

# Model Name: GA-Q87M-MK

SHEET TITLE

01	COVER SHEET
02	BOM & PCB MODIFY HISTORY
03	BLOCK DIAGRAM
04	CPU_LGA1150-A
05	CPU_LGA1150-B
06	CPU_LGA1150-C
07	DDR III CHANNEL A
08	DDR III CHANNEL B
09	PCH_FDI,DMI,USB,PCIE,NVRAM
10	PCH_DP,CLK BUFFER
11	PCH_HOST,SATA,PCI
12	PCH_GPIO,CTRL,AUDIO
13	PCH_PWR,GND
14	PCI EX16 SLOT
15	mSATA/mini PCIE slot
16	PCIEX1 /PCI SLOT
17	ITE 8728 LPC IO
18	KB_MS, R_USB
19	HWM,FAN CTRL,-PROCHOT
20	BIOS,TPM
21	FP,FUSB,SPK,SATALED
22	Realtek CODEC
23	REAR AUDIO JACK
24	INTEL i217 PHY
25	DISCRETE POWER
26	ATX, M3 POWER
27	VCORE ISL95820_1

SHEET TITLE

28	VCORE ISL95820_2
29	RT8120_DDR POWER
30	COM , LPT , 80PORT
31	DVI, HDMI ,DP
32	IT8892E PCI BRIDGE
33	INTEL i210 LAN

www.aitech1.ru

Gigabyte Technology		
Cover Sheet		
Title	Document Number	Rev
	GA-Q87M-MK	1.1
Date:	Monday, August 19, 2013	Sheet 1 of 33

## D

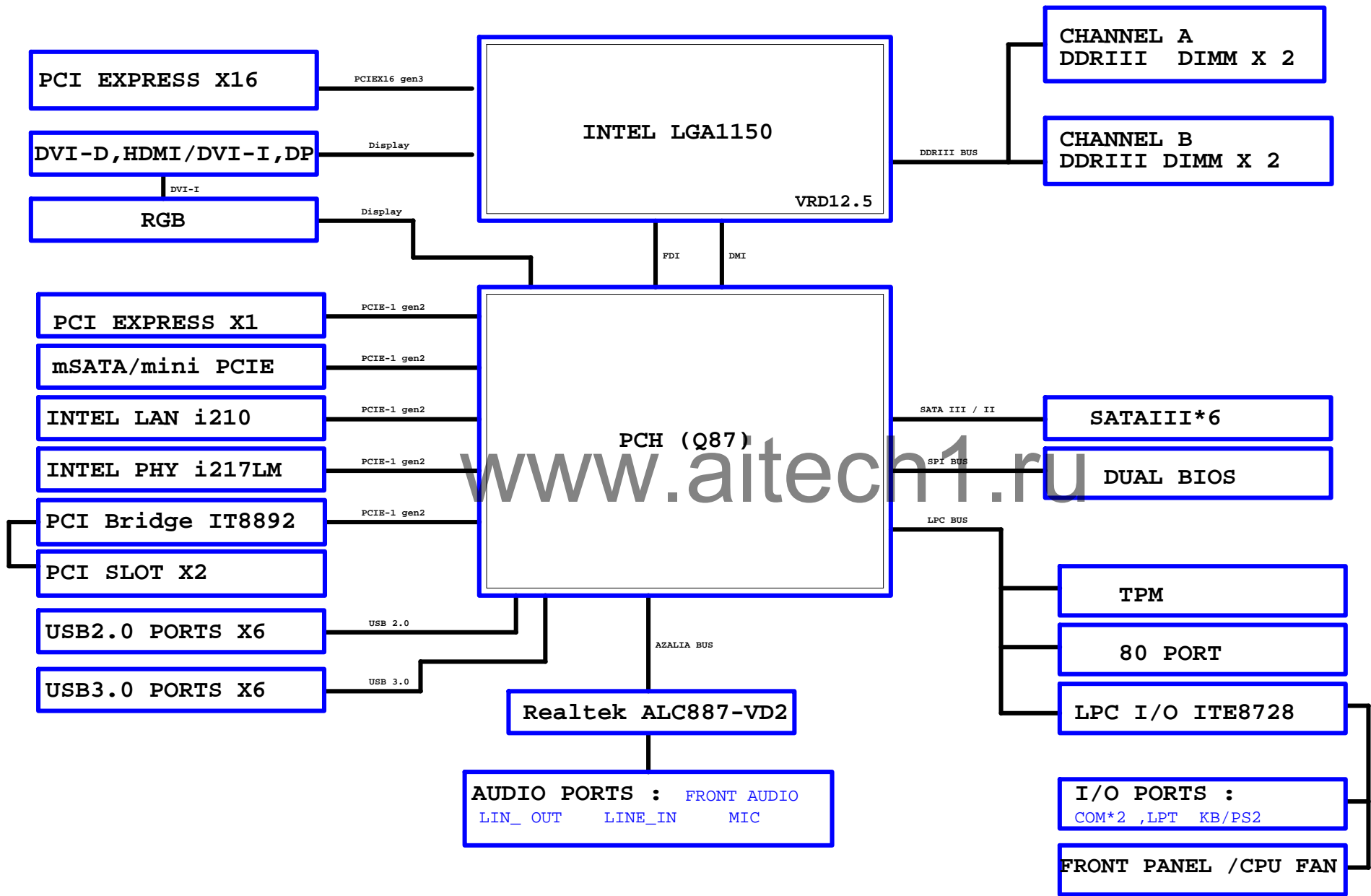
C

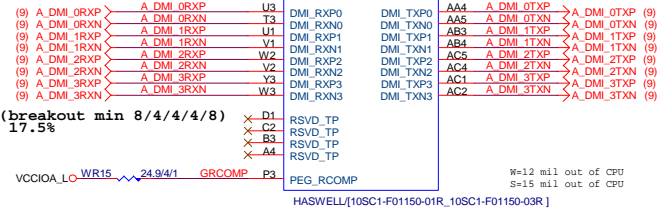
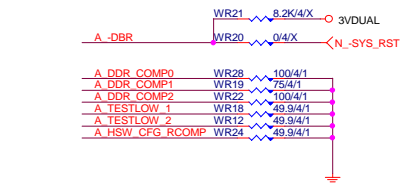
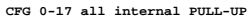
→

3

1

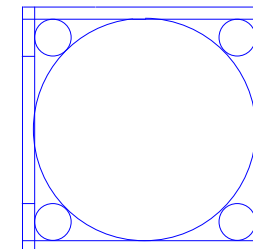
BLOCK DIAGRAM





# LGA1155 (CR)

CR  
CPU RETAINTION/X



LGA1150



ILM\_BP/1156/CS/ILM\_BP/1156/CS/12KRC-0F0001-52R\_12KRC-0F0001-51R

www.gigabyte.ru

LGA1150A

MAAA0	AU13	DDR0_MA0	DDR0_DQ0	AD38	MDA0
MAAA1	AV16	DDR0_MA1	DDR0_DQ1	AD39	MDA1
MAAA2	AU16	DDR0_MA2	DDR0_DQ2	AF38	MDA2
MAAA3	AW17	DDR0_MA3	DDR0_DQ3	AF39	MDA3
MAAA4	AU17	DDR0_MA3	DDR0_DQ3	AD37	MDA4
MAAA5	AW18	DDR0_MA4	DDR0_DQ4	AD40	MDA5
MAAA6	AV17	DDR0_MA5	DDR0_DQ5	AF37	MDA6
MAAA7	AT18	DDR0_MA6	DDR0_DQ6	AF40	MDA7
MAAA8	AU18	DDR0_MA7	DDR0_DQ7	AF40	MDA9
MAAA9	AT19	DDR0_MA8	DDR0_DQ8	AH39	MDA13
MAAA10	AW11	DDR0_MA9	DDR0_DQ9	AK38	MDA10
MAAA11	AV19	DDR0_MA10	DDR0_DQ10	AK39	MDA11
MAAA12	AU19	DDR0_MA11	DDR0_DQ11	AH37	MDA12
MAAA13	AY10	DDR0_MA12	DDR0_DQ12	AH38	MDA8
MAAA14	AT20	DDR0_MA13	DDR0_DQ13	AK37	MDA14
MAAA15	AU21	DDR0_MA14	DDR0_DQ14	AK40	MDA15
MODT_A0	AW10	DDR0_MA15	DDR0_DQ15	AM38	MDA17
MODT_A1	AY8	DDR0_ODT0	DDR0_ODT0	AP38	MDA18
MODT_A2	AW9	DDR0_ODT1	DDR0_ODT1	AP39	MDA19
MODT_A3	AU8	DDR0_ODT2	DDR0_ODT2	AM37	MDA20
		DDR0_ODT3	DDR0_ODT3	AM38	MDA16
				AP37	MDA22
				AP40	MDA23
				AV37	MDA25
				AW37	MDA29
				AU35	MDA26
				AV35	MDA27
				AT37	MDA28
				U37	MDA24
				AT35	MDA30
				AW35	MDA31
				AY6	MDA33
				AU6	MDA37
				AY4	MDA34
				AU4	MDA35
				AW6	MDA36
				AV6	MDA32
				AW4	MDA38
				AY4	MDA39
				AR1	MDA41
				AR4	MDA45
				AN3	MDA42
				AN4	MDA43
				AR2	MDA44
				AR3	MDA46
				AN2	MDA47
				AN1	MDA47
				AL1	MDA49
				AL4	MDA53
				AJ3	MDA50
				AJ4	MDA51
				AL2	MDA52
				AL3	MDA48
				AJ2	MDA54
				AJ1	MDA55
				AG4	MDA57
				AG1	MDA61
				AE3	MDA58
				AE4	MDA59
				AG2	MDA60
				AG3	MDA56
				AE2	MDA62
				AE1	MDA63
				AE39	DQSA0
				AJ39	DQSA1
				AN39	DQSA2
				AV36	DQSA3
				AV5	DQSA4
				AP3	DQSA5
				AK3	DQSA6
				AF3	DQSA7
				AV32	DQSA0
				AE38	DQSA1
				AJ38	DQSA2
				AN38	DQSA3
				AU36	DQSA4
				AW5	DQSA5
				AP2	DQSA6
				AK2	DQSA7
				AF2	DQSA7
				AU32	

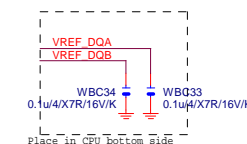
HASWELL[10SC1-F01150-01R\_10SC1-F01150-03R]

LGA1150B

MAAB0	AL19	DDR1_MA0	DDR1_DQ0	AE34	MDB0
MAAB1	AK23	DDR1_MA1	DDR1_DQ1	AE35	MDB1
MAAB2	AM22	DDR1_MA2	DDR1_DQ2	AG35	MDB2
MAAB3	AM23	DDR1_MA3	DDR1_DQ3	AH35	MDB3
MAAB4	AP23	DDR1_MA4	DDR1_DQ4	AD34	MDB4
MAAB5	AL23	DDR1_MA5	DDR1_DQ5	AD35	MDB5
MAAB6	AY24	DDR1_MA6	DDR1_DQ6	AG34	MDB6
MAAB7	AV25	DDR1_MA7	DDR1_DQ7	AH34	MDB7
MAAB8	AU26	DDR1_MA8	DDR1_DQ8	AL34	MDB8
MAAB9	AW26	DDR1_MA9	DDR1_DQ9	AL35	MDB9
MAAB10	AP18	DDR1_MA10	DDR1_DQ10	AK31	MDB10
MAAB11	AY25	DDR1_MA11	DDR1_DQ11	AL31	MDB11
MAAB12	AV26	DDR1_MA12	DDR1_DQ12	AK34	MDB12
MAAB13	AR15	DDR1_MA13	DDR1_DQ13	AK35	MDB13
MAAB14	AV27	DDR1_MA14	DDR1_DQ14	AK32	MDB14
MAAB15	AY28	DDR1_MA15	DDR1_DQ15	AL32	MDB15
				AN34	MDB17
				AP34	MDB21
				AN31	MDB19
				AP31	MDB23
				AN35	MDB20
				AP35	MDB18
				AN32	MDB22
				AP32	MDB25
				AM28	MDB26
				AR23	MDB27
				AP28	MDB30
				AL29	MDB24
				AL28	MDB29
				AP29	MDB28
				AP28	MDB31
				AR12	MDB32
				AP12	MDB33
				AL13	MDB34
				AL12	MDB35
				AP13	MDB36
				AM13	MDB37
				AM13	MDB38
				AM12	MDB39
				AR9	MDB45
				AP9	MDB41
				AR6	MDB47
				AP6	MDB43
				AR10	MDB44
				AP10	MDB40
				AR7	MDB46
				AP7	MDB42
				AL9	MDB52
				AL6	MDB50
				AL7	MDB55
				AM10	MDB48
				AL10	MDB49
				AM6	MDB54
				AM7	MDB51
				AH6	MDB61
				AH7	MDB60
				AE6	MDB59
				AE7	MDB63
				AJ6	MDB58
				AJ7	MDB57
				AF6	MDB59
				AF7	MDB62
				AF35	DQSB0
				AL33	DQSB1
				AP33	DQSB2
				AN28	DQSB3
				AN12	DQSB4
				AP8	DQSB5
				AL8	DQSB6
				AG7	DQSB7
				AN25	DQSB0
				AF34	DQSB1
				AK33	DQSB2
				AN33	DQSB3
				AN29	DQSB4
				AN13	DQSB5
				AR8	DQSB6
				AM8	DQSB7
				AG6	DQSB7
				AN26	

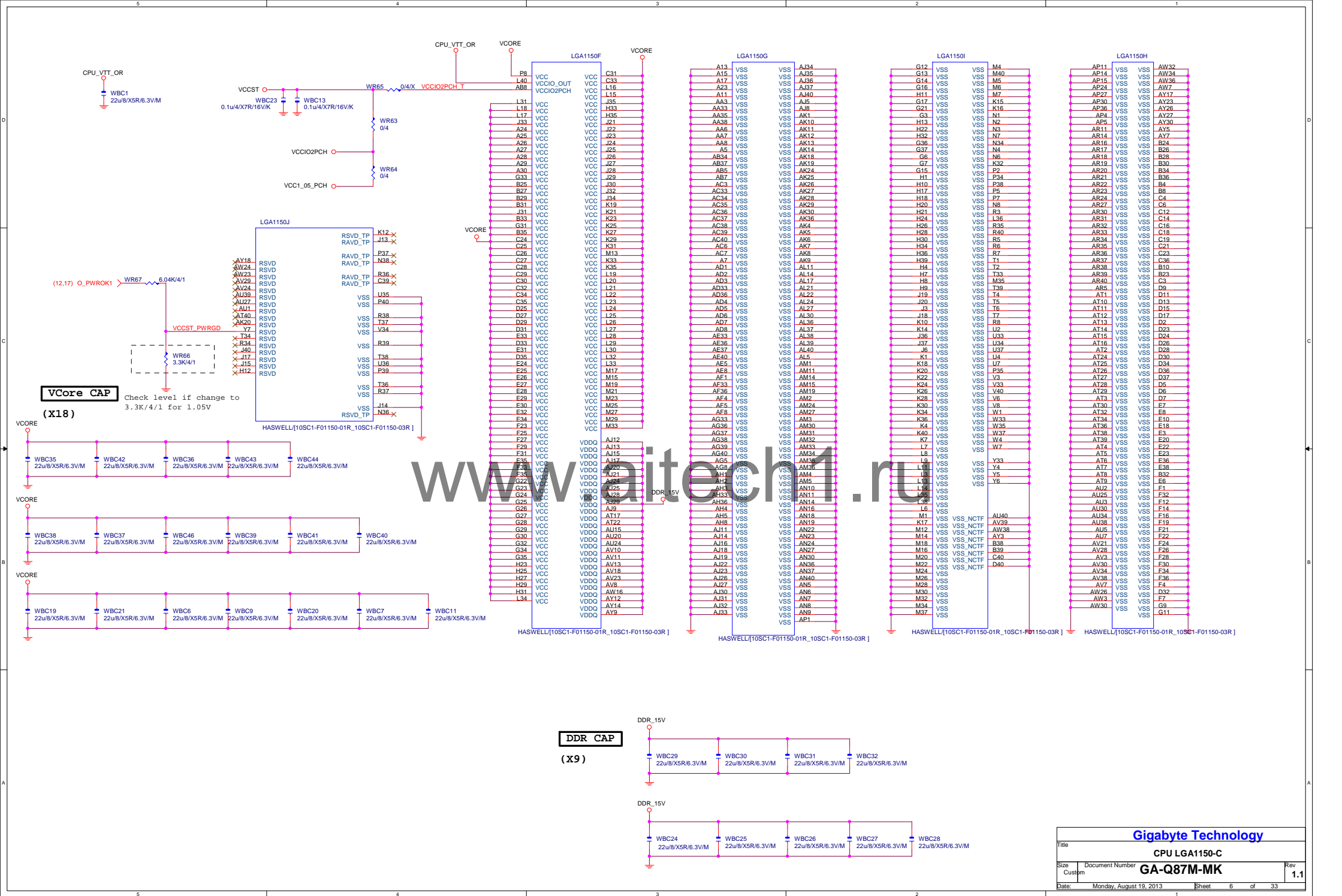
HASWELL[10SC1-F01150-01R\_10SC1-F01150-03R]

(7) MODT_A0[0..3]	MODT_A0_31
(8) MODT_B0[0..3]	MODT_B0_31
(7) MDA[0..63]	MDA[0..63]
(8) MDB[0..63]	MDB[0..63]
(7) DQSA[0..7]	DQSA[0..7]
(7) -DQSA[0..7]	-DQSA[0..7]
(7) MAAA[0..15]	MAAA[0..15]
(8) MAAB[0..15]	MAAB[0..15]
(8) DQSB[0..7]	DQSB[0..7]
(8) -DQSB[0..7]	-DQSB[0..7]



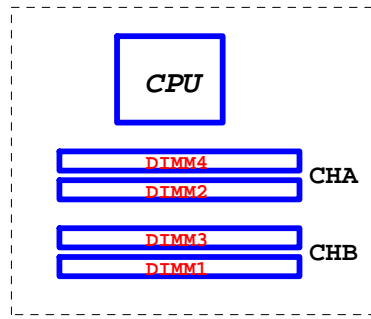
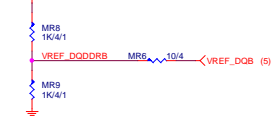
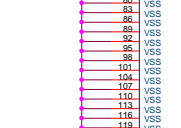
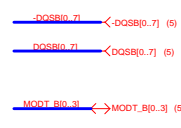
Gigabyte Technology

Title			CPU LGA1150-B
Size			Custom
Document Number			GA-Q87M-MK
Rev			1.1
Date:			Monday, August 19, 2013
Sheet			5 of 33



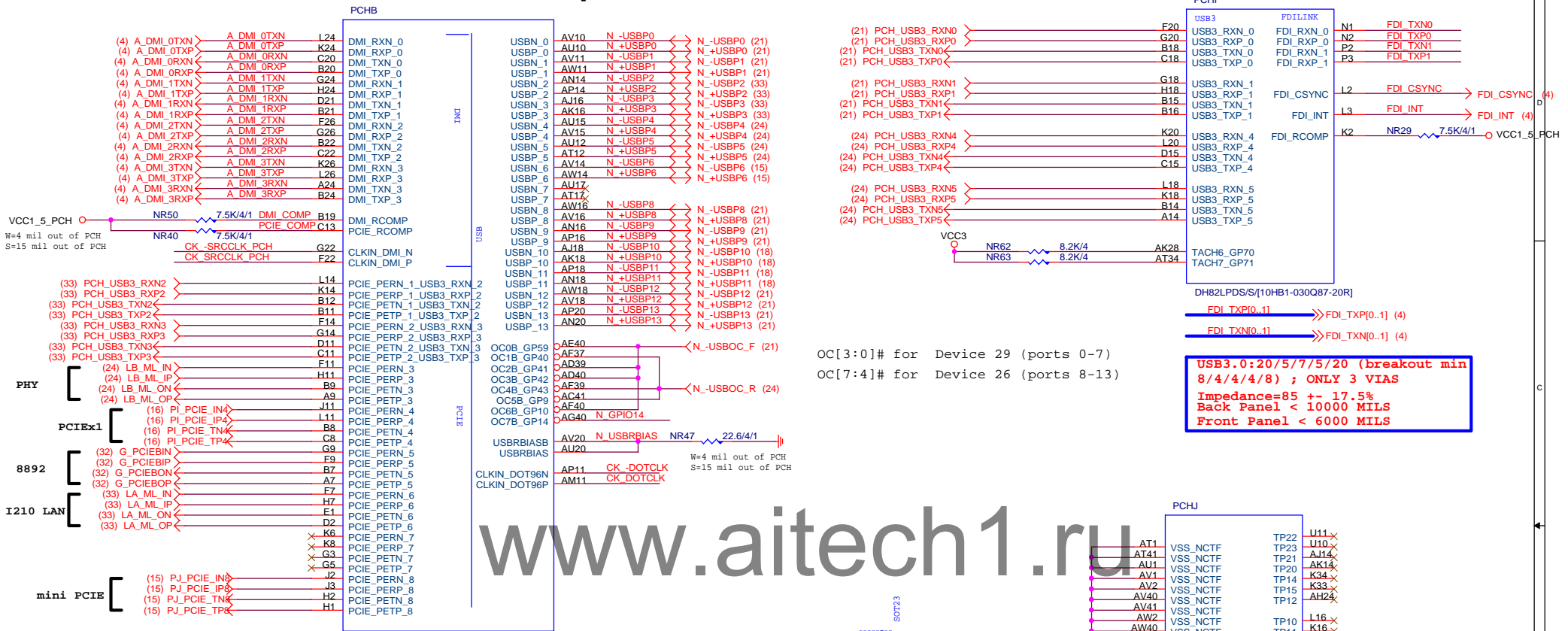






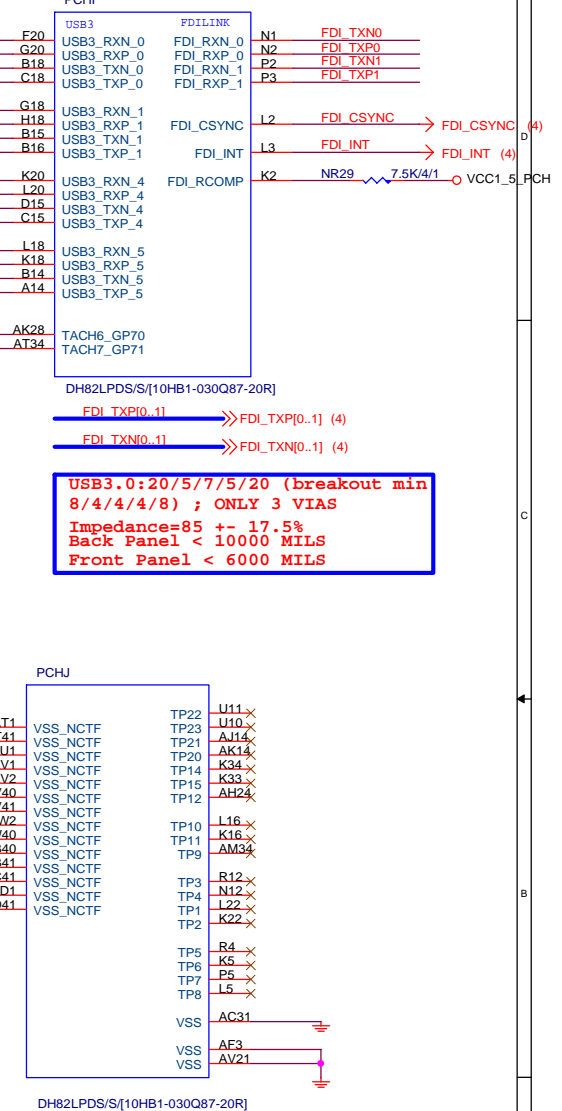
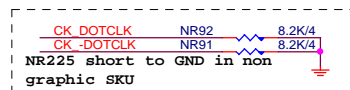
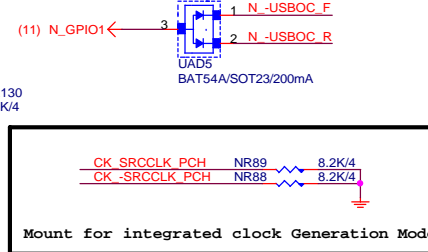
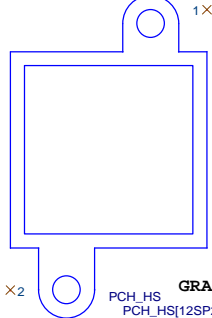


USB2.0 : 12/4.5/7.5/4.5/12 (breakout min 8/4/4/4/8)  
Impedance=90 +- 17.5%

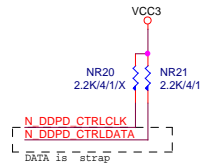
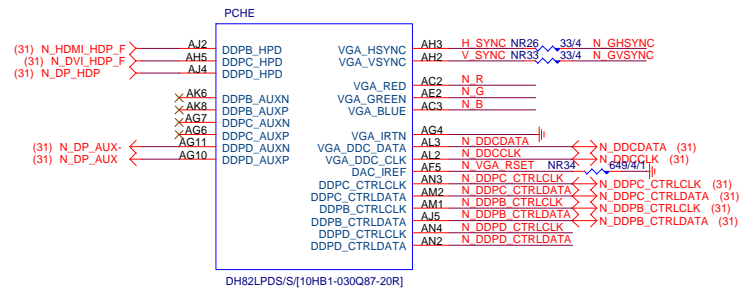


LOW COST ICH7 HEATSINK

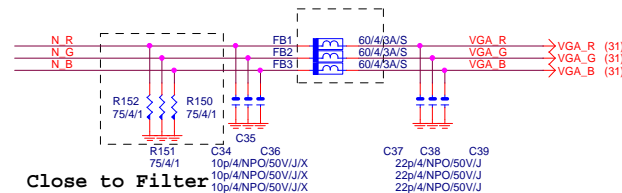
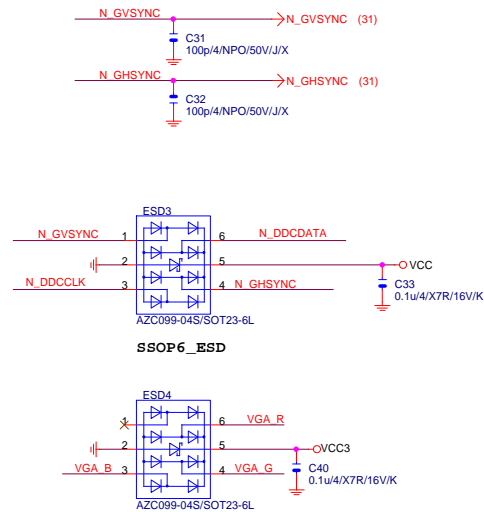
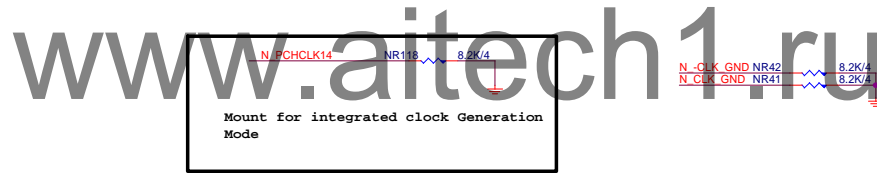
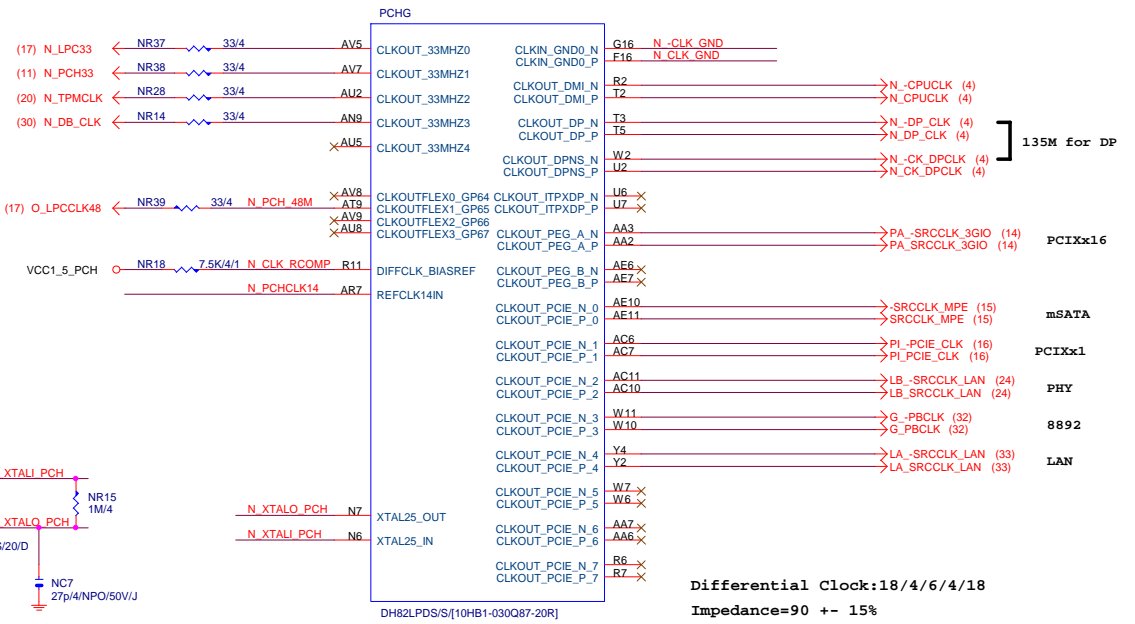
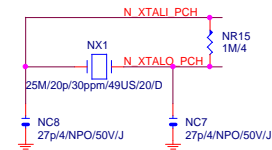
SB\_HEATSIN



Gigabyte Technology			
Title			
PCH FDI,DMI,USB ,PCIE,NVRAM			
Size	Document Number	GA-Q87M-MK	Rev 1.1
Custom			
Date:	Monday, August 19, 2013	Sheet	9 of 33

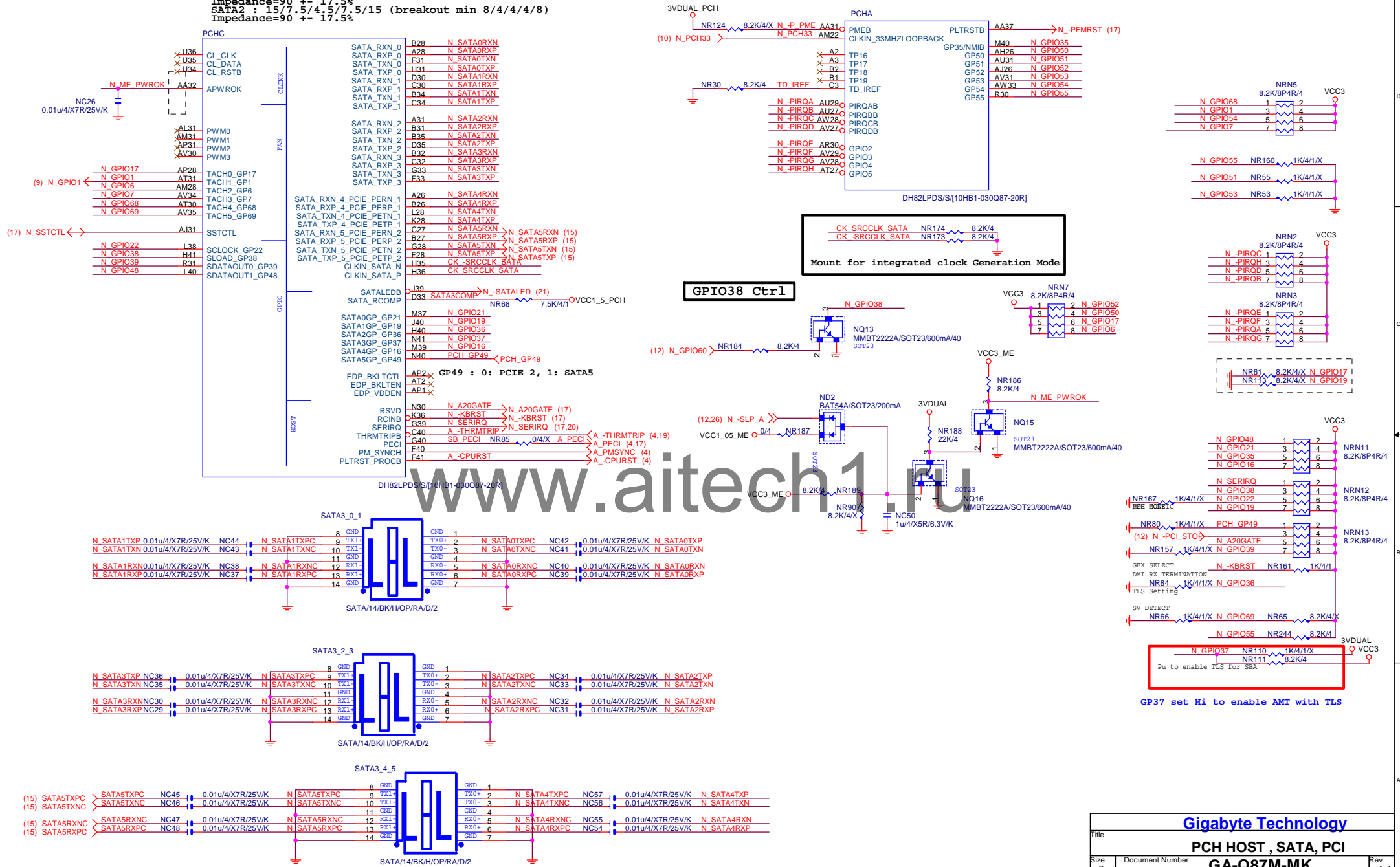


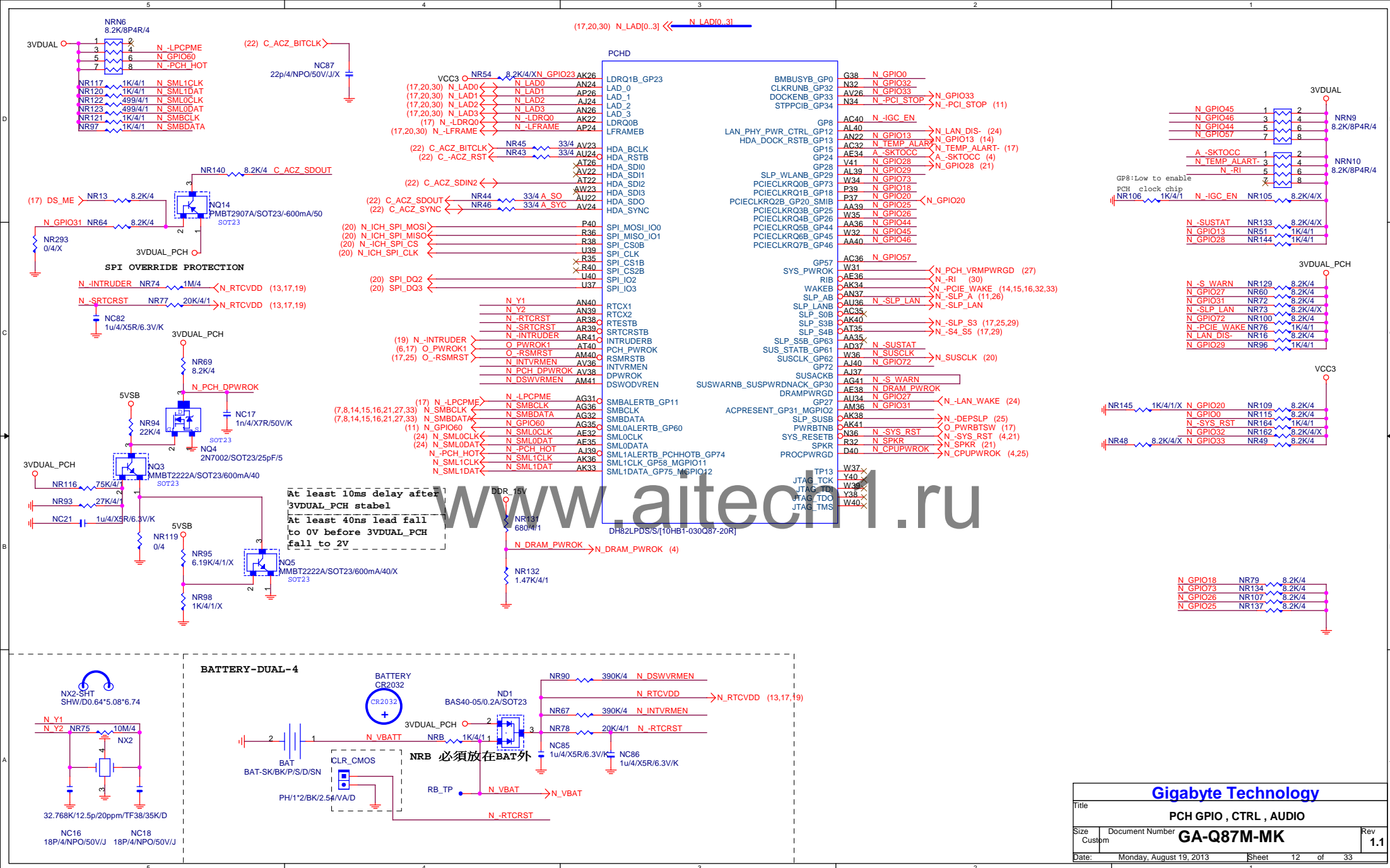
Flex1,2,3,4 :  
14/24/33/48MHZ

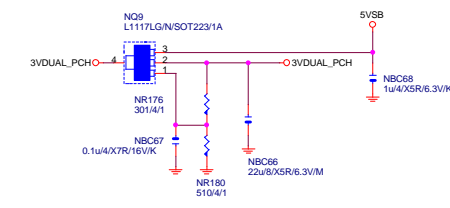
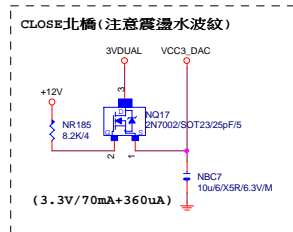
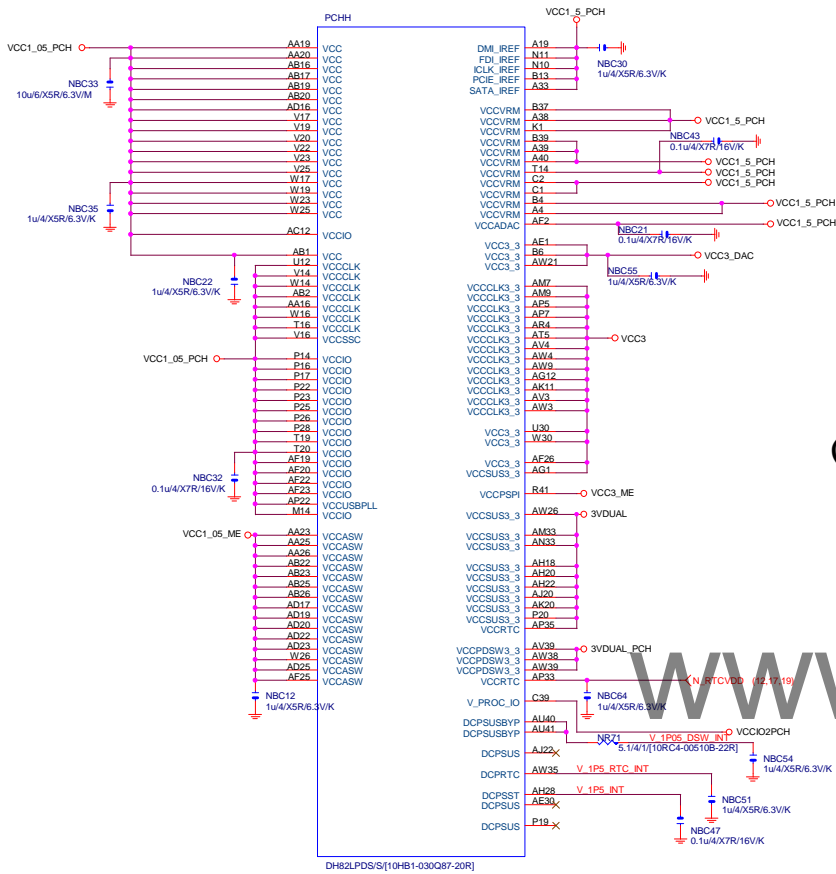


Gigabyte Technology			
Title			
PCH DISPLAY, CLK BUFFER			
Size	Document Number	GA-Q87M-MK	
Custom			Rev 1.1
Date:	Monday, August 19, 2013	Sheet	10 of 33

```
SATA3 : 20/7.5/4.5/7.5/20 (breakout min 8/4/4/4/8)
Impedance=90 +- 17.5%
SATA2 : 15/7.5/4.5/7.5/15 (breakout min 8/4/4/4/8)
Impedance=90 +- 17.5%
```







(3.3V) (X6)

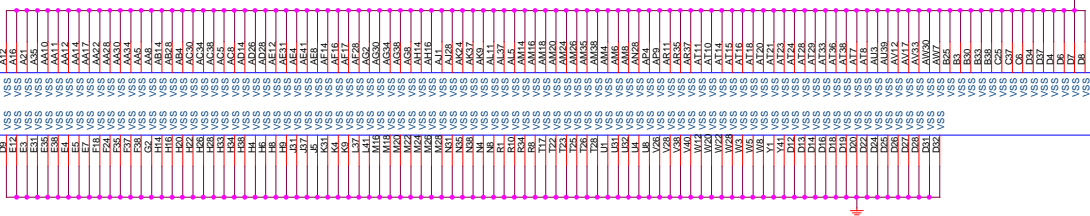
(1.05V) (X5)

(1.05V) (X4)

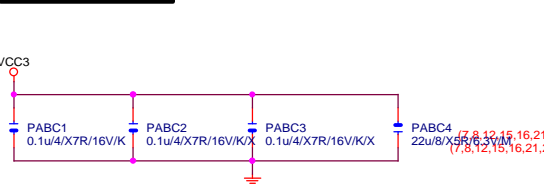
(1.5V) (X10)

(1.05V) (X2)

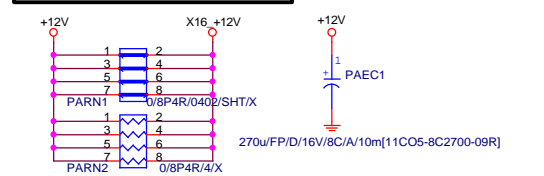
(3.3V) (X2)



## PCIEX16 CAP

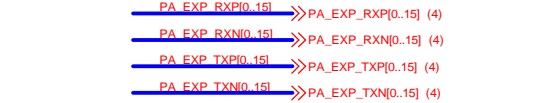


## PCIEX16 PROTECT SHT

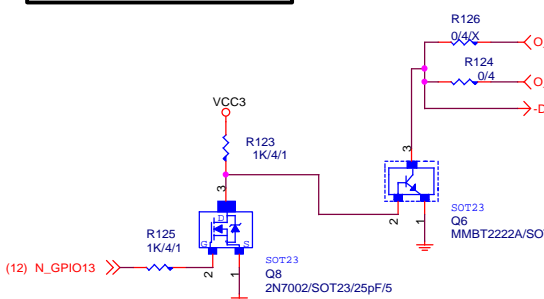


## PCIEX16 AC CAP

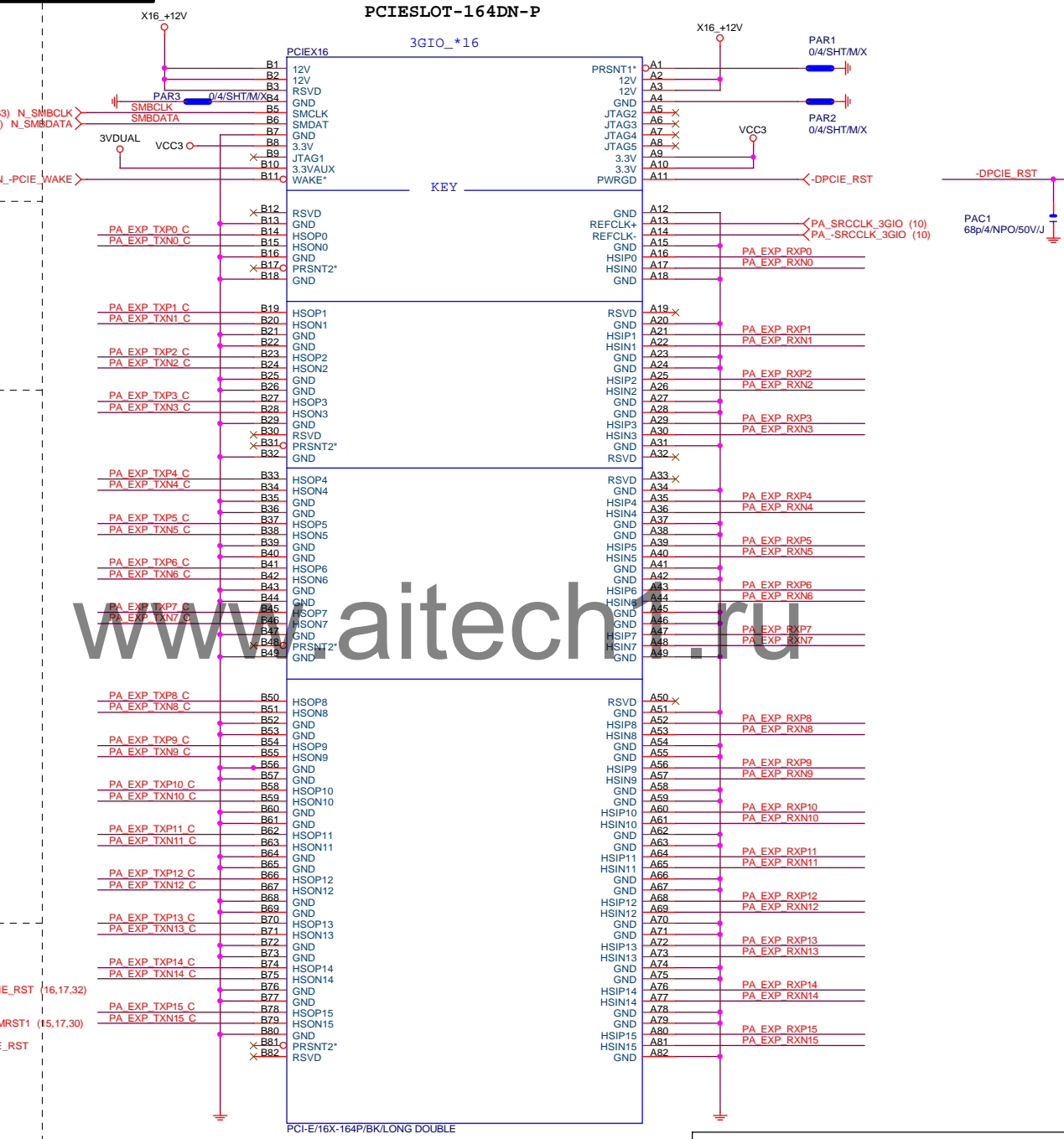
PA EXP TXP0	PAC5	0.22u/4X5R/6.3V/K	PA EXP TXP0 C
PA EXP TXN0	PAC4	0.22u/4X5R/6.3V/K	PA EXP TXN0 C
PA EXP TXP1	PAC6	0.22u/4X5R/6.3V/K	PA EXP TXP1 C
PA EXP TXN1	PAC7	0.22u/4X5R/6.3V/K	PA EXP TXN1 C
PA EXP TXP2	PAC8	0.22u/4X5R/6.3V/K	PA EXP TXP2 C
PA EXP TXN2	PAC9	0.22u/4X5R/6.3V/K	PA EXP TXN2 C
PA EXP TXP3	PAC10	0.22u/4X5R/6.3V/K	PA EXP TXP3 C
PA EXP TXN3	PAC11	0.22u/4X5R/6.3V/K	PA EXP TXN3 C
PA EXP TXP4	PAC12	0.22u/4X5R/6.3V/K	PA EXP TXP4 C
PA EXP TXN4	PAC13	0.22u/4X5R/6.3V/K	PA EXP TXN4 C
PA EXP TXP5	PAC14	0.22u/4X5R/6.3V/K	PA EXP TXP5 C
PA EXP TXN5	PAC15	0.22u/4X5R/6.3V/K	PA EXP TXN5 C
PA EXP TXP6	PAC16	0.22u/4X5R/6.3V/K	PA EXP TXP6 C
PA EXP TXN6	PAC17	0.22u/4X5R/6.3V/K	PA EXP TXN6 C
PA EXP TXP7	PAC18	0.22u/4X5R/6.3V/K	PA EXP TXP7 C
PA EXP TXN7	PAC19	0.22u/4X5R/6.3V/K	PA EXP TXN7 C
PA EXP TXP8	PAC20	0.22u/4X5R/6.3V/K	PA EXP TXP8 C
PA EXP TXN8	PAC21	0.22u/4X5R/6.3V/K	PA EXP TXN8 C
PA EXP TXP9	PAC22	0.22u/4X5R/6.3V/K	PA EXP TXP9 C
PA EXP TXN9	PAC23	0.22u/4X5R/6.3V/K	PA EXP TXN9 C
PA EXP TXP10	PAC24	0.22u/4X5R/6.3V/K	PA EXP TXP10 C
PA EXP TXN10	PAC25	0.22u/4X5R/6.3V/K	PA EXP TXN10 C
PA EXP TXP11	PAC26	0.22u/4X5R/6.3V/K	PA EXP TXP11 C
PA EXP TXN11	PAC27	0.22u/4X5R/6.3V/K	PA EXP TXN11 C
PA EXP TXP12	PAC28	0.22u/4X5R/6.3V/K	PA EXP TXP12 C
PA EXP TXN12	PAC29	0.22u/4X5R/6.3V/K	PA EXP TXN12 C
PA EXP TXP13	PAC30	0.22u/4X5R/6.3V/K	PA EXP TXP13 C
PA EXP TXN13	PAC31	0.22u/4X5R/6.3V/K	PA EXP TXN13 C
PA EXP TXP14	PAC32	0.22u/4X5R/6.3V/K	PA EXP TXP14 C
PA EXP TXN14	PAC33	0.22u/4X5R/6.3V/K	PA EXP TXN14 C
PA EXP TXP15	PAC34	0.22u/4X5R/6.3V/K	PA EXP TXP15 C
PA EXP TXN15	PAC35	0.22u/4X5R/6.3V/K	PA EXP TXN15 C



## PCIEX16 SOFT RESET



## PCIEX16 SLOT

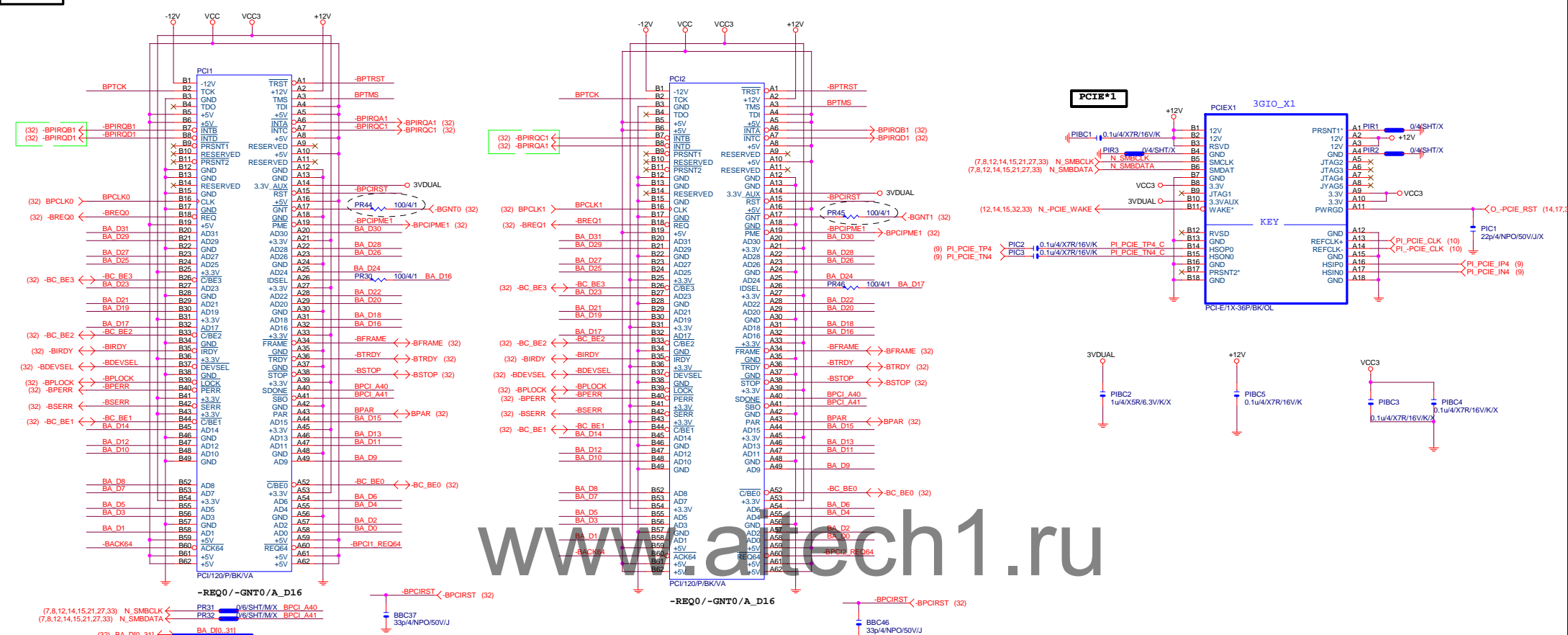




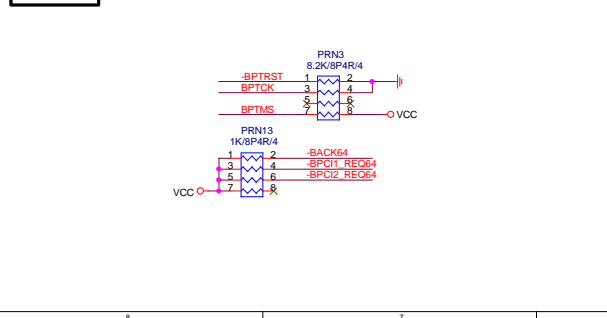




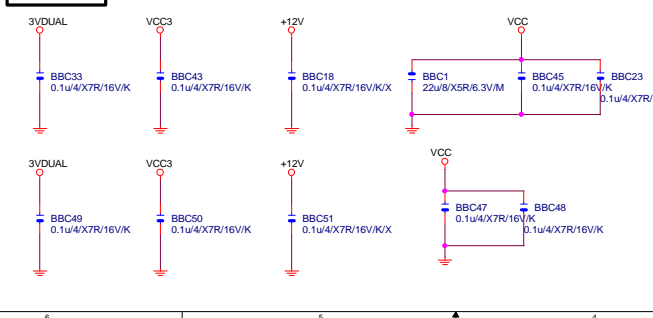
PCI SLOT



PCI PU



PCI CAP

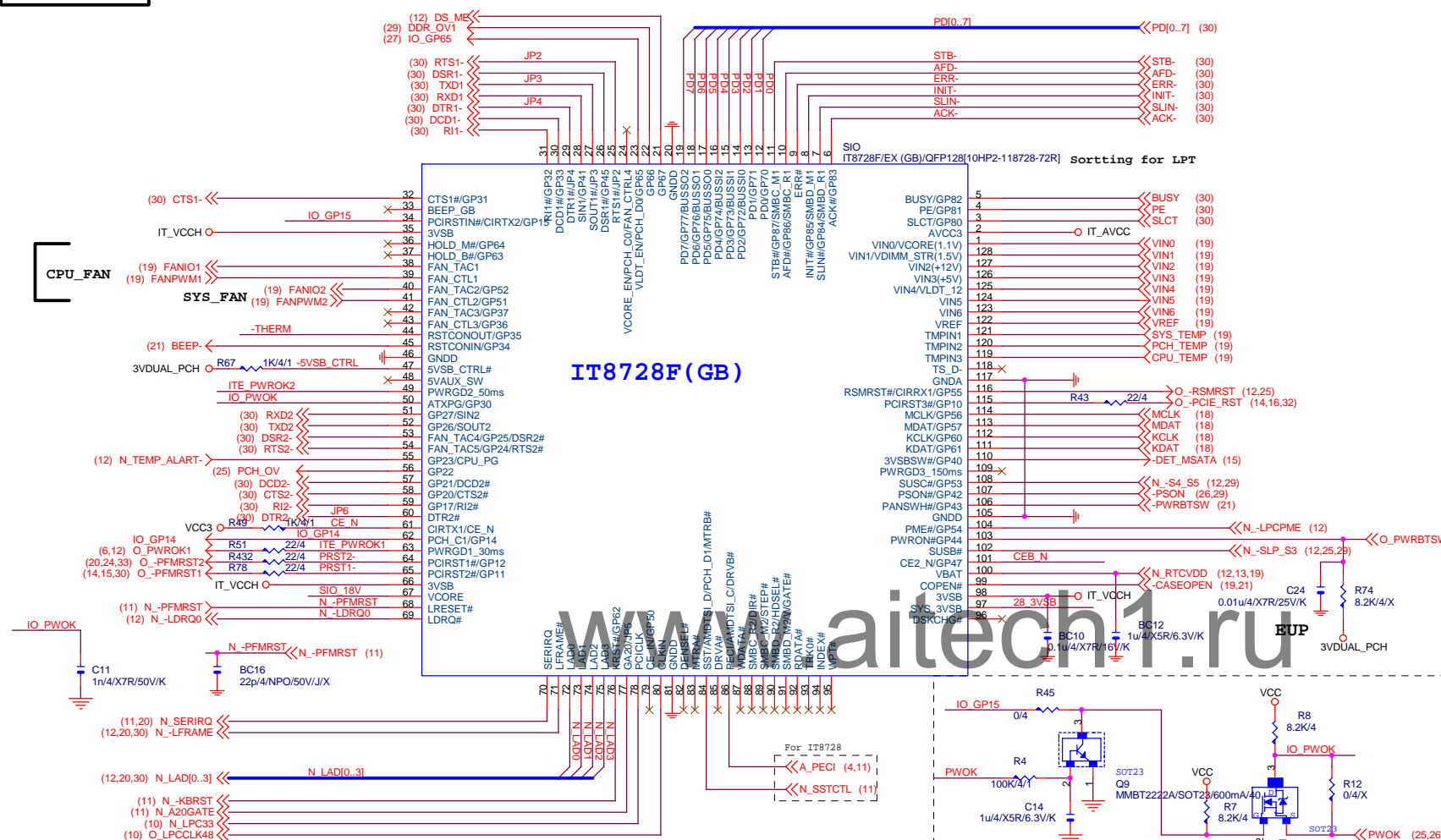


## Gigabyte Technology

PCI SLOT 1&2  
GA-Q87M-MK

Title			
PCI SLOT 1&2			
Size Custom	Document Number	GA-Q87M-MK	Rev 1.1
Date:	Monday, August 19, 2013	Sheet 16 of 33	

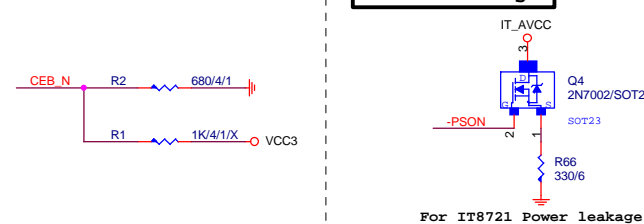
## SIO IT8728F



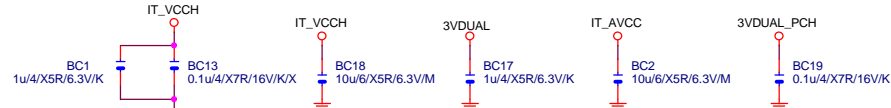
## IT8728F NOTE

IT8728	
PIN121	VCORE_EN/PCH_C0
PIN120	VLDI_EN/PCH_D0
PIN19	ATXPG
PIN31	PCH_C1
PIN53	SST/AMDTSI_D/MTRB#/PCH_D1
PIN55	PECI/AMDTSI_C/DRV#
PIN66	SYS_3VSB
PIN70	GP47
PIN95	VIN2(VCC5)
PIN96	VIN1(VCC12)
PIN97	VIN1/VDIMM_STR(1.5V)
PIN98	VIN0/VCORE(1.1V)/NC

## Power leakage

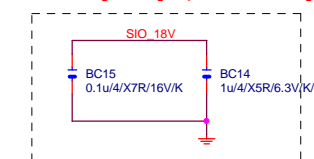


## SIO CAP

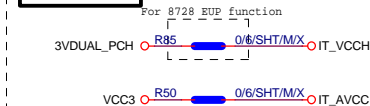


## SIO\_18V

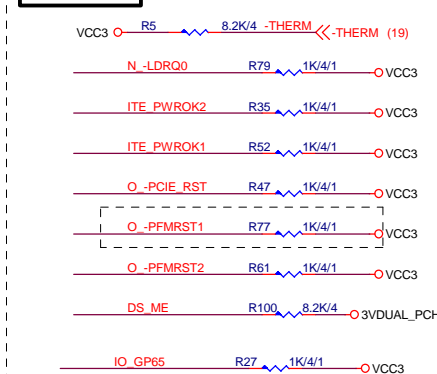
internal power pin, max 22nF cap



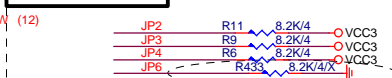
## PWR SHT



## SIO PU



## SIO STRAP

IT8728-EX  
PULL DOWN ENABLE FORCE OVPEUP control by PCH  
3VDUAL 100/4/1 R83 28\_3VSBJP3--- High SPI-Flash Disable  
Low SPI-Flash Enable

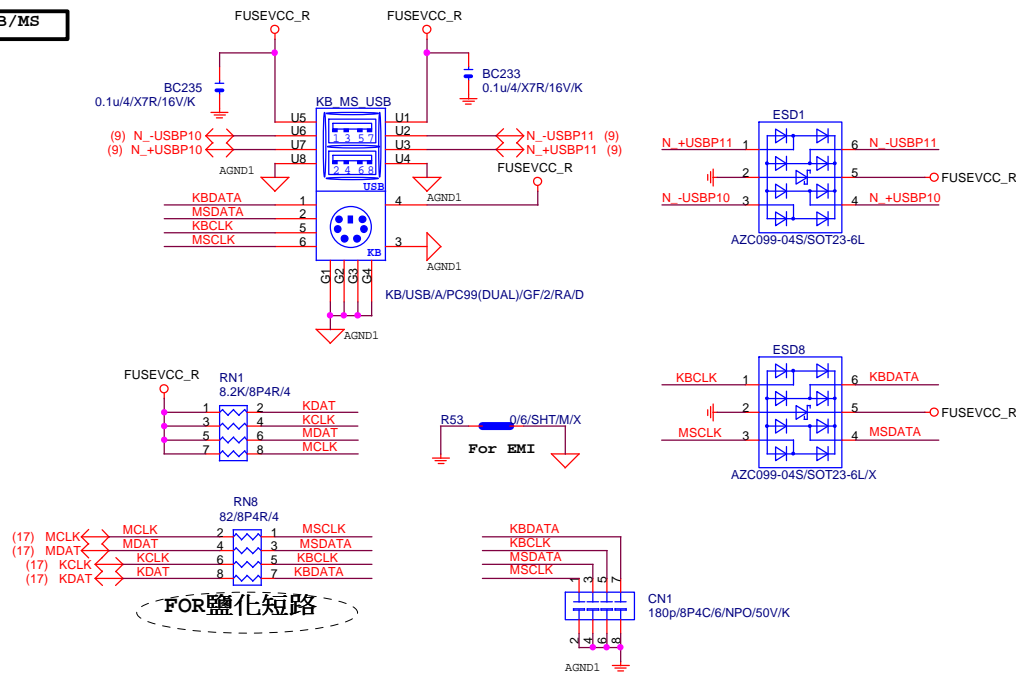
## Gigabyte Technology

Title		ITE 8728 LPC IO	
Size	Document Number	GA-Q87M-MK	
Custom			Rev 1.1
Date:	Monday, August 19, 2013	Sheet	17 of 33

KB/MS

USB2.0 ESD

USB2.0 PWR

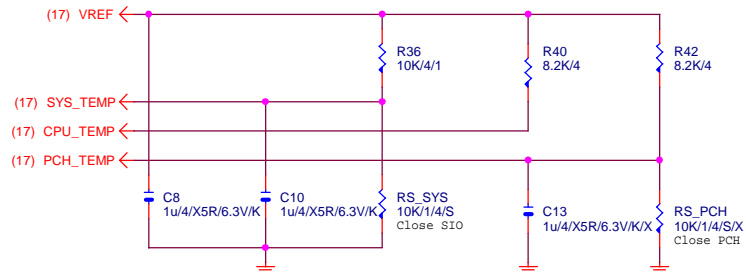


www.aitech1.ru

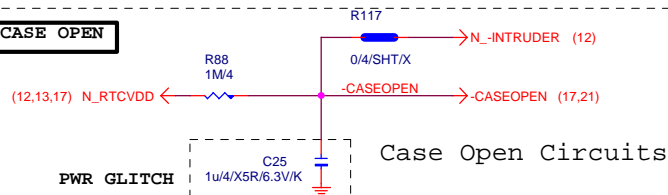
Gigabyte Technology

Title			
KB/MS,RUSB			
Size	Document Number	Rev	
Custom	GA-Q87M-MK	1.1	
Date:	Monday, August 19, 2013	Sheet	18 of 33

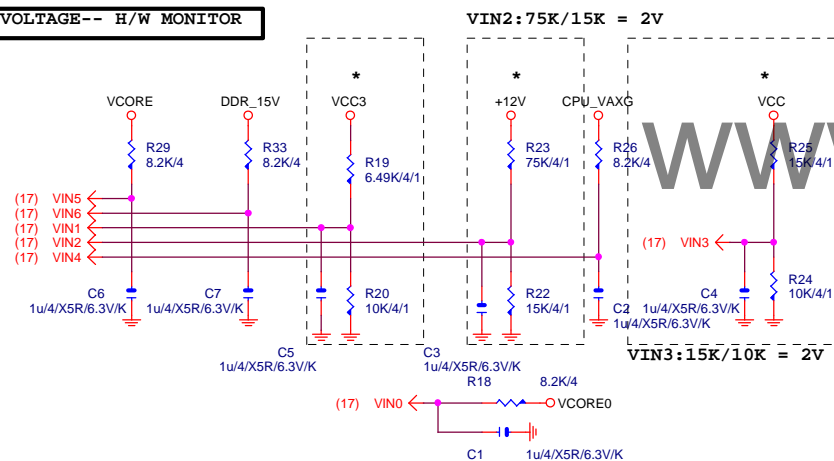
# TEMP H/W MONITOR



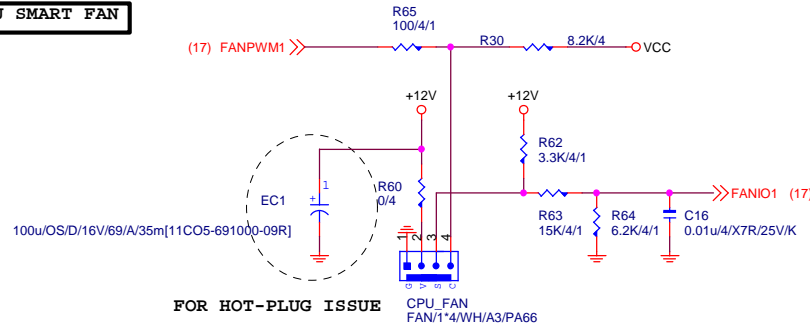
# CASE OPEN



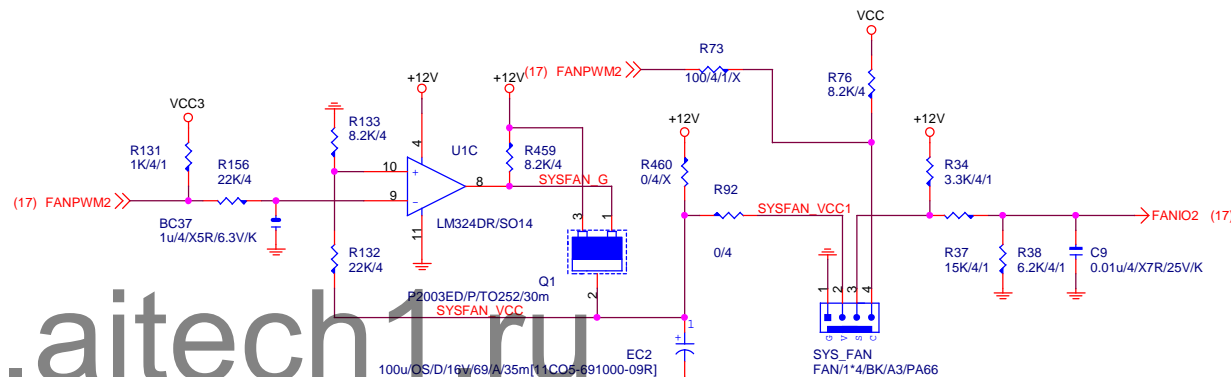
# VOLTAGE-- H/W MONITOR



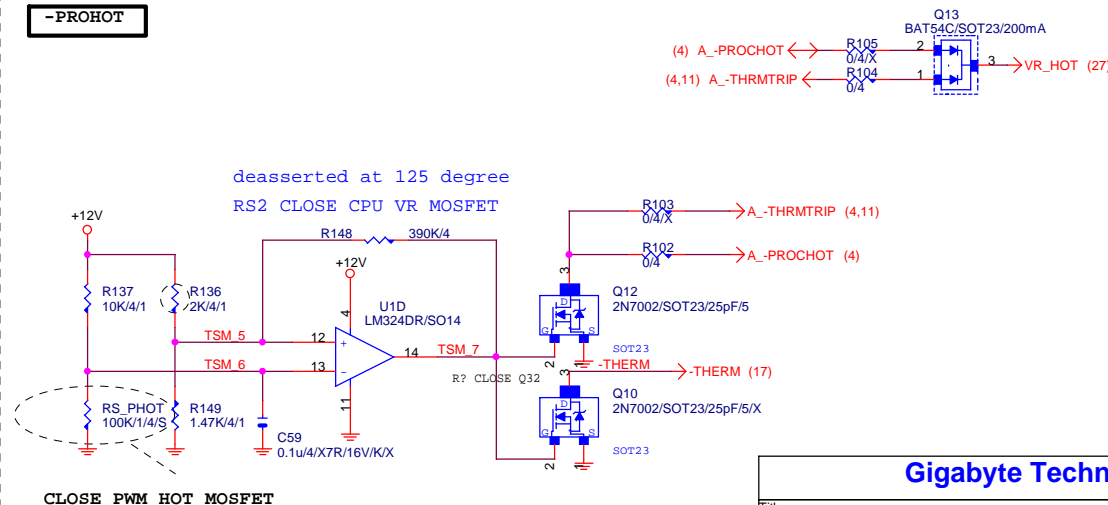
# CPU SMART FAN



# SYS SMART FAN



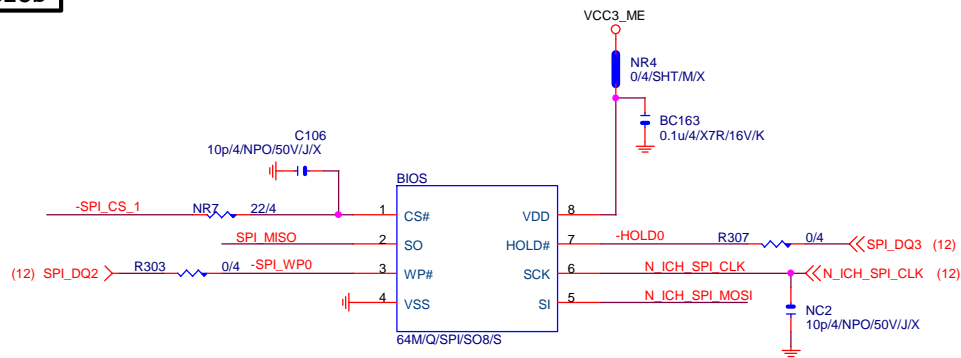
# -PROHOT



Gigabyte Technology

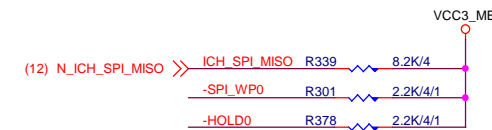
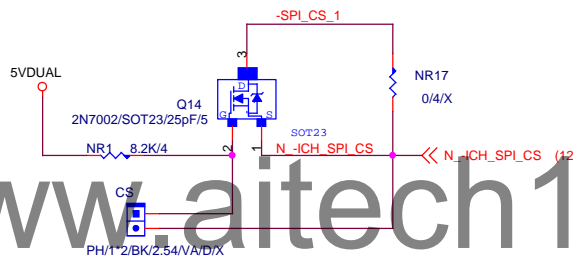
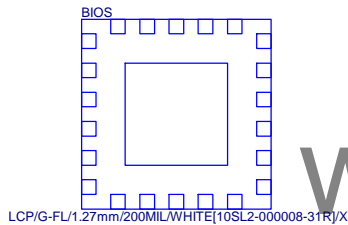
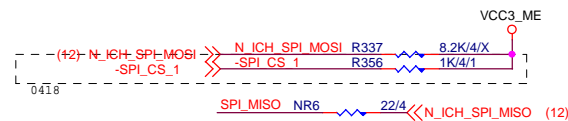
Title			HWM,FAN CTRL,OV
Size	Document Number	GA-Q87M-MK	
Custom		Rev 1.1	
Date:	Monday, August 19, 2013	Sheet	19 of 33

# BIOS

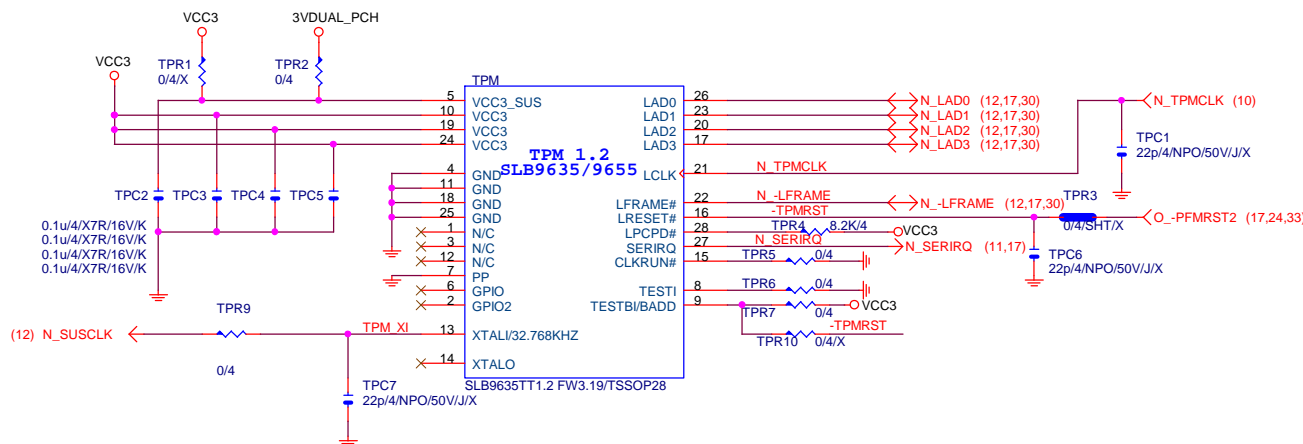


BOOT DEVICE	GP51	GP19
LPC	0	0
SPI	1	1

1 means internal PU  
0 means PD 1K



# TPM



	SLB9635	SLB9655
TPR2, TPR4, TPR5, TPR6, TPR7, TPR9	MOUNT	N/A
TPR1, TPR10	N/A	MOUNT

**Gigabyte Technology**

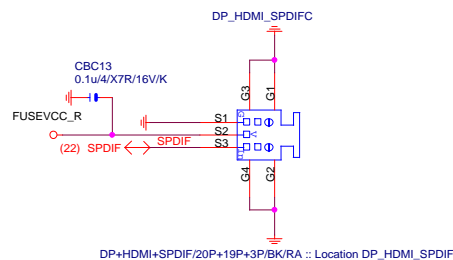
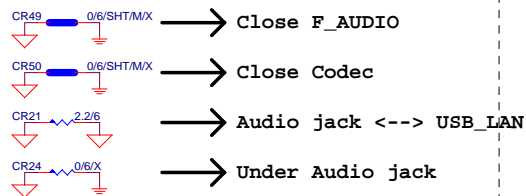
Title		
BIOS ,TPM		
Size	Document Number	Rev
B	GA-Q87M-MK	1.1
Date:	Monday, August 19, 2013	Sheet 20 of 33



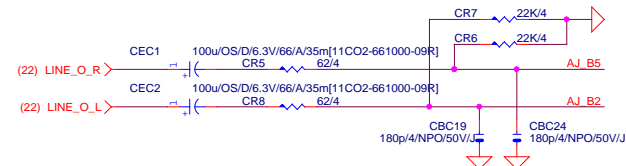




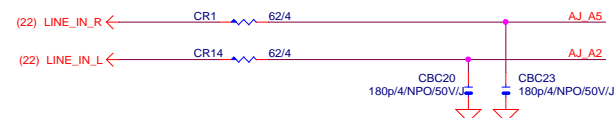
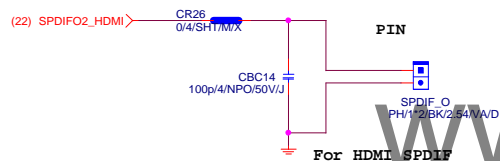
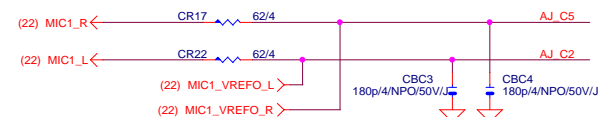
## CODEC POWER/EMI PAD



**LINE-OUT**

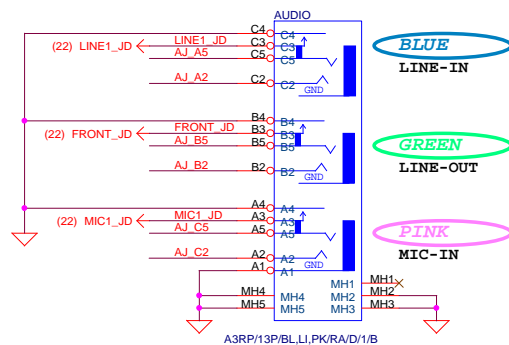


## LINE-IN

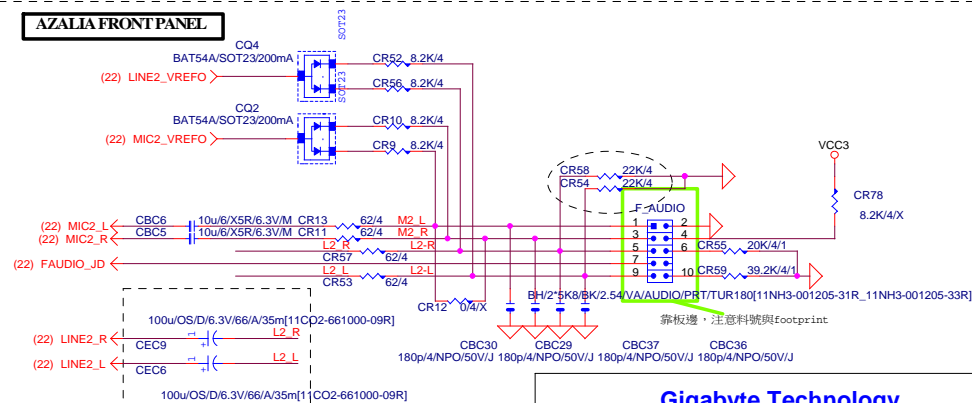
**MIC-IN**

**AZALIA JACK**

BTX AZALIA CONNECTOR

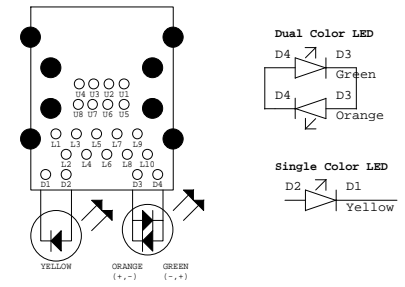
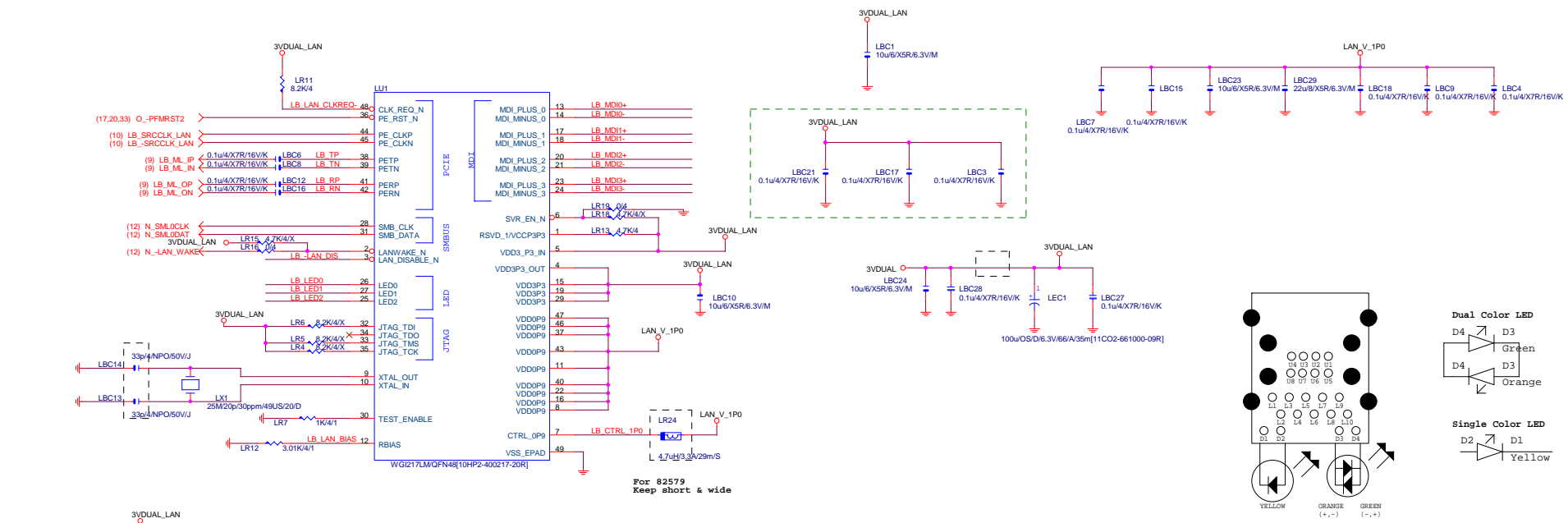


## AZALIA FRONT PANEL



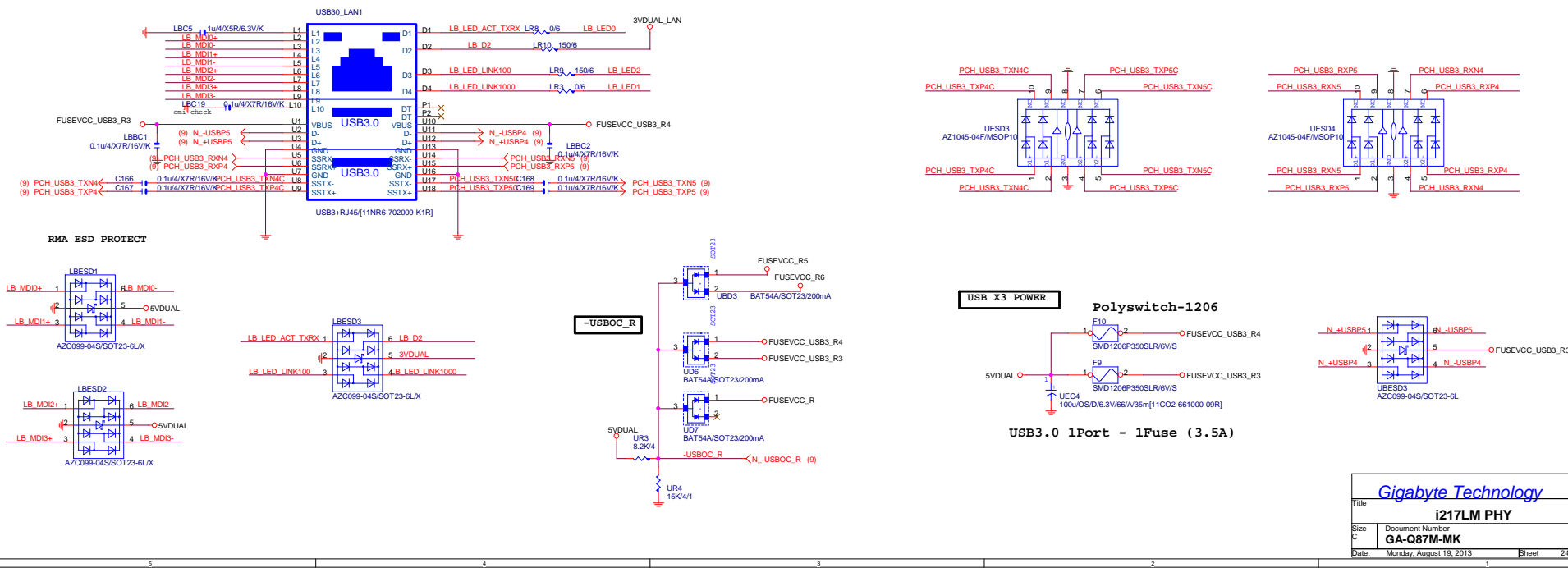
## Gigabyte Technology

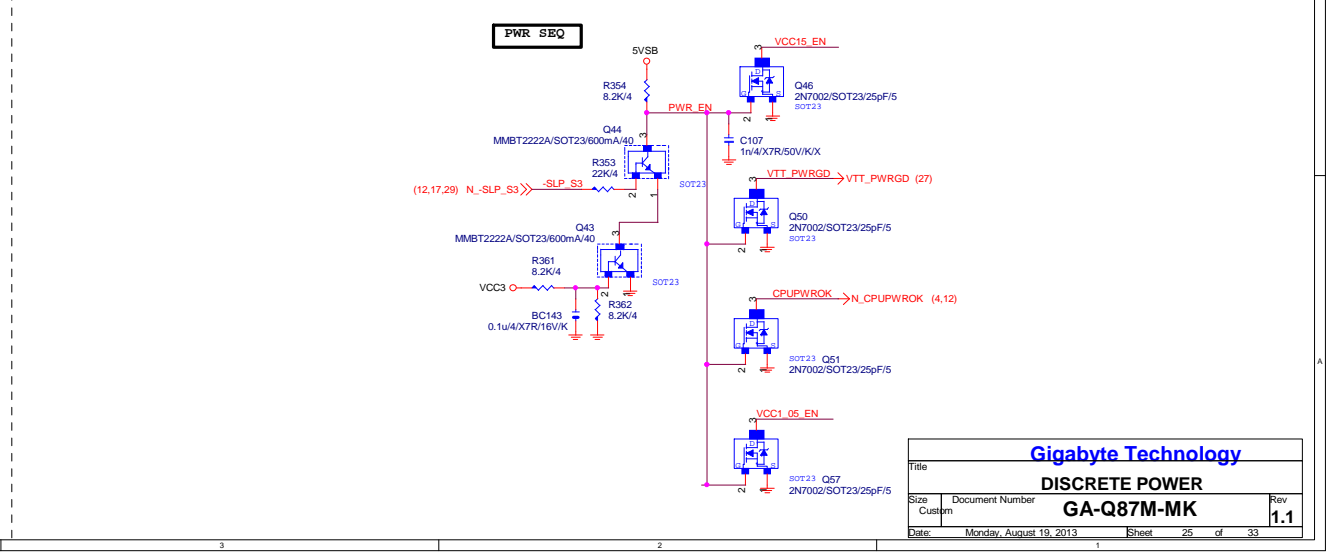
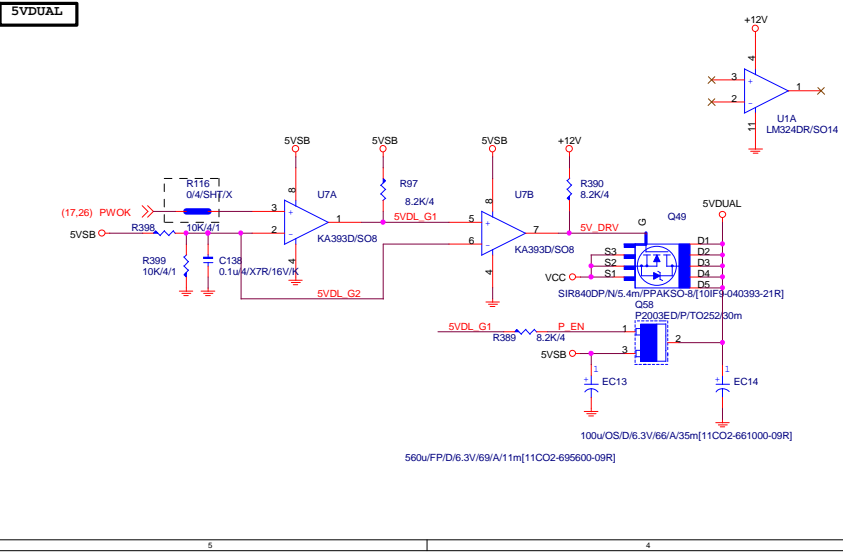
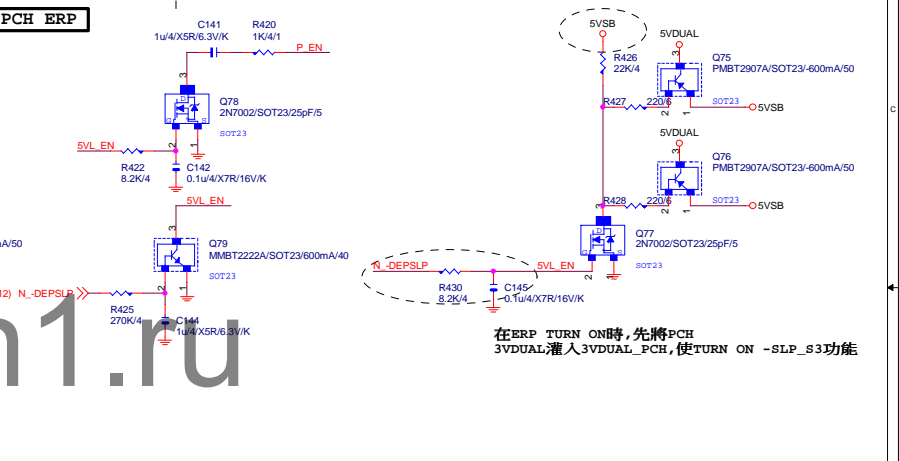
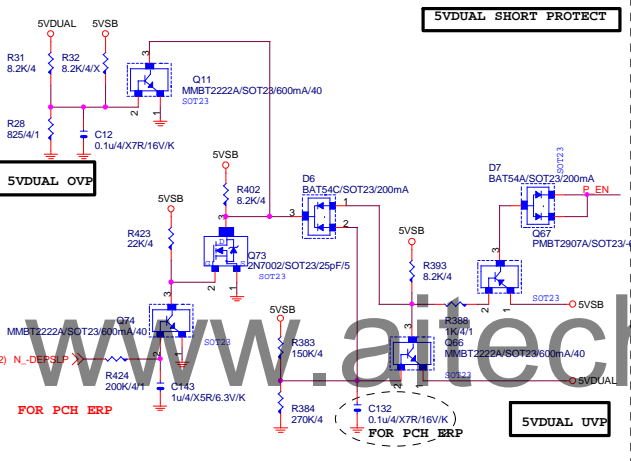
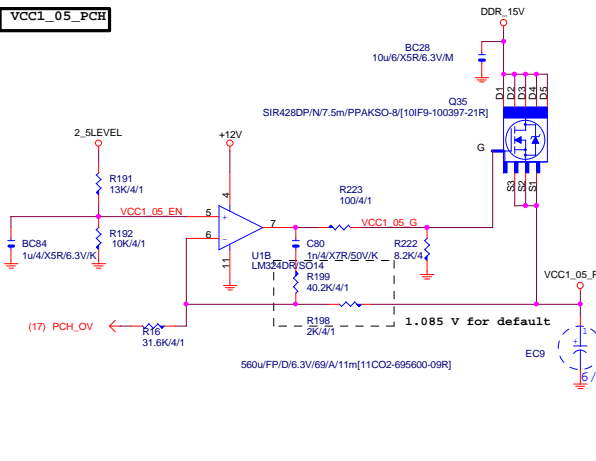
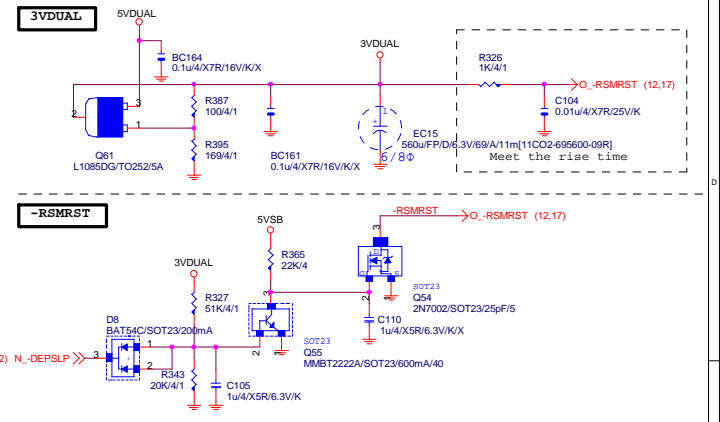
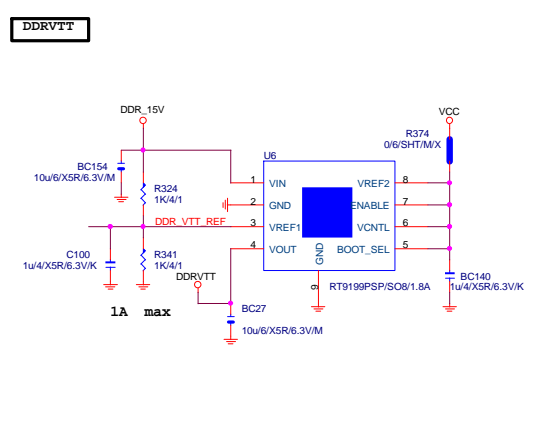
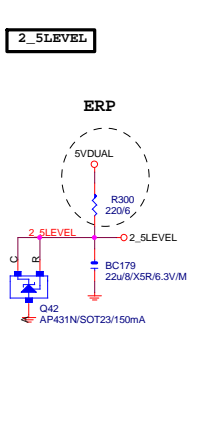
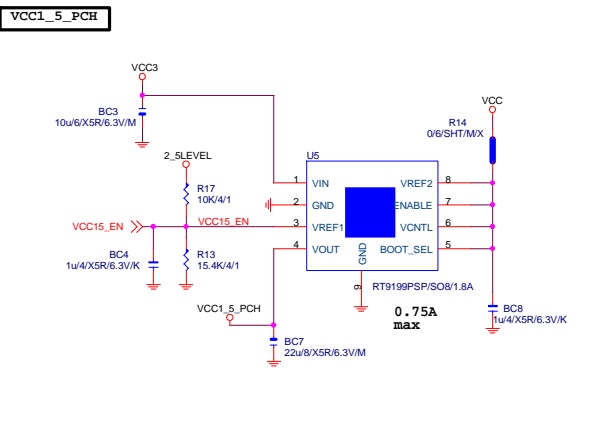
Title			
AUDIO JACK			
Size	Document Number		Rev
Custom	GA-Q87M-MK		1.1
Date:	Monday, August 19, 2013	Sheet	23 of 33



1Gb	Orange	Access	Blinking
100Mb	Green	Link	Yellow
10Mb	Off		

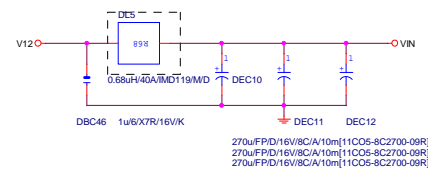
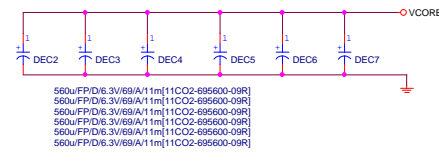
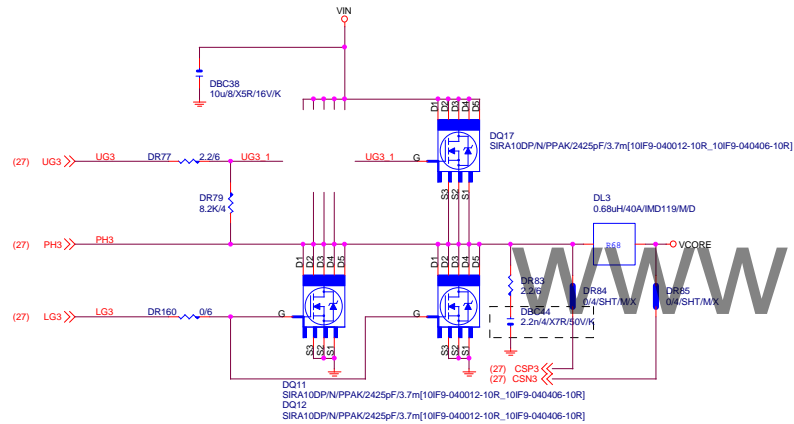
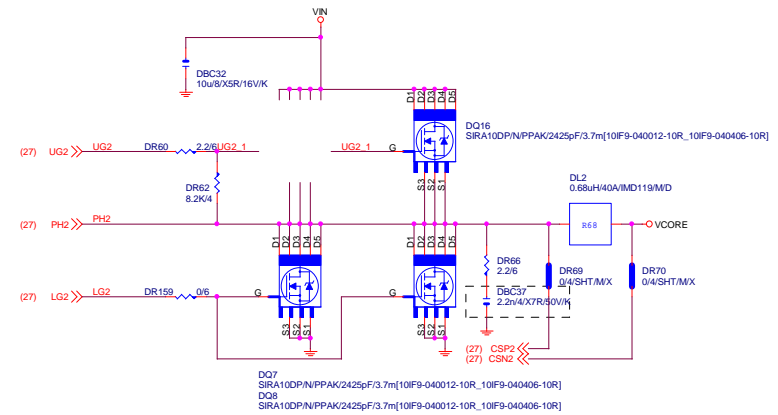
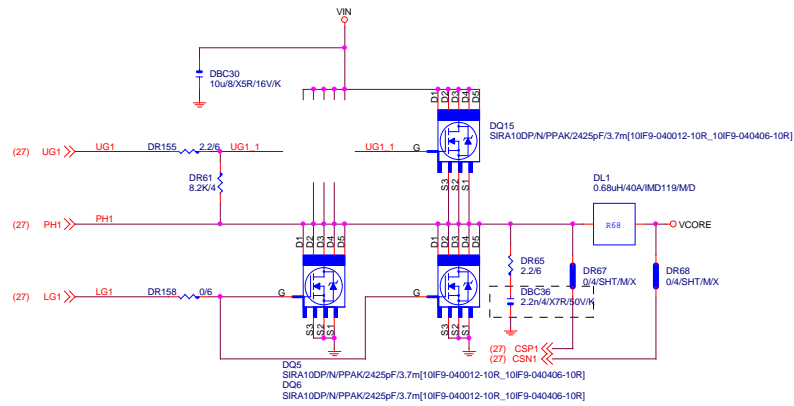
www.aitech1.ru







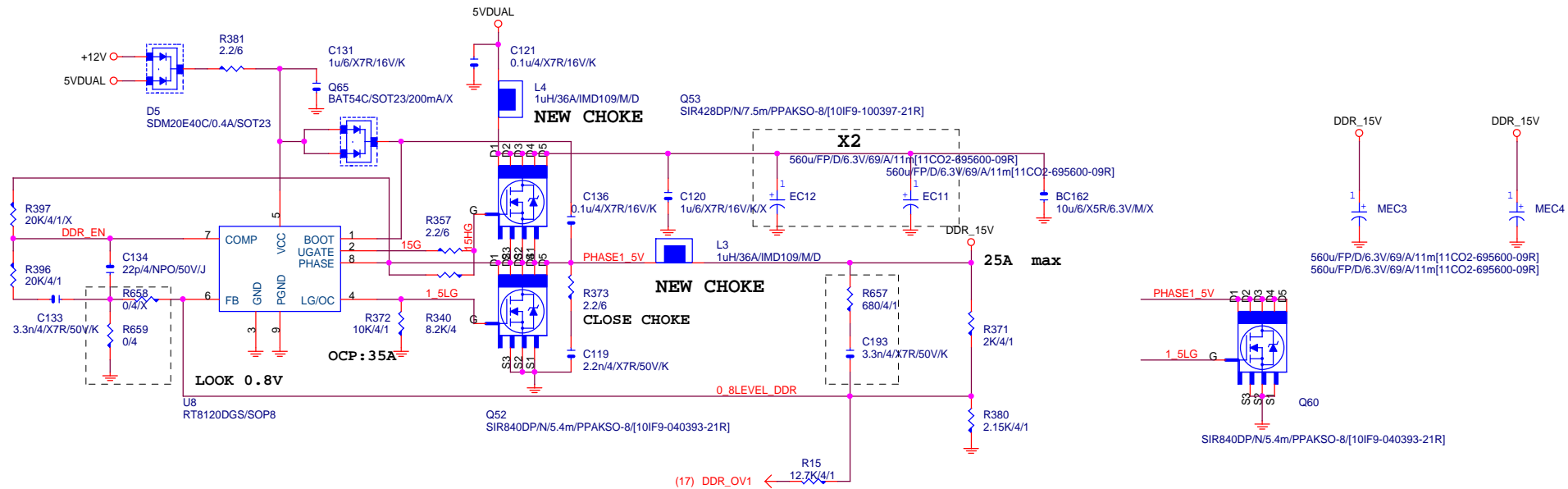




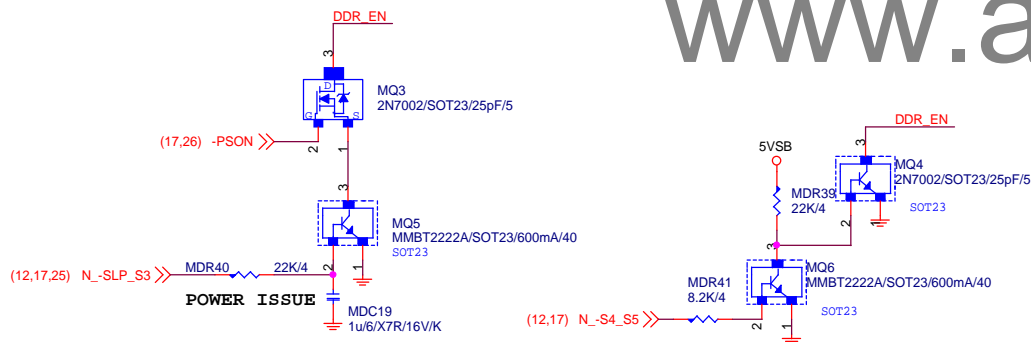
**Gigabyte Technology**

Title			CPU CORE VR-2
Size	Document Number	GA-Q87M-MK	
Custom			Rev 1.1
Date:	Monday, August 19, 2013	Sheet	28 of 33

# DDR1.5V



# PWR\_SEQ



VIN=5V, VOUT=1.5V, IOUT=25A, PHASE=1  
 IRMS=11.45A  
 560u/FP/D/6.3V/68/8m RIPPLE CURRENT=4.7A  
 Coefficient=1.7(85°C), 1(105°C)  
 VIN Ripple current=4.7X1.7=7.99A(85°C)  
 -->故固態電容須2X7.99=15.98>11.45A

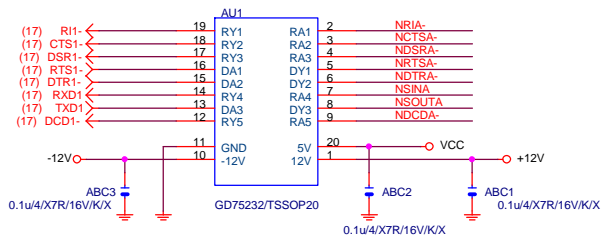
Rocset=(Iocp\*Lgate,rdson)/Iocset  
 Rocset=(45A\*6.7mOhm)/10uA = 30K  
 Iocset=10uA

**Gigabyte Technology**

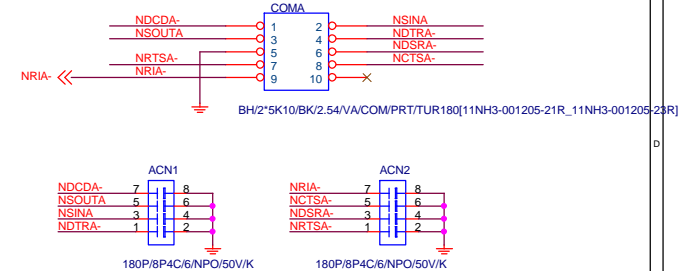
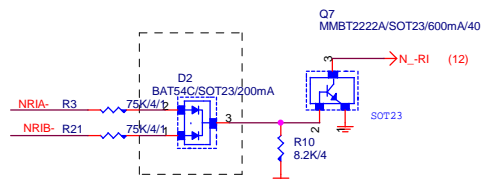
Title		
DDR POWER		
Size	Document Number	Rev
Custom	GA-Q87M-MK	1.1
Date:	Monday, August 19, 2013	Sheet 29 of 33



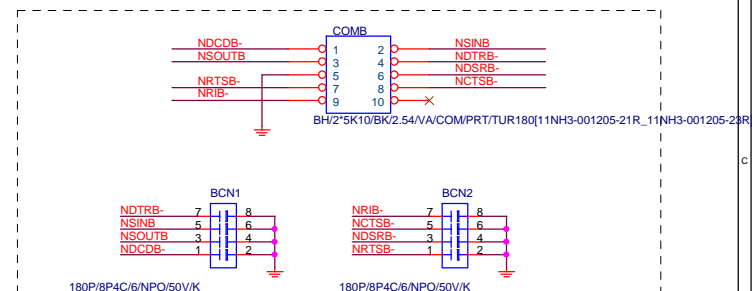
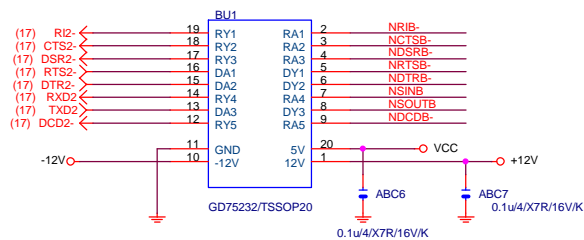
COMA



COM RI

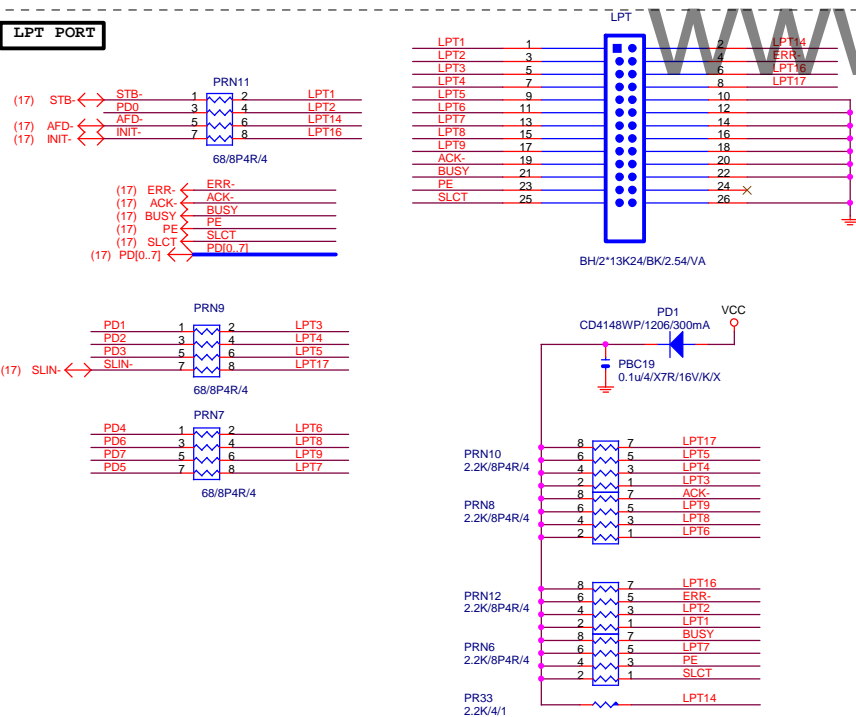


COMB



PLACE NEAR COM CONNECTOR

LPT PORT



## 80 PORT

