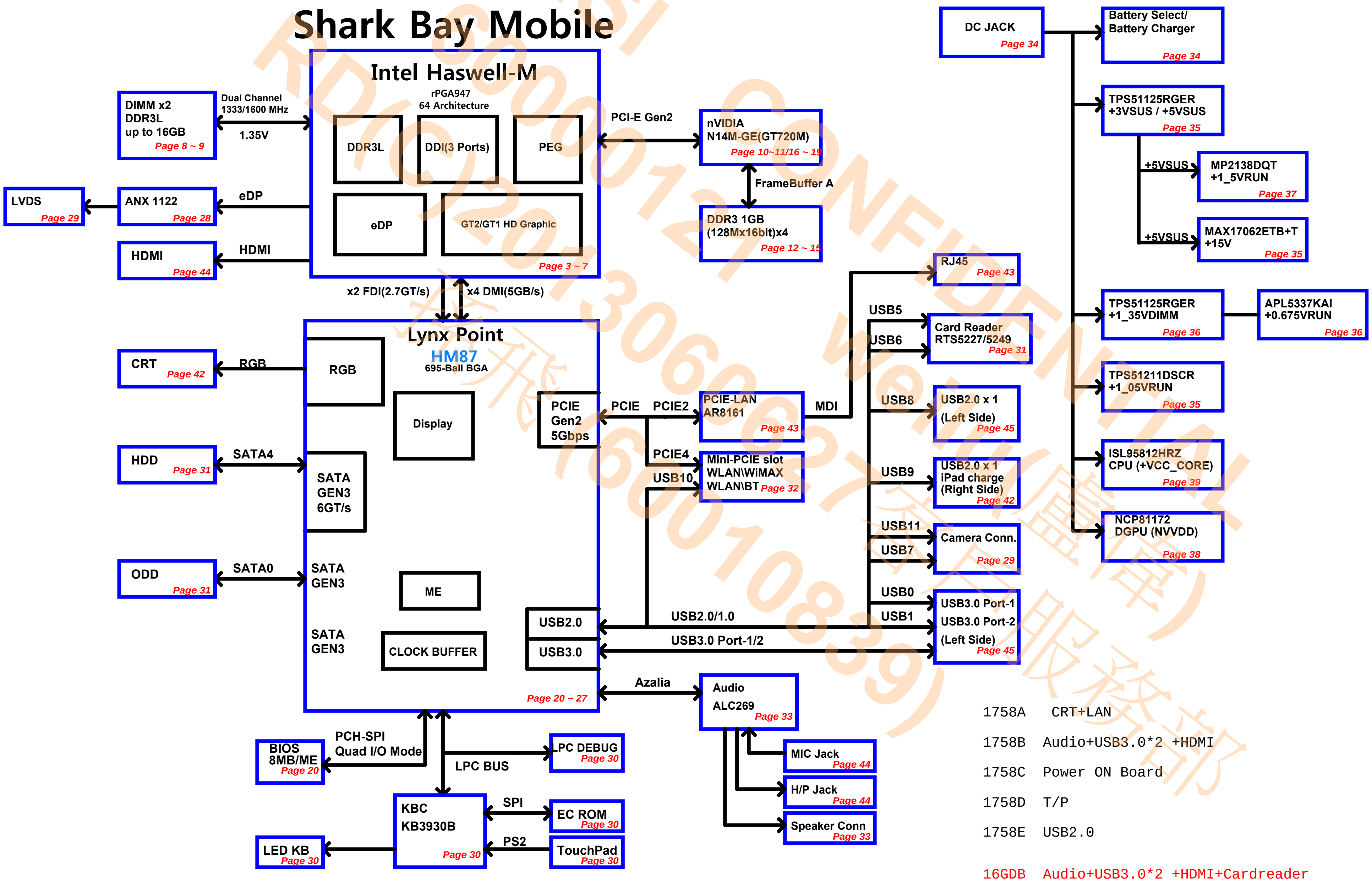
MS-16GD ver:0A



1758A CRT+LAN

1758B Audio+USB3.0*2 +HDMI

1758C Power ON Board

1758D T/P

1758E USB2.0

16GDB Audio+USB3.0*2 +HDMI+Cardreader

16GDD N/A

Title	Block Diagram
Size Custom / Document Number	MS-16GD
Rev	0B
Date:	Wednesday, April 03, 2013
Sheet	1 of 51

SCHEMATIC ANNOTATIONS AND BOARD INFORMATION

Voltage Rails

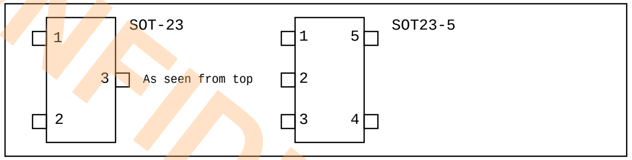
Voltage	Description	Control Signal
PWR_SRC	AC ADAPTER OR BATTERY IN	
+5VALW	5.0V always on power rail	PWR_SRC
+3VALW	3.3V always on power rail	PWR_SRC
+5VSUS	5.0V power rail	SUS_ON
+3VSUS	3.3V power rail	SUS_ON
+1_35VDIMM	1.35V DDR3L power rail (off in S4-S5)	PM_SLP_S4#
+0_675VRUN	0.675V DDR3L Termination voltage (off in S3-S5)	PM_SLP_S3#
+5VRUN	5.0V switched power rail (off in S3-S5)	PM_SLP_S3#
+3VRUN	3.3V switched power rail (off in S3-S5 / M0)	PM_SLP_S3#
+1_5VRUN	1.5V switched power rail (off in S3-S5)	PM_SLP_S3#
+VCC_CORE	1.2V Core Voltage for Processor	VR_ON
+1_05VRUN	1.05V rail for Processor	PM_SLP_S3#
NVVDD	0.6~1.2V(VBoot:0.9V)Core Voltage for nVIDIA N14E-GE DGPU	GPIO11_GPUVID
+3V3_NV	3.3V PEX power rail (off in Optimus OFF)	DGPU_PWR_EN#
FBVDDQ	1.35V FB / GDDR5 power rail (off in Optimus OFF)	GPU_PWRGD
PEX_VDD	1.05V PLL power rail (off in Optimus OFF)	GPU_PWRGD

Net Naming Conventions

Suffix
= Active Low Signal

Prefix
H = Host
M = DDR Memory
TP = Test Point (does not connect anywhere else)

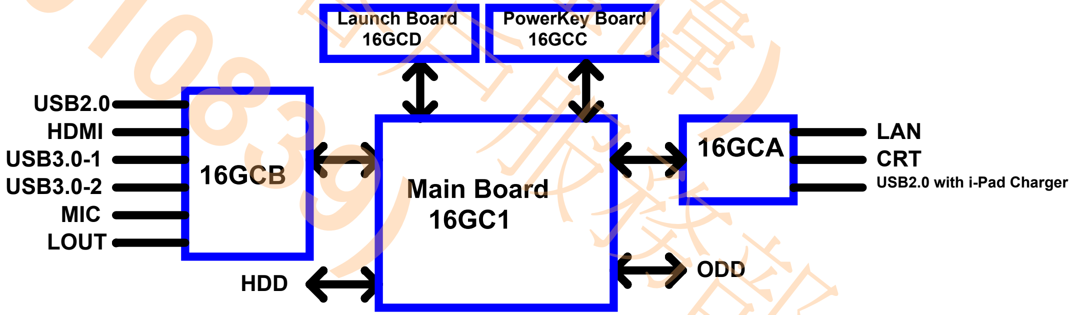
PCB Footprints



POWER STATES

STATE \ SIGNAL	SLP_S3#	SLP_S4#	SLP_S5#	+V*ALW	+*VSUS	+*VRUN	Clocks
S0(Full ON)	HIGH	HIGH	HIGH	ON	ON	ON	ON
S3(Suspend to RAM)	LOW	HIGH	HIGH	ON	ON	OFF	OFF
S4(Suspend to Disk)	LOW	LOW	HIGH	ON	OFF	OFF	OFF
S5 (Soft OFF)	LOW	LOW	LOW	ON	OFF	OFF	OFF

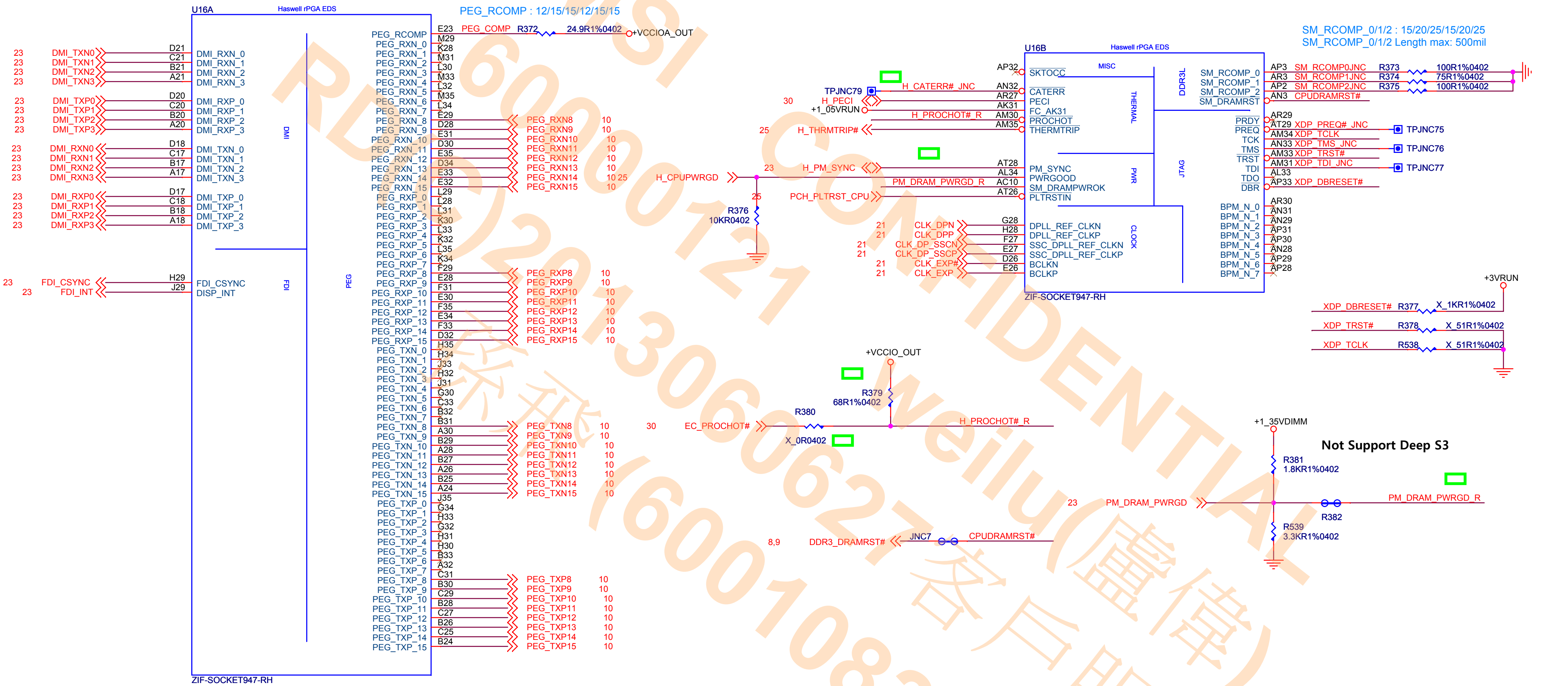
Note : WHEN AC MODE , System turn on then +V*SUS will always keep high



Title	Platform	
Size Custom	Document Number MS-16GD	Rev 0B
Date: Wednesday, April 03, 2013	Sheet 2 of 51	

Haswell (DMI,PEG,FDI)

Haswell (CLK,MISC,JTAG)

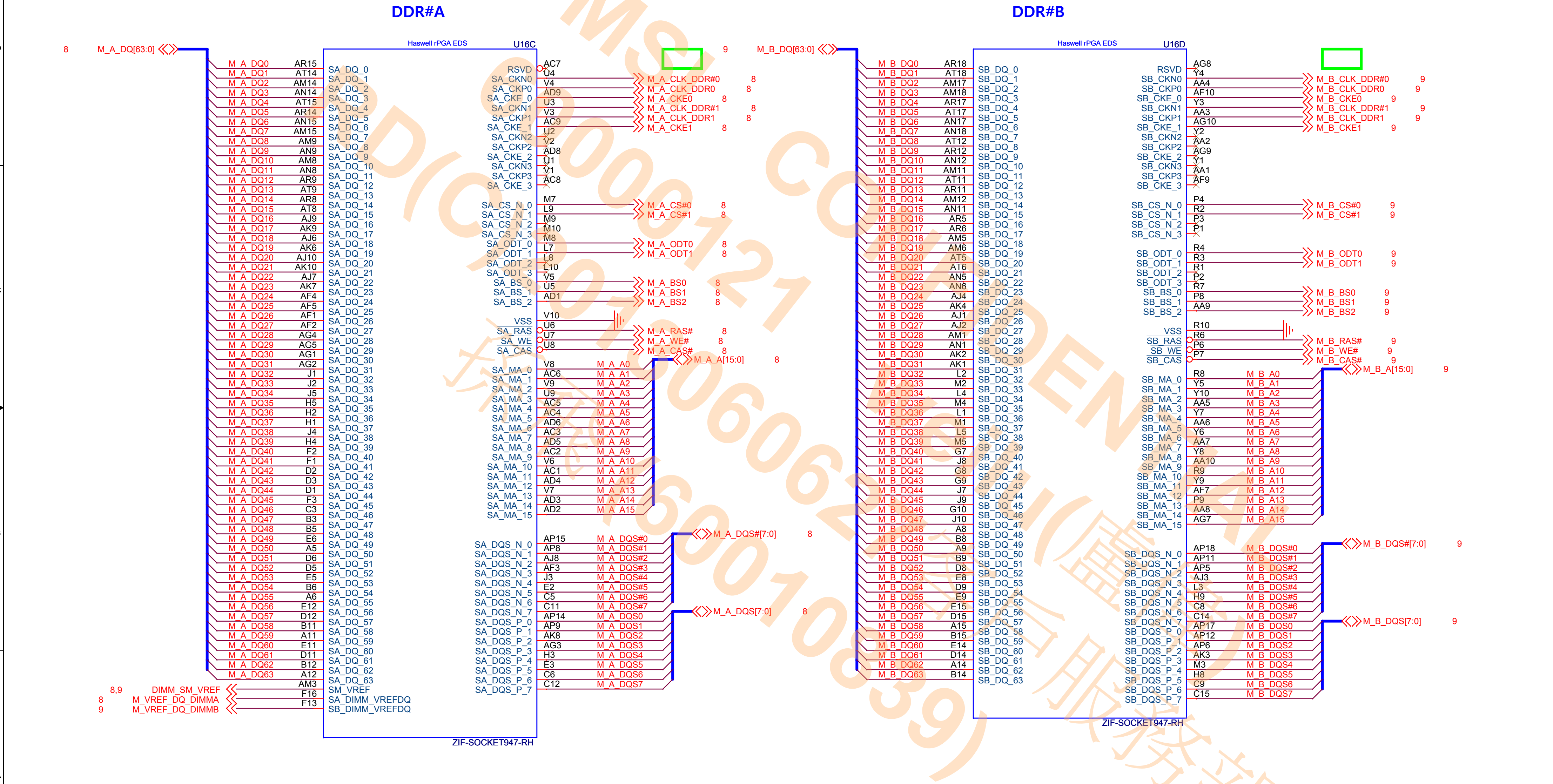


Title
CPU-1 (Host Bus)

Size	Document Number	Rev
Custom	MS-16GD	0B

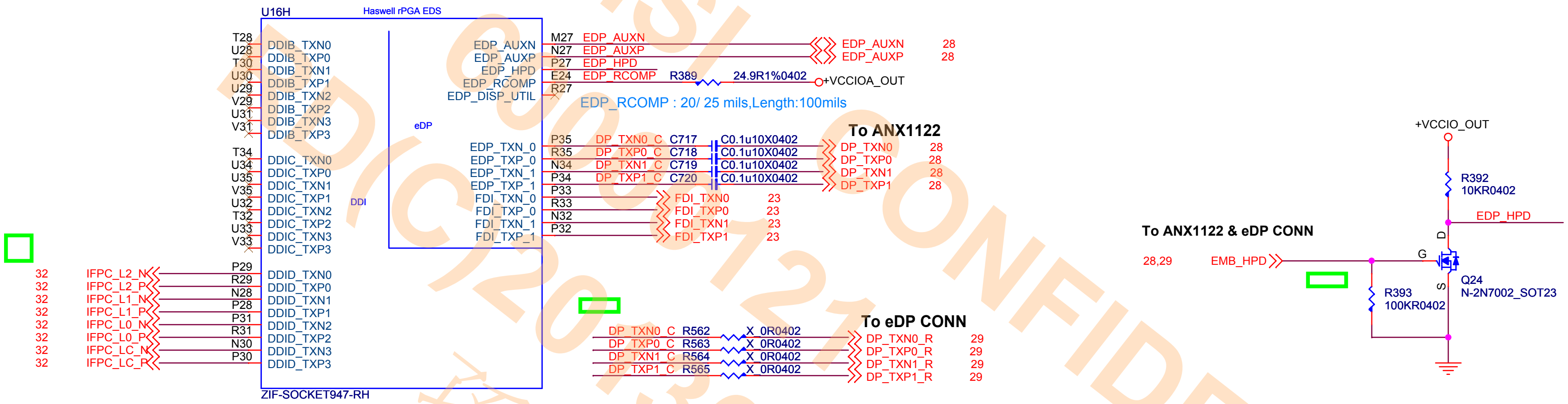
Date: Wednesday, April 03, 2013 Sheet 3 of 51

Haswell (DDR3L)

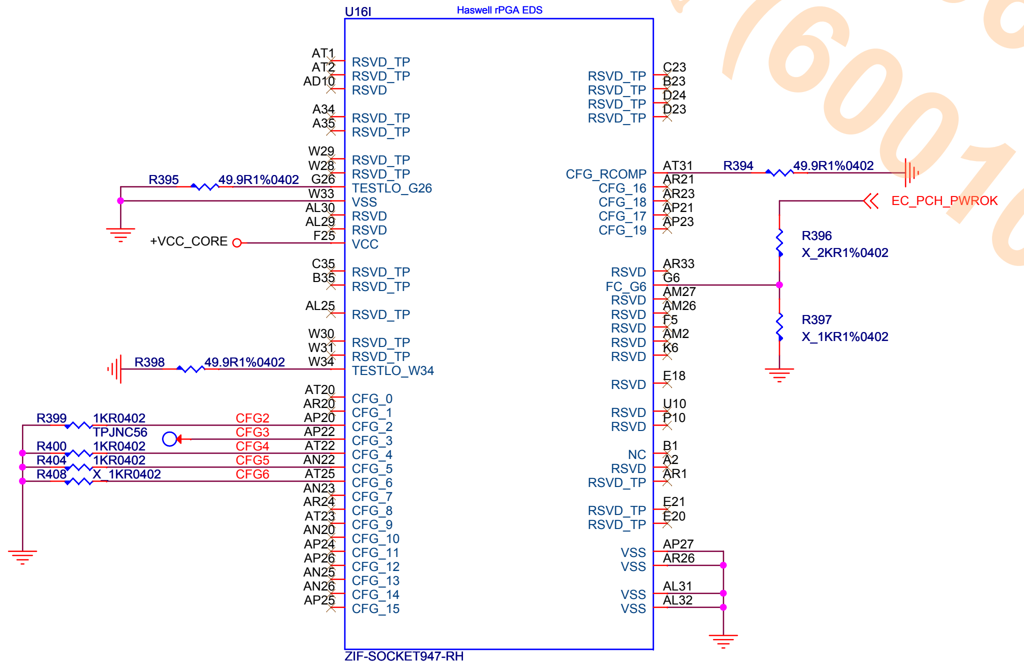


Title	CPU-2 (DDR3L)	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 4 of 51	

Haswell (Display)



Haswell (Reserved)



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

MSR Privacy Bit Feature	
CFG3	1 = Debug capability is determined by IA32_Debug_Interface_MSR (0xC80) bit[0] setting 0 = IA32_Debug_Interface_MSR (0xC80) bit[0] default setting overridden

eDP enable	
CFG4	1 = Disabled 0 = Enabled

PCI Express* Bifurcation	
CFG[5:6]	00 = 1 x8, 2 x4 PCI Express 01 = reserved 10 = 2 x8 PCI Express 11 = 1 x16 PCI Express

PEG DEFER TRAINING	
CFG7	1: (Default) PEG Train immediately following xxRESETB de assertion 0: PEG Wait for BIOS for training

Title	CPU-3 (Display/Reserved)	
Size: Custom	Document Number: MS-16GD	Rev: 0B
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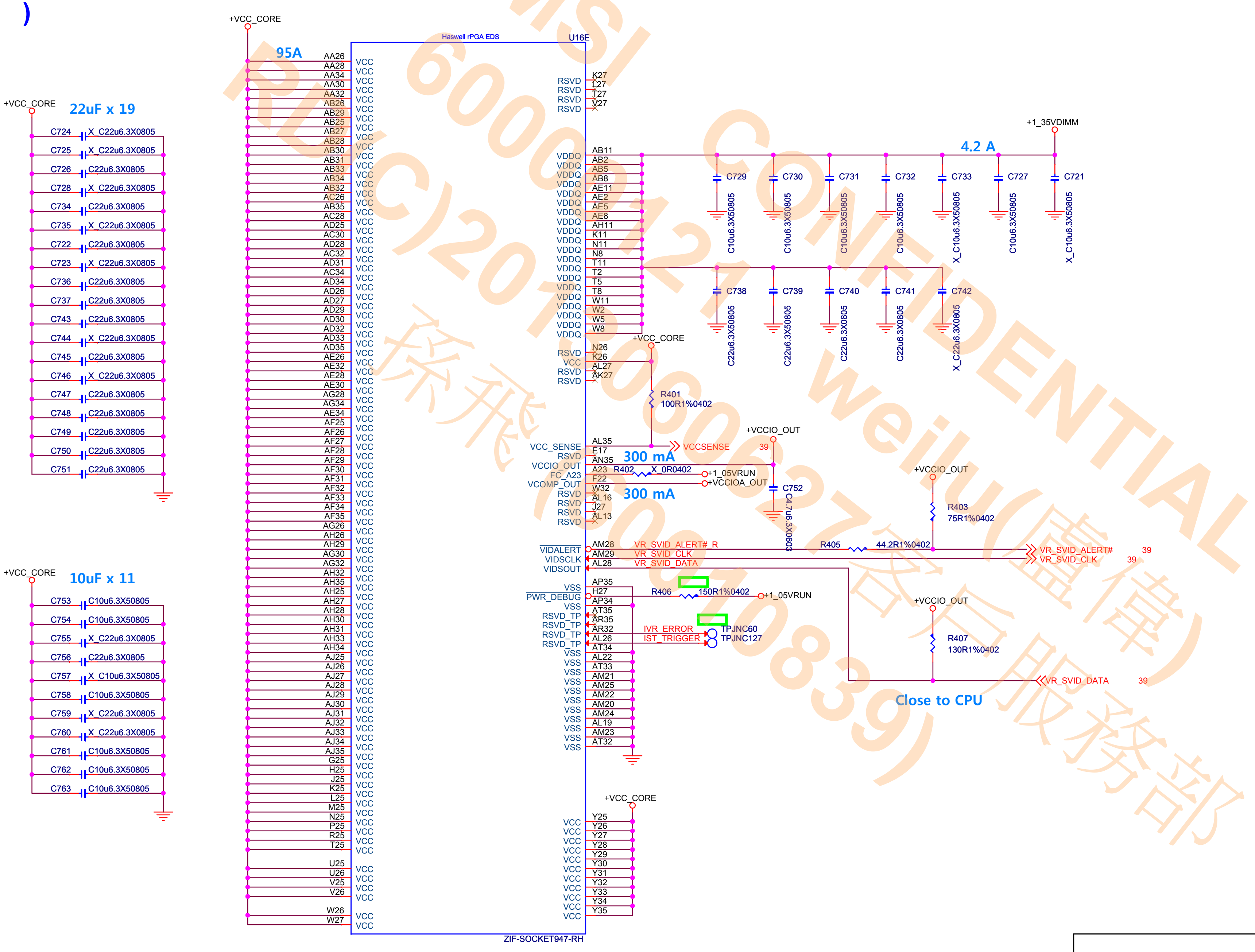
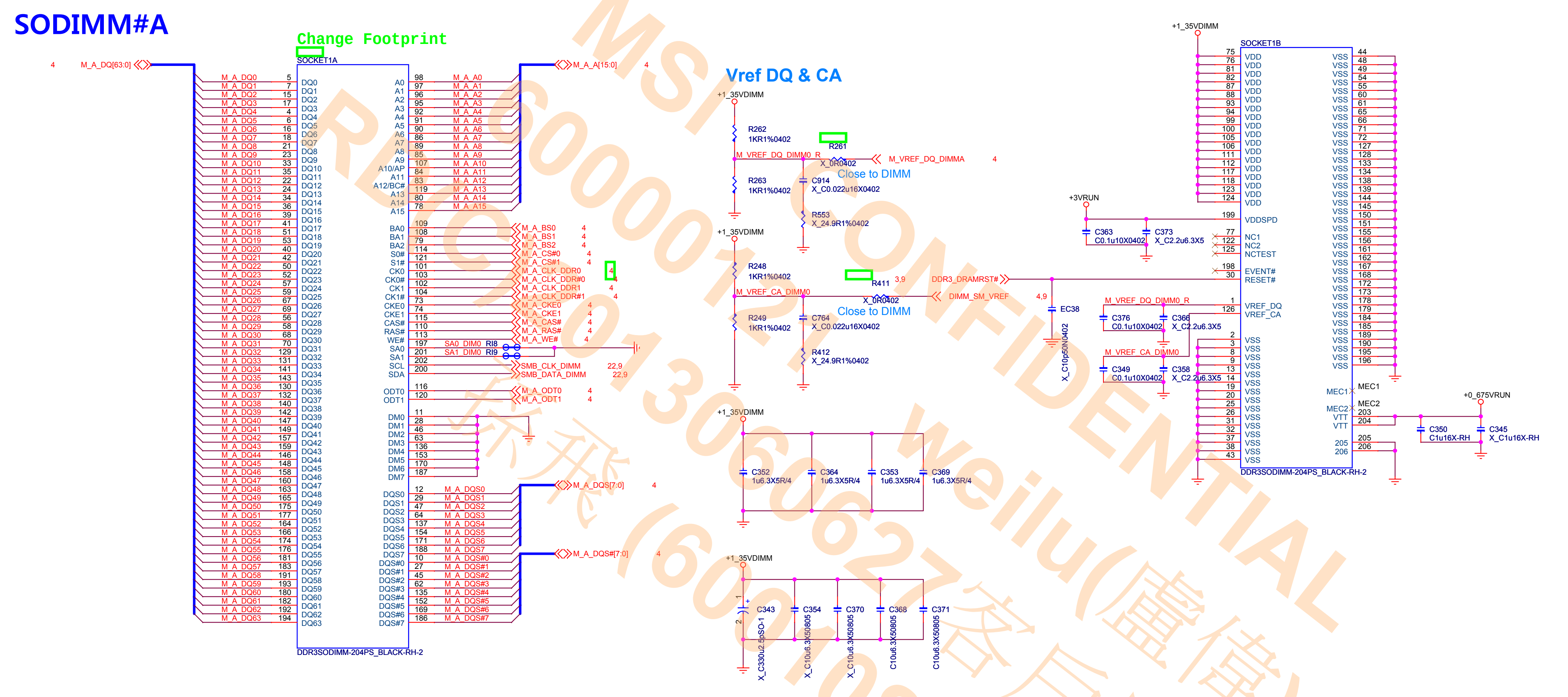
Haswell (POWER)



Title	CPU-4 (Power)	
Size Custom	Document Number MS-16GD	Rev 0B
Date: Wednesday, April 03, 2013	Sheet 6 of 51	

Haswell (GND)

Title	CPU-5 (GND)	
Size Custom	Document Number MS-16GD	Rev 0B
Date: Wednesday, April 03, 2013	Sheet 7 of 51	



Title: DDR3L SODIMM 0

Size: Custom | Document Number: MS-16GD | Rev: 0B

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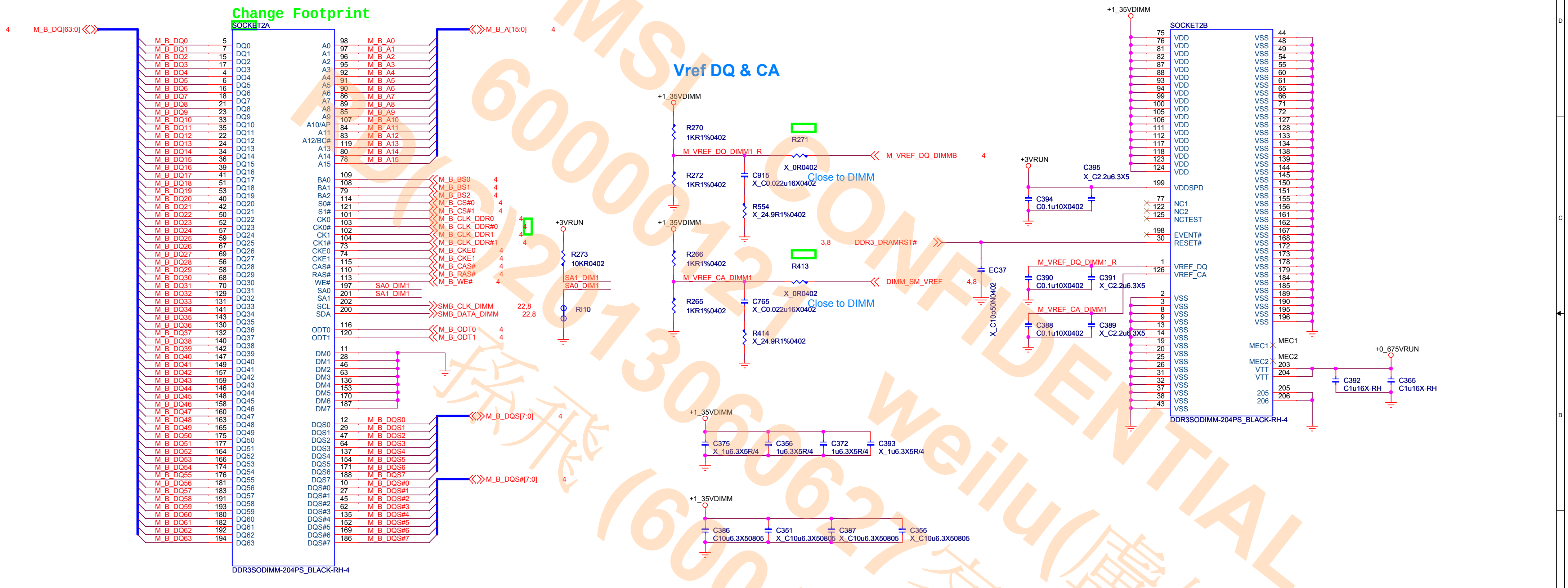
SODIMM#B



Title	DDR3L SODIMM 1
Size: Custom	Document Number: MS-16GD
Rev	0B
Date:	Wednesday, April 03, 2013
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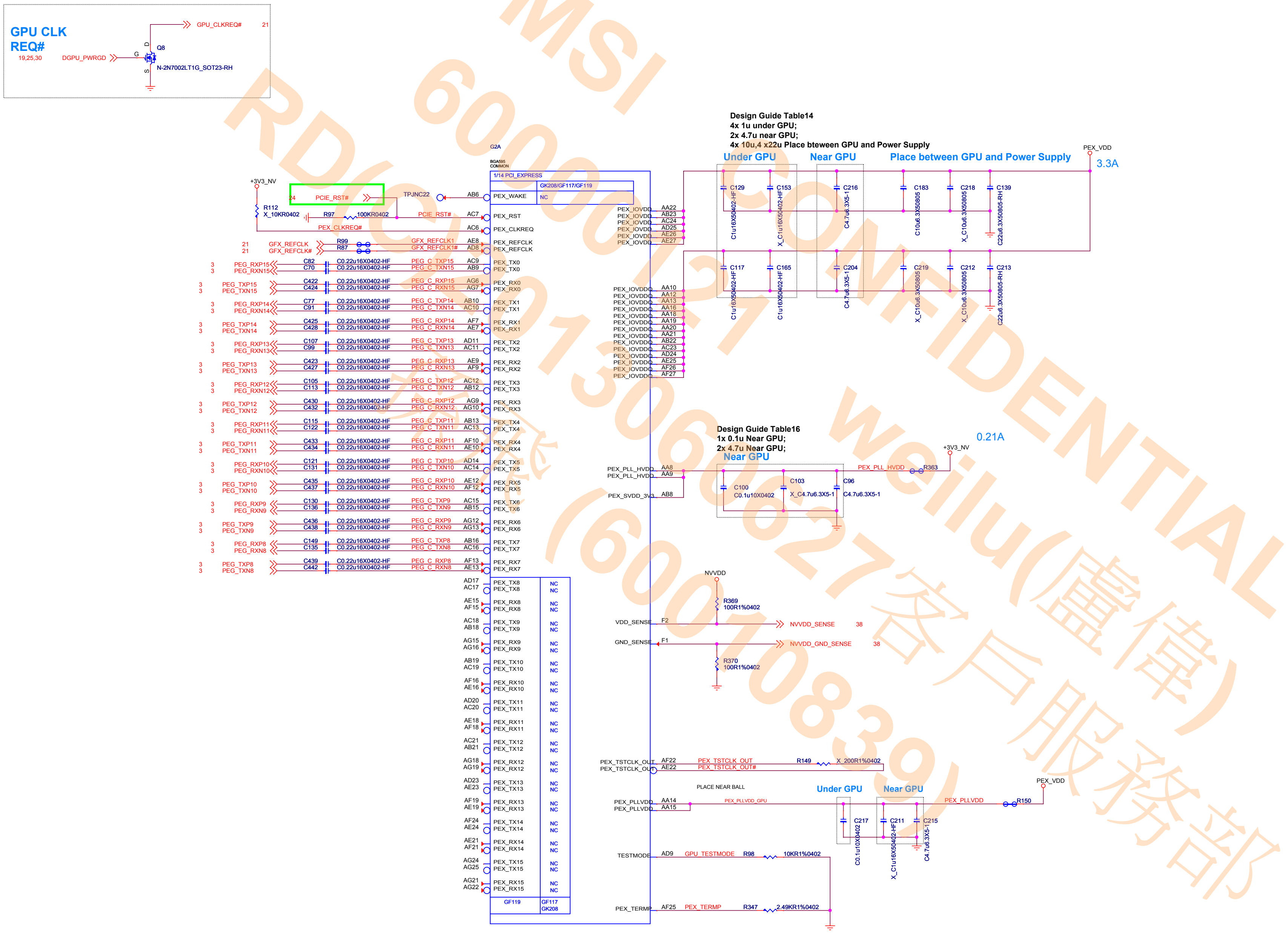
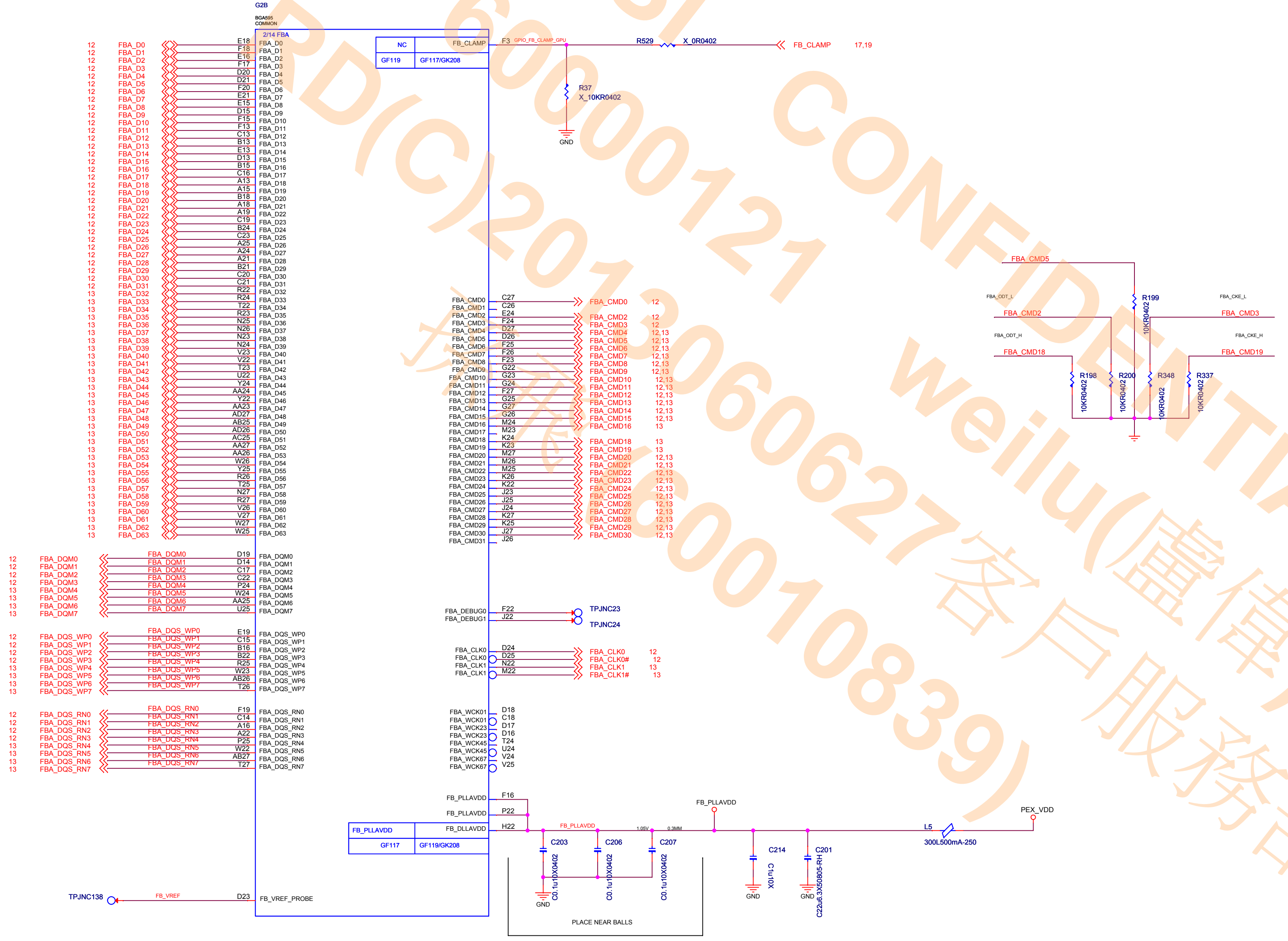
N14M-GE(PCI-Express Gen2 x8 Interface)



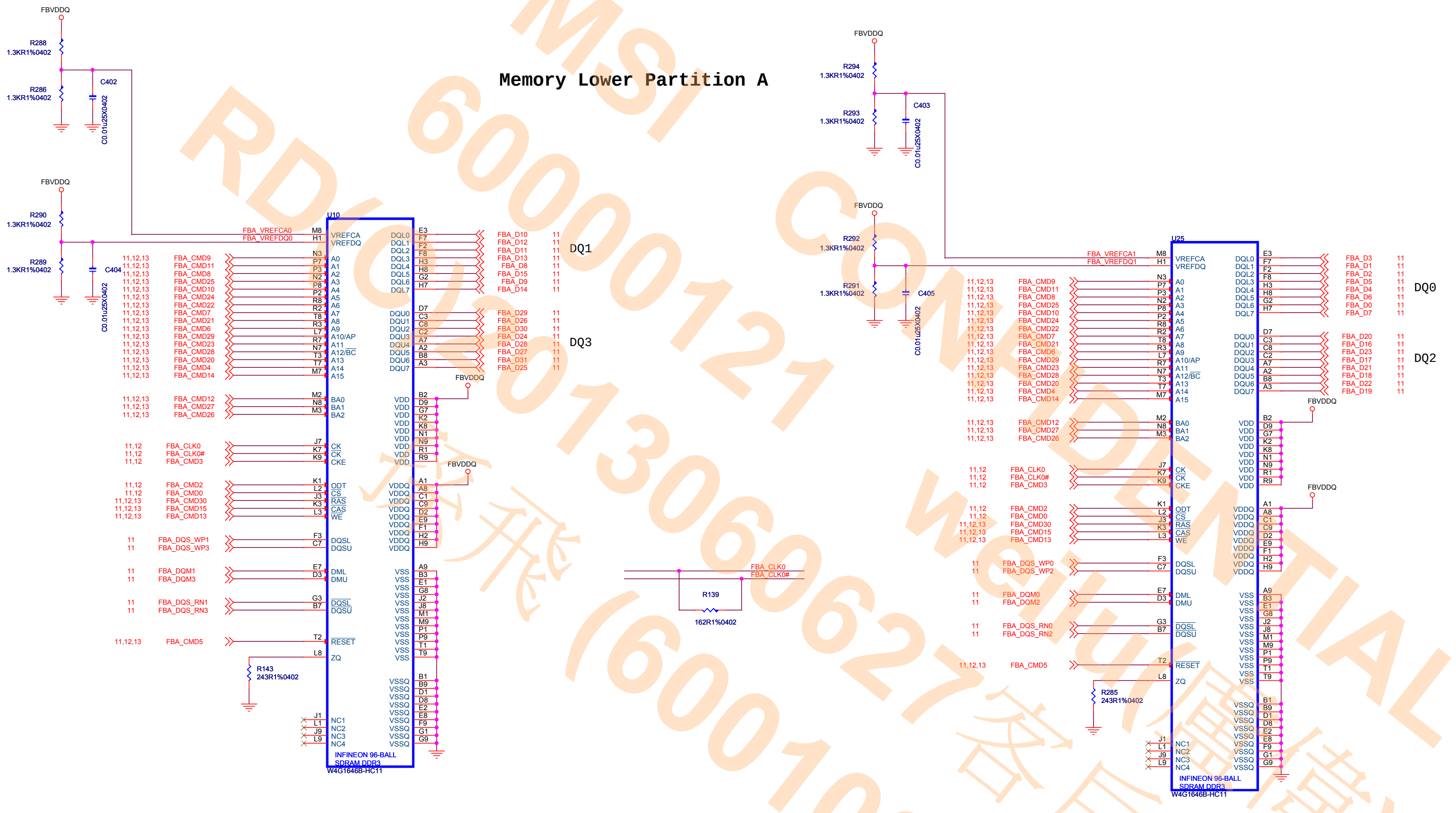
Title	N14E-GE PCI-E Host	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 10 of 51	

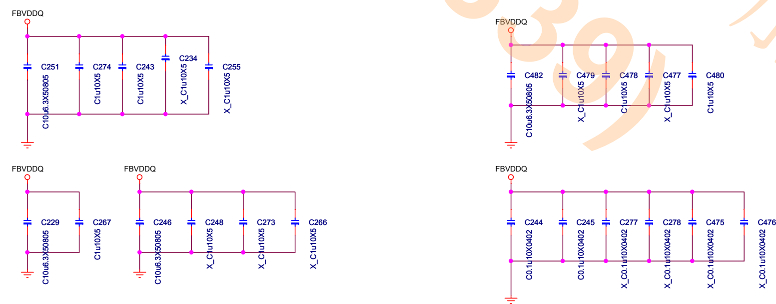
N14M-GE(Frame Buffer Interface)



Title	N14M-GE_MEM IF A/B	
Size Custom	Document Number MS-16GD	Rev 0B
Date: Wednesday, April 03, 2013	Sheet 11 of 51	

N14M-GE(DDR3 Frame A-1)





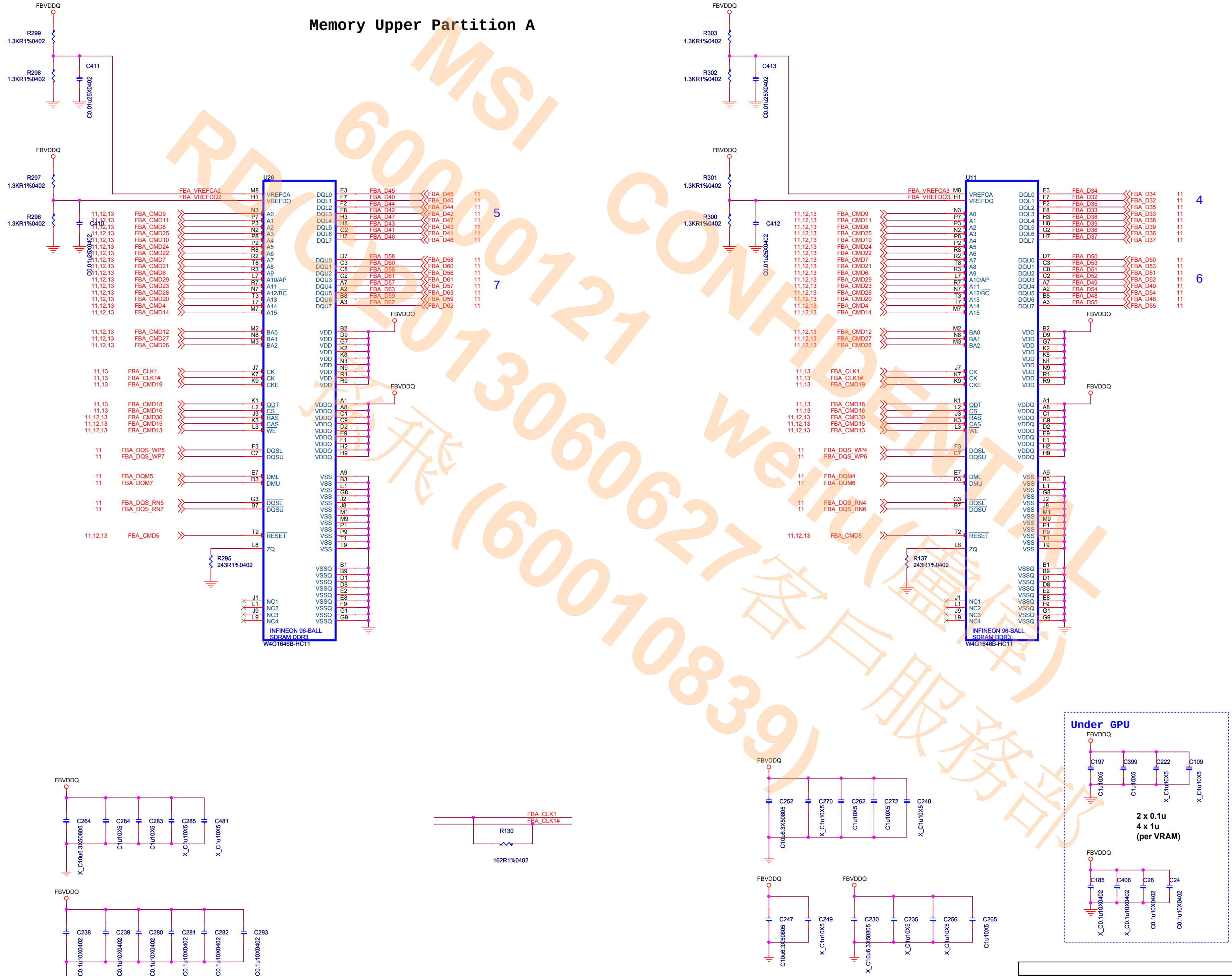
GF1XX SDDR3 CMD MAPPING

	0-31	32-63
CMD0	CS0*	
CMD1		
CMD2	ODT	
CMD3	CKE	
CMD4	A14	A14
CMD5	RST	RST
CMD6	A9	A9
CMD7	A7	A7
CMD8	A2	A2
CMD9	A0	A0
CMD10	A4	A4
CMD11	A1	A1
CMD12	BA0	BA0
CMD13	WE*	WE*
CMD14	A15	A15
CMD15	CAS*	CAS*
CMD16		CS0*
CMD17		
CMD18		ODT
CMD19		CKE
CMD20	A13	A13
CMD21	A8	A8
CMD22	A6	A6
CMD23	A11	A11
CMD24	A5	A5
CMD25	A3	A3
CMD26	BA2	BA2
CMD27	BA1	BA1
CMD28	A12	A12
CMD29	A10	A10
CMD30	RAS*	RAS*
CMD31		

* A15 is not required for any x16 device, even up to 4Gb density
* A15 is only needed if we support x8 configurations, and only at 4Gb

Title	N14E-GE_GDDR5 Frame A-1	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 12 of 51	

Memory Upper Partition A



Title	N14E-GE_GDDR5 Frame A-2
Size	Custom
Document Number	MS-16GD
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Date:	Wednesday, April 03, 2013
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DGPU POWER ON SEQUENCE

Title	Reserve	
Size: Custom	Document Number: MS-16GD	Rev: 0B
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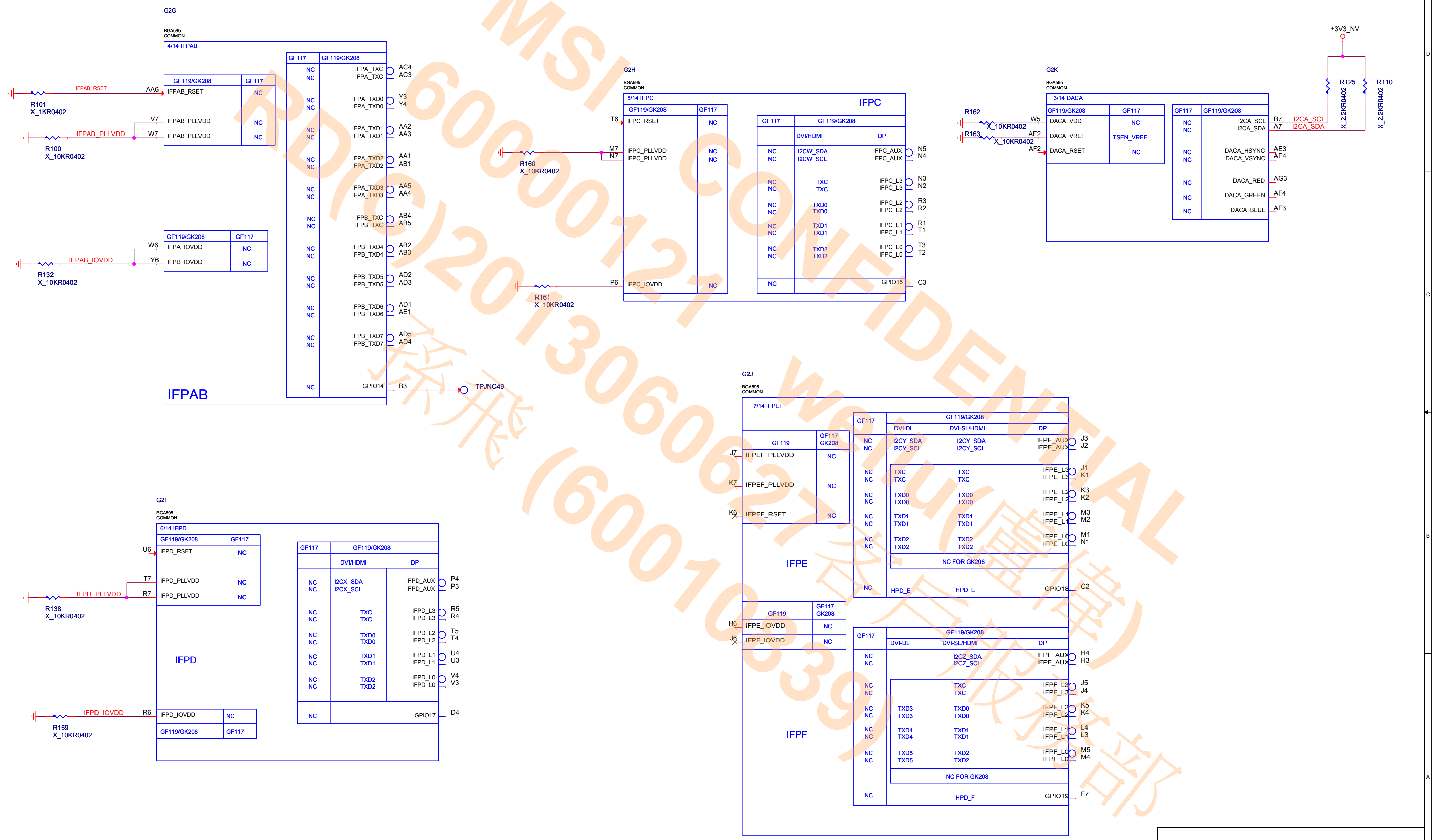
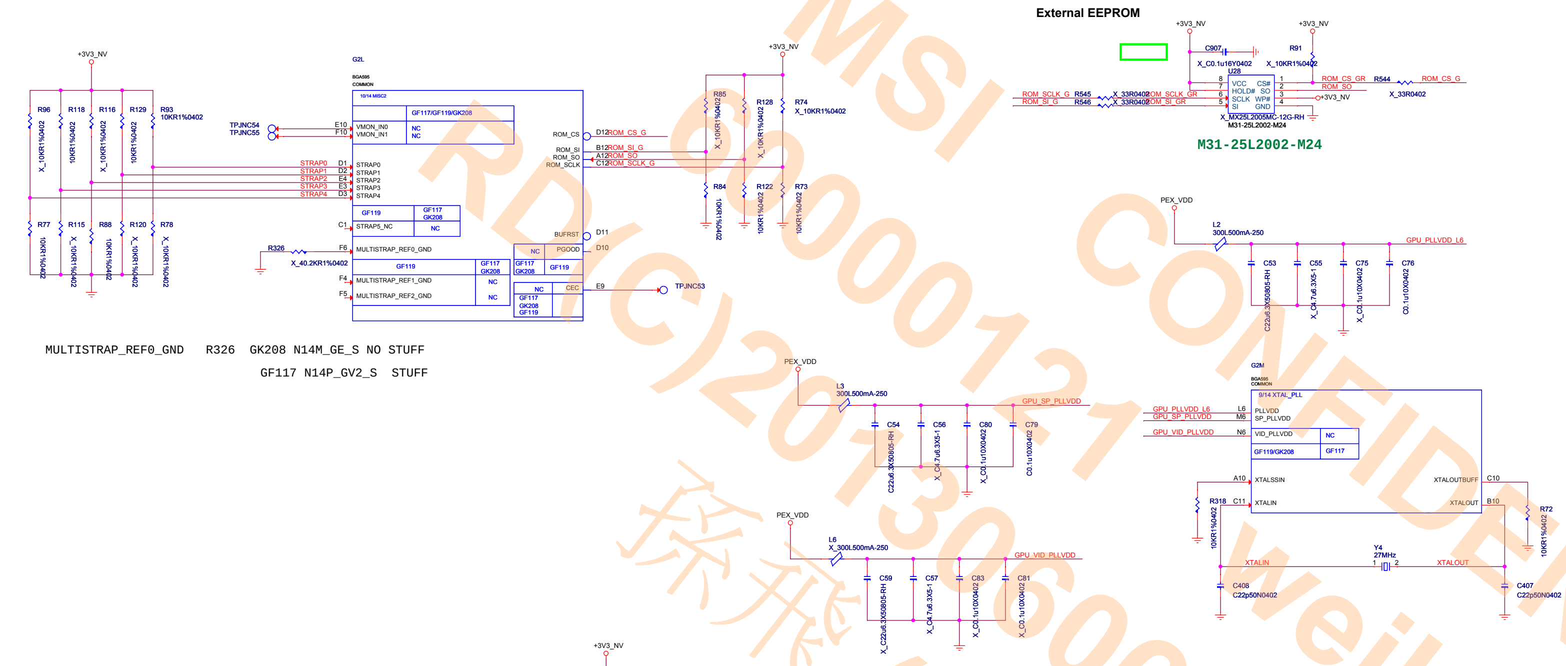
Title	Reserve	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 15 of 51	



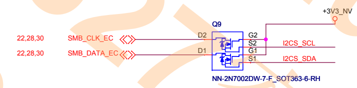
Title	N14E-GE_Display IF		
Size Custom	Document Number MS-16GD		Rev 0B
Date:	Wednesday, April 03, 2013	Sheet 16 of 51	

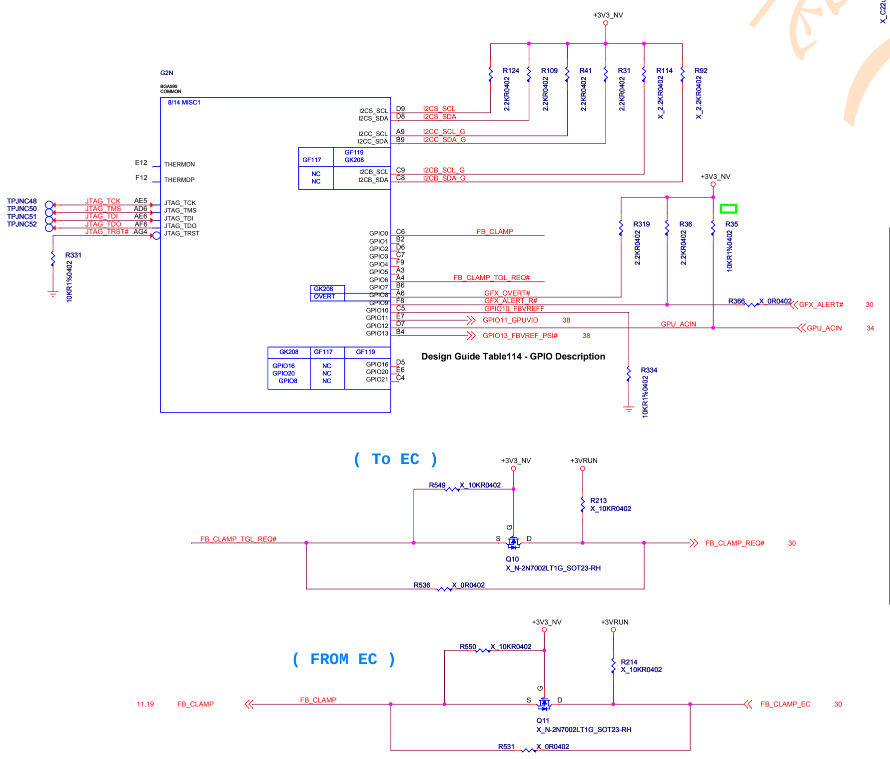
N14M-GE(Thermal & GPIO)



MULTISTRAP_REF0_GND R326 GK208 N14M_GE_S NO STUFF

GF117 N14P_GV2_S STUFF



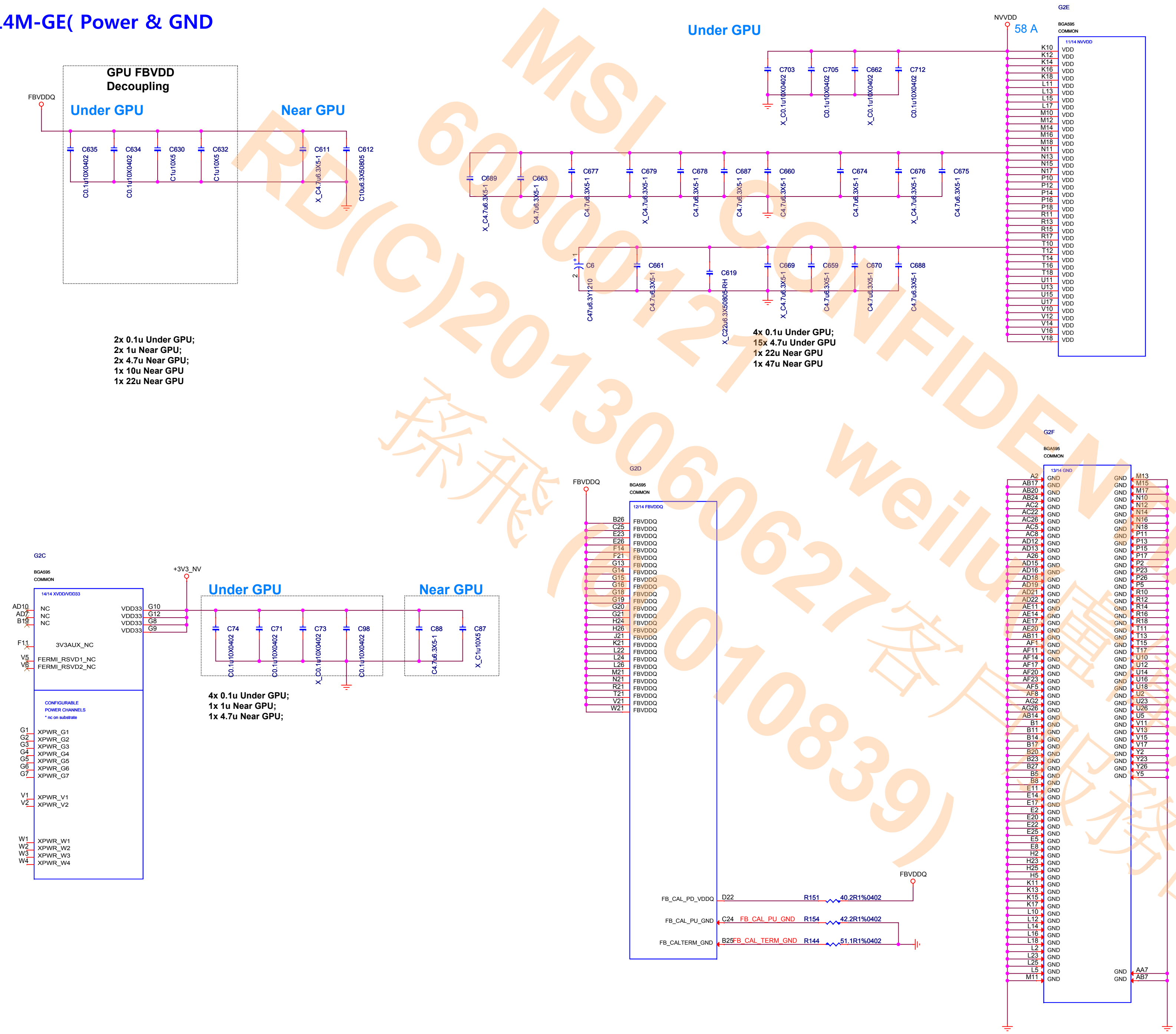


Design Guide Table114 - GPIO Description

GPIO	GK208	GF117
GPIO 0	DEBUG Service	FAN_PWM/FB_CLAMP/DEBUG Service
GPIO 1	MEM_VDD_CTL/FAN_PWM	NVVDD_VID2
GPIO 2	LCD brightness control (LCD_BLPWM)	UNUSED
GPIO 3	LCD Power enable (LCD_PPEN)	UNUSED
GPIO 4	LCD Backlight enable (LCD_BLEN)	UNUSED
GPIO 5	NVVDD PWM_VID_BOOT_EN	NVVDD VID0
GPIO 6	Remote Sensor Error Correction	NVVDD VID1
GPIO 7	LVDS_Switch/3D VISION/STEREO	UNUSED
GPIO 8	GPU Overtemp	GPU Overtemp
GPIO 9	GPU thermal Alert	GPU Thermal Alert
GPIO 10	FB Vref Control	UNUSED
GPIO 11	NVVDD PWM_VID	MEM_VDD_CTL
GPIO 12	PWR_Level AC Detect	PWR_Level AC Detect
GPIO 13	NVVDD PSI	UNUSED(No Need to Set in VBIOS)
GPIO 14	HPD IFPAB (DPIIM)	N/A on Package
GPIO 15	HPD IFPC (DP)	N/A on Package
GPIO 16	FAN_PWM	N/A on Package
GPIO 17	HPD IFPD (eDP)	N/A on Package
GPIO 18	UNUSED	N/A on Package
GPIO 19	HPD IFPF (DPIIM)	N/A on Package
GPIO 20	UNUSED	N/A on Package
GPIO 21	UNUSED	N/A on Package

Title	N14E-GE_Thermal & GPIO	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 17 of 51	

N14M-GE(Power & GND)



2x 0.1u Under GPU;
2x 1u Near GPU;
2x 4.7u Near GPU;
1x 10u Near GPU
1x 22u Near GPU

4x 0.1u Under GPU;
15x 4.7u Under GPU
1x 22u Near GPU
1x 47u Near GPU

4x 0.1u Under GPU;
1x 1u Near GPU;
1x 4.7u Near GPU;

Title	N14E-GE_Power & GND
Size: Custom	Document Number: MS-16GD
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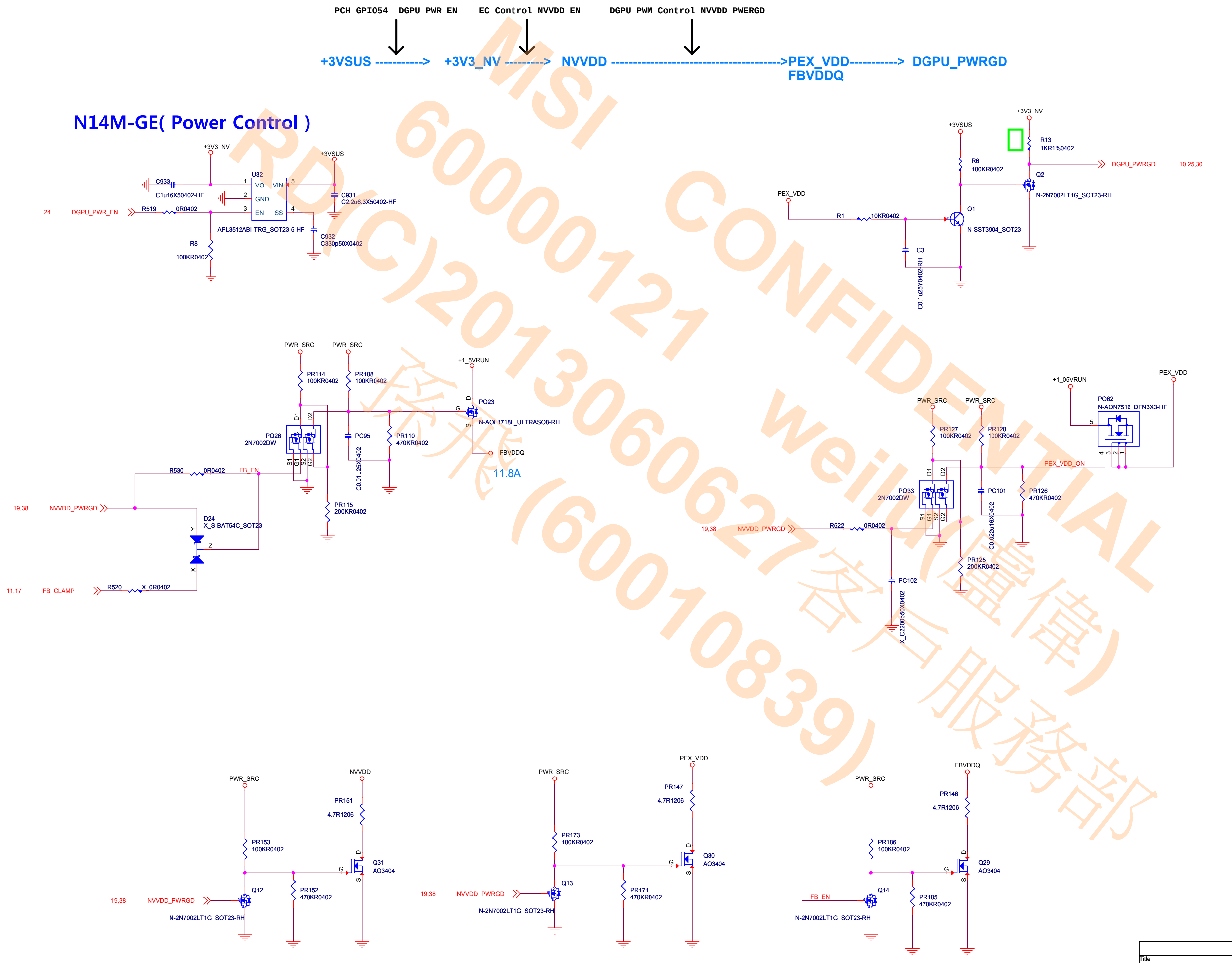
N14M-GE(Power Control)



Title	<Title>	
Size Custom	Document Number MS-16GD	Rev 0B
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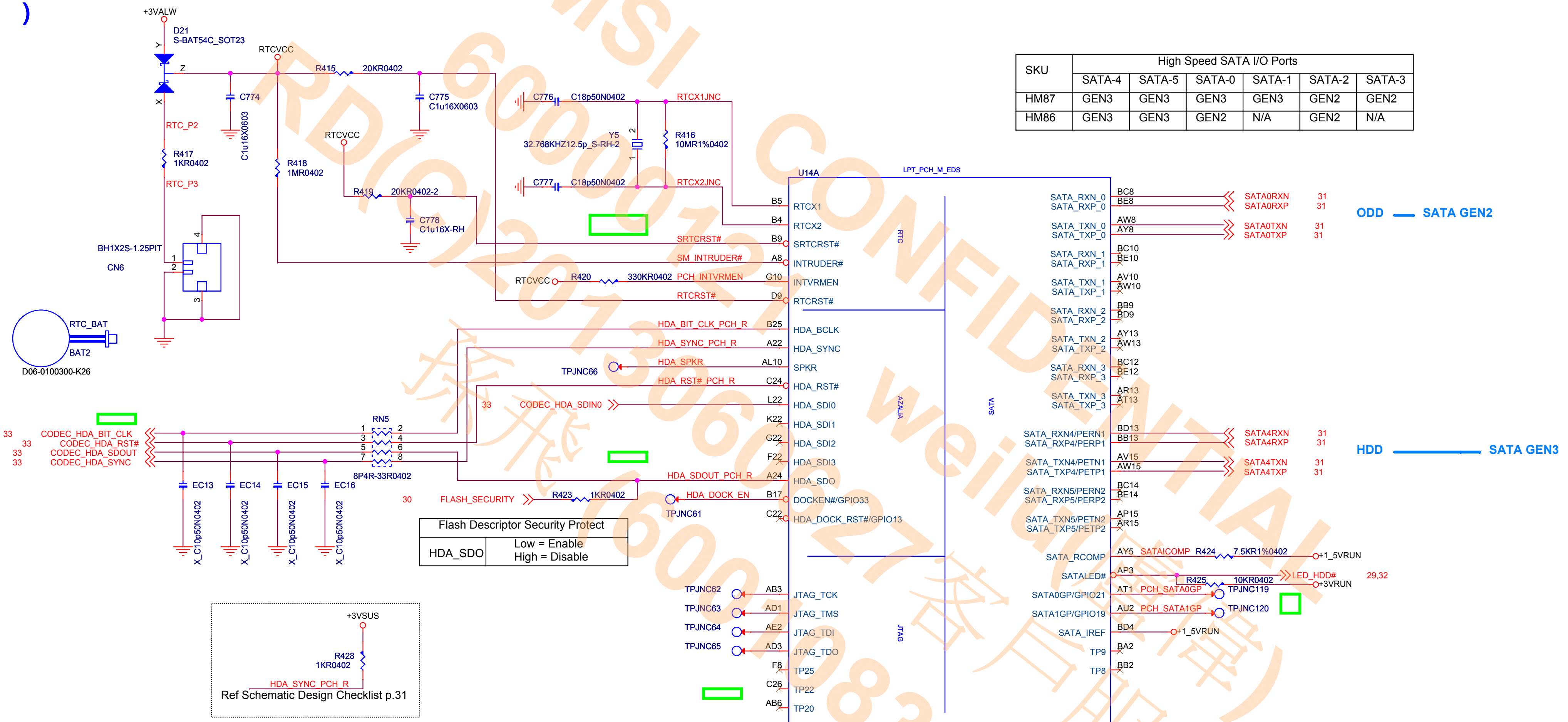
Lynx Point (HDA,JTAG,SATA)

SKU	High Speed SATA I/O Ports					
	SATA-4	SATA-5	SATA-0	SATA-1	SATA-2	SATA-3
HM87	GEN3	GEN3	GEN3	GEN3	GEN2	GEN2
HM86	GEN3	GEN3	GEN2	N/A	GEN2	N/A



Flash Descriptor Security Protect	
HDA_SDO	Low = Enable High = Disable

Title: PCH-1 (HDA/JTAG/SATA
Size: Custom
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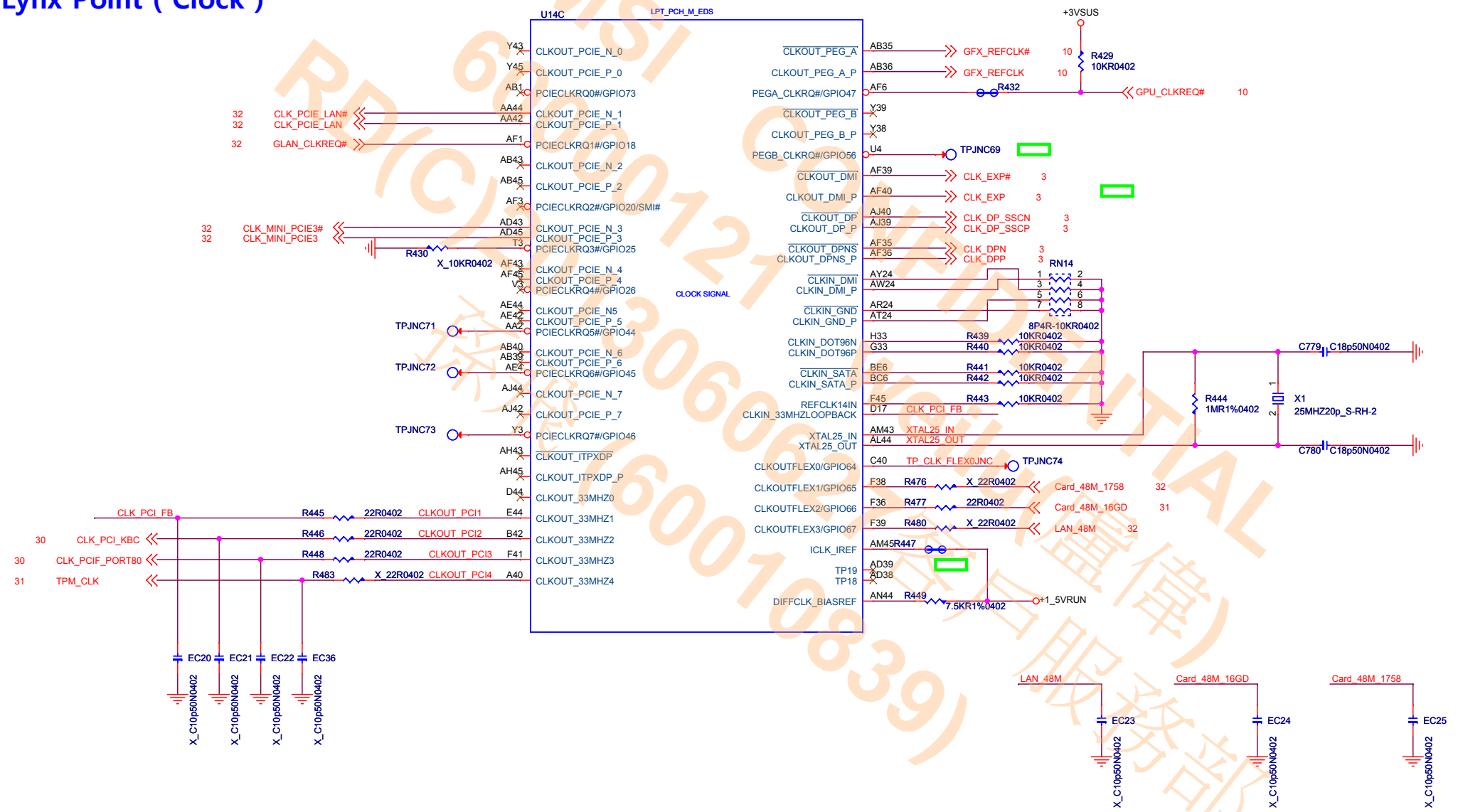
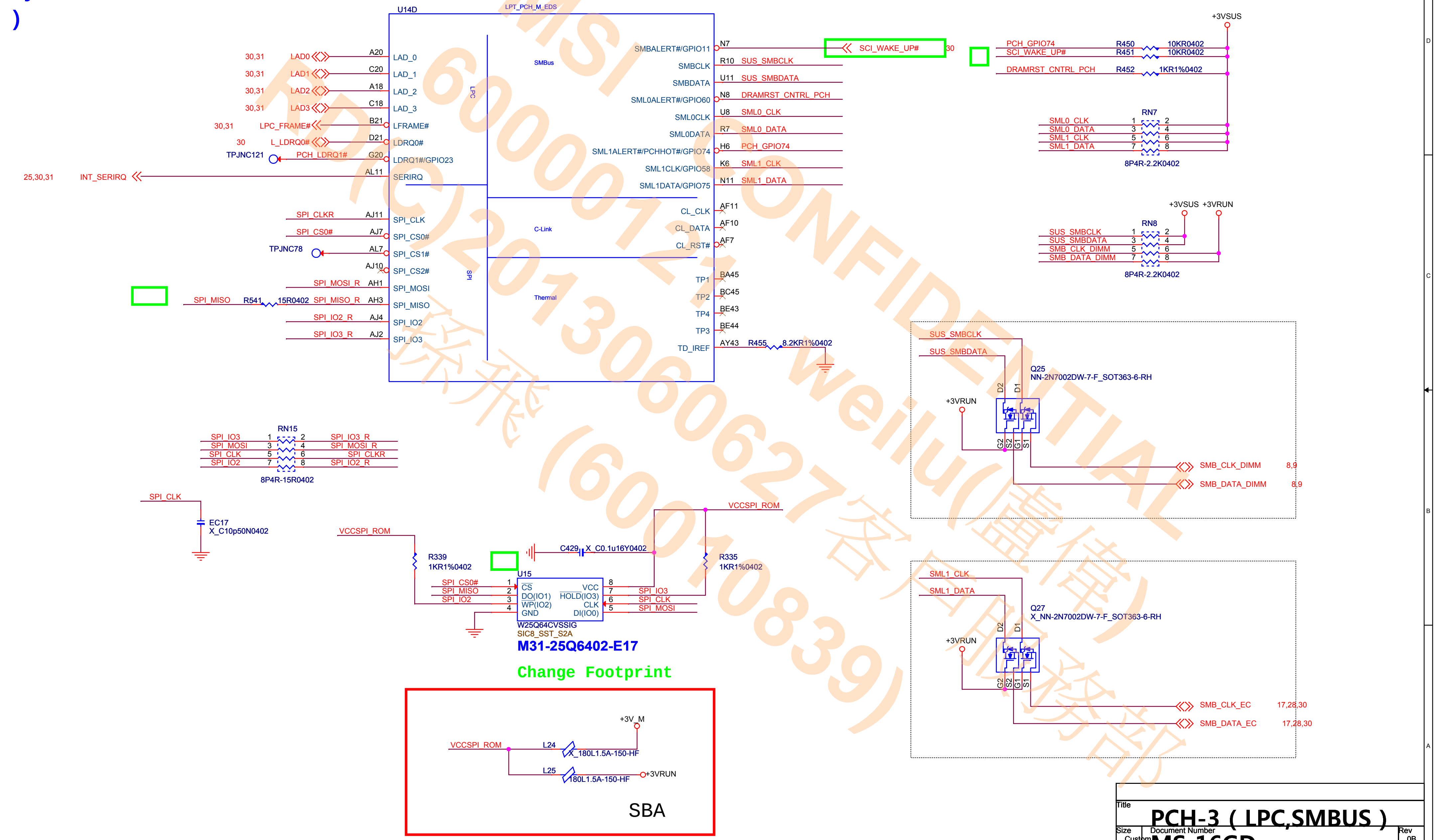
Lynx Point (Clock)



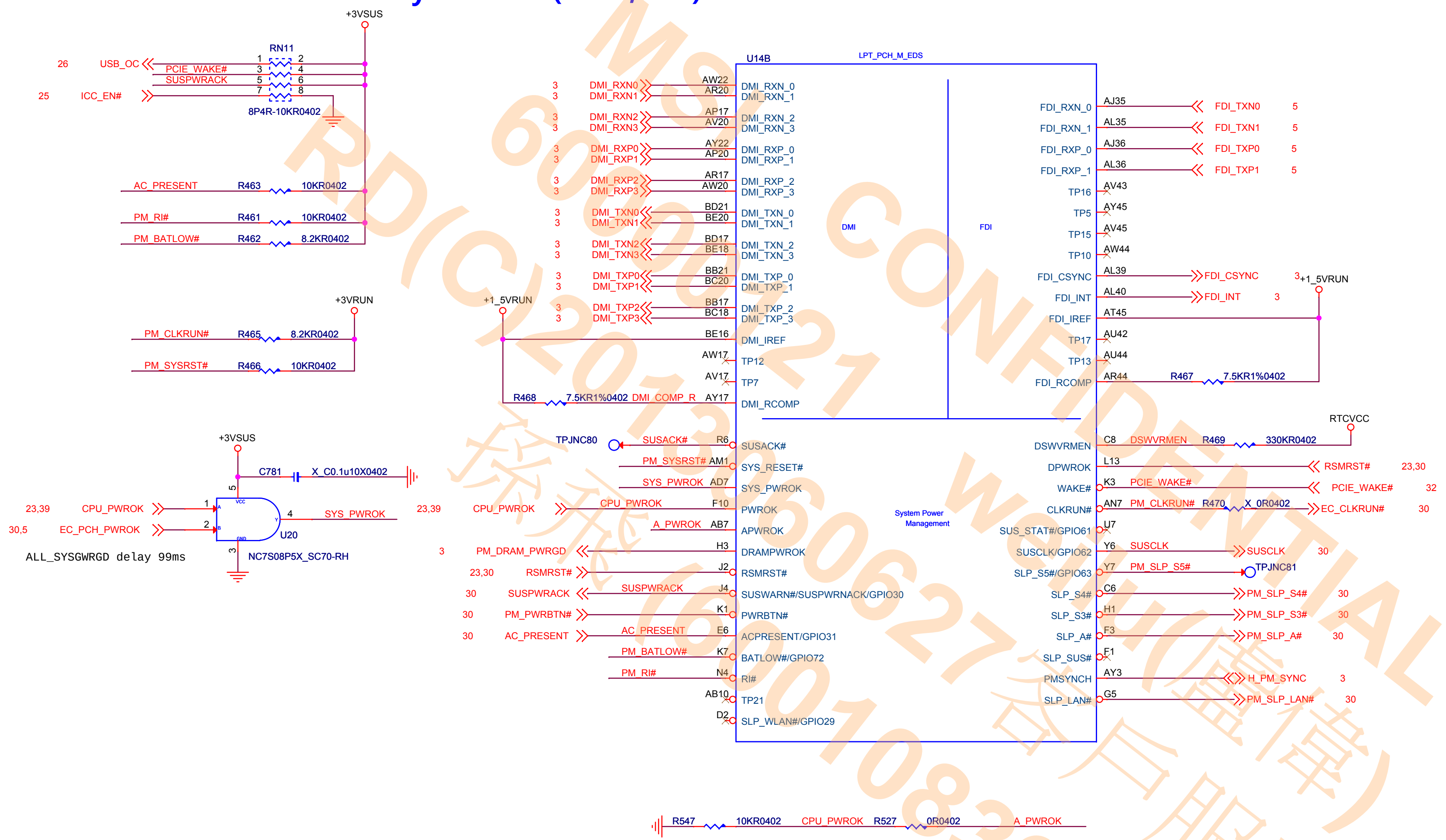
Title	PCH-2 (CLK)		
Size: Custom	Document Number: MS-16GD		Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 21 of 51		

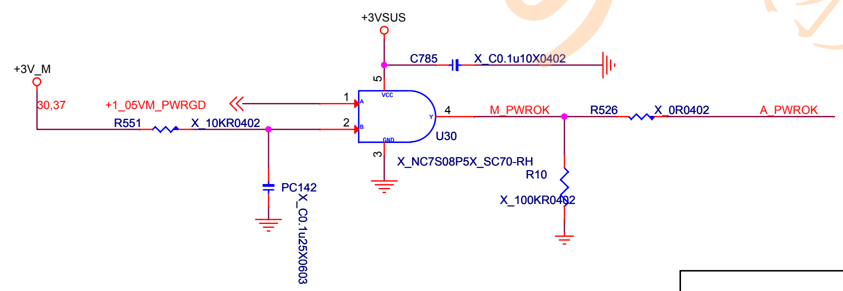
Lynx Point (LPC,SMBUS)



Title	PCH-3 (LPC,SMBUS)	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 22 of 51	

Lynx Point (DMI,FDI)

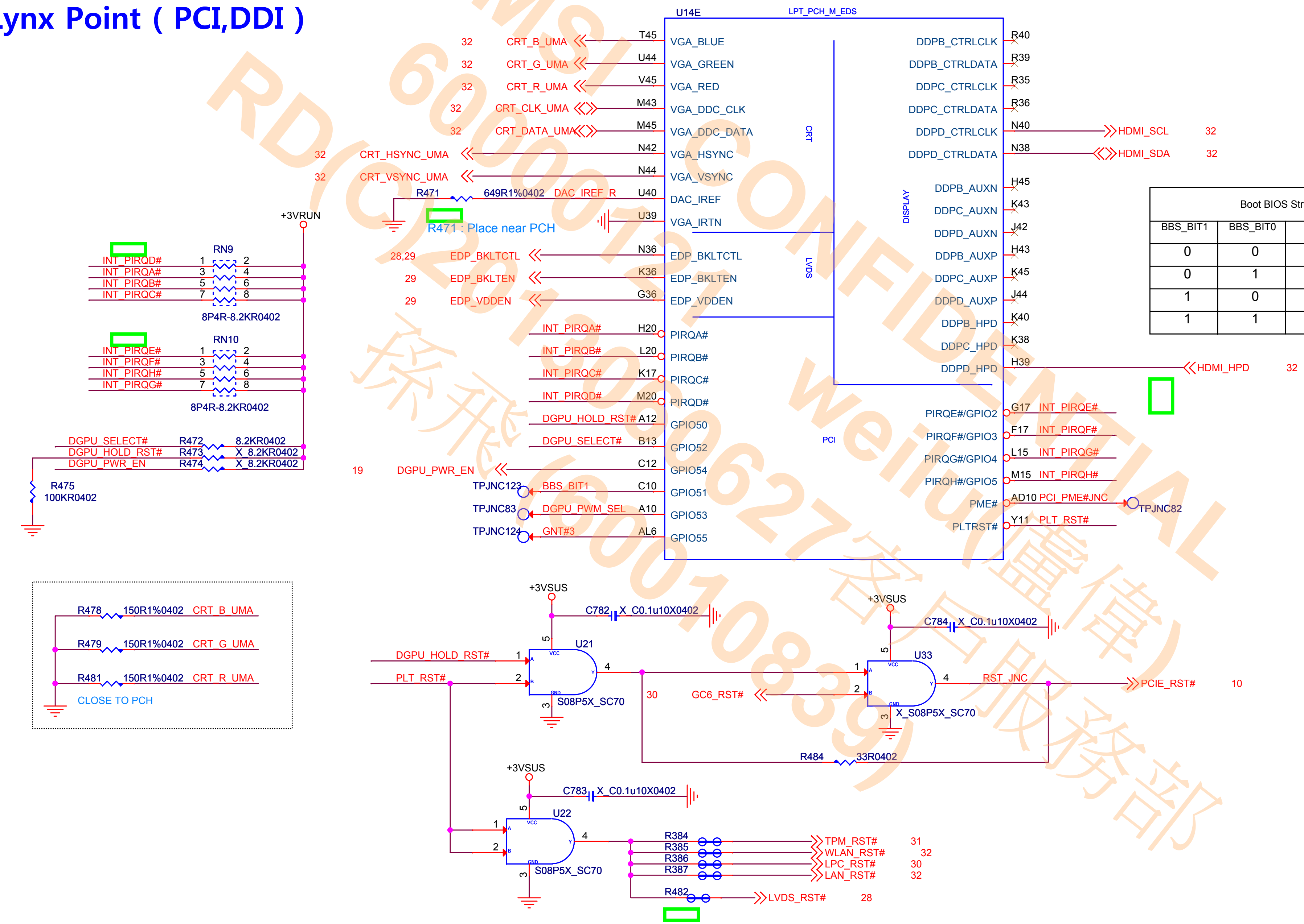




APWROK not supporting Intel AMT , it can be connected to PWROK
GPIO31 : If not used,require pull up +3VSUS
DSWODVREN - On Die DSW VR Enable HIGH : Enable internal 1.05V regulator LOW : Disable
DPWROK Without deep s4/s5 support tied together with RSMRST#

Title PCH-4 (DMI,FDI)
Size Custom Document Number MS-16GD Rev 0B
Date: Wednesday, April 03, 2013 Sheet 23 of 51

Lynx Point (PCI,DDI)



Boot BIOS Strap

BBS_BIT1	BBS_BIT0	Boot BIOS Location
0	0	LPC
0	1	Reserved (NAND)
1	0	N/A
1	1	SPI

Title: PCH-5 (PCI,DDI)

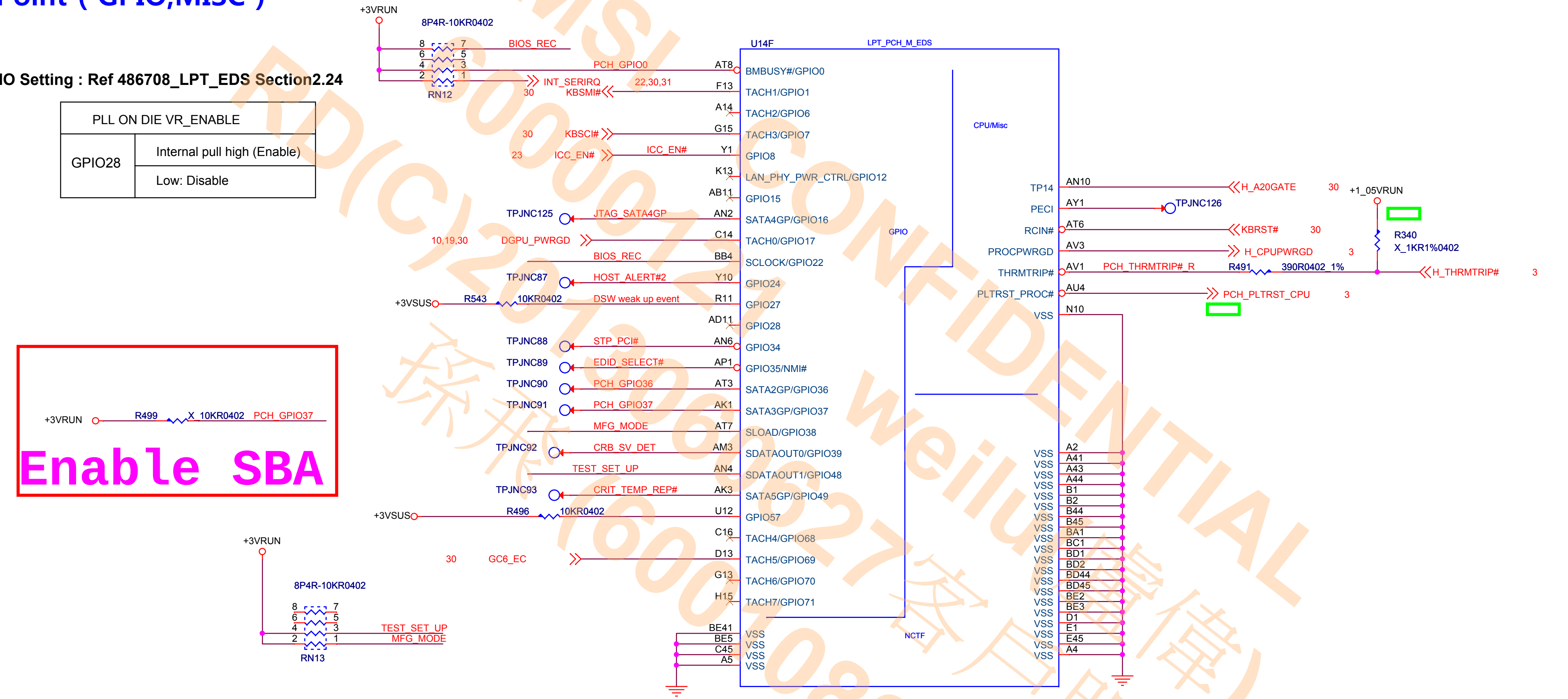
Size: Custom | Document Number: MS-16GD | Rev: 0B

Date: Wednesday, April 03, 2013 | Sheet 24 of 51

Lynx Point (GPIO,MISC)

GPIO Setting : Ref 486708_LPT_EDS Section2.24

	PLL ON DIE VR_ENABLE
GPIO28	Internal pull high (Enable)
	Low: Disable



Title: **PCH-6 (GPIO,MISC)**

Size	Document Number	Rev
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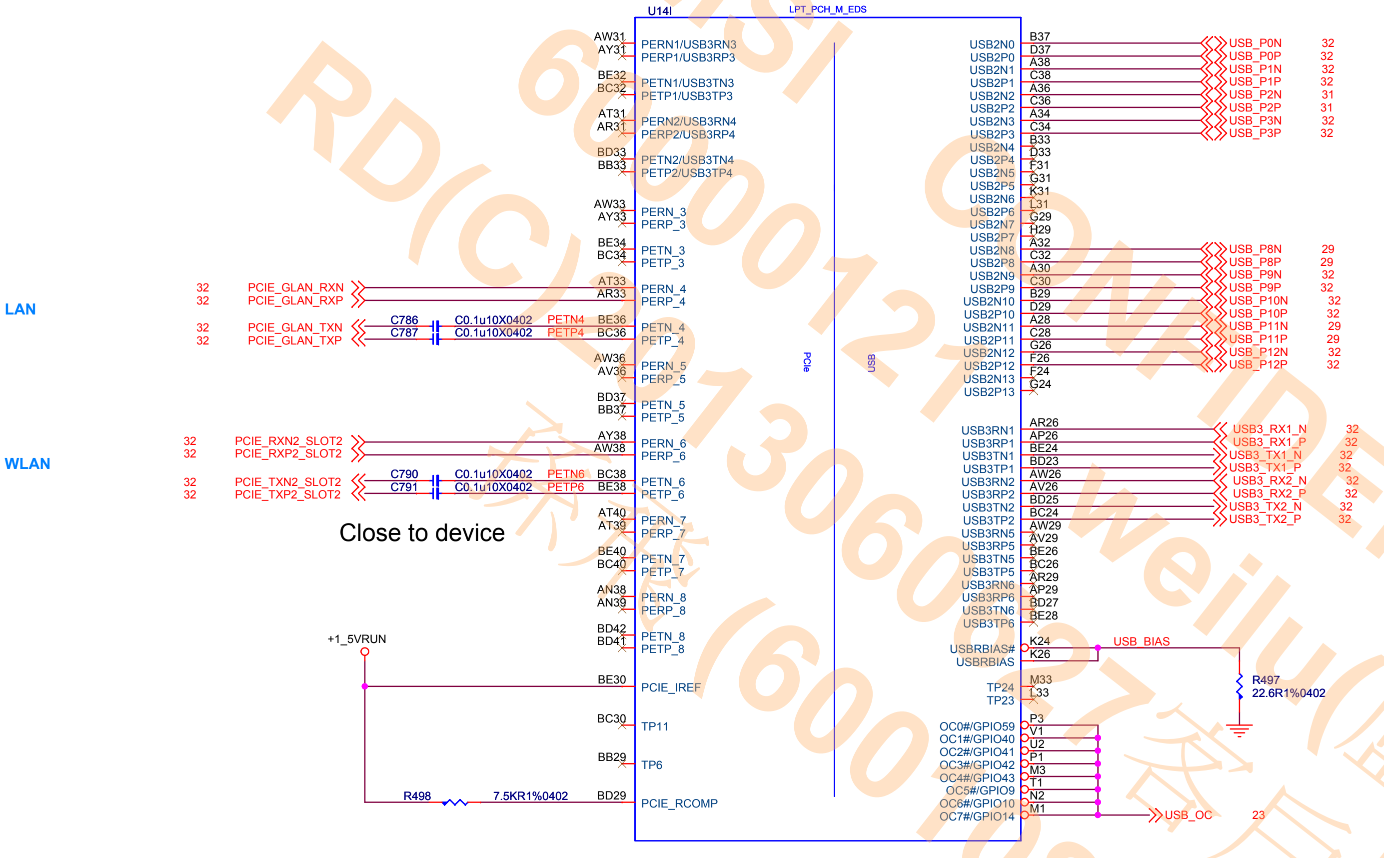
Lynx Point (PCIE,USB)

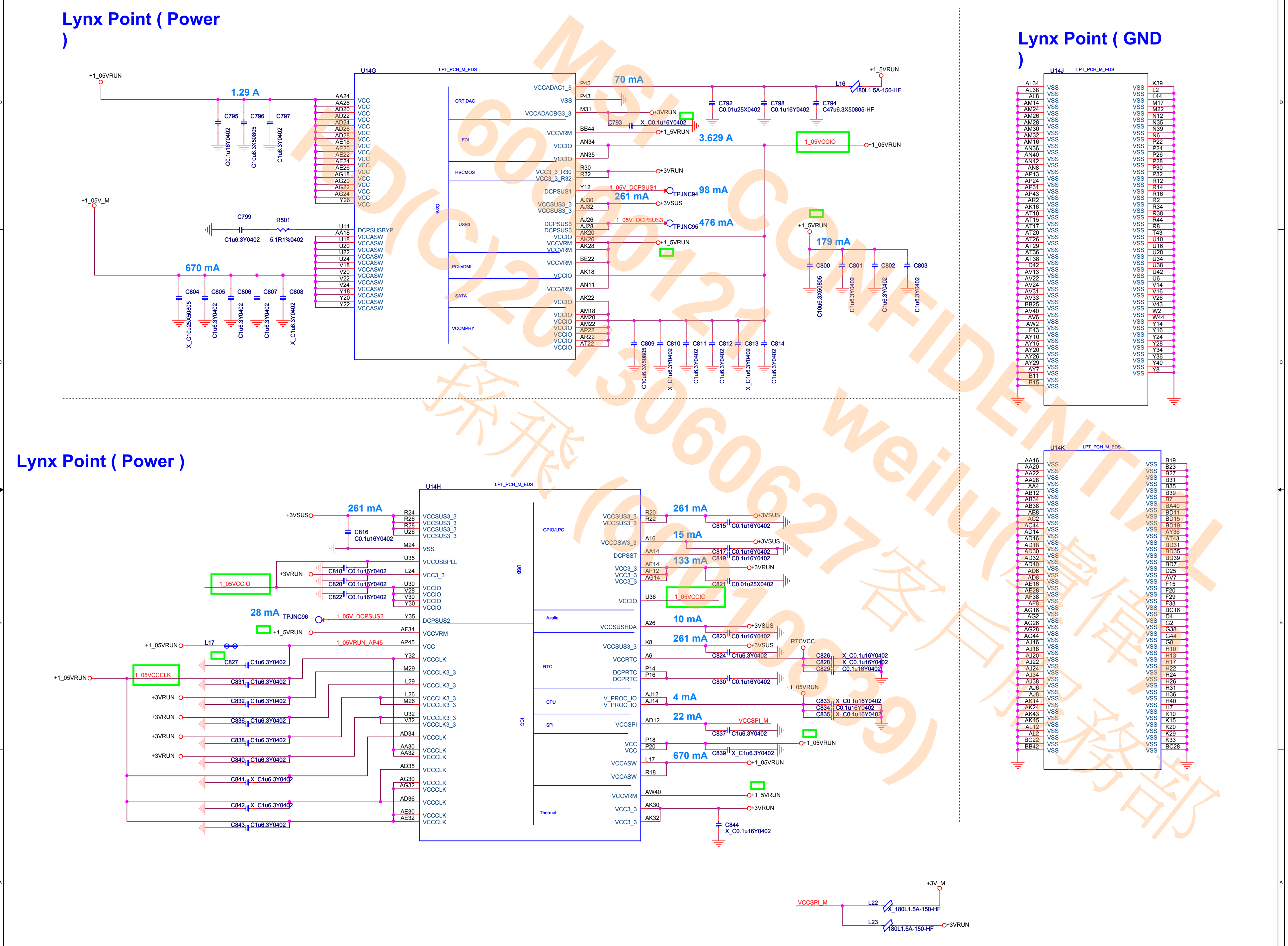


USB			
USB 2.0	**USB 3.0**	**Device**	**Note**
0	1	USB 3.0 Port 1	(16GDB/1758B)
1	2	USB 3.0 Port 2	(16GDB/1758B)
2			(16GD1 Cardreader)
3			(1758B Cardreader)
4			NC
5			NC
6			
7			NC
8		WebCam	EDP panel
9		USB 2.0 Port	(16GDA/1758A)
10		WLAN	
11		WebCam	LVDS panel
12		USB 2.0 Port	(1758E)
13			NC
	3		NC
	4		NC
	5		NC
	6		NC

Title <Title>

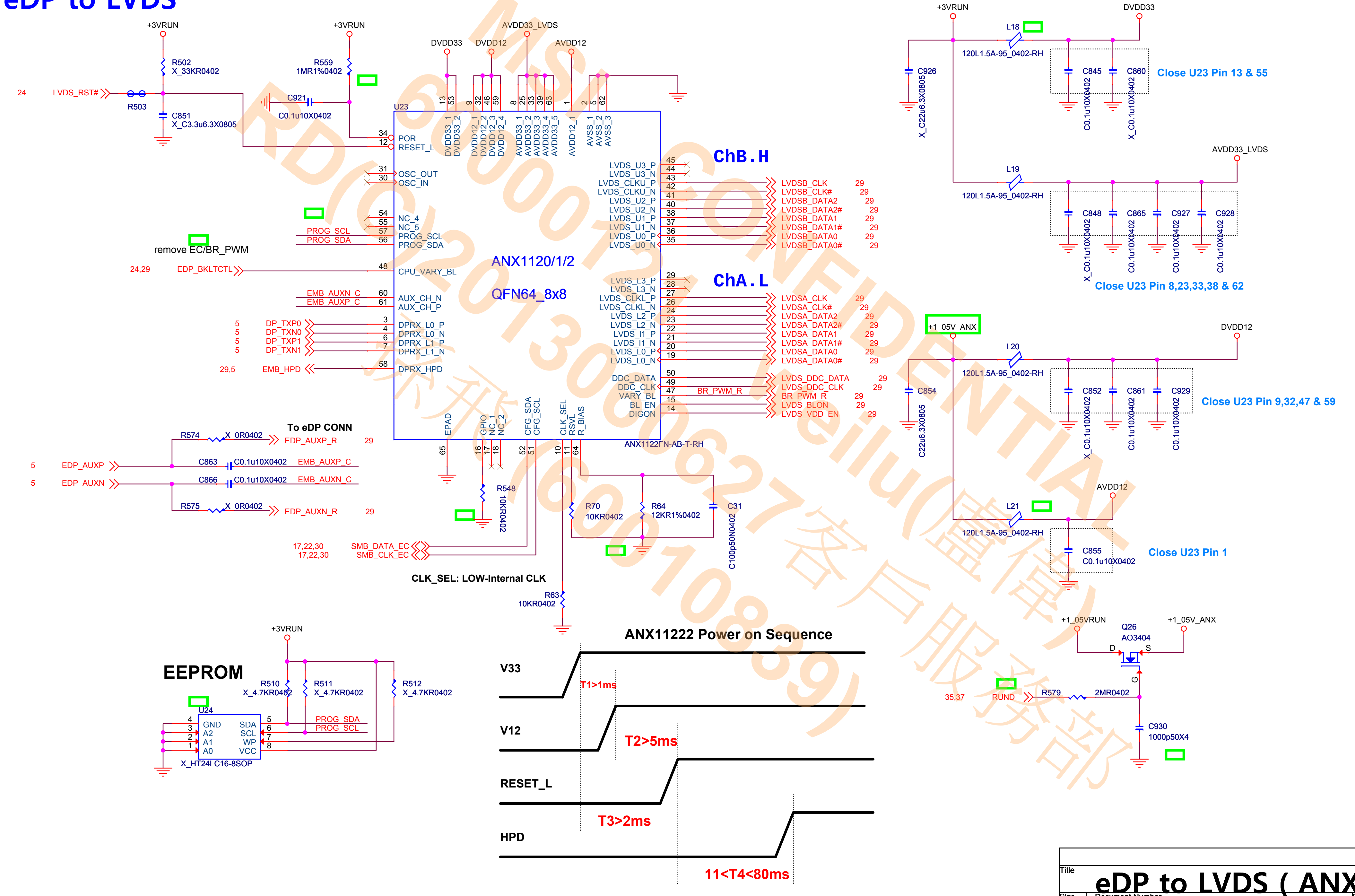
Size Custom | Document Number MS-16GD | Rev 0B

Date: Wednesday, April 03, 2013 | Sheet 26 of 51



Title	<Title>		
Size Custom	Document Number MS-16GD		Rev 0B
Date:	Wednesday, April 03, 2013	Sheet 27 of 51	

eDP to LVDS



Title: eDP to LVDS (ANX11

Size: Custom Document Number: MS-16GD Rev: 0B

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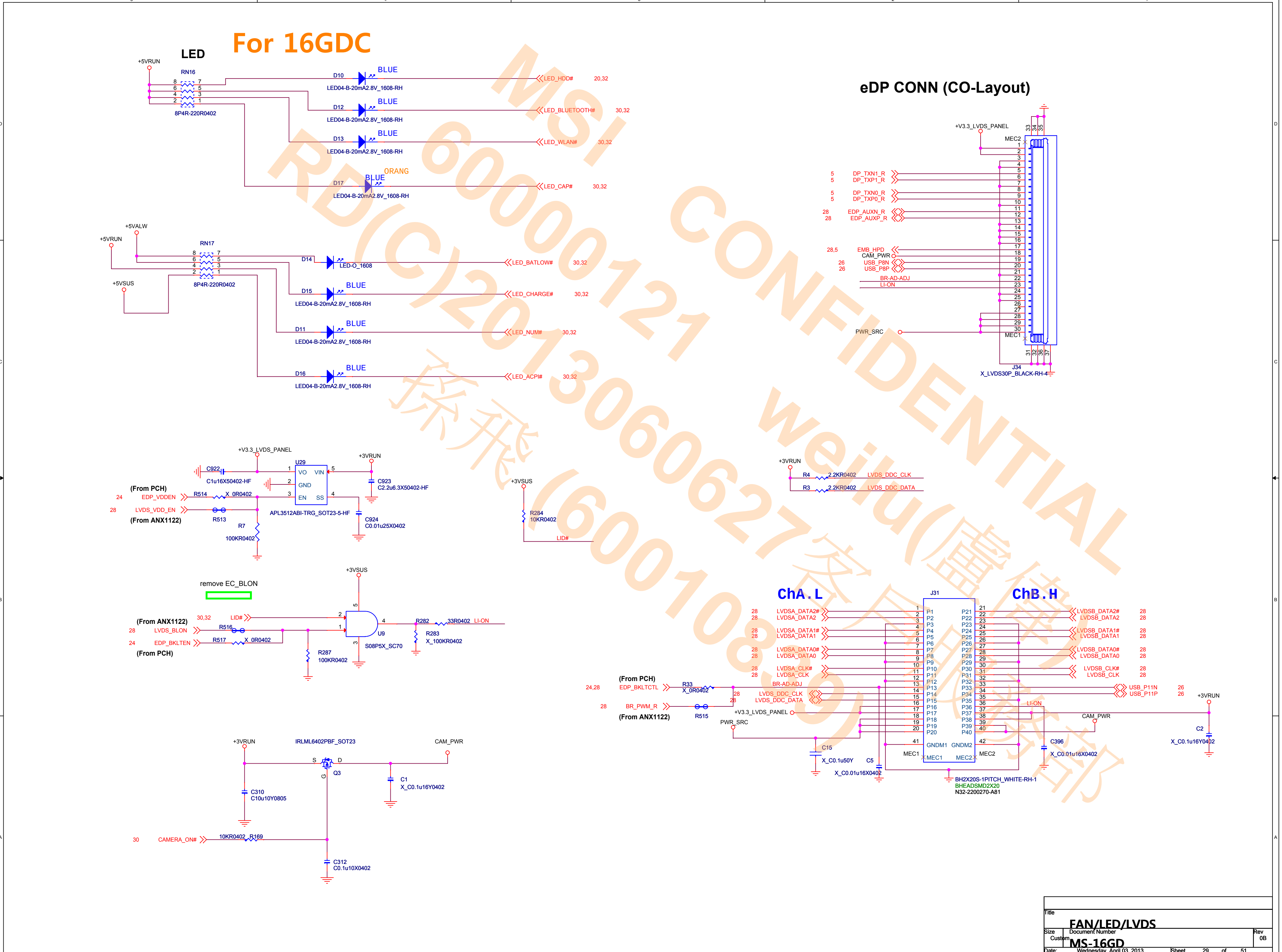
For 16GDC
LED
+5VRUN
RN16
8P4R-220R0402
D10
D12
D13
D17
BLUE
ORANG
LED04-B-20mA2.8V_1608-RH
LED_HDD# 20,32
LED_BLUETOOTH# 30,32
LED_WLAN# 30,32
LED_CAP# 30,32
+5VALW
+5VSUS
RN17
D14
LED-O_1608
D15
D11
D16
LED_BATLOW# 30,32
LED_CHARGE# 30,32
LED_NUM# 30,32
LED_ACPI# 30,32
eDP CONN (CO-Layout)
+V3.3_LVDS_PANEL
MEC2
MEC1
DP_TXN1_R
DP_TXP1_R
DP_TXN0_R
DP_TXP0_R
EDP_AUXN_R
EDP_AUXP_R
EMB_HPD
CAM_PWR
USB_P8N
USB_P8P
BR-AD-ADJ
LI-ON
PWR_SRC
J34
X_LVDS30P_BLACK-RH-4
+V3.3_LVDS_PANEL
+3VRUN
C922
C1u16X50402-HF
U29
VO VIN GND EN SS
C923
C2.2u6.3X50402-HF
(From PCH)
EDP_VDDEN
R514 X_0R0402
LVDS_VDD_EN
R513
(From ANX1122)
R7
100KR0402
APL3512ABI-TRG_SOT23-5-HF
C924
C0.01u25X0402
+3VSUS
R284
10KR0402
LID#
+3VRUN
R4 2.2KR0402 LVDS_DDC_CLK
R3 2.2KR0402 LVDS_DDC_DATA
remove EC_BLON
+3VSUS
(From ANX1122)
LID#
LVDS_BLON
R516
EDP_BKLTEN
R517 X_0R0402
(From PCH)
R287
100KR0402
U9
S08P5X_SC70
R282 33R0402 LI-ON
R283
X_100KR0402
ChA.L
ChB.H
J31
LVDSA_DATA2#
LVDSA_DATA2
LVDSA_DATA1#
LVDSA_DATA1
LVDSA_DATA0#
LVDSA_DATA0
LVDSA_CLK#
LVDSA_CLK
BR-AD-ADJ
LVDS_DDC_CLK
LVDS_DDC_DATA
LVDSB_DATA2#
LVDSB_DATA2
LVDSB_DATA1#
LVDSB_DATA1
LVDSB_DATA0#
LVDSB_DATA0
LVDSB_CLK#
LVDSB_CLK
USB_P11N
USB_P11P
LI-ON
CAM_PWR
(From PCH)
EDP_BKLTCTL
R33 X_0R0402
BR_PWM_R
R515
(From ANX1122)
+V3.3_LVDS_PANEL
PWR_SRC
C15
X_C0.1u50Y
C5
X_C0.01u16X0402
C396
X_C0.01u16X0402
C2
X_C0.1u16Y0402
GNDM1 GNDM2
BH2X20S-1PITCH_WHITE-RH-1
BHEADSMD2X20
N32-2200270-A81
+3VRUN
IRLML6402PBF_SOT23
CAM_PWR
Q3
C310
C10u10Y0805
C1
X_C0.1u16Y0402
CAMERA_ON#
10KR0402 R169
C312
C0.1u10X0402
Title
FAN/LED/LVDS
Size Custom
Document Number
MS-16GD
Rev 0B
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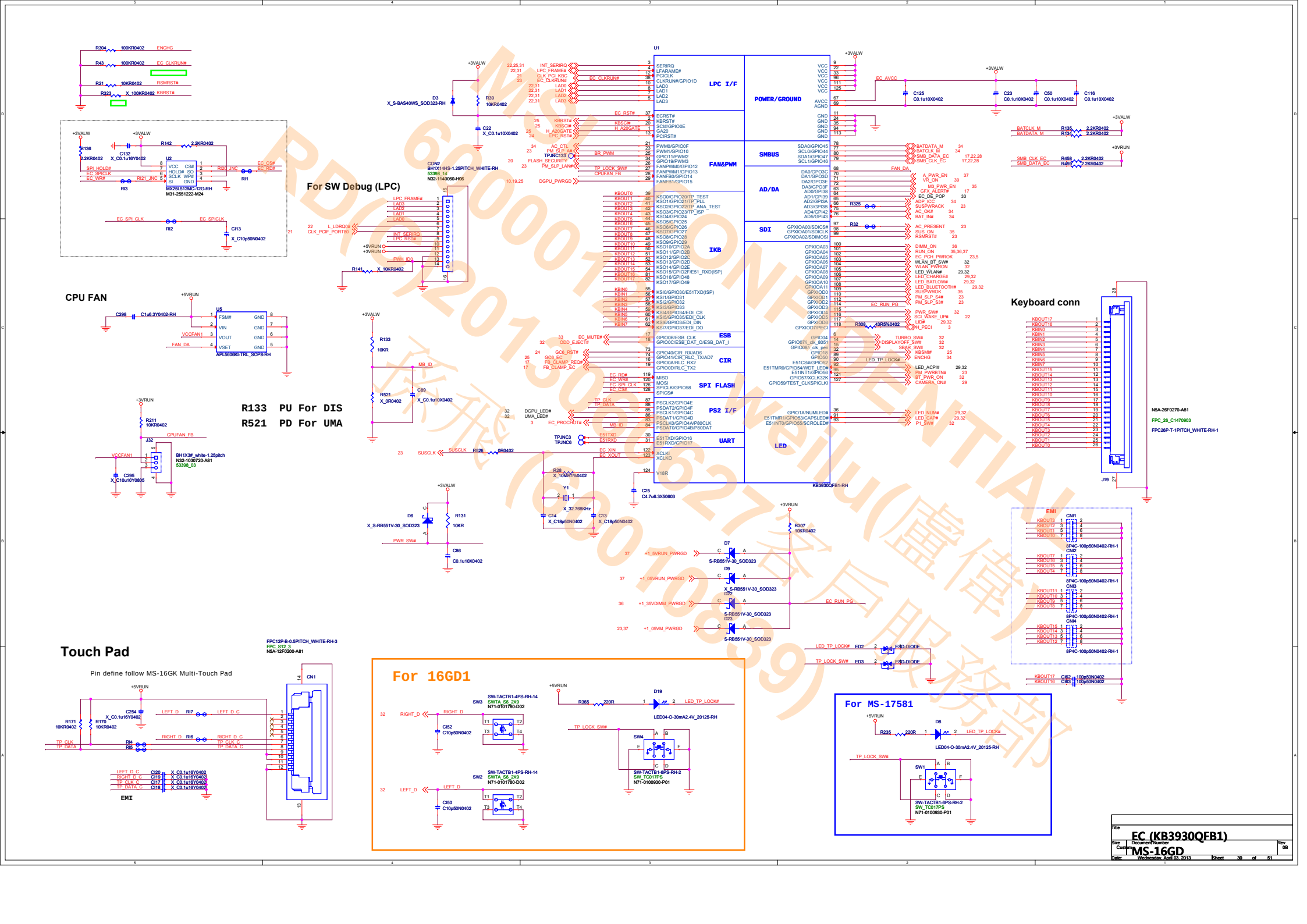
U1
LPC I/F
FAN&PWM
IKB
ESB
CIR
SPI FLASH
PS2 I/F
UART
LED
POWER/GROUND
SMBUS
AD/DA
SDI
KB3930QFB1-RH
For SW Debug (LPC)
CPU FAN
APL5606KI-TRL_SOP8-RH
R133 PU For DIS
R521 PD For UMA
Keyboard conn
Touch Pad
Pin define follow MS-16GK Multi-Touch Pad
For 16GD1
For MS-17581
EMI
Title
EC (KB3930QFB1)
MS-16GD
Size
Custom
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30
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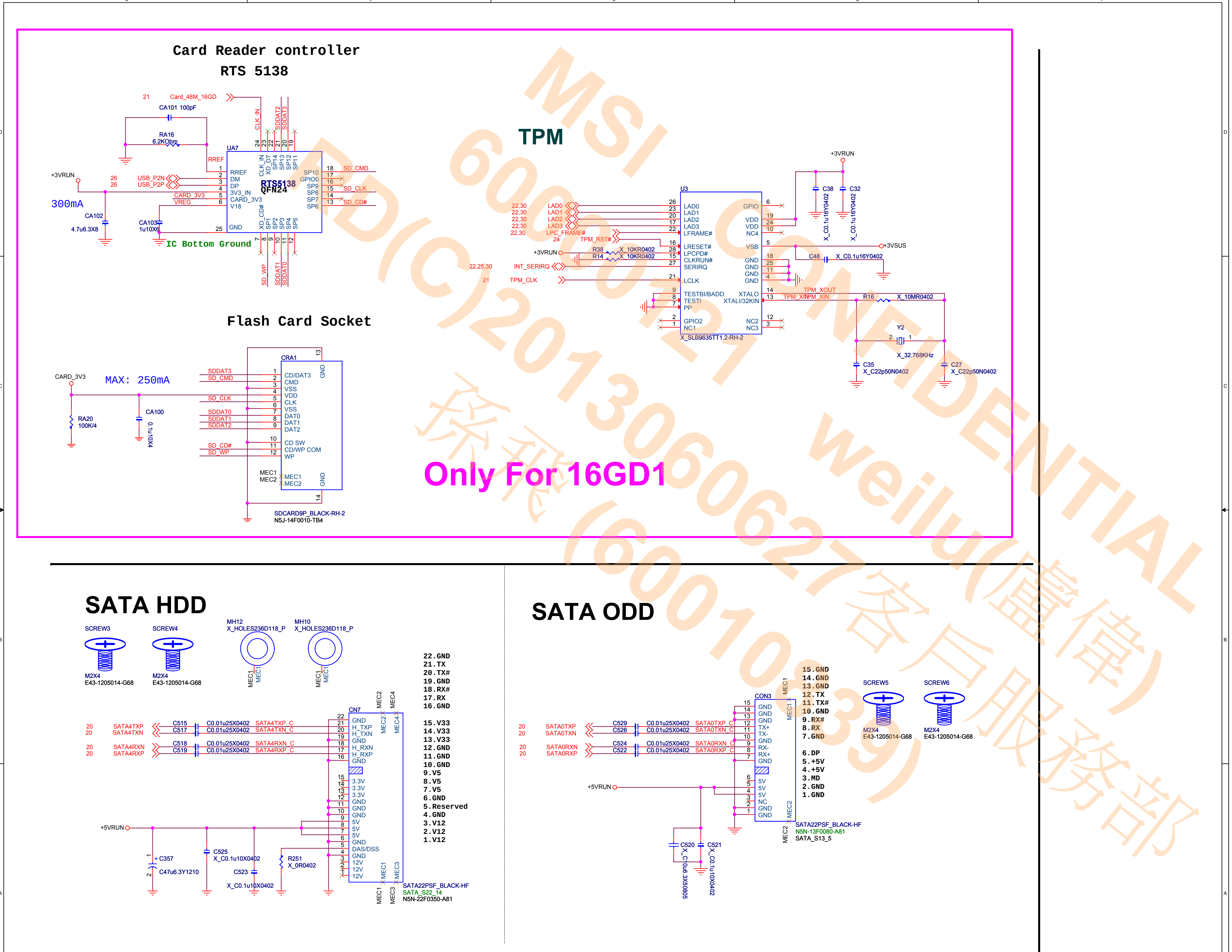
51



Title: Card Reader/HDD/SSD/ODD

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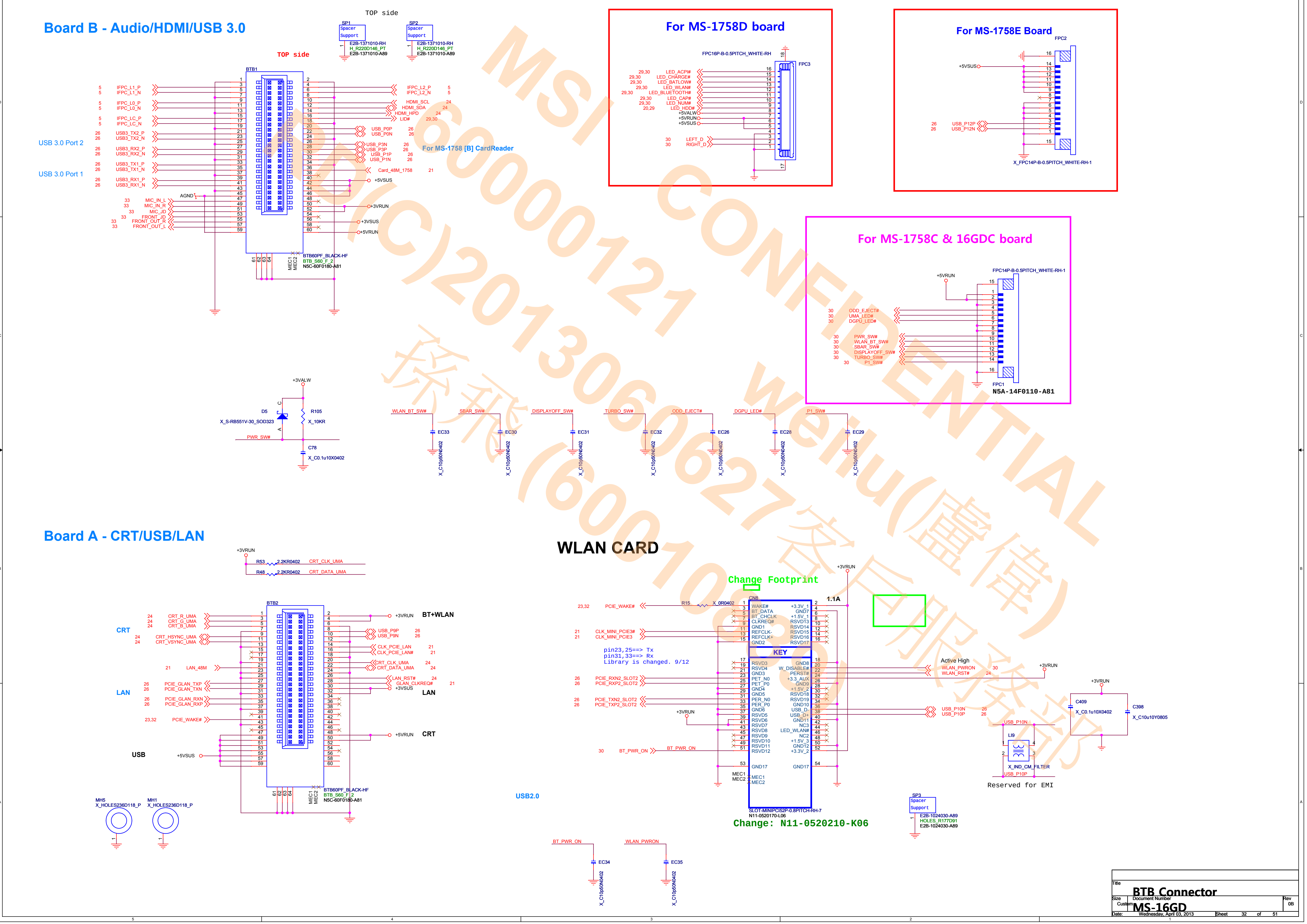
Date: Wednesday, April 03, 2013 | Sheet 31 of 51



Title: BTB Connector

Size: Custom | Document Number: MS-16GD | Rev: 0B

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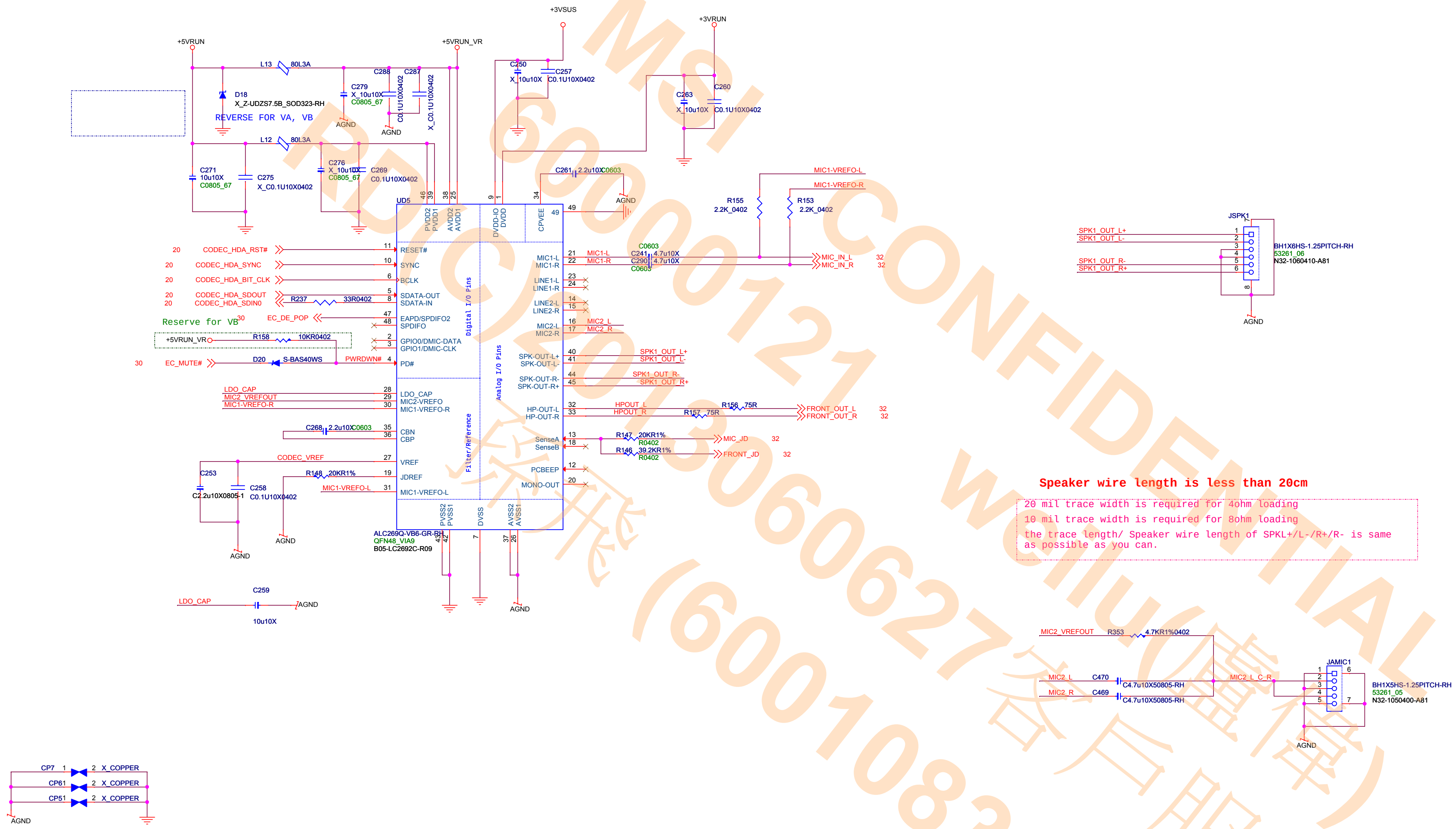

Title	Audio CODEC/Audio AMP
Size	Custom
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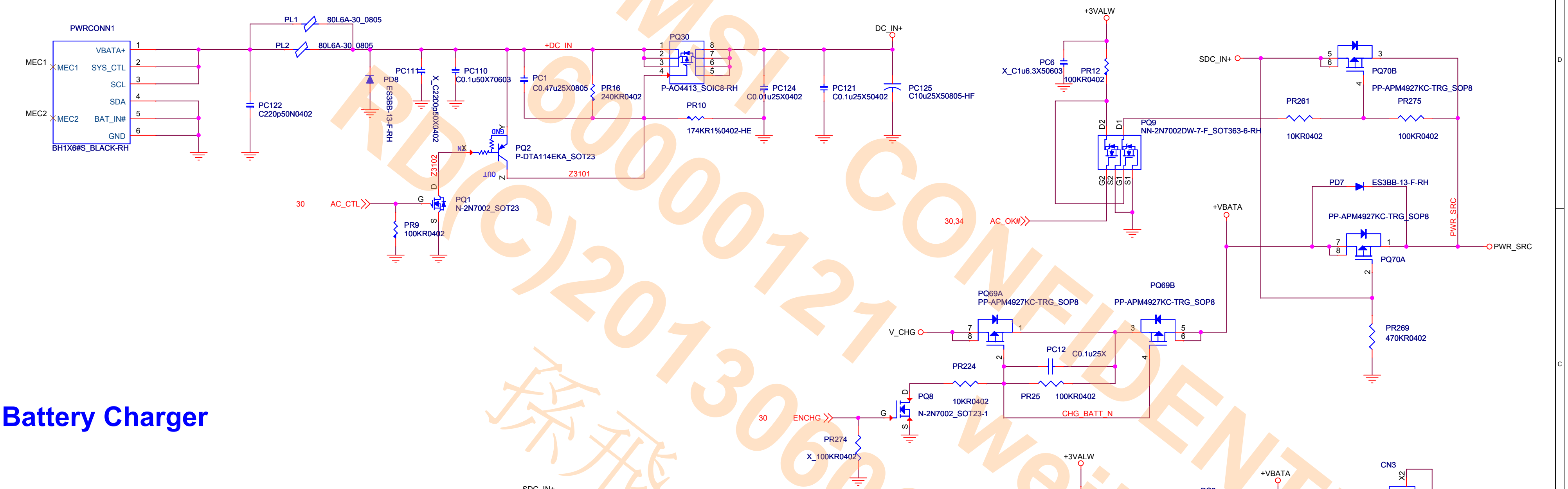
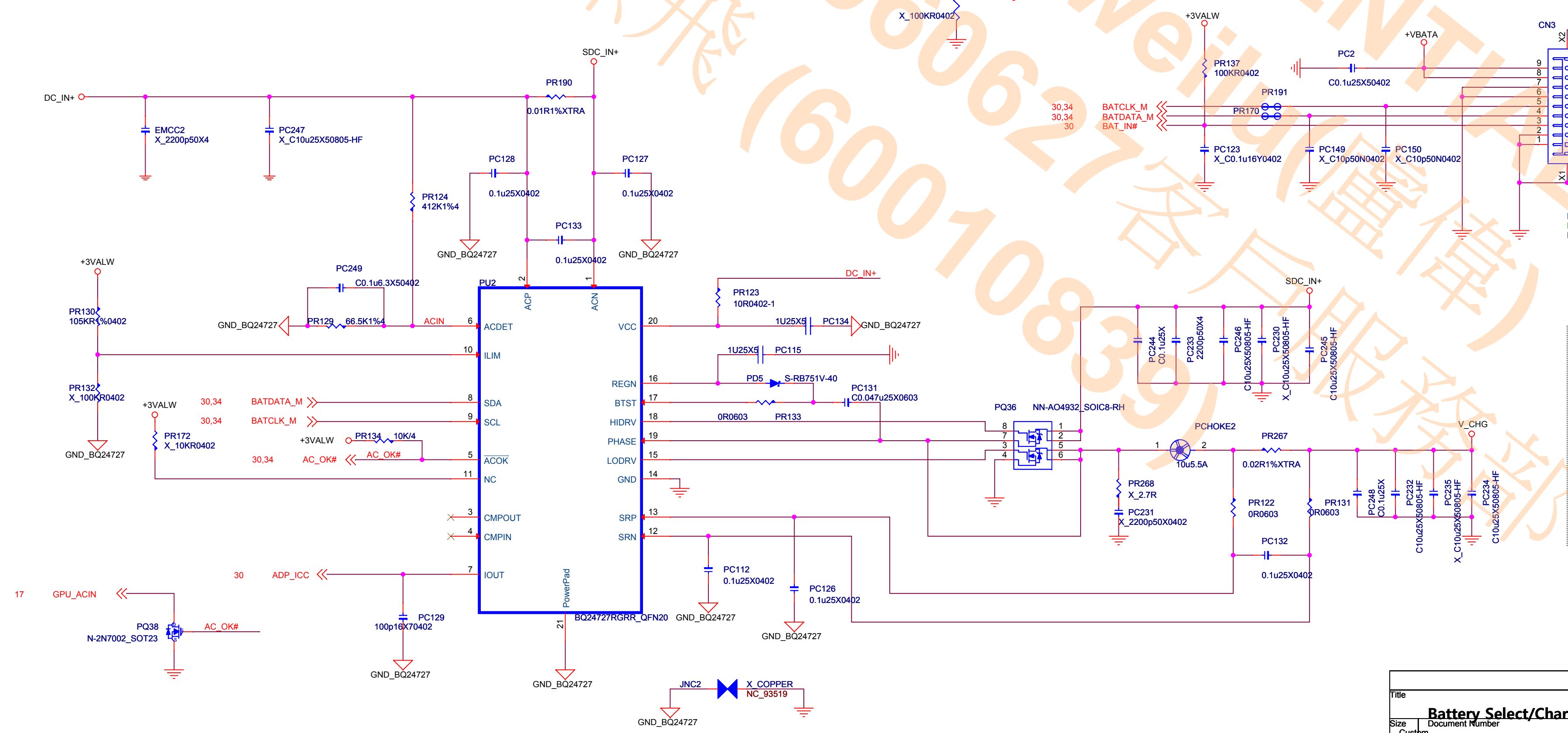
Battery Select



Battery Charger



JBAT1 Pin Definition

1: GND
2: GND
3: BAT_IN#
4: SMBDATA
5: SMBCLK
6: NC
7: NC
8: VBATA+
9: VBATA+

Title: Battery Select/Charger
Size: Custom
Document Number: MS-16GD
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Date: Wednesday, April 03, 2013
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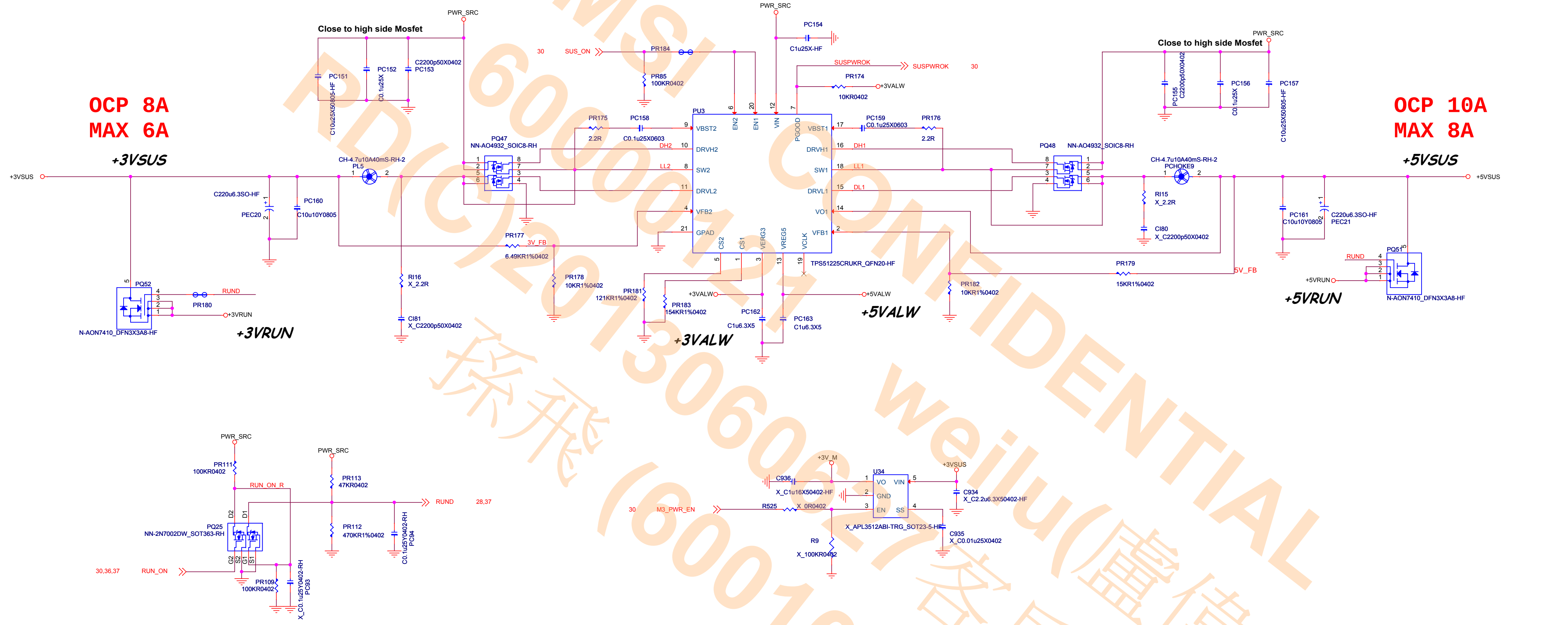
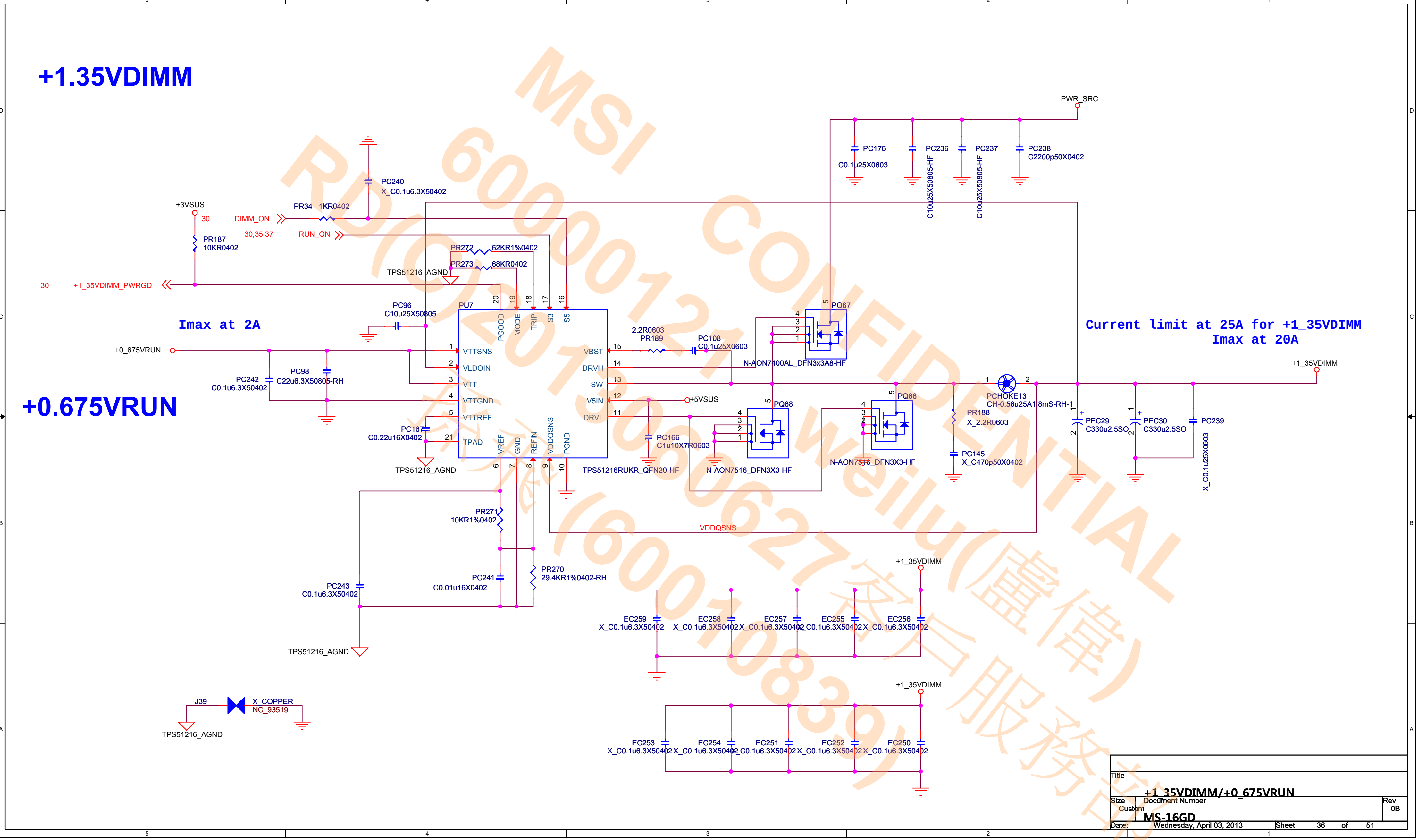
System Power



Title	System Power	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 35 of 51	



+1.35VDIMM
+0.675VRUN
Imax at 2A
Current limit at 25A for +1_35VDIMM
Imax at 20A
PWR_SRC
PC176
C0.1u25X0603
PC236
C10u25X50805-HF
PC237
C10u25X50805-HF
PC238
C2200p50X0402
PC240
X_C0.1u6.3X50402
+3VSUS
30
DIMM_ON
PR34 1KR0402
30,35,37
RUN_ON
PR187
10KR0402
PR272 62KR1%0402
PR273 68KR0402
TPS51216_AGND
30
+1_35VDIMM_PWRGD
PC96
C10u25X50805
PU7
PGOOD
MODE
TRIP
S3
S5
VTTSNS
VLDOIN
VTT
VTTGND
VTTREF
TPAD
VBST
DRVH
SW
V5IN
DRVL
VREF
GND
REFIN
VDDQSNS
PGND
TPS51216RUKR_QFN20-HF
+0_675VRUN
PC98
C22u6.3X50805-RH
PC242
C0.1u6.3X50402
PC167
C0.22u16X0402
2.2R0603
PR189
PC108
C0.1u25X0603
PQ67
N-AON7400AL_DFN3x3A8-HF
+5VSUS
PC166
C1u10X7R0603
PQ68
N-AON7516_DFN3X3-HF
PQ66
N-AON7516_DFN3X3-HF
PCHOKE13
CH-0.56u25A1.8mS-RH-1
PR188
X_2.2R0603
PC145
X_C470p50X0402
PEC29
C330u2.5SO
PEC30
C330u2.5SO
PC239
X_C0.1u25X0603
+1_35VDIMM
VDDQSNS
PR271
10KR1%0402
PR270
29.4KR1%0402-RH
PC241
C0.01u16X0402
PC243
C0.1u6.3X50402
TPS51216_AGND
+1_35VDIMM
EC259 X_C0.1u6.3X50402
EC258 X_C0.1u6.3X50402
EC257 X_C0.1u6.3X50402
EC255 X_C0.1u6.3X50402
EC256 X_C0.1u6.3X50402
+1_35VDIMM
EC253 X_C0.1u6.3X50402
EC254 X_C0.1u6.3X50402
EC251 X_C0.1u6.3X50402
EC252 X_C0.1u6.3X50402
EC250 X_C0.1u6.3X50402
J39
X_COPPER
NC_93519
TPS51216_AGND
MSI CONFIDENTIAL
Title
+1_35VDIMM/+0_675VRUN
Size Custom
Document Number
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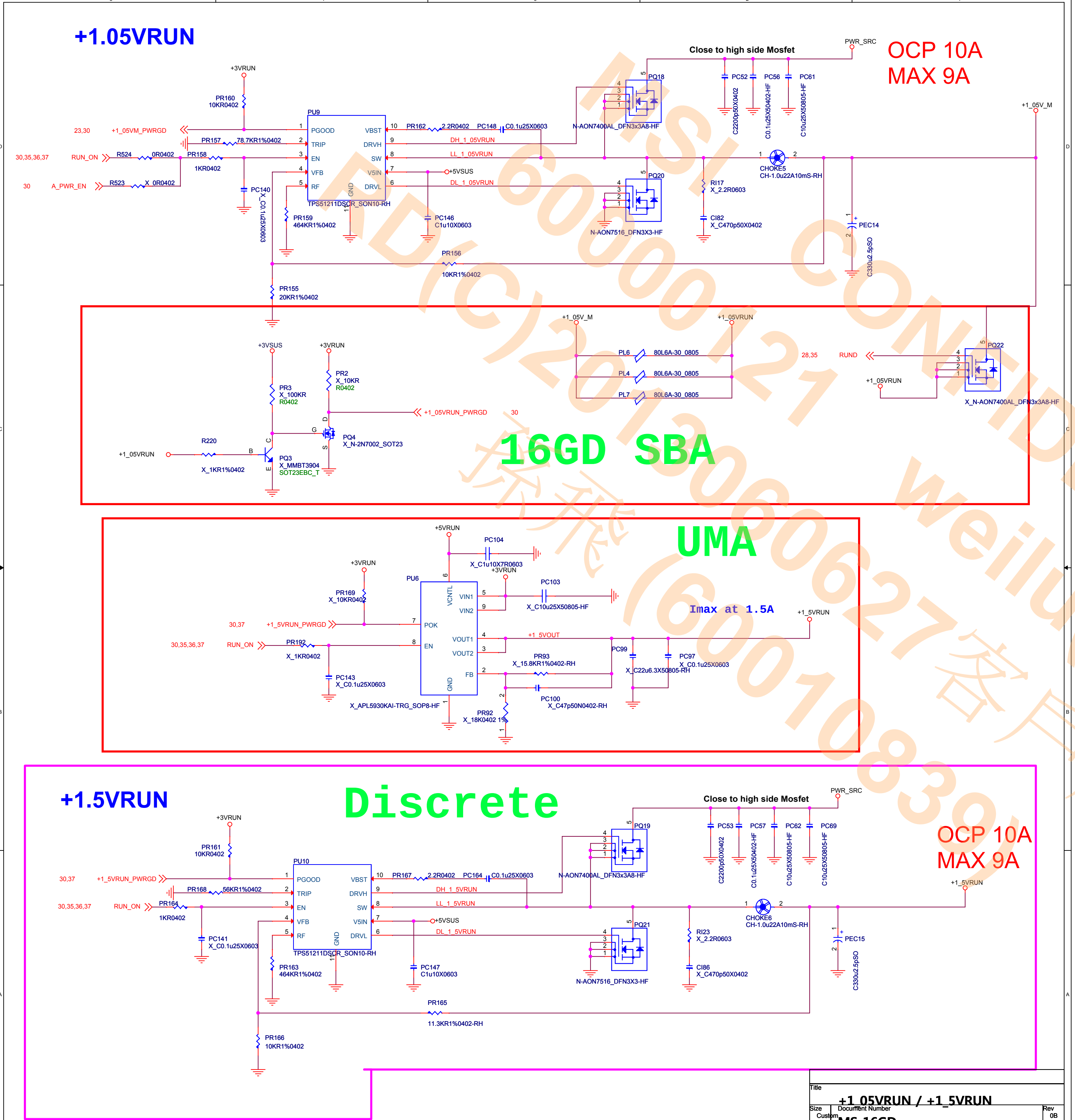

Title: +1_05VRUN / +1_5VRUN

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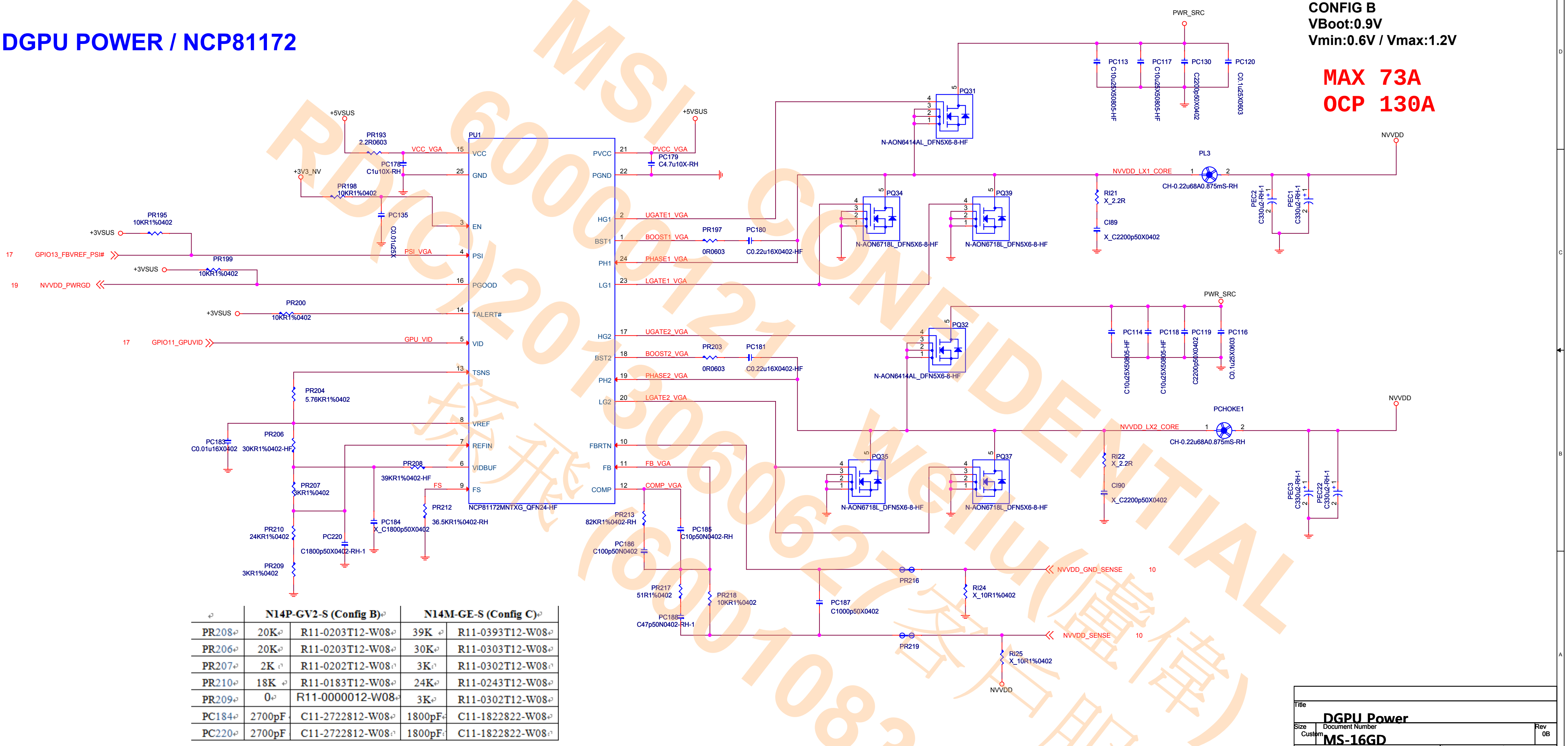
DGPU POWER / NCP81172

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

MAX 73A
OCP 130A



	N14P-GV2-S (Config B)		N14M-GE-S (Config C)	
PR208	20K	R11-0203T12-W08	39K	R11-0393T12-W08
PR206	20K	R11-0203T12-W08	30K	R11-0303T12-W08
PR207	2K	R11-0202T12-W08	3K	R11-0302T12-W08
PR210	18K	R11-0183T12-W08	24K	R11-0243T12-W08
PR209	0	R11-0000012-W08	3K	R11-0302T12-W08
PC184	2700pF	C11-2722812-W08	1800pF	C11-1822822-W08
PC220	2700pF	C11-2722812-W08	1800pF	C11-1822822-W08

Title: DGPU Power
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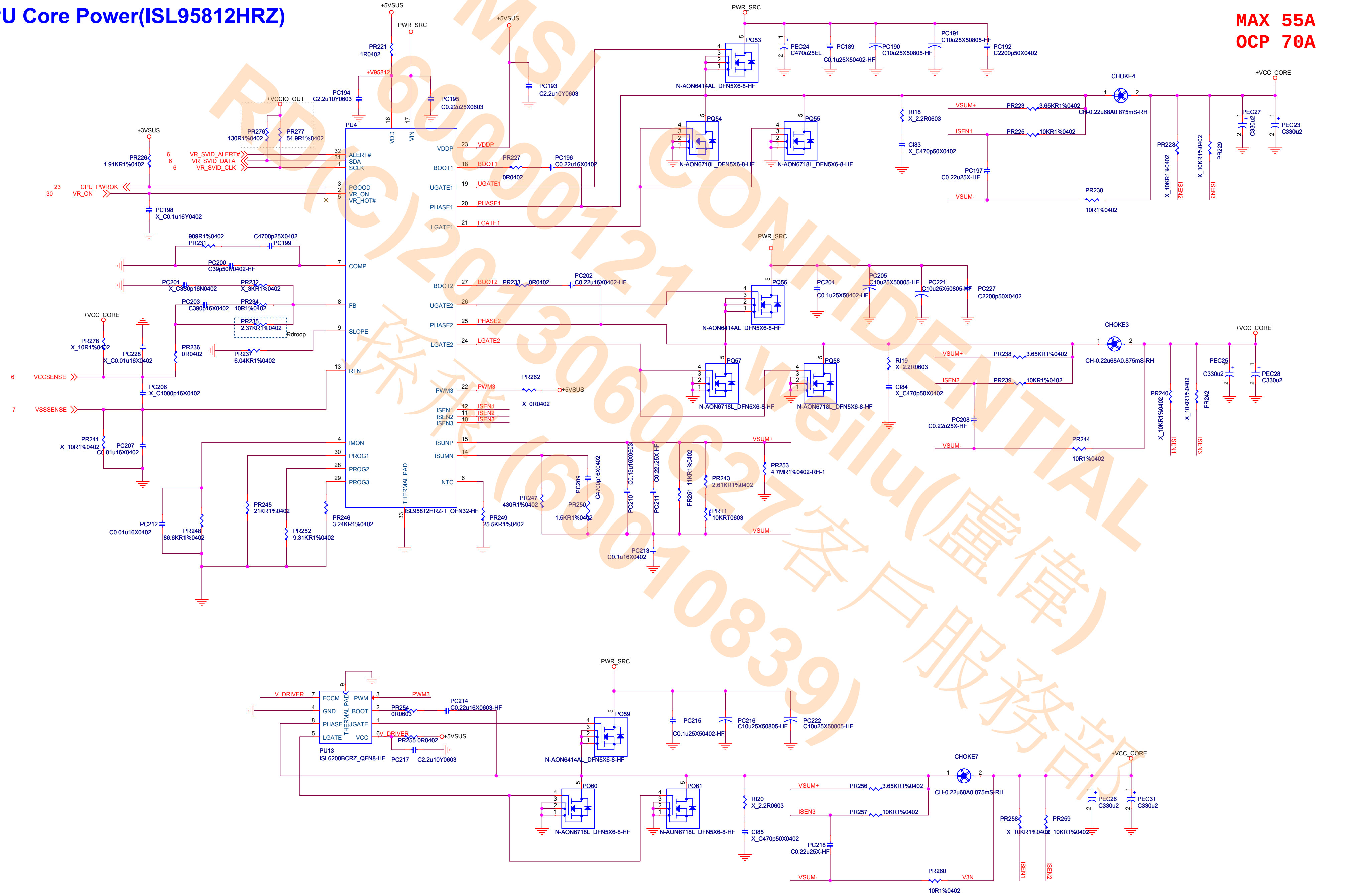
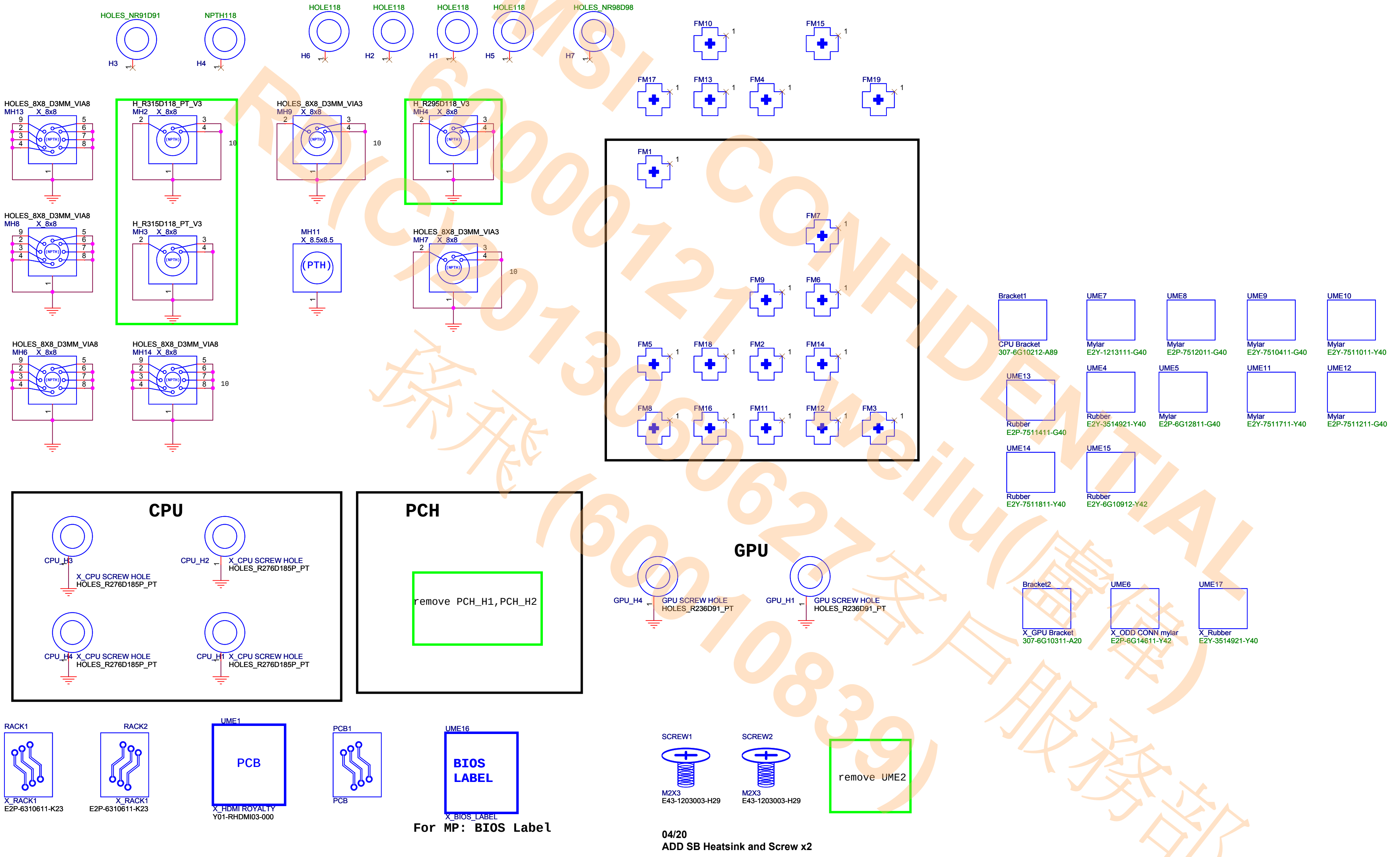
CPU Core Power(ISL95812HRZ)

MAX 55A
OCP 70A



Title	CPU Power	
Size Custom	Document Number MS-16GD	Rev 0B
Date: Wednesday, April 03, 2013	Sheet 39 of 51	



Title	Screw/ME
Size	Custom
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Title: EMI		
Size: Custom	Document Number: MS-16GD	Rev: 0B
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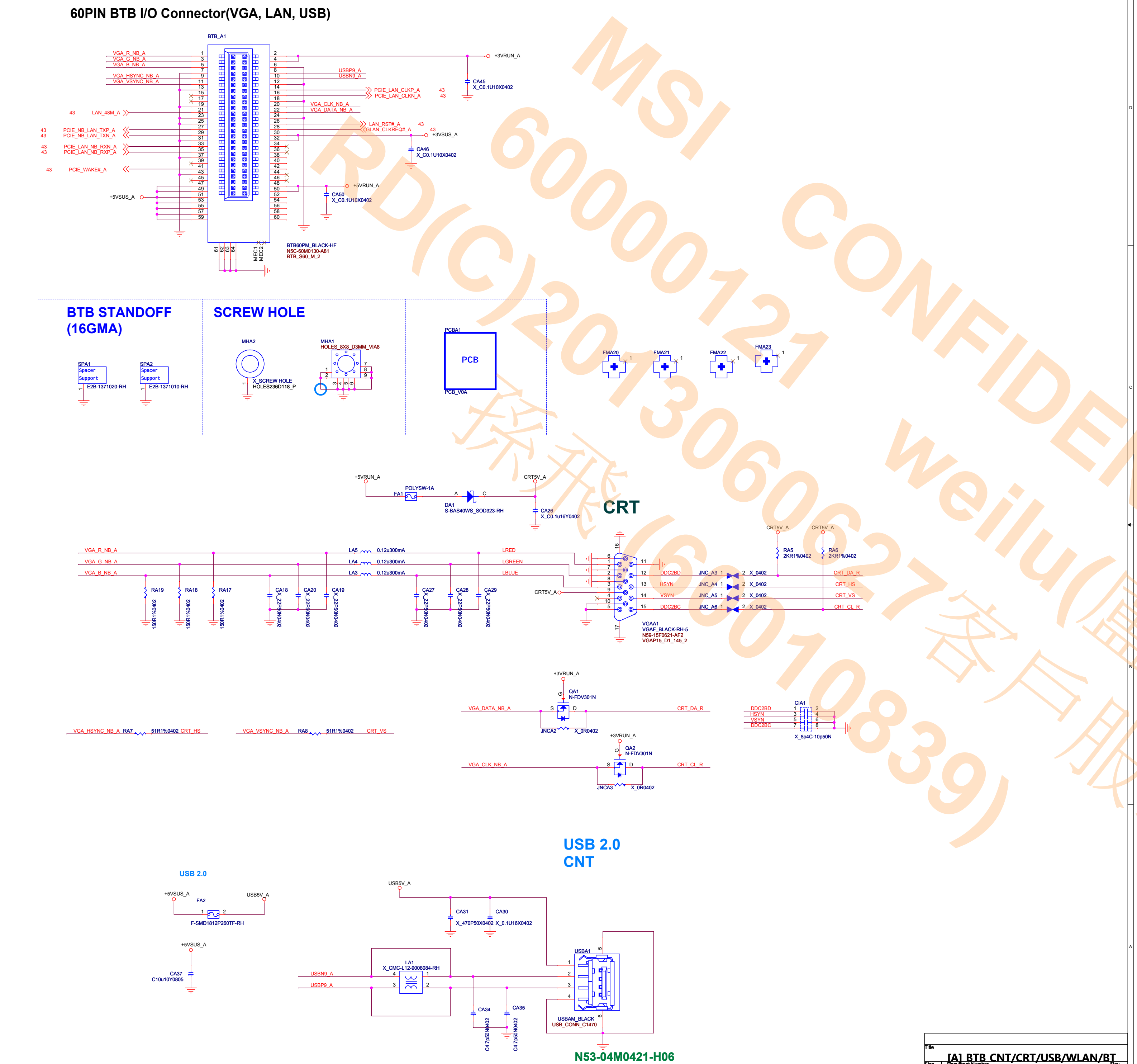

Title	[A] BTB CNT/CRT/USB/WLAN/BT
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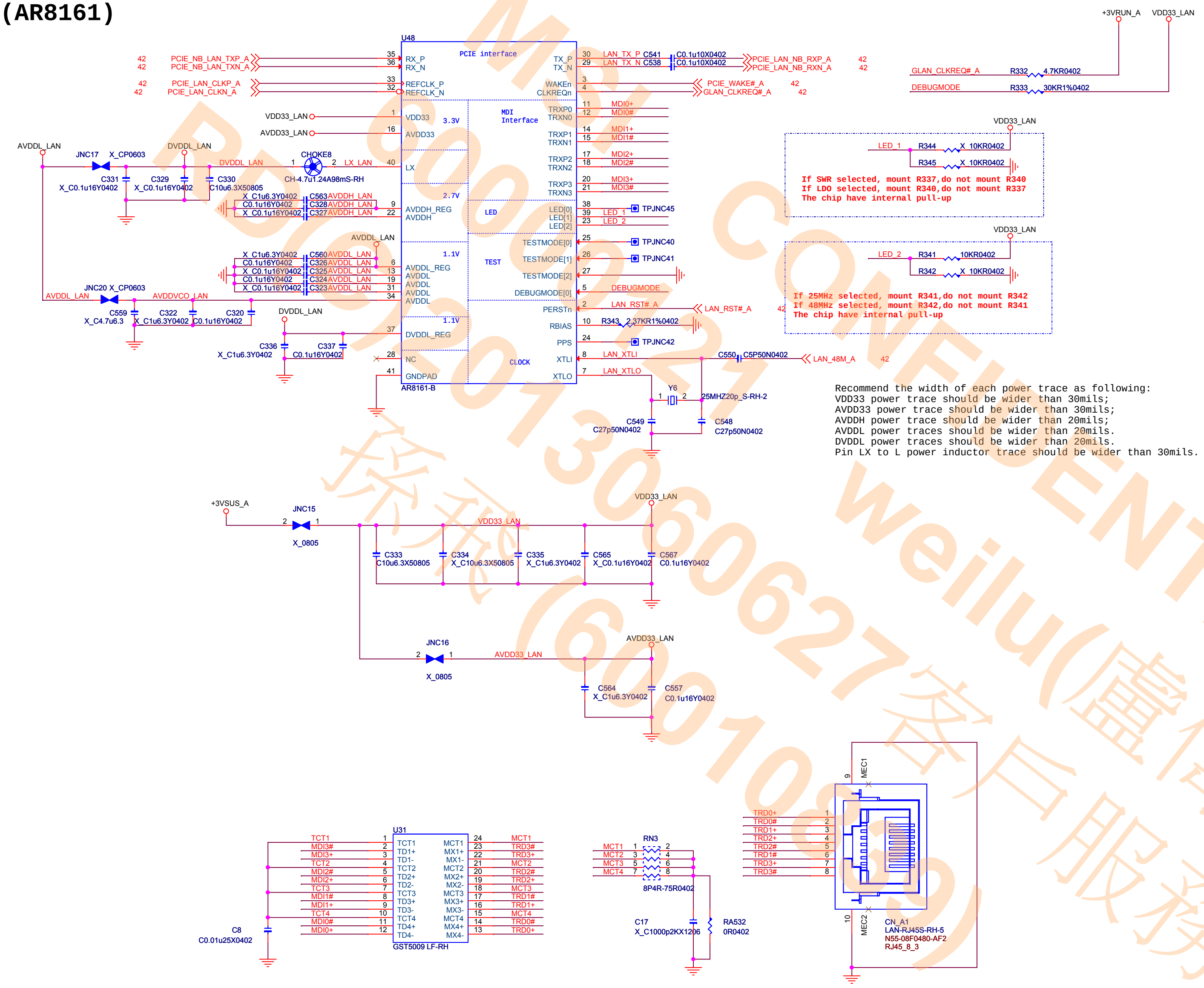
GIGA LAN(AR8161)



Recommend the width of each power trace as following:
VDD33 power trace should be wider than 30mils;
AVDD33 power trace should be wider than 30mils;
AVDDH power trace should be wider than 20mils;
AVDDL power traces should be wider than 20mils.
DVDDL power traces should be wider than 20mils.
Pin LX to L power inductor trace should be wider than 30mils.

Title	[A] GIGA LAN(BFN2205B)
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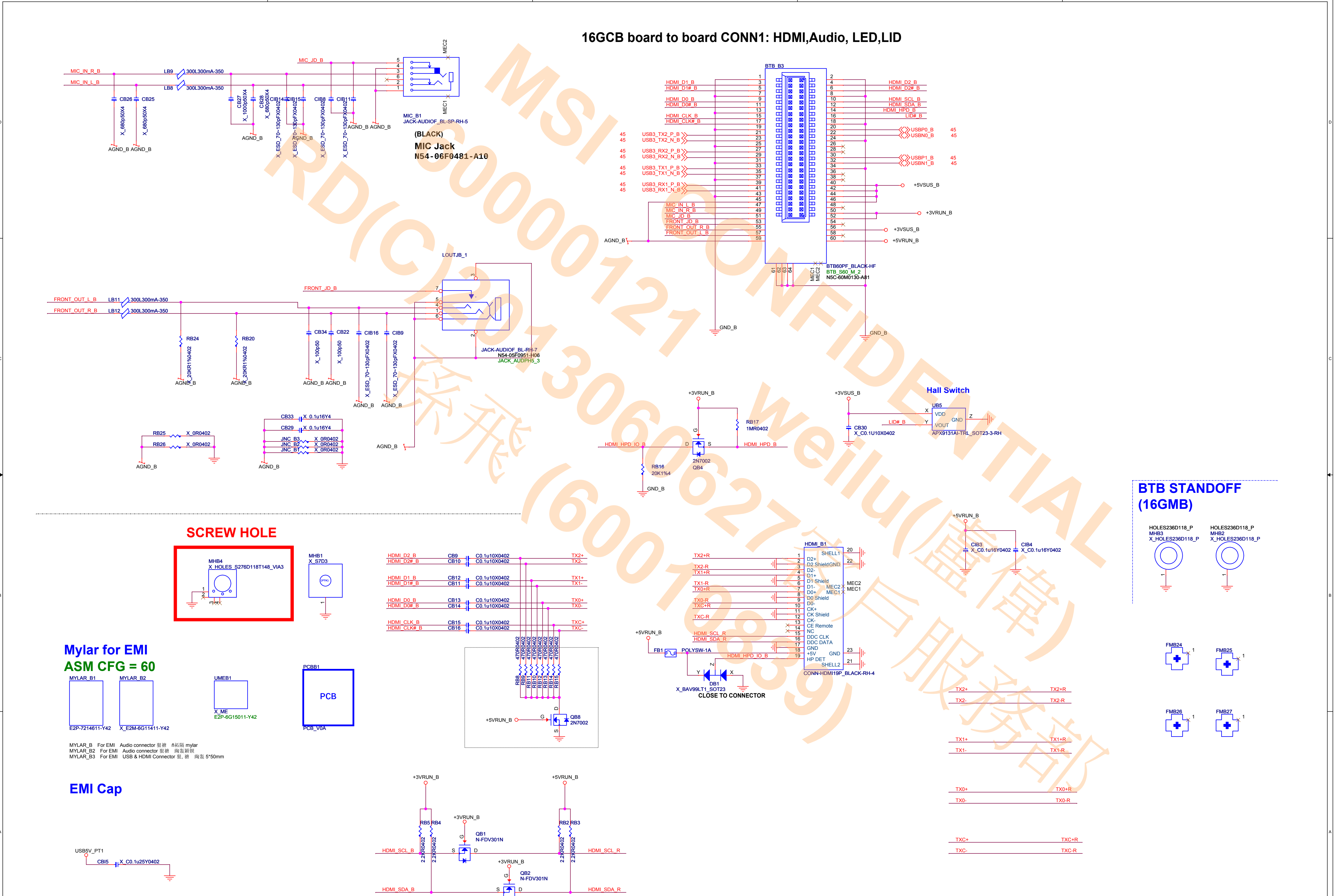
16GCB board to board CONN1: HDMI,Audio, LED,LID
MIC_B1
JACK-AUDIOF_BL-SP-RH-5
(BLACK)
MIC Jack
N54-06F0481-A10
BTB_B3
BTB60PF_BLACK-HF
BTB_S60_M_2
N5C-60M0130-A81
LOUTJB_1
JACK-AUDIOF_BL-RH-7
N54-05F0951-H06
JACK_AUDPH5_3
Hall Switch
UB5
APX9131AI-TRL_SOT23-3-RH
2N7002
QB4
SCREW HOLE
MHB4
X_HOLES_S276D118T148_VIA3
MHB1
X_S7D3
HDMI_B1
CONN-HDMI19P_BLACK-RH-4
CLOSE TO CONNECTOR
BTB STANDOFF
(16GMB)
Mylar for EMI
ASM CFG = 60
MYLAR_B1
E2P-7214611-Y42
MYLAR_B2
X_E2M-6G11411-Y42
UMEB1
X_ME
E2P-6G15011-Y42
PCBB1
PCB
PCB_V0A
MYLAR_B For EMI Audio connector
MYLAR_B2 For EMI Audio connector
MYLAR_B3 For EMI USB & HDMI Connector 5*50mm
EMI Cap
QB1
N-FDV301N
QB2
N-FDV301N
QB8
2N7002

Title	[B] BTB_CNT/Audio/HDMI
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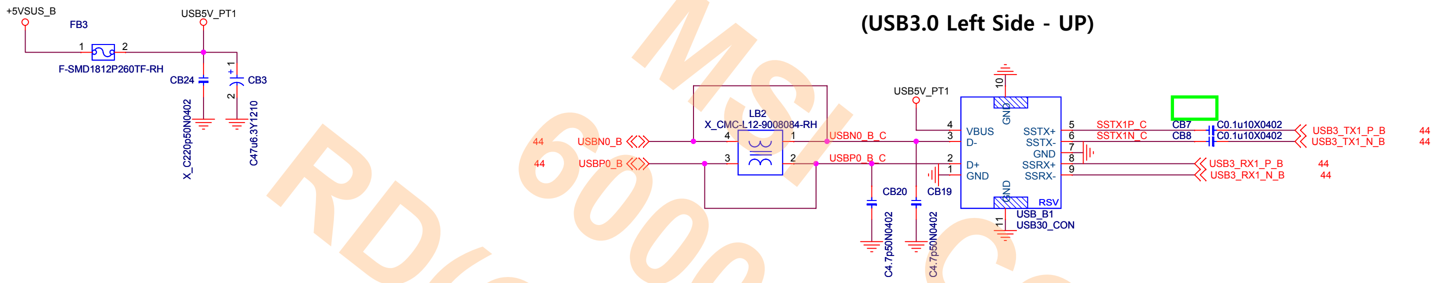
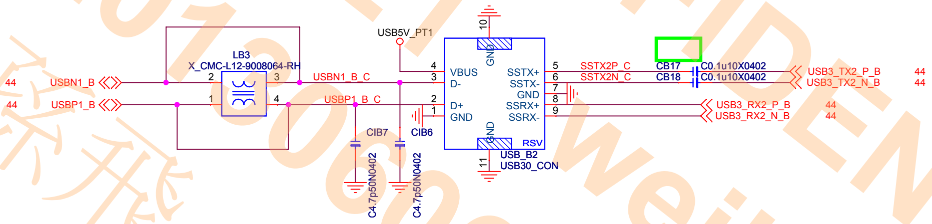
USB 3.0 CNT1

(USB3.0 Left Side - UP)



USB 3.0 CNT 2

(USB3.0 Left Side - Down)



Title	[B] USB3.0x2/USB2.0x1/LED KB	
Size: Custom	Document Number: MS-16GD	Rev: 0B
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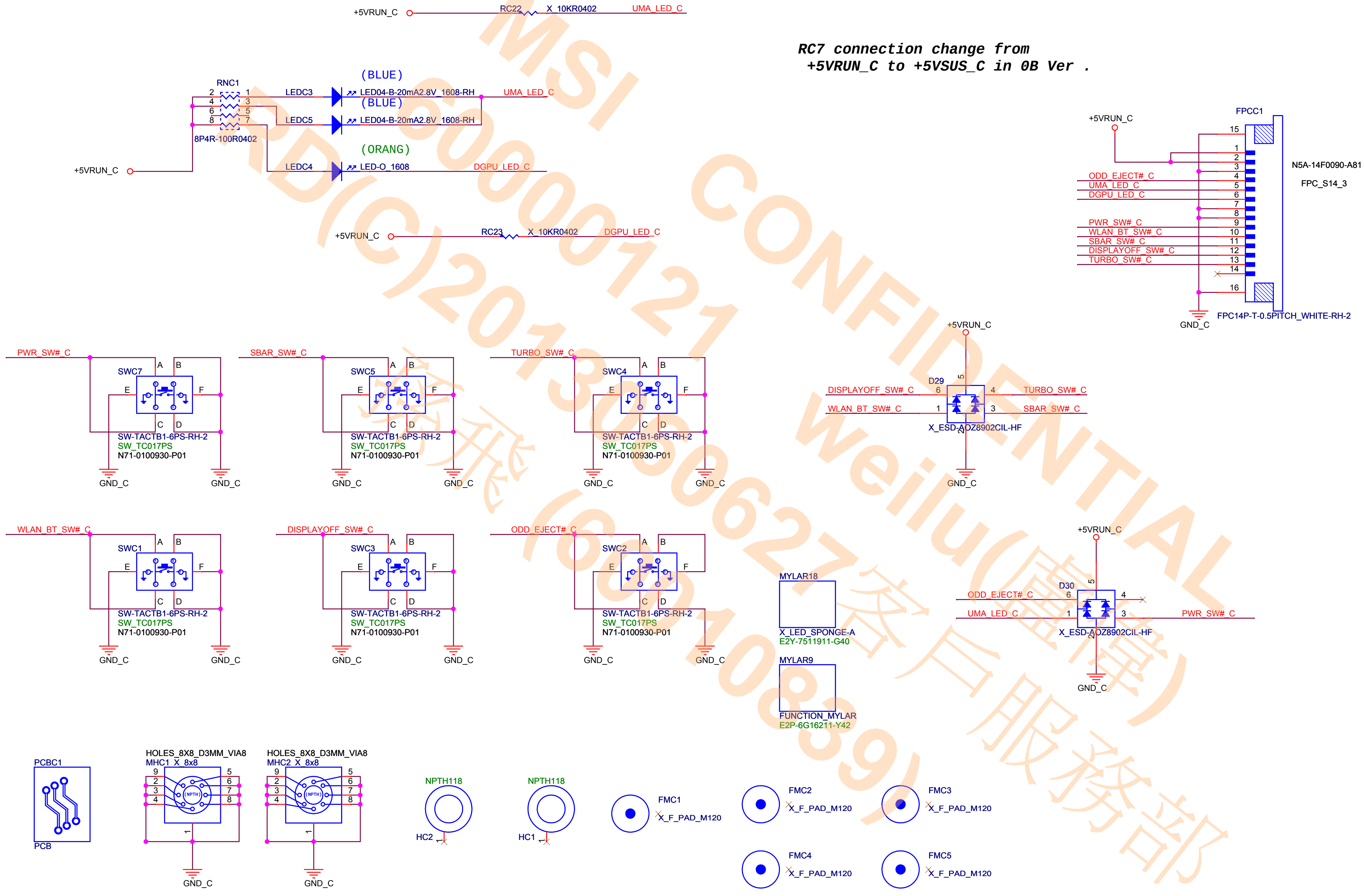

Title: [C] PowerKey Board

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POWER ON SEQUENCE FOR AC MODE

Title	<Title>	
Size Custom	Document Number MS-16GD	Rev 0B
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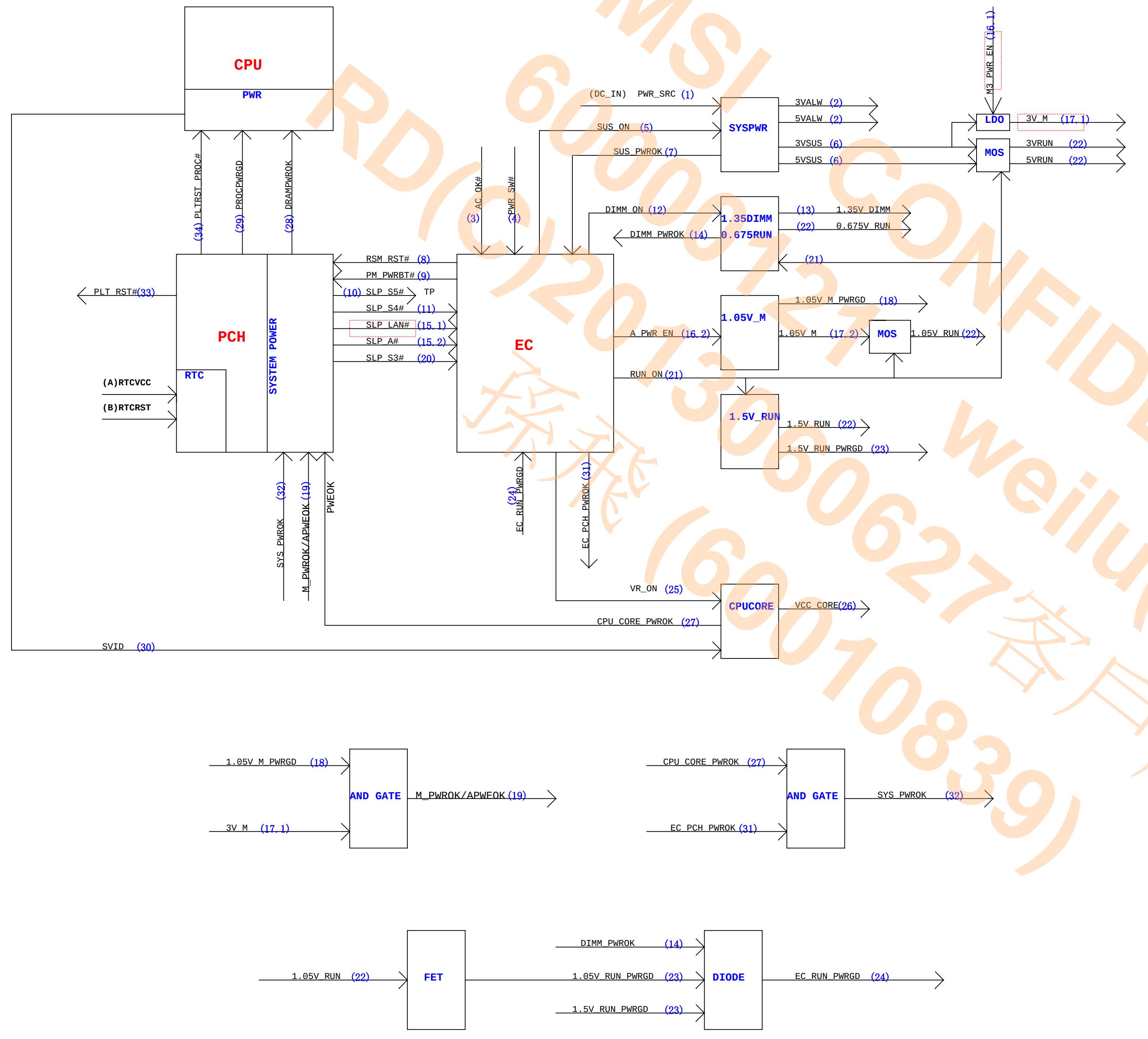
Power Sequence



Title	<Title>		
Size: Custom	Document Number: MS-16GD		Rev: 0B
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POWER ON SEQUENCE FOR AC MODE

Title	<Title>	
Size: Custom	Document Number: MS-16GD	Rev: 0B
Date: Wednesday, April 03, 2013	Sheet 51 of 51	