ZZZ PCB@

PCB 1Q3 LA-D821P REV1 M/B 1

DA80017D010

UC1 KBL_15W_2+2@

S IC A31 FJ8067702739720 QKKS G0 2.4G

SA00009PJ0L

UC1 SKL_15W@

S IC FJ8066201931104 SR2EU D1 2.3G A31!

SA000092N4L

UC1 KBL_15W_I3@

SA0000A382L

KBL_U_SR2VN

S IC FJ8067702739738 SR2VN H0 2.4G A31!

UC1 KBL_15W_I5@

SA0000A372L

KBL_U_SR2VL

S IC FJ8067702739739 SR2VL H0 2.5G A31!

UC1 KBL_15W_I7@

SA0000A342L

KBL_U_SR2VM

S IC FJ8067702739740 SR2VM H0 2.7G A31!

UC1 KBL_15W_2+1@

S IC A31 FJ8067702739920 QKKQ G0 1.7G

SA00009QM0L

UC1 KBL_15W_SUP_ES@

S IC A31 FJ8067702739718 QKJW G0 2.6G

SA00009UR0L

Compal Confidential

BKA50 / BKA40 / BKD50 / BKD40

MB Schematic Document

LA-D821P

Rev: 1.0

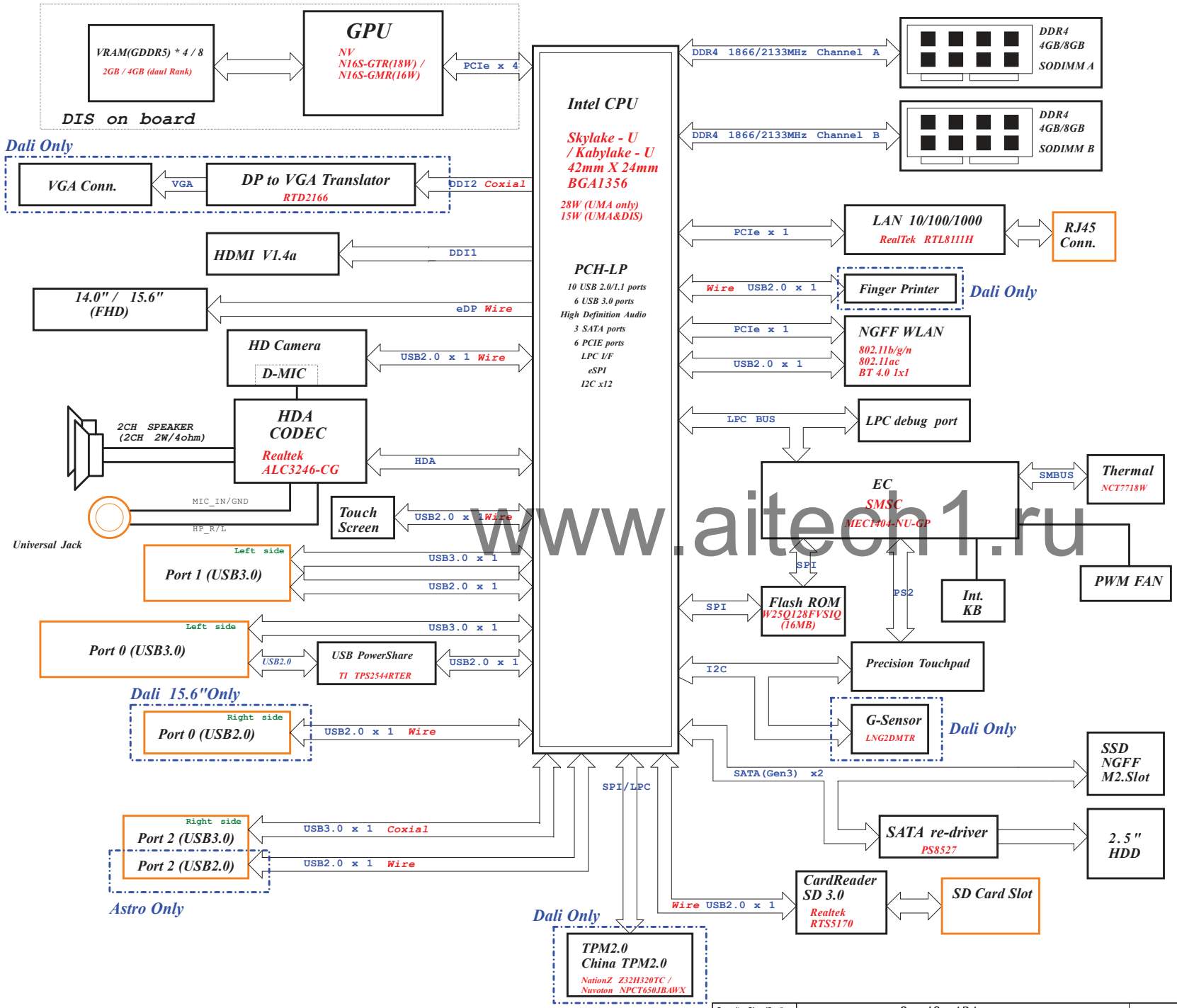
2016.05.30

Compal Electronics, Inc.

Title: Cover Page

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 1 of 55



Security Classification	Compal Secret Data		
Issued Date	2014/05/19	Deciphered Date	2015/12/31

Compal Electronics, Inc.			
Title	SKL-U 2+2 Block Diagrams		
Size	Document Number		Rev
Custom	LA-D821P		0.1
Date:	Monday, June 06, 2016	Sheet 2 of 55	

POWER STATES

State \ Signal	SLP S3#	SLP S4#	SLP S5#	ALWAYS PLANE	SUS PLANE	RUN PLANE	CLOCKS
S0 (Full ON) / M0	HIGH	HIGH	HIGH	ON	ON	ON	ON
S3 (Suspend to RAM) / M3	LOW	HIGH	HIGH	ON	ON	OFF	OFF
S4 (Suspend to DISK) / M3	LOW	LOW	HIGH	ON	OFF	OFF	OFF
S5 (SOFT OFF) / M3	LOW	LOW	LOW	ON	OFF	OFF	OFF
G3	OFF	OFF	OFF	OFF	OFF	OFF	OFF

PM TABLE

State \ power plane	+RTC_CELL +RTC_VCC +3VLP +19VB	+1.0V_PRIM +1.0V_MPHYPLL +5VALW +3VALW +3.3V_ALW_DSW +1.8V_PRIM	+1.0V_VCCST +1.2V_DDR +2.5V_MEM +3VALW_PCH	+1.0VS_VCCIO +1.0V_VCCSTG +VCC_GT +VCC_SA +VCC_CORE +GPU_CORE +5VS +3VS +1.8VS +0.6V_DDR_VTT
S0	ON	ON	ON	ON
S3	ON	ON	ON	OFF
S4&S5 / AC	ON	ON	OFF	OFF
S4&S5 / DC	ON	OFF	OFF	OFF

Board ID & Model ID table

Item	Pull-down(K ohm)	Pull-up (K ohm)	Voltage	Board ID/Model ID
1	100	10.0	3.000	EVT(X00)
2	100	13.7	2.902	DVT1(X01)
3	100	17.8	2.801	DVT2(X02)
4	100	22.1	2.703	Pilot(A00)
5	100	27.0	2.598	
6	100	32.4	2.492	
7	100	37.4	2.402	
8	100	49.9	2.201	
9	100	57.6	2.094	
10	100	64.9	2.001	
11	100	73.2	1.905	
12	100	82.5	1.808	
13	100	93.1	1.709	
14	100	107.0	1.594	

USB PORT#	DESTINATION
1	USB3.0 Port0
2	USB3.0 Port1
3	USB3.0 Port2 (IO Board)
4	USB2.0 Port0
5	HD CAM
6	Card Reader
7	Touch Screen
8	BT
9	Finger Printer
10	N/A

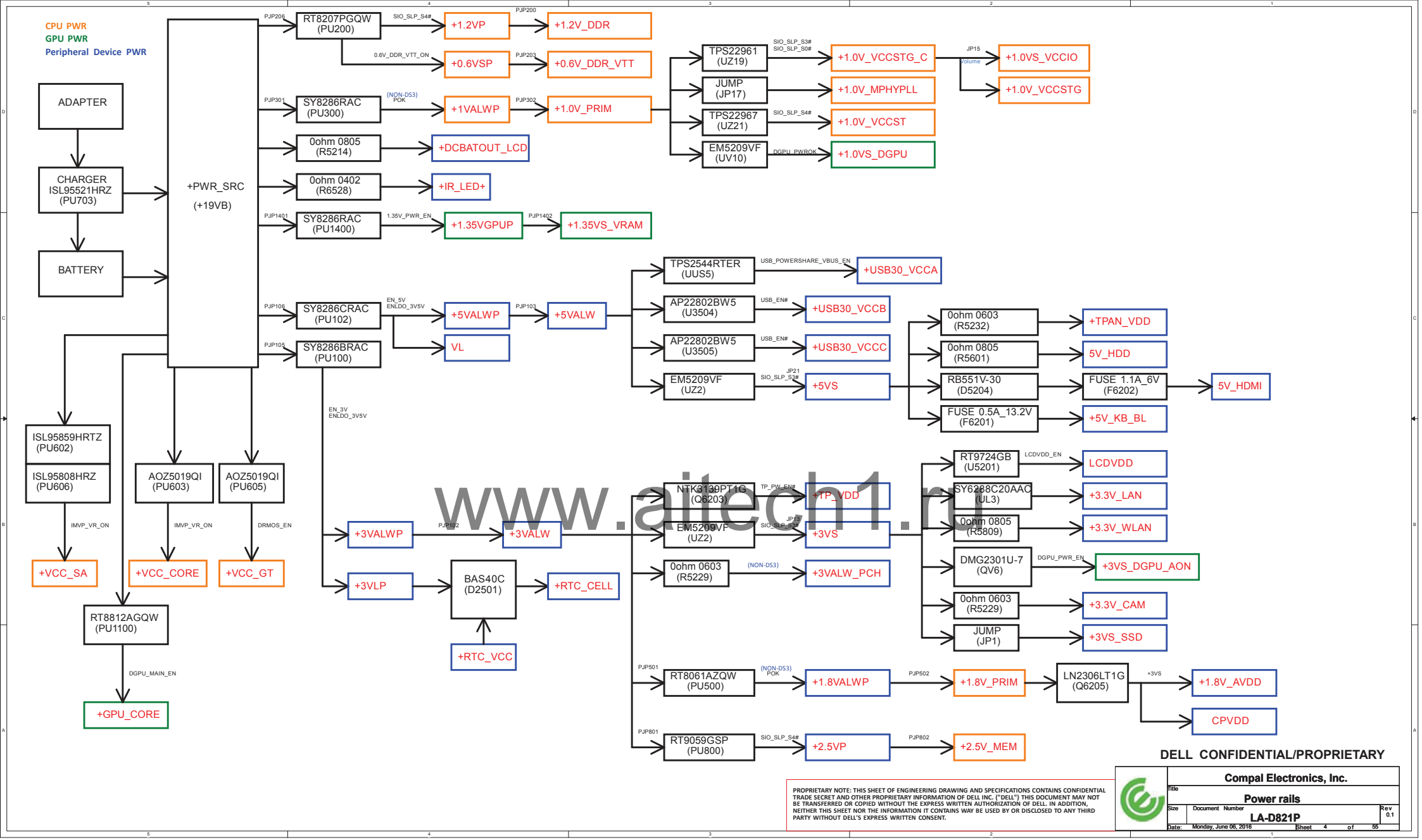
USB3.0	SSIC	PCIE	SATA	DESTINATION
USB3.0-1				USB3.0 Port0
USB3.0-2	SSIC-1			USB3.0 Port1
USB3.0-3	SSIC-2			USB3.0 Port2 (IO Board)
USB3.0-4				N/A
USB3.0-5		PCIE-1		GPU
USB3.0-6		PCIE-2		GPU
		PCIE-3		GPU
		PCIE-4		GPU
		PCIE-5		WLAN
		PCIE-6		GLAN
		PCIE-7	SATA-0	SATA HDD
		PCIE-8	SATA-1	N/A
		PCIE-9		N/A
		PCIE-10		N/A
		PCIE-11	SATA-1*	N/A
		PCIE-12	SATA-2	SATA SSD

Compal Electronics, Inc.

Title: Port assignment

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 3 of 55

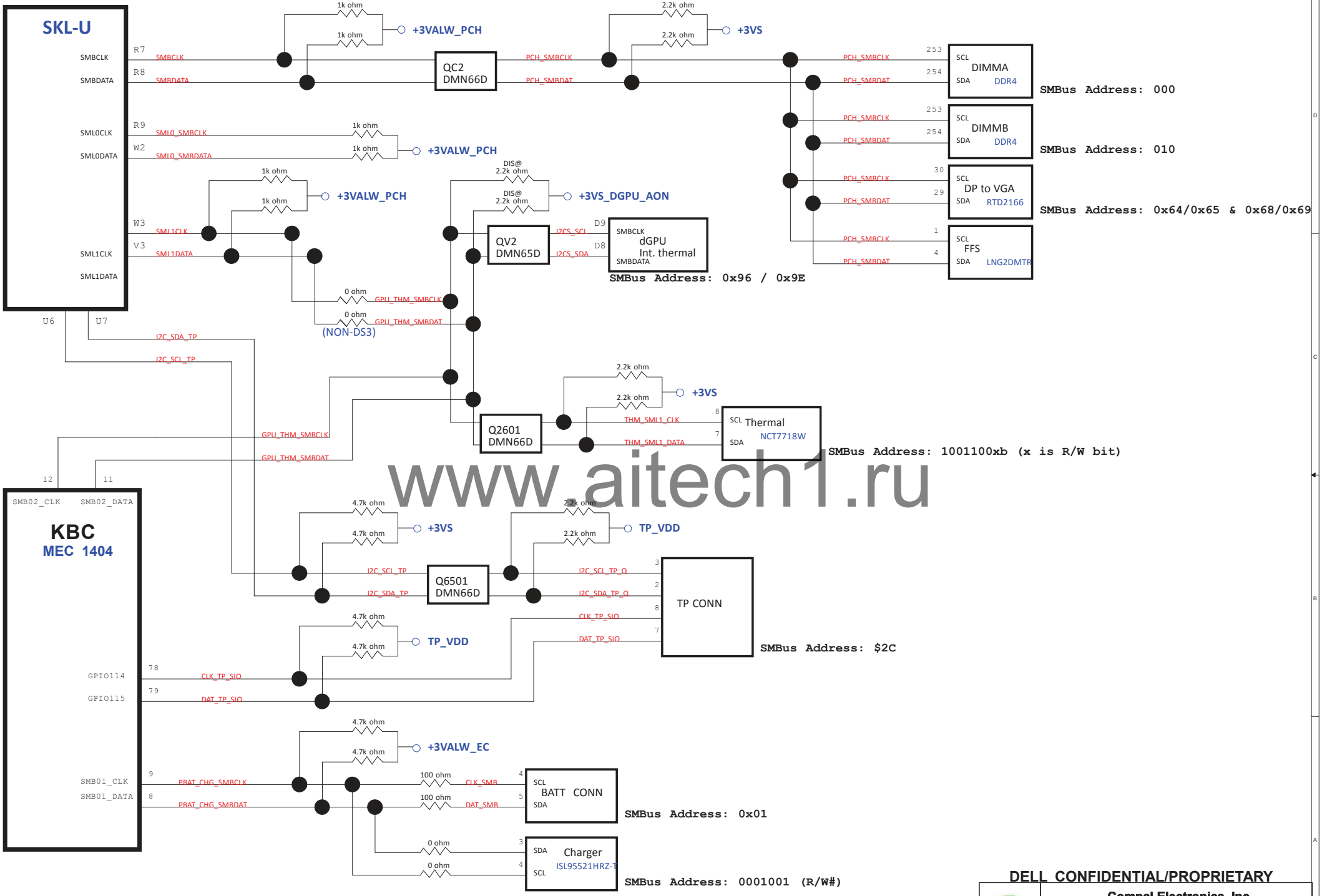


Compal Electronics, Inc.

Title: Power rails

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 4 of 55



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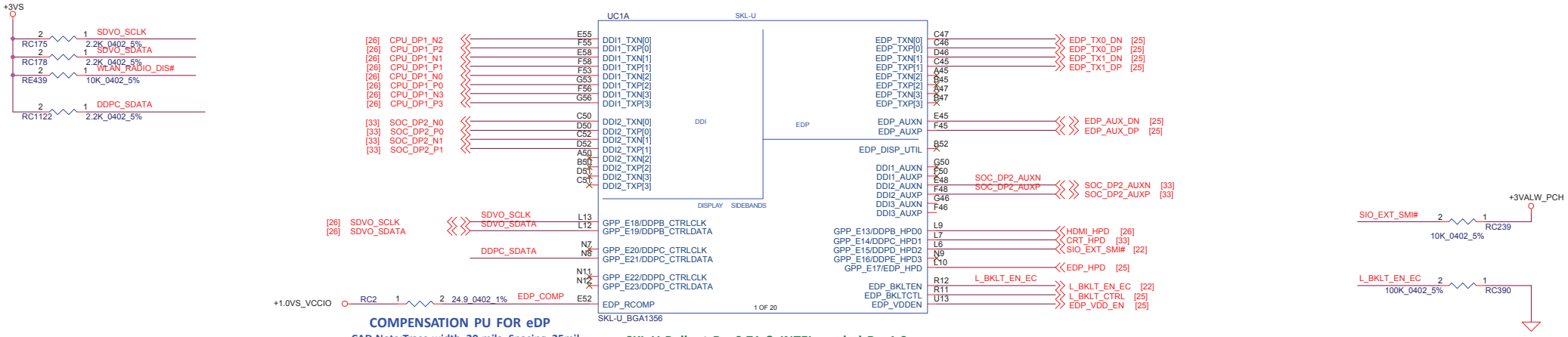
Compal Electronics, Inc.

Title: SMbus Block diagram

Size | Document Number: LA-D461P | Rev: 0.1(100)

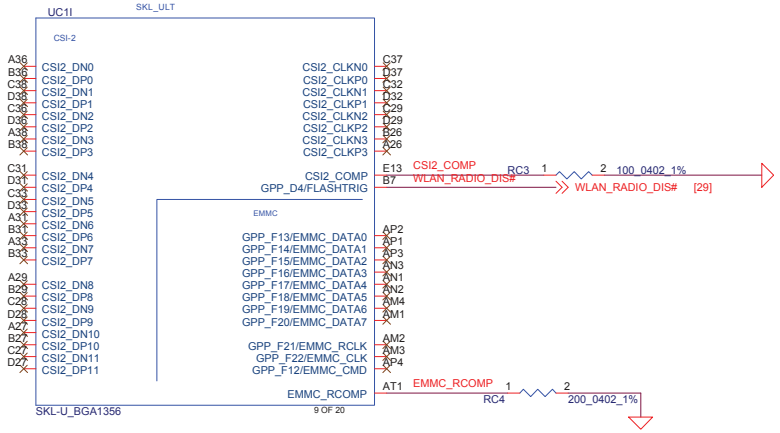
Date: Monday, June 06, 2016 | Sheet 5 of 62



COMPENSATION PU FOR eDP

CAD Note:Trace width=20 mils ,Spacing=25mil, Max length=100 mils.

SKL-U Ballout Rev0.71 & INTEL symbol Rev1.0



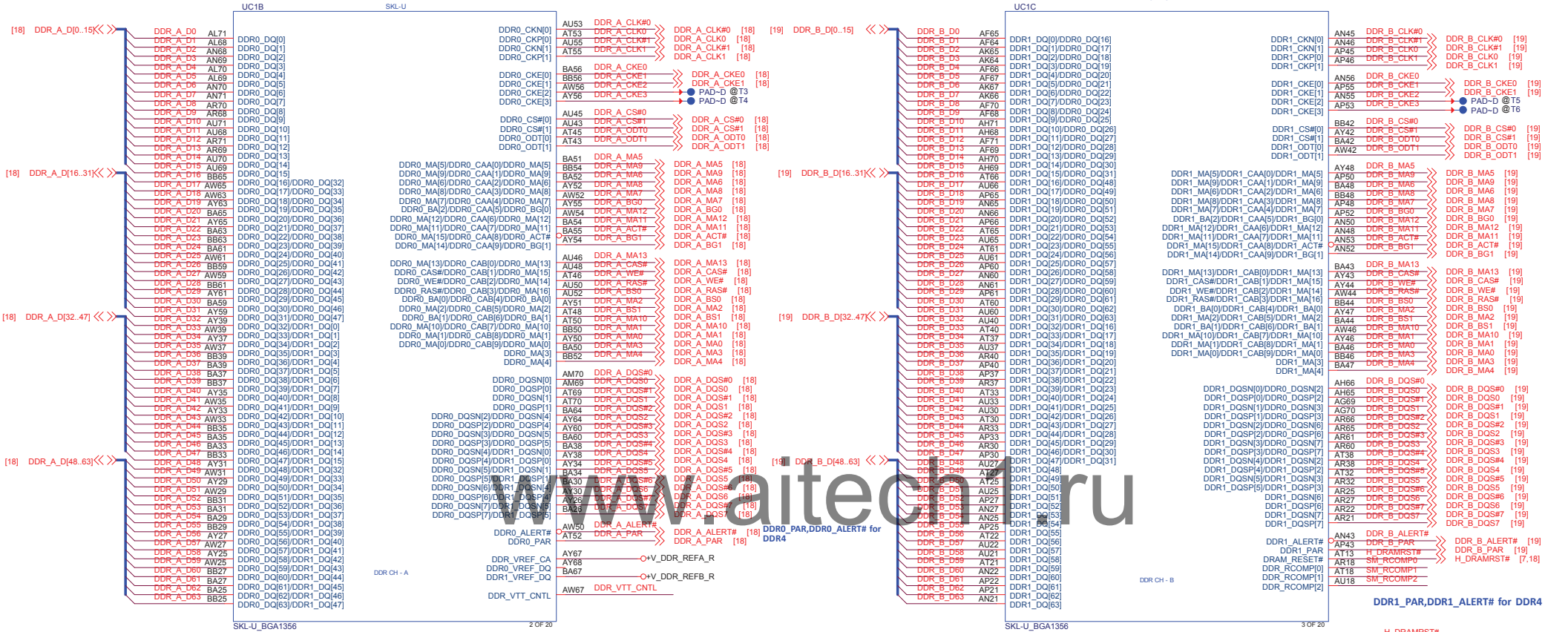
Compal Electronics, Inc.

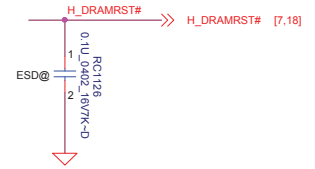
Title: CPU (1/14)

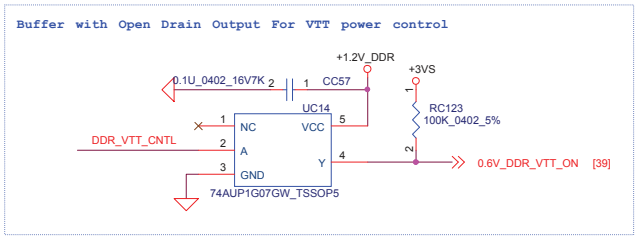
Size | Document Number: LA-D821P | Rev: 0.1

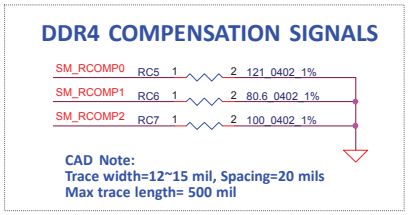
Date: Monday, June 06, 2016 | Sheet 6 of 55

DDR4, Ballot for B2B(Interleave)









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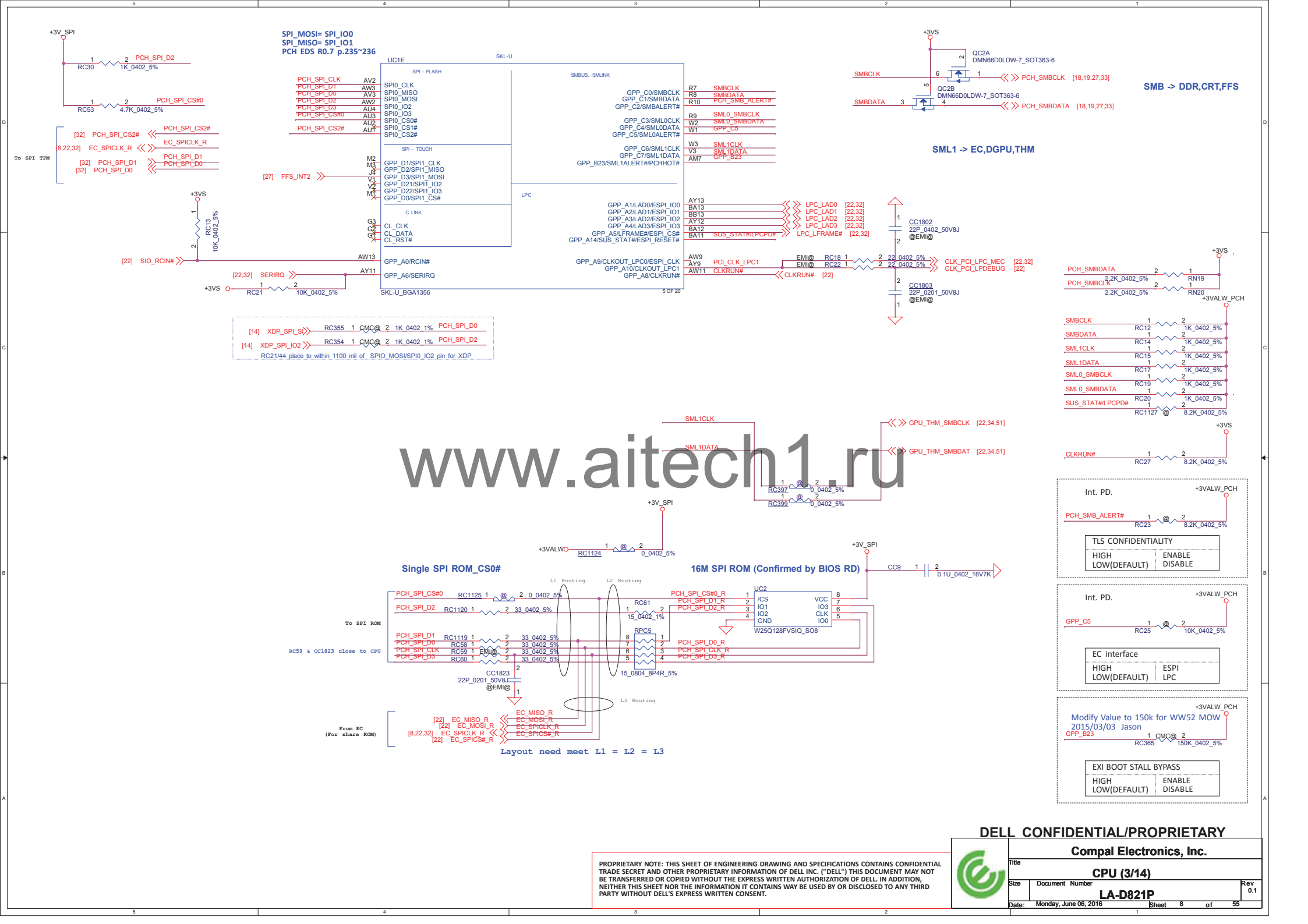
Title: CPU (2/14)			
Size	Document Number: LA-D821P		Rev: 0.1
Date: Monday, June 06, 2016	Sheet 7 of 55		



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Title: CPU (3/14)

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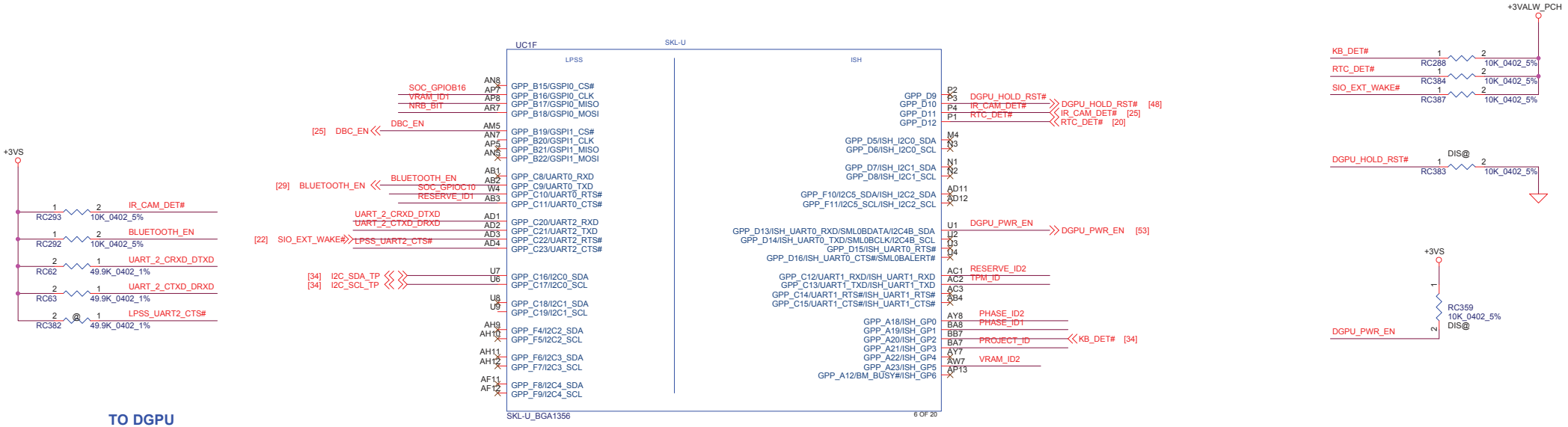
Date: Monday, June 06, 2016 | Sheet 8 of 55



TO DGPU

SOC_GPIOC10 — RC2041 — @ — 0_0402_5% — GPU_EVENT# → GPU_EVENT# [51]

SOC_GPIOB16 — RC1951 — @ — 0_0402_5% — GC6_FB_EN → GC6_FB_EN [51,52]

+3VALW_PCH — 1 — RC186 — 2 — NRB_BIT — 4.7K_0402_5%

NO REBOOT STRAP	
HIGH	No REBOOT
LOW(DEFAULT)	REBOOT ENABLE

Weak IPD

Win7 Debug solution

Option 2 : For Open Chassis Platforms

+5VALW — JWDB1 — GND GND — UART_2_CTXD_DRXD — UART_2_CRXD_DTXD — CVILU_CI1804M1VRA-NH — CONN@

RC1105 4G@ 10K_0402_5% SD028100280

RC1106 4G@ 10K_0402_5% SD028100280

RC1104 2G@ 10K_0402_5% SD028100280

RC1107 2G@ 10K_0402_5% SD028100280

RC1105 UMA@ 10K_0402_5% SD028100280

RC1107 UMA@ 10K_0402_5% SD028100280

PHASE ID	PHASE_ID1 (GPP_A19)	PHASE_ID2 (GPP_A18)
EVT	0	0
DVT1	0	1
DVT2	1	0
Pilot	1	1

PROJECT ID	PROJECT_ID (GPP_A21)
Dali	0
Astro	1

VRAM ID (PCBA VRAM Size Config.)	VRAM_ID2 (GPP_A23)	VRAM_ID1 (GPP_B17)
UMA	0	0
2G	0	1
4G	1	0
Reserved	1	1

PROJECT ID	TPM_ID (GPP_C13)
SW_TPM	0
HW_TPM	1

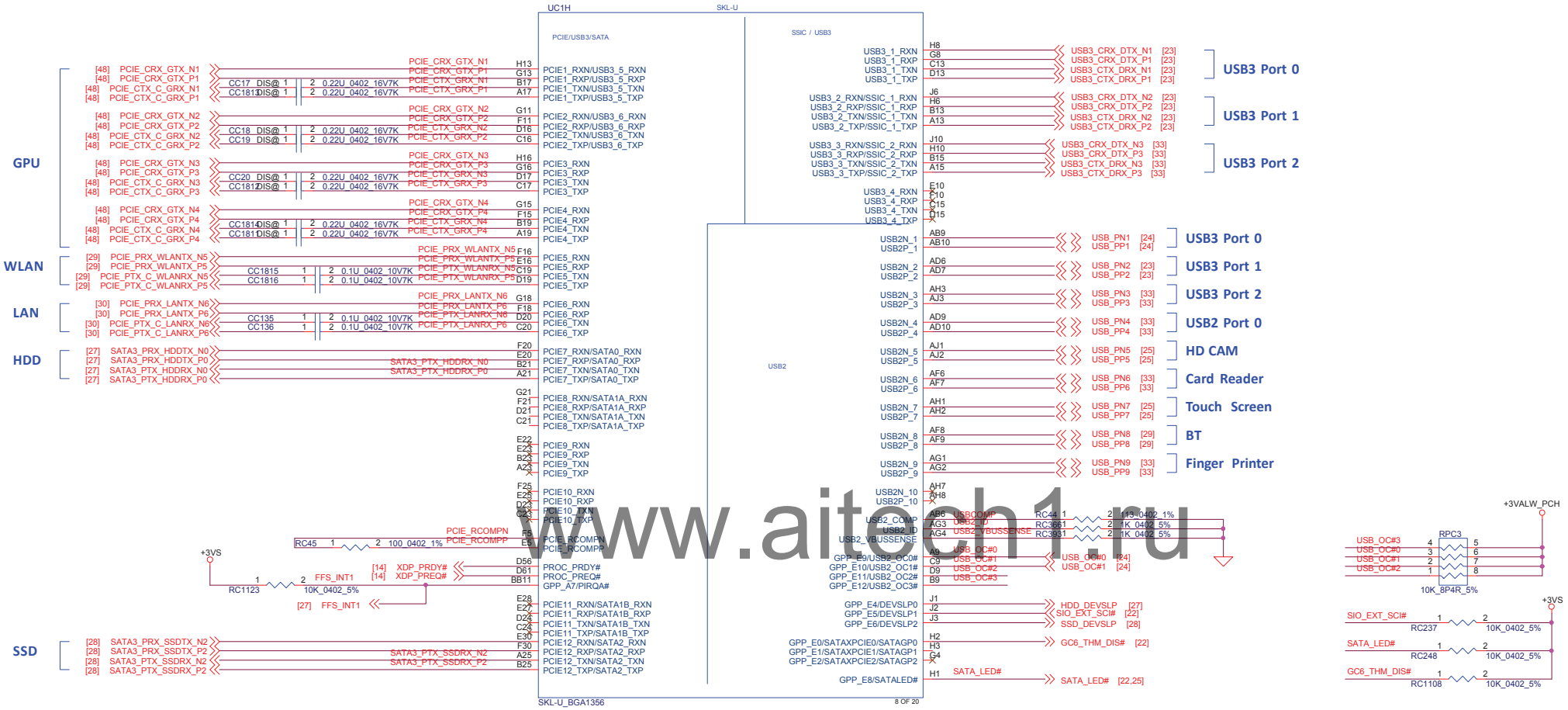
RESERVE ID	RESERVE_ID1 (GPP_C11)	RESERVE_ID2 (GPP_C12)

Compal Electronics, Inc.

Title: CPU (4/14)

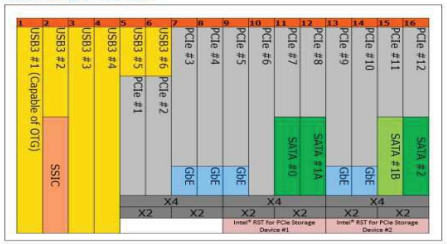
Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 9 of 55



3.4.1 SKL PCH U Flexible I/O

Figure 3-1. HSIO Muxing on SKL PCH U



There are 16 HSIO lanes on SKL PCH-LP U Series, supporting the following port configurations:

1. Up to 12 PCIe* lanes (multiplexed with USB 3.0 ports, SATA Ports)
   - Only a maximum of 6 PCIe* ports (or devices) can be enabled at any time.
   - Ports 1-4, Ports 5-8, and Ports 9-12, can each be individually configured as 4x1, 2x2, 1x2 + 2x1, or 1x4.
2. Up to 3 SATA ports (multiplexed with PCIe*)
   - SATA Port 1 has the flexibility to be mapped to either PCIe* Port 8 or Port 11.
3. Up to 6 USB 3.0 ports (multiplexed with PCIe*)
   - USB Dual Role (OTG) capability is available on USB 3.0 Port 1
   - One SSIC x1 port is multiplexed with USB 3.0 Port 2
4. One GbE lane
   - GbE can be mapped into one of the PCIe* Ports 3-5 and Ports 9-10
   - When GbE is enabled, there can be at most up to 5 PCIe* ports enabled.
5. Up to 2 Intel RST for PCIe* storage devices supported
   - Devices can be x2 or x4
   - Devices can be implemented on PCIe Ports 5-8 and Ports 9-12

Table 1-3. PCH-LP HSIO Detail

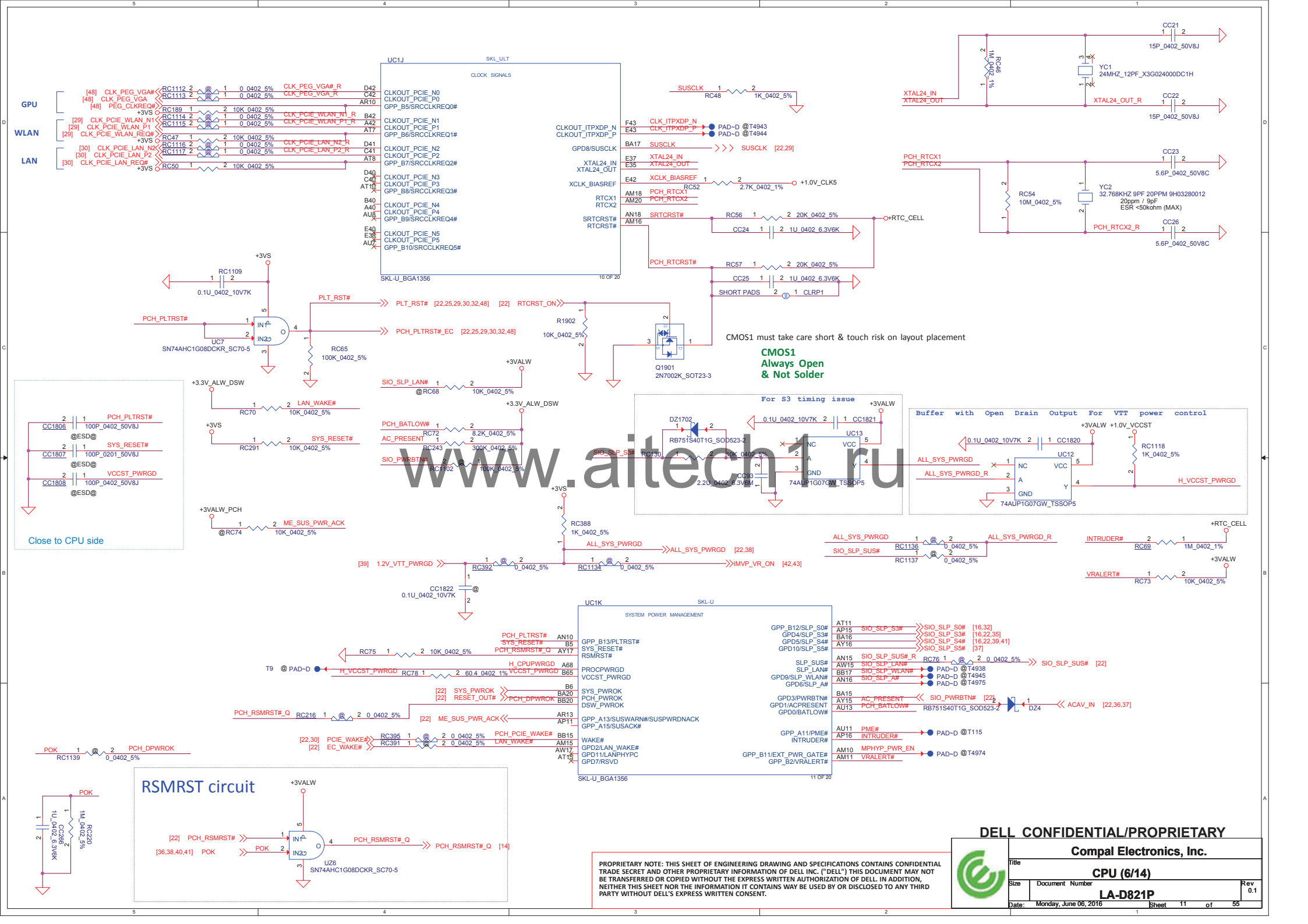
SKU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Base-U	USB 3.0/ OTG	USB 3.0/ SSIC	USB 3.0	USB 3.0	PCIe	PCIe	PCIe/ LAN	PCIe/ LAN	PCIe/ LAN	PCIe	SATA	SATA	PCIe/ LAN	PCIe/ LAN	N/A	N/A
Premium-U	USB 3.0/ OTG	USB 3.0/ SSIC	USB 3.0	USB 3.0	PCIe/ USB 3.0	PCIe/ USB 3.0	PCIe/ LAN	PCIe/ LAN	PCIe/ LAN	PCIe	PCIe/ SATA	PCIe/ SATA	PCIe/ LAN	PCIe/ LAN	PCIe/ SATA	PCIe/ SATA
Premium-Y	USB 3.0/ OTG	USB 3.0/ SSIC	USB 3.0	USB 3.0	PCIe/ USB 3.0	PCIe/ USB 3.0	PCIe/ LAN	PCIe/ LAN	PCIe/ LAN	PCIe	PCIe/ SATA	PCIe/ SATA	PCIe/ LAN	PCIe/ LAN	N/A	N/A

Compal Electronics, Inc.

Title: CPU (5/14)

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 10 of 55



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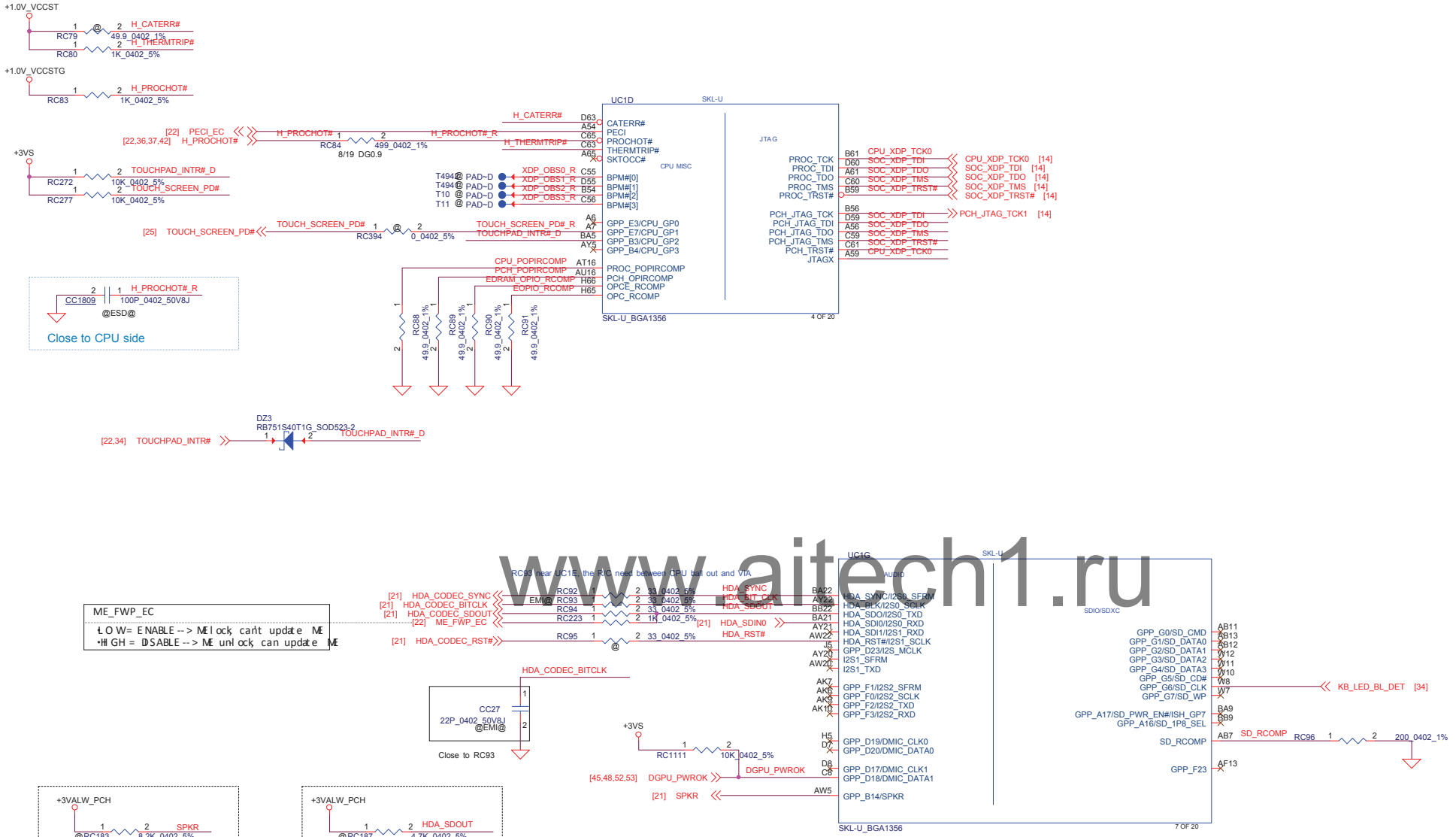
Compal Electronics, Inc.

Title: CPU (6/14)

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 11 of 55



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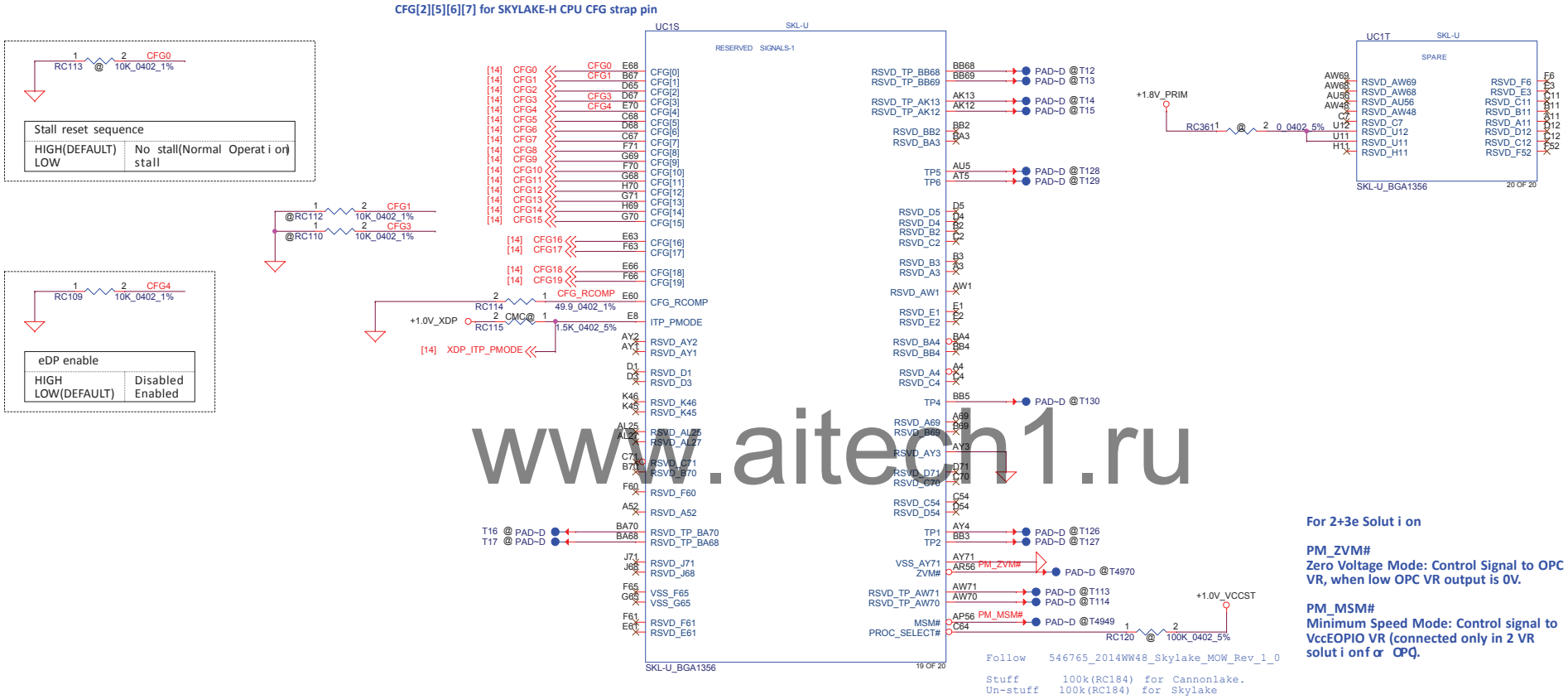
Title: CPU (7/14)

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 12 of 55



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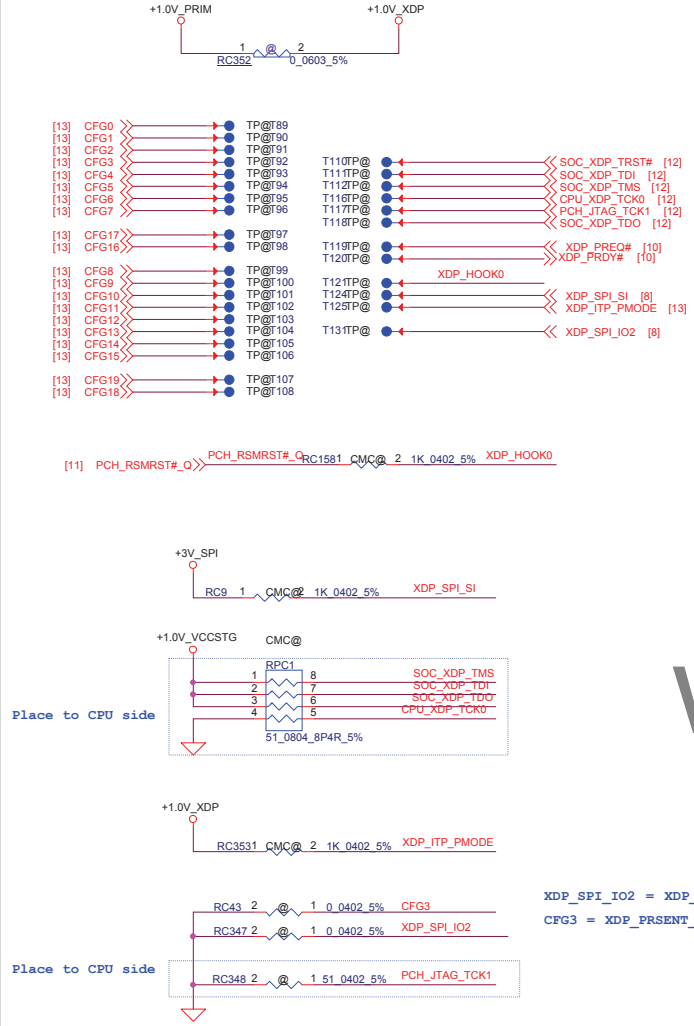
Title: CPU (8/14)

Size | Document Number: LA-D821P | Rev: 0.1

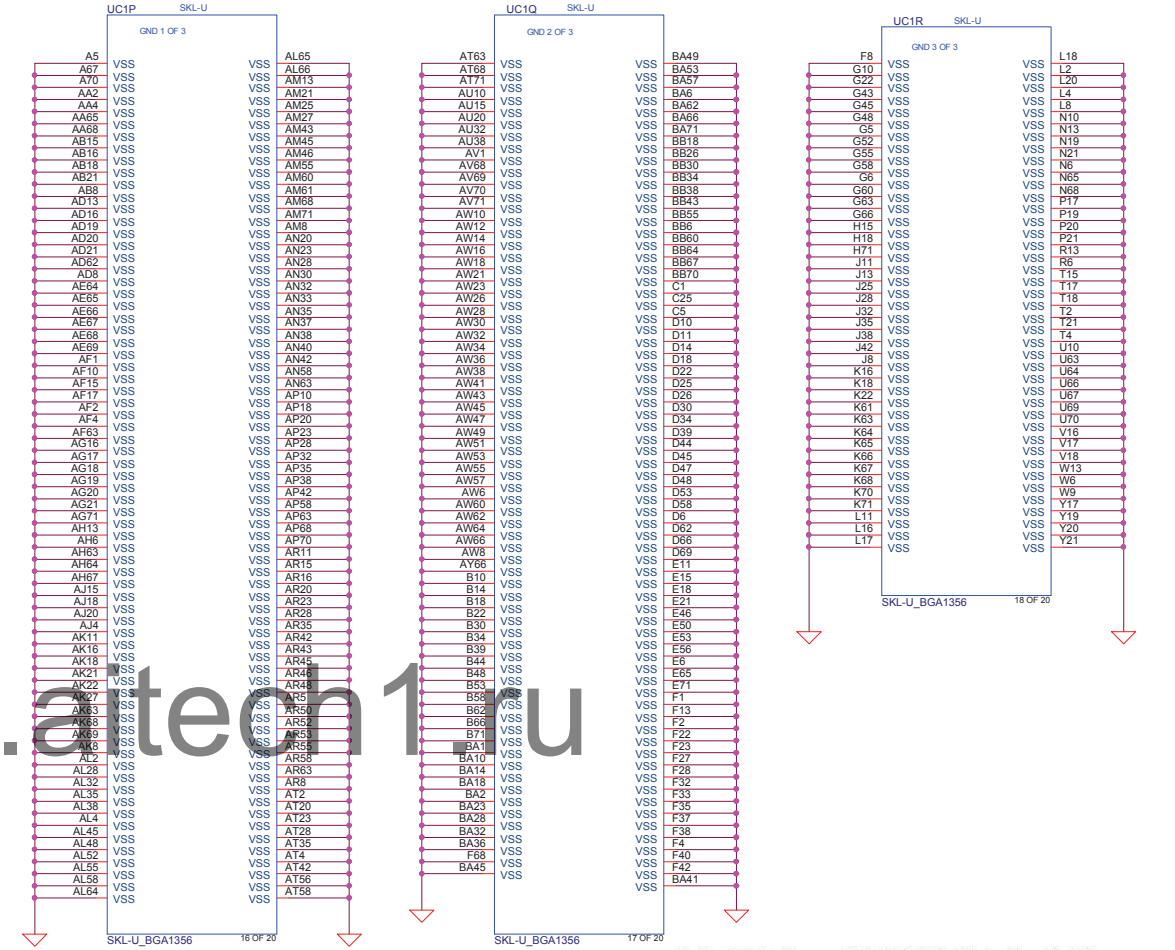
Date: Monday, June 06, 2016 | Sheet 13 of 55

PRIMARY CMC CONN



XDP_SPI_IO2 = XDP_PRSENT_PCH

CFG3 = XDP_PRSENT_CPU



For Pre-ES Parts: Disconnect PCH CORE_VID[1:0] to the VR and fix PCH VCCPRIM_CORE voltage at 1.00 V.

- R1: not populated
- R2, R3: populated to set VCCPRIM_CORE to 1.00V. Consult with VR vendor for appropriate values.
- R4, R5 (feedback resistor): populated if needed. Some VRs only support up to 0.95V natively with VID options. 1.00 V should be created by selecting 0.95V option and using feedback resistors to shift voltage up 50 mV. Consult with VR vendor for appropriate values for proper VR operation while minimizing power consumption

For ES and Later Parts: Connect PCH CORE_VID[1:0] to the VR.

- R1: populated
- R2, R3: not populated
- R4, R5 (feedback resistors): populated if needed to obtain appropriate voltage per the updated PCH VID encoding table above. Consult with VR vendor for appropriate values

For VRs that only support up to 0.95V natively with VID options, using R4 and R5 to shift the voltage table up 50mV will result in the LPM voltage output being shifted up slightly. If the VR supports LPM voltage, the specified, lowest supportable voltage is 0.70V for optimized power consumption. With R4, R5 configured to shift from 0.95V to 1.00V, the LPM voltage will effectively be shifted from 0.70V to ~0.75V. This will not be a functional issue for the platforms, but will slightly de-optimize power consumption. It is recommended that customers work with their VR vendors to adjust to the new voltage table.

Compal Electronics, Inc.

Title: CPU (9/14)

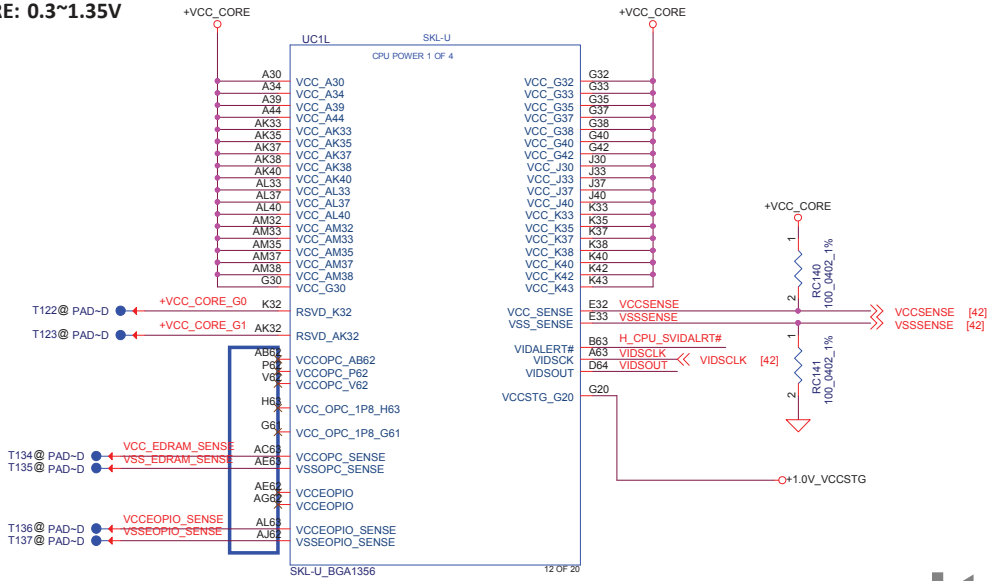
Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 14 of 55

PSC(Primary side cap) : Place as close to the package as possible
BSC(Backside cap) : Place on secondary side, underneath the package

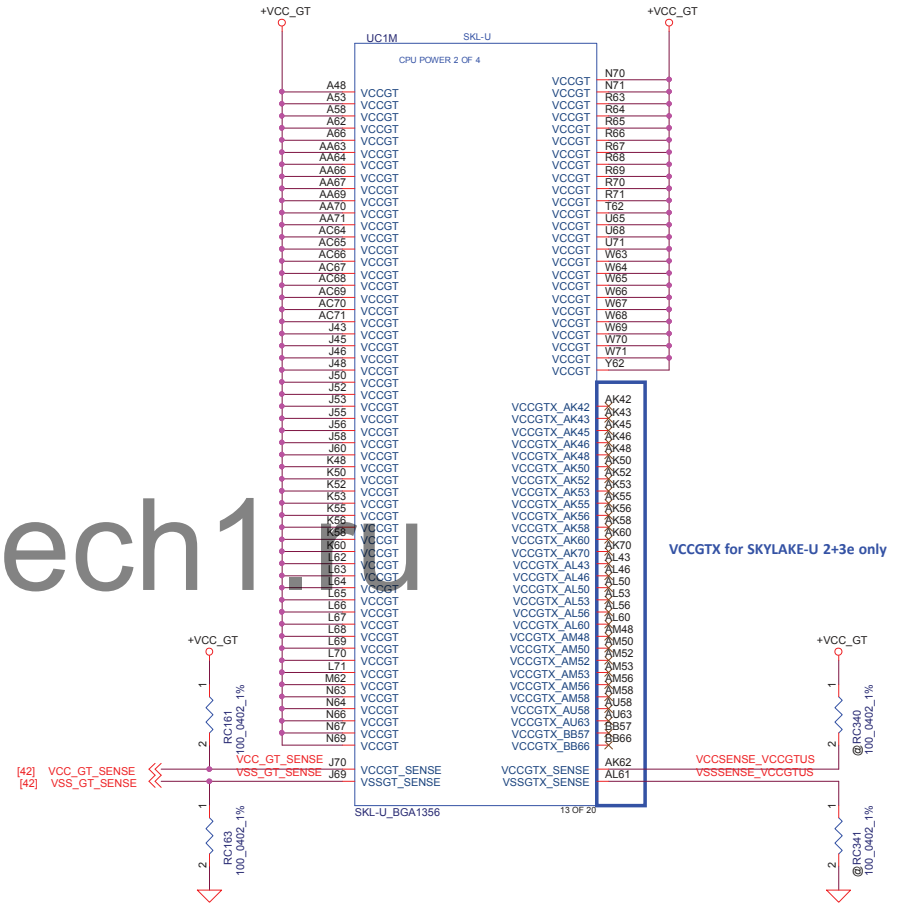
Component placement order:
Package edge > 0402 caps > 0805 caps > Bulk caps >Power source

+VCC_CORE: 0.3~1.35V



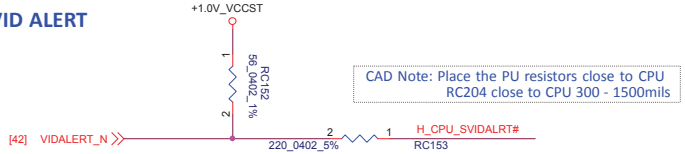
VCCOPC,VCCOPC_1P8,VCCEOPIO for SKYLAKE-U 2+3e
(w/ on package cache)

+VCCGT: 0.3~1.35V
+VCCGTX : 0.3~1.35V



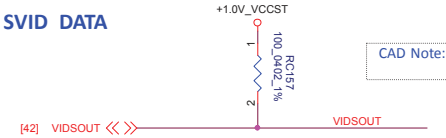
VCCGTX for SKYLAKE-U 2+3e only

SVID ALERT



CAD Note: Place the PU resistors close to CPU
RC204 close to CPU 300 - 1500mils

SVID DATA



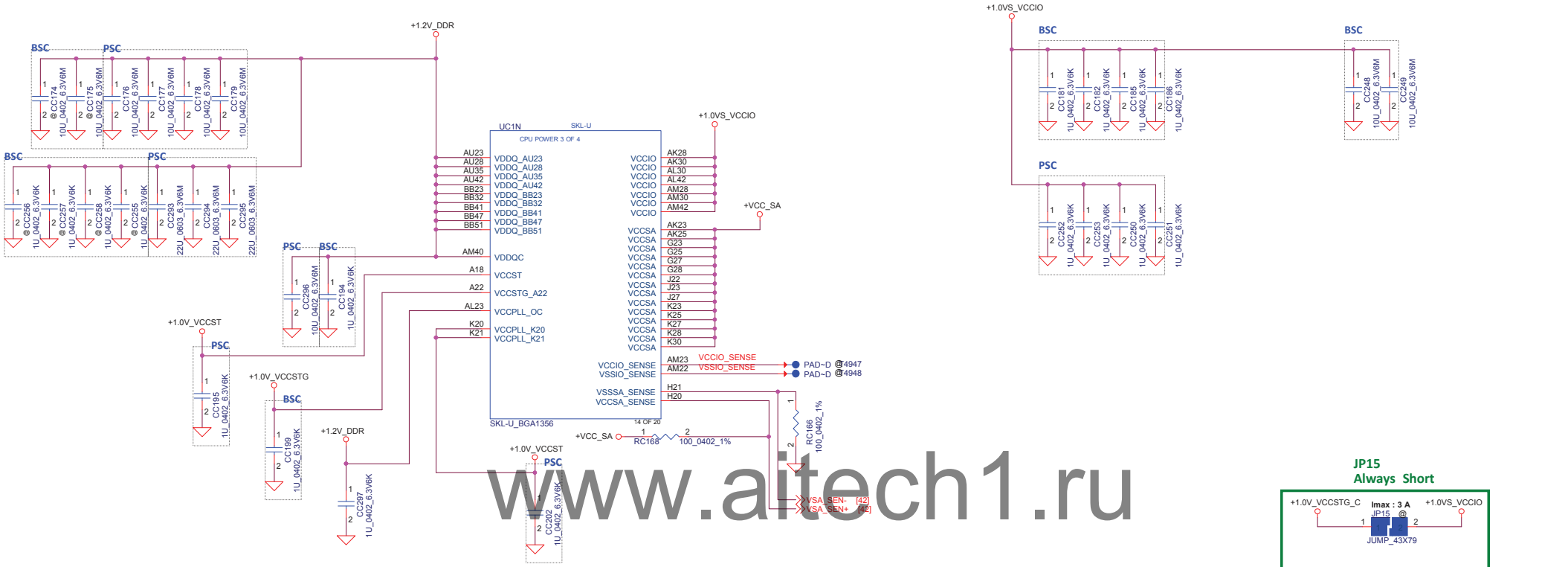
CAD Note: Place the PU resistors close to CPU
RC208close to CPU 300 - 1500mils

Compal Electronics, Inc.

Title: CPU (10/14)

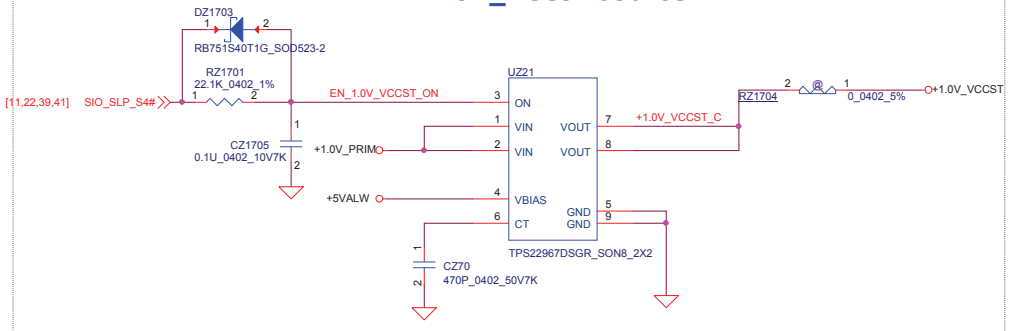
Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 15 of 55



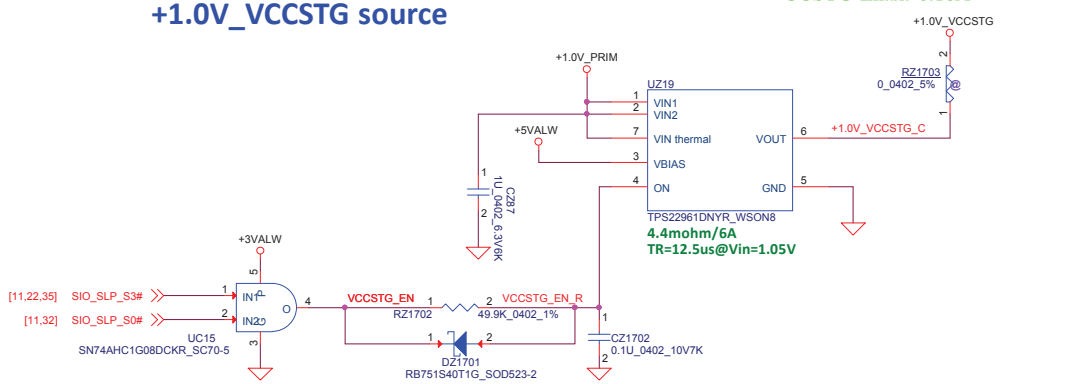
JP15
Always Short

+1.0V_VCCST source



+1.0V_VCCSTG source

VCCSTG Imax: 0.16A

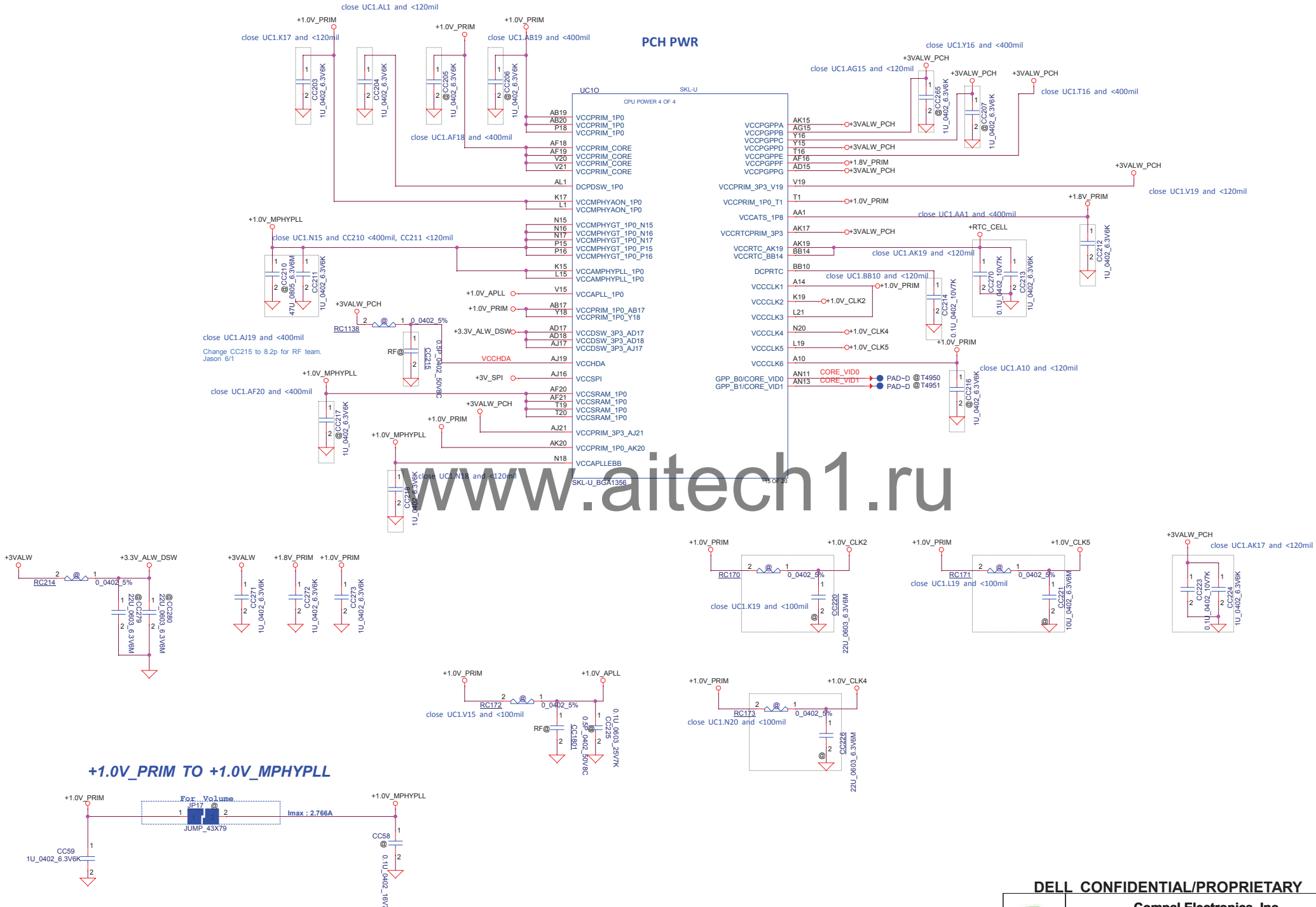


Compal Electronics, Inc.

Title: CPU (12/14)

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 16 of 55



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Compal Electronics, Inc.

Title: CPU (13/14)

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 17 of 55

Layout Note:
Place near JDIMM1.257,259

Layout Note:
Place near JDIMM1.258

Layout Note:
Place near JDIMM1.255

Layout Note:
Place near JDIMM1

[7] DDR_A_D[0..63]
[7] DDR_A_MA[0..13]
[7] DDR_A_DQS#[0..7]
[7] DDR_A_DQS[0..7]

+2.5V_MEM
+0.6V_DDR_VTT
+3VS
+1.2V_DDR

JDIMM1

DEREN_40-42271-26001RHF

CONN@

place cap near DIMM RESET PIN

All VREF traces should have 10 mil trace width

Security Classification	Compal Secret Data		
Issued Date	2015/01/30	Deciphered Date	2016/12/31

Compal Electronics, Inc.

Title: DDRIII DIMMA

Size	Document Number	Rev
	LA-D821P	0.1

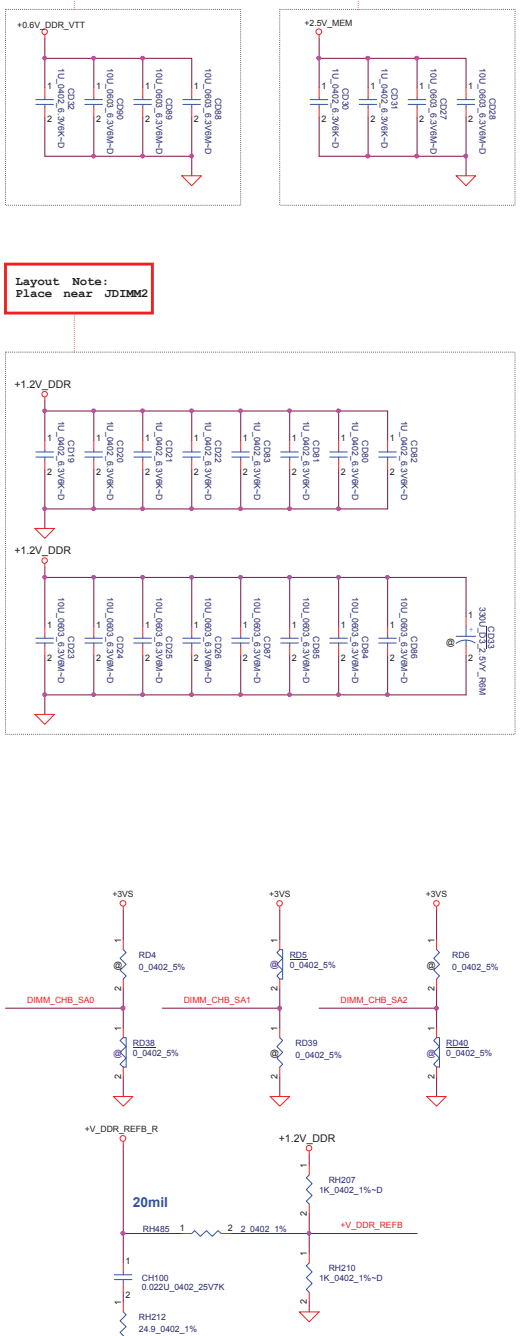
Date: Monday, June 06, 2016 Sheet 18 of 55

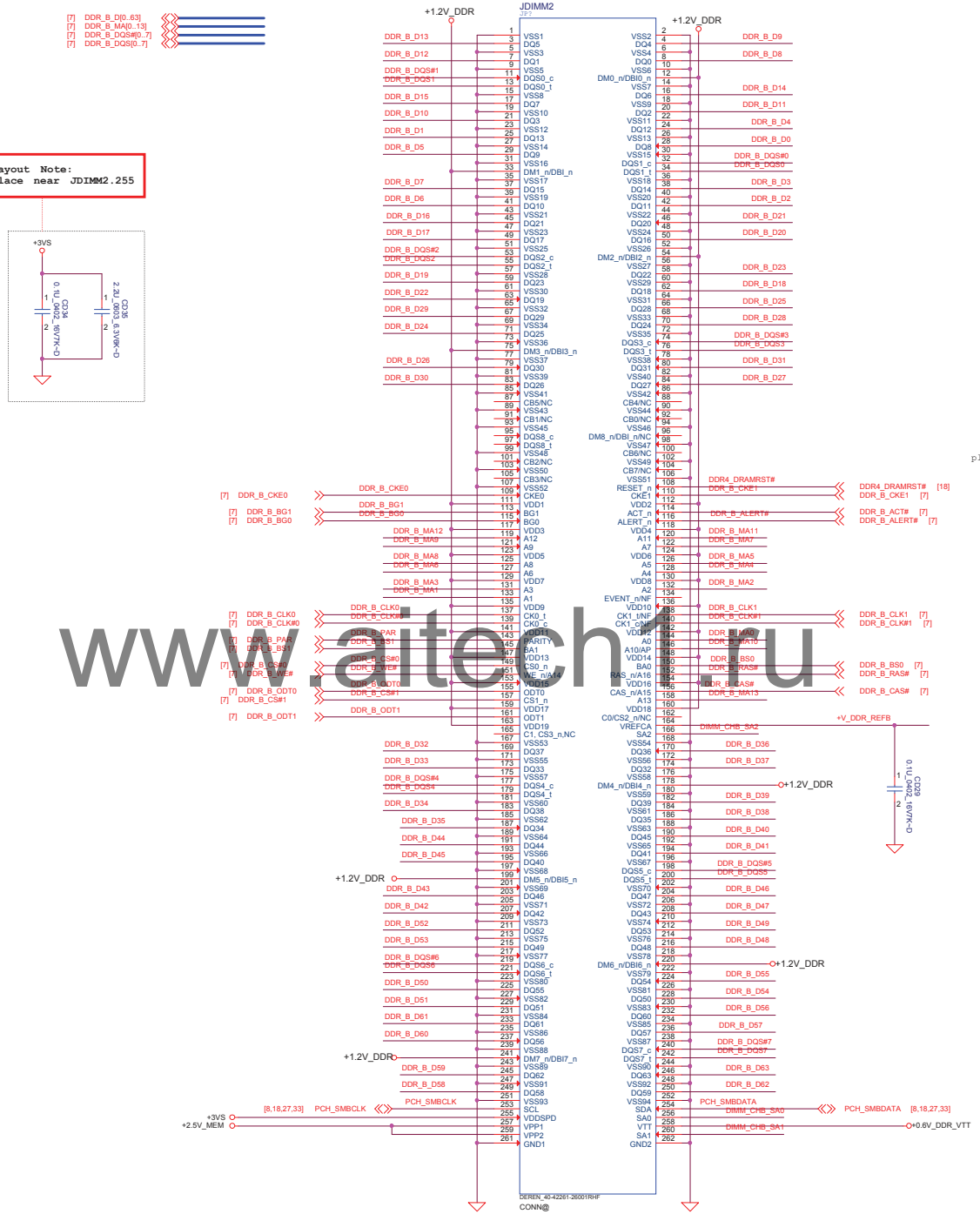
Layout Note:
Place near JDIMM2.258

Layout Note:
Place near JDIMM2.257,259

Layout Note:
Place near JDIMM2.255

Layout Note:
Place near JDIMM2





Security Classification	Compal Secret Data		
Issued Date	2015/01/30	Deciphered Date	2016/12/31

Compal Electronics, Inc.

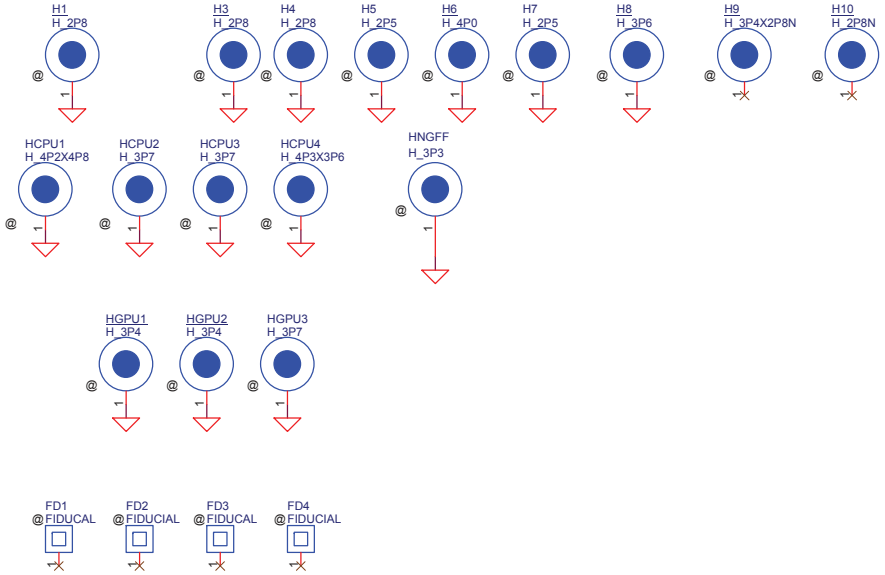
Title: DDRIII DIMMB

Size	Document Number	Rev
	LA-D821P	0.1

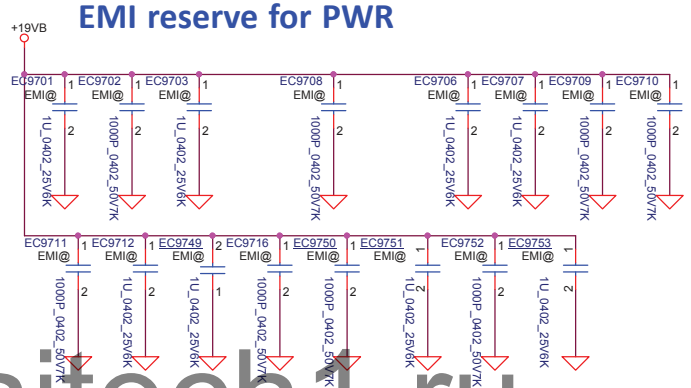
Date: Monday, June 06, 2016 | Sheet 19 of 55

Main Func = Other

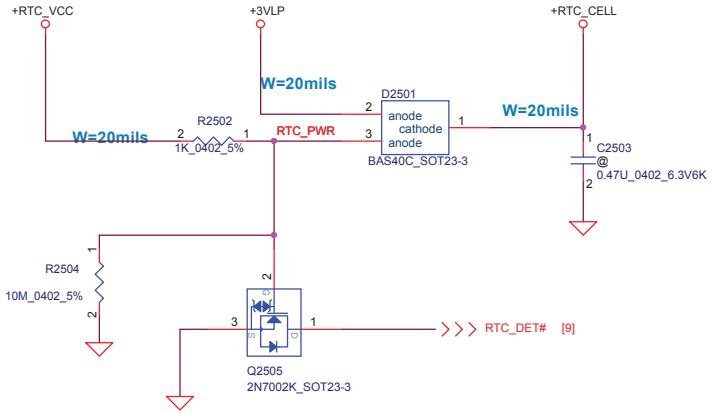
Screw hole/FD/EMI stop



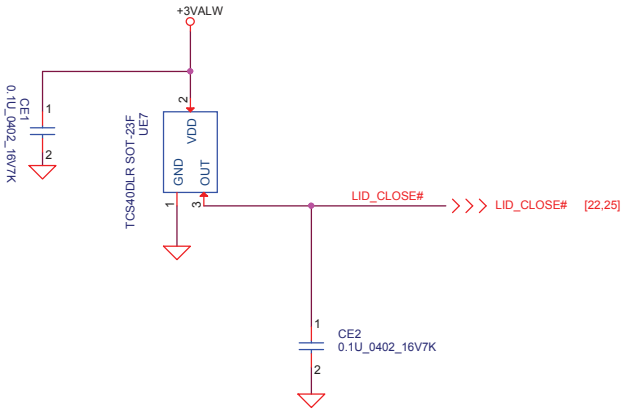
EMI reserve for PWR



Main Func = RTC



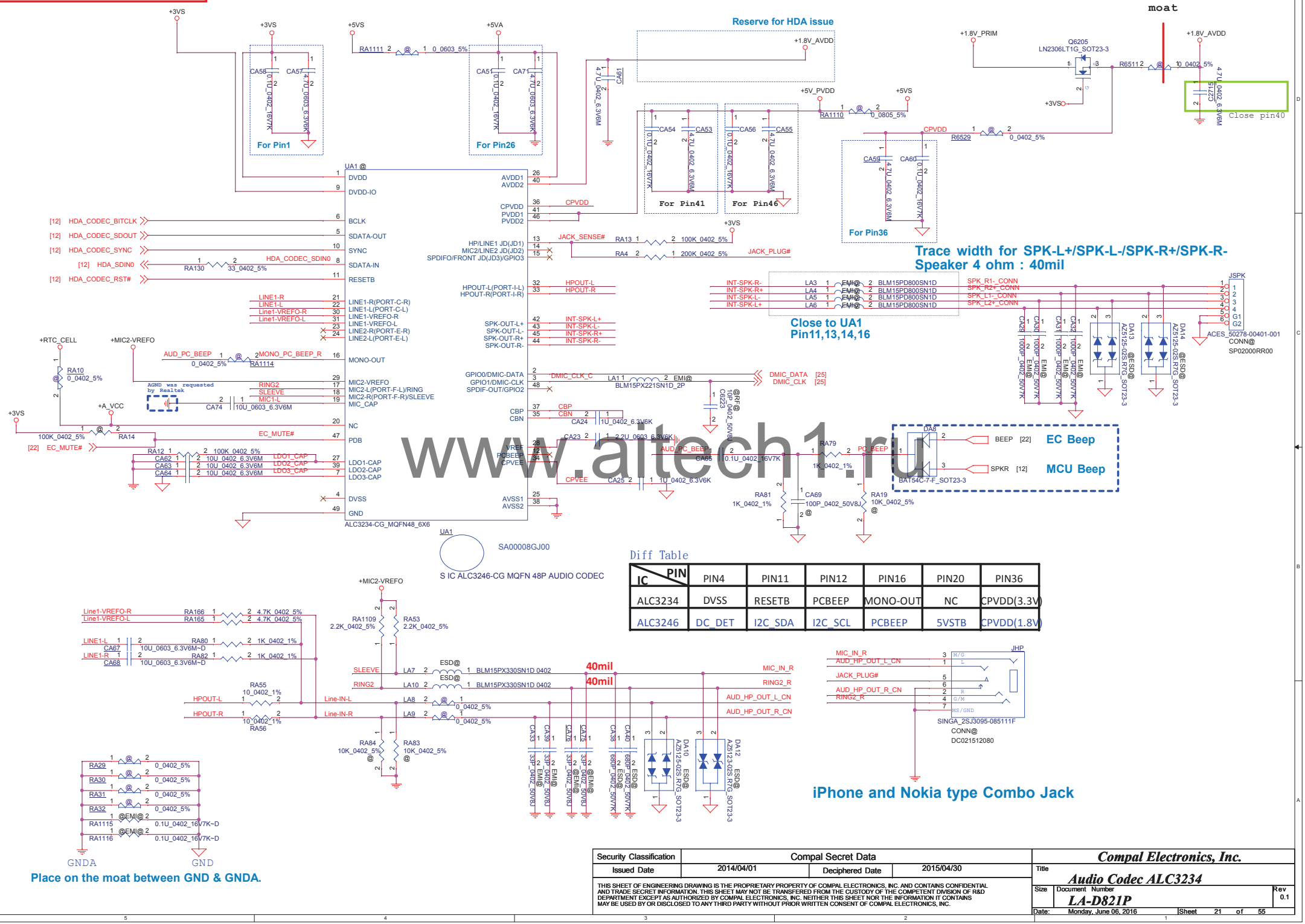
Main Func = LID Switch



Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.	
Title	RTC/Screw hole/EMI caps
Size	Document Number: LA-D821P
Rev	0.1
Date:	Monday, June 06, 2016
Sheet	20 of 55

Main Func = Audio



Diff Table

IC \ PIN	PIN4	PIN11	PIN12	PIN16	PIN20	PIN36
ALC3234	DVSS	RESETB	PCBEEP	MONO-OUT	NC	CPVDD(3.3V)
ALC3246	DC_DET	I2C_SDA	I2C_SCL	PCBEEP	5VSTB	CPVDD(1.8V)

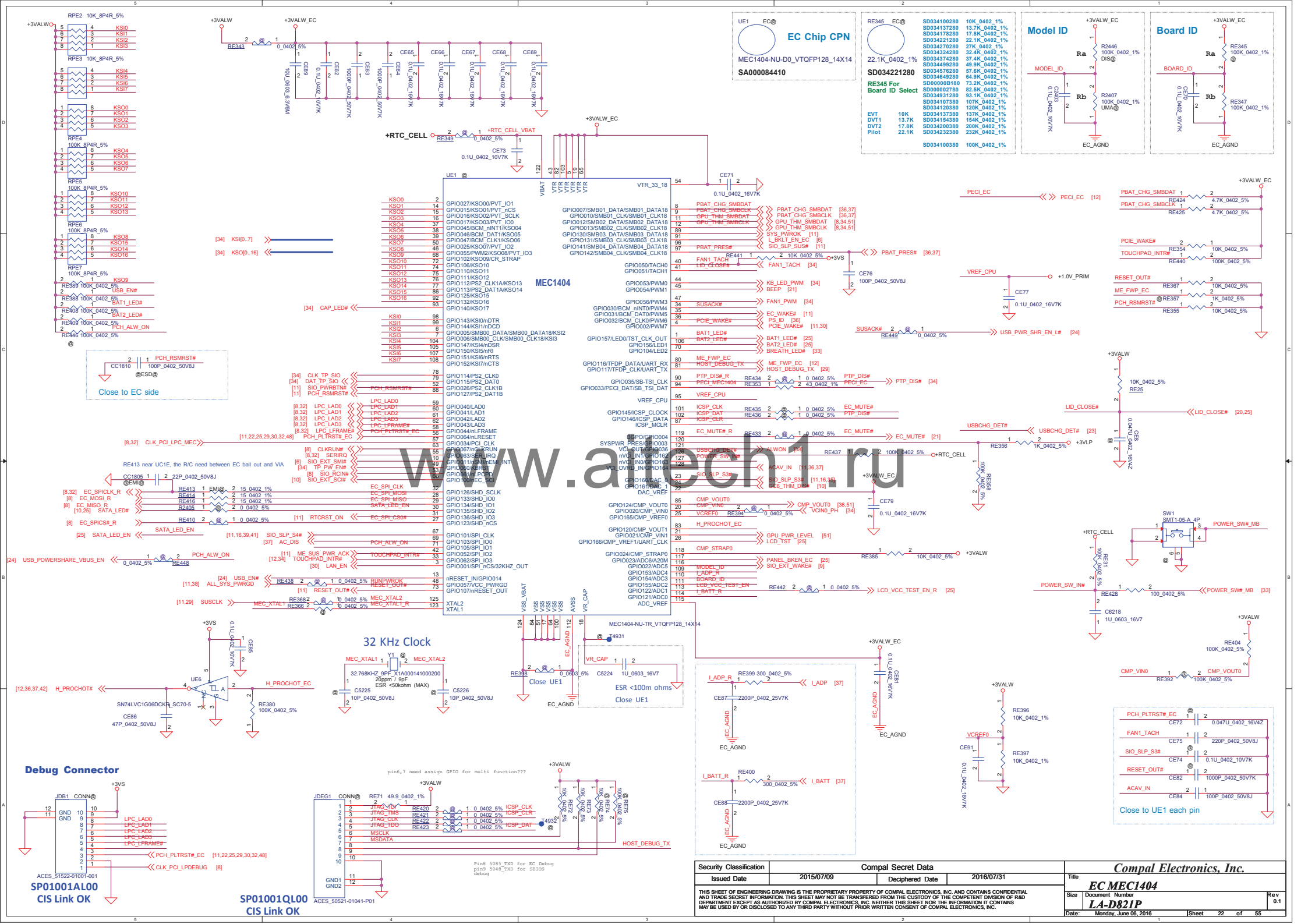
Security Classification	Compal Secret Data		
Issued Date	2014/04/01	Deciphered Date	2015/04/30

Compal Electronics, Inc.

Title: Audio Codec ALC3234

Size: | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 21 of 55



Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

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Compal Electronics, Inc.

Title: EC MEC1404

Size: | Document Number: LA-D821P | Rev: 0.1

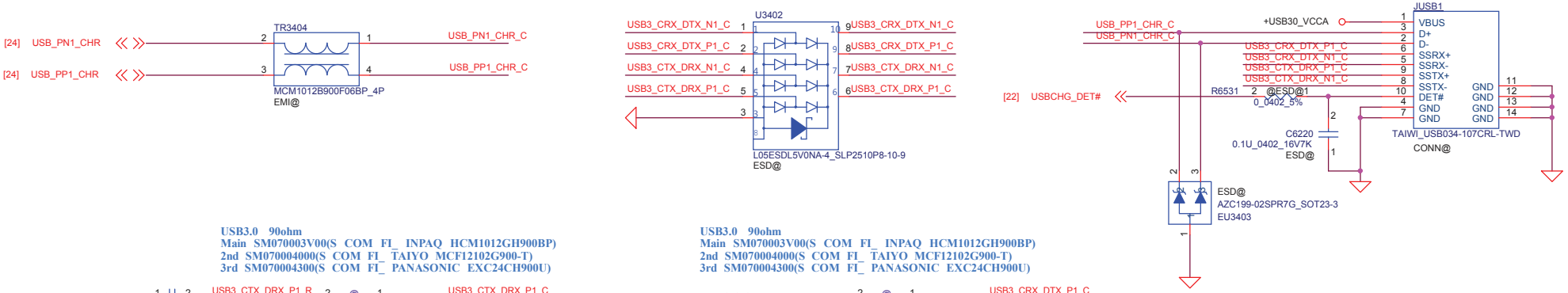
Date: Monday, June 06, 2016 | Sheet 22 of 55

Main Func = USB3.0 Port1/Port2

USB2.0 Port2 and USB2.0 Port3 are on IOBD

USB3.0 Port1

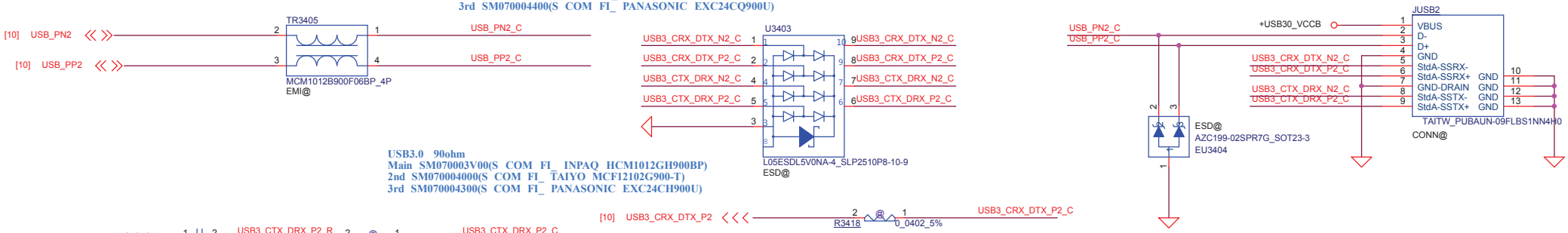
USB2.0 90ohm
Main SM070003Z00(S COM FI_ INPAQ MCM1012B900F06BP)
2nd SM070004U00(S COM FI_ MURATA DLM11SN900HY2L)
3rd SM070004400(S COM FI_ PANASONIC EXC24CQ900U)



USB3.0 90ohm
Main SM070003V00(S COM FI_ INPAQ HCM1012GH900BP)
2nd SM070004000(S COM FI_ TAIYO MCF12102G900-T)
3rd SM070004300(S COM FI_ PANASONIC EXC24CH900U)

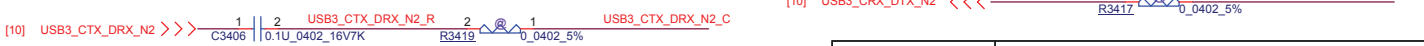
USB3.0 90ohm
Main SM070003V00(S COM FI_ INPAQ HCM1012GH900BP)
2nd SM070004000(S COM FI_ TAIYO MCF12102G900-T)
3rd SM070004300(S COM FI_ PANASONIC EXC24CH900U)

USB2.0 90ohm
Main SM070003Z00(S COM FI_ INPAQ MCM1012B900F06BP)
2nd SM070004U00(S COM FI_ MURATA DLM11SN900HY2L)
3rd SM070004400(S COM FI_ PANASONIC EXC24CQ900U)



USB3.0 90ohm
Main SM070003V00(S COM FI_ INPAQ HCM1012GH900BP)
2nd SM070004000(S COM FI_ TAIYO MCF12102G900-T)
3rd SM070004300(S COM FI_ PANASONIC EXC24CH900U)

USB3.0 90ohm
Main SM070003V00(S COM FI_ INPAQ HCM1012GH900BP)
2nd SM070004000(S COM FI_ TAIYO MCF12102G900-T)
3rd SM070004300(S COM FI_ PANASONIC EXC24CH900U)



Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.

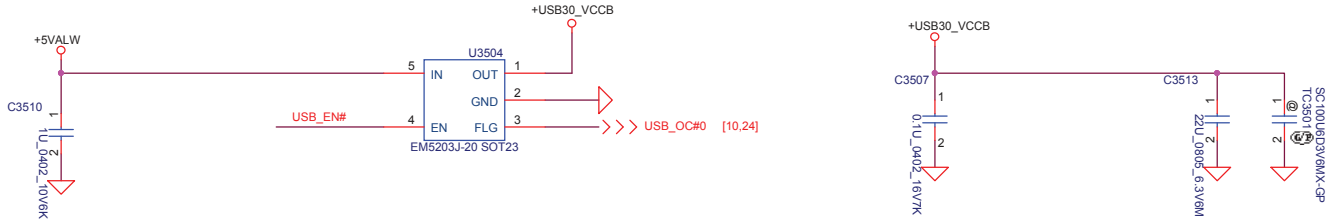
Title: **USB3.0 CONN**

Size	Document Number	Rev
	LA-D821P	0.1

Date: Monday, June 06, 2016 | Sheet 23 of 55

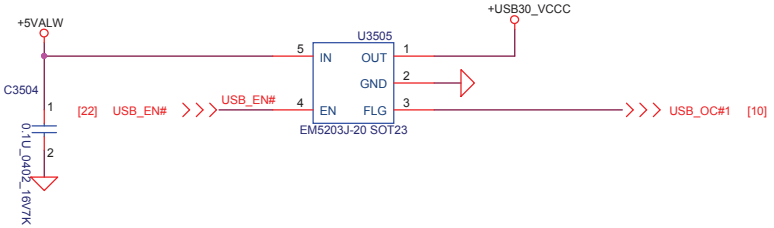
Main Func = USB3.0 Port2

USB3.0 Port2



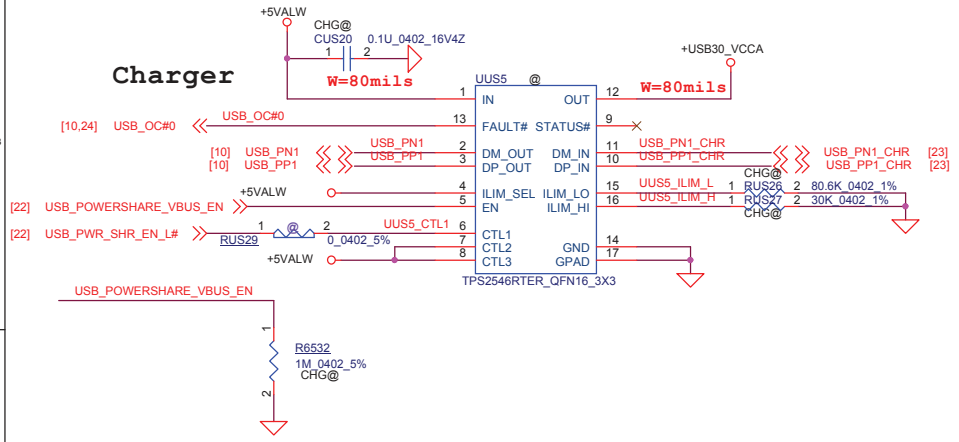
Main Func = USB3.0 Port3

USB3 Port3/USB2 Port1 (IO Board)



Main Func = USB Chager

Charger



Charger CT	CTL1	CTL2	CTL3	ILIM_SEL
EC GPIO	GPXIOA07(pin104)	GPIO22(pin41)	GPXIOA11(pin108)	GPIO21(pin40)
S0/S3(CDP)	1	1	1	1
S4/S5(DCP)	0	1	1	1

UUS5

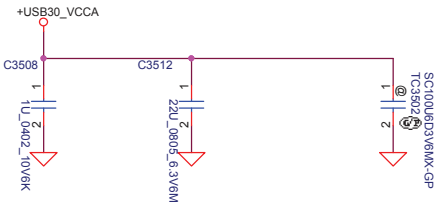
SA000070N00

CHG@

S IC TPS2544RTER WQFN 16P PWR SW

Diff Table

IC \ PIN	PIN9
TPS2546	STATUS#
TPS2544	NC



Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

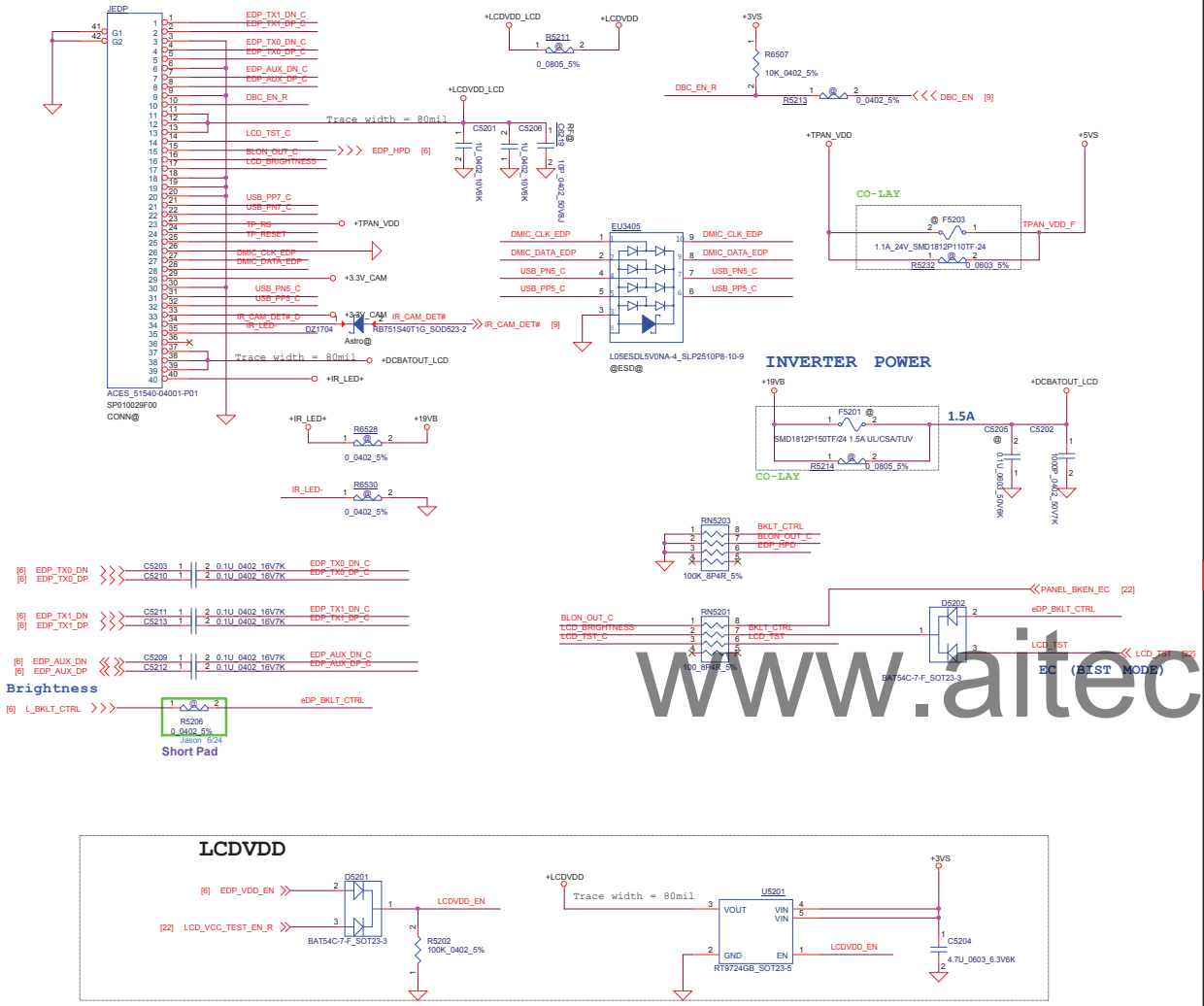
Compal Electronics, Inc.

Title: USB Power SW

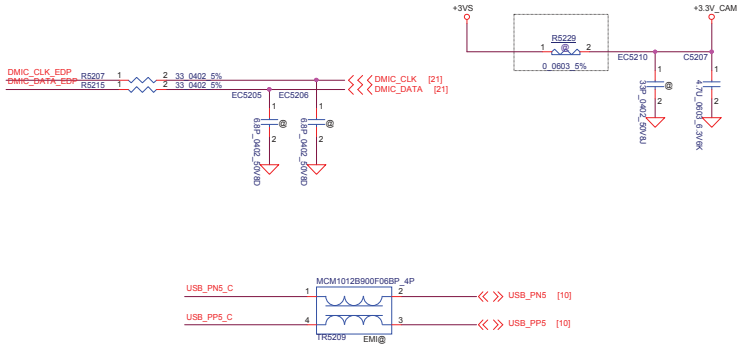
Size	Document Number	Rev
	LA-D821P	0.1

Date: Monday, June 06, 2016 Sheet 24 of 55

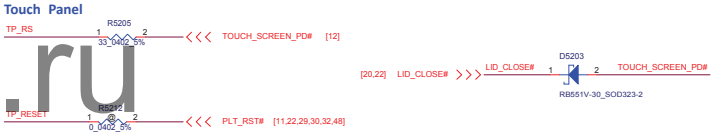
Main Func = LCD

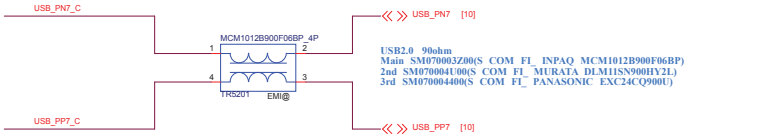


Main Func = CAM



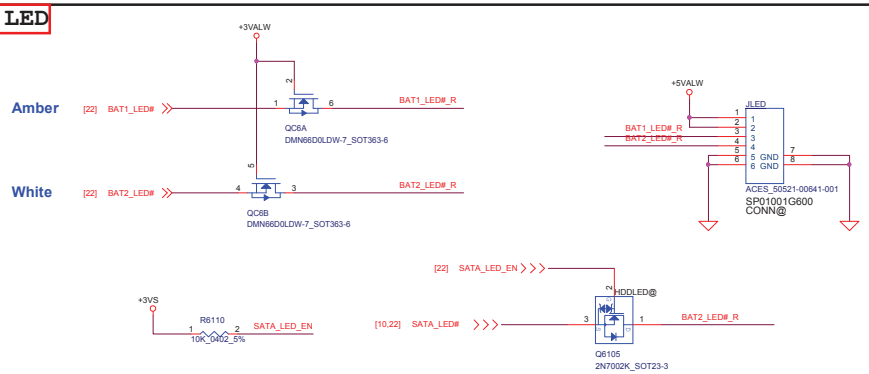
Main Func = TS





LCDVDD

Main Func = LED



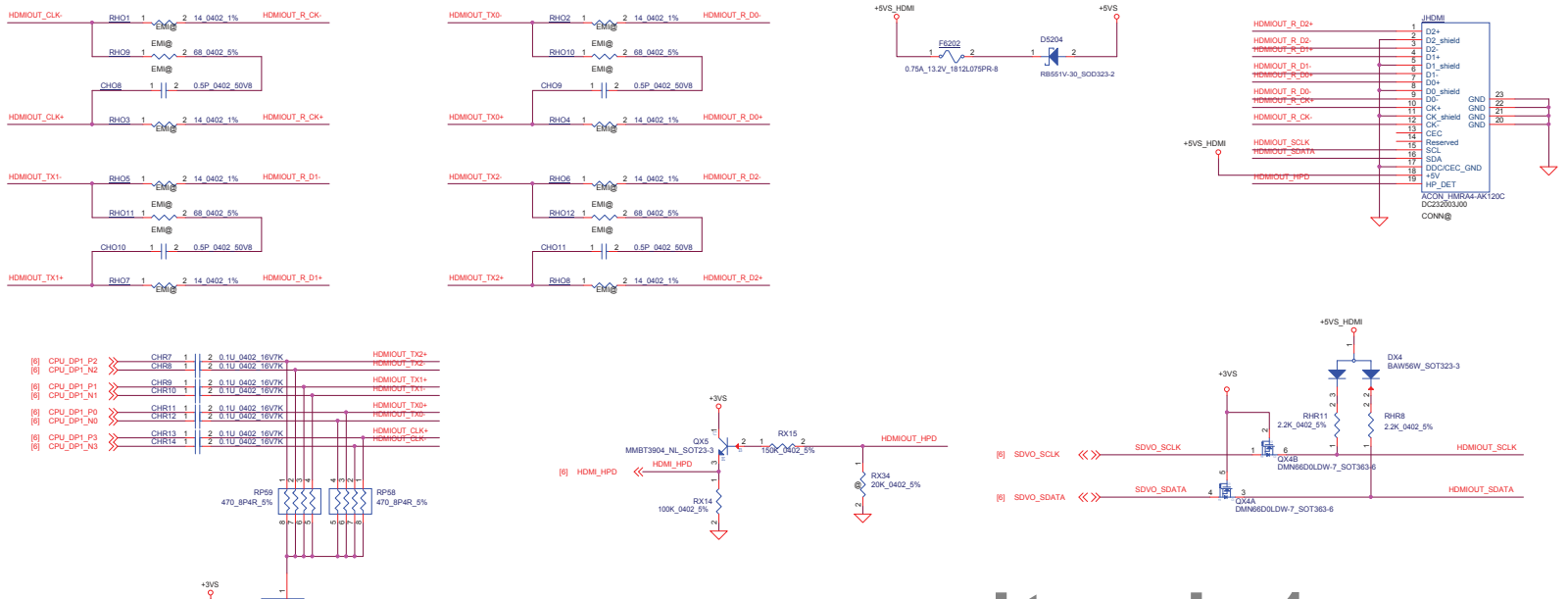
Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.	
Title	LCD/Inverter CONN
Size	Document Number: LA-D821P
Rev	0.1
Date:	Monday, June 06, 2016
Sheet	25 of 55

Main Func = HDMI

2014.12.25
1. LHO1 4HO2 LH3 · LH O4 chan ge ro ot p in (SI ZE : 050 4) a nd unpp
2. RHO1,RHO3,RHO5,RHO7,RHO2,RHO4,RHO6,RHO8,RHO13,RHO14,RHO15,RHO16, change to pop.

HDMI-OUT Connector



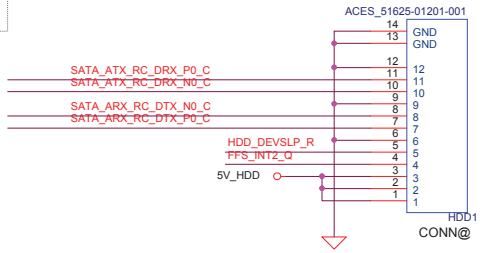
Security Classification	Compal Secret Data		
Issued Date	2014/04/02	Deciphered Date	2015/10/02

Compal Electronics, Inc.		
Title: P21-HDMI		
Size	Document Number: LA-D821P	Rev: 0.1
Date: Monday, June 06, 2016	Sheet 26 of 55	

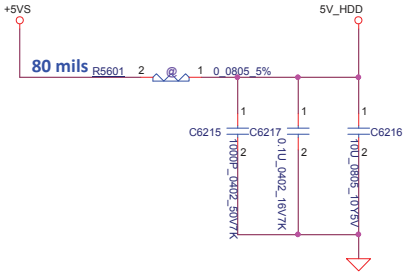
Main Func = HDD

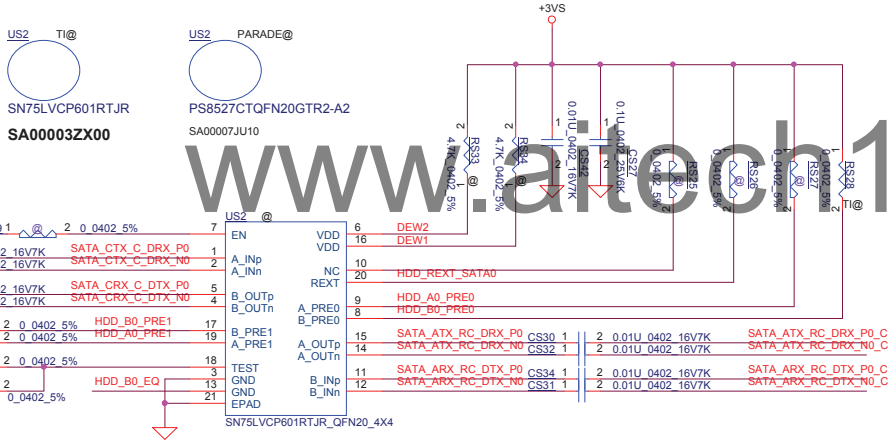
SATA HDD Connector

Reserve, refer to M15 EE Implementation Requirements

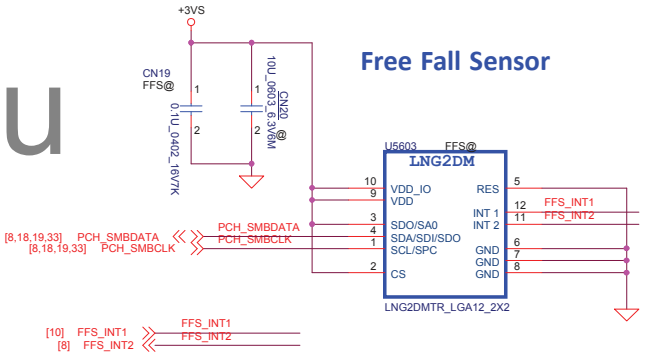


CONN		FFC
GND	S1	1
A+	S2	2
A-	S3	3
GND	S4	4
B-	S5	5
B+	S6	6
GND	S7	7
GND	P1	
GND	P2	
GND	P3	
5V	P4	10
5V	P5	11
5V	P6	12
GND	P7	
GND	P8	

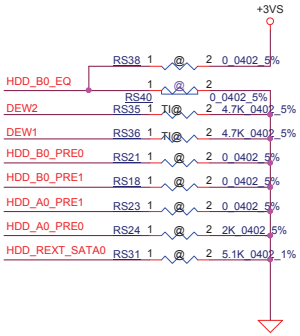


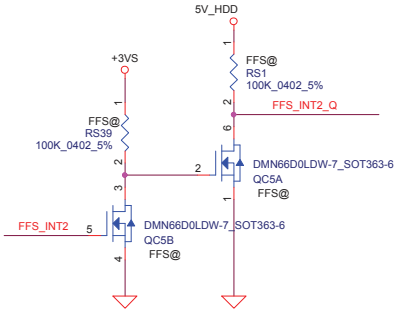


Free Fall Sensor



	US2	RS35	RS36	RS18	RS22	RS23	RS24	RS28
TI	SA00003ZX00	4.7K	4.7K	NC	NC	NC	2K	V
PARADE	SA00007JU00	7.5K	NC	V	V	V	NC	NC





Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

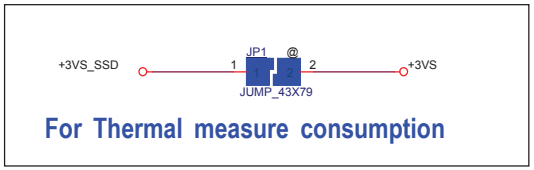
Compal Electronics, Inc.

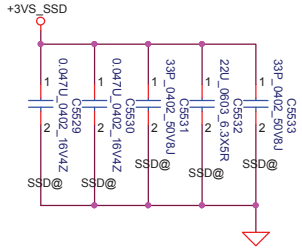
Title: HDD/ODD

Size | Document Number: LA-D821P | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 27 of 55

Main Func = SSD





2/6 TX Cap change P/N,
Now It's 0402 0ohm resistor.

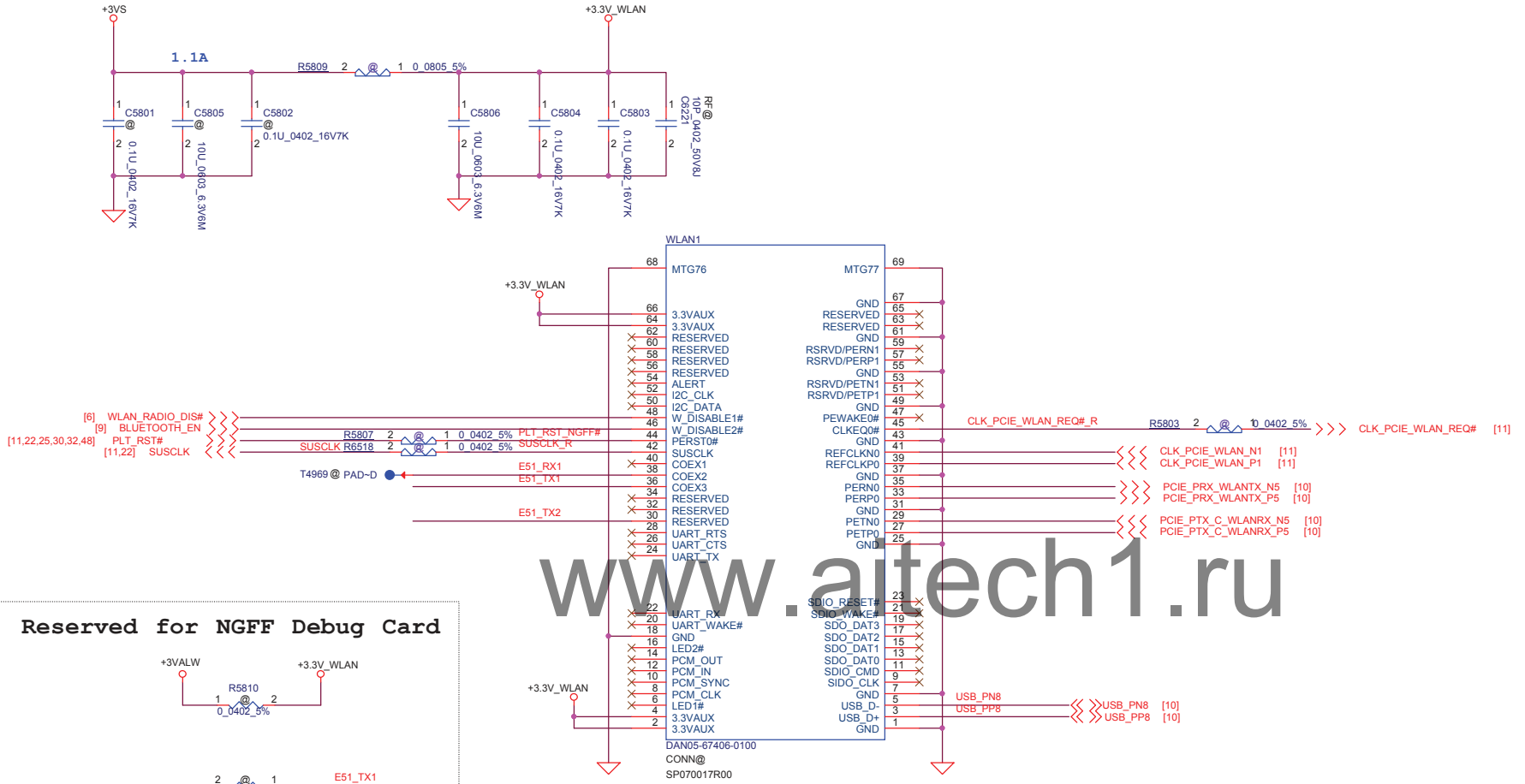
SSD
NGFF Slot_2 Key M

For Layout change pin define

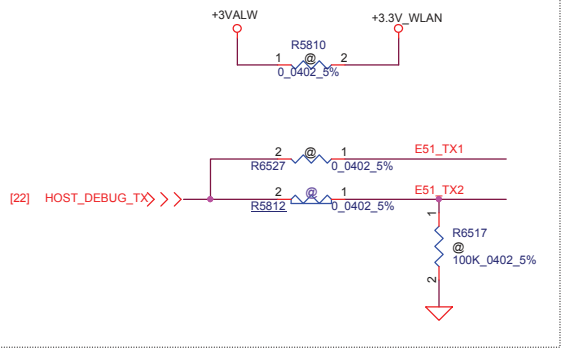
Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.			
Title: SSD			
Size	Document Number: LA-D821P		Rev: 0.1
Date: Monday, June 06, 2016	Sheet 28 of 55		

Main Func = WLAN



Reserved for NGFF Debug Card



Support: Intel Dual Band Wireless-AC 3160

Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.

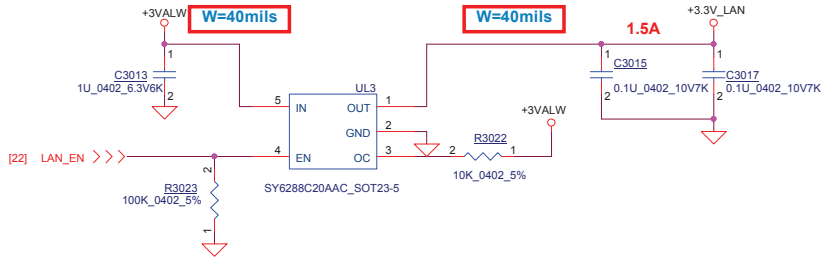
Title: NGFF_WLAN CONN

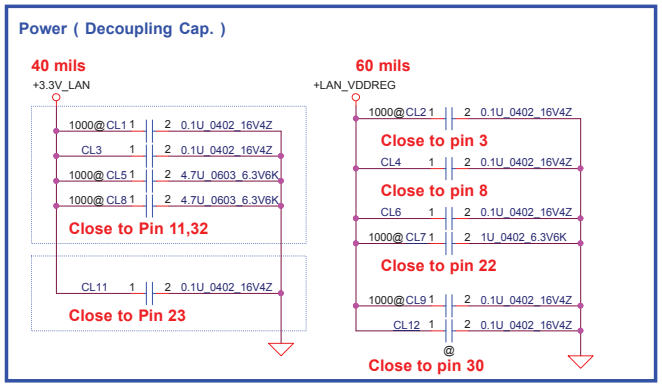
Size | Document Number: LA-D821P | Rev: 0.1

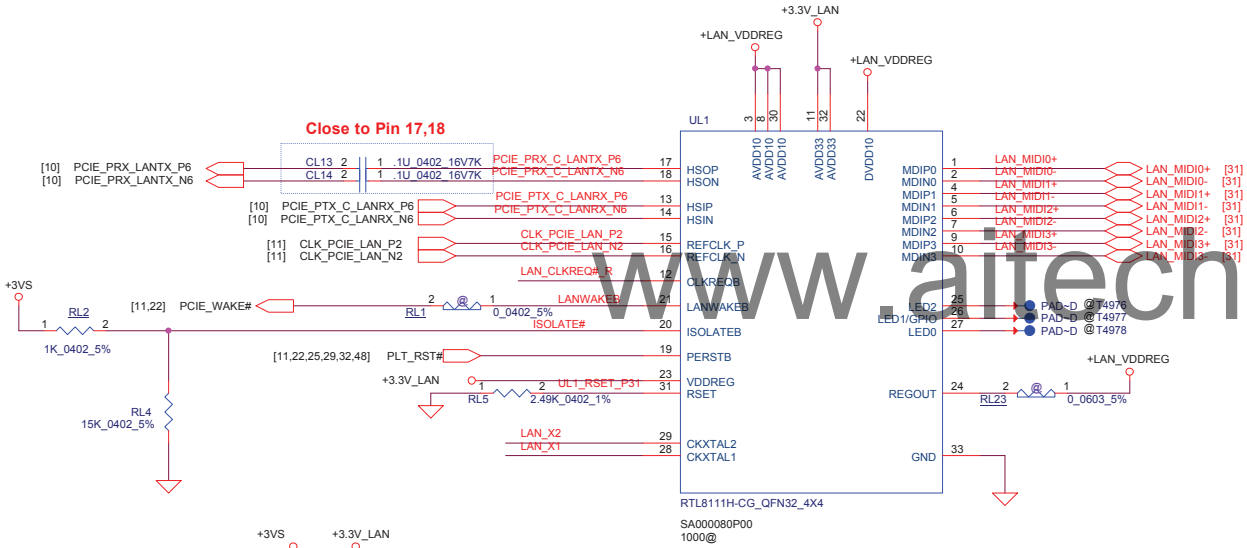
Date: Monday, June 06, 2016 | Sheet 29 of 55

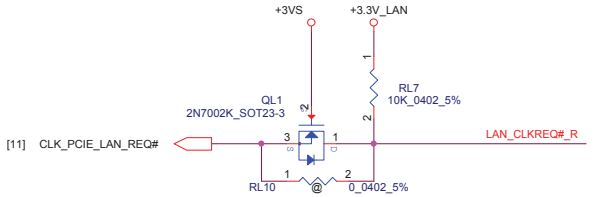
Main Func = LAN

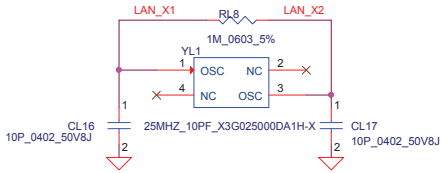
+3.3V_LAN rising time (10%~90%) need > 0.5ms and <100ms.











Security Classification	Compal Secret Data		
Issued Date	2014/12/15	Deciphered Date	2016/12/15

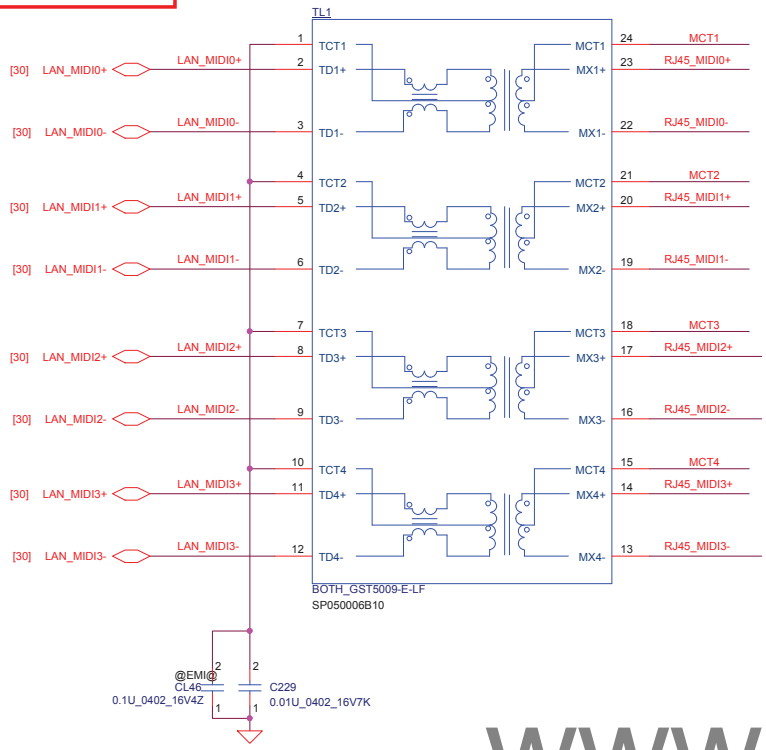
Compal Electronics, Inc.

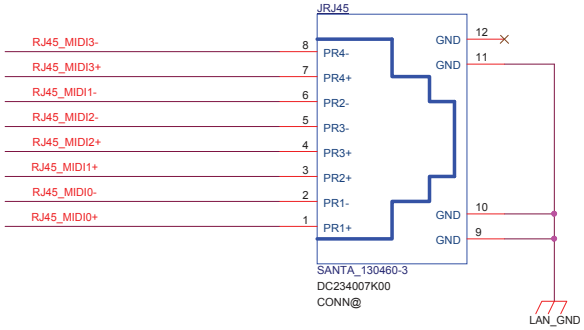
Title: LAN RTL8111H-CG

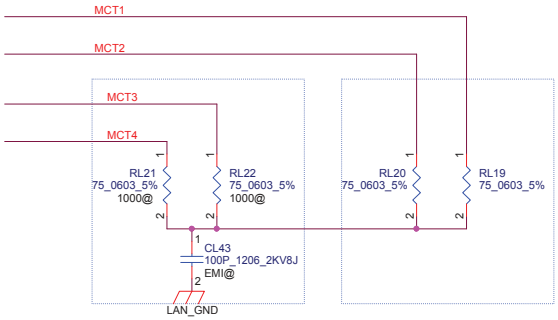
Size	Document Number	Rev
Custom	LA-D821P	0.1

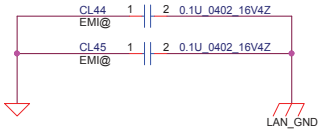
Date: Monday, June 06, 2016 | Sheet 30 of 55

Main Func = LAN









Security Classification	Compal Secret Data		
Issued Date	2012/04/27	Deciphered Date	2013/04/27

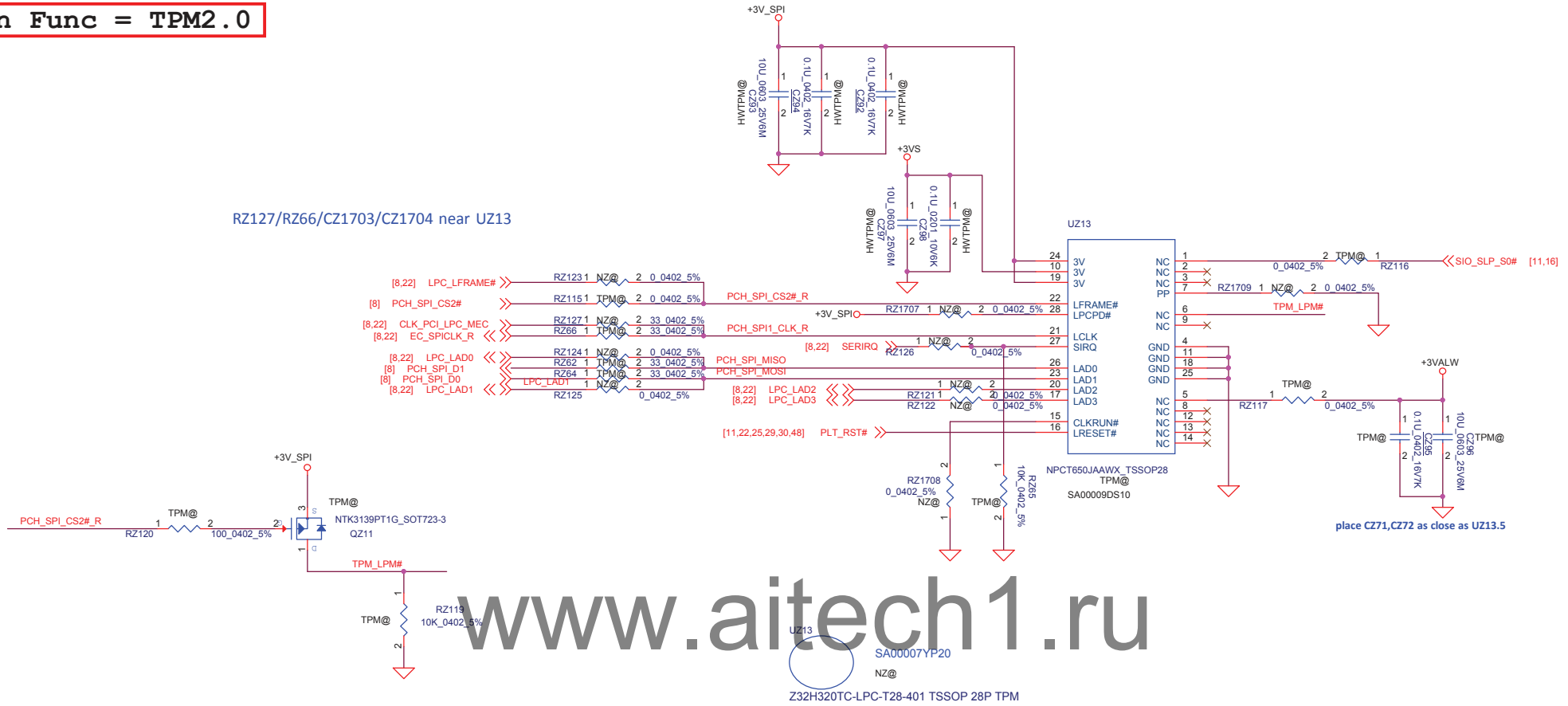
Compal Electronics, Inc.

Title: **JMB385 Media Card Controller**

Size	Document Number	Rev
Custom	LA-D821P	0.1

Date: Monday, June 06, 2016 | Sheet 31 of 55

Main Func = TPM2.0



Security Classification	Compal Secret Data		
Issued Date		Deciphered Date	2015/07/21

Compal Electronics, Inc.

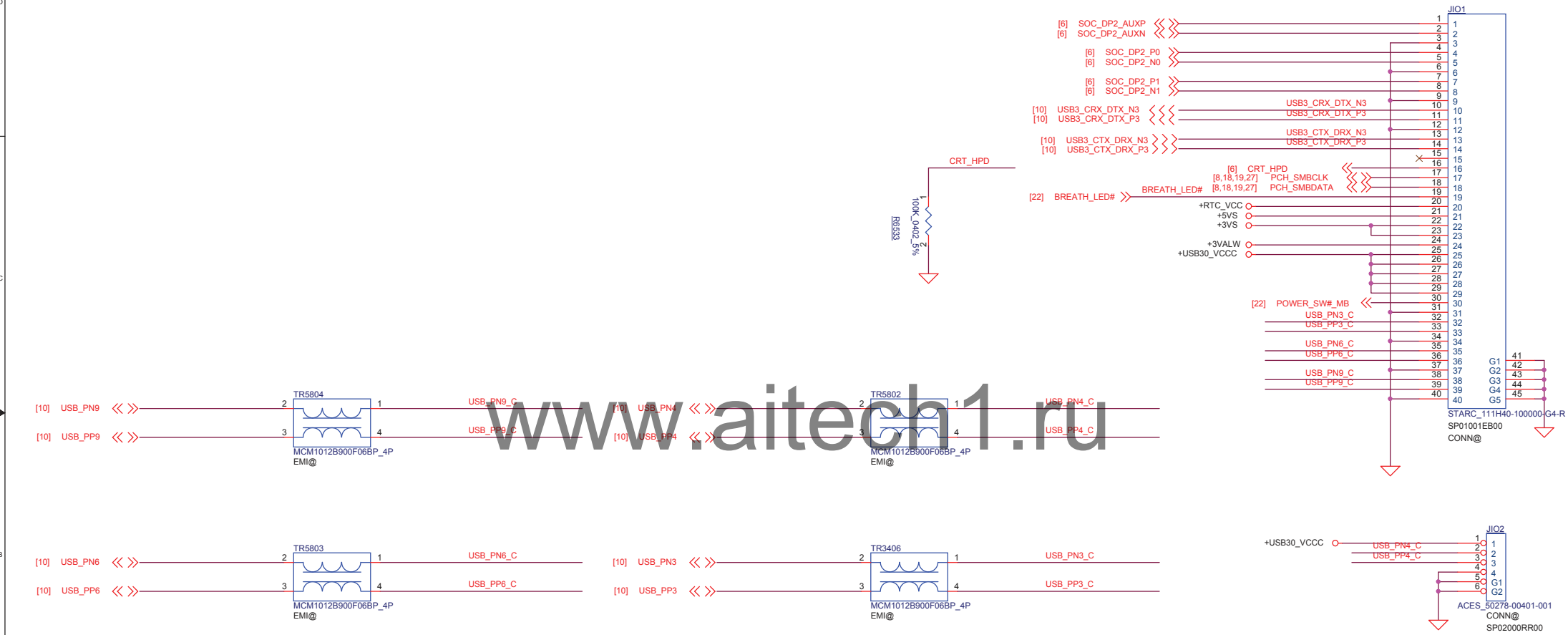
Title: *TPM*

Size: Custom | Document Number: *LA-D821P* | Rev: 0.1

Date: | Sheet 32 of 55

Main Func = IO Connector

I/O Board Connector



Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.

Title: IO Board Connector

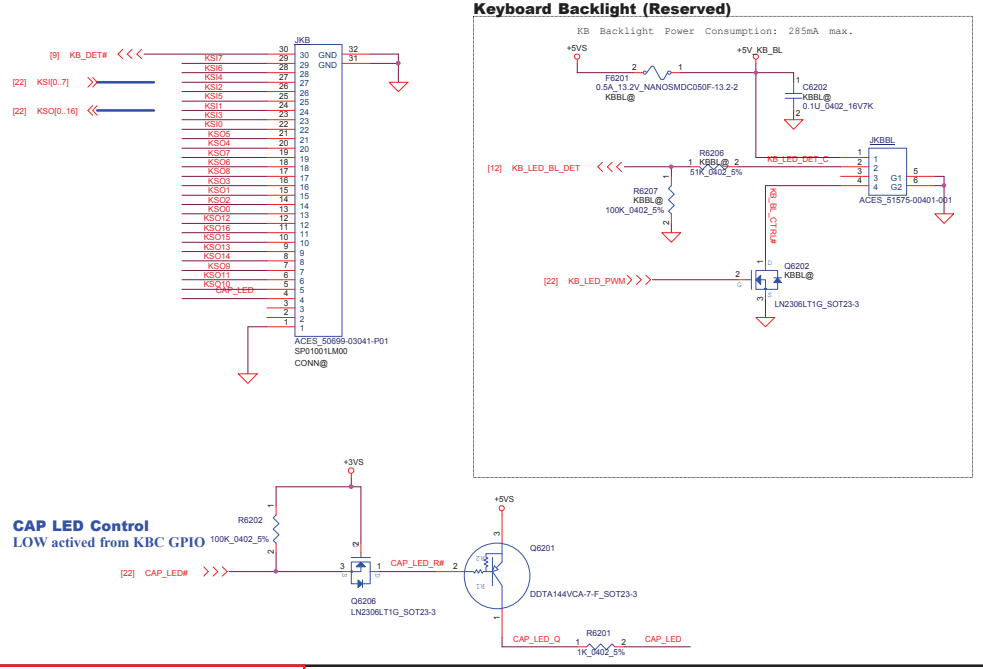
Size	Document Number	Rev
	LA-D821P	0.1

Date: Monday, June 06, 2016 Sheet 33 of 55

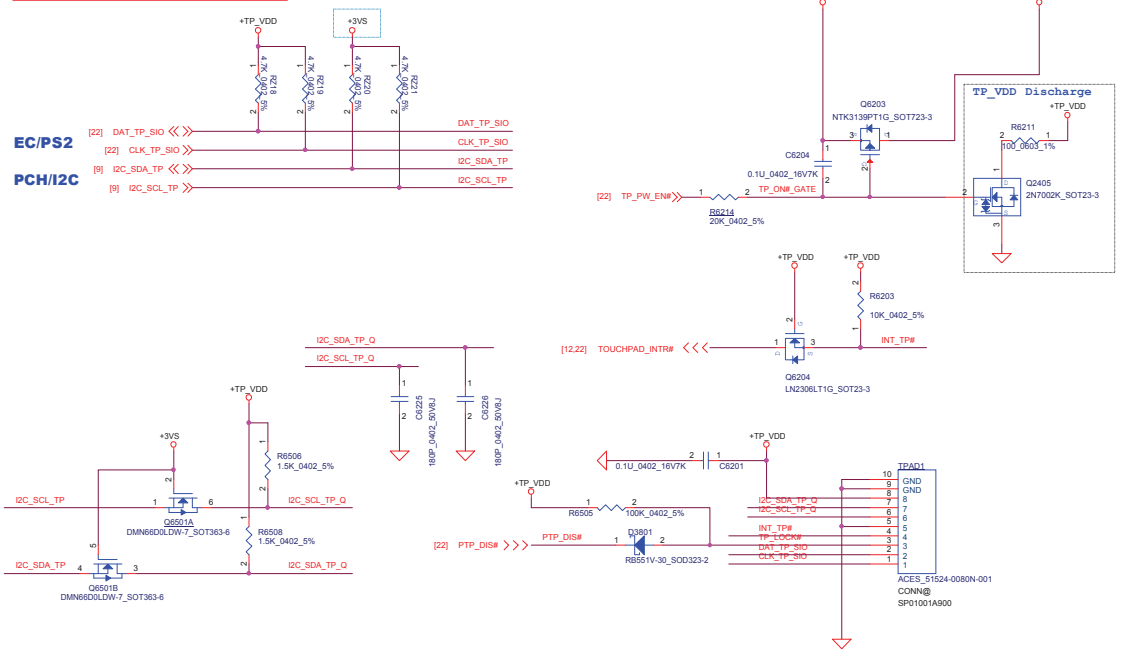
Main Func = KB

Keyboard Backlight (Reserved)

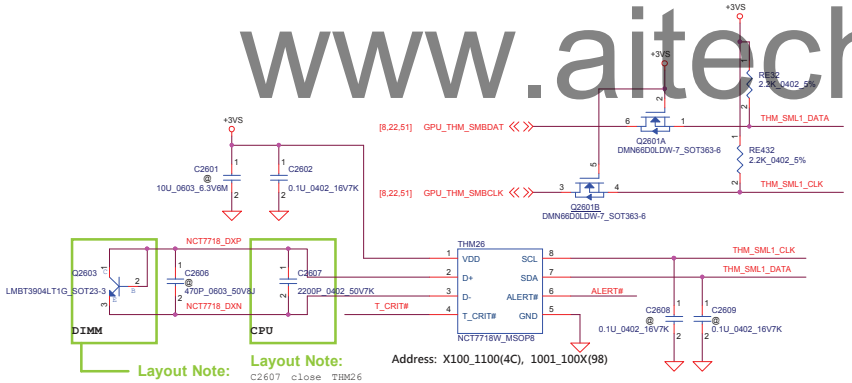
KB Backlight Power Consumption: 285mA max.



Main Func = TPAD



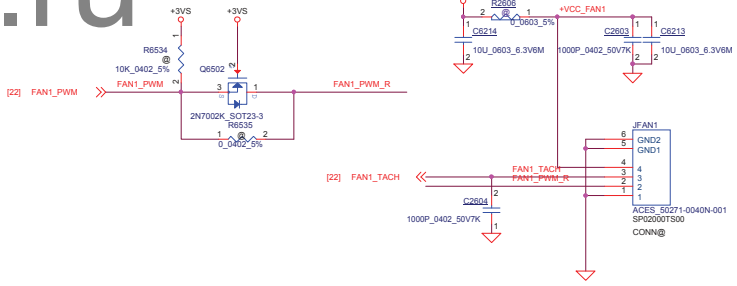
Main Func = Thermal

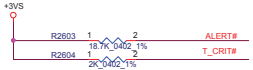


Layout Note: C2607 close THM26

Address: X100_1100(4C), 1001_100X(98)

DXN and DXP routing width and spacing is 10 mil / 10 mil.

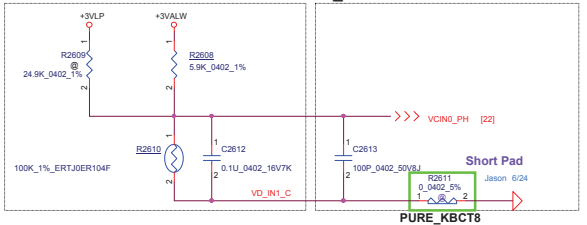




TEMPERATURE (℃)		T_CRIT#				
		2KΩ	7.5KΩ	10.5KΩ	14KΩ	18.7KΩ
ALERT#	2KΩ	77	87	97	107	117
	7.5KΩ	79	89	99	109	119
	10.5KΩ	81	91	101	111	121
	14KΩ	83	93	103	113	123
	18.7KΩ	85	95	105	115	125

Close to Thermal sensor

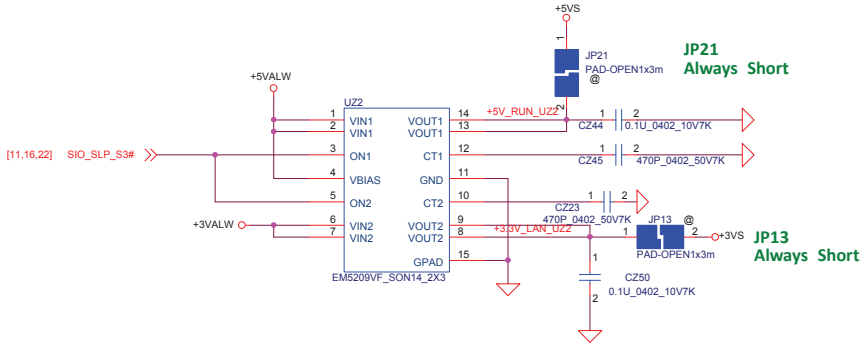
Close to KBC VD_IN1 for system thermal sensor



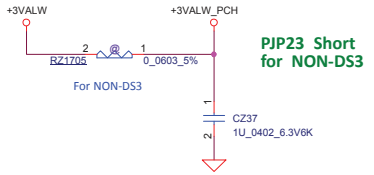
Security Classification	Compal Secret Data		
Issued Date	2015/07/09	Deciphered Date	2016/07/31

Compal Electronics, Inc.	
Title	Keyboard/Touch Pad/Thermal
Size	Document Number: LA-D821P
Rev	0.1
Date:	Monday, June 06, 2016
Sheet	34 of 55

+5V_RUN/+3.3V_RUN for System



+3VALW_PCH for System

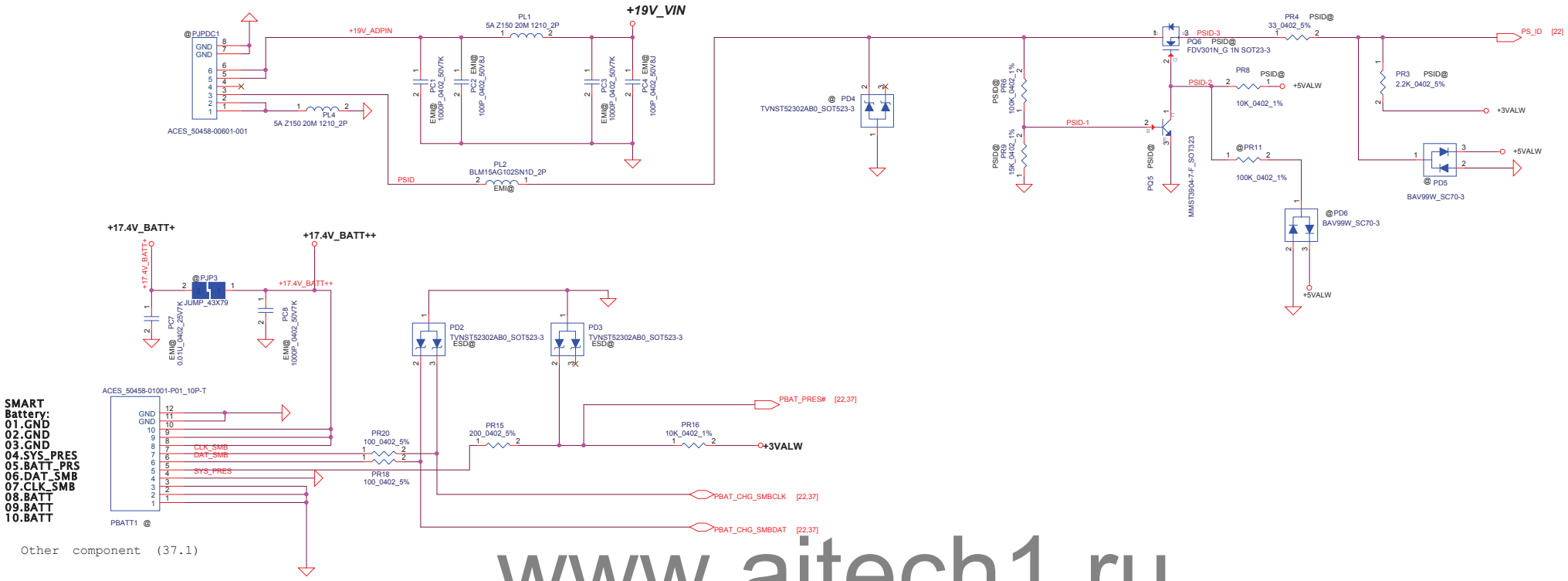


Compal Electronics, Inc.

Title: Power control

Size | Document Number: LA-D821P | Rev: 0.1

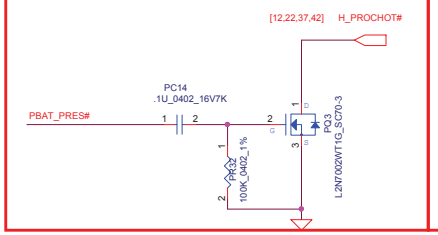
Date: Monday, June 06, 2016 | Sheet 35 of 55



Other component (37.1)

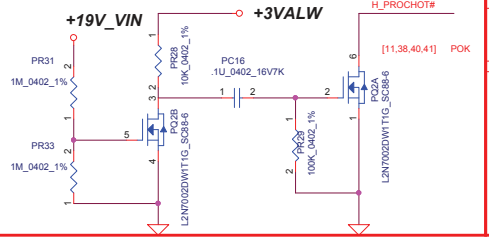
Adapter protection

if battery removed, adaptor only, then trigger the H_PROCHOT#, keep @ in BOM since battery can not be removed by end user

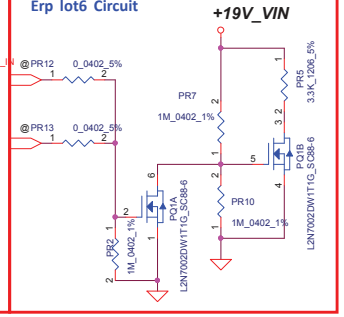


Battery protection

asserts H_PROCHOT# when adaptor is unplugged, keep low for 10ms till SW PROCHOT# is issued by EC



Erp lot6 Circuit



15W_U22+VGA(SKL)
X63:PSID@/U22_SKL@/VGA@
X4P:EMI@/ESD@/VGA@EMI@/RF@VGA@

15W_U22+VGA(KBL)
X63:PSID@/U22_KBL@/VGA@
X4P:EMI@/ESD@/VGA@EMI@/RF@VGA@

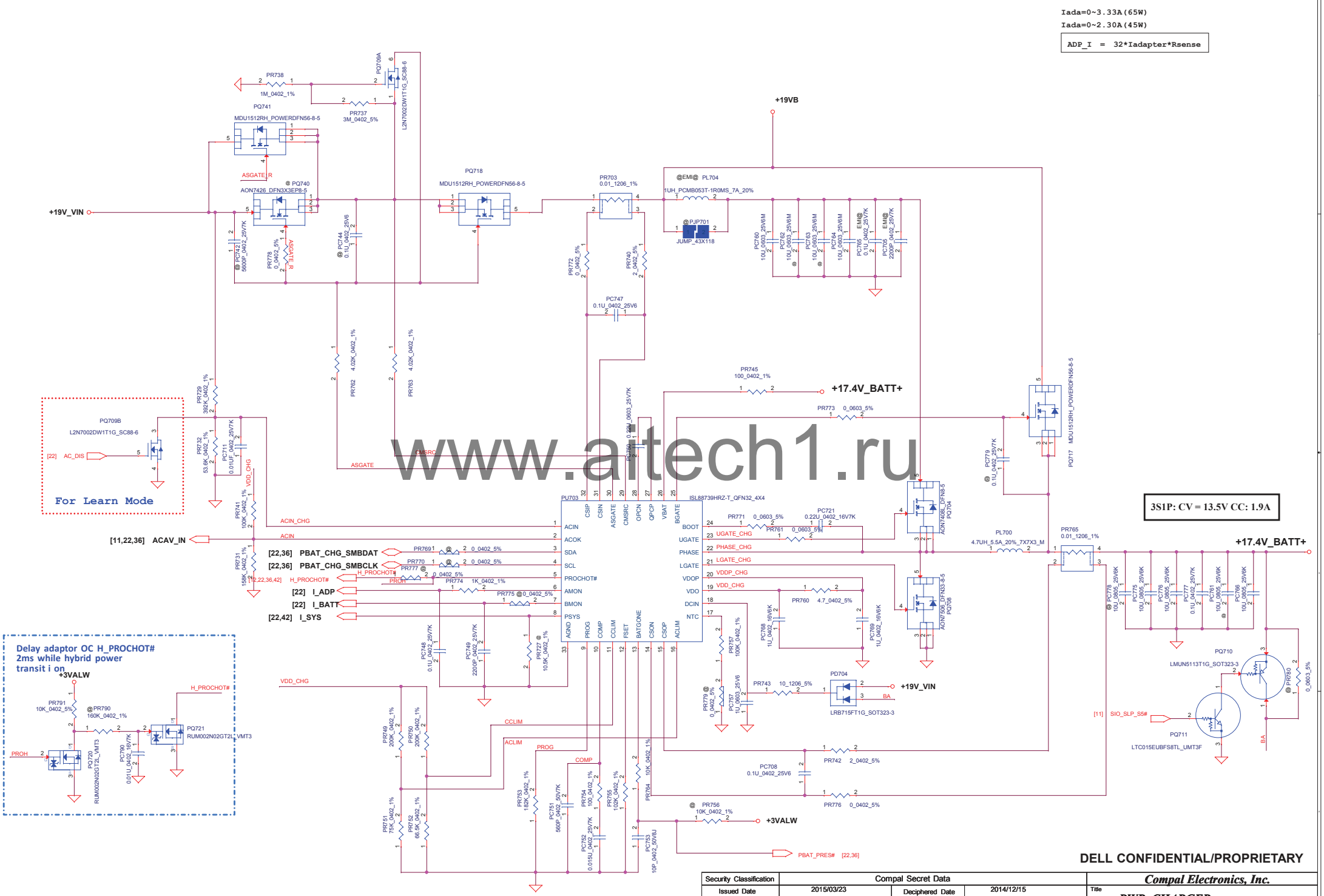
Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

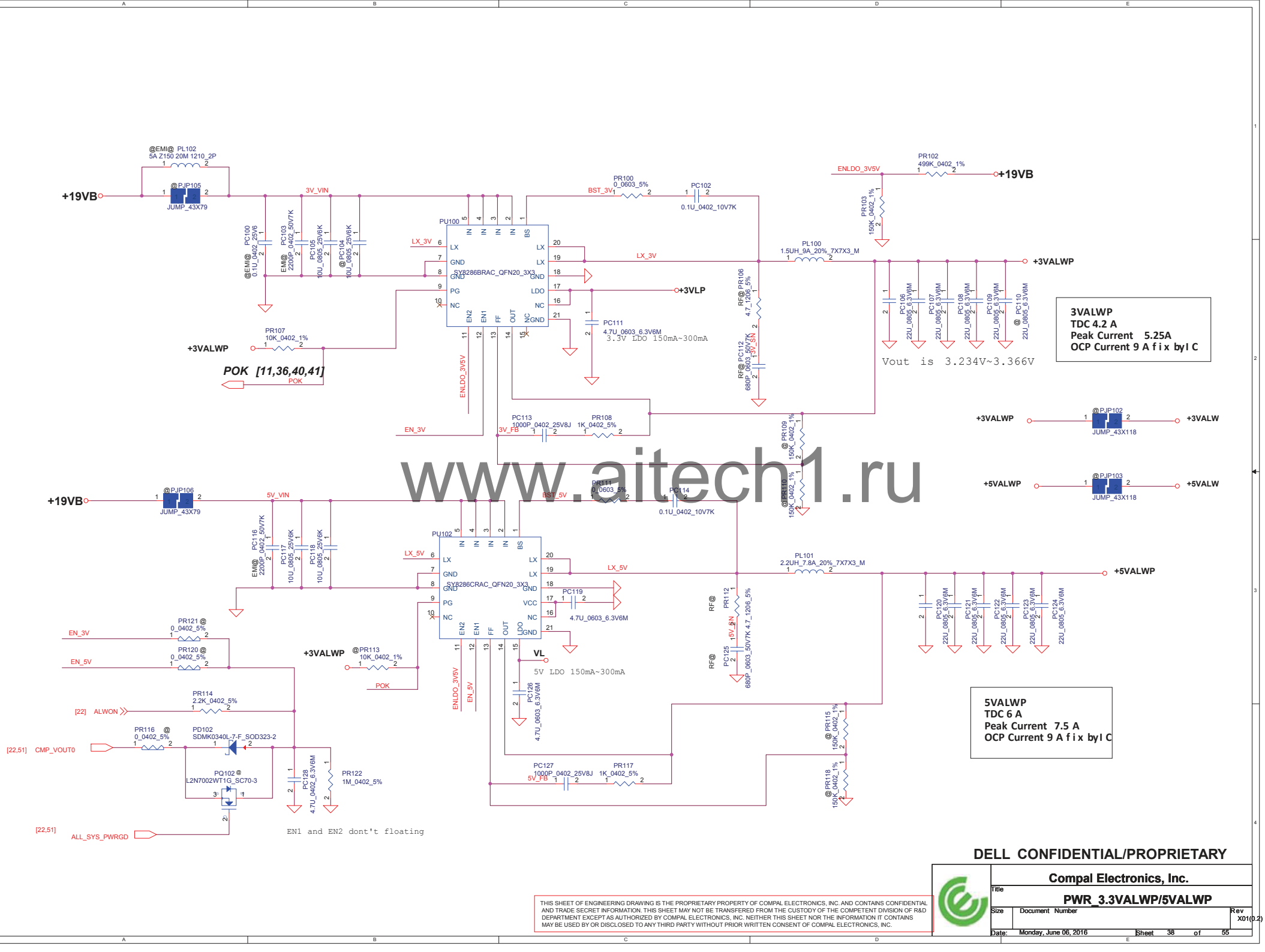
Compal Electronics, Inc.

Title: PWR_DCIN/BATT CONN/OTP

Size	Document Number	Rev
		X01(0.2)

Date: Monday, June 06, 2016 Sheet 36 of 55



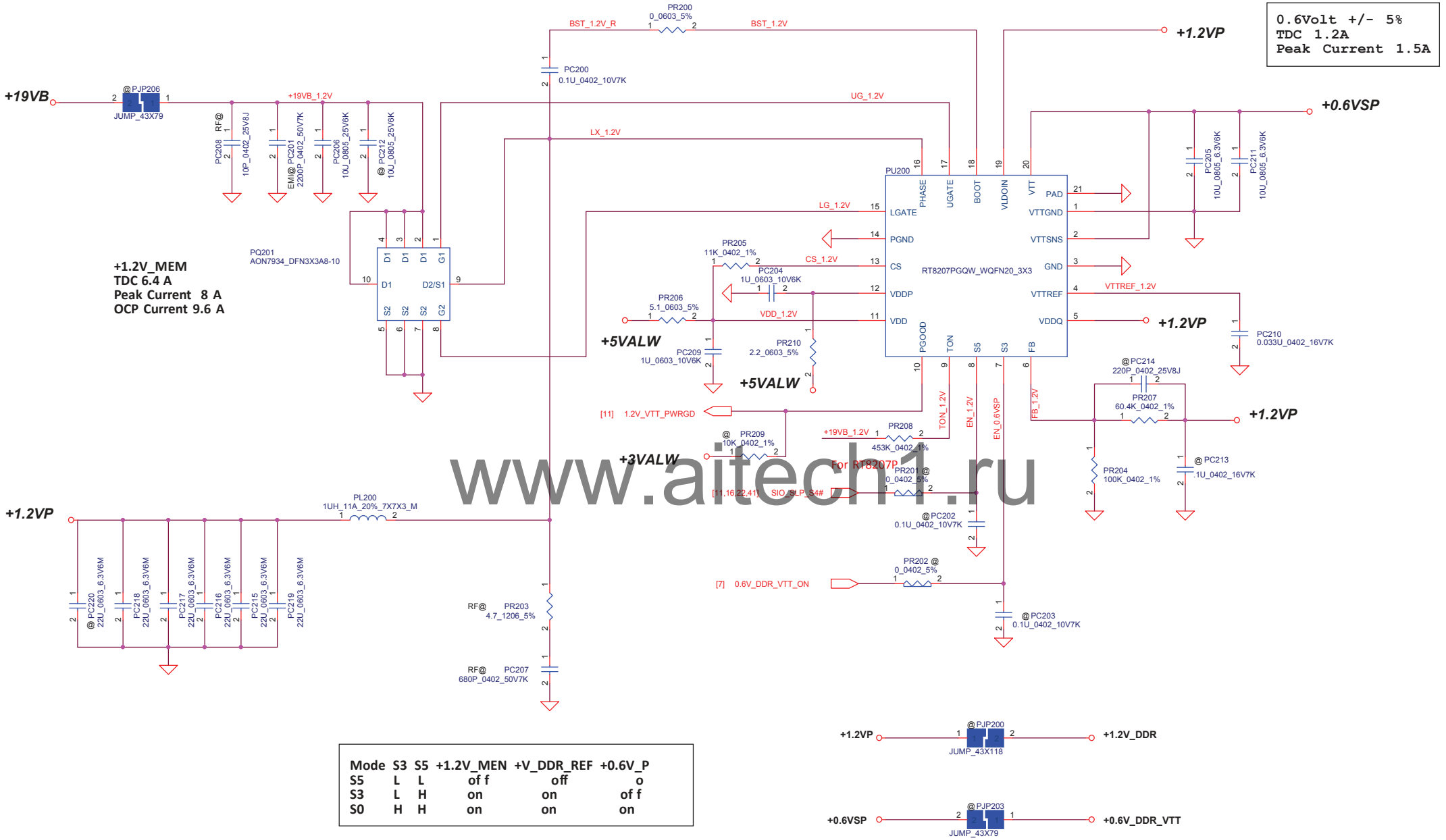


Compal Electronics, Inc.

Title: PWR_3.3VALWP/5VALWP

Size: | Document Number: | Rev: X01(0.2)

Date: Monday, June 06, 2016 | Sheet 38 of 55



Mode	S3	S5	+1.2V_MEN	+V_DDR_REF	+0.6V_P
S5	L	L	of f	off	o
S3	L	H	on	on	of f
S0	H	H	on	on	on

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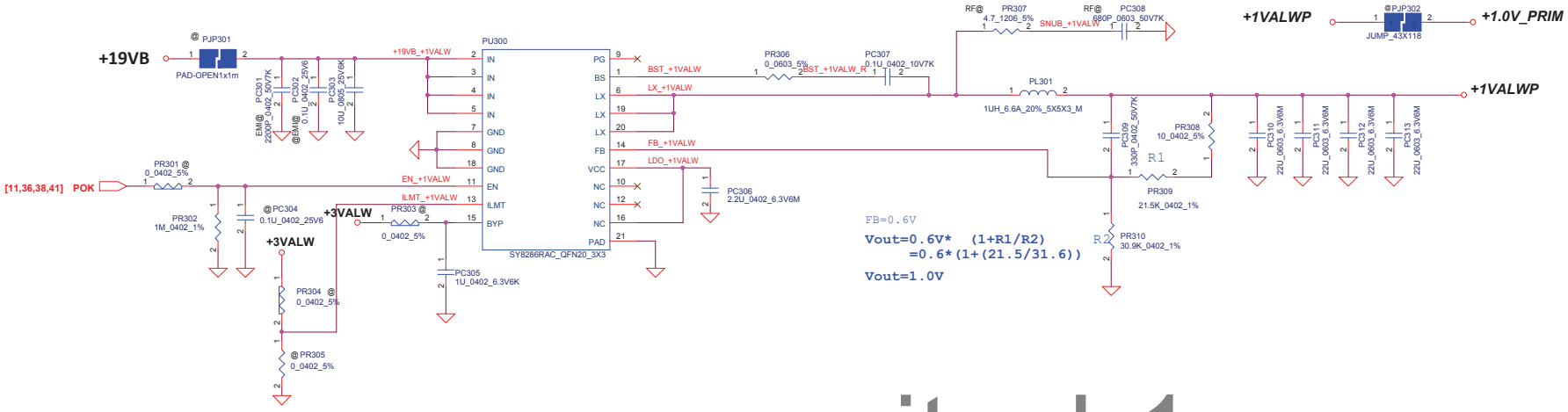
Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

Title	PWR_+1.2V_MEN/+0.6V_DDR_VTT		
Size	Document Number		Rev
Custom			X01(0.2)
Date:	Monday, June 06, 2016	Sheet	39 of 55



The current limit is set to 6A, 9A or 12A when this pin is pull low, floating or pull high

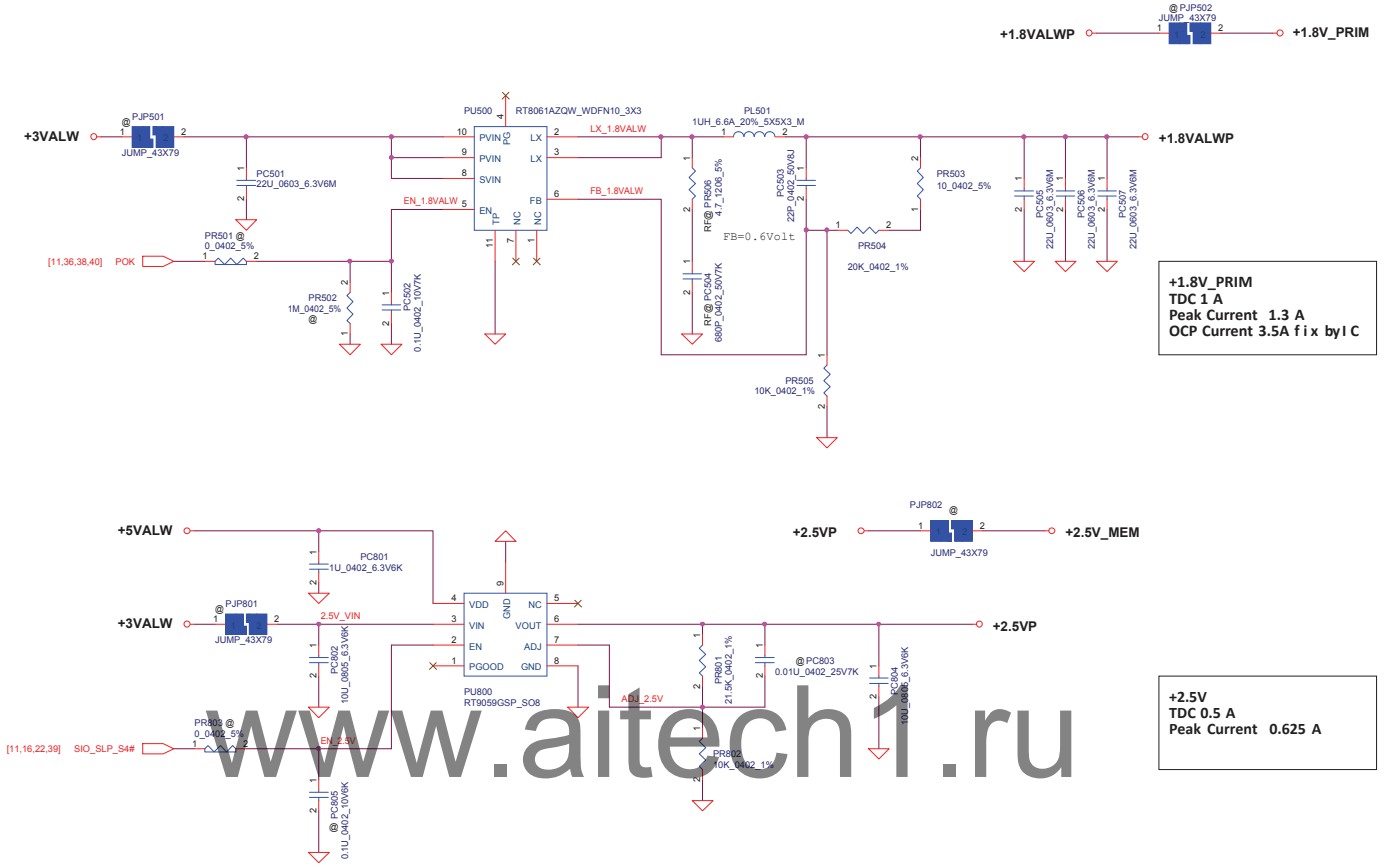
OCP setting	ILMT(pin3)
6A	Pull low
9A	Floating
12A	Pull high

+1.0V_PRIM
TDC 6 A
Peak Current 8.6 A
OCP Current 12 A Fix by IC

	TYP	MAX
Choke DCR	11.0mohm ,	12.0mohm

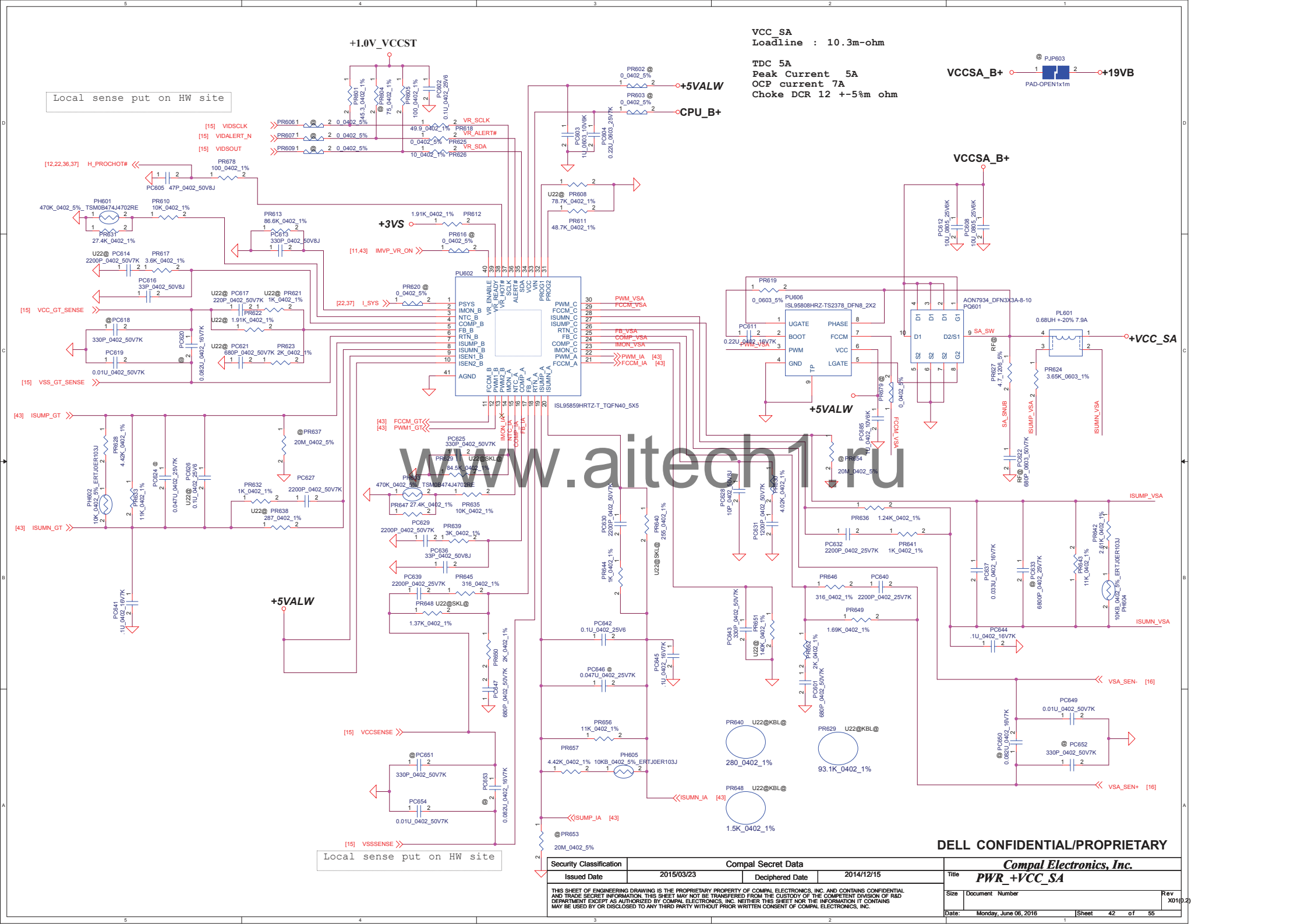
Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

Compal Electronics, Inc.			
Title	PWR_+1VALWP		
Size C	Document Number		Rev X01(0.2)
Date: Monday, June 06, 2016	Sheet 40 of 55		



Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

Compal Electronics, Inc.			
Title	PWR +1.8V PRIM and +2.5V		
Size C	Document Number		Rev XD1(0.2)
Date: Monday, June 06, 2016		Sheet 41 of 55	



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Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

Compal Electronics, Inc.

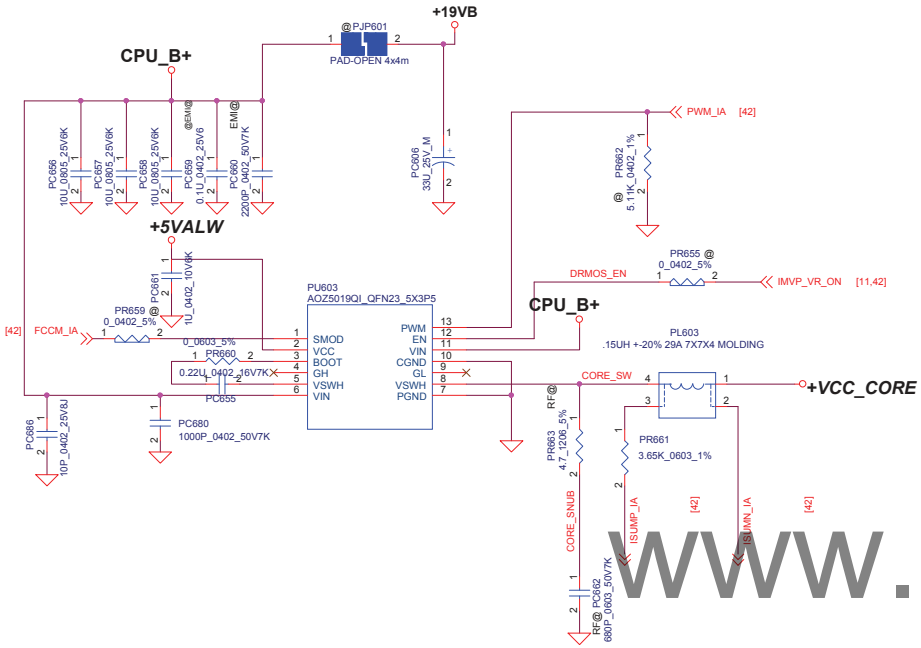
Title	PWR_+VCC_SA		
Size	Document Number		Rev X01(0.2)
Date: Monday, June 06, 2016		Sheet 42 of 55	

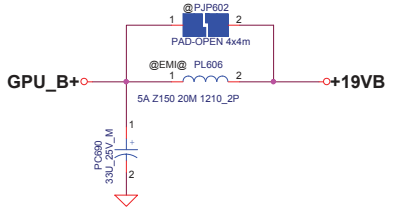
VCC_core
U22 - 15W
Loadline : 2.4m-ohm

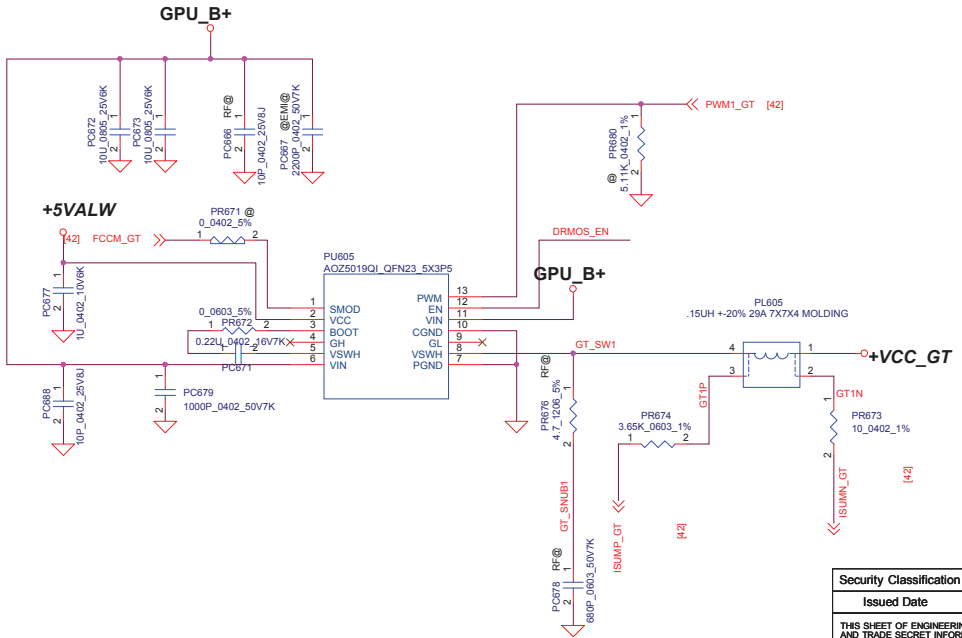
TDC 21A
Peak Current 29A
OCP current 34A
Choke DCR 0.66 +-7%m ohm

VCC_GT
U22 - 15W
Loadline : 3.1m-ohm

U22-15W
TDC 18A
Peak Current 31A
OCP current 37A
Choke DCR 0.66 +-7%m ohm







Security Classification	Compal Secret Data		
Issued Date	2015/03/23	Deciphered Date	2014/12/15

Compal Electronics, Inc.

Title: PWR_+VCC_core and +VCC_GT

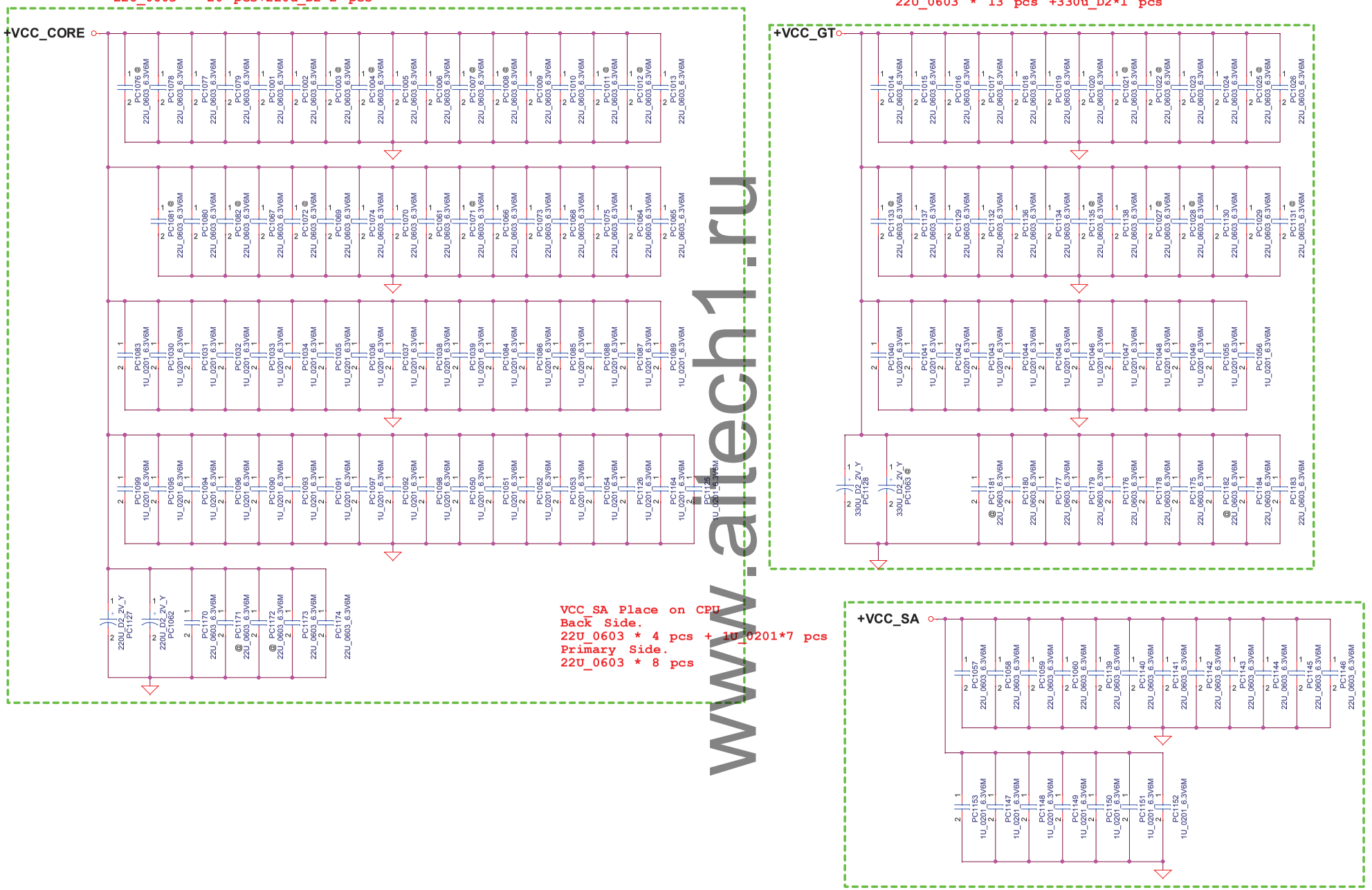
Size	Document Number	Rev
		X01(0.2)

Date: Monday, June 06, 2016 Sheet 43 of 55

VCC_CORE Place on CPU
Back Side.
22U_0603 * 13 pcs +1U_0201*35 pcs
Primary Side.
22U_0603 * 20 pcs+220u_D2*2 pcs

VCC_GT Place on CPU
Back Side.
22U_0603 * 13 pcs +1U_0201*12 pcs
Primary Side.
22U_0603 * 13 pcs +330u_D2*1 pcs

VCC_SA Place on CPU
Back Side.
22U_0603 * 4 pcs + 1U_0201*7 pcs
Primary Side.
22U_0603 * 8 pcs



DELL CONFIDENTIAL/PROPRIETARY

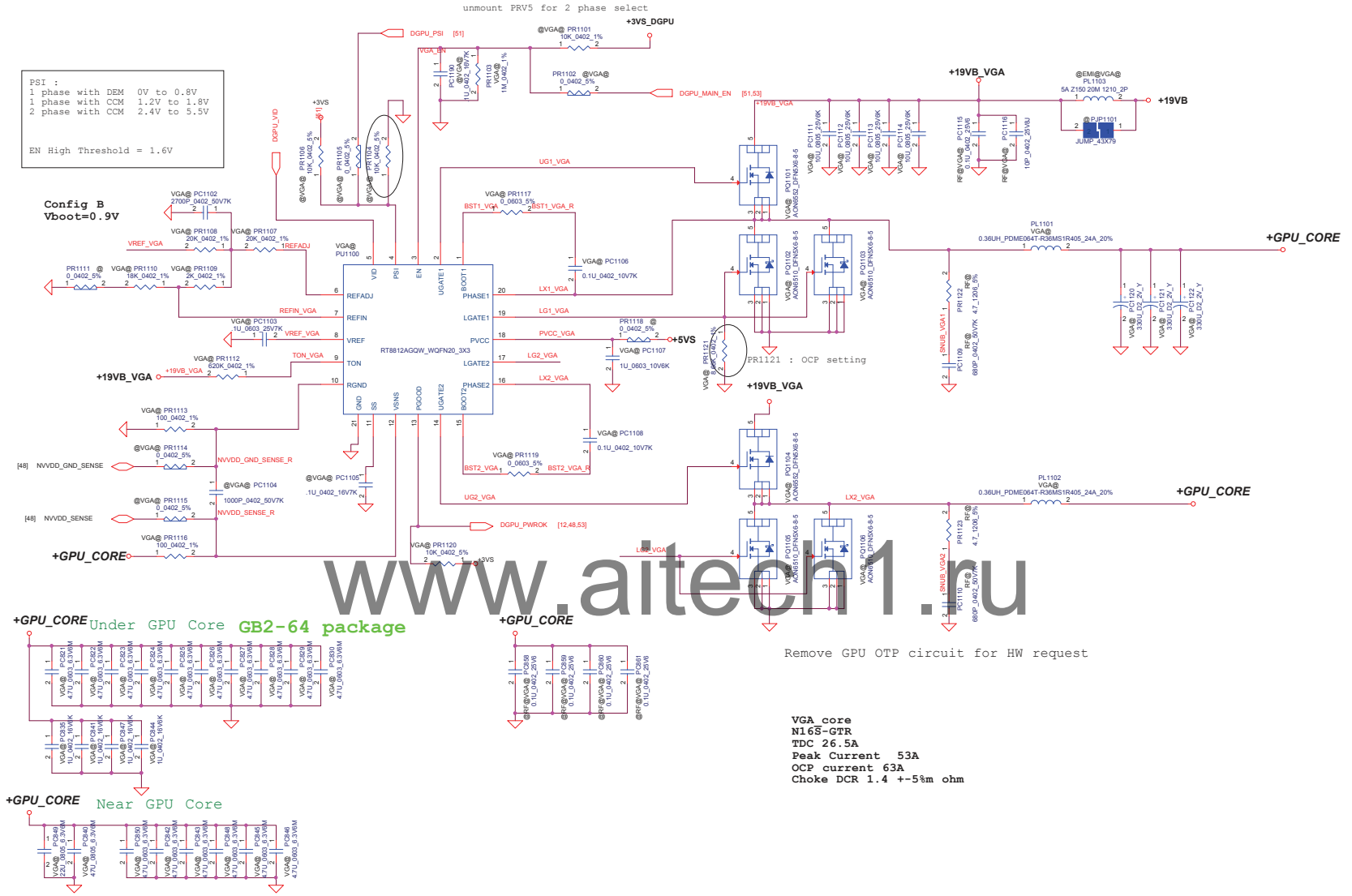
Security Classification	Compal Secret Data		
Issued Date	2014/11/05	Deciphered Date	2014/12/15

Compal Electronics, Inc.

Title: PWR_CPU&VGA bulk and MLCC

Size	Document Number	Rev
		X00(0.1)

Date: Monday, June 06, 2016 | Sheet 44 of 55



Security Classification	Compal Secret Data		Compal Electronics, Inc.
Issued Date	2015/03/23	Deciphered Date 2014/12/15	Title PWR_VGA_CORE
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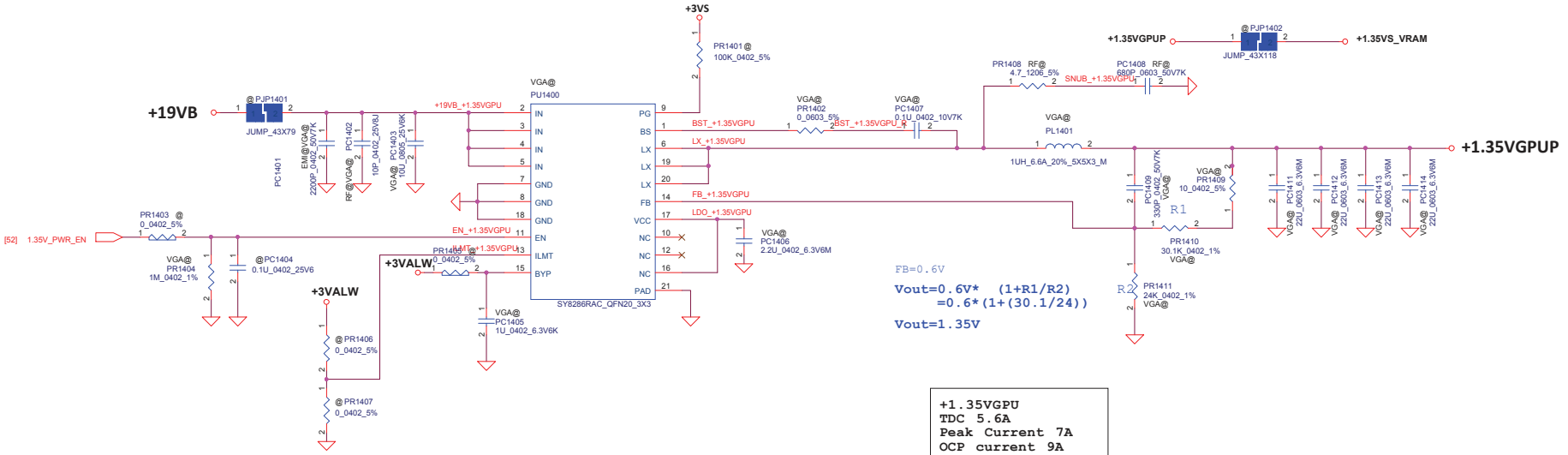
			Date: Monday, June 06, 2016 / Sheet 45 of 55



+1.35VGPUP
TDC 5.6A
Peak Current 7A
OCP current 9A

The current limit is set to 6A, 9A or 12A when this pin is pull low, floating or pull high

OCP setting	ILMT(pin13)
6A	Pull low
9A	Floating
12A	Pull high

Security Classification	Compal Secret Data		
Issued Date	2014/03/31	Deciphered Date	2015/04/30

Compal Electronics, Inc.

Title: PWR +1.35VGPU

Size | Document Number | Rev 0.1

Date: Monday, June 06, 2016 | Sheet 46 of 55

Version Change List (P. I. R. List)

Item	Page#	Title	Date	Request Owner	Issue Description	Solution Description	Rev.
1	P37	PWR	20160303	COMPAL	to change charger IC	change charger IC(PU703) to ISL88739	0.2(X00)

2	P39
	P43
	P45
	P46
		PWR	20160303	COMPAL	to prevent RF issue	add PC208
						add PC666,PR676,PC678
						add PC1116,PR1122,PC1109,
						add PC1402,PR1408,PC1408	

3	P42	PWR	20160303	COMPAL	to adjust +VCC_CORE and +VCC_GT load line	change PR622 to 1.91K,PR638 to 287 ohm,PC626 to 0.1uF,PC642 to 0.1uF	
4	P36,P42	PWR	20160303	COMPAL	to save layout space	delete PL3,PL602(reserve location)	
5	P36	PWR	20160303	COMPAL	to fix battery connector ME issue	to change battery connector	
6	P37	PWR	20160304	COMPAL	to fix Temp/Voltage 19.5V DC-IN issue	change PR732 to 53.6K	
7	P44	PWR	20160304	COMPAL	to fix DFB solder open problem	change PC1127,PC1062,PC1128 footprint	
8	P38	PWR	20160308	COMPAL	to prevent OTP functions abnormal issue	to reserve PQ102 and connect to ALL_SYS_PWRGD	
9	P37	PWR	20160316	COMPAL	to save layout space by EMI request	change PC760,PC762,PC763,PC764 to 0603 size and delete PR766,PC767	
10	P43	PWR	20160328	COMPAL	according to test result to adjust VCC_CORE and GT_CORE's load line	to unmount PC624 and PC646	
11	P44	PWR	20160328	COMPAL	according to test result to adjust VCC_CORE and GT_CORE's output MLCC's location(only change BOM) and bulk cap	unmount:PC1021,PC1135,PC1133,PC1131,PC1022,PC1025,PC1027, PC1028,PC1063, PC1008,PC1003,PC1011,PC1072,PC1076,PC1071,PC1081,PC1082,PC1004, PC1007,PC1012 to mount:PC1176,PC1175,PC1177,PC1179,PC1178,PC1180,PC1183,PC1184, PC1170,PC1173,PC1174 to change PC1127,PC1062 to 220uF/9m ohm	
12	P36	PWR	20160429	COMPAL	To improve EMI and reduce inrush current to mount π filter' s bead and change cap	unmount:PL1,PL4 change:PC2,PC4 to 100pF	
13	P37	PWR	20160429	COMPAL	ISL88739 doesn't support PSYS function	unmount:PR727 change PR774 to 1K ohm change PC748 0.1uF	0.3(X02)
14	P39	PWR	20160429	COMPAL	to adjust 1.2V OCP to 10.2A	change PR205 to 11K	
15	P37	PWR	20160429	COMPAL	to aviod inrush to damage MOS	to reserve PQ741	

Security Classification	Compal Secret Data		
Issued Date	2015/07/15	Deciphered Date	2016/07/31

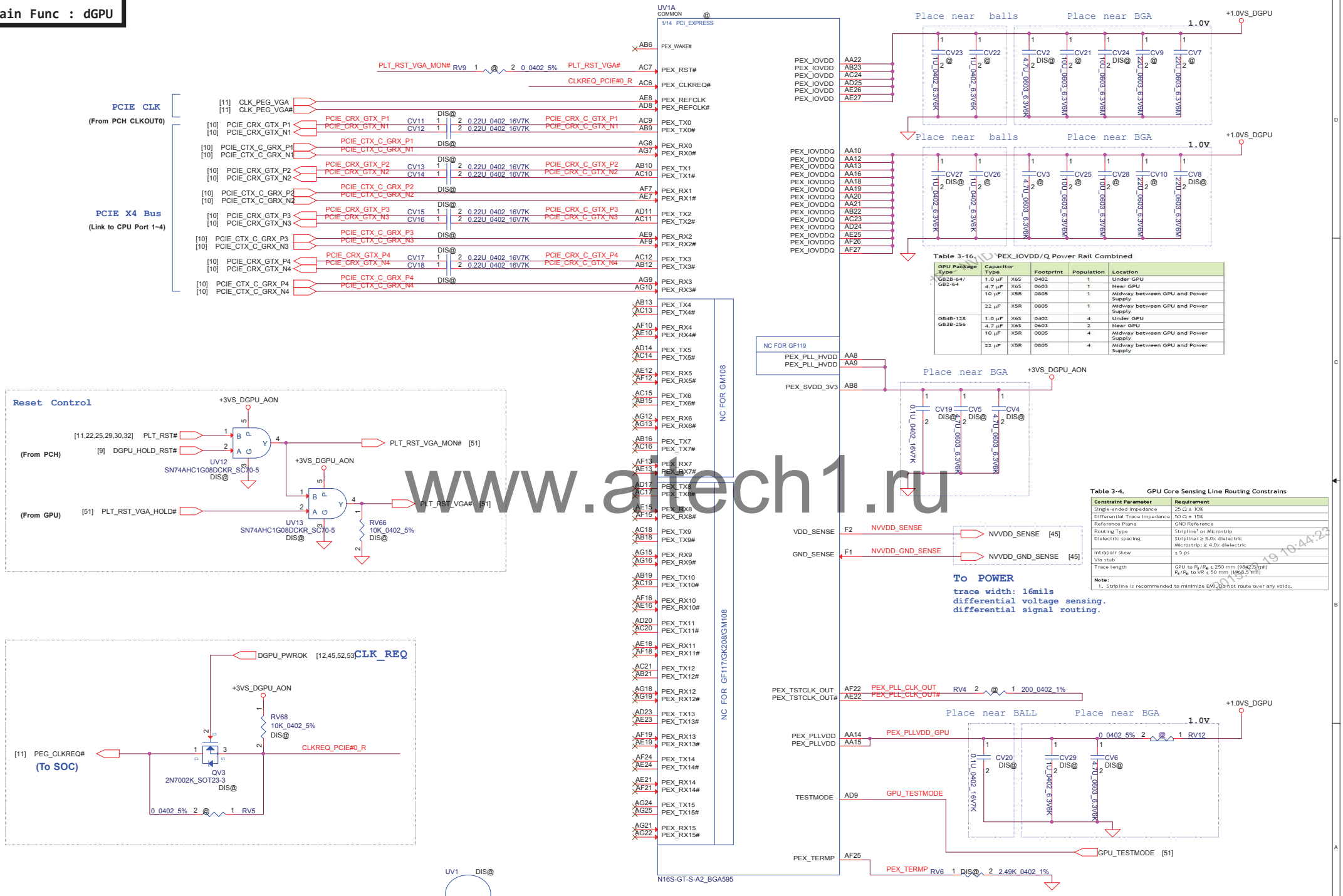
Compal Electronics, Inc.

Title: PWR_Change list

Size | Document Number | Rev

Date: Monday, June 06, 2016 | Sheet 47 of 55

Main Func : dGPU



Security Classification	Compal Secret Data		
Issued Date	2014/05/19	Deciphered Date	2015/12/31

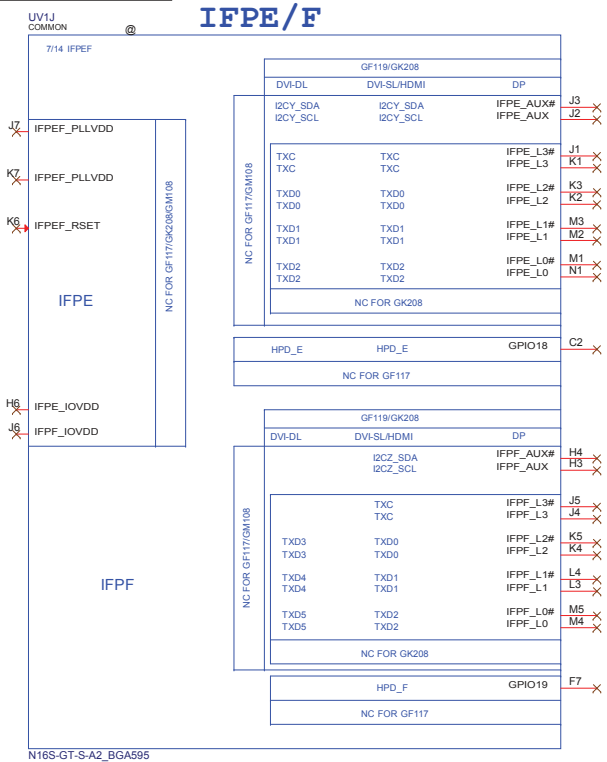
Compal Electronics, Inc.

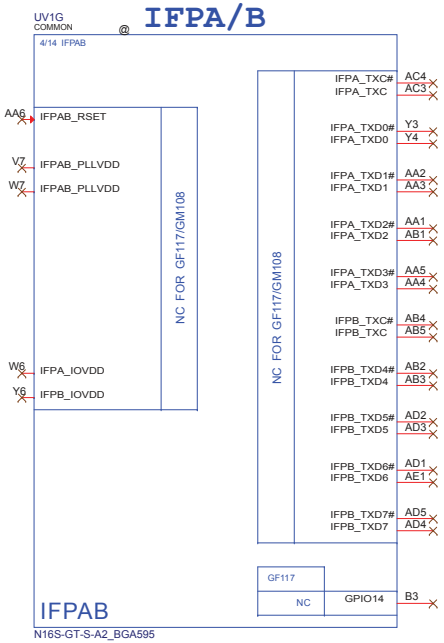
Title: NV(1/5)-PCIE

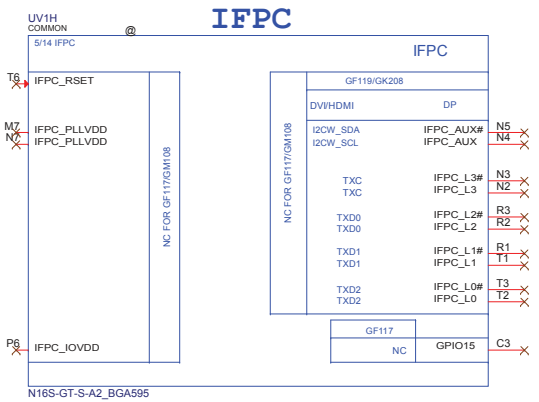
Size: Custom | Document Number: LA-C071P | Rev: 0.2

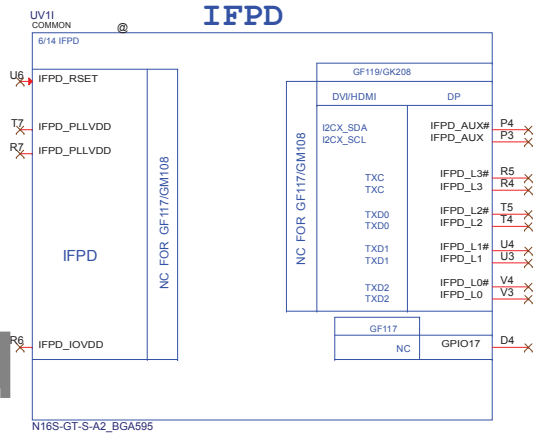
Date: Monday, June 06, 2016 | Sheet 48 of 55

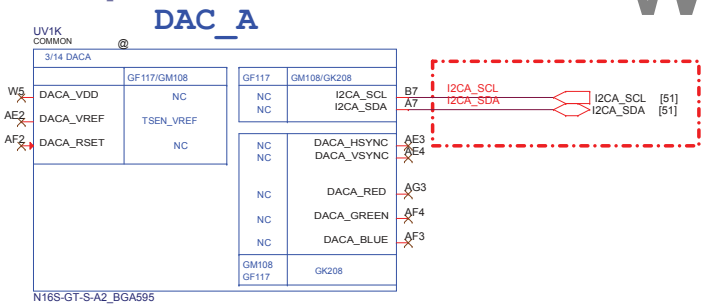
Main Func : dGPU

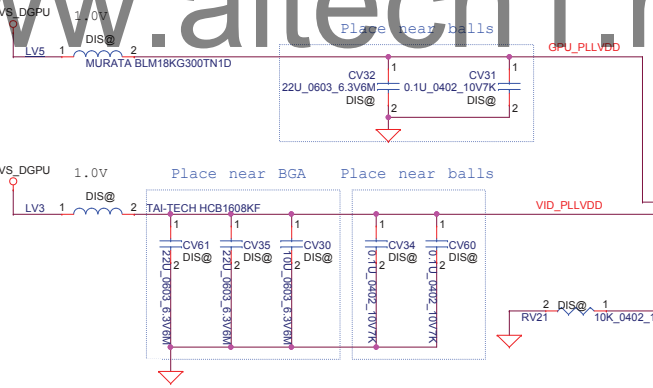












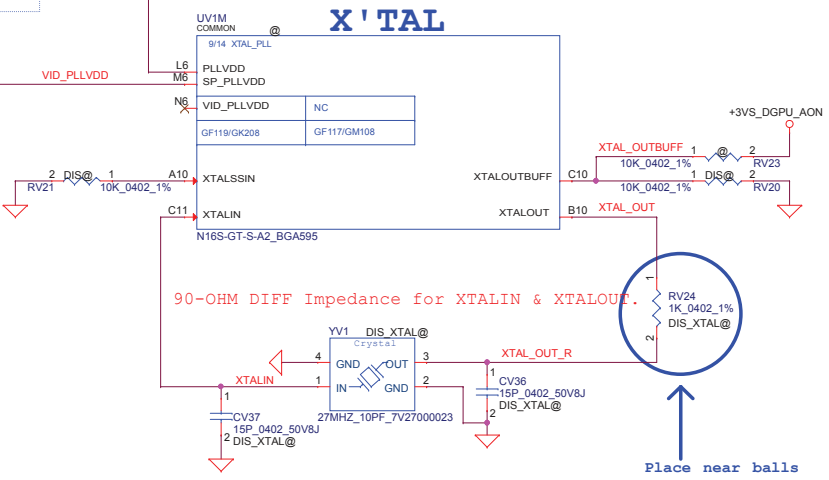


Table 3-33. SP_PLLVDD Power Rail Filtering [1]

GPU Package	PLL Rails	Capacitor Type		Footprint	Population	Location
GB2-64 GB2B-64 GB4B-128 GB3B-256	SP_PLLVDD (+ VID_PLLVDD)[1]	0.1 µF	X7R	0402	1 per ball	Under GPU
		10 µF	X5R	0603	1	Near GPU
		47 µF	X5R	0805	1	Near GPU
		Bead Type				
		300 Ω (ESR=0.2 Ω)		0603	1	Near GPU

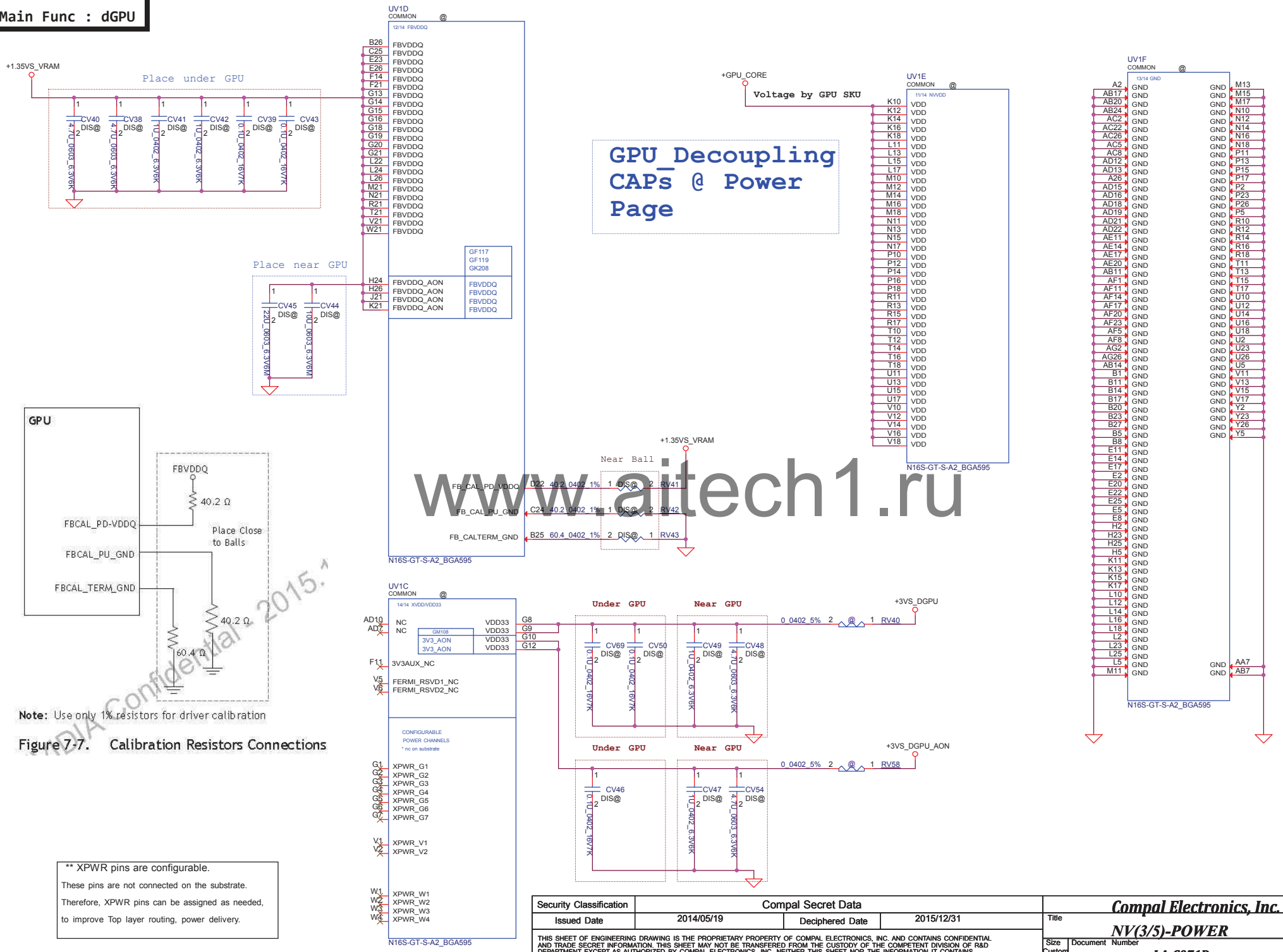
Note:

1. SP_PLLVDD and VID_PLLVDD power rails can be combined for customers who either do not use VGA display or uses VGA display with maximum resolution lower than 1024 x 768 with a 240 Hz refresh rate.

Security Classification	Compal Secret Data		
Issued Date	2014/05/19	Deciphered Date	2015/12/31

Compal Electronics, Inc.			
Title	NV(2/5)-IFP ABCDEF DAC XTAL		
Size: Custom	Document Number: LA-C071P		Rev: 0.2
Date: Monday, June 06, 2016		Sheet 49 of 55	

Main Func : dGPU



Note: Use only 1% resistors for driver calibration

Figure 7-7. Calibration Resistors Connections

** XPWR pins are configurable.
These pins are not connected on the substrate.
Therefore, XPWR pins can be assigned as needed, to improve Top layer routing, power delivery.

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Title: NV(3/5)-POWER			
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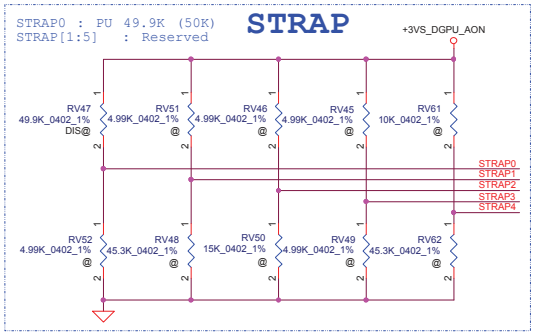
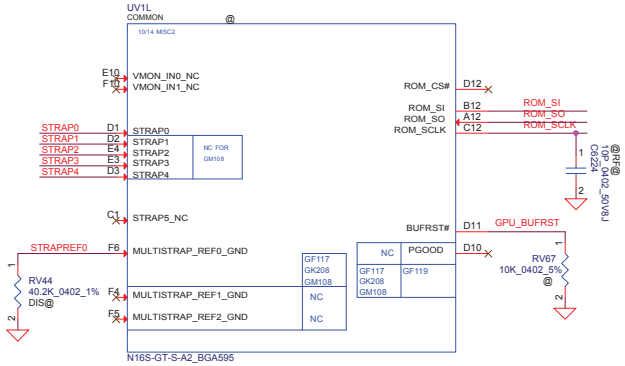
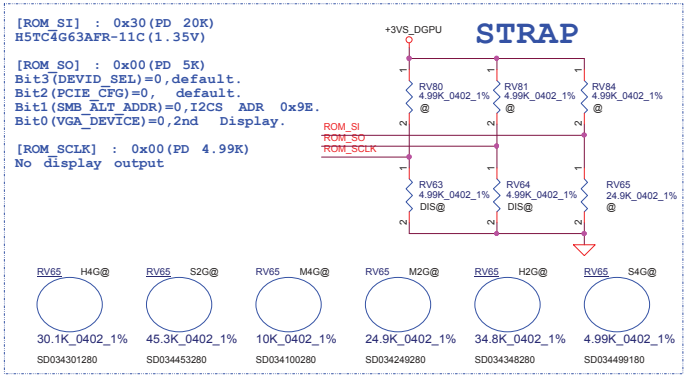
Date: Monday, June 06, 2016	Sheet 50 of 55		

Main Func : dGPU







Resistor Values	Pull-Up to 3V3_MAIN	Pull-Down to GND
4.99 kΩ	1000	0000
10.0 kΩ	1001	0001
15.0 kΩ	1010	0010
20.0 kΩ	1011	0011
24.9 kΩ	1100	0100
30.1 kΩ	1101	0101
34.8 kΩ	1110	0110
45.3 kΩ	1111	0111

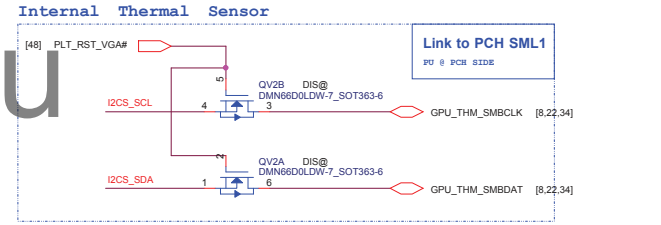
VRAM Type		RAM_CFG[3:0] (ROM_SI)	BKD40 /BKA40
K4G80325FB-HC28	S4G@	0x0(PD 4.99K)	
MT51J256M32HF-70:A	M4G@	0x1(PD 10K)	
EDW4032BABG-70-F	M2G@	0x4(PD 24.9K)	V (SSI)
H5GC4H24AJR-R0C	H2G@	0x6(PD 34.8K)	
K4G41325FE-HC28	S2G@	0x7(PD 45.3K)	
H5GC8H24MJR-R0C	H4G@	0x5(PD 30.1K)	

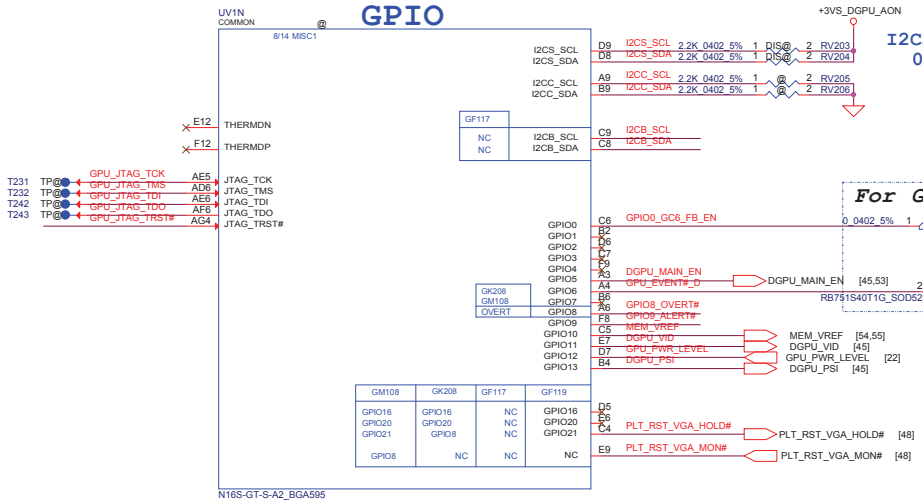
Table 15-8. I2CS Slave Address

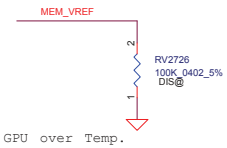
SMBUS_ALT_ADDR	Description
0	0x9E (Default)
1	0x9C (Multi-GPU usage)

10.2.2 I²CS Slave Address

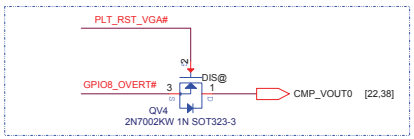
N16x GPUs use I²CS slave address 0x96h for NVIDIA internal testing. I²C address 0x96h must not be used by other I²C devices on the same bus as the GPU to avoid address conflict. The SMB_ALT_ADDR strap does not affect this 0x96h address. Refer to Chapter 15 (Straps) for a list of useful I²CS Slave addresses can be used with SMB_ALT_ADDR strapping.

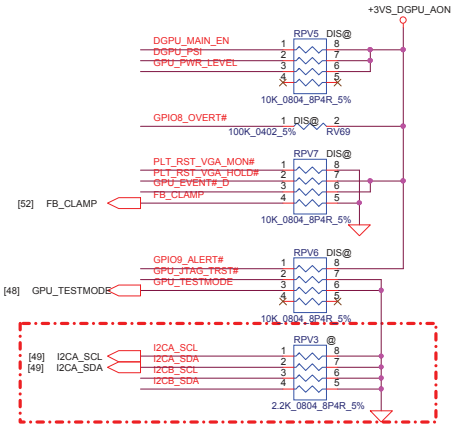






Shutdown System when GPU over Temp.





VGA_THERMDN and VGA_THERMDP:
1. 5mil track width and spacing
2. 5mil grounded gurad tracks width and spacing
3. ground referenced
4. Connect guard tracks to pin5

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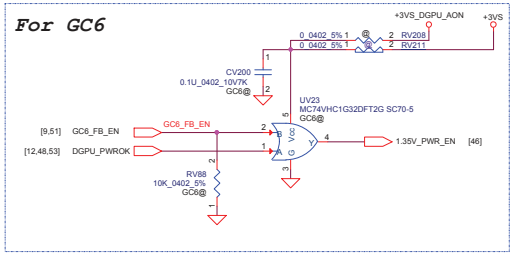
Date: Monday, June 06, 2016 Sheet 51 of 55

Main Func : dGPU



From DG-07158-001_v05_secured(NVDIA Spec)

Table 7-3. Supported GDDR5 Command Mappings by GPU and Package

Package	Supported CMD Mapping	Benefits
GB2-64	H	4-signal layers fan-out
GB2B-64	H	4-signal layers fan-out
GB4B-128	H	4-signal layers fan-out
GB3B-256	F	4-signal layers fan-out

Table 7-4. GDDR5 Mode H Mapping

GB2-64, GB2B-64, GB4B-128	Channel 0 0..31	GB2-64, GB2B-64, GB4B-128	Channel 1 32..63
CMD0	CS*	CMD16	CS*
CMD1	A3_BA3	CMD17	A3_BA3
CMD2	A2_BA0	CMD18	A2_BA0
CMD3	A4_BA2	CMD19	A4_BA2
CMD4	A5_BA1	CMD20	A5_BA1
CMD5	WE*	CMD21	WE*
CMD6	A7_A8	CMD22	A7_A8
CMD7	A6_A11	CMD23	A6_A11
CMD8	ABI*	CMD24	ABI*
CMD9	A12_RFU	CMD25	A12_RFU
CMD10	A0_A10	CMD26	A0_A10
CMD11	A1_A9	CMD27	A1_A9
CMD12	RAS*	CMD28	RAS*
CMD13	RST*	CMD29	RST*
CMD14	CKE*	CMD30	CKE*
CMD15	CAS*	CMD31	CAS*
GB2-64, GB2B-64, GB4B-128	**Channel 0 & 1**		
CMD32	Not used		
CMD33'	Not used		
CMD34	DEBUG0[2]		
CMD35	DEBUG1[2]		

Notes:
1. Not available in GB2-64 and GB2B-64 packages.
2. GPU debug pins; not connected to DRAM. See section 7.1.13.

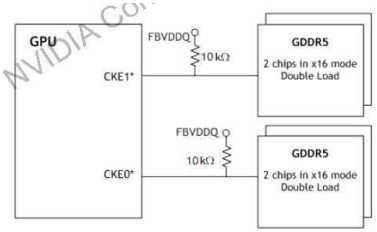


Figure 7-5. Clock Enable (CKE*) Signal Connection, ×16 Mode

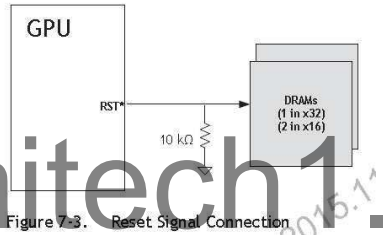


Figure 7-6. Reset Signal Connection

Note:
- GB2-64 32-bit implementation will use channel 1 data bits [63:32]. Unused channel 0 data bits [31:0] can be left unconnected.
- For 32-bit implementation on GB2-64, please inform account AE for VBIOS support.

Table 7-6. Memory-Side Termination

Signal	Termination	Notes
DQ , DBI, CMD, ADDR	ODT	ODT impedance set using an external resistor (ZQ). Digitally adjustable to ZQ or ZQ/2 based on loading consideration
WCK	ODT	Single-ended (60 Ω to FBDDQ) ODT is supported by DRAM.
CK	External, termination on the board is required.	ODT is NOT supported by DRAMs.

Table 7-7. GPU-Side Termination

Signal	Termination	Notes
DQ, DBI	ODT	40 Ω pull-up, fixed. Disabled during low performance states.

7.1.13 FBx_Debug0/1

The FBx_Debug0/1 signals are used for debug purposes only. These debug signals are on CMD34 and CMD35. Reserve a footprint for a 0402 package size pull-up resistor to FBVDDQ on each FBx_Debug0/1 signal. The resistor should be no-stuffed for normal operation.

7.1.14 DBI/EDC

The DBI signals should be connected to the GPU balls named FBx_DQMx. The EDC signals should be connected to the GPU balls named FBx_DQS_WPx. Refer to the reference board schematics for detailed connections.

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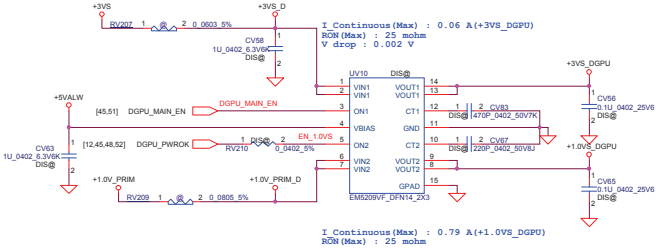
Date: Monday, June 06, 2016	Sheet 52 of 55		

Main Func : dGPU

+3VS to +3VS_DGPU



+1.0V_PRIM to +1.0VS_DGPU

+3VS to +3VS_DGPU_AON

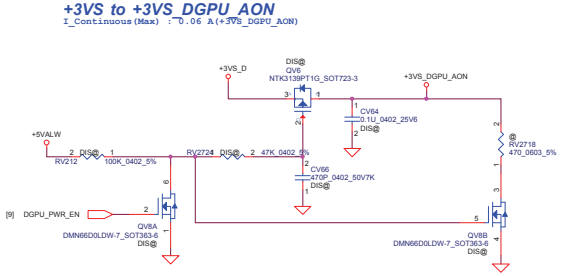


Table 5. EDP-Continuous [3]

Products	VRAM Type	GPU Core	GPU FBIO		FB Total [1,5]		1.05V Total [2]	3.3V Total
		–	1.5V [4]	1.35V [4]	1.5V [4]	1.35V [4]	1.05V [4]	3.3V [4]
		(A)	(A)	(A)	(A)	(A)	(A)	(A)
N16S-GMR	GDDR5	19.0	–	2.0	–	4.2	0.80	0.06
	DDR3/L	21.0	1.4	1.4	2.4	2.3	0.80	0.06
N16S-GTR	GDDR5	26.5	–	2.0	–	4.2	0.80	0.06
	DDR3/L	26.0	1.4	1.4	2.4	2.3	0.80	0.06

Table 3-8. Power Rail Specification for GDDR5 Frame Buffer Interface

Constraint Parameter	Requirement
FBVDD/FBVDDQ	1.35, 1.50V, or 1.50 V memory with DVS[1] support at 1.35V
FBVDD/FBVDDQ switching time	< 64 µs
DC Tolerance	± 3%
AC Tolerance	Transient noise tolerance: 80 mV pk-pk within 20 MHz BW High frequency noise tolerance: 200 mV pk-pk within 1 GHz BW
GPU FBVREF [2]	Internal VREF
Memory FBVREF	0.7 x FBVDDQ when termination is enabled 0.5 x FBVDDQ when termination is disabled

Note:
1. DVS = Dynamic Voltage Switching.
2. Since the GPU internal VREF is used, the FBVREF pin on the GPU can be left unconnected.

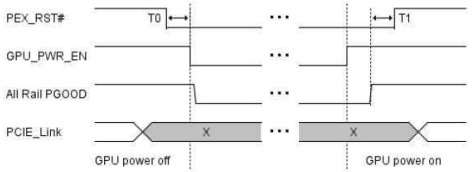


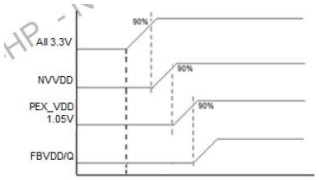
Figure 18-7. Optimus Entry/Exit Timing Diagram

Table 18-1. Optimus Timing Parameters

Symbol	Description	Min	Max	Units
T0	PEX_RST# assertion to GPU_PWR_EN=0	>0	5	ms
T1	All GPU power rail up and stable to PEX_RST# de-assertion	0.1	5	ms

Chapter 3

- Added 1.0V support to PEX_VDD and all 1.05V Power Rails



Notes: - All 3.3V includes all rails powered at 3.3V
- PEX_VDD 1.05V includes all rails that are shared

Figure 3-7. ■ Example of Power-Up Sequencing Order

Note:
- The ramp time for any rail must be more than 40 µs and is recommended to be less than 2ms.

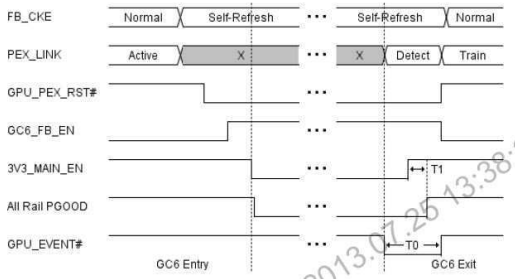


Figure 18-15. GC6 2.0 Entry/Exit Sequence Timing Diagram

Table 18-3. GC6 2.0 Entry/Exit Sequence Timing Parameters

Symbol	Description	Min	Max	Unit
T0	GPU_EVENT# assertion period	0.001	N/A	ms
T1	3V3_MAIN_EN assertion to all power rails up and stable	0.04	4	ms

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Size | Document Number | Rev 0.2

Date: Monday, June 06, 2016 | Sheet 53 of 55

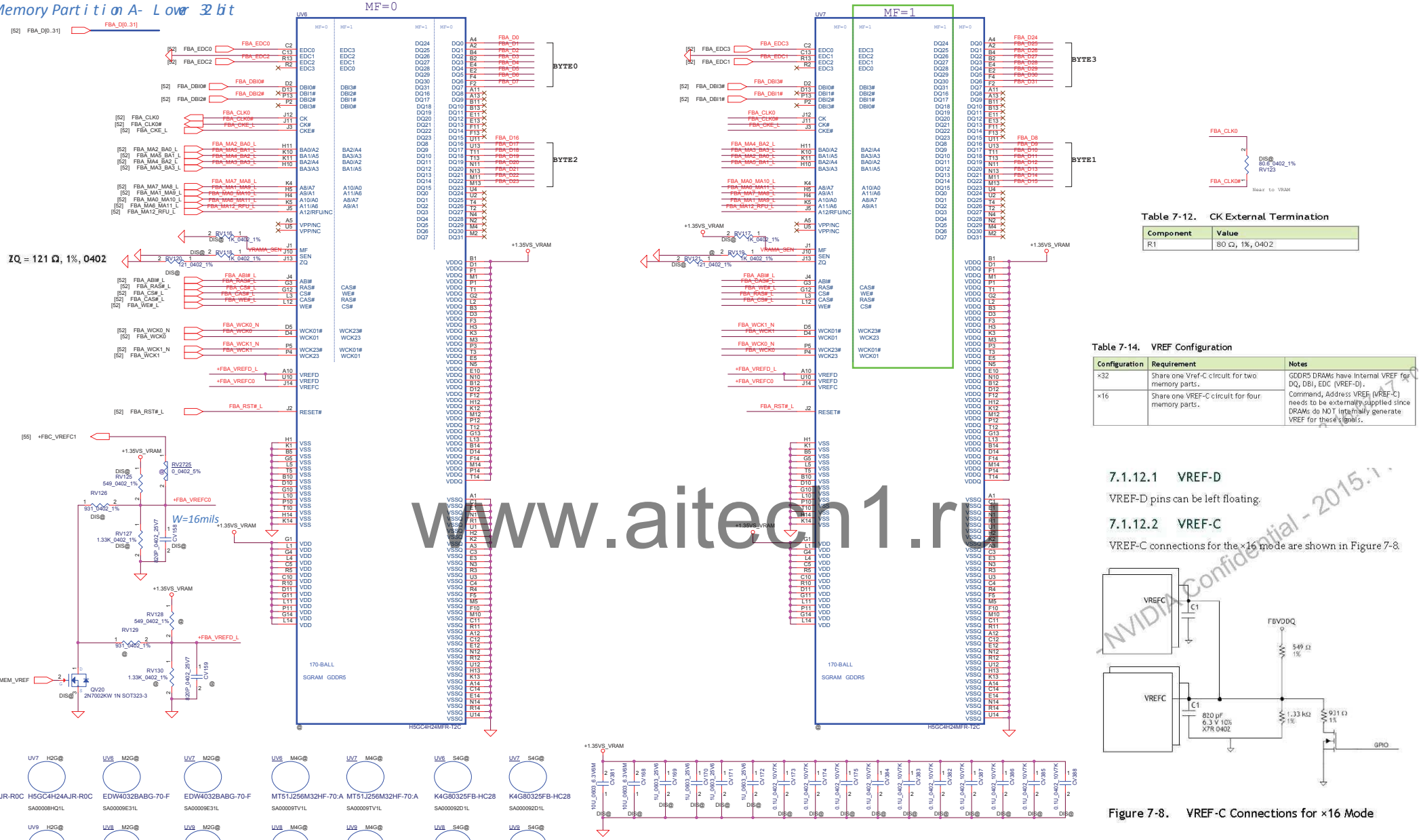

Table 7-12. CK External Termination

Component	Value
R1	80 Ω, 1%, 0402

Table 7-14. VREF Configuration

Configuration	Requirement	Notes
×32	Share one Vref-C circuit for two memory parts.	GDDR5 DRAMs have internal VREF for DQ, DBI, EDC (VREF-D). Command, Address VREF (VREF-C) needs to be externally supplied since DRAMs do NOT internally generate VREF for these signals.
×16	Share one VREF-C circuit for four memory parts.	

7.1.12.1 VREF-D

VREF-D pins can be left floating.

7.1.12.2 VREF-C

VREF-C connections for the ×16 mode are shown in Figure 7-8.

Figure 7-8. VREF-C Connections for ×16 Mode

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Size: | Document Number: Thor | Rev: 0.1

Date: Monday, June 06, 2016 | Sheet 54 of 55

Memory Partition A- Lower 32 bit

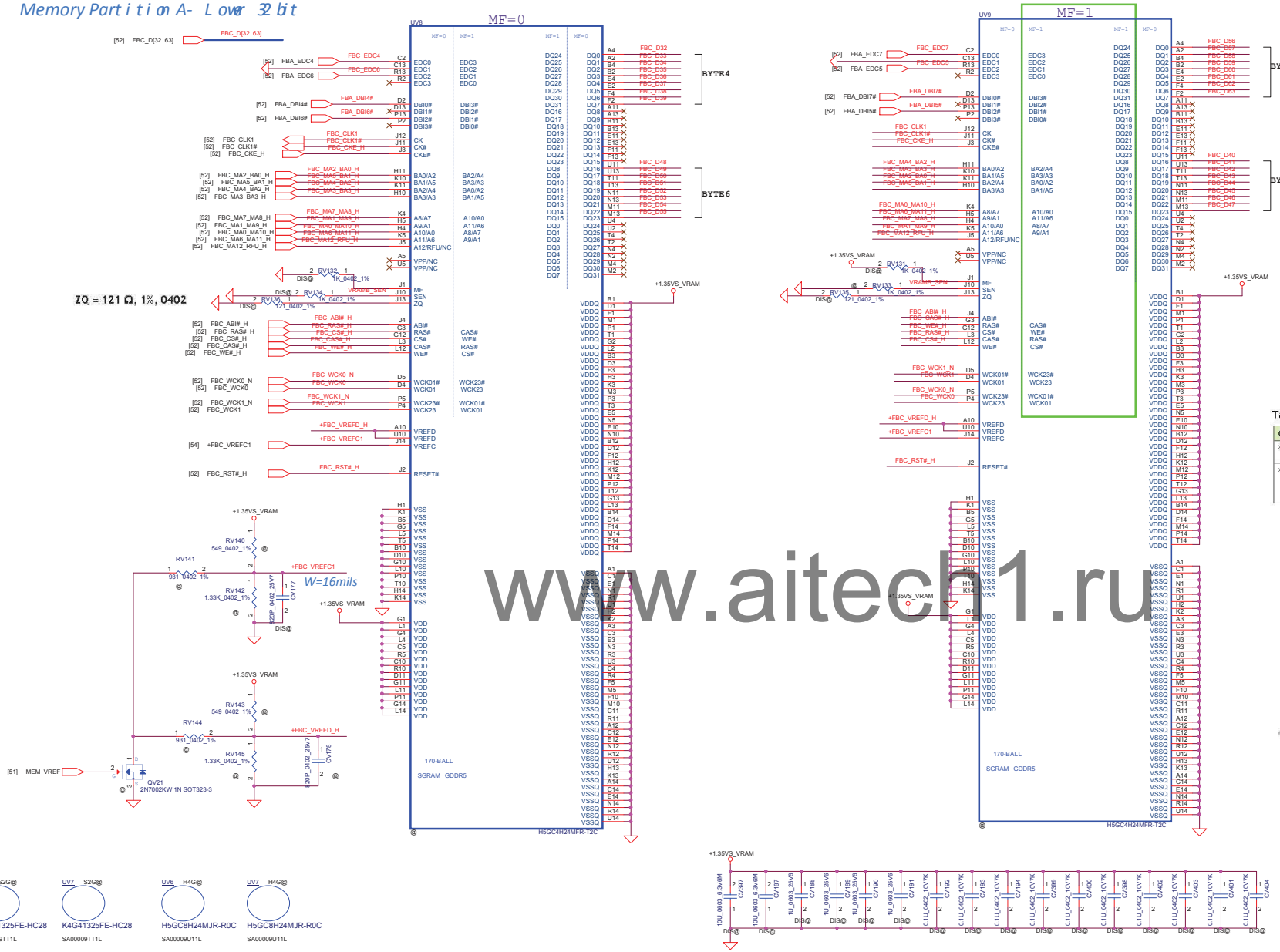

Table 7-12. CK External Termination

Component	Value
R1	80 Ω, 1%, 0402

Table 7-14. VREF Configuration

Configuration	Requirement	Notes
×32	Share one Vref-C circuit for two memory parts.	GDDR5 DRAMs have internal VREF for DQ, DBI, EDC (VREF-D).
×16	Share one VREF-C circuit for four memory parts.	Command, Address VREF (VREF-C) needs to be externally supplied since DRAMs do NOT internally generate VREF for these signals.

7.1.12.1 VREF-D

VREF-D pins can be left floating.

7.1.12.2 VREF-C

VREF-C connections for the ×16 mode are shown in Figure 7-8.

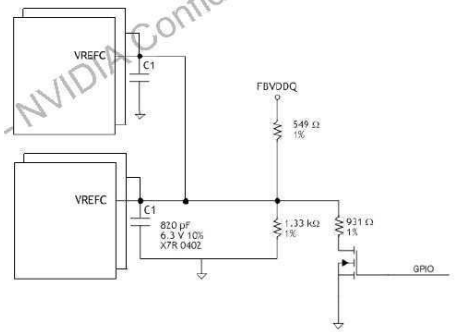

Figure 7-8. VREF-C Connections for ×16 Mode

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