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MS-7C13

ATX:226mm*185mm

Ver: 11

intel -CoffeeLake-S plamform

CPU:

LGA1151

CPU POWER PAK *4Phase

GT POWER PAK *2 Phase

Onboard Chip:

SIO: NCT5567D

HD Audio Codec: ALC887

LAN: RTL8111H

Flash ROM: SPI 128Mb/16 MB

DP to VGA: IT6516

Main Memory:

DDR4 * 2 (Dual Channel)

ACPI:

5VDAUL:uP7501

5VDIMM:uP7501

3VSB:MP2147

3VDSW: GS7133

VCCSTPLL:GS7133

Expansion Slots:

PCI Express (X16) Slot * 1

PCI Express (X1) Slot * 2

System Chipset:

Kaby Lake H310C

PWM:

VCORE - RT3607

DDR - RT8231

DDR VPP25- MP2143

PCH(1.05V) - RT8125E

VCCSA - RT8125E

VCCIO - SY8288

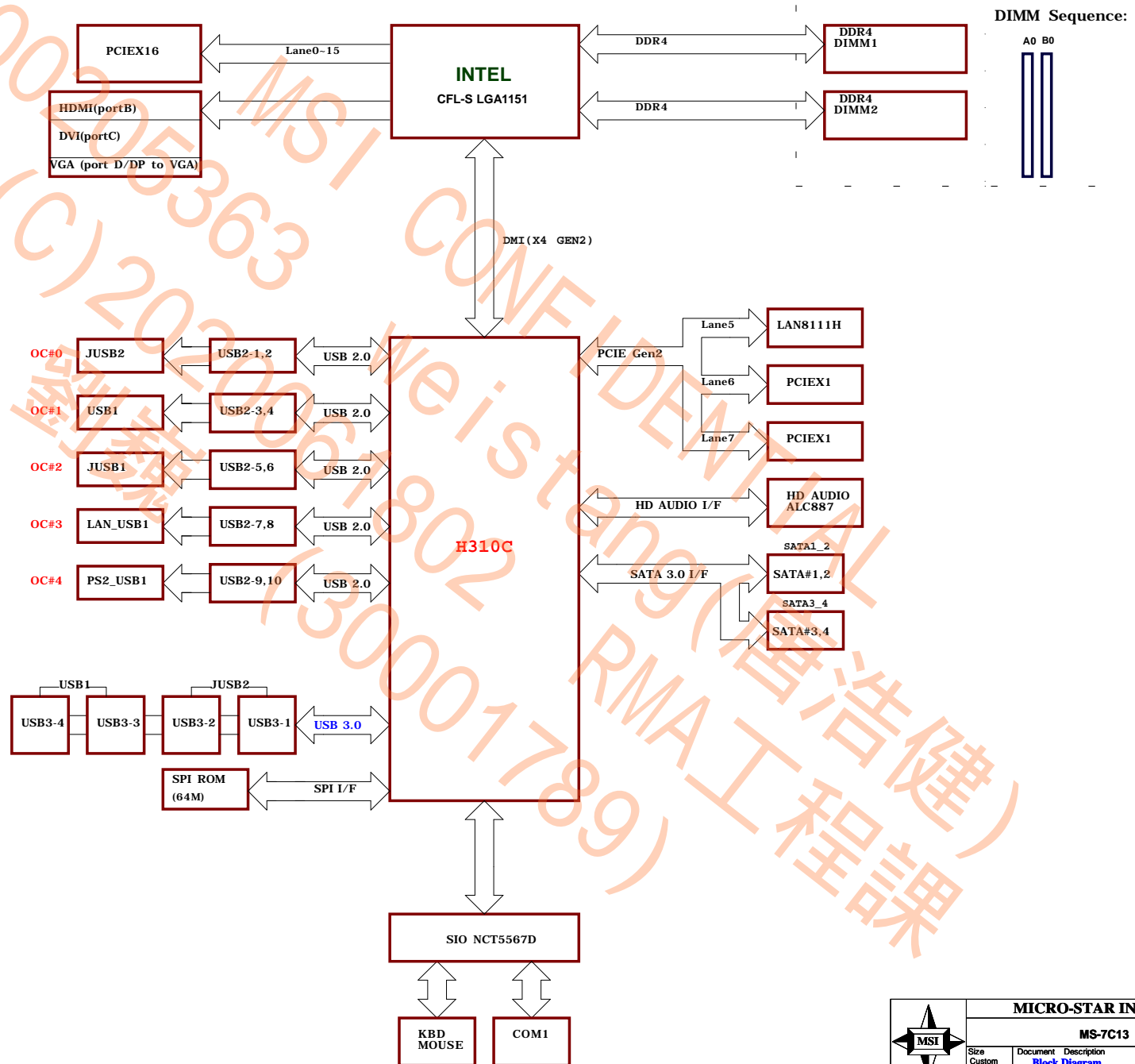


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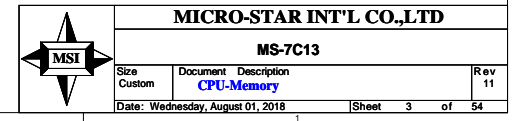
MS-7C13 Block Diagram

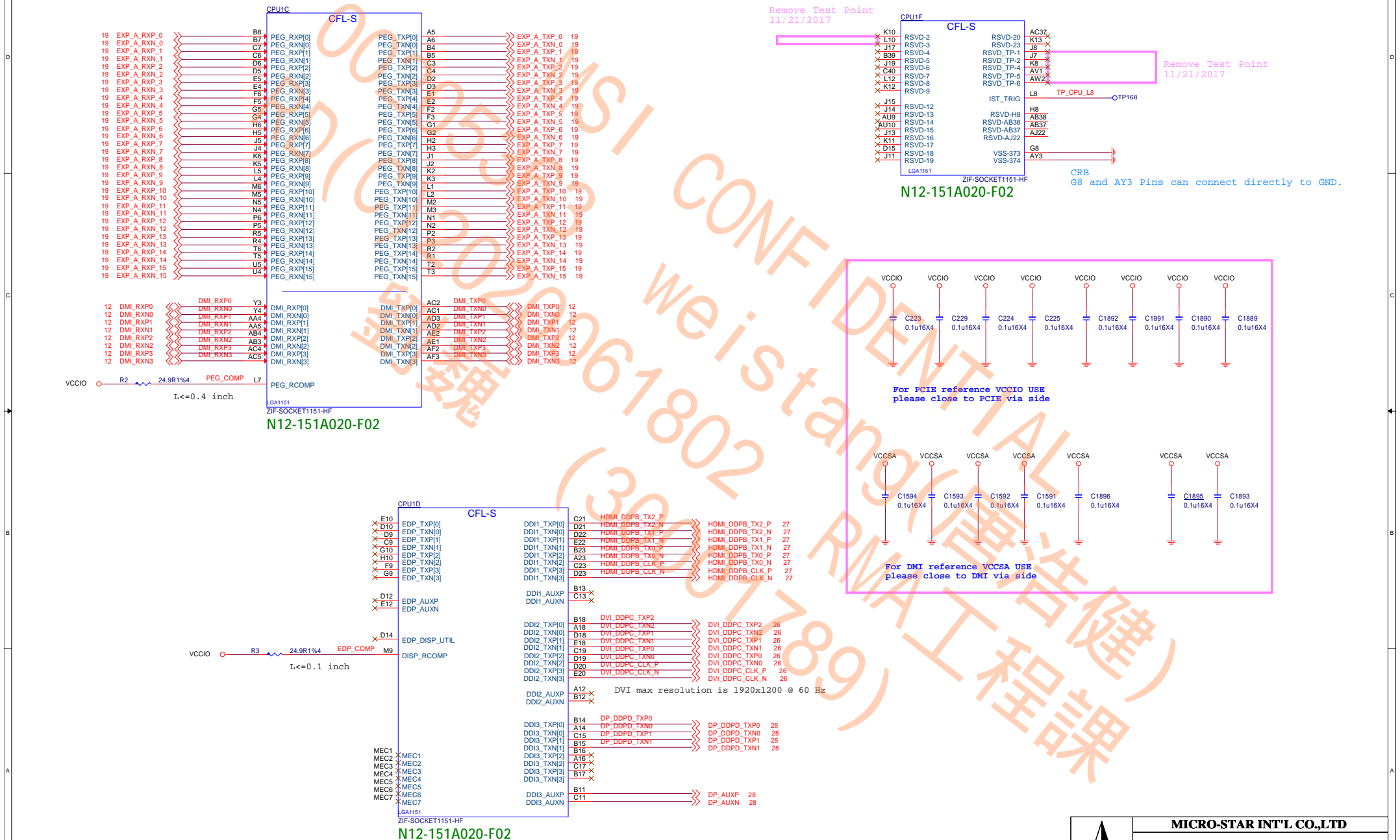


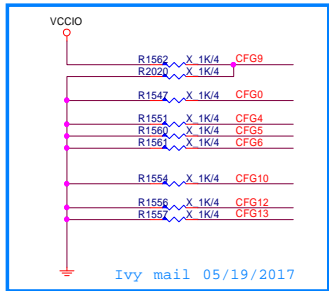
Slot Sequence:

- PCIEX16** (By CPU GEN3)
- PCIEX1** (By PCH GEN2)
- PCIEX1** (By PCH GEN2)

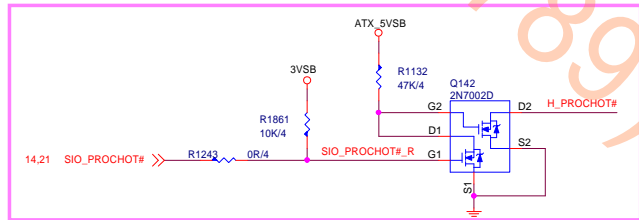
MICRO-STAR INT'L CO.,LTD			
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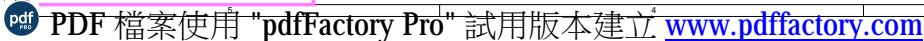


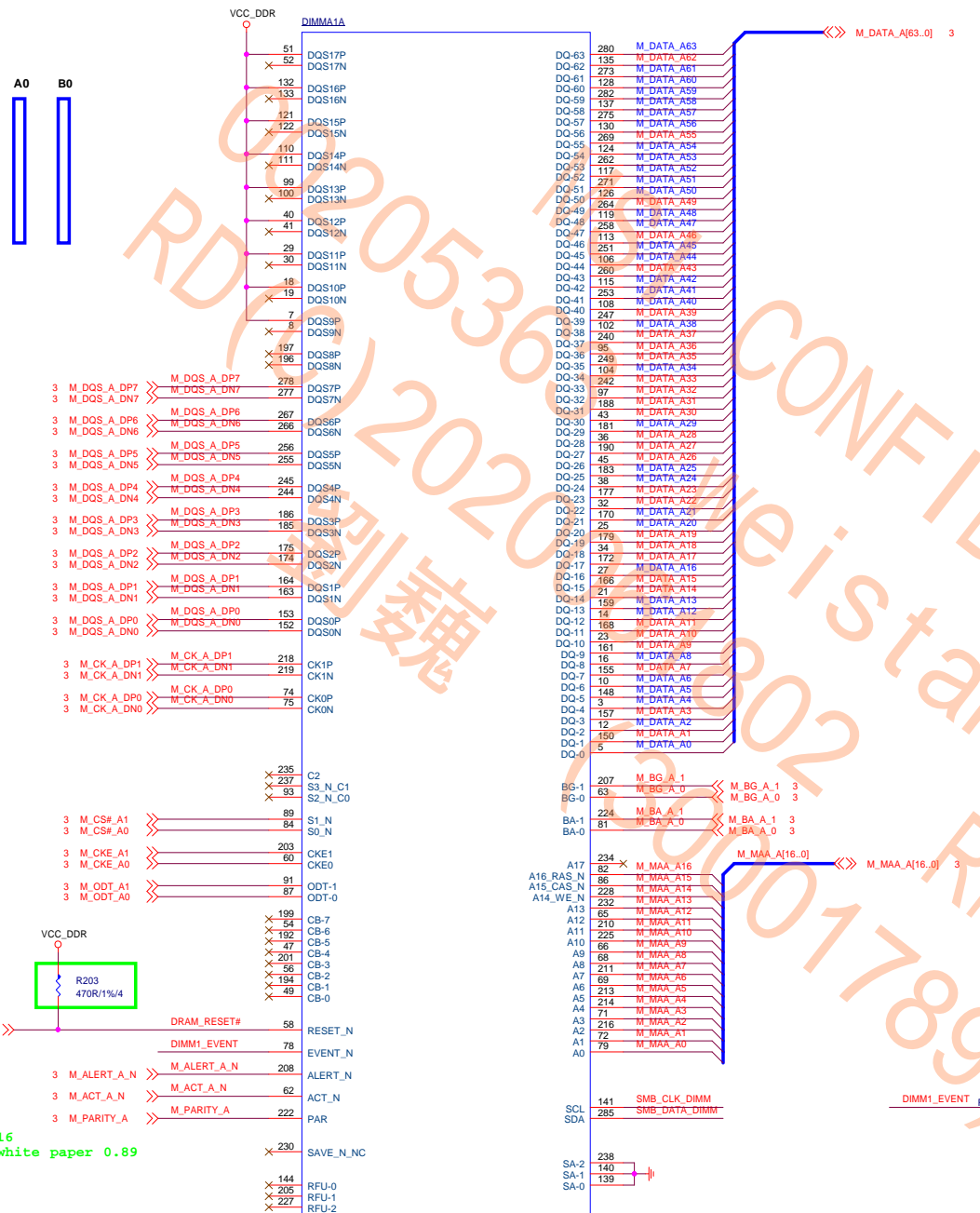




CFG Table			
	HIGH	LOW	DESCRIPTION
0	NO LOCK	LOCK	PCU PG LOCK
2	NORM	REVERSE	PG_LANE_REVERSAL
3	DISABLE	ENABLE	RSVD
4	DISABLE	ENABLE	CDP
5	DISABLE	ENABLE	PGCFG0SEL[0]
6	DISABLE	ENABLE	PGCFG0SEL[1]
7	RESET#	BIOS REQ	PGQ_OSTP_TRAINING
8			RSVD
9			RSVD
10			RSVD
11			RSVD
12			RSVD
13			RSVD
14	RSVD		
15	RSVD		



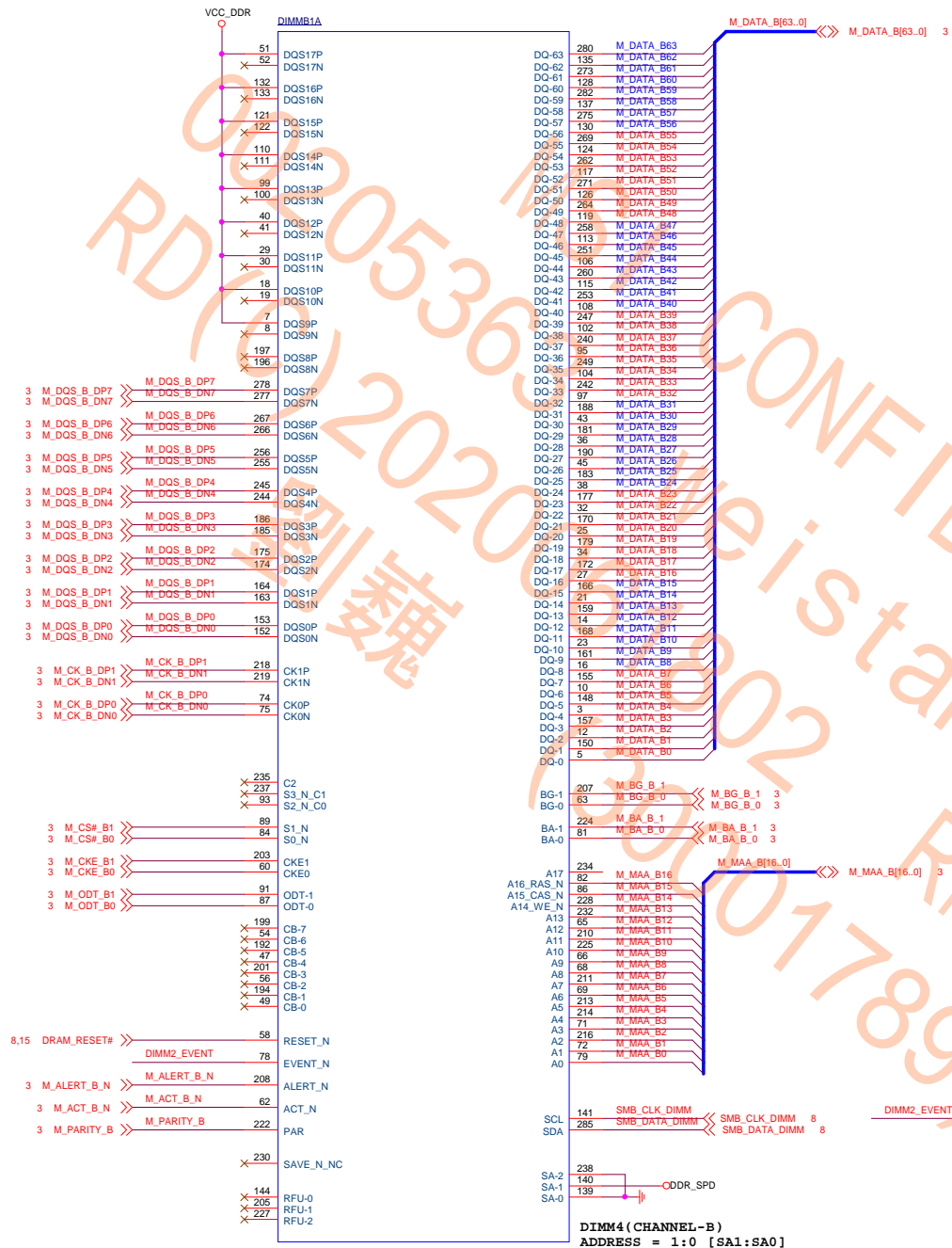




DDRIV-288P_BLACK-RH-23
N13-2880561-L06

15,21 SMBCLK_VCC >> SMBCLK_VCC R238 0R/4 SMB_CLK_DIMM >> SMB_CLK_DIMM 9
15,21 SMBDATA_VCC >> SMBDATA_VCC R241 0R/4 SMB_DATA_DIMM >> SMB_DATA_DIMM 9

		MICRO-STAR INT'L CO.,LTD	
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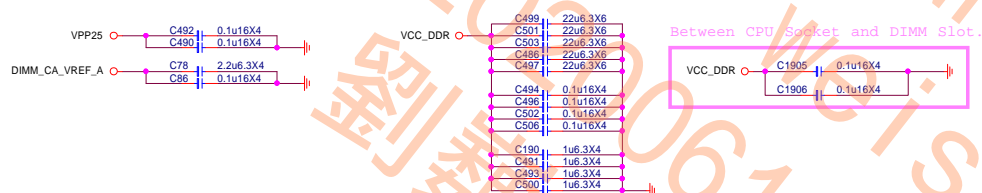
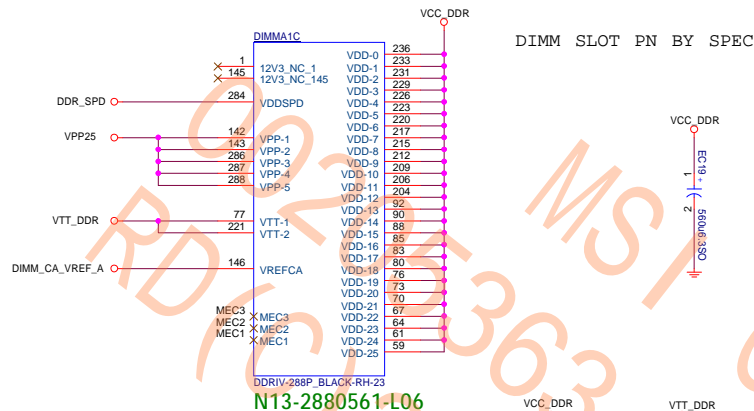
DDRIV-288P_BLACK-RH-23
N13-2880561-L06



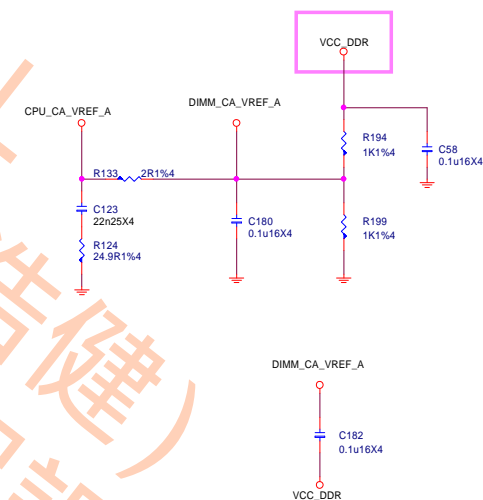
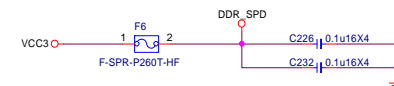
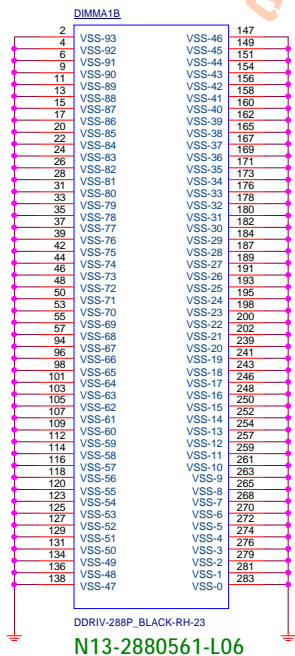
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0.1uFx1 per dimm



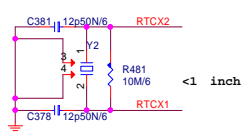
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MS-7C13

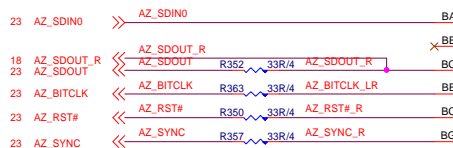
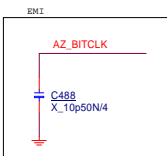
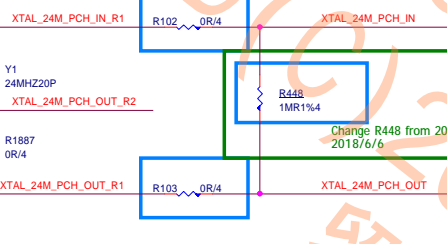
Size	Document	Description	Rev
Custom	DDR4-POWER/GND-1		11
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Close to PCH

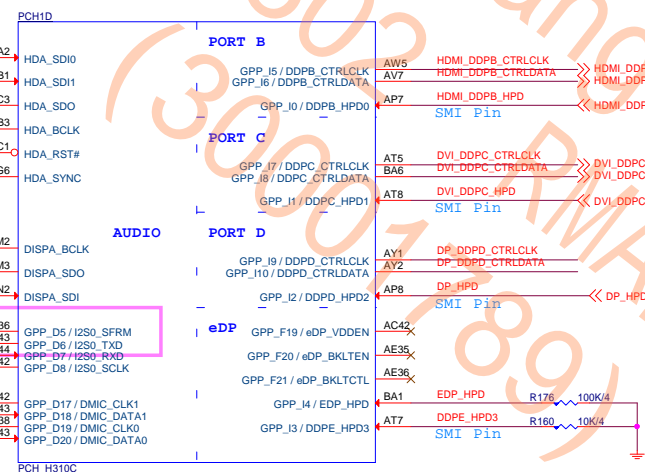
Close to PCH



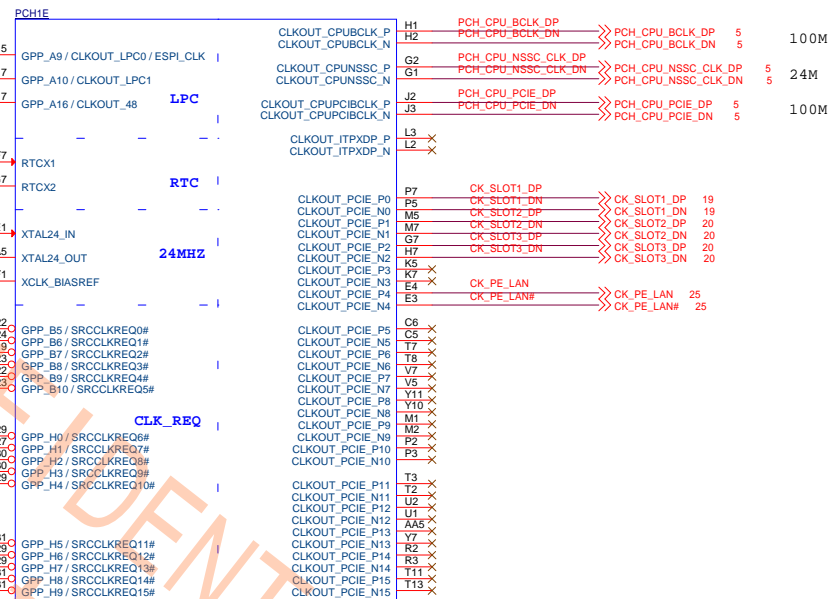
32.768KHZ12.5p_D-RH-9
Change Y2 from D04-0305901-F07 to D04-0306001-C11
2018/7/2



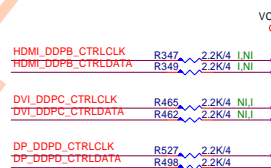
Remove Test Point
11/21/2017



OB1-7C10001-I06



PCH_H310C
OB1-7C10001-I06



Port B HDMI

Port C DVI

Port D DisplayPort to VGA



VH is main BOM.

VD BOM R329 stuf f, R332 unstuff., R347, R349 unstuff.

Model	ERP	Opti on	R329	R332	R347, R349	R465, R462
7C13-VH	7C31-01*	STD	unstuff	stuff	stuff	unstuff
7C13-VD	7C31-02*	A	stuff	unstuff	unstuff	stuff
7C13-WATER	7C31-03*	B	stuff	unstuff	unstuff	stuff
7C13-FIRE	7C31-04*	C	unstuff	stuff	stuff	unstuff

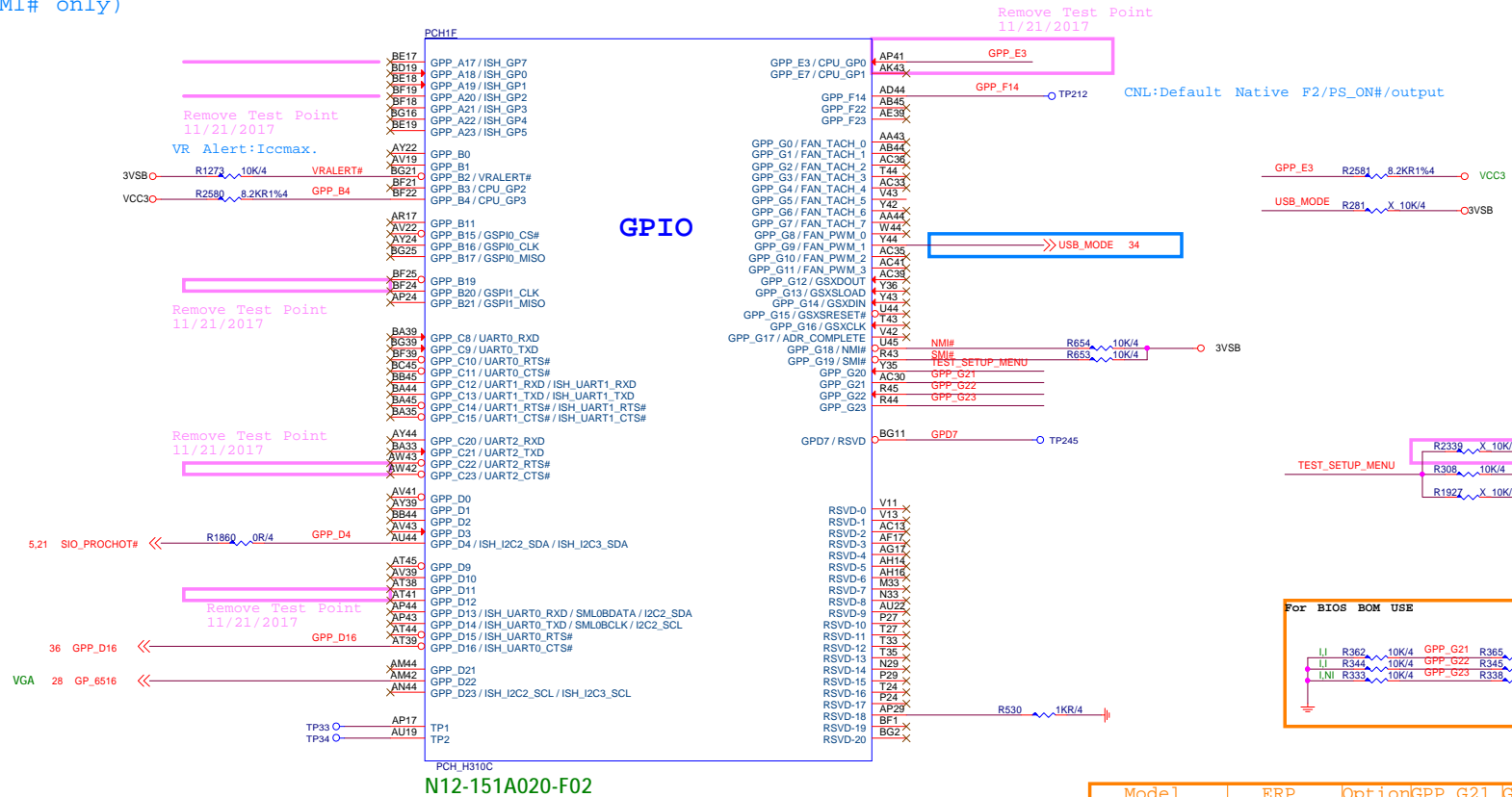


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GPIO(SMI/NMI):
 GPP_B14,GPP_B20,GPP_B23
 GPP_C[23:22]
 GPP_D[4:0]
 GPP_E[8:0]
 GPP_I[3:0]
 GPP_G[7:0](Support SMI# only)



N12-151A020-F02

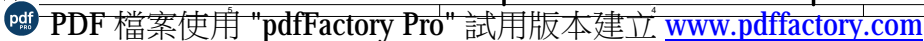
Model	ERP	Option	GPP_G21	GPP_G22	GPP_G23
7C13-VH	7C31-01*	STD	0	0	0
7C13-VD	7C31-02*	A	0	0	1
7C13-WATER	7C31-03*	B	0	1	0
7C13-FIRE	7C31-04*	C	0	1	1
7C13-VH V2	7C31-05*	D	1	0	0

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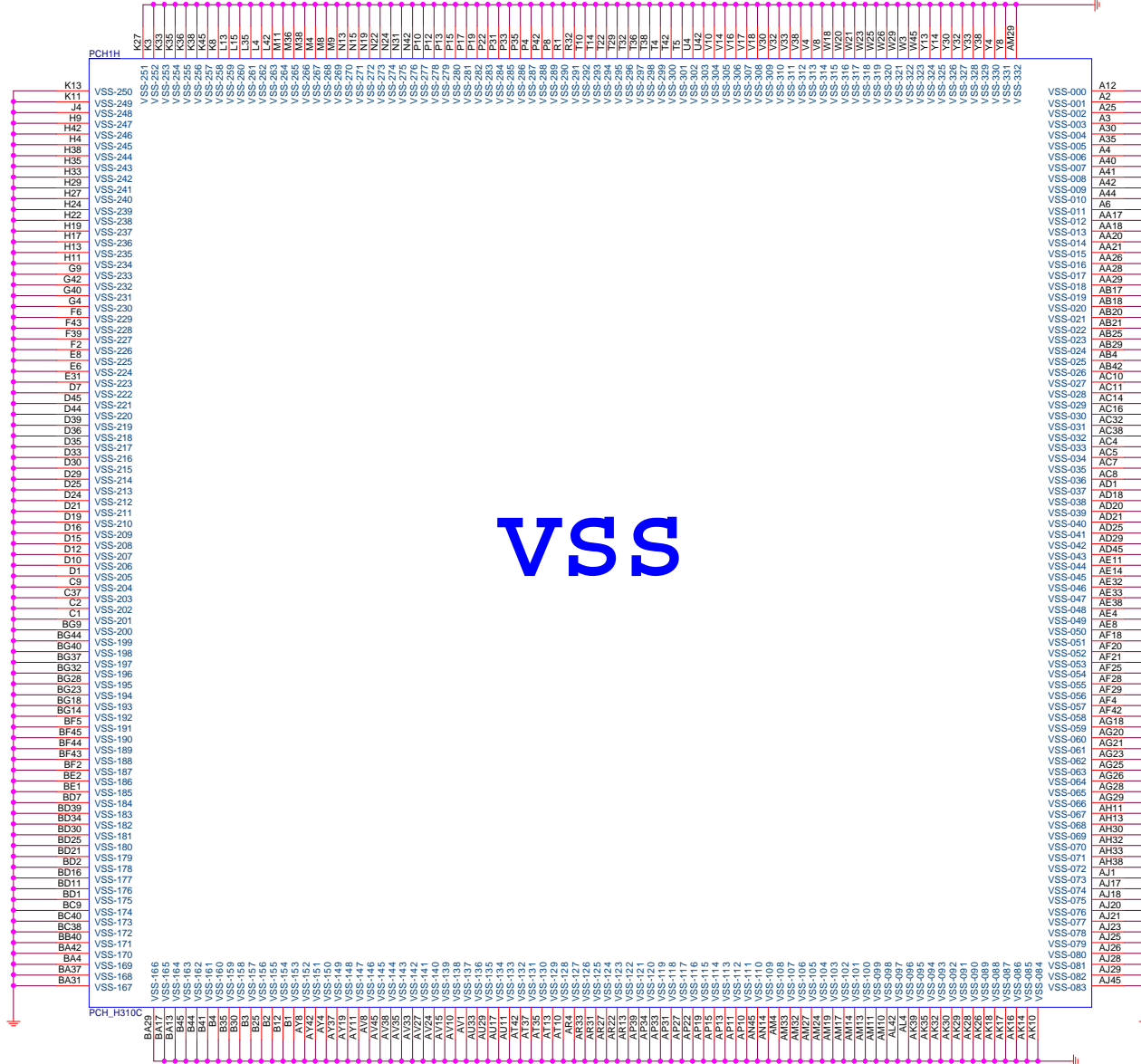
Size Custom Document Description **PCH-GPIO/USB0C/SATASTRAP** Rev 11

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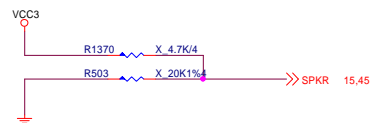


VSS

	MICRO-STAR INT'L CO.,LTD		
	MS-7C13		
	Size Custom	Document Description PCH-GND	Rev 11
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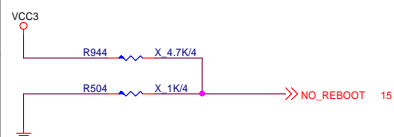


TOP Swap



Internal pull-down 20K is disabled after PLTRST#

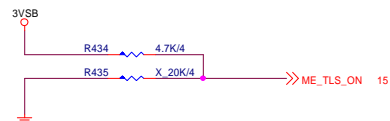
No Reboot



0 : DISABLE (Default)
1 : ENABLE

Internal pull-down 20K is disabled after PLTRST#

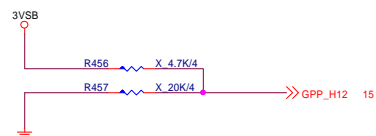
AMT and SBA with confidentiality



0 : DISABLE
1 : ENABLE (Default)

Internal pull-down 20K is disabled after RSMRST

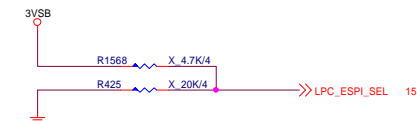
ESPI FLASH SHARING MODE



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

Internal pull-down 20K is disabled after RSMRST

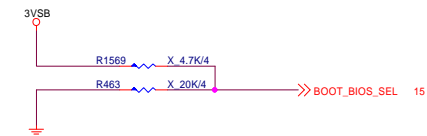
LPC eSPI Mode



0 : LPC
1 : eSPI

Internal pull-down 20K is disabled after RSMRST

Boot BIOS

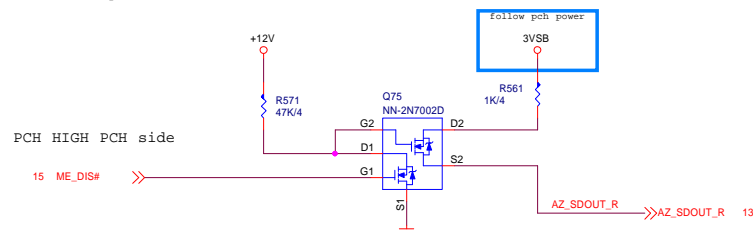


0 : SPI
1 : LPC

Internal pull-down 20K is disabled after PLTRST

HDA_SDO

ME flash by GPIO

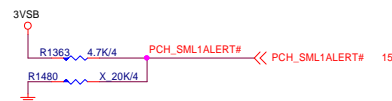


PCH HIGH PCH side

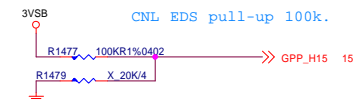
15 ME_DIS#

AZ_SDOUT_R_13

Reserved



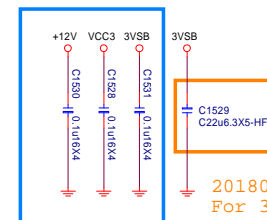
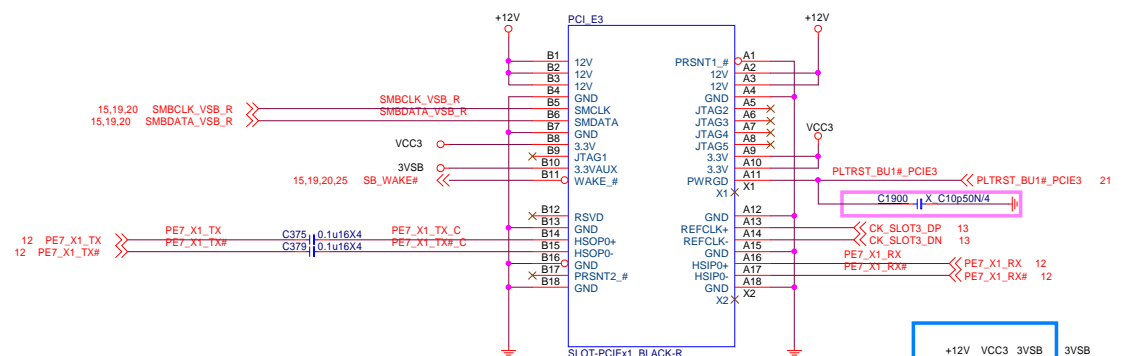
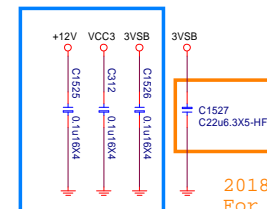
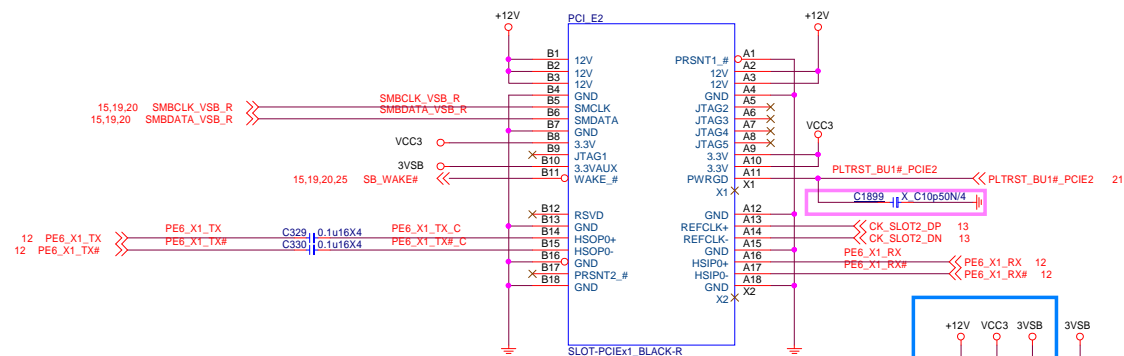
Reserved




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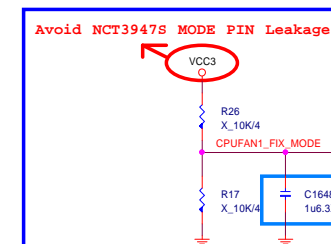
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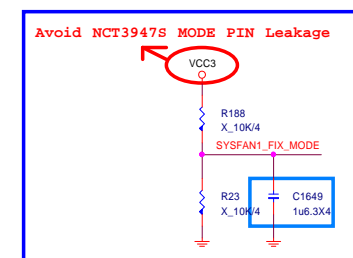


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		MS-7C13	
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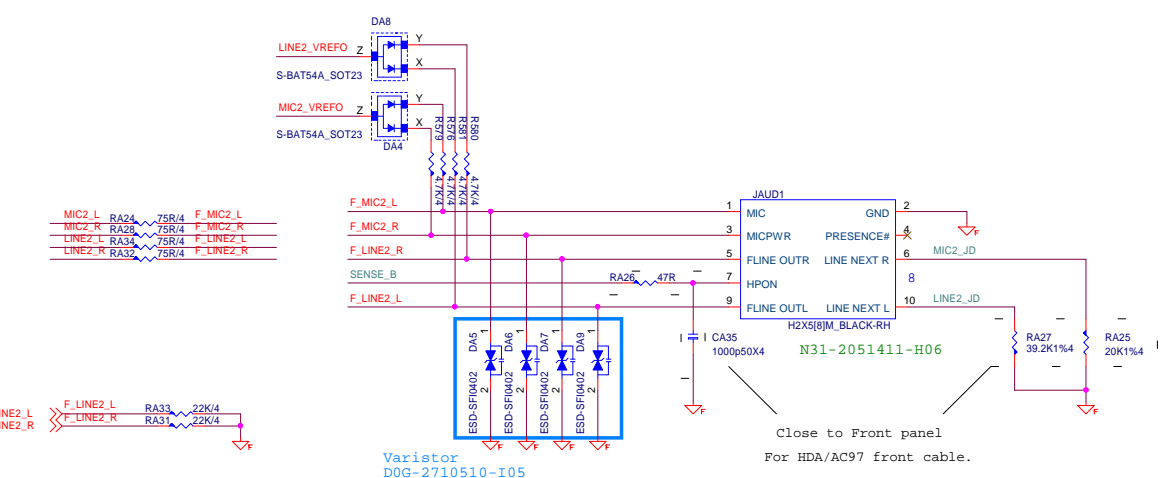
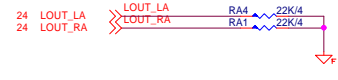
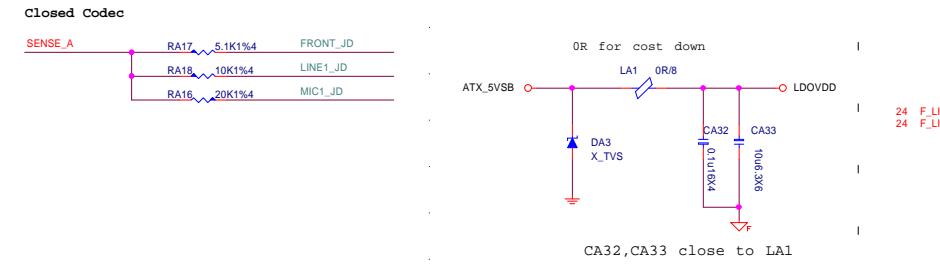
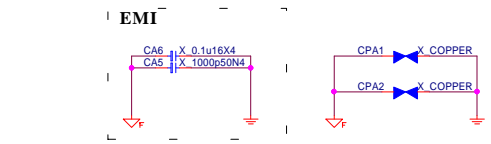
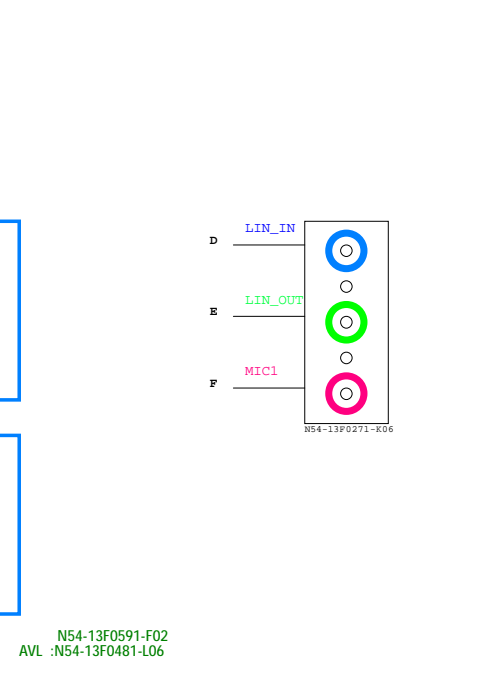
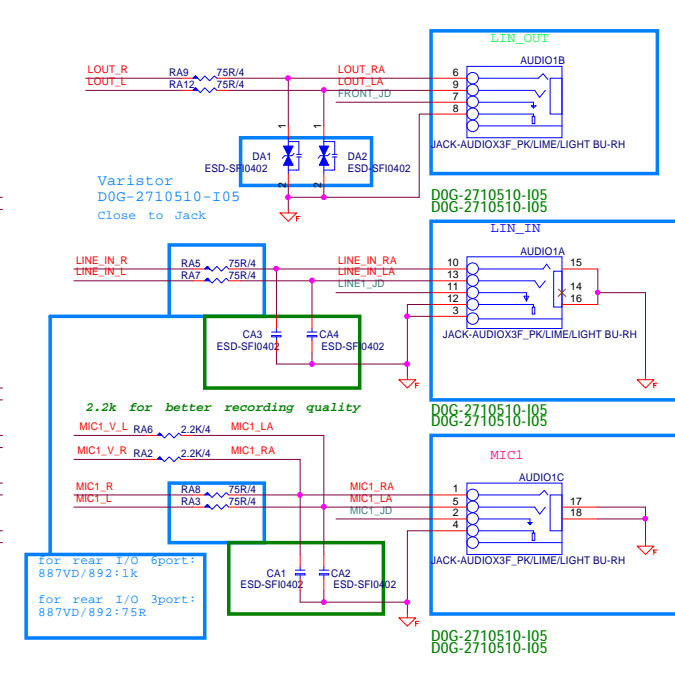
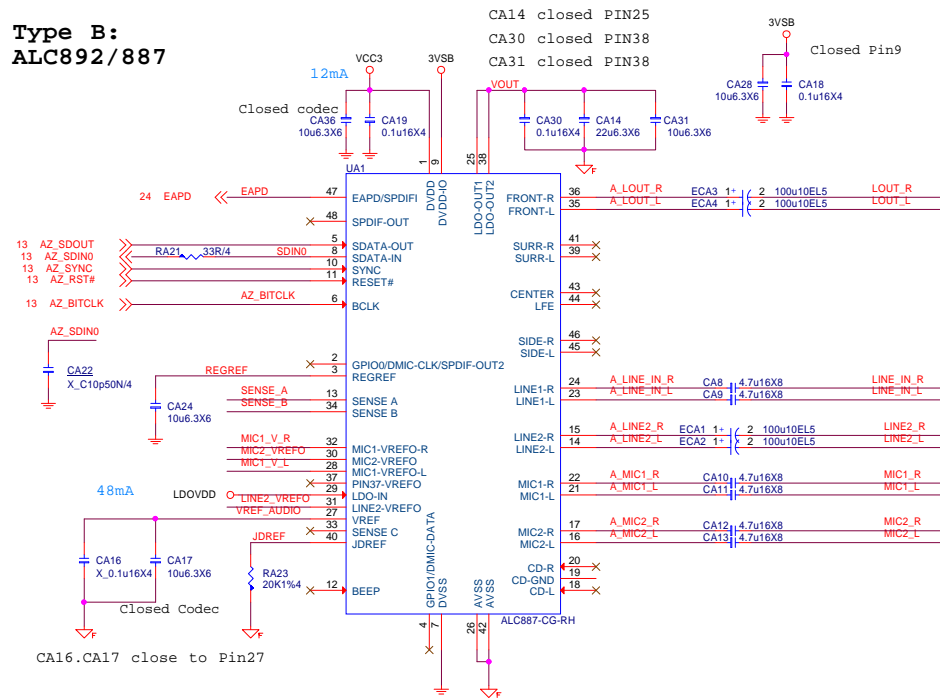
2.GPIO 自由BS 切换 PW M/DC M O D E



2. GPIO 由 B0 切换 PW M/D C M O D E



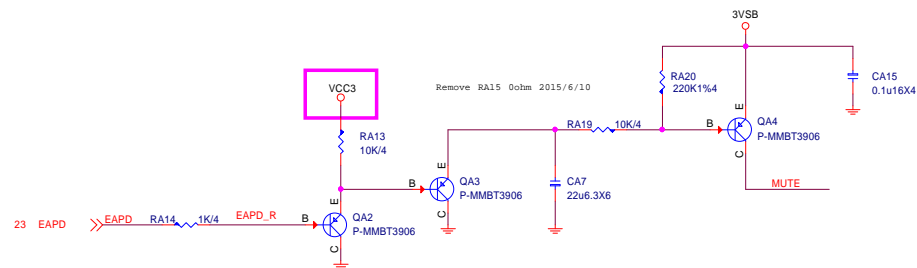
Type B:
ALC892/887



			
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Custom		AUDIO - ALC892/887	11
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Rear Line OUT De-POP circuit

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



History:

2014/02/13: stuff de-pop circuit of Line out & HP out.

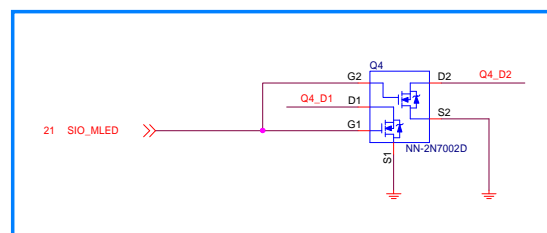
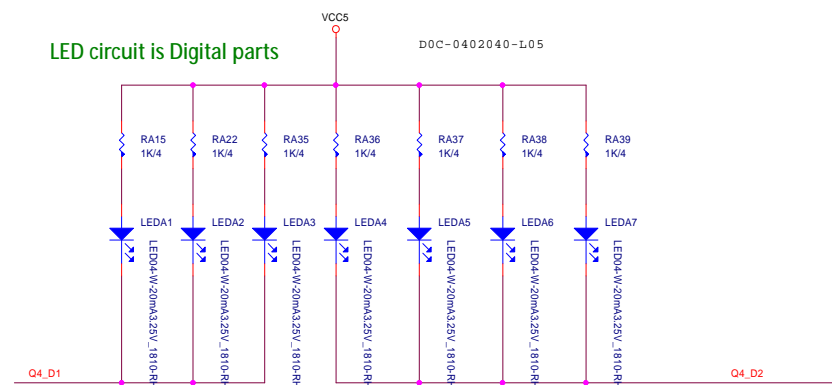
Digital

Analog



Audio LED

LED circuit is Digital parts

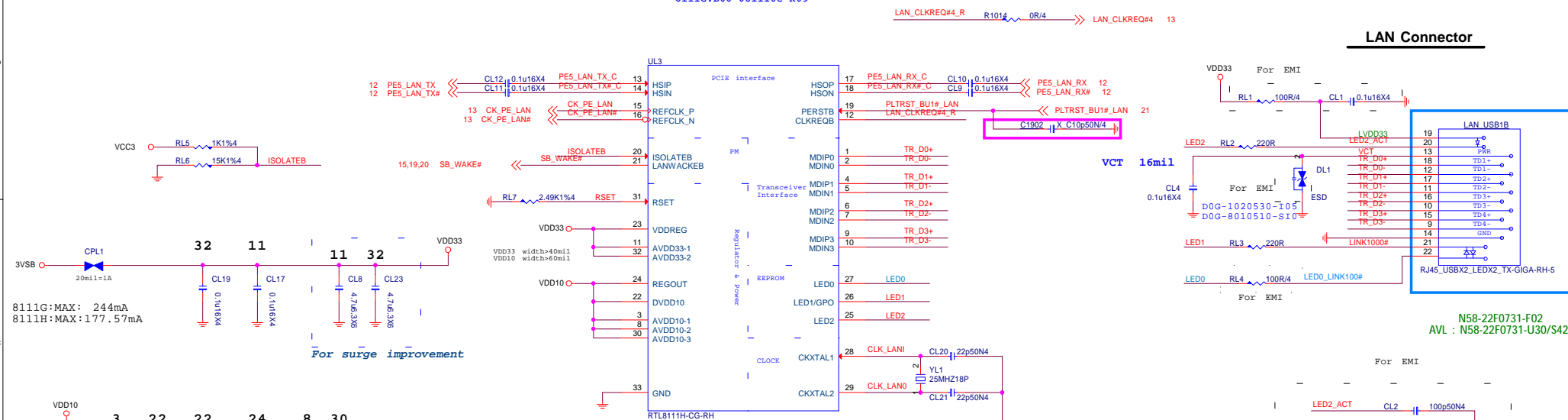


2016.01.12: Modify Q4 to Dual 7002 & Remove OR

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RTL8111G/RTL8111H Giga LAN

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



8111G:MAX: 244mA
8111H:MAX:177.57mA

For surge improvement

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

8111G POWER Consumption

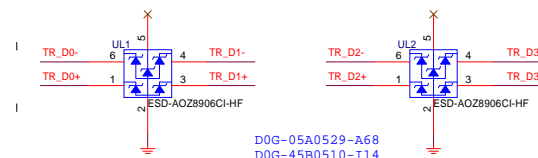
	3.3V @ mA	mW
10 M Idle/TxRx	17.15/116.7	56.6/385.1
100 M Idle/TxRx	71.45/129.5	235.8/427.4
Giga Idle/TxRx	179.1/243.9	591/804.9
ALDPS	6.41	21.15

8111H POWER Consumption

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

ESD Protect

UL1 & UL2 close to connector



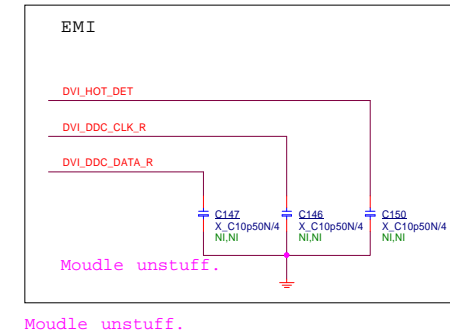
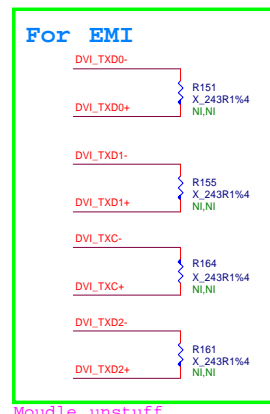
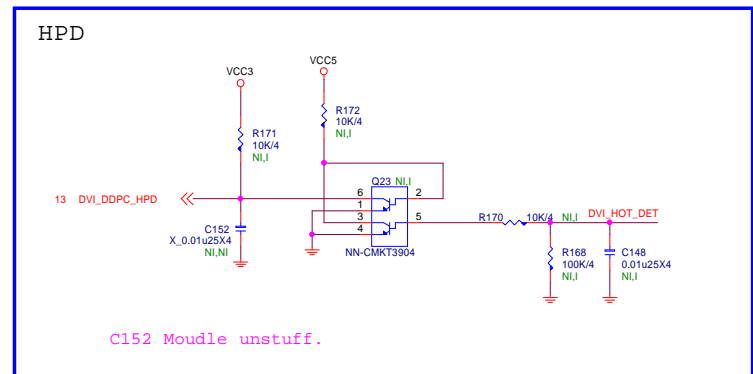
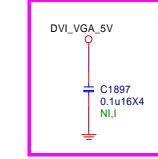
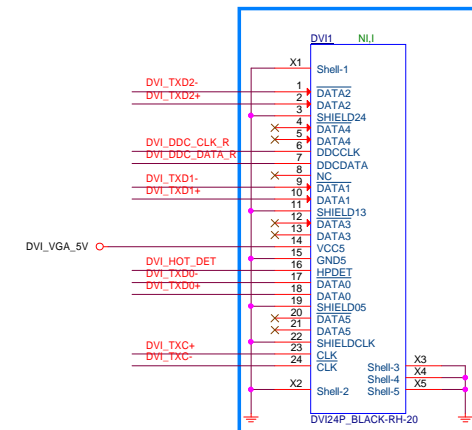
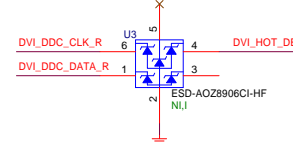
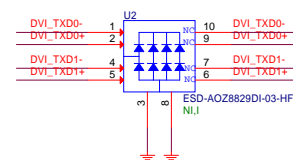
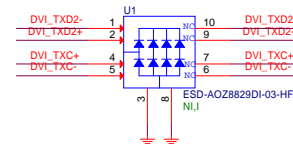
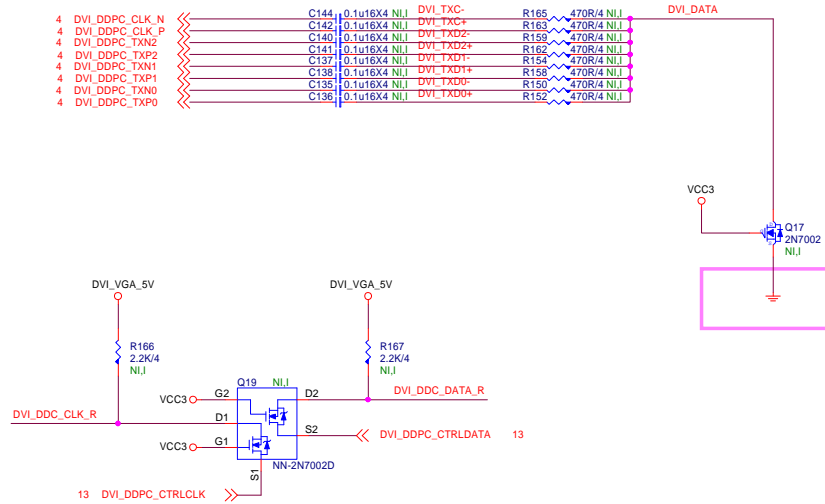
MICRO-STAR INT'L CO.,LTD

MS-7C13

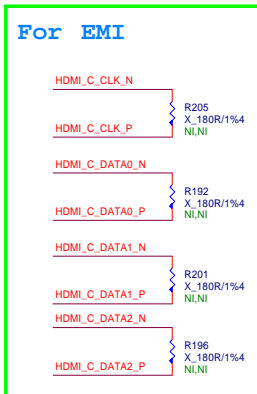
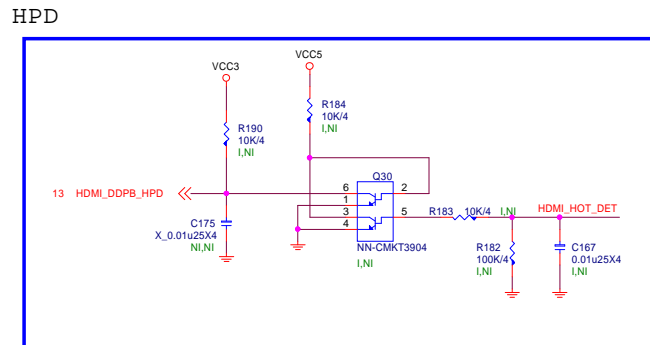
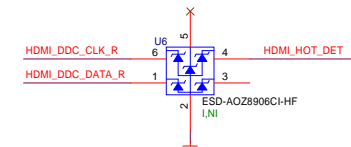
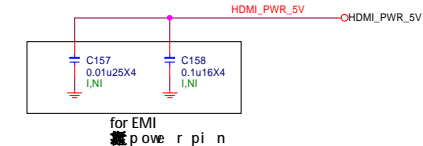
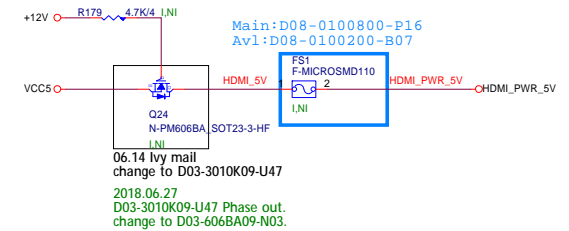
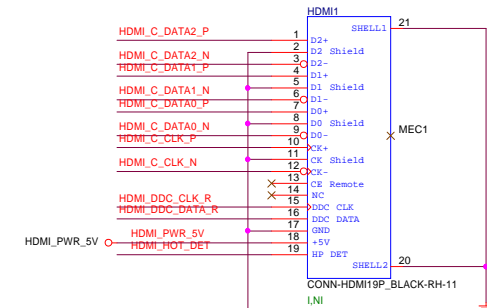
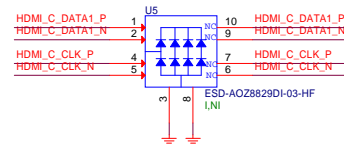
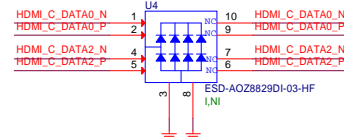
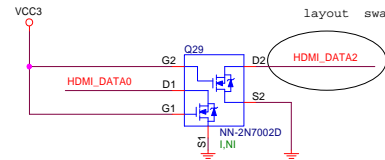
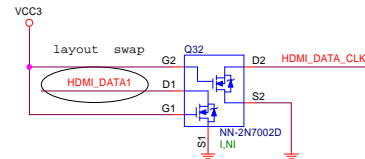
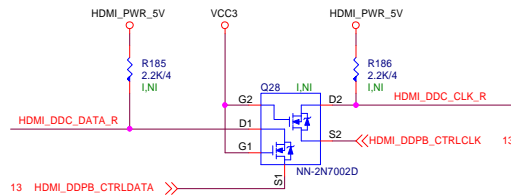
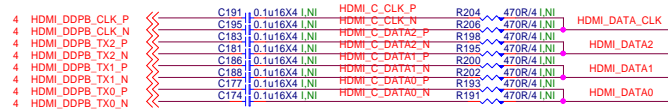
Size	Document	Description	Rev
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DVI level shifter

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

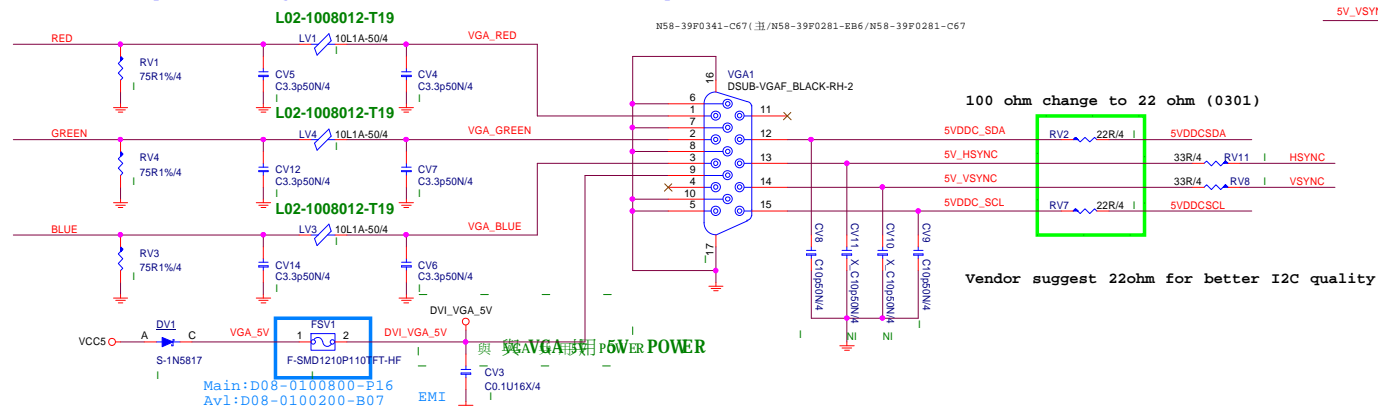
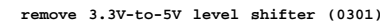



HDMI, DVI : 1920x1200 at 60 Hz (16:10 WUXGA)

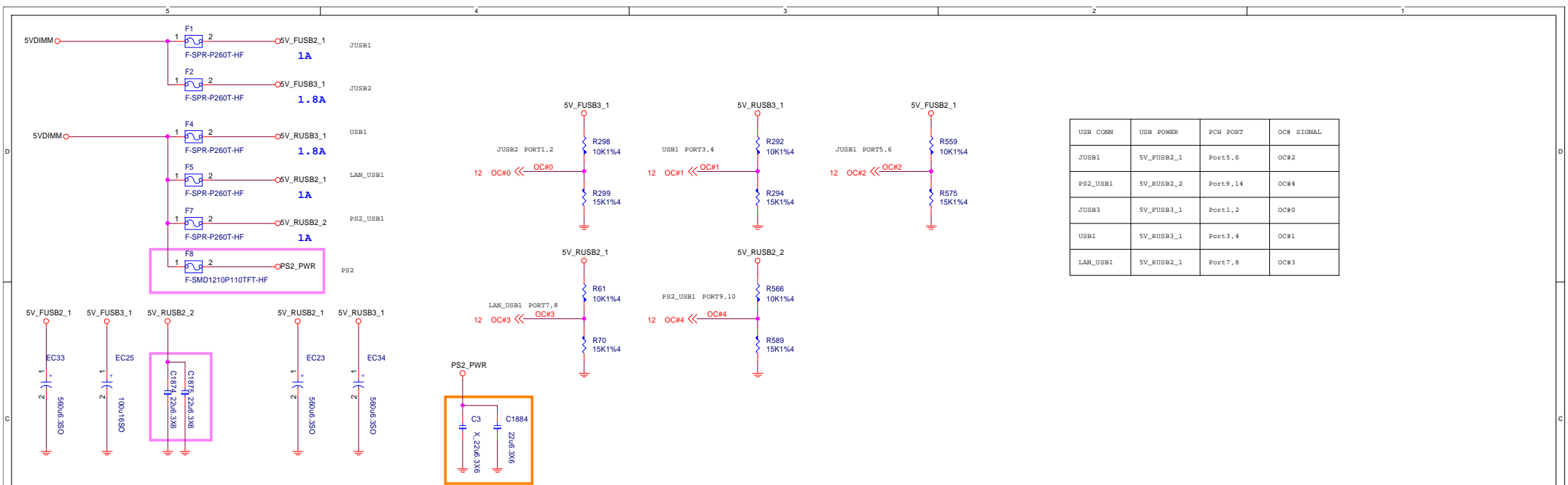


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If connect to eDP port,must confirm whether it support hot plug detection HPD and re-auxtraining

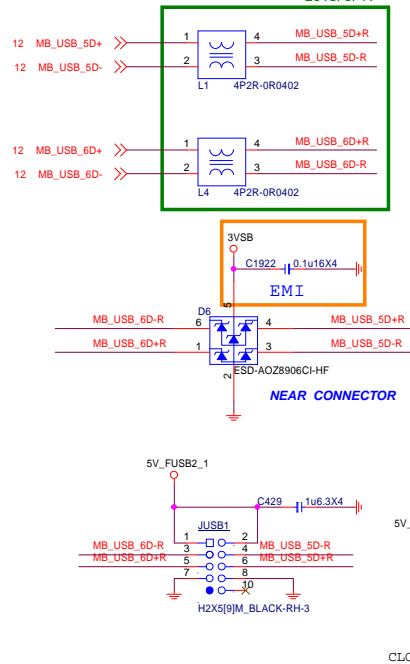


	MICRO-STAR INT'L CO.,LTD		
	MS-7C13		
	Size Custom	Document Description VGA - ITE6516	Rev 11
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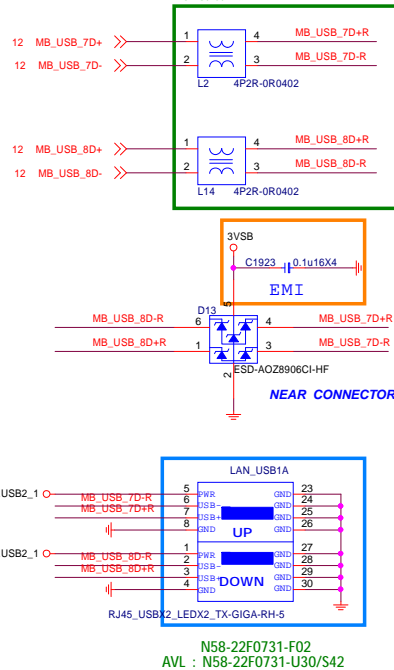
FRONT JUSB2 PORT 5,6

Change L1,L4 from NI to I 0ohm.
2018/6/19



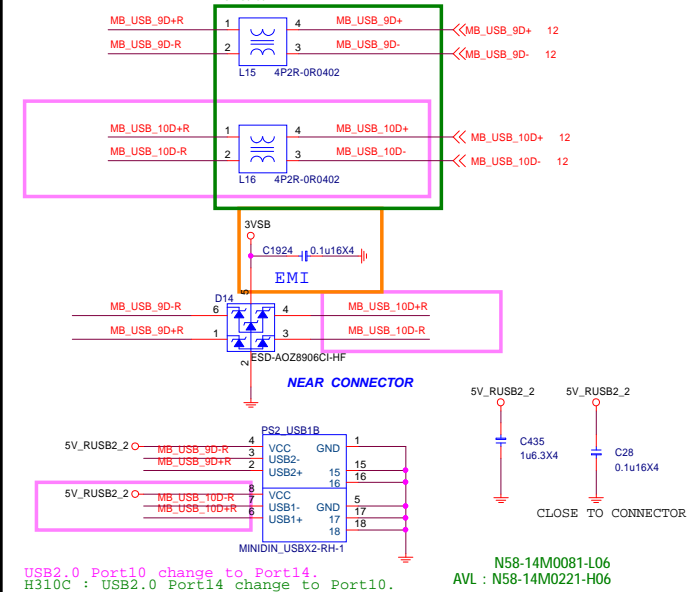
USB1 PORT 7,8

Change L2,L14 from NI to I 0ohm.
2018/6/19



FRONT PS2_USB1 PORT 9,10

Change L15,L16 from NI to I 0ohm.
2018/6/19



USB2.0 Port10 change to Port14.
H310C : USB2.0 Port14 change to Port10.



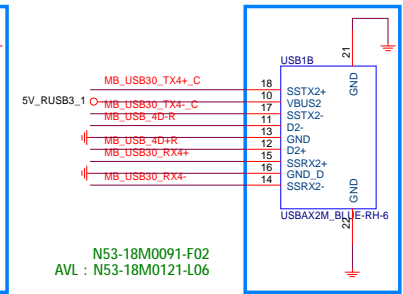
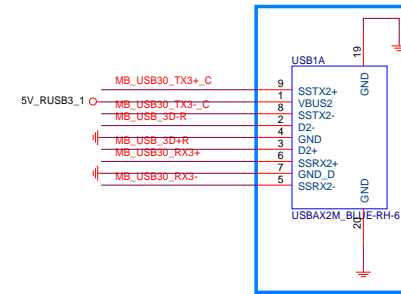
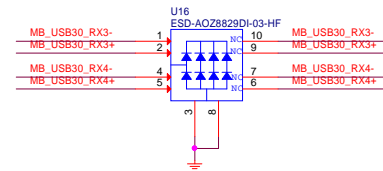
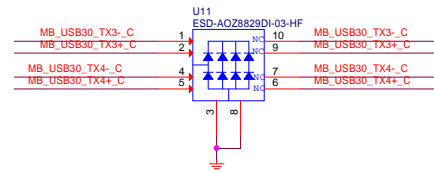
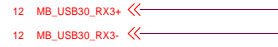
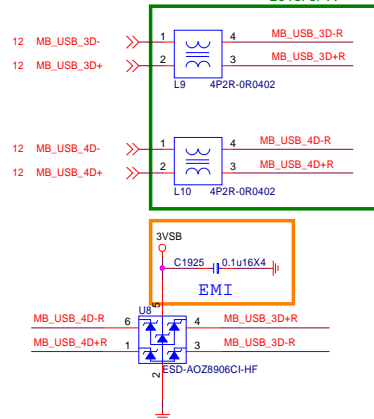
MICRO-STAR INT'L CO.,LTD

MS-7C13

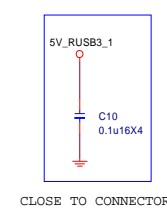
Size	Document	Description	Rev
Custom	MS-7C13	USB2.0 Connector	11
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Rear USB1 port 9,10

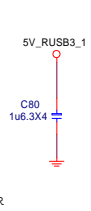
Change L9,L10 from NI to I 0ohm.
2018/6/19



N53-18M0091-F02
AVL : N53-18M0121-L06



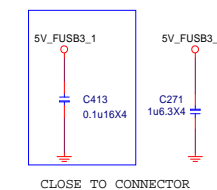
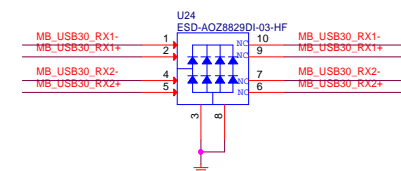
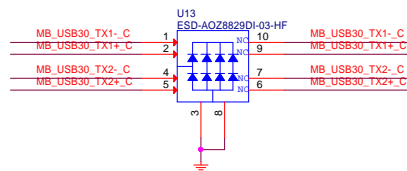
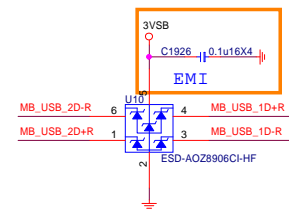
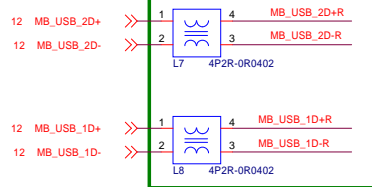
CLOSE TO CONNECTOR



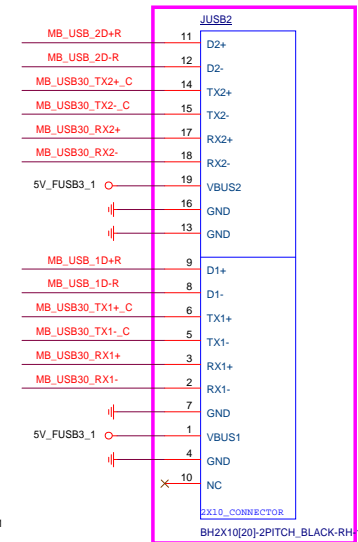
CLOSE TO CONNECTOR

Front JUSB3 port 1,2

Change L7,L8 from NI to I 0ohm.
2018/6/19



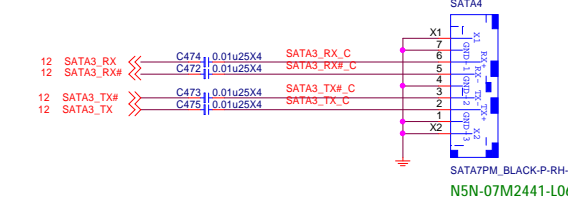
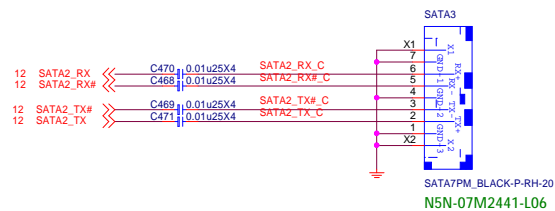
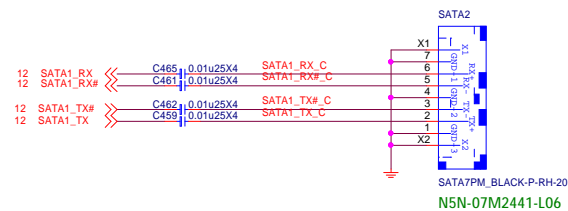
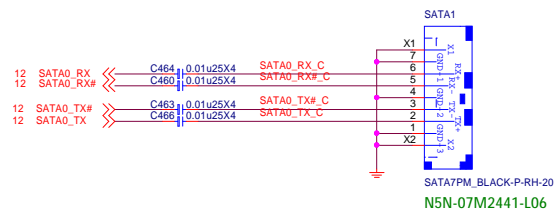
CLOSE TO CONNECTOR




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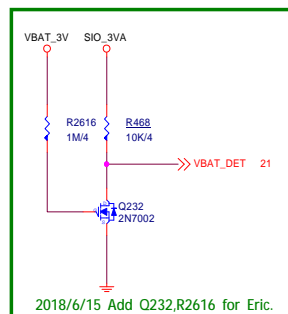
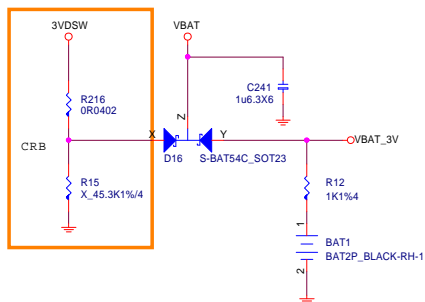
Size Custom	Document Description Rear USB3 & Front Connector	Rev 11
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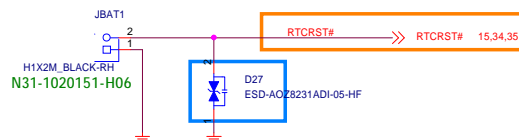
MICRO-STAR INT'L CO.,LTD			
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VBAT




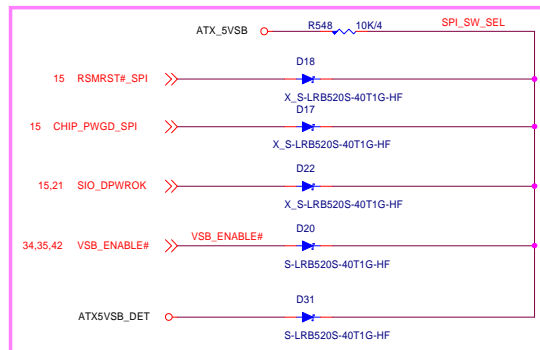
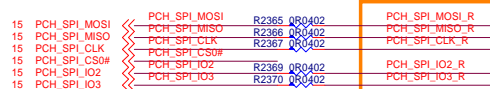
For Factory VBAT test use.
Connector to SIO 5567 GP73.
BIOS request form need programing to GPI.
LOW:VBAT OK.
HIGH : VBAT LOSS

2018/6/15 Add Q232,R2616 for Eric.

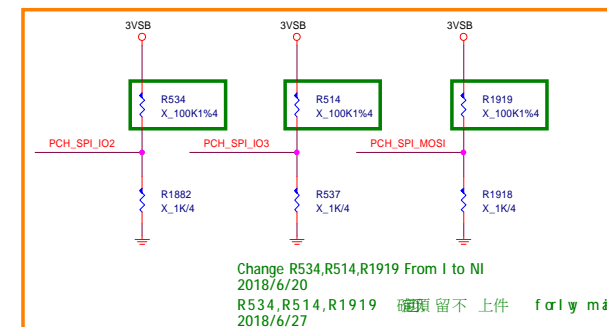
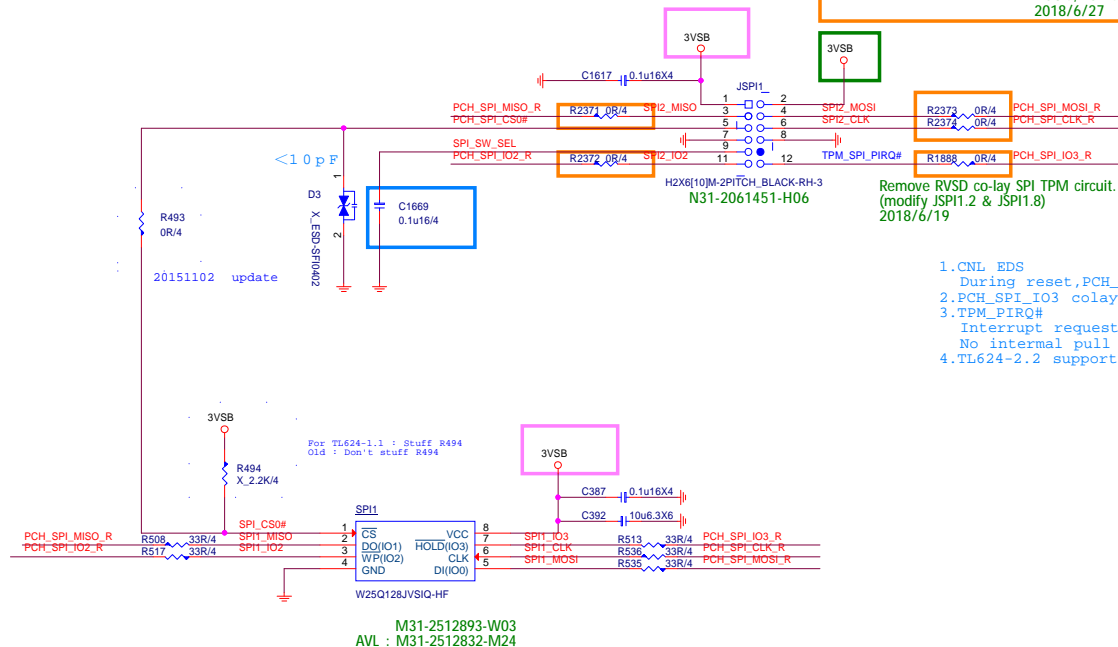


By Ivy's word document.
Main:D0G-130050C-A68
Avl:D0G-3000600-L07/D0G-1200520-I05

		MICRO-STAR INT'L CO.,LTD	
		MS-7C13	
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Custom		CUT VBAT circuit	11
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Main:D01-5204000-LA9
Avl:D01-BAS4030-P15



- 1.CNL EDS
During reset,PCH_GPP_K21 via 20k pull up to 3.3V.
- 2.PCH_SPI_I03 colay TPM_PIRQ#(1.8V or 3.3V,OD)
- 3.TPM_PIRQ#
Interrupt request signal to the host.
No internal pull up resistor.Active low.
- 4.TL624-2.2 support SPI Standard Mode.



MICRO-STAR INT'L CO.,LTD

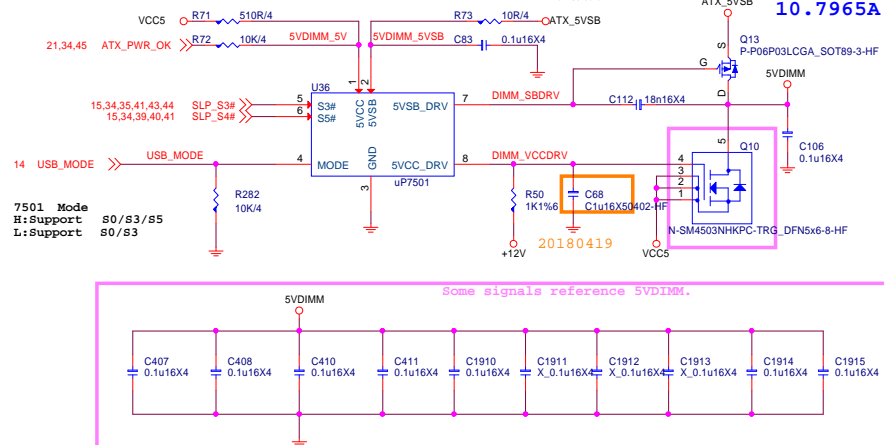
MS-7C13

Size Custom	Document Description BIOS ROM	Re 1
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5V DIMM FOR DDR

(3A for DDR, 6.6A for USB) Change MOS Q10 P/N, from D03-632BA0C-N03 change to D03-4503N0C-ST8.
2018/6/6

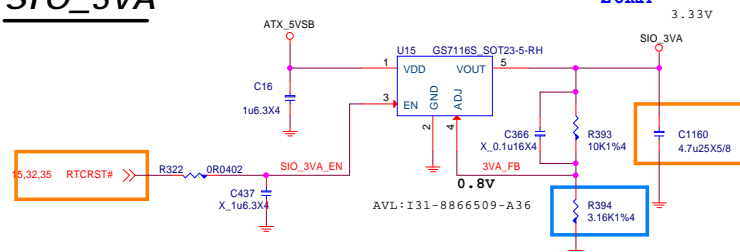
10.7965A



SIO_3VA

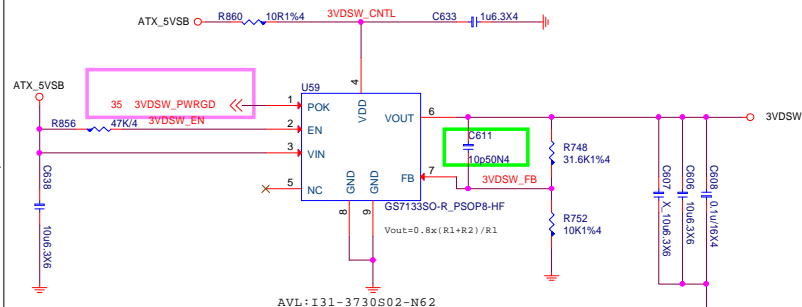
20mA

3.33V



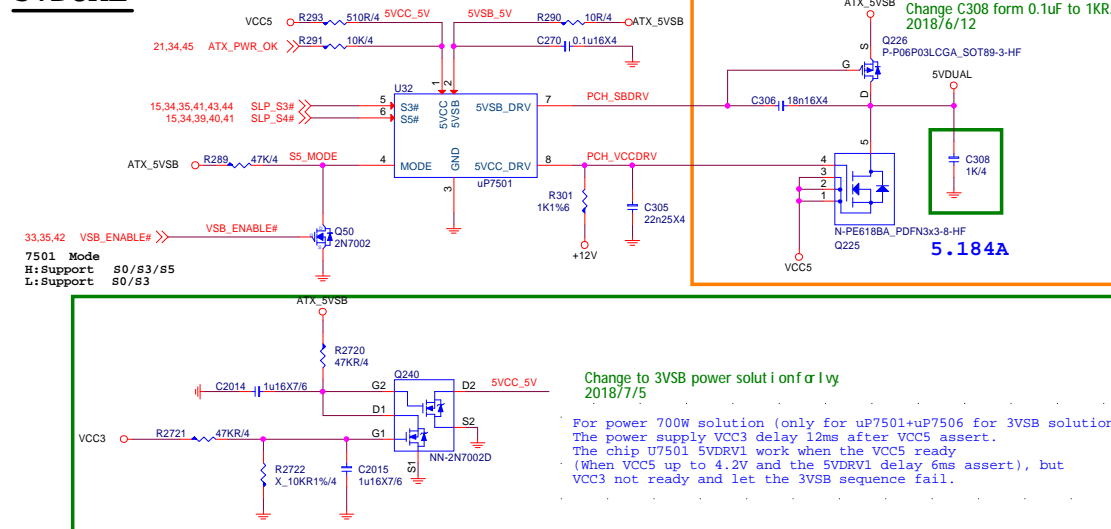
3VDSW

113mA (PCH) + 0.6mA (RTC) + 90mA (SLG4F42051)

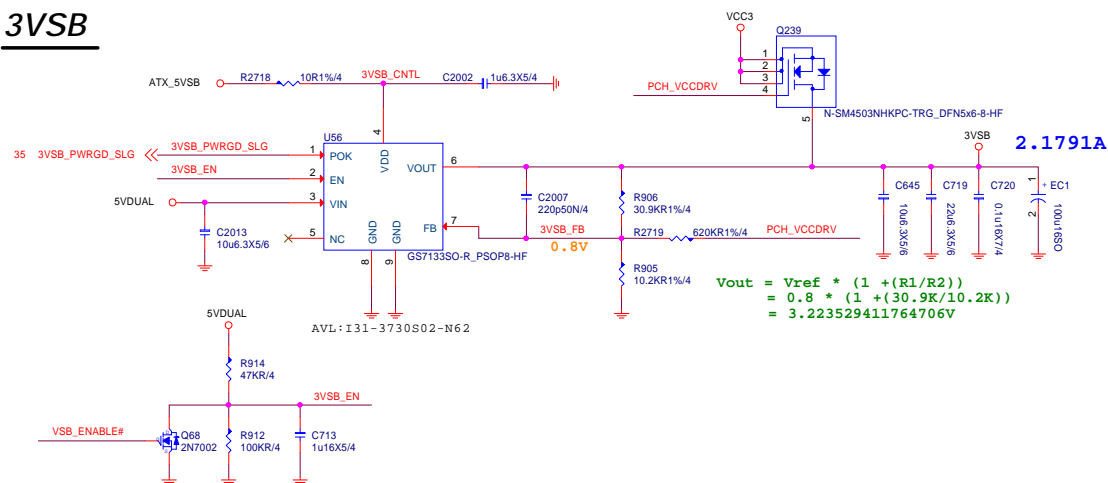


5VDUAL

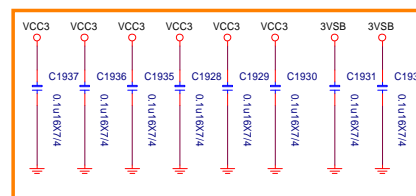
5VDUAL is power source of 1P0SB, 1.8PSB & 3VSB



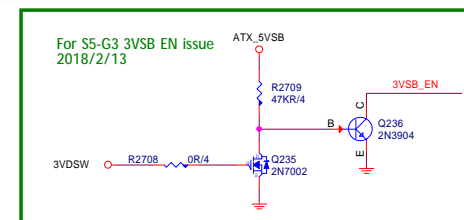
3VSB



Change to 3VSB power solution & I vy
2018/7/5



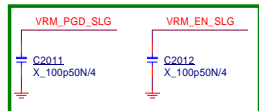
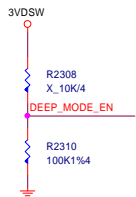
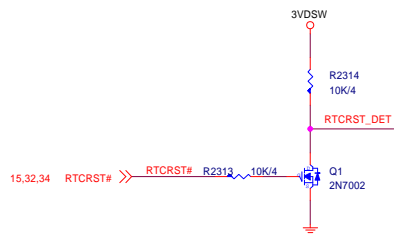
For Layout.



MICRO-STAR INT'L CO.,LTD

MS-7C13

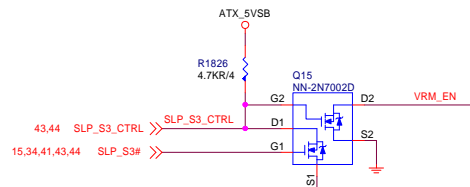
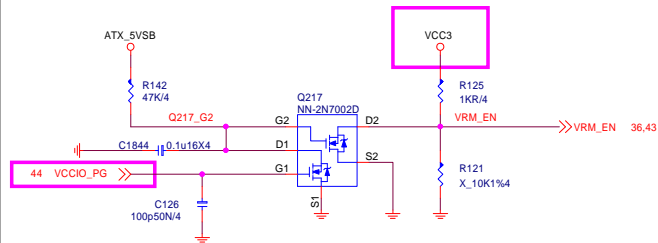
Size Custom	Document Description ACPI CONTROLLER	R
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Add C2011 and C2012 for channel module circuit
2018/7/2

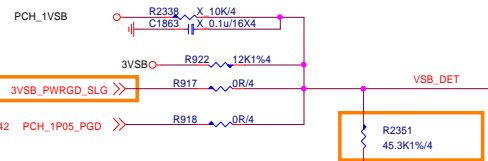
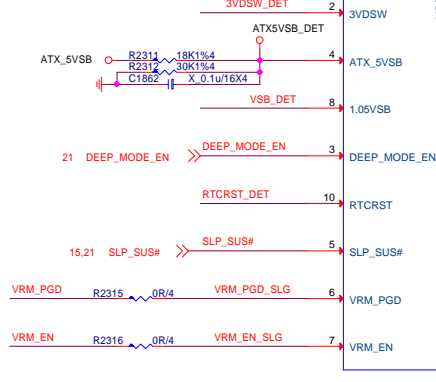
SIO GP54.

	DEEP_MODE_EN
DEEP_MODE	1
S5_MODE	0



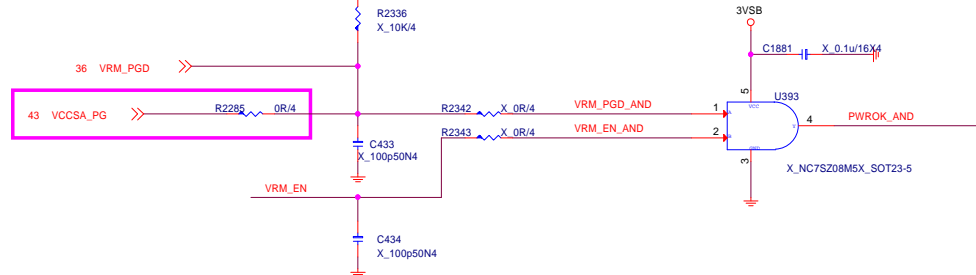
SLP_S3# assertion to IMVP VRM_EN deassertion
max:1us

ATX5VSB_DET
high:2.7V/low 2.55V



20180213
For 3VSB no 100uF dip cap,45.3K change to 82K.
For new 3VSB circuit use 100uF dip cap,
R2351 change from 82Kohm to 45.3Kohm.
2018/7/31

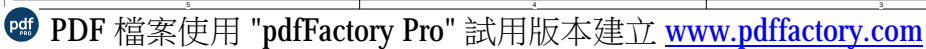
Colay SLG4F42051.

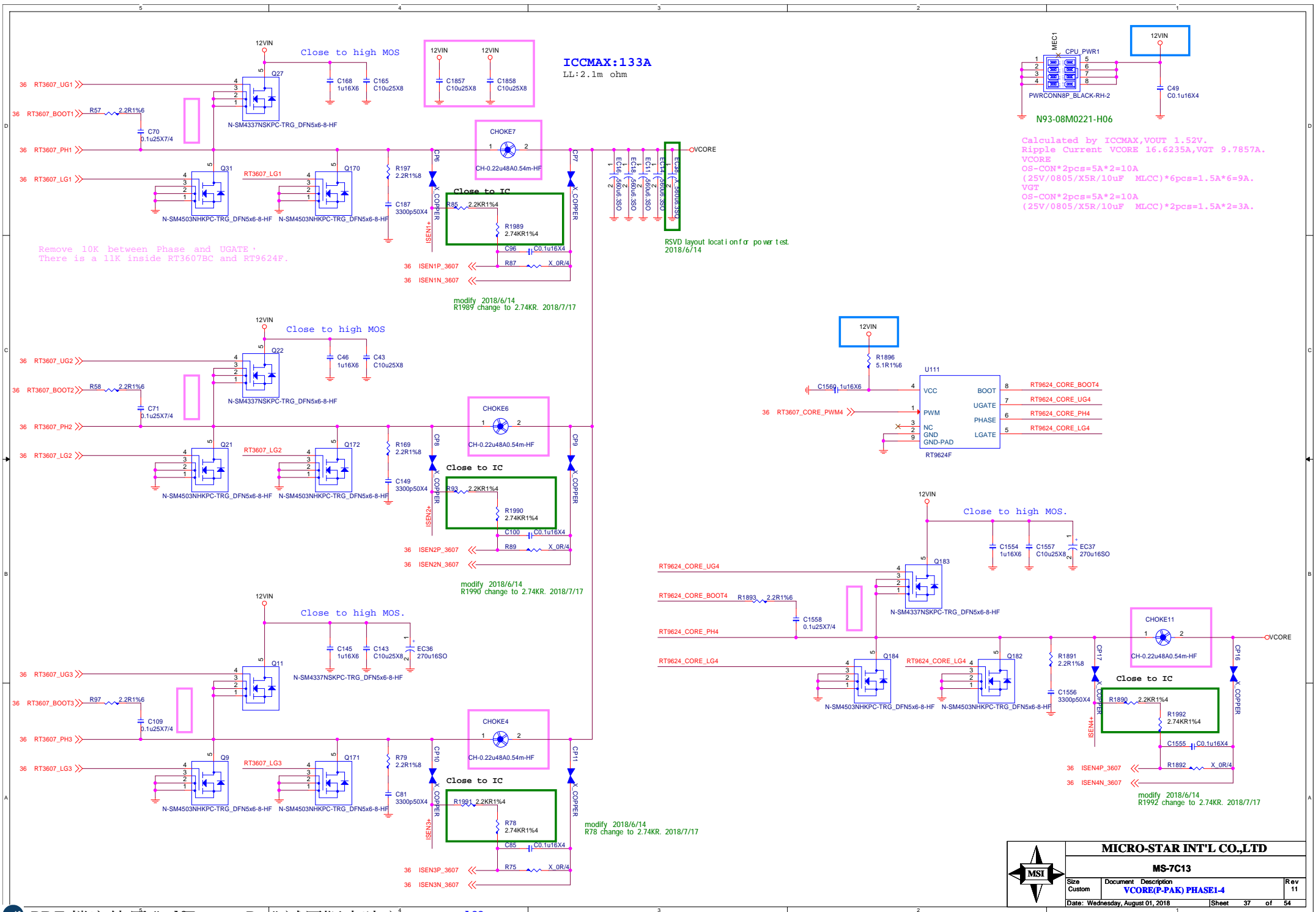


MICRO-STAR INT'L CO.,LTD

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DDR4_1.2V 3.3A+ 7.85A+0.35A+0.13A=11.63A

3.3A FOR CPU
7.85A FOR 2DIMM DDR4
0.35A FOR VTT_DDR
0.13A FOR VCCPLL_OC

D03-632BA0C-N03 3~4.6mohm/4.5V
Current limit= $140K \cdot 5uA / 4.6mohm = 15.217A$
Current limit= $140K \cdot 5uA / 3mohm = 23.333A$
Output Choke Isat=32A

OCV Test Value=20.32A

Vcs= $140K \cdot 5uA = 0.7V$ (Spec: 0.4V~3V)

$V_{out} = 0.75V / 1.65K \cdot (1.65K + 1K) = 1.204V$

NCT3933 source 10uA

$V_{out} = [V_{REF} \cdot (1 + R173/R1056)] + 10uA \cdot R173$
 $= 0.75V \cdot (1 + 1K/3.16K) + 10uA \cdot 1K = 1.204V + 0.010V = 1.214V$

NCT3933 sink 10uA

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

$I_{in} = I_{OCP} \cdot V_{out} / 0.8 / V_{in}$

$I_{in} = 4.565A \sim 6.9999A$

L02-3008043-M26

Over 85°C, Rated Current 1.5A need check bead temp.

VID Pin	VREF (V)
H	0.675
L	0.75

$I_{rms} = I_{out} \cdot \sqrt{(V_{out}/V_{in}) \cdot (1 - (V_{out}/V_{in}))}$
 $= 9.525 \cdot 0.427$
 $= 4.06797A$

f: 426.57KHz (Spec: 320KHz to 480KHz)
tON: 636.4456ns (Spec: 100ns to 3us)

Current Limit 2.6A

0.1uFxl per dimm

SLP_S4# de-assertion to VDDQ ramp down start

VPP ramp down after VDDQ ramp down

Change MOS P/N.
hi: D03-616BA0C-N03 change to D03-4337N0C-ST8.
lo: D03-632BA0C-N03 change to D03-4503N0C-ST8.
2018/6/6

Main: L04-82B7181-T15
AVL: L04-82B7211-L65

MAX: 9.525A

1.2V

UPI VOLTAGE CONSOLE

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

$L = t_{ON} \cdot (V_{IN} - V_{DDQ}) / (I_{IR} \cdot I_{LOAD(MAX)})$
tON=636.4456ns
IIR: 20%~40%
L: 0.63uH~1.27uH.



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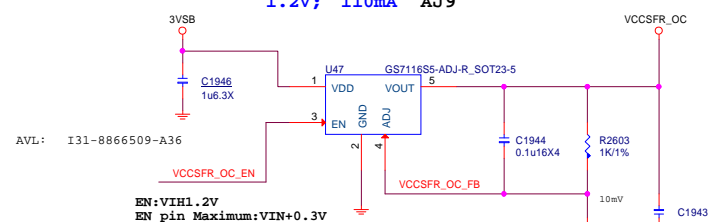
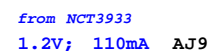
MS-7C13

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1.05V; 250mA



2018/6/12 add.



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Size Custom	Document Description CPU PWR_ST/PLL	Rev 11
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1.0V; MAX:11.043A

Change R407 form 806R to 768R.
2018/6/12

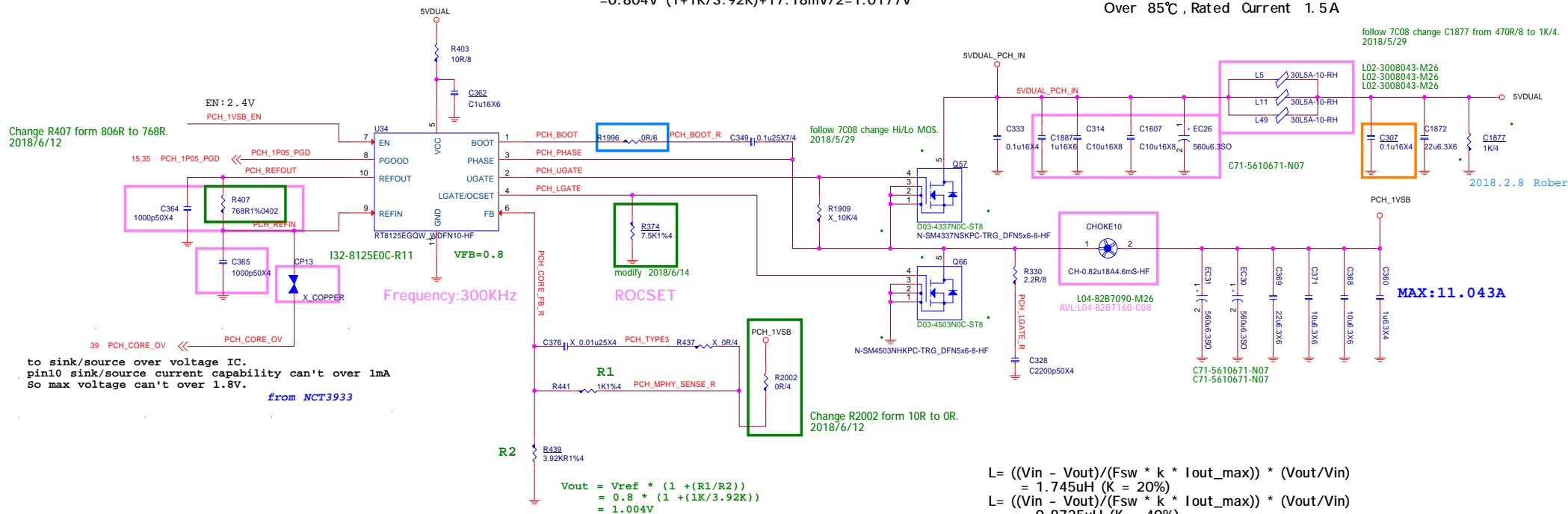
Default Vout=1V

NCT3933 source 10uA
 $V_{REFIN} = V_{REFOUT} + 10\mu A \cdot R_{407} = 796mV + 8mV = 804mV$
 $V_{out} = [V_{REFOUT} \cdot (1 + R_{434}/R_{435})] + \Delta V_{out}/2$
 $= 0.804V \cdot (1 + 1K/3.92K) + 17.18mV/2 = 1.0177V$

$$\begin{aligned} I_{rms} &= I_{out} * \text{SQRT}((V_{out}/V_{in}) * (1 - (V_{out}/V_{in}))) \\ &= 8.72 * 0.276 \\ &= 2.407A \end{aligned}$$

$I_{in} = I_{OCP} \cdot V_{out} / 0.8 / V_{in}$
 $= 17.05A \cdot 1.1V / 0.8 / 5V = 4.2625A$
 L02-3008043-M26
 Over 85°C, Rated Current 1.5A

follow 7C08 change C1877 from 470R/8 to 1K/4.
2018/5/29



$$L = \frac{(V_{in} - V_{out})}{(F_{sw} * k * I_{out_max})} * (V_{out}/V_{in})$$

$$= 1.745\mu H \text{ (K = 20\%)}$$

$$L = \frac{(V_{in} - V_{out})}{(F_{sw} * k * I_{out_max})} * (V_{out}/V_{in})$$

$$= 0.8725\mu H \text{ (K = 40\%)}$$

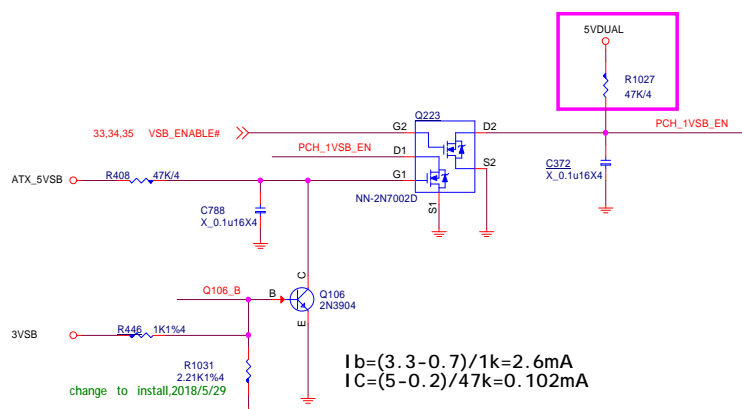
K is the ratio between inductor ripple current and rated output current.
 $20\% < k < 40\%$

$$V_{out} = [V_{REFOUT} * (1 + R_{434}/R_{435})] + \Delta V_{out} / 2$$

$$= 0.796V * (1 + 1K/3.92K) + 17.18mV / 2 = 1.007V$$

$$V_{REFOUT} = 0.796V$$

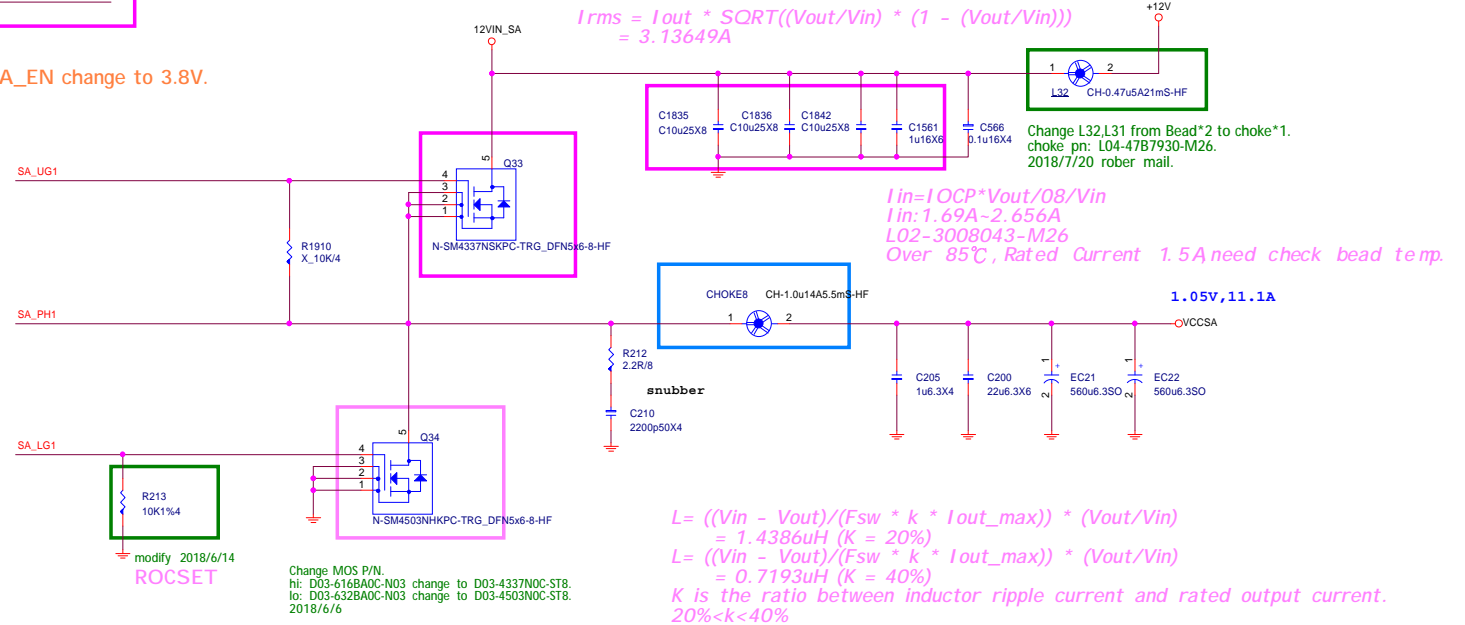
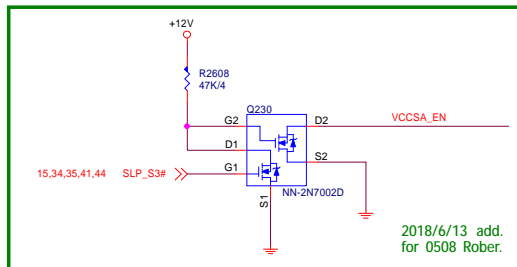
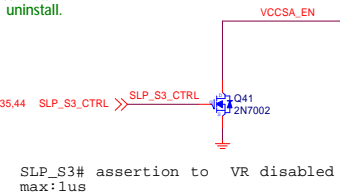
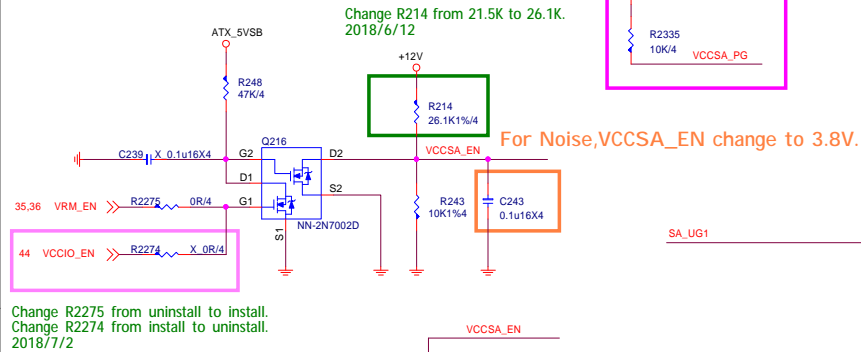
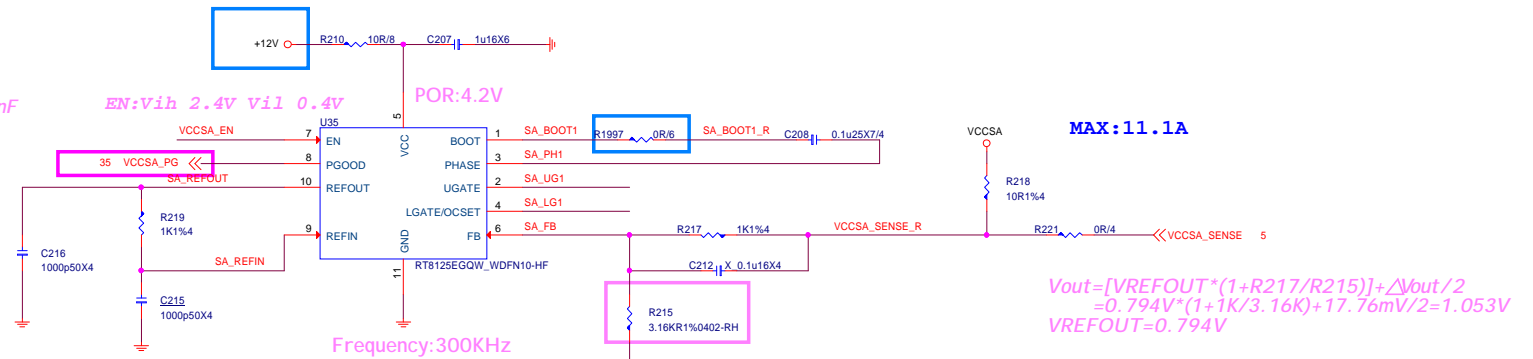
$$\begin{aligned} \Delta V_{out_ESR} &= \Delta I_L * ESR = 40\% * 8.72A * 4m\Omega = 13.952mV \\ \Delta V_{out_C} &= \Delta I_L * 1/(8 * C_{out} * f_{SW}) = 40\% * 8.72A / (8 * 560\mu F * 2 * 300KHz) = 1.3mV \\ V_{out_SAG} &= ESR * \Delta I_{out} = 4m\Omega * 10.743A = 34.88mV \end{aligned}$$



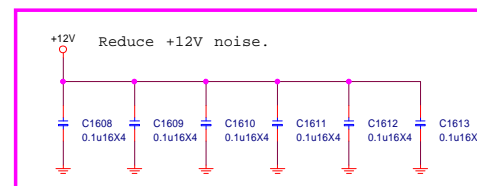
	MICRO-STAR INT'L CO.,LTD			
	MS-7C13			
	Size Custom	Document Description PCB Core power		Rev 11
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SA Power:1.05V,11.1A

D03-632BA0C-N03 2.1~3.3mohm/10V Ciss=2096pF<8nF
Current limit= $5.1K \cdot 10uA / 3.3mohm = 15.455A$
Current limit= $5.1K \cdot 10uA / 2.1mohm = 24.286A$
CHOKE Isat=17A
From CHOKE I-L Curve, when I=25A, L=0.6uH.
OCP Test Value=21.92A



$\Delta V_{out_ESR} = \Delta I_L \cdot ESR = 4.0\% \cdot 11.1A \cdot 4m\Omega = 17.76mV$
 $\Delta V_{out_C} = \Delta I_L \cdot V / (8 \cdot C_{out} \cdot F_{sw}) = 4.0\% \cdot 11.1A / (8 \cdot 560uF \cdot 2 \cdot 300KHz) = 1.65mV$
 $V_{out_SAG} = ESR \cdot \Delta I_{out} = 4m\Omega \cdot 11.1A = 44.4mV$



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VCCIO

0.95V; 6.4A

IMAX 8A
ILIMIT=12A
IOC=ILIMIT+40%*IMAX/2=13.6A.
CHOKE Isat=15A
OCP Test Value=14.52A

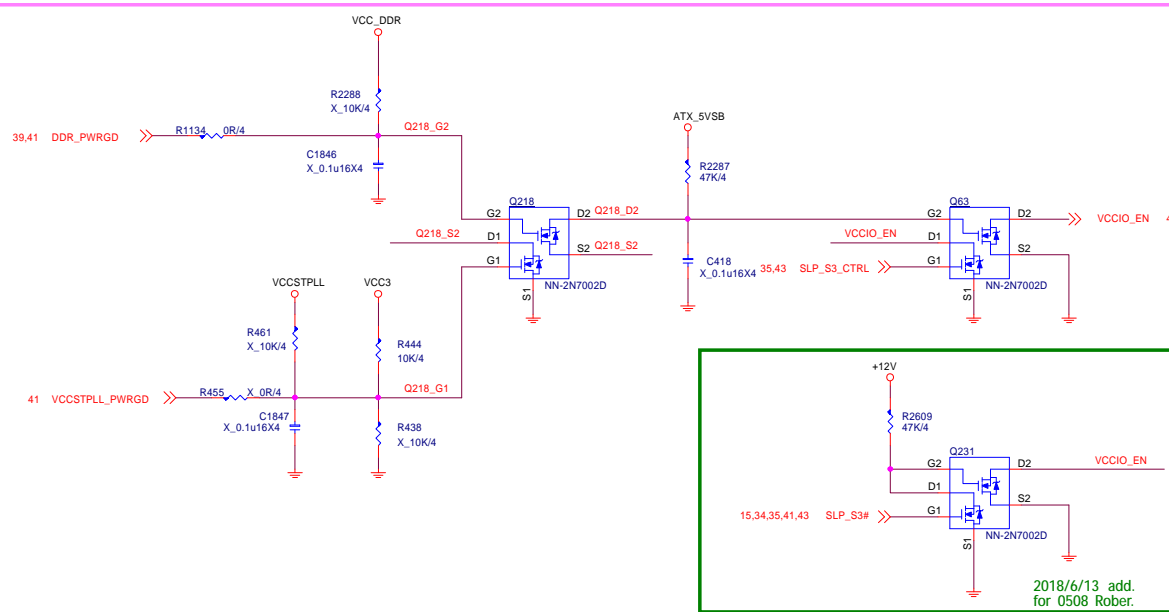
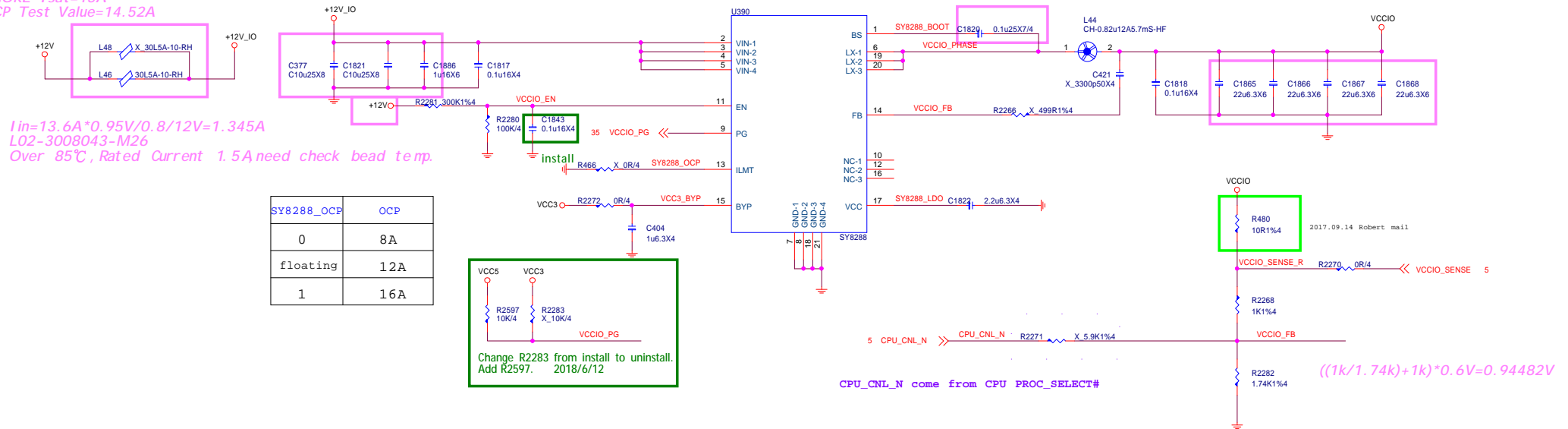
$$I_{rms} = I_{out} * \sqrt{(V_{out}/V_{in}) * (1 - (V_{out}/V_{in}))}$$

$$= 1.72799A$$

$$L = V_{out} * (1 - V_{out}/V_{in}) / (F_{sw} * I_{out} * 40\%)$$

$$= 0.95V * (1 - 0.95V/12V) / (500KHz * 6.4A * 40\%) = 0.68uH.$$

MAX: 6.4A



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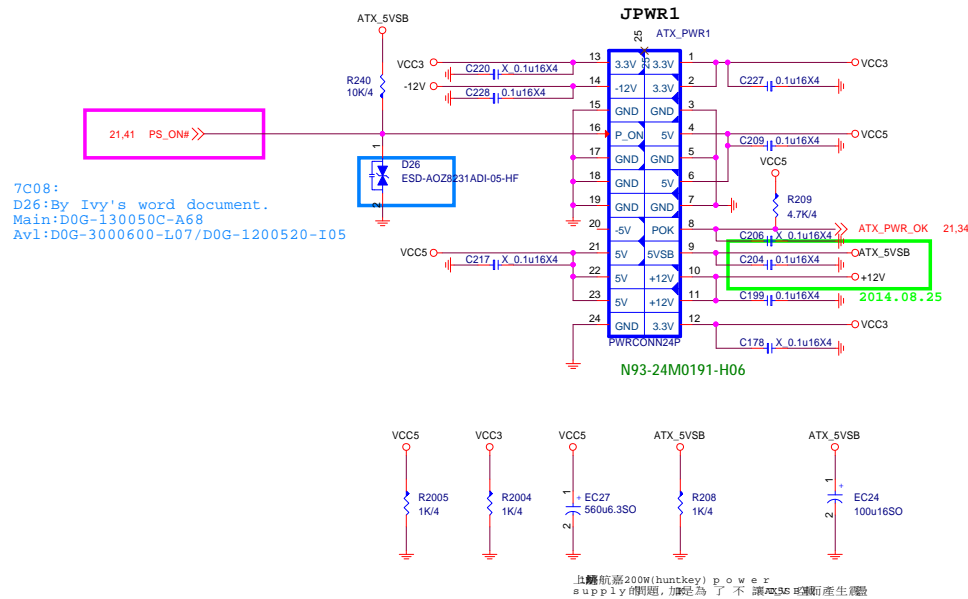
MS-7C13

Size Custom Document Description VCCIO - POWER MP5077 Rev 11

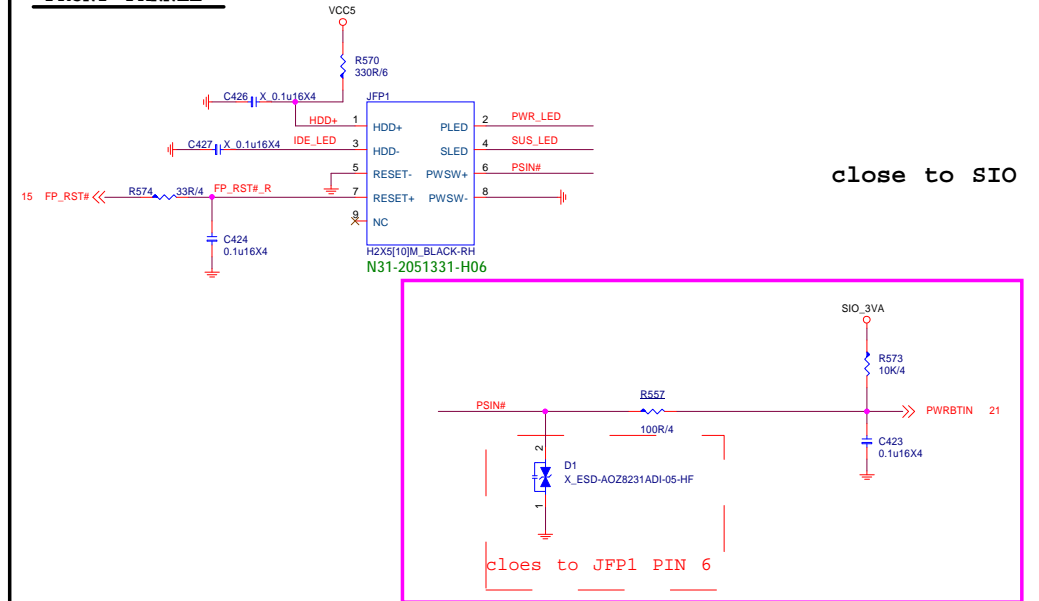
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ATX POWER CONNECTOR

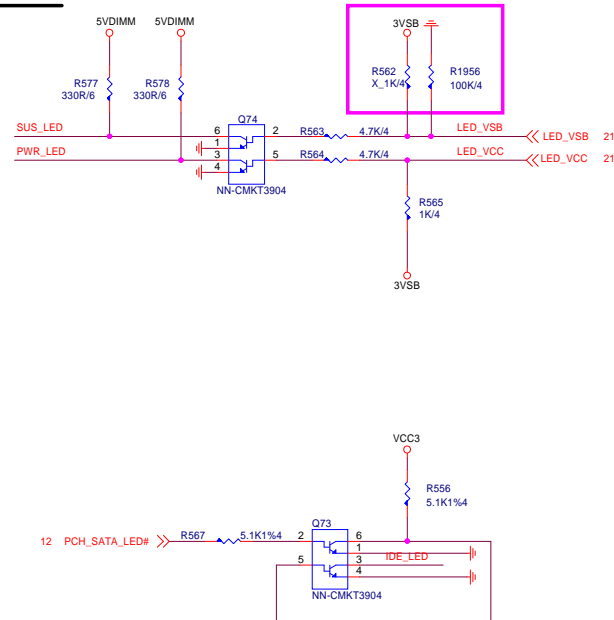
D26:By Ivy's word document.
Main:D0G-130050C-A68
Av1:D0G-3000600-L07/D0G-1200520-I05



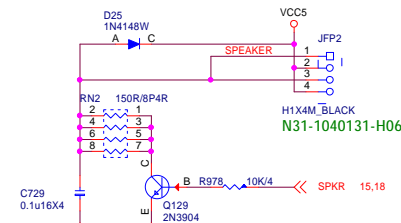
FRONT PANNEL



LED

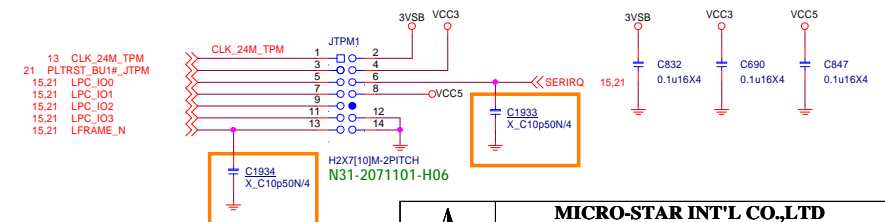


Speaker Pin Header



TPM

Don't colay espi debug.



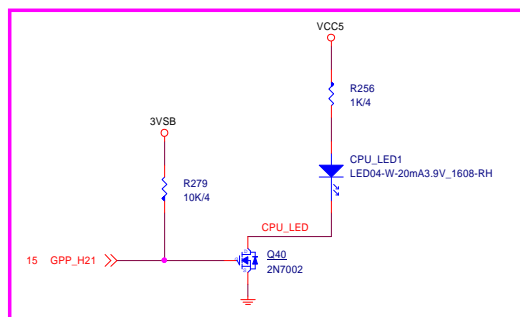
MICRO-STAR INT'L CO.,LTD

MS-7C13

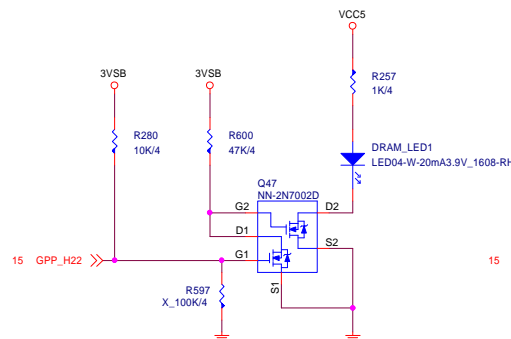
Size	Document	Description	Rev
Custom	ATX F_Panel/TPM/MSI_LED		11
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DEBUG LED

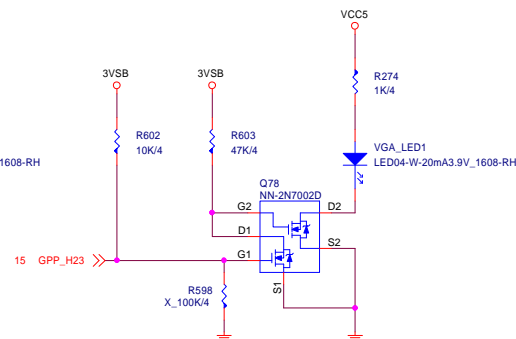
CPU



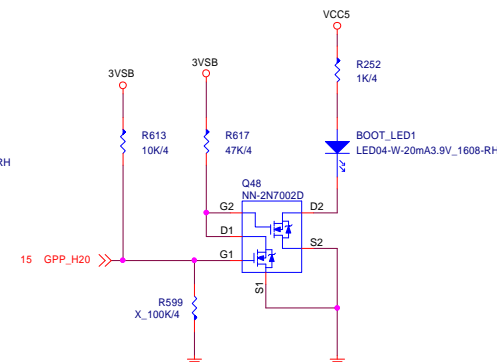
DRAM



VGA



DEVICE



LED	GPP_H21	GPP_H22	GPP_H23	GPP_H20
亮	GPO HIGH	GPO LOW	GPO LOW	GPO LOW
滅	GPO LOW (default LOW)	GPO HIGH (default HIGH)	GPO HIGH (default HIGH)	GPO HIGH (default HIGH)


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

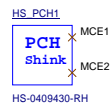
WHI:D0C-040T200-H91
AVL:D0C-040S200-E07

開機斷電狀態下，3個LED先維持 default 暗開機後

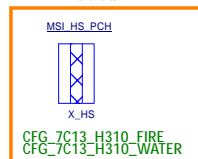
1. 首先進行 CPU check CPU LED 亮，check PASS 後則 CPU LED 滅
2. 接著依序進行 Memory / memory LED 亮 check PASS 後則 memory LED 滅
3. VGA 的 check/VGA LED 亮，check PASS 後則 VGA LED 滅
4. 因此最後正常順利開機後，三個 LED 燈都是滅掉的。(系統重啟或其他原因造成系統重開機，則 LED 仍按上述行為動作)

EMI CAP

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MSI Heatsink



CFG_7C13_H310_FIRE
CFG_7C13_H310_WATER



E21-7557050-L06
AVL: E21-7557060-P02



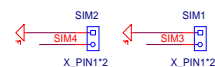
G51-M1SPXXA-A09

HDMI LABEL
Y01-RHDMI03-000

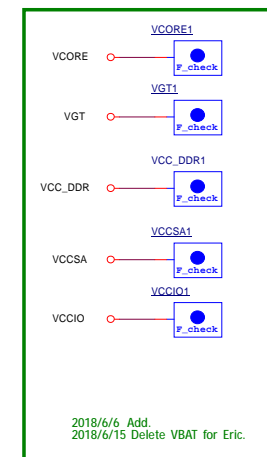
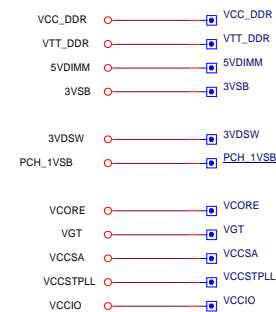
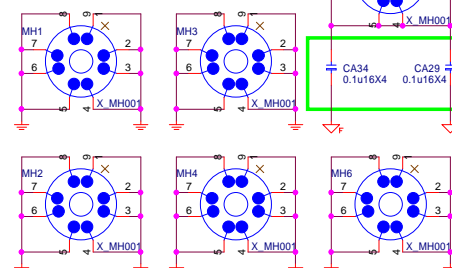
Optical Fiducial Marks-120



Simulation



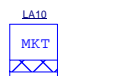
Mounting Holes



2018/6/6 Add.
2018/6/15 Delete VBAT for Eric.

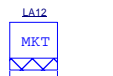
Marketing Name

H310M PRO-VH PLUS: G51-M1SPN45-Q13
H310M PRO-VD PLUS: G51-M1SPN42-Q13
H310M WATER PLUS: G51-M1SPN44-Q13
H310M FIRE PLUS: G51-M1SPN43-Q13
H310M PRO-VH V2: TBD



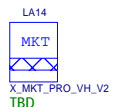
MKT_PRO_VH_PLUS
G51-M1SPN45-Q13

X_MKT_PRO_VD_PLUS
G51-M1SPN42-Q13



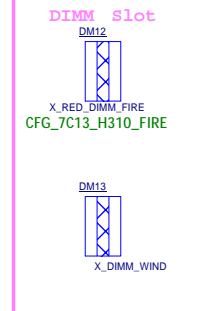
X_MKT_WATER_PLUS
G51-M1SPN44-Q13

X_MKT_FIRE_PLUS
G51-M1SPN43-Q13

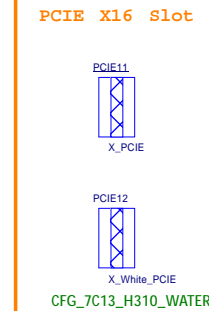


X_MKT_PRO_VH_V2
TBD

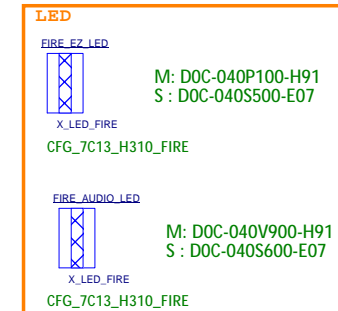
CFG_7C13_H310_RIRE DIMM : RED



CFG_7C13_H310_WATER X16 : WHITE



CFG_7C13_H310_FIRE LED : RED



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