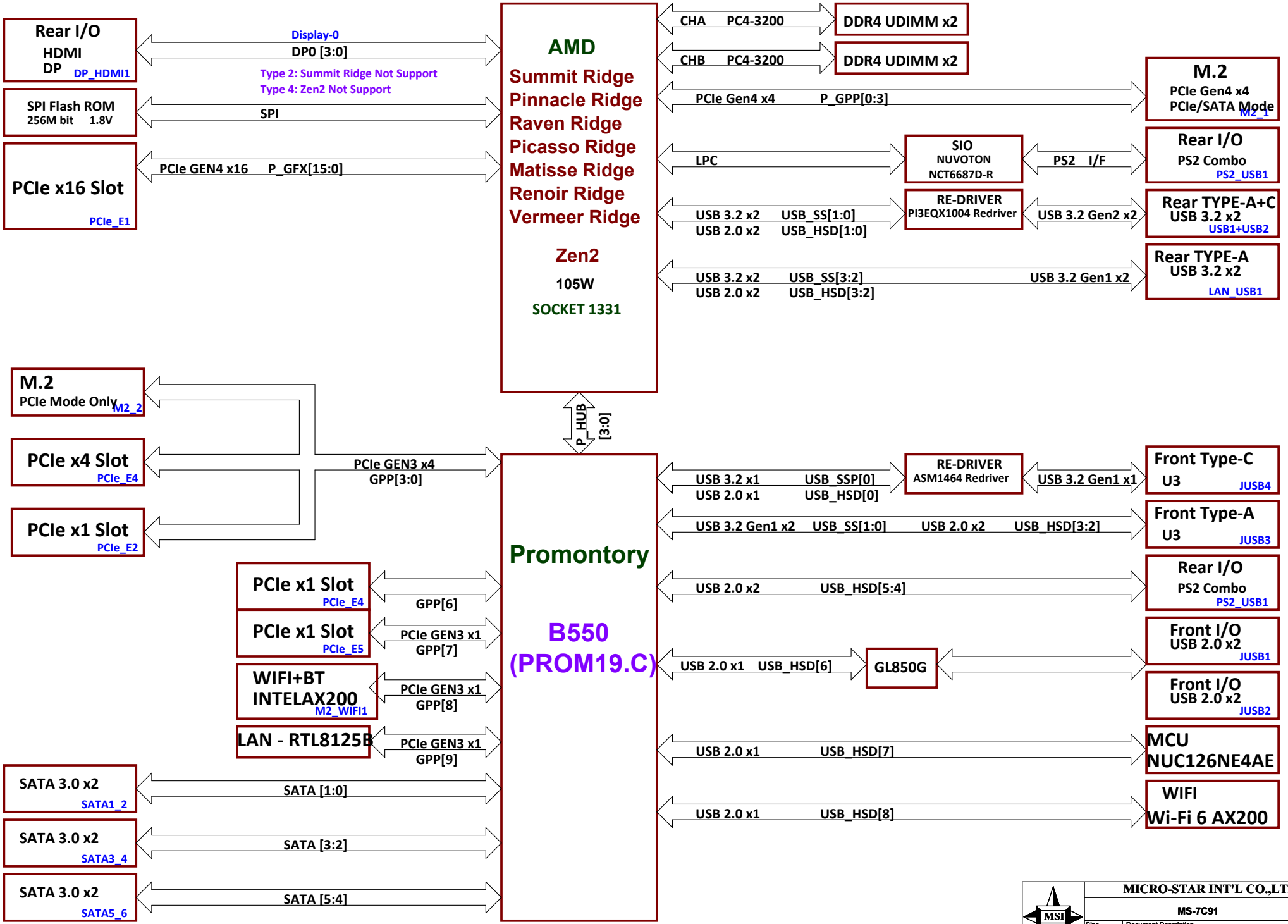
AMD AM4
B550

MICRO-STAR INT'L CO.,LTD

MS-7C91

Size: Custom | Document Description: Cover Sheet | Rev: 20

Date: Thursday, February 13, 2020 | Sheet 1 of 78



MICRO-STAR INT'L CO.,LTD

MS-7C91

Size	Document Description	Rev
Custom	Block Diagram	20

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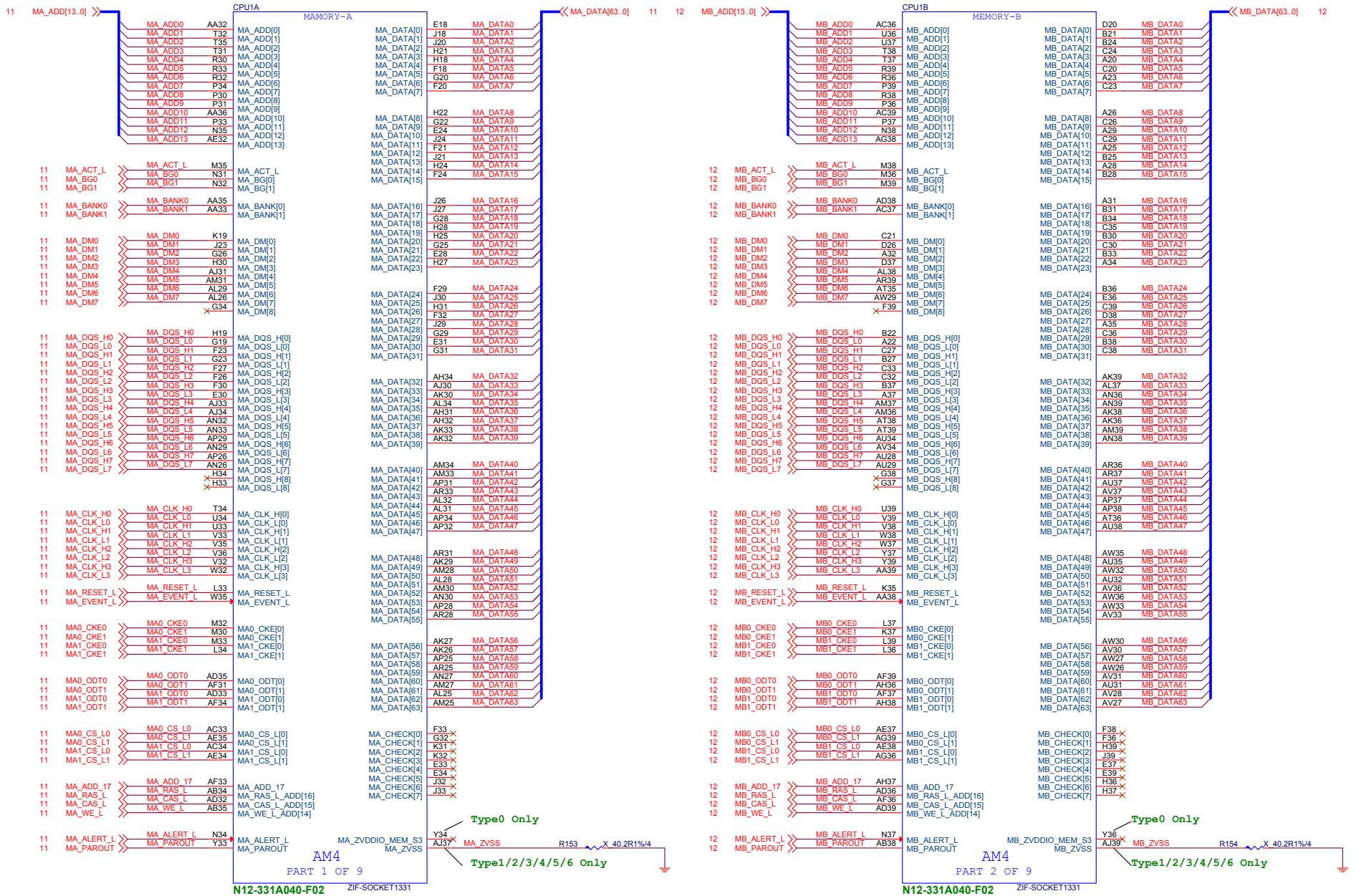

MICRO-STAR INT'L CO.,LTD

MS-7C91

Size	Document Description	Rev
Custom	AM4 DDR4 I/F	20

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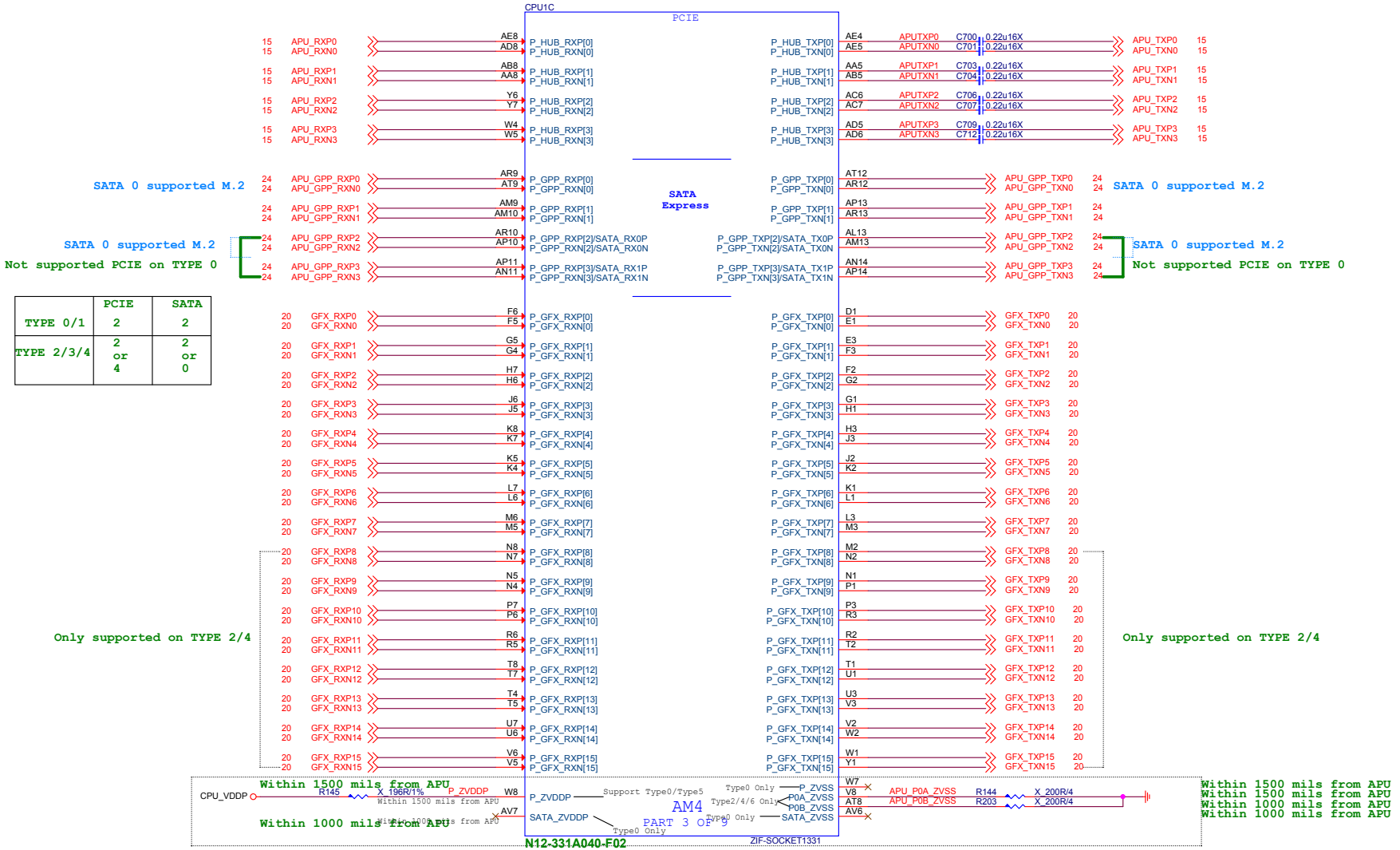

	PCIE	SATA
TYPE 0/1	2	2
TYPE 2/3/4	2 or 4	2 or 0

MICRO-STAR INT'L CO.,LTD		
MS-7C91		
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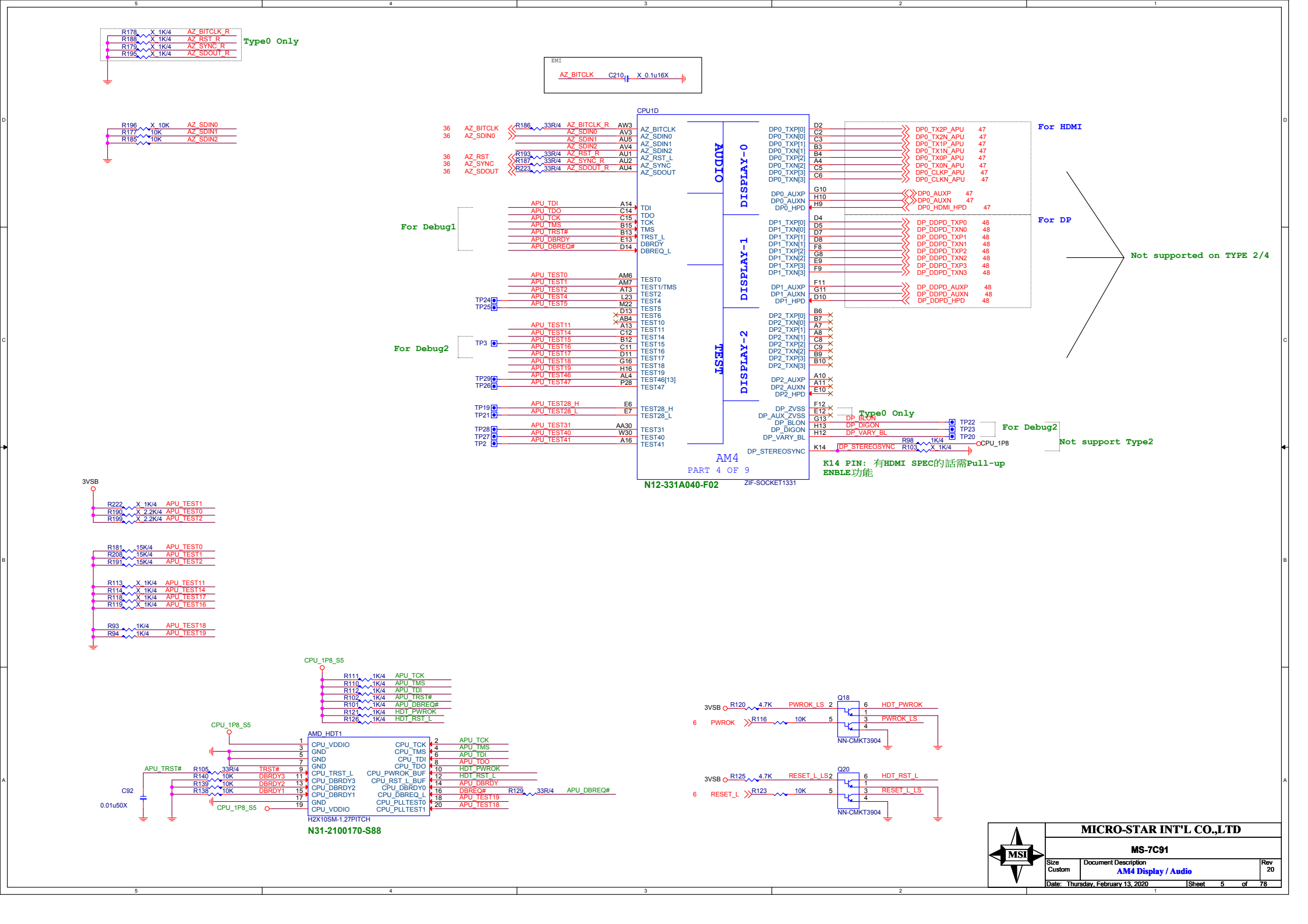
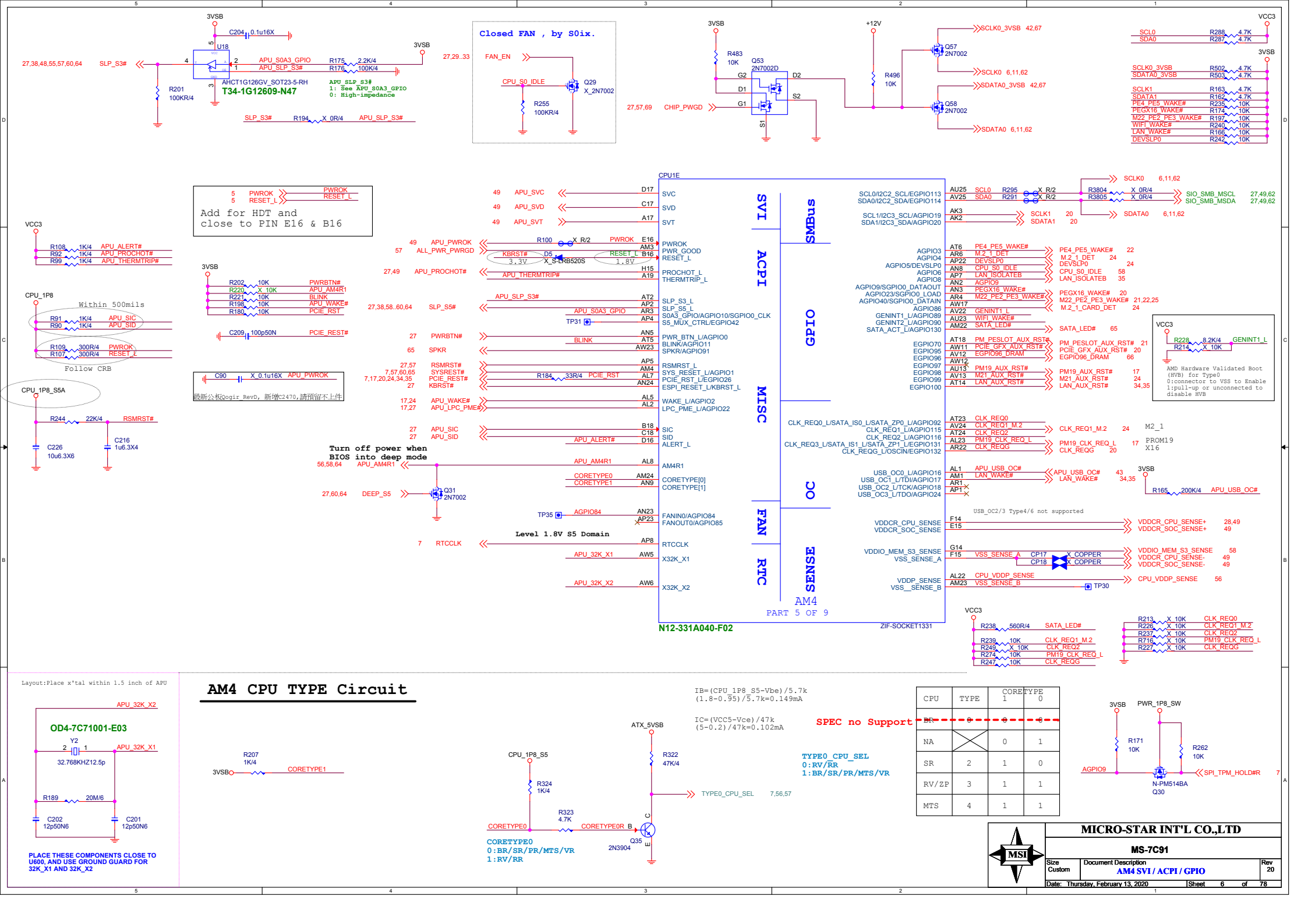
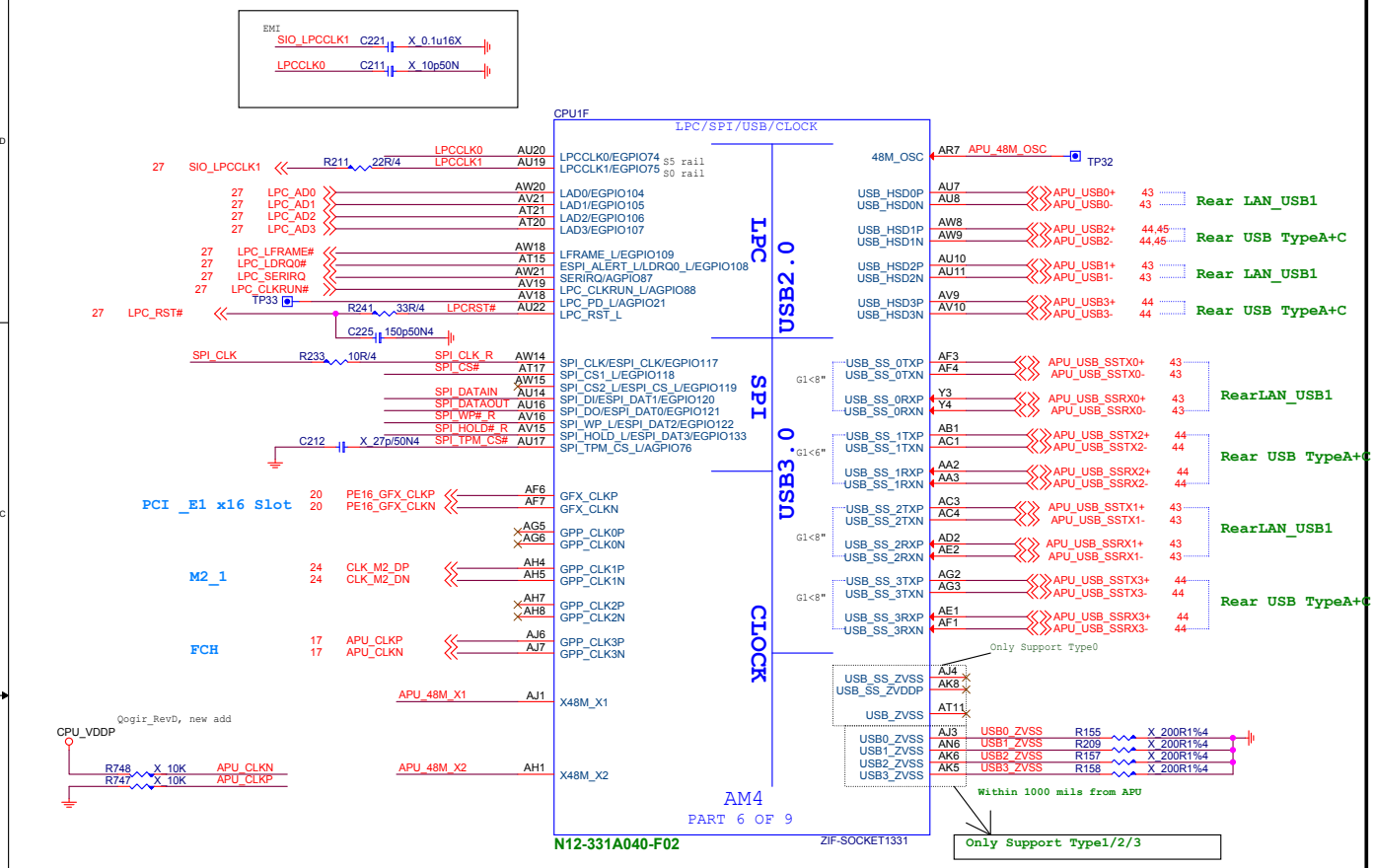
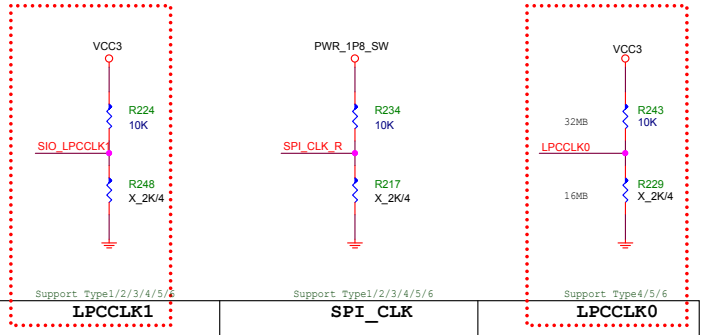

Type0 Only
EMI
AZ_BITCLK C210 X_0.1u16X
CPU1D
AUDIO
DISPLAY-0
DISPLAY-1
DISPLAY-2
TEST
For HDMI
For DP
Not supported on TYPE 2/4
For Debug1
For Debug2
Type0 Only
For Debug2
Not support Type2
K14 PIN: 有HDMI SPEC的話需Pull-up
ENBLE功能
AM4
PART 4 OF 9
N12-331A040-F02
ZIF-SOCKET1331
3VSB
CPU_1P8_S5
AMD_HDT1
H2X10SM-1.27PITCH
N31-2100170-S88
Q18
Q20
NN-CMKT3904
MICRO-STAR INT'L CO.,LTD
MS-7C91
AM4 Display / Audio
Thursday, February 13, 2020

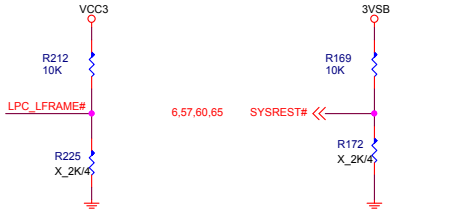

Closed FAN , by S0ix.
Add for HDT and close to PIN E16 & B16
Turn off power when BIOS into deep mode
Level 1.8V S5 Domain
CPU1E
SVI
ACPI
GPIO
MISC
FAN
RTC
SMBus
OC
SENSE
AM4
PART 5 OF 9
N12-331A040-F02
ZIF-SOCKET1331
AM4 CPU TYPE Circuit
SPEC no Support
MICRO-STAR INT'L CO.,LTD
MS-7C91
AM4 SVI / ACPI / GPIO



Strapping Options

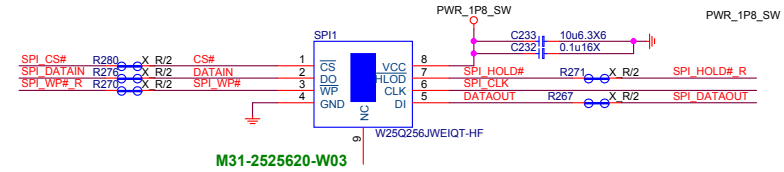


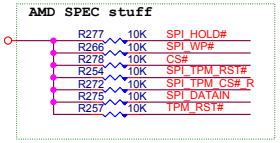
	LPCCLK1	SPI_CLK	LPCCLK0
PULL HIGH	Configured for Internal clock generator **(Default)**	Use 48Mhz crystal clock and generate both internal and external clocks **(Default)**	PSP should modify SPI page register bits [25:24] to remap physical ROM to upper image **(Default)**
PULL LOW	Configured for External clock generator ?????	Use 100Mhz PCIE clock as reference clock and generate internal clocks only	PSP should not modify SPI page register bits [25:24]

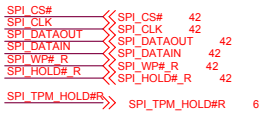


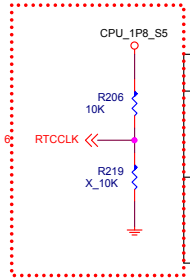
	AGPIO3	LFRAME	SYSREST#
PULL HIGH	Enhanced Reset logic **(Default)**	SPI ROM **(Default)**	Normal reset mode **(Default)**
PULL LOW	Traditional Reset logic	LPC ROM	short reset mode

SPI ROM(1.8V)



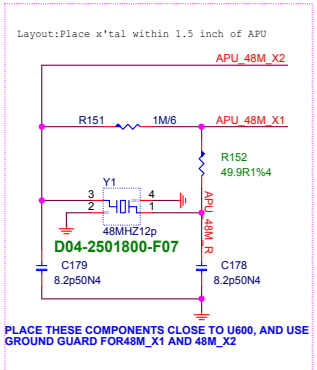


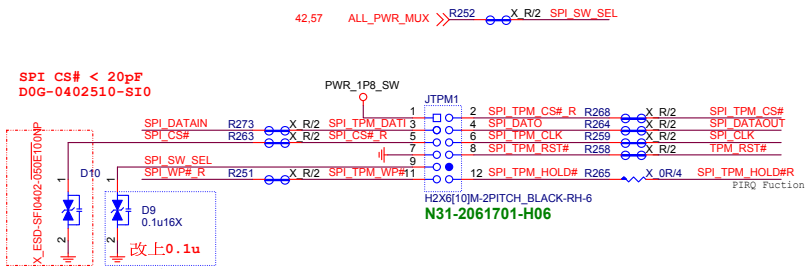


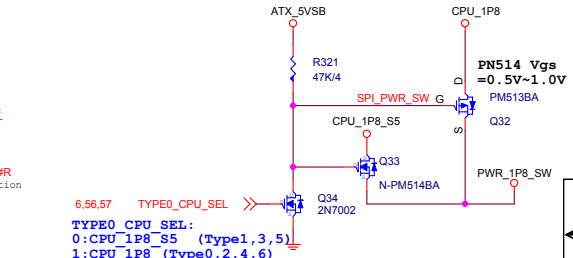


	RTCCLK
PULL HIGH	RTCCLK is input and is used as the bypass clock **(Default)**
PULL LOW	Normal Mode: Use 32Khz xtal as the source of RTC clock

Support Type4/6







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MS-7C91

Size	Document Description	Rev
Custom	AM4 LPC / SPI / USB / CLK / STRAP	20

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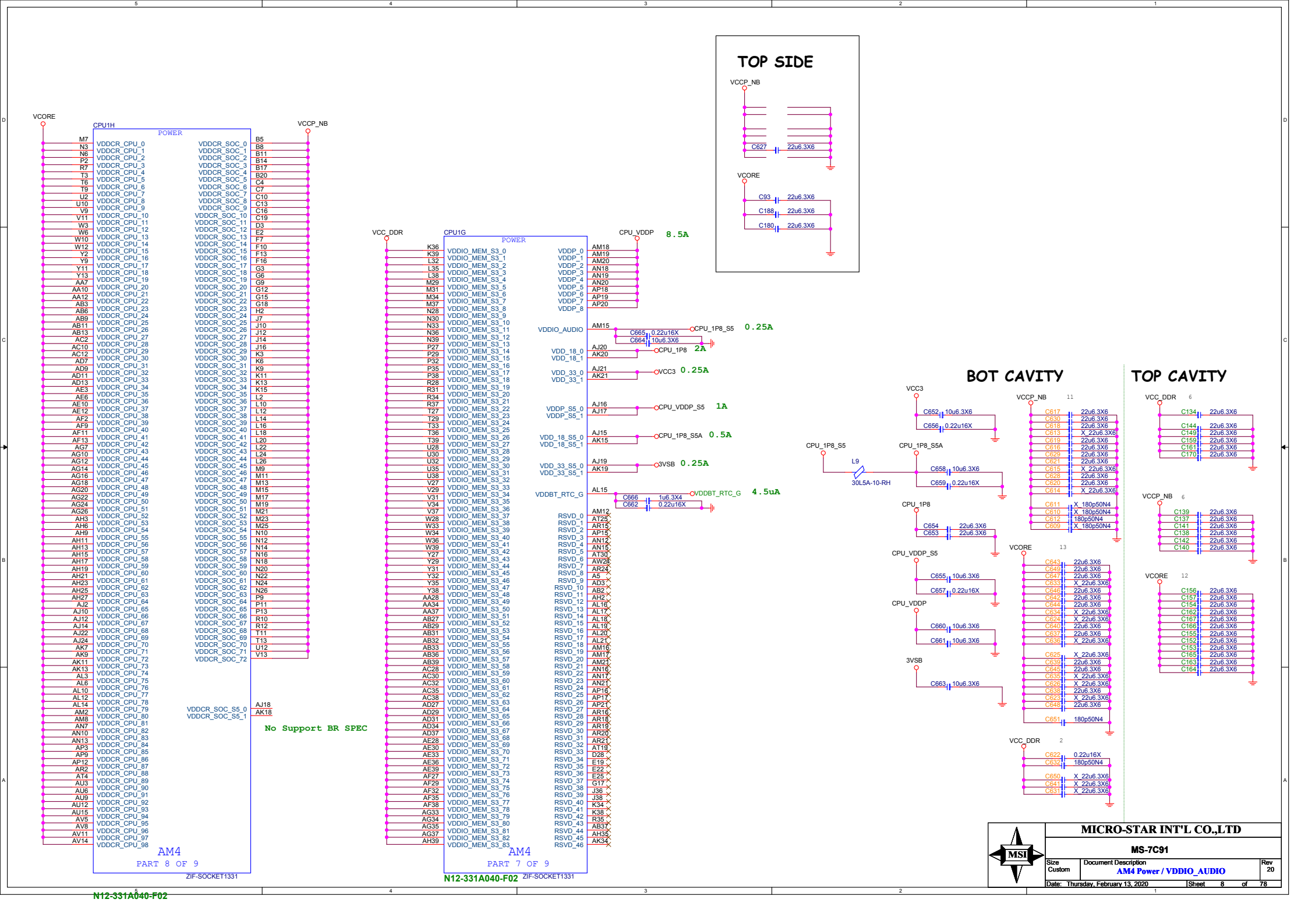
TOP SIDE
VCCP_NB
C627 22u6.3X6
VCORE
C93 22u6.3X6
C188 22u6.3X6
C180 22u6.3X6
VCORE
CPU1H
POWER
VCCP_NB
VDDCR_CPU_0 M7
VDDCR_CPU_1 N3
VDDCR_CPU_2 N6
VDDCR_CPU_3 P2
VDDCR_CPU_4 R7
VDDCR_CPU_5 T3
VDDCR_CPU_6 T6
VDDCR_CPU_7 T9
VDDCR_CPU_8 U2
VDDCR_CPU_9 U10
VDDCR_CPU_10 V9
VDDCR_CPU_11 V11
VDDCR_CPU_12 W3
VDDCR_CPU_13 W6
VDDCR_CPU_14 W10
VDDCR_CPU_15 W12
VDDCR_CPU_16 Y2
VDDCR_CPU_17 Y9
VDDCR_CPU_18 Y11
VDDCR_CPU_19 Y13
VDDCR_CPU_20 AA7
VDDCR_CPU_21 AA10
VDDCR_CPU_22 AA12
VDDCR_CPU_23 AB3
VDDCR_CPU_24 AB6
VDDCR_CPU_25 AB9
VDDCR_CPU_26 AB11
VDDCR_CPU_27 AB13
VDDCR_CPU_28 AC2
VDDCR_CPU_29 AC10
VDDCR_CPU_30 AC12
VDDCR_CPU_31 AD7
VDDCR_CPU_32 AD9
VDDCR_CPU_33 AD11
VDDCR_CPU_34 AD13
VDDCR_CPU_35 AE3
VDDCR_CPU_36 AE6
VDDCR_CPU_37 AE10
VDDCR_CPU_38 AE12
VDDCR_CPU_39 AF2
VDDCR_CPU_40 AF9
VDDCR_CPU_41 AF11
VDDCR_CPU_42 AF13
VDDCR_CPU_43 AG7
VDDCR_CPU_44 AG10
VDDCR_CPU_45 AG12
VDDCR_CPU_46 AG14
VDDCR_CPU_47 AG16
VDDCR_CPU_48 AG18
VDDCR_CPU_49 AG20
VDDCR_CPU_50 AG22
VDDCR_CPU_51 AG24
VDDCR_CPU_52 AG26
VDDCR_CPU_53 AH3
VDDCR_CPU_54 AH6
VDDCR_CPU_55 AH9
VDDCR_CPU_56 AH11
VDDCR_CPU_57 AH13
VDDCR_CPU_58 AH15
VDDCR_CPU_59 AH17
VDDCR_CPU_60 AH19
VDDCR_CPU_61 AH21
VDDCR_CPU_62 AH23
VDDCR_CPU_63 AH25
VDDCR_CPU_64 AH27
VDDCR_CPU_65 AJ2
VDDCR_CPU_66 AJ10
VDDCR_CPU_67 AJ12
VDDCR_CPU_68 AJ14
VDDCR_CPU_69 AJ22
VDDCR_CPU_70 AJ24
VDDCR_CPU_71 AK7
VDDCR_CPU_72 AK9
VDDCR_CPU_73 AK11
VDDCR_CPU_74 AK13
VDDCR_CPU_75 AL3
VDDCR_CPU_76 AL6
VDDCR_CPU_77 AL10
VDDCR_CPU_78 AL12
VDDCR_CPU_79 AL14
VDDCR_CPU_80 AM2
VDDCR_CPU_81 AM8
VDDCR_CPU_82 AN7
VDDCR_CPU_83 AN10
VDDCR_CPU_84 AN13
VDDCR_CPU_85 AP3
VDDCR_CPU_86 AP9
VDDCR_CPU_87 AP12
VDDCR_CPU_88 AR2
VDDCR_CPU_89 AT4
VDDCR_CPU_90 AU3
VDDCR_CPU_91 AU6
VDDCR_CPU_92 AU9
VDDCR_CPU_93 AU12
VDDCR_CPU_94 AU15
VDDCR_CPU_95 AV5
VDDCR_CPU_96 AV8
VDDCR_CPU_97 AV11
VDDCR_CPU_98 AV14
VDDCR_SOC_0 B5
VDDCR_SOC_1 B8
VDDCR_SOC_2 B11
VDDCR_SOC_3 B14
VDDCR_SOC_4 B17
VDDCR_SOC_5 B20
VDDCR_SOC_6 C4
VDDCR_SOC_7 C7
VDDCR_SOC_8 C10
VDDCR_SOC_9 C13
VDDCR_SOC_10 C16
VDDCR_SOC_11 C19
VDDCR_SOC_12 D3
VDDCR_SOC_13 E2
VDDCR_SOC_14 F7
VDDCR_SOC_15 F10
VDDCR_SOC_16 F13
VDDCR_SOC_17 F16
VDDCR_SOC_18 G3
VDDCR_SOC_19 G6
VDDCR_SOC_20 G9
VDDCR_SOC_21 G12
VDDCR_SOC_22 G15
VDDCR_SOC_23 G18
VDDCR_SOC_24 H2
VDDCR_SOC_25 J7
VDDCR_SOC_26 J10
VDDCR_SOC_27 J12
VDDCR_SOC_28 J14
VDDCR_SOC_29 J16
VDDCR_SOC_30 K3
VDDCR_SOC_31 K6
VDDCR_SOC_32 K9
VDDCR_SOC_33 K11
VDDCR_SOC_34 K13
VDDCR_SOC_35 K15
VDDCR_SOC_36 L2
VDDCR_SOC_37 L10
VDDCR_SOC_38 L12
VDDCR_SOC_39 L14
VDDCR_SOC_40 L16
VDDCR_SOC_41 L18
VDDCR_SOC_42 L20
VDDCR_SOC_43 L22
VDDCR_SOC_44 L24
VDDCR_SOC_45 L26
VDDCR_SOC_46 M9
VDDCR_SOC_47 M11
VDDCR_SOC_48 M13
VDDCR_SOC_49 M15
VDDCR_SOC_50 M17
VDDCR_SOC_51 M19
VDDCR_SOC_52 M21
VDDCR_SOC_53 M23
VDDCR_SOC_54 M25
VDDCR_SOC_55 N10
VDDCR_SOC_56 N12
VDDCR_SOC_57 N14
VDDCR_SOC_58 N16
VDDCR_SOC_59 N18
VDDCR_SOC_60 N20
VDDCR_SOC_61 N22
VDDCR_SOC_62 N24
VDDCR_SOC_63 N26
VDDCR_SOC_64 P9
VDDCR_SOC_65 P11
VDDCR_SOC_66 P13
VDDCR_SOC_67 R10
VDDCR_SOC_68 R12
VDDCR_SOC_69 T11
VDDCR_SOC_70 T13
VDDCR_SOC_71 U12
VDDCR_SOC_72 V13
VDDCR_SOC_S5_0 AJ18
VDDCR_SOC_S5_1 AK18
No Support BR SPEC
AM4
PART 8 OF 9
ZIF-SOCKET1331
N12-331A040-F02
VCC_DDR
CPU1G
POWER
VDDIO_MEM_S3_0 K36
VDDIO_MEM_S3_1 K39
VDDIO_MEM_S3_2 L32
VDDIO_MEM_S3_3 L35
VDDIO_MEM_S3_4 L38
VDDIO_MEM_S3_5 M29
VDDIO_MEM_S3_6 M31
VDDIO_MEM_S3_7 M34
VDDIO_MEM_S3_8 M37
VDDIO_MEM_S3_9 N28
VDDIO_MEM_S3_10 N30
VDDIO_MEM_S3_11 N33
VDDIO_MEM_S3_12 N36
VDDIO_MEM_S3_13 N39
VDDIO_MEM_S3_14 P27
VDDIO_MEM_S3_15 P29
VDDIO_MEM_S3_16 P32
VDDIO_MEM_S3_17 P35
VDDIO_MEM_S3_18 P38
VDDIO_MEM_S3_19 R28
VDDIO_MEM_S3_20 R31
VDDIO_MEM_S3_21 R34
VDDIO_MEM_S3_22 R37
VDDIO_MEM_S3_23 T27
VDDIO_MEM_S3_24 T29
VDDIO_MEM_S3_25 T33
VDDIO_MEM_S3_26 T36
VDDIO_MEM_S3_27 T39
VDDIO_MEM_S3_28 U28
VDDIO_MEM_S3_29 U30
VDDIO_MEM_S3_30 U32
VDDIO_MEM_S3_31 U35
VDDIO_MEM_S3_32 U38
VDDIO_MEM_S3_33 V27
VDDIO_MEM_S3_34 V29
VDDIO_MEM_S3_35 V31
VDDIO_MEM_S3_36 V34
VDDIO_MEM_S3_37 V37
VDDIO_MEM_S3_38 W28
VDDIO_MEM_S3_39 W33
VDDIO_MEM_S3_40 W34
VDDIO_MEM_S3_41 W36
VDDIO_MEM_S3_42 W39
VDDIO_MEM_S3_43 Y27
VDDIO_MEM_S3_44 Y29
VDDIO_MEM_S3_45 Y31
VDDIO_MEM_S3_46 Y32
VDDIO_MEM_S3_47 Y35
VDDIO_MEM_S3_48 Y38
VDDIO_MEM_S3_49 AA28
VDDIO_MEM_S3_50 AA34
VDDIO_MEM_S3_51 AA37
VDDIO_MEM_S3_52 AB27
VDDIO_MEM_S3_53 AB29
VDDIO_MEM_S3_54 AB31
VDDIO_MEM_S3_55 AB32
VDDIO_MEM_S3_56 AB33
VDDIO_MEM_S3_57 AB36
VDDIO_MEM_S3_58 AB39
VDDIO_MEM_S3_59 AC28
VDDIO_MEM_S3_60 AC30
VDDIO_MEM_S3_61 AC32
VDDIO_MEM_S3_62 AC35
VDDIO_MEM_S3_63 AC38
VDDIO_MEM_S3_64 AD27
VDDIO_MEM_S3_65 AD29
VDDIO_MEM_S3_66 AD31
VDDIO_MEM_S3_67 AD34
VDDIO_MEM_S3_68 AD37
VDDIO_MEM_S3_69 AE28
VDDIO_MEM_S3_70 AE30
VDDIO_MEM_S3_71 AE33
VDDIO_MEM_S3_72 AE36
VDDIO_MEM_S3_73 AE39
VDDIO_MEM_S3_74 AF27
VDDIO_MEM_S3_75 AF29
VDDIO_MEM_S3_76 AF32
VDDIO_MEM_S3_77 AF35
VDDIO_MEM_S3_78 AF38
VDDIO_MEM_S3_79 AG33
VDDIO_MEM_S3_80 AG34
VDDIO_MEM_S3_81 AG35
VDDIO_MEM_S3_82 AG37
VDDIO_MEM_S3_83 AH39
CPU_VDDP 8.5A
VDDP_0 AM18
VDDP_1 AM19
VDDP_2 AM20
VDDP_3 AN18
VDDP_4 AN19
VDDP_5 AN20
VDDP_6 AP18
VDDP_7 AP19
VDDP_8 AP20
VDDIO_AUDIO AM15
C665 0.22u16X
C664 10u6.3X6
CPU_1P8_S5 0.25A
VDD_18_0 AJ20
VDD_18_1 AK20
CPU_1P8 2A
VDD_33_0 AJ21
VDD_33_1 AK21
VCC3 0.25A
VDDP_S5_0 AJ16
VDDP_S5_1 AJ17
CPU_VDDP_S5 1A
VDD_18_S5_0 AJ15
VDD_18_S5_1 AK15
CPU_1P8_S5A 0.5A
VDD_33_S5_0 AJ19
VDD_33_S5_1 AK19
3VSB 0.25A
VDDBT_RTC_G AL15
C666 1u6.3X4
C662 0.22u16X
VDDBT_RTC_G 4.5uA
AM12
RSVD_0 AT25
RSVD_1 AR15
RSVD_2 AP15
RSVD_3 AN12
RSVD_4 AN15
RSVD_5 AT30
RSVD_6 AW24
RSVD_7 AR24
RSVD_8 A5
RSVD_9 AD3
RSVD_10 AB2
RSVD_11 AH2
RSVD_12 AL16
RSVD_13 AL17
RSVD_14 AL18
RSVD_15 AL19
RSVD_16 AL20
RSVD_17 AL21
RSVD_18 AM16
RSVD_19 AM17
RSVD_20 AM21
RSVD_21 AN16
RSVD_22 AN17
RSVD_23 AN21
RSVD_24 AP16
RSVD_25 AP17
RSVD_26 AP21
RSVD_27 AR16
RSVD_28 AR18
RSVD_29 AR19
RSVD_30 AR20
RSVD_31 AR21
RSVD_32 AT19
RSVD_33 D28
RSVD_34 E19
RSVD_35 E22
RSVD_36 E25
RSVD_37 G17
RSVD_38 J36
RSVD_39 J38
RSVD_40 K34
RSVD_41 K38
RSVD_42 R35
RSVD_43 AB37
RSVD_44 AH35
RSVD_45 AK34
RSVD_46
AM4
PART 7 OF 9
ZIF-SOCKET1331
N12-331A040-F02
BOT CAVITY
TOP CAVITY
VCC3
C652 10u6.3X6
C656 0.22u16X
CPU_1P8_S5
L9
30L5A-10-RH
CPU_1P8_S5A
C658 10u6.3X6
C659 0.22u16X
CPU_1P8
C654 22u6.3X6
C653 22u6.3X6
CPU_VDDP_S5
C655 10u6.3X6
C657 0.22u16X
CPU_VDDP
C660 10u6.3X6
C661 10u6.3X6
3VSB
C663 10u6.3X6
VCCP_NB 11
C617 22u6.3X6
C630 22u6.3X6
C618 22u6.3X6
C613 X_22u6.3X6
C619 22u6.3X6
C616 22u6.3X6
C629 22u6.3X6
C621 22u6.3X6
C615 X_22u6.3X6
C628 22u6.3X6
C620 22u6.3X6
C614 X_22u6.3X6
C611 X_180p50N4
C610 X_180p50N4
C612 180p50N4
C609 X_180p50N4
VCORE 13
C643 22u6.3X6
C649 22u6.3X6
C647 22u6.3X6
C633 X_22u6.3X6
C646 22u6.3X6
C642 22u6.3X6
C644 22u6.3X6
C634 X_22u6.3X6
C624 X_22u6.3X6
C640 22u6.3X6
C637 22u6.3X6
C636 X_22u6.3X6
C625 X_22u6.3X6
C639 22u6.3X6
C645 22u6.3X6
C635 X_22u6.3X6
C626 X_22u6.3X6
C638 22u6.3X6
C623 X_22u6.3X6
C648 22u6.3X6
C651 180p50N4
VCC_DDR 2
C622 0.22u16X
C632 180p50N4
C650 X_22u6.3X6
C641 X_22u6.3X6
C631 X_22u6.3X6
VCC_DDR 6
C134 22u6.3X6
C144 22u6.3X6
C149 22u6.3X6
C159 22u6.3X6
C161 22u6.3X6
C170 22u6.3X6
VCCP_NB 6
C139 22u6.3X6
C137 22u6.3X6
C141 22u6.3X6
C138 22u6.3X6
C142 22u6.3X6
C140 22u6.3X6
VCORE 12
C156 22u6.3X6
C157 22u6.3X6
C154 22u6.3X6
C162 22u6.3X6
C167 22u6.3X6
C166 22u6.3X6
C155 22u6.3X6
C152 22u6.3X6
C153 22u6.3X6
C165 22u6.3X6
C163 22u6.3X6
C164 22u6.3X6
MSI
MICRO-STAR INT'L CO.,LTD
MS-7C91
Size Custom
Document Description
AM4 Power / VDDIO_AUDIO
Rev 20
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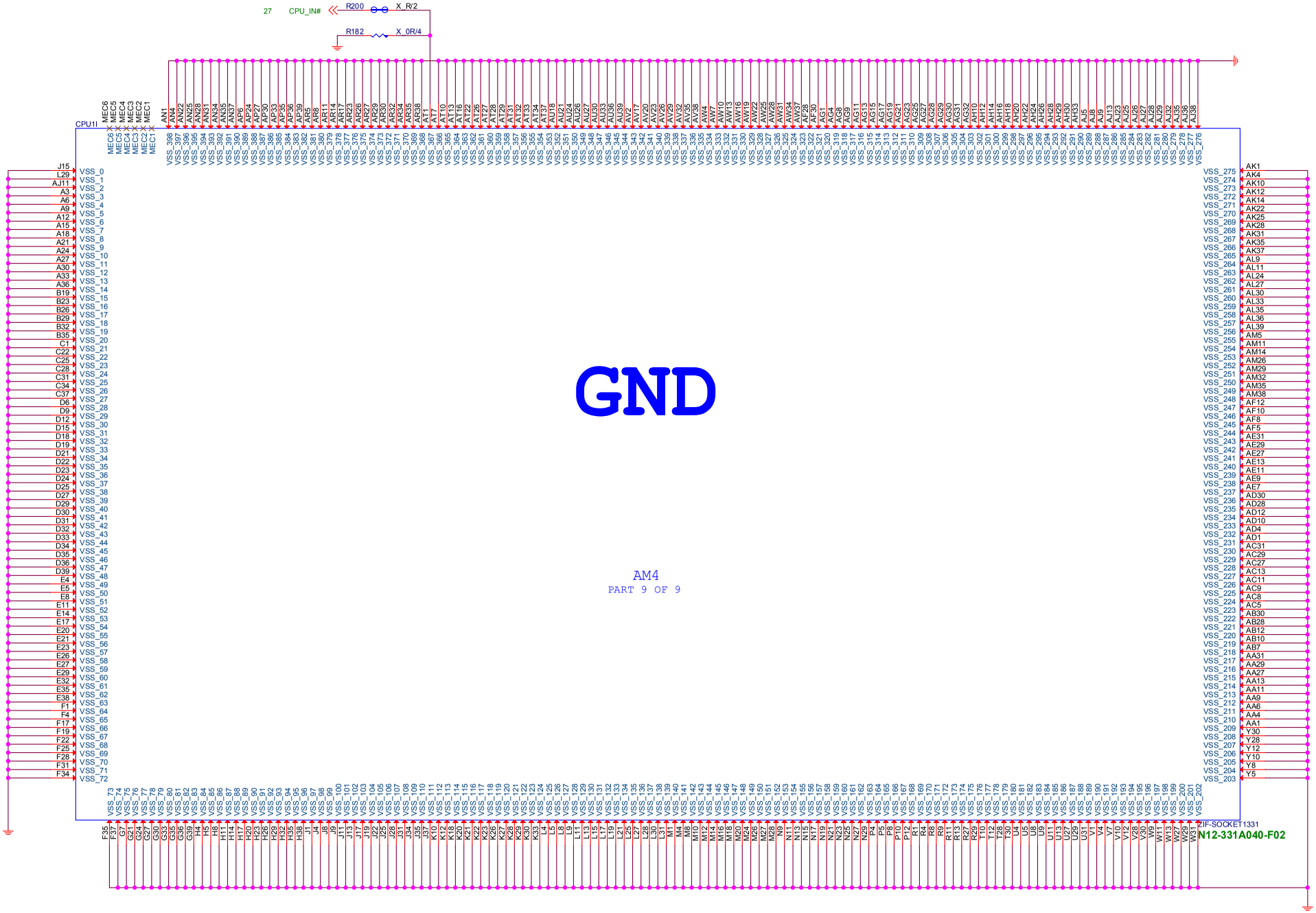

MICRO-STAR INT'L CO.,LTD

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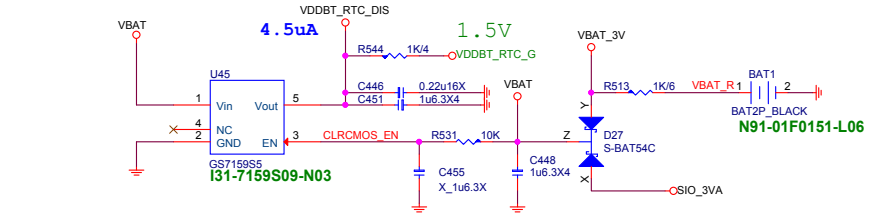
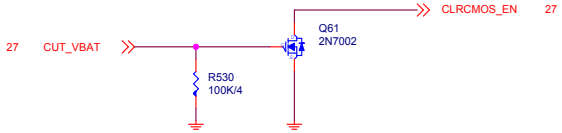
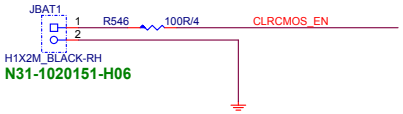
RTC & Clear CMOS Circuit





Clear CMOS button



MICRO-STAR INT'L CO.,LTD		
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Size: Custom	Document Description: RTC / CMOS	Rev: 20
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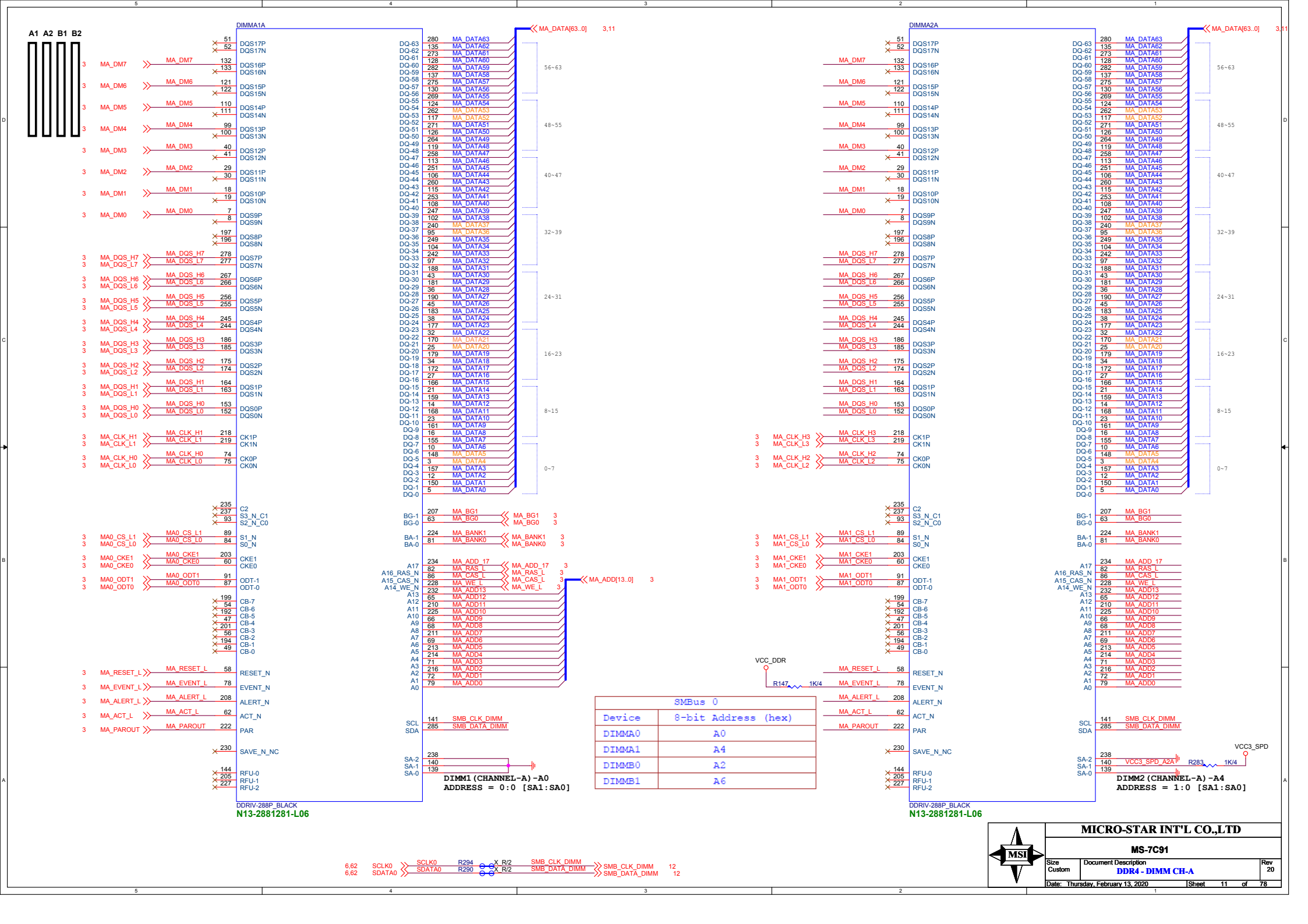
A1 A2 B1 B2
DIMMA1A
DIMMA2A
MA_DATA[63..0] 3,11
MA_DATA[13..0] 3
DQS17P
DQS17N
DQS16P
DQS16N
DQS15P
DQS15N
DQS14P
DQS14N
DQS13P
DQS13N
DQS12P
DQS12N
DQS11P
DQS11N
DQS10P
DQS10N
DQS9P
DQS9N
DQS8P
DQS8N
DQS7P
DQS7N
DQS6P
DQS6N
DQS5P
DQS5N
DQS4P
DQS4N
DQS3P
DQS3N
DQS2P
DQS2N
DQS1P
DQS1N
DQS0P
DQS0N
CK1P
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
56~63
48~55
40~47
32~39
24~31
16~23
8~15
0~7
VCC_DDR
R147 1K/4
VCC3_SPD
R283 1K/4
VCC3_SPD_A2A
DIMM1(CHANNEL-A)-A0
ADDRESS = 0:0 [SA1:SA0]
DIMM2(CHANNEL-A)-A4
ADDRESS = 1:0 [SA1:SA0]
DDRIV-288P_BLACK
N13-2881281-L06
SMBus 0
Device
8-bit Address (hex)
DIMMA0
A0
DIMMA1
A4
DIMMB0
A2
DIMMB1
A6
SCLK0
SDATA0
R294
R290
R/2
SMB_CLK_DIMM
SMB_DATA_DIMM
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MS-7C91
Size
Custom
Document Description
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20
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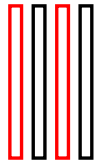

DIMMB1A

DDRIV-288P_BLACK

N13-2881281-L06

DIMM3(CHANNEL-B)-A2
ADDRESS = 0:1 [SA1:SA0]

DIMMB2A

DDRIV-288P_BLACK

N13-2881281-L06

DIMM4(CHANNEL-B)-A6
ADDRESS = 1:1 [SA1:SA0]

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avl:D08-0301100-B07

F4
VCC3 1 2 VCC3_SPD
F-SPR-P260T
D08-0301000-P16

DIMM SLOT PN BY SPEC

DIMMA1C
VCC_DDR
1 12V3_NC_1
145 12V3_NC_145
VCC3_SPD 284 VDDSPD
VPP25 142 143 286 287 288 VPP-1 VPP-2 VPP-3 VPP-4 VPP-5
VTT_DDR 77 221 VTT-1 VTT-2
DIMM_CA_VREF_A 146 VREFCA
X3 X2 X1
VDD-0 236
VDD-1 233
VDD-2 231
VDD-3 229
VDD-4 226
VDD-5 223
VDD-6 220
VDD-7 217
VDD-8 215
VDD-9 212
VDD-10 209
VDD-11 206
VDD-12 204
VDD-13 92
VDD-14 90
VDD-15 88
VDD-16 85
VDD-17 83
VDD-18 80
VDD-19 76
VDD-20 73
VDD-21 70
VDD-22 67
VDD-23 64
VDD-24 61
VDD-25 59
DDRIV-288P_BLACK
N13-2881281-L06

DIMMA2C
VCC_DDR
1 12V3_NC_1
145 12V3_NC_145
VCC3_SPD 284 VDDSPD
VPP25 142 143 286 287 288 VPP-1 VPP-2 VPP-3 VPP-4 VPP-5
VTT_DDR 77 221 VTT-1 VTT-2
DIMM_CA_VREF_A 146 VREFCA
X3 X2 X1
VDD-0 236
VDD-1 233
VDD-2 231
VDD-3 229
VDD-4 226
VDD-5 223
VDD-6 220
VDD-7 217
VDD-8 215
VDD-9 212
VDD-10 209
VDD-11 206
VDD-12 204
VDD-13 92
VDD-14 90
VDD-15 88
VDD-16 85
VDD-17 83
VDD-18 80
VDD-19 76
VDD-20 73
VDD-21 70
VDD-22 67
VDD-23 64
VDD-24 61
VDD-25 59
DDRIV-288P_BLACK
N13-2881281-L06

DDR VREF

(place resistors close to DIMMs)

DIMM_CA_VREF_A
C31 0.1u16X
VCC_DDR

DIMM_CA_VREF_A
VCC_DDR
R38 1K1%4
C34 0.1u16X
C46 1000p50X
C49 0.1u16X
R36 1K1%4

VCC3_SPD C243 0.1u16X
DIMM_CA_VREF_A C57 2.2u6.3X4 C63 0.1u16X
VTT_DDR C169 0.1u16X
VPP25 C257 0.1u16X C251 0.1u16X

VCC_DDR C107 1u6.3X4 C113 1u6.3X4 C129 1u6.3X4 C110 1u6.3X4 C98 X_0.1u16X C184 0.1u16X C132 0.1u16X

VCC3_SPD C244 0.1u16X
DIMM_CA_VREF_A C56 2.2u6.3X4 C62 0.1u16X
VTT_DDR C133 0.1u16X
VPP25 C260 0.1u16X C250 0.1u16X

VCC_DDR C197 1u6.3X4 C131 1u6.3X4 C103 1u6.3X4 C173 1u6.3X4 C111 X_0.1u16X C176 0.1u16X C187 0.1u16X

DIMMA1B
2 4 6 9 11 13 15 17 20 22 24 26 28 31 33 35 37 39 42 44 46 48 50 53 55 57 94 96 98 101 103 105 107 109 112 114 116 118 120 123 125 127 129 131 134 136 138 VSS-93 VSS-92 VSS-91 VSS-90 VSS-89 VSS-88 VSS-87 VSS-86 VSS-85 VSS-84 VSS-83 VSS-82 VSS-81 VSS-80 VSS-79 VSS-78 VSS-77 VSS-76 VSS-75 VSS-74 VSS-73 VSS-72 VSS-71 VSS-70 VSS-69 VSS-68 VSS-67 VSS-66 VSS-65 VSS-64 VSS-63 VSS-62 VSS-61 VSS-60 VSS-59 VSS-58 VSS-57 VSS-56 VSS-55 VSS-54 VSS-53 VSS-52 VSS-51 VSS-50 VSS-49 VSS-48 VSS-47
VSS-46 VSS-45 VSS-44 VSS-43 VSS-42 VSS-41 VSS-40 VSS-39 VSS-38 VSS-37 VSS-36 VSS-35 VSS-34 VSS-33 VSS-32 VSS-31 VSS-30 VSS-29 VSS-28 VSS-27 VSS-26 VSS-25 VSS-24 VSS-23 VSS-22 VSS-21 VSS-20 VSS-19 VSS-18 VSS-17 VSS-16 VSS-15 VSS-14 VSS-13 VSS-12 VSS-11 VSS-10 VSS-9 VSS-8 VSS-7 VSS-6 VSS-5 VSS-4 VSS-3 VSS-2 VSS-1 VSS-0
147 149 151 154 156 158 160 162 165 167 169 171 173 176 178 180 182 184 187 189 191 193 195 198 200 202 239 241 243 246 248 250 252 254 257 259 261 263 265 268 270 272 274 276 279 281 283
DDRIV-288P_BLACK
N13-2881281-L06

DIMMA2B
2 4 6 9 11 13 15 17 20 22 24 26 28 31 33 35 37 39 42 44 46 48 50 53 55 57 94 96 98 101 103 105 107 109 112 114 116 118 120 123 125 127 129 131 134 136 138 VSS-93 VSS-92 VSS-91 VSS-90 VSS-89 VSS-88 VSS-87 VSS-86 VSS-85 VSS-84 VSS-83 VSS-82 VSS-81 VSS-80 VSS-79 VSS-78 VSS-77 VSS-76 VSS-75 VSS-74 VSS-73 VSS-72 VSS-71 VSS-70 VSS-69 VSS-68 VSS-67 VSS-66 VSS-65 VSS-64 VSS-63 VSS-62 VSS-61 VSS-60 VSS-59 VSS-58 VSS-57 VSS-56 VSS-55 VSS-54 VSS-53 VSS-52 VSS-51 VSS-50 VSS-49 VSS-48 VSS-47
VSS-46 VSS-45 VSS-44 VSS-43 VSS-42 VSS-41 VSS-40 VSS-39 VSS-38 VSS-37 VSS-36 VSS-35 VSS-34 VSS-33 VSS-32 VSS-31 VSS-30 VSS-29 VSS-28 VSS-27 VSS-26 VSS-25 VSS-24 VSS-23 VSS-22 VSS-21 VSS-20 VSS-19 VSS-18 VSS-17 VSS-16 VSS-15 VSS-14 VSS-13 VSS-12 VSS-11 VSS-10 VSS-9 VSS-8 VSS-7 VSS-6 VSS-5 VSS-4 VSS-3 VSS-2 VSS-1 VSS-0
147 149 151 154 156 158 160 162 165 167 169 171 173 176 178 180 182 184 187 189 191 193 195 198 200 202 239 241 243 246 248 250 252 254 257 259 261 263 265 268 270 272 274 276 279 281 283
DDRIV-288P_BLACK
N13-2881281-L06

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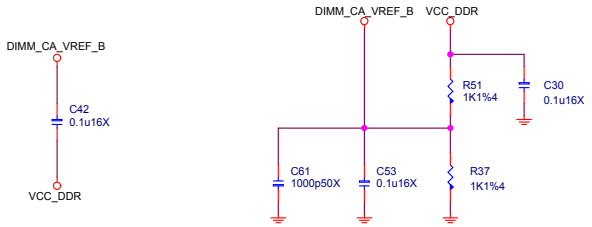
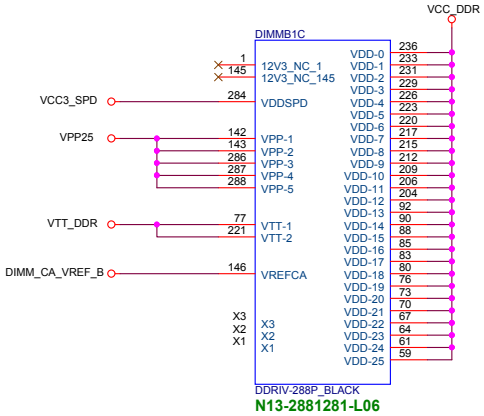
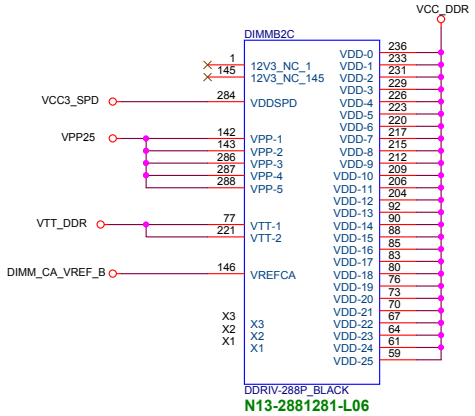
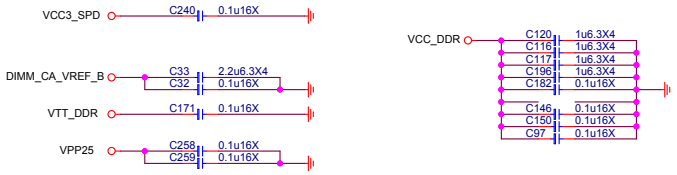
DDR VREF

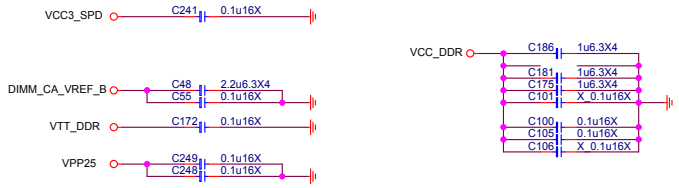
(place resistors close to DIMMs)

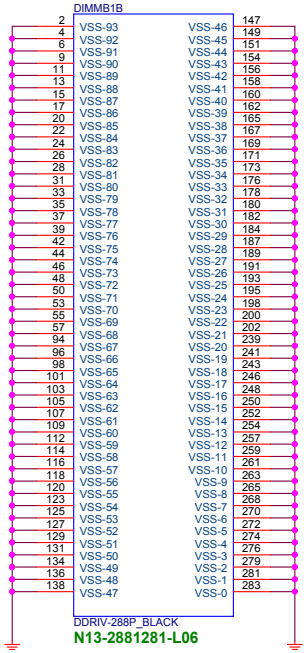


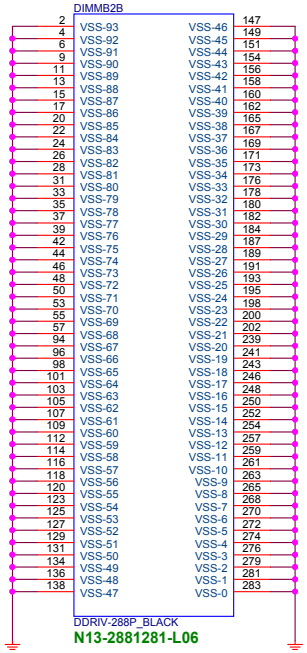












MICRO-STAR INT'L CO.,LTD

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Custom	DDR4 - POWER/GND-2	20

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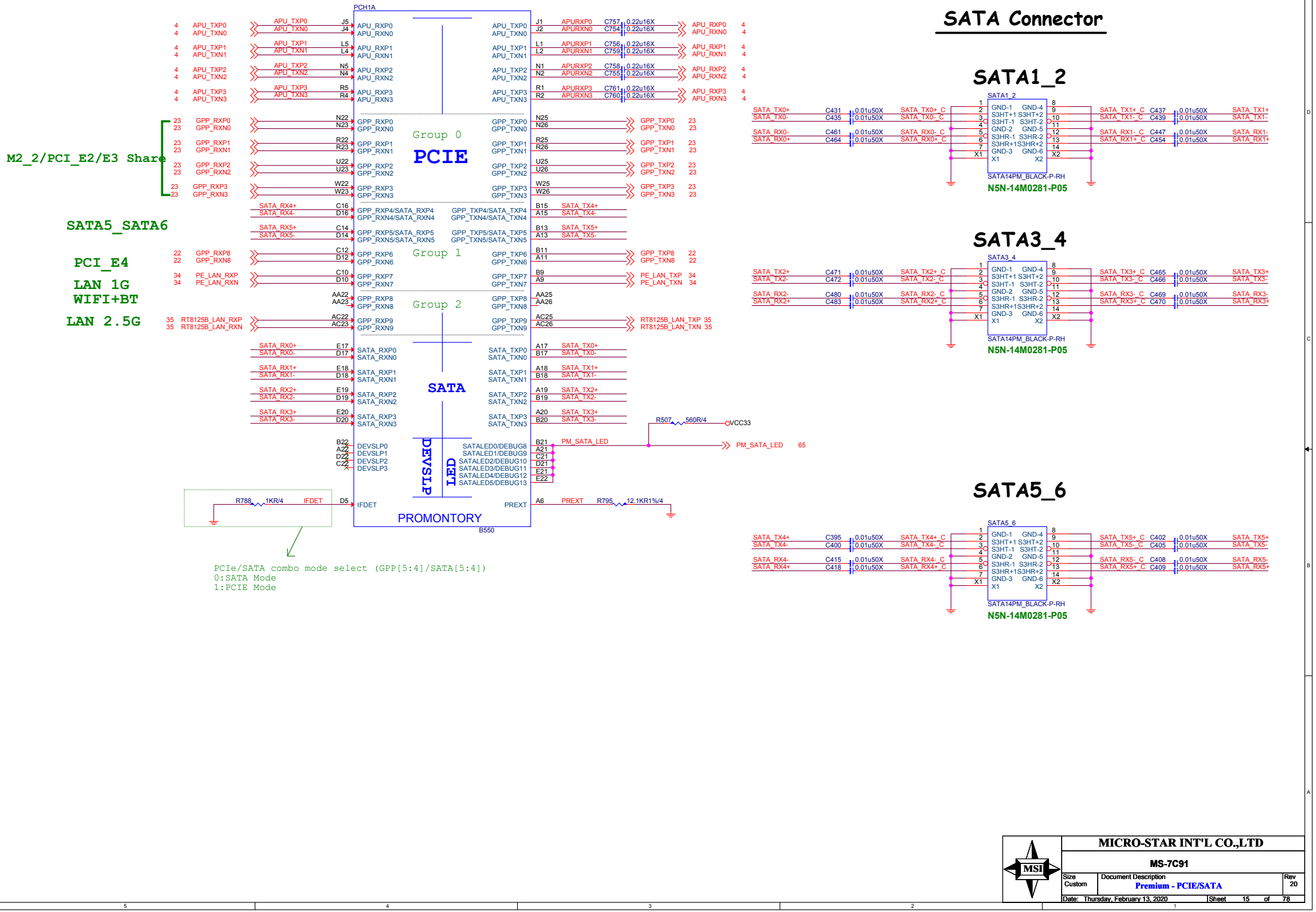

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Size: Custom	Document Description: Premium - PCIE/SATA
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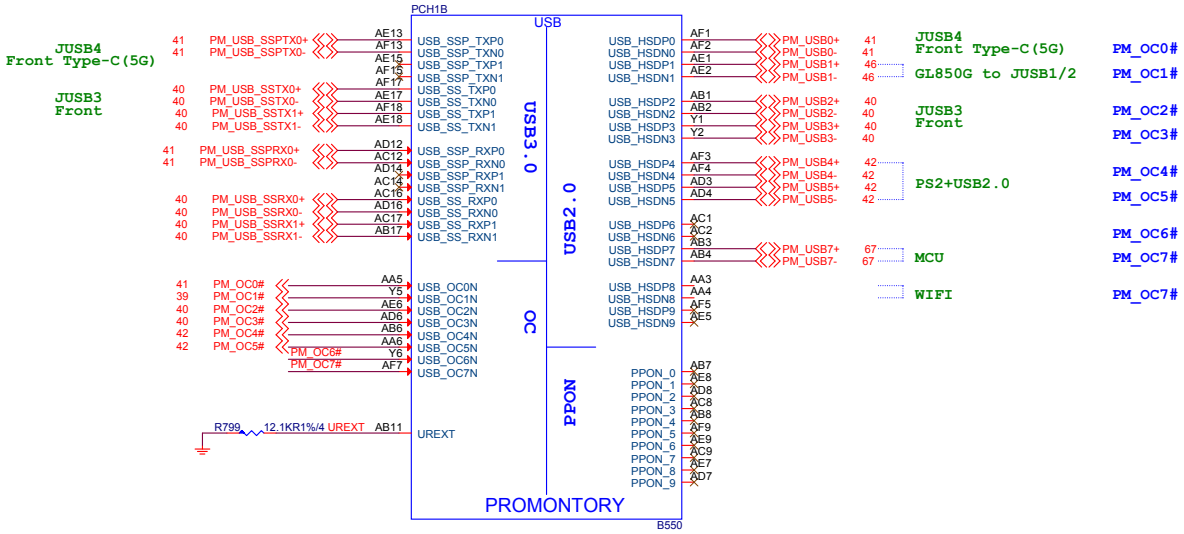

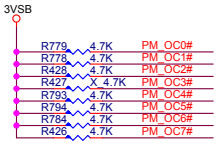

USB mapping

USB_SSP_TX/RX[0] + USB_HSDP/N[0] + USB_OC0N
USB_SSP_TX/RX[1] + USB_HSDP/N[1] + USB_OC1N

USB_SS_TX/RX[0] + USB_HSDP/N[2] + USB_OC2N
USB_SS_TX/RX[1] + USB_HSDP/N[3] + USB_OC3N
USB_HSDP/N[4] + USB_OC4N
USB_HSDP/N[5] + USB_OC5N
USB_HSDP/N[6] + USB_OC6N
USB_HSDP/N[7] + USB_OC7N
USB_HSDP/N[8] + USB_OC7N
USB_HSDP/N[9] + USB_OC7N

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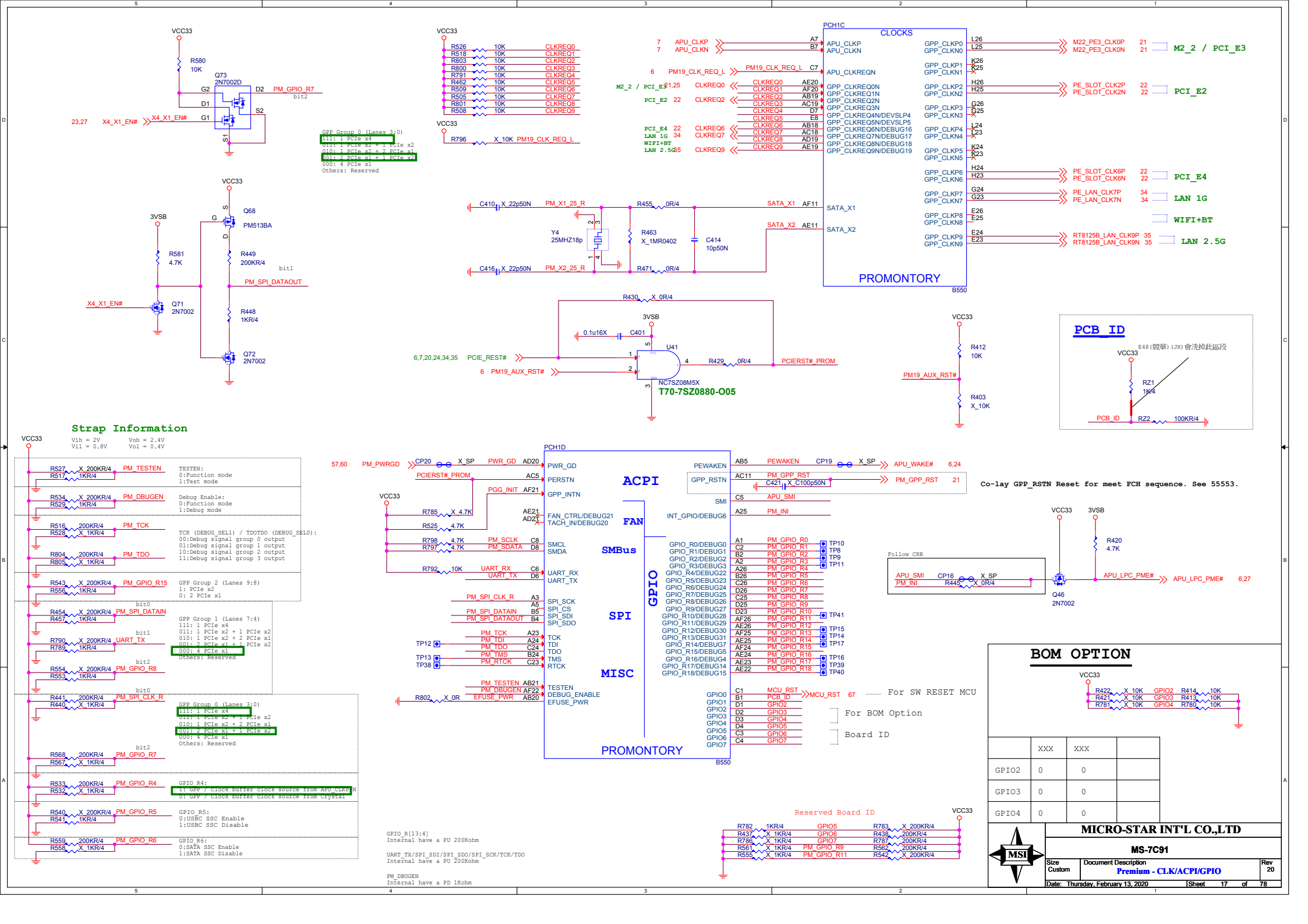
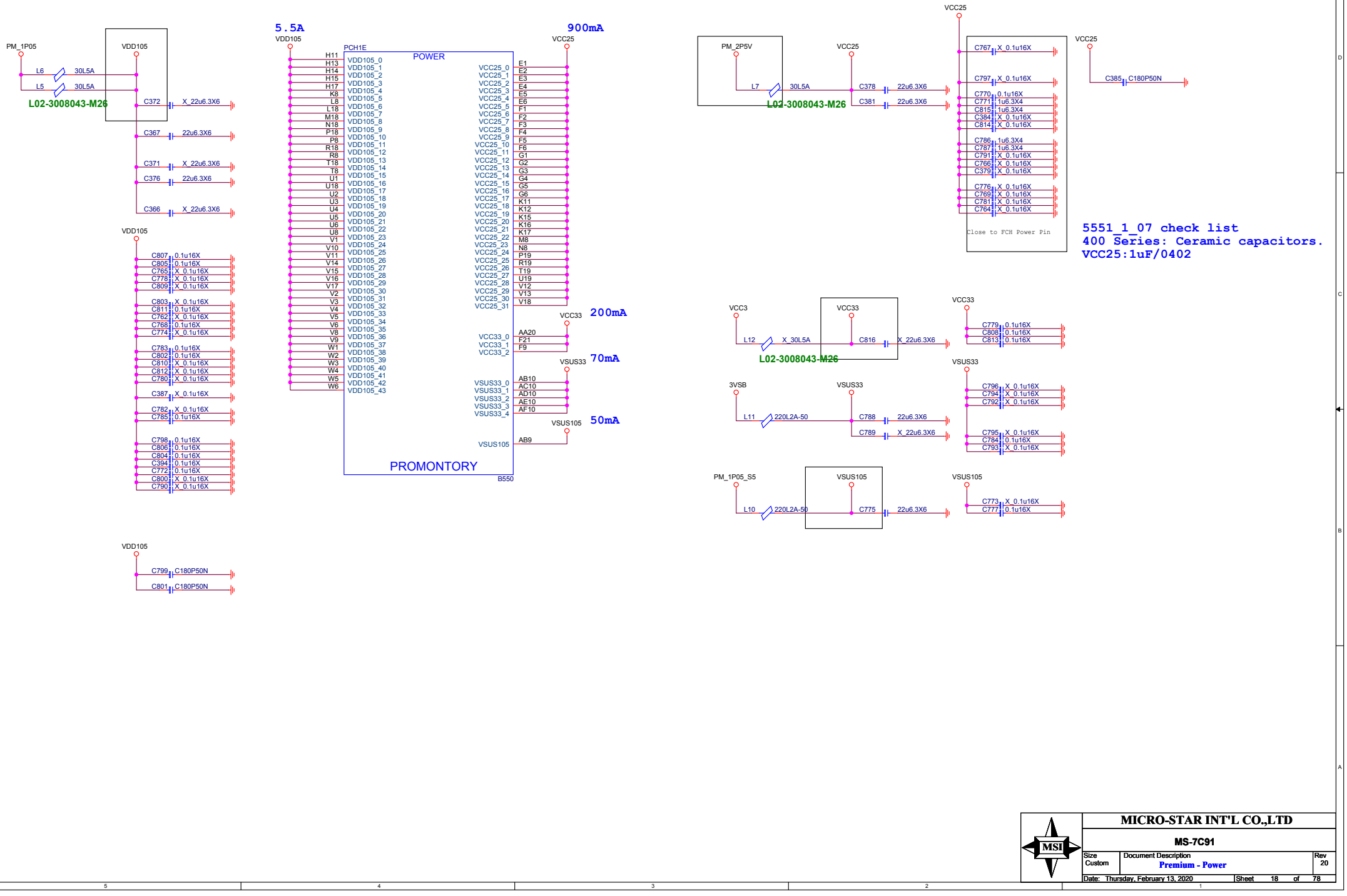
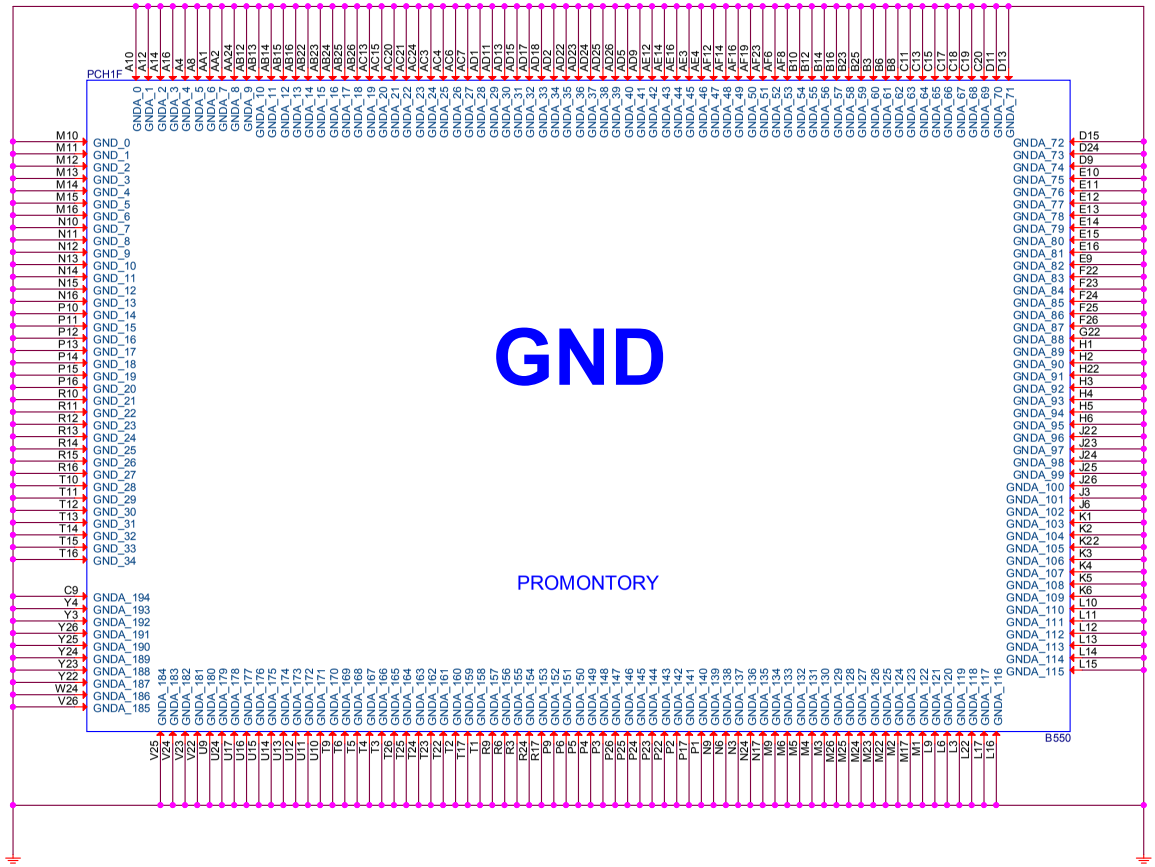

PCH1C
CLOCKS
PROMONTORY
B550
SATA_X1
SATA_X2
M2_2 / PCI_E3
PCI_E2
PCI_E4
LAN 1G
WIFI+BT
LAN 2.5G
PCB_ID
Strap Information
PCH1D
ACPI
FAN
SMBus
SPI
MISC
GPIO
PROMONTORY
BOM OPTION
Reserved Board ID
MICRO-STAR INT'L CO.,LTD
MS-7C91
Premium - CLK/ACPI/GPIO
Thursday, February 13, 2020



MICRO-STAR INT'L CO.,LTD		
MS-7C91		
Size: Custom	Document Description: Premium - Power	Rev: 20
Date: Thursday, February 13, 2020	Sheet 18 of 78	



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Size: Custom	Document Description: Premium - GND
Rev: 20	
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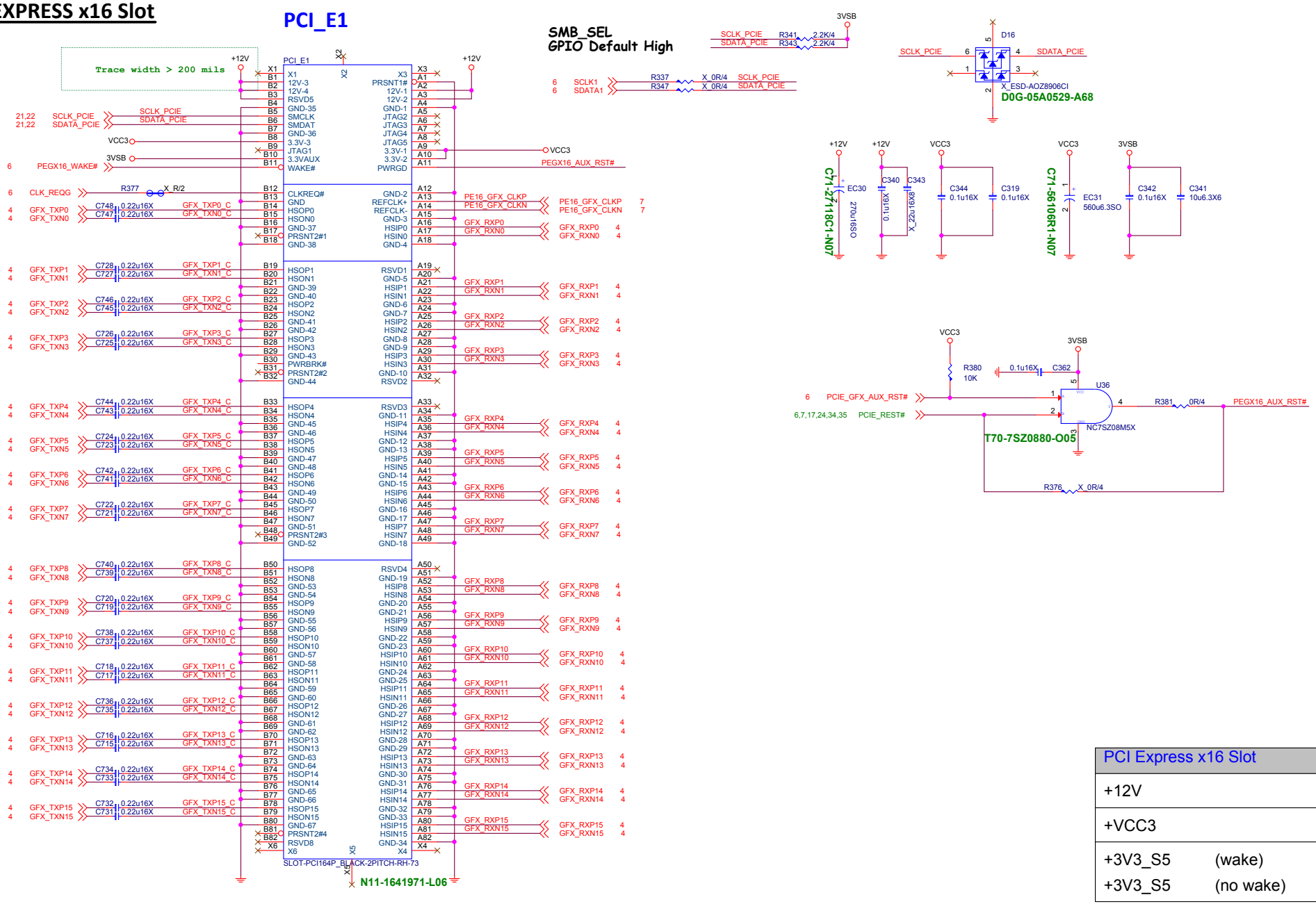
PCI_EXPRESS x16 Slot



PCI Express x16 Slot		
+12V		- 5.5 A
+VCC3		- 3A
+3V3_S5	(wake)	- 375mA
+3V3_S5	(no wake)	- 20mA

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Size: Custom | Document Description: PCI_E2 (X16) | Rev: 20

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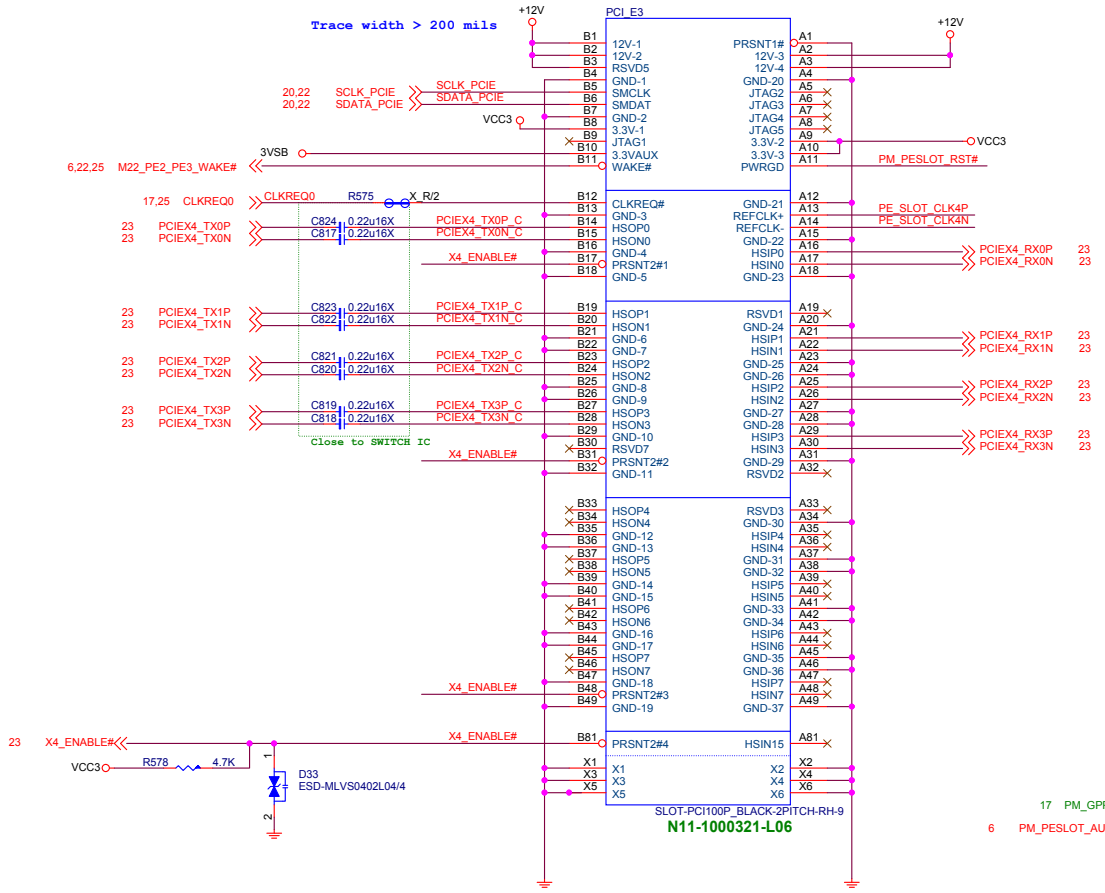
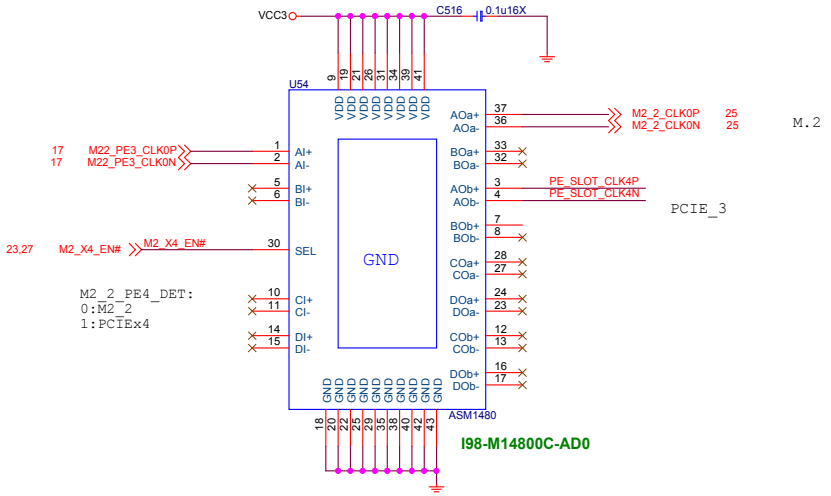
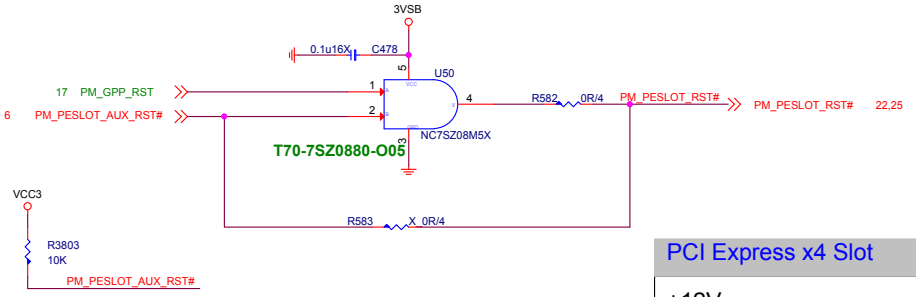
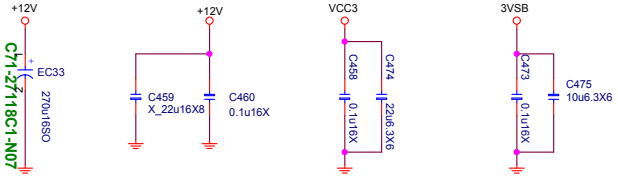
PCI_EXPRESS x4 SLOT

PCI_E3 X4









PCI Express x4 Slot		
+12V		- 2.1A
+VCC3		- 3A
+3V3_S5	(wake)	- 375mA
+3V3_S5	(no wake)	- 20mA

MICRO-STAR INT'L CO.,LTD

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Custom	PCI_E3 (X4)	20

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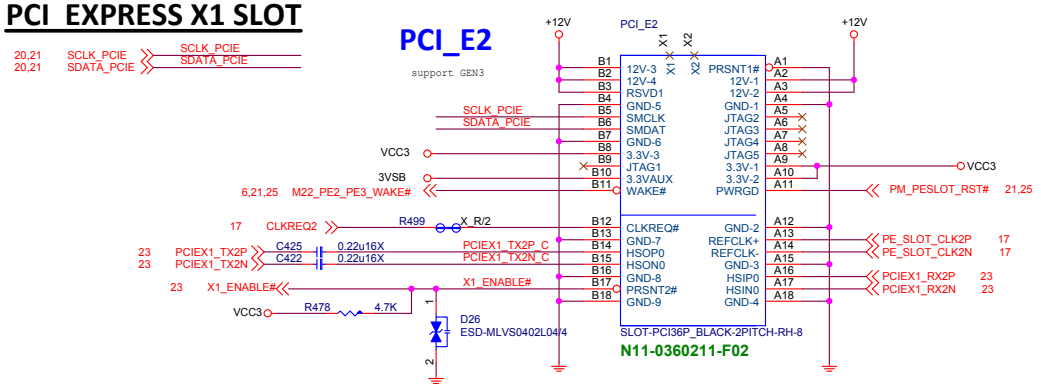
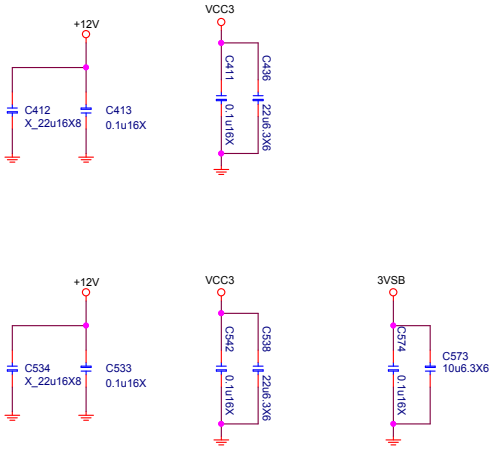
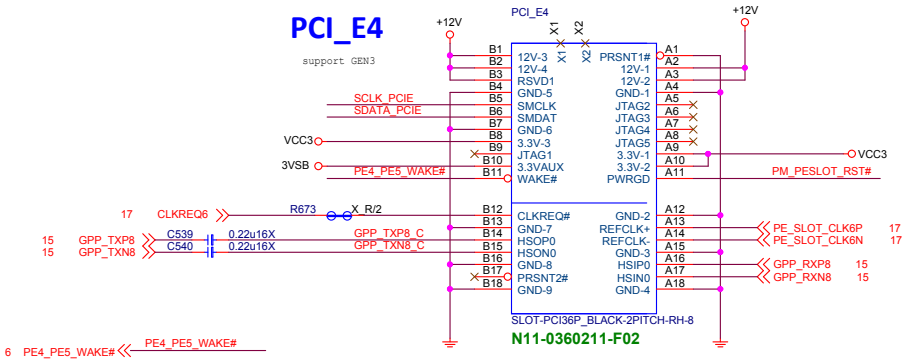
PCI_EXPRESS X1 SLOT







PCI Express x1 Slot *3		
+12V		- 1.5 A
+VCC3		- 9A
+3V3_S5	(wake)	- 1.125A
+3V3_S5	(no wake)	- 20mA

MICRO-STAR INT'L CO.,LTD

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Custom	PCI_E2/E4_X1	20

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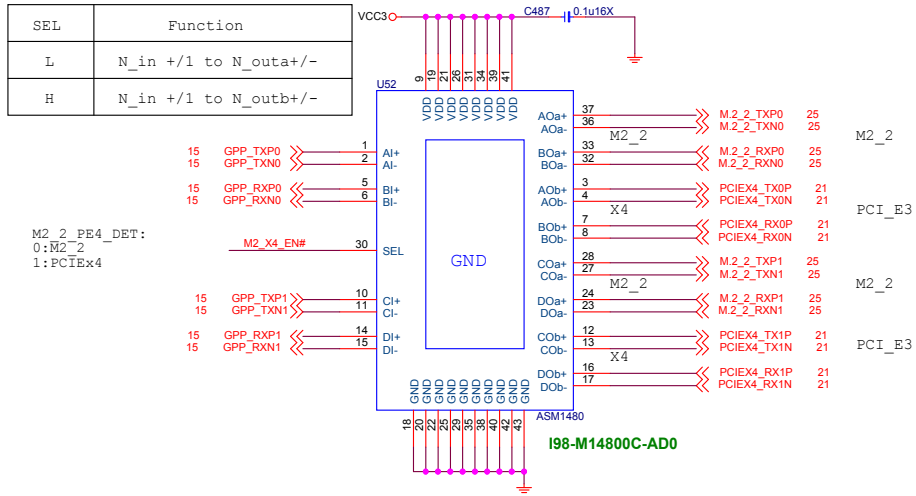
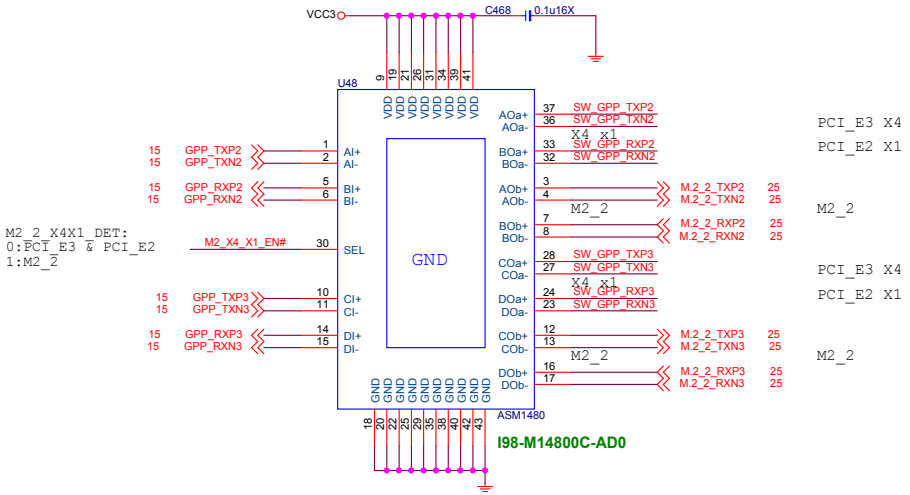
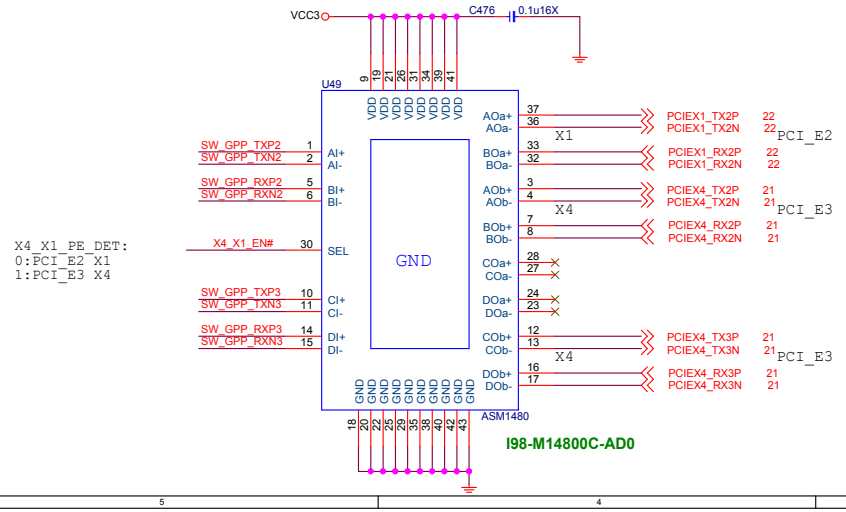
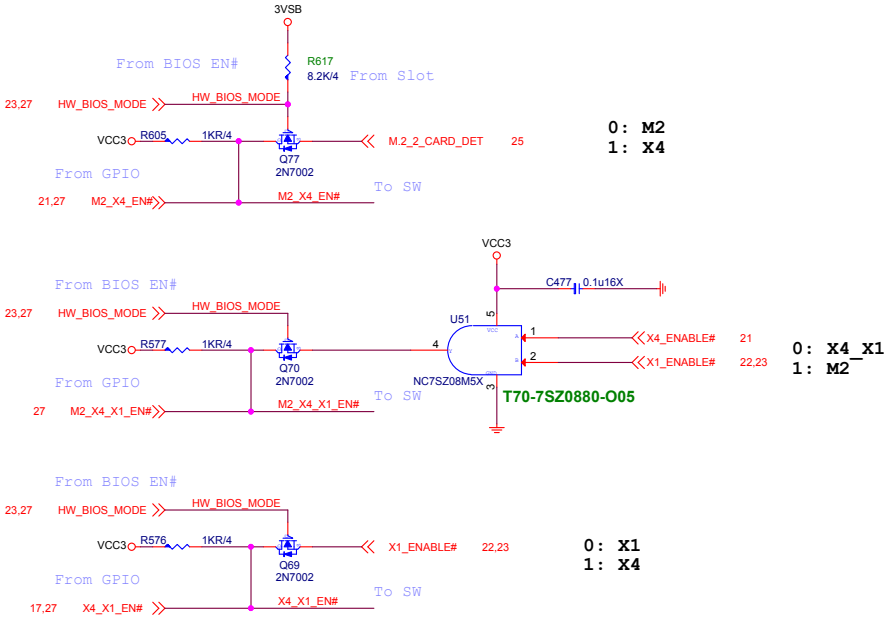
SEL	Function
L	N_in +/1 to N_outa+/-
H	N_in +/1 to N_outb+/-







PCIE Lanes control circuit



HW_BIOS_MODE = High(HW MODE)

DEVICE	M2_2 X4	●(4)	X	X	●(2)	●(2)	X	X	●(2)
	PCI_E3 X4	X	●(4)	X	●(0)	X	●(2)	X	●(0)
	PCI_E2 X1	X	X	●(1)	X	●(1)	●(1)	X	●(1)
DETECT	M.2_2_CARD_DET	O	1	1	O	O	1	1	O
	X1_ENABLE#	1	1	O	1	O	O	1	O
	X4_ENABLE#	1	O	1	O	1	O	1	O

●(X) = availability Lanes number

HW_BIOS_MODE = Low(BIOS MODE)

BIOS GPIO SWITCH	M2_X4_EN#	O	O	O	O	1	1	1	1
	M2_X4_X1_EN#	O	O	1	1	O	O	1	1
	X4_X1_EN#	O	1	O	1	O	1	O	1
DEVICE	M2_2 X4	●(2)	●(2)	●(4)	●(4)	●(0)	●(0)	●(0)	●(0)
	PCI_E3 X4	●(0)	●(0)	●(0)	●(0)	●(2)	●(4)	●(2)	●(2)
	PCI_E2 X1	●(1)	●(0)	●(0)	●(0)	●(1)	●(0)	●(0)	●(0)

MICRO-STAR INT'L CO.,LTD

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Size	Document Description	Rev
Custom	PCIE GEN3 SWITCH	20

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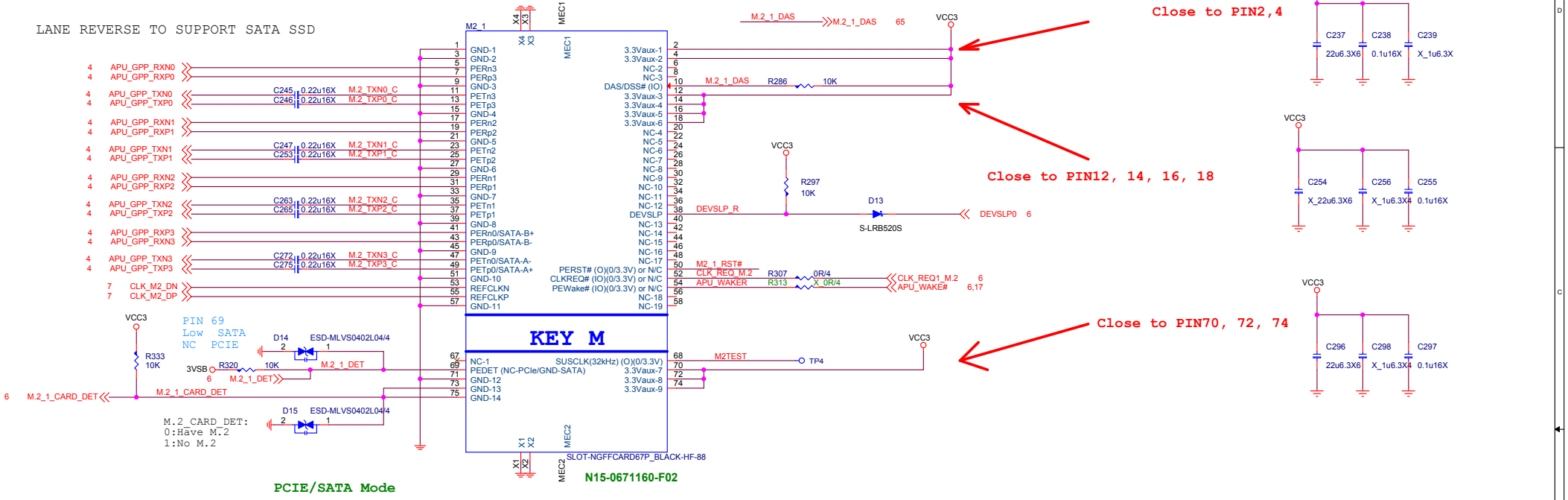
M.2_1 Connector

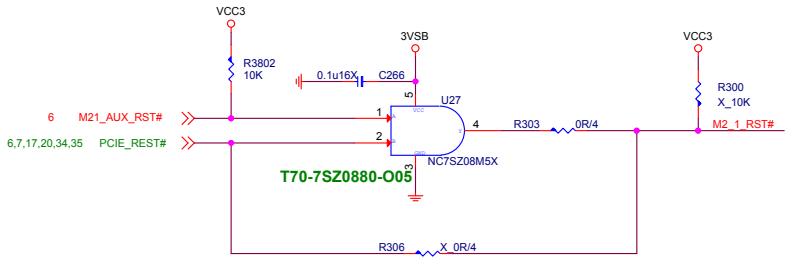
VCC3 4.25A
Max: 14W

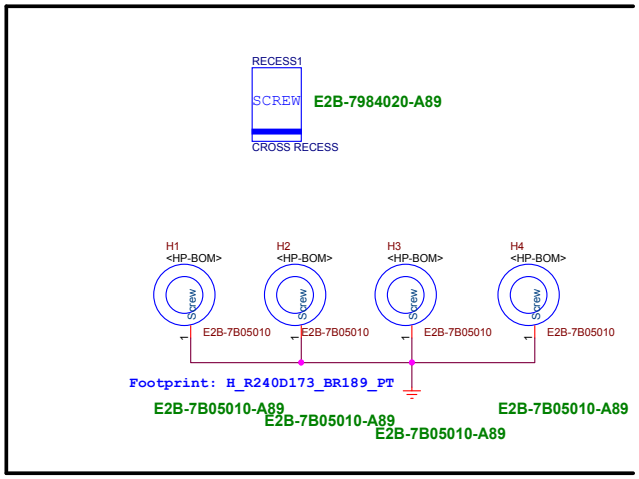
M2下方零件擺放限高要小於0.9mm的零件



PCIE/SATA Mode

N15-0671160-F02



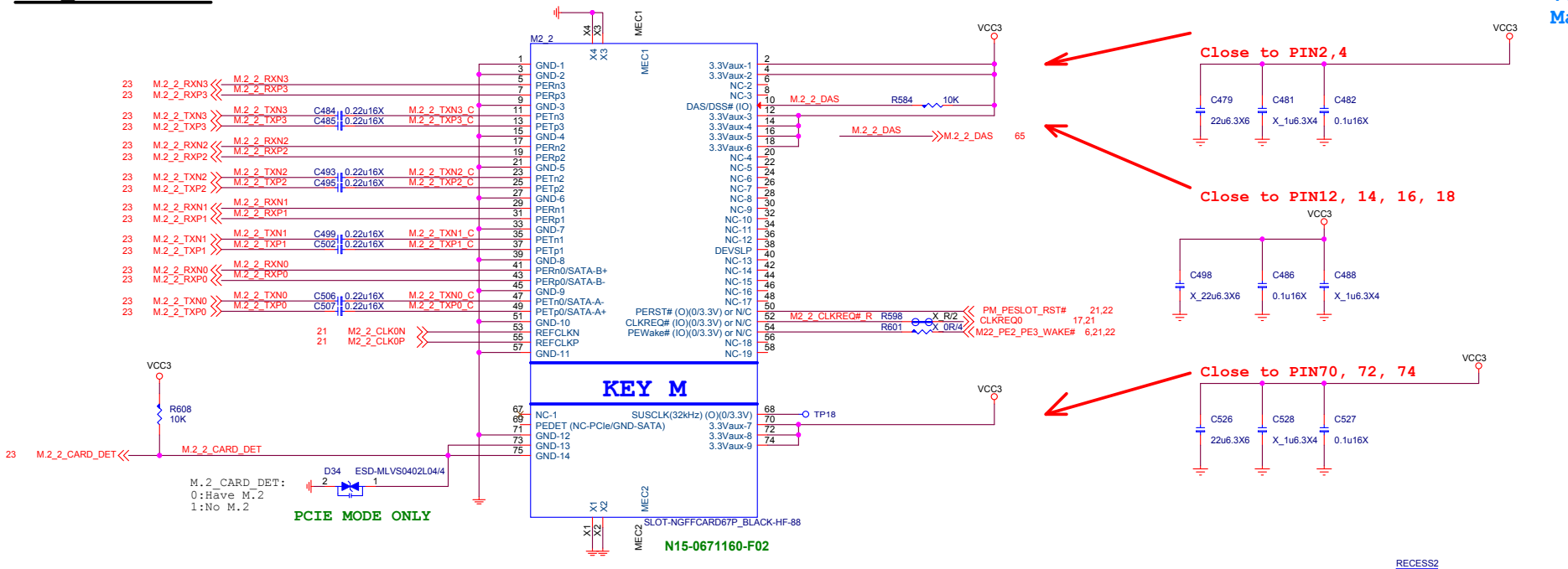


MICRO-STAR INT'L CO.,LTD		
MS-7C91		
Size: Custom	Document Description: M2_1 PCIE/SATA Mode(KEY_M)	Rev: 20
Date: Thursday, February 13, 2020	Sheet 24 of 78	

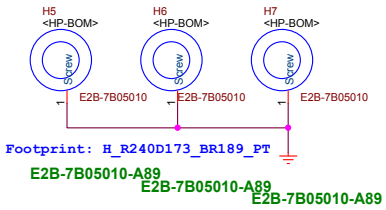
M.2_2 Connector

M2下方零件擺放限高要小於0.9mm的零件

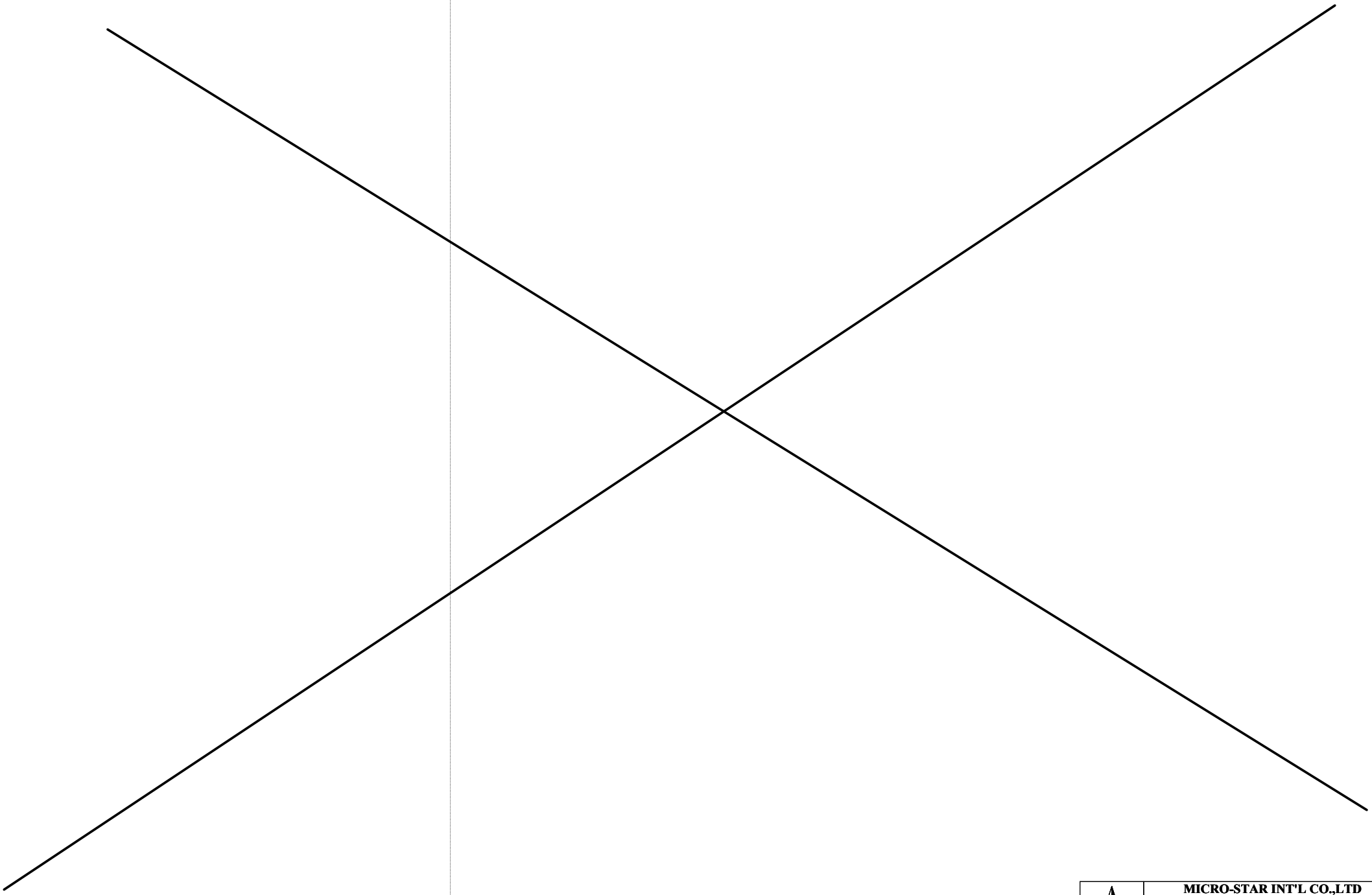
VCC3 4.25A
Max: 14W



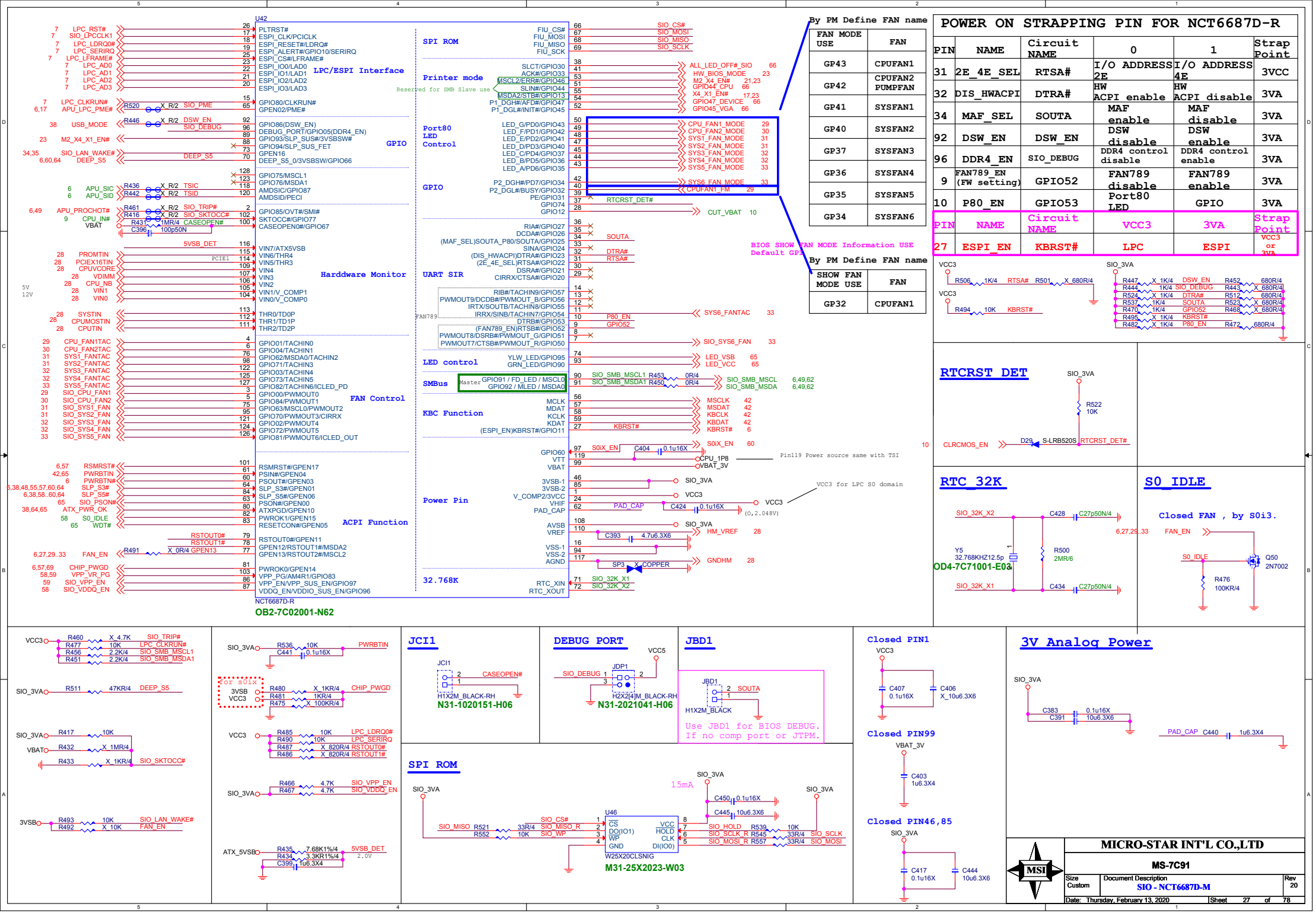
M2_2 use have four-hole footprint
V0A/1.0 BOM : N15-0670330-L06
V2.0 BOM : N15-0671160-F02



MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: M2_2 PCIE Mode(KEY_M)
Rev: 20	
Date: Thursday, February 13, 2020	Sheet 25 of 78



MICRO-STAR INT'L CO.,LTD		
MS-7C91		
Size: Custom	Document Description: M2_2 - WIFI+BT	Rev: 20
Date: Thursday, February 13, 2020	Sheet 26 of 78	


U42
NCT6687D-R
OB2-7C02001-N62
LPC/ESPI Interface
GPIO
Harddware Monitor
FAN Control
ACPI Function
SPI ROM
Printer mode
Port80 LED Control
UART SIR
LED control
SMBus
KBC Function
Power Pin
32.768K
By PM Define FAN name
FAN MODE USE
FAN
GP43 CPUFAN1
GP42 CPUFAN2 PUMPFAN
GP41 SYSFAN1
GP40 SYSFAN2
GP37 SYSFAN3
GP36 SYSFAN4
GP35 SYSFAN5
GP34 SYSFAN6
BIOS SHOW FAN MODE Information USE Default GPI
By PM Define FAN name
SHOW FAN MODE USE
FAN
GP32 CPUFAN1
POWER ON STRAPPING PIN FOR NCT6687D-R
PIN NAME Circuit NAME 0 1 Strap Point
31 2E_4E_SEL RTSA# I/O ADDRESS 2E I/O ADDRESS 4E 3VCC
32 DIS_HWACPI DTRA# HW ACPI enable HW ACPI disable 3VA
34 MAF_SEL SOUTA MAF enable MAF disable 3VA
92 DSW_EN DSW_EN DSW disable DSW enable 3VA
96 DDR4_EN SIO_DEBUG DDR4 control disable DDR4 control enable 3VA
9 FAN789_EN (FW setting) GPIO52 FAN789 disable FAN789 enable 3VA
10 P80_EN GPIO53 Port80 LED GPIO 3VA
PIN NAME Circuit NAME VCC3 3VA Strap Point
27 ESPI_EN KBRST# LPC ESPI VCC3 or 3VA
RTCRST_DET
RTC_32K
S0_IDLE
Closed FAN , by S0i3.
3V Analog Power
JCI1
N31-1020151-H06
DEBUG PORT
N31-2021041-H06
JBD1
Use JBD1 for BIOS DEBUG. If no comp port or JTPM.
SPI ROM
M31-25X2023-W03
Closed PIN1
Closed PIN99
Closed PIN46,85
MICRO-STAR INT'L CO.,LTD
MS-7C91
SIO - NCT6687D-M
Rev 20
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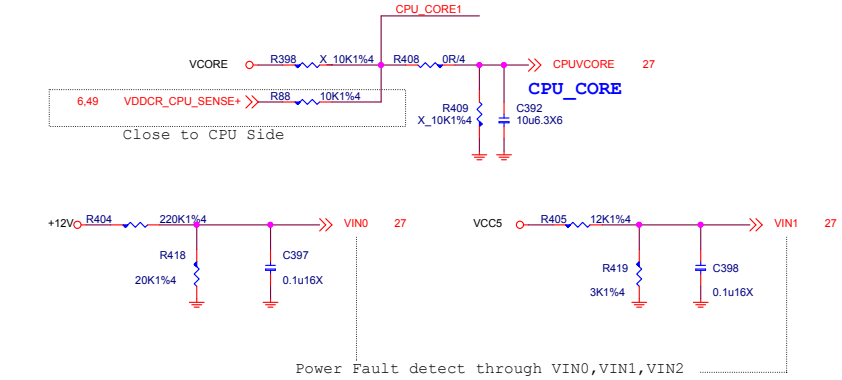
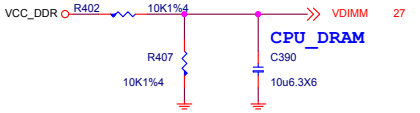
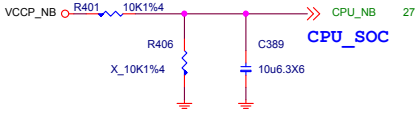
HW Monitor - Voltage

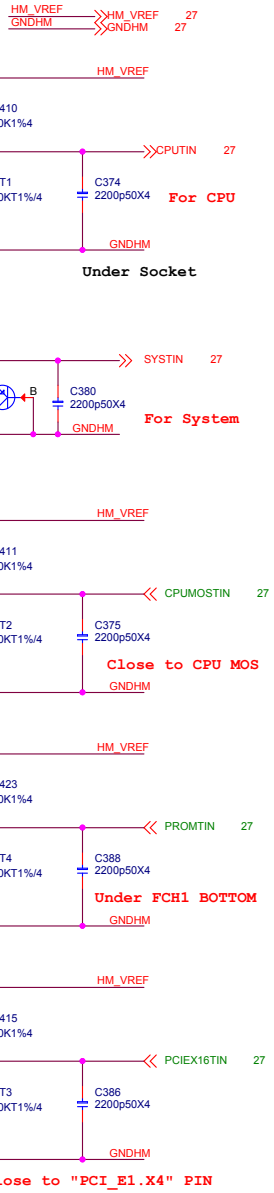
SIO HM Voltage over 2.048V will not detect







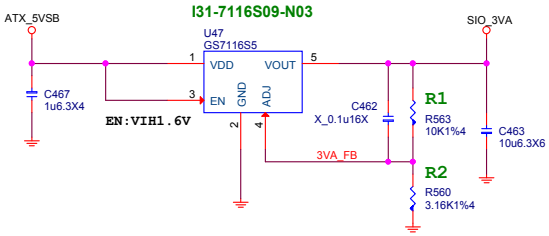
TEMP SENSOR



PM RESET

CPU RESET

SIO_3VA



Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(10K/3.16K))
= 3.33V

MICRO-STAR INT'L CO.,LTD

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Size	Document Description	Rev
Custom	SIO - HW Monitor	20

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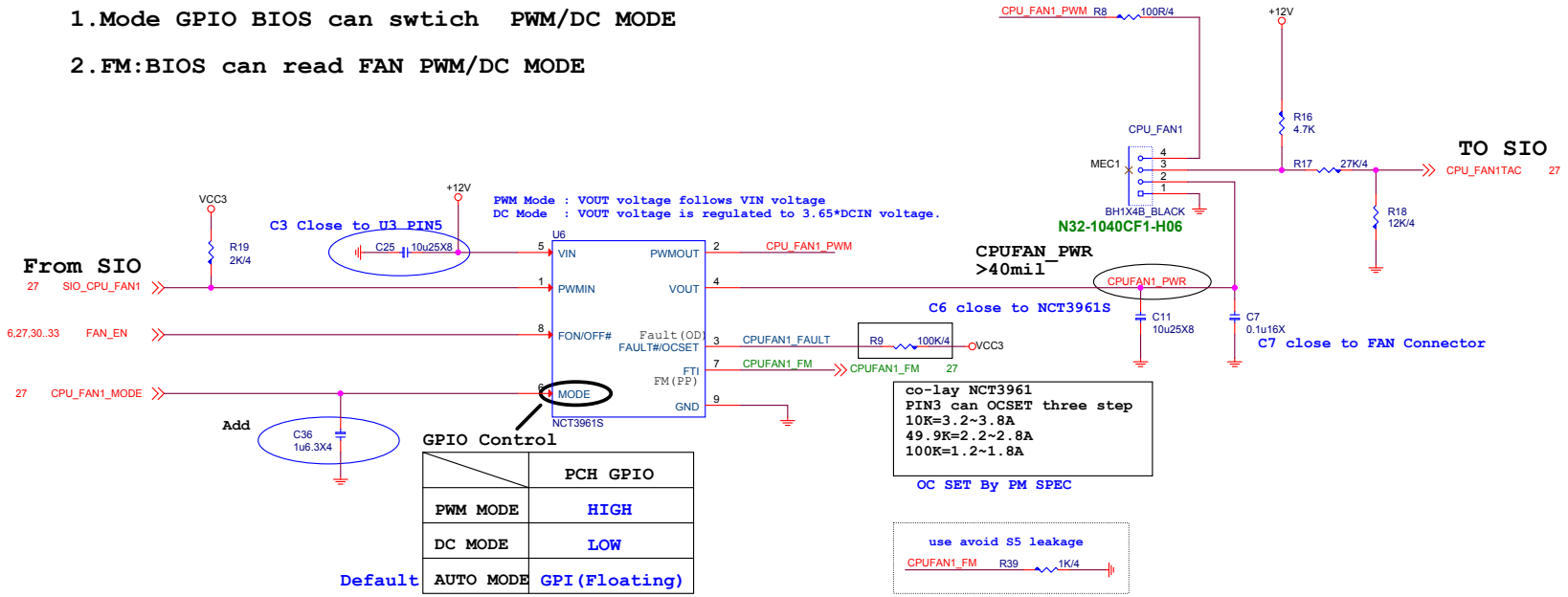
CPUFAN1 TYPE N : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE

2.FM:BIOS can read FAN PWM/DC MODE



	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

MICRO-STAR INT'L CO.,LTD

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Size: Custom | Document Description: FAN TYPE-L CPUFAN1 | Rev: 20

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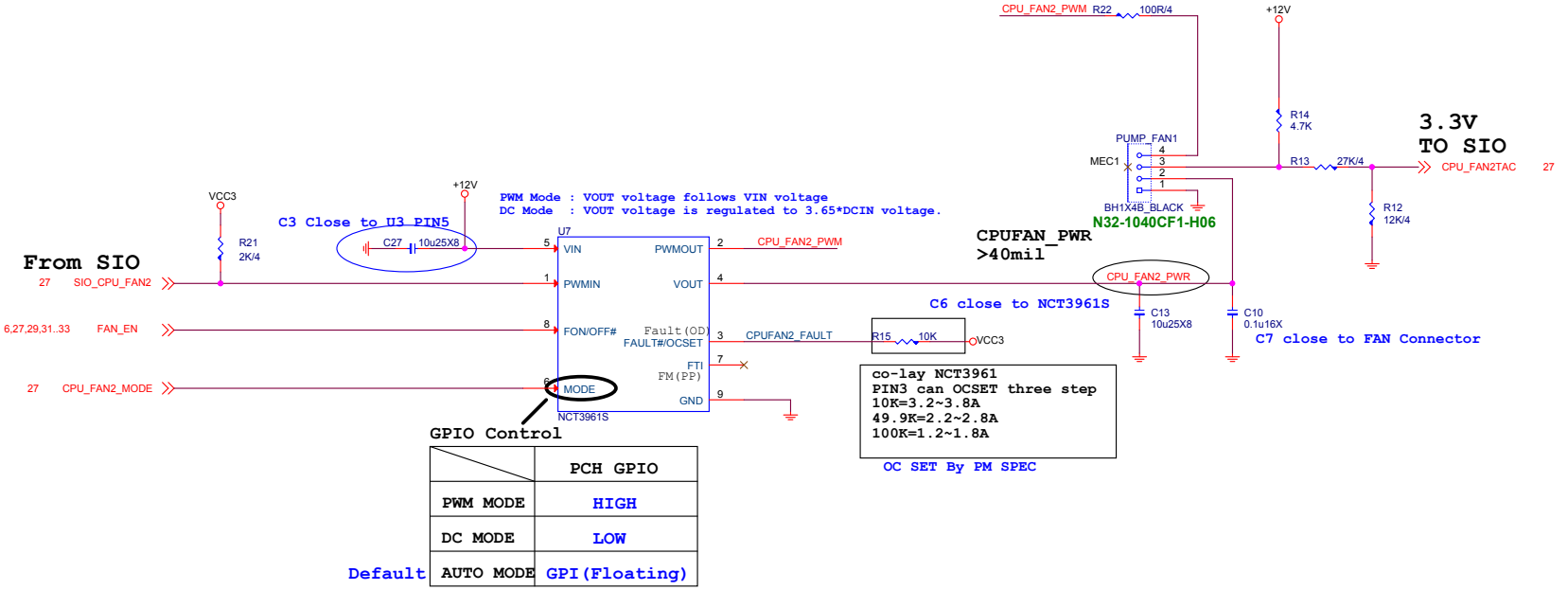
PUMPFAN1

TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE



GPIO Control

	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: FAN TYPE-K PUMPFAN1
Rev: 20	
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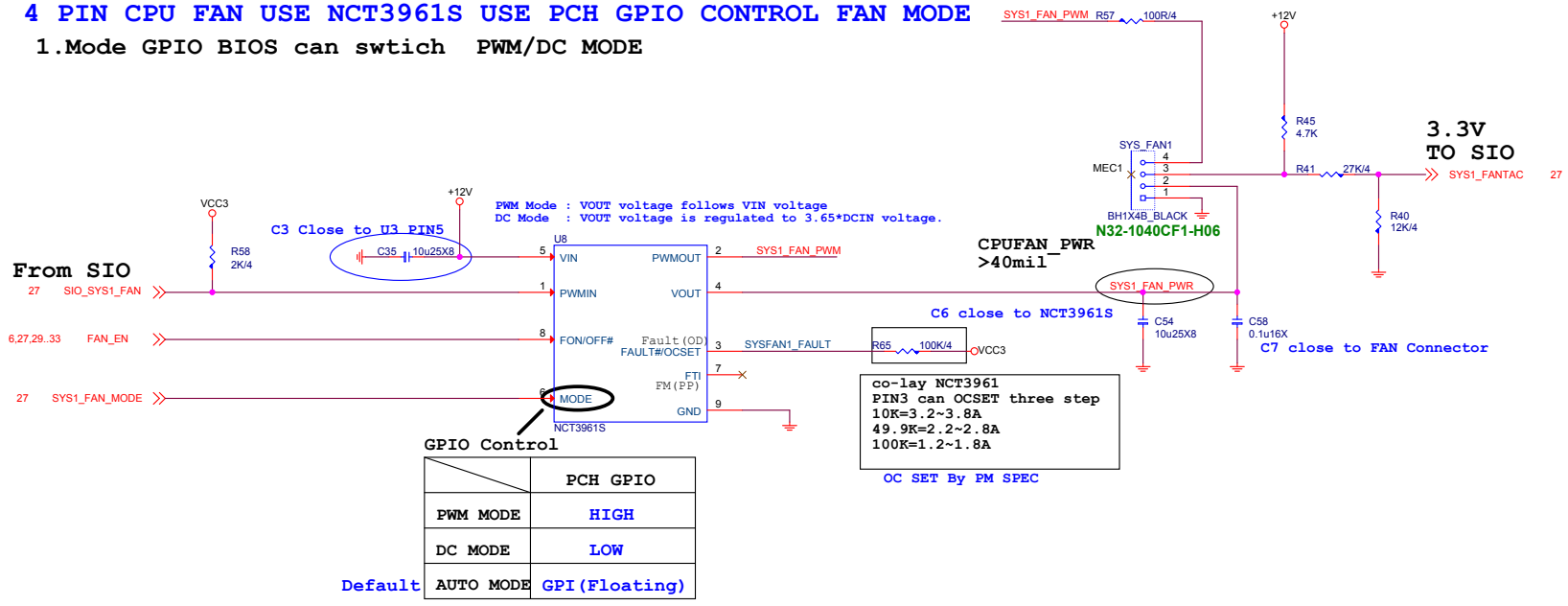
SYSFAN1

TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE

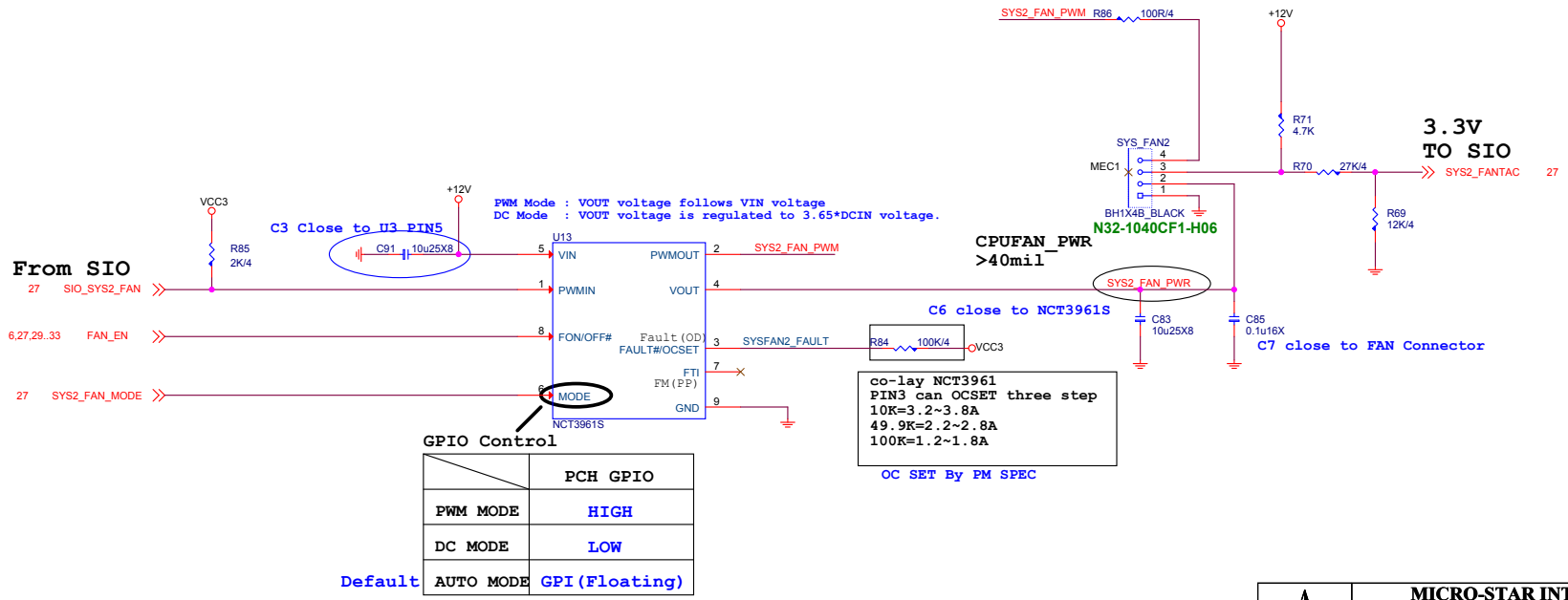


	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

SYSFAN2

TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE



	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

MICRO-STAR INT'L CO.,LTD

MS-7C91

Size: Custom | Document Description: FAN TYPE-K SYSFAN1/2 | Rev: 20

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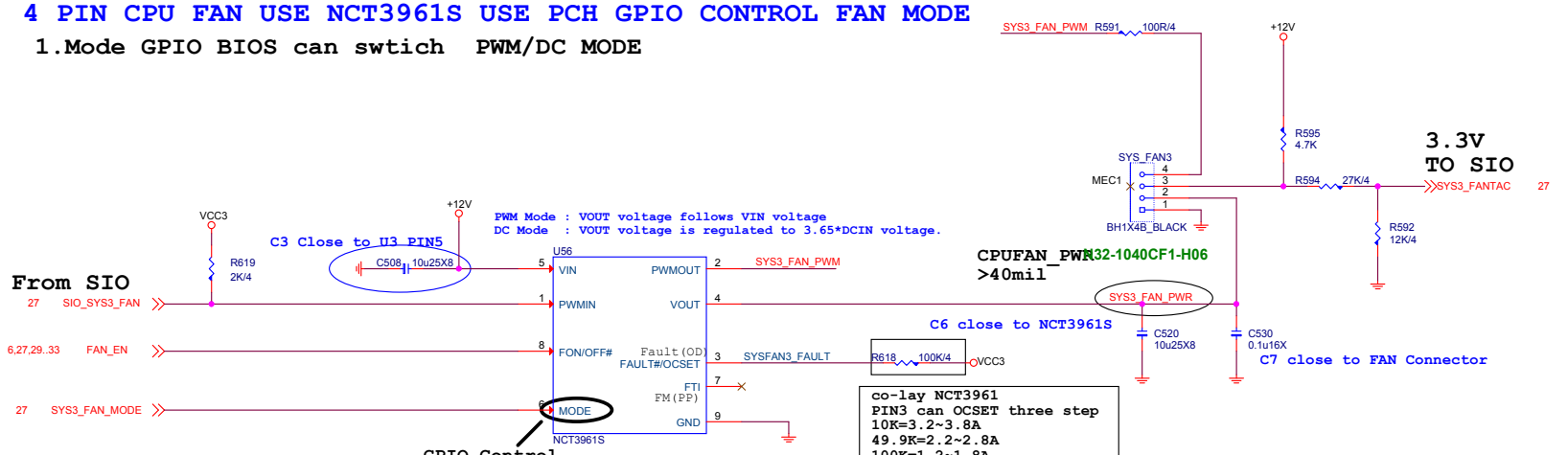
SYSFAN3

TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE

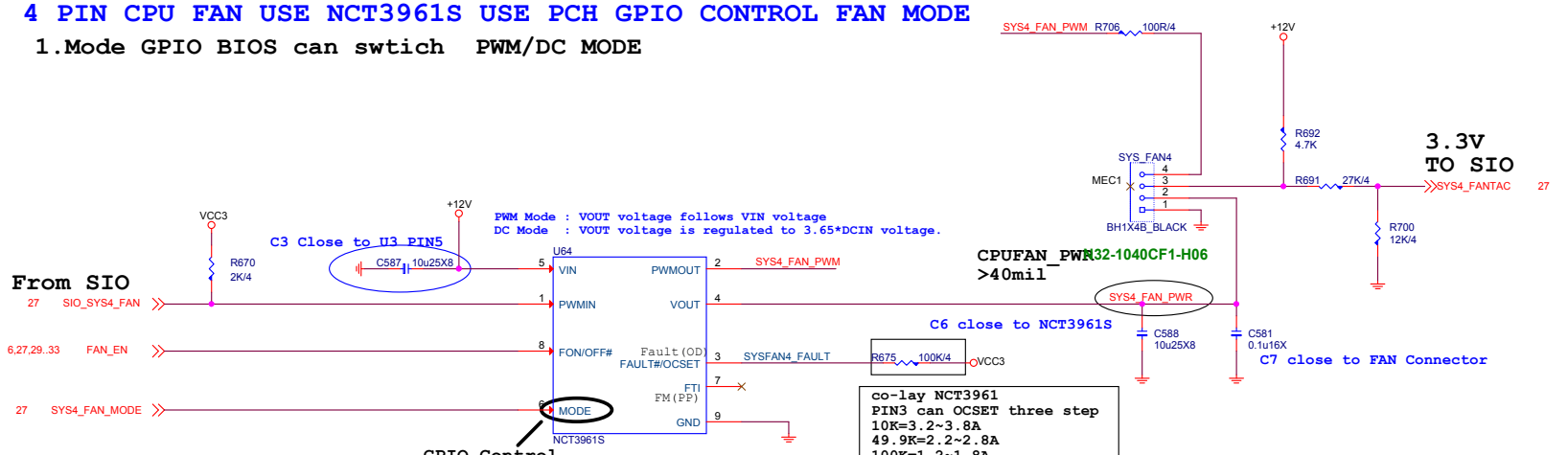


	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

SYSFAN4

TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE



	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

MICRO-STAR INT'L CO.,LTD

MS-7C91

Size	Document Description	Rev
Custom	FAN TYPE-K SYSFAN3/4	20

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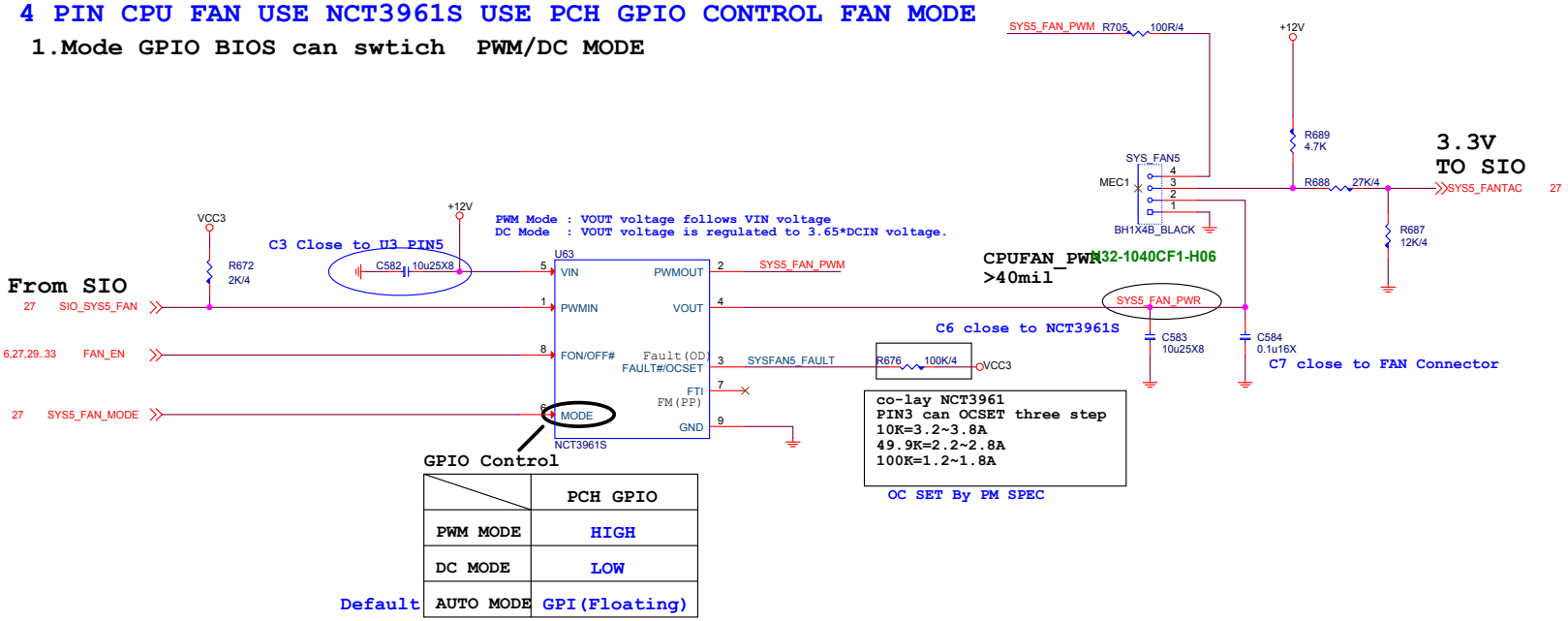
SYSFAN5 TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

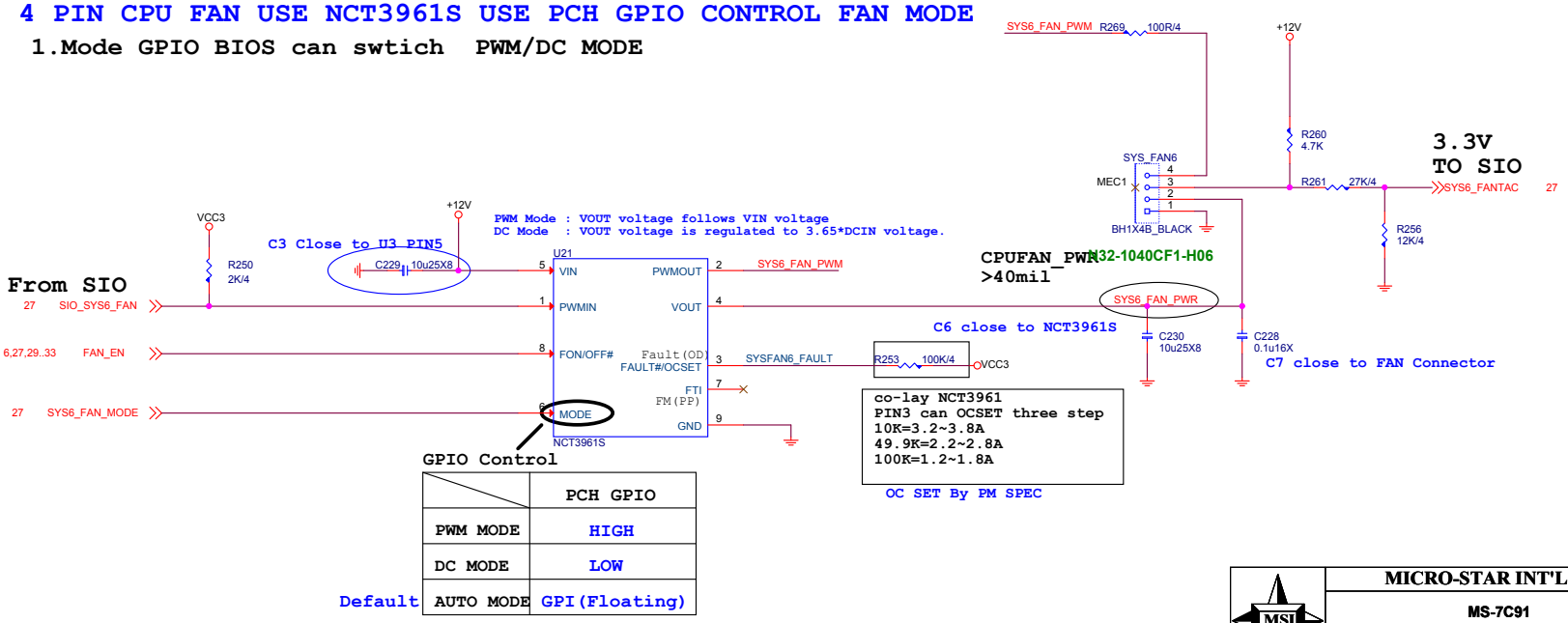
1.Mode GPIO BIOS can swtich PWM/DC MODE



	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

SYSFAN6 TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE



	PCH GPIO
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

MICRO-STAR INT'L CO.,LTD

MS-7C91

Size: Custom | Document Description: FAN TYPE-N SYSFAN5 | Rev: 20

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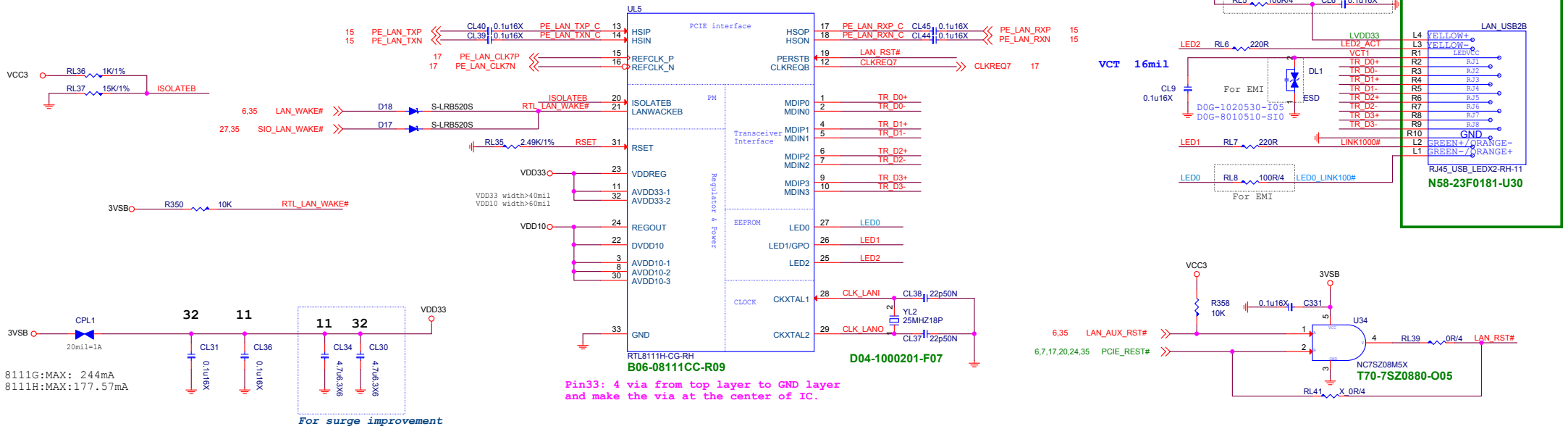
RTL8111H Giga LAN



8111G POWER Consumption

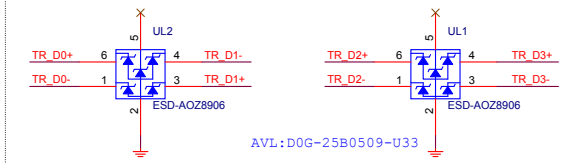
	3.3V @ mA	mW
10 M Idle/TxRx	17.15/116.7	56.6/385.1
100 M Idle/TxRx	71.45/129.5	235.8/427.4
Giga Idle/TxRx	179.1/243.9	591/804.9
ALDPS	6.41	21.15

8111H POWER Consumption

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

ESD Protect

UL2&UL3 close to connector



MICRO-STAR INT'L CO.,LTD

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Size	Document Description	Rev
Custom	RTL8111H Giga LAN	20

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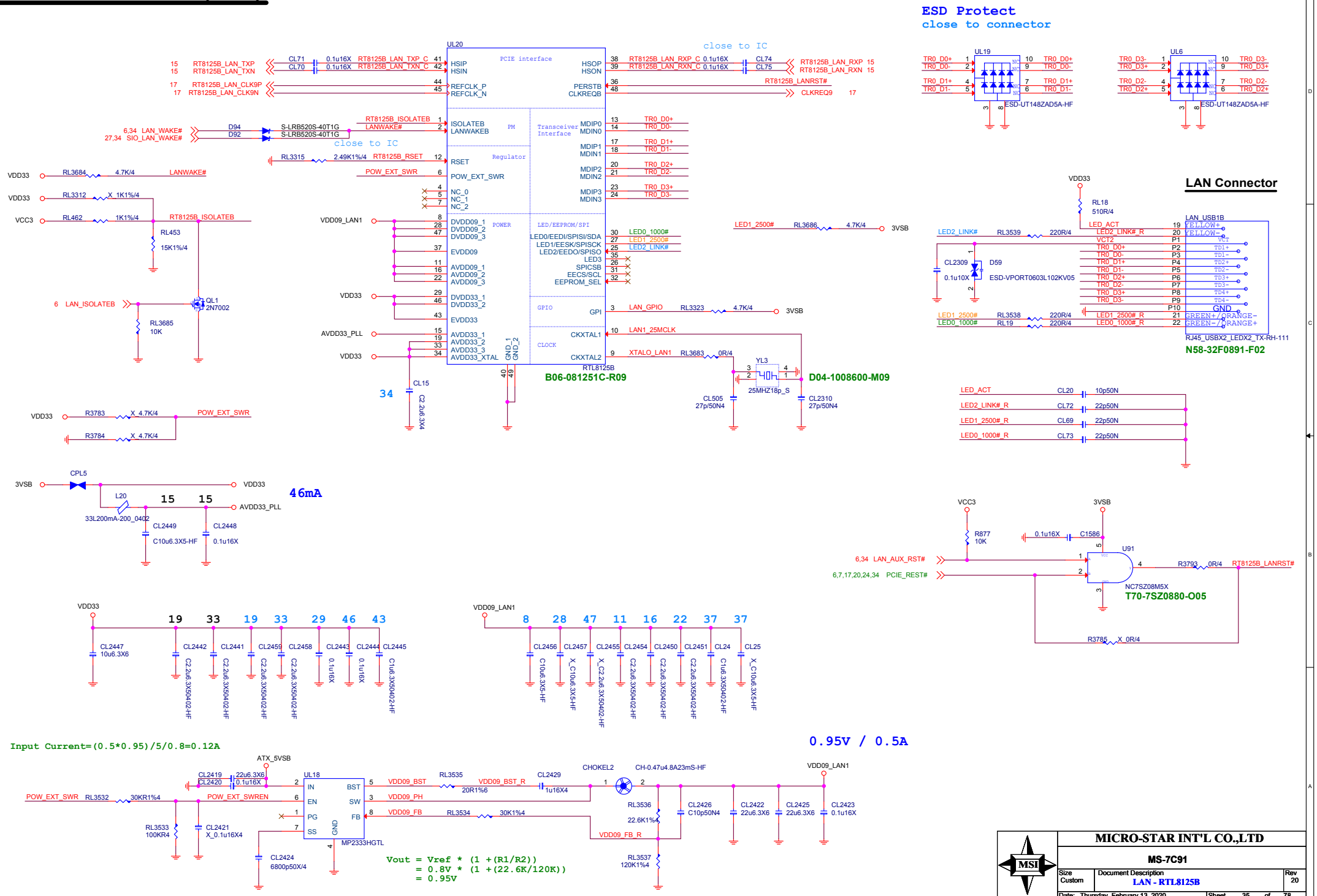
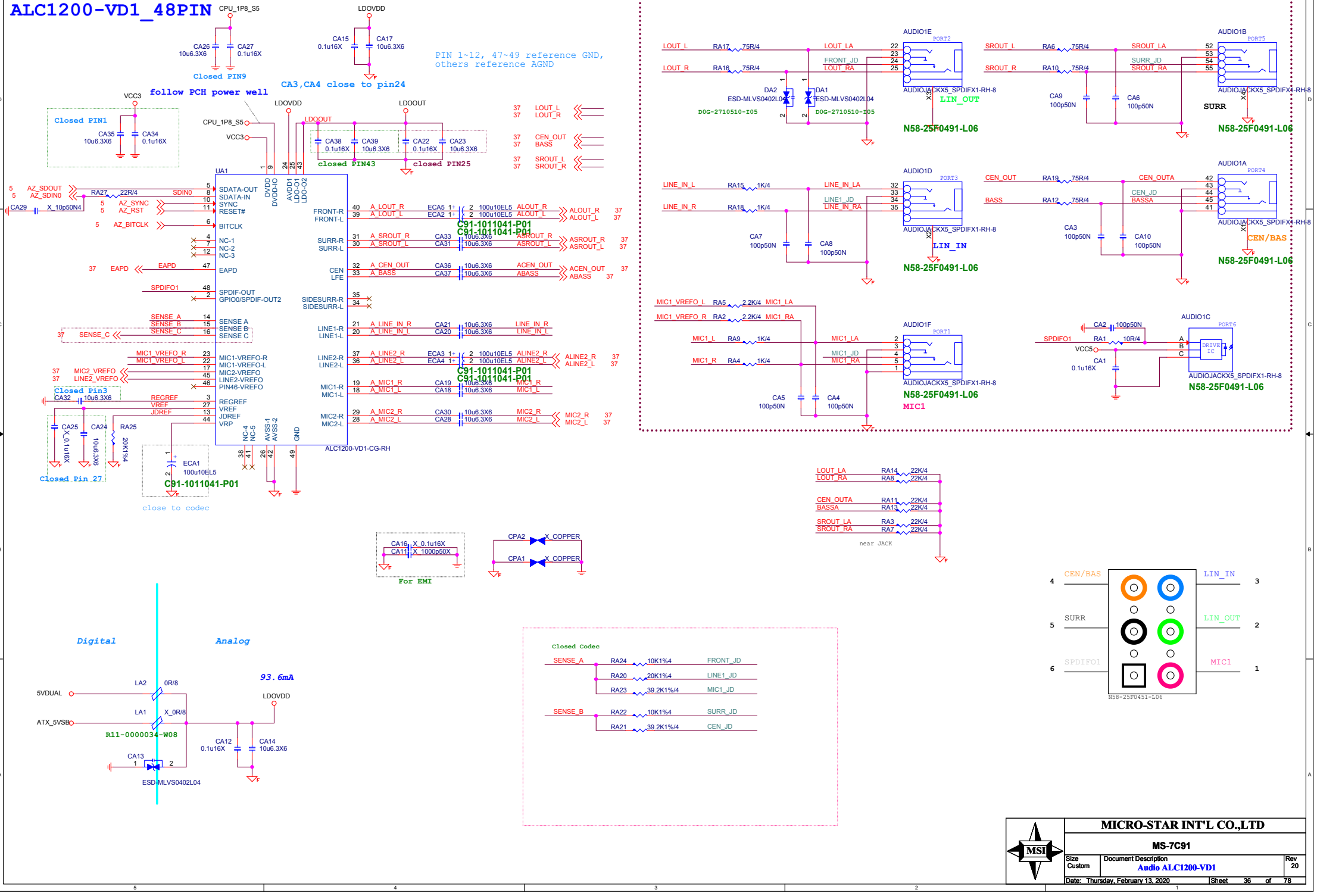
Realtek Lan1-RTL8125B(2.5G)



ALC1200-VD1_48PIN



MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: Audio ALC1200-VD1
Rev: 20	
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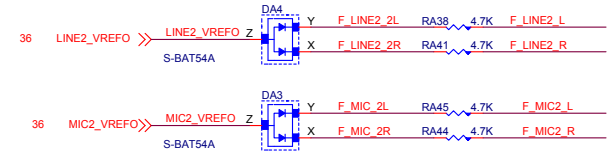
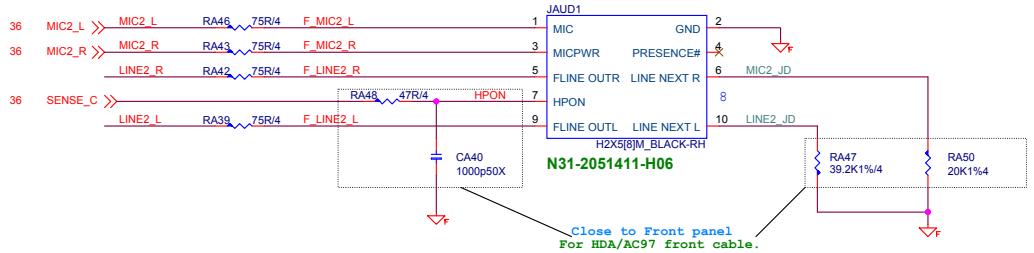
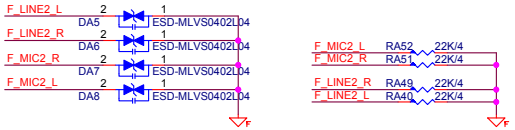




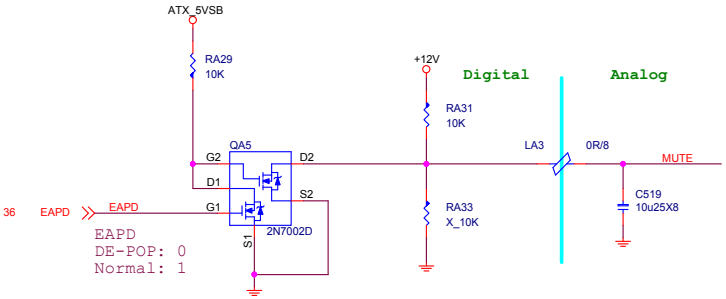
D0G-2710510-I05
Close to Front panel

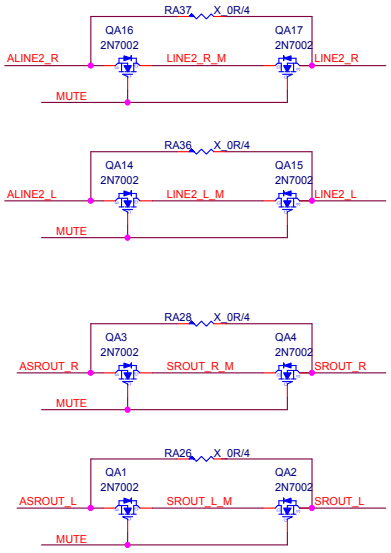
ESD protect

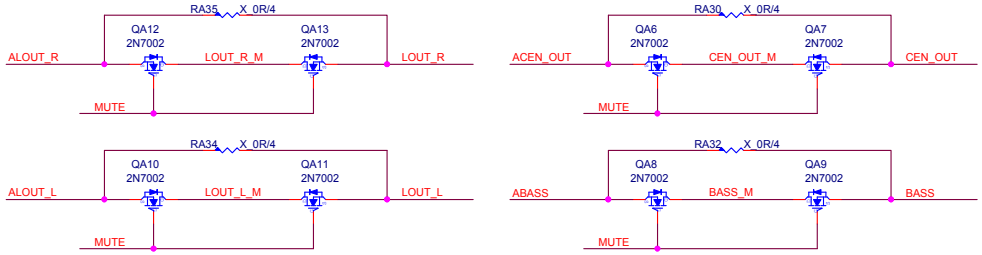
D0G-2710510-I05
AVL:D0G-2950500-SI0

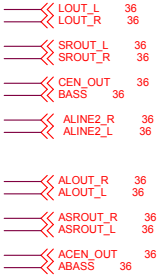


De-POP circuit









MICRO-STAR INT'L CO.,LTD

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Custom	Audio DePop	20

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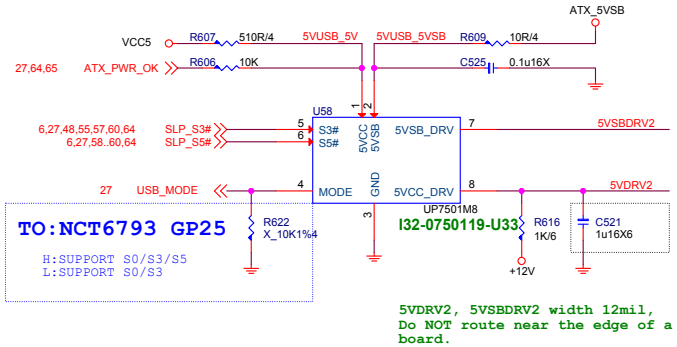
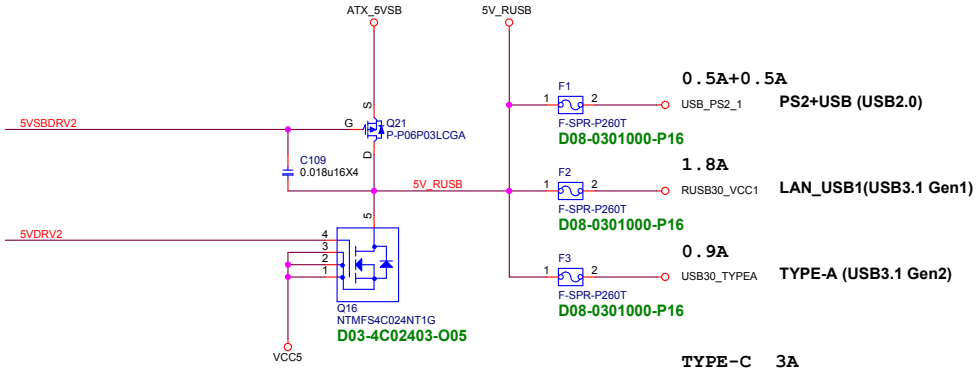
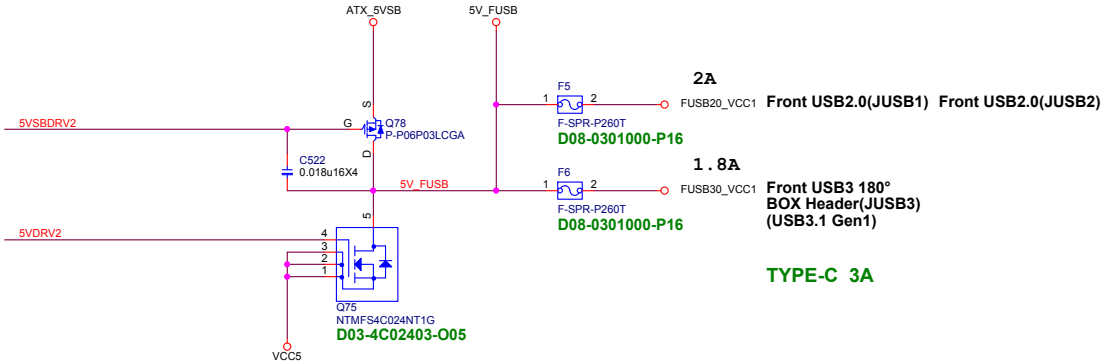
USB Power





Rear (6.7A)

Front (6.8A)



MICRO-STAR INT'L CO.,LTD		
MS-7C91		
Size: Custom	Document Description: USB Power - UP7501	Rev: 20
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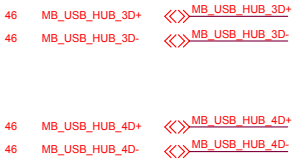
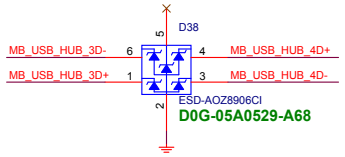
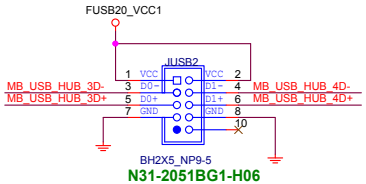
Front USB2.0(JUSB2)

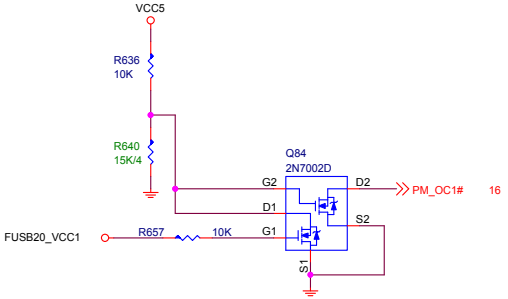
Form GL850G USB2.0 HUB

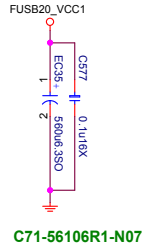
5V@1A







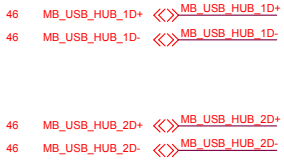


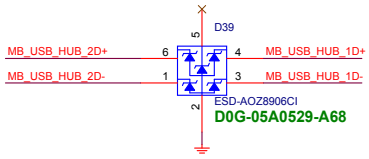


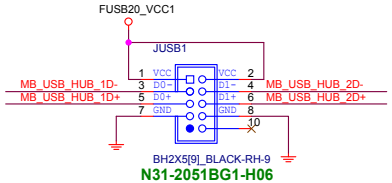
Front USB2.0(JUSB1)

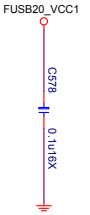
Form GL850G USB2.0 HUB

5V@1A









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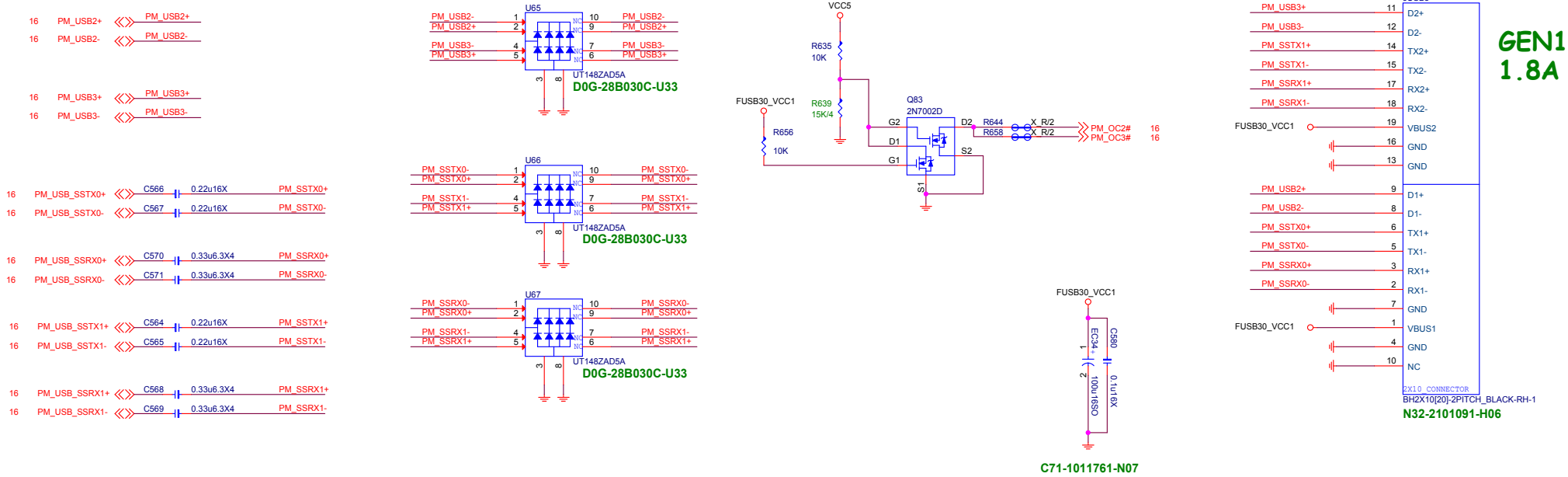
Front USB3 180°

BOX Header(JUSB3)

5V@1.8A



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MS-7C91		
Size: Custom	Document Description: Front USB3.0 Header	Rev: 20
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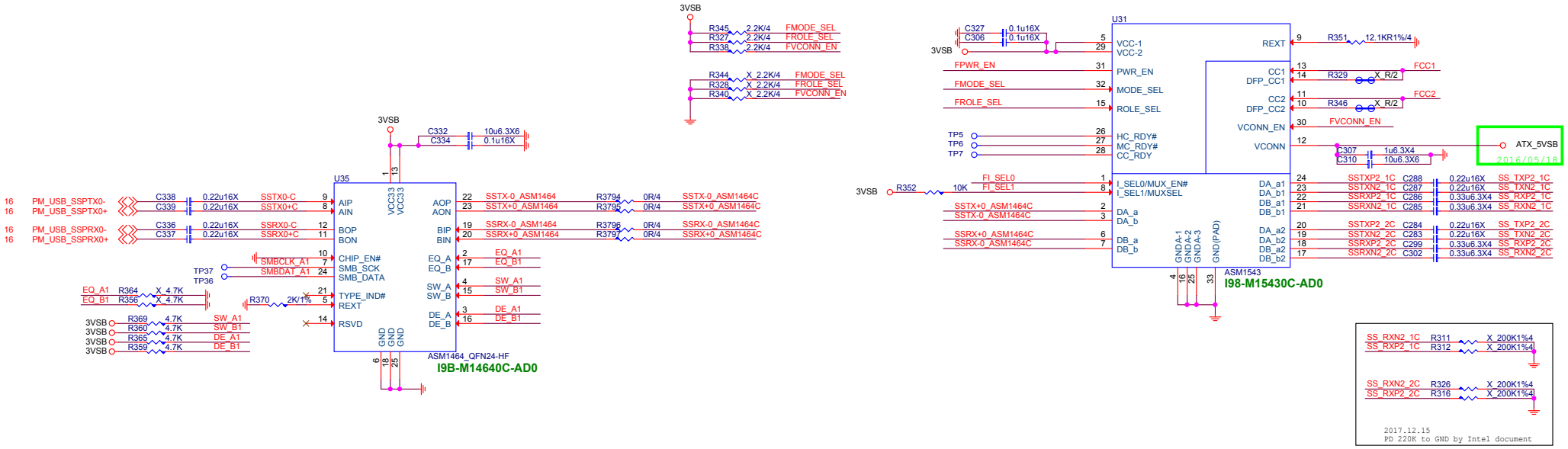

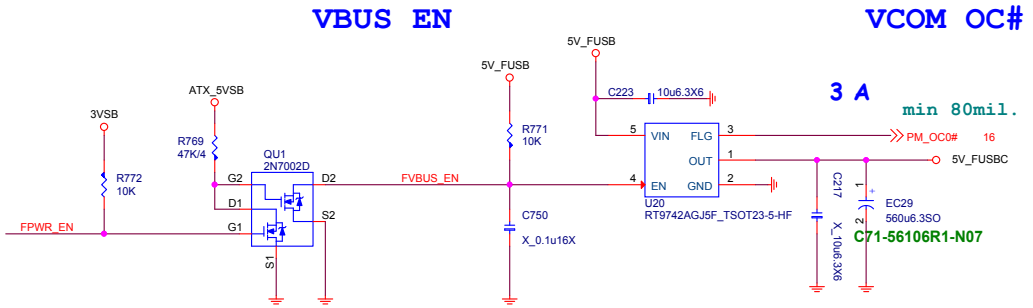

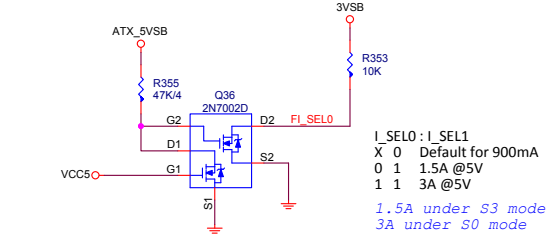

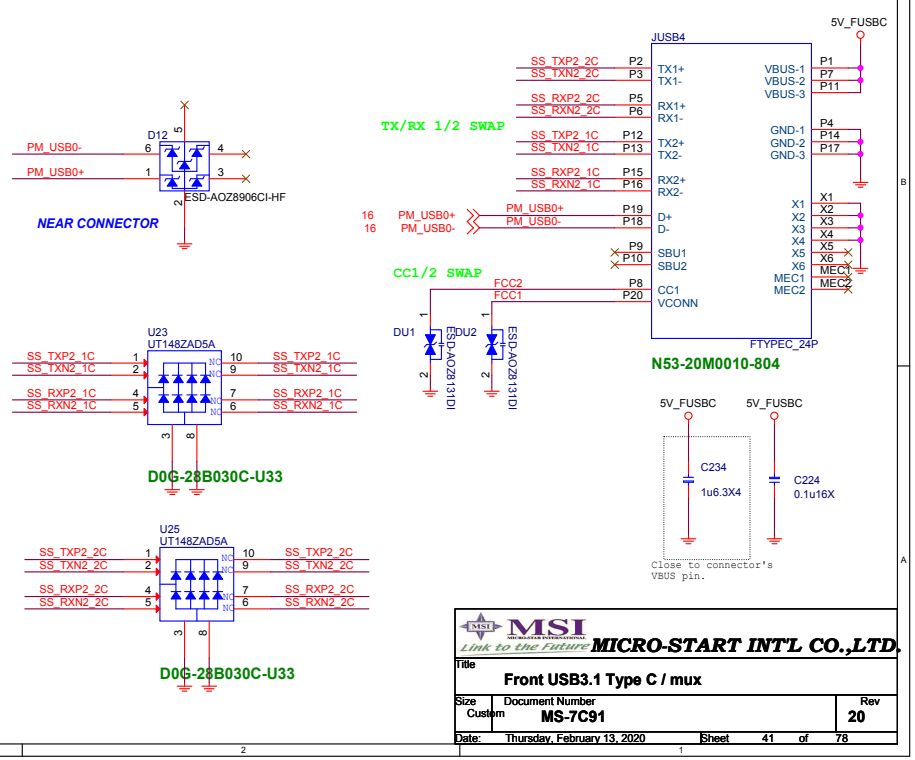

MSI MICRO-STAR INTL CO.,LTD.
Link to the Future

Title	Front USB3.1 Type C / mux		
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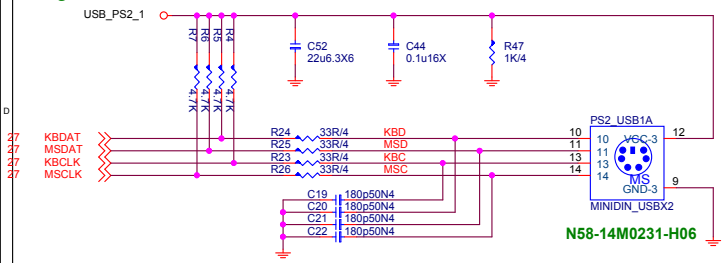
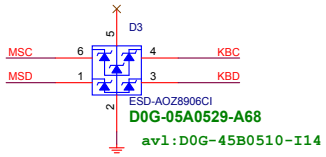
PS2+USB (USB2.0)

5V@1A

layout note:
C21 must close to TVS pin5
TVS must near KB_MS1 connector and route without branch
Varistor must close to TVS and route without branch



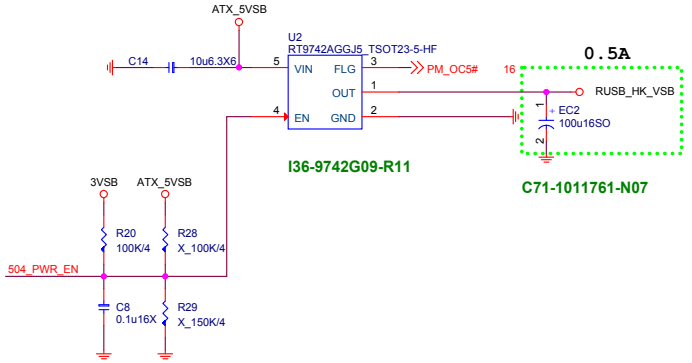
N58-14M0231-H06



D0G-05A0529-A68

avl:D0G-45B0510-I14

HOTKEY POWER



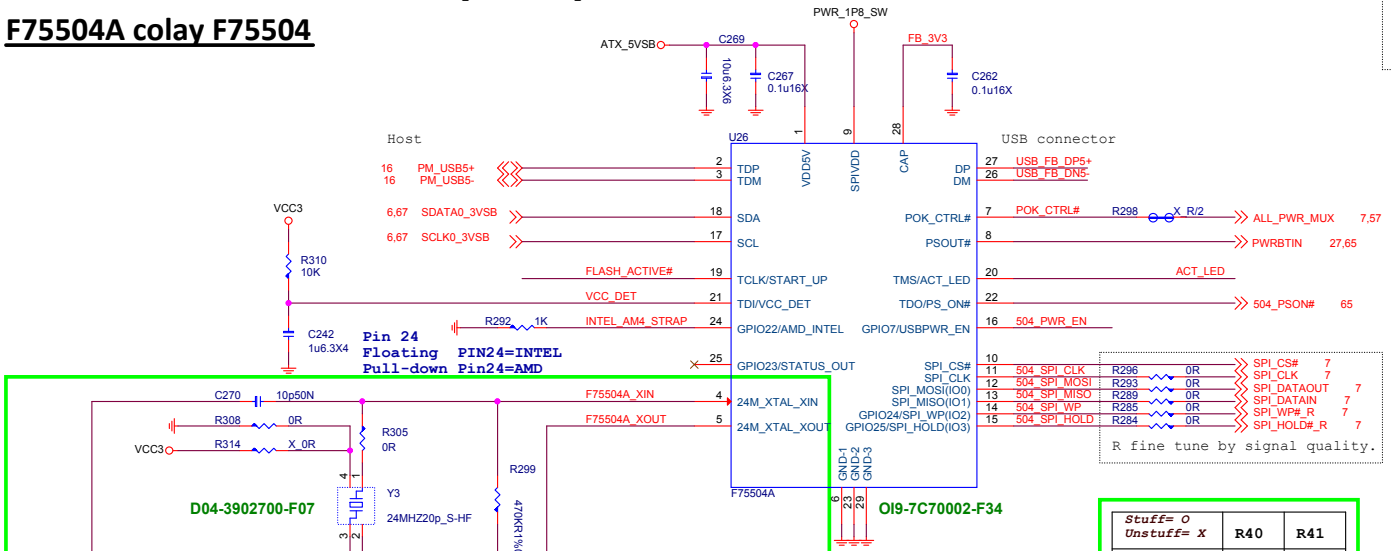
I36-9742G09-R11

C71-1011761-N07

USB Flash BIOS

F75504A colay F75504

F75504A/F75504 layout placement must meet to spi/usb trace length spec with host.
As for as possible place near to host.



Pin 24
Floating PIN24=INTEL
Pull-down Pin24=AMD

D04-3902700-F07

OI9-7C70002-F34

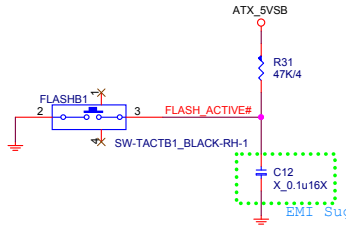
R498, R499,R40 placed close to Crystal side
Don't have the branches

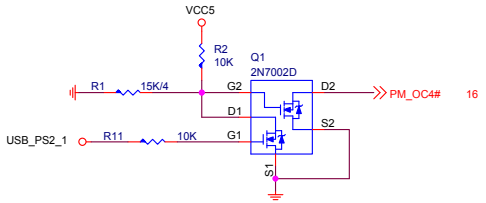
R503 placed close R40

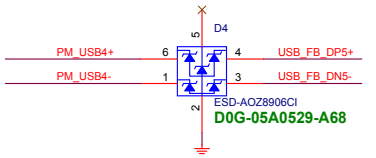
Stuff= O Unstuff= X	R500	R502	R503	R504	C510	R497	R499	R501	Y1
F75504A	O	O	X	X	10pF	0R	X	O	D04-3902700-F07
F75504	X	X	O	O	X	0.1uF	O	X	D05-1100600-F07

Stuff= O Unstuff= X	R40	R41
F75504A	O	O
F75504	X	X

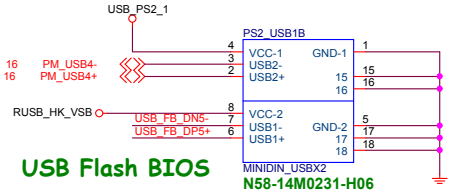
2019/06/17







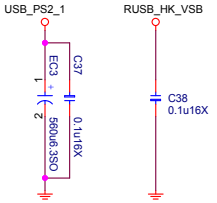
D0G-05A0529-A68



USB Flash BIOS

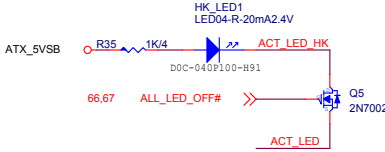
N58-14M0231-H06

1A



C71-56106R1-N07

LED close to USB port



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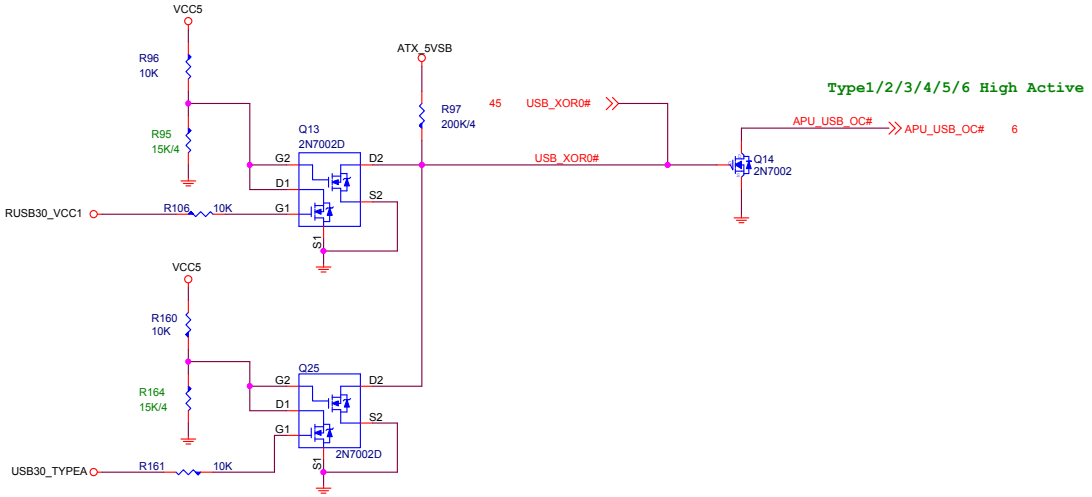
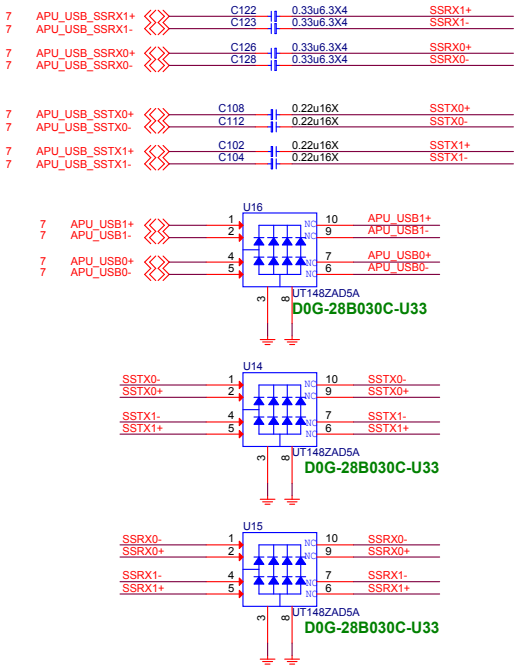
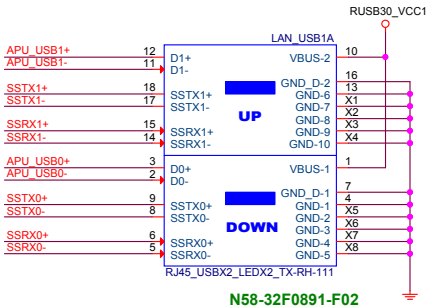
CPU USB_OC

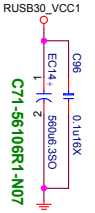


Rear USB3.1 GEN1 5V@1.8A





1.8A



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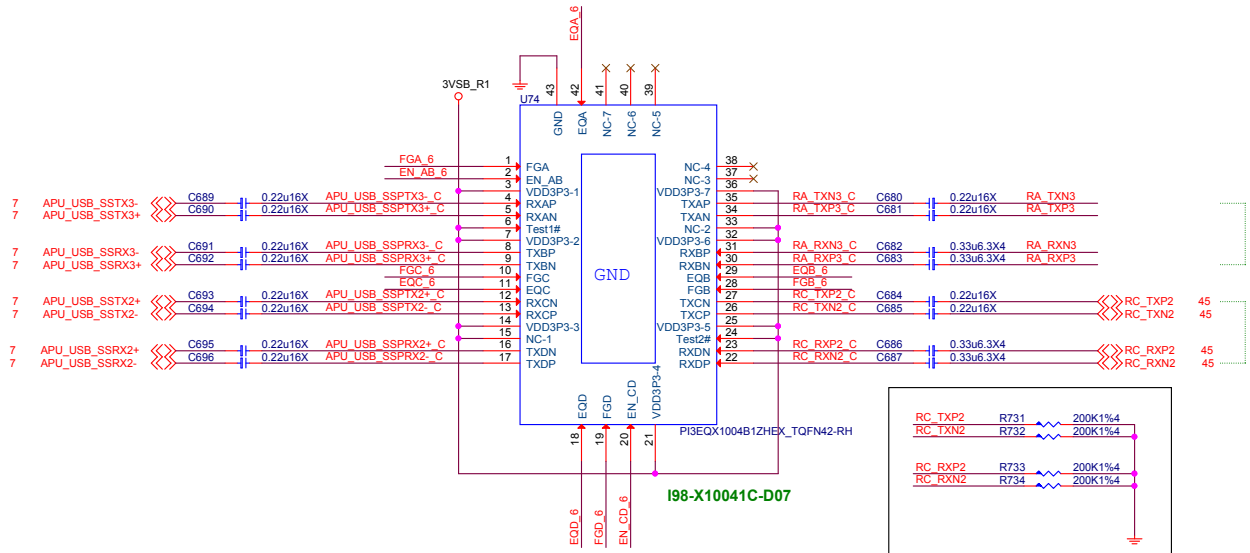
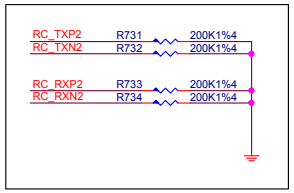
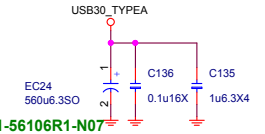
TYPE-A PI3EQX1004 Redriver

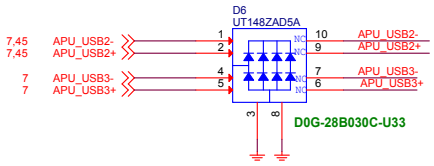


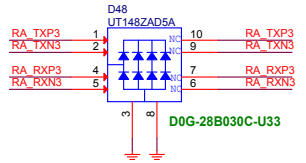
Rear TYPE-A

Rear TYPE-C

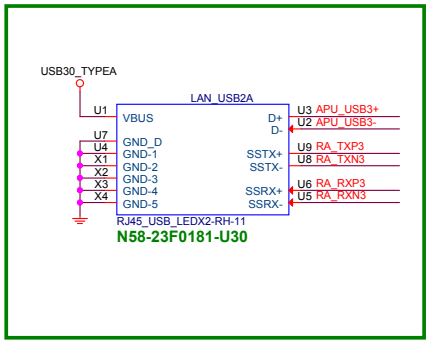




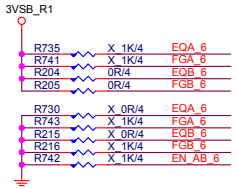


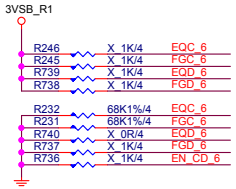


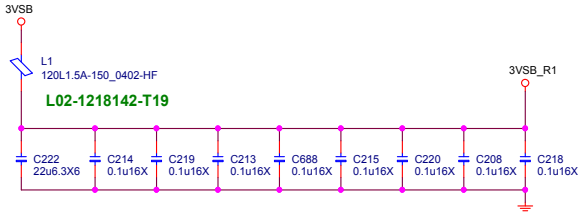
GEN2 0.9A



0A BOM







EQ	dB	
0	10.9	0 to GND
R	6.7	68K to GND
F	8.9	NC
1	13.1	0 to VDD

		EQ	FG
USB3_TX4	A	R	F
USB3_RX4	B	R	L
USB3_TX3	C	R	F
USB3_RX3	D	R	L

FG	dB	
0	-3	0 to GND
R	-1.5	68K to GND
F	0	NC
1	2	0 to VDD

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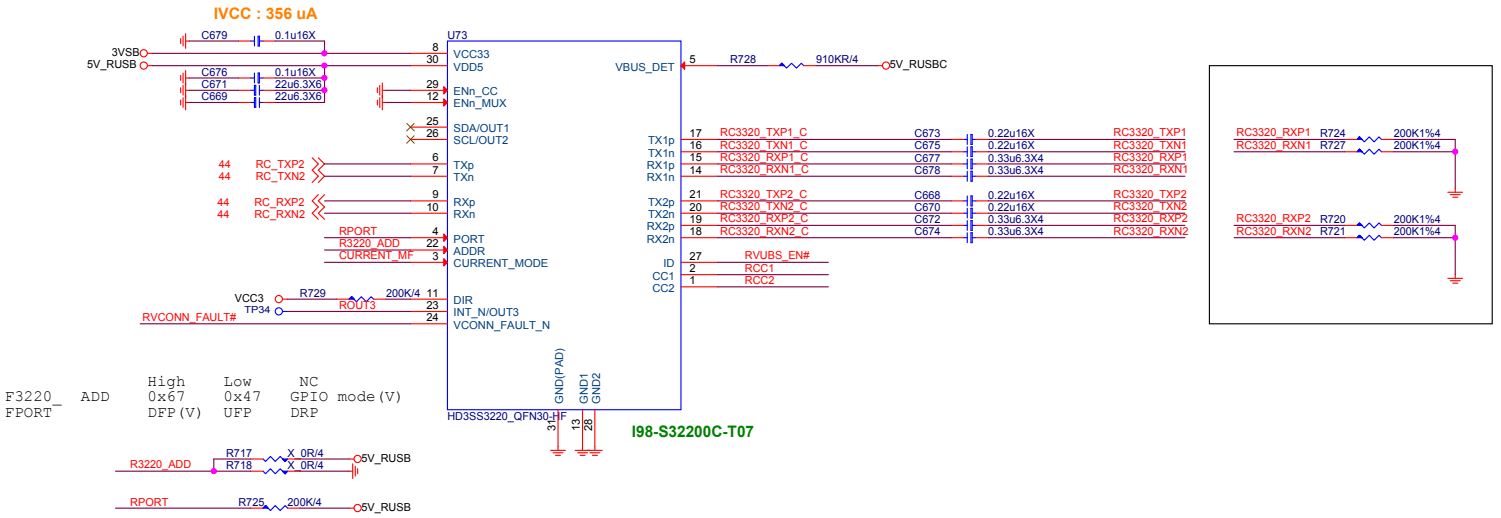
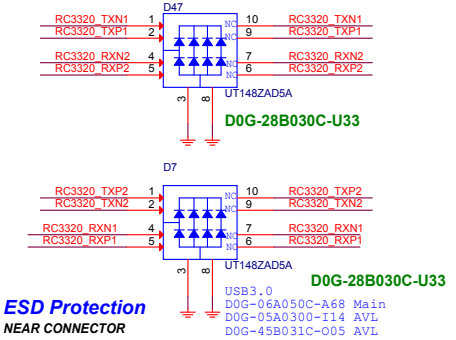
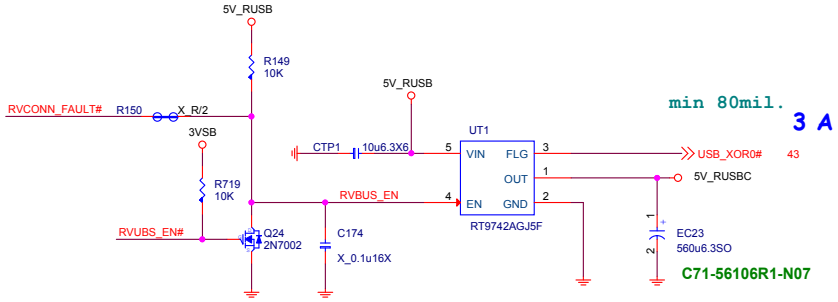
USB 3.1-Type-C

USB Type-C MUX with Configuration Channel (CC)

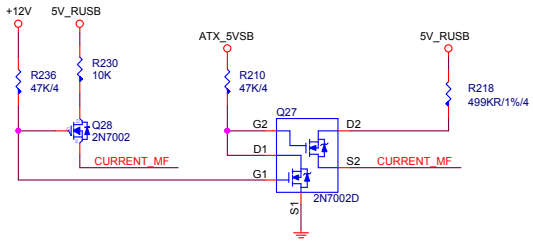


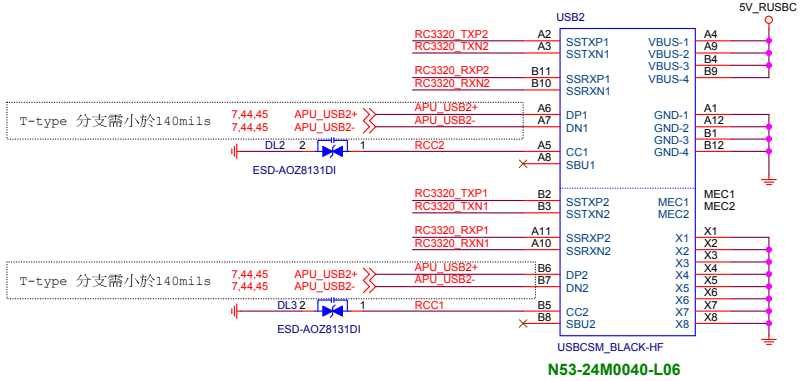


VBUS EN

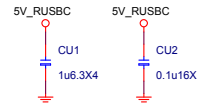


Current Mode





close to Type C Connector



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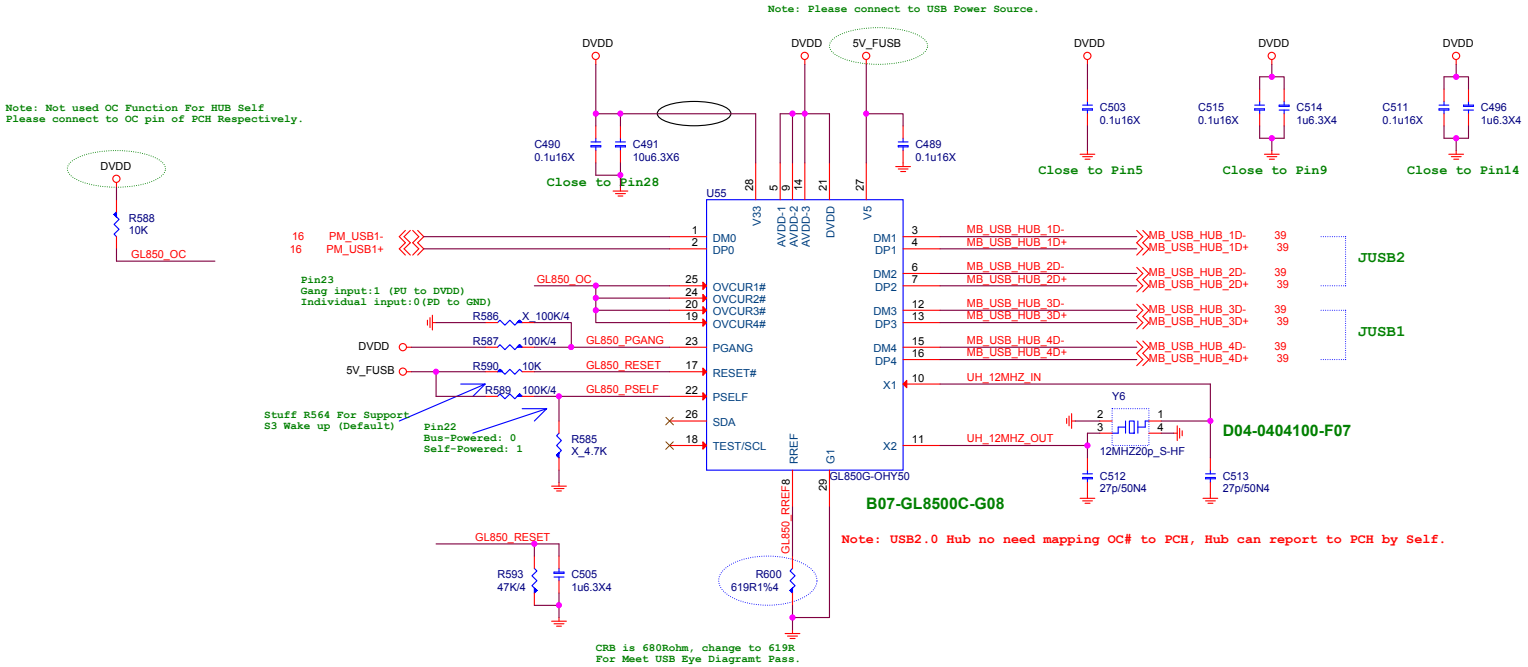
GL850G USB2.0 HUB

5V_FUSB



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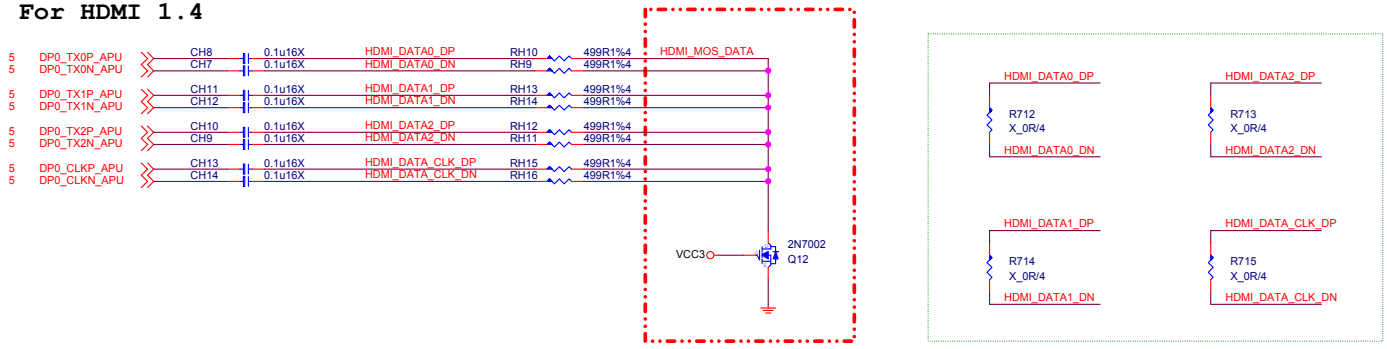
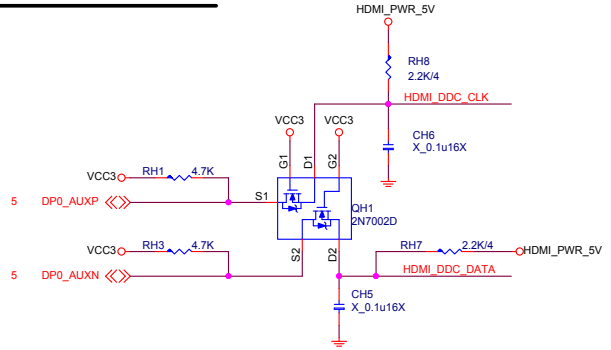
HDMI CONNECTOR

For HDMI 1.4

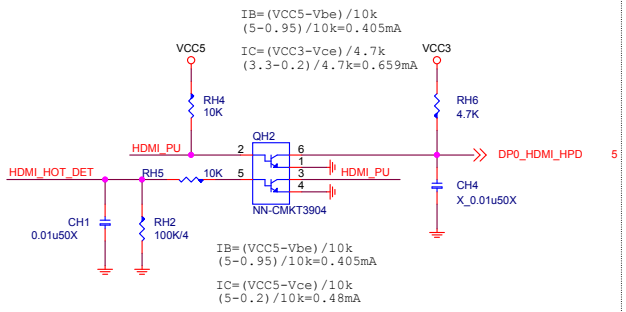


HDMI_MOS_DATA trace length <500mil
other platform please check design guide

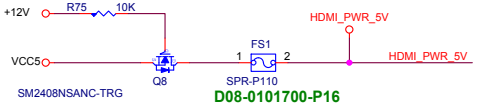
AUX Level Shifter



HPD Circuit



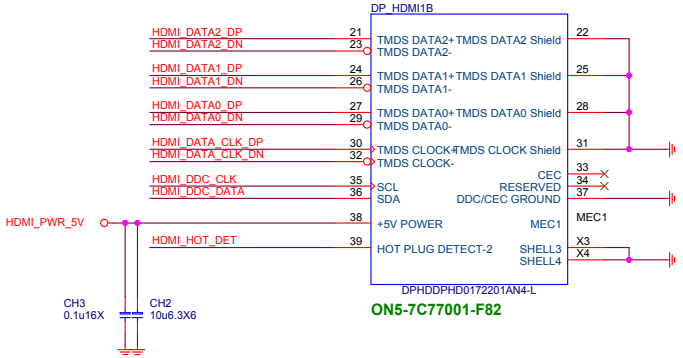
Connector Power



D08-0101700-P16

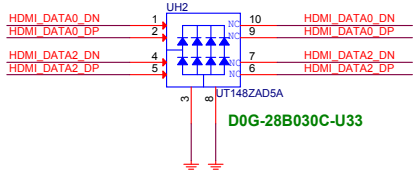
如果用DIODE SA測試電壓會不過

Connector

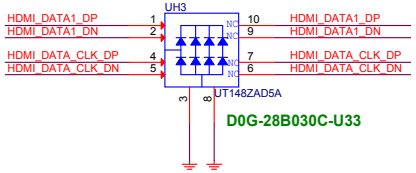


ON5-7C77001-F82

For EMI

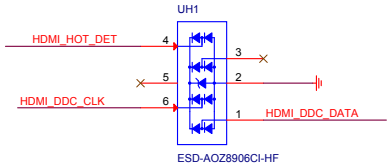


D0G-28B030C-U33



D0G-28B030C-U33

注意:耐壓5V零件



ESD-AOZ8906CI-HF

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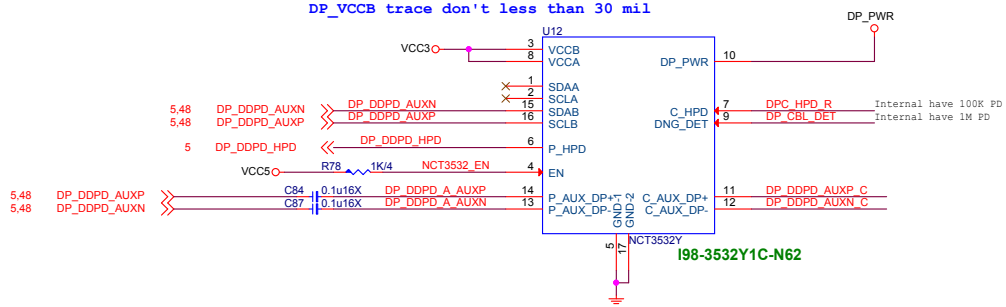
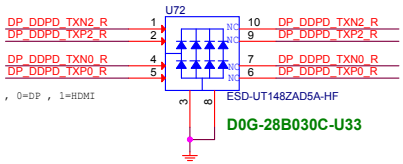
500mA

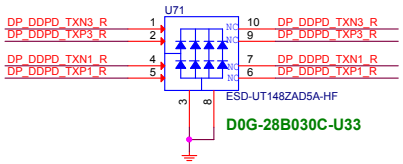
DP_VCCB trace don't less than 30 mil



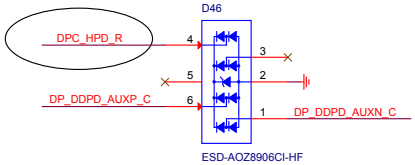
I98-3532Y1C-N62

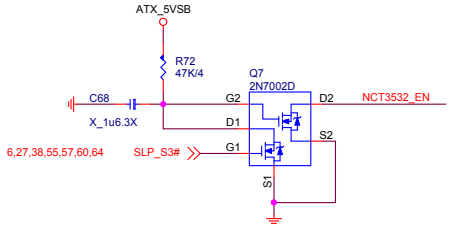


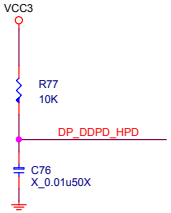
D0G-28B030C-U33

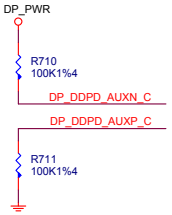


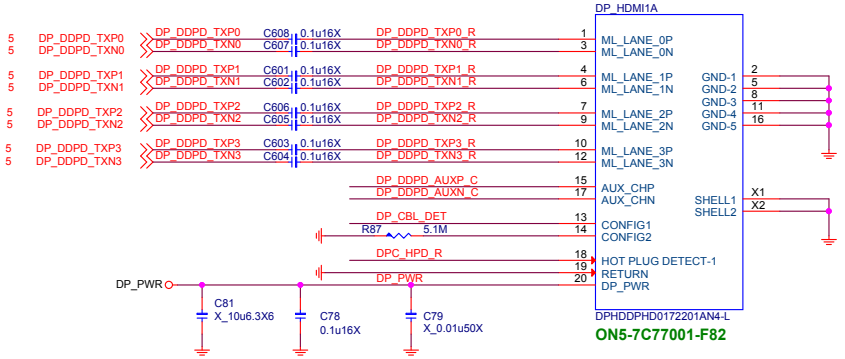
D0G-28B030C-U33











ON5-7C77001-F82

MICRO-STAR INT'L CO.,LTD

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Custom	DP	20

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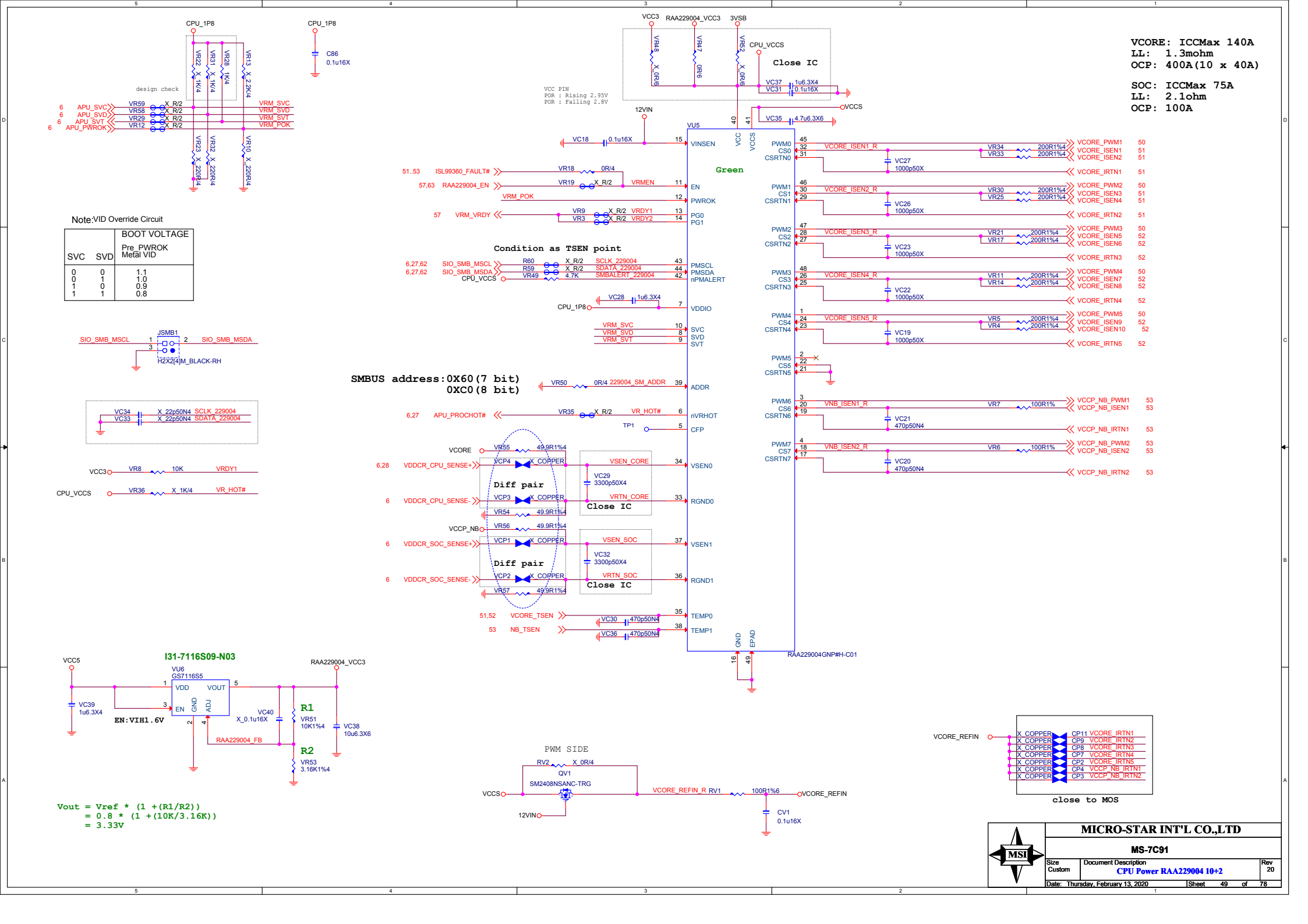
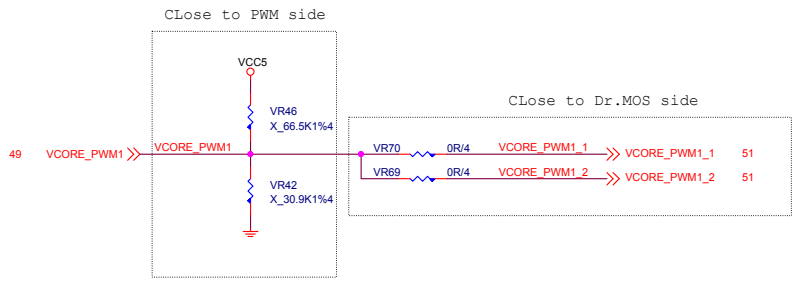


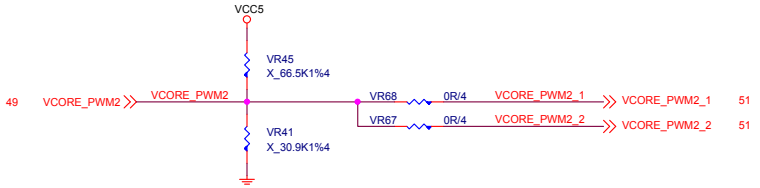
Note:VID Override Circuit

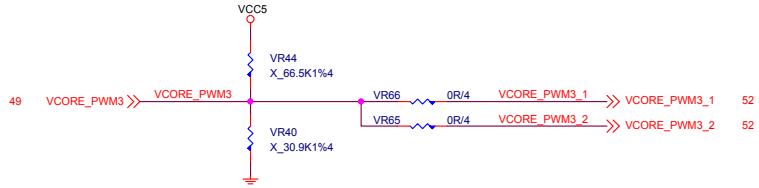
SVC	SVD	BOOT VOLTAGE Pre_PWROK Metal VID
0	0	1.1
0	1	1.0
1	0	0.9
1	1	0.8

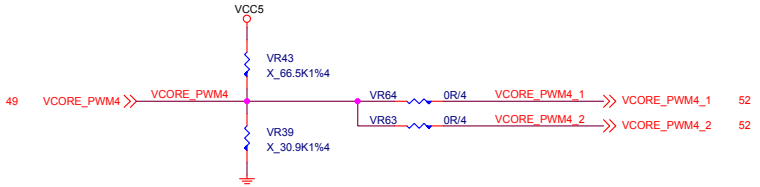
CPU_CORE Driver IC

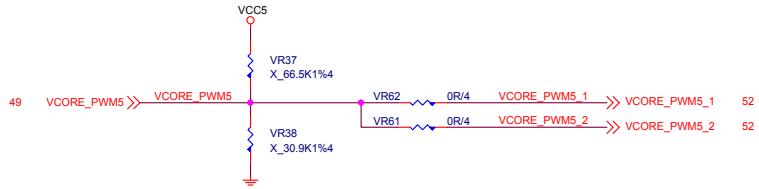
VCORE Double 10-PHASE











MICRO-STAR INT'L CO.,LTD

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Size	Document Description	Rev
Custom	CPU Power Phase Double IC SPS	20

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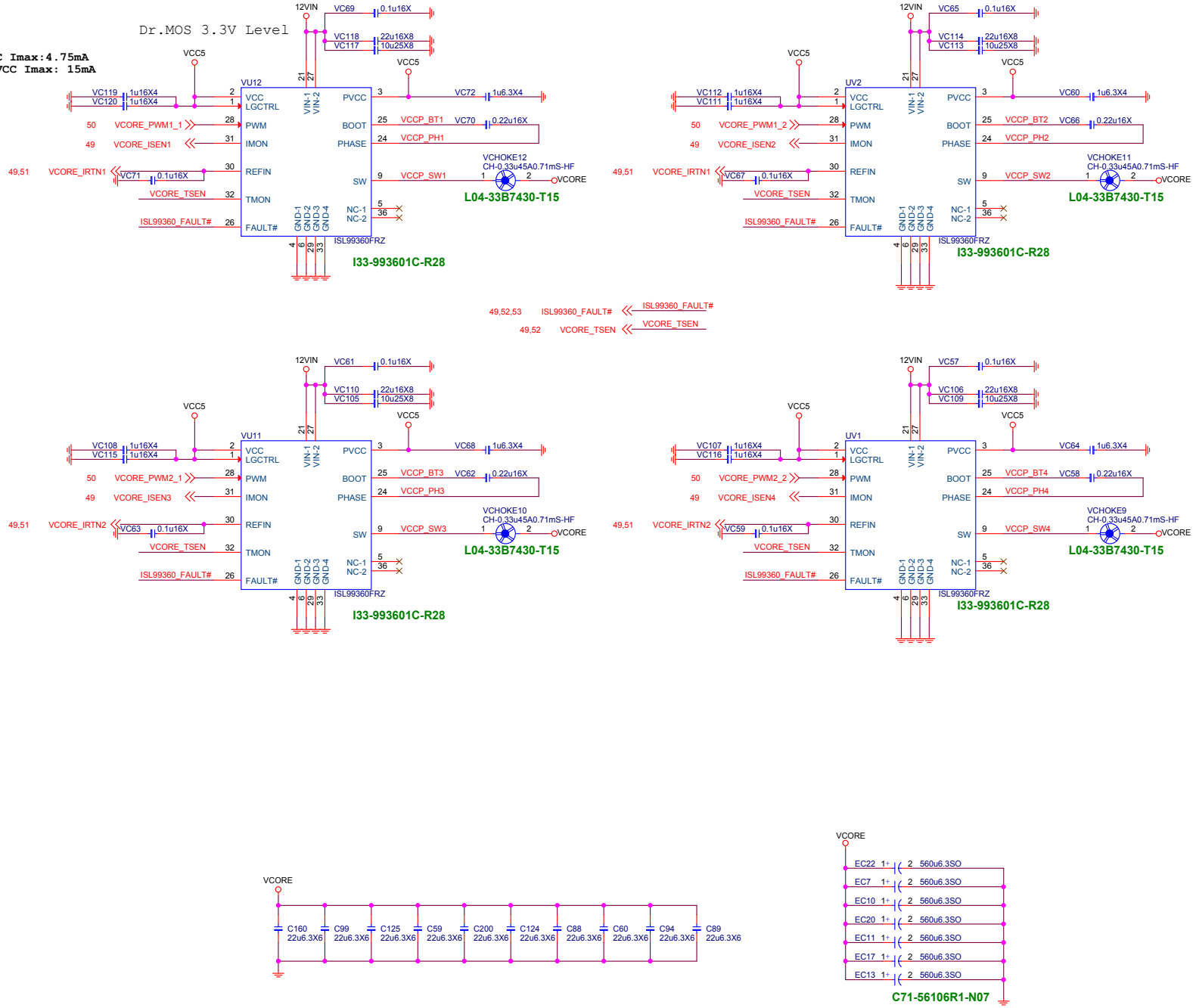
Vcore EDC Max 140A

Dr.MOS 3.3V Level

VCC Imax:4.75mA
IPVCC Imax: 15mA



MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: CPU Power Vocre Phase 1- 4
Rev: 20	
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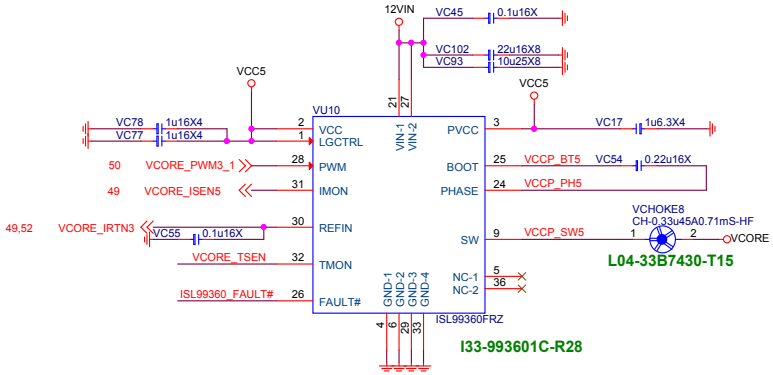
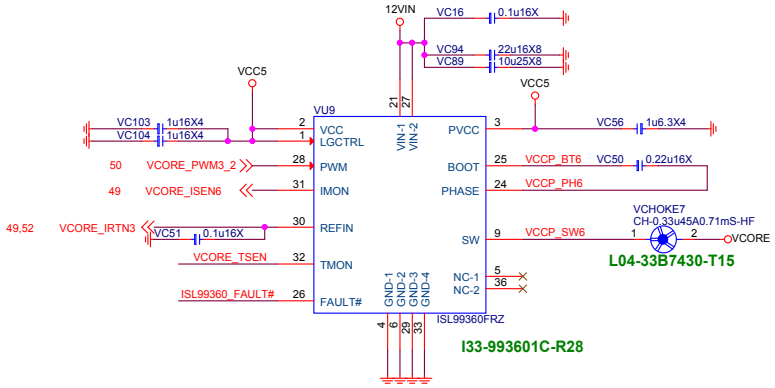
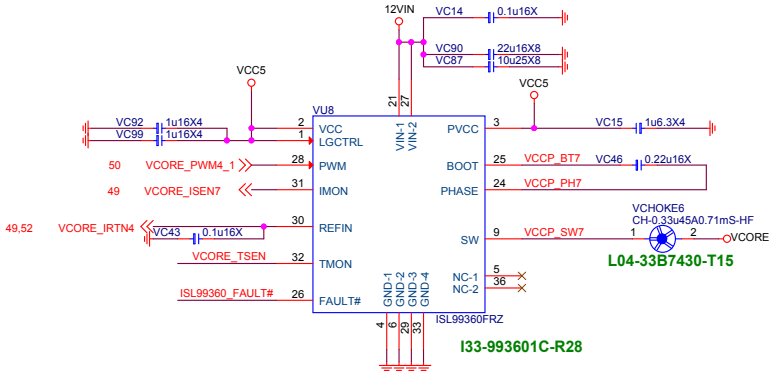
49,51,53 ISL99360_FAULT# ISL99360_FAULT#

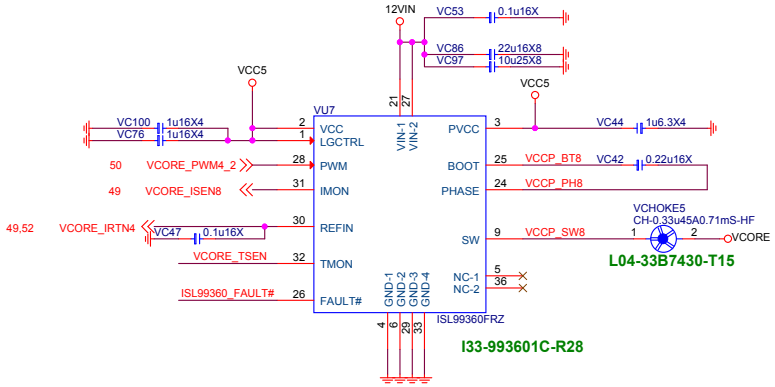
49,51 VCORE_TSEN VCORE_TSEN

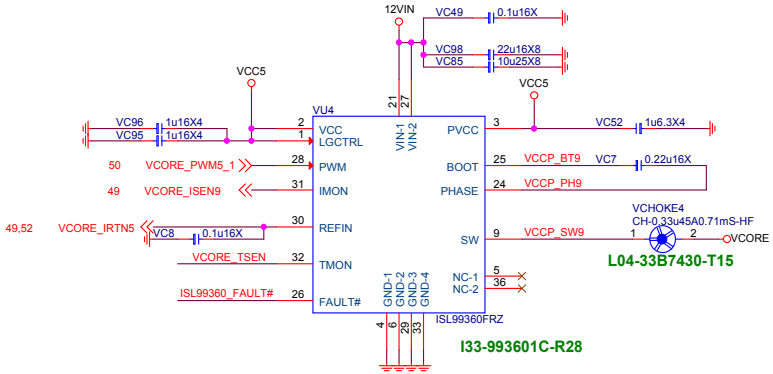
Dr.MOS 5V Level

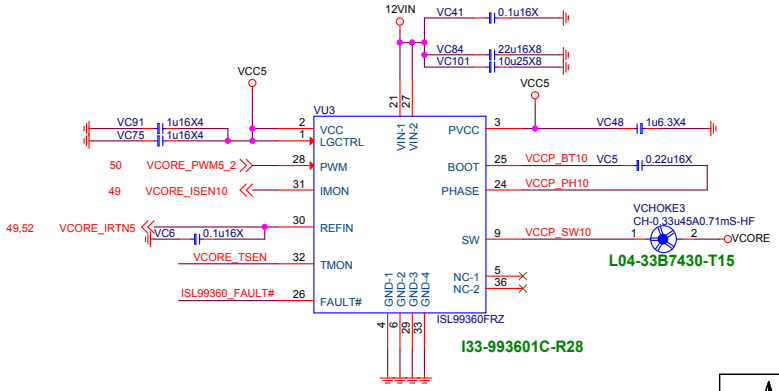












MICRO-STAR INT'L CO.,LTD

MS-7C91

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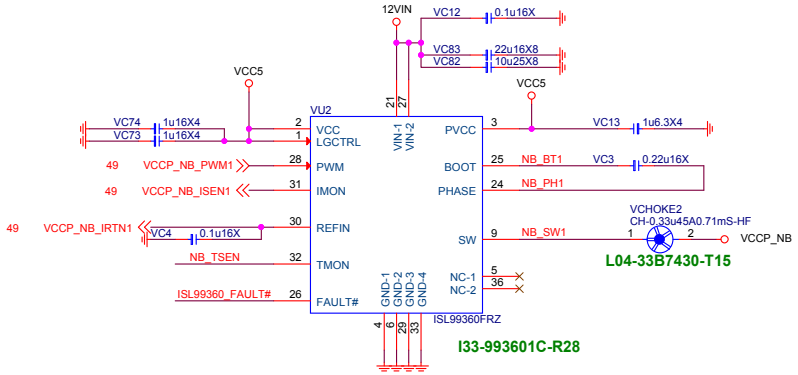
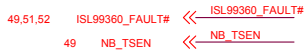
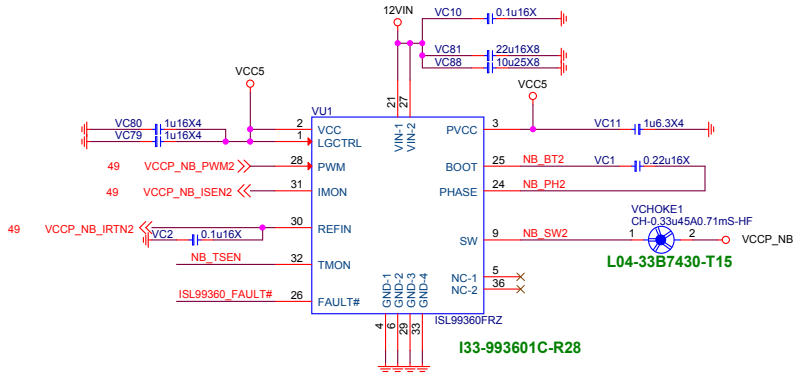
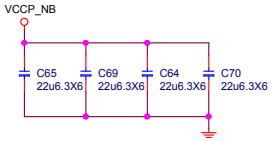
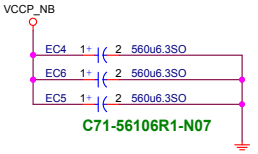
Dr.MOS 3.3V Level











MICRO-STAR INT'L CO.,LTD

MS-7C91

Size	Document Description	Rev
Custom	CPU Power NB Phase 1-2	20

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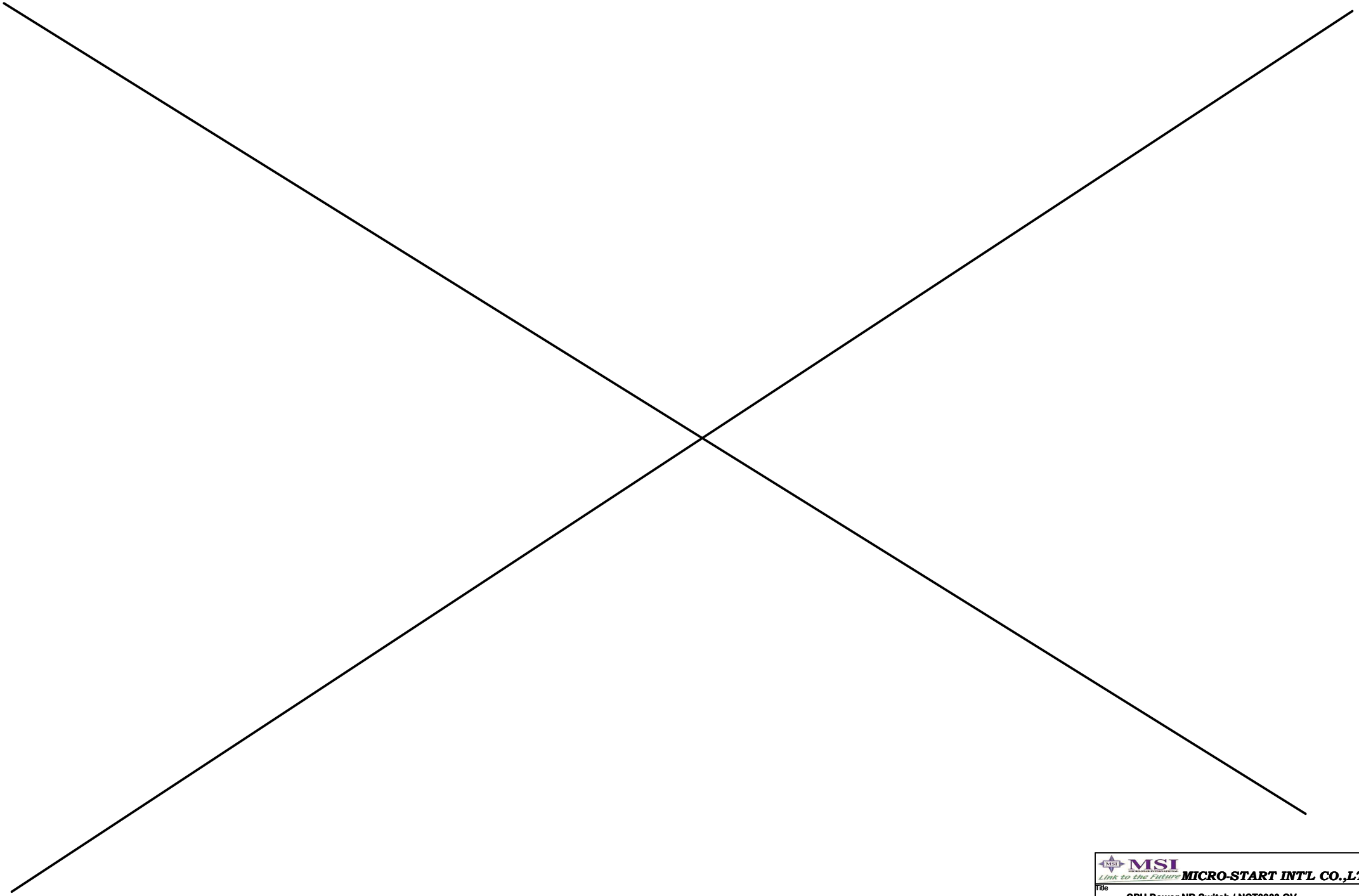

MSI MICRO-STAR INTERNATIONAL
Link to the Future
MICRO-START INT'L CO.,LTD.

Title	CPU Power NB Switch / NCT3933 OV	
Size: Custom	Document Number: MS-7C51	Rev: 20
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CPU 1.8V S5

CPU 1.8V_S5@0.5A
CPU_VDDP_S5@1A
AUDIO1.8V@0.25A

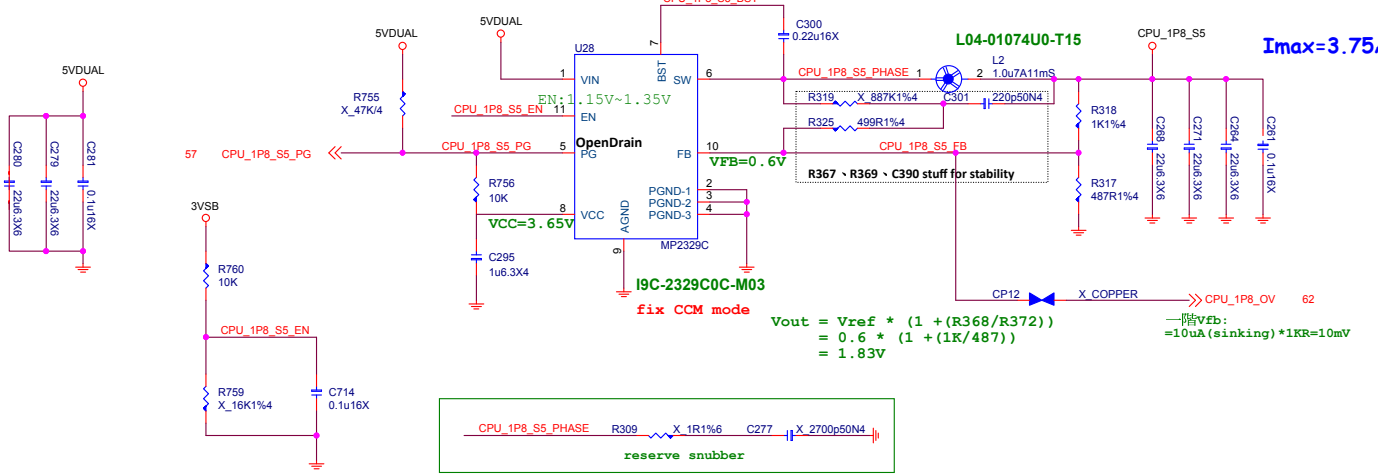
Continuous Conduction Mode (CCM)

Input Current = (6.5A*1.8V)/5V/0.8 = 3A

CPU_1P8_BST、CPU_1P8_BST_R >50 mils.

OCP = 6.5A

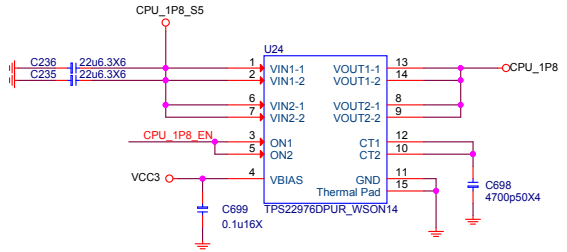
Imax=3.75A(S5+S0)

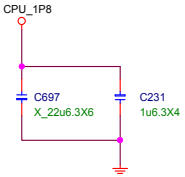


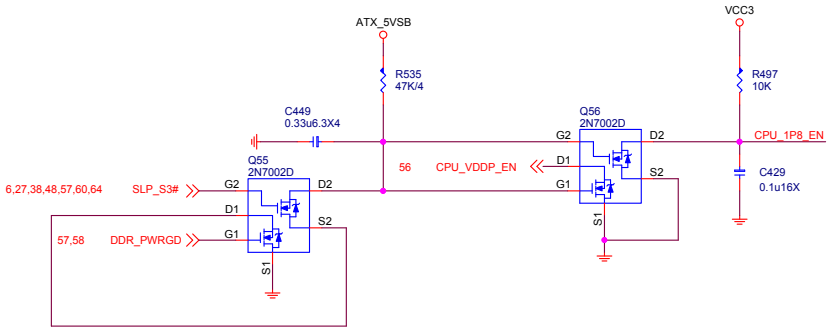
Vout = Vref * (1 +(R368/R372))
= 0.6 * (1 +(1K/487))
= 1.83V

CPU 1.8V S0

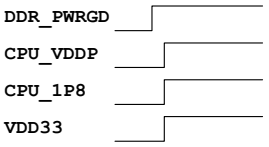
CPU 1.8V_S0@2A







Adijustable Rise Time
SR = 0.42*CT+66
SR is the slew rate in (μs/V)
CT is constant value on CT pin (in pF)
The units for the constant 66 is in (μs/V)



MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: CPU Power 1.8_S0 / S5 — Rev: 20
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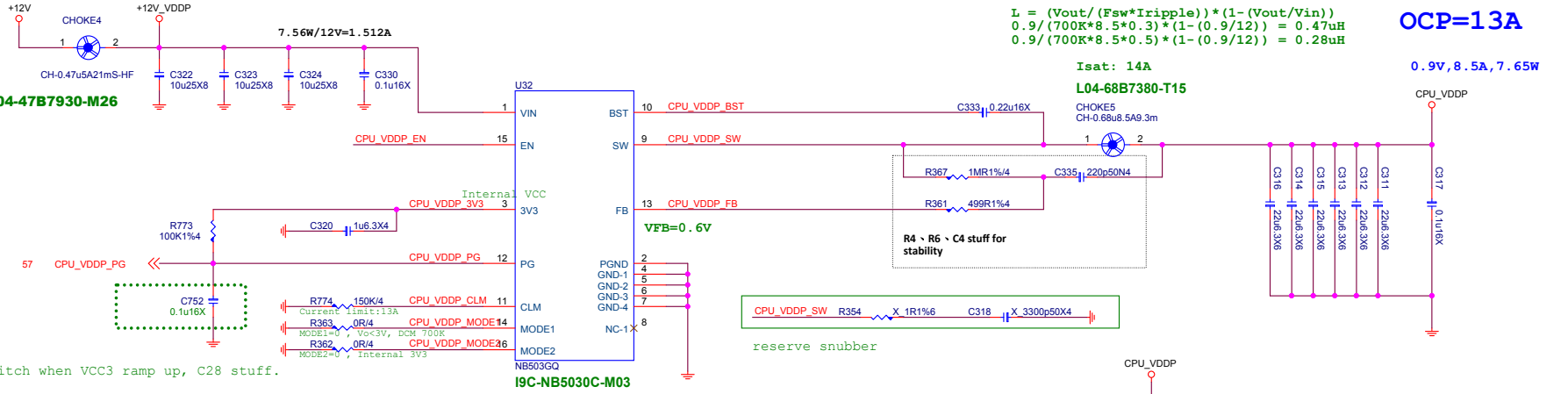
CPU_VDDP_S0

0.9V@S0:8.5A

```
Input Current = (13A*0.9V)/12V/0.8 = 1.22A
Choke Isat = 8A
Irms=Iout*SQRT((Vo/Vi)*(1-(Vo/Vi)))
=13*SQRT((0.9/12)*(1-(0.9/12))) = 3.42A
Choke Irms =5 A
```




```
L = (Vout/(Fsw*Iripple))*(1-(Vout/Vin))
0.9/(700K*8.5*0.3)*(1-(0.9/12)) = 0.47uH
0.9/(700K*8.5*0.5)*(1-(0.9/12)) = 0.28uH
```

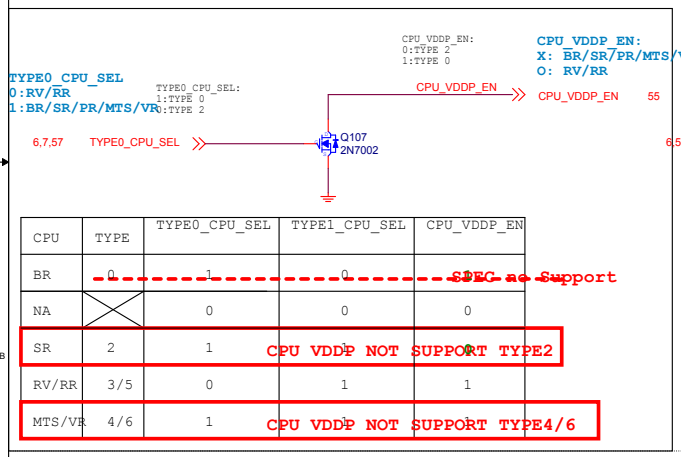
OCP=13A

Isat: 14A

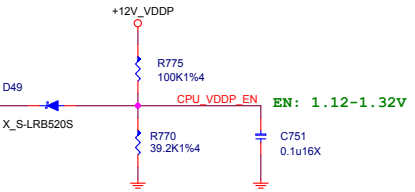
L04-68B7380-T15

0.9V,8.5A,7.65W

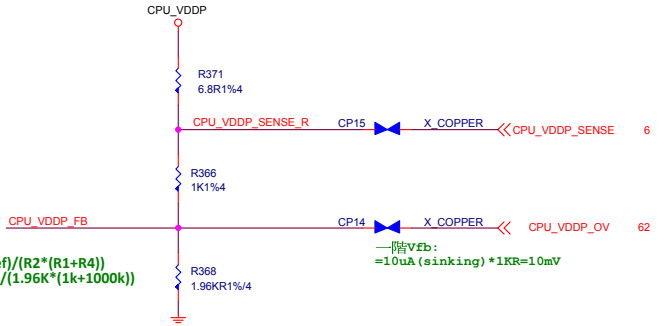
20180822
fix PG glitch when VCC3 ramp up, C28 stuff.



CPU	TYPE	TYPE0_CPU_SEL	TYPE1_CPU_SEL	CPU_VDDP_EN
BR	0	1	0	SPEC no Support
NA	X	0	0	0
SR	2	1	CPU VDDP NOT SUPPORT TYPE2	0
RV/RR	3/5	0	1	1
MTS/VR	4/6	1	CPU VDDP NOT SUPPORT TYPE4/6	1

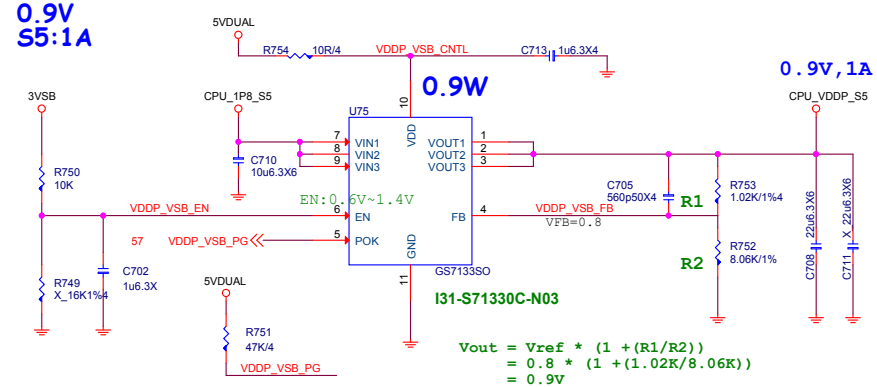



```
Vout = Vref + (R1*R4*Vref)/(R2*(R1+R4))
= 0.6+(1k*1000k*0.6)/(1.96K*(1k+1000k))
= 0.9058V
```



CPU_VDDP_S5

0.9V
S5:1A




```
Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(1.02K/8.06K))
= 0.9V
```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MS-7C91
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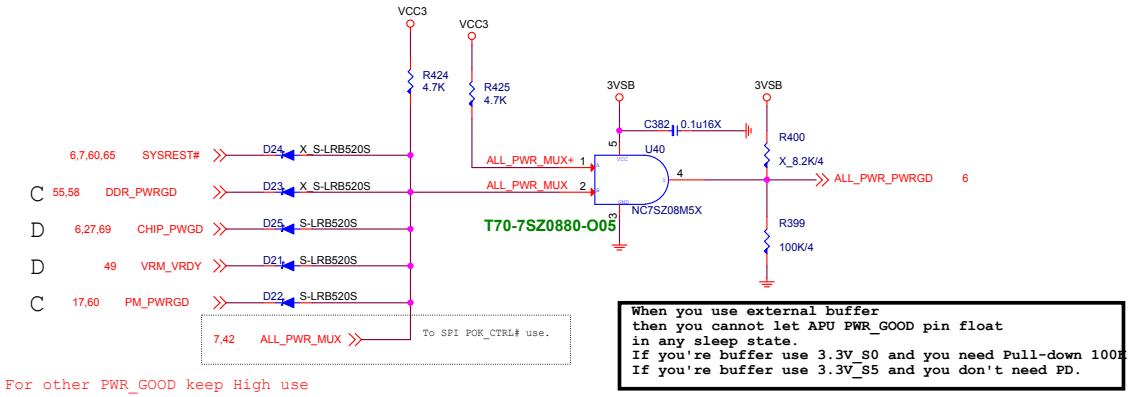
ALL POWER GOOD MUX

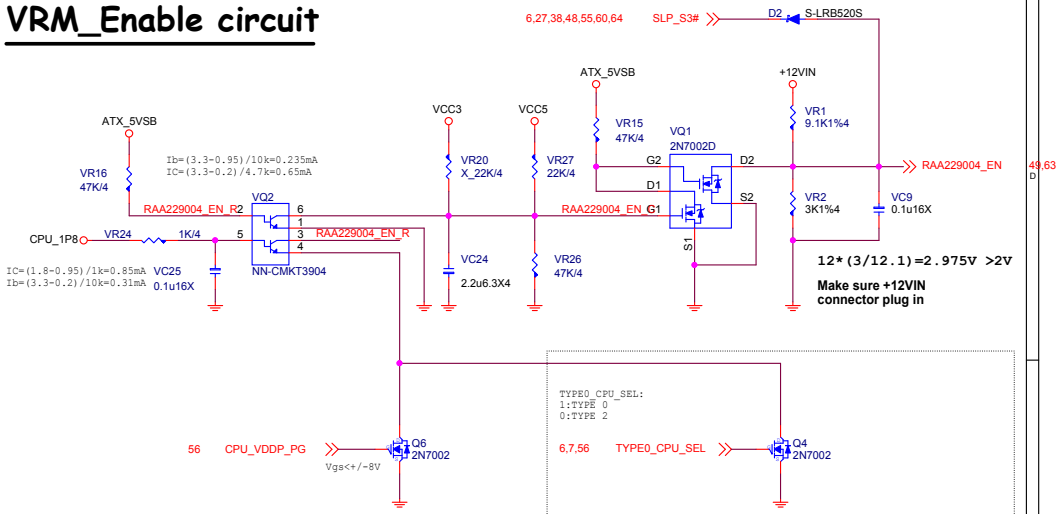
S0 PG



When you use external buffer then you cannot let APU PWR_GOOD pin float in any sleep state.
If you're buffer use 3.3V_S0 and you need Pull-down 100K
If you're buffer use 3.3V_S5 and you don't need PD.

For other PWR_GOOD keep High use

VRM_Enable circuit



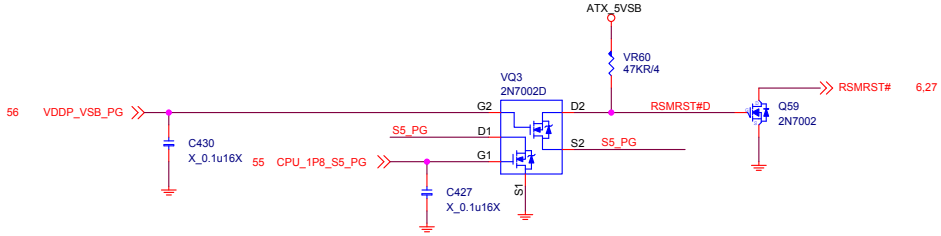
CPU	TYPE	TYPE1_CPU_SEL	TYPE0_CPU_SEL
BR	0	0	1
NA	X	0	0
SR	2	1	0
RV/ZP	3	1	0
MTS	4	1	1

SPEC no Support.

CPU VDDP NOT SUPPORT TYPE2

CPU VDDP NOT SUPPORT TYPE4

S5 PG



MICRO-STAR INT'L CO.,LTD	
MS-7C91	
Size: Custom	Document Description: VRM PWRGD
Rev: 20	
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DDR4_1.2V@28.7A

18A FOR CPU
9.5A FOR 4DIMM
1.2A FOR DDR VTT

Rocset=1.5*Imax*Rdson(Low side)/Iocset
=1.5*28.7A*2mohm/10uA
=8.61K

OCP = 43.05A; Choke Isat=43A

Rocset = 1.5 * Imax * Rdson(low) / Iocset
R639 = 1.5 * 28.7 * 2mohm / 10uA
R639 = 8.61K

Rdson(Low Side) 5V
D03-4C02403-O05:3.3 ~ 4mohm

5VDIMM
R68 47K/4
55,57 DDR_PWRGD
C67 0.22u16X
C74 1000p50X
R79 665R1%4
C71 1000p50X
DDR_REFOUT
DDR_REFIN

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

U11 RT8125HGQW
EN PGOOD REFOUT REFIN VCC GND BOOT PHASE UGATE LGATE/OCSET FB
DDR_EN
DDR_BOOT1 R80 0R/6 DDR_BOOT1_R C80 0.1u16X
DDR_PH1
DDR_UG1
DDR_LG1
DDR_FB

FB:0.8V

I32-8125H0C-R11

Fixed Operating frequency: 300KHz

10mV*(1.96K/2.96K)=6.62mV
REFIN(R625)=6.62mV/10uA=662R

5VDIMM
R76 10R/6
DDR_VCC C77 1u16X6

VCC_DDR
close to DIMM side
R67 0R/4
R1
R73 1K1%4
C66 X_0.1u16X
DDR_VSENP R66 X_0R/4
VDDIO_MEM_S3_SENSE 6
R2
R74 1.96KR1%/4

Vout = Vref * (1 + (R1/R2))
= 0.8 * (1 + (1K/1.96K))
= 1.208V

CP6 X_COPPER
DDR_OV 62

DDR_VR_EN
FROM SIO_VDDQ_EN:R230/R220 stuff
FROM VPP_VR_PG:R230/R220 un stuff

5VDIMM
R458 2.2K/1%4
DDR_EN
R479 2.2K/1%4
R459 20K/1%4
Default:FCCM
4.5V:FCCM
2.37V:DEM

27 S0_IDLE R504 0R/4
6 CPU_S0_IDLE R498 X_0R/4
DDR_MODE Q52 2N7002

Default:FCCM
L:FCCM
H:DEM

Input Current=(28.7*1.2)/5/0.8=8.61A

L04-68B7350-T15
CHOKE2 CH-0.68u15A5mS

5VDUAL_IN_DDR
C72 1u16X6
C73 10u6.3X6
EC8 560u6.3SO
EC9 560u6.3SO
C23 0.1u16X
5VDIMM

C71-56106R1-N07

Q9
DDR_UG1 R82 0R/6 DDR_UG1_R
R83 X_10K
NTMFS4C029NT1G
D03-4C02903-O05

OL4-7C94001-T15
CHOKE3
CH-0.47u36A0.88m

DDR_PH1
VCC_DDR

Q10 NTMFS4C024NT1G
Q11 NTMFS4C024NT1G
DDR_LG1
R89 8.66K1%4
R81 2.2R/8
C82 3300p50X4
snubber

C114 1u6.3X4
C95 22u6.3X6
EC16 560u6.3SO
EC21 560u6.3SO
EC18 560u6.3SO

D03-4C02403-O05
D03-4C02403-O05

C71-56106R1-N07

Rocset=1.5*Imax*Rdson(Low side)/Iocset
=1.5*28.7A*2mohm/10uA
=8.61K

27 SIO_VDDQ_EN R465 0R/4
27,59 VPP_VR_PG R464 X_0R/4

ATX_5VSB
R488 47K/4
Q48 2N7002D
G2 D2 D1 S2 G1 S1
6,56,64 APU_AM4R1

ATX_5VSB
R489 47K/4
Q49 2N7002D
G2 D2 D1 S2 G1 S1
DDR_EN
6,27,38,59,60,64 SLP_S5#

C118 2.2u6.3X4
C119 2.2u6.3X4
EC27 560u6.3SO
EC15 560u6.3SO
VCC_DDR

C71-56106R1-N07

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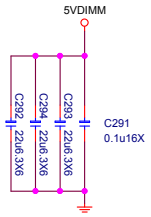
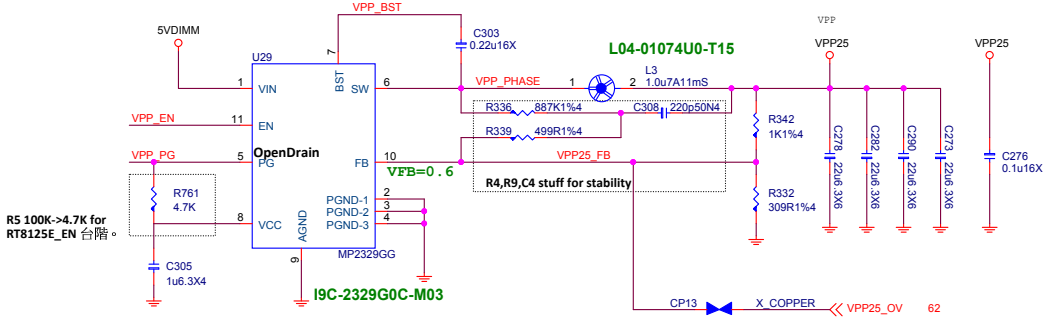
4DIMM : VPP25

2.5V@2.24A

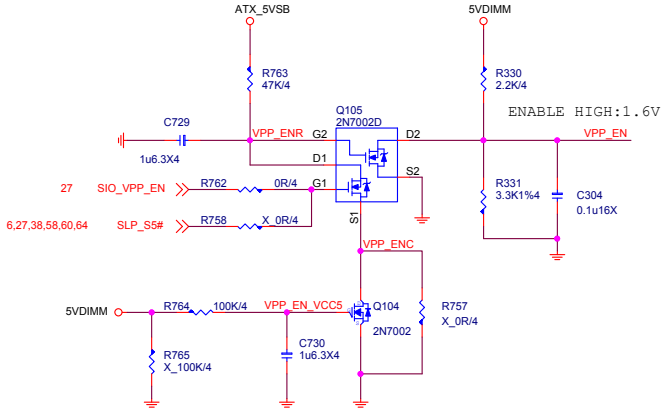
VPP_BST>50 mils.

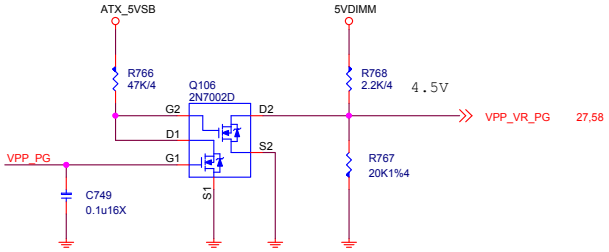
Input Current=(2.24*2.5)/5/0.8=1.4A

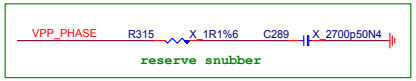




Vout = Vref + (R1*R4*Vref)/(R2*(R1+R4))
= 0.6+(1k*887k*0.6)/(309*(1k+887k))
= 2.54V

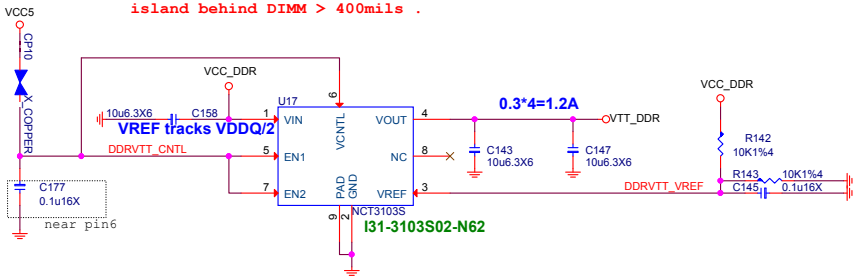


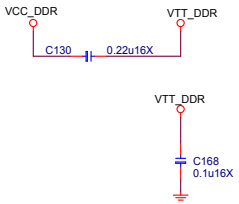




DDR VTT Power

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





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FOR Promontory 1.05V_S0

1.05V
S0:5.5A

Input Current= (OCP8A*1.05V)/5V/0.8=2.1A

Width:>80mil

L04-01074U0-T15

OCP=8A

1.05V@5.5A

5VDUAL — CHOKE6 CH-0.47u5A21mS — SY8288_VIN

L04-47B7930-M26

C360 10u25X8 | C359 10u25X8 | C363 0.1u16X | R382 100K1%4

ATX_5VSB — R373 47K/4 — C345 X_1u6.3X — VSB_EN

Q37 2N7002D

6,27,38,48,55,57,64 SLP_S3# — R372 0R/4

6,27,38,58,59,64 SLP_S5# — R374 X_0R/4

R383 68K/1% | C347 0.1u16X | 2V

U38 SY8288

VIN-1 VIN-2 VIN-3 VIN-4 | EN >0.8V | EN | PG | ILMT | BYP | VCC | BS | LX-1 LX-2 LX-3 | FB | NC-1 NC-2 NC-3 | GND-1 GND-2 GND-3 GND-4

PM_1P05_EN

3VSB — R391 10K — PM_1P05_PG

R384 0R/4 — PM_1P05_OCP

3VSB — R378 0R/4 — VCC3_BYP — C356 1u6.3X4

PM_1P05_BOOT — C364 0.1u16X

PM_1P05_PHASE — L4 1.0u7A11mS

PM_1P05_FB — R386 X_499R1%4 — PM_1P05_FB_R

0.6V

C346 X_330p50X/4 | C354 0.1u16X | C349 22u6.3X6 | C351 22u6.3X6 | C348 22u6.3X6 | C350 22u6.3X6 | C352 22u6.3X6

PM_1P05

PM_1P05_LDO — C358 2.2u6.3X4

by Silergy FAE Suggestion
please connect pin17 (Vcc)/pin16(NC) and it's good for VCC layout.

I9C-8288R0C-SZ1

R1 R387 1KR1%/4 — PM_1P05_FB — SP1 X_COPPER — PM_1P05_OV 62

R2 R385 1.33K1%4

Vout = Vref * (1 + (R1/R2))
= 0.6 * (1 + (1K/1.33K))
= 1.051V

ILIMT	OCP
0	8A
floating	12A
1	16A

VSB_EN — 27 S0iX_EN — Q45 2N7002 — R439 10K

	S5	S0	S3	S0
SLP_S3#				
GPIO(as S5#)				
VSB_EN				
PM_1P05_EN				

	S5	S0	S0iX	S0	S5
SLP_S5#					
GPIO(as S5#)					
VSB_EN					
PM_1P05_EN					

FOR PROM PM_1P05_S5

1.05V@0.05A

I31-7116S09-N03

3VSB — U43 GS7116S5 — VDD VOUT EN GND ADJ — 0.11W

PM_1P05_S5_EN — EN:VIH1.6V

R484 10K | C426 1u6.3X | C423 1u6.3X4

C419 X_0.1u16X | C420 10u6.3X6

R1 R474 1KR1%/4 | R2 R473 3.16K1%/4 — PM_1P05_S5_FB — VFB=0.8

PM_1P05_S5

Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(1K/3.16K))
= 1.05V

6,27,64 DEEP_S5 — Q47 2N7002

Promontory-2.5V

2.5V@900mA

5VDUAL — R395 10R/4 — PM_2P5V_CNTL — C368 1u6.3X4

Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(10K/4.7K))
= 2.502V

0.72W

U39 GS7133SO-R_PSOP8-HF

61 PM_2P5V_POK — PM_2P5V_POK

PM_1P05_EN — EN >1.4V

3VSB — C377 10u6.3X6

VIN | NC | VDD | VOUT | GND | GND | FB

PM_2P5V_FB — VFB=0.8

C369 560p50X/4

R1 R396 1KR1%/4 | R2 R397 470R1%/4

PM_2P5V | C370 22u6.3X6

I31-7133S02-N03

AVL: I31-3730S02-N62

SP2 X_COPPER — PM_2P5V_OV 62

3VSB — R514 10K

PM_2P5V_POK — D30 S-LRB520S

PM_1P05_PG — D28 S-LRB520S

6,7,57,65 SYSREST# — D32 X_S-LRB520S — Add by CRB

PM_PWRGD 17,57

ATX_5VSB — R510 47K/4 — C432 X_1u6.3X — Q54 2N7002D

VCC33 — R515 10K — C443 X_0.1u16X

C442 1u6.3X4

3VSB	
PM_1P05_S5	
PM_1P05	
PM_2P5V	
VCC33	

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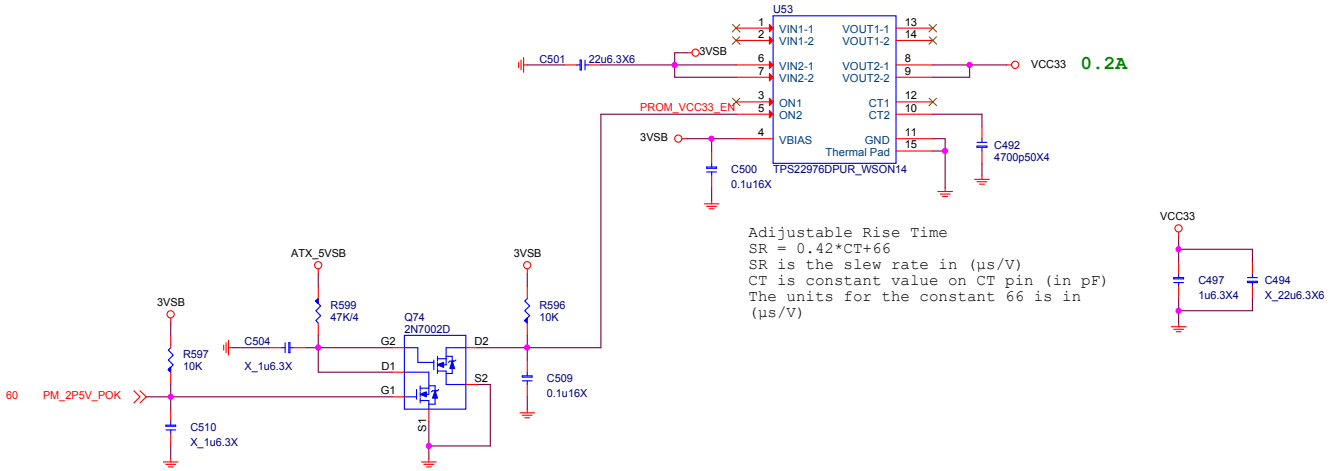
PROM_VCC33

VCC33@0.2A



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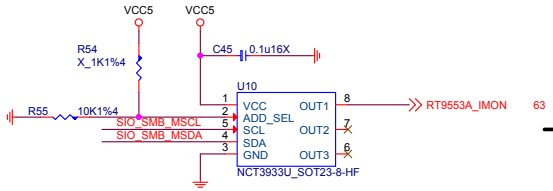
Over Voltage Control IC

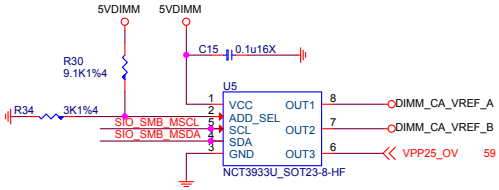
UPI VOLTAGE CONSOLE

ADDRESS	0x2A	0X28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%

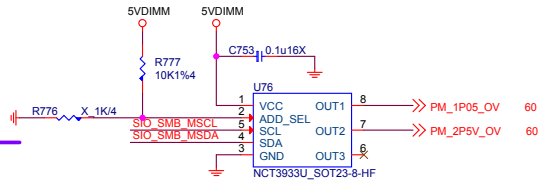
0x2A:RH=OPEN,RL=10K



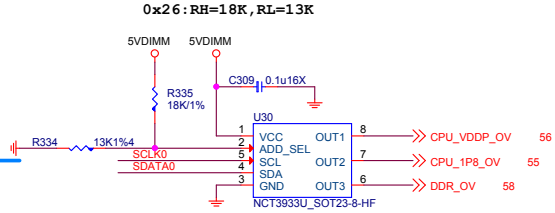
0x28:RH=9.1K,RL=3K



0x20:RH=10K,RL=OPEN



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



6,27,49 SIO_SMB_MSCL — SIO_SMB_MSCL
6,27,49 SIO_SMB_MSDA — SIO_SMB_MSDA

6,11 SCLK0 — SCLK0
6,11 SDATA0 — SDATA0

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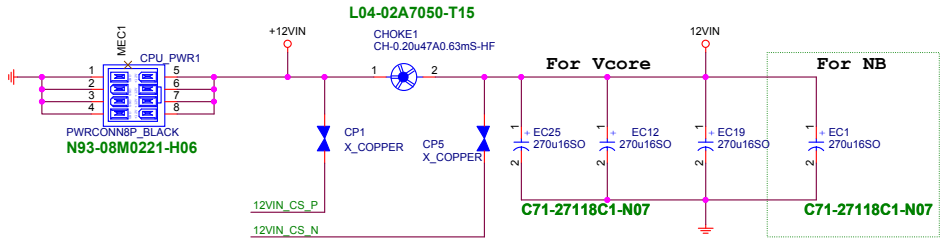
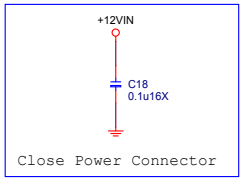
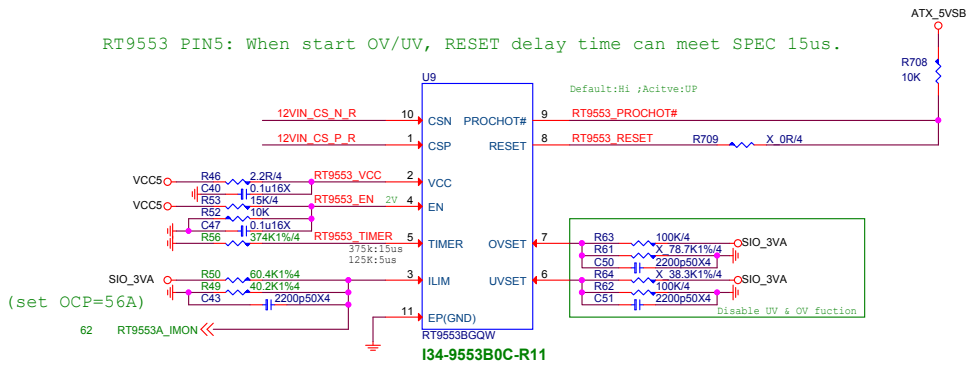
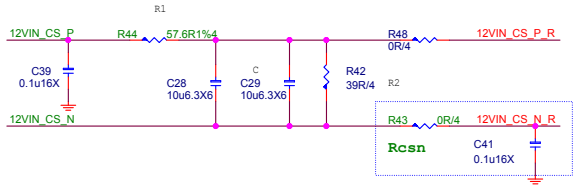
CPU POWER CONNECTOR





RT9553B CURRENT SENSE

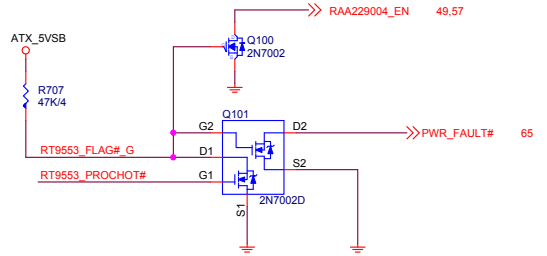




$$\Delta VILIM=10uA*[(60.4K*40.2K)/(60.4K+40.2K)]$$
$$=226mV$$

$$Isense = VILIM / 100*Rsense$$

$$\Delta Isense=226mV/100*0.39m=5.795A$$



Vcore

D=Vout/Vin			
Vin	=	12	> input voltage
Vout	=	2	> output Vcore
D	=	0.166667	

I o = Icore(max)*0.8			
I core(max)	=	200	> Vcore current
I avg.	=	160	A

I ripple={ Io*√D*√(1-D)} / Phase			
Phase	=	10	phase
I ripple	=	5.962848	A

How many pcs. Of Cap.			
I ripple(cap)	=	4700	m A
COE TEMP	=	1	
Input Cap.	=	2	pcs.

SOC

D=Vout/Vin			
Vin	=	12	> input voltage
Vout	=	1.55	> output Vcore
D	=	0.129167	

I o = Icore(max)*0.8			
I core(max)	=	75	> Vcore current
I avg.	=	60	A

I ripple={ Io*√D*√(1-D)} / Phase			
Phase	=	2	phase
I ripple	=	10.06153	A

How many pcs. Of Cap.			
I ripple(cap)	=	4700	m A
COE TEMP	=	1	
Input Cap.	=	3	pcs.

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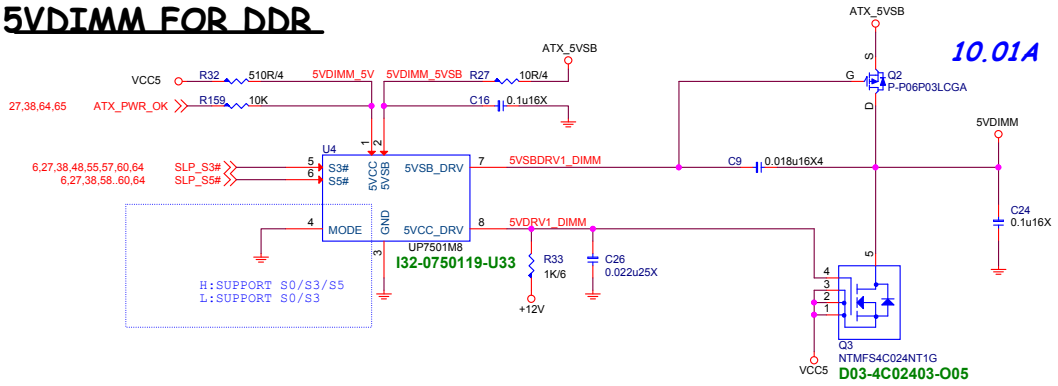
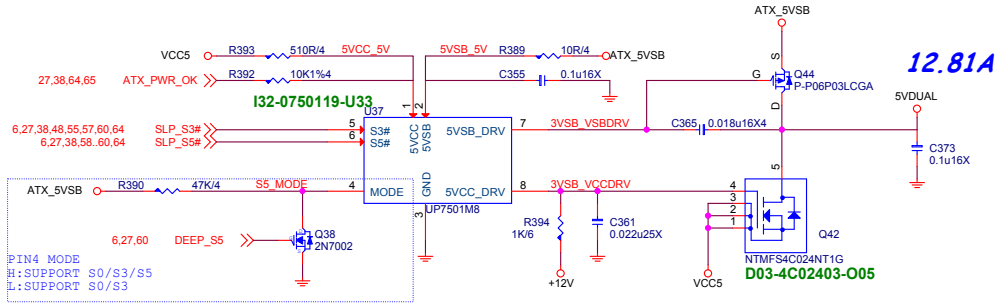
5VDIMM FOR DDR

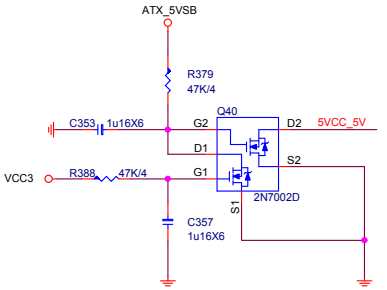


VCC_DDR=8.61A
VPP25=1.4A

5VDUAL For 3VSB/CPU1.8V/VDDP

LDOVDD=93.6mA
CPU_1P8_S5 VIN=3A
PM_1P05 VIN=2.1A
3VSB = 4.71A
LED_VCC5 = 3A



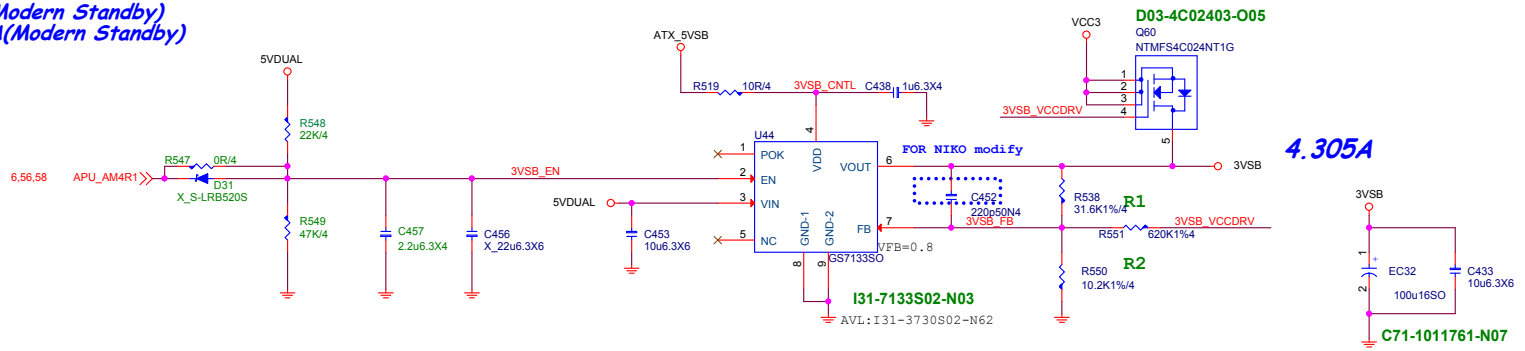


For power 700W solution (only for uP7501+uP7506 for 3VSB solution)
The power supply VCC3 delay 12ms after VCC5 assert.
The chip U7501 5VDRV1 work when the VCC5 ready
(When VCC5 up to 4.2V and the 5VDRV1 delay 6ms assert), but
VCC3 not ready and let the 3VSB sequence fail.

3VSB cost down

3.3V@4.305A

CPU:VDD_33_S5=0.25A
CHIP:VDD_33_S5=0.07A
PCIE=(375mA*5)=1.875A
M.2WIFI= 0.78A
RT8111H LAN=0.18A
PM_1P05_S5 :0.05A
PM_2P5V :0.9A(Modern Standby)
PCH VCC33 :0.2A(Modern Standby)



Vout = Vref * (1 +(R1/R2))
= 0.8 * (1 +(31.6K/10.2K))
= 3.328V

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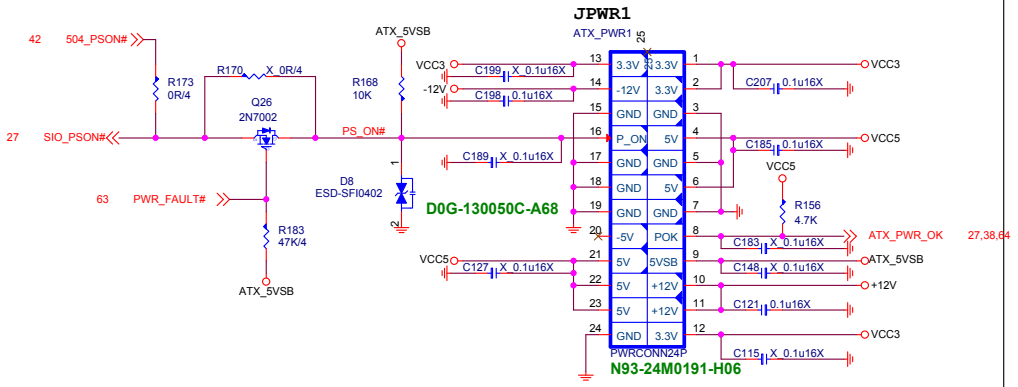
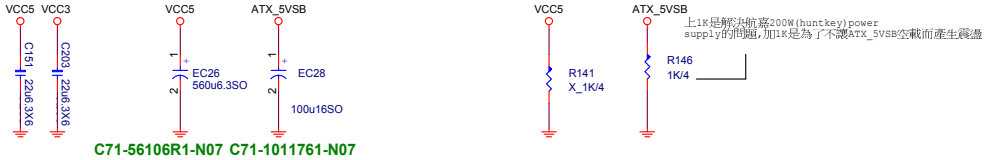
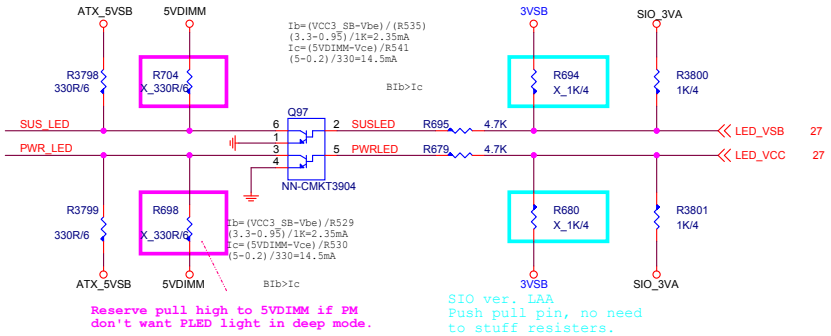
ATX POWER CONNECTOR

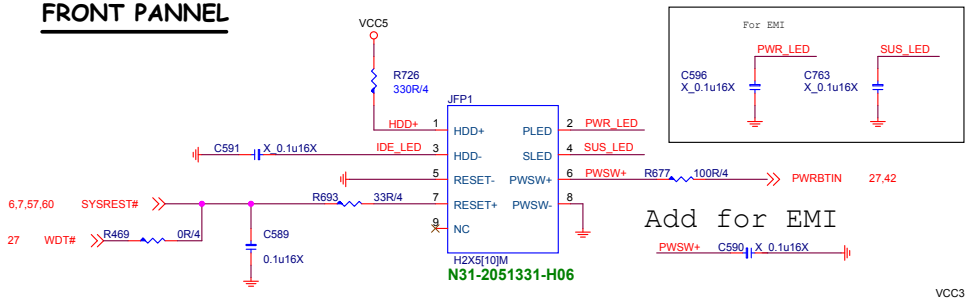


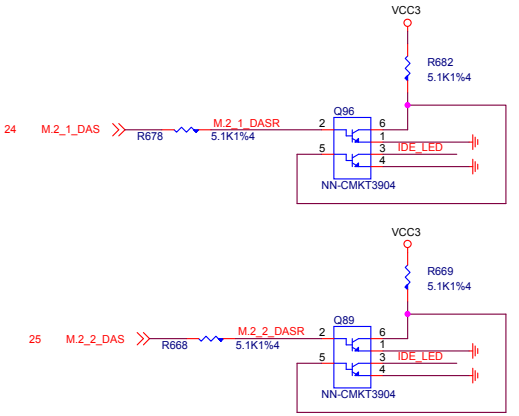


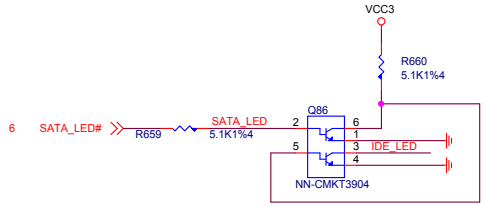
LED (for NCT6687D-R)

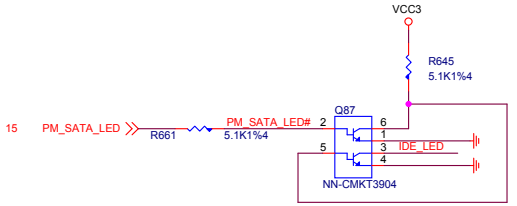


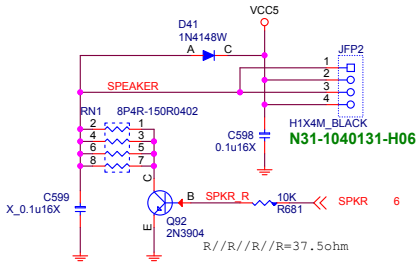
FRONT PANNEL











Voltage Mearsure Point

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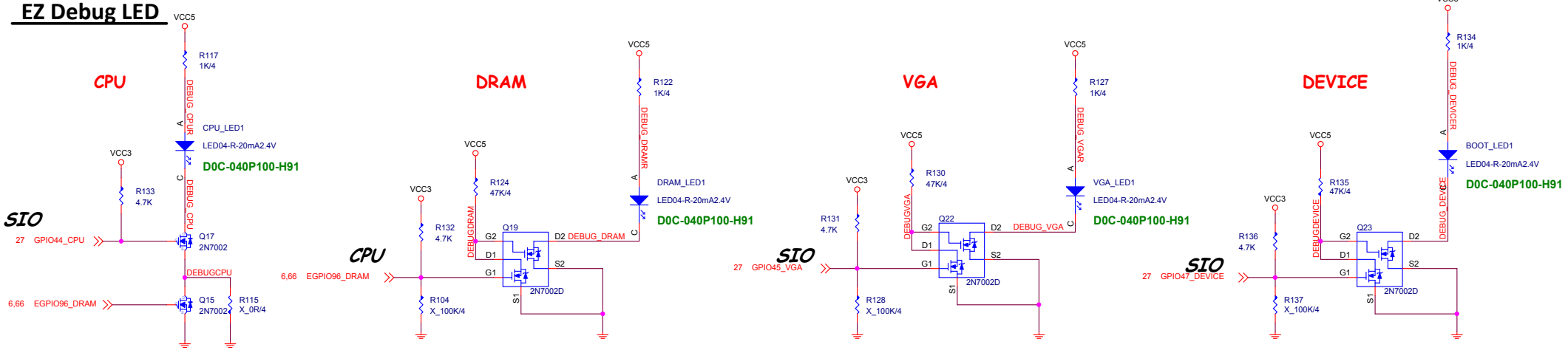
EZ Debug LED



LEDGPIO	GPIO44	EGPIO96	GPIO45	GPIO47
亮	OPEN-Drain	GPO LOW	GPO LOW	GPO LOW
滅	GPO LOW	GPO HIGH	OPEN-Drain	OPEN-Drain

default Input

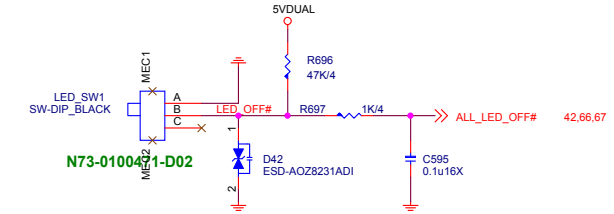
LED亮燈時同時將CPU LED關掉

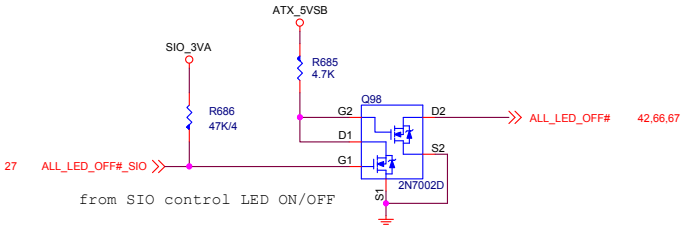
LED_SW1 FORM SIO

D0C-040P100-H91/D0C-040S500-E07

LED SW1 for ALL LED OFF

B-C: LED ON(default)
B-A: LED OFF





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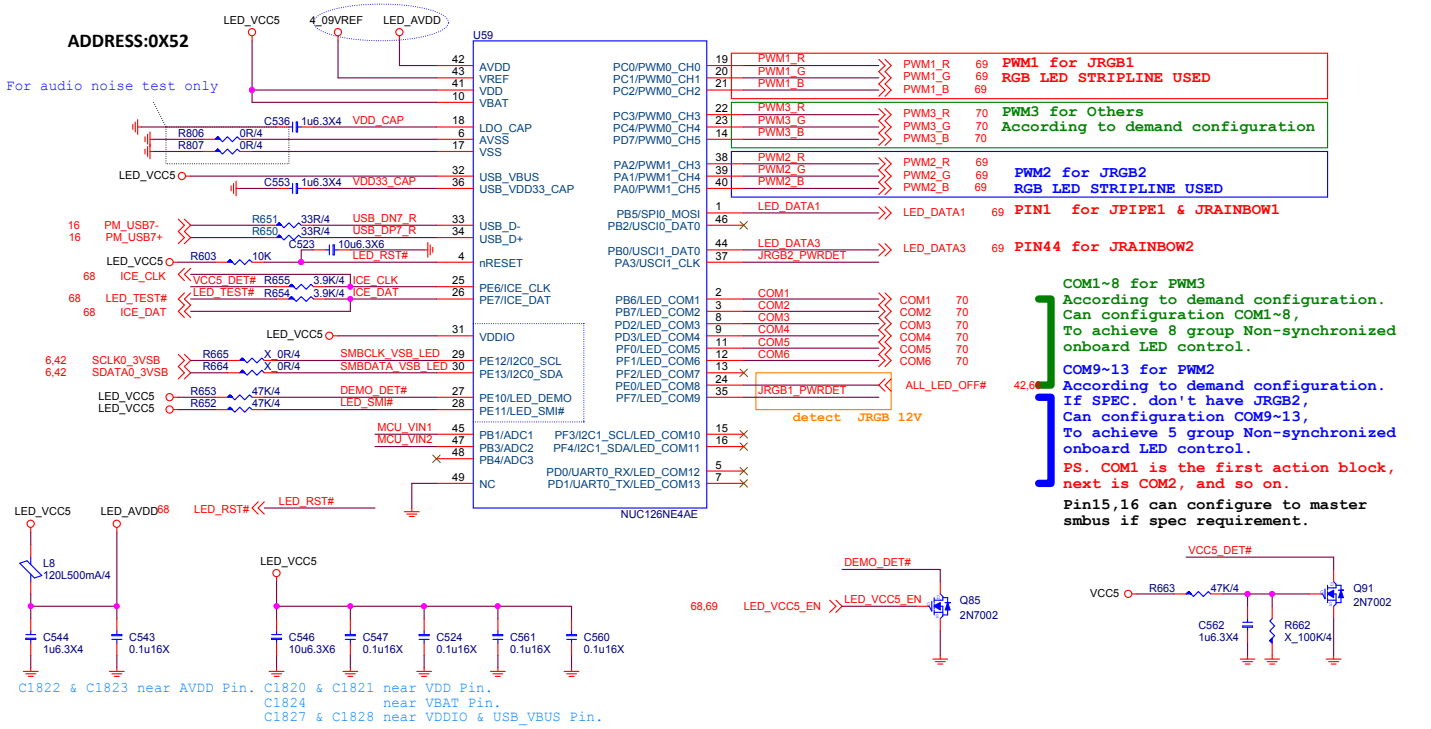
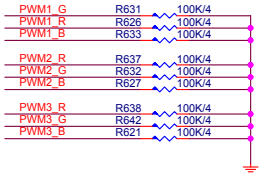
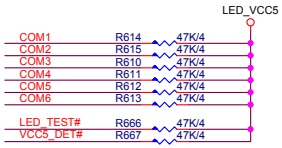
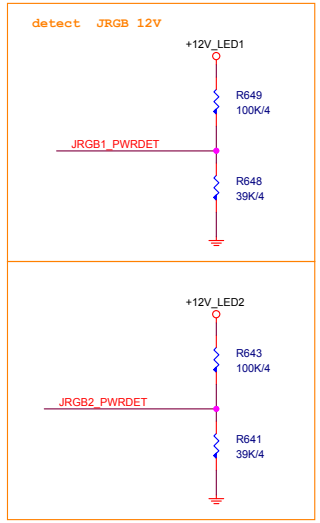
48 PIN LED MCU

If you use ADC function,need to separate VREF from AVDD and 4_09VREF stuff for VREF.



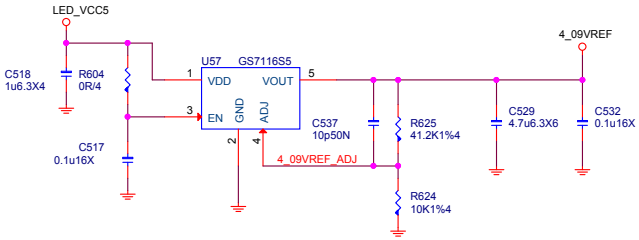


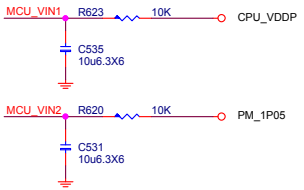




Clear MCU Circuit

Control	Net Name	PWM USE
PCH	LED_DATA1	No Use
AUDIO Cover	LED_GPIO_01	No Use
MOS/IO cover	LED_GPIO_02	No Use
JRAINBOW1	LED_GPIO_03	No Use
JCORSAIR1	LED_DATA2	No Use
JRGB1/JRGB2	PWM1/ PWM2	PWM1/ PWM2
Board Side LED	COM 1~8	PWM3
Board Side LED	COM 9~13	PWM2





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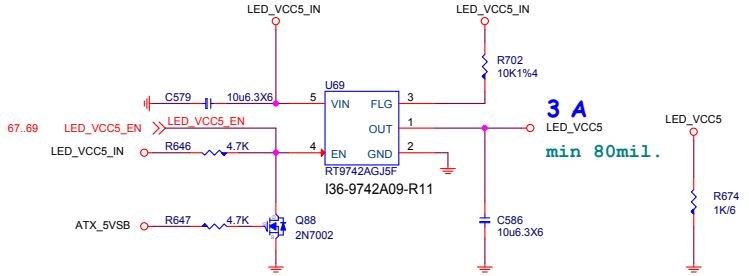
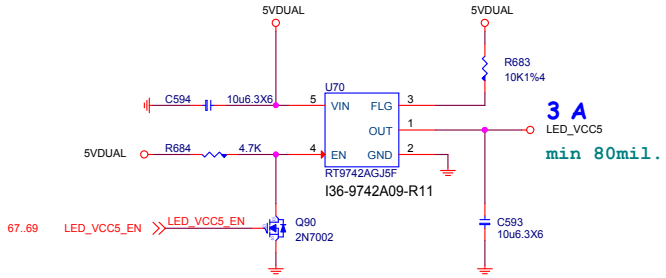
EXTERNAL POWER INPUT

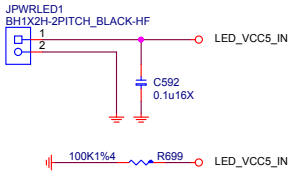




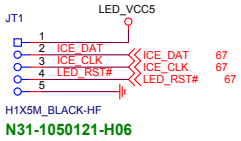
External Power

2A Connector

N32-1020CB1-H06

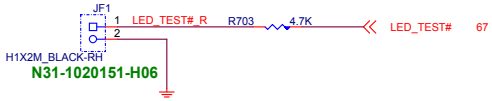


JT1 for FW update



N31-1050121-H06

JF1 for Factory test



N31-1020151-H06

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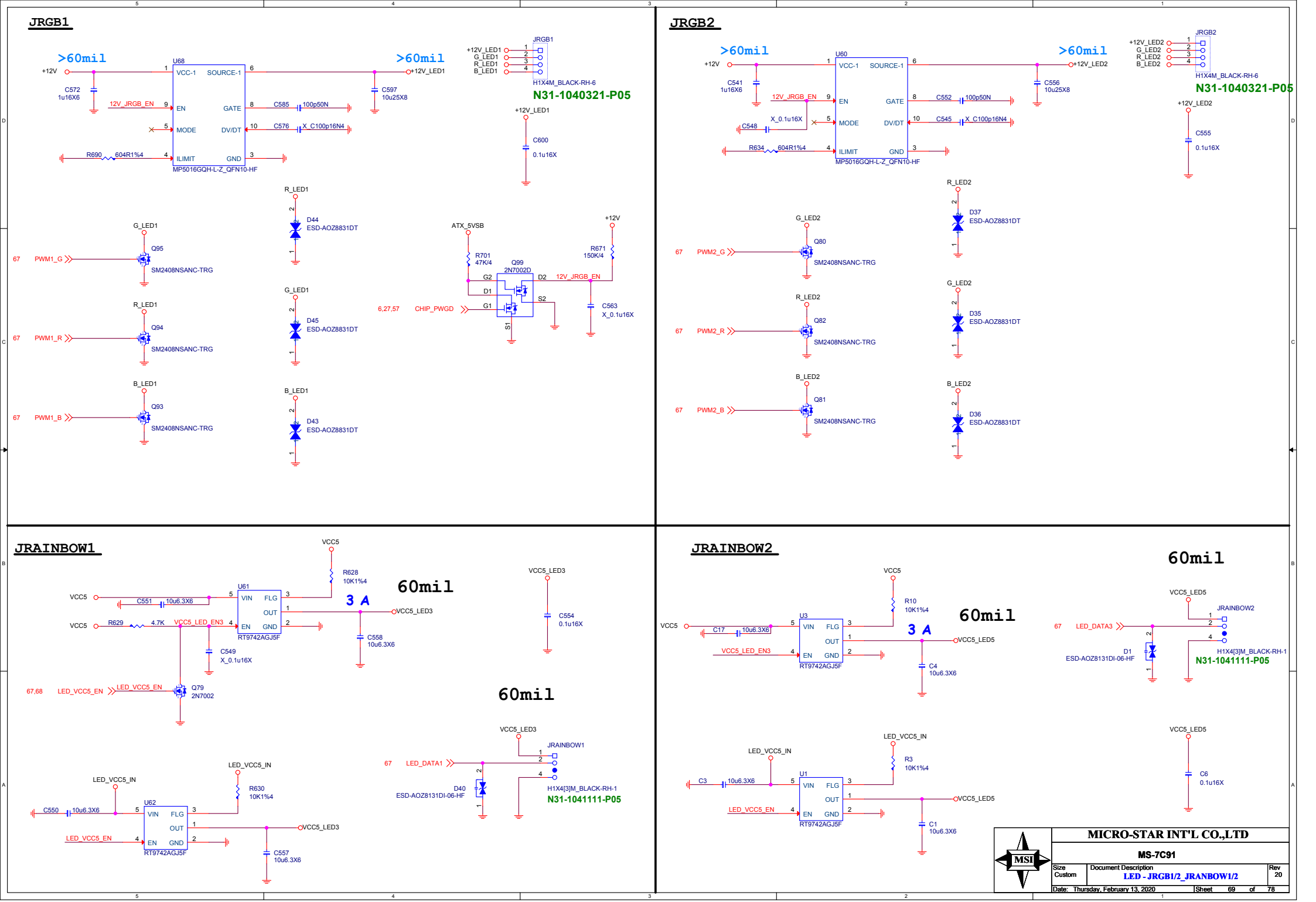
JRGB1
>60mil
U68
VCC-1
SOURCE-1
EN
GATE
MODE
DV/DT
ILIMIT
GND
MP5016GQH-L-Z_QFN10-HF
+12V
+12V_LED1
12V_JRGB_EN
C572 1u16X6
C597 10u25X8
C585 100p50N
C576 X_C100p16N4
R690 604R1%4
C600 0.1u16X
JRGB1
H1X4M_BLACK-RH-6
N31-1040321-P05
R_LED1
G_LED1
B_LED1
D44 ESD-AOZ8831DT
D45 ESD-AOZ8831DT
D43 ESD-AOZ8831DT
Q95 SM2408NSANC-TRG
Q94 SM2408NSANC-TRG
Q93 SM2408NSANC-TRG
67 PWM1_G
67 PWM1_R
67 PWM1_B
ATX_5VSB
R701 47K/4
Q99 2N7002D
G2
D1
G1
S2
D2
S1
R671 150K/4
C563 X_0.1u16X
6,27,57 CHIP_PWGD
JRGB2
>60mil
U60
+12V_LED2
C541 1u16X6
C548 X_0.1u16X
R634 604R1%4
C552 100p50N
C545 X_C100p16N4
C556 10u25X8
C555 0.1u16X
H1X4M_BLACK-RH-6
N31-1040321-P05
D37 ESD-AOZ8831DT
D35 ESD-AOZ8831DT
D36 ESD-AOZ8831DT
Q80 SM2408NSANC-TRG
Q82 SM2408NSANC-TRG
Q81 SM2408NSANC-TRG
67 PWM2_G
67 PWM2_R
67 PWM2_B
JRAINBOW1
U61
VIN
FLG
OUT
EN
GND
RT9742AGJ5F
VCC5
VCC5_LED3
VCC5_LED_EN3
R628 10K1%4
R629 4.7K
C551 10u6.3X6
C549 X_0.1u16X
C558 10u6.3X6
C554 0.1u16X
3 A
60mil
67,68 LED_VCC5_EN
LED_VCC5_EN
Q79 2N7002
LED_VCC5_IN
U62
C550 10u6.3X6
R630 10K1%4
C557 10u6.3X6
JRAINBOW1
67 LED_DATA1
D40 ESD-AOZ8131DI-06-HF
H1X4[3]M_BLACK-RH-1
N31-1041111-P05
JRAINBOW2
U3
R10 10K1%4
C17 10u6.3X6
C4 10u6.3X6
U1
R3 10K1%4
C3 10u6.3X6
C1 10u6.3X6
VCC5_LED5
C6 0.1u16X
D1 ESD-AOZ8131DI-06-HF
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Size Custom
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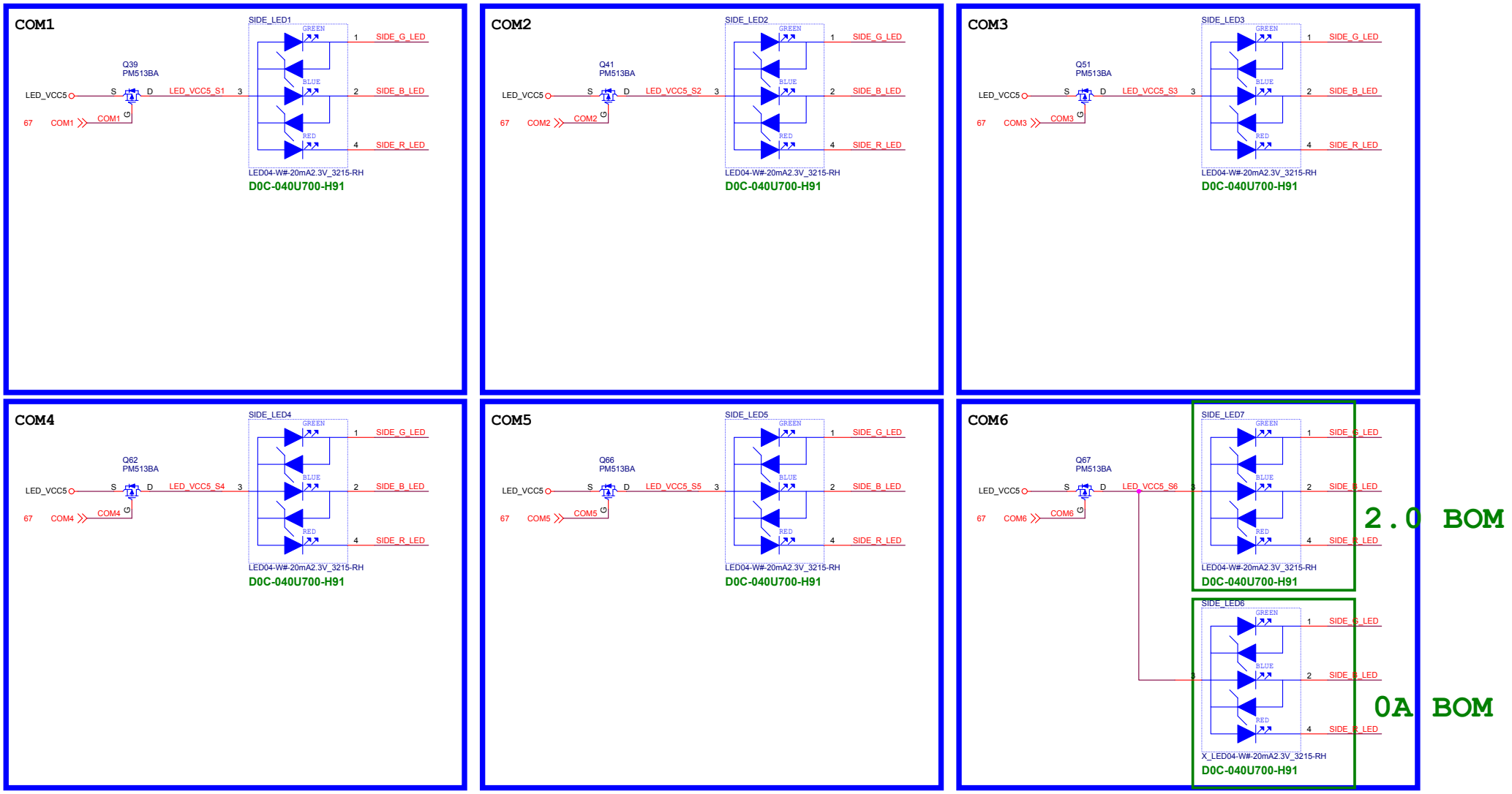
BOARD SIDE LED *6



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CPU Socket

CPU2

E95-0000022-A91

E95-0000022-A91

Simulation

X_JS1 SIM1 X_PIN1*2

X_JS2 SIM2 X_PIN1*2

X_JS3 SIM3 X_PIN1*2

FM2 FM3 FM1 FM4 FM5 FM6 FM8 FM7 X_FM120

Optics Orientation Holes

MH1 MH2 MH3 MH5 MH6 MH4 MH7 MH8 MH9 X_MH001

C575 0.1u16X

C559 0.1u16X

MANUAL PART

AMI_LAB1

G51-M1SPXXA-A09

G51-M1SPXXA-A09

CFOS1 <MSI-BOM>

Y02-MU00170-CFO

Y02-MU00170-CFO

HDMI_LA1

Label HDMI

HDMI LABEL

Y01-RHDMI03-000

MKT_LA1

Label MKT_LABEL

X_MKT LABEL

G51-M1SPP78-Q13

BAT1_X1

BAT-BCR2032P

AVL:

D06-0100161-F52

D06-0100101-K26

PCB

PCB

PCB1

7C91_20

PD0-07C9120-E48

PD0-07C9120-G37

Moat CAP

Reserve for bypass 12VIN noise use

ATX_5VSB

C5 X_0.1u16X

C2 X_0.1u16X

MOS HEATSINK

N MOS W MOS

PCH HEATSINK

Audio COVER

IO COVER

DDR COVER

20190201 Remove DDR_COVER1

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