

Compal Confidential

KAL90/KALH0 M/B Schematics Document

Intel Penryn Processor with Cantiga + DDRII + ICH9M

2008-12-17

REV:1.0

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				Size Custom	Document Number KAL90KALH0
				Date: Wednesday, December 17, 2008	Rev 0.2
				Sheet 1 of 52	

Model Name : KAL90/KALH0



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				Size B	Document Number	Rev 0.2
				Date: Thursday, November 20, 2008		
				Sheet 2 of 52		

Voltage Rails

Power Plane	Description	S1	S3	S5
VIN	Adapter power supply (19V)	N/A	N/A	N/A
B+	AC or battery power rail for power circuit.	N/A	N/A	N/A
+CPU_CORE	Core voltage for CPU	ON	OFF	OFF
+0.9VS	0.9V switched power rail for DDR terminator	ON	OFF	OFF
+1.05VS	1.05V switched power rail	ON	OFF	OFF
+1.25VS	1.25V switched power rail	ON	OFF	OFF
+1.5V	1.5V power rail for HDA	ON	ON	OFF
+1.5VS	1.5V switched power rail	ON	OFF	OFF
+1.8V	1.8V power rail for DDR	ON	ON	OFF
+1.8VS	1.8V switched power rail	ON	OFF	OFF
+1.1VS	1.1V switched power rail	ON	OFF	OFF
+3VALW	3.3V always on power rail	ON	ON	ON*
+3V	3.3V power rail for SB	ON	ON	X
+3V_LAN	3.3V power rail for LAN	ON	ON	X
+3VS	3.3V switched power rail	ON	OFF	OFF
+5VALW	5V always on power rail	ON	ON	ON*
+5VS	5V switched power rail	ON	OFF	OFF
+VSB	VSB always on power rail	ON	ON	ON*
+RTCVCC	RTC power	ON	ON	ON
+VGA_CORE	Core voltage for GPU	ON	OFF	OFF

Note : ON* means that this power plane is ON only with AC power available, otherwise it is OFF.

External PCI Devices

Device	IDSEL#	REQ#/GNT#	Interrupts
--------	--------	-----------	------------

EC SM Bus1 address

Device	Address	Device	Address
Smart Battery	0001 011X b	ADI ADT7421	1001 100X b
MEDIA CONSOLE	1010 000X b	NB9M THERMAL SENSOR	

ICH9M SM Bus address

Device	Address
Clock Generator (ICS9LPRS367, SLG8SP56V)	1101 001Xb
DDR DIMM0	1001 000Xb
DDR DIMM2	1001 010Xb

STATE	SIGNAL	SLP_S1#	SLP_S3#	SLP_S4#	SLP_S5#	+VALW	+V	+VS	Clock
Full ON		HIGH	HIGH	HIGH	HIGH	ON	ON	ON	ON
S1 (Power On Suspend)		LOW	HIGH	HIGH	HIGH	ON	ON	ON	LOW
S3 (Suspend to RAM)		LOW	LOW	HIGH	HIGH	ON	ON	OFF	OFF
S4 (Suspend to Disk)		LOW	LOW	LOW	HIGH	ON	OFF	OFF	OFF
S5 (Soft OFF)		LOW	LOW	LOW	LOW	ON	OFF	OFF	OFF

Board ID / SKU ID Table for AD channel

Vcc	3.3V +/- 5%			
Ra/Rc/Re	100K +/- 5%			
Board ID	Rb / Rd / Rf	VAD_BID min	VAD_BID typ	VAD_BID max
0	0	0 V	0 V	0 V
1	8.2K +/- 5%	0.216 V	0.250 V	0.289 V
2	18K +/- 5%	0.436 V	0.503 V	0.538 V
3	33K +/- 5%	0.712 V	0.819 V	0.875 V
4	56K +/- 5%	1.036 V	1.185 V	1.264 V
5	100K +/- 5%	1.453 V	1.650 V	1.759 V
6	200K +/- 5%	1.935 V	2.200 V	2.341 V
7	NC	2.500 V	3.300 V	3.300 V

BOARD ID Table

Board ID	PCB Revision
0	0.1
1	0.2
2	0.3
3	1.0
4	1A
5	
6	
7	

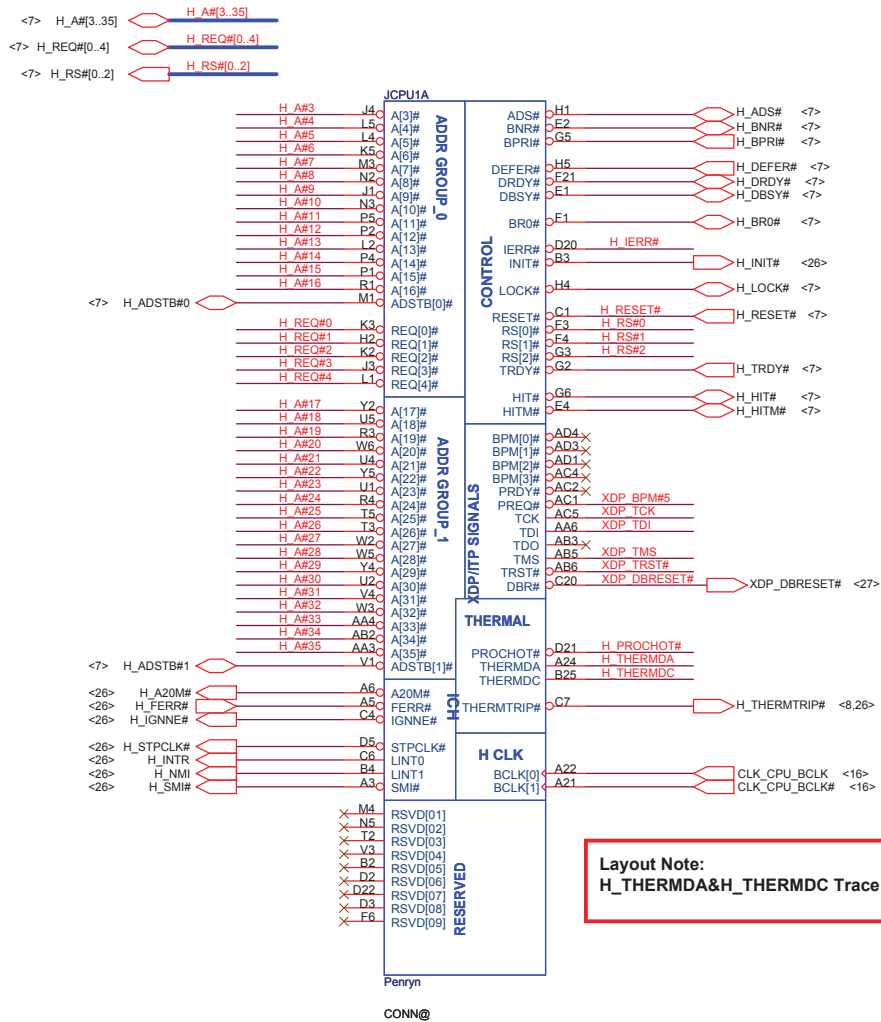
BTO Option Table

BTO Item	BOM Structure
KAL90	JAL90@
UMA	GM@
PM@	PM@
ALC888VC	888VC@
ALC888VB	888VB@
AR8121	8121@
AR8112	8112@
ALC268	268@
GL40	GL40@
GM45	GM45@

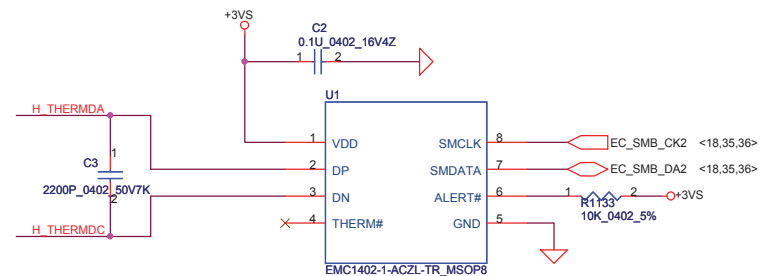
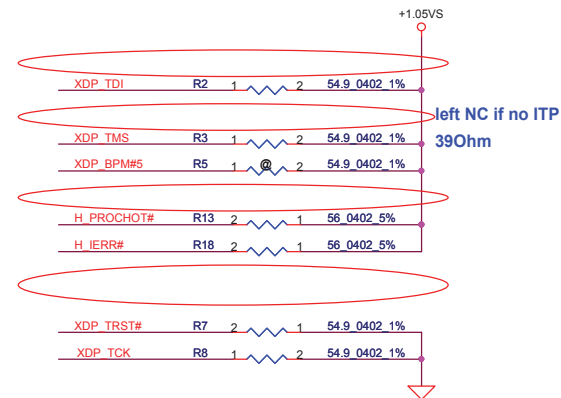
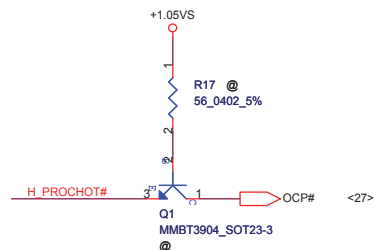
BOM Configuration Table

Project	BOM Configuration
KAL90-UMA	XXXXXXXXXX:KAL90@/GM@/888VC@/8121@/GM45@
KAL90-Dis	XXXXXXXXXX:KAL90@/PM@/888VC@/8121@
KAL90-GM45	XXXXXXXXXX:KALH0@/GM@/888VC@/8121@/GM45@
KAL90-GL40	XXXXXXXXXX:KALH0@/GM@/888VC@/8121@/GL40@
KAL90-PM45	XXXXXXXXXX:KALH0@/PM@/888VC@/8121@

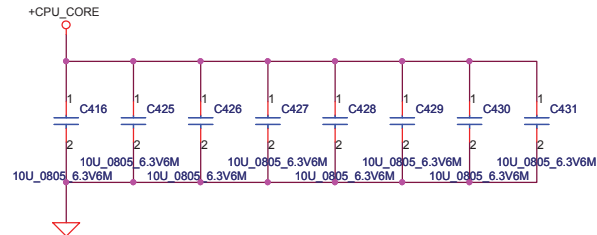
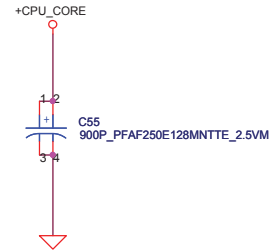
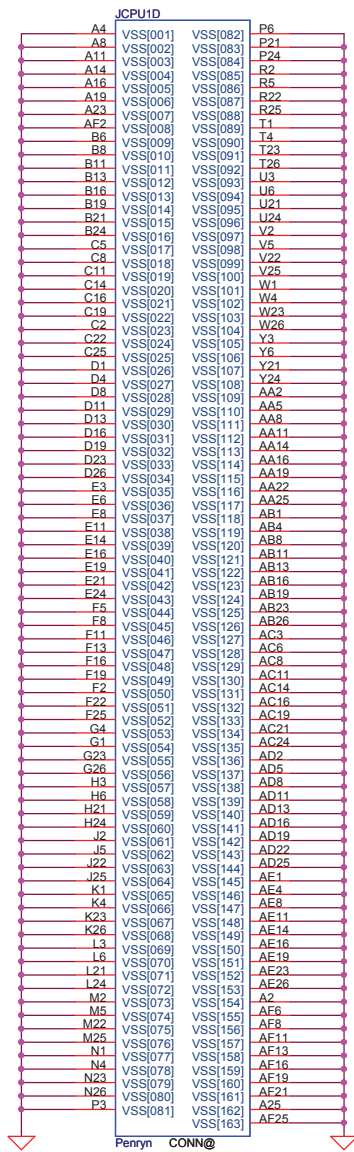
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				Size B	Document Number KAL90KALH0	Rev 0.2
				Date:	Thursday, November 20, 2008	Sheet 3 of 52



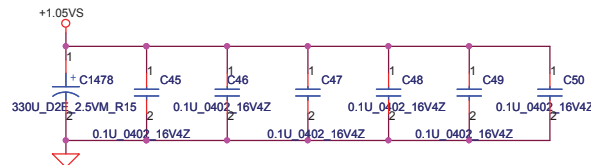
BSEL2	BSEL1	BSEL0	BCLK
0	0	0	266
0	1	0	200
0	1	1	166



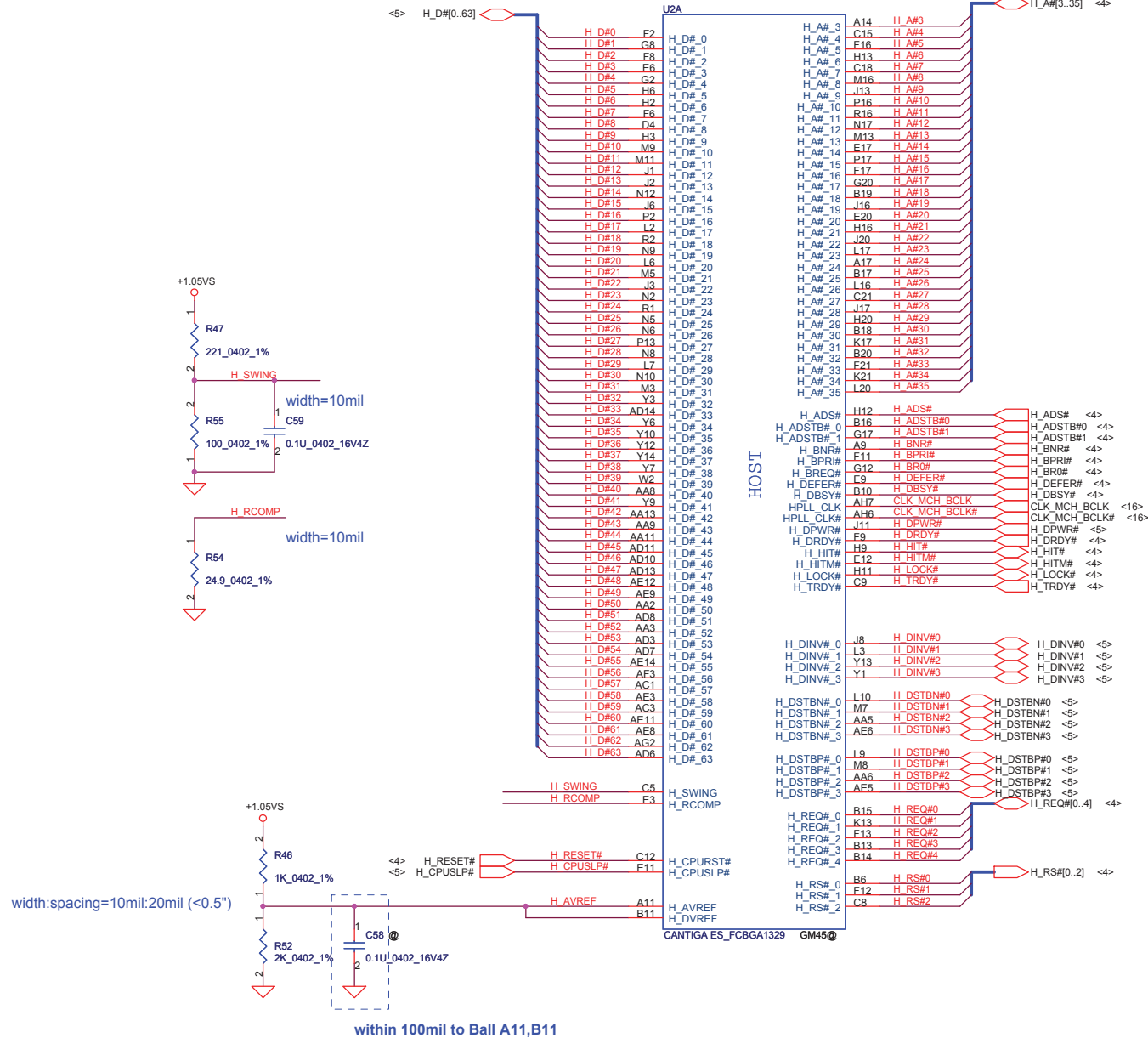
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								Penryn (1/3)		
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							KAL90KALH0			
						Date:	Thursday, November 20, 2008		Sheet	4



+CPU-CORE Decoupling	C,uF	ESR, mohm	ESL,nH
SPCAP, Polymer	4X330uF	6m ohm/4	1.8nH/6
MLCC 0805 X5R	32X22uF	3m ohm/32	0.6nH/32
	32X10uF	3m ohm/32	0.6nH/32



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						kAL90KALH0					
						Date:		Thursday, November 20, 2008		Sheet 6 of 52	

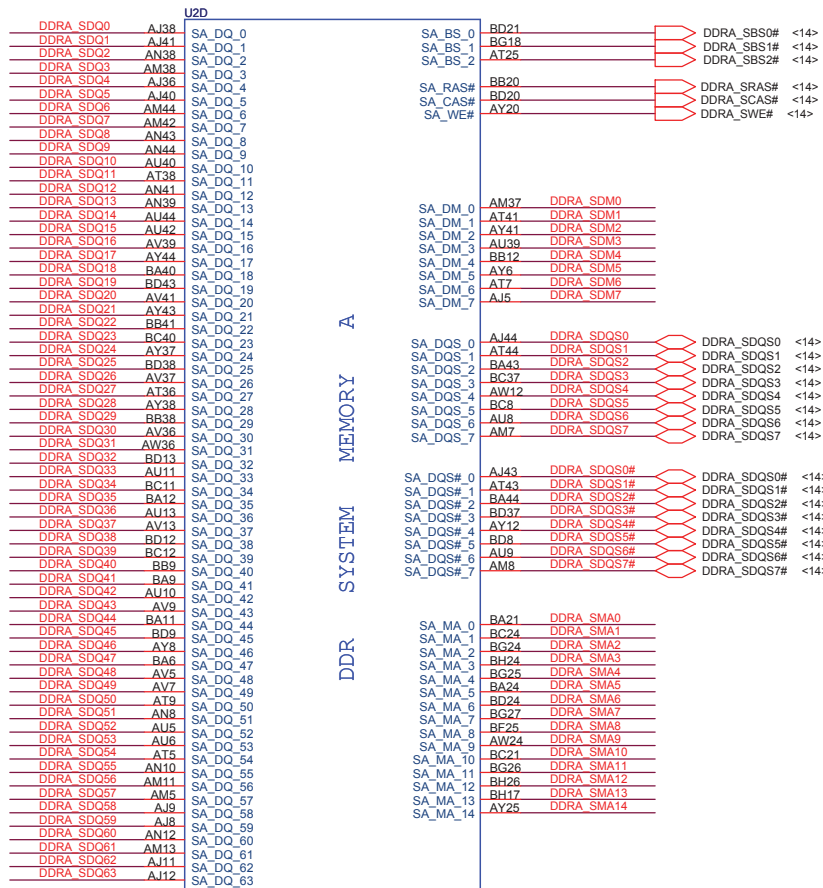


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				Date	Thursday, November 20, 2008
				Sheet	7 of 52
				Rev	0.2

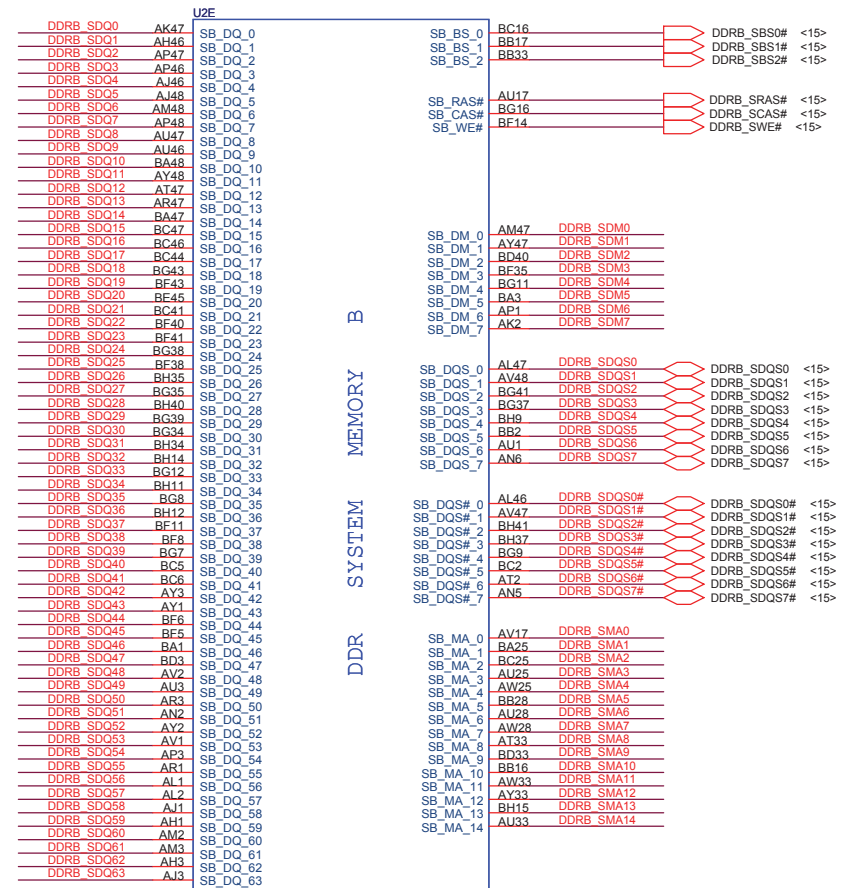


<14> DDRA_SDQ[0..63] DDRA_SDQ[0..63]
<14> DDRA_SDM[0..7] DDRA_SDM[0..7]
<14> DDRA_SMA[0..14] DDRA_SMA[0..14]

<15> DDRB_SDQ[0..63] DDRB_SDQ[0..63]
<15> DDRB_SDM[0..7] DDRB_SDM[0..7]
<15> DDRB_SMA[0..14] DDRB_SMA[0..14]

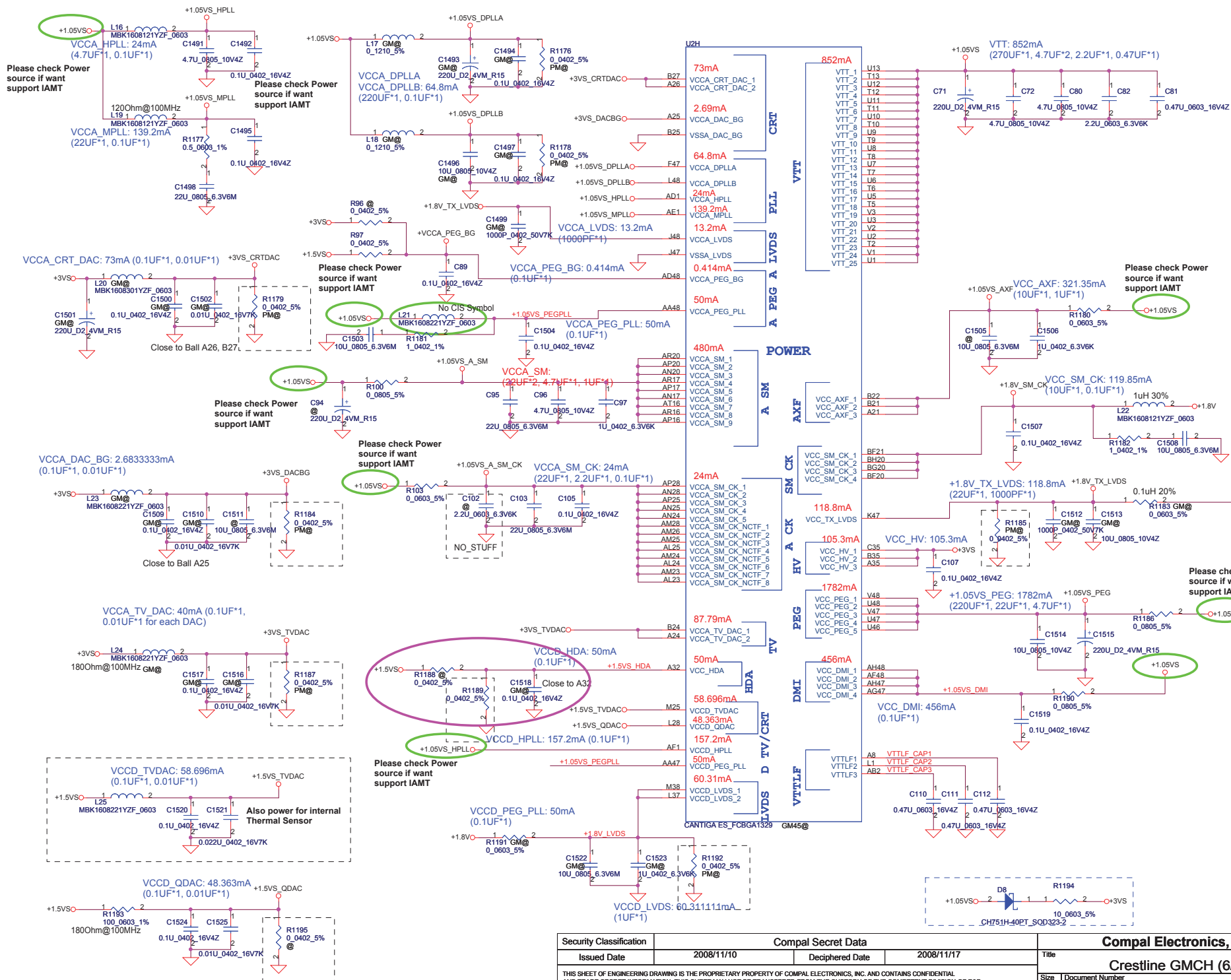


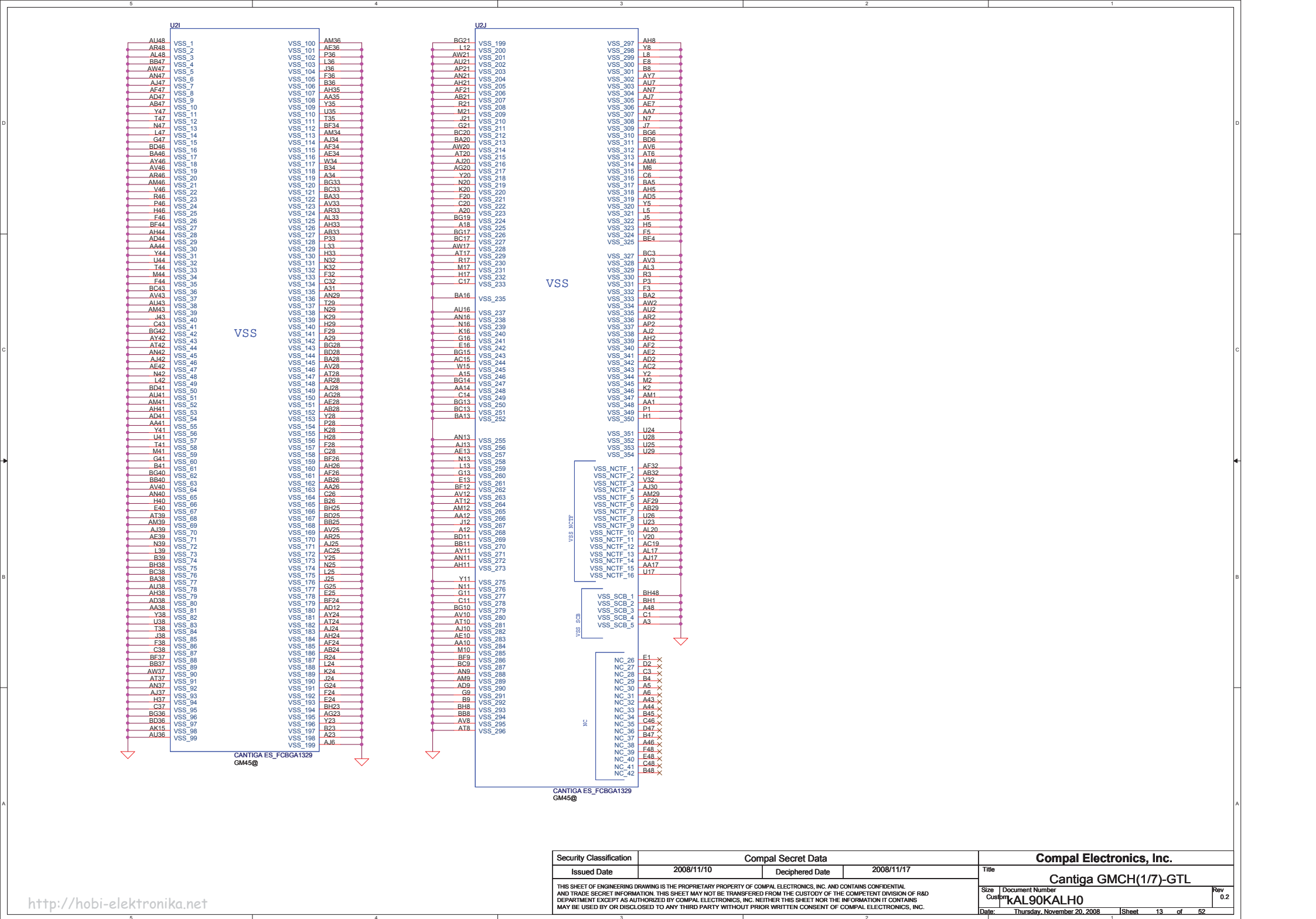
CANTIGA_ES_FCBGA1329 GM45@



CANTIGA_ES_FCBGA1329 GM45@

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Size	B	Document Number	KAL90KALH0		Rev
Date:	Thursday, November 20, 2008	Sheet	9	of	52





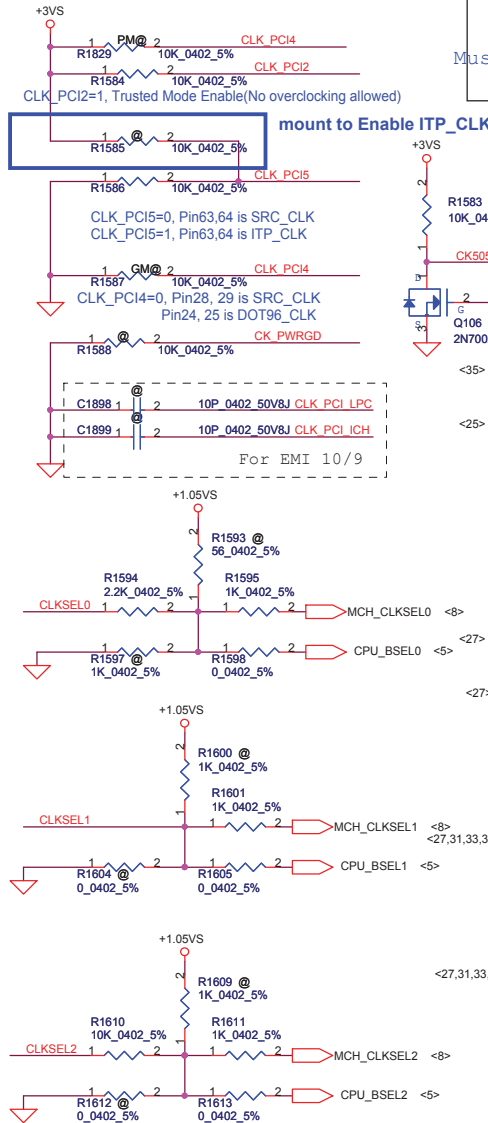


FSLC CLKSEL2	FSLB CLKSEL1	FSLA CLKSEL0	CPU MHz	SRC MHz	PCI MHz
0	0	0	266	100	33.3
0	1	0	200	100	33.3
0	1	1	166	100	33.3

Table : ICS9LPRS387

CLK_REQ#	Control	Free-Run
CR#_10(WLAN)	PCIEX10	PCIEX0
CR#_6(MCH)	PCIEX6	PCIEX1
CR#_4(NEW CARD)	PCIEX4	
CR#_9(MINI CARDII)	PCIEX9	

SRC7(VGA_CLK): Discrete VGA[Enable] UMA[Disable]



Must Close to CLKGEN PIN 28,29

mount to Enable ITP_CLK

CLK_PCI5=0, Pin63,64 is SRC_CLK

CLK_PCI5=1, Pin63,64 is ITP_CLK

CLK_PCI4=0, Pin28, 29 is SRC_CLK

Pin24, 25 is DOT96_CLK

For EMI 10/9

CLK_PCI1

CLK_PCI2

CLK_PCI3

CLK_PCI4

CLK_PCI5

CLK_PCI6

CLK_PCI7

CLK_PCI8

CLK_PCI9

CLK_PCI10

CLK_PCI11

CLK_PCI12

CLK_PCI13

CLK_PCI14

CLK_PCI15

CLK_PCI16

CLK_PCI17

CLK_PCI18

CLK_PCI19

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CLK_PCI238

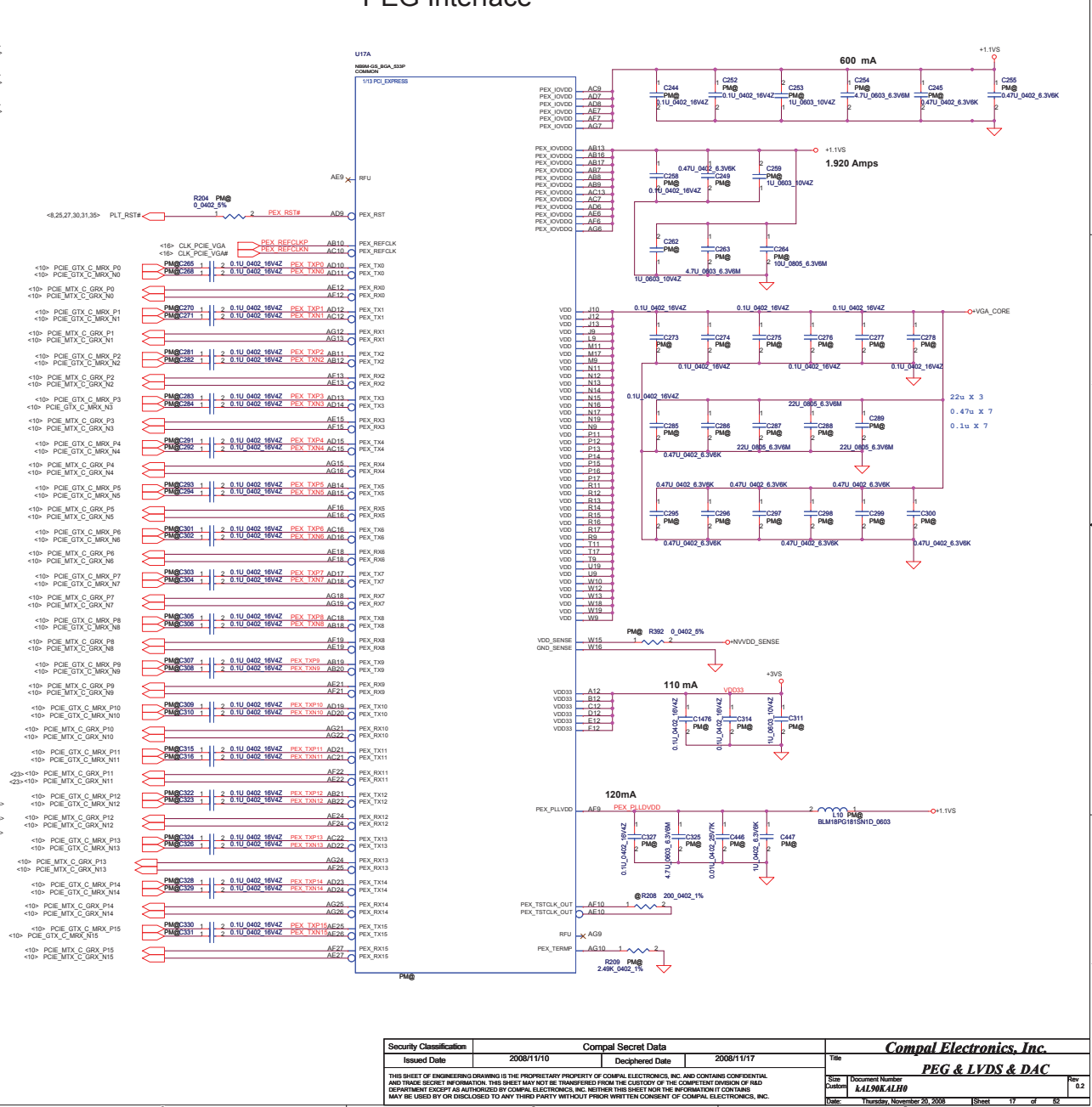
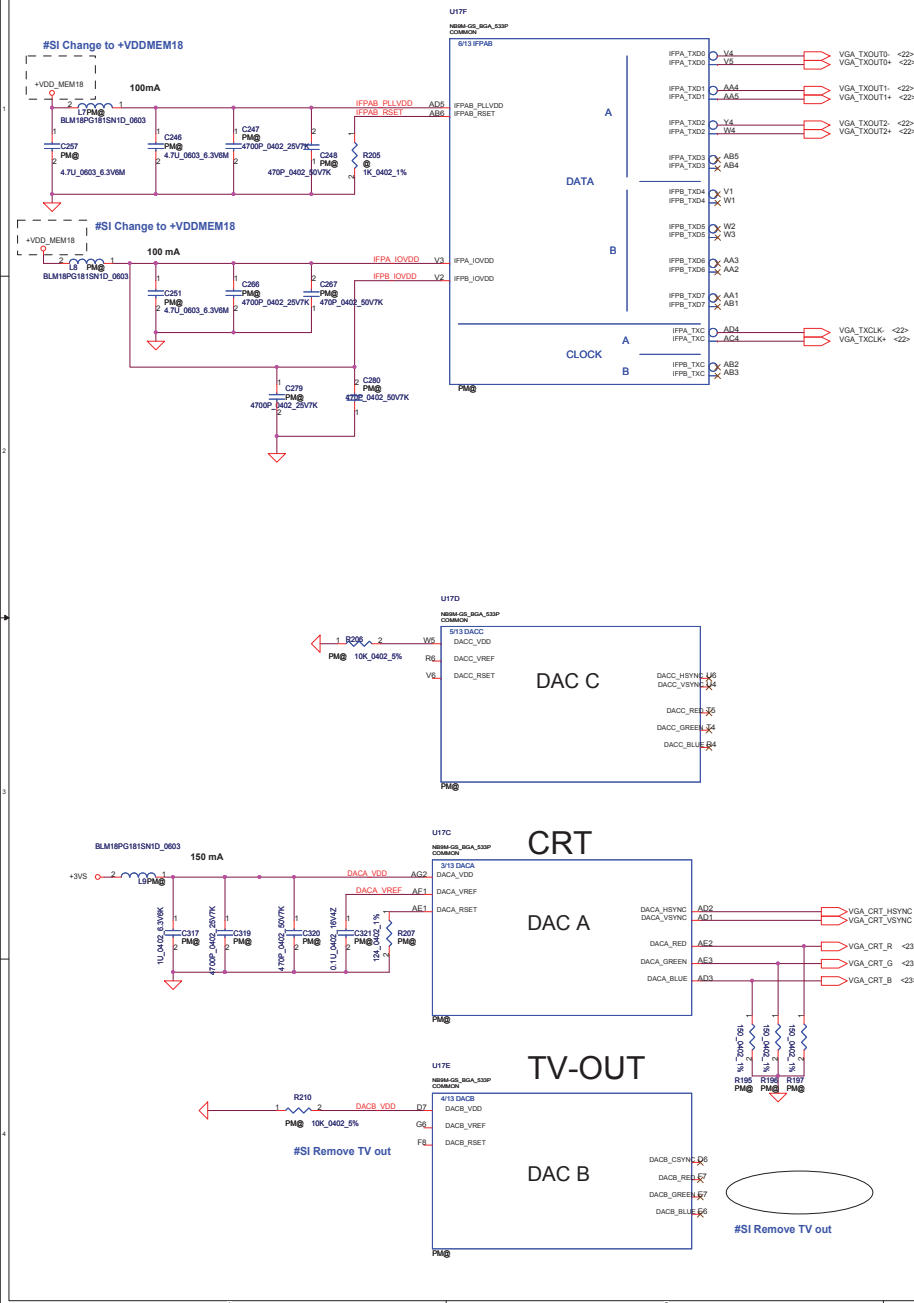
CLK_PCI239

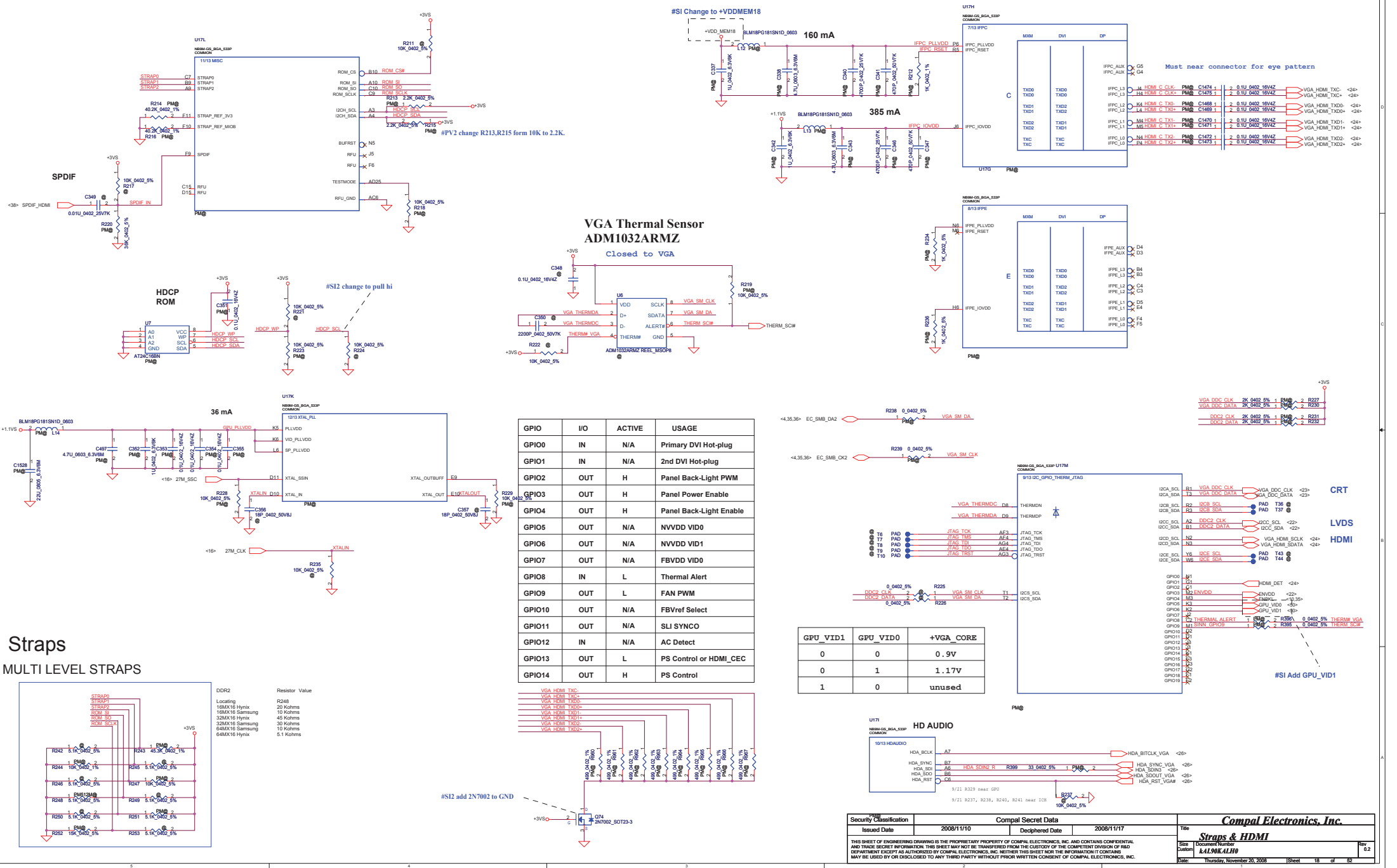
CLK_PCI240

CLK_PCI241

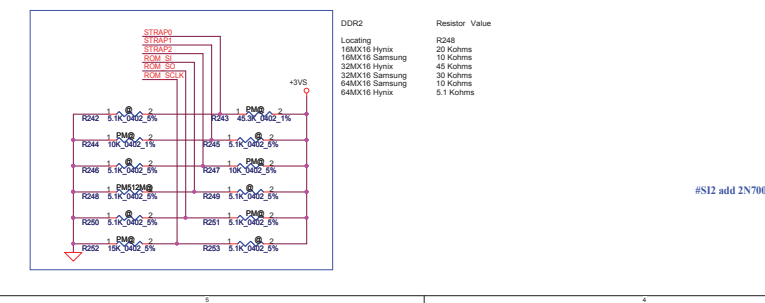
LVDS & DAC Interface

PEG Interface





Straps
MULTI LEVEL STRAPS

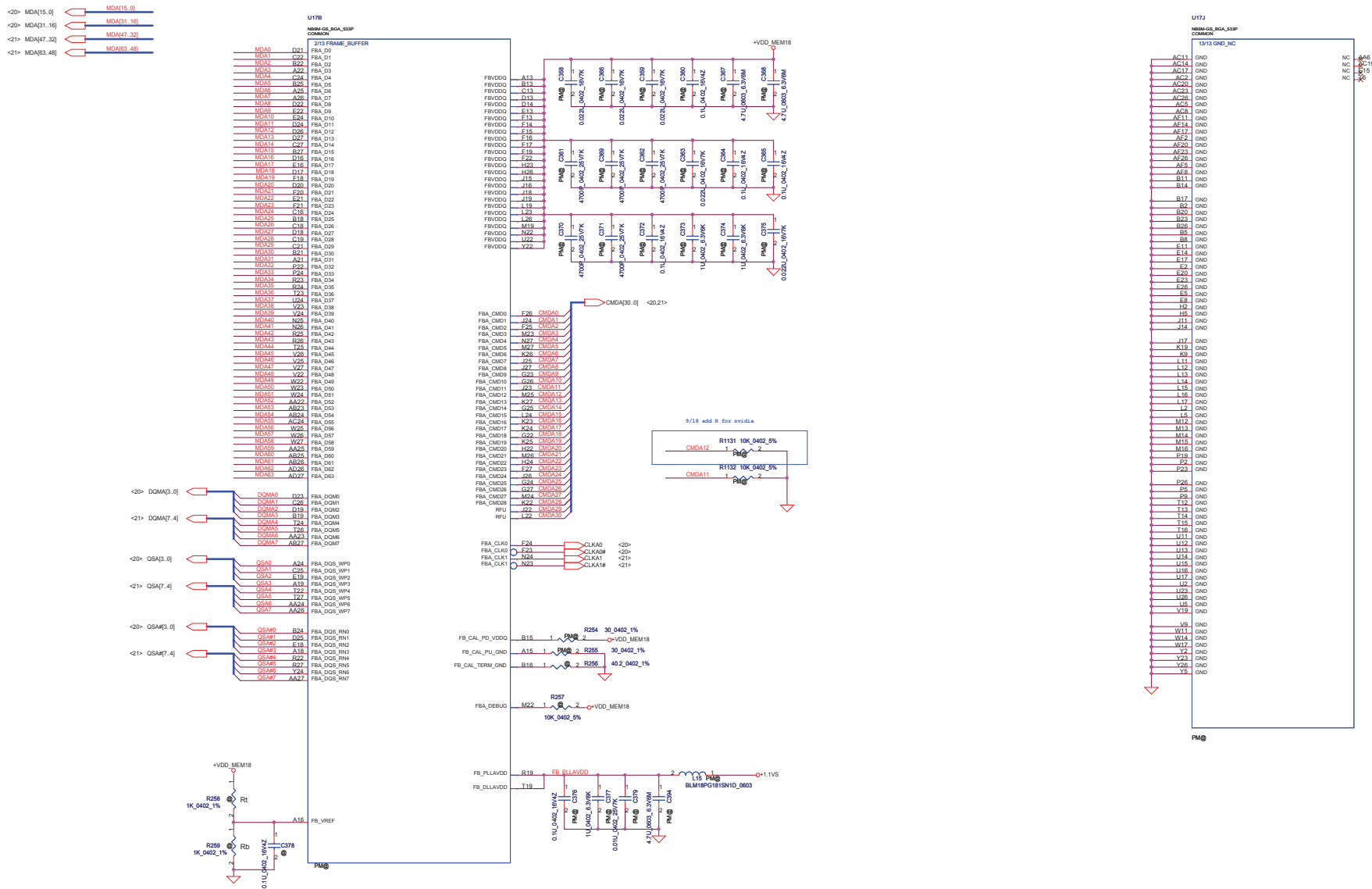
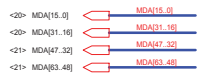


GPIO	I/O	ACTIVE	USAGE
GPIO0	IN	N/A	Primary DVI Hot-plug
GPIO1	IN	N/A	2nd DVI Hot-plug
GPIO2	OUT	H	Panel Back-Light PWM
GPIO3	OUT	H	Panel Power Enable
GPIO4	OUT	H	Panel Back-Light Enable
GPIO5	OUT	N/A	NVDD VID0
GPIO6	OUT	N/A	NVDD VID1
GPIO7	OUT	N/A	FBVDD VID0
GPIO8	IN	L	Thermal Alert
GPIO9	OUT	L	FAN PWM
GPIO10	OUT	N/A	FBVref Select
GPIO11	OUT	N/A	SLI SYNCN
GPIO12	IN	N/A	AC Detect
GPIO13	OUT	L	PS Control or HDMI_CEC
GPIO14	OUT	H	PS Control

GPU_VID1	GPU_VID0	+VGA_CORE
0	0	0.9V
0	1	1.17V
1	0	unused

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Size	Document Number			Rev	
1	KAL90KALH0			0.2	
Date	Thursday, November 20, 2008			Sheet	18 of 62

VRAM Interface



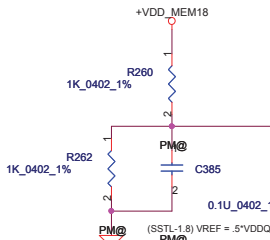
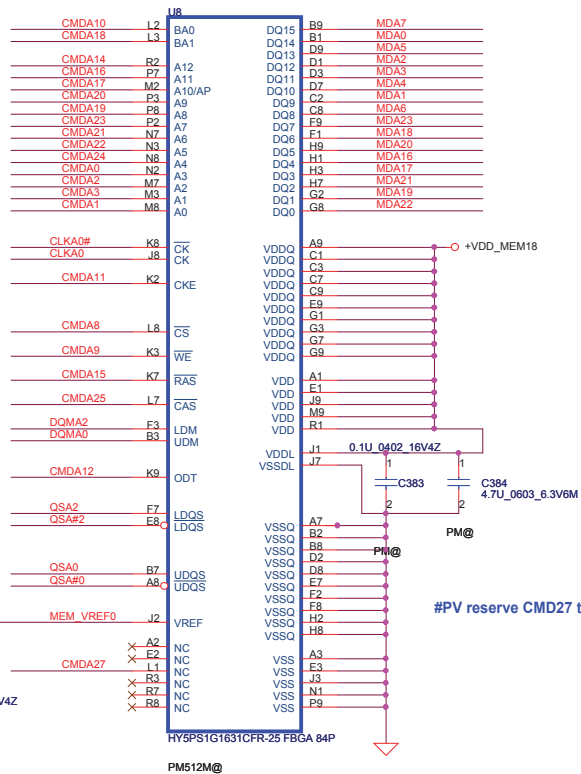
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Date	November 20, 2008	Sheet	19	of 82	

VRAM DDR2 chips (256MB & 512MB)

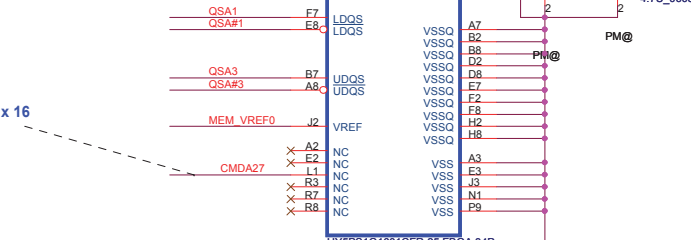
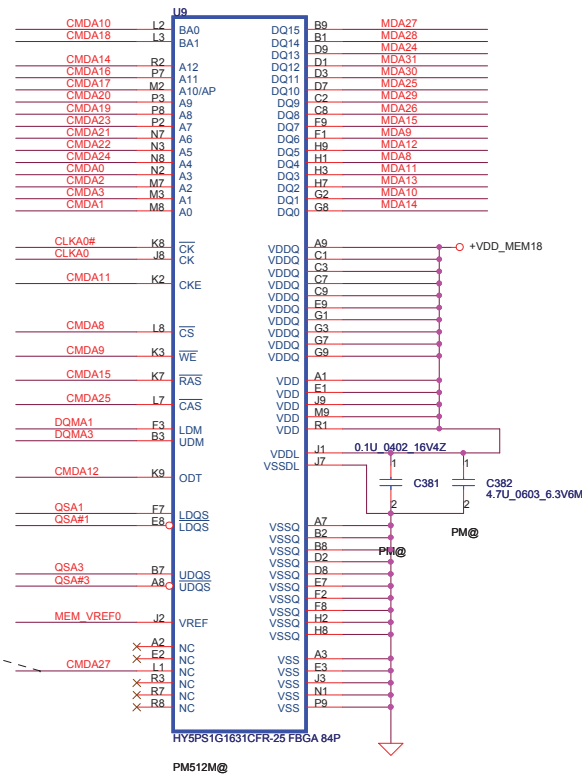
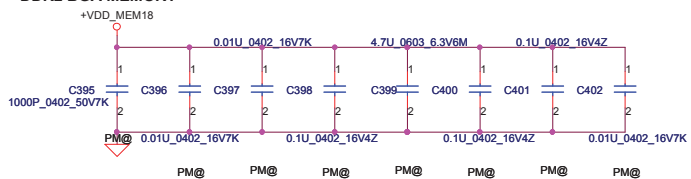
32Mx16 DDR2 400MHz *4==>256MB

64Mx16 DDR2 400MHz*4==>512MB

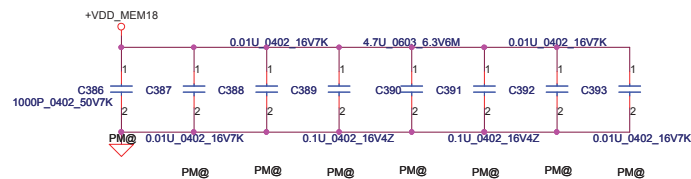
<19,21> QSA[7..0] QSA[7..0]
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<19,21> DQMA[7..0] DQMA[7..0]
<19,21> MDA[63..0] MDA[63..0]
<19,21> CMDA[30..0] CMDA[30..0]



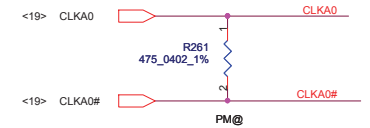
DDR2 BGA MEMORY



DDR BGA MEMORY



DATA Bus	
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CMD1	A0
CMD2	A2
CMD3	A1
CMD4	A3
CMD5	A4
CMD6	A5
CMD7	
CMD8	CS#
CMD9	WE#
CMD10	BA0
CMD11	CKE
CMD12	ODT
CMD13	
CMD14	A12
CMD15	RAS#
CMD16	A11
CMD17	A10
CMD18	BA1
CMD19	A8
CMD20	A9
CMD21	A6
CMD22	A5
CMD23	A7
CMD24	A4
CMD25	CAS#
CMD26	A13
CMD27	BA2
CMD28	
CMD29	
CMD30	

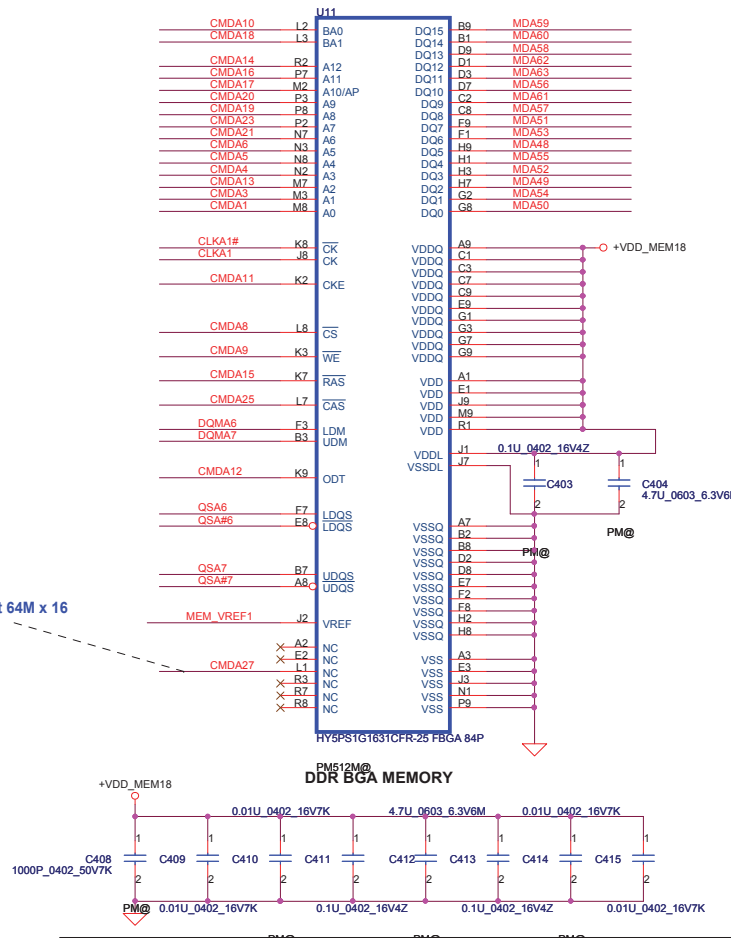
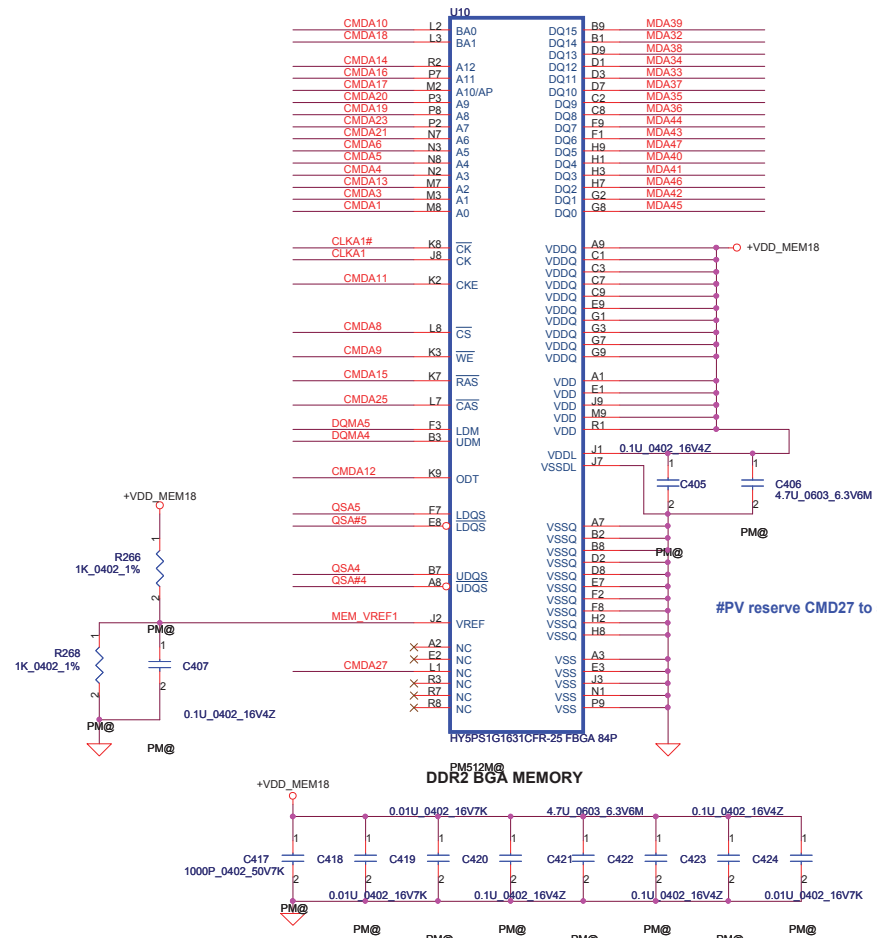
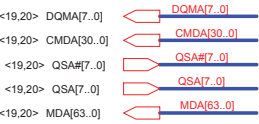


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					KAL90
				Date:	Thursday, November 20, 2008
				Sheet	7 of 16

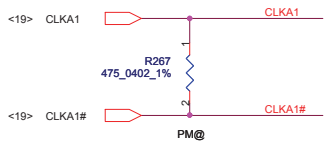
VRAM DDR2 chips (256MB & 512MB)

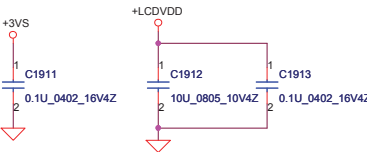
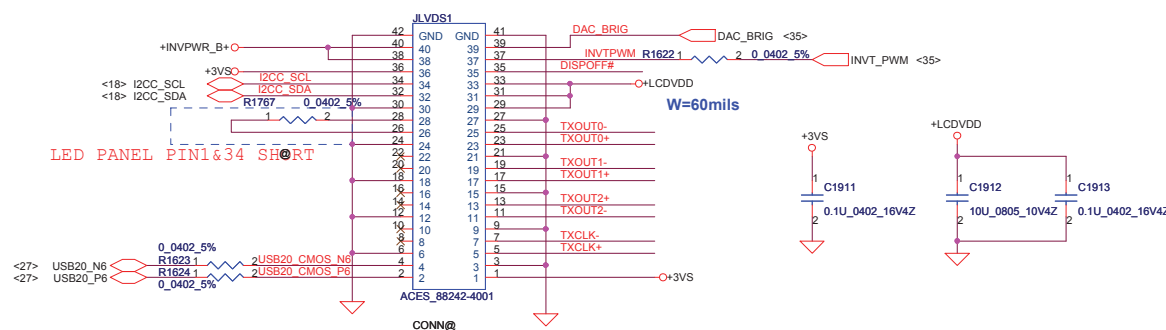
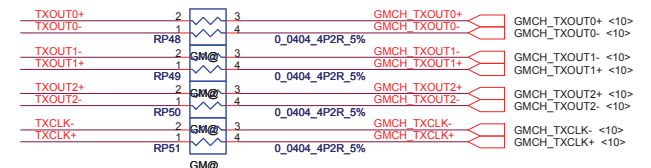
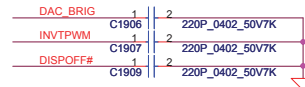
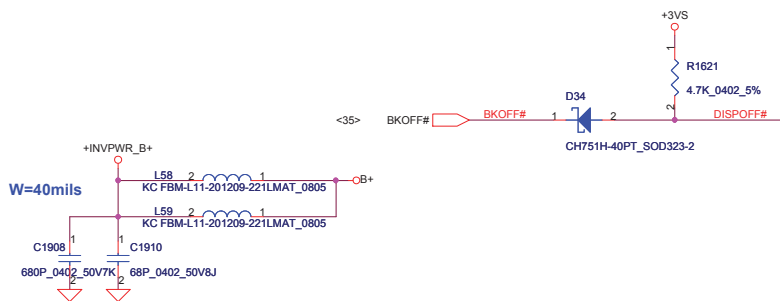
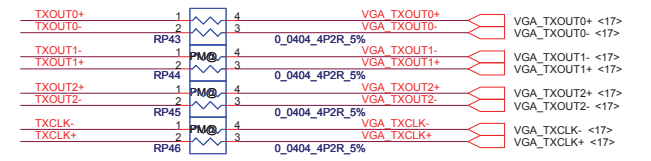
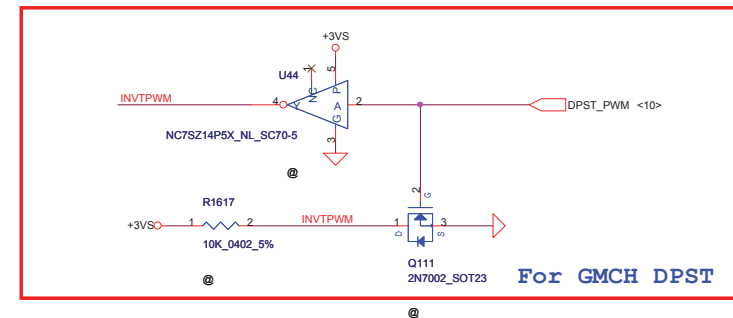
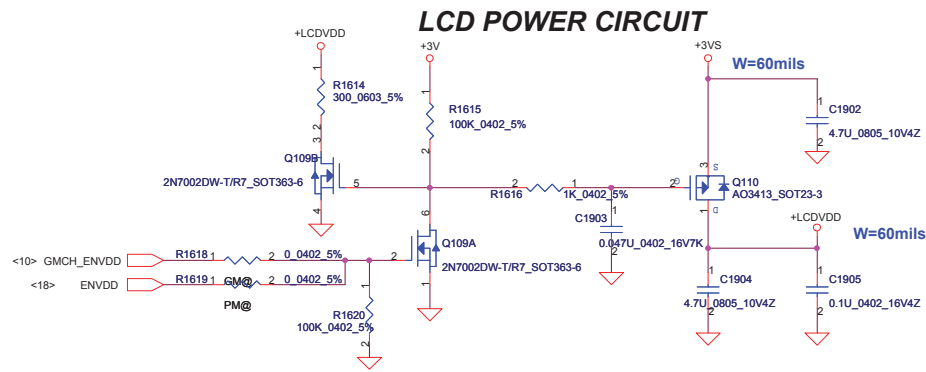
32Mx16 DDR2 400MHz *4==>256MB

64Mx16 DDR2 400MHz*4==>512MB



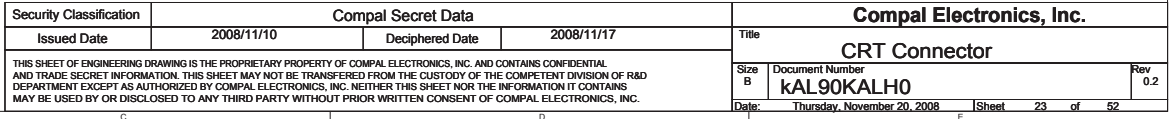
DATA Bus		
Address	0..31	32..63
CMD0	A3	
CMD1	A0	A0
CMD2	A2	
CMD3	A1	A1
CMD4		A3
CMD5		A4
CMD6		A5
CMD7		
CMD8	CS#	CS#
CMD9	WE#	WE#
CMD10	BA0	BA0
CMD11	CKE	CKE
CMD12	ODT	ODT
CMD13		
CMD14	A12	A12
CMD15	RAS#	RAS#
CMD16	A11	A11
CMD17	A10	A10
CMD18	BA1	BA1
CMD19	A8	A8
CMD20	A9	A9
CMD21	A6	A6
CMD22	A5	
CMD23	A7	A7
CMD24	A4	
CMD25	CAS#	CAS#
CMD26	A13	A13
CMD27	BA2	BA2
CMD28		
CMD29		
CMD30		

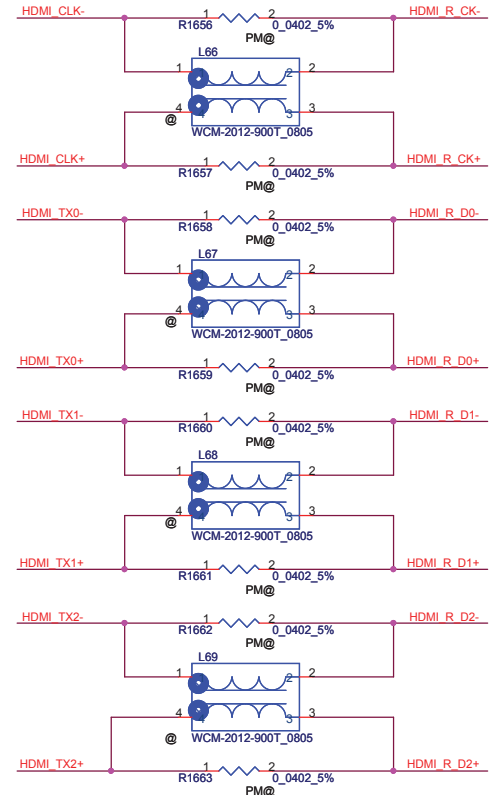
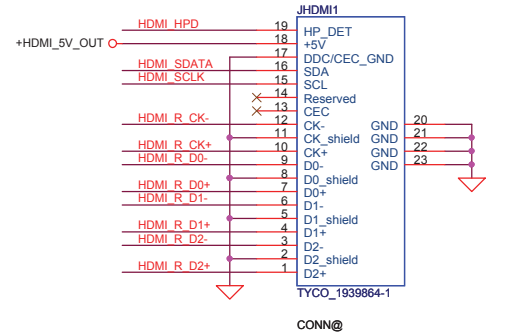
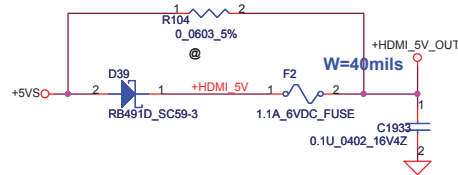
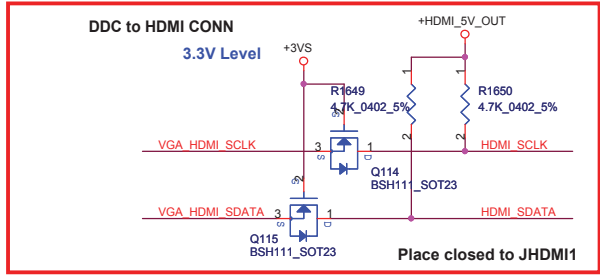
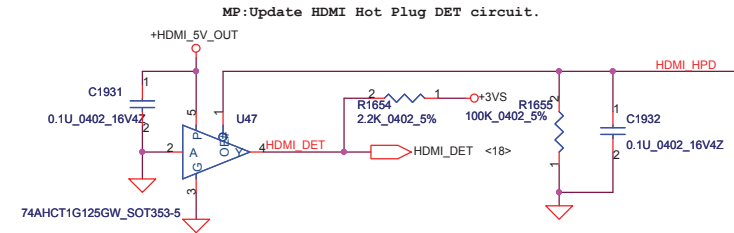
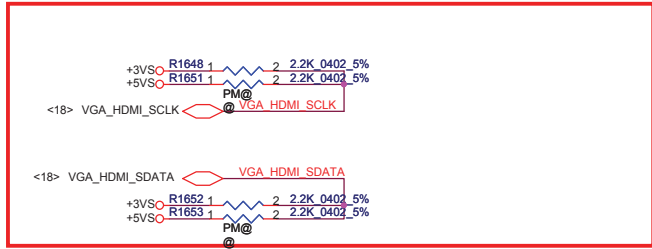




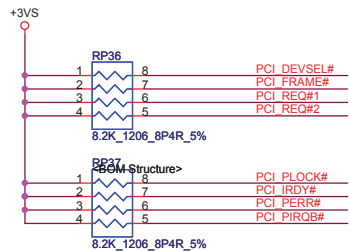
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Issued Date	2008/11/10	Deciphered Date	2008/11/17	Title	
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Size		Document Number		Rev	
Custom		KAL90KALH0		0.2	
Date:		Thursday, November 20, 2008		Sheet 22 of 52	

<http://hobi-elektronika.net>

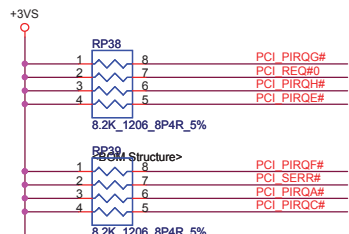




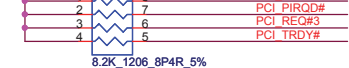
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Size		Document Number		Rev	
Custom		KAL90KALH0		0.2	
Date:		Thursday, November 20, 2008		Sheet 24 of 52	



<BOM Structure>



<BOM Structure>

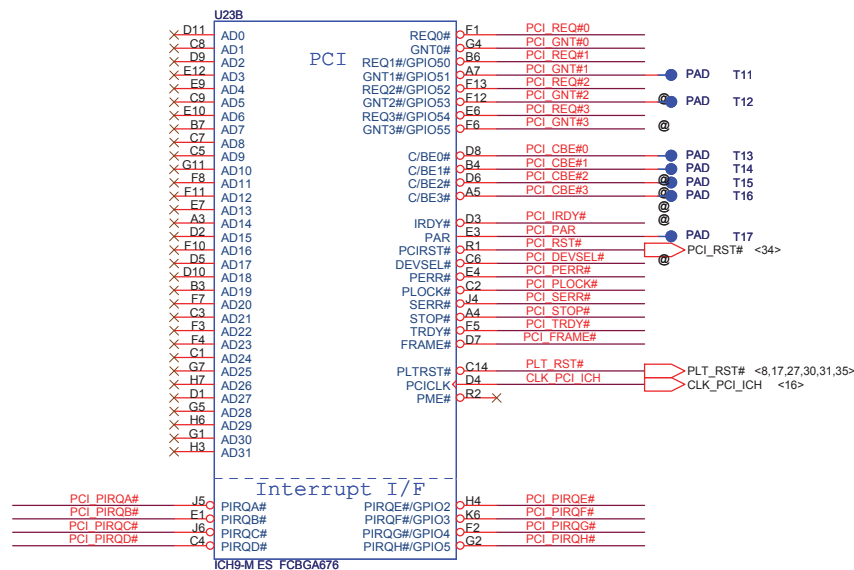
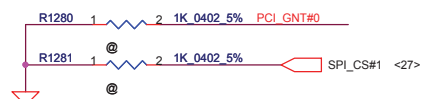


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A16 Swap Override Strap	
PCI_GNT#3	Low= A16 swap override Enable High= Default*

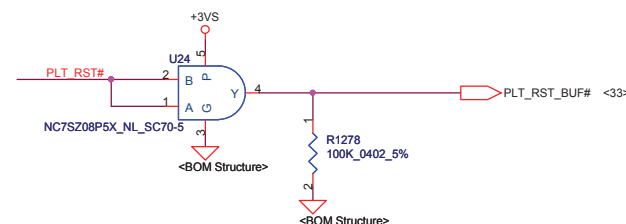
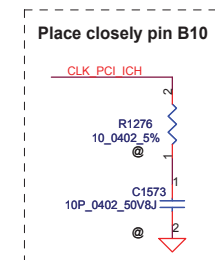


Boot BIOS Strap		
PCI_GNT#0	SPI_CS#1	Boot BIOS Location
0	1	SPI
1	0	PCI
1	1	LPC*

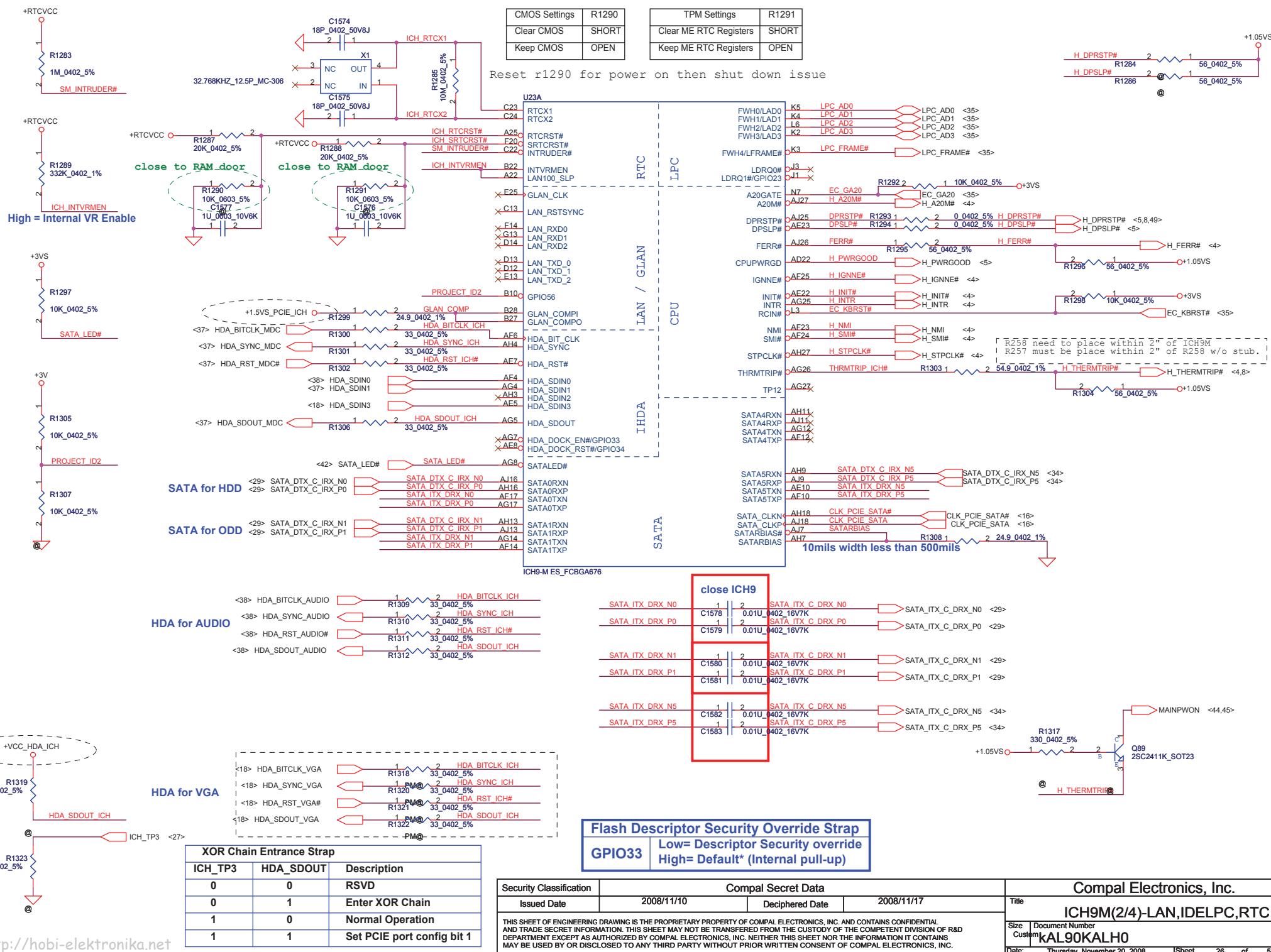


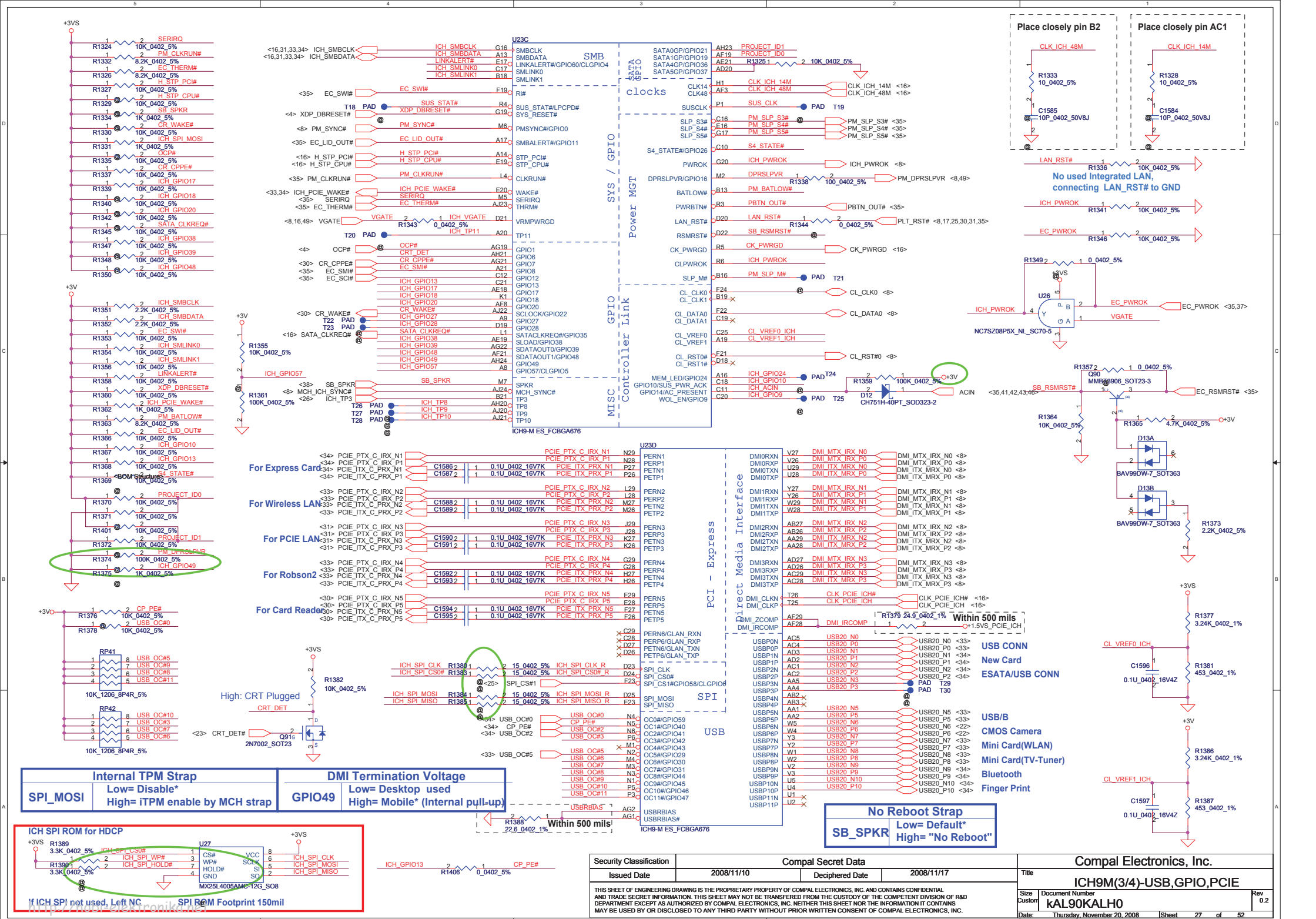
<BOM Structure>

DMI for ESI-compatible operation	
PCI_GNT#1	Low= DMI for ESI-compatible operation High= Default* (Internal pull-up)

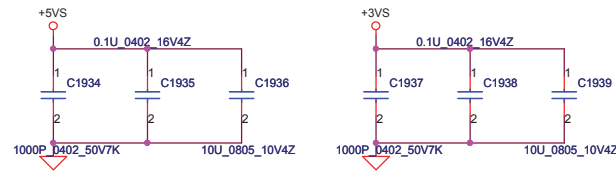


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Size		Document Number		Rev	
Date		Thursday, November 20, 2008		Sheet 25 of 52	
R1280		R1281		KAL90KALH0	
0.2		1		52	

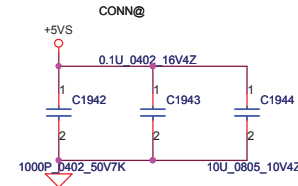
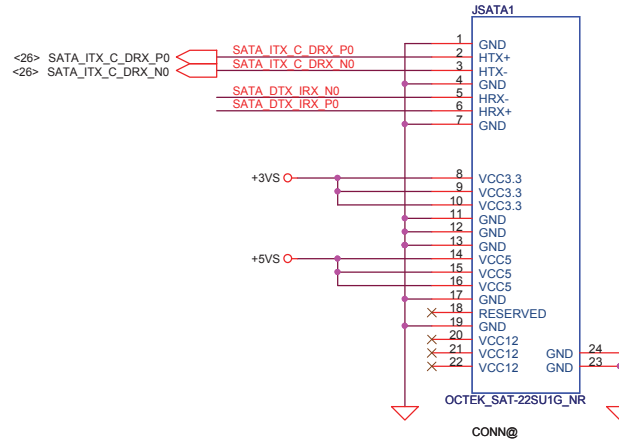
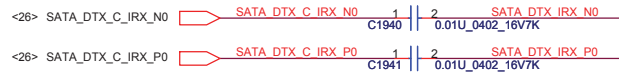




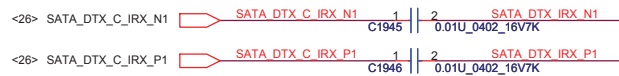
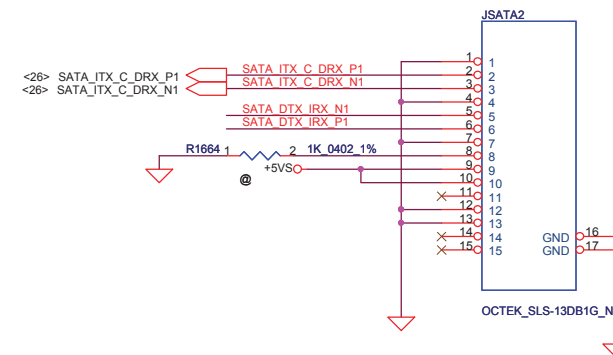




SATA HDD Conn.

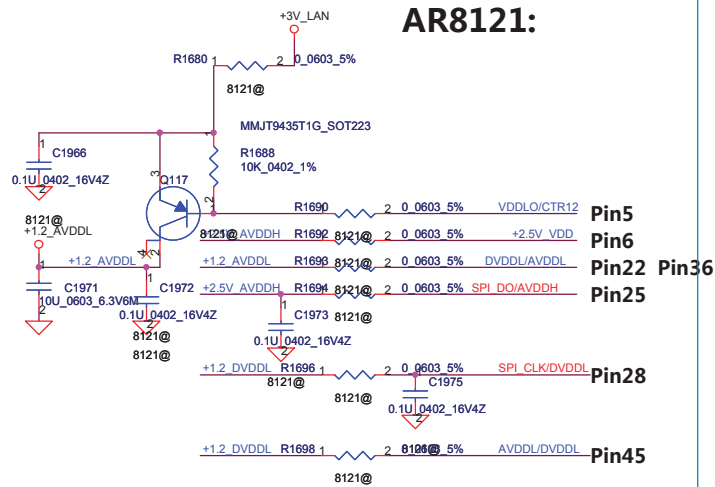


SATA ODD Conn.

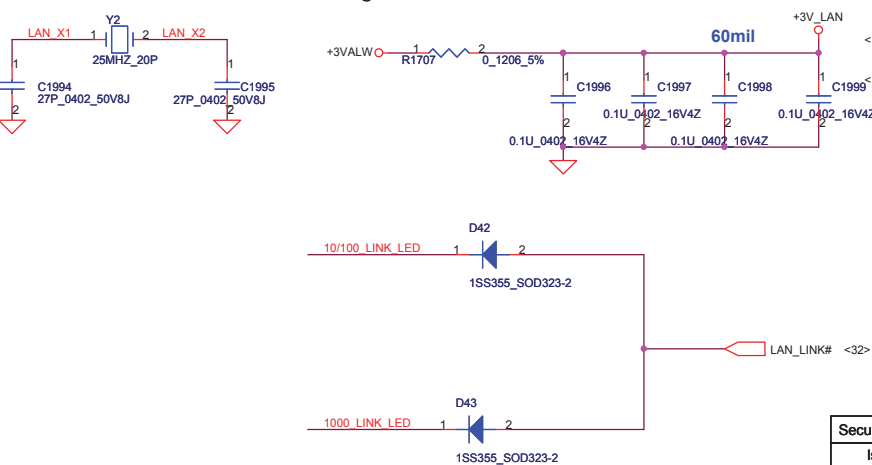
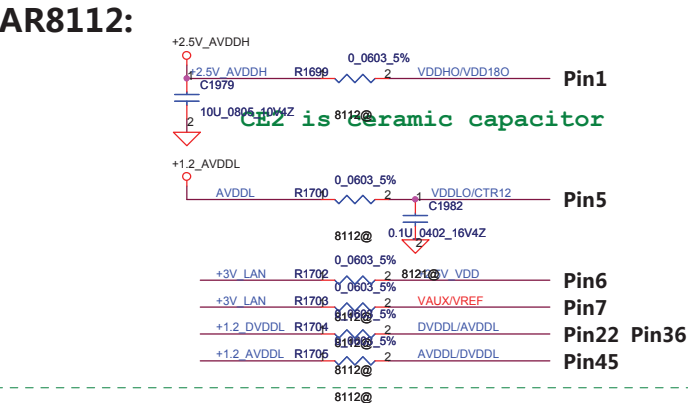


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Size		Document Number		Rev	
Custom		KAL90KALH0		0.2	
Date:		Thursday, November 20, 2008		Sheet 29 of 52	

AR8121:



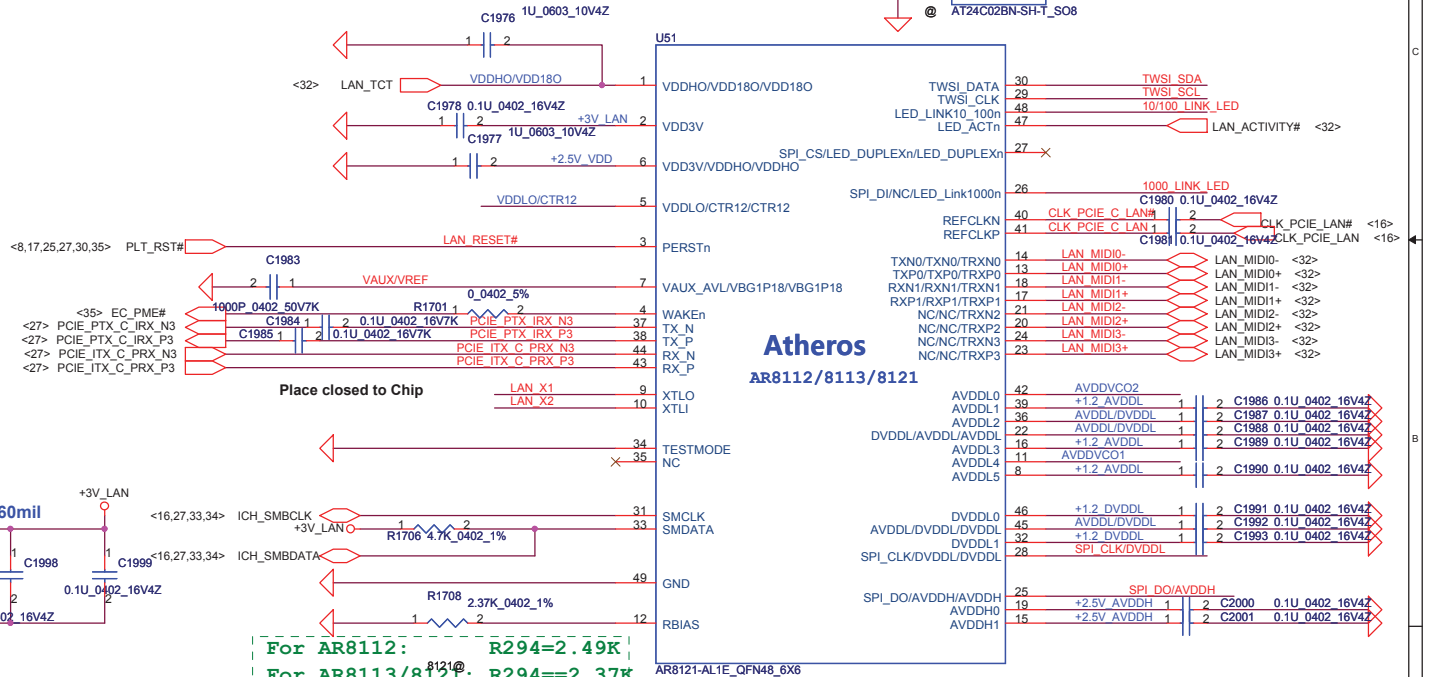
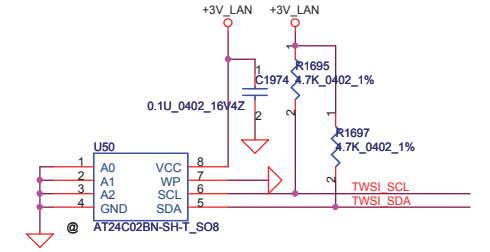
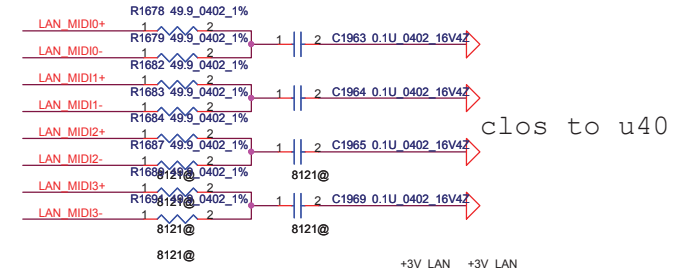
AR8112:



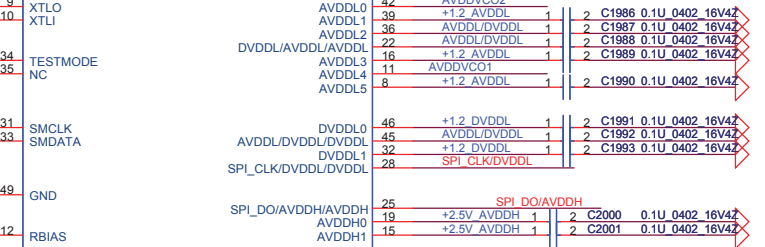
AR8113/AR8121: If overclocking, R592, L49 stuffed a removed. If not overclocking, R591, L49 suffed and R592 emoved.

AR8112: Stuff R591, R48 and L49 for all mode.

LAN AR8121/8112



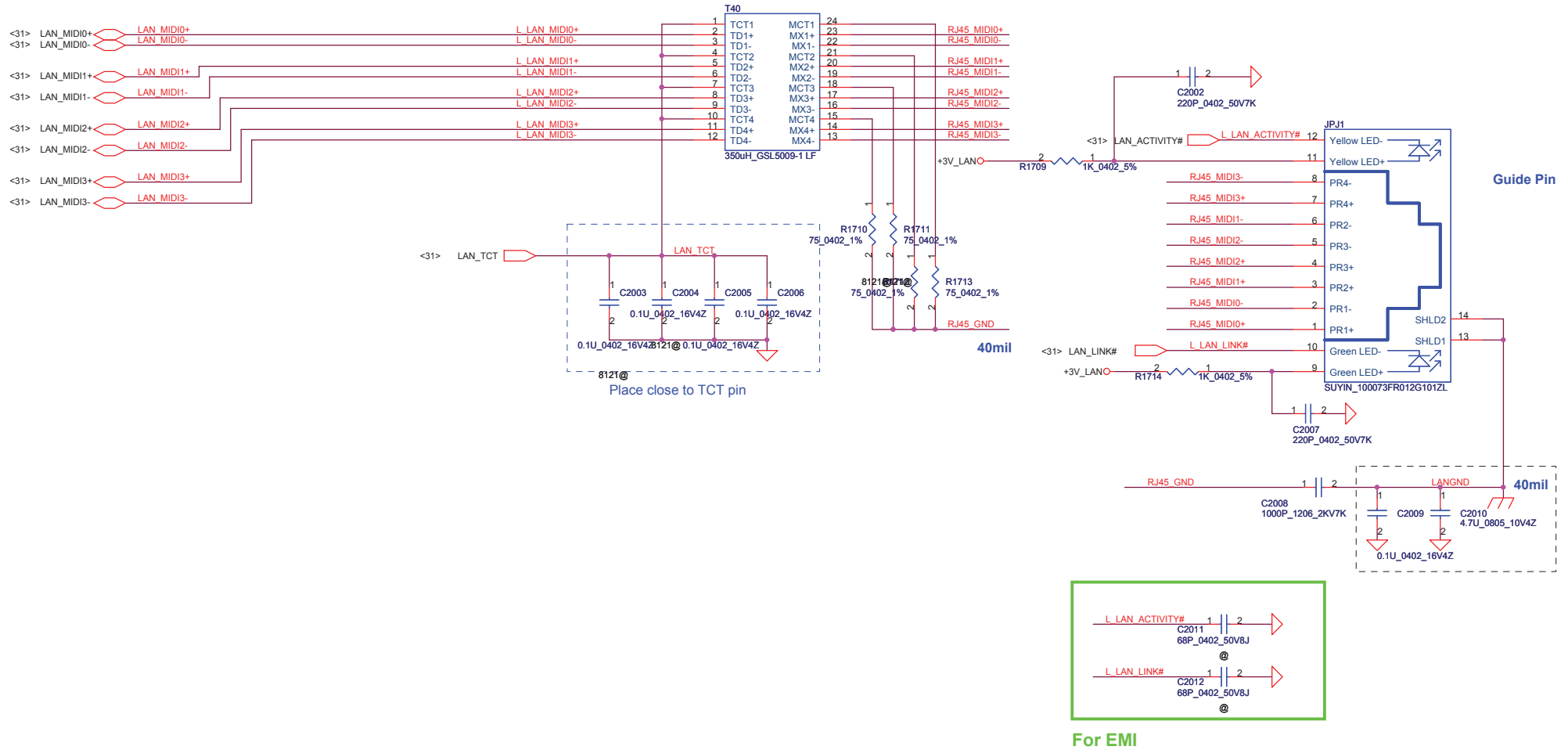
Atheros AR8112/8113/8121



For AR8112: R294=2.49K
For AR8113/8121: R294=2.37K

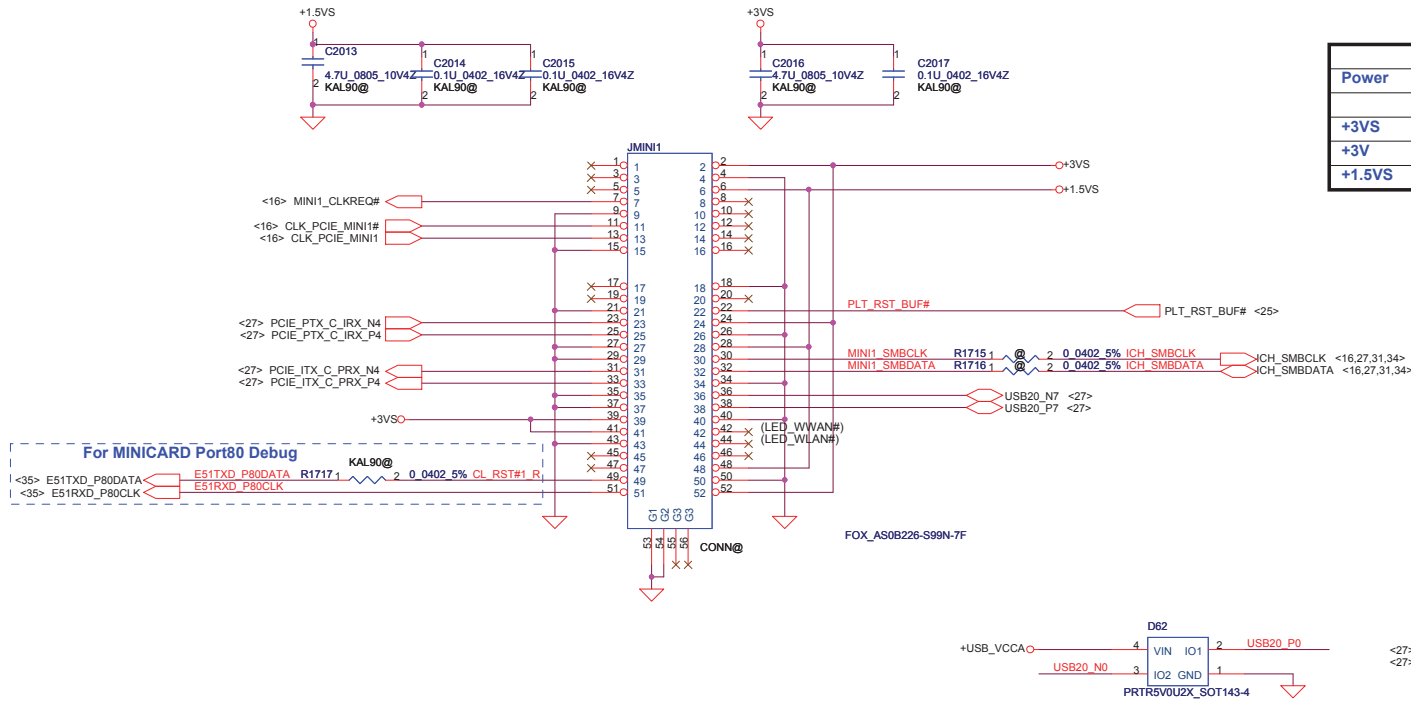
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Size	Custom	Document Number	KAL90KALH0	Rev	0.2
Date	Thursday, November 20, 2008	Sheet	31	of	52

LAN AR8121/8112

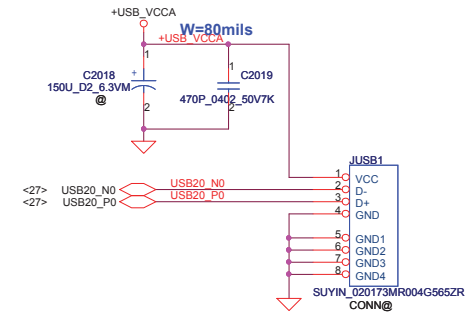


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				Date	Thursday, November 20, 2008
				Sheet	32 of 52
				Rev	0.2

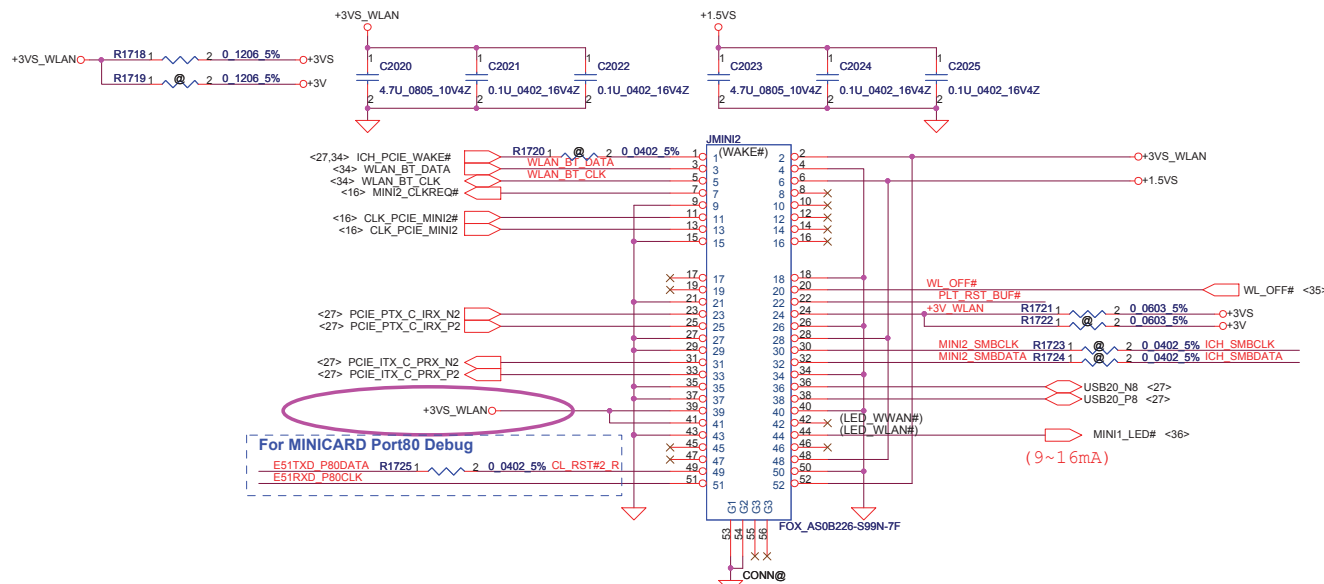
For Robson2



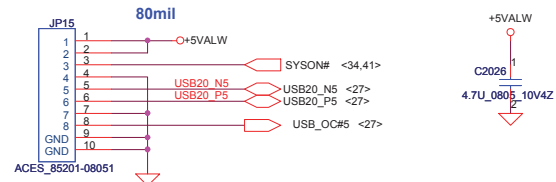
USB CONN.



For Wireless LAN

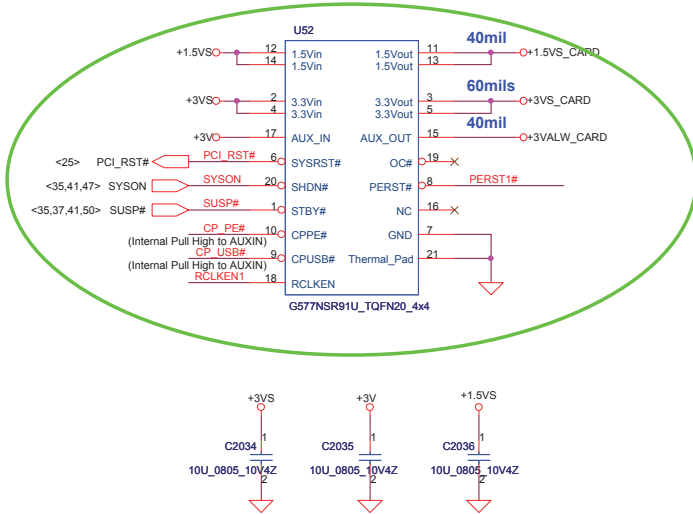


To USB/B Connector

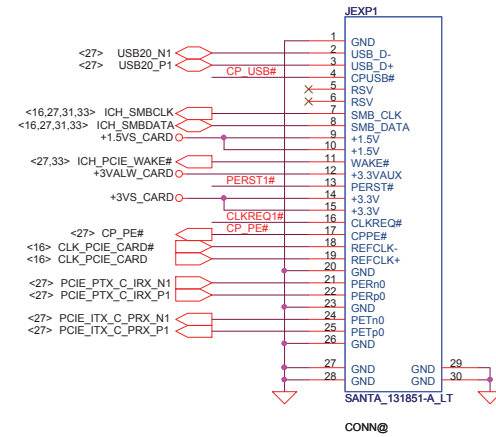


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Size B		Document Number		Rev 0.2	
Date:		Thursday, November 20, 2008		Sheet 33 of 52	

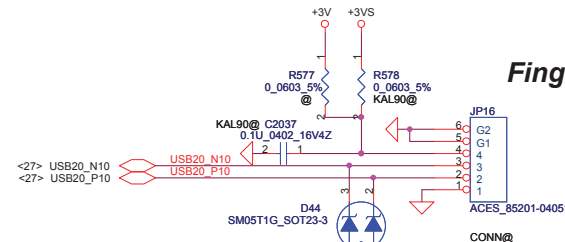
New Card Power Switch



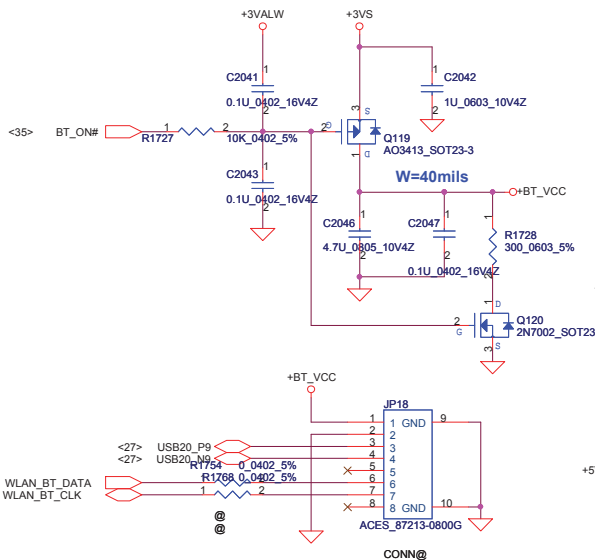
New Card Socket (Left/TOP)



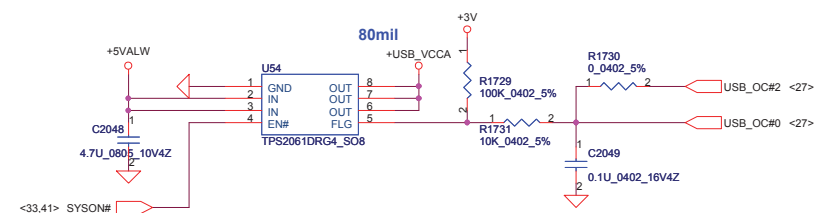
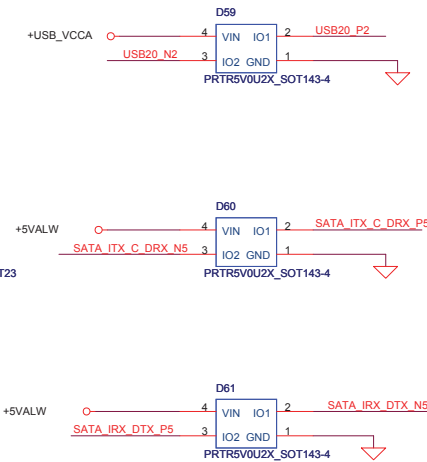
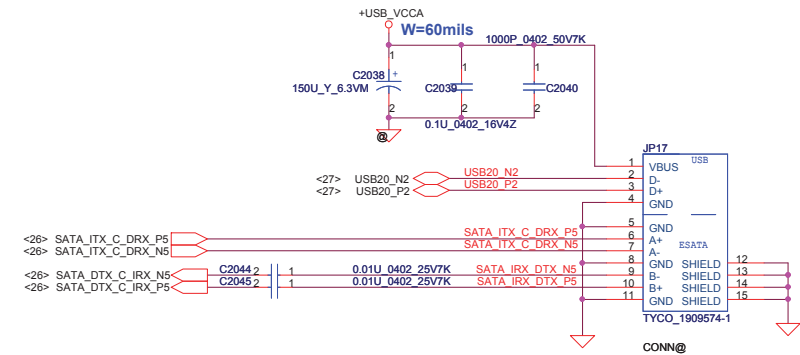
Finger Print Conn.



Bluetooth Conn.



ESATA CONN

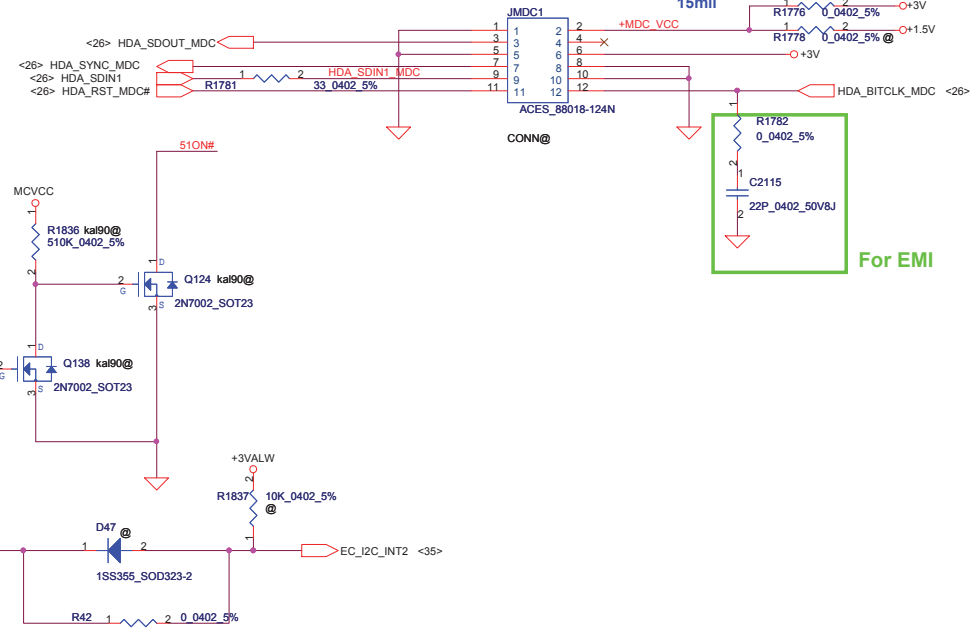
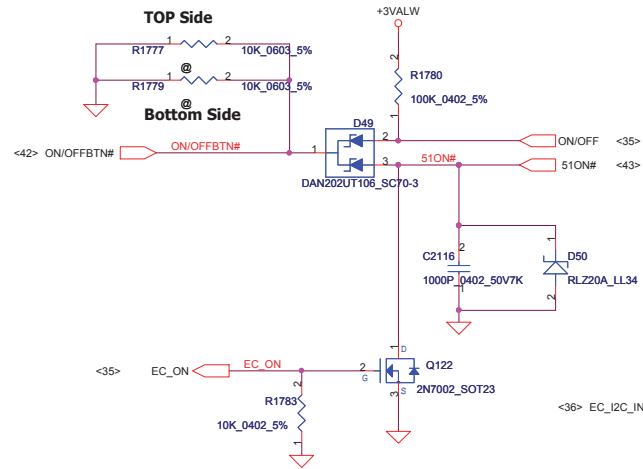


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Size B	Document Number	kAL90KALH0		Rev	0.2
Date:	Thursday, November 20, 2008	Sheet	34	of	52

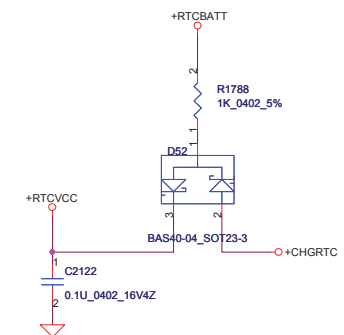


ON/OFF switch

The diagram shows a circuit component labeled C2114, which is a 10V Zener diode (1U_0603_10V4Z). It is connected to a +3V source at pin 1 and to ground at pin 2.



The schematic diagram illustrates the power management circuitry for the South Bridge and North Bridge. The top section, labeled "For South Bridge", shows a power regulation circuit for the South Bridge. It includes a VR_ON input, a CH751H-40PT_SOD323-2 MOSFET, and two SN74LVC14APWLE_TSSOP14 inverters (U59A, U59B) to generate SYS_PWROK from EC_PWROK. The bottom section, labeled "For +VCCP/+1.05VS", shows a power regulation circuit for the North Bridge. It includes a SUSP# input, a 2N7002_SOT23 MOSFET, and two SN74LVC14APWLE_TSSOP14 inverters (U59C, U59D) to generate VS_ON from SUSP#.



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Issued Date	2008/11/10	Deciphered Date	2008/11/17	Title Power OK, Reset,RTC, CIR, MDC			
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					KAL90KALH0	0.2	
				Date	Thursday, November 20, 2008	Sheet	37 of 52

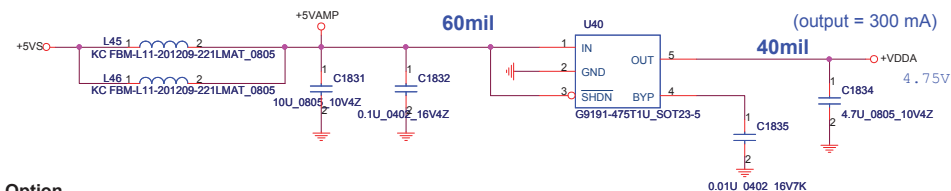
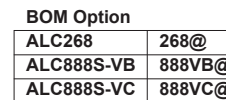
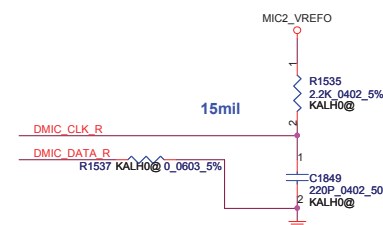
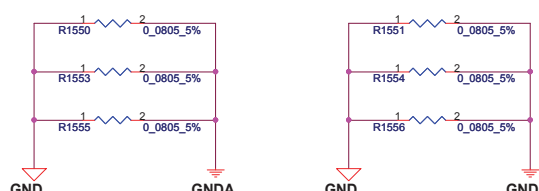
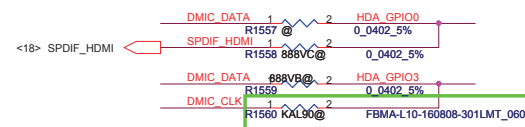


Diagram of the DMIC connector pinout. The connector is labeled JP24 and has four pins. Pin 1 is labeled DMIC DATA R, Pin 2 is labeled DMIC CLK R, Pin 3 is labeled G1, and Pin 4 is labeled G2. The connector is labeled ACES_88266-02001 and CONN@.

[illegible]

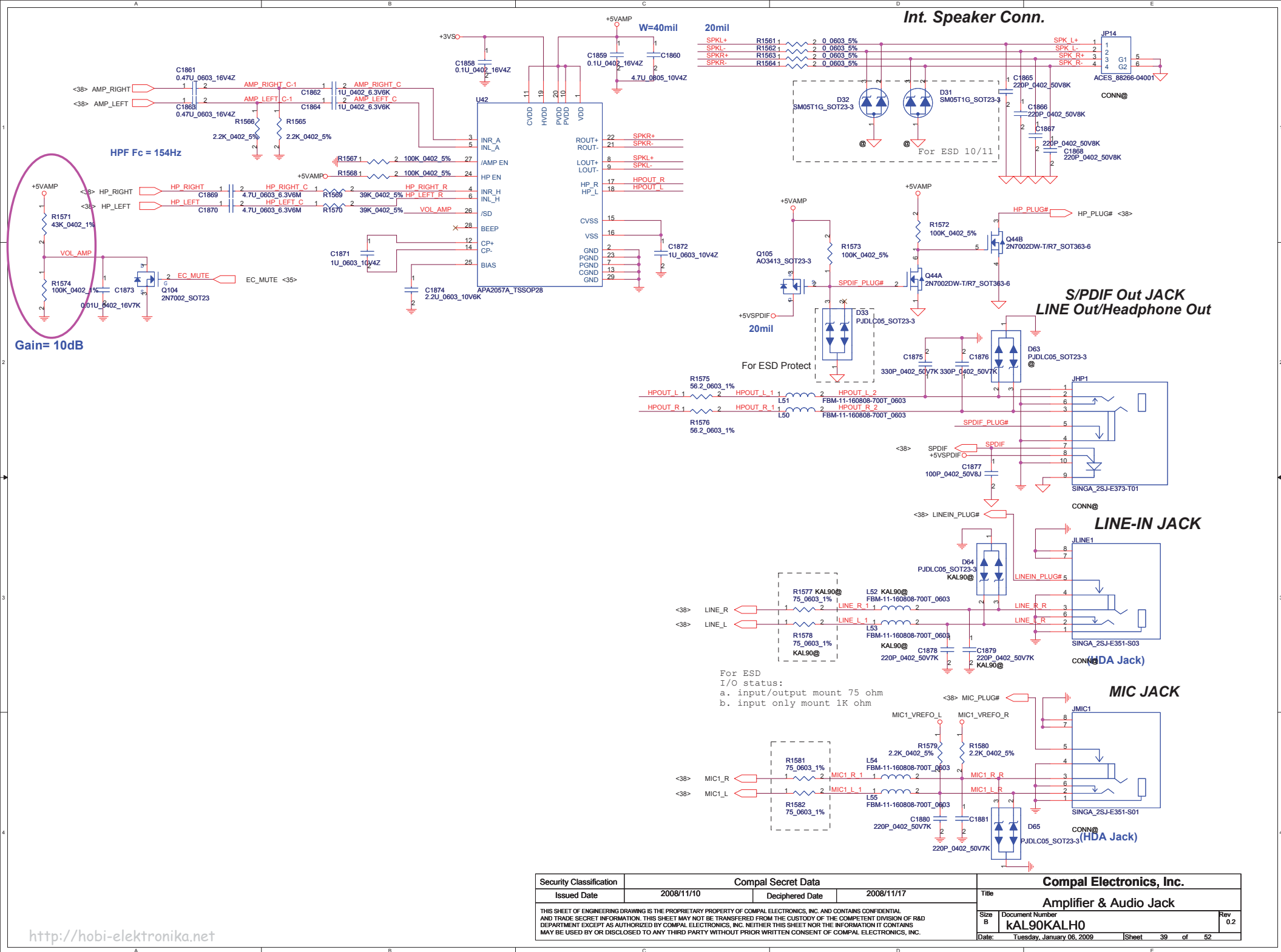
Sense Pin	Impedance	Codec Signals
SENSE A	39.2K	PORT-A (PIN 39, 41)
	20K	PORT-B (PIN 21, 22)
	10K	PORT-C (PIN 23, 24)
	5.1K	PORT-D (PIN 35, 36)
SENSE B	39.2K	PORT-E (PIN 14, 15)
	20K	PORT-F (PIN 16, 17)
	10K	PORT-G (PIN 43, 44)
	5.1K	PORT-H (PIN 45, 46)

AGNI

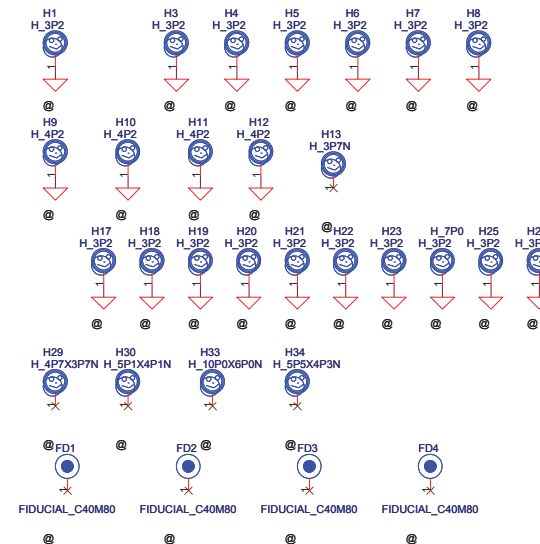
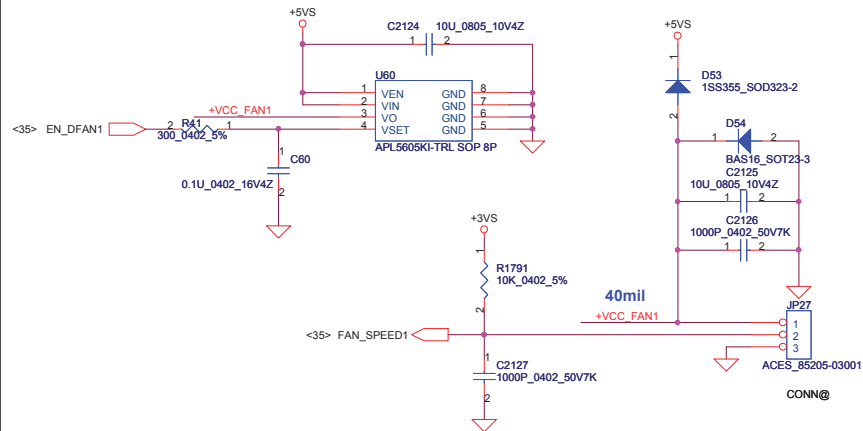


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Compal Electronics, Inc.			
Title		HD Audio Codec ALC888S-VC	
Size B	Document Number		Rev 0
	KAL90KALH0		
Date: Wednesday, December 10, 2008		Sheet 28 of 62	

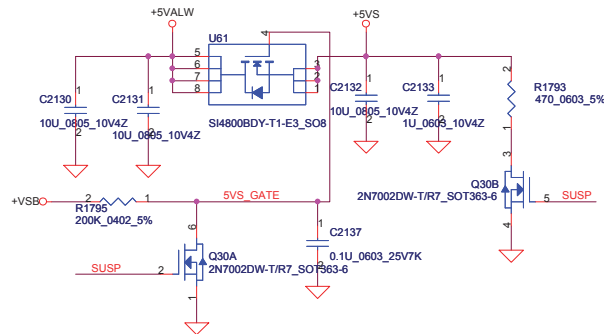


FAN1 Conn

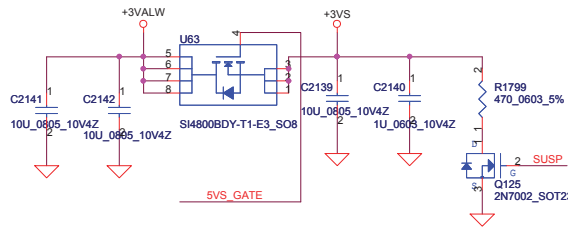


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Issued Date	2008/11/10	Deciphered Date	2008/11/17	Title	
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Size	B	Document Number	kAL90KALH0		Rev
Date:		Thursday, November 20, 2008	Sheet	40	of 52

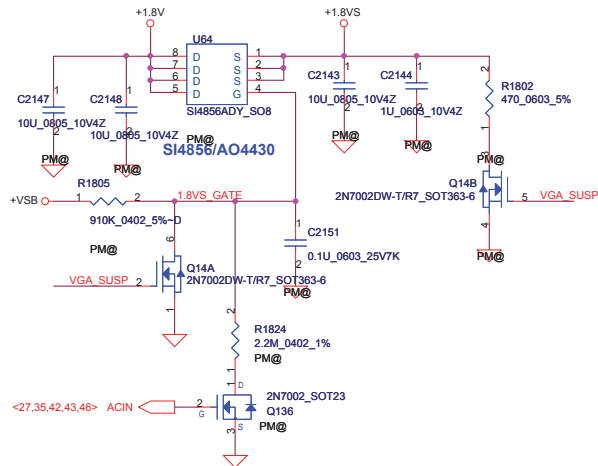
+5VALW TO +5VS



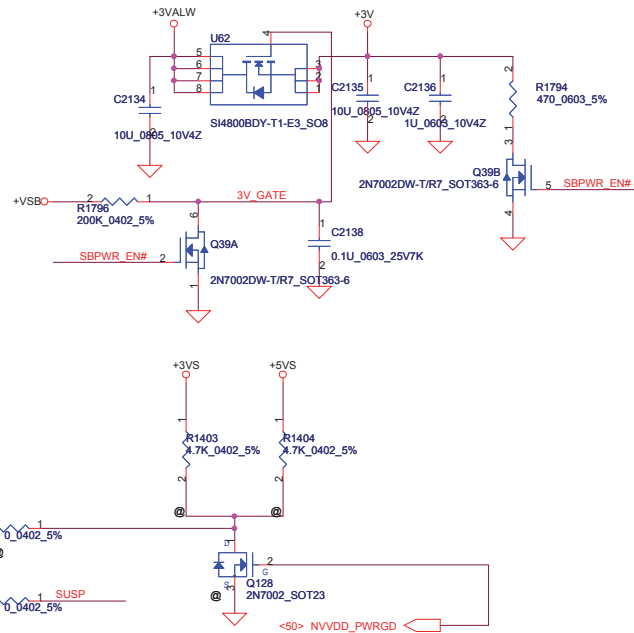
+3VALW TO +3VS



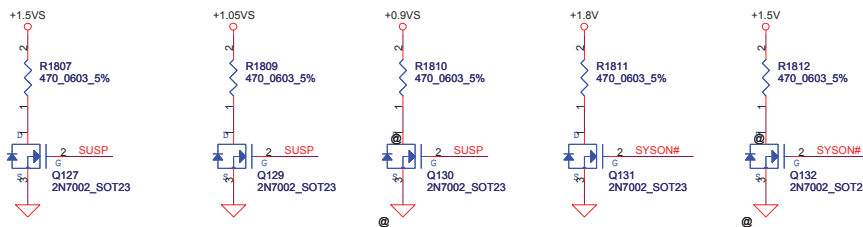
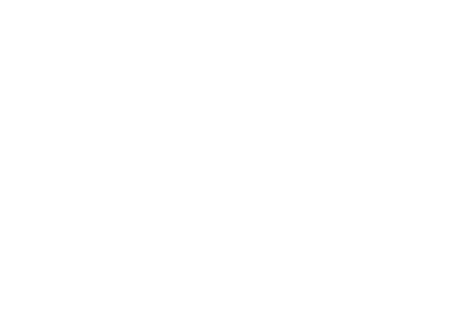
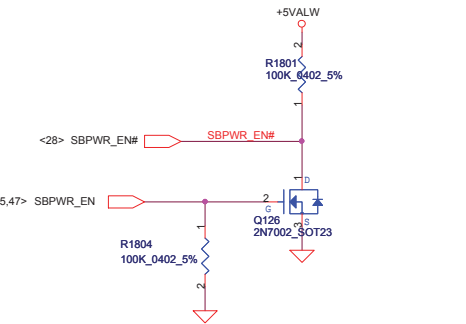
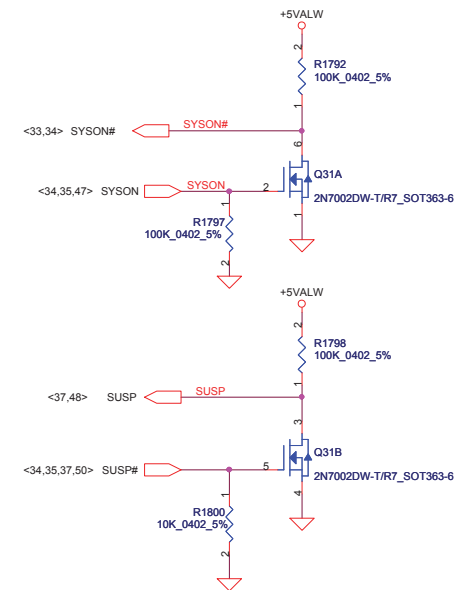
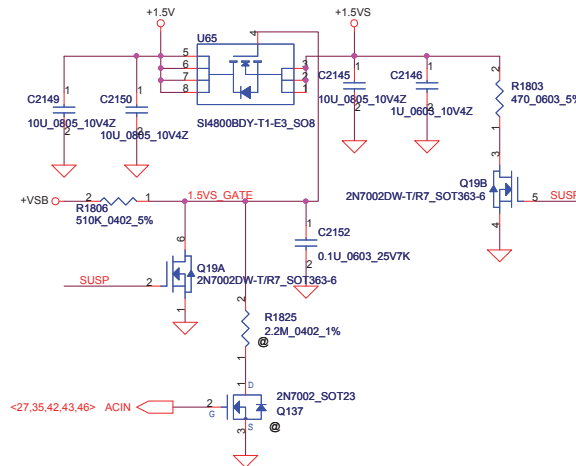
+1.8V to +1.8VS



+3VALW TO +3V_SB(ICH8M AUX Power)

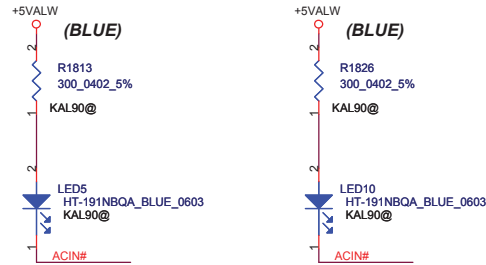


+1.5V to +1.5VS

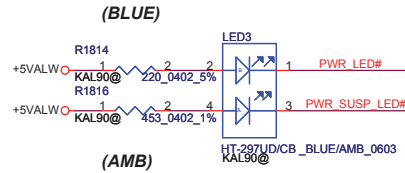


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				kAL90KALH0	
				Date:	Wednesday, December 24, 2008
				Sheet	41 of 52
				Rev	0.2

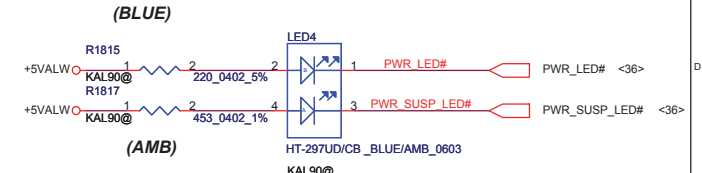
Enlightener LED



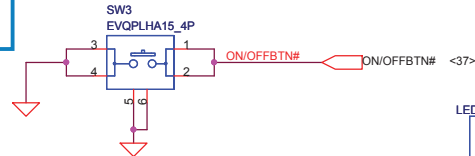
ON/OFF LED LEFT



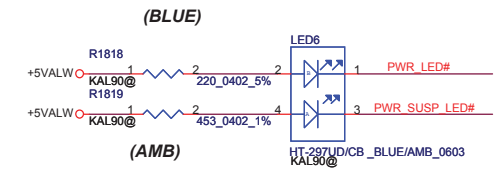
ON/OFF LED RIGHT



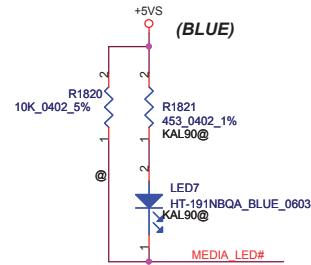
ON/OFF Button



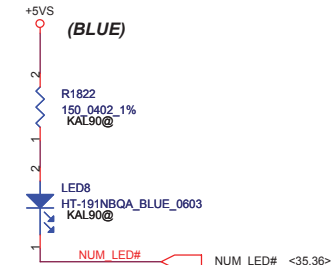
ON/OFF LED DOWN



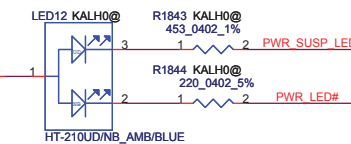
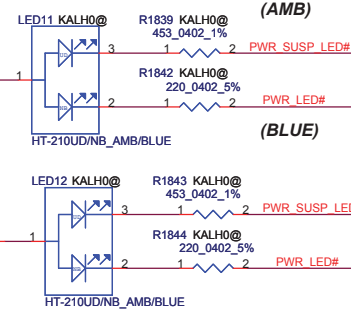
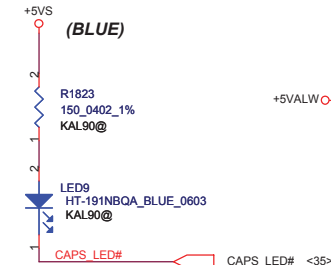
MEDIA_LED



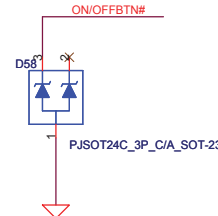
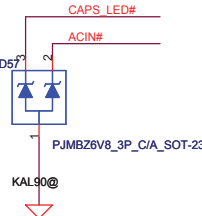
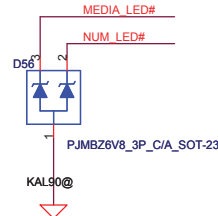
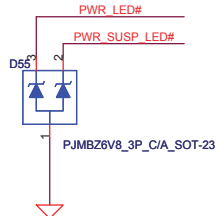
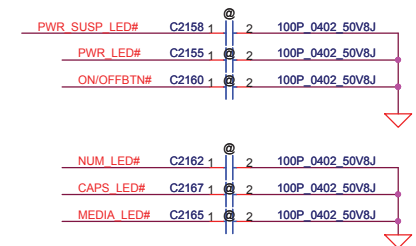
NUM_LED



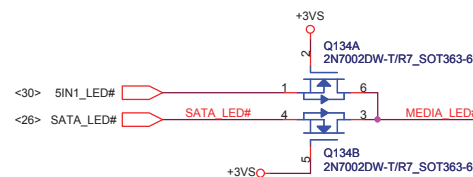
CAPS_LED



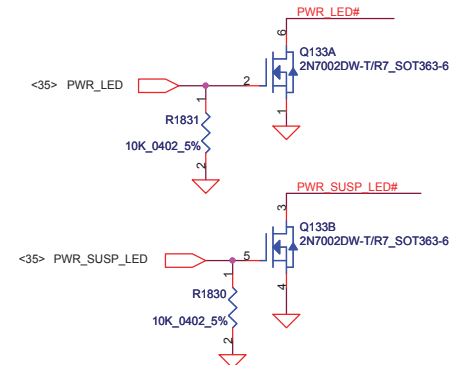
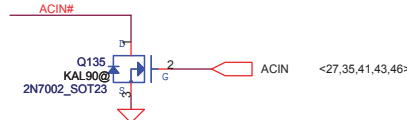
FOR EMI



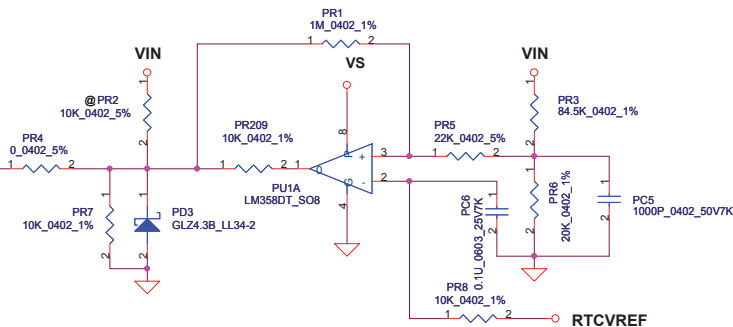
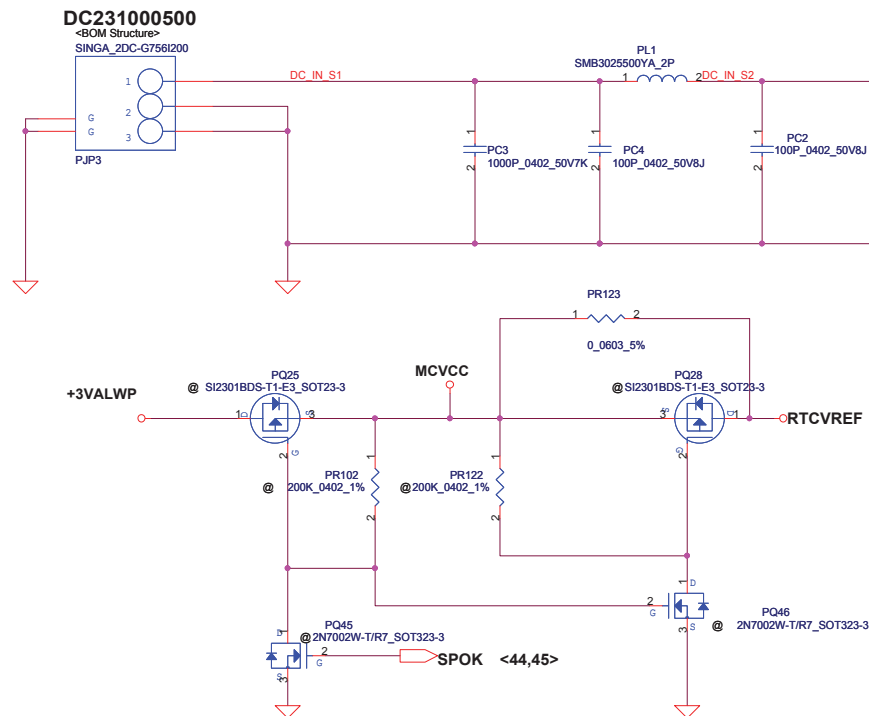
D1 D2 D3 USE PANJIT PJMBZ6V8
SCA00000I00
6.8V



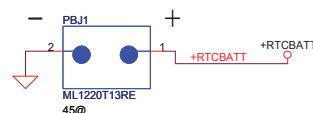
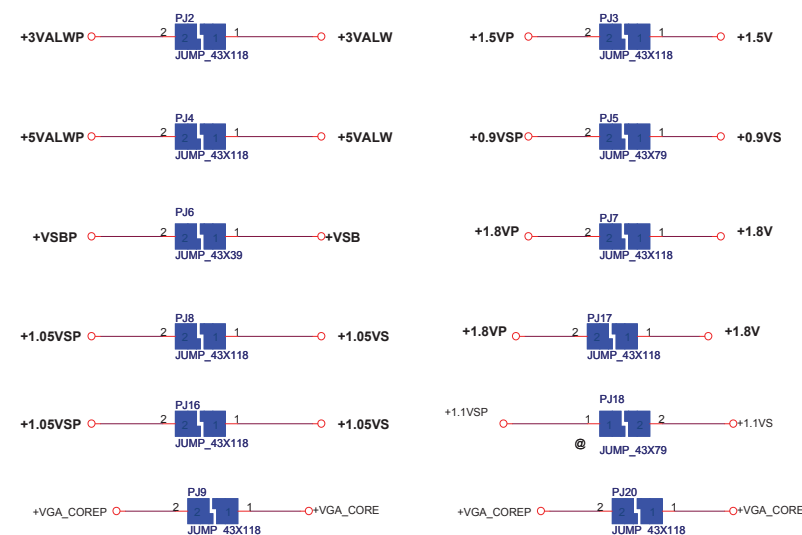
D4 USE
PJSOT24C 3P C/A SOT-23
SCA00000E00
24V



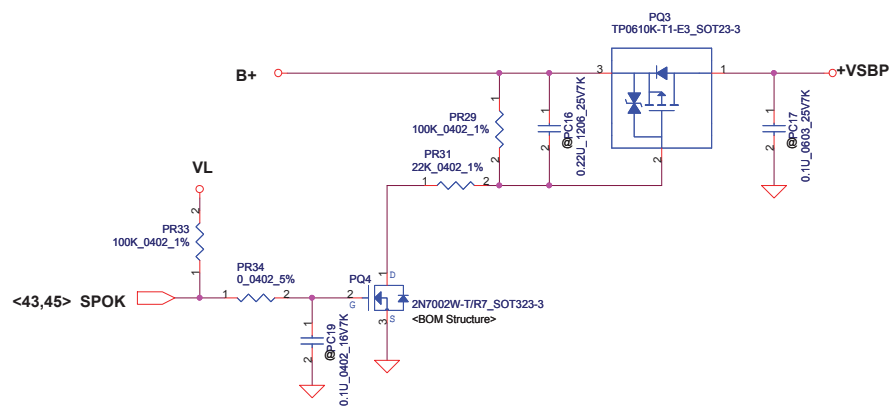
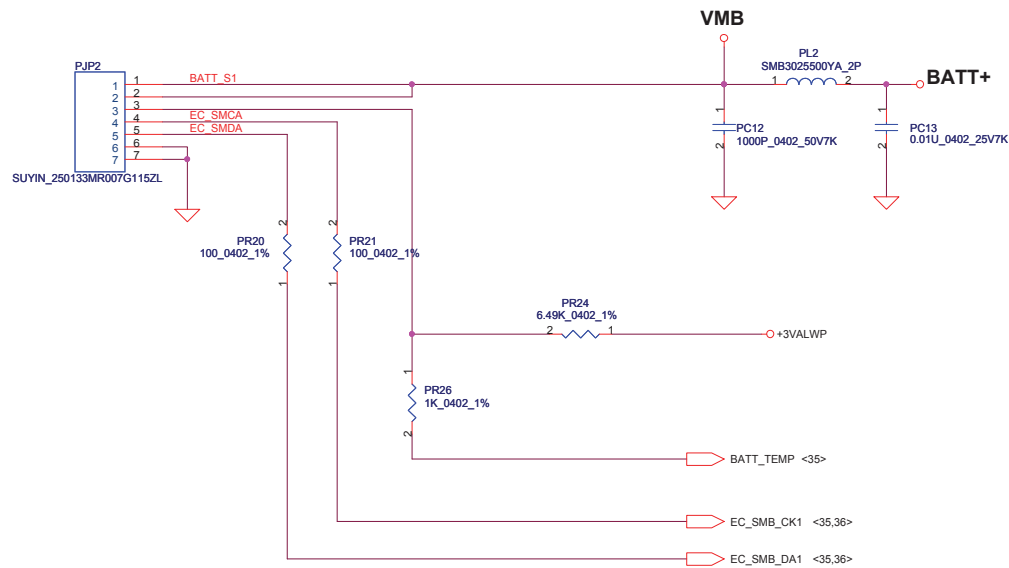
Security Classification		Compal Secret Data		Compal Electronics, Inc.	
Issued Date	2008/11/10	Deciphered Date	2008/11/17	Title	PWR/B
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				Custom	KAL90KALH0
				Date	Wednesday, December 24, 2008
				Sheet	42 of 52
				Rev	0.2



Vin Detector			
	Min.	Typ	Max.
H-->L	16.976V	17.525V	17.728V
L-->H	17.430V	17.901V	18.384V

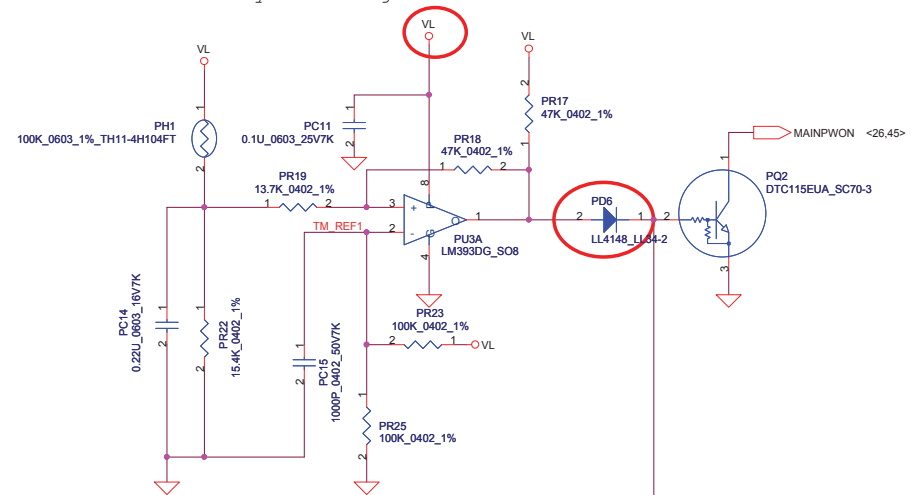


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Size	Document Number	Customer		Rev	
Date:	Tuesday, December 09, 2008	Sheet	43	of	52



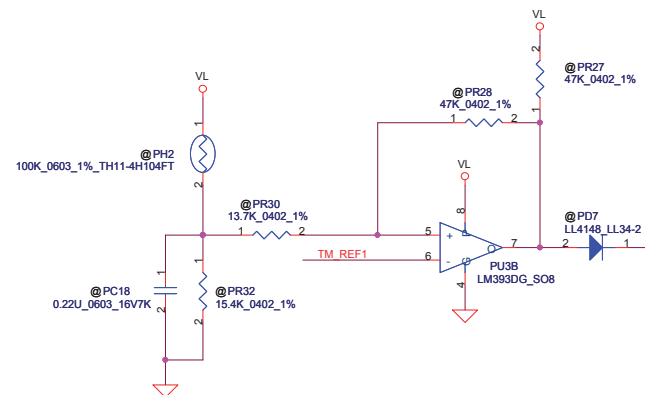
PH1 under CPU botten side :

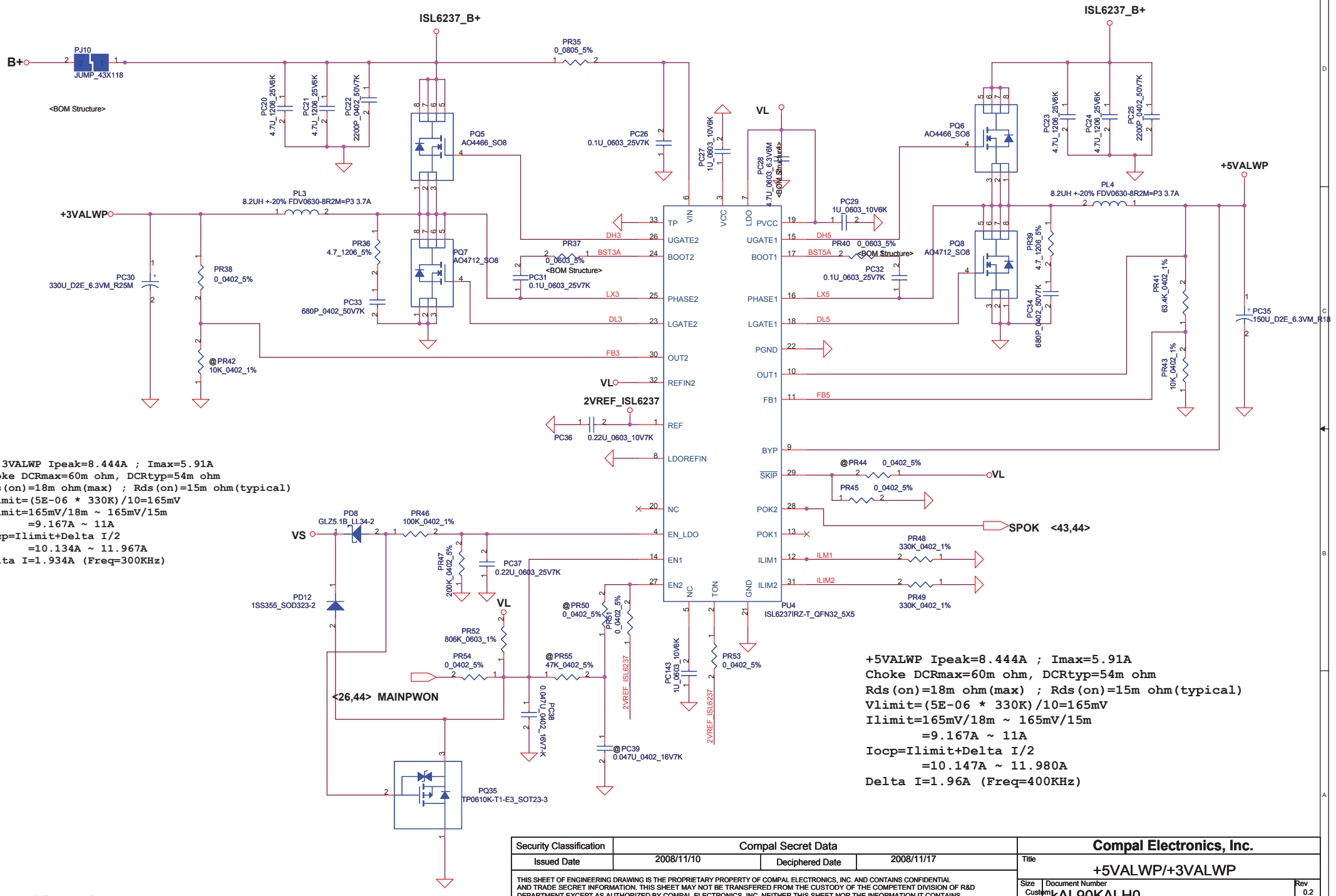
CPU thermal protection at 96 degree C
Recovery at 60 degree C



PH2 near main Battery CONN :

BAT. thermal protection at 79 degree C
Recovery at 47 degree C

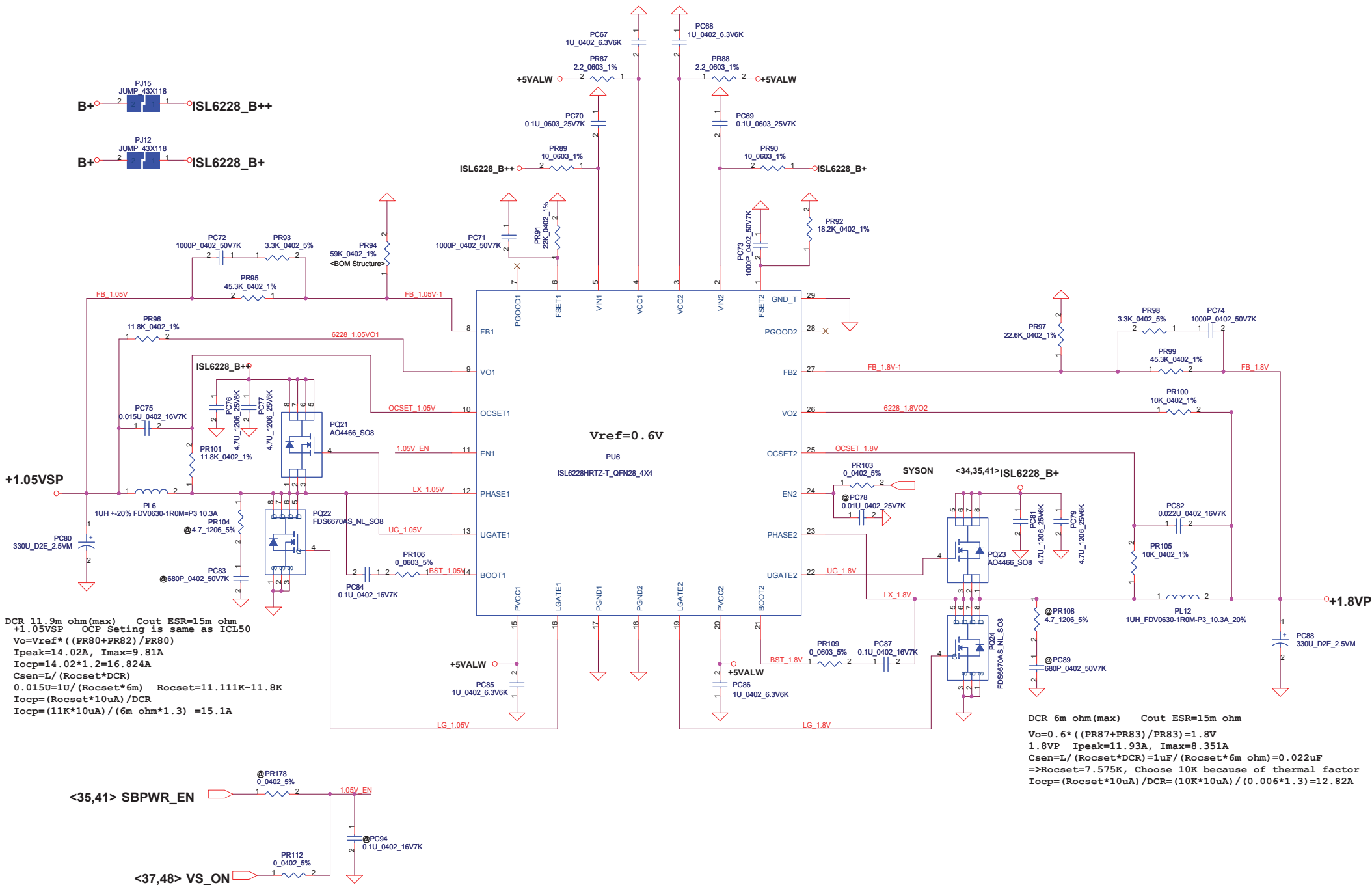




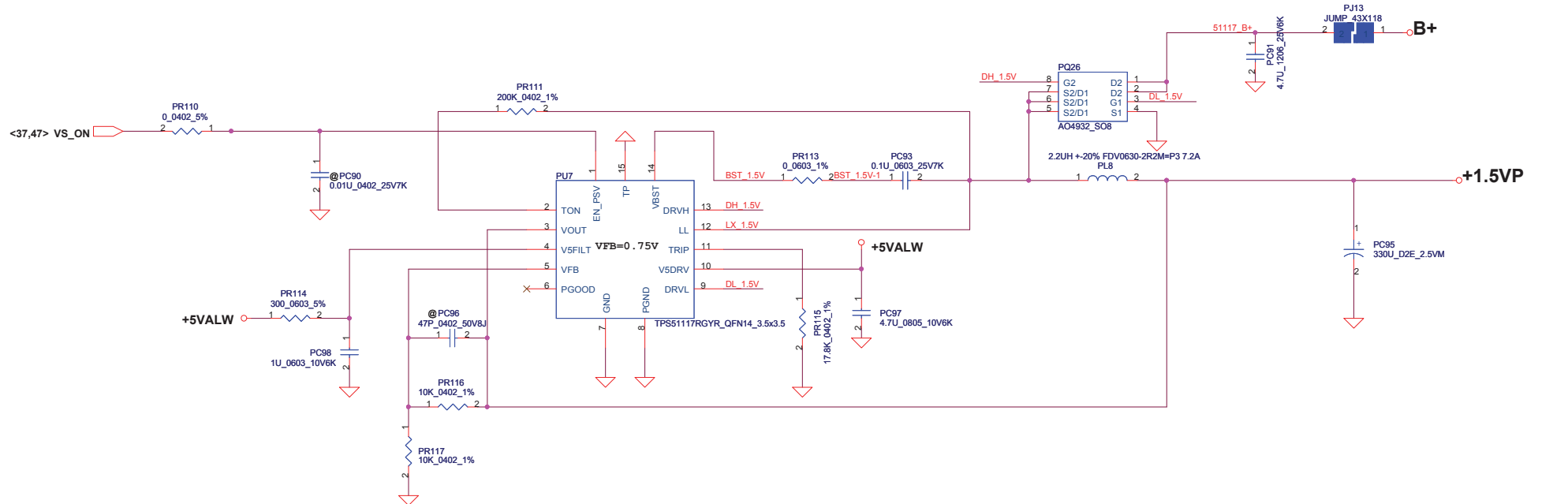
+3.3VALWP Ipeak=8.444A ; Imax=5.91A
Choke DCRmax=60m ohm, DCRtyp=54m ohm
Rds(on)=18m ohm(max) ; Rds(on)=15m ohm(typical)
Vlimit=(5E-06 * 330K)/10=165mV
Ilimit=165mV/18m ~ 165mV/15m
=9.167A ~ 11A
Iocp=Ilimit+Delta I/2
=10.134A ~ 11.967A
Delta I=1.934A (Freq=300KHz)

+5VALWP Ipeak=8.444A ; Imax=5.91A
Choke DCRmax=60m ohm, DCRtyp=54m ohm
Rds(on)=18m ohm(max) ; Rds(on)=15m ohm(typical)
Vlimit=(5E-06 * 330K)/10=165mV
Ilimit=165mV/18m ~ 165mV/15m
=9.167A ~ 11A
Iocp=Ilimit+Delta I/2
=10.147A ~ 11.980A
Delta I=1.96A (Freq=400KHz)

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				Custom	0.2
				KAL90KALH0	
				Date:	Thursday, November 20, 2008
				Sheet	45 of 52

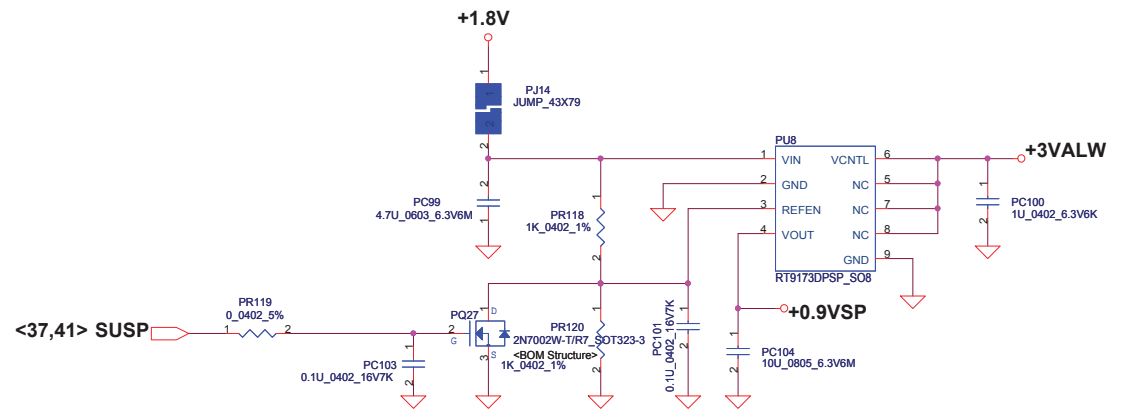


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Size		Document Number		Rev	
Customer		KAL90KALH0		0.2	
Date:		Thursday, November 20, 2008		Sheet	47 of 52

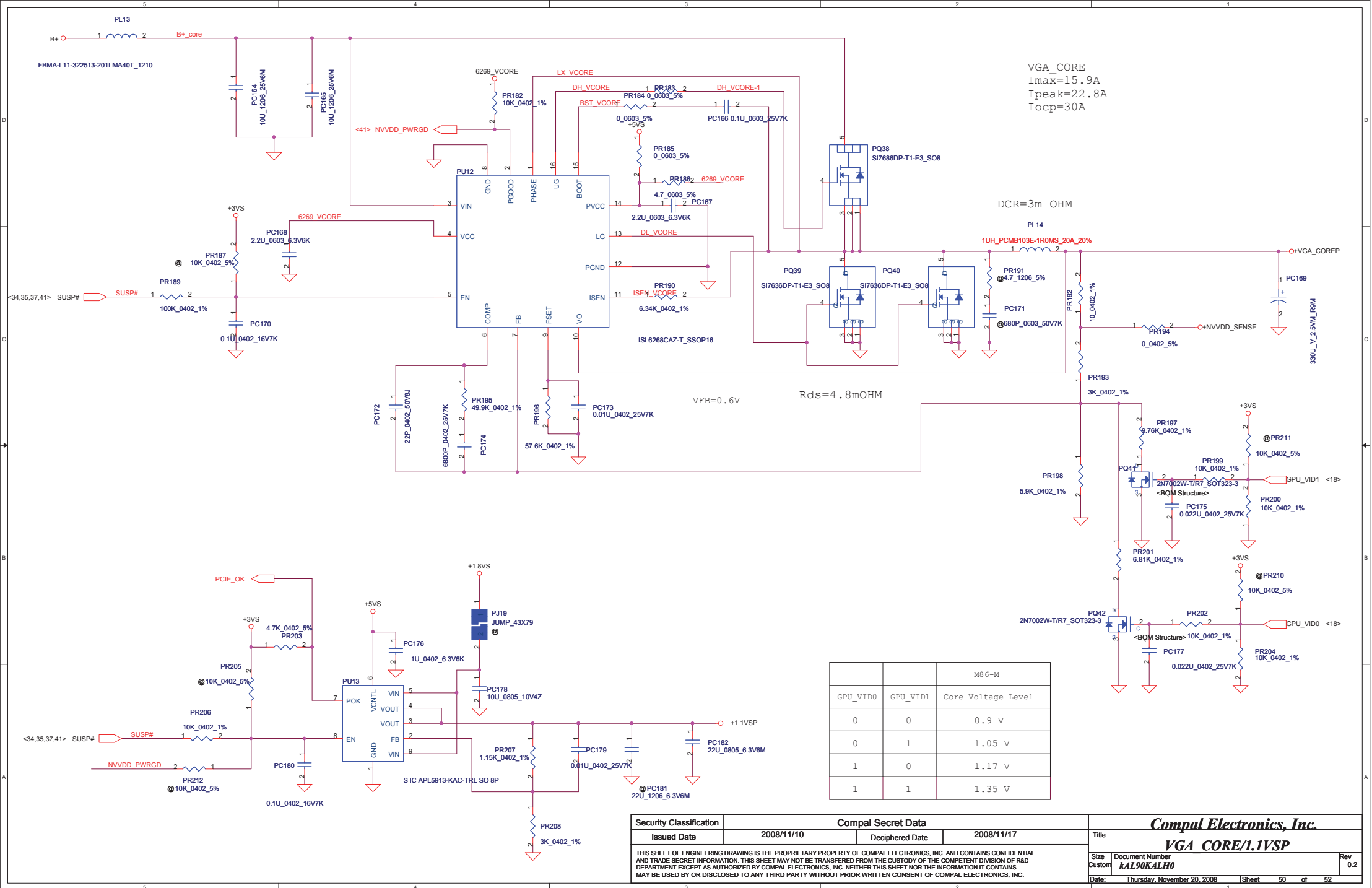


VFB=0.75V
 $V_o = VFB * (1 + PR87 / PR88) = 0.75 * (1 + 4.02K / 10K) = 1.05V$
 $Ton = 200K$
 $Fsw = 400KHz$

Cout ESR=15m ohm
 $I_{peak} = 14.02A$, $I_{max} = 9.81A$
 $\Delta I = ((19 - 1.05) * (1.05 / 19)) / (L * Fsw) = 2.4872A$
 $\Rightarrow 1/2 \Delta I = 1.243A$
 $V_{trip} = R_{trip} * I_{0uA} = 17.8K * 10uA = 0.178V$
 $I_{ocpmin} = V_{trip} / R_{dsonmax} * 1.2 + 1.243A$
 $= 0.178 / (0.0115 * 1.2) + 1.243 = 12.898A + 1.243A = 14.141A$
 $I_{ocpmax} = (0.178 / (0.009 * 1.1)) + 1.243A = 17.98A + 1.243A = 19.22A$
 $I_{ocp} = 14.141A \sim 19.22A$



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Size	Custom	Document Number	KAL90KALH0	
Date:	Thursday, November 20, 2008	Sheet	48	Rev 0.2



Version change list (P.I.R. List)

Item	Fixed Issue	Reason for change	Rev.	PG#	Modify List	Date	Phase
1	cpu load line fail	Measure cpu load line can't fit spec	0.2	49	change the resistance value of pr173.from 4.42k to 3.83k	2008/08/08	DVT
2	Change resistance size	EMI request	0.2	49	Change pc116 and pc117 size from 0402 to 0603	2008/08/08	DVT
3	Change p-mos part number	Vender change EOL	0.2	46	PQ12 part number from 4835bdy to 483500y	2008/08/08	DVT
4	Change device size	device too large can't fit layout space	0.2	44-50	PQ4, PQ14, PQ16, PQ18, PQ19, PQ20, PQ27, PQ36, PQ37, PQ41, PQ42 change to sot323-3	2008/08/12	DVT
5	Change resistance value	1.05V tranient fail	0.2	47	PR94 from 60.4k to 59k	2008/08/12	DVT
6	change resistance	for hdmi	0.2	45	pr41 change from 61.3k to 63.4k	2008/08/14	DVT

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		2008/11/17		Title	
				PIR (PWR)	
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				kAL90KALH0	
				Date:	Thursday, November 20, 2008
				Sheet	51 of 52
				Rev	0.2

A --> C Change List

- 1120-----

Page 35,Chang

R1745,R1746 to 4.7K SD028470180
- 1120-----

Page 36,Add

R106,R109,R1846,R1847 to 0R
- 1120-----

Page 37,Add

R1845 to 10K
- 1120-----

Page 37,Add

R49 to 1K, JP24 to ACES_88266_02001
- 1217-----

Page 42,Delete

R1814,R1815,R1816,R1817,R1818,R1819
- 0106-----

Page 39, Delete D63 for Microsoft certification;

Page 36, Delelte R1773, modify value or R1774, R1775 for LED color.

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Date:		Tuesday, January 06, 2009		Sheet	52 of 52