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 :

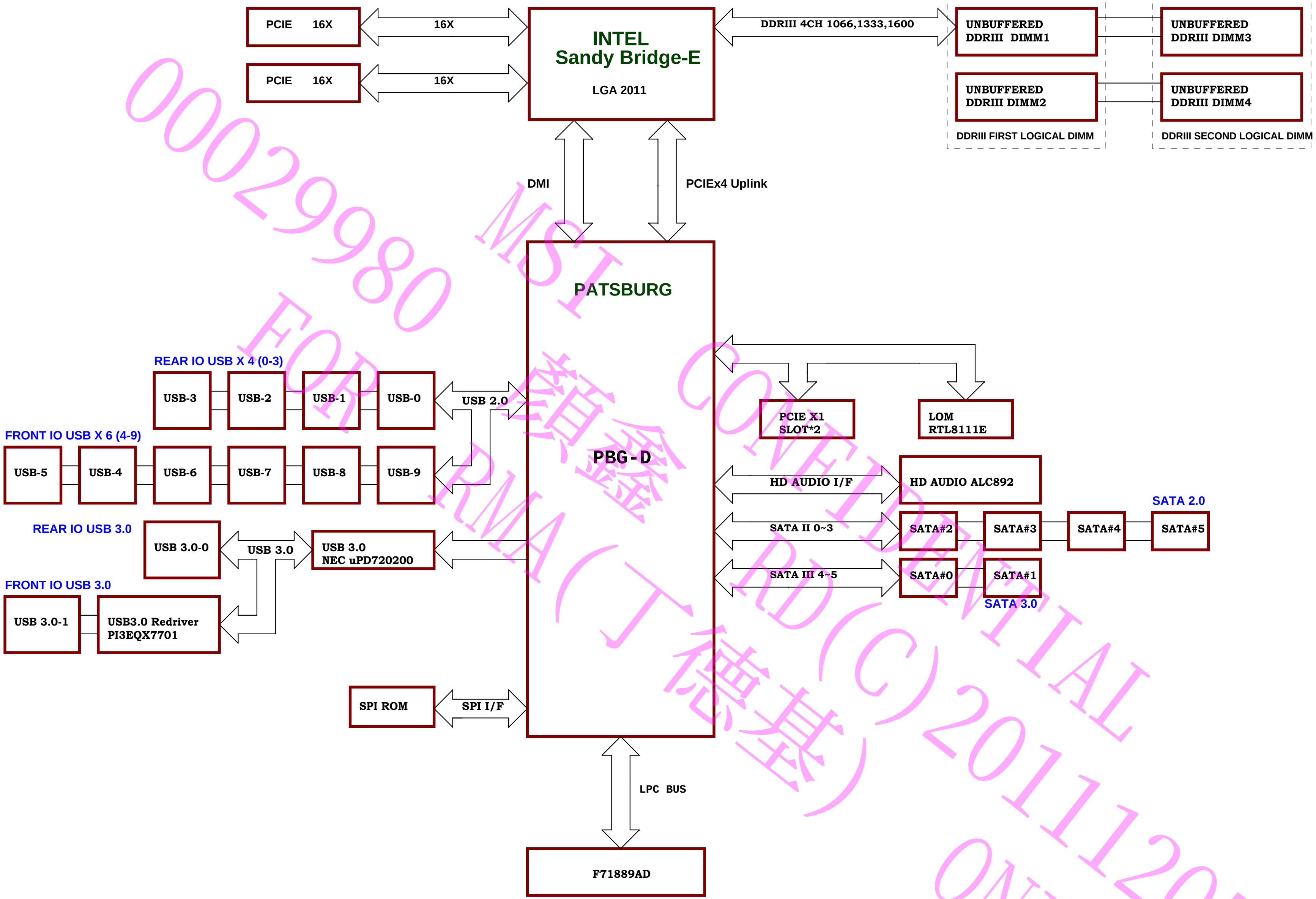
4 Channel DDR III * 4 (Max 16GB)

Expansion Slot :

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

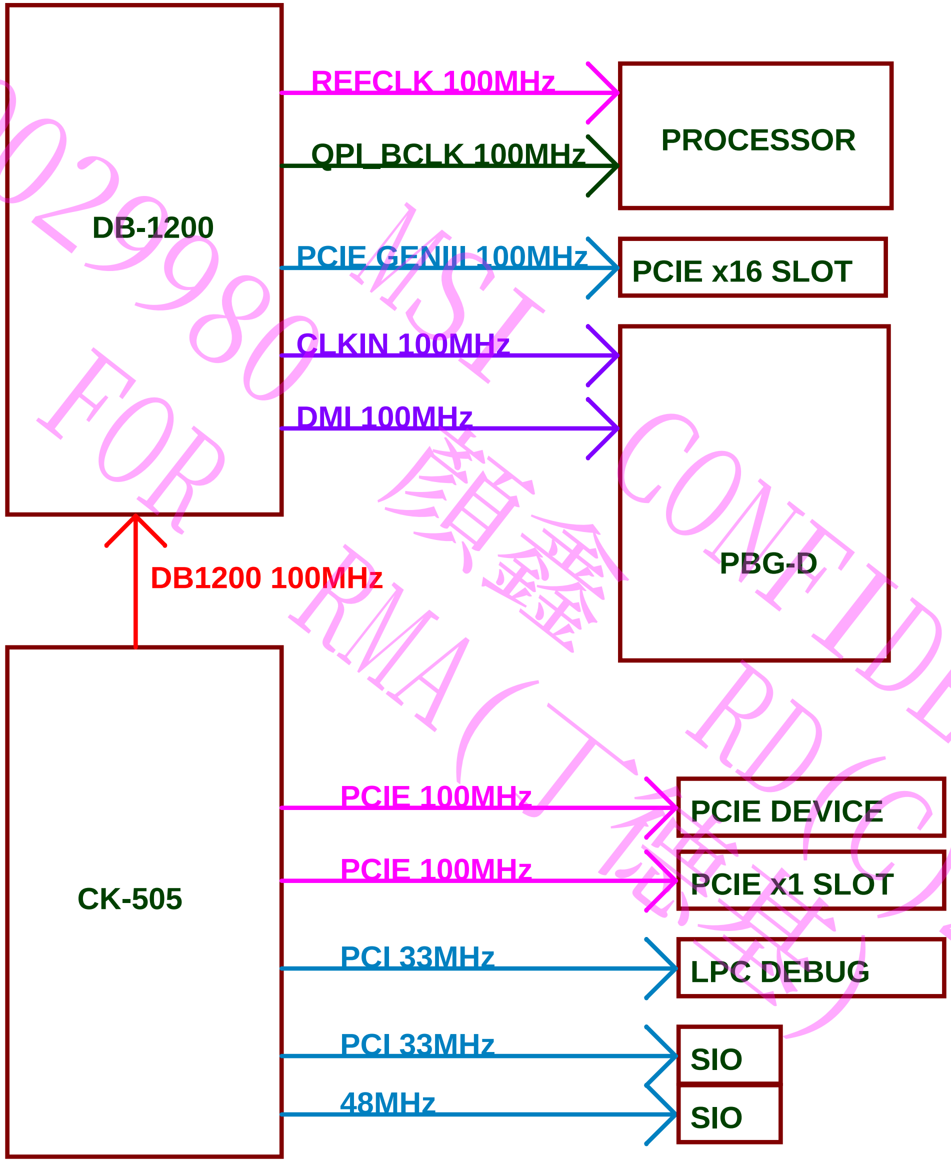
MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title	Cover Sheet	
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 1 of 45	

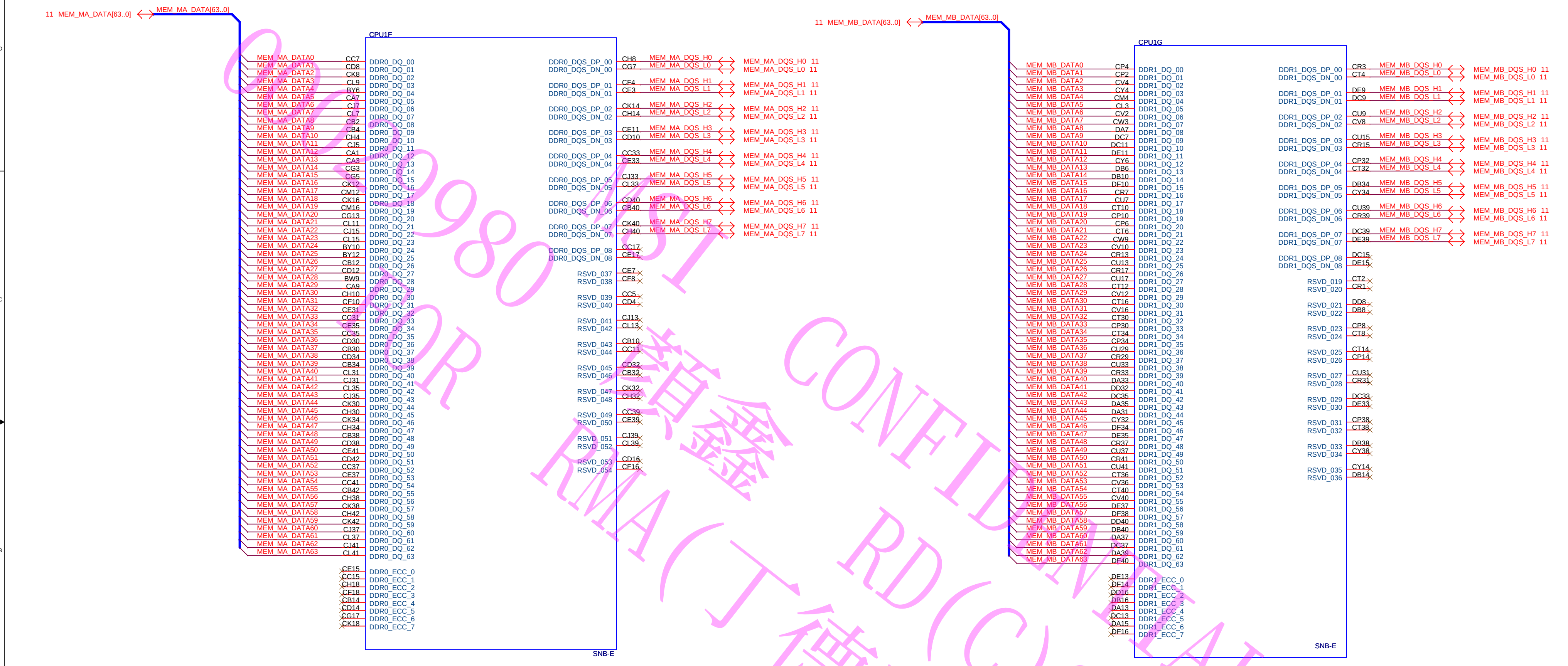


MICRO-START INT'L CO.,LTD.

Title	Block Diagram
Size / Document Number	MS-7712
Rev	1.0
Date:	Tuesday, September 27, 2011
Sheet	2 of 45



MICRO-START INT'L CO.,LTD.			
Title: Clock Distribution			
Size	Document Number: MS-7712		Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 3	of 45	

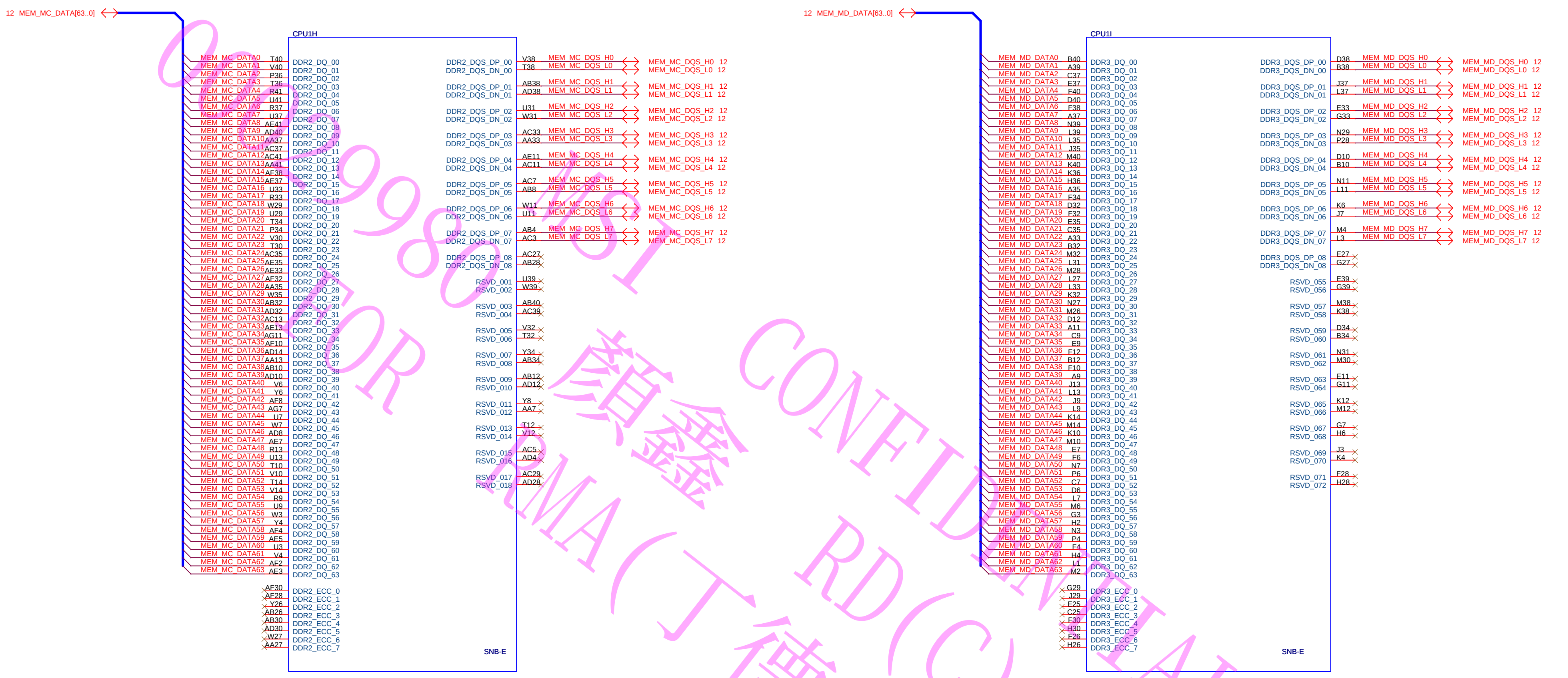


MSI MICRO-START INT'L CO.,LTD.

Title: SNB-E MEMORY 1 & 2

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 4 of 45

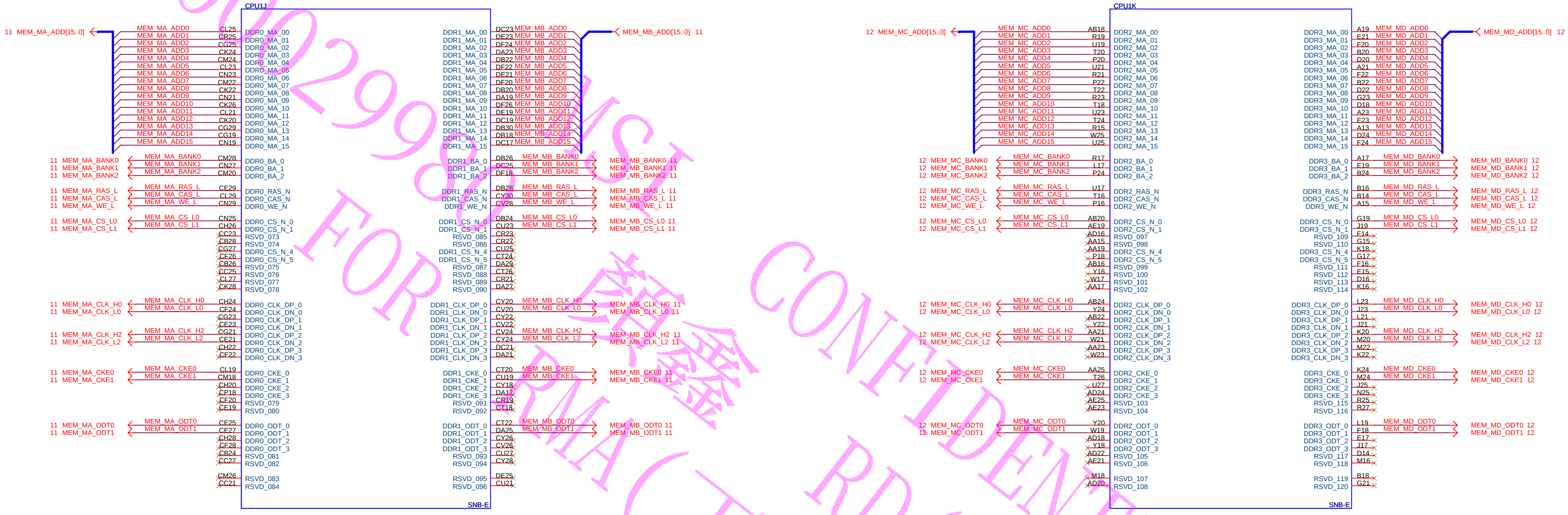


MICRO-START INT'L CO.,LTD.

Title: SNB-E MEMORY 3 & 4

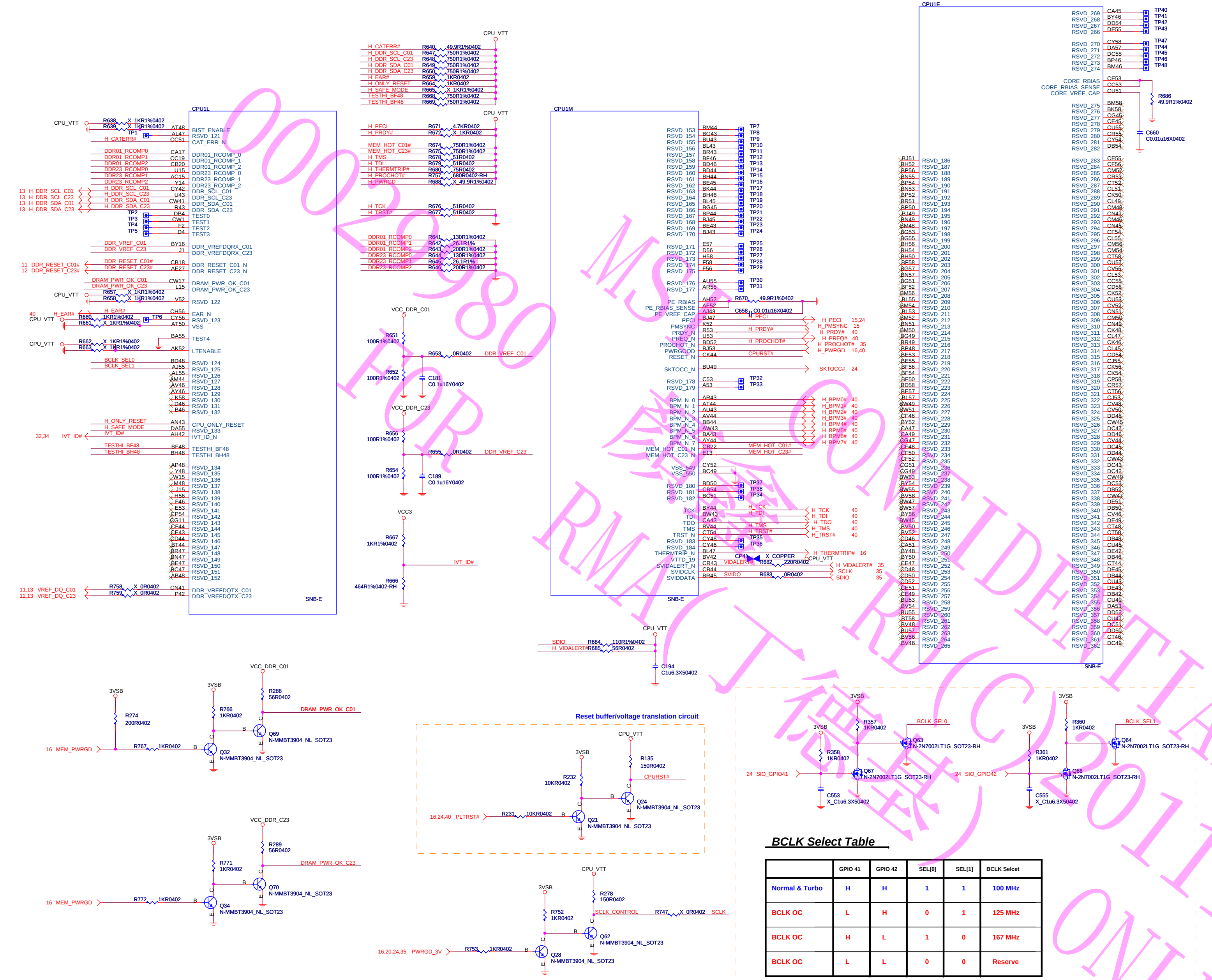
Size | Document Number: MS-7712 | Rev 1.0

Date: Tuesday, September 27, 2011 | Sheet 5 of 45



MICRO-START INT'L CO.,LTD.

Title	SNB-E MEMORY CONTROLLER	
Size	Document Number MS-7712	Rev 1.0
Date: Tuesday, September 27, 2011	Sheet 6 of 45	



BCLK Select Table

	GPIO 41	GPIO 42	SEL[0]	SEL[1]	BCLK Selcet
Normal & Turbo	H	H	1	1	100 MHz
BCLK OC	L	H	0	1	125 MHz
BCLK OC	H	L	1	0	167 MHz
BCLK OC	L	L	0	0	Reserve

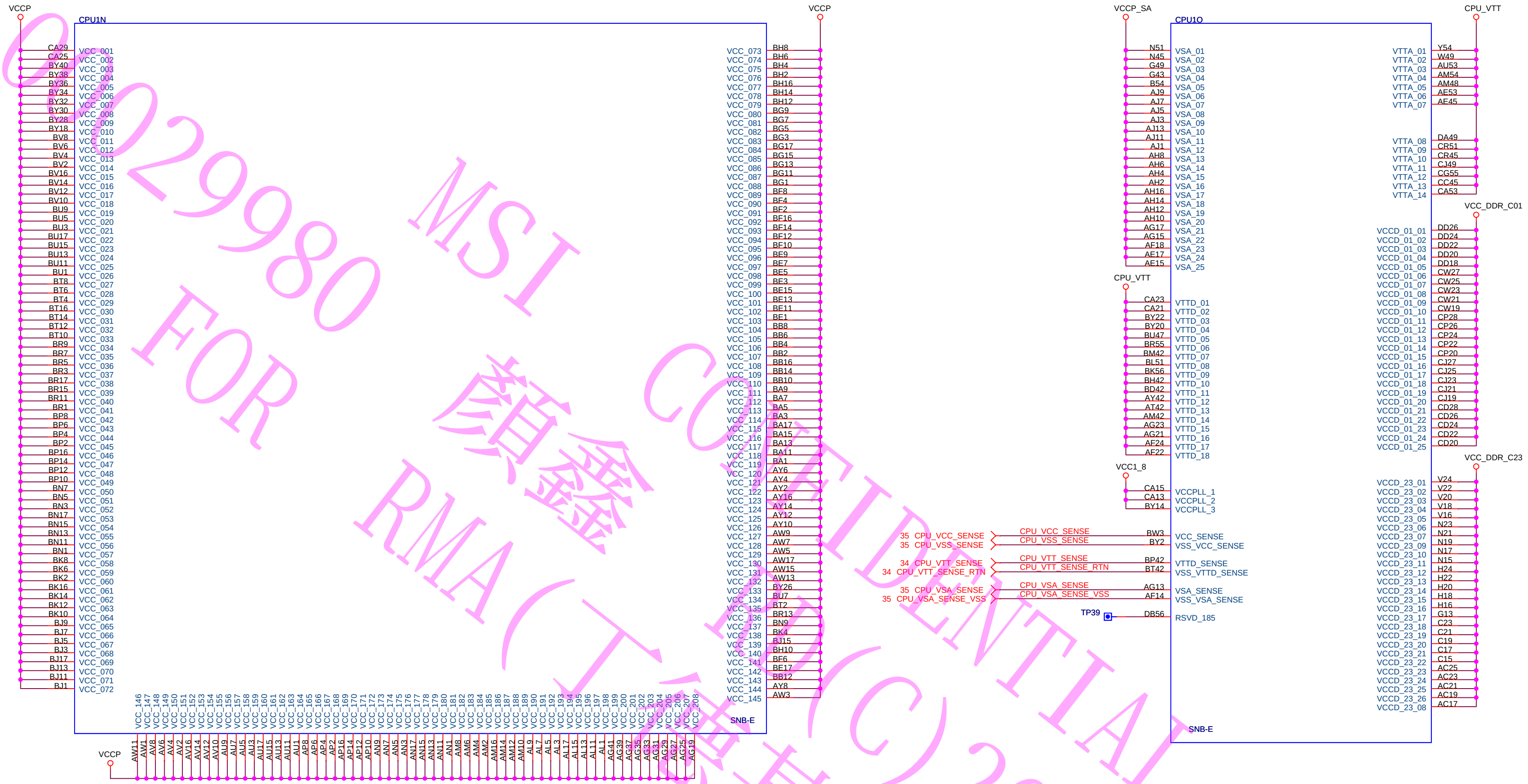
MSI MICRO-START INT'L CO.,LTD.

Title: SNB-E MISC/RESERVED

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

Date: Tuesday, September 27, 2011 | Sheet 7 of 45


CPU1B
PE2A_RX_DP_0 … PE2D_RX_DN_15
PE2A_TX_DP_0 … PE2D_TX_DN_15
EXP_A_RXP_0 … EXP_A_RXN_15
EXP_A_TXP_0 … EXP_A_TXN_15
SNB-E
CPU1C
PE3A_RX_DP_0 … PE3D_RX_DN_15
PE3A_TX_DP_0 … PE3D_TX_DN_15
EXP_B_RXP_0 … EXP_B_RXN_15
EXP_B_TXP_0 … EXP_B_TXN_15
SNB-E
CPU1A
PE1A_RX_DP_0 … PE1B_RX_DN_7
PE1A_TX_DP_0 … PE1B_TX_DN_7
EXP_C_RXP_0 … EXP_C_RXN_3
EXP_C_TXP_0 … EXP_C_TXN_3
PE1_TXP0 … PE1_TXN3
C0.22u10X50402-RH
SNB-E
CPU1D
DMI_TX_DP_0 … DMI_TX_DN_3
DMI_RX_DP_0 … DMI_RX_DN_3
C0.1u16X0402
BCLK1_DN
BCLK1_DP
BCLK0_DN
BCLK0_DP
CK_PE_REFCLK#
CK_PE_REFCLK
CK_QPI_BCLK#
CK_QPI_BCLK
SNB-E
MSI
MICRO-START INT'L CO.,LTD.
Title
SNB-E PCIE/DMI
Size
Document Number
MS-7712
Rev
1.0
Date: Tuesday, September 27, 2011
Sheet 8 of 45

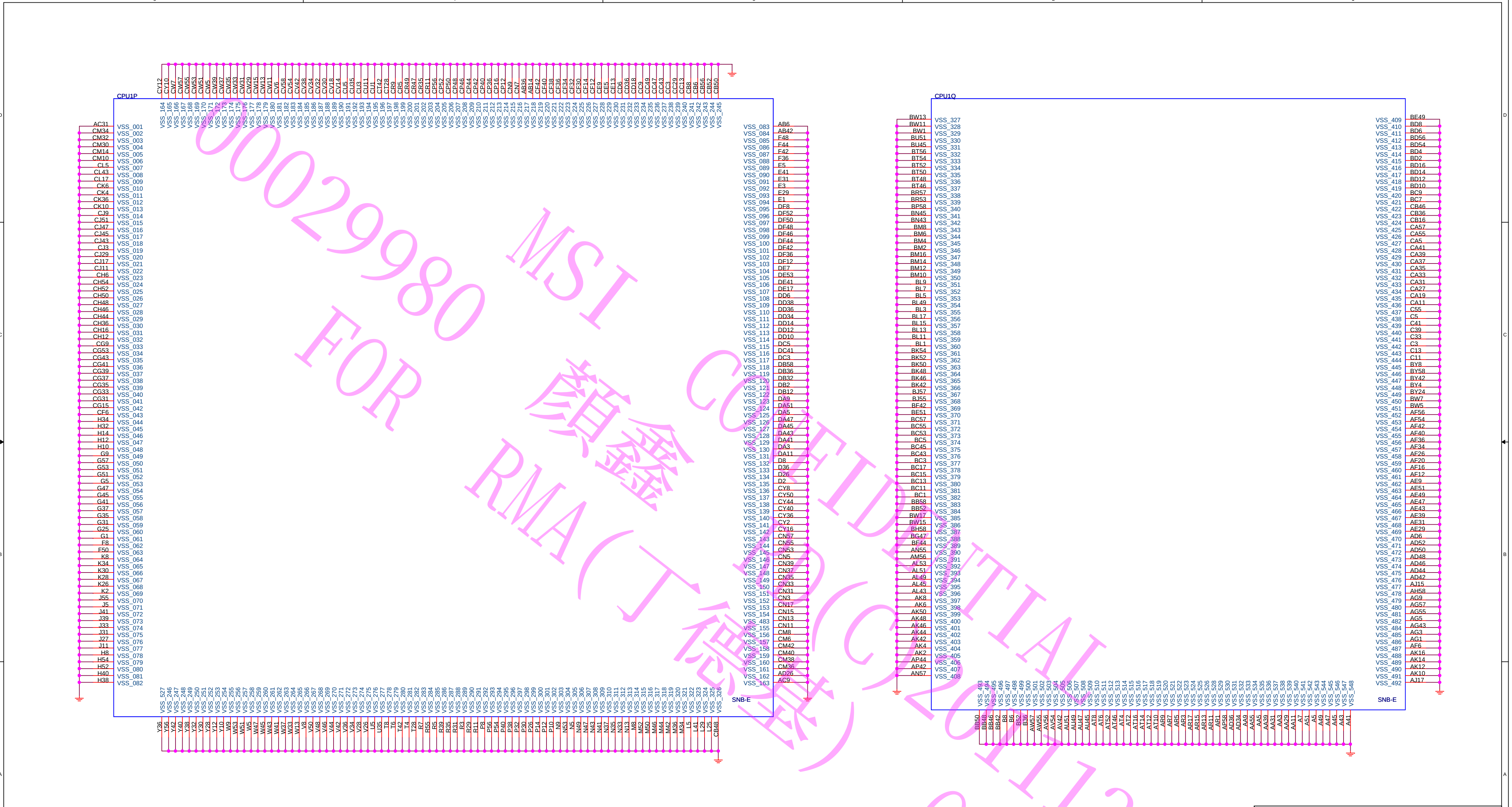


MICRO-START INT'L CO.,LTD.

Title: **SNB-E POWER**

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 9 of 45



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

Title: SNB-E GND

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

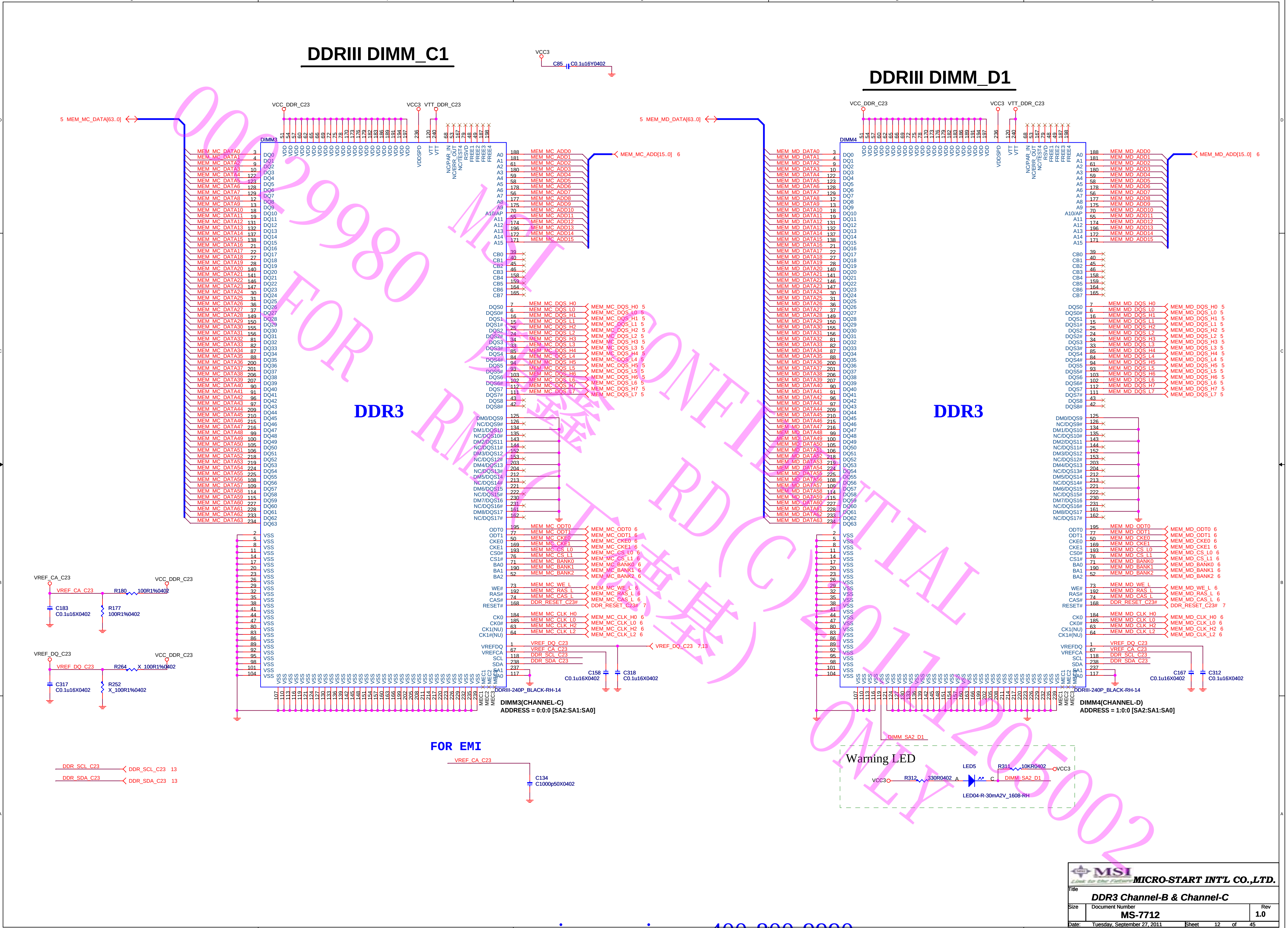
Date: Tuesday, September 27, 2011 | Sheet 10 of 45

MICRO-START INT'L CO.,LTD.

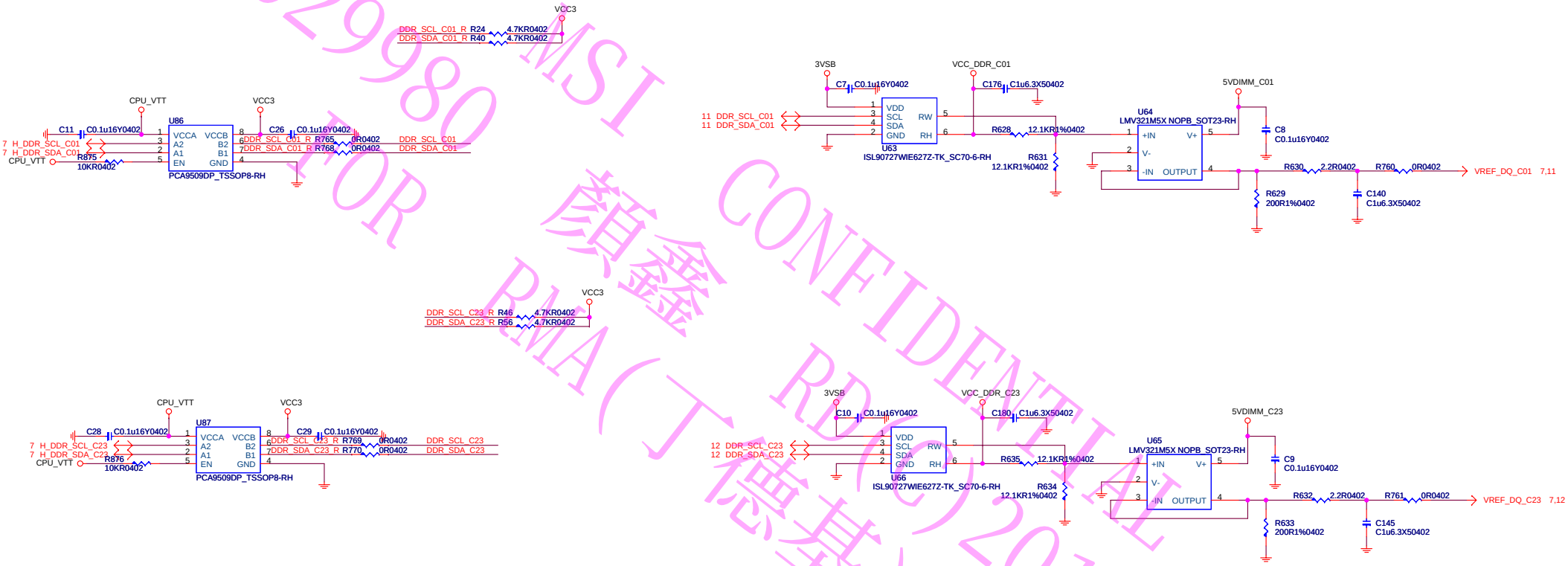
Title: DDR3 Chanel-A & Chanel-B

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 11 of 45



DDRIII DIMM_C1
DDRIII DIMM_D1
DDR3
DDR3
VCC3
C85 C0.1u16Y0402
VCC_DDR_C23
VTT_DDR_C23
5 MEM_MC_DATA[63..0]
5 MEM_MD_DATA[63..0]
MEM_MC_ADD[15..0] 6
MEM_MD_ADD[15..0] 6
DIMM3
DIMM4
DDRIII-240P_BLACK-RH-14
DIMM3(CHANNEL-C)
ADDRESS = 0:0:0 [SA2:SA1:SA0]
DIMM4(CHANNEL-D)
ADDRESS = 1:0:0 [SA2:SA1:SA0]
VREF_CA_C23
VREF_DQ_C23
R180 100R1%0402
R177 100R1%0402
C183 C0.1u16X0402
R264 X_100R1%0402
R252 X_100R1%0402
C317 C0.1u16X0402
C158 C0.1u16X0402
C318 C0.1u16X0402
C167 C0.1u16X0402
C312 C0.1u16X0402
VREF_DQ_C23 7,13
DDR_RESET_C23# 7
FOR EMI
C134 C1000p50X0402
DDR_SCL_C23 13
DDR_SDA_C23 13
DIMM_SA2_D1
Warning LED
LED5
R311 10KR0402
R312 330R0402
LED04-R-30mA2V_1608-RH
MICRO-START INT'L CO.,LTD.
Title
DDR3 Channel-B & Channel-C
Size
Document Number
MS-7712
Rev
1.0
Date: Tuesday, September 27, 2011
Sheet 12 of 45

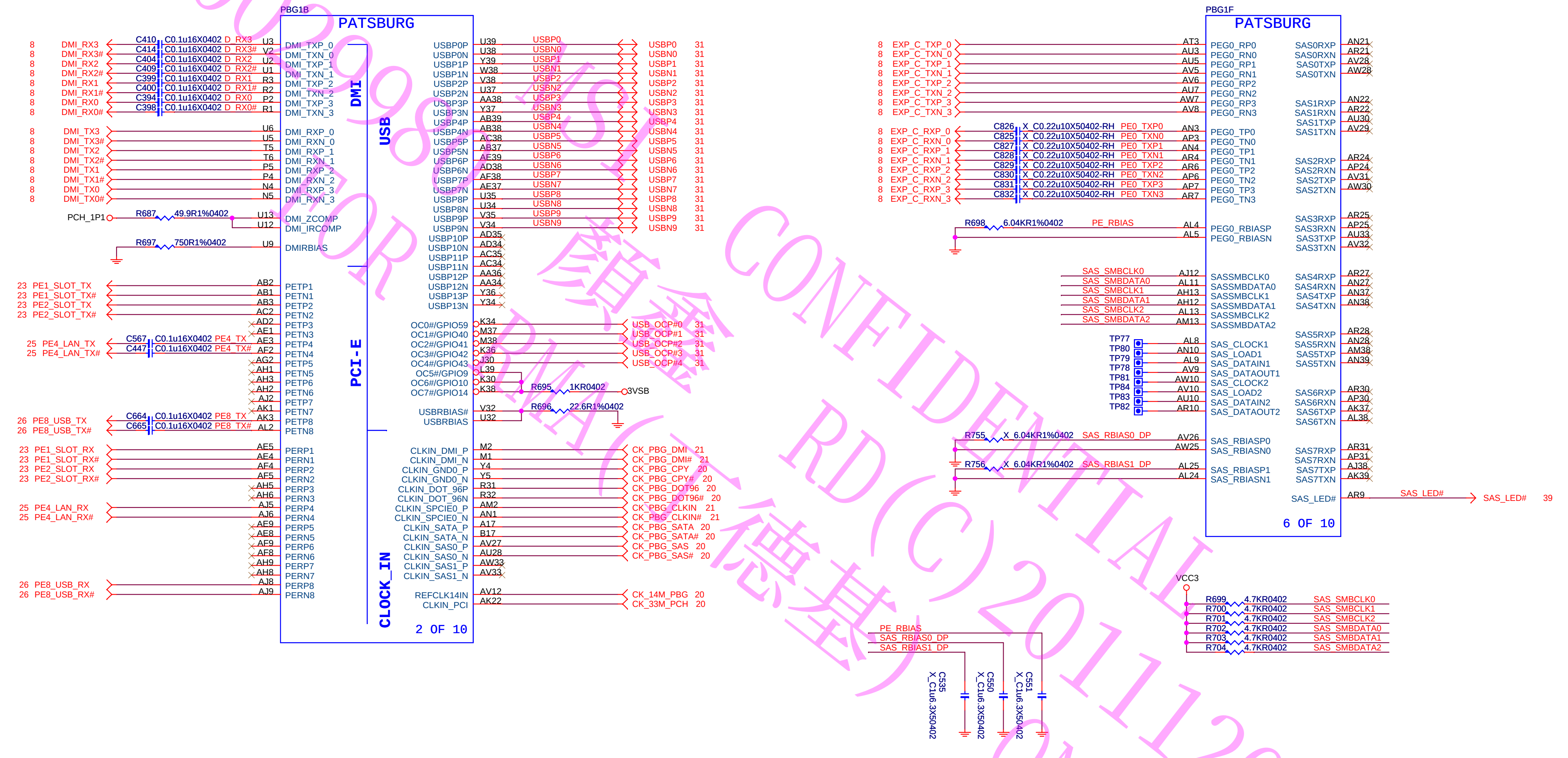


MICRO-START INT'L CO.,LTD.

Title: DDR3 DQ VREF

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 13 of 45

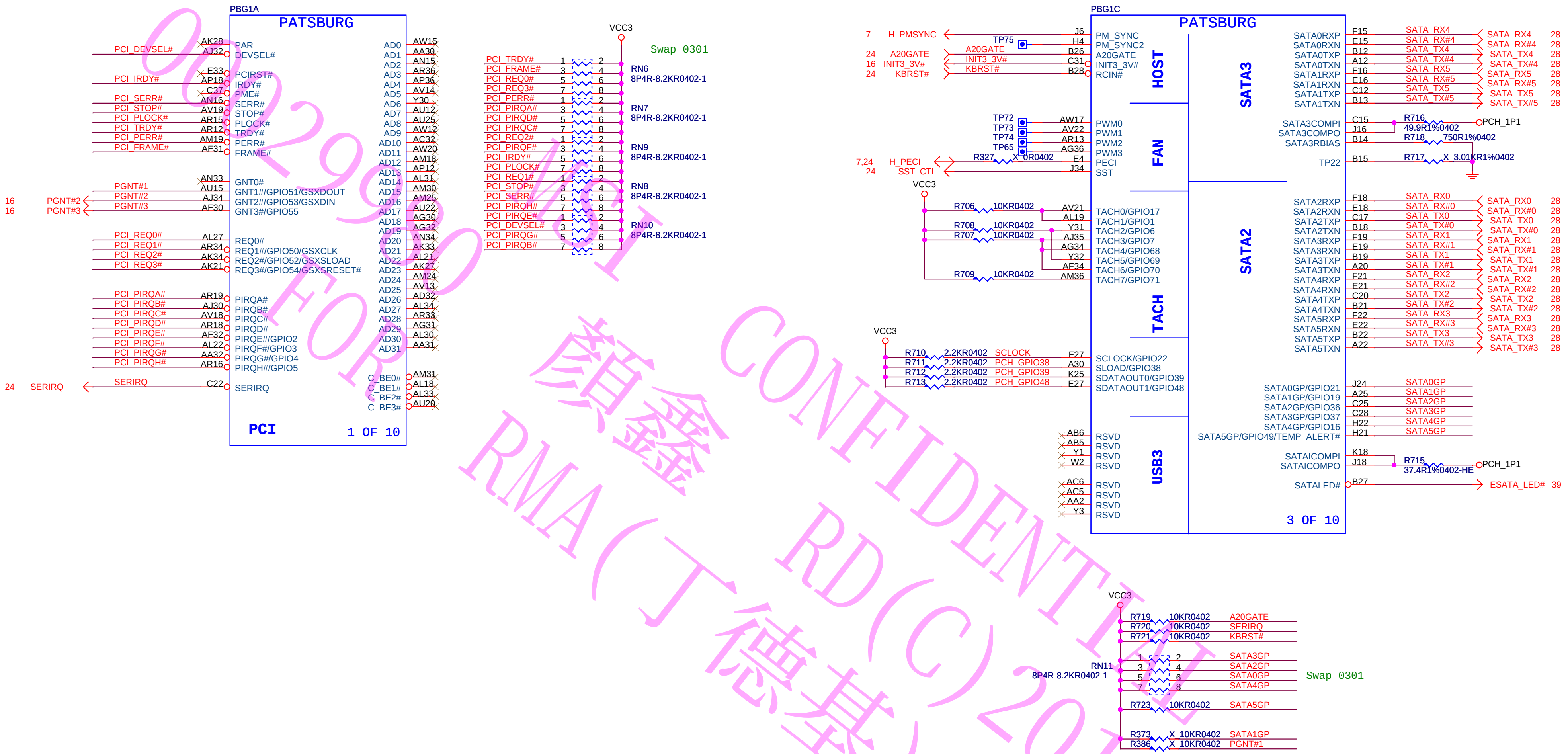


MICRO-START INT'L CO.,LTD.

Title: PBG-PCIE/USB/DMI/SAS

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 14 of 45



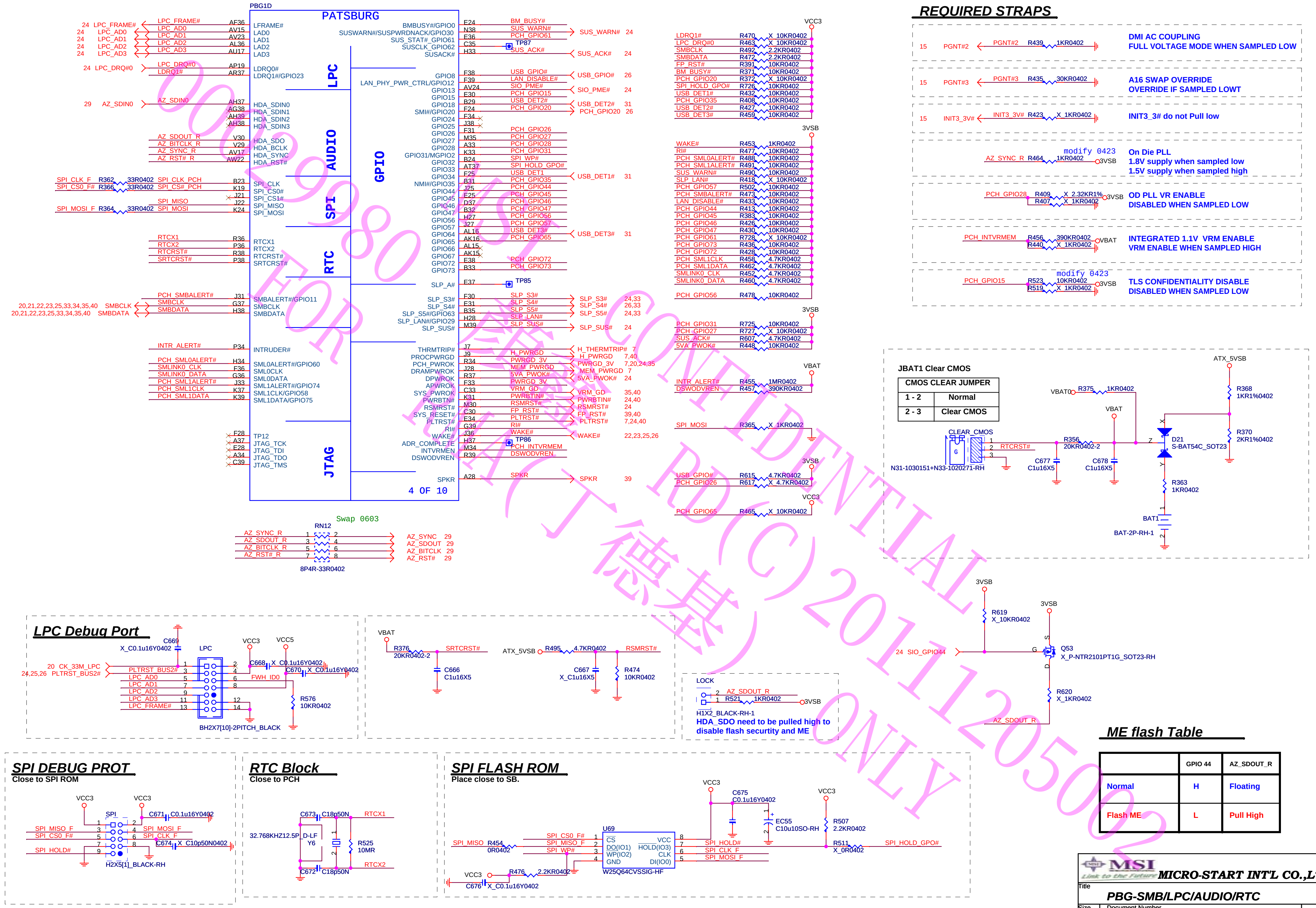
BOOT DEVICE	GNT1#	SATA1GP/GPIO19
LPC	0	0
PCI	1	0
SPI	1	1

MICRO-START INT'L CO.,LTD.

Title: **PBG-PCI/SATA**

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

Date: Tuesday, September 27, 2011 | Sheet 15 of 45

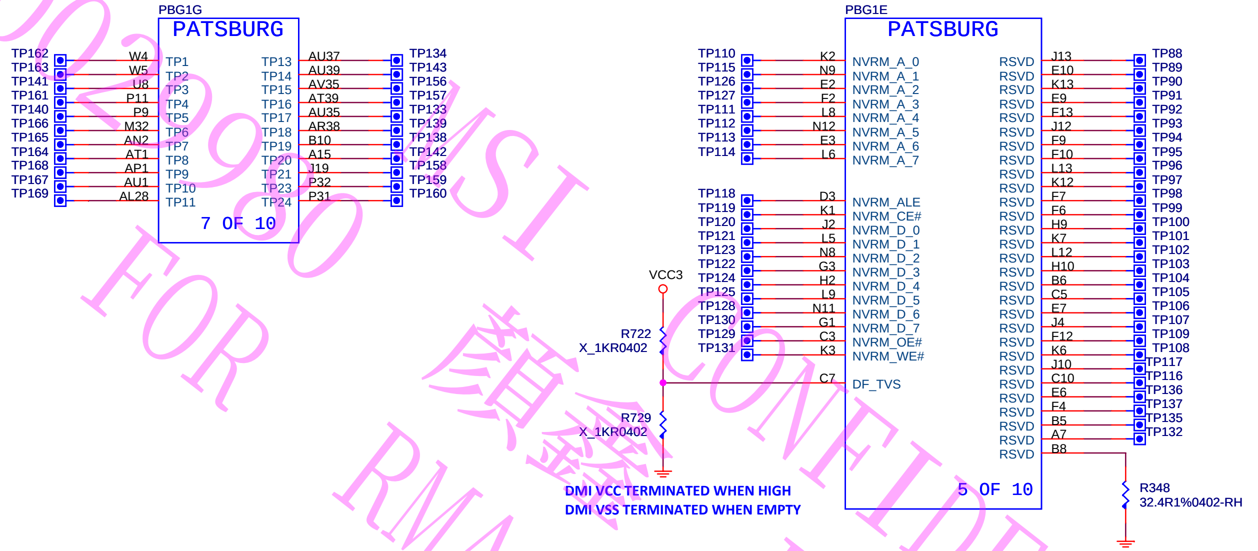


ME flash Table

	GPIO 44	AZ_SDOUT_R
Normal	H	Floating
Flash ME	L	Pull High

MICRO-START INT'L CO.,LTD.

Title	PBG-SMB/LPC/AUDIO/RTC	
Size	Document Number: MS-7712	Rev 1.0
Date: Tuesday, September 27, 2011	Sheet 16 of 45	

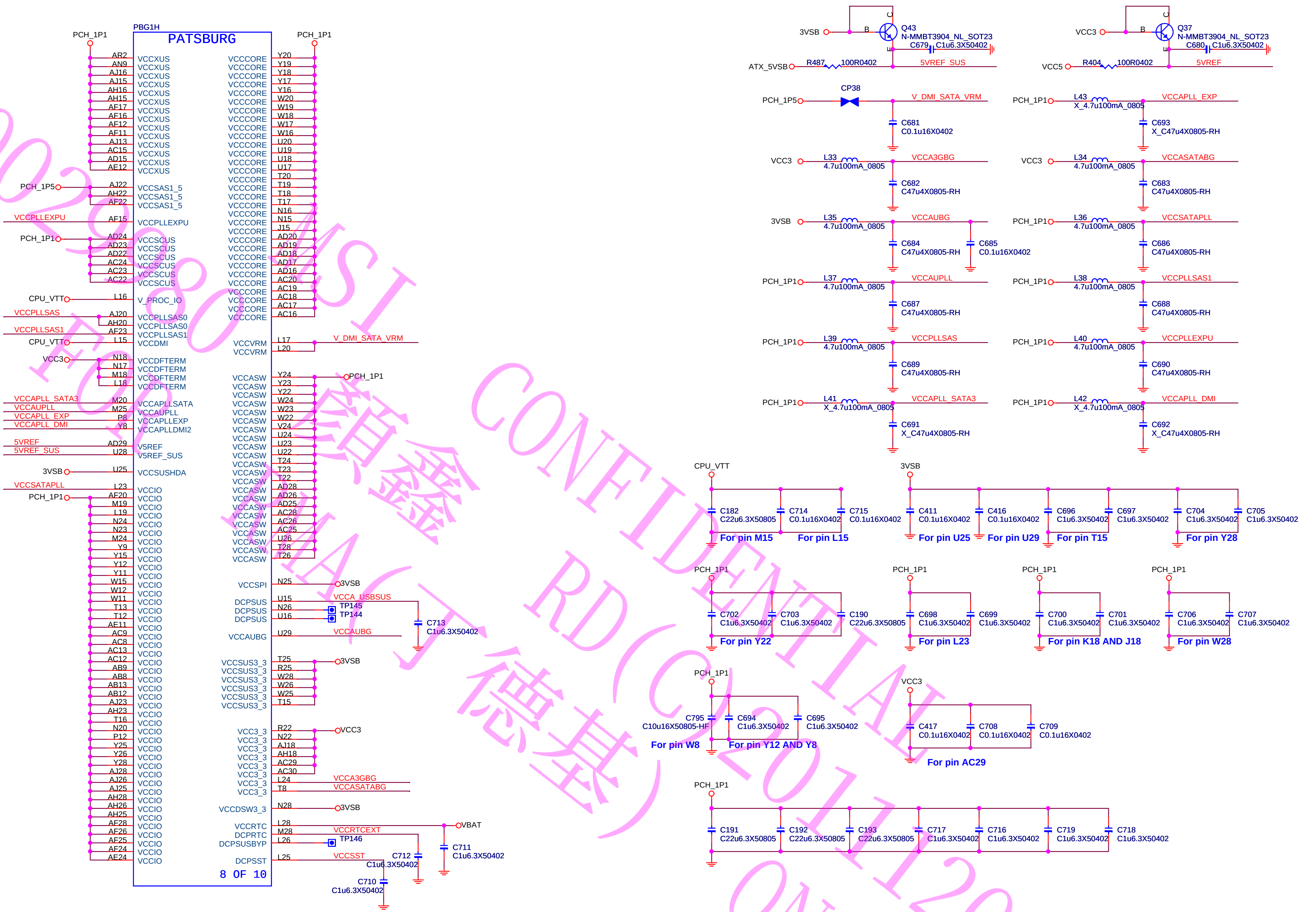


MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: **PBG-NVRM**

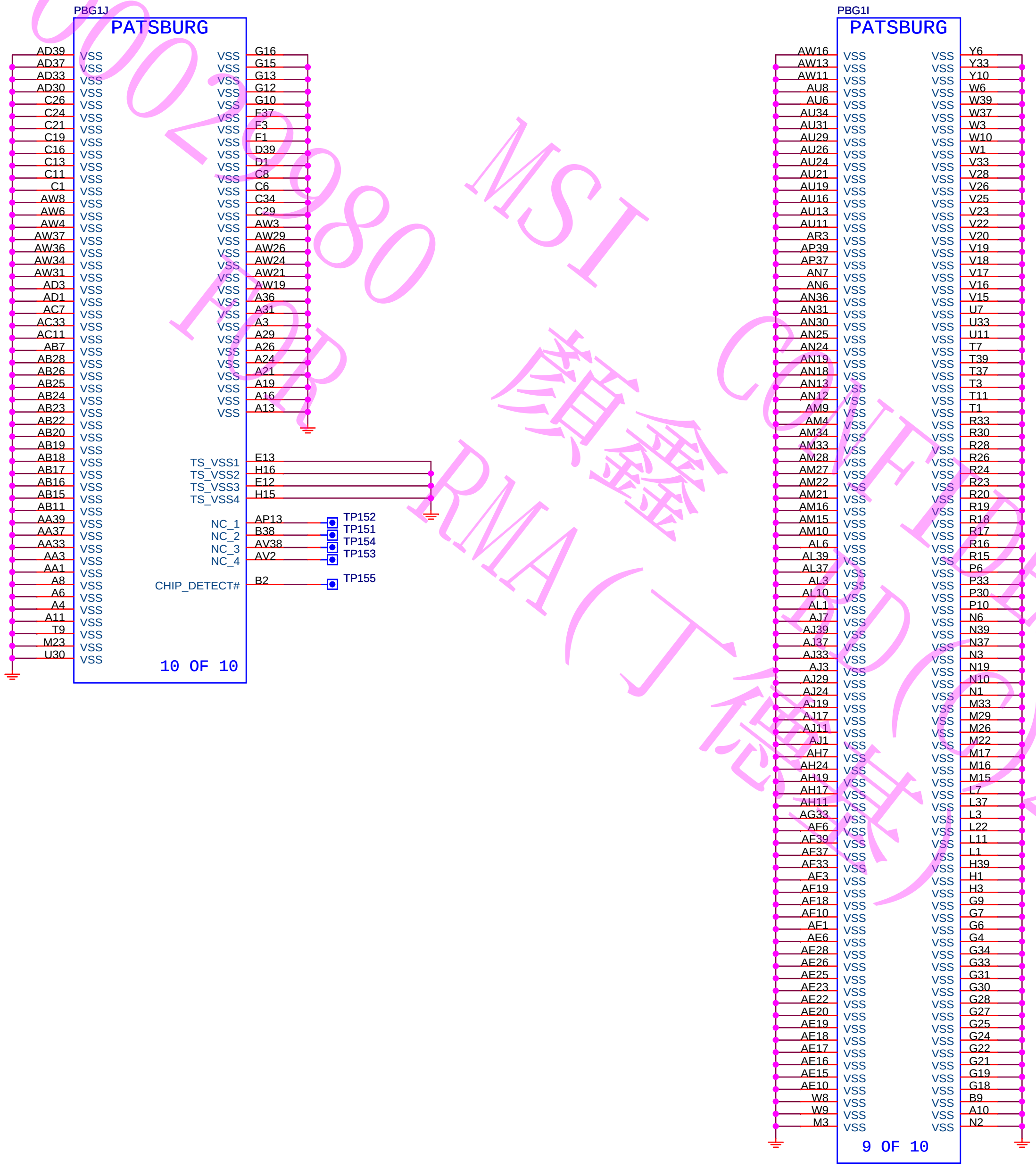
Size | Document Number: **MS-7712** | Rev: 1.0

Date: Tuesday, September 27, 2011 | Sheet 17 of 45



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

Title	PBG-POWER	
Size	Document Number MS-7712	Rev 1.0
Date: Tuesday, September 27, 2011	Sheet 18 of 45	



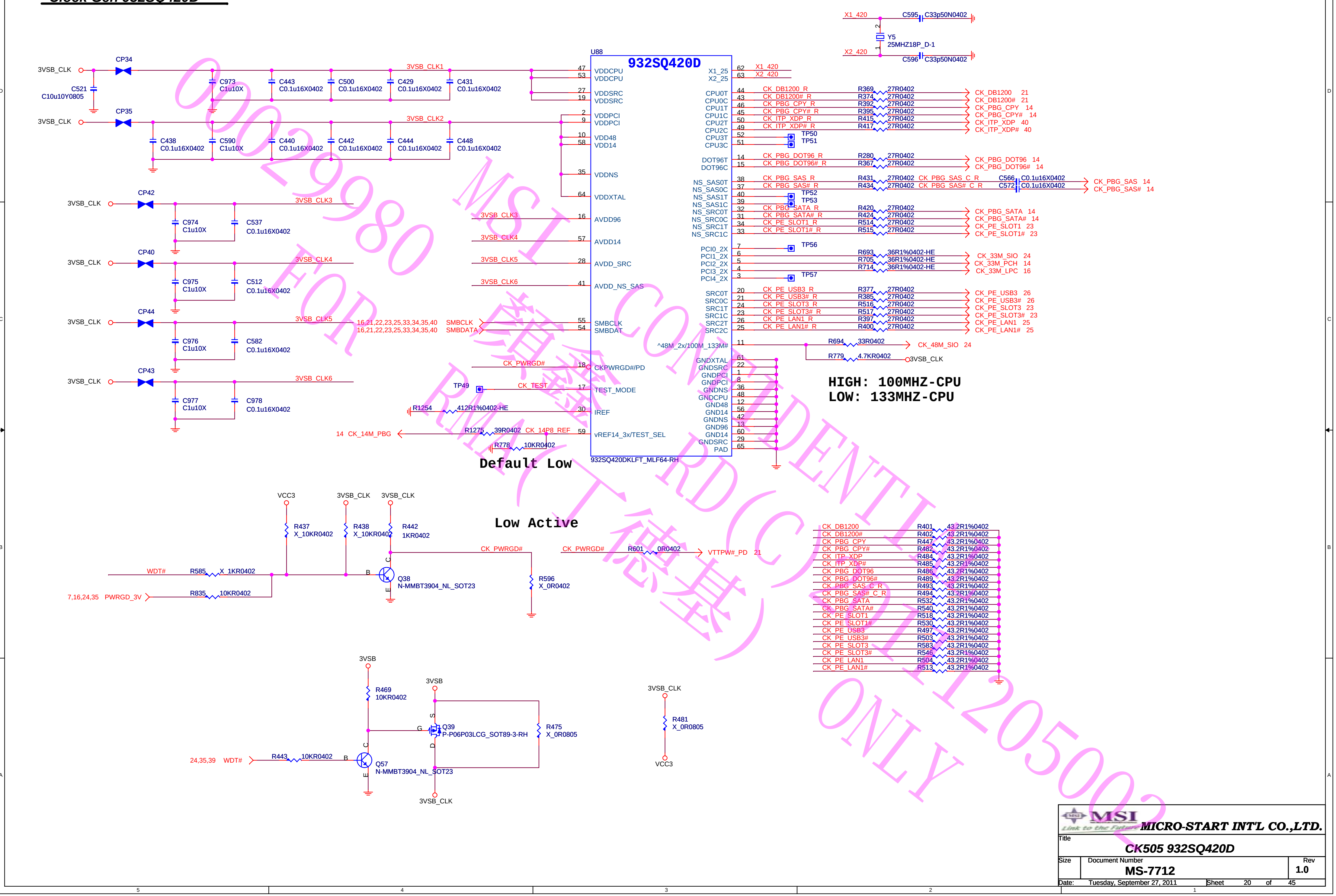
MICRO-START INT'L CO.,LTD.

Title: **PBG-GND**

Size	Document Number	Rev
	MS-7712	1.0

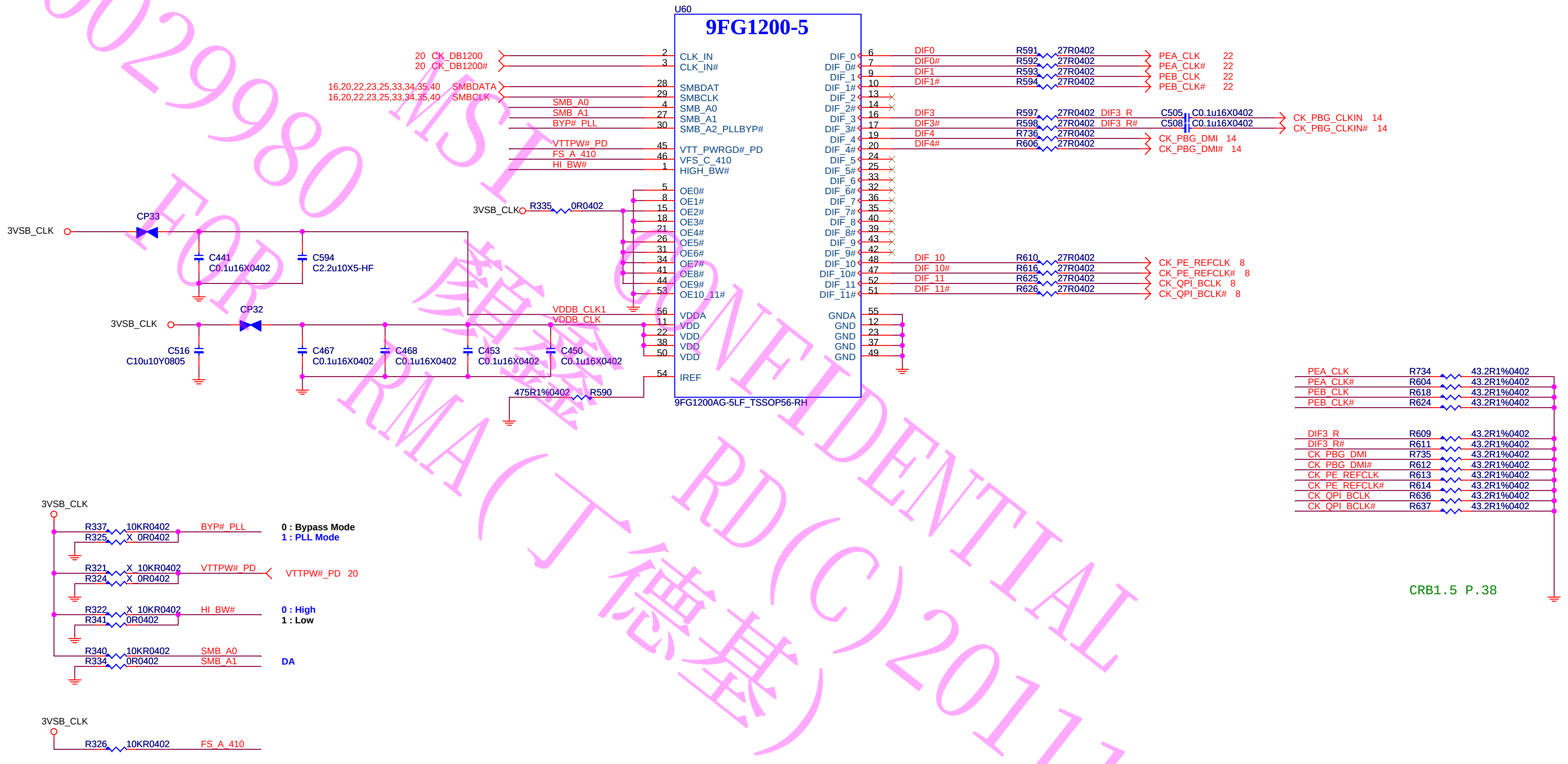
Date: Tuesday, September 27, 2011 Sheet 19 of 45

Clock Gen 932SQ420D



Clock Gen 932SQ420D
U88
932SQ420D
932SQ420DKLFT_MLF64-RH
VDDCPU
VDDSRC
VDDPCI
VDD48
VDD14
VDDNS
VDDXTAL
AVDD96
AVDD14
AVDD_SRC
AVDD_NS_SAS
SMBCLK
SMBDAT
CKPWRGD#/PD
TEST_MODE
IREF
vREF14_3x/TEST_SEL
X1_25
X2_25
CPU0T
CPU0C
CPU1T
CPU1C
CPU2T
CPU2C
CPU3T
CPU3C
DOT96T
DOT96C
NS_SAS0T
NS_SAS0C
NS_SAS1T
NS_SAS1C
NS_SRC0T
NS_SRC0C
NS_SRC1T
NS_SRC1C
PCI0_2X
PCI1_2X
PCI2_2X
PCI3_2X
PCI4_2X
SRC0T
SRC0C
SRC1T
SRC1C
SRC2T
SRC2C
^48M_2x/100M_133M#
GNDXTAL
GNDSRC
GNDPCI
GNDNS
GNDCPU
GND48
GND14
GND96
PAD
3VSB_CLK
3VSB_CLK1
3VSB_CLK2
3VSB_CLK3
3VSB_CLK4
3VSB_CLK5
3VSB_CLK6
CP34
CP35
CP40
CP42
CP43
CP44
C521 C10u10Y0805
C973 C1u10X
C443 C0.1u16X0402
C500 C0.1u16X0402
C429 C0.1u16X0402
C431 C0.1u16X0402
C438 C0.1u16X0402
C590 C1u10X
C440 C0.1u16X0402
C442 C0.1u16X0402
C444 C0.1u16X0402
C448 C0.1u16X0402
C974 C1u10X
C537 C0.1u16X0402
C975 C1u10X
C512 C0.1u16X0402
C976 C1u10X
C582 C0.1u16X0402
C977 C1u10X
C978 C0.1u16X0402
X1_420
X2_420
C595 C33p50N0402
C596 C33p50N0402
Y5 25MHZ18P_D-1
16,21,22,23,25,33,34,35,40 SMBCLK
16,21,22,23,25,33,34,35,40 SMBDATA
CK_PWRGD#
TP49 CK_TEST
R1254 412R1%0402-HE
14 CK_14M_PBG
R1275 39R0402 CK_14P8_REF
R778 10KR0402
Default Low
CK_DB1200 21
CK_DB1200# 21
CK_PBG_CPY 14
CK_PBG_CPY# 14
CK_ITP_XDP 40
CK_ITP_XDP# 40
CK_PBG_DOT96 14
CK_PBG_DOT96# 14
CK_PBG_SAS 14
CK_PBG_SAS# 14
CK_PBG_SATA 14
CK_PBG_SATA# 14
CK_PE_SLOT1 23
CK_PE_SLOT1# 23
CK_33M_SIO 24
CK_33M_PCH 14
CK_33M_LPC 16
CK_PE_USB3 26
CK_PE_USB3# 26
CK_PE_SLOT3 23
CK_PE_SLOT3# 23
CK_PE_LAN1 25
CK_PE_LAN1# 25
R694 33R0402 CK_48M_SIO 24
R779 4.7KR0402 3VSB_CLK
C566 C0.1u16X0402
C572 C0.1u16X0402
HIGH: 100MHZ-CPU
LOW: 133MHZ-CPU
VCC3
R437 X_10KR0402
R438 X_10KR0402
R442 1KR0402
Low Active
WDT#
R585 X_1KR0402
7,16,24,35 PWRGD_3V
R835 10KR0402
Q38 N-MMBT3904_NL_SOT23
R596 X_0R0402
R601 0R0402
VTTPW#_PD 21
R401 43.2R1%0402
3VSB
R469 10KR0402
Q39 P-P06P03LCG_SOT89-3-RH
R475 X_0R0805
24,35,39 WDT#
R443 10KR0402
Q57 N-MMBT3904_NL_SOT23
R481 X_0R0805
MICRO-START INT'L CO.,LTD.
Title
CK505 932SQ420D
Size
Document Number
MS-7712
Rev
1.0
Date: Tuesday, September 27, 2011
Sheet 20 of 45

Clock Buffer 9FG1200D



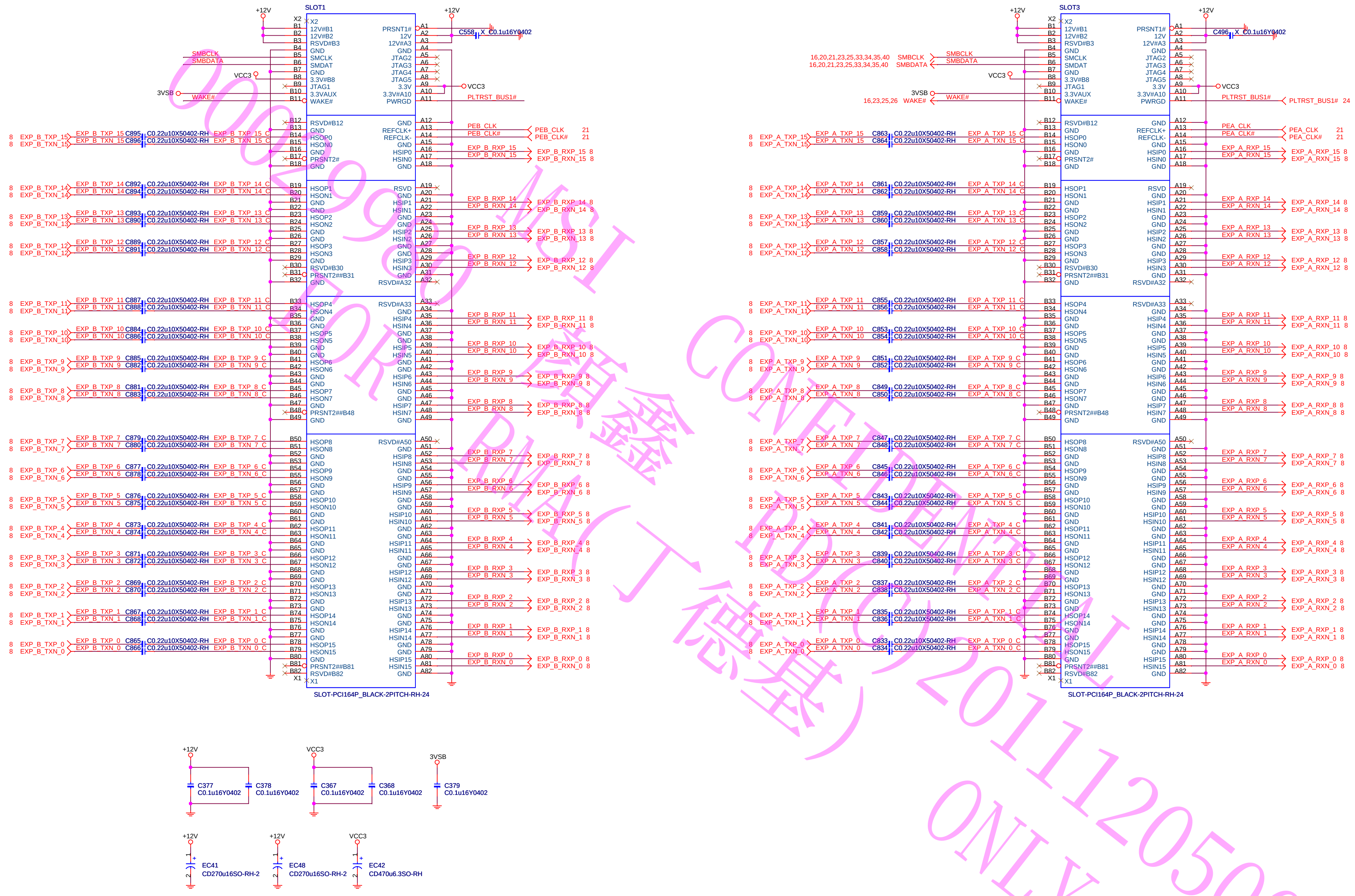
MICRO-START INT'L CO.,LTD.

Title: Clock Buffer DB1200

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

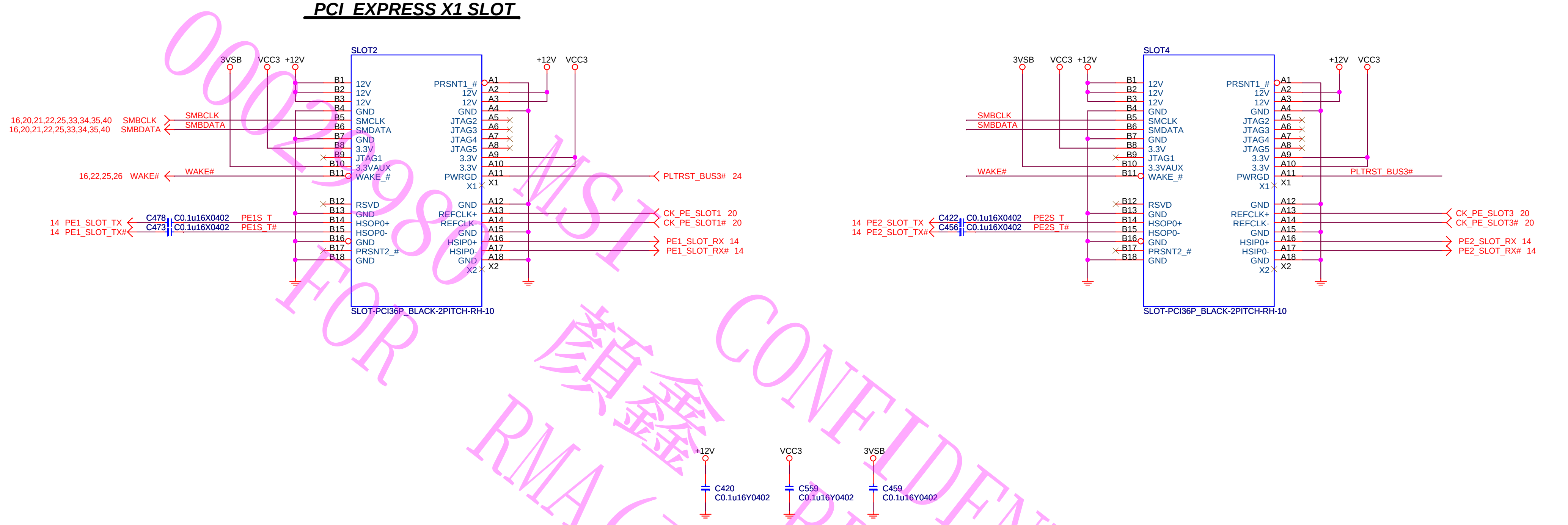
Date: Tuesday, September 27, 2011 | Sheet 21 of 45

PCI EXPRESS X16 SLOT



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

Title	PCIE X16 slot	
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 22 of 45	

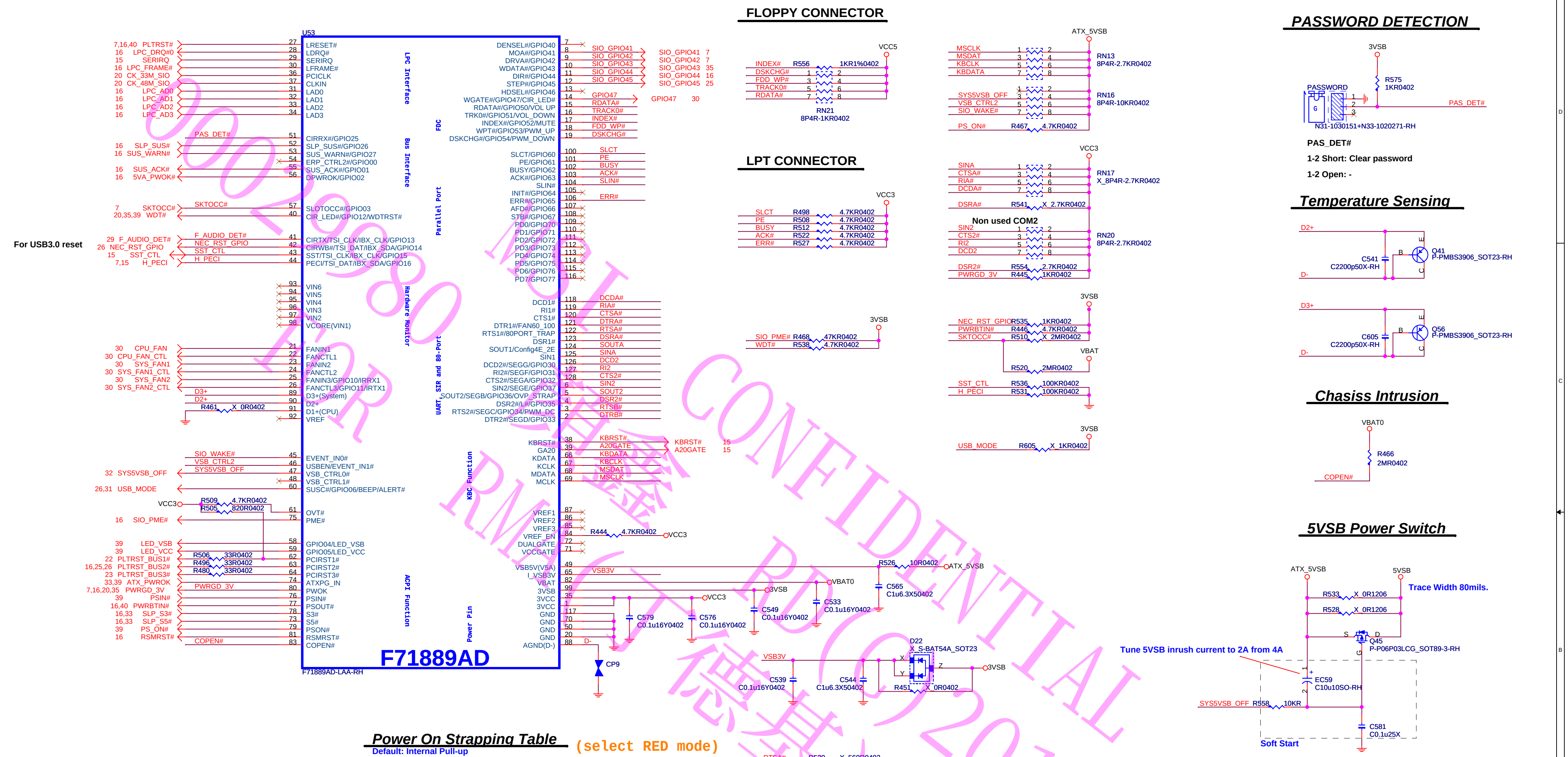


MSI MICRO-START INT'L CO.,LTD.

Title: PCIE x1 SLOTS

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 23 of 45



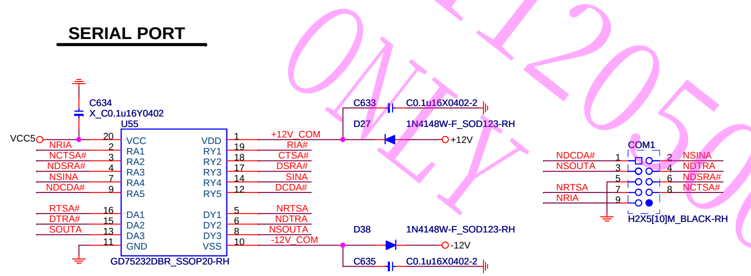
Power On Strapping Table

Default: Internal Pull-up

(select RED mode)

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

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

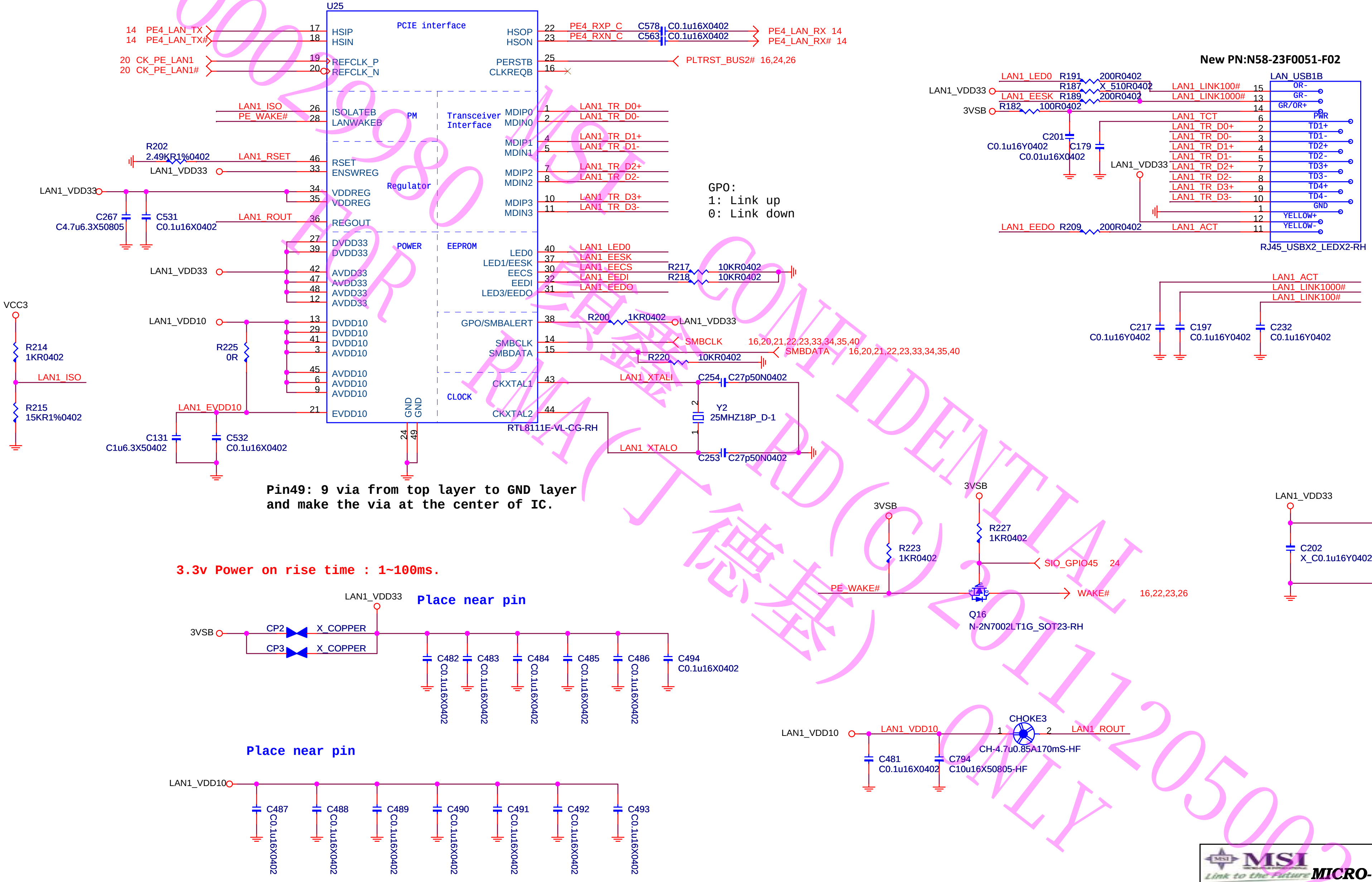


MICRO-START INT'L CO.,LTD.

Title: Super I/O - F71889AD

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 24 of 45



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.

Place near pin

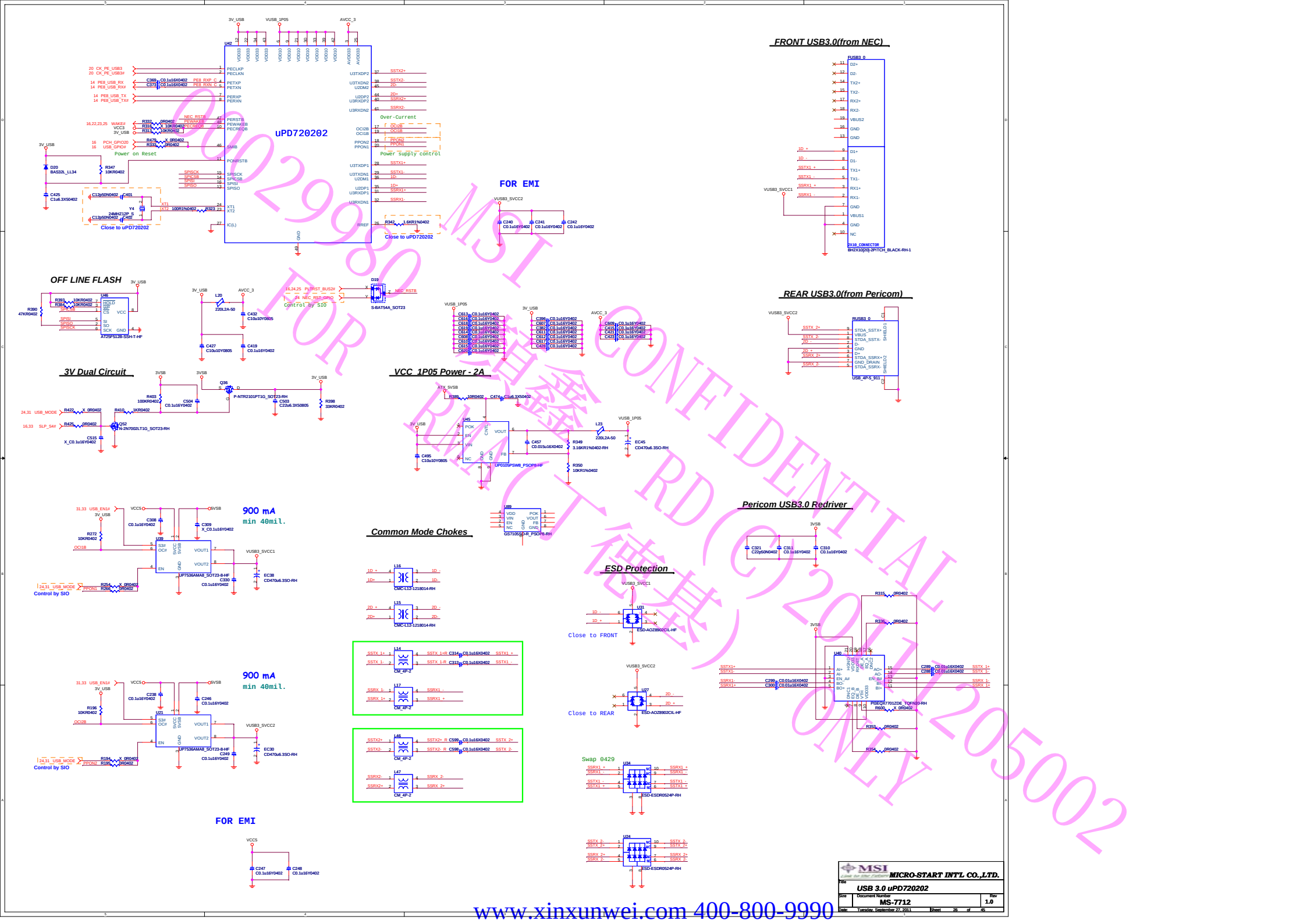
Place near pin

MICRO-STAR INT'L CO.,LTD.

Title: LAN1-RTL8111E

Size	Document Number	Rev
	MS-7712	1.0

Date: Tuesday, September 27, 2011 Sheet 25 of 45


uPD720202
Over-Current
Power supply control
Power on Reset
Close to uPD720202
FOR EMI
FRONT USB3.0(from NEC)
REAR USB3.0(from Pericom)
OFF LINE FLASH
3V Dual Circuit
VCC_1P05 Power - 2A
Common Mode Chokes
ESD Protection
Pericom USB3.0 Redriver
900 mA
min 40mil.
Control by SIO
Close to FRONT
Close to REAR
Swap 0429
MICRO-START INTL CO.,LTD.
USB 3.0 uPD720202
MS-7712
1.0
Tuesday, September 27, 2011
www.xinxunwei.com 400-800-9990

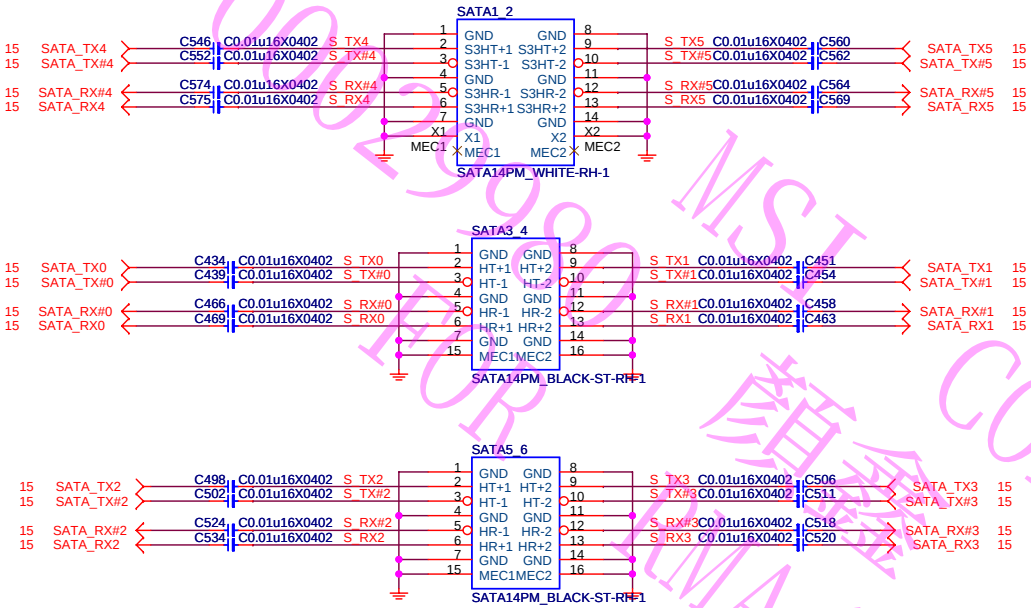
MSI Link to the Future MICRO-START INT'L CO.,LTD.

Title: N/A

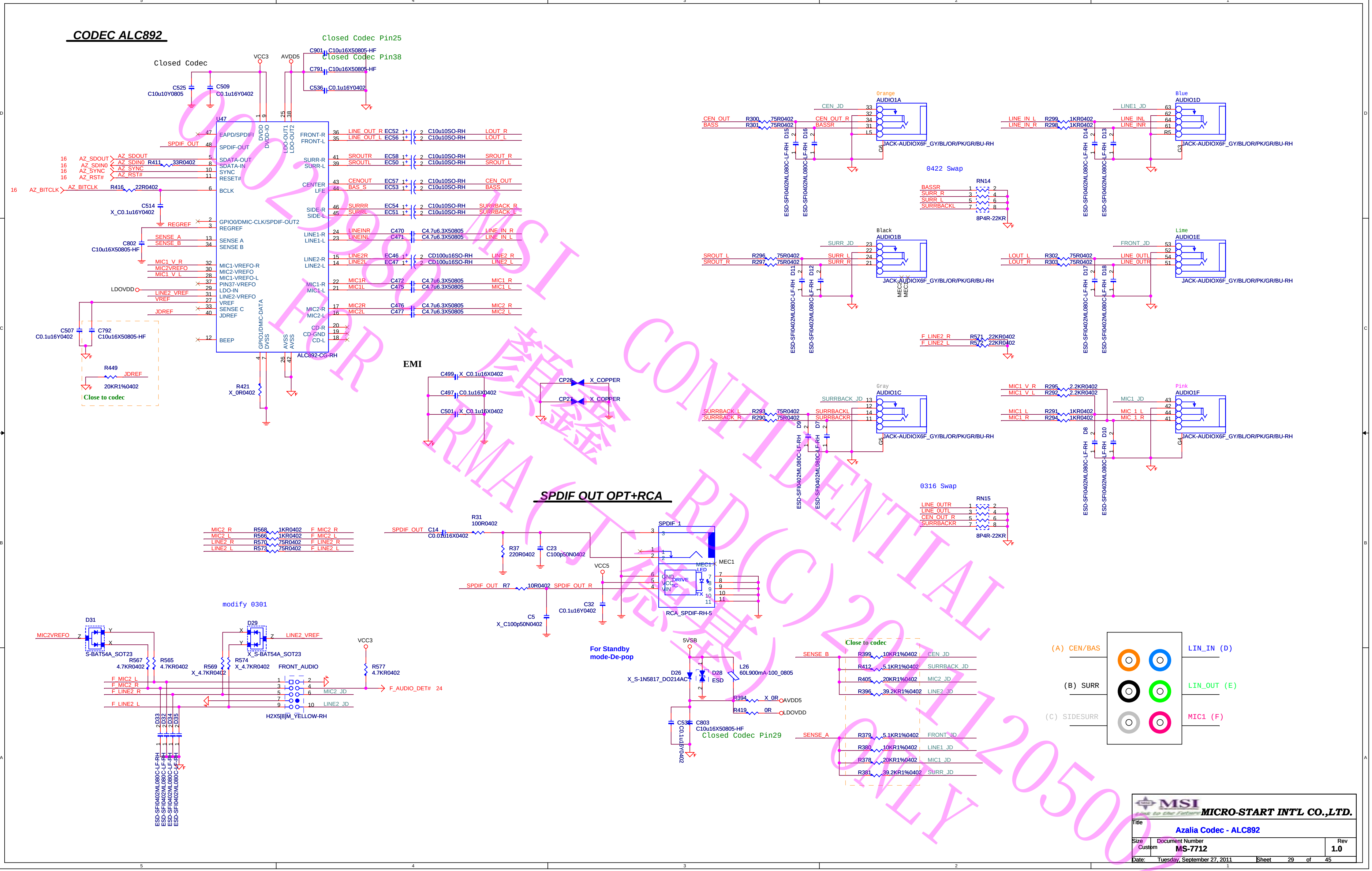
Size | Document Number: MS-7712 | Rev: 1.0

Date: Tuesday, September 27, 2011 Sheet 27 of 45

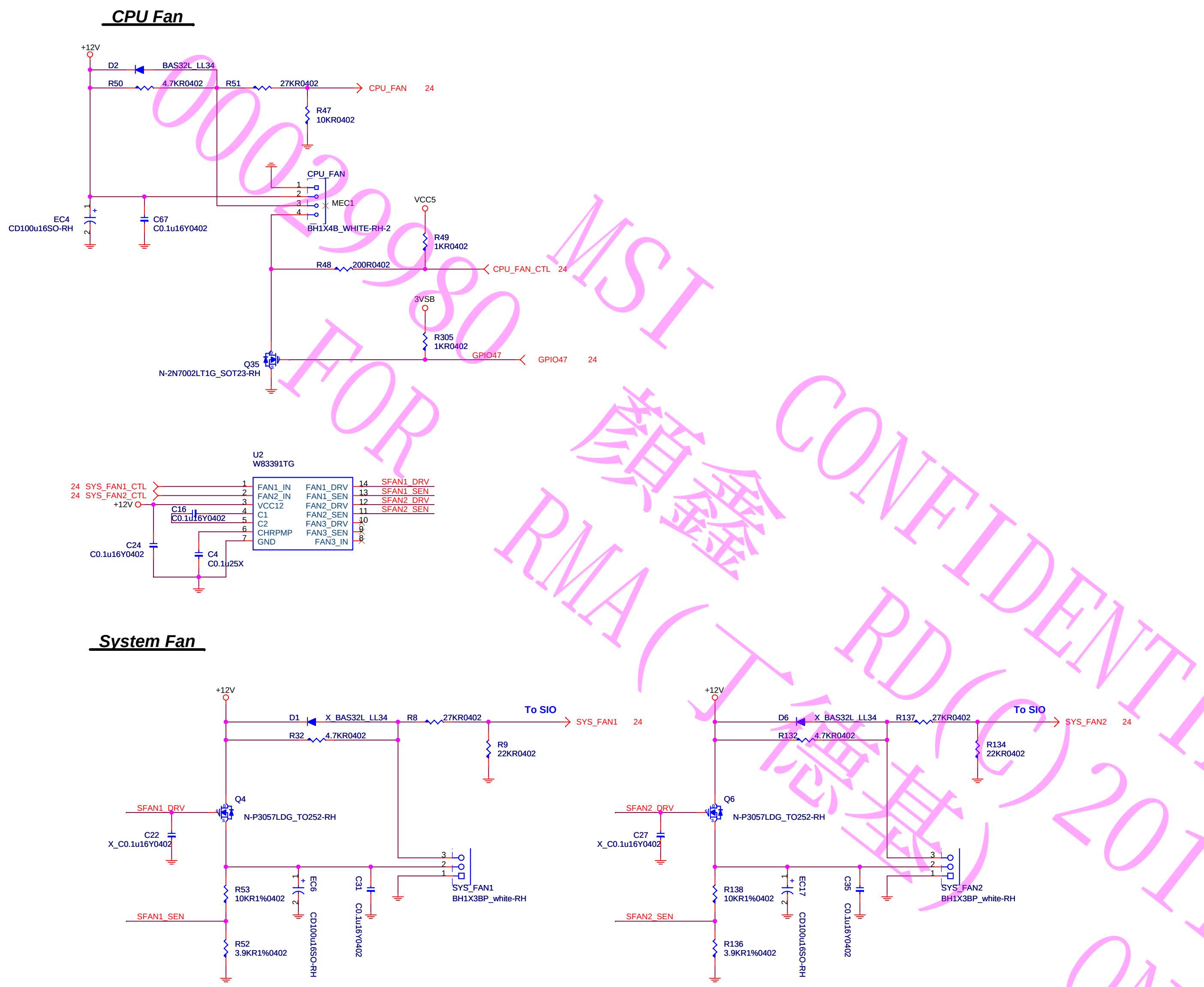
SATA Connector



MSI Link to the Future	MICRO-START INT'L CO.,LTD.	
Title: SATA Port		
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 28 of 45	

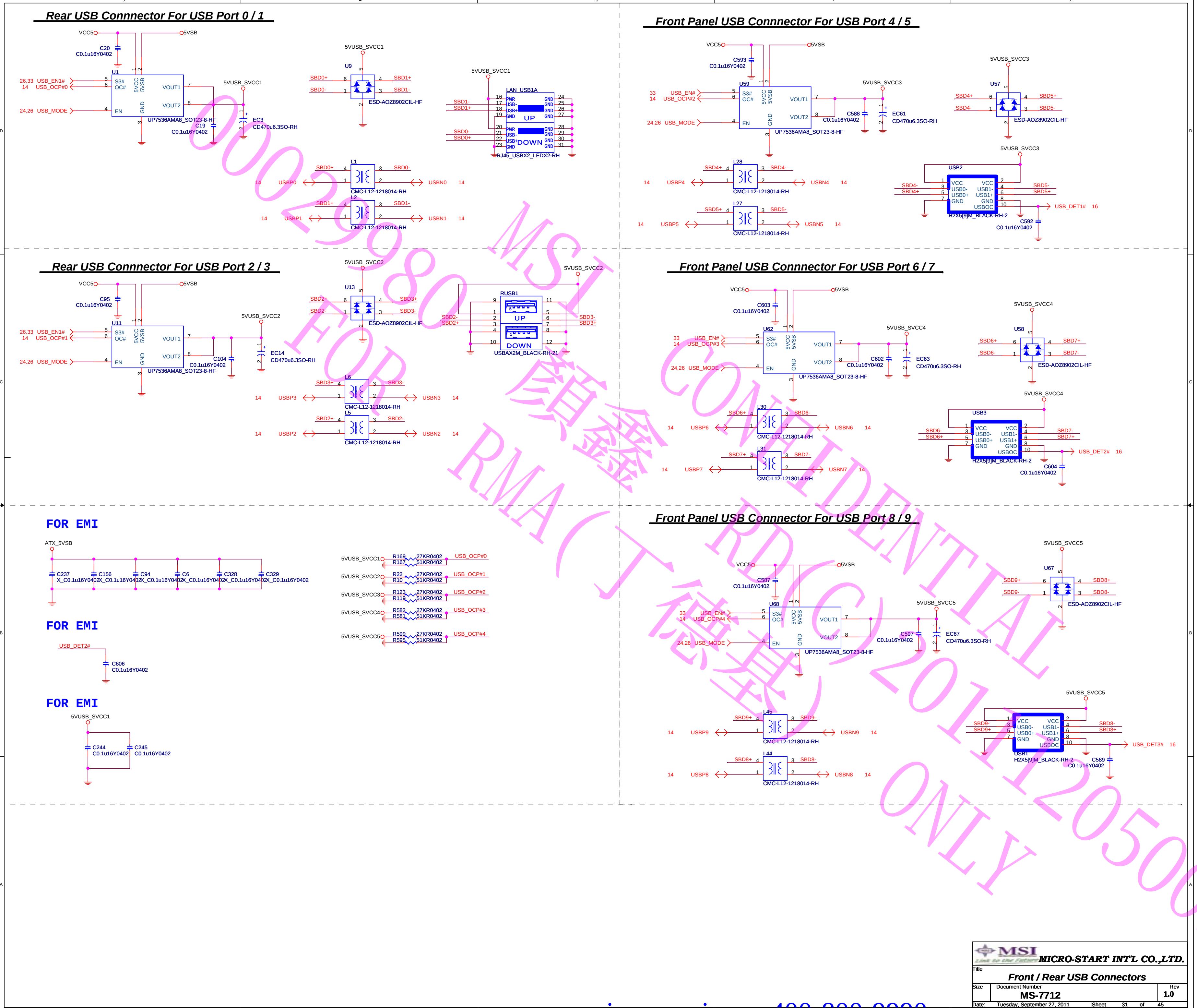


CODEC ALC892
Closed Codec
Closed Codec Pin25
Closed Codec Pin38
U47
ALC892-CG-RH
EMI
SPDIF OUT OPT+RCA
RCA_SPDIF-RH-5
modify 0301
For Standby
mode-De-pop
Closed Codec Pin29
Close to codec
0422 Swap
0316 Swap
JACK-AUDIOX6F_GY/BL/OR/PK/GR/BU-RH
H2X5[8]M_YELLOW-RH
(A) CEN/BAS
(B) SURR
(C) SIDESURR
LIN_IN (D)
LIN_OUT (E)
MIC1 (F)
MICRO-START INT'L CO.,LTD.
Title
Azalia Codec - ALC892
Size Custom
Document Number MS-7712
Rev 1.0
Date: Tuesday, September 27, 2011
Sheet 29 of 45



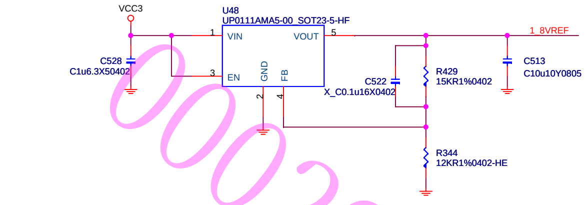
MSI MICRO-STAR INT'L CO.,LTD.

Title		
FAN PORT		
Size	Document Number: MS-7712	Rev 1.0
Date: Tuesday, September 27, 2011	Sheet 30 of 45	



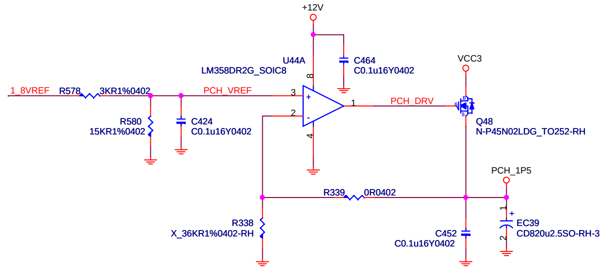
Rear USB Connnector For USB Port 0 / 1
Front Panel USB Connnector For USB Port 4 / 5
Rear USB Connnector For USB Port 2 / 3
Front Panel USB Connnector For USB Port 6 / 7
Front Panel USB Connnector For USB Port 8 / 9
FOR EMI
FOR EMI
FOR EMI
UP7536AMA8_SOT23-8-HF
ESD-AOZ8902CIL-HF
CMC-L12-1218014-RH
RJ45_USBX2_LEDX2-RH
USBAX2M_BLACK-RH-21
H2X5[9]M_BLACK-RH-2
CD470u6.3SO-RH
C0.1u16Y0402
ATX_5VSB
MICRO-START INT'L CO.,LTD.
Front / Rear USB Connectors
Document Number
MS-7712
Rev
1.0
Date: Tuesday, September 27, 2011
Sheet 31 of 45

1.8V Reference Power



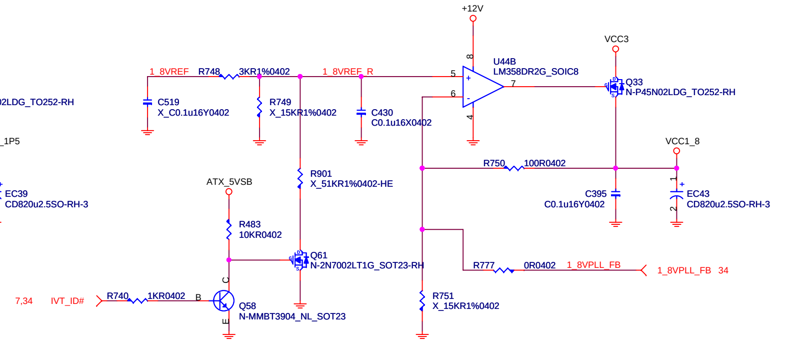
PBG 1.5V Power Rail

Linear 1.5V, 0.512A Imax



VCCPLL Power Rail

Linear 1.8V, 2A Imax

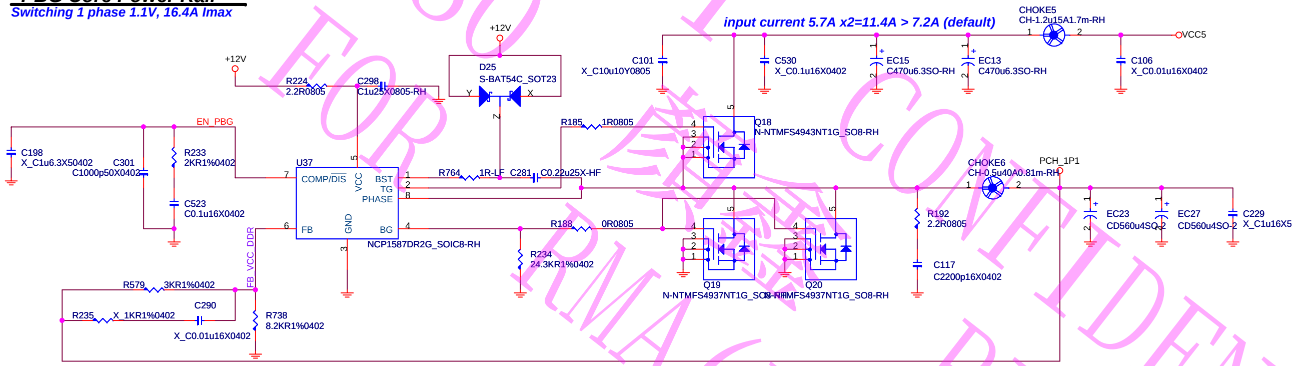


IVT_ID#		VOLTAGE
H	SNB-E	1.8V(normal)
L	IVB-E	1.7V

PBG Core Power Rail

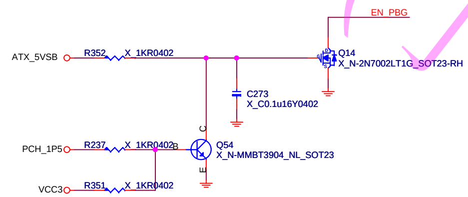
Switching 1 phase 1.1V, 16.4A Imax

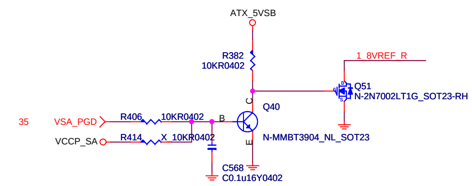
input current 5.7A x2=11.4A > 7.2A (default)



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

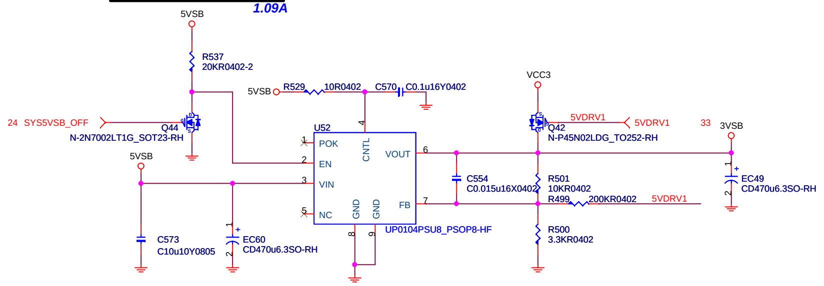
Iocth=(Iocset*Rocset)/Rdson
=(10uA*24.3K)/7.2m
=33.75A(>1.5*16.64A)





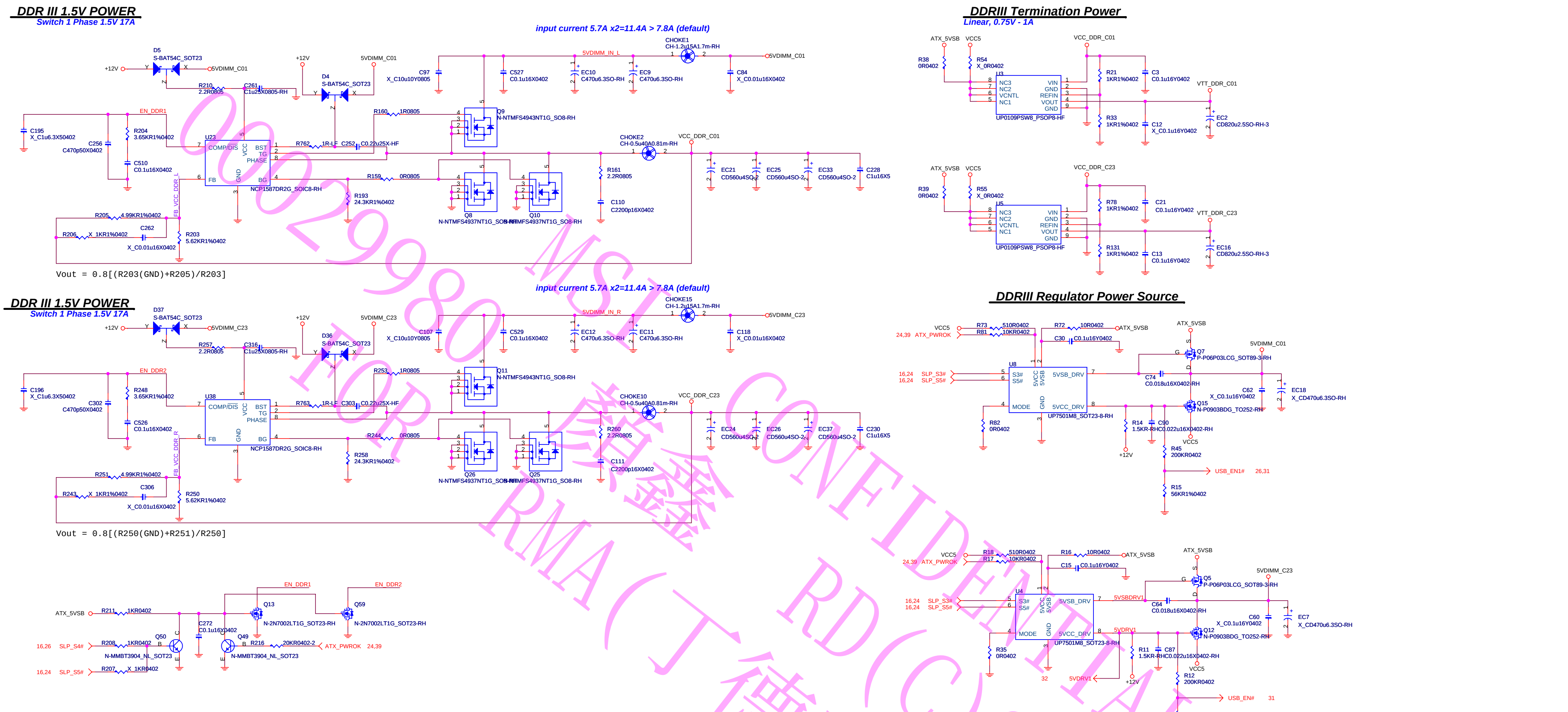
3VSB Power Rail

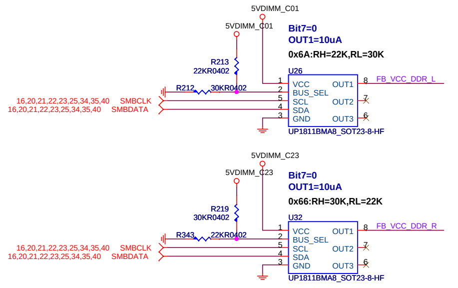
1.09A



MICRO-START INT'L CO.,LTD.

Title	PBG Core Power	
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 32 of 45	



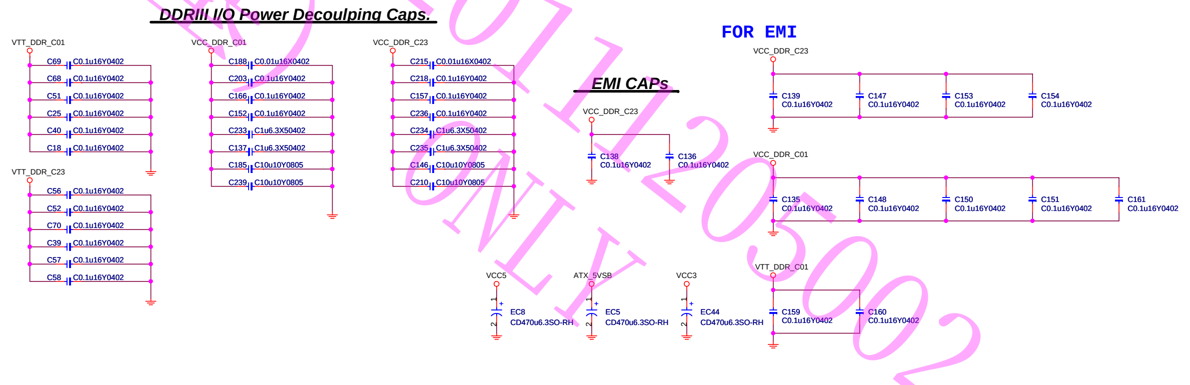


UPI VOLTAGE CONSOLE

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%



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

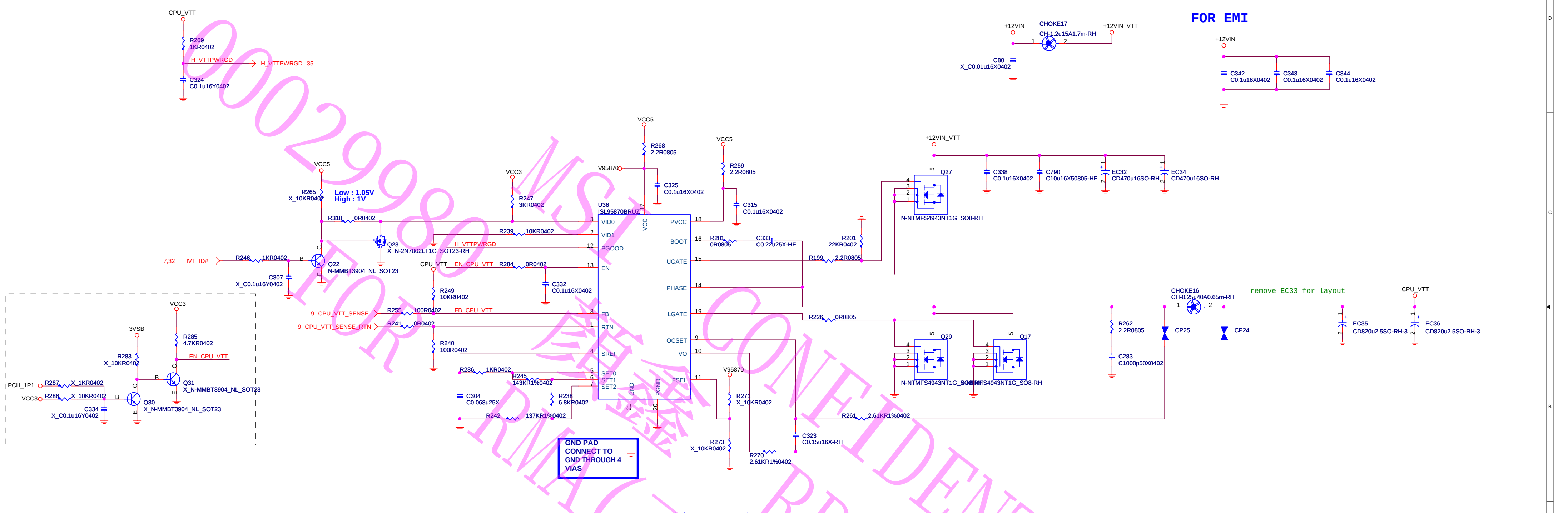
Title: DDR Power

Size | Document Number: MS-7712 | Rev 1.0

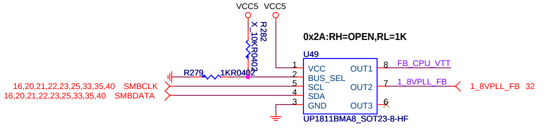
Date: Tuesday, September 27, 2011 | Sheet 33 of 45

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%

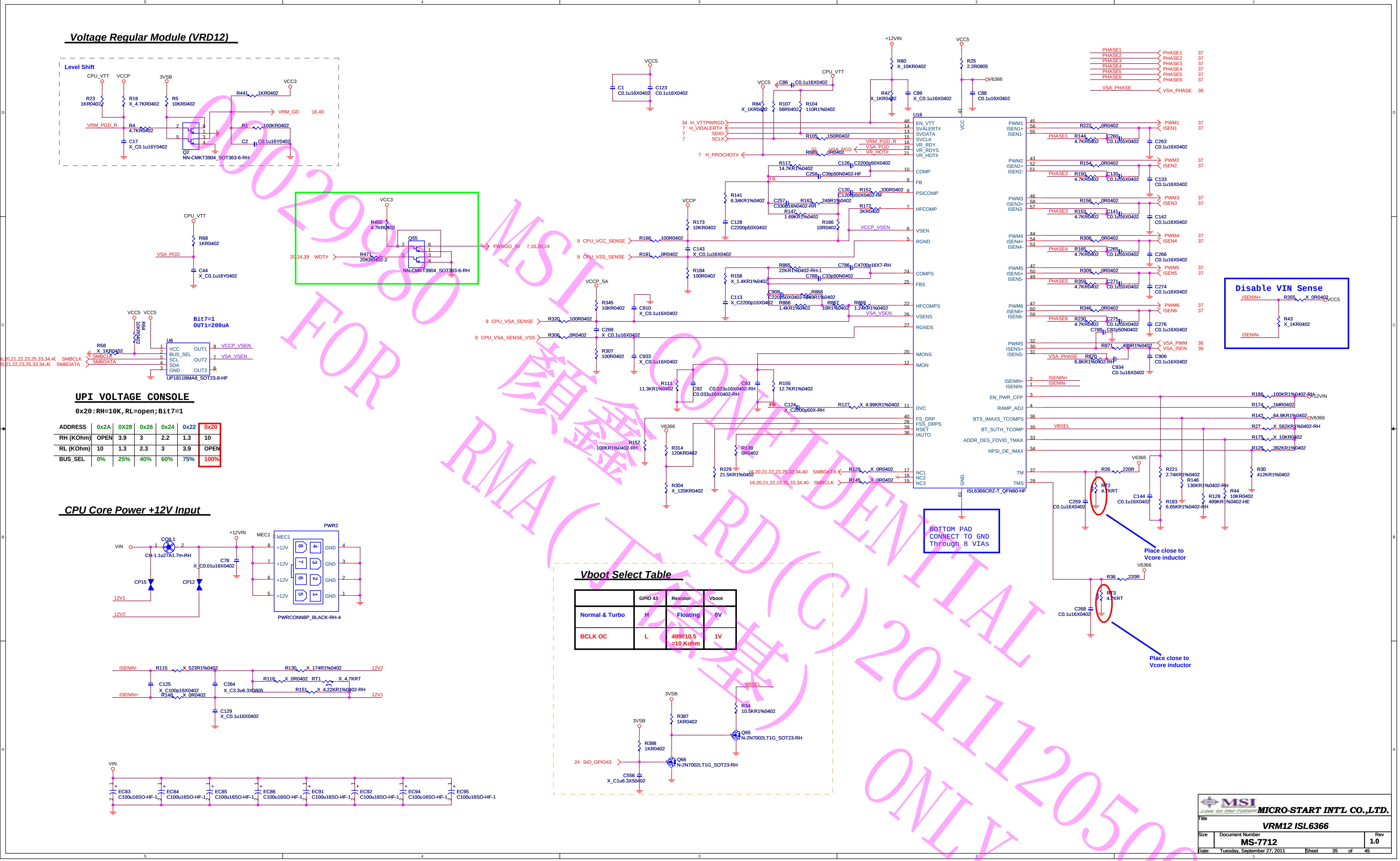
MSI MICRO-START INT'L CO.,LTD.

Title: CPU VTT VR

Size | Document Number: MS-7712 | Rev 1.0

Date: Tuesday, September 27, 2011 | Sheet 34 of 45

Voltage Regular Module (VRD12)



UPI VOLTAGE CONSOLE

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

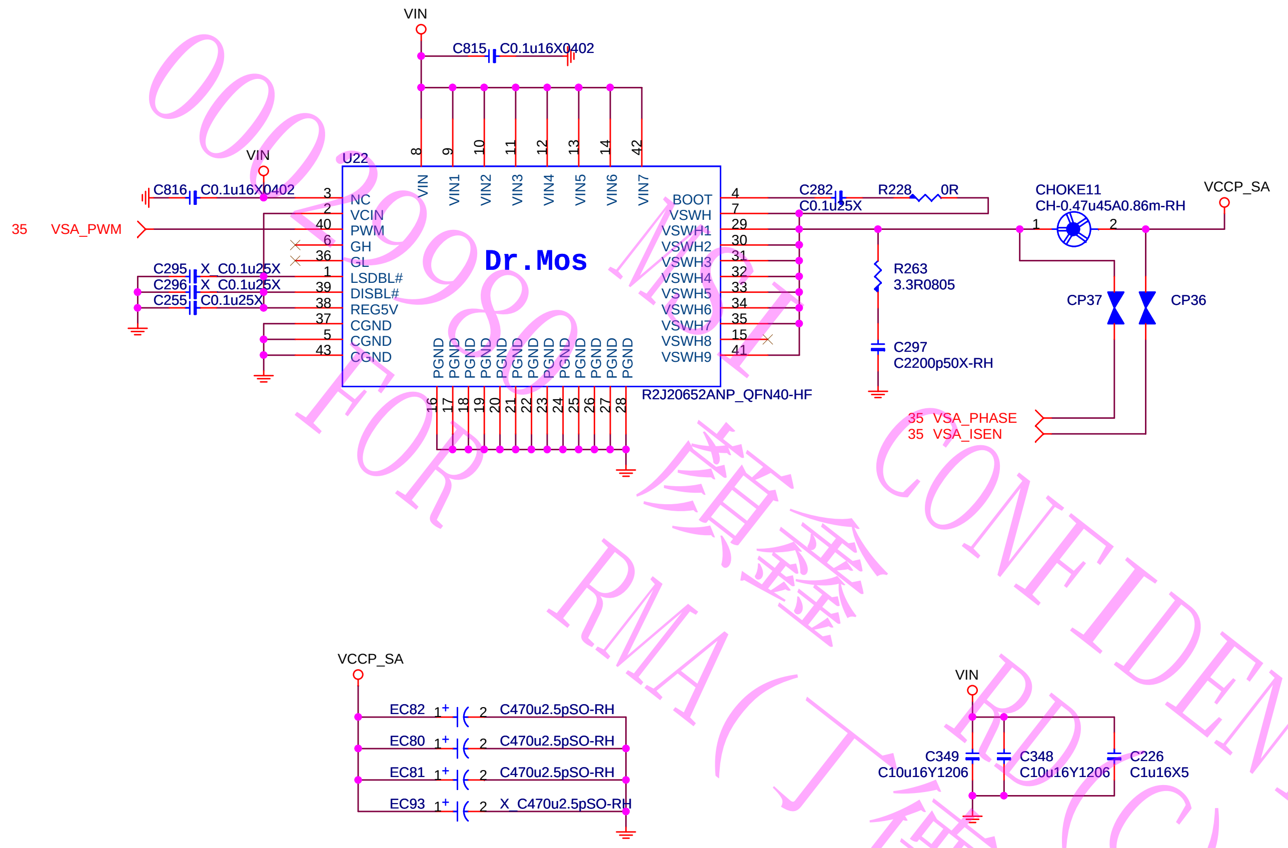
ADDRESS	0x2A	0x28	0x26	0x24	0x22	0x20
RH (KOhm)	OPEN	3.9	3	2.2	1.3	10
RL (KOhm)	10	1.3	2.3	3	3.9	OPEN
BUS_SEL	0%	25%	40%	60%	75%	100%

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: Tuesday, September 27, 2011	Sheet 35 of 45	

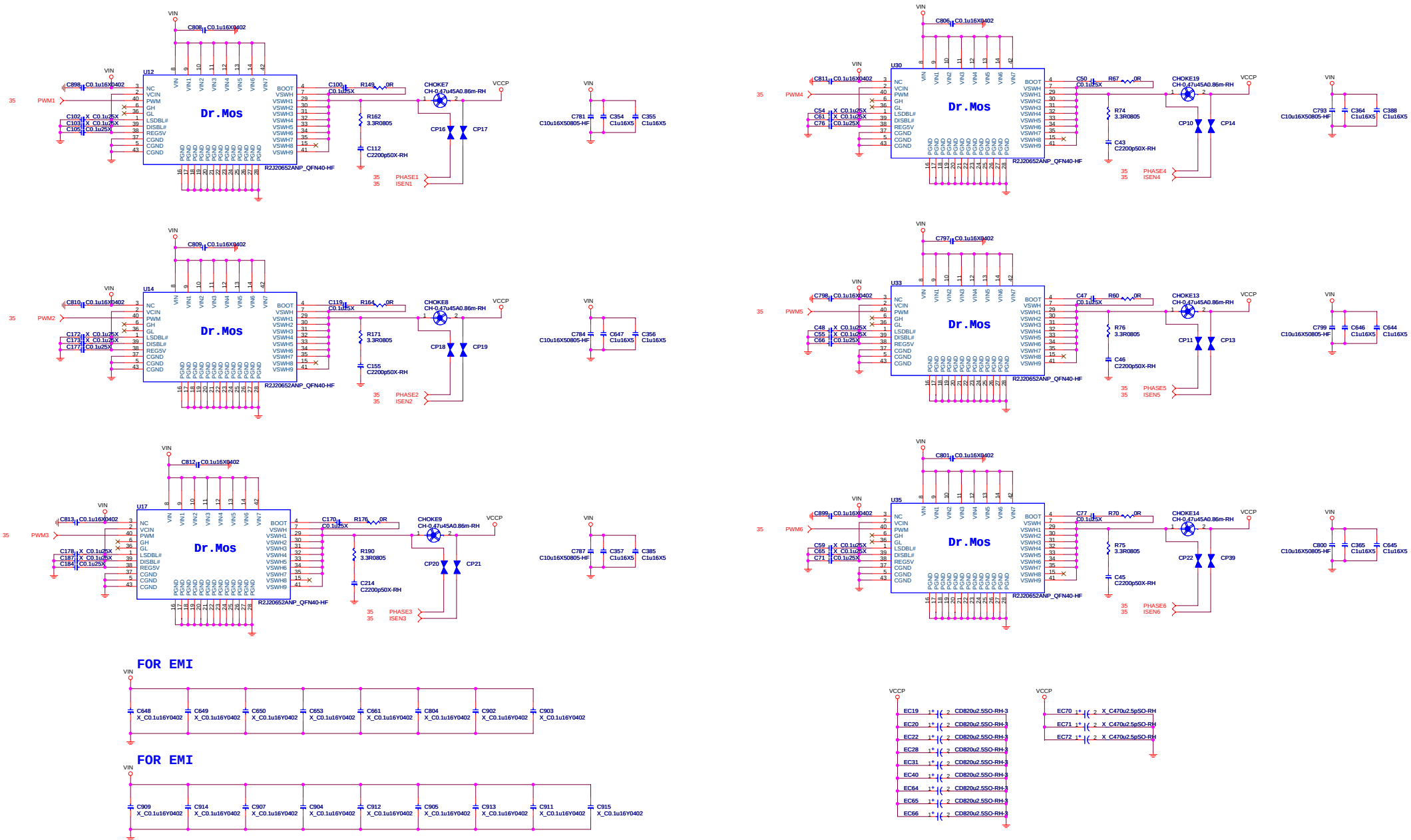


MSI MICRO-START INT'L CO.,LTD.

Title: PHASE EXTENDER

Size	Document Number	Rev
	MS-7712	1.0

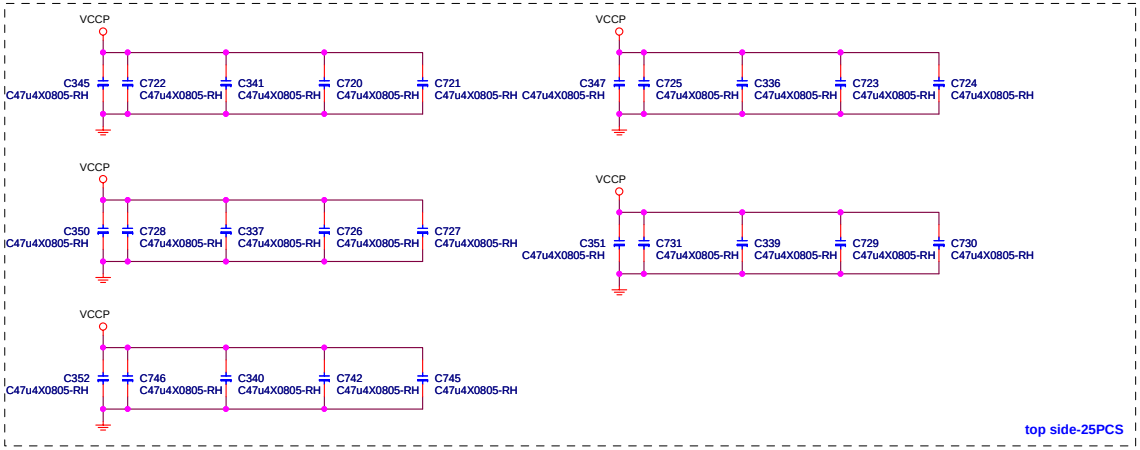
Date: Tuesday, September 27, 2011 Sheet 36 of 45



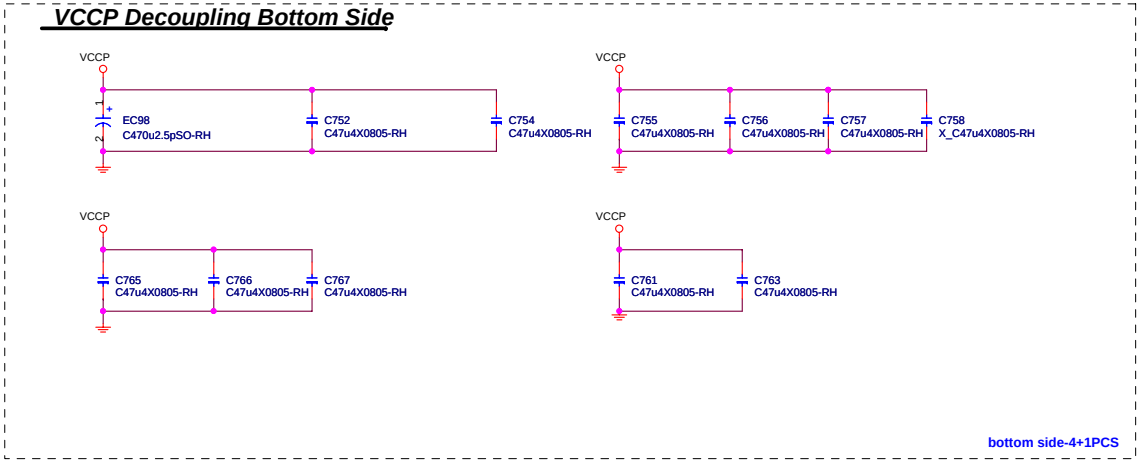
MICRO-START INTL CO.,LTD.

Title	VCCP POWER	
Size	Document Number MS-7712	Rev 1.0
Date: Tuesday, September 27, 2011	Sheet 37 of 45	

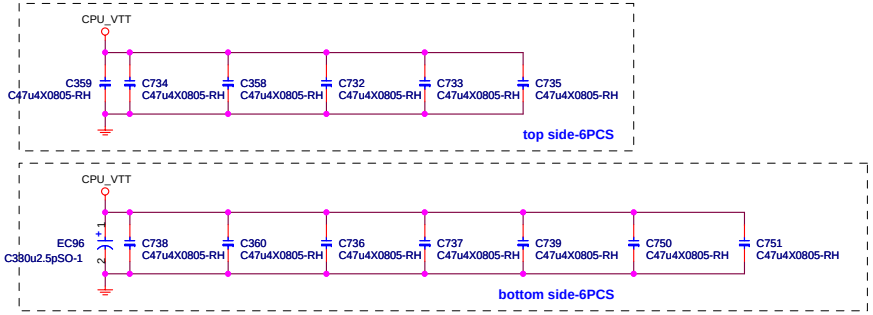
VCCP Decoupling



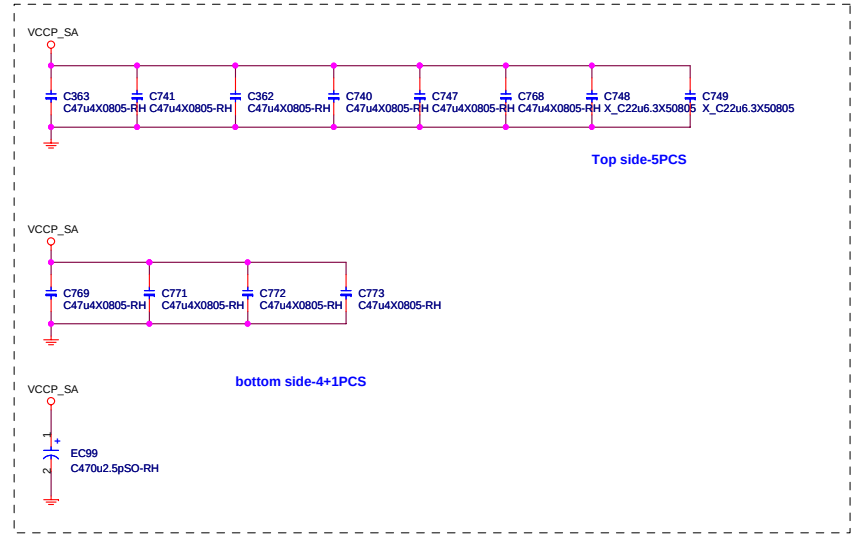
VCCP Decoupling Bottom Side



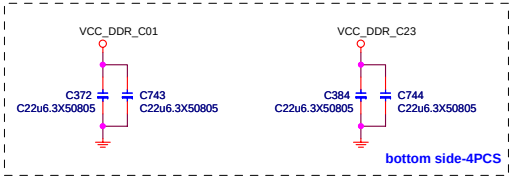
CPU_VTT Decoupling



CPU_VSA Decoupling



CPU VCC_DDR Decoupling

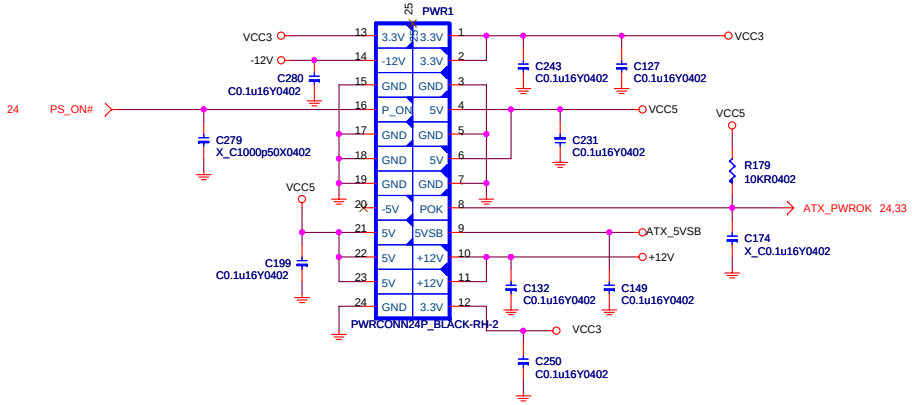


MICRO-START INT'L CO.,LTD.

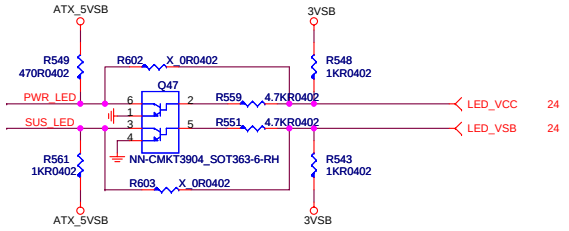
Title: VCCP & VSA POWER		
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 38 of 45	

ATX Power Connector / Front Panel / LED

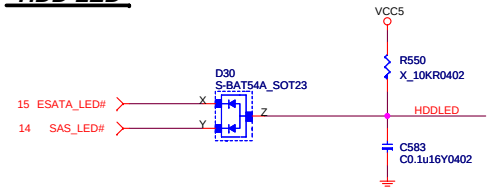
24 Pin ATX Power Connector



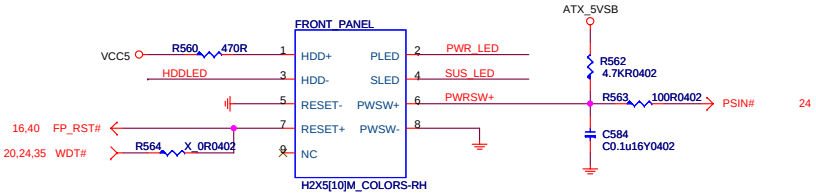
Power LED



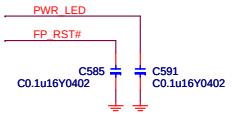
HDD LED



Front Panel

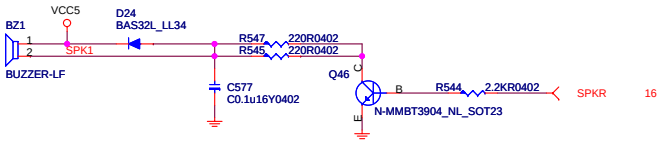


For EMI
(close pin header)



FOR EMI

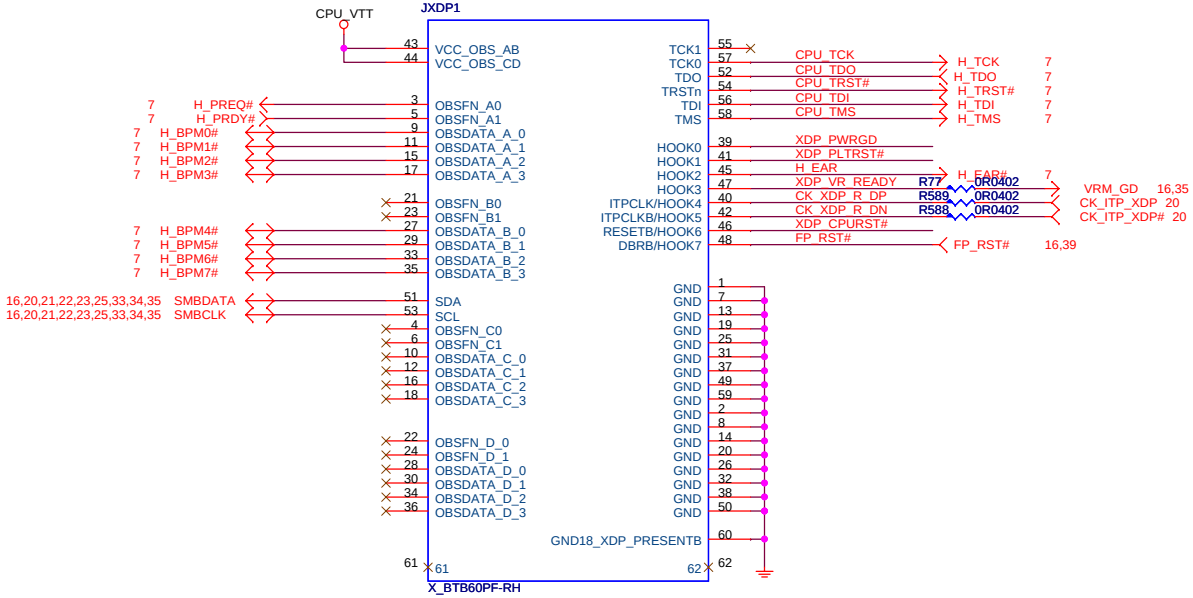
Buzzer Circuit

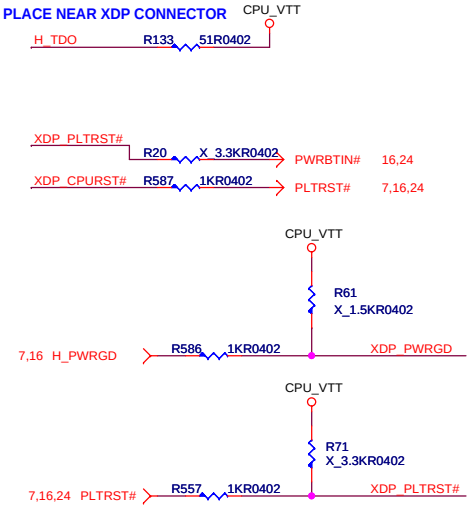


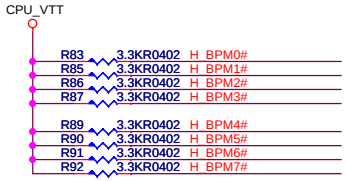
MICRO-START INT'L CO.,LTD.

Title	ATX Connector / Front Panel / LED	
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 39 of 45	

CPU XDP PORT



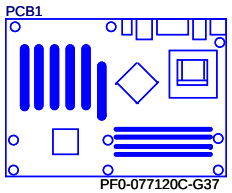




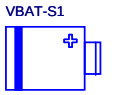
MSI Link to the Future **MICRO-START INT'L CO.,LTD.**

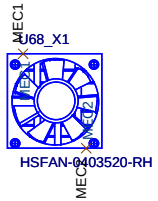
Title: **CPU/PCH XDP**		
Size	Document Number: **MS-7712**	Rev: **1.0**
Date: Tuesday, September 27, 2011	Sheet 40 of 45	

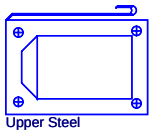
Manual Parts

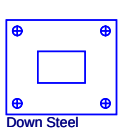


精成PF0-077120C-G37

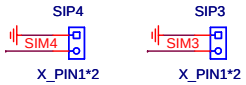


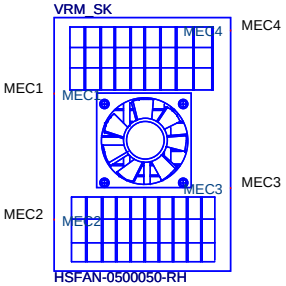






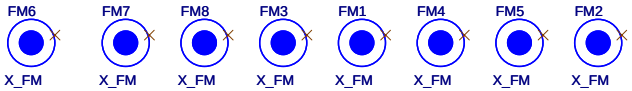
Simulation





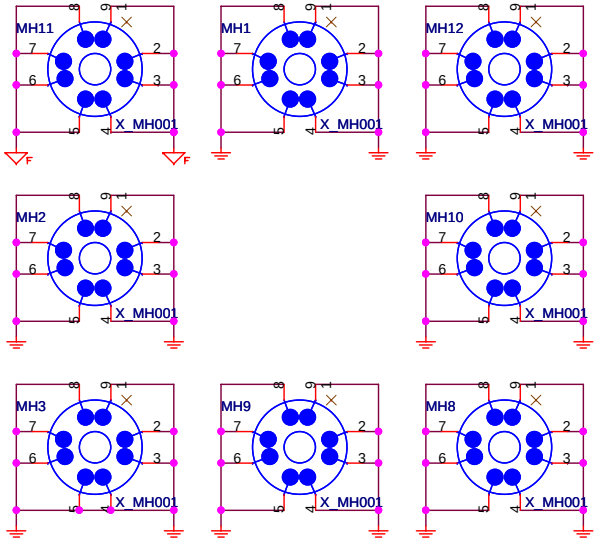
Optics Orientation Holes

Optical Fiducial Marks-120



PCB Mounting Holes

Mounting Holes



MICRO-START INT'L CO.,LTD.		
Title: Manual Parts & Option Parts		
Size	Document Number: MS-7712	Rev: 1.0
Date: Tuesday, September 27, 2011	Sheet 41 of 45	