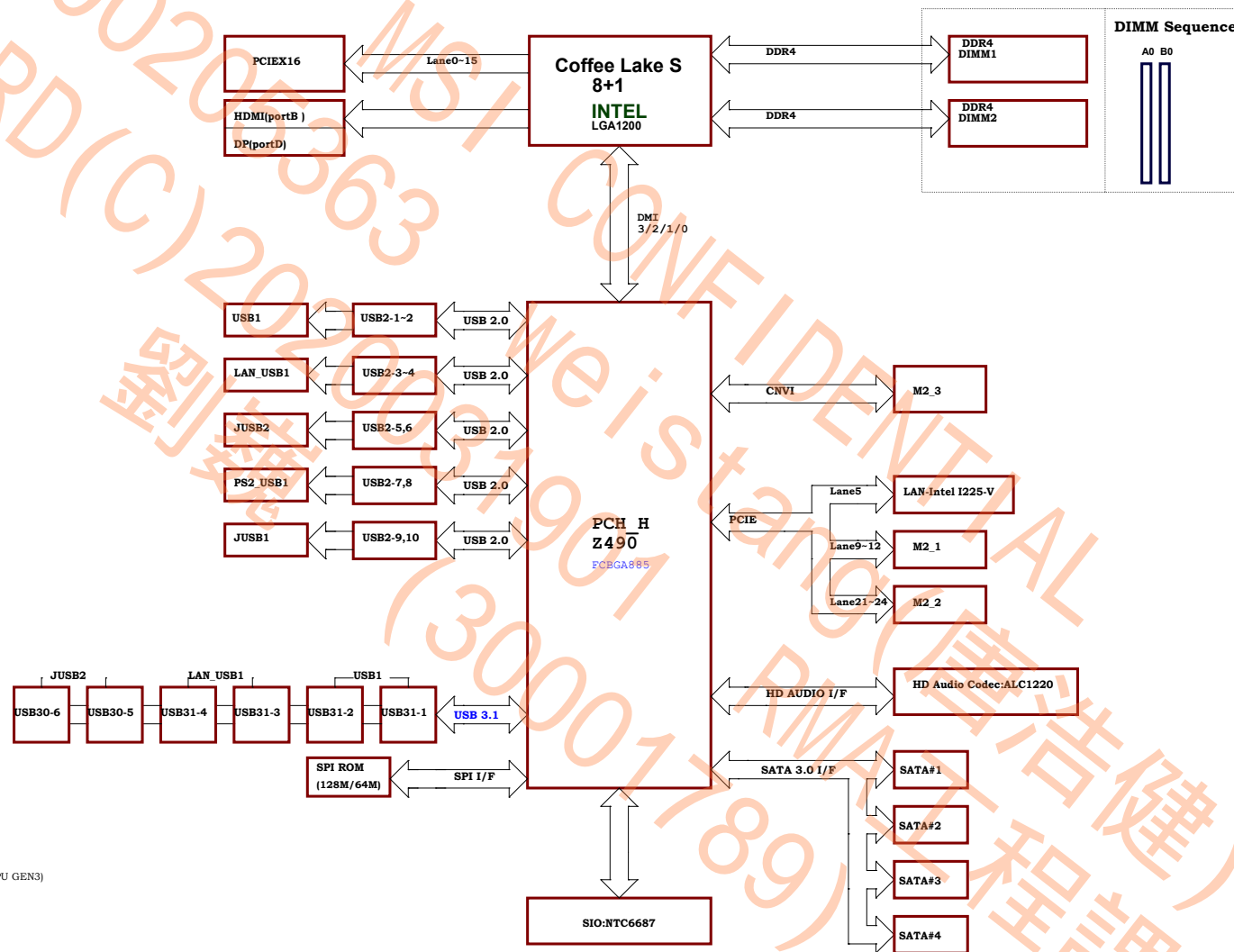


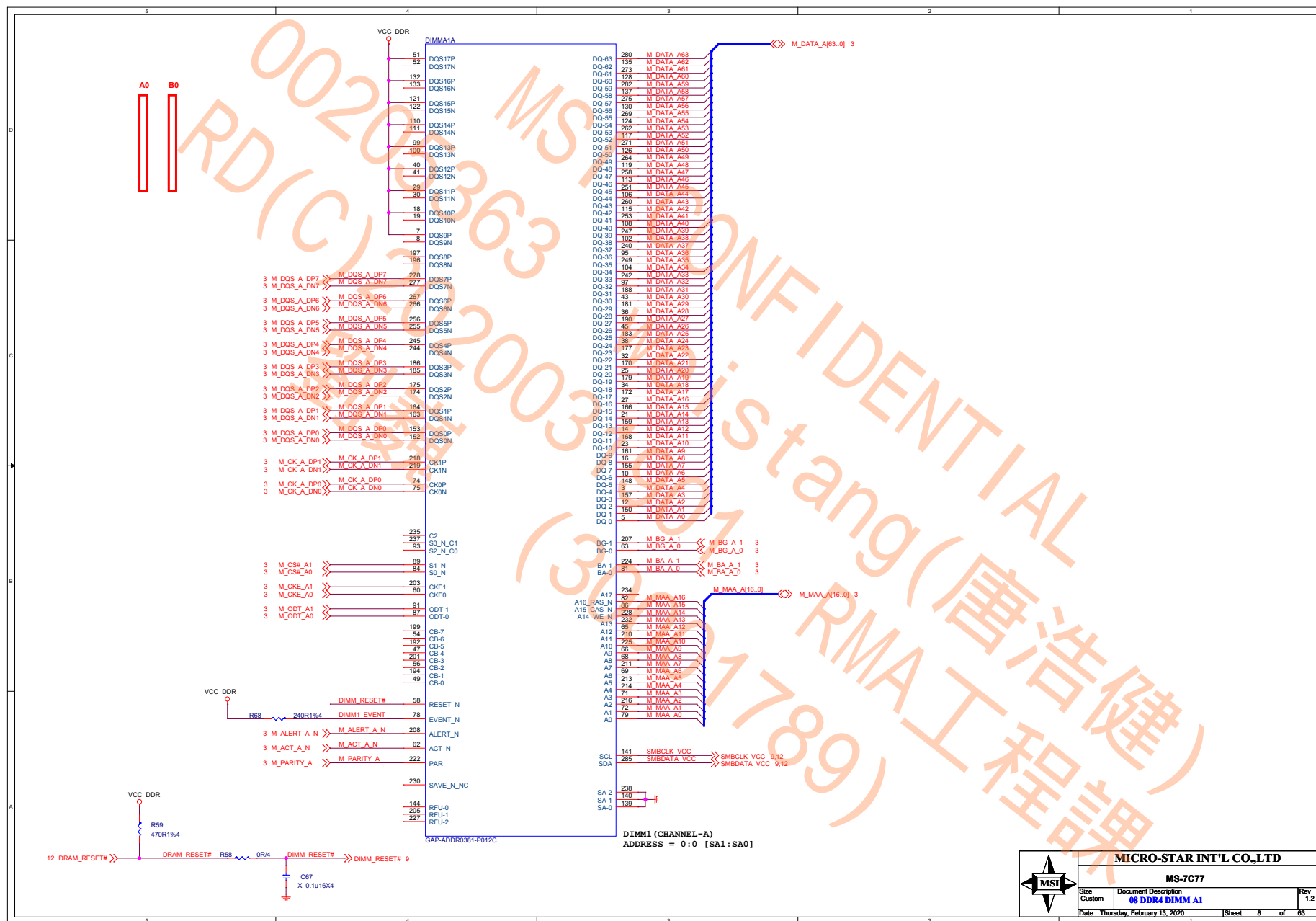
TITLE		Page	MS-7C77		ITX:170*170
Cover Sheet		1			Ver: 1.2
Block Diagram		2	CML Platform		
CPU-Memory, CPU-Control/MISC/CFG/Audio		3,4	CPU: Comet lake S		System Chipset: Z490 PCH_H
CPU-PEG/Display/RSVD		5	LGA1200		
CPU-Power,CPU-GND		6,7	CPU POWER PAK *8 Phase		
DDR4 DIMM1&DDR4 DIMM2 & DDR4 POWER		8,9,10,11	GT POWER PAK *1 Phase		
PCH-LPC/SPI/SMBUS/MISC		12	Onboard Chip: SIO:NCT6687		
PCH-Audio/Display/Clock		13	HD Audio Codec:ALC1220		
PCH-DMI/PCIE/USB/SATA		14	LAN-Intel I225-V		
PCH-GPIO/RSVD/CNVI		15	Flash ROM: SPI 128 MB X1		
PCH-Power/Gnd/Strip		16,17,18	Main Memory: DDR4 * 2 (Dual Channel)		
PCIE SLOT-CPU(X16)		19	ACPI:		Power:
SIO-NCT6687D		20,21	5VDAUL:uP7501		VCORE/GT/SA - ISL69269
SPI ROM BIOS/ FAN VBAT/CLR COMS		22,23,24,25	5VDIMM:uP7501		VCCIO -RT8125E
MCU JRAINBOW/DEBUG LED		26	3VSB:TPS566235		VCCST/VCCSTG-MP2333
AUDIO - ALC1220P		27,28	3VDSW:GS7133		VCCPLL/VCCPLL_OC-GS7133
TR DP / PD		29,30,31,32	SIO_3VA:GS7116		DDR - RT8231
LAN - INTEL I255V		33			PCH(1.05V) - RT8125E
Rear LAN USB3.1&USB2.0		34			1P8_VSB - GS7133
Rear-USB31 TYPEA+TYPE C/Front USB 3.2/2.0		35,36	Expansion Slots:		
Front USB31 TYPE C / USB POWER		37,38	PCI Express (X16) Slot * 1		
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			

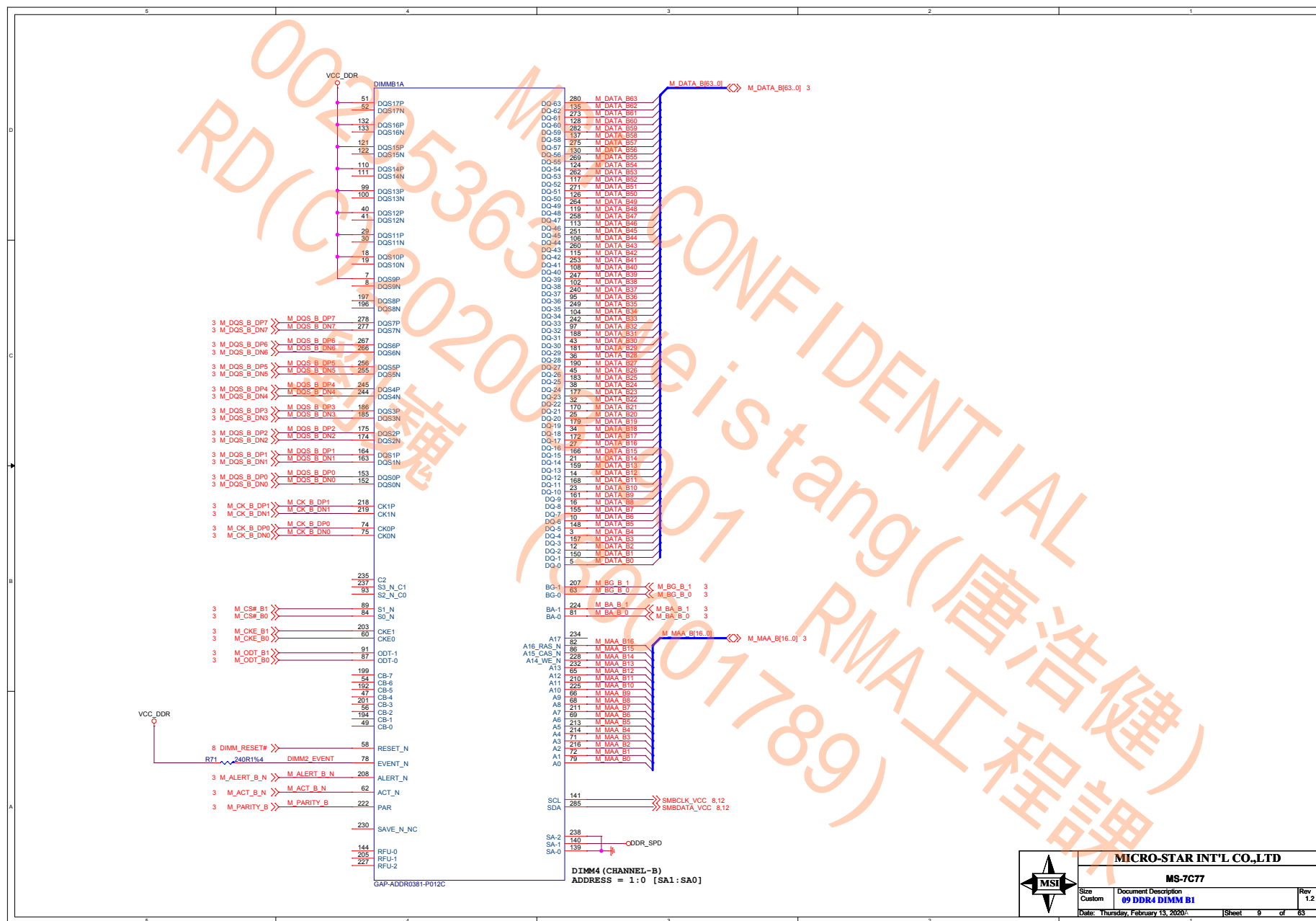
MS-7C77 Block Diagram

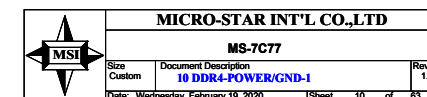


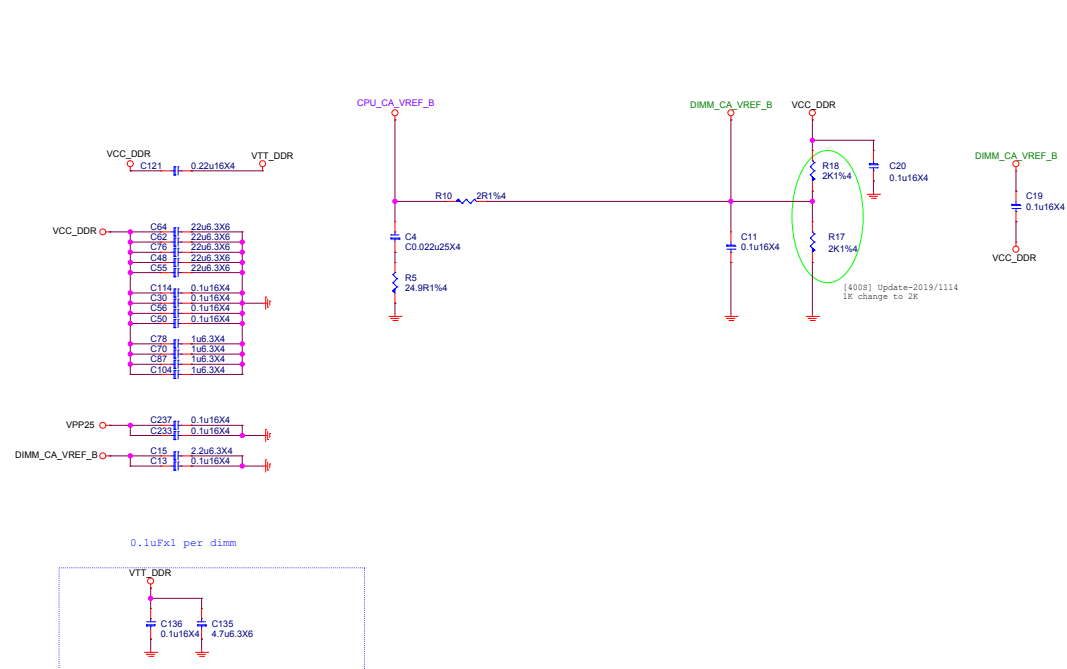
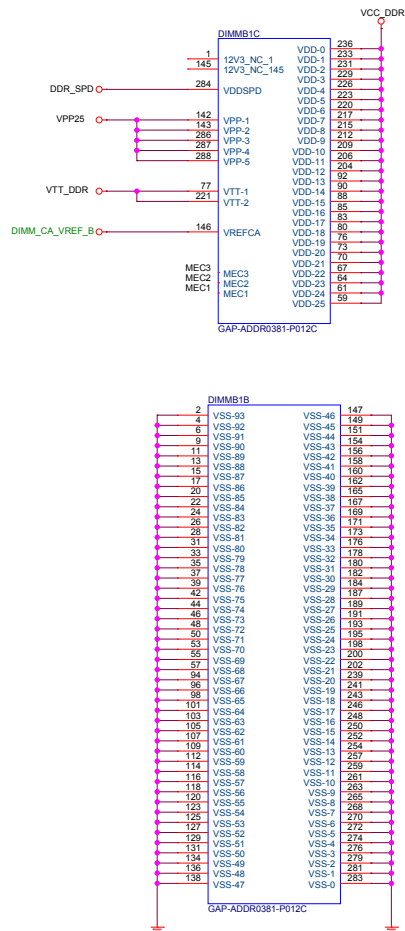


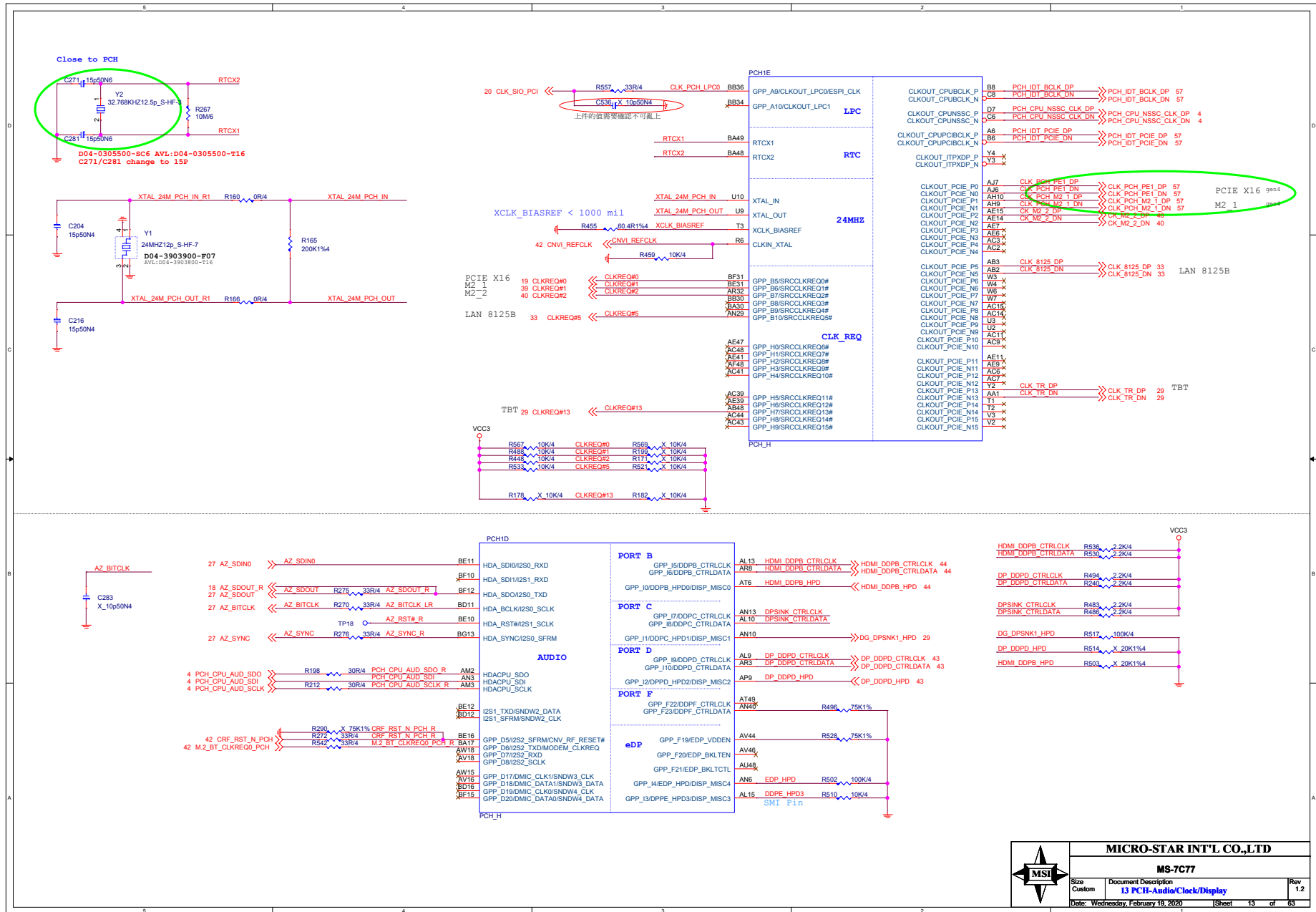
SOCKET1200-HF_1

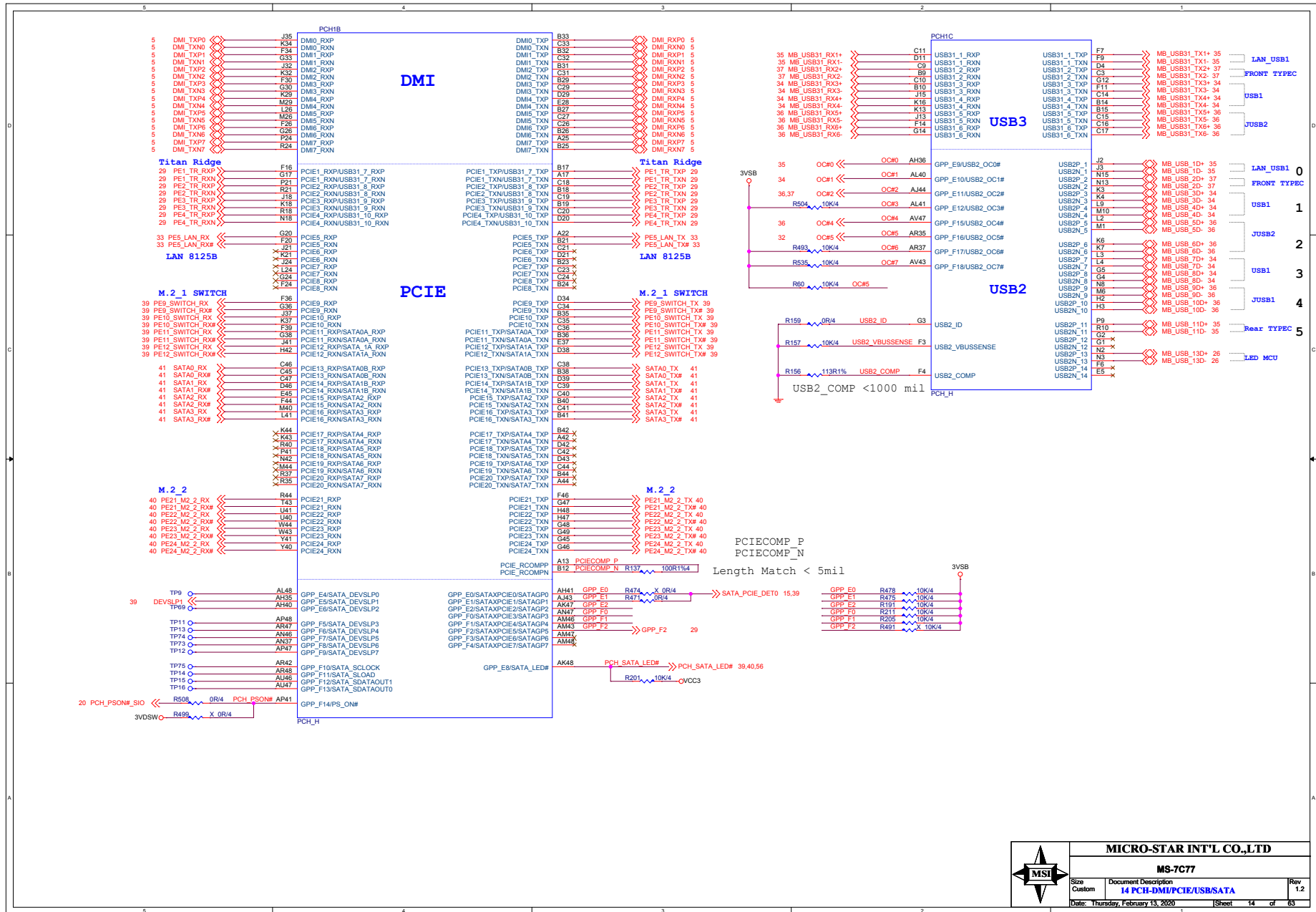








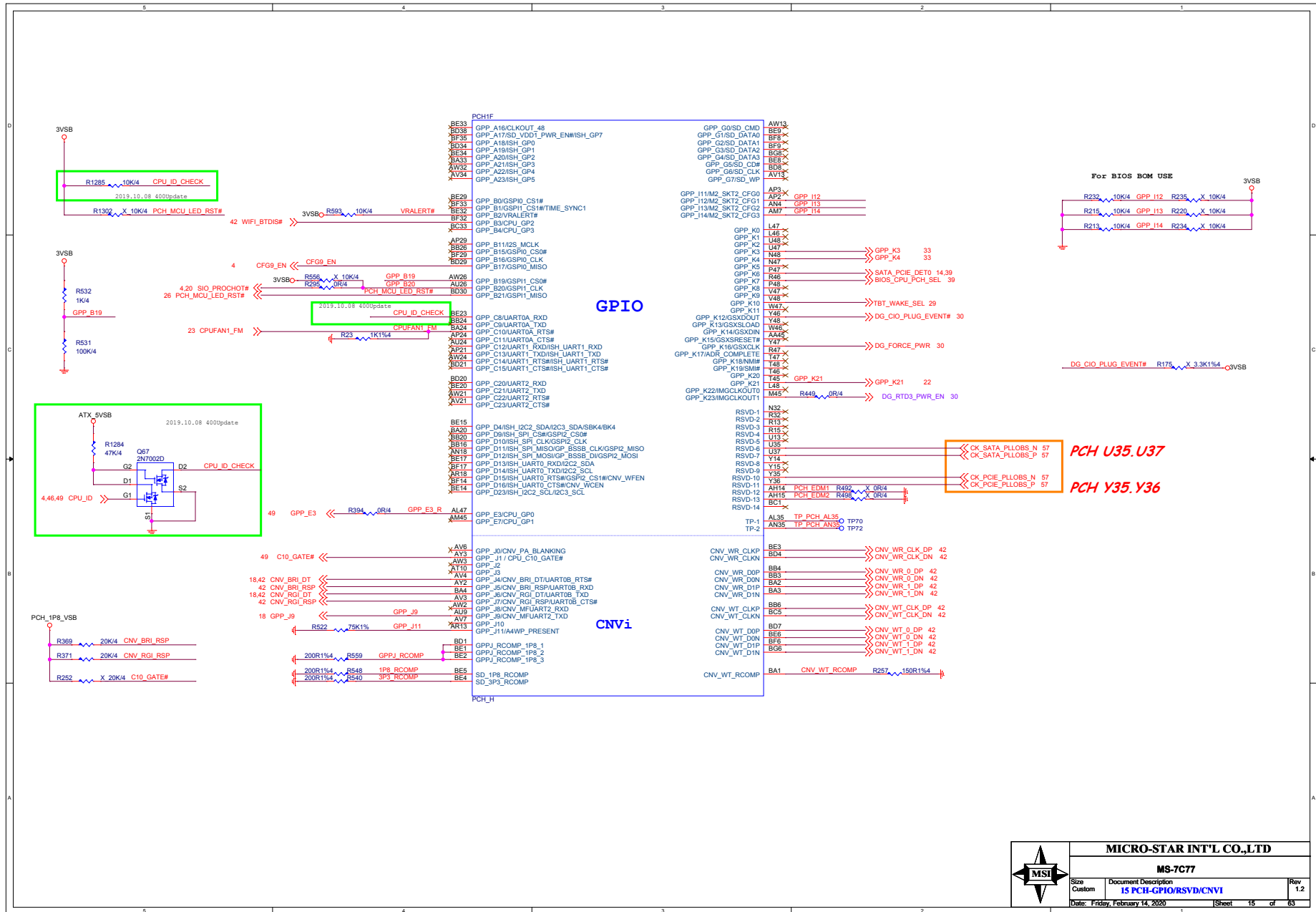




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Size	Document Description	Rev
Custom	14 PCH-DMI/PCIE/USB/SATA	1.2
Date: Thursday, February 15, 2020		Sheet 14 of 63



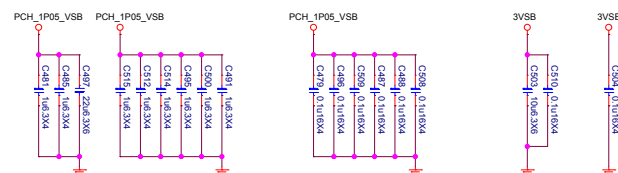
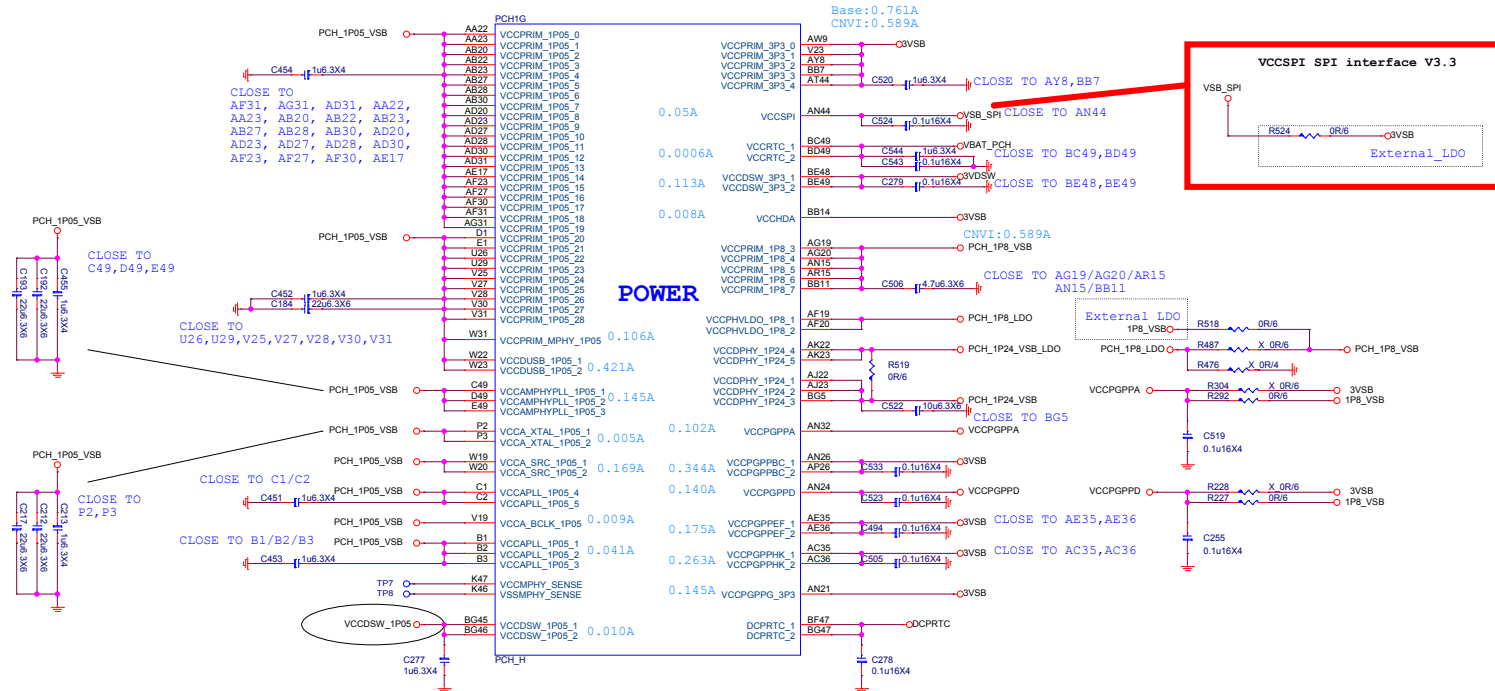
MICRO-STAR INT'L CO.,LTD

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Size	Document Description	Rev
Custom	15 PCH-GPIO/RSVD/CNV1	1.2
Date: Friday, February 14, 2020		Sheet 15 of 63

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

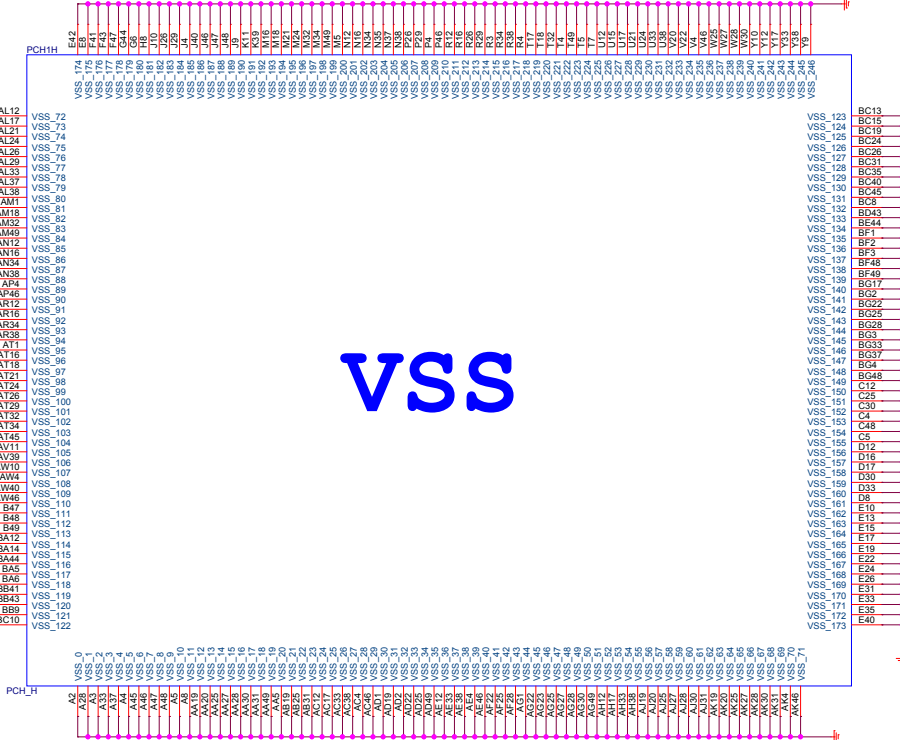
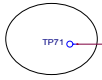
```
Base 7.169A
Base other 1.089A
DMI Gen3 0.5A
PCIe Gen3 1.602A
USB3.1 Gen1 1.062A
SATA3.0 0.668A
```

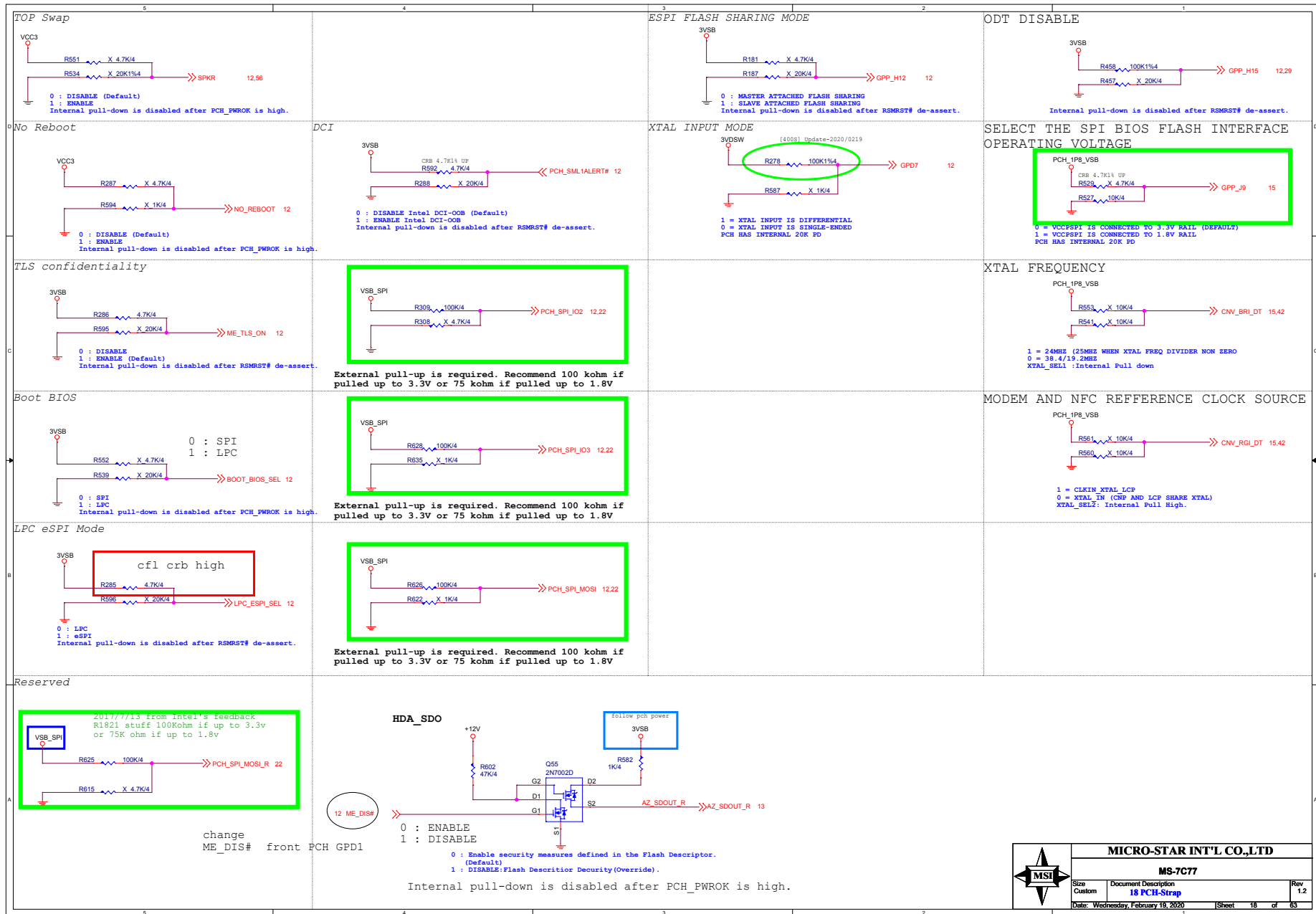


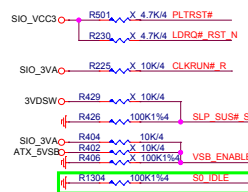
MS-7C77

Size Custom	Document Description 16 PCH-Power	Rev 1.2
Date: Wednesday, February 19, 2020		Sheet 16 of 63

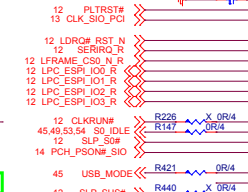
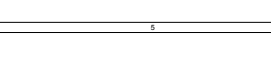
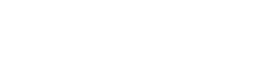
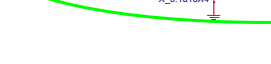
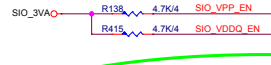
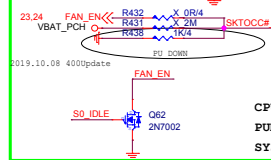
VSS



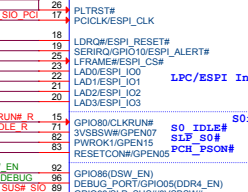
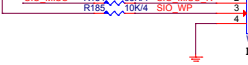
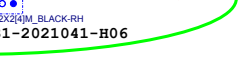
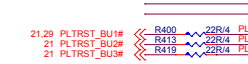
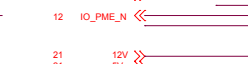
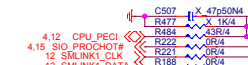




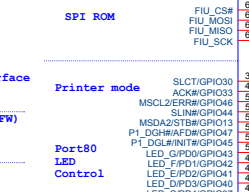
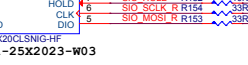
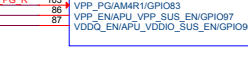
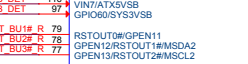
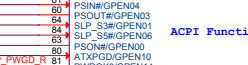
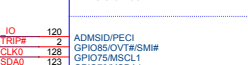
RTCRST DET
20190319
3VDSW change to SIO_3VA



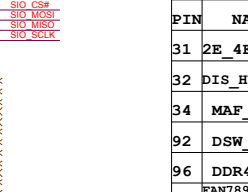
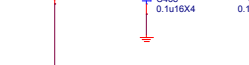
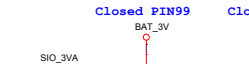
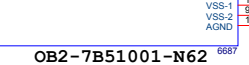
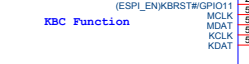
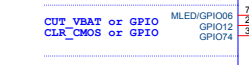
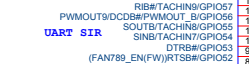
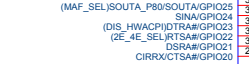
DSW Interface



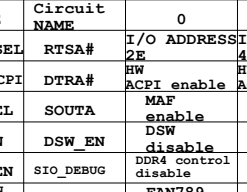
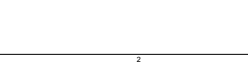
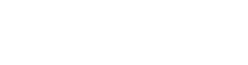
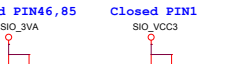
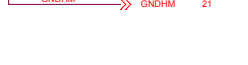
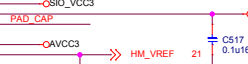
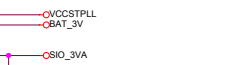
Hardware Monitor



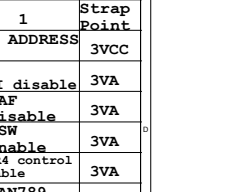
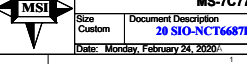
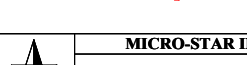
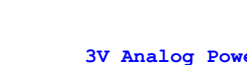
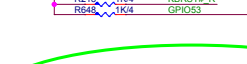
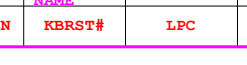
LED control



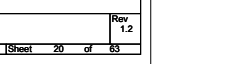
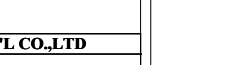
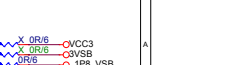
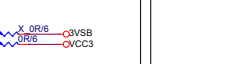
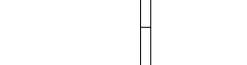
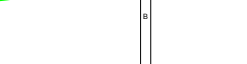
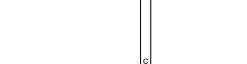
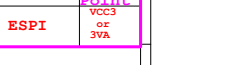
Power Pin



OB2-7B51001-N62



3V Analog Power



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 disable	DSW enable	3VA
96	DDR4_EN	SIO_DEBUG	DDR4 control disable	DDR4 control enable	3VA
9	FAN789_EN (FW setting)	GPIO52	FAN789 disable	FAN789 enable	3VA
PIN	NAME	Circuit NAME	VCC3	3VA	Strap Point
27	ESPI_EN	KBRST#	LPC	ESPI	VCC3 or 3VA

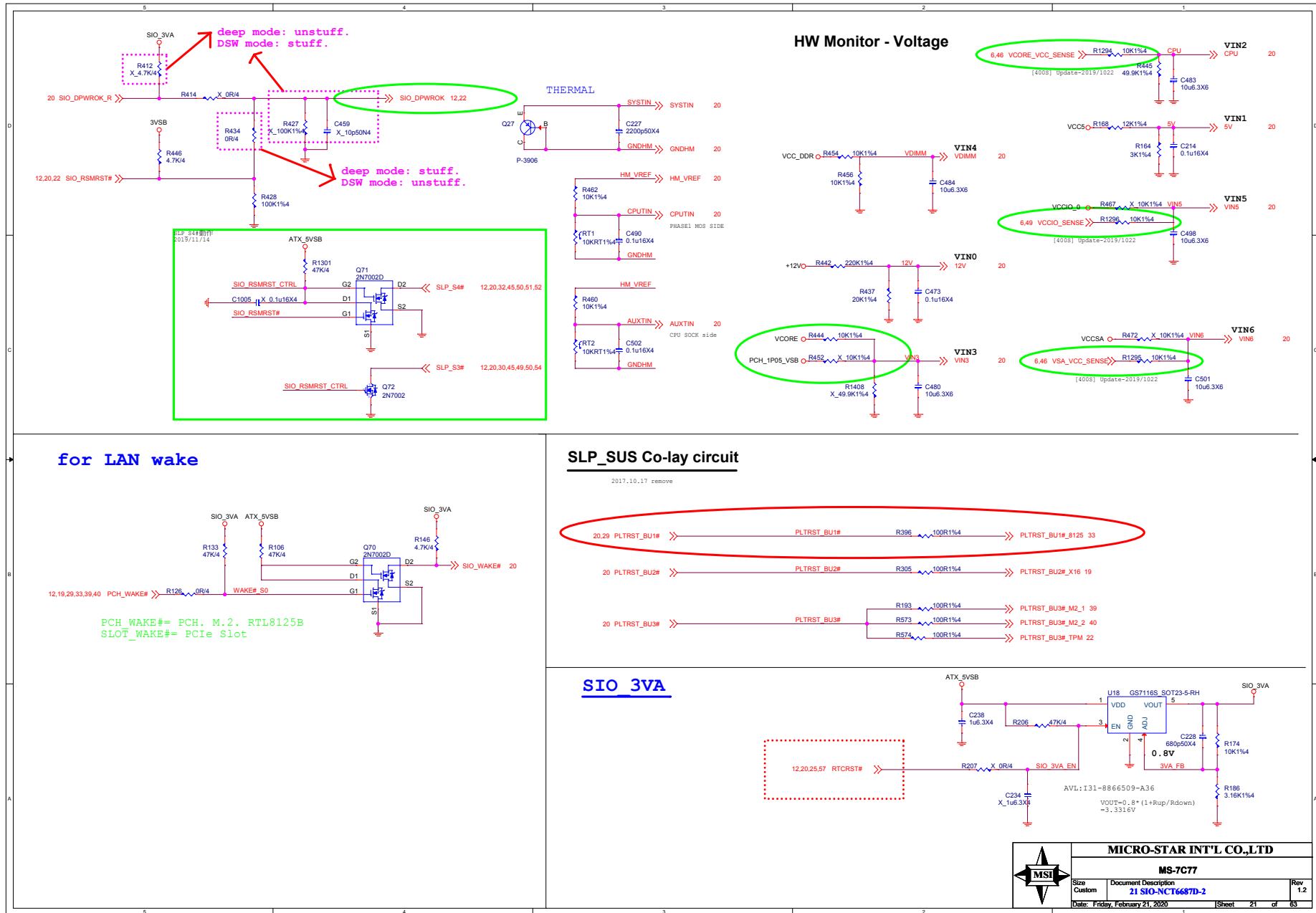


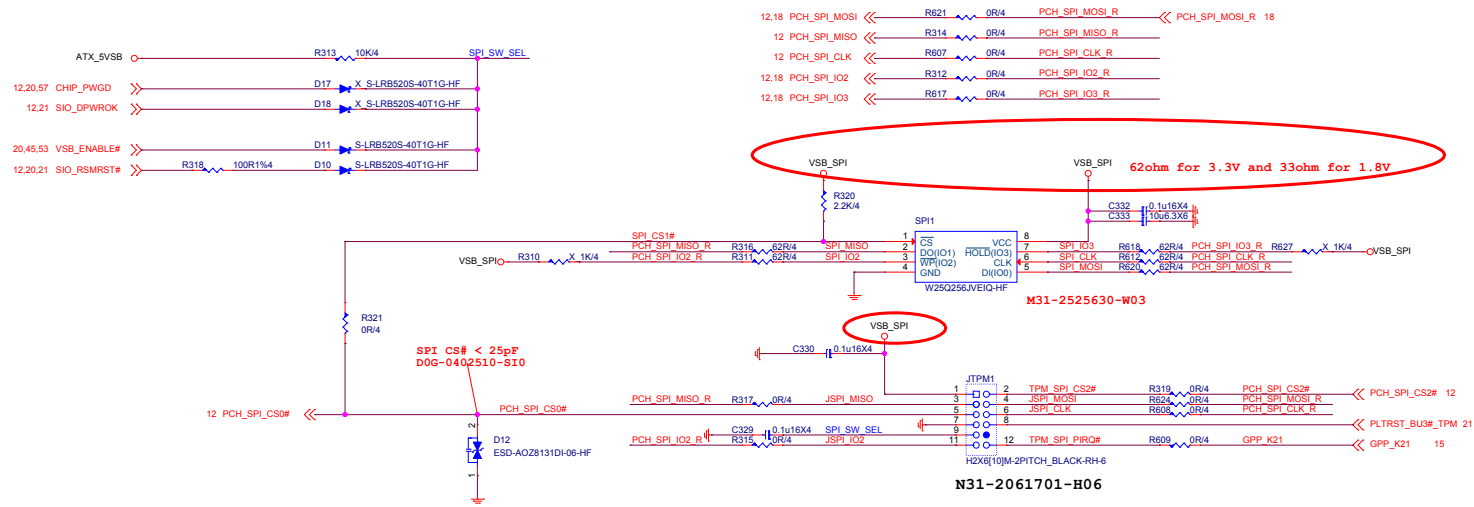
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Size Custom Document Description 20 SIO-NCT6687D-1 Rev 1.2

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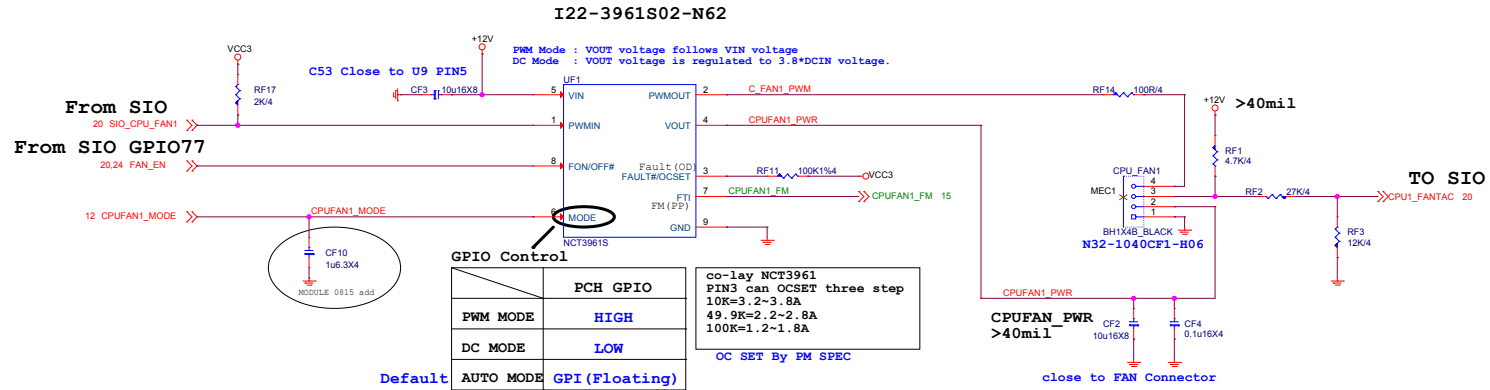
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Size	Document Description	Rev
Custom	22 SPI ROM BIOS	1.2
Date: Monday, February 24, 2020	Sheet 22 of 63	

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

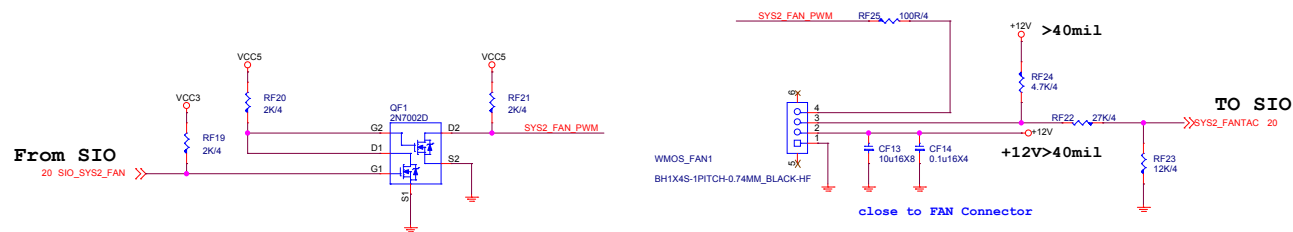
1.Mode GPIO BIOS can swtich PWM/DC MODE

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



2019/11/11 add real IO fan

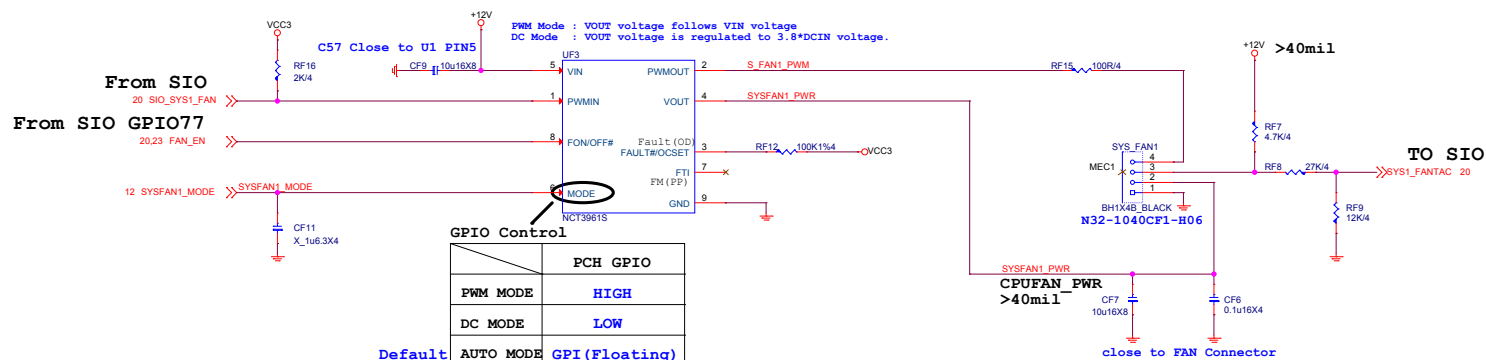
TYPE O : 4 PIN FAN ONLY PWM MODE



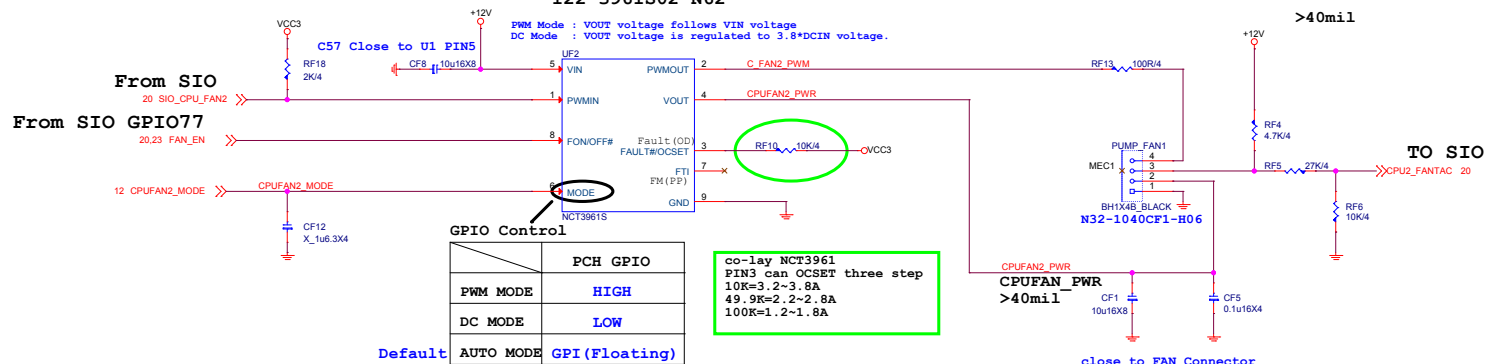
TYPE M : 4 PIN CPU FAN USE NCT3961S USE PCH GPIO CONTROL FAN MODE

1.Mode GPIO BIOS can switch PWM/DC MODE

I22-3961S02-N62



I22-3961S02-N62

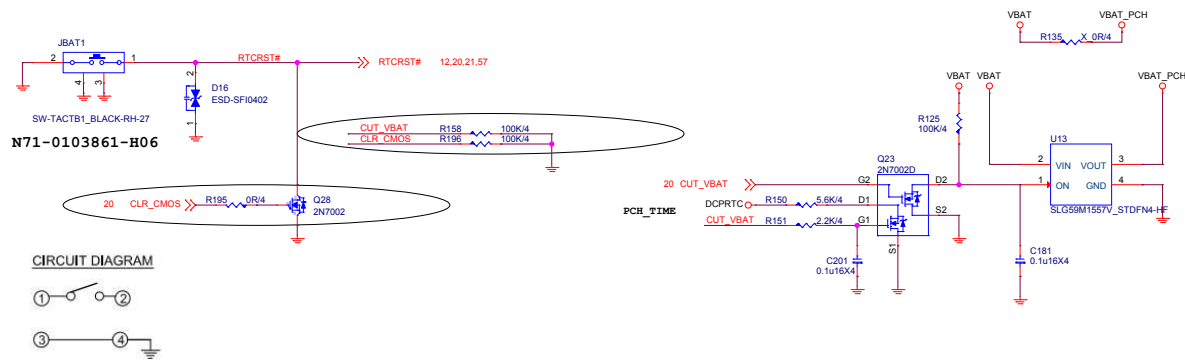


MICRO-STAR INT'L CO.,LTD

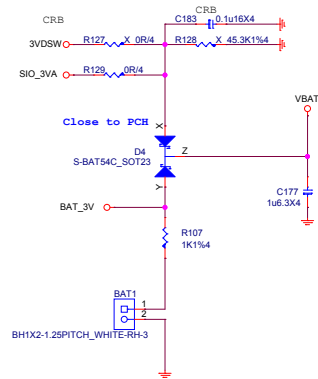
MS-7C77

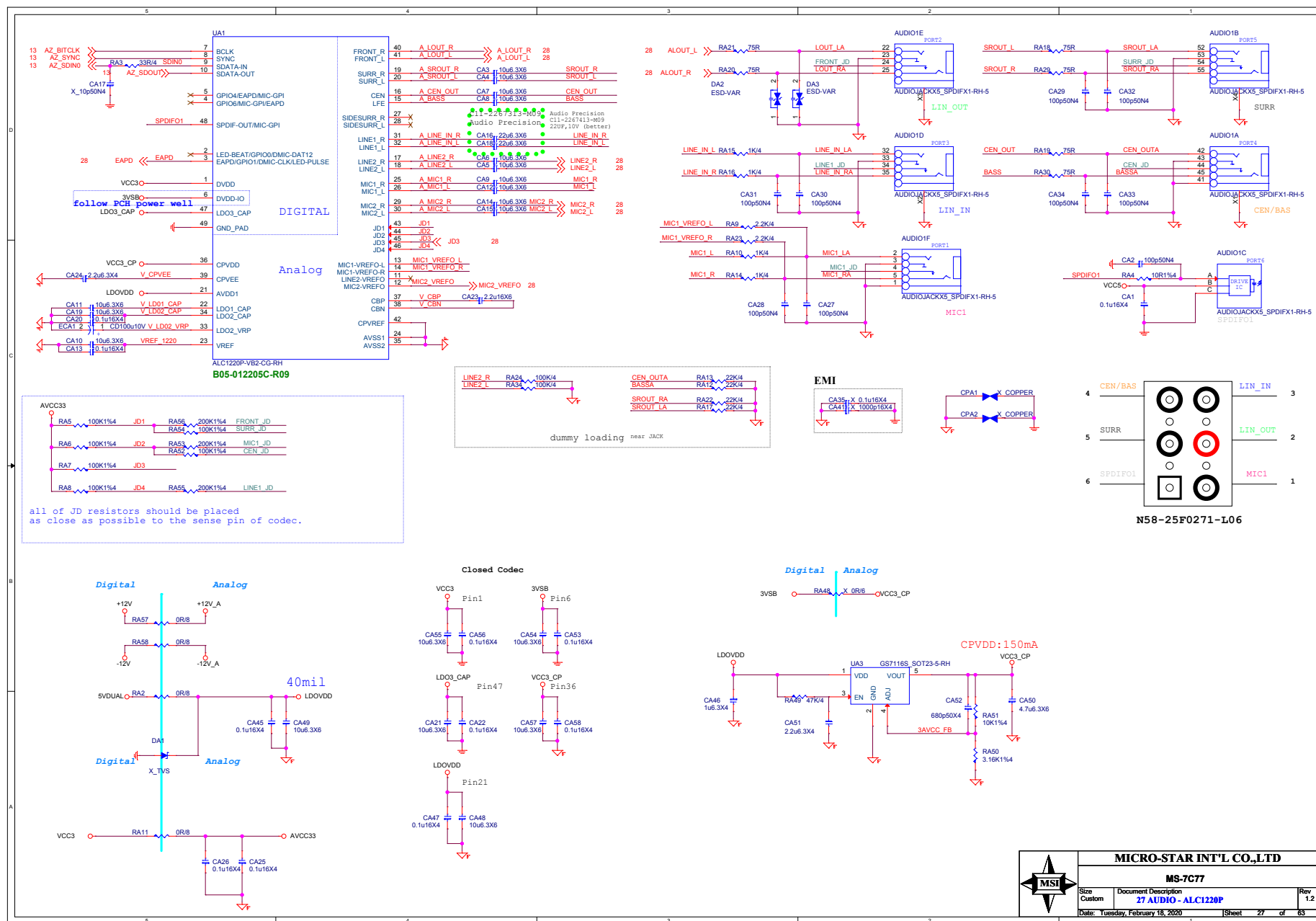
Size Custom Document Description 24 FAN PUMP/SYS M Rev 1.2
Date: Monday, February 24, 2020 Sheet 24 of 63

CLR COMS

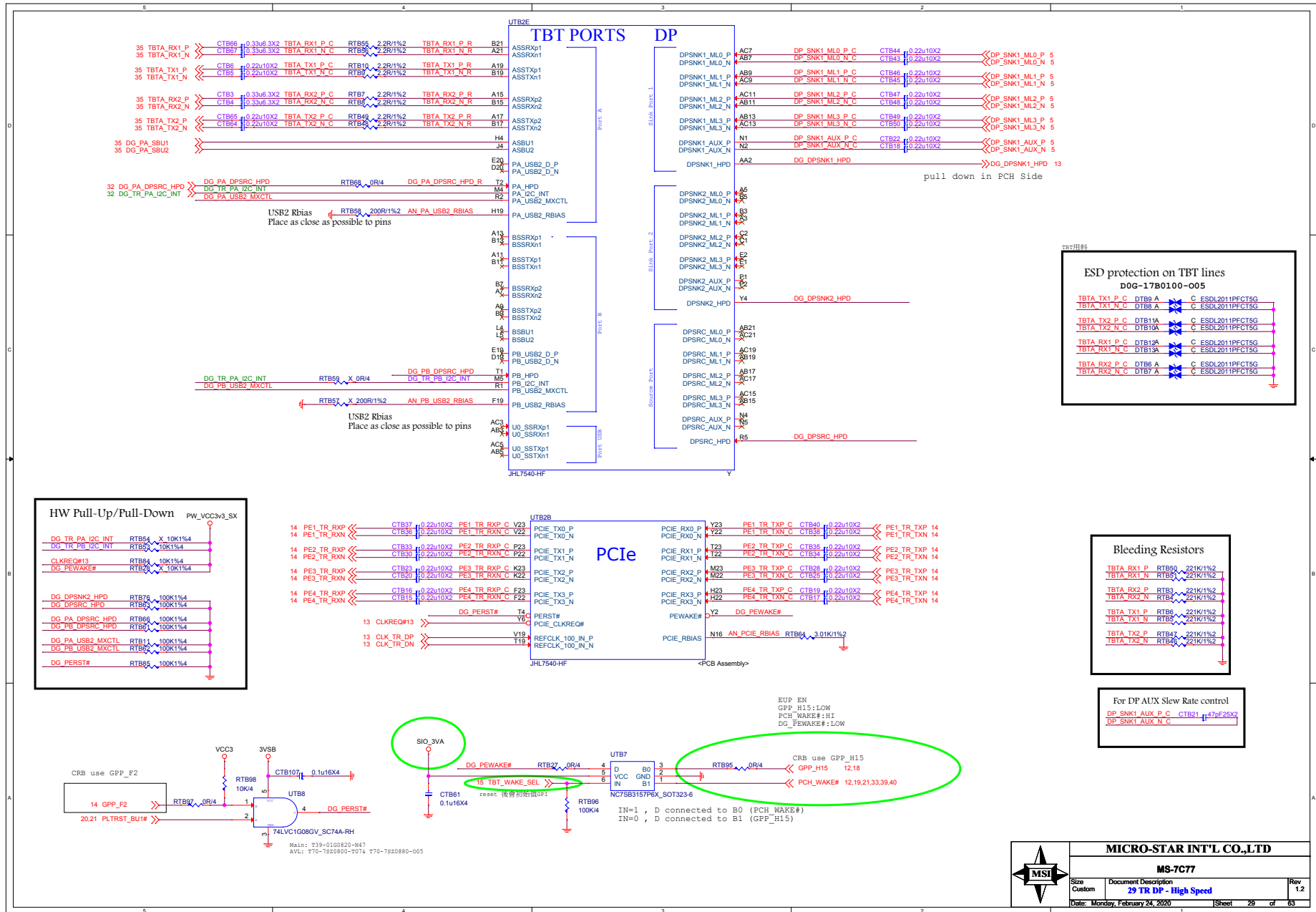


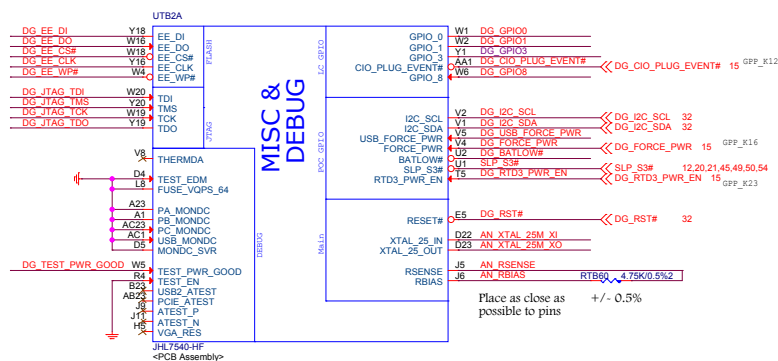
VBAT



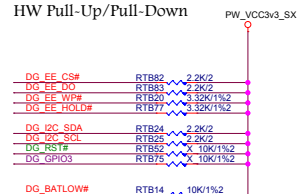


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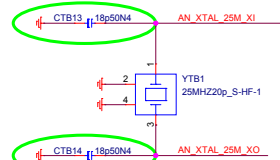
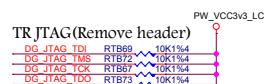




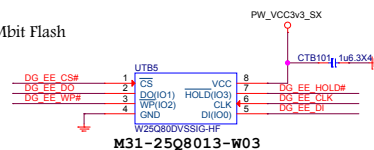
HW Pull-Up/Pull-Down



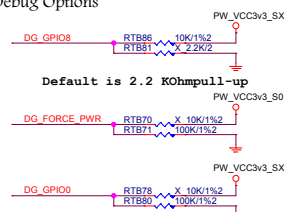
TR JTAG(Remove header)



SMBit Flash



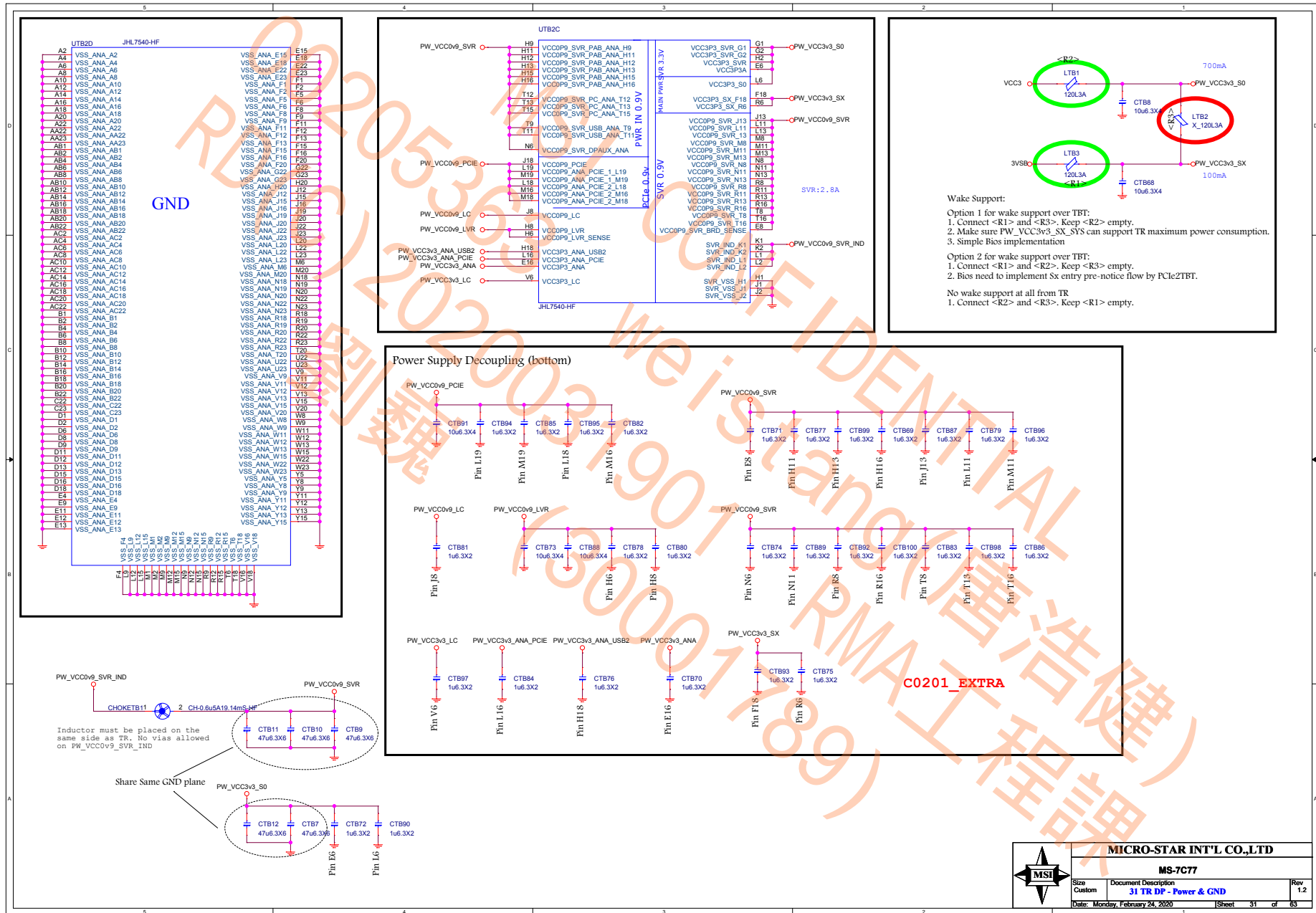
Debug Options



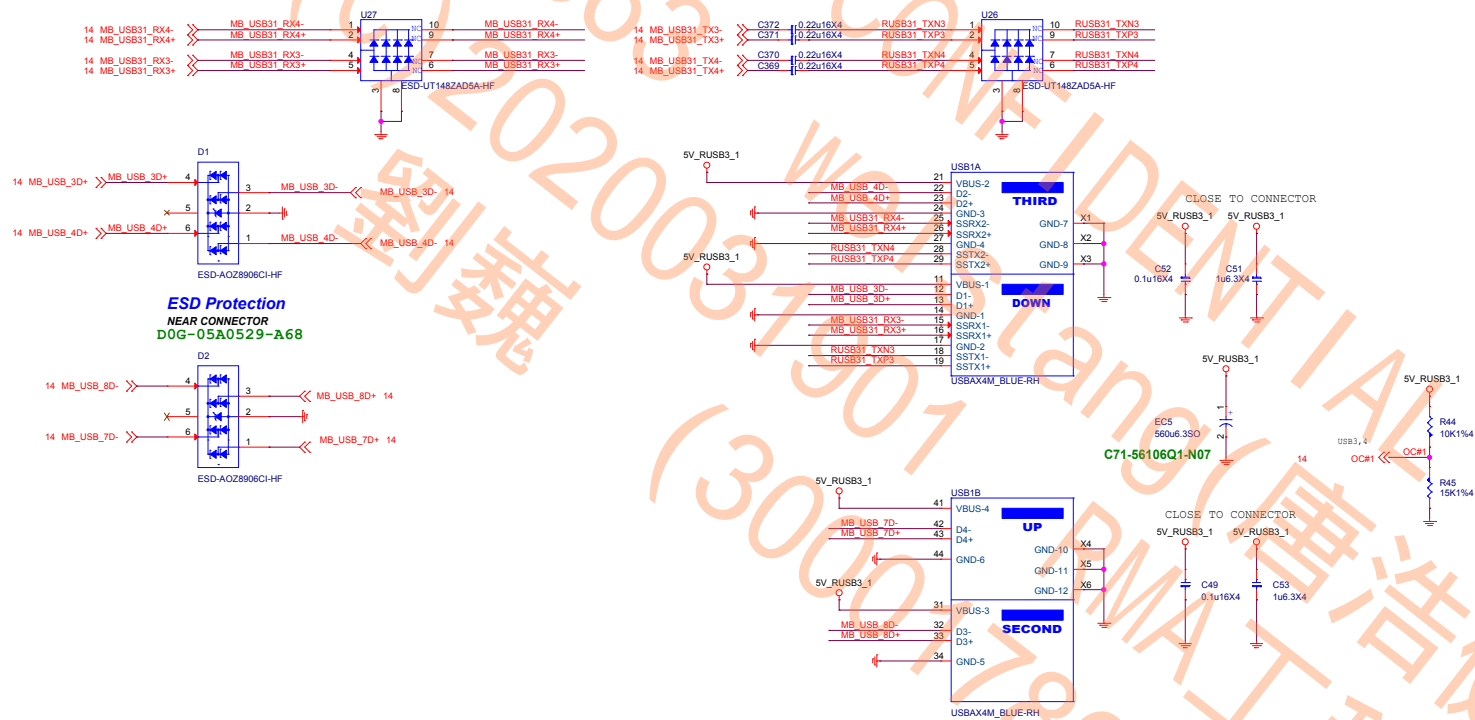
MICRO-STAR INT'L CO.,LTD

MS-7C77

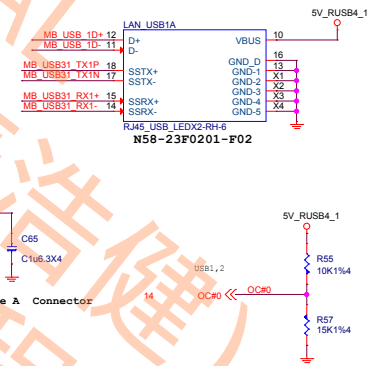
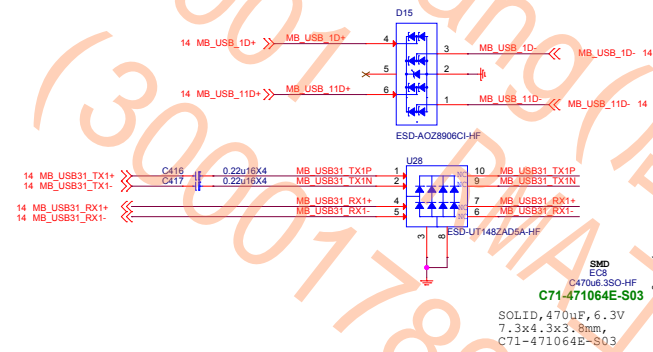
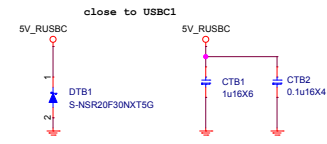
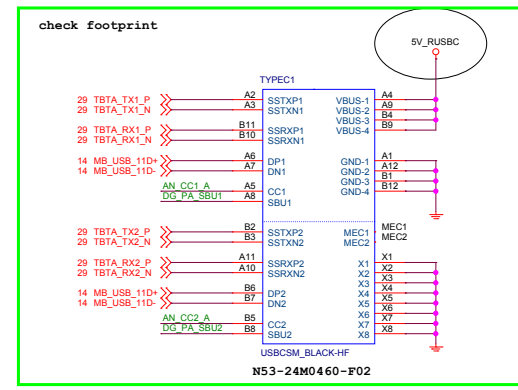
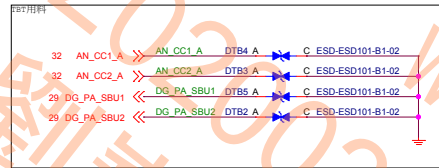
Size Custom	Document Description 30 TR DP - Misc	Rev 1.2
Date: Monday, February 24, 2020	Sheet 30 of 63	



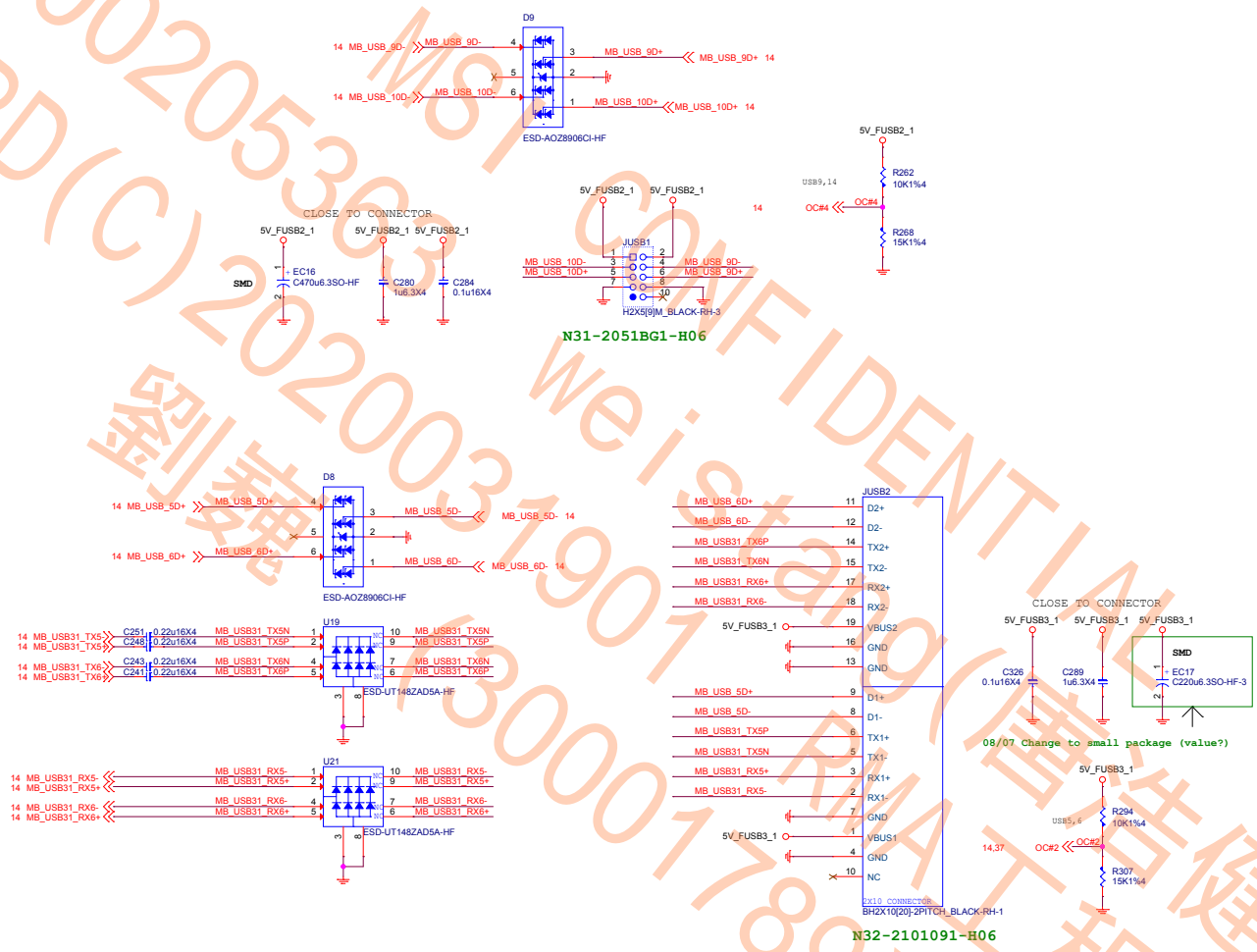


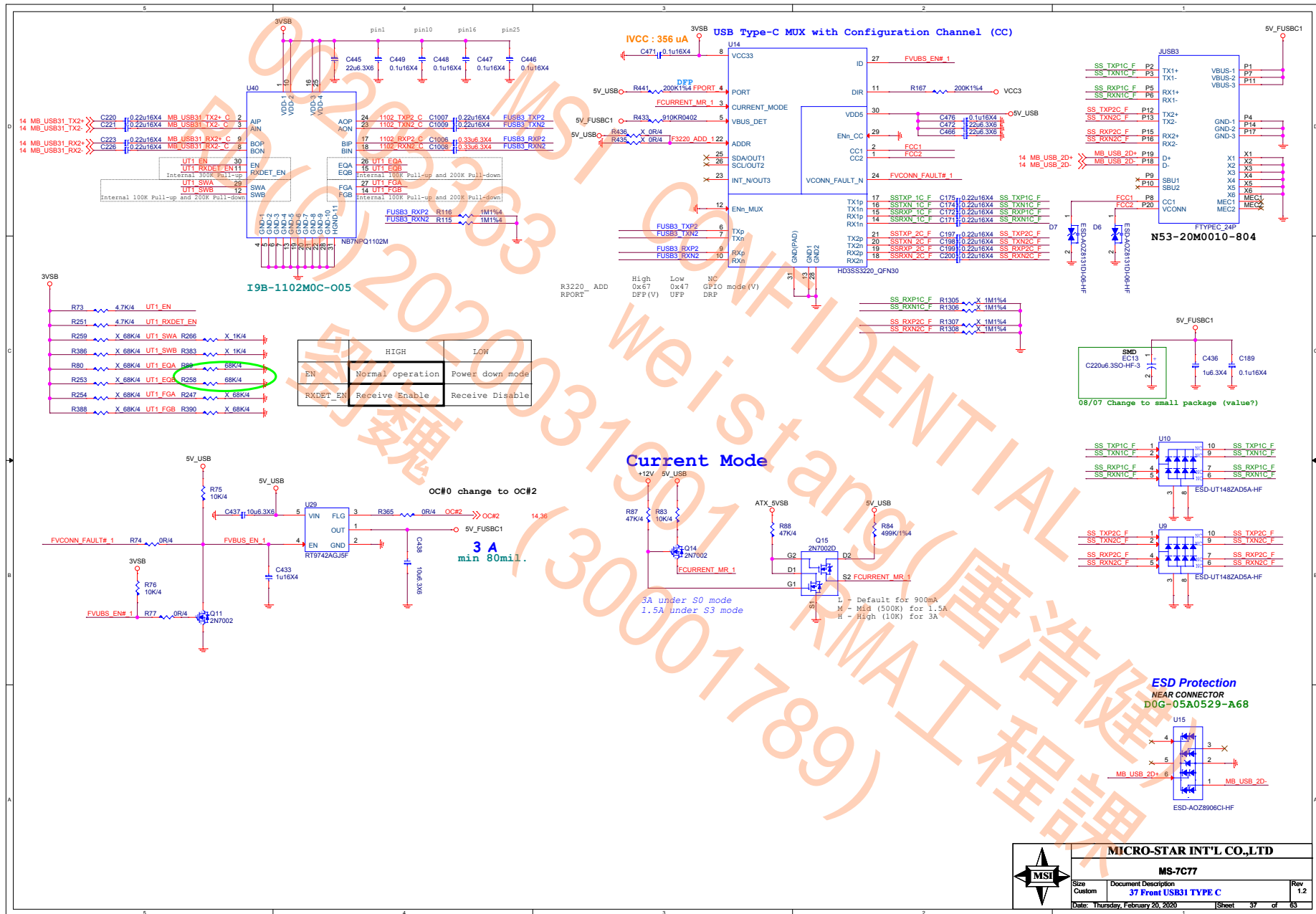


00205363 MS1 CONFIDENTIAL (3001789)



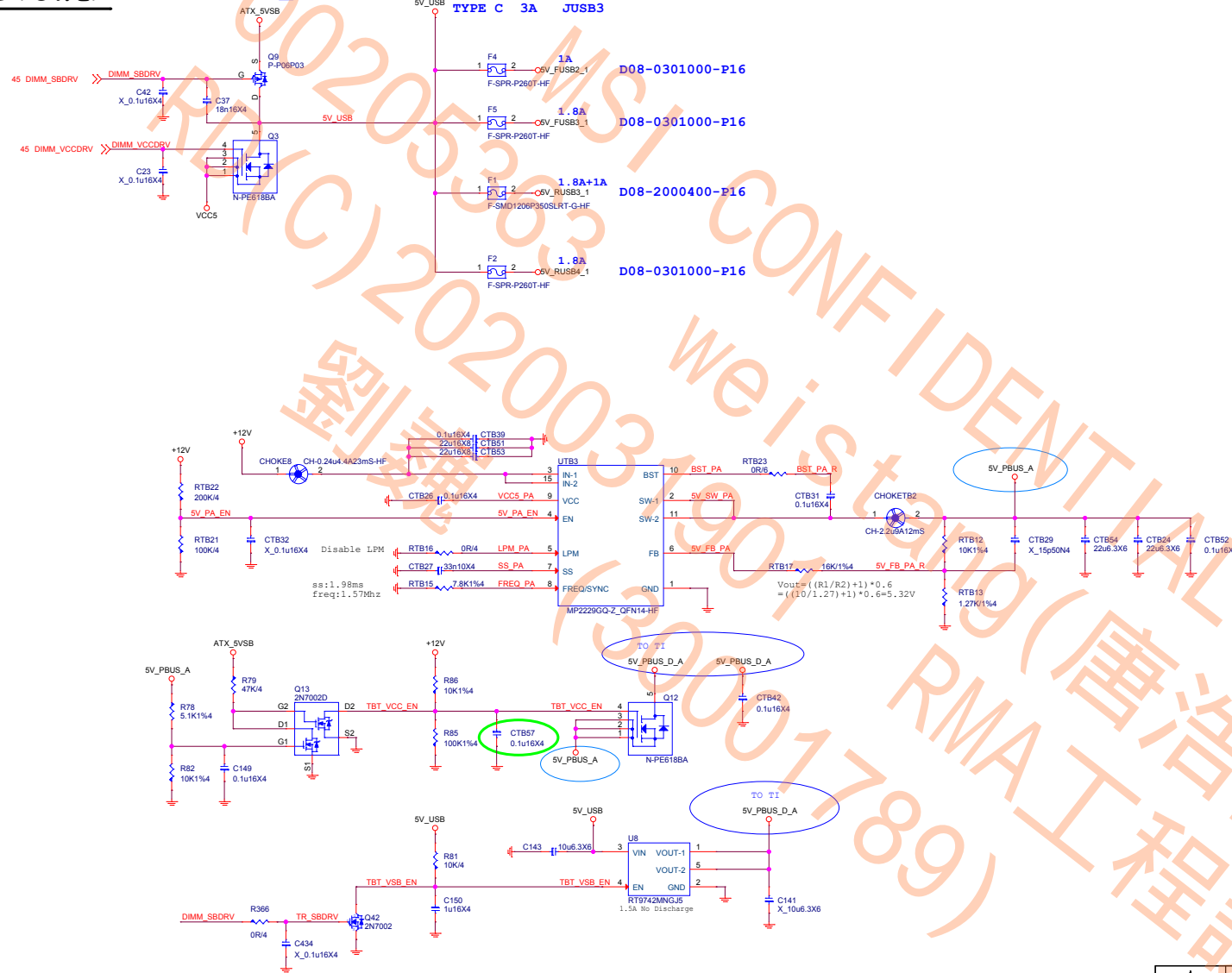
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RD(C) 20200319017901789 (We i s t a r 科技(健))

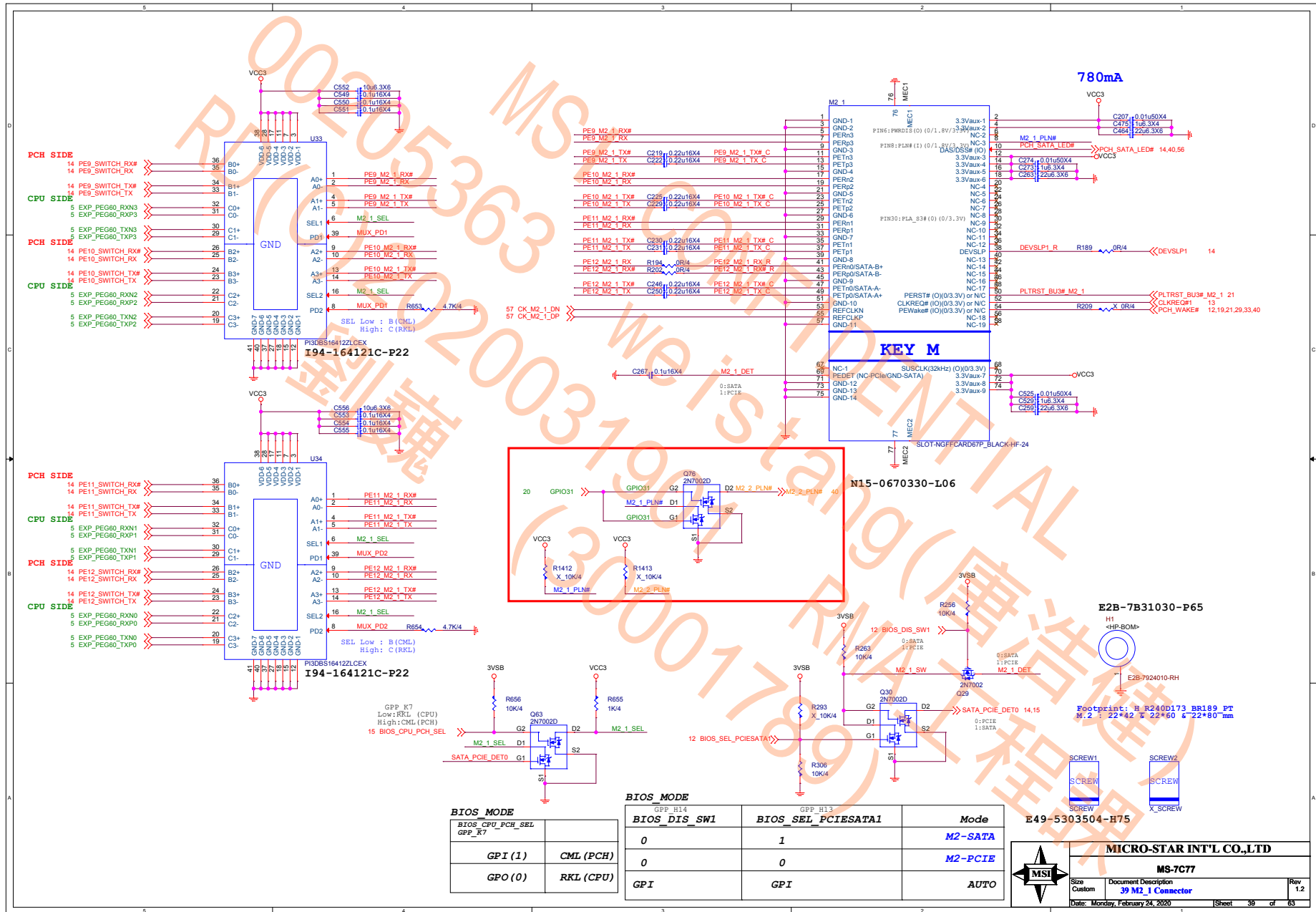


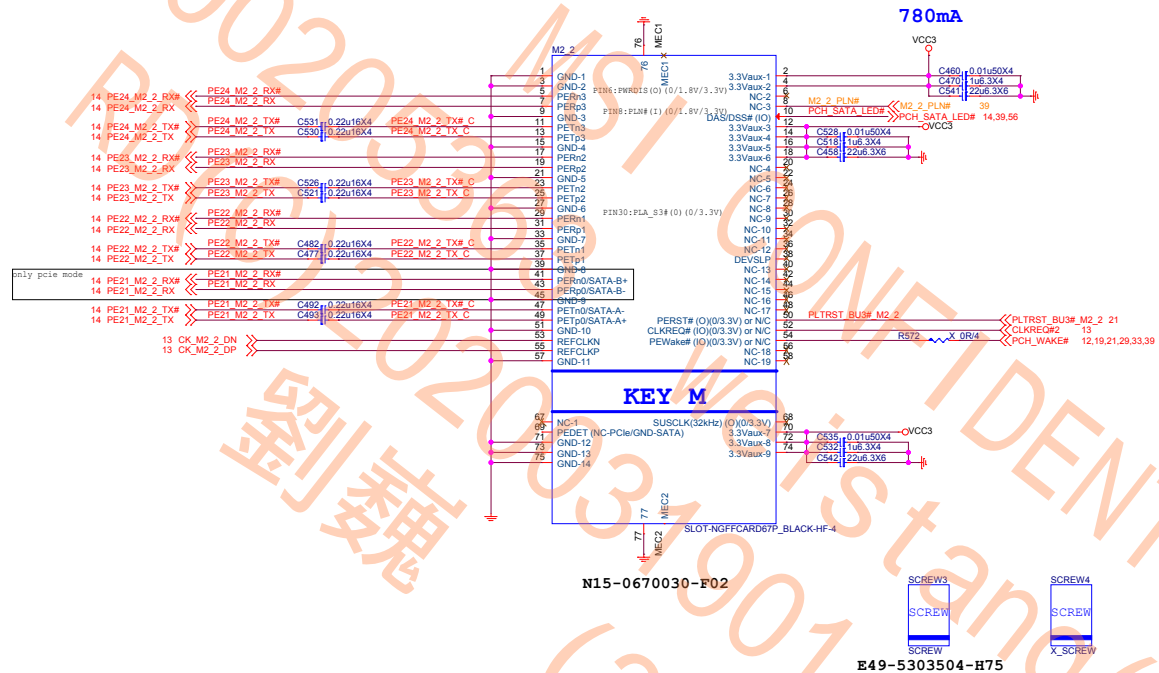


USB POWER

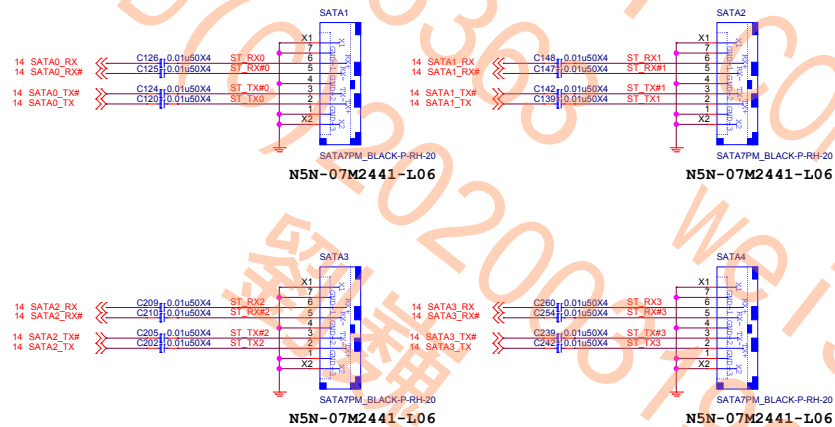
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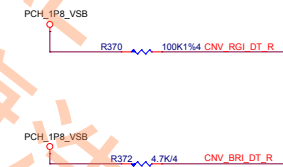
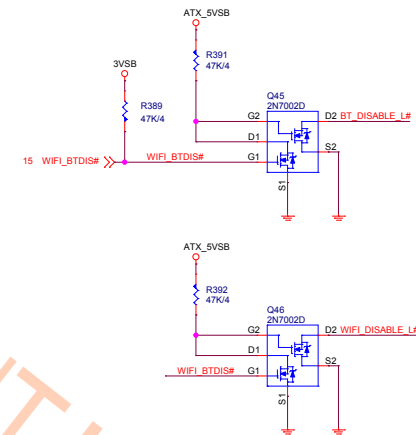
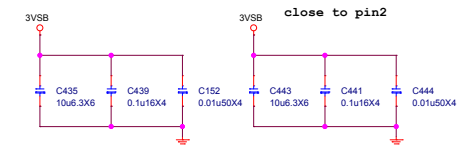
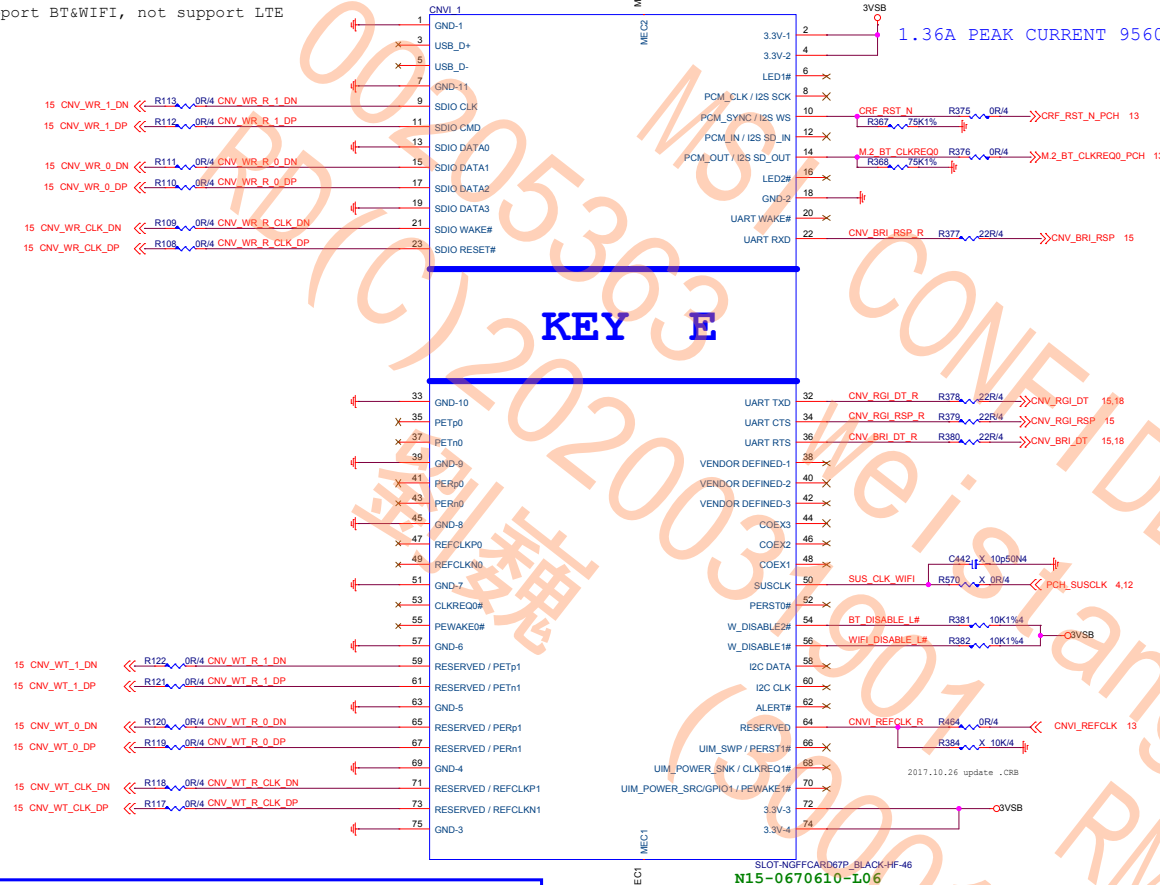




SATA GEN3



support BT&WIFI, not support LTE



COVER1

VR Cover

X1

X2

X_E21-4442021-RH

TOP E21-7C73020-C22

BOT E21-7C73010-C22

Footprint WIFI_MODULE_37_7X35_4

Wireless1

INTEL-8265

Wireless

604-4467-04S



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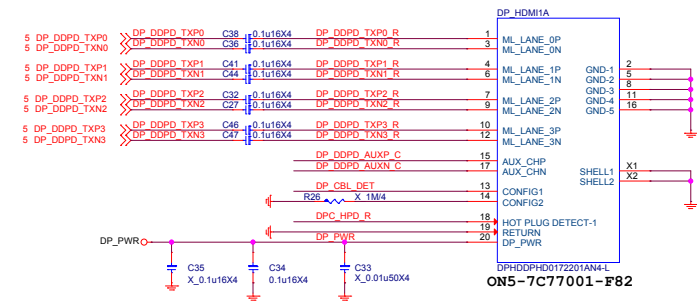
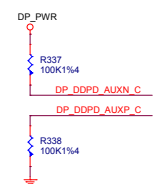
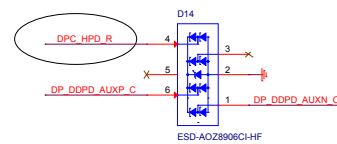
Size Custom

Document Description 42 CNV1 WIFI

Date: Wednesday, February 19, 2020

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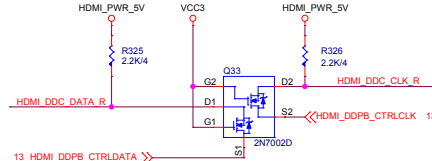
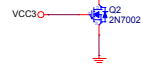
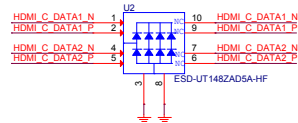
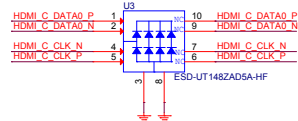
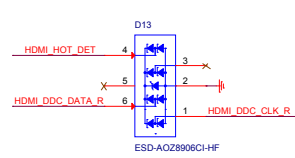
Rev 1.2



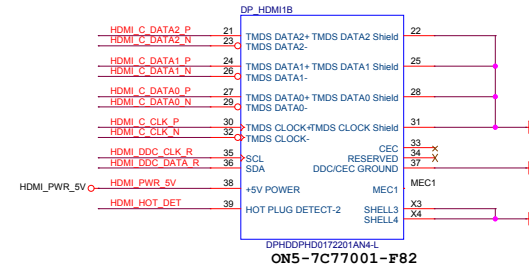
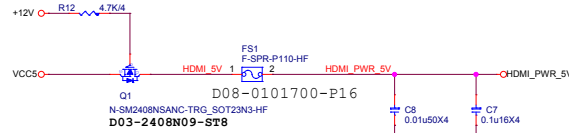
HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)

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

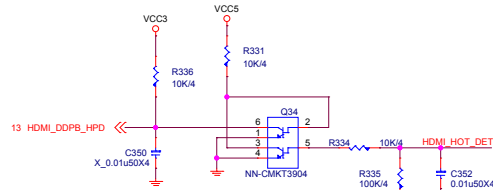
HDMI_MOS_DATA trace length < 500mil
 Other platform please check your design guide length



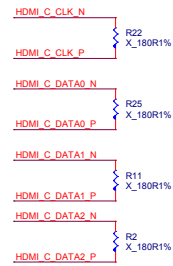
HDMI_DDC_DATA RC339 X 10u50N4
 HDMI_DDC_CLK_R C340 X 10u50N4



HPD



For EMI

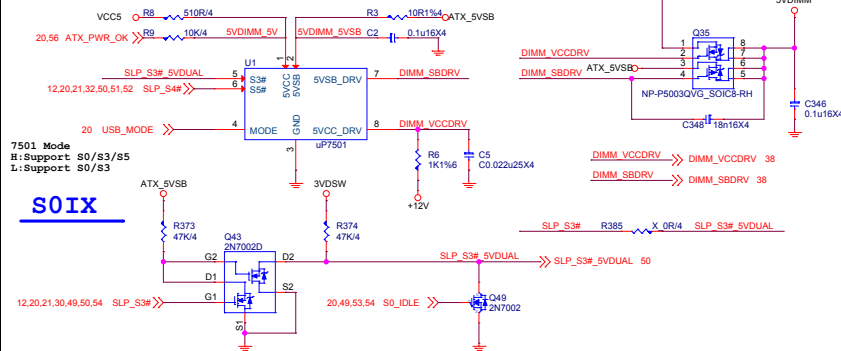


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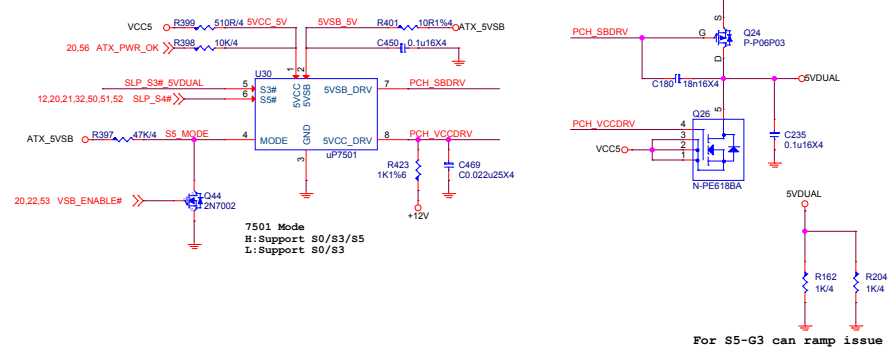
MS-7C77

Size	Document Description	Rev
Custom	44 HDMI Connector	1.2
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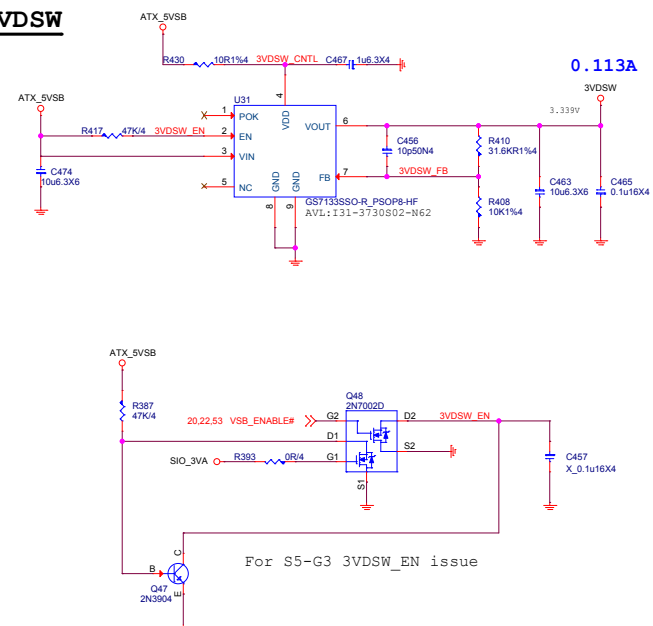
5VDIMM& USB POWER



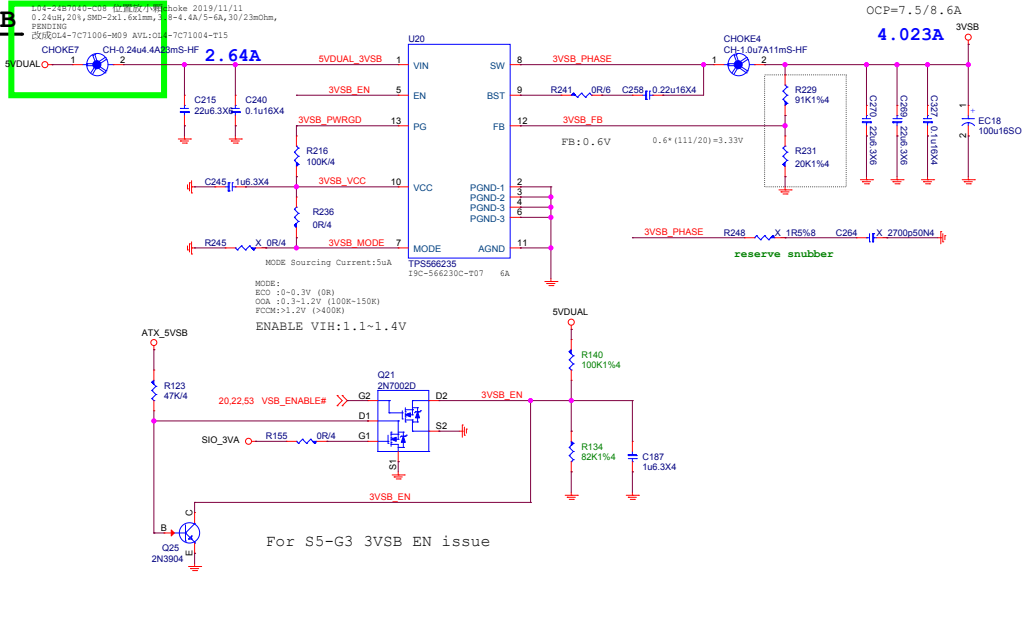
5VDUAL

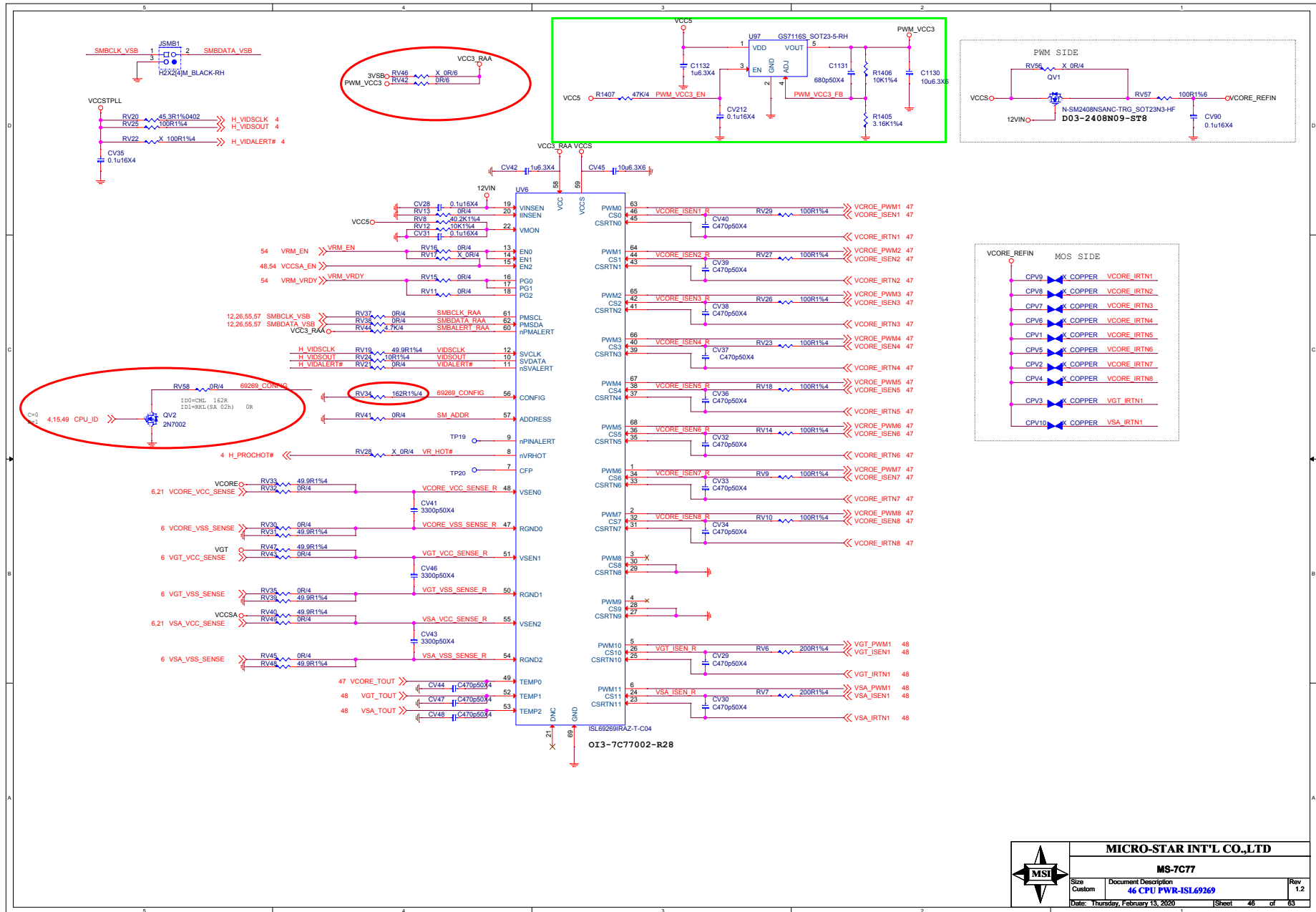


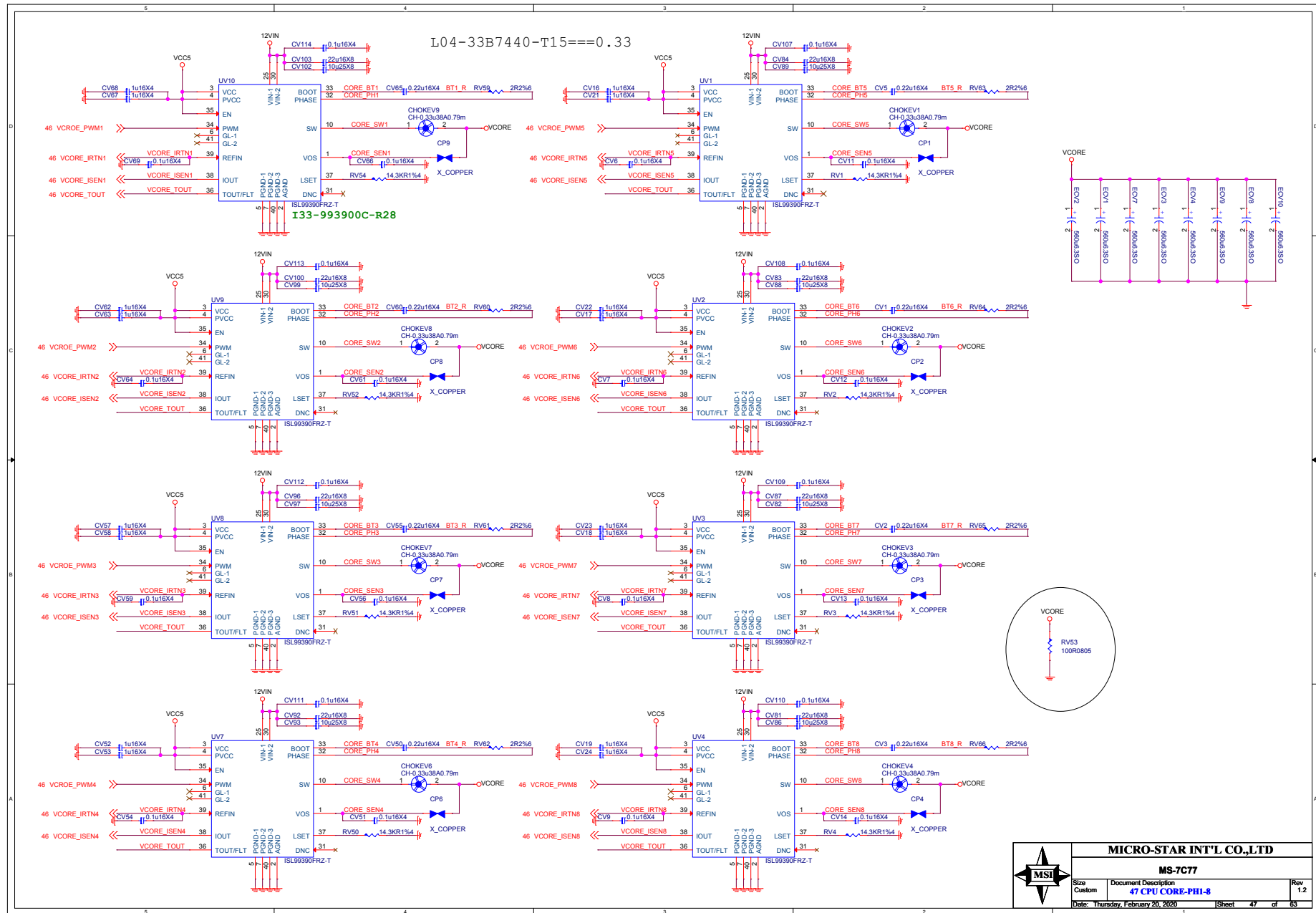
3VDSW



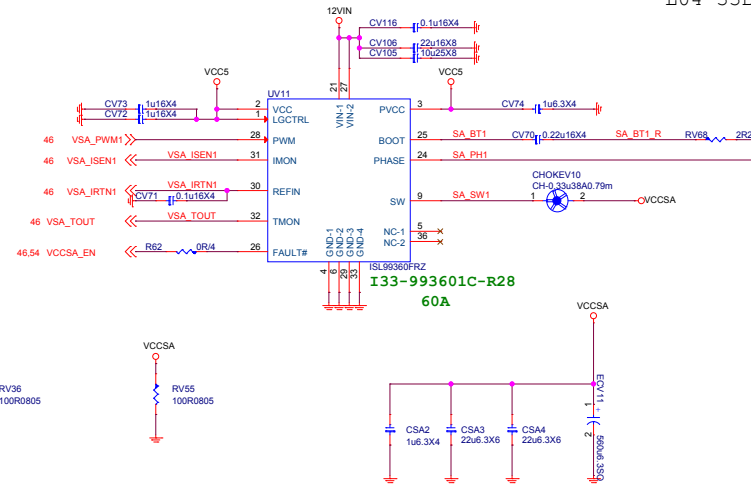
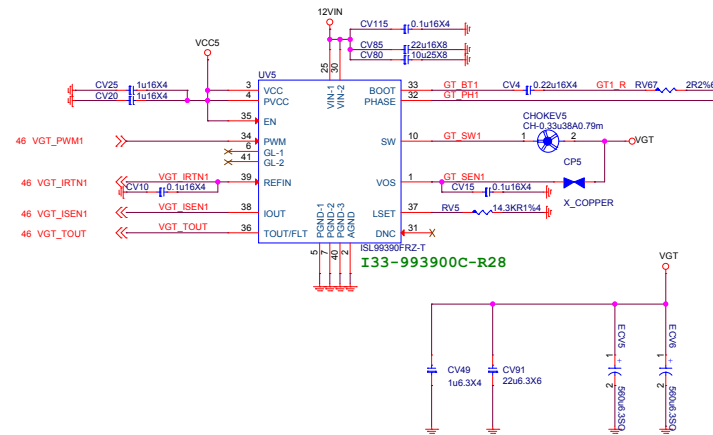
3VSB



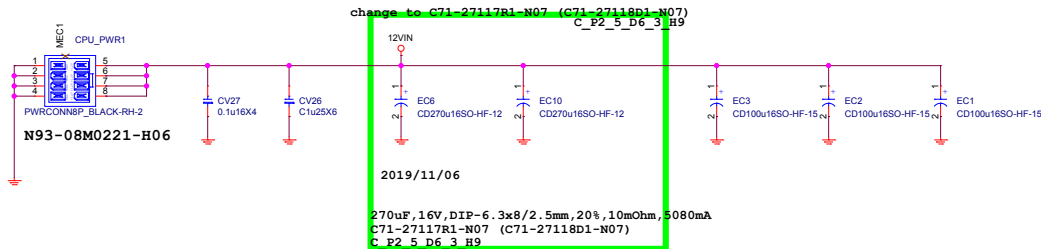




L04-33B7440-T15==0.33



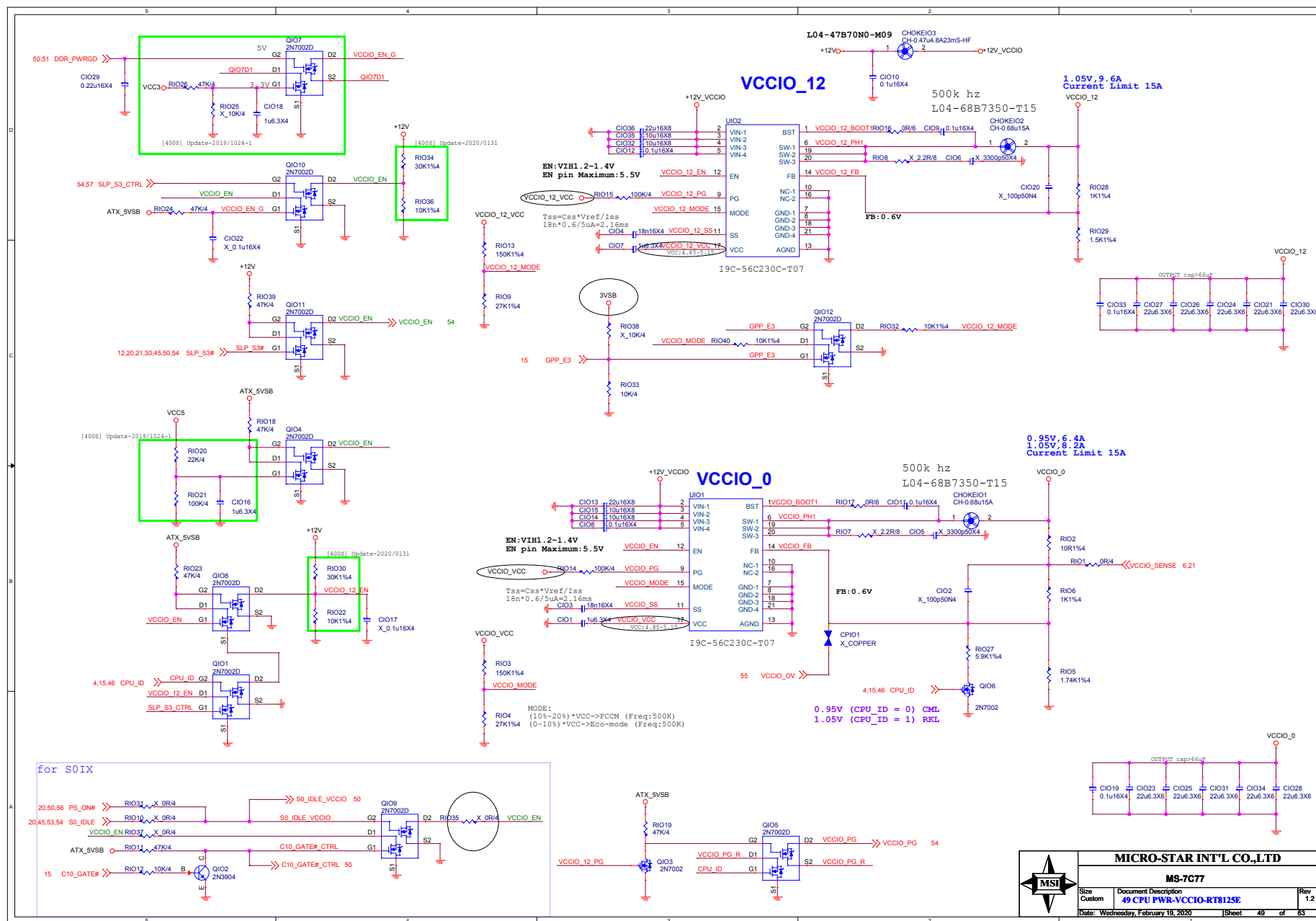
CPU Power connector



12VIN:22.84A+1.143A=23.983A

CPU 12VIN=(193+40)*1/0.85/12=22.84A

MICRO-STAR INT'L CO.,LTD			
MS-7C77			
Size	Document Description	Rev	
Custom	48 CPU GT PH/SA PH1	1.2	
Date	Thursday, February 20, 2020	Sheet	48 of 63

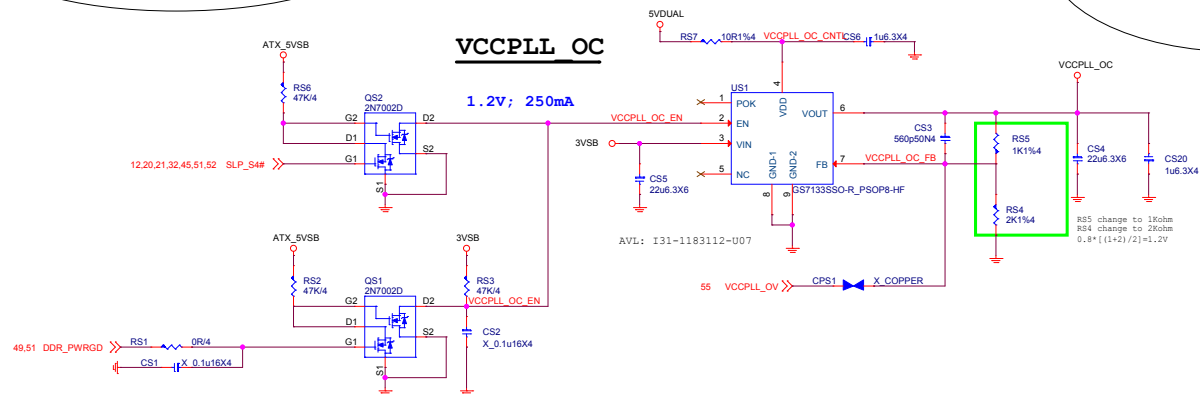
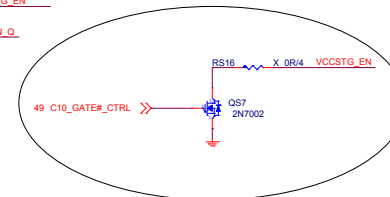
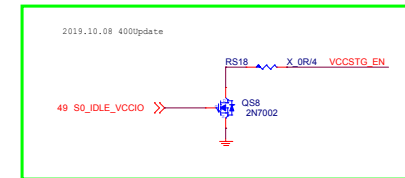
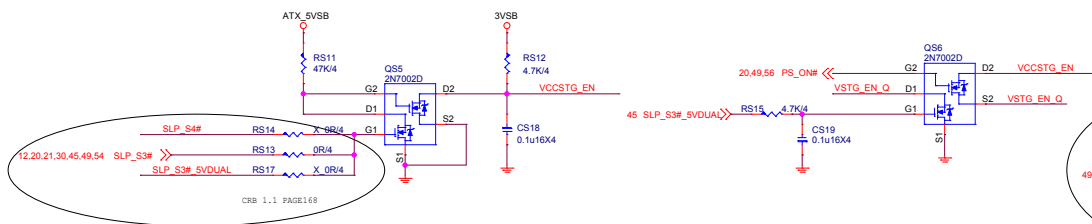
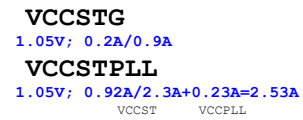


MICRO-STAR INT'L CO.,LTD

MS-7C77

Size	Document Description
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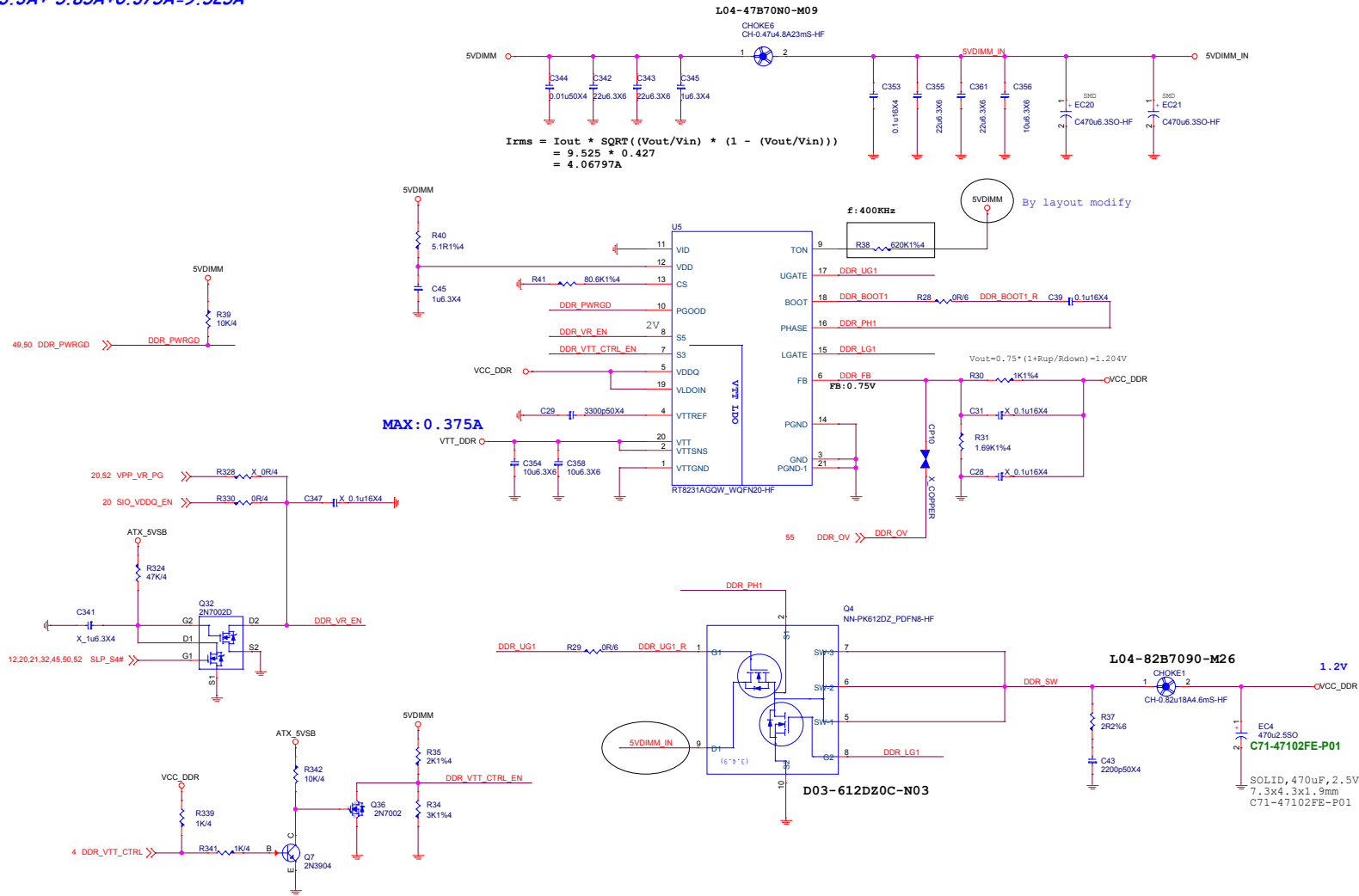
Date: Wednesday, February 19, 2020 Sheet 49 of 63



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VDDQ Power:1.2V;9.525A

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



VPP Power:2.5V; 1.12A FOR 2DIMM

VPP25 Power 2.5V; 1.12A

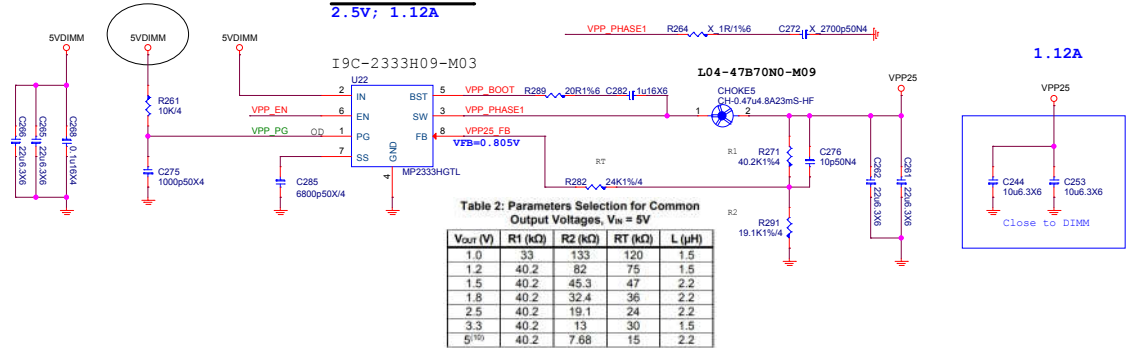


Table 2: Parameters Selection for Common Output Voltages, $V_{IN} = 5V$

V_{OUT} (V)	$R1$ (k Ω)	$R2$ (k Ω)	RT (k Ω)	L (μ H)
1.0	33	133	120	1.5
1.2	40.2	82	75	1.5
1.5	40.2	45.3	47	2.2
1.8	40.2	32.4	36	2.2
2.5	40.2	19.1	24	2.2
3.3	40.2	13	30	1.5
5 ⁽¹⁰⁾	40.2	7.68	15	2.2

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 V_{IN} limits the EN input current below 40 μ A to prevent damage to the Zener diode. For example, when connecting a 604k Ω pull-up resistor to 12V V_{IN} , $I_{Zener} = (12V - 2.8V) / (604k\Omega + 35k\Omega) = 14\mu A$.

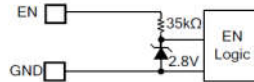
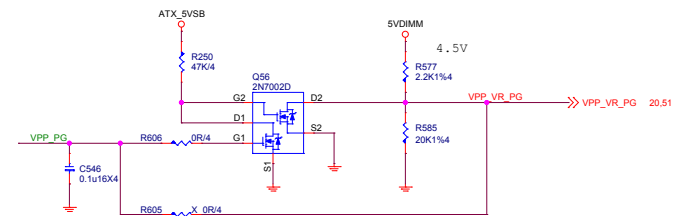
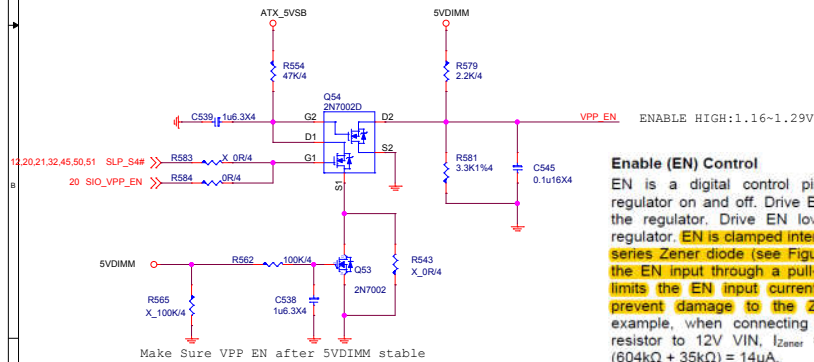
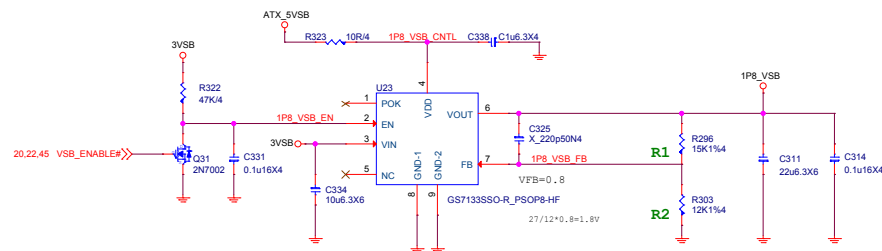


Figure 2: Zener Diode between EN and GND

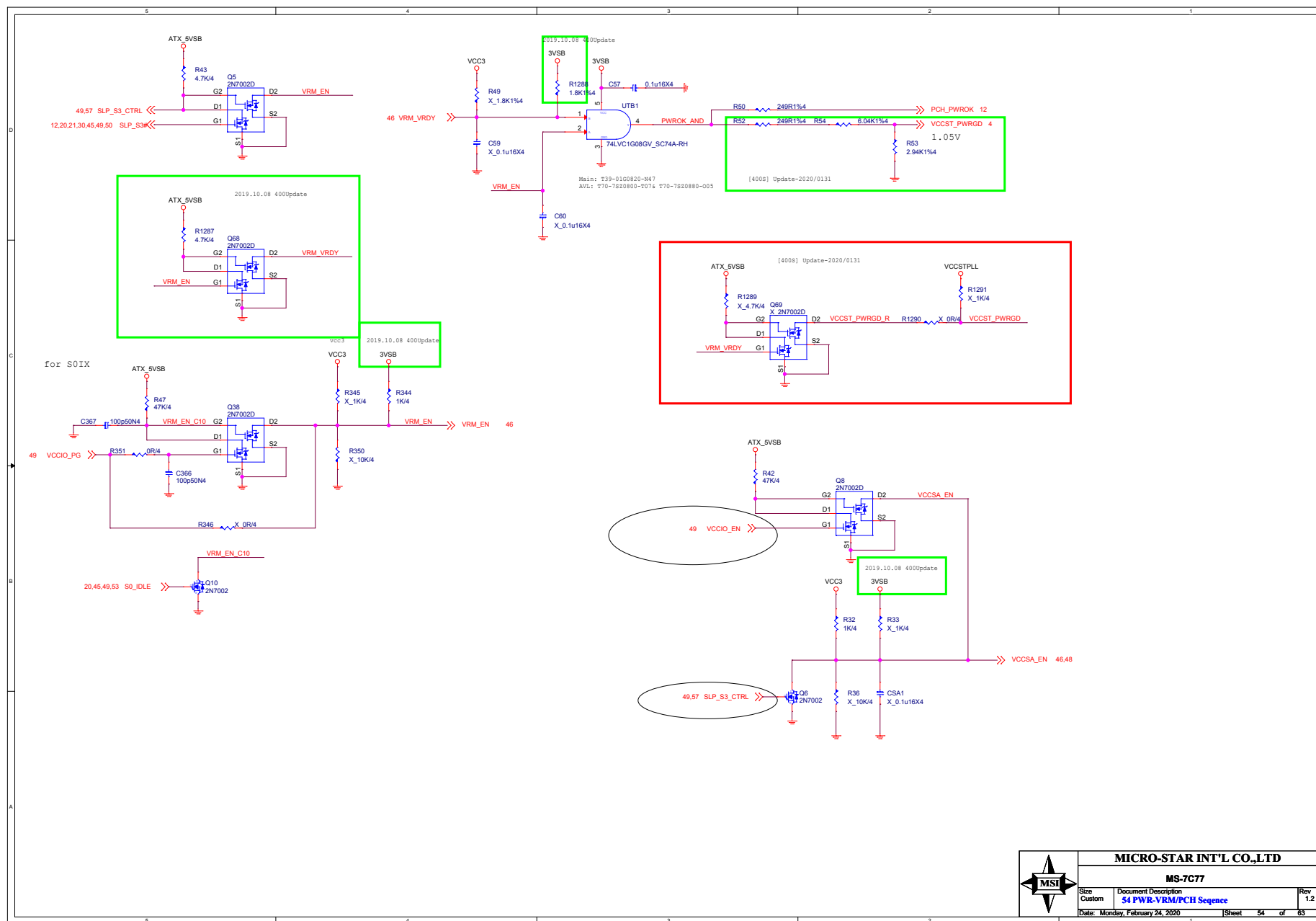


D03-612DZ0C-N03 2.2~3.1mohm@5V
OCP=1.6A*1.3=20.8A

$$\begin{aligned} \text{IOCSET} &= 10\mu\text{A} \\ \text{OCP_max} &= \text{Iocset} * \text{Rocset} / \text{Rdson}(\text{min}) \\ &= 10\mu\text{A} * 6.8\text{k} / 2.2\text{mohm} \\ &= 21.9\text{A} \end{aligned}$$
$$\begin{aligned} \text{OCP_max} &= \text{Iocset} * \text{Rocset} / \text{Rdson (min)} \\ &= 10\mu\text{A} * 6.8\text{k} / 2.2\text{mohm} \\ &= 21.9\text{A} \end{aligned}$$


MS-7C77

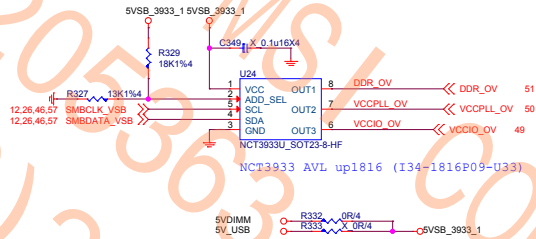
Size Custom	Document Description 53 PCH POWER-RT8125E/IP8_VSB	Rev 1.2
Date: Friday, February 21, 2020		Sheet 53 of 63



UPI VOLTAGE CONSOLE

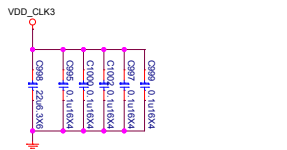
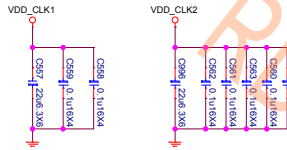
0x26:RH=18K,RL=13K

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



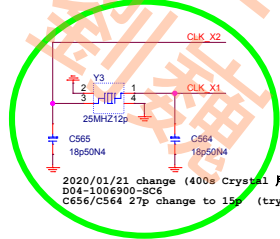
MICRO-STAR INT'L CO.,LTD			
MS-7C77			
Size	Document Description	Rev	
Custom	55 OV-NCT3933	1.2	
Date: Thursday, February 15, 2020		Sheet	55 of 63

2.20mA
VCC3_CLK1 R485 0R/6 VDD_CLK1
VCC3_CLK2 R657 0R/6 VDD_CLK2
VCC3_CLK3 R1254 0R/6 VDD_CLK3

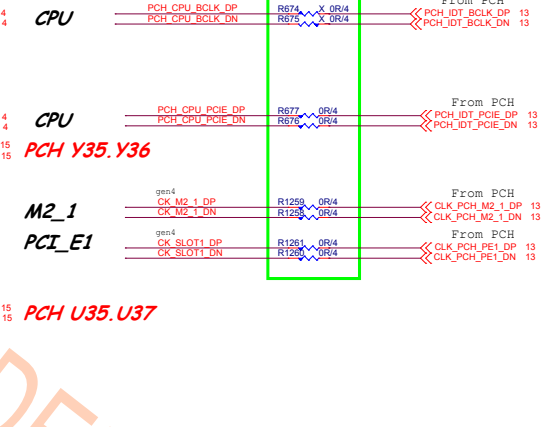
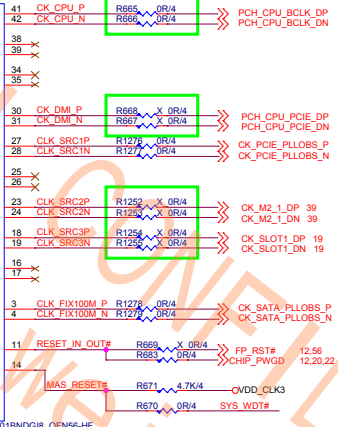
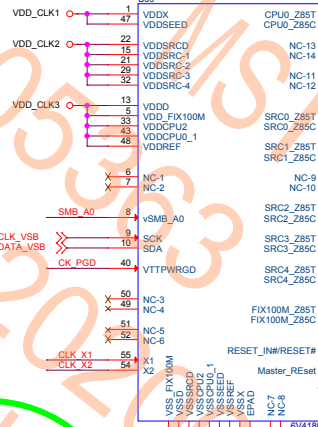


VDD_CLK3 R659 4.7K/4 SMB_A0
R659 4.7K/4

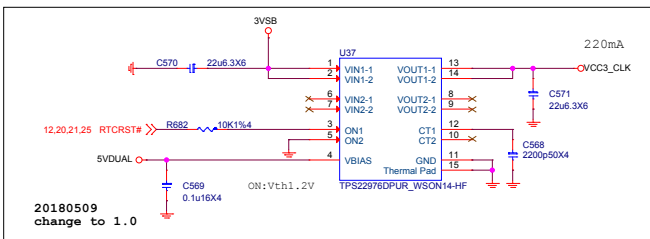
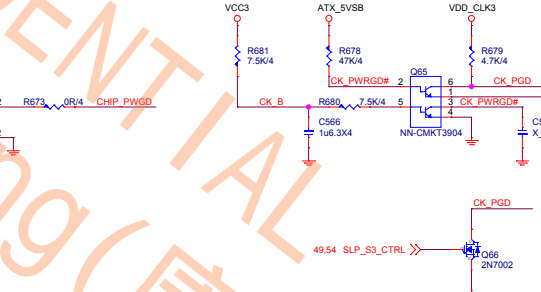
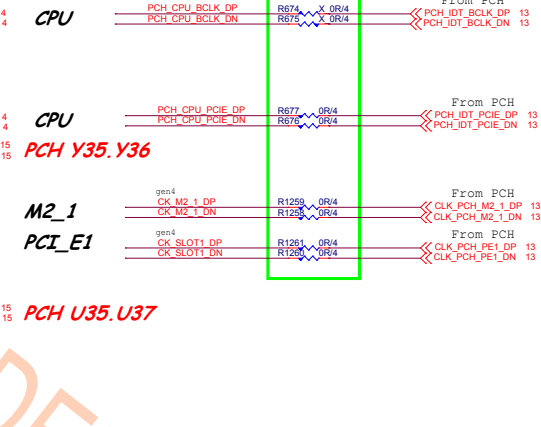
SMB_A0	ADDR
0	D2/D3
1	D8/D9



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

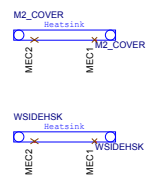


Layout注意擺放，不可分枝

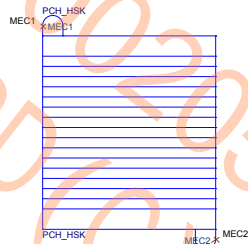


20180509
change to 1.0

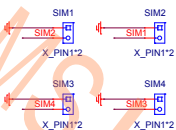
MSI		MICRO-STAR INT'L CO.,LTD	
Size Custom		MS-7C77	
Document Description		57 Clock Gen-6V41821	
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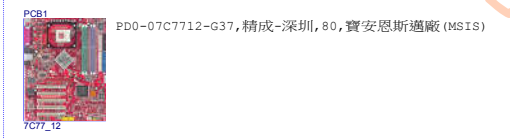
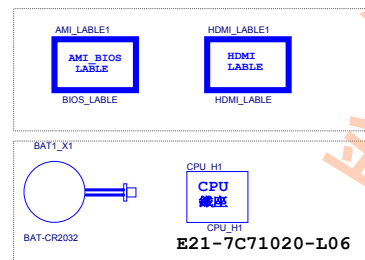
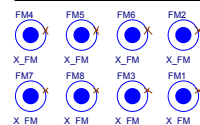
PCH_SINK E31-0410430-A87
M2_COVER E31-0002490-A87
W MOS SINK E32-0500070-A87



Simulation



Optical Fiducial Marks-120



Mounting Holes

