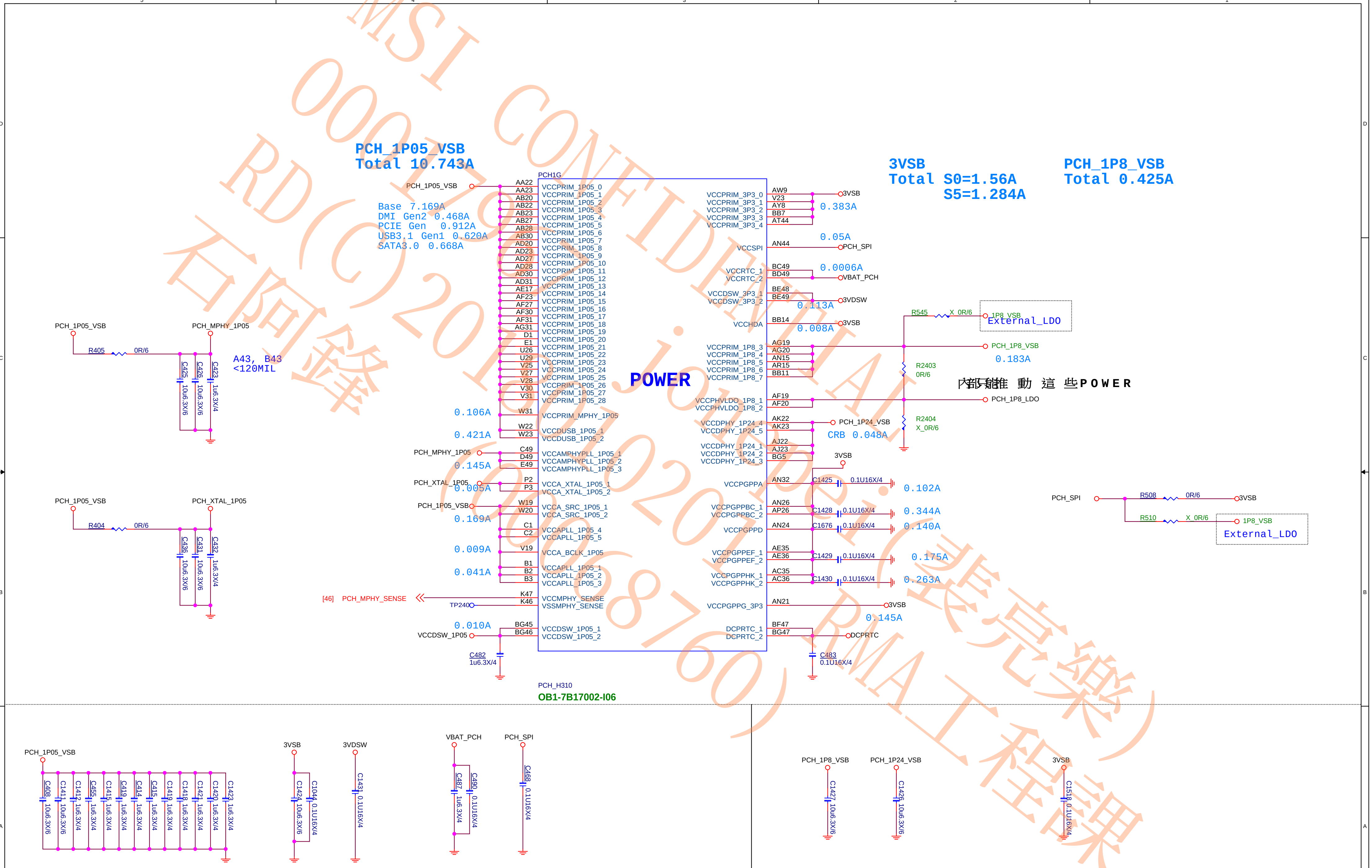


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	PCH-LPC/SPI/SMBUS/MISC	10/20/30

Date: Tuesday, December 12, 2017 Sheet 15 of 53

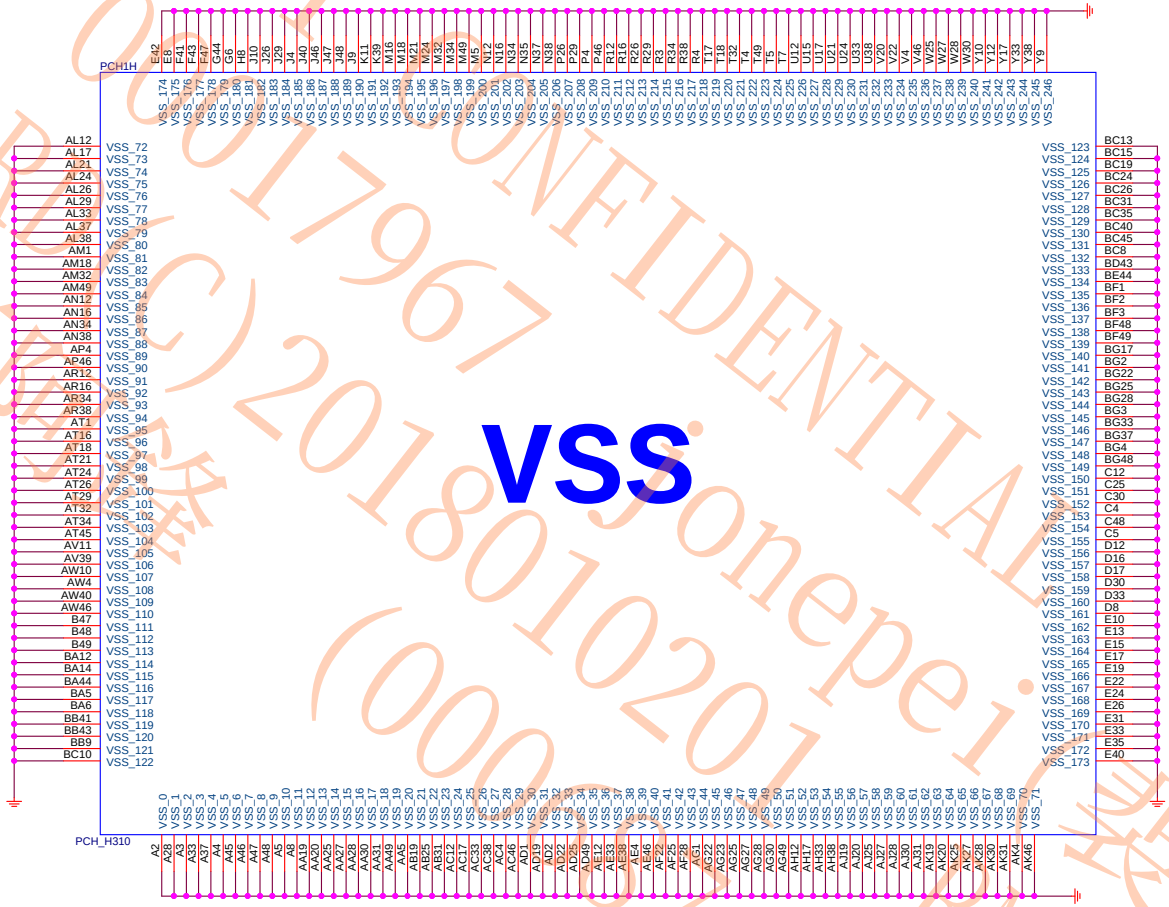


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom
Document Description: PCH-Power
Rev: 10/20/30

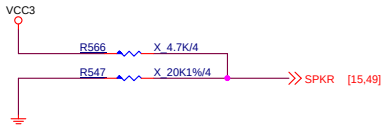
Date: Tuesday, December 12, 2017 Sheet 16 of 53



OB1-7B17002-I06

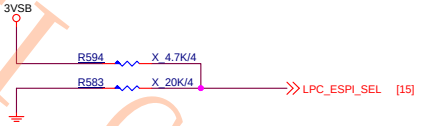
MICRO-STAR INT'L CO.,LTD			
MS-7B28			
Size: Custom	Document Description: PCH-GND		Rev: 10/20/30
Date: Tuesday, December 12, 2017		Sheet 17 of 53	

TOP Swap



Internal pull-down 20K is disabled after PLTRST#

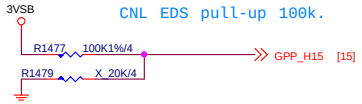
LPC eSPI Mode



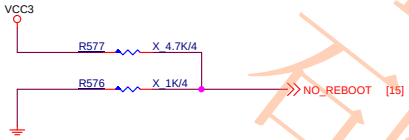
0 : LPC
1 : eSPI

Internal pull-down 20K is disabled after RSMRST

Reserved



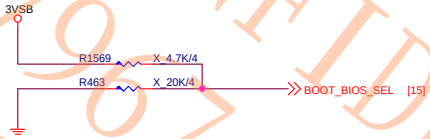
No Reboot



0 : DISABLE (Default)
1 : ENABLE

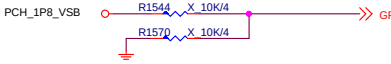
Internal pull-down 20K is disabled after PLTRST#

Boot BIOS



0 : SPI
1 : LPC

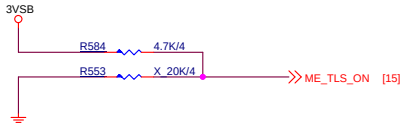
Internal pull-down 20K is disabled after PLTRST



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

AMT and SBA with confidentiality

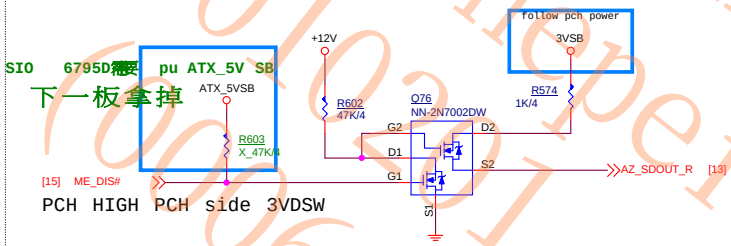


0 : DISABLE
1 : ENABLE (Default)

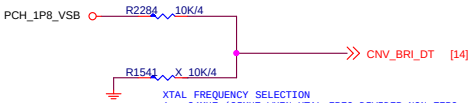
Internal pull-down 20K is disabled after RSMRST

HDA_SDO

ME flash by GPIO

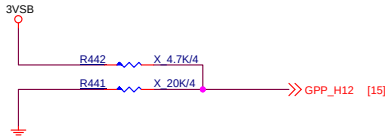


PCH HIGH PCH side 3VDSW



XTAL FREQUENCY SELECTION
1 = 24MHZ (25MHZ WHEN XTAL FREQ DIVIDER NON ZERO
0 = 38.4/19.2MHZ

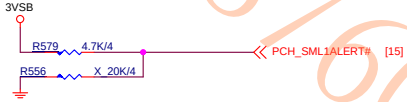
ESPI FLASH SHARING MODE

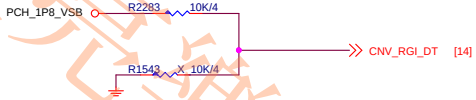


0 : MASTER ATTACHED FLASH SHARING
1 : SLAVE ATTACHED FLASH SHARING

Internal pull-down 20K is disabled after RSMRST

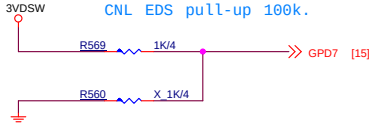
Reserved





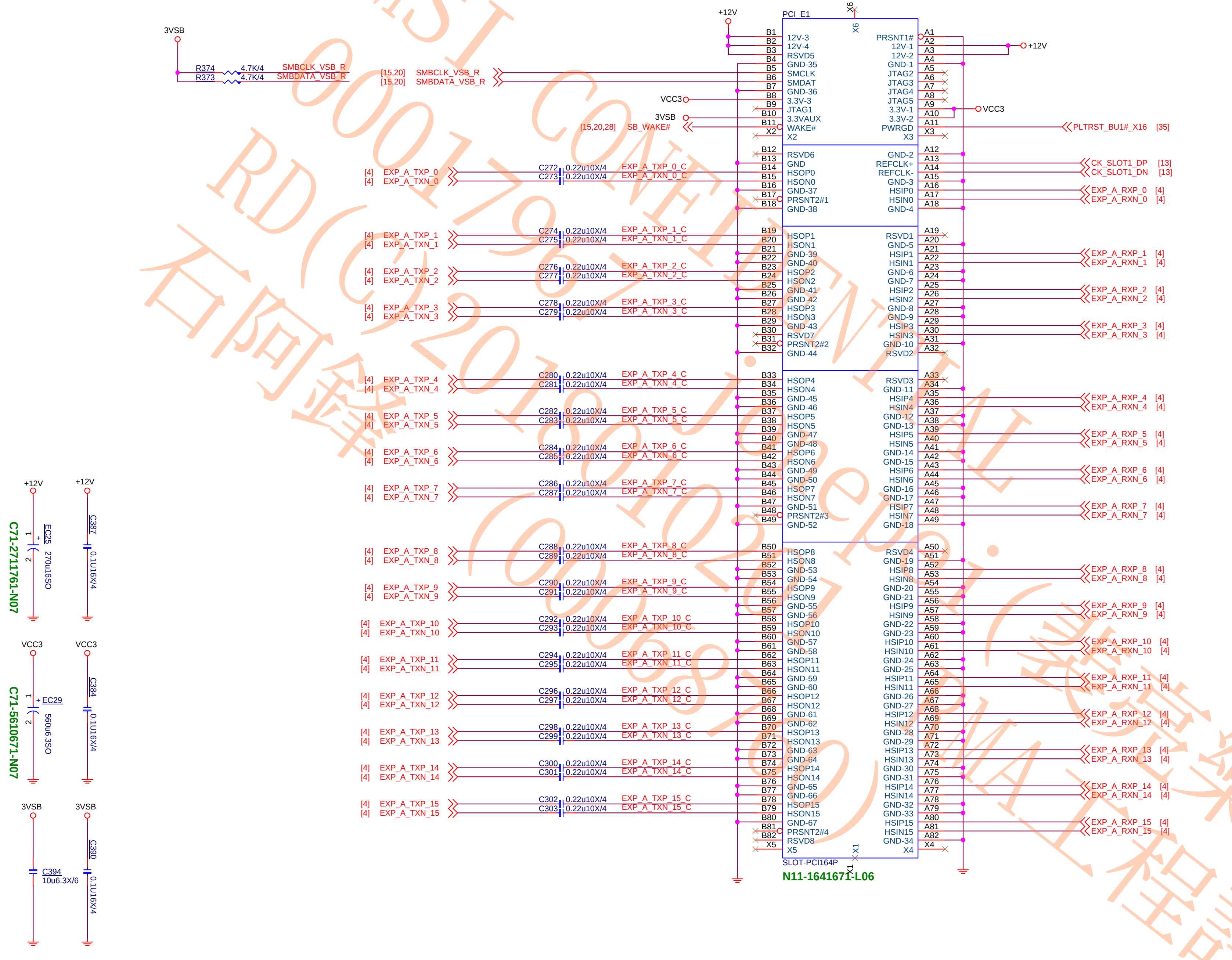
CNL EDS
1 = Integrated CNVi enable
0 = Integrated CNVi disable

Reserved



XTAL INPUT MODE
0 = XTAL INPUT IS SINGLE-ENDED
1 = XTAL INPUT IS DIFFERENTIAL
PCH HAS INTERNAL 20K PD

MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: PCH-Strap	Rev: 10/20/30
Date: Tuesday, December 12, 2017	Sheet 18 of 53	

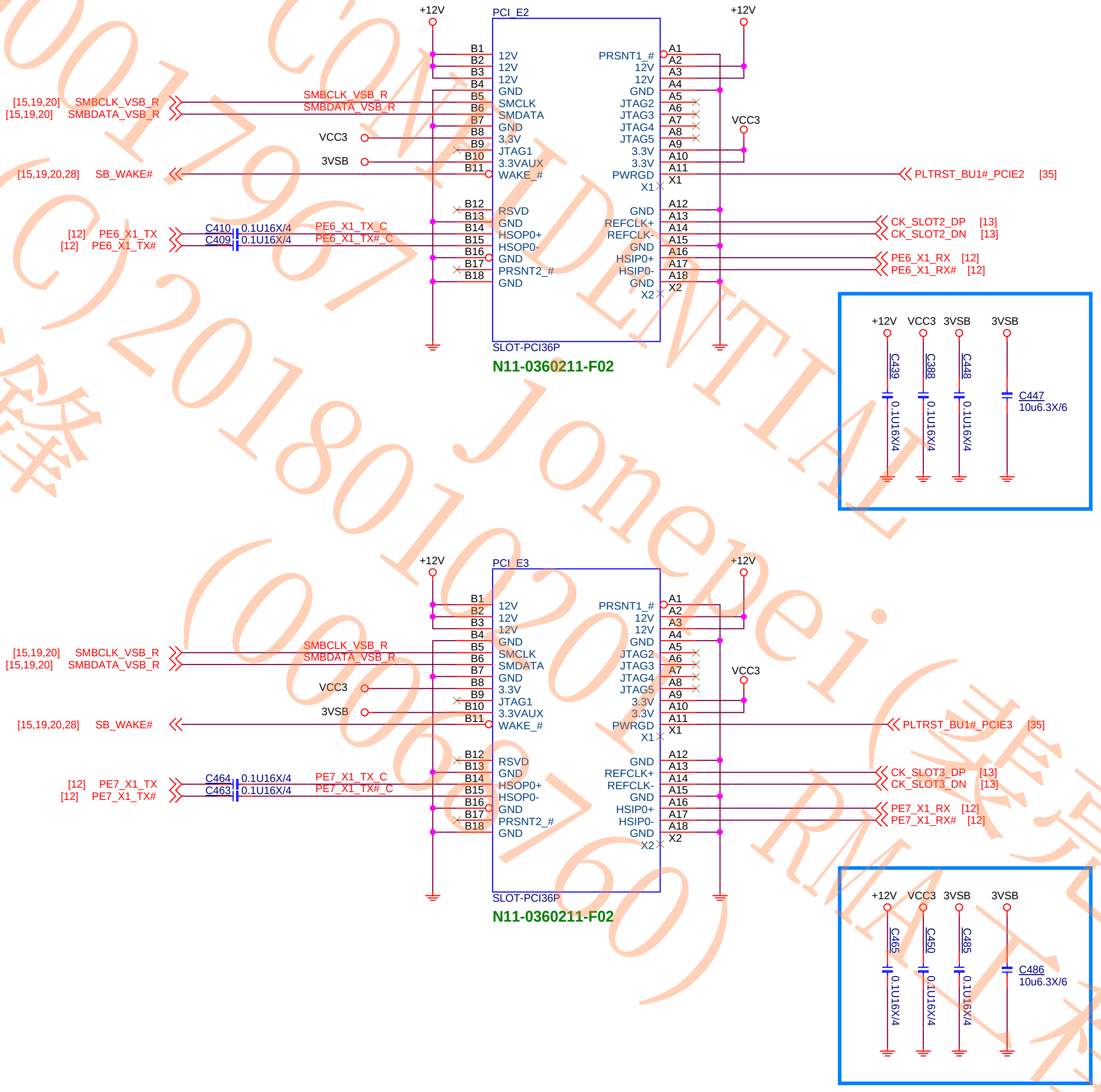


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	PCIE SLOT-CPU(X16)	10/20/30

Date: Tuesday, December 12, 2017 | Sheet 19 of 53



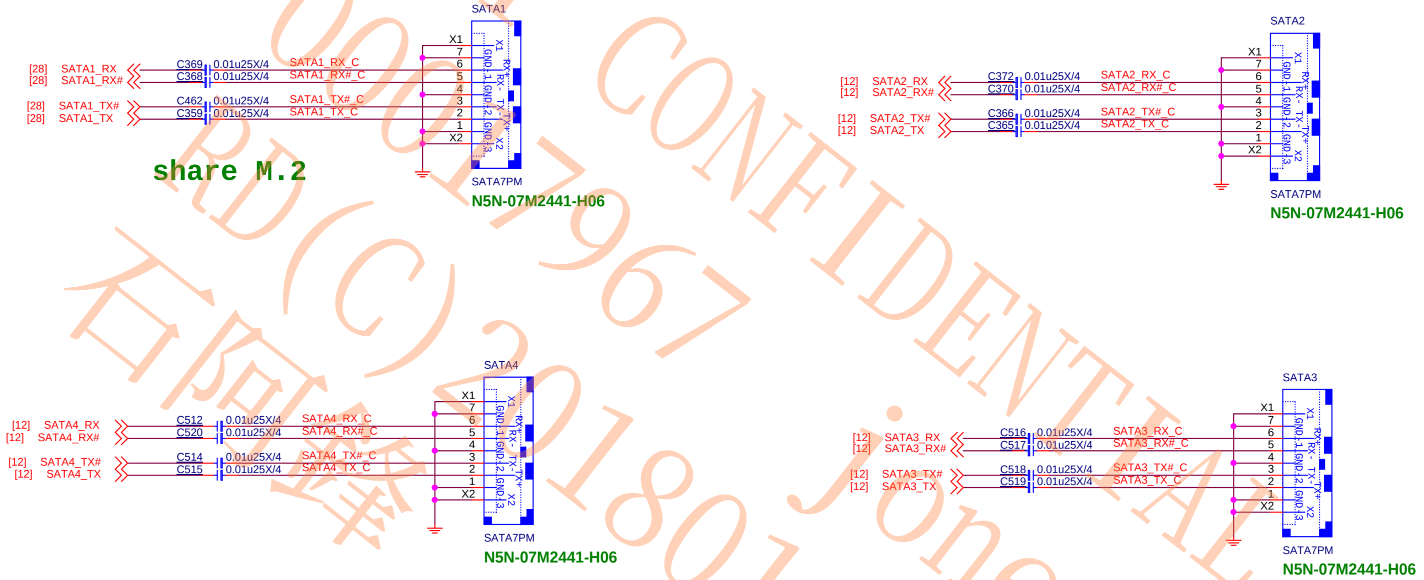
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	PCIE SLOT-PCH(X1)	10/20/30

Date: Tuesday, December 12, 2017 Sheet 20 of 53

SATA 6G

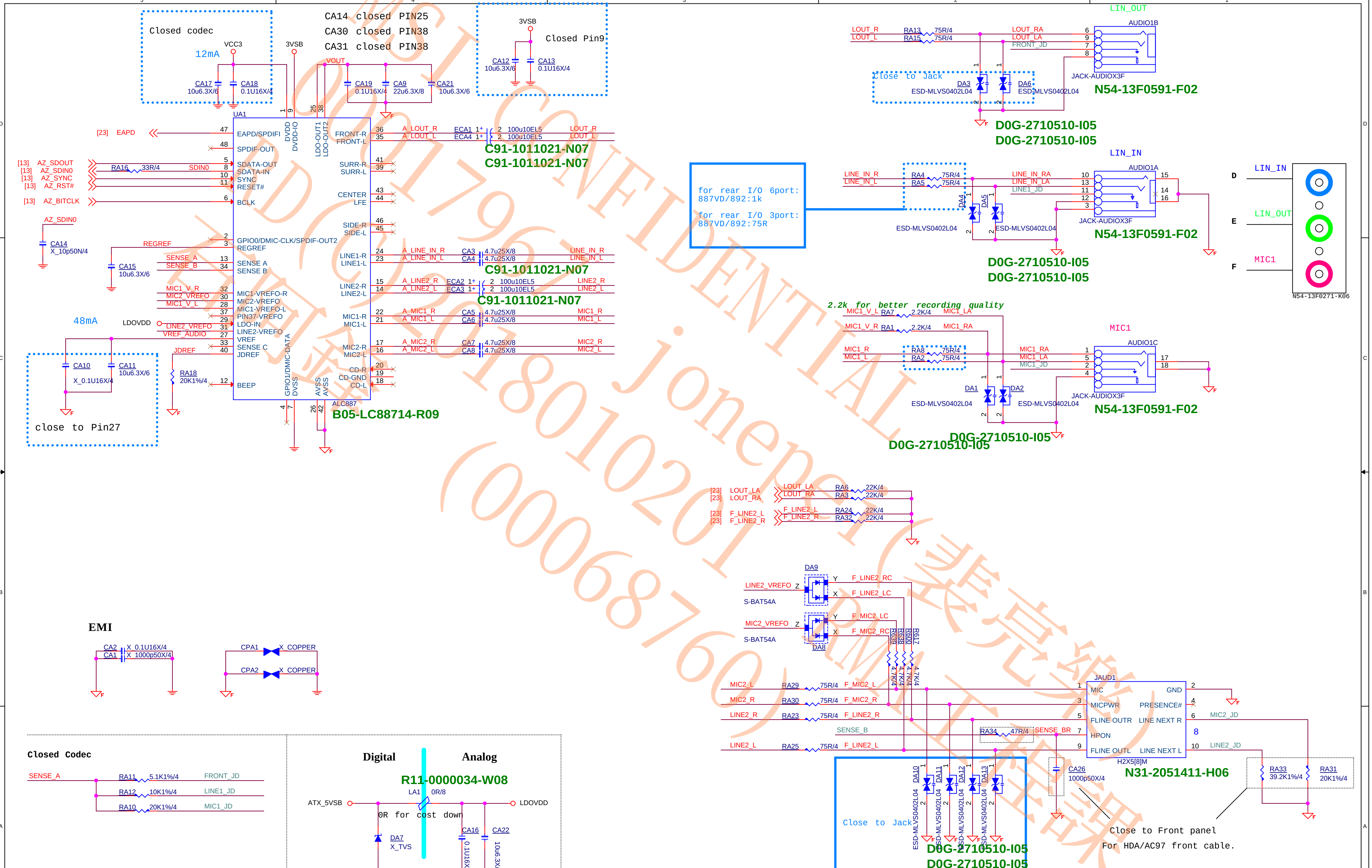


MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	SATA connector	10/20/30

Date: Tuesday, December 12, 2017 Sheet 21 of 53



MICRO-STAR INT'L CO.,LTD

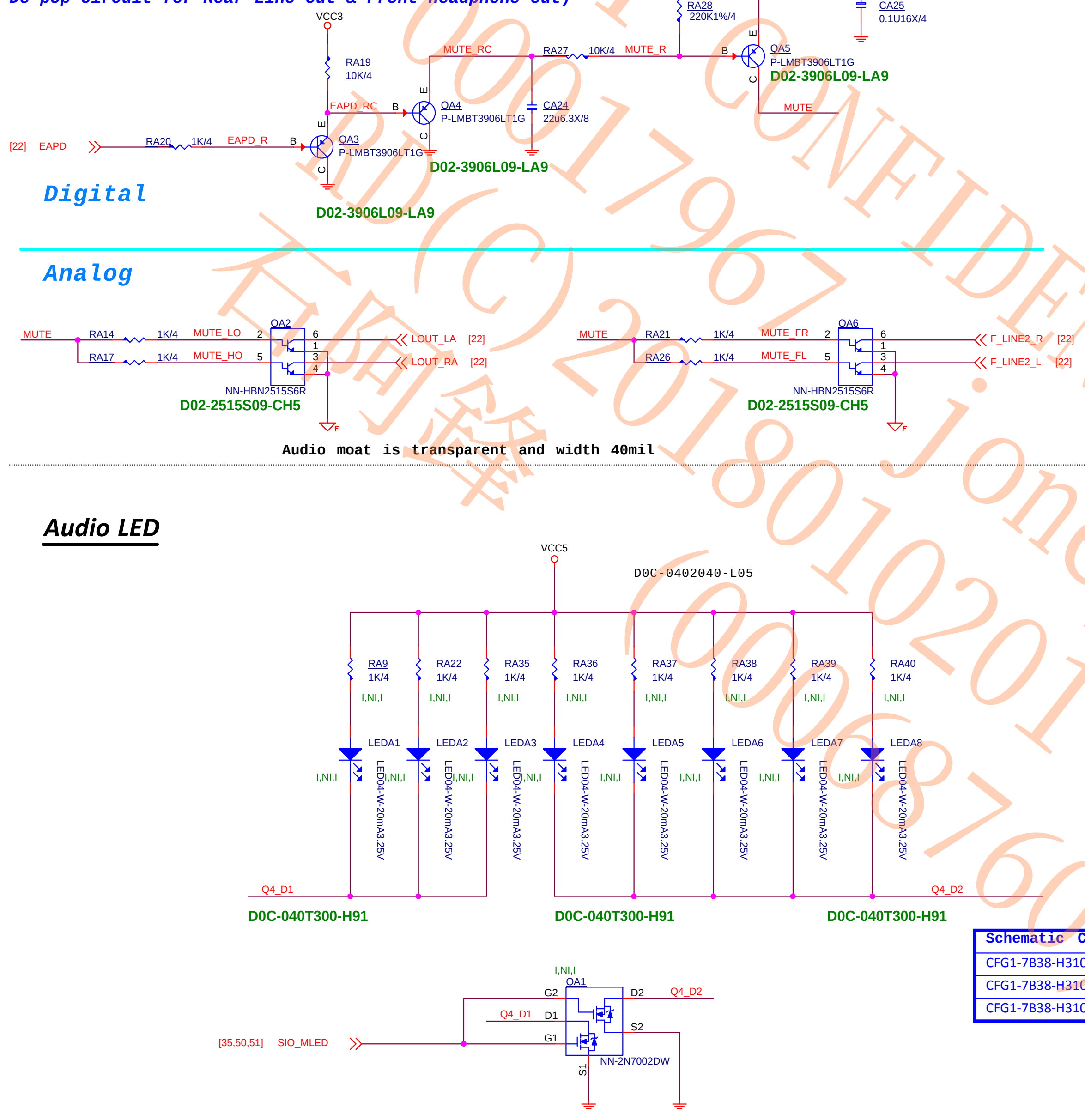
MS-7B28

Size	Document Description	Rev
Custom	AUDIO - ALC892/887	10/20/30

Date: Tuesday, December 12, 2017 Sheet 22 of 53

Rear Line OUT De-POP circuit

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



Schematic Cfg	Project	
CFG1-7B38-H310 (H310M GAMING PLUS) ver.1.0	V	A
CFG1-7B38-H310-APRO (H310-A Pro) ver.2.0	X	B
CFG1-7B38-H310 (H310-A GAMING ARCTIC) ver.3.0	V	C

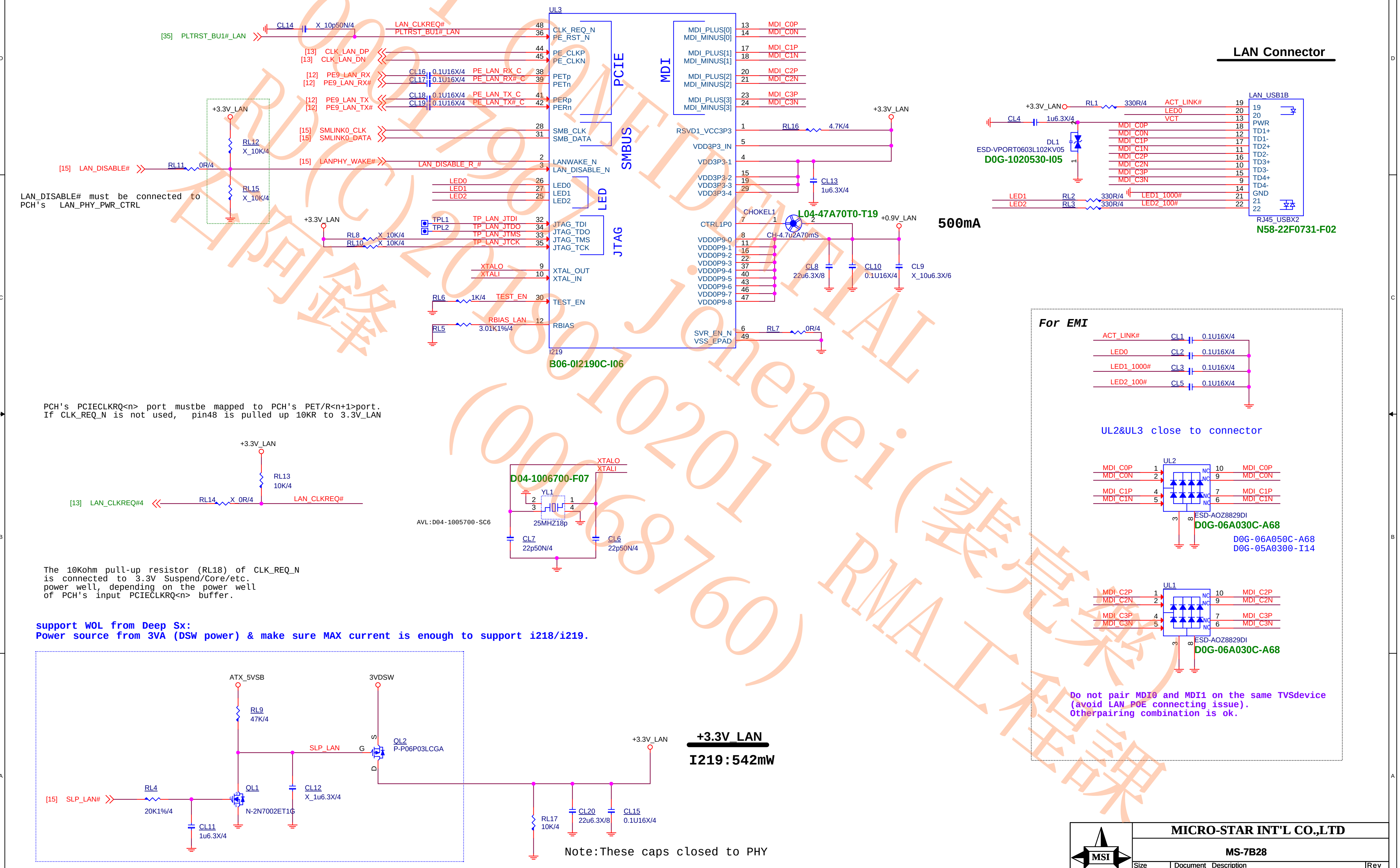
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: AUDIO - depop circuit | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 23 of 53

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.

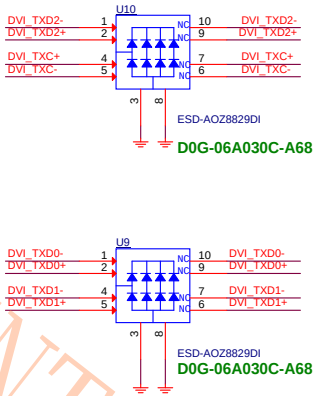
Do not pair MDI0 and MDI1 on the same TVSdevice (avoid LAN POE connecting issue). Otherpairing combination is ok.

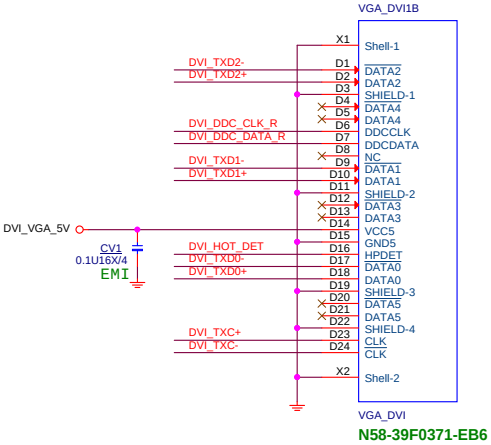
Note:These caps closed to PHY

MICRO-STAR INT'L CO.,LTD	
MS-7B28	
Size: Custom	Document Description: LAN - I219
Rev: 10/20/30	
Date: Tuesday, December 12, 2017	Sheet 24 of 53

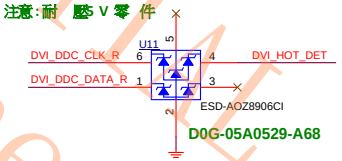
DVI level shifter

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

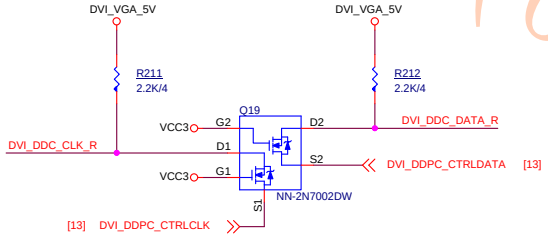




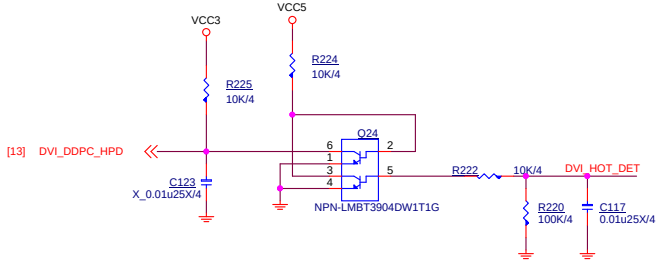
注意:耐壓5V零件

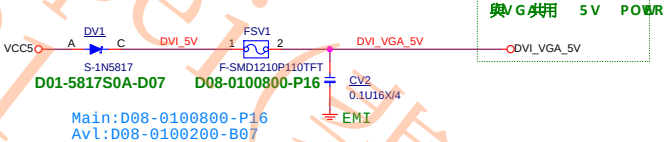


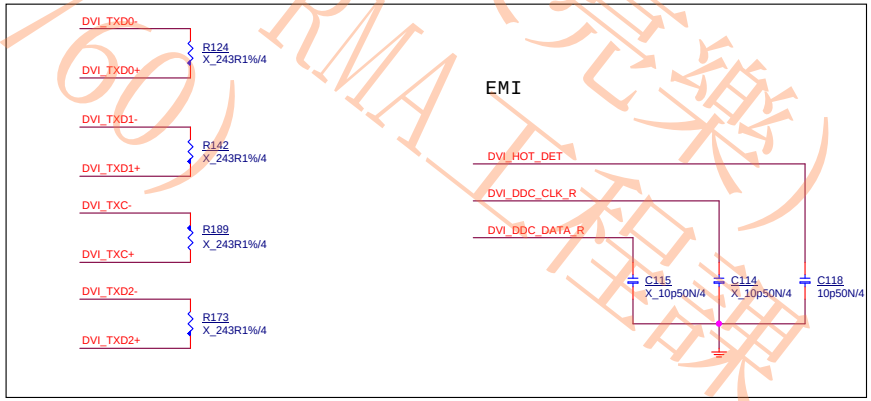
LEVEL SHIFT using I2C Repeater



HPD

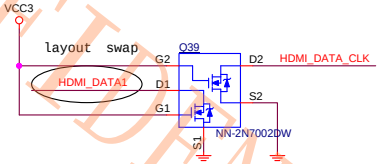


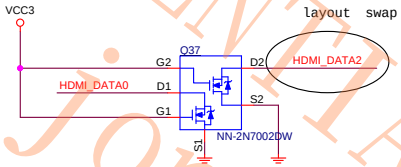


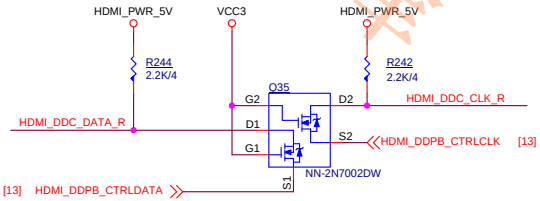


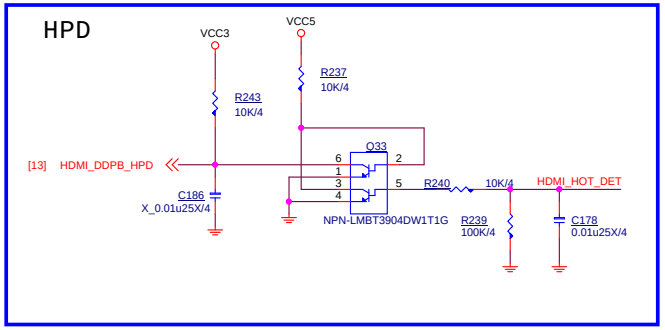
MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: DVI	Rev: 10/20/30
Date: Tuesday, December 12, 2017	Sheet 25 of 53	

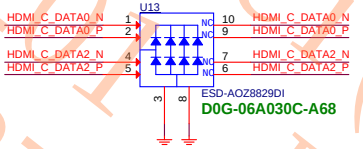
HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)

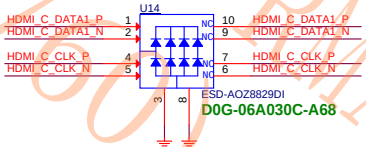


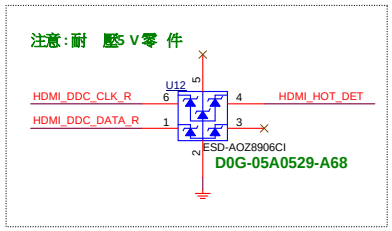


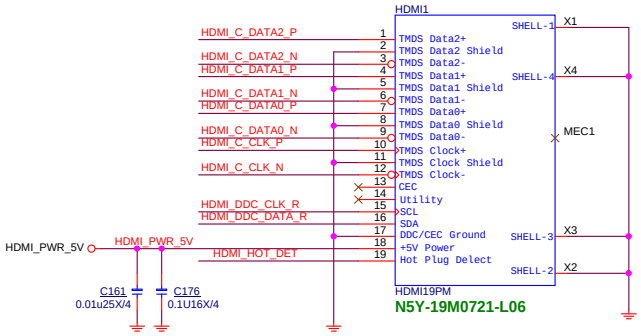


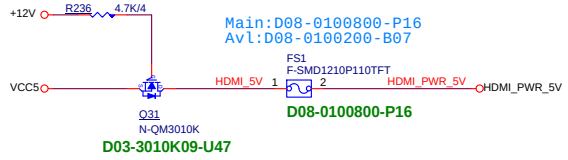




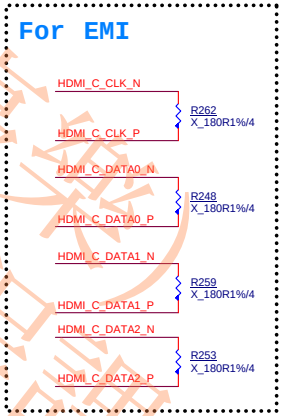






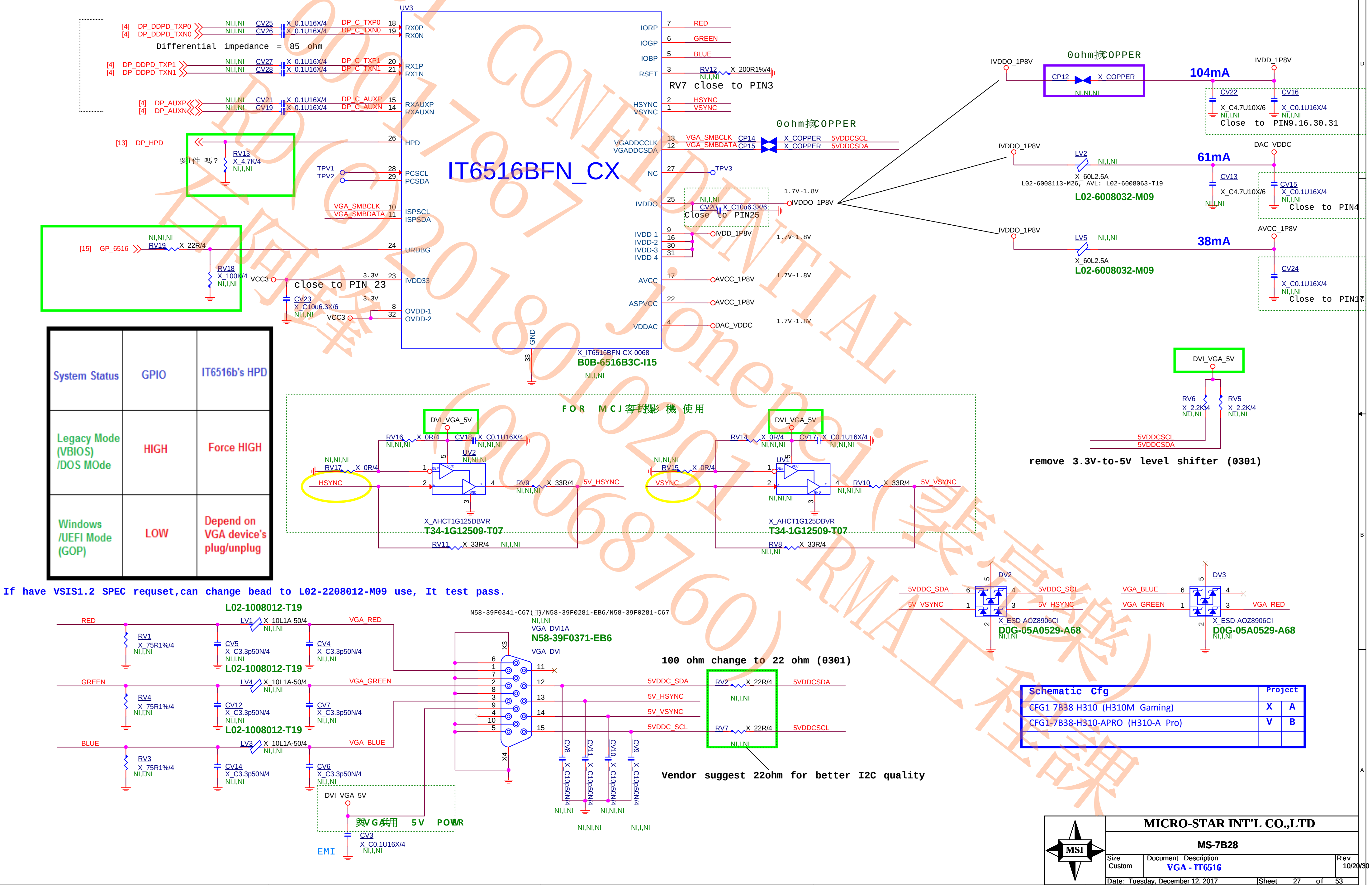


Main:D08-0100800-P16
Avl:D08-0100200-B07



MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: HDMI Connector	Rev: 10/20/30
Date: Tuesday, December 12, 2017	Sheet 26 of 53	

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

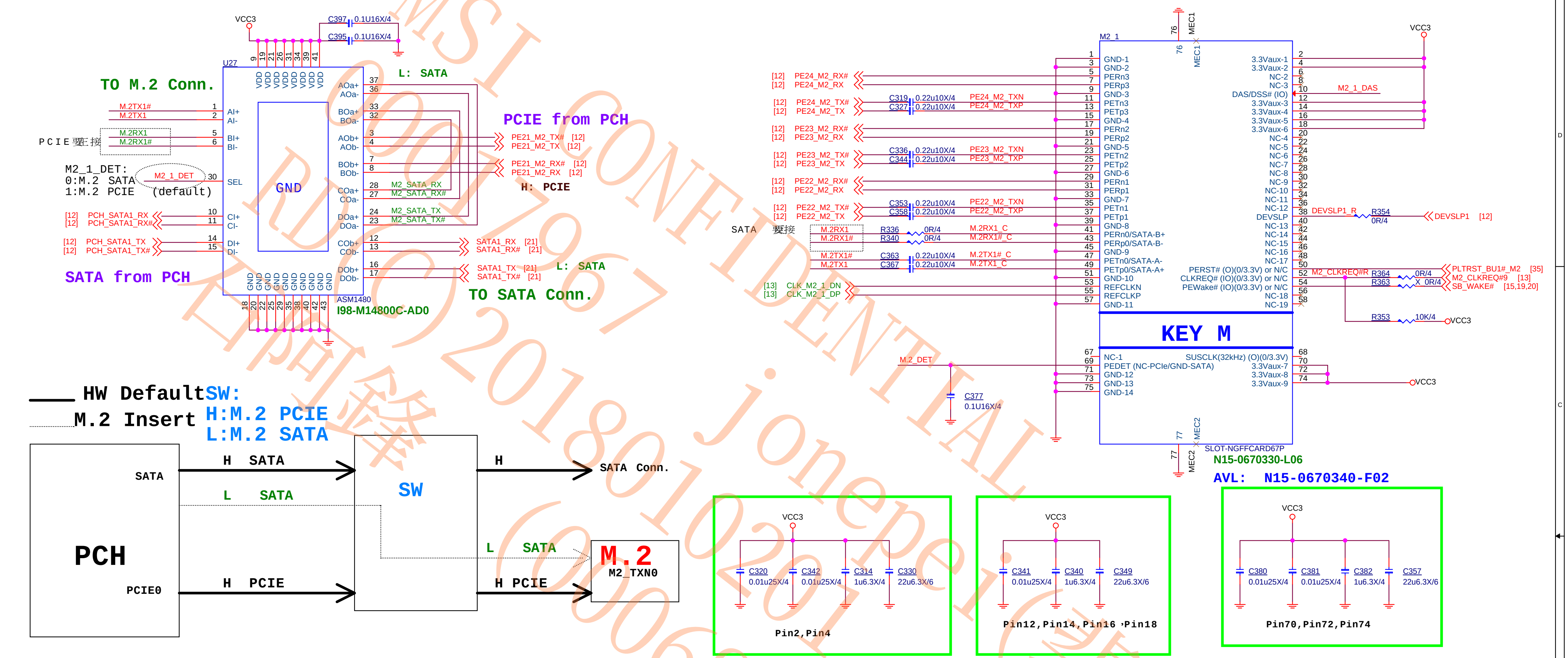


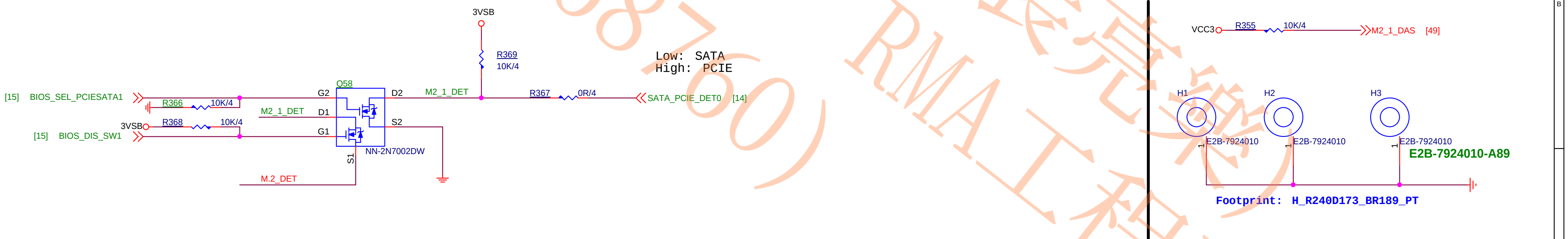
System Status	GPIO	IT6516b's HPD
Legacy Mode (VBIOS) /DOS MOde	HIGH	Force HIGH
Windows /UEFI Mode (GOP)	LOW	Depend on VGA device's plug/unplug

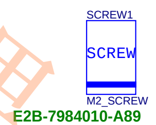
If have VSIS1.2 SPEC requset,can change bead to L02-2208012-M09 use, It test pass.

Schematic Cfg	Project	
CFG1-7B38-H310 (H310M Gaming)	X	A
CFG1-7B38-H310-APRO (H310-A Pro)	V	B

MICRO-STAR INT'L CO.,LTD
MS-7B28
Size: Custom — Document Description: VGA - IT6516 — Rev 10/20/30
Date: Tuesday, December 12, 2017 — Sheet 27 of 53







GPP_H14	GPP_H13	BIOS_MODE
BIOS_DIS_SW1	BIOS_SEL_PCIESATA1	Mode
0	1	M2-SATA
0	0	M2-PCIE
GPI	GPI	AUTO

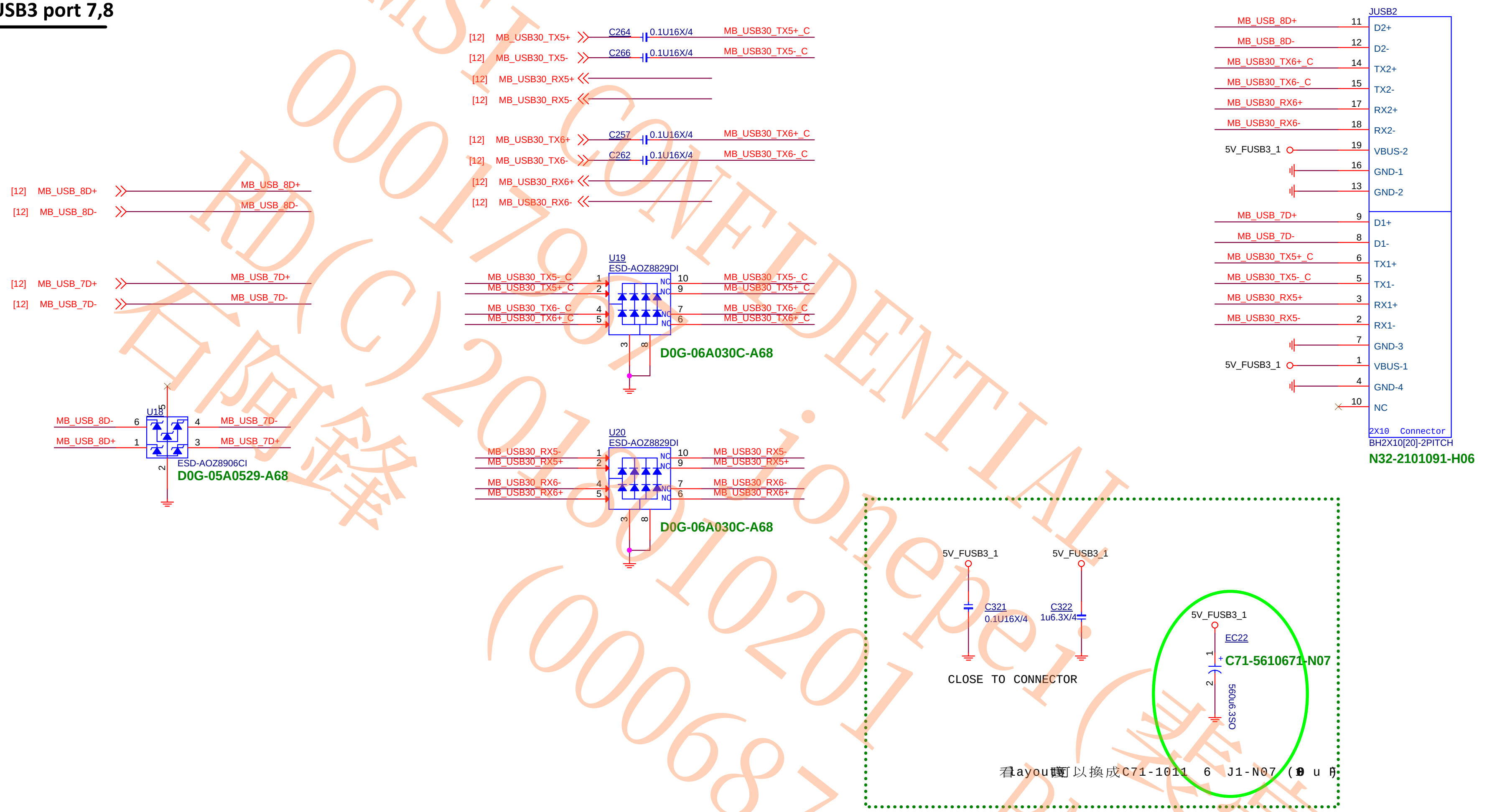
MICRO-STAR INT'L CO.,LTD

MS-7B28

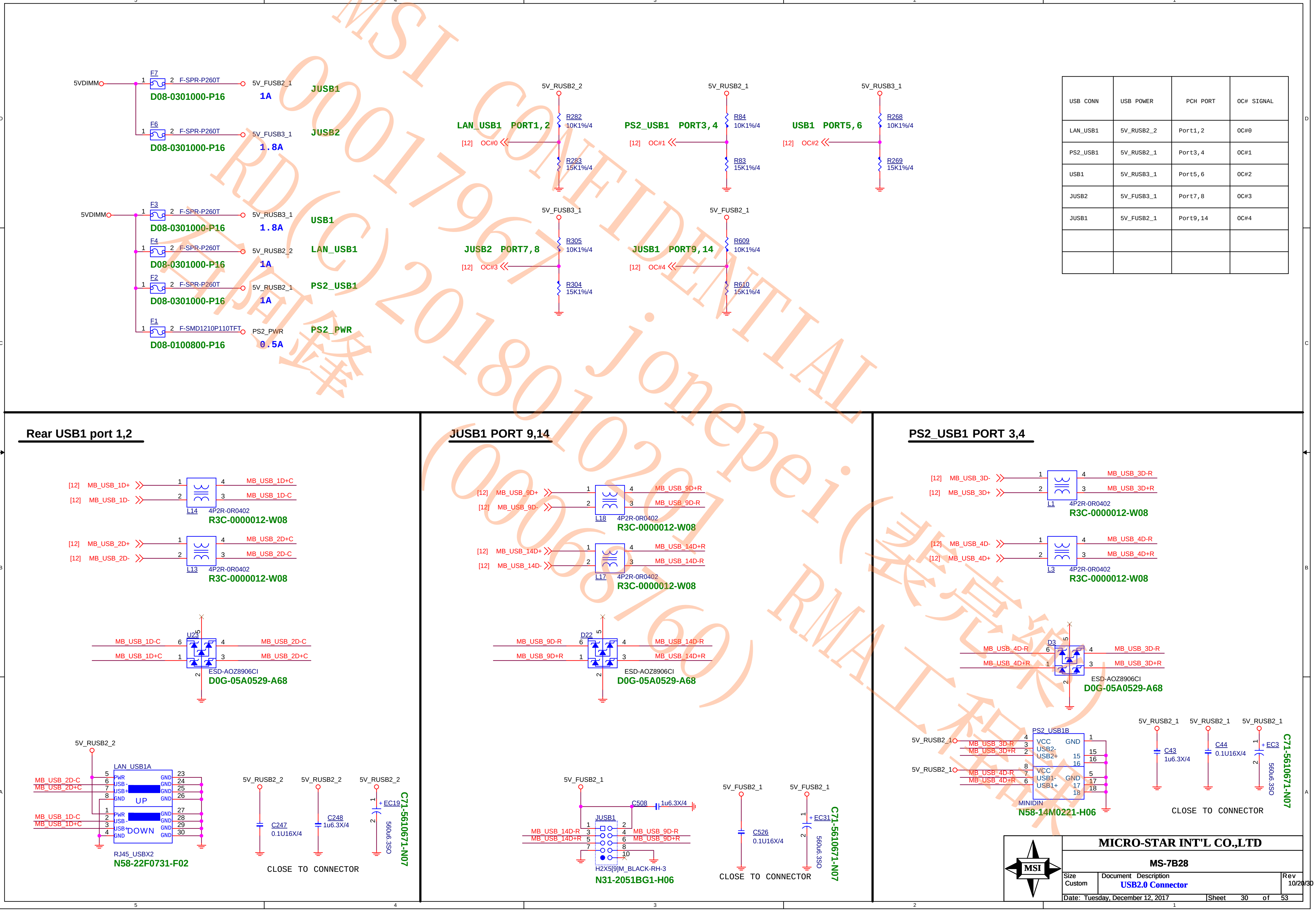
Size	Document Description	Rev
Custom	M.2-SLOT1	10/20/30

Date: Tuesday, December 12, 2017 Sheet 28 of 53

Front JUSB3 port 7,8



MICRO-STAR INT'L CO.,LTD	
MS-7B28	
Size: Custom	Document Description: Front USB3.0 Connector
Rev: 10/20/30	
Date: Tuesday, December 12, 2017	Sheet 29 of 53



USB CONN	USB POWER	PCH PORT	OC# SIGNAL
LAN_USB1	5V_RUSB2_2	Port1,2	OC#0
PS2_USB1	5V_RUSB2_1	Port3,4	OC#1
USB1	5V_RUSB3_1	Port5,6	OC#2
JUSB2	5V_FUSB3_1	Port7,8	OC#3
JUSB1	5V_FUSB2_1	Port9,14	OC#4

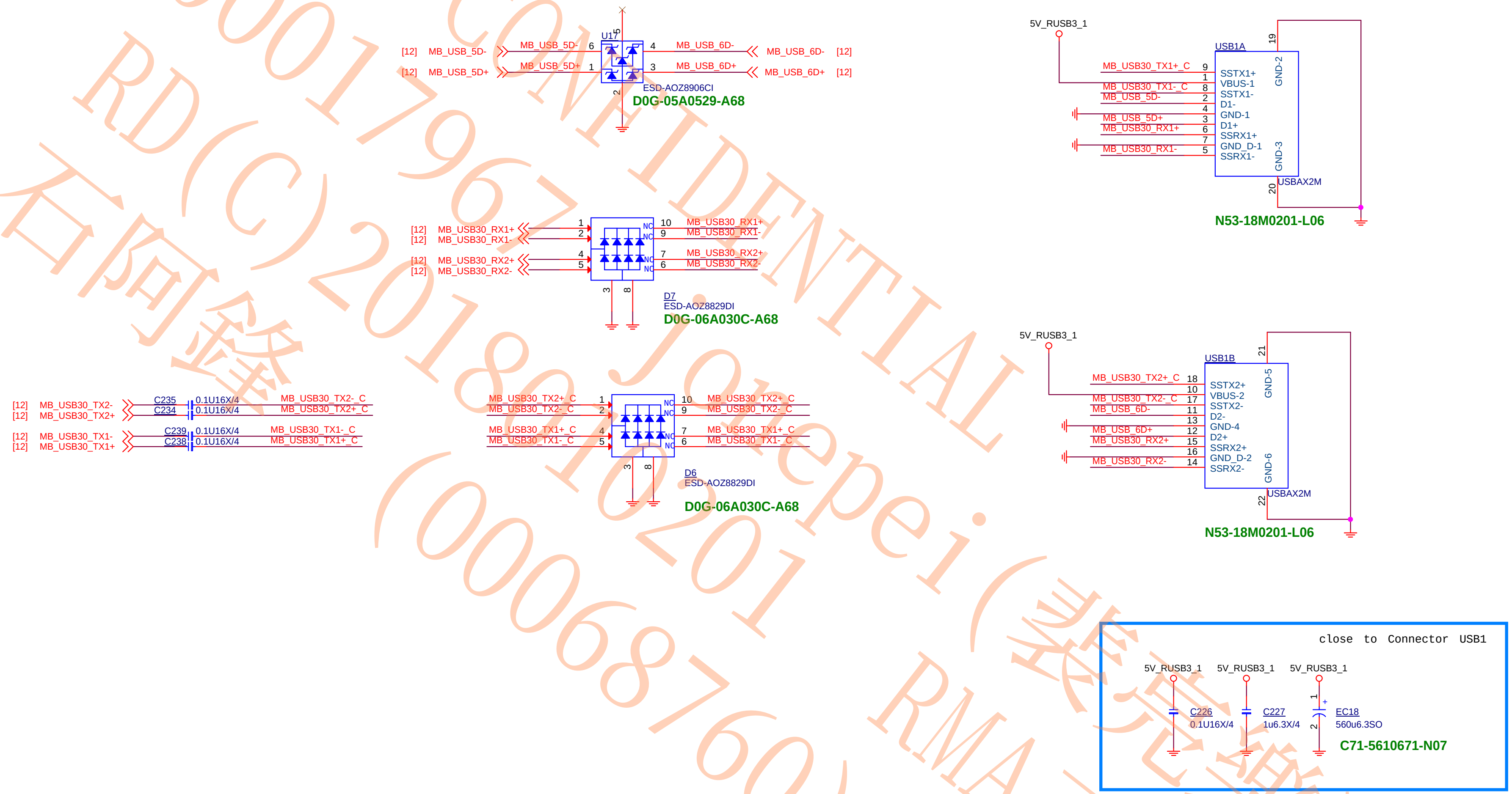
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom — Document Description: USB2.0 Connector — Rev 10/20/30

Date: Tuesday, December 12, 2017 — Sheet 30 of 53

REAR USB1 Connect



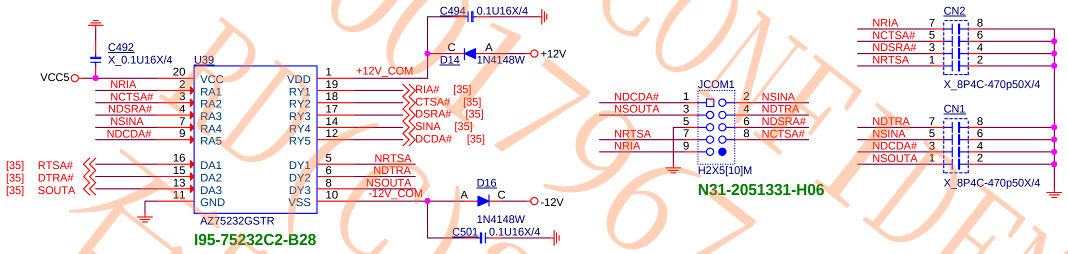
MICRO-STAR INT'L CO.,LTD

MS-7B28

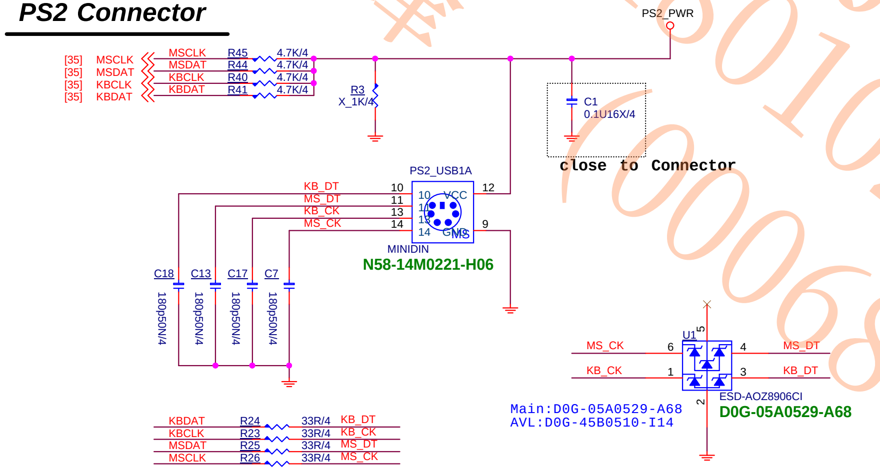
Size	Document Description	Rev
Custom	REAR USB1 Connect	10/20/30

Date: Tuesday, December 12, 2017 Sheet 31 of 53

SERIAL PORT 1



PS2 Connector



MICRO-STAR INT'L CO.,LTD

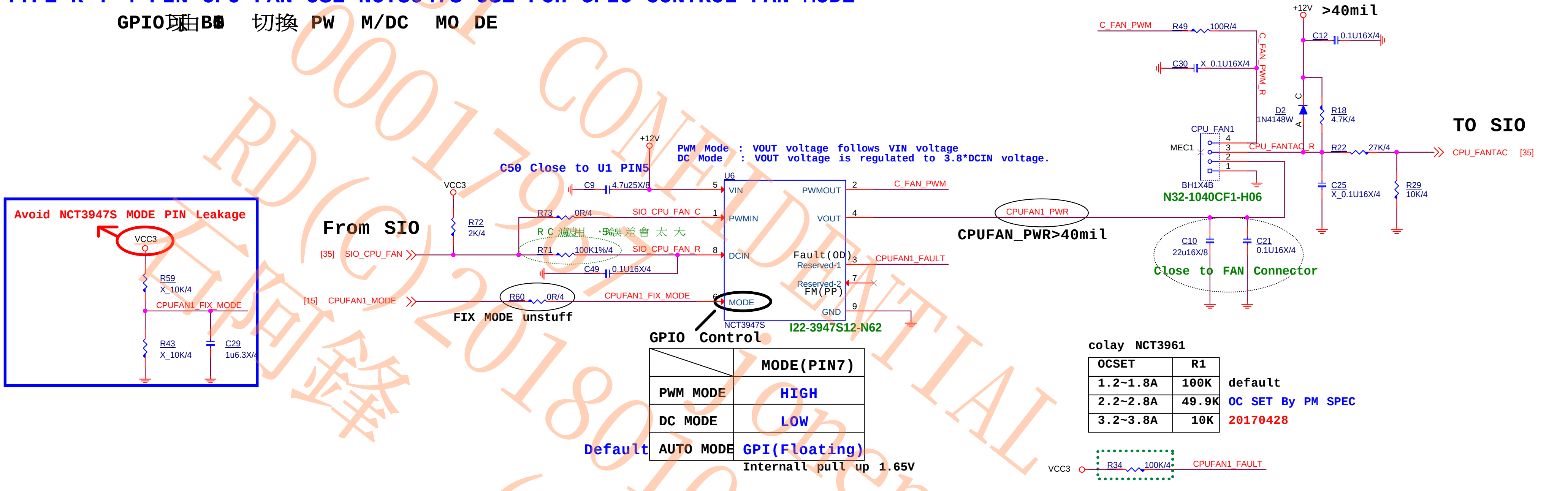
MS-7B28

Size	Document Description	Rev
Custom	SERIAL POR/PS2	10/20/30

Date: Tuesday, December 12, 2017 Sheet 32 of 53

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

GPIO球由B0 切換 PW M/DC MO DE



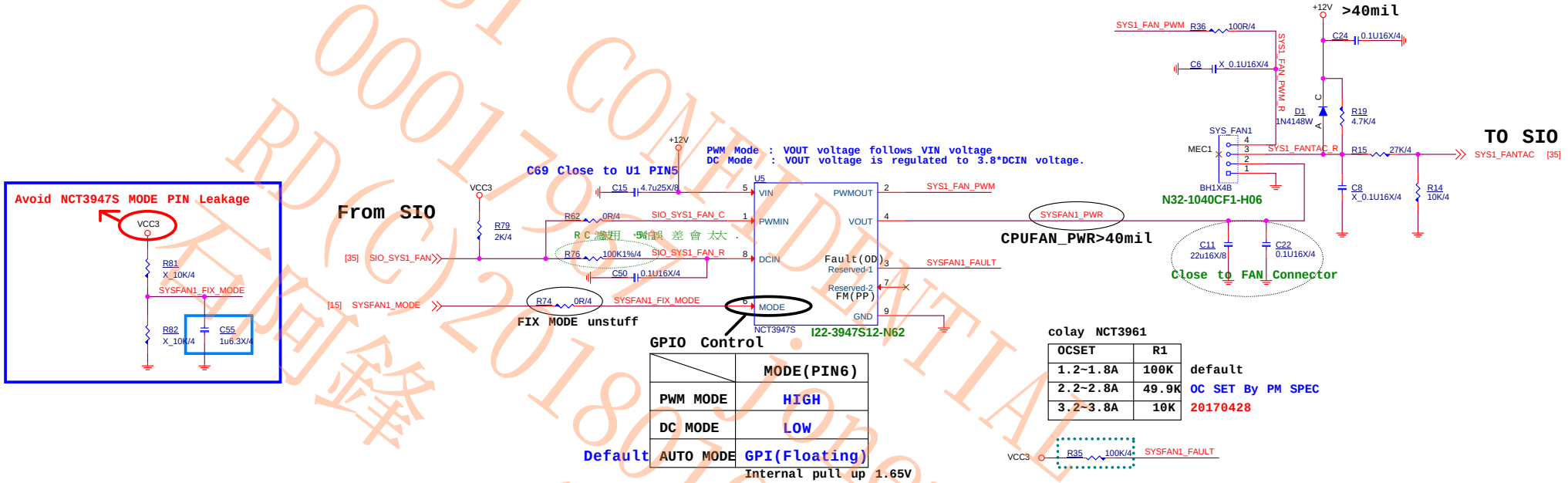
	MODE(PIN7)
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

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



GPIO Control

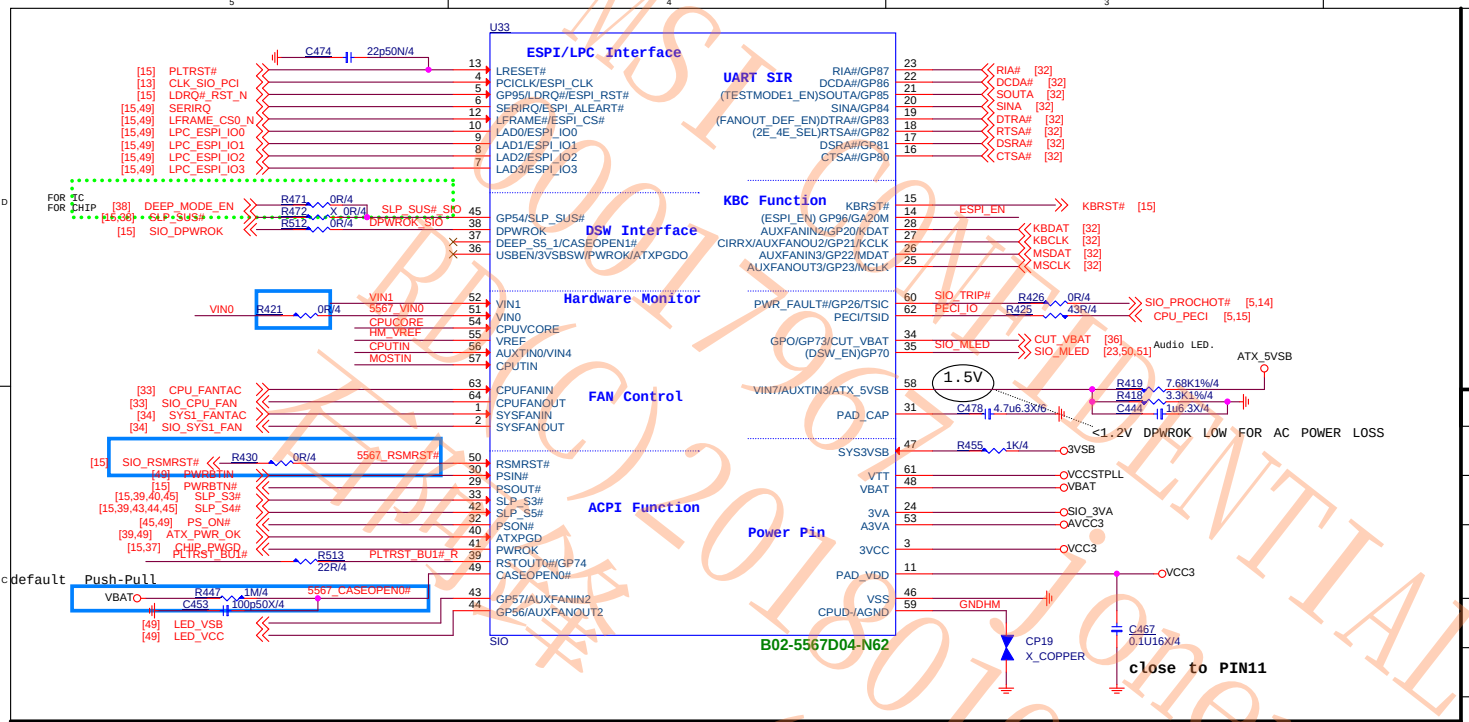
	MODE(PIN6)
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

Internal pull up 1.65V

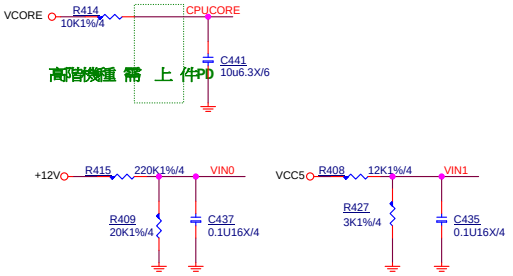
colay NCT3961

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

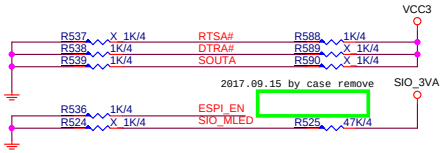
MICRO-STAR INT'L CO.,LTD	
MS-7B28	
Size: Custom	Document Description: SYSTEM FAN
Rev: 10/20/30	
Date: Tuesday, December 12, 2017	Sheet 34 of 53



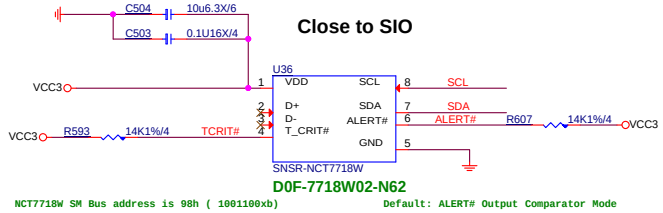
HW Monitor - Voltage

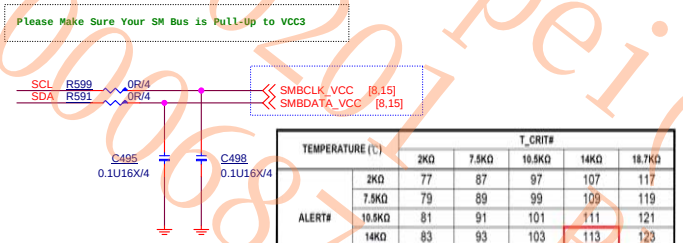


PIN	5567D NAME	Circuit NAME	0	1
18	2E_4E_SEL	RTSA#	I/O ADDRESS 2E	I/O ADDRESS 4E
19	FANOUT_DEF_EN	DTRA#	CPU FANOUT default RPM 50%.	CPU FANOUT default RPM 100%
21	TESTMODE1_EN	SOUTA	DISABLE TEST1MODE	ENABLE TEST1MODE
14	ESPI_EN	GA20M	ENABLE LPC	ENABLE ESPI
35	DSW_EN	DSW_EN	DISABLE	ENABLE DSW_EN



NCT7718W



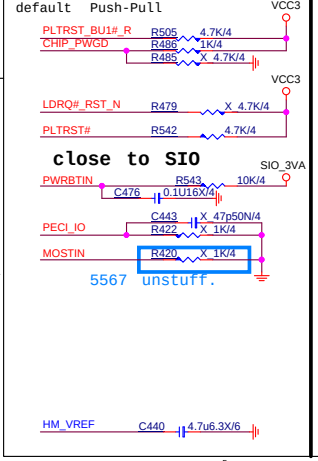


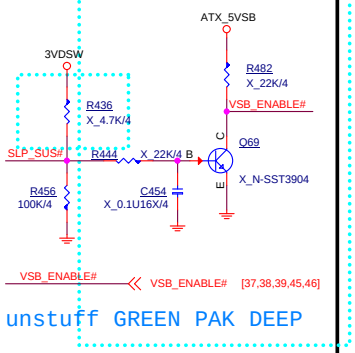
TEMPERATURE (℃)		T_CRIT#				
		2KΩ	7.5KΩ	10.5KΩ	14KΩ	18.7KΩ
ALERT#	2KΩ	77	87	97	107	117
	7.5KΩ	79	89	99	109	119
	10.5KΩ	81	91	101	111	121
	14KΩ	83	93	103	113	123
	18.7KΩ	85	95	105	115	125

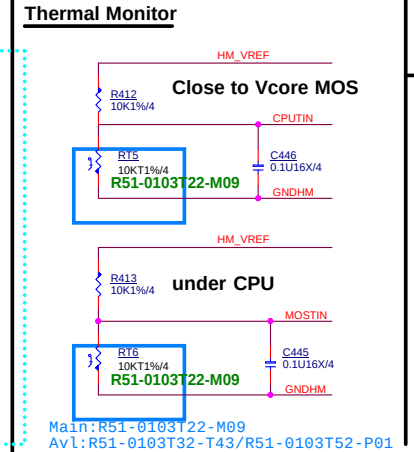
need near SIO

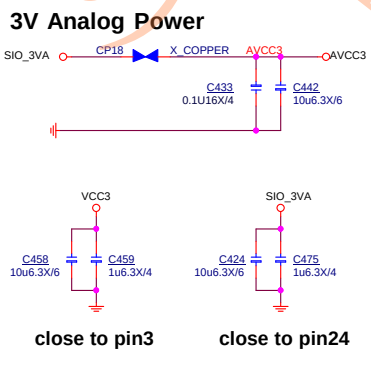
5567 colay 5565.

5567		5565
5567 Pin51		5565 Pin51
5567_VIN0	R428 X 0R/4 VIN1	
5567 Pin50		5565 Pin50
5567_RSMRST#	R429 X 0R/4 VIN0	
5567 Pin49		5565 Pin49
5567_CASEOPEN0#	R440 X 0R/4 SIO_RSMRST#	









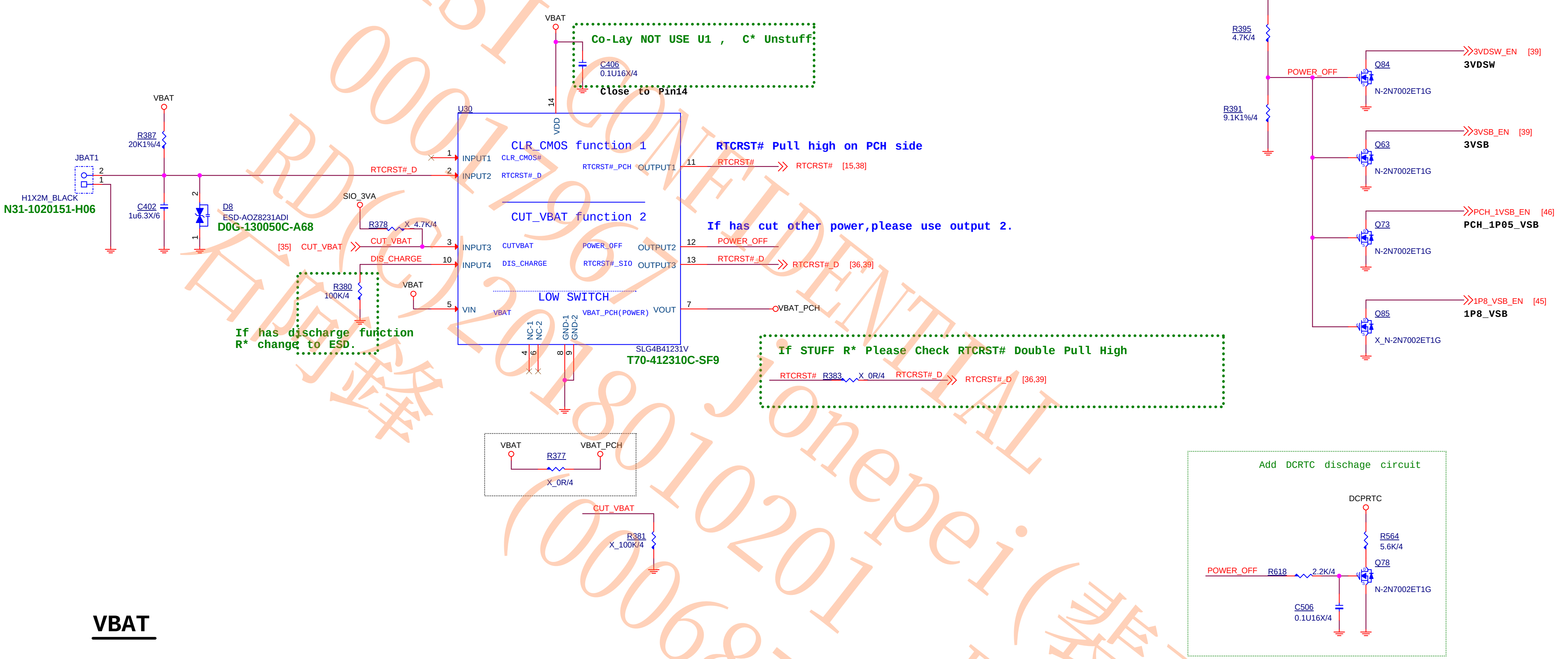
MICRO-STAR INT'L CO.,LTD

MS-7B28

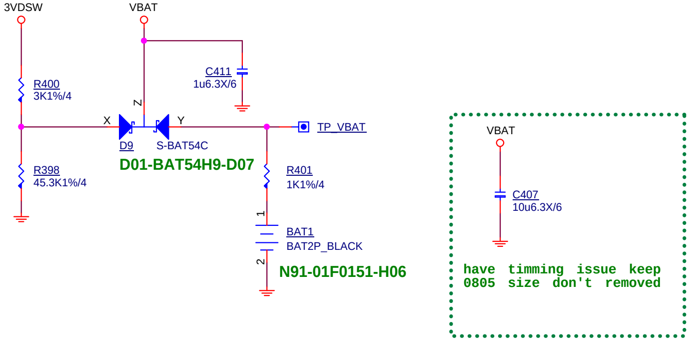
Size: Custom | Document Description: SIO NCT6797-1 | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 35 of 53

Cut VBAT



VBAT



Function 1

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

Function 2

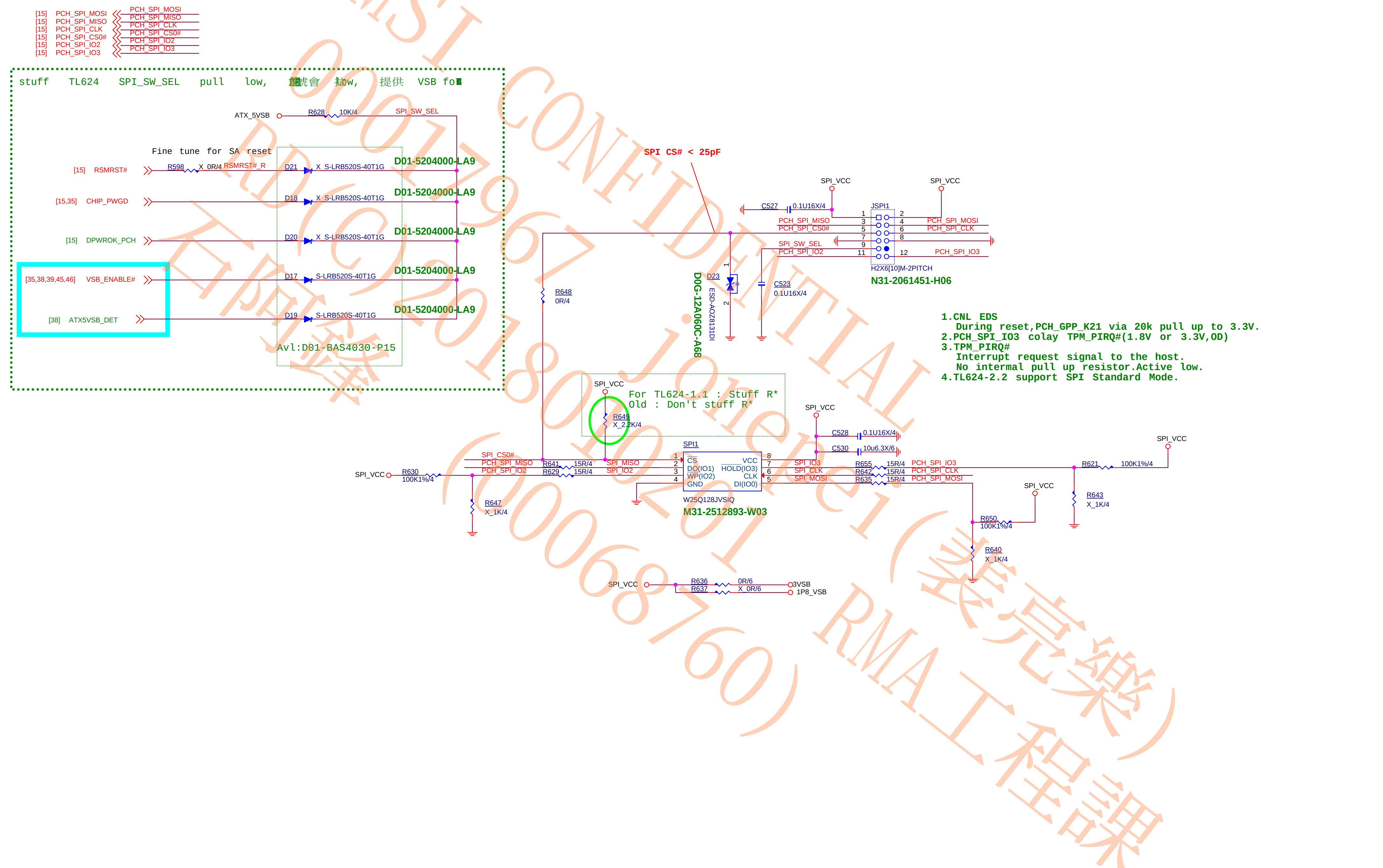
IN		OUT			
INPUT3 & lowswitch EN	INPUT4	OUTPUT2	OUTPUT3	VOUT	
0	0	0	1	1	Default
1	0	1	1	0 (discharge)	
0	1	1	0	0 (discharge)	
1	1	1	0	0 (discharge)	

MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: CUT VBAT circuit | Rev 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 36 of 53

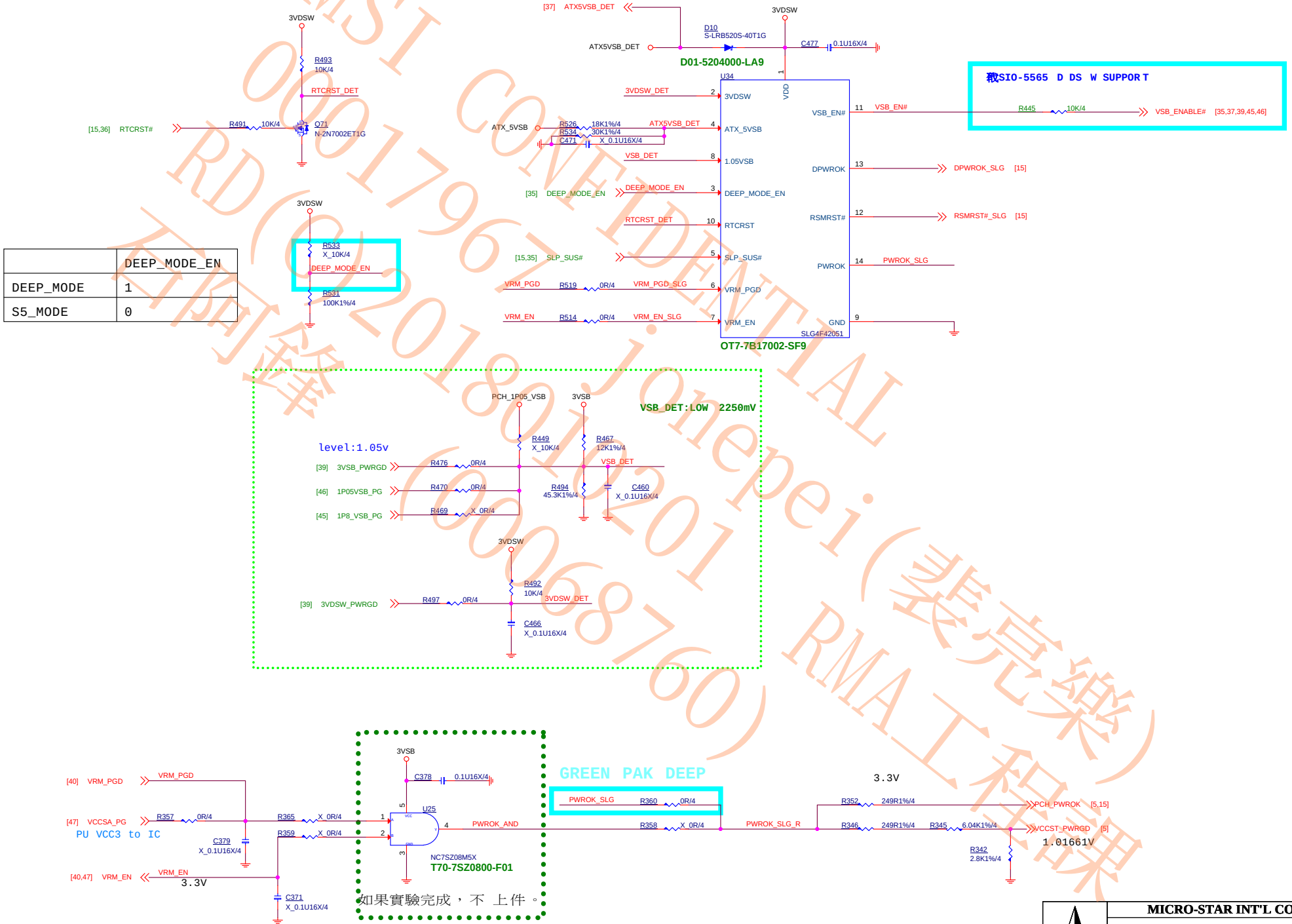


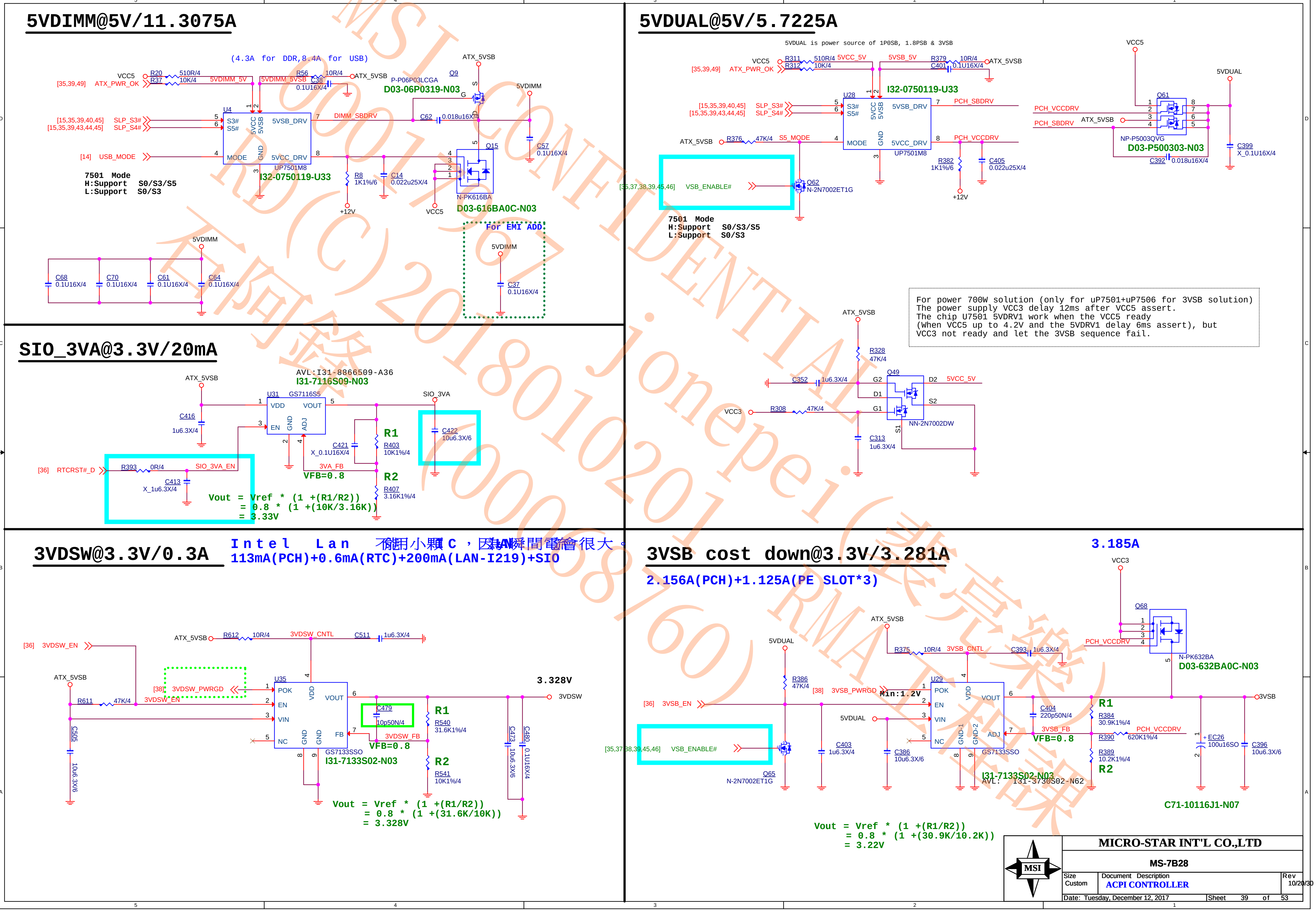
MICRO-STAR INT'L CO.,LTD

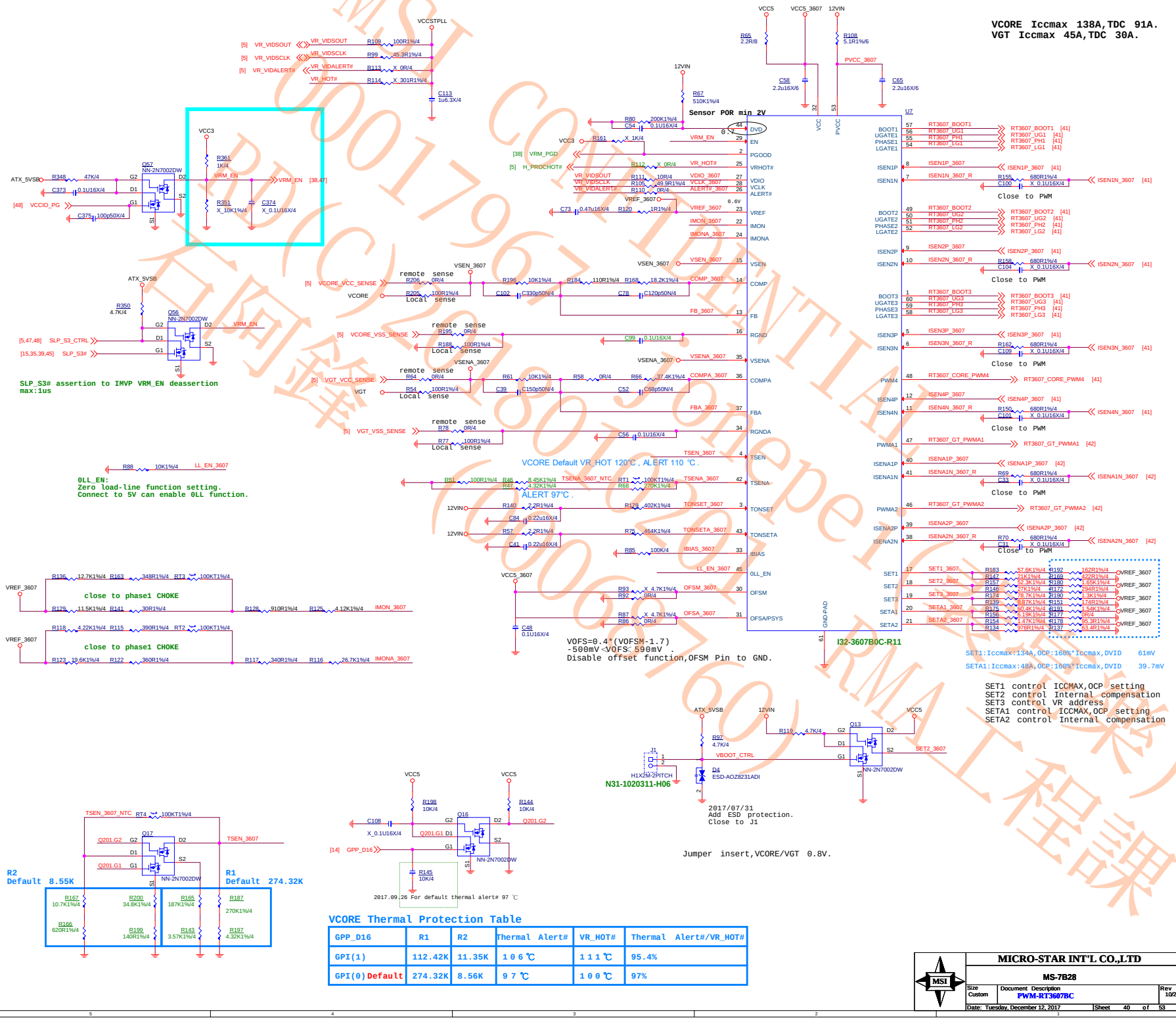
MS-7B28

Size	Document Description	Rev
Custom	BIOS ROM	10/20/30

Date: Tuesday, December 12, 2017 Sheet 37 of 53


3VDSW
R493
10K/4
RTCRST_DET
[15,36] RTCRST#
R491 10K/4
Q71
N-2N7002ET1G
[37] ATX5VSB_DET
D10
S-LRB520S-40T1G
ATX5VSB_DET
C477 0.1U16X/4
D01-5204000-LA9
U34
3VDSW_DET
3VDSW
ATX_5VSB
R526 18K1%/4
R534 30K1%/4
C471 X_0.1U16X/4
ATX5VSB_DET
VSB_DET
1.05VSB
[35] DEEP_MODE_EN
DEEP_MODE_EN
RTCRST_DET
RTCRST
[15,35] SLP_SUS#
SLP_SUS#
VRM_PGD R519 0R/4 VRM_PGD_SLG
VRM_PGD
VRM_EN R514 0R/4 VRM_EN_SLG
VRM_EN
VDD
GND
SLG4F42051
VSB_EN#
DPWROK
RSMRST#
PWROK
11 VSB_EN#
13 DPWROK_SLG [15]
12 RSMRST#_SLG [15]
14 PWROK_SLG
9
R445 10K/4
VSB_ENABLE# [35,37,39,45,46]
OT7-7B17002-SF9
R533
X_10K/4
DEEP_MODE_EN
R531
100K1%/4
DEEP_MODE_EN
DEEP_MODE
S5_MODE
1
0
PCH_1P05_VSB
3VSB
VSB_DET:LOW 2250mV
level:1.05v
R449
X_10K/4
R467
12K1%/4
[39] 3VSB_PWRGD
R476 0R/4
VSB_DET
[46] 1P05VSB_PG
R470 0R/4
R494
45.3K1%/4
C460
X_0.1U16X/4
[45] 1P8_VSB_PG
R469 X_0R/4
3VDSW
R492
10K/4
[39] 3VDSW_PWRGD
R497 0R/4
3VDSW_DET
C466
X_0.1U16X/4
3VSB
C378 0.1U16X/4
U25
NC7SZ08M5X
T70-7SZ0800-F01
GREEN PAK DEEP
[40] VRM_PGD
VRM_PGD
[47] VCCSA_PG
R357 0R/4
PU VCC3 to IC
R365 X_0R/4
R359 X_0R/4
C379
X_0.1U16X/4
[40,47] VRM_EN
VRM_EN
3.3V
C371
X_0.1U16X/4
PWROK_AND
PWROK_SLG
R360 0R/4
R358 X_0R/4
PWROK_SLG_R
3.3V
R352 249R1%/4
R346 249R1%/4
R345 6.04K1%/4
R342
2.8K1%/4
PCH_PWROK [5,15]
VCCST_PWRGD [5]
1.01661V
如果實驗完成，不 上件。
MICRO-STAR INT'L CO.,LTD
MS-7B28
Size Custom
Document Description
GREEN PAK DEEP
Rev 10/20/30
Date: Tuesday, December 12, 2017
Sheet 38 of 53


5VDIMM@5V/11.3075A
(4.3A for DDR,8.4A for USB)
7501 Mode
H:Support S0/S3/S5
L:Support S0/S3
I32-0750119-U33
D03-06P0319-N03
D03-616BA0C-N03
For EMI ADD
5VDUAL@5V/5.7225A
5VDUAL is power source of 1P0SB, 1.8PSB & 3VSB
I32-0750119-U33
D03-P500303-N03
7501 Mode
H:Support S0/S3/S5
L:Support S0/S3
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.
SIO_3VA@3.3V/20mA
AVL:I31-8866509-A36
I31-7116S09-N03
VFB=0.8
Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(10K/3.16K))
= 3.33V
3VDSW@3.3V/0.3A
Intel Lan
113mA(PCH)+0.6mA(RTC)+200mA(LAN-I219)+SIO
3.328V
I31-7133S02-N03
VFB=0.8
Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(31.6K/10K))
= 3.328V
3VSB cost down@3.3V/3.281A
3.185A
2.156A(PCH)+1.125A(PE SLOT*3)
D03-632BA0C-N03
Min:1.2V
VFB=0.8
I31-7133S02-N03
AVL: I31-3730S02-N62
C71-10116J1-N07
Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(30.9K/10.2K))
= 3.22V
MICRO-STAR INT'L CO.,LTD
MS-7B28
Size Custom
Document Description
ACPI CONTROLLER
Rev 10/20/30
Date: Tuesday, December 12, 2017
Sheet 39 of 53



VCORE Thermal Protection Table

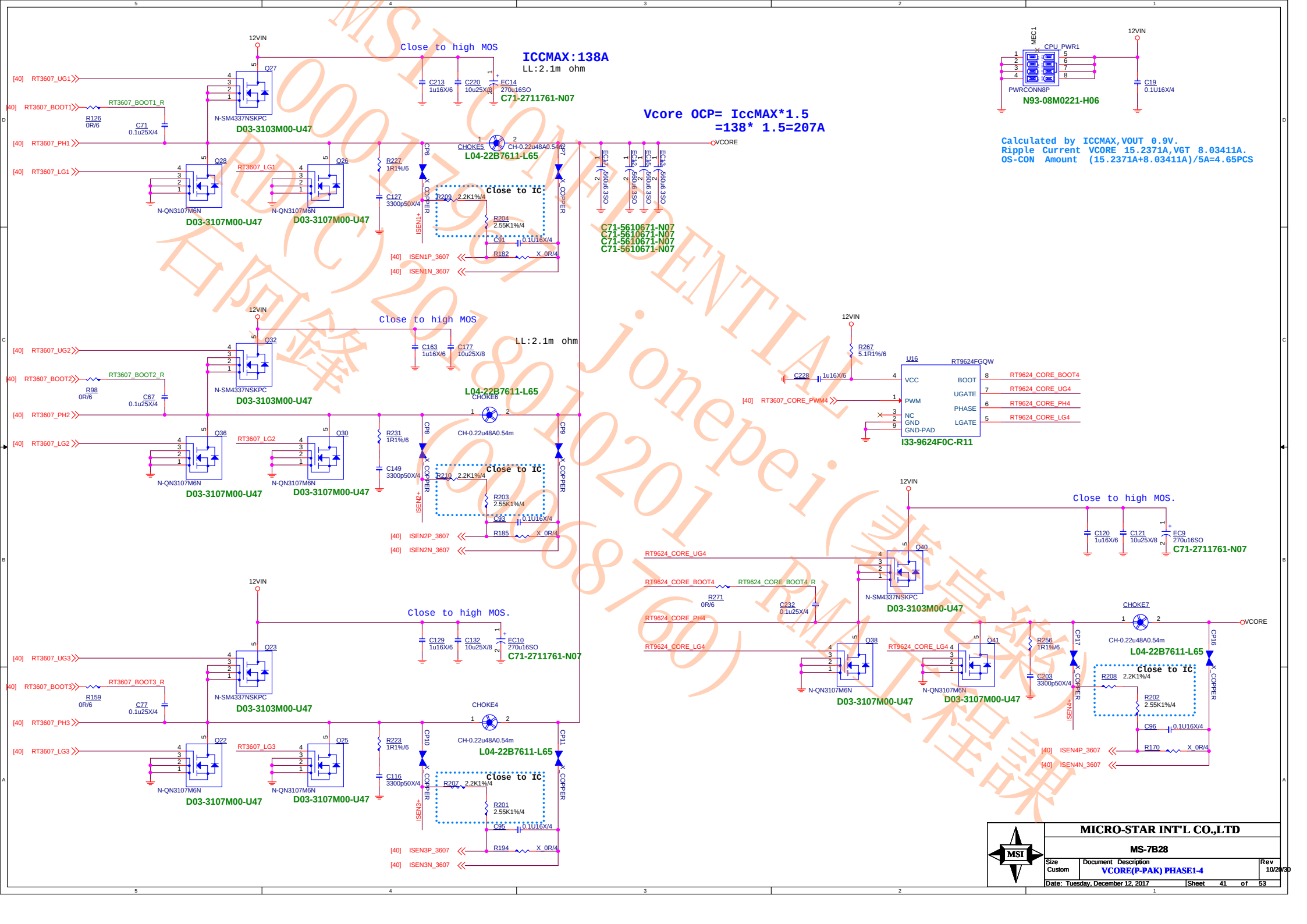
GPP_D16	R1	R2	Thermal Alert#	VR_HOT#	Thermal Alert#/VR_HOT#
GPI(1)	112.42K	11.35K	106℃	111℃	95.4%
GPI(0) Default	274.32K	8.56K	97℃	100℃	97%

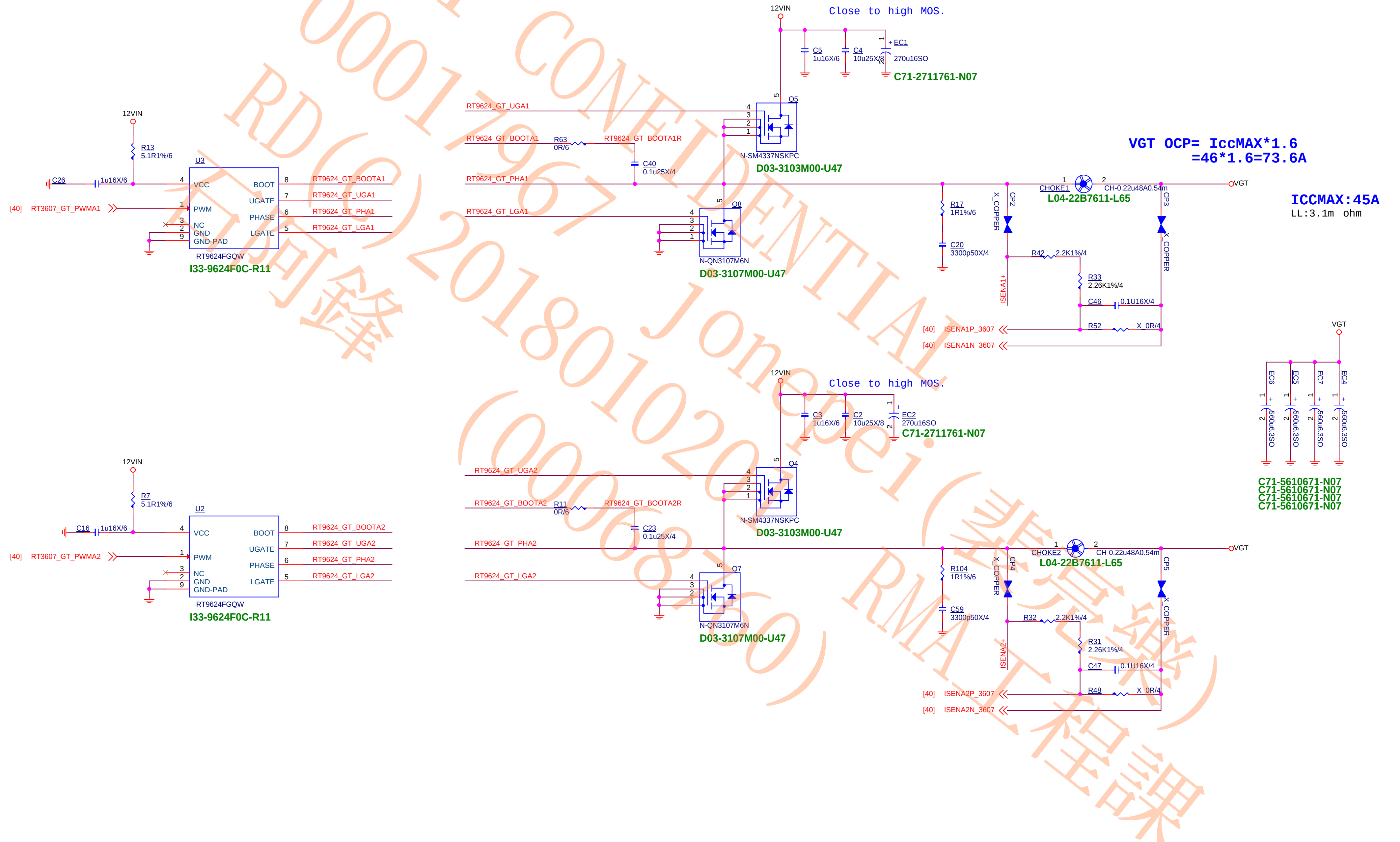
MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: PWM-RT3607BC | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 40 of 53


ICCMAX:138A
LL:2.1m ohm
Vcore OCP= IccMAX*1.5
=138* 1.5=207A
Calculated by ICCMAX,VOUT 0.9V.
Ripple Current VCORE 15.2371A,VGT 8.03411A.
OS-CON Amount (15.2371A+8.03411A)/5A=4.65PCS
Close to high MOS
Close to high MOS.
Close to IC
12VIN
VCORE
CHOKE5
CHOKE6
CHOKE4
CHOKE7
L04-22B7611-L65
CH-0.22u48A0.54m
C71-2711761-N07
C71-5610671-N07
D03-3103M00-U47
D03-3107M00-U47
N-SM4337NSKPC
N-QN3107M6N
I33-9624F0C-R11
RT9624FGQW
N93-08M0221-H06
PWRCONN8P
MSI CONFIDENTIAL
MICRO-STAR INT'L CO.,LTD
MS-7B28
VCORE(P-PAK) PHASE1-4
Date: Tuesday, December 12, 2017
Sheet 41 of 53
Rev 10/20/30



MICRO-STAR INT'L CO.,LTD

MS-7B28

Size	Document Description	Rev
Custom	VGT(P-PAK) PHASE1-2	10/20/30

Date: Tuesday, December 12, 2017 Sheet 42 of 53

VCC_DDR@1.2V/11.525A

DDR4_1.2V 3.3A+ 7.85A+0.375A=11.525A

3.3A FOR CPU
10A FOR 2DIMM DDR4
0.375A FOR VTT_DDR

Rlimit = Llimit * Rds * 10 /5uA

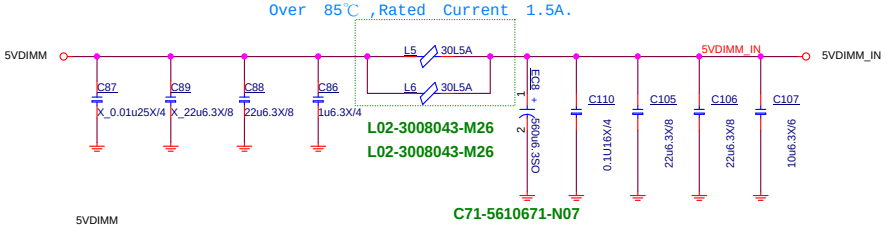
Rlimit = 14.9825*4*10/5

D03-632BA0C-N03
Current limit= 118K*5uA/10/4mohm)=14.75A

0.4V<=Rlimit *5uA<=3V

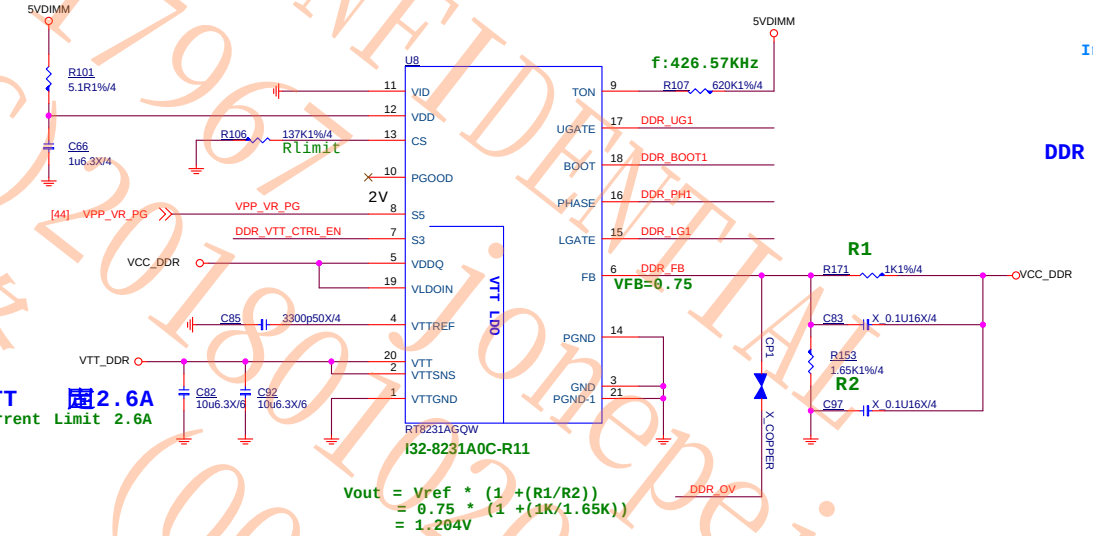
VID	Reference Voltage (V)
H	0.675
L	0.75

Input Current= (11.525A*1.2V)/5V/0.8=3.4575A
L02-3008043-M26
Over 85℃ ,Rated Current 1.5A.



Irms = Iout * SQRT((Vout/Vin) * (1-(Vout/Vin)))
=11.525* 0.427
= 4.921175A

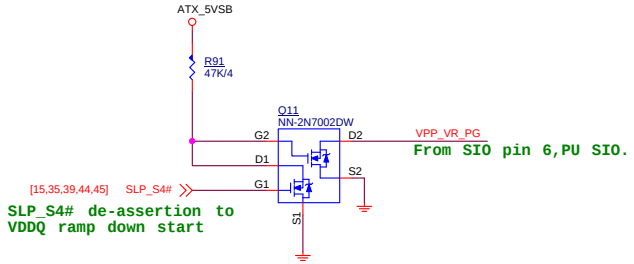
DDR OCP= R44*5uA/10/Dds(on)
138k*5uA/10/3m=23A
138k*5uA/10/4.6m=15A
MOS Rds(on)是3m~4.6m ohm



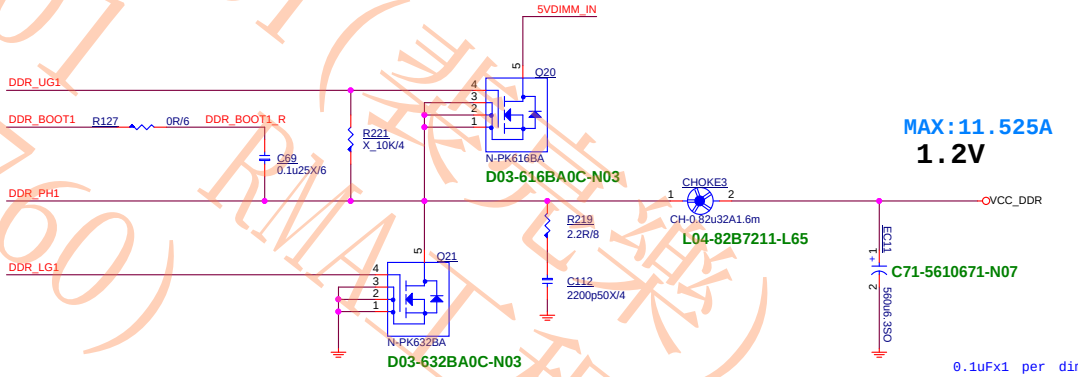
VTT 電流2.6A
Current Limit 2.6A

i32-8231A0C-R11

Vout = Vref * (1 +(R1/R2))
= 0.75 * (1 +(1K/1.65K))
= 1.204V

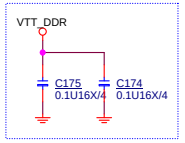


SLP_S4# de-assertion to
VDDQ ramp down start

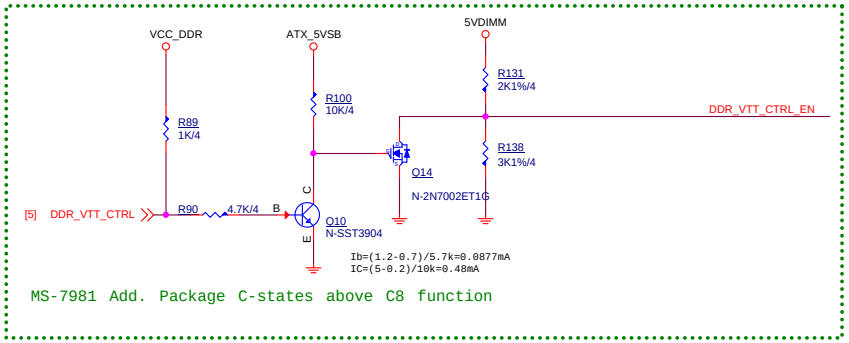


MAX:11.525A
1.2V

0.1uFx1 per dimm

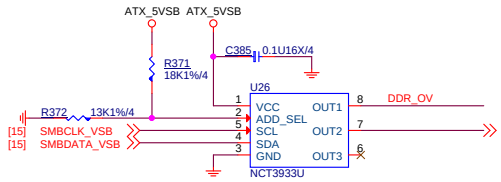


VPP ramp down after VDDQ ramp down



UPI VOLTAGE CONSOLE

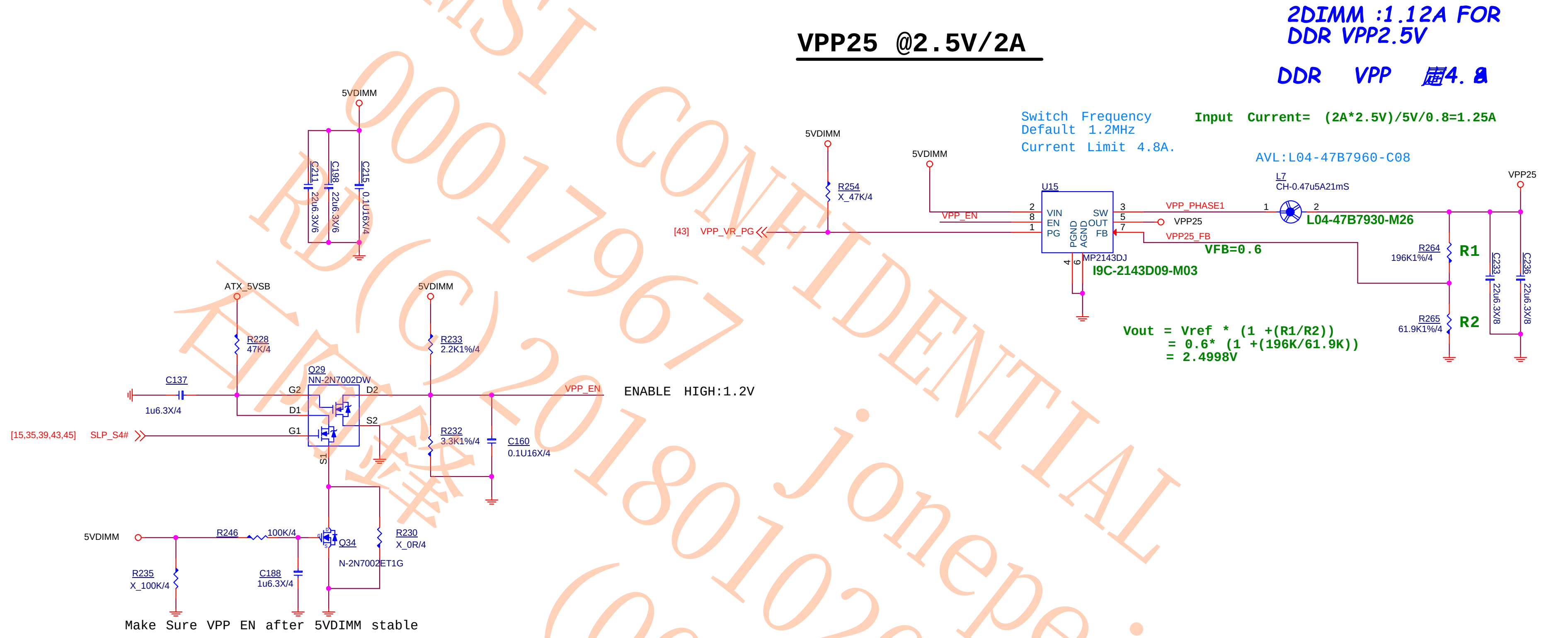
0x26:RH=18K,RL=13K



I34-3933U09-N62

MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: DDR-RT8231	Rev: 10/20/30
Date: Tuesday, December 12, 2017	Sheet 43 of 53	

VPP25 @2.5V/2A



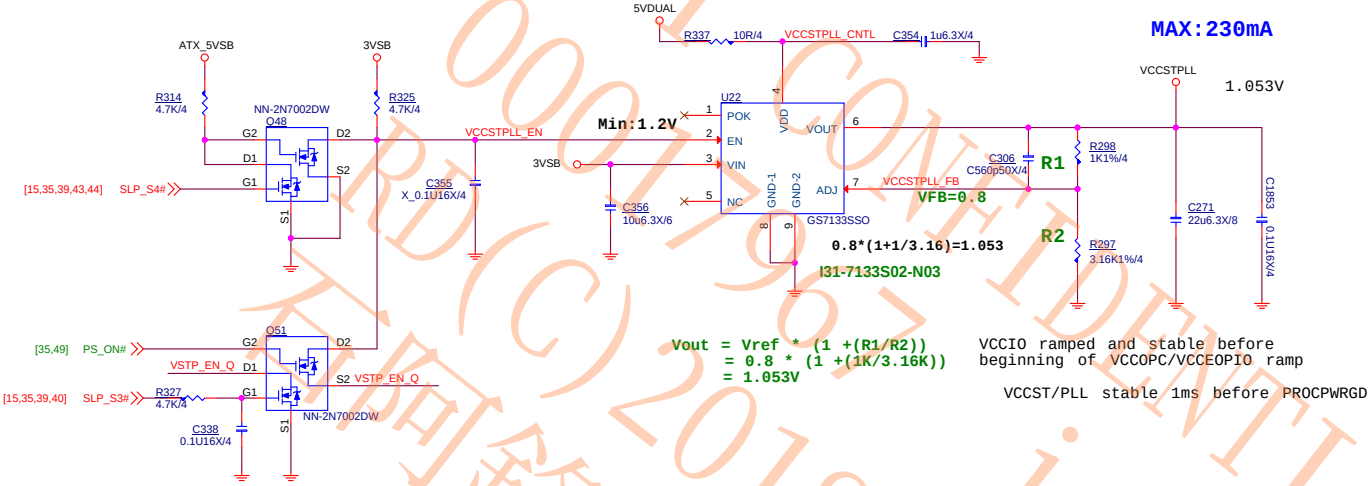
MICRO-STAR INT'L CO.,LTD

MS-7B28

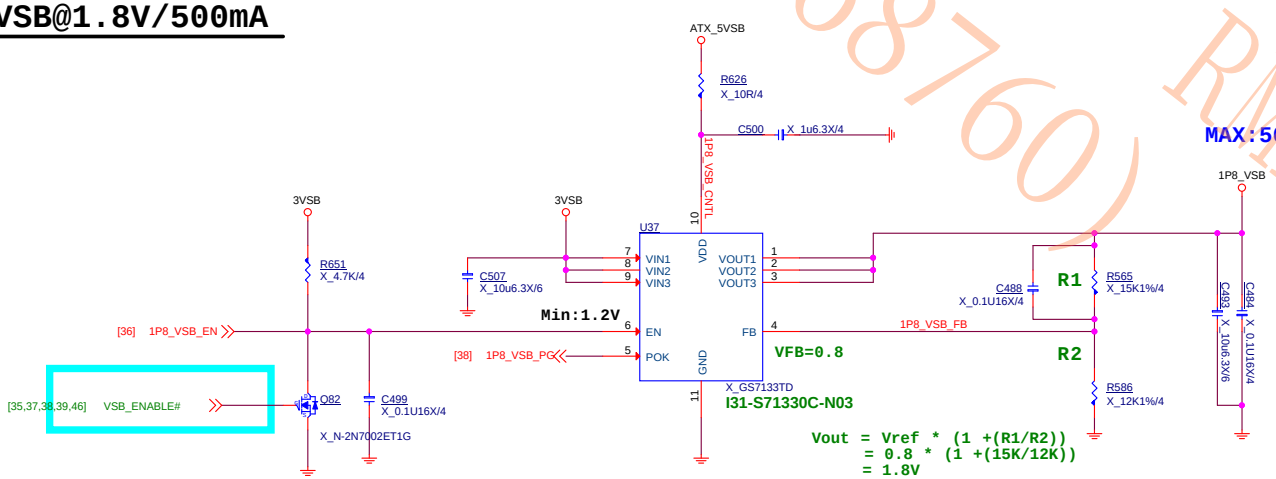
Size	Document Description	Rev
Custom	DDR-MP2143-VPP25	10/20/30

Date: Tuesday, December 12, 2017 Sheet 44 of 53

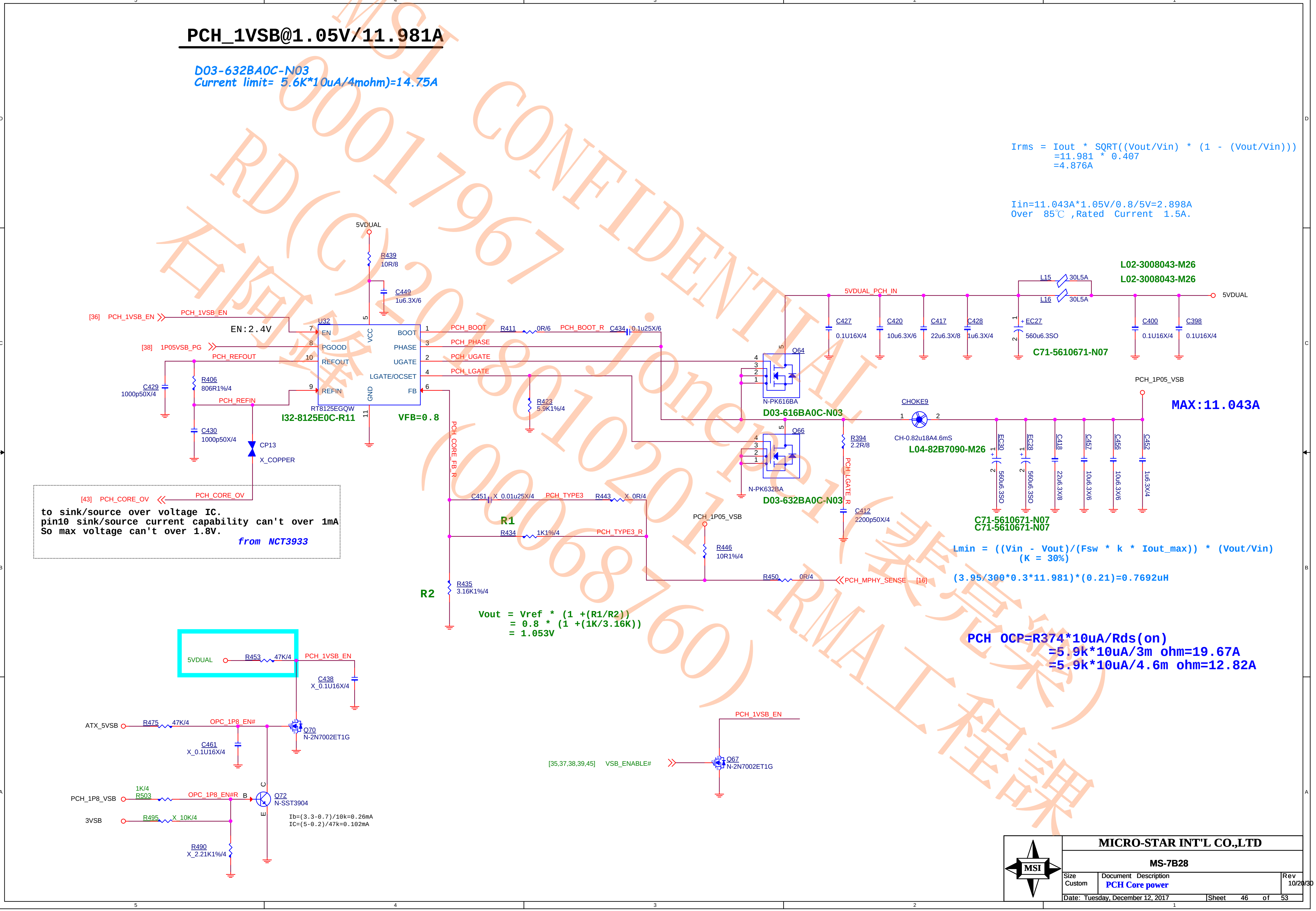
VCCSTPLL@1.05V/230mA



1P8_VSB@1.8V/500mA



MICRO-STAR INT'L CO.,LTD	
MS-7B28	
Size: Custom	Document Description: CPU PWR_ST/PLL
Rev: 10/20/30	
Date: Tuesday, December 12, 2017	Sheet 45 of 53



PCH_1VSB@1.05V/11.981A
D03-632BA0C-N03
Current limit= 5.6K*10uA/4mohm)=14.75A
Irms = Iout * SQRT((Vout/Vin) * (1 - (Vout/Vin)))
=11.981 * 0.407
=4.876A
Iin=11.043A*1.05V/0.8/5V=2.898A
Over 85℃ ,Rated Current 1.5A.
L02-3008043-M26
L02-3008043-M26
5VDUAL
5VDUAL_PCH_IN
L15 30L5A
L16 30L5A
C427 0.1U16X/4
C420 10u6.3X/6
C417 22u6.3X/8
C428 1u6.3X/4
EC27 560u6.3SO
C71-5610671-N07
C400 0.1U16X/4
C398 0.1U16X/4
R439 10R/8
C449 1u6.3X/6
[36] PCH_1VSB_EN
PCH_1VSB_EN
EN:2.4V
[38] 1P05VSB_PG
PCH_REFOUT
U32
EN
PGOOD
REFOUT
REFIN
VCC
GND
BOOT
PHASE
UGATE
LGATE/OCSET
FB
RT8125EGQW
I32-8125E0C-R11
VFB=0.8
PCH_BOOT
R411 0R/6
PCH_BOOT_R
C434 0.1u25X/6
PCH_PHASE
PCH_UGATE
PCH_LGATE
Q64
N-PK616BA
D03-616BA0C-N03
Q66
N-PK632BA
D03-632BA0C-N03
PCH_1P05_VSB
MAX:11.043A
CHOKE9
CH-0.82u18A4.6mS
L04-82B7090-M26
EC30 560u6.3SO
EC28 560u6.3SO
C418 22u6.3X/8
C457 10u6.3X/6
C456 10u6.3X/6
C452 1u6.3X/4
C71-5610671-N07
C71-5610671-N07
R394 2.2R/8
PCH_LGATE_R
C412 2200p50X/4
R423 5.9K1%/4
C429 1000p50X/4
R406 806R1%/4
PCH_REFIN
C430 1000p50X/4
CP13
X_COPPER
[43] PCH_CORE_OV
PCH_CORE_OV
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
PCH_CORE_FB_R
C451 X_0.01u25X/4
PCH_TYPE3
R443 X_0R/4
R1
R434 1K1%/4
PCH_TYPE3_R
PCH_1P05_VSB
R446 10R1%/4
R450 0R/4
PCH_MPHY_SENSE [16]
R2
R435 3.16K1%/4
Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(1K/3.16K))
= 1.053V
Lmin = ((Vin - Vout)/(Fsw * k * Iout_max)) * (Vout/Vin)
(K = 30%)
(3.95/300*0.3*11.981)*(0.21)=0.7692uH
PCH OCP=R374*10uA/Rds(on)
=5.9k*10uA/3m ohm=19.67A
=5.9k*10uA/4.6m ohm=12.82A
5VDUAL
R453 47K/4
PCH_1VSB_EN
C438 X_0.1U16X/4
ATX_5VSB
R475 47K/4
OPC_1P8_EN#
Q70 N-2N7002ET1G
C461 X_0.1U16X/4
PCH_1P8_VSB
1K/4 R503
OPC_1P8_EN#R
Q72 N-SST3904
3VSB
R495 X_10K/4
R490 X_2.21K1%/4
Ib=(3.3-0.7)/10k=0.26mA
IC=(5-0.2)/47k=0.102mA
PCH_1VSB_EN
[35,37,38,39,45] VSB_ENABLE#
Q67 N-2N7002ET1G
MICRO-STAR INT'L CO.,LTD
MS-7B28
Size Custom
Document Description
PCH Core power
Rev 10/20/30
Date: Tuesday, December 12, 2017
Sheet 46 of 53

VCCSA@1.05V/11.1A

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

Width: >20mil

+12V R324 10R/6 VCCSA_VCC C347 1u16X/6

VCC3 R335 10K/4

EN:VIH2.4V
EN pin Maximum:6.5V

[38] VCCSA_PG

U24 I32-8125E0C-R11
VCCSA_EN 7 EN
8 PGOOD
SA_REFOUT 10 REFOUT
9 REFIN
VCC 5
GND 11
BOOT 1 SA_BOOT1 R318 0R/6 C328 0.1u25X/4
PHASE 3 SA_PH1
UGATE 2 SA_UG1
LGATE/OCSET 4 SA_LG1
FB 6 SA_FB
RT8125EGQW
I32-8125E0C-R11

C348 1000p50X/4
R329 768R1%/4
SA_REFIN
C361 1000p50X/4

FB:0.8V

R1 R331 1K1%/4 VCCSA_SENSE_R R326 0R/4 VCCSA_SENSE [5]
C362 X_100p50N/4

VCCSA
R330 10R1%/4

R2 R332 3.16K1%/4

Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(1K/3.16K))
= 1.053V

+12V
L11 30L5A L02-3008043-M26
L12 30L5A L02-3008043-M26

+12V_SA

8/25 Add C487 GND connect to Low Side GND

C351 1u16X/6
C331 10u16X/8
C334 22u16X/8
C333 22u16X/8
C335 0.1U16X/4
C350 0.1u25X/6

SA_UG1 R316 0R/6 SA_UG1_R
Q50 N-PK616BA D03-616BA0C-N03

VCCSA 13 A
MAX:11.1A
1.05V,11.1A

SA_PH1
CHOKE8 CH-1.0u14A5.5mS L04-01073F0-M26
VCCSA

R2471 2.2R/8
C267 1u6.3X/4
C269 22u6.3X/8
C265 22u6.3X/8
EC21 560u6.3SO
EC20 560u6.3SO

SA_LG1
Q45 N-PK632BA D03-632BA0C-N03
R320 5.1K1%/4

snubber
SA_PH1_R
C1902 3300p50X/4
0908 stuff Snubber

Lmin = ((Vin - Vout)/(Fsw * k * Iout_max)) * (Vout/Vin)
= 0.5914uH (K = 30%)

2014.12.25
for up1540:R417 no stuff

ATX_5VSB R343 47K/4
+12V R334 26.1K1%/4

C364 0.1U16X/4 VCCSA_EN_G2
Q53 NN-2N7002DW
G2 D2 G1 D1 S2 S1
VCCSA_EN_G1
VCCSA_EN 3.3V

[38,40] VRM_EN R344 X_0R/4
[48] VCCIO_EN R341 0R/4

R339 10K1%/4
C360 X_0.1U16X/4

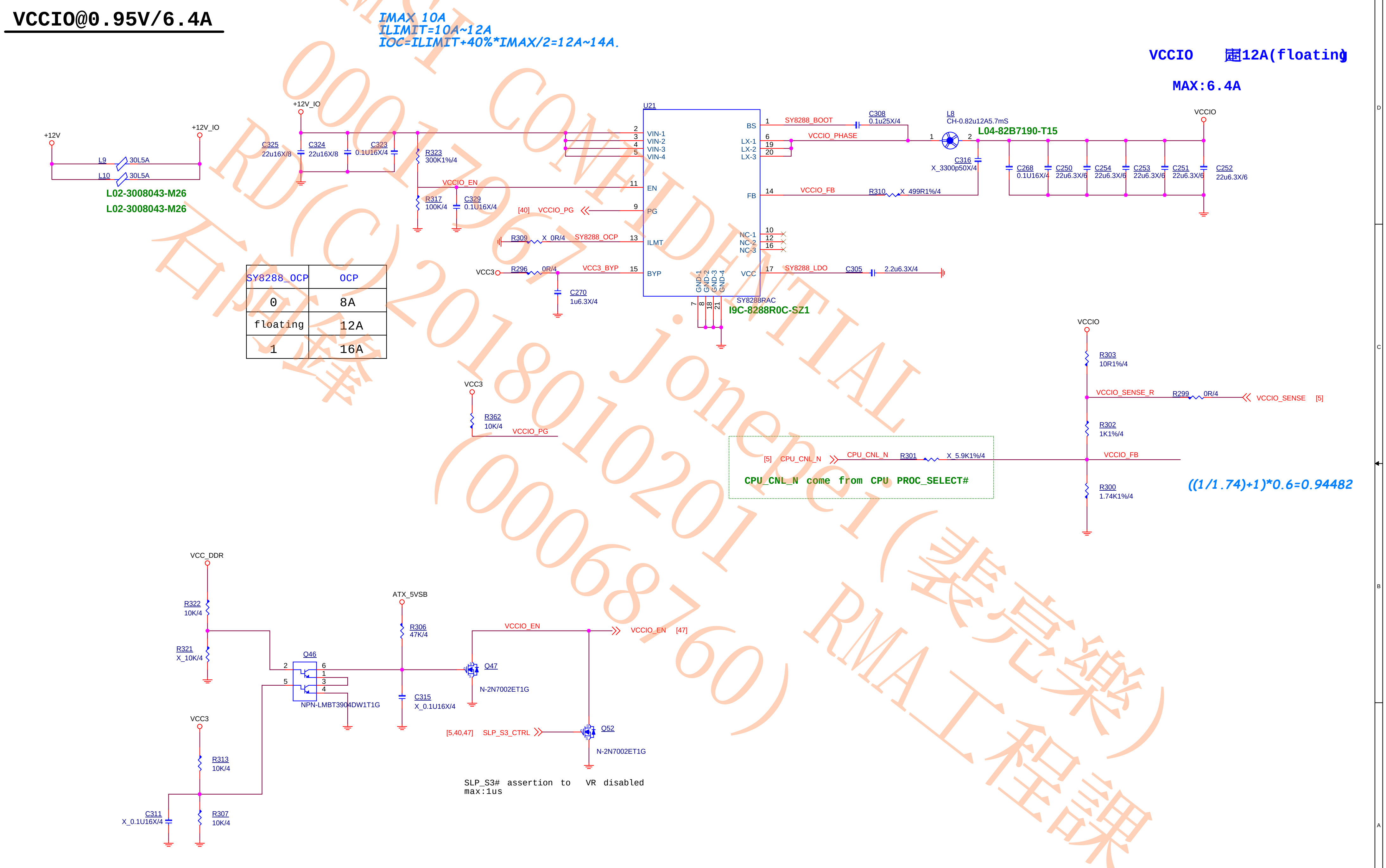
EN:VIH2.4V
EN pin Maximum:6.5V

VCCSA_EN
[5,40,48] SLP_S3_CTRL
Q54 N-2N7002ET1G

SLP_S3# assertion to VR disabled
max:1us

MICRO-STAR INT'L CO.,LTD
MS-7B28
Size: Custom
Document Description: VCCSA - POWER NB685GQ
Rev: 10/20/30
Date: Tuesday, December 12, 2017
Sheet 47 of 53

VCCIO@0.95V/6.4A



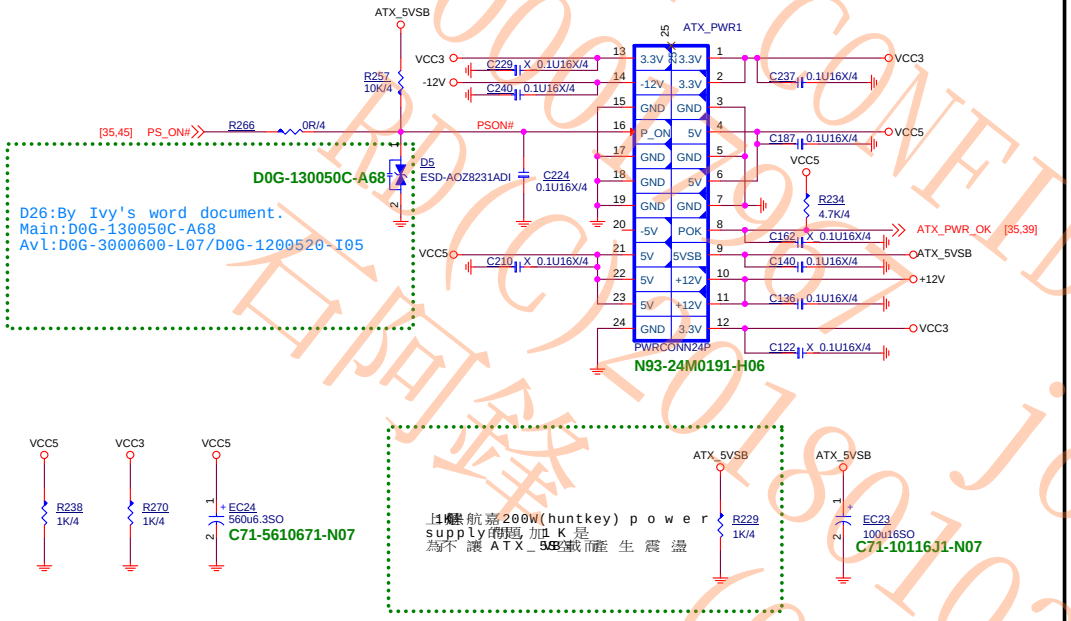
SY8288_OCP	OCP
0	8A
floating	12A
1	16A

MICRO-STAR INT'L CO.,LTD

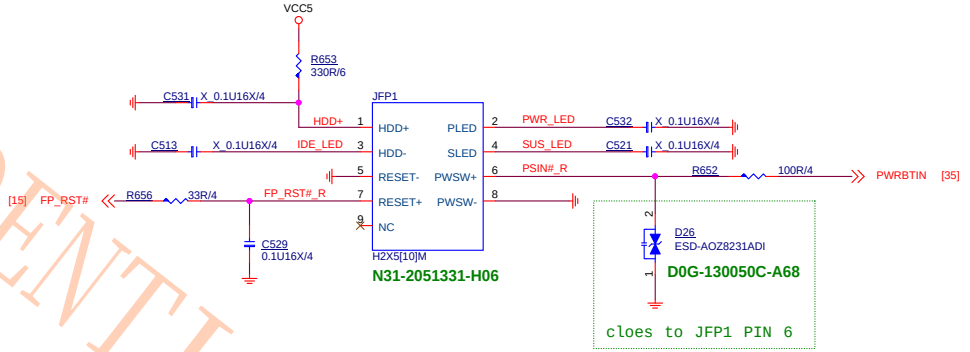
MS-7B28

Size: Custom | Document Description: VCCIO - POWER SY8288 | Rev: 10/20/30

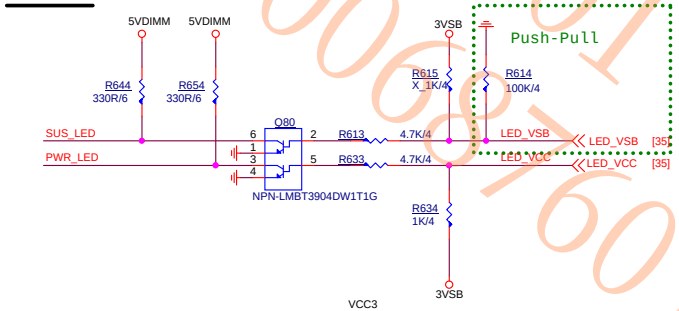
ATX POWER CONNECTOR

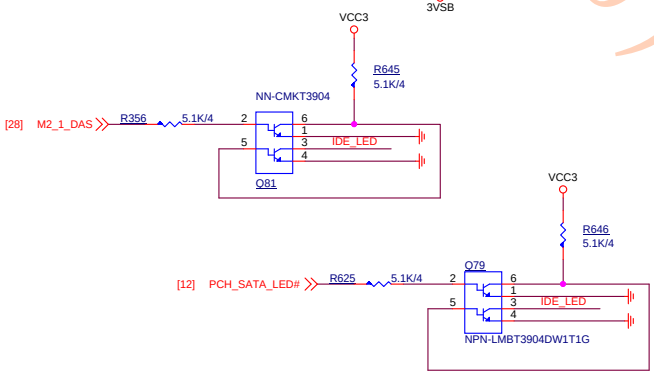


FRONT PANNEL

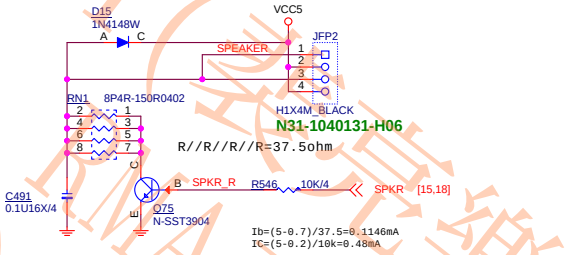


LED

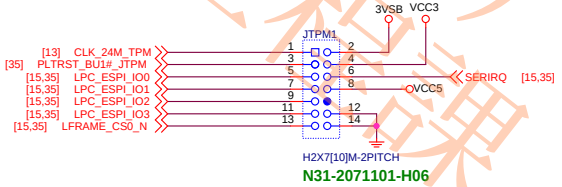


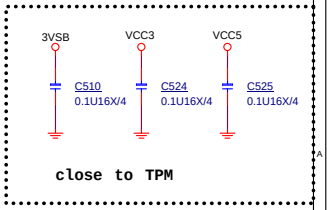


Speaker Pin Header



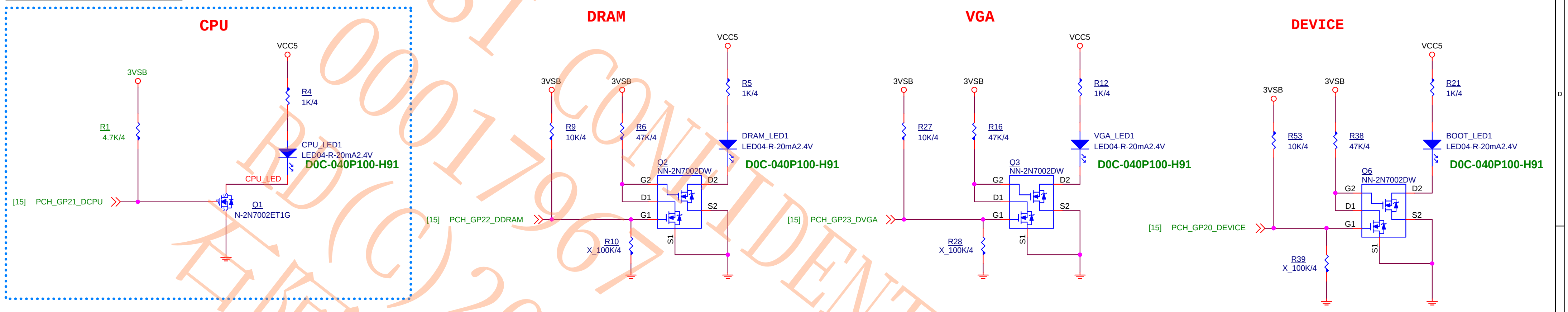
TPM





MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: ATX F_Panel/TPM/MSI_LED	Rev: 10/20/30
Date: Tuesday, December 12, 2017	Sheet 49 of 53	

EZ DEBUG LED



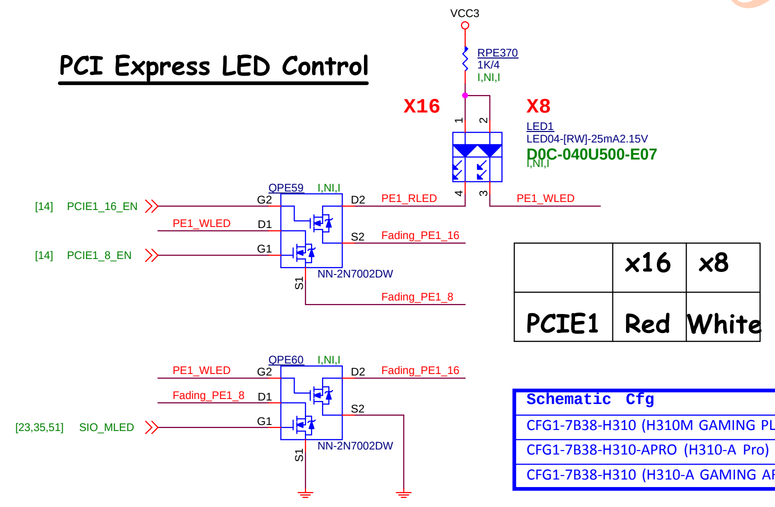
LED	PCH_GP20	PCH_GP21	PCH_GP22	PCH_GP23
亮	NATIVE PULL HIGH	GPO PULL HIGH	GPO PULL HIGH	NATIVE PULL HIGH
滅	NATIVE LOW	GPO LOW (default LOW)	GPO LOW (default LOW)	GPO LOW (default LOW)

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

WHI:D0C-040T200-H91
AVL:D0C-040S200-E07

關機斷電狀態下，3個LED先維持default全暗開機上電後
1. 首先進行CPU check CPU 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，三個燈都是滅掉的。
(系統重啟或其他原因造成系統重開機則仍按上述行為動作)

PCI Express LED Control

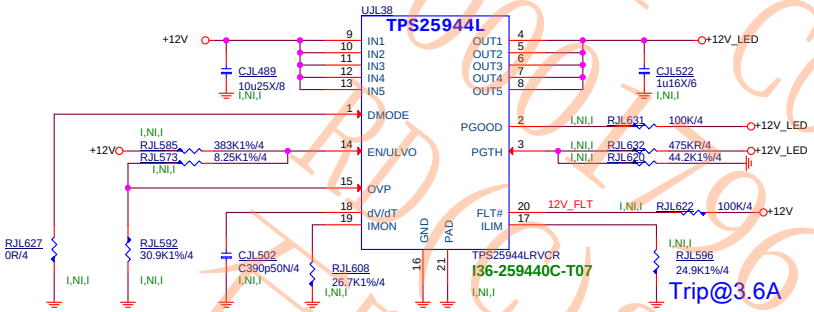


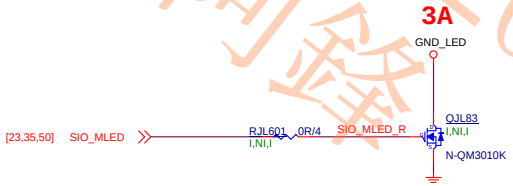
	x16	x8
PCIE1	Red	White

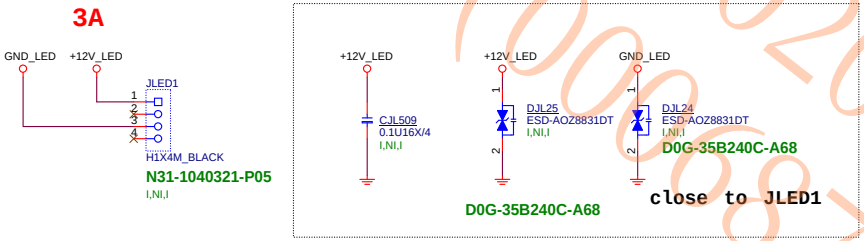
Schematic Cfg	Project	
CFG1-7B38-H310 (H310M GAMING PLUS) ver.1.0	V	A
CFG1-7B38-H310-APRO (H310-A Pro) ver.2.0	X	B
CFG1-7B38-H310 (H310-A GAMING ARCTIC) ver.3.0	V	C

MICRO-STAR INT'L CO.,LTD		
MS-7B28		
Size: Custom	Document Description: ALL LED Control	Rev 10/20/30
Date: Tuesday, December 12, 2017	Sheet 50 of 53	

LED Control by SIO(JLED1)







Schematic Cfg	Project	
CFG1-7B38-H310 (H310M GAMING PLUS) ver.1.0	V	A
CFG1-7B38-H310-APRO (H310-A Pro) ver.2.0	X	B
CFG1-7B38-H310 (H310-A GAMING ARCTIC) ver.3.0	V	C

MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: JLED | Rev: 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 51 of 53

OPTION BOM PARTS

Schematic Cfg	Project
CFG1-7B38-H310 (H310M GAMING PLUS) ver.1.0	A
CFG1-7B38-H310-APRO (H310-A Pro) ver.2.0	B
CFG1-7B38-H310 (H310-A GAMING ARCTIC) ver.3.0	C

5010 Level

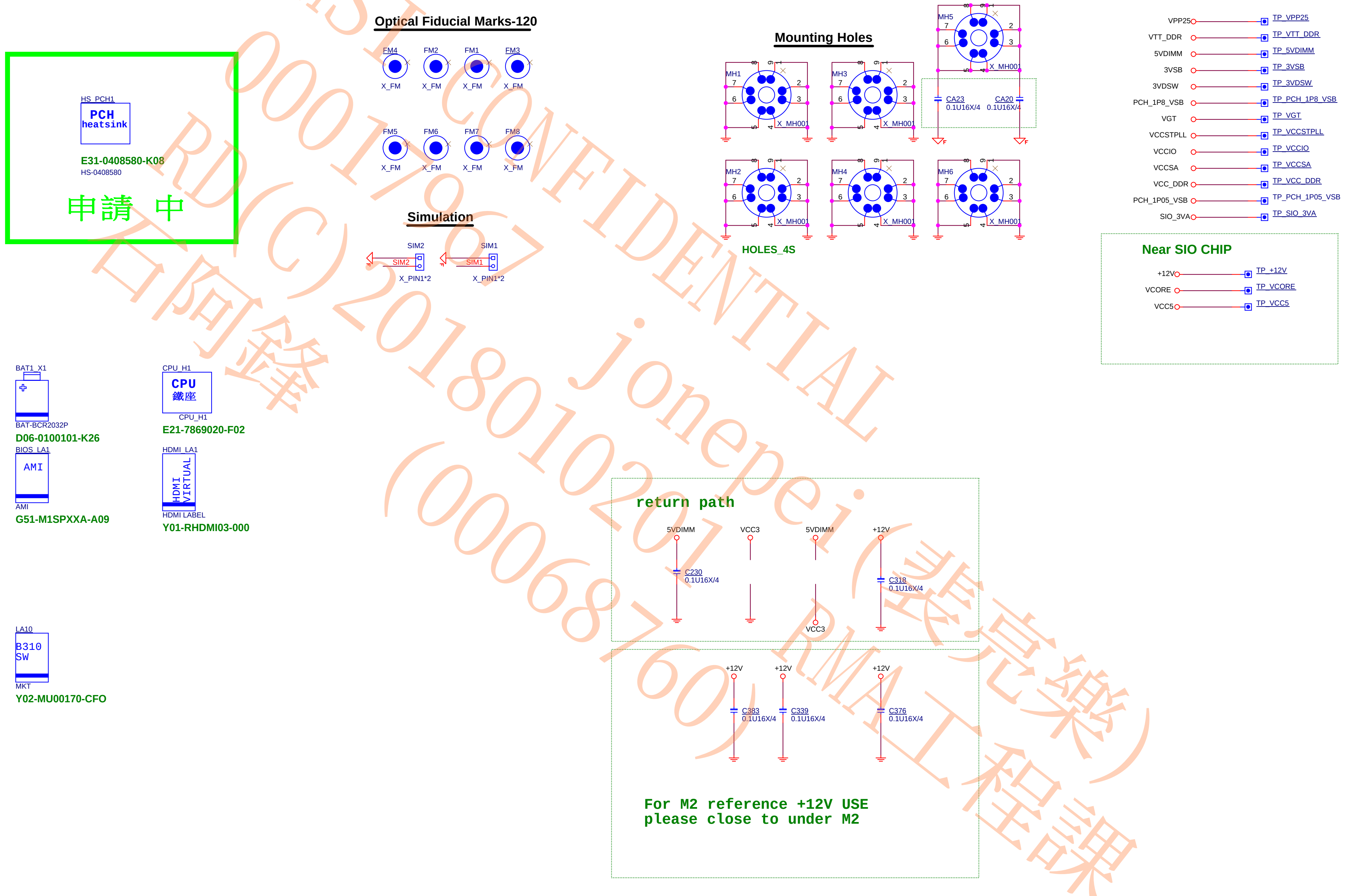
	A	B	C
EZ Debug LED	OPT_EZ_GPLUS Audio/bot LED LED04-R-20mA2.4V_1608-HF D0C-040P100-H91 Red	OPT_EZ_PRO Audio/bot LED LED04-R-20mA2.4V_1608-HF D0C-040T200-H91 White	OPT_EZ_GARCTIC Audio/bot LED LED04-R-20mA2.4V_1608-HF D0C-040T200-H91 White
PCB	PD0-07B2810-E48 PD0-07B2810-G37 OPT_PCB_GPLUS  7B28_10	PK0-07B2820-E48 PK0-07B2820-G37 OPT_PCB_PRO  7B28_20	PS0-07B2830-E48 PS0-07B2830-G37 OPT_PCB_GARCTIC  7B28_30

5020 Level

	A	B	C
AUDIO LED	OPT_AUDLED_GPLUS AUDIO LED X_LED04-W-20mA3.25V USB_C1_24_2 D0C-040S600-E07 Red	X	OPT_AUDLED_GARCTIC AUDIO LED LED04-W-20mA3.9V_1608-RH USB_C1_24_2 D0C-040T300-H91 White

60 Level

	A	B	C
REAR U3	OPT_REARU3_GPLUS LAN+ U3 USBAX2M_RED-RH-2 USB_C1_24_2 N53-18M0201-L06	OPT_REARU3_PRO LAN+ U3 USBAX2M_BLUE-RH-6 USB_C1_24_2 N53-18M0091-F02	OPT_REARU3_GARCTIC LAN+ U3 USBAX2M_RED-RH-2 USB_C1_24_2 N53-18M0201-L06
DDR Slot	OPT_DDRSLOT_GPLUS DDR Slot DDRIV-288P_RED-RH-1 DDRIV_D288 N13-2880681-L06	OPT_DDRSLOT_PRO DDR Slot DDRIV-288P_BLACK-RH-21 DDRIV_D288 N13-2880561-L06	OPT_DDRSLOT_GARCTIC DDR Slot DDRIV-288P_BLACK-RH-21 DDRIV_D288 N13-2880521-L06
PCIEx16 Slot	OPT_PCIEX16_GPLUS PCIE_16 SLOT-PCI164P_RED-2PITCH-RH-1 N11-1641671-L06	OPT_PCIEX16_PRO PCIE_16 SLOT-PCI164P_BLACK-2PITCH-RH-38 N11-1641221-L06	OPT_PCIEX16_GARCTIC PCIE_16 SLOT-PCI164P_WHITE-2PITCH-RH-4 N11-1641601-L06
DVI	OPT_VGA_GPLUS VGA DVI24P_BLACK-RH-17 N5B-24F0771-EB6		OPT_VGA_GARCTIC VGA DVI24P_BLACK-RH-17 N5B-24F0771-EB6
VGA+DVI		OPT_VGADVI_PRO VGA+DVI VGA_DVI-RH-31 N58-39F0371-EB6	
PACK LABEL	OPT_LA_GPLUS B310 Lable MKT G51-M1SPM62-Q13	OPT_LA_PRO B310 Lable MKT G51-M1SPM61-Q13	OPT_LA_GARCTIC B310 Lable MKT G51-M1SPM60-Q13



MICRO-STAR INT'L CO.,LTD

MS-7B28

Size: Custom | Document Description: **Manual Parts** | Rev 10/20/30

Date: Tuesday, December 12, 2017 | Sheet 53 of 53