Model Name: GA-Z97-D3H

1.11

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
10	PCH_RGB,CLK BUFFER
11	PCH_HOST,SATA,PCI
12	PCH_GPIO,CTRL,AUDIO
13	PCH_PWR,GND
14	PCI EXPRESS*16 SLOT
15	PCIEX1*2 , PCIEX4 SLOT
16	ITE8892 PCI BRIDGE
17	PCI SLOT 1&2
18	I/O ITE8728
19	COM, -PROHOT, R_USB
20	Dual BIOS , TPM SLB9635TT
21	ALC892 CODEC
22	REAR AUDIO JACK
23	VCORE PWM_IR3564a
24	VCORE+DDR PWM IR3553+IR3598
25	ME POWER
26	NCP3933 OVER VOLTAGE
27	DISCRETE POWER

SHEET	TITLE
28	F_PANEL , F_USB2.0/3.0
29	ATX POWER, CLOCK GEN
30	HWM , KB/MS , FAN CTRL
31	LAN INTEL i217
32	DVI
33	HDMI , R_USB30
34	TABLE LIST
35	
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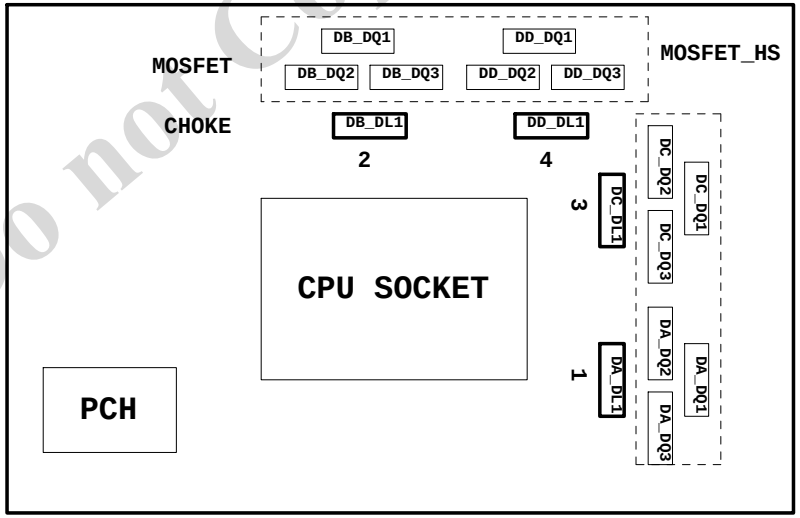
39	
40	



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Title: Cover Sheet

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GA-Z97-D3H

Component value change history

Data	Change Item	Reason
0.1-11	1. M_BIOS要加腳座,腳座放在SMD,BIOS零件放在DIP區	
	2. PCH_HS & MOS_HS 料號要UPDATE	
	3. F_USB30硬殼料號,M2 & SATA EXPRESS料號	
	4. SLOT顏色確認	
0.2		
H97-D3H	1. Z97 --> H97	
	2. NCT3933只保留U7,其餘移除,包含MR3/MR16 10/4	
	3. INTEL SBA enable : N_GPIO37	
	4. VCORE MOSFET改上一下一,注意擺放位置,Thermistor位置(注意:阻值不同)	
0.3	1. ADD PCH_HS & MOS_HS料號	
	2. HR2/3/18/19 28K/4/1 --> 2.2K/4/1	
	3.N_GPIO73 NR134 Change to NR253	
	4.ADD SER11	
	5.背面電容移除	
	6. M2螺絲 M2_80A M2_80B	
	7.anti pop	
	8. DR130/DR140 2.87K/4/1 , DAR11 4.99K/4/1, DAR17:4.12K/4/1	
	9. ESD IC 指定 : AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]	
	10. Remove M_BIOS SOCKET	
	11. Vcore P-PAK 改成 : SIRA12DP/PPAKSO8/2070pF/4.3m/[10IF9-040012-10R_10IF9-040406-10R]	
	12. Non-Vcore P-PAK 改成 : SiRA18DP-T1/PPAKSO-8/1000pF/7.5m/[10IF9-070018-01R_10IF9-070410-00R]	
10A-0307	1. REMOVE M2RN2	
	2. VCORE / Non-Vcore 指定用 VISHAY	
	3. VGA指定用 : VGA/BK/SC/RA/D/2/HR/[11NR6-103015-12R]	
10B-0411	1. UPDATE Z97 料號:10HB1-030Z97-20R	
10C-0425	1. SATA EXPRESS CAP : SEC1~SEC8 CHANGE TO 0.1u/4/X7R/16V/K	
10D-0509	1. MA_DQ1~MA_DQ3 --> NTMFS4C10NT1G/PPAK/970pF/7.3m/[10IF9-070410-00R]	
11A-0603	1. AUDIO LED 模組線路 MASK --> Non-MASK	
11C-0623	1. SATA/SATA EXPRESS /M2 AC couple cap change to short pad	

Circuit or PCB layout change

DATE	Change Item	Reason
2013/10/18	1. H87-D3H 1.12 修改成 Z97-D3H 0.1	
2013/01/10 PCB:0.2	1. DVI add level shifter IC 2. Fix M2 & SATA EXPRESS circuit 3. CPU_OPT & SYS_FAN1 FAN Control change	
PCB:0.3	1. All 0ohm SHORT PAD (包含0402,0603,0805,8P4R) 2. Vcore 一上二下 --> 另一顆是否mask? 3. Remove BIOS_PH 4. Update "NGFF-M-75P-8CM-1" & "C0402-2" 5. Add "SER11" for M2 control circuit 6. Fix Audio pop noise 7. 2_5LEVEL control , NR205 改R0402-2-SHORT10 8. 背面電容mask (包含CPU & PCH) 9. DFM check 10. BIOS_PH 改成 MASK	
PCB:1.0	1. All 0ohm SHORT PAD (包含0402,0603,0805,8P4R)	
PCB:1.1	1. AUDIO LED 模組線路 MASK --> Non-MASK	
PCB:1.01	1. SATA/SATA EXPRESS /M2 AC couple cap change to short pad	

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Title: BOM & PCB MODIFY HISTORY

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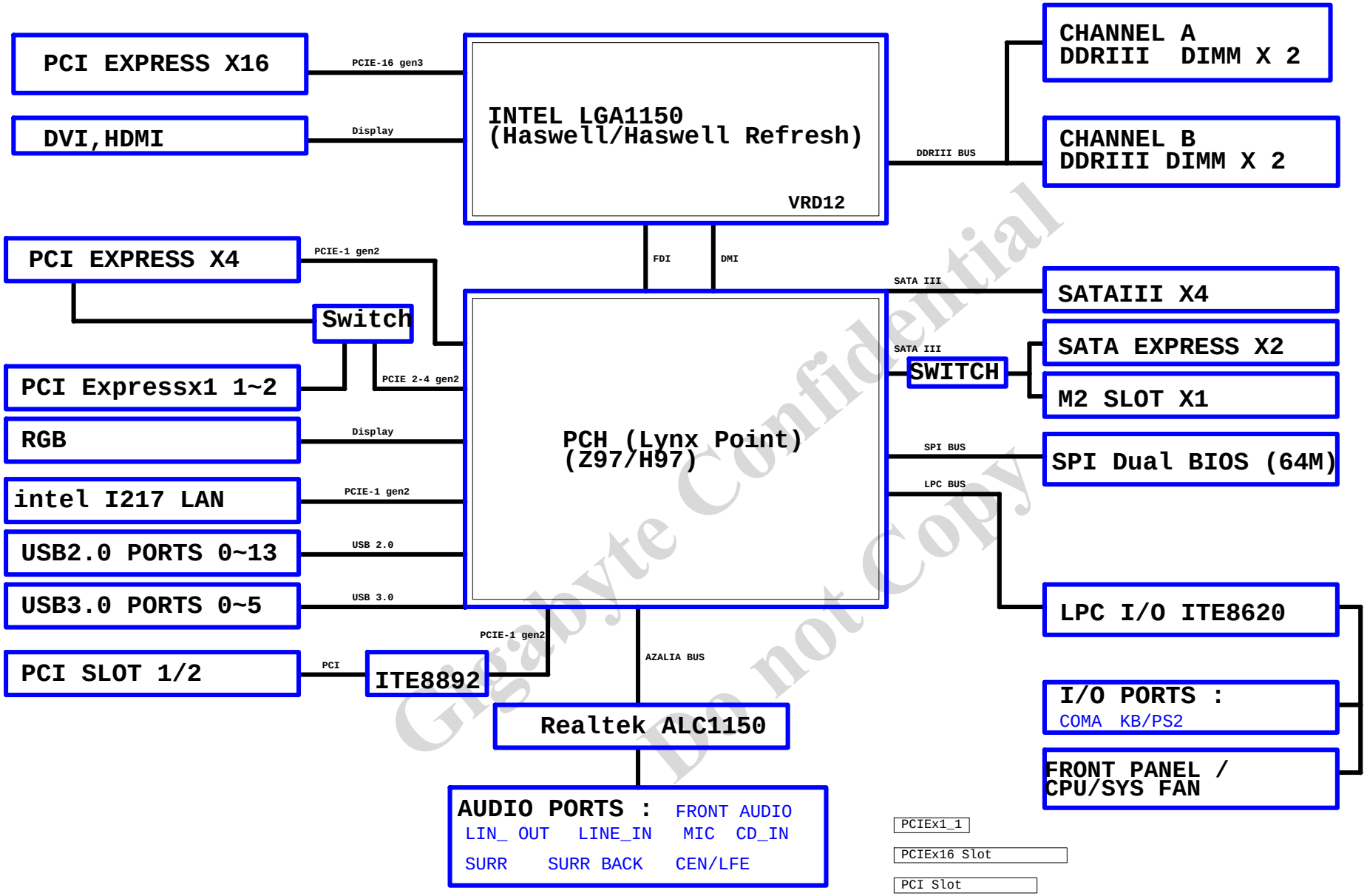
BLOCK DIAGRAM



Gigabyte Technology			
Title: BLOCK DIAGRAM			
Size: C	Document Number: GA-Z97-D3H		Rev: 1.11
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LGA1150 (E)

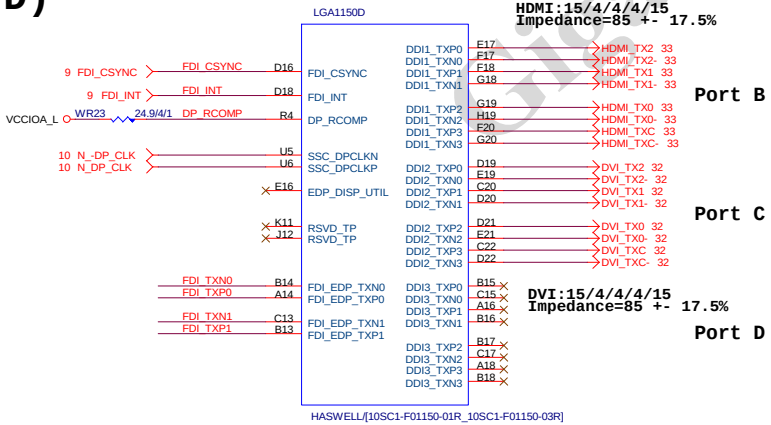
CFG	H	L	NOTE
0	RSVD	RSVD	RSVD
1	RSVD	RSVD	RSVD
2	**NORM**	**Reverse**	LANE REVERSAL[0],x16
3	RSVD	RSVD	RSVD
4	**Disable**	**Enable**	eDP Enable
7	RSVD	RSVD	RSVD
8	RSVD	RSVD	RSVD
9	RSVD	RSVD	RSVD
10	RSVD	RSVD	RSVD
11	RSVD	RSVD	RSVD
12	RSVD	RSVD	RSVD
13	RSVD	RSVD	RSVD
14	RSVD	RSVD	RSVD
15	RSVD	RSVD	RSVD
16	RSVD	RSVD	RSVD
17	RSVD	RSVD	RSVD

CFG6	CFG5	PCIE CONFIG
1	1	1X16 , Default
1	0	2X8
0	1	RSVD
0	0	X8,X4,X4

CFG 0-17 all internal PULL-UP

LGA1150 (D)

HDMI 需接Port B For WHQL

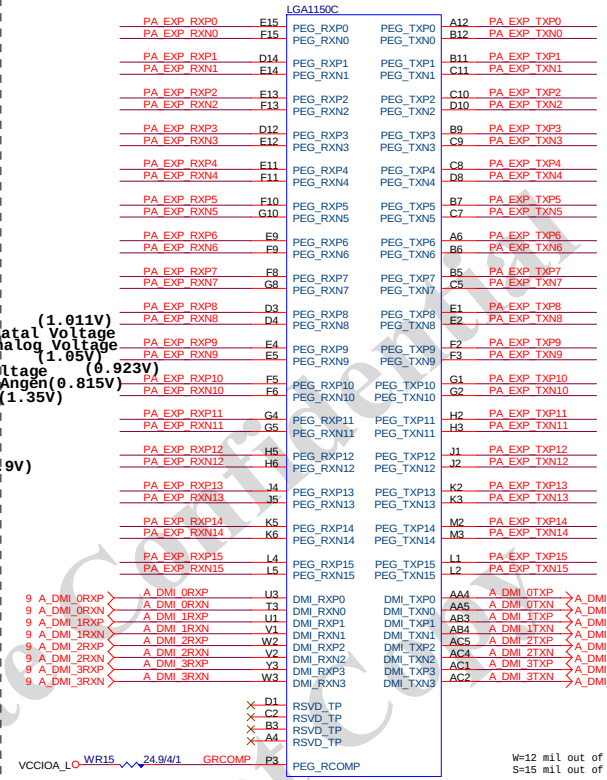


FDI:12/4/4/4/12(breakout min 6/4/4/4/6)
Impedance=85 +- 17.5%

FDI_TXP[0..1] → FDI_TXP[0..1] 9
FDI_TXN[0..1] → FDI_TXN[0..1] 9

LGA1155 (C)

PCIEX16:20/5/4/5/20(breakout min 10/4/4/4/10)
Impedance=80 +- 17.5%

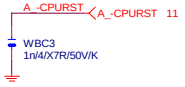


DMI:12/4/4/4/12(breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

PA_EXP_TXP[0..15] → PA_EXP_TXP[0..15] 14
PA_EXP_TXN[0..15] → PA_EXP_TXN[0..15] 14
PA_EXP_RXP[0..15] → PA_EXP_RXP[0..15] 14
PA_EXP_RXN[0..15] → PA_EXP_RXN[0..15] 14

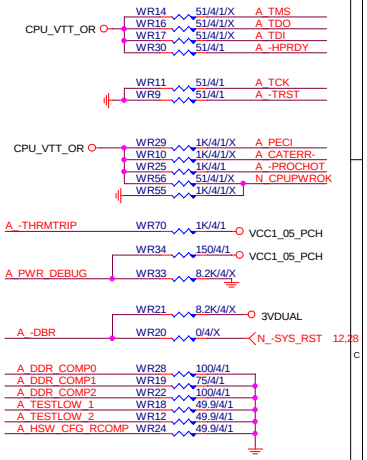
-CPURST

1.1V分壓

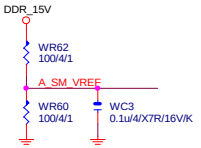


CPU SVID

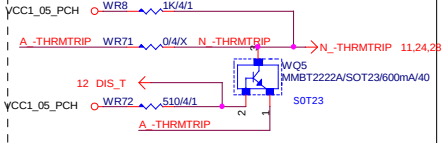
CPU PU/PD



SM REF



THRMTRIP DISABLE



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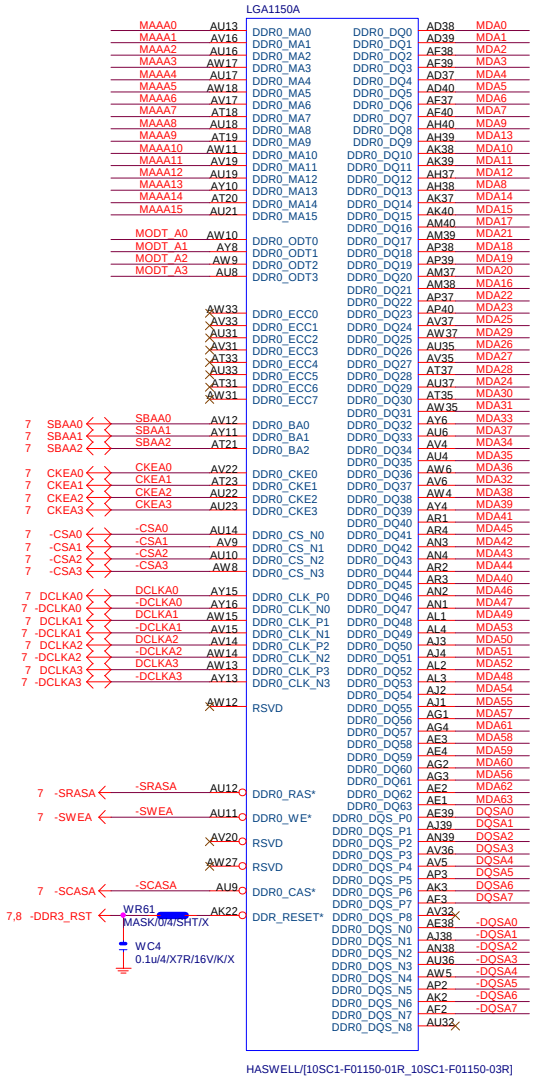
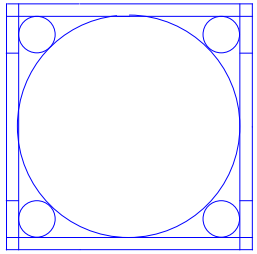
LGA1150 (A)

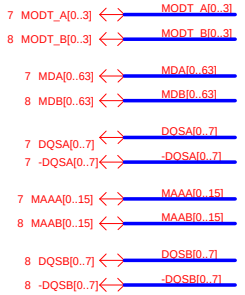


LGA1150 (B)

LGA1150 (CR)



DDR BUS



Gigabyte Technology			
Title: CPU LGA1150-B			
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LGA1150 (F,J)

(1.0V)
CPU_VTT_OR
WBC1
22u/8/X5R/6.3V/M
VCCST
WBC23
1u/4/X5R/6.3V/K
WBC13
0.1u/4/X7R/16V/K
WR65
0/4/X
WR63
MASK/0/4/SHT/X
VCCIO2PCH
(1.07V)
WR64
MASK/0/4/SHT/X
VCC1_05_PCH
VCORE

LGA1150F

P8	VCC	VCC	C31
L40	VCCIO_OUT	VCC	C33
AB8	VCCIO2PCH	VCC	L16
		VCC	L15
L31	VCC	VCC	J35
L18	VCC	VCC	H33
L17	VCC	VCC	H35
J33	VCC	VCC	J21
A24	VCC	VCC	J22
A25	VCC	VCC	J23
A26	VCC	VCC	J24
A27	VCC	VCC	J25
A28	VCC	VCC	J26
A29	VCC	VCC	J27
A30	VCC	VCC	J28
G33	VCC	VCC	J29
B25	VCC	VCC	J30
B27	VCC	VCC	J32
B29	VCC	VCC	J34
B31	VCC	VCC	K19
J31	VCC	VCC	K21
B33	VCC	VCC	K23
G31	VCC	VCC	K25
B35	VCC	VCC	K27
C24	VCC	VCC	K29
C25	VCC	VCC	K31
C26	VCC	VCC	M13
C27	VCC	VCC	K33
C28	VCC	VCC	K35
C29	VCC	VCC	L19
C30	VCC	VCC	L20
C32	VCC	VCC	L21
C34	VCC	VCC	L22
C35	VCC	VCC	L23
D25	VCC	VCC	L24
D27	VCC	VCC	L25
D29	VCC	VCC	L26
D31	VCC	VCC	L27
E33	VCC	VCC	L28
D33	VCC	VCC	L29
E31	VCC	VCC	L30
D35	VCC	VCC	L32
E24	VCC	VCC	L33
E25	VCC	VCC	M17
E26	VCC	VCC	M15
E27	VCC	VCC	M19
E28	VCC	VCC	M21
E29	VCC	VCC	M23
E30	VCC	VCC	M25
E32	VCC	VCC	M27
E34	VCC	VCC	M29
F23	VCC	VCC	M33
F25	VCC		
F27	VCC	VDDQ	AJ12
F29	VCC	VDDQ	AJ13
F31	VCC	VDDQ	AJ15
E35	VCC	VDDQ	AJ17
F33	VCC	VDDQ	AJ20
F35	VCC	VDDQ	AJ21
G22	VCC	VDDQ	AJ24
G23	VCC	VDDQ	AJ25
G24	VCC	VDDQ	AJ28
G25	VCC	VDDQ	AJ29
G26	VCC	VDDQ	AJ9
G27	VCC	VDDQ	AT17
G28	VCC	VDDQ	AT22
G29	VCC	VDDQ	AU15
G30	VCC	VDDQ	AU20
G32	VCC	VDDQ	AU24
G34	VCC	VDDQ	AV10
G35	VCC	VDDQ	AV11
H23	VCC	VDDQ	AV13
H25	VCC	VDDQ	AV18
H27	VCC	VDDQ	AV23
H29	VCC	VDDQ	AV8
H31	VCC	VDDQ	AW16
L34	VCC	VDDQ	AY12
		VDDQ	AY14
		VDDQ	AY9

DDR_15V

HASWELL/[10SC1-F01150-01R_10SC1-F01150-03R]

LGA1150J

		RSVD_TP	K12
		RAVD_TP	J13
		RAVD_TP	P37
		RAVD_TP	N38
AY18	RSVD	RAVD_TP	R36
AW24	RSVD	RAVD_TP	C39
AW23	RSVD	VSS	U35
AV29	RSVD	VSS	P40
AV24	RSVD	VSS	R38
AU39	RSVD	VSS	T37
AU27	RSVD	VSS	V34
AU1	RSVD	VSS	R39
AT40	RSVD	VSS	T38
AK20	RSVD	VSS	U36
Y7	RSVD	VSS	P39
T34	RSVD	VSS	T36
R34	RSVD	VSS	R37
J40	RSVD	VSS	J14
J17	RSVD	RSVD_TP	N36
J15	RSVD		
H12	RSVD		

HASWELL/[10SC1-F01150-01R_10SC1-F01150-03R]

WR67
6.04K/4/1
(1.02V)
VCCST_PWRGD
11,12,18 O_PWROK1
WR66
3.16K/4/1

LGA1150 (G,H,I)

LGA1150G

A13	VSS	VSS	AJ34
A15	VSS	VSS	AJ35
A17	VSS	VSS	AJ36
A23	VSS	VSS	AJ37
A11	VSS	VSS	AJ40
AA3	VSS	VSS	AJ5
AA33	VSS	VSS	AJ8
AA35	VSS	VSS	AK1
AA38	VSS	VSS	AK10
AA6	VSS	VSS	AK11
AA7	VSS	VSS	AK12
AA8	VSS	VSS	AK13
A5	VSS	VSS	AK14
AB34	VSS	VSS	AK18
AB37	VSS	VSS	AK19
AB5	VSS	VSS	AK24
AB7	VSS	VSS	AK25
AC3	VSS	VSS	AK26
AC33	VSS	VSS	AK27
AC34	VSS	VSS	AK28
AC35	VSS	VSS	AK29
AC36	VSS	VSS	AK30
AC37	VSS	VSS	AK36
AC38	VSS	VSS	AK4
AC39	VSS	VSS	AK5
AC40	VSS	VSS	AK6
AC6	VSS	VSS	AK7
AC7	VSS	VSS	AK8
A7	VSS	VSS	AK9
AD1	VSS	VSS	AL11
AD2	VSS	VSS	AL14
AD3	VSS	VSS	AL17
AD33	VSS	VSS	AL21
AD36	VSS	VSS	AL22
AD4	VSS	VSS	AL24
AD5	VSS	VSS	AL27
AD6	VSS	VSS	AL30
AD7	VSS	VSS	AL36
AD8	VSS	VSS	AL37
AE33	VSS	VSS	AL38
AE36	VSS	VSS	AL39
AE37	VSS	VSS	AL40
AE40	VSS	VSS	AL5
AE5	VSS	VSS	AM1
AE8	VSS	VSS	AM11
AF1	VSS	VSS	AM14
AF33	VSS	VSS	AM15
AF36	VSS	VSS	AM19
AF4	VSS	VSS	AM2
AF5	VSS	VSS	AM24
AF8	VSS	VSS	AM27
AG33	VSS	VSS	AM3
AG36	VSS	VSS	AM30
AG37	VSS	VSS	AM31
AG38	VSS	VSS	AM32
AG39	VSS	VSS	AM33
AG40	VSS	VSS	AM34
AG5	VSS	VSS	AM35
AG8	VSS	VSS	AM36
AH1	VSS	VSS	AM4
AH2	VSS	VSS	AM5
AH3	VSS	VSS	AN10
AH33	VSS	VSS	AN11
AH36	VSS	VSS	AN14
AH4	VSS	VSS	AN16
AH5	VSS	VSS	AN18
AH8	VSS	VSS	AN19
AJ11	VSS	VSS	AN22
AJ14	VSS	VSS	AN23
AJ16	VSS	VSS	AN24
AJ18	VSS	VSS	AN27
AJ19	VSS	VSS	AN30
AJ22	VSS	VSS	AN36
AJ23	VSS	VSS	AN37
AJ26	VSS	VSS	AN40
AJ30	VSS	VSS	AN5
AJ31	VSS	VSS	AN6
AJ32	VSS	VSS	AN7
AJ33	VSS	VSS	AN8
		VSS	AN9
		VSS	AP1

HASWELL/[10SC1-F01150-01R_10SC1-F01150-03R]

LGA1150I

G12	VSS	VSS	M4
G13	VSS	VSS	M40
G14	VSS	VSS	M5
G16	VSS	VSS	M6
H11	VSS	VSS	M7
G17	VSS	VSS	K15
G21	VSS	VSS	K16
G3	VSS	VSS	N1
H13	VSS	VSS	N2
H22	VSS	VSS	N3
H32	VSS	VSS	N7
G36	VSS	VSS	N34
G37	VSS	VSS	N4
G6	VSS	VSS	N6
G7	VSS	VSS	K32
G15	VSS	VSS	P2
H1	VSS	VSS	P34
H10	VSS	VSS	P38
H17	VSS	VSS	P5
H18	VSS	VSS	P7
H20	VSS	VSS	N8
H21	VSS	VSS	R3
H24	VSS	VSS	L36
H26	VSS	VSS	R35
H28	VSS	VSS	R40
H30	VSS	VSS	R5
H34	VSS	VSS	R6
H36	VSS	VSS	R7
H39	VSS	VSS	T1
H4	VSS	VSS	T2
H7	VSS	VSS	T33
H8	VSS	VSS	M35
H9	VSS	VSS	T39
J19	VSS	VSS	T4
J20	VSS	VSS	T5
J3	VSS	VSS	T6
J18	VSS	VSS	T7
K10	VSS	VSS	R8
K14	VSS	VSS	U2
J36	VSS	VSS	U33
J37	VSS	VSS	U34
J6	VSS	VSS	U37
K1	VSS	VSS	U4
K18	VSS	VSS	U7
K20	VSS	VSS	P35
K22	VSS	VSS	V3
K24	VSS	VSS	V33
K26	VSS	VSS	V40
K28	VSS	VSS	V6
K30	VSS	VSS	V8
K34	VSS	VSS	W1
K36	VSS	VSS	W33
K4	VSS	VSS	W35
K40	VSS	VSS	W37
K7	VSS	VSS	W4
L7	VSS	VSS	W7
L8	VSS		
L9	VSS	VSS	Y33
L11	VSS	VSS	Y4
L3	VSS	VSS	Y5
L13	VSS	VSS	Y6
L14	VSS		
L35	VSS		
L38	VSS		
L6	VSS		
M1	VSS	VSS_NCTF	AU40
K17	VSS	VSS_NCTF	AV39
M12	VSS	VSS_NCTF	AW38
M14	VSS	VSS_NCTF	AY3
M18	VSS	VSS_NCTF	B38
M16	VSS	VSS_NCTF	B39
M20	VSS	VSS_NCTF	C40
M22	VSS	VSS_NCTF	D40
M24	VSS		
M26	VSS		
M28	VSS		
M30	VSS		
M32	VSS		
M34	VSS		
M37	VSS		

HASWELL/[10SC1-F01150-01R_10SC1-F01150-03R]

LGA1150H

AP11	VSS	VSS	AW32
AP14	VSS	VSS	AW34
AP15	VSS	VSS	AW36
AP24	VSS	VSS	AW7
AP27	VSS	VSS	AY17
AP30	VSS	VSS	AY23
AP36	VSS	VSS	AY26
AP4	VSS	VSS	AY27
AP5	VSS	VSS	AY30
AR11	VSS	VSS	AY5
AR14	VSS	VSS	AY7
AR16	VSS	VSS	B24
AR17	VSS	VSS	B26
AR18	VSS	VSS	B28
AR19	VSS	VSS	B30
AR20	VSS	VSS	B34
AR21	VSS	VSS	B36
AR22	VSS	VSS	B4
AR23	VSS	VSS	B8
AR24	VSS	VSS	C4
AR27	VSS	VSS	C6
AR30	VSS	VSS	C12
AR31	VSS	VSS	C14
AR32	VSS	VSS	C16
AR33	VSS	VSS	C18
AR34	VSS	VSS	C19
AR35	VSS	VSS	C21
AR36	VSS	VSS	C23
AR37	VSS	VSS	C36
AR38	VSS	VSS	B10
AR39	VSS	VSS	B23
AR40	VSS	VSS	C3
AR5	VSS	VSS	D9
AT1	VSS	VSS	D11
AT10	VSS	VSS	D13
AT11	VSS	VSS	D15
AT12	VSS	VSS	D17
AT13	VSS	VSS	D2
AT14	VSS	VSS	D23
AT15	VSS	VSS	D24
AT16	VSS	VSS	D26
AT2	VSS	VSS	D28
AT24	VSS	VSS	D30
AT25	VSS	VSS	D34
AT26	VSS	VSS	D36
AT27	VSS	VSS	D37
AT28	VSS	VSS	D5
AT29	VSS	VSS	D6
AT3	VSS	VSS	D7
AT30	VSS	VSS	E7
AT32	VSS	VSS	E8
AT34	VSS	VSS	E10
AT36	VSS	VSS	E18
AT38	VSS	VSS	E3
AT39	VSS	VSS	E20
AT4	VSS	VSS	E22
AT5	VSS	VSS	E23
AT6	VSS	VSS	E36
AT7	VSS	VSS	E38
AT8	VSS	VSS	B32
AT9	VSS	VSS	E6
AU2	VSS	VSS	F1
AU25	VSS	VSS	F32
AU3	VSS	VSS	F12
AU30	VSS	VSS	F14
AU34	VSS	VSS	F16
AU38	VSS	VSS	F19
AU5	VSS	VSS	F21
AU7	VSS	VSS	F22
AV21	VSS	VSS	F24
AV28	VSS	VSS	F26
AV3	VSS	VSS	F28
AV30	VSS	VSS	F30
AV34	VSS	VSS	F34
AV38	VSS	VSS	F36
AV7	VSS	VSS	F4
AW26	VSS	VSS	D32
AW3	VSS	VSS	F7
AW30	VSS	VSS	G9
		VSS	G11

HASWELL/[10SC1-F01150-01R_10SC1-F01150-03R]

VCore CAP (X30)

VCORE

WBC35 MASK/22u/8/X5R/6.3V/M/X
WBC42 MASK/22u/8/X5R/6.3V/M/X
WBC36 MASK/22u/8/X5R/6.3V/M/X
WBC43 MASK/22u/8/X5R/6.3V/M/X
WBC44 MASK/22u/8/X5R/6.3V/M/X
WBC38 MASK/22u/8/X5R/6.3V/M/X
WBC37 MASK/22u/8/X5R/6.3V/M/X
WBC46 MASK/22u/8/X5R/6.3V/M/X
WBC39 MASK/22u/8/X5R/6.3V/M/X
WBC41 MASK/22u/8/X5R/6.3V/M/X

VCORE

WBC40 MASK/22u/8/X5R/6.3V/M/X
WBC19 22u/8/X5R/6.3V/M
WBC21 22u/8/X5R/6.3V/M
WBC6 22u/8/X5R/6.3V/M
WBC9 22u/8/X5R/6.3V/M
WBC20 22u/8/X5R/6.3V/M
WBC7 22u/8/X5R/6.3V/M
WBC11 22u/8/X5R/6.3V/M
WBC8 22u/8/X5R/6.3V/M
WBC4 22u/8/X5R/6.3V/M

VCORE

WBC5 22u/8/X5R/6.3V/M
WBC10 22u/8/X5R/6.3V/M
WBC12 22u/8/X5R/6.3V/M
WBC22 22u/8/X5R/6.3V/M
WBC45 MASK/22u/8/X5R/6.3V/M/X
WBC14 22u/8/X5R/6.3V/M
WBC15 22u/8/X5R/6.3V/M
WBC16 22u/8/X5R/6.3V/M
WBC17 22u/8/X5R/6.3V/M
WBC18 22u/8/X5R/6.3V/M

DDR CAP (X15)

DDR_15V

WBC24 22u/8/X5R/6.3V/M
WBC25 22u/8/X5R/6.3V/M
WBC26 22u/8/X5R/6.3V/M
WBC27 22u/8/X5R/6.3V/M
WBC28 22u/8/X5R/6.3V/M

DDR_15V

WBC29 22u/8/X5R/6.3V/M
WBC30 22u/8/X5R/6.3V/M
WBC31 22u/8/X5R/6.3V/M
WBC32 22u/8/X5R/6.3V/M
SBC1 MASK/22u/8/X5R/6.3V/M/X
SBC2 MASK/22u/8/X5R/6.3V/M/X

DDR_15V

MBC50 MASK/22u/8/X5R/6.3V/M/X
MBC51 MASK/22u/8/X5R/6.3V/M/X
MBC48 MASK/1u/4/X5R/6.3V/M/X
MBC49 MASK/1u/4/X5R/6.3V/M/X

Gigabyte Technology	
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DDR3 (A)

DDR3_4

DDRVTT

VSS

RSVD

ODT1 ODT0

NC/PAR_IN NC/ERR_OUT NC/TEST4

CB0 CB1 CB2 CB3 CB4 CB5 CB6 CB7

DQS0* DQS1* DQS2* DQS3* DQS4* DQS5* DQS6* DQS7* DQS8*

DM0/DQS9 NC/DQS9* DM1/DQS10 NC/DQS10* DM2/DQS11 NC/DQS11* DM3/DQS12 NC/DQS12* DM4/DQS13 NC/DQS13* DM5/DQS14 NC/DQS14* DM6/DQS15 NC/DQS15* DM7/DQS16 NC/DQS16* DM8/DQS17 NC/DQS17*

VDD

DQ0 DQ1 DQ2 DQ3 DQ4 DQ5 DQ6 DQ7 DQ8 DQ9 DQ10 DQ11 DQ12 DQ13 DQ14 DQ15 DQ16 DQ17 DQ18 DQ19 DQ20 DQ21 DQ22 DQ23 DQ24 DQ25 DQ26 DQ27 DQ28 DQ29 DQ30 DQ31 DQ32 DQ33 DQ34 DQ35 DQ36 DQ37 DQ38 DQ39 DQ40 DQ41 DQ42 DQ43 DQ44 DQ45 DQ46 DQ47 DQ48 DQ49 DQ50 DQ51 DQ52 DQ53 DQ54 DQ55 DQ56 DQ57 DQ58 DQ59 DQ60 DQ61 DQ62 DQ63

MODT_A[0..3] -DQSA[0..7] DQSA[0..7]

-DDR3_RST

MC6 100p/4/NPO/50V/J

N_SMBDATA N_SMBCLK

MC10 100p/4/NPO/50V/J/X MC11 100p/4/NPO/50V/J/X

VDDSPD SHORT PROTECT R0402-2

VCC3 VDDSPD MF1 SPR-P200T/6V/8/S

DDR_15V

MC4 0.1u/4/X7R/16V/K

VDDSPD

MC5 0.1u/4/X7R/16V/K MC1 0.1u/4/X7R/16V/K

VREF_DDRA VREF_DDDRA VREFCA VREFDQ

8,12,14,15,17,23,27 N_SMBCLK 8,12,14,15,17,23,27 N_SMBDATA

SCL SDA SA1 SA0

SBAA2 SBAA1 SBAA0 BA2 BA1 BA0

CKEA1 CKEA0 CKE1 CKE0

-CSA1 -CSA0 S1* S0*

-DCLKA1 DCLKA1 CK1/NU* CK1/NU

-DCLKA0 DCLKA0 CK0* CK0

MAAA[0..15] A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10/AP A11 A12 A13 A14 A15

-DDR3_RST -SCASA -SRASA -SWEA RESET* CAS* RAS* WE*

MDA[0..63]

DDR3/240/BK/VA/D

DDR3

DDR3_2

DDR3/240/GR/VA/D

DDR3 VREF

DDR_15V

MR15 1K/4/1 MR14 1K/4/1

VREF_DDRA MR13 MASK/0/4/SHT/X M_VREFCA_A 27

MBC28 1u/4/X5R/6.3V/K

MR4 1K/4/1 MR5 1K/4/1

VREF_DDDDRA MR1 10/4 VREF_DQA 5

MR3 10/4/X VREF_DQA_ADJ 27

DDR TERMINATION CHANNEL A/B

DDR15V Decouple

DDRVTT Decouple

MEC1 MEC2 MEC3 560u/FP/D/6.3V/69/A/11m

MBC43 MBC44 22u/8/X5R/6.3V/M

MBC39 MBC40 22u/8/X5R/6.3V/M

MBC5 MBC6 MBC7 0.1u/4/X7R/16V/K

MBC8 2.2u/6/X5R/6.3V

MBC18 MBC26 MBC41 0.1u/4/X7R/16V/K

MBC4 MBC10 1u/4/X5R/6.3V/K

MBC9 MBC11 MBC12 MBC13 MBC14 MBC15 MBC16 MBC17 MBC19 MBC20 MBC21 MBC22 MBC23 1u/4/X5R/6.3V/K

MBC24 MBC25 MBC27 MBC29 MBC30 MBC31 MBC32 MBC33 MBC34 MBC35 MBC36 MBC37 MBC47 1u/4/X5R/6.3V/K

Gigabyte Technology

Title: DDRIII CHANNEL A

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DDR3 (B)

DDR3_3

DDR3 1066,1333,1600MHZ BANDWIDTH

DDR3 1066MHZ
DDR3 clock=533MHZ
DDR3 single channel bandwidth=533x2x8Byte=8.5GB/s
DDR3 dual channel bandwidth=533x2x2x8Byte=17GB/s

DDR3 1333MHZ
DDR3 clock=667MHZ
DDR3 single channel bandwidth=10.6GB/s
DDR3 dual channel bandwidth=21GB/s

DDR3 1600MHZ
DDR3 clock=800MHZ
DDR3 single channel bandwidth=12.8GB/s
DDR3 dual channel bandwidth=25.6GB/s

COUPON

CPU

DIMM4 (黑色) CHA
DIMM2 (灰色) CHA
DIMM3 (黑色) CHB
DIMM1 (灰色) CHB

Gigabyte Technology

Title: DDRIII CHANNEL B

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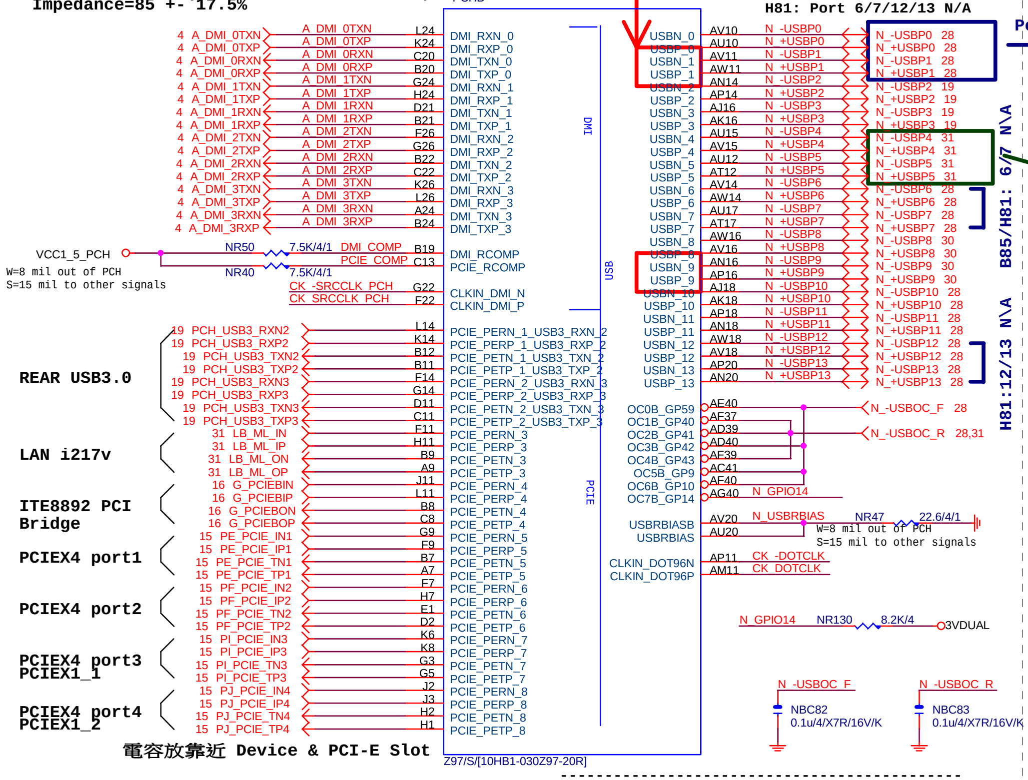
PCH (B)

USB Port 1/9一定要接出來,For Debug port test (logo)

DMI:12/4/4/4/12(breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

USB2.0 : 12/5/7/5/12 (breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

B85: Port 6/7 N/A
H81: Port 6/7/12/13 N/A



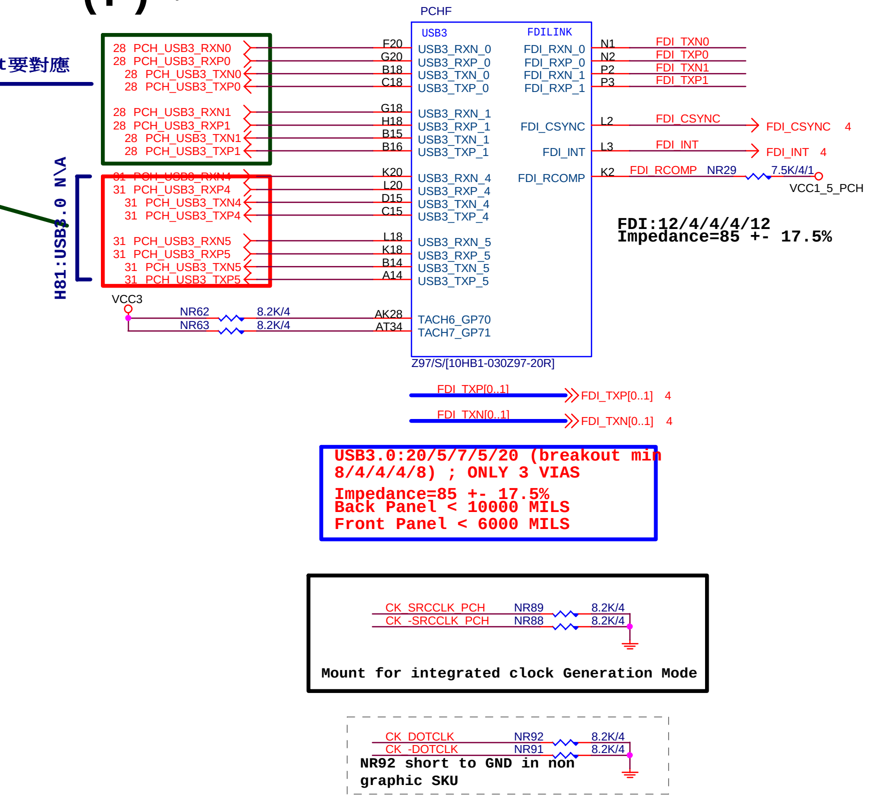
PCIEX1:15/4/4/4/15 (breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

PCH PCIE ,DMI 15/4/4//15

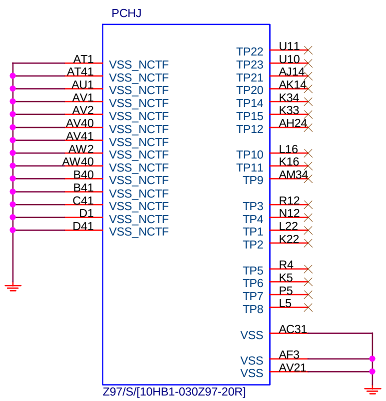
usb2.0 12/5/7/5//12
usb3.0 20/5/7/5//20

PCH (F)

USB3.0 : 20/5/7/5/20 (breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

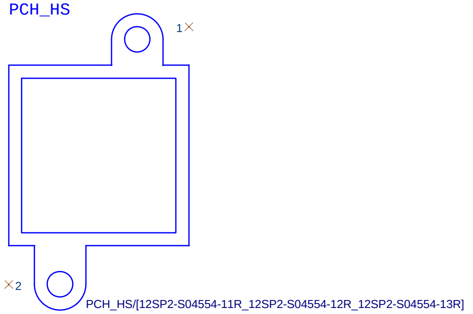


PCH (J)



PCH H/S

BGAHSINK-Z97X-SLI



USB TABLE

OC[3:0]# for Device 29 (ports 0-7)
OC[7:4]# for Device 26 (ports 8-13)

USB OC# Configure	
OC0#	USB0,1
OC1#	USB2,3
OC2#	USB4,5
OC3#	USB6,7
OC4#	USB8,9
OC5#	USB10,11
OC6#	USB12,13
OC7#	Not Use

Gigabyte Technology

Title: PCH FDI,DMI,USB ,PCIE

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PCH (E)

PCHE

33 N_HDMI_HDP_F
32 N_DVI_HDP_F

AJ2 DDPB_HPD
AH5 DDPC_HPD
AJ4 DDPD_HPD
AK6 DDPB_AUXN
AK8 DDPB_AUXP
AG7 DDPC_AUXN
AG6 DDPC_AUXP
AG11 DDPD_AUXN
AG10 DDPD_AUXP

VGA_HSYNC AH3 H_SYNC
VGA_VSYNC AH2 V_SYNC
VGA_RED AC2 N_R
VGA_GREEN AE2 N_G
VGA_BLUE AC3 N_B
VGA_IRTN AG4
VGA_DDC_DATA AL3 N_DDCDATA
VGA_DDC_CLK AL2 N_DDCCLK
DAC_IREF AF5 N_VGA_RSET
DDPC_CTRLCLK AN3 N_DDPC_CTRLCLK
DDPC_CTRLDATA AM2 N_DDPC_CTRLDATA
DDPB_CTRLCLK AM1 N_DDPB_CTRLCLK
DDPB_CTRLDATA AJ5 N_DDPB_CTRLDATA
DDPD_CTRLCLK AN4
DDPD_CTRLDATA AN2

CLOSE PCH<0.75";4/10;+-1000;GND

NR26 33/4 N_GHSYNC
NR33 33/4 N_GVSYNC

VGA 4/20;+-200MILS;GND REF

DDC DIFF 4/5;+-1000

NR34 649/4/1

IREF 4/12;<500MILS;GND

N_DDPC_CTRLCLK 32
N_DDPC_CTRLDATA 32
N_DDPB_CTRLCLK 33
N_DDPB_CTRLDATA 33

Z97/S/[10HB1-030Z97-20R]

VGA DISABLE
R,G,B NC OR GND
IRTN / IREF GND
VGA_HSYNC, VGA_VSYNC,DDC_CLK, DDC_DATA NC
POWER VCCADAC(AF2), VCCADACBG(AE1) GND

PCH (G)

PCHG

18 N_LPC33 NR37 33/4 AV5 CLKOUT_33MHZ0
11 N_PCH33 NR38 33/4 AV7 CLKOUT_33MHZ1
20 T_TPMCLK NR28 33/4 AU2 CLKOUT_33MHZ2
AN9 CLKOUT_33MHZ3
AU5 CLKOUT_33MHZ4

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

18 O_LPCCLK48 NR39 33/4 N_PCH_48M AV8 CLKOUTFLEX0_GP64
AT9 CLKOUTFLEX1_GP65
AV9 CLKOUTFLEX2_GP66
AU8 CLKOUTFLEX3_GP67

VCC1_5_PCH NR18 7.5K/4/1 N_CLK_RCOMP R11 DIFFCLK_BIASREF
N_PCHCLK14 AR7 REFCLK14IN

CLKIN_GND0_N G16 N_-CLK_GND
CLKIN_GND0_P F16 N_CLK_GND
CLKOUT_DMI_N R2 N_-CPUCLK 4
CLKOUT_DMI_P T2 N_CPUCLK 4
CLKOUT_DP_N T3 N_-DP_CLK 4
CLKOUT_DP_P T5 N_DP_CLK 4
CLKOUT_DPNS_N W2 N_-CK_DPCLK 4
CLKOUT_DPNS_P U2 N_CK_DPCLK 4
CLKOUT_ITPXDP_N U6
CLKOUT_ITPXDP_P U7
CLKOUT_PEG_A_N AA3 PA_-SRCCLK_3GIO 14
CLKOUT_PEG_A_P AA2 PA_SRCCLK_3GIO 14
CLKOUT_PEG_B_N AE6
CLKOUT_PEG_B_P AE7
CLKOUT_PCIE_N_0 AE10 CK_M2_100M_DN 26
CLKOUT_PCIE_P_0 AE11 CK_M2_100M_DP 26
CLKOUT_PCIE_N_1 AC6 LB_-SRCCLK_LAN 31
CLKOUT_PCIE_P_1 AC7 LB_SRCCLK_LAN 31
CLKOUT_PCIE_N_2 AC11 G_-PBCLK 16
CLKOUT_PCIE_P_2 AC10 G_PBCLK 16
CLKOUT_PCIE_N_3 W11
CLKOUT_PCIE_P_3 W10
CLKOUT_PCIE_N_4 Y4 PJ_-PCIE_CLK2 15
CLKOUT_PCIE_P_4 Y2 PJ_PCIE_CLK2 15
CLKOUT_PCIE_N_5 W7 PE_-SRCCLK_3GIO1 15
CLKOUT_PCIE_P_5 W6 PE_SRCCLK_3GIO1 15
CLKOUT_PCIE_N_6 AA7 PI_-PCIE_CLK1 15
CLKOUT_PCIE_P_6 AA6 PI_PCIE_CLK1 15
CLKOUT_PCIE_N_7 R6
CLKOUT_PCIE_P_7 R7

N_XTALO_PCH N7 XTAL25_OUT
N_XTALI_PCH N6 XTAL25_IN

Z97/S/[10HB1-030Z97-20R]

PCIXx16
M.2 CLK 限用 CLKOUT_PCIE_0
M.2 slot
Intel lan I217
ITE8892
PCIXx1_2
PCIXx4
PCIXx1_1

PCIEX4 CLOCK(PE_SRCCLK_3GIO1) 由PIN R6,R7 換成PIN W7,W6 避免跟CRYSTAL 25MHZ干擾

Differential Clock:18/4/6/4/18
Impedance=90 +- 15%

N_XTALI_PCH
NR15 1M/4
NX1
N_XTALO_PCH
25M/16p/30ppm/49US/20/D
NC8 20p/4/NPO/50V/J
NC7 20p/4/NPO/50V/J

X'TAL 25MHz須參考GND
CRYSTAL/TRACE 週邊不要有訊號,VIA靠近
走線遠離其他40mil以上

PCH CLK PD

N_-CLK_GND NR42 8.2K/4
N_CLK_GND NR41 8.2K/4
N_PCHCLK14 NR118 8.2K/4

Mount for integrated clock Generation Mode

VGA DDC

VCC
防漏電
HBD3 BAT54A/SOT23/200mA SOT23
VCC3
R146 2.2K/4/1
R147 2.2K/4/1
Q47 2N7002/SOT23/25pF/5
R144 2.2K/4/1
R145 2.2K/4/1
N_DDCDATA
VGADDCDATA
Q48 2N7002/SOT23/25pF/5
N_DDCCLK
VGADDCCLK
SOT23
N_GVSYNC
C31 100p/4/NPO/50V/J/X
N_GHSYNC
C32 100p/4/NPO/50V/J/X

VGA CONNECTOR

FUSEVCC_R5
BC63 0.1u/4/X7R/16V/K/X
VGA
VGA_R
VGA_G
VGA_B
VGADDCDATA
N_GHSYNC
N_GVSYNC
VGADDCCLK
VGA/BK/SC/RA/D/2/HR/[11NR6-103015-12R]

VGA ESD

ESD3
VGADDCDATA
VGADDCCLK
N_GHSYNC
N_GVSYNC
VCC
C33 0.1u/4/X7R/16V/K
AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

SSOP6_ESD

ESD4
VGA_R
VGA_B
VGA_G
VCC3
C40 0.1u/4/X7R/16V/K
AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

VGA DDC

N_R
N_G
N_B
NR36 150/4/1/X
NR27 150/4/1/X
NR35 150/4/1/X
Close to PCH
FB1
FB2
FB3
60/4/3A/S
VGA_R
VGA_G
VGA_B
R152 75/4/1
R150 75/4/1
R151 75/4/1
C35
C34 10p/4/NPO/50V/J
C36 10p/4/NPO/50V/J
C37 22p/4/NPO/50V/J
C38 22p/4/NPO/50V/J
C39 22p/4/NPO/50V/J
Close to Filter

Gigabyte Technology

Title	PCH DISPLAY ,CLK BUFFER	
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PCH (C)

SATA3 : 20/4/4/4/20 (breakout min 8/4/4/4/8)
Impedance=85 +- 17.5%

PCHC

CL_CLK
CL_DATA
CL_RSTB
APWROK
PWM0
PWM1
PWM2
PWM3
TACH0_GP17
TACH1_GP1
TACH2_GP6
TACH3_GP7
TACH4_GP68
TACH5_GP69
SSTCTL
SCLOCK_GP22
SLOAD_GP38
SDATAOUT0_GP39
SDATAOUT1_GP48

SATA_RXN_0 SATA_RXP_0 SATA_TXN_0 SATA_TXP_0 SATA_RXN_1 SATA_RXP_1 SATA_TXN_1 SATA_TXP_1
SATA_RXN_2 SATA_RXP_2 SATA_TXN_2 SATA_TXP_2 SATA_RXN_3 SATA_RXP_3 SATA_TXN_3 SATA_TXP_3

B85 6G
H81 6G
H81 X

SATA_RXN_4_PCIE_PERN_1 SATA_RXP_4_PCIE_PERP_1 SATA_TXN_4_PCIE_PETN_1 SATA_TXP_4_PCIE_PETP_1
SATA_RXN_5_PCIE_PERN_2 SATA_RXP_5_PCIE_PERP_2 SATA_TXN_5_PCIE_PETN_2 SATA_TXP_5_PCIE_PETP_2
CLKIN_SATA_N CLKIN_SATA_P

B85/H81 3G

SATALEDB SATA_RCOMP
SATA0GP_GP21 SATA1GP_GP19 SATA2GP_GP36 SATA3GP_GP37 SATA4GP_GP16 SATA5GP_GP49
EDP_BKLTCTL EDP_BKLTEN EDP_VDDEN
RSVD RCINB SERIRQ THRMTRIPB PECI PM_SYNCH PLTRST_PROCB

Z97/S/[10HB1-030Z97-20R]

PCH (A)

PCHA

PMEB
CLKIN_33MHZLOOPBACK
TP16 TP17 TP18 TP19 TD_IREF
PIRQAB PIRQBB PIRQCB PIRQDB
GPIO2 GPIO3 GPIO4 GPIO5
PLTRSTB
GP35/NMIB GP50 GP51 GP52 GP53 GP54 GP55

Z97/S/[10HB1-030Z97-20R]

BOOT DEVICE	GP51	GP19
LPC	0	0
SPI	1	1

Default int pull up on GP51,
Default SPI boot devices

PCH CLK PD

Mount for integrated clock Generation Mode

PCH PU/PD

ME PWROK N_GPIO37 For H97/H87/B85

SATA3 CONNECTOR

[Z87/H87] all SATA3
SATA3(From Z87) - 黑色
SATA3(From Marvell) - 灰色
[B85] SATA2+SATA3
SATA2(From B85) - 黑色
SATA3(From B85) - 白色

SATA3_0 SATA3_1 SATA3_2 SATA3_3

SATA2/7/BK/H/OP/VA/D/1/B/[11NH5-110307-62R_11NH5-110307-63R]

GPIO38 Ctrl

MFG Mode
N_GPIO38 : Lo --> Enable
Hi --> Disable

Gigabyte Technology

Title: PCH HOST , SATA, PCI

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PCH (D)

PCHD

LDRQ1B_GP23
LAD_0
LAD_1
LAD_2
LAD_3
LDRQ0B
LFRAMEB
HDA_BCLK
HDA_RSTB
HDA_SDI0
HDA_SDI1
HDA_SDI2
HDA_SDI3
HDA_SDO
HDA_SYNC
SPI_MOSI_IO0
SPI_MISO_IO1
SPI_CS0B
SPI_CLK
SPI_CS1B
SPI_CS2B
SPI_IO2
SPI_IO3
RTCX1
RTCX2
RTESTB
SRTCRSTB
INTRUDERB
PCH_PWROK
RSMRSTB
INTVRMEN
DPWROK
DSWODVREN
SMBALERTB_GP11
SMBCLK
SMBDATA
SML0ALERTB_GP60
SML0CLK
SML0DATA
SML1ALERTB_PCHHOTB_GP74
SML1CLK_GP58_MGPIO11
SML1DATA_GP75_MGPIO12

BMBUSYB_GP0
CLKRUNB_GP32
DOCKENB_GP33
STPPCIB_GP34
GP8
LAN_PHY_PWR_CTRL_GP12
HDA_DOCK_RSTB_GP13
GP15
GP24
GP28
SLP_WLANB_GP29
PCIECLKRQ0B_GP73
PCIECLKRQ1B_GP18
PCIECLKRQ2B_GP20_SMIB
PCIECLKRQ3B_GP25
PCIECLKRQ4B_GP26
PCIECLKRQ5B_GP44
PCIECLKRQ6B_GP45
PCIECLKRQ7B_GP46
GP57
SYS_PWROK
RIB
WAKEB
SLP_AB
SLP_LANB
SLP_S0B
SLP_S3B
SLP_S4B
SLP_S5B_GP63
SUS_STATB_GP61
SUSCLK_GP62
GP72
SUSACKB
SUSWARNB_SUSPWRDNACK_GP30
DRAMPWRGD
GP27
ACPRESENT_GP31_MGPIO2
SLP_SUSB
PWRBTNB
SYS_RESETB
SPKR
PROCPWRGD
TP13
JTAG_TCK
JTAG_TDI
JTAG_TDO
JTAG_TMS

Z97S/[10HB1-030Z97-20R]

VCC3 NR54 8.2K/4/X N_GPIO23 AK26
18,20 N_LAD0 N_LAD0 AN24
18,20 N_LAD1 N_LAD1 AP26
18,20 N_LAD2 N_LAD2 AJ24
18,20 N_LAD3 N_LAD3 AN26
18 N_-LDRQ0 N_-LDRQ0 AK22
18,20 N_-LFRAME N_-LFRAME AP24
21 C_ACZ_BITCLK NR45 33/4 AV23
21 C_-ACZ_RST NR43 33/4 AU24
21 C_ACZ_SDIN2 AT22
21 C_ACZ_SDOUT NR44 33/4 A_SO AU22
21 C_ACZ_SYNC NR46 33/4 A_SYC AV24
20 N_ICH_SPI_MOSI N_ICH_SPI_MOSI P40
20 N_ICH_SPI_MISO N_ICH_SPI_MISO R36
20 N_-ICH_SPI_CS N_-ICH_SPI_CS R38
20 N_ICH_SPI_CLK N_ICH_SPI_CLK U39
20 N_-ICH_SPI_CS1 N_-ICH_SPI_CS1 R35
20 SPI_DQ2 SPI_DQ2 U40
20 SPI_DQ3 SPI_DQ3 U37
N_Y1 AN40
N_Y2 AN39
N_-RTCRST AR38
N_-SRTCRST AR39
N_-INTRUDER AR41
6,11,18 O_PWROK1 O_PWROK1 AT40
18,27 O_-RSMRST O_-RSMRST AM40
N_INTVRMEN AV36
N_PCH_DPWROK AV38
N_DSWVRMEN AM41
18 N_-LPCPME N_-LPCPME AG31
7,8,14,15,17,23,27 N_SMBCLK N_SMBCLK AG36
7,8,14,15,17,23,27 N_SMBDATA N_SMBDATA AG32
11 N_GPIO60 N_GPIO60 AG35
31 N_SML0CLK N_SML0CLK AE32
31 N_SML0DAT N_SML0DAT AE35
N_-PCH_HOT AJ39
N_SML1CLK AK36
N_SML1DAT AK33

BMBUSYB_GP0 G38 N_GPIO0
CLKRUNB_GP32 N32 N_GPIO32
DOCKENB_GP33 AV26 N_GPIO33
STPPCIB_GP34 N34 N_-PCI_STOP → N_-PCI_STOP 11
GP8 AC40 N_-IGC_EN
LAN_PHY_PWR_CTRL_GP12 AL40 N_LAN_DIS- → N_LAN_DIS- 31
HDA_DOCK_RSTB_GP13 AN22 N_GPIO13
GP15 AC32 N_TEMP_ALART- → N_TEMP_ALART- 18
GP24 AE34 A_-SKTOCC → A_-SKTOCC 4
GP28 V41 N_GPIO28
SLP_WLANB_GP29 AL39 N_GPIO29
PCIECLKRQ0B_GP73 W34 N_GPIO73 → N_GPIO73 26
PCIECLKRQ1B_GP18 P39 N_GPIO18
PCIECLKRQ2B_GP20_SMIB P37 N_GPIO20
PCIECLKRQ3B_GP25 AA39 N_GPIO25
PCIECLKRQ4B_GP26 W35 N_GPIO26
PCIECLKRQ5B_GP44 AA36 N_GPIO44
PCIECLKRQ6B_GP45 W32 N_GPIO45 NR245 MASK/0/4/SHT/X → DIS_T 4
PCIECLKRQ7B_GP46 AA40 N_GPIO46
GP57 AC36 N_GPIO57
SYS_PWROK W31 → N_PCH_VRMPWRGD 18
RIB AE36 N_-RI → N_-RI 19
WAKEB AK34 N_-PCIE_WAKE → N_-PCIE_WAKE 14,15,17,26
SLP_AB AN37 N_-SLP_A → N_-SLP_A 11,25
SLP_LANB AU36 N_-SLP_LAN
SLP_S0B AC35
SLP_S3B AK40 N_-SLP_S3 → N_-SLP_S3 18
SLP_S4B AT35 N_-S4_S5 → N_-S4_S5 18
SLP_S5B_GP63 AA35
SUS_STATB_GP61 AD37 N_-SUSTAT
SUSCLK_GP62 W36 N_SUSCLK → N_SUSCLK 20,26
GP72 AJ40 N_GPIO72
SUSACKB AJ37
SUSWARNB_SUSPWRDNACK_GP30 AG41 N_-S_WARN
DRAMPWRGD AE38 N_DRAM_PWROK
GP27 AU34 N_GPIO27 → N_-LAN_WAKE 31
ACPRESENT_GP31_MGPIO2 AM36 N_GPIO31
SLP_SUSB AK38 N_-DEPSLP → N_-DEPSLP 27
PWRBTNB AK41 O_PWRBTSW → O_PWRBTSW 18
SYS_RESETB N36 N_-SYS_RST → N_-SYS_RST 4,28
SPKR R32 N_SPKR → N_SPKR 28
PROCPWRGD D40 N_CPUPWROK → N_CPUPWROK 4,18
TP13 W37 N_PCH_RST
JTAG_TCK Y40 N_PCH_TCK
JTAG_TDI W39 N_PCH_TDI
JTAG_TDO Y38 N_PCH_TDO
JTAG_TMS W40 N_PCH_TMS

DDR_15V
NR131 680/4/1
N_DRAM_PWROK → N_DRAM_PWROK 4
NR132 1.47K/4/1

ACZ_SDOUT

SPI OVERRIDE PROTECTION

C_ACZ_SDOUT : HI --> ME Enable
Lo --> ME Disable

NR140 8.2K/4 C_ACZ_SDOUT
NQ14 PMBT2907A/SOT23/-600mA/50 S0T23
N_GPIO57 NR64 8.2K/4
18 DS_ME DS_ME NR178 8.2K/4
3VDUAL_PCH

PCH_DPWROK

3VDUAL_PCH
At least 10ms delay after 3VDUAL_PCH stabel
NR69 8.2K/4
N_PCH_DPWROK → N_PCH_DPWROK 18,27
NC17 1n/4/X7R/50V/K

For IT8620 Ctrl

VCC3
DAR62 1K/4/1
N_PCH_VRMPWRGD 18
DAR66 100K/4/1
DAC23 0.1u/4/X7R/16V/K

PCH PU/PD

3VDUAL
GP44:DFX test Mode
NR103 8.2K/4/X N_GPIO44
NR139 8.2K/4/X N_GPIO46
A_-SKTOCC
N_GPIO57
NRN9 8.2K/8P4R/4
N_-IGC_EN:Low to over clock validation strap
NR106 1K/4/1 N_-IGC_EN NR105 8.2K/4/X
NR153 1K/4/1/X N_SUSCLK NR154 8.2K/4/X
SUSCLK : Lo --> OD PLL VR Disable
N_-SUSTAT NR133 8.2K/4/X
N_GPIO13 NR51 1K/4/1
N_GPIO28 NR144 1K/4/1
N_GPIO29 NR96 1K/4/1
NR155 8.2K/4/X N_GPIO45 NR247 8.2K/4/X
N_TEMP_ALART- NR248 8.2K/4

3VDUAL_PCH
N_-S_WARN NR129 8.2K/4
N_GPIO27 NR60 8.2K/4
N_GPIO31 NR72 8.2K/4
N_-SLP_LAN NR73 8.2K/4/X
N_GPIO72 NR100 8.2K/4
N_-PCIE_WAKE NR76 1K/4/1
DS_ME NR81 1K/4/1

VCC3
NR145 8.2K/4/X N_GPIO20 NR109 8.2K/4
N_GPIO0 NR115 8.2K/4
N_-SYS_RST NR164 8.2K/4
N_GPIO32 NR162 8.2K/4/X
NR48 8.2K/4 N_GPIO33 NR49 8.2K/4/X

3VDUAL
NR134 8.2K/4/X N_GPIO73 NR253 8.2K/4
N_PCH_RST NR172 20K/4/1
N_PCH_TDI NR170 200/4/1
N_PCH_TDO NR141 200/4/1
N_PCH_TMS NR169 200/4/1
N_PCH_TCK NR87 200/4/1/X
N_PCH_RST NR143 1K/4/1/X
N_PCH_TDI NR171 100/4/1
N_PCH_TDO NR168 100/4/1
N_PCH_TMS NR142 100/4/1
N_PCH_TCK NR108 51/4/1
N_GPIO18 NR79 8.2K/4
N_GPIO26 NR107 8.2K/4
N_GPIO25 NR137 8.2K/4
N_-SYS_RST NC58 1n/4/X7R/50V/K
N_DRAM_PWROK NC59 1n/4/X7R/50V/K

NRN6 8.2K/8P4R/4 3VDUAL
N_-PCH_HOT
N_GPIO60
N_-LPCPME
N_-RI
N_SML1CLK NR117 1K/4/1
N_SML1DAT NR120 1K/4/1
N_SML0CLK NR122 499/4/1
N_SML0DAT NR123 499/4/1
N_SMBCLK NR121 1K/4/1
N_SMBDATA NR97 1K/4/1

HSW_STRAP13

3VDUAL_PCH
NR182 8.2K/4/X → A_HSW_STRAP13 4
NR183 8.2K/4
S0T23
NQ11 MMBT2222A/SOT23/600mA/40
NQ12 MMBT2222A/SOT23/600mA/40 S0T23
N_-IGC_EN NR135 8.2K/4

32.768KHZ

NX2-SHT SHW/D0.64*5.08*6.74
N_Y1
N_Y2 NR75 10M/4 NX2
32.768K/12.5p/20ppm/TF38/35K/D
NC16 18P/4/NPO/50V/J
NC18 18P/4/NPO/50V/J

CLR_CMOS

BATTERY CR2032
BAT BAT-SK/BK/P/S/D/SN
N_VBATT NRB 1K/4/1
ND1 BAS40-05/0.2A/SOT23
3VDUAL_PCH
NR90 390K/4 N_DSWVRMEN
N_RTCVDD → N_RTCVDD 13,28
NR67 390K/4 N_INTVRMEN
N_INTERMEN : Integrated 1.05V SUS VRM Enable
NR78 20K/4/1 N_-RTCRST
NC15 1u/4/X5R/6.3V/K
NC20 1u/4/X5R/6.3V/K
RB_TP
N_VBAT → N_VBAT 18

BATTERY-DUAL-4
RB 必須放在BAT外

N_-INTRUDER NR74 1M/4 → N_RTCVDD 13,28
N_-SRTCRST NR77 20K/4/1 → N_RTCVDD 13,28
NC19 1u/4/X5R/6.3V/K

CLR_CMOS
N_-RTCRST
PH/1*2/BK/2.54/VA/D

Gigabyte Technology
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PCH (H)

PCHH

Z97/S[10HB1-030Z97-20R]

VCC3_DAC

CLOSE北橋(注意震盪水波紋)

(3.3V/70mA+360uA)

3VDUAL_PCH

SHT PWR

CAP

(3.3V)(X6)

(1.05V)(X5)

(1.05V)(X6)

(1.05V)(X2)

(3.3V)(X3)

(1.5V) (X10)

PCH (I)

PCHI
Z97/S[10HB1-030Z97-20R]

Gigabyte Technology	
Title	PCH PWR ,GND
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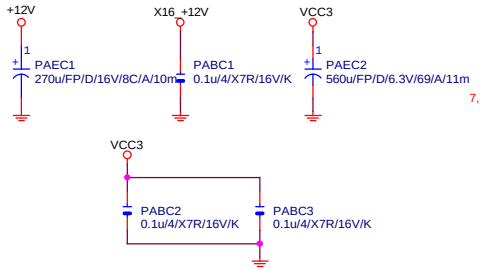
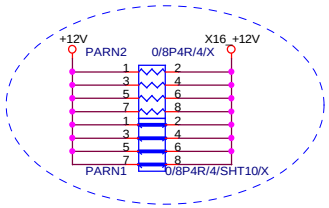
PCIEX16 CAP



PCIEX16 PROTECT SHT

+12 protect short-wire test



PCIEX16 AC CAP

PA_EXP_TXP0	PAC5	0.22u/4/X5R/6.3V/K	PA_EXP_TXP0_C
PA_EXP_TXN0	PAC4	0.22u/4/X5R/6.3V/K	PA_EXP_TXN0_C
PA_EXP_TXP1	PAC6	0.22u/4/X5R/6.3V/K	PA_EXP_TXP1_C
PA_EXP_TXN1	PAC7	0.22u/4/X5R/6.3V/K	PA_EXP_TXN1_C
PA_EXP_TXP2	PAC8	0.22u/4/X5R/6.3V/K	PA_EXP_TXP2_C
PA_EXP_TXN2	PAC9	0.22u/4/X5R/6.3V/K	PA_EXP_TXN2_C
PA_EXP_TXP3	PAC10	0.22u/4/X5R/6.3V/K	PA_EXP_TXP3_C
PA_EXP_TXN3	PAC11	0.22u/4/X5R/6.3V/K	PA_EXP_TXN3_C
PA_EXP_TXP4	PAC12	0.22u/4/X5R/6.3V/K	PA_EXP_TXP4_C
PA_EXP_TXN4	PAC13	0.22u/4/X5R/6.3V/K	PA_EXP_TXN4_C
PA_EXP_TXP5	PAC14	0.22u/4/X5R/6.3V/K	PA_EXP_TXP5_C
PA_EXP_TXN5	PAC15	0.22u/4/X5R/6.3V/K	PA_EXP_TXN5_C
PA_EXP_TXP6	PAC16	0.22u/4/X5R/6.3V/K	PA_EXP_TXP6_C
PA_EXP_TXN6	PAC17	0.22u/4/X5R/6.3V/K	PA_EXP_TXN6_C
PA_EXP_TXP7	PAC19	0.22u/4/X5R/6.3V/K	PA_EXP_TXP7_C
PA_EXP_TXN7	PAC18	0.22u/4/X5R/6.3V/K	PA_EXP_TXN7_C
PA_EXP_TXP8	PAC20	0.22u/4/X5R/6.3V/K	PA_EXP_TXP8_C
PA_EXP_TXN8	PAC21	0.22u/4/X5R/6.3V/K	PA_EXP_TXN8_C
PA_EXP_TXP9	PAC22	0.22u/4/X5R/6.3V/K	PA_EXP_TXP9_C
PA_EXP_TXN9	PAC23	0.22u/4/X5R/6.3V/K	PA_EXP_TXN9_C
PA_EXP_TXP10	PAC24	0.22u/4/X5R/6.3V/K	PA_EXP_TXP10_C
PA_EXP_TXN10	PAC25	0.22u/4/X5R/6.3V/K	PA_EXP_TXN10_C
PA_EXP_TXP11	PAC26	0.22u/4/X5R/6.3V/K	PA_EXP_TXP11_C
PA_EXP_TXN11	PAC27	0.22u/4/X5R/6.3V/K	PA_EXP_TXN11_C
PA_EXP_TXP12	PAC28	0.22u/4/X5R/6.3V/K	PA_EXP_TXP12_C
PA_EXP_TXN12	PAC29	0.22u/4/X5R/6.3V/K	PA_EXP_TXN12_C
PA_EXP_TXP13	PAC30	0.22u/4/X5R/6.3V/K	PA_EXP_TXP13_C
PA_EXP_TXN13	PAC31	0.22u/4/X5R/6.3V/K	PA_EXP_TXN13_C
PA_EXP_TXP14	PAC32	0.22u/4/X5R/6.3V/K	PA_EXP_TXP14_C
PA_EXP_TXN14	PAC33	0.22u/4/X5R/6.3V/K	PA_EXP_TXN14_C
PA_EXP_TXP15	PAC34	0.22u/4/X5R/6.3V/K	PA_EXP_TXP15_C
PA_EXP_TXN15	PAC35	0.22u/4/X5R/6.3V/K	PA_EXP_TXN15_C

PCI-E REV:1.1--> 2.5GHZ

PCE-E X1(單向) BANDWITH=2.5GHz*(8b/10b)=2Gb/s=250MB/s

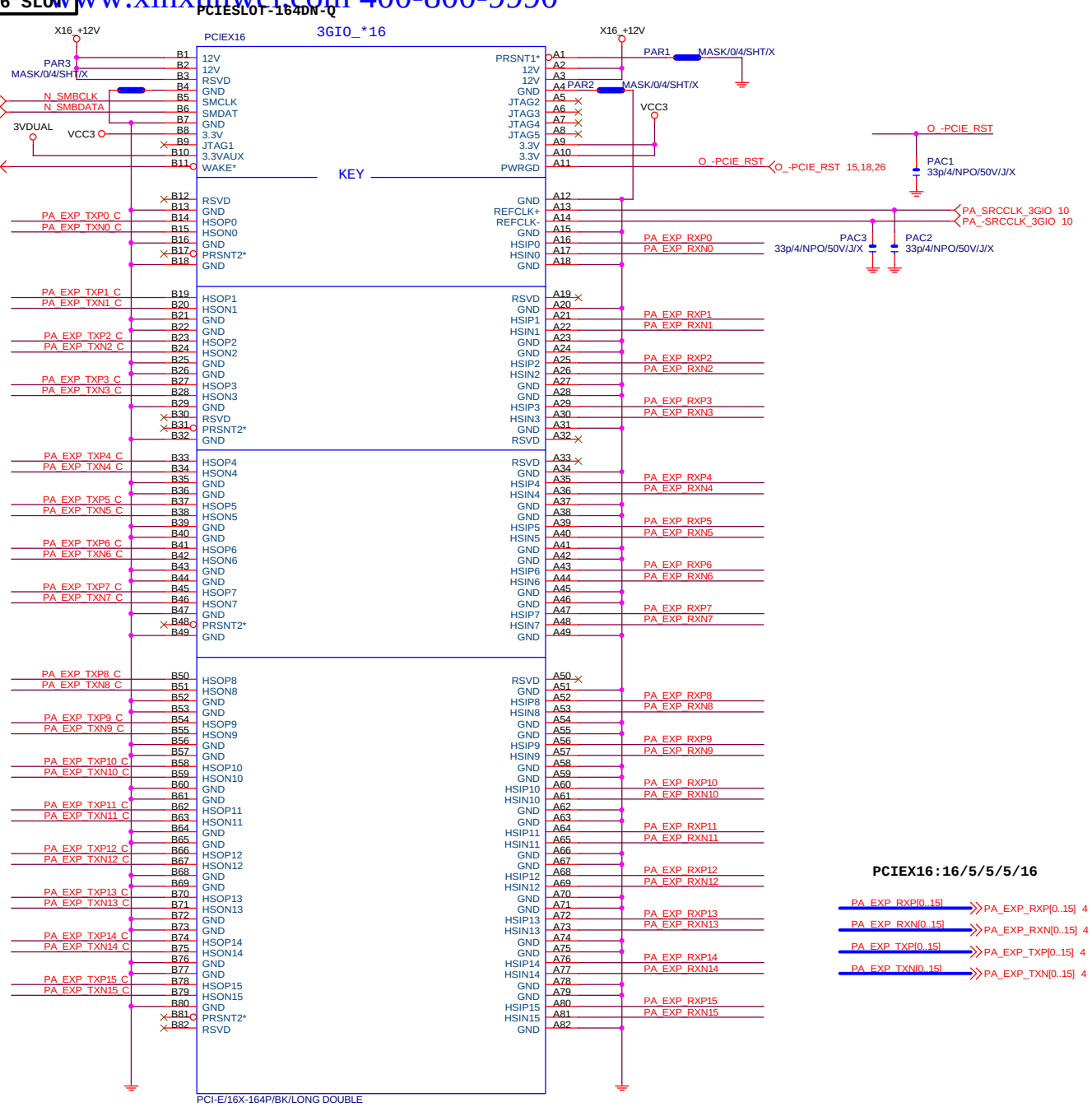
PCE-E X1(雙向) BANDWITH=2.5GHz*(8b/10b)X2=4Gb/s=500MB/s

PCE-E X16(單向) BANDWITH=2.5GHz*(8b/10b)X16=32Gb/s=4GB/s

PCE-E X16(雙向) BANDWITH=2.5GHz*(8b/10b)X16X2=64Gb/s=8GB/s

PCI-E REV:2.0--> 5GHZ

PCIEX16 SLOT



Title	PCI EXPRESS * 16
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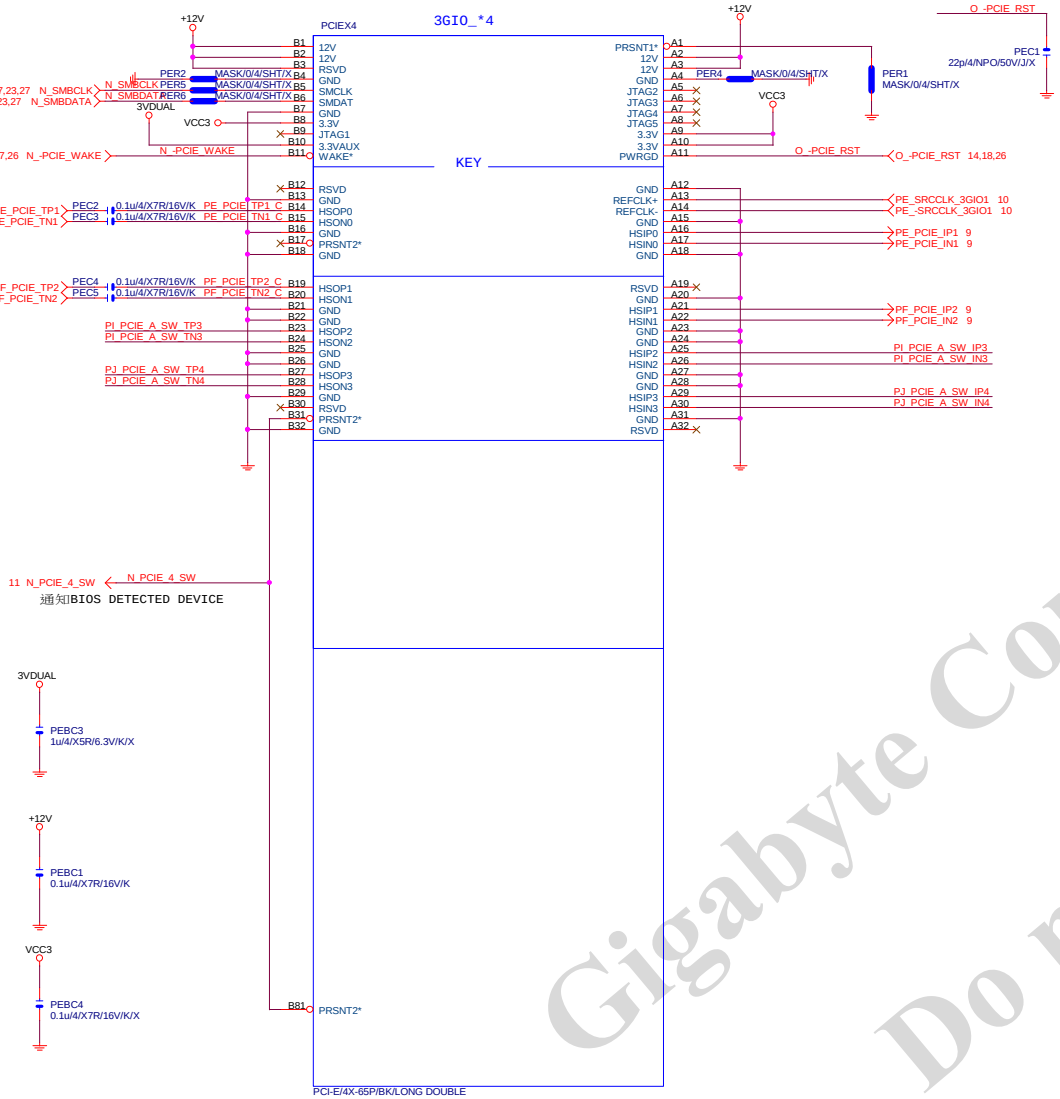
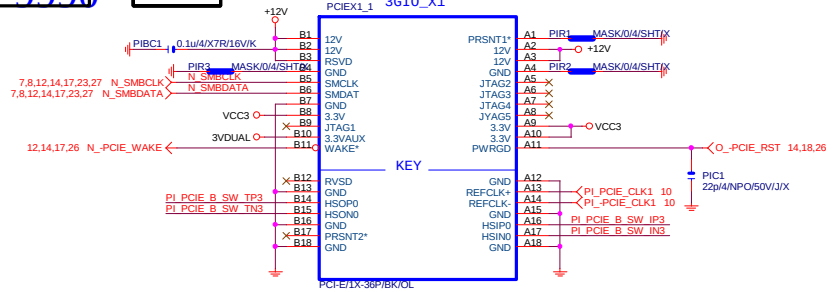
Gigabyte Technology

PCIEX4 SLOT

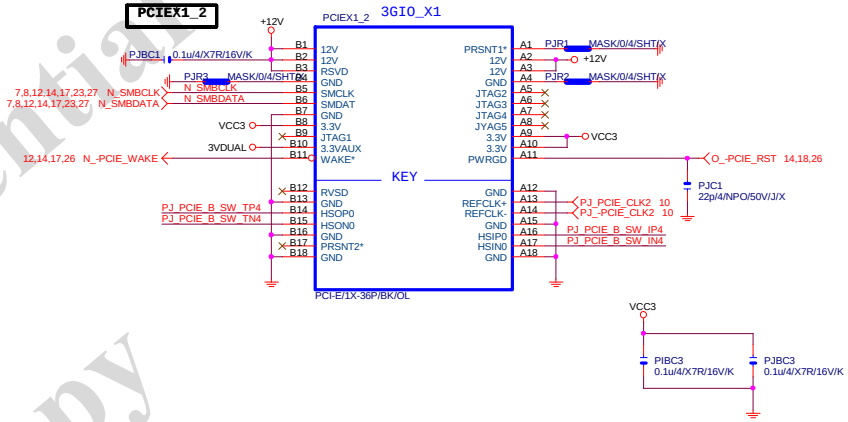


	N_PCIE_4_SW (PCH GPIO48)	PCIEX4_X1 (SIO_GPIO26)
P IEX1,PCIEX4 --> X1 (Default)	H	H
PCIEX4 No devices PCIEX4 -> X1	H	H
PCIEX4 Have devices PCIEX4 -> X4 PCIEX1_1/2 --> N/A	L	L

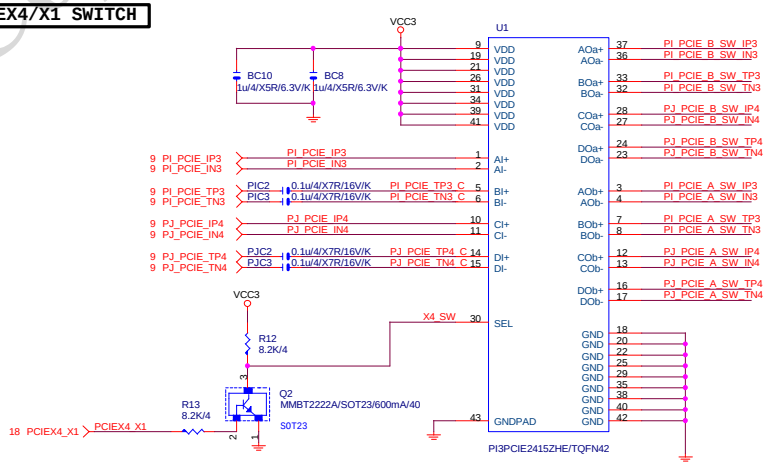
PCIEX1_1



PCIEX1_2



PCIEX4/X1 SWITCH



Function	SEL
xI--> xOa	L;PCIEX4 SLOT-->X1
xI--> xOb	H;PCIEX4 SLOT-->X4

Gigabyte Technology

Title: PCIE_X1 1,2

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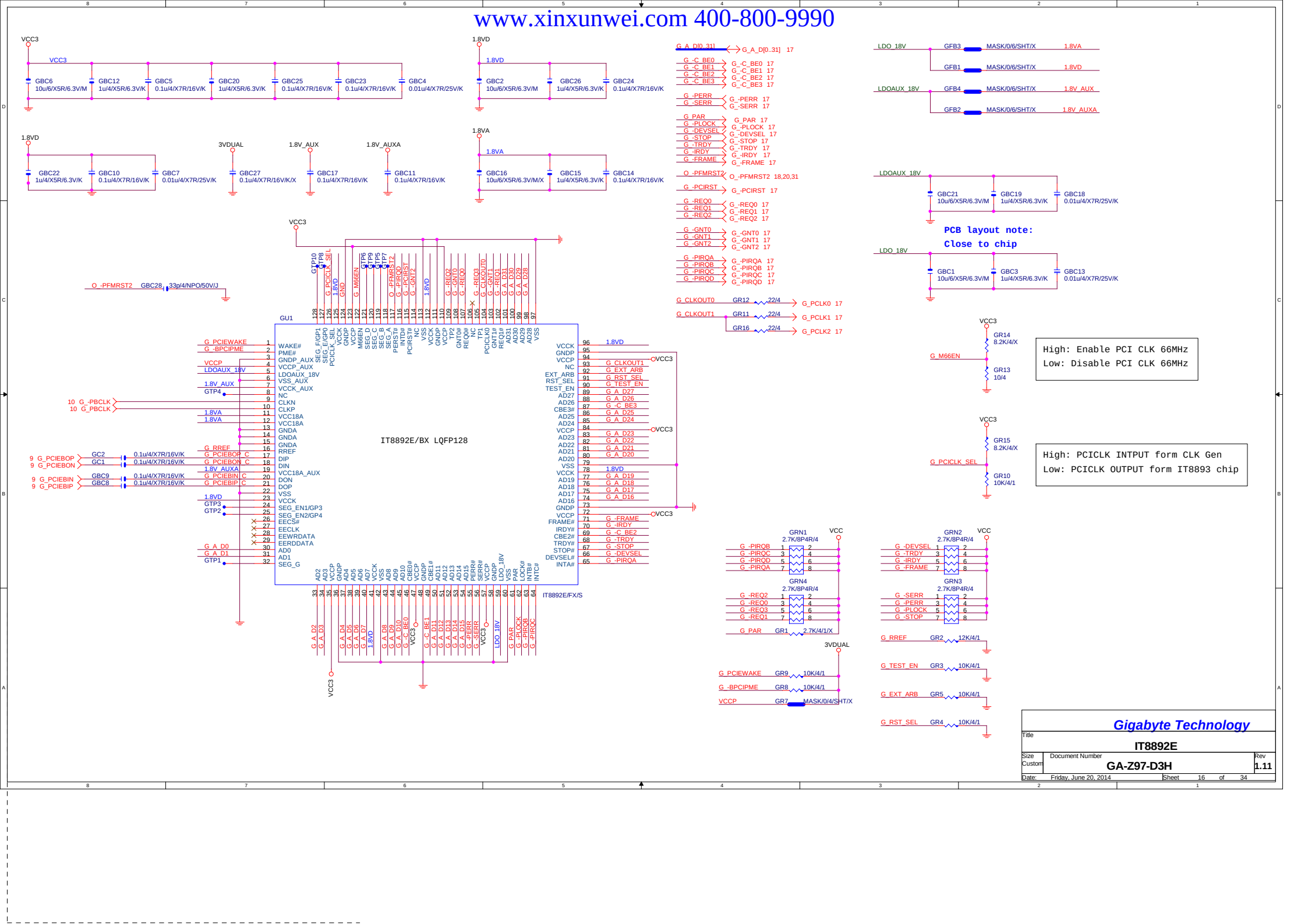

Title	IT8892E
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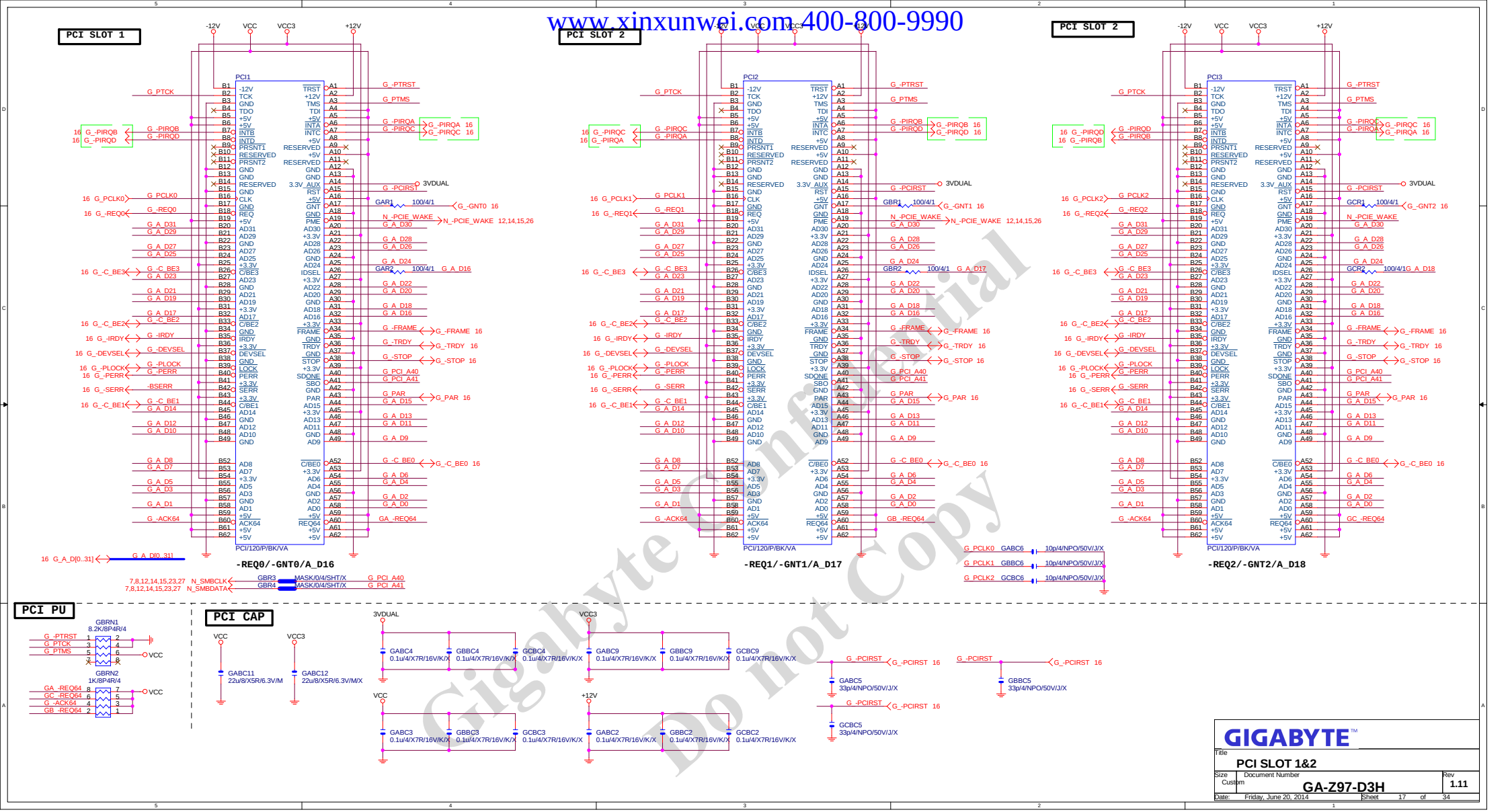
Gigabyte Technology



GIGABYTE™

Title	PCI SLOT 1&2	
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SIO IT8728F

30 FANIO1 — C234 0.047u/4/X7R/16V/K
30 FANIO2 — C28 0.047u/4/X7R/16V/K
30 FANIO4 — C2 0.047u/4/X7R/16V/K
30 FANIO3 — C26 0.047u/4/X7R/16V/K
30 FANIO5 — C4 0.047u/4/X7R/16V/K

CPU_OPT

CPU_FAN
SYS_FAN1
SYS_FAN2

Power Leakage

+12V — OR1 8.2K/4 — OQ1 2N7002/SOT23/25pF/5 (SOT23) — OR49 0/4/X — IT_AVCC / VCC3

PWR SHT

For 8728 EUP function
3VDUAL_PCH — OR25 MASK/0/6/SHT/X — IT_VCCH

SIO PU

SVID_CTRL	OR84	8.2K/4/X	VCC3
IO_GP21	OR81	1K/4/1	3VDUAL_PCH
PCIEX4_X1	OR14	1K/4/1	3VDUAL_PCH
-PROCHOT_CON	OR29	8.2K/4	VCC3
N_-LDRQ0	OR27	1K/4/1	VCC3
ITE_PWROK2	OR16	1K/4/1	VCC3
ITE_PWROK	OR10	1K/4/1	VCC3
O_-PCIE_RST	OR71	1K/4/1/X	VCC3
O_-PFMRST2	OR2	1K/4/1/X	VCC3
N_A20GATE	OR31	680/4/1/X	

Hi :Disable WDT
Lo :Enable WDT to rest PWROK

IT8620E_CX

SIO

SLP_SUS#/PCIRSTIN#/GP16
3VSB
HOLD_M#/GP64
HOLD_B#/GP63
FAN_TAC1
FAN_CTL1
FAN_TAC2/GP52
FAN_CTL2/GP51
FAN_TAC3/GP37
FAN_CTL3/GP36
VCC18_EN/GP35
VTT_PWRGD/GP34
GNDD
SLP_SUS_FET/5VSB_CTRL#
SUS_WARN_5VDUAL/5VAUX_SW
PWRGD2
ATXPG/GP30
INV_IN1/SIN2/GP27
INV_OUT1_SOUT2/GP26
FAN_TAC4/DSR2#/GP25
FAN_TAC5/RTS2#/GP24
DPWORK/CPU_PG/GP23
SPI_SI/GP22
IO_SMI#/DCD2#/GP21
THR_PWM_CTS2#/GP20
R12#/GP17
DTR2#/JP5
SPI_SO/CIRTX1
PCH_C1/GP14
SUSACK#/PWRGD1
PCIRST1#/GP12
PCIRST2#/GP11
3VSB
VCORE
LRESET#
LDRQ#
SERIRQ
LFRAME#

LS_IN1/SLCT/GP80
VREF_2.5
TR6/VIN9
TR5/VIN8
TR4/VIN7
AVCC3
VIN0/VCORE(1.1V)
VIN1/VDIMM_STR(1.5V)
VIN2(+12V_SEN)
VIN3(+5V_SEN)
VIN4/VLDT_12
VIN5/5VDUAL
VIN6
VREF
TMPIN1
TMPIN2
TMPIN3
TS_D-
GNDA
RSMRST#/CIRRX1/GP55
CPURST#/GP10
MCLK/FAN_TAC6/GP56
MDAT/FAN_CTL6/GP57
KCLK/GP60
KDAT/GP61
3VSBSW#/GP40
PWRGD3
SUSC#/GP53
PSON#
PANSWH#/GP43
GNDD
PME#/GP54
PWRON#/GP44
SUSB#
CE_N/GPO47/JP6
VBAT
COPEN#
3VSB

LAD0 LAD1 LAD2 LAD3 KRST#/GP62 GA20 SPICLK/UP1 SPICLK GNDCLK CLKIN CPUPWRGD/GP95 VCC1_05_EN/GP66 VLDT_EN/PCH_D0/GP65 VCORE_EN/PCH_C0 VR_RDY/GP97 PCH_VRMPWRGD/GP96 SUSWARN#/SST/AMDTSI_D/PCH_D GP67 PECI/AMDTSI_C PROCHOT#/GP94 HDLED_IN/GP93 HDLED_OUT/GP92 PWRLED_GP91 DDR_EN/GP90 GP42/SCK/FAN_CTL4/THRMTRIP SYS_3VSB

IT8620E/CX/S

EUP from PCH

3VDUAL_PCH — 8.2K/4 OR62 — O_PWRBTSW 12
OC5 0.01u/4/X7R/25V/K

SIO STRAP

JP3--- High SPI-Flash Disable
Low SPI-Flash Enable

OR33	1K/4/1/X	JP2	OR36	8.2K/4	VCC3
		JP3	OR35	8.2K/4	VCC3
		JP4	OR32	8.2K/4	VCC3
OR80	8.2K/4/X	JP5	OR12	8.2K/4/X	VCC3

JP5:N\A FOR 8728 DX
JP5:PULL DOWN FOR 8728 EX
anti-surge enable

EUP control detect
3VDUAL — OR47 100/4/1 28_3VSB

JP4	1	k8 power sequency function is Disable
	0	k8 power sequency function is Enable
JP3 JP5	1 1	The default value of EC Index 63h/6Bh/73h is 80h.
	1 0	The default value of EC Index 63h/6Bh/73h is FFh.
	0 1	The default value of EC Index 63h/6Bh/73h is 00h.
	0 0	The default value of EC Index 63h/6Bh/73h is 40h.

IT8620E GPIO問題匯整

PIN 50	GP26--- 第一次接上POWER時會拉 LO
PIN 90/91	DEFAULT為HDLED FUNCTION, GP93 BYPASS TO GP92
	高溫時 GP92 會被拉Lo(ITE BUG)
PIN 108	GP40--- POWER ON 時會拉 LO
PIN 111/112	MOUSE 跟FAN6 FUNCTION 擇一使用,不然會互相干擾

DUAL BIOS OPT STRAP

CEB_N — OR58 680/4/1/X — OR56 1K/4/1 — VCC3

Power leakage

IT_AVCC — OQ3 MASK/2N7002/SOT23/25pF/5/X (SOT23) — -PSON — OR50 330/6/X

SIO_18V

internal power pin, max 22nF cap

SIO_18V — OBC4 0.1u/4/X7R/16V/K/X — OBC5 0.1u/4/X7R/16V/K

MB ID

VCC3 — OR7 8.2K/4 — OR15 8.2K/4/X — MB_ID2
VCC3 — OR51 8.2K/4/X — OR48 8.2K/4 — MB_ID3

GPIO86
Rev1.0 --> MB_ID3 : Hi
Rev1.1 --> MB_ID3 : Low

SIO CAP

IT_VCCH — OBC12 10u/6/X5R/6.3V/M — OBC3 0.1u/4/X7R/16V/K
IT_VCCH — OBC2 1u/4/X5R/6.3V/K — OBC7 0.1u/4/X7R/16V/K
IT_AVCC — OBC10 10u/6/X5R/6.3V/M
3VDUAL_PCH — OBC8 0.1u/4/X7R/16V/K

OBC11 0.1u/4/X7R/16V/K — OBC13 1u/4/X5R/6.3V/K — OBC14 1u/4/X5R/6.3V/K
OC1 1n/4/X7R/50V/K — OBC6 330p/4/NPO/50V/J/X — OC2 10p/4/NPO/50V/J/X

Gigabyte Technology	
Title	ITE 8620 LPC IO
Size B	Document Number GA-Z97-D3H Rev 1.11
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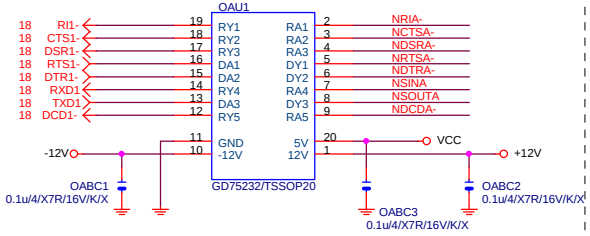
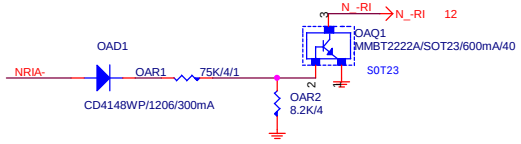
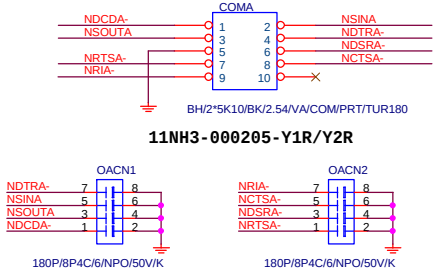
COMA



COM RI

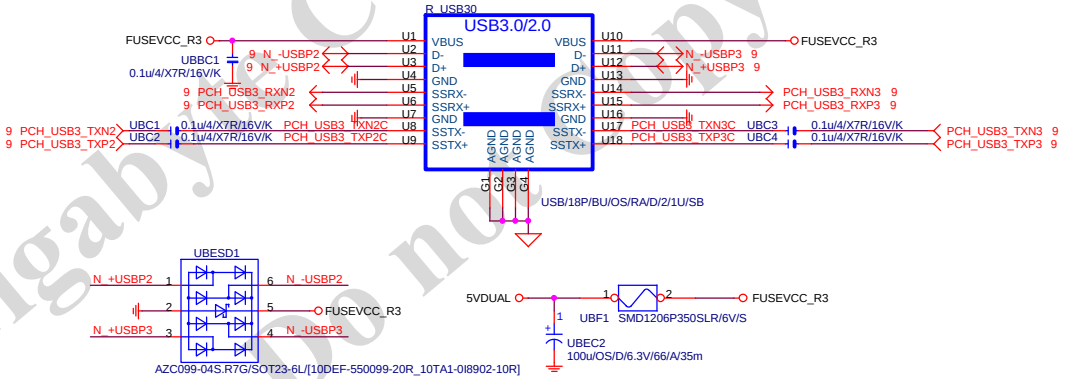


COM BUFFER

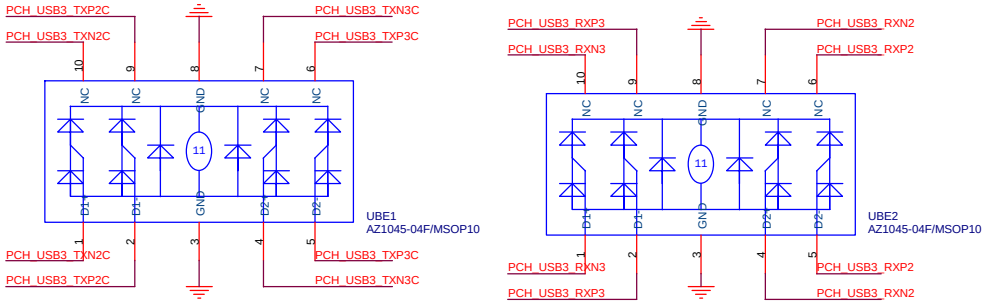


R_USB

R_USB30



CLOSE R_USB30



Gigabyte Technology		
Title: COM & PROHOT/Dynamic O.C.		
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DUAL BIOS

指定用DII

VCC3_ME
NR226 330/4/1
-SPI_CS_1
NR227 1K/4/1
NR228 0/4/X
-SPI_HOLD_M NR233 1K/4/1/X
NQ20 SOT23
N_-ICH_SPI_CS
MMBT2222A/SOT23/600mA/40
NQ21 MMBT2222A/SOT23/600mA/40 SOT23
-SPI_HOLD_B NR229 8.2K/4

指定用DII

VCC3_ME
NR230 330/4/1
-SPI_CS_2
NR231 1K/4/1
-SPI_HOLD_B NR234 1K/4/1/X
NQ22 MMBT2222A/SOT23/600mA/40 SOT23
N_-ICH_SPI_CS
NQ23 MMBT2222A/SOT23/600mA/40 SOT23
-SPI_HOLD_M NR232 8.2K/4

MAIN BIOS

M_BIOS
-SPI_CS_1 NR7 22/4
NC1 10p/4/NPO/50V/J/X
SPI_MISO
12 SPI_DQ2 NR220 MASK/0/4/SHT/X N_-SPI_WP0
CS# VDD
SO HOLD#
WP# SCK
VSS SI
NR4 MASK/0/4/SHT/X
NBC2 1u/4/X5R/6.3V/K
NR221 MASK/0/4/SHT/X
NR222 8.2K/4/X -SPI_HOLD_M
-HOLD0
N_ICH_SPI_CLK
N_ICH_SPI_MOSI
NC2 10p/4/NPO/50V/J/X
SPI_DQ3 12
12 N_ICH_SPI_MISO
64M/Q/SPI/SO8/S[10HP4-112564-30R]

BACKUP BIOS

B_BIOS
-SPI_CS_2 NR8 22/4
SPI_MISO
12 SPI_DQ2 NR223 MASK/0/4/SHT/X N_-SPI_WP1
CS# VDD
SO HOLD#
WP# SCK
VSS SI
NR12 MASK/0/4/SHT/X
NBC3 1u/4/X5R/6.3V/K
NR224 MASK/0/4/SHT/X
NR225 8.2K/4/X -SPI_HOLD_B
-HOLD1
N_ICH_SPI_CLK
N_ICH_SPI_MOSI
SPI_DQ3 12
N_ICH_SPI_CLK 12
N_ICH_SPI_MOSI 12
64M/Q/SPI/SO8/S[10HP4-112564-30R]
NBC4 0.1u/4/X7R/16V/K

MOSI For DMI RX Termination Voltage

12 N_ICH_SPI_MOSI N_ICH_SPI_MOSI NR10 8.2K/4/X
12 N_-ICH_SPI_CS N_-ICH_SPI_CS NR9 8.2K/4/X
12 N_-ICH_SPI_CS1 N_-ICH_SPI_CS1 NR246 8.2K/4/X
18 -SPI_HOLD_M -SPI_HOLD_M NR3 1K/4/1
18 -SPI_HOLD_B -SPI_HOLD_B NR11 1K/4/1

N_-SPI_WP1 NR2 8.2K/4/X
N_-SPI_WP0 NR1 8.2K/4/X
N_ICH_SPI_MISO NR5 8.2K/4
-HOLD0 NR235 1K/4/1/X
-HOLD1 NR236 1K/4/1/X

18 -SPI_HOLD_M -SPI_HOLD_M NR237 1K/4/1/X
18 -SPI_HOLD_B -SPI_HOLD_B NR238 1K/4/1/X
12 N_ICH_SPI_MISO NR6 22/4 SPI_MISO

VCC3_ME
5VDUAL

BOOT DEVICE	GNT0	GNT1
LPC	0	0
PCI	0	1
NAND	1	0
SPI	1	1

1 means floating
0 means PD 1K

TPM CONNECT

VCC3
3VDUAL_PCH
TPM
10 T_TPMCLK LCLK
12,18 N_-LFRAME N_-LFRAME LFRAME#
16,18,31 O_-PFMRST2 O_-PFMRST2 LRESET#
12,18 N_LAD3 N_LAD3 LAD3
N_LAD0 LAD0
VCC3
RSV0
SB3V
GND
LPCPD#
GND
VCC5
LAD2
LAD1
GND
RSV1
SERIRQ
CLKRUN#
RSV2
pin 4 防靠
N_LAD2 N_LAD2 12,18
N_LAD1 N_LAD1 12,18
N_SERIRQ N_SERIRQ 11,18
TR2 8.2K/4
TPM_GP14 18
TBC1 0.1u/4/X7R/16V/K/X
TBC2 0.1u/4/X7R/16V/K/X
BH/2*10K4/BK/2.54/VA/HA
12,26 N_SUSCLK TR1 10/4

BIOS Debug port

VCC3_ME
BIOS_PH
N_-ICH_SPI_CS
SPI_MISO
N_-ICH_SPI_CS1
-HOLD0
N_ICH_SPI_CLK
N_ICH_SPI_MOSI
MASK/PH/2*5K1,K7/BK/2.54/VA/D[11NH2-020205-81R]/X

M_BIOS
LCP/G-FL/1.27mm/200MIL/WHITE[10SL2-000008-31R]/X

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AZALIA CODEC

Thermal pad is DGND

Digital Area

Analog Area

CU1 ALC1150-CG/QFN48

0/6/X For AGND/GND moat under Codec Body

ALC1150/ALC887-VD2 default不上
ESD protection diode :
Without : 6~7KV , With : 8.5~9.5KV

JD resistors close CODEC

EAPD: Default L
H : ON
L : OFF

Close to ALC1150

(IT8620 GP26) 18 G_PLED

有LED機種,請上CR98

BOM OPTION : 1. 台固/日固/日黑固/MUSE MW音效電容
2. 金屬外罩 Reserve
3. LED Reserve (若LED有上,G_PLED p-up請上CR98)

ALC1150 "CD1" 惠誠指定default要上

Title	HD AUDIO ALC1150
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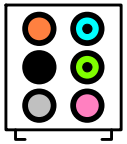
Gigabyte Technology

AZALIA JACK



CR23 2.2/6 → Audio jack -> USB(各打2 VIA hole)

CR44 MASK/0/6/SHT/X → Under Audio jack(各打2 VIA hole)

MOATR1 MASK/0/4/SHT/X, MOATC1 0.1u/4/X7R/16V/K → Near F_AUDIO(各打2 VIA hole)

MOATR2 MASK/0/4/SHT/X, MOATC2 0.1u/4/X7R/16V/K → Near Codec (各打2 VIA hole)

MOATR3 MASK/0/4/SHT/X, MOATC3 0.1u/4/X7R/16V/K → Near R_AUDIO(各打2 VIA hole)

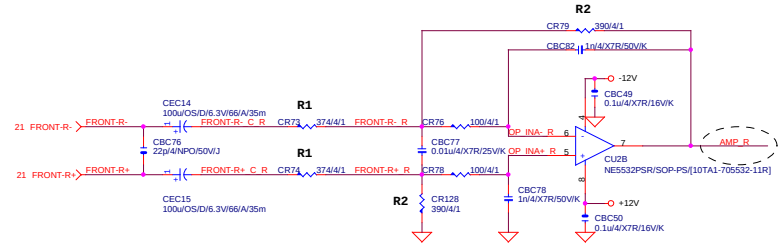
MOATR4 MASK/0/4/SHT/X, MOATC4 0.1u/4/X7R/16V/K → Near AMP (各打2 VIA hole)

SPDIF_OUT

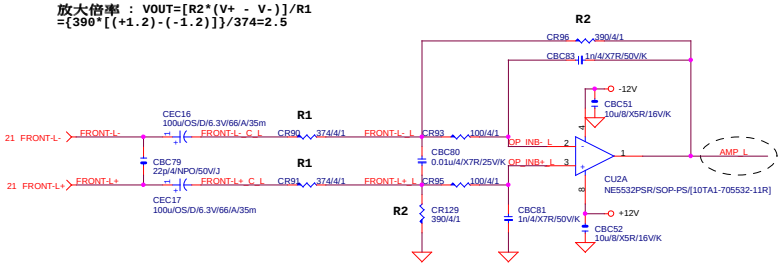
For HDMI SPDIF

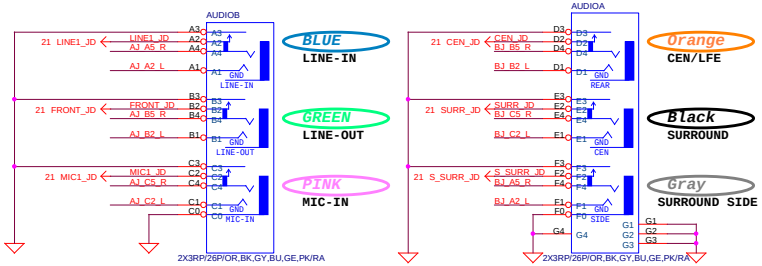
21 SPDIFO2_HDMI, CR52 MASK/0/4/SHT/X, CBC37 100p/4/NPO/50V/J, SPDIF_O, PH/1*2/BK/2.54/VA/D

Differential to Single-End AMPLIFIED

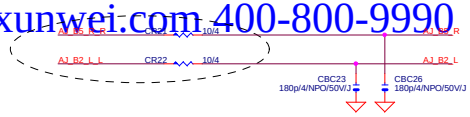


放大倍率 : VOUT=[R2*(V+ - V-)]/R1
={390*[(+1.2)-(-1.2)]}/374=2.5

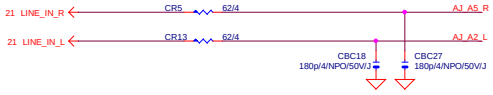




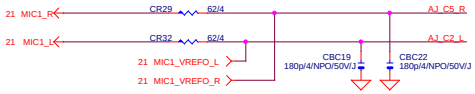
LINE-OUT



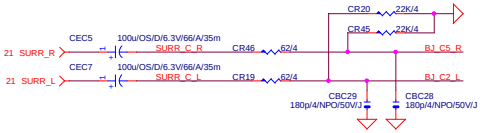
LINE-IN



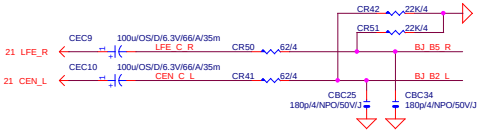
MIC-IN



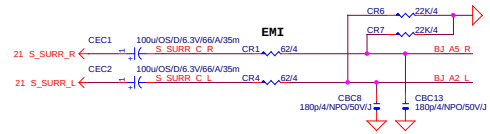
SURROUND

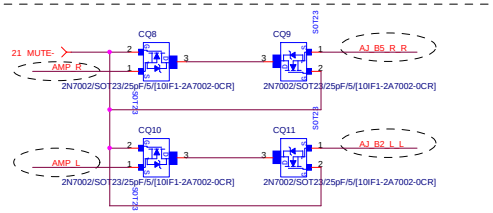


CEN/LFE

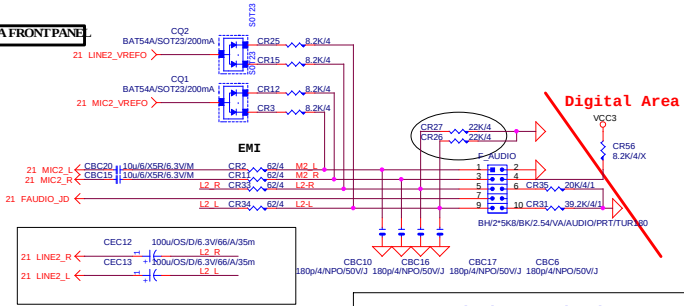


SURR BACK





AZALIA FRONT PANEL



Gigabyte Technology

Title: AUDIO JACK

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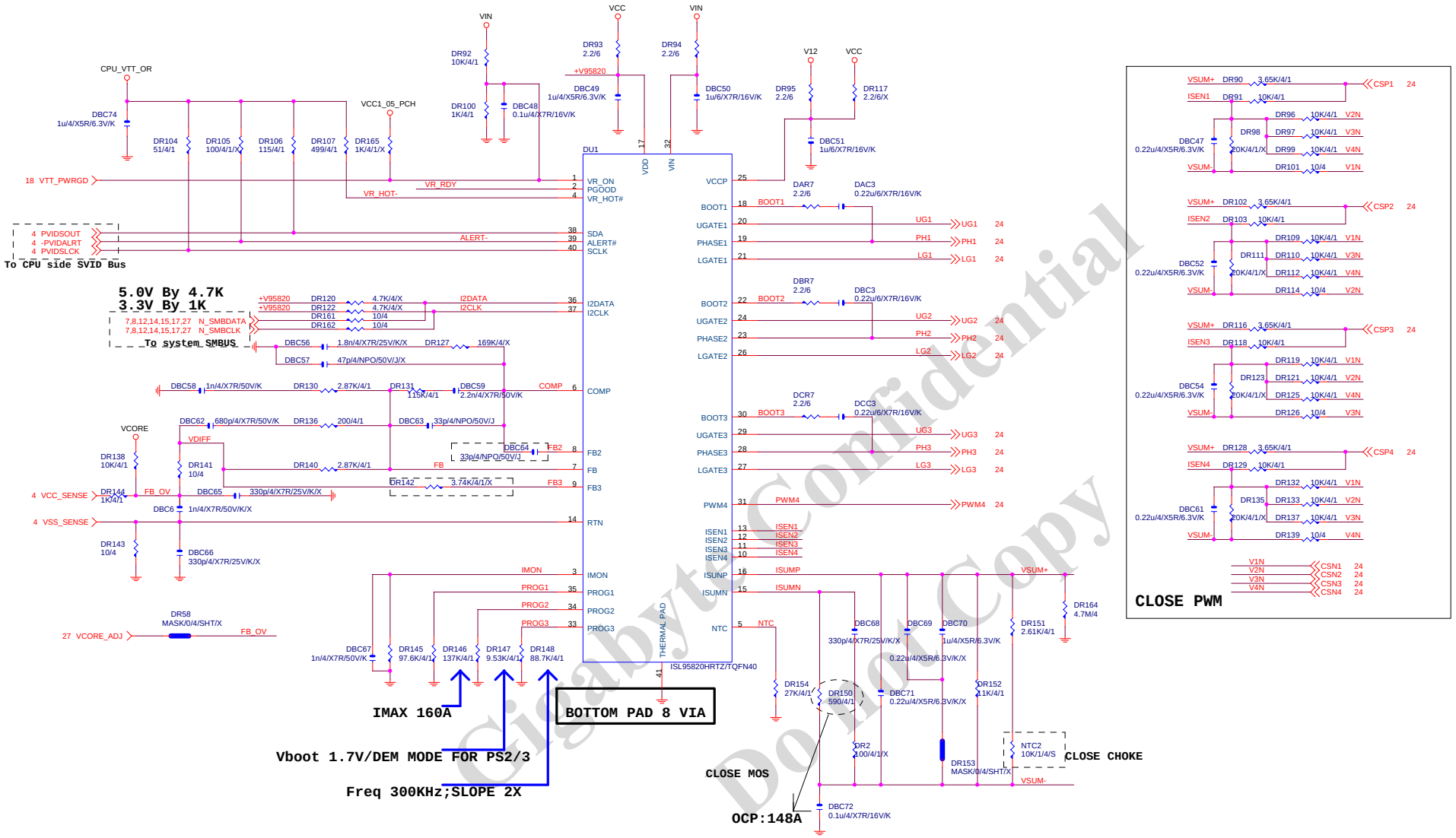

VCORE各層切割

第一層:VCORE
第二層:VCORE
第三層:GND
第四層:VCORE

Gigabyte Technology			
Title: VCORE_ ISL95820			
Size: Custom	Document Number: GA-Z97-D3H		Rev: 1.11
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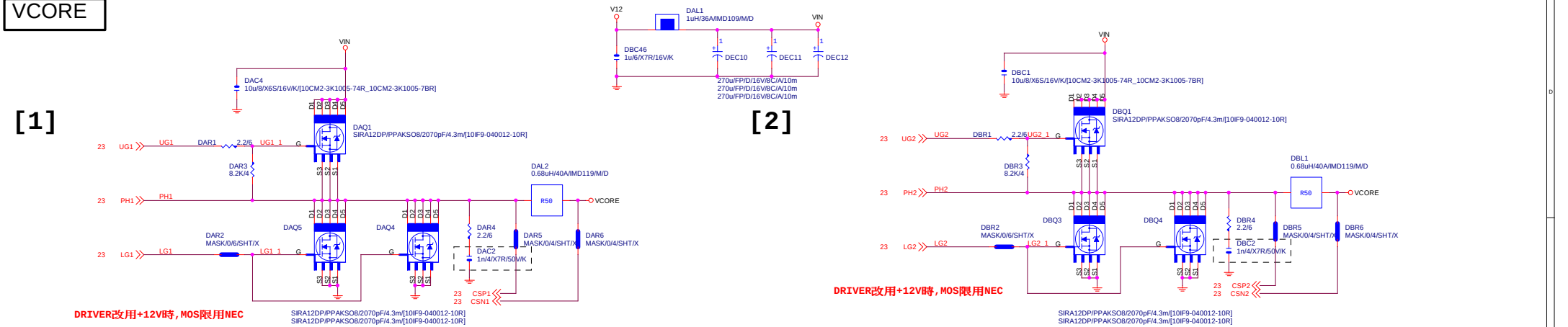
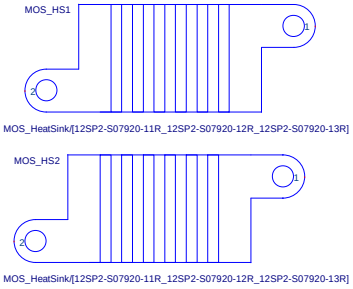
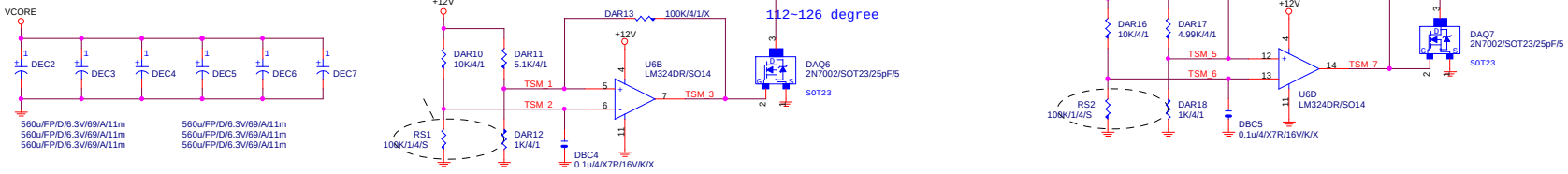
VCORE



MOSFET HEATSINK



MOSHSINK-Z97X-SLI



Gigabyte Technology			
Title	ISL95820_2		
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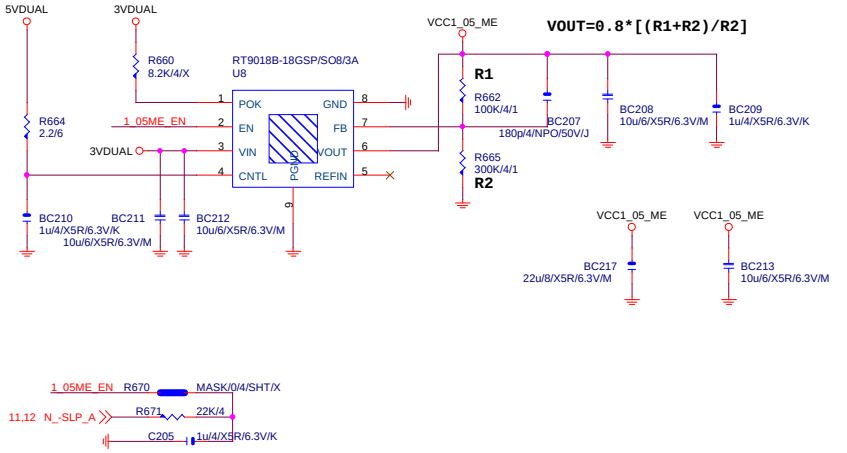
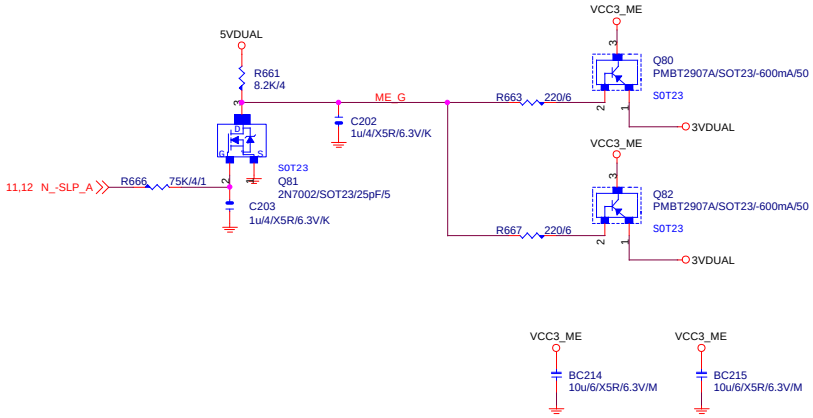
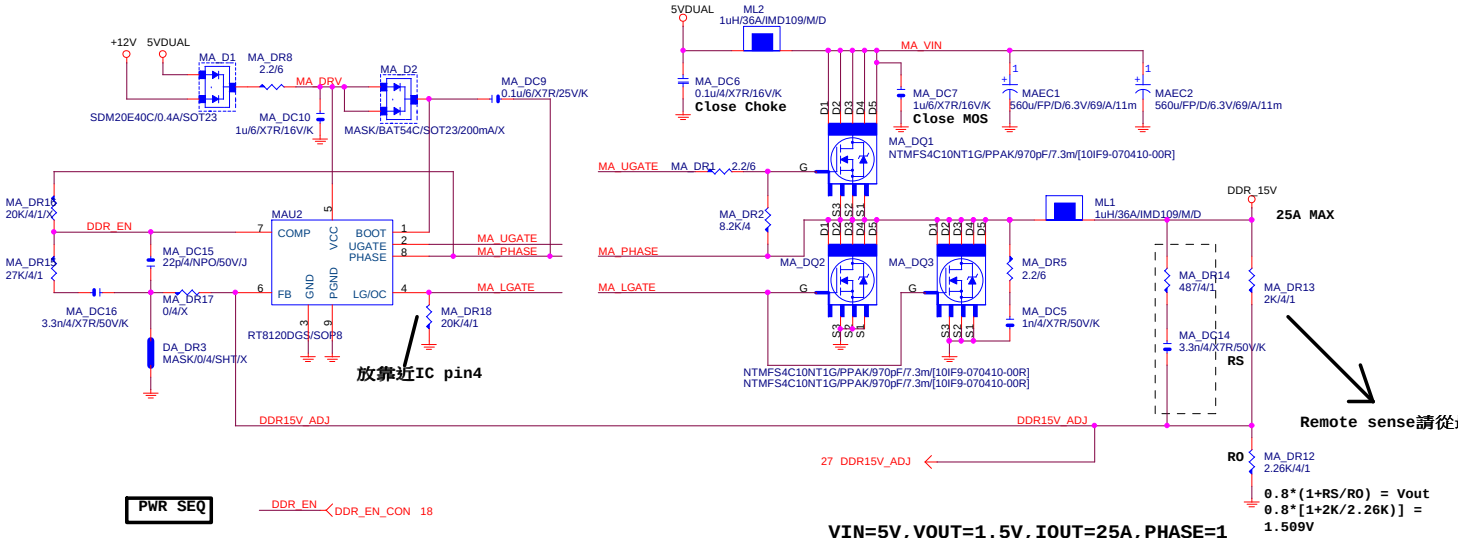
VCC1_05_ME



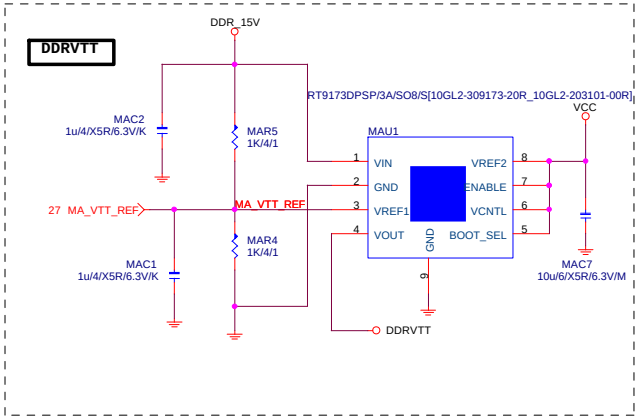
VCC3_ME



DDR_15V



DDRVTT



PWR SEQ

DDR_EN — DDR_EN_CON 18

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℃),1(105℃)

VIN Ripple current=4.7X1.7=7.99A(85℃)
-->故固態電容須2X7.99=15.98>11.45A

OCP:35.82A for Rds=6.7m for vishay@4.5V
OCP:72.727A for Rds=3.3m for renesas@10V
OCP:48A=Roset*Iocset / Rds(on)
=12K*10uA / [5//5]

GIGABYTE™

Title: RT8120_DDR_15V		
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0 : PCIE M.2
1 : SATA M.2

M.2 SLOT

M2 SLOT M KEY料號
嘉澤:10NR5-130067-31R
鴻海:10NR5-130067-32R

M.2插卡時為LOW

M2R12,M2R13,M2R14 改0/4/X

M.2 CLK 限用
CLKOUT_PCIE_0

SATA EXPRESS

PCH

M2

Function	SEL
xI--> xOa	L
xI--> xOb	H

SATA EXPRESS CONNECTOR

SATA EXPRESS/18P/BK/H/RA/D/GF/1/[11NR6-C10118-03R]::Location SATA_EXPRESS

0 : SATA EXPRESS
1 : SATA (Standard)

SATA EXPRESS料號
單層:11NR6-C10118-02R
雙層:11NR6-C10236-02R

SMD螺柱 (DIP階上件)

M2_42 CR/[11KS2-040002-01R]
M2_60 CR/[11KS2-040002-01R]
M2_80 CR/[11KS2-040002-01R]

DIP螺柱

M2_80A CR/[12KSF-F10303-01R]

螺絲

M2_80B CR/[12KS2-110202-01R]

Title	M2_SATA_EXPRESS
Size	Custom
Document Number	GA-Z97-D3H
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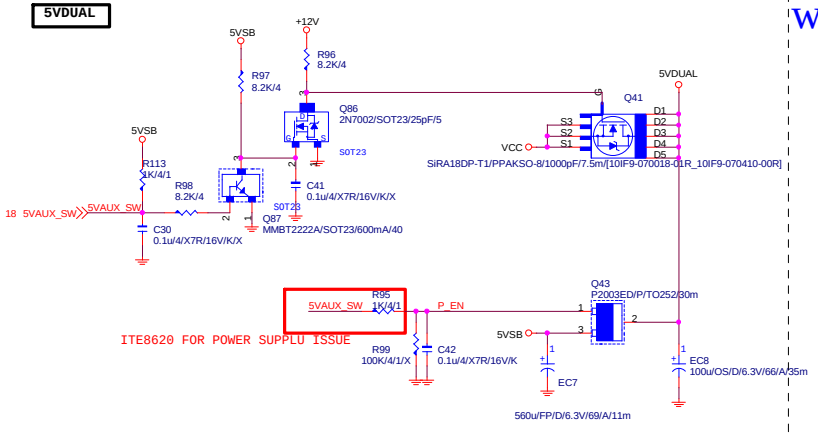
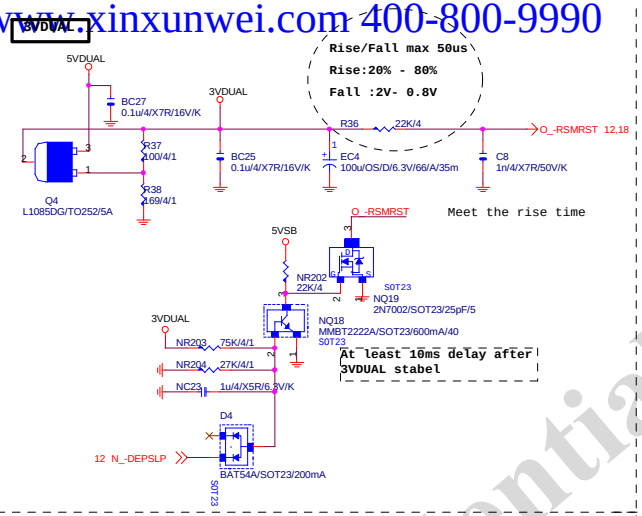
5VDUAL

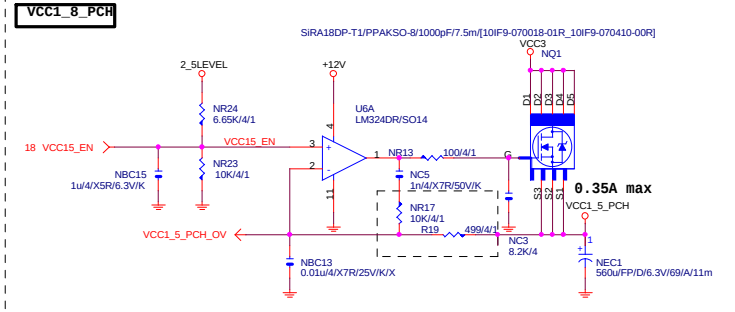


5VSB OVP發生時 : 5VDUAL=0.8V --> 解除時,須拔POWER CORE 才可開機
5VDUAL OVP發生時 : 5VDUAL=6.0V --> 解除時則恢復正常

3VDUAL



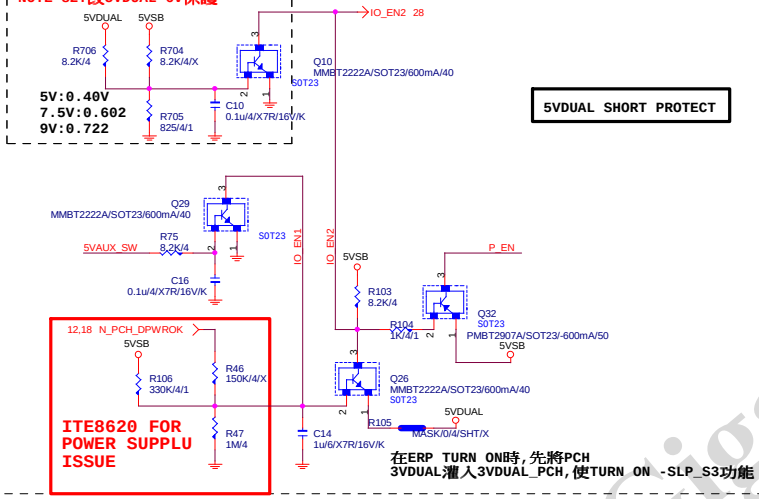
VCC1_8_PCH



5VSB OVP:7.5V protection

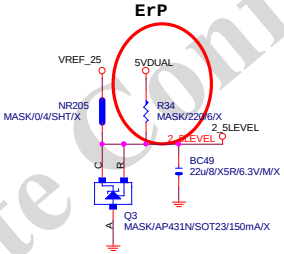
NOTE 82:改5VDUAL 6v保護

5VDUAL SHORT PROTECT

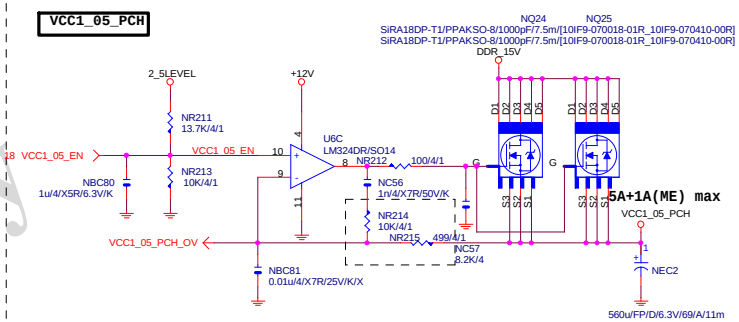


在ERP TURN ON時,先將PCH 3VDUAL灌入3VDUAL_PCH,使TURN_ON -SLP_S3功能

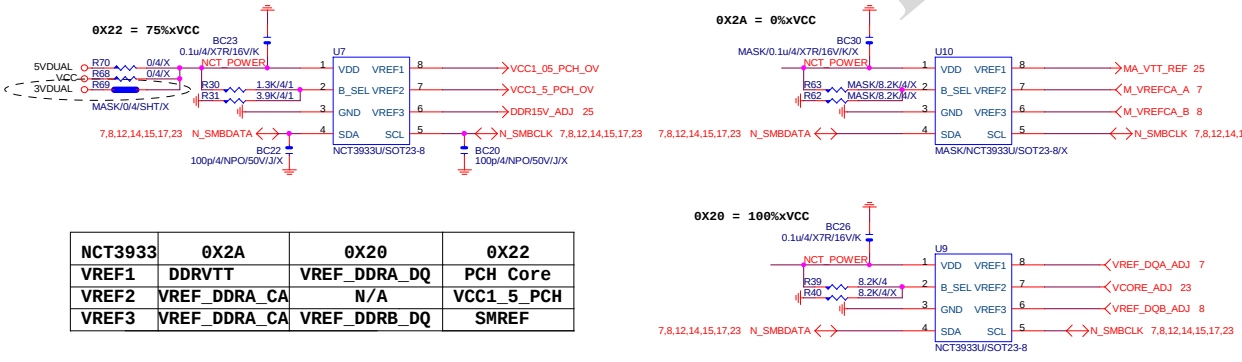
2_5LEVEL



VCC1_05_PCH



OVER VOLTAGE



NCT3933	0X2A	0X20	0X22
VREF1	DDRVTT	VREF_DDRA_DQ	PCH Core
VREF2	VREF_DDRA_CA	N/A	VCC1_5_PCH
VREF3	VREF_DDRA_CA	VREF_DDRB_DQ	SMREF

Gigabyte Technology

Title: DISCRETE POWER

Size: Custom | Document Number: GA-Z97-D3H | Rev: 1.11

Date: Friday, June 20, 2014 | Sheet 27 of 34

Front USB3.0

F_USB30 REV=1

FUSEVCC_F1 → F_USB30 VBUS; UAC2 0.1u/4/X7R/16V/K

9 PCH_USB3_RXN0 / 9 PCH_USB3_RXP0 → SSRX1-/SSRX1+; UAC3 / UAC4 0.1u/4/X7R/16V/K → 9 PCH_USB3_TXN0 / 9 PCH_USB3_TXP0

PCH_USB3_TXN0C / PCH_USB3_TXP0C → SSTX1-/SSTX1+

9 N_-USBP0 / 9 N_+USBP0 → D1-/D1+

GND GND GND GND

FUSEVCC_F1 → F_USB30 VBUS

PCH_USB3_TXN1C UAC6 0.1u/4/X7R/16V/K → PCH_USB3_TXN1 9

PCH_USB3_TXP1C UAC7 0.1u/4/X7R/16V/K → PCH_USB3_TXP1 9

SSTX2-/SSTX2+ → PCH_USB3_RXN1 9 / PCH_USB3_RXP1 9

D2-/D2+ → N_-USBP1 9 / N_+USBP1 9

BH/2*10K20/BK/ON/2.0/VA/D/GF

F_USB30 ESD PROTECT

PCH_USB3_RXN1 / PCH_USB3_RXP1

PCH_USB3_TXP0C / PCH_USB3_TXN0C / PCH_USB3_RXP0 / PCH_USB3_RXN0

HCBE2 AZ1065-06Q/MSOP8L

GND VDD → 3VDUAL

Close to connector

PCH_USB3_TXN1C / PCH_USB3_TXP1C

N_+USBP1 / N_-USBP1 / N_+USBP0 / N_-USBP0

HCBE1 AZ1065-06Q/MSOP8L

GND VDD → 3VDUAL

F_USB30 PWR

5VDUAL → UAFB2 SMD1206P350SLR/6V/S → FUSEVCC_F1

UAEC3 100u/OS/D/6.3V/66/A/35m

SATA LED

VCC3

FPR10 1K/4/1 -HDLED

FPC2 180p/4/NPO/50V/J/X

FPR12 1K/4/1

11 N_-SATALED

26 -M2_LED

FPD2 BAT54A/SOT23/200mA

FPR11 8.2K/4

FPQ1 MMBT2222A/SOT23/600mA/40 SOT23

FPQ4 MMBT2222A/SOT23/600mA/40

SPKR

VCC

FPD1 CD4148WP/1206/300mA

To disable TCO timer

VCC3 FPR16 1K/4/1

FPR17 1K/4/1

FPR18 8.2K/4

FPQ7 2N7002/SOT23/25pF/5

18 BEEP- BEEP-

SPK- FPR13 75/6/1 FPR14 75/6/1

FPQ5 MMBT2222A/SOT23/600mA/40 SOT23

FPQ6 MMBT2222A/SOT23/600mA/40

FPR15 8.2K/4 N_SPKR

N_SPKR 12

FRONT USB1

FUSEVCC_F3

UABC1 0.1u/4/X7R/16V/K

F_USB1

9 N_-USBP13 / 9 N_+USBP13 → N_-USBP12 9 / N_+USBP12 9

BH/2*5K9/BK/ON/2.54/VA/USB/PRT/TUR180

UAESD1

N_+USBP12 / N_-USBP13 → N_-USBP12 / N_+USBP13 / 3VDUAL

AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

Close to connector

UAF1 SPR-P200T/6V/8/S

5VDUAL → FUSEVCC_F3

UAEC1 100u/OS/D/6.3V/66/A/35m

FRONT USB2

FUSEVCC_F5

UABC3 0.1u/4/X7R/16V/K

F_USB2

9 N_-USBP11 / 9 N_+USBP11 → N_-USBP10 9 / N_+USBP10 9

BH/2*5K9/BK/ON/2.54/VA/USB/PRT/TUR180

UAESD2

N_+USBP10 / N_-USBP11 → N_-USBP10 / N_+USBP11 / 3VDUAL

AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

Close to connector

UAF3 SPR-P200T/6V/8/S

5VDUAL → FUSEVCC_F5

FRONT USB3

FUSEVCC_F7

UABC5 0.1u/4/X7R/16V/K

F_USB3

9 N_-USBP7 / 9 N_+USBP7 → N_-USBP6 9 / N_+USBP6 9

BH/2*5K9/BK/ON/2.54/VA/USB/PRT/TUR180

UAESD3

N_+USBP6 / N_-USBP7 → N_-USBP6 / N_+USBP7 / 3VDUAL

AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

UAF5 SPR-P200T/6V/8/S

5VDUAL → FUSEVCC_F7

INTEL FRONT PANEL

5VDUAL FPR22 8.2K/4/X MPD-

5VDUAL VCC FPR2 330/6 FPR7 330/6/X PD+

VCC

FPR1 330/6 FPBC1 0.01u/4/X7R/25V/K/X

F_PANEL

HD+ HD- GND RESET CI- CI+ PWR+ PWR- PWR- SP+ NC NC SP-

MSG/PD+ MSG/PD- PW+ PW- SP+ NC NC SP-

HD+ -HDLED -RST -CASEOPEN PD+ MPD-

PD+ MPD- -PWRBT_1 -PWRBTSW 18

5VSB FPR6 8.2K/4/X FPR5 100/4/1

4,12 N_-SYS_RST

FPBC2 0.01u/4/X7R/25V/K

3VDUAL_PCH FPR3 8.2K/4 FPR9 33/4 FPC1 0.01u/4/X7R/25V/K/X FPBC3 0.01u/4/X7R/25V/K

VCC

18 MPD-

FPESD1 -PWRBT_1 -RST → 5VSB

AZC099-04S.R7G/SOT23-6L/[10DEF-550099-20R_10TA1-0I8902-10R]

CASE OPEN

12,13 N_RTCVDD FPR8 1M/4 -CASEOPEN → -CASEOPEN 18

FPBC4 0.01u/4/X7R/25V/K

F_USB POWER PROTECT

11 N_GPIO1 UAD5 BAT54A/SOT23/200mA

N_-USBOC_F N_-USBOC_R → N_-USBOC_R 9,31

-USBOC_F

FUSEVCC_F1 FUSEVCC_F3 UAD1 BAT54A/SOT23/200mA

FUSEVCC_F5 FUSEVCC_F7 UAD2 BAT54A/SOT23/200mA

5VDUAL UAR1 8.2K/4 N_-USBOC_F → N_-USBOC_F 9

UAR14 15K/4/1

USB2.0 Signal & power short protection

USB2.0 Signal > 4.9V

Enable --> 3VDUAL=3.6V

3VDUAL UAR15 MASK/4.42/4/1/X

UAR16 MASK/1K/4/1/X UABC7 MASK/0.1u/4/X7R/16V/K/X

5VDUAL

2_5LEVEL UABC8 MASK/0.1u/4/X7R/16V/K/X

UAU1A MASK/LM358DR/SO8/X

UAU1B MASK/LM358DR/SO8/X

UAQ1 MASK/2N7002/SOT23/25pF/5/X N_-THRMTRIP 4,11,24 (開機短路保護)

UAQ2 MASK/2N7002/SOT23/25pF/5/X IO_EN2 27 (開機短路保護)

Gigabyte Technology

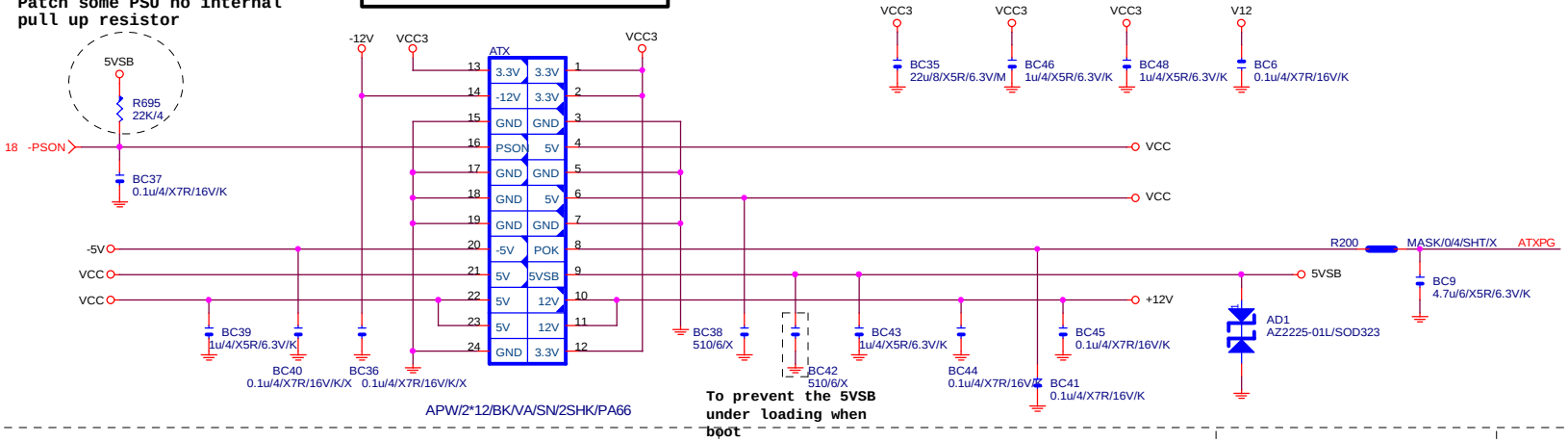
Title: FP,F_USB,USB PWR,FDD,BZ

Size: Custom | Document Number: GA-Z97-D3H | Rev: 1.11

Date: Friday, June 20, 2014 | Sheet 28 of 34

ATXX24 POWER CONNECTOR

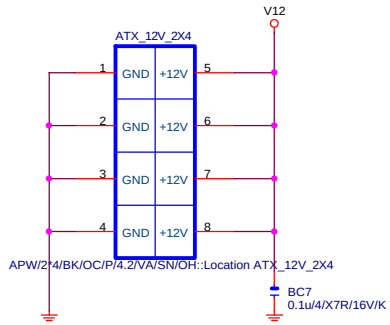
Patch some PSU no internal pull up resistor

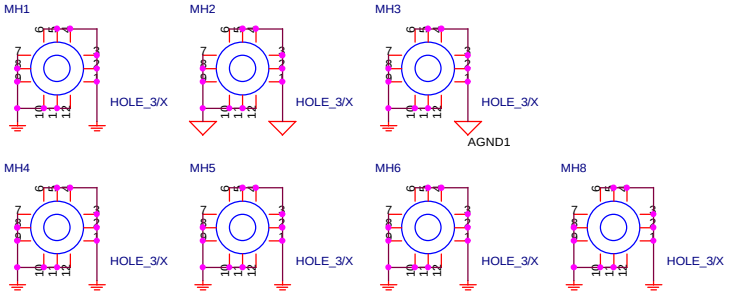


APW/2*12/BK/VA/SN/2SHK/PA66

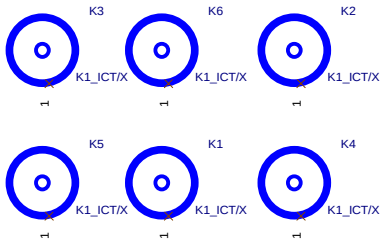
To prevent the 5VSB under loading when boot

ATXX4 POWER CONNECTOR

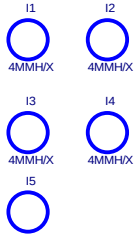




HOLE_4-RH-1



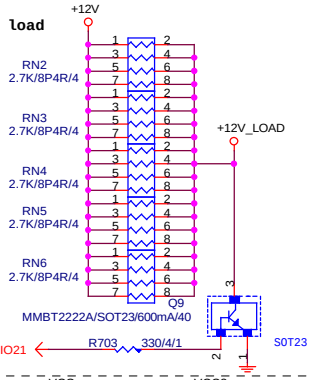
K1-ICT

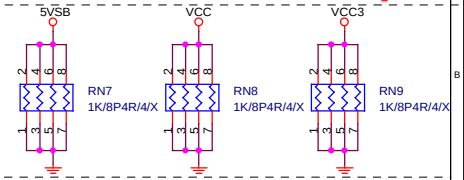


4MMH

【技術通報R&D技術通報153】

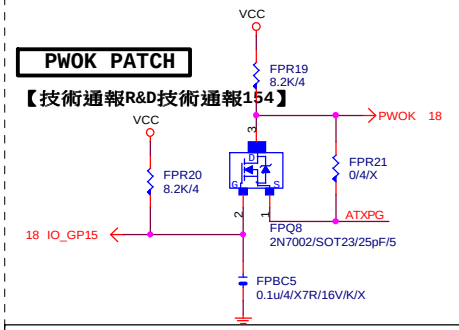
To fix 12V light load abnromal issue





PWOK PATCH

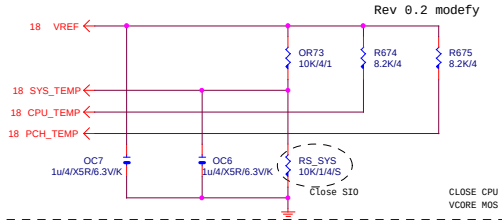
【技術通報R&D技術通報154】

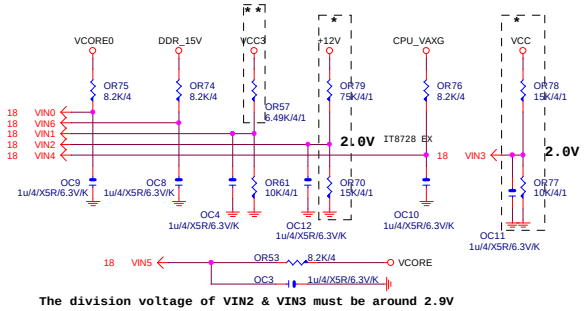


Gigabyte Technology

Title: ATX POWER CONNECTOR			
Size: Custom	Document Number: GA-Z97-D3H		Rev: 1.11
Date: Friday, June 20, 2014	Sheet 29 of 34		

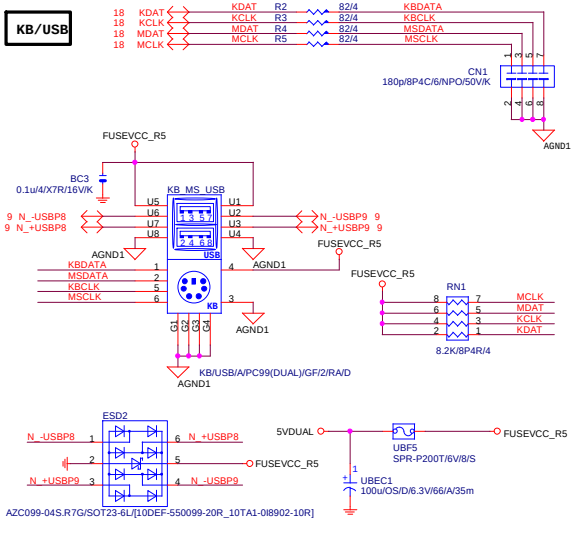
TEMP H/W MONITOR



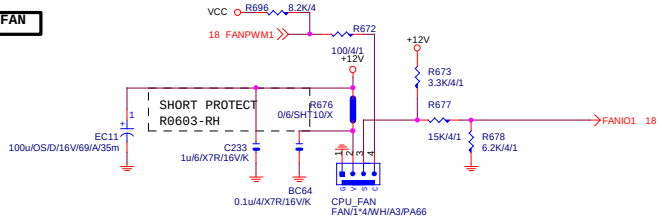


The division voltage of VIN2 & VIN3 must be around 2.9V

KB/USB



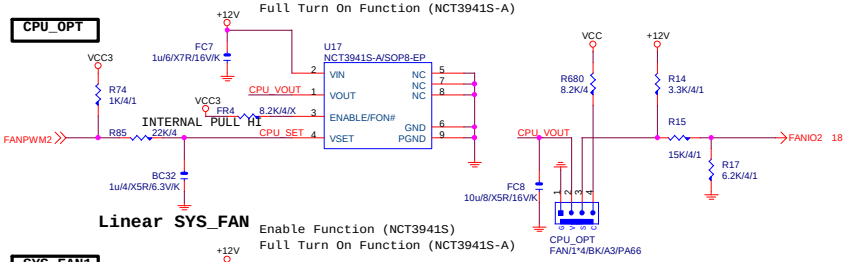
CPU_FAN



Linear SYS_FAN

Enable Function (NCT3941S)
Full Turn On Function (NCT3941S-A)

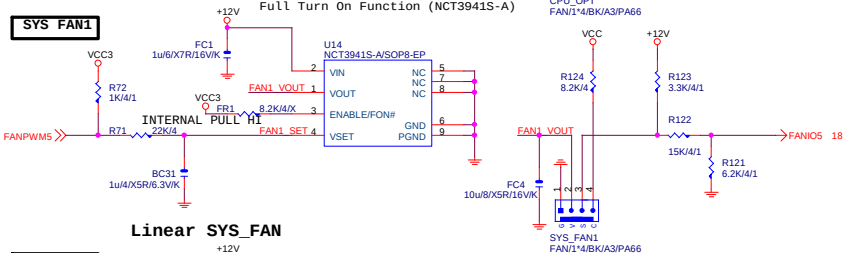
CPU_OPT



Linear SYS_FAN

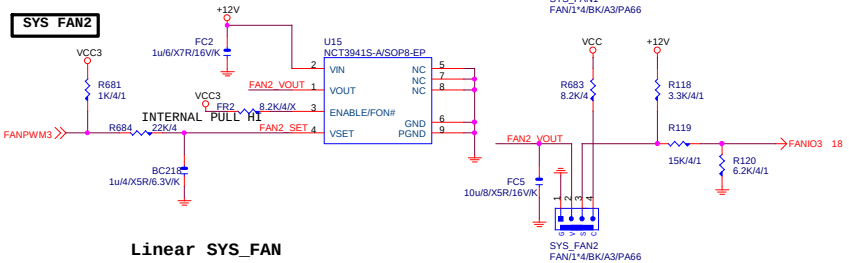
Enable Function (NCT3941S)
Full Turn On Function (NCT3941S-A)

SYS FAN1



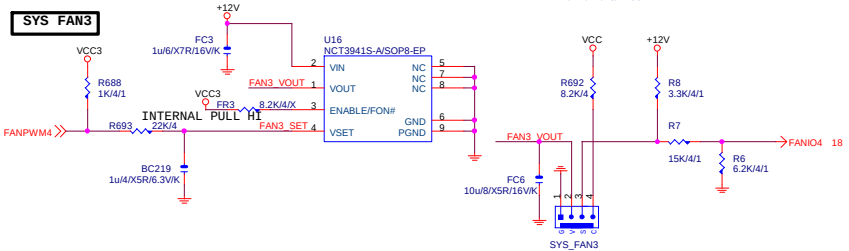
Linear SYS_FAN

SYS FAN2

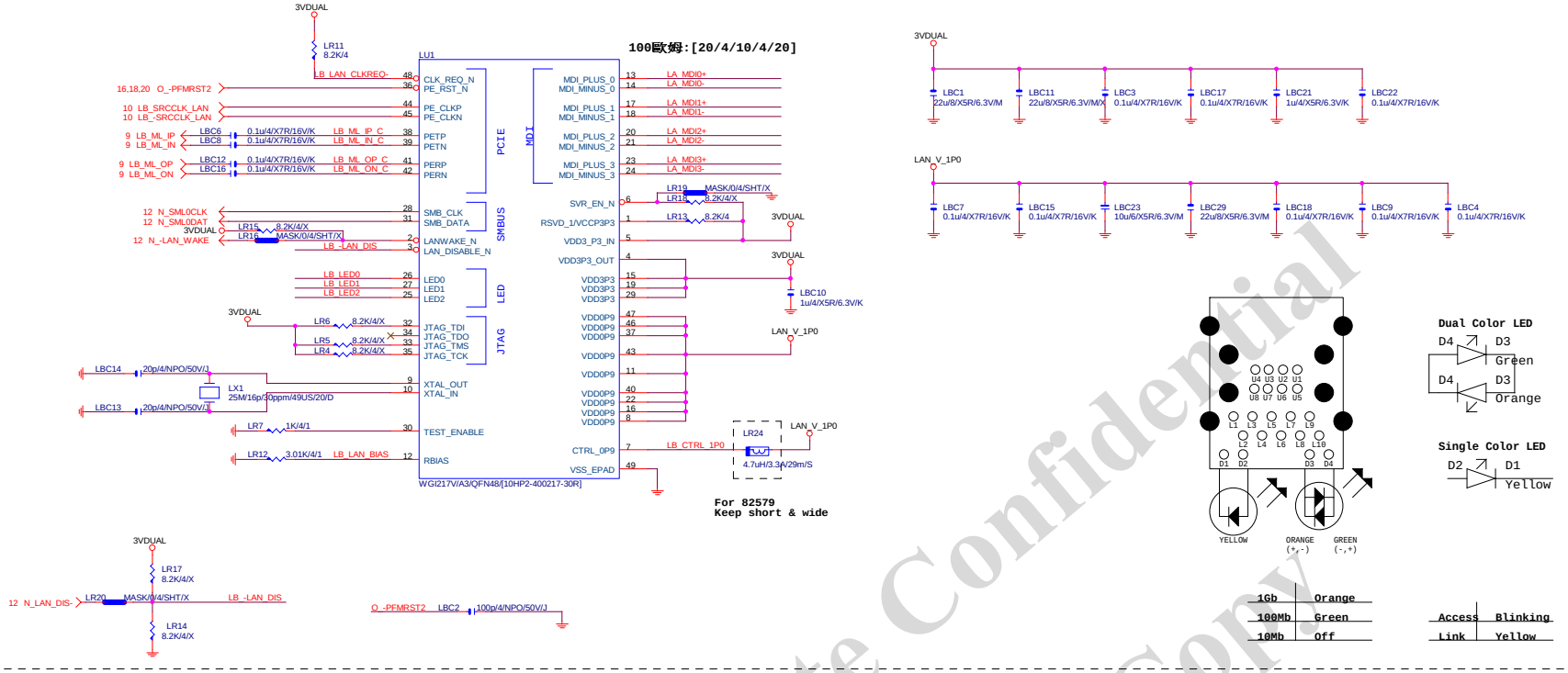


Linear SYS_FAN

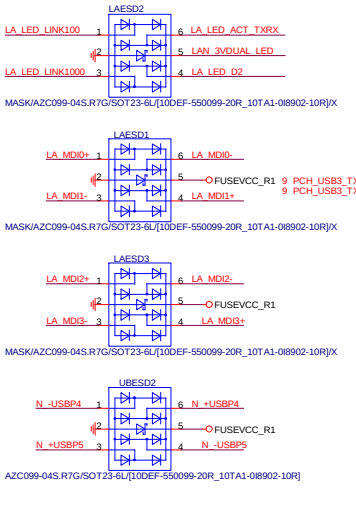
SYS FAN3



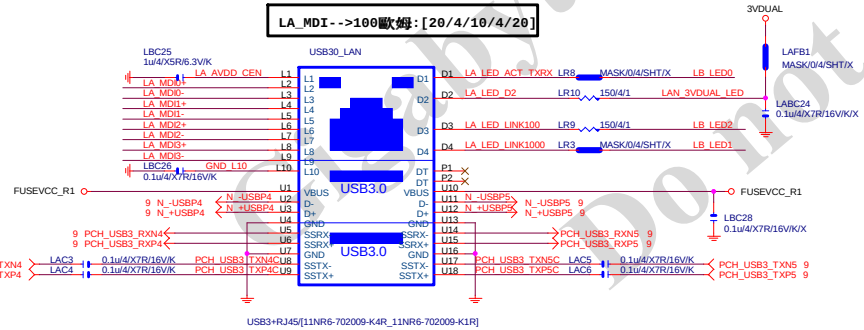
Gigabyte Technology		
Title: HWM,KB/MS, FAN CTRL		
Size: Custom	Document Number: GA-Z97-D3H	Rev: 1.11
Date: Friday, June 20, 2014	Sheet 30 of 34	



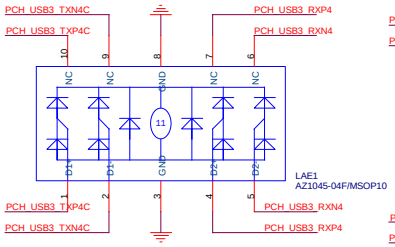
USB30_LAN CONNECTOR

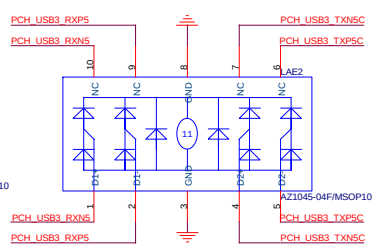


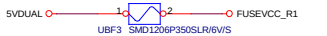
LA_MDI-->100歐姆:[20/4/10/4/20]



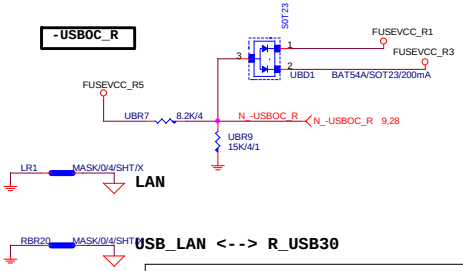
USB30 ESD PROCTECT



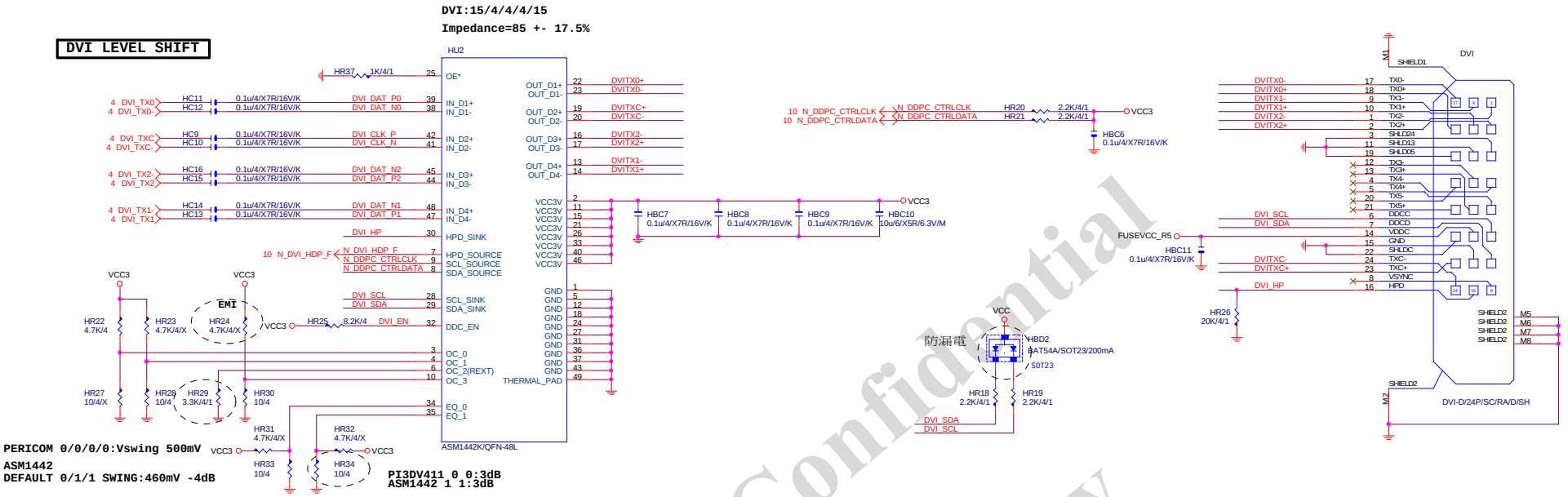




-USBOC_R



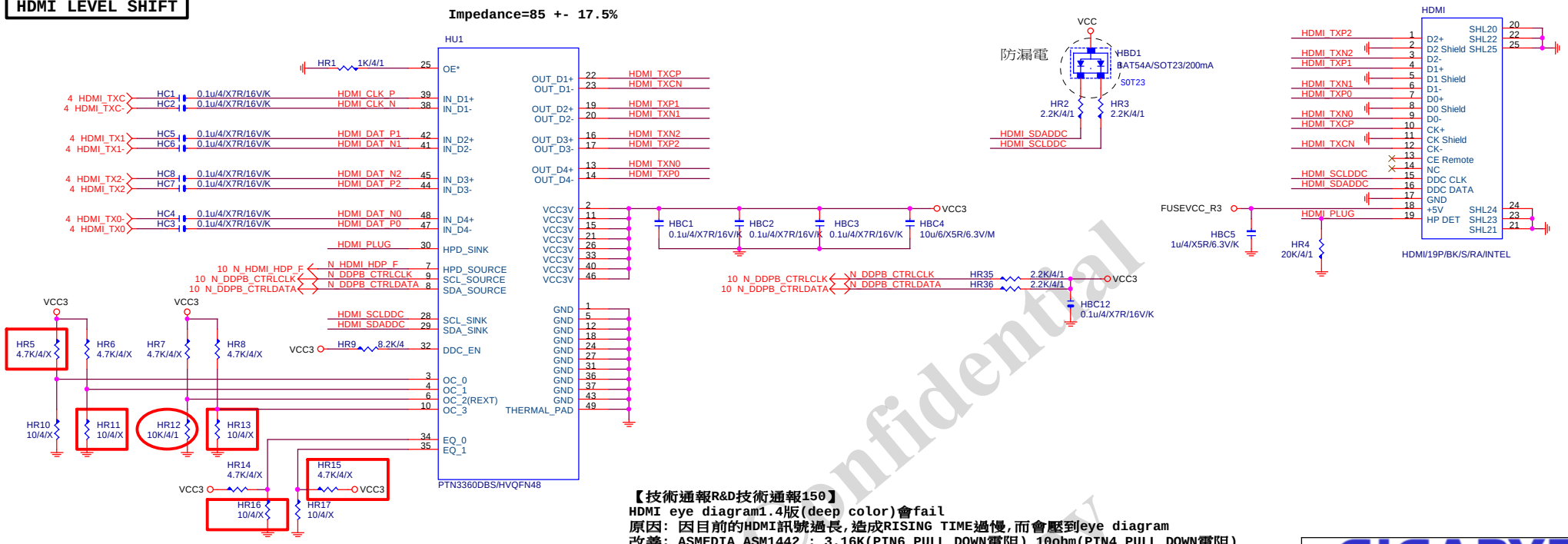
Gigabyte Technology		
Title	INTEL LAN I217	
Size: Custom	Document Number: GA-Z97-D3H	Rev: 1.11
Date: Friday, June 20, 2014	Sheet 31 of 34	



Gigabyte Technology		
Title: DVI		
Size: Custom	Document Number: GA-Z97-D3H	Rev: 1.11
Date: Friday, June 20, 2014	Sheet 32 of 34	

HDMI LEVEL SHIFT

HDMI:20/4/6/4/20
Impedance=85 +- 17.5%



PTN3360:PIN 4/10/34/35 NC PIN,都不上值;只上HR12:10K
ASM1442:紅色框要上,HR12:3.16K

【技術通報R&D技術通報150】
HDMI eye diagram1.4版(deep color)會fail
原因: 因目前的HDMI訊號過長,造成RISING TIME過慢,而會壓到eye diagram
改善: ASMEDIA ASM1442 : 3.16K(PIN6 PULL DOWN電阻) 10ohm(PIN4 PULL DOWN電阻)

GIGABYTE™

Title: HDMI & USB		
Size: Custom	Document Number: GA-Z97-D3H	Rev: 1.11
Date: Friday, June 20, 2014	Sheet 33 of 34	

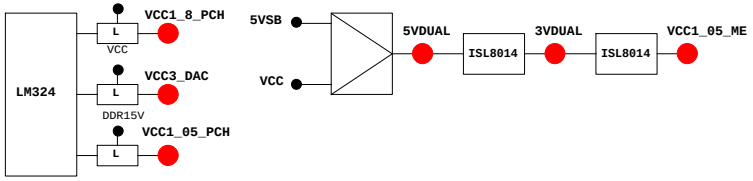
PCH GPIO LIST TABLE

PIN NAME	PWR	AFTER/ PLTRST	Default	USAGE	NOTE
GP0	MAIN	H-Z	GPI	GPIO0	N/A
GP1/TACH1	MAIN		GPI	GPIO1	N/A
GP2/PIRQE#	MAIN		GPI	-PIRQE	P/U 8.2K VCC3
GP3/PIRQF#	MAIN		GPI	-PIRQF	P/U 8.2K VCC3
GP4/PIRQG#	MAIN		GPI	-PIRQG	P/U 8.2K VCC3
GP5/PIRQH#	MAIN		GPI	-PIRQH	P/U 8.2K VCC3
GP6/TACH2	MAIN		GPI	PCIEX1 Detect	P/U 8.2K VCC3
GP7/TACH3	MAIN		GPI	GPIO7	P/U 8.2K VCC3
GP8	STBY	H	GPI	GPIO8	N/A
GP9/OC5#	STBY		NATIVE	USB OC5#	N/A
GP10/OC6#	STBY		NATIVE	USB OC6#	N/A
GP11/SMBALERT#	STBY		NATIVE	USB PWR protect	P/U 8.2K 3VDUAL
GP12	STBY	L	GPI	GPIO12	N/A
GP13	STBY	L	GPI	LPCPME#	P/U 8.2K 3VDUAL
GP14/OC7#	STBY		NATIVE	USB OC7#	N/A
GP15	STBY	L	GPI	GPIO15(TLS Enable)	P/U 8.2K 3VDUAL
GP16	MAIN		GPI	GPIO16	P/U 8.2K VCC3
GP17/TACH0	MAIN		GPI	GPIO17	P/U 8.2K VCC3
GP18	MAIN		GPI	Mobile Only	N/A
GP19	MAIN		GPI	GPIO19	P/U 8.2K VCC3
GP20	MAIN		GPI	GPIO20	P/U 8.2K VCC3
GP21	MAIN		GPI	GPIO21	P/U 8.2K VCC3
GP22	MAIN	H-Z	GPI	GPIO22	P/U 8.2K VCC3
GP23	MAIN		GPI	GPIO23	N/A
GP24	STBY	L	GPI	SKTOCC#	N/A
GP25	STBY			Mobile Only	N/A
GP26	STBY			Mobile Only	N/A
GP27	STBY	H	GPO	GPIO27	P/U 8.2K 3VDUAL
GP28	STBY	H	GPO	PWR LED	P/U 8.2K 3VDUAL
GP29	STBY	L	GPI	GPIO29	N/A
GP30	STBY	H-Z	GPI	Mobile Only	N/A
GP31	STBY	H-Z	GPI	Mobile Only	N/A
GP32	MAIN	H	GPO	N/A	N/A
GP33	MAIN	H	GPO	N/A	N/A
GP34	MAIN	H-Z	GPI	-PCI_STOP	P/U 8.2K VCC3
GP35	MAIN	L	GPO	-ACZ_DET	P/U 8.2K VCC3
GP36	MAIN		GPI	N/A	N/A
GP37	MAIN		GPI	N/A	N/A
GP38	MAIN	H-Z	GPI	PCIEX4 Detect	P/U 8.2K VCC3
GP39	MAIN	H-Z	GPI	GPIO39	P/U 8.2K VCC3
GP40	STBY		NATIVE	USB OC1#	N/A
GP41	STBY		NATIVE	USB OC2#	N/A
GP42	STBY		NATIVE	USB OC3#	N/A
GP43	STBY		NATIVE	USB OC4#	N/A
GP44	STBY	L	NATIVE	GPIO44	P/U 8.2K 3VDUAL
GP45	STBY		NATIVE	GPIO45	P/U 8.2K 3VDUAL
GP46	STBY	L	NATIVE	GPIO46	P/U 8.2K 3VDUAL
GP47	STBY			Mobile Only	N/A
GP48	MAIN	H-Z	IN	GPIO48	P/U 8.2K 3VDUAL
GP49	MAIN	H-Z	IN	GPIO49	P/U 8.2K 3VDUAL
GP50	MAIN		NATIVE	-REQ1	P/U 2.2K VCC
GP51	MAIN	H	NATIVE	-GNT1	N/A
GP52	MAIN		NATIVE	-REQ2	P/U 2.2K VCC
GP53	MAIN	H	NATIVE	-GNT2	N/A
GP54	MAIN		NATIVE	-REQ3	P/U 2.2K VCC
GP55	MAIN	H	NATIVE	-GNT3	N/A
GP56	STBY		NATIVE	Mobile Only	N/A
GP57	STBY	H-Z	IN	VCORE_OV1	P/U 8.2K 3VDUAL
GP58	STBY	H-Z	NATIVE	F_USB_OC	P/U 8.2K 3VDUAL
GP59	STBY		NATIVE	USB_OC0#	N/A
GP60	STBY	H-Z	NATIVE	N/A(Reverse)	P/U 8.2K 3VDUAL
GP61	STBY	L	NATIVE	-SUSTAT	N/A
GP62	STBY	L	NATIVE	SUSCLK	N/A
GP63	STBY	L	NATIVE	GPIO63	N/A
GP64	MAIN	L	NATIVE	CLKOUTFLEX0	N/A
GP65	MAIN	L	NATIVE	CLKOUTFLEX1	N/A
GP66	MAIN	L	NATIVE	CLKOUTFLEX2	N/A
GP67	MAIN	L	NATIVE	CLKOUTFLEX3	N/A
GP72	STBY	H-Z	NATIVE	VCORE_OV4	P/U 8.2K 3VDUAL
GP73	STBY			Mobile Only	N/A
GP74	STBY	H-Z	NATIVE	1_05V_OV2	P/U 8.2K 3VDUAL
GP75	STBY	H-Z	NATIVE	N/A(Reverse)	P/U 8.2K 3VDUAL

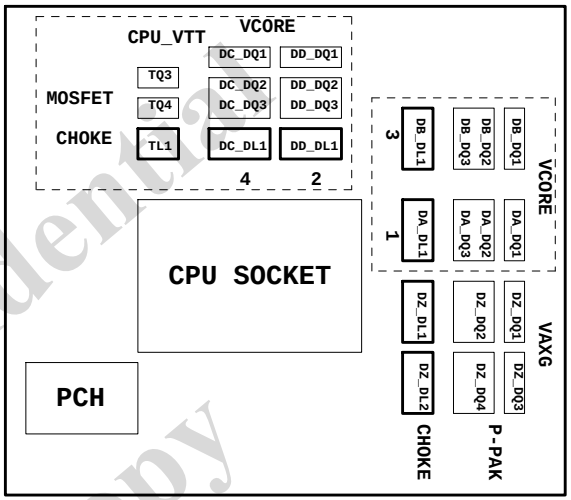
Super I/O ITE8720 GPIO Table

PIN NAME	USAGE	NOTE
SVC/PECI_RQT/GP14	-PECI_REQ	
PWROK1/GP13	PWROK1/ITE_PWROK	
KRST#/GP62	-KBRST	
SO/GP50	-ICH_SPI_CS	
IRTX/GP47/CE2_N/JP7	CEB_N	
GP46/IRRX	-LAN2_DSM	
PSION#/GP42	-PSON	
PWROK2#/GP41	PECI_CTL	
PCIRST3#/GP10/VDIMM_STR_EN	-PCIE_RST	
RSMRST#CIRRX1/GP55	-RSMRST	
PME#/GP54	-LPCPME	
PD5/GP75/BUSSO0	N/A	

PIN NAME	USAGE	NOTE
FAN_TAC2/GP52	FANIO2	
FAN_TAC3/GP37	FANIO3	
VIDO3/FAN_TAC4/GP25/DSR2#	FANIO4	
FAN_CTL2/GP51	FANPWM2	
FAN_CTL3/GP36	FANPWM3	
VID4/GP34	BEEP-	
VID3/GP33	TURBO1	
VID2/GP32	TURBO0	
VCORE_GOOD/VID6/GP63	CPUT_LED1_C	
VID5/GP35	CPUT_LED2_C	
VID1/GP31	CPUT_LED3_C	
VID0/GP30	-LAN1_DSM	NBT_LED1_C
SLCT/GP80	CPU_LED1_C	
PE/GP81	CPU_LED2_C	
BUSY/GP82	CPU_LED3_C	
PD3/GP73/BUSSI1	SB_LED1_C	
PD4/GP74/BUSSI2	SB_LED2_C	
VCORE_EN/VID7/GP64	IT_GP64	SB_LED3_C
PD0/GP70	NB_LED1_C	
PD1/GP71	NB_LED2_C	
PD2/GP72/BUSSI0	NB_LED3_C	
GP22/SCK	LOW_PWR_1	
VIDO5/GP27/SIN2	LOW_PWR_2	
PCIRST2#/GP11	-PFMRST1	
PCIRST1#/GP12	-PFMRST2	
3VSBSW#/GP40	CSI_F0	BSEL166_1
SUSC#/GP53	CSI_F1	BSEL166_2
GP23/SI	BSEL166_3/CSISBSL	
VIDO0/GP20/CTS2#	CPUT_LED1_C	BSEL166_4
GP65/VDDA_EN/GB_01	MB_ID2	
PD6/GP76/BUSSO1	MB_ID3	
PD7/GP77/BUSSO2	MB_ID4	
AFD#/GP86/SMBC_R	空 PIN	FST_2X8
INIT#/GP85/SMBD_M	SEC_2x8	GTLREF_AD2
ACK#/GP83	DDR_LED1_C	
VIDO1/GP21/DCD2#	DDR_LED2_C	
STB#/GP87/SMBC_M	DDR_LED3_C	
PWRON#GP44	VCORE_OV1	
PANSWH#/GP43	PWRBTSW	
KDAT/GP61	-PWRBTSW	
KCLK/GP60	KDAT	
MDAT/GP57	KCLK	
MACL/GP56	MDAT	
GP66/VLDT_EN/GB_02	NBT_LED1_C	MCLK
SVD/PCIRSTIN#/CIRTX/GP15	PWM2_CR	
KDAT/GP61	PWM2_CR	
GP67/CPU_PG/GB_03	EN_LOADLINE	IT_GP67/-EN_PWM2
SLIN#/GP84/SMBD_R	-EN_PWM2	
PSI_L/FAN_CLT5/CIRRX2/GP16	-THERM	
VIDO4/GP26/SOUT2	DDR18V_PH2_EN	
VIDO2/FAN_TAC5/GP24/DSR2#	DDR18V_LED	
VIDO6/GP17/RI2#	1_1V_PH_EN	
VIDO7/JP6/DTR2#	JP6	
PD5/GP75/BUSSO0	SB_LED3_C	



PWM各相位的擺法如下：



BIOS超電壓對應表：

線路圖名稱	BIOS選項
Vcore	CPU Vcore
CPU_VTT	CPU Termination
CPU_VAXG	CPU Graphic Core
VCC1_8_PCH	CPU PLL
VCC1_05_PCH	PCH core
3VDUAL	3VDUAL
DDR15V	DRAM voltage
DDRVTT	DRAM Terminatio
VREF_CA_A/VREF_CA_B	DRAM Address Ref
VREF_DQ_A/VREF_DQ_B	DRAM Data Ref

散熱模組料號：

Z77-D3H :
PCH :
12SP2-S05511-01R/02R/03R
MOSFET :
12SP2-S08924-01R/02R/03R

	3 pin FAN control	4 pin FAN control	FAN speed	Controller
CPU FAN	FANPWM1	FANPWM3	FANIO1	IT8720
	ICH_FAN_PWM2	ICH_FAN_PWM0	ICH_FAN_TACH0	PCH
SYS FAN	FANPWM2	N/A	FANIO2	IT8720
	ICH_FAN_PWM1	N/A	ICH_FAN_TACH1	PCH
PWR FAN	N/A	N/A	FANIO3	IT8720
			ICH_FAN_TACH2	PCH

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