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MS-7396L2-0A

CPU:

Intel Prescott
Intel Conroe
Intel Kentsfield
Intel Wolfdale

System Chipset:

Intel G31 - GMCH (North Bridge)
Intel ICH7(South Bridge)

On Board Chipset:

BIOS -- SPI FLASH 4Mb
Azalia CODEC(ALC 662)
LPC Super I/O -- ITE8718F
INTEL 82562GZ/82573L
Clock Generator - ICS9LP505-2

Main Memory:

Dual Channel DDR II * 2

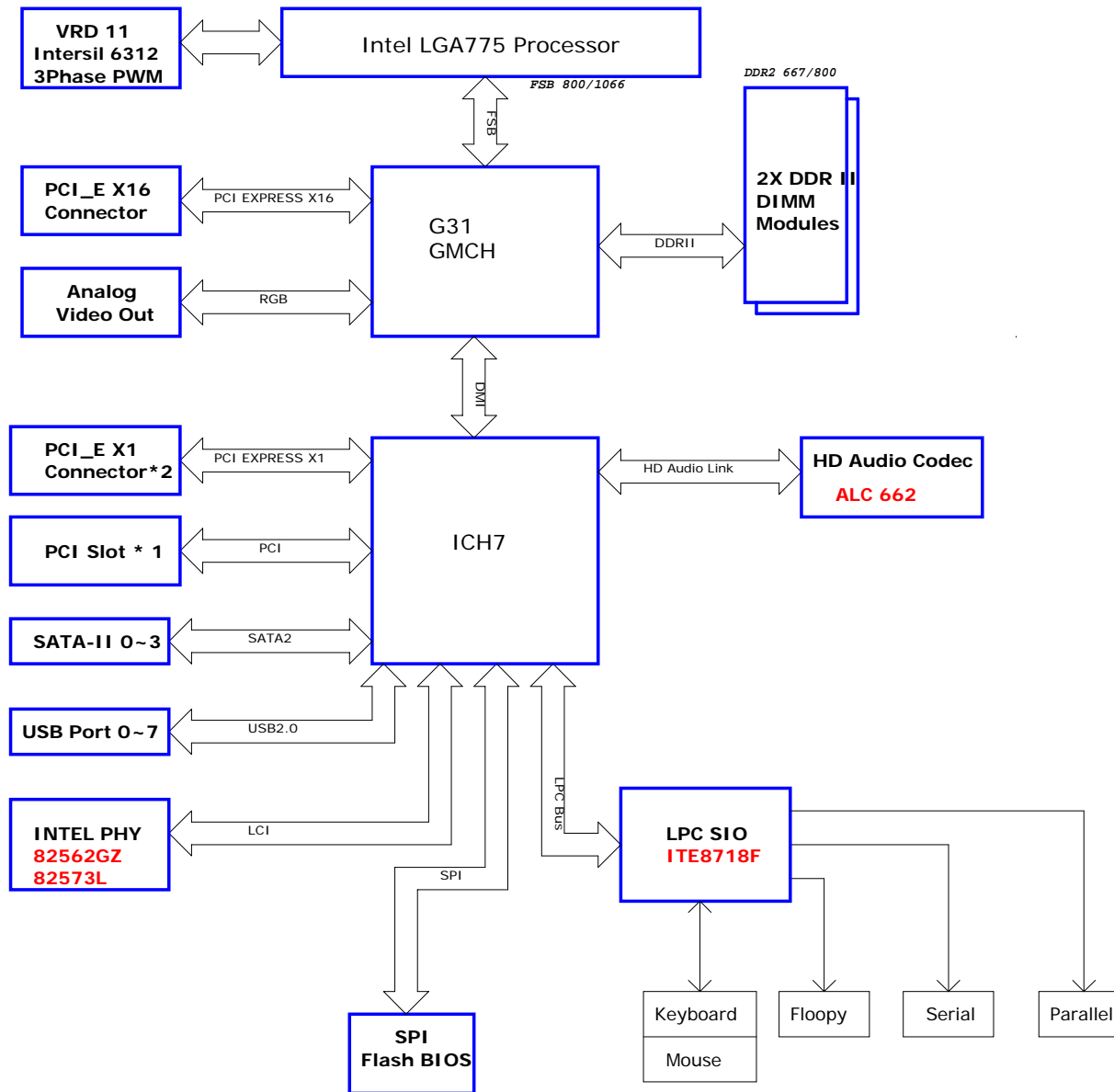
Expansion Slots:

PCI Express X16 SLOT * 1
PCI Express X1 SLOT * 2
PCI SLOT * 1

Intersil PWM:

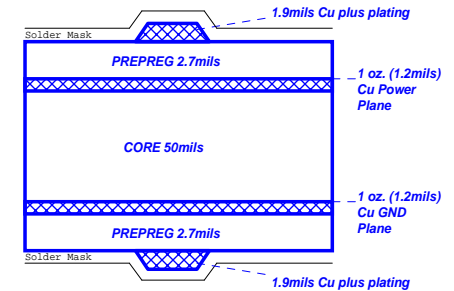
Intersil 6312 3 Phase

Block Diagram



Board Stack-up

(1080 Prepreg Considerations)



Single End 50ohm Top/Bottom : 4mils
 USB2.0 - 90ohm : 15/7.5/4.5/7.5/15
 SATA - 95ohm : 15/8/4/8/15
 LAN - 100ohm : 15/10/4/10/15
 PCIE - 95ohm : 15/8/4/8/15

ICH7

GPIO	Alt Func	Pin	I/O/NC	Power	PU	SMI	Tol	Default	Signal Name
GPIO[0]	BM_BUSY#	AB18	I/O	Vcc3p3	N	Y	5	Input	GPI0
GPIO[1]	PCIREQ[5]#	C8	I/O	V5REF	N	Y	5	Input	PREQ#5
GPIO[2]	PIRQE#	G8	I/OD	V5REF	N	Y	5	Input	PIRQ#E
GPIO[3]	PIRQF#	F7	I/OD	V5REF	N	Y	5	Input	PIRQ#F
GPIO[4]	PIRQG#	F8	I/OD	V5REF	N	Y	5	Input	PIRQ#G
GPIO[5]	PIRQH#	G7	I/OD	V5REF	N	Y	5	Input	PIRQ#H
GPIO[6]	unmuxed	AC21	I/O	Vcc3p3	N	Y	3.3	Input	ATADET0
GPIO[7]	unmuxed	AC18	I/O	Vcc3p3	N	Y	3.3	Input	GPI7
GPIO[8]	unmuxed	E21	I/O	VccSus3p3	N	Y	3.3	Input	GPI8
GPIO[9]	unmuxed	E20	I/O	VccSus3p3	N	Y	3.3	Input	GPI9
GPIO[10]	unmuxed	A20	I/O	VccSus3p3	N	Y	3.3	Input	GPI10
GPIO[11]	SMBALERT#	B23	I/O	VccSus3p3	N	Y	3.3	Input	SMB_ALERT#
GPIO[12]	unmuxed	F19	I/O	VccSus3p3	N	Y	3.3	Input	CLR_COMS#
GPIO[13]	unmuxed	E19	I/O	VccSus3p3	N	Y	3.3	Input	SIO_PME#
GPIO[14]	unmuxed	R4	I/O	VccSus3p3	N	Y	3.3	Input	GPI14
GPIO[15]	unmuxed	E22	I/O	VccSus3p3	N	Y	3.3	Input	GPI15
GPIO[16]	unmuxed	AC22	I/O	Vcc3p3	N	N	3.3	N/A	GPIO16_ICH
GPIO[17]	PCIGNT[5]#	D8	I/O	Vcc3p3	N	N	3.3	Input	PGNT#5
GPIO[18]	unmuxed	AC20	I/O	Vcc3p3	N	N	3.3	N/A	NC
GPIO[19]	SATA1GP	AH18	I/O	Vcc3p3	N	N	3.3	Input	GPI19
GPIO[20]	unmuxed	AF21	I/O	Vcc3p3	N	N	3.3	Input	FAN_CTRL
GPIO[21]	SATA0GP	AF19	I/O	Vcc3p3	N	N	3.3	Input	GPI21
GPIO[22]	PCIREQ[4]#	A13	I/O	Vcc3p3	N	N	3.3	Input	PREQ#4
GPIO[23]	LDRQ1#	AA5	I/O	Vcc3p3	N	N	3.3	Input	GPI23
GPIO[24]		R3	I/O	VccSus3p3	N	N	3.3	Input	LAN_DIS#
GPIO[25]	unmuxed	D20	I/O	VccSus3p3	Y	N	3.3	Input	DMI_MODE
GPIO[26]	unmuxed	A21	I/O	VccSus3p3	N	N	3.3	N/A	NC
GPIO[27]	unmuxed	B21	I/O	VccSus3p3	N	N	3.3	N/A	NC
GPIO[28]	unmuxed	E23	I/O	VccSus3p3	N	N	3.3	N/A	NC
GPIO[29]	OC5#	C3	I/O	VccSus3p3	N	N	3.3	Input	OC#2
GPIO[30]	OC6#	A2	I/O	VccSus3p3	N	N	3.3	Input	OC#2
GPIO[31]	OC7#	B3	I/O	VccSus3p3	N	N	3.3	Input	OC#2
GPIO[32]	unmuxed	AG18	I/O	Vcc3p3	N	N	3.3	Input	NC
GPIO[33]	unmuxed	AC19	I/O	Vcc3p3	N	N	3.3	N/A	NC
GPIO[34]	unmuxed	U2	I/O	Vcc3p3	N	N	3.3	N/A	NC
GPIO[35]	unmuxed	AD21	I/O	Vcc3p3	N	N	3.3	N/A	NC
GPIO[36]	SATA2GP	AH19	I/O	Vcc3p3	N	N	3.3	Input	GPIO36_ICH
GPIO[37]	SATA3GP	AE19	I/O	Vcc3p3	N	N	3.3	Input	GPIO37_ICH
GPIO[38]		AD20	I/O	Vcc3p3	N	N	3.3	Input	SPI_WP#1
GPIO[39]	unmuxed	AE20	I/O	Vcc3p3	N	N	3.3	Input	SPI_WP#2
GPIO[48]	GNT4#	A14	I/O	Vcc3p3	N	N	3.3	N/A	PGNT#4
GPIO[49]	CPUPWRGD	AG24	I/O	V_CPU_IO	N	N	CPU	N/A	H_PWRGD

Following are the GPIOs that need to be terminated properly if not used:
GPIO[39:36,23:21,19,7:0]: default as inputs and should be pulled up to Vcc3_3 if unused.
GPIO[31:29,15:8]: default as inputs and should be pulled up to VccSus3_3 if unused.

PCI Config.

DEVICE	MCP1 INT Pin	REQ#/GNT#	IDSEL	CLOCK
PCI SLOT 1	PIRQ#A PIRQ#B PIRQ#C PIRQ#D	PREQ#0 PGNT#0	AD16	PCI_CLK0
PCI 1394	PIRQ#C	PREQ#2 PGNT#2	AD20	1394_PCLK

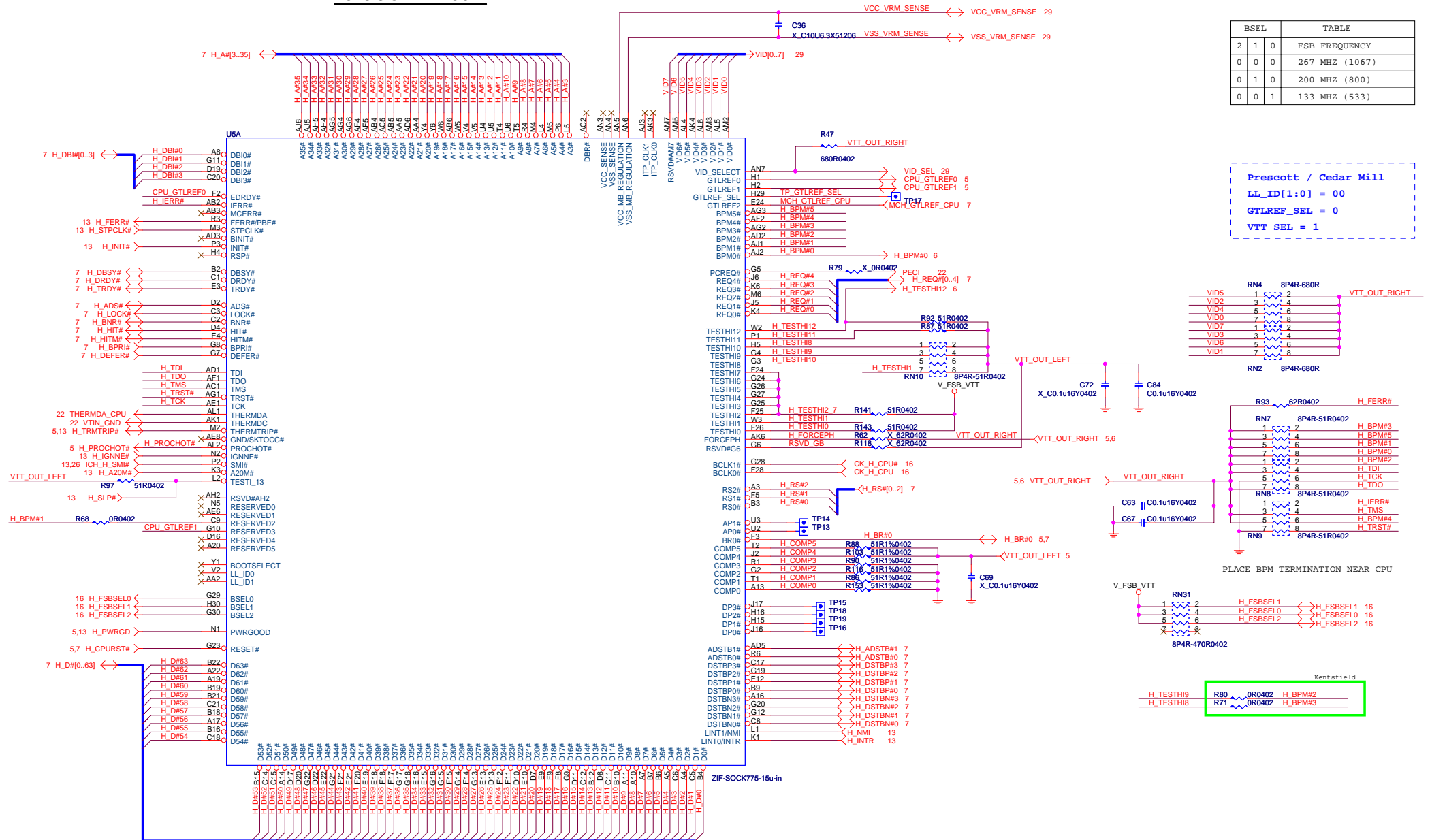
DDRII DIMM Config.

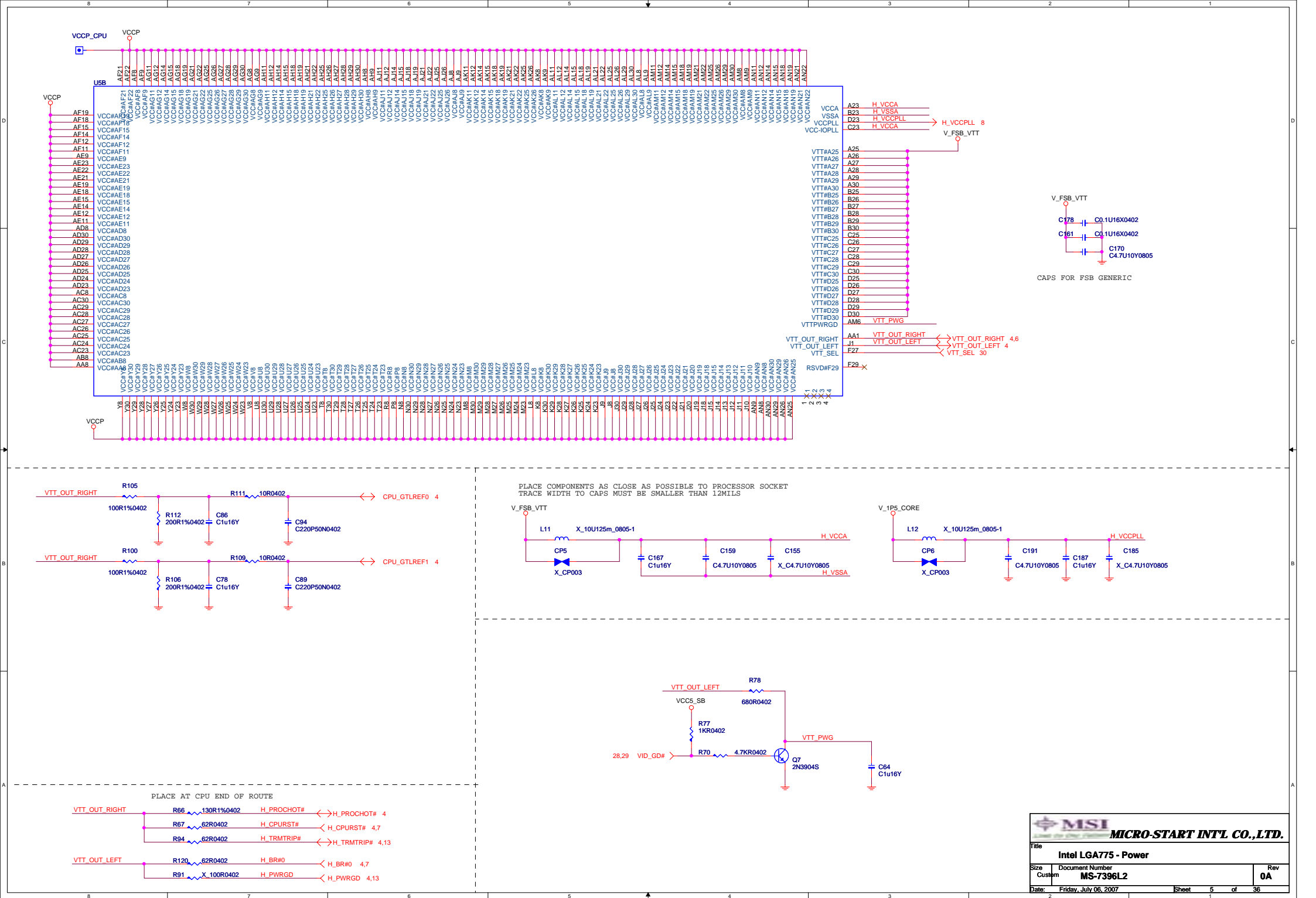
DEVICE	ADDRESS	CLOCK
DIMM 1	A0H	MCLK_A0/MCLK_A#0 MCLK_A1/MCLK_A#1 MCLK_A2/MCLK_A#2
DIMM 2	A4H	MCLK_B0/MCLK_B#0 MCLK_B1/MCLK_B#1 MCLK_B2/MCLK_B#2

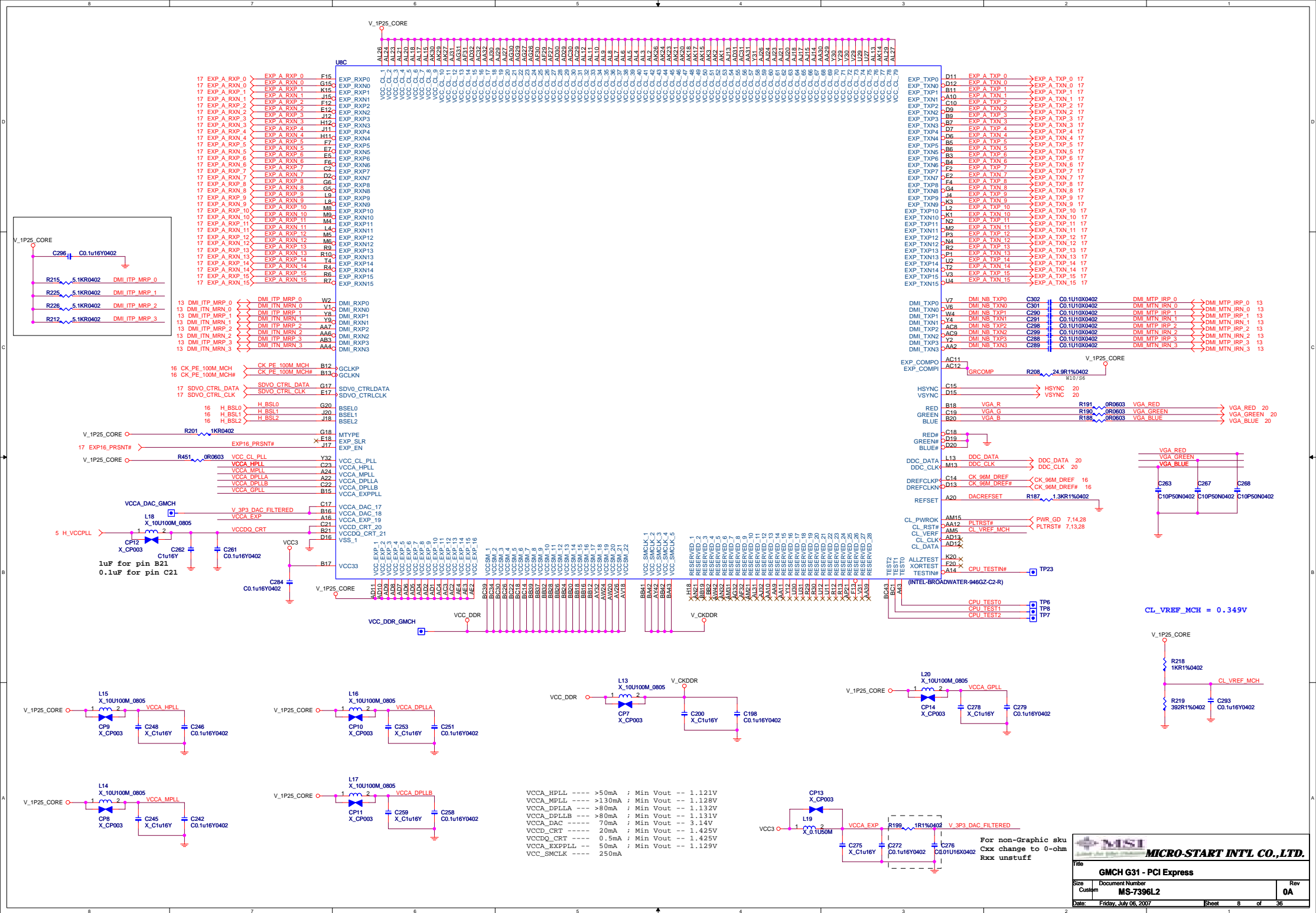
JUMPER SETTING

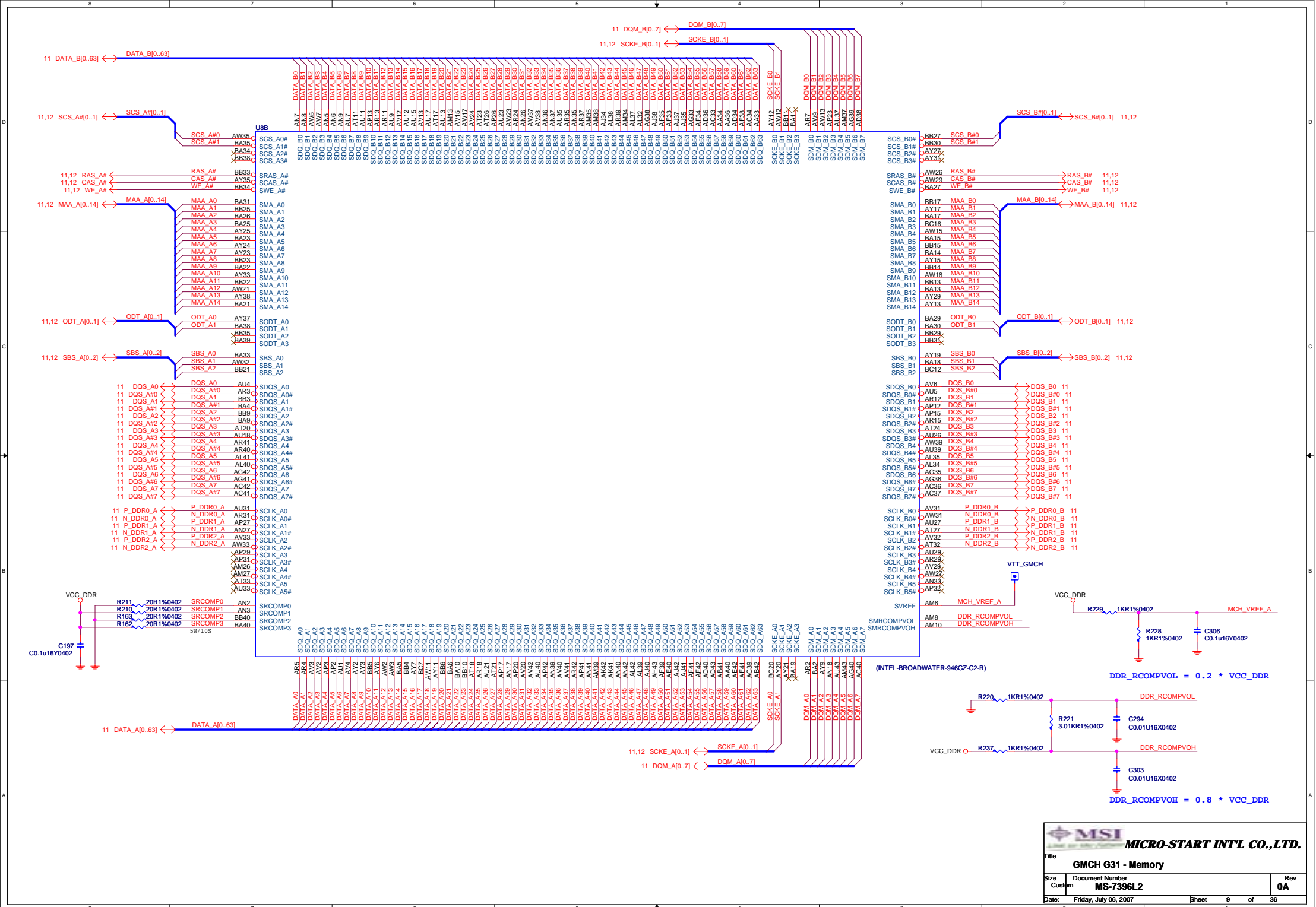
JBAT1	(1-2)NORMAL	(2-3)CLEAR
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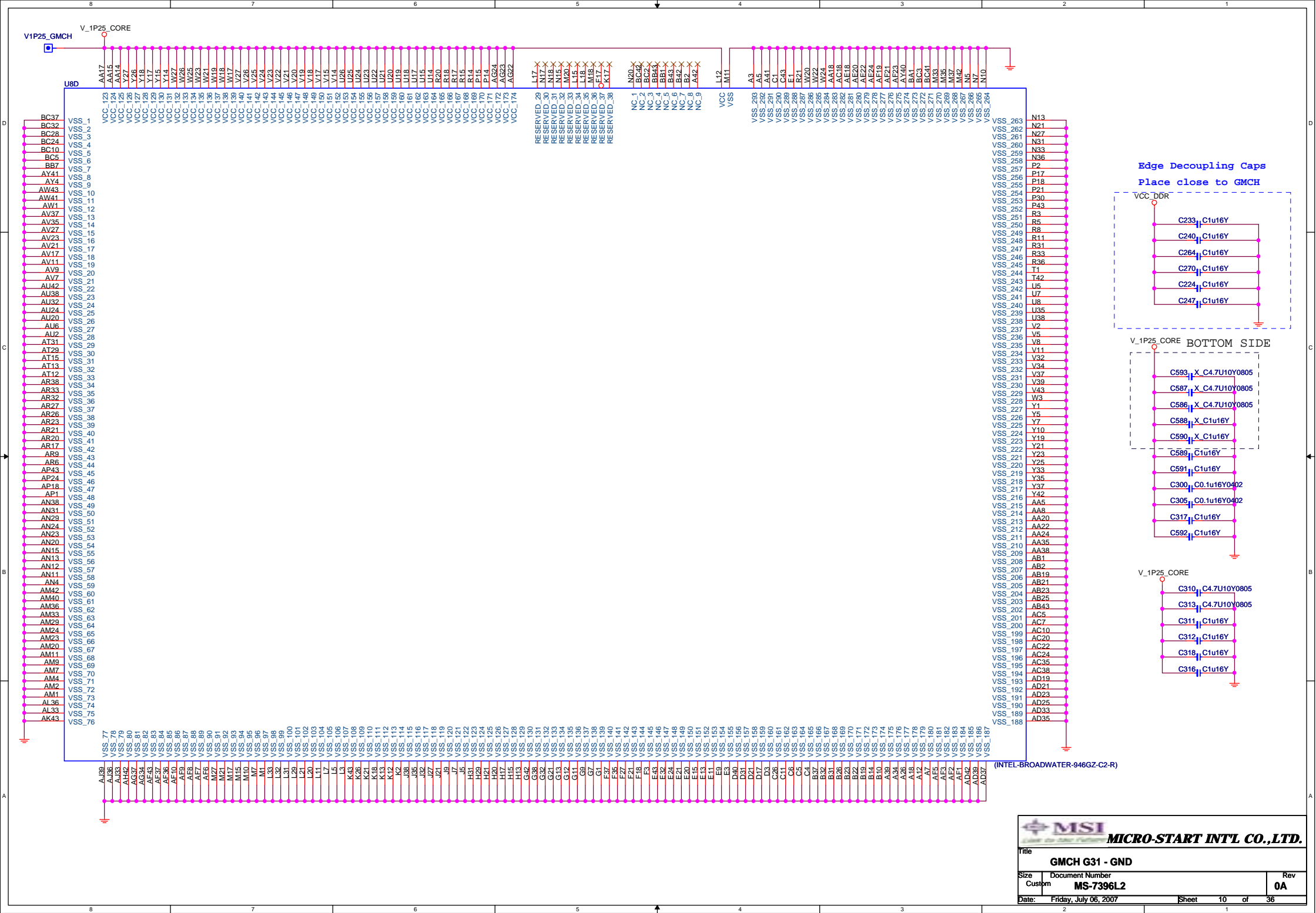
CPU SIGNAL BLOCK

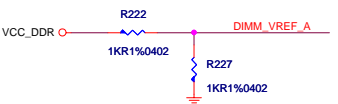
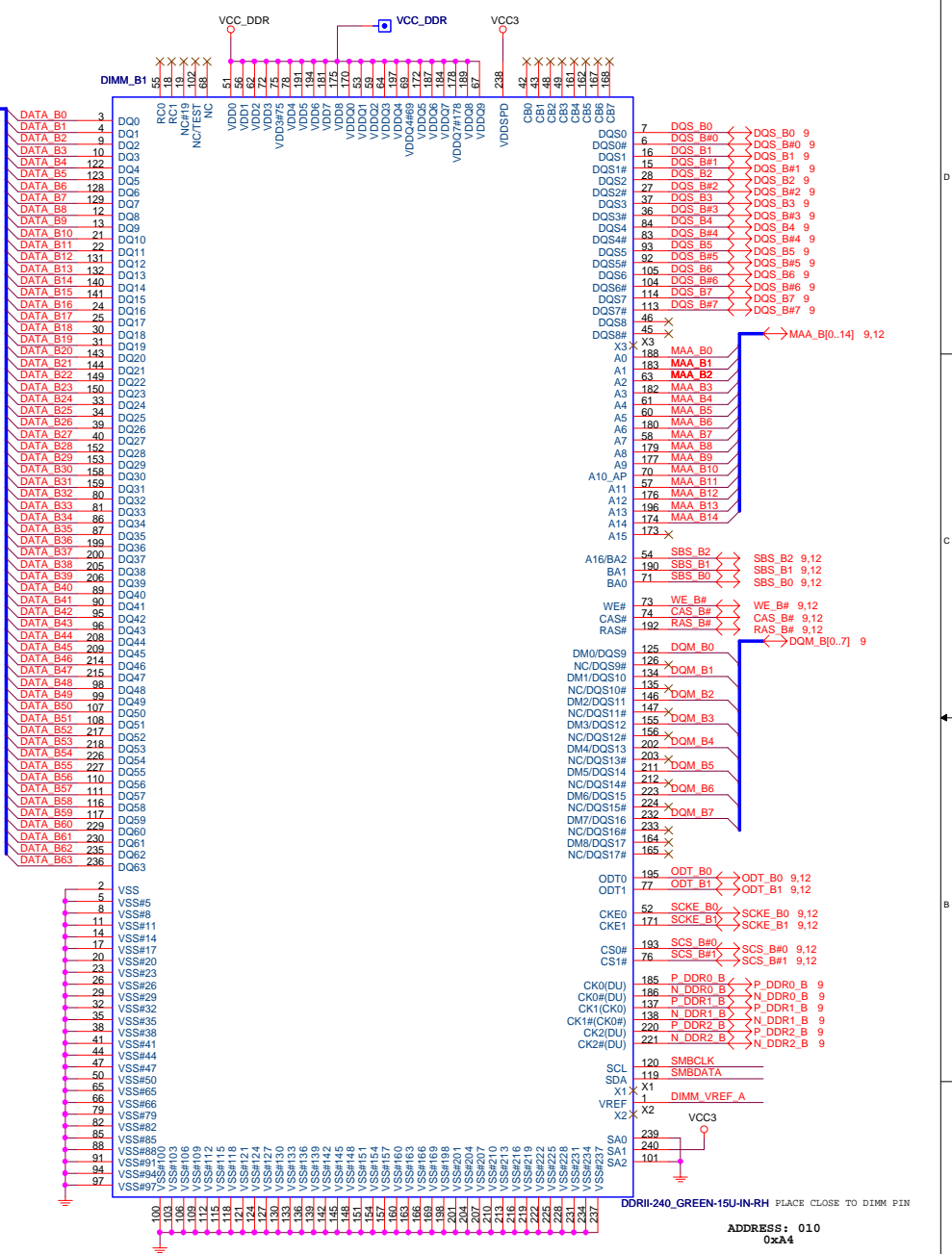
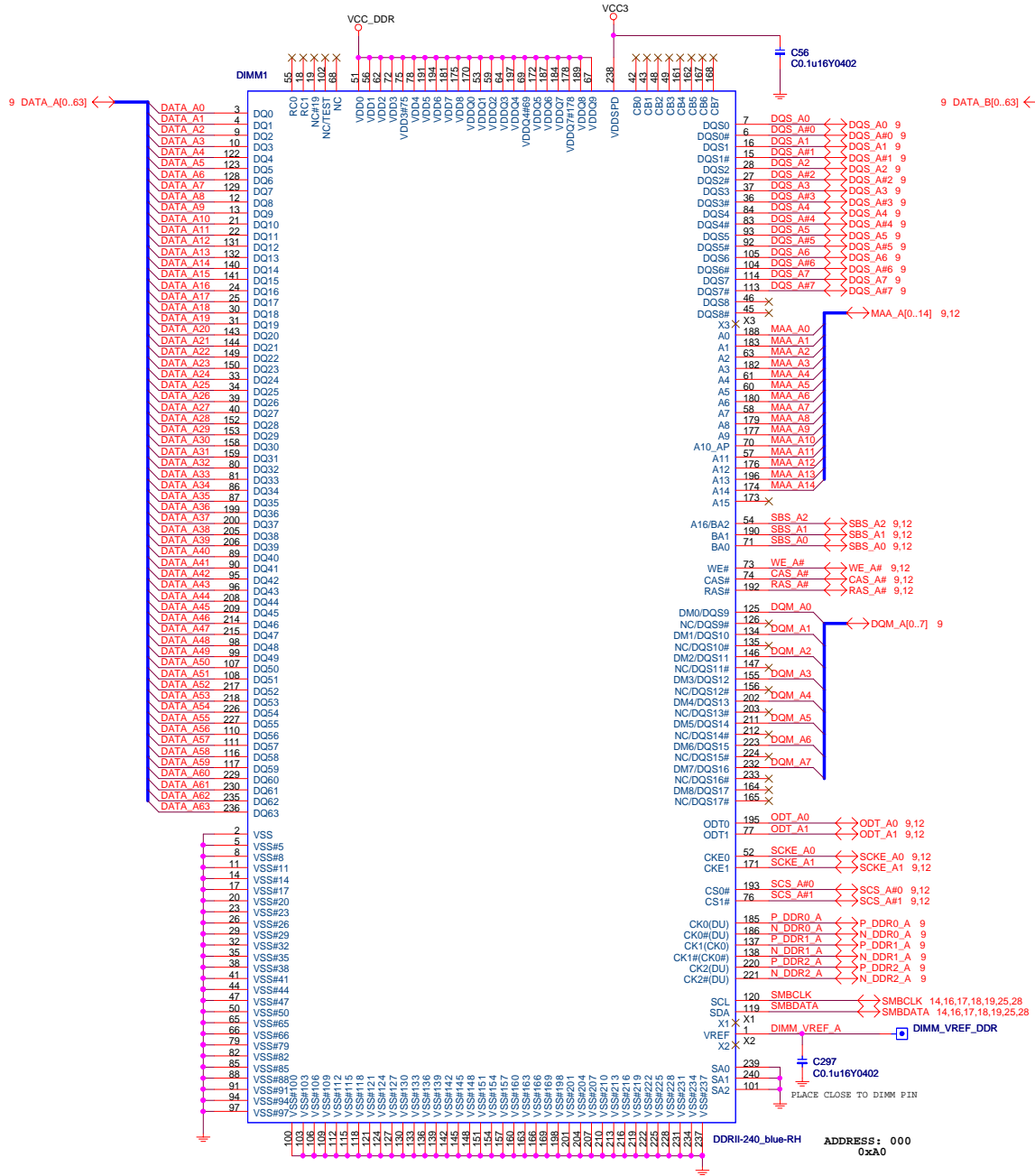








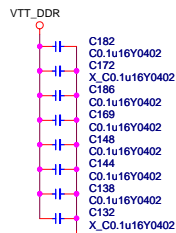




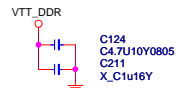
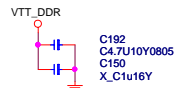
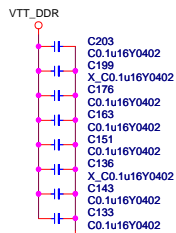
DDR2 DIMM1

DDR2 DIMM2

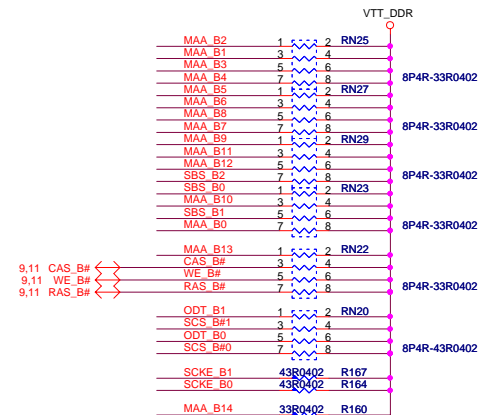
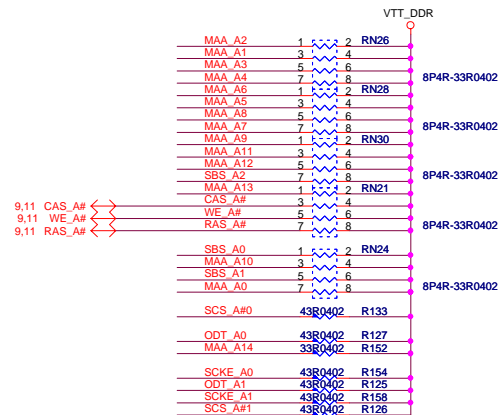
CHANNEL A VTT_DDR
DECOUPLING CAPS



CHANNEL B VTT_DDR
DECOUPLING CAPS

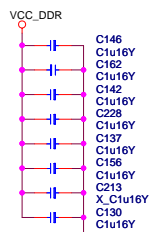
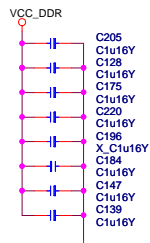


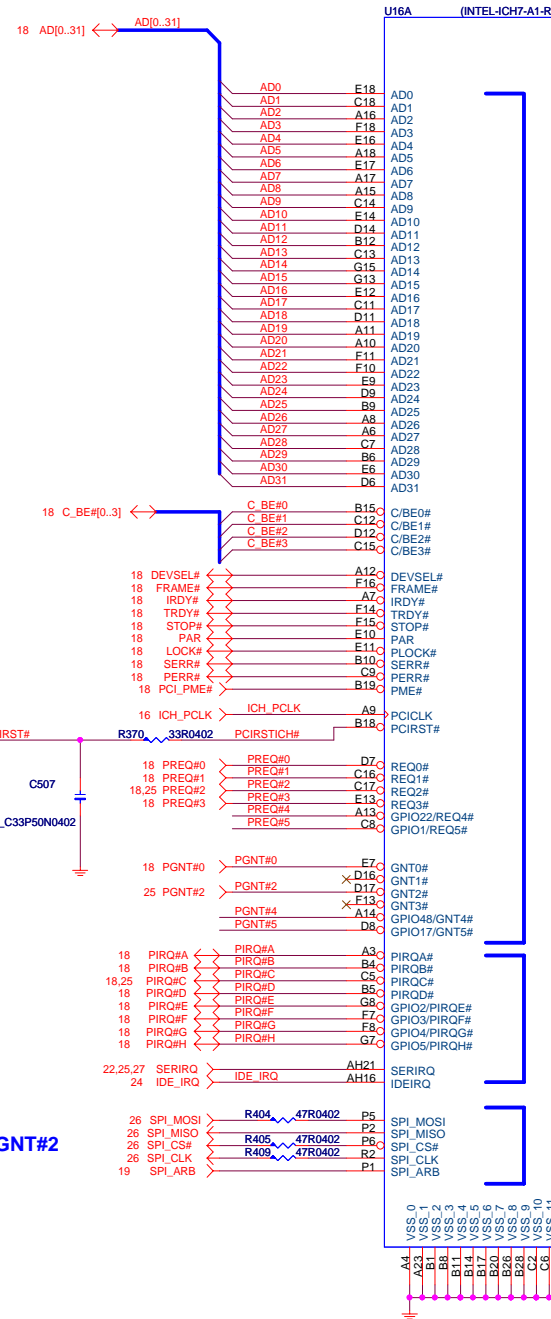
DDR II TERMINATION



9,11 MAA_A[0..14] <->
9,11 SBS_A[0..2] <->
9,11 SCS_A#[0..1] <->
9,11 SCKE_A[0..1] <->
9,11 ODT_A[0..1] <->

9,11 MAA_B[0..14] <->
9,11 SBS_B[0..2] <->
9,11 SCS_B#[0..1] <->
9,11 SCKE_B[0..1] <->
9,11 ODT_B[0..1] <->





ICH 7
PART 1/3

PCI INTERFACE

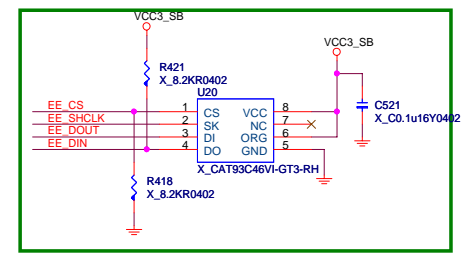
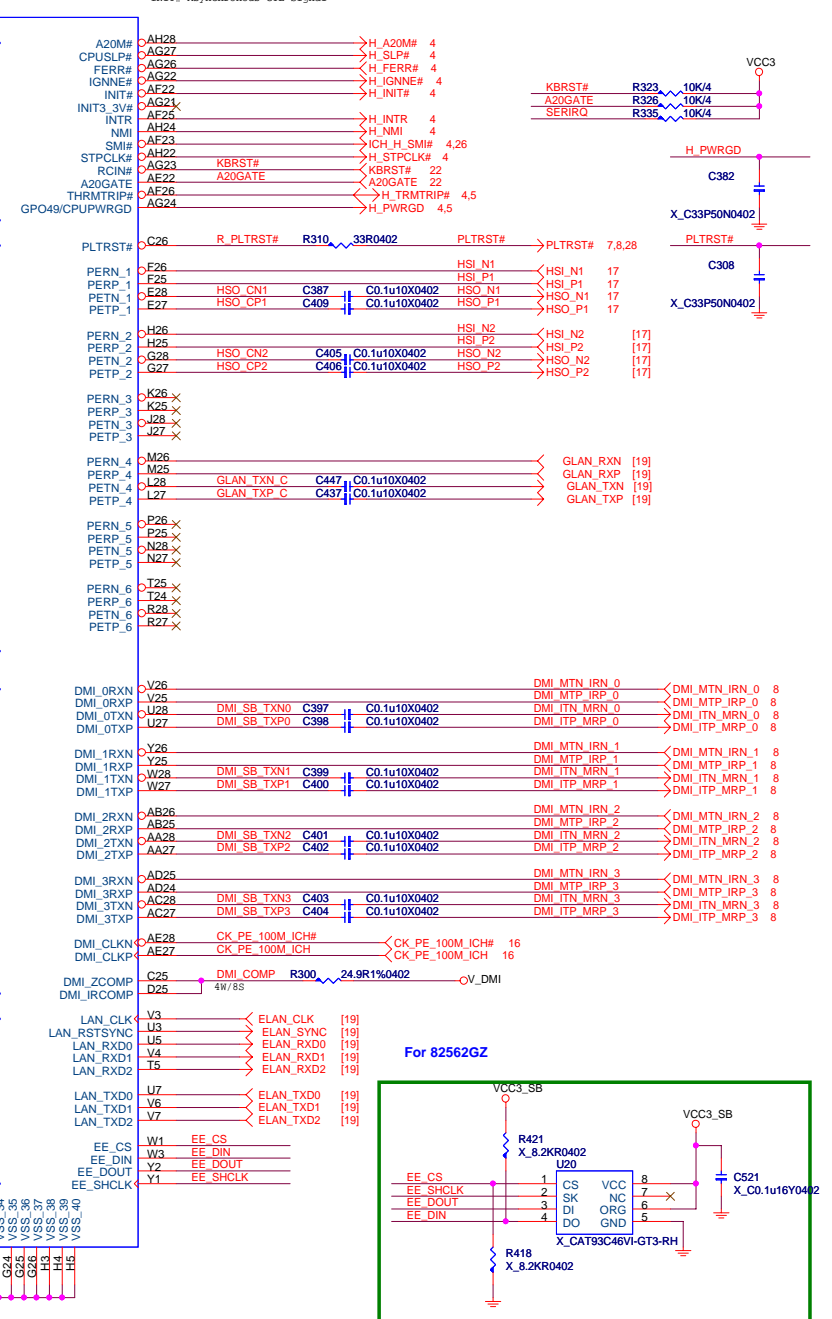
PCI EXPRESS

DIRECT MEDIA

LAN

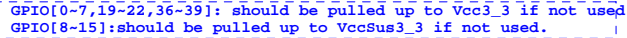
INTERRUPT

SPI



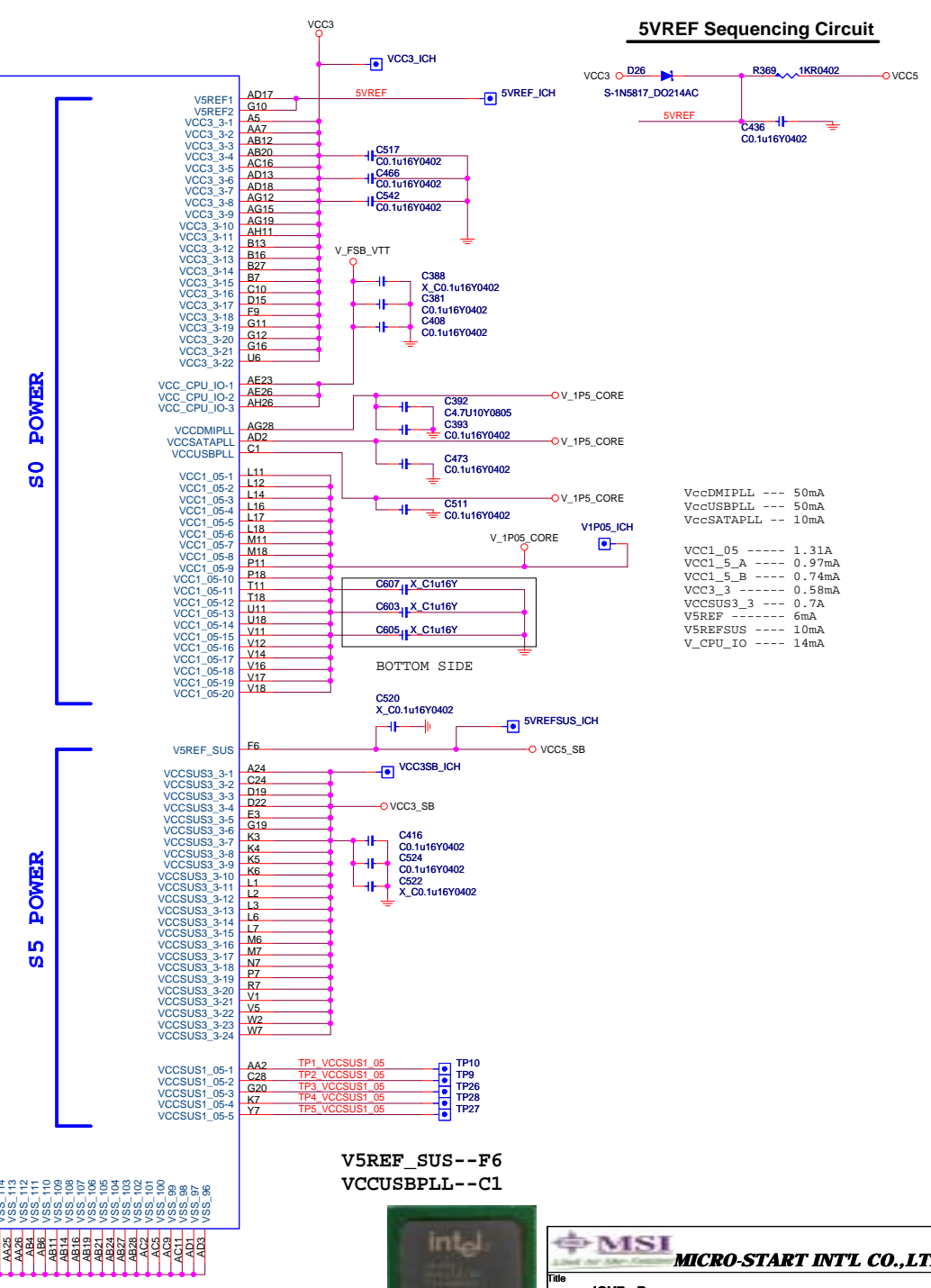
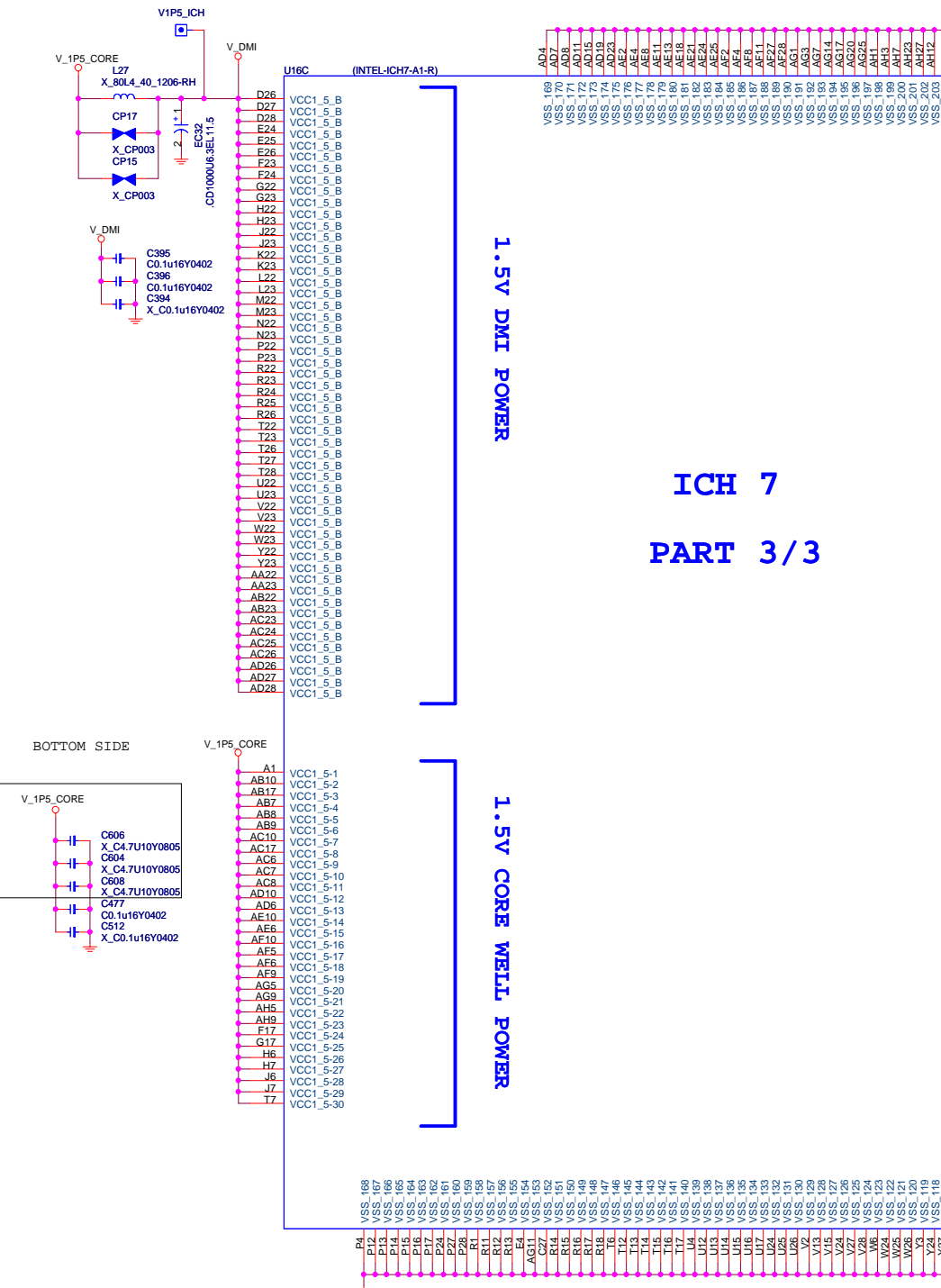
* Put a GND Plane under X'TAL

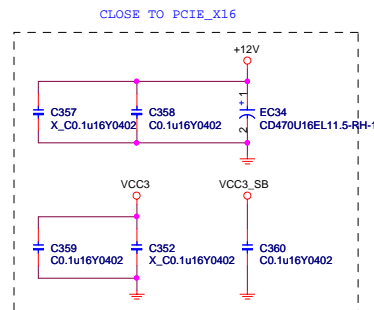
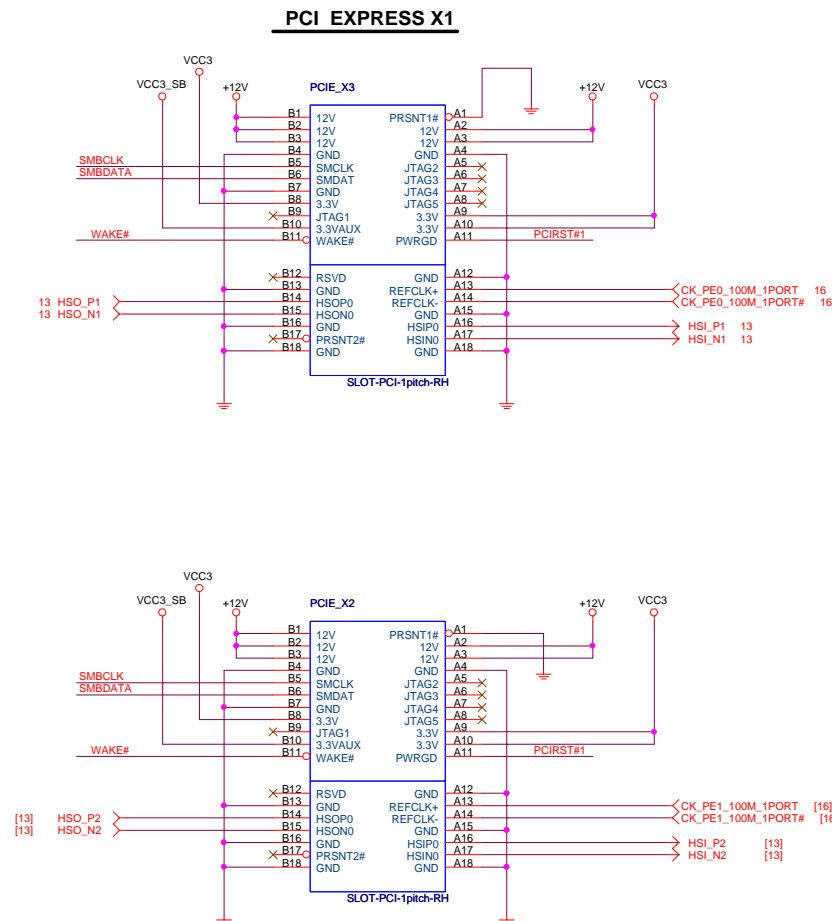
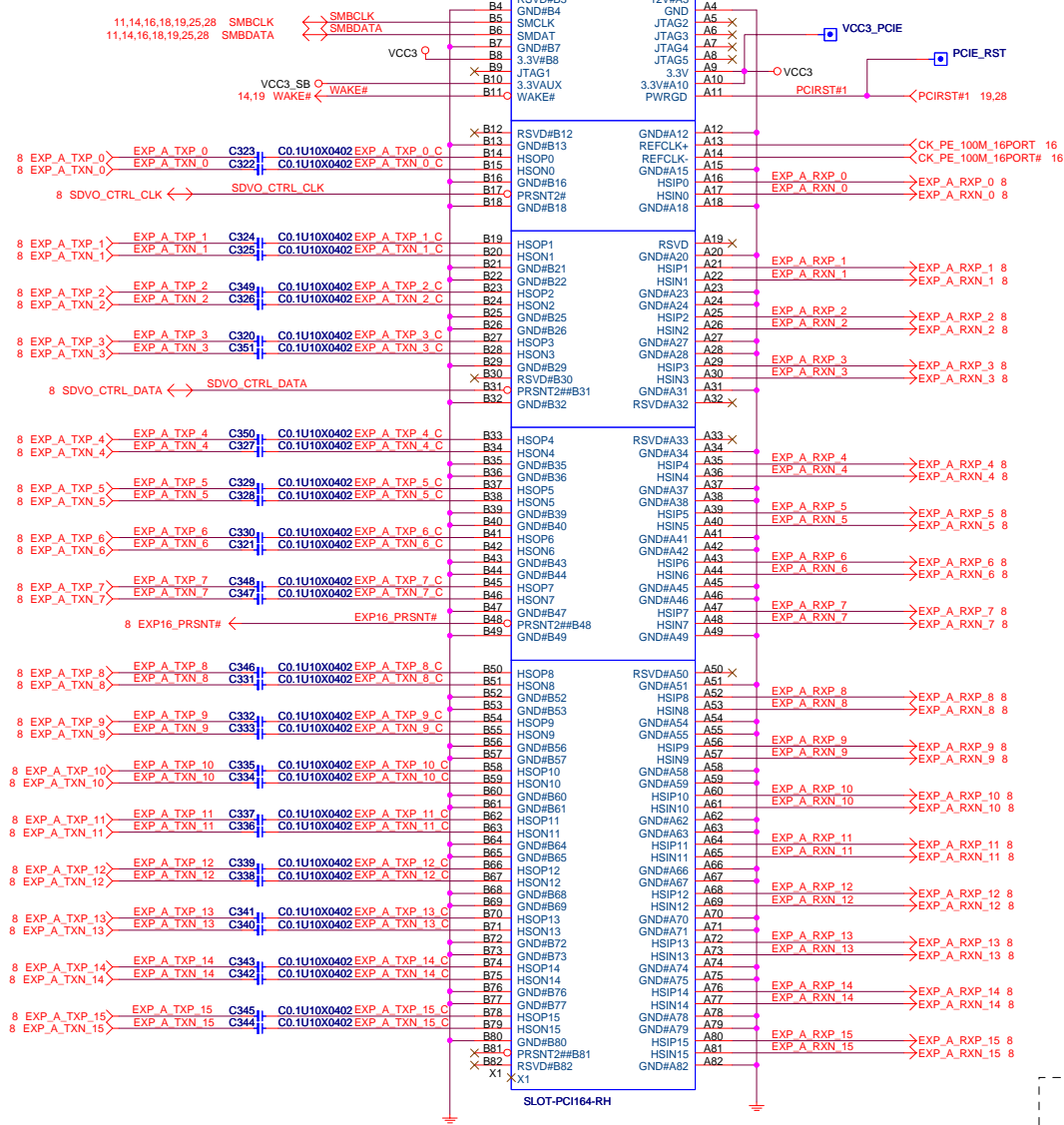
* Put a GND Plane under X'TAL



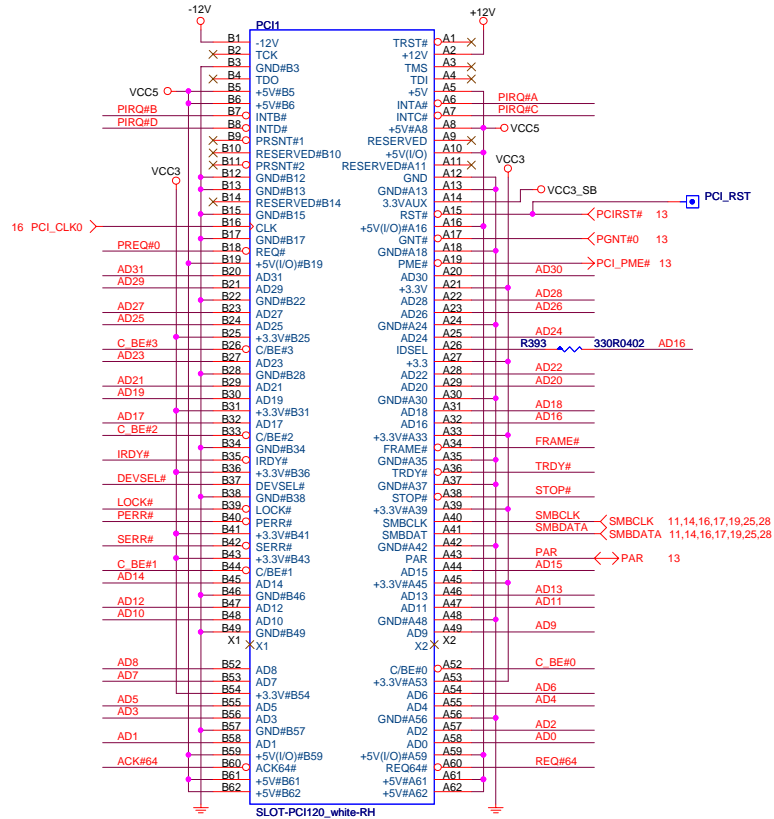
Firmware Hub/LPC interface:
No external pull-ups required.
Connect straight to FWH/LPC.
ICH7 integrates 20K ohm nominal
pull-up.





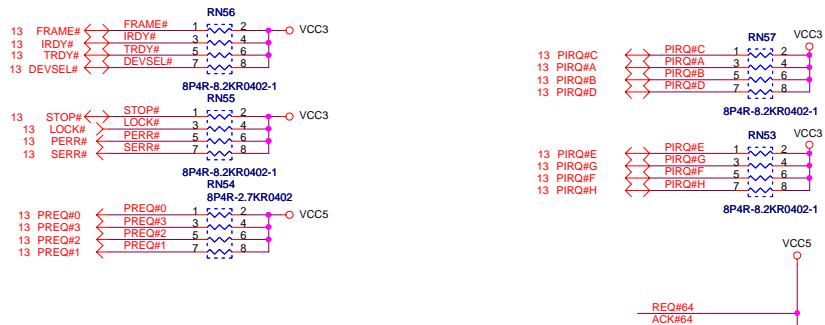


PCI SLOT 1 (PCI VER: 2.3 COMPLY)

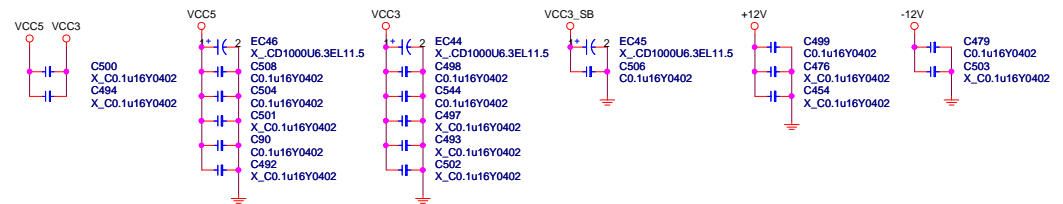


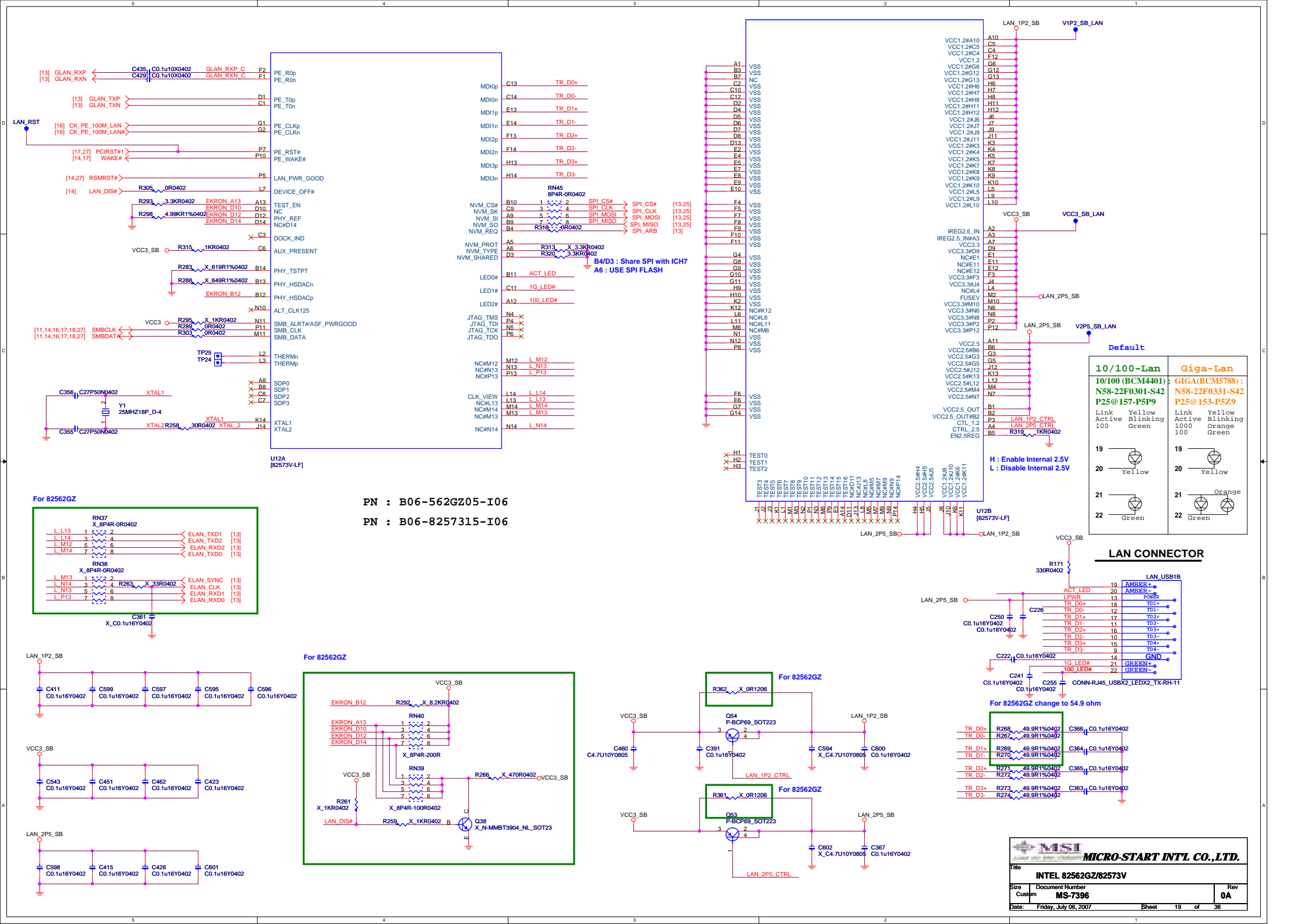
IDSEL = AD16
MASTER = PREQ#0
PCI_INTA#

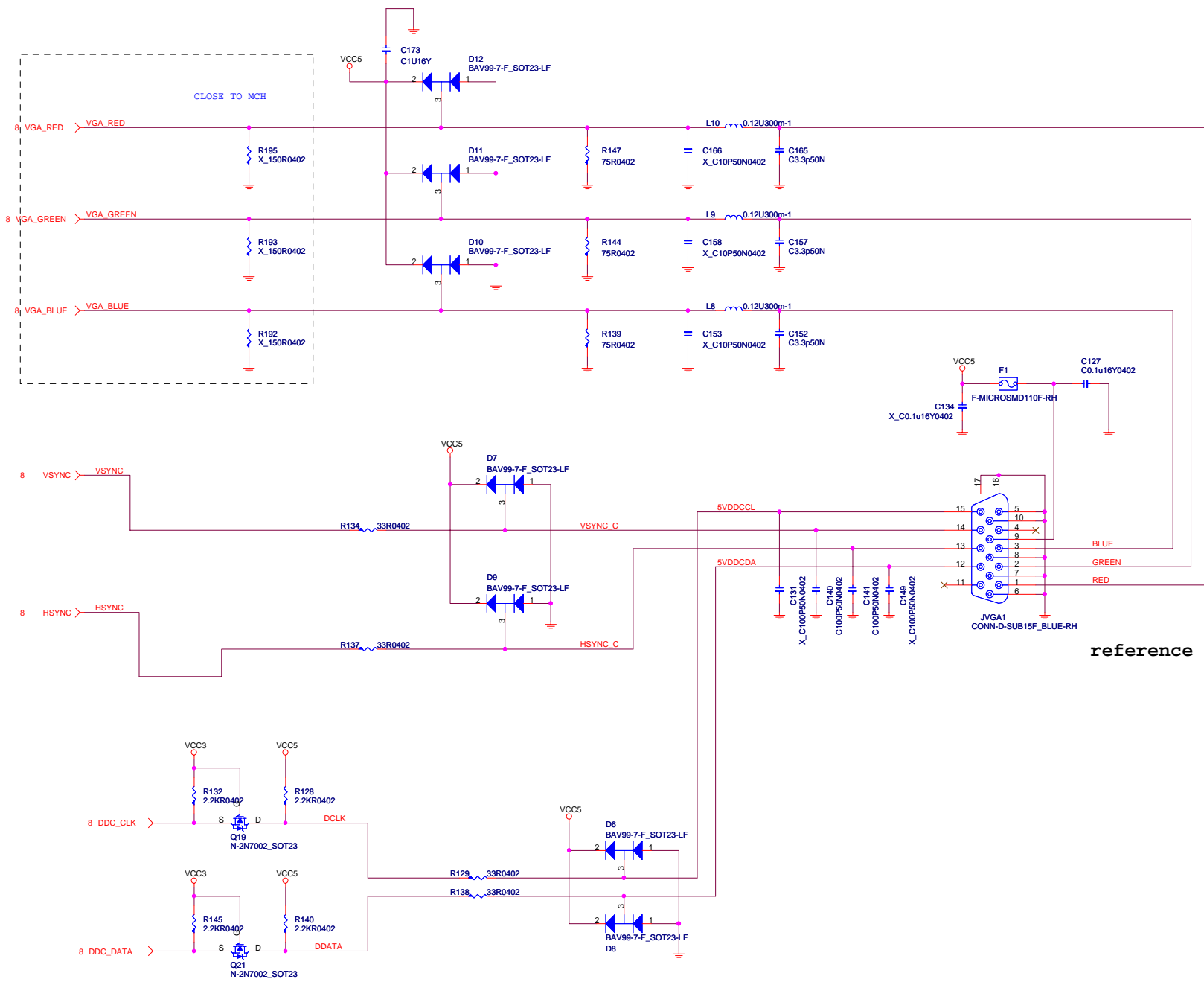
PCI PULL-UP / DOWN RESISTORS



PCI SLOT DECOUPLING CAPACITORS

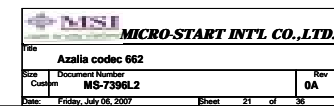
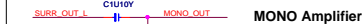
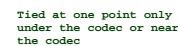
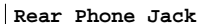






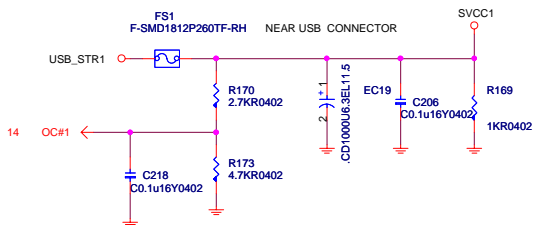
reference to GND.

JD resistors and front microphone input cap. should be placed as close as possible to the sense pin of CODEC.

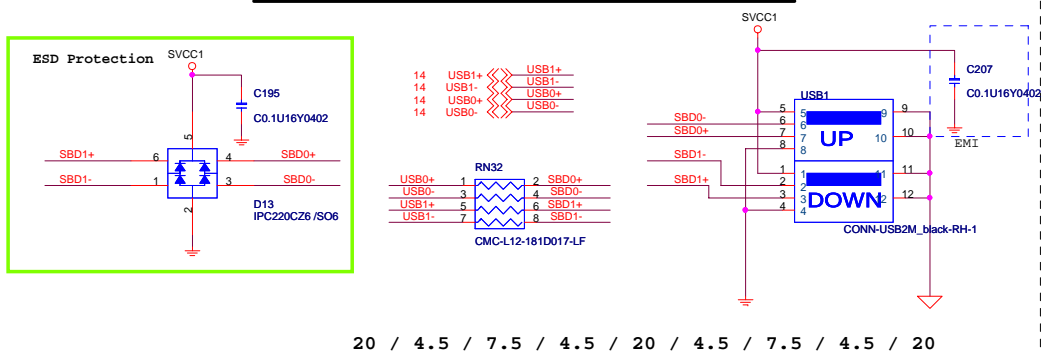


POWER CIRCUIT FOR USB PORT 0,1,2,3

Rear



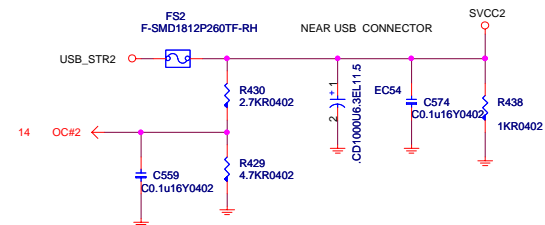
REAR PANEL USB CONNECTOR FOR USB PORT 0,1



20 / 4.5 / 7.5 / 4.5 / 20 / 4.5 / 7.5 / 4.5 / 20

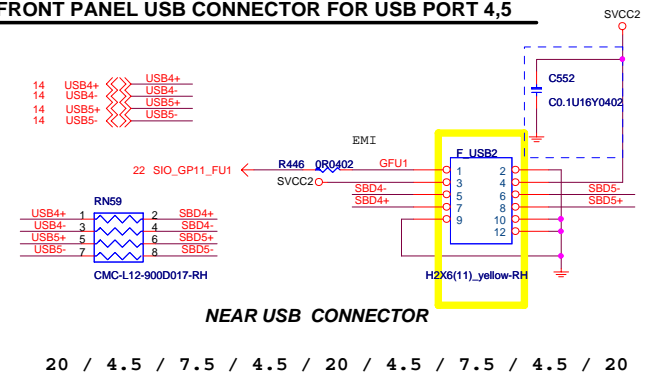
POWER CIRCUIT FOR USB PORT 4,5,6,7

FRONT



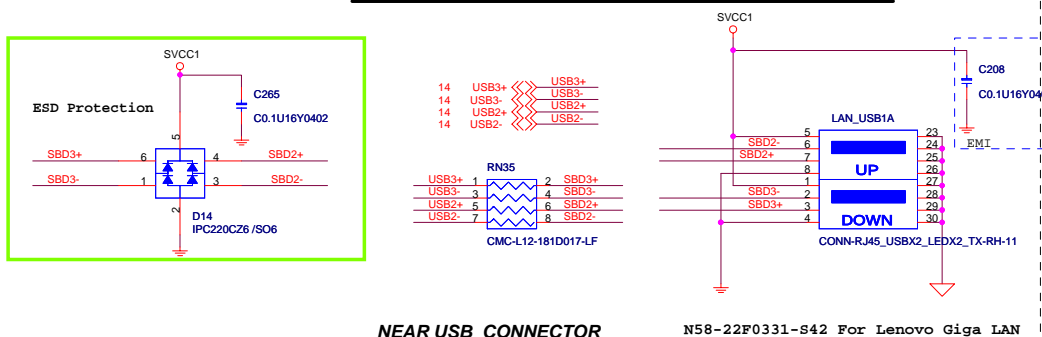
Reserved, can be taken off riser card within bead

FRONT PANEL USB CONNECTOR FOR USB PORT 4,5



20 / 4.5 / 7.5 / 4.5 / 20 / 4.5 / 7.5 / 4.5 / 20

REAR PANEL USB CONNECTOR FOR USB PORT 2,3

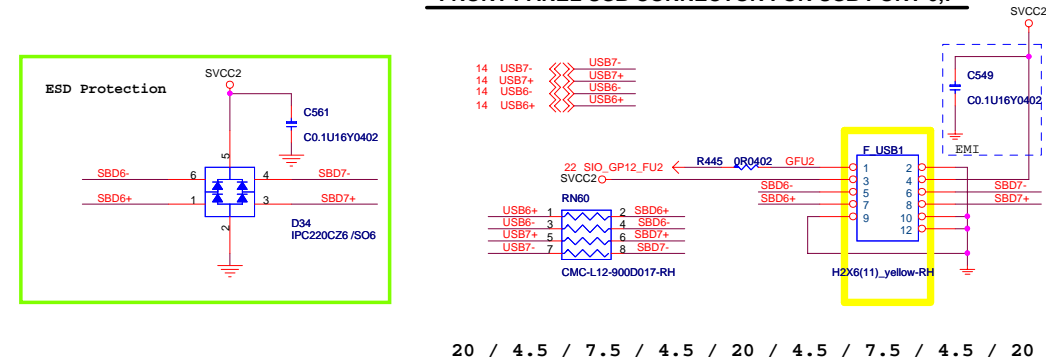


NEAR USB CONNECTOR

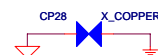
N58-22F0331-S42 For Lenovo Giga LAN

20 / 4.5 / 7.5 / 4.5 / 20 / 4.5 / 7.5 / 4.5 / 20

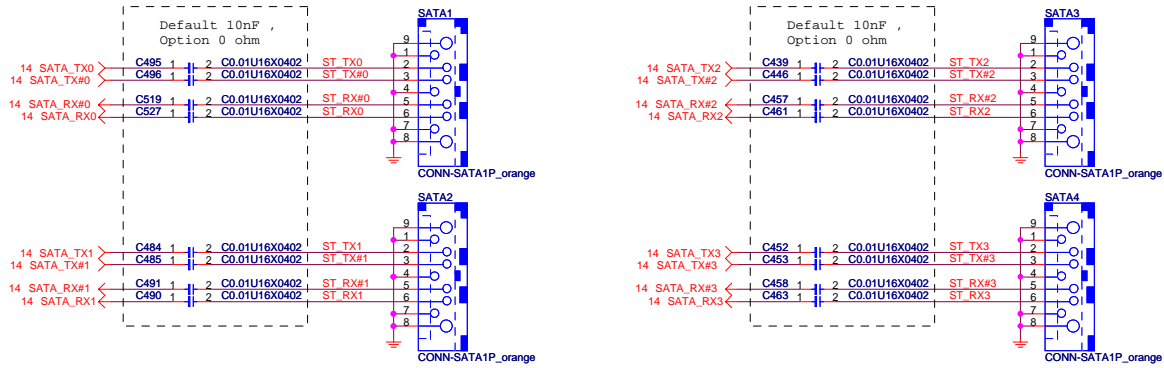
FRONT PANEL USB CONNECTOR FOR USB PORT 6,7



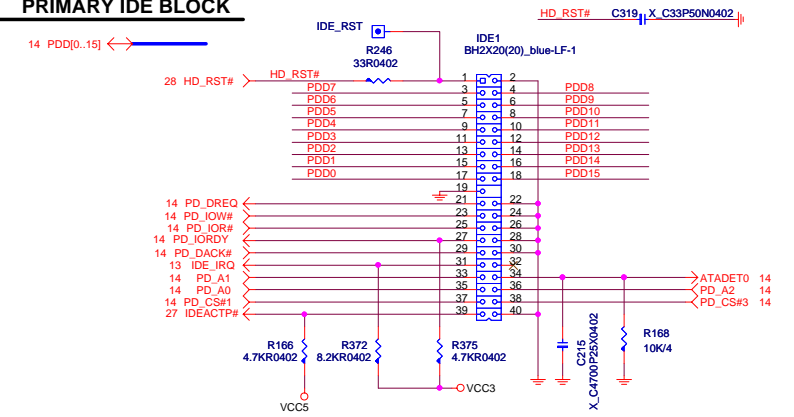
20 / 4.5 / 7.5 / 4.5 / 20 / 4.5 / 7.5 / 4.5 / 20



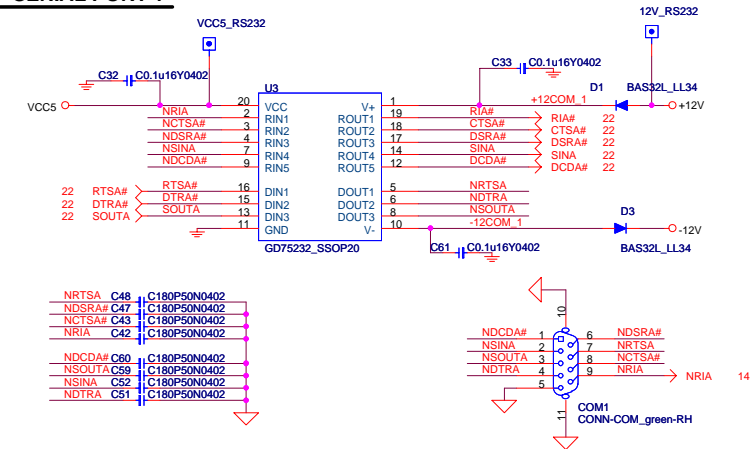
SERIAL ATA CONNECTOR BLOCK



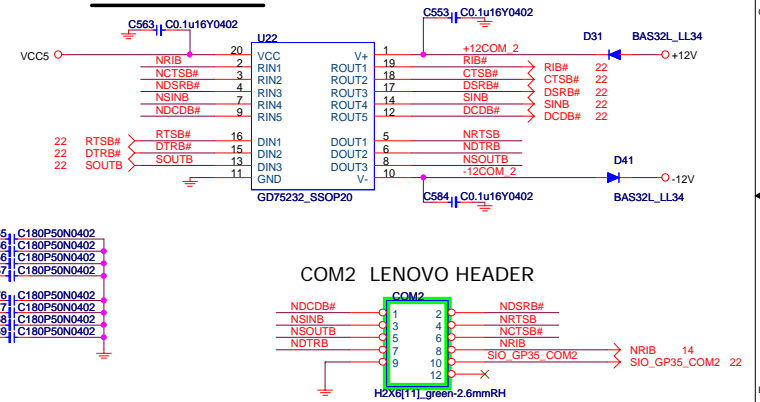
PRIMARY IDE BLOCK



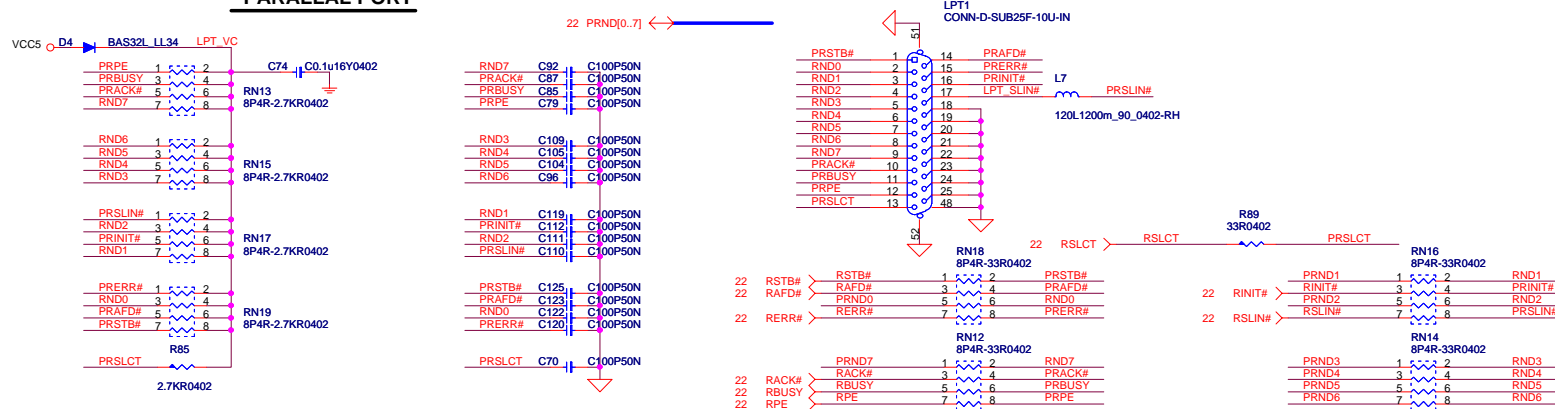
SERIAL PORT 1



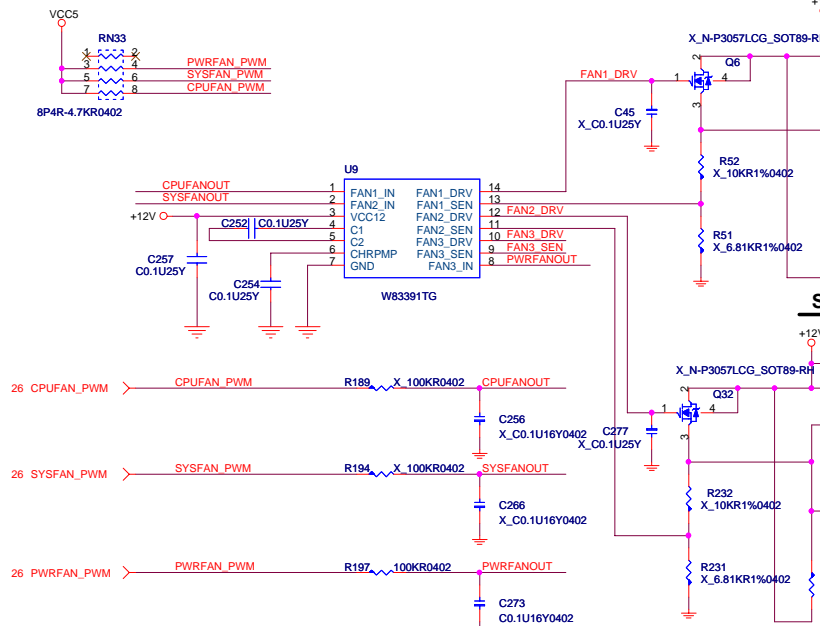
SERIAL PORT 2



PARALLAL PORT



FAN CONTROL



CPU FAN

SYSTEM FAN

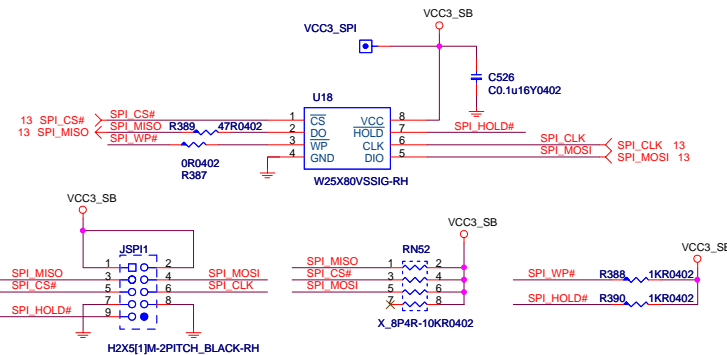
stuff 4PIN BOM
N32-1040991-H06

stuff 4PIN BOM
N32-1040991-H06

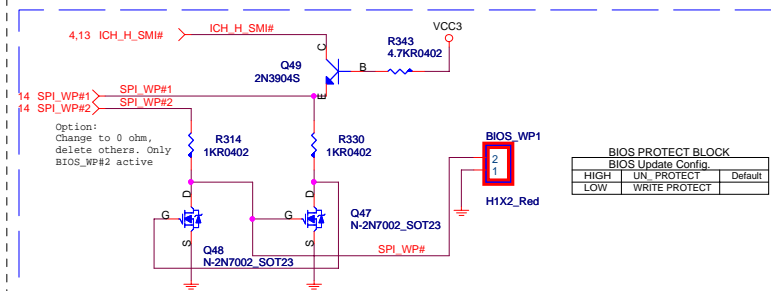
POWER FAN

stuff 3PIN BOM
N32-1030451-H06

SPI BIOS



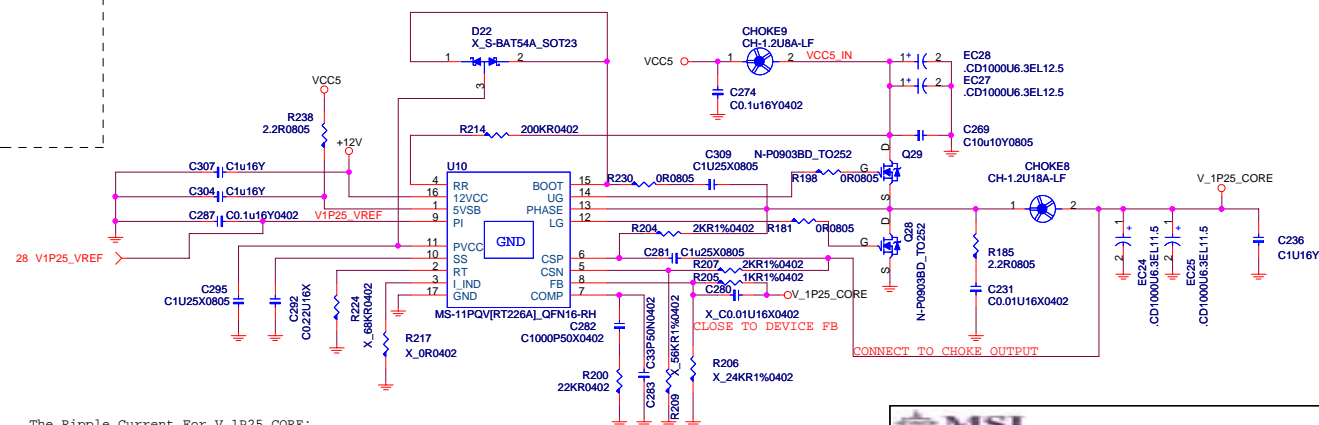
BIOS WRITE PROTECT



USE GPIO

GMCH 1.25V POWER

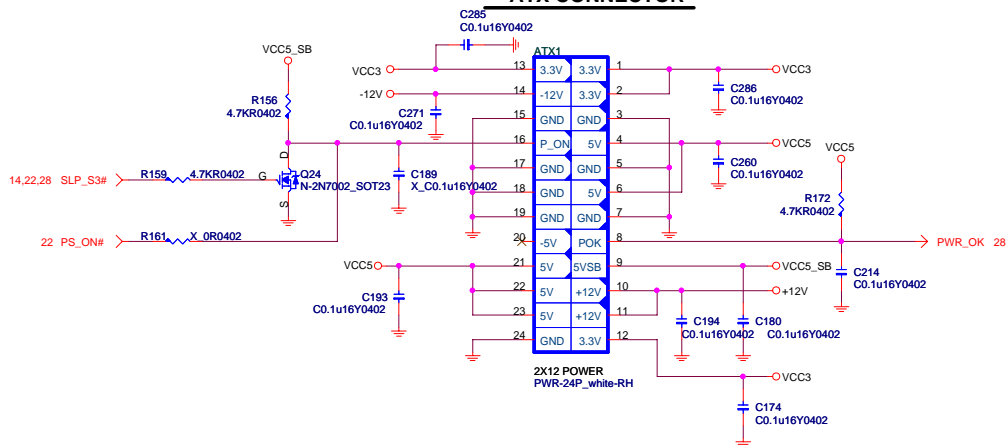
16.3A



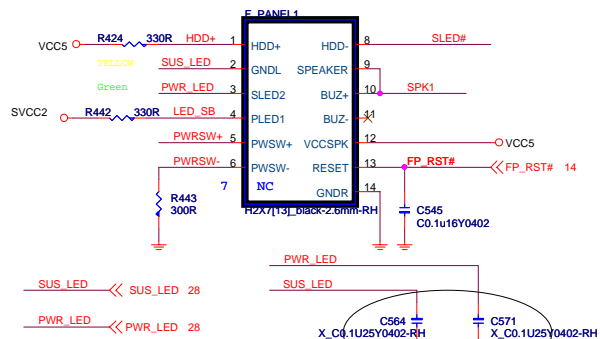
The Ripple Current For V_{1P25_CORE}:
 $Duty = (1.25V/5V) * (100\%/80\%) = 0.313$ (Efficiency: 80%)
 $I_{rms} = I_o * \{ [Duty * (1 - Duty)]^{0.5} \}$
 $= 20 * \{ [0.313 * 0.687]^{0.5} \} = 9.27$ (A)

Rated Ripple Current (65 degree): $1800mA * 2.3 * 2 + 1140mA * 1.3 = 9.726 > 9.27A$

ATX CONNECTOR

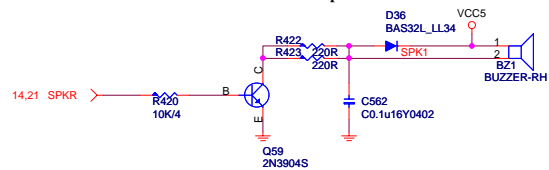


LENOVO Front Panel Connector

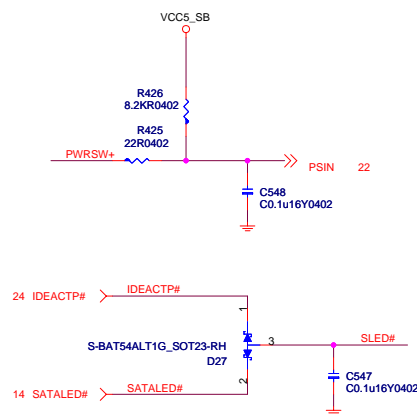


EMI

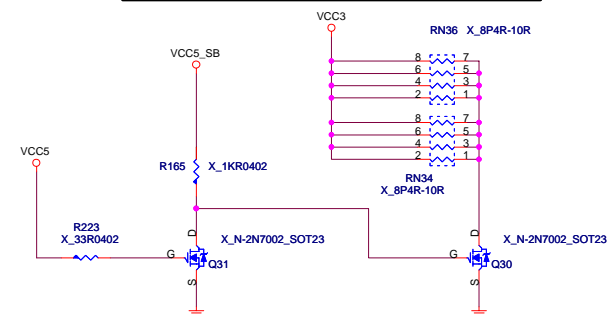
EMI Near Super I/O



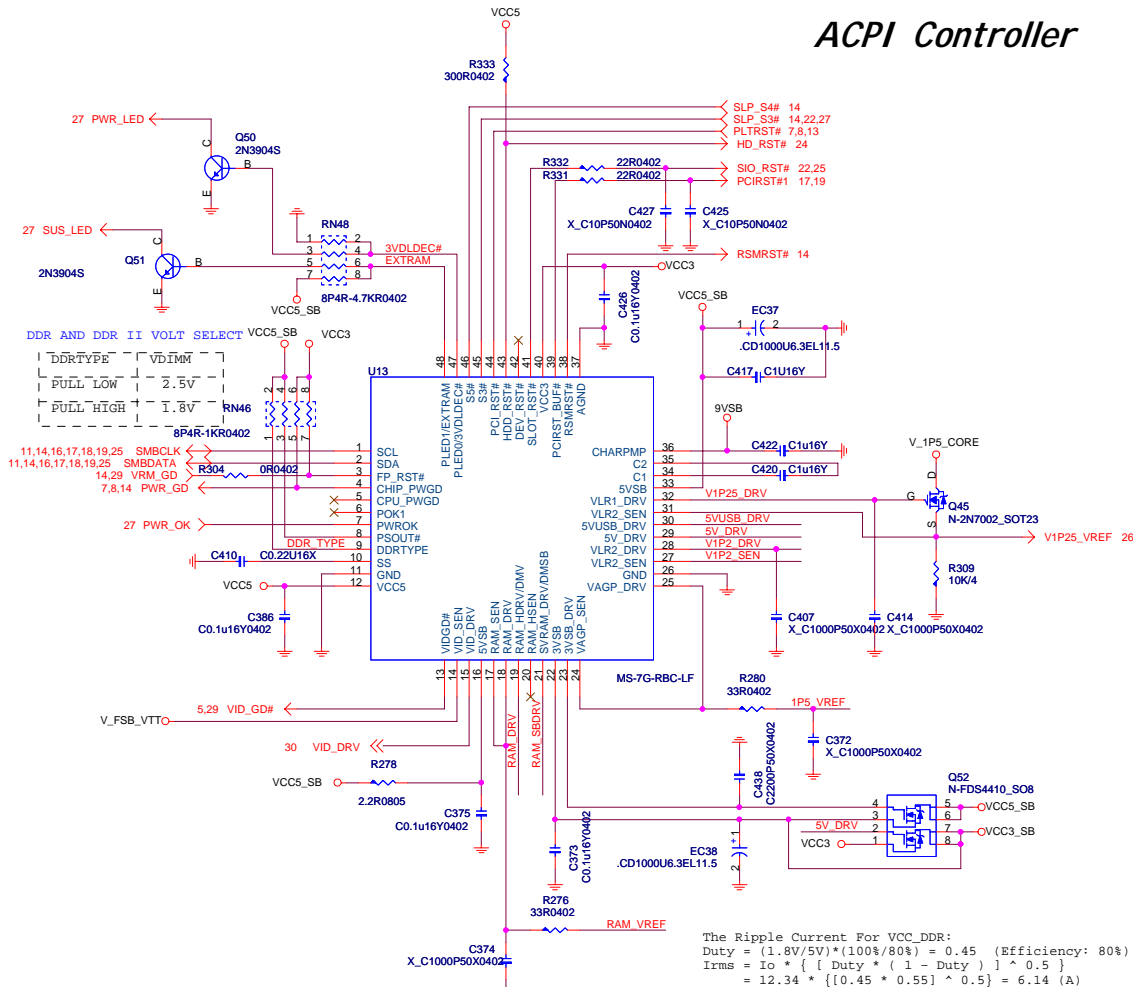
POWER BUTTON



3.3V minimum load protect



ACPI Controller



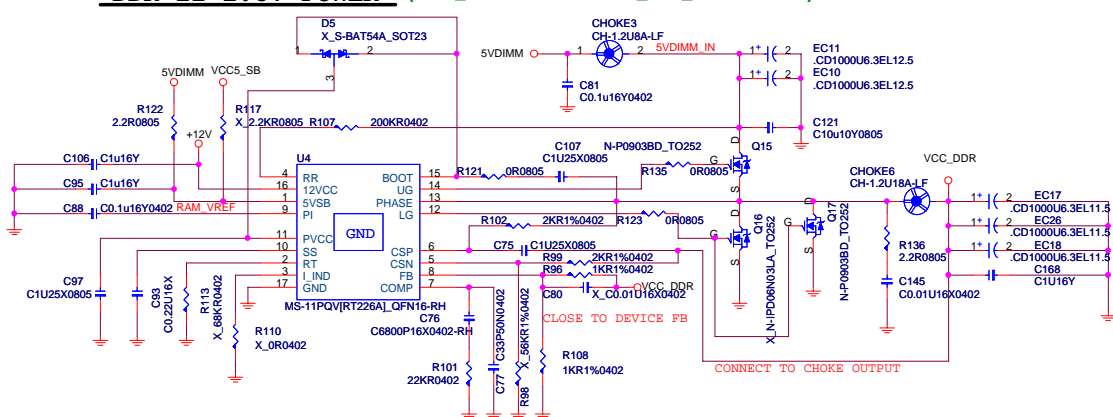
The Ripple Current For VCC_DDR:

$$\text{Duty} = (1.8\text{V}/5\text{V}) * (100\%/80\%) = 0.45 \quad (\text{Efficiency: } 80\%)$$
$$\text{Irms} = I_o * \{ [\text{Duty} * (1 - \text{Duty})] ^{0.5} \}$$
$$= 12.34 * \{ [0.45 * 0.55] ^{0.5} \} = 6.14 \text{ (A)}$$

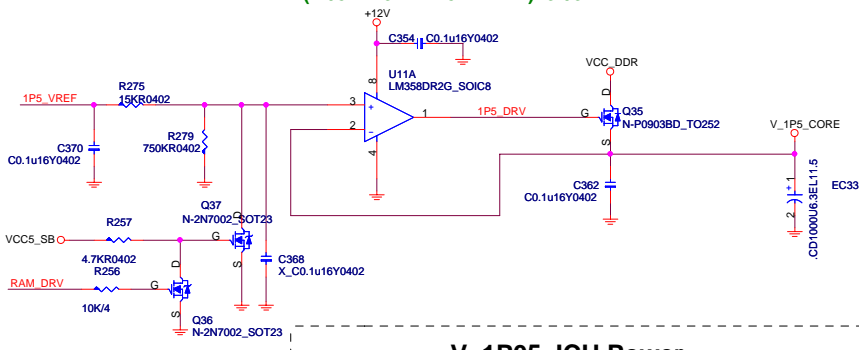
Rated Ripple Current (65 degree):
 $1800\text{mA} * 2.3 * 2 = 8.28\text{A} > 6.14\text{A}$

Abstract

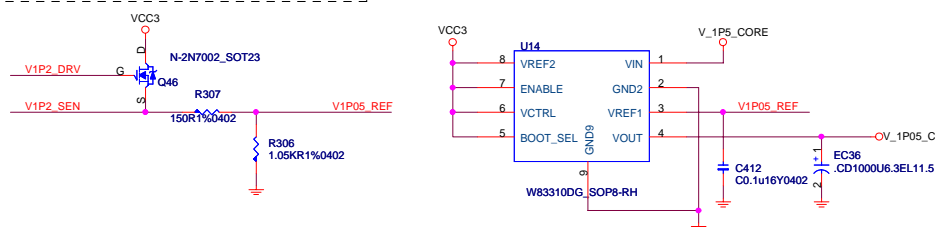
DDR II 1.8V POWER (VCC_DDR 2DIMM -8A+V_1P5_CORE-4.34A)=12.34A



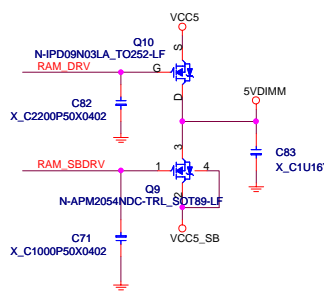
1.5V POWER
(1.05V-1.31A+1.5V-1.72A)=3.03A



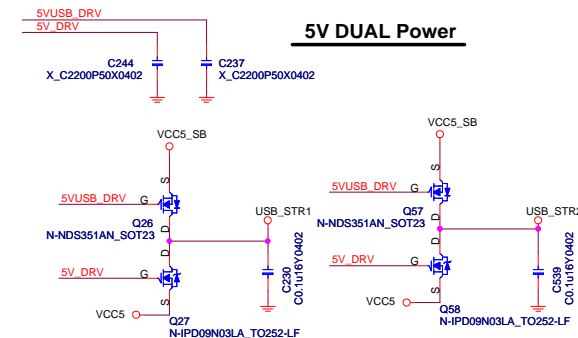
V_1P05_ICH Power 1.31A



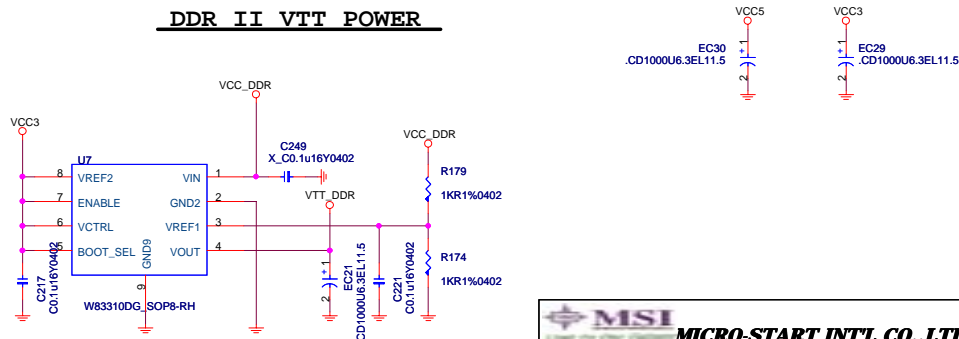
5V DIMM Power 10A



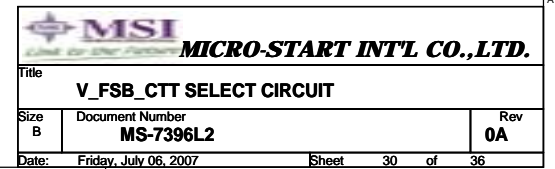
5V DUAL Power

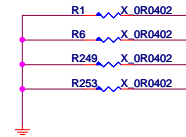
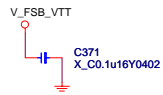
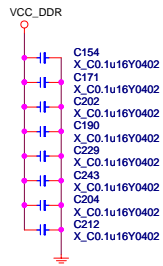
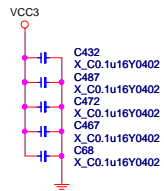
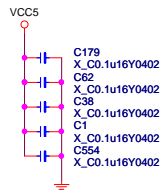


DDR II VTT POWER

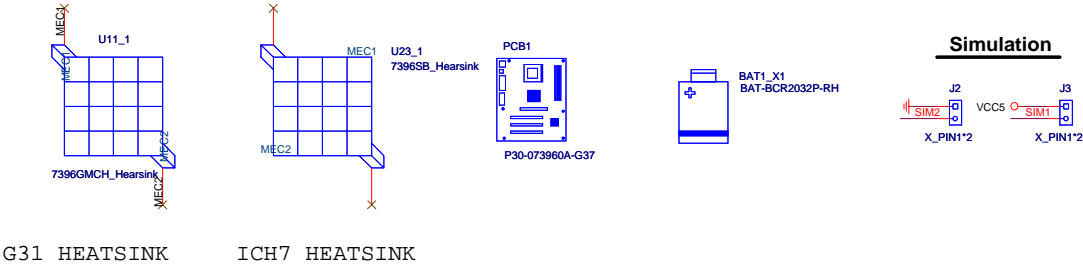


Title			
MS-7 ACPI Controller			
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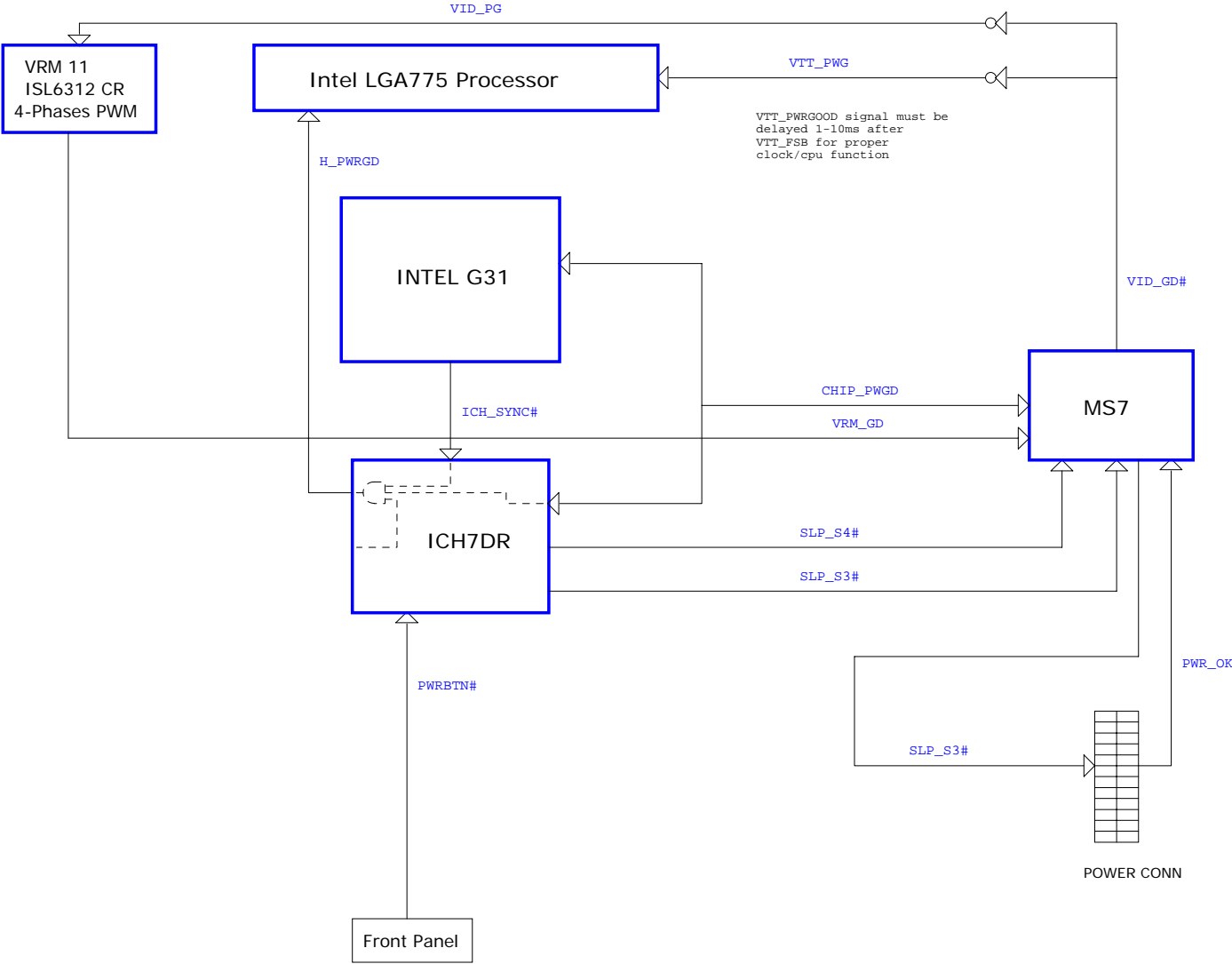




Auto-BOM Manual Parts



PWROK MAP




Version 0A

- 2007/06/20
- 1. modify 1394 header netname
 - 2. change FAN +12VA to +12V
 - 3. change R300, R309, R317 to 6.81Kohm
 - 4. uniform V_1P05_ICH to V_1P05_CORE
 - 5. VCC_CL_PLL is open

- 2007/07/01
- 1. v6312 connect to VCC5
 - 2. LC_SENSE connect to SB
 - 3. R348 connect to V_1P25_CORE
 - 4. reserve VID_DRV

- 2007/07/05
- 1. change



MICRO-START INTL CO.,LTD.

Title		
History		
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LGA775-CPU	
1.15V - 1.50V Core (MAX)-	100A
1.2V FSB Vtt	- 5.3A

Broadwater G31	
1.2V FSB_VTT	- 1.0 A
1.25V Core	- 18.1A
1.25V (PCIe & DMI)	- TBD A
1.25V VCC_CL	- TBD A
1.8V DDR2 I/O (S0,S1)	- 3.2 A
1.8V DDR2 SMCLK	- 250 mA
3.3V DAC	- 65.8mA
3.3V	- 15.8mA

ICH7	
1.05V Core	- 1.31A
1.2V V_FSB_VTT	- 14 mA
VCC1_5(USB&SATA&PLL)	- 0.97A
VCC1_5(PCIe)	- 0.74A
VCCRTC	- TBDuA
3.3V Vcc3_3	- 0.58A
3.3V Sus3_3	- 0.7 A
1.5V DMI	- TBD A

ITE 8718F	
3.3V	- 10 mA
3.3V_SB	- 0.2mA
5VSB	- 1 mA

HD Audio ALC662	
3.3V AUDIO	- 32 mA
5V AUDIO	- 200mA

ICS9LP505-2	
+3.3V	- 250mA
+0.8V	- 80 mA

mavell 8056	
3.3V_SB I/O	- 15.5mA
1.8V	- 418.2mA
1.0V	- 277.2mA

ISL6312	
VCCP VRM 11	
1.15V-1.5V	
4-Phase Switch	

W83310DG	
VTT_DDR	
0.9V Linear	0.6A

MS11 Regulator	
VCC_DDR	
1.8V PWM	26.85A

MS11 Regulator	
V_1P25_CORE	
1.25V PWM	20.57A

MS7 Regulator	
V_FSB_VTT	
1.2V Linear	5.8A
V_1P5_CORE	
1.5V Linear	2.75A
V_1P05_ICH	
1.05V Linear	2A
VCC3_SB	
3.3V Linear	3A
5VDUAL1	
5V Switch	10A
5VSB Switch	500mA
5VDIMM	
5V Switch	10A
5VSB Switch	700mA

5VAudio	
+5VR	
500mA	

+12V	
ATX 2x2	

+5V	+3.3V	+5VSB	+12V
ATX POWER			

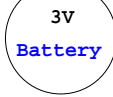
DDRII x2 & TERMINATOR	
0.9V VTT_DDR	- 1.2A
1.8V VCC_DDR (S0,S1)	- 9.4A
1.8V VCC_DDR (S3)	- 200mA

PCI Express x16 1slot & x1 1slot.	
+12V	- 5.5 A
+3.3Vaux (wake)	- 375mA
+3.3Vaux (no wake)	- 20mA
+3.3V	- 3.0A

PCI Express x2 slot	
+12V	- 0.5 A
+3.3Vaux (wake)	- 375mA
+3.3Vaux (no wake)	- 20mA
+3.3V	- 3.0A

USB x8	
+5V (S0,S1)	- 2.0A
+5V (S3)	- 20mA

PS2	
+5V (S0,S1)	- 345mA
+5V (S3)	- 2.0mA



MICRO-START INTL CO.,LTD.

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INTEL BEARLAKE PLATFORM CLOCK GENERATOR MAP

