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Typhon Berlin HP PN: 840102-001 SSID:0x8268 Ver:X3

CPU:

INTEL HSW-E LGA2011-3

System Chipset:

INTEL - Wellsbug-X

OnBoard Chipset:

HD Audio Codec:ALC1150

RTL8161GSH

eSIO: NCT6683D-T

Flash ROM: 64 Mb SPI Quad Read

TPM: SLB9670

Main Memory:

DDR4 (2133MHz) * 4 (Qual Channel) @1.2V

Expansion Slots:

PCI Express (X16) Slot * 2

M.2 Key M(SSD) * 1

M.2 Key A(WLAN) * 1

PWM:

VRD12.5 - ISL6376 Extend to10-Phase Dr.MOS

MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: Cover Sheet

Size | Document Number: Berlin | Rev: X3

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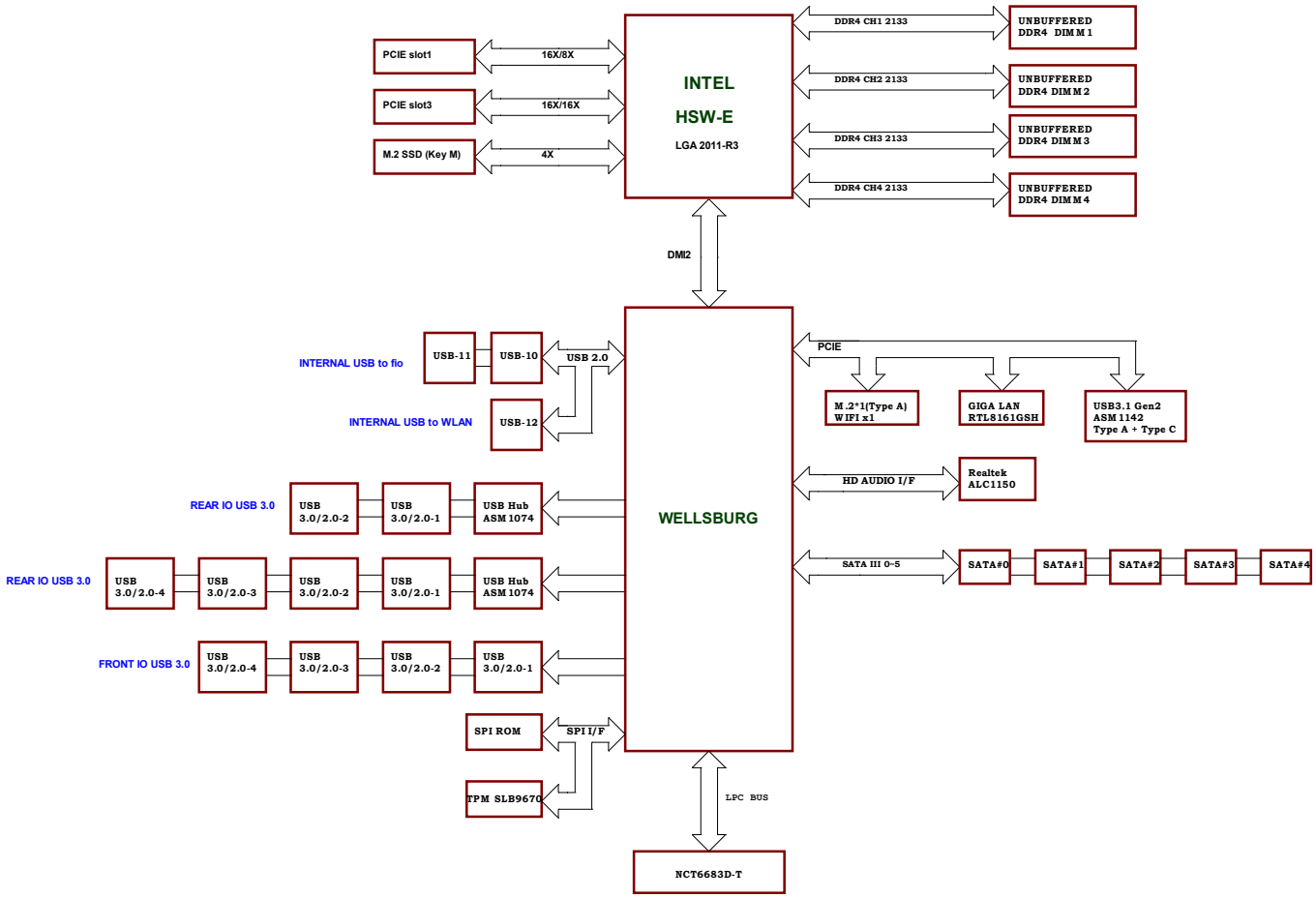

MICRO-START INT'L CO.,LTD.

Title: Block Diagram

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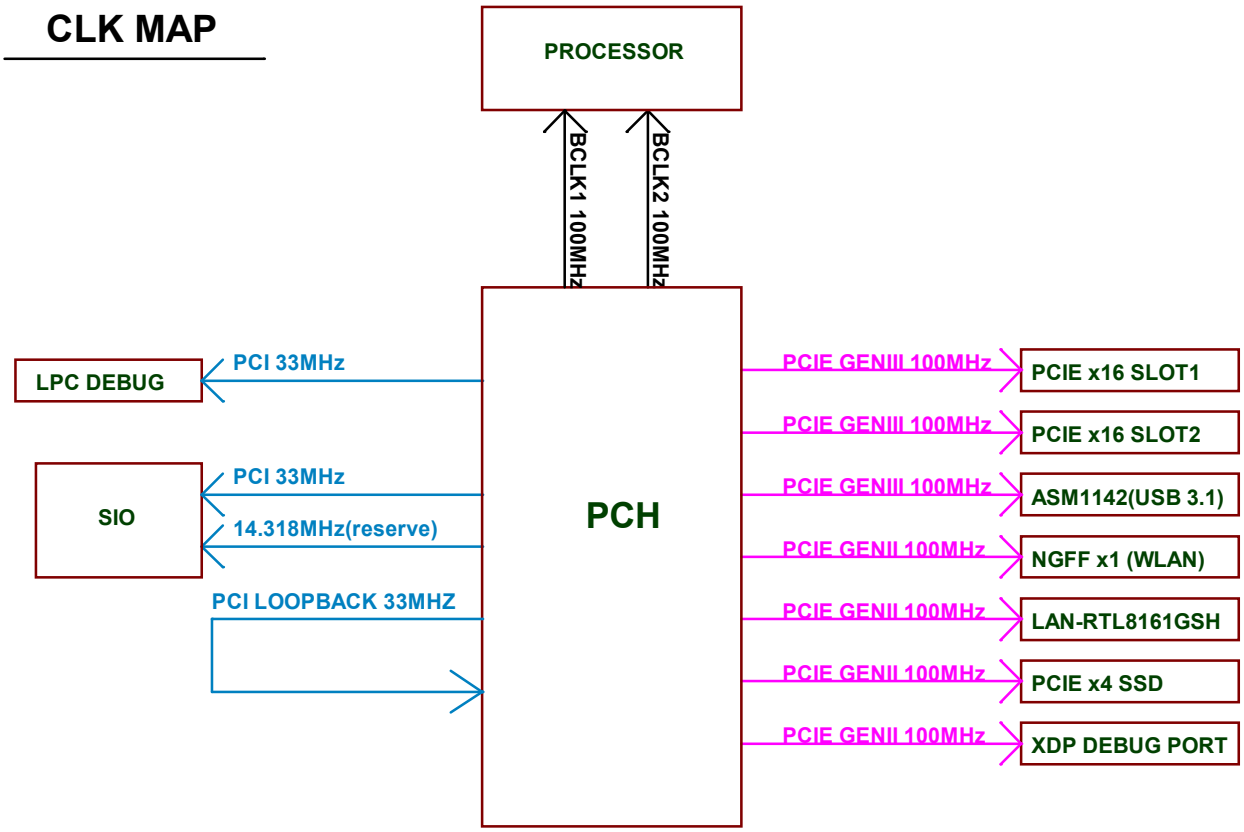
CLK MAP



MSI MICRO-START INT'L CO.,LTD.
Link to the Future

Title: Clock Map		
Size	Document Number: Berlin	Rev: X3
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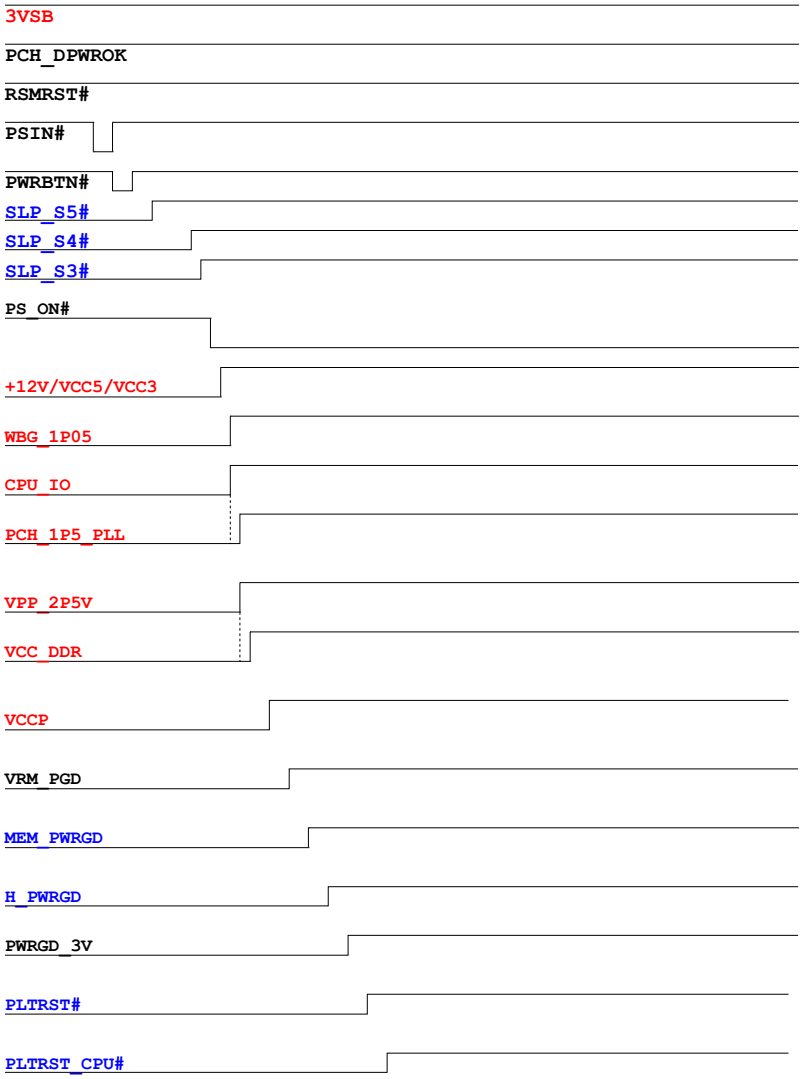
G3-->S5-->S0

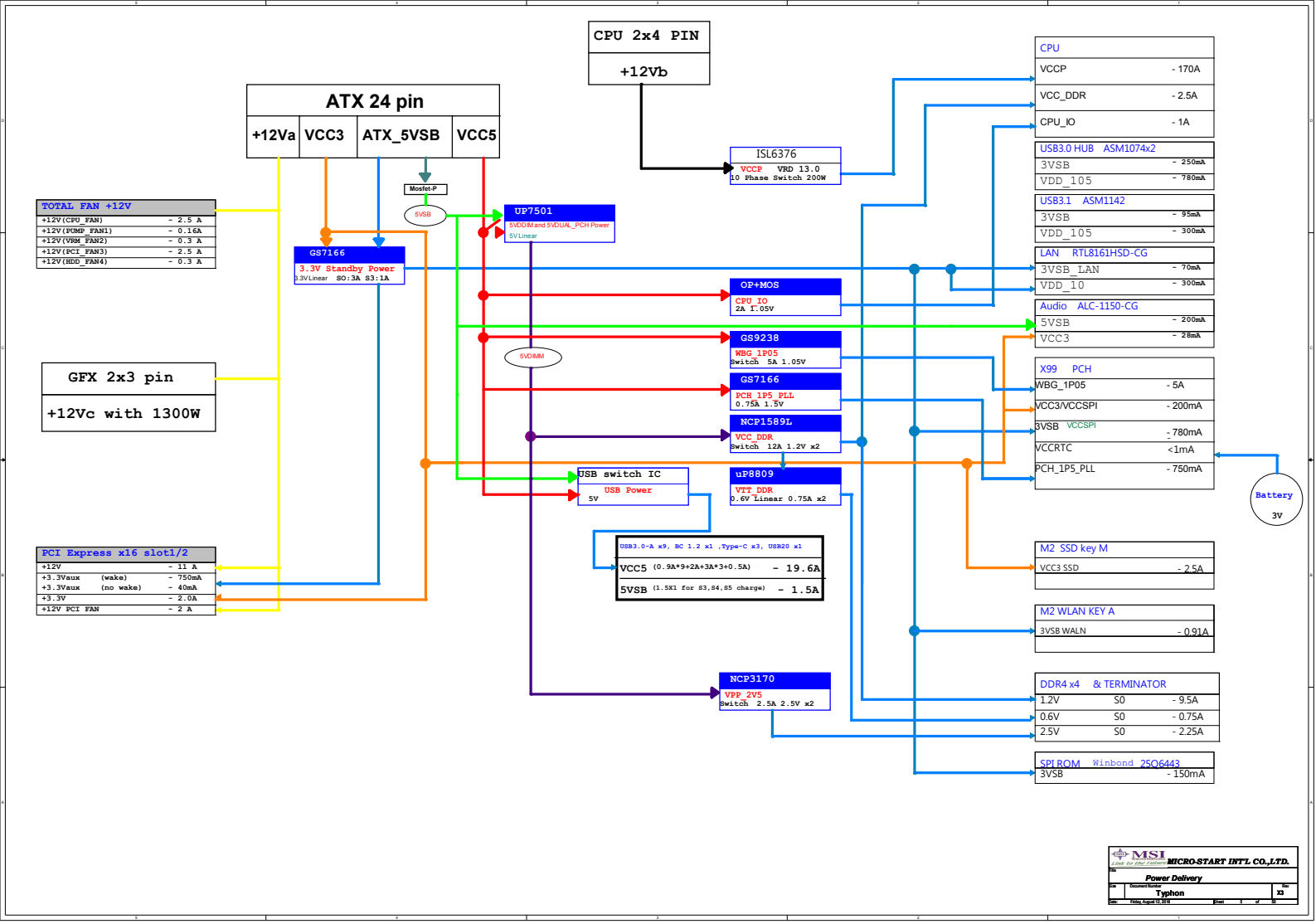


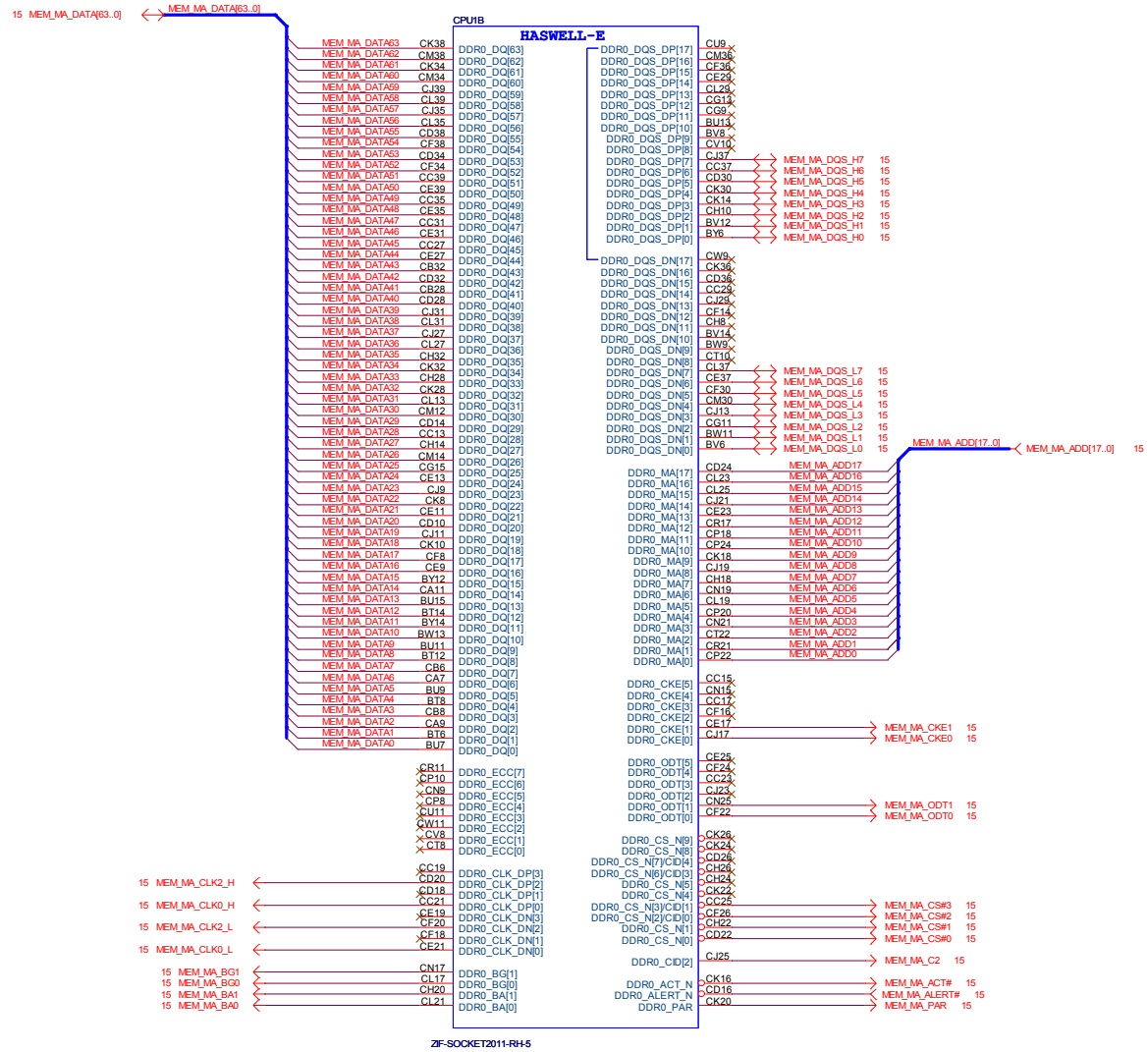
MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: Power Sequence

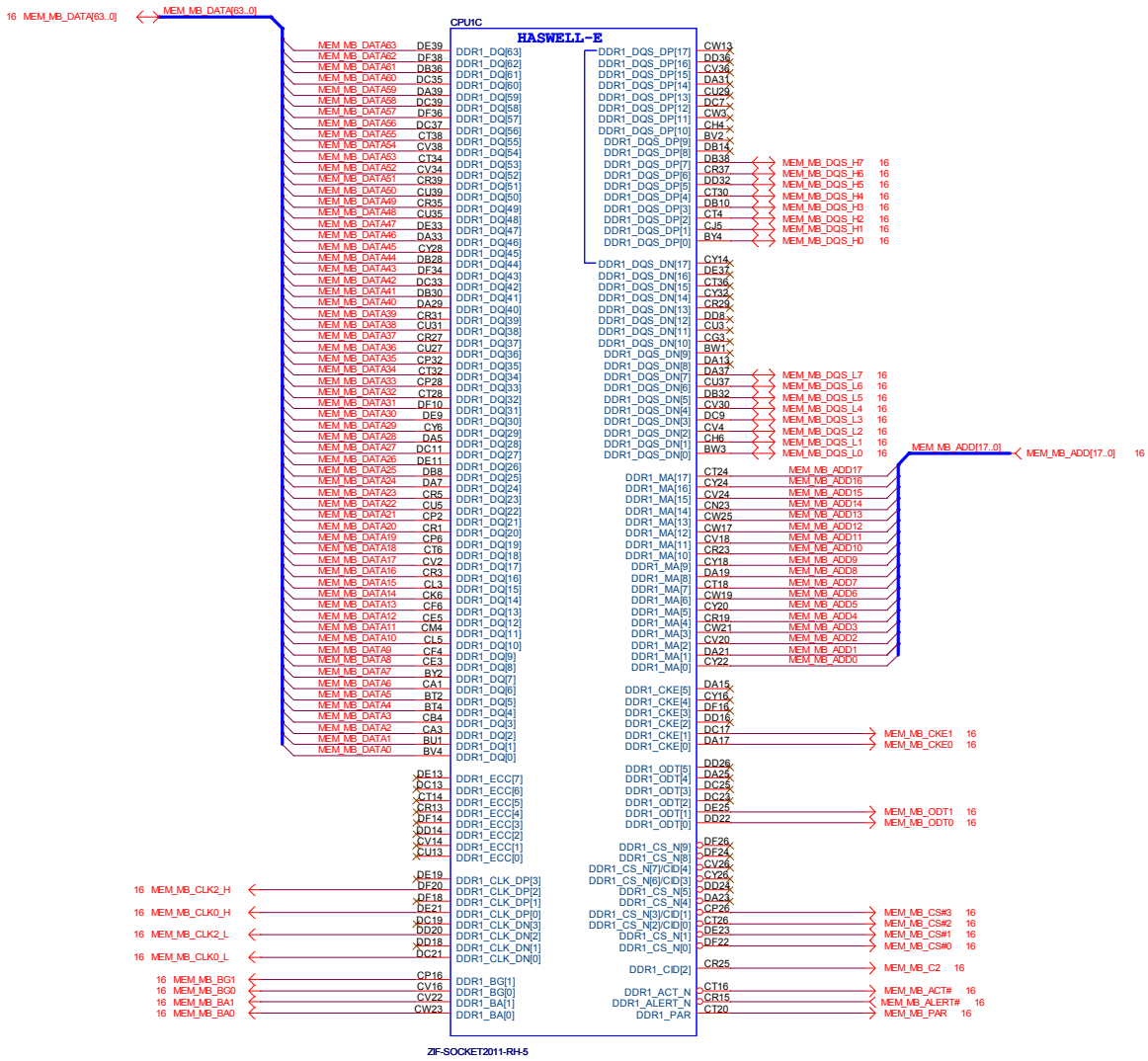
Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 4 of 50


CPU 2x4 PIN
+12Vb
ATX 24 pin
+12Va
VCC3
ATX_5VSB
VCC5
Mosfet-P
5VSB
ISL6376
VCCP VRD 13.0
10 Phase Switch 200W
CPU
VCCP - 170A
VCC_DDR - 2.5A
CPU_IO - 1A
USB3.0 HUB ASM1074x2
3VSB - 250mA
VDD_105 - 780mA
USB3.1 ASM1142
3VSB - 95mA
VDD_105 - 300mA
LAN RTL8161HSD-CG
3VSB_LAN - 70mA
VDD_10 - 300mA
Audio ALC-1150-CG
5VSB - 200mA
VCC3 - 28mA
TOTAL FAN +12V
+12V(CPU_FAN) - 2.5 A
+12V(PUMP_FAN1) - 0.16A
+12V(VRM_FAN2) - 0.3 A
+12V(PCI_FAN3) - 2.5 A
+12V(HDD_FAN4) - 0.3 A
GS7166
3.3V Standby Power
3.3VLinear SO:3A S3:1A
UP7501
5VDDIM and 5VDUAL_PCH Power
5VLinear
OP+MOS
CPU_IO
2A 1.05V
GS9238
WBG_1P05
Switch 5A 1.05V
5VDIMM
GS7166
PCH_1P5_PLL
0.75A 1.5V
NCP1589L
VCC_DDR
Switch 12A 1.2V x2
GFX 2x3 pin
+12Vc with 1300W
USB switch IC
USB Power
5V
uP8809
VTT_DDR
0.6V Linear 0.75A x2
X99 PCH
WBG_1P05 - 5A
VCC3/VCCSPI - 200mA
3VSB VCCSPI - 780mA
VCCRTC <1mA
PCH_1P5_PLL - 750mA
Battery
3V
PCI Express x16 slot1/2
+12V - 11 A
+3.3Vaux (wake) - 750mA
+3.3Vaux (no wake) - 40mA
+3.3V - 2.0A
+12V PCI FAN - 2 A
USB3.0-A x9, BC 1.2 x1 ,Type-C x3, USB20 x1
VCC5 (0.9A*9+2A+3A*3+0.5A) - 19.6A
5VSB (1.5X1 for S3,S4,S5 charge) - 1.5A
M2 SSD key M
VCC3 SSD - 2.5A
M2 WLAN KEY A
3VSB WALN - 0.91A
NCP3170
VPP_2V5
Switch 2.5A 2.5V x2
DDR4 x4 & TERMINATOR
1.2V S0 - 9.5A
0.6V S0 - 0.75A
2.5V S0 - 2.25A
SPI ROM Winbond 25Q6443
3VSB - 150mA
MSI
MICRO-STAR INTL CO.,LTD.
Power Delivery
Typhon
X3



MSI	MICRO-START INTL CO.,LTD.	
Title	HSW-E MEMORY 1	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 6 of 50	

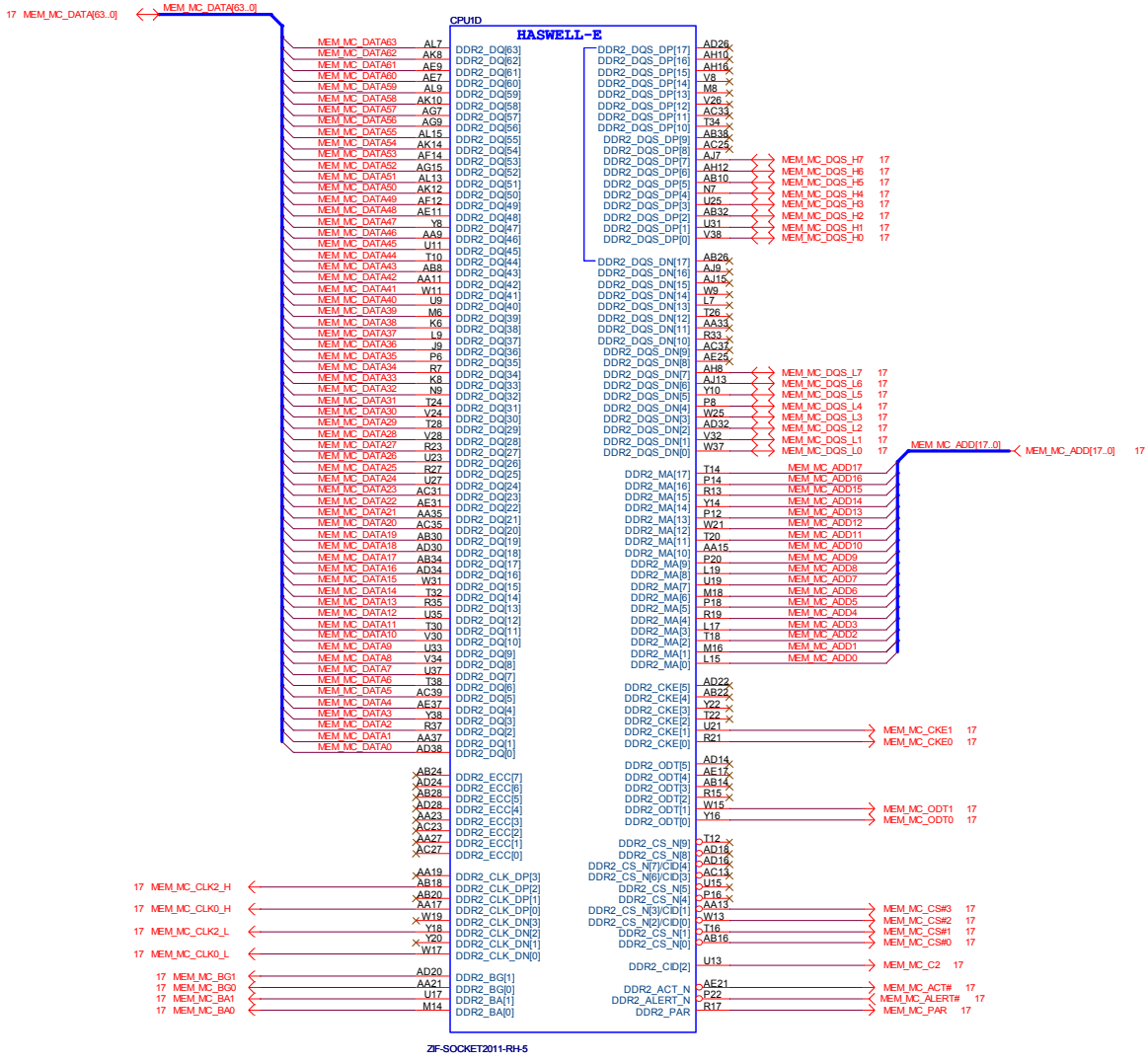


MICRO-START INTL CO.,LTD.

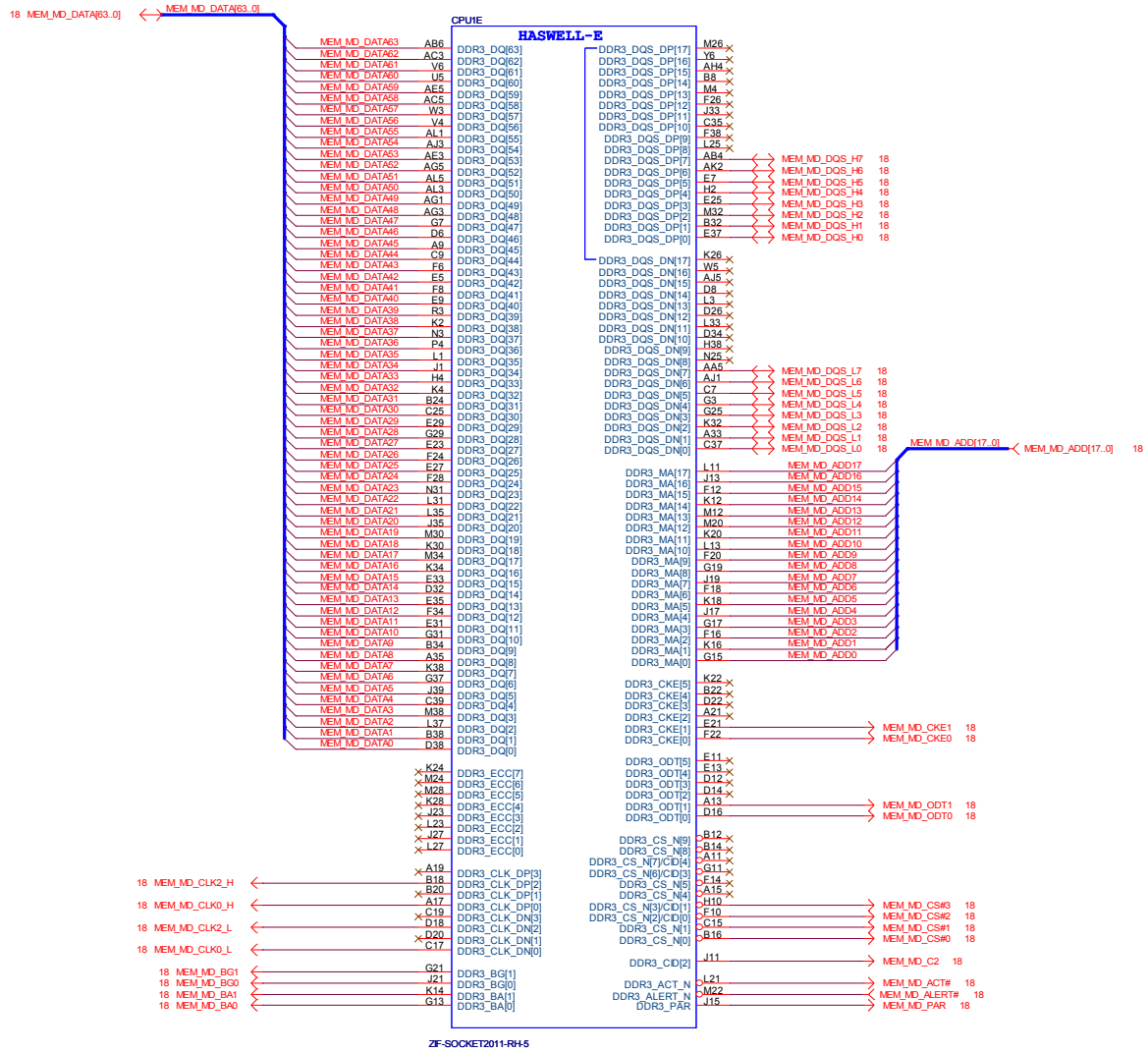
Title: HSW-E MEMORY 2

Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 7 of 50



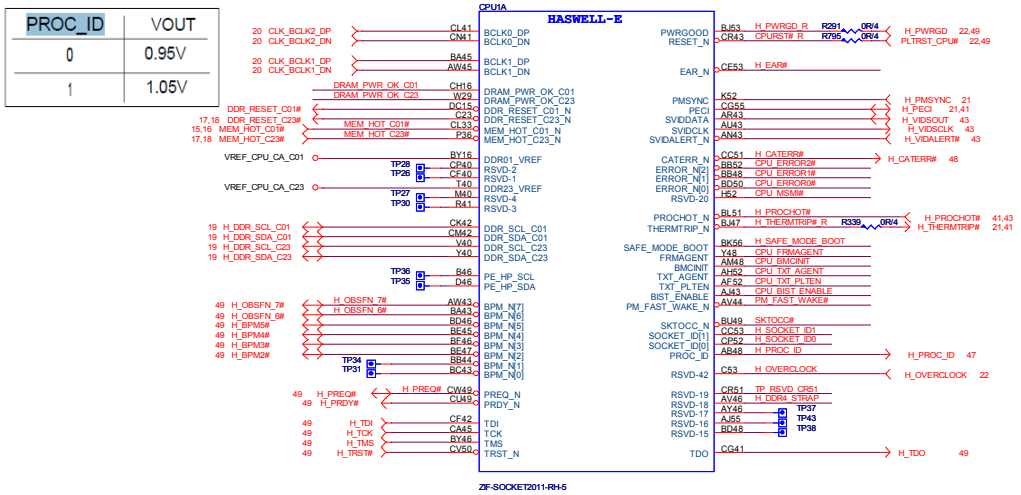
MSI	MICRO-START INTL CO.,LTD.	
Title	HSW-E MEMORY 3	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 8 of 50	

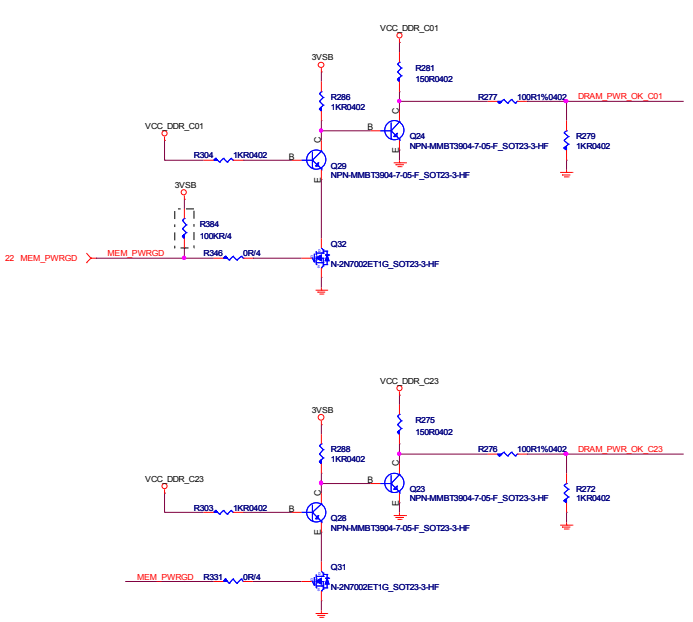


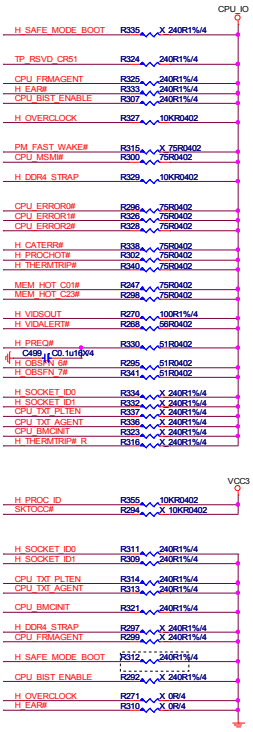
MICRO-START INTL CO.,LTD.

Title	HSW-E MEMORY 4	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 9 of 50	

PROC_ID	VOUT
0	0.95V
1	1.05V





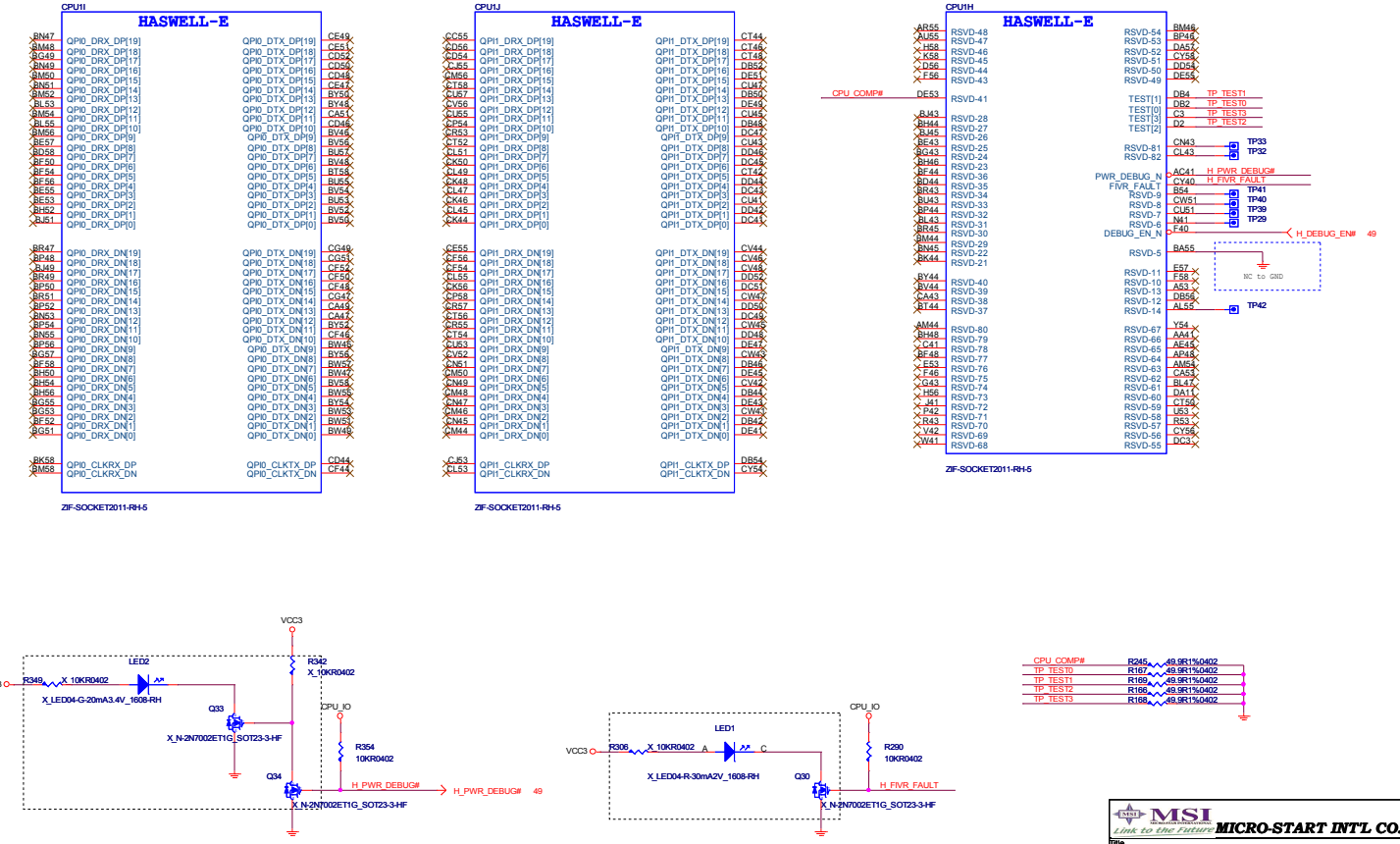


MICRO-START INT'L CO.,LTD.

Title: HSW-E MISC

Size: | Document Number: Berlin | Rev: X3

Date: Friday, August 12, 2016 | Sheet 10 of 50

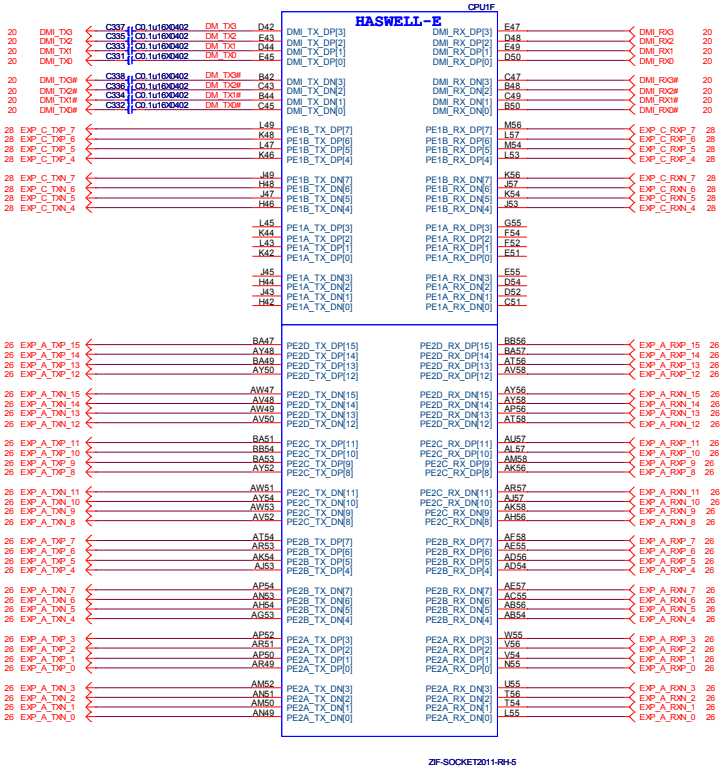


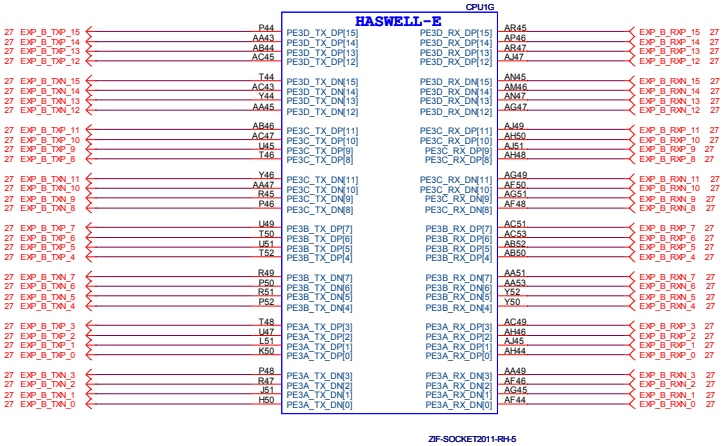
MICRO-START INT'L CO.,LTD.

Title: HSW-E RESERVED

Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 11 of 50





PCIe Port 1	Dev 1, Func 0	PE1A_RX_DP[3:0], PE1A_RX_DN[3:0] PE1A_TX_DP[3:0], PE1A_TX_DN[3:0]	PEG C	Not functional in HSW-E 28-lane SKU
IOU2	Dev 1, Func 1	PE1B_RX_DP[7:4], PE1B_RX_DN[7:4] PE1B_TX_DP[7:4], PE1B_TX_DN[7:4]		---

MSI MICRO-START INT'L CO.,LTD.

Title: HSW-E PCIE/DMI

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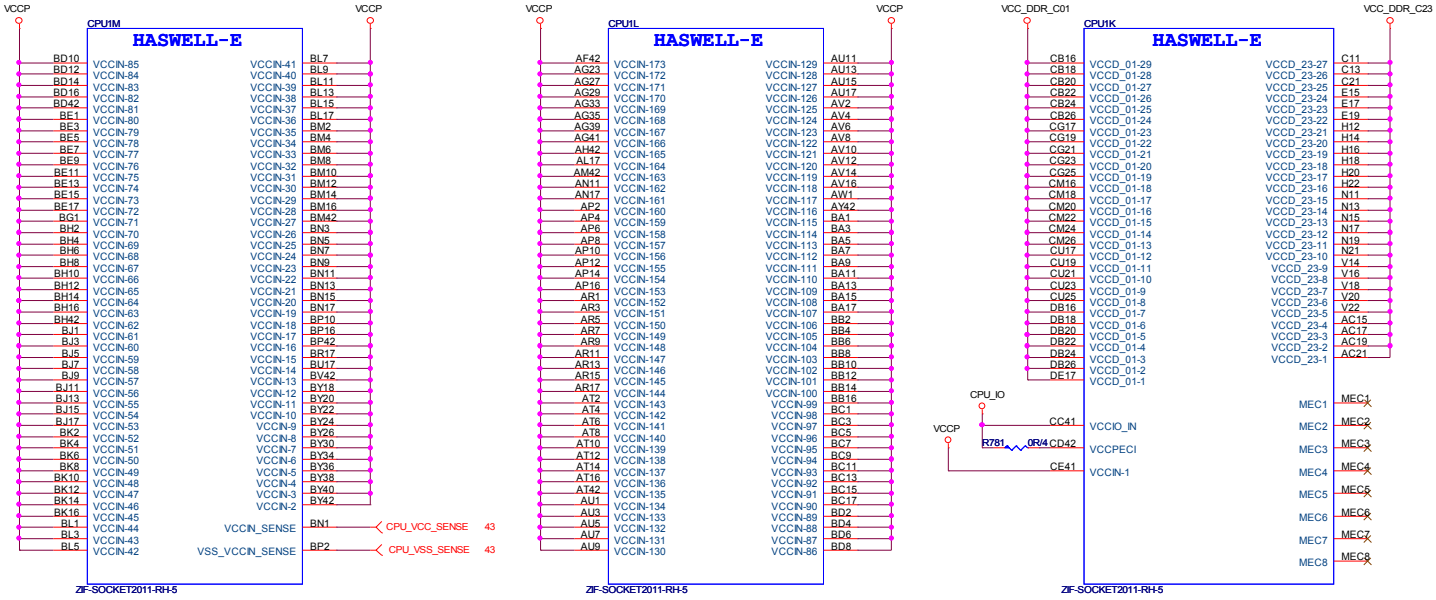
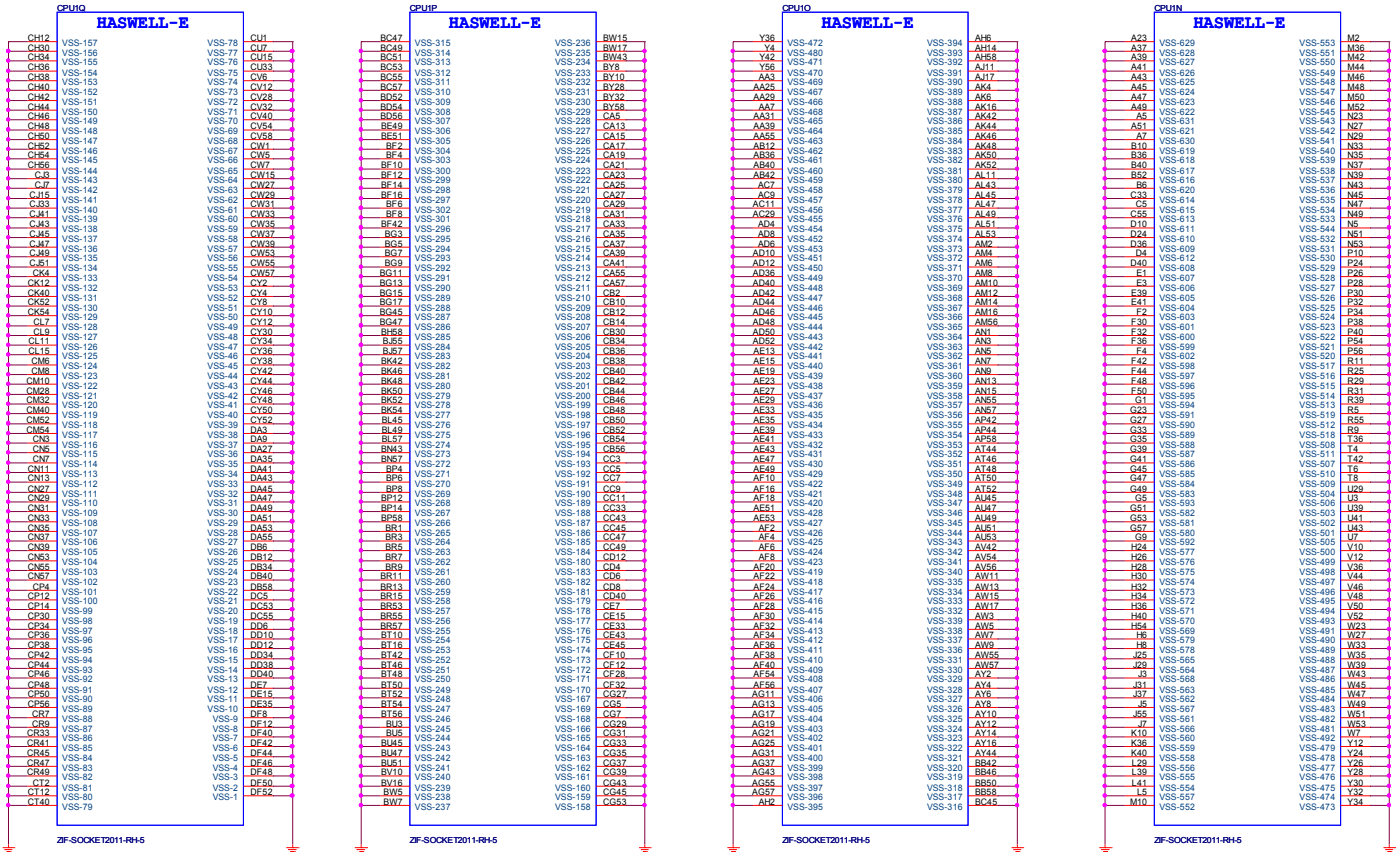


MICRO-START INTL CO.,LTD.

Title: HSW-E POWER

Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 13 of 50

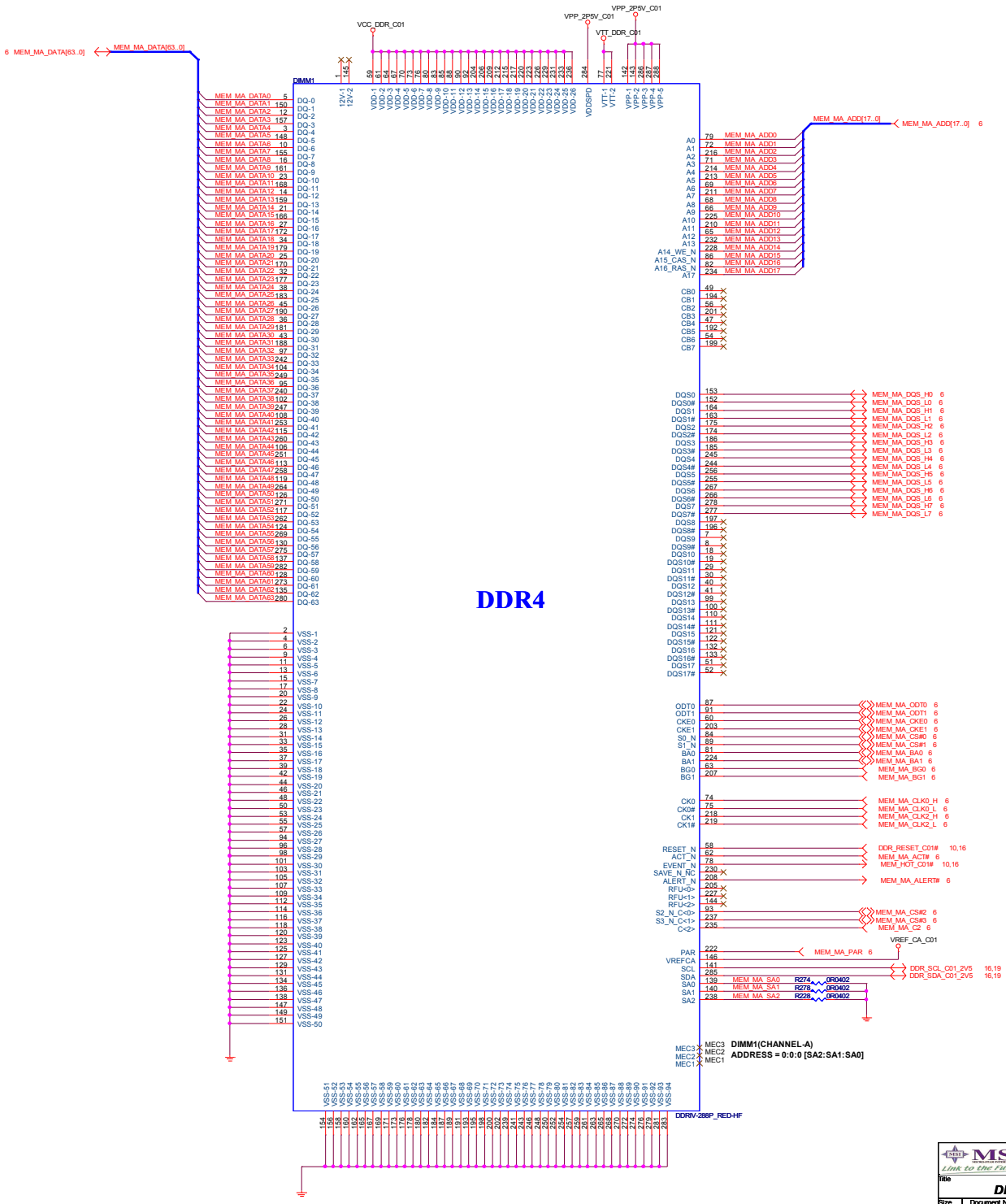


MSI MICRO-START INT'L CO.,LTD.

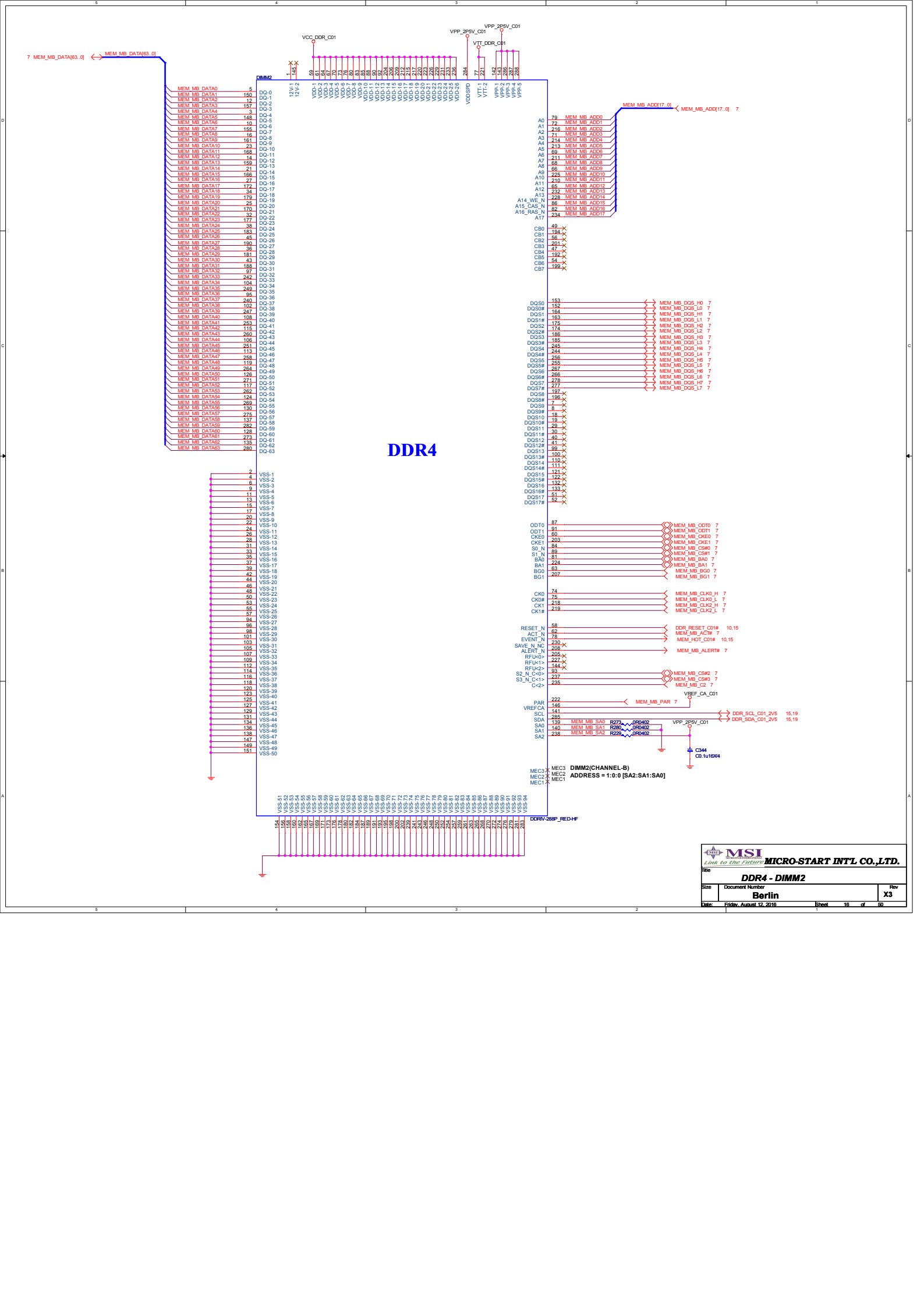
Title: HSW-E GND

Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 14 of 50



MSI MICRO-STAR INT'L CO.,LTD.		
Title: DDR4 - DIMM1		
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 15 of 50	


DDR4
DIMM2
DDRIV-288P_RED-HF
MEM_MB_DATA[63..0]
MEM_MB_ADD[17..0]
VCC_DDR_C01
VPP_2P5V_C01
VTT_DDR_C01
MEC3 DIMM2(CHANNEL-B)
MEC2 ADDRESS = 1:0:0 [SA2:SA1:SA0]
MEC1
MICRO-START INT'L CO.,LTD.
DDR4 - DIMM2
Berlin
X3
Friday, August 12, 2016
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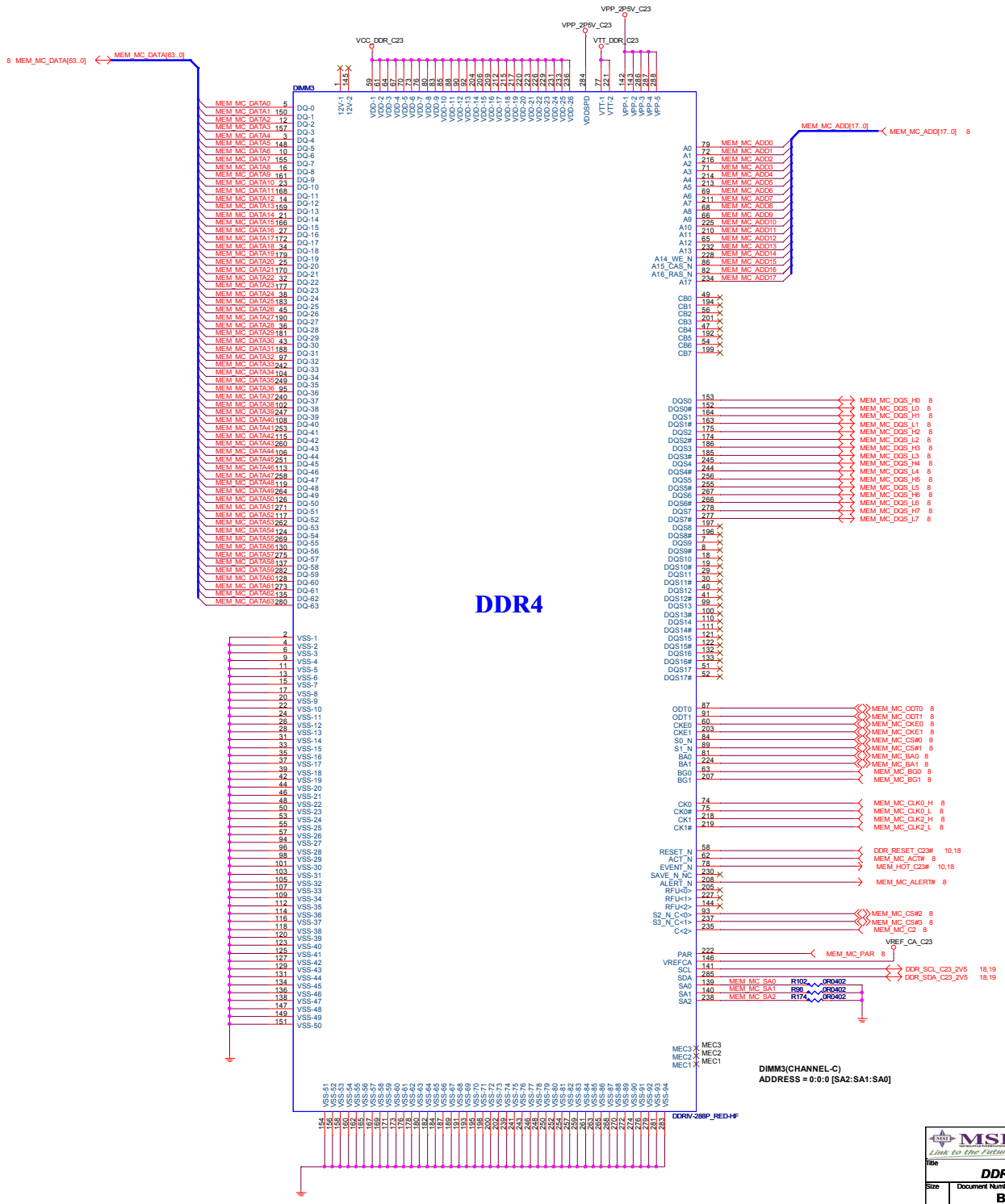
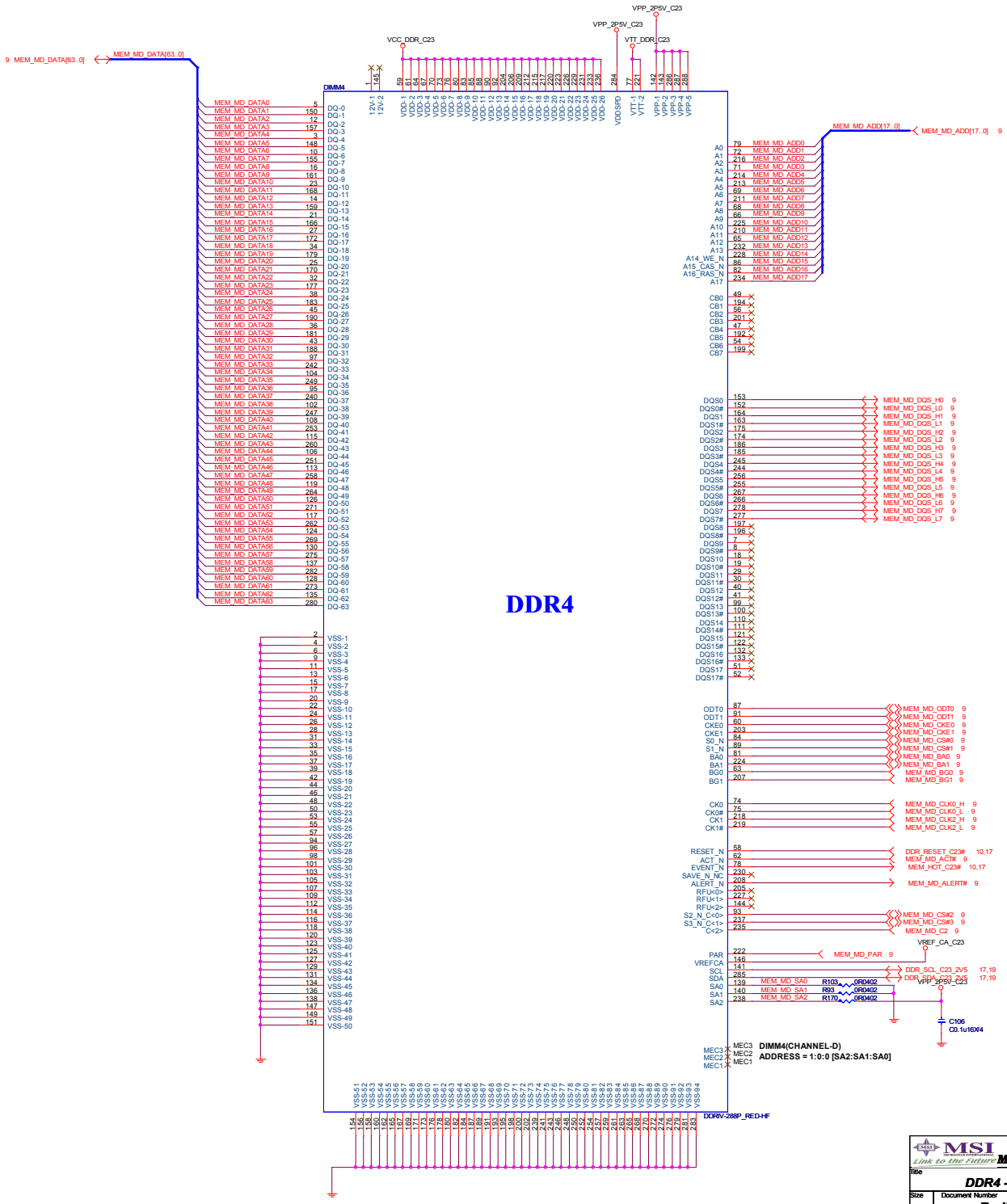
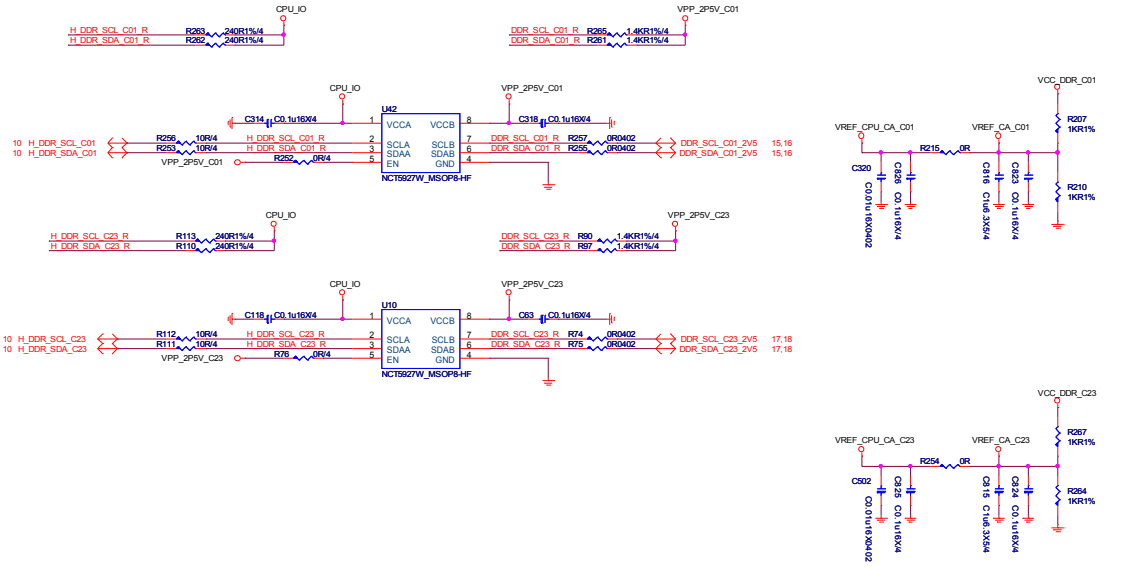


MICRO-START INT'L CO.,LTD.			
Title: DDR4 - DIMM3			
Size	Document Number: Berlin		Rev: X3
Date: Friday, August 12, 2016		Sheet 17 of 50	



MSI MICRO-START INT'L CO.,LTD.		
Title: DDR4 - DIMM4		
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 18 of 50	

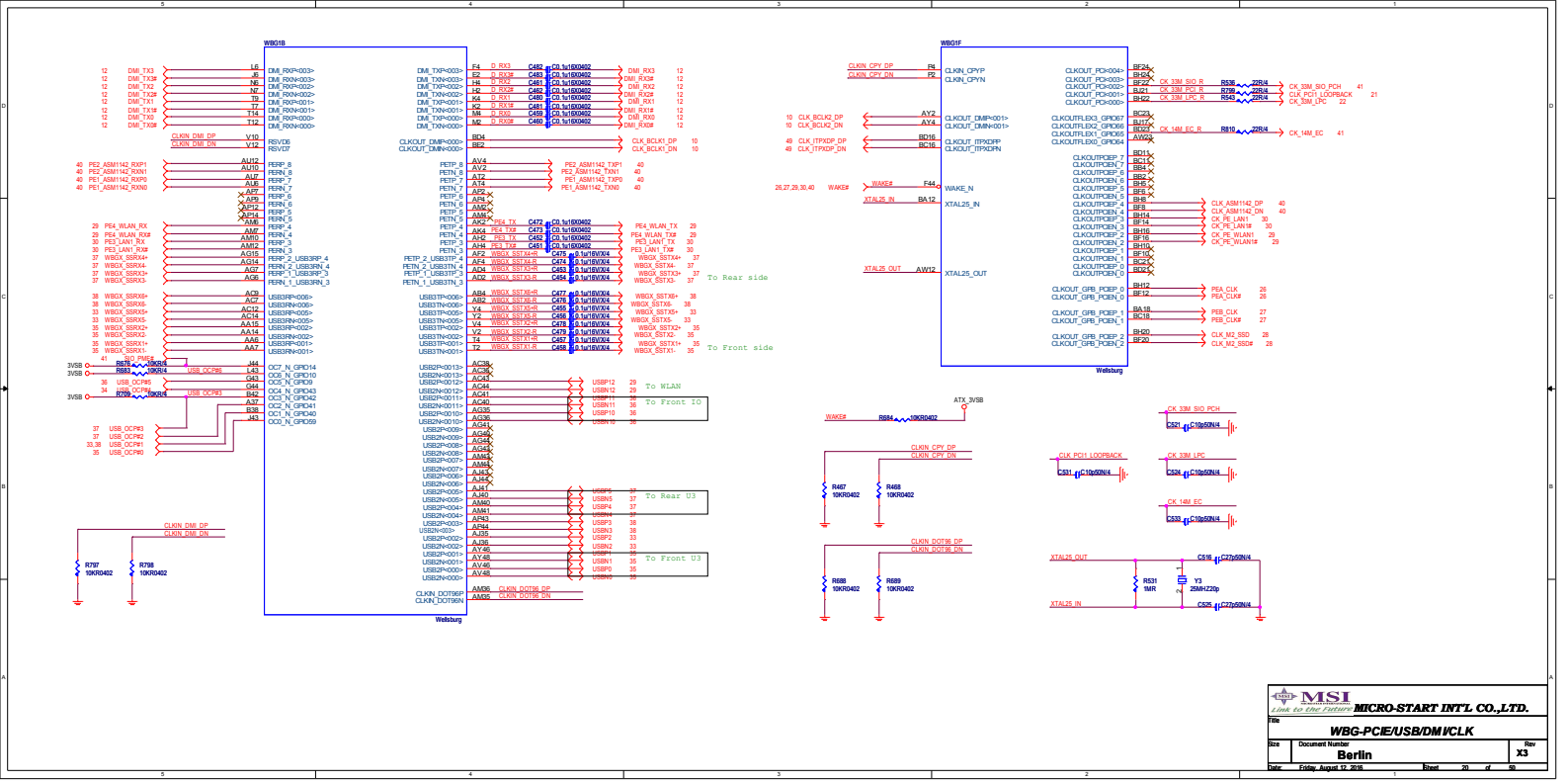


MICRO-START INT'L CO.,LTD.

Title: DDR4 CA VREF

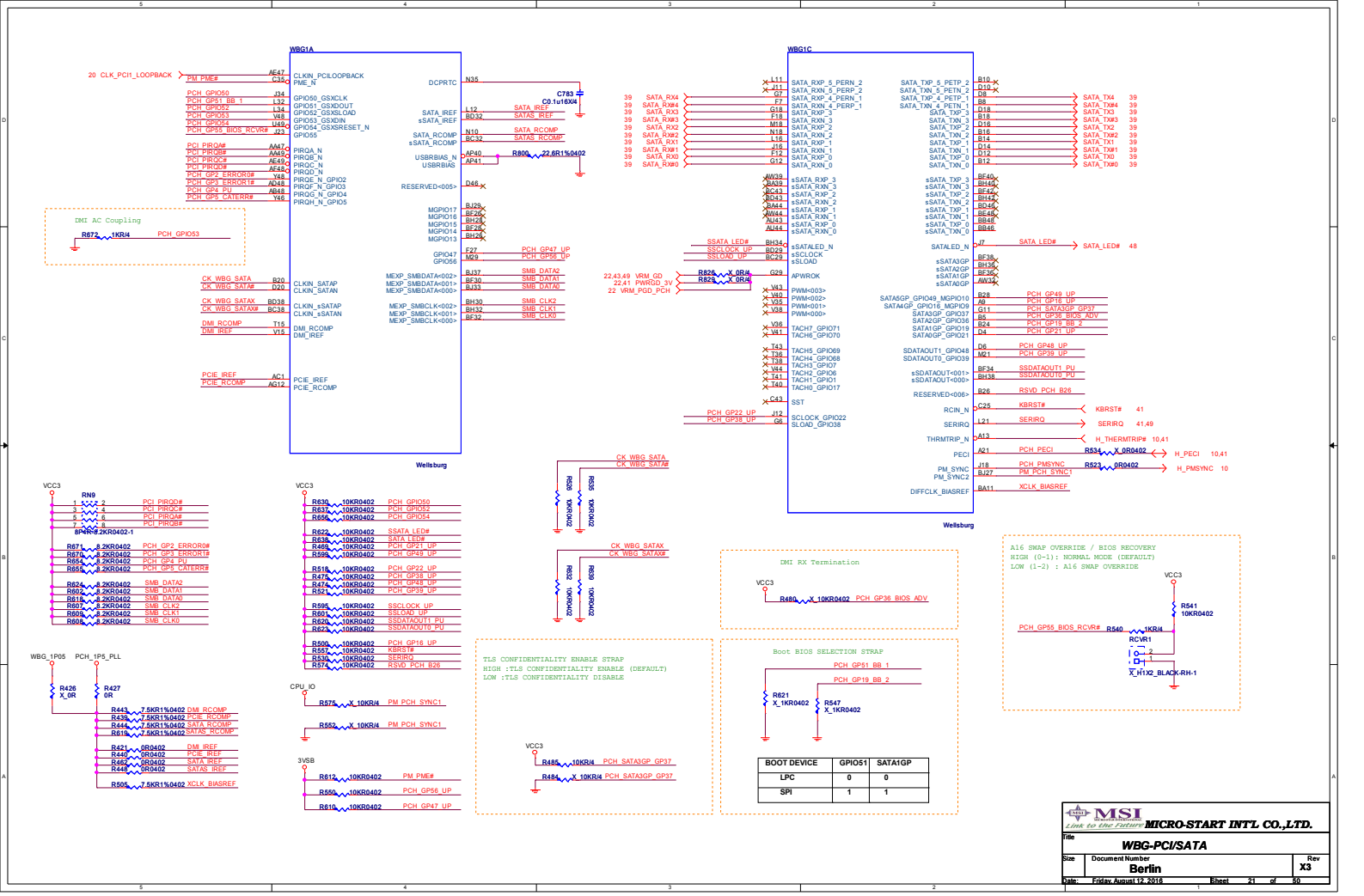
Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 19 of 50

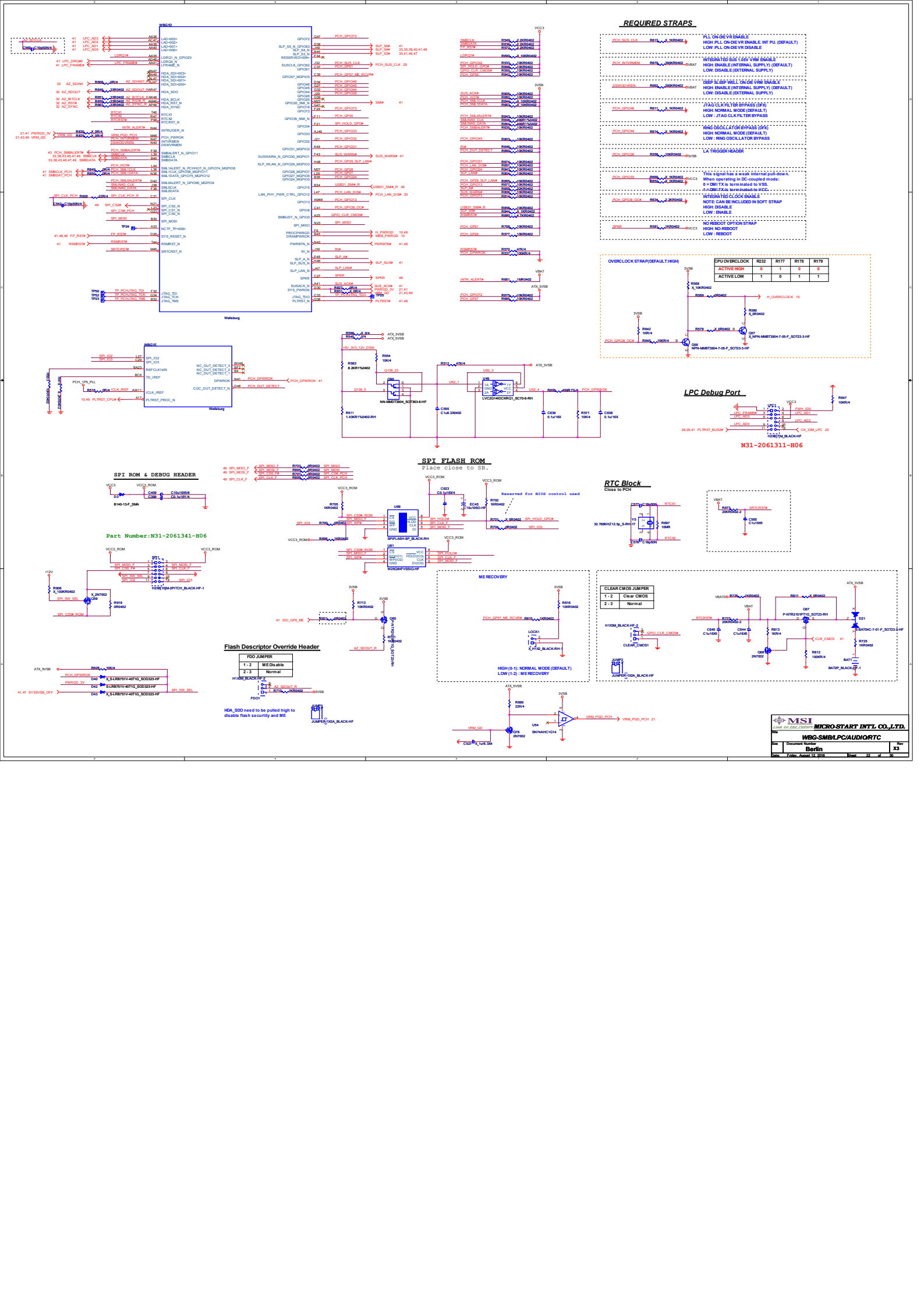


MSI COMPUTER
Link to the Future
MICRO-START INT'L CO.,LTD.

Title	WBG-PCIE/USB/DMI/CLK	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 20 of 89	



Title	MICRO-START INT'L CO.,LTD.	
	WBG-PCI/SATA	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 21 of 50	


REQUIRED STRAPS
PCH_SUS_CLK
PLL ON-DIE VR ENABLE
HIGH :PLL ON-DIE VR ENABLE. INT PU (DEFAULT)
LOW :PLL ON-DIE VR DISABLE
PCH_INTVRMEN
INTEGRATED SUS 1.05V VRM ENABLE
HIGH: ENABLE (INTERNAL SUPPLY) (DEFAULT)
LOW: DISABLE (EXTERNAL SUPPLY)
DSWODVREN
DEEP SLEEP WELL ON-DIE VRM ENABLE
HIGH: ENABLE (INTERNAL SUPPLY) (DEFAULT)
LOW: DISABLE (EXTERNAL SUPPLY)
PCH_GPIO46
JTAG CLK FILTER BYPASS (DFX)
HIGH: NORMAL MODE (DEFAULT)
LOW : JTAG CLK FILTER BYPASS
PCH_GPIO44
RING OSCILLATOR BYPASS (DFX)
HIGH: NORMAL MODE (DEFAULT)
LOW : RING OSCILLATOR BYPASS
PCH_GPIO28
LA TRIGGER HEADER
PCH_GPIO33
This signal has a weak internal pull-down.
When operating in DC-coupled mode:
0 = DMI TX is terminated to VSS.
1 = DMI TX is terminated to VCC.
PCH_GPIO8_OC#
INTEGRATED CLOCK ENABLE
NOTE: CAN BE INCLUDED IN SOFT STRAP
HIGH: DISABLE
LOW : ENABLE
SPKR
NO REBOOT OPTION STRAP
HIGH: NO-REBOOT
LOW : REBOOT
OVERCLOCK STRAP(DEFAULT:HIGH)
CPU OVERCLOCK
R232
R177
R178
R179
ACTIVE HIGH
0
1
0
0
ACTIVE LOW
1
0
1
1
H_OVERCLOCK 10
N31-2061311-H06
LPC Debug Port
WBG1D
Wellsburg
WBG1E
SPI ROM & DEBUG HEADER
Part Number:N31-2061341-H06
SPI_FLASH_ROM
Place close to SB.
RTC Block
Close to PCH
ME RECOVERY
CLEAR CMOS JUMPER
1 - 2 Clear CMOS
2 - 3 Normal
Flash Descriptor Override Header
FDO JUMPER
1 - 2 ME Disable
2 - 3 Normal
HDA_SDO need to be pulled high to disable flash security and ME
MICRO-START INT'L CO.,LTD.
WBG-SMB/LPC/AUDIO/RTC
Berlin
X3
Friday, August 12, 2016
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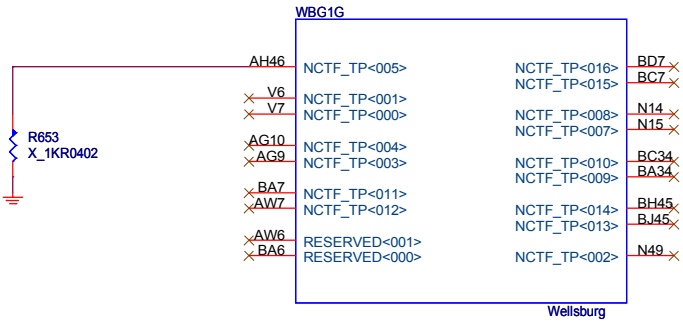
50



MSI MICRO-STAR INTERNATIONAL
Link to the Future
MICRO-START INT'L CO.,LTD.

Title: **WBG-NVRM**

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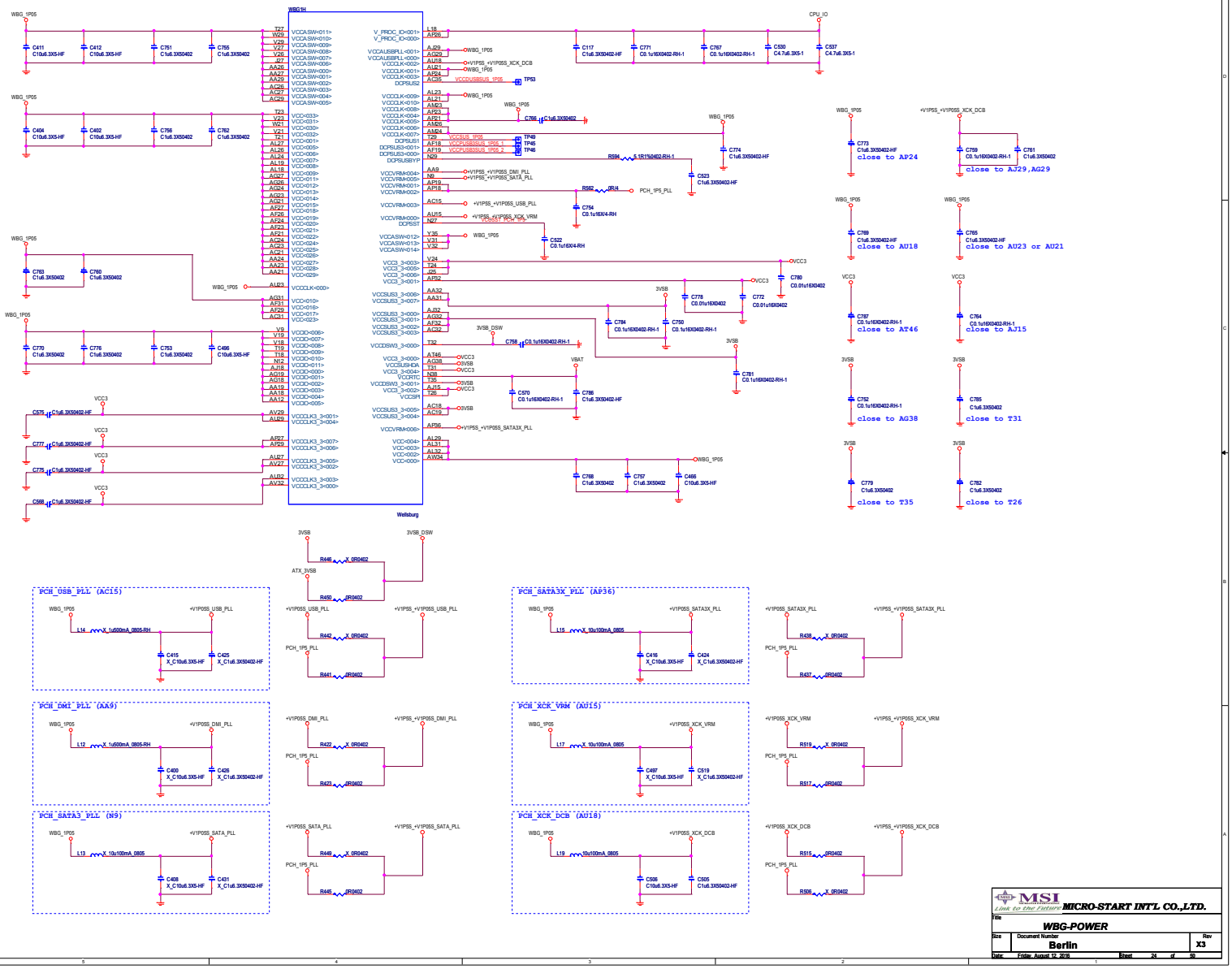
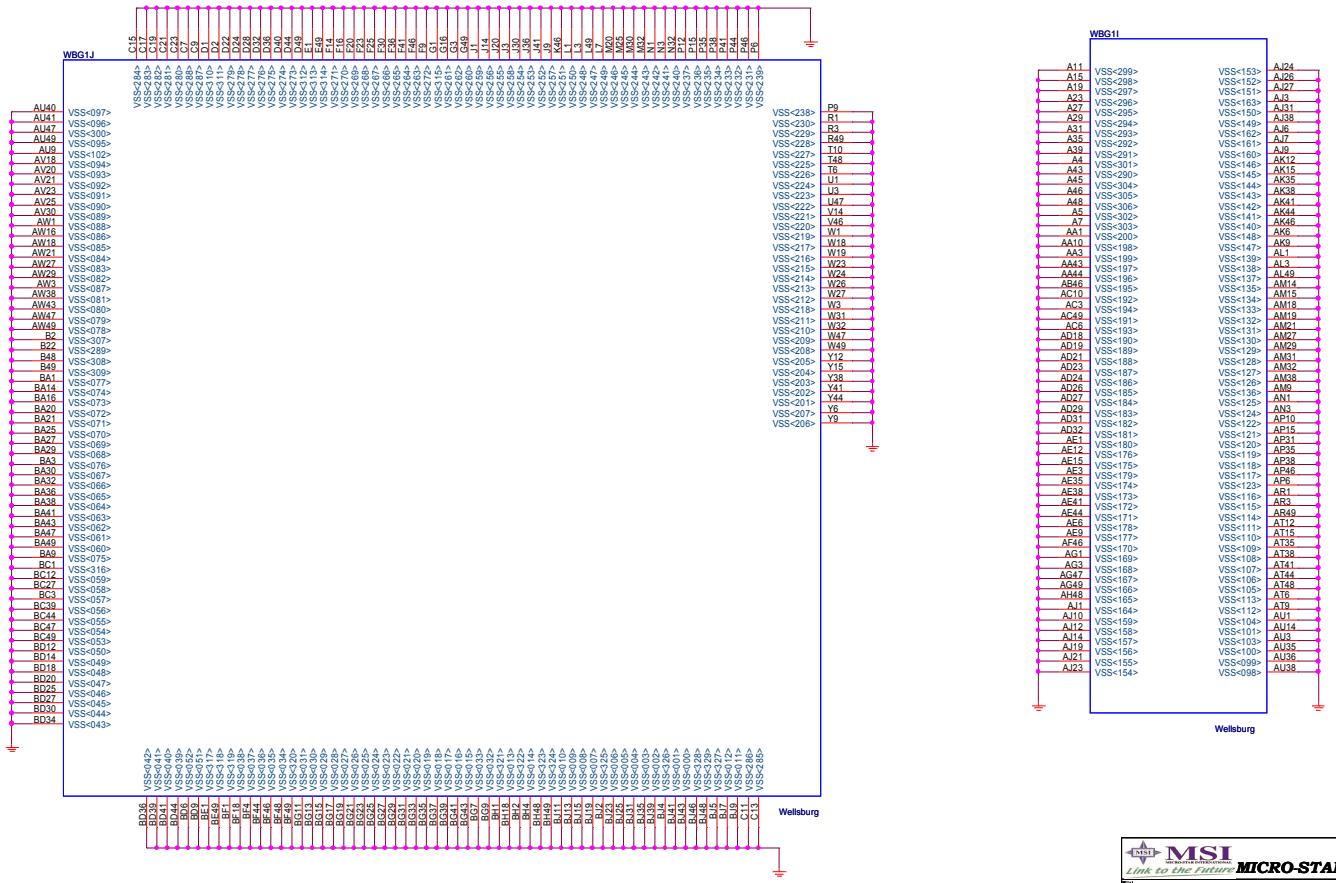


MSI COMPUTER CORP.
Link to the Future
MICRO-START INT'L CO.,LTD.

Title: **WBG-POWER**

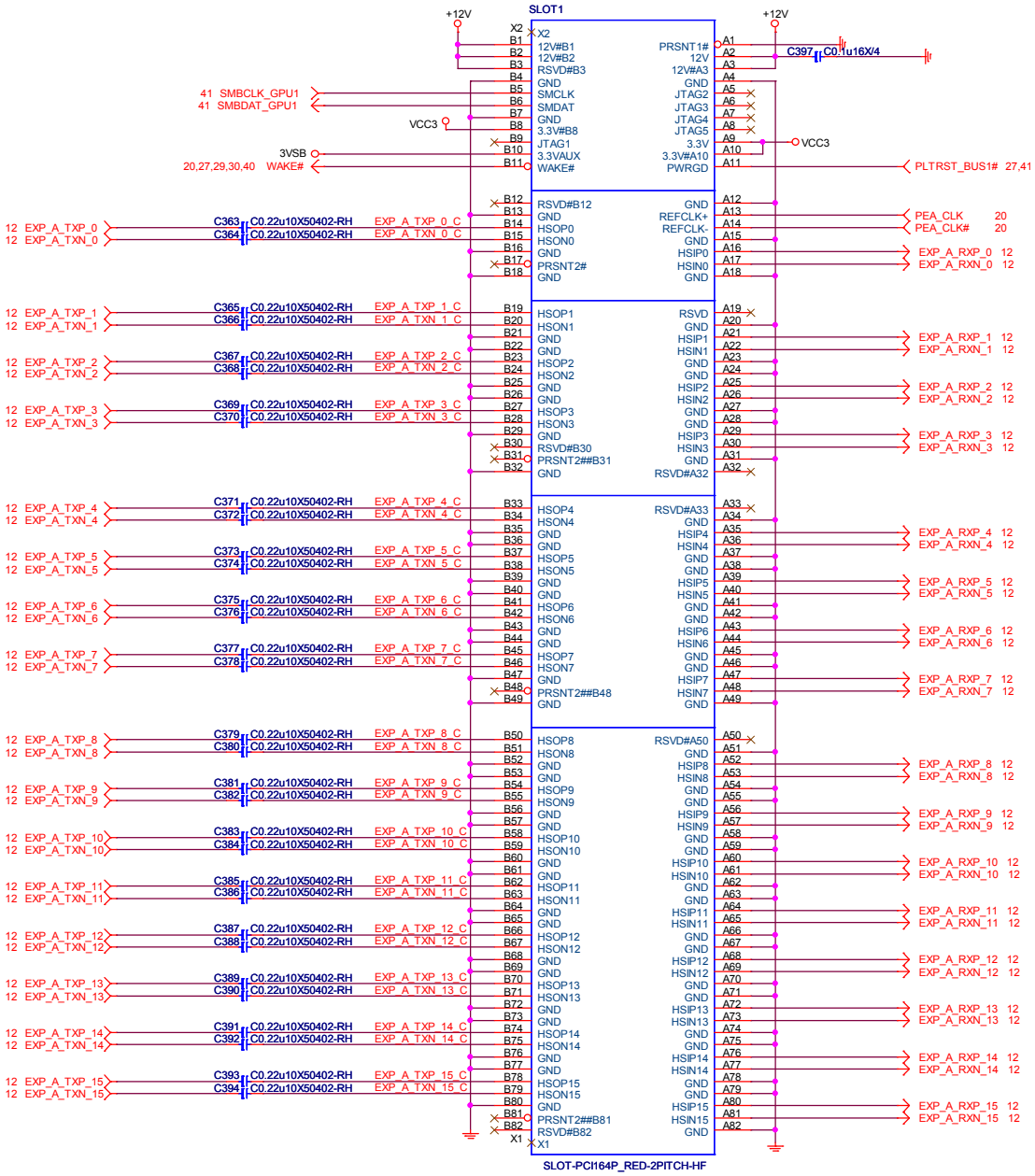
Size	Document Number	Rev
	Berlin	X3

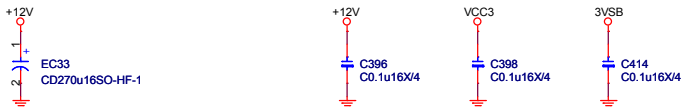
Date: Friday, August 12, 2016 Sheet 24 of 50



MSI MICRO-STAR INTERNATIONAL
Link to the Future MICRO-START INT'L CO.,LTD.

Title	WBG-GND	
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 25 of 50	





MSI MICRO-STAR INT'L CO.,LTD.
Link to the Future

Title	PCIE X16 Slot1	
Size	Document Number: Berlin	Rev: X3
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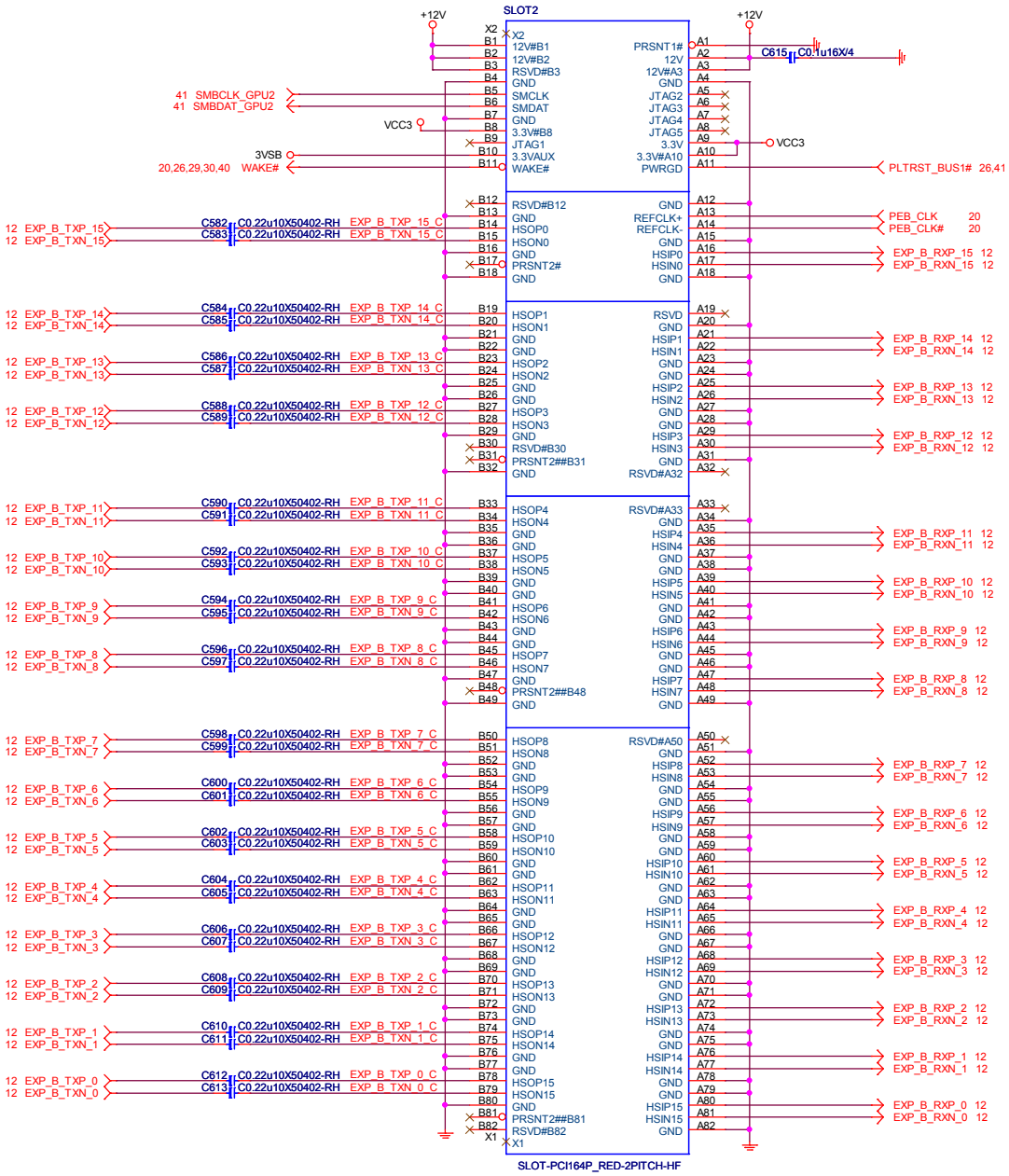
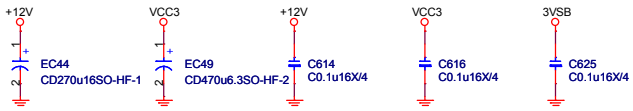
PCI EXPRESS X16 SLOT



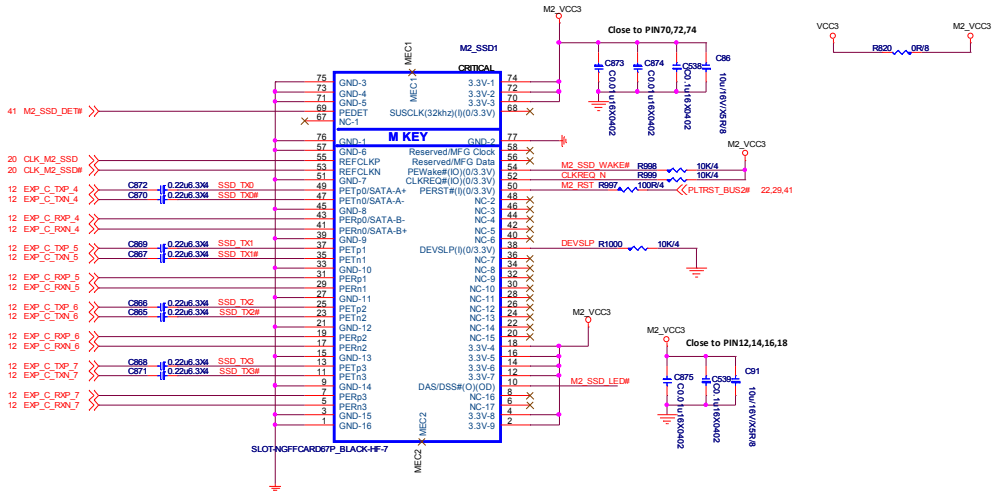


MICRO-START INT'L CO.,LTD.

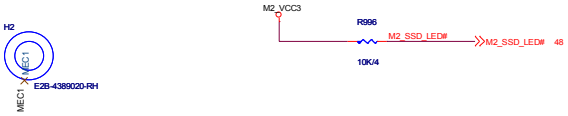
Title: PCIE X16 Slot2

Size	Document Number	Rev
	Berlin	X3

Date: Friday, August 12, 2016 Sheet 27 of 50



D20,D21 Close to M2 connector



MICRO-START INT'L CO.,LTD.

Title: M.2 SSD Key M

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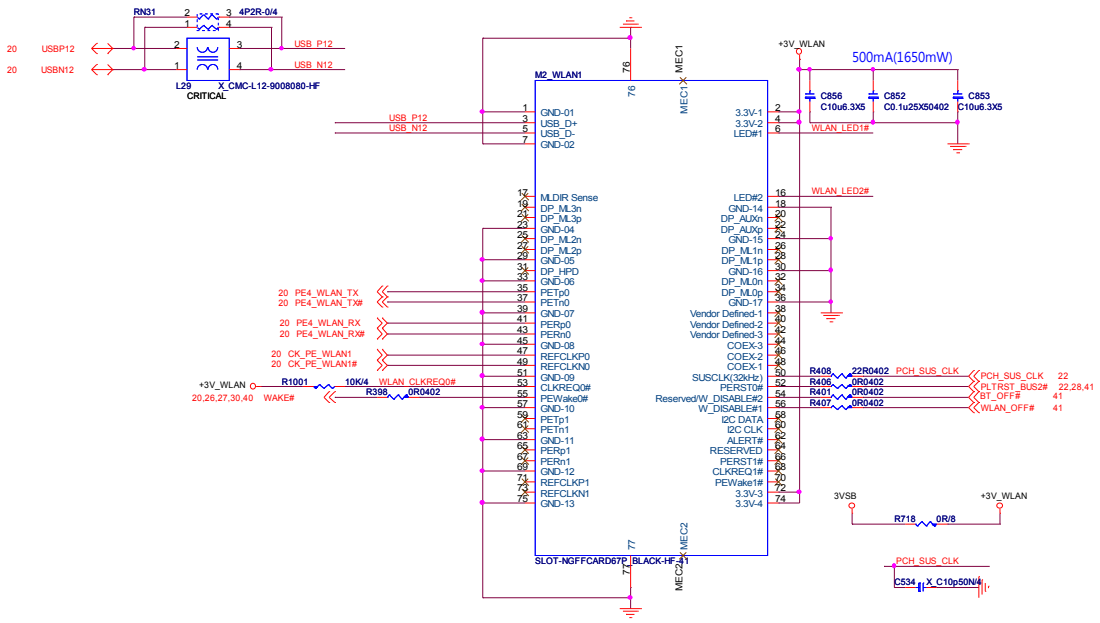
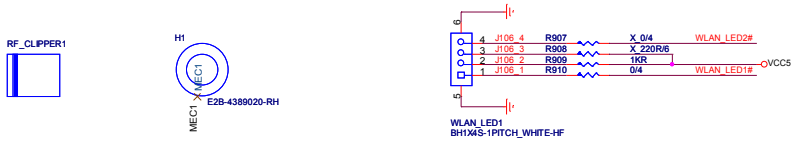


WLAN LED HEADER



RF_CLIPPER1

H1
MEC1
E2B-4389020-RH

MSI MICRO-START INTL CO.,LTD.
Link to the Future

Title	WLAN Key A	
Size	Document Number: Berlin	Rev: X3
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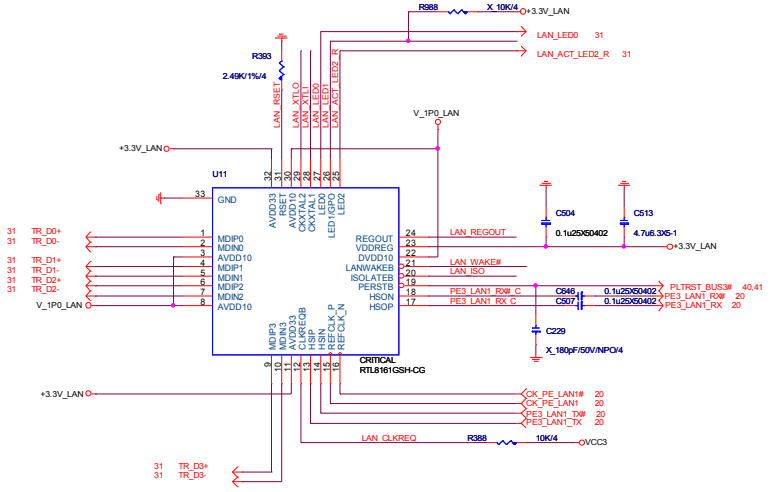
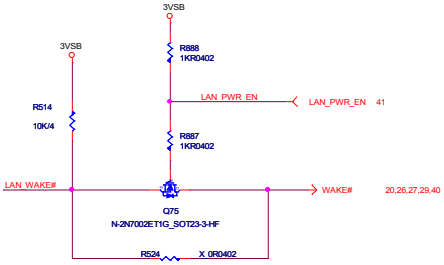
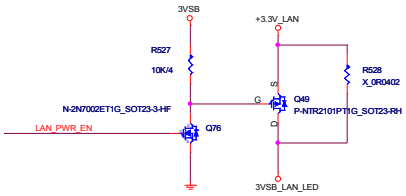
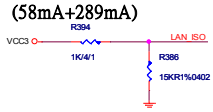
Gigabit LAN RTL8161GSH-CG

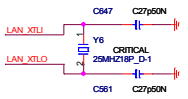


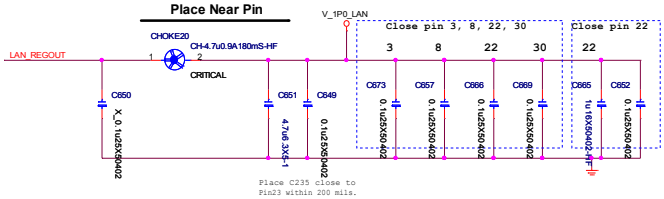




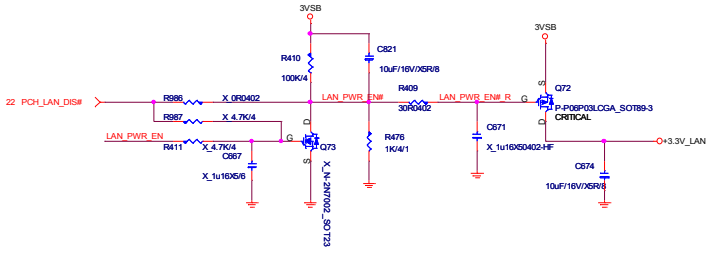
(58mA+289mA)

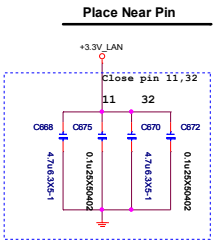


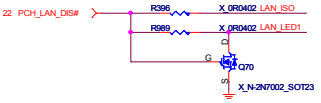




LAN Power







MSI Link to the Future	MICRO-START INT'L CO.,LTD.	
Title: LAN RTL8161GSH		
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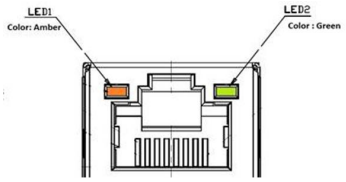
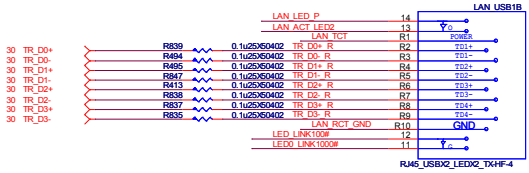
LAN Connector



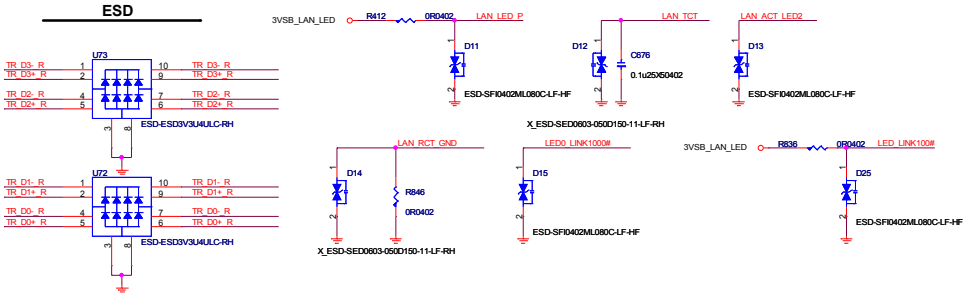
Giga-Lan

Link	Amber
Active	Blinking
1000	Green
100	Green
10	Green

L4
L3 — Amber
L2
L1 — Green



ESD



MSI Micro-Star International — Link to the Future
MICRO-START INT'L CO.,LTD.

Title	LAN JACK	
Size	Document Number: Berlin	Rev: X3
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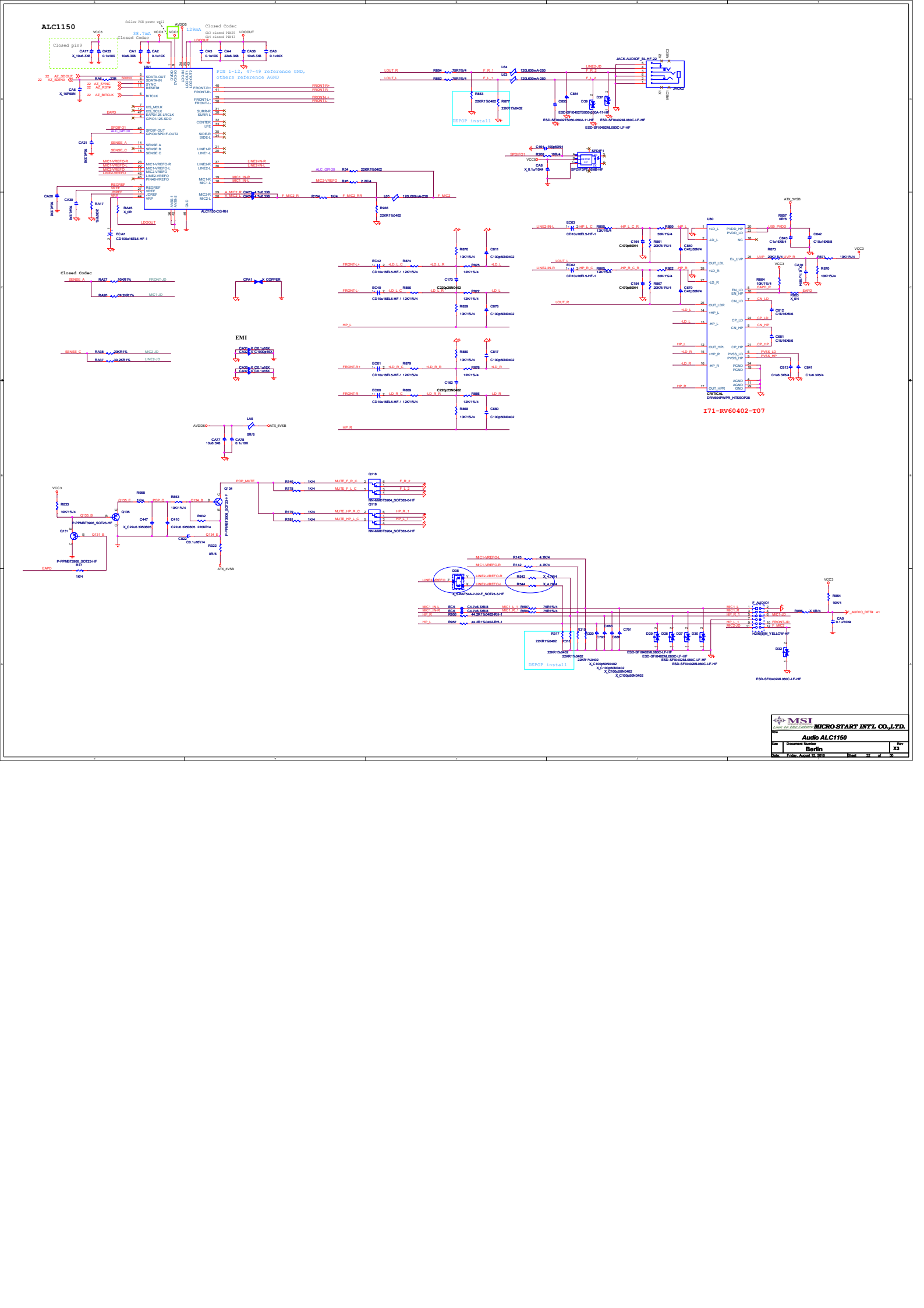
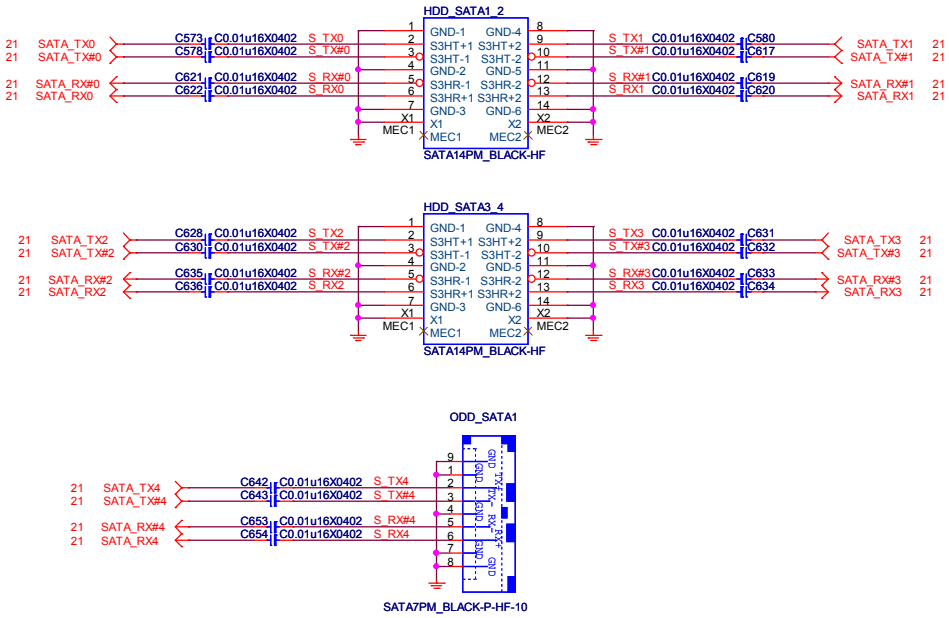

ALC1150
Closed pin9
Closed Codec
38.7mA
129mA
PIN 1-12, 47-49 reference GND, others reference AGND
ALC1150-CG-RH
DEPOP install
I71-RV60402-T07
EMI
MICRO-START INT'L CO.,LTD.
Audio ALC1150
Berlin
X3

SATA 3.0 Connector



MSI MICRO-STAR INTERNATIONAL
Link to the Future **MICRO-START INT'L CO.,LTD.**

Title: **SATA PORT**		
Size	Document Number: **Berlin**	Rev: **X3**
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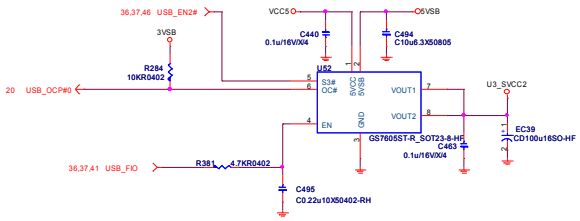
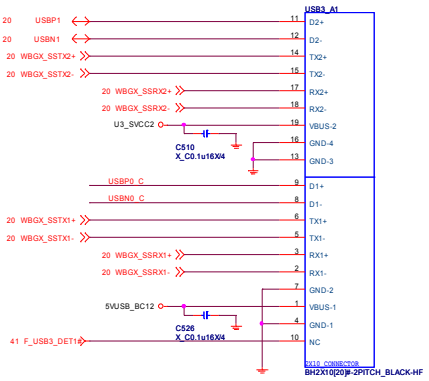
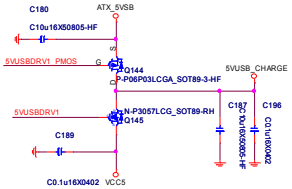
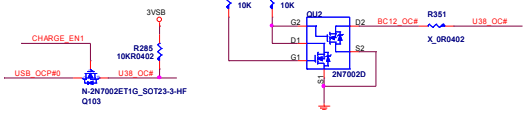
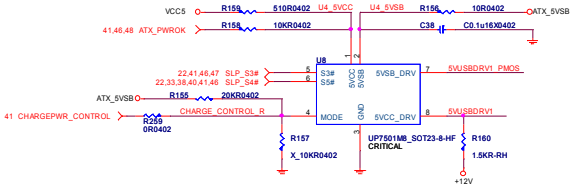
Front USB3.0 Port0 for chager

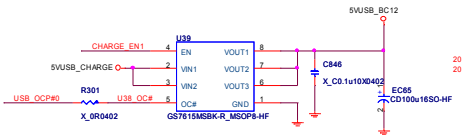


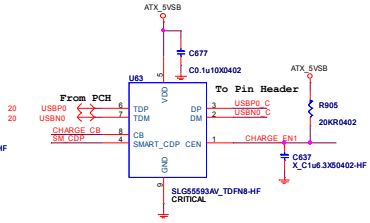








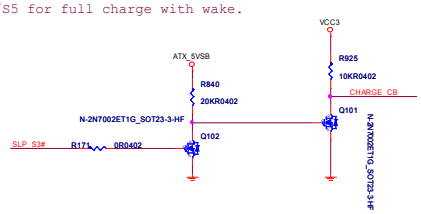


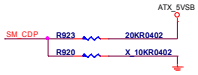


CB MODE: Hi support S0 for full charge function without KB/MOUSE wake.
CB MODE: Low support S3/S4/S5 for full charge with wake.

Truth Table

CB	SMART-CDP	Function
0	X	DCP autodetect with mouse/keyboard wakeup
1	0	S0 charging with SDP only
1	1	S0 charging with CDP or SDP only (depending on external device) And, when Non-CDP phone is plugged in, the CDP mode will be changed automatically to SDP mode during handshaking protocol for supporting data communication.





MSI COMPUTER Link to the Future MICRO-START INT'L CO.,LTD.

Title: Front USB2.0

Size	Document Number	Rev
	Berlin	X3

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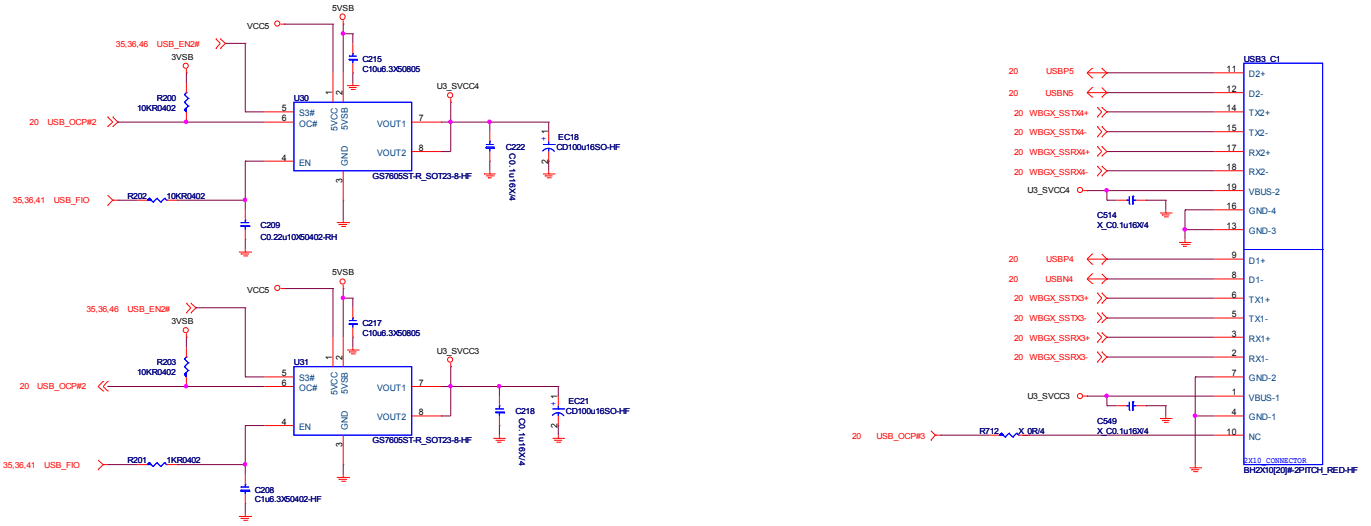

MICRO-START INT'L CO.,LTD.

Title: Front USB3.0 x4

Size	Document Number	Rev
	Berlin	X3

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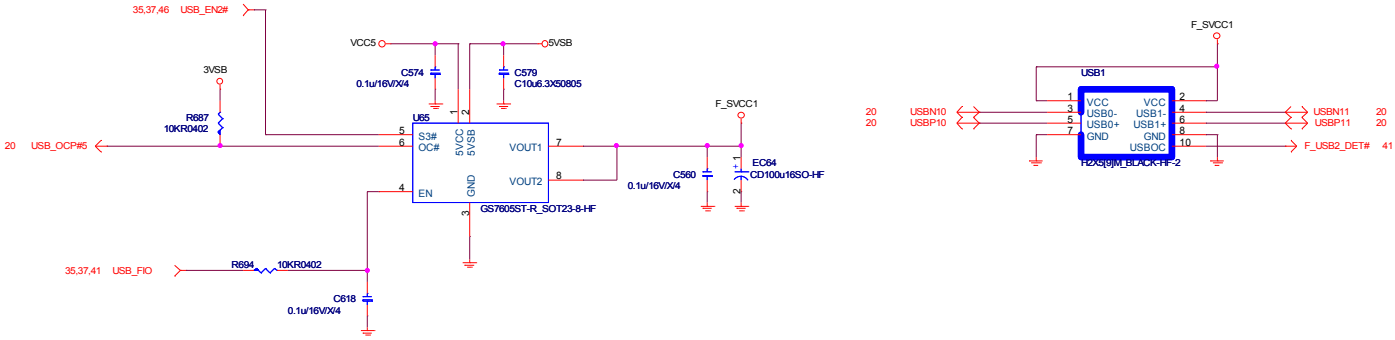
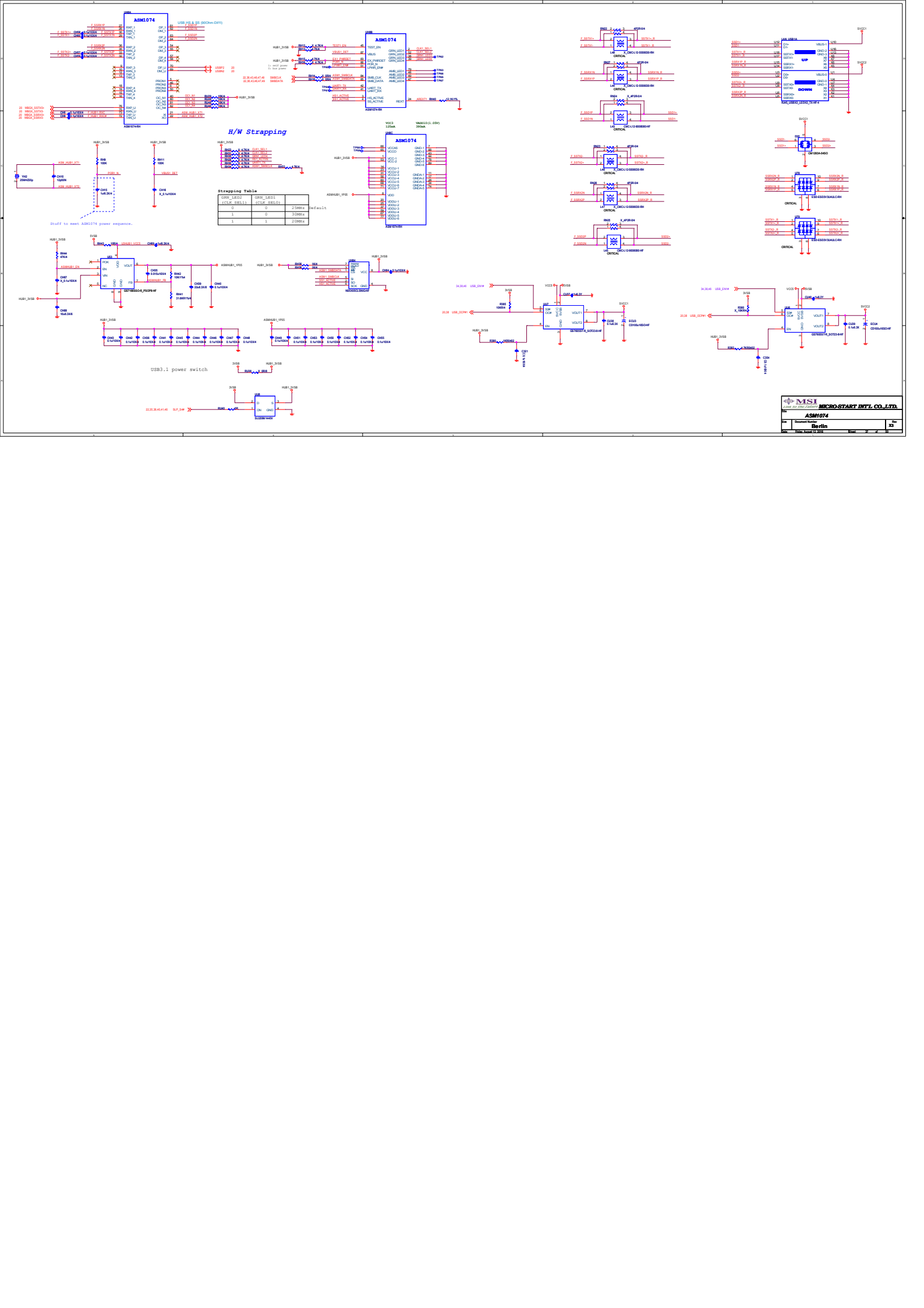
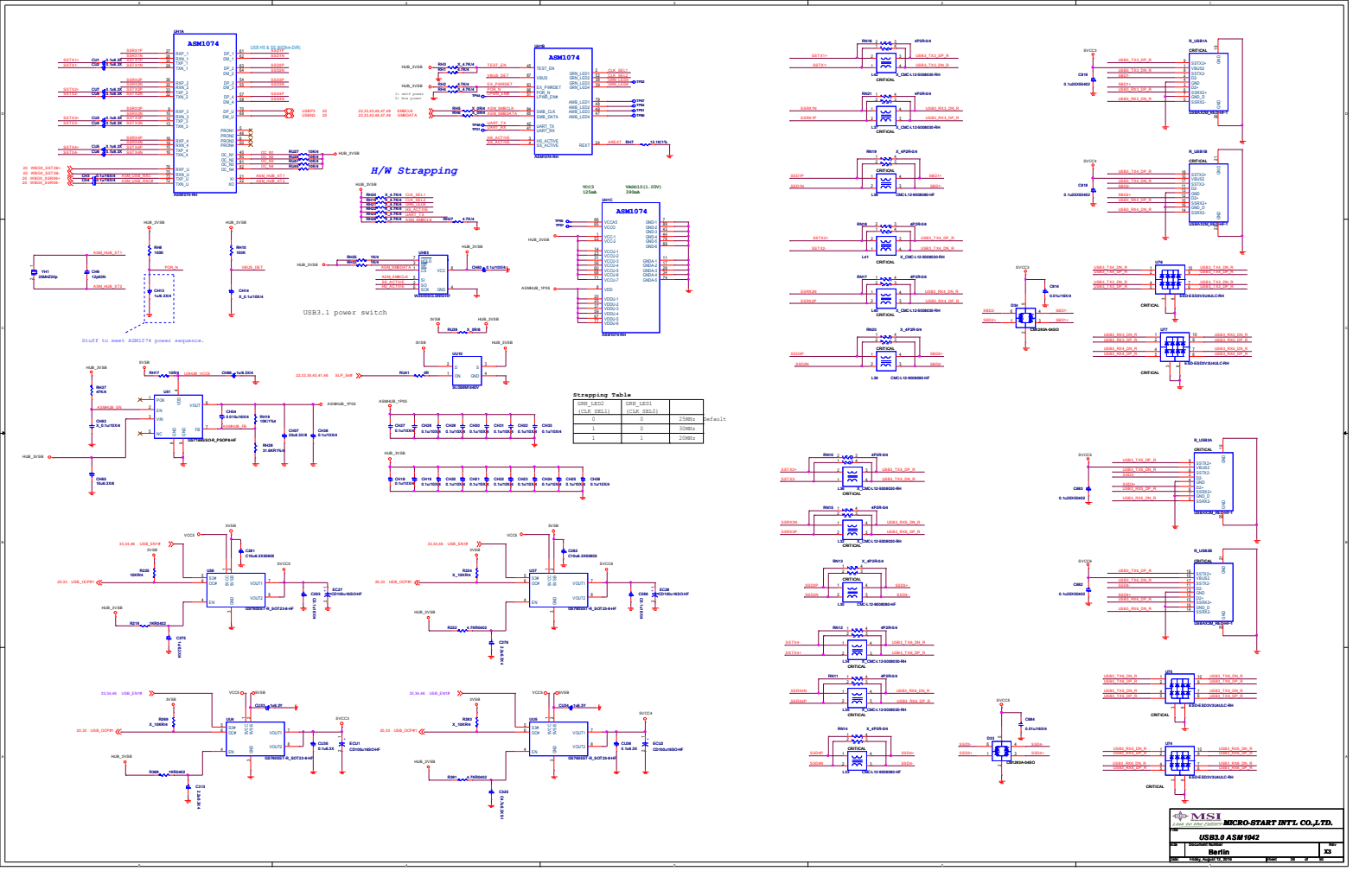
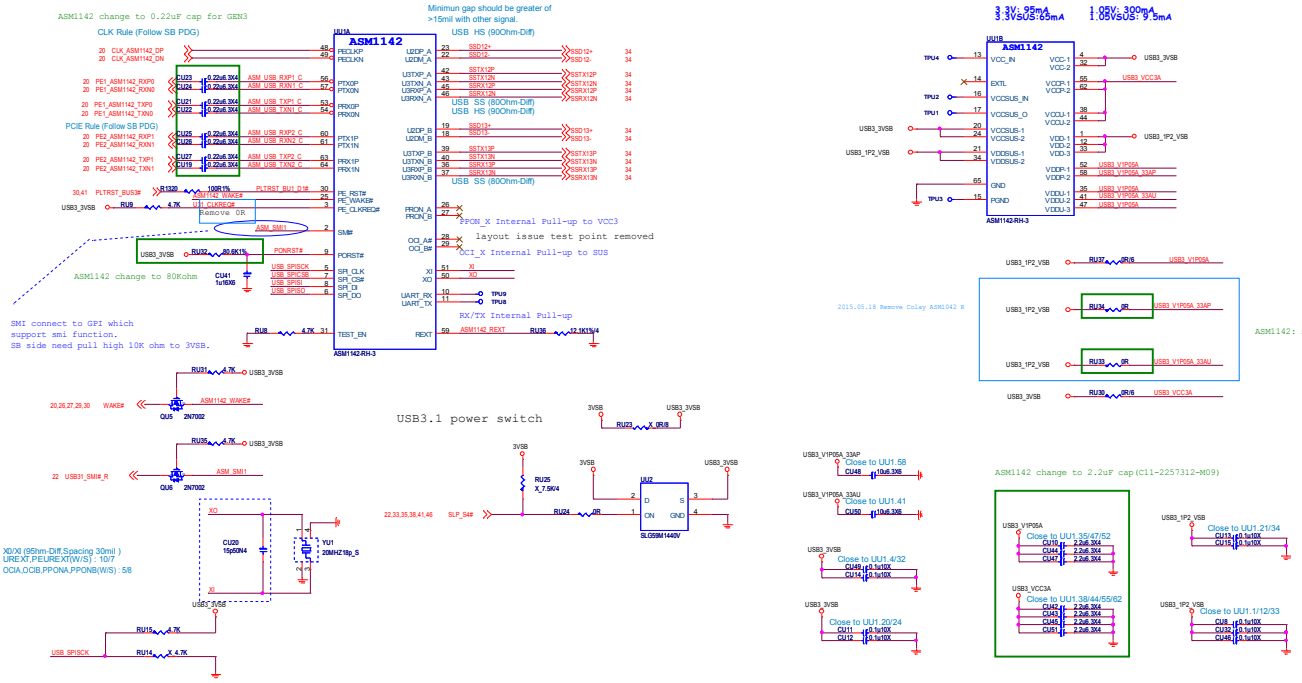
Front USB2.0 Port 11/12



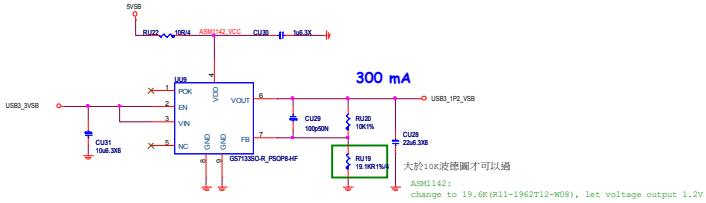
MICRO-START INTL CO.,LTD.		
Title: Front USB2.0		
Size	Document Number: Berlin	Rev: X3
Date: Friday, August 12, 2016	Sheet 36 of 50	


ASM1074
USB HS & SS (90Ohm-Diff1)
H/W Strapping
Strapping Table
GRN_LED2 (CLK_SEL1)
GRN_LED1 (CLK_SEL0)
0 0 25MHz Default
1 0 30MHz
1 1 20MHz
Stuff to meet ASM1074 power sequence.
USB3.1 power switch
LAN_USB1A
UP
DOWN
MICRO-START INT'L CO.,LTD.
ASM1074
Berlin

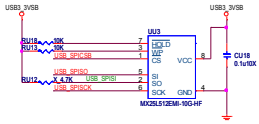

ASM1074
H/W Strapping
USB3.1 power switch
Stuff to meet ASM1074 power sequence.
Strapping Table
GEN_SEL2 (CLK_SEL1)
GEN_SEL1 (CLK_SEL0)
25MHz Default
30MHz
20MHz
MICRO-START INTL CO.,LTD.
USB3.0 ASM1042
Berlin
X3
Friday, August 13, 2010



ASM1142 1.2 VSB Power



EEPROM



MICRO-START INT'L CO.,LTD.		
Title: ASM1142		
Size	Document Number: Berlin	Rev: X3
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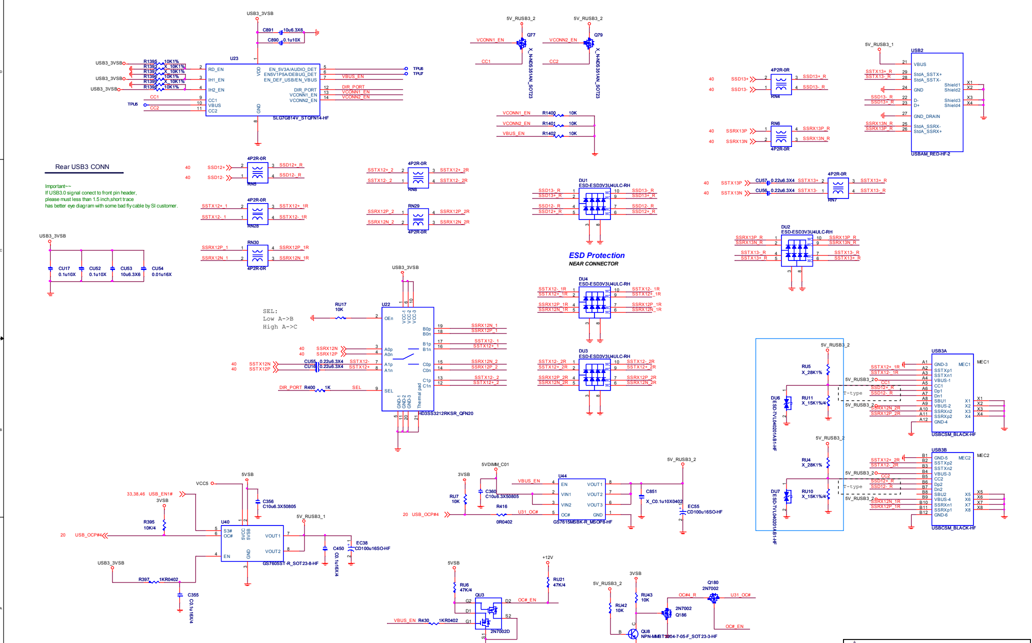

MICRO-START INT'L CO.,LTD.

Title: Type A + C		
Size	Document Number: Berlin	Rev: X3
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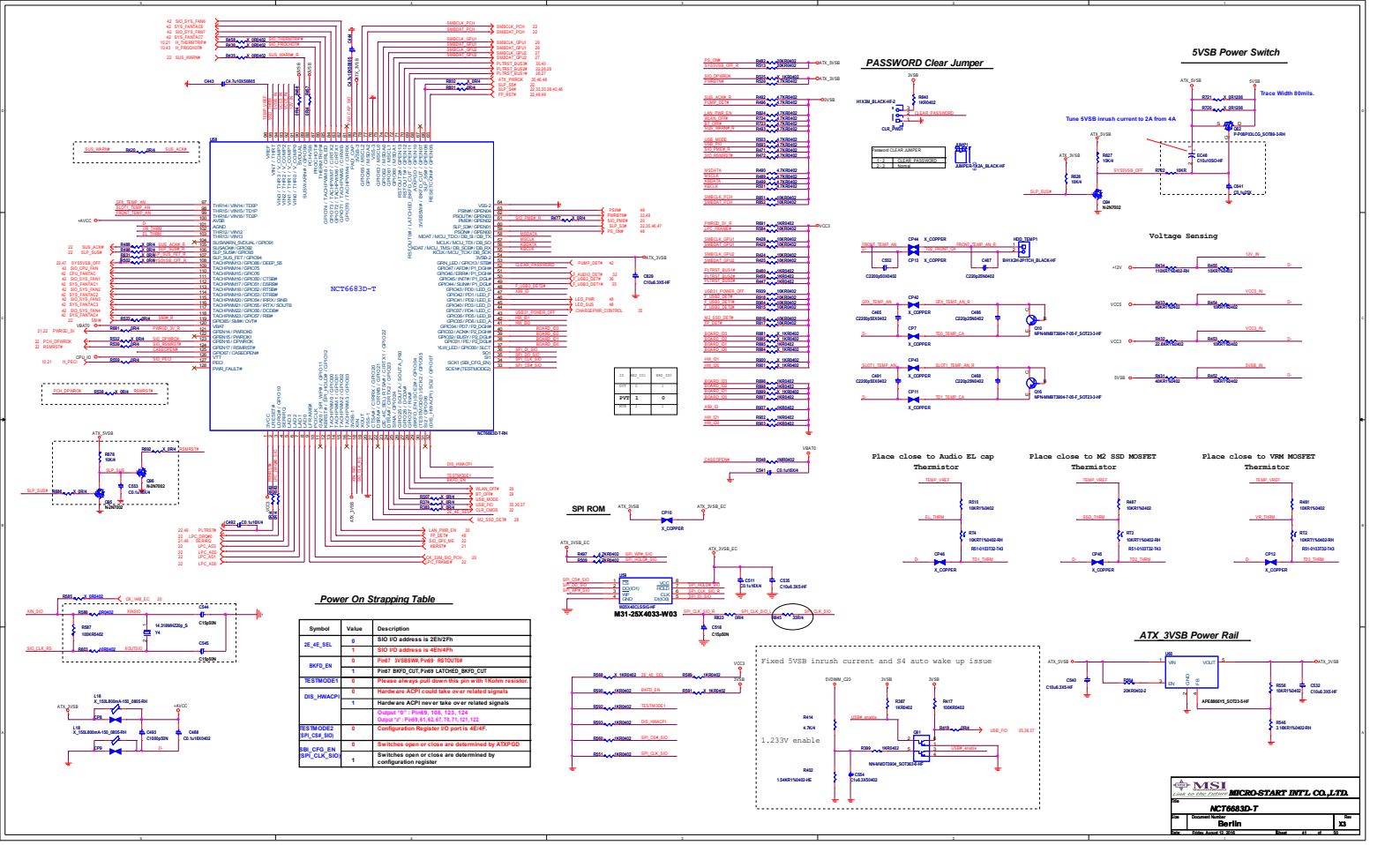

Power On Strapping Table

Symbol	Value	Description
2E_4E_SEL	0	SIO I/O address is 2Eh/2Fh
	1	SIO I/O address is 4Eh/4Fh
BKFD_EN	0	Pin87 3VSBSW, Pin88 RSTOUT#
	1	Pin87 BKFD_CUT, Pin88 LATCHED_BKFD_CUT
TESTMODE1	0	Please always pull down this pin with 1Kohm resistor.
DIS_HWACPI	0	Hardware ACPI could take over related signals
	1	Hardware ACPI never take over related signals
RESTMODE2 SPI_CS# SIO	0	Output "0" : Pin69, 108, 123, 124 Output "z" : Pin69, 61, 62, 67, 70, 71, 121, 122
	1	Configuration Register I/O port is 4E/4F.
SBI_CFG_EN SPI_CLK_SIO	0	Switches open or close are determined by ATXPGD
	1	Switches open or close are determined by configuration register

MSI
Link to the Future
MICRO-STAR INT'L CO.,LTD.

Title	NCT6683D-T	
Size	Document Number	Rev
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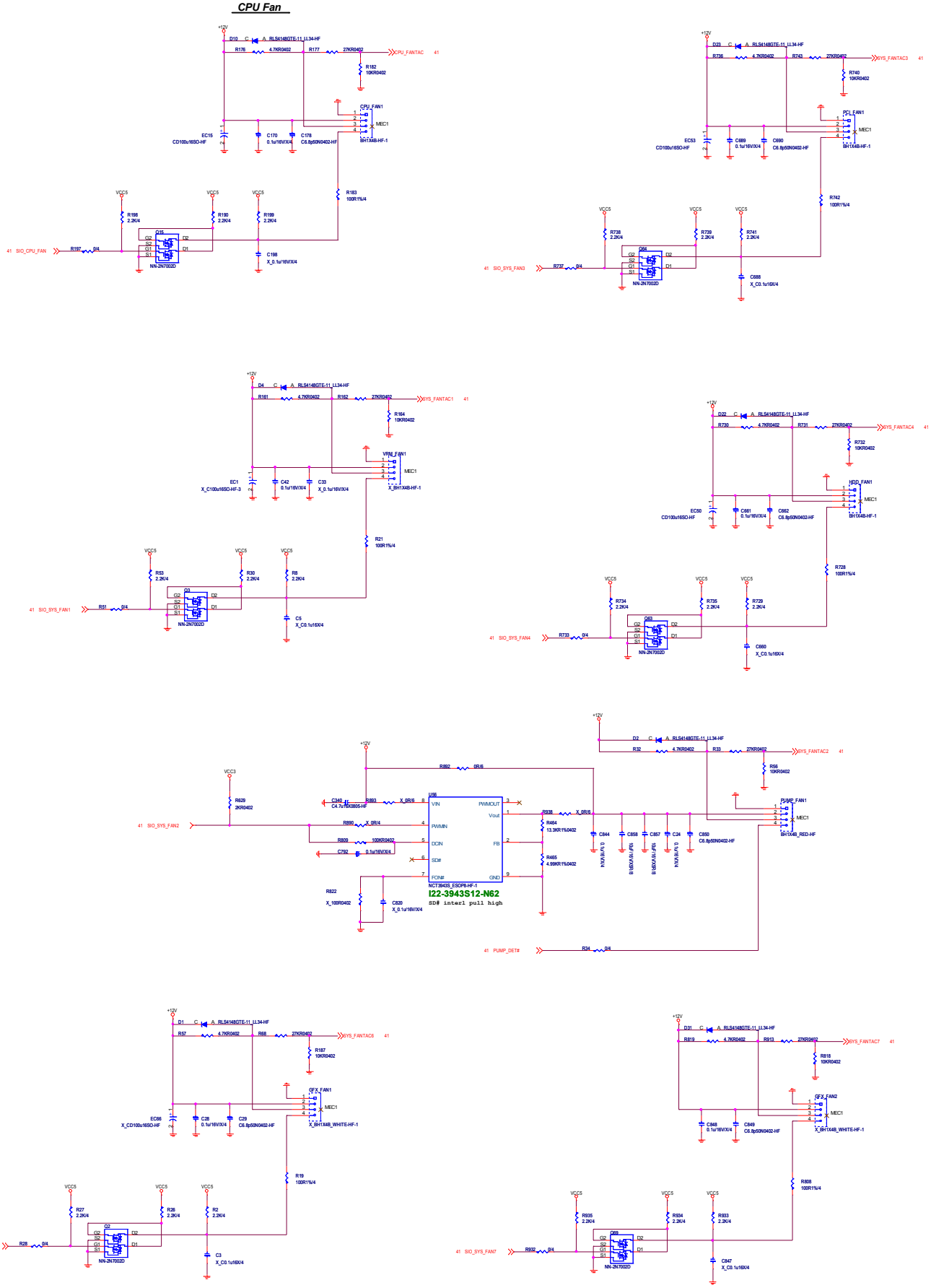
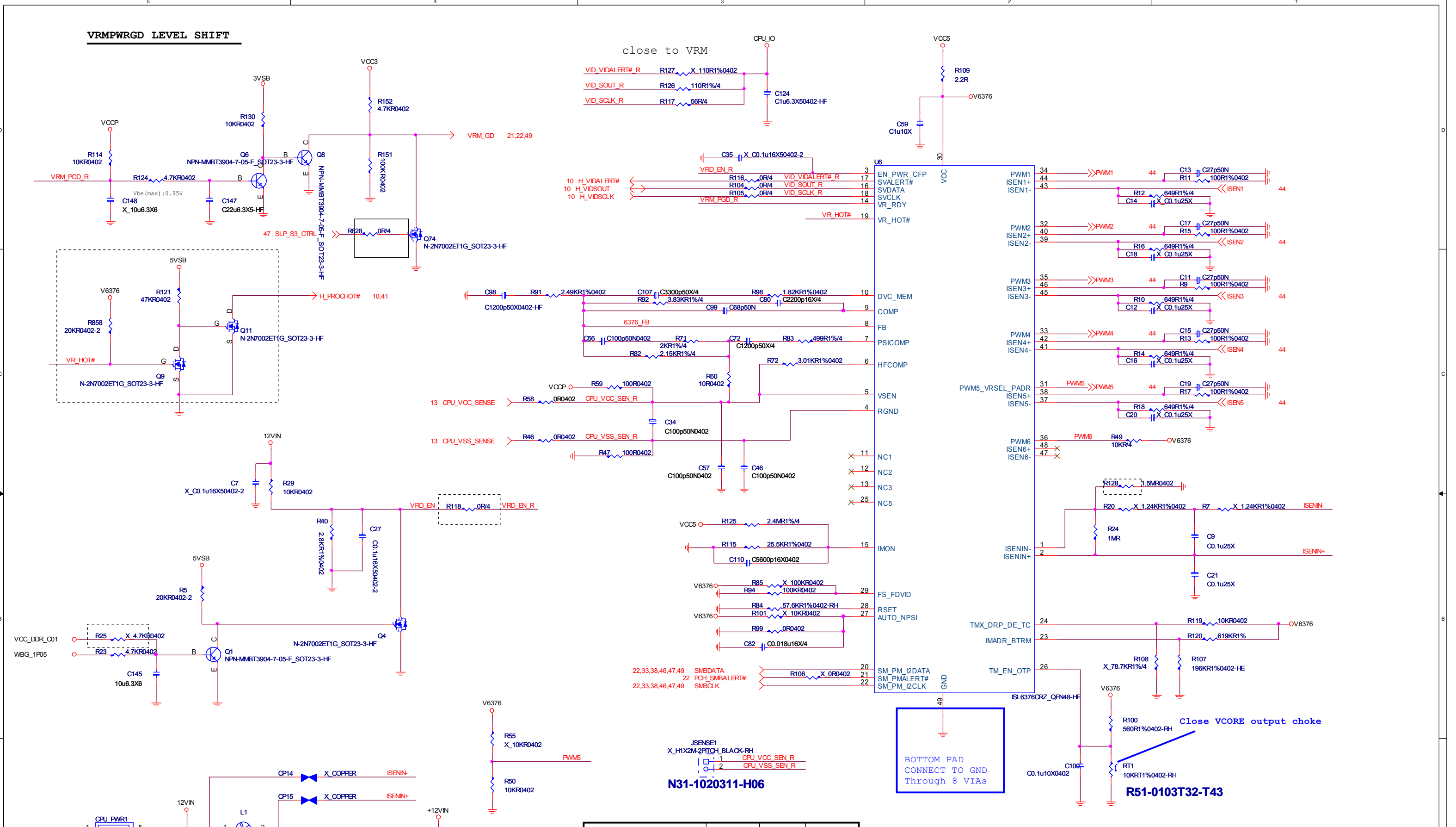


MSI Link to the Future	MICRO-START INT'L CO.,LTD.		
Title	Fan Control		
Size	Document Number	Rev	
	Berlin	X3	
Date: Friday, August 12, 2016	Sheet 42 of 50		



Pin descriptions	Rup	Rdown	Register
BTS_DES_TCOMPS	499K	NC	DFh
BT_FDVID_TCOMP	499K	NC	DFh
ADDR_IMAXS_TMAX	NC	10K	0h
NPSI_DE_IMAX	845K	267K	C3h

MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: VRD12.5 - PWM-ISL6376

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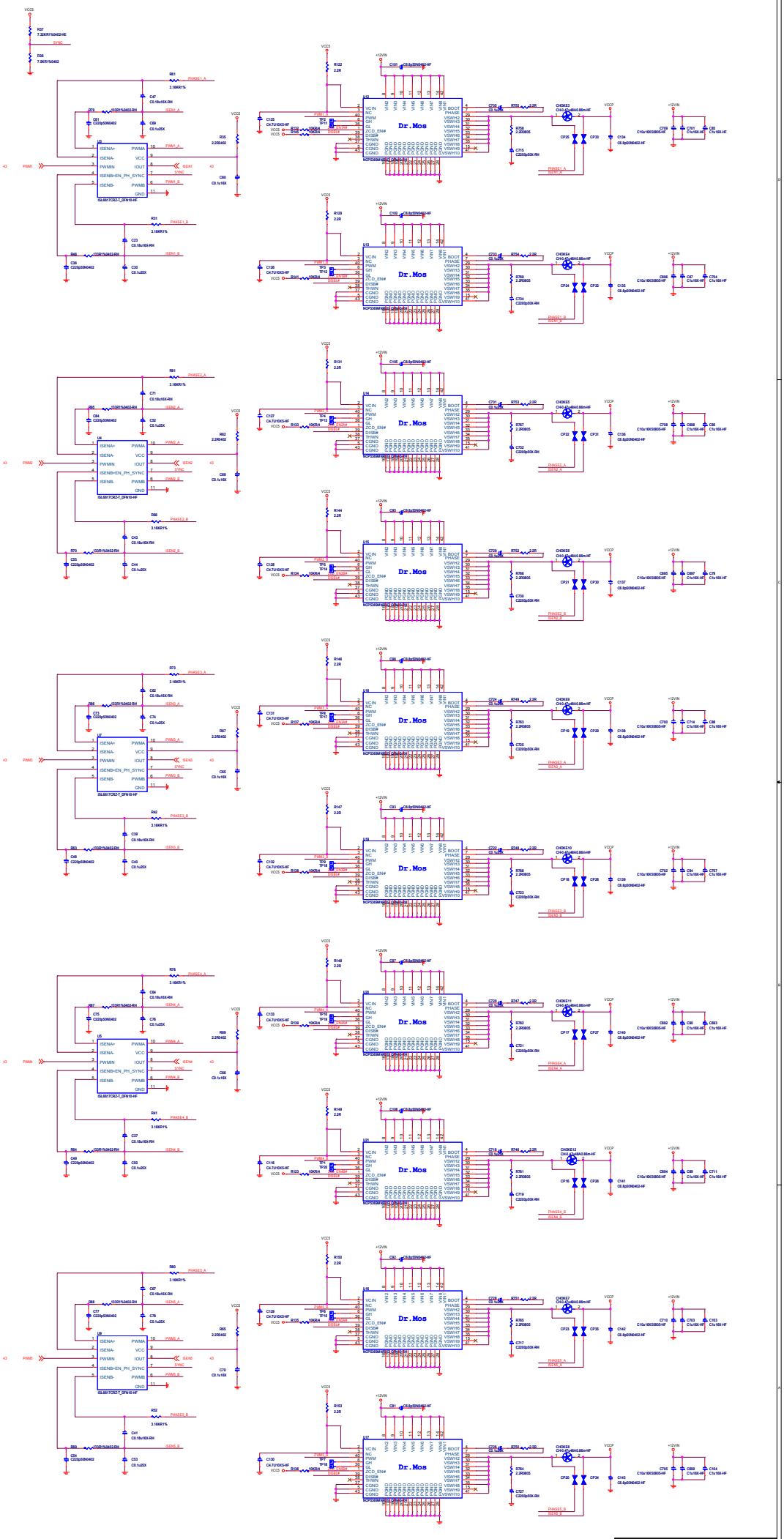

MSI Link to the future	MICRO-START INT'L CO.,LTD.		
Title	VCORE(Dr.MOS) PHASE1~10		
Size	Document Number		Rev
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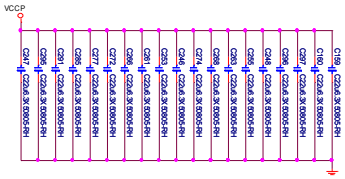
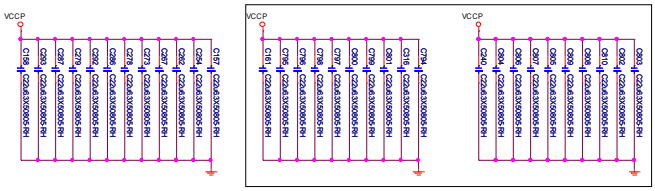
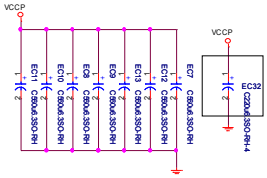
+CPU_VCCP-Decoupling



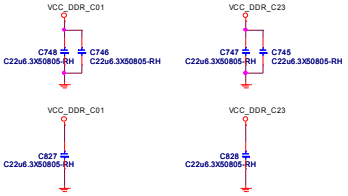
PLACE 0805 CAPS INSIDE CPU SOCKET CAVITY



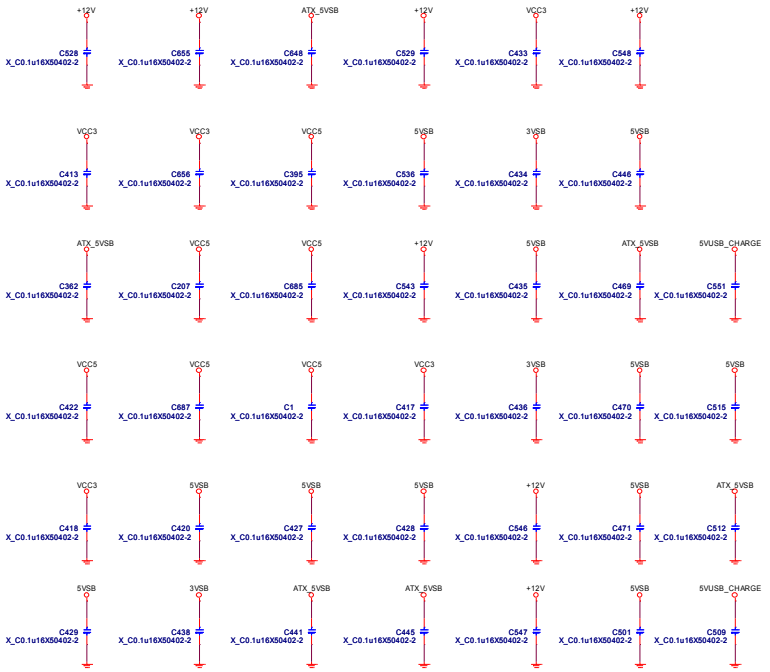
PLACE 0805CAPS Bottom CPU SOCKET edge



CPU VCC_DDR Decoupling



EMI



MSI Computer Corp. Link to the Future **MICRO-START INT'L CO.,LTD.**

Title	**CPU Decoupling Caps**	
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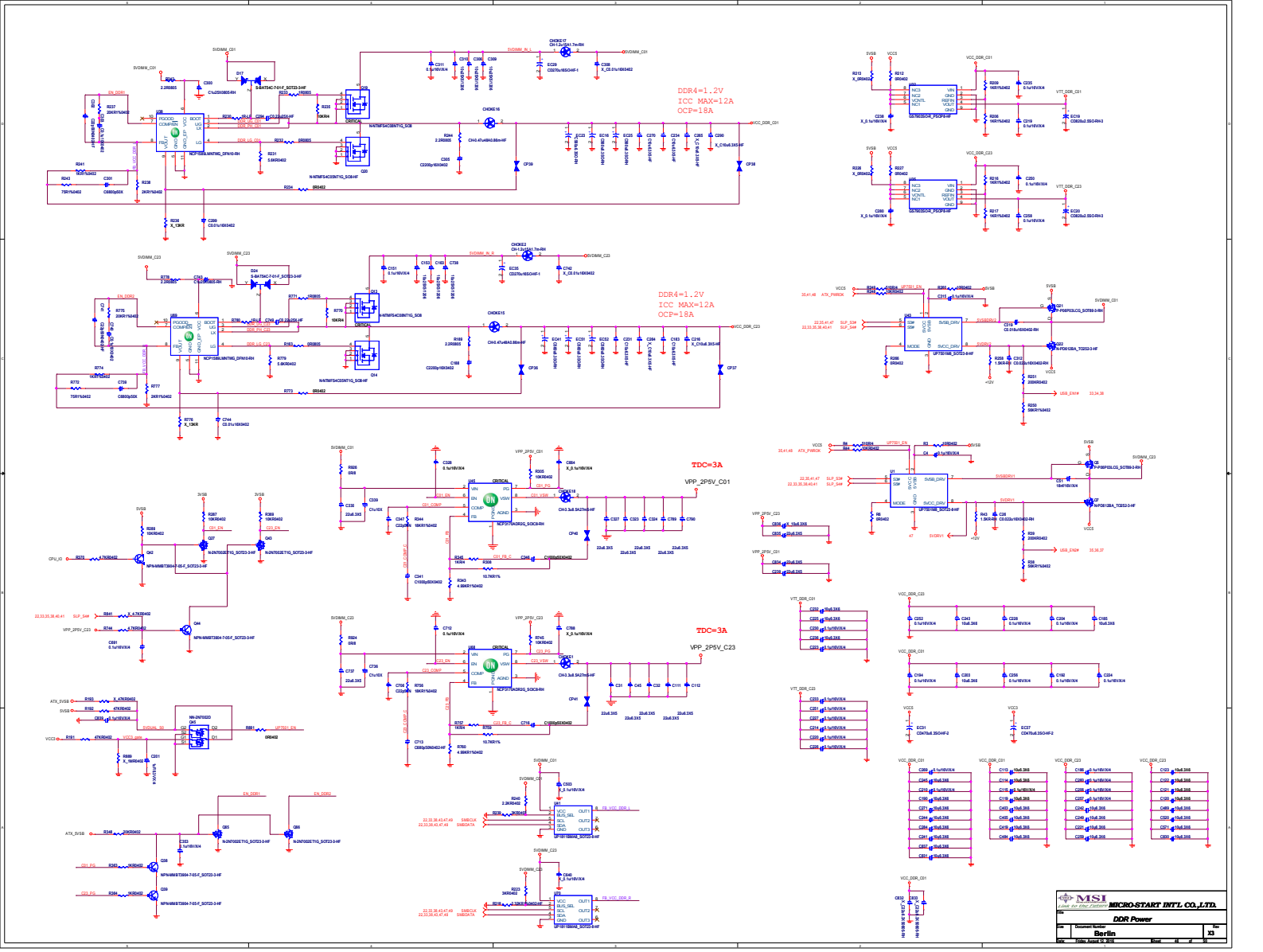
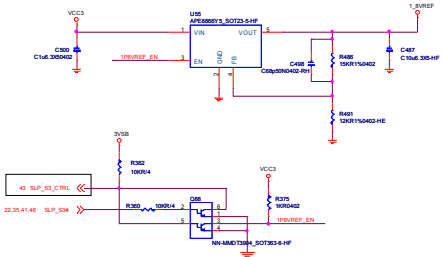
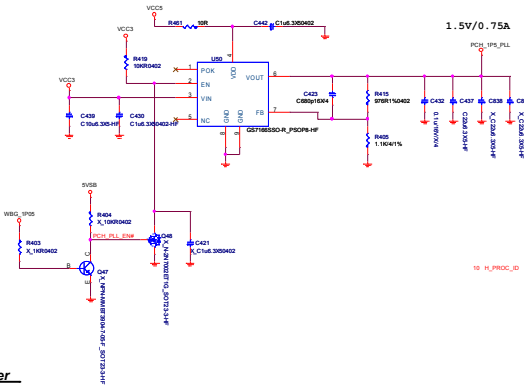

DDR4=1.2V
ICC MAX=12A
OCP=18A
DDR4=1.2V
ICC MAX=12A
OCP=18A
TDC=3A
VPP_2P5V_C01
TDC=3A
VPP_2P5V_C23
MICRO-START INT'L CO.,LTD.
DDR Power
Berlin
X3

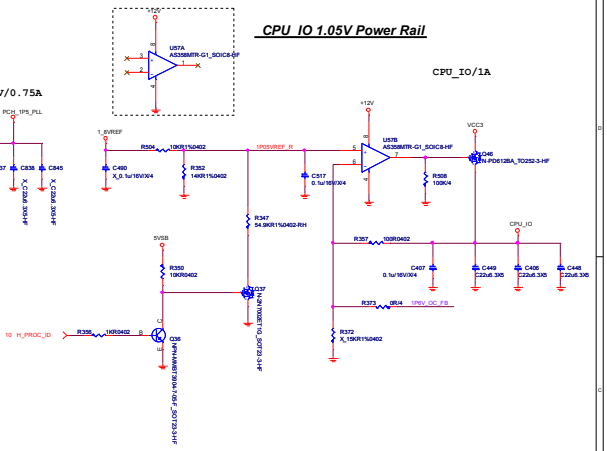
1.8V Reference Power



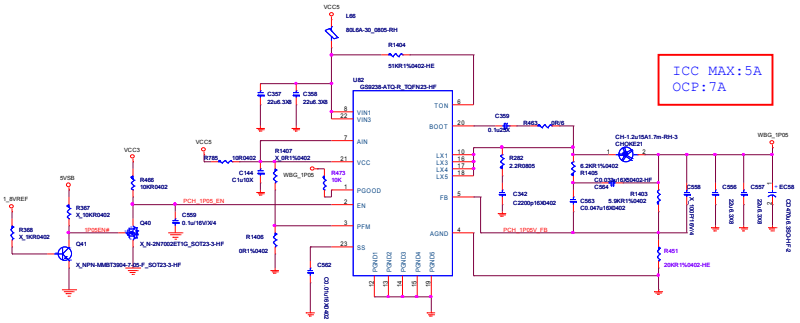
WBG 1.5V PLL Power Rail



CPU_IO 1.05V Power Rail



PCH Core Power

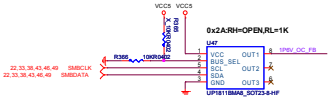


PROC_ID	VOUT
0	0.95V
1	1.05V

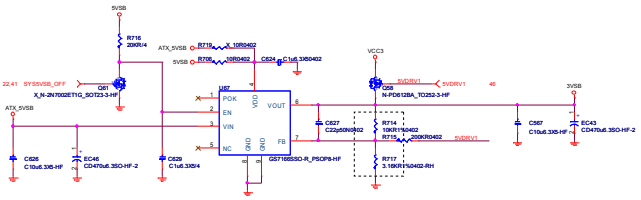
ICC MAX:5A
OCP:7A

UPI VOLTAGE CONSOLE

ADDRESS	0x2A	0X28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%



3VSB Power Rail



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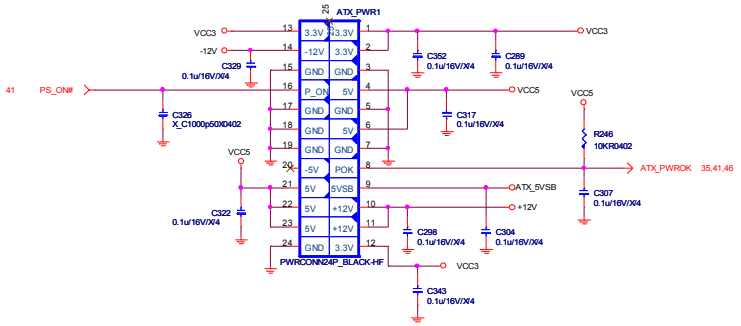
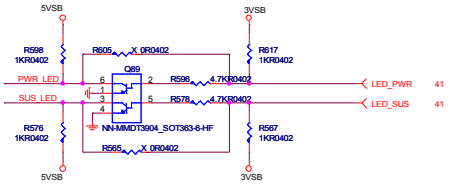
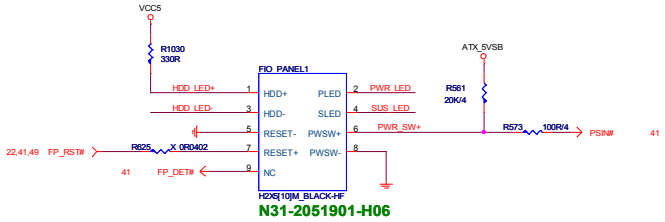
24 Pin ATX Power Connector



Power LED

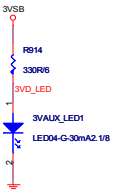


Front Panel

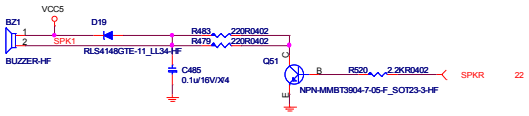


N31-2051901-H06

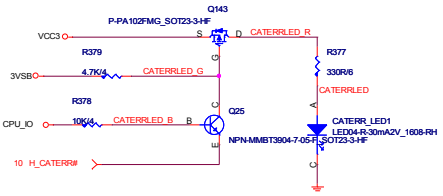
3VDUAL



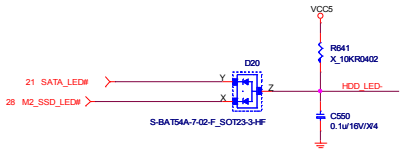
Buzzer Circuit

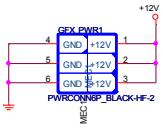


IERR



HDD LED





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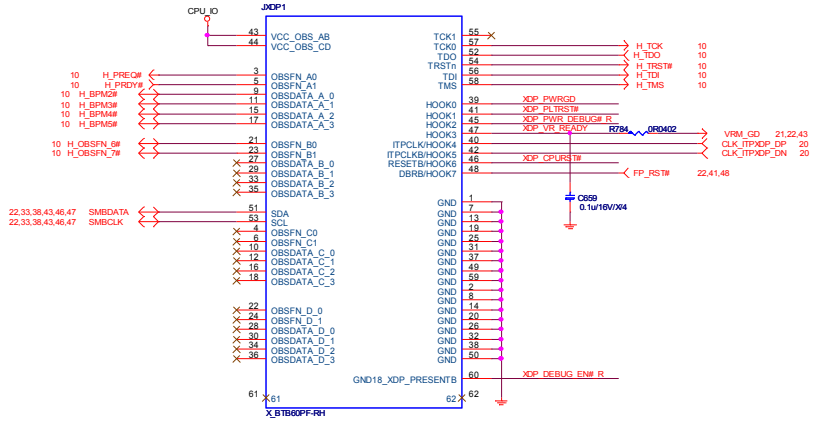
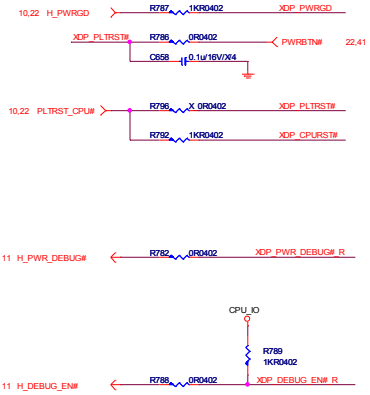
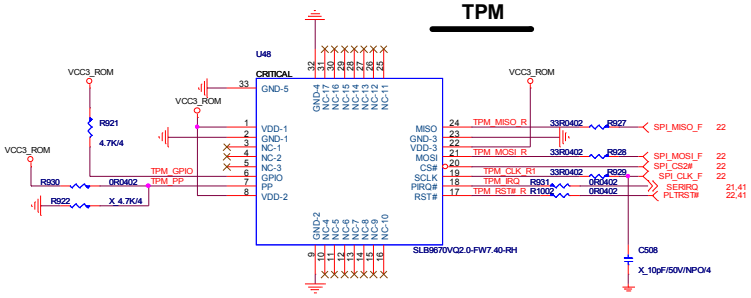
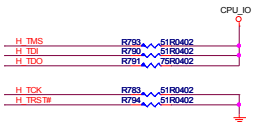
CPU XDP PORT





TPM





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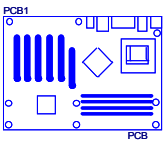
Manual Parts



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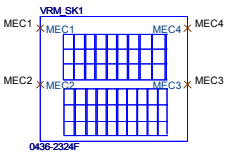
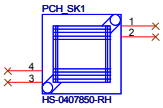
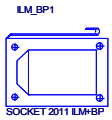
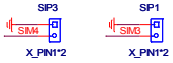
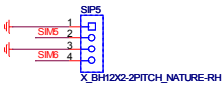


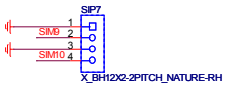


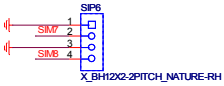


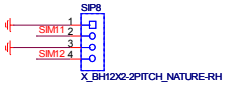
Simulation



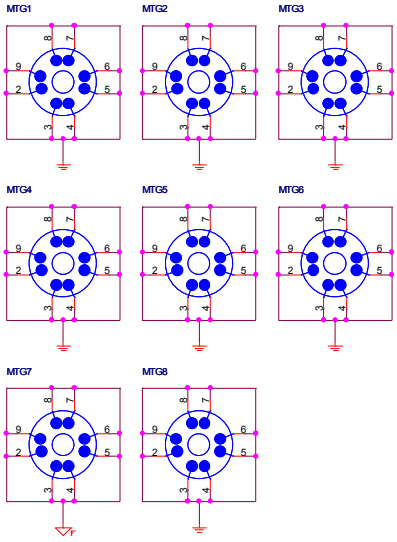






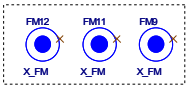


PCB Mounting Holes



Optics Orientation Holes

Optical Fiducial Marks-120



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