MS-7B87 Ver:10

CPU:
AMD AM4

System Chipset:
Promontory B450
(Value DIY or System Builder)

Main Memory:
DDR IV * 2 MAX:32 GB

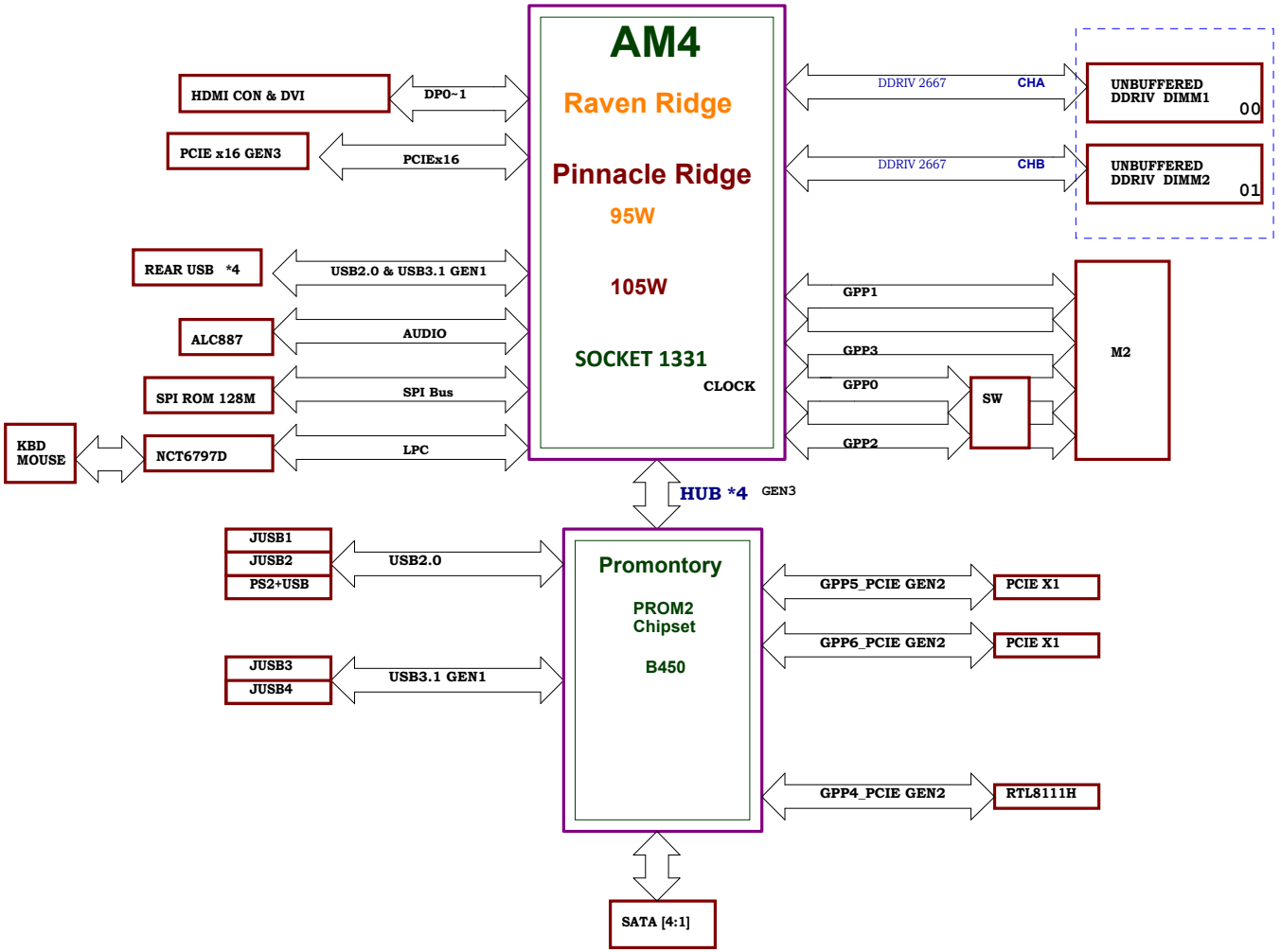
VRM
RT8894 4+2

On Board Chipset:
LPC Super I/O --NCT6797D-M
LAN RTL8111H
Azalia CODEC - Realtek ALC887

Expansion Slots:
From CPU
PCI Express X16 Slot * 1
PCI Express X1 Slot * 1
PCI Express X1 Slot * 1
M2_2 * 1

OCP IC:
RT9553B

FUSION BLOCK DIAGRAM



MICRO-START INT'L CO.,LTD.

Title: Block Diagram		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 1 of 56	

AMD AM4

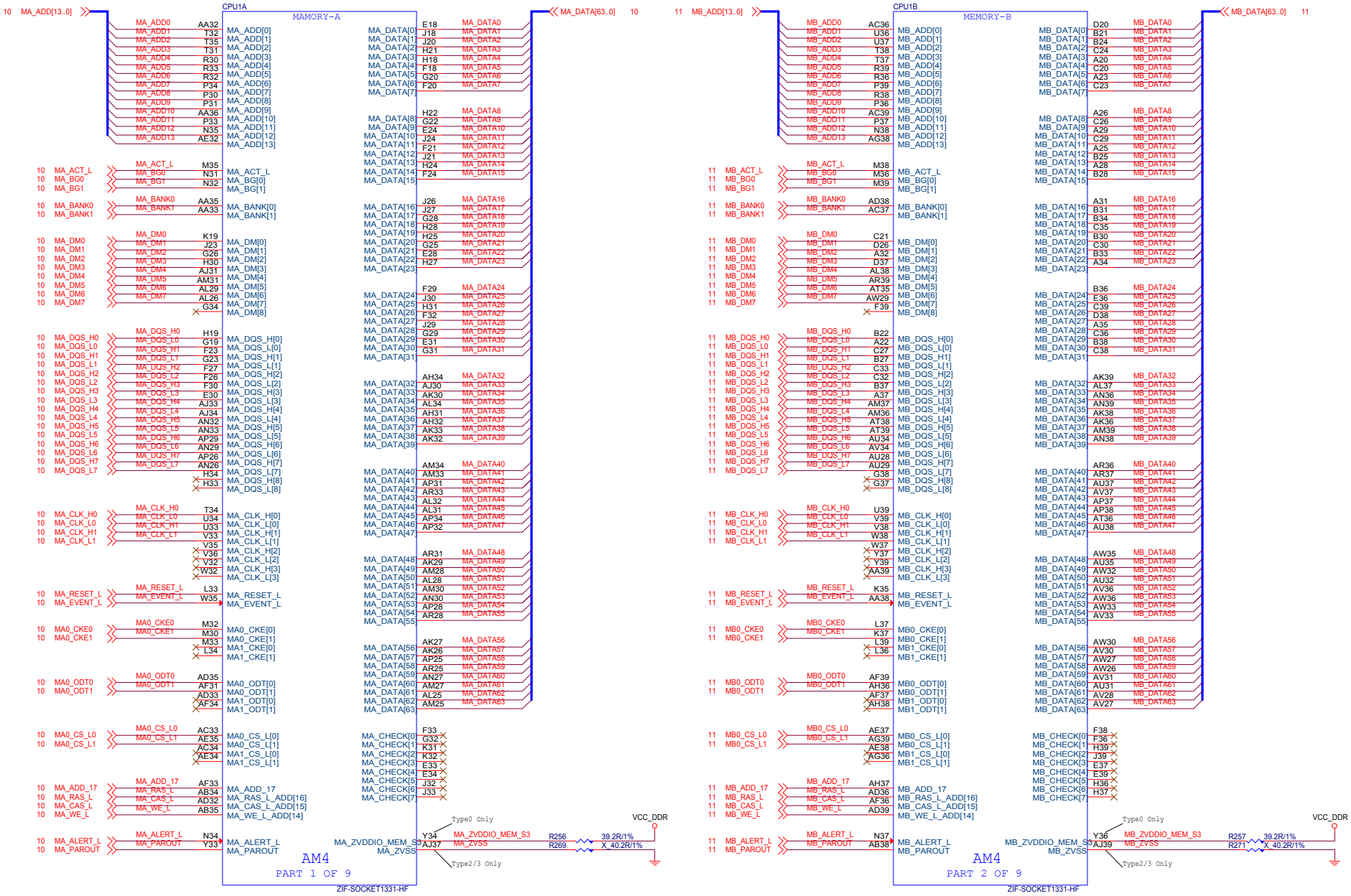
01 Block Diagram	38 CPU Power 1P8V-MP2147
02 Cover Sheet	39 CPU Power VDDP-MP8712
03 FM4 DDR4 I/F	40 CPU Power Connector/PWRGD
04 AM4 PCIE/SATAE	41 CPU Power RT8894 3+2 Phase
05 AM4 Display/Audio	42/43 CPU Power Phase 1-4
06 AM4 SVI/ACPI/GPIO	44 CPU Power NB Phase 1-2
07 AM4 LPC/SPI/USB/CLK/STRAP	45 CPU Power NB Switch/NCT3933
08 AM4 Power/RTC Power/ 09 AM4 GND	46 RT9553B CURRENT SENSE
10,11 DDR4-DIMM CH-A/B	47 ATX/Front Panel
12,13 DDR4-POWER/GND	48 ALL LED Control
14 Promontory-PCIE/SATA/SATAE	49 JRGB1/JRGB2
15 Promontory-USB/OC	50 BOM Option
16 Promontory-CLK/ACPI/GPIO	51 RTC Circuit/Moat Cap
17 Promontory-Power / 18 Promontory-GND	52 M2_2
19 PCIE X16(X1*2) SLOT	53 History
20 SIO NCT6797D	54 Power Sequence
21 SIO HWM/COM	55 Power Delivery
22 DVI Connector	56 GPIO MAP
23 FAN Control TYPE L/ K	
24 / 25 / 26 LAN-RTL8111H/Audio ALC887	
27 USB Rear PS2+USB2.0	
28 USB Rear LAN+USB3.1 GEN1	
29 Rear USB3.1 Type C / mux	
30 USB Front Side	
31 SATA Connector	
32 HDMI Connector	
34 ACPI uPI-5VDIMM&3VSB	
35 PM-SY8288RAC-1.05V/GS7133-2.5V	
36 DDR PWR VPP25/VTT-MP2147	
37 DDR Power-RT8231AGQW	

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

Title: COVER SHEET

Size: Custom | Document Number: MS-7B87 | Rev: 10

Date: Wednesday, May 30, 2018 | Sheet 2 of 56

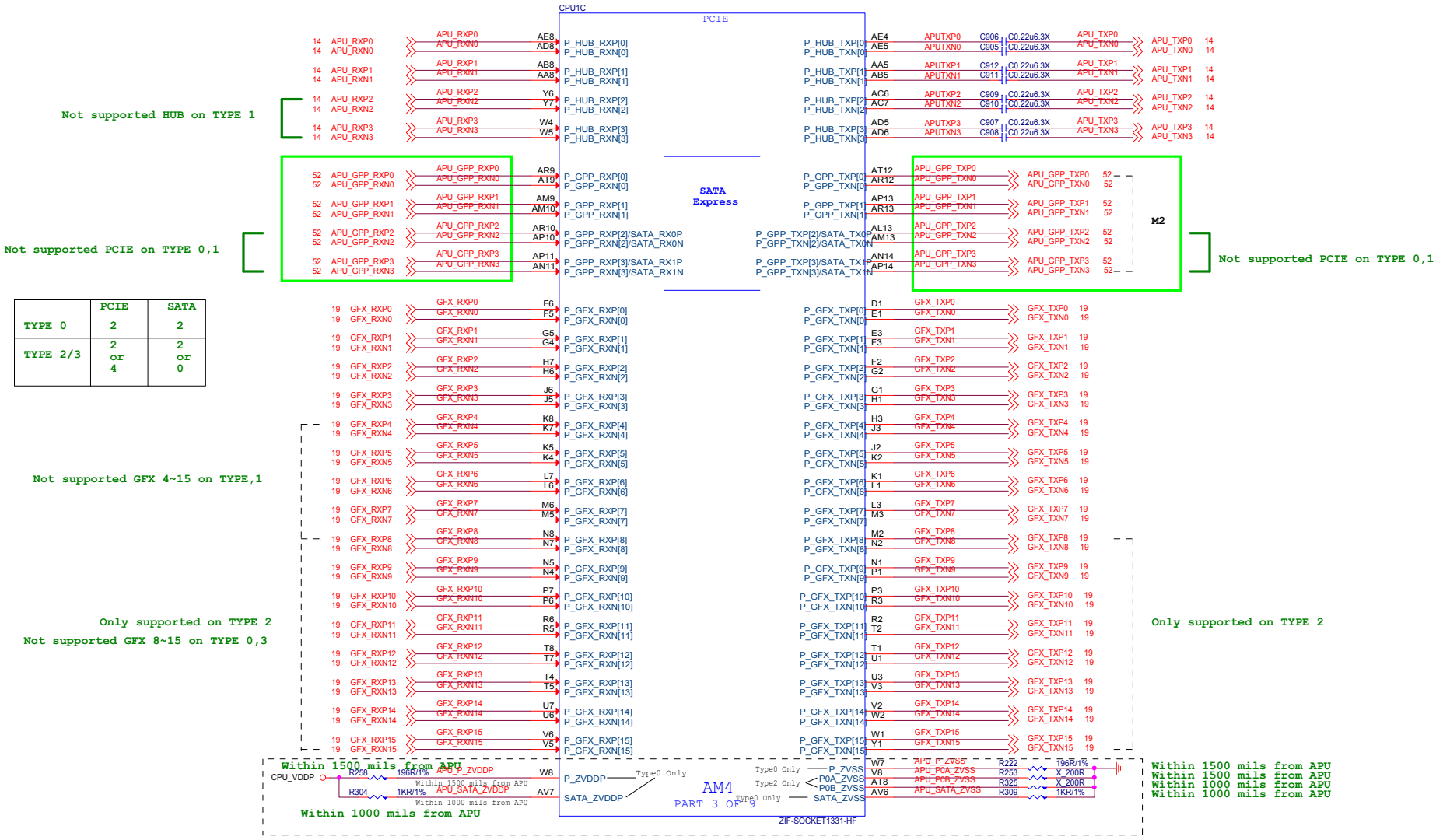


Schematic Cfg	Project	
	V	A

MICRO-START INT'L CO.,LTD.

Link to the Future

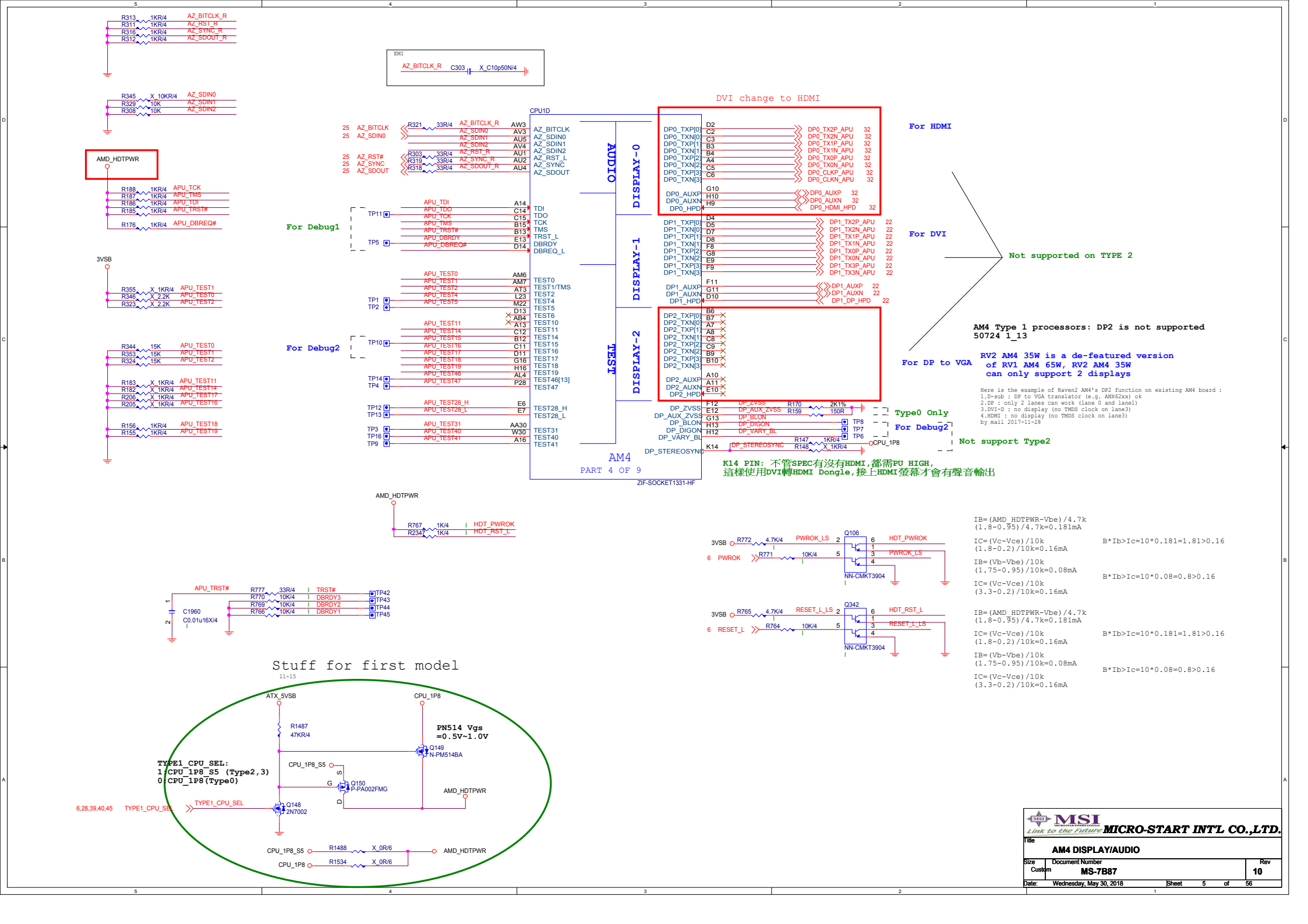
Title	AM4 DDR4 I/F	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 3 of 56	

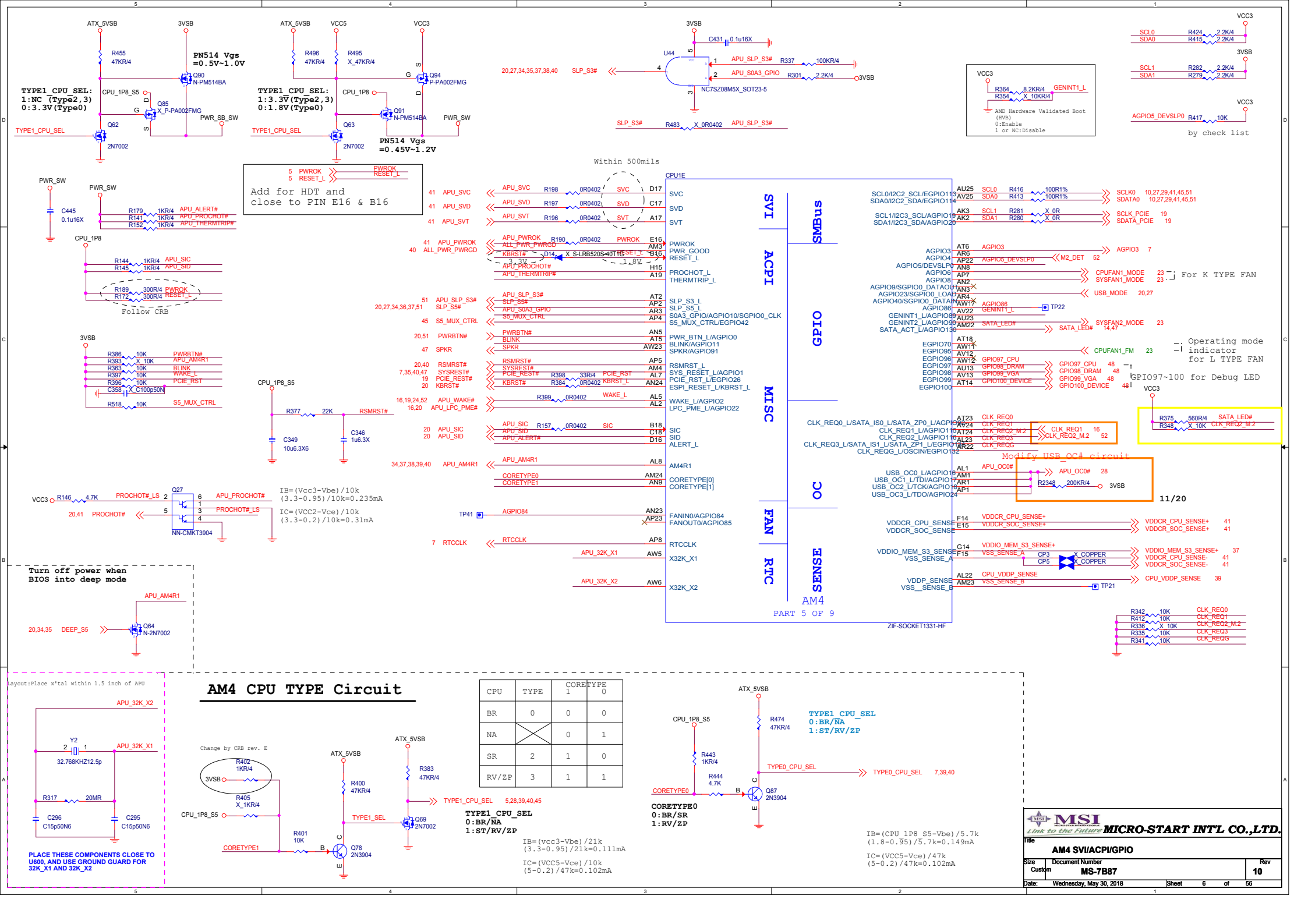


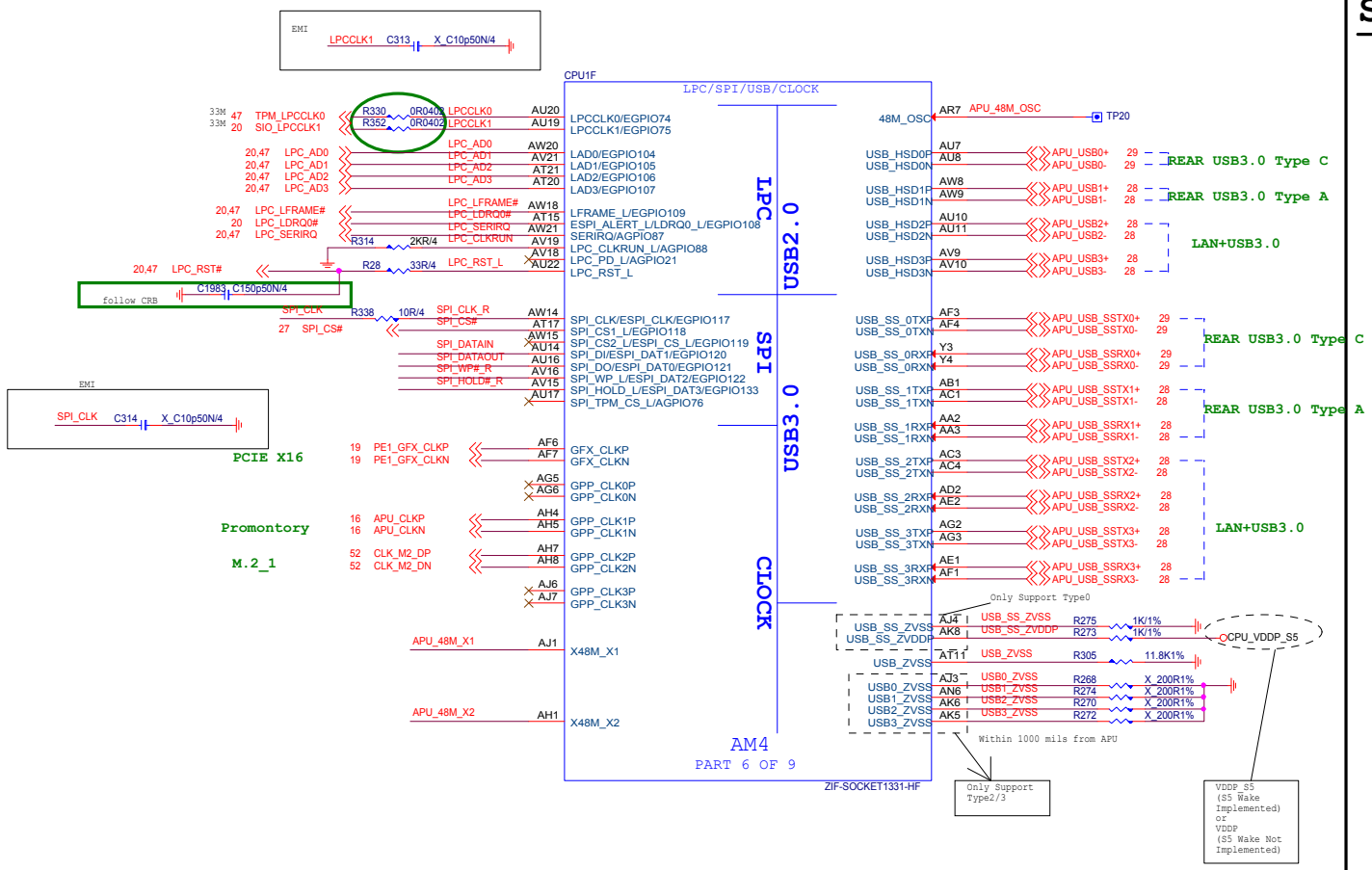
	PCIE	SATA
TYPE 0	2	2
TYPE 2/3	2 or 4	2 or 0

Title	AM4 PCIE/SATAE	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 4 of 56	

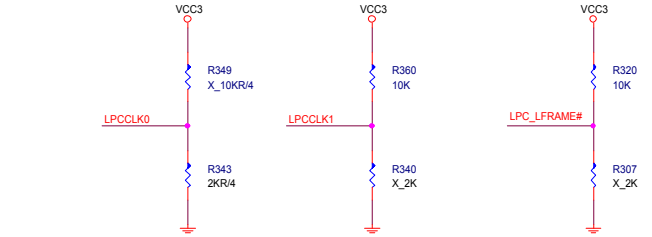
MICRO-STAR INT'L CO.,LTD.


DVI change to HDMI
For HDMI
For DVI
For DP to VGA
Not supported on TYPE 2
AM4 Type 1 processors: DP2 is not supported
50724 1_13
RV2 AM4 35W is a de-featured version
of RV1 AM4 65W, RV2 AM4 35W
can only support 2 displays
Here is the example of Raven2 AM4's DP2 function on existing AM4 board :
1.D-sub : DP to VGA translator (e.g. ANX62xx) ok
2.DP : only 2 lanes can work (lane 0 and lane1)
3.DVI-D : no display (no TMDS clock on lane3)
4.HDMI : no display (no TMDS clock on lane3)
by mail 2017-11-28
For Debug1
For Debug2
Type0 Only
For Debug2
Not support Type2
K14 PIN: 不管SPEC有沒有HDMI,都需PU HIGH,
這樣使用DVI轉HDMI Dongle,接上HDMI螢幕才會有聲音輸出
AM4
PART 4 OF 9
ZIF-SOCKET1331-HF
Stuff for first model
TYPE1_CPU_SEL:
1:CPU_1P8_S5 (Type2,3)
0:CPU_1P8(Type0)
PN514 Vgs
=0.5V~1.0V
IB=(AMD_HDTPWR-Vbe)/4.7k
(1.8-0.95)/4.7k=0.181mA
IC=(Vc-Vce)/10k
(1.8-0.2)/10k=0.16mA
B*Ib>Ic=10*0.181=1.81>0.16
IB=(Vb-Vbe)/10k
(1.75-0.95)/10k=0.08mA
IC=(Vc-Vce)/10k
(3.3-0.2)/10k=0.16mA
B*Ib>Ic=10*0.08=0.8>0.16
MICRO-START INT'L CO.,LTD.
AM4 DISPLAY/AUDIO
MS-7B87
10
Wednesday, May 30, 2018
5 of 56

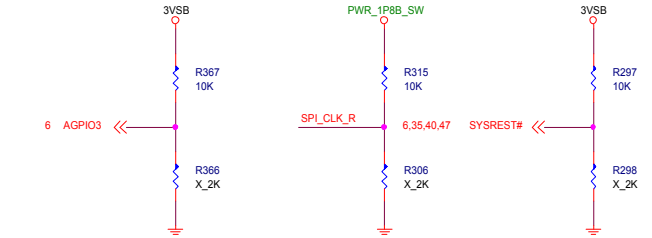

AM4 CPU TYPE Circuit
PART 5 OF 9
AM4
SVI
ACPI
GPIO
MISC
OC
FAN
RTC
SMBus
SENSE
Add for HDT and close to PIN E16 & B16
Within 500mils
Follow CRB
For K TYPE FAN
Operating mode indicator for L TYPE FAN
GPIO97~100 for Debug LED
Modify USB_OC# circuit
11/20
Turn off power when BIOS into deep mode
PLACE THESE COMPONENTS CLOSE TO U600, AND USE GROUND GUARD FOR 32K_X1 AND 32K_X2
MICRO-START INT'L CO.,LTD.
AM4 SVI/ACPI/GPIO
MS-7B87
10
Wednesday, May 30, 2018



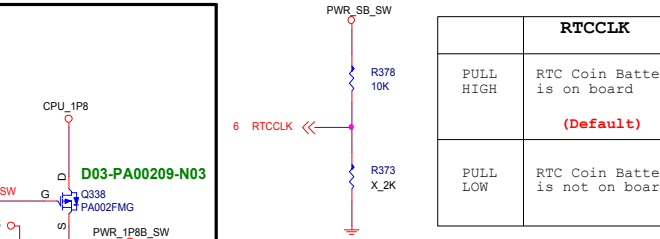
Strapping Options



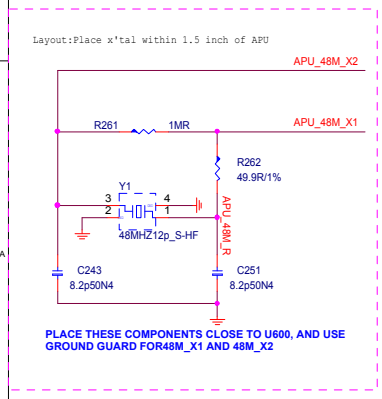
	LPCCLK0	LPCCLK1	SIO_LFRAME
PULL HIGH	LPC device Boot Fail Timer Enabled	Configured for Internal clock generator **(Default)**	SPI ROM **(Default)**
PULL LOW	LPC device Boot Fail Timer Disabled **(Default)**	Configured for External clock generator ?????	LPC ROM



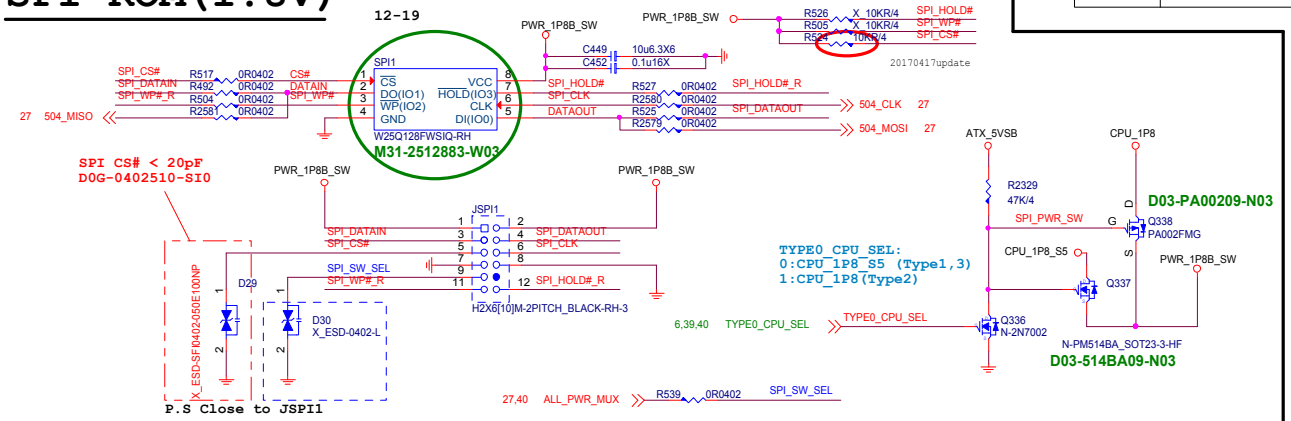
	AGPIO3	SPI_CLK	SYSREST#
PULL HIGH	Enhanced Reset logic **(Default)**	Use 48Mhz crystal clock and generate both internal and external clocks **(Default)**	Normal reset mode **(Default)**
PULL LOW	Traditional Reset logic	Use 100Mhz PCIE clock as reference clock and generate internal clocks only	short reset mode



	RTCCLK
PULL HIGH	RTC Coin Battery is on board **(Default)**
PULL LOW	RTC Coin Battery is not on board

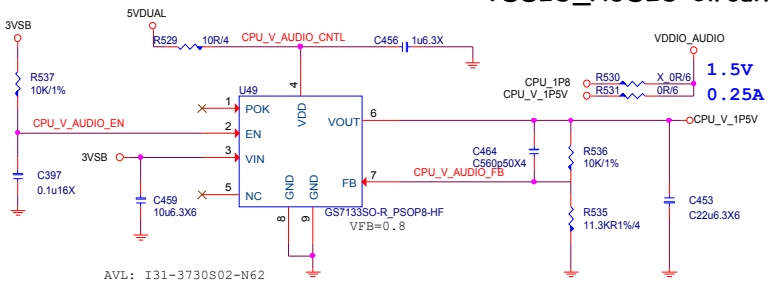


SPI ROM(1.8V)

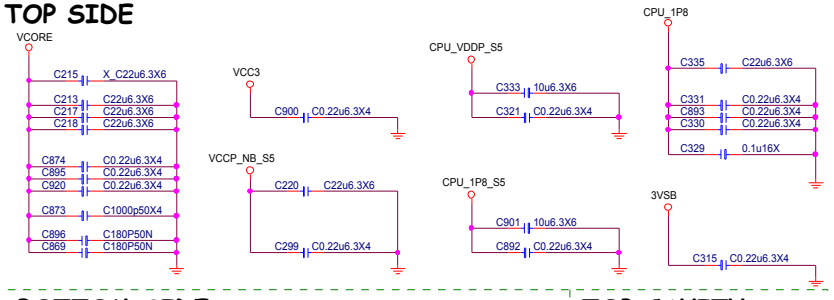


MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future
Title: AM4 LPC/SPI/USB/CLK/STRAP
Size: Custom | Document Number: MS-7B87 | Rev: 10
Date: Wednesday, May 30, 2018 | Sheet 7 of 56

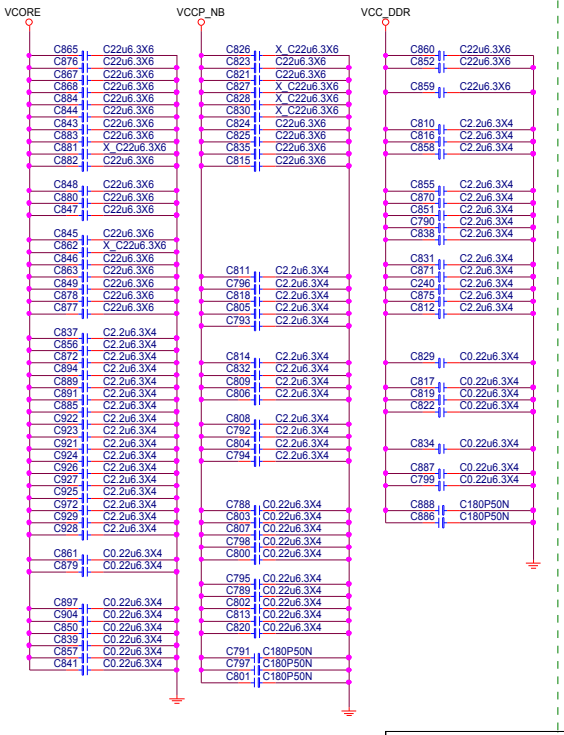
VDDIO_AUDIO Circuit



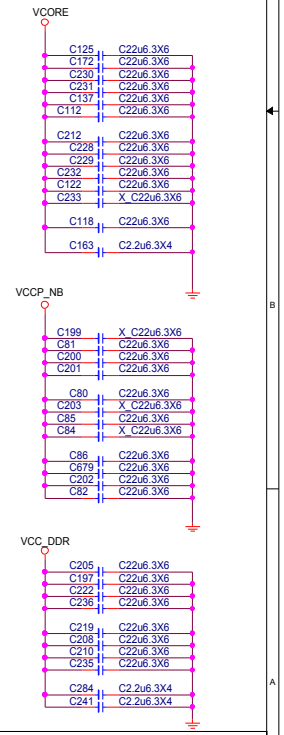
TOP SIDE

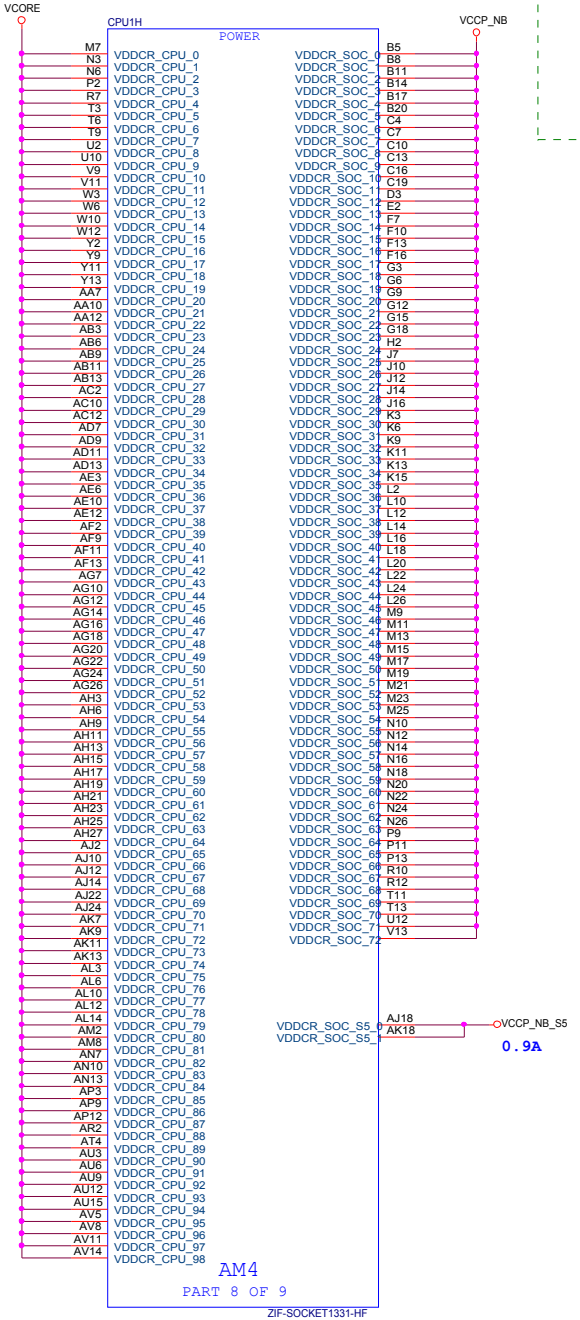


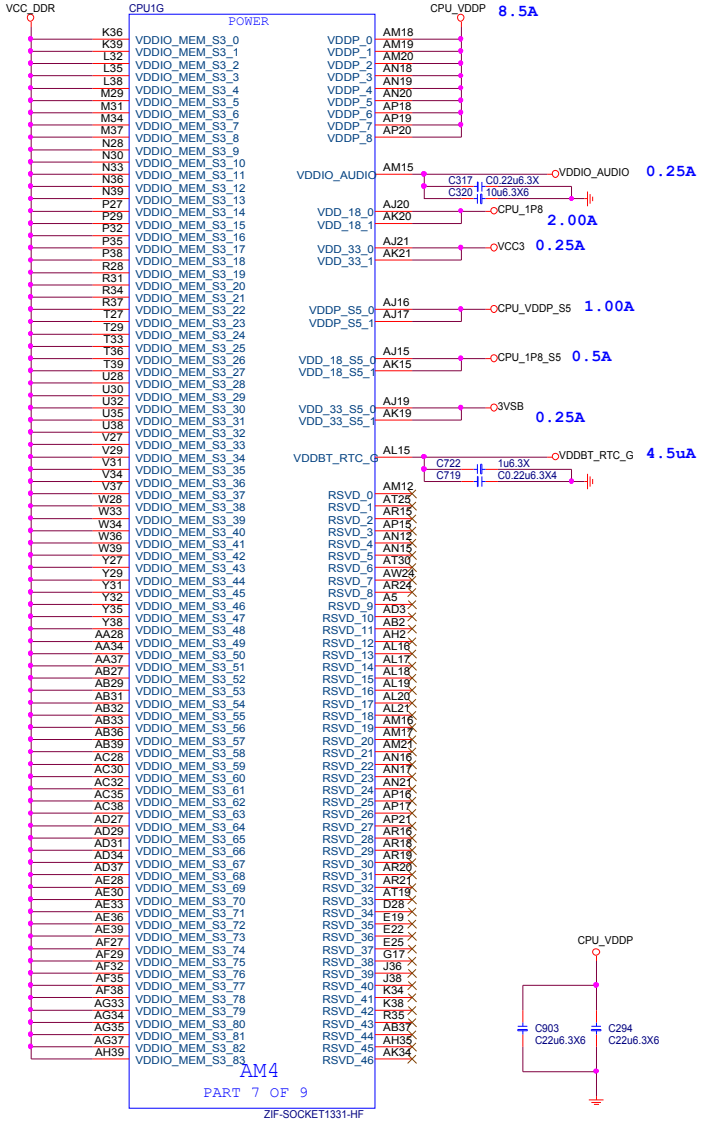
BOTTOM SIDE



TOP CAVITY

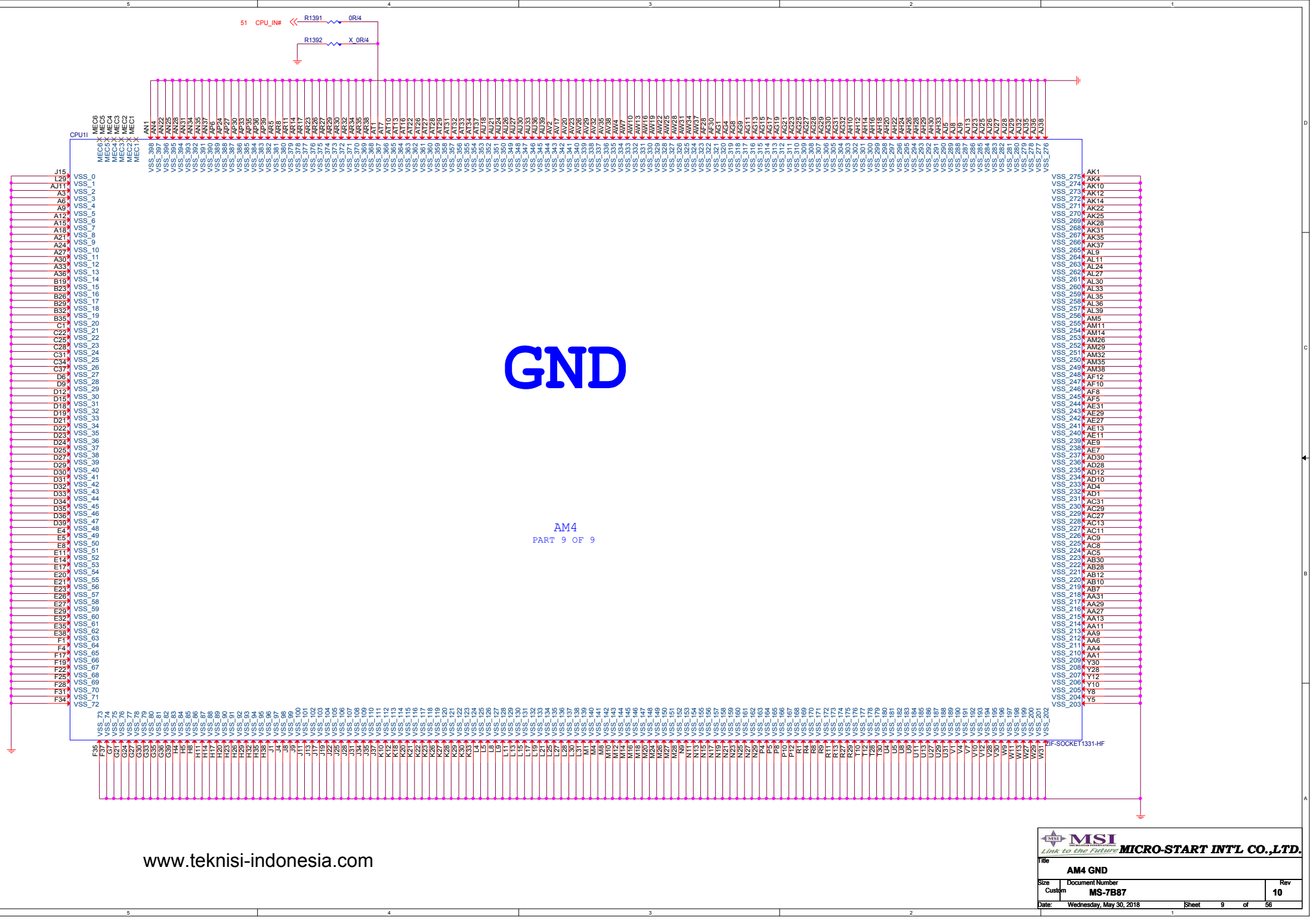






Title	AM4 Power/RTC Power
Size	Custom
Document Number	MS-7B87
Rev	10
Date:	Wednesday, May 30, 2018
Sheet	8 of 56

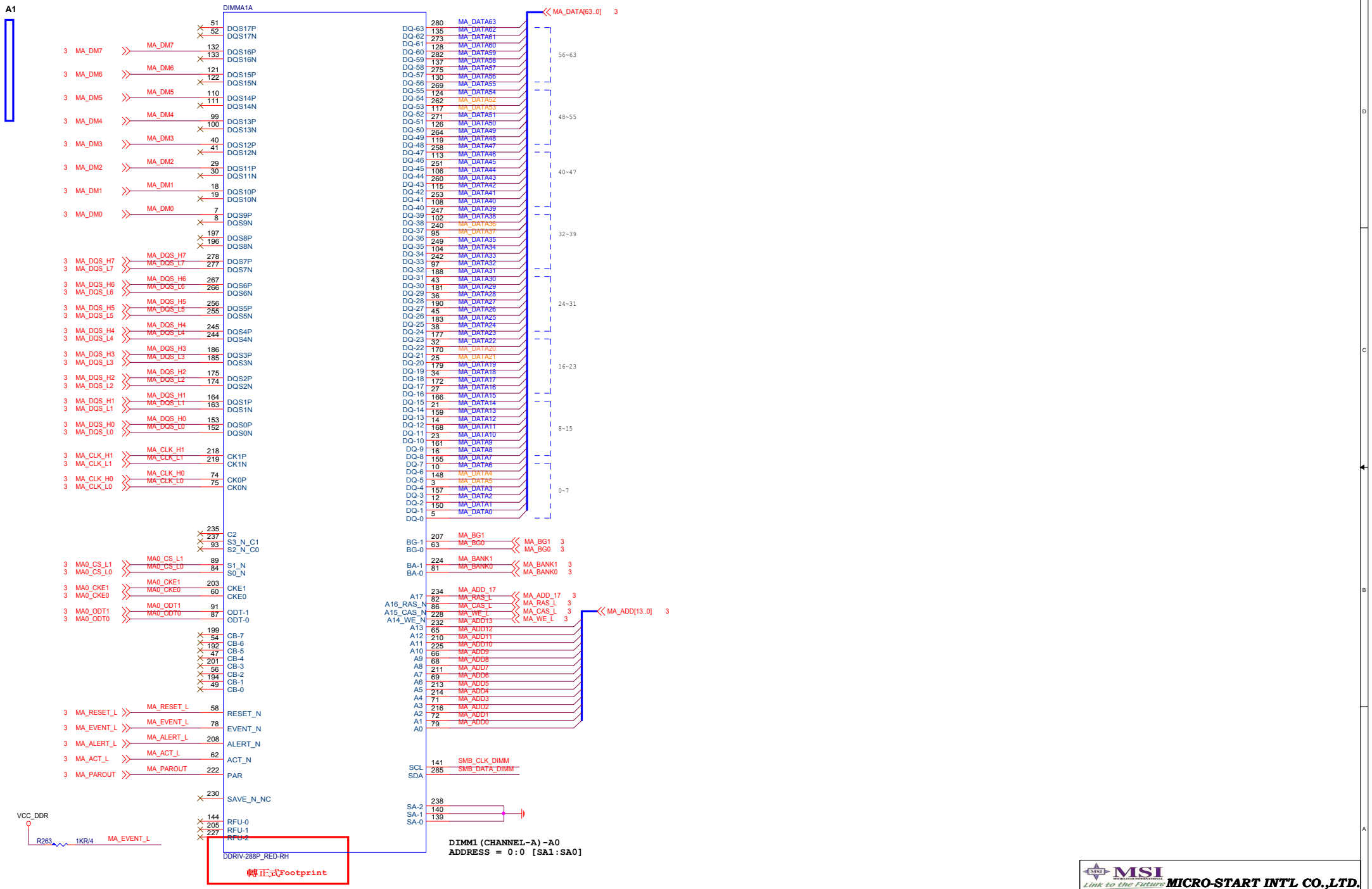
MICRO-STAR INT'L CO.,LTD.

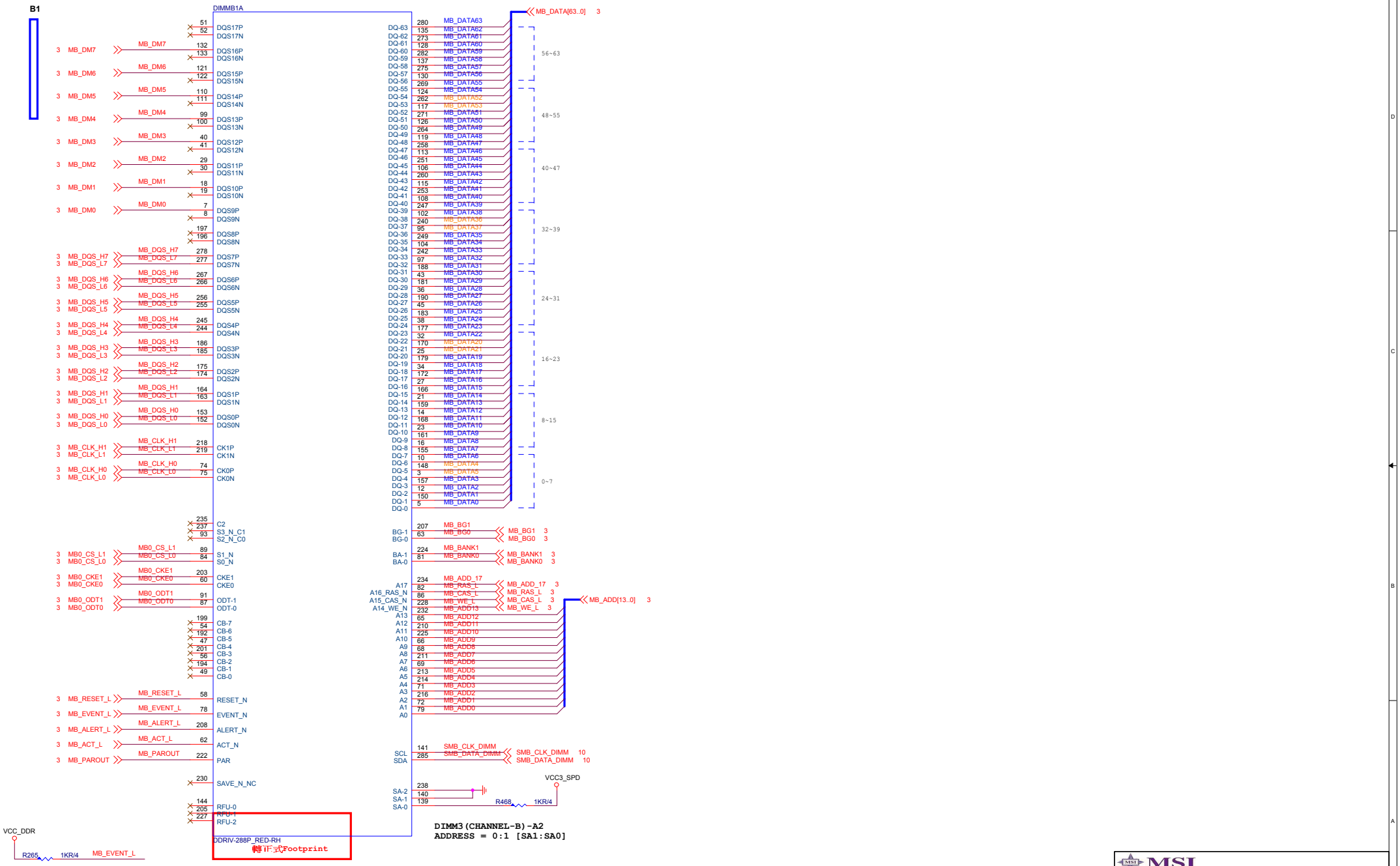


www.teknisi-indonesia.com

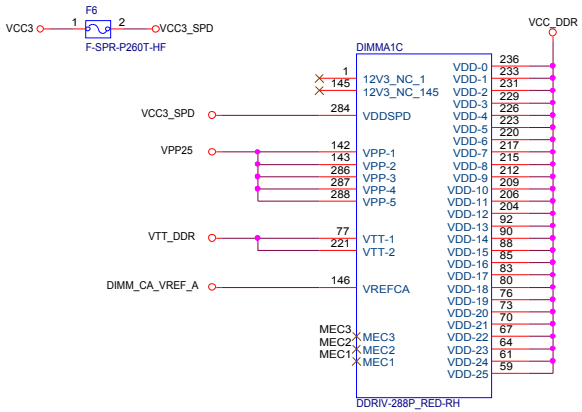
MSI MICRO-START INT'L CO.,LTD.
Link to the Future

Title	AM4 GND	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 9 of 56	


A1
DIMMA1A
MA_DATA[63..0] 3
MA_ADD[13..0] 3
DIMM1(CHANNEL-A)-A0
ADDRESS = 0:0 [SA1:SA0]
DDRIV-288P_RED-RH
傅正式Footprint
VCC_DDR
R263 1KR/4 MA_EVENT_L
MSI MICRO-START INT'L CO.,LTD.
Link to the Future
Title
DDR4 DIMM CH-A
Size Custom
Document Number MS-7B87
Rev 10
Date: Wednesday, May 30, 2018
Sheet 10 of 56



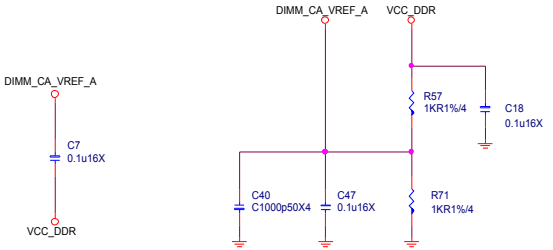
MSI MICRO-STAR INT'L CO.,LTD.			
Title: DDR4 DIMM CH-B			
Size: Custom	Document Number: MS-7B87		Rev: 10
Date: Wednesday, May 30, 2018	Sheet 11 of 56		

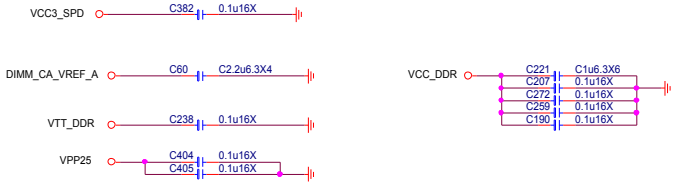


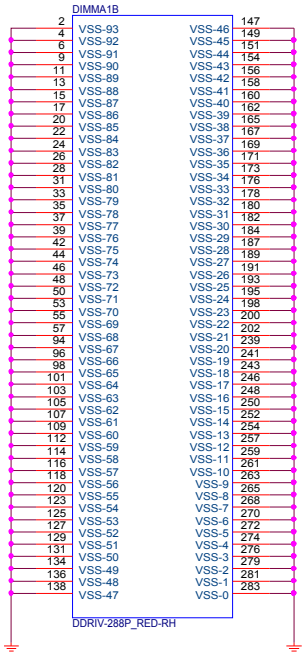
DIMM SLOT PN BY SPEC

DDR VREF

(place resistors close to DIMMs)







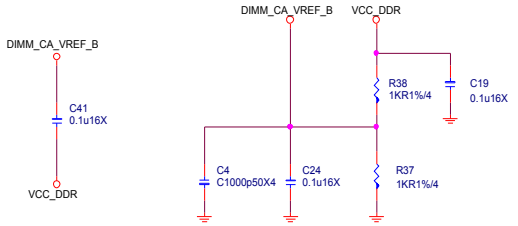
MICRO-START INT'L CO.,LTD.

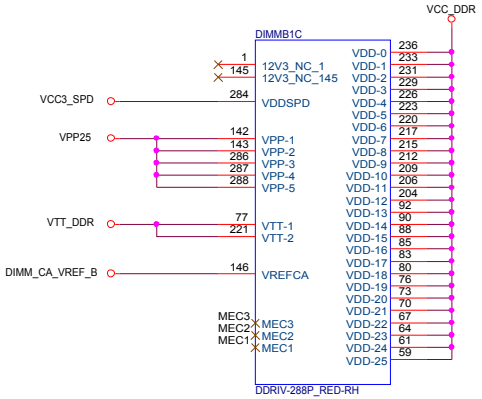
Link to the Future

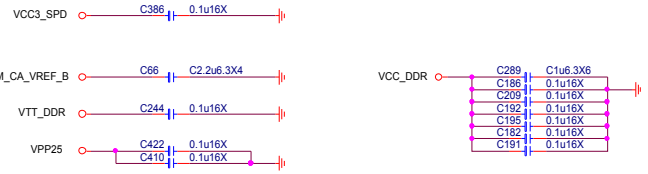
Title: DDR4-POWER/GND-1		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 12 of 56	

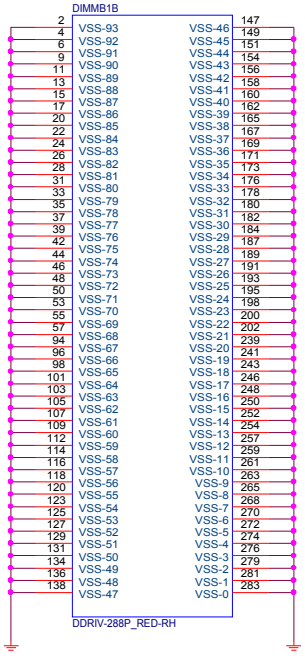
DDR VREF

(place resistors close to DIMMs)





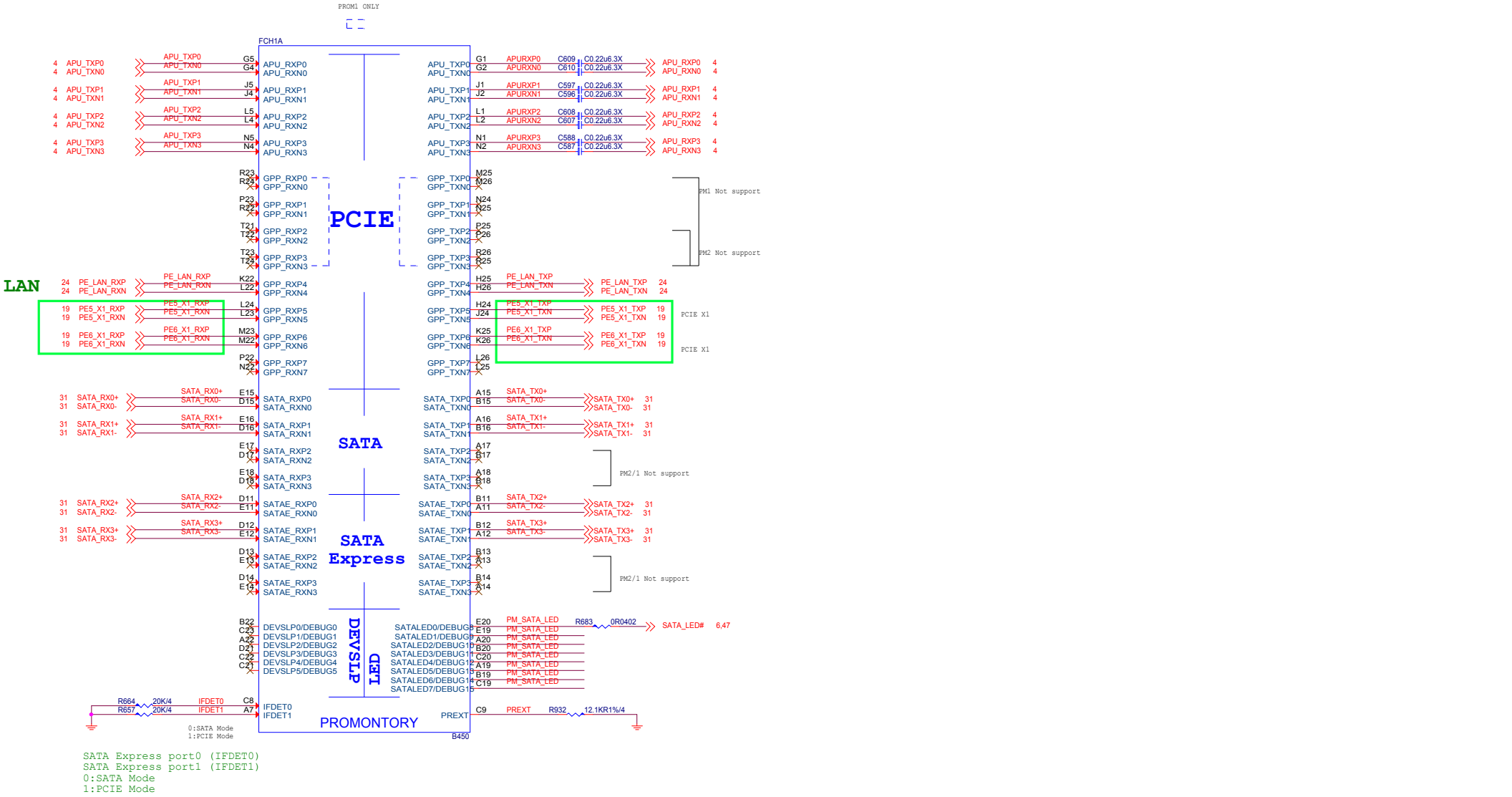




MSI MICRO-STAR INT'L CO.,LTD.

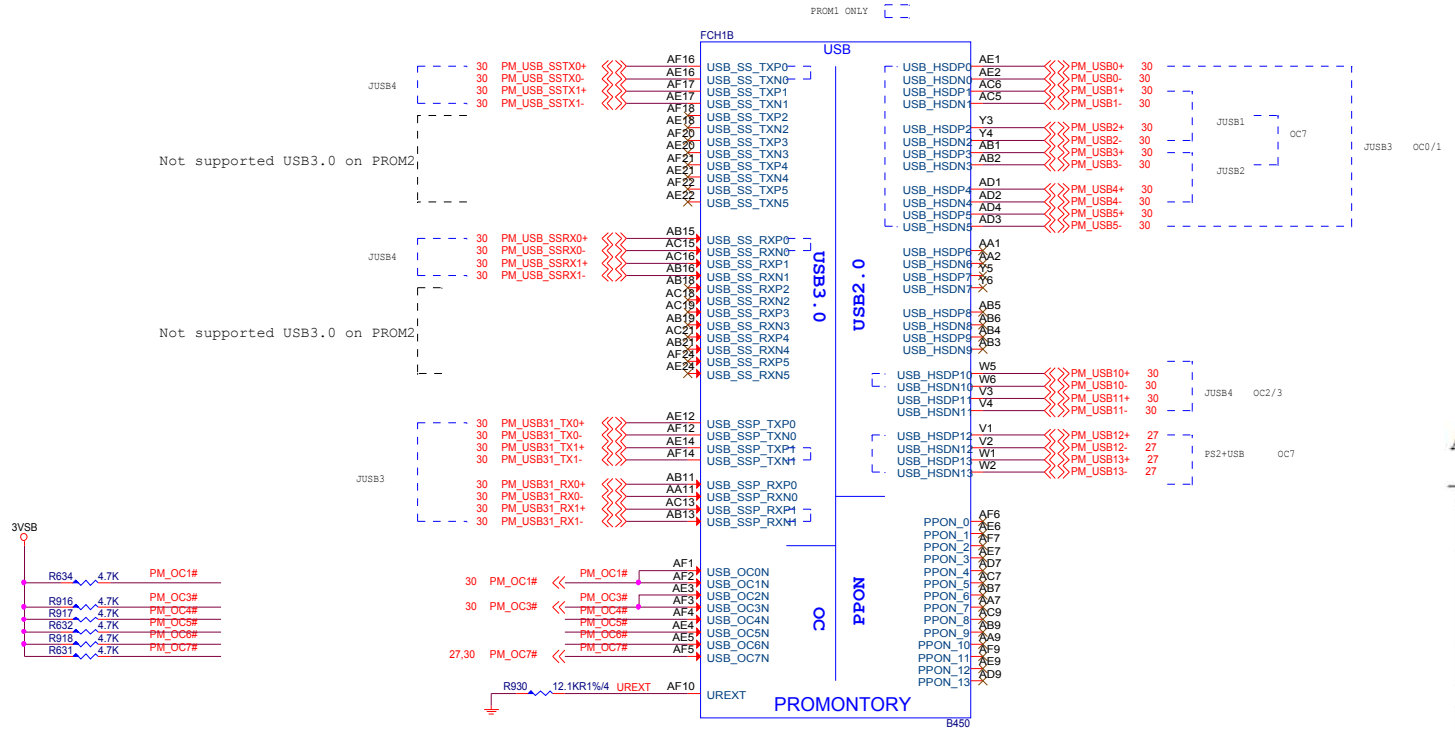
Link to the Future

Title: DDR4-POWER/GND-2		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 13 of 56	



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

Title	Promontory-PCIE/SATA/SATAE	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 14 of 56	



Appendix D USB Port to OC Pin Mapping

USB3.1	USB2.0	USB_OC
USB_SSP_TX/RXP/N[0]	USB_HSDP/N[5]	USB_OC0N
USB_SSP_TX/RXP/N[1]	USB_HSDP/N[0]	USB_OC1N
USB3.0	**USB2.0**	**USB_OC**
USB_SS_TX/RXP/N[0]	USB_HSDP/N[10]	USB_OC2N
USB_SS_TX/RXP/N[1]	USB_HSDP/N[11]	USB_OC3N
USB_SS_TX/RXP/N[2]	USB_HSDP/N[6]	USB_OC4N
USB_SS_TX/RXP/N[3]	USB_HSDP/N[7]	USB_OC5N
USB_SS_TX/RXP/N[4]	USB_HSDP/N[8]	USB_OC6N
USB_SS_TX/RXP/N[5]	USB_HSDP/N[9]	USB_OC7N
	USB_HSDP/N[1]	USB_OC7N
	USB_HSDP/N[2]	USB_OC7N
	USB_HSDP/N[3]	USB_OC7N
	USB_HSDP/N[4]	USB_OC7N
	USB_HSDP/N[12]	USB_OC7N
	USB_HSDP/N[13]	USB_OC7N

Appendix C Port Mapping for Different Bus Models

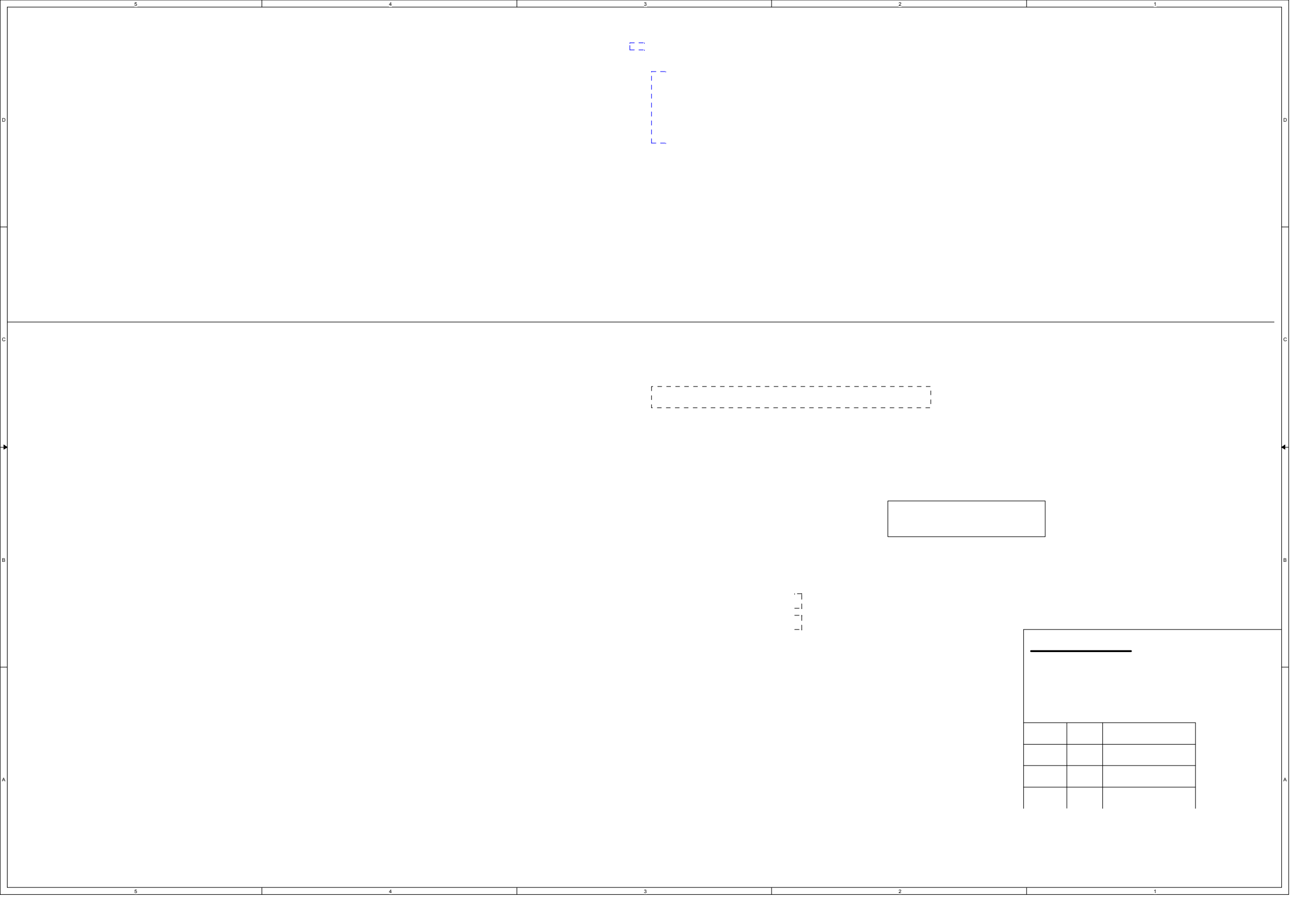
BUS Model	USB			
	3.1 Gen2 10 Gbps	3.1 Gen1 5 Gbps	2.0	Debug Port
PROM4	USB_SSP Port0~1	USB_SS Port 0~5	USB_HSD Port0~13	USB_SSP Port0
PROM2	USB_SSP Port0~1	USB_SS Port 0~1	USB_HSD Port0~5 USB_HSD Port10~13	USB_SSP Port0
PROM1	USB_SSP Port0	USB_SS Port0 USB_SSP Port1	USB_HSD Port0~5 USB_HSD Port10, 12~13	USB_SSP Port0

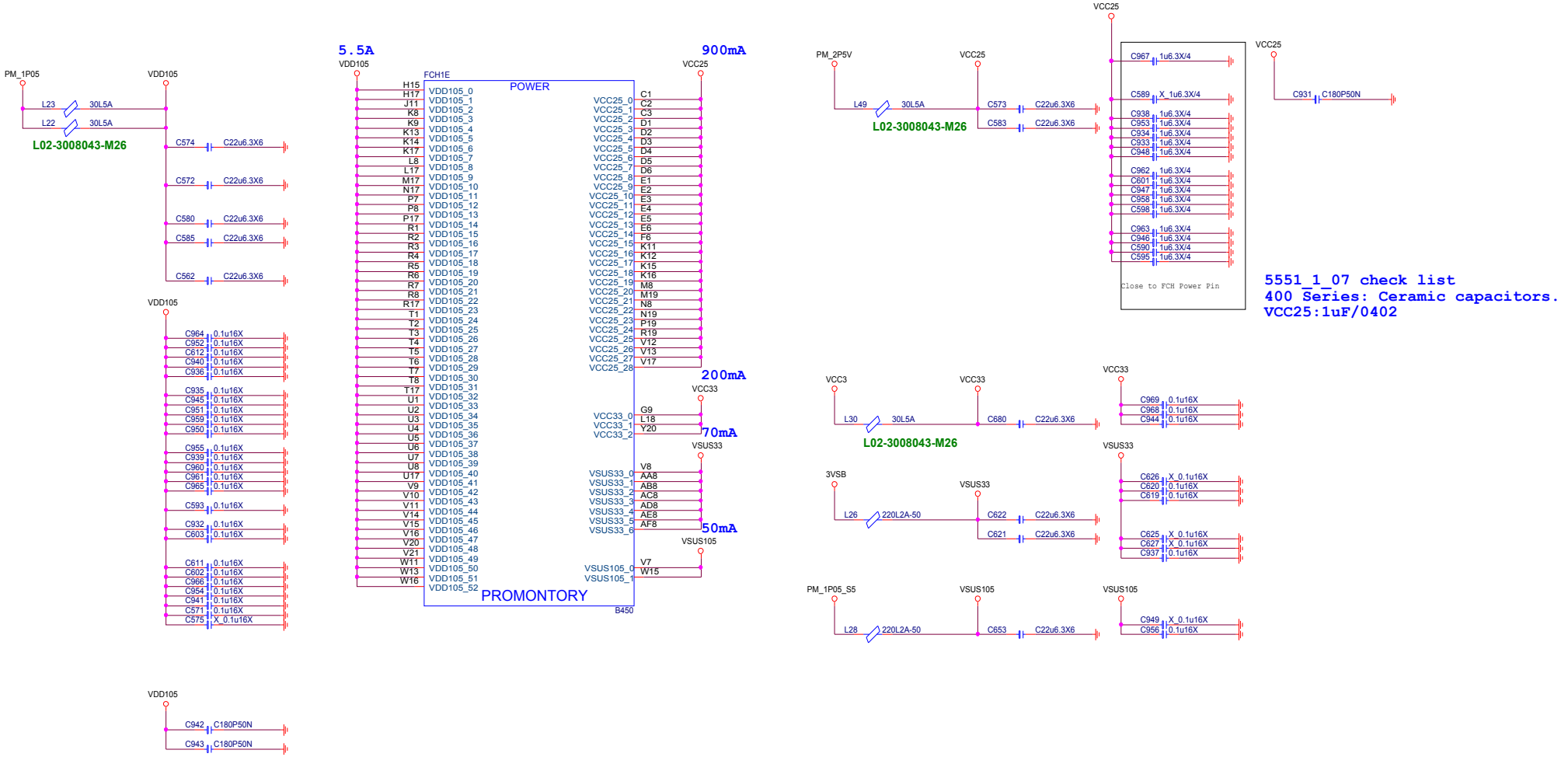
BUS Model	SATA 3.0	SATA Express	PCI Express® Gen2 GPP	PCI Express® CLK
PROM4	SATA port0~3	SATAE port0~3	GPP lane0~7	CLK0~7
PROM2	SATA port0~1	SATAE port0~1	GPP lane0~1 GPP lane4~7	CLK0~1 CLK4~7
PROM1	SATA port0~1	SATAE port0~1	GPP lane4~7	CLK4~7

CLK2.3不能用
CLK1-3不能用

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

Title	Promontory-USB/OC	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Thursday, May 31, 2018	Sheet 15 of 56	

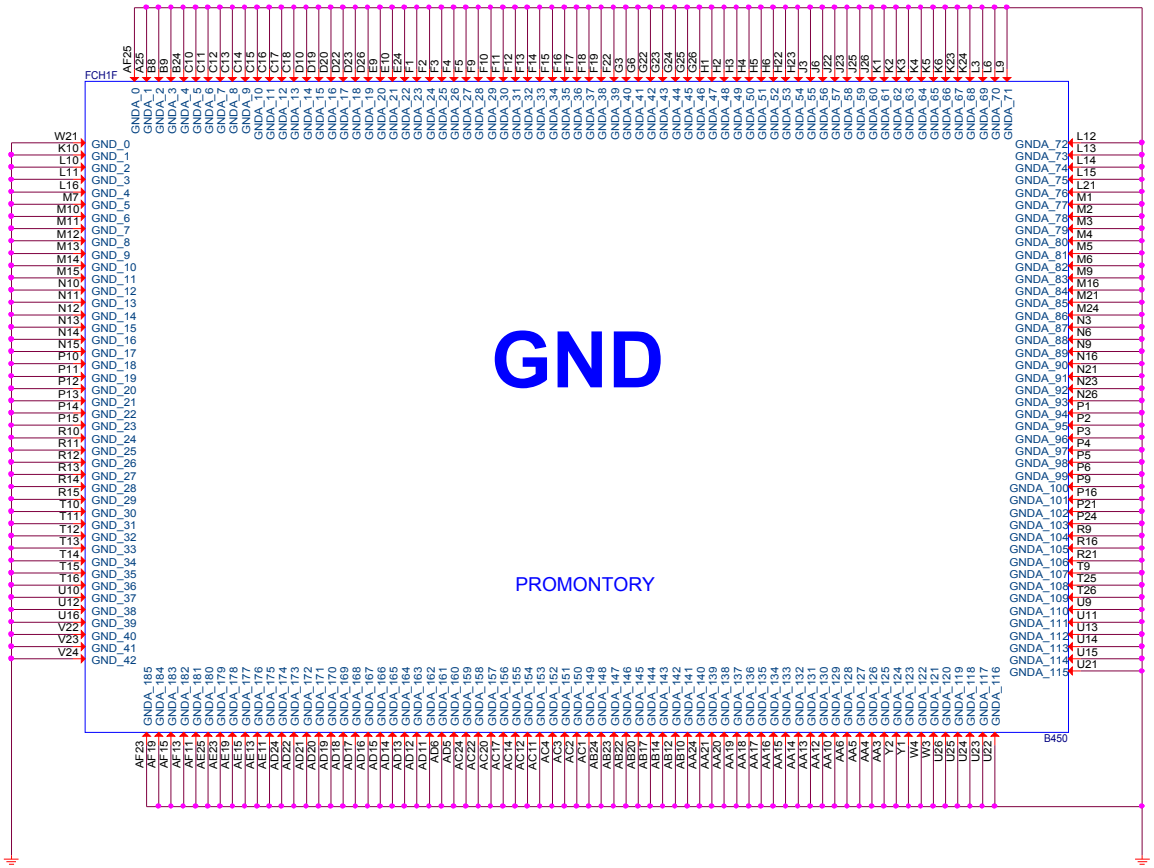




MICRO-START INT'L CO.,LTD.

Link to the Future

Title: Promontory-Power		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 17 of 56	



MSI MICRO-STAR INT'L CO.,LTD.	
Title	Promontory-GND
Size: Custom	Document Number: MS-7B87
Rev	10
Date: Wednesday, May 30, 2018	Sheet 18 of 56

20170413 PCIE Slot change to N11-1641491-L06

PCI EXPRESS x16 Slot

3.3V 3.0A
12V 5.5A

Trace width > 200 mils

PCIEX1 12V 0.5A
3.3V weak 375mA

3.3V 3.0A
12V 0.5A

PCI_E1
SLOT-PCI164P_RED-2PITCH-RH-4

PCI_E2
SLOT-PCI36P_BLACK-2PITCH-RH-8

PCI_E3
SLOT-PCI36P_BLACK-2PITCH-RH-8

within 500mil

PROM RESET

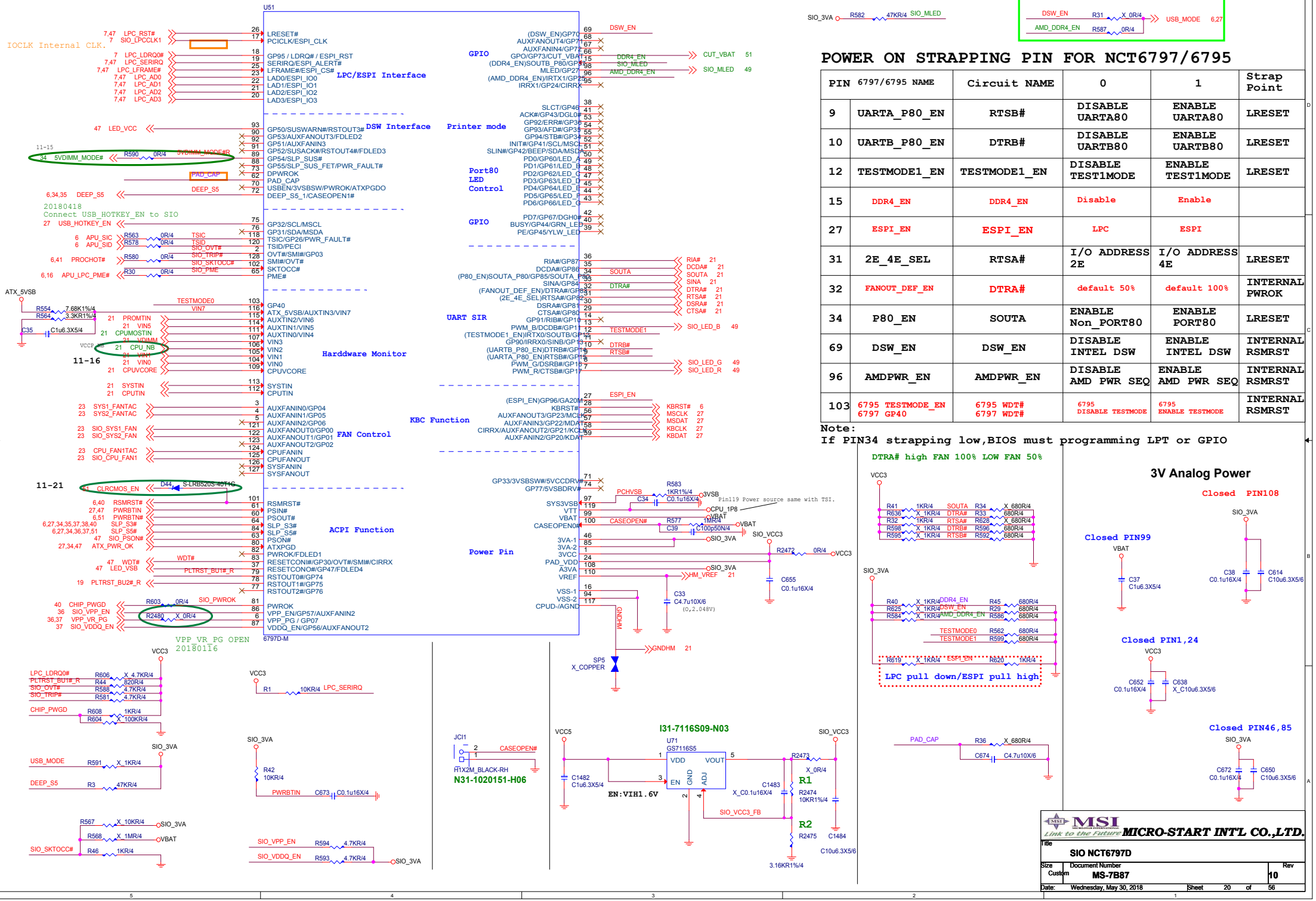
Co-lay FCH Reset for meet FCH sequence. See 55553.

SMBus separate circuit

SMB_SEL
GPIO Default High

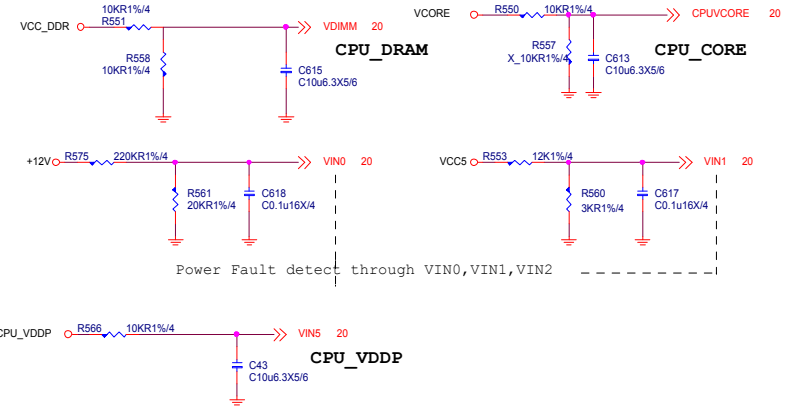
Title	PCIE X16(X1*2) SLOT
Size	Custom
Document Number	MS-7B87
Rev	10
Date:	Wednesday, May 30, 2018
Sheet	19 of 56

MICRO-START INT'L CO.,LTD.

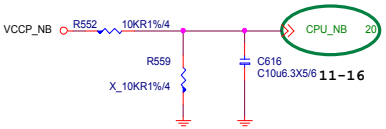

U51
LRESET#
PCICLK/ESPI_CLK
GP95 / LDRQ# / ESPI_RST
SERIRQ/ESPI_ALERT#
LFRAME#/ESPI_CS#
LAD0/ESPI_IO0
LAD1/ESPI_IO1
LAD2/ESPI_IO2
LAD3/ESPI_IO3
LPC/ESPI Interface
GP50/SUSWARN#/RSTOUT3#
GP53/AUXFANOUT3/FDLED2
GP51/AUXFANIN3
GP52/SUSACK#/RSTOUT4#/FDLED3
GP54/SLP_SUS#
GP55/SLP_SUS_FET/PWR_FAULT#
DPWROK
PAD_CAP
USBEN/3VSBSW/PWROK/ATXPGDO
DEEP_S5_1/CASEOPEN1#
DSW Interface
GP32/SCL/MSCL
GP31/SDA/MSDA
TSIC/GP26/PWR_FAULT#
TSID/PECI
OVT#/SMI#/GP03
SMI#/OVT#
SKTOCC#
PME#
GP40
ATX_5VSB/AUXTIN3/VIN7
AUXTIN2/VIN6
AUXTIN1/VIN5
AUXTIN0/VIN4
VIN3
VIN2
VIN1
VIN0
CPUVCORE
Harddware Monitor
SYSTIN
CPUTIN
AUXFANIN0/GP04
AUXFANIN1/GP05
AUXFANIN2/GP06
AUXFANOUT0/GP00
AUXFANOUT1/GP01
AUXFANOUT2/GP02
CPUFANIN
CPUFANOUT
SYSFANIN
SYSFANOUT
FAN Control
RSMRST#
PSIN#
PSOUT#
SLP_S3#
SLP_S5#
PSON#
ATXPGD
PWROK/FDLED1
RESETCONI#/GP30/OVT#/SMI#/CIRRX
RESETCONO#/GP47/FDLED4
RSTOUT0#/GP74
RSTOUT1#/GP75
RSTOUT2#/GP76
ACPI Function
PWROK
VPP_EN/GP57/AUXFANIN2
VPP_PG / GP07
VDDQ_EN/GP56/AUXFANOUT2
6797D-M
GPIO
(DSW_EN)GP70
AUXFANOUT4/GP71
AUXFANIN4/GP72
GPO/GP73/CUT_VBAT
(DDR4_EN)SOUTB_P80/GP74
MLED/GP27
(AMD_DDR4_EN)IRTX1/GP25
IRRX1/GP24/CIRRX
Printer mode
SLCT/GP46
ACK#/GP43/DGL0#
GP92/ERR#/GP36
GP93/AFD#/GP35
GP94/STB#/GP34
INIT#/GP41/SCL/MSCL
SLIN#/GP42/BEEP/SDA/MSDA
Port80 LED Control
PD0/GP60/LED_A
PD1/GP61/LED_B
PD2/GP62/LED_C
PD3/GP63/LED_D
PD4/GP64/LED_E
PD5/GP65/LED_F
PD6/GP66/LED_G
GPIO
PD7/GP67/DGH0#
BUSY/GP44/GRN_LED
PE/GP45/YLW_LED
UART SIR
RIA#/GP87
DCDA#/GP86
(P80_EN)SOUTA_P80/GP85/SOUTA_P80
SINA/GP84
(FANOUT_DEF_EN)DTRA#/GP83
(2E_4E_SEL)RTSA#/GP82
DSRA#/GP81
CTSA#/GP80
GP91/RIB#/GP10
PWM_B/DCDB#/GP11
(TESTMODE1_EN)IRTX0/SOUTB/GP12
GP90/IRRX0/SINB/GP13
(UARTB_P80_EN)DTRB#/GP14
(UARTA_P80_EN)RTSB#/GP15
PWM_G/DSRB#/GP16
PWM_R/CTSB#/GP17
KBC Function
(ESPI_EN)GP96/GA20M
KBRST#
AUXFANOUT3/GP23/MCLK
AUXFANIN3/GP22/MDAT
CIRRX/AUXFANOUT2/GP21/KCLK
AUXFANIN2/GP20/KDAT
Power Pin
GP33/3VSBSW#/5VCCDRV#
GP77/5VSBDRV#
SYS3VSB
VTT
VBAT
CASEOPEN#
3VA-1
3VA-2
3VCC
PAD_VDD
A3VA
VREF
VSS-1
VSS-2
CPUD-/AGND
GNDHM
SP5
X_COPPER
SIO_3VA
R582
47KR/4
SIO_MLED
DSW_EN
R31
X_0R/4
USB_MODE
AMD_DDR4_EN
R587
0R/4
POWER ON STRAPPING PIN FOR NCT6797/6795
PIN
6797/6795 NAME
Circuit NAME
0
1
Strap Point
9 UARTA_P80_EN RTSB# DISABLE UARTA80 ENABLE UARTA80 LRESET
10 UARTB_P80_EN DTRB# DISABLE UARTB80 ENABLE UARTB80 LRESET
12 TESTMODE1_EN TESTMODE1_EN DISABLE TEST1MODE ENABLE TEST1MODE LRESET
15 DDR4_EN DDR4_EN Disable Enable
27 ESPI_EN ESPI_EN LPC ESPI
31 2E_4E_SEL RTSA# I/O ADDRESS 2E I/O ADDRESS 4E LRESET
32 FANOUT_DEF_EN DTRA# default 50% default 100% INTERNAL PWROK
34 P80_EN SOUTA ENABLE Non_PORT80 ENABLE PORT80 LRESET
69 DSW_EN DSW_EN DISABLE INTEL DSW ENABLE INTEL DSW INTERNAL RSMRST
96 AMDPWR_EN AMDPWR_EN DISABLE AMD PWR SEQ ENABLE AMD PWR SEQ INTERNAL RSMRST
103 6795 TESTMODE_EN 6797 GP40 6795 WDT# 6797 WDT# 6795 DISABLE TESTMODE 6795 ENABLE TESTMODE INTERNAL RSMRST
Note:
If PIN34 strapping low,BIOS must programming LPT or GPIO
DTRA# high FAN 100% LOW FAN 50%
LPC pull down/ESPI pull high
3V Analog Power
Closed PIN108
Closed PIN99
Closed PIN1,24
Closed PIN46,85
I31-7116S09-N03
N31-1020151-H06
VPP_VR_PG OPEN
20180116
20180418
Connect USB_HOTKEY_EN to SIO
IOCLK Internal CLK.
MICRO-START INT'L CO.,LTD.
Title
SIO NCT6797D
Size
Custom
Document Number
MS-7B87
Rev
10
Date: Wednesday, May 30, 2018
Sheet 20 of 56

HW Monitor - Voltage

SIO HM Voltage over 2.048V will not detect

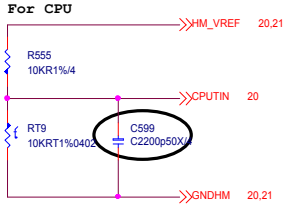


Inform BIOS disable VIN2 with Power Fault



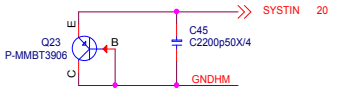
TEMP SENSOR

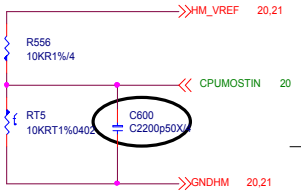
For CPU



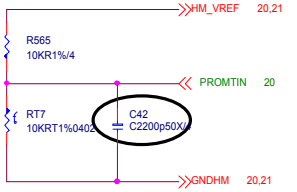
Under Socket

For System



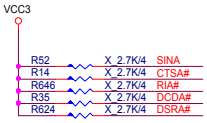


Close to CPU MOS

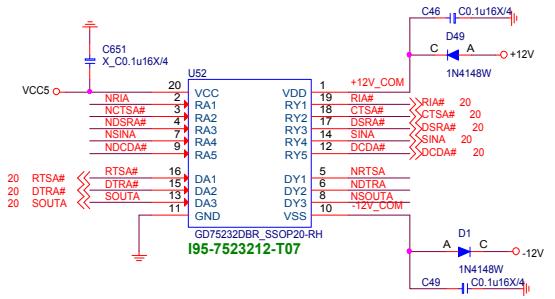


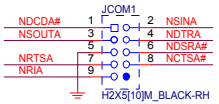
RT3 under FCH1 BOTTOM

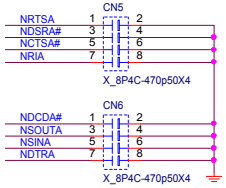
COM PORT



NO USE UART PORT1



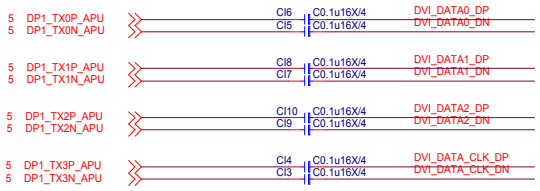




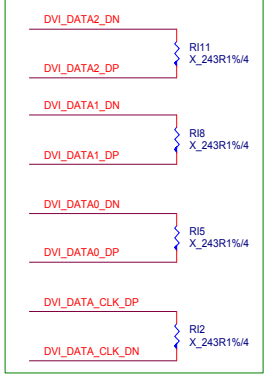
MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

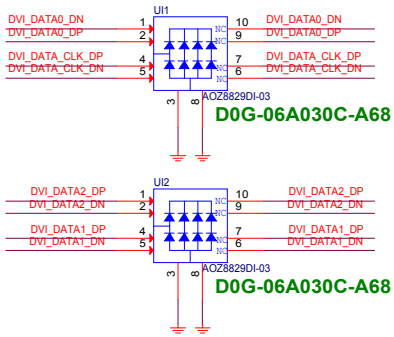
Title	SIO HWM/COM	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 21 of 56	

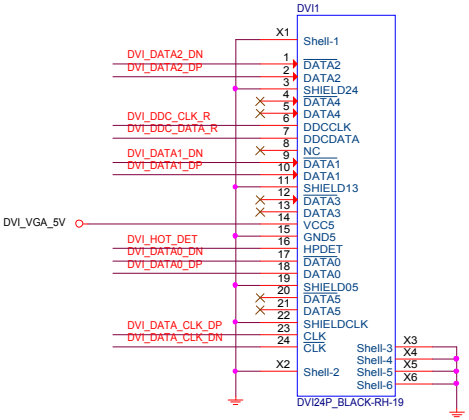
DVI CONNECTOR

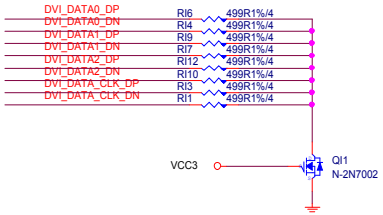


For EMI

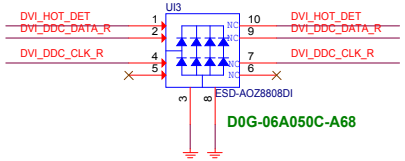




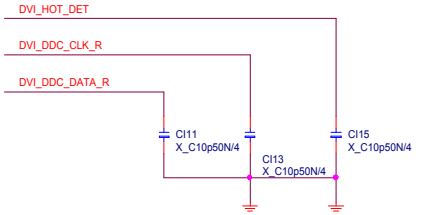




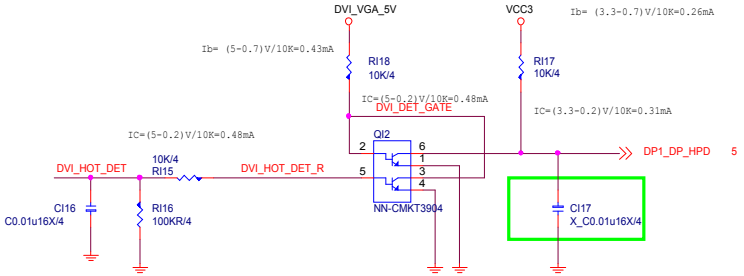
注意:耐壓5V零件



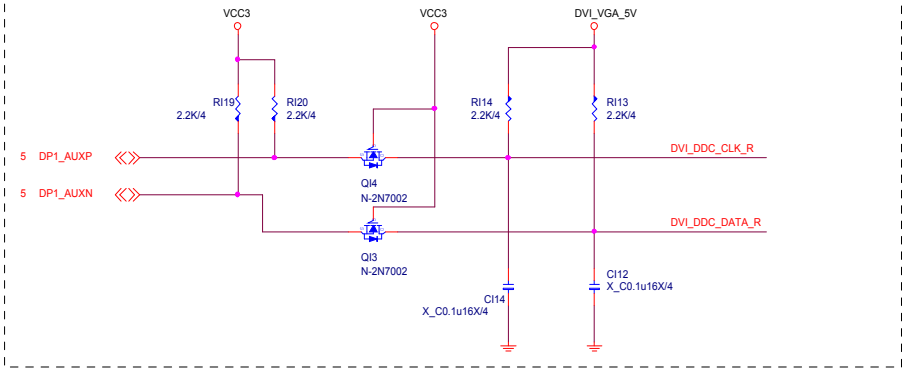
For EMI

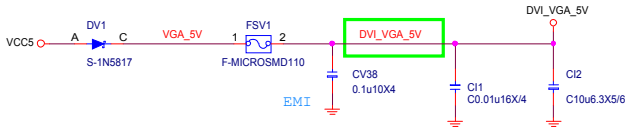


HPD



LEVEL SHIFT using I2C Repeater



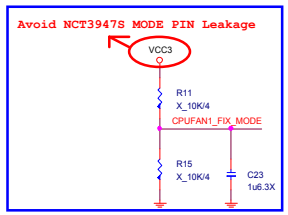


MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

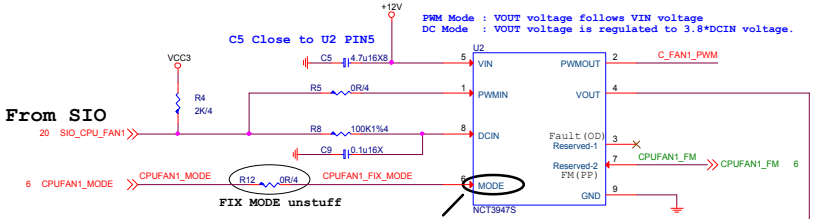
Title: DVI		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 22 of 56	

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

2.GPIO可以由BIOS切換 PWM/DC MODE



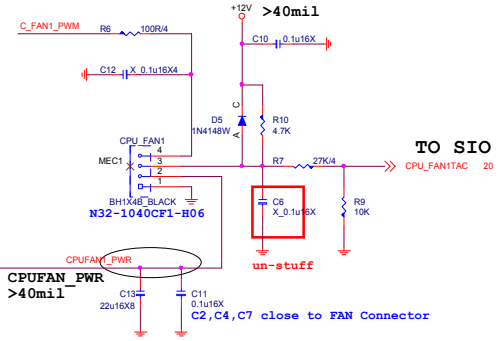
Resever For FIX DC or PWM MODE USE By PM SPEC

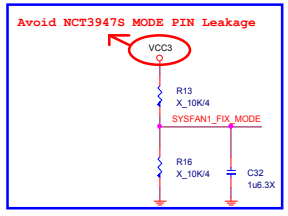


GPIO Control

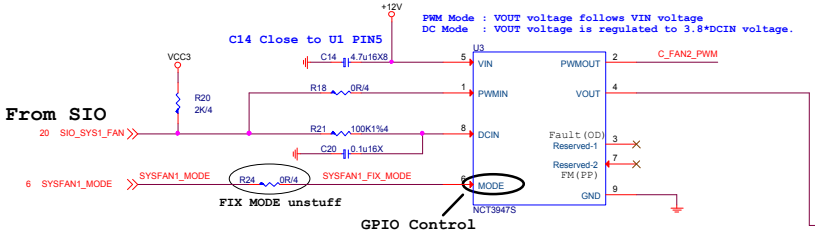
	MODE(PIN7)
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

Internall pull up 1.65V





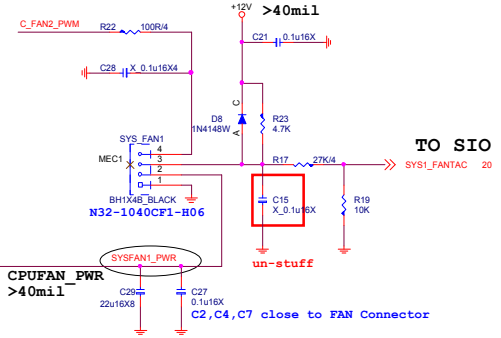
Resever For FIX DC or PWM MODE USE By PM SPEC

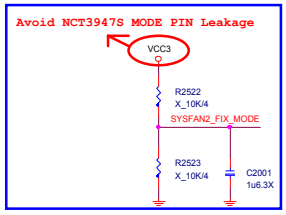


GPIO Control

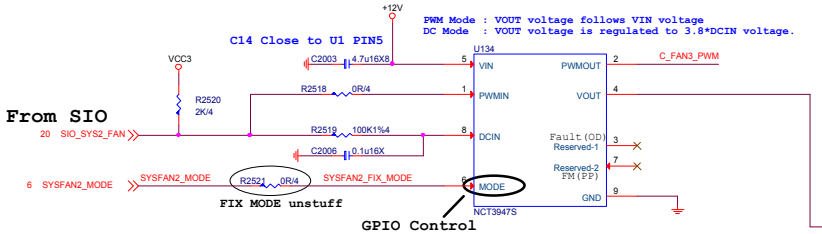
	MODE(PIN7)
PWM MODE	HIGH
DC MODE	LOW
Default AUTO MODE	GPI(Floating)

Internall pull up 1.65V





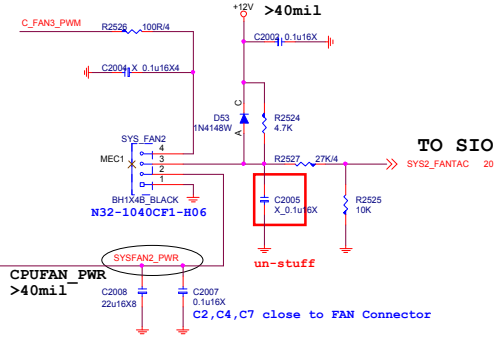
Resever For FIX DC or PWM MODE USE By PM SPEC



GPIO Control

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

Internall pull up 1.65V



MSI MICRO-START INT'L CO.,LTD.

Link to the Future

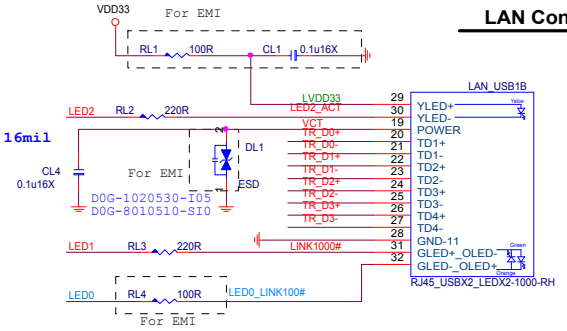
Title: CPU FAN Control

Size: Custom | Document Number: MS-7B87 | Rev: 10

Date: Wednesday, May 30, 2018 | Sheet 23 of 56

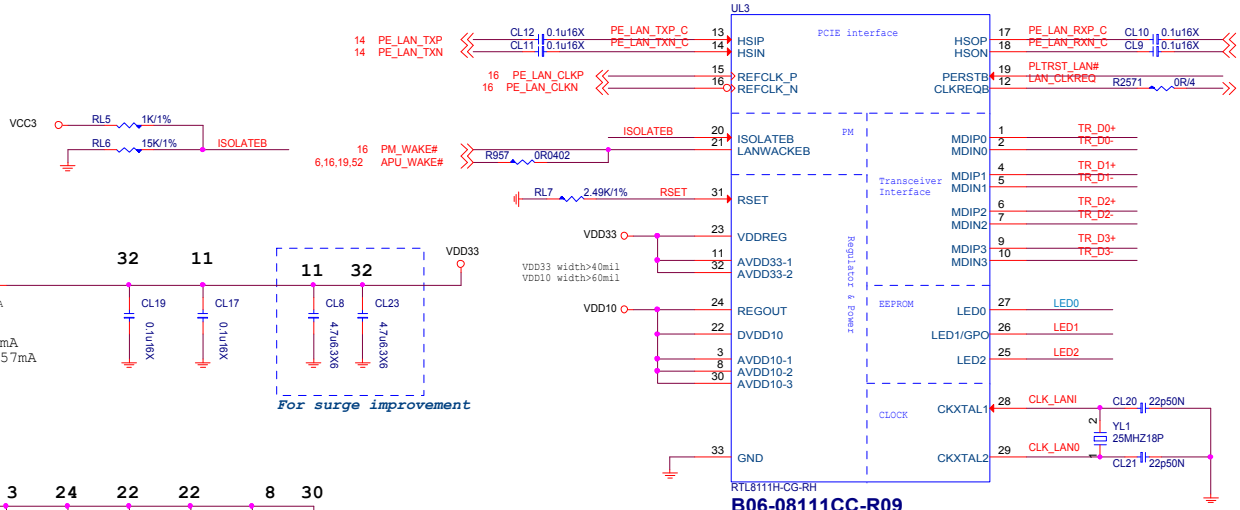
RTL8111G/RTL8111H Giga LAN

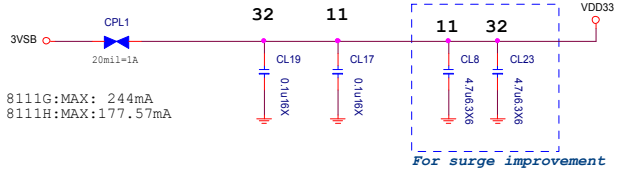
LAN Connector

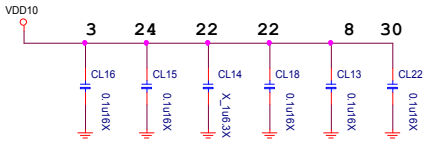


VCT 16mil

8111H:B06-08111CC-R09
8111G:B06-081116C-R09



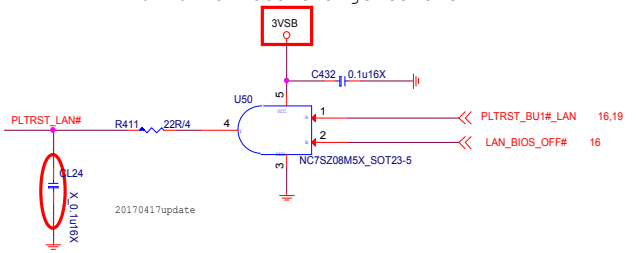


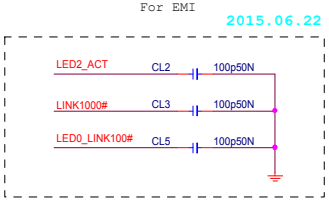


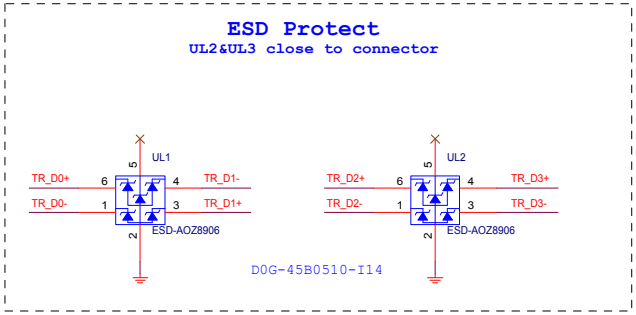
B06-08111CC-R09

Pin33: 4 via from top layer to GND layer and make the via at the center of IC.

20170413 VCC3 change to 3VSB







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

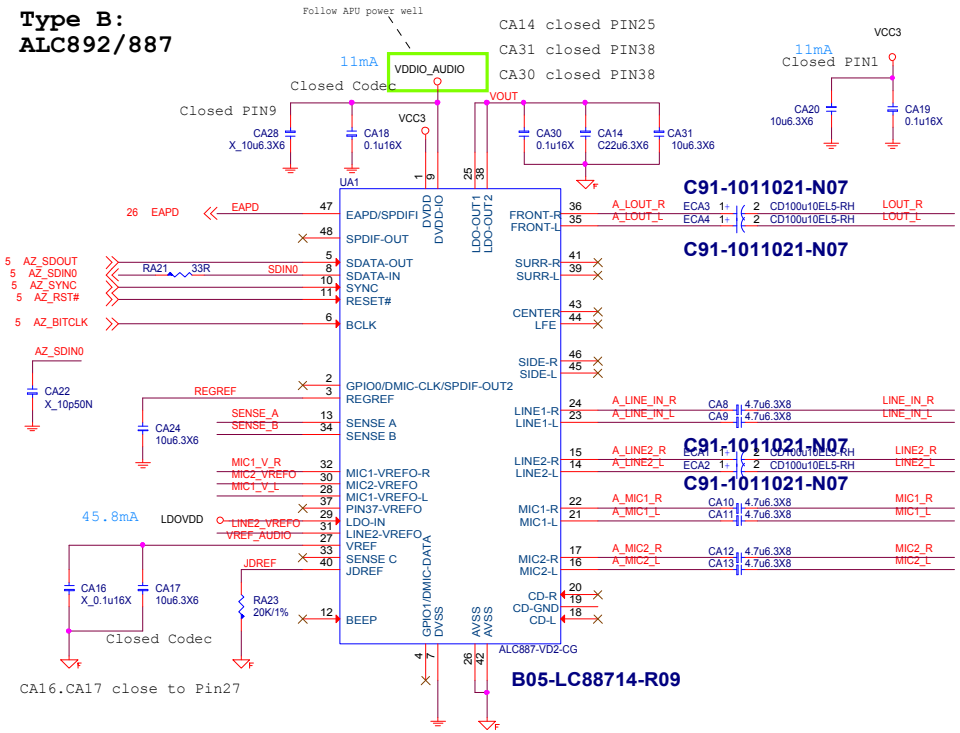
8111H POWER Consumption

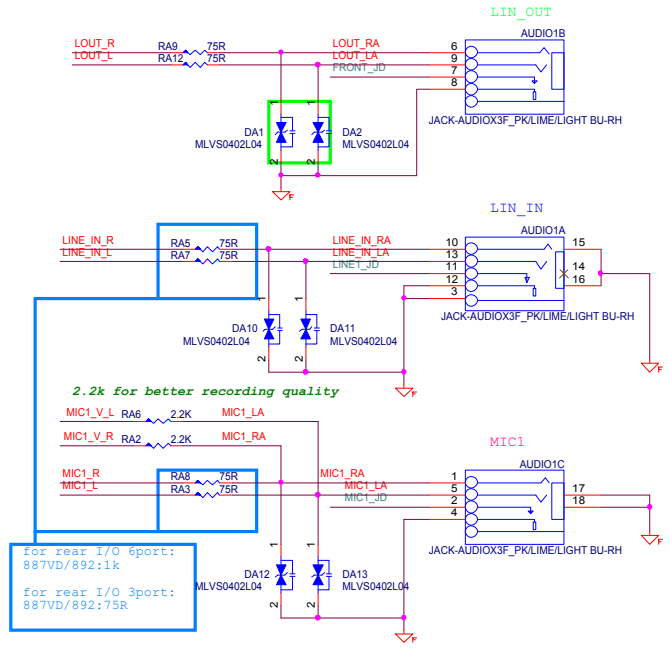
	3.3V @ mA	mW
10 M Idle/TxRx	9.9/84.69	32.67/279.48
100 M Idle/TxRx	48.11/92.44	158.76/305.05
Giga Idle/TxRx	124.5/177.57	410.85/585.98
ALDPS	5.50	18.15

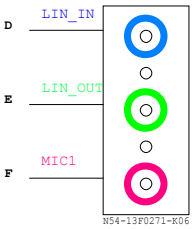
MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

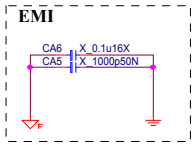
Title	LAN-RTL8111H	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 24 of 56	

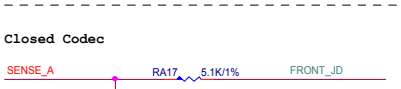
Type B: ALC892/887

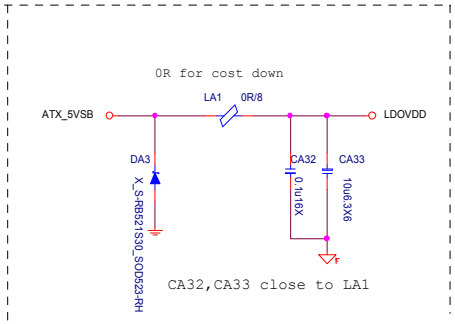


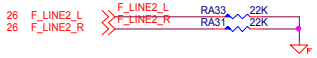


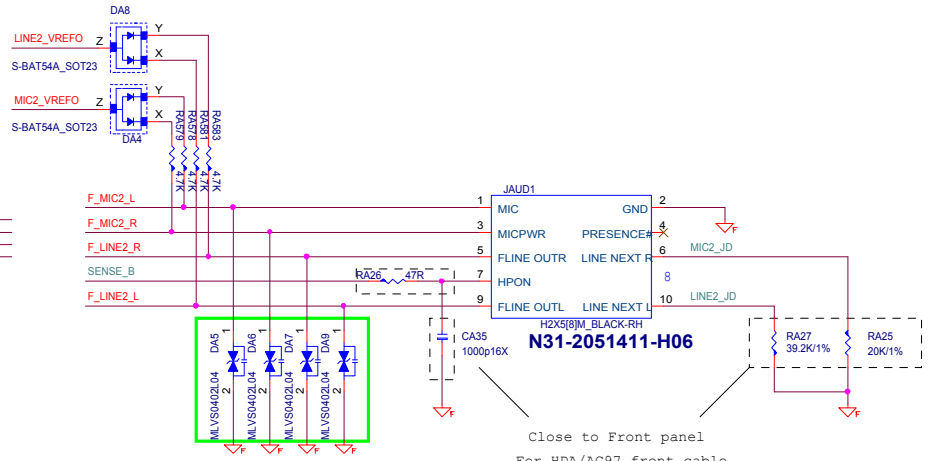












Varister --> cap for cost down

D0G-2710510-I05
D0G-2950500-SI0
Close to Jack

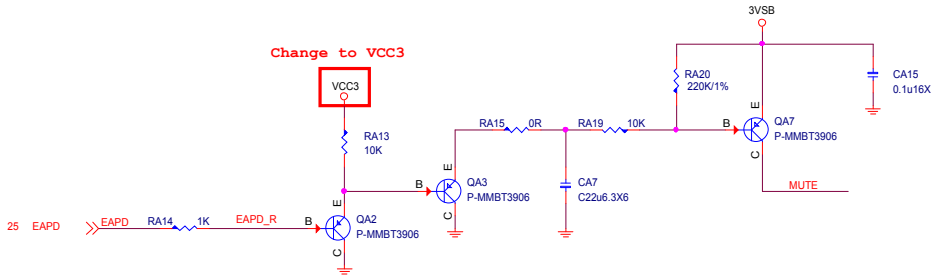
MICRO-START INT'L CO.,LTD.

Title	Audio ALC887-1	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 25 of 56	

使用測光LED

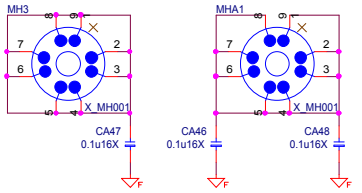
Rear Line OUT De-POP circuit

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



Digital

Analog



MICRO-START INT'L CO.,LTD.

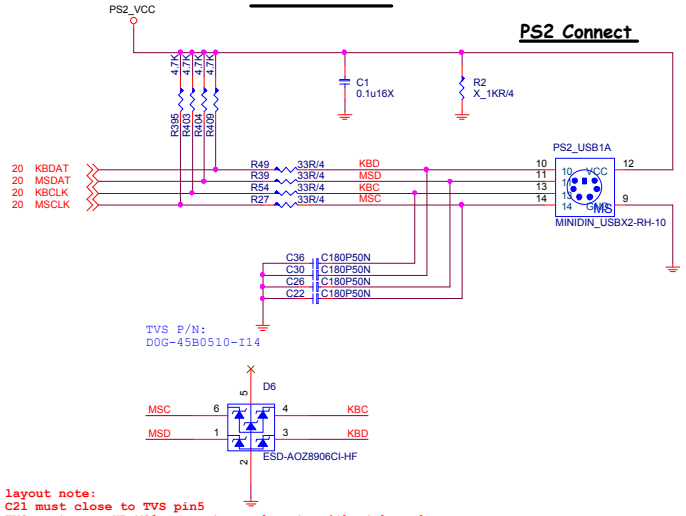
Title: Audio ALC887-2

Size: Custom | Document Number: MS-7B87 | Rev: 10

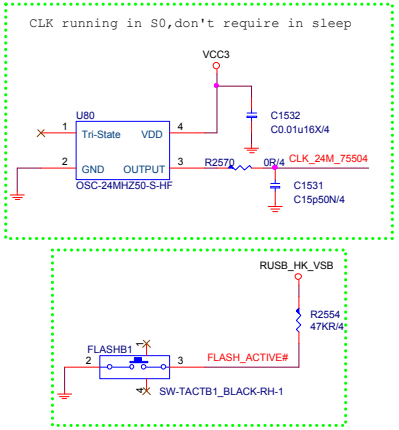
Date: Wednesday, May 30, 2018 | Sheet 26 of 56

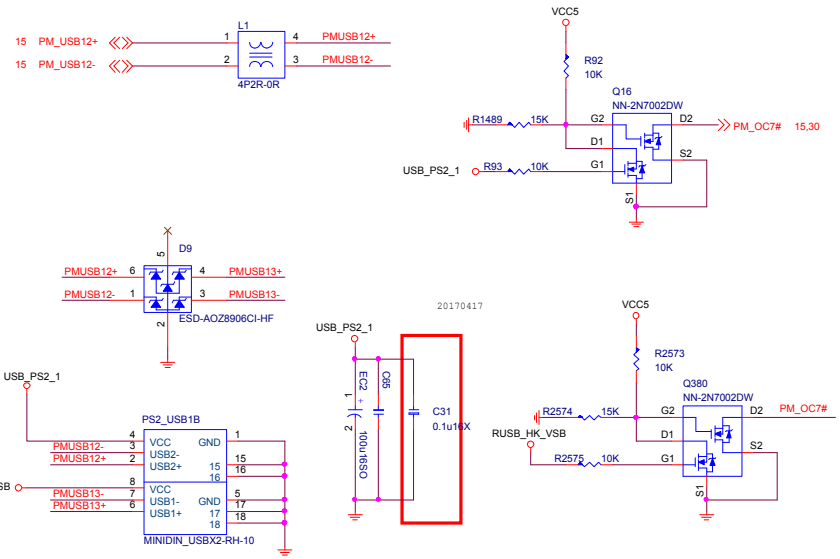
PS2+USB

PS2 Connect

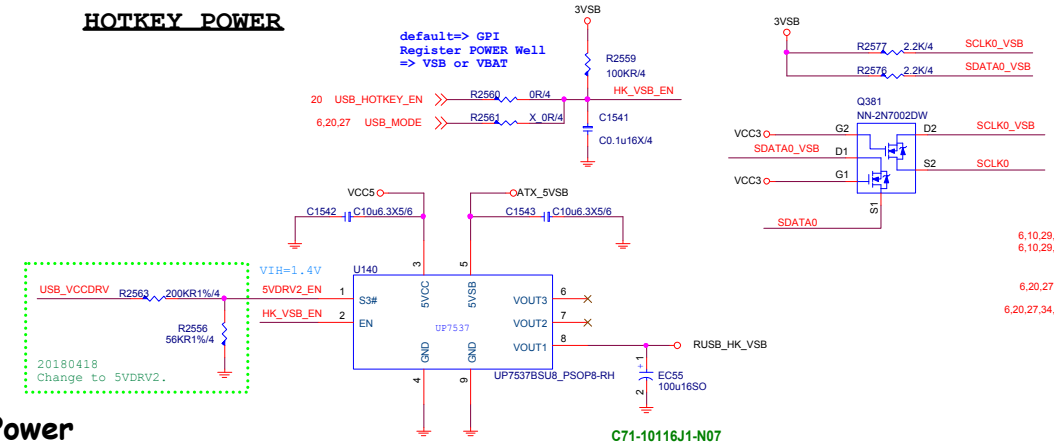


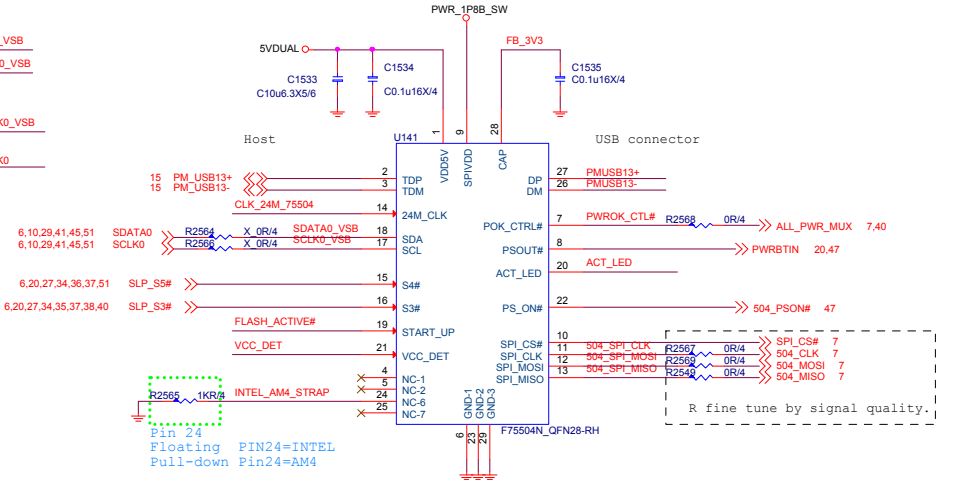
layout note:
C21 must close to TVS pin5
TVS must near KB_MS1 connector and route without branch
Varistor must close to TVS and route without branch





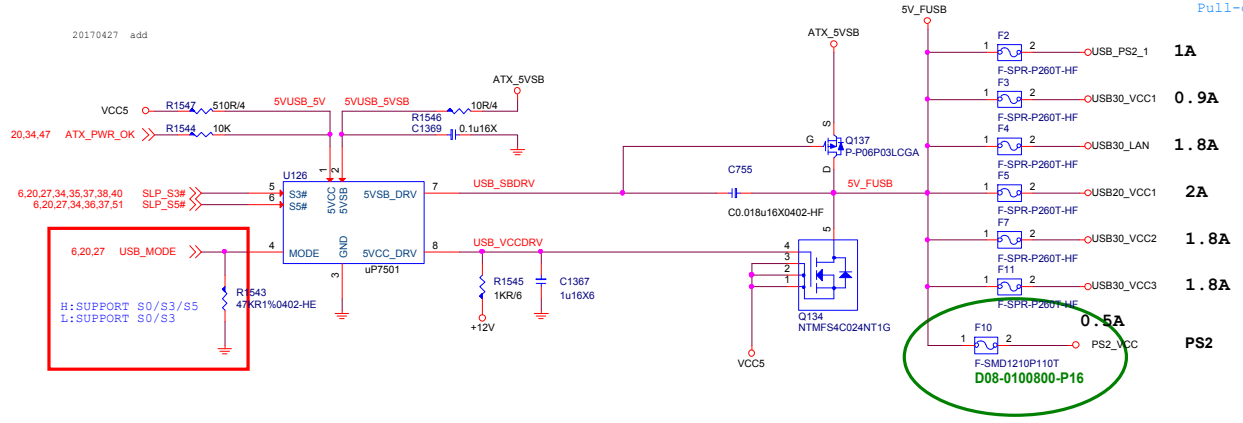
HOTKEY POWER

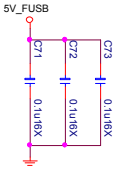


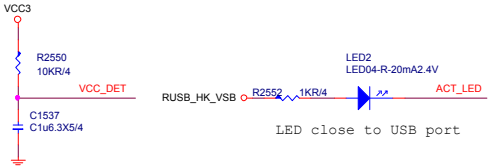


C71-10116J1-N07

USB Power





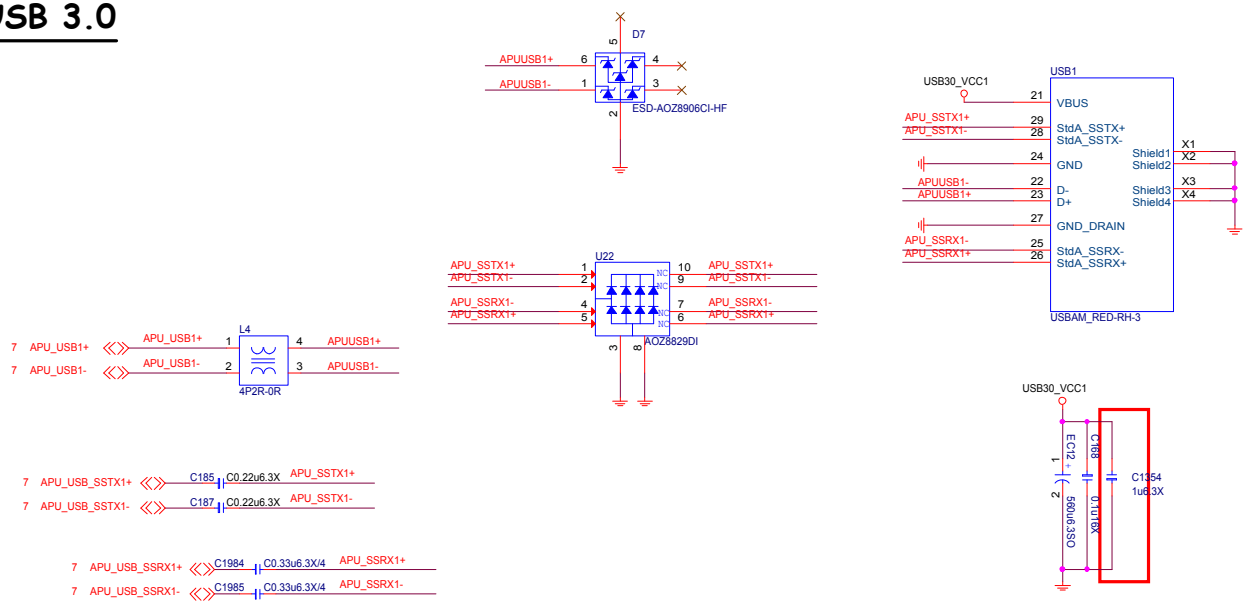


11-18

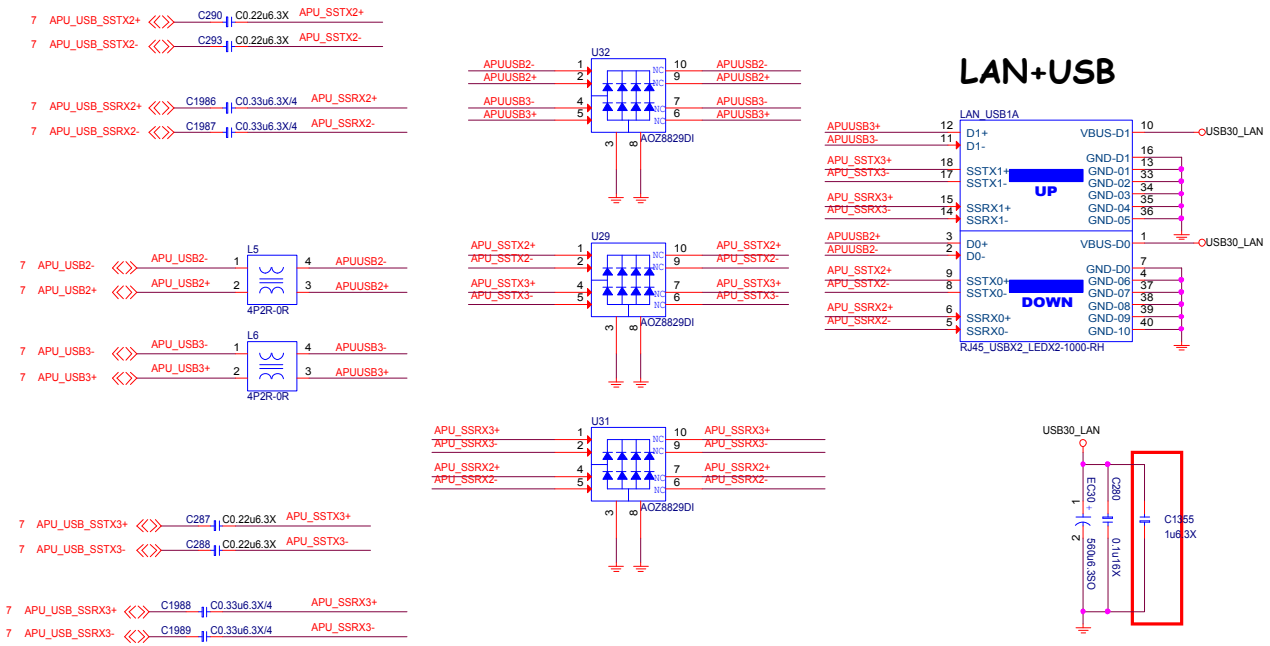
MSI MICRO-STAR INTERNATIONAL
Link to the Future MICRO-START INT'L CO.,LTD.

Title	USB Rear PS2+USB2.0	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 27 of 56	

USB 3.0

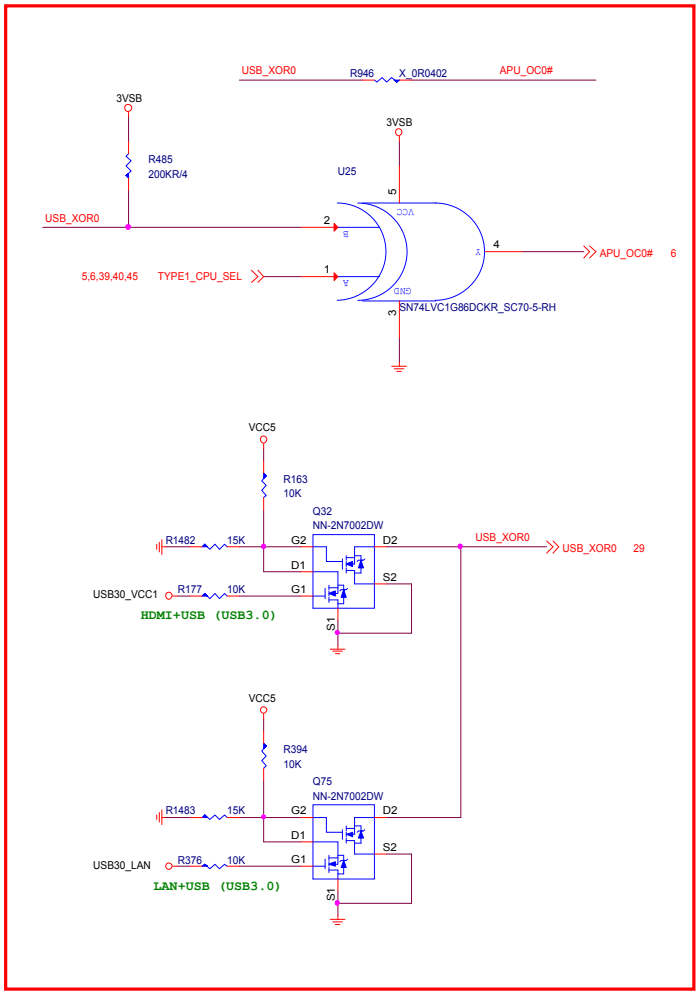


USB3.1 GEN1



APU_USB_OC

Modify USB_OC# circuit



	CORETYPE1(A)	USB_PWR(B)	APU_USB_OC(Y)
BR	0	0	0
Act. Low	0	1	1
SR	1	0	1
Act. High	1	1	0

MICRO-START INT'L CO.,LTD.

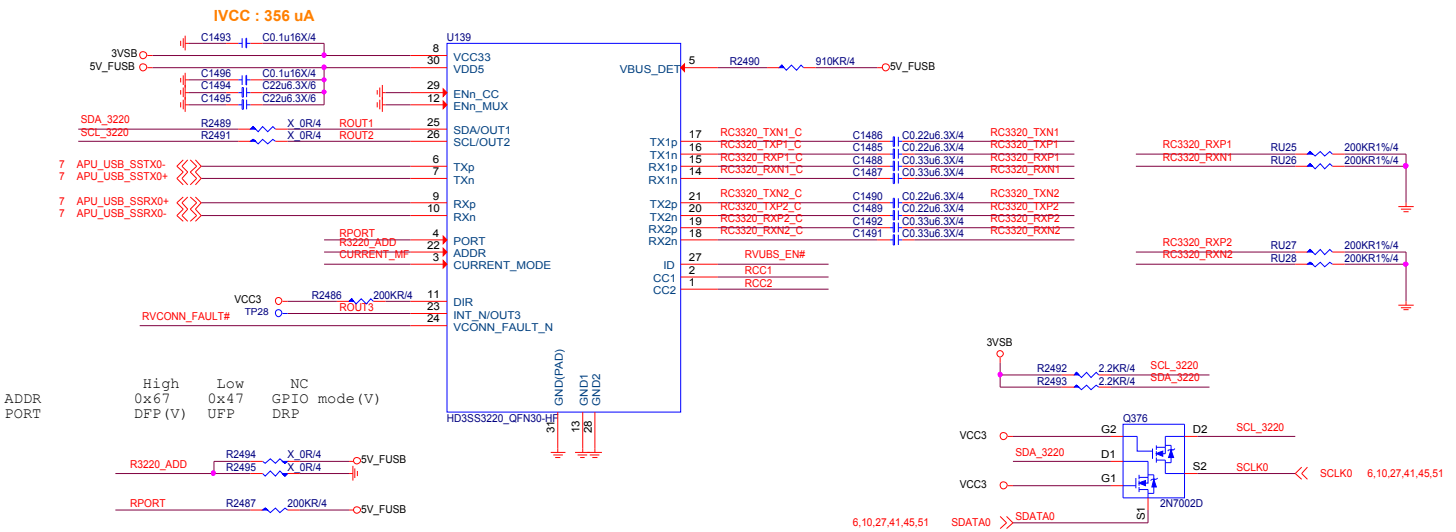
Title: USB Rear LAN+USB3.1 GEN1

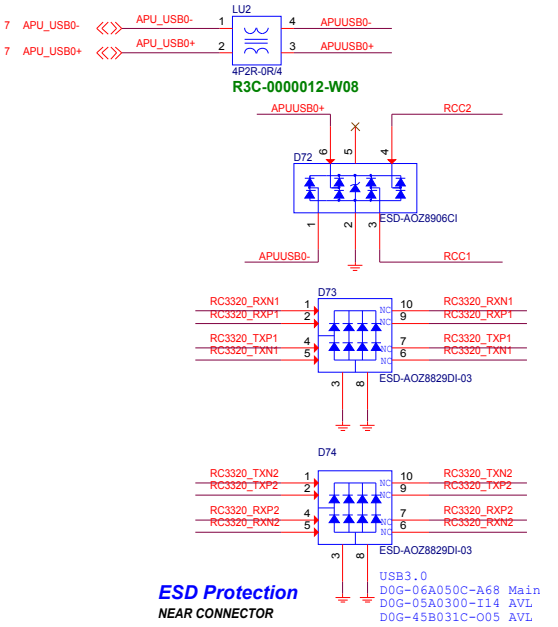
Size: Custom | Document Number: MS-7B87 | Rev: 10

Date: Wednesday, May 30, 2018 | Sheet 28 of 56

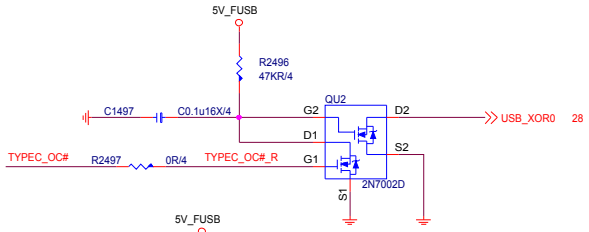
USB 3.1-Type-C

USB Type-C MUX with Configuration Channel (CC)



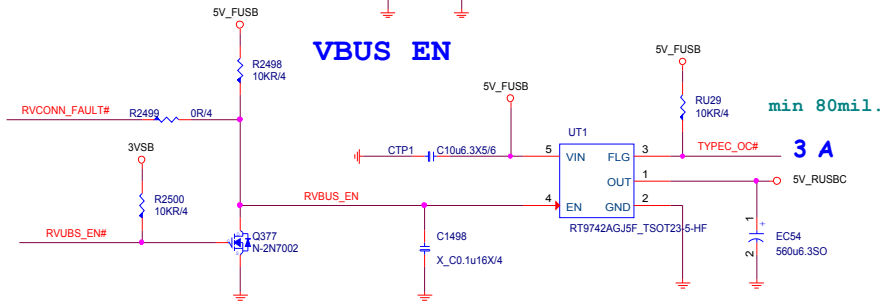


VBUS OC# LEVEL SHIFT

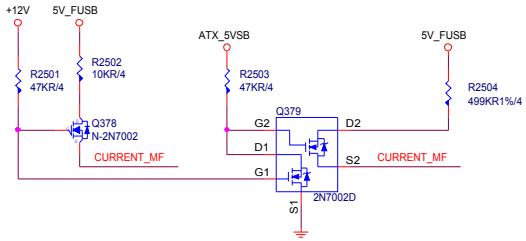


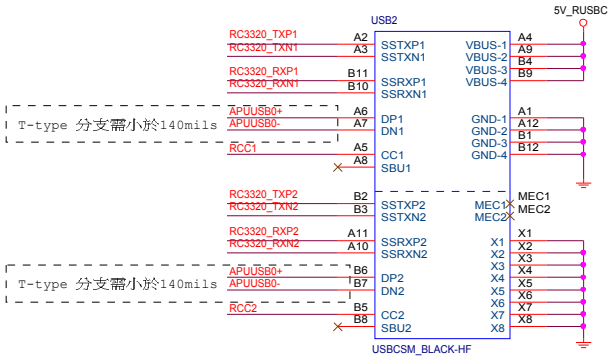
VCOM OC#

VBUS EN

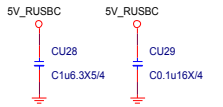


Current Mode





close to Type C Connector



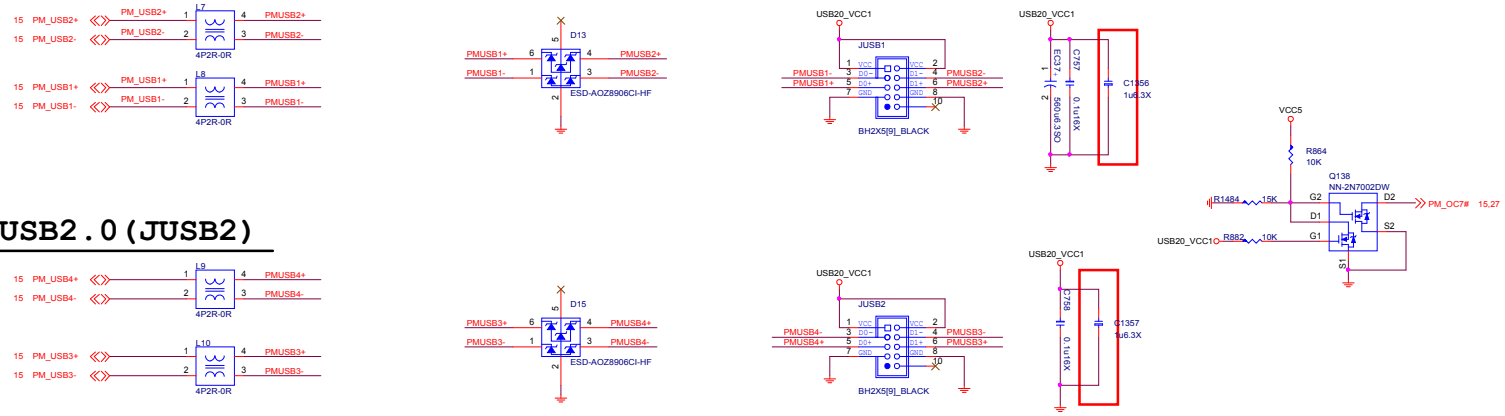
MICRO-START INT'L CO.,LTD.

Link to the Future

Title	Rear USB3.1 Type C / mux	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 29 of 56	

Front USB2.0(JUSB1)

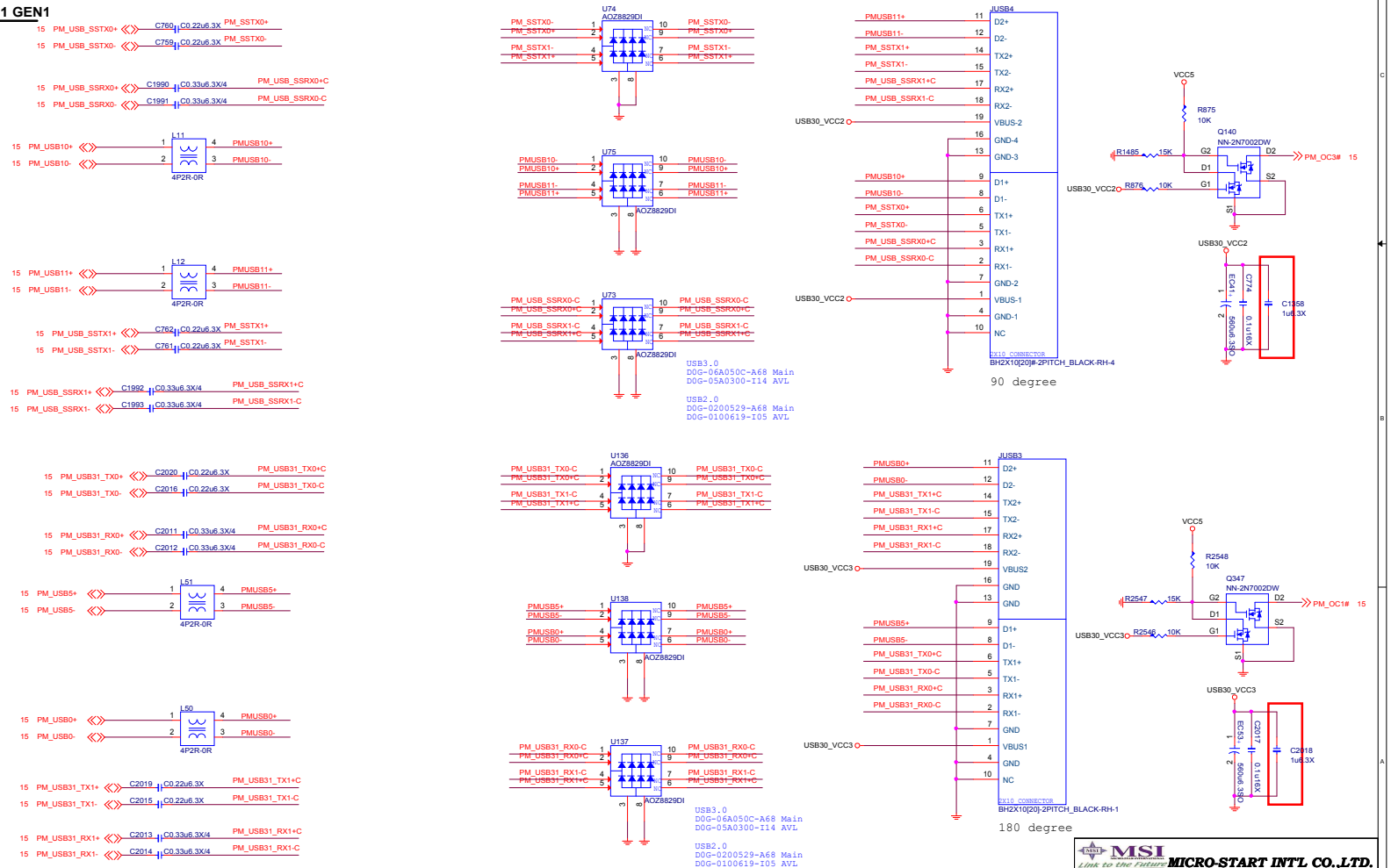
5V@1A



Front USB2.0(JUSB2)

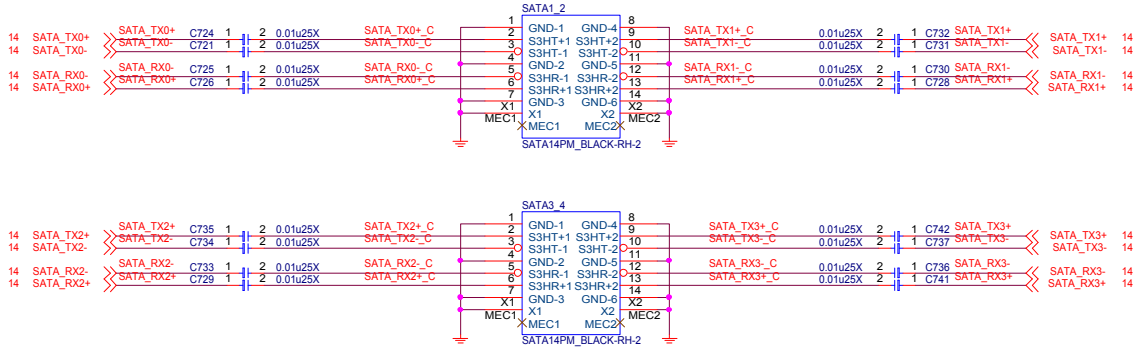
5V@1A

Front USB3.1 GEN1



MSI	MICRO-START INT'L CO.,LTD.		
Title	USB Front Side		
Size	Document Number		Rev
Custom	MS-7B87		10
Date:	Wednesday, May 30, 2018	Sheet 30 of 56	

SATA Connector



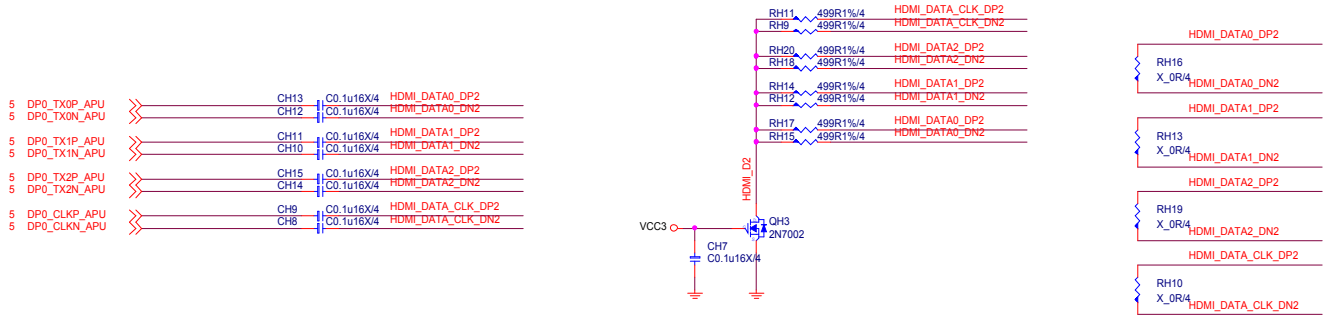
MICRO-START INT'L CO.,LTD.

Link to the Future

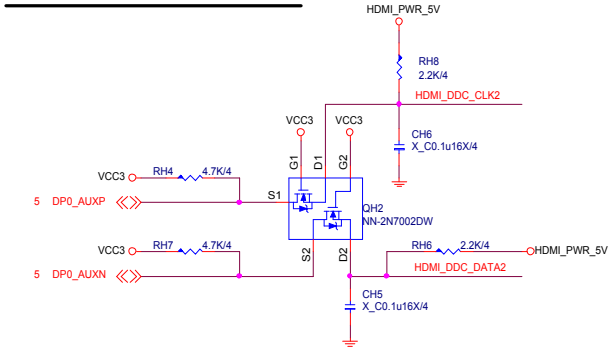
Title: SATA Connector		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 31 of 56	

HDMI CONNECTOR

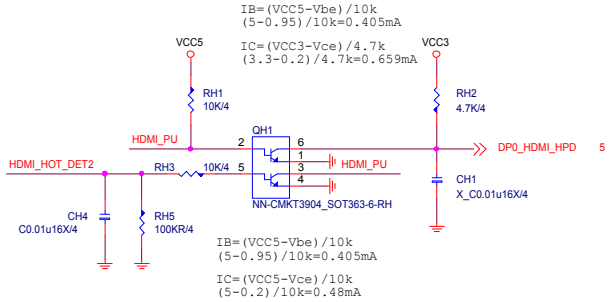
For HDMI 1.4



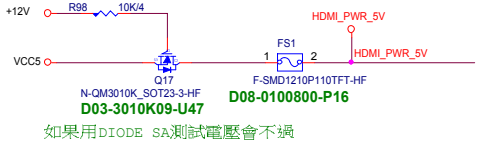
AUX Level Shifter



HPD Circuit

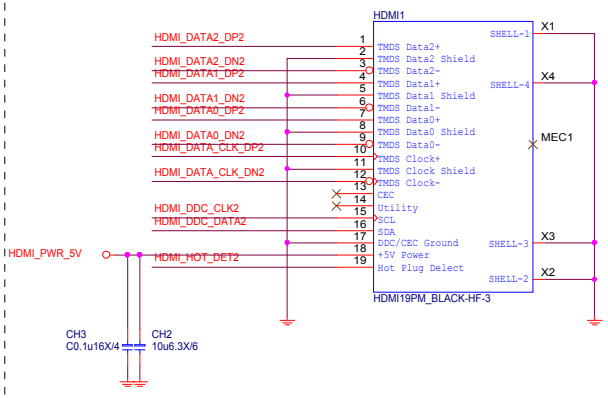


Connector Power

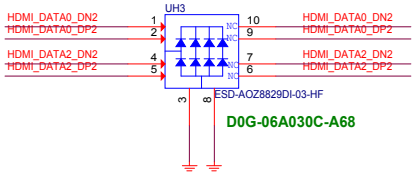


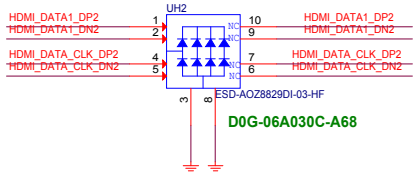
如果用DIODE SA測試電壓會不過

Connector

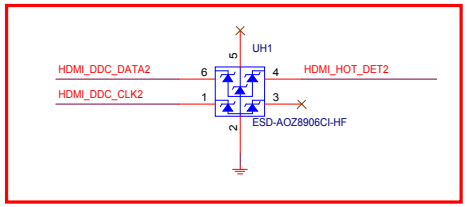


For EMI





20170426



MSI MICRO-START INT'L CO.,LTD.

Link to the Future

Title: HDMI Connector		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 32 of 56	

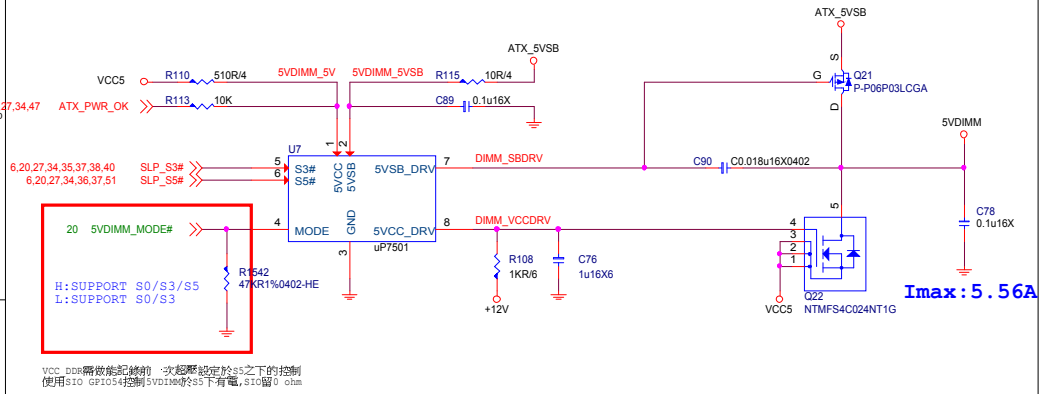
MSI MICRO-STAR INTERNATIONAL
Link to the Future
MICRO-START INT'L CO.,LTD.

Title: DP to VGA RT6516

Size: Custom | Document Number: MS-7B87 | Rev: 10

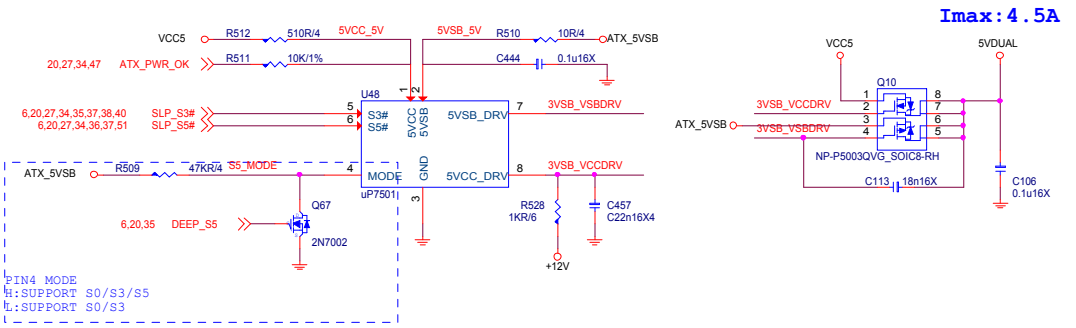
Date: Wednesday, May 30, 2018 | Sheet 33 of 56

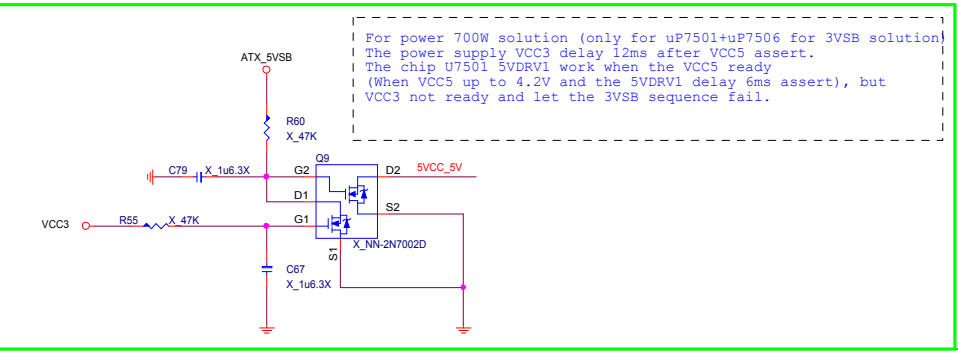
5VDIMM FOR DDR



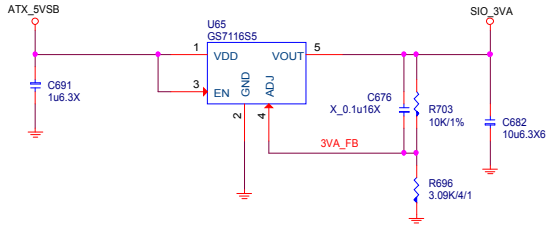
VCC_DDR需做能記錄前 ,次起要設定於S5之下的控制
使用SIO GPIO54控制5VDIMM於S5下有電,SIO留0 ohm

5VDUAL For 3VSB、CPU 1.8V 、 VDDP

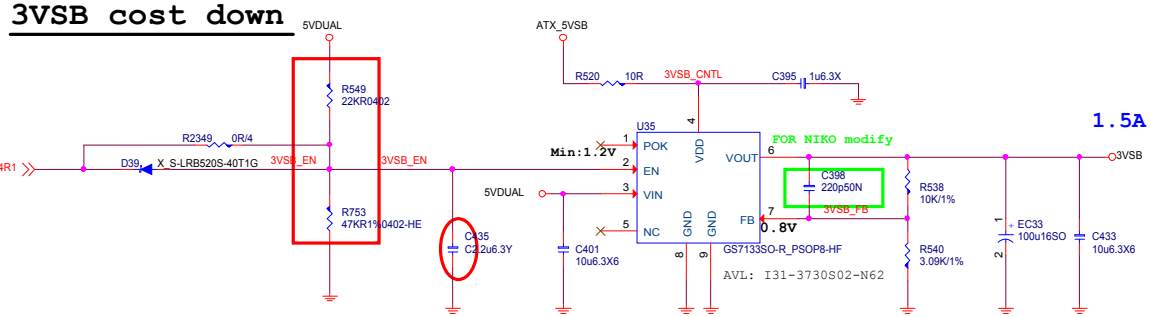




SIO_3VA



3VSB cost down

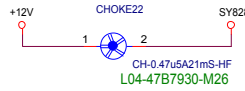


MSI MICRO-START INT'L CO.,LTD.
Link to the Future

Title	ACPI uPI-5VDIMM&3VSB	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 34 of 56	

FOR Promontory 1.05V_S0

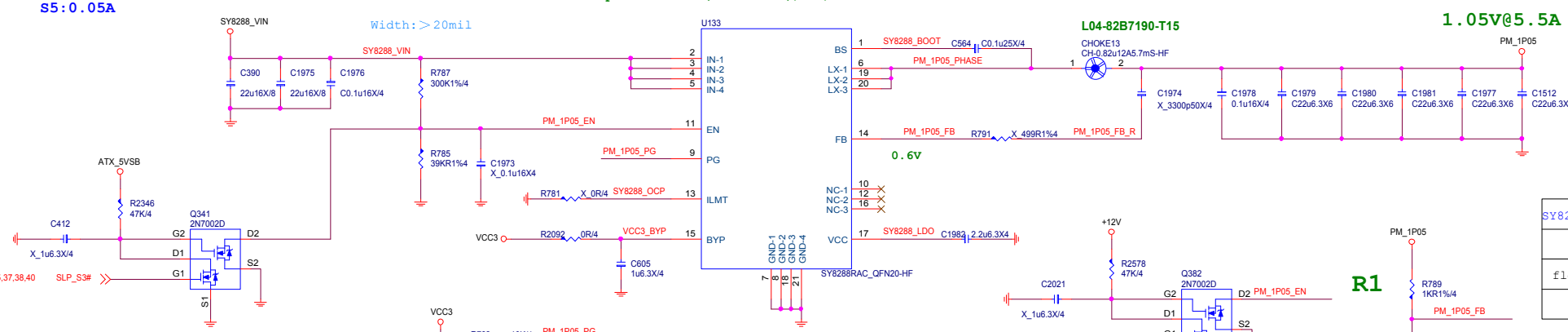
1.05V
S0:5.5A
S5:0.05A



Input Current= (5.5A*1.05V)/12V/0.8=0.6A

OCP=12A

1.05V@5.5A

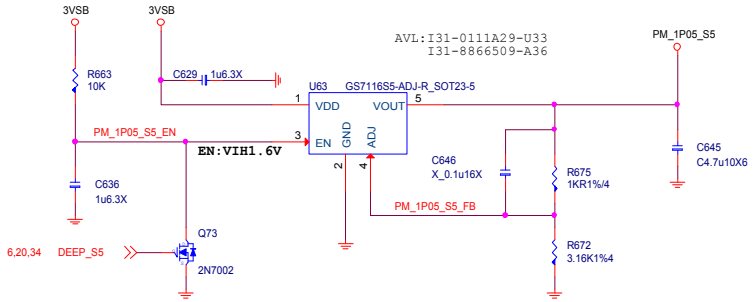


SY8288_OCP	OCP
0	8A
floating	12A
1	16A

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

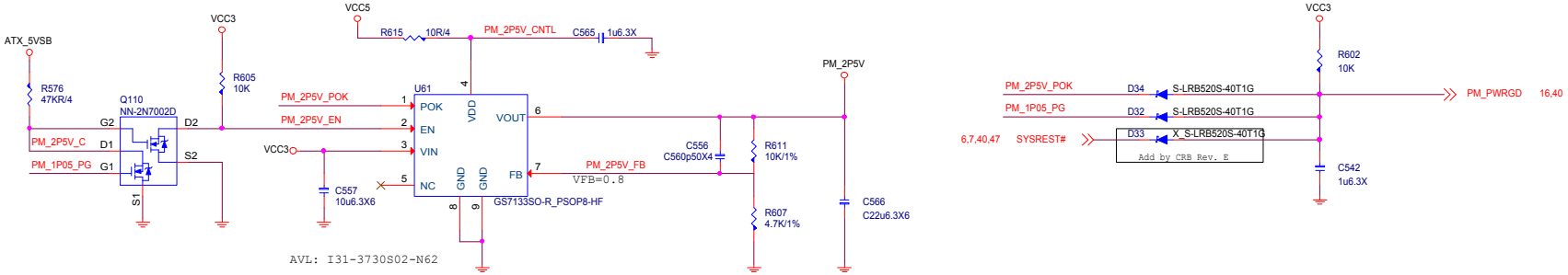
FOR Promontory 1.05V_S5

0.05A



Promontory-2.5V

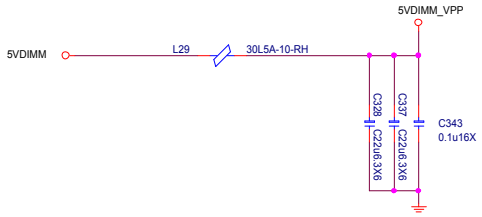
2.5V; 900mA

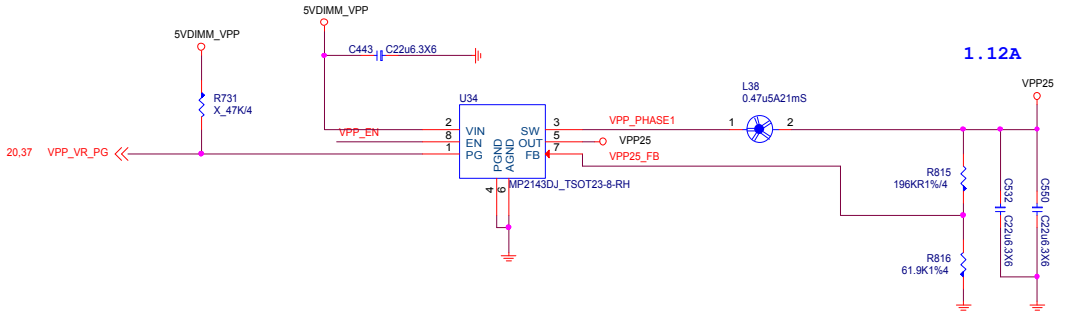


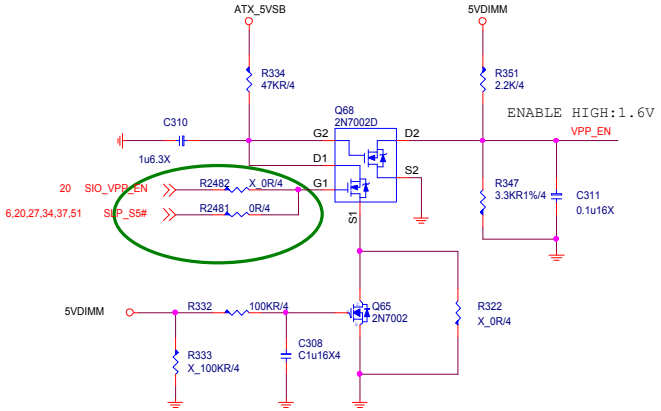
MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

Title	Promontory-NB671LB-1.05V/GS7133-2.5V	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 35 of 56	

2DIMM :1.12A FOR DDR VPP2.5V







MICRO-START INT'L CO.,LTD.

Link to the Future

Title: DDR PWR VPP25/VTT-MP2143		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 36 of 56	

DDR4_1.2V 15.5A+4.75A+0.6A=20.85A

15.5A FOR CPU

4.75A FOR 2DIMM

0.6A FOR DDR VTT

Irms = Iout * SQRT{D/N- (D)^2]}

VCCDDR:
D=Vout/Vin=1.2/5=0.24
N=Phase number=1
=20.85A*SQRT(0.24-0.0576)
=5.21A

VID	Reference Voltage (V)
H	0.675
L	0.75

OCP:27.5A

Imax: 20.85A

By layout modify

f:400KHz

I32-8231A0C-R11

MAX:20.85A

1.2V

0.1uFx1 per dimm

1.1uH change to 0.47uH

D03-4C02903-O05

D03-4C02403-O05

Title	DDR PWR VPP25/VTT-MP2143
Size	Custom
Document Number	MS-7B87
Rev	10
Date:	Wednesday, May 30, 2018
Sheet	37 of 56

MICRO-START INT'L CO.,LTD.

FOR CPU 1.8V S5

0.5A

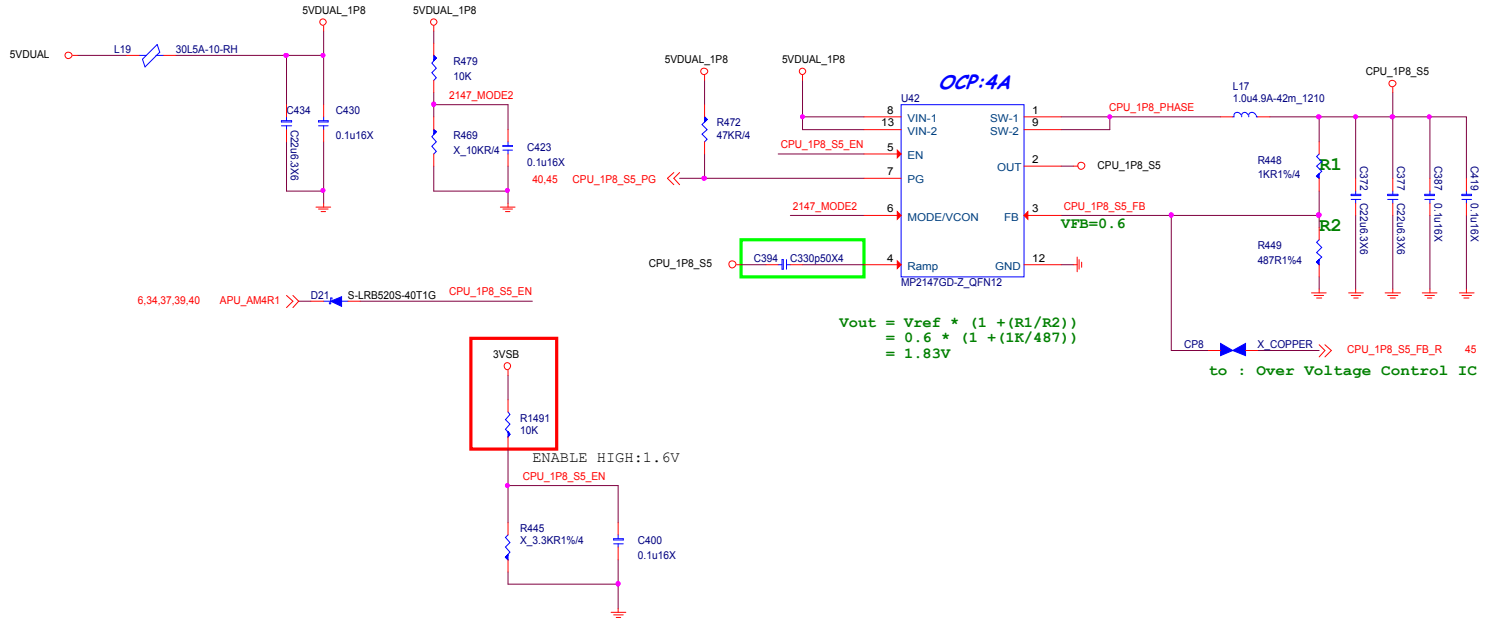
FOR VCCP_SOC_S5

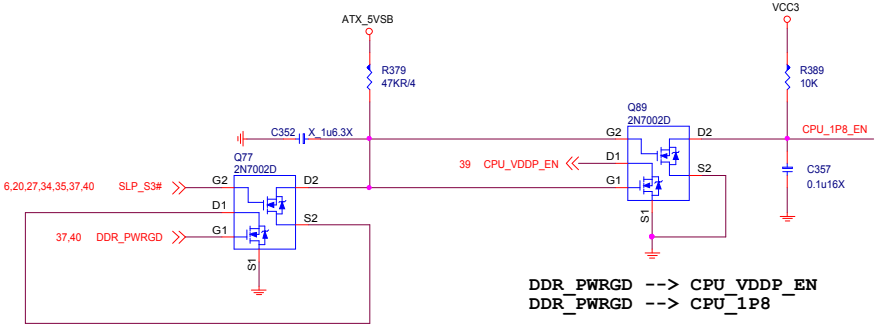
0.9A

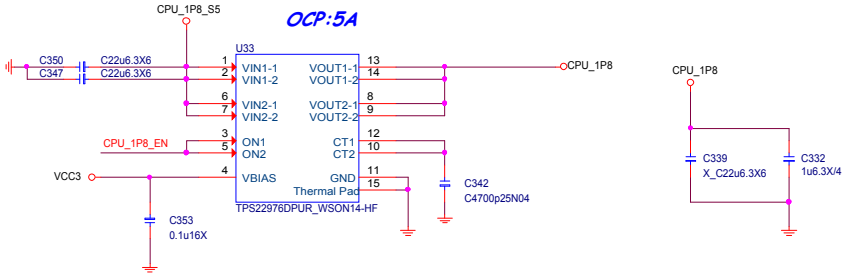
FOR CPU 1.8V S0

2.0A

0.5A + 2.0A + 0.9A =3.4A







MICRO-START INT'L CO.,LTD.

Title	CPU Power 1P8V-MP2147	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 38 of 56	

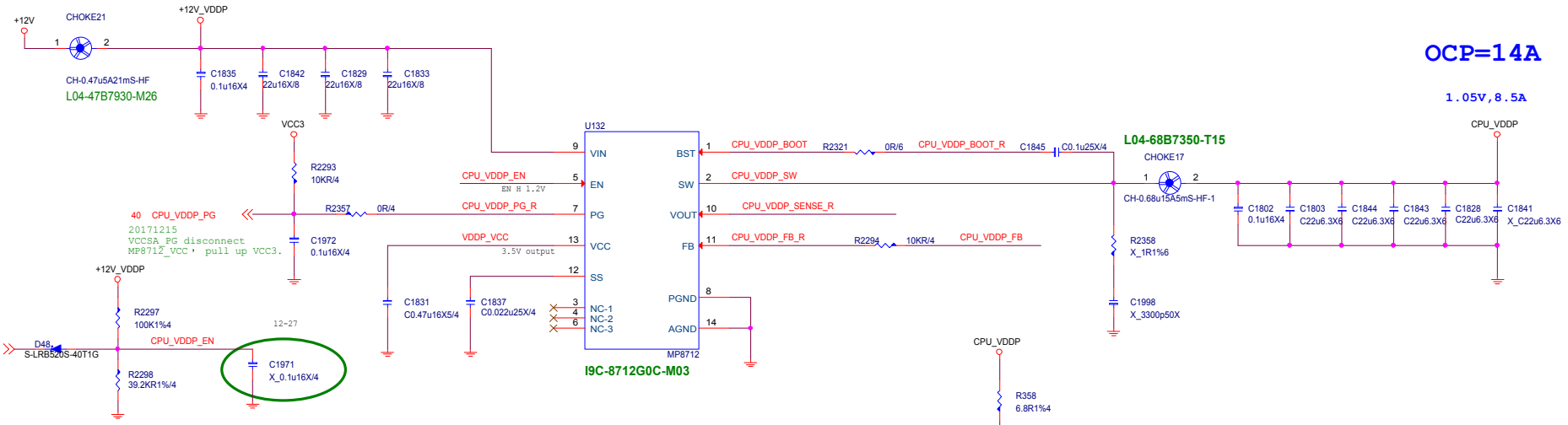
CPU_VDDP_S0

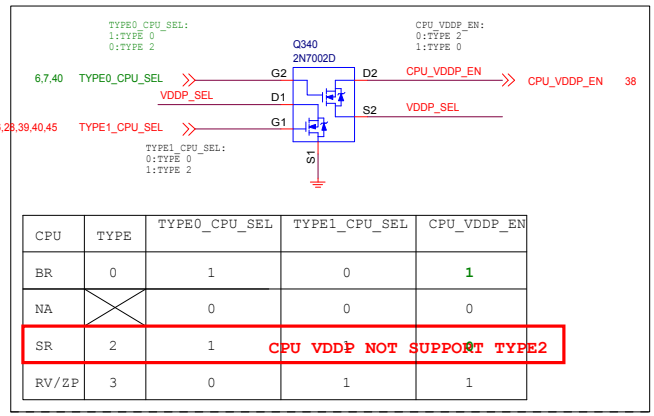
Input Current= (8.5A*1.05V)/12V/0.8=0.93A

1.05V/0.9V@S0:8.5A

S0:8.5A
S5:1A

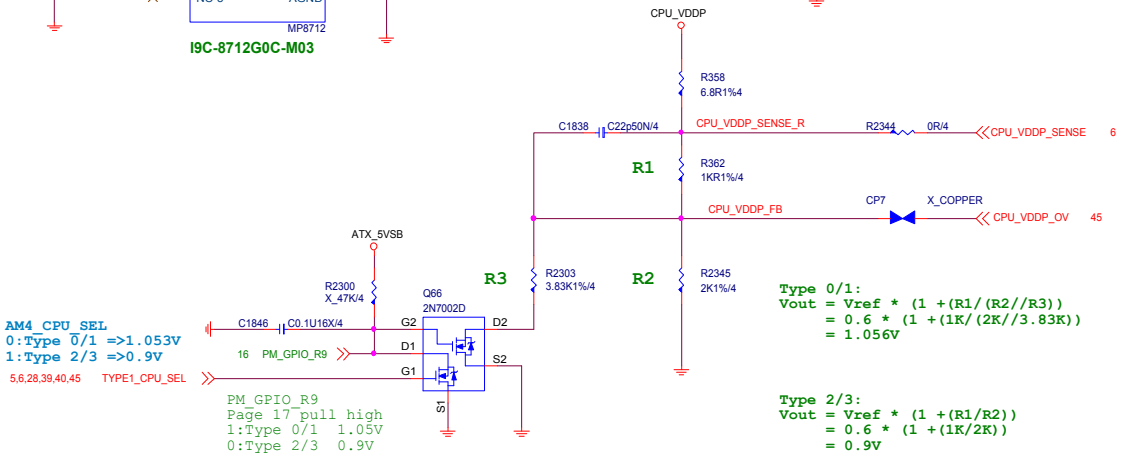
OCP=14A





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

CPU VDDP NOT SUPPORT TYPE2

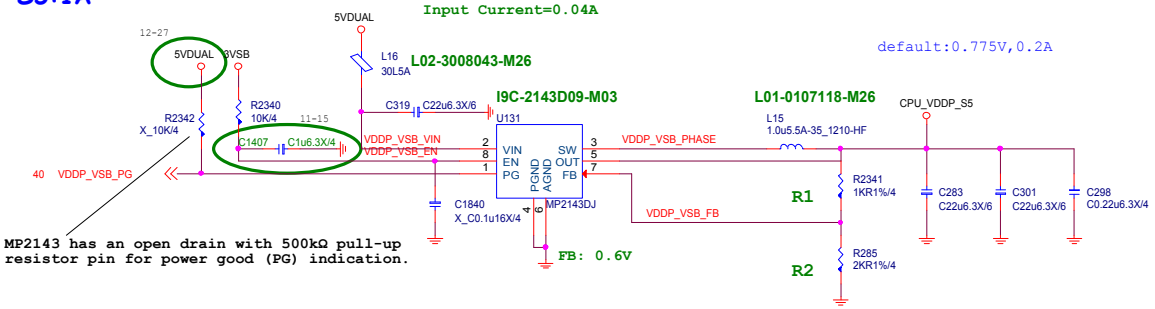


CPU_VDDP_S5

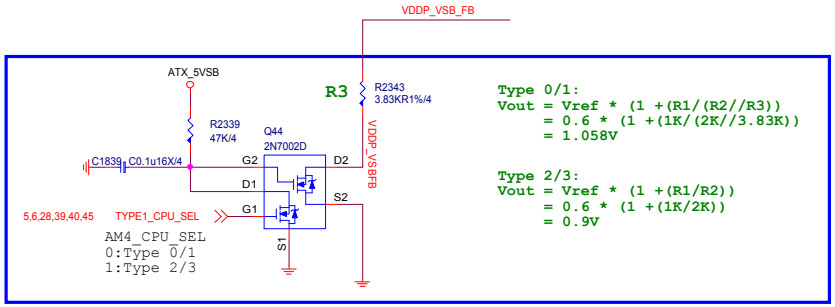
1.05V/0.9V

S5:1A

Input Current=0.04A



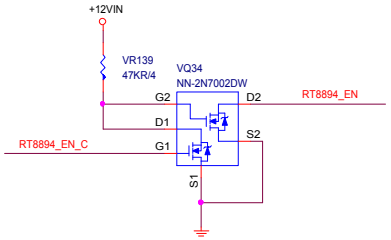
MP2143 has an open drain with 500kΩ pull-up resistor pin for power good (PG) indication.



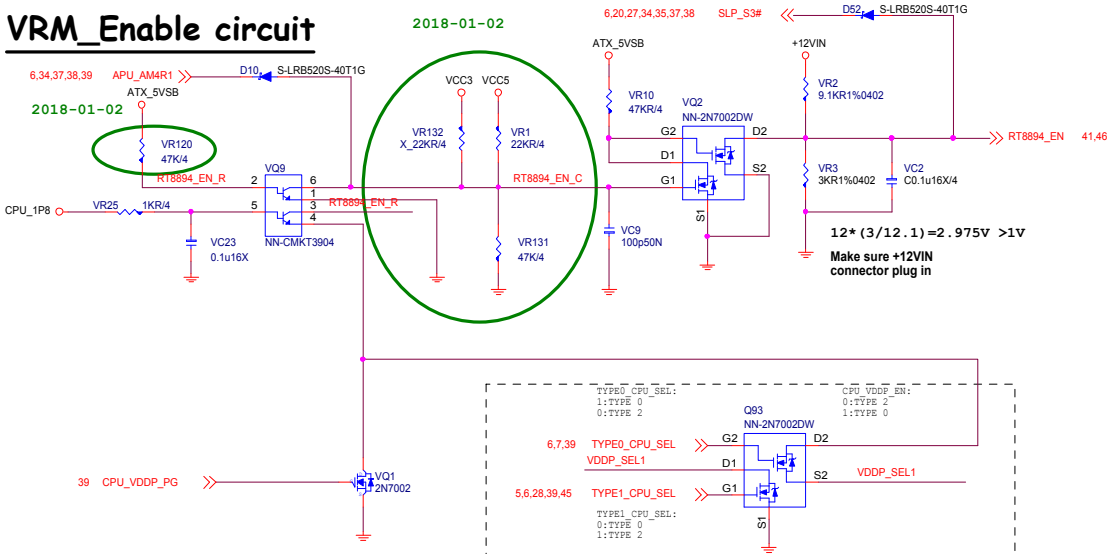
MICRO-START INT'L CO.,LTD.

Link to the Future

Title	CPU Power VDDP-RT8125E	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 39 of 56	



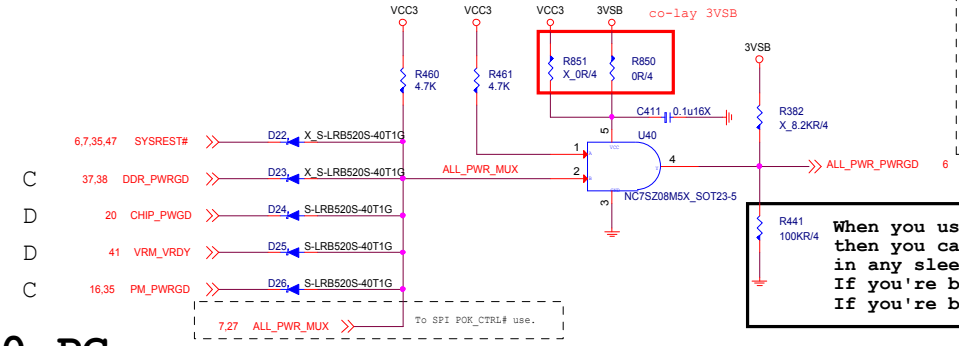
VRM_Enable circuit



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

CPU VDDP NOT SUPPORT TYPE2

ALL POWER GOOD MUX

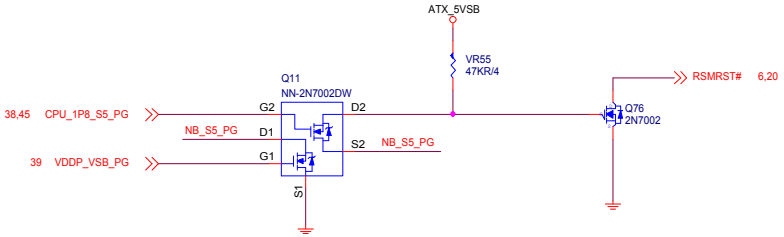


R441
100KR/4

**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.**

S0 PG

S5 PG



MICRO-STAR INT'L CO.,LTD.

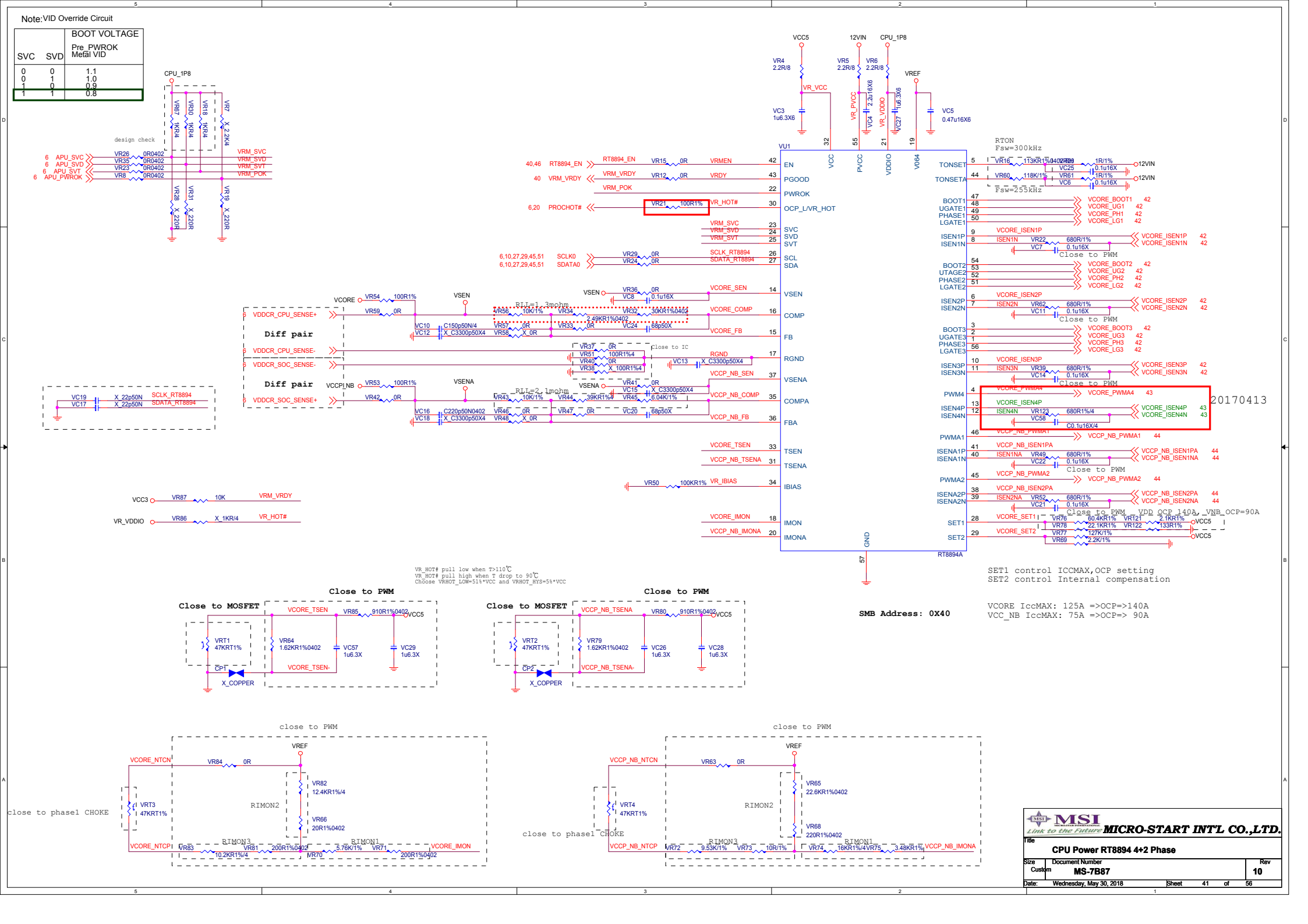
Title: CPU PWR-IR3599

Size: Custom | Document Number: MS-7B87 | Rev: 10

Date: Wednesday, May 30, 2018 | Sheet 40 of 56

Note: VID Override Circuit

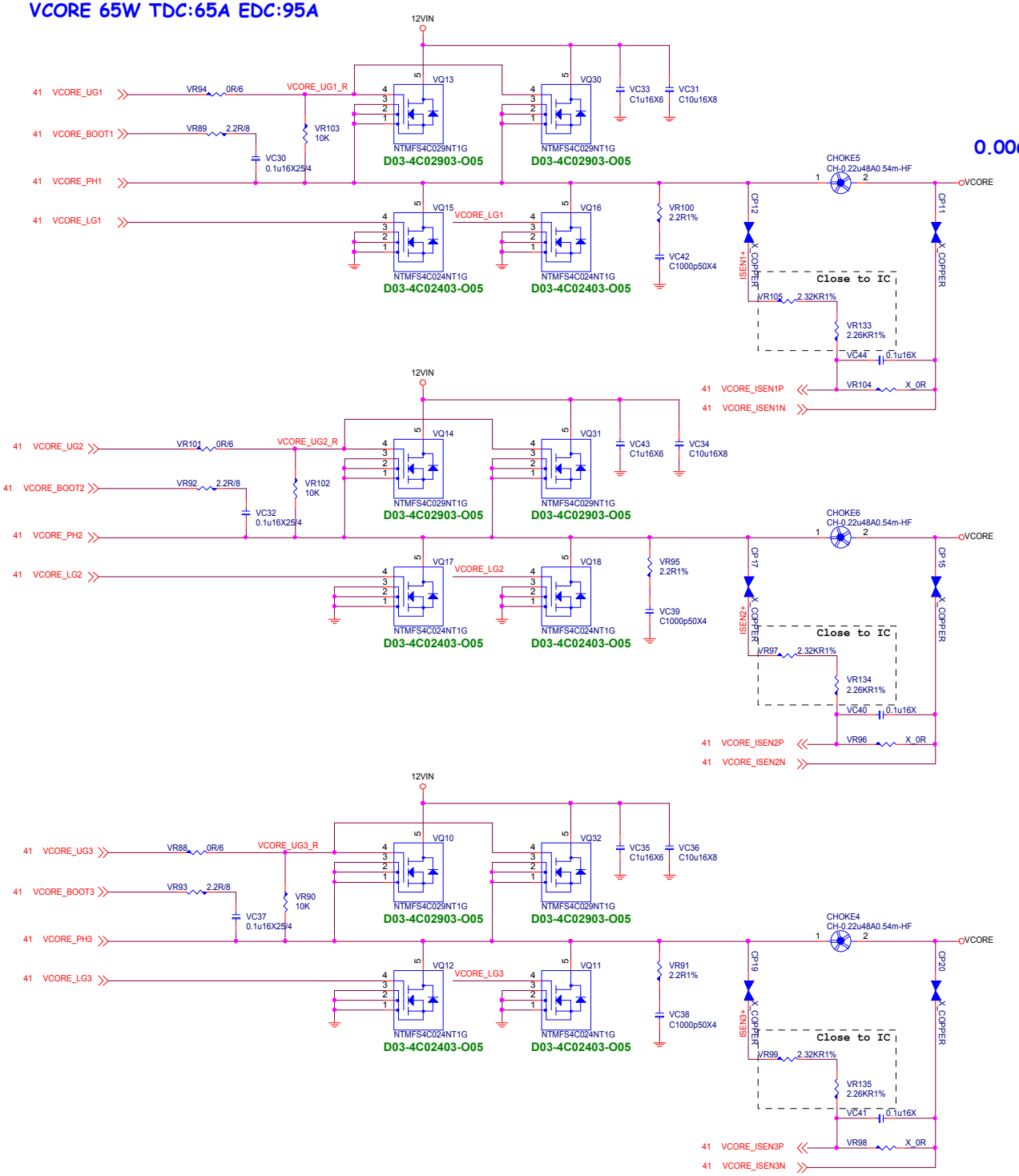
SVC	SVD	BOOT VOLTAGE Pre_PWROK Metal VID
0	0	1.1
0	1	1.0
1	0	0.9
1	1	0.8



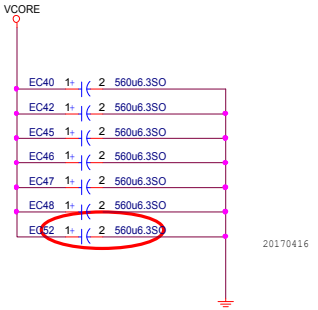
MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

Title	CPU Power RT8894 4+2 Phase		
Size: Custom	Document Number: MS-7B87		Rev: 10
Date: Wednesday, May 30, 2018	Sheet 41 of 56		

VCORE 95W TDC:80A EDC:125A
VCORE 65W TDC:65A EDC:95A

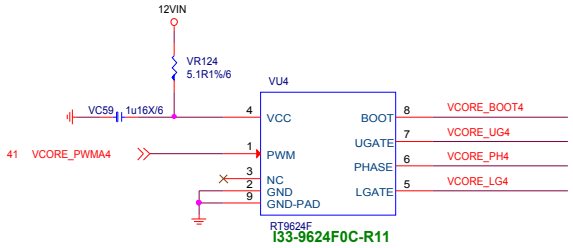


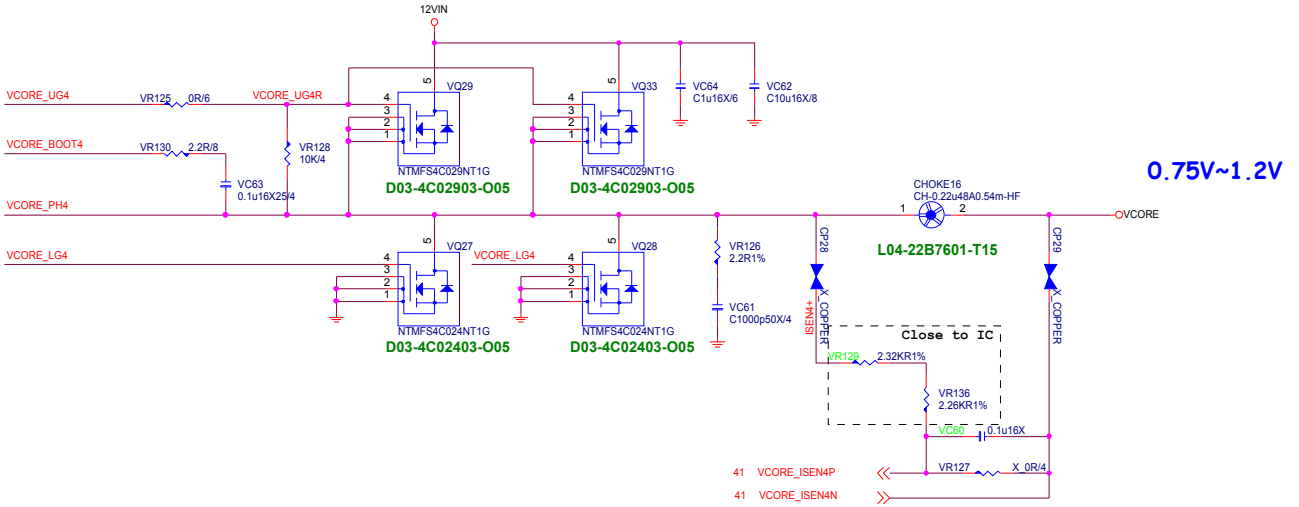
0.00625V~1.55V



MICRO-START INT'L CO.,LTD.

Title: CPU Power Phase 1-3		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 42 of 56	





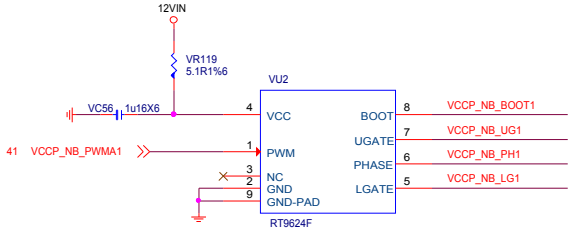
MICRO-STAR INT'L CO.,LTD.

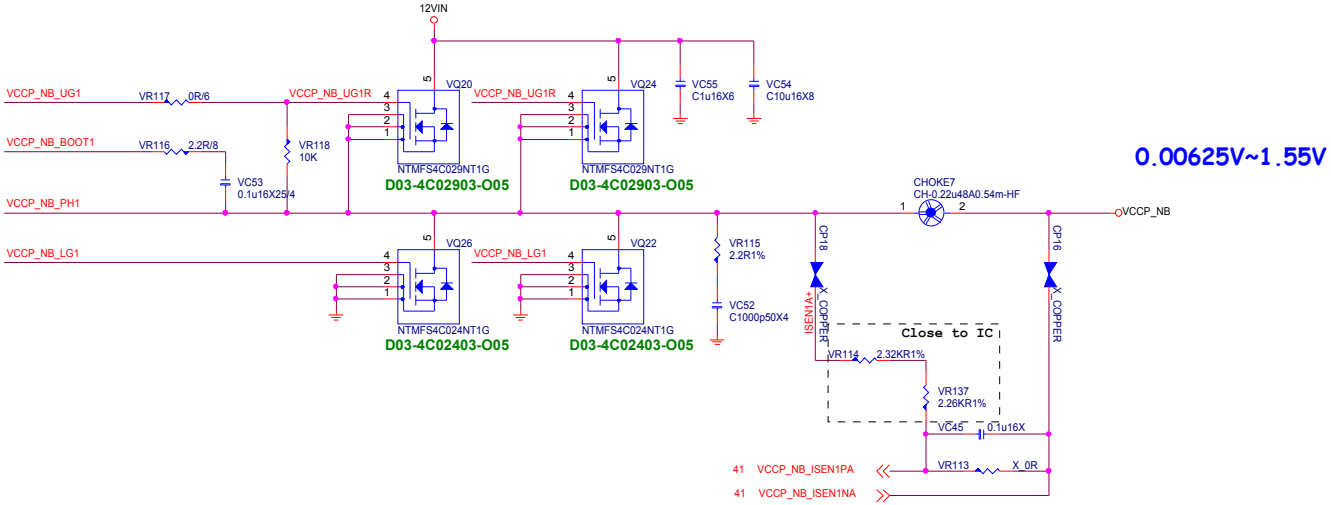
Title: CPU Power Phase 4

Size	Document Number	Rev
Custom	MS-7B87	10

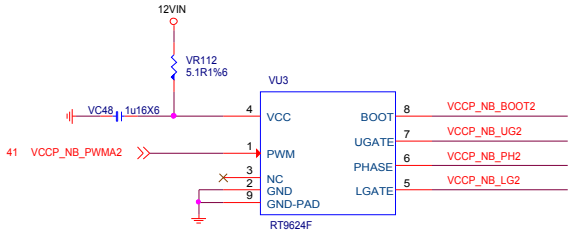
Date: Wednesday, May 30, 2018 Sheet 43 of 56

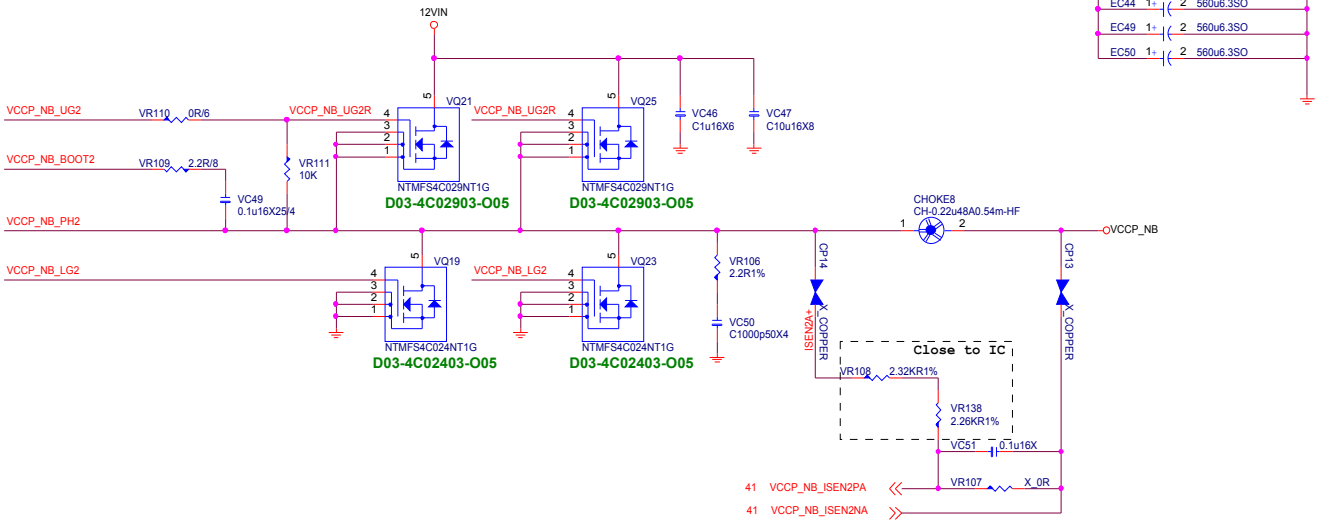
VCCP_NB 95W TDC:50A EDC:75A
VCCP_NB 65W TDC:50A EDC:75A

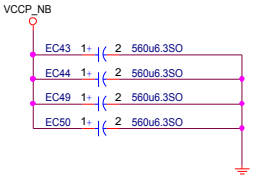




0.00625V~1.55V







MICRO-STAR INT'L CO.,LTD.

Title: CPU Power NB Phase 1-2		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 44 of 56	

FOR
VCCP_SOC_s5
0.9A

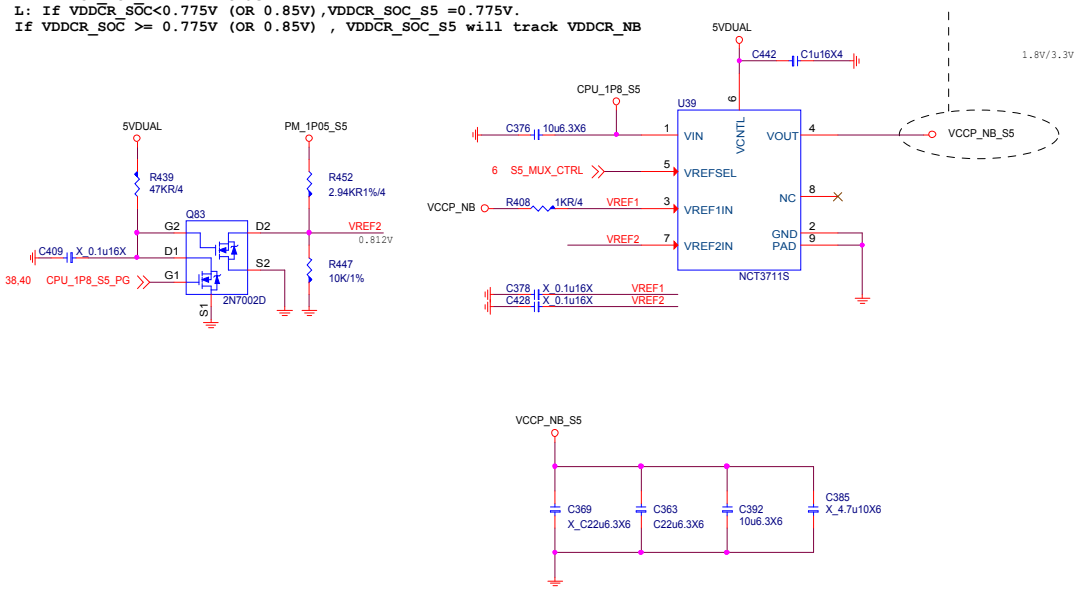
(VDDCR_SOC_S5 is only used for AMD TYPE0)

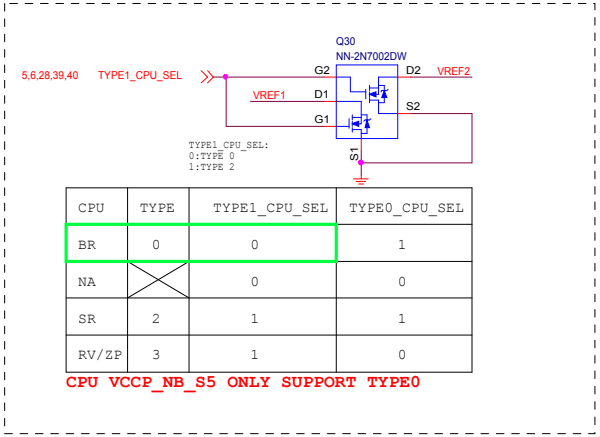
TYPE0 Only

S5_MUX_CTRL
HIGH:S0
LOW: S3/S5

H: +VDDCR_FCH_ALW will track VDDNB
L: If VDDCR_SOC<0.775V (OR 0.85V),VDDCR_SOC_S5 =0.775V.
If VDDCR_SOC >= 0.775V (OR 0.85V) , VDDCR_SOC_S5 will track VDDCR_NB

(VDDCR_SOC_S5 is only used for AMD Family 15h Models 60h-6Fh processors) Bristol Ridge TYPE0



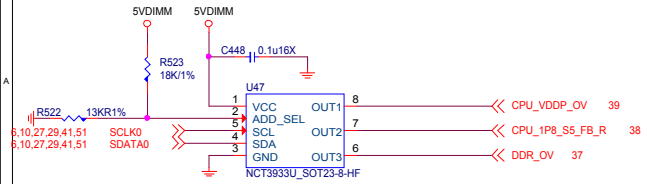


CPU	TYPE	TYPE1_CPU_SEL	TYPE0_CPU_SEL
BR	0	0	1
NA		0	0
SR	2	1	1
RV/ZP	3	1	0

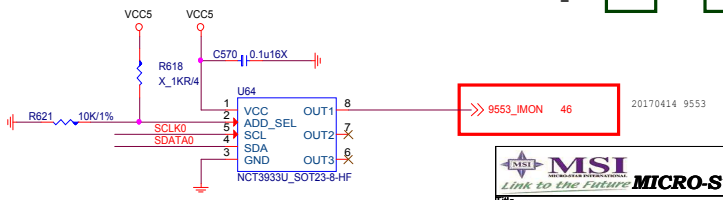
CPU VCCP_NB_S5 ONLY SUPPORT TYPE0

Over Voltage Control IC

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



0x2A:RH=OPEN,RL=10K



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%

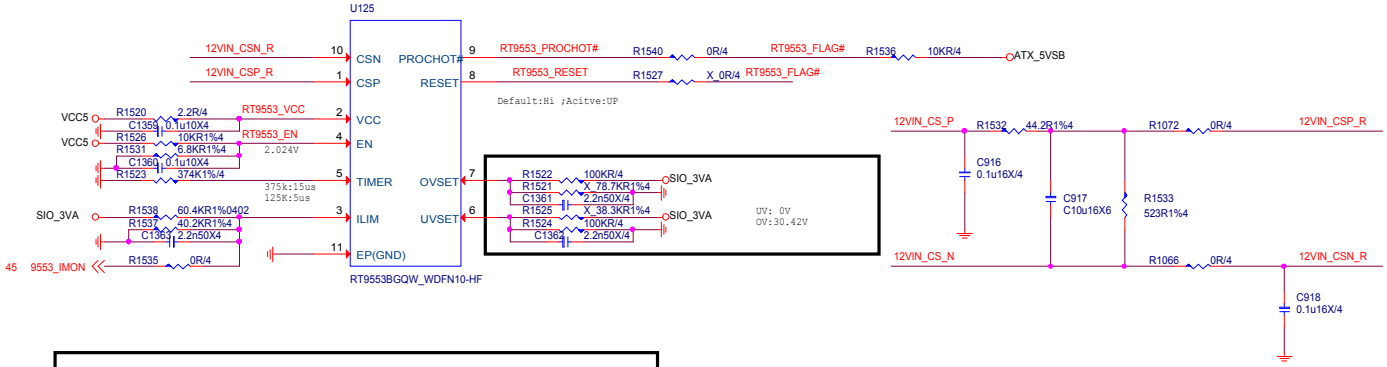
MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

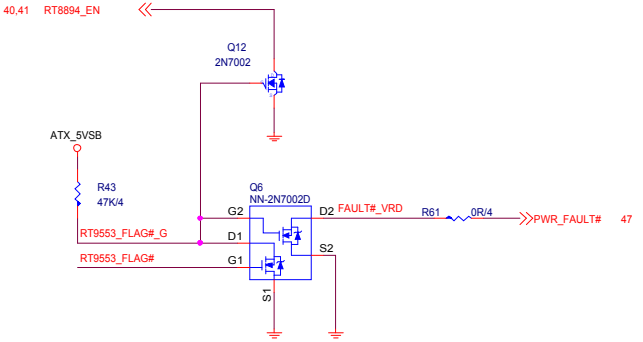
Title	CPU Power NB Switch / NCT3933 OV	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 45 of 56	

RT9553 CURRENT SENSE

VCORE EDC MAC 125A

NB EDC MAX75A

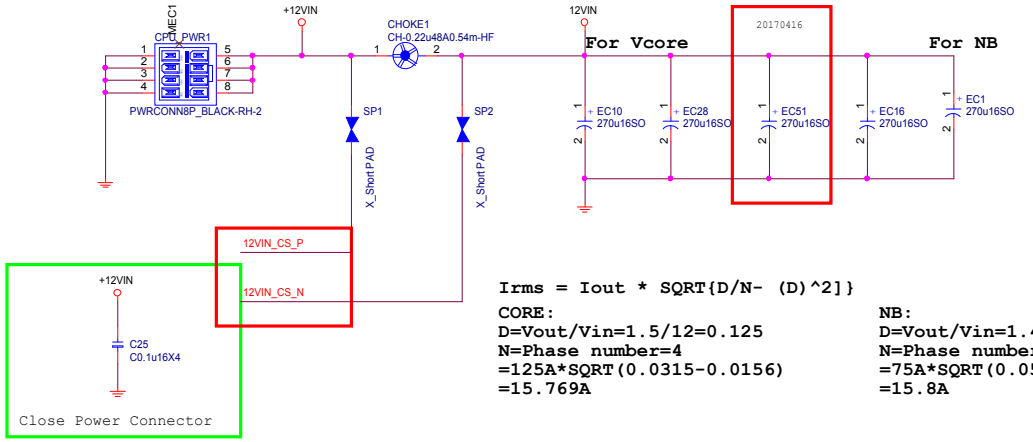




OCP:30A
Real OCP:30.05A
R17+R18>100k Vsio_3va= 3.38V Rdcr= 0.5 mohm

I3933_imon*[R17*R18/(R17+R18)]= Istep* Rdcr*100
I3933_imon= 10uA/step
Istep=4.785A

CPU POWER CONNECTOR



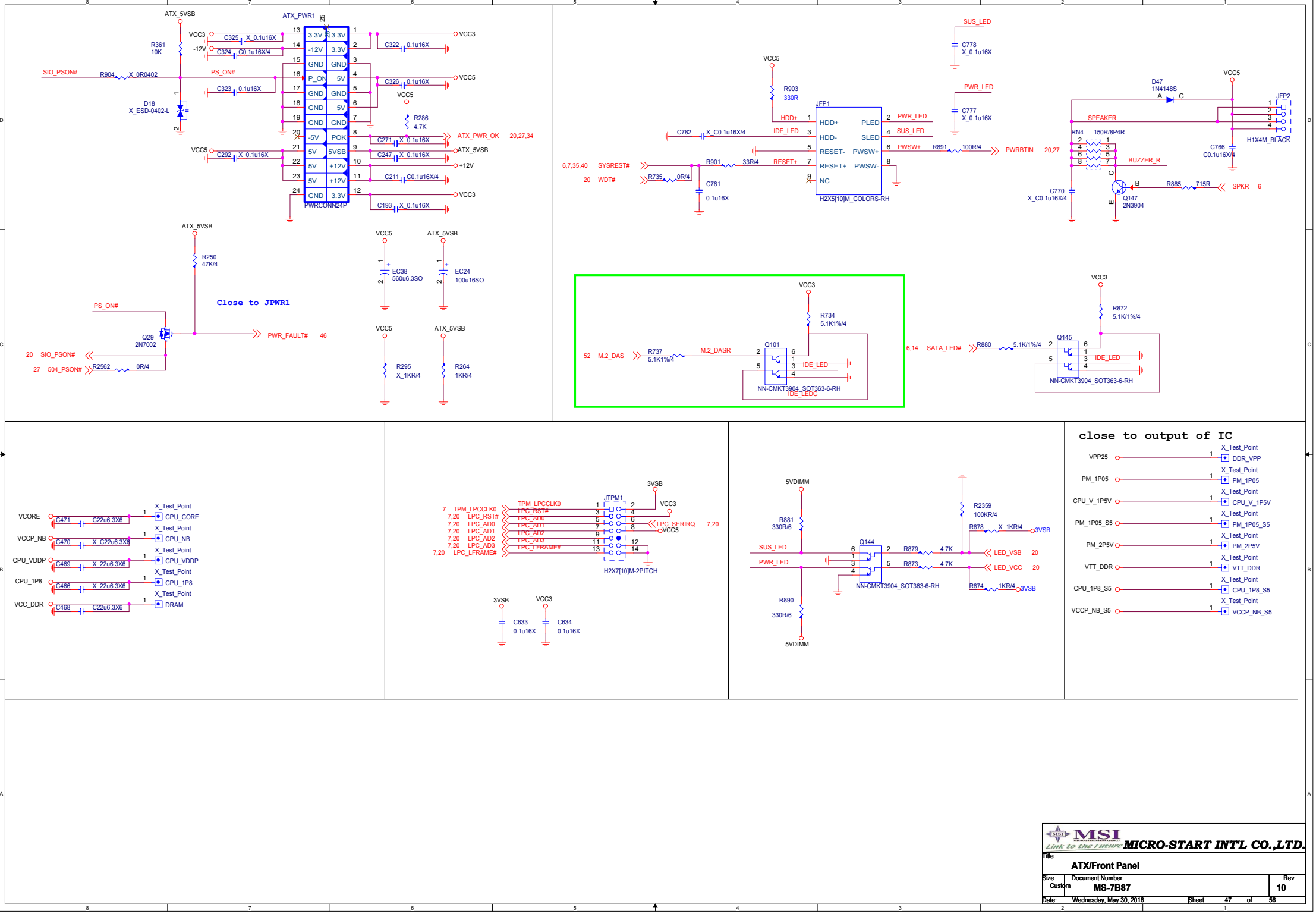
Irms = Iout * SQRT{D/N- (D)^2]}

CORE:
D=Vout/Vin=1.5/12=0.125
N=Phase number=4
=125A*SQRT(0.0315-0.0156)
=15.769A

NB:
D=Vout/Vin=1.4/12=0.1166
N=Phase number=2
=75A*SQRT(0.0583-0.0136)
=15.8A

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

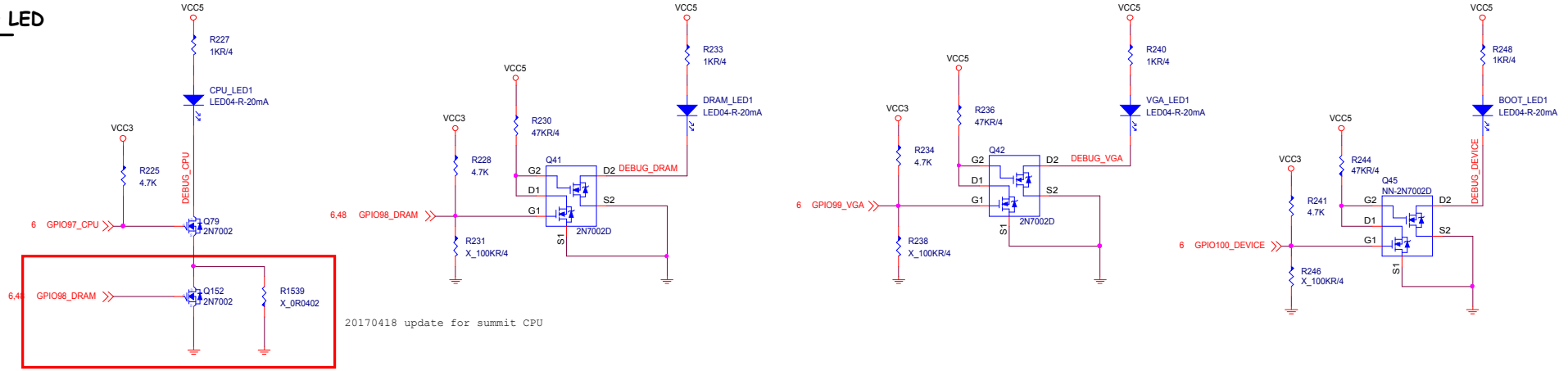
Title: RT9553B CURRENT SENSE		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 46 of 56	



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

Title	ATX/Front Panel	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 47 of 56	

EZ Debug LED



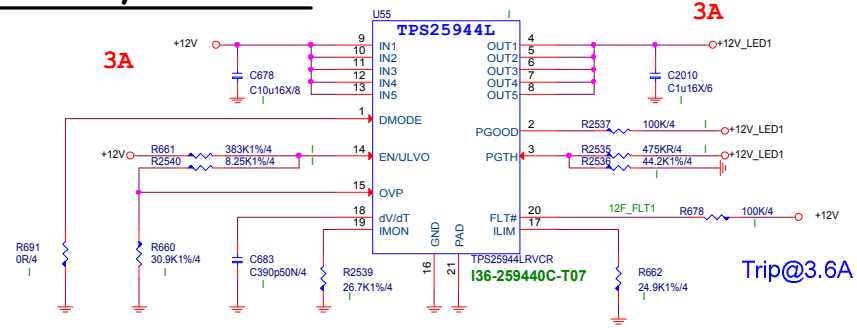
20170418 update for summit CPU

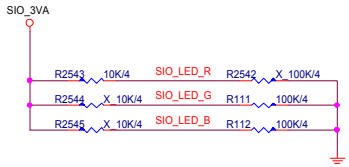
MICRO-START INT'L CO.,LTD.

Title: ALL LED Control		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 48 of 56	

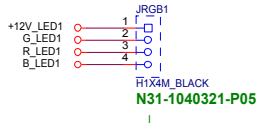
JRGB1 by SIO

2016.07.06 Use TPS25944L

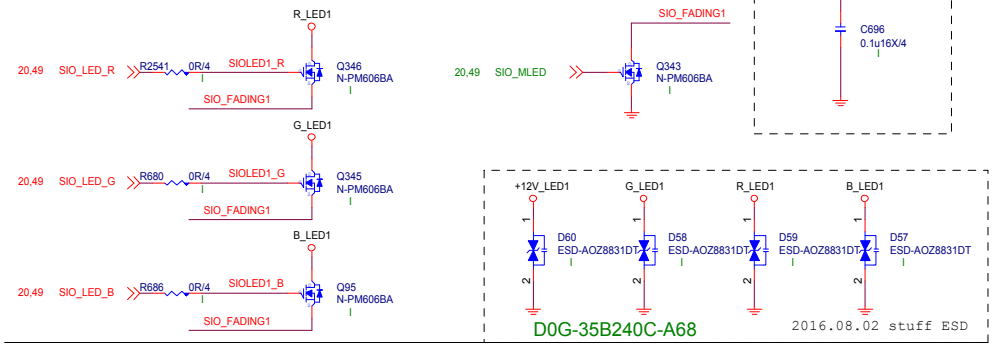




Color	SIO_LED_R	SIO_LED_G	SIO_LED_B
RED	1	0	0
GREEN	0	1	0
BLUE	0	0	1
WHITE	1	1	1

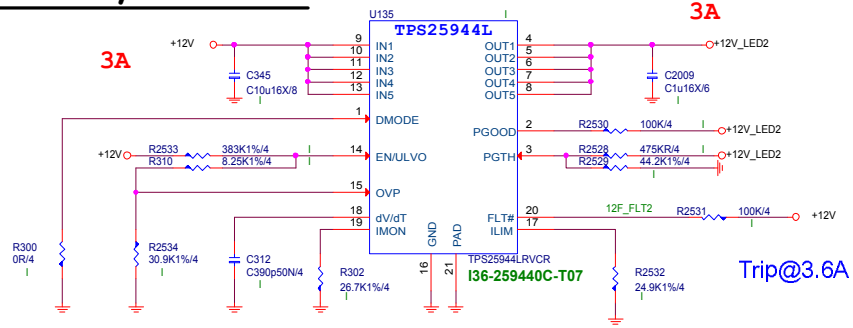


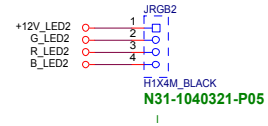
2016.08.02 Add +12V_LED 0.1uF



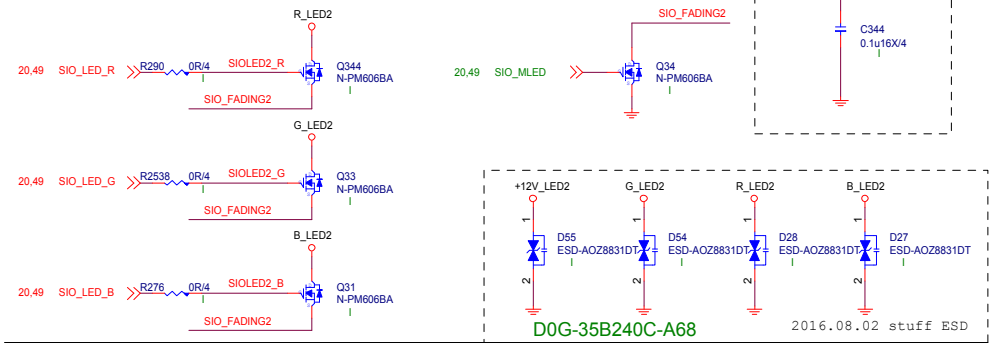
JRGB2 by SIO

2016.07.06 Use TPS25944L





2016.08.02 Add +12V_LED 0.1uF



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

Title	JRGB1/JRGB2		
Size: Custom	Document Number: MS-7B87		Rev: 10
Date: Wednesday, May 30, 2018		Sheet 49 of 56	

HEAT SINK

PM_HS1
FCH_HS
PM_HS

CPU Socket

CPU2
E95-0000022-C22

RETENTION MODULE

Simulation

X_JS3
SIM1
X_PIN1*2

X_JS4
SIM2
X_PIN1*2

MANUAL PART

UEFI1
G51-M1SPXXA-A09

BAT1_X1
BAT-CR2032-RH

PCB1

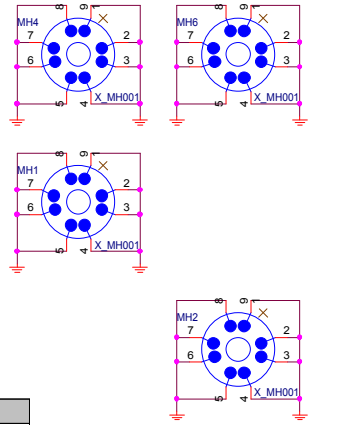
7B87-10
PK0-07B8411-G37,精成-深圳,23,賀安恩斯通廠(MSIS)
PK0-07B8411-E48,精華,23,賀安恩斯通廠(MSIS)

MOS HS(VCORE)

HDMI_LA1
Label
HDMI
HDMI LABEL

MOS_HS1
MOS_HS
MOS_HS

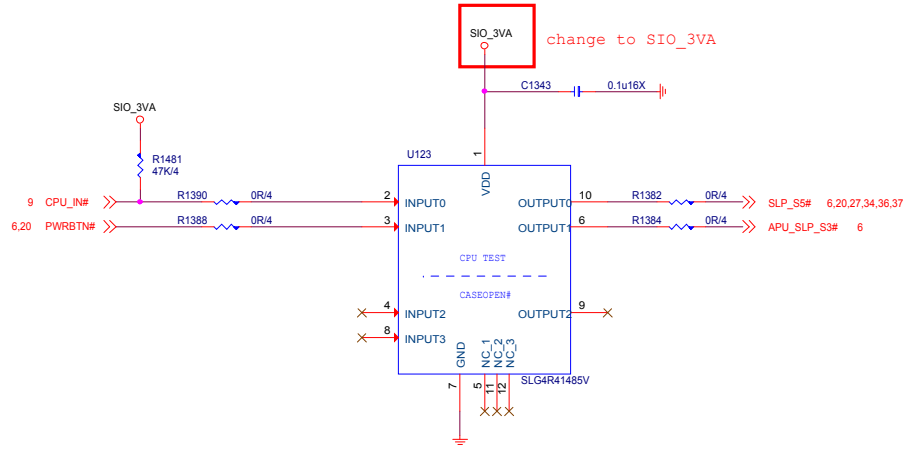
Optics Orientation Holes



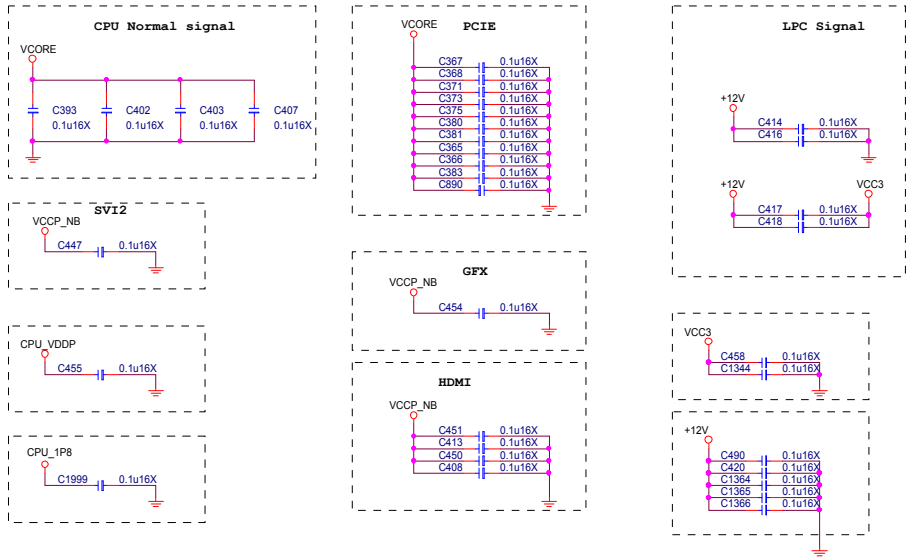
OPT	Configure	BOM	Function
		601-7B84-A01	XXXX

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

Title: BOM OPTION		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 50 of 56	

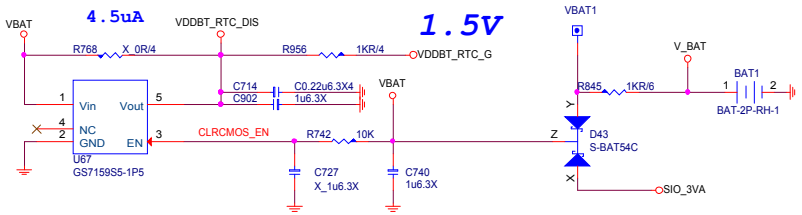


Moat Cap

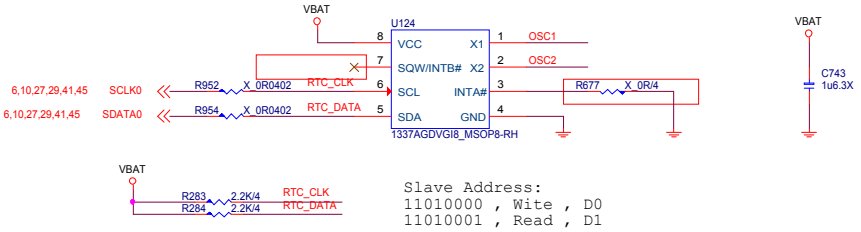


RTC & Clear CMOS Circuit

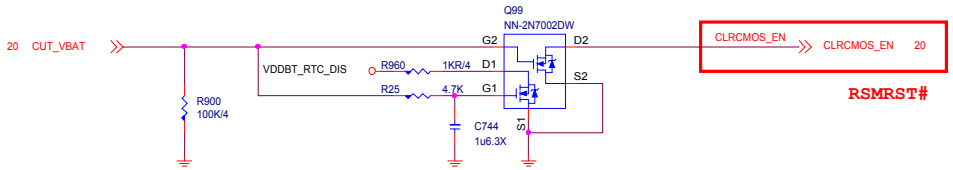
Placement Bottom Side

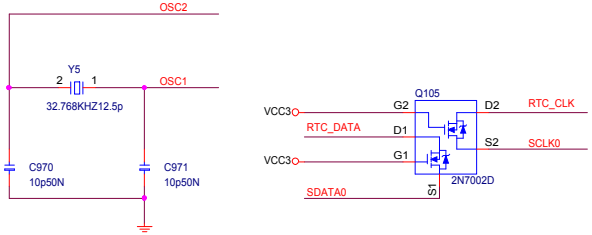


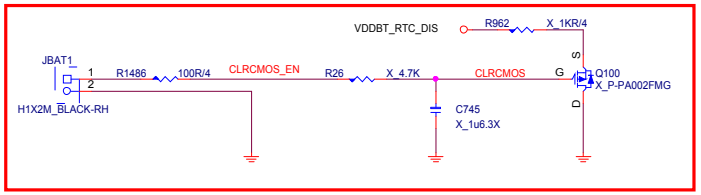
20170413 PIN7floating PIN3 resever pull down



Slave Address:
11010000 , Wite , D0
11010001 , Read , D1





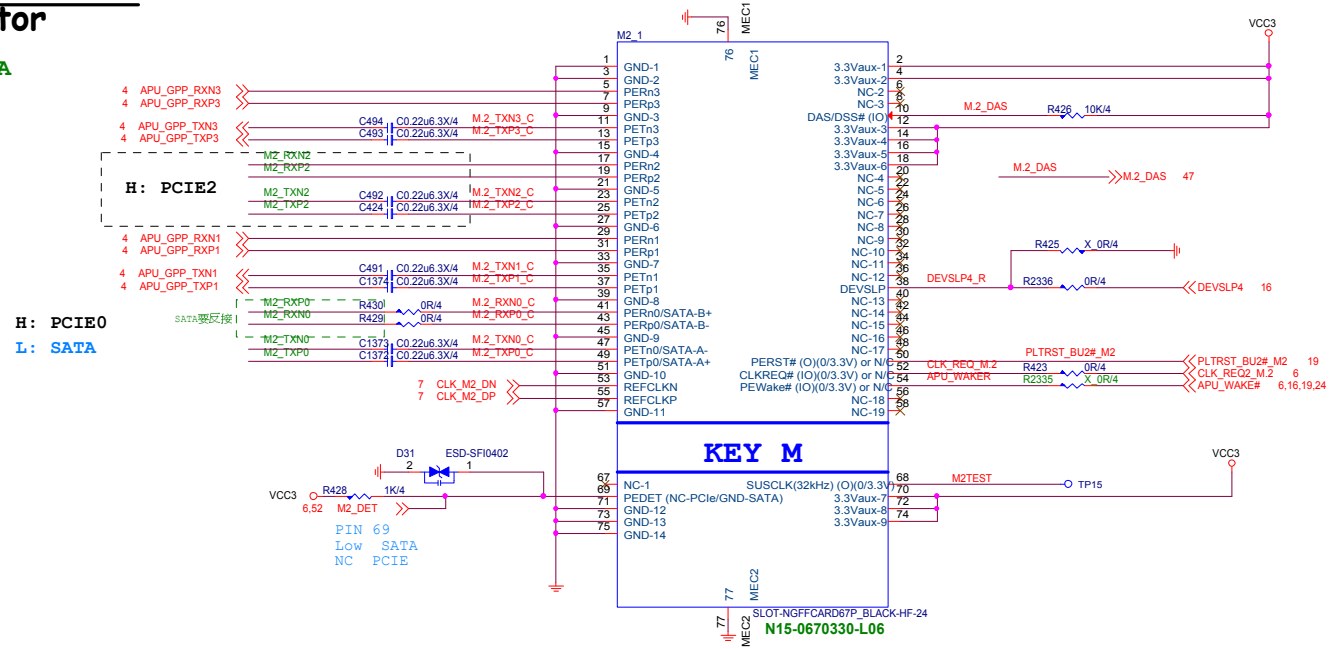


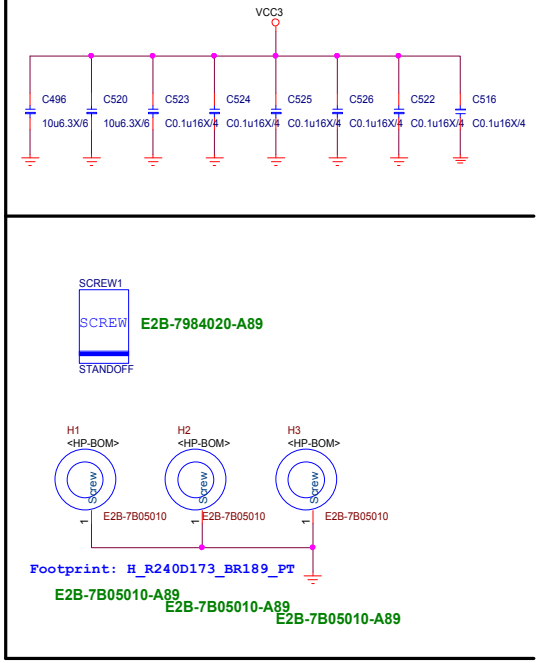
MICRO-START INT'L CO.,LTD.

Title	RTC Circuit	
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 51 of 56	

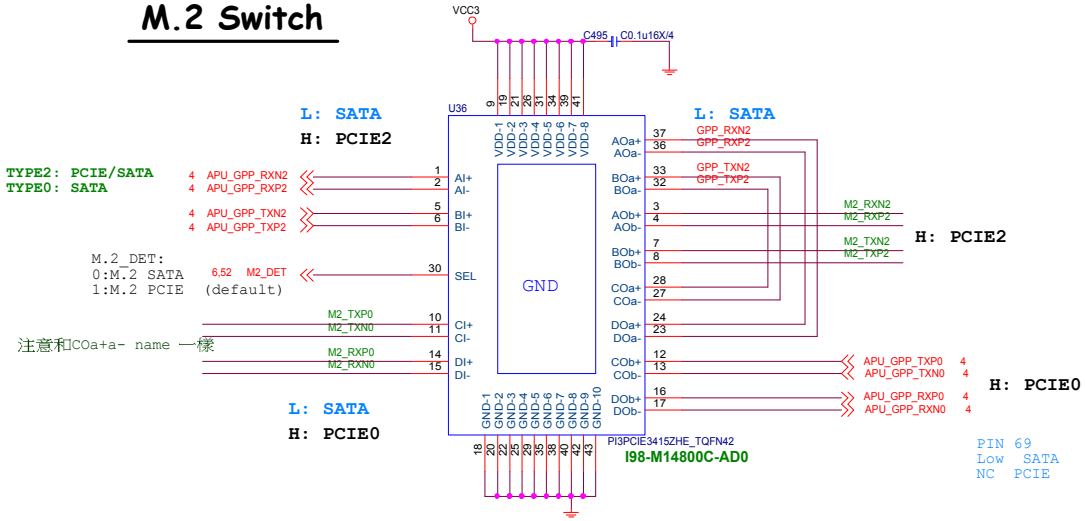
M.2 Connector

3.3V@2.5A





M.2 Switch



MICRO-START INT'L CO.,LTD.		
Title: M2		
Size: Custom	Document Number: MS-7B87	Rev: 10
Date: Wednesday, May 30, 2018	Sheet 52 of 56	