

TITLE	Page
Cover Sheet	1
Block Diagram	2
CPU-Memory, CPU-Control/MISC/CFG/Audio	3,4
CPU-PEG/Display/RSVD	5
CPU-Power,CPU-GND	6,7
DDR4 DIMM1&DDR4 DIMM2 & DDR4 POWER	8,9,10,11
PCH-LPC/SPI/SMBUS/MISC	12
PCH-Audio/Display/Clock	13
PCH-DMI/PCIE/USB/SATA	14
PCH-GPIO/RSVD/CNVI	15
PCH-Power/Gnd/Strip	16,17,18
PCIE SLOT-CPU(X16)	19
SIO-NCT6687D	20,21
SPI ROM BIOS/ FAN VBAT/CLR COMS	22,23,24,25
MCU JRAINBOW/DEBUG LED	26
AUDIO - ALC1220P	27,28
TR DP / PD	29,30,31,32
LAN - INTEL I255V	33
Rear LAN USB3.1&USB2.0	34
Rear-USB31 TYPEA+TYPE C/Front USB 3.2/2.0	35,36
Front USB31 TYPE C / USB POWER	37,38
M2 Connector/SATA/CNVI	39,40,41,42
HDMI Connector/DP	43,44
ACPI CONTROLLER	45
PWR-ISL69269/CORE-PH1-8/GT PH1/SA PH1	46,47,48
PWR-VCCIO-RT8125E/PWR-VCCST/PLL	49,50
DDR-RT8231/VPP25-MP2333	51,52
PCH RT8125E/1P8_VSB/PWR-VRM/PCH Sequence	53,54
OV-NCT3933/ATX F_Panel	55,56

# MS-7C77

ITX:170\*170

Ver: 1.3

## CML Platform

**CPU:** Comet lake S

LGA1200

CPU POWER PAK \*8 Phase

GT POWER PAK \*1 Phase

**System Chipset:** Z490 PCH\_H

**Onboard Chip:** SIO:NCT6687

HD Audio Codec:ALC1220

LAN-Intel I225-V

Flash ROM: SPI 128 MB X1

**Main Memory:** DDR4 \* 2 (Dual Channel)

### ACPI:

5VDAUL:uP7501

5VDIMM:uP7501

3VSB:TPS566235

3VDSW:GS7133

SIO\_3VA:GS7116

### Power:

VCORE/GT/SA - ISL69269

VCCIO -RT8125E

VCCST/VCCSTG-MP2333

VCCPLL/VCCPLL\_OC-GS7133

DDR - RT8231

PCH(1.05V) - RT8125E

1P8\_VSB - GS7133

### Expansion Slots:

PCI Express (X16) Slot \* 1

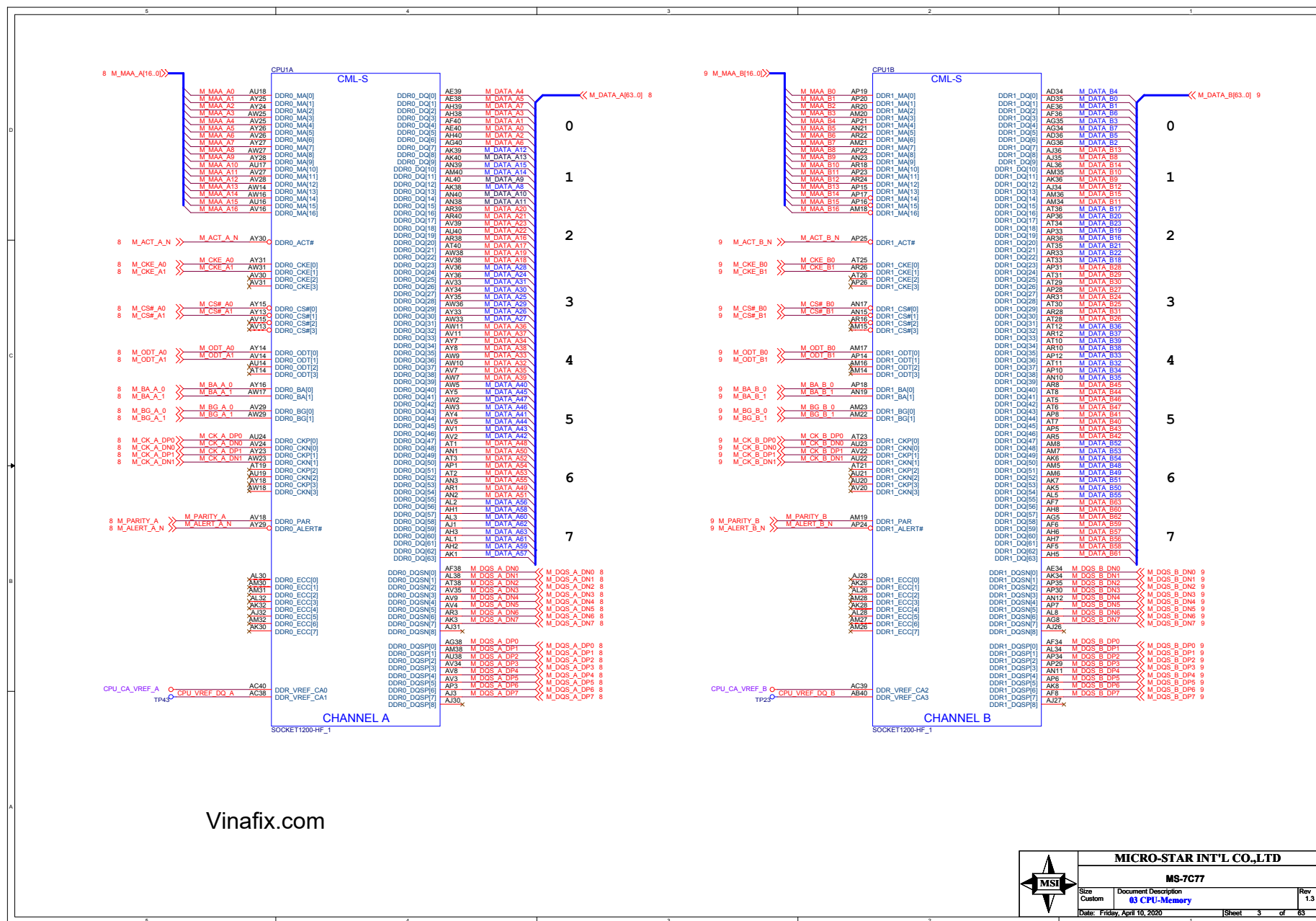


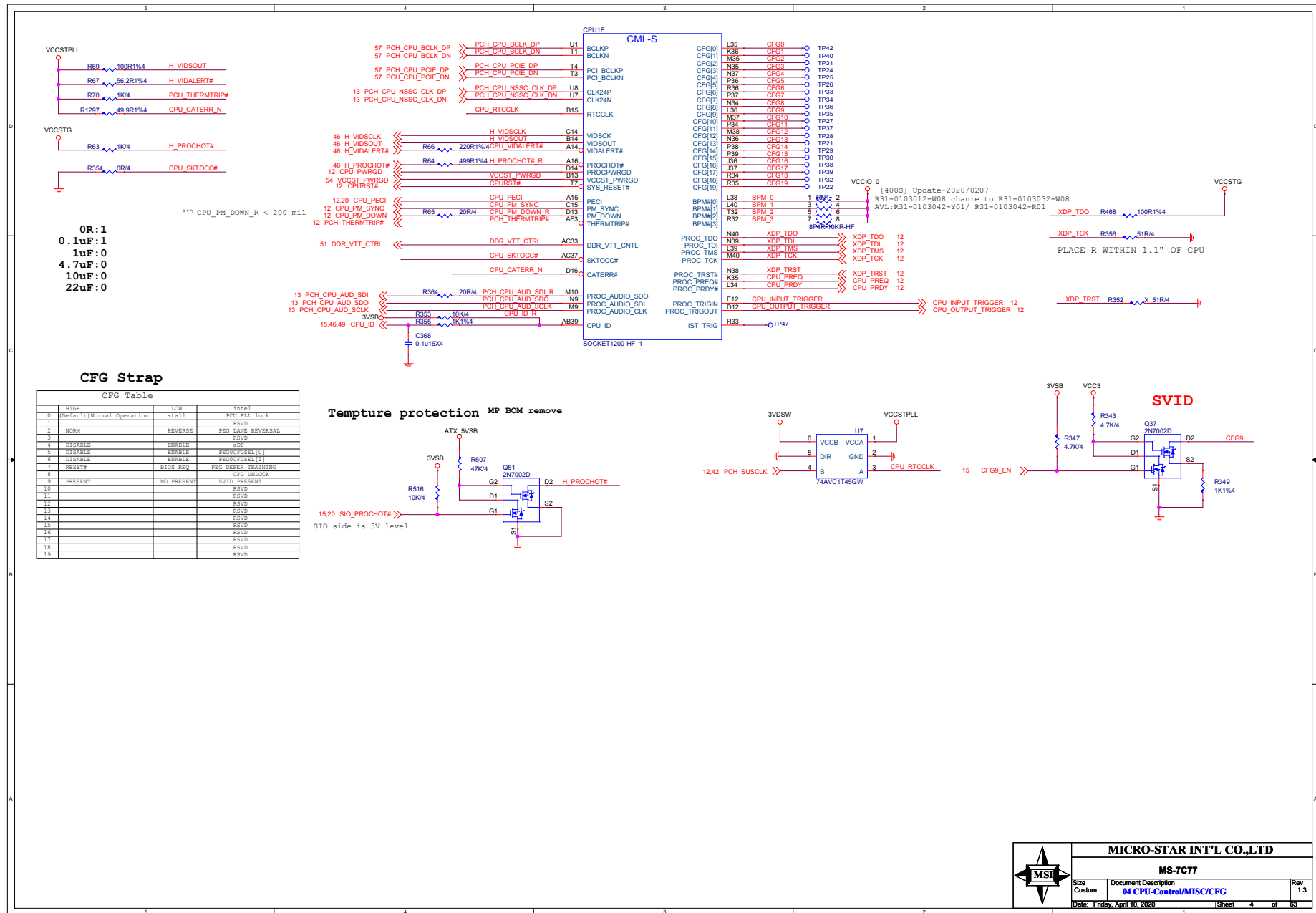
MICRO-STAR INT'L CO.,LTD

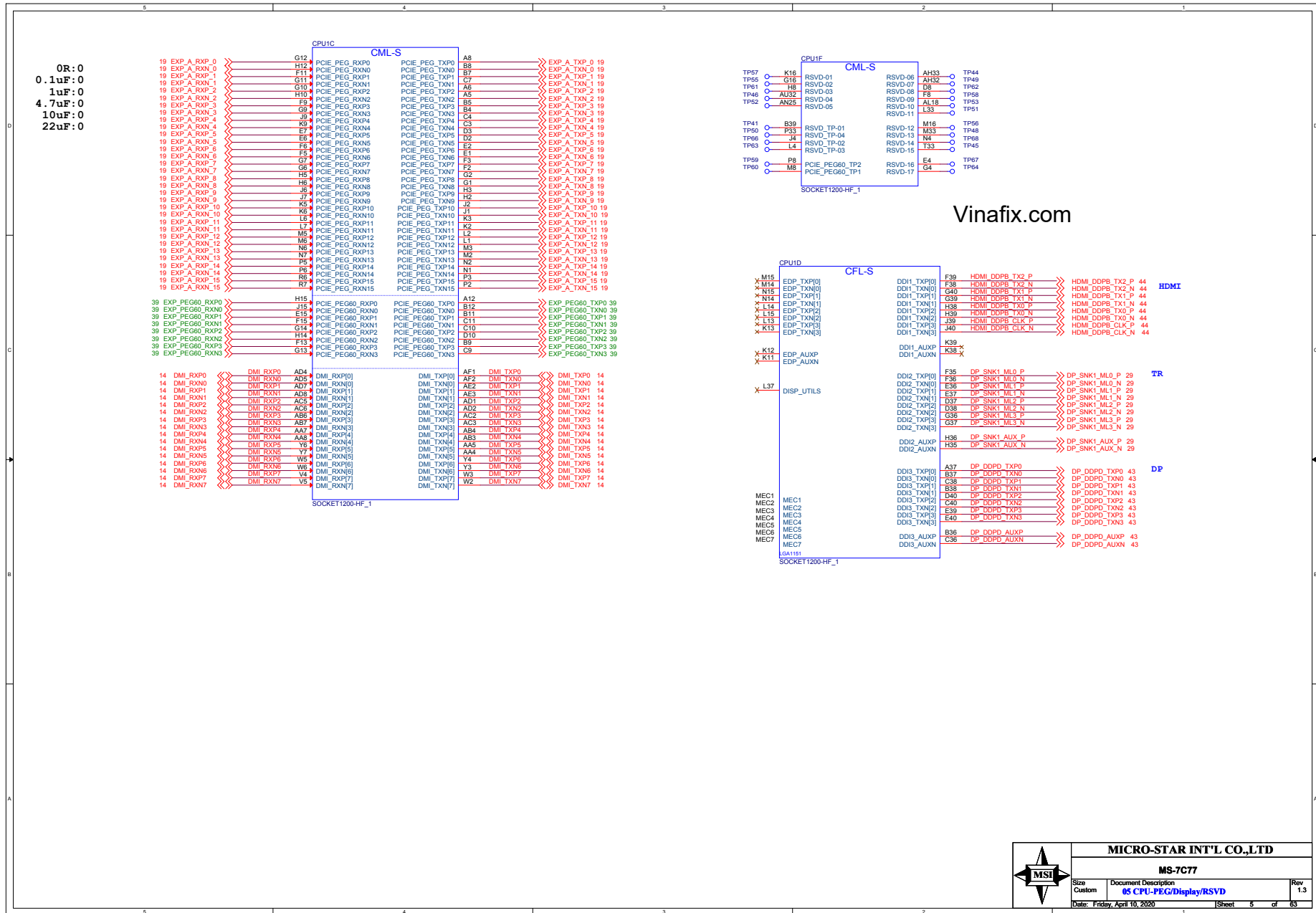
MS-7C77

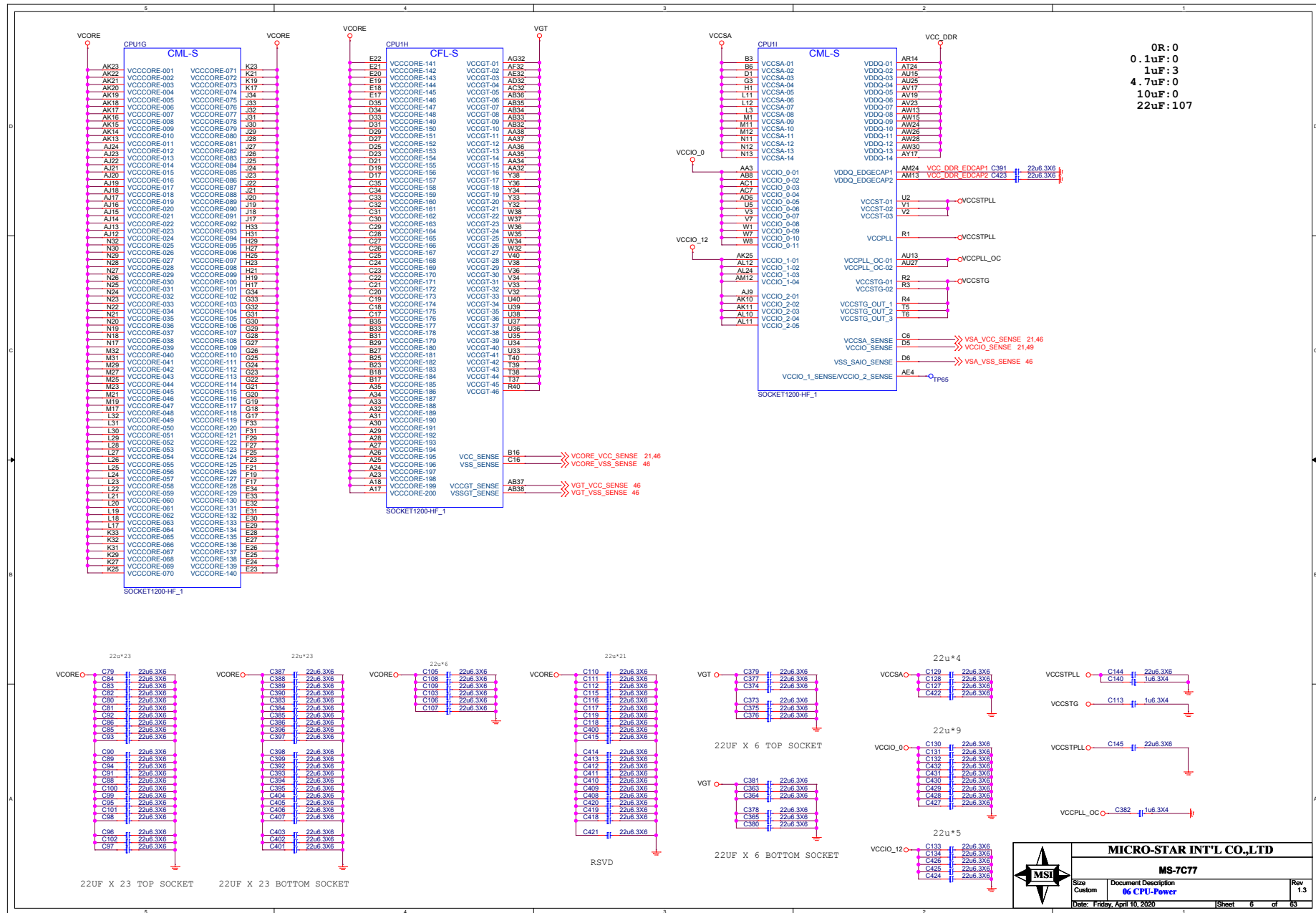
Size Custom	Document Description 01 Cover Sheet.....	Rev 1.3
Date: Friday, April 10, 2020	Sheet 1 of 63	

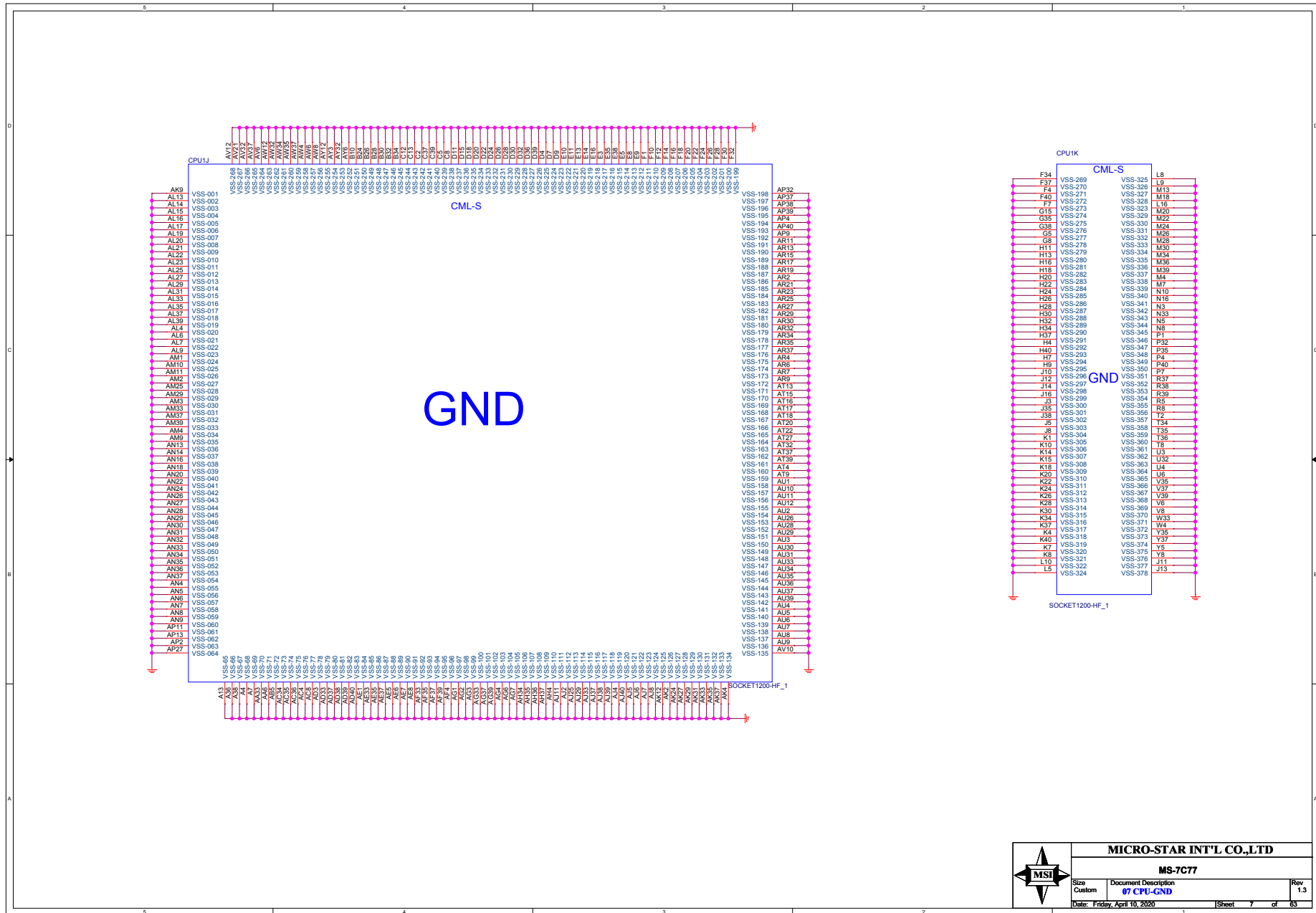








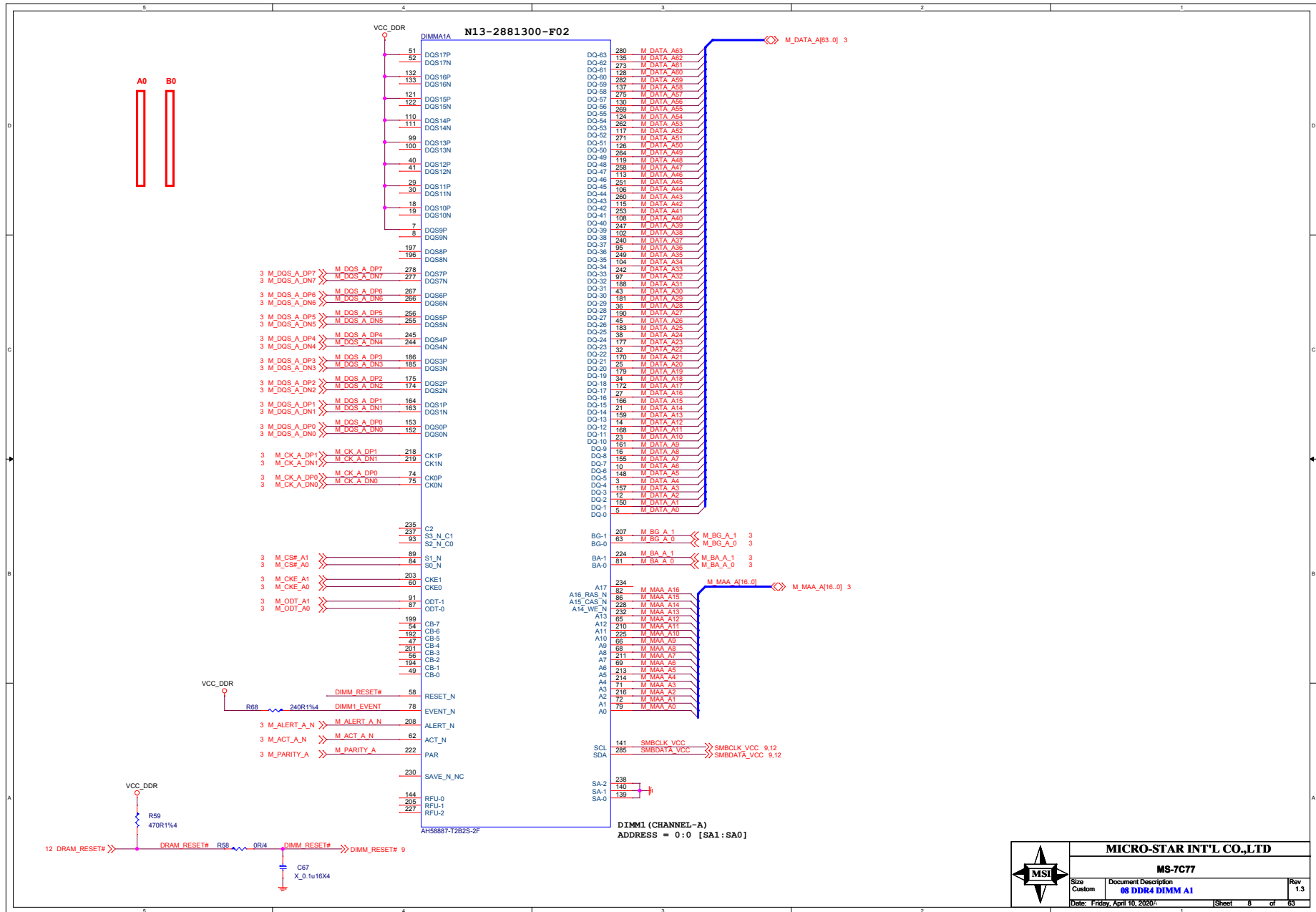




MICRO-STAR INT'L CO.,LTD

MS-7C77

Size	Document Description	Rev
Custom	07 CPU-GND	1.3
Date: Friday, April 10, 2020		Sheet 7 of 63

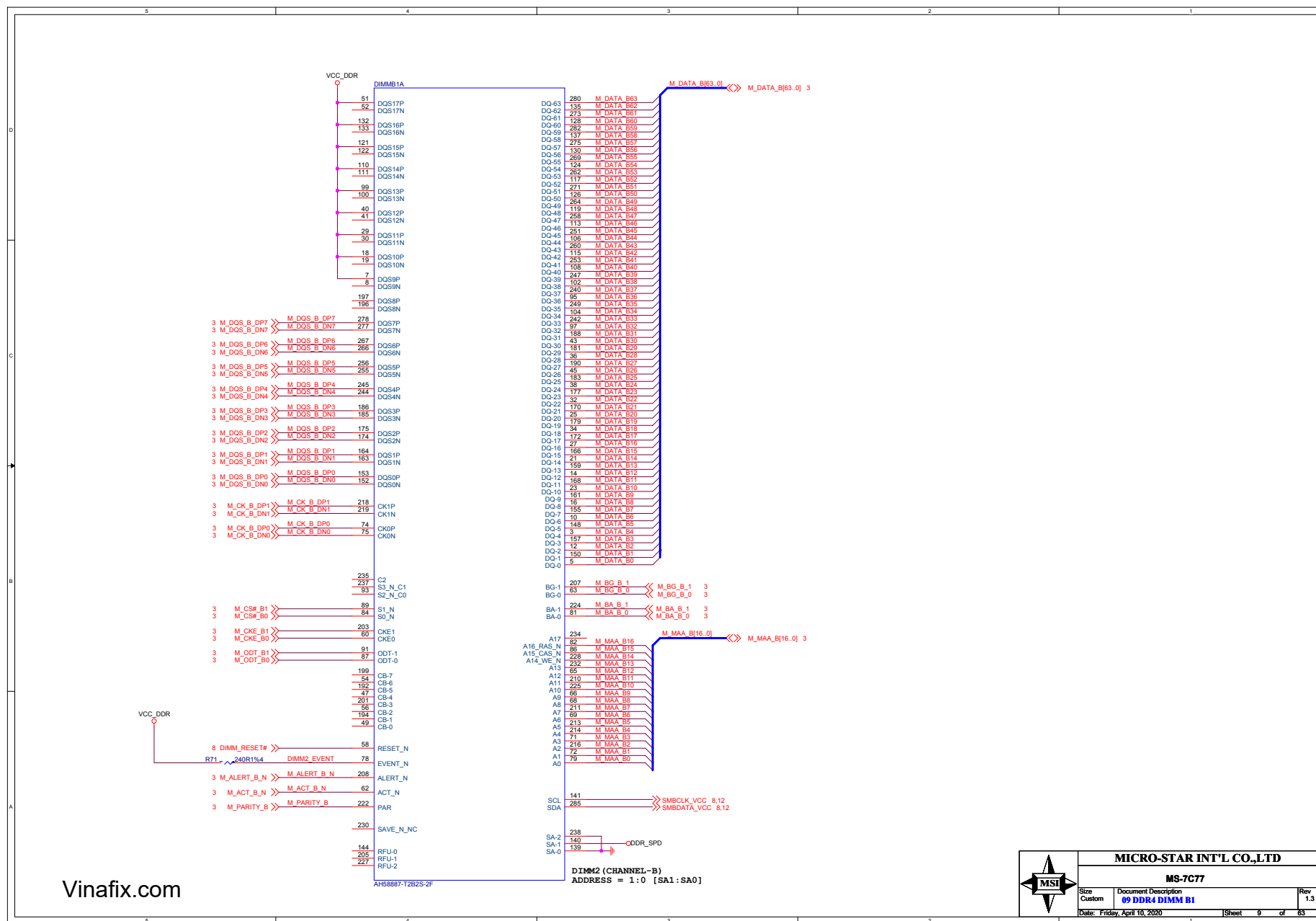


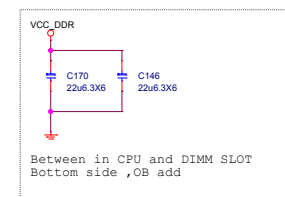
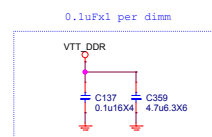
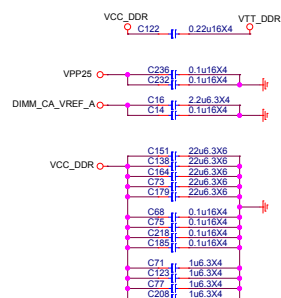
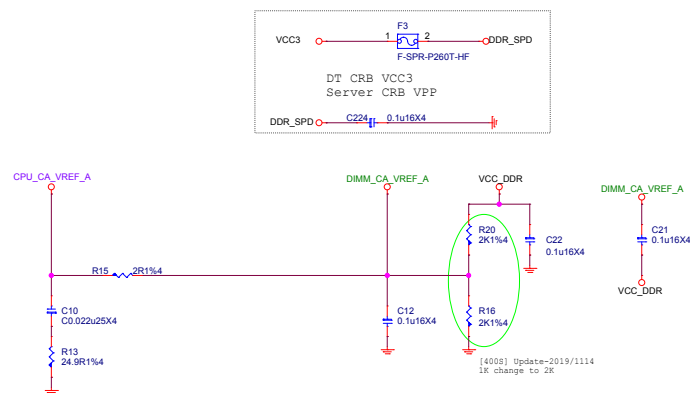
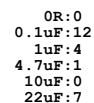
**MICRO-STAR INT'L CO.,LTD**

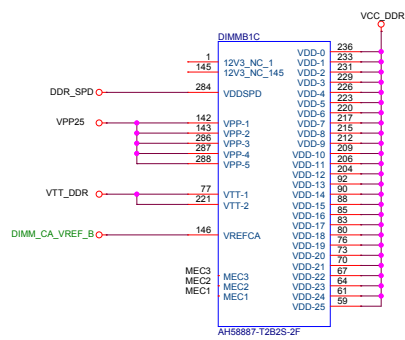
**MS-7C77**

Size	Custom	Document Description	Rev
		<b>08 DDR4 DIMM A1</b>	<b>1.3</b>
Date:	Friday, April 10, 2020	Sheet	8 of 63

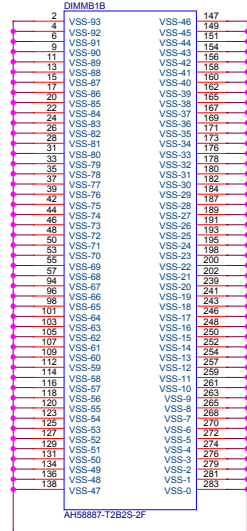
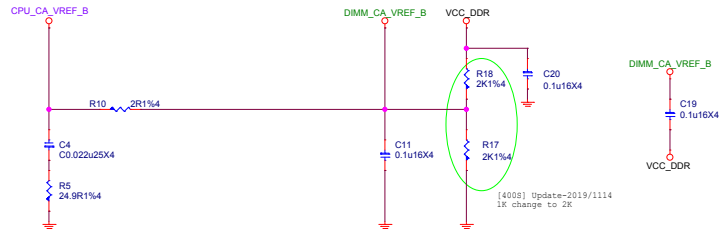
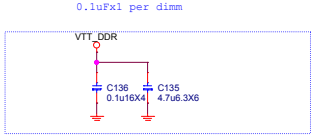
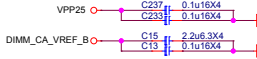
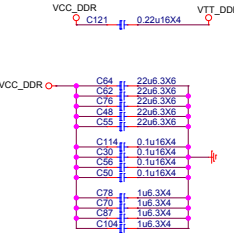


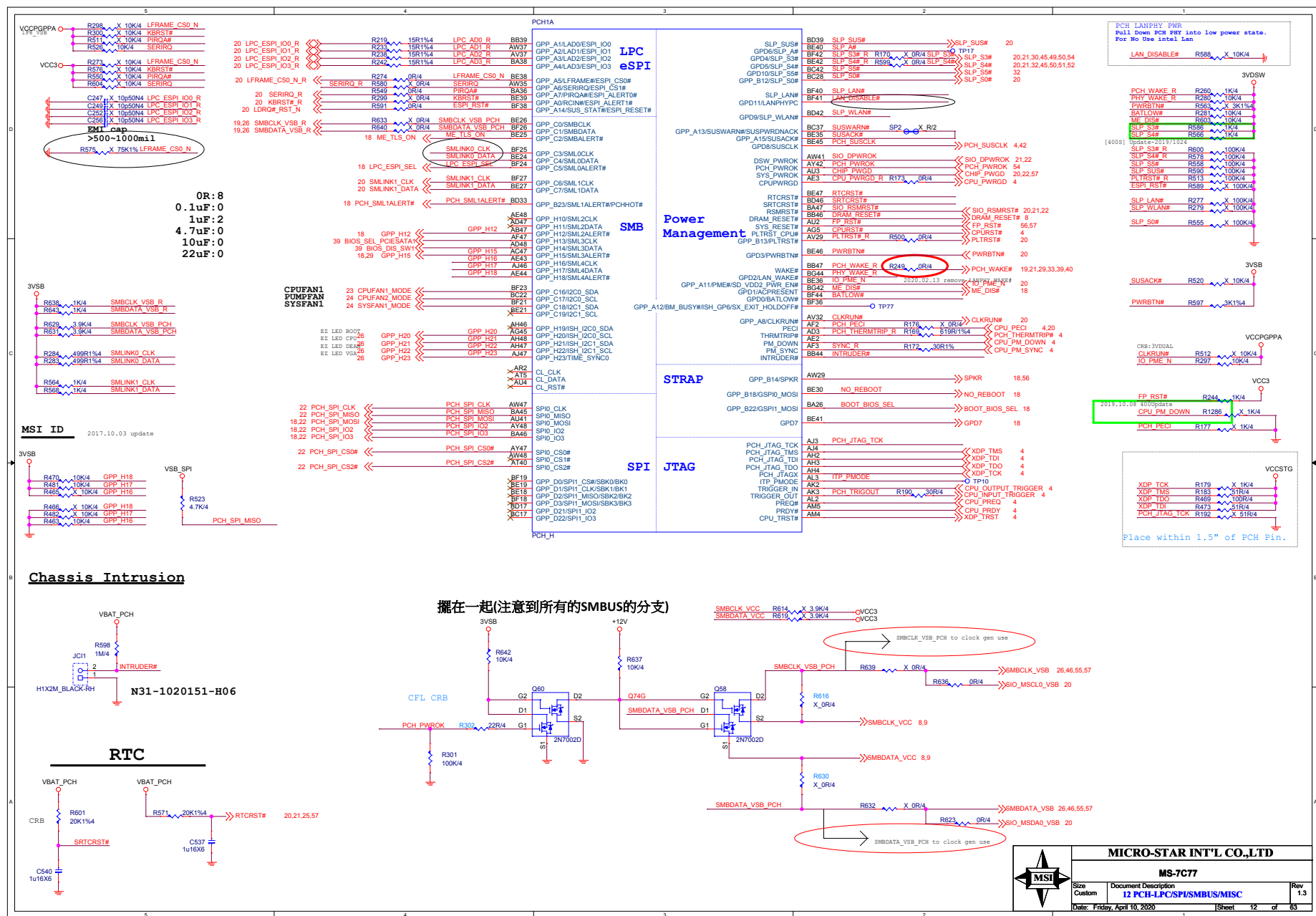




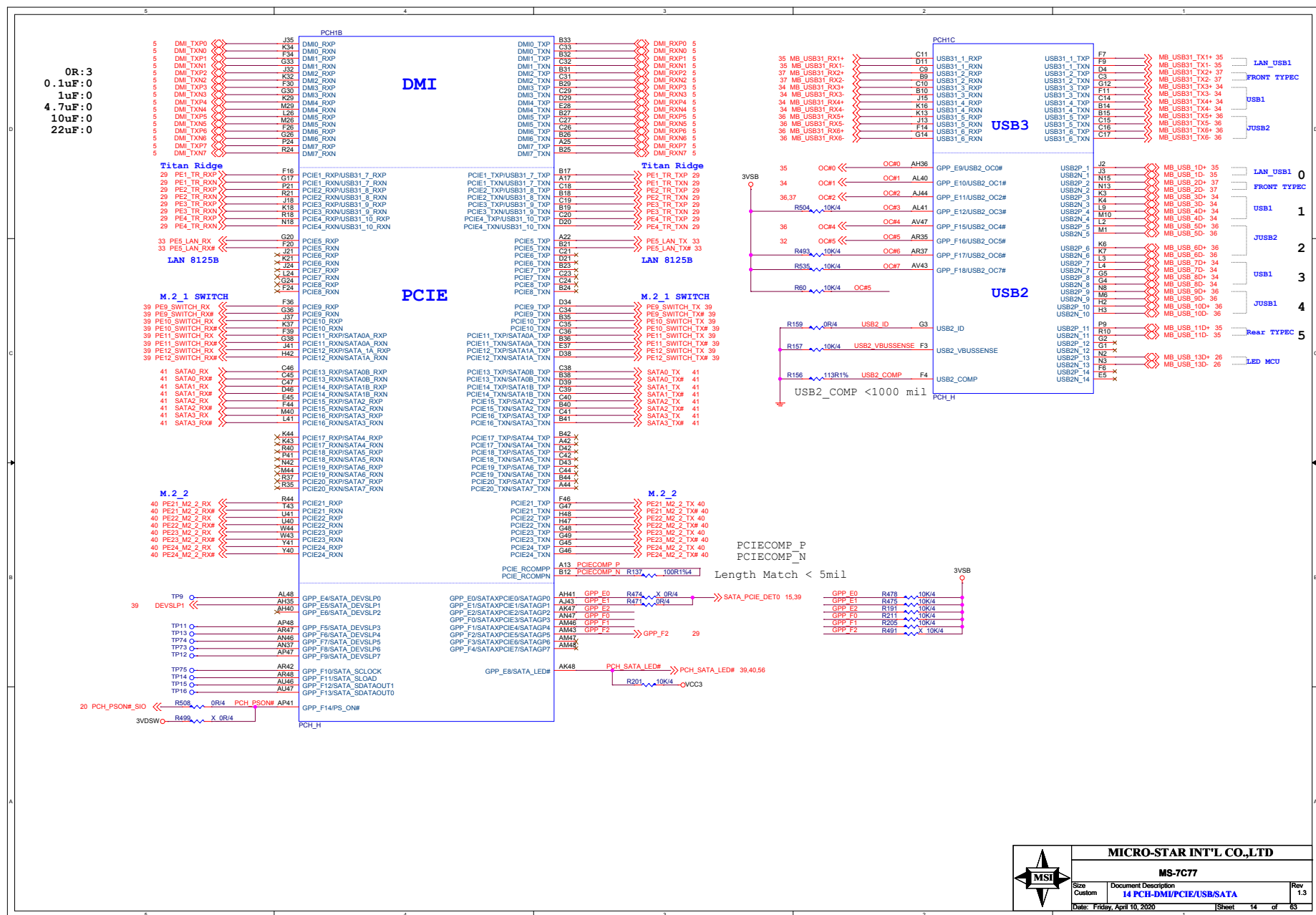


OR:0  
0.1uF:11  
1uF:4  
4.7uF:1  
10uF:0  
22uF:5









0R:3  
0.1uF:0  
1uF:0  
4.7uF:0  
10uF:0  
22uF:0



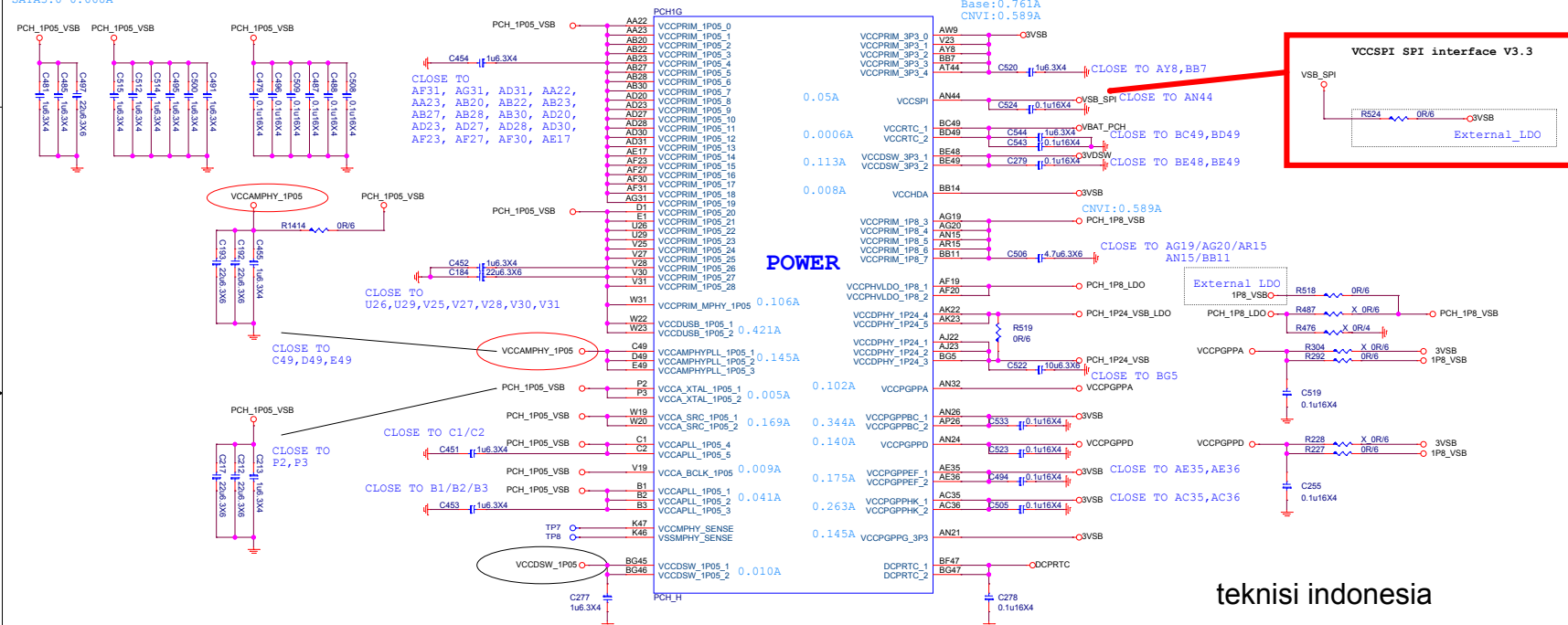
3VSB  
Total  $2.437A + 0.14A = 2.577A$   
PCH 1P8 VSB  
Total  $0.772A + 0.14A = 0.912A$

```

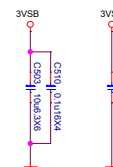
    OR: 5
0.1uF: 18
 1uF: 17
4.7uF: 0
10uF: 2
22uF: 6

```

```
Base 7.169A
Base other 1.089A
DMI Gen3 0.5A
PCIE Gen3 1.602A
USB3.1 Gen1 1.062A
SATA3.0 0.668A
```



teknisi indonesia



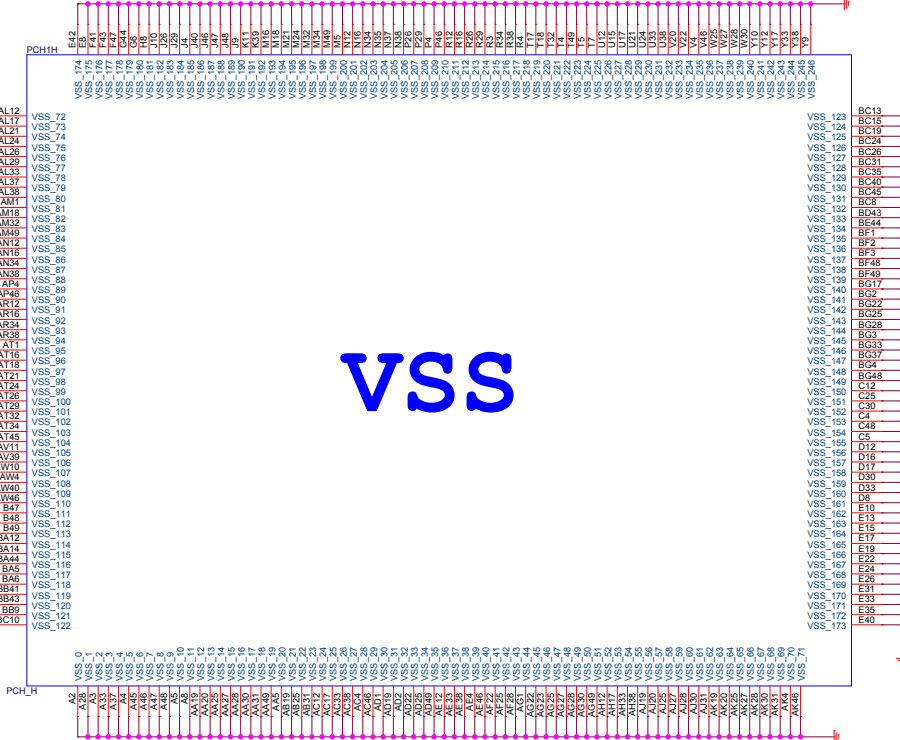
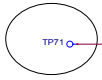
MS-7C77

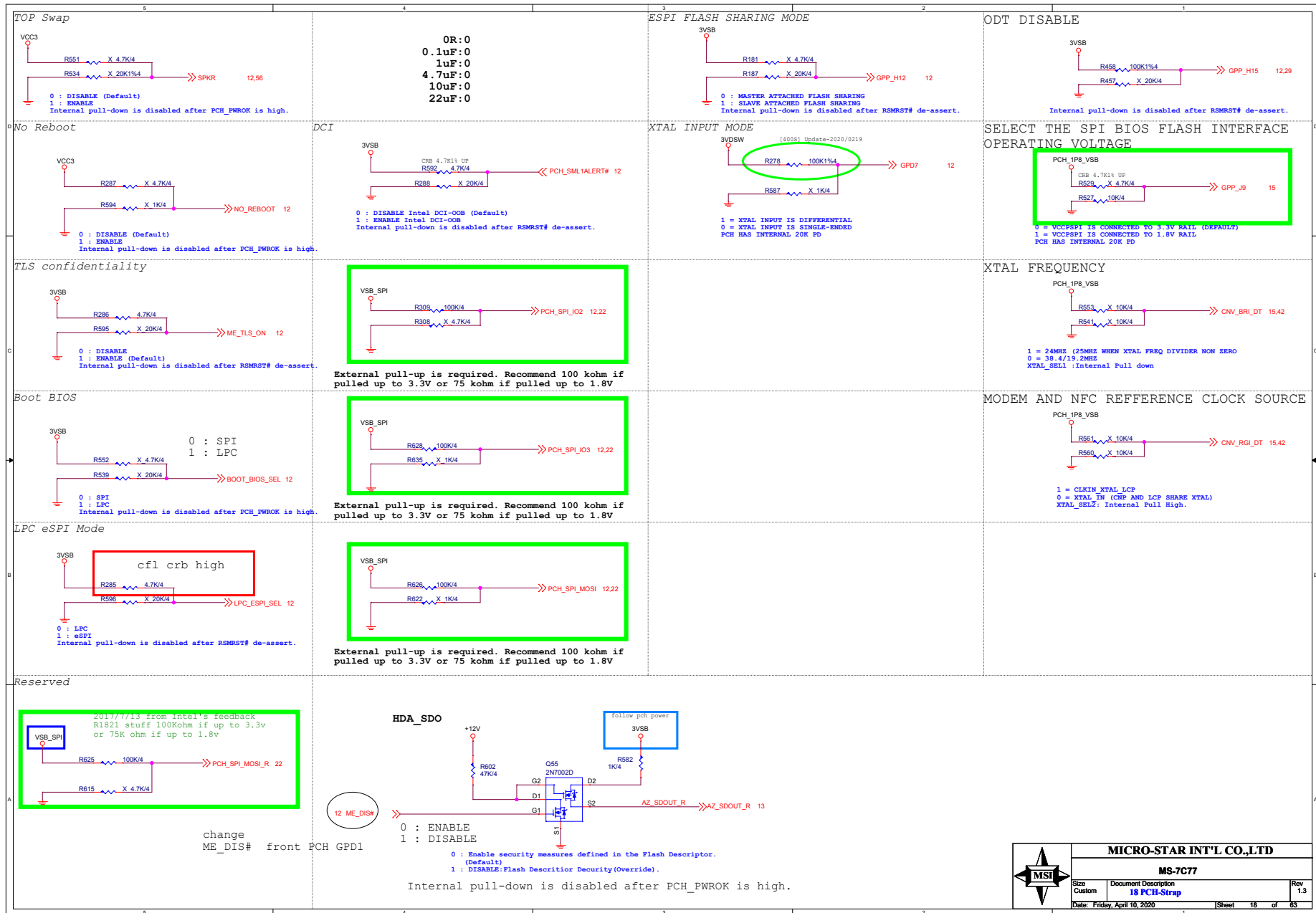
Size Custom	Document Description <b>16 PCH-Power</b>	Rev 1.3
Date: Friday, April 10, 2020		Sheet 16 of 63

Rev	1.3
-----	-----

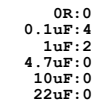


VSS





```
3VSB:0.375A(wake)
3VSB:0.02A (no wake)
VCC3:3A
+12V:5.5A
```



Vinafix.com

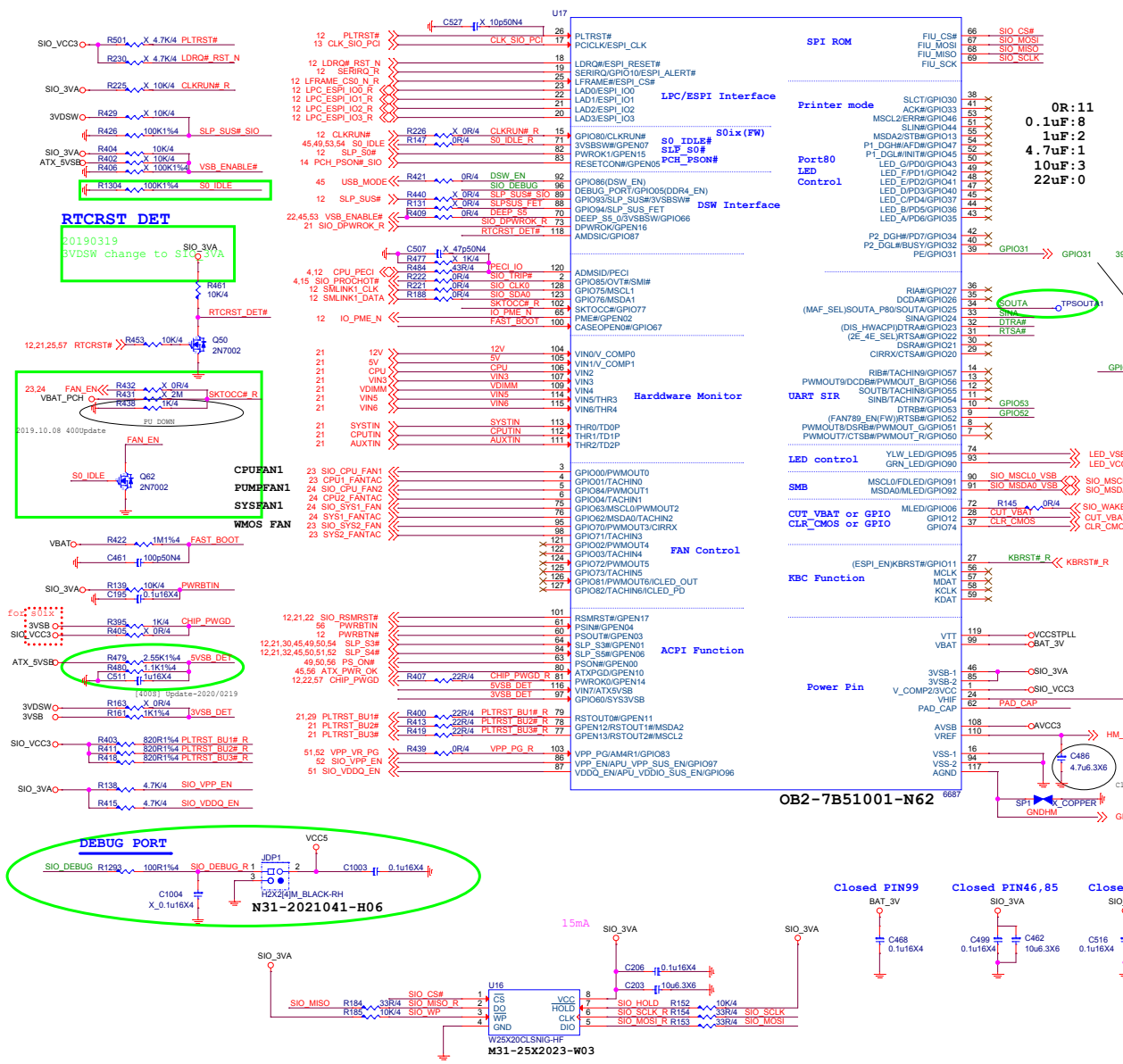


MS-7C77

Rev	1.3
-----	-----

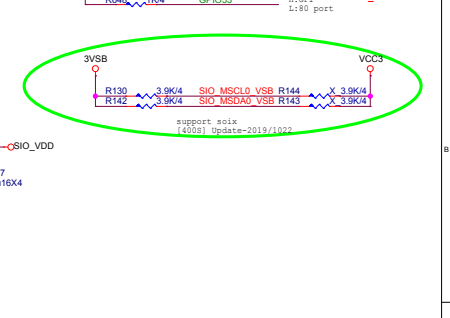
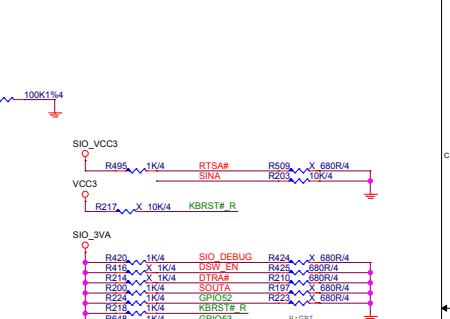
Date: Friday, April 10, 2020

Sheet 19 of 63



POWER ON STRAPPING PIN FOR NCT6687

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 enable	DSW disable	3VA
96	DDR4_EN	SIO_DEBUG	DDR4 control enable	DDR4 control disable	3VA
9	FAN789_EN (FW setting)	GPI052	FAN789 disable	FAN789 enable	3VA
PIN	NAME	Circuit NAME	VCC3	3VA	Strap Point
27	ESPI_EN	KBRST#	LPC	ESPI	VCC3 or 3VA



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

**MS-7C77**

Size Custom	Document Description 20 SIO-NCT6687D-1	Rev 1.3
Date: Friday, April 10, 2020	Sheet 20	of 63



A

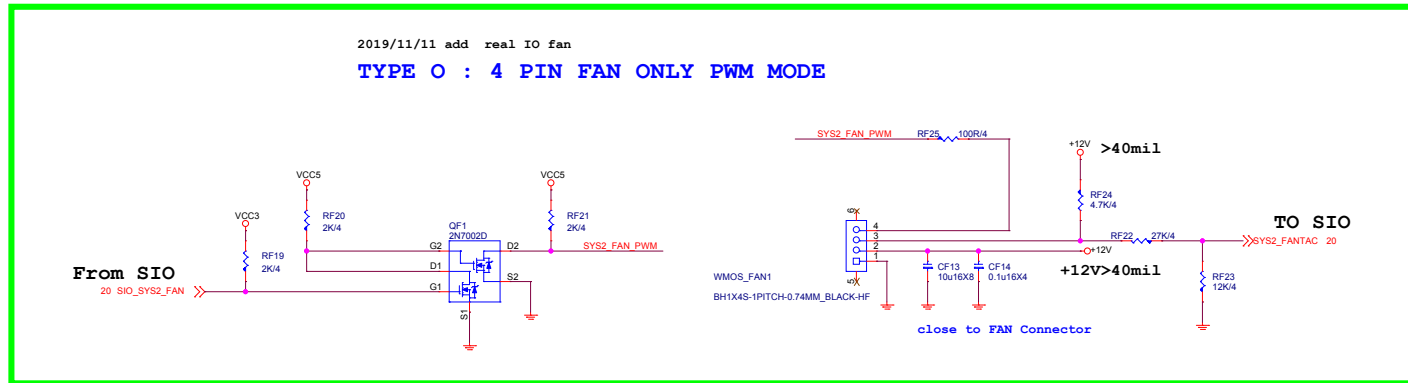
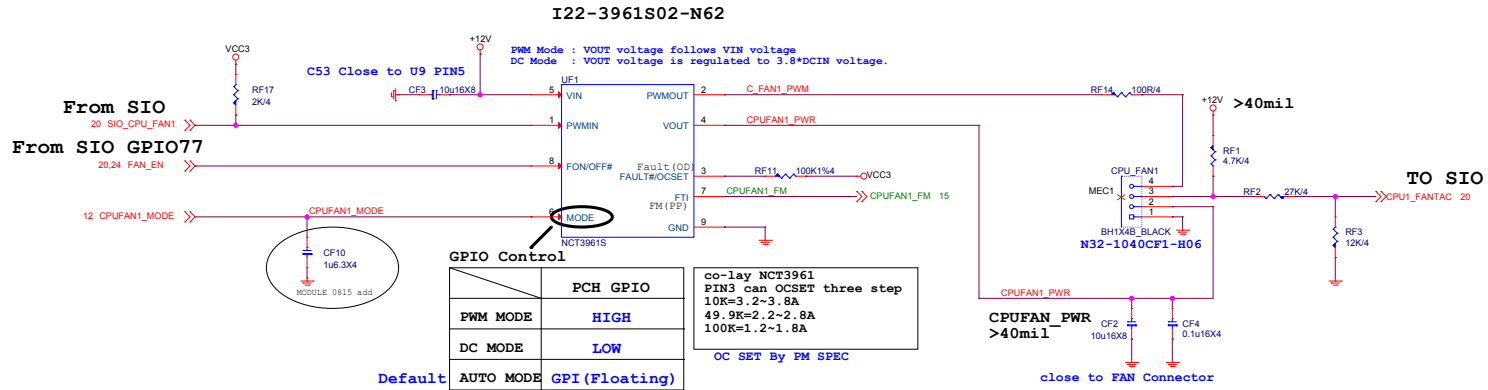


# TYPE N : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can swtich PWM/DC MODE

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

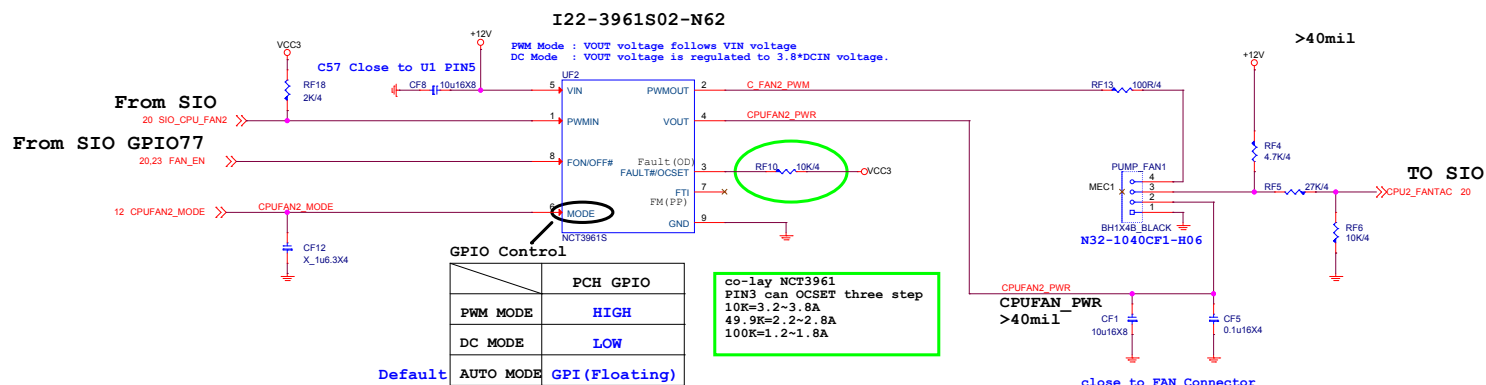
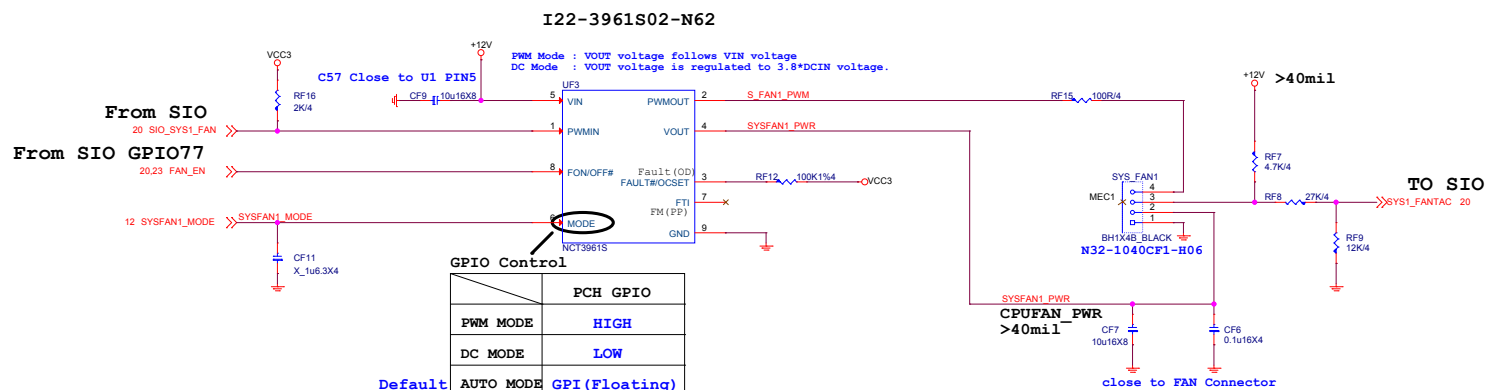
OR:0  
0.1uF:2  
1uF:1  
4.7uF:0  
10uF:3  
22uF:0



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

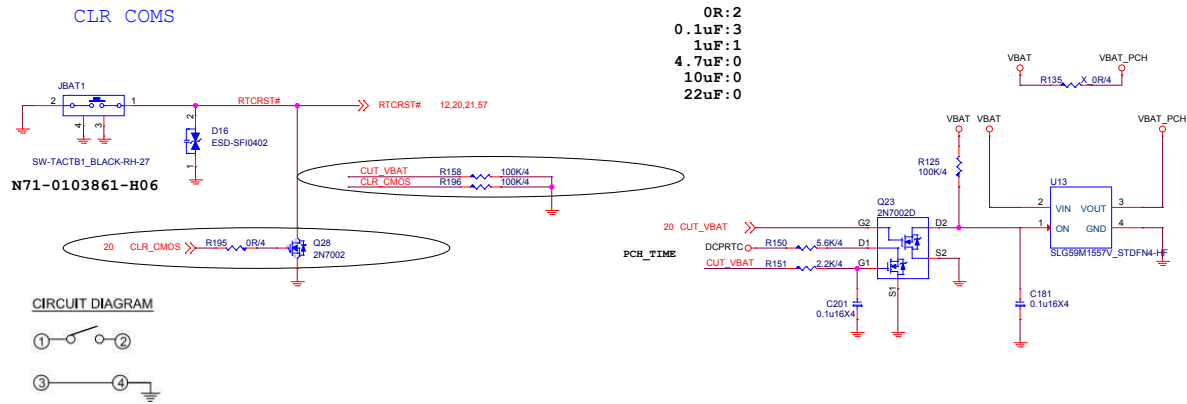
1.Mode GPIO BIOS can switch PWM/DC MODE

0R:2  
0.1uF:2  
1uF:0  
4.7uF:0  
10uF:4  
22uF:0

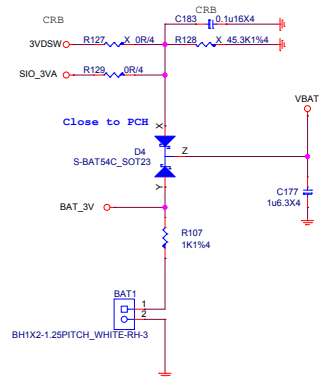




## CLR COMS



## VBAT



MICRO-STAR INT'L CO.,LTD

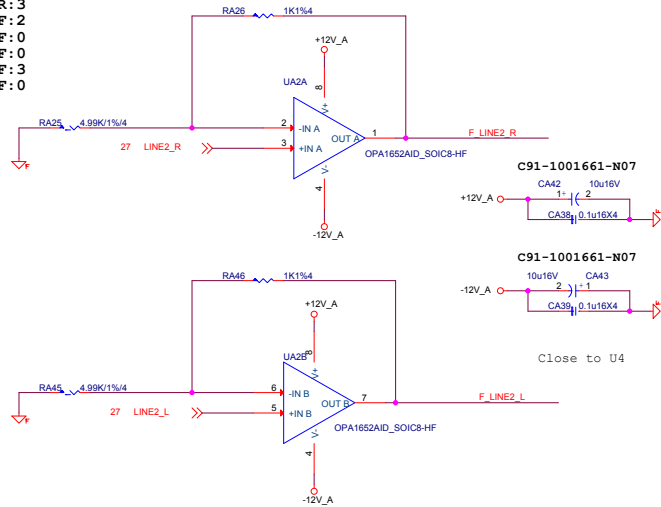
MS-7C70

Size Custom	Document Description 25 VBAT/CLR COMS	Rev 1.3
Date: Friday, April 10, 2020	Sheet 25 of 63	





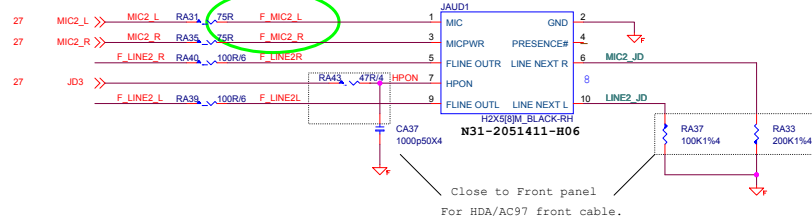
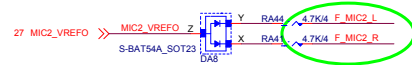
0R:3  
0.1uF:2  
1uF:0  
4.7uF:0  
10uF:3  
22uF:0



C91-1001661-N07

C91-1001661-N07

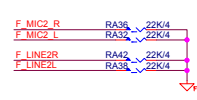
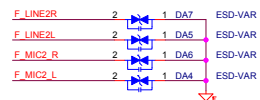
Close to U4



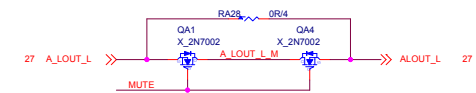
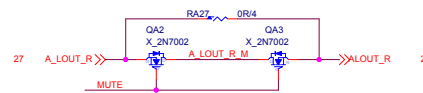
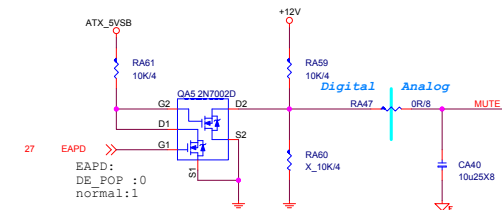
Close to Front panel  
For HDA/AC97 front cable.

Close to Jack

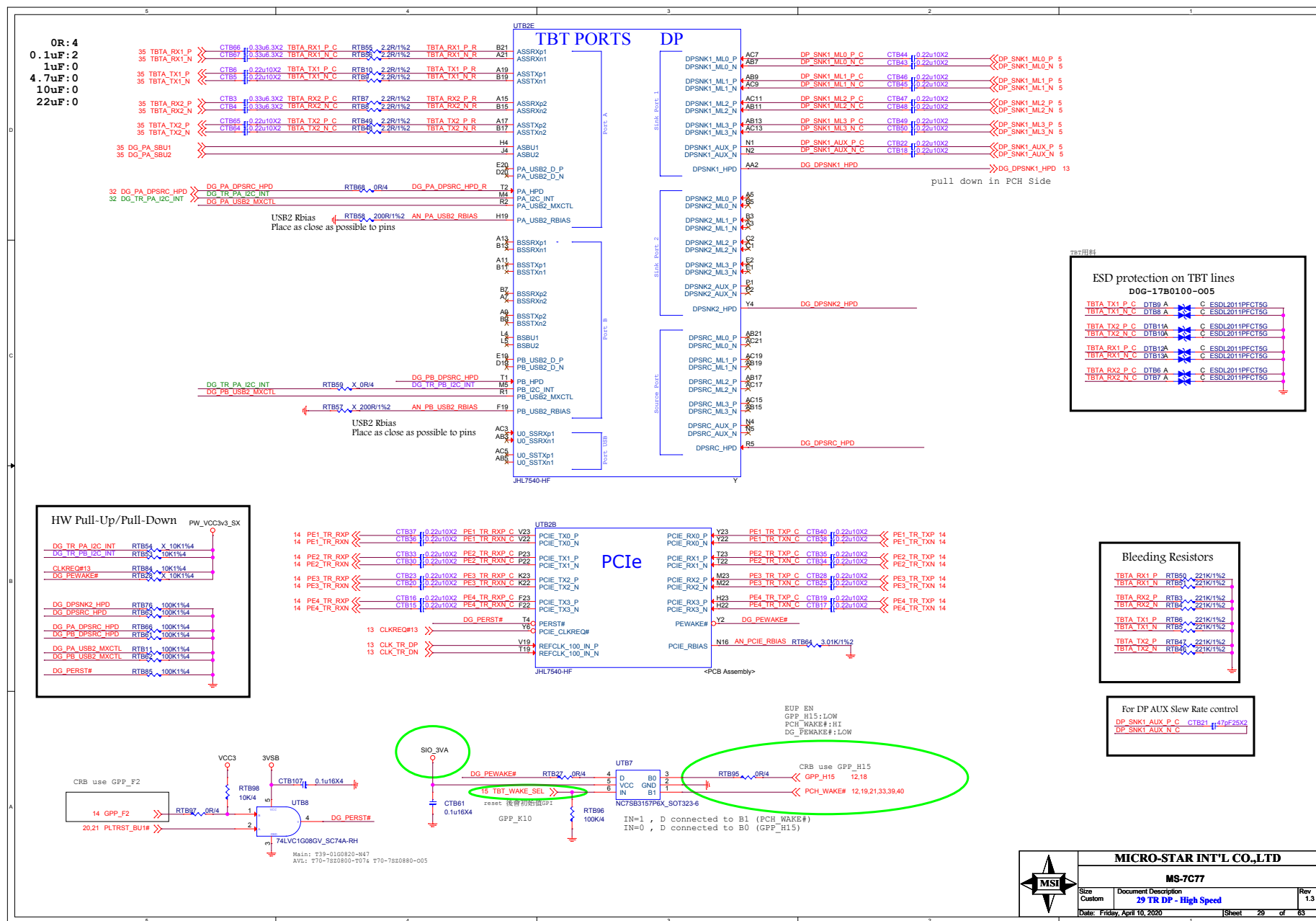
ESD protect



## De-POP circuit



Vinafix.com



[illegible]

HW Pull-Up/Pull-Down

DG EE CS#	RTB82	2.2K/2
DG EE DQ	RTB83	2.2K/2
DG EE WP#	RTB50	3.30K/1%2
DG EE HOLD#	RTB7	3.32K/1%2
DG I2C SDA	RTB24	2.2K/2
DG I2C SCL	RTB25	2.2K/2
DG RS7#	RTB52	X 10K/1%2
DG GPIO3	RTB75	X 10K/1%2
DG BATLOW#	RTB14	10K/1%2


DG JTAG TDI	RTB69	10K1%4
DG JTAG TMS	RTB72	10K1%4
DG JTAG TCK	RTB67	10K1%4
DG JTAG TDO	RTB73	10K1%4

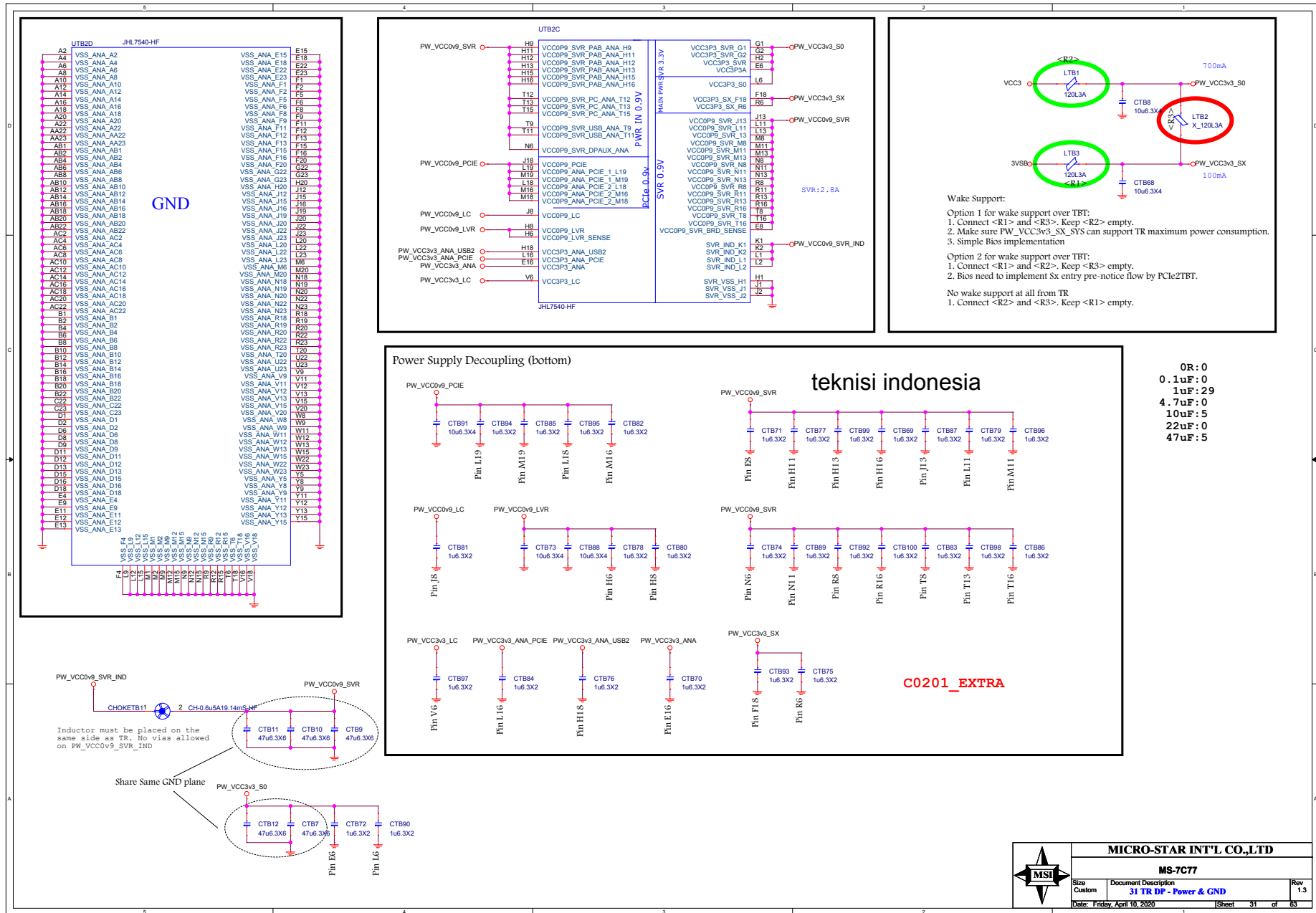
Pin 1 to 4 connection diagram for M31-25Q8013-W03. The diagram shows a blue box representing the device with pins 1 through 8. Pin 1 is labeled 'DG\_EE\_CS#', pin 2 'DG\_EE\_DO', pin 3 'DG\_EE\_WP#', and pin 4 is connected to ground. On the right side, pin 8 is 'VCC', pin 7 is 'HOLD#', pin 6 is 'DG\_EE\_CLK', and pin 5 is 'DG\_EE\_DI'. The device is identified as 'W25Q80DVSSIG-HF' and 'M31-25Q8013-W03'.

Figure 10 illustrates the RTB pin connections for the RTB86 and RTB70/RTB80. The diagram shows three connection options for the RTB pins, each connected to a pull-up resistor and then to a power supply pin.

- Option 1:** DG\_GPIO8 is connected to RTB86 (10K/1%2) and RTB81 (X 2.2K2), which are then connected to PW\_VCC3v3\_SX.
- Option 2:** DG\_FORCE\_PWR is connected to RTB70 (X 10K/1%2) and RTB71 (100K/1%2), which are then connected to PW\_VCC3v3\_S0.
- Option 3:** DG\_GPIO0 is connected to RTB78 (X 10K/1%2) and RTB80 (100K/1%2), which are then connected to PW\_VCC3v3\_SX.

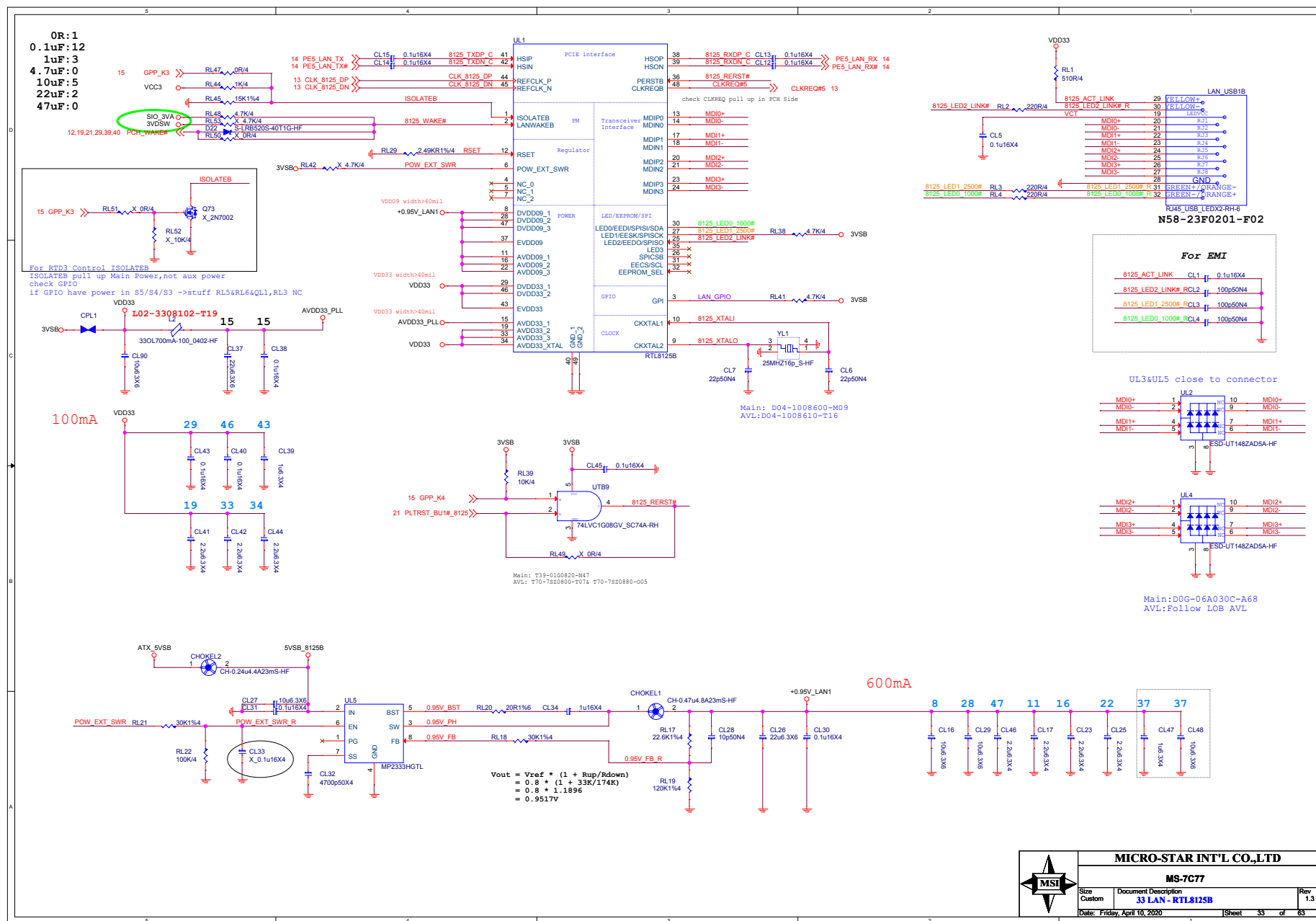
Default is 2.2 KOHmpull-up

	<b>MICRO-STAR INT'L CO.,LTD</b>		
	<b>MS-7C77</b>		
	Size Custom	Document Description <b>30 TR DP - Misc</b>	Rev 1.3
	Date: Friday, April 10, 2020		Sheet 30 of 33

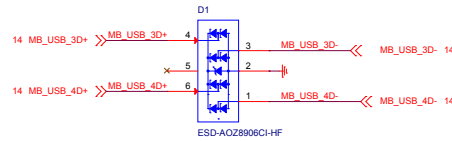
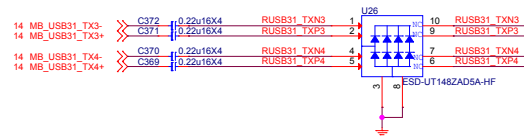
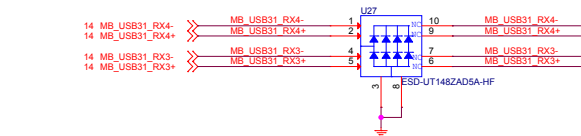




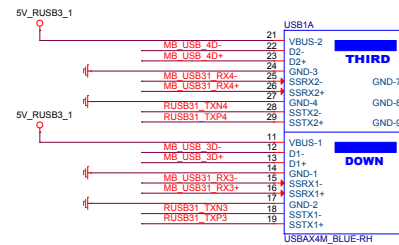
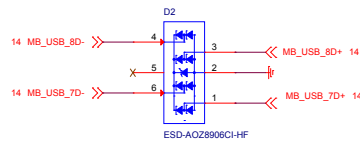




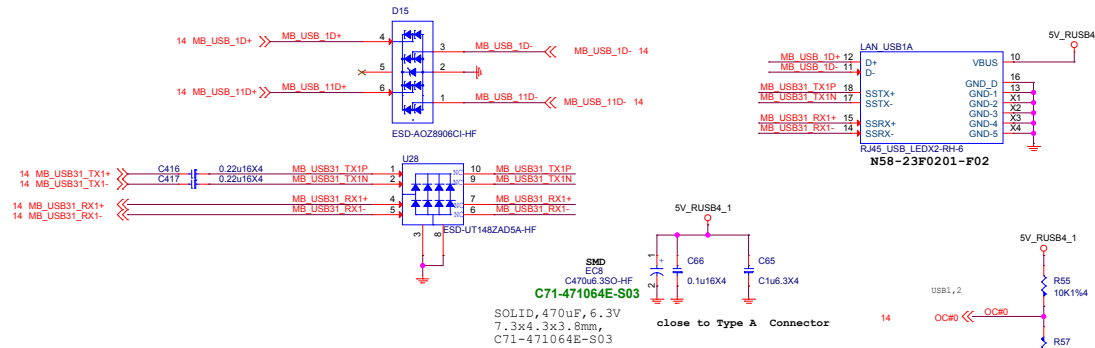
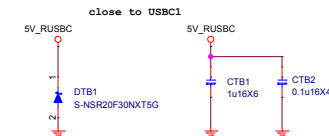
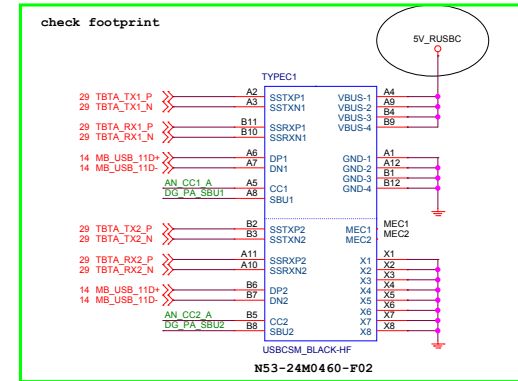
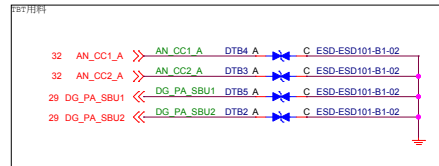
OR: 0  
0.1uF: 2  
1uF: 2  
4.7uF: 0  
10uF: 0  
22uF: 0  
47uF: 0



**ESD Protection**  
**NEAR CONNECTOR**  
**D0G-05A0529-A68**



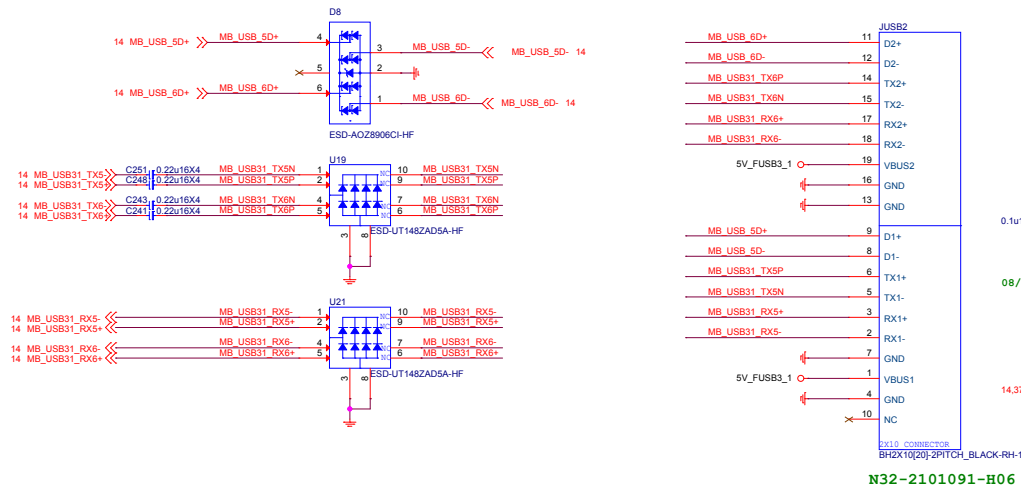
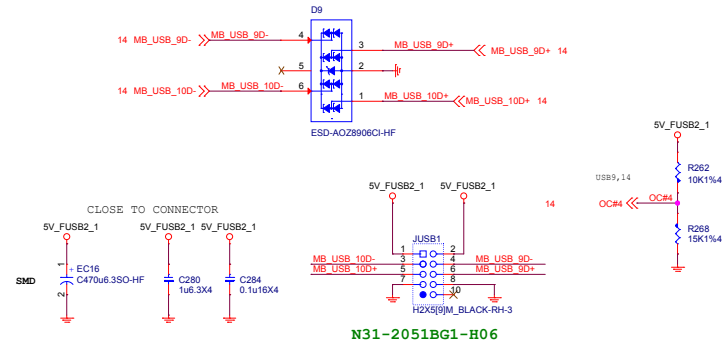
0R:0  
0.1uF:2  
1uF:1  
4.7uF:0  
10uF:0  
22uF:0  
47uF:0

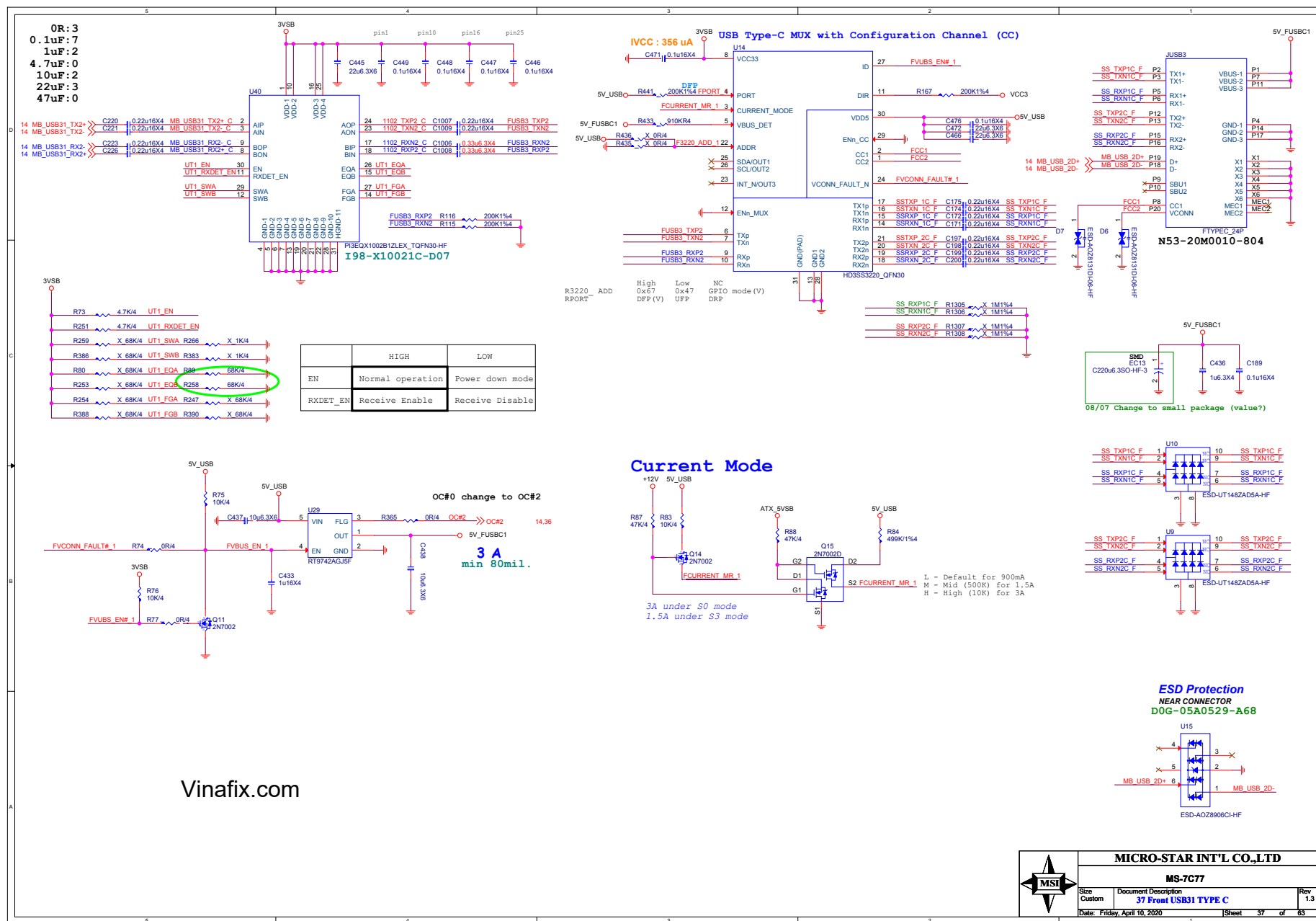


teknisi indonesia

MICRO-STAR INT'L CO.,LTD			
MS-7C77			
Size	Document Description	Rev	
Custom	35 Rear-USB31 TYPEA+TYPE C	1.3	
Date: Friday, April 10, 2020	Sheet	35	of 63

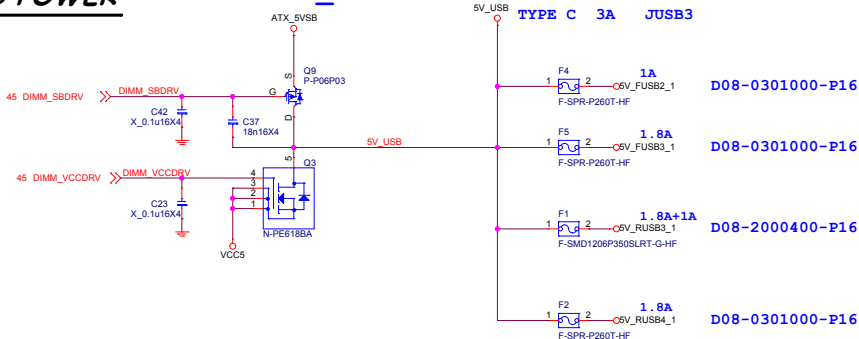
OR:0  
0.1uF:2  
1uF:2  
4.7uF:0  
10uF:0  
22uF:0  
47uF:0





## USB POWER

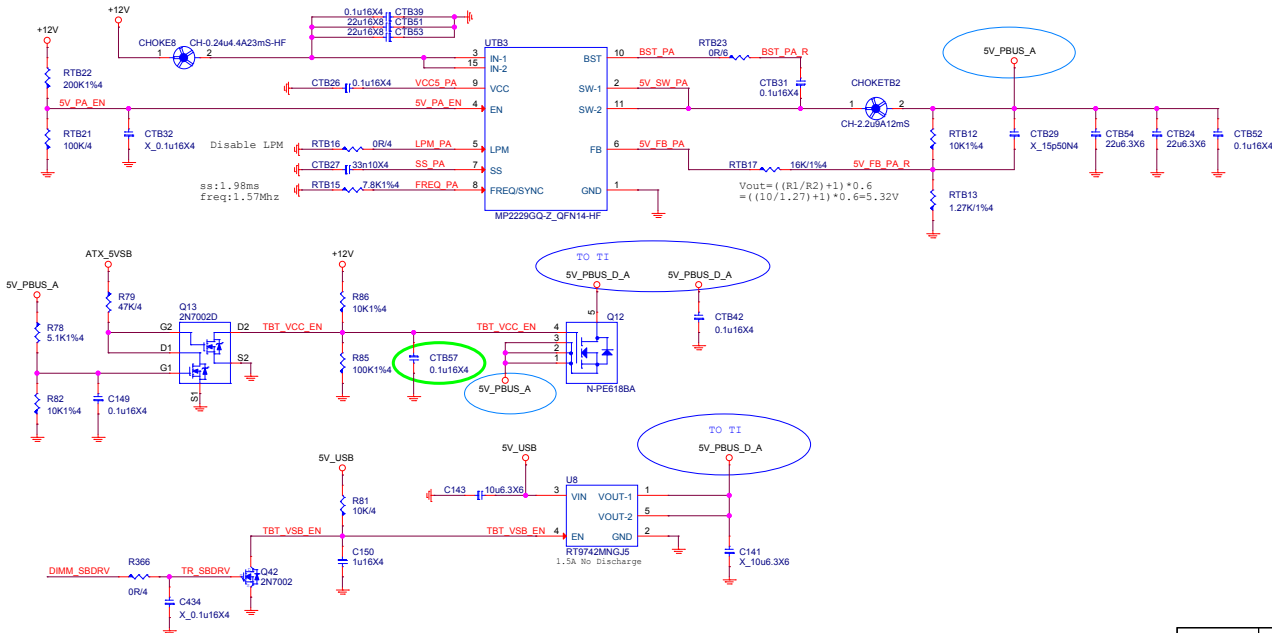
5V USB:10.4A



```

0R:3
0.1uF:7
1uF:1
4.7uF:0
10uF:1
22uF:4
47uF:0

```



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

MS-7C77

Size	Document Description
Custom	<b>38 USB POWER</b>

Date: Friday, April 10, 2020

Rev  
1.

63

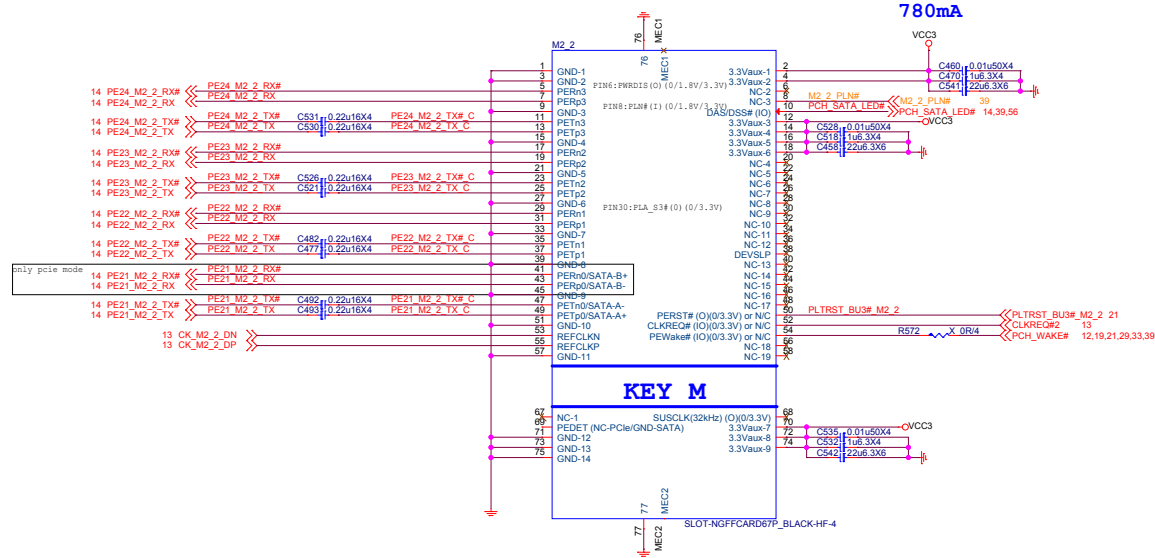
CPU SIDE



BIOS MODE		
GPP_R14 <u>BIOS_DIS_SW1</u>	GPP_R13 <u>BIOS_SEL_PCIESATA1</u>	<u>Mode</u>
0	1	M2-SATA
0	0	M2-PCIE
GPI	GPI	AUTO

<b>MICRO-STAR INT'L CO.,LTD</b>			
<b>MS-7C77</b>			
Size Custom	Document Description <b>39 M2_1 Connector</b>		Rev 1.3
Date: Friday, April 10, 2020/A		Sheet 39 of	63

0R:0  
0.1uF:0  
1uF:3  
4.7uF:0  
10uF:0  
22uF:3  
47uF:0



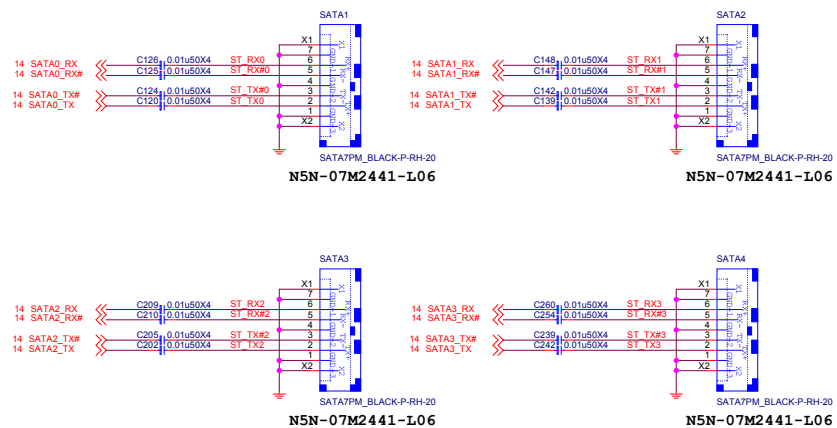
### KEY M

N15-0670030-F02

SCREW3  
SCREW  
E49-5303504-H75  
SCREW4  
SCREW  
X\_SCREW



# SATA GEN3

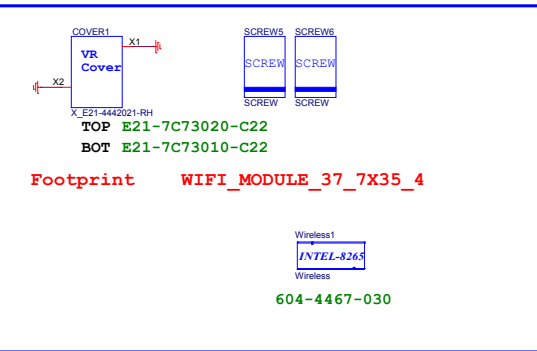


Vinafix.com

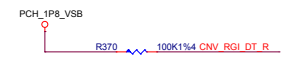
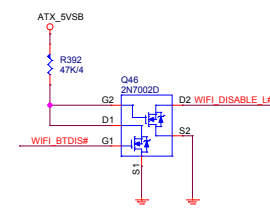
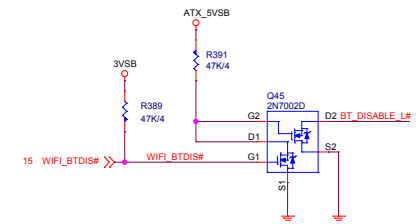
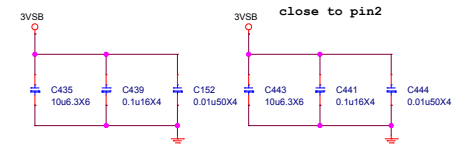
support BT&WIFI, not support LTE

0R:15  
0.1uF:2  
1uF:0  
4.7uF:0  
10uF:2  
22uF:0  
47uF:0

KEY E



1.36A PEAK CURRENT 9560



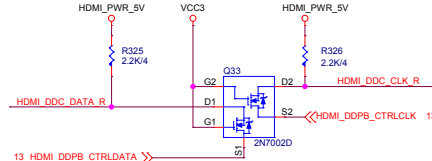
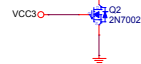
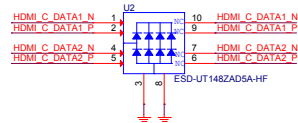
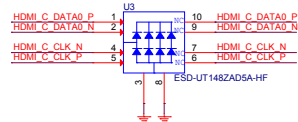
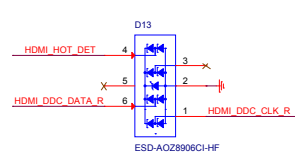
SLOT:NGFFCARD67P\_BLACK-HF-46  
N15-0670610-L06



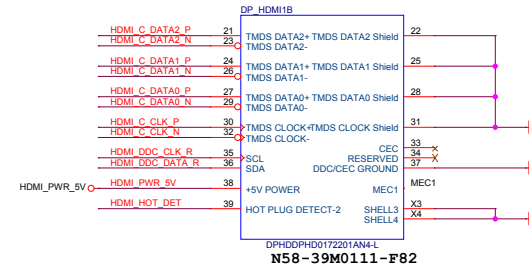
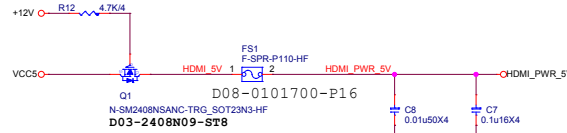
# HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)

5 HDMI\_DDPB\_CLK\_P << C17 0.1u16X4 HDMI\_C\_CLK\_P R19 470R/4 HDMI\_MOS\_DATA  
 5 HDMI\_DDPB\_CLK\_N << C18 0.1u16X4 HDMI\_C\_CLK\_N R21 470R/4  
 5 HDMI\_DDPB\_TX2\_P << C3 0.1u16X4 HDMI\_C\_DATA2\_P R1 470R/4  
 5 HDMI\_DDPB\_TX2\_N << C3 0.1u16X4 HDMI\_C\_DATA2\_N R4 470R/4  
 5 HDMI\_DDPB\_TX1\_P << C6 0.1u16X4 HDMI\_C\_DATA1\_P R7 470R/4  
 5 HDMI\_DDPB\_TX1\_N << C9 0.1u16X4 HDMI\_C\_DATA1\_N R14 470R/4  
 5 HDMI\_DDPB\_TX0\_P << C26 0.1u16X4 HDMI\_C\_DATA0\_P R27 470R/4  
 5 HDMI\_DDPB\_TX0\_N << C26 0.1u16X4 HDMI\_C\_DATA0\_N R24 470R/4

HDMI\_MOS\_DATA trace length < 500mil  
 Other platform please check your design guide length

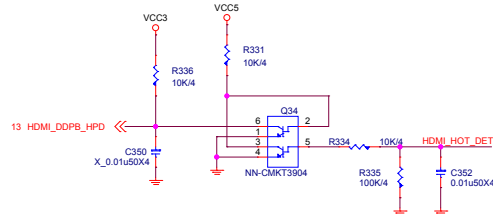


HDMI\_DDC\_DATA RC339 X 10u50N4  
 HDMI\_DDC\_CLK\_R C340 X 10u50N4

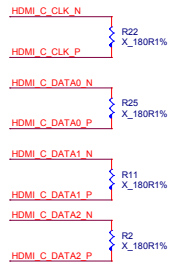


0R:0  
 0.1uF:9  
 1uF:0  
 4.7uF:0  
 10uF:0  
 22uF:0  
 47uF:0

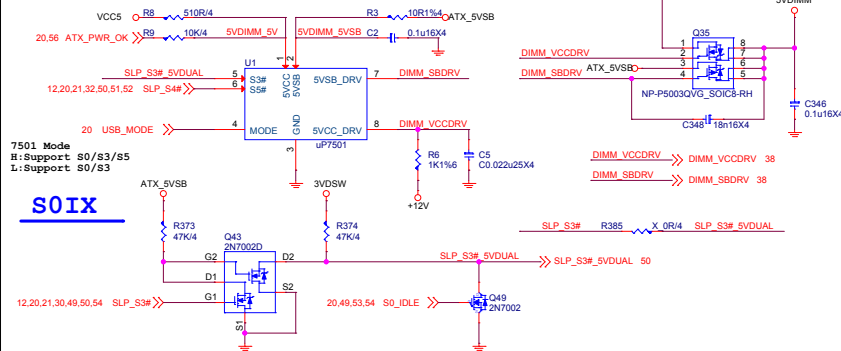
## HPD



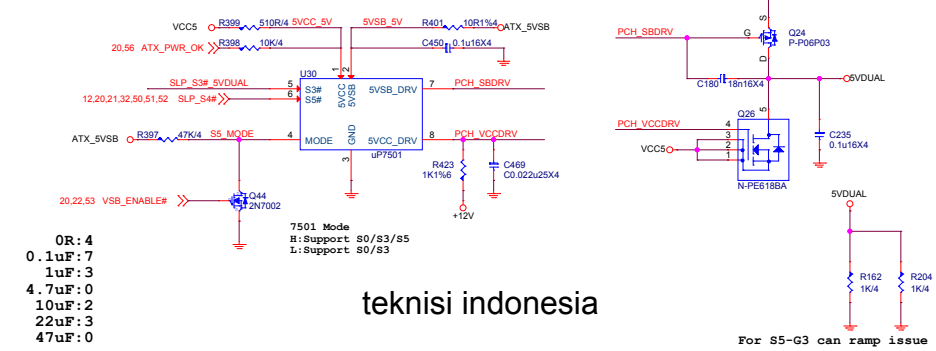
## For EMI



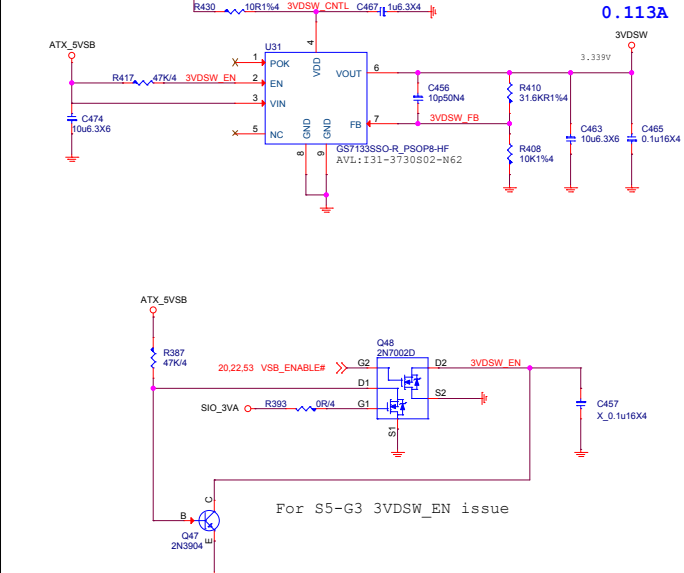
## 5VDIMM& USB POWER



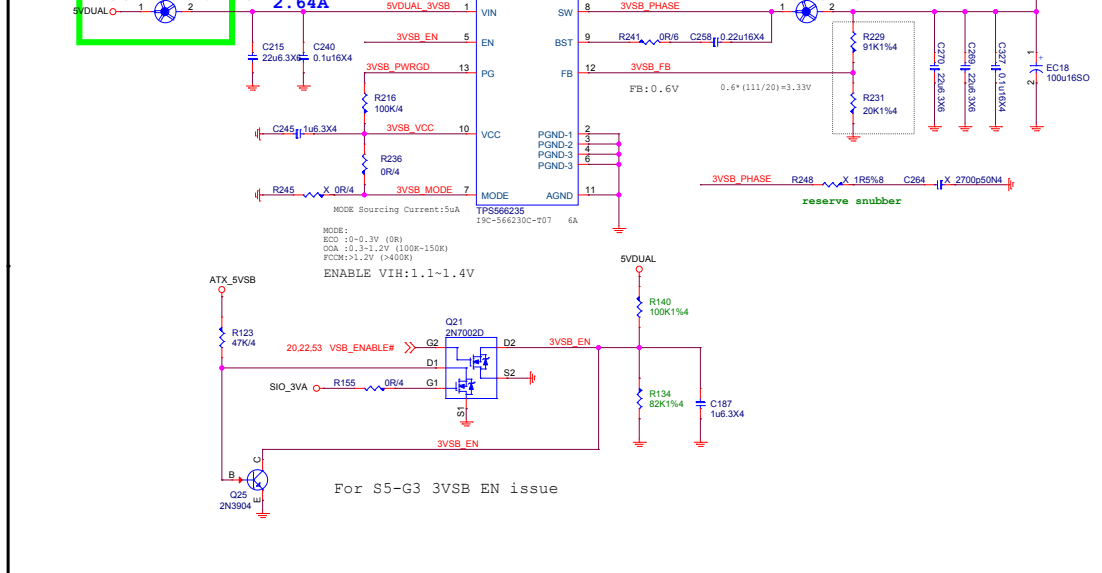
## 5VDUAL

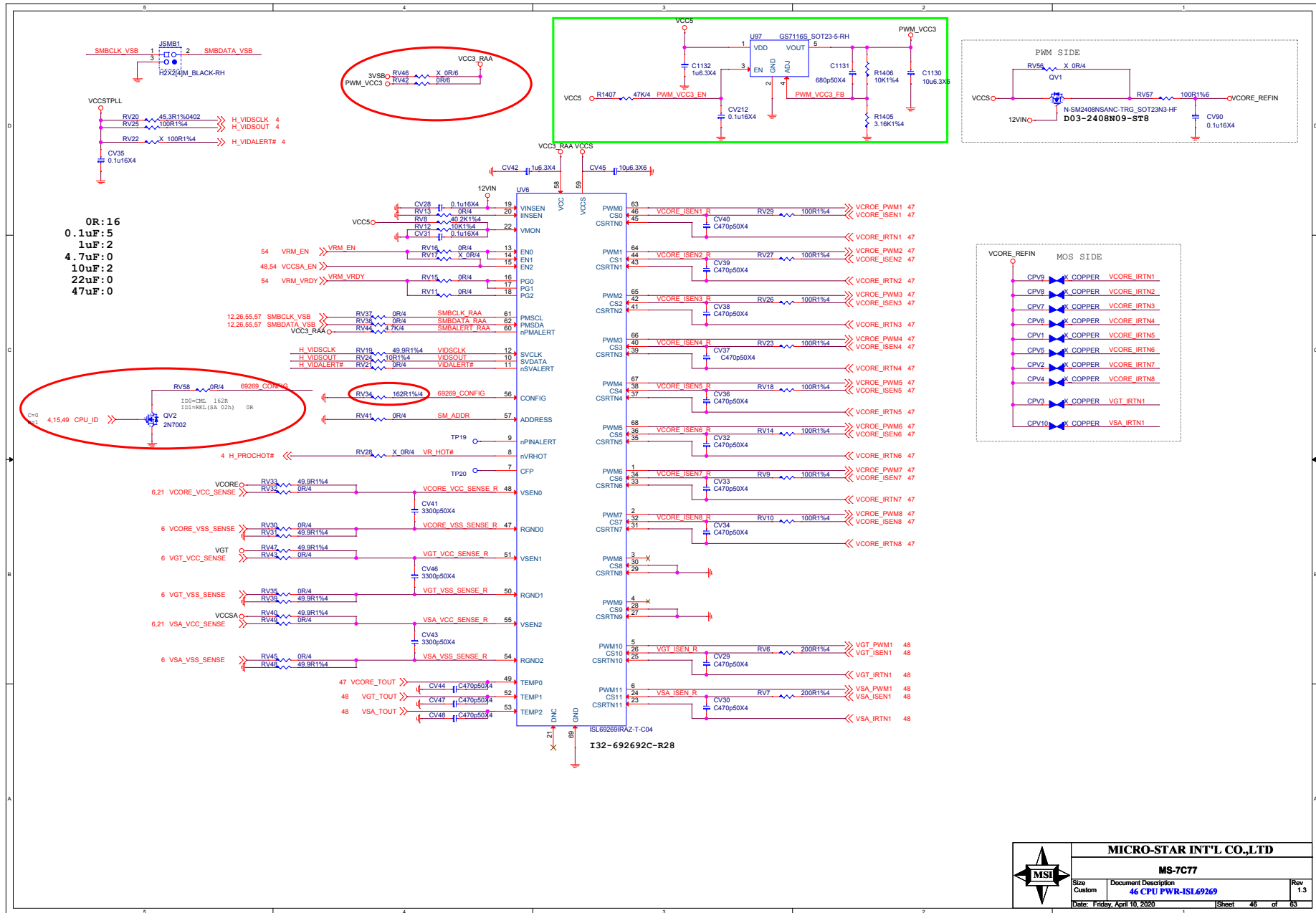


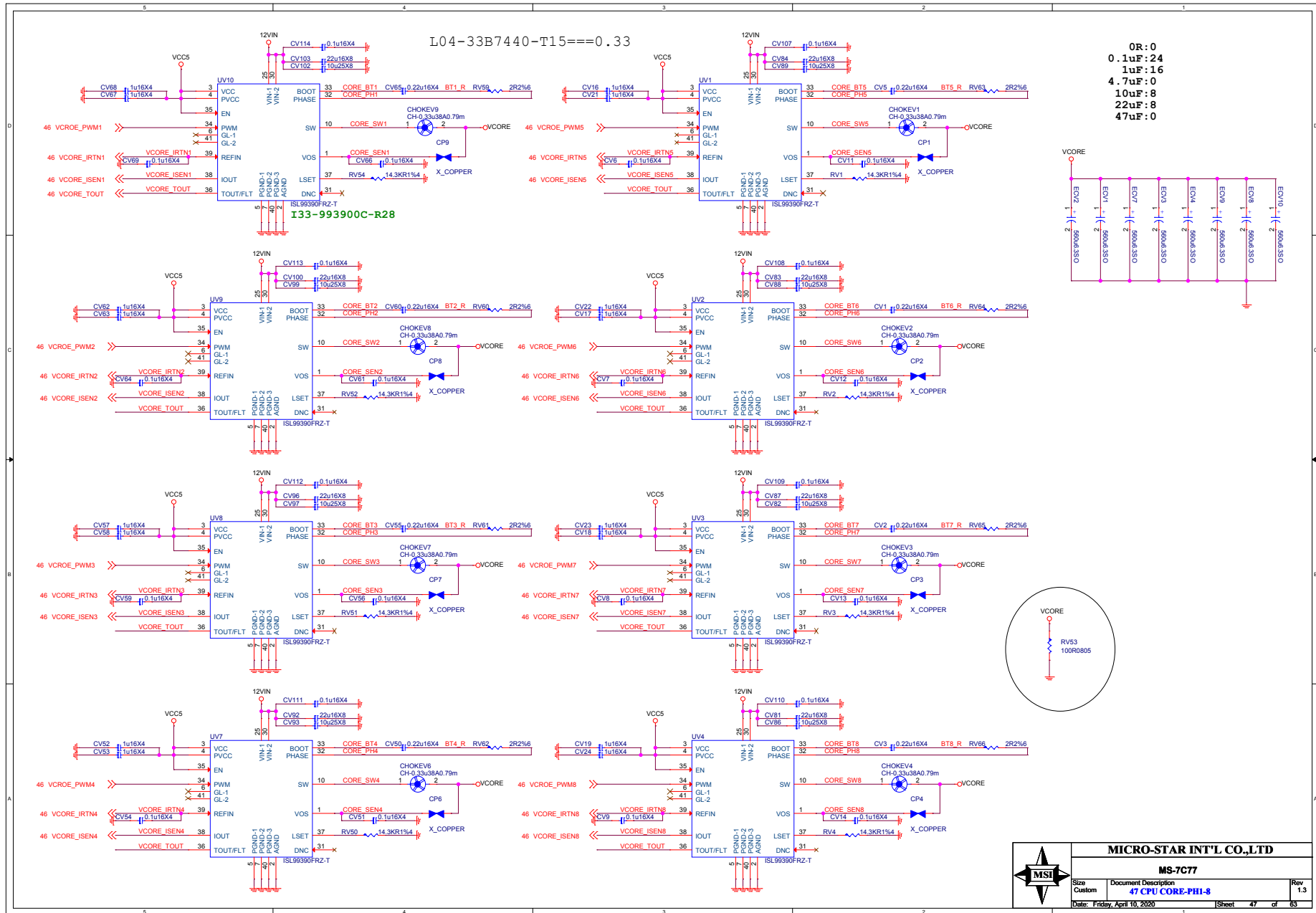
## 3VDSW

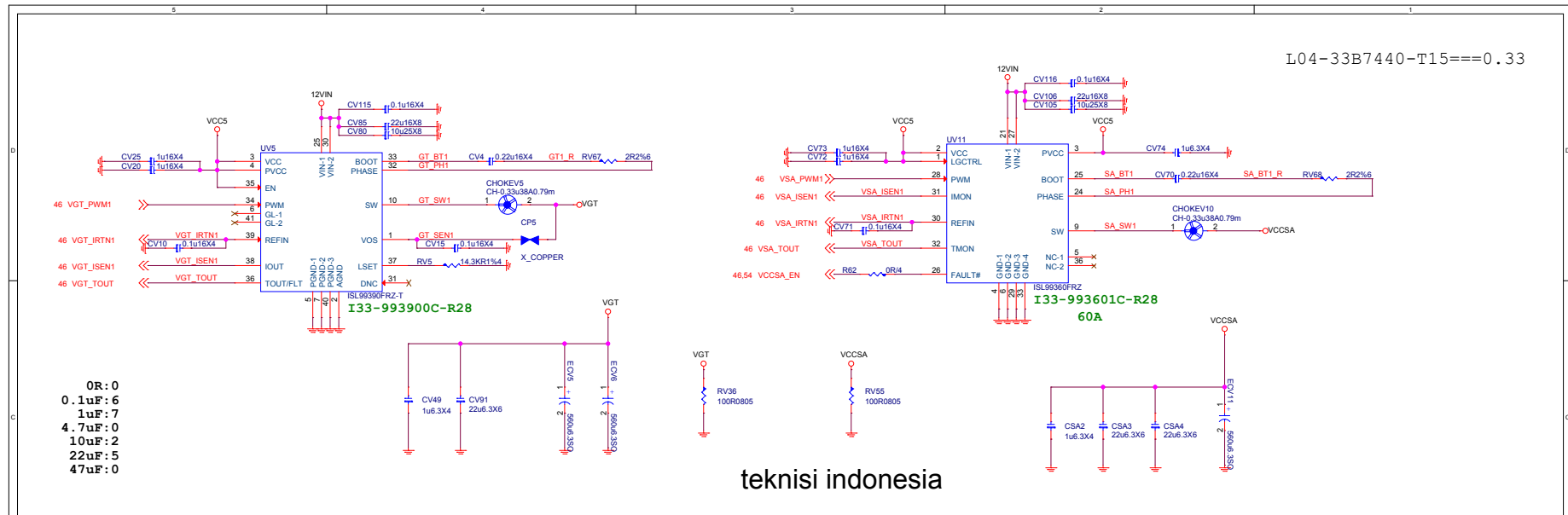


## 3VSB

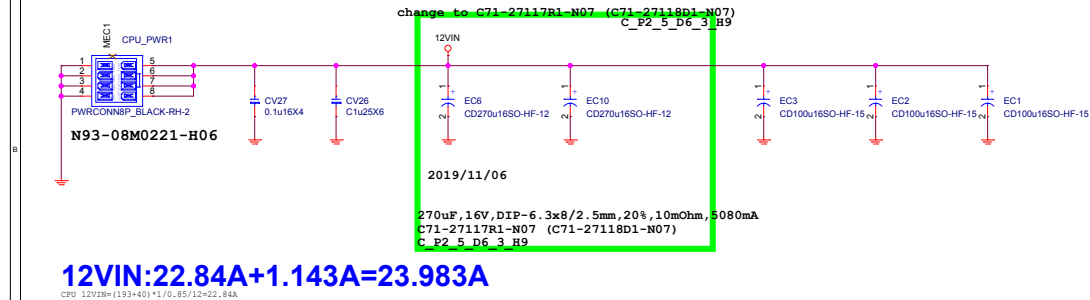




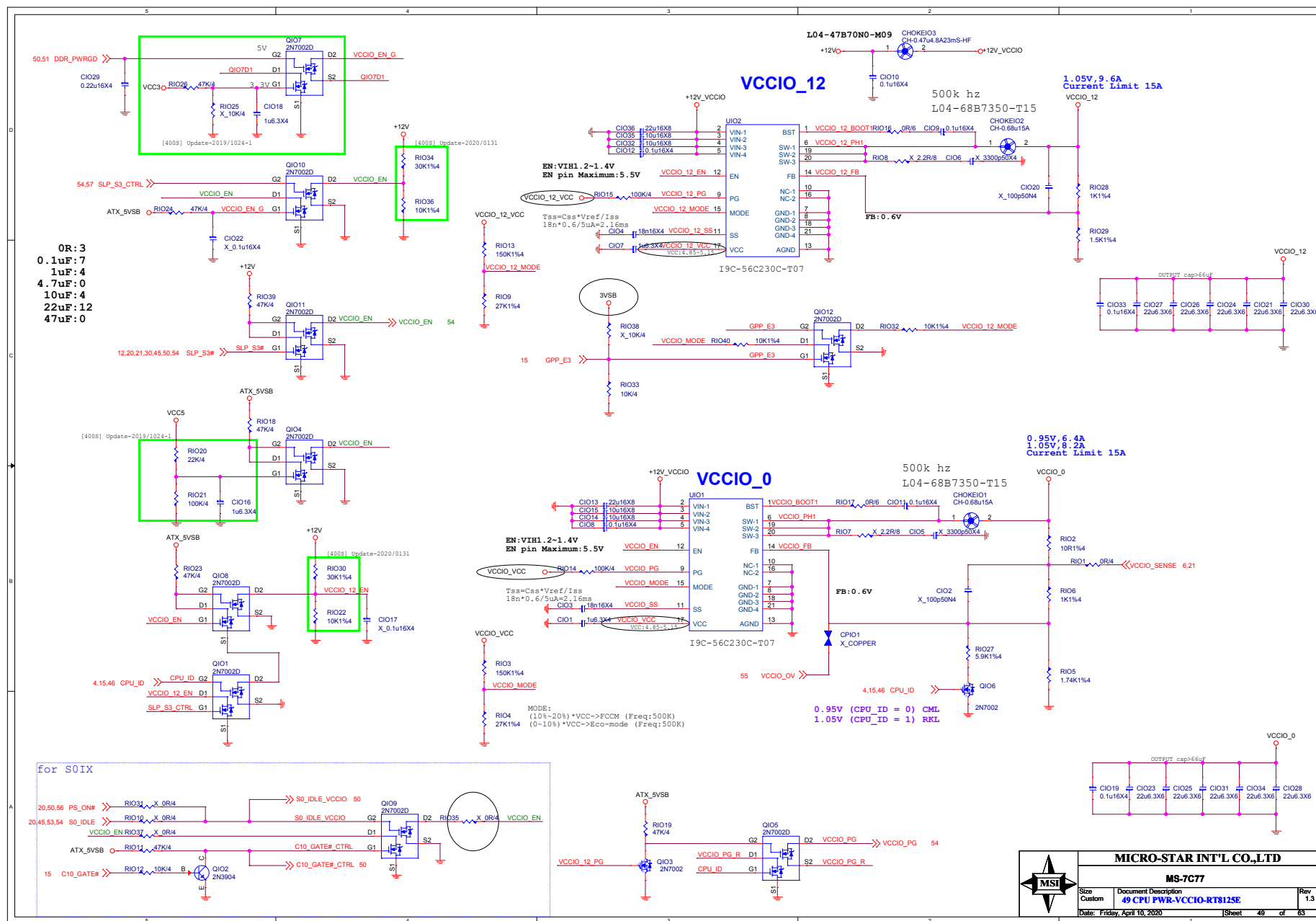




### CPU Power connector





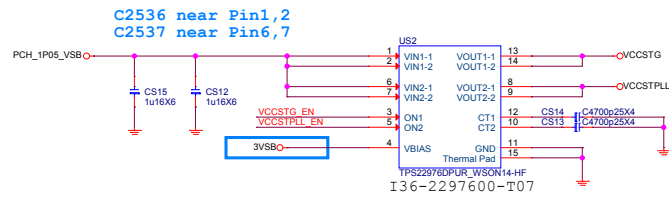


**MICRO-STAR INT'L CO.,LTD**

MS-7C77

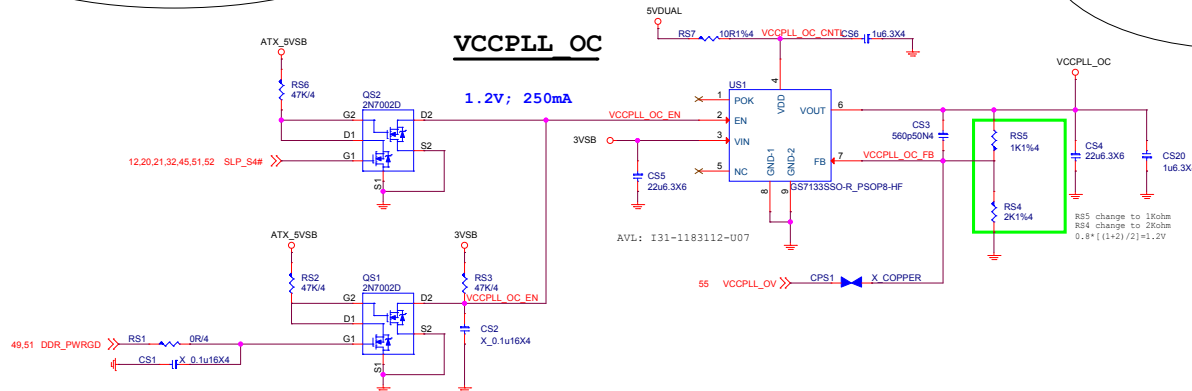
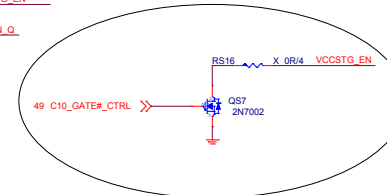
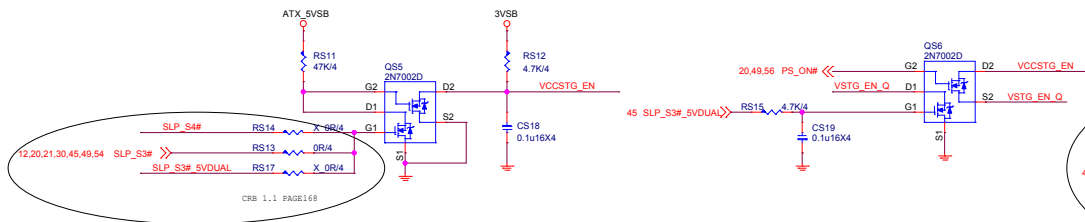
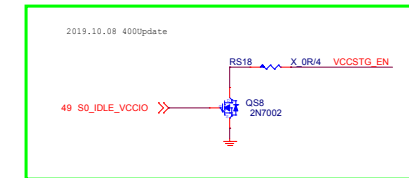
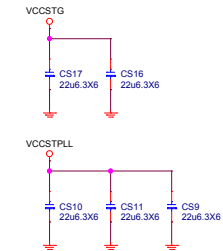
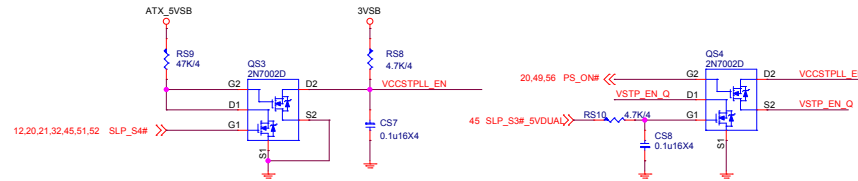
Size Custom	Document Description <b>49 CPU PWR-VCCIO-RT8125E</b>
----------------	---

Date: Friday, April 10, 2020 Sheet 49 of 63



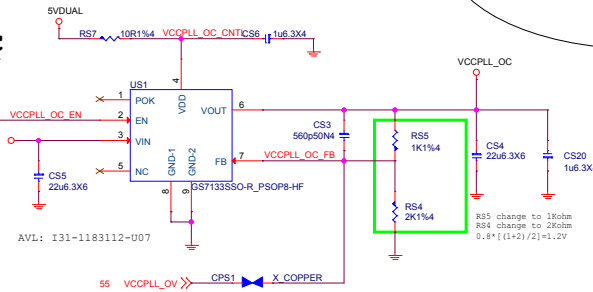
**VCCSTG**  
1.05V; 0.2A/0.9A  
**VCCSTPLL**  
1.05V; 0.92A/2.3A+0.23A=2.53A  
VCCST VCCPLL

0R:2  
0.1uF:4  
1uF:4  
4.7uF:0  
10uF:0  
22uF:7  
47uF:0



**VCCPLL OC**

1.2V; 250mA



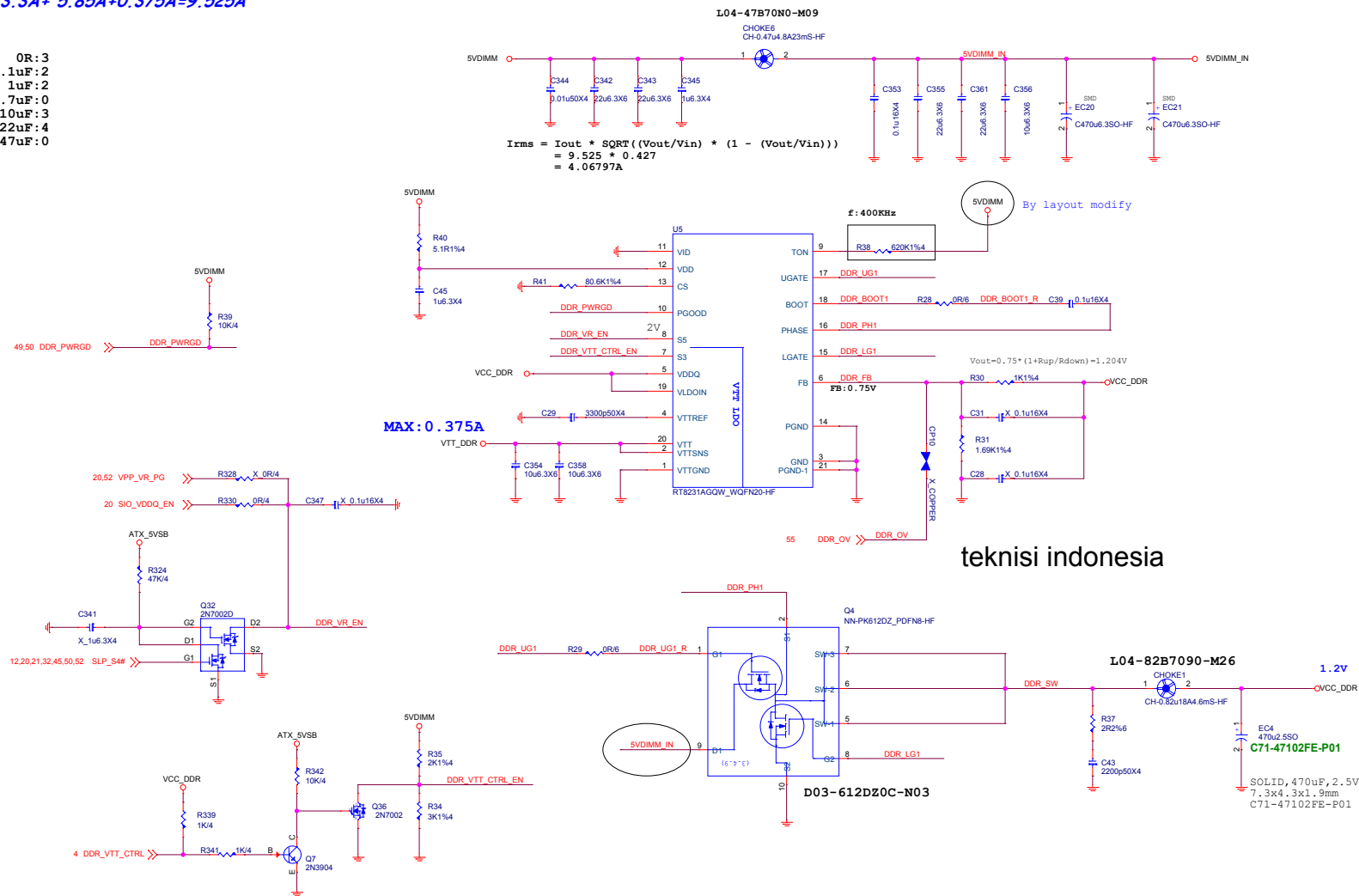
$$3.3A + 5.85A + 0.375A = 9.525A$$

```

    OR:3
0.1uF:2
    1uF:2
4.7uF:0
    10uF:3
    22uF:4
    47uF:0

```

$$\begin{aligned} I_{rms} &= I_{out} * \text{SQRT}((V_{out}/V_{in}) * (1 - (V_{out}/V_{in}))) \\ &= 9.525 * 0.427 \\ &= 4.06797\text{A} \end{aligned}$$



teknisi indonesia



MS-7C77

Size Custom	Document Description <b>51 DDR-RT8231</b>
----------------	--

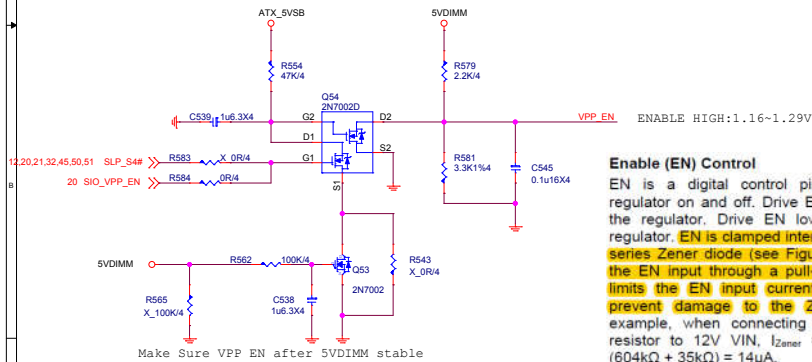
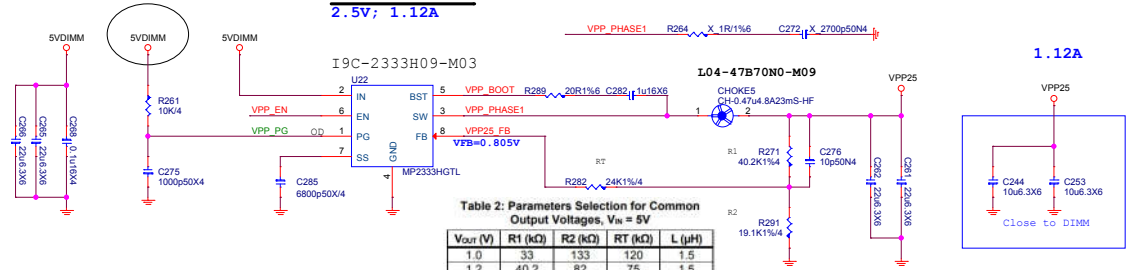
Date: Friday, April 10, 2020 Sheet 51 of 63

Rev  
1.3

## VPP Power:2.5V; 1.12A FOR 2DIMM

OR:2  
0.1uF:3  
1uF:3  
4.7uF:0  
10uF:2  
22uF:4  
47uF:0

### VPP25 Power 2.5V; 1.12A



### Enable (EN) Control

EN is a digital control pin that turns the regulator on and off. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator. EN is clamped internally using a 2.8V series Zener diode (see Figure 2). Connecting the EN input through a pull-up resistor to VIN limits the EN input current below 40μA to prevent damage to the Zener diode. For example, when connecting a 604kΩ pull-up resistor to 12V VIN,  $I_{Zener} = (12V - 2.8V) / (604kΩ + 35kΩ) = 14μA$ .

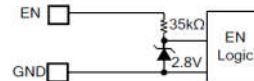
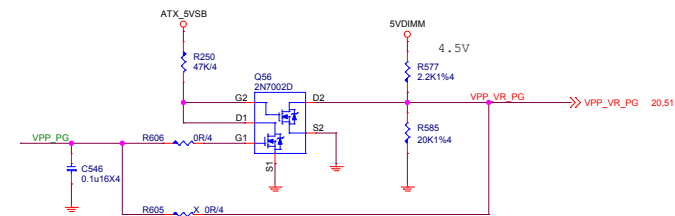


Figure 2: Zener Diode between EN and GND



D03-612DZ0C-N03 2.2~3.1mohm@5V  
OCP=1.6A\*1.3=20.8A

```

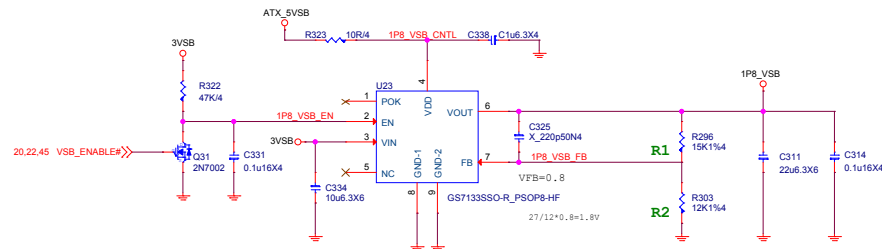
IOCSET=10uA
OCP_max=IOCset*Rocset/Rdson(min)
        =10uA*6.8k/2.2mohm
        =21.9A
OCP_max=IOCset*Rocset/Rdson(min)
        =10uA*6.8k/2.2mohm
        =21.9A

```

```

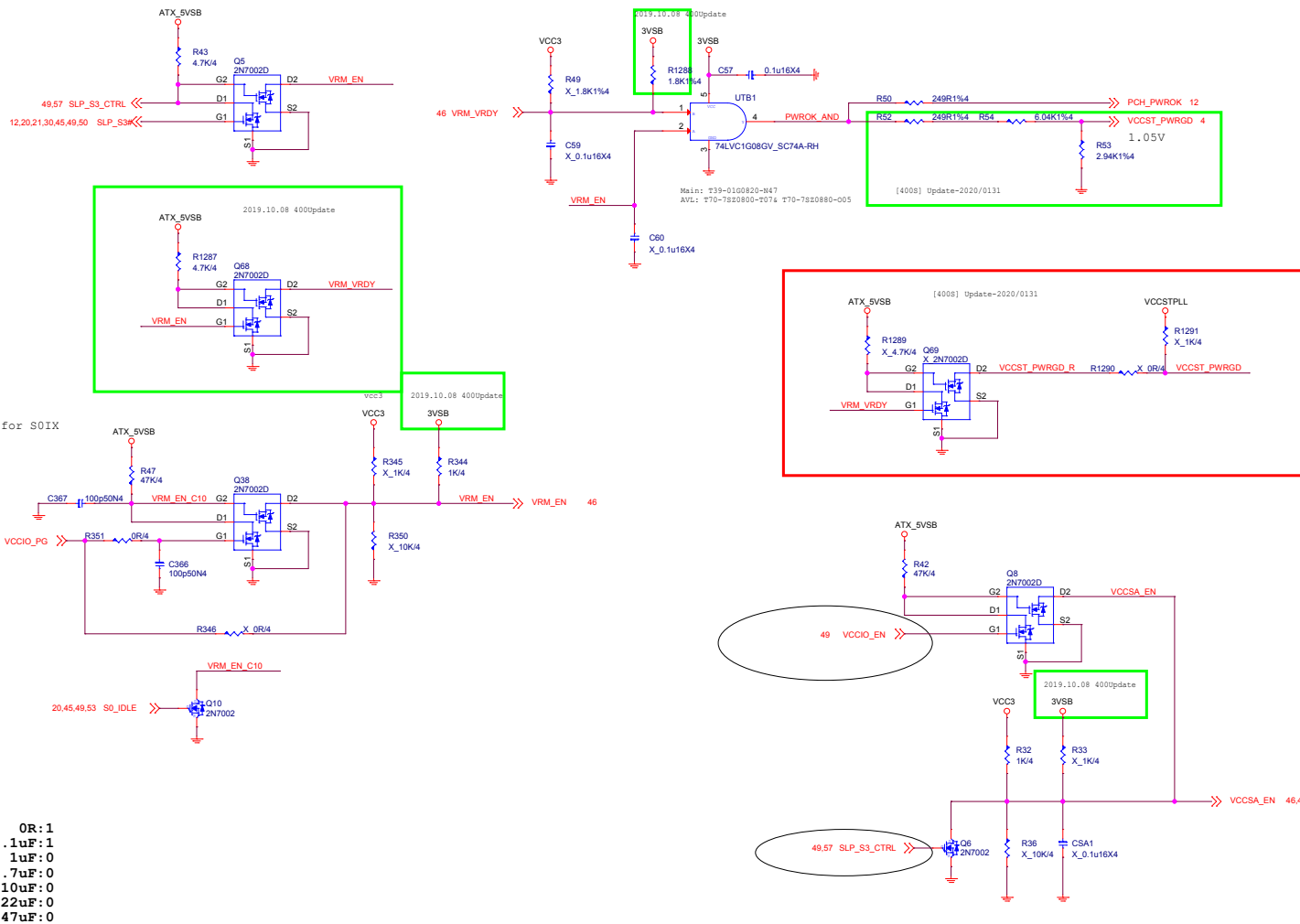
0R:4
0.1uF:4
1uF:2
4.7uF:0
10uF:4
22uF:3
47uF:0

```



MS-7C77

Size Custom	Document Description <b>53 PCH POWER-RT8125E/IP8_VSB</b>	Rev 1.3
Date: Friday, April 10, 2020		Sheet 53 of 63

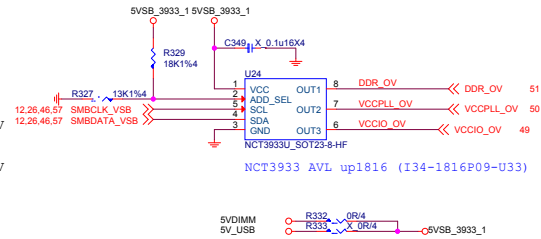


0R:1  
 0.1uF:0  
 1uF:0  
 4.7uF:0  
 10uF:0  
 22uF:0  
 47uF:0

NCT3933 source 10uA  
 $V_{out} = [V_{REF} * (1 + R173/R1056)] + 10uA * R173$   
 $= 0.75V * (1 + 1K/3.16K) + 10uA * 1K = 1.204V + 0.010V = 1.214V$   
 NCT3933 sink 10uA  
 $V_{out} = [V_{REF} * (1 + R173/R1056)] - 10uA * R173$   
 $= 0.75V * (1 + 1K/3.16K) - 10uA * 1K = 1.204V - 0.010V = 1.194V$

# UPI VOLTAGE CONSOLE

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

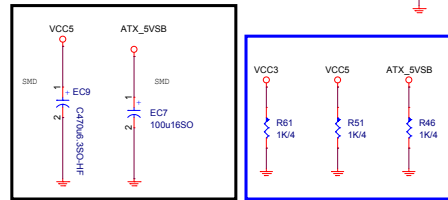
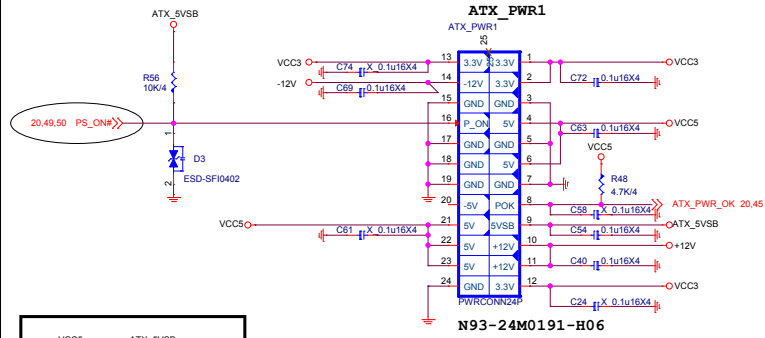


Vinafix.com

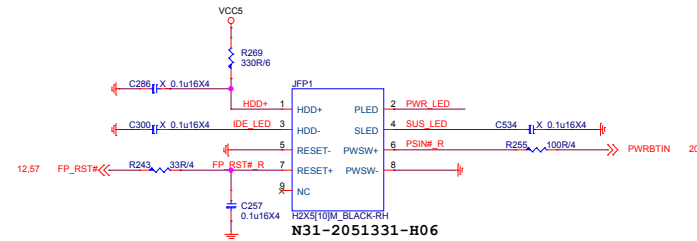
MICRO-STAR INT'L CO.,LTD			
MS-7C77			
Size	Document Description	Rev	
Custom	55 OV-NCT3933	1.3	
Date: Friday, April 10, 2020		Sheet	55 of 63

## ATX POWER CONNECTOR

note: If -12V to 5V pin were connected, remember add MLCC cap close pin

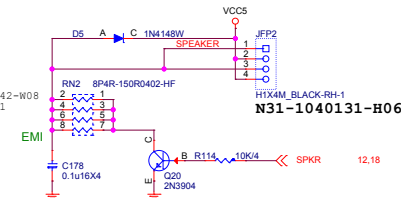


## FRONT PANNEL

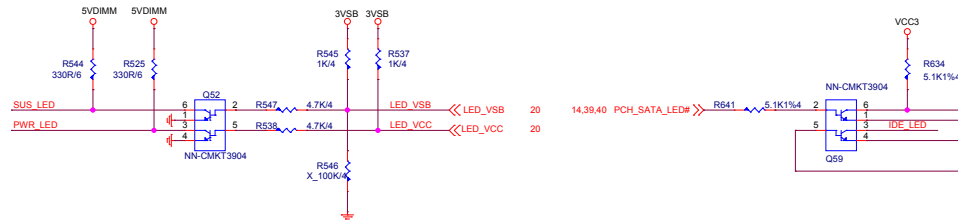


## Speaker Pin Header

[4008] Update=2020/0207  
R31-0151012-W08 change to R31-0151042-W08  
AVL:R31-0151052-Y01/ R31-0151052-R01



## FRONT PANEL LED

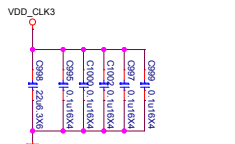
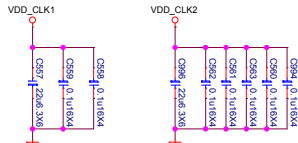


0R:18  
0.1uF:7  
1uF:0  
4.7uF:0  
10uF:0  
22uF:5  
47uF:0

MICRO-STAR INT'L CO.,LTD			
MS-7C77			
Size	Custom	Document Description	Rev
		56 ATX F_Panel	1.3
Date:	Friday, April 10, 2020	Sheet	56 of 63



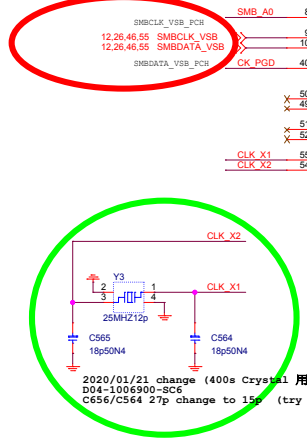
220mA  
VCC3\_CLK1 R485 0R/6 VDD\_CLK1  
VCC3\_CLK R657 0R/6 VDD\_CLK2  
VCC3\_CLK R125 0R/6 VDD\_CLK3



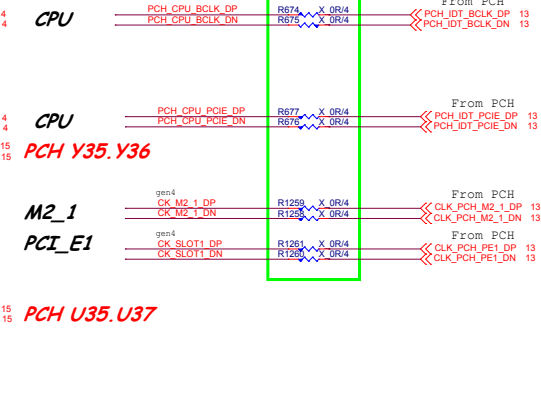
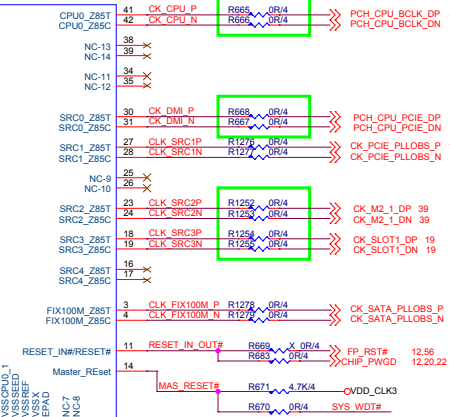
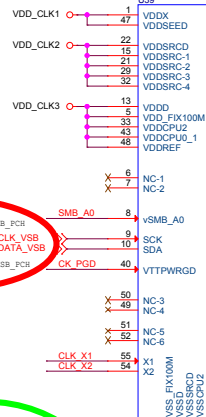
VDD\_CLK3 R659 4.7K/4 SMB\_A0  
R658 4.7K/4

SMB_A0	ADDR
0	D2/D3
1	D8/D9

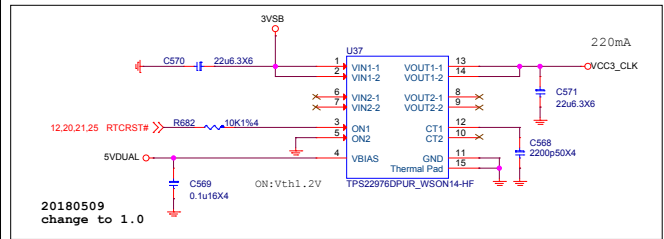
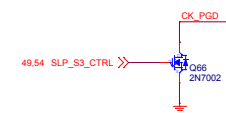
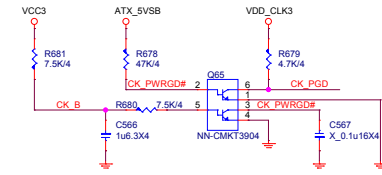
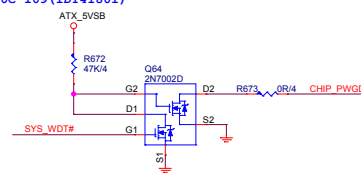
0R:18  
0.1uF:13  
1uF:1  
4.7uF:0  
10uF:0  
22uF:5  
47uF:0



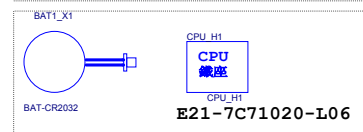
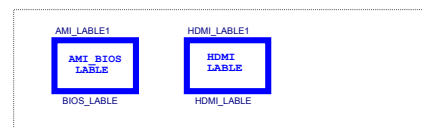
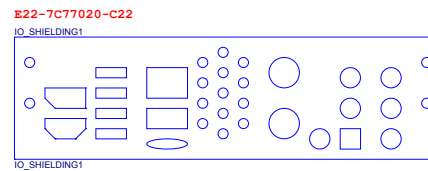
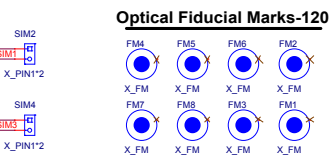
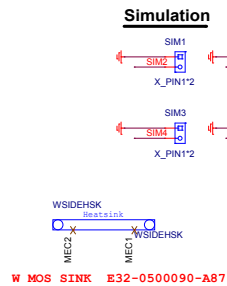
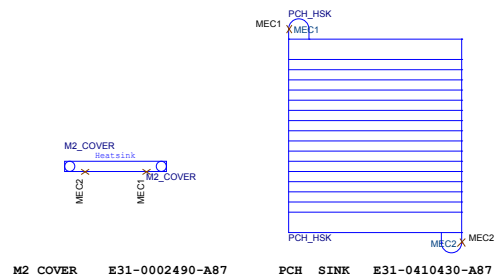
2020/01/21 change (400s Crystal 1 用料問題-for Clock gen)  
D04-1006900-9C6  
C656/C564 27p change to 15p (try 18p for SA)



Layout注意擺放，不可分枝



20180509  
change to 1.0



### Mounting Holes

