MS-7712 Version : 1.0

CPU :

INTEL Sandy Bridge-E Processor

System Chipset :

INTEL Patsburg Chipset

On Board Chipset :

VRM 12 -- ISL6366 6 Phase
Gigabit LAN -- RTL8111E
USB 3.0 -- UPD720202
HDA Codec -- Realtek ALC892
Super I/O -- F71889AD
SPI Flash 64Mb

Main Memory :

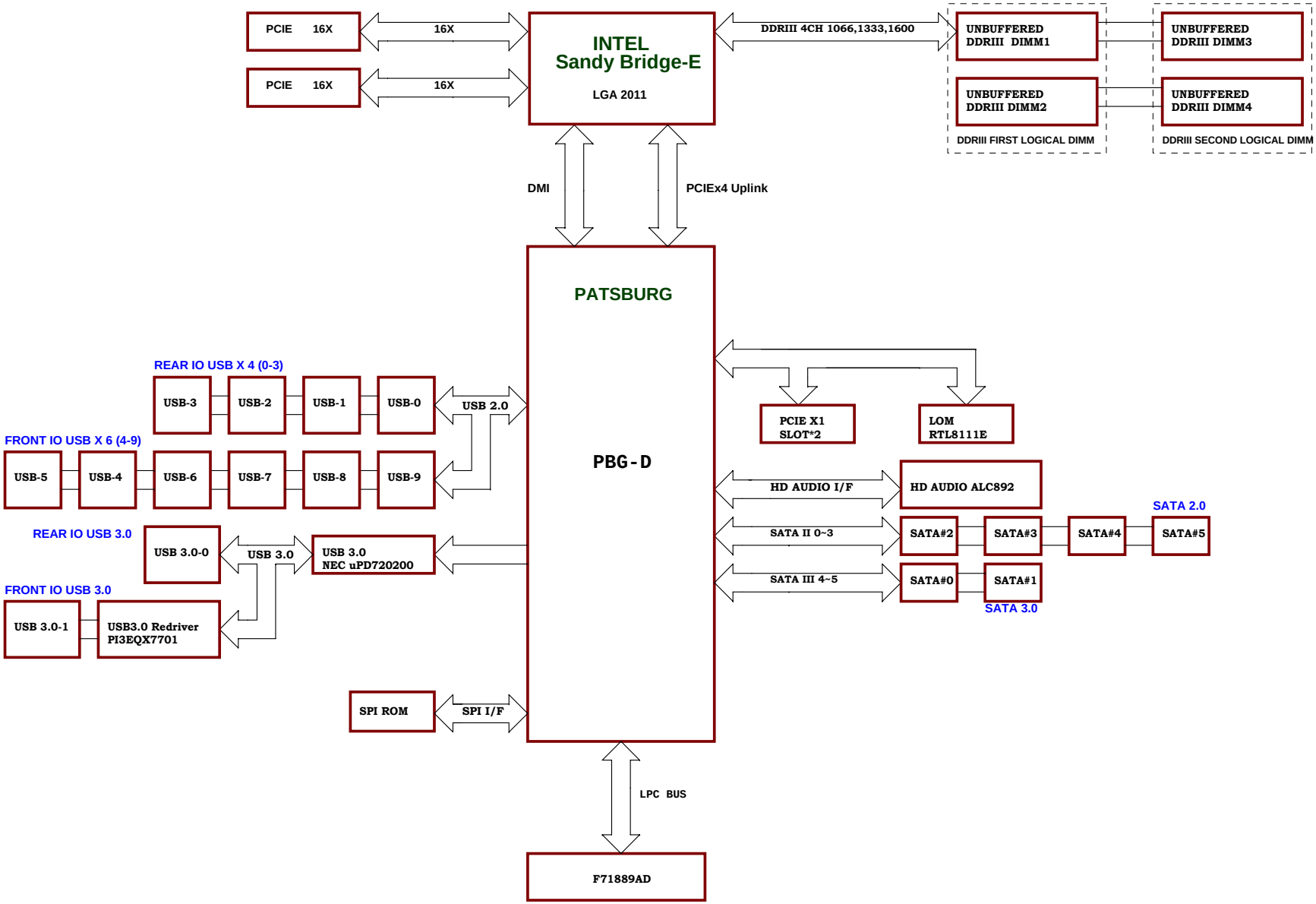
4 Channel DDR III * 4 (Max 16GB)

Expansion Slot :

PCI Express x16 Slot * 2
PCI Express x1 Slot * 2

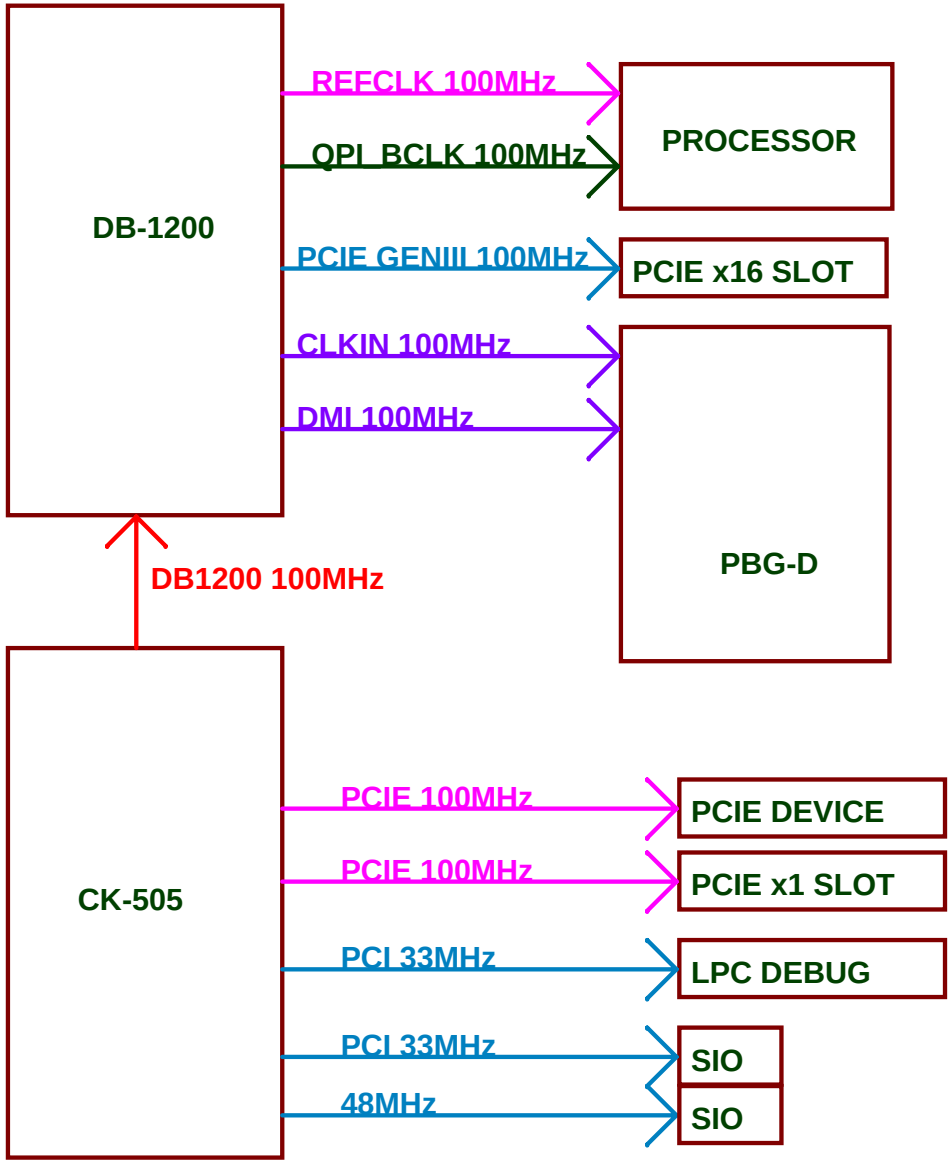
MSI Link to the Future **MICRO-START INT'L CO.,LTD.**

Title: Cover Sheet		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 1 of 45	



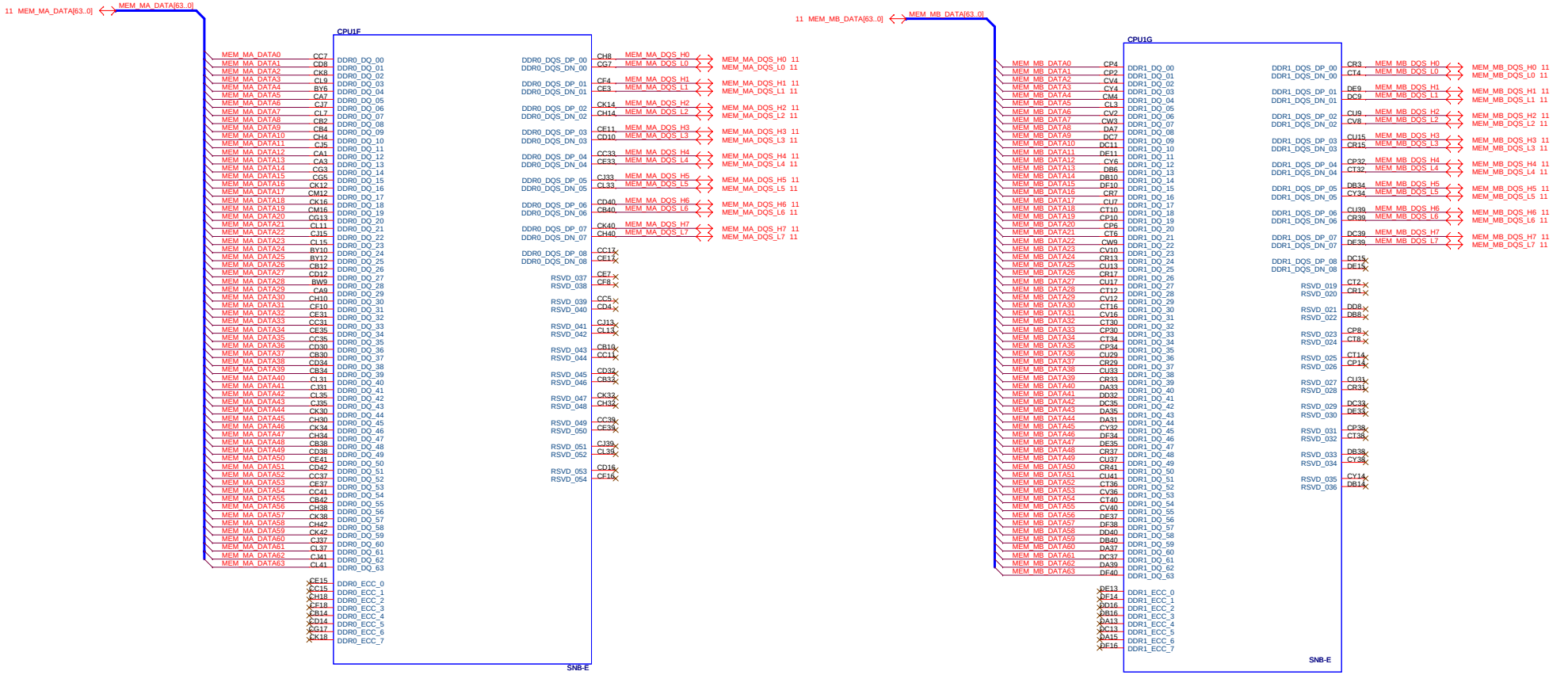
MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: Block Diagram		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 2 of 45	



MICRO-START INT'L CO.,LTD.

Title: Clock Distribution		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 3 of 45	

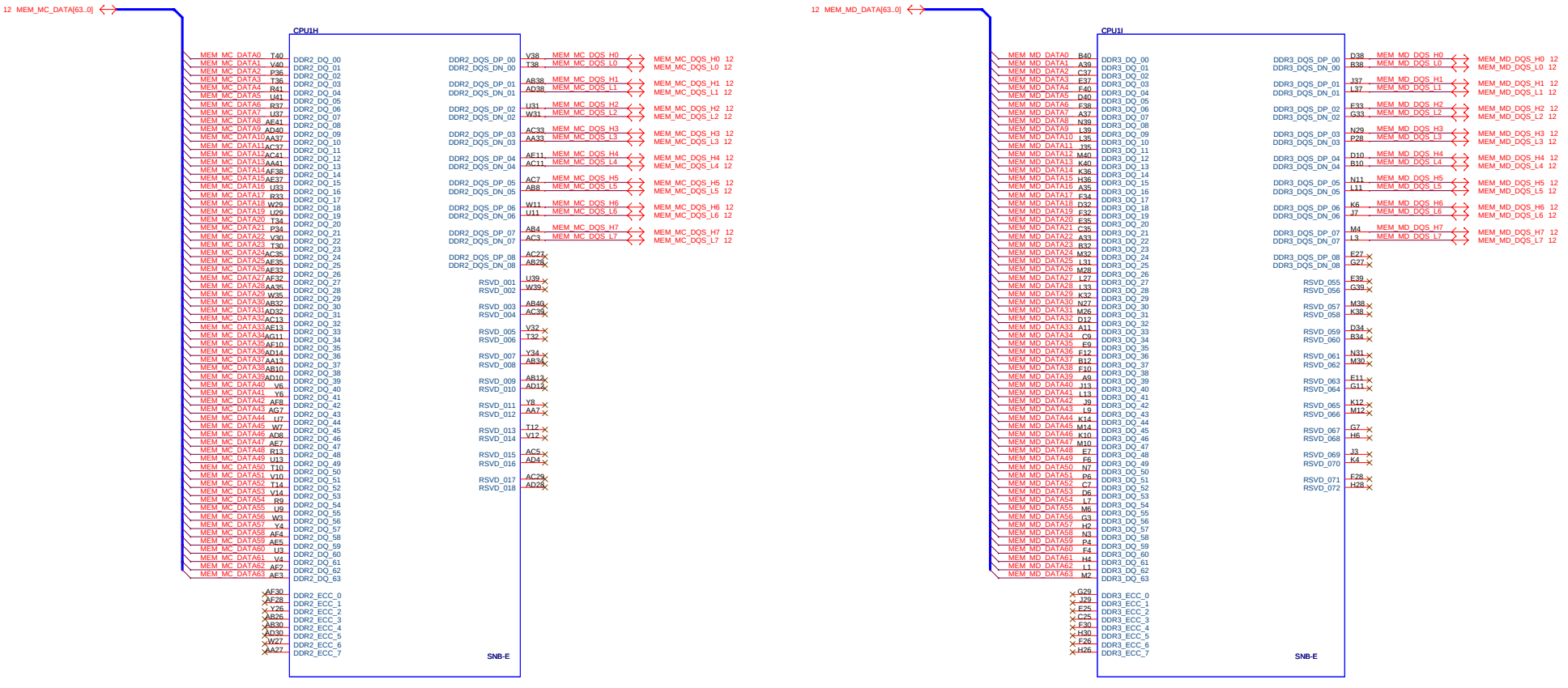


MICRO-START INT'L CO.,LTD.

Title: SNB-E MEMORY 1 & 2

Size | Document Number: MS-7712 | Rev: 1.0

Date: Wednesday, November 09, 2011 | Sheet 4 of 45

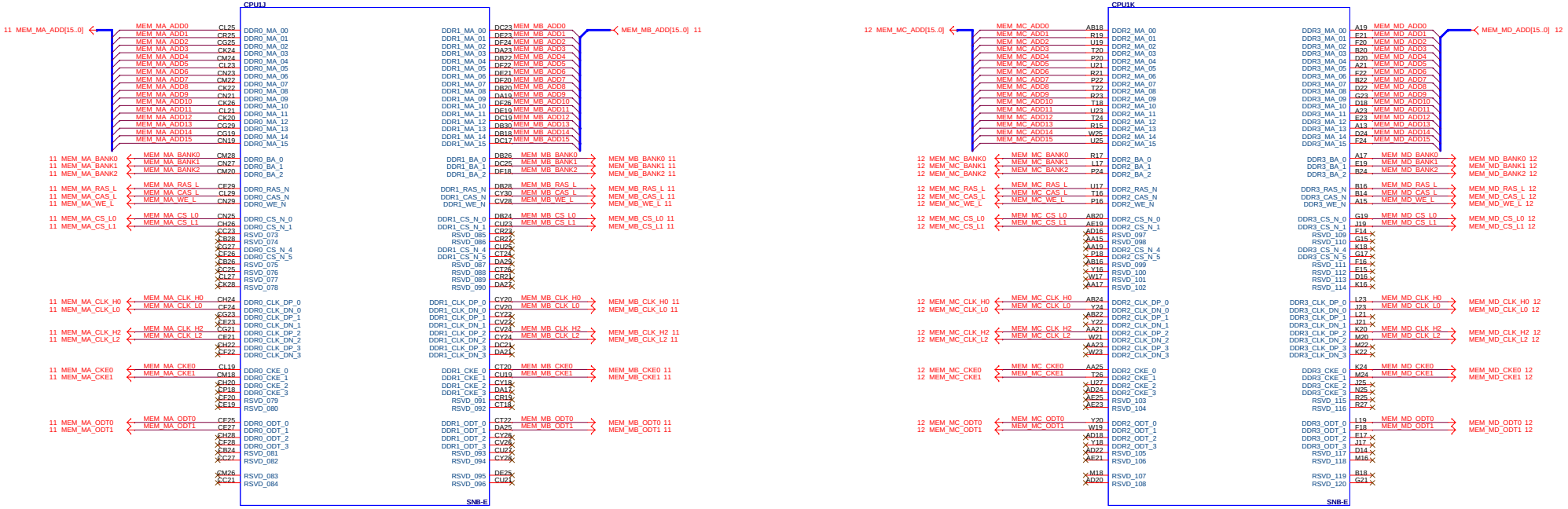


MICRO-START INT'L CO.,LTD.

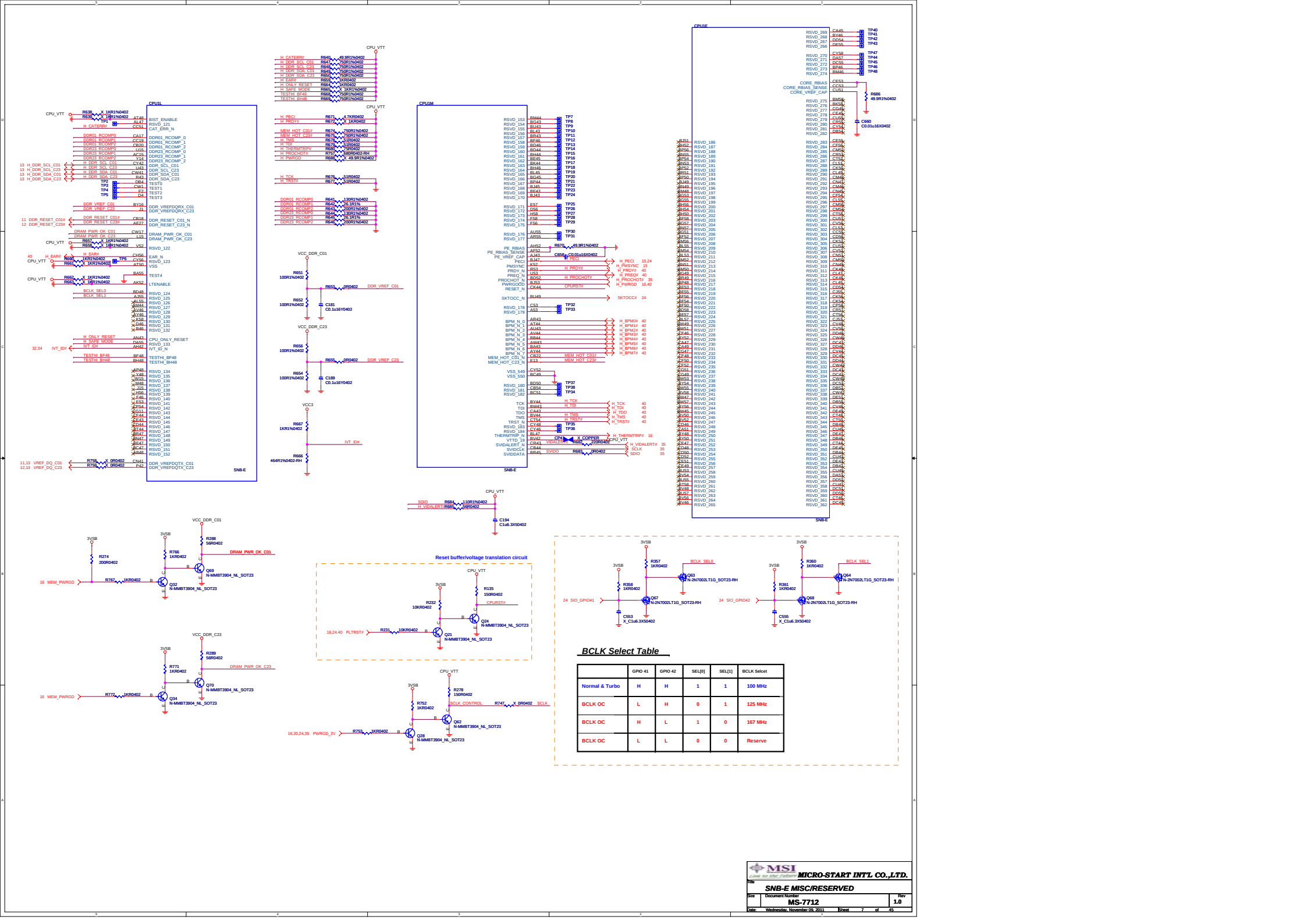
Title: SNB-E MEMORY 3 & 4

Size	Document Number	Rev
	MS-7712	1.0

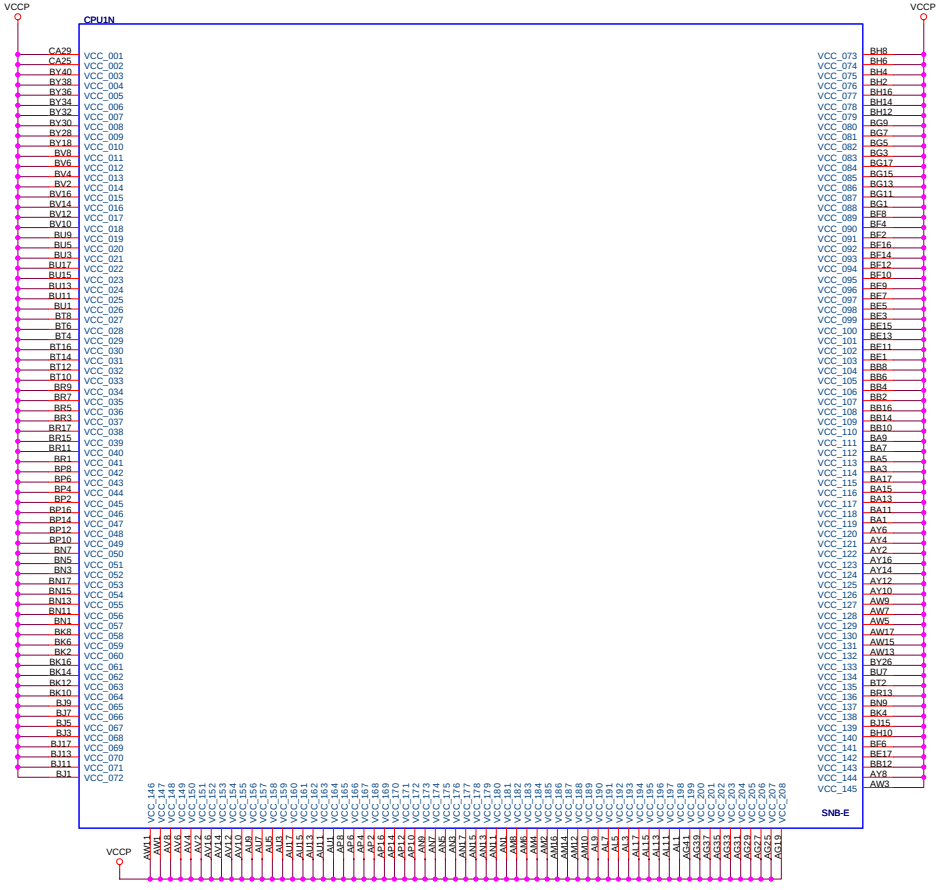
Date: Wednesday, November 09, 2011 Sheet 5 of 45

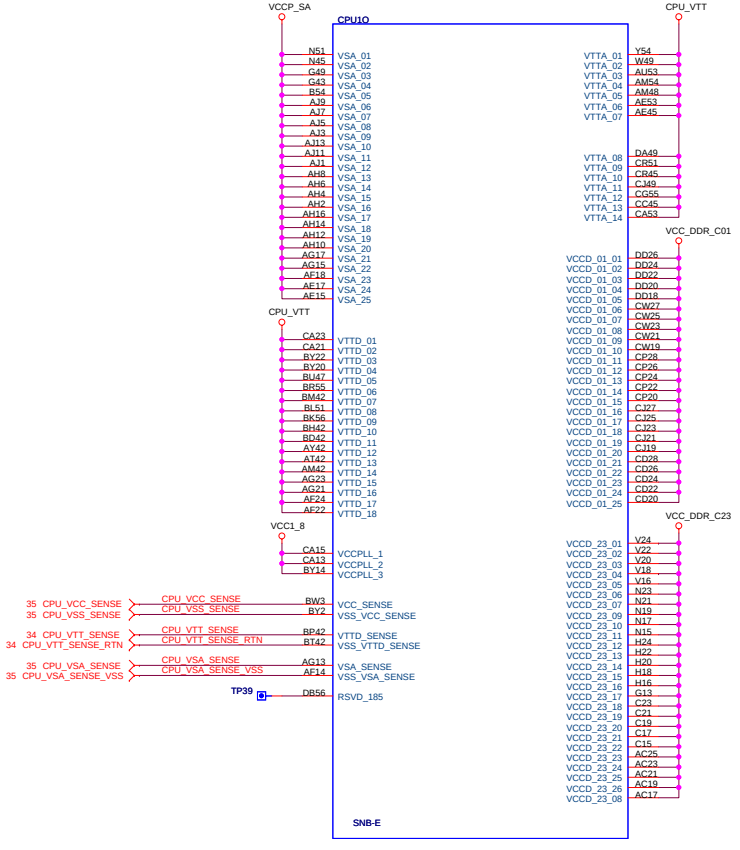


MSI MICRO-START INTL CO.,LTD.		
Title: SNB-E MEMORY CONTROLLER		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 6 of 45	

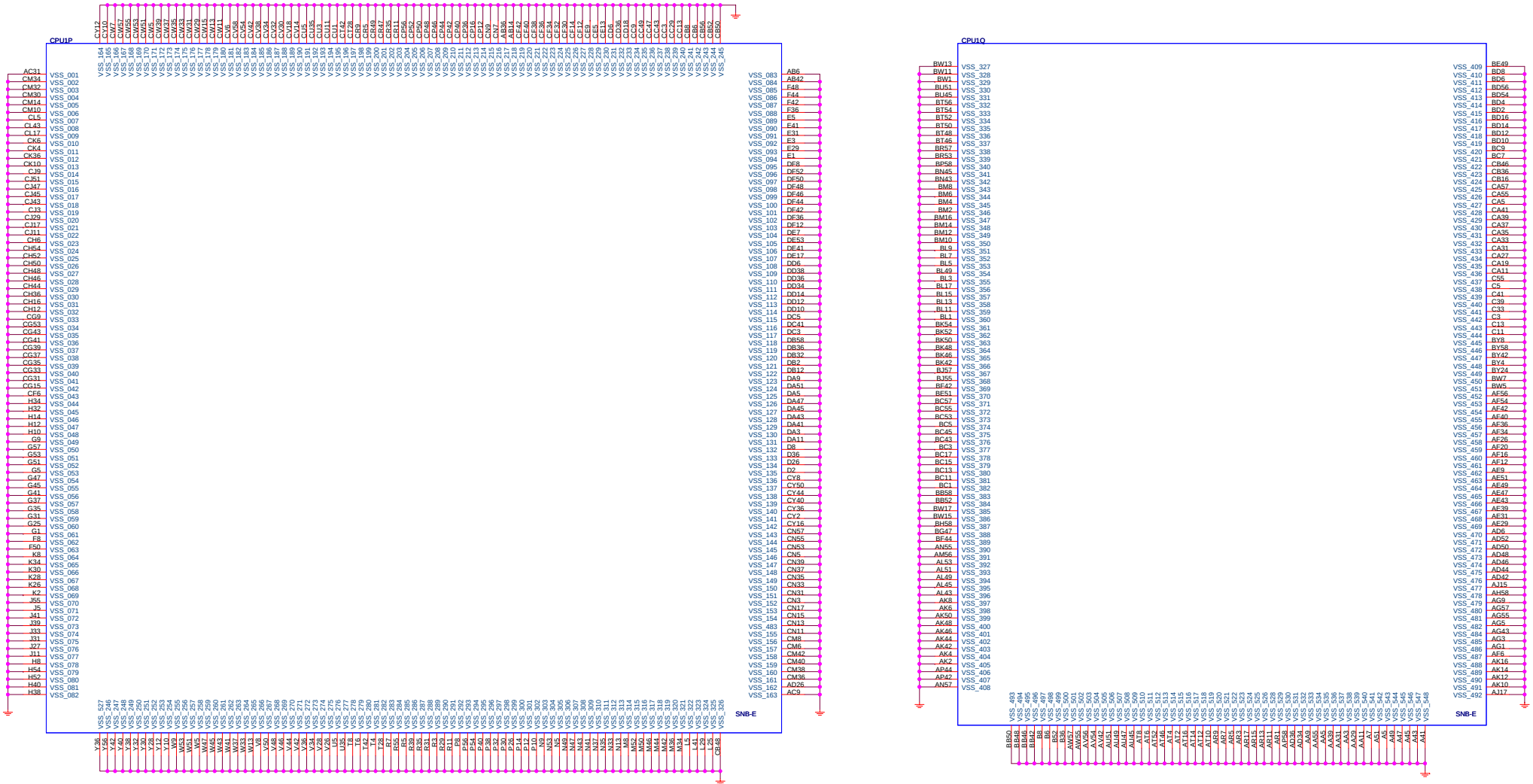

CPU1L
CPU1M
CPU1E
SNB-E
CPU_VTT
VCC_DDR_C01
VCC_DDR_C23
VCC3
3VSB
Reset buffer/voltage translation circuit
BCLK Select Table
GPIO 41
GPIO 42
SEL[0]
SEL[1]
BCLK Selcet
Normal & Turbo
BCLK OC
Reserve
MICRO-START INT'L CO.,LTD.
SNB-E MISC/RESERVED
MS-7712
1.0
Wednesday, November 09, 2011

MSI MICRO-START INT'L CO.,LTD.			
Title: SNB-E PCIE/DMI			
Size	Document Number: MS-7712		Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 8 of 45		

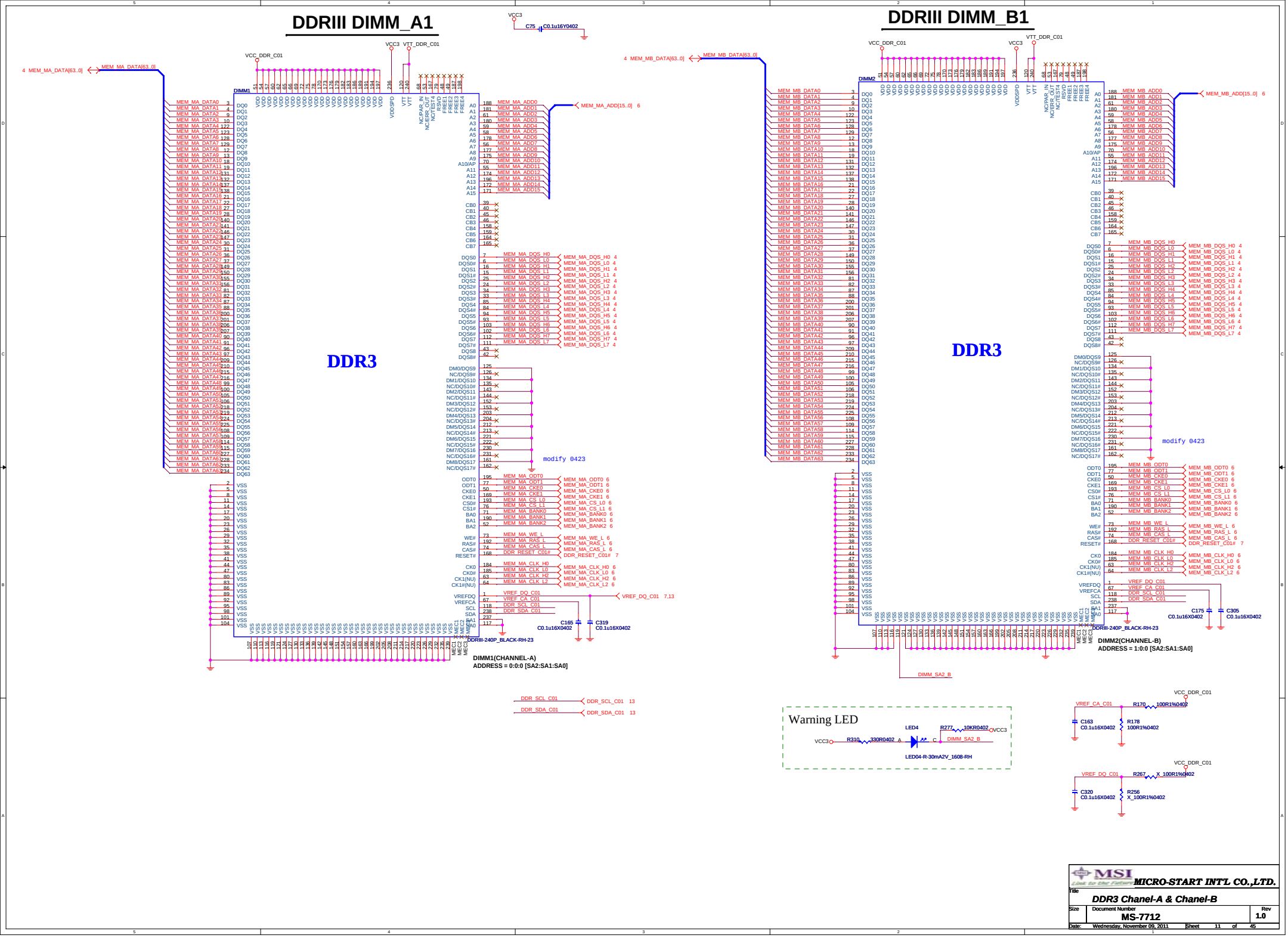




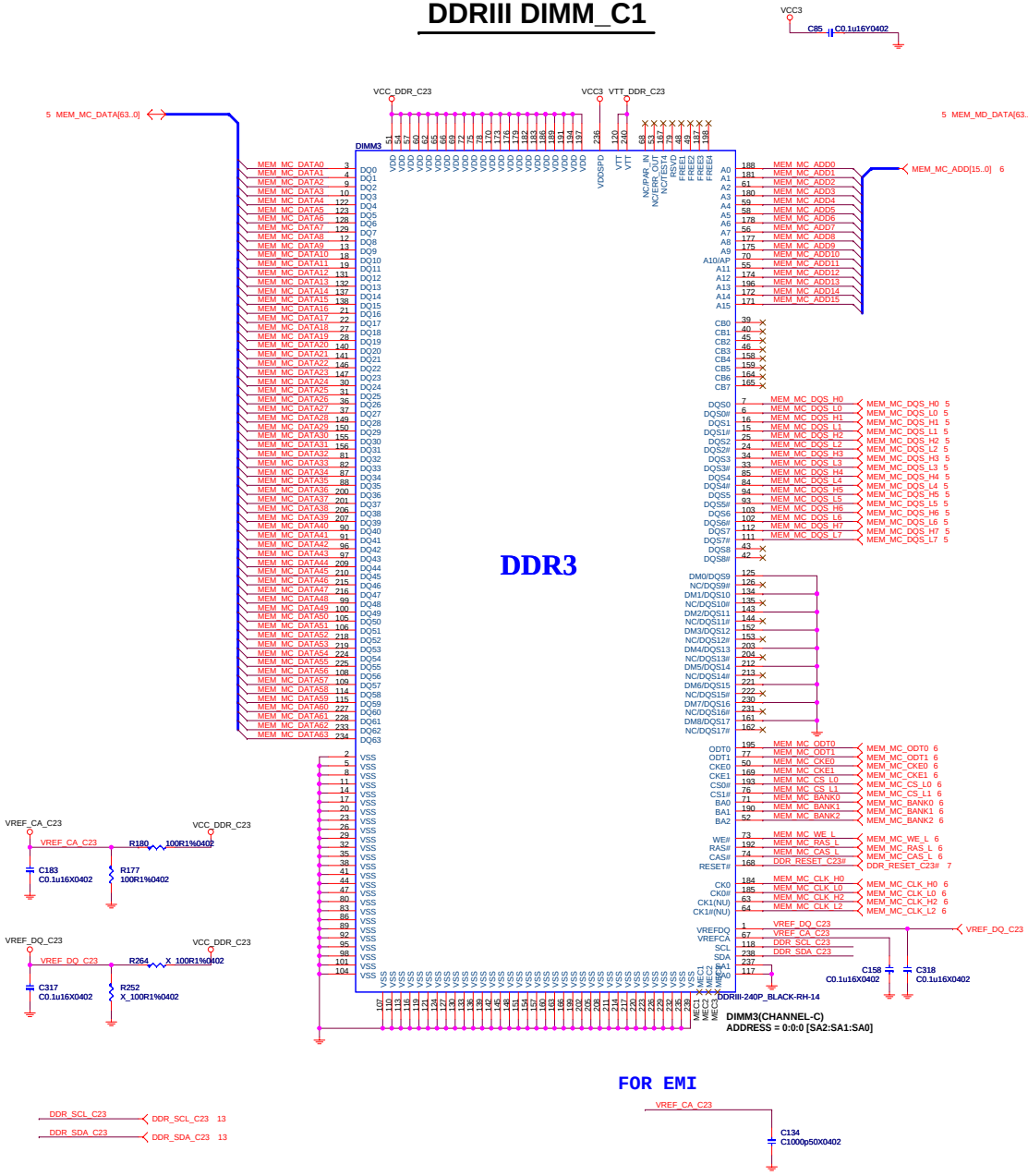
MSI Lead to the Future	MICRO-START INT'L CO.,LTD.	
Title	SNB-E POWER	
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 9 of 45	



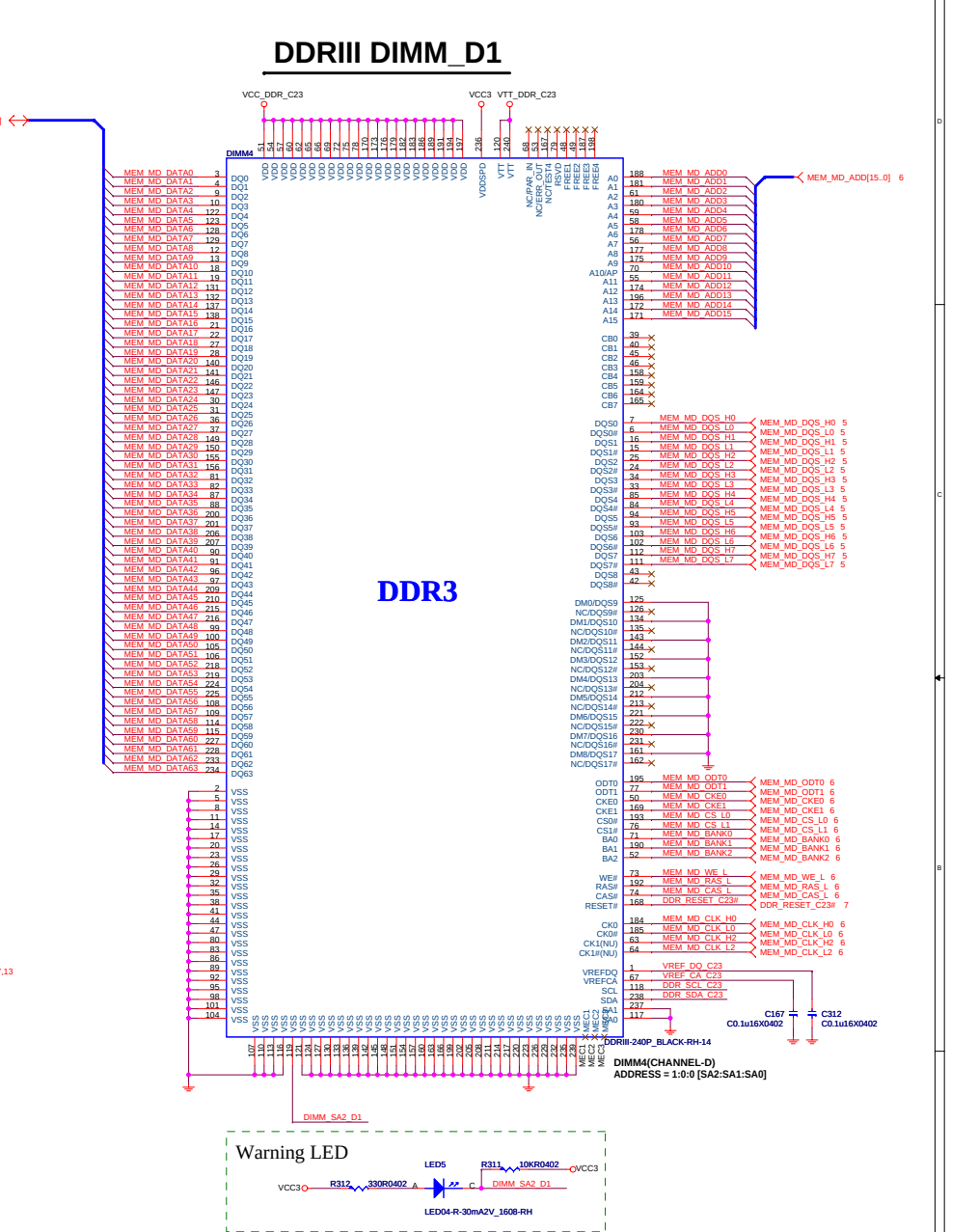
MSI	MICRO-START INT'L CO.,LTD.
Title	SNB-E GND
Size	Document Number: MS-7712
Rev	1.0
Date:	Wednesday, November 09, 2011
Sheet	10 of 45


DDRIII DIMM_A1
DDRIII DIMM_B1
DDR3
DDR3
DIMM1
DIMM2
DDRIII-240P_BLACK-RH-23
DDRIII-240P_BLACK-RH-23
DIMM1(CHANNEL-A)
ADDRESS = 0:0:0 [SA2:SA1:SA0]
DIMM2(CHANNEL-B)
ADDRESS = 1:0:0 [SA2:SA1:SA0]
modify 0423
modify 0423
Warning LED
LED4
LED04-R-30mA2V_1608-RH
MSI
MICRO-START INTL CO.,LTD.
DDR3 Chanel-A & Chanel-B
MS-7712
1.0
Wednesday, November 09, 2011
11
45

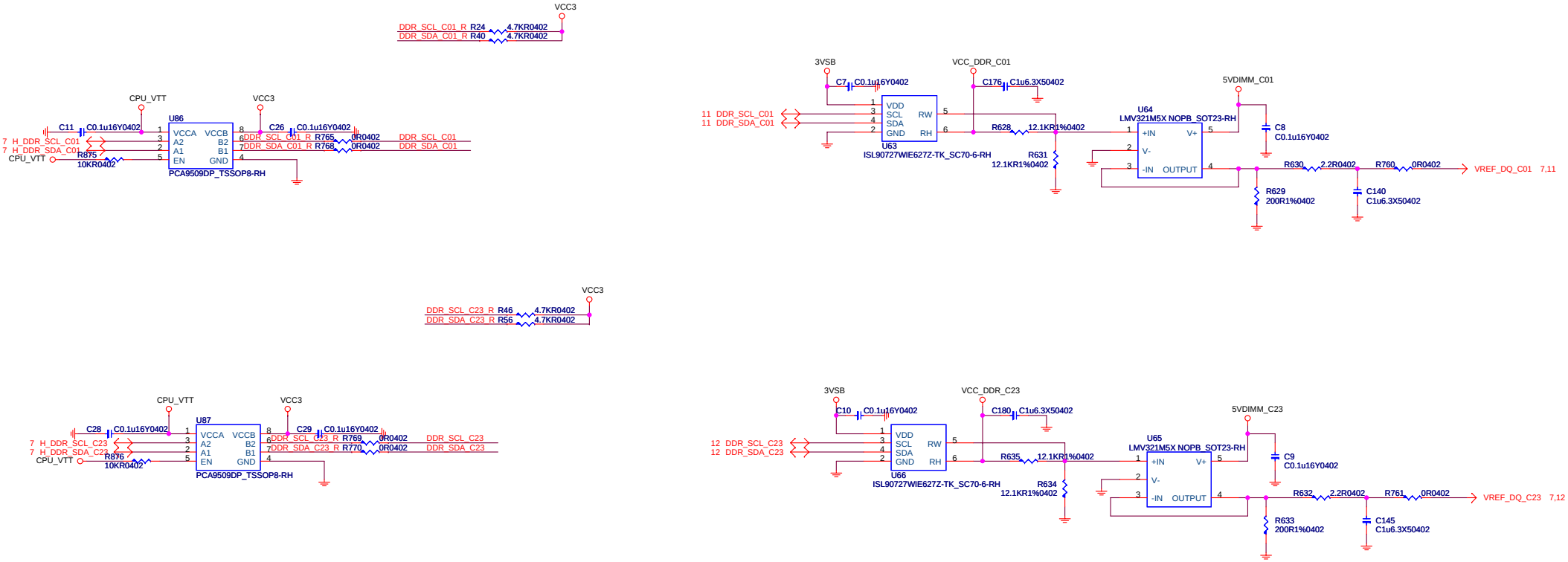
DDRIII DIMM_C1



DDRIII DIMM_D1



MICRO-START INTL CO.,LTD.			
Title: DDR3 Channel-B & Channel-C			
Size	Document Number: MS-7712		Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 12 of 45		

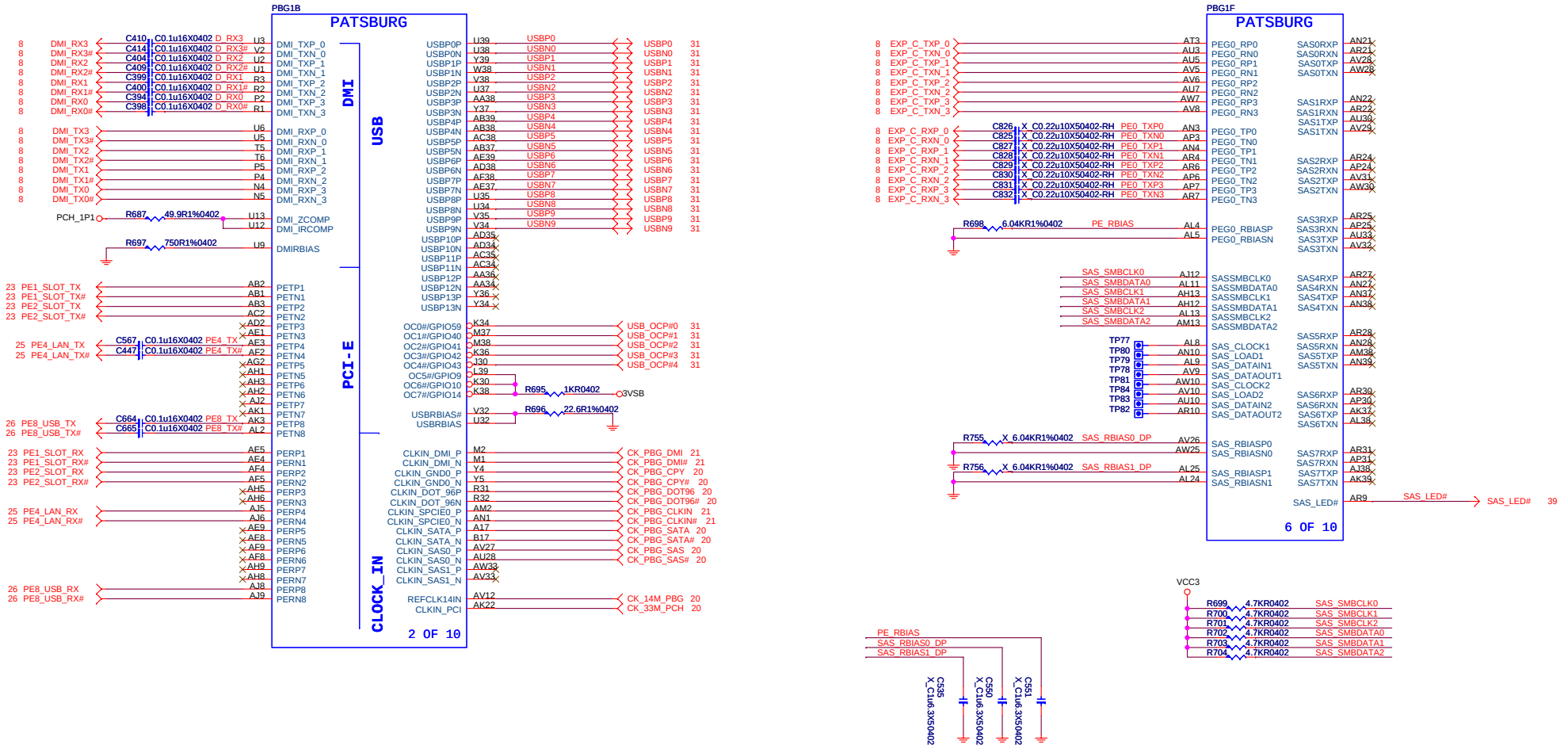


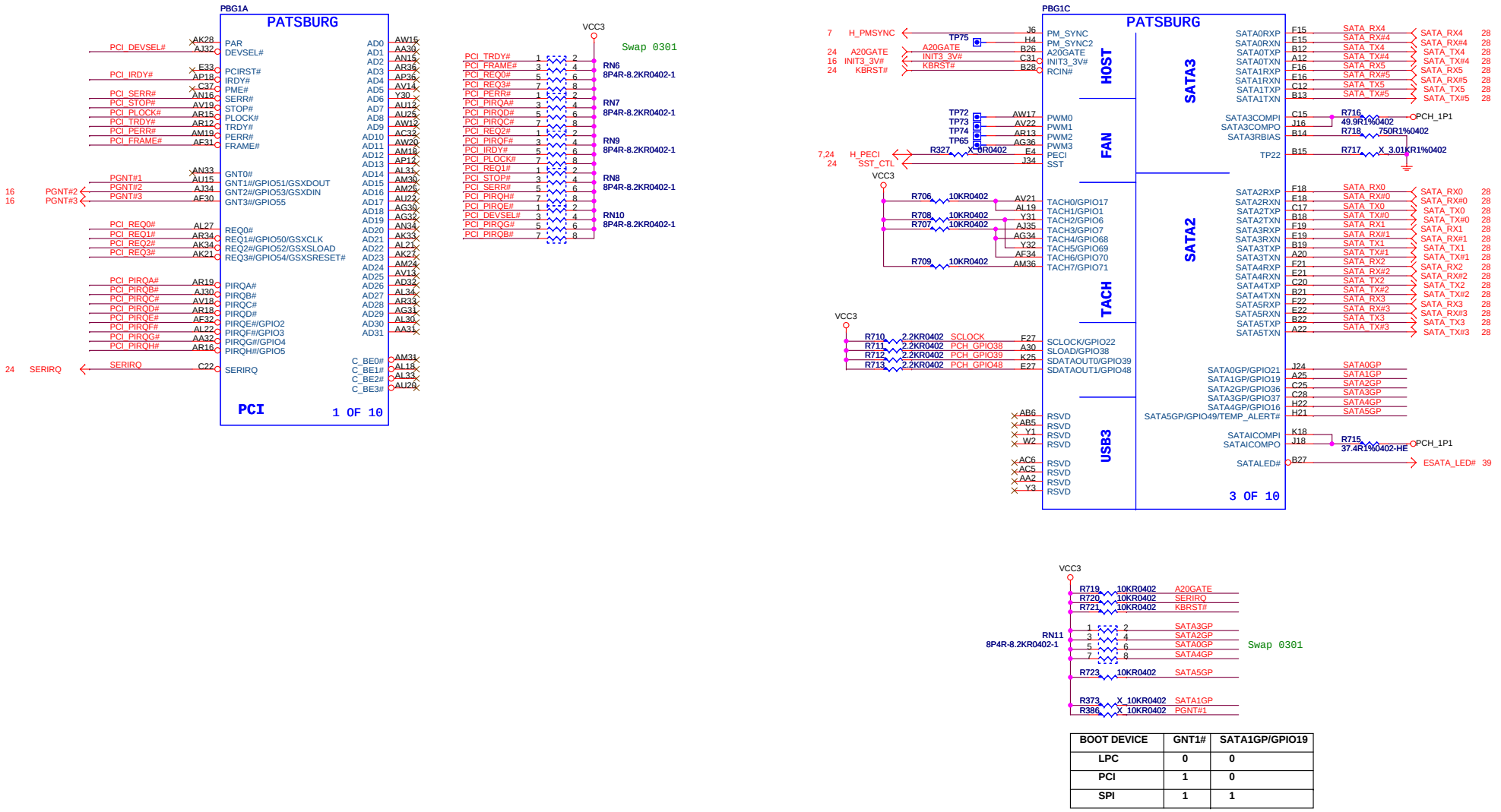
MICRO-START INT'L CO.,LTD.

Title: DDR3 DQ VREF

Size	Document Number	Rev
	MS-7712	1.0

Date: Wednesday, November 09, 2011 Sheet 13 of 45


PBG1B
PATSBURG
DMI
USB
PCI-E
CLOCK_IN
2 OF 10
PBG1F
PATSBURG
6 OF 10
MICRO-START INT'L CO.,LTD.
PBG-PCIE/USB/DMI/SAS
MS-7712
1.0
Wednesday, November 09, 2011
Sheet 14 of 45



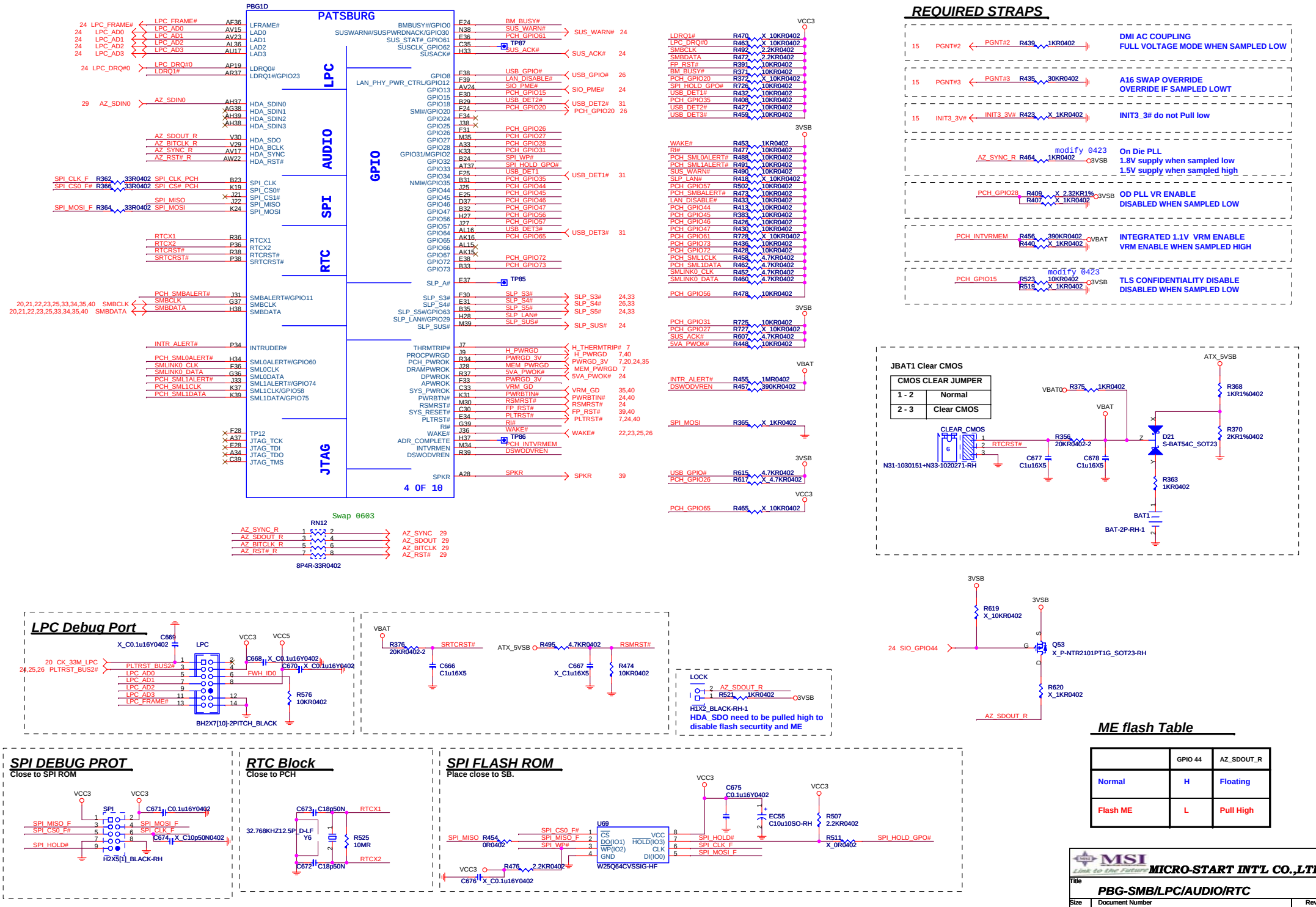
BOOT DEVICE	GNT1#	SATA1GP/GPIO19
LPC	0	0
PCI	1	0
SPI	1	1

MICRO-START INT'L CO.,LTD.

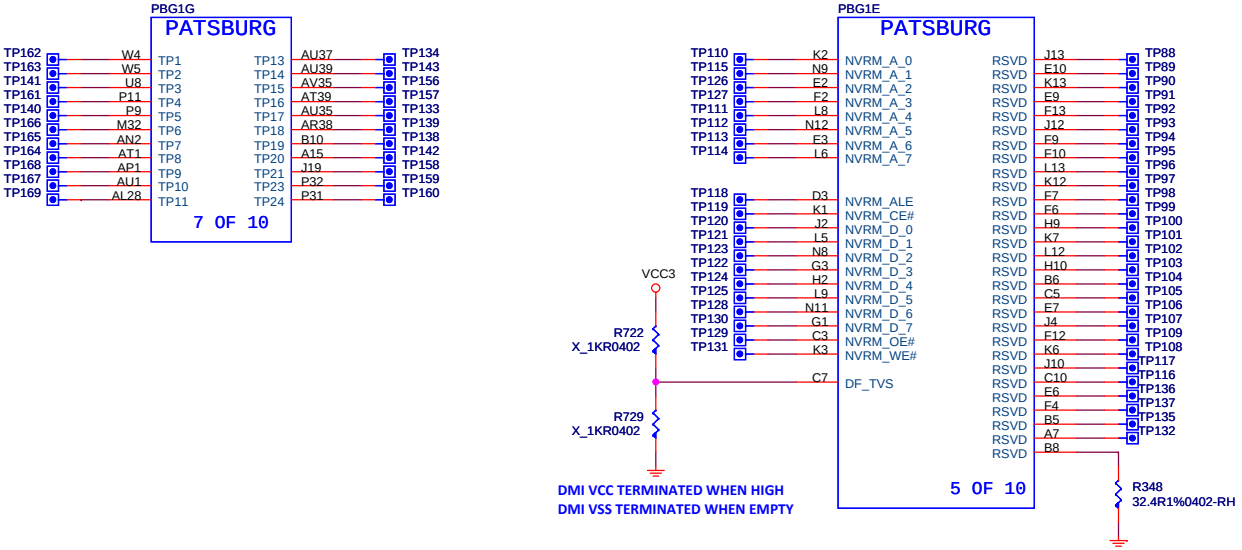
Title: PBG-PCI/SATA

Size | Document Number: MS-7712 | Rev: 1.0

Date: Wednesday, November 09, 2011 | Sheet 15 of 45



	GPIO 44	AZ_SDOUT_R
Normal	H	Floating
Flash ME	L	Pull High



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

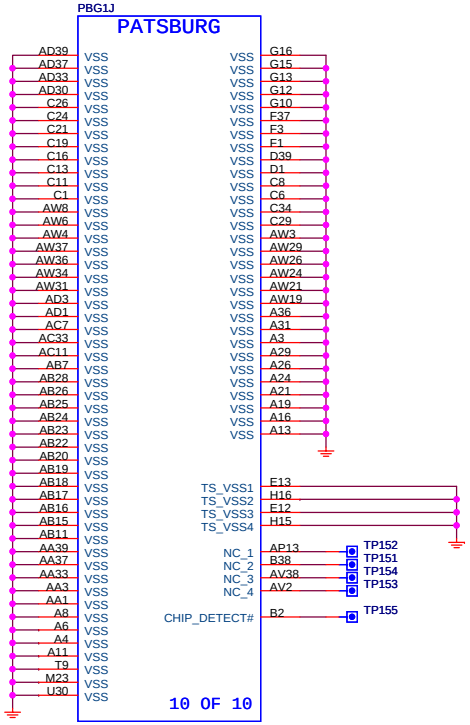
Title	**PBG-NVRM**	
Size	Document Number **MS-7712**	Rev **1.0**
Date: Wednesday, November 09, 2011	Sheet 17 of 45	

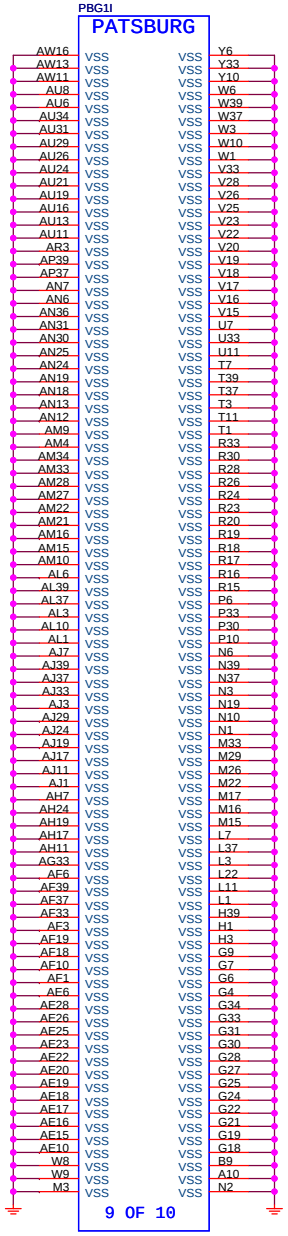
MSI MICRO-START INT'L CO.,LTD.

Title: PBG-POWER

Size | Document Number: MS-7712 | Rev: 1.0

Date: Wednesday, November 09, 2011 | Sheet 18 of 45

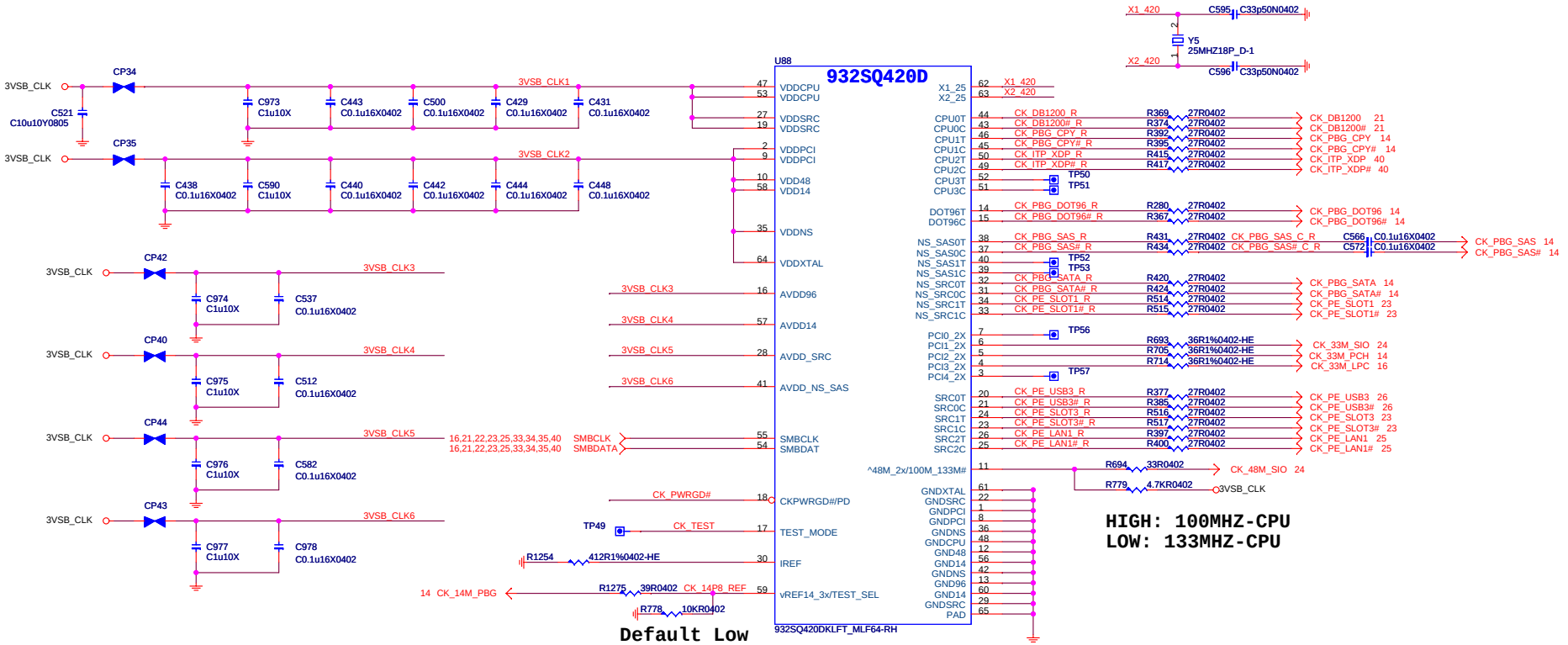


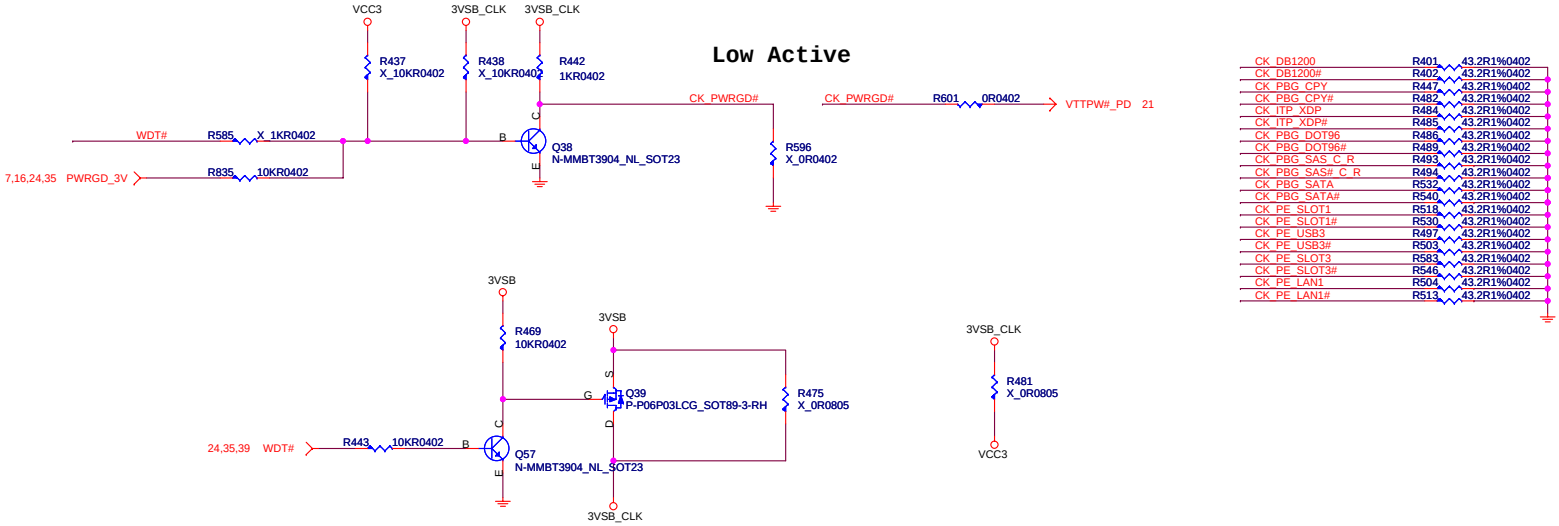


MSI Link to the Future **MICRO-START INT'L CO.,LTD.**

Title	**PBG-GND**	
Size	Document Number **MS-7712**	Rev **1.0**
Date: Wednesday, November 09, 2011	Sheet 19 of 45	

Clock Gen 932SQ420D

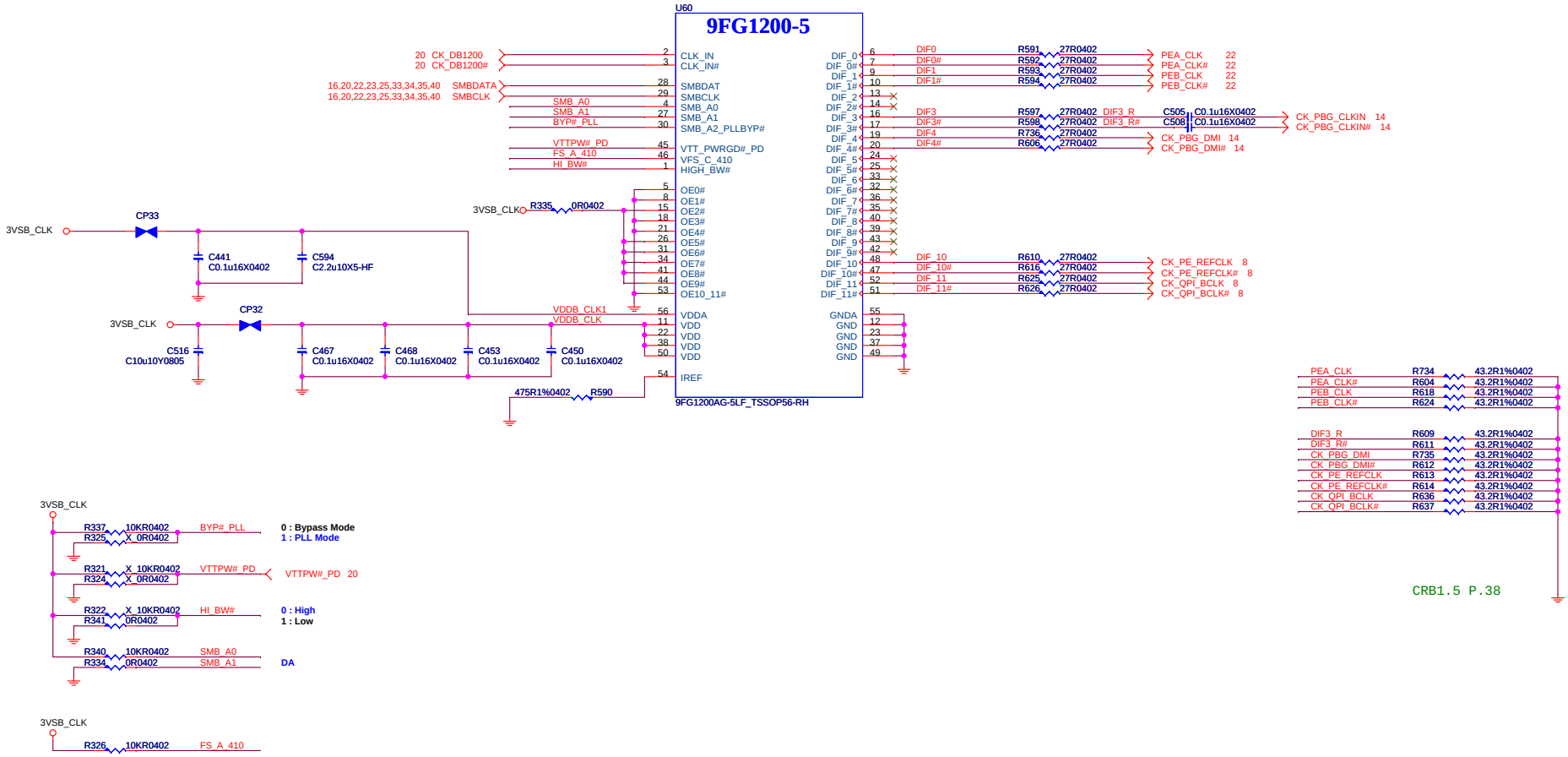




MICRO-START INT'L CO.,LTD.

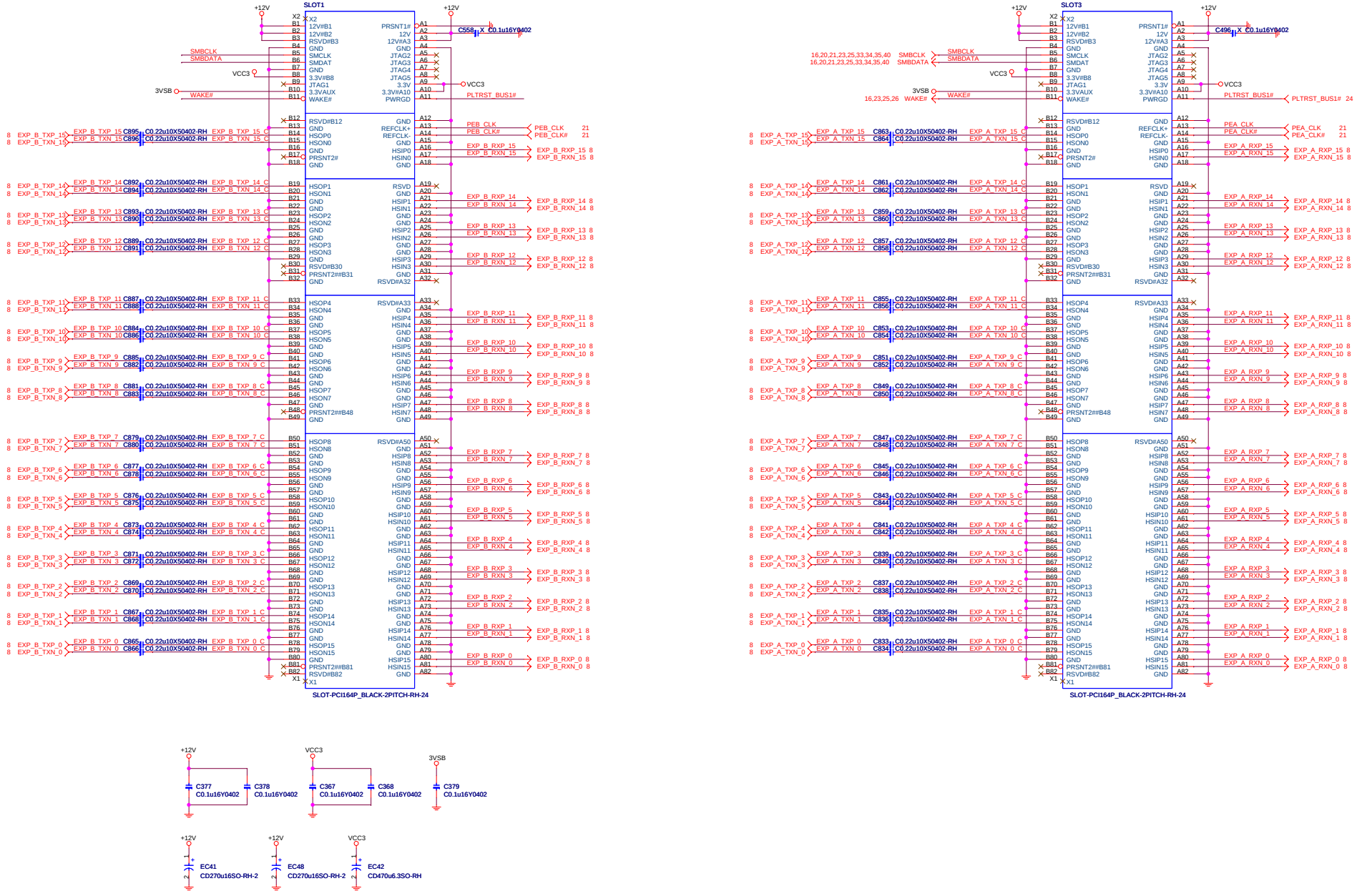
Title	CK505 932SQ420D	
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 20 of 45	

Clock Buffer 9FG1200D



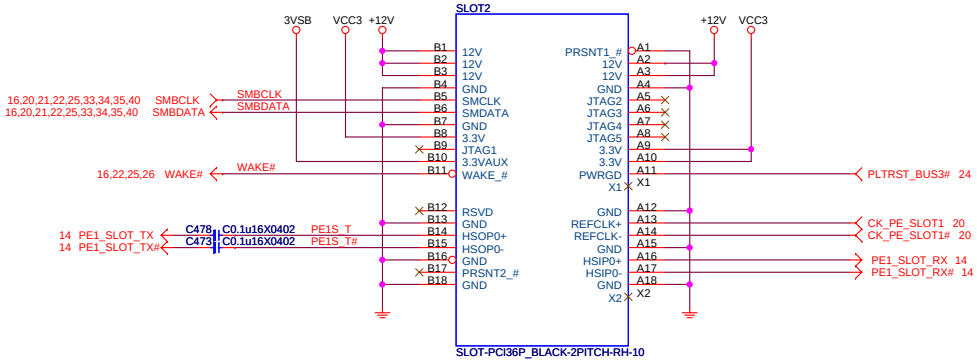
MSI Link to the Future	MICRO-START INT'L CO.,LTD.	
Title	Clock Buffer DB1200	
Size	Document Number MS-7712	Rev 1.0
Date: Wednesday, November 09, 2011	Sheet 21 of 45	

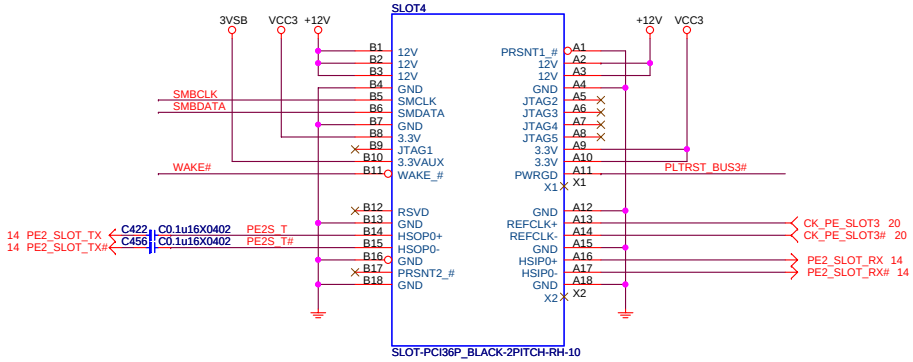
PCI_EXPRESS X16 SLOT

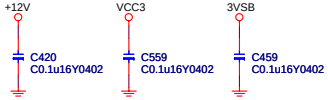


MSI / MICRO-START INT'L CO.,LTD.	
Title	PCIE X16 slot
Size	Document Number: MS-7712
Rev	1.0
Date: Wednesday, November 09, 2011	Sheet 22 of 45

PCI EXPRESS X1 SLOT

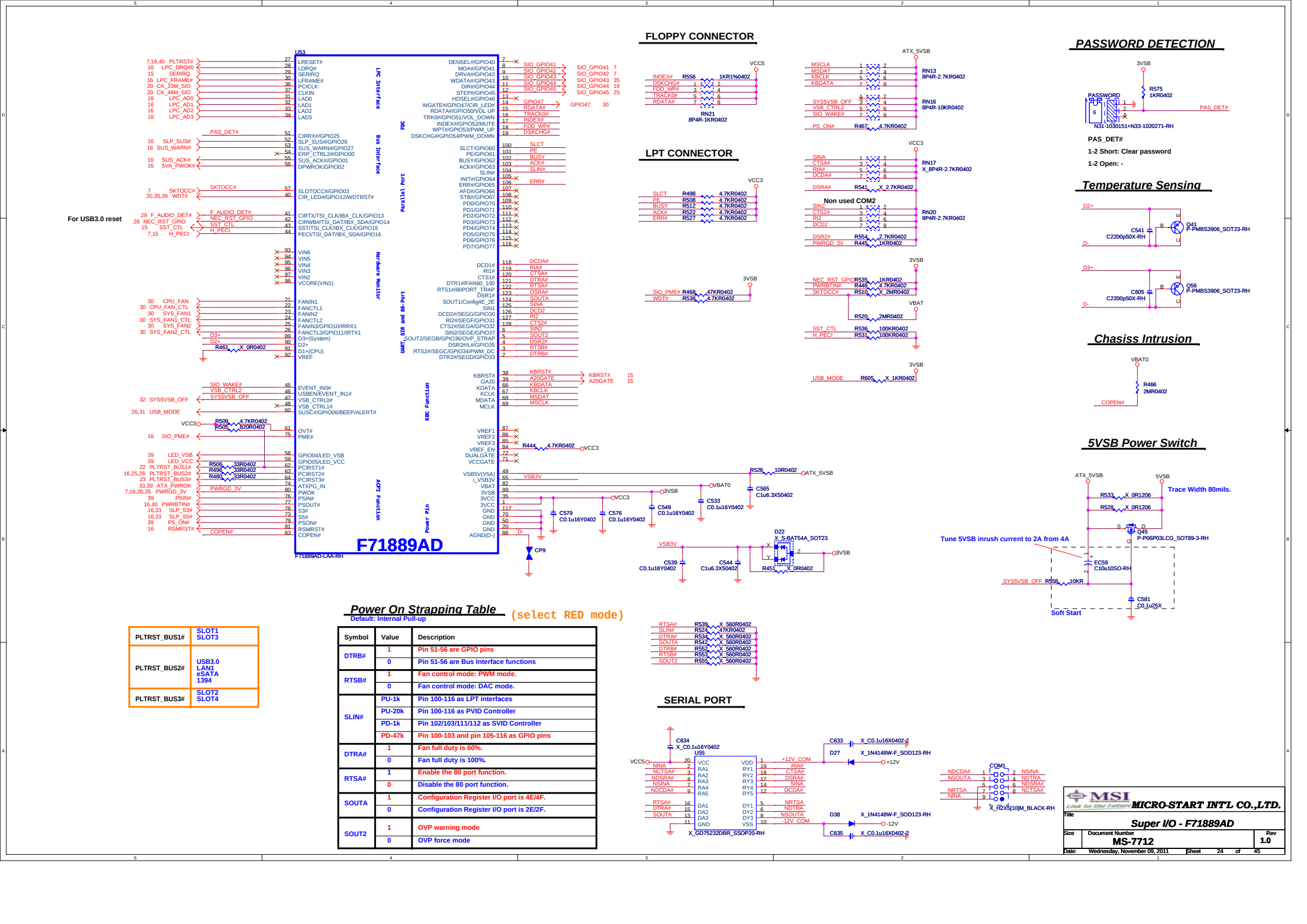






MICRO-START INT'L CO.,LTD.

Title: PCIE x1 SLOTS		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 23 of 45	



Power On Strapping Table

Default: Internal Pull-up (select RED mode)

Symbol	Value	Description
DTRB#	1	Pin 51-56 are GPIO pins
	0	Pin 51-56 are Bus Interface functions
RTSB#	1	Fan control mode: PWM mode.
	0	Fan control mode: DAC mode.
SLIN#	PU-1k	Pin 100-116 as LPT interfaces
	PU-20k	Pin 100-116 as PVID Controller
	PD-1k	Pin 102/103/111/112 as SVID Controller
	PD-47k	Pin 100-103 and pin 105-116 as GPIO pins
DTRA#	1	Fan full duty is 60%.
	0	Fan full duty is 100%.
RTSA#	1	Enable the 80 port function.
	0	Disable the 80 port function.
SOUTA	1	Configuration Register I/O port is 4E/4F.
	0	Configuration Register I/O port is 2E/2F.
SOUT2	1	OVP warning mode
	0	OVP force mode

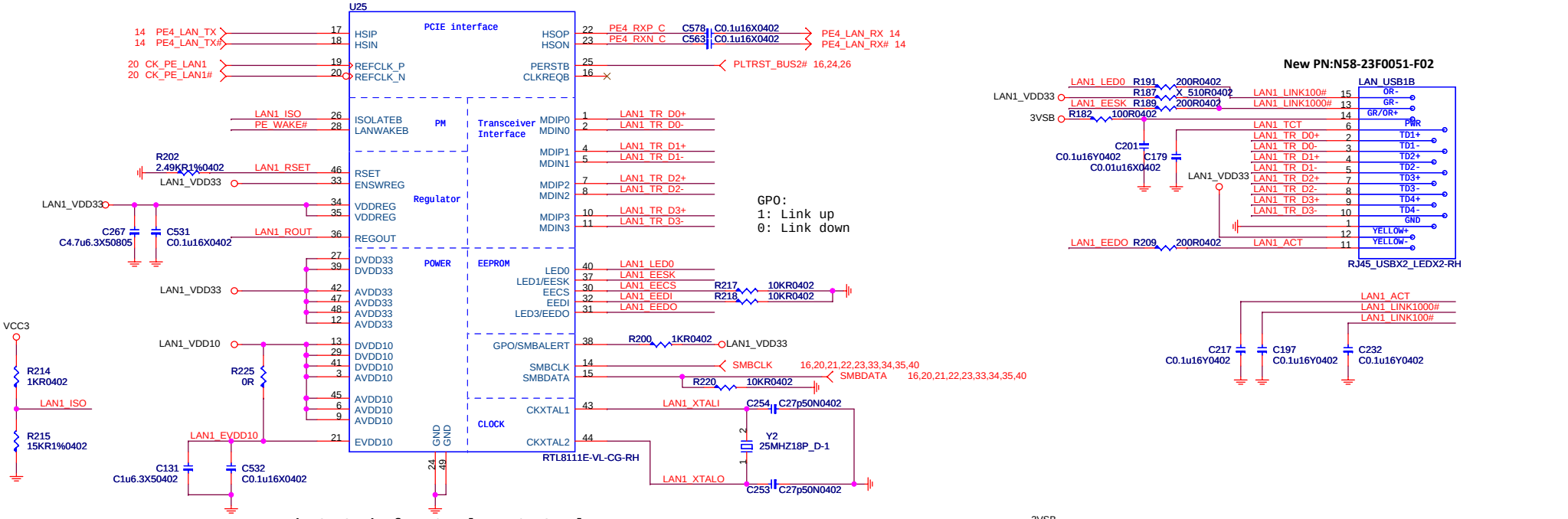
PLTRST_BUS1#	SLOT1 SLOT3
PLTRST_BUS2#	USB3.0 LAN1 eSATA 1394
PLTRST_BUS3#	SLOT2 SLOT4

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

Title: Super I/O - F71889AD

Size	Document Number	Rev
	MS-7712	1.0

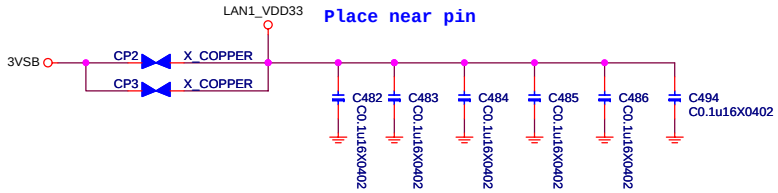
Date: Wednesday, November 09, 2011 Sheet 24 of 45

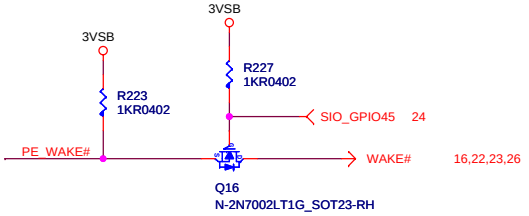


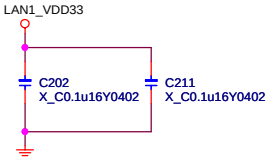
GPO:
1: Link up
0: Link down

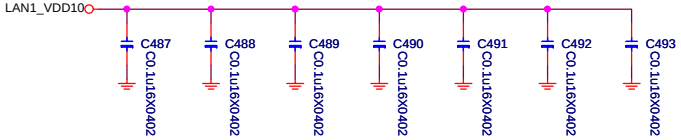
Pin49: 9 via from top layer to GND layer and make the via at the center of IC.

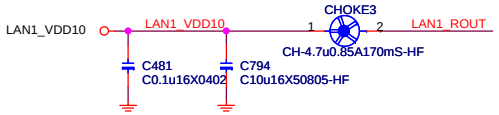
3.3v Power on rise time : 1~100ms.





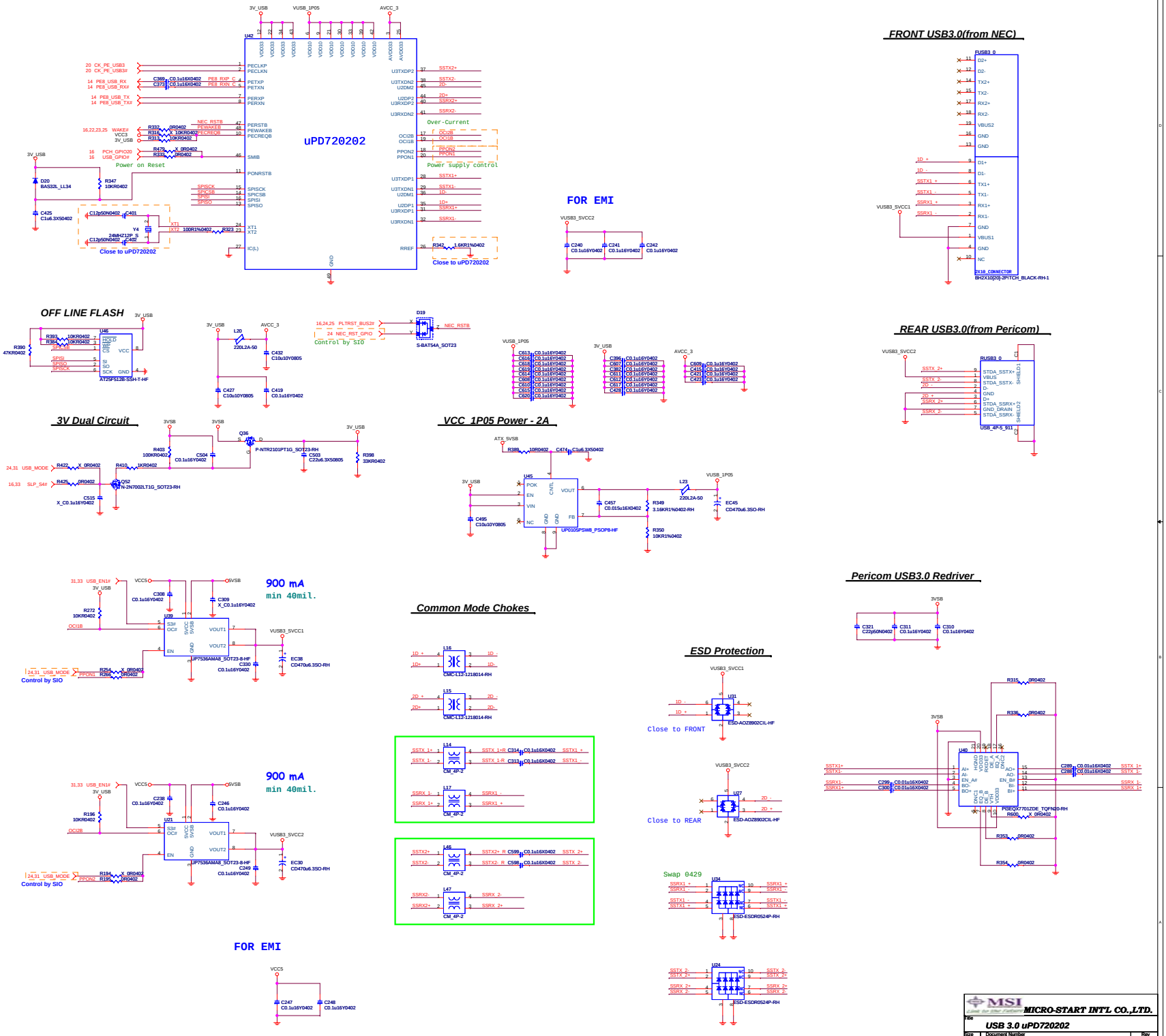






MICRO-START INT'L CO.,LTD.

Title	LAN1-RTL8111E	
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 25 of 45	


uPD720202
Over-Current
Power supply control
Power on Reset
Close to uPD720202
FOR EMI
FRONT USB3.0(from NEC)
OFF LINE FLASH
REAR USB3.0(from Pericom)
3V Dual Circuit
VCC_1P05 Power - 2A
900 mA
min 40mil.
Control by SIO
Common Mode Chokes
ESD Protection
Close to FRONT
Close to REAR
Swap 0429
Pericom USB3.0 Redriver
FOR EMI
MICRO-START INT'L CO.,LTD.
USB 3.0 uPD720202
MS-7712
1.0
Wednesday, November 09, 2011

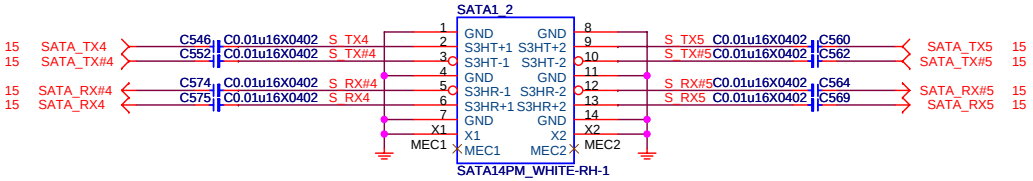
MSI Link to the Future MICRO-START INT'L CO.,LTD.

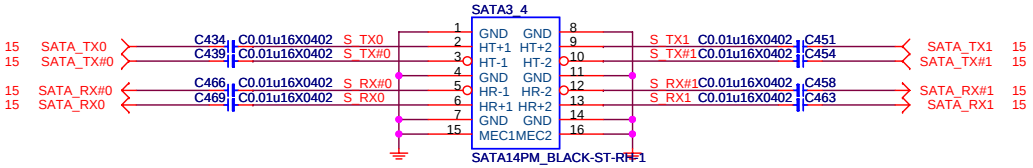
Title: N/A

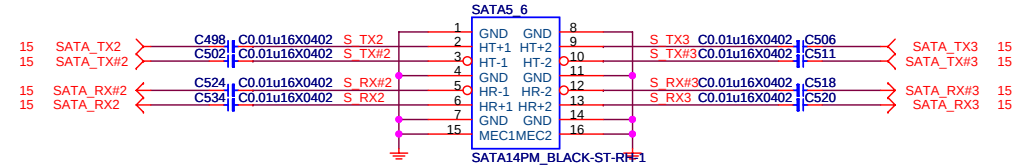
Size | Document Number: MS-7712 | Rev: 1.0

Date: Wednesday, November 09, 2011 Sheet 27 of 45

SATA Connector







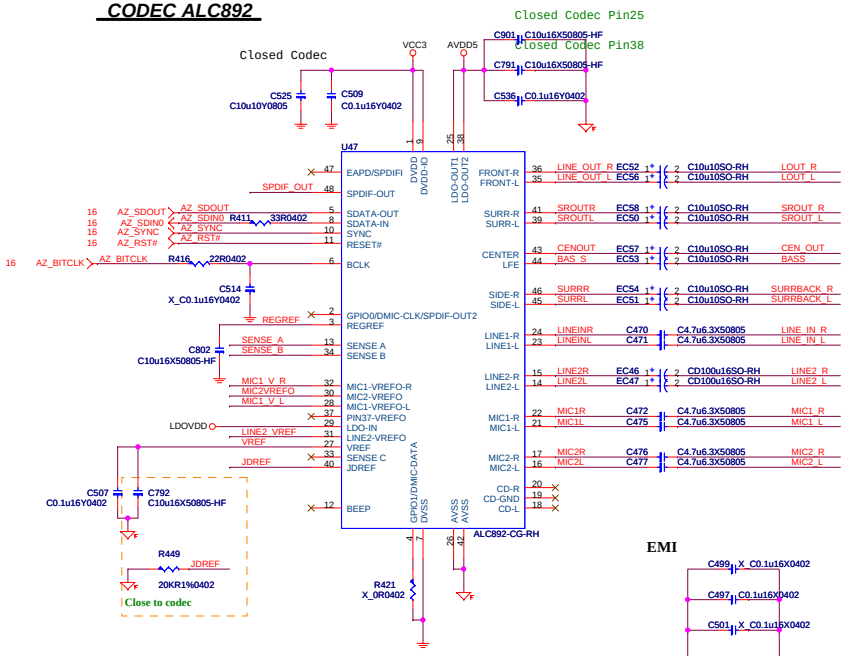
MICRO-START INT'L CO.,LTD.

Title: SATA Port

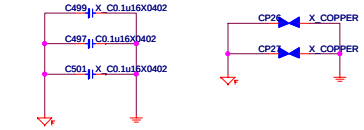
Size	Document Number	Rev
	MS-7712	1.0

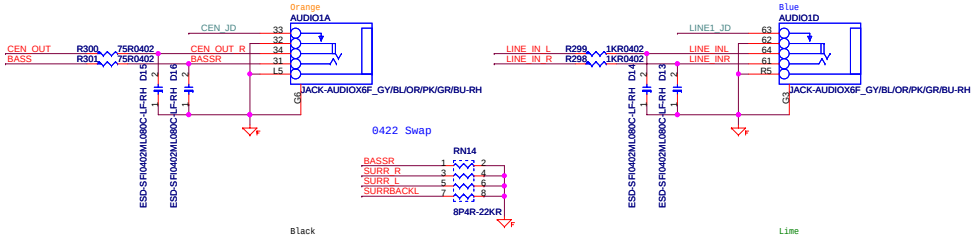
Date: Wednesday, November 09, 2011 Sheet 28 of 45

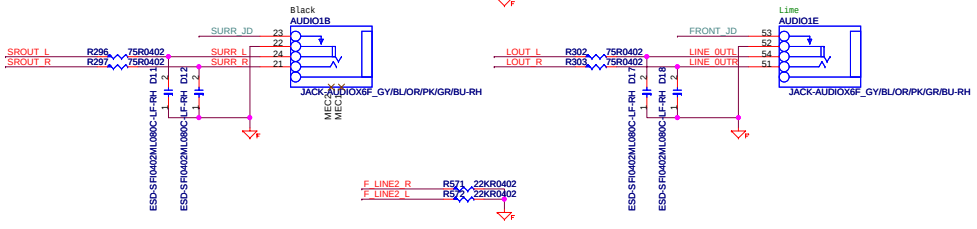
CODEC ALC892

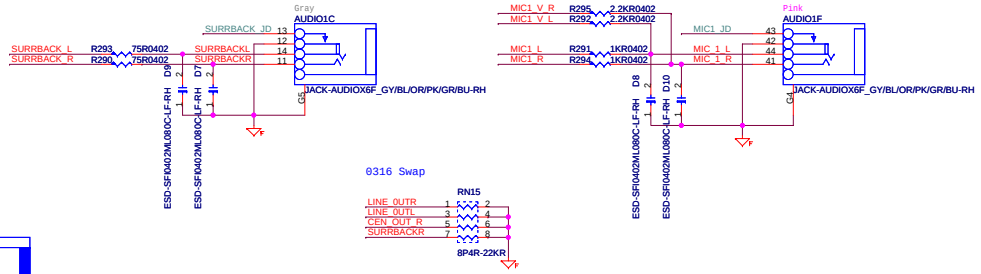


EMI

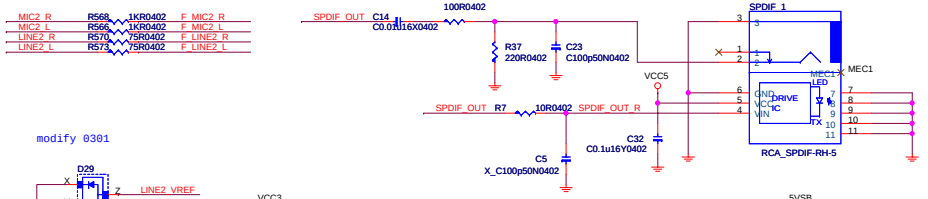


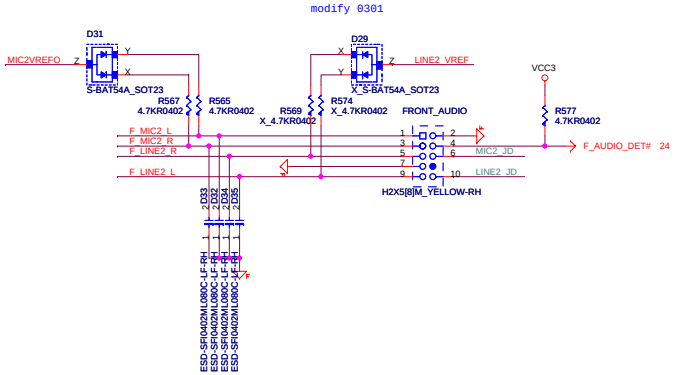


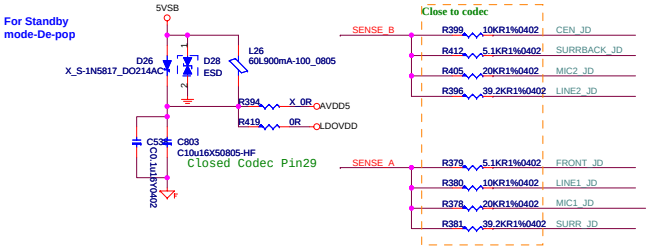


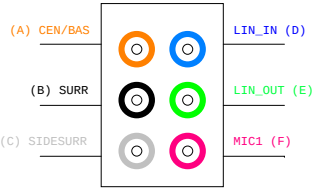


SPDIF OUT OPT+RCA









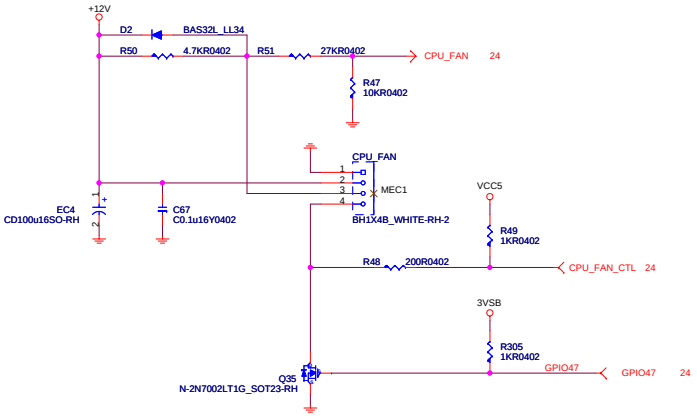
MSI MICRO-START INT'L CO.,LTD.

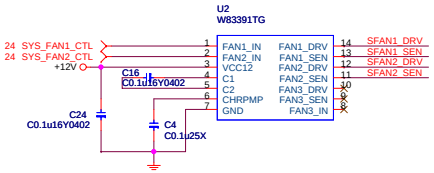
Title: Azalia Codec - ALC892

Size	Document Number	Rev
Custom	MS-7712	1.0

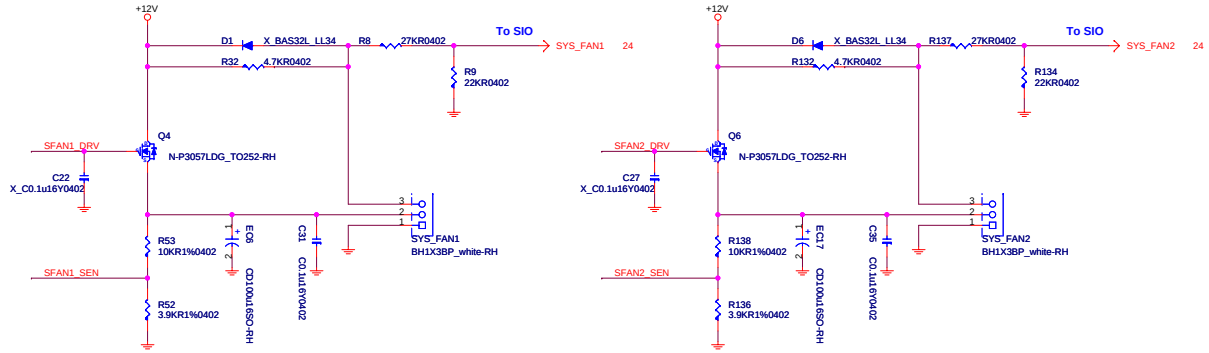
Date: Wednesday, November 09, 2011 Sheet 29 of 45

CPU Fan





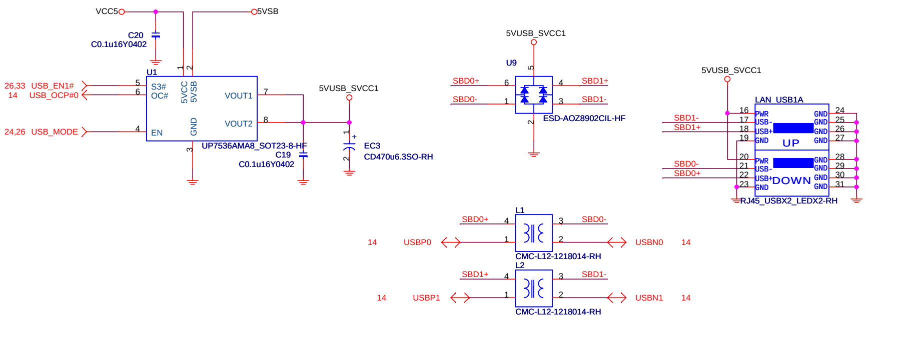
System Fan



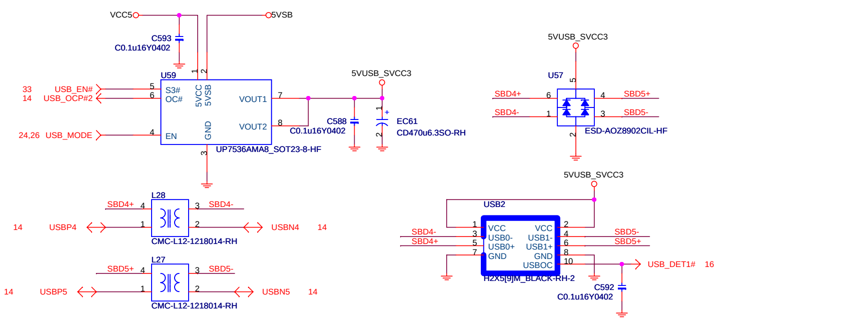
MSI Link to the Future **MICRO-START INTL CO.,LTD.**

Title	FAN PORT	
Size	Document Number MS-7712	Rev 1.0
Date: Wednesday, November 09, 2011	Sheet 30 of 45	

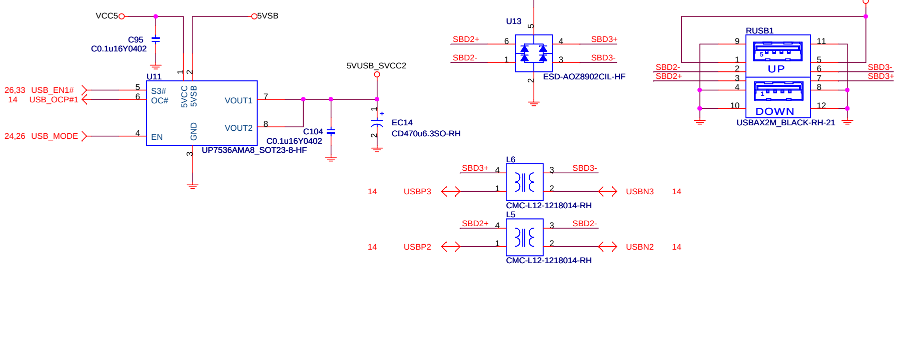
Rear USB Connnector For USB Port 0 / 1



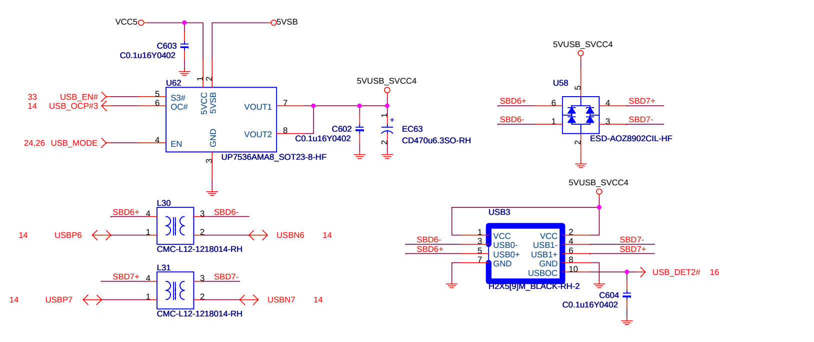
Front Panel USB Connnector For USB Port 4 / 5



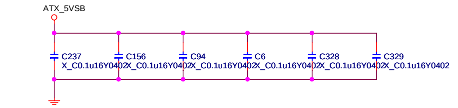
Rear USB Connnector For USB Port 2 / 3

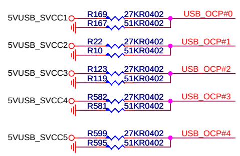


Front Panel USB Connnector For USB Port 6 / 7

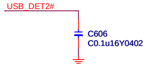


FOR EMI

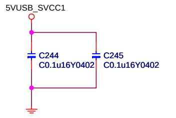




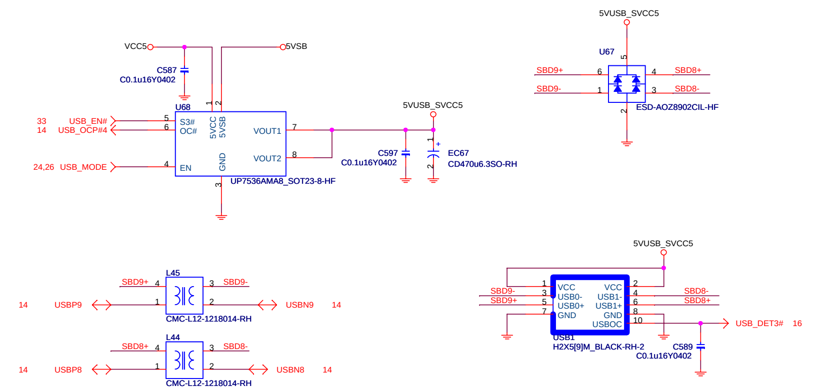
FOR EMI



FOR EMI



Front Panel USB Connnector For USB Port 8 / 9



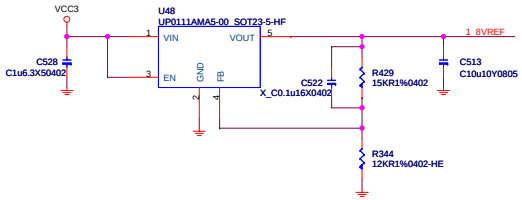
MSI MICRO-START INT'L CO.,LTD.

Title: Front / Rear USB Connectors

Size	Document Number	Rev
	MS-7712	1.0

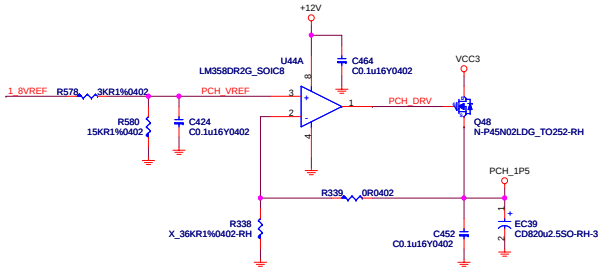
Date: Wednesday, November 09, 2011 Sheet 31 of 45

1.8V Reference Power



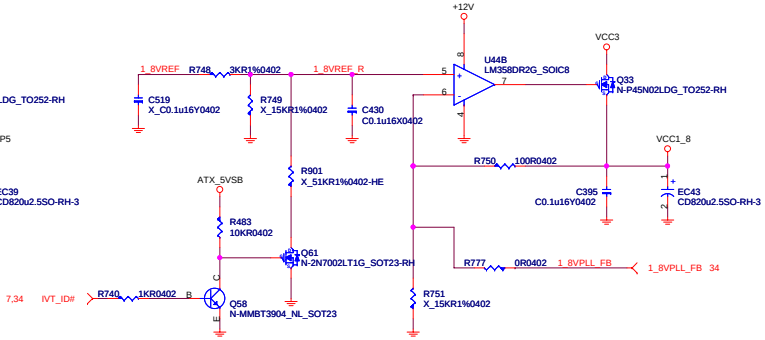
PBG 1.5V Power Rail

Linear 1.5V, 0.512A Imax



VCCPLL Power Rail

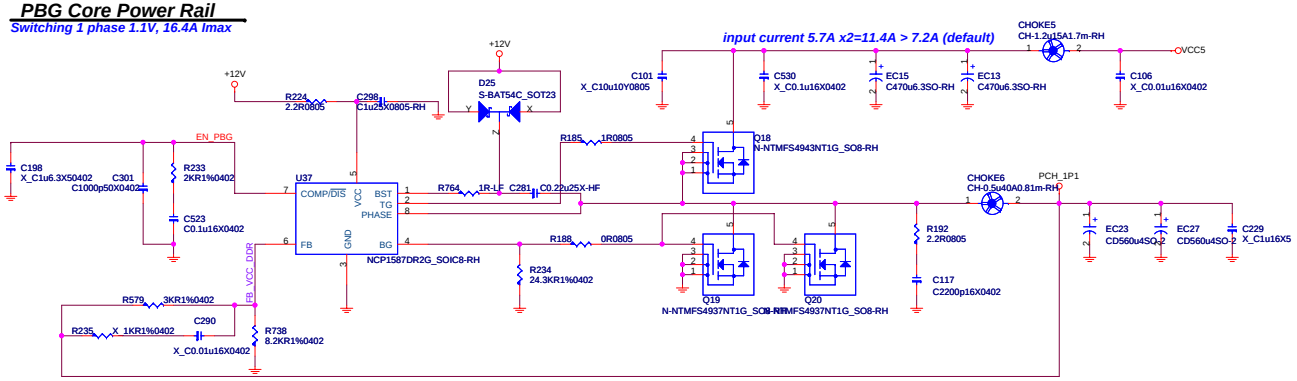
Linear 1.8V, 2A Imax



PBG Core Power Rail

Switching 1 phase 1.1V, 16.4A Imax

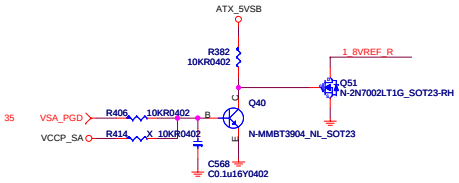
input current 5.7A x2=11.4A > 7.2A (default)

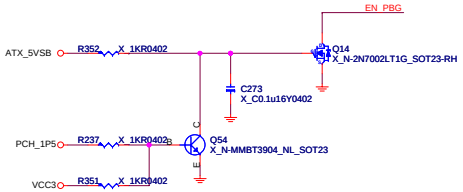


Vout = 0.8[(R738(GND)+R579)/R738]
=0.8[(8.2+3)/8.2]
=1.09268(V)

Iocth=(Iocset*Rocset)/Rdson
=(10uA*24.3K)/7.2m
=33.75A(>1.5*16.64A)

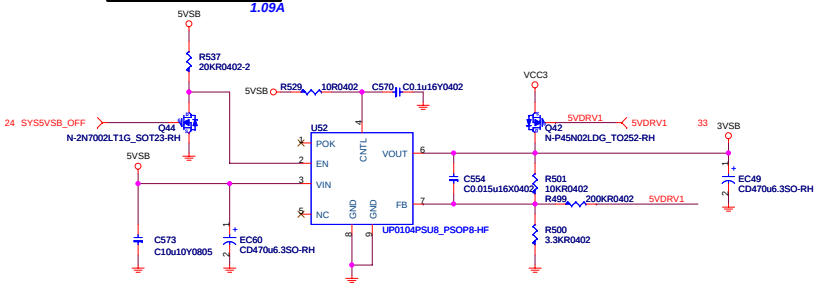
IVT_ID#		VOLTAGE
H	SNB-E	1.8V(normal)
L	IVB-E	1.7V





3VSB Power Rail

1.09A



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

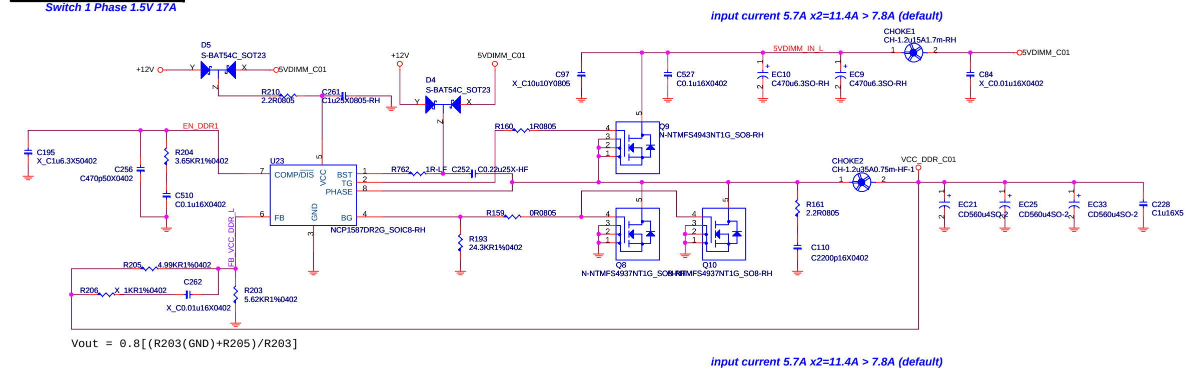
Title: PBG Core Power

Size	Document Number	Rev
	MS-7712	1.0

Date: Wednesday, November 09, 2011 Sheet 32 of 45

DDR III 1.5V POWER
Switch 1 Phase 1.5V 17A

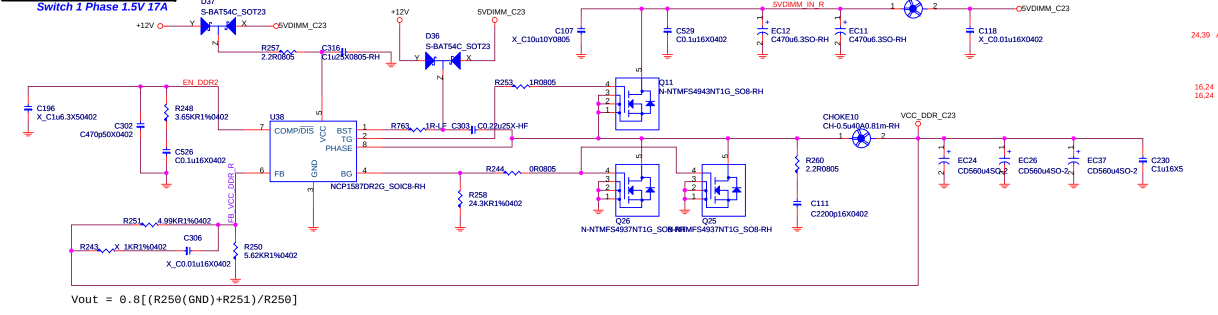
input current 5.7A x2=11.4A > 7.8A (default)



Vout = 0.8[(R203(GND)+R205)/R203]

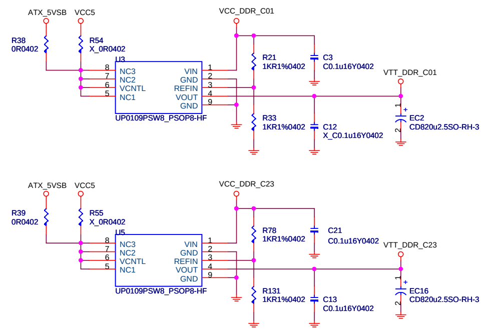
DDR III 1.5V POWER
Switch 1 Phase 1.5V 17A

input current 5.7A x2=11.4A > 7.8A (default)

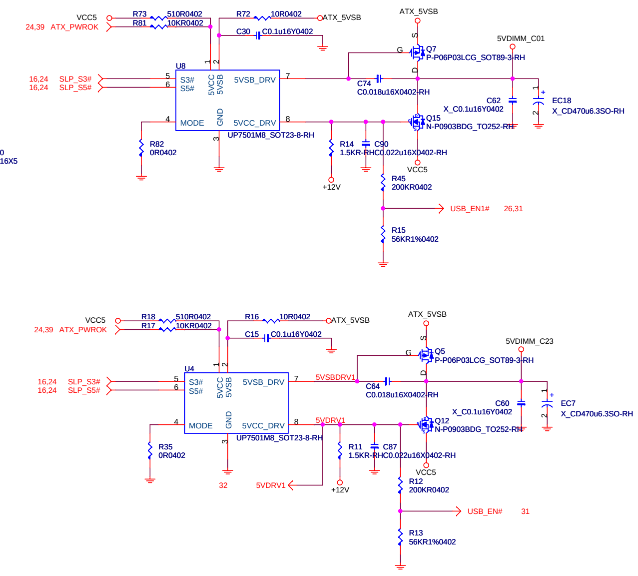


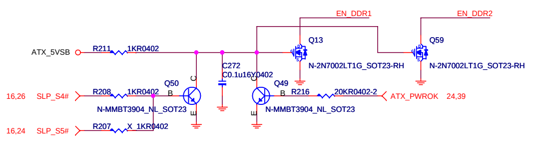
Vout = 0.8[(R250(GND)+R251)/R250]

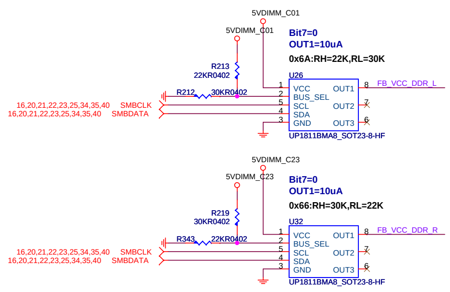
DDRIII Termination Power
Linear, 0.75V - 1A



DDRIII Regulator Power Source







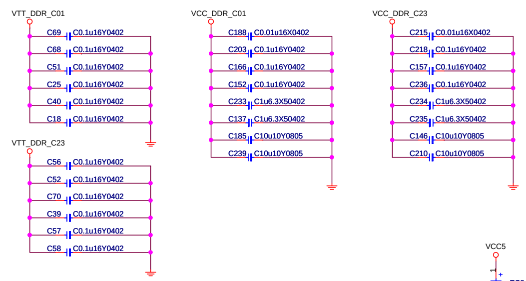
UPI VOLTAGE CONSOLE

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%

UPI VOLTAGE CONSOLE

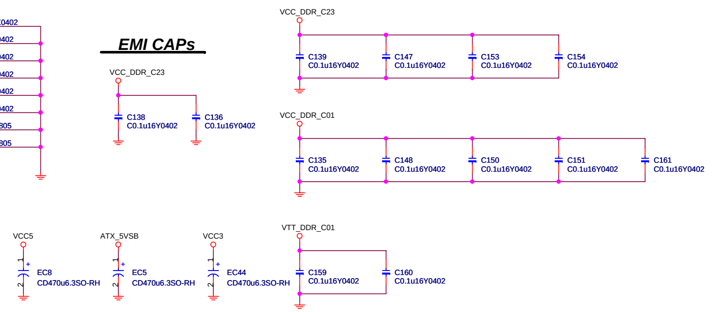
ADDRESS	0x2A	0X28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%

DDRIII I/O Power Decoupling Caps.



EMI CAPs

FOR EMI

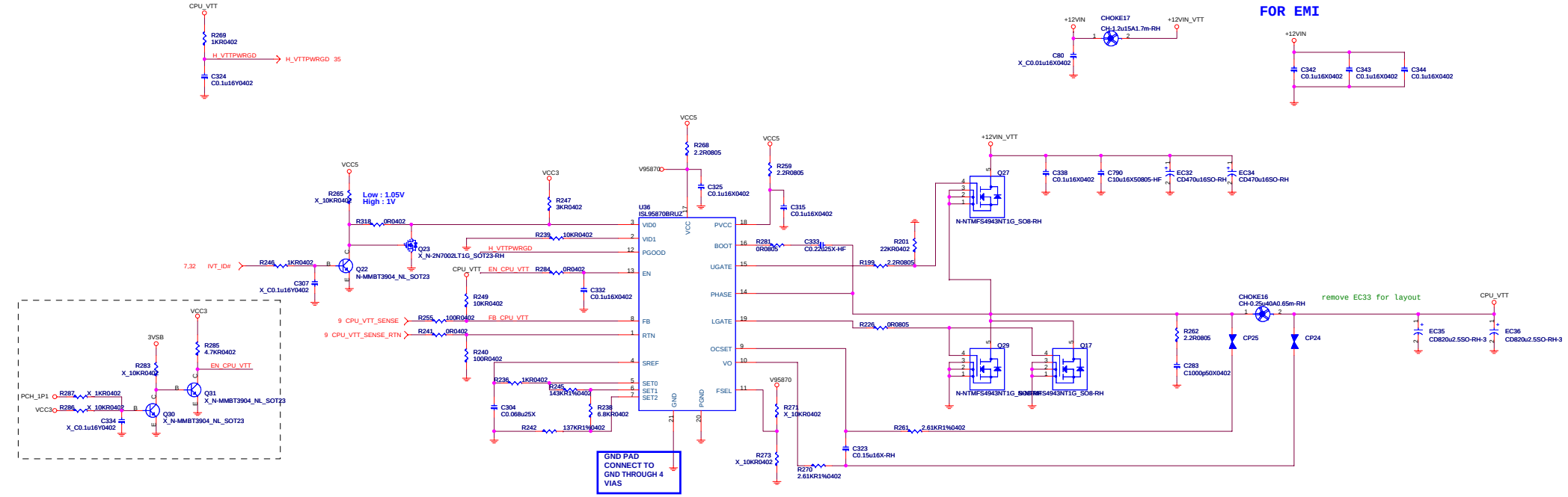


MICRO-START INT'L CO.,LTD.

Title	DDR Power	
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 33 of 45	

CPU VTT Power Rail

Switch 1 Phase 1.05V 22A

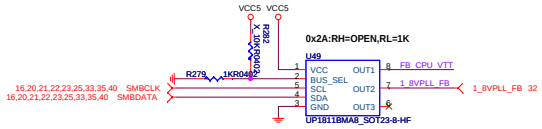


1. Rocest = Iout*DCR/Iocset ; Iocset = 10uA

   If DCR = 1m ; Iout = 20A, Rocset = 20A*1m/10uA --> Rocset = 2K

2. Csen = L/Rocset*DCR

   If DCR = 1m ; L = 1U, Csen = 1U/2K*1m --> Csen = 0.5U



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%

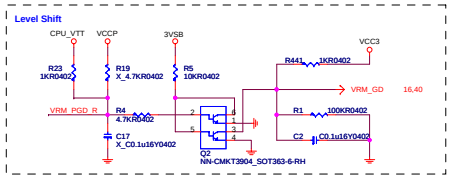
MICRO-START INT'L CO.,LTD.

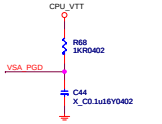
Title: CPU VTT VR

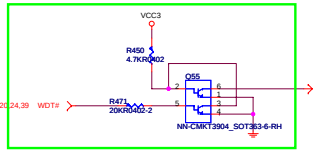
Size	Document Number	Rev
	MS-7712	1.0

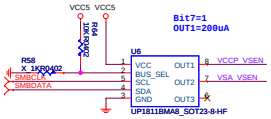
Date: Wednesday, November 09, 2011 Sheet 34 of 45

Voltage Regular Module (VRD12)







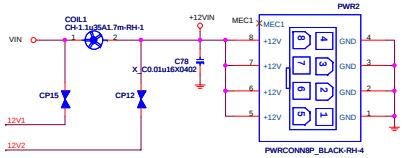


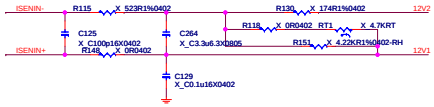
UPI VOLTAGE CONSOLE

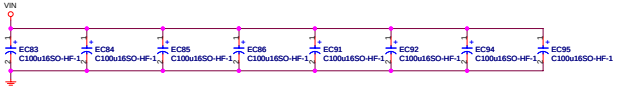
0x20:RH=10K,RL=open;Bit7=1

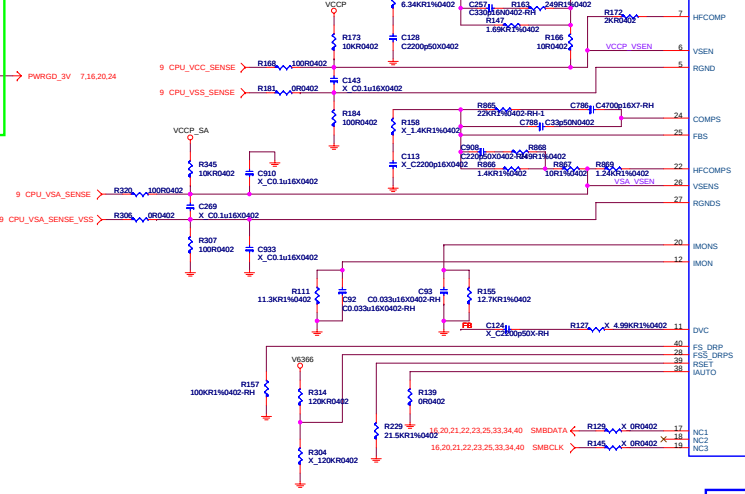
ADDRESS	0x2A	0x28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%

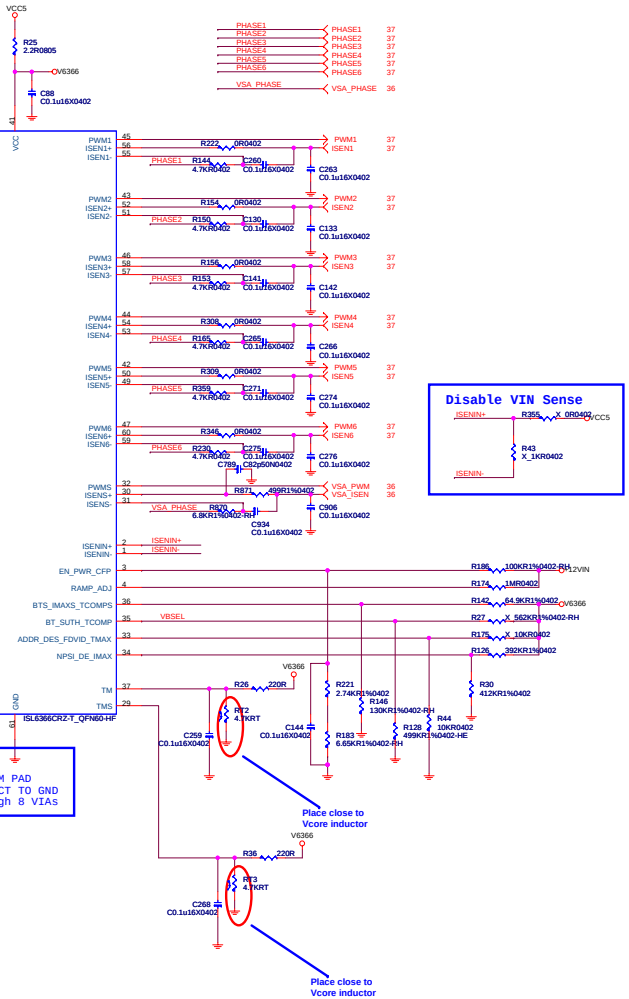
CPU Core Power +12V Input





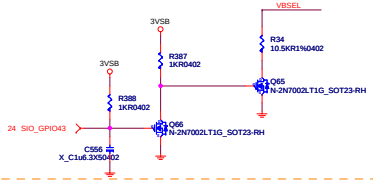




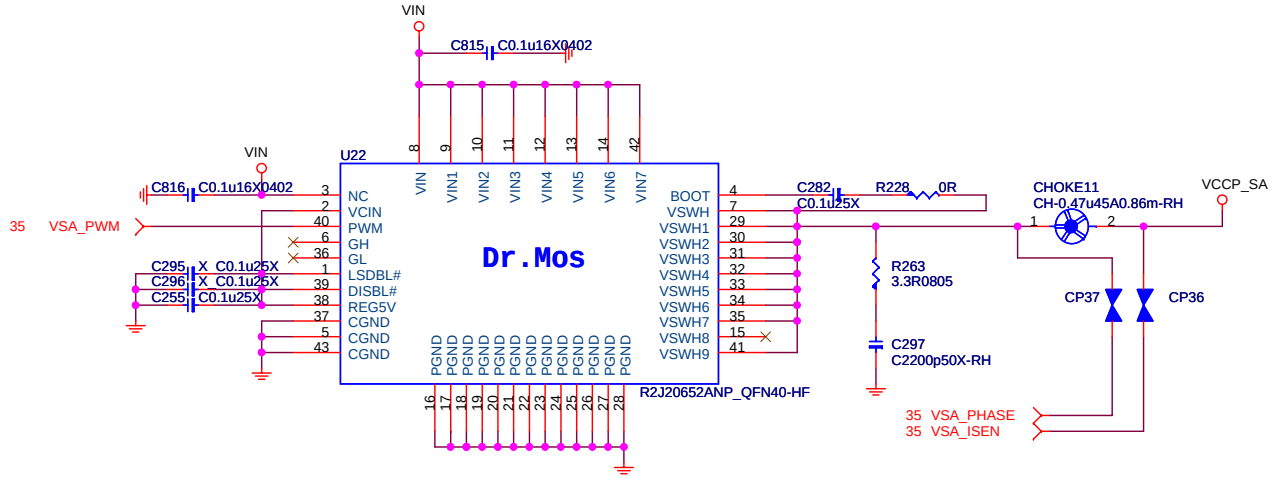


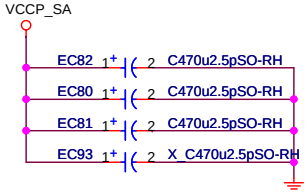
Vboot Select Table

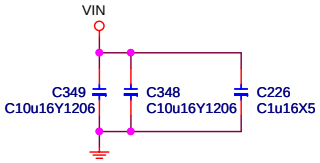
	GPIO 43	Resistor	Vboot
Normal & Turbo	H	Floating	0V
BCLK OC	L	499//10.5 =10 Kohm	1V



MSI	MICRO-START INT'L CO.,LTD.		
Title	VRM12 ISL6366		
Size	Document Number MS-7712		Rev 1.0
Date: Wednesday, November 09, 2011	Sheet 35 of 45		





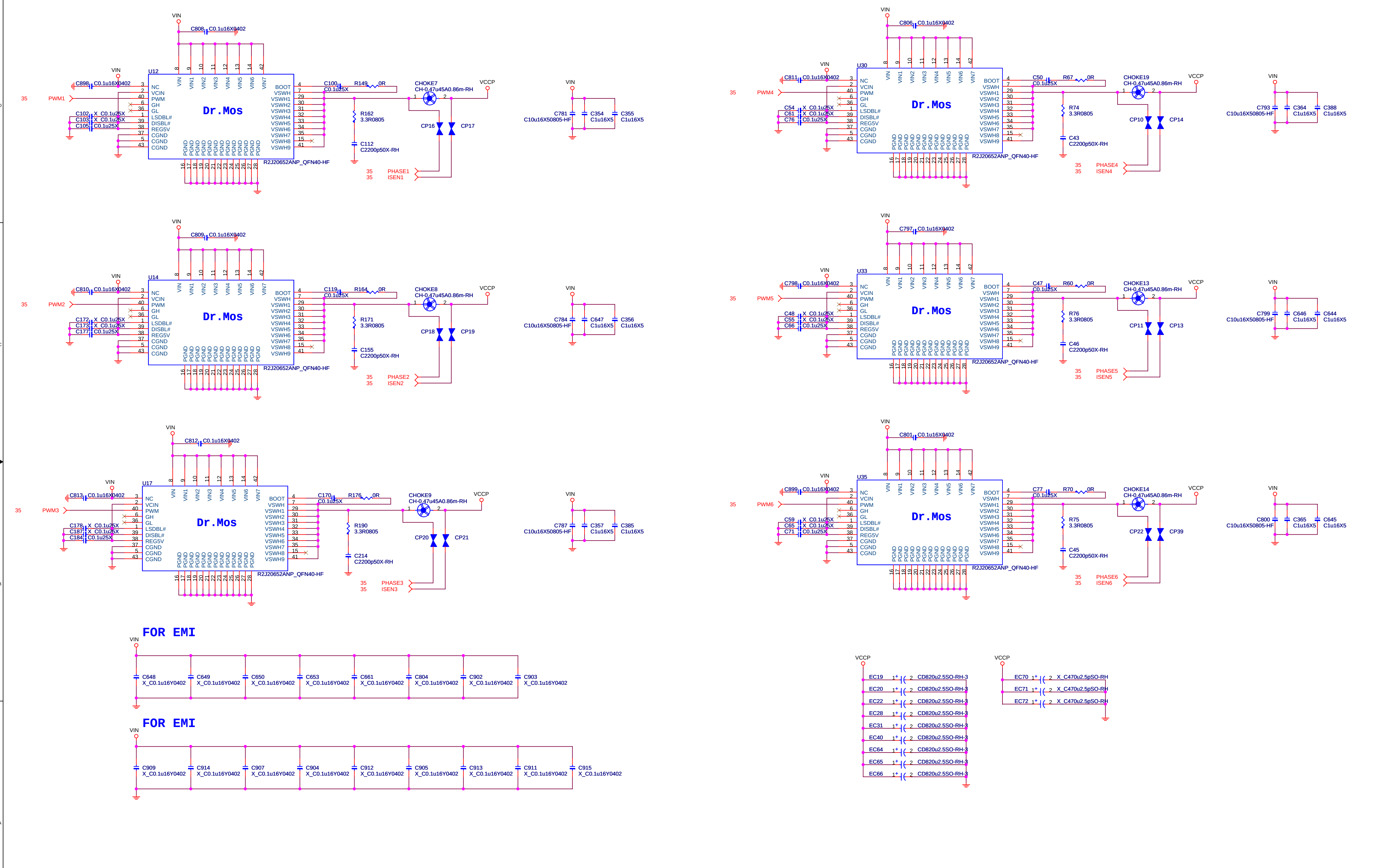


MICRO-START INT'L CO.,LTD.

Title: PHASE EXTENDER

Size	Document Number	Rev
	MS-7712	1.0

Date: Wednesday, November 09, 2011 Sheet 36 of 45



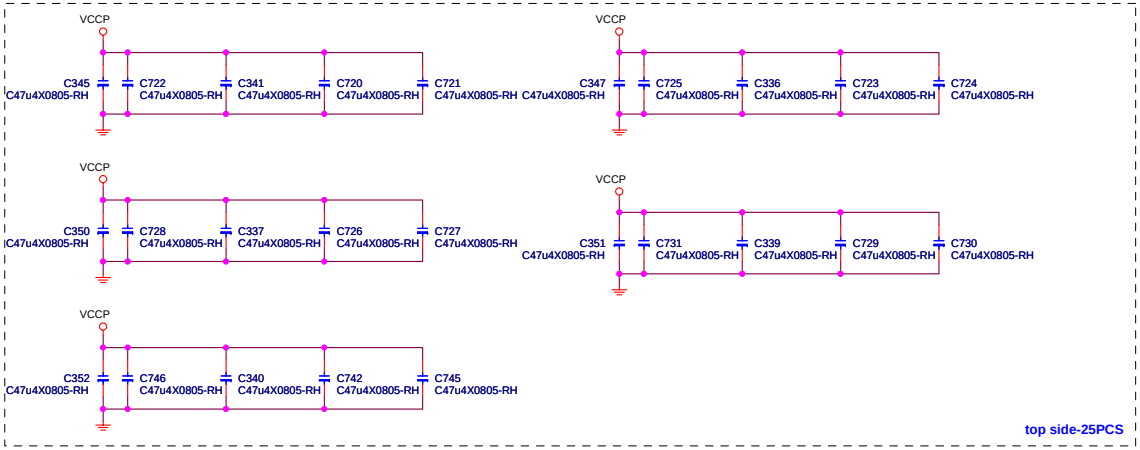
MICRO-START INT'L CO.,LTD.

Title: VCCP POWER

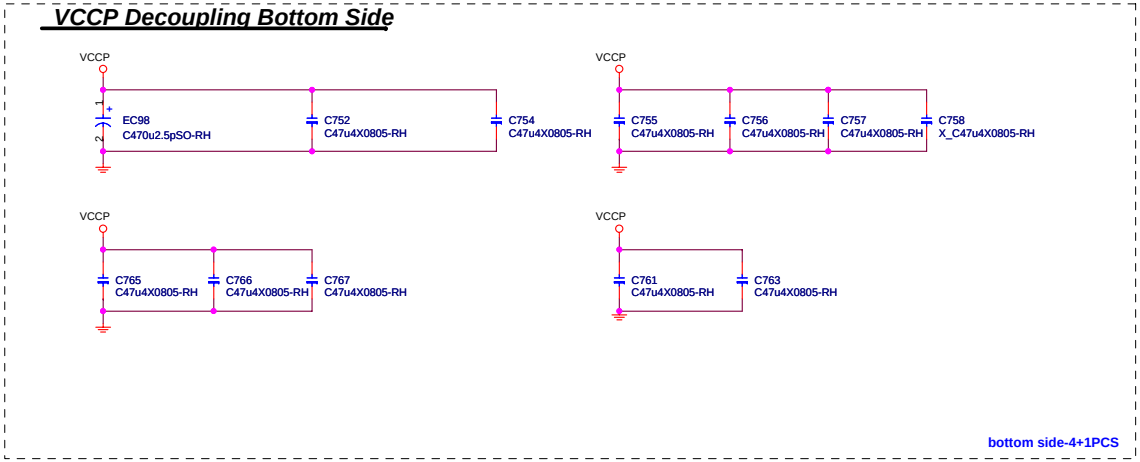
Size	Document Number	Rev
	MS-7712	1.0

Date: Wednesday, November 09, 2011 Sheet 37 of 45

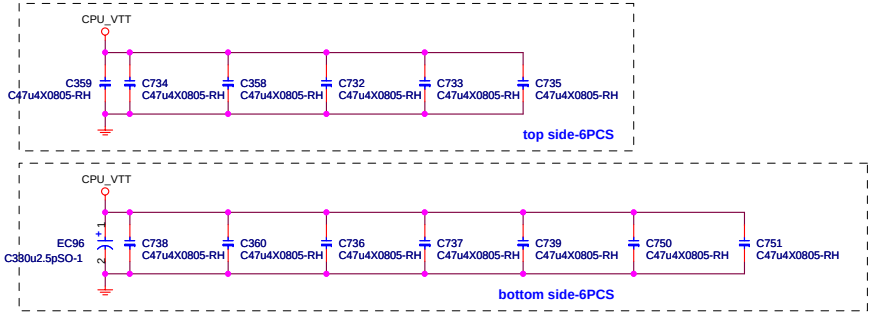
VCCP Decoupling



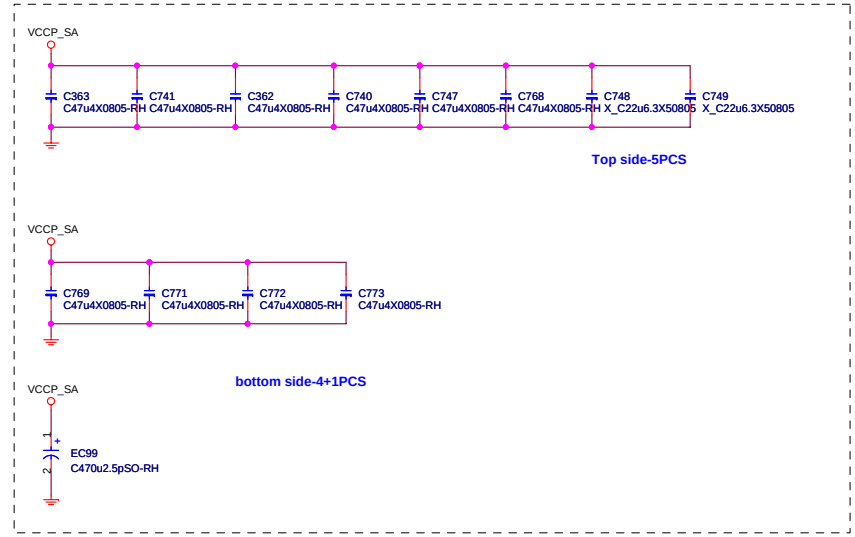
VCCP Decoupling Bottom Side



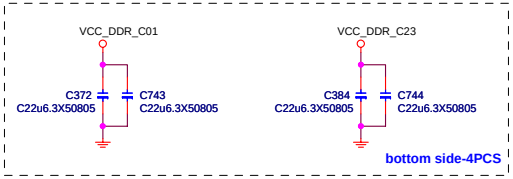
CPU VTT Decoupling



CPU VSA Decoupling



CPU VCC DDR Decoupling

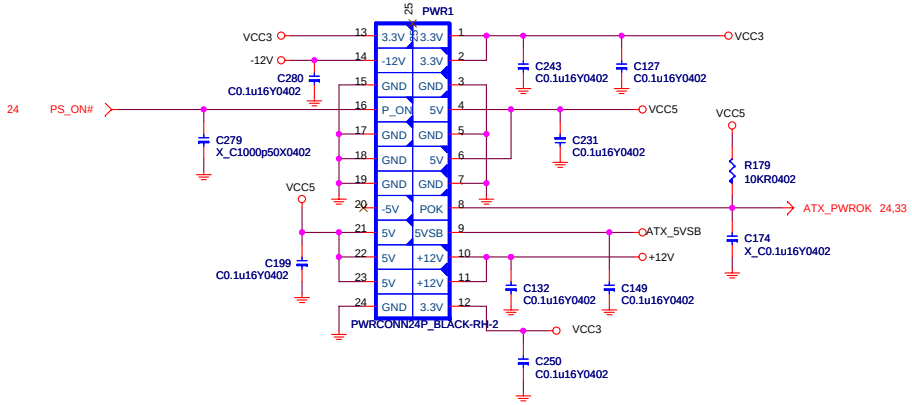


MICRO-START INT'L CO.,LTD.

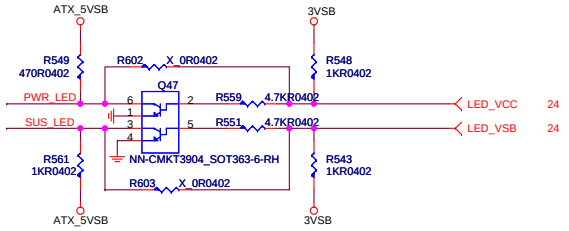
Title	VCCP & VSA POWER	
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 38 of 45	

ATX Power Connector / Front Panel / LED

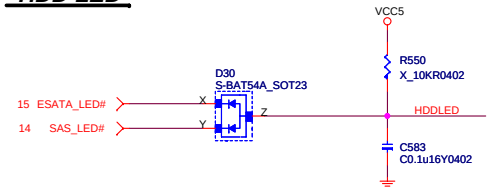
24 Pin ATX Power Connector



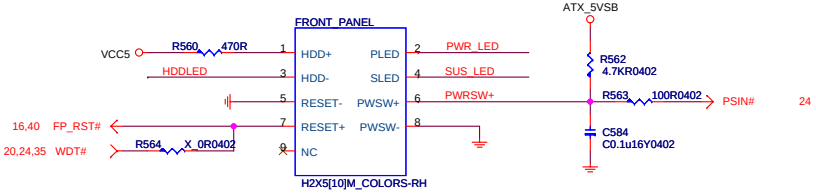
Power LED



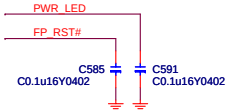
HDD LED



Front Panel

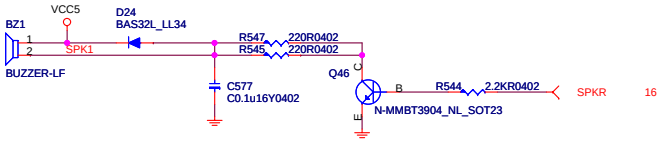


For EMI
(close pin header)



FOR EMI

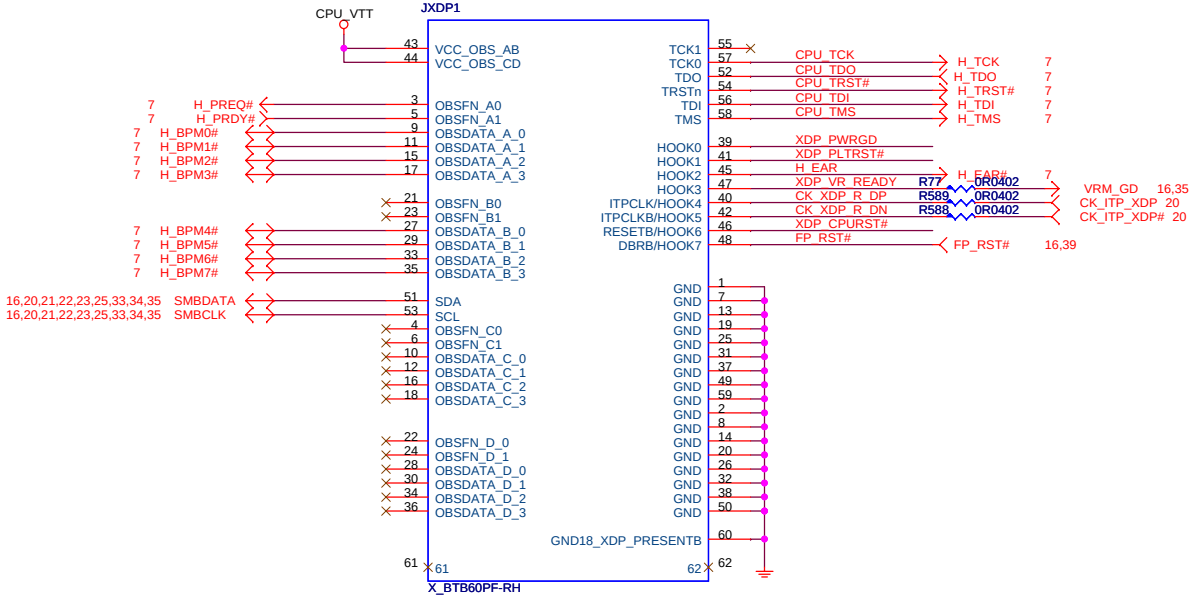
Buzzer Circuit

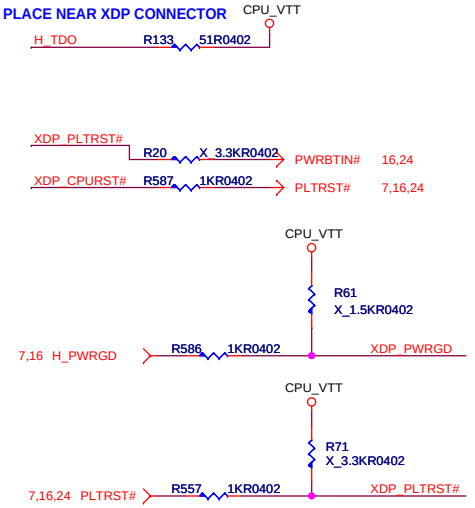


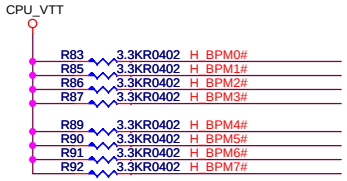
MICRO-START INT'L CO.,LTD.

Title: ATX Connector / Front Panel / LED		
Size	Document Number: MS-7712	Rev: 1.0
Date: Wednesday, November 09, 2011	Sheet 39 of 45	

CPU XDP PORT



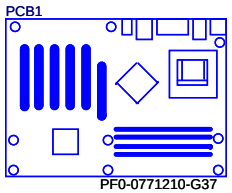




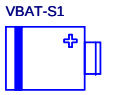
MICRO-START INT'L CO.,LTD.

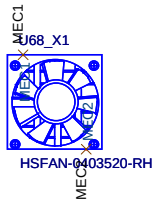
Title	CPU/PCH XDP	
Size	Document Number MS-7712	Rev 1.0
Date: Wednesday, November 09, 2011	Sheet 40 of 45	

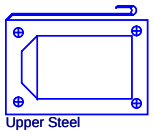
Manual Parts

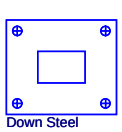


精成PF0-0771210-G37

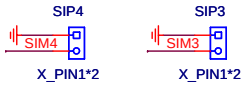


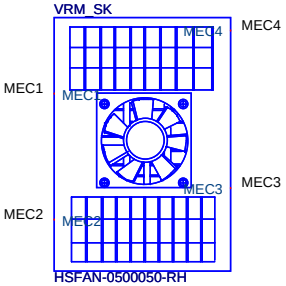






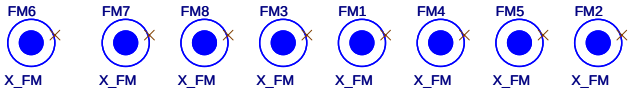
Simulation





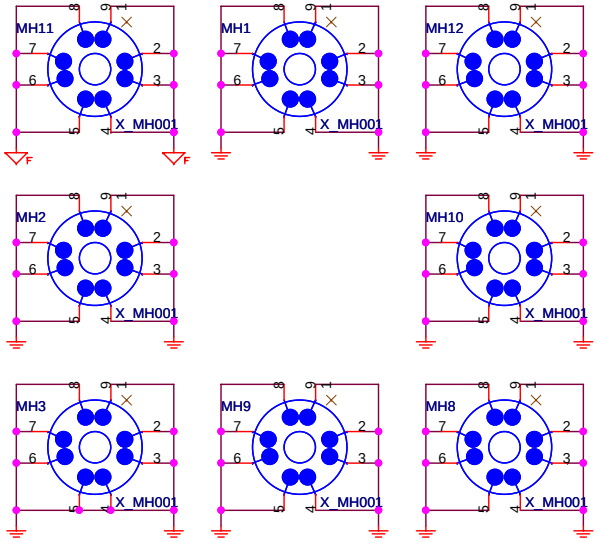
Optics Orientation Holes

Optical Fiducial Marks-120



PCB Mounting Holes

Mounting Holes



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

Title: **Manual Parts & Option Parts**		
Size	Document Number: **MS-7712**	Rev: **1.0**
Date: Wednesday, November 09, 2011	Sheet 41 of 45	