Project Name : C14CR

Platform : Ivy Bridge(PROCESSOR)+Panther Poinrt(PCH)

PAGE CONTENT

M/B Schematic Version Change List

Release Date	Version	PCB P/N	PCB Description	PCBA P/N	Note
2011/10/24	A	71R-C14CR6-T80A	Motherboard,C14CR0X,189.8*202*1.2mm, 2pcs,6L,Ver.A,TTL,	6BR-C14CR0-000A	
2011/12/06	B	71R-C14CR6-T80B	Motherboard,C14CR0X,189.8*202*1.2mm,2, 6L,Rev.B,TTL,	6BR-C14CR0-000B	

Daughter Board Schematic Version Change List

Release Date	Version	PCB P/N	PCB Description	PCBA P/N	Note

Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: INDEX		Rev: A
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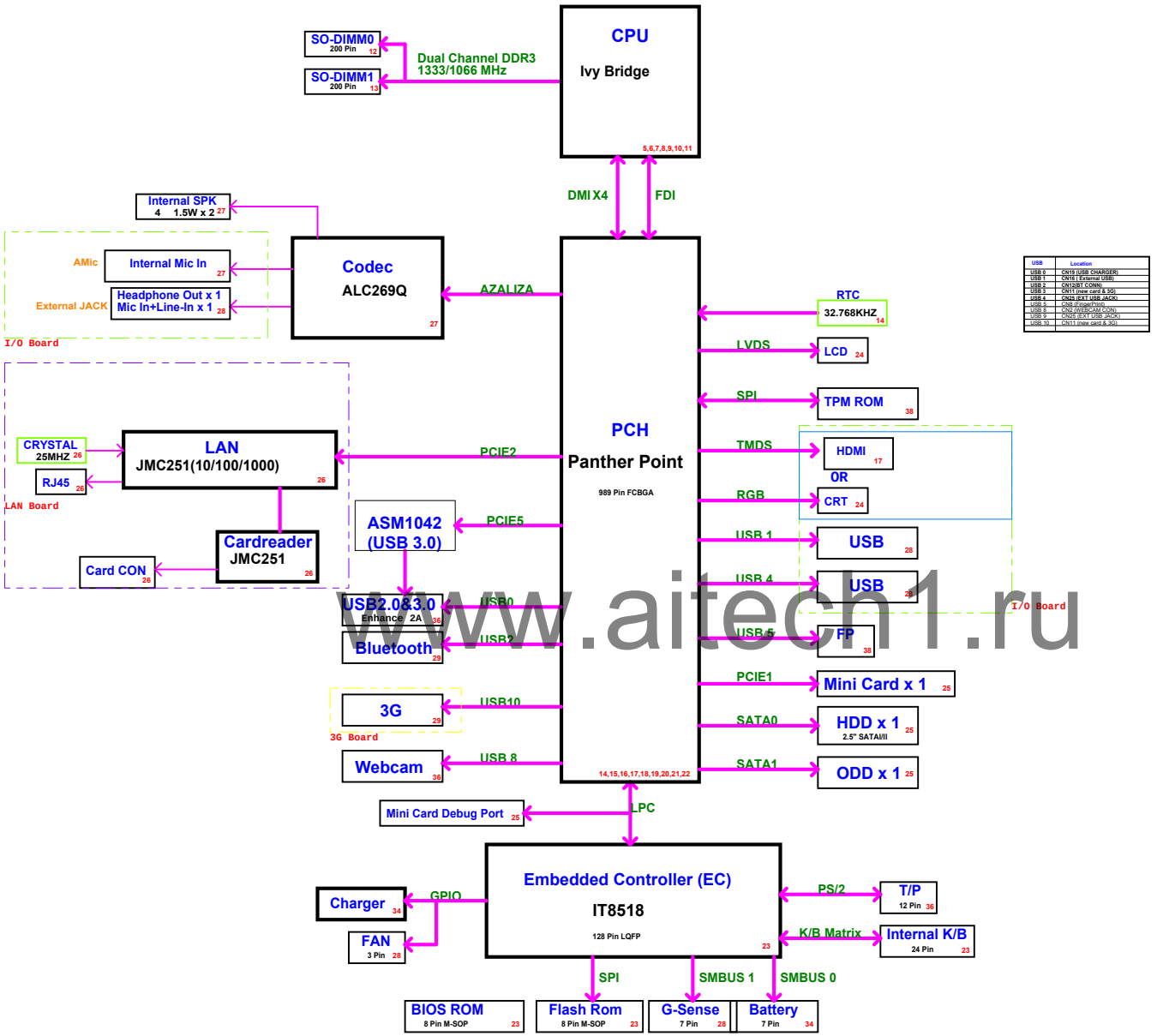
SYSTEM BLOCK DIAGRAM



USB	Location
USB 0	CN19 (USB CHARGER)
USB 1	CN16 (External USB)
USB 2	CN12(BT CONN)
USB 3	CN11 (mini card & 3G)
USB 4	CN26 (EXT USB JACK)
USB 5	CN8 (Finger Print)
USB 6	CN2 (WEBCAM CON)
USB 9	CN25 (EXT USB JACK)
USB 10	CN11 (mini card & 3G)

Shuttle Inc.		
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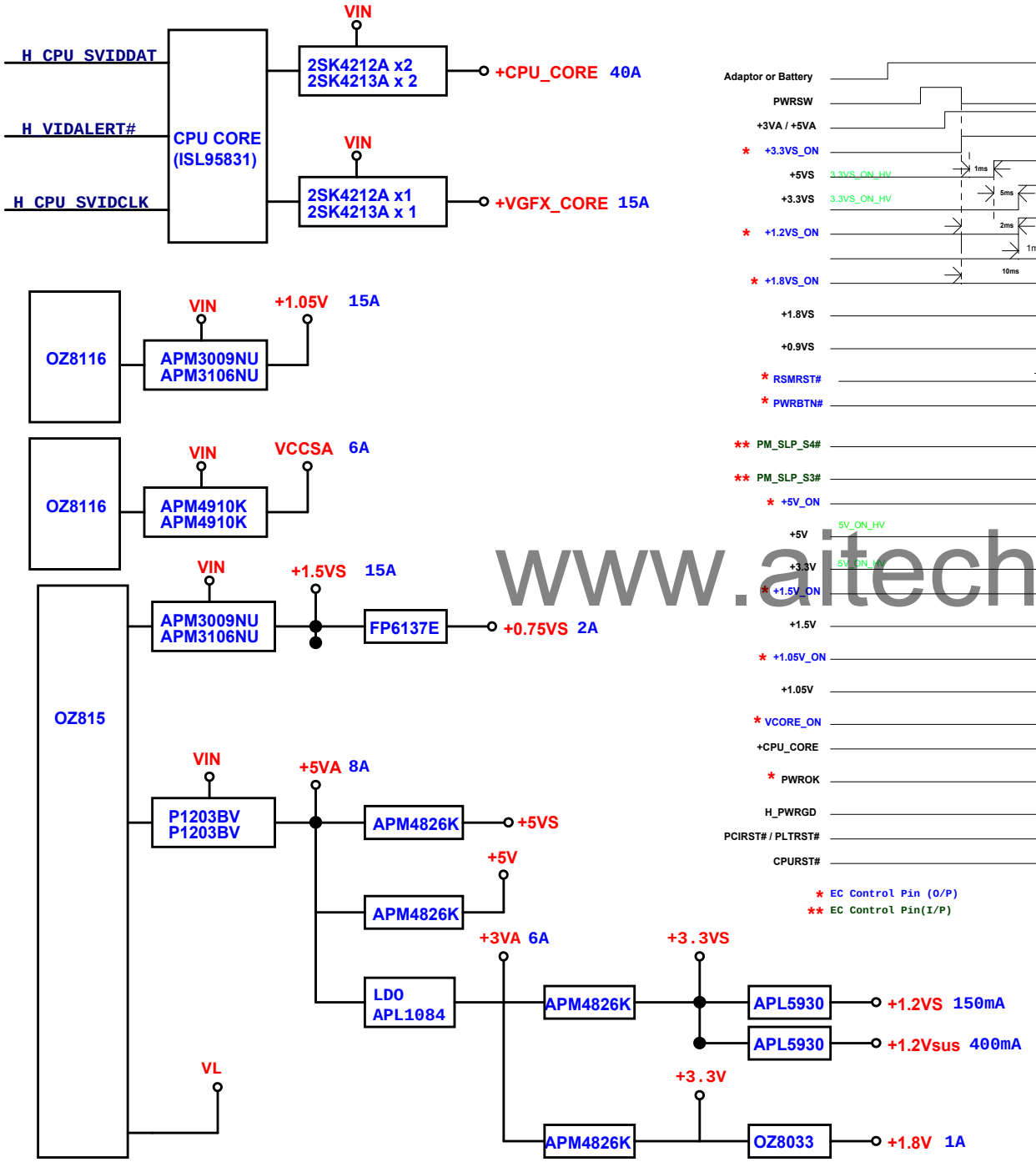
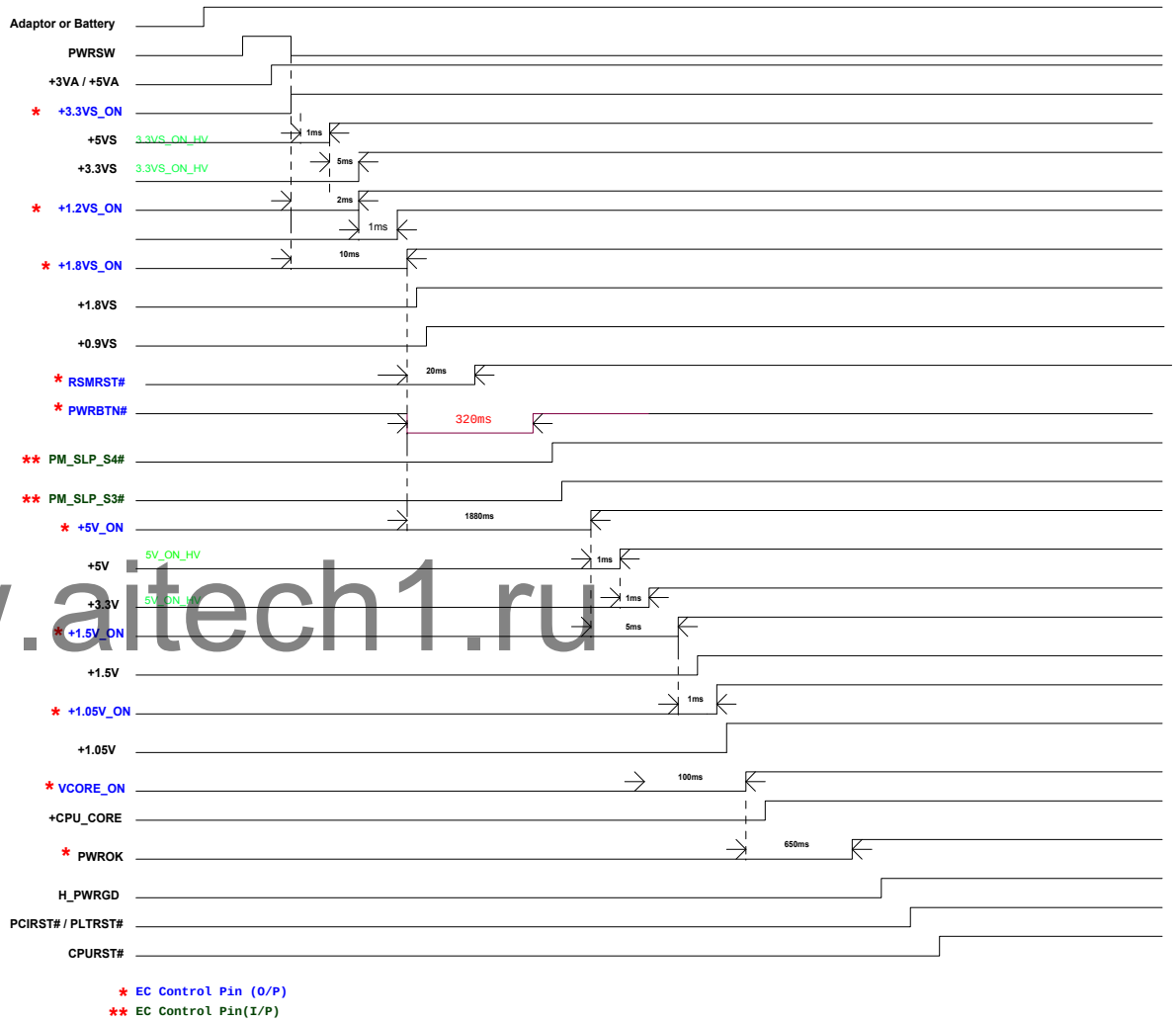
POWER BLOCK DIAGRAM



System Poewr On Sequence



* EC Control Pin (O/P)
** EC Control Pin(I/P)

Shuttle Inc		
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Panther Point GPIO	
GPIO0	PM_BM_BUSY#
GPIO1	EC_EXTSMI#
GPIO2	INT_PIRQE#
GPIO3	INT_PIRQF#
GPIO4	INT_PIRQG#
GPIO5	INT_PIRQH#
GPIO6	BIOS_REC
GPIO7	N.C(TACH3)
GPIO8	N.C
GPIO9	N.C(WOL_EN)
GPIO10	N.C(ALERT#)
GPIO11	SMB_ALERT#
GPIO12	LAN_PHYPC
GPIO13	N.C(GLAN_DOCK#)
GPIO14	N.C(NETDETECT)
GPIO15	PM_STPPCI#
GPIO17	N.C(TACH0)
GPIO18	N.C
GPIO19	SATA1GP
GPIO21	SATA0GP
GPIO22	N.C(SCLOCK)
GPIO23	LDRQ1#
GPIO24	CRB_SV_DET
GPIO25	PM_STPCPU#
GPIO26	PM_SLP_S4_STATE#
GPIO27	QRT_STATE0
GPIO28	QRT_STATE1
GPIO29	USB_OC#5
GPIO30	USB_OC#6
GPIO31	USB_OC#7
GPIO32	PM_CLKRUN#
GPIO33	HDA_DOCK_EN
GPIO34	N.C(HDA_DOCK_RST)
GPIO35	CLK_SATA_OE#
GPIO36	SATA2GP
GPIO37	SATA3GP
GPIO38	ODD_DET
GPIO39	ICH_GPIO39
GPIO40	USB_OC#1
GPIO41	USB_OC#2
GPIO42	USB_OC#3
GPIO43	USB_OC#4
GPIO48	MFG_MODE
GPIO49	H_PWRGD
GPIO50	PCI_REQ#1
GPIO51	PCI_GNT#1
GPIO52	PCI_REQ#2
GPIO53	PCI_GNT#2
GPIO54	PCI_REQ#3
GPIO55	PCI_GNT#3

ITE8518 GPIO		Default Pull/Mode
GPA0	PID_3_RF_LED_ON#	UP / GPI
GPA1	BATT_VA_OFF#	UP / GPI
GPA2	BTL_BEEP	UP / GPI
GPA3	WLAN_PWR#	UP / GPI
GPA4	+1.05V_ON	UP / GPI
GPA5	SENBAT_V	UP / GPI
GPA6	PM_RSMRST#	UP / GPI
GPA7	EC_BL_PWM	UP / GPI
GPB0	PM_SLP_S4#	UP / GPI
GPB1	PM_SLP_S3#	UP / GPI
GPB2	3G_PWR#	Dn / GPI
GPB3	SMBCLK	/ GPI
GPB4	SMBDAT	/ GPI
GPB5	H_A20GATE	/ GPO
GPB6	H_RCIN#	UP / Func1
GPB7	SAFTY_PROTECT	Dn / GPI
GPC0	+1.5V_ON	Dn / GPI
GPC1	SMB_CLK_EC	/ GPI
GPC2	SMB_DAT_EC	/ GPI
GPC3	PID_0_CHG_B_LED	Dn / GPI
GPC4	PWRBTN3#	Dn / GPI
GPC5	PANEL_DETECT 2	Dn / GPI
GPC6	VCCSA_ON	Dn / GPI
GPC7	+1.5VS_ON	UP / GPI
GPD0	ADAP_IN	UP / GPI
GPD1	PWRBTN#	UP / GPI
GPD2	PLT_RST#	UP / Func1
GPD3	PM_SUS_STAT#	UP / GPI
GPD4	EC_EXTSMI#	UP / GPI
GPD5	Fastcharge_EN	UP / GPI
GPD6	+5V_ON	Dn / GPI
GPD7	SET_V	Dn / GPI
GPE0	LID#	Dn / GPI
GPE1	PWR_USB_LED	Dn / GPI
GPE2	ALL_SYS_PGD	Dn / GPI
GPE3	Vcore_ON	Dn / GPI
GPE4	PWRSW	UP / GPI
GPE5	LVDS_VIN	Dn / GPI
GPE6	WLAN_ON	Dn / GPI
GPE7	AMP_MUTE#	UP / GPI
GPF0	PCH_BL_EN	UP / GPI
GPF1	+1.8V_ON	UP / GPI
GPF2	BT_ON	UP / GPI
GPF3	N.C	UP / GPI
GPF4	TP_CLK	UP / GPI
GPF5	TP_DATA	UP / GPI
GPF6	EC_PECI	UP / GPI
GPF7	CHG_HI_VOLT#	UP / GPI
GPG0	PWRBTN2#	Dn/GPO/TM
GPG1	+3.3VS_ON	Dn/GPO/ID7
GPG2	EC_PORST	
GPG6	WEBCAN_ON	Dn / GPI
GPH0	PM_CLKRUN#	Dn/GPI/ID0
GPH1	PID_1_CHG_R_LED	Dn/GPI/ID1
GPH2	PID_2_PWR_LED	Dn/GPI/ID2
GPH3	EC_HSCS0#	Dn/GPI/ID3
GPH4	EC_HSCK	Dn/GPI/ID4
GPH5	EC_HMISO	Dn/GPI/ID5
GPH6	EC_HMOSI	Dn/GPI/ID6

ITE8518 GPIO		Default Pull/Mode
GPI0	CRT_DETECT	/GPI/ADC
GPI1	PANEL_DETECT	/GPI/ADC
GPI2	PLATFORM_ID	/GPI/ADC
GPI3	CPPE#	/GPI/ADC
GPI4	BAT_I	/GPI/ADC
GPI5	BATT_TEMP	/GPI/ADC
GPI6	ADAPTOR_1	/GPI/ADC
GPI7	BAT_V	/GPI/ADC
GPJ0	EC_BL_ON	/GPI/DAC
GPJ1	EC_PROCHOT	/GPI/DAC
GPJ2	FAN_CTRL0	/GPI/DAC
GPJ3	CHG_REF	/GPI/DAC
GPJ4	CHG_I	/GPI/DAC
GPJ5	PWR_USB#	/GPI/DAC

Ivy Bridge CPU

	CPU CORE(V)	ICC(A)	W	TEMP( )
IMVP-7	1.05	44.0	36	

Panther Point

VCC	ICC(mA)	W	TEMP( )
+3.3V	262	0.87	105
+1.8VS	3249	5.73	
+1.5V	86	0.129	
+1.05	14688.52	15.43	

Panther Point

VCC	ICC(mA)	mW	TEMP( )
+5V	4	20	70
+5VS	2	10	
+3.3V	347	1145.1	
+3.3VS	212	699.6	
+1.5V	1988	2982	
+1.05V	1634	1715.7	

ITE8518

VCC	ICC(mA)	mW	TEMP( )
+3.3V	100	330	70

IDT92HD87B

VCC	ICC(mA)	mW	TEMP( )
+3.3V(DVDD)	200	660	70
+5V(AVDD)	1000	5000	

ADM1032

VCC	ICC	mW	TEMP( )
+3.3V	170uA	0.56	150

JMC251

VCC	ICC(mA)	mW	TEMP( )
+3.3VS	300	990	70
+1.2VS	150	180	

Shuttle Inc

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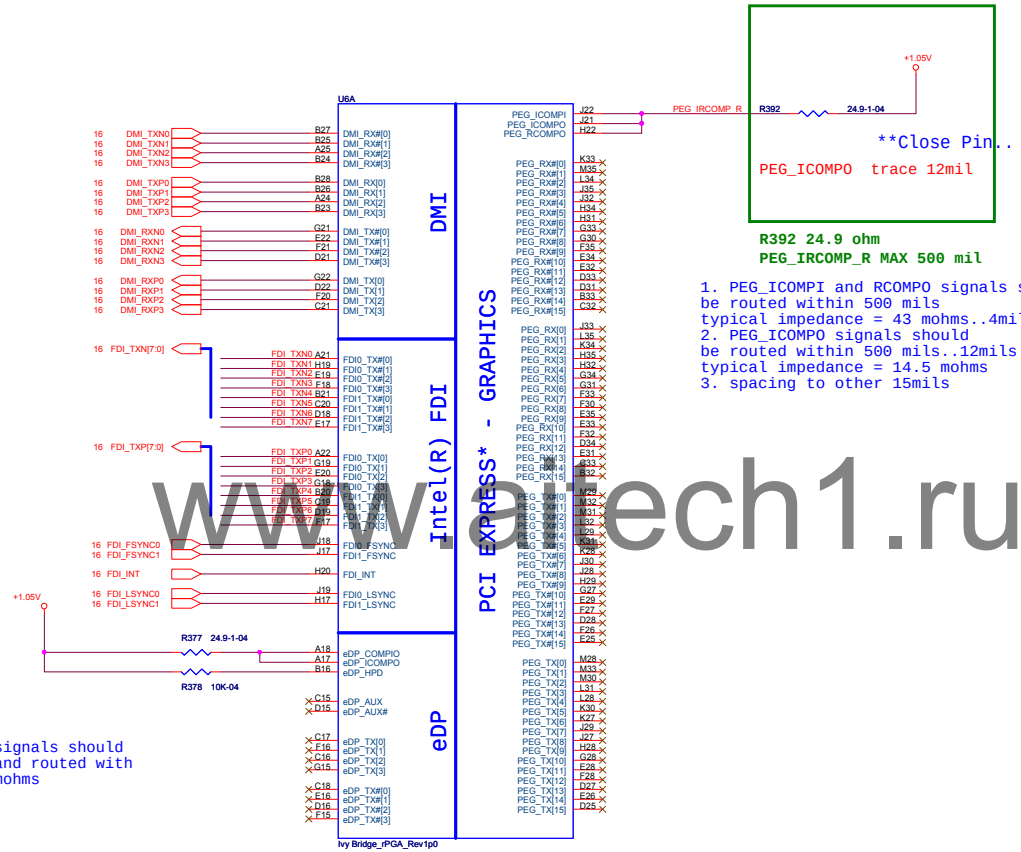
IVY BRIDGE PROCESSOR(DMI,PEG,FDI)



R392 24.9 ohm
PEG_IRCOMP_R MAX 500 mil

1. PEG_ICOMPI and RCOMPO signals should be routed within 500 mils typical impedance = 43 mohms..4mils
2. PEG_ICOMPO signals should be routed within 500 mils..12mils typical impedance = 14.5 mohms
3. spacing to other 15mils

DP_ICOMPO trace 12mil

eDP_COMPIO and ICOMPO signals should be shorted near balls and routed with typical impedance <25 mohms

Shuttle Inc			
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IVY BRIDGE PROCESSOR (CLK, MISC, JTAG)

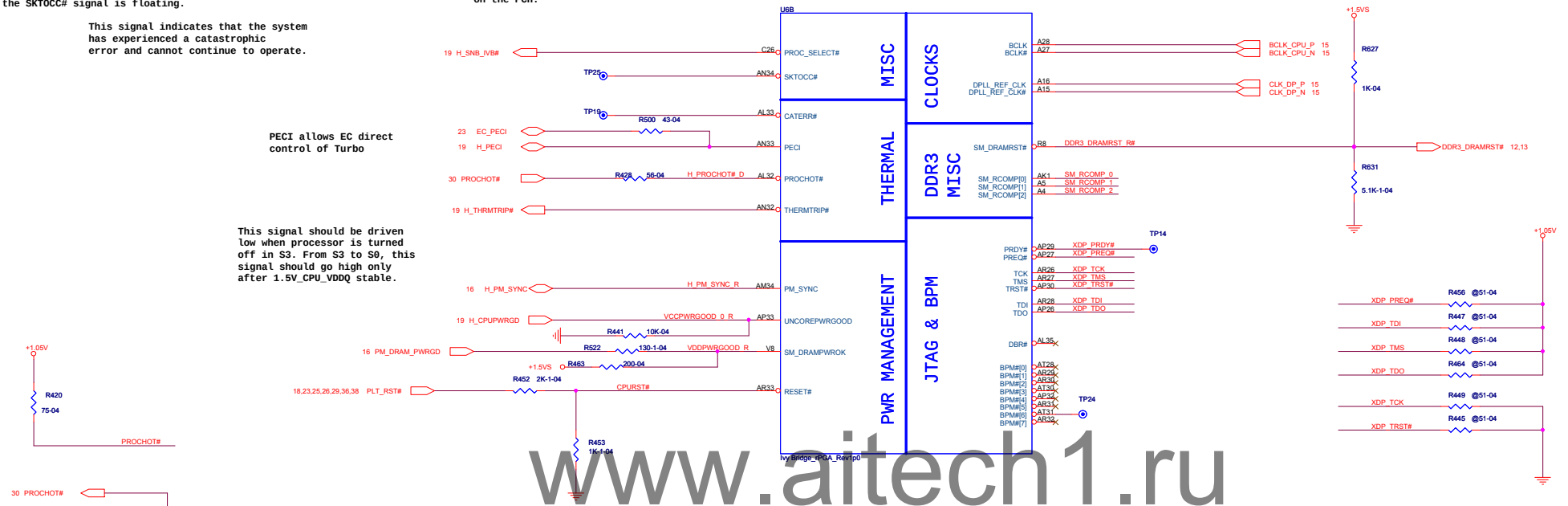
The SKTOCC# pin is driven to ground by the processor when the processor is socketed in the system, otherwise the SKTOCC# signal is floating.

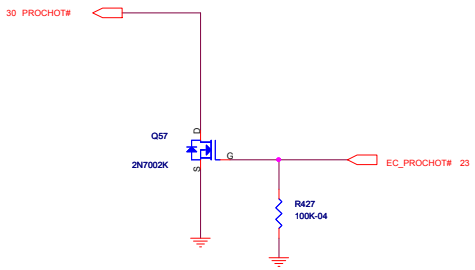
This signal indicates that the system has experienced a catastrophic error and cannot continue to operate.

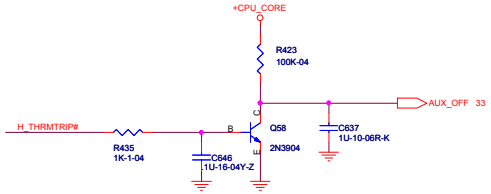
This pin is for compability with future platforms. A pull up resistor to VCPLL is required if connected to the DF_TVS strap on the PCH.

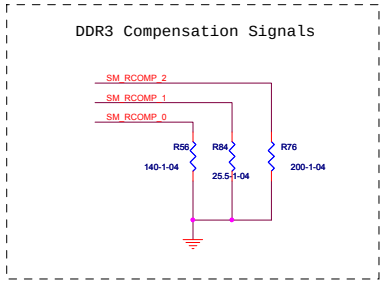
PECI allows EC direct control of Turbo

This signal should be driven low when processor is turned off in S3. From S3 to S0, this signal should go high only after 1.5V_CPU_VDDQ stable.









Shuttle Inc		
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Size: Custom	Document Number: CPU_CLK/MISC/JTAG (2 of 7)	Rev: A
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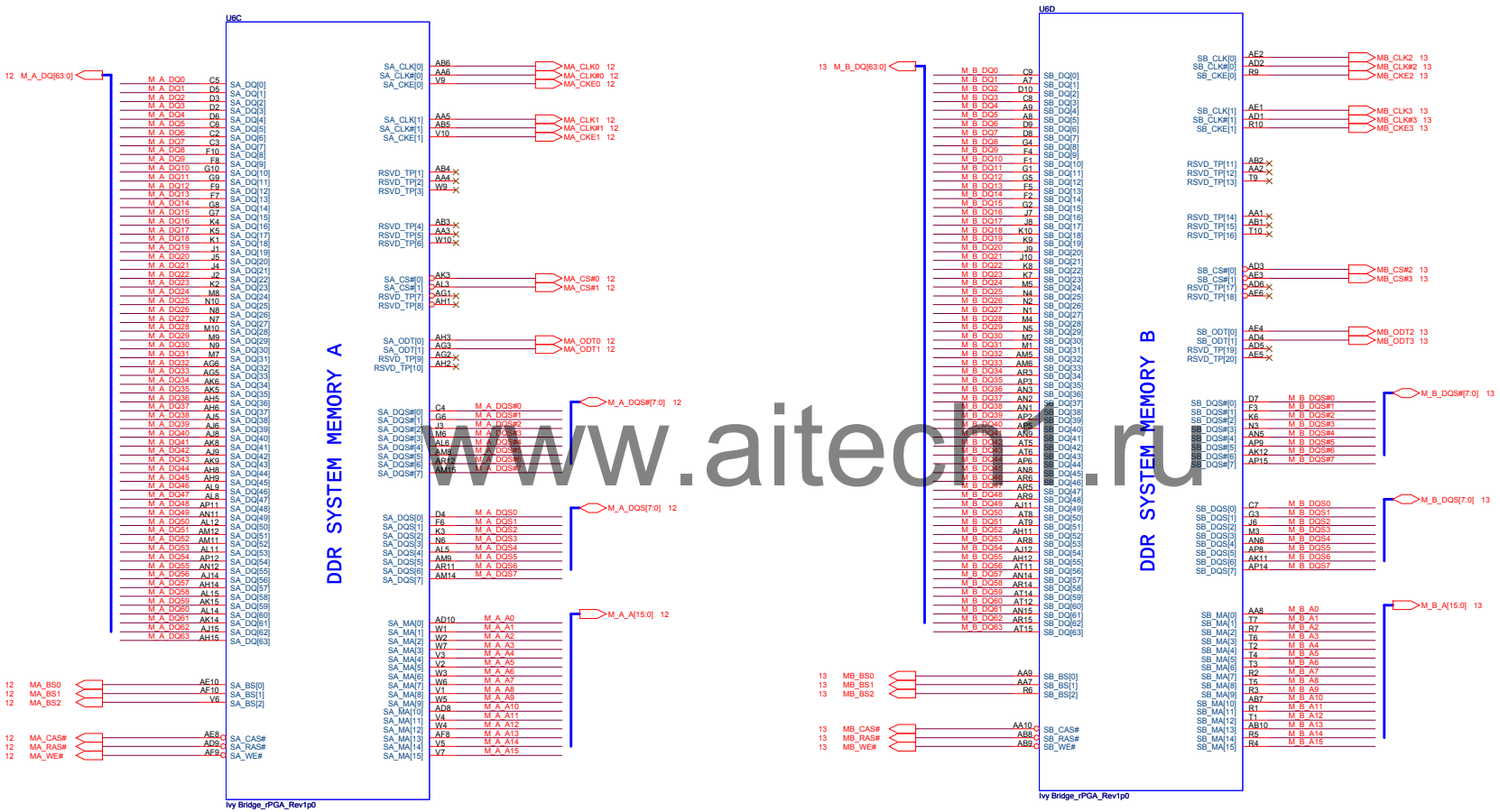
IVY BRIDGE PROCESSOR (DDR3)



Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: CPU_DDR3 BUS (3 of 7)	Rev: A
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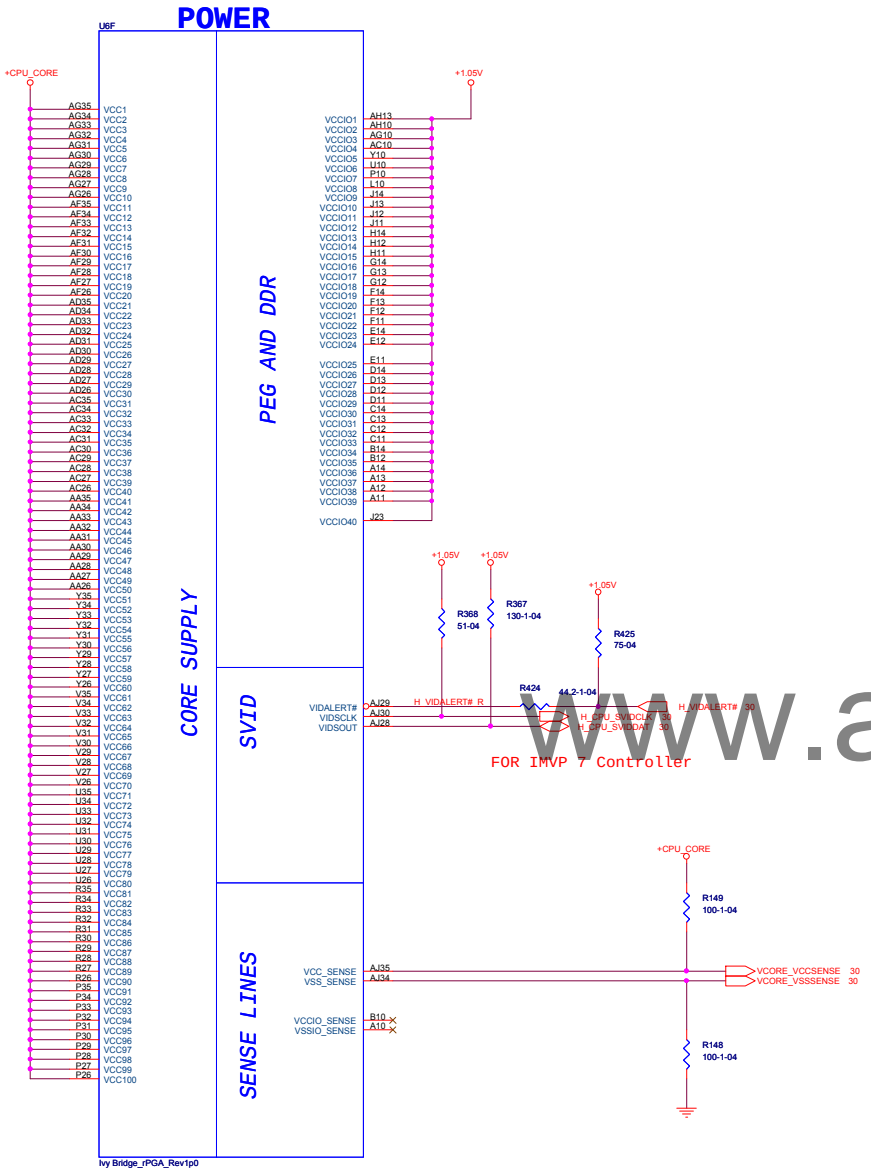
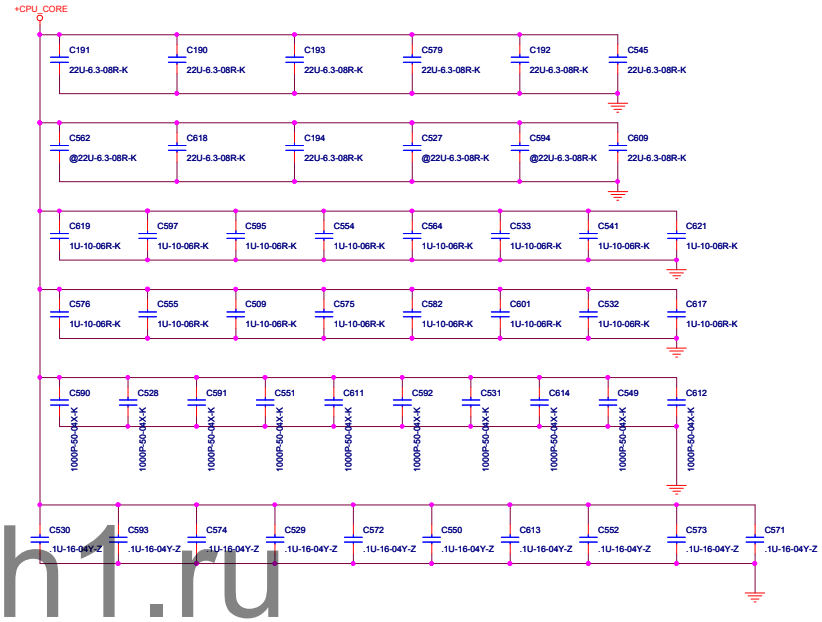
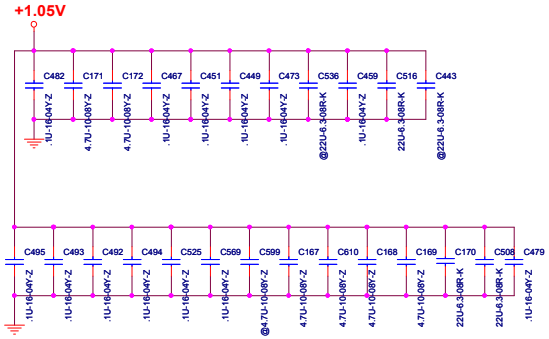
IVY BRIDGE PROCESSOR (POWER)



+CPU_Core Decoupling





Shuttle Inc		
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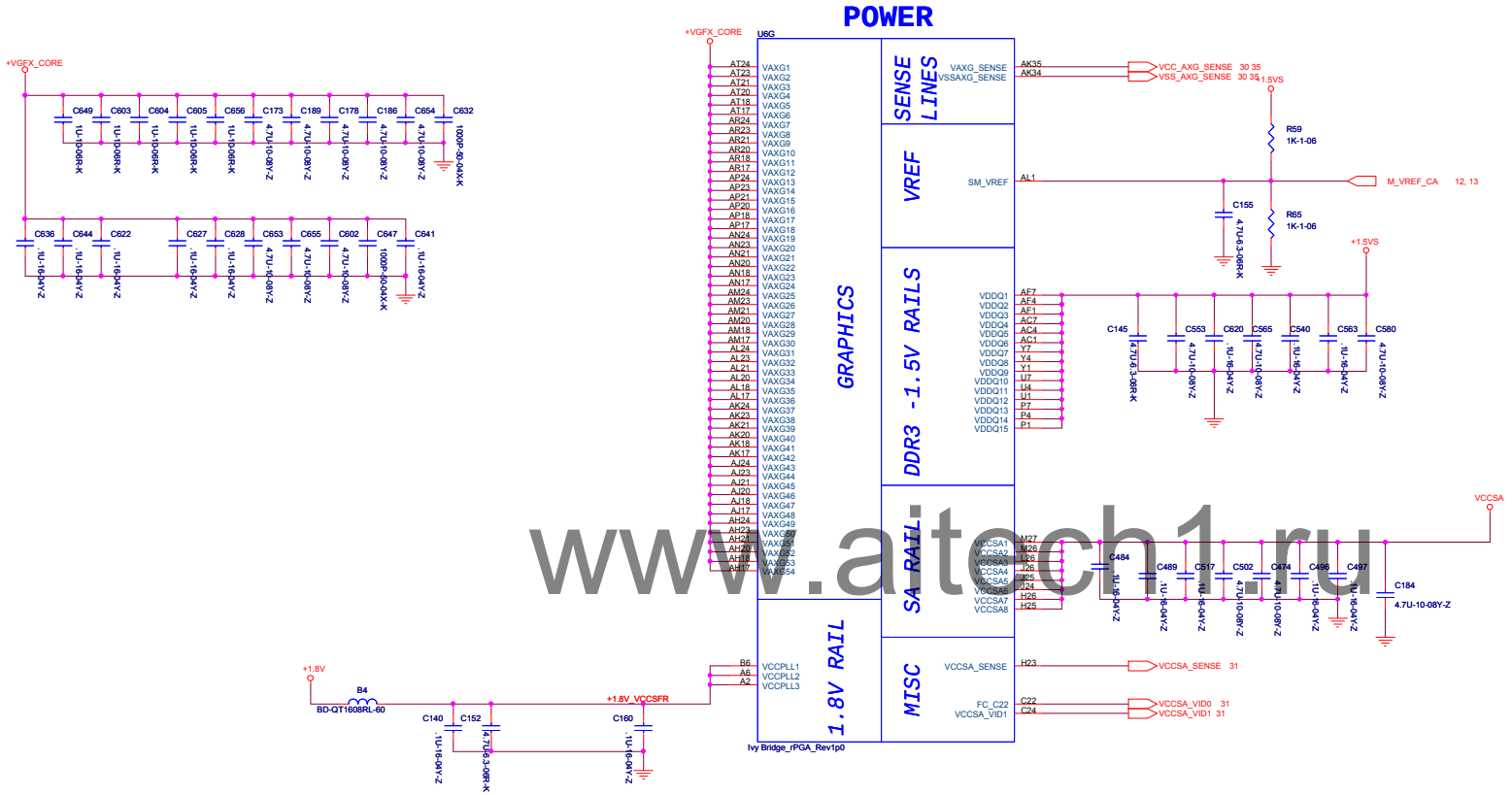
IVY BRIDGE PROCESSOR (POWER)



Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: CPU_GRAPHICS POWER (5 of 7)	Rev: A
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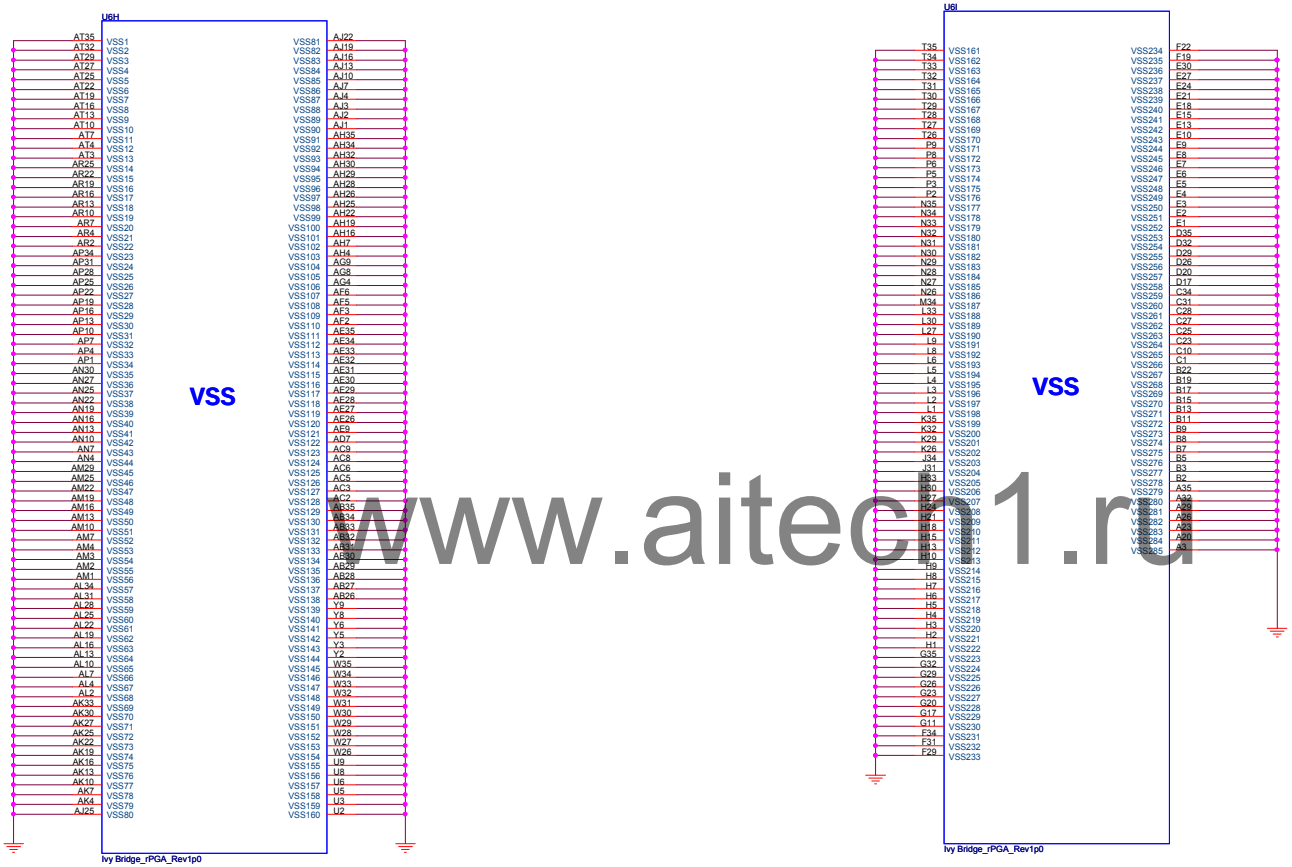
IVY BRIDGE PROCESSOR (VSS)



Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: CPU_GND (6 of 7)		Rev: A
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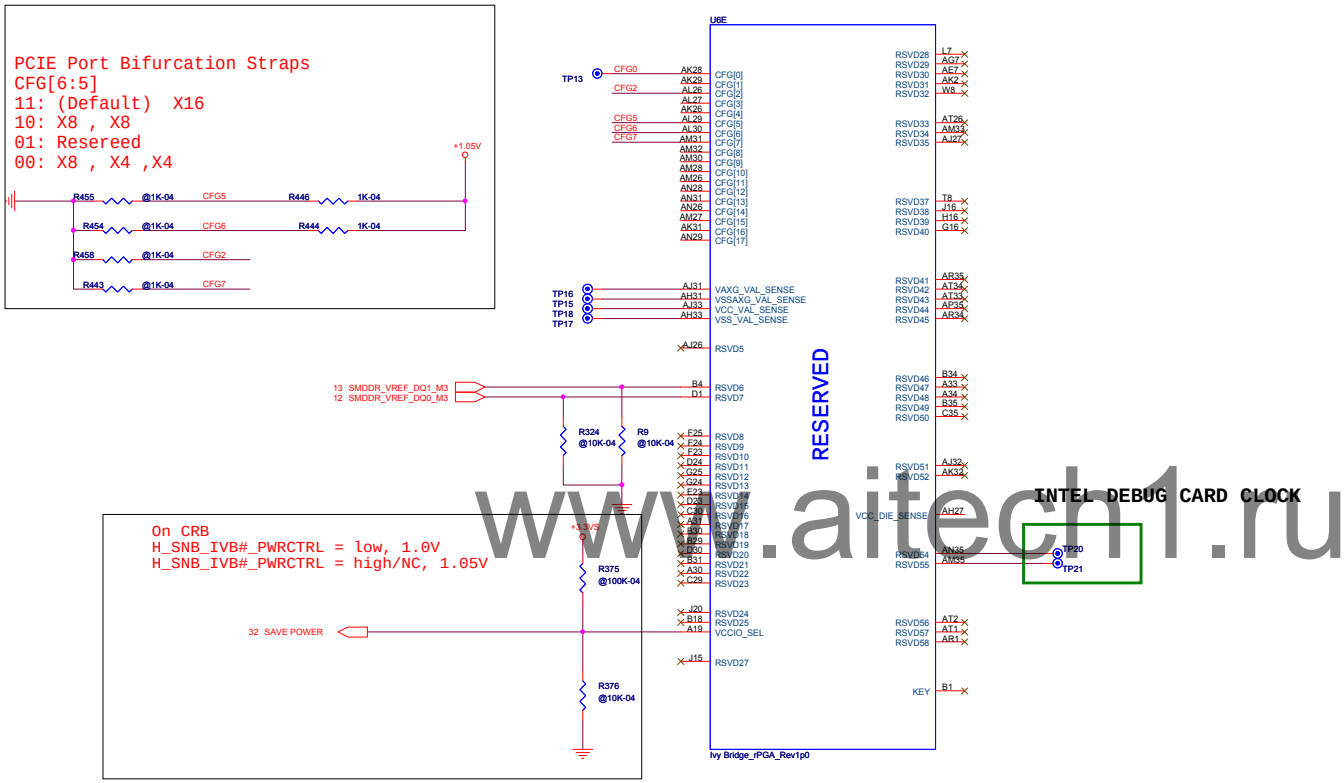
IVY BRIDGE PROCESSOR (RESERVED)



Shuttle Inc		
Title: C14CR		
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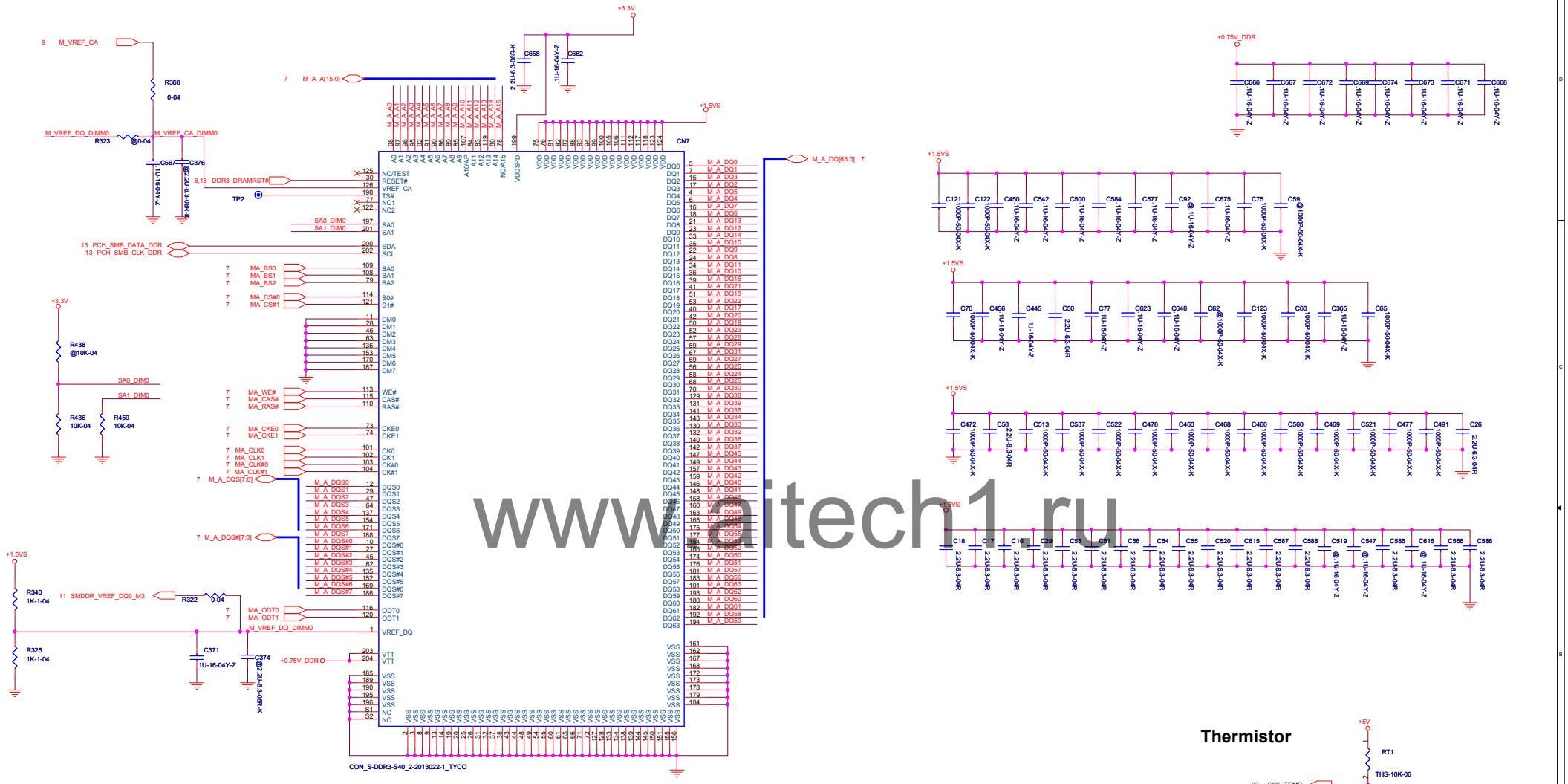
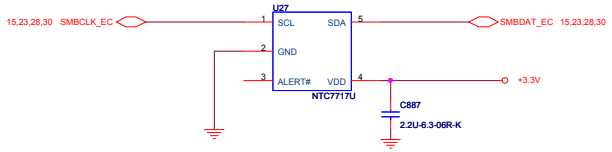
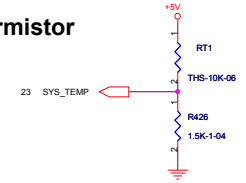


CPU Thermal Sensor



Thermistor



Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: DDR3 SODIMM-A		Rev: A
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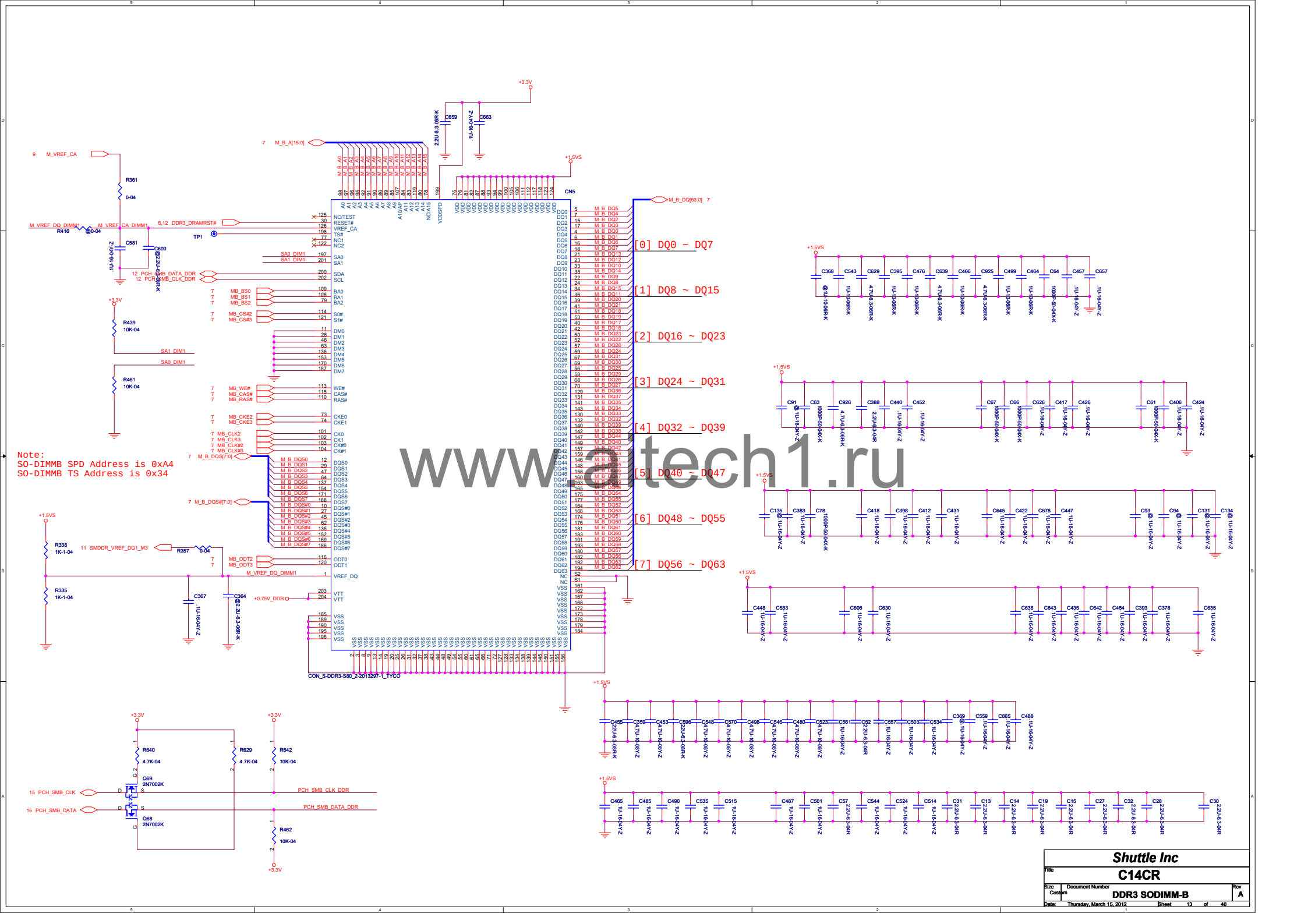
CN5
CON_S-DDR3-S80_2-2013297-1_TYCO
[0] DQ0 ~ DQ7
[1] DQ8 ~ DQ15
[2] DQ16 ~ DQ23
[3] DQ24 ~ DQ31
[4] DQ32 ~ DQ39
[5] DQ40 ~ DQ47
[6] DQ48 ~ DQ55
[7] DQ56 ~ DQ63
Note:
SO-DIMMB SPD Address is 0xA4
SO-DIMMB TS Address is 0x34
www.altech1.ru
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DDR3 SODIMM-B
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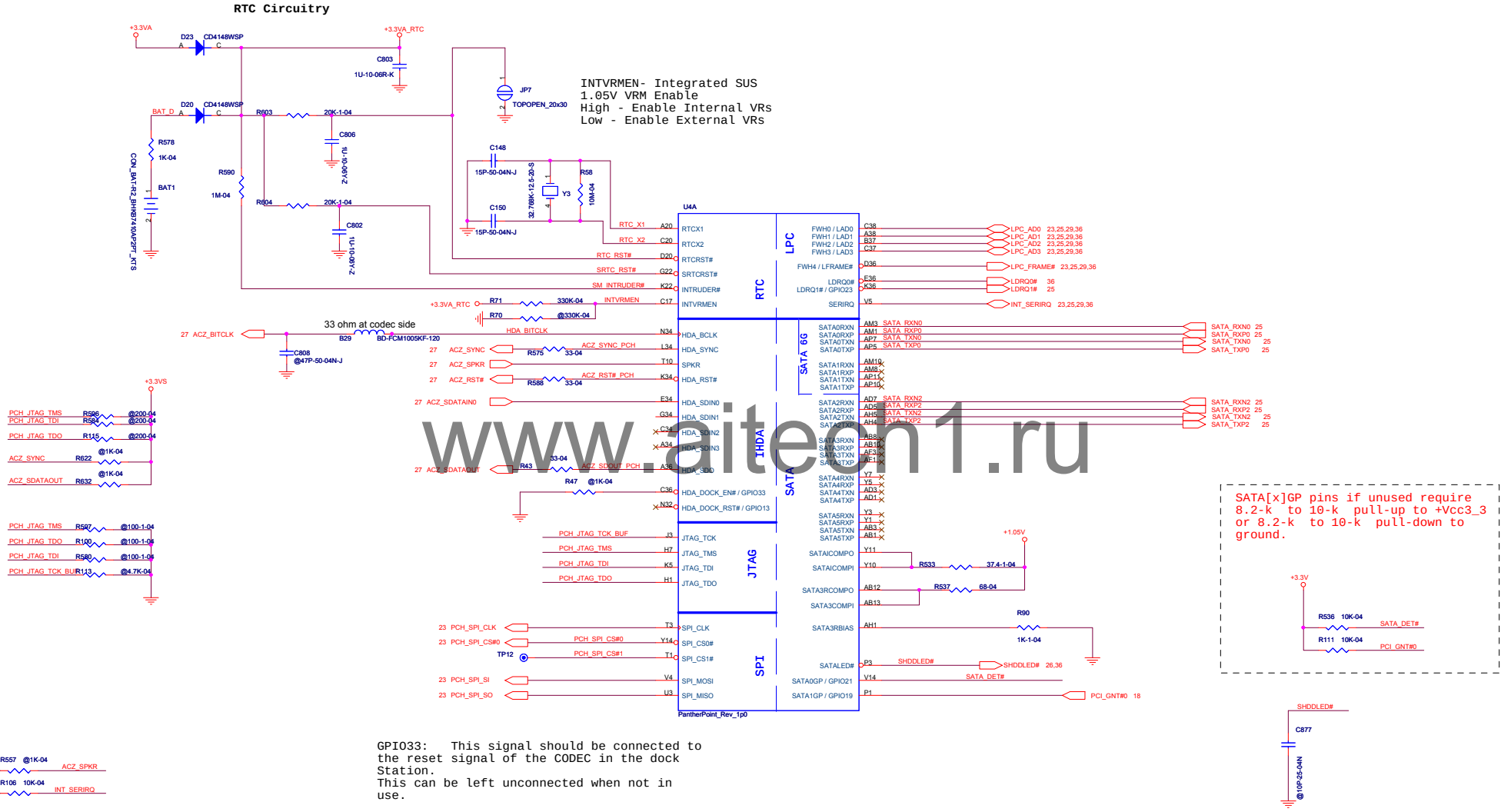
Panther Point Chipset (RTC,LPC,SATA,HDA,SPI,JTAG)



Shuttle Inc	
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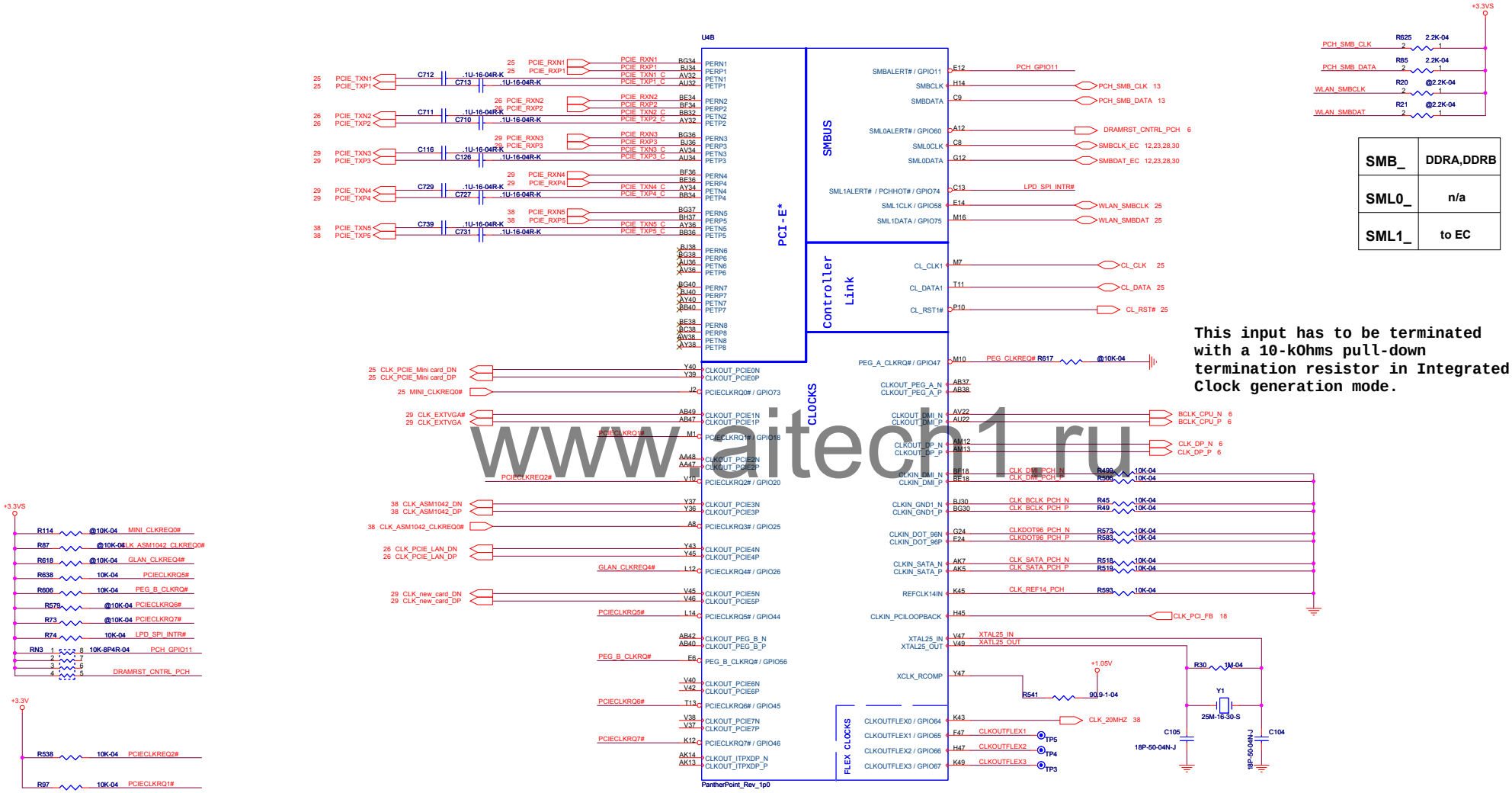
Panther Point Chipset (PCIE,SMBUS,CLOCK)



This input has to be terminated with a 10-kOhms pull-down termination resistor in Integrated Clock generation mode.

SMB_	DDRA,DDRB
SML0_	n/a
SML1_	to EC

Shuttle Inc	
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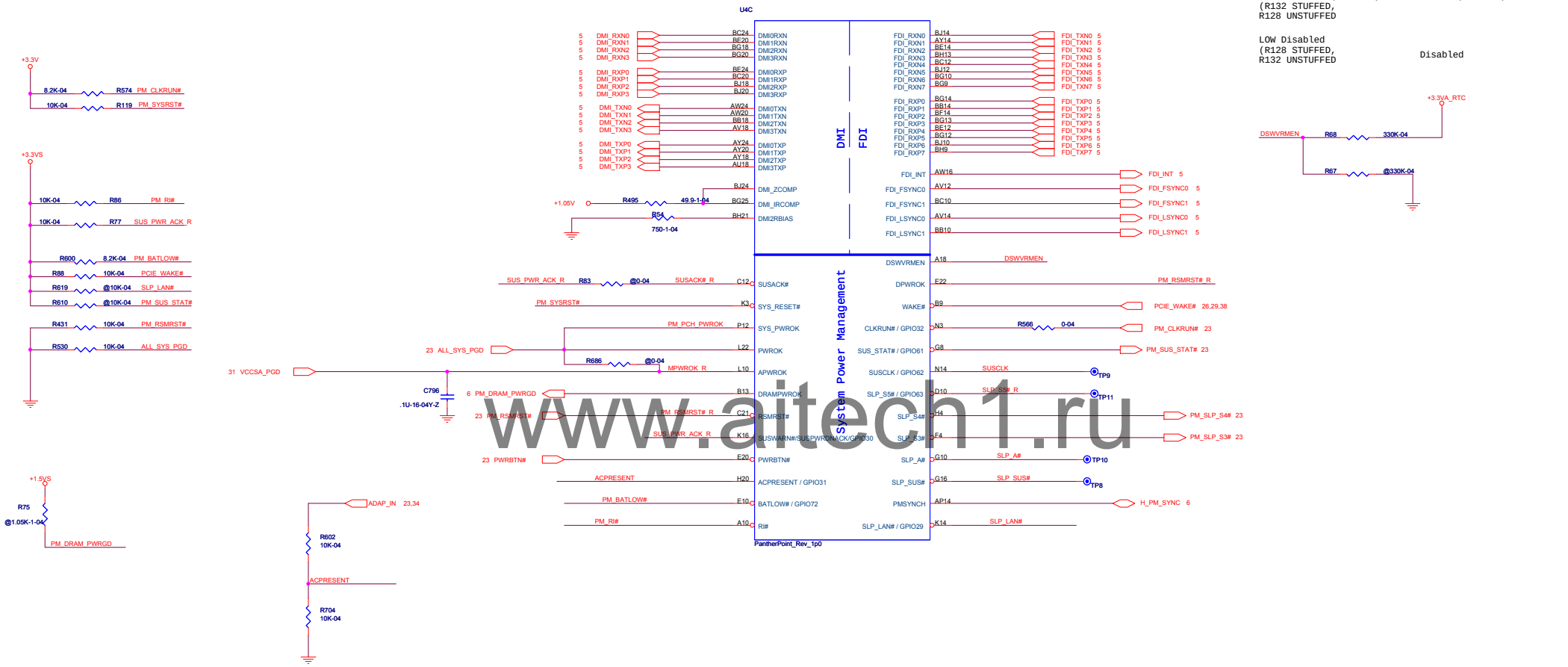
Panther Point Chipset (DMI,FDI)



DSWODVREN - On Die DSW VR Enable

HIGH Enabled (DEFAULT) (R132 STUFFED, R128 UNSTUFFED	Enabled (DEFAULT)
LOW Disabled (R128 STUFFED, R132 UNSTUFFED	Disabled

Shuttle Inc		
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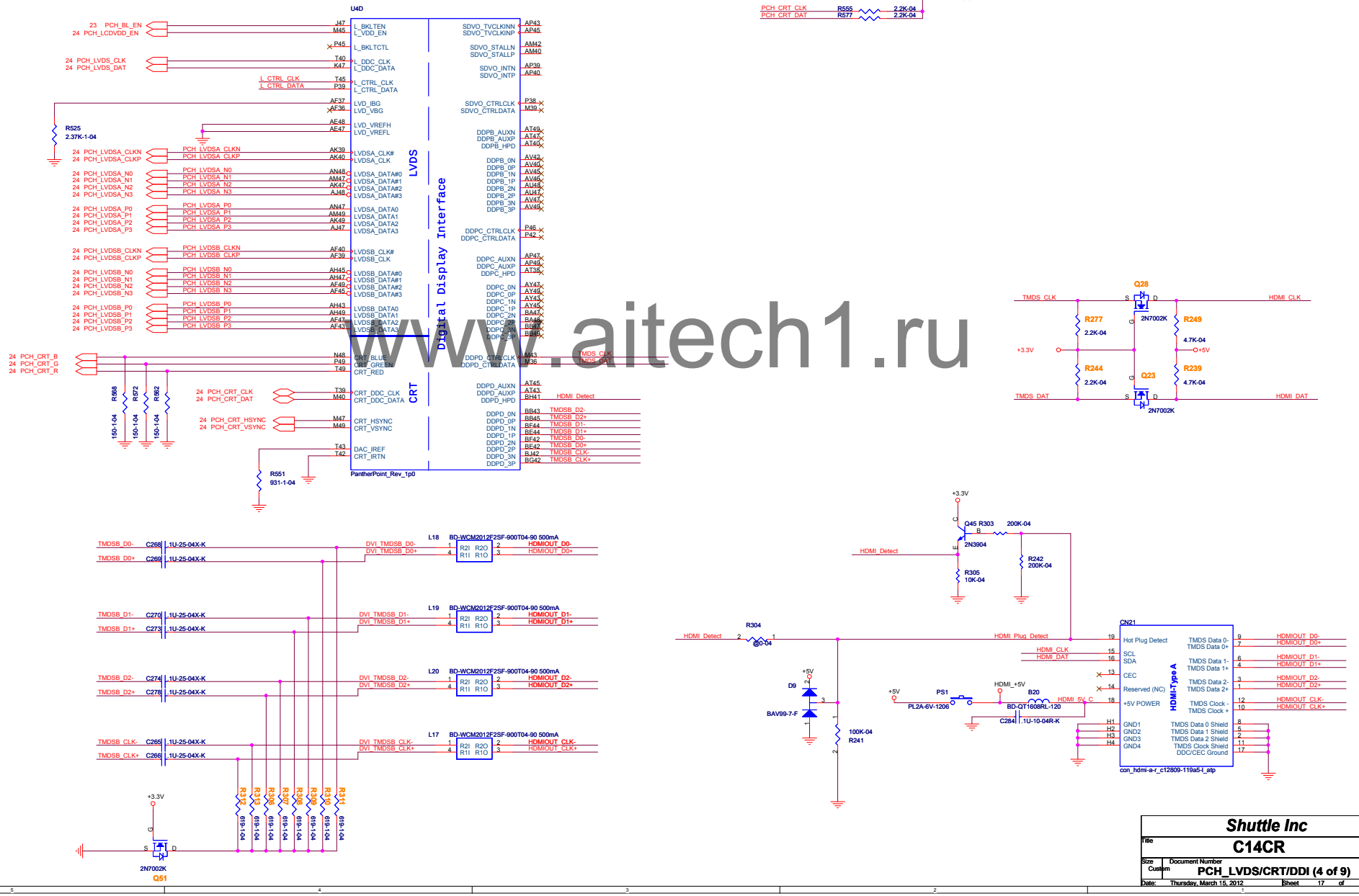
Panther Point Chipset (LVDS,CRT,Digital Display)



Shuttle Inc		
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Size: Custom	Document Number: PCH_LVDS/CRT/DDI (4 of 9)	Rev: A
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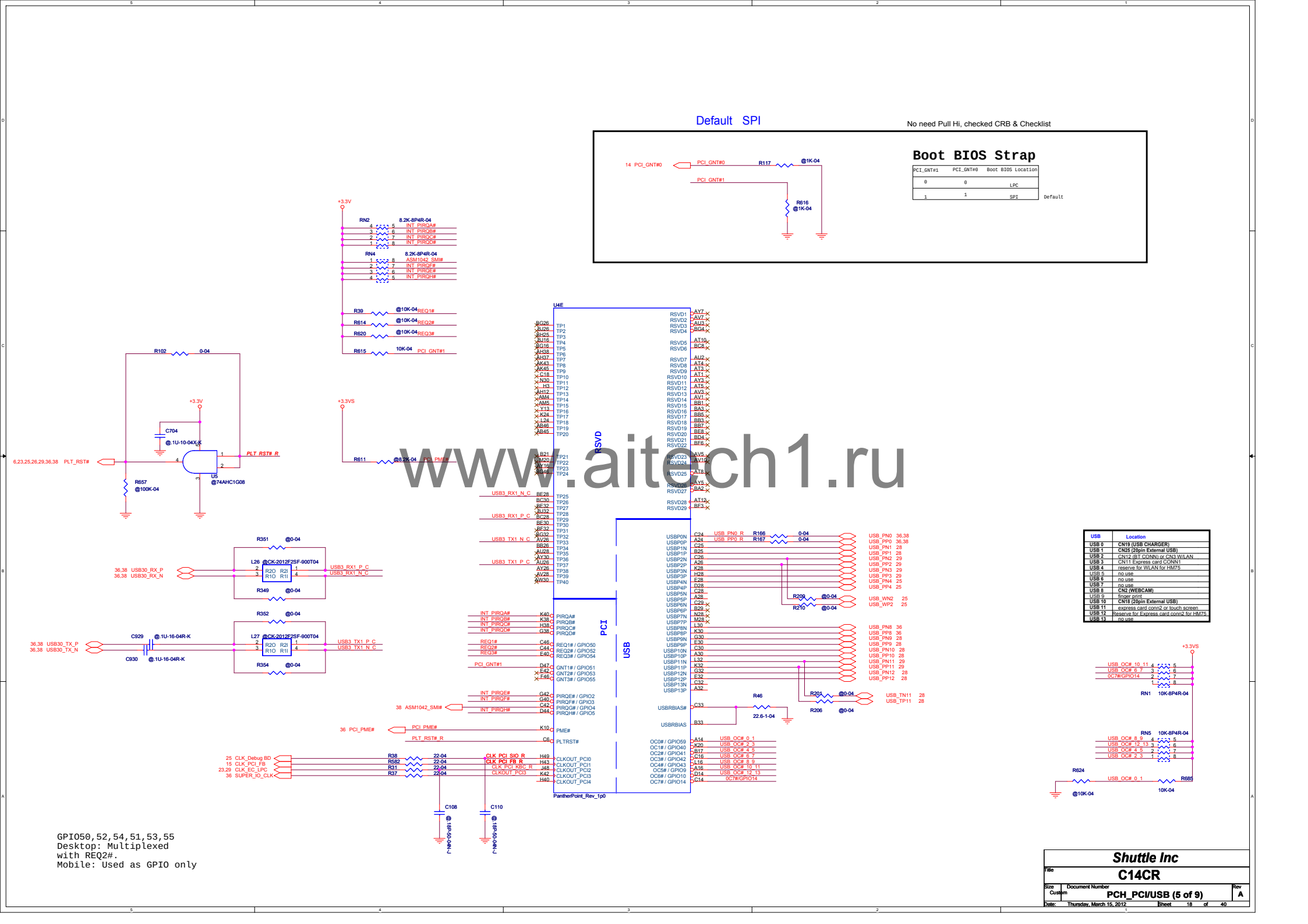

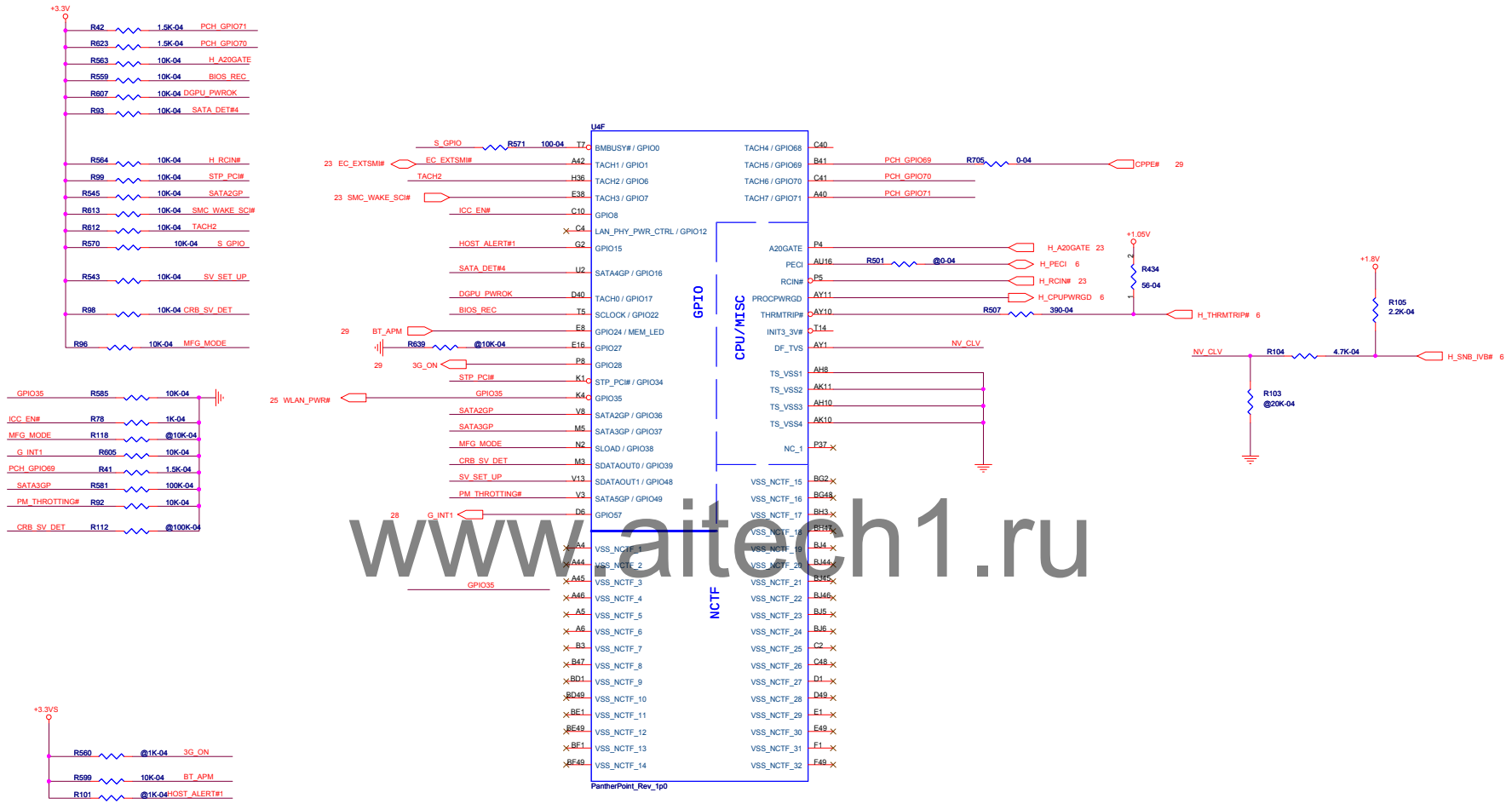

Shuttle Inc			
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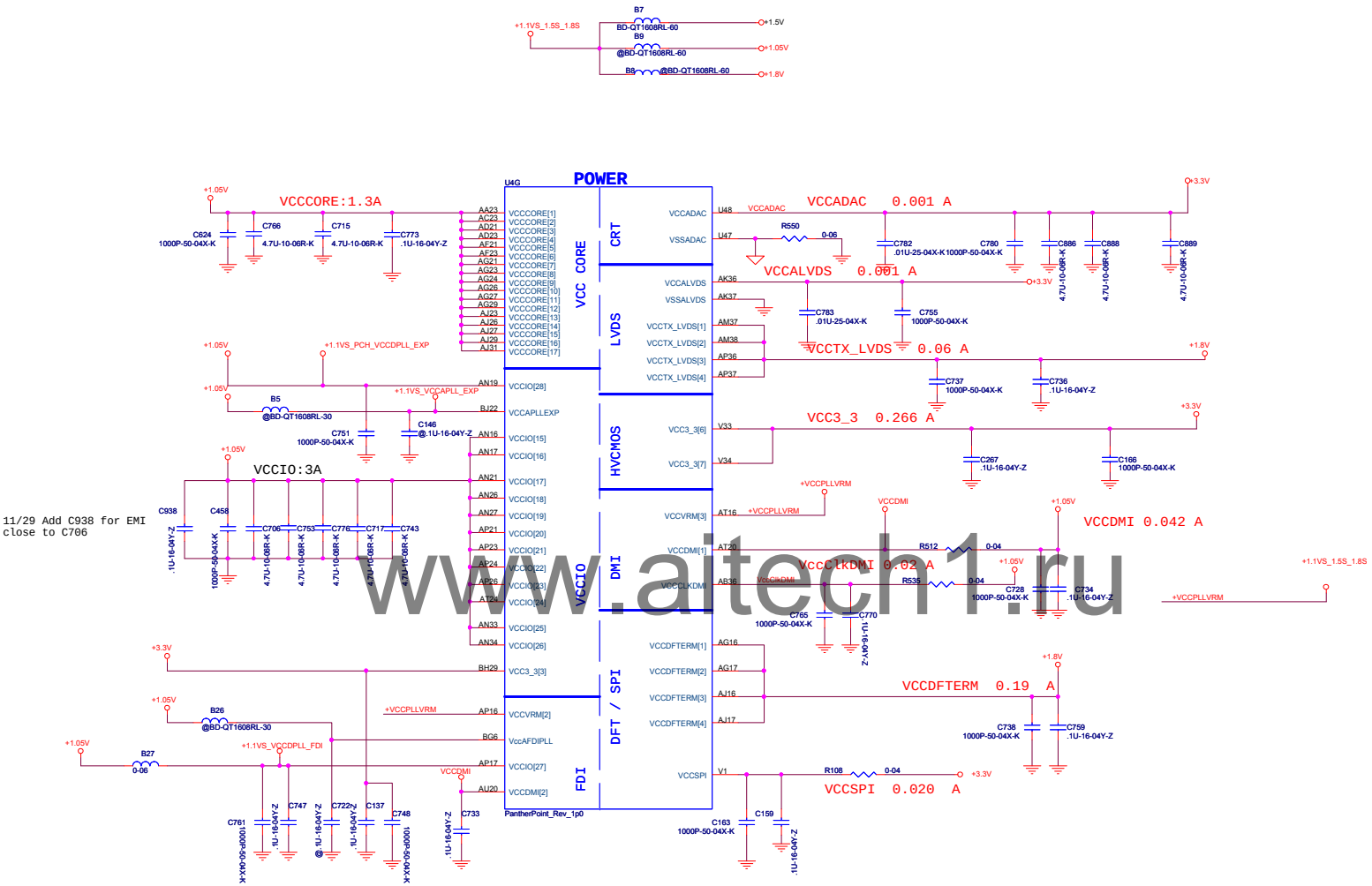

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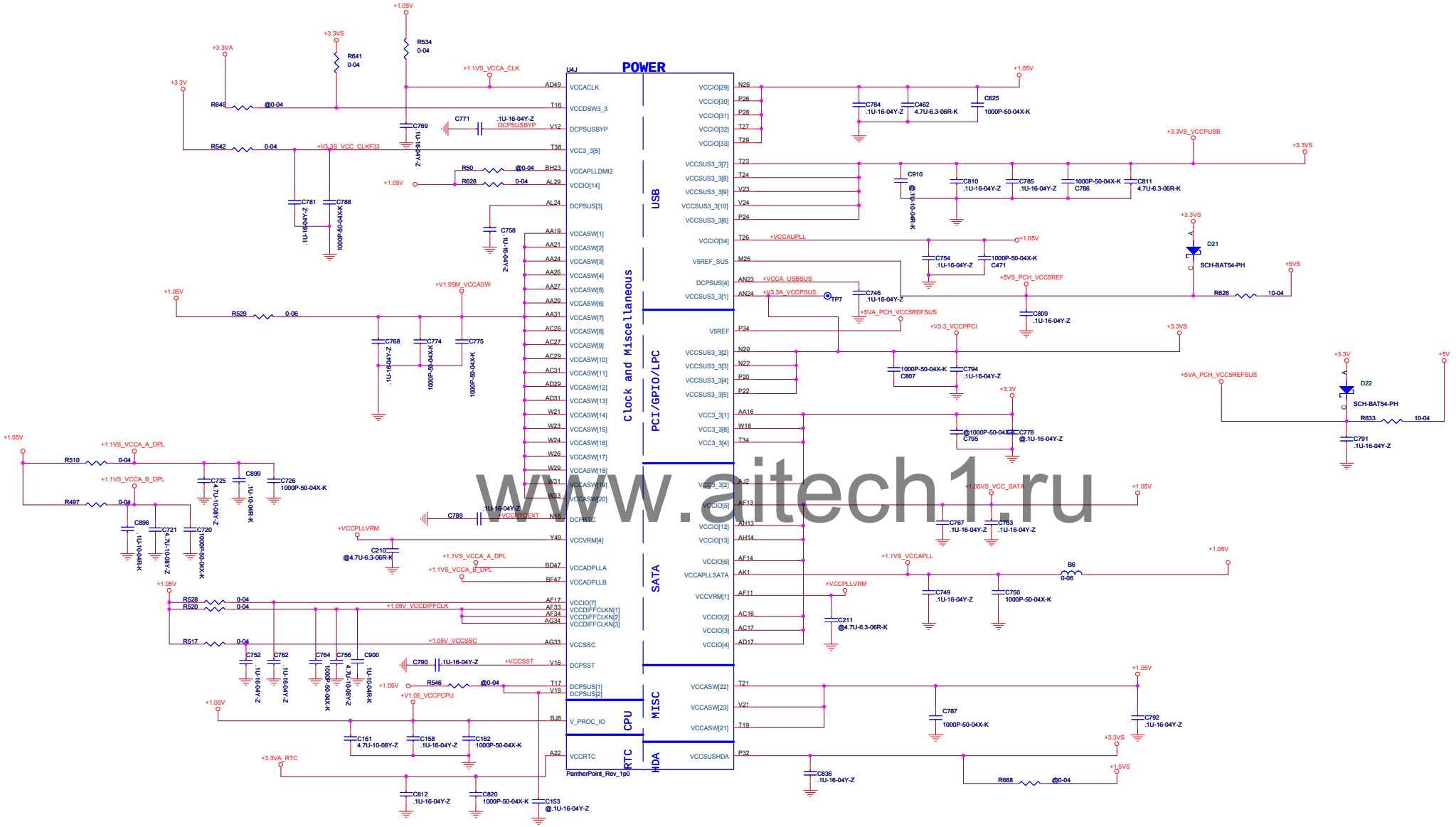

Shuttle Inc		
Title: C14CR		
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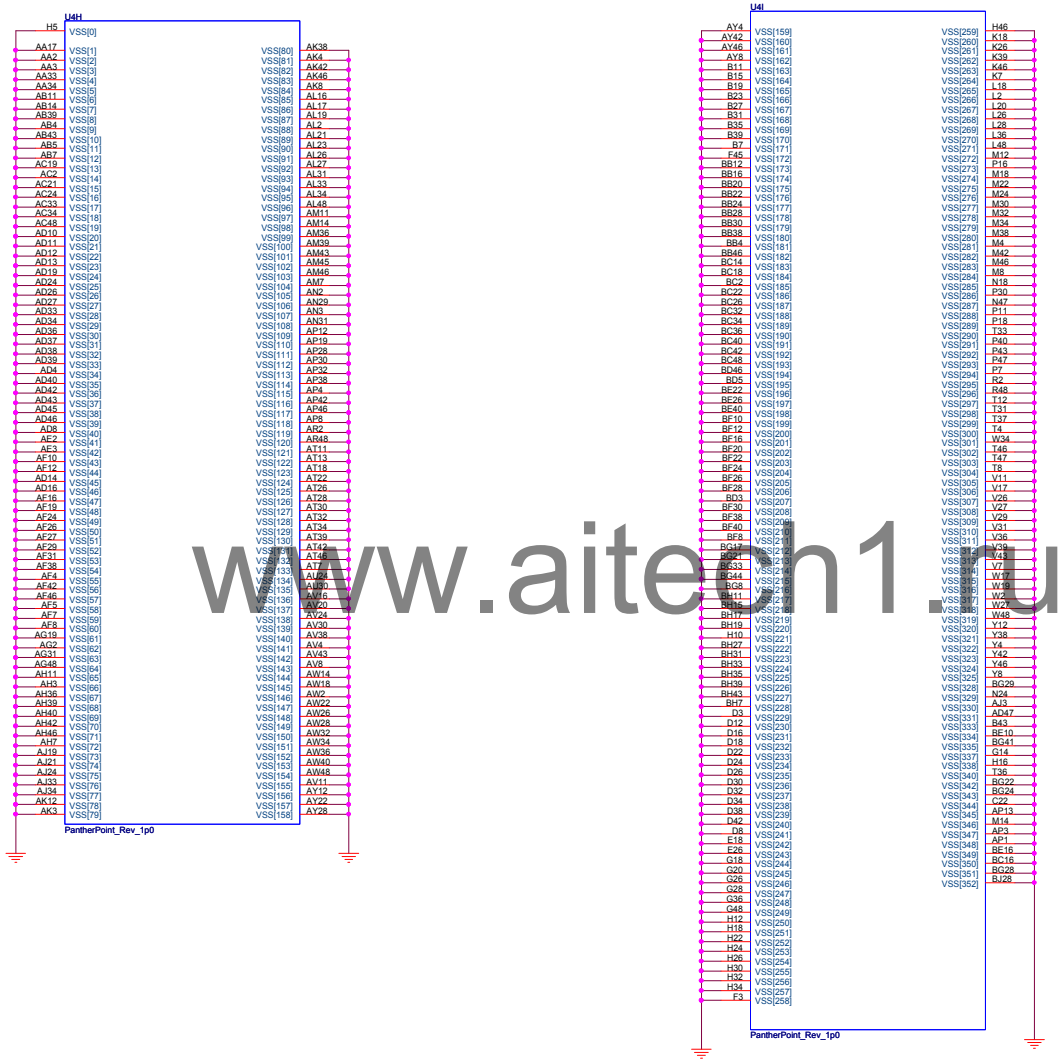

Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: PCH GND (9 of 9)	Rev: A
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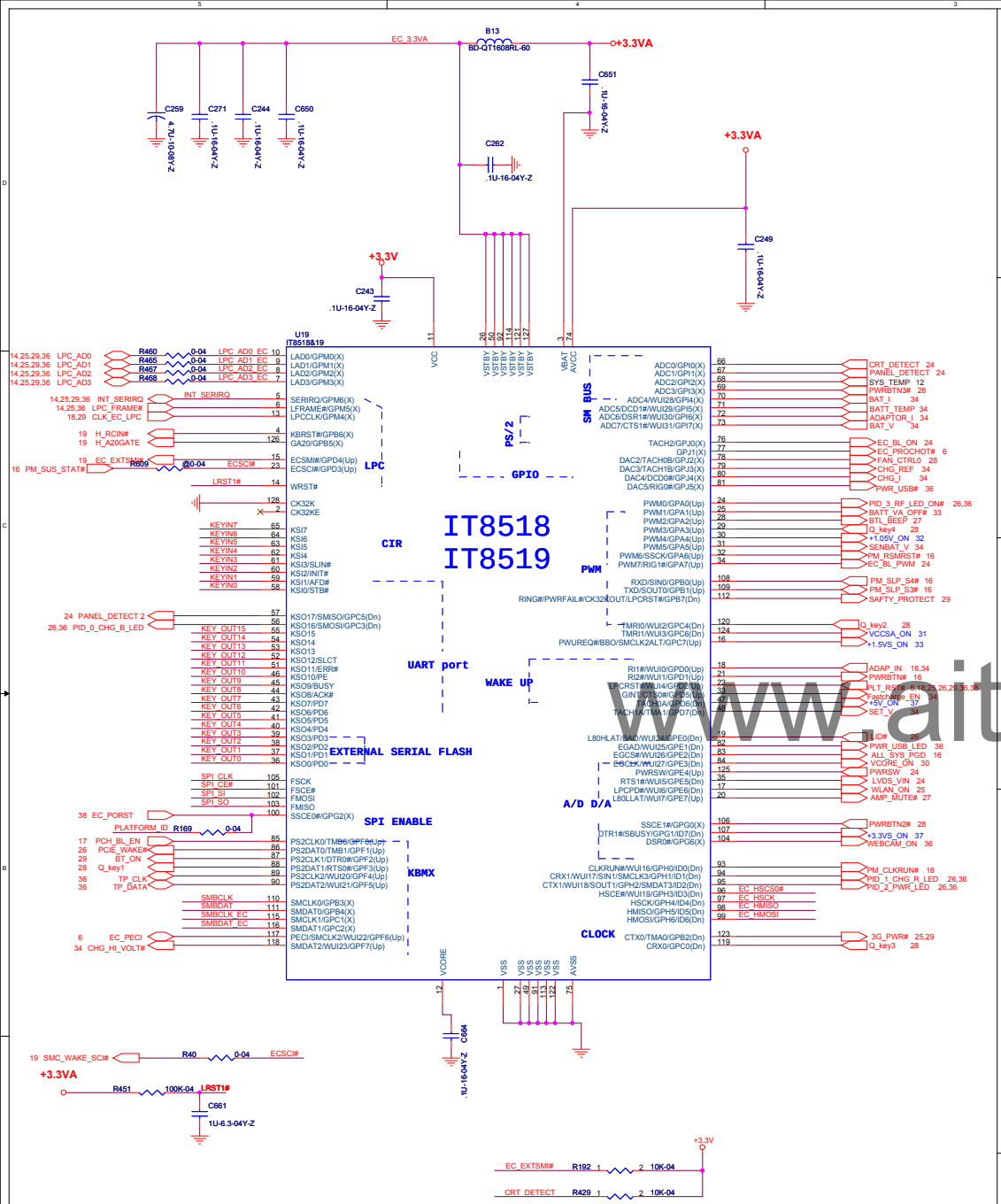

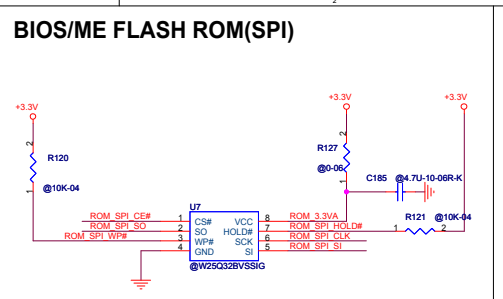

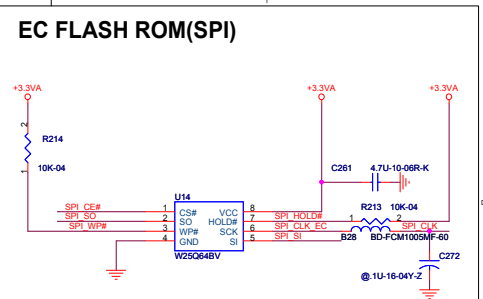

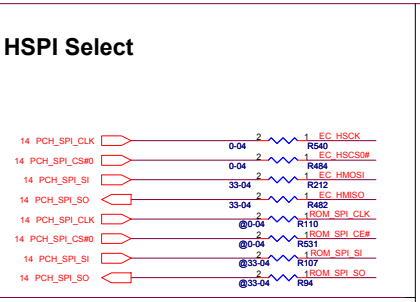

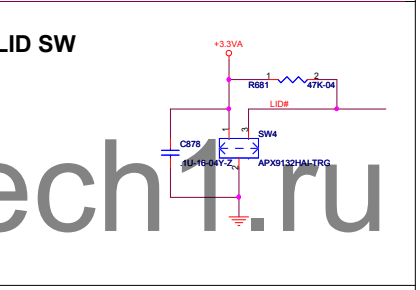

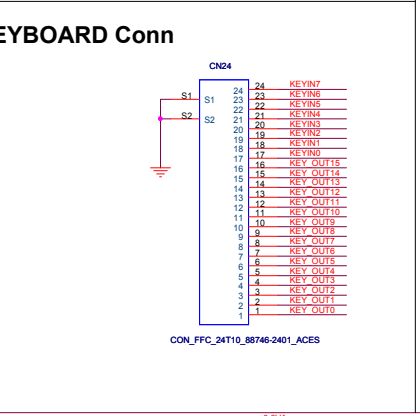

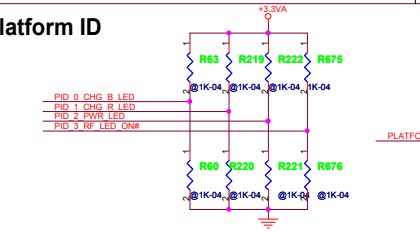

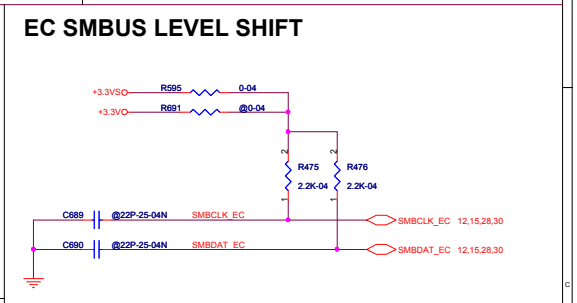

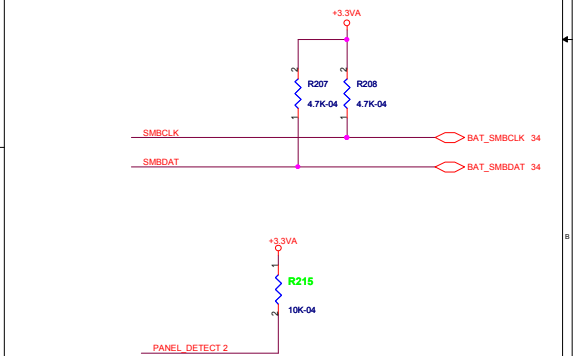

SMB0	only for Batt.
SMB1	PCH,G-sensor

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Title: C14CR

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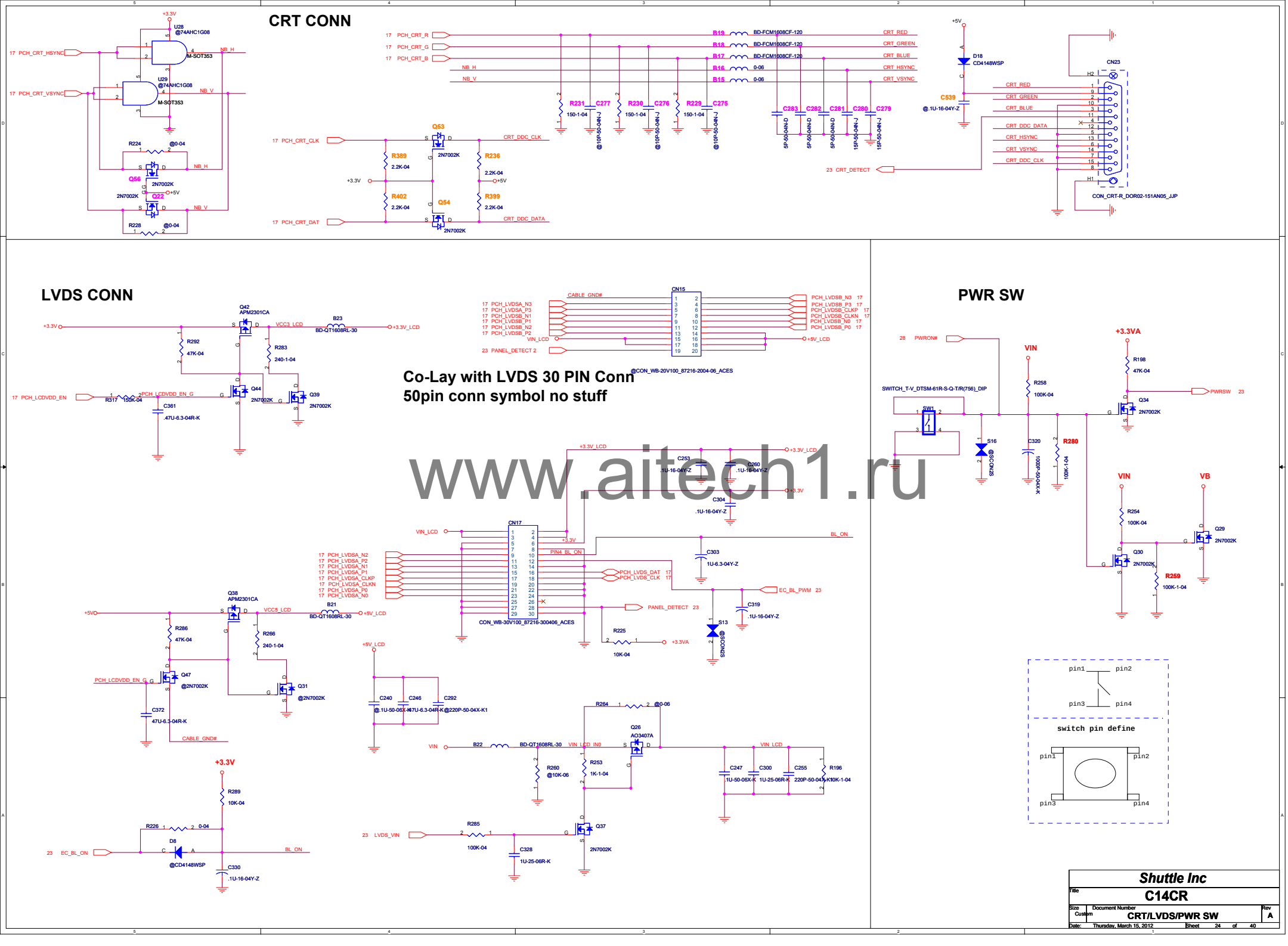
CRT CONN
LVDS CONN
PWR SW
Co-Lay with LVDS 30 PIN Conn
50pin conn symbol no stuff
www.aitech1.ru
switch pin define
pin1
pin2
pin3
pin4
Shuttle Inc
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CRT/LVDS/PWR SW
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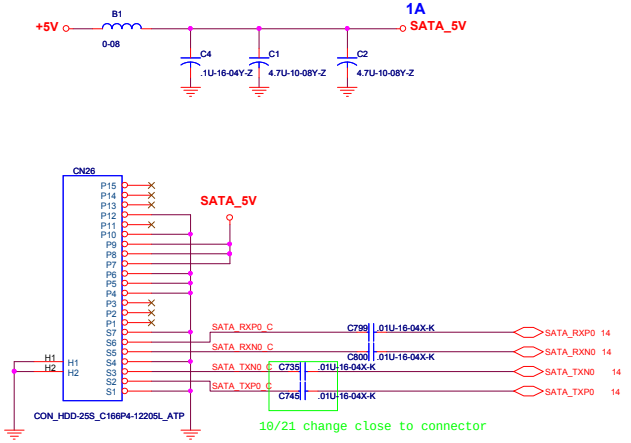
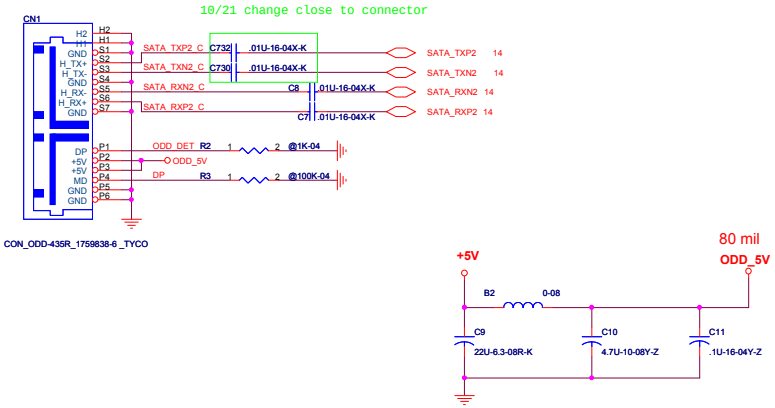
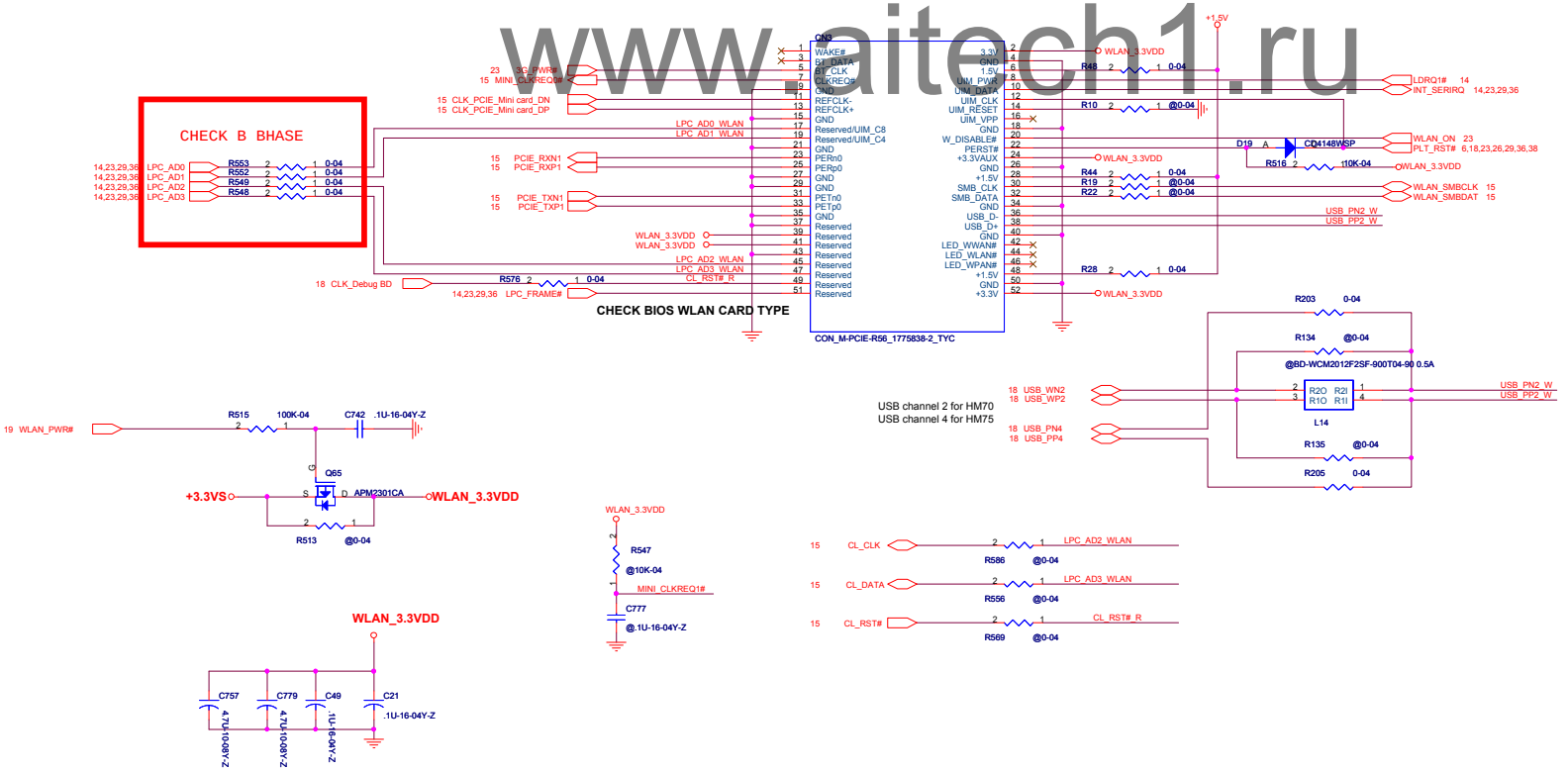
SATA-HDD



CD-ROM



MINI CARD CONN



Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: HDD/ODD /MINI CARD		Rev: A
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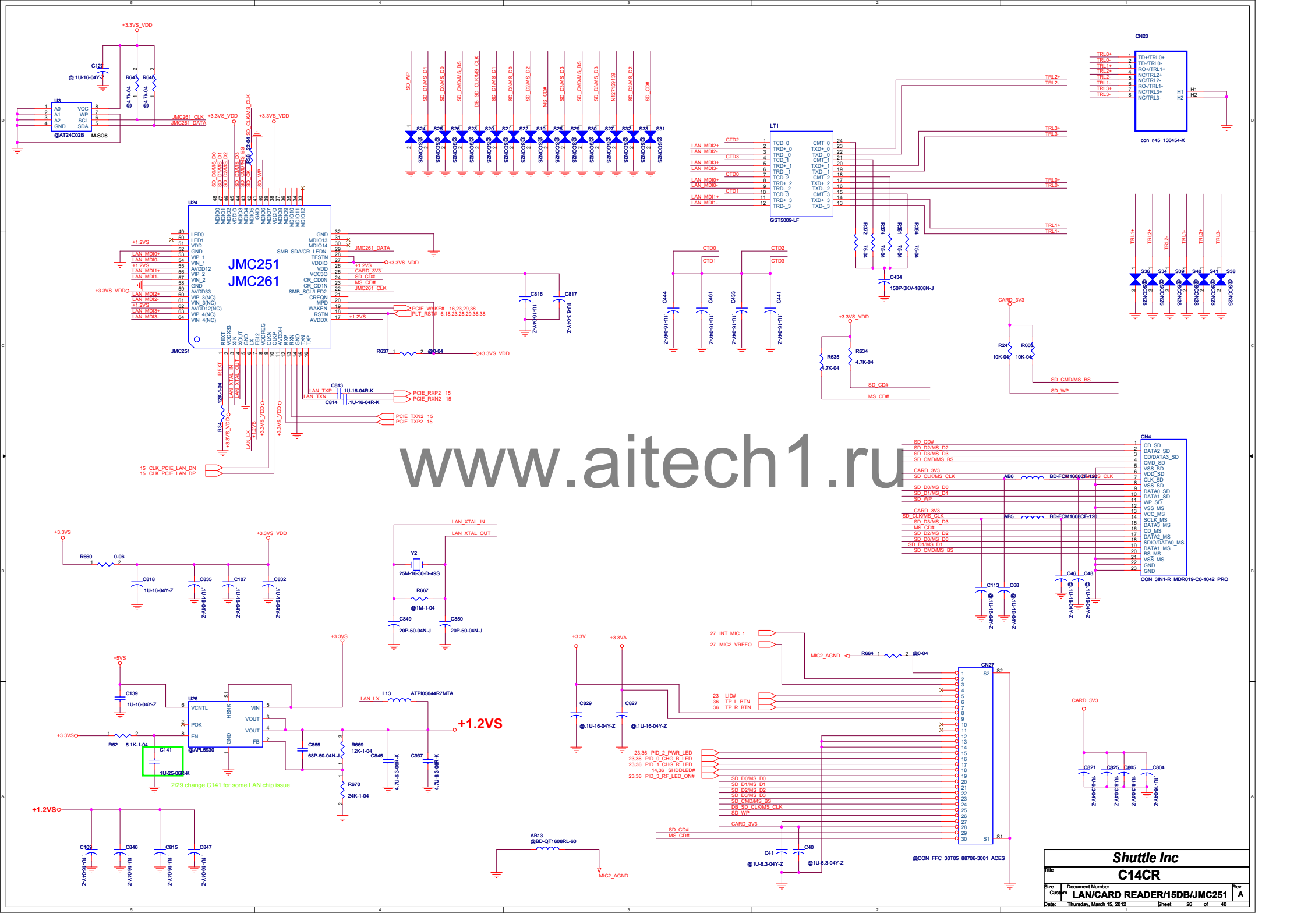
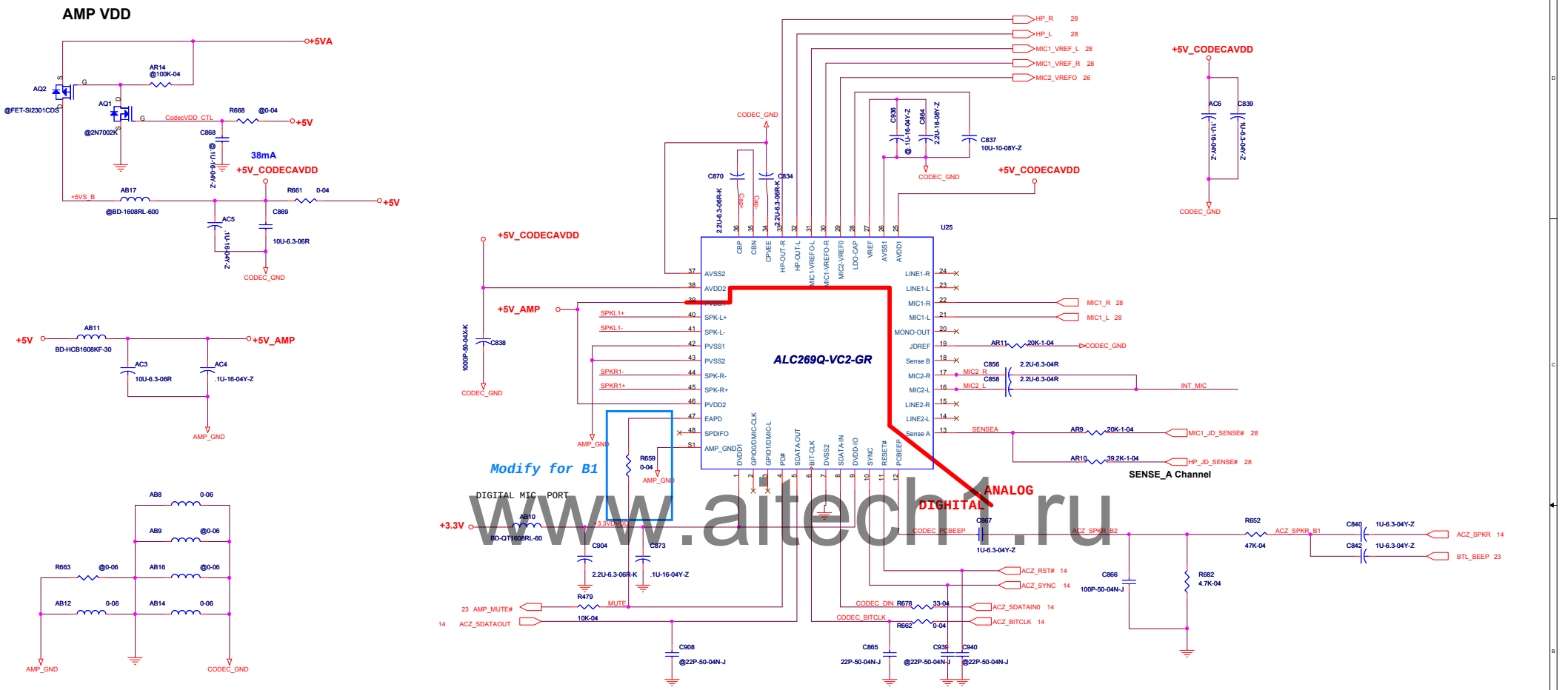
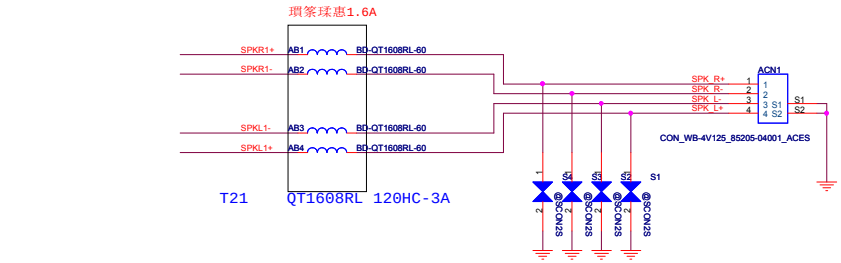


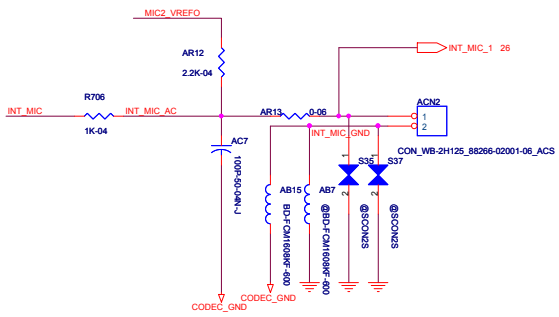
CODEC ALC269Q



INT_SPEAKER



INT_MIC



Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: CODEC(ALC269)/INT MIC/SPKR	Rev: A
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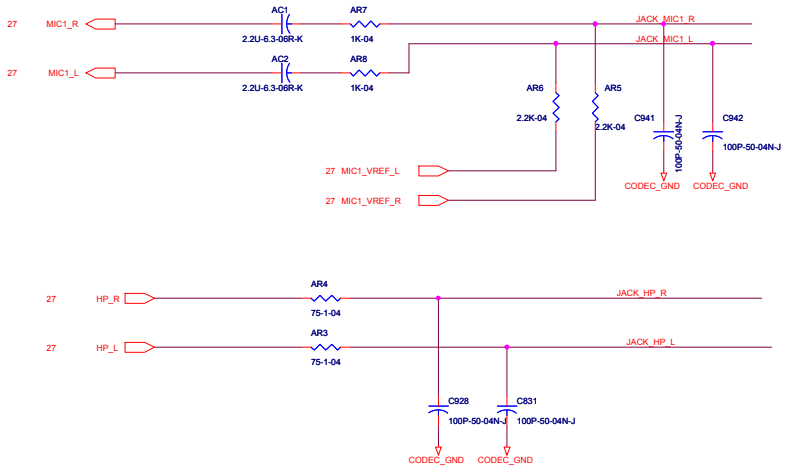
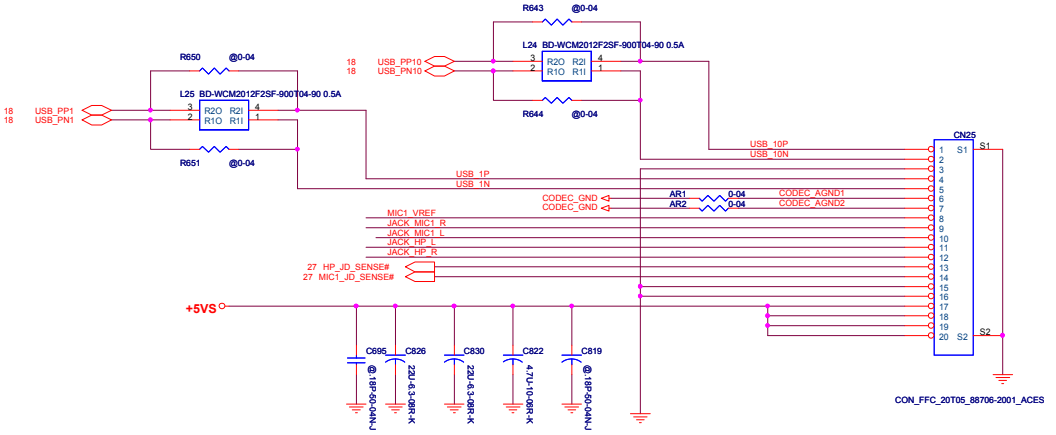
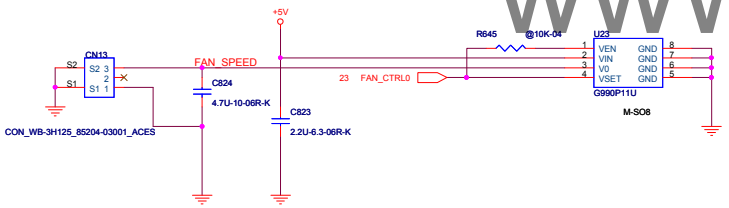
EXT MIC / EXT LINE IN / EXT USB JACK

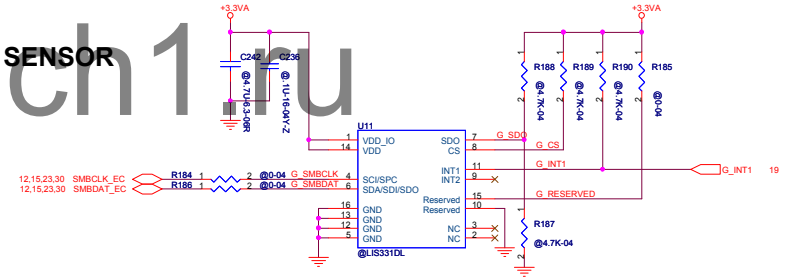




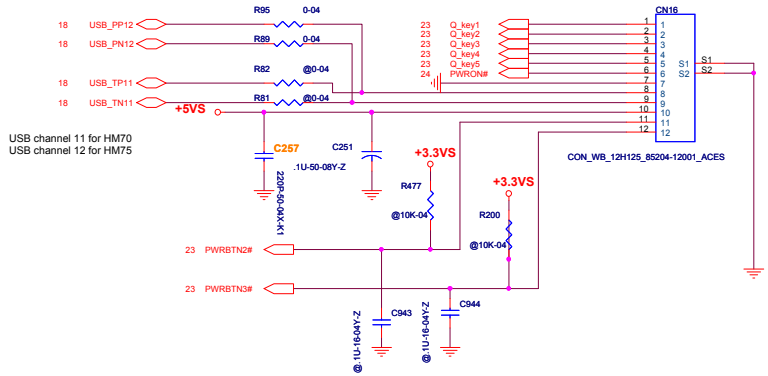
FAN CONTROLLER



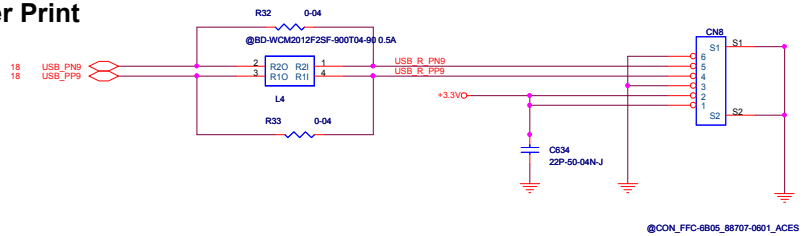
G SENSOR



EXT USB PORT 4 & Q KEY



Finger Print



Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: EXT_MIC/H_P/USB/FAN/G-SENSOR/3G	Rev: A
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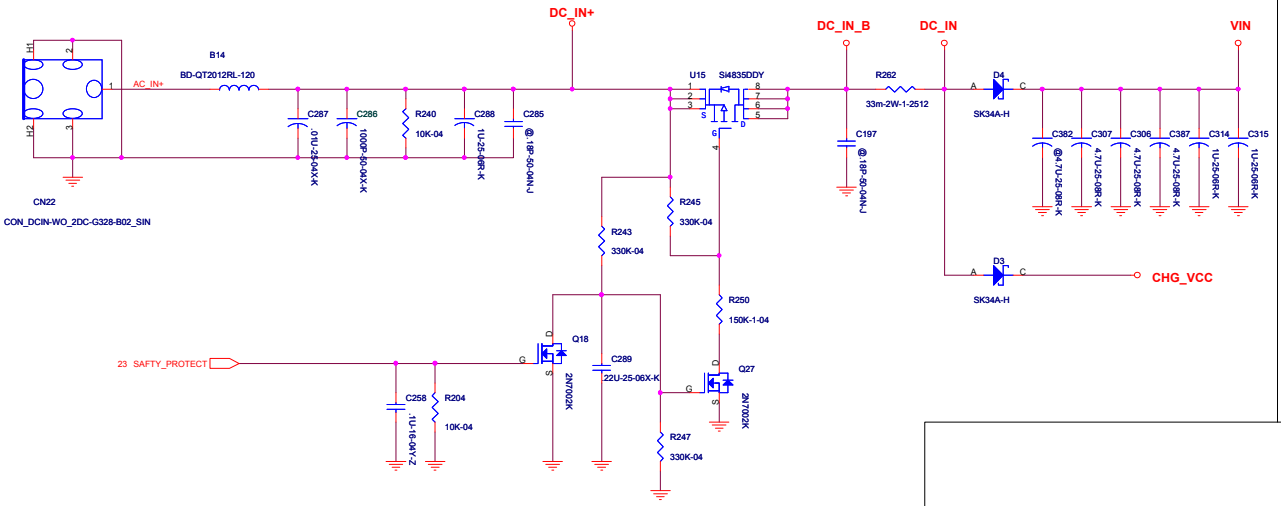
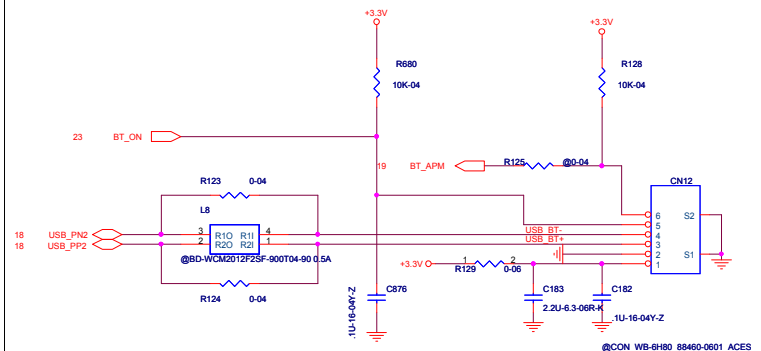
DC IN

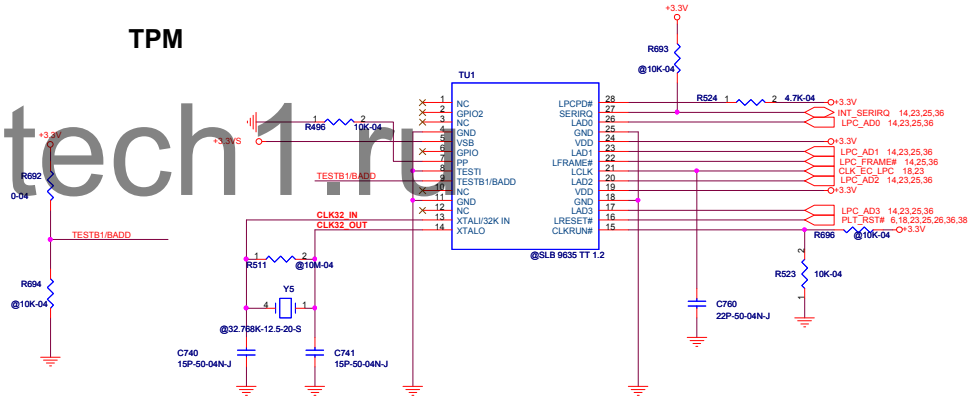
PROJECT	C14CR03		
Adaptor	65W	90W	120W
Rsense	33m Ohm	25m Ohm	18m Ohm
Stop Charger	60W	80W	110W



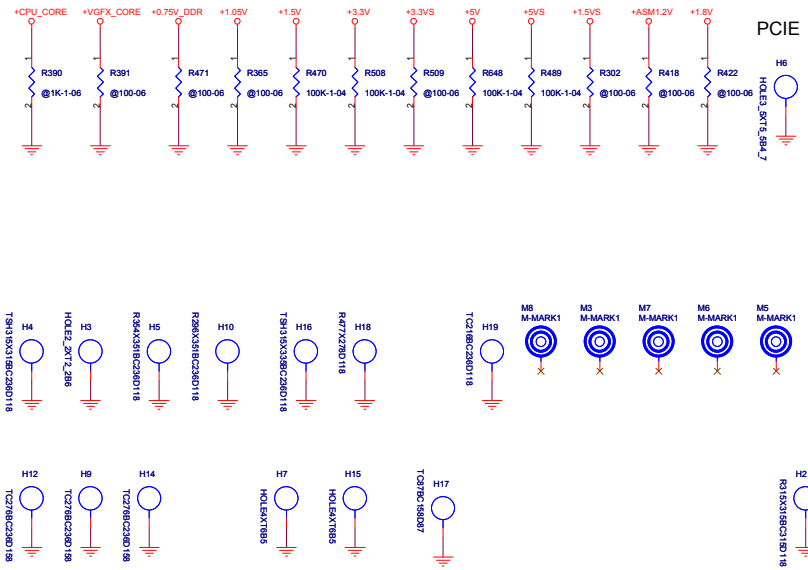
BT CONN

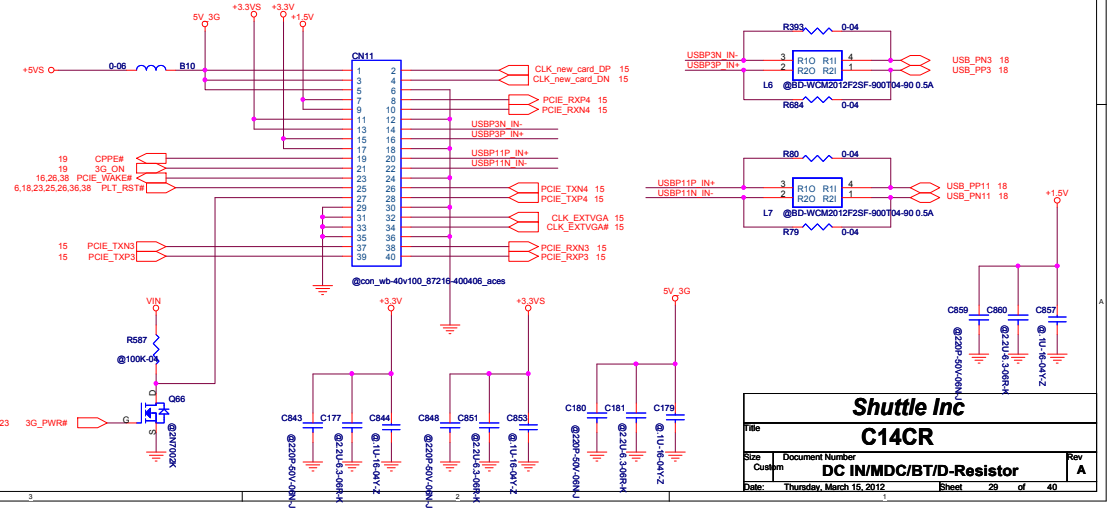


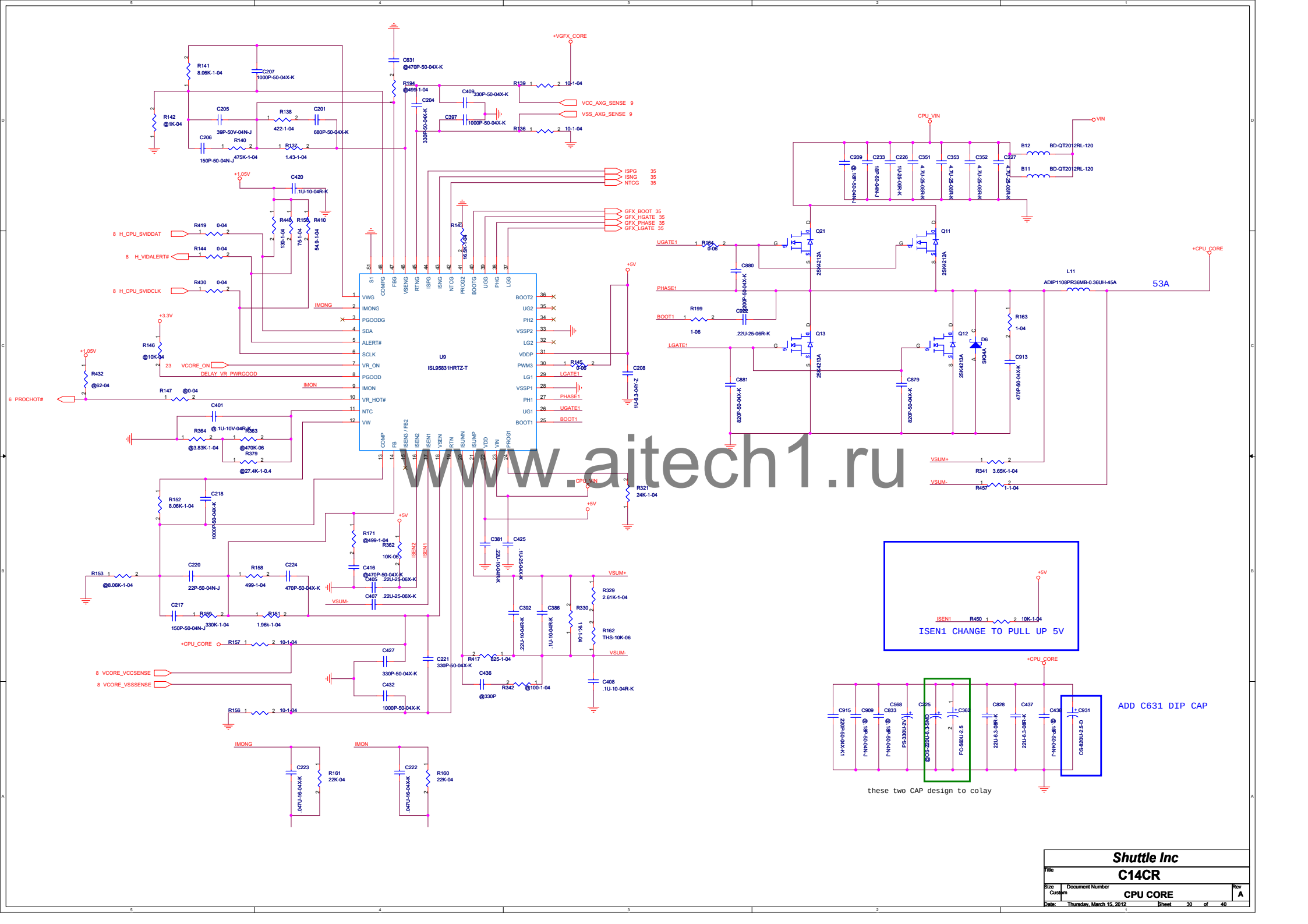
TPM



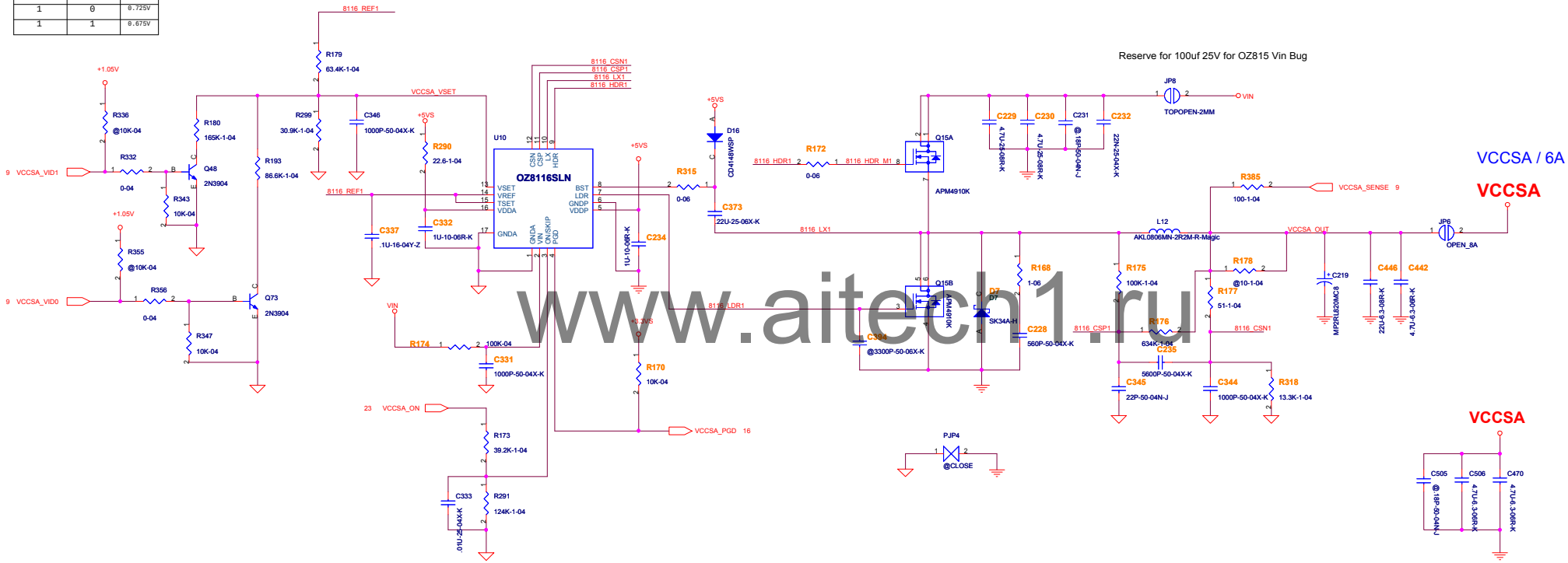
Discharge Resistor







VCCSA_SEL		
VCCSA_VID0	VCCSA_VID1	V_set
0	0	0.9V
0	1	0.8V
1	0	0.725V
1	1	0.675V



Title	C14CR	
Size: Custom	Document Number: CPU VCCSA	Rev: A
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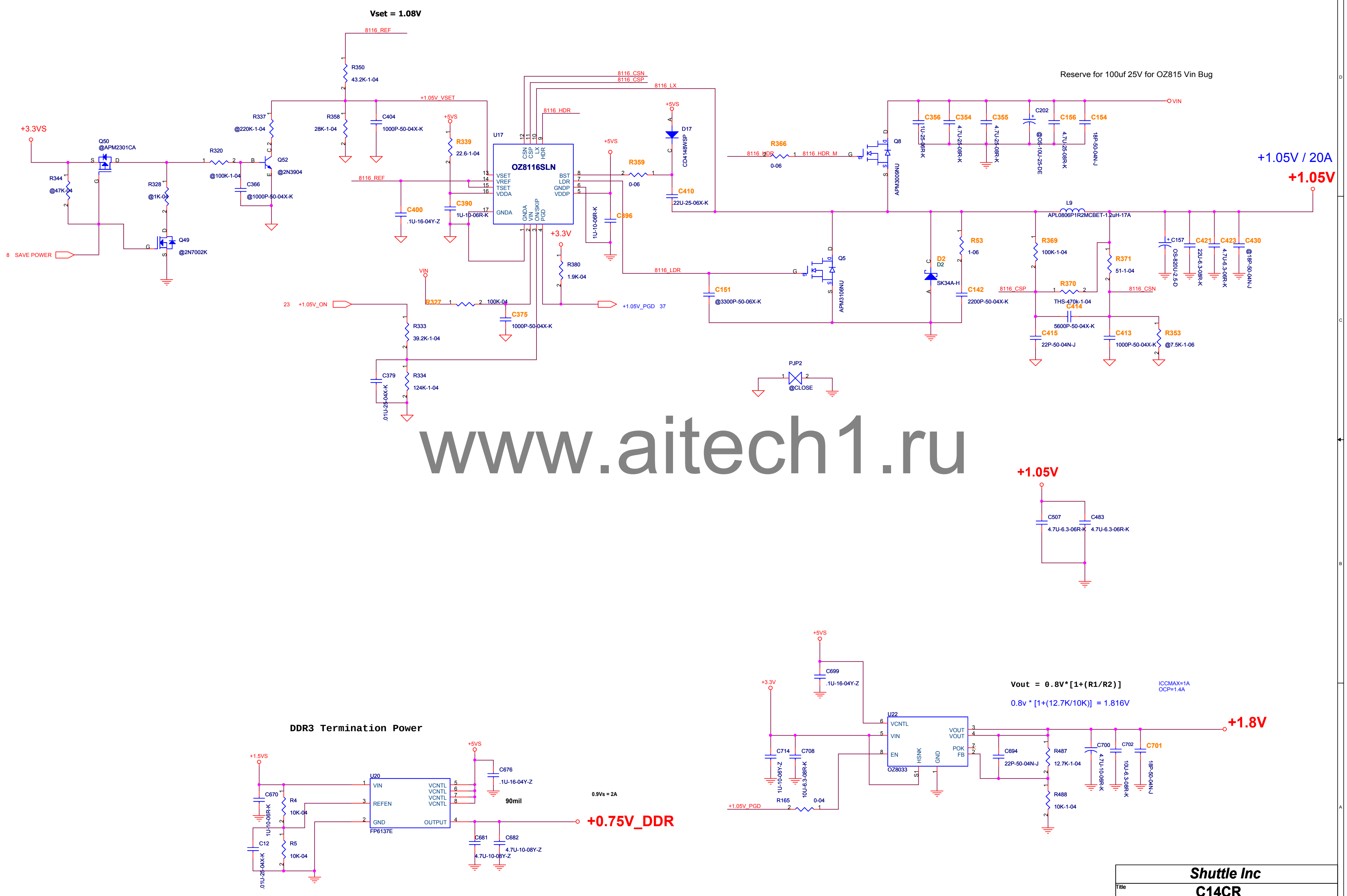

Shuttle Inc

Title: C14CR

Size: Custom | Document Number: +1.5VS(OZ8116)/+0.75VS/+1.8V | Rev: A

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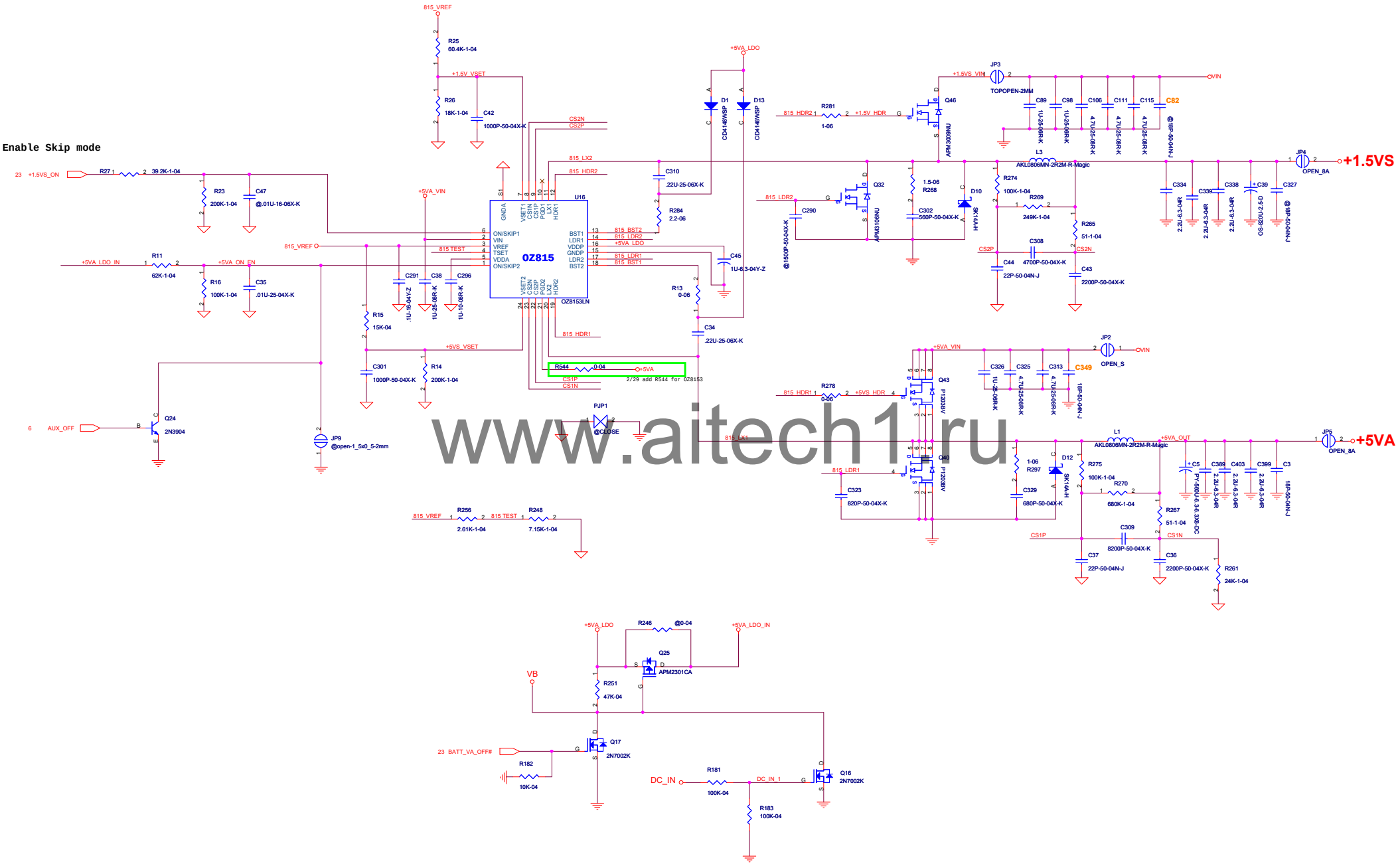
+1.8V/+5V_ON Voltage	Mode
<0.4V	OFF
>0.6V	PWM
>2.1V	SKIP

Output Voltage =[Vref x R2/(R1+R2)] x 2

Enable Skip mode



Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: +1.05VS/+5VA (OZ815)		Rev: A
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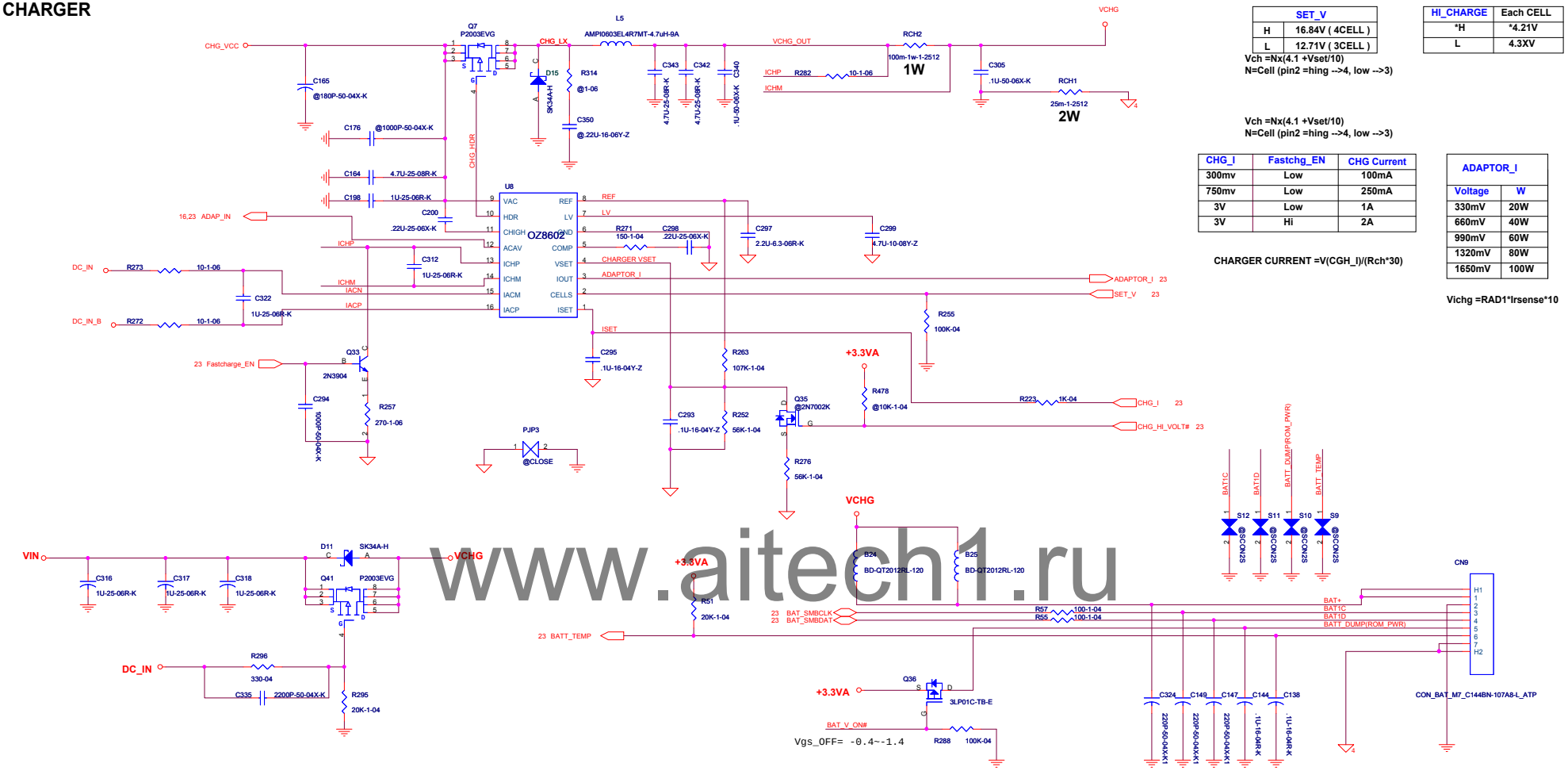
CHARGER



SET_V	
H	16.84V (4CELL)
L	12.71V (3CELL)

Vch =Nx(4.1 +Vset/10)
N=Cell (pin2 =hing -->4, low -->3)

HI_CHARGE	Each CELL
*H	*4.21V
L	4.3XV

Vch =Nx(4.1 +Vset/10)
N=Cell (pin2 =hing -->4, low -->3)

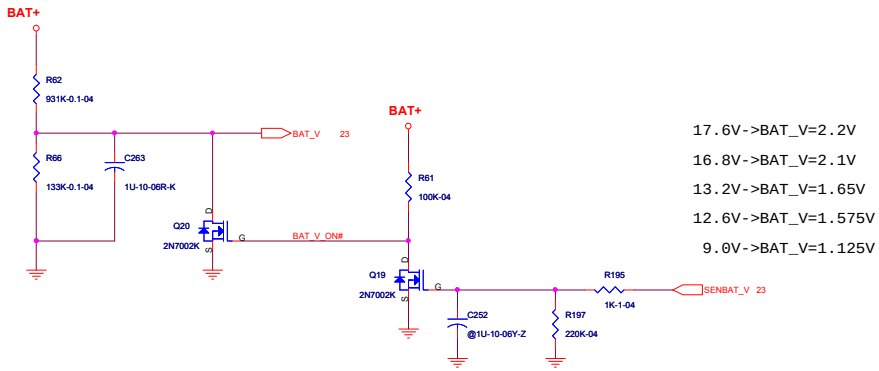
CHG_I	Fastchg_EN	CHG Current
300mv	Low	100mA
750mv	Low	250mA
3V	Low	1A
3V	Hi	2A

CHARGER CURRENT =V(CGH_I)/(Rch*30)

ADAPTOR_I	
Voltage	W
330mV	20W
660mV	40W
990mV	60W
1320mV	80W
1650mV	100W

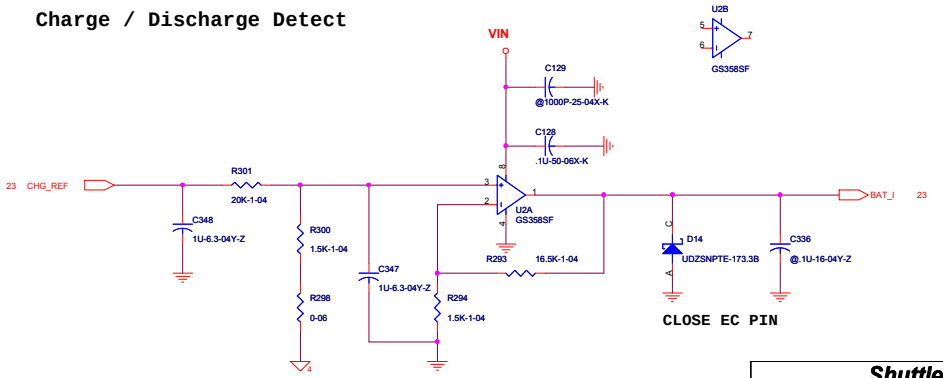
Vichg =RAD1*Irsense*10

Battery Voltage Detect



17.6V->BAT_V=2.2V
16.8V->BAT_V=2.1V
13.2V->BAT_V=1.65V
12.6V->BAT_V=1.575V
9.0V->BAT_V=1.125V

Charge / Discharge Detect



CLOSE EC PIN

Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: BATT IN/CHARGER(OZ8602)	Rev: A
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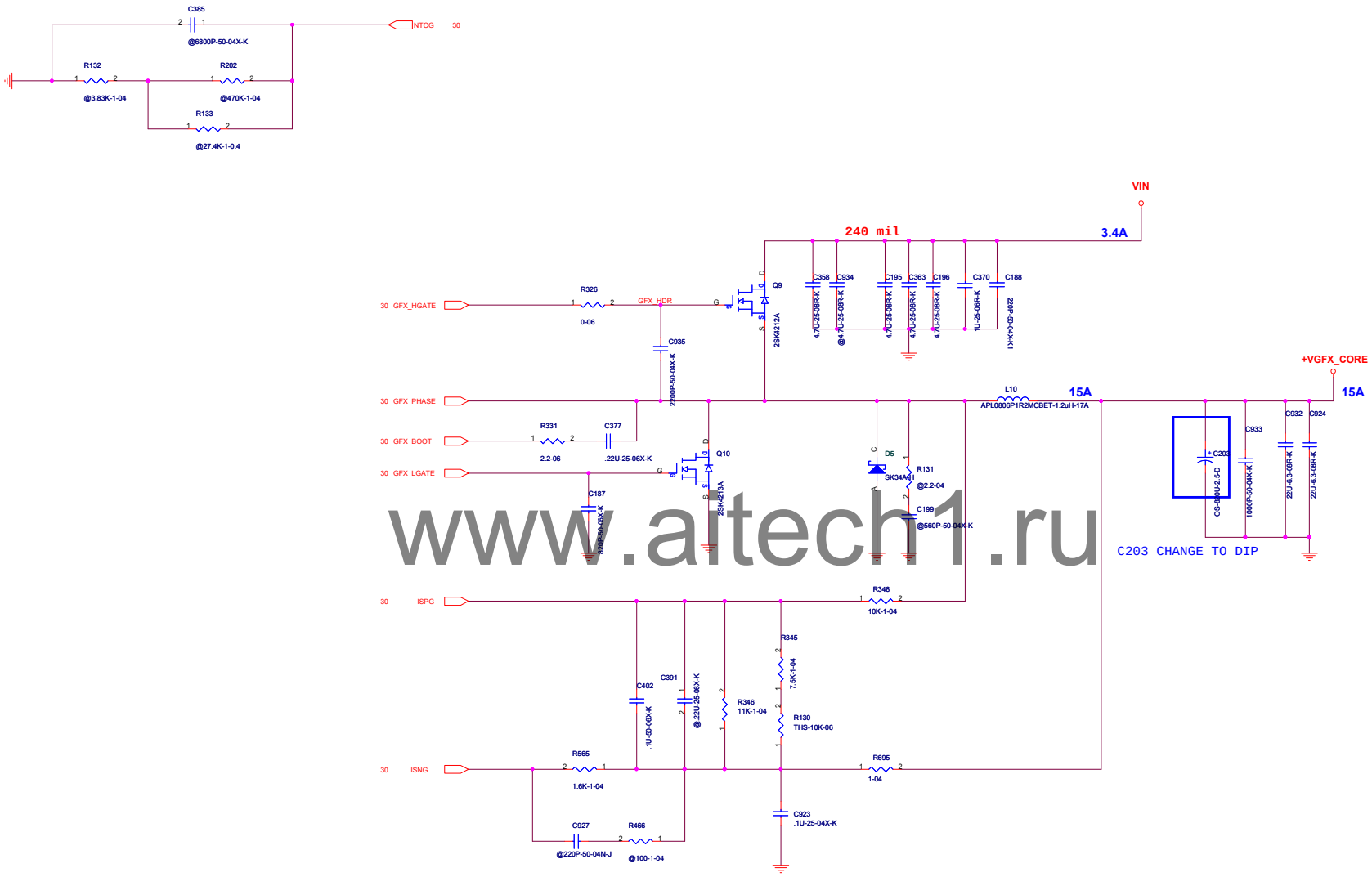

Shuttle Inc		
Title: C14CR		
Size: Custom	Document Number: iGPU_CORE	Rev: A
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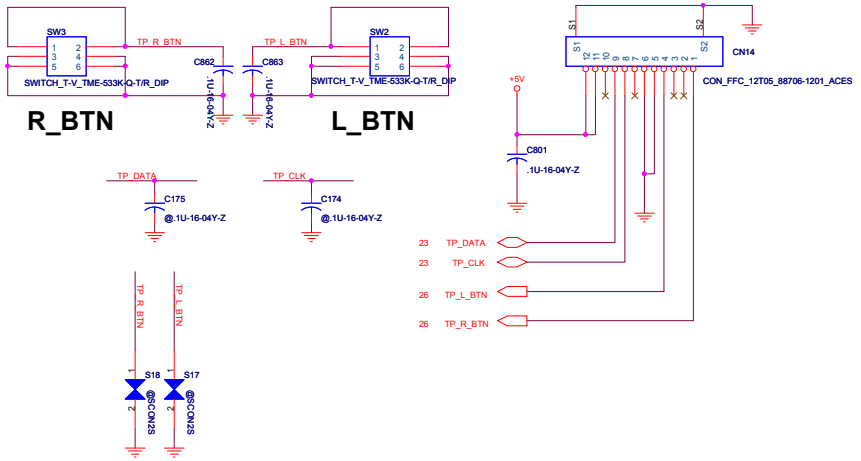
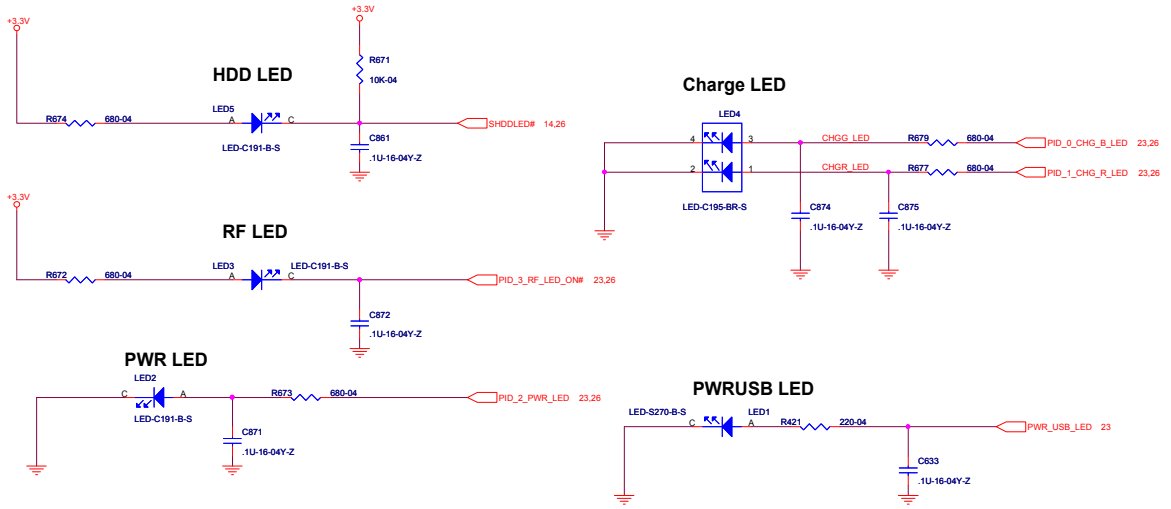
Touch Pad

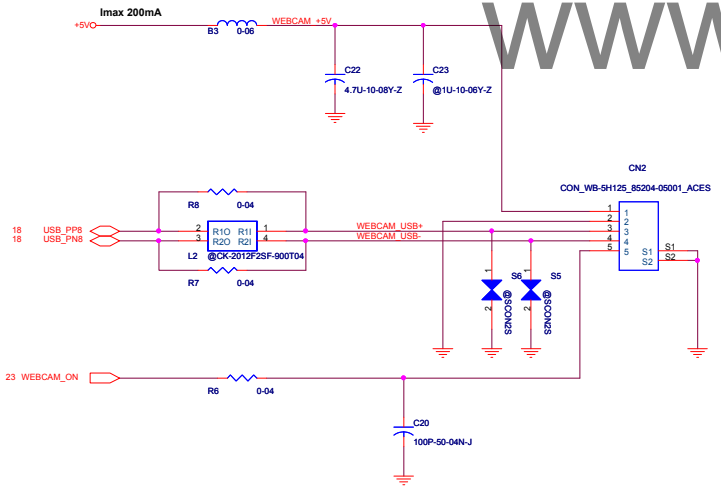


LED

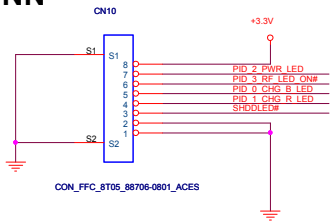


Webcam CONN

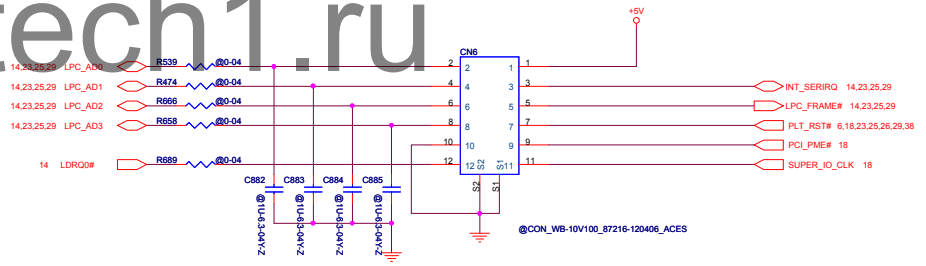
WEBCAM_ON	
1	ON
0	OFF



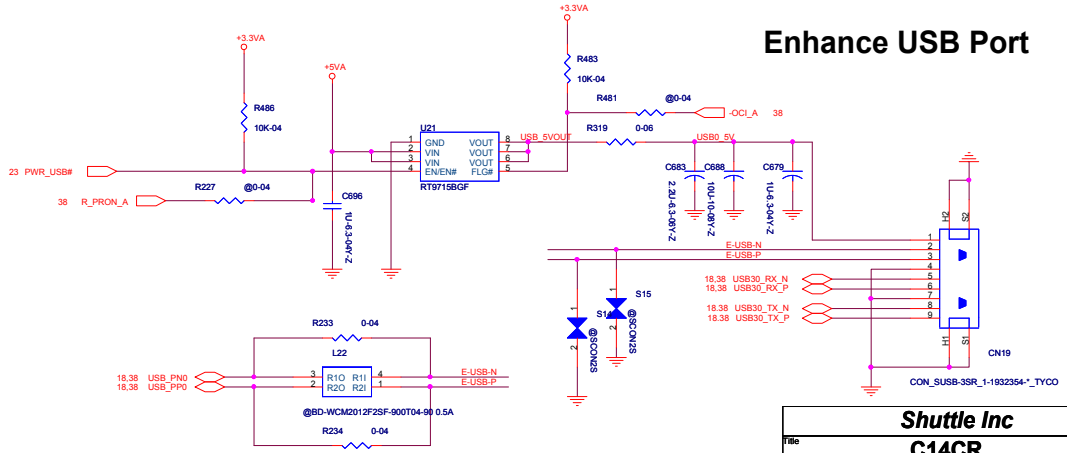
LED CONN



RS232 CONN



Enhance USB Port



Shuttle Inc			
Title: C14CR			
Size: Custom	Document Number: TP/LED/WEBCAM/USB CHARGER		Rev: A
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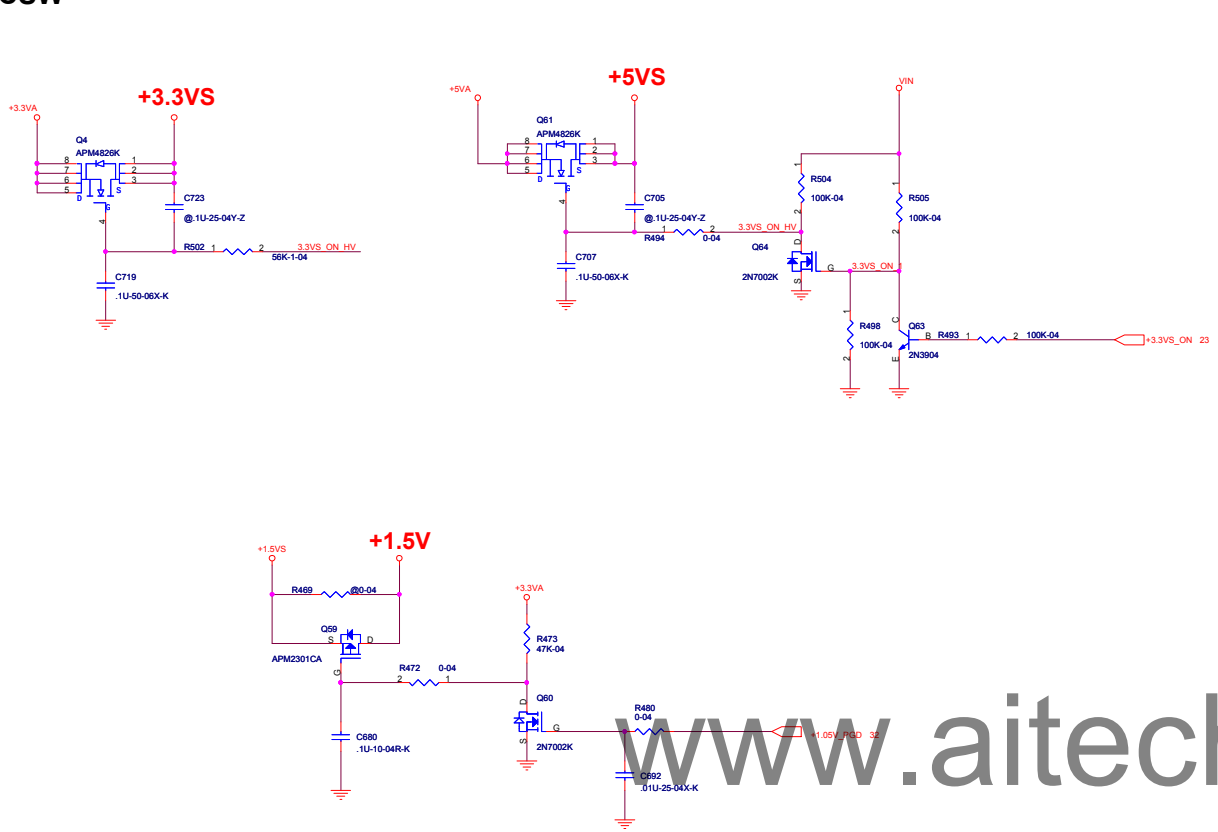
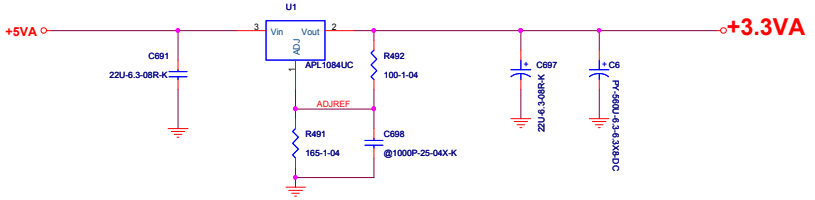
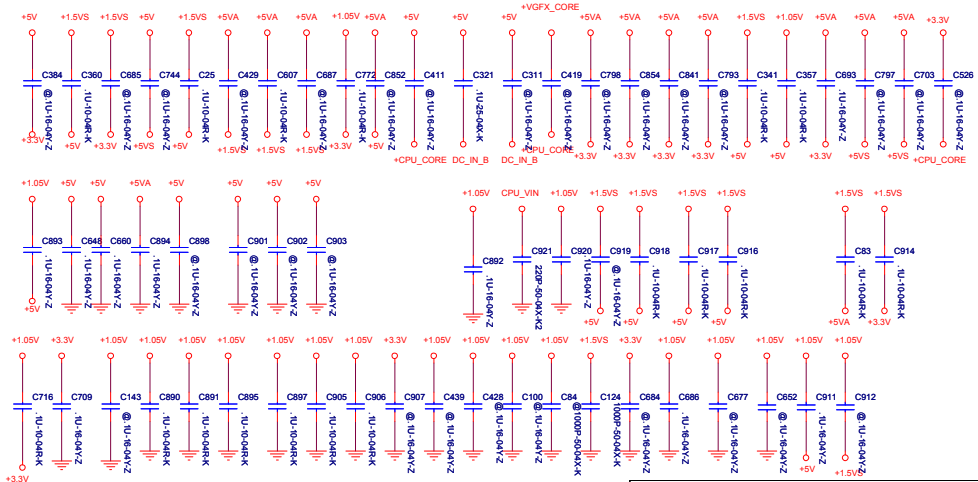
VCCSW



LDO



HIGH-SPEED CAP



	Shuttle Inc		
Title	C14CR		
Size: Custom	Document Number: VCC SW/+3.3VA/HIGH-SPEED CAP		Rev: A
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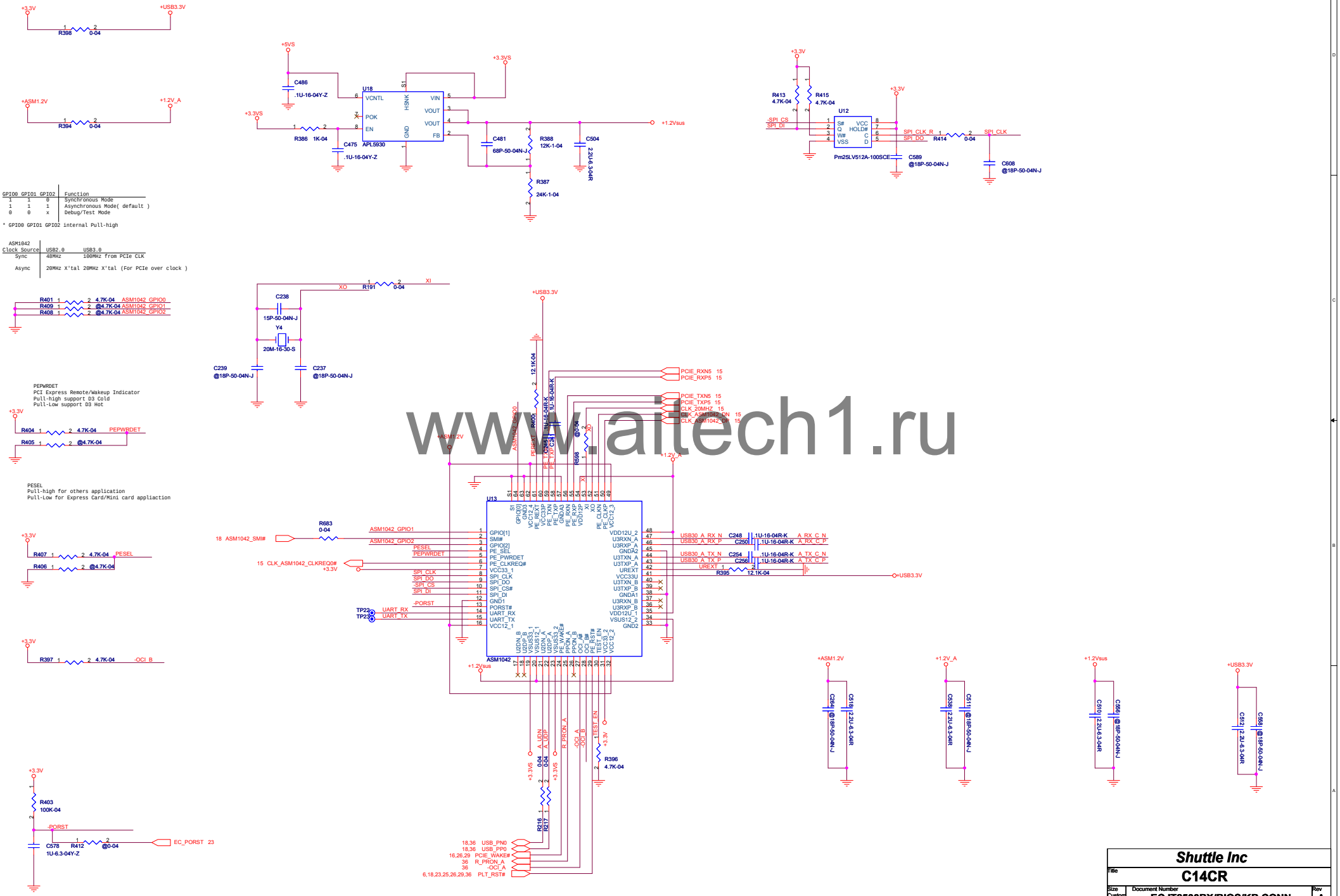
USB 3.0



Shuttle Inc		
Title	C14CR	
Size: Custom	Document Number: EC IT8500BX/BIOS/KB CONN	Rev: A
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Shuttle Inc		
Title: **C14CR**		
Size: Custom	Document Number: **Reserved**	Rev: **A**
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MA1:Change net name from PCH_SMB_CLK to PCH_SMB_CLK_DDR
MA2:Change net name from PCH_SMB_DATA to PCH_SMB_DATA_DDR
MA3:DEL CLK_ASM1042_CLKREQ0# path(R87 OP)
MA4:Change ACPRESENT to EC pin 88
MA5:ADD 0R FOR 25MHZ CLK(R534)
MA6:ADD 0R FOR PCH SATA POWER(B6)
MA7:Sharing System BIOS ROM for KB & EC Codes(Del U7)
MA8:ADD EC_HSCK path for sharing ROM(ADD R540)
MA9:ADD EC_HSCS0# path for sharing ROM(ADD R484)
MA10:ADD EC_HMOSI path for sharing ROM(ADD R212)
MA11:ADD EC_HMISO path for sharing ROM(ADD R482)
MA12:ADD 0R FOR AMP_GND(ADD AB12)
MA13:Change CN16 PIN DEFINE
MA14:DEL R147 for PROCHOT issue
MA15:ADD ISEN1 Pull Hi +5V(ADD R356)
MA16:Change C203 SMD CAP TO DIP CAP
MA17:ADD ASM1042_SMI# path(ADD R683)
MA18:Change CN19 PIN DEFINE
MA19:ADD EMI solution(ADD C251,C257,C357,C341,C684,C686,C25,C660,C677   DEL C99,C430)

MB1:Change CPURST# path(OP:R457,Q72,R656,Q71,R659   ADD:R452,R453)
MB2:Change DDR3_DRAMRST_R path(OP:Q67   ADD:R628)
MB3:Change PM_SYSRST# Pull_up power to +3.3V
MB4:Change USB part 1(External USB)to USB part 12 for testingSignal
MB5:Sharing System BIOS ROM for KB & EC Codes(OP:R110,R531,R107,R94)
MB6:ADD SYS_TEMP EC Pin68 for Thermal(ADD RT1,R426)
MB7:ADD CPU Thermal Sensor NTC7717U for Thermal(ADD U27,R693,C887)
MB8:Change SATA3RBIAS external pull-down resistor for testingSignal (R90:1K-1-04)
MB9:ADD RS-232 CONNECT FOR DA18(OP:CN6,,R539,R474,R666,R658,R689,C882,C883,C884,C885)
MB10:Change ASM1042_SMI# path for AMI(GPIO4)

V1.0 1:Change R417 resistor 0R
V1.0 2:Add R400,R395 resistor for BOM issue
V1.0 3:Change R403 resistor 100K for USB3.0 power sequence
V1.0 4:Add R193,C585,R171,C416 place for ISL95831 IC
V1.0 5:ADD EMI solution(OP:C430,C428,C912,C652,C677,C327,C368,C369,C82,C778,C795,C153,C146,C722 Add:C251,C257,C357,C341,C25,AB8.AB9,C360,C83,C917,C879,C188,C916,C607,C918,C914,C772,C716,C321,C758,C746)

1. 10/10 connect SM_VREF(page 09) to DIMM pin 126(page 12,13)
2. 10/10 R360 R361 placement, R323 R416 OP (page12,13)
3. 10/10 R433 mount, R437 OP(page 23)
4. 10/10 change CRT HSYNC & VSYNC FET to gate, change C279, C280 from 10p to 15p (page 24).
5. 10/11 A,B phase Power input & output add jump, convenient for power measurement & debug
6. 10/11 VCCSA power R178 unmount
7. 10/11 1.05V power R337unmount，disable VCCIO 1.0V, reserve the other circuit.
8. 10/20 C693 C894 placement for ESD issue (page 37)
9. 10/21 separate connect MIC1_VREF_L & MIC1_VREF_R to MIC1_L & MIC1_R (page 28)
10. 10/21 add C928 C831 & AR7 AR8. (page 28)
11. 10/21 change CPU core,IGPU core to ISL95831
12. 10/21 R352 R354 change to capacitor (C929 C930)
12. 10/22 Cancel JP11,JP12,JP13,JP14
13. 10/22 placement C709
14. 10/21 placement C730 C732 C735 C745 close to connector
15. 11/07 change plateform ID, R433 OP and R437 placement

B Phase

16. 11/30 EMI change R218 to B28, R589 to B29, change value for R662,L24,L25,AR1 , add C938.
17. 11/30 internal USB3.0 change value for C248,C250,C254,C256, mount R481, R401.
18. 11/30 internal USB3.0 add R352,R354
19. 11/30 CRT add Q56,Q22 for colay; U28,U29 unmount; change value for R551.
20. 11/30 flash ROM OP R120,R121,R127,C185.
21. 11/30 VCCSA change C362,C380 to R343,R347; OP R336,R355; change value for R332,R356,R385.
22. 11/30 1.05V OP: Q52,Q50,Q49,R328,R320,R344,R376,C443,C536,C599,R370.
23. 11/30 CPU_CORE OP C527,C562,C594,C225; add C362.
24. 11/30 LAN add C937,L13.
25. 11/30 USB add R89,R95,R203,R205.
26. 11/30 OP 0 ohm resistor: R442,R521,R693,R594,R592,R526,R591,R705,R656,R514,R116,R687,R532,R527,R621,R544,R630,R279,R35,R636,R382,R383,R373,R154,R155,R665,R201,R558,
27. 11/30 audio change value for U25,AR3,AR4; OP: C908,AB7; mount AC7,AB15,AB8; add C941,C942.
28. 11/30 add TPM, finger print, Express card component.
29. 12/02 SATA change value for R537.

12/06 done

C Phase

30. 2/29 add R544 connect to 5VA for OZ8153
31. 2/29 connect +VCCPLLVRM with page 20 and page 21
32. 2/29 add WOL, (connect LAN wake on to EC).
33. 3/2 Del SW5, add JP9

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