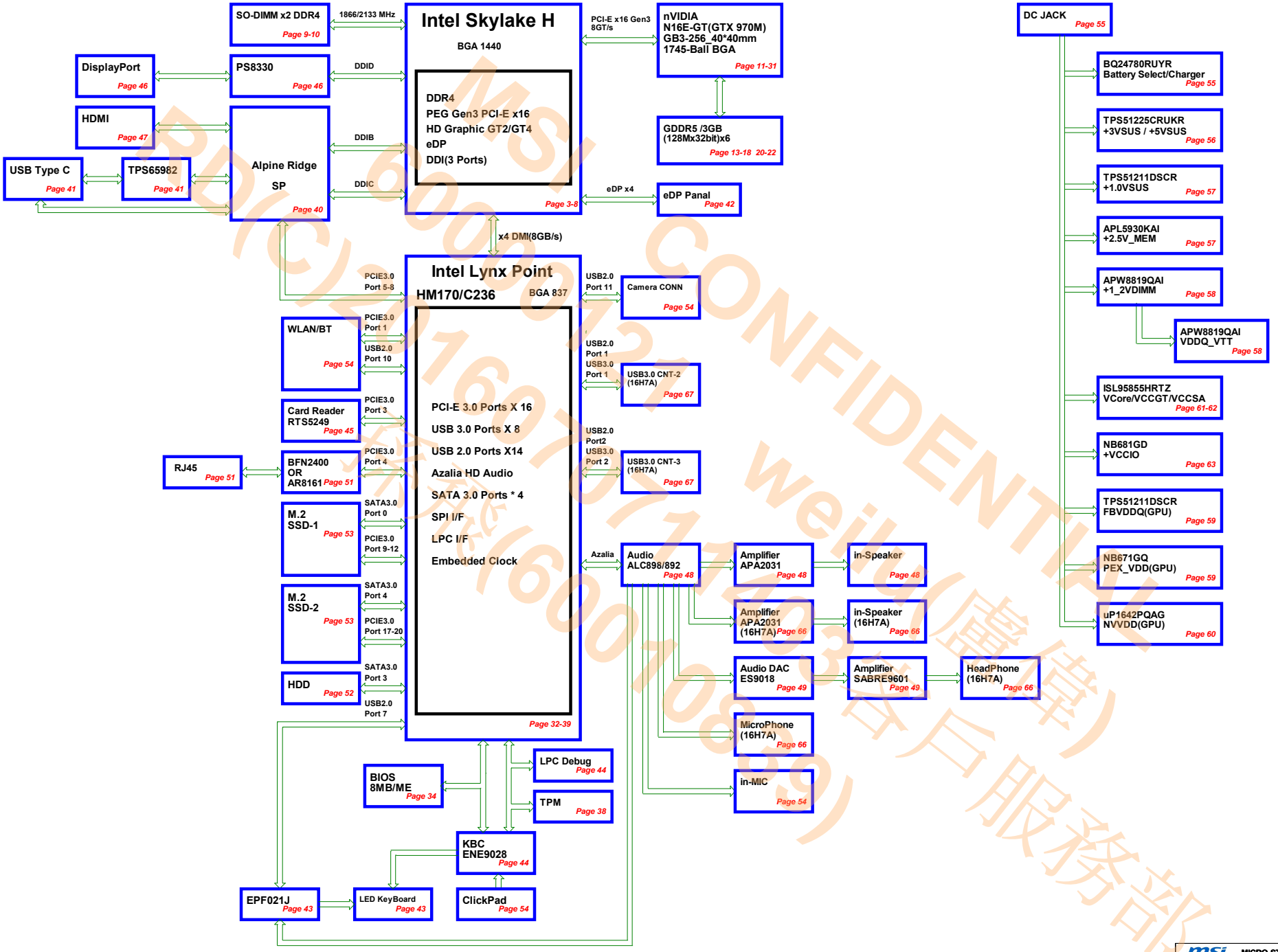
MS-16H7 Ver:1.2 Intel Skylake Platform



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PD(C)2016071108(1.0)
技术支持(6001108)
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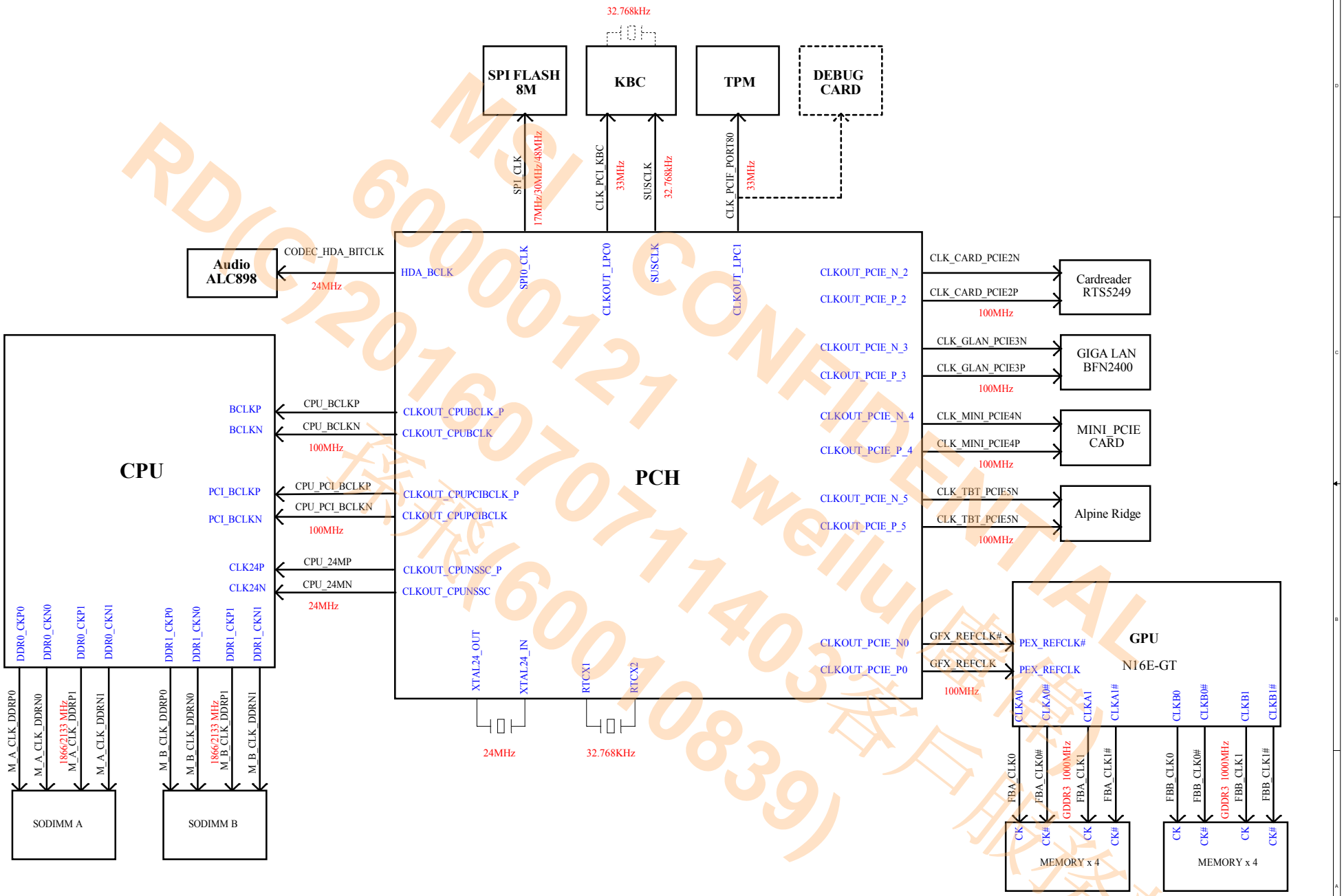
msi MICRO-STAR INT'L CO.,LTD.

Title: Block Diagram

Size | Document Number: MS-16H7 | Rev: 1.2

Date: | Sheet 1 of 74



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600000121 weiliu(微信)
维修(600100839)
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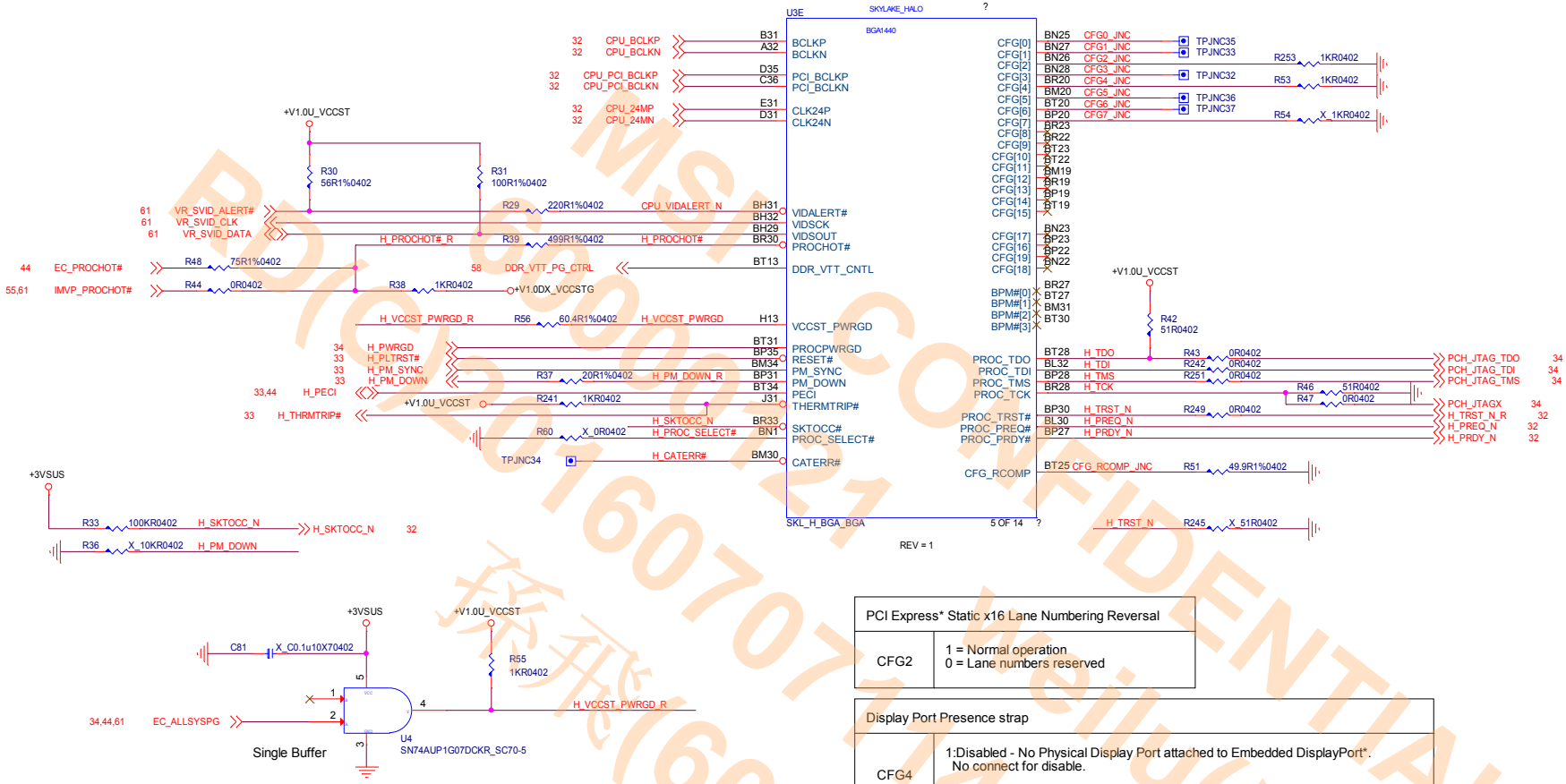
MICRO-STAR INT'L CO.,LTD.

Title: CLock Delivery chart

Size | Document Number: MS-16H7 | Rev: 1.2

Date: Wednesday, September 16, 2015 | Sheet 2 of 74



PCI Express* Static x16 Lane Numbering Reversal	
CFG2	1 = Normal operation 0 = Lane numbers reserved

Display Port Presence strap	
CFG4	1:Disabled - No Physical Display Port attached to Embedded DisplayPort*. No connect for disable. 0:Enabled - A Display Port device is connected to the Embedded Display Port. Pull-down to GND through a 1 KΩ ±5% resistor to enable port

PCI Express* Bifurcation	
CFG[6:5]	00 = 1x8, 2x4 PCI Express* 01 = reserved 10 = 2x8 PCI Express* 11 = 1x16 PCI Express* Recommend 1K Ω ±5% pull-down resistor to GND.

PEG Training	
CFG7	1 = (default) PEG train immediately following RESET# de assertion. 0 = PEG wait BIOS for training.

I7_6700

I7-6700HQ

A0D-6700H15-I06

I7-6700HQ

MICRO-STAR INT'L CO.,LTD.

Title: Skylake(HOST)

Size | Document Number: MS-16H7 | Rev: 1.2

Date: Wednesday, September 16, 2015 | Sheet 3 of 74

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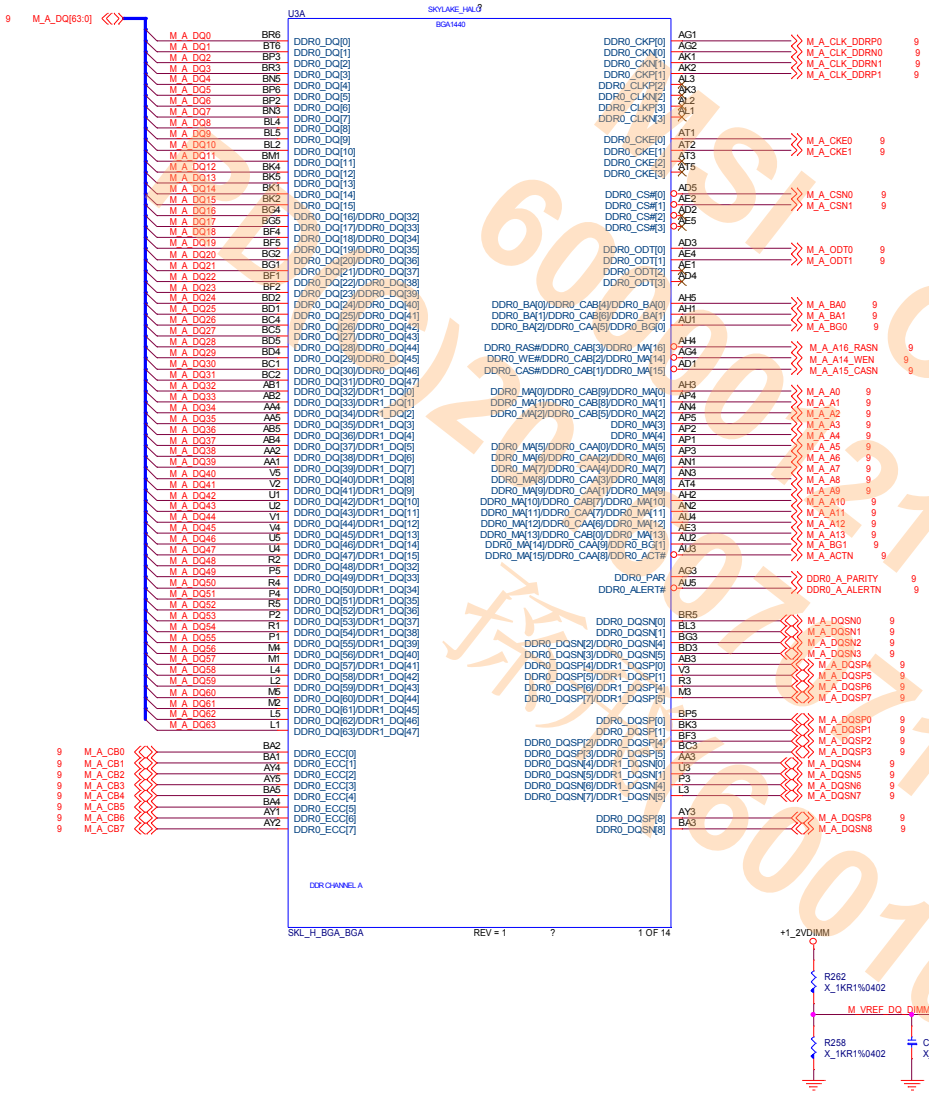
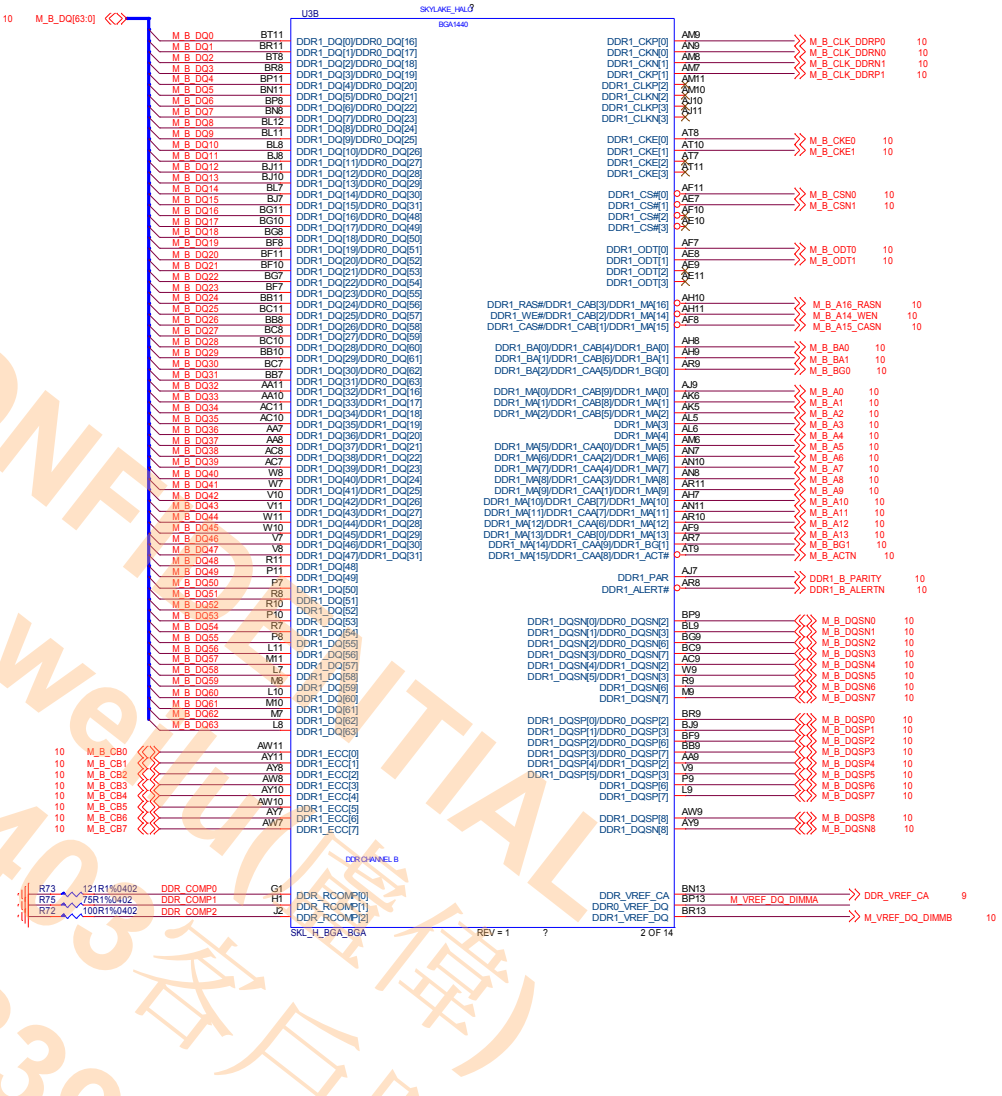
DDR Channel A



DDR Channel B



MICRO-STAR INT'L CO.,LTD.			
Title: Skylake(DDR4)			
Size	Document Number: MS-16H7		Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 4 of 74		

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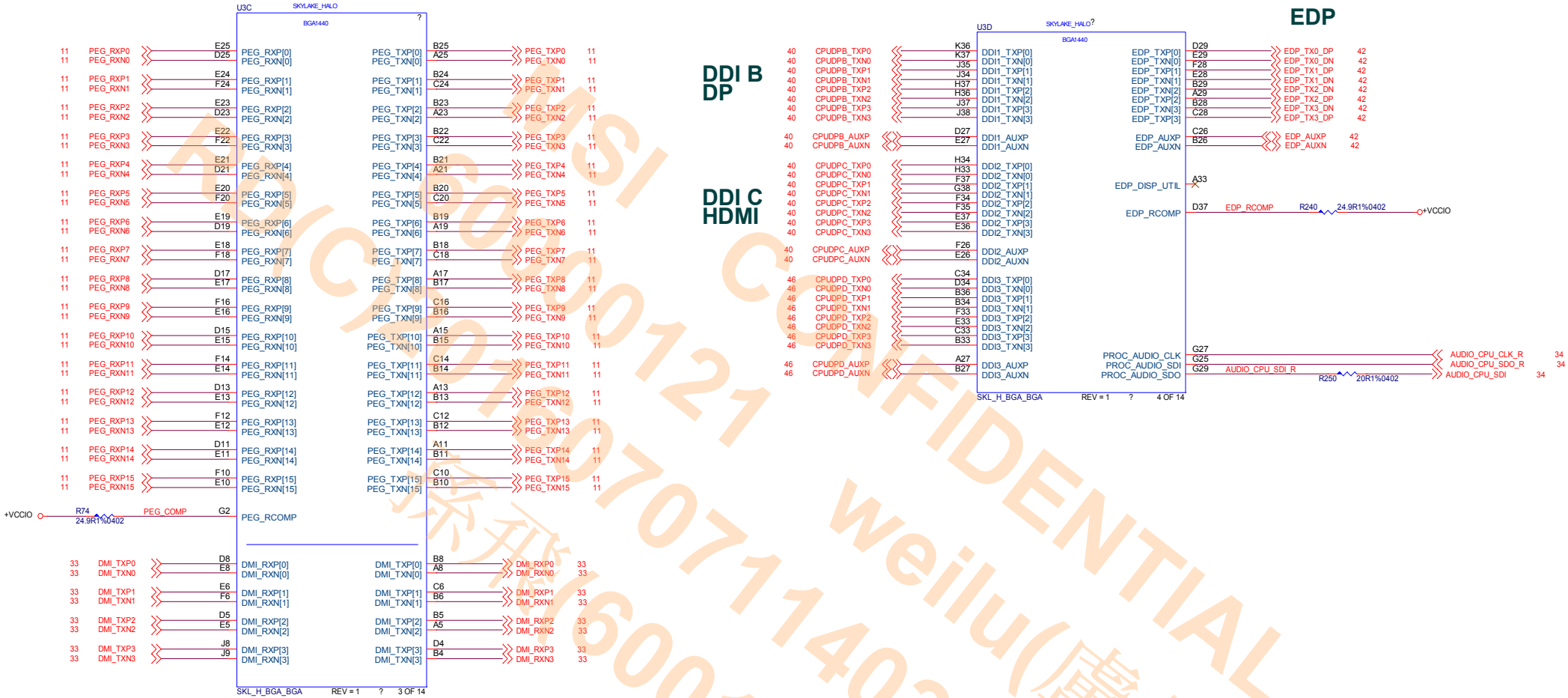

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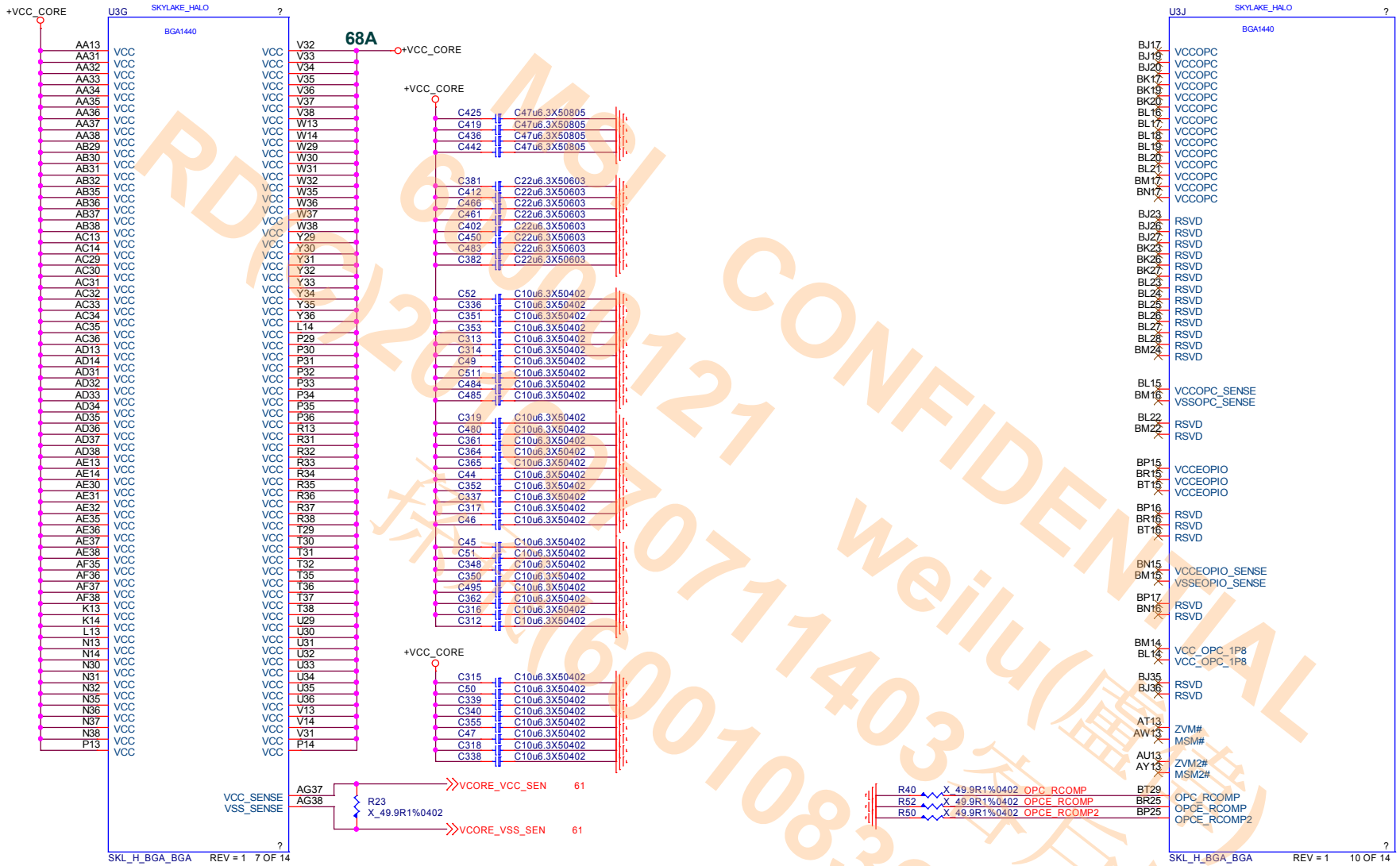
msi	MICRO-STAR INT'L CO.,LTD.	
Title	Skylake(DMI/Display)	
Size	Document Number: MS-16H7	Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 5 of 74	



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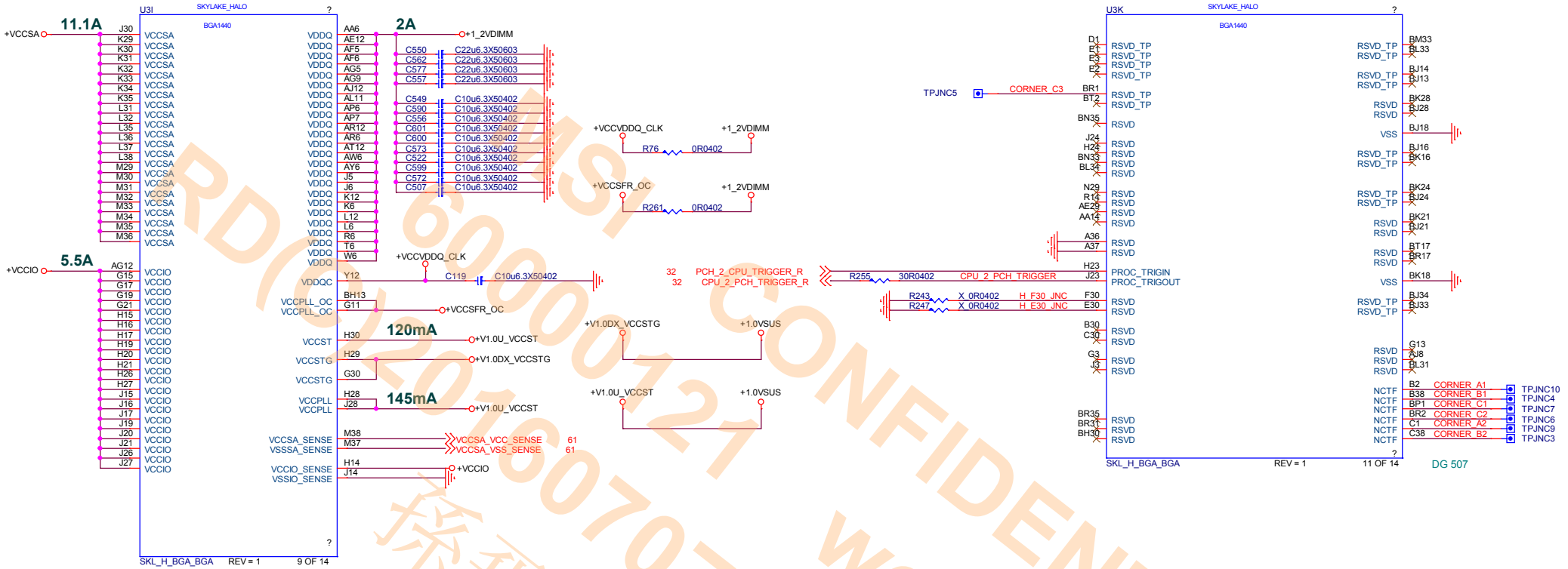
MICRO-STAR INT'L CO.,LTD.		
Title: Skylake(Power1)		
Size	Document Number: MS-16H7	Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 6 of 74	



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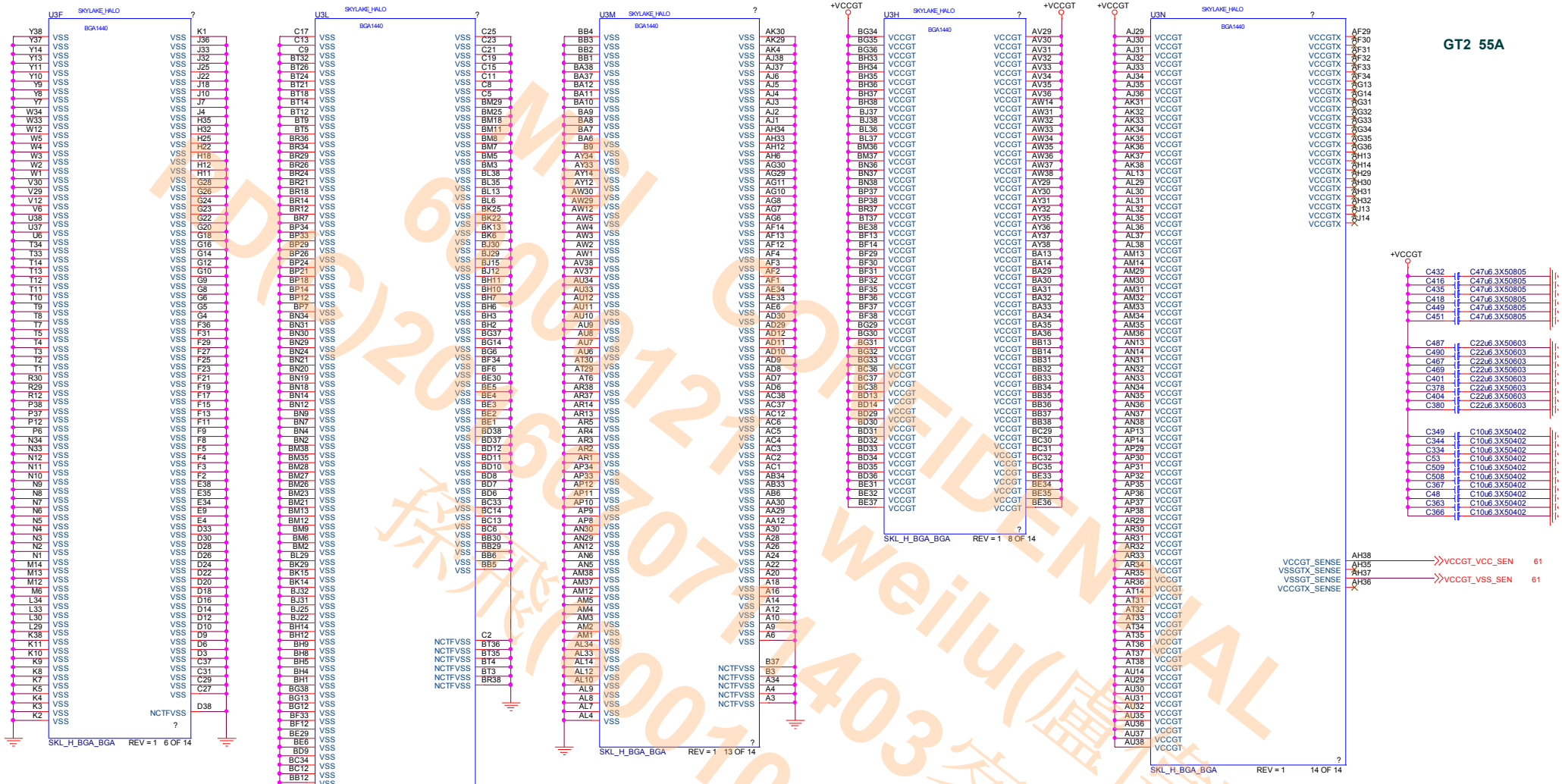
MSI CONFIDENTIAL 6000121 weilu(盧偉)
採飛(600010839)

msi	MICRO-STAR INT'L CO.,LTD.		
Title	Skylake(Power2)		
Size	Document Number MS-16H7		Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 7 of 74		



MICRO-STAR INT'L CO.,LTD.			
Title: Skylake(Power3)			
Size	Document Number: MS-16H7		Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 8 of 74		

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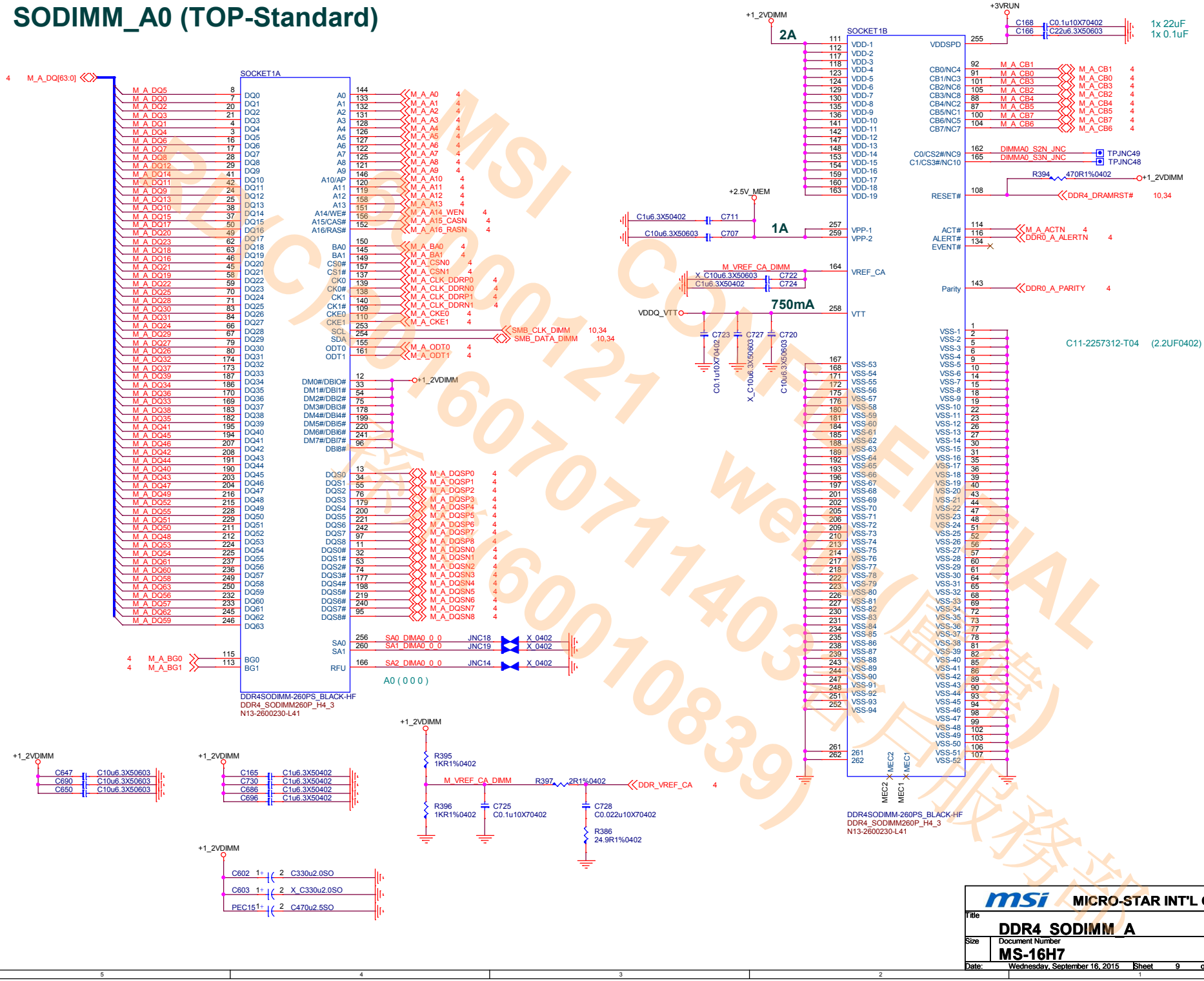
SODIMM_A0 (TOP-Standard)



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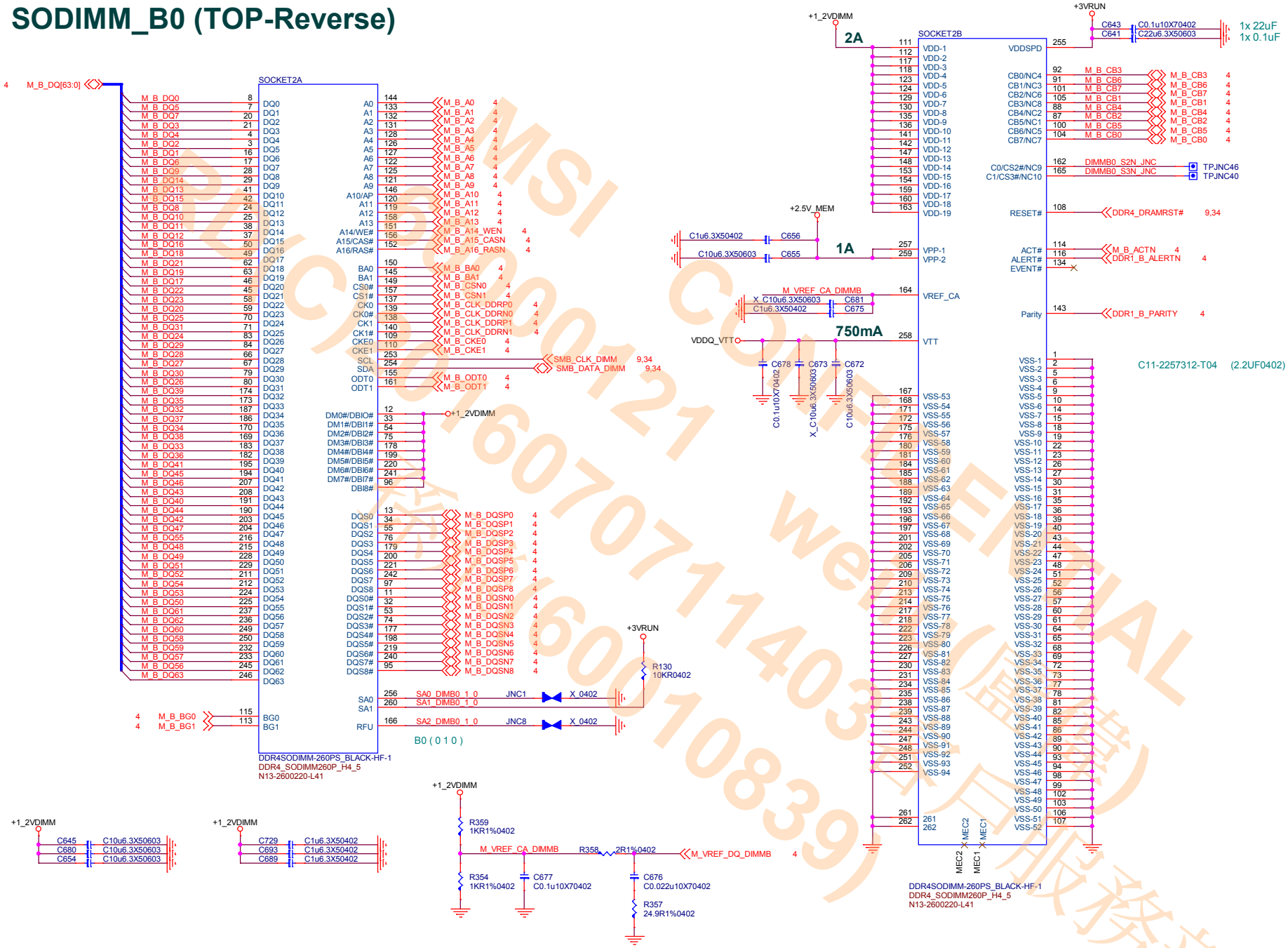
Title: DDR4_SODIMM_A			
Size	Document Number: MS-16H7	Rev: 1.2	
Date: Wednesday, September 16, 2015	Sheet 9 of 74		

SODIMM_B0 (TOP-Reverse)



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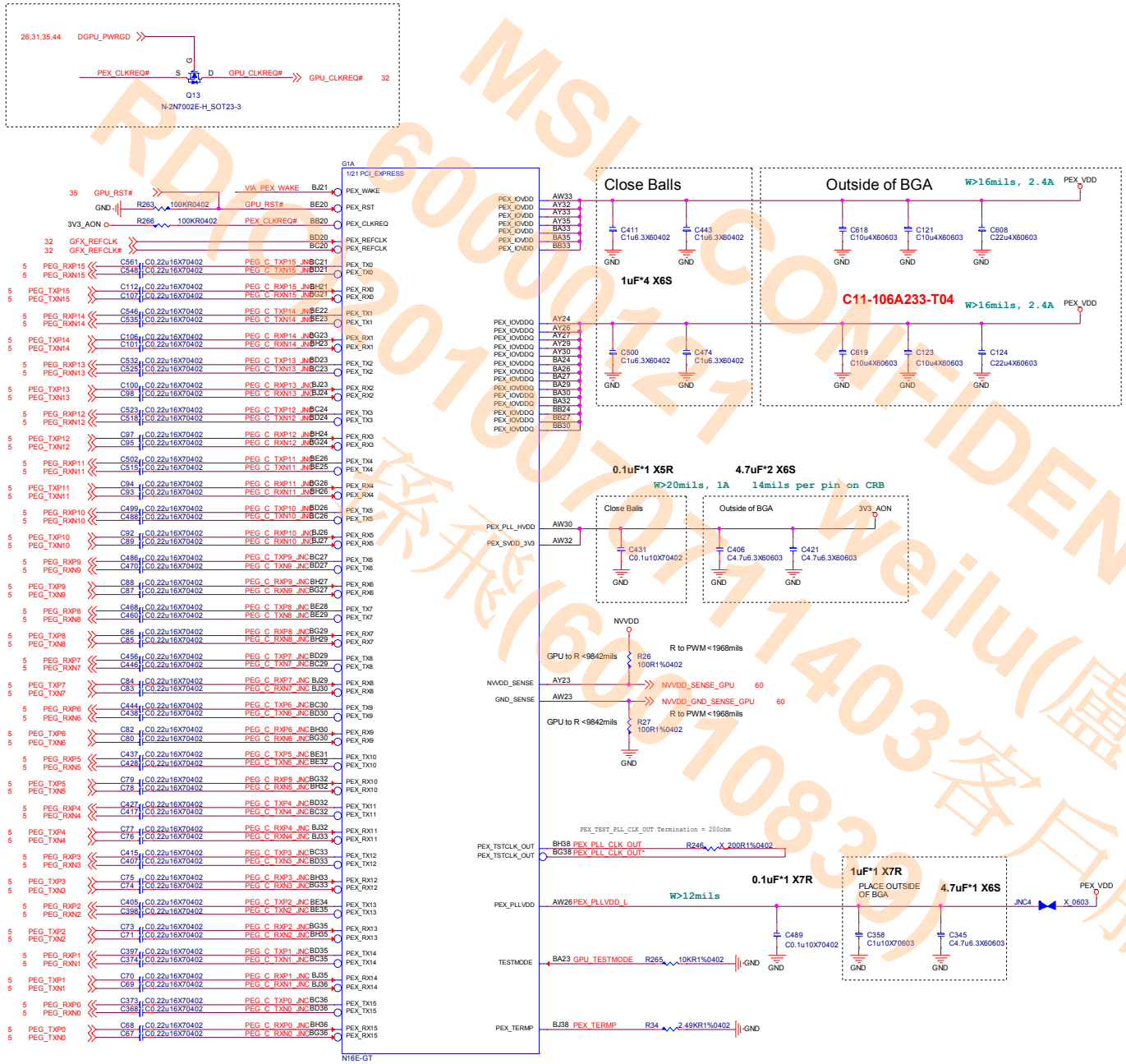
GPU PCI EXPRESS



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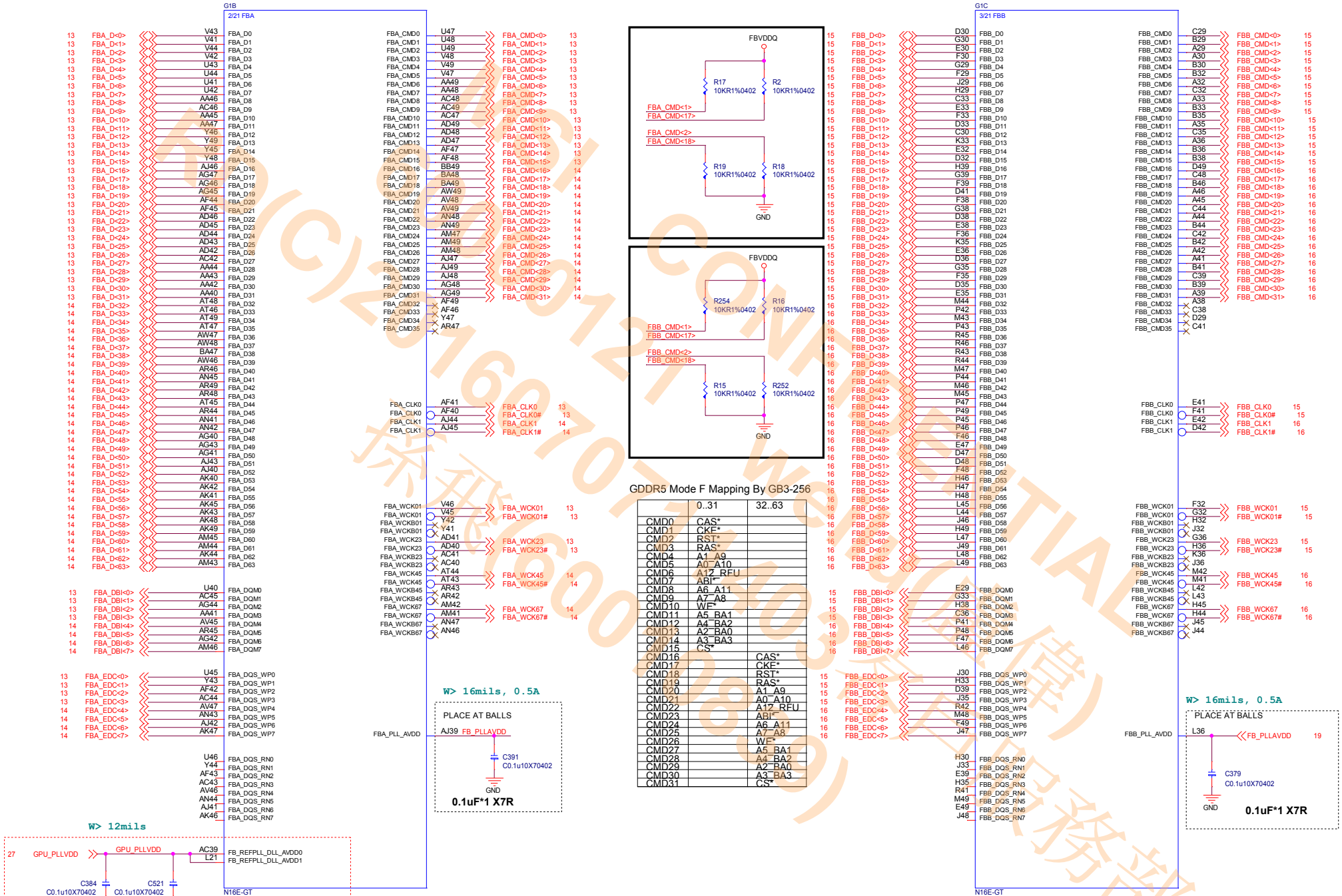
Title	DGPU_PCI-E Host	
Size	Document Number MS-16H7	Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 11 of 74	

GPU Frame Buffer Partition A/B



GDDR5 Mode F Mapping By GB3-256

	0..31	32..63
CMD0	CAS*	
CMD1	CKE*	
CMD2	RST*	
CMD3	RAS*	
CMD4	A1_A9	
CMD5	A0_A10	
CMD6	A12_RFU	
CMD7	ABI*	
CMD8	A6_A11	
CMD9	A7_A8	
CMD10	WE*	
CMD11	A5_BA1	
CMD12	A4_BA2	
CMD13	A2_BA0	
CMD14	A3_BA3	
CMD15	CS*	
CMD16		CAS*
CMD17		CKE*
CMD18		RST*
CMD19		RAS*
CMD20		A1_A9
CMD21		A0_A10
CMD22		A12_RFU
CMD23		ABI*
CMD24		A6_A11
CMD25		A7_A8
CMD26		WE*
CMD27		A5_BA1
CMD28		A4_BA2
CMD29		A2_BA0
CMD30		A3_BA3
CMD31		CS*

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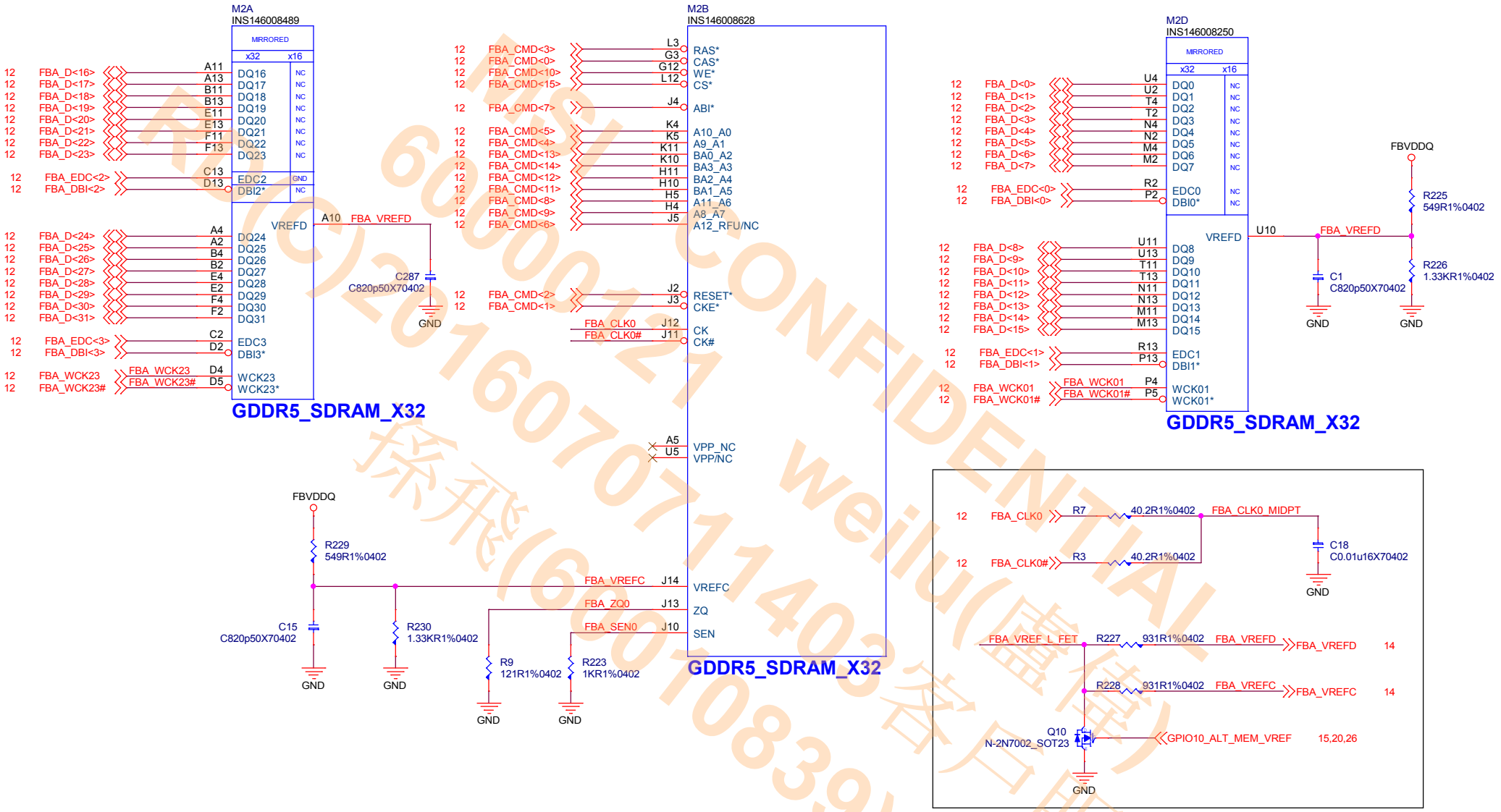
Title	DGPU_MEM IF A/B	
Size	Document Number: MS-16H7	Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 12 of 74	

DGPU_GDDR5 FrameBuffer A0

M3 5010



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徐飞(62610839)
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MICRO-STAR INT'L CO.,LTD.		
Title: DGPU_GDDR5 FrameBuffer A0		
Size	Document Number: MS-16H7	Rev: 1.2
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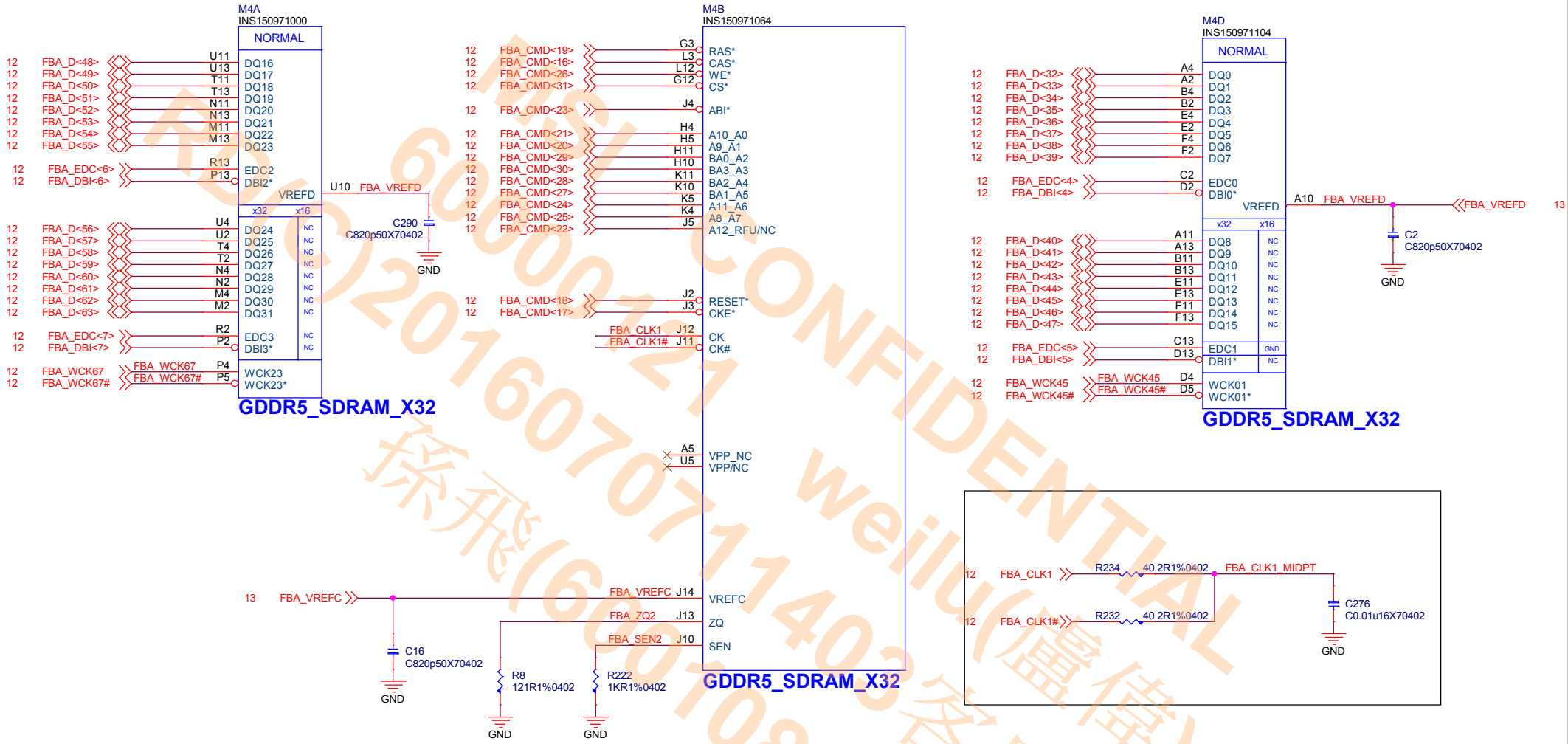
DGPU_GDDR5 FrameBuffer A1

M5 5010



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Title	DGPU_GDDR5 FrameBuffer A1	
Size	Document Number MS-16H7	Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 14 of 74	

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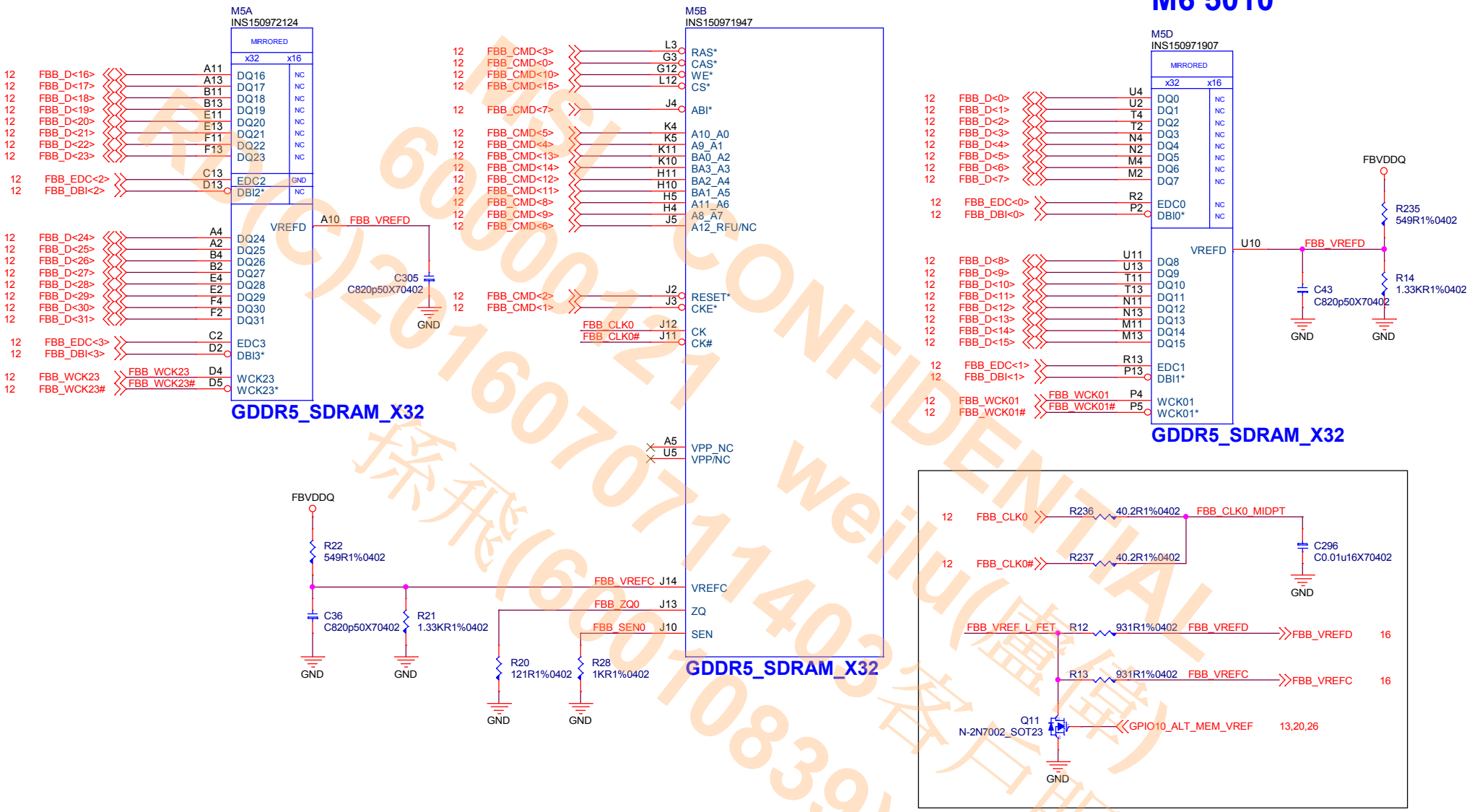
DGPU_GDDR5 FrameBuffer B0

M6 5010



MICRO-STAR INT'L CO.,LTD.

Title	DGPU_GDDR5 FrameBuffer B0	
Size	Document Number MS-16H7	Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 15 of 74	

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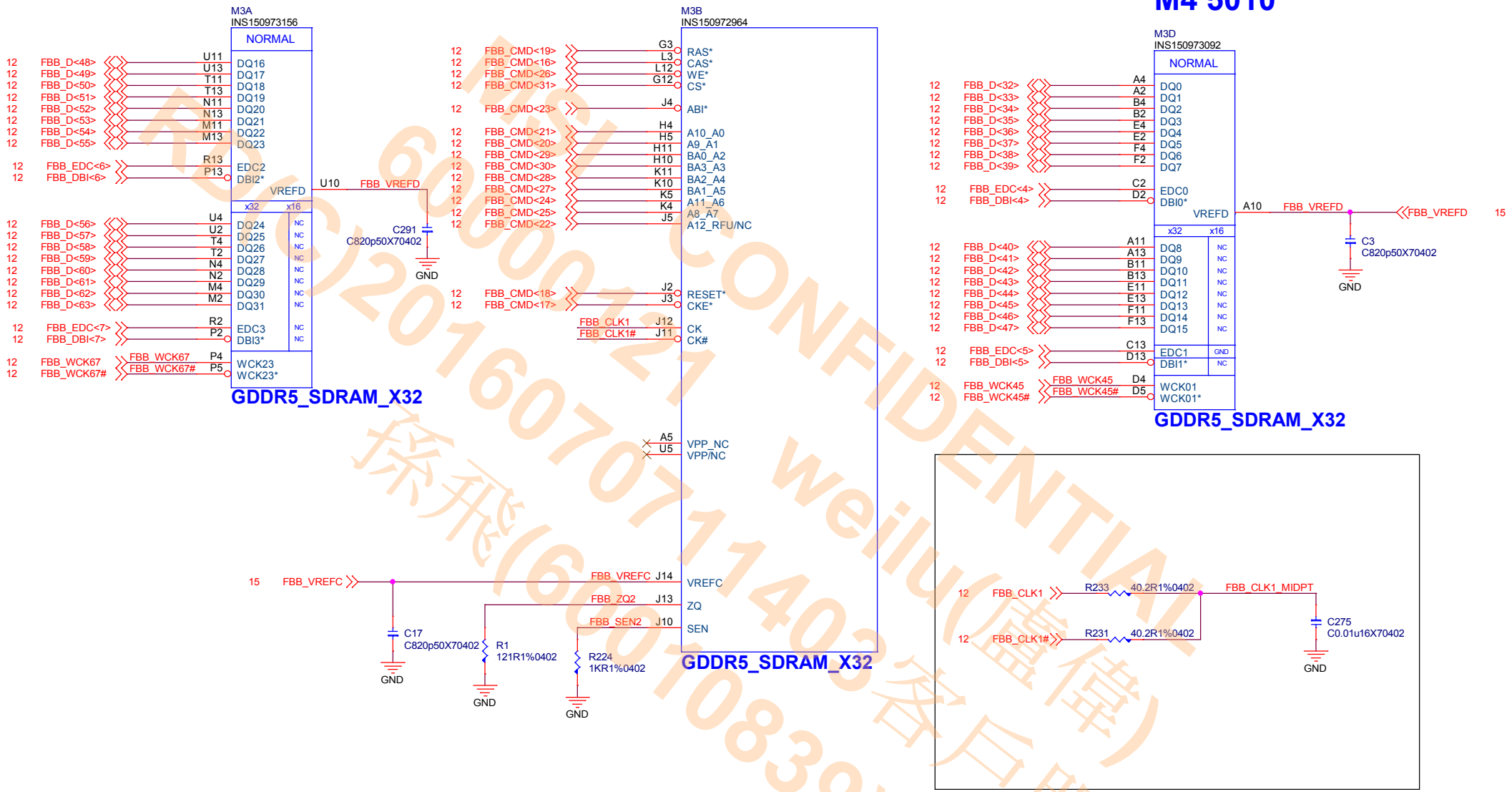
DGPU_GDDR5 FrameBuffer B1

M4 5010



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Title: DGPU_GDDR5 FrameBuffer B1			
Size	Document Number: MS-16H7		Rev: 1.2
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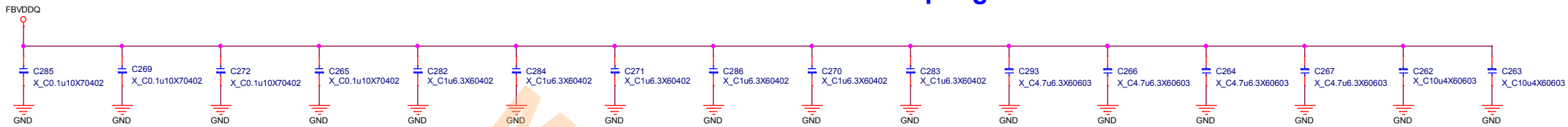
Frame Buffer Partition A Decoupling



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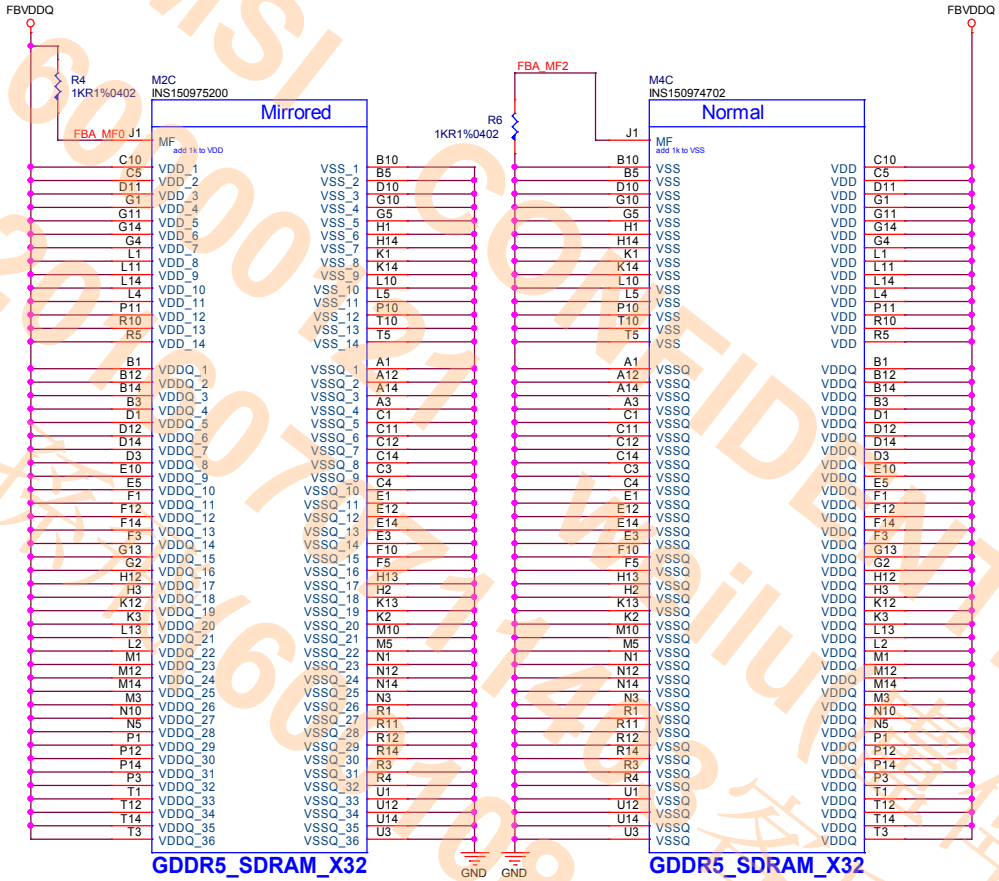

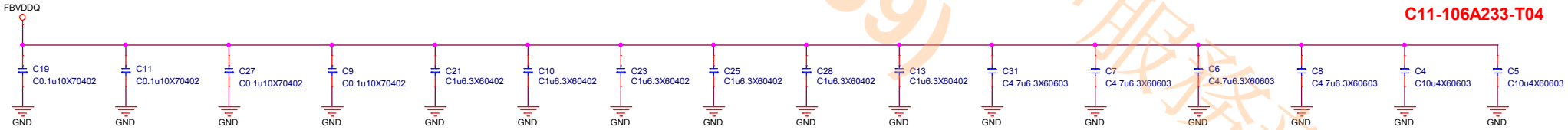

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Title	DGPU_GDDR5 FB-A_DECOUPLING	
Size	Document Number MS-16H7	Rev 1.2
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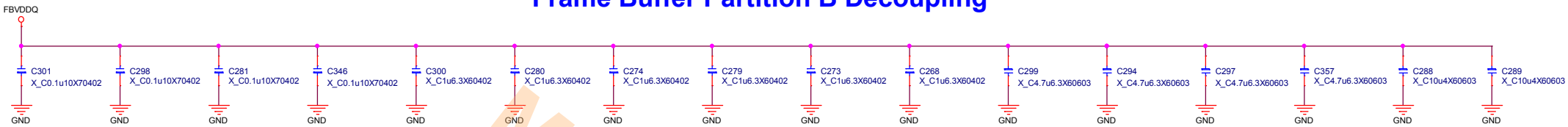
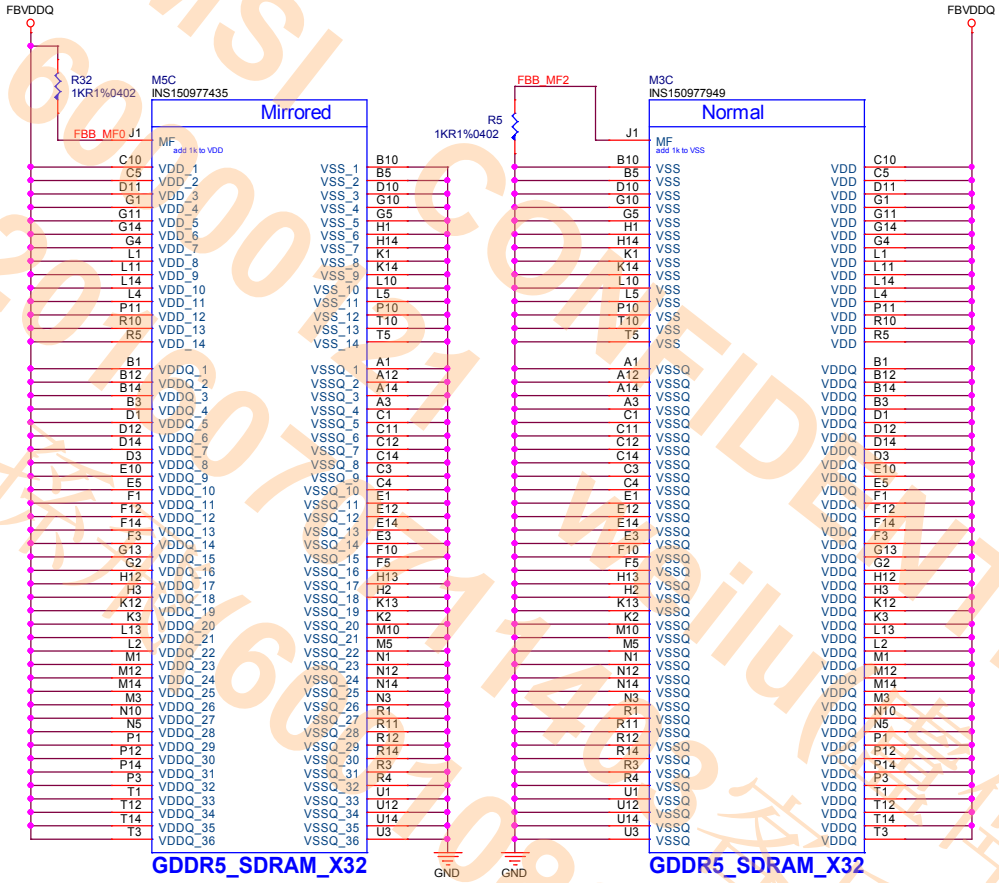
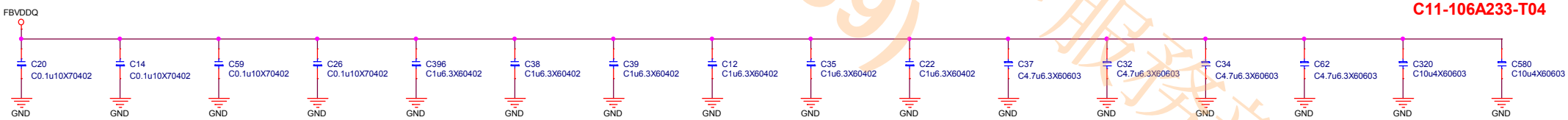
Frame Buffer Partition B Decoupling



C11-106A233-T04





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Title: DGPU_GDDR5 FB-B_DECOUPLING

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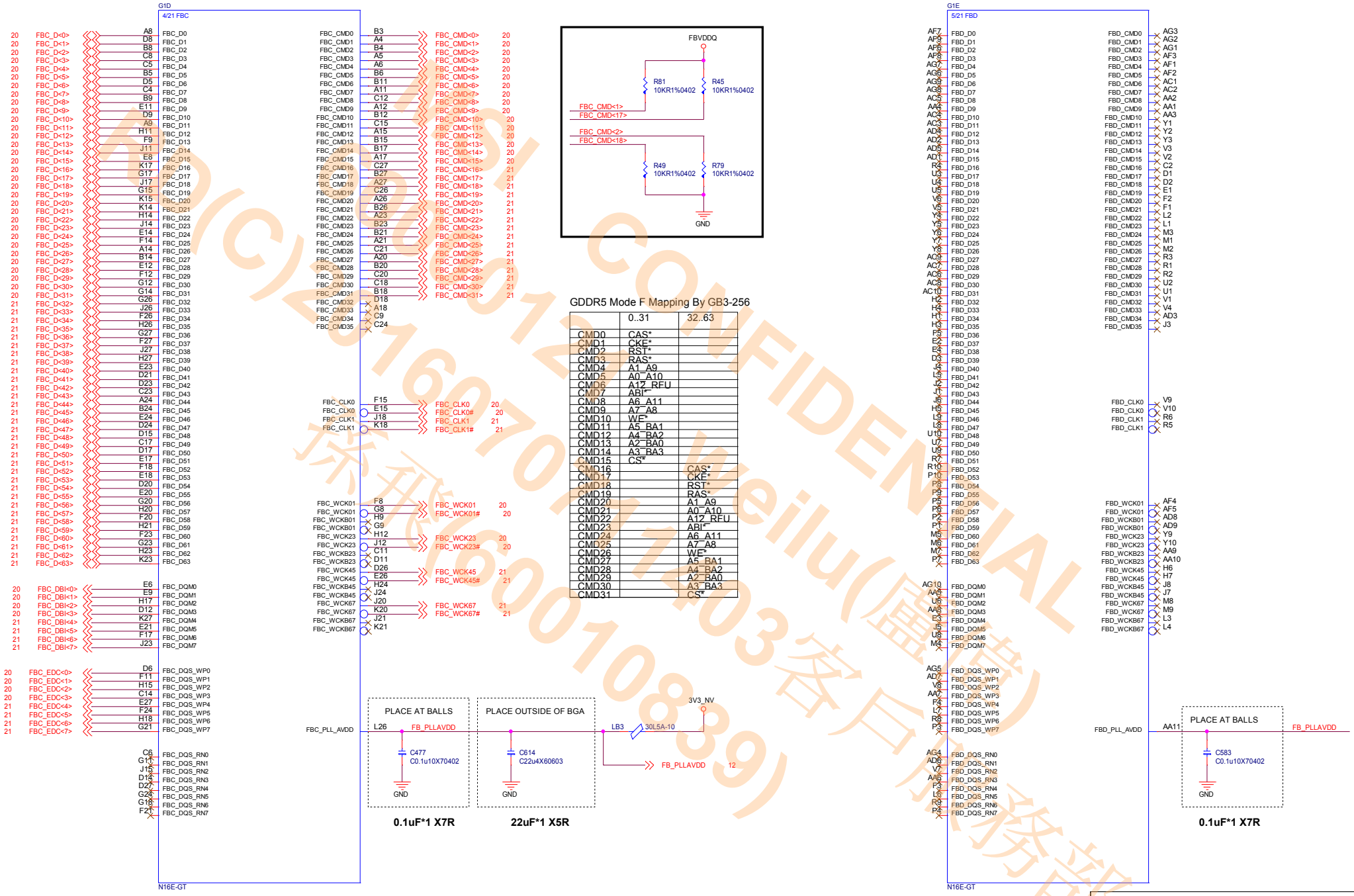
GPU Frame Buffer Partition C/D



GDDR5 Mode F Mapping By GB3-256

	0..31	32..63
CMD0	CAS*	
CMD1	CKE*	
CMD2	RST*	
CMD3	RAS*	
CMD4	A1_A9	
CMD5	A0_A10	
CMD6	A12_RFU	
CMD7	ABI*	
CMD8	A6_A11	
CMD9	A7_A8	
CMD10	WE*	
CMD11	A5_BA1	
CMD12	A4_BA2	
CMD13	A2_BA0	
CMD14	A3_BA3	
CMD15	CS*	
CMD16		CAS*
CMD17		CKE*
CMD18		RST*
CMD19		RAS*
CMD20		A1_A9
CMD21		A0_A10
CMD22		A12_RFU
CMD23		ABI*
CMD24		A6_A11
CMD25		A7_A8
CMD26		WE*
CMD27		A5_BA1
CMD28		A4_BA2
CMD29		A2_BA0
CMD30		A3_BA3
CMD31		CS*

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Title	DGPU_MEM IF C/D	
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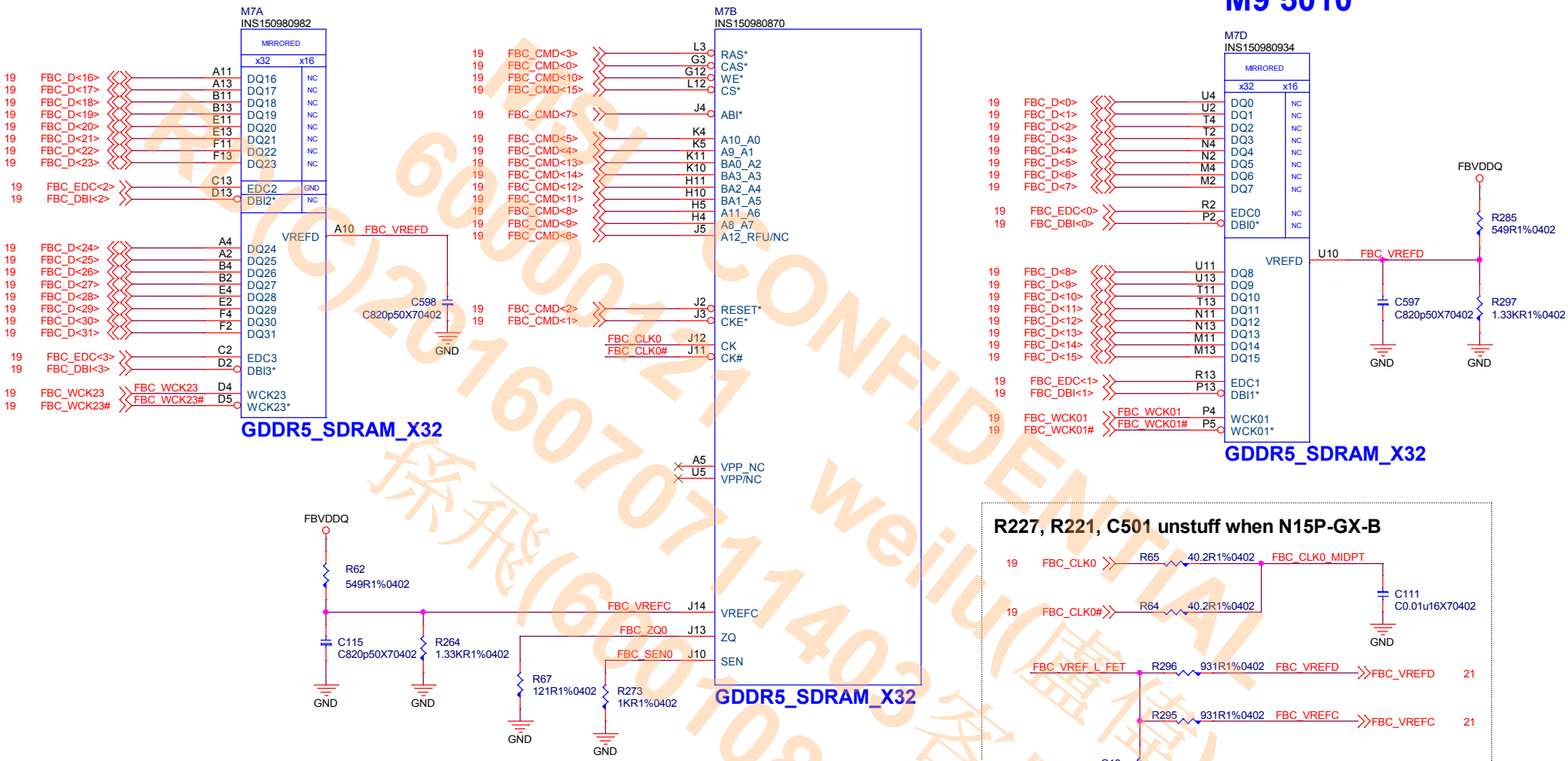
DGPU_GDDR5 FrameBuffer C0

M9 5010



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Title: DGPU_GDDR5 FrameBuffer C		
Size	Document Number: MS-16H7	Rev: 1.2
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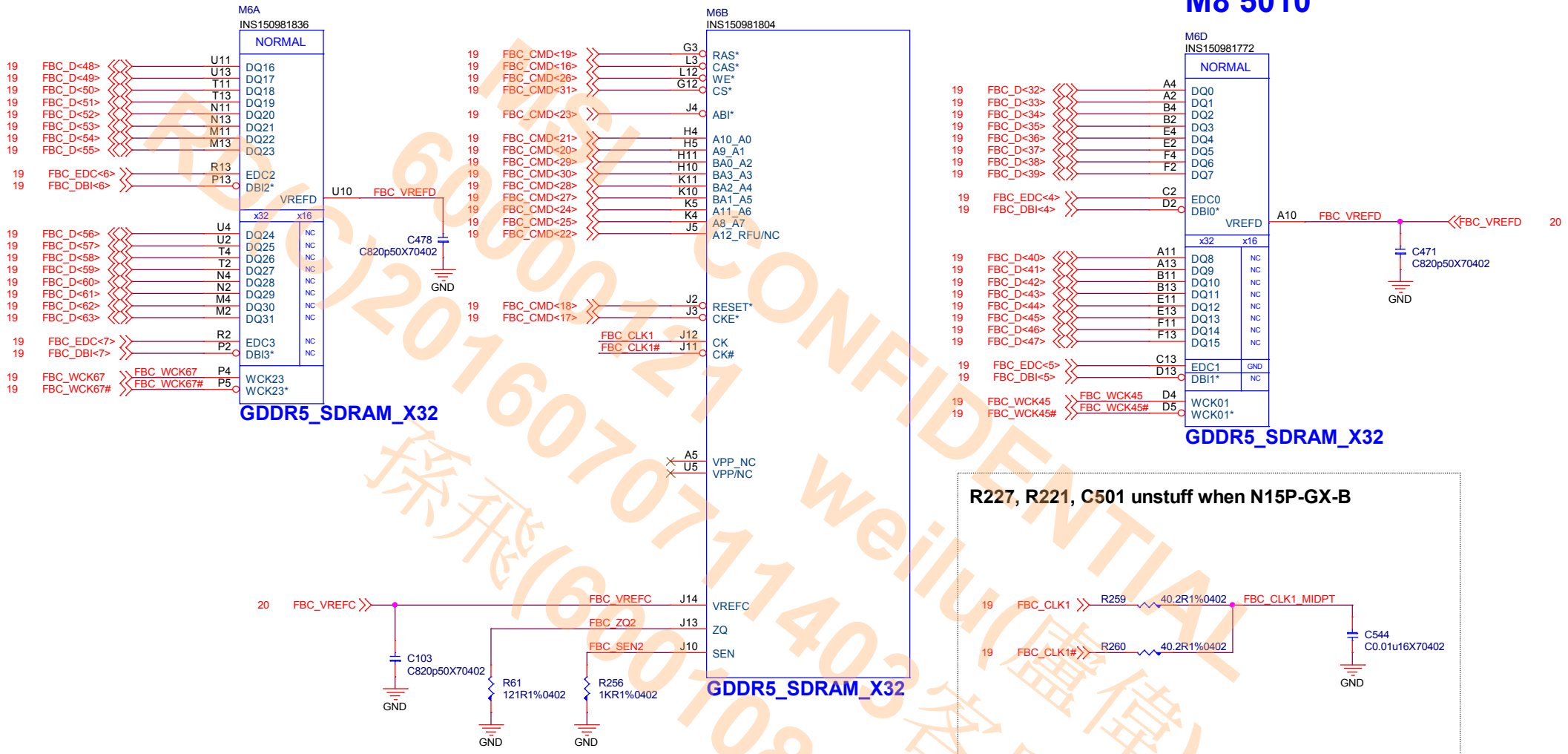
DGPU_GDDR5 FrameBuffer C1

M8 5010



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Title: DGPU_GDDR5 FrameBuffer C		
Size	Document Number: MS-16H7	Rev: 1.2
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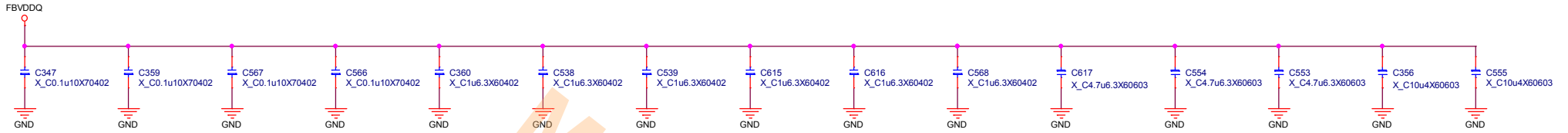
Frame Buffer Partition C Decoupling



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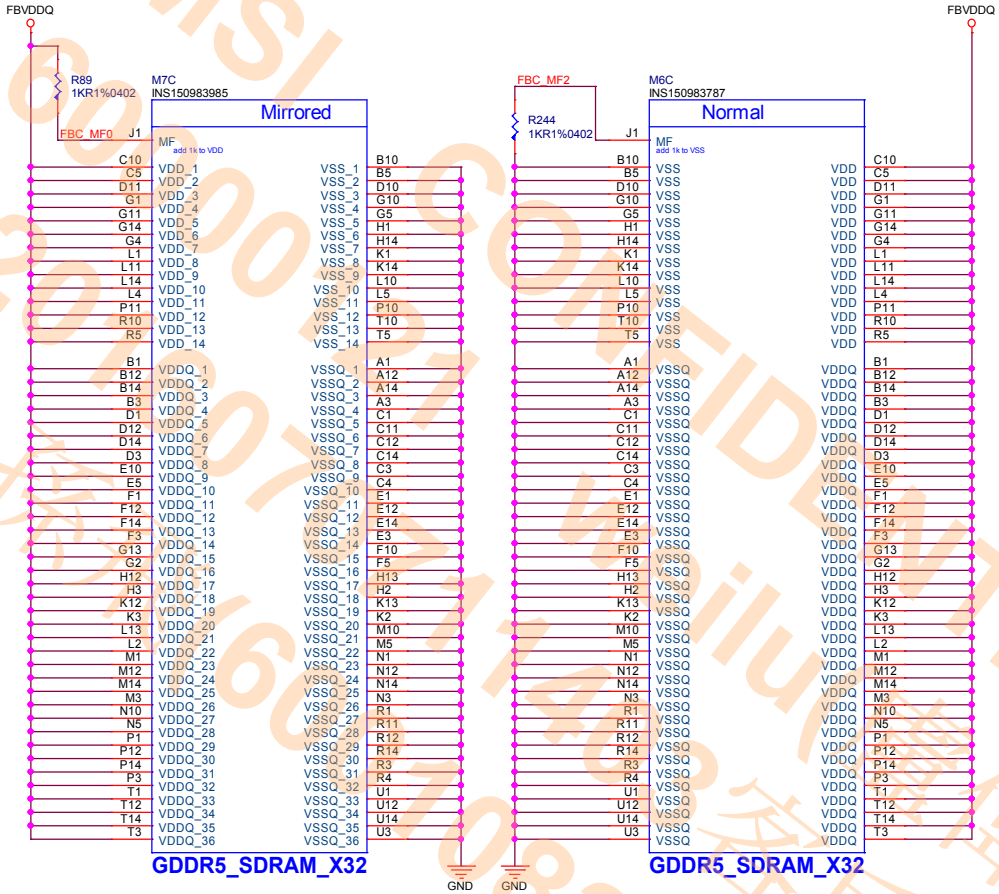

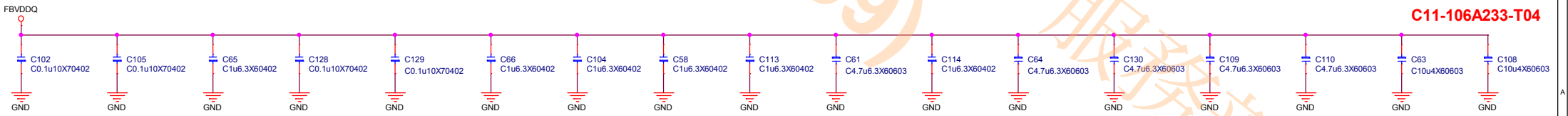

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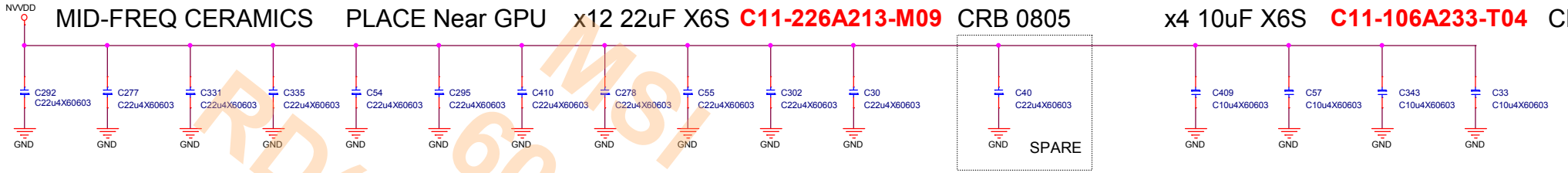
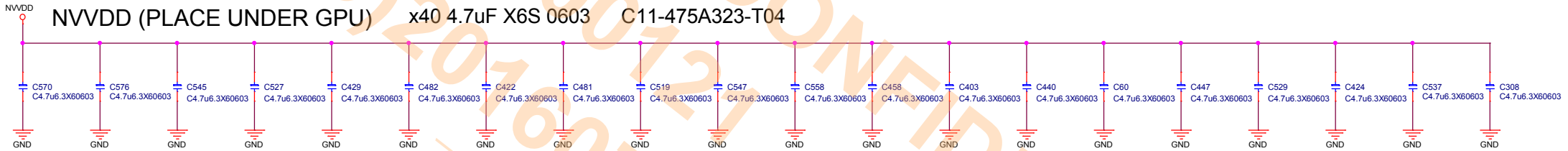
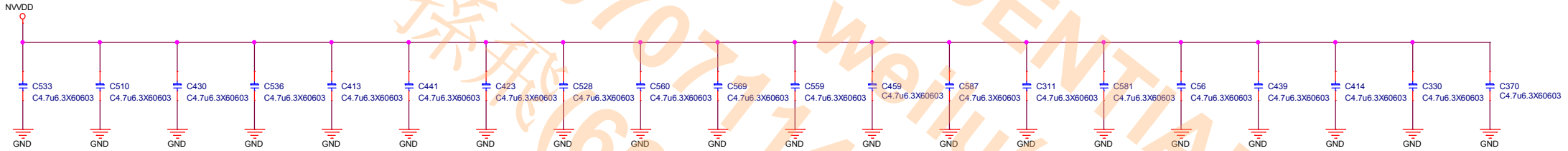
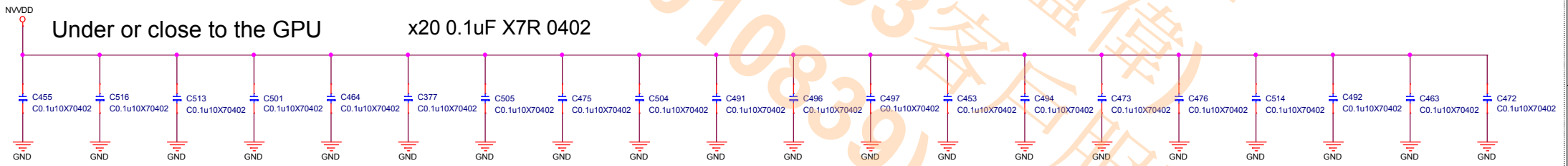
Title	DGPU_GDDR5 FB-C_DECOUPLING	
Size	Document Number MS-16H7	Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 22 of 74	

GPU DECOUPLING A









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RD(C)20160711403 weihu(魏伟)
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MICRO-STAR INT'L CO.,LTD.

Title: DGPU_GPU DECOUPLING A

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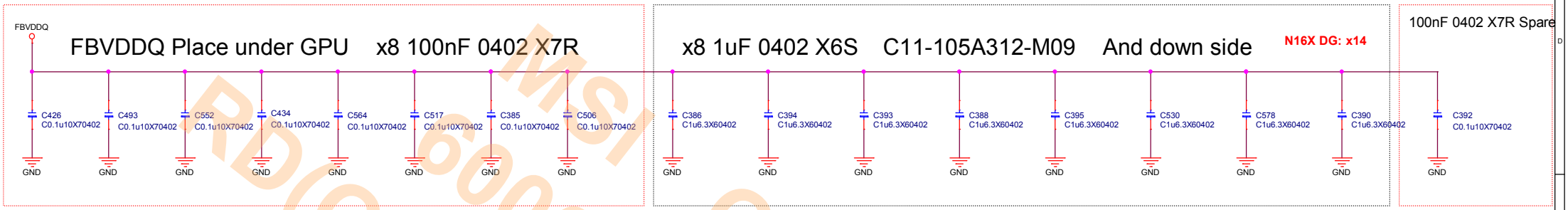
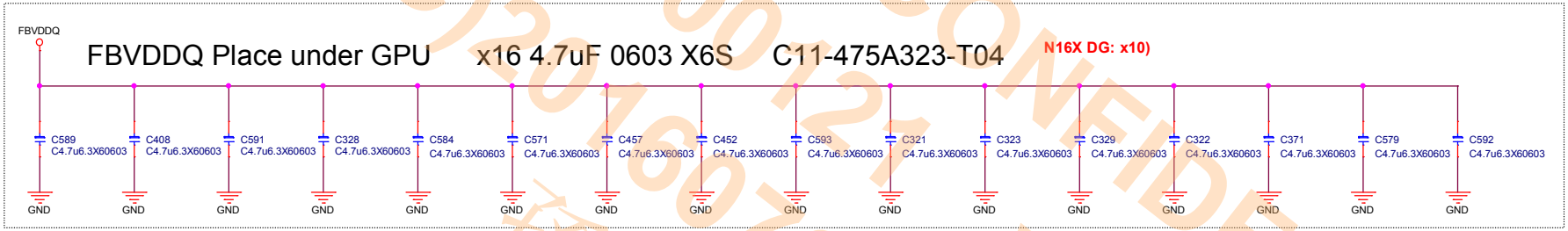
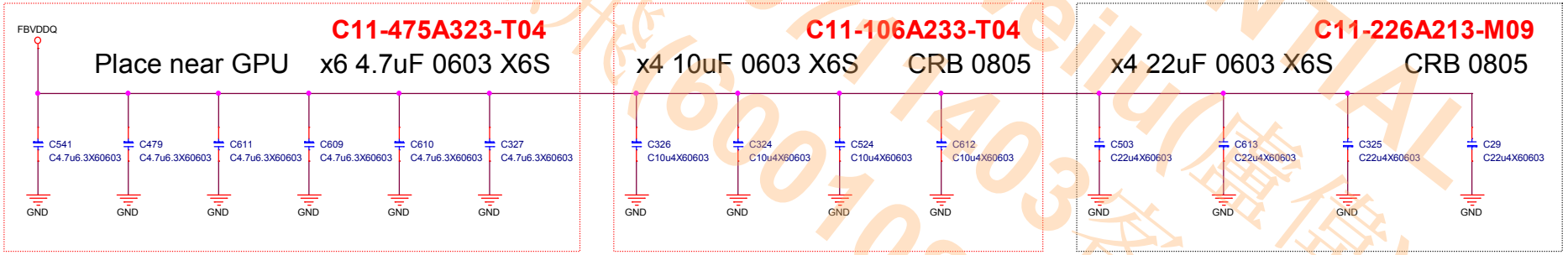
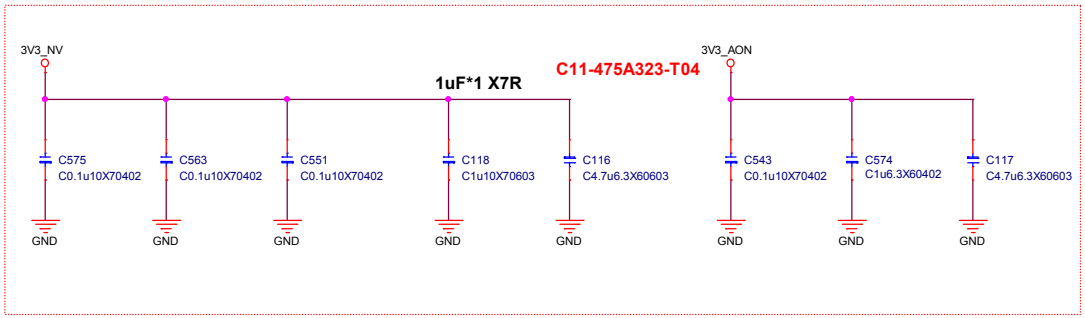
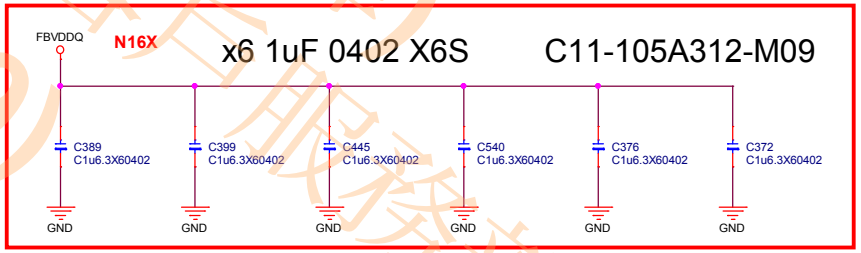
GPU DECOUPLING B











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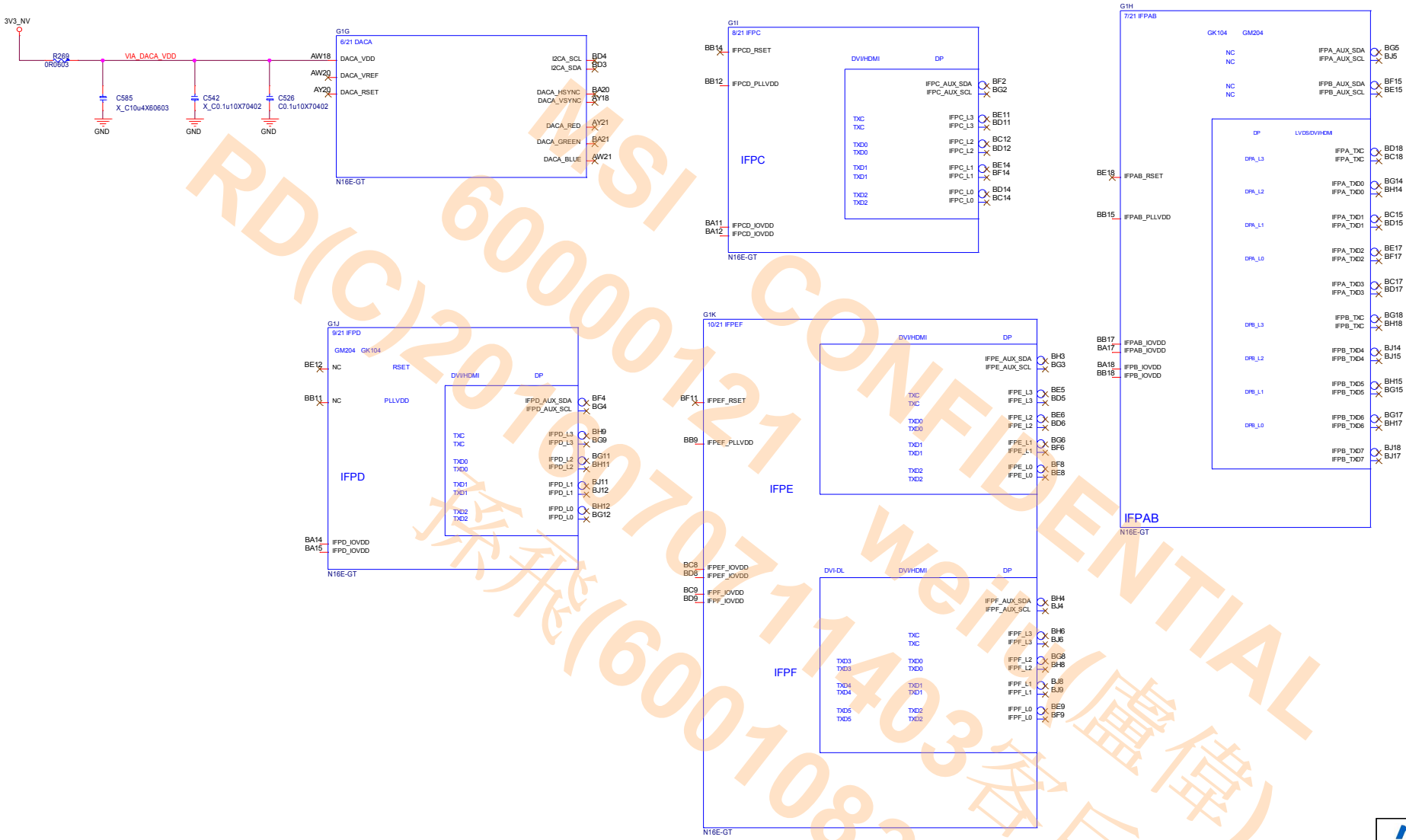
Title	DGPU_GPU DECOUPLING B	
Size	Document Number MS-16H7	Rev 1.2
Date: Wednesday, September 16, 2015	Sheet 24 of 74	

DACA,Display IF



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Title: DGPU_DACA,Display IF		
Size	Document Number: MS-16H7	Rev: 1.2
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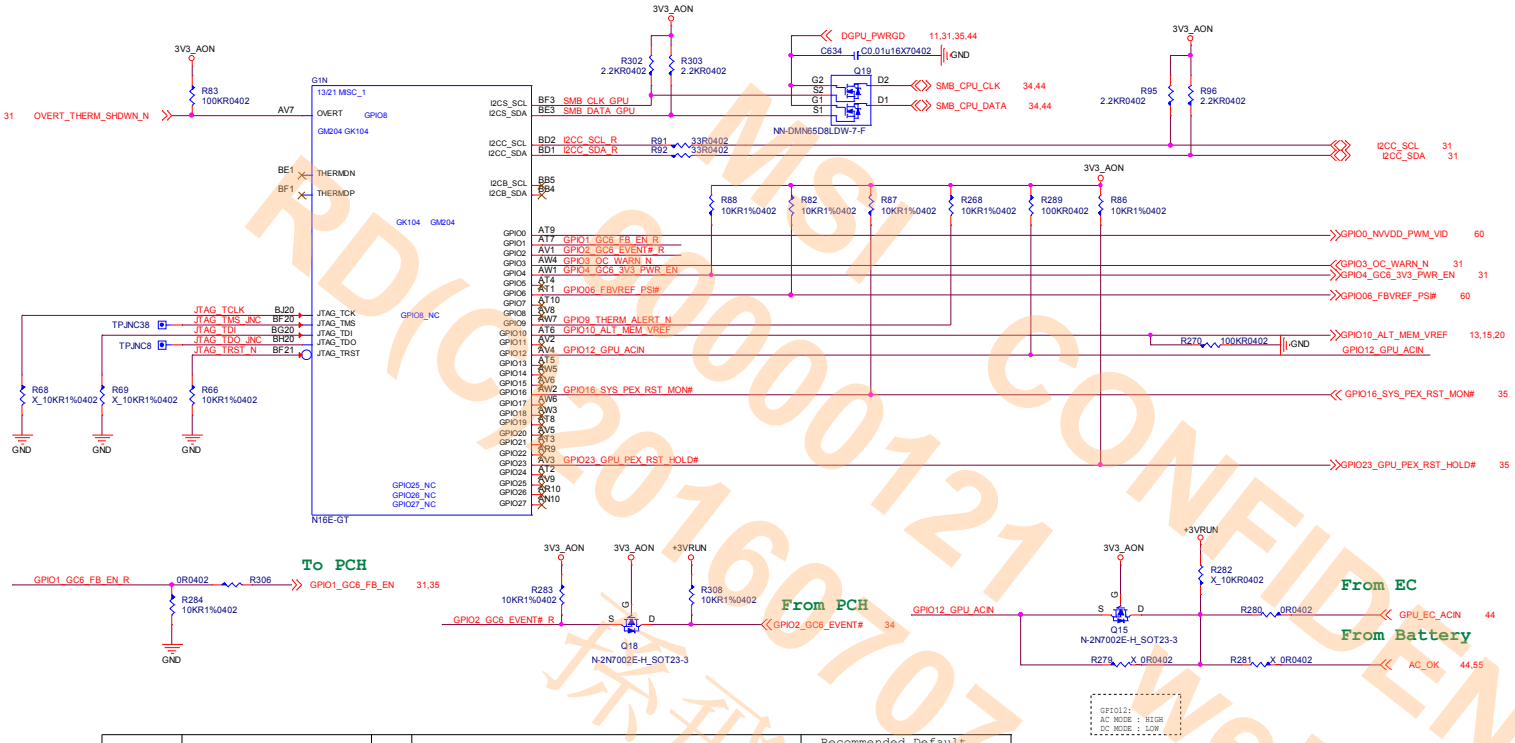
DGPU GPIO, I2C



Pin Name	Normal function	I/O	Functional Description	Recommended Default Pull-up or Pull-down
GPIO0	PWR_VID	O	GPU Core VDD PWM control signal	
GPIO1	GC6_FB_EN	O	FB Enable for GC6 2.0	10K pull-down
GPIO2	GPU_EVENT#	I	GPU wake signal for GC6 2.0	10K pull-up to 3V3 _AON
GPIO3	OC_WARN	I	Over current throttling	10K pull-up to 3V3 _AON
GPIO4	3V3_MAIN_EN	O	GPU POWER Sequencing for GC6 2.0	10K pull-up to 3V3 _AON
GPIO5	RESERVED			
GPIO6	PSI	O	Phase shedding	
GPIO7	LCD_BL_PWM	O	Panel Backlight PWM Brighteness Control	100K pull-down
GPIO8	HPD_F	I	Hot Plug Detect for IFPDF	
GPIO9	THERM_ALERT	I/O	Active Low Thermal Alert	10K pull-up to 3V3 _AON
GPIO10	MEM_VREF_CTL	O	Memory VREF Control	100K pull-down
GPIO11	LCD_VCC	O	Panel Power Enable	100K pull-down
GPIO12	PWR_LEVEL	I	AC power detect or power supply overdraw input	100K pull-up to 3V3 _AON
GPIO13	LCD_BLEN	O	Panel Backlight Enable	100K pull-down
GPIO14	HPD_A	I	Hot Plug Detect for IFPAB	
GPIO15	HPD_C	I	Hot Plug Detect for IFPC	
GPIO16	SYS_PEX_RST_MON#	I	System side PCI reset Monitor	10K pull-up to 3V3 _AON
GPIO17	HPD_D	I	Hot Plug Detect for IFPD	
GPIO18	HPD_E	I	Hot Plug Detect for IFPE	
GPIO19	3DVision	O	3D Vision L/R signal	100K pull-down
GPIO20	RESERVED			
GPIO21	SLI_RASTER_SYNC	I	SLI Raster Sync	100K pull-down
GPIO22	SLI_SWAP_DRY	I	SLI Swap Ready	1K pull-up to 3V3 _AON
GPIO23	GPU_PEX_RST_HOLD	O	GPU PCIE self-reset control	10K pull-up to 3V3 _AON
GPIO24	MEM_VDD_CTL	O	Memory VDD VID	
GPIO25	RESERVED			
GPIO26	RESERVED			
GPIO27	HPD_B	I	Hot Plug Detect for IFPB	
OVERT	OVERT(OVERT#)	I/O	Catastrophic Over Temperature	100K pull-up to 3V3 _AON

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Title: DGPU_GPIO,I2C

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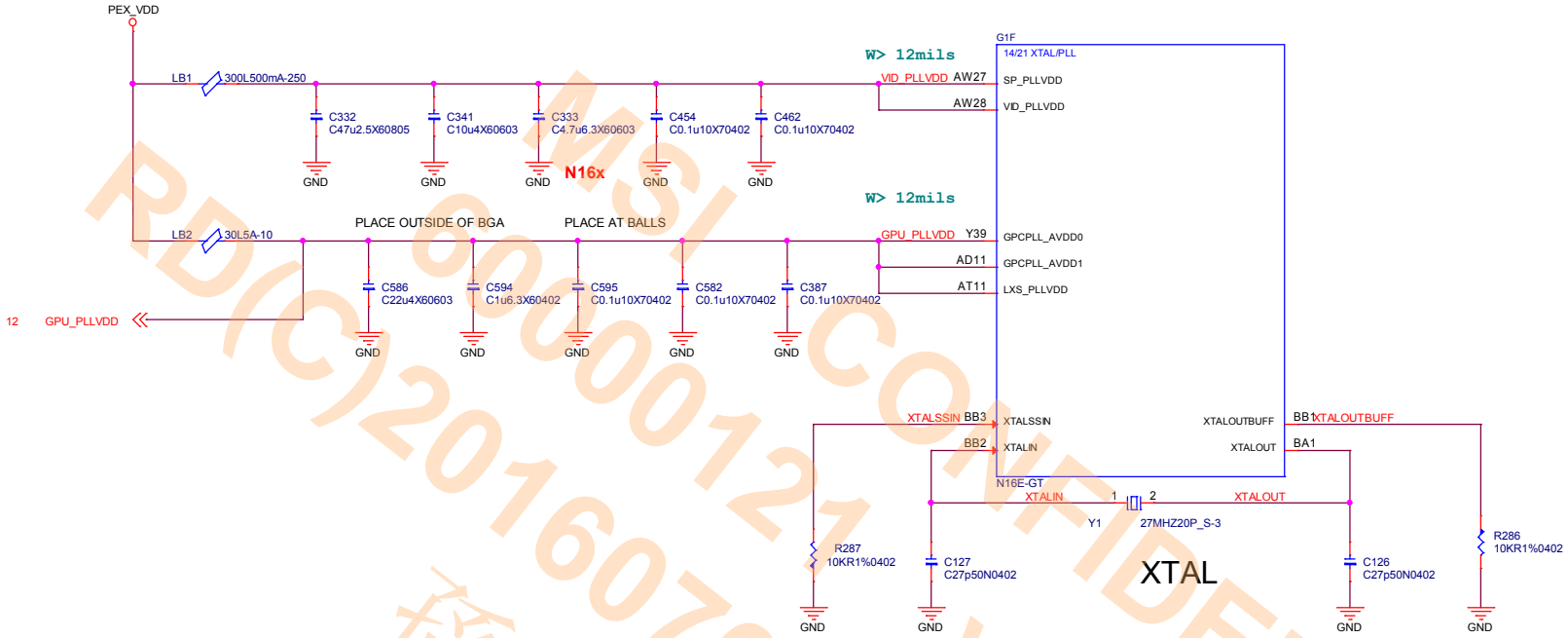
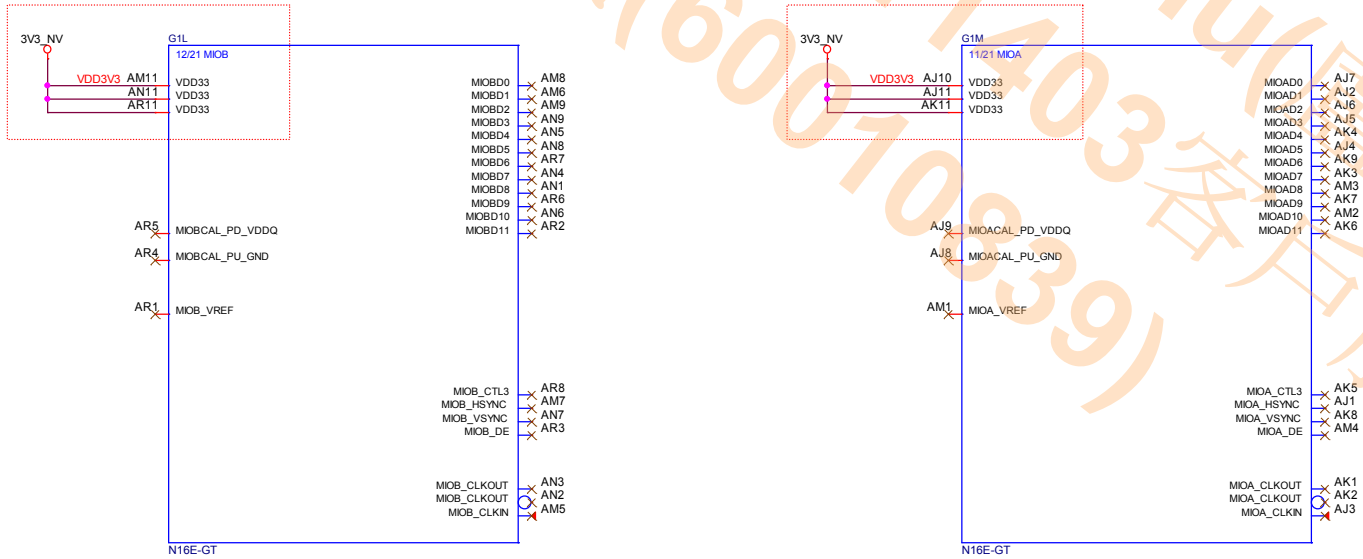
採購(0021839)

DGPU MIO & XTAL



Multi-use IO(MIO) Interface



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600012121
徐飛(60010939)
客戶服務部

MICRO-STAR INT'L CO.,LTD.

Title	DGPU MIO & XTAL	
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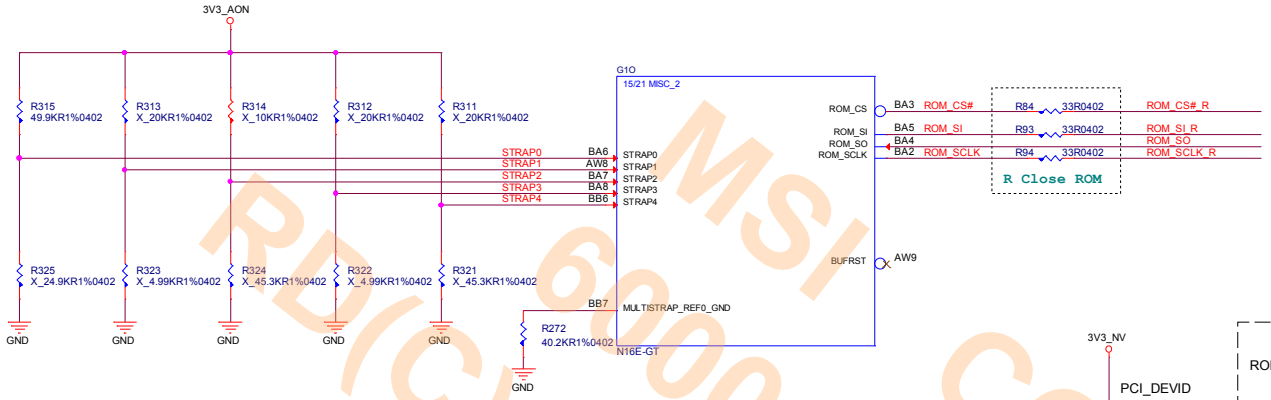
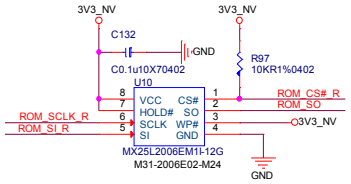
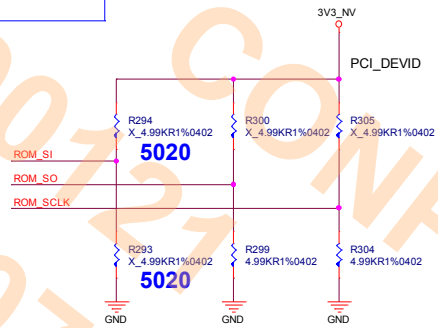
ROM, MULTI-LEVEL STRAPS







GDDR5 Parts
5010 : M2 , M3 , M4 , M5 , M6 , M7

3G/2G

PU4K99 **Hynix**	**128Mx32bit**	V_TOP1 **5010**
R11-4991T12-W08	X_4.99KR1%0402	**M12-5GC4H65-H23** X_H5GC4H24AJR-T2C
PD20K **Samsung**	**128Mx32bit**	V_TOP2 **5010**
R11-0203T12-W08	X_20KR1%0402	**M12-4132525-S02** X_K4G41325FC-HC03
PD24R9 **Micron**	**128Mx32bit**	V_TOP3 **5010**
R11-249AT12-W08	X_24.9R1%0402	**M12-4032B05-E59** X_EDW4032BABG-60-F

6G/4G

PU30K1 **Samsung**	**256Mx32bit**	V_TOP4 **5010**
R11-3012T12-R01	X_30K1R1%0402	**M12-8032505-S02** X_K4G80325FB-HC03

N16E_GS — N16E_GS **B03-N16EG05-N08** N16E-GS-KCD-A1

N16E_GT — N16E_GT **B03-0N16E25-N08** N16E-GT-A1

	N16E-GS 2G	N16E-GT 3G	N16E-GT 6G
ROM_SI	4K99 PU Hynix 128x32bit 20K PD Samsung 125x32bit 24R9 PD Micron 128x32bit	4K99 PU Hynix 128x32bit 20K PD Samsung 128x32bit 24R9 PD Micron 128x32bit	30K1 PU Samsung 256x32bit
ROM_SO	5K PD	5K PD	5K PD
ROM_SCLK	5K PD	5K PD	5K PD
STRAP0	50K PU 3V3_AON	50K PU 3V3_AON	50K PU 3V3_AON
STRAP1	Reserved	Reserved	Reserved
STRAP2	Reserved	Reserved	Reserved
STRAP3	Reserved	Reserved	Reserved
STRAP4	Reserved	Reserved	Reserved

MICRO-STAR INT'L CO.,LTD.

Title: DGPU_ROM,HW Straps

Size: | Document Number: MS-16H7 | Rev: 1.2

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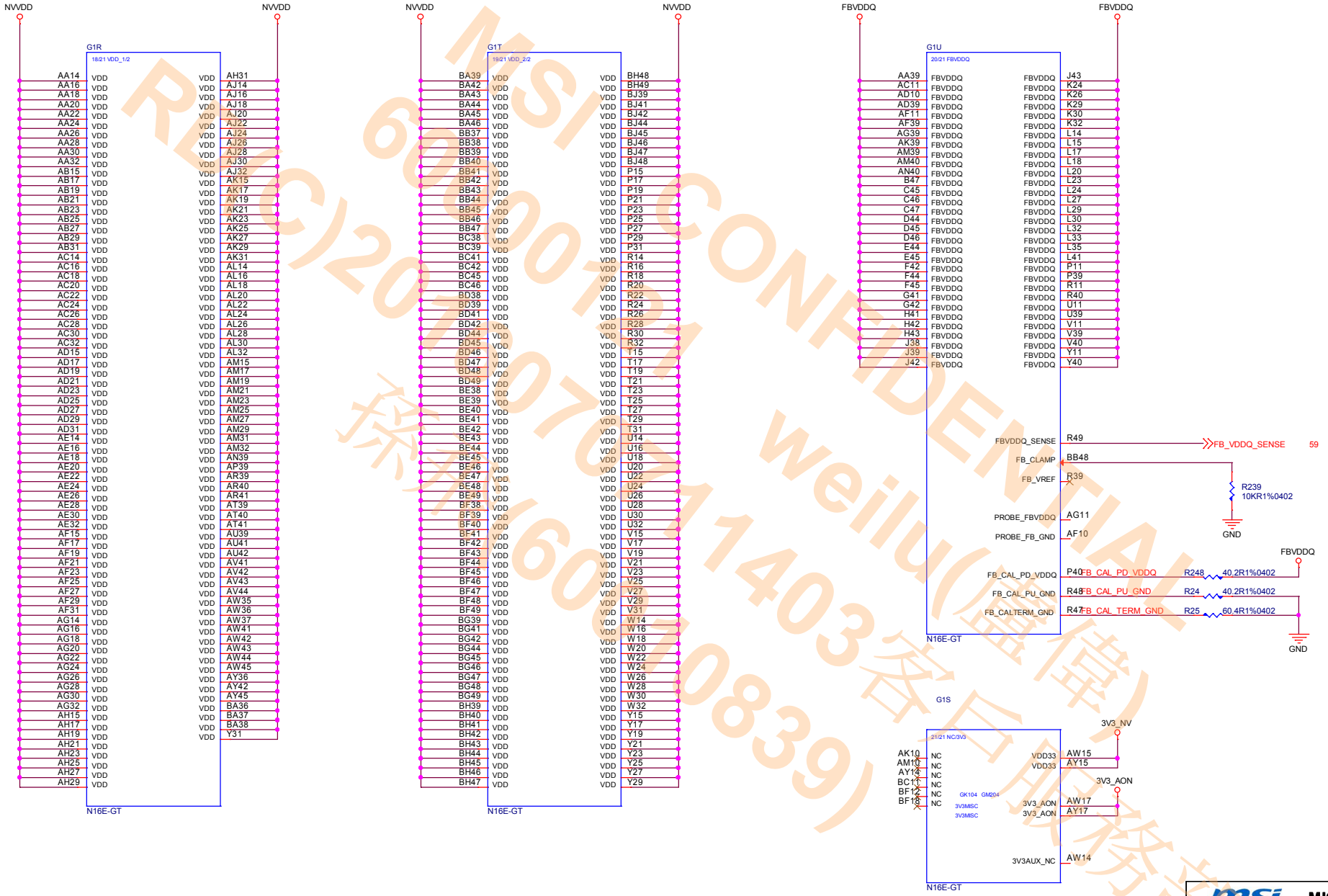
GPU NVVDD, FBVDDQ



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MICRO-STAR INT'L CO.,LTD.		
Title: DGPU NVVDD, FBVDDQ		
Size	Document Number: MS-16H7	Rev: 1.2
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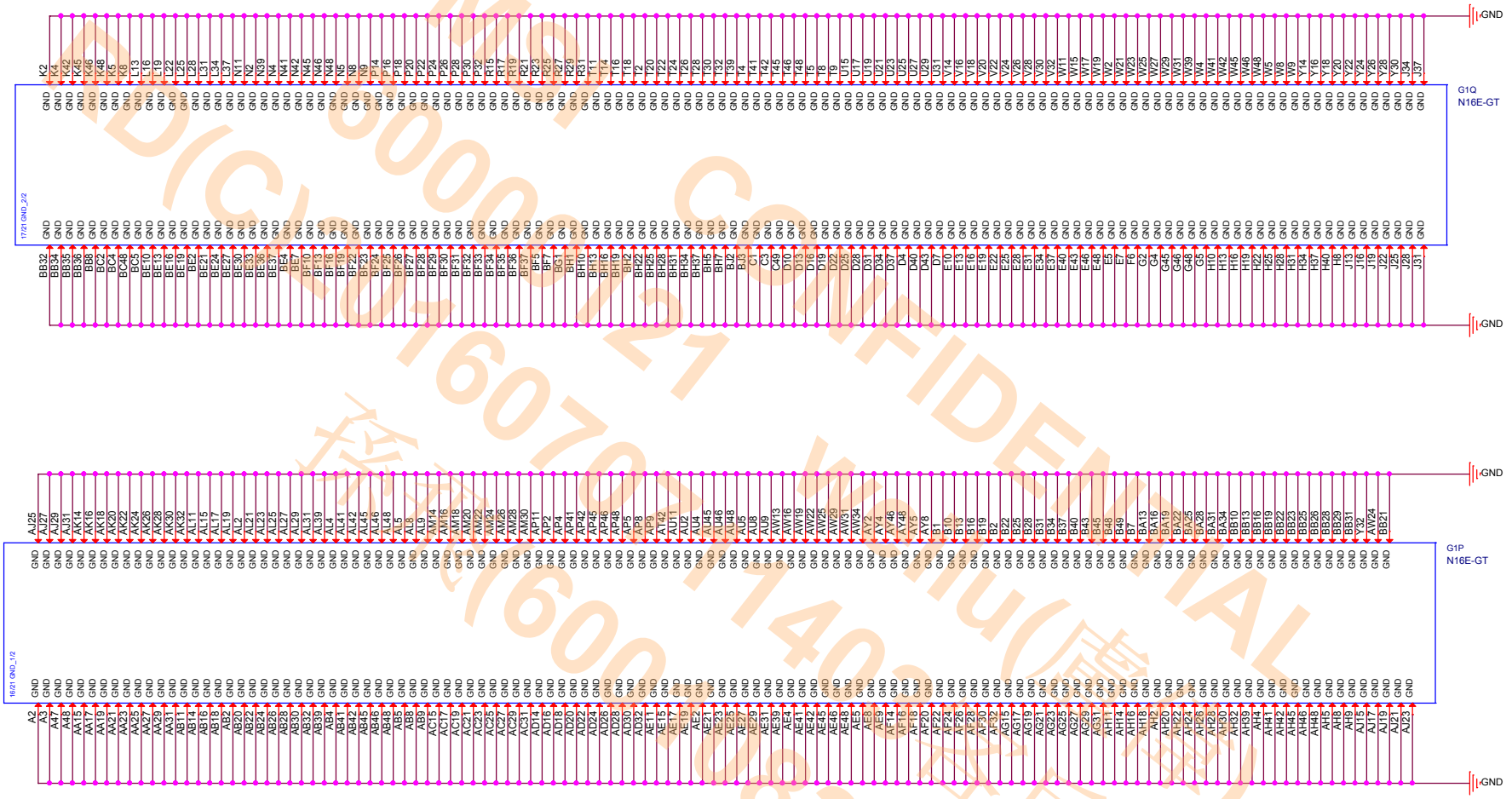
DGPU GND



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Title: DGPU GND		
Size	Document Number: MS-16H7	Rev: 1.2
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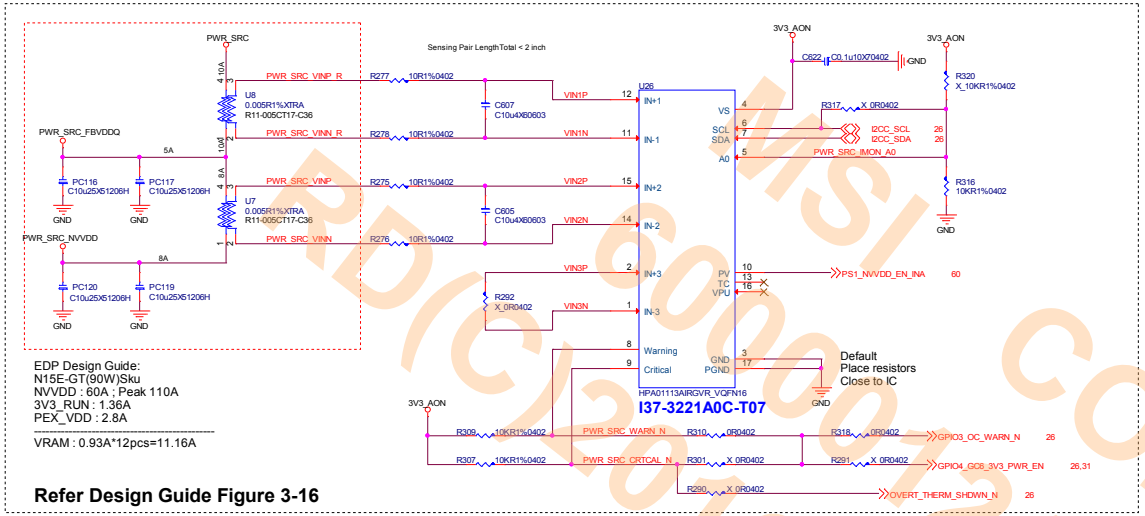
DGPU_Power Control

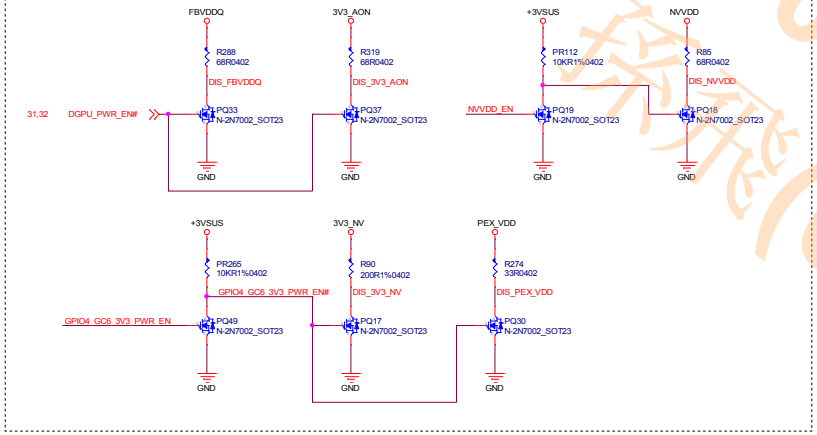


EDP Design Guide:
N15E-GT(90W)Sku
NVVDD : 60A ; Peak 110A
3V3_RUN : 1.36A
PEX_VDD : 2.8A

VRAM : 0.93A*12pcs=11.16A

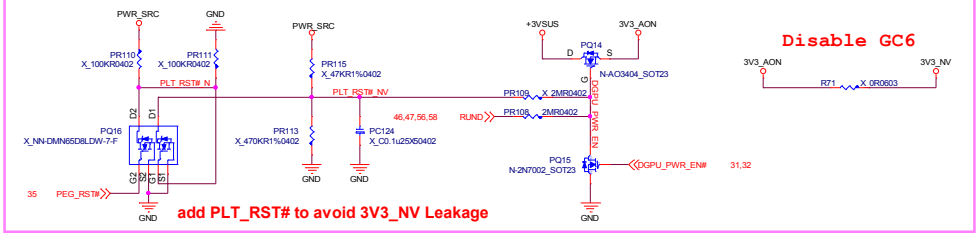
Refer Design Guide Figure 3-16

Discharge Circuit

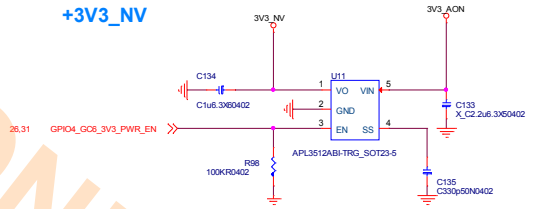


nVIDIA Power Sequence Control

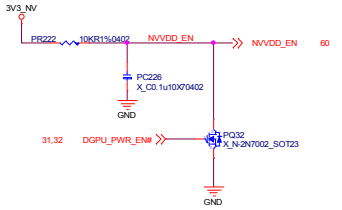
3V3_NV -> NVVDD, PEX_VDD -> FBVDDQ -> DGPUPWRGD



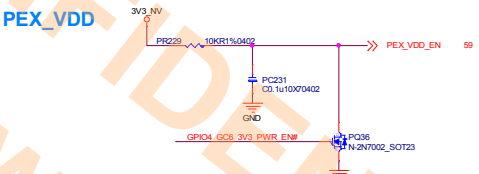
+3V3_NV



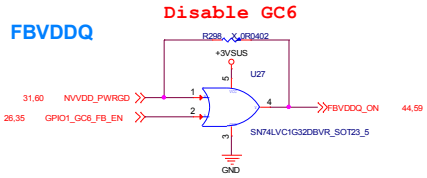
NVVDD



PEX_VDD



FBVDDQ



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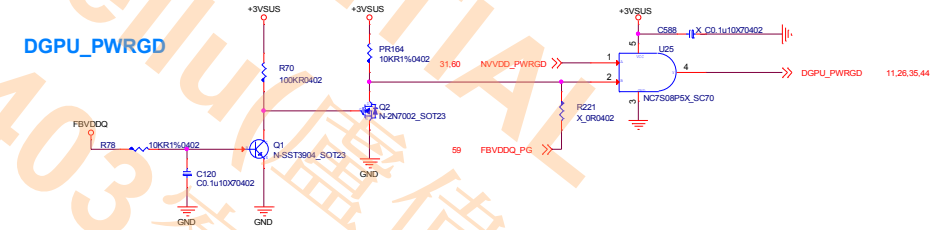

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Title: DGPU_Power Control		
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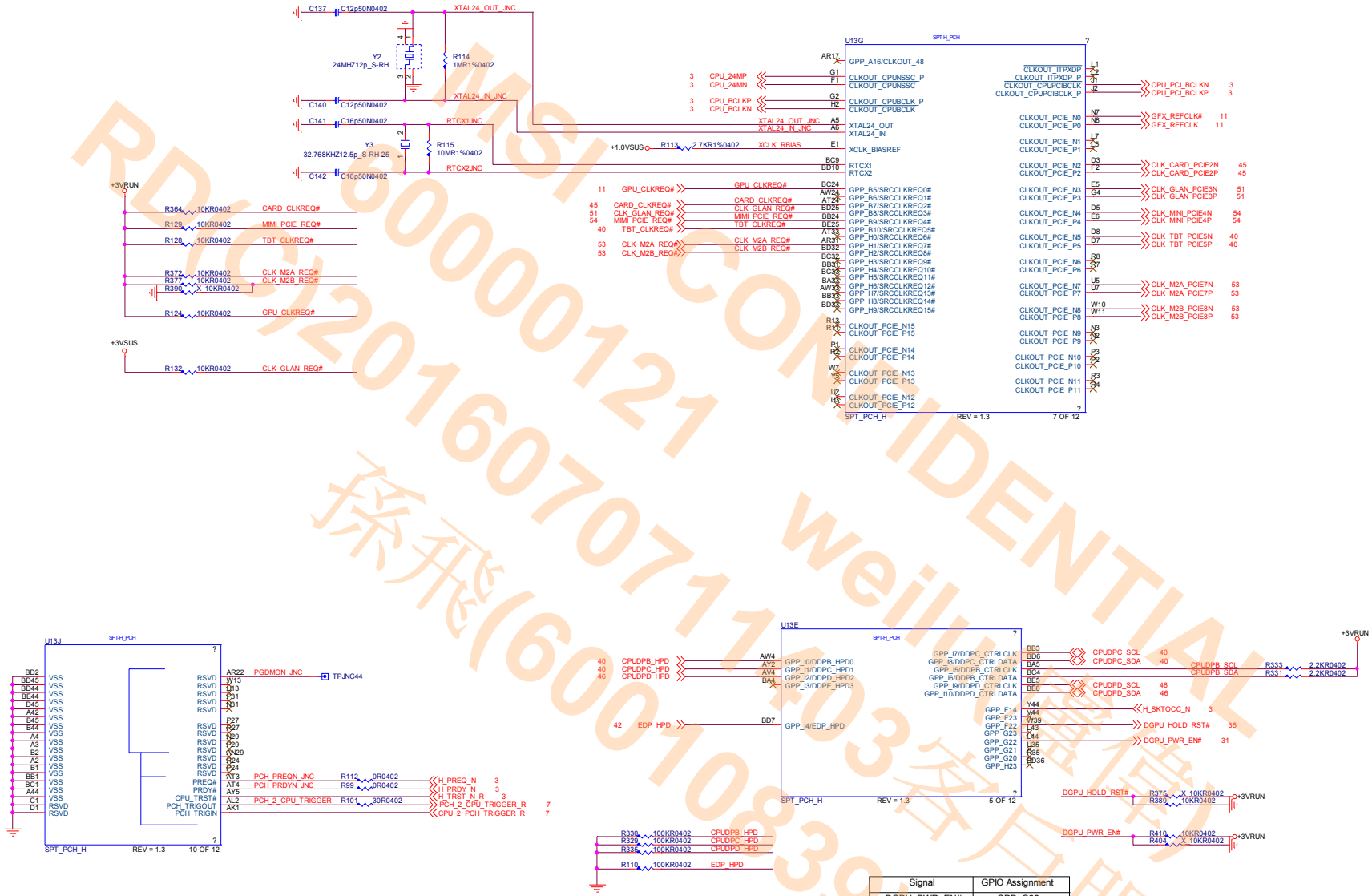

Signal	GPIO Assignment
DGPU_PWR_EN#	GPP_G22
DGPU_PWROK	NA
DGPU_HOLD_RST#	GPP_F22

HM170 HM170 B01-HM17005-I06 HM170

CM236 CM236 B01-CM23605-I06 CM236

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Title: PCH-1 (CLK/DDI)

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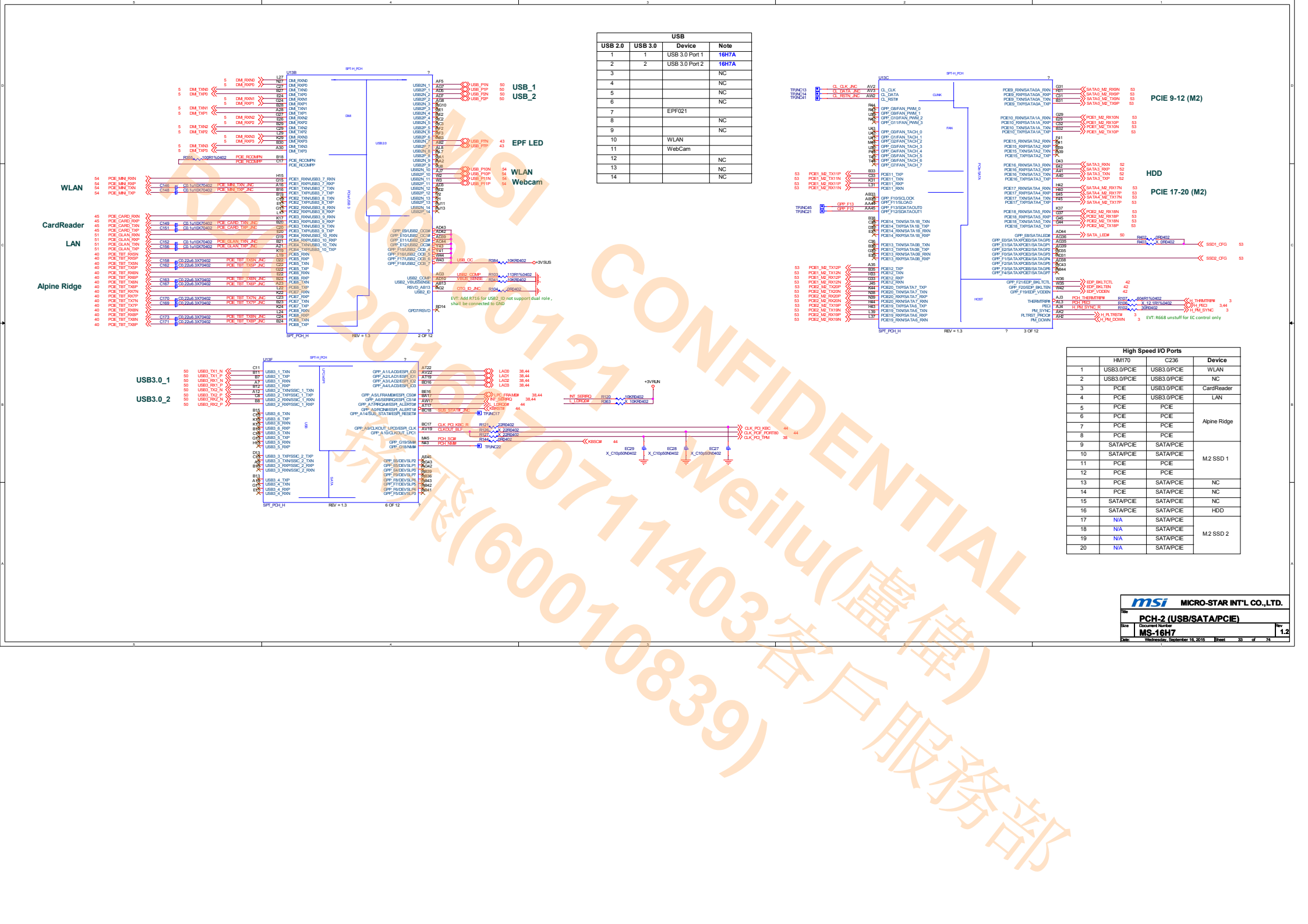
RD(2016071103)徐飞(600010839)客户服务部



USB			
USB 2.0	USB 3.0	Device	Note
1	1	USB 3.0 Port 1	16H7A
2	2	USB 3.0 Port 2	16H7A
3			NC
4			NC
5			NC
6			NC
7		EPF021	
8			NC
9			NC
10		WLAN	
11		WebCam	
12			NC
13			NC
14			NC

High Speed I/O Ports			
	HM170	C236	Device
1	USB3.0/PCIE	USB3.0/PCIE	WLAN
2	USB3.0/PCIE	USB3.0/PCIE	NC
3	PCIE	USB3.0/PCIE	CardReader
4	PCIE	USB3.0/PCIE	LAN
5	PCIE	PCIE	Alpine Ridge
6	PCIE	PCIE	
7	PCIE	PCIE	
8	PCIE	PCIE	
9	SATA/PCIE	SATA/PCIE	M.2 SSD 1
10	SATA/PCIE	SATA/PCIE	
11	PCIE	PCIE	
12	PCIE	PCIE	
13	PCIE	SATA/PCIE	NC
14	PCIE	SATA/PCIE	NC
15	SATA/PCIE	SATA/PCIE	NC
16	SATA/PCIE	SATA/PCIE	HDD
17	N/A	SATA/PCIE	M.2 SSD 2
18	N/A	SATA/PCIE	
19	N/A	SATA/PCIE	
20	N/A	SATA/PCIE	

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Title: PCH-2 (USB/SATA/PCIE)

Size: Document Number: MS-16H7 Rev: 1.2

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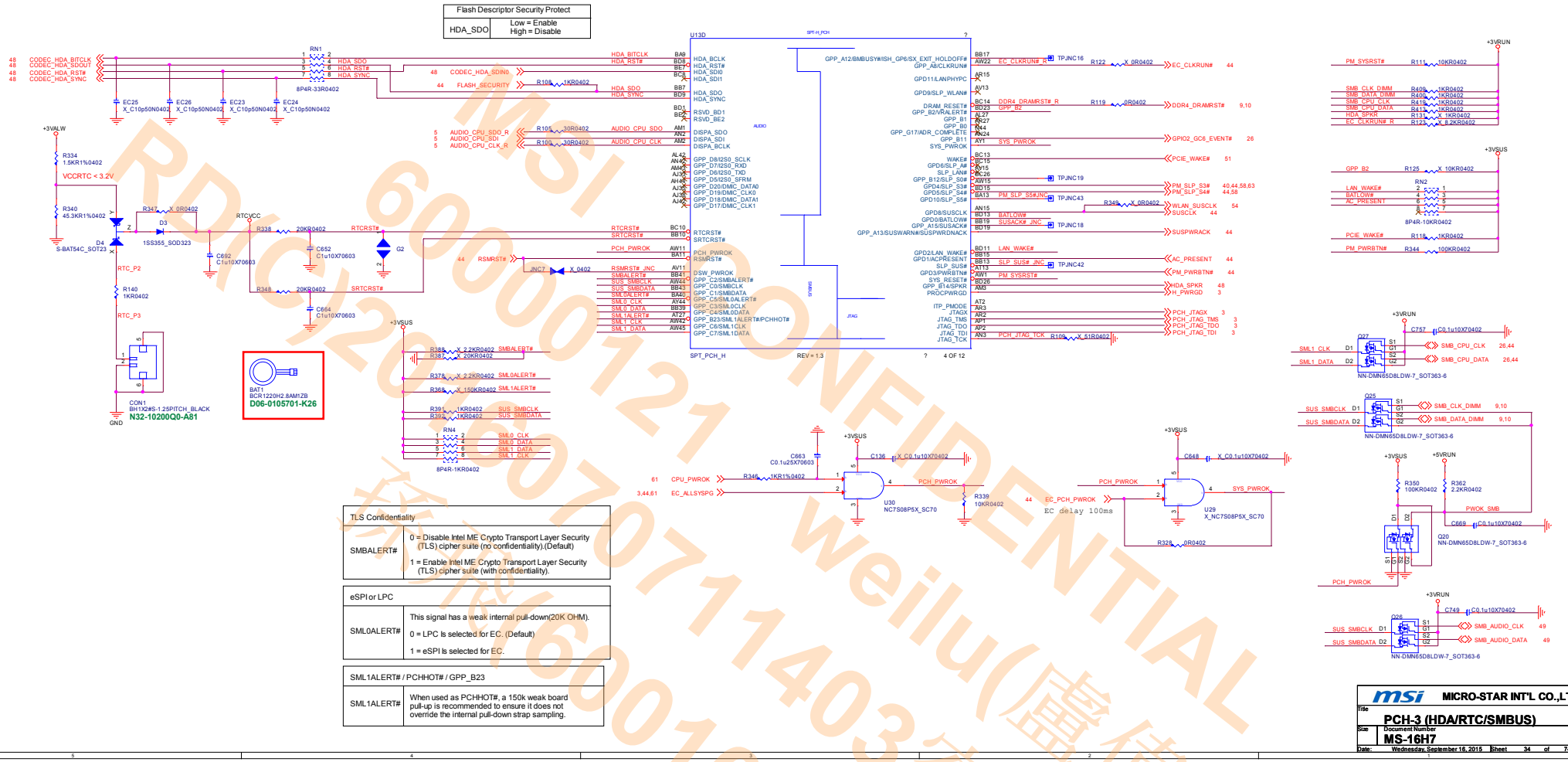

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RDC2016070711403(鐘偉)
weilu
技嘉6001083

Title	PCH-3 (HDA/RTC/SMBUS)
Size	MS-16H7
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Date	Wednesday, September 16, 2015
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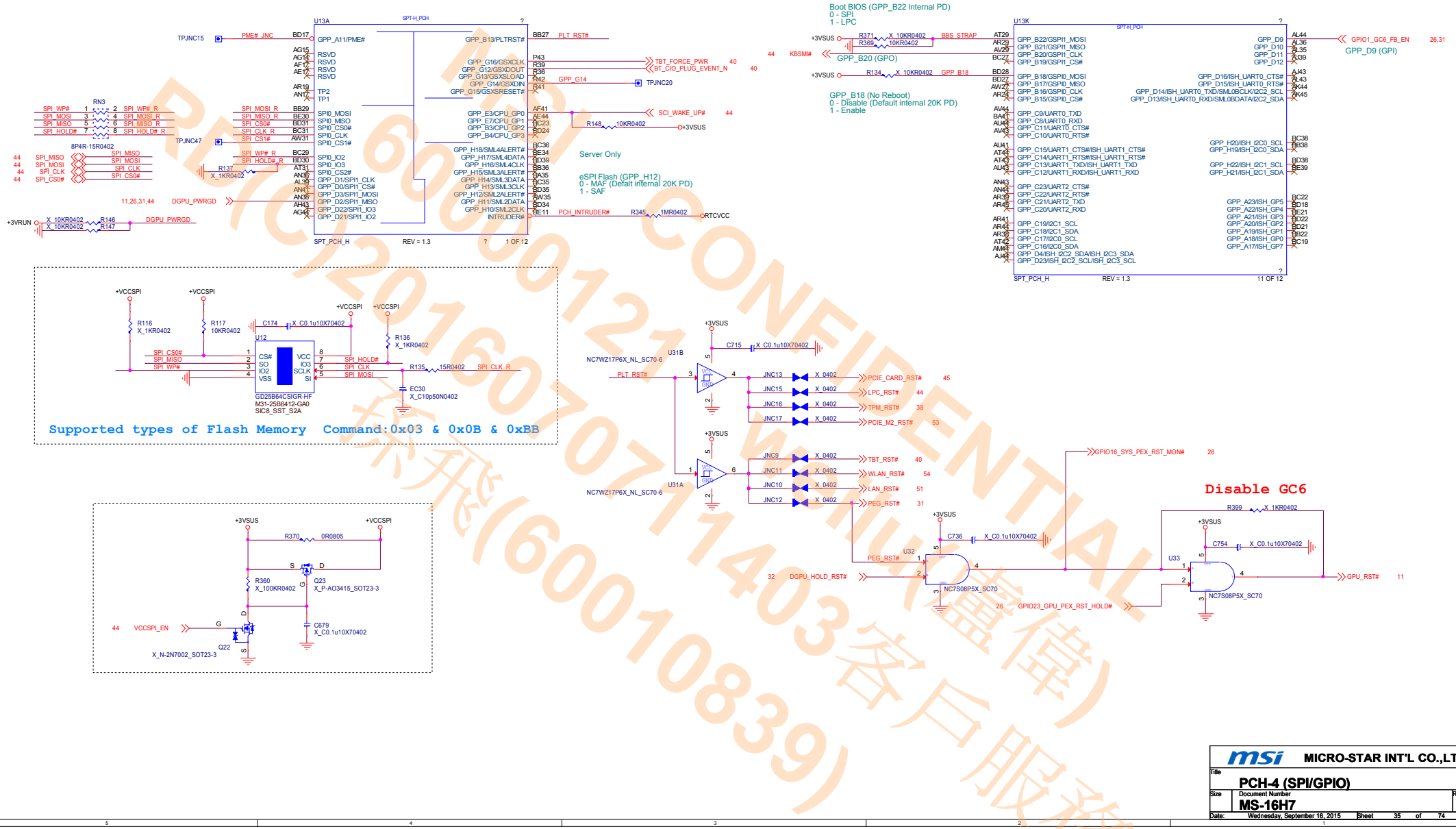

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REV:1.0(20160707111403)
威盛(600108390)

MICRO-STAR INT'L CO.,LTD.		
Title: PCH-4 (SPI/GPIO)		
Size	Document Number: MS-16H7	Rev: 1.2
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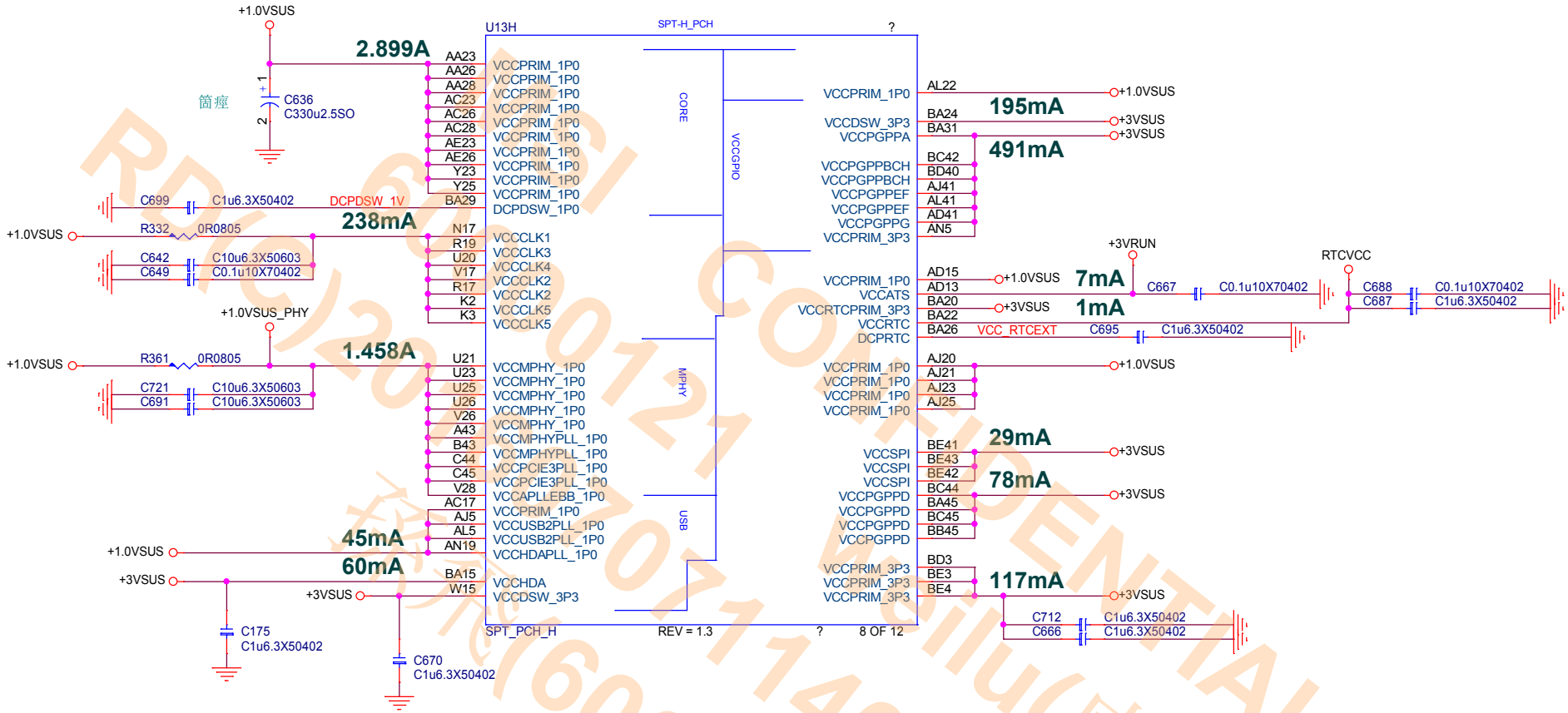

RD(20121107)Weilu(盧偉)
602001211 CONFIDENTIAL
容錯(60010839)
容錯客戶服務部

MICRO-STAR INT'L CO.,LTD.		
Title: PCH-5 (Power)		
Size	Document Number: MS-16H7	Rev: 1.2
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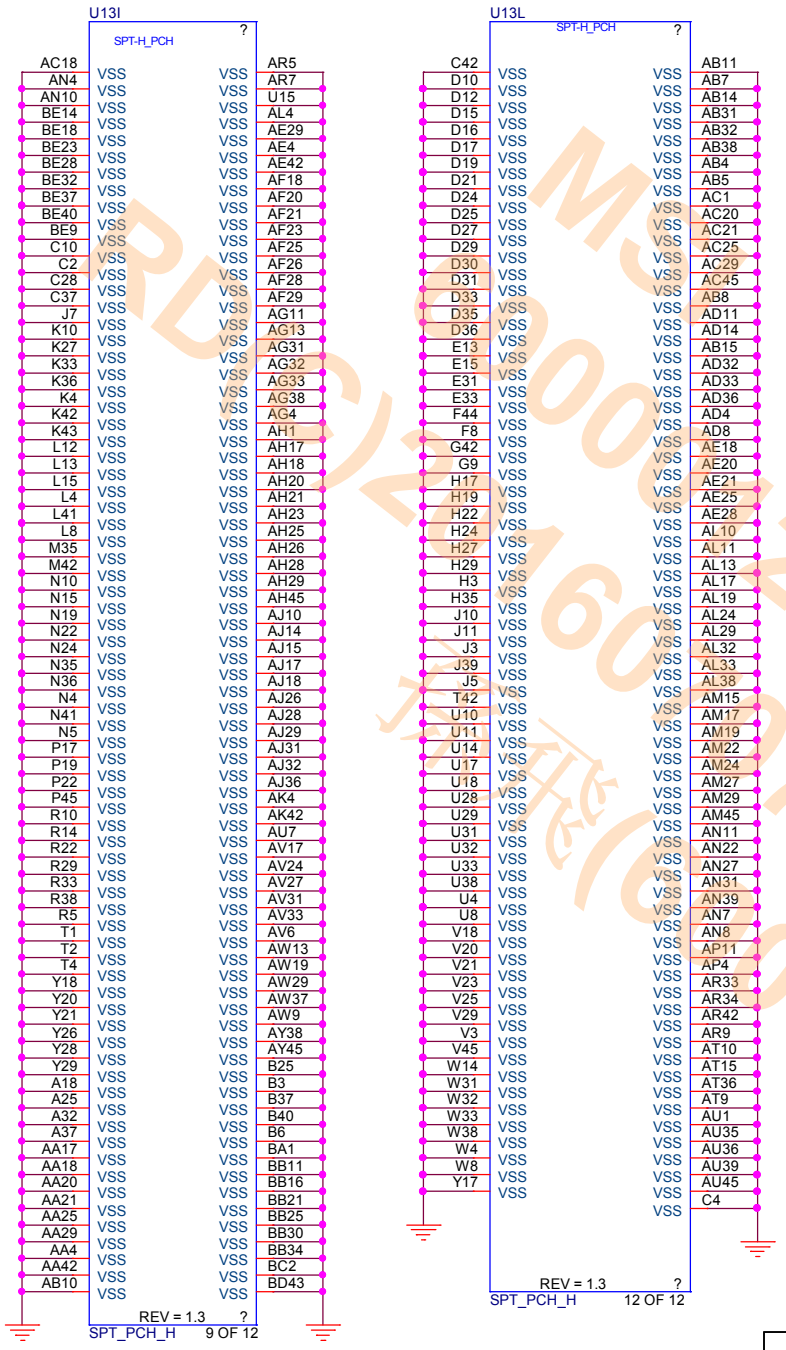

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Title: PCH-06 (GND)		
Size	Document Number: MS-16H7	Rev: 1.2
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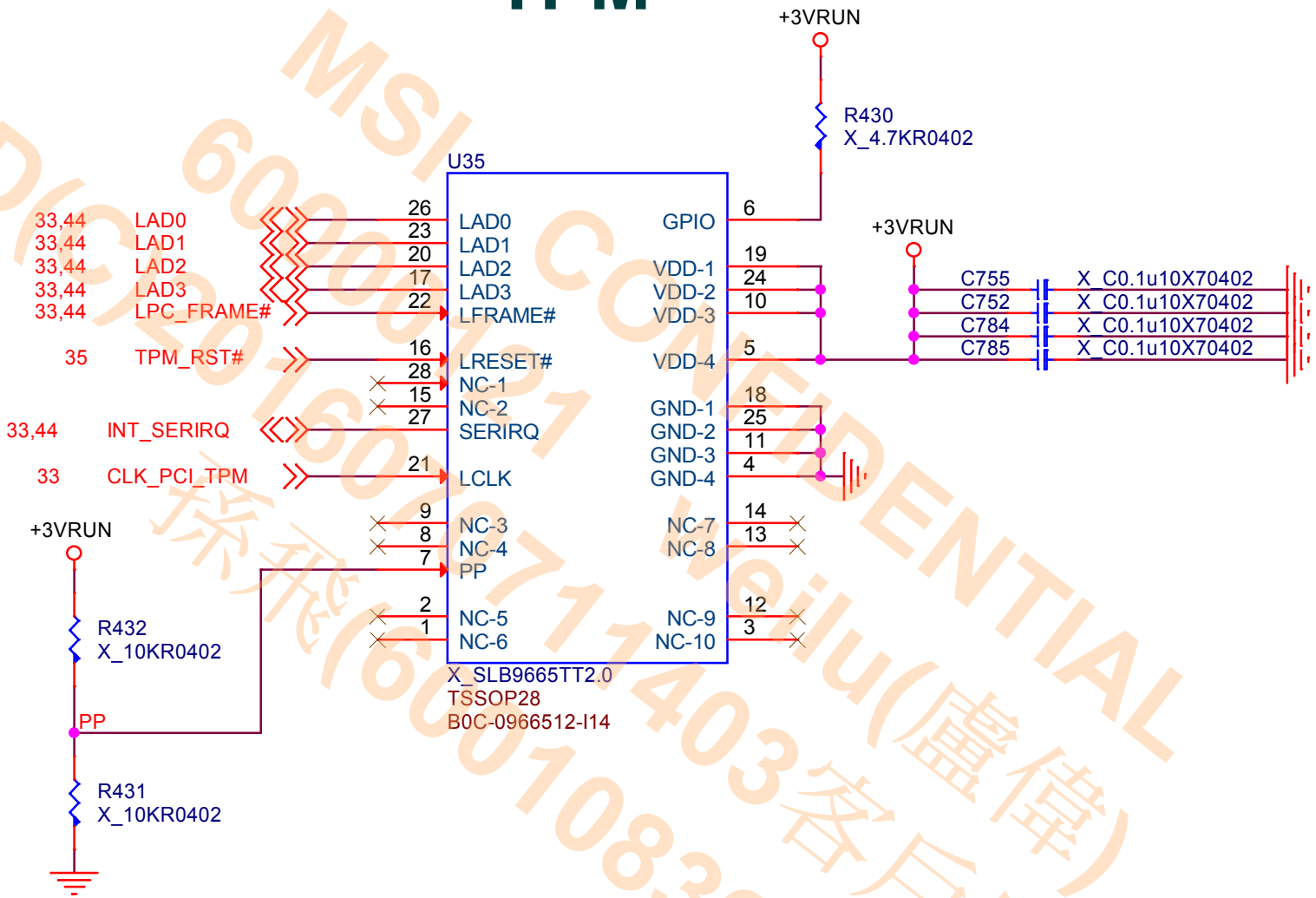
TPM



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採米(60010839)

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Title			
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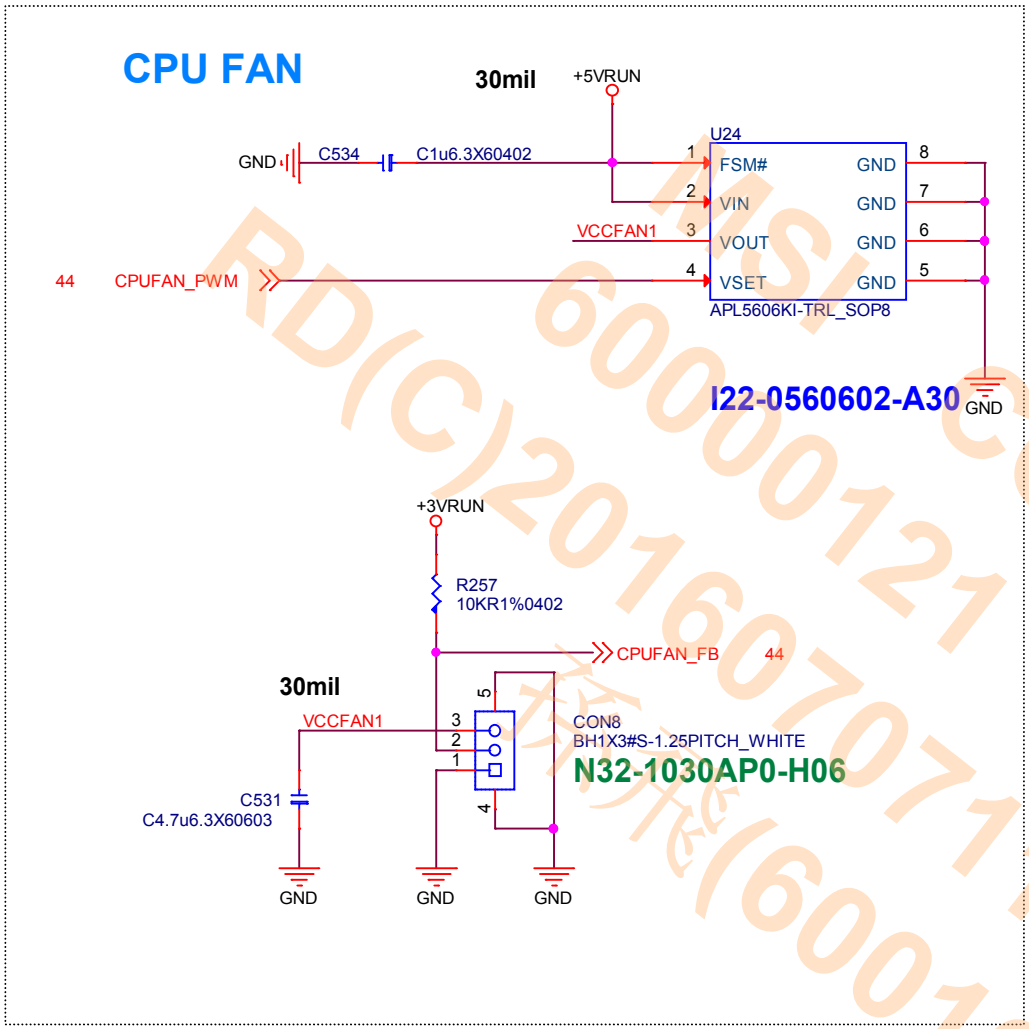

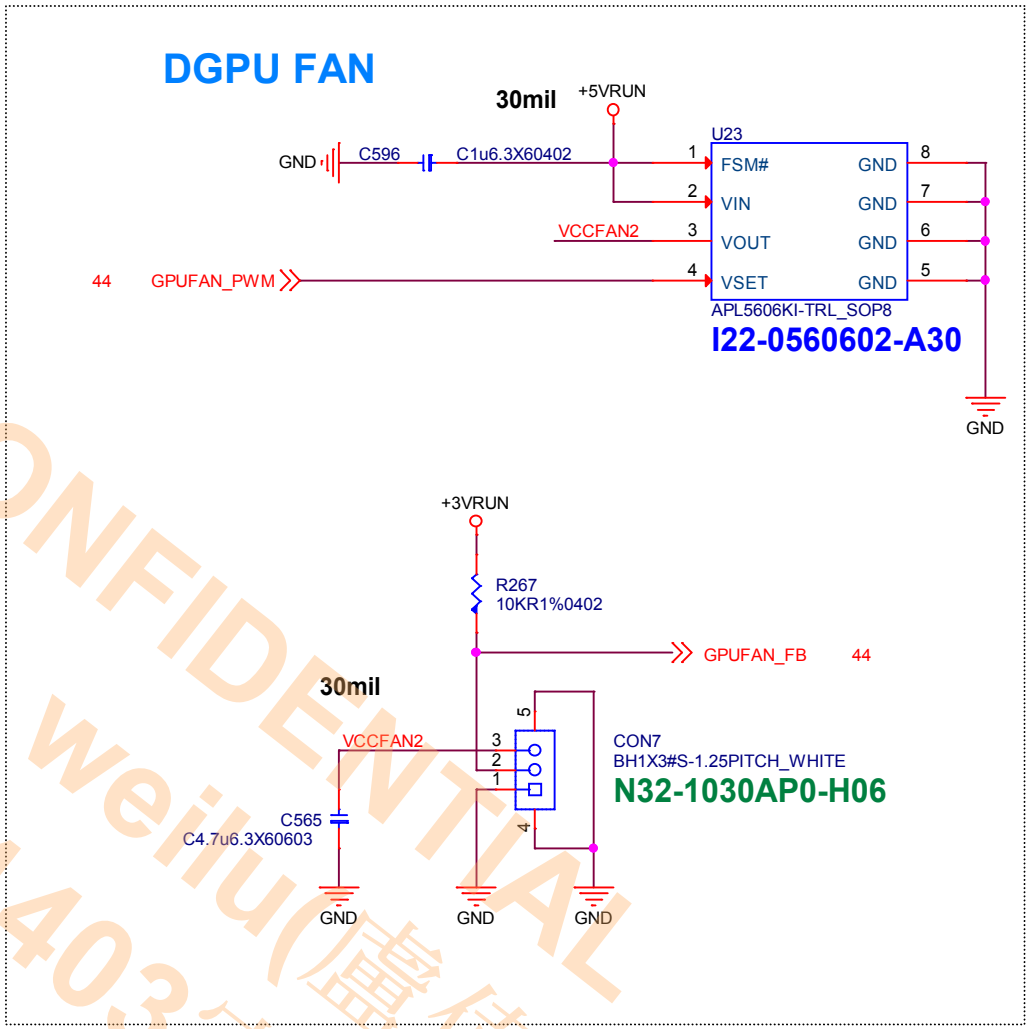

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600000121
RD(C)20160711403
weilu(卫璐)
(600010839)
资产属(客户)所有

MICRO-STAR INT'L CO.,LTD.

Title: CPU FAN/DGPU FAN

Size | Document Number: MS-16H7 | Rev: 1.2

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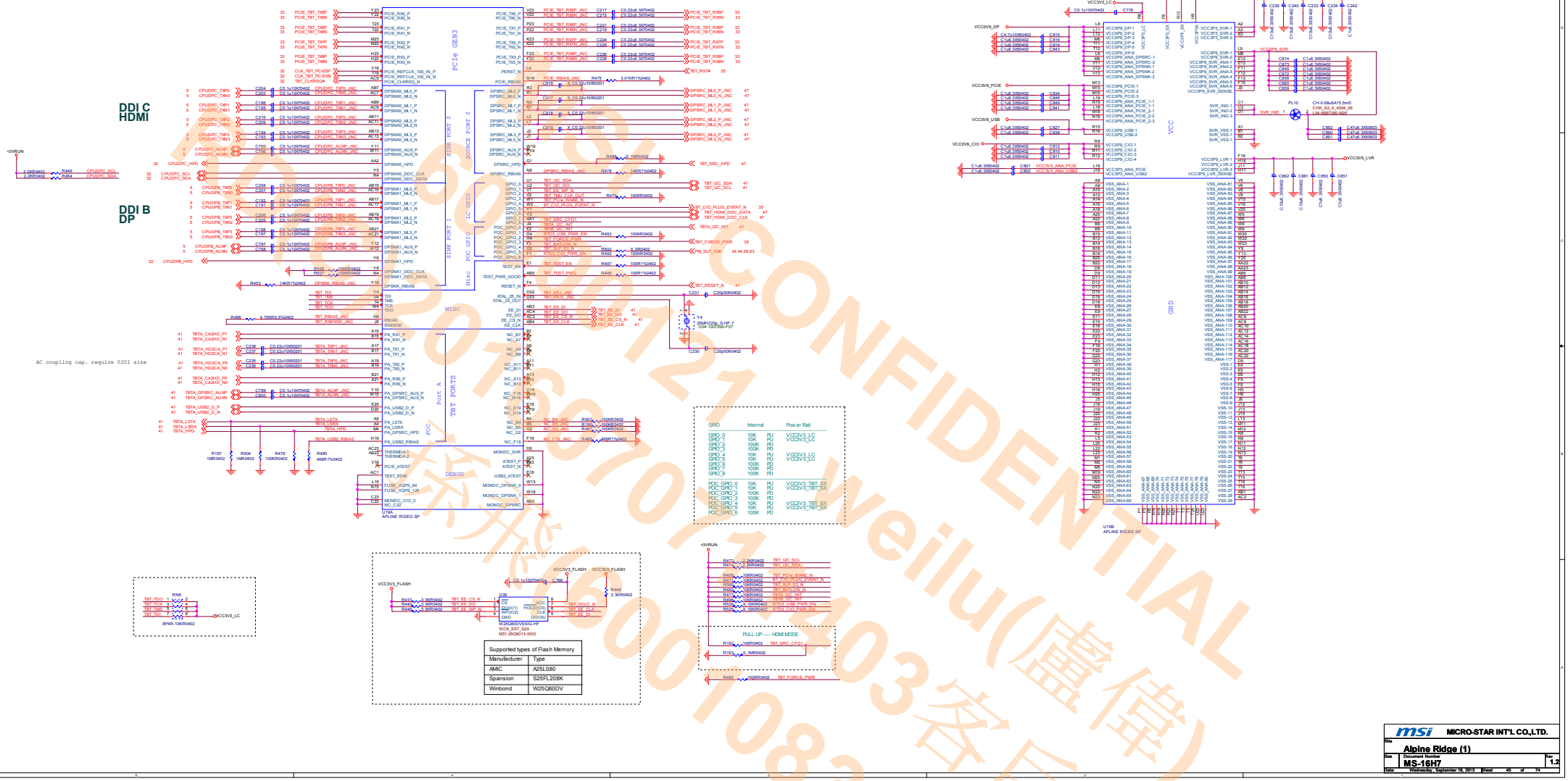
Thunderbolt



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(600010839)

msi	MICRO-STAR INT'L CO.,LTD.
Title	Alpine Ridge (1)
Size	Document Number: MS-16H7 Rev: 1.2
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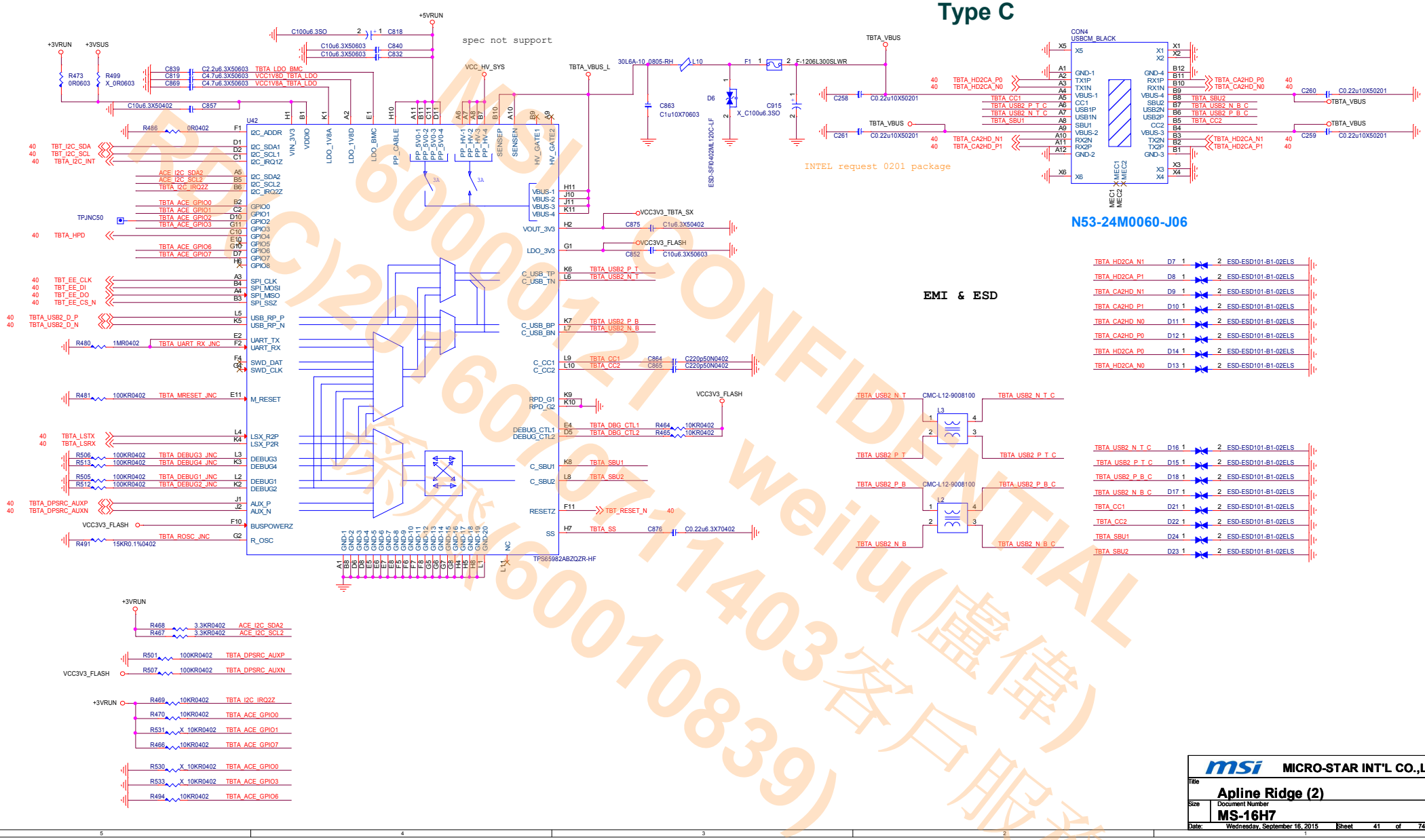

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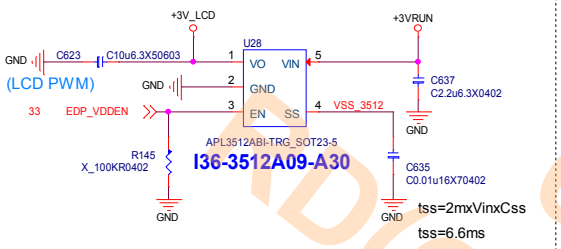
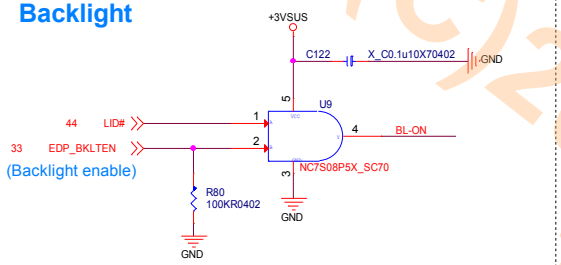
PEC)2016071403客户服务部
(600010839)
weilu(儒偉)

eDP Connector

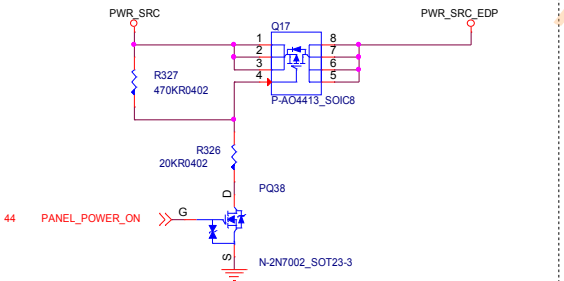
Pannel Device Logic Power



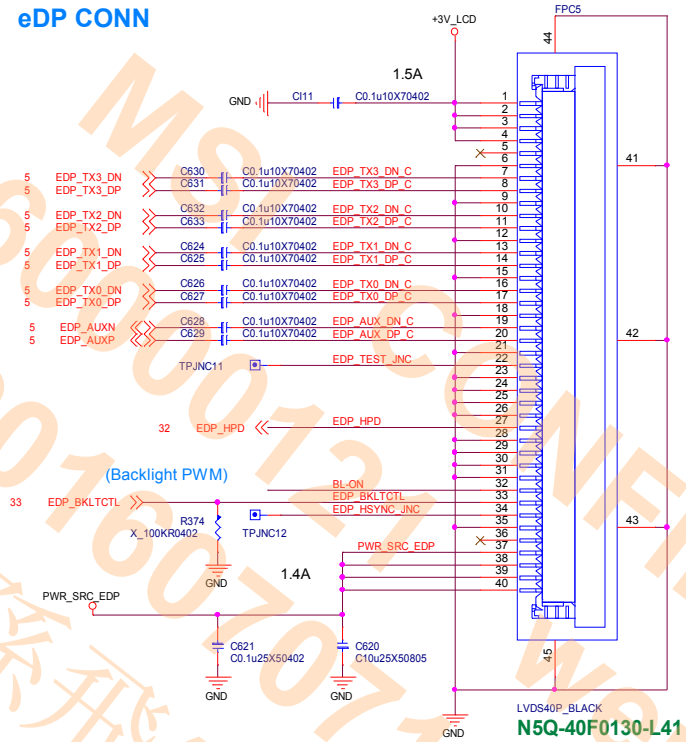
Backlight



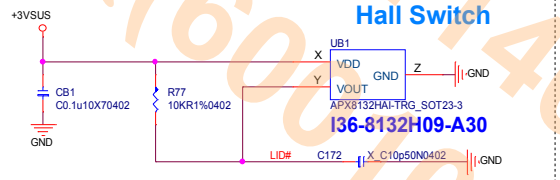
Pannel Power

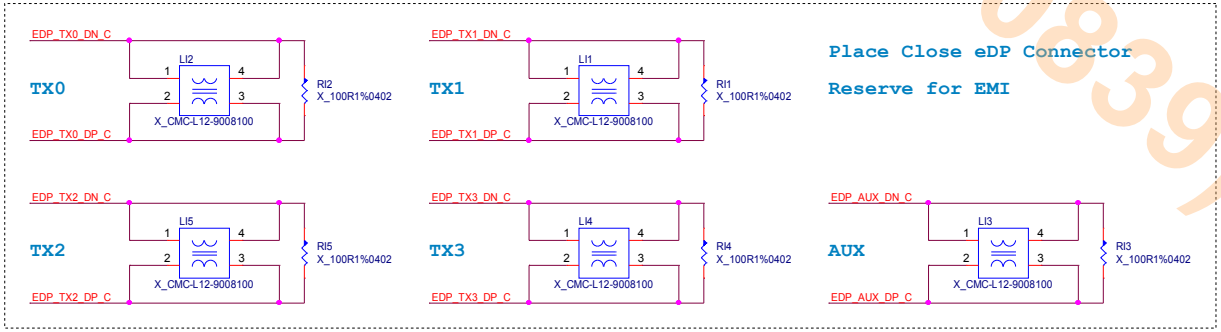


eDP CONN



Hall Switch





LCD Module Pin Define

Pin No	Symbol	Description
1	WP	EEPROM Write Protect(Keep open)
2	H_GND	High Speed Ground(0V)
3	eDP_Rx_3N	Complement Signal Link Lane 3
4	eDP_Rx_3P	True Signal Link Lane 3
5	H_GND	High Speed Ground(0V)
6	eDP_Rx_2N	Complement Signal Link Lane 2
7	eDP_Rx_2P	True Signal Link Lane 2
8	H_GND	H_GND
9	eDP_Rx_1N	Complement Signal Link Lane 1
10	eDP_Rx_1P	True Signal Link Lane 1
11	H_GND	H_GND
12	eDP_Rx_0N	Complement Signal Link Lane 0
13	eDP_Rx_0P	True Signal Link Lane 0
14	H_GND	H_GND
15	eDP_AUX_CH_P	True Signal Aux Channel
16	eDP_AUX_CH_N	Complement Signal Aux Channel
17	H_GND	H_GND
18	LCD_VCC	LCD logic and driver power
19	LCD_VCC	LCD logic and driver power
20	LCD_VCC	LCD logic and driver power
21	LCD_VCC	LCD logic and driver power
22	TEST	LCD Test Port
23	LCD_GND	LCD logic and driver ground(0V)
24	LCD_GND	LCD logic and driver ground(0V)
25	LCD_GND	LCD logic and driver ground(0V)
26	LCD_GND	LCD logic and driver ground(0V)
27	eDP_HPD	HPD signal pin
28	BL_GND	Backlight ground(0V)
29	BL_GND	Backlight ground(0V)
30	BL_GND	Backlight ground(0V)
31	BL_GND	Backlight ground(0V)
32	BL_ENABLE	Backlight enable
33	BL_PWM_DIM	System PWM signal input
34	SDA	I2C-bus Data
35	SCL	I2C-bus Clock
36	BL_PWR	Backlight power (5~21V)
37	BL_PWR	Backlight power (5~21V)
38	BL_PWR	Backlight power (5~21V)
39	BL_PWR	Backlight power (5~21V)
40	HSYNC	HSYNC output from Tcon

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Title: eDP Connector

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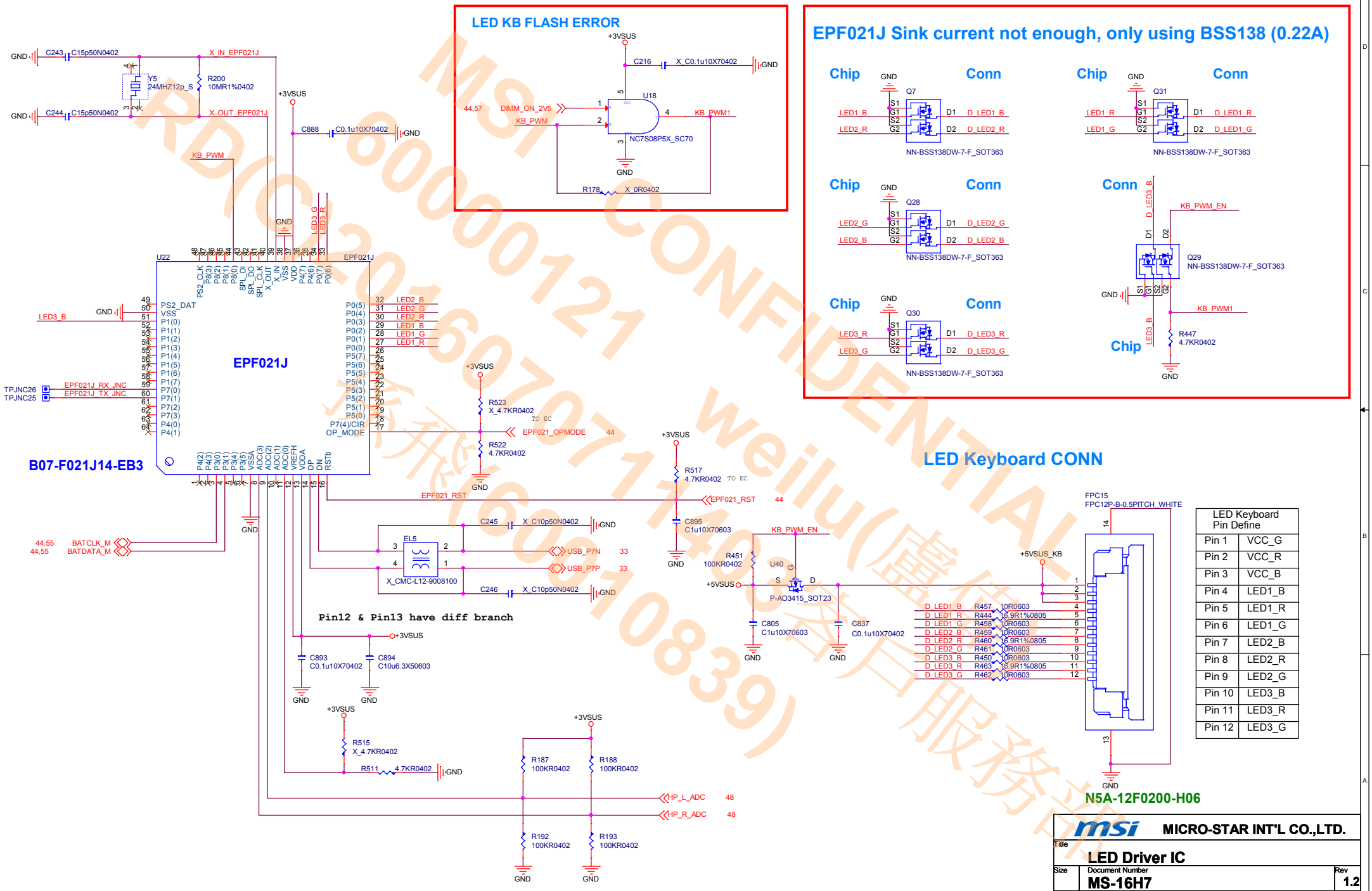
LED Driver IC(EPF021J)



LED Keyboard Pin Define	
Pin 1	VCC_G
Pin 2	VCC_R
Pin 3	VCC_B
Pin 4	LED1_B
Pin 5	LED1_R
Pin 6	LED1_G
Pin 7	LED2_B
Pin 8	LED2_R
Pin 9	LED2_G
Pin 10	LED3_B
Pin 11	LED3_R
Pin 12	LED3_G

MICRO-STAR INT'L CO.,LTD.

Title: LED Driver IC

Size	Document Number	Rev
	MS-16H7	1.2

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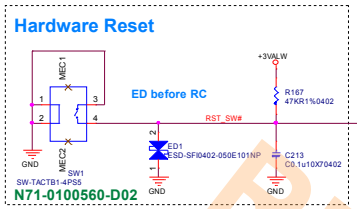
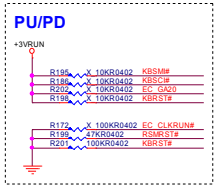
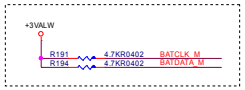
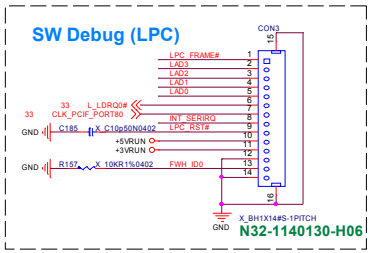
KBC/EC/uP (ENE9028)

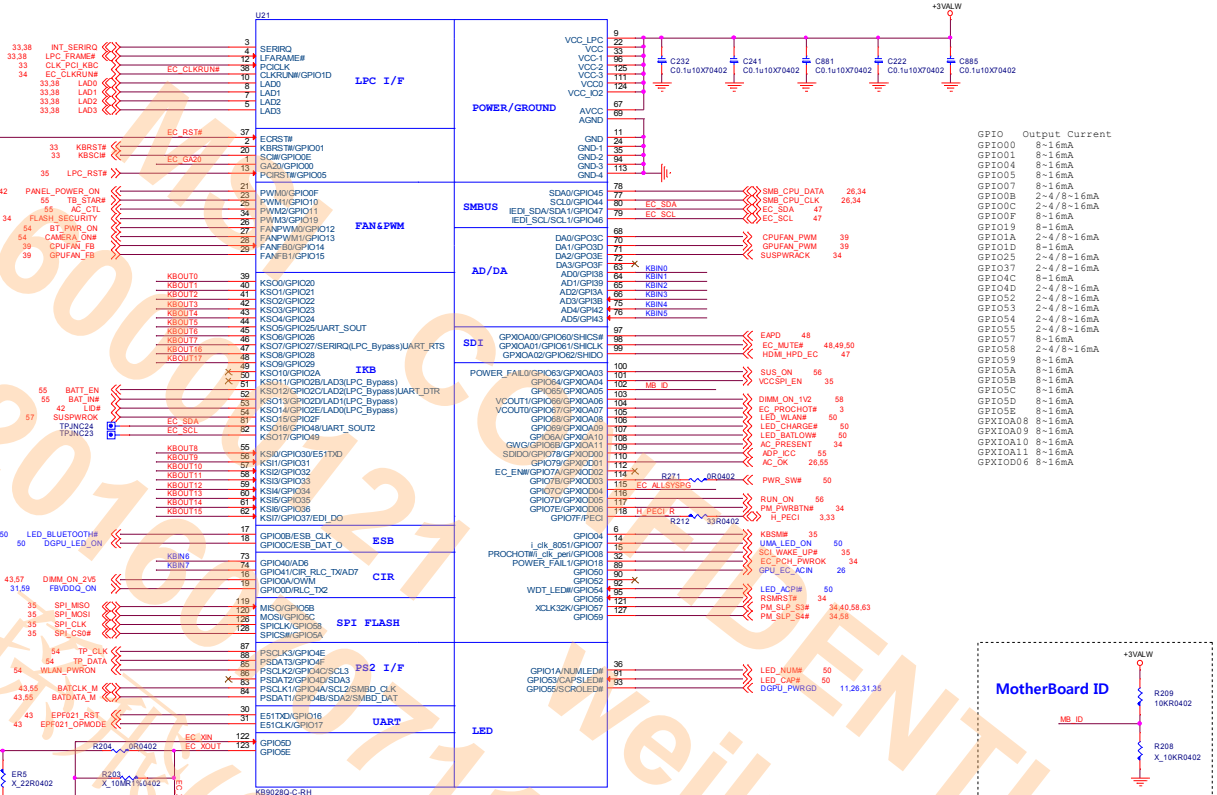


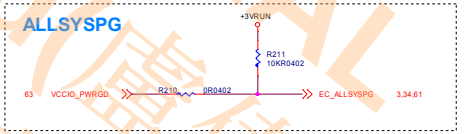
RSMRST# follow DG modify to 10K

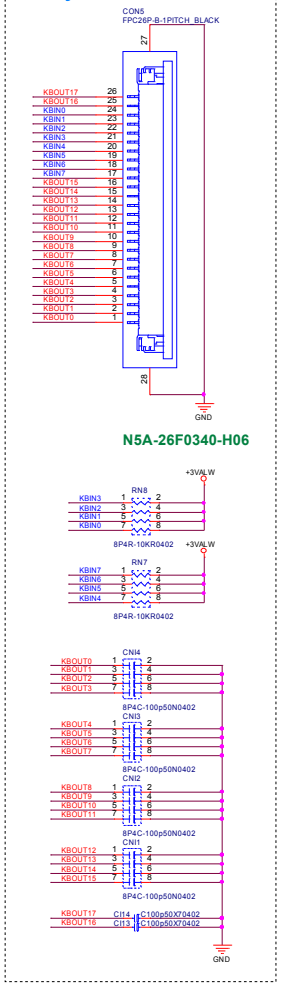












GPIO Output Current

GPIO00	8~16mA
GPIO01	8~16mA
GPIO04	8~16mA
GPIO05	8~16mA
GPIO07	8~16mA
GPIO0B	2~4/8~16mA
GPIO0C	2~4/8~16mA
GPIO0F	8~16mA
GPIO19	8~16mA
GPIO1A	2~4/8~16mA
GPIO1D	8~16mA
GPIO25	2~4/8~16mA
GPIO37	2~4/8~16mA
GPIO4C	8~16mA
GPIO4D	2~4/8~16mA
GPIO52	2~4/8~16mA
GPIO53	2~4/8~16mA
GPIO54	2~4/8~16mA
GPIO55	2~4/8~16mA
GPIO57	8~16mA
GPIO58	2~4/8~16mA
GPIO59	8~16mA
GPIO5A	8~16mA
GPIO5B	8~16mA
GPIO5C	8~16mA
GPIO5D	8~16mA
GPIO5E	8~16mA
GPXIOA08	8~16mA
GPXIOA09	8~16mA
GPXIOA10	8~16mA
GPXIOA11	8~16mA
GPXIOD06	8~16mA

msi	MICRO-STAR INT'L CO.,LTD.		
Title	KBC (ENE9028)		
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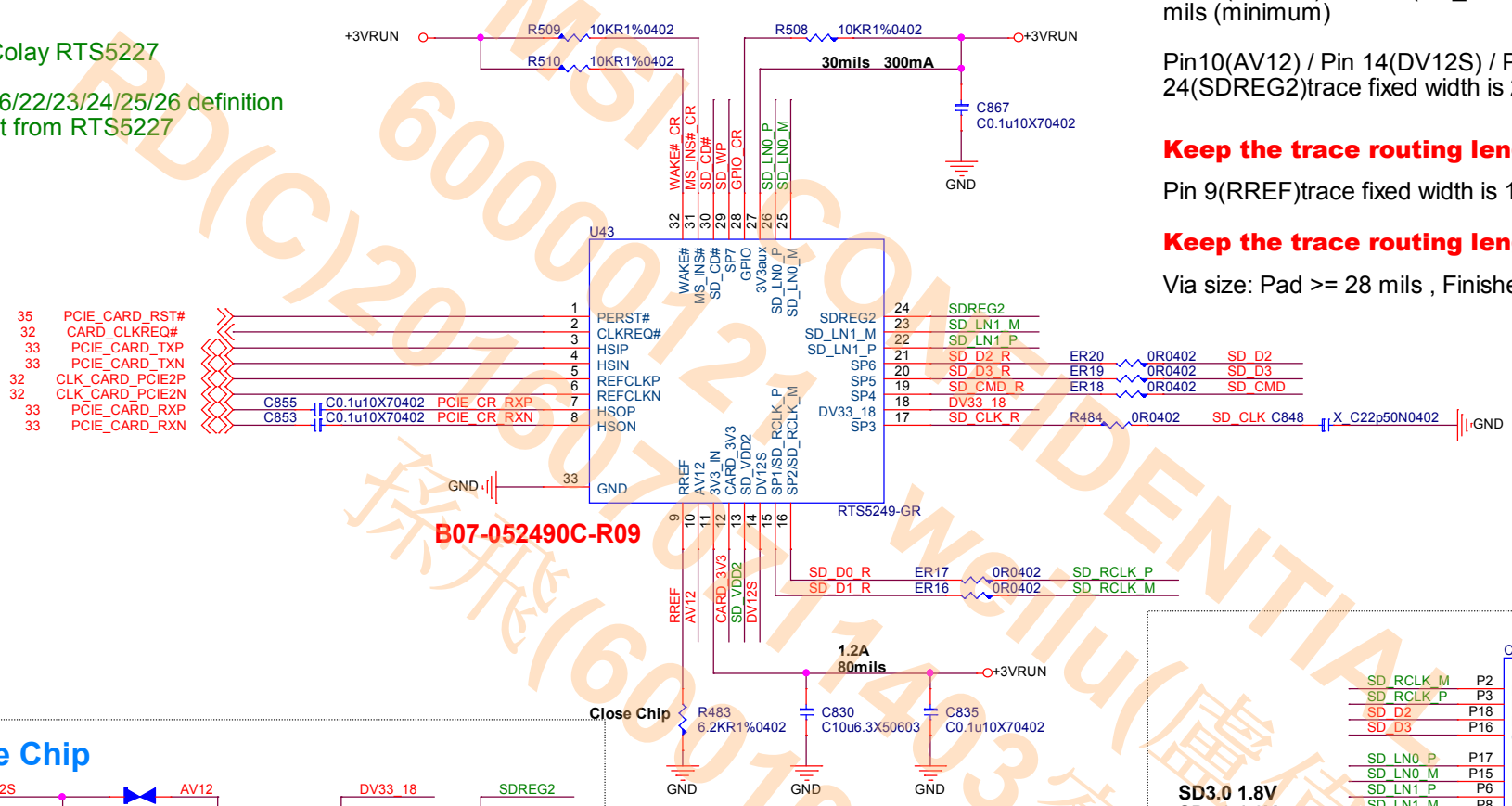
客户服务部

CardReader (RTS5249)

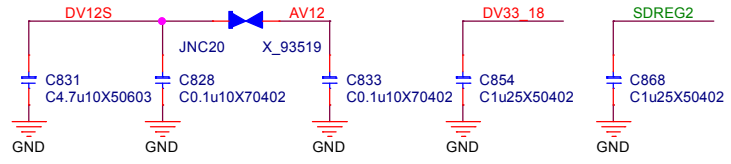
RTS5249 Colay RTS5227

Pin 13/15/16/22/23/24/25/26 definition are different from RTS5227

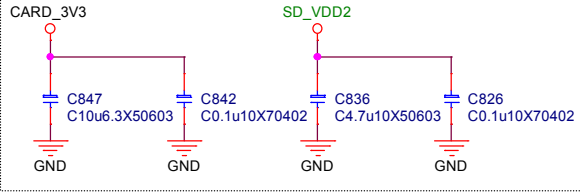


B07-052490C-R09

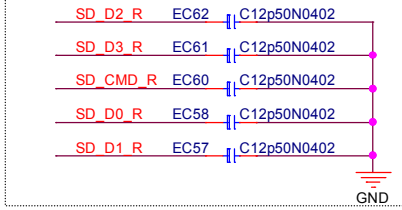
Close Chip



Close Connector



EMI



Power Trace

Pin11(3V3_IN) / Pin 12(CARD_3V3)trace fixed width is 40 mils (minimum)

Pin27(3V3aux) / Pin 13(SD_VDD2)trace fixed width is 30 mils (minimum)

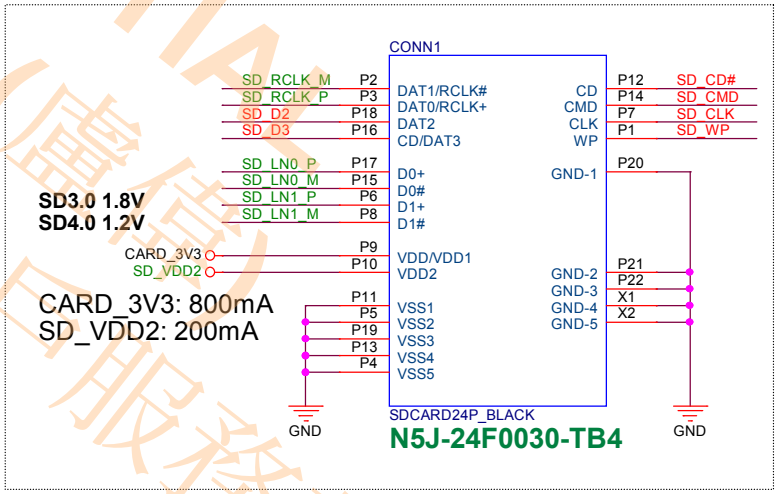
Pin10(AV12) / Pin 14(DV12S) / Pin 18(DV33_18) / Pin 24(SDREG2)trace fixed width is 20 mils (minimum)

Keep the trace routing lengths is limit to 200 mils

Pin 9(RREF)trace fixed width is 12 mils (minimum)

Keep the trace routing lengths is limit to 200 mils

Via size: Pad >= 28 mils , Finished hole >= 16 mils.



msi	MICRO-STAR INT'L CO.,LTD.	
Title	Card Reader	
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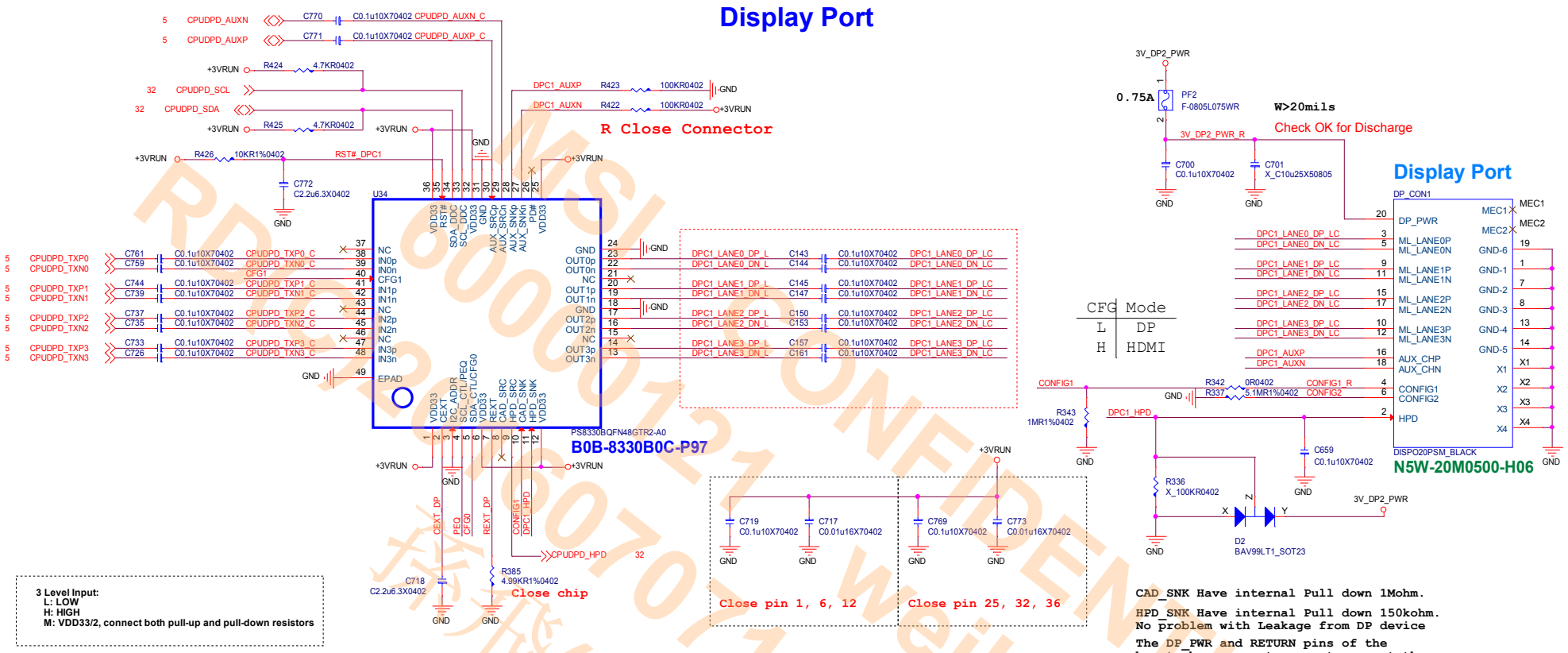
Display Port



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RD Dept 07114403 Weilu(盧煒) 分機(5010839)
技術支援(5010839)

MSI	MICRO-STAR INT'L CO.,LTD.
Title	DP with Repeater
Size	Document Number: MS-16H7
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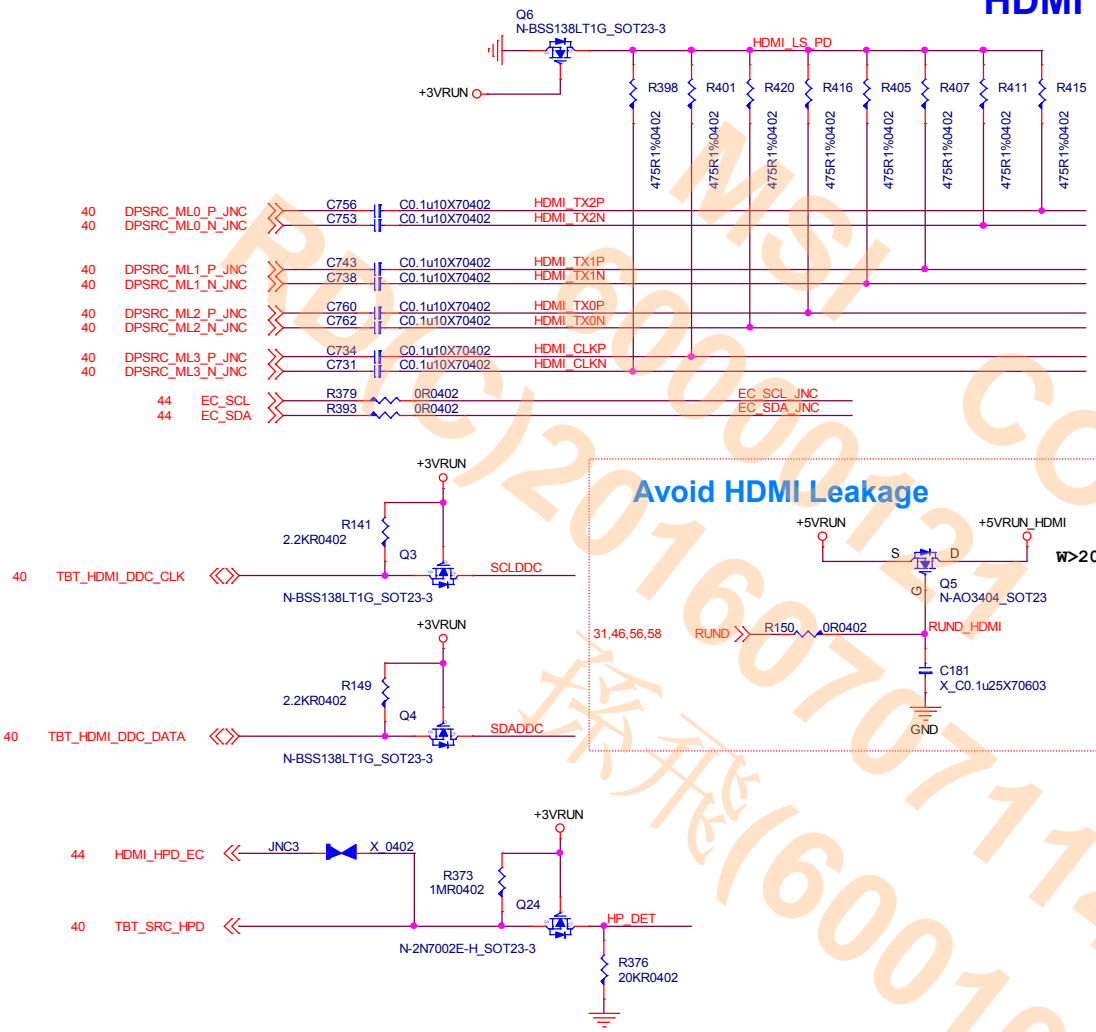
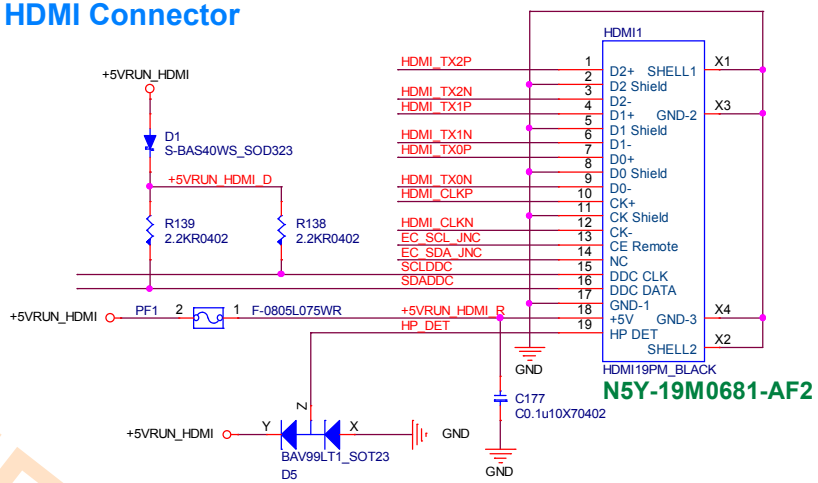
HDMI Repeater



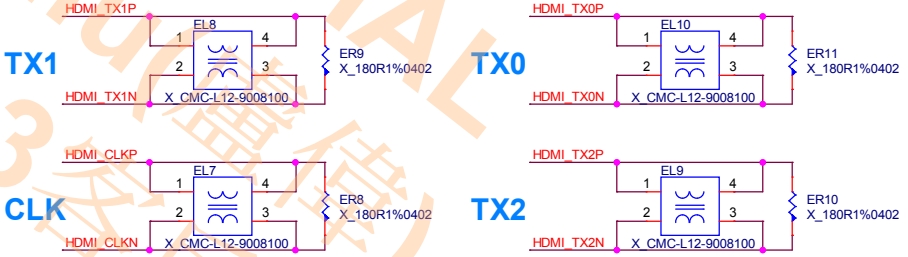
Avoid HDMI Leakage

HDMI Connector



An HDMI Source shall have +5V Power signal over-current protection of no more than 0.5A.

EMI Close Connector



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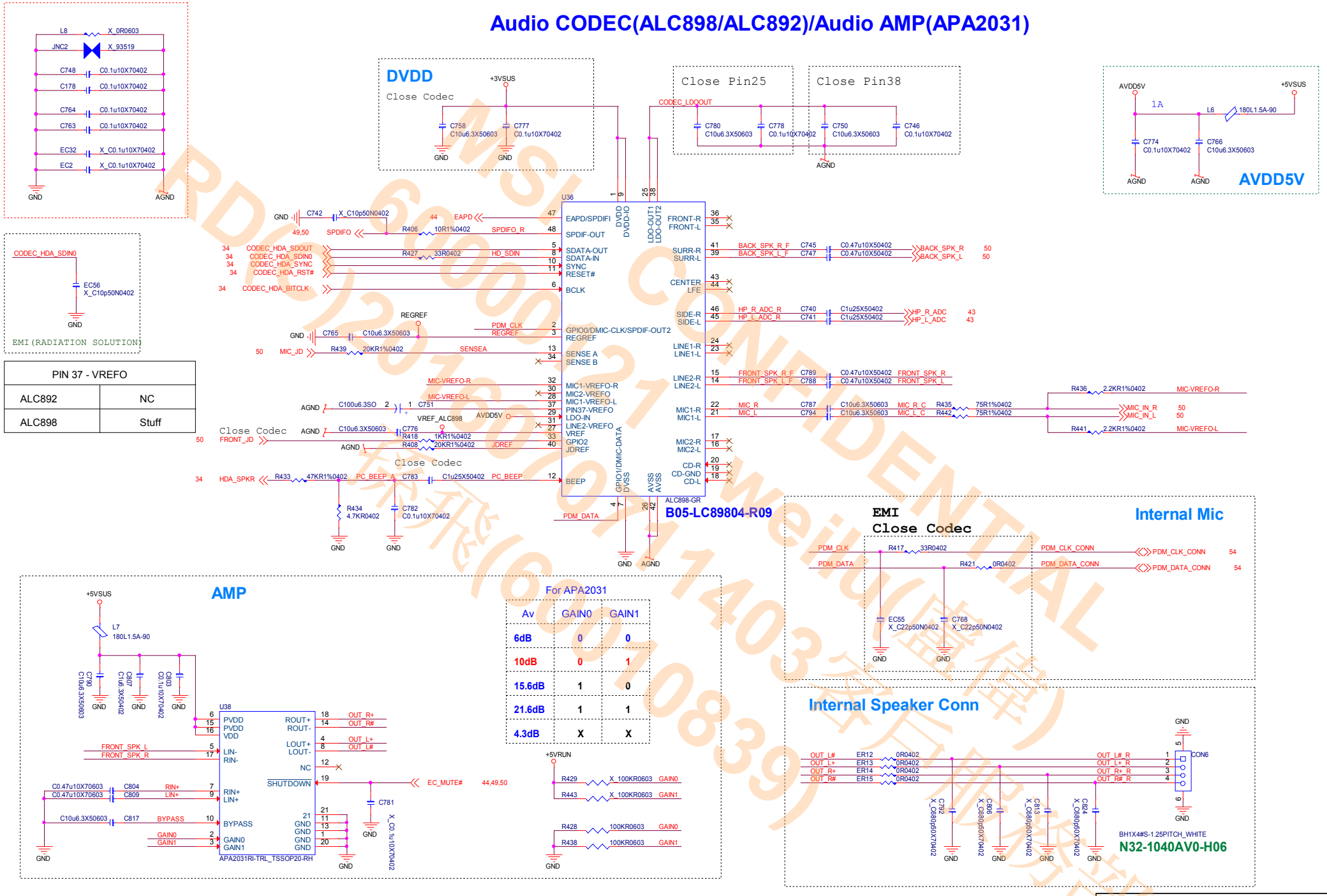
msi MICRO-STAR INT'L CO.,LTD.		
Title: HDMI Repeater		
Size	Document Number: MS-16H7	Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet 47 of 74	

Audio CODEC(ALC898/ALC892)/Audio AMP(APA2031)



PIN 37 - VREFO	
ALC892	NC
ALC898	Stuff

For APA2031		
Av	GAIN0	GAIN1
6dB	0	0
10dB	0	1
15.6dB	1	0
21.6dB	1	1
4.3dB	X	X

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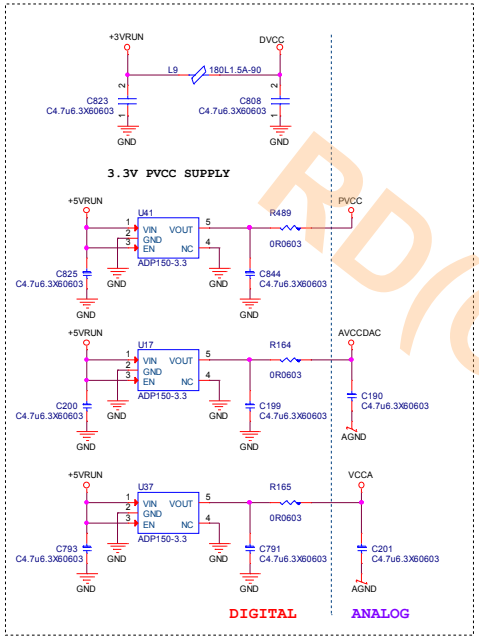
MICRO-STAR INT'L CO.,LTD.

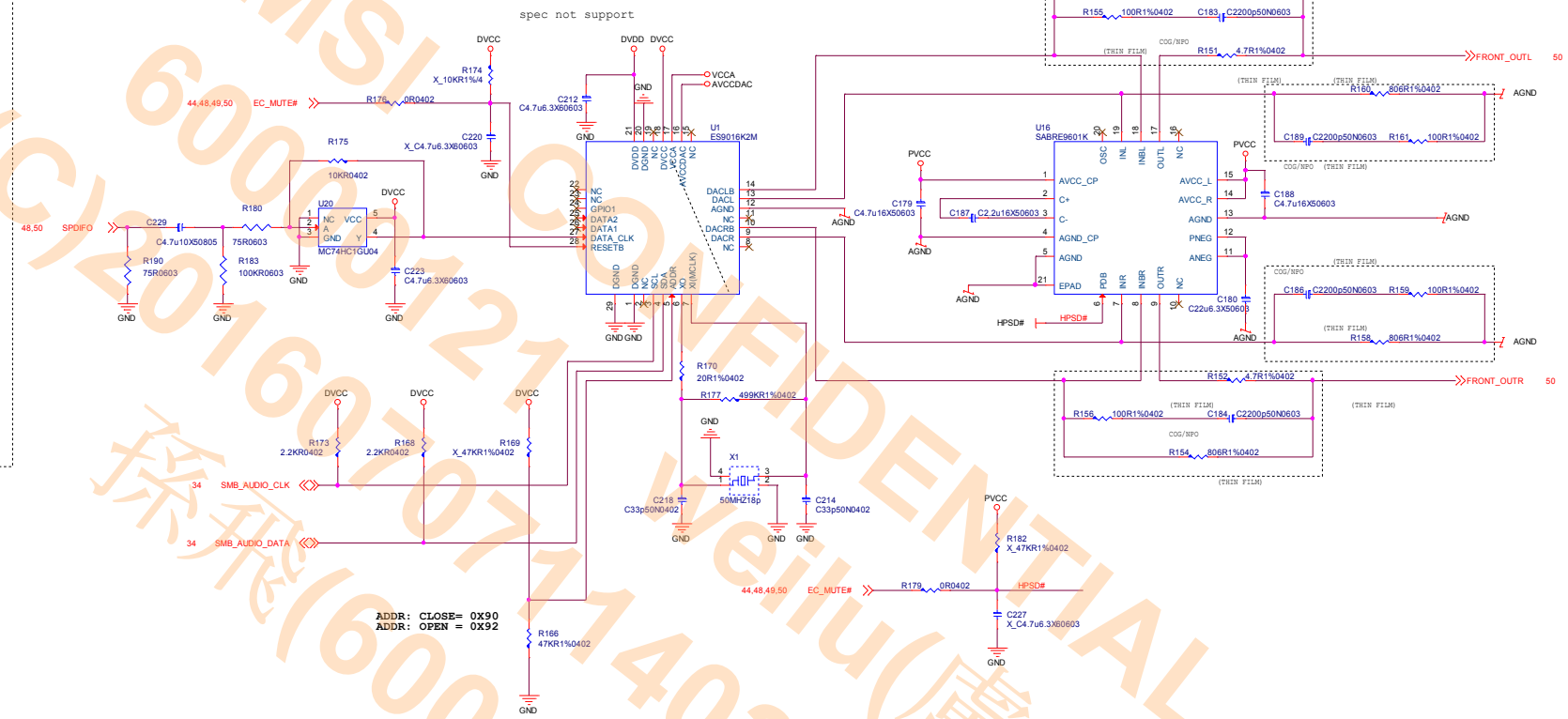
Title: Audio CODEC/Audio AMP

Size | Document Number: MS-16H7 | Rev: 1.2

Date: Wednesday, September 16, 2015 | Sheet 48 of 74

Audio DAC(ES9018)/Headphone Driver(SABRE9601)





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Weihu(魏偉)
探飛(600010839)客戶服務部

MICRO-STAR INT'L CO.,LTD.			
Title: Audio DAC/Headphone Driver			
Size	Document Number: MS-16H7		Rev: 1.2
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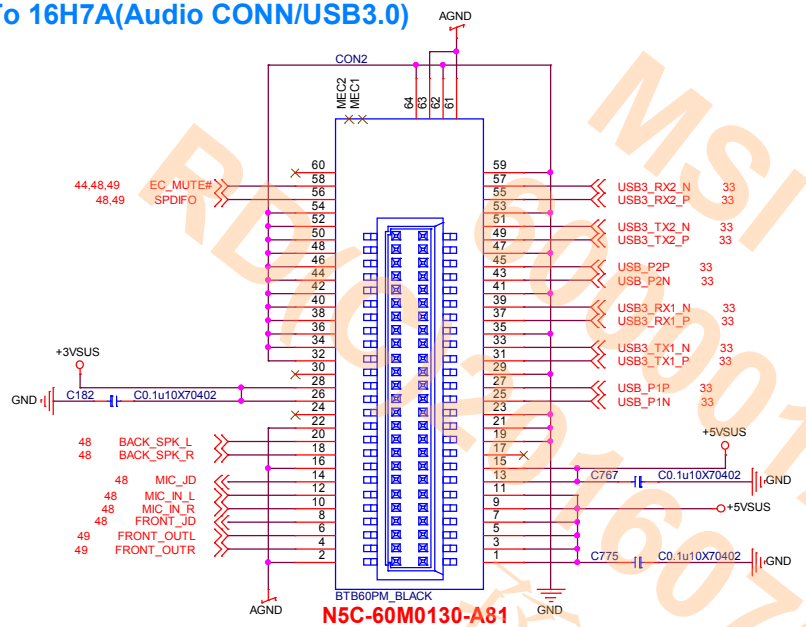
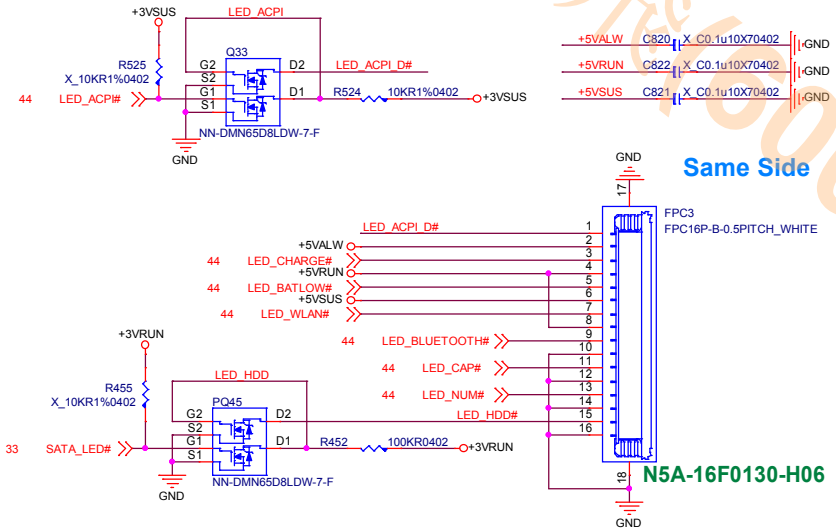
BTB CONN

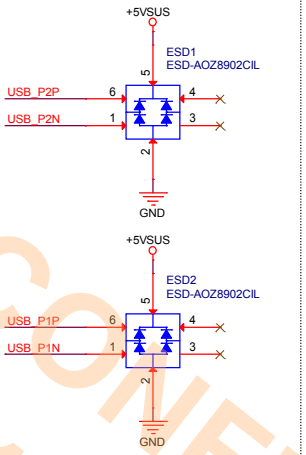
To 16H7A(Audio CONN/USB3.0)



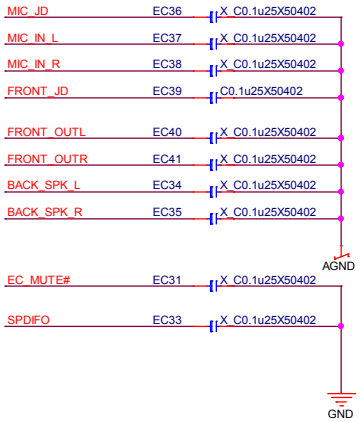
To 16H7B(LED Board)



ESD



EMI



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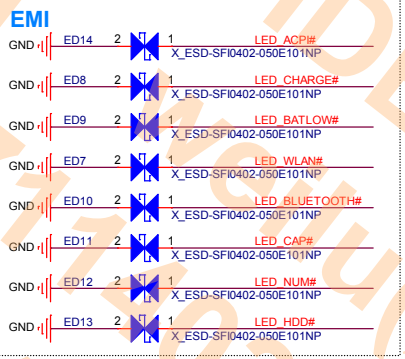
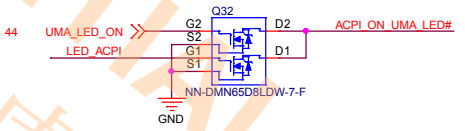
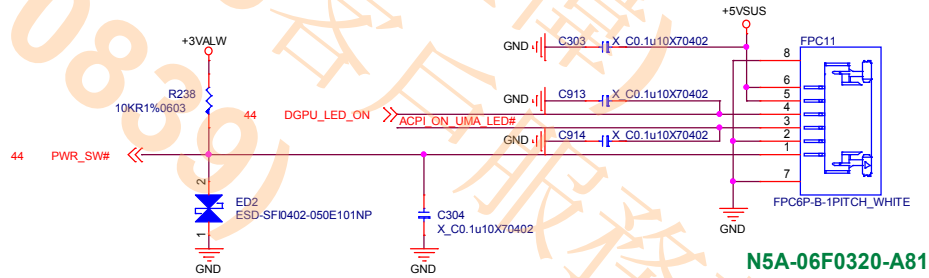


S3 Breath
S0 No active



To 16H7C (Power Board)



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MICRO-STAR INT'L CO.,LTD.		
Title: BTB CONN		
Size	Document Number: MS-16H7	Rev: 1.2
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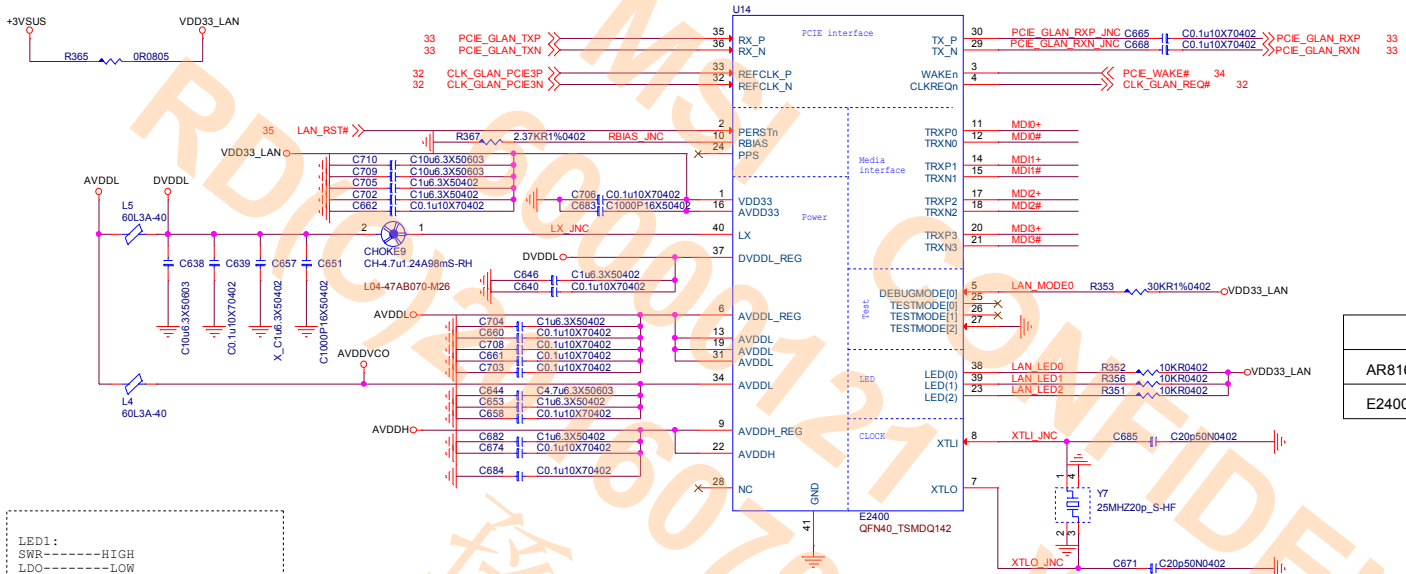
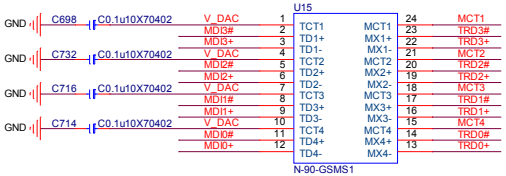
GIGA LAN(BFN2400/AR8161)

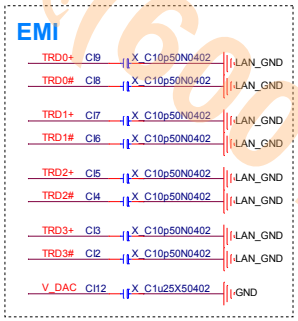


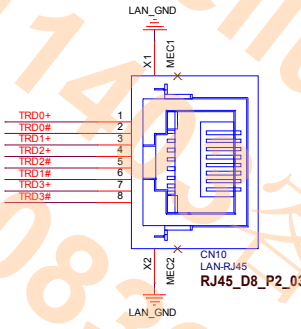
PIN 38 (LAN_LED0)	
AR8161	NC
E2400	Stuff

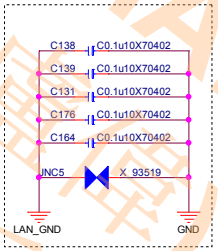
LED1:
SWR-------HIGH
LDO--------LOW
The chip have internal pull-up

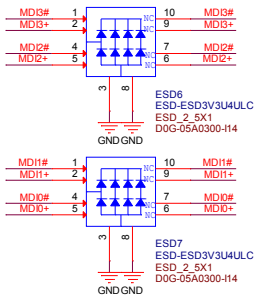
LED2:
25MHz--------HIGH
48MHz---------LOW
The chip have internal pull-up





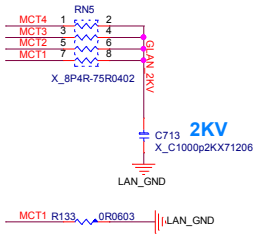






MSI N_90_GSMS1 L05-0200280-A91 N-90-GSMS1

ODM GST5009_V L05-0200150-B09 GST5009-V LF



msi MICRO-STAR INT'L CO.,LTD.			
Title: GIGA LAN(BFN2400/AR8161)			
Size	Document Number: MS-16H7		Rev: 1.2
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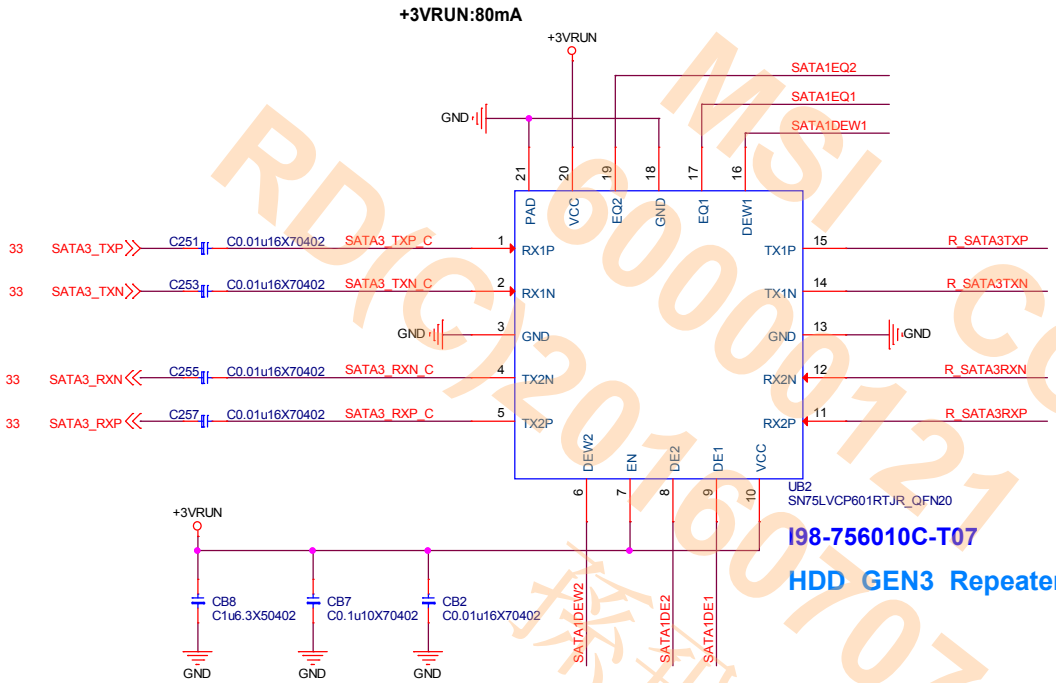
MSI CONFIDENTIAL weilu(魏璐) RDC 2007114 (6601839) 徐飞(66018390) 技术支持服务部

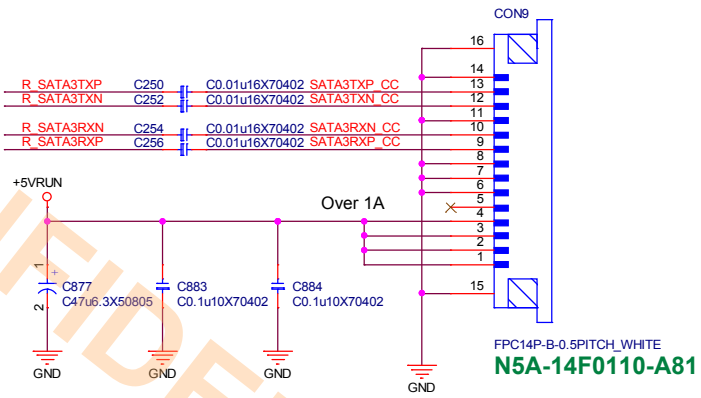
HDD (With Repeater)



I98-756010C-T07

HDD GEN3 Repeater

BTB Connecter



N5A-14F0110-A81

TI SN75LVCP601RTJR HW Setting

DE1/DE2	CH1/CH2De-Emphasis dB(at 6Gbps)	DQ1/DQ2	CH1/CH2De-Emphasis dB(at 6Gbps)
NC(default)	-4	NC(default)	0
0	0	0	7
1	-2	1	14

DEW1/DEW2	Device Function --> De Width for CH1/CH2
0	De-emphasis Pulse duration, short(recommended setting when linkoperates at SATA 1.5/3/6 Gbps)
1(default)	De-emphasis Pulse duration, long(recommended setting when linkoperates at SATA 1.5/3/6 Gbps)

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RDIC20160711403(60010839)
weilu(微信)
软件(60010839)
客户服务部

MICRO-STAR INT'L CO.,LTD.

Title: HDD With Repeater

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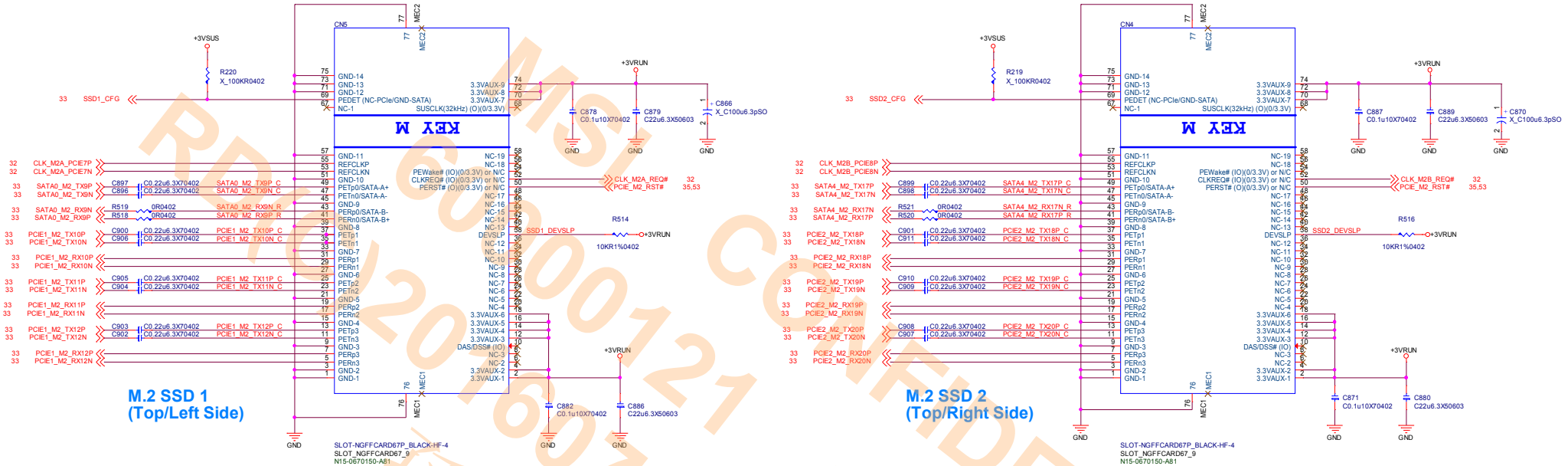
SSD



MICRO-STAR INT'L CO.,LTD.			
Title: SSD			
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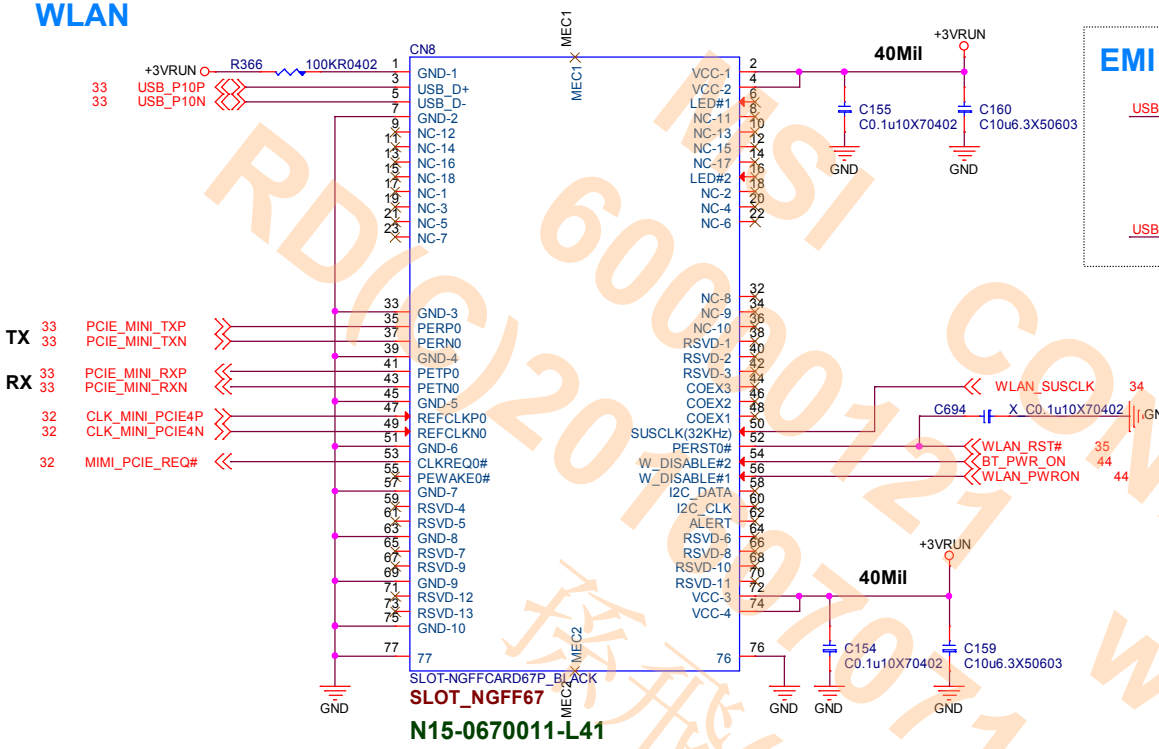
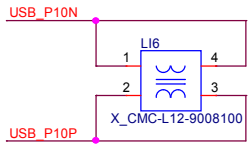
RD# 2016071403(60010121)
weilu(卫伟)
蔡飞(60010839)客户服务部

WLAN /Camera/ClickPad/FP

WLAN

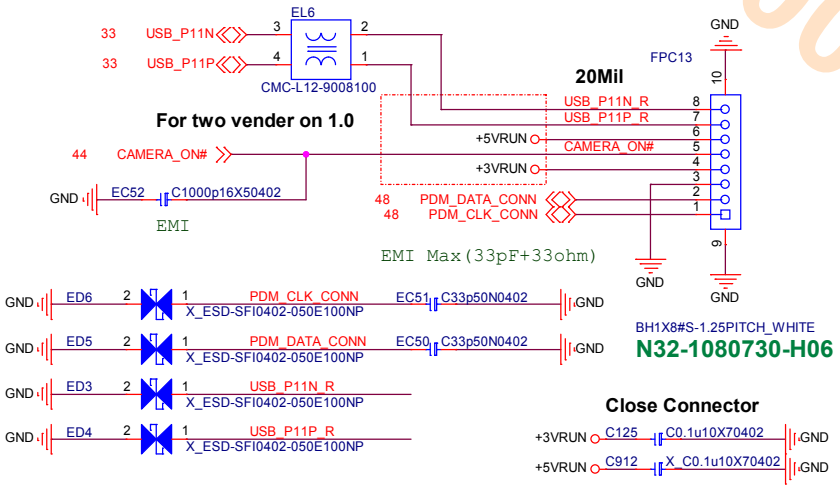


EMI

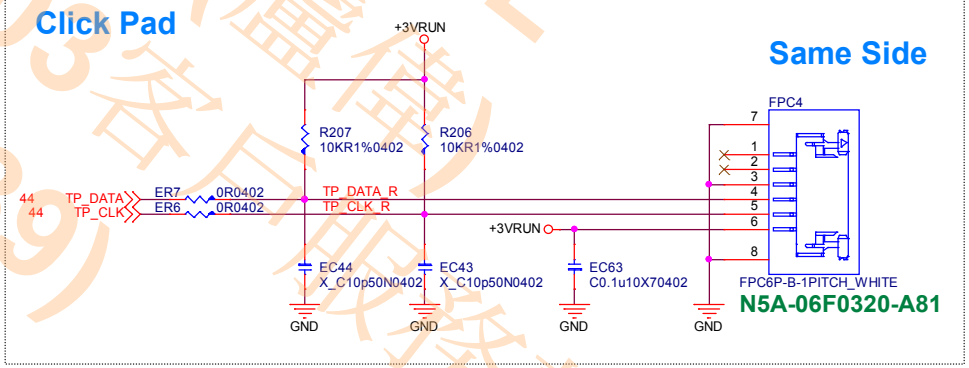


Pin 1	GND		
Pin 3	USB_D+	Pin 2	3.3V
Pin 5	USB_D-	Pin 4	3.3V
Pin 7	GND	Pin 6	LED1#
Pin 9	Module Key	Pin 8	Module Key
Pin 11	Module Key	Pin 10	Module Key
Pin 13	Module Key	Pin 12	Module Key
Pin 15	Module Key	Pin 14	Module Key
Pin 17	N/C	Pin 16	LED2#
Pin 19	N/C	Pin 18	GND
Pin 21	N/C	Pin 20	N/C
Pin 23	N/C	Pin 22	N/C
Pin 25	Module Key	Pin 24	Module Key
Pin 27	Module Key	Pin 26	Module Key
Pin 29	Module Key	Pin 28	Module Key
Pin 31	Module Key	Pin 30	Module Key
Pin 33	GND	Pin 32	N/C
Pin 35	PERP0	Pin 34	N/C
Pin 37	PERN0	Pin 36	N/C
Pin 39	GND	Pin 38	Clink Reset (I 3.3V)
Pin 41	PETP0	Pin 40	N/C
Pin 43	PETN0	Pin 42	N/C
Pin 45	GND	Pin 44	N/C
Pin 47	REFCLKP0	Pin 46	N/C
Pin 49	REFCLKN0	Pin 48	N/C
Pin 51	GND	Pin 50	N/C (SUSCLK (32kHz) for DSx)
Pin 53	CLKREQ0#	Pin 52	PERST0#
Pin 55	PEWAKE0#	Pin 54	BT_EN (W_DISABLE2#)
Pin 57	GND	Pin 56	WLAN_EN(W_DISABLE2#)
Pin 59	N/C	Pin 58	N/C
Pin 61	N/C	Pin 60	N/C
Pin 63	GND	Pin 62	N/C
Pin 65	N/C	Pin 64	Resever
Pin 67	N/C	Pin 66	N/C
Pin 69	GND	Pin 68	N/C
Pin 71	N/C	Pin 70	N/C
Pin 73	N/C	Pin 72	3.3V
Pin 75	GND	Pin 74	3.3V

CAMERA



Click Pad



Same Side

RD(C)2015071140310839 msi 6000121 CONFIDENTIAL weilu(魏璐) 徐飞(60010839)

msi	MICRO-STAR INT'L CO.,LTD.		
Title	WLAN /Camera/ClickPad/FP		
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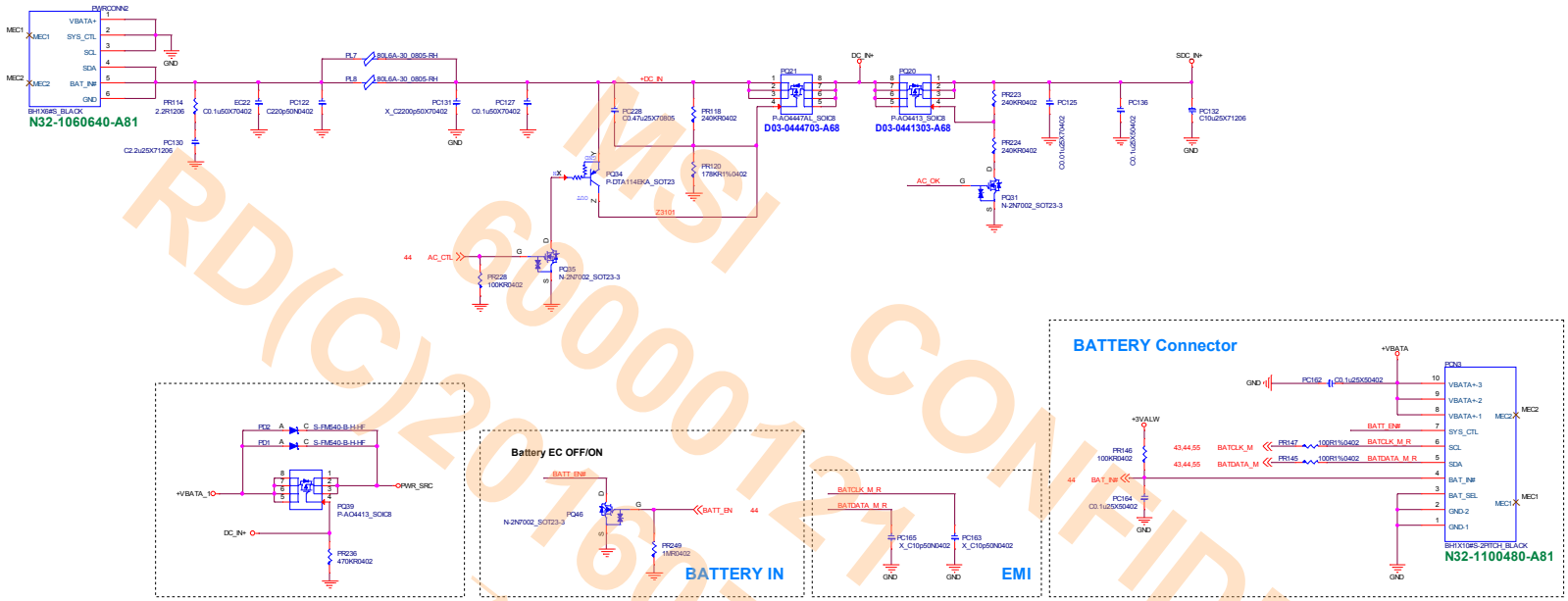
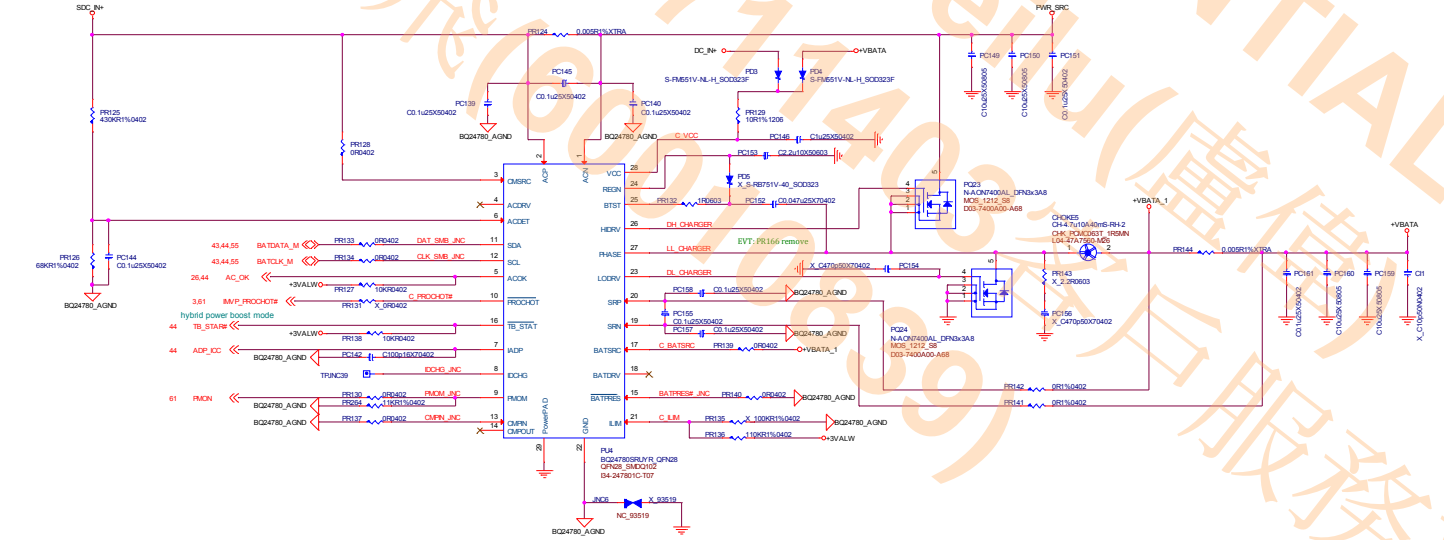
Battery Select/Charger

Battery Select



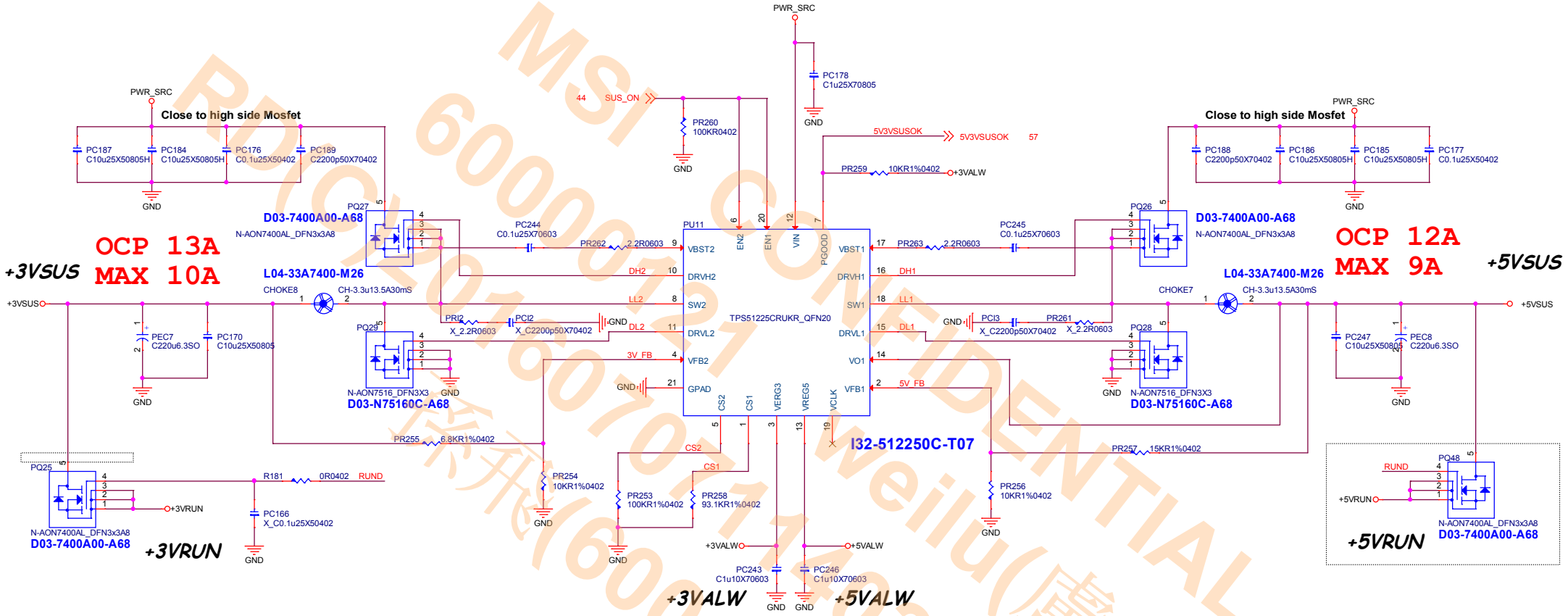
Battery Charger



RD(C)20160707 1405 微信公众服务部 (602126359)
MSI CONFIDENTIAL 6900012 weiju

MICRO-STAR INT'L CO.,LTD.			
Title: Battery Select/Charger			
Size	Document Number: MS-16H7		Rev: 1.2
Date: Wednesday, September 16, 2015	Sheet: 55 of 74		

System Power



MSI CONFIDENTIAL
RD C1(60010211403 weilu(盧偉) 客戶服務(60010839)
保存(60010839)

msi	MICRO-STAR INT'L CO.,LTD.		
Title	System Power		
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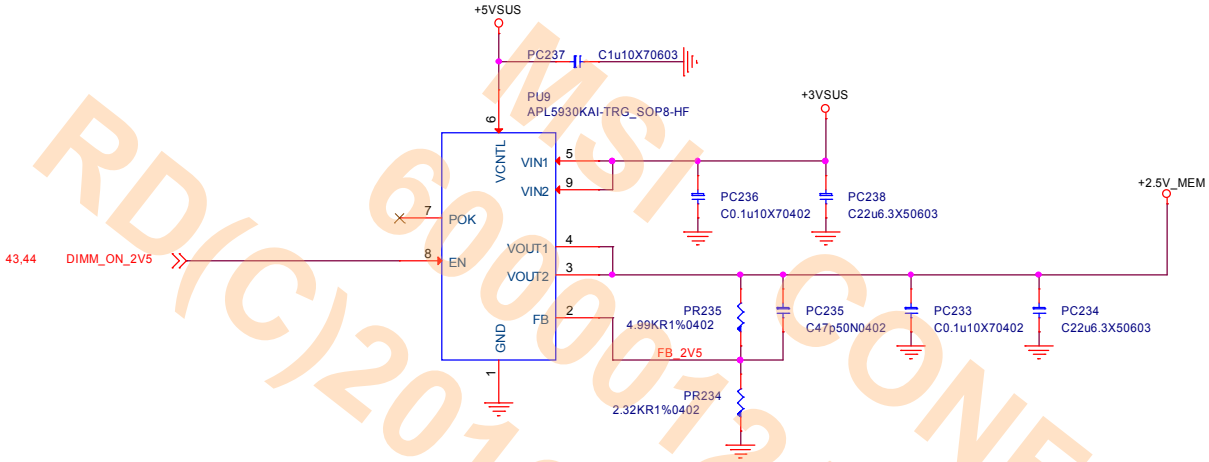
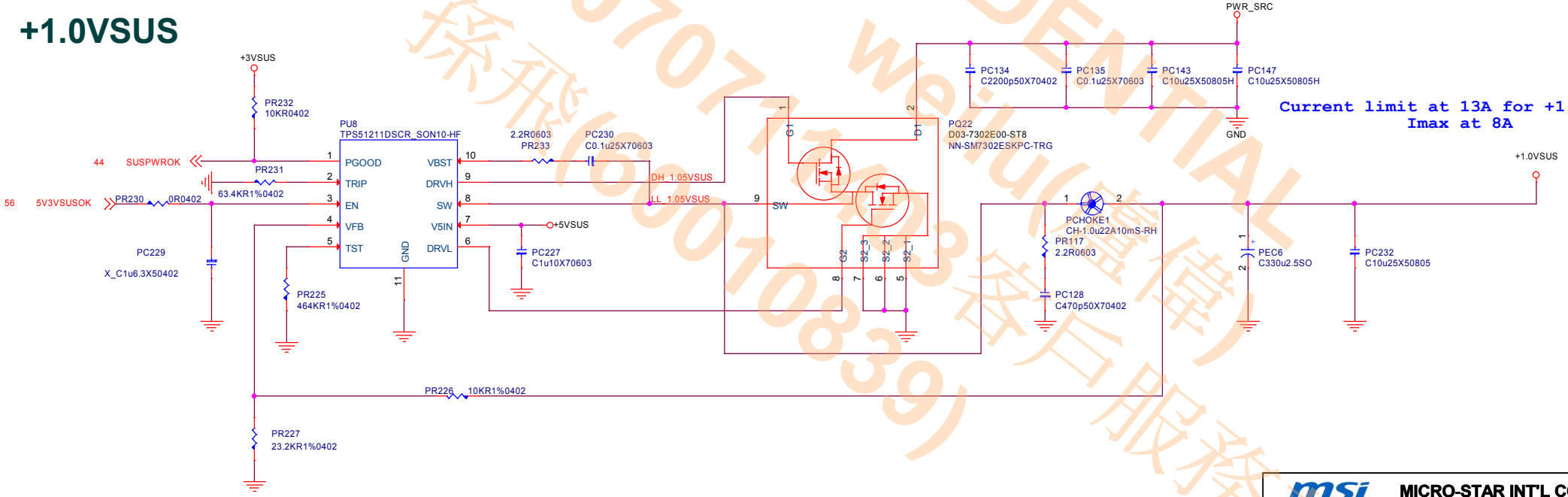
+2.5V_MEM



OCP 4.2A
MAX 1A

+1.0VSUS



Current limit at 13A for +1.0VSUS
Imax at 8A

MSI CONFIDENTIAL
RD(C)20160707114033(魏伟)
6006001121
徐飞(60010839)
售后服务

msi	MICRO-STAR INT'L CO.,LTD.	
Title	2.5VMEM/1.0VSUS	
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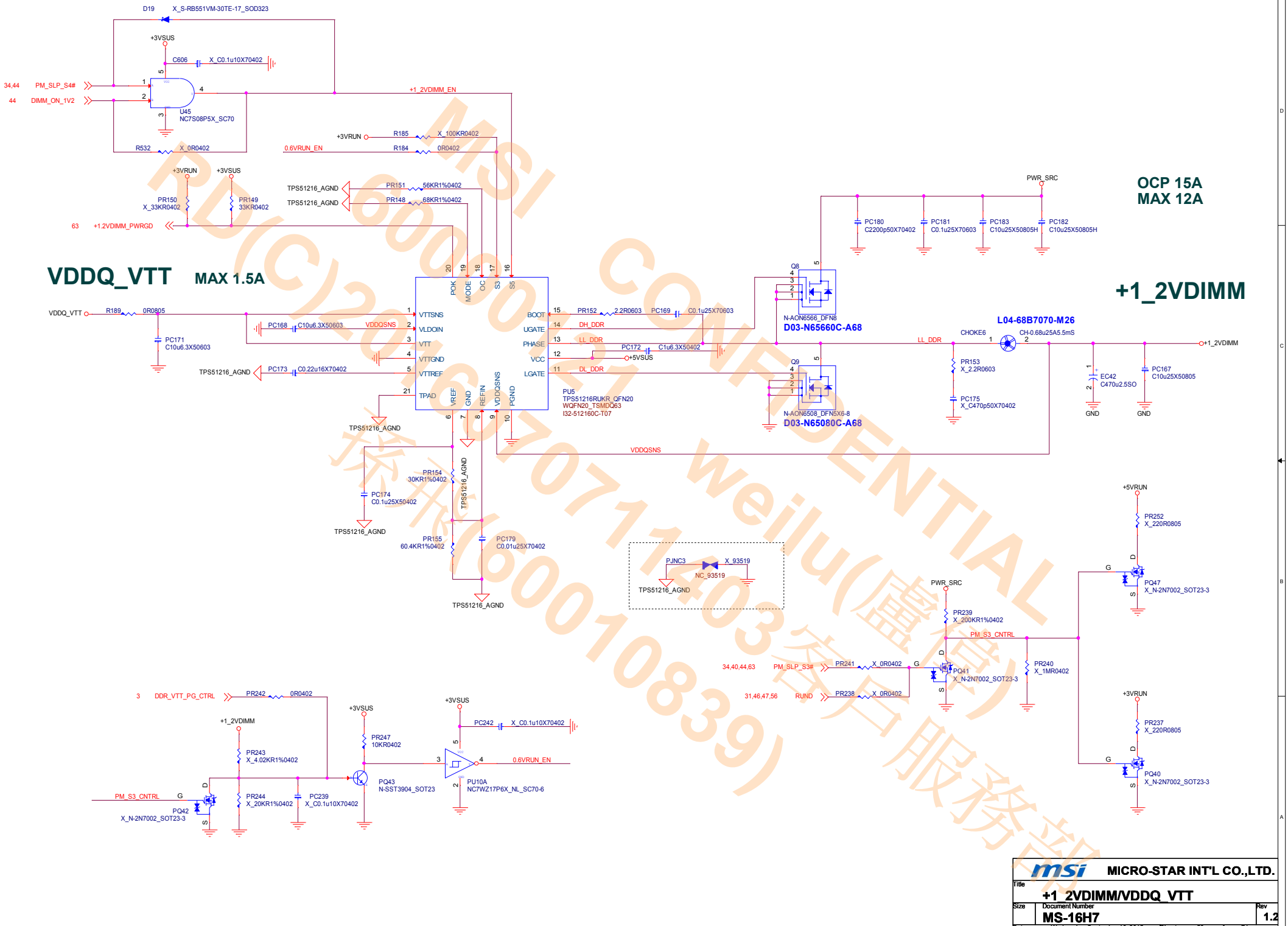
VDDQ_VTT
MAX 1.5A
+1_2VDIMM
OCP 15A
MAX 12A
D19 X_S-RB551VM-30TE-17_SOD323
+3VSUS
C606 X_C0.1u10X70402
34,44 PM_SLP_S4#
44 DIMM_ON_1V2
U45 NC7S08P5X_SC70
+1_2VDIMM_EN
R532 X_0R0402
+3VRUN
R185 X_100KR0402
0.6VRUN_EN
R184 0R0402
PR150 X_33KR0402
PR149 33KR0402
63 +1.2VDIMM_PWRGD
TPS51216_AGND
PR151 56KR1%0402
PR148 68KR1%0402
PWR_SRC
PC180 C2200p50X70402
PC181 C0.1u25X70603
PC183 C10u25X50805H
PC182 C10u25X50805H
Q8
N-AON6566_DFN8
D03-N65660C-A68
L04-68B7070-M26
CHOKE6
CH-0.68u25A5.5mS
LL_DDR
+1_2VDIMM
VDDQ_VTT
R189 0R0805
PC171 C10u6.3X50603
PC168 C10u6.3X50603
VDDQSNS
PC173 C0.22u16X70402
PR152 2.2R0603
PC169 C0.1u25X70603
PC172 C1u6.3X50402
+5VSUS
Q9
N-AON6508_DFN5X6-8
D03-N65080C-A68
PR153 X_2.2R0603
PC175 X_C470p50X70402
EC42 C470u2.5SO
PC167 C10u25X50805
GND
PU5
TPS51216RUKR_QFN20
WQFN20_TSMD063
I32-512160C-T07
VTTSNS
VLDOIN
VTT
VTTGND
VTTREF
TPAD
BOOT
UGATE
PHASE
VCC
LGATE
POK
MODE
OC
S3
S5
VREF
GND
REFIN
VDDQSNS
PGND
DH_DDR
DL_DDR
PR154 30KR1%0402
PC174 C0.1u25X50402
PR155 60.4KR1%0402
PC179 C0.01u25X70402
PJNC3 X_93519
NC_93519
+5VRUN
PR252 X_220R0805
PQ47 X_N-2N7002_SOT23-3
PR239 X_200KR1%0402
PM_S3_CNTRL
34,40,44,63 PM_SLP_S3#
PR241 X_0R0402
31,46,47,56 RUND
PR238 X_0R0402
PQ41 X_N-2N7002_SOT23-3
PR240 X_1MR0402
PR237 X_220R0805
PQ40 X_N-2N7002_SOT23-3
3 DDR_VTT_PG_CTRL
PR242 0R0402
PR243 X_4.02KR1%0402
PR244 X_20KR1%0402
PC239 X_C0.1u10X70402
PQ42 X_N-2N7002_SOT23-3
PR247 10KR0402
PC242 X_C0.1u10X70402
PQ43 N-SST3904_SOT23
PU10A NC7WZ17P6X_NL_SC70-6
MICRO-STAR INT'L CO.,LTD.
Title
+1_2VDIMM/VDDQ_VTT
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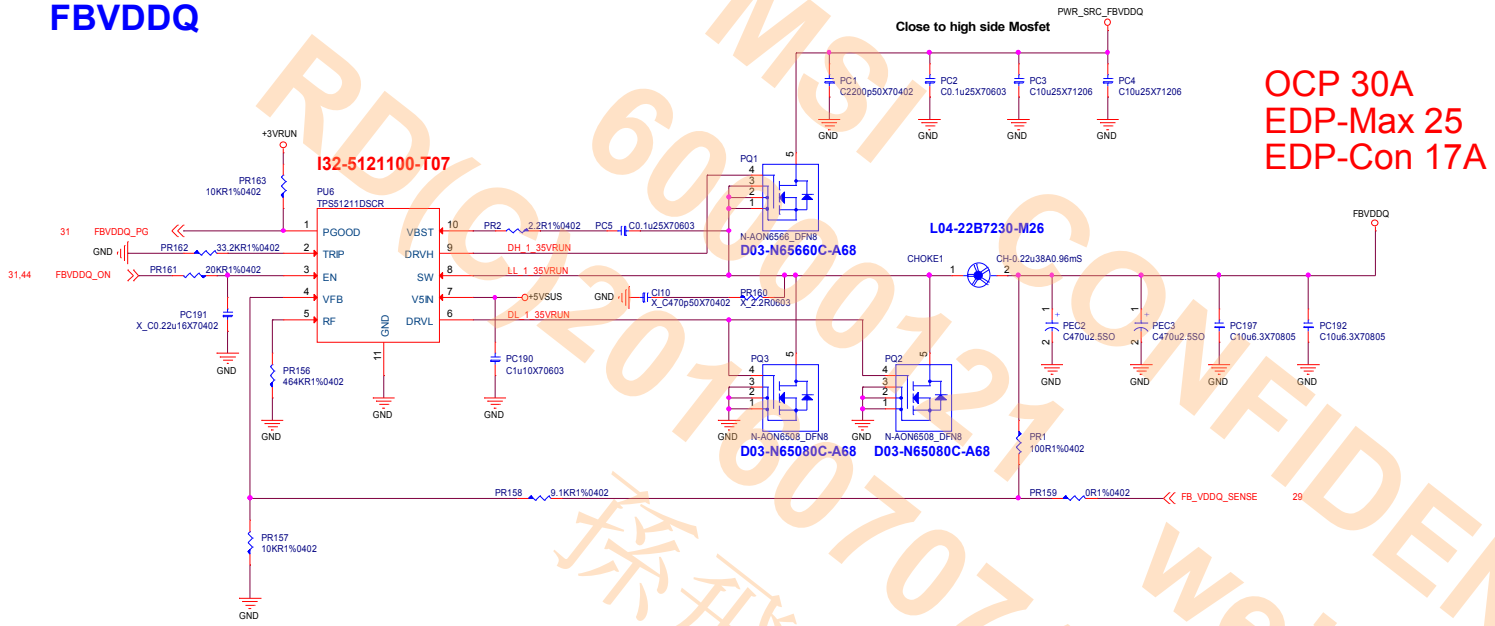
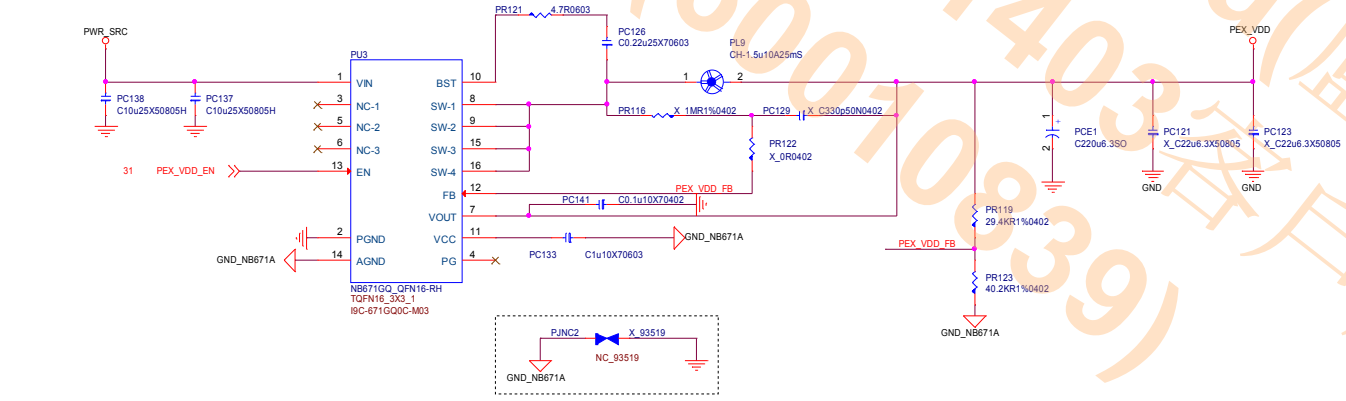
DGPU POWER FBVDDQ

FBVDDQ



OCP 30A
EDP-Max 25
EDP-Con 17A

PEX_VDD



Imax at 4A

MICRO-STAR INT'L CO.,LTD.		
Title: DGPU POWER FBVDDQ / PEX_VDD		
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RD(6020150701211403客台服務部)
weilu(儒偉)
採飛(60010839)

DGPU POWER NVVDD

DGPU POWER / UP1642PQAG

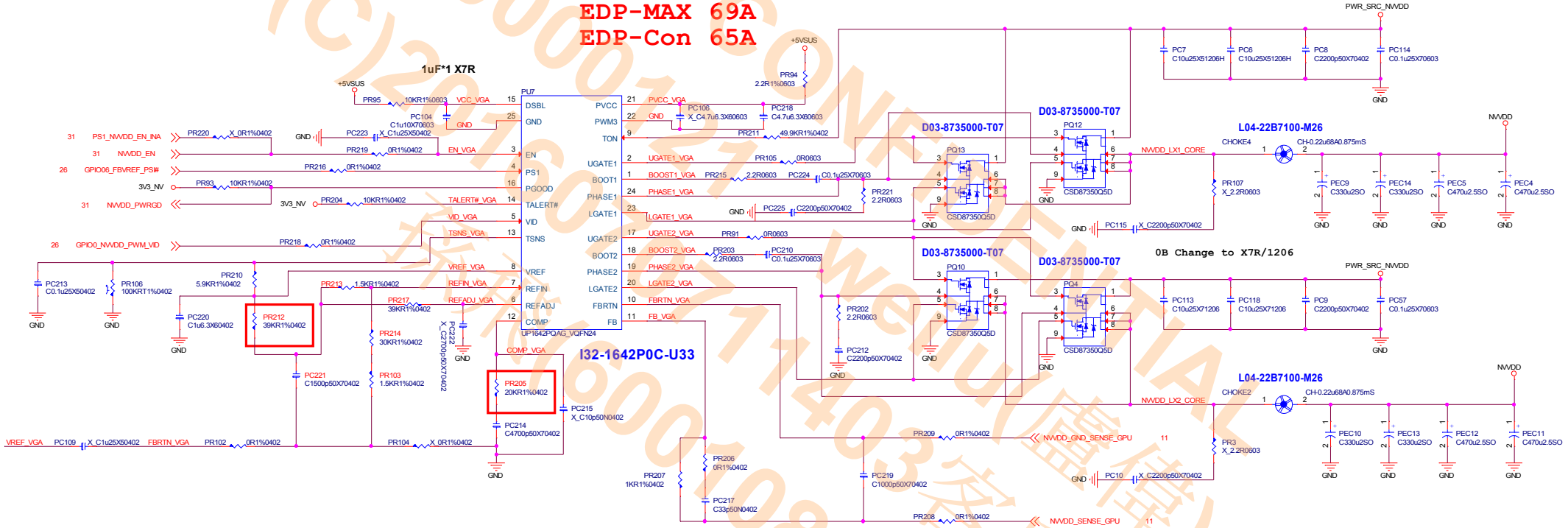
CONFIG B
VBoot:0.9V
Vmin:0.6V / Vmax:1.2V

EDP-Peak 130A
EDP-MAX 69A
EDP-Con 65A

0B Change to X7R/1206
1.0 Change to X5R/1206 high

1uF*1 X7R

I32-1642P0C-U33



MSI CONFIDENTIAL
RD(C)2015 600010111403 Weiyu(魏宇)
保存编号600010839)
微星台服务部

msi	MICRO-STAR INT'L CO.,LTD.		
Title	DGPU POWER NVVDD		
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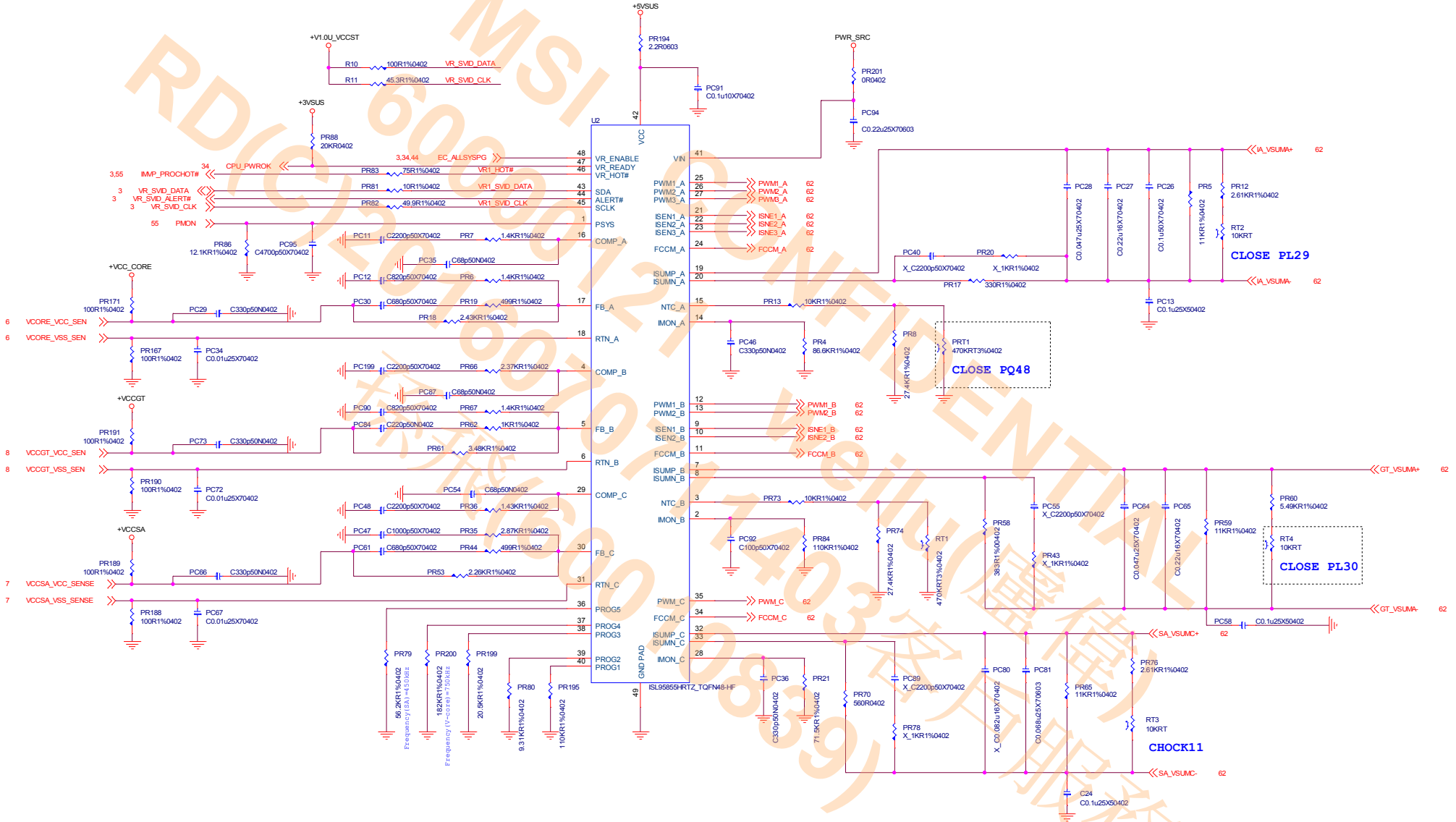
CPU Power IC (ISL95855)



MSI 602-8S12N-C2R 60070-1N403 CONFIDENTIAL RD(C2R60701N403)(鐘偉 0839) Weilu 採購(66010839) 技術服務部

msi	MICRO-STAR INT'L CO.,LTD.		
Title	CPU Power IC (ISL95855)		
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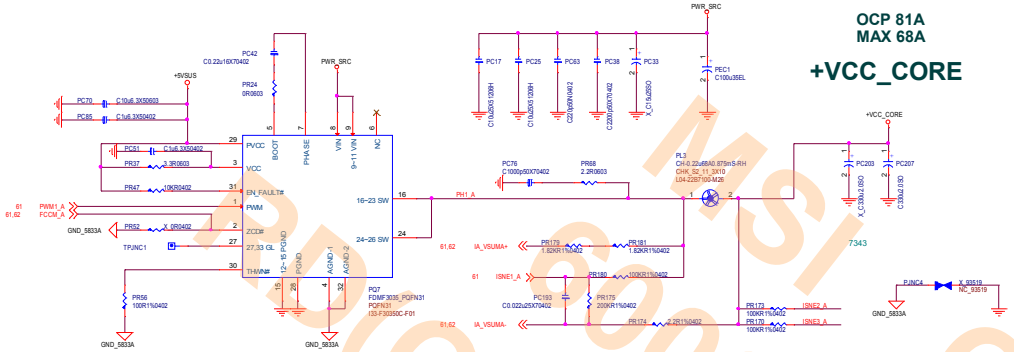

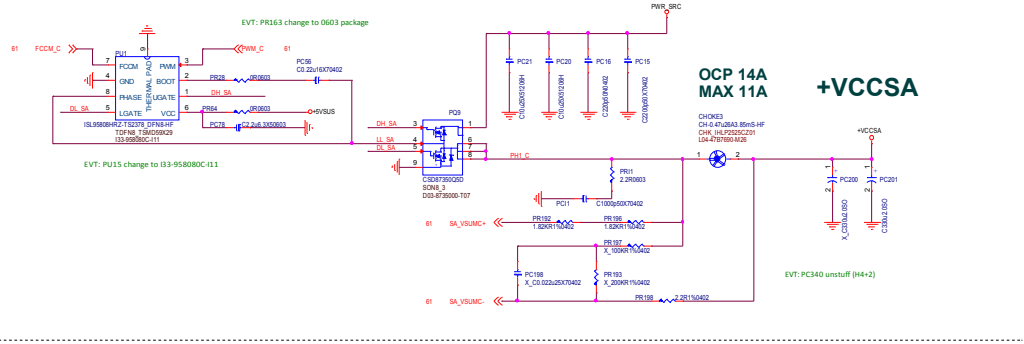

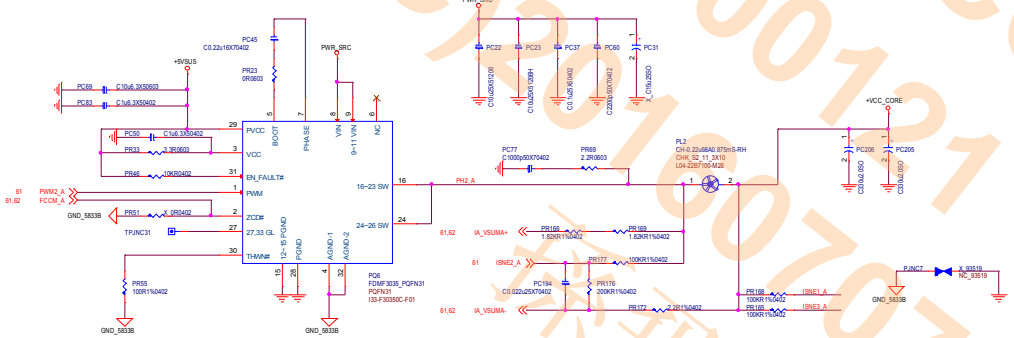

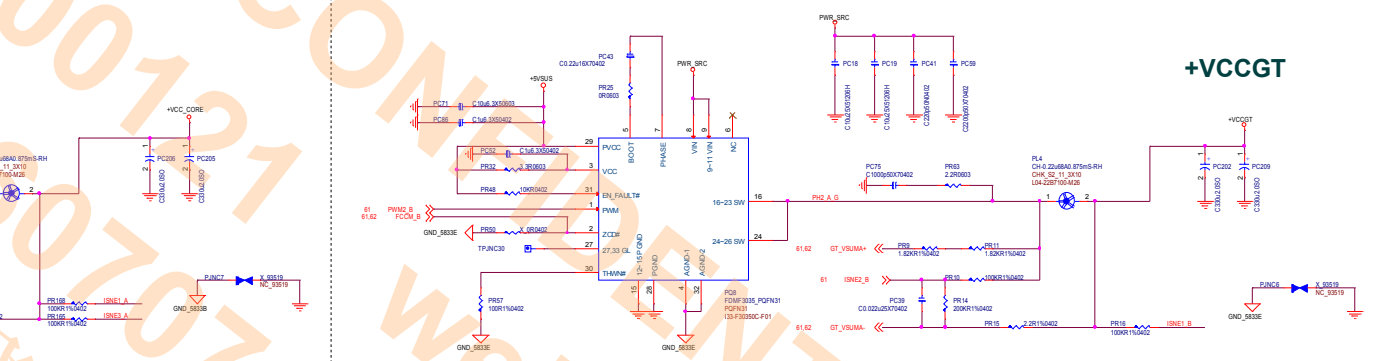

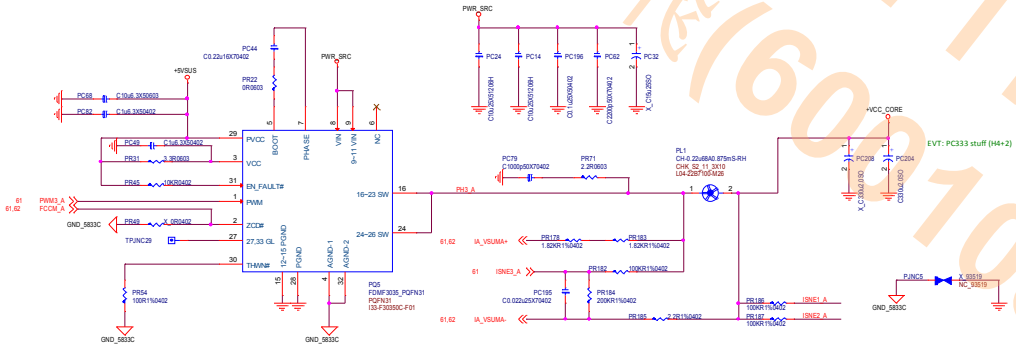

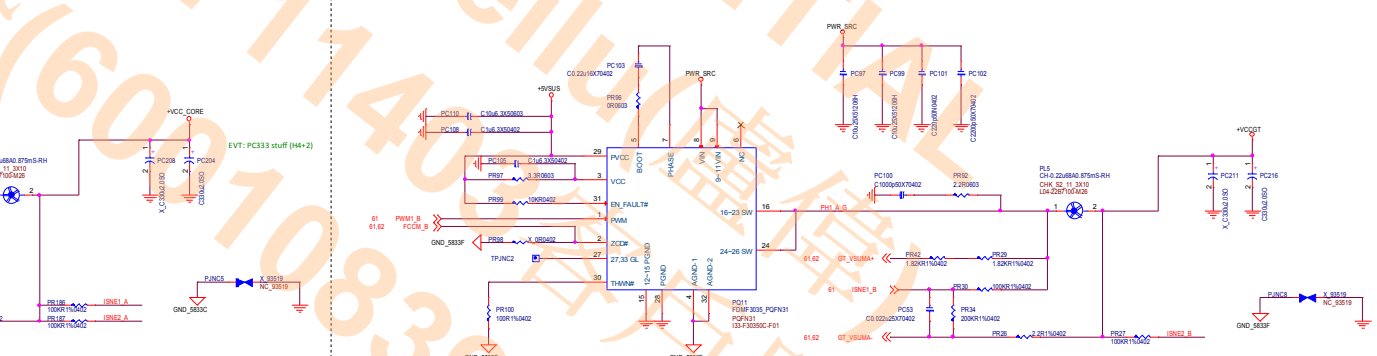

msi	MICRO-STAR INT'L CO.,LTD.		
Title	CPU Power(VCore/VCCGT/VCCSA)		
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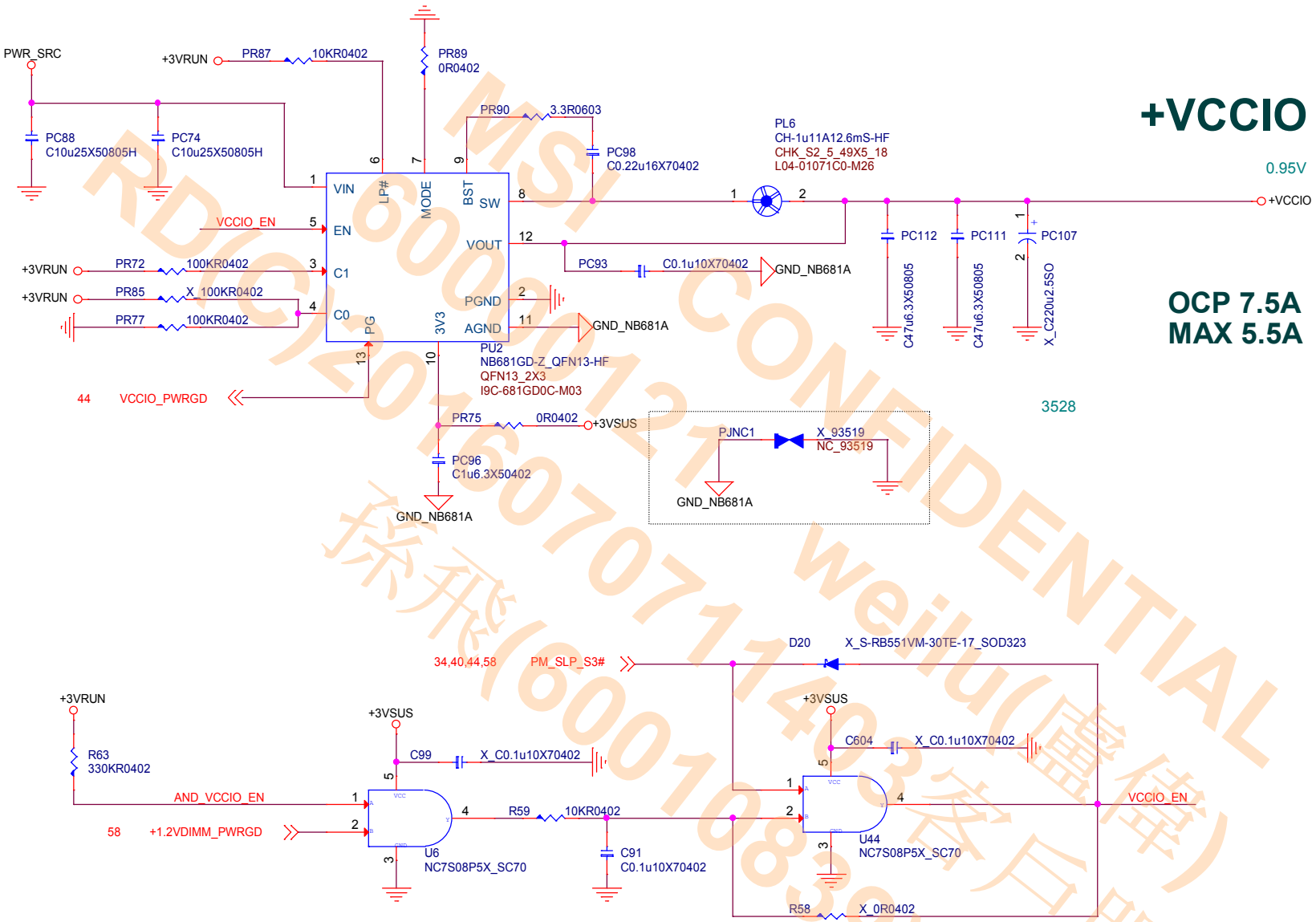
MSI CONFIDENTIAL
6900012I
weilu(威鲁)
PPC(2016070711402)
深圳(60210839)
技术服务部



MSI CONFIDENTIAL
RD(C)2016070711403(徐飛(600108139)
weilu(盧偉)
徐飛(600108139)客戶服務部

msi	MICRO-STAR INT'L CO.,LTD.	
Title	CPU Power(VCCIO)	
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EMI/ Impedence

Impedence Connector No PN

40 ohm

J29 2 L1_6.5mil_40_Ohm 1 GND2 X_H1X2M_BLACK

J21 2 L3_5mil_40_Ohm 1 GND2_GND4 X_H1X2M_BLACK

J14 2 L10_5mil_40_Ohm 1 GND9_GND11 X_H1X2M_BLACK

45 ohm

J31 2 L1_5.5mil_45_Ohm 1 GND2 X_H1X2M_BLACK

J28 2 L3_4mil_45_Ohm 1 GND2_GND4 X_H1X2M_BLACK

J4 2 L5_4mil_45_Ohm 1 GND4_GND6 X_H1X2M_BLACK

J20 2 L10_4mil_45_Ohm 1 GND9_GND11 X_H1X2M_BLACK

J9 2 L12_5.5mil_45_Ohm 1 GND11 X_H1X2M_BLACK

50 ohm

J30 2 L1_4mil_50_Ohm 1 GND2 X_H1X2M_BLACK

J27 2 L3_3mil_50_Ohm 1 GND2_GND4 X_H1X2M_BLACK

J12 2 L5_3mil_50_Ohm 1 GND4_GND6 X_H1X2M_BLACK

J13 2 L10_3mil_50_Ohm 1 GND9_GND11 X_H1X2M_BLACK

J1 2 L12_4mil_50_Ohm 1 GND11 X_H1X2M_BLACK

80 ohm

J35 L1_DIFF_4.5/4/4.5_80ohm+ L1_DIFF_4.5/4/4.5_80ohm- X_H1X4_BLACK GND2

J25 L3_DIFF_4.5/7/4.5_80ohm+ L3_DIFF_4.5/7/4.5_80ohm- X_H1X4_BLACK GND2_GND4

J10 L5_DIFF_4.5/7/4.5_80ohm+ L5_DIFF_4.5/7/4.5_80ohm- X_H1X4_BLACK GND4_GND6

J16 L10_DIFF_4.5/7/4.5_80ohm+ L10_DIFF_4.5/7/4.5_80ohm- X_H1X4_BLACK GND9_GND11

J2 L12_DIFF_4.5/4/4.5_80ohm+ L12_DIFF_4.5/4/4.5_80ohm- X_H1X4_BLACK GND11

85 ohm

J36 L1_DIFF_4.5/4.5/4.5_85ohm+ L1_DIFF_4.5/4.5/4.5_85ohm- X_H1X4_BLACK GND2

J26 L3_DIFF_4/6.5/4_85ohm+ L3_DIFF_4/6.5/4_85ohm- X_H1X4_BLACK GND2_GND4

J11 L5_DIFF_4/6.5/4_85ohm+ L5_DIFF_4/6.5/4_85ohm- X_H1X4_BLACK GND4_GND6

J18 L10_DIFF_4/6.5/4_85ohm+ L10_DIFF_4/6.5/4_85ohm- X_H1X4_BLACK GND9_GND11

J7 L12_DIFF_4.5/4.5/4.5_85ohm+ L12_DIFF_4.5/4.5/4.5_85ohm- X_H1X4_BLACK GND11

88 ohm

J34 L1_DIFF_4.5/6/4.5_88ohm+ L1_DIFF_4.5/6/4.5_88ohm- X_H1X4_BLACK GND2

J23 L3_DIFF_3.5/4.5/3.5_88ohm+ L3_DIFF_3.5/4.5/3.5_88ohm- X_H1X4_BLACK GND2_GND4

J17 L10_DIFF_3.5/4.5/3.5_88ohm+ L10_DIFF_3.5/4.5/3.5_88ohm- X_H1X4_BLACK GND9_GND11

90 ohm

J33 L1_DIFF_4/6/4_90ohm+ L1_DIFF_4/6/4_90ohm- X_H1X4_BLACK GND2

J24 L3_DIFF_3.5/5.5/3.5_90ohm+ L3_DIFF_3.5/5.5/3.5_90ohm- X_H1X4_BLACK GND2_GND4

J8 L5_DIFF_3.5/5.5/3.5_90ohm+ L5_DIFF_3.5/5.5/3.5_90ohm- X_H1X4_BLACK GND4_GND6

J15 L10_DIFF_3.5/5.5/3.5_90ohm+ L10_DIFF_3.5/5.5/3.5_90ohm- X_H1X4_BLACK GND9_GND11

J5 L12_DIFF_4/6/4_90ohm+ L12_DIFF_4/6/4_90ohm- X_H1X4_BLACK GND11

100 ohm

J32 L1_DIFF_3.5/7.5/3.5_100ohm+ L1_DIFF_3.5/7.5/3.5_100ohm- X_H1X4_BLACK GND2

J22 L3_DIFF_3/10/3_100ohm+ L3_DIFF_3/10/3_100ohm- X_H1X4_BLACK GND2_GND4

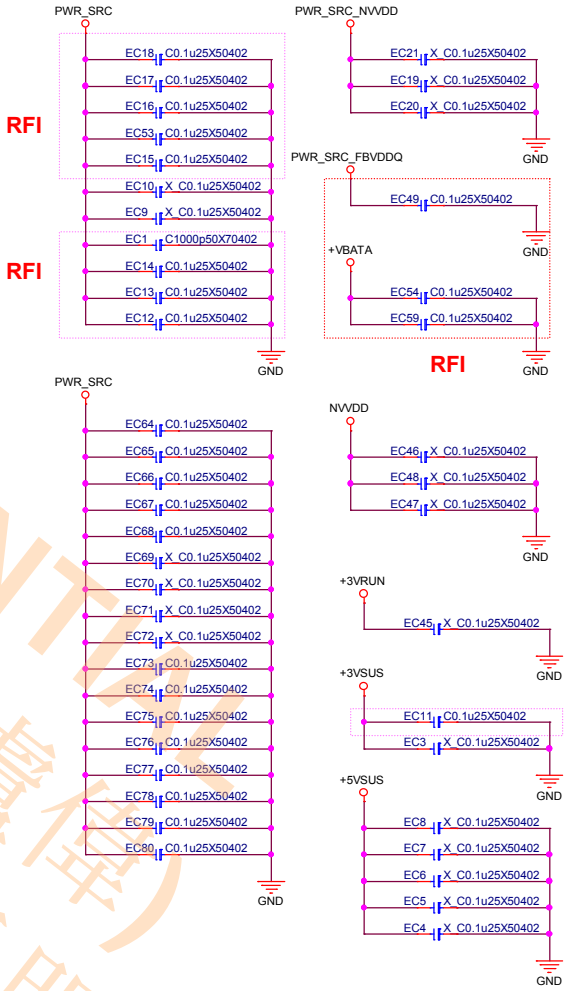
J6 L5_DIFF_3/10/3_100ohm+ L5_DIFF_3/10/3_100ohm- X_H1X4_BLACK GND4_GND6

J19 L10_DIFF_3/10/3_100ohm+ L10_DIFF_3/10/3_100ohm- X_H1X4_BLACK GND9_GND11

J3 L12_DIFF_3.5/7.5/3.5_100ohm+ L12_DIFF_3.5/7.5/3.5_100ohm- X_H1X4_BLACK GND11

CLAMP8 CLAMP7 CLAMP6 CLAMP5 CLAMP4 CLAMP3 CLAMP2 CLAMP1 GND E21-5801010-RH

EMI



Intel CONFIDENTIAL Weilu(魏隆) 6000121 RD(CV)2016071140328(陈代伟(60161839))

MICRO-STAR INT'L CO.,LTD.		
Title: EMI/ Impedence		
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CPU/GPU Holes

MCPU4 H_R200D150 — GND X_CPU_HOLE
MCPU2 H_R200D150 — GND X_CPU_HOLE
MCPU3 H_R200D150 — GND X_CPU_HOLE
MCPU1 H_R200D150 — GND X_CPU_HOLE
MGPU4 H_R276D169_PB — GND X_CPU_HOLE
MGPU3 H_R276D169_PB — GND X_CPU_HOLE
MGPU2 H_R276D169_PB — GND X_CPU_HOLE
MGPU1 H_R276D169_PB — GND X_CPU_HOLE

EMI

SPRING2 HS-MS-1721 — GND E2M-7213211-CA7 ATE_C006_106
SPRING3 HS-MS1058 — GND E2M-2142011-CA7 ATE_C006_106
SPRING1 HS-MS-1029 — GND E23-1029060-CA7 ATE_C006_106

RUBBER1 E2Y-6H20713-Y40 RUBBER
BRACKET1 307-6H20111-C22 CPU_BRACKET
RUBBER2 E2Y-6H21312-Y40 RUBBER
BRACKET2 307-6H20111-C22 CPU_BRACKET
RUBBER3 E2Y-6H21312-Y40 RUBBER
BRACKET3 307-6H20211-C22 GPU_BRACKET

MYLAR1 E2P-6H22111-Y42 X_MYLAR
MYLAR2 E2P-6H24211-Y42 MYLAR
MYLAR3 E2P-6H22711-Y42 MYLAR
MYLAR4 E2P-6H23011-Y42 GPU MYLAR
MYLAR5 E2P-6H23111-Y42 GPU MYLAR
MYLAR6 E2P-6G13911-Y42 MYLAR

M1 X_H_R197D118_PT_V3 H_R197D118_PT_V3 — GND
M8 X_H_R197D118_PT_V3 H_R197D118_PT_V3 — GND

FM1 X_F_PAD_X
FM2 X_F_PAD_X
FM3 X_F_PAD_X
FM4 X_F_PAD_X
FM5 X_F_PAD_X
FM6 X_F_PAD_X
FM7 X_F_PAD_X
FM8 X_F_PAD_X

UME1 HDMI Lable — HDMI ROYALTY Y01-RHDMI03-000
UME2 BIOS Lable — BIOS_LABEL G51-LA01678-A09

PCB1 PF0-16H7112-H73
PF0-16H7112-H73
Hannstar: PF0-16H7112-H73
TRIPOD: PF0-16H7112-T53

SSD Stand off

SSD 1
MH2 H_R220D146_PTB E2B-16H2020 — GND

SSD 2
MH1 H_R220D146_PTB E2B-16H2020 — GND

MH4 H_R197D91 X_ME_ SCREW HOLE — GND

MH3 NPTH157 X_NPTH157

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6000121403 (6001083)
(客戶服務保留)

MICRO-STAR INT'L CO.,LTD.

Title	Screw/ME	
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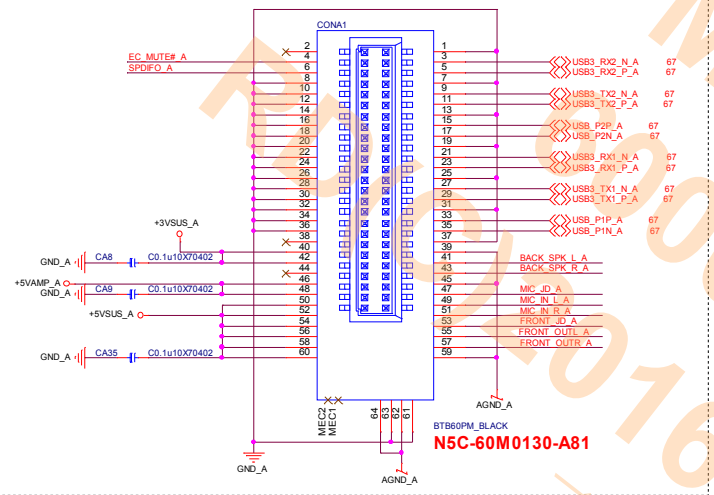
16H7-A Board (Audio CONN)

BTB Connector From MB

CONN Pin Current Capability : 0.5A/Pin

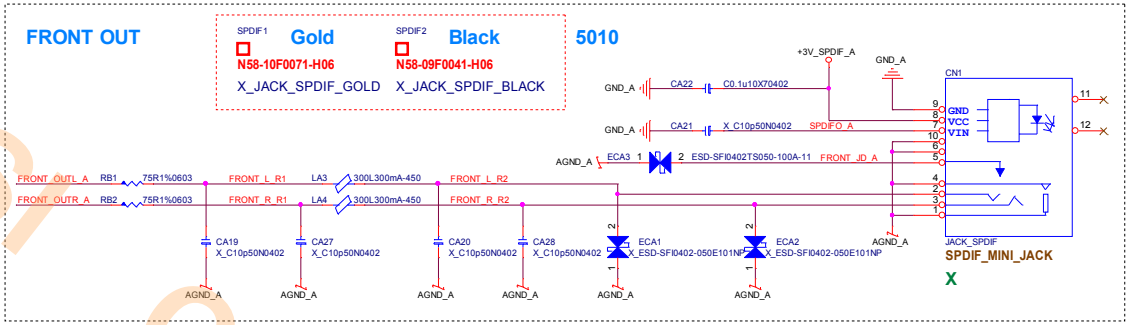


FRONT OUT

SPDIF1 Gold N58-10F0071-H06 X_JACK_SPDIF_GOLD

SPDIF2 Black N58-09F0041-H06 X_JACK_SPDIF_BLACK

5010

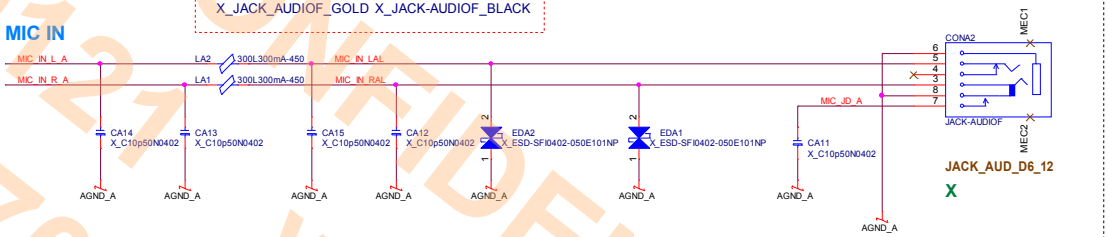


MIC IN

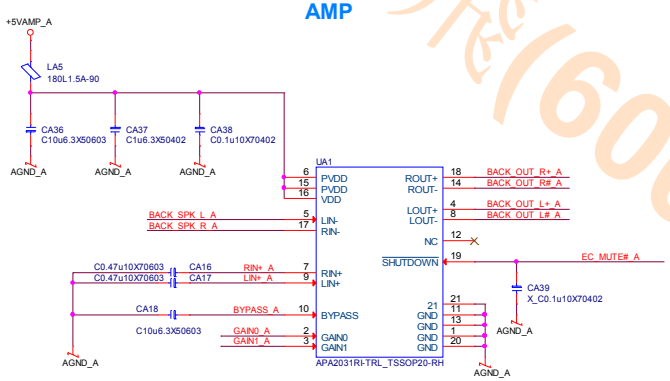
MIC1 Gold N54-06F1191-H06 X_JACK_AUDIOF_GOLD

MIC2 Black N54-06F0481-H06 X_JACK-AUDIOF_BLACK

5010

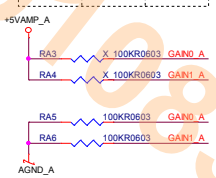


AMP

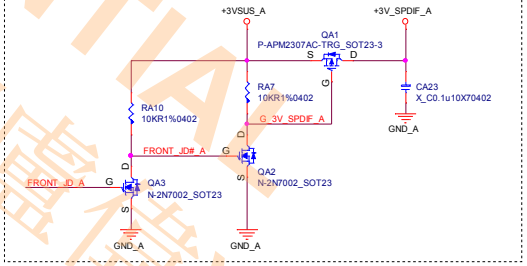


For APA2031

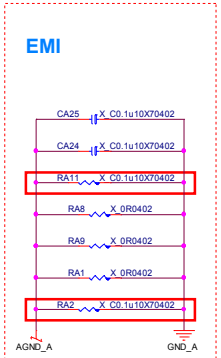
Av	GAIN0	GAIN1
6dB	0	0
10dB	0	1
15.6dB	1	0
21.6dB	1	1
4.3dB	X	X



SPDIF Power



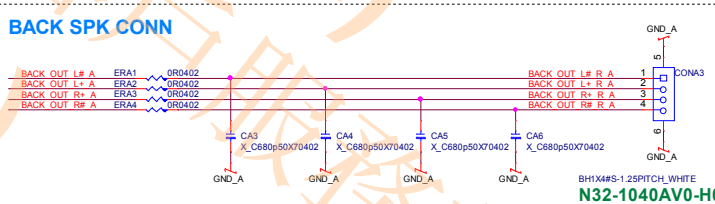
EMI



Change to Cap

Change to Cap

BACK SPK CONN



MSI CONFIDENTIAL weilu(卫璐) R20001211 2016070710403 徐飞(60019839) 研发部

MICRO-STAR INT'L CO.,LTD.

Title: [A] Audio

Size: Document Number: MS-16H7 Rev: 1.2

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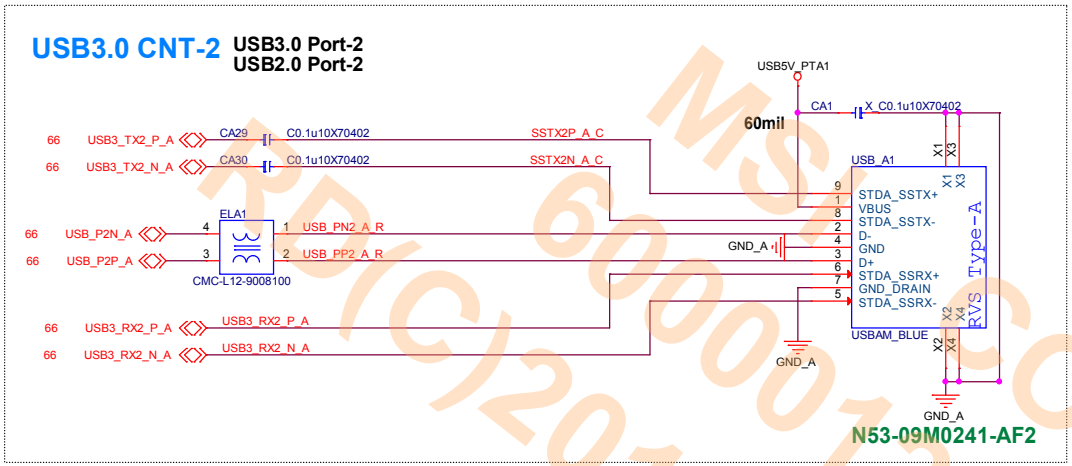
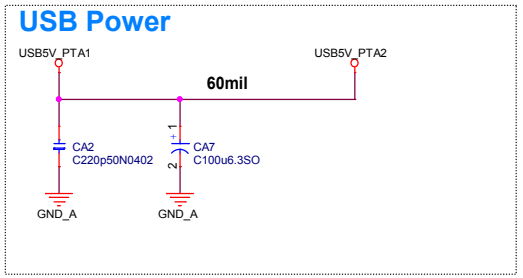
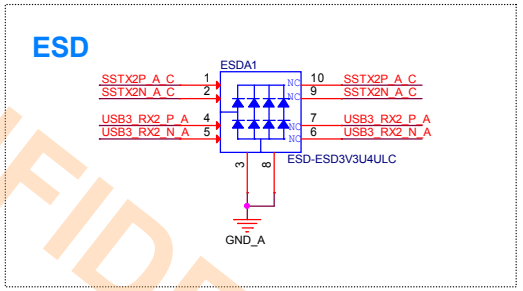
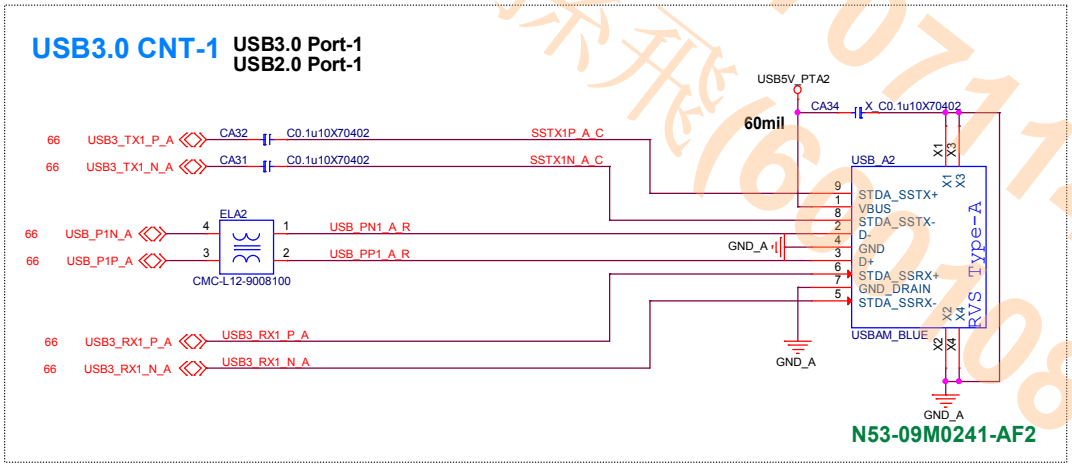
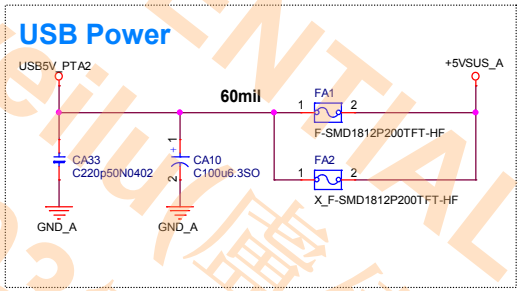
[A] USB3.0 CNT-2/-3

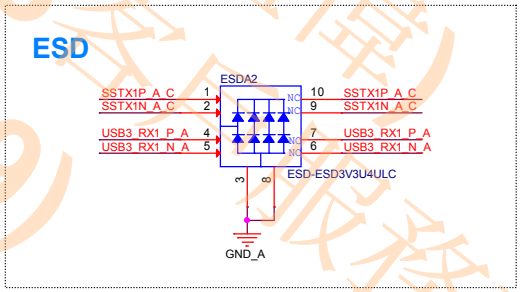


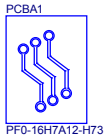












PF0-16H7A12-H73
Hannstar: PF0-16H7A12-H73
TRIPOD: PF0-16H7A12-T53

MYLARA1	MYLARA2
E2P-6H22812-G40	E2P-6H22311-G40
MYLAR	MYLAR

MICRO-STAR INT'L CO.,LTD.

Title: [A] USB3.0 CNT-3/-4

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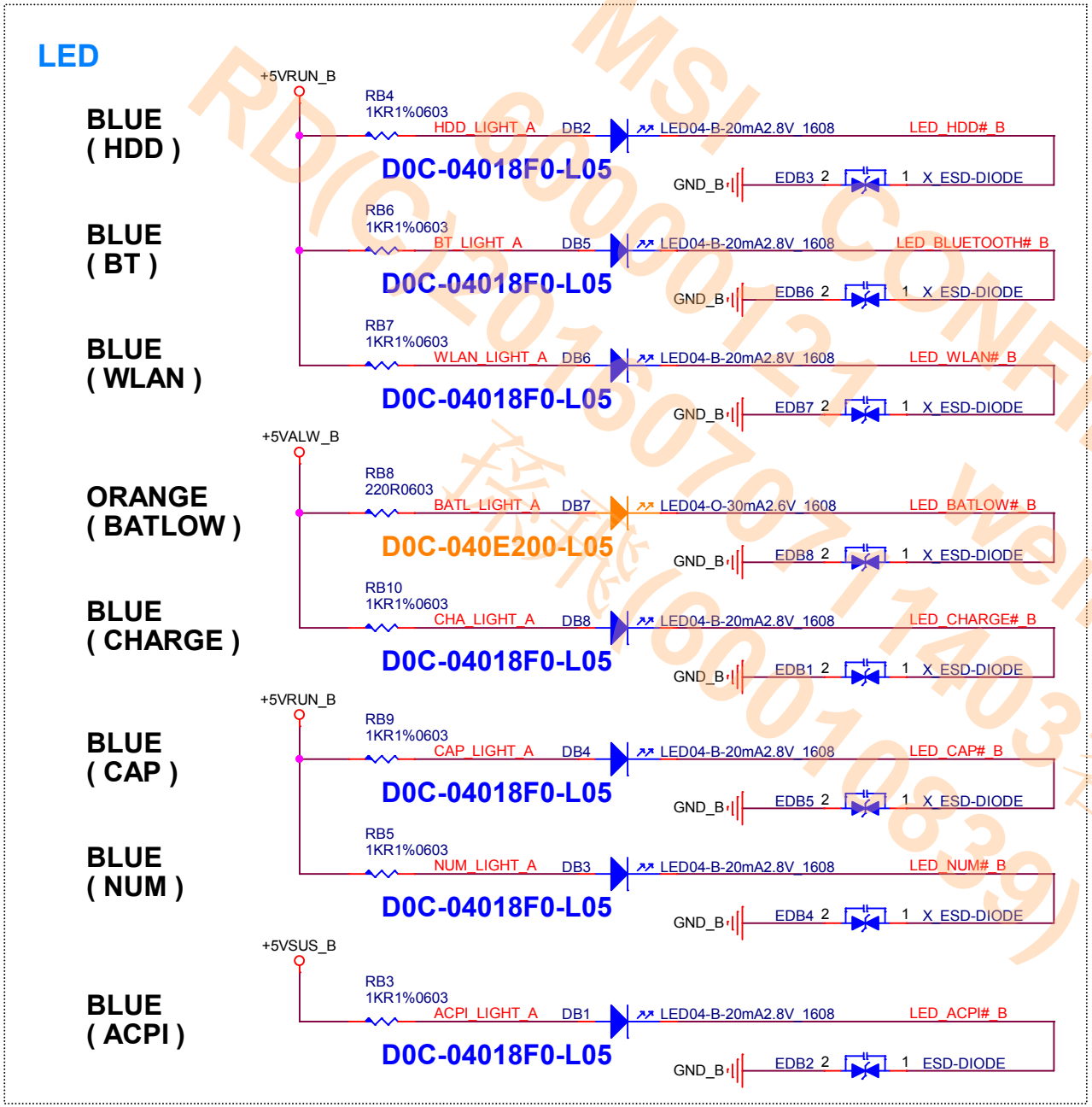
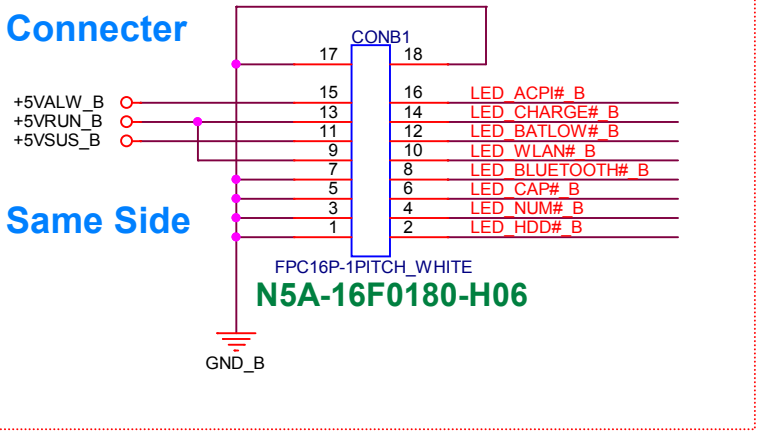
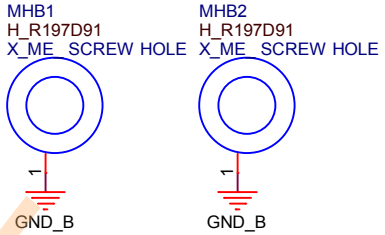
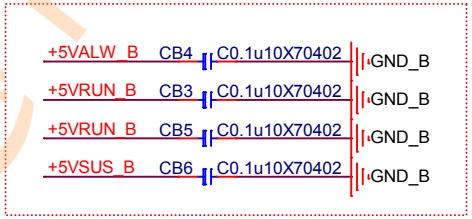
RD(C)20160707(1403)(60000121)
weibu(微步)
深圳(66210839)

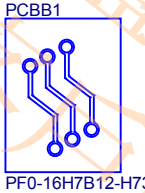
16H7-B Board (LED Board)











PF0-16H7B12-H73

Hannstar: PF0-16H7B11-H73
TRIPOD: PF0-16H7B11-T53

MSI	MICRO-STAR INT'L CO.,LTD.		
Title	LED Board		
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RD(2015071403)
weilu(6601839)

16H7-C Board (Power SW Board)

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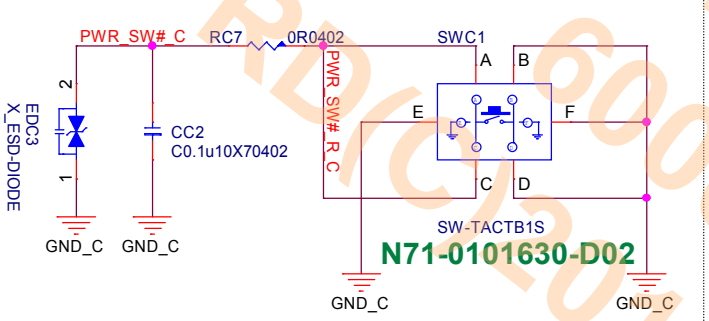
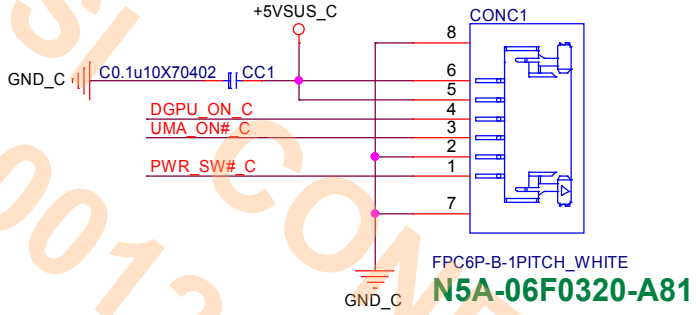
RD(C)2016070711403(客户服务部)
600001210 weiru(魏儒) 18001083

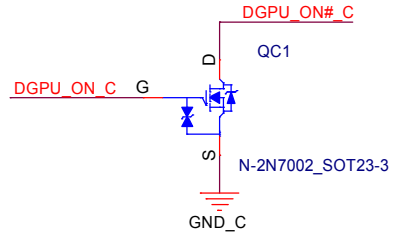
Power Switch



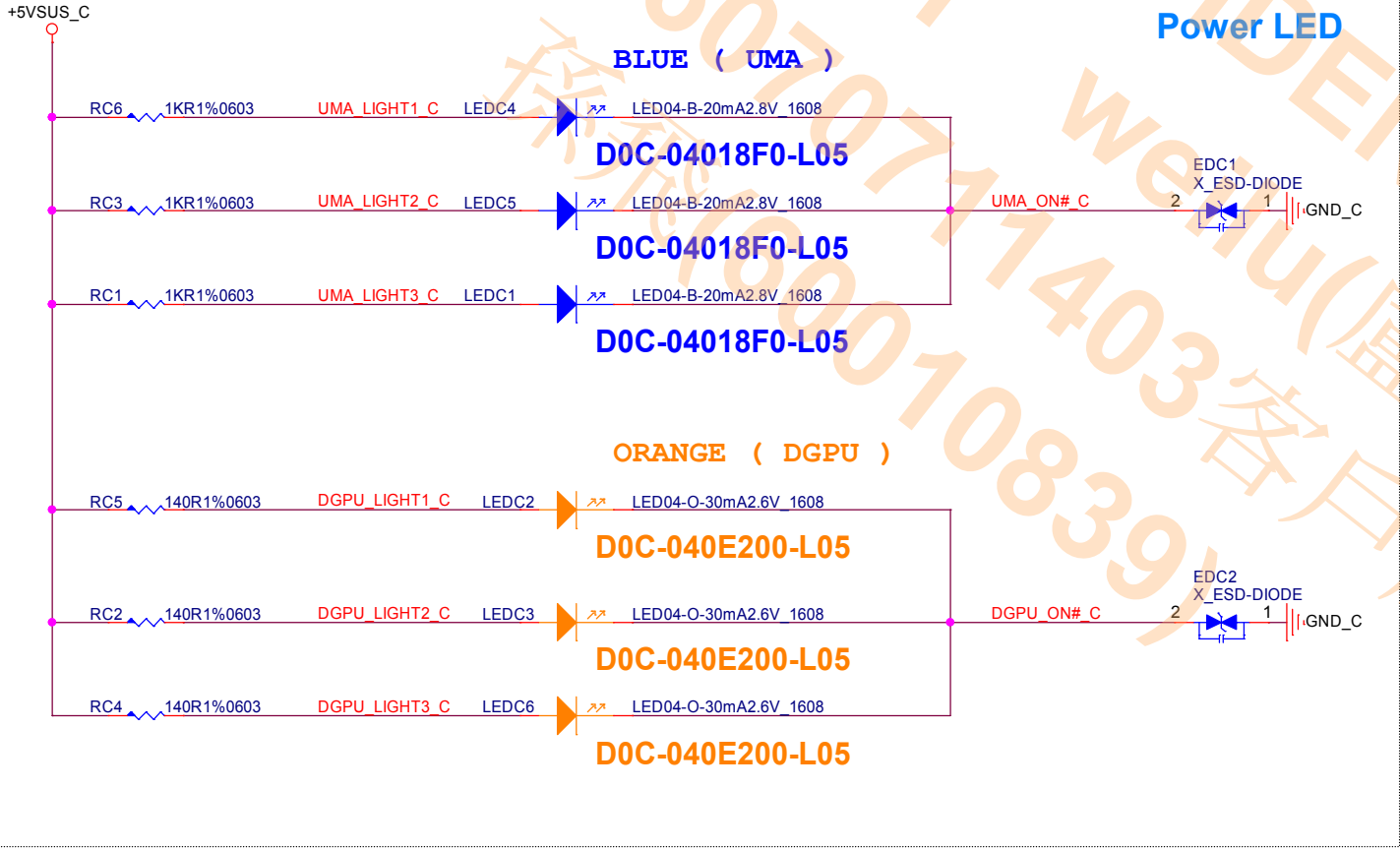
Diff Side Connecter

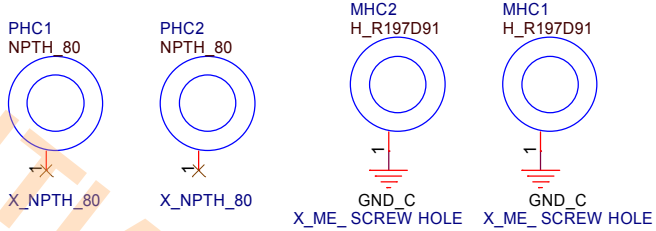


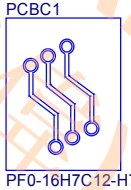
DGPU Logic



Power LED







PF0-16H7C12-H73

Hannstar: PF0-16H7C12-H73
TRIPOD: PF0-16H7C12-T53

MICRO-STAR INT'L CO.,LTD.		
Title: Power SW Board		
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MS-16H7 DGPU POWER SEQUENCE

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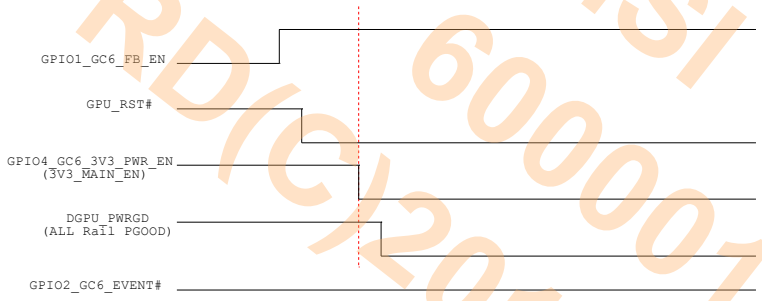
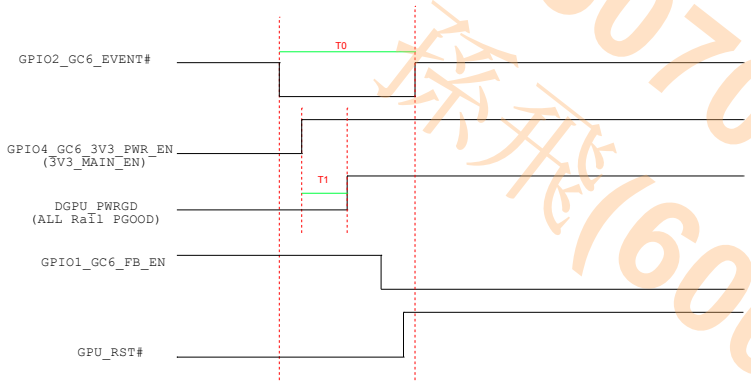
6000012121
RD(C)20160707114O3客戶服務部
徐飛(60010839)
Weifu(魏偉)

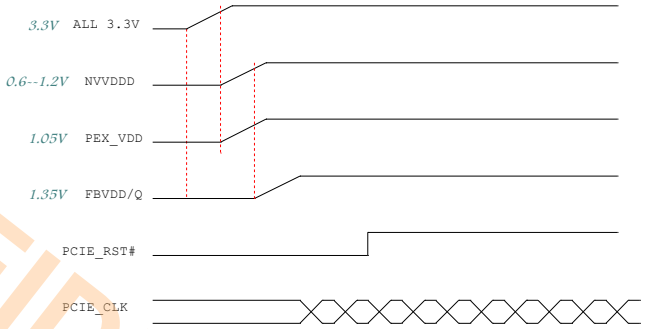
GC6 2.0 ENTRY SEQUENCE



GC6 2.0 EXIT SEQUENCE



GPU POWER ON SEQUENCE



NOTES:

1. The ramp time for any rail must be more than 40 us and is recommended to be less than 2ms.
2. The ramp up overshoot should not exceed the silicon reliability limit voltagr.
3. A VDD33 must ramp up to 90% before NVVDD and PEX_VDD in sequence can ramping up.
   NVVDD must ramp up to 90% before FBVDD/Q in sequence can ramping up.
3. No signal should be applied to the GPU before the power rails are fully ramped.
4. Refer to JEDEC Memory Specification for memory related power sequencing.

GC6 2.0 TIMING

	Min	Max	Unit	Description
T0	0.001	N/A	mS	GPU_EVENT# assertion
T1	0.04	4	mS	3V3_MAIN_EN assertion to all power rails up and stable

NOTES:

1. ALL RailPGOOD=1 represents all GPU power rails are ramped up and in regulation.
   If any GPU power rail cannot ge guaranteed in regulation this state should equal to 0.
2. During GC6 exit, the order of power rail ramp-up must follow the Power up sequence described in Chapter 3 with the exception that FBVDD/Q stays on.
3. All delays should be minimized to increase time spent in GC6 for maximum power saving.
4. The entire entry and exit sequence must complete within 200 ms.

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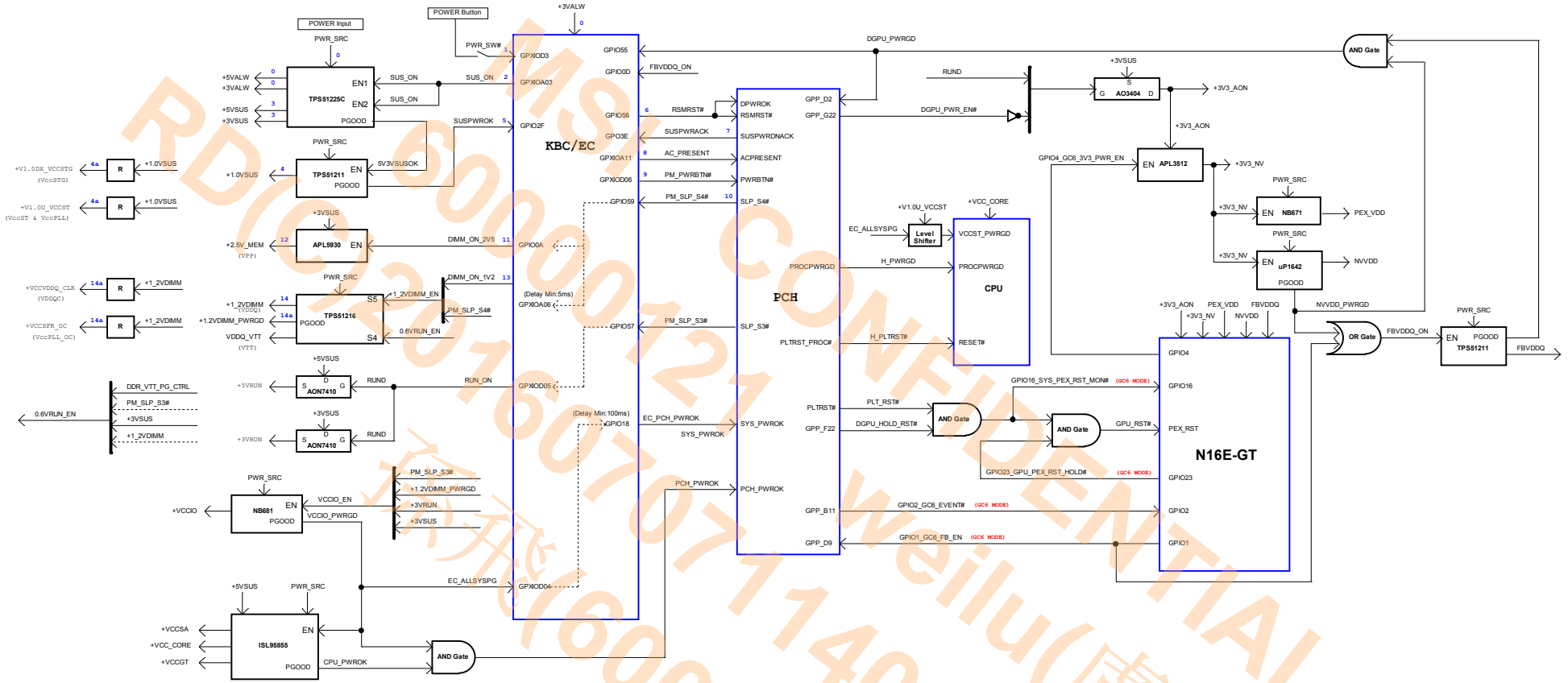
MS-16H7 Power On Block Diagram



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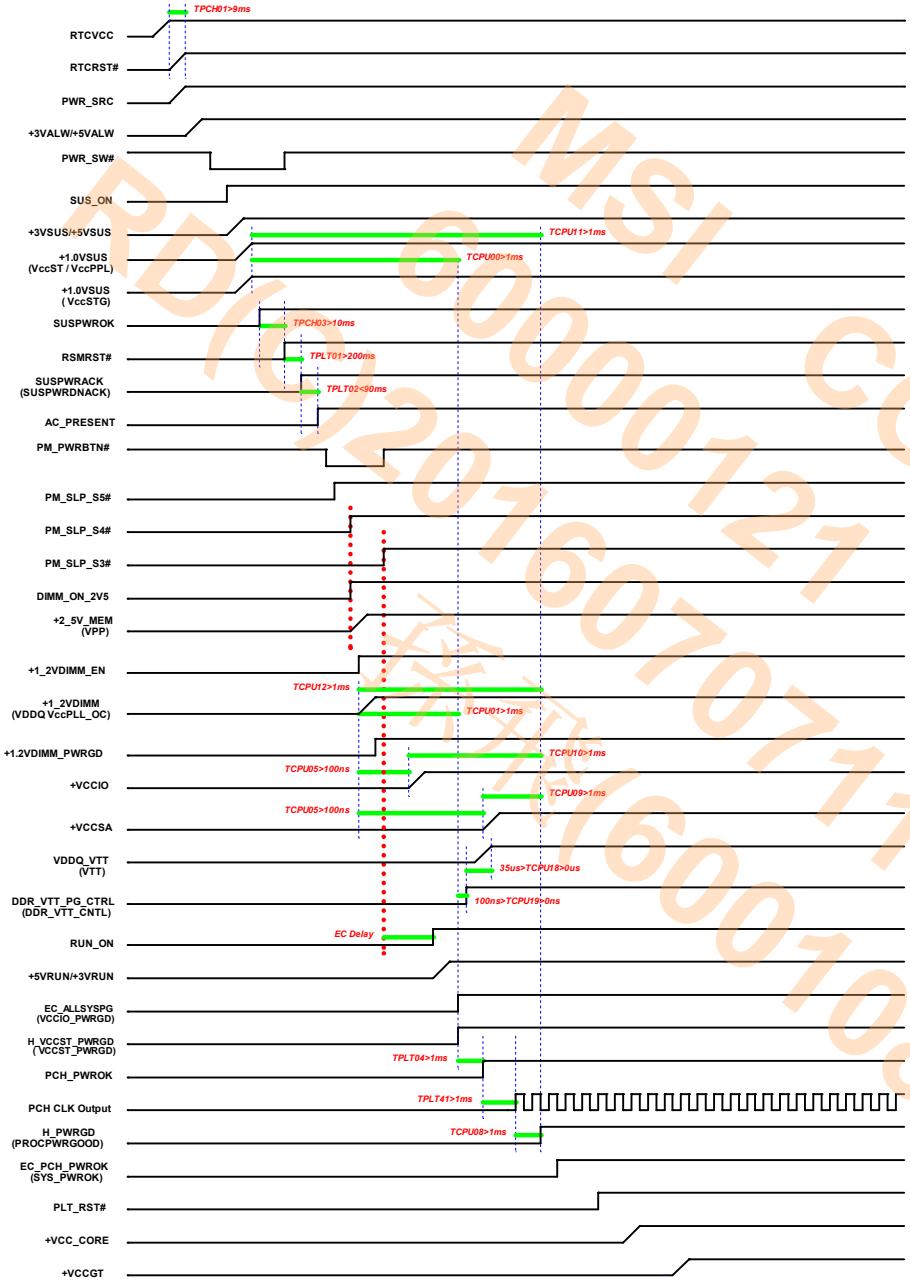
Power On Sequence

G3 -> S0



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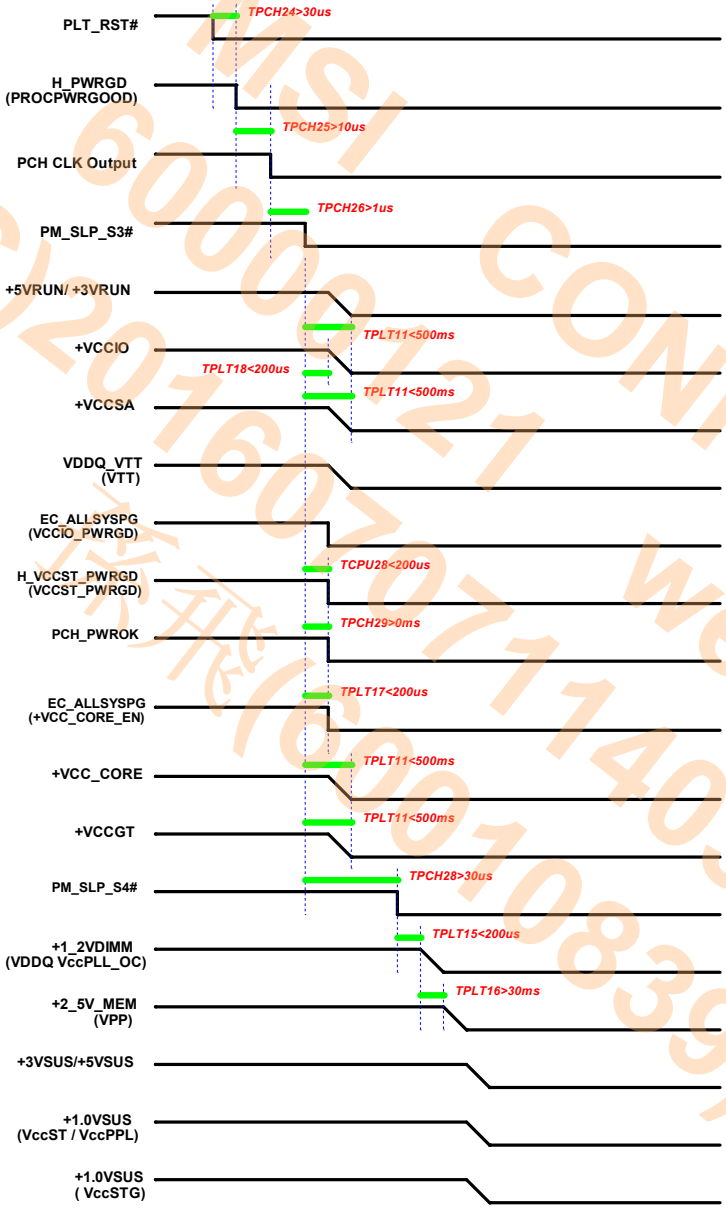
Power Down Sequence

S0 -> G3



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History

1.0: 2015/5/18

01. P55 DEL PC148
ADD PR264

02 P40 ADD R526
ADD R527
ADD R528
ADD R529

03 P41 DEL ESD3
DEL ESD4
DEL ESD5
ADD D4~D18

2015/5/22

01. P56 R220 to +3VSUS
R219 to +3VSUS

2015/5/25

01. P58 ADD U45
ADD R532
ADD C606

02. P63 ADD U44
ADD C604

03. P49 U1 PIN29 to GND

04. P58 ADD D19

05. P63 ADD D20

2015/5/25

01. P64 ADD EC64~EC68
ADD EC69~EC72

1.1: 2015/6/26

01. P31 ADD PR265
ADD PQ49

02 P40 ADD C916
ADD C917
ADD C918
ADD C919

03 P49 C183 0402---->0603
C184 0402---->0603
C186 0402---->0603
C189 0402---->0603

04 P55 PC132 0805----->1206

05 P64 ADD EC73~EC80

2015/7/2

01. P10 SOCKET2
DDR4_SODIMM260P_H4_2---->DDR4_SODIMM260P_H4_5

02 P44 ADD R271

2015/7/3

01. P41 ADD R530
ADD R531
ADD R533
DEL TPJNC50

1.2: 2015/9/1

01 P40 ADD C920
ADD C921
ADD C922

02 P41 ADD D21
ADD D22
ADD D23
ADD D24

C239 0603---->0402
C240 0603---->0402
C233 0603---->0402
C234 0603---->0402
C862 0603---->0402
C861 0603---->0402

03 P52 C877 1206---->0805

2015/9/2

01 P40 DEL C920
DEL C921
DEL C922

02 P52 ADD R534
ADD R535
ADD R536
ADD R537
ADD R538
ADD R539

DEL TPJNC27
DEL TPJNC27

2015/9/6

01 P34 Q26 PIN D1 ----> SUS_SMBCLK
Q26 PIN D2 ----> SUS_SMBDATA

02 P40 DEL J37

2015/9/6

01 P41 DEL TPJNC53
DEL R216
DEL R217

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