Ratchet-1 WHL SVT Logic Schematics

RT1WL-3
VER 3.12
April/1/2019

BASE LOGIC :
Ratchet-1 WHL SIT Logic Schematic Ver 2.18

1. TITLE PAGE
2. EC HISTORY
3. CPU (1/16): DDI/EDP
4. CPU (2/16): DDR (1/2)
5. CPU (3/16): DDR (2/2)
6. CPU (4/16): MISC/JTAG
7. CPU (5/16): LPC/SPI/SMBUS/C-LINK
8. CPU (6/16): LPSS/ISH
9. CPU (7/16): AUDIO/SDXC
10. CPU (8/16): PCIE/USB/SATA
11. CPU (9/16): CSI-2/EMMC/CNVI
12. CPU (10/16): CLOCK SIGNALS
13. CPU (11/16): SYSTEM PM
14. CPU (12/16): CPU POWER (1/2)
15. CPU (13/16): CPU POWER (2/2)
16. CPU (14/16): PCH POWER
17. CPU (15/16): GND
18. CPU (16/16): CFG/RESERVED
19. XDP CONNECTOR
20. RTC BATTERY
21. SPI FLASH
22. LPDDR3 BASE MEMORY CH-A (1/2)
23. LPDDR3 BASE MEMORY CH-A (2/2)
24. LPDDR3 BASE MEMORY CH-B (1/2)
25. LPDDR3 BASE MEMORY CH-B (2/2)
26. LCD/TOUCH INTERFACE
27. LID/CAMERA/MIC/SENSOR INTERFACE
28. BLANK
29. HDMI CONNECTOR
30. ALPINE RIDGE (1/2)
31. ALPINE RIDGE (2/2)
32. USB PD CONTROLLER
33. USB PD DEMUX
34. BLANK
35. DOCKING CONNECTOR
36. THUNDERBOLT CONNECTOR
37. M.2 SOCKET 3 MODULE I/F
38. USB TYPE-A CONNECTOR
39. USB TYPE-A SUBCARD INTERFACE
40. GBE JACKSONVILLE
41. BLANK
42. BLANK
43. M.2 TYPE 1216 MODULE
44. M.2 SOCKET 2 MODULE I/F
45. BLANK
46. BLANK
47. AUDIO SIP (ALC3286)
48. AUDIO CONNECTOR
49. BLANK
50. BLANK
51. AUDIO SPEAKER
52. AUDIO BEEP
53. SMART AMP
54. BLANK
55. BLANK
56. MEC1663 (1/3)
57. MEC1663 (2/3)
58. MEC1663 (3/3)
59. KEYBOARD/TRACK POINT
60. TOUCH PAD/NFC/FPR
61. FAN CONNECTOR
62. APS G-SENSOR
63. BLANK
64. BLANK
65. BLANK
66. BLANK
67. ISH ACCELEROMETER
68. DISCRETE TPM 2.0
69. LPC DEBUG PORT
70. THINK ENGINE-3 (1/2)
71. THINK ENGINE-3 (2/2)
72. DC-IN
73. BATTERY INPUT
74. BATTERY CHARGER (BQ25700A)
75. DC/DC VCC5M (NB690)
76. DC/DC VCC5M_PD (NB693)
77. DC/DC VCC3M (TPS51393P)
78. BLANK
79. DC/DC IMVP8 (MP2979AGQKT)
80. DC/DC VCCCPUCORE (MP86941 X 2)
81. BLANK
82. DC/DC VCCGFXCORE_I (MP86901C)
83. DC/DC VCCSA (MP86901A)
84. BLANK
85. DC/DC VCCCPUIO(NB692)
86. DC/DC VCC1R05_SUS (NB692)
87. LOAD SW VCCST & VCCSTG
88. DC/DC VCC1R2A/0R6B/1R8A (NB688)
89. LOAD SW VCCPLL_OC
90. DC/DC VCC1R8_SUS (MP1603L)
91. DC/DC VCCPCHCORE(NB692)
92. BLANK
93. LOAD SW PCH SUS
94. LOAD SW LAN
95. LOAD SW B
96. LOAD SW TOUCH PANEL
97. ENERGY ESTIMATION ENGINE
98. PTH FOR SCREW HOLES

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Project Name : Ratchet-1	Title : TITLE PAGE
Size : C	Document Number :
Date : Monday, April 01, 2019	

EC HISTORY

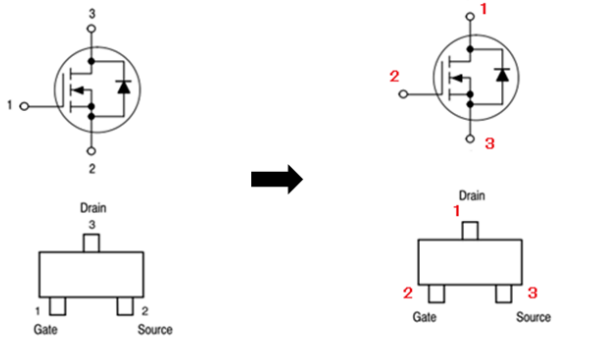
RT1IL-3

(Base Logic : Ratchet-1 WHL SIT Logic Schematic Ver. 2.18)

VER.3.00 2019/02/18 APPLIED Ratchet-1 SVT EC001,EC002
VER.3.01 2019/02/19 APPLIED Ratchet-1 SVT EC003
VER.3.02 2019/02/20 APPLIED Ratchet-1 SVT EC004,EC005
VER.3.03 2019/02/21 APPLIED Ratchet-1 SVT EC006,EC007,EC008,EC009,EC010
VER.3.04 2019/02/22 APPLIED Ratchet-1 SVT EC011
VER.3.05 2019/02/25 APPLIED Ratchet-1 SVT EC012,EC013
VER.3.06 2019/02/27 APPLIED Ratchet-1 SVT EC014,EC015
VER.3.07 2019/03/04 APPLIED Ratchet-1 SVT EC016,EC017,EC018
VER.3.08 2019/03/13 APPLIED Ratchet-1 SVT EC019,EC020
VER.3.09 2019/03/14 APPLIED Ratchet-1 SVT EC021
VER.3.10 2019/03/15 APPLIED Ratchet-1 SVT EC022,EC023
VER.3.11 2019/03/20 APPLIED Ratchet-1 SVT EC024
VER.3.12 2019/04/01 APPLIED Ratchet-1 SVT EC025,EC026,EC027

LCFC 3Pin Symbol rule
Orcad Symbol & PCB Footprint pin assignment

Use common rule, Top side is Pin1, not follow original datasheet definition to avoid confusion with different vender definition. Below is an example.



part supplier pin assignment

LCFC common pin assignment

TABLE: Chip Capacitor Thermal Characteristics

		Code
-55 to 150degC -55 to 125degC	+/-30ppm/degC +/-30ppm/degC	NPO C0G
-55 to 125degC -55 to 105degC -55 to 85degC	+/-15% +/-22% +/-15%	X7R X6S X5R

TABLE: Chip Capacitor Tolerance

Tolerance	Code
+/-0.1pF +/-0.25pF +/-0.5pF	B C D
+/-5% +/-10% +/-20% +80/-20%	J K M Z

TABLE: Chip Part Dimension

Size [mm]	mm Size Code	Inch Size Code
0.40 x 0.20	0402	01005
0.60 x 0.30	0603	0201
1.00 x 0.50	1005	0402
1.60 x 0.80	1608	0603
2.00 x 1.25	2125	0805
2.00 x 1.60	2016	0806
2.50 x 2.00	2520	1008
3.20 x 1.60	3216	1206
3.20 x 2.50	3225	1210
4.50 x 1.60	4516	1806
4.50 x 2.50	4525	1810
4.50 x 3.20	4532	1812
5.00 x 2.50	5025	2010
6.40 x 3.20	6432	2512

LOGIC

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Project Name : Ratchet-1	Title : EC HISTORY
Size : C	Document Number :
Date : Monday, April 01, 2019	

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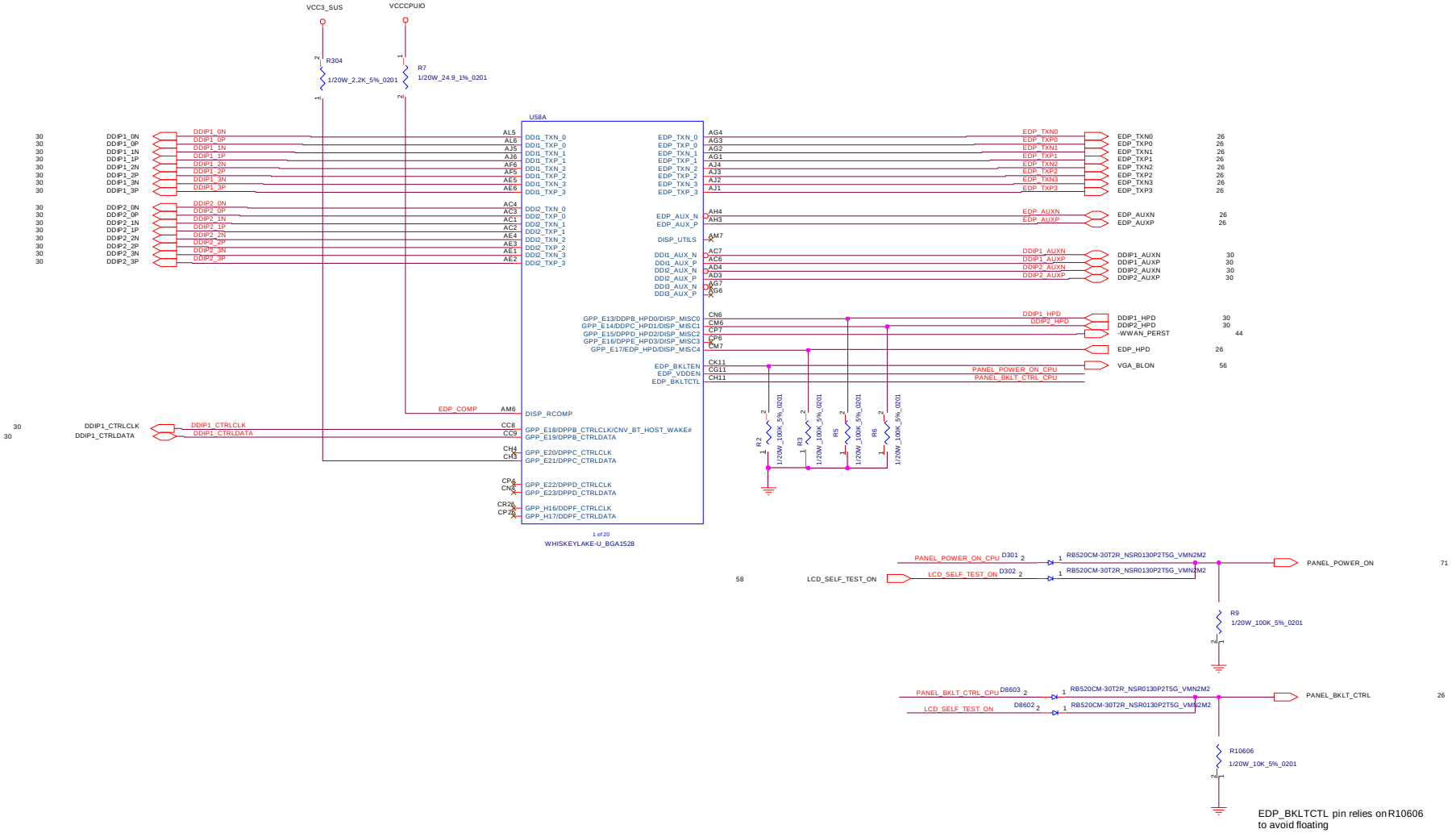
TABLE : Functional Strap

GPP_E19/DDPB_CTRLDATA(DISPLAY PORT B DETECTED)	
GPP_E21/DDPC_CTRLDATA(DISPLAY PORT C DETECTED)	
GPP_E23/DDPD_CTRLDATA(DISPLAY PORT D DETECTED)	
HIGH	ENABLE
LOW	DISABLE



EDP_BKLTCTL pin relies on R10606 to avoid floating

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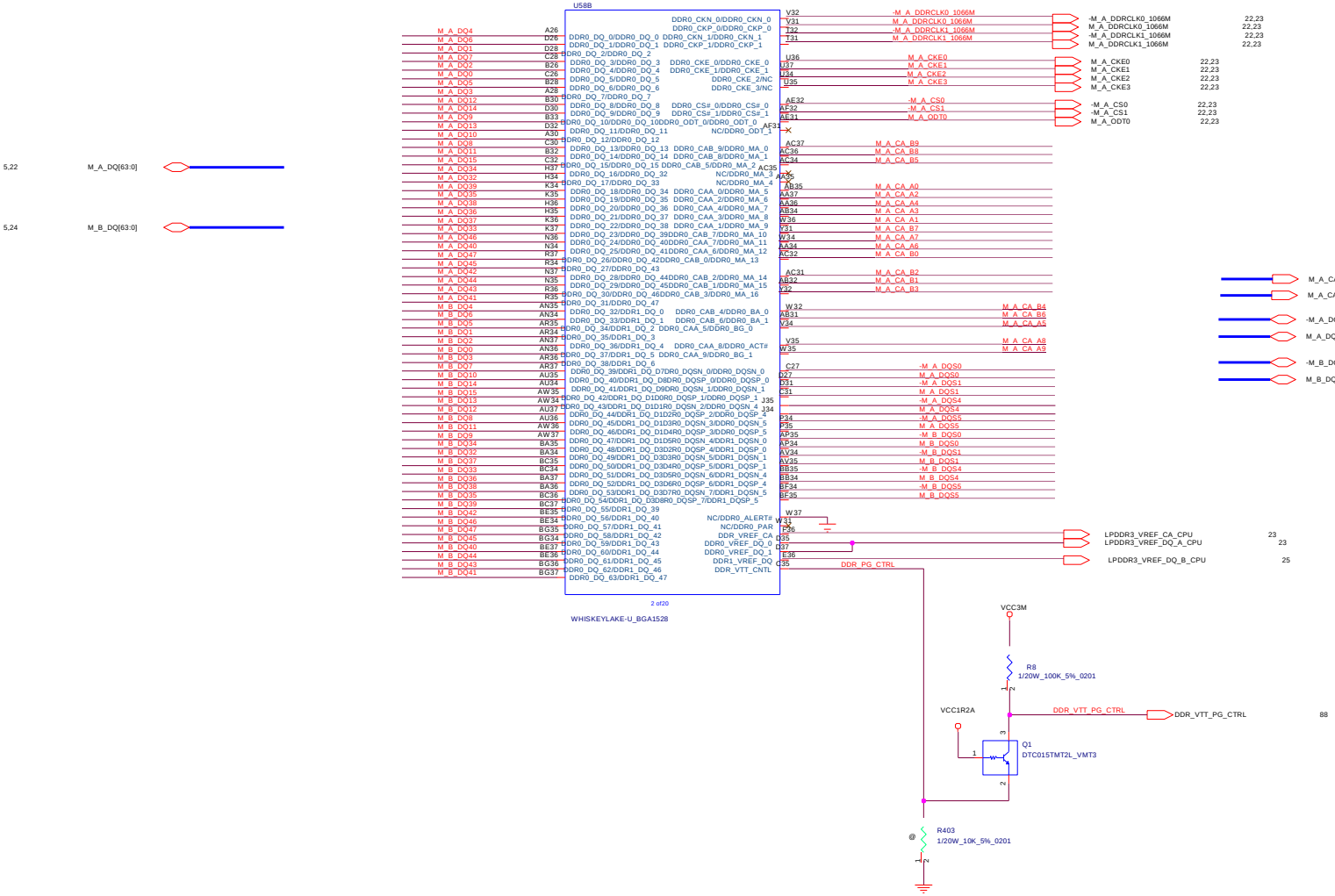
Project Name : Ratchet-1	Title : CPU(1/16) : DDI/EDP
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 3 of 98



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Project Name : Ratchet-1	Title : CPU(2/16) : DDR (1/2)
Size : C	Document Number :
Rev : 0.01	
Date : Monday, April 01, 2019	Sheet : 4 of 98

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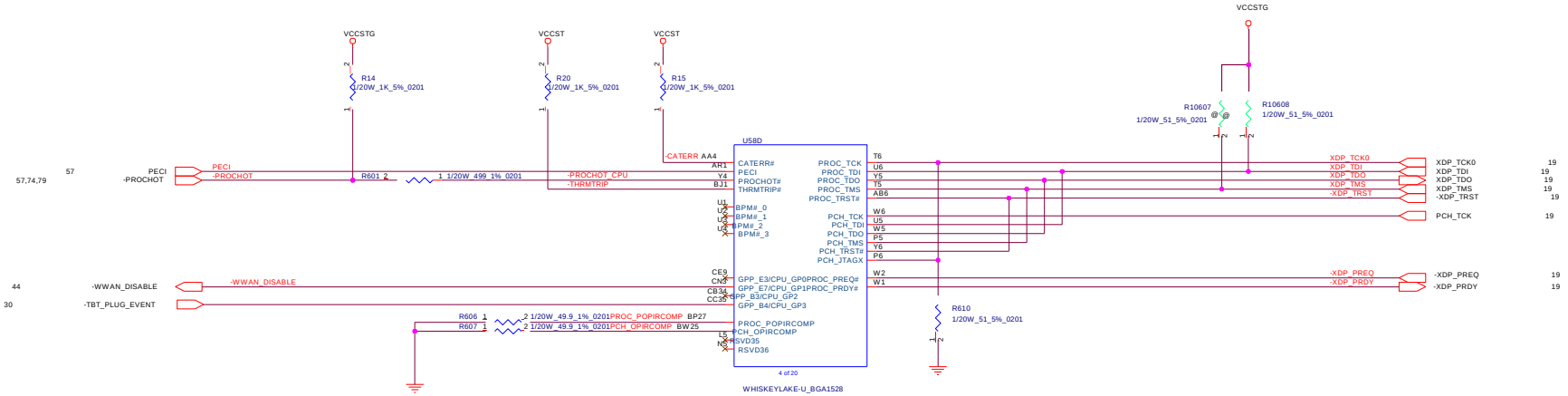
Project Name : Ratchet-1	Title : CPU(3/16) : DDR (2/2)
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 5 of 98



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Project Name : Ratchet-1	Title : CPU(4/16) : MISC/JTAG
Size : C	Document Number :
Rev : 0.01	
Date : Monday, April 01, 2019	Sheet : 6 of 98

TABLE : Functional Strap

SPI0_IO2 (Consent Strap)	
HIGH	Disable (Default)
LOW	Enable

← LOGIC

TABLE : Functional Strap

GPP_B23/SML1ALERT#/PCHHOT#	
HIGH	Enable Intel(R) DCI-OOB
LOW	Disable Intel(R) DCI-OOB (Default)

← LOGIC

TABLE : Functional Strap

GPP_C2/SMLALERT#(TLS Confidentiality)	
HIGH	Enable ME Crypto TLS with Confidentiality
LOW	Disable ME Crypto TLS (Default)

← LOGIC

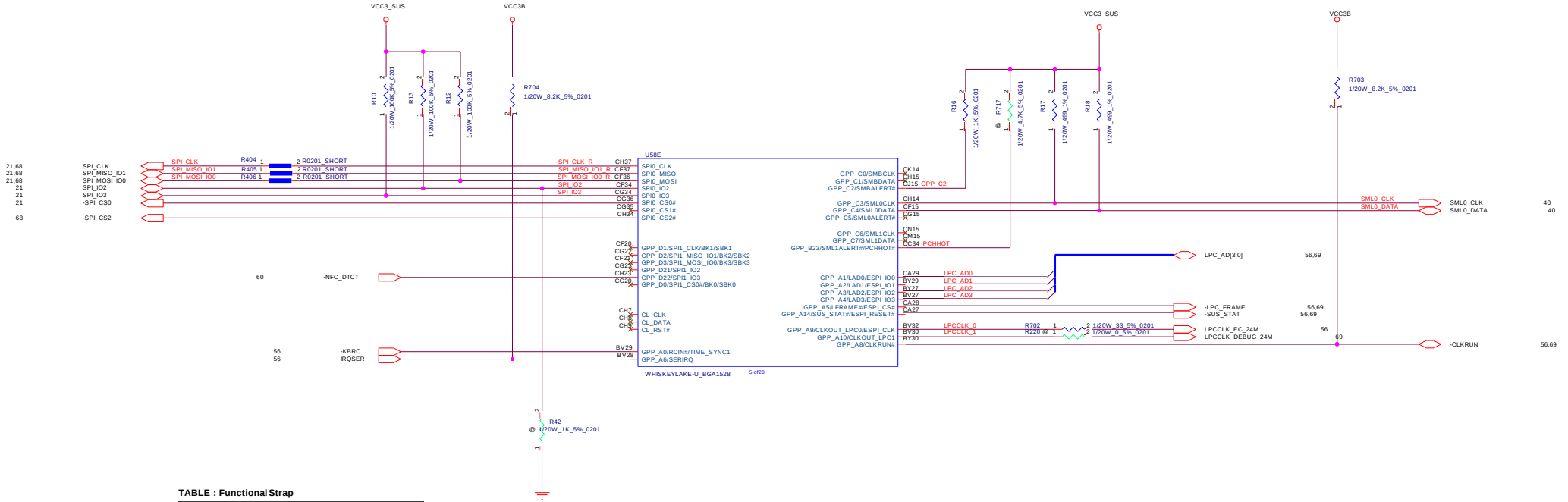

TABLE : Functional Strap

GPP_C5/SML0ALERT# (LPC or eSPI)	
HIGH	eSPI is selected
LOW	LPC is selected (Default)

← LOGIC

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Project Name : Ratchet-1	Title : CPU(5/16) : LPC/SPI/SMBUS/C-LINK
Size : C	Document Number :
Date : Monday, April 01, 2019	

TABLE : Functional Strap

GPP_B18/GSPI0_MOSI (No Reboot)	
HIGH	Enable "No Reboot" Mode
LOW	Disable "No Reboot" Mode (Default)

LOGIC

TABLE : Functional Strap

GPP_B22/GSPI1_MOSI (Boot BIOS Destination)	
HIGH	Boot BIOS from LPC
LOW	Boot BIOS from SPI(Default)

LOGIC

TABLE : Functional Strap

GPP_F6/CNV_RGI_DT(M.2 CNVi Mode Select)	
HIGH	Integrated CNVi Disabled
LOW	Integrated CNVi Enabled

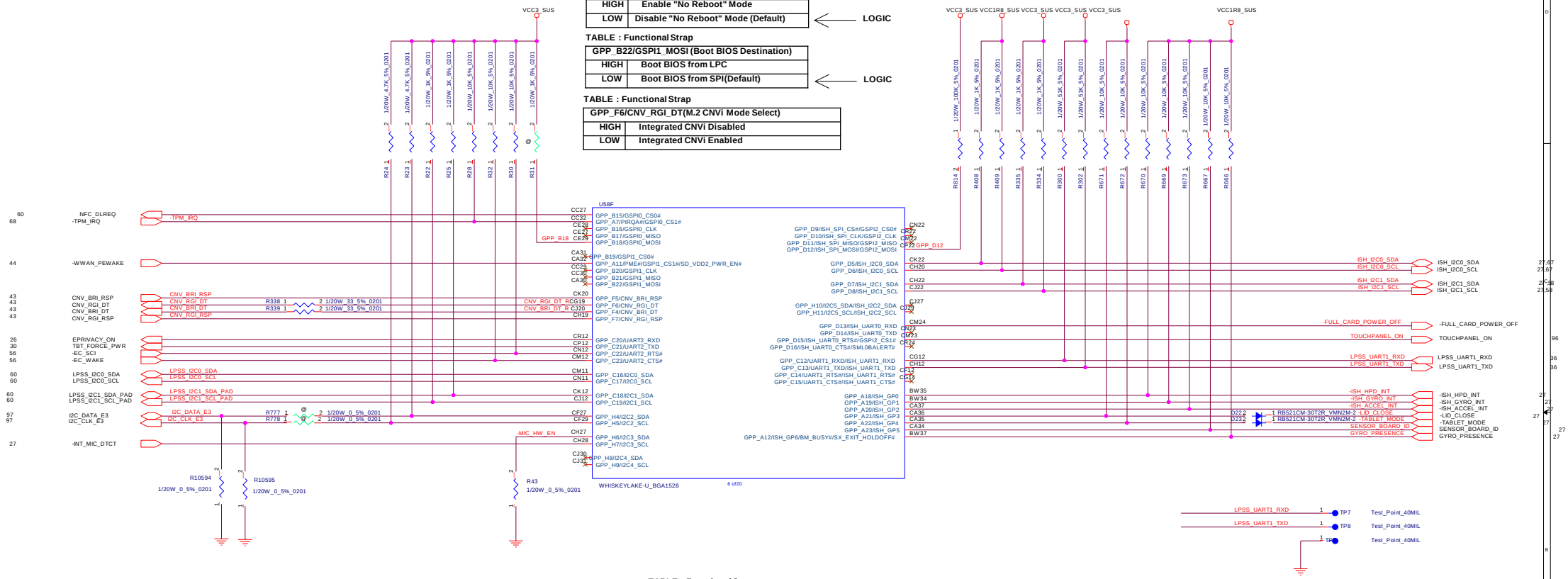

TABLE : Functional Strap

GPP_D12(JTAG ODT Disable)	
HIGH	JTAG ODT Enable (Default)
LOW	JTAG ODT Disable

LOGIC

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Project Name : Ratchet-1	Title : CPU(6/16) : LPSS/ISH
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 8 of 98

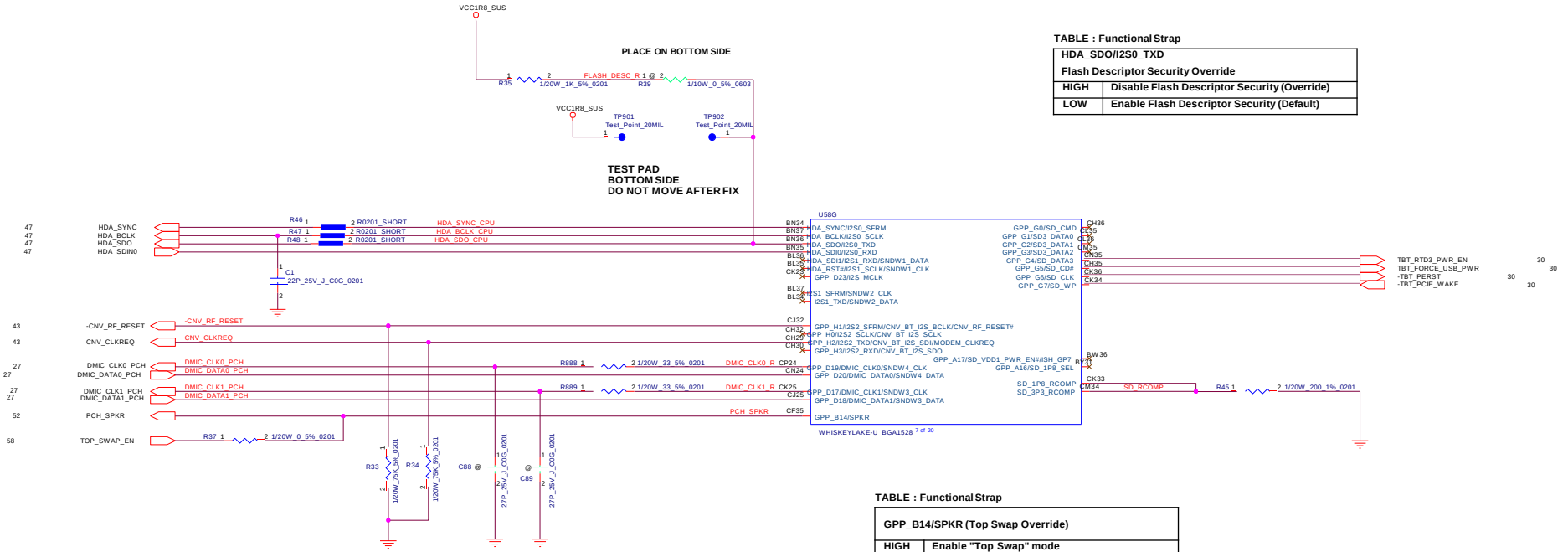

TABLE : Functional Strap

HDA_SDO/I2S0_TXD Flash Descriptor Security Override	
HIGH	Disable Flash Descriptor Security (Override)
LOW	Enable Flash Descriptor Security (Default)

TABLE : Functional Strap

GPP_B14/SPKR (Top Swap Override)	
HIGH	Enable "Top Swap" mode
LOW	Disable "Top Swap" mode (Default)

← LOGIC

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Project Name : Ratchet-1

Title : CPU(7/16) : AUDIO/SDXC

Size : C

Document Number :

Rev : 0.01

Date : Monday, April 01, 2019

Sheet : 9 of 98

Flexible I/O Configuration

HSIO Port	High Speed Signals	PCI Device	PCI Function	HSIO PCI Configuration	Descriptor for PCIe	Net Name	PCI Device	PCI Function
Port 1	USB3 1 / PCIE1	1Ch	0h	PCIE 1	4x1 LaneReversal Disabled	PCIE0	1Ch	0h
Port 2	USB3 2 / PCIE2		1h	PCIE 2		PCIE1	1Ch	1h
Port 3	USB3 3 / PCIE3		2h	USB3 3		USB3P3		
Port 4	USB3 4 / PCIE4		3h	USB3 4		USB3P4		
Port 5	USB3 5 / PCIE5	1Ch	4h	PCIE 5	4x1 LaneReversal Disabled	N/A		
Port 6	USB3 6 / PCIE6		5h	PCIE 6		N/A		
Port 7	PCIE 7 (GbE)		6h	PCIE 7		N/A		
Port 8	PCIE 8 (GbE)		7h	PCIE 8 (GbE)		PCIE7	1Fh	6h
Port 9	PCIE 9 (GbE)	1Dh	0h	PCIE 9 (x4)	1x4 LaneReversal Enabled	PCIE8_L3	1Dh	0h
Port10	PCIE 10		1h	PCIE 10(x4)		PCIE8_L2		
Port11	PCIE 11 / SATA 0		2h	PCIE 11(x4)		PCIE8_L1		
Port12	PCIE 12 / SATA 1A		3h	GPIO STRAP		PCIE8_L0_SATA1		
Port13	PCIE 13 (GbE)	1Dh	4h	PCIE 13(x4)	1x4 LaneReversal Disabled	PCIE12_L0	1Dh	4h
Port14	PCIE 14 (GbE)		5h	PCIE 14(x4)		PCIE12_L1		
Port15	PCIE 15 / SATA 1B		6h	PCIE 15(x4)		PCIE12_L2		
Port16	PCIE 16 / SATA 2		7h	PCIE 16(x4)		PCIE12_L3		

PCIe Port Assignment

PCIE 1	WWAN
PCIE 2	N/A
PCIE 3	(USB3_3)
PCIE 4	(USB3_4)
PCIE 5	N/A
PCIE 6	N/A
PCIE 7	N/A
PCIE 8	GBE
PCIE 9 (x4)	NVMe SSD
PCIE 13 (x4)	Alpine Ridge-DP

SATA Port Assignment

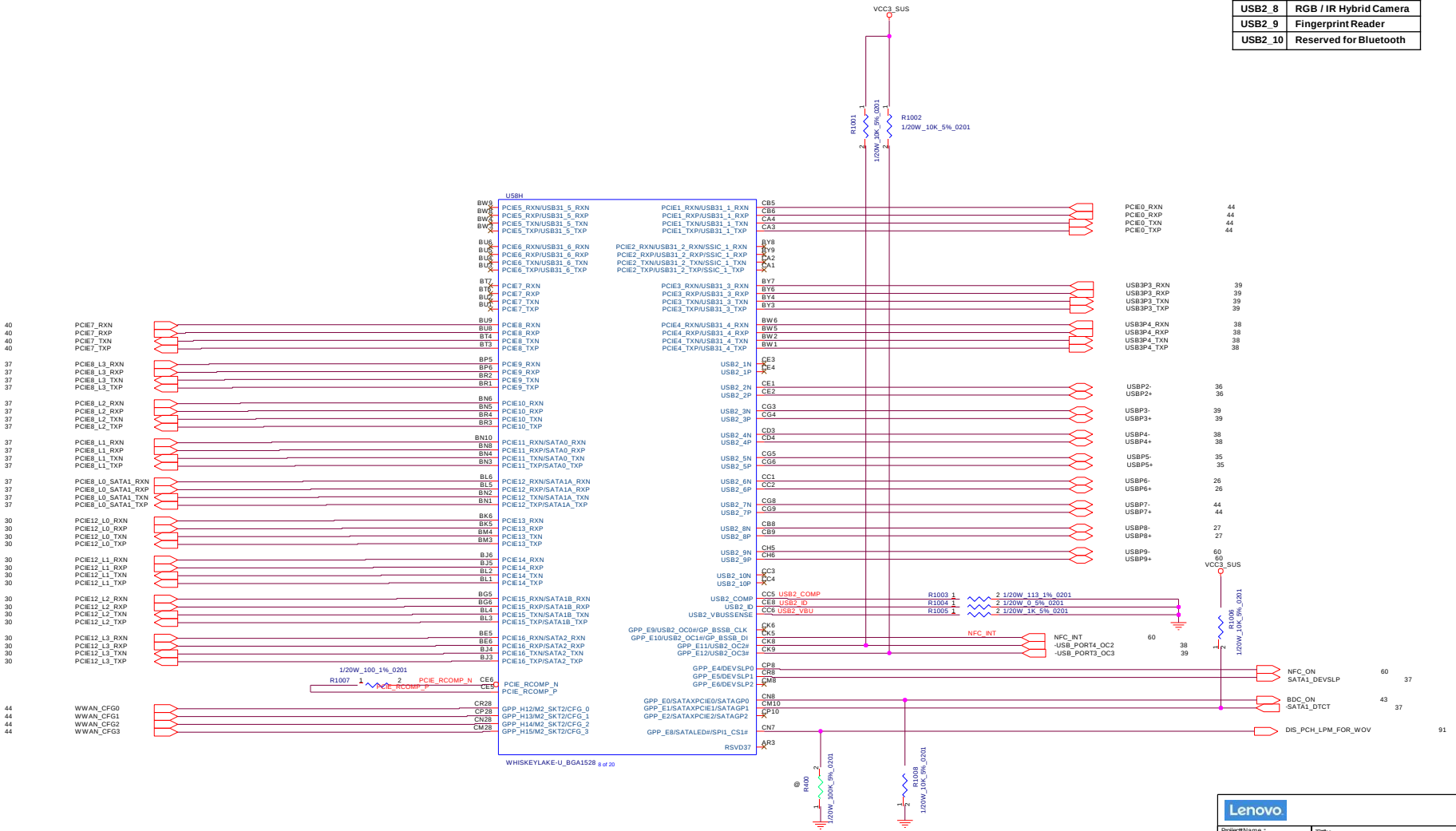
SATA 0	(PCIE11)
SATA 1A	SATA SSD
SATA 1B	(PCIE15)
SATA 2	(PCIE16)

USB 3.1 Port Assignment

USB3_1	(PCIE1)
USB3_2	(PCIE2)
USB3_3	Type-A Port (AOU)
USB3_4	Type-A Port (DCI)
USB3_5	(PCIE5)
USB3_6	(PCIE6)

USB 2.0 Port Assignment

USB2_1	(Reserved)
USB2_2	Type-C Port A
USB2_3	Type-A Port (AOU)
USB2_4	Type-A Port (DCI)
USB2_5	Type-C Port B (DOCK)
USB2_6	Touch Panel
USB2_7	WWAN Card
USB2_8	RGB / IR Hybrid Camera
USB2_9	Fingerprint Reader
USB2_10	Reserved for Bluetooth



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Project Name : Ratchet-1

Title : CPU(8/16) : PCIE/USB/SATA

Size : C

Document Number :

Date : Monday, April 01, 2019

TABLE : Functional Strap

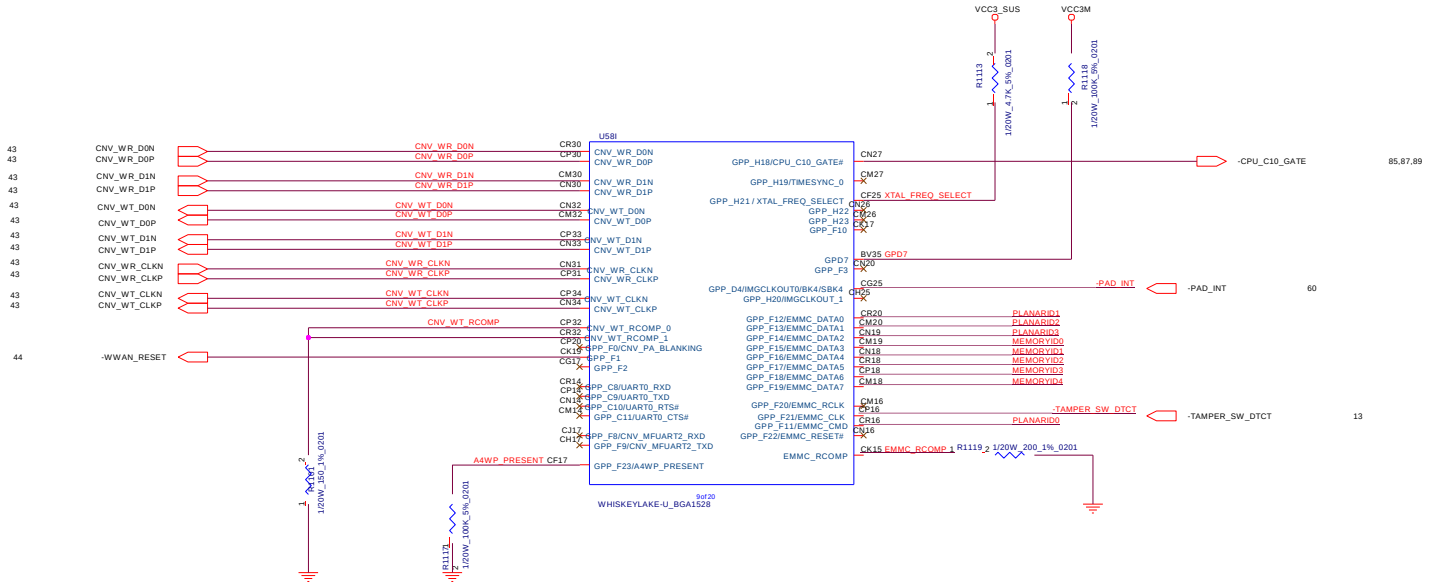
GPP_H23(eSPI Flash Sharing Mode)	
HIGH	Enable SAFS
LOW	Enable MAFS(Default)

← LOGIC

TABLE : Functional Strap

GPP_H21 (XTAL Frequency Select)	
HIGH	24MHz XTAL selected
LOW	38.4MHz XTAL frequency selected (Default)

← LOGIC



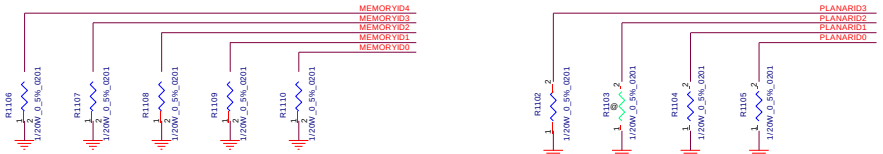


TABLE:

MEMORYID[4:0]	U170,U171,U172,U173			Capacity
00h (00000b)	Samsung	K4E6E304EC-EGCG	16Gbit DDP	8GB
01h (00001b)		K4EBE304EC-EGCG	32Gbit QDP	16GB
02h (00010b)	SK hynix	H9CCNNNBJTALAR-NVD	16Gbit DDP	8GB
03h (00011b)		H9CCNNNCLGALAR-NVD	32Gbit QDP	16GB
04h (00100b)	Samsung	K4E6E304EB-EGCG	16Gbit DDP	8GB
05h (00101b)		K4EBE304EB-EGCG	32Gbit QDP	16GB
06h (00110b)		K4E6E304ED-EGCG	16Gbit DDP	8GB
07h (00111b)		K4EBE304ED-EGCG	32Gbit QDP	16GB
08h (01000b)	Nanya	NT6CL512T32AM-H0	16Gbit DDP	8GB

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TABLE

LEVEL	PLANAR ID			
	3	2	1	0
	R1102	R1103	R1104	R1105
1	NA	NA	NA	NA
0	ASM	ASM	ASM	ASM

TABLE

LEVEL	PLANARID[3:0]
EVT	0000B
FVT	0001B
MESIT	0010B
SIT	0011B
SVT	0100B

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Project Name : Ratchet-1

Title : CPU(9/16) : CSI-2/EMMC/CNVI

Size :

Document Number :

Date : Monday, April 01, 2019

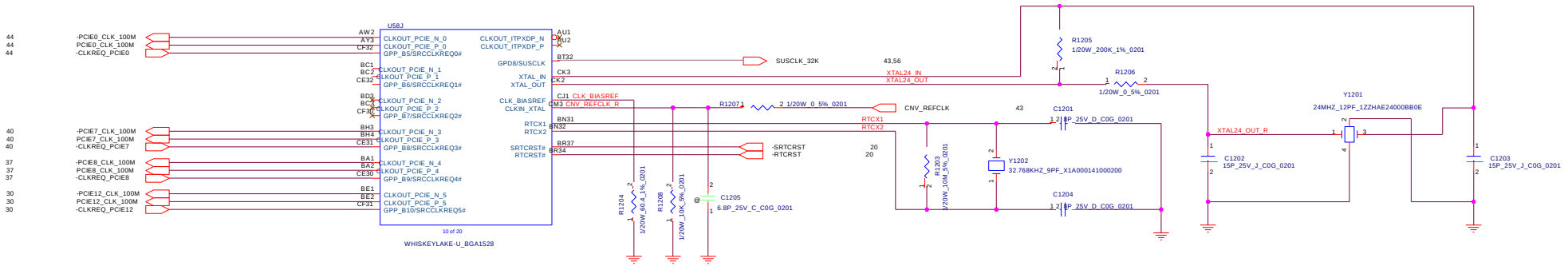

	TABLE of Y1202	
Vendor	P/N	LCFC P/N
EPSON	X1A000141000200	SJ10000IX00
TXC	9H03280012	SJ10000J900
KDS	1TJF090DJ1A000B	SJ100069400

	TABLE of Y1201	
Vendor	P/N	LCFC P/N
KDS	1ZZHAE24000BB0E	SJ10000TG00
TXC	8Y24080004	SJ10000TN00

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Project Name : Ratchet-1	Title : CPU(10/16) : CLOCK SIGNALS
Size : C	Document Number :
Date : Monday, April 01, 2019	

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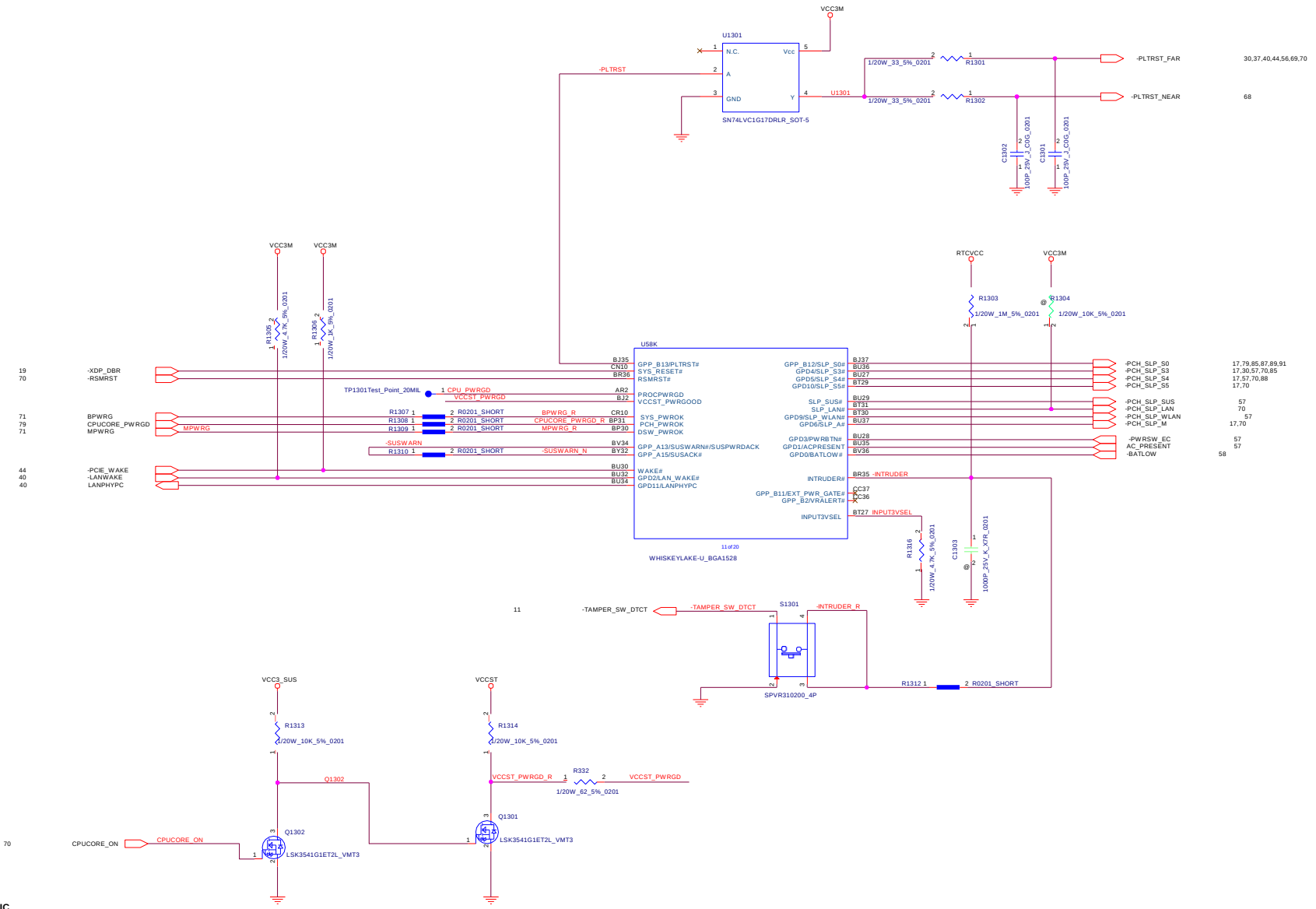

TABLE : Functional Strap

INPUT3VSEL (3.0V Select)	
HIGH	3.3V supply is 3.0V +/- 5%
LOW	3.3V supply is 3.3V +/- 5%

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Project Name : Ratchet-1

Title : CPU(11/16) : SYSTEM PM

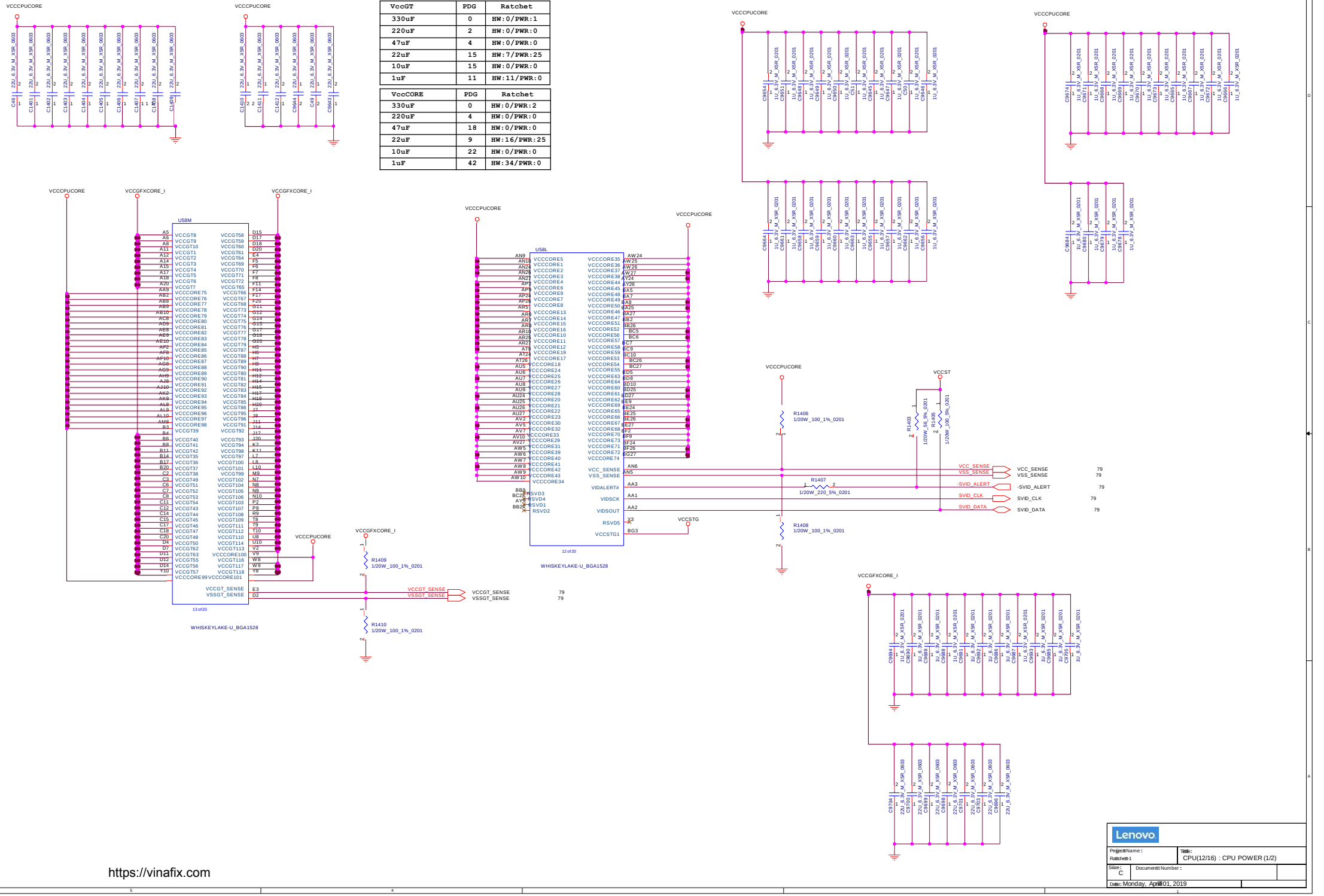
Size : C

Document Number :

Date : Monday, April 01, 2019

VccGT	PDG	Ratchet
330uF	0	HW:0/PWR:1
220uF	2	HW:0/PWR:0
47uF	4	HW:0/PWR:0
22uF	15	HW:7/PWR:25
10uF	15	HW:0/PWR:0
1uF	11	HW:11/PWR:0

VccCORE	PDG	Ratchet
330uF	0	HW:0/PWR:2
220uF	4	HW:0/PWR:0
47uF	18	HW:0/PWR:0
22uF	9	HW:16/PWR:25
10uF	22	HW:0/PWR:0
1uF	42	HW:34/PWR:0



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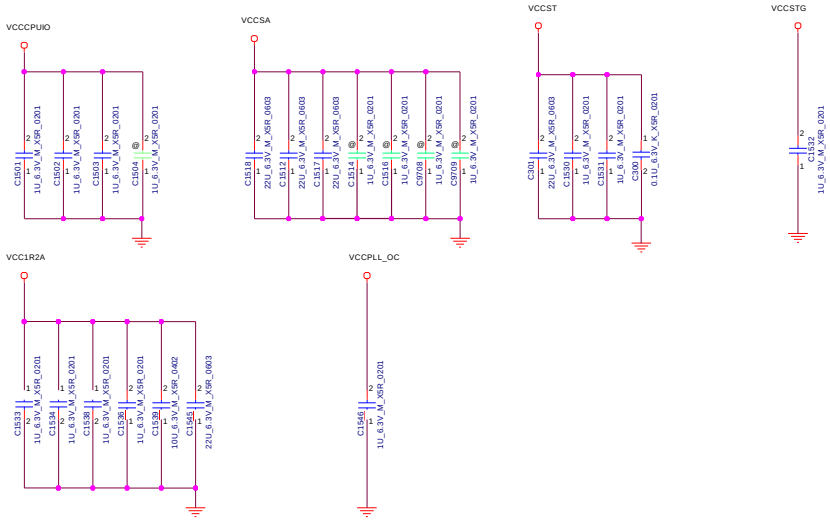
Project Name: Ratchet-1

Title: CPU(12/16) : CPU POWER (1/2)

Size: C

Document Number:

Date: Monday, April 01, 2019



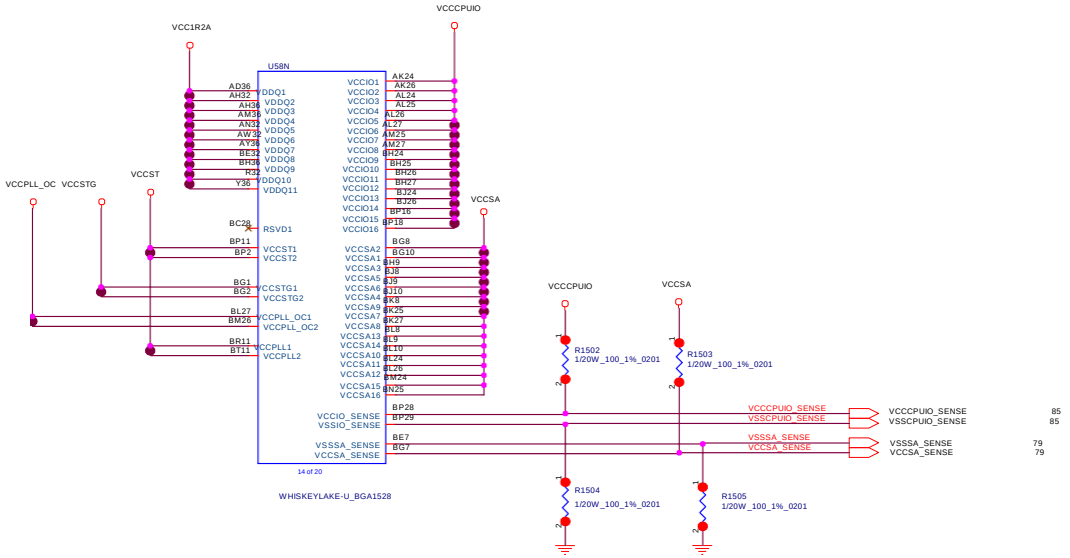
VccSA	PDG	Ratchet
47uF	2	HW:0/PWR:0
22uF	0	HW:3/PWR:6
10uF	13	HW:0/PWR:0
1uF	0	HW:0/PWR:0

VDDQ	PDG	Ratchet
47uF	0	HW:0/PWR:0
22uF	1	HW:1/PWR:5
10uF	9	HW:1/PWR:0/MEM:12
1uF	4	HW:4/PWR:0/MEM:36
0.1uF	0	HW:0/PWR:1
0.01uF	0	HW:0/PWR:1
2200pF	0	HW:0/PWR:1

VccIO	PDG	Ratchet
47uF	0	HW:0/PWR:0
22uF	0	HW:0/PWR:4
10uF	6	HW:0/PWR:0
1uF	4	HW:3/PWR:0
0.1uF	0	HW:0/PWR:1

VccPLL/VCCST	PDG	Ratchet
22uF	0	HW:1/PWR:0
1uF	1	HW:2/PWR:0
0.1uF	1	HW:1/PWR:1

VccPLL_OC	PDG	Ratchet
1uF	1	HW:1/PWR:0



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Project Name : Ratchet-1

Title : CPU(13/16) : CPU POWER (2/2)

Size : C

Document Number :

Date : Monday, April 01, 2019

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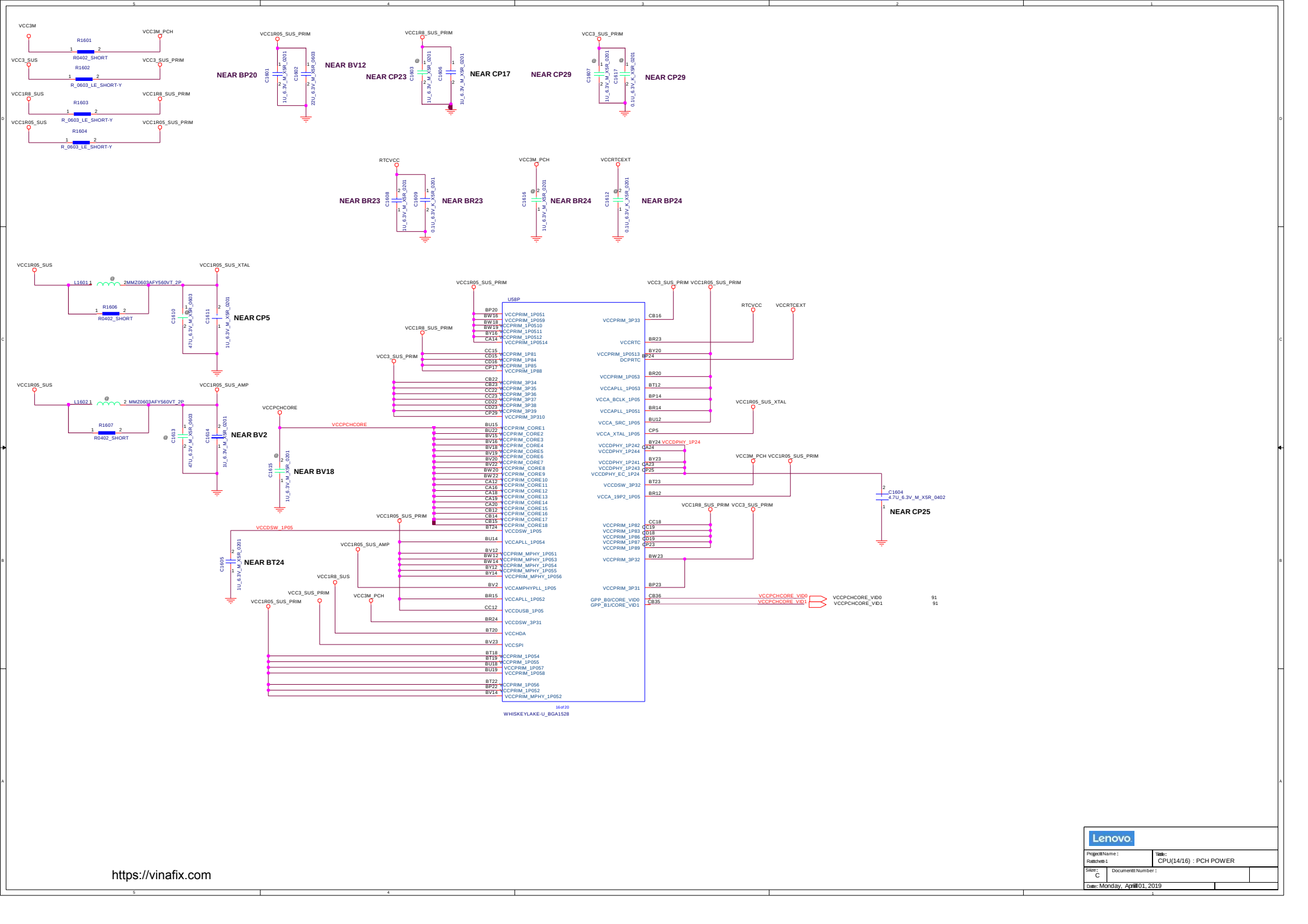
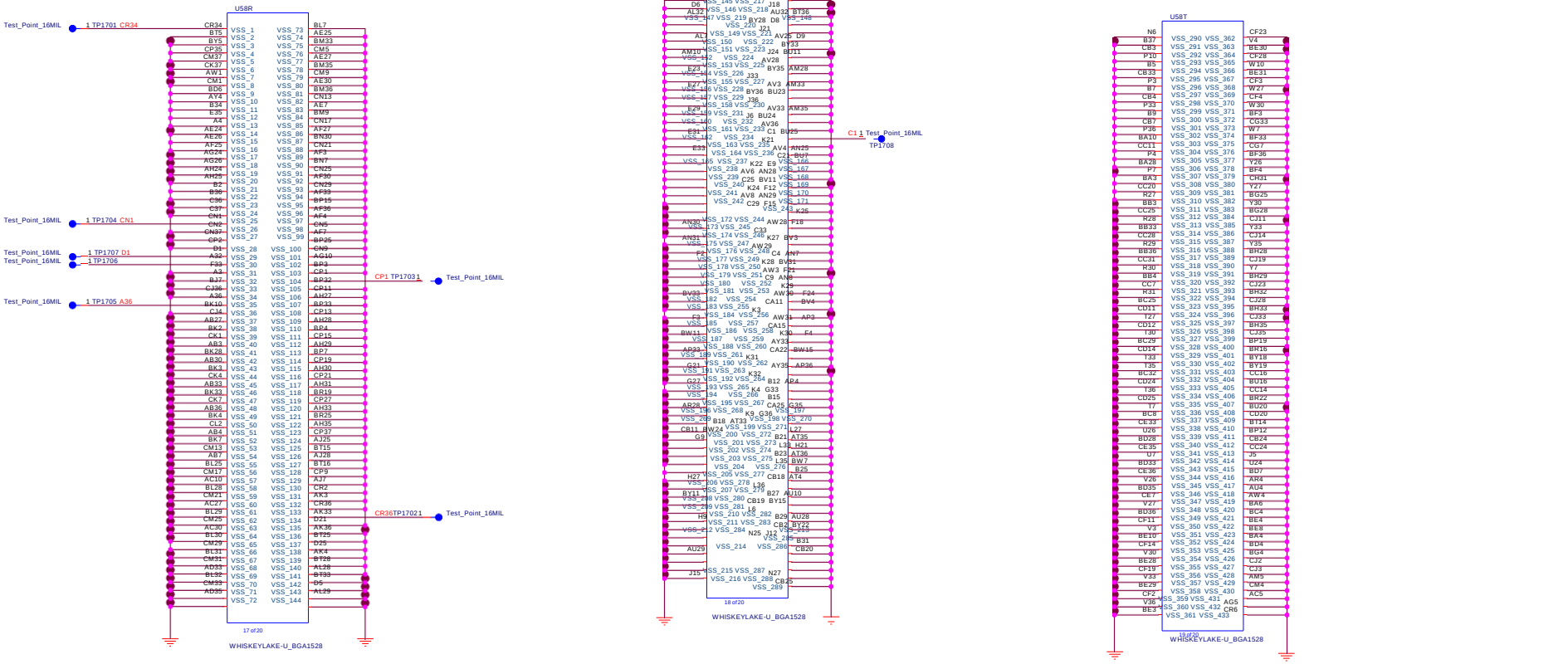


https://vinafix.com

Project Name: Ratchet-1	Title: CPU(14/16) : PCH POWER
Size: C	Document Number:
Date: Monday, April 01, 2019	

APS/PETS Interface



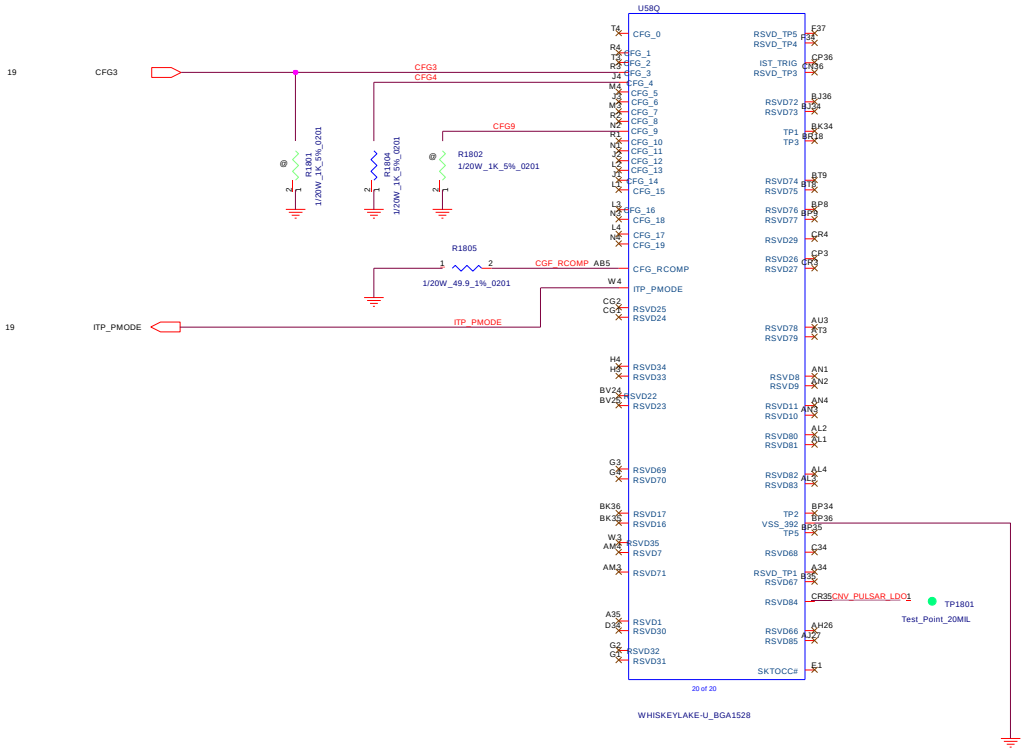
https://vinafix.com

Lenovo

Project Name: Ratchett-1	Title: CPU(15/16) : GND
Size: C	Document Number:
Date: Monday, April 01, 2019	

TABLE

CFG0: Stall Reset Sequence after PCU PLL Lock untill de-asserted **1:No Stall** **0: Stall**
CFG3: MSR Privacy Bit Feature **1: MSR (C80h) bit[0] setting** **0: MSR (C80h) bit[0] overridden**
CFG4: eDP Enable **1:Disabled** **0:Enabled**
CFG9: SVID Bus Communication **1:Enabled** **0:Disabled**



https://vinafix.com

Lenovo

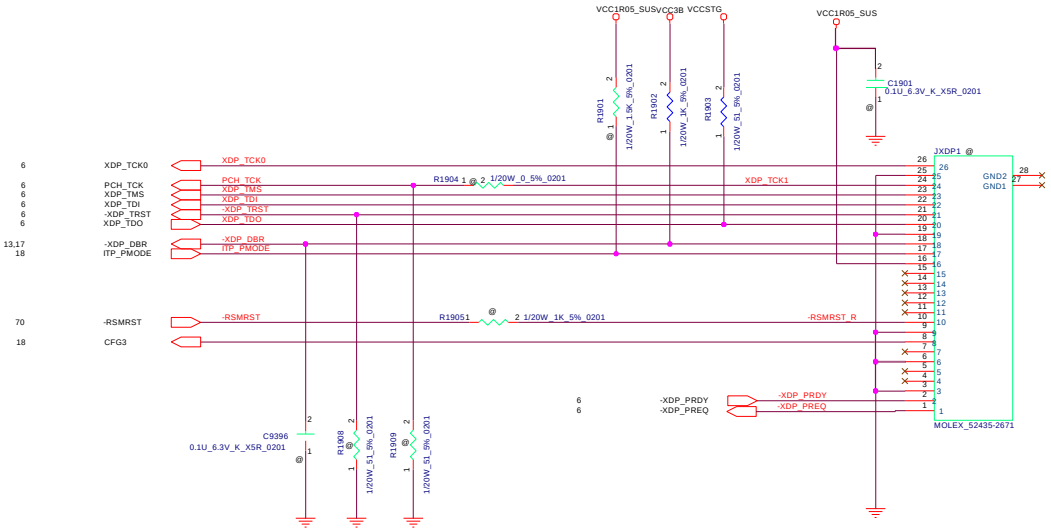
Project Name : Ratchet-1

Title : CPU(16/16) : CFG/RESERVED

Size : C

Document Number :

Date : Monday, April 01, 2019



TABLE

Logic	RefDes	Merged	DCI 2.0
Page 6	R10607	ASM	NO_ASM
	R10608	ASM	NO_ASM
Page 7	R42	ASM	NO_ASM
Page 18	R1801	ASM	NO_ASM
Page 19	JXDP1	ASM	NO_ASM
	C1901	ASM	NO_ASM
	R1903	ASM	ASM
	R1902	ASM	ASM
	R1901	ASM	NO_ASM
	R1905	ASM	NO_ASM
	R1904	ASM	NO_ASM

LOGIC

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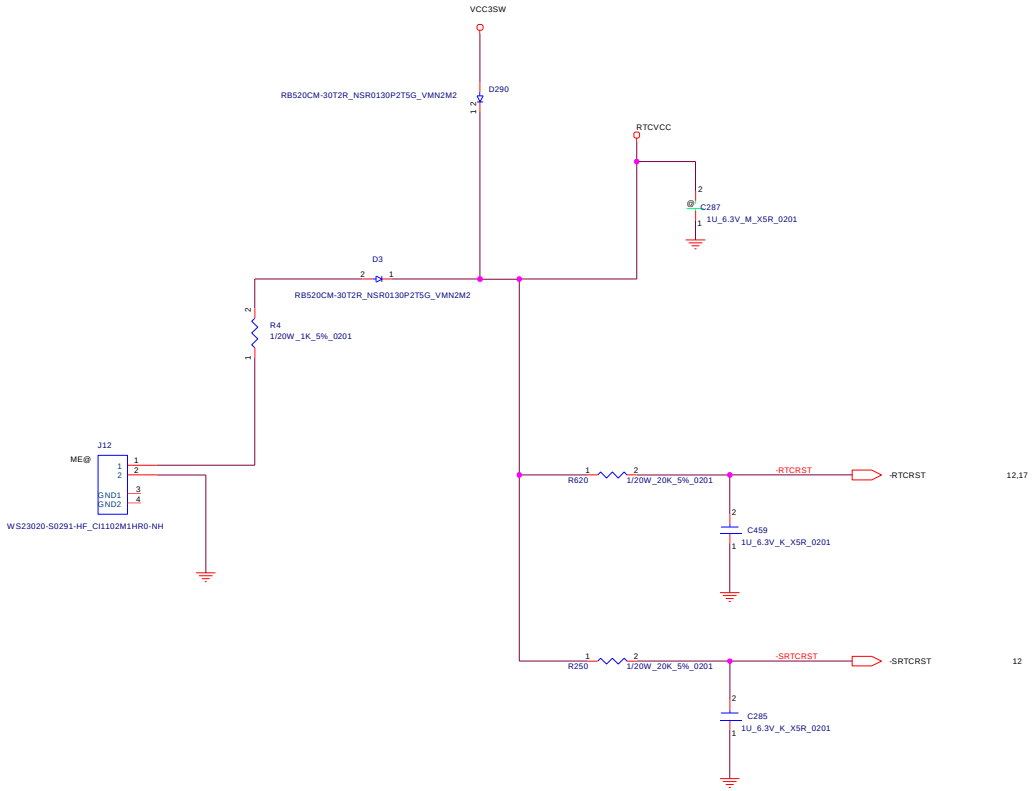
Lenovo

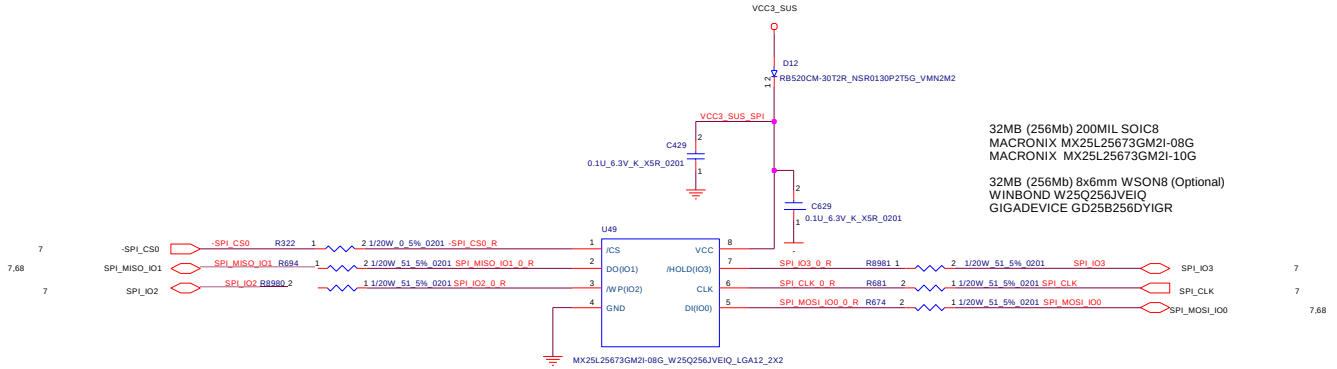
Project Name: Ratchet-1	Title: XDP CONNECTOR
Size: C	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet: 19 of 98



Lenovo

Project Name : Ratchet-1	Title : RTC BATTERY
Size : C	Document Number :
Date : Monday, April 01, 2019	

https://vinafix.com



TABLE

SF100 PIN HEADER INTERFACE (TOP VIEW)					
1	VCC	D12.1	GND	GND	2
3	CS#	R322.2	R681.2	CLK	4
5	MISO	R694.2	R674.2	MOSI	6
7	(KEY)	N/A	N/A	(RESET)	8

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Lenovo

Project Name: Ratchet-1	Title: SPI FLASH
Size: C	Document Number:
Date: Monday, April 01, 2019	

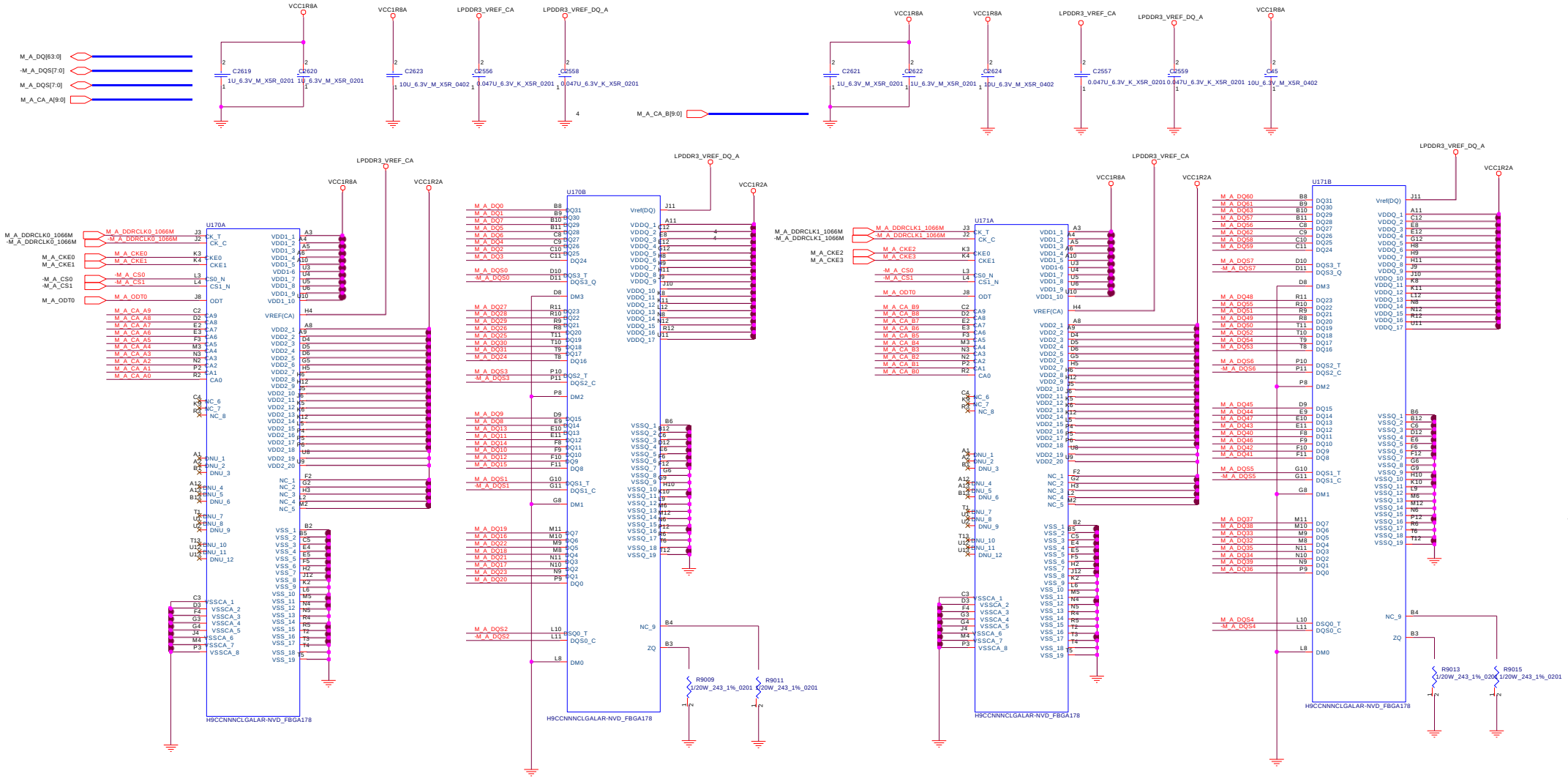


TABLE: LPDDR3 SDRAM Source

Supplier	Capacity	Supplier's P/N	Package Size		Die	Configuration	ZQ0/ZQ	ZQ1/NC	Dual Ch
Samsung	16Gb	K4E6E304EB-EGCG	11.0 x 11.5mm	DDP	8Gb (256Mx32)	2 Rank x (256Mx32)	ZQ	NC	8GB
		K4E6E304ED-EGCG	11.0 x 11.5mm	DDP	8Gb (256Mx32)	2 Rank x (256Mx32)	ZQ	NC	8GB
	32Gb	K4EBE304EB-EGCG	11.0 x 11.5mm	QDP	8Gb (512Mx16)	2 Rank x (512Mx32)	ZQ0	ZQ1	16GB
		K4EBE304ED-EGCG	11.0 x 11.5mm	QDP	8Gb (512Mx16)	2 Rank x (512Mx32)	ZQ0	ZQ1	16GB
SK hynix	16Gb	H9CCNNNBJTALAR-NVD	11.0 x 11.5mm	DDP	8Gb (256Mx32)	2 Rank x (256Mx32)	ZQ	NC	8GB
	32Gb	H9CCNNNCLGALAR-NVD	11.0 x 11.5mm	QDP	8Gb (512Mx16)	2 Rank x (512Mx32)	ZQ0	ZQ1	16GB
Nanya	16Gb	NT6CL512T32AM-H0	10.5 x 11.5mm	DDP	8Gb (256Mx32)	2 Rank x (256Mx32)	ZQ	NC	8GB

Lenovo

Project Name: Ratchet-1

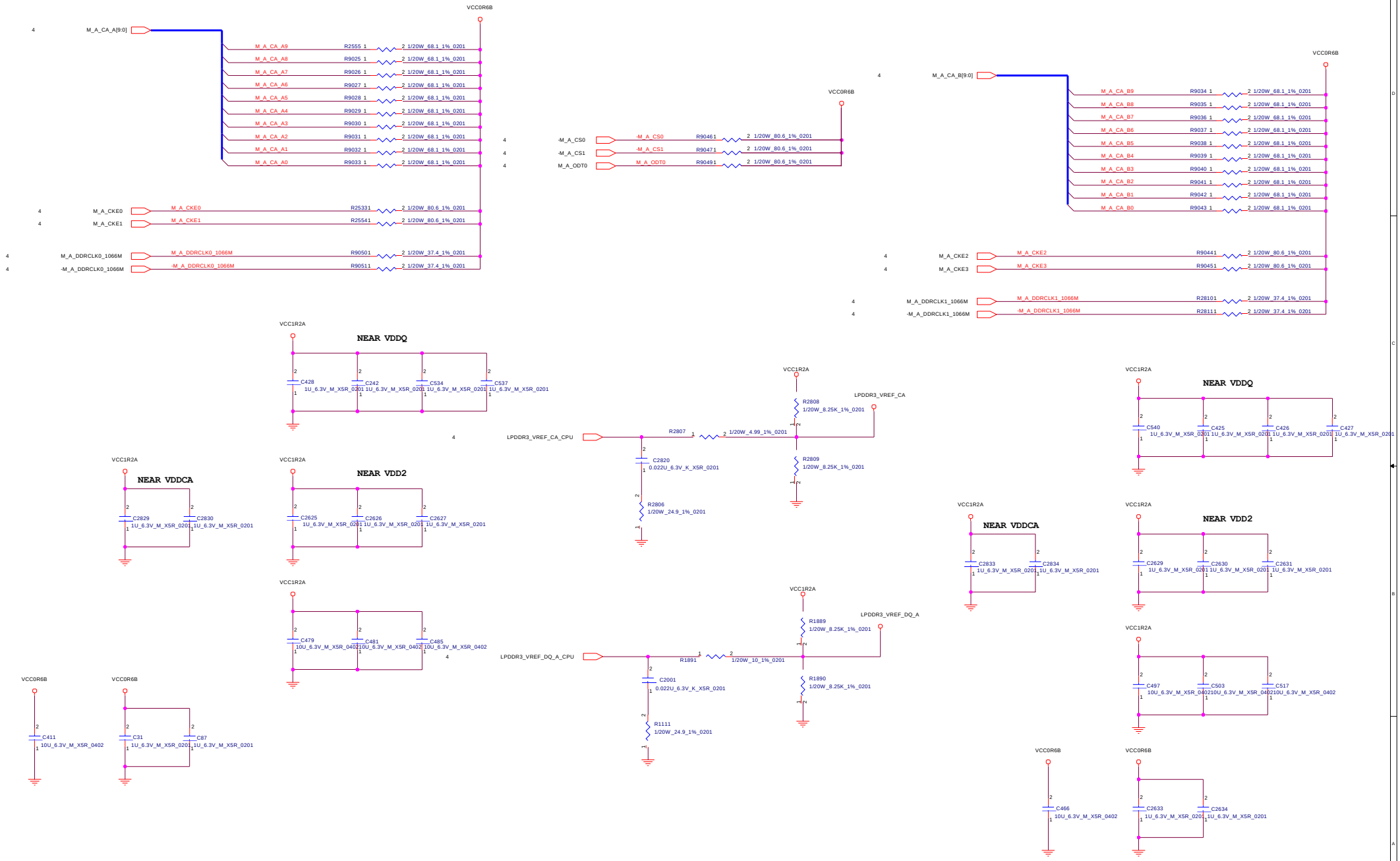
Title: LPDDR3 BASE MEMORY CH-A (1/2)

Size: C

Document Number:

Date: Monday, April 01, 2019

https://vinafix.com



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Lenovo

Project Name: Ratchet-1	Title: LPDDR3 BASE MEMORY CH-A (2/2)
Size: C	Document Number:
Date: Monday, April 01, 2019	

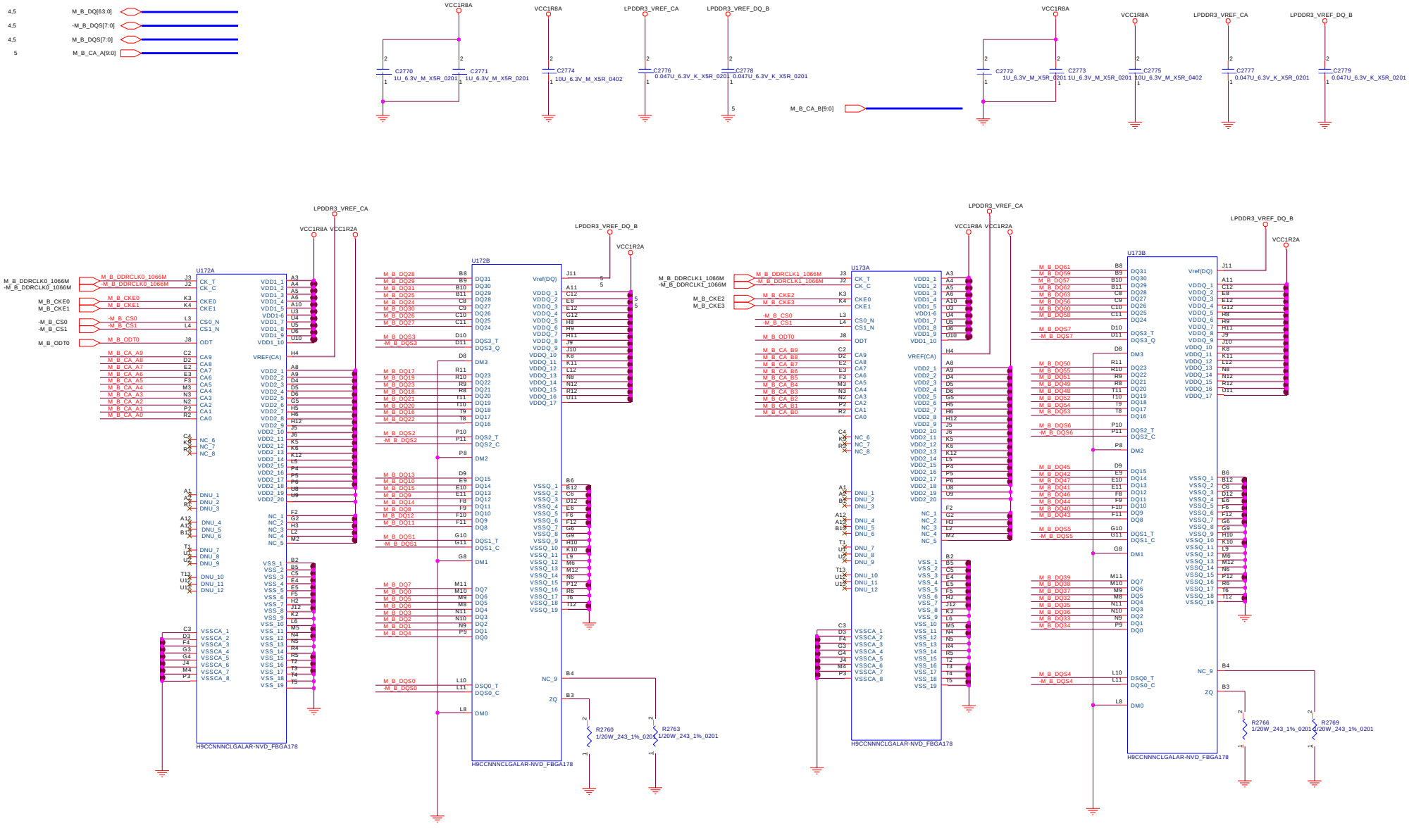

TABLE: LPDDR3 SDRAM Source

Supplier	Capacity	Supplier's P/N	Package Size		Die	Configuration	ZQ0/ZQ	ZQ1/NC	Dual Ch
Samsung	16Gb	K4E6E304EB-EGCG	11.0 x 11.5 mm	DDP	8Gb (256M x32)	2 Rank x (256M x32)	ZQ	NC	8GB
		K4E6E304ED-EGCG	11.0 x 11.5 mm	DDP	8Gb (256M x32)	2 Rank x (256M x32)	ZQ	NC	8GB
	32Gb	K4EBE304EB-EGCG	11.0 x 11.5 mm	QDP	8Gb (512M x16)	2 Rank x (512M x32)	ZQ0	ZQ1	16GB
		K4EBE304ED-EGCG	11.0 x 11.5 mm	QDP	8Gb (512M x16)	2 Rank x (512M x32)	ZQ0	ZQ1	16GB
SK hynix	16Gb	H9CCNNNBJTALAR-NVD	11.0 x 11.5 mm	DDP	8Gb (256M x32)	2 Rank x (256M x32)	ZQ	NC	8GB
	32Gb	H9CCNNNCLGALAR-NVD	11.0 x 11.5 mm	QDP	8Gb (512M x16)	2 Rank x (512M x32)	ZQ0	ZQ1	16GB
Nanya	16Gb	NT6CL512T32AM-H0	10.5 x 11.5 mm	DDP	8Gb (256M x32)	2 Rank x (256M x32)	ZQ	NC	8GB

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Lenovo

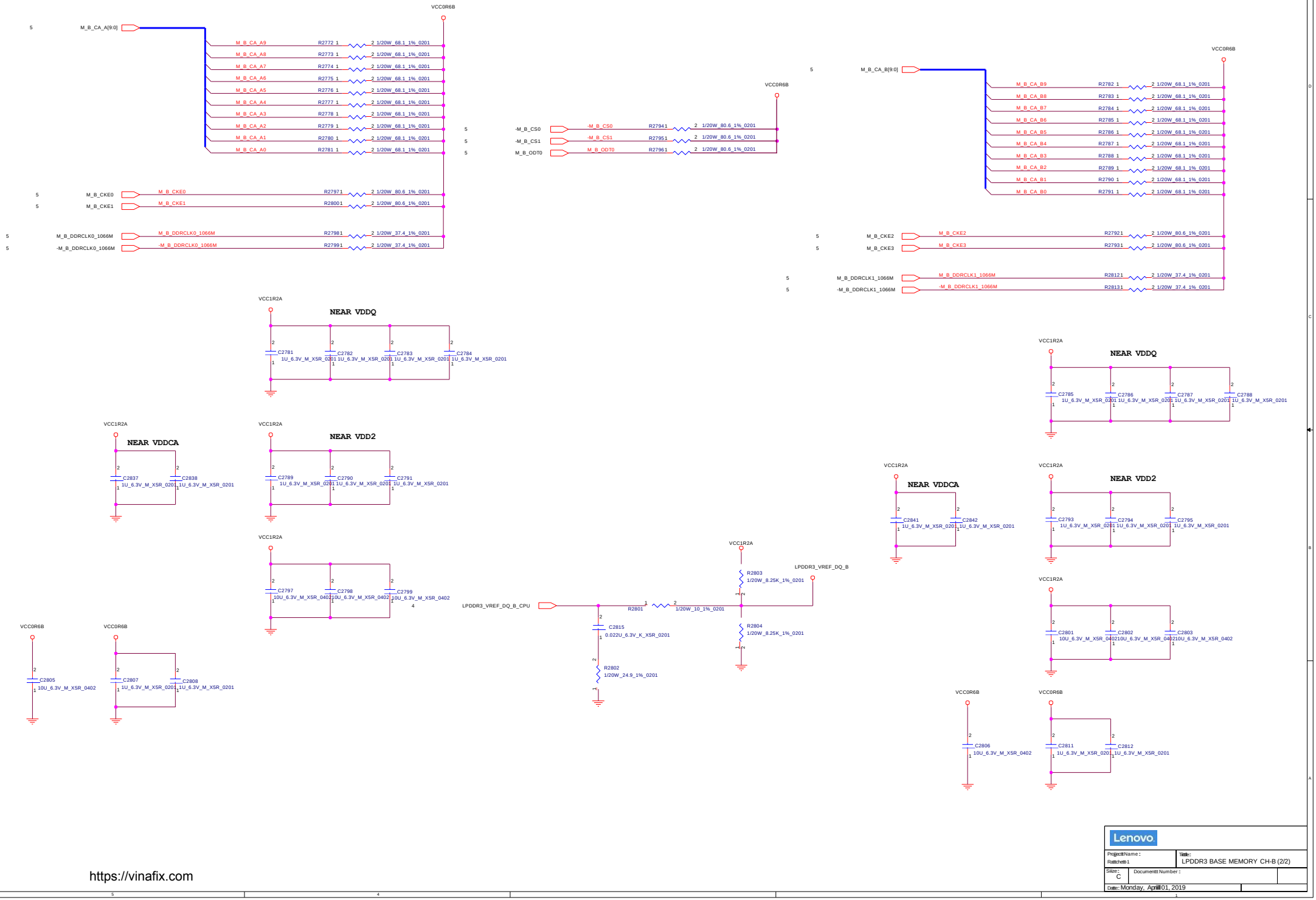
Project Name: Ratchet-1

Title: LPDDR3 BASE MEMORY CH-B (1/2)

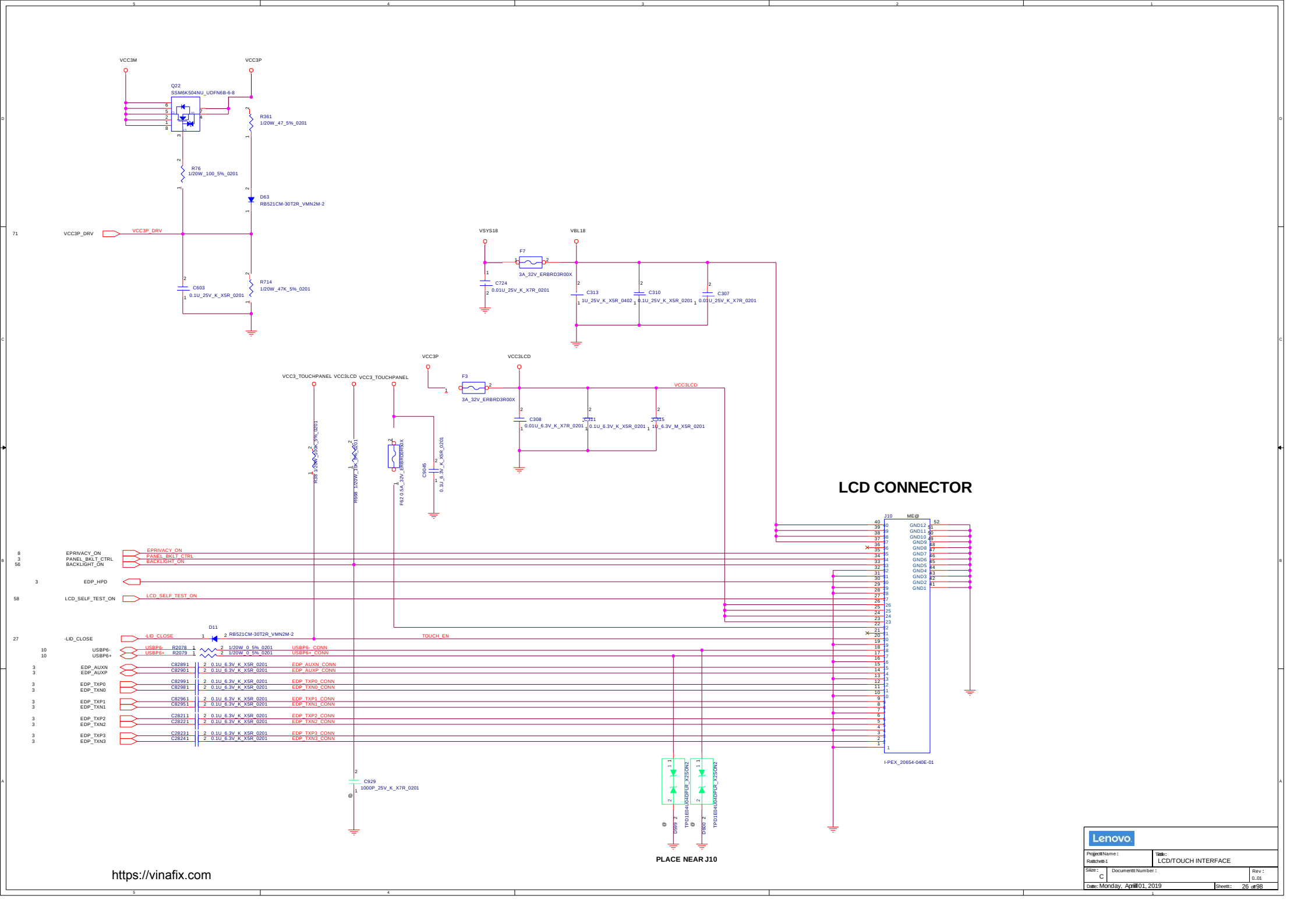
Size: C

Document Number:

Date: Monday, April 01, 2019

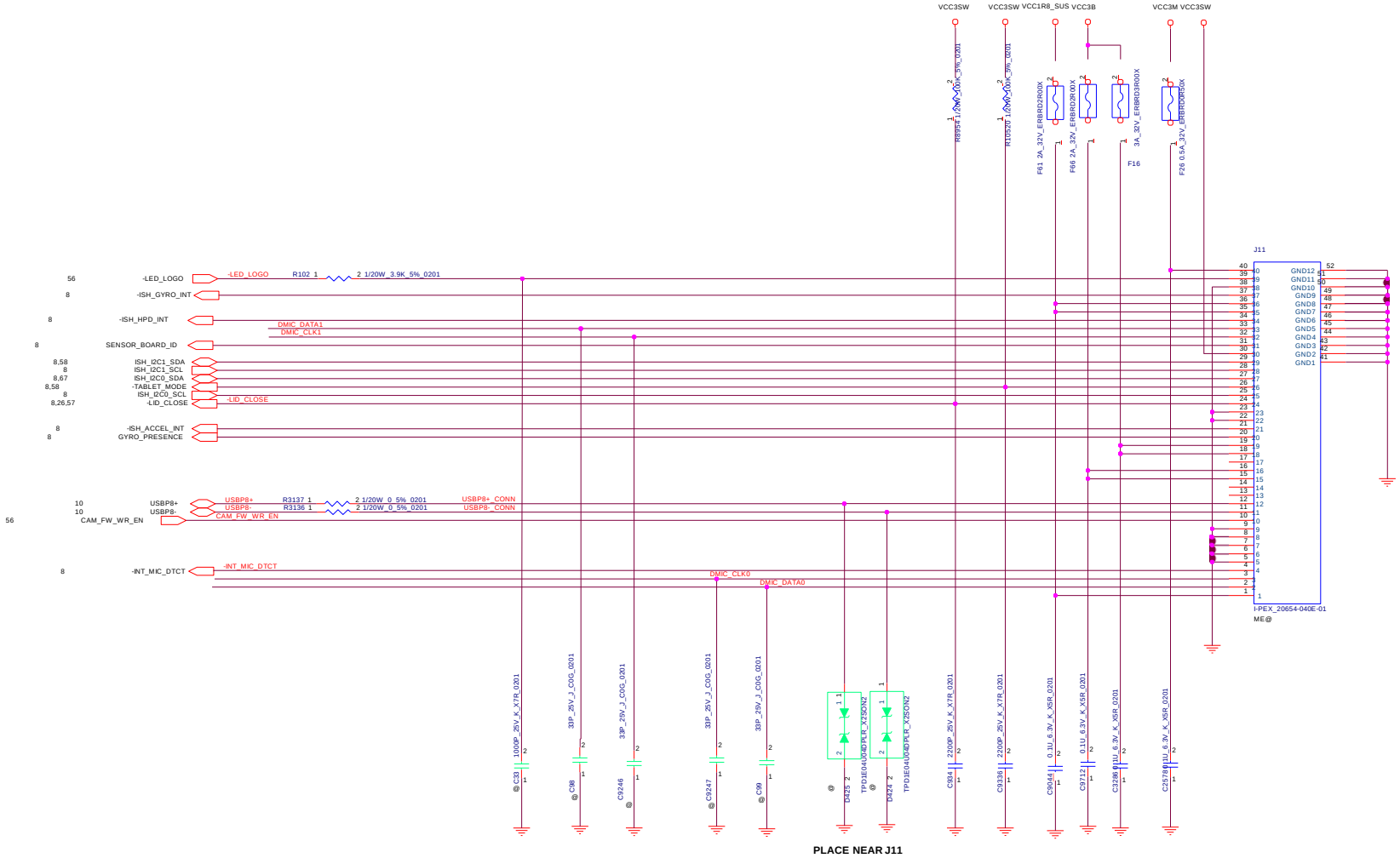


https://vinafix.com



https://vinafix.com

Project Name : Ratchet-1	Title : LCD/TOUCH INTERFACE
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 26 of 98



PLACE NEAR J11

9 DMIC_DATA1_PCH — R2701 2 — 1 R0201_SHORT — DMIC_DATA1

9 DMIC_CLK1_PCH — R2703 2 — 1 R0201_SHORT — DMIC_CLK1

9 DMIC_DATA0_PCH — R2705 2 — 1 R0201_SHORT — DMIC_DATA0

9 DMIC_CLK0_PCH — R2707 2 — 1 R0201_SHORT — DMIC_CLK0

Lenovo

Project Name: Ratchet-1	Title: LID/CAMERA/MIC/SENSOR INTERFACE
Size: C	Document Number:
Date: Monday, April 01, 2019	

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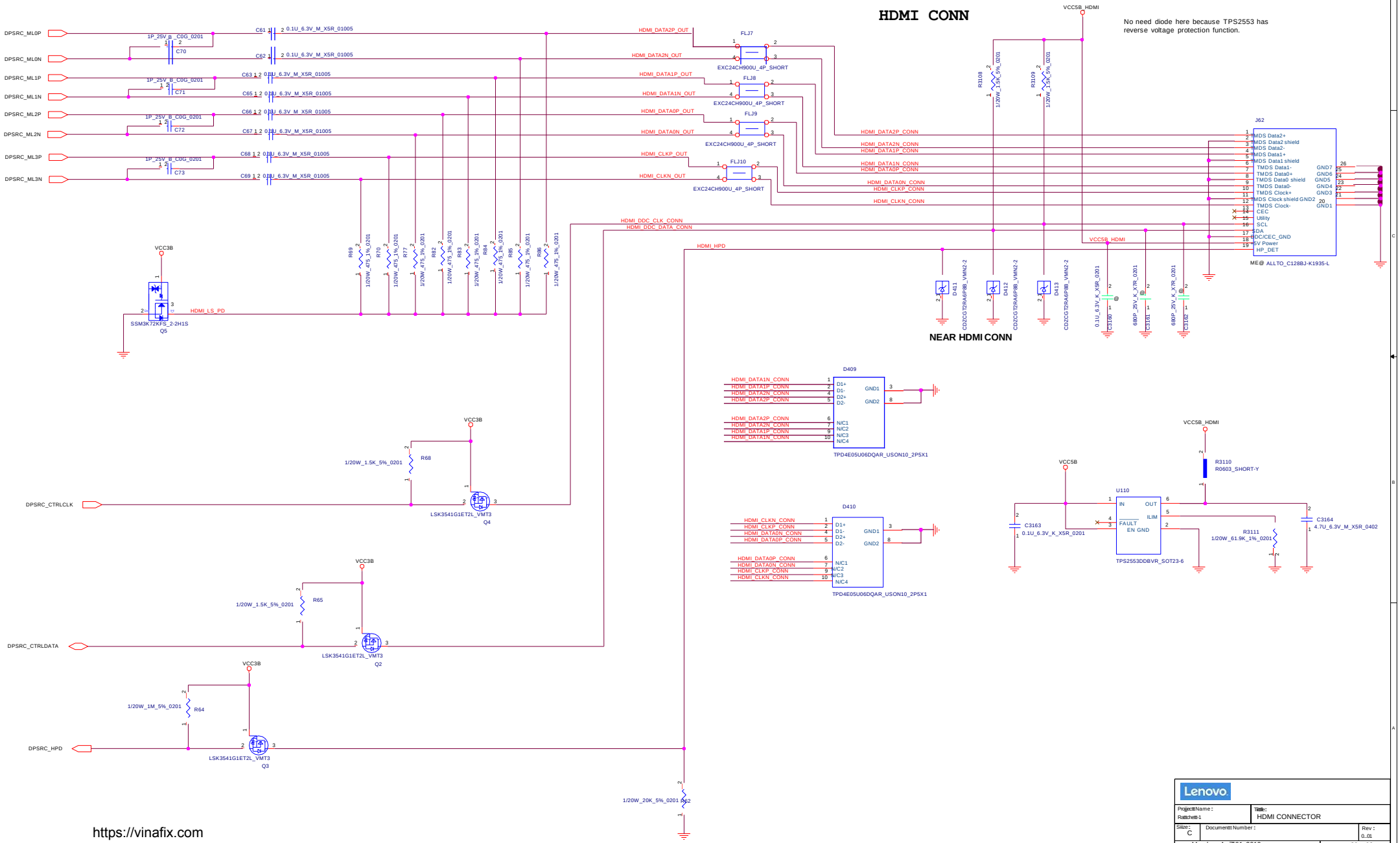
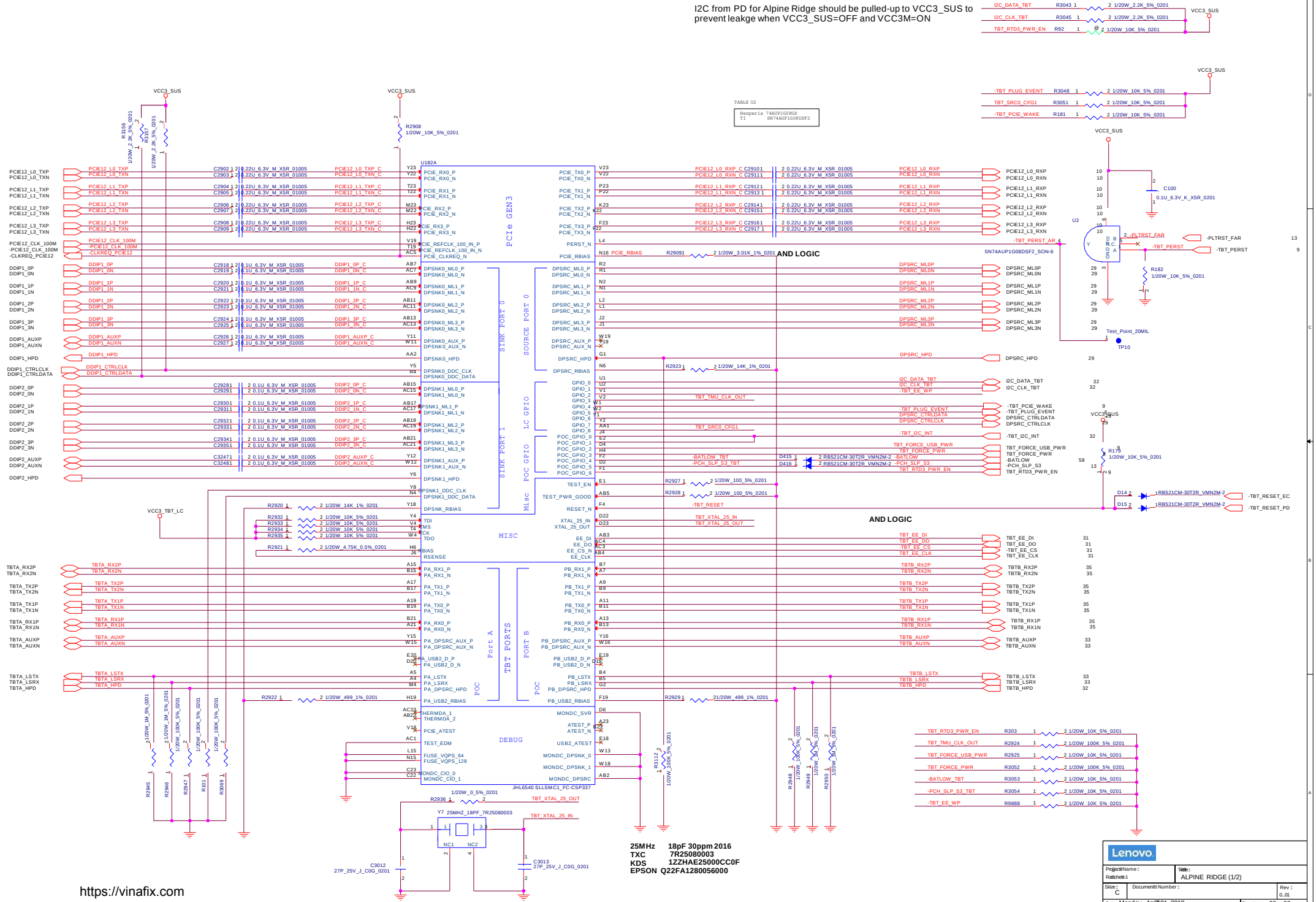
HDMI CONN


No need diode here because TPS2553 has reverse voltage protection function.
NEAR HDMI CONN
DPSRC_ML0P
DPSRC_ML0N
DPSRC_ML1P
DPSRC_ML1N
DPSRC_ML2P
DPSRC_ML2N
DPSRC_ML3P
DPSRC_ML3N
HDMI_DATA2P_OUT
HDMI_DATA2N_OUT
HDMI_DATA1P_OUT
HDMI_DATA1N_OUT
HDMI_DATA0P_OUT
HDMI_DATA0N_OUT
HDMI_CLKP_OUT
HDMI_CLKN_OUT
HDMI_DDC_CLK_CONN
HDMI_DDC_DATA_CONN
HDMI_HPD
HDMI_LS_PD
DPSRC_CTRLCLK
DPSRC_CTRLDATA
DPSRC_HPD
VCC3B
VCC5B_HDMI
VCC5B
SSM3K72KFS_2-2H1S
Q5
LSK3541G1ET2L_VMT3
Q4
Q2
Q3
EXC24CH900U_4P_SHORT
FLJ7
FLJ8
FLJ9
FLJ10
J62
ME@ ALLTO_C128BJ-K1935-L
TPD4E05U06DQAR_USON10_2P5X1
D409
D410
U110
TPS2553DDBVR_SOT23-6
R3110
R0603_SHORT-Y
R3111
1/20W_61.9K_1%_0201
C3163
0.1U_6.3V_K_X5R_0201
C3164
4.7U_6.3V_M_X5R_0402
1/20W_20K_5%_0201
https://vinafix.com
Lenovo
Project Name: Ratchet-1
Title: HDMI CONNECTOR
Size: C
Document Number:
Rev: 0.01
Date: Monday, April 01, 2019
Sheet: 29 of 98

I2C from PD for Alpine Ridge should be pulled-up to VCC3_SUS to prevent leakge when VCC3_SUS=OFF and VCC3M=ON



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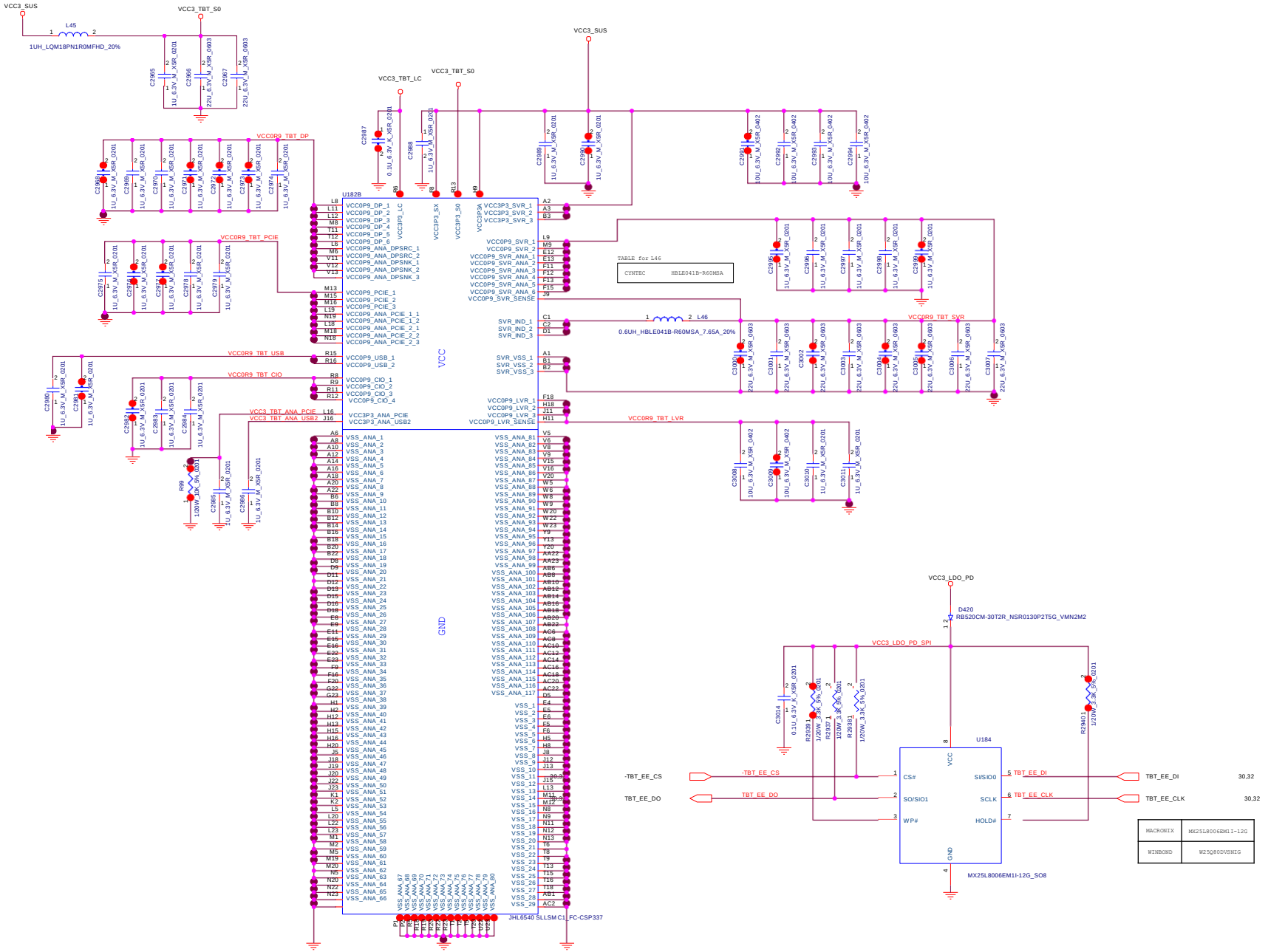
Project Name :	ALPINE RIDGE (1/2)
Size : C	Document Number :
Rev : 0.01	
Date : Monday, April 01, 2019	Sheet : 30 of 98



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Lenovo

Project Name: Ratchet-1

Title: ALPINE RIDGE (2/2)

Size: C

Document Number:

Rev: 0.01

Date: Monday, April 01, 2019

Sheet: 31 of 98

TABLE I2C Addressing

I2C1(to EC)	TBTA PORT	0x23
	TBTB PORT	0x27
I2C2(to AR)	TBTA PORT	0x38
	TBTB PORT	0x3F

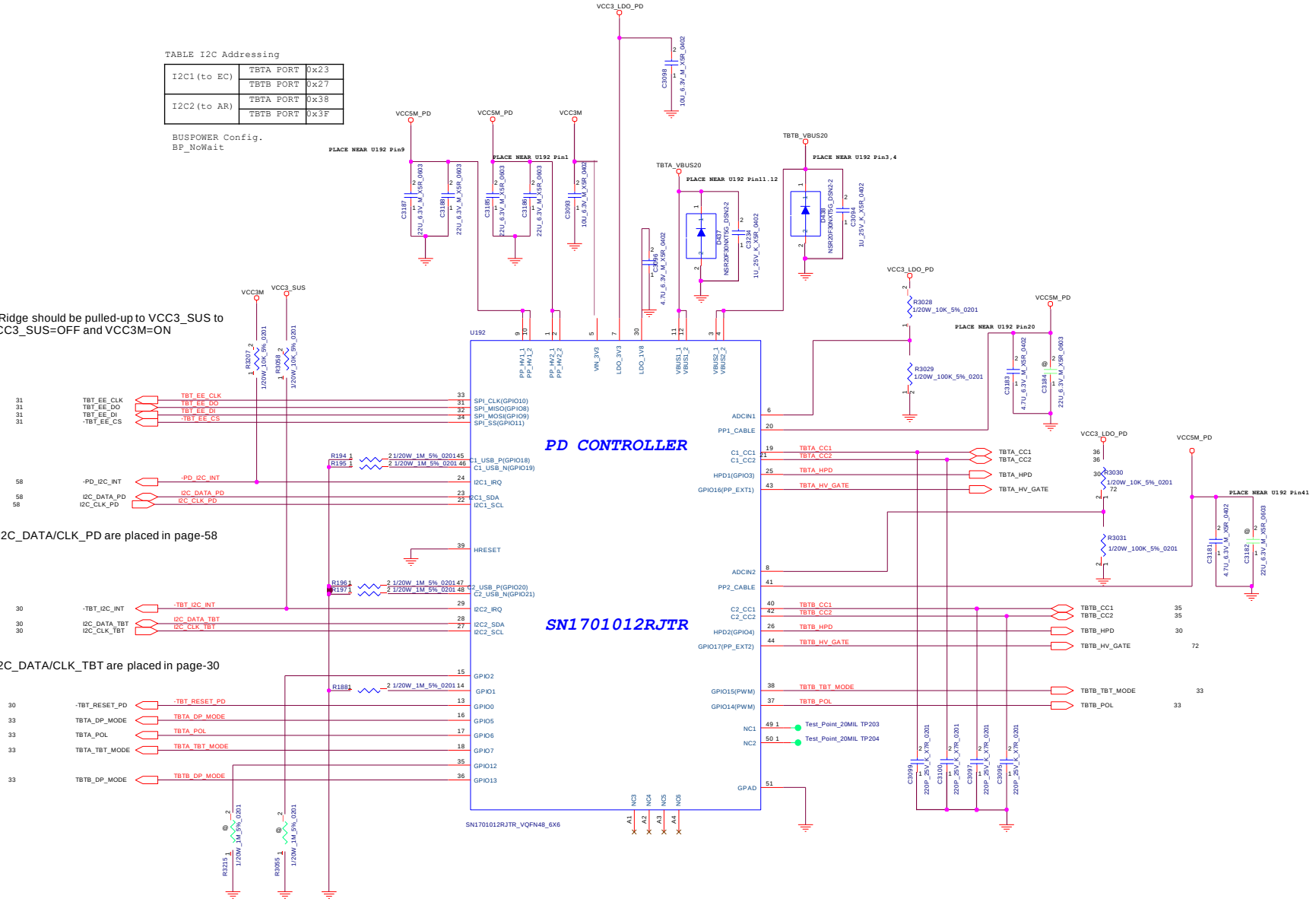
BUSPOWER Config.
BP_NoWait

I2C from PD for Alpine Ridge should be pulled-up to VCC3_SUS to prevent leakge when VCC3_SUS=OFF and VCC3M=ON

Pull-up resisters for I2C_DATA/CLK_PD are placed in page-58

Pull-up resisters for I2C_DATA/CLK_TBT are placed in page-30

GPIO2/12 can be floating when unused.



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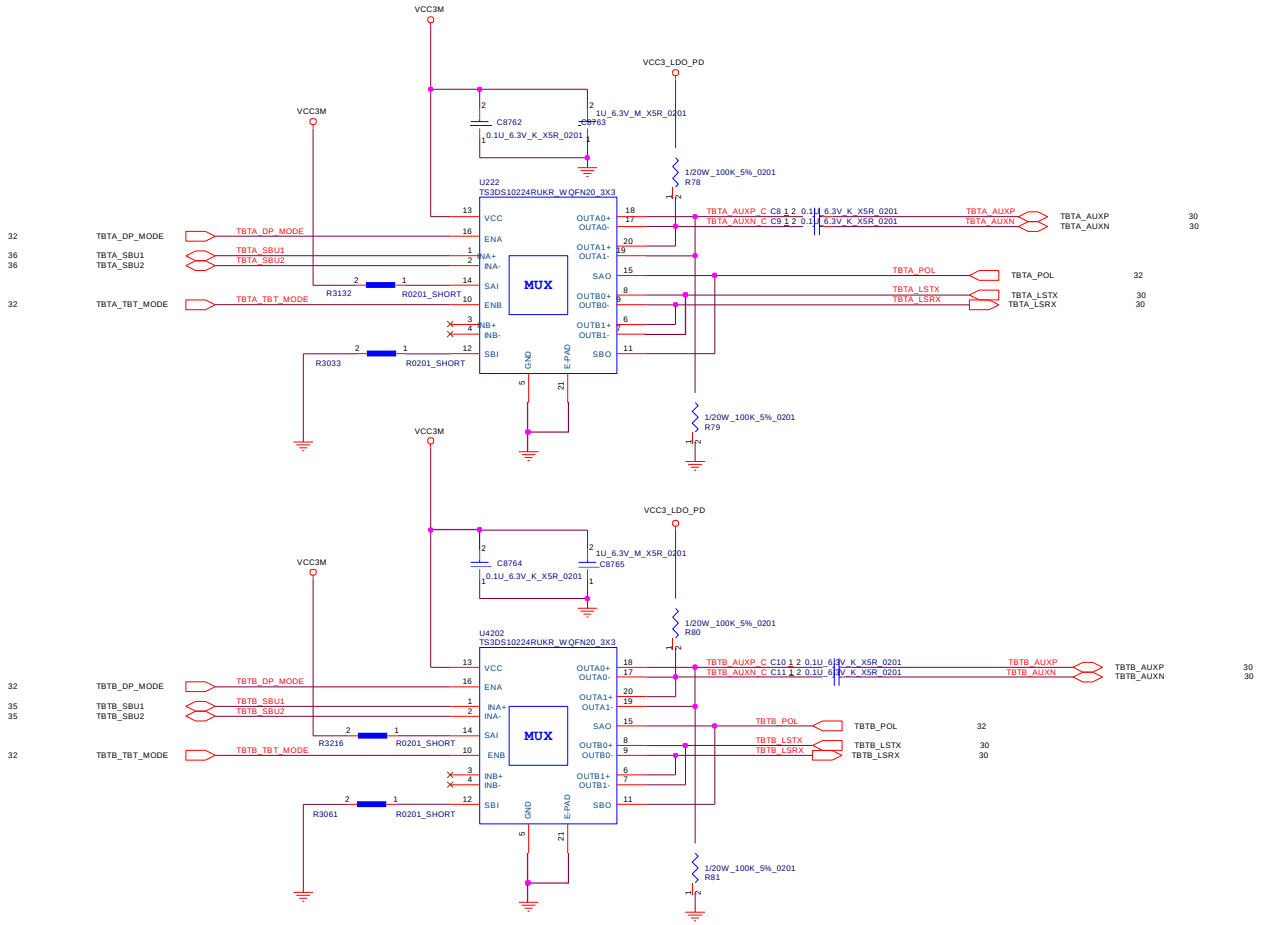
Lenovo

Project Name : Ratchet-1	Title: USB PD CONTROLLER
Size:	Document Number : Rev : 0.01
Date: Monday, April 01, 2019	Sheet 32 of 98



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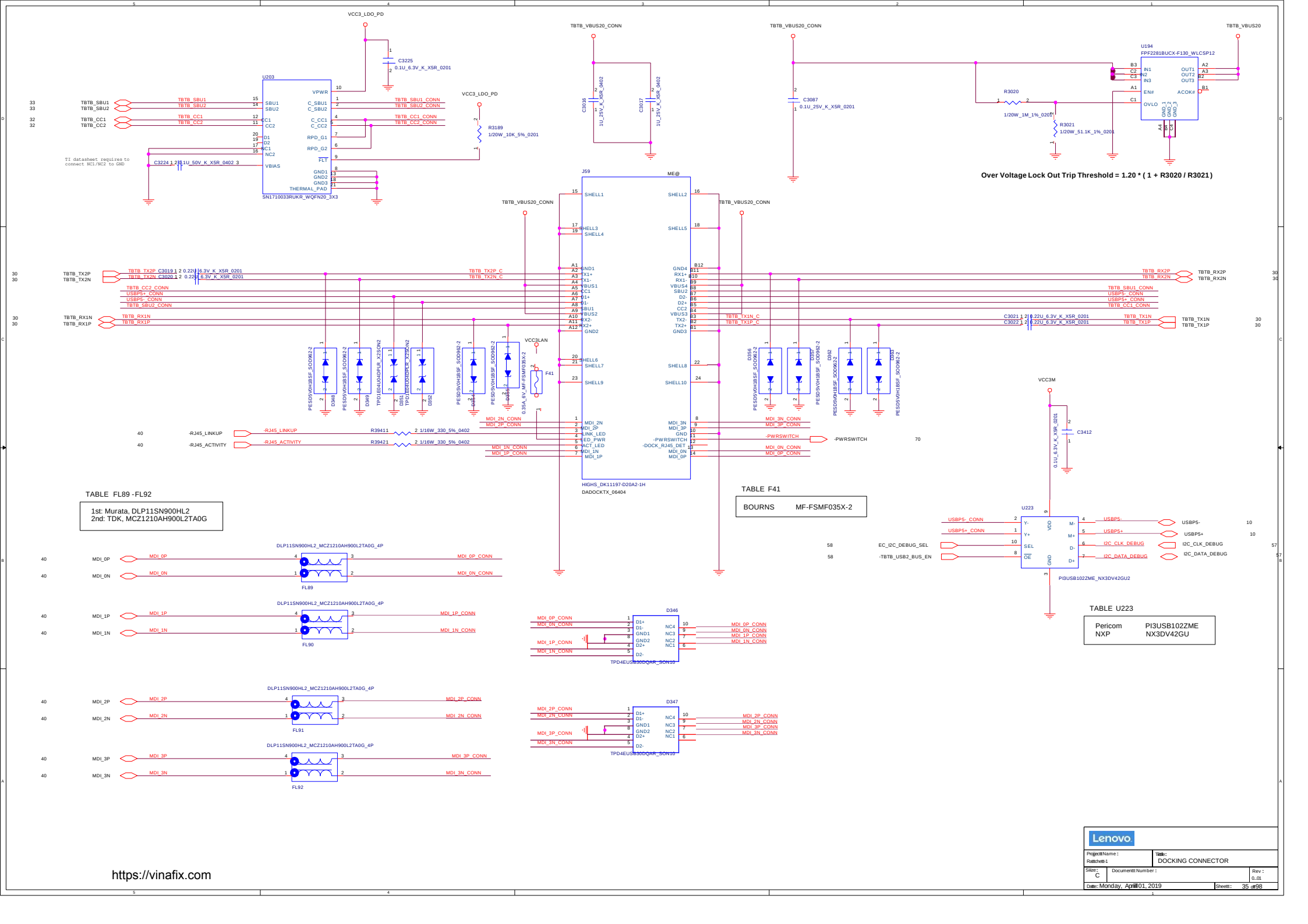
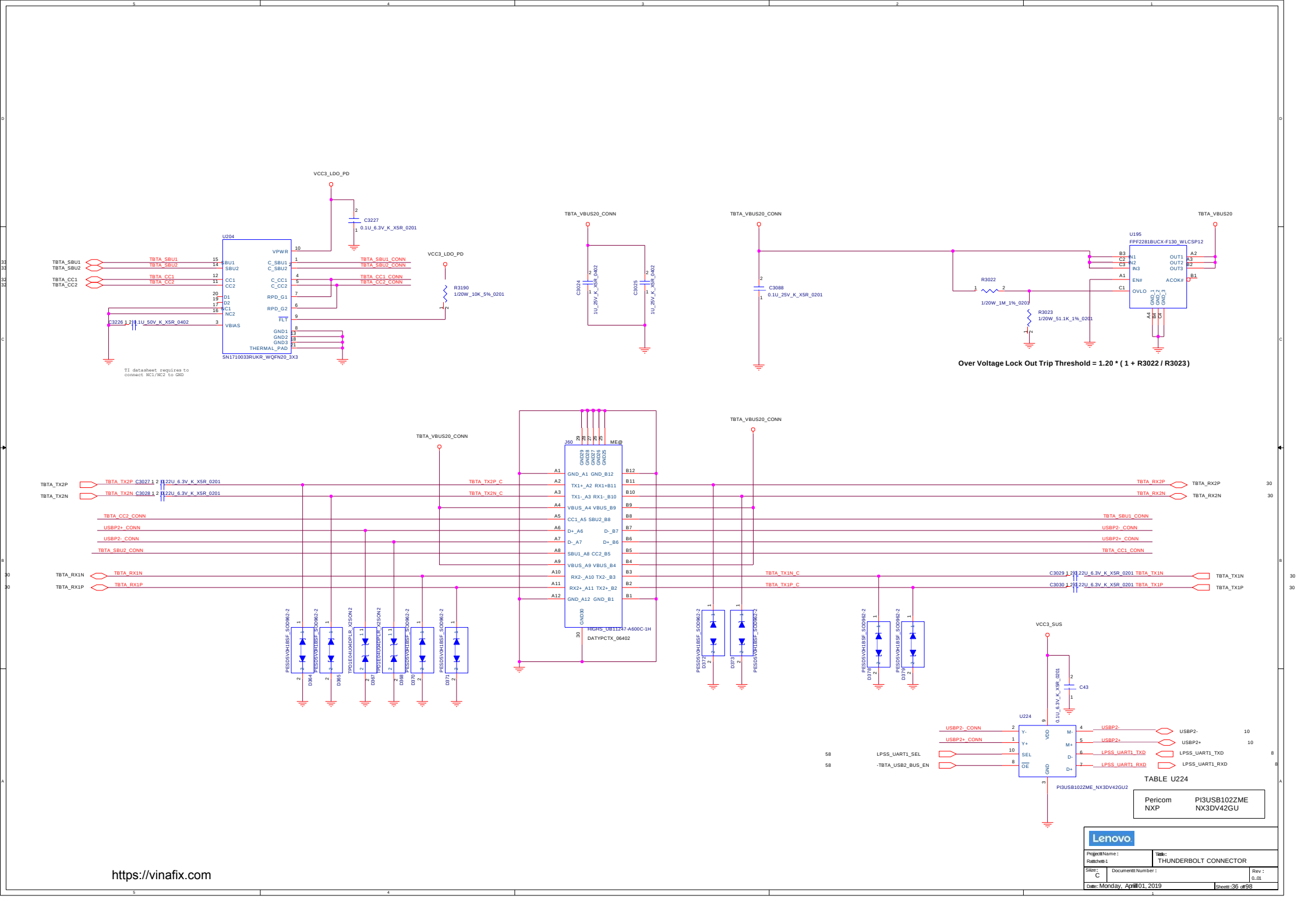
Lenovo

Project Name : Ratchet-1	Title : USB PD DEMUX
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 33 of 98



https://vinafix.com



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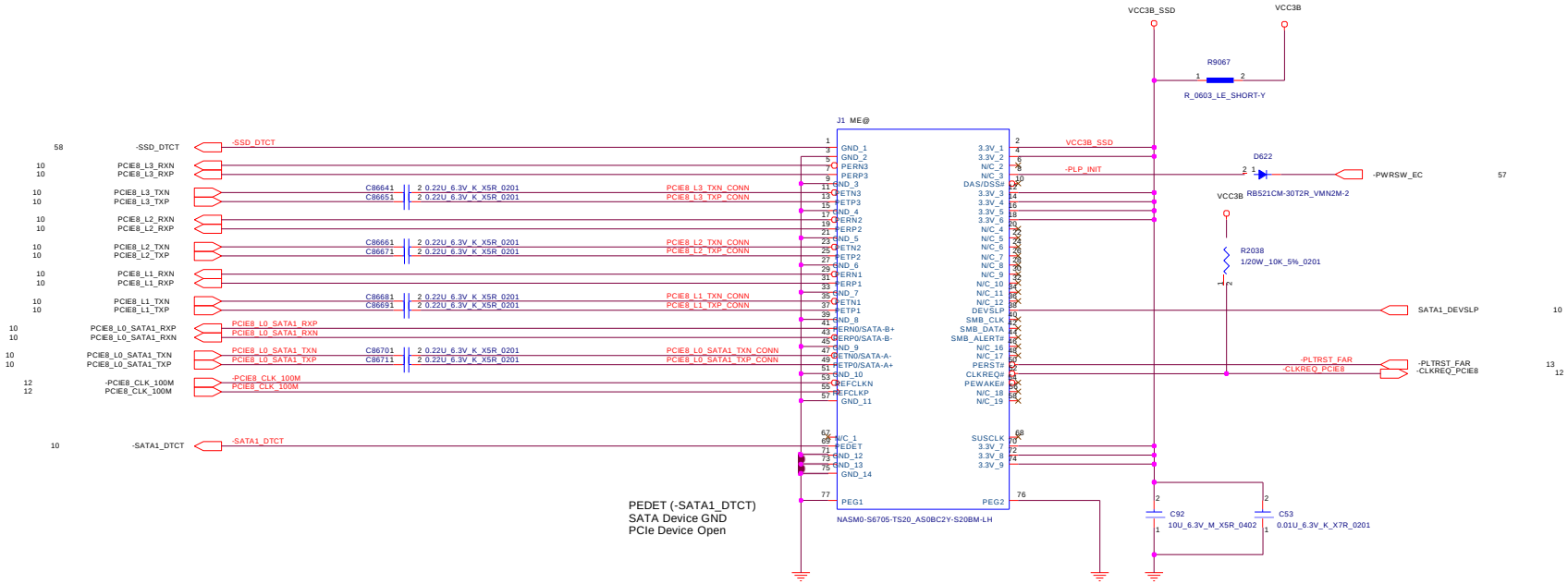
M.2 Socket 3 (Key-M) for 2280 S3 SSD

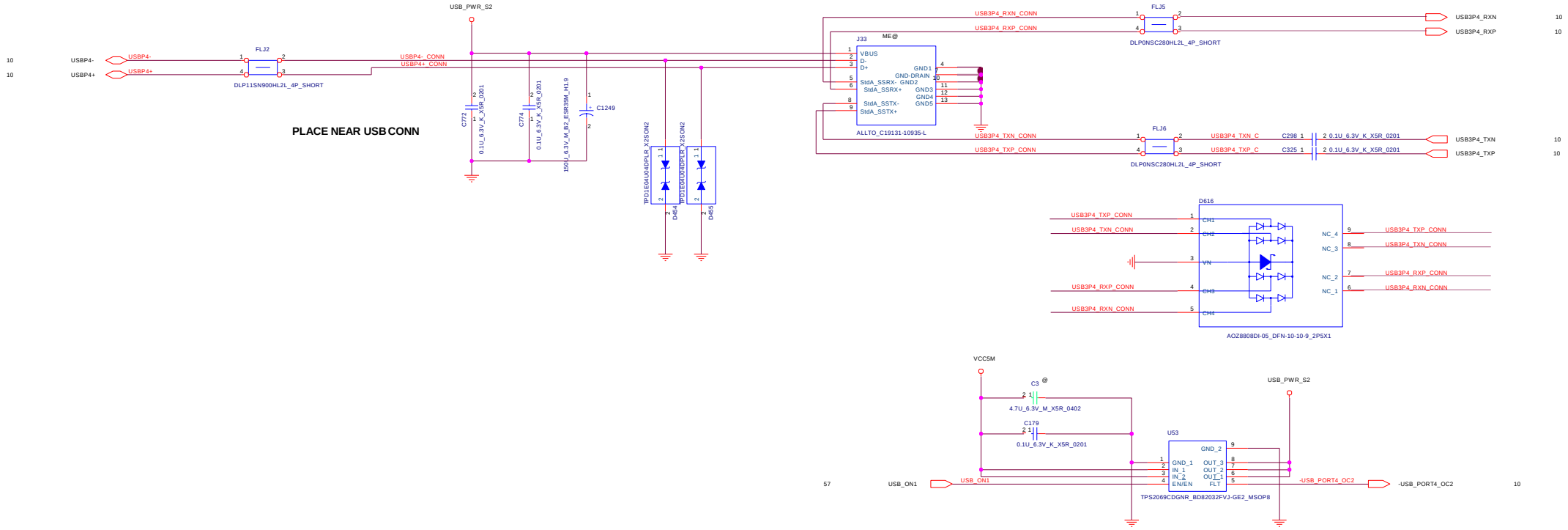
H=2.00mm Connector



PEDET (-SATA1_DTCT)
SATA Device GND
PCIe Device Open

https://vinafix.com

Project Name : Ratchet-1	Title : M.2 SOCKET 3 MODULE I/F
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 37 of 98



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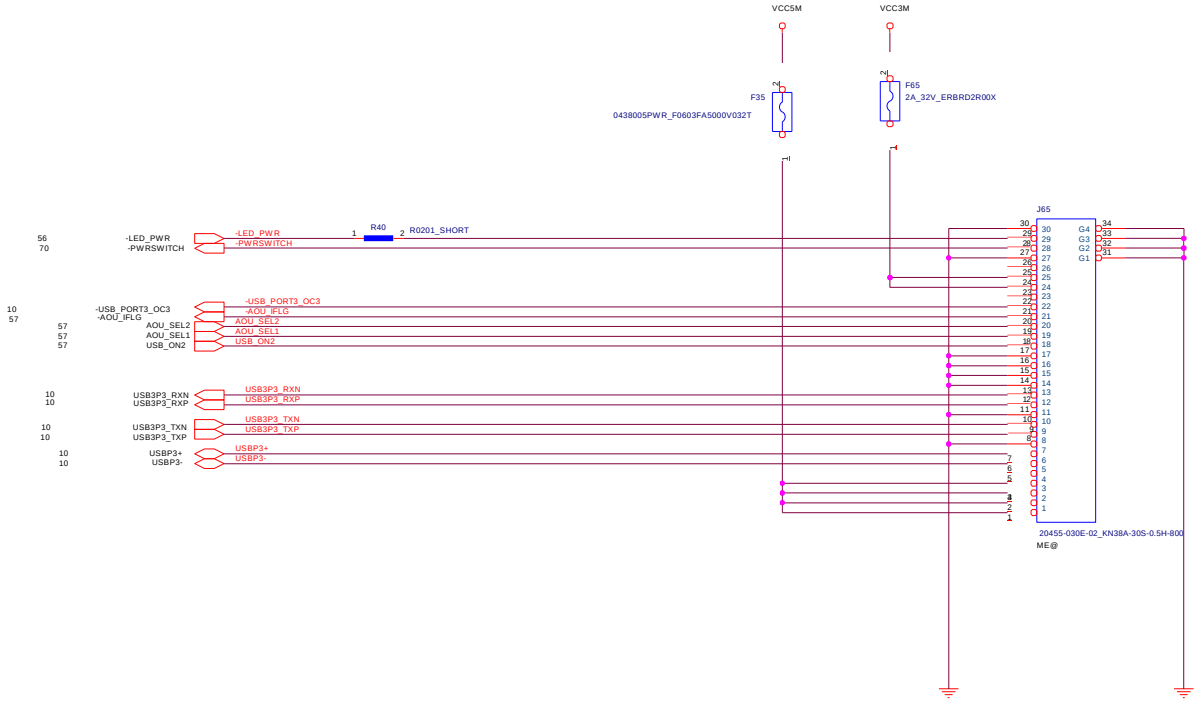
Project Name : Ratchet-1	Title : USB TYPE-A CONNECTOR
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 38 of 98



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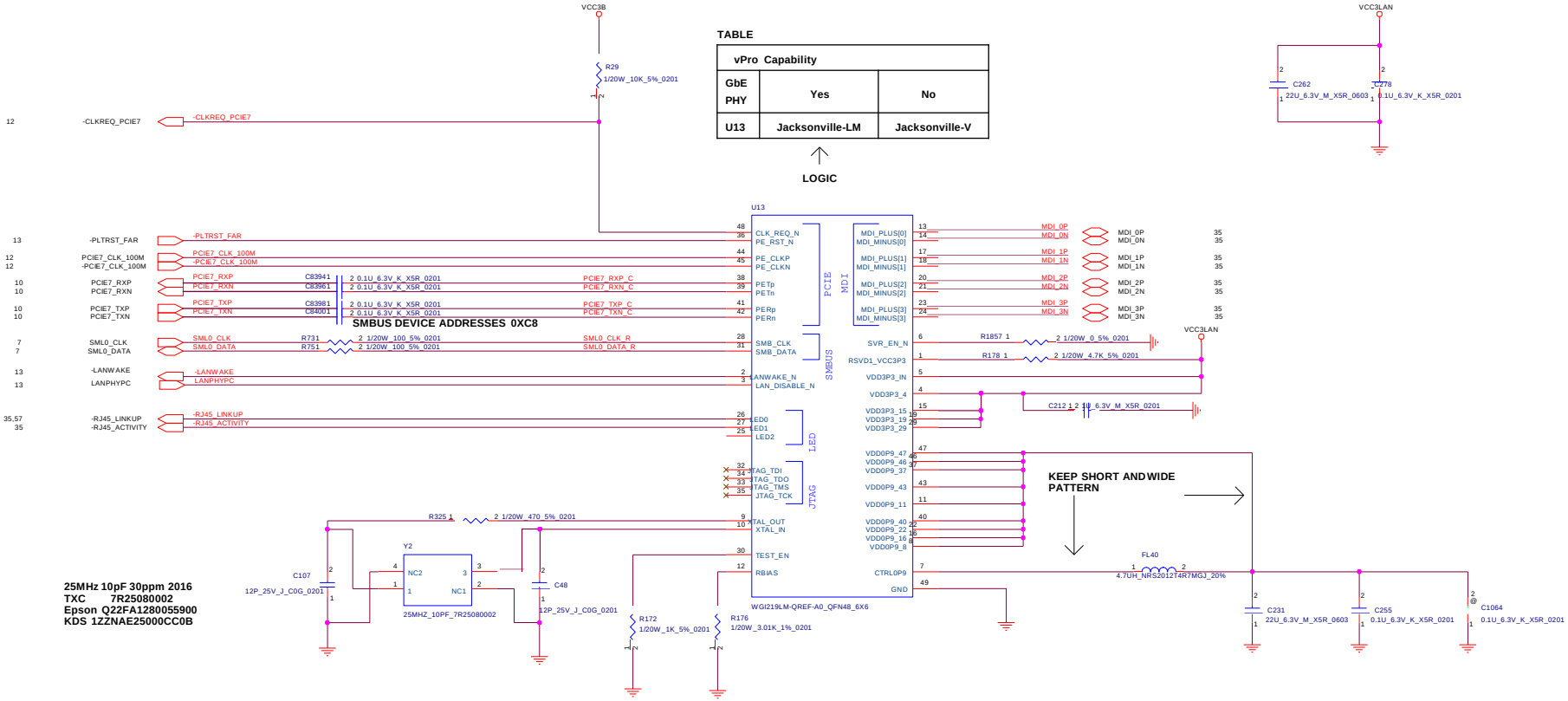
Lenovo

Project Name: Ratchet-1	Title: USB TYPE-A SUBCARD INTERFAC
Size: C	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet 39 of 98



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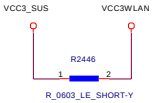
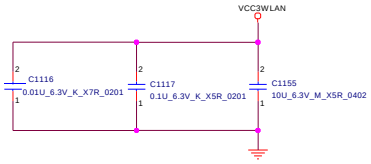
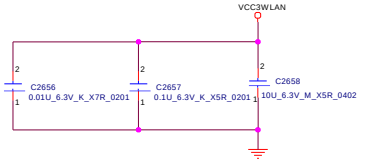
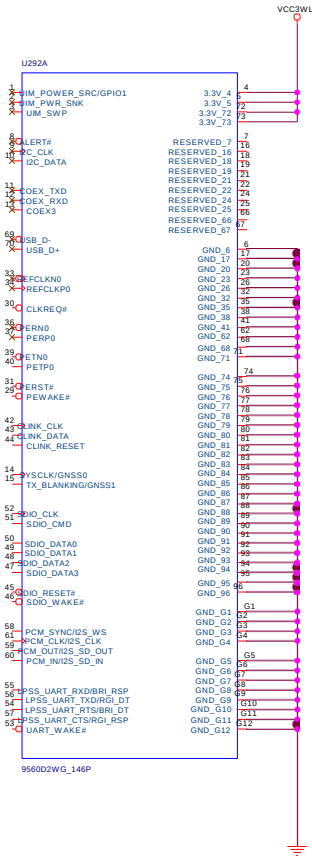
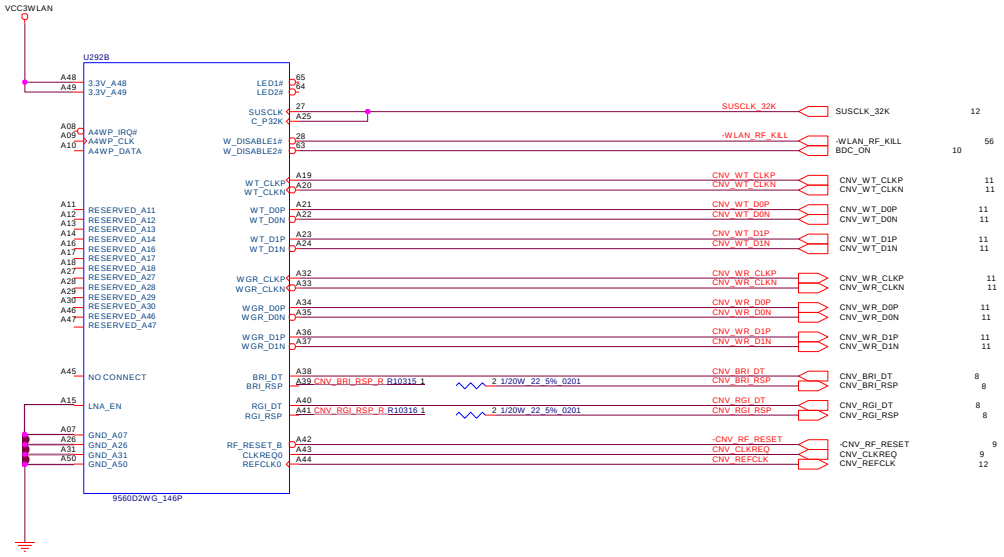
M.2 Type 1216 Module for WLAN / Bluetooth











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Lenovo

Project Name : Ratchet-1	Title : M.2 TYPE 1216 MODULE
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 43 of 98

M.2 Socket 2 (Key-B) for 3042 S3 WWAN

H=2.00mm Connector

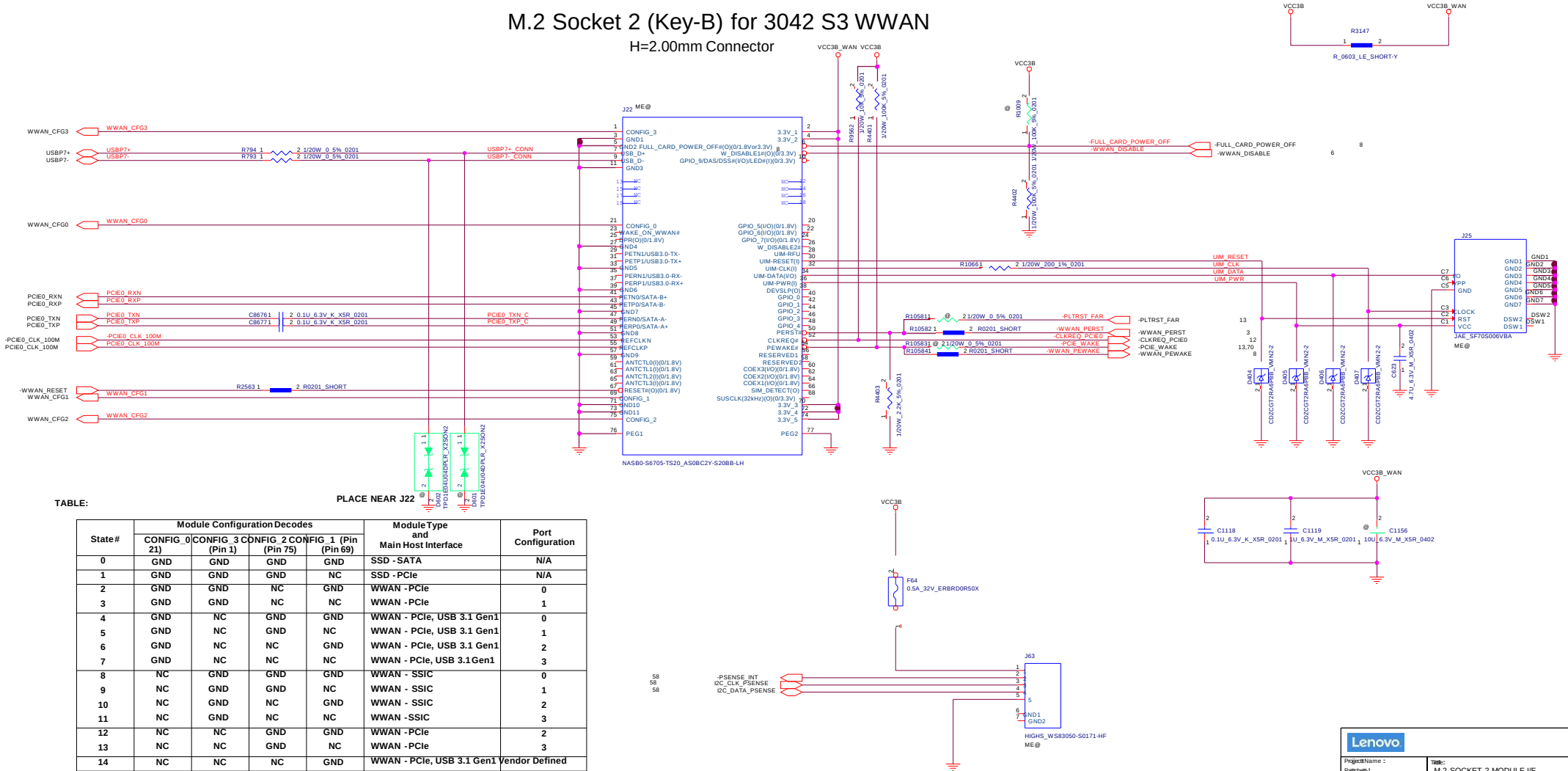

TABLE:

State#	Module Configuration Decodes				Module Type and Main Host Interface	Port Configuration
	CONFIG_0 (Pin 21)	CONFIG_3 (Pin 1)	CONFIG_2 (Pin 75)	CONFIG_1 (Pin 69)		
0	GND	GND	GND	GND	SSD -SATA	N/A
1	GND	GND	GND	NC	SSD -PCIe	N/A
2	GND	GND	NC	GND	WWAN -PCIe	0
3	GND	GND	NC	NC	WWAN -PCIe	1
4	GND	NC	GND	GND	WWAN - PCIe, USB 3.1 Gen1	0
5	GND	NC	GND	NC	WWAN - PCIe, USB 3.1 Gen1	1
6	GND	NC	NC	GND	WWAN - PCIe, USB 3.1 Gen1	2
7	GND	NC	NC	NC	WWAN - PCIe, USB 3.1Gen1	3
8	NC	GND	GND	GND	WWAN - SSIC	0
9	NC	GND	GND	NC	WWAN - SSIC	1
10	NC	GND	NC	GND	WWAN - SSIC	2
11	NC	GND	NC	NC	WWAN -SSIC	3
12	NC	NC	GND	GND	WWAN -PCIe	2
13	NC	NC	GND	NC	WWAN -PCIe	3
14	NC	NC	NC	GND	WWAN - PCIe, USB 3.1 Gen1 Vendor Defined	
15	NC	NC	NC	NC	No Module Present	N/A

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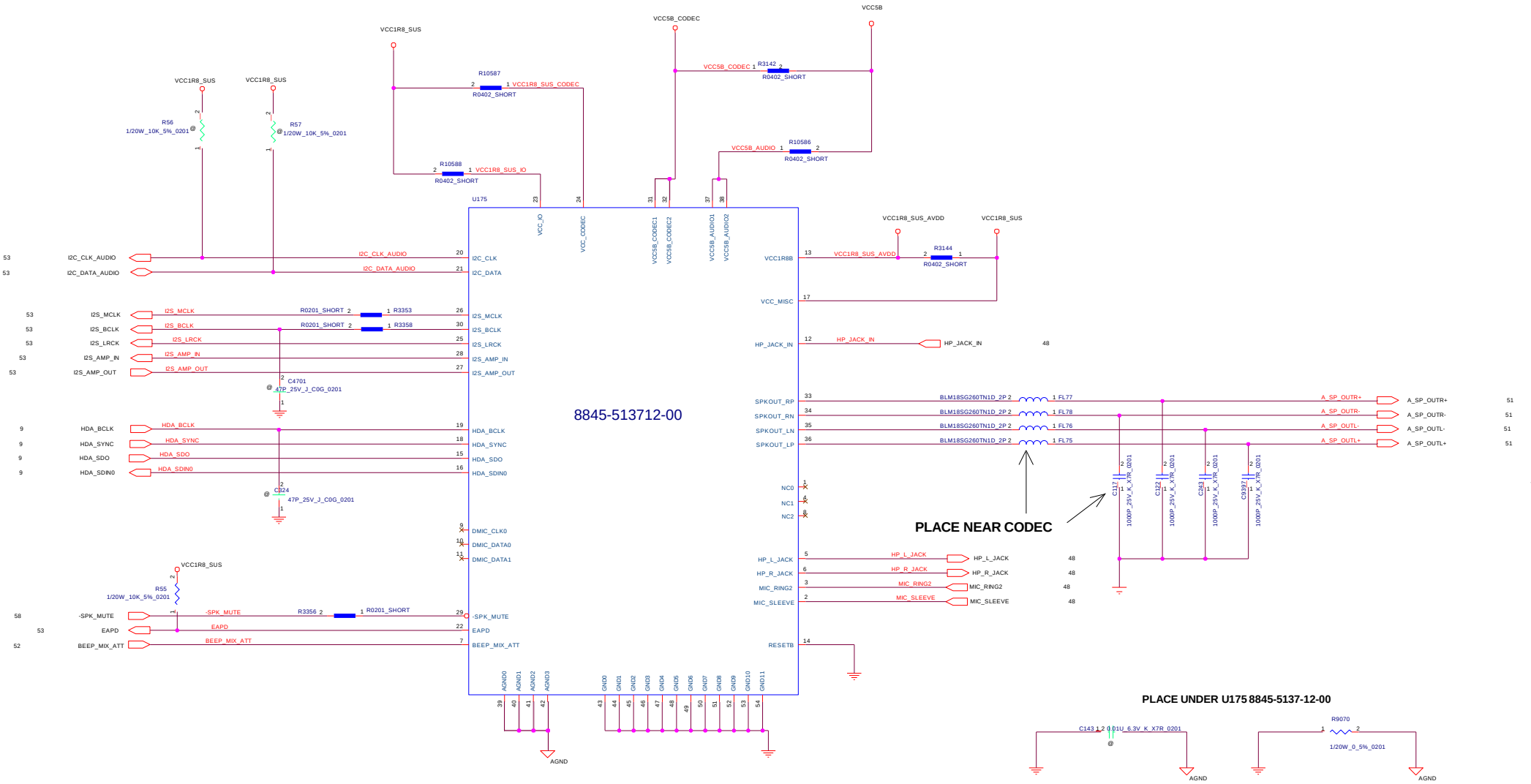
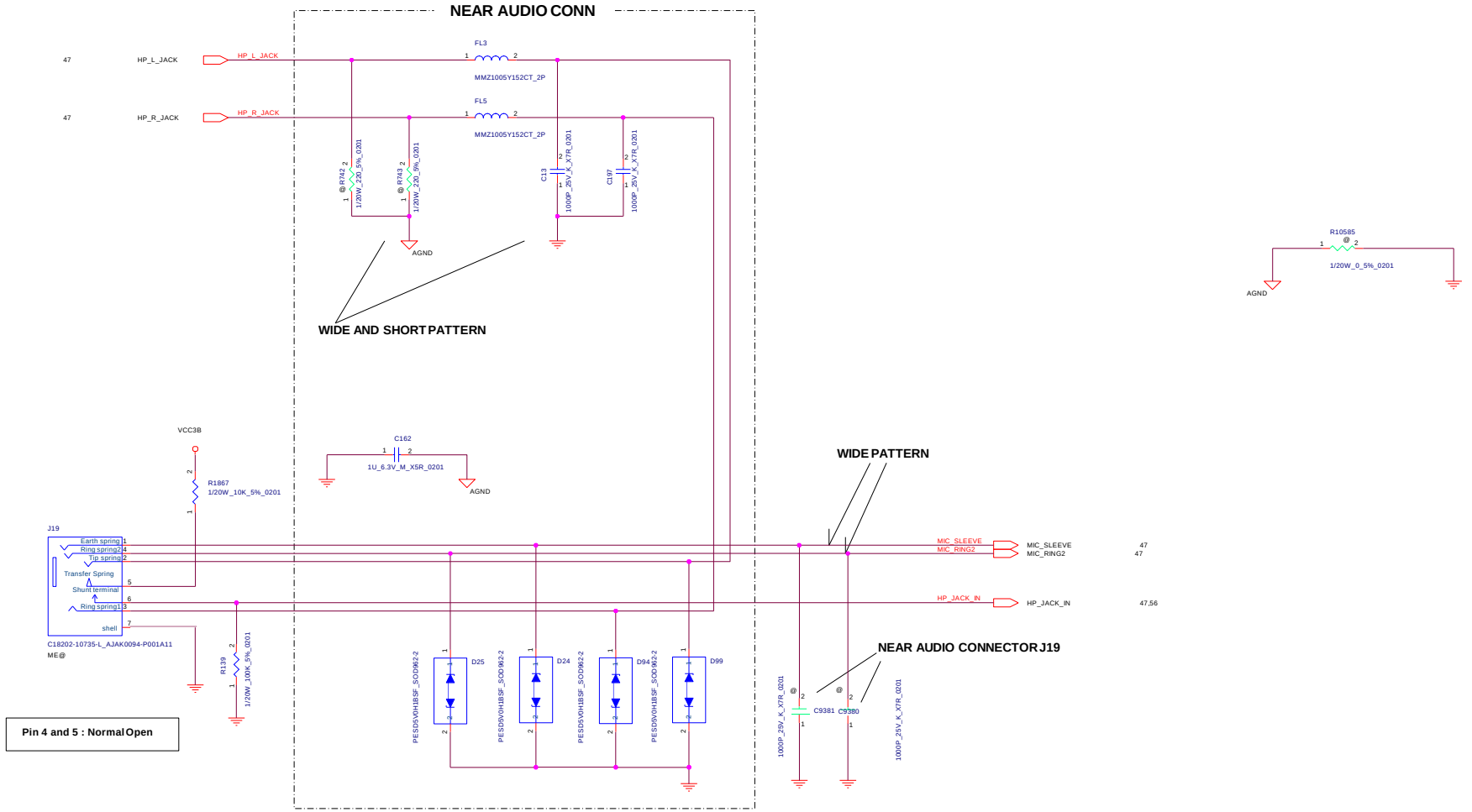
Project Name : Ratchet-1	Title : M.2 SOCKET 2 MODULE I/F
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 44 of 98



https://vinafix.com

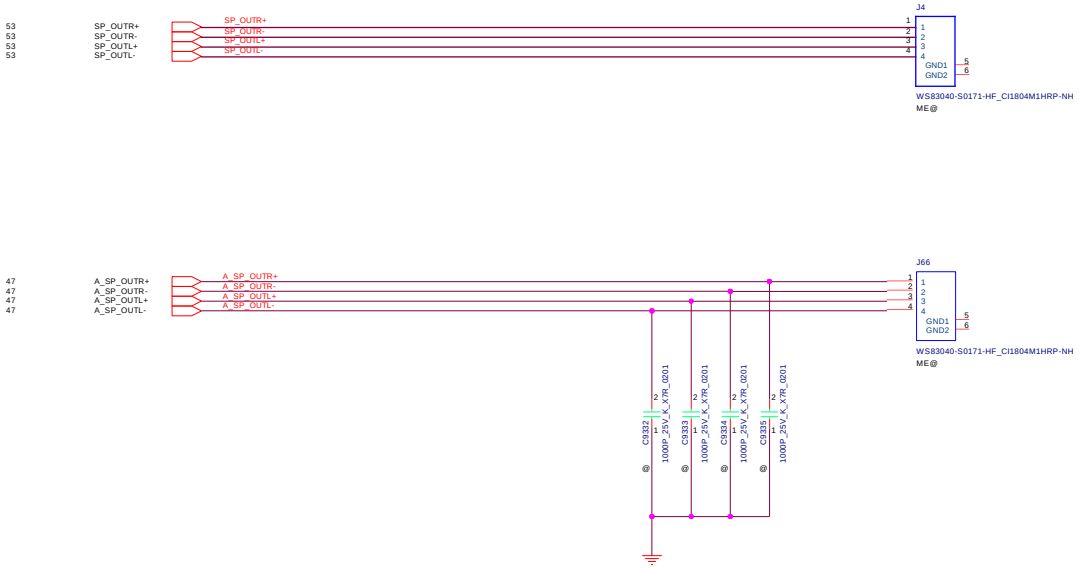
Project Name : Ratchet-1	Title : AUDIO SIP (ALC3286)
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 47 of 98



https://vinafix.com

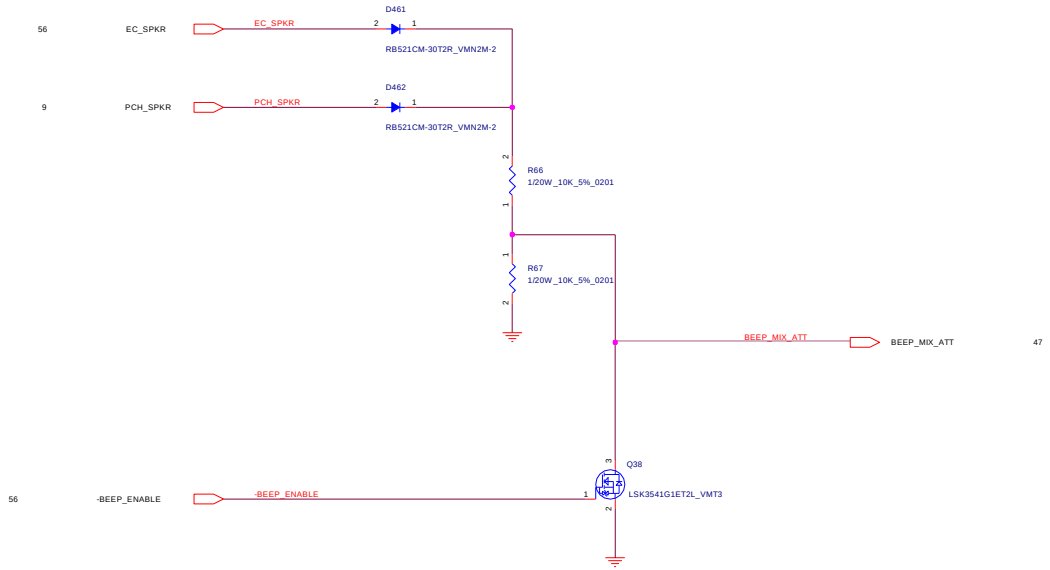
Lenovo

Project Name : Ratchet-1	Title : AUDIO CONNECTOR
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 48 of 98



https://vinafix.com

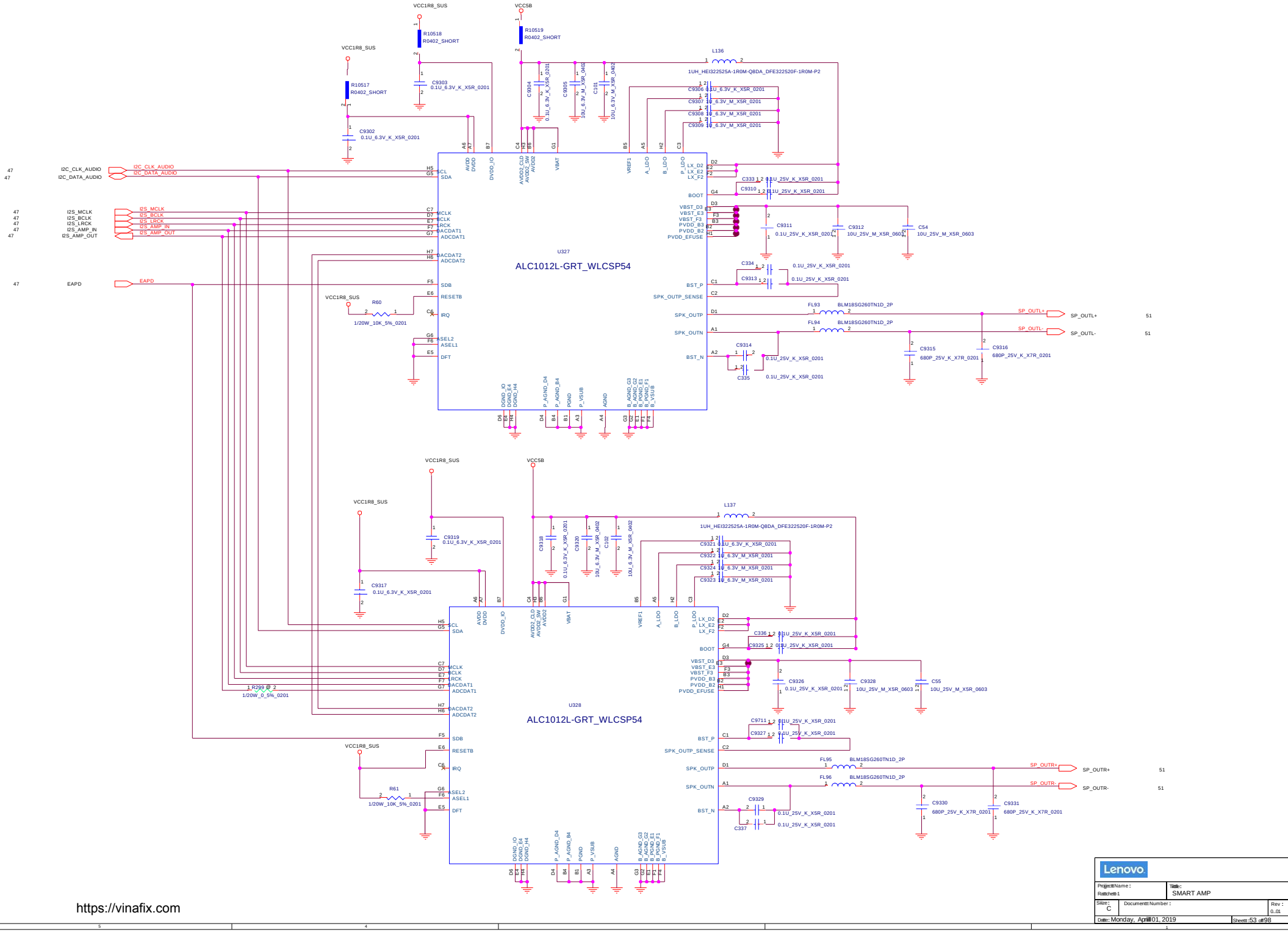
Lenovo		
Project Name : Ratchet-1	Title : AUDIO SPEAKER	
Size : C	Document Number :	Rev : 0.01
Date : Monday, April 01, 2019	Sheet 51 of 98	



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : AUDIO BEEP
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 52 of 98



https://vinafix.com

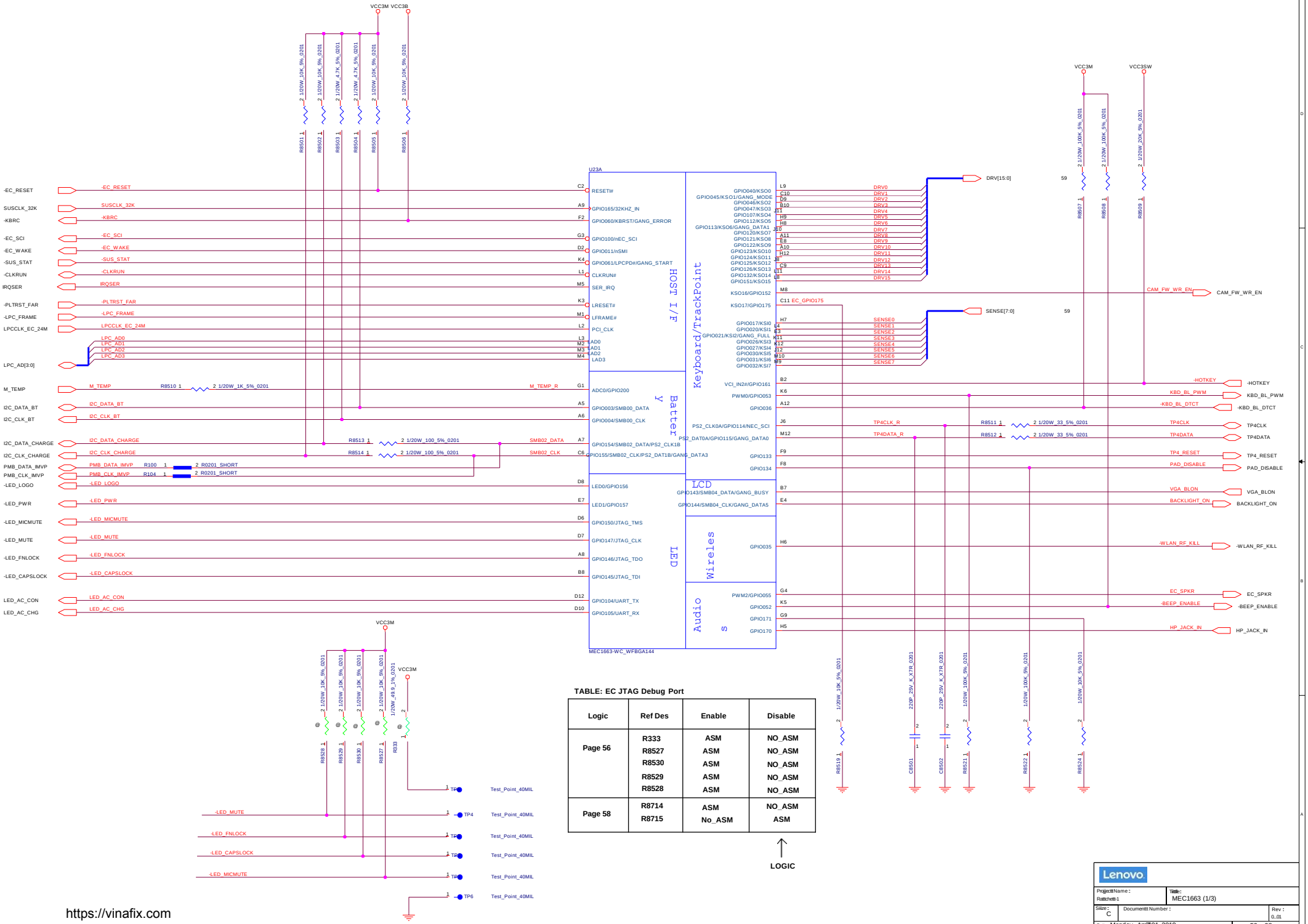
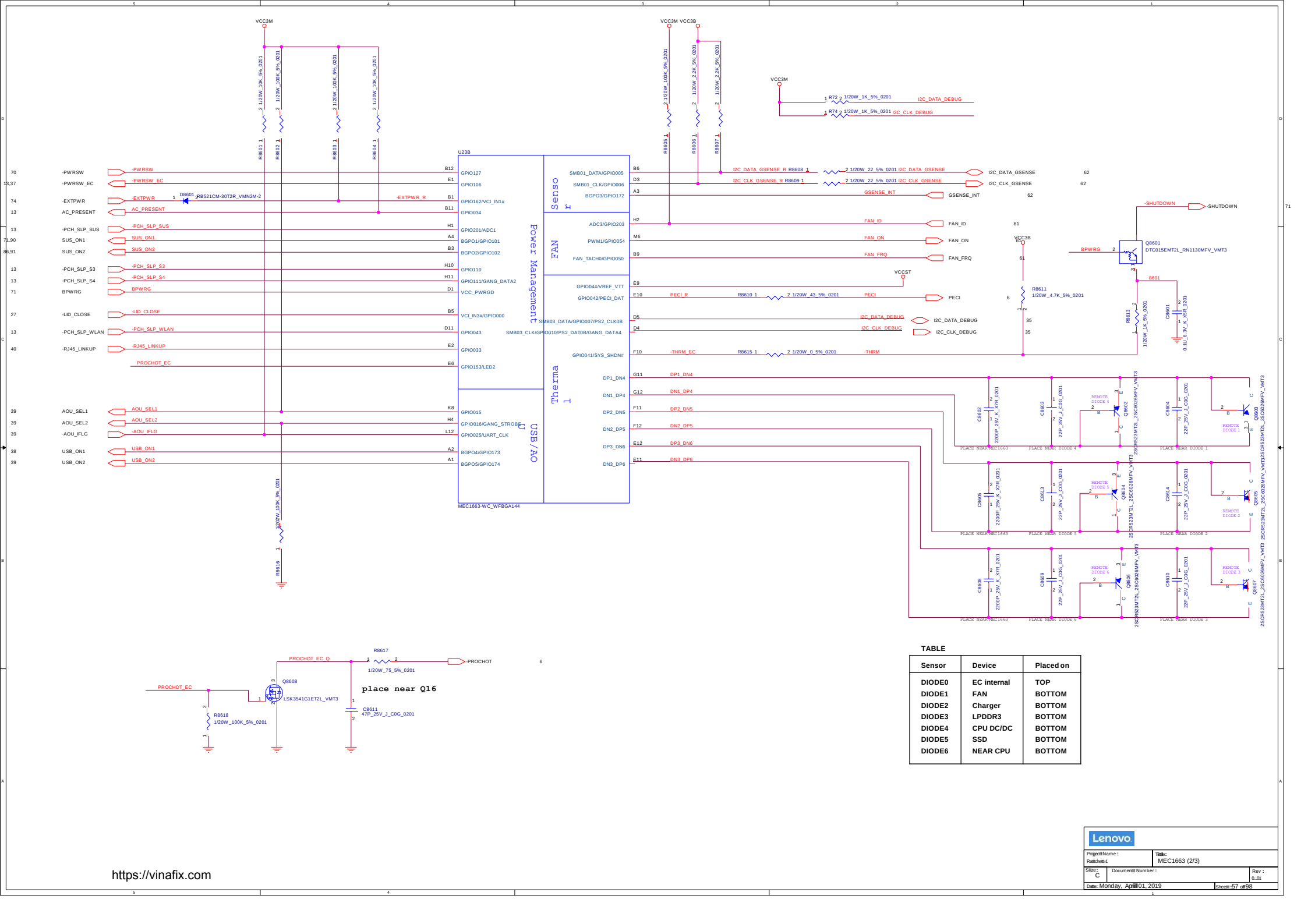


TABLE: EC JTAG Debug Port

Logic	Ref Des	Enable	Disable
Page 56	R333	ASM	NO_ASM
	R8527	ASM	NO_ASM
	R8530	ASM	NO_ASM
	R8529	ASM	NO_ASM
	R8528	ASM	NO_ASM
Page 58	R8714	ASM	NO_ASM
	R8715	No_ASM	ASM

LOGIC

Project Name:	Rattchett-1
Title:	MEC1663 (1/3)
Size:	C
Document Number:	
Rev:	0.01
Date:	Monday, April 01, 2019
Sheet:	56 of 98



TABLE

Sensor	Device	Placed on
DIODE0	EC internal	TOP
DIODE1	FAN	BOTTOM
DIODE2	Charger	BOTTOM
DIODE3	LPDDR3	BOTTOM
DIODE4	CPU DC/DC	BOTTOM
DIODE5	SSD	BOTTOM
DIODE6	NEAR CPU	BOTTOM

Lenovo

Project Name: Ratchet-1

Title: MEC1663 (2/3)

Size: C

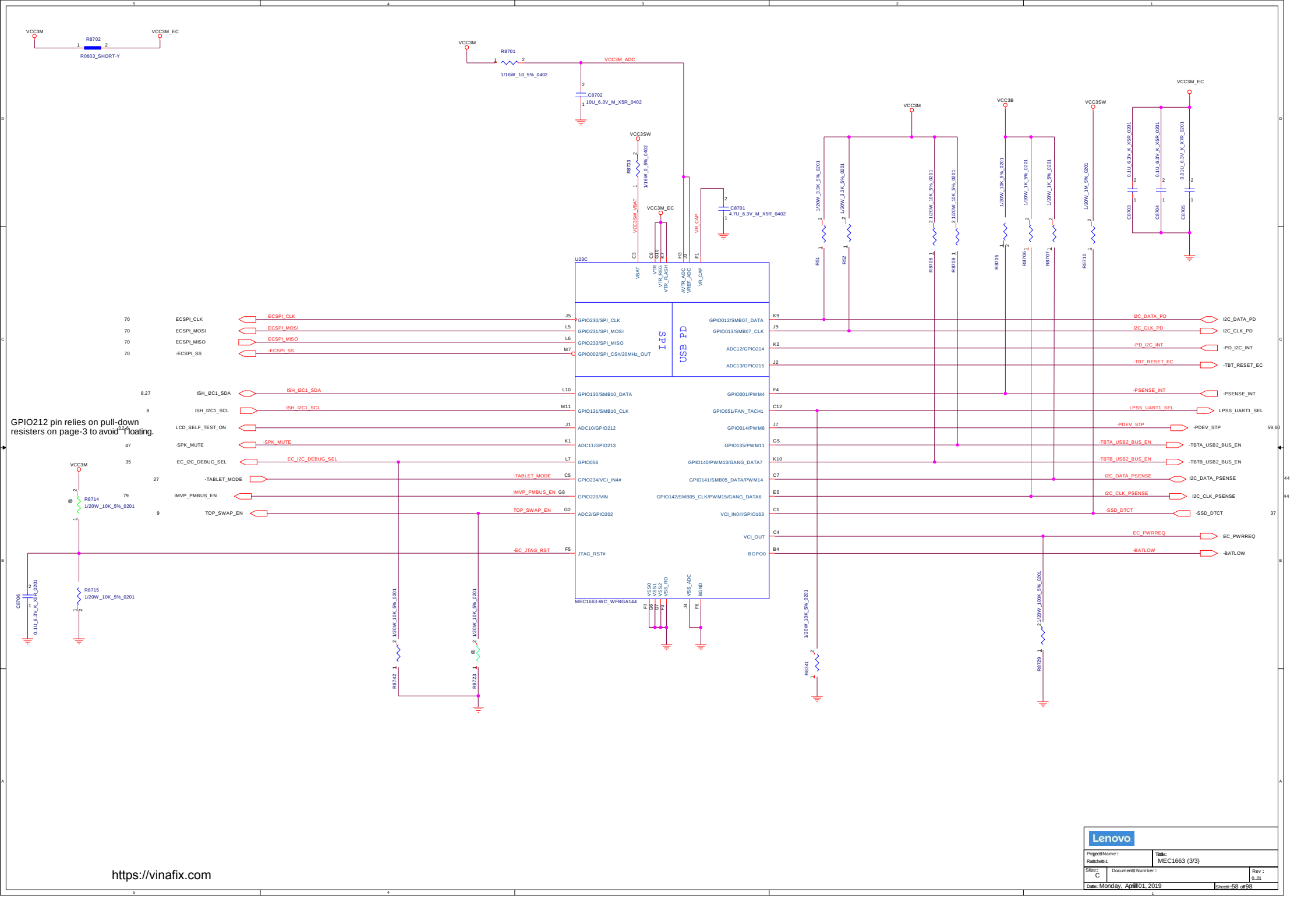
Document Number:

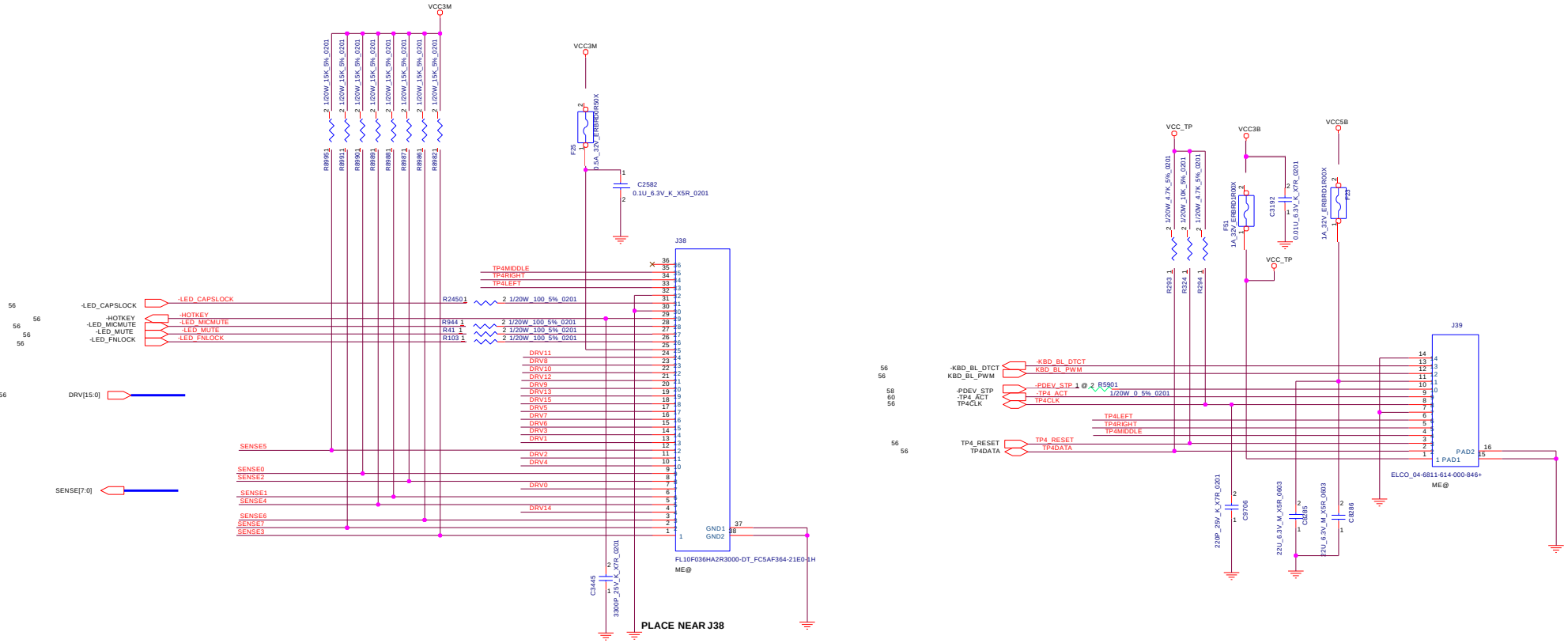
Rev: 0.01

Date: Monday, April 01, 2019

Sheet 57 of 98

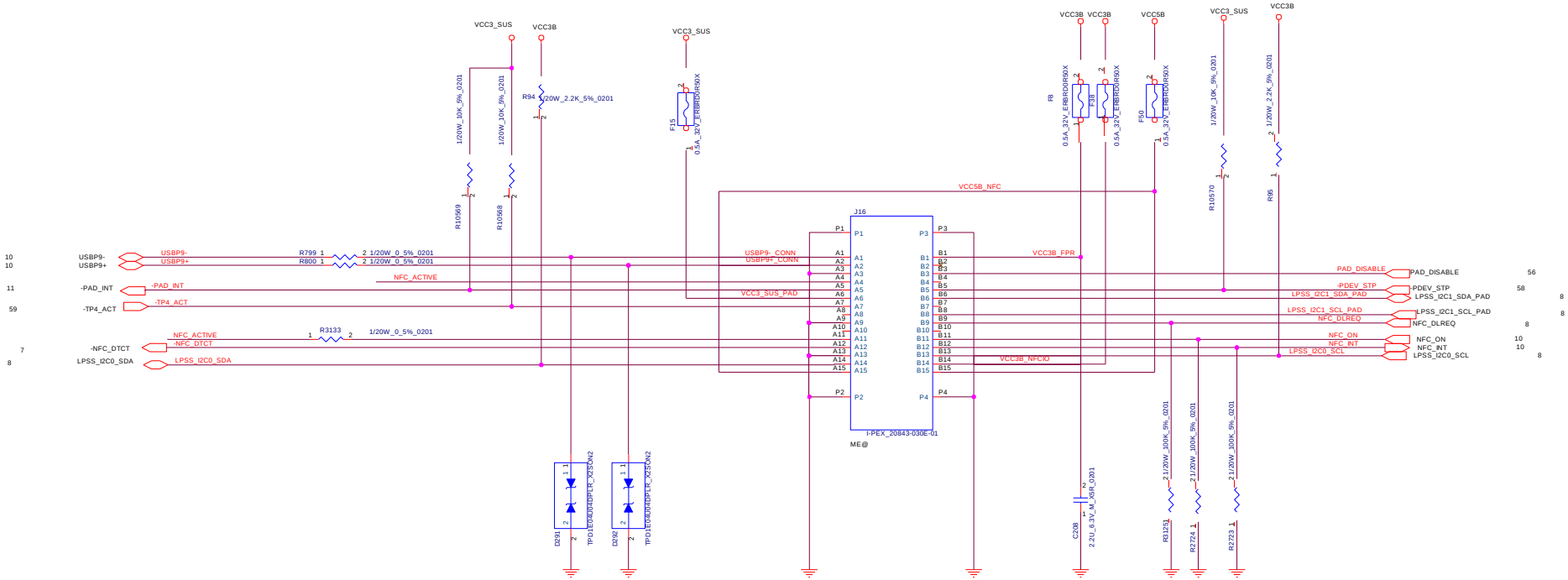
https://vinafix.com


VCC3M
R8702
VCC3M_EC
R0603_SHORT-Y
VCC3M
R8701
1/16W_10_5%_0402
VCC3M_ADC
C8702
10U_6.3V_M_X5R_0402
VCC3SW
R8703
1/16W_0_5%_0402
VCC3SW_VBAT
VCC3M_EC
C8701
4.7U_6.3V_M_X5R_0402
VR_CAP
U23C
VBAT
VTR
VTR_REF
VTR_FLASH
AVTR_ADC
VREF_ADC
VR_CAP
SPI
USB PD
GPIO230/SPI_CLK
GPIO231/SPI_MOSI
GPIO233/SPI_MISO
GPIO002/SPI_CS#/20MHz_OUT
GPIO012/SMB07_DATA
GPIO013/SMB07_CLK
ADC12/GPIO214
ADC13/GPIO215
GPIO130/SMB10_DATA
GPIO131/SMB10_CLK
ADC10/GPIO212
ADC11/GPIO213
GPIO056
GPIO234/VCI_IN4#
GPIO220/VIN
ADC2/GPIO202
JTAG_RST#
GPIO001/PWM4
GPIO051/FAN_TACH1
GPIO014/PWM6
GPIO135/PWM11
GPIO140/PWM13/GANG_DATA7
GPIO141/SMB05_DATA/PWM14
GPIO142/SMB05_CLK/PWM15/GANG_DATA6
VCI_IN0#/GPIO163
VCI_OUT
BGPO0
VSS0
VSS1
VSS2
VSS_RO
VSS_ADC
BGND
MEC1663-WC_WFBGA144
ECSPI_CLK
ECSPI_MOSI
ECSPI_MISO
-ECSPI_SS
ISH_I2C1_SDA
ISH_I2C1_SCL
LCD_SELF_TEST_ON
-SPK_MUTE
EC_I2C_DEBUG_SEL
-TABLET_MODE
IMVP_PMBUS_EN
TOP_SWAP_EN
-EC_JTAG_RST
I2C_DATA_PD
I2C_CLK_PD
-PD_I2C_INT
-TBT_RESET_EC
-PSENSE_INT
LPSS_UART1_SEL
-PDEV_STP
-TBTA_USB2_BUS_EN
-TBTB_USB2_BUS_EN
I2C_DATA_PSENSE
I2C_CLK_PSENSE
-SSD_DTCT
EC_PWRREQ
-BATLOW
R51
R52
R8708
R8709
R8705
R8706
R8707
R8710
C8703
C8704
C8705
R8714
1/20W_10K_5%_0201
R8715
1/20W_10K_5%_0201
C8706
0.1U_6.3V_K_X5R
R8742
R8723
R8341
R8729
GPIO212 pin relies on pull-down resisters on page-3 to avoid "Floating.
https://vinafix.com
Lenovo
Project Name : Ratchet-1
Title : MEC1663 (3/3)
Size : C
Document Number :
Rev : 0.01
Date : Monday, April 01, 2019
Sheet 58 of 98



https://vinafix.com

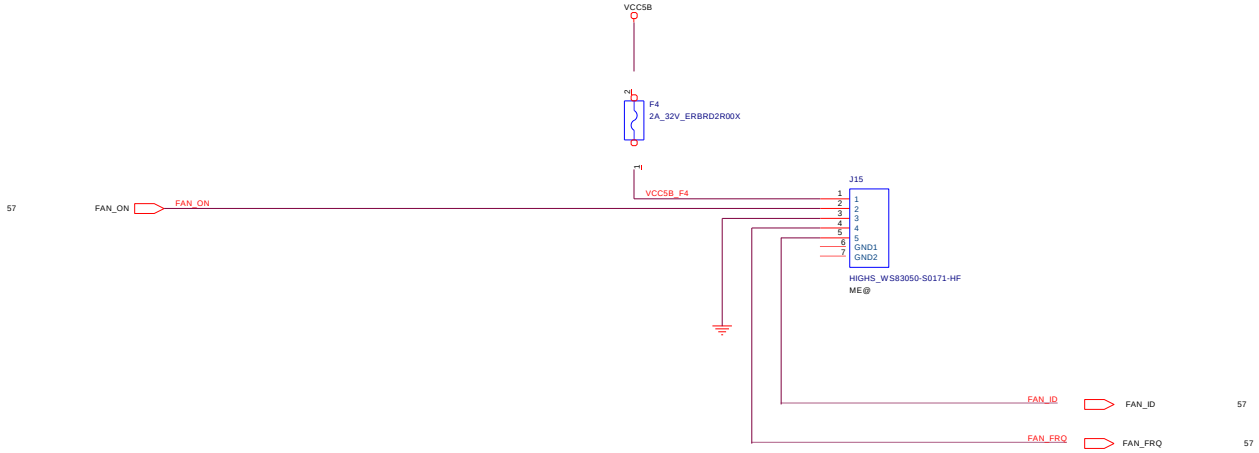
Lenovo	
Project Name: Ratchet-1	Title: KEYBOARD/TRACK POINT
Size: C	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet 59 of 98



PLACE NEAR J16

https://vinafix.com

Project Name: Ratchet-1	Title: TOUCH PAD/NFC/FPR
Size: C	Document Number:
Rev: 0.01	
Date: Monday, April 01, 2019	Sheet: 60 of 98



https://vinafix.com

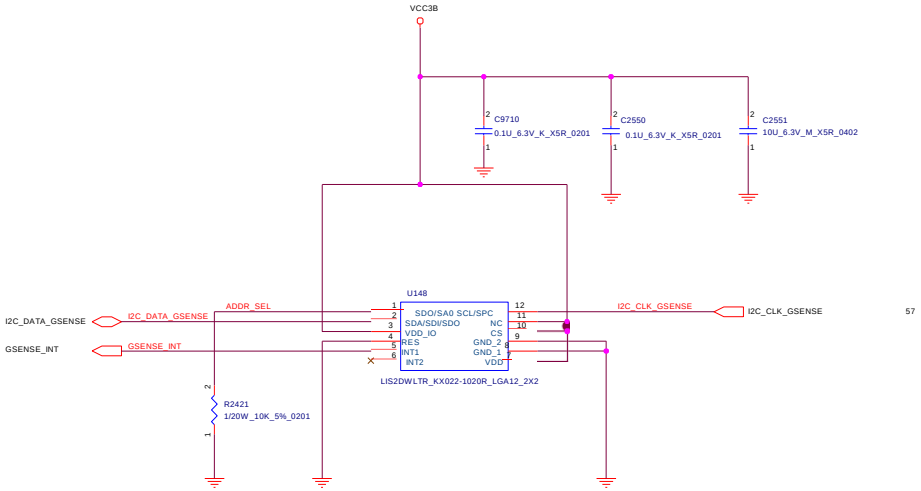
Project Name: Ratchet-1	Title: FAN CONNECTOR	
Size: C	Document Number:	Rev: 0.01
Date: Monday, April 01, 2019	Sheet: 61 of 98	

TABLE : G-Sensor Power

HDD Support	VCC3M
SSD Only	VCC3B

TABLE

P/N	ADDR_SEL	Address
LIS2DWL	H L	32h (W) & 33h(R) 30h (W) & 31h(R)
KX022-1020	H L	3Eh (W) & 3Fh(R) 3Ch (W) & 3Dh(R)



I2C_DATA_GSENSE 57

GSENSE_INT 57

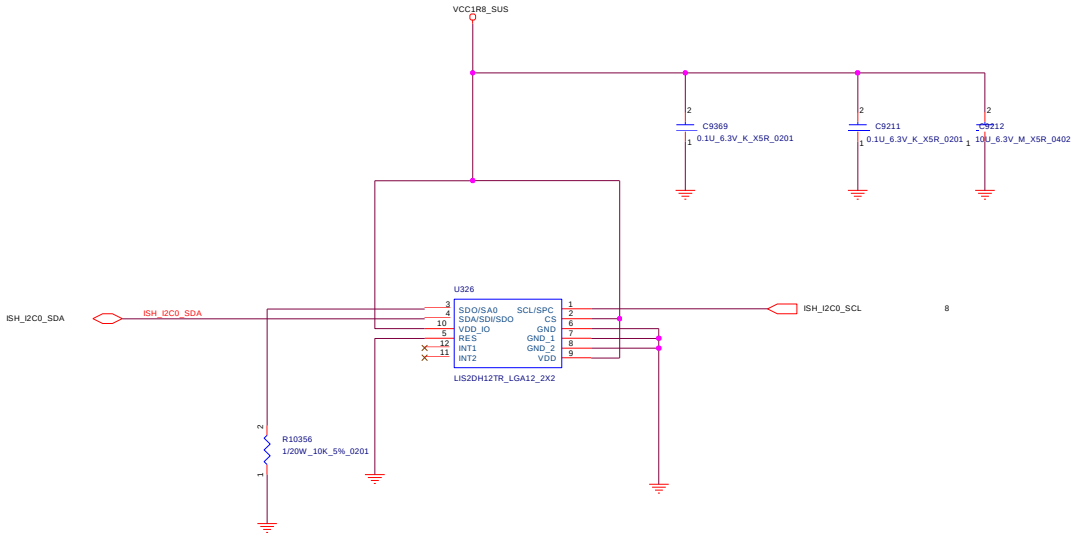
I2C_CLK_GSENSE 57

https://vinafix.com

Project Name : Ratchet-1		Title : APS G-SENSOR	
Size : C	Document Number :		Rev : 0.01
Date : Monday, April 01, 2019		Sheet : 62 of 98	

TABLE

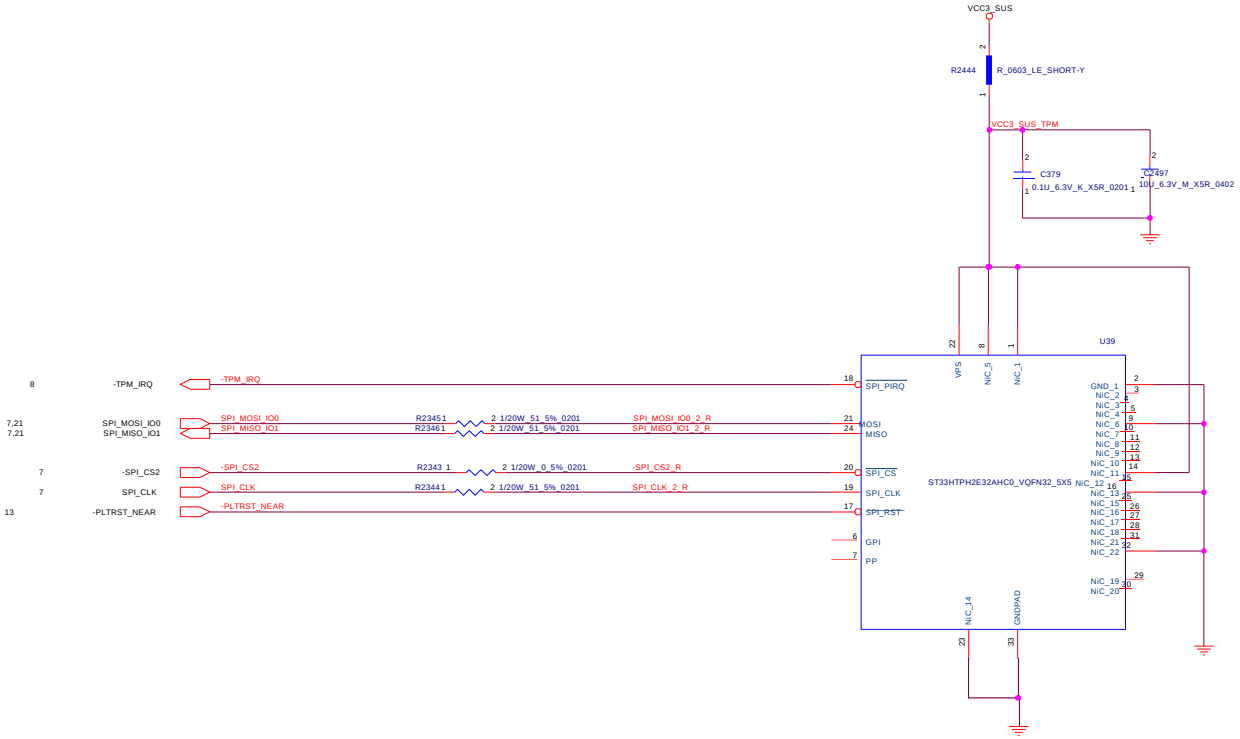
P/N	ADDR_SEL	Address
LIS2DH12TR	H	31h (W) & 30h(R)
	L	33h (W) & 32h(R)



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : ISH ACCELEROMETER
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 67 of 98
	Rev : 0.01



TABLE

Pin No	TCG PTP Spec Rev.01.03.v22	ST Micro ST33HTPH2E32AHC0	Nuvoton NPCT750LABYX
1	VDD/VSB	NC	VSB
2	GND	GND	NC
3	GPIO	NC	NC
4	GPIO	NC	PP/GPIO6
5	NC	NC	NC
6	VNC/GPIO/I2C_PIRQ#	GPIO	GPIO3
7	GPIO/VDD	PP	NC
8	VDD	NC	VHIO
9	GND	NC	NC
10	VNC	NC	NC
11	NC	NC	NC
12	NC	NC	NC
13	VNC/GPIO/I2C_PIRQ#	NC	GPIO4
14	VDD	NC	NC
15	NC	NC	NC
16	GND	NC	GND
17	SPI_RST#	SPI_RST#	PLTRST#
18	SPI_PIRQ#	SPI_PIRQ#	PIRQ#/GPIO2
19	SPI_CLK	SPI_CLK	SCLK
20	SPI_CS#	SPI_CS#	SCS#/GPIO5
21	MOSI	MOSI	MOSI/GPIO7
22	VDD	VPS	VHIO
23	GND	NC	GND
24	MISO	MISO	MISO
25	NC	NC	NC
26	NC	NC	NC
27	VNC/GPIO	NC	NC
28	VNC/GPIO	NC	NC
29	SDA	NC	SDA/GPIO0
30	SCL	NC	SCL/GPIO1
31	VNC	NC	NC
32	GND	NC	NC

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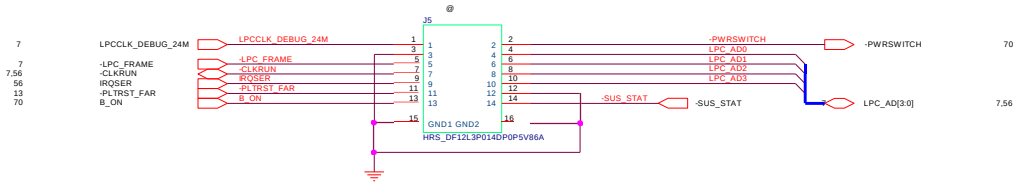
Lenovo

Project Name: Ratchet-1	Title: DISCRETE TPM 2.0
Size: C	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet: 68 of 98

TABLE

REF DES	ENABLE	DISABLE
J5	ASM	NO_ASM
R220	ASM	NO_ASM

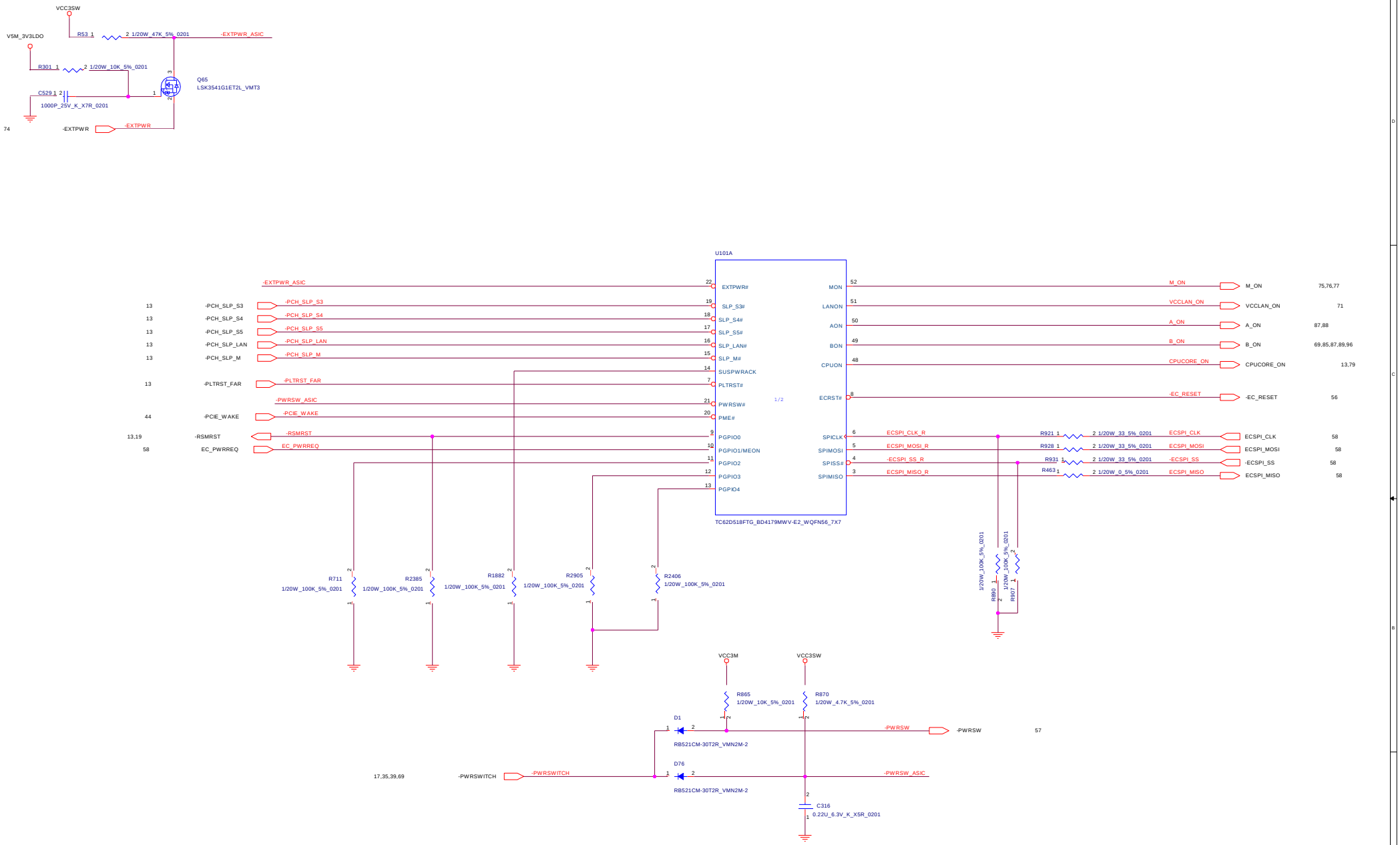
LOGIC



https://vinafix.com

Lenovo

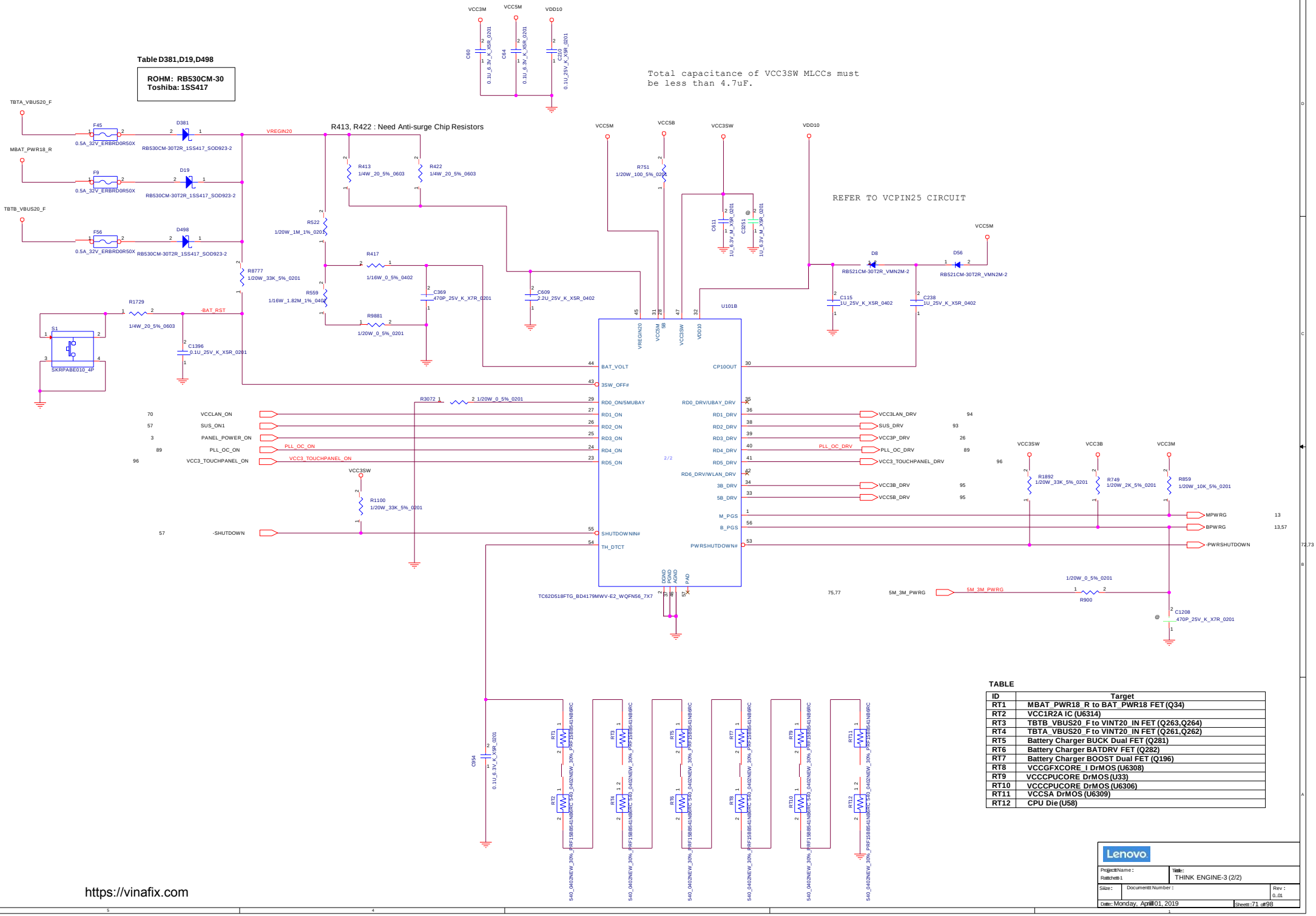
Project Name: Ratchet-1	Title: LPC DEBUG PORT
Size: C	Document Number:
Rev: 0.01	
Date: Monday, April 01, 2019	Sheet: 69 of 98



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : THINK ENGINE-3 (1/2)
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 70 of 98



TABLE

ID	Target
RT1	MBAT_PWR18_R to BAT_PWR18 FET (Q34)
RT2	VCC1R2A IC (U6314)
RT3	TBTB_VBUS20_F to VINT20_IN FET (Q263,Q264)
RT4	TBTA_VBUS20_F to VINT20_IN FET (Q261,Q262)
RT5	Battery Charger BUCK Dual FET (Q281)
RT6	Battery Charger BATDRV FET (Q282)
RT7	Battery Charger BOOST Dual FET (Q196)
RT8	VCCGFXCORE_I DrMOS (U6308)
RT9	VCCCPUCORE DrMOS (U33)
RT10	VCCCPUCORE DrMOS (U6306)
RT11	VCCSA DrMOS (U6309)
RT12	CPU Die (U58)

Lenovo

Project Name: Ratchet-1

Title: THINK ENGINE-3 (2/2)

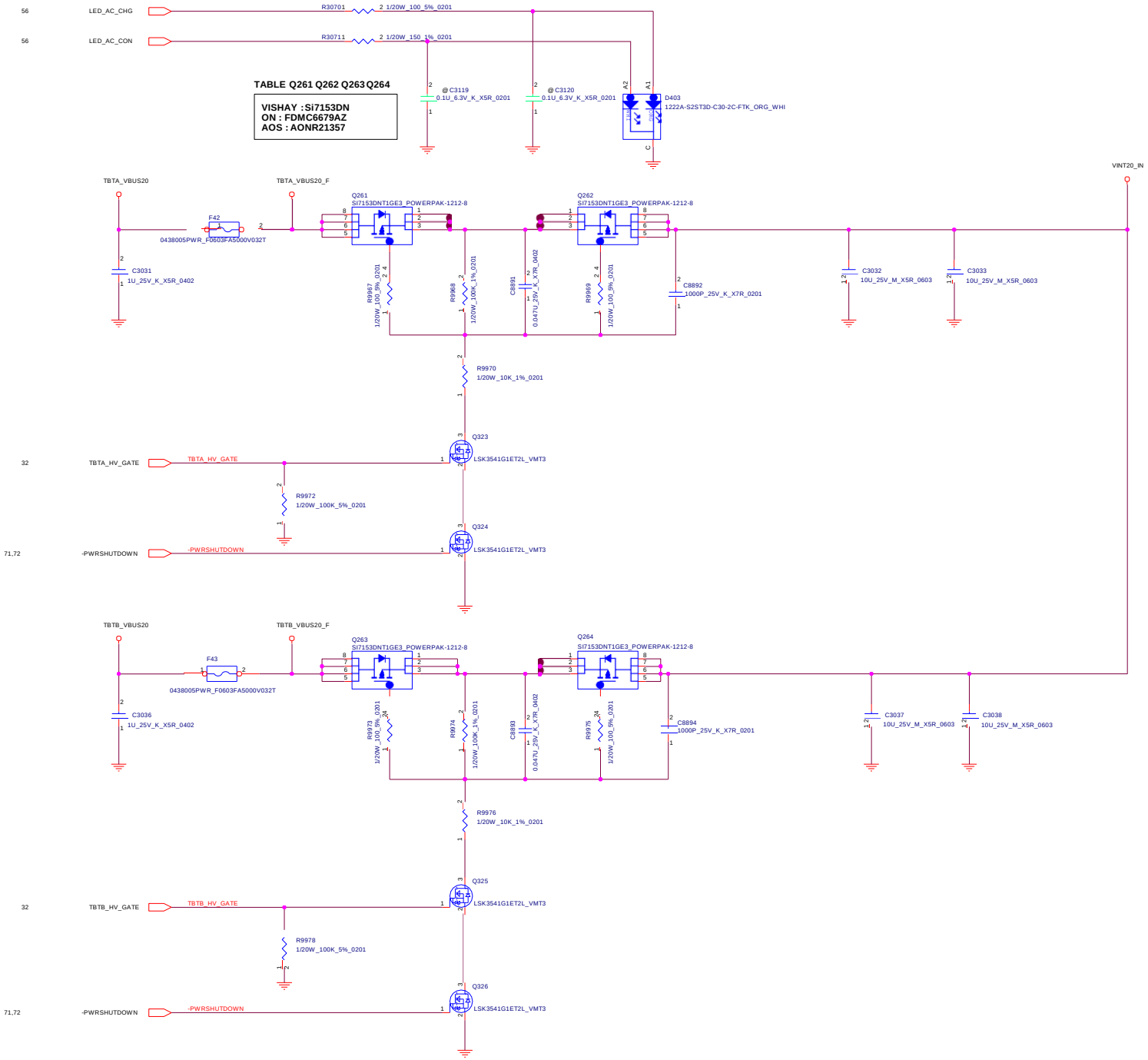
Size:

Document Number:

Rev: 0.01

Date: Monday, April 01, 2019

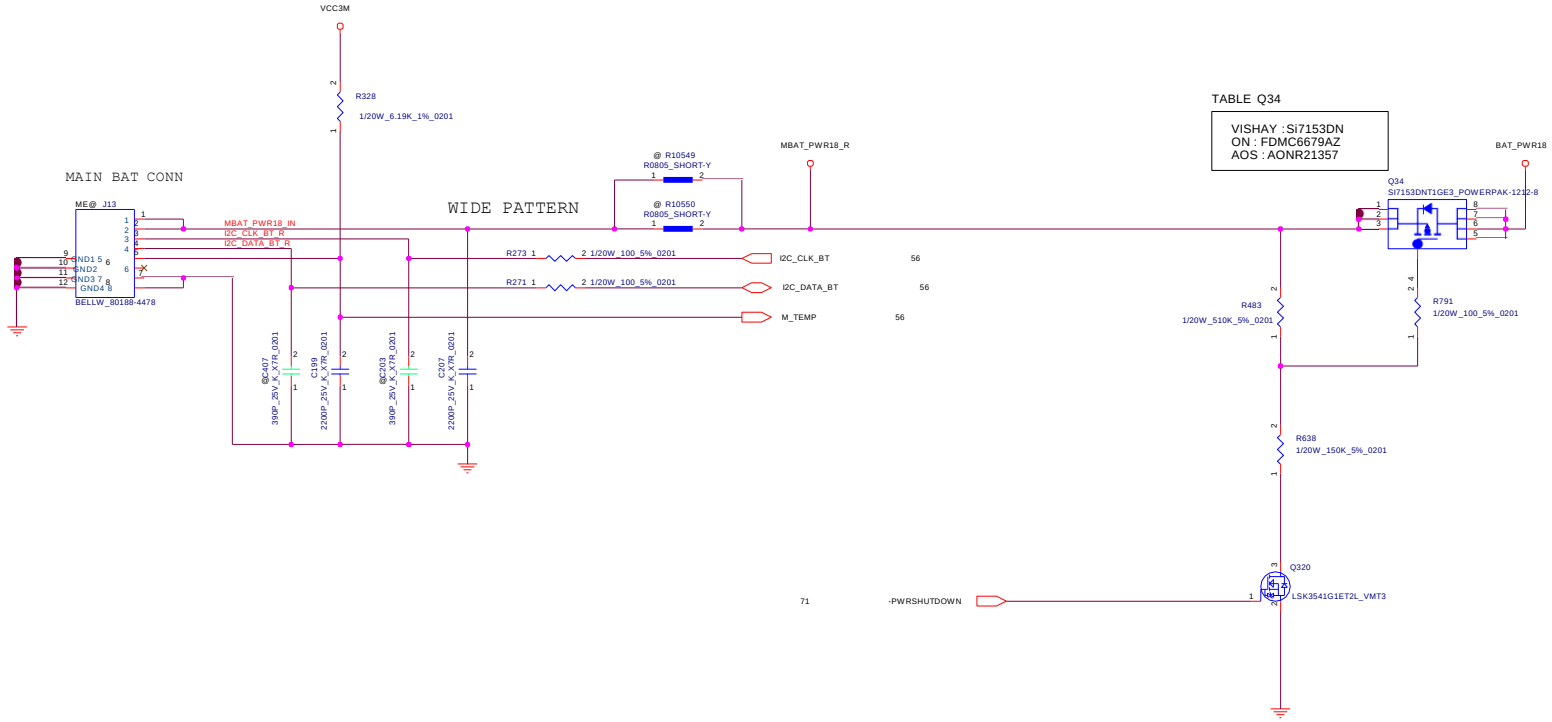
Sheet: 71 of 98



Lenovo

Project Name : Ratchet-1	Title : DC-IN
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 72 of 98

https://vinafix.com



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : BATTERY INPUT
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 73 of 98

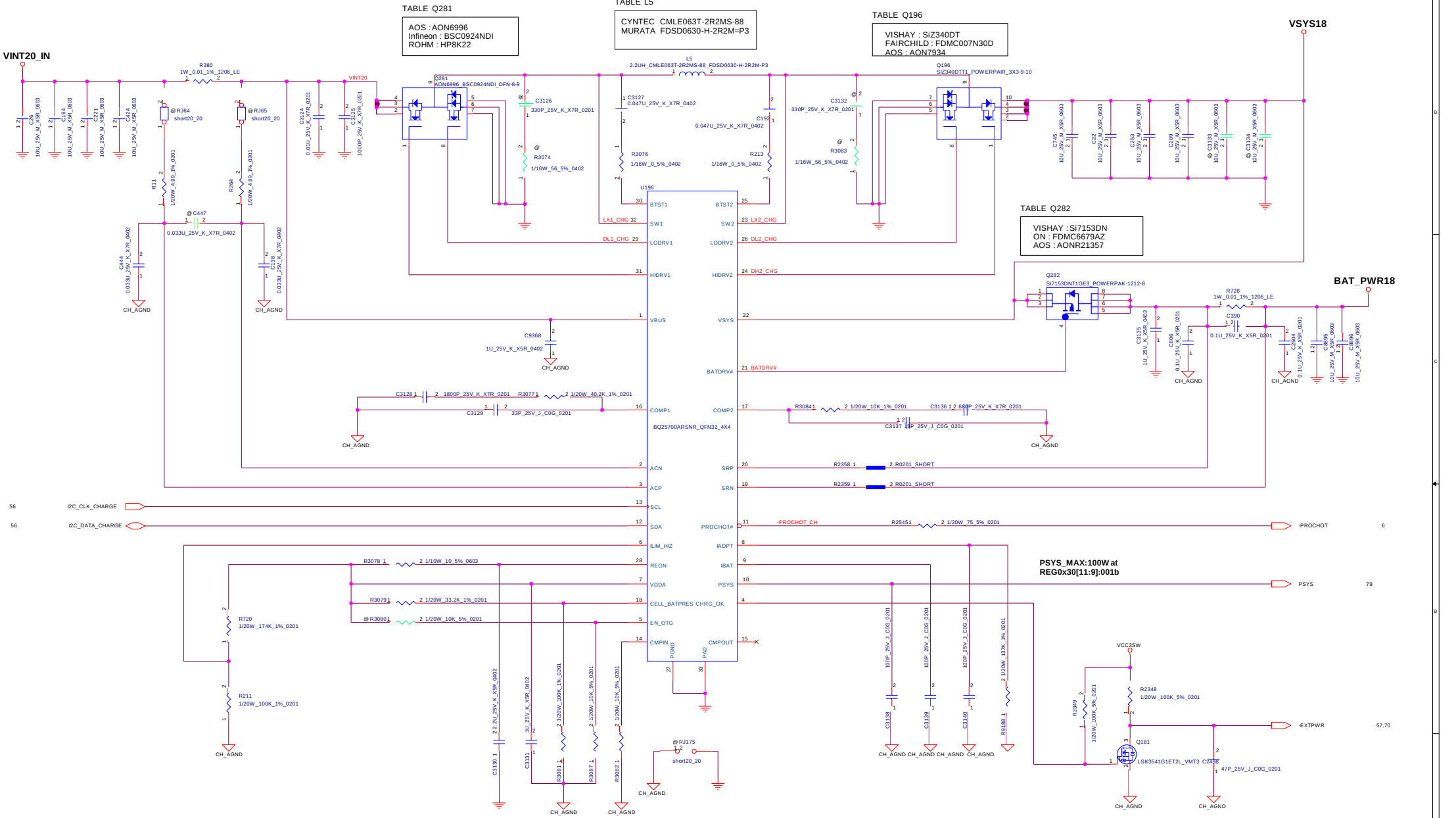


TABLE Q281
AOS :AON6996
Infineon : BSC0924NDI
ROHM : HP8K22
TABLE L5
CYNTEC CMLE063T-2R2MS-88
MURATA FDSD0630-H-2R2M=P3
TABLE Q196
VISHAY : SiZ340DT
FAIRCHILD : FDMC007N30D
AOS : AON7934
VSYS18
VINT20_IN
TABLE Q282
VISHAY :Si7153DN
ON : FDMC6679AZ
AOS : AONR21357
BAT_PWR18
BQ25700ARSNR_QFN32_4X4
PSYS_MAX:100W at
REG0x30[11:9]:001b
TABLE : ILIM_HIZ
IDPM | V (ILIM)
500mA | 1.2V
1.0A | 1.4V
1.5A | 1.6V
2.0A | 1.8V | 237K
3.0A | 2.2V | 174K
3.25A | 2.3V | 162K
LOGIC
TABLE : CELL_BATPRES
# of CELL | V (CELL_PRES) | R3079
1-CELL | 1.5V | 301K
2 CELL | 2.5V | 140K
3 CELL | 3.5V | 71.5K
4 CELL | 4.5V | 33.2K
LOGIC
TABLE
Inductor | R(IADP) | fsw@POR
1.0uH | 93kohm | 800kHz
2.2uH | 137kohm | 800kHz
3.3uH | 169kohm | 800kHz
LOGIC
https://vinafix.com
Lenovo
BATTERY CHARGER (BQ25700A)
Monday, April 01, 2019

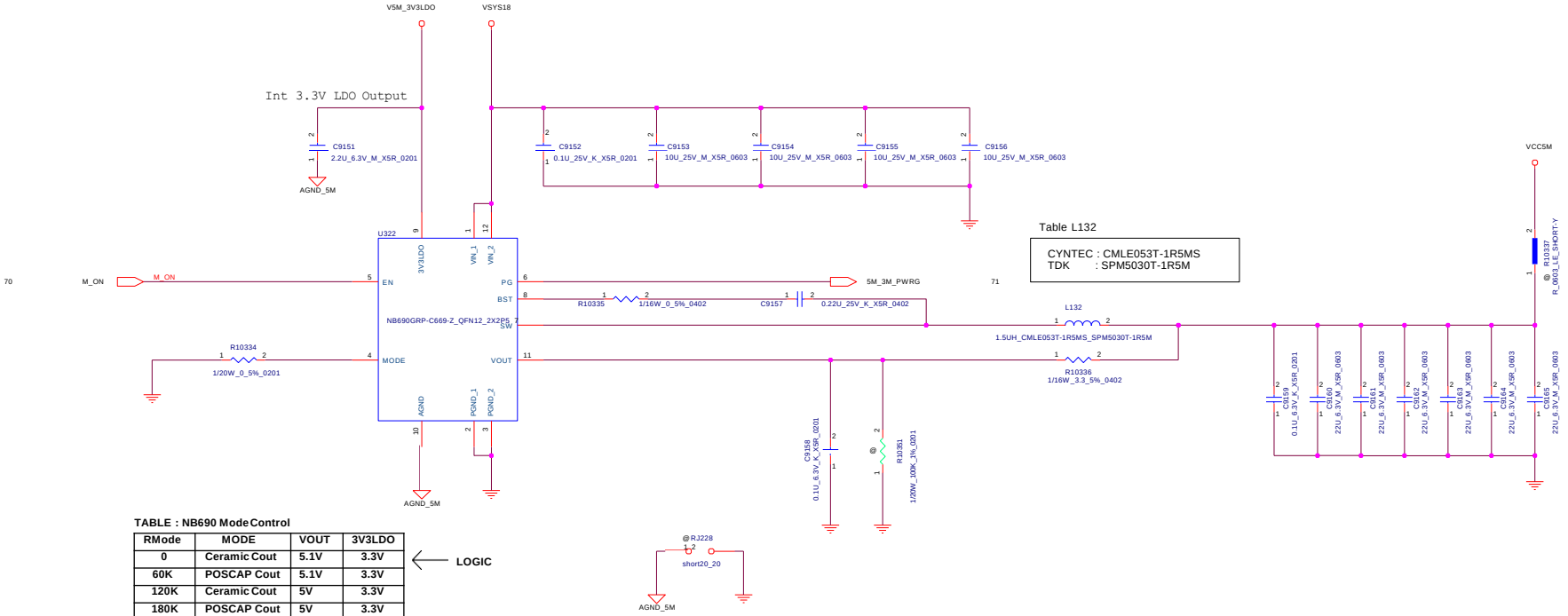


Table L132

CYNTEC	: CMLE053T-1R5MS
TDK	: SPM5030T-1R5M

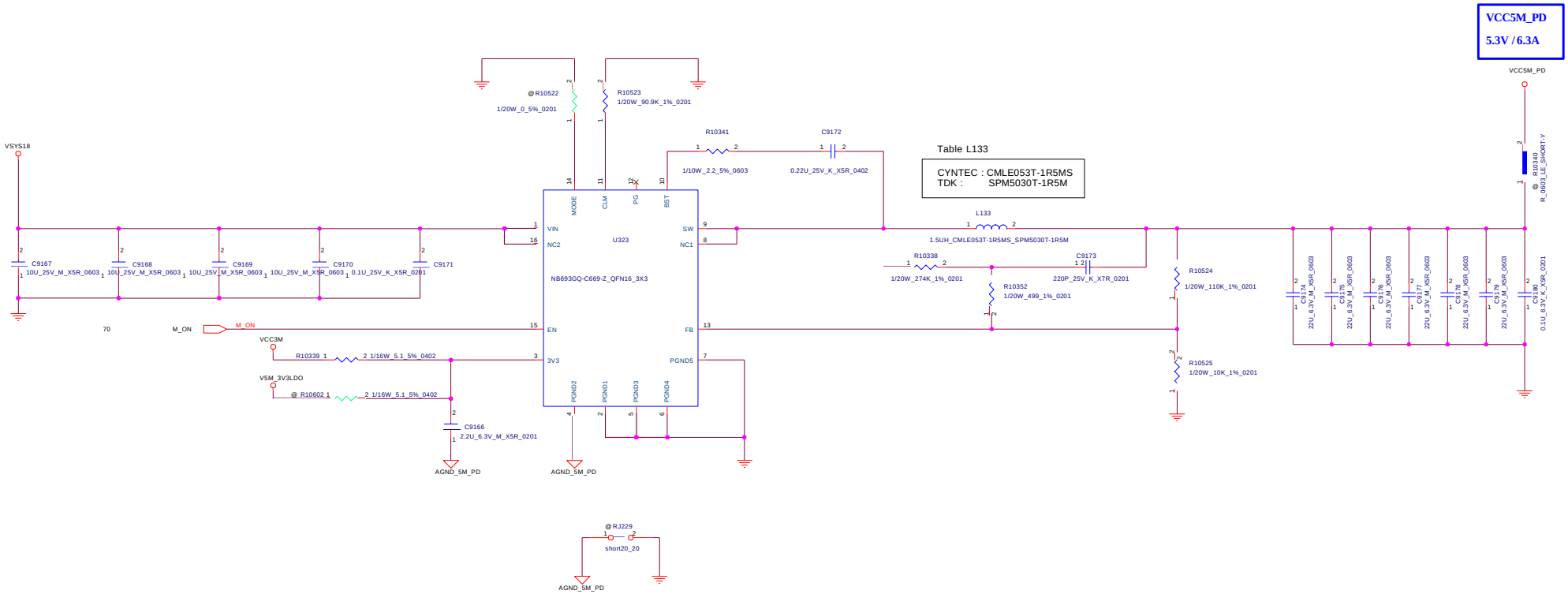
TABLE : NB690 Mode Control

RMode	MODE	VOUT	3V3LDO
0	Ceramic Cout	5.1V	3.3V
60K	POSCAP Cout	5.1V	3.3V
120K	Ceramic Cout	5V	3.3V
180K	POSCAP Cout	5V	3.3V
Floating	X	3.3V	3.3V

← LOGIC

Lenovo			
Project Name : Ratchet-1		Title : DC/DC VCC5M (NB690)	
Size : C	Document Number :		Rev : 0.01
Date : Monday, April 01, 2019		Sheet : 75 of 98	

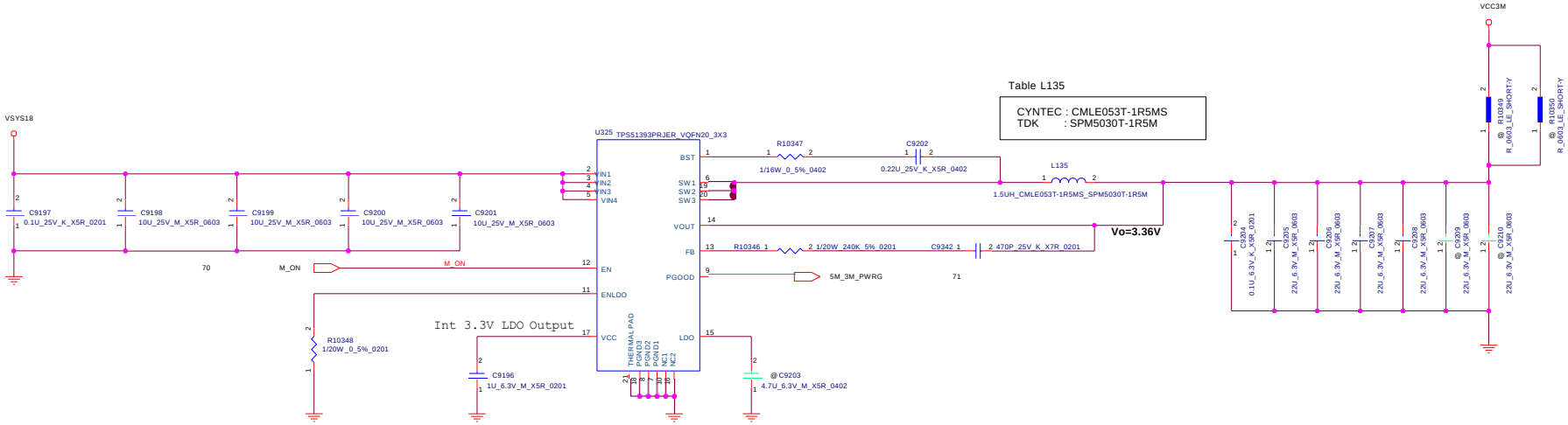
https://vinafix.com



https://vinafix.com

Lenovo

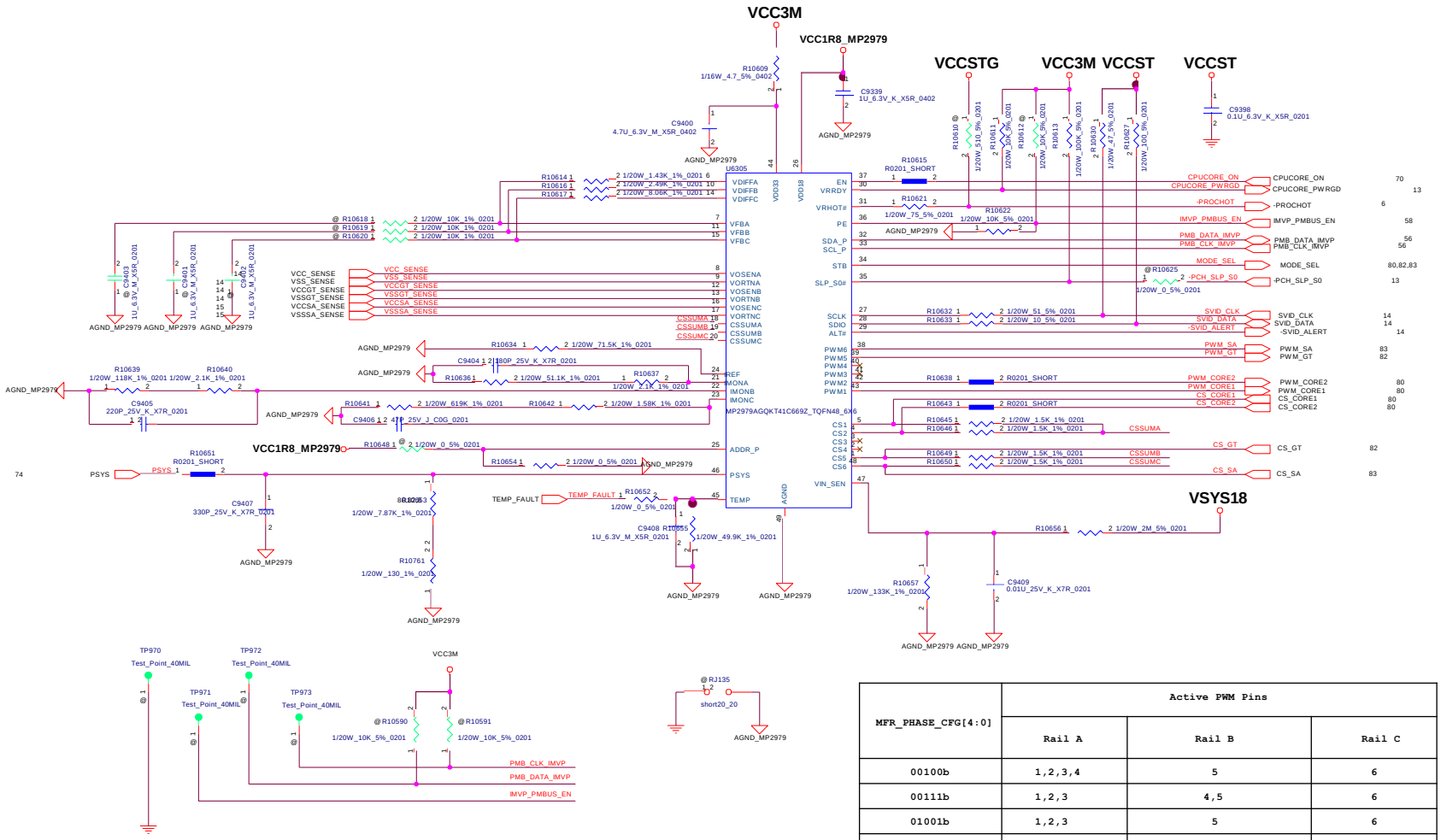
Project Name : Ratchet-1	Title : DC/DC VCC5M_PD (NB690)
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 76 of 98



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : DC/DC VCC3M (NB690)
Size : C	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 77 of 98



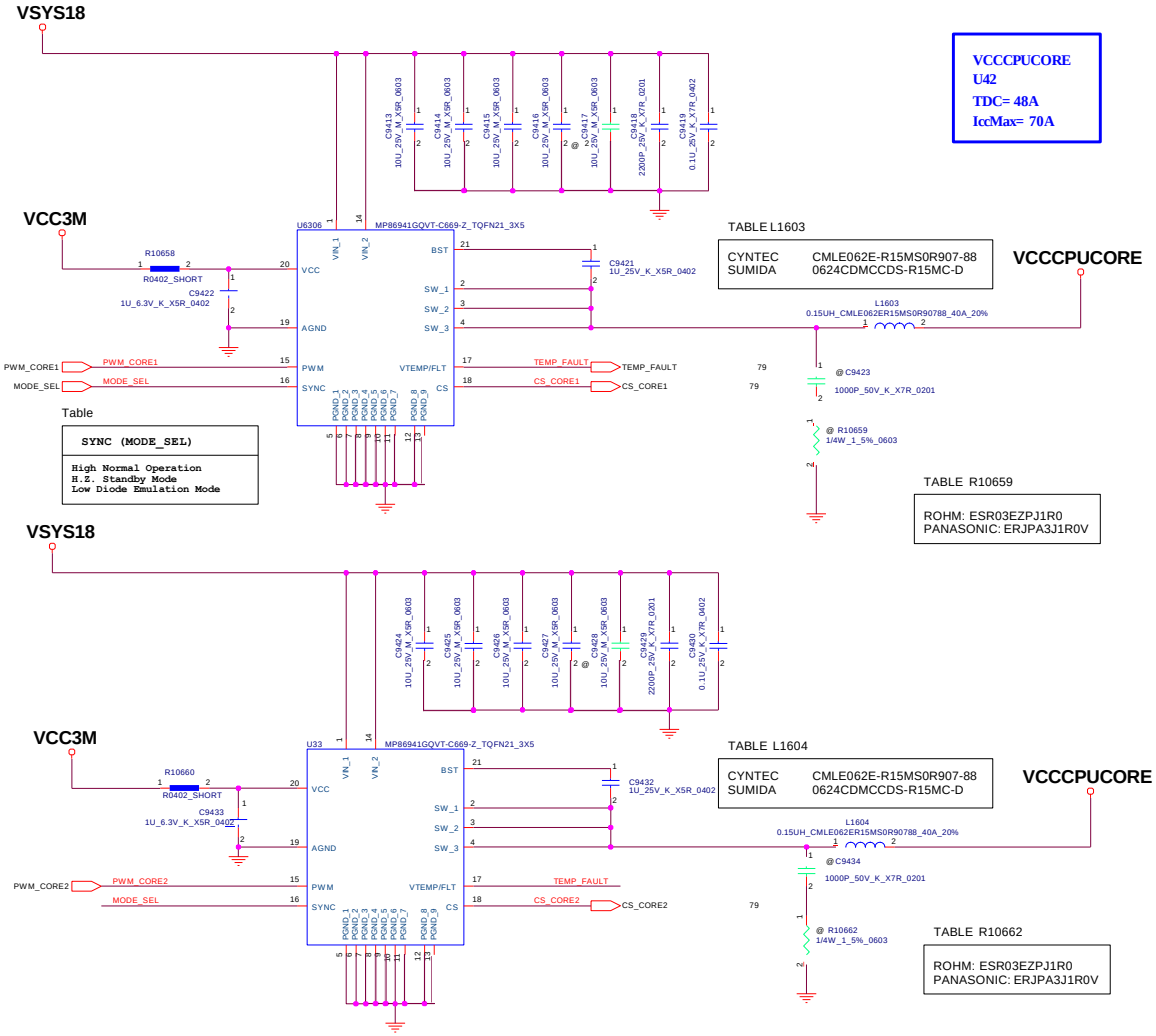
MFR_PHASE_CFG[4:0]	Active PWM Pins		
	Rail A	Rail B	Rail C
00100b	1,2,3,4	5	6
00111b	1,2,3	4,5	6
01001b	1,2,3	5	6
01100b	1,2	4,5	6
01110b	1,2	5	6
10001b	1	5	6

← LOGIC

https://vinafix.com

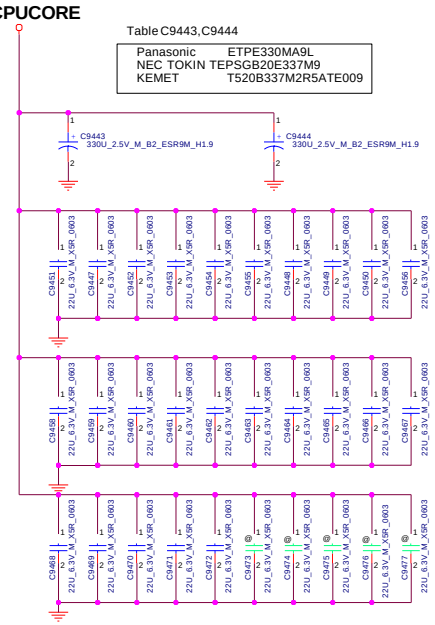
Lenovo

Project Name: Ratchet-1	Title: DC/DC IMVP8 (MP2979AGQKT)
Size: C	Document Number:
Date: Monday, April 01, 2019	Sheet: 79 of 98



VCCCPUCORE
U42
TDC= 48A
IccMax= 70A

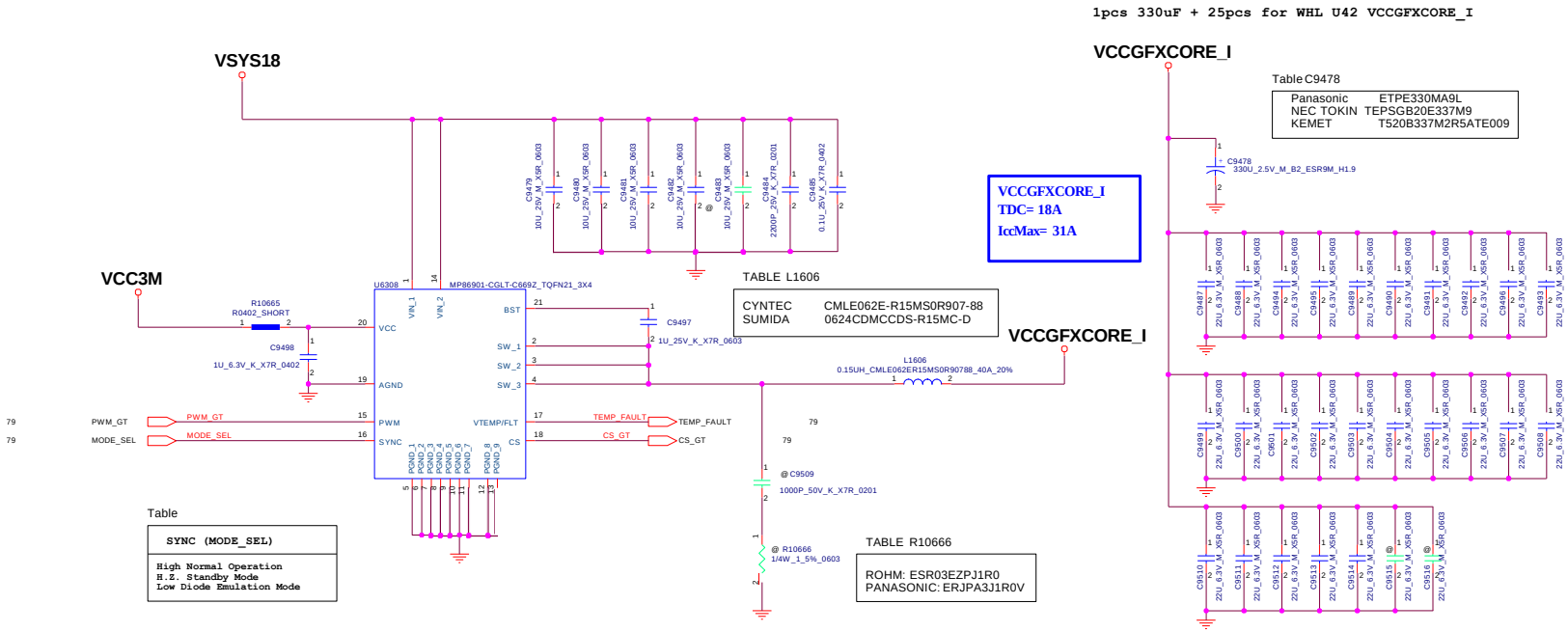
2pcs 330uF + 25pcs for WHL U42 VCCCPUCORE



https://vinafix.com

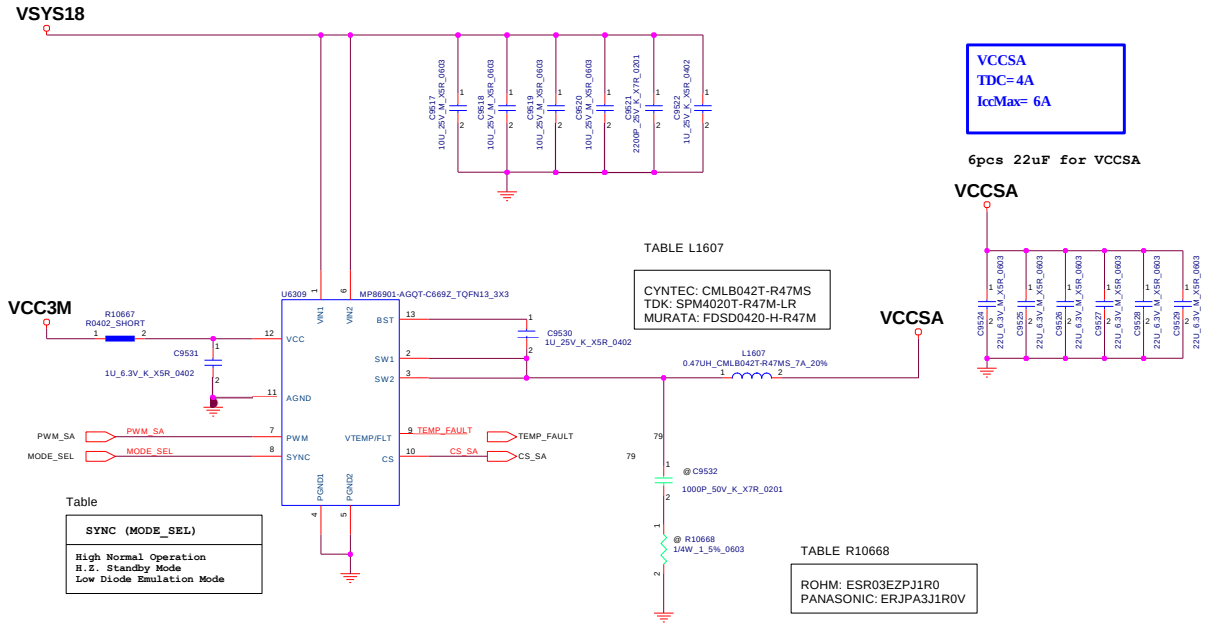
Lenovo

Project Name: Ratchet-1	Title: DC/DC VCCCPUCORE (MP86941 X 2)
Size:	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet 80 of 98



https://vinafix.com

Project Name: Rattchett-1	Title: DC/DC VCCGFXCORE_I (MP86901C)
Size:	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet 82 of 98



https://vinafix.com

Lenovo

Project Name: Ratchet-1	Title: DC/DC VCCSA (MP86901A)
Size:	Document Number: Rev: 0.01
Date: Monday, April 01, 2019	Sheet 83 of 98

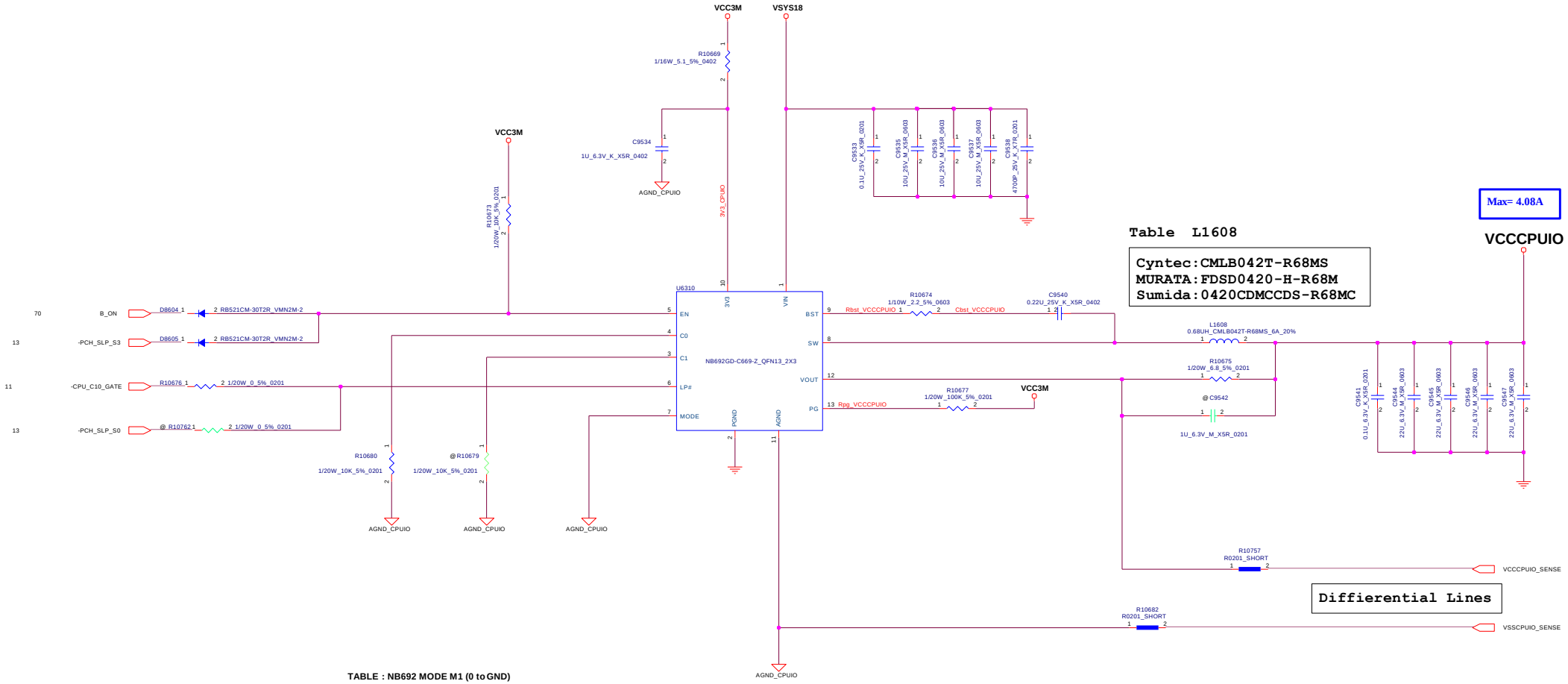


TABLE : NB692 MODE M1 (0 to GND)

LP#	C1	C0	VOUT	
0	X	X	0.000V	← SLP_S0#
1	0	0	0.850V	
1	0	1	0.875V	
1	1	0	0.950V	← LOGIC
1	1	1	0.975V	

Project Name :	Title : DC/DC VCCCPUIO(NB692)
Rattchett-1	
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet : 85 of 98

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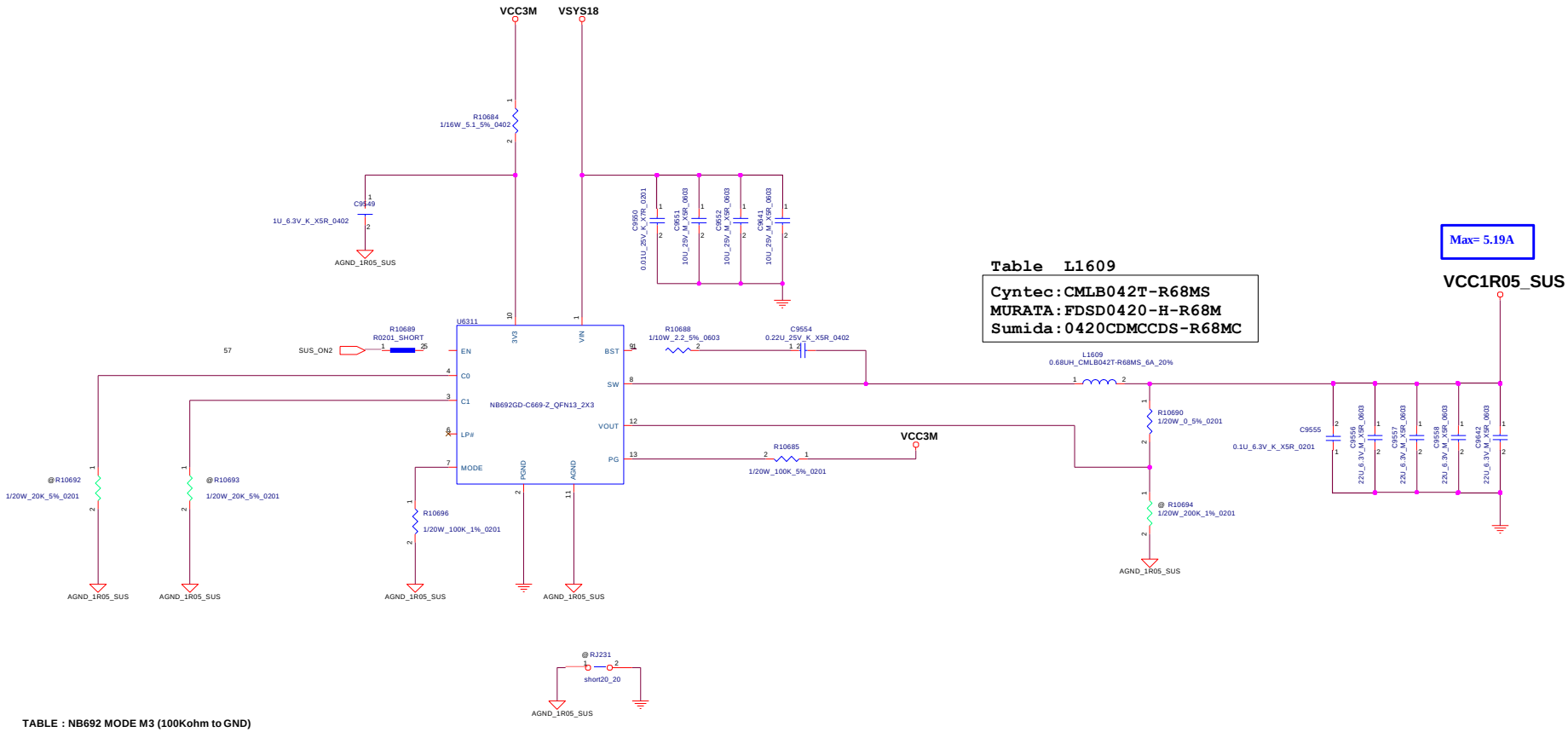


Table L1609

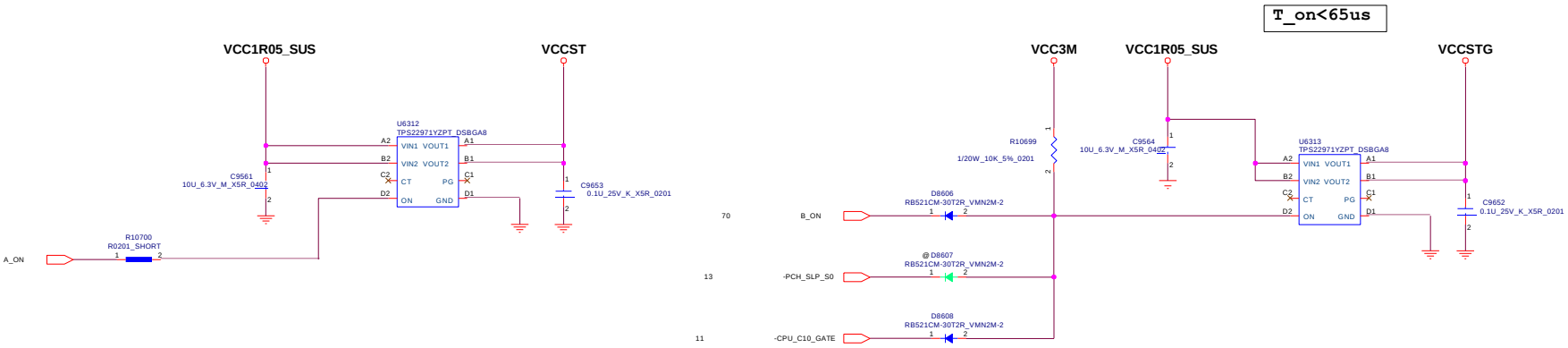
Cyntec:CMLB042T-R68MS
MURATA:FDSD0420-H-R68M
Sumida:0420CDMCCDS-R68MC

TABLE : NB692 MODE M3 (100Kohm to GND)

LP#	C1	C0	VOUT(V)	
0	X	X	0V	
1	0	0	0.8V	
1	0	1	0.95V	
1	1	0	1V	
1	1	1	1.05V	← Default Value

Lenovo		
Project Name : Ratchet-1	Title: DC/DC VCC1R05_SUS (NB692)	
Size:	Document Number :	Rev : 0.01
Date: Monday, April 01, 2019	Sheet: 86 of 98	

https://vinafix.com



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : LOAD SW VCCST &VCCSTG
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 87 of 98

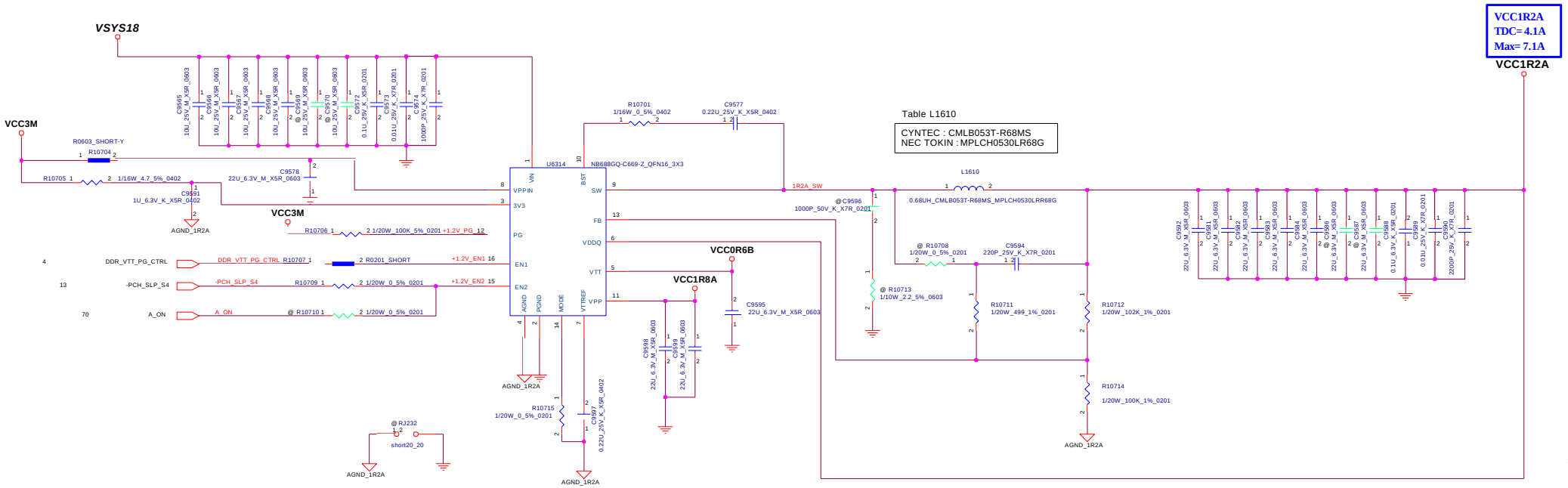


TABLE NB688BGQ:EN1/EN2

State	EN1	EN2	VDDQ	VTTREF	VTT	VPP
S0	High	High	ON	ON	ON	ON
S3	Low	High	ON	ON	OFF(High-Z)	ON
S4/S5	Low	Low	OFF	OFF	OFF	OFF
Others	High	Low	OFF	OFF	OFF	OFF

TABLE NB688BGQ:MODE

State	USM	Fs	Resistor to GND
M1	NO	700KHz	0
M2	YES	700KHz	90K
M3	NO	500KHz	150K
M4	YES	500KHz	>230K or Float

LOGIC

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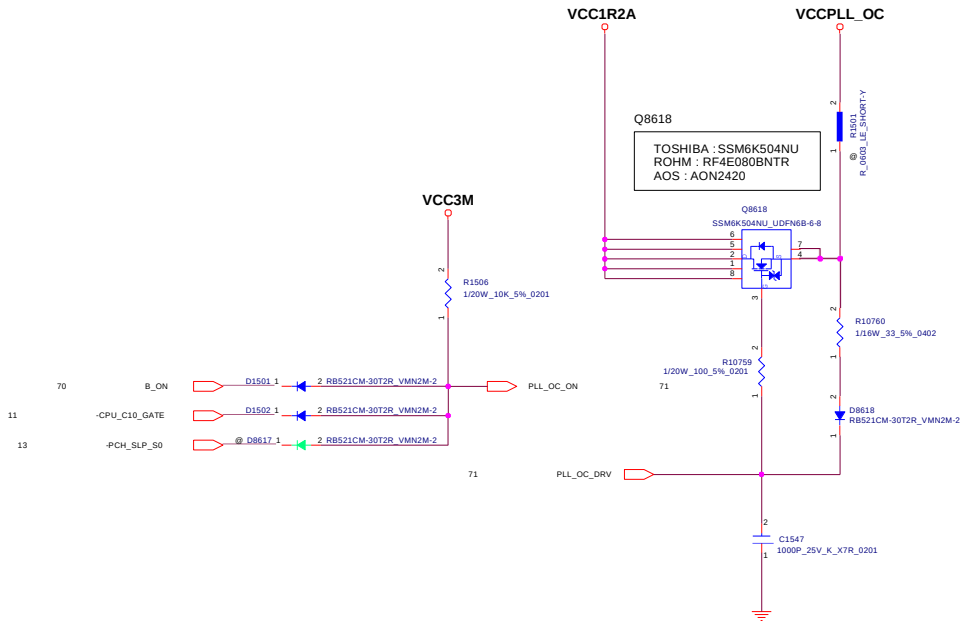
Lenovo

Project Name : Ratchet-1

Title: DC/DC VCC1R2A/0R6B/1R8A(NB688)

Size: Document Number : Rev : 0.01

Date: Monday, April 01, 2019 Sheet 88 of 98



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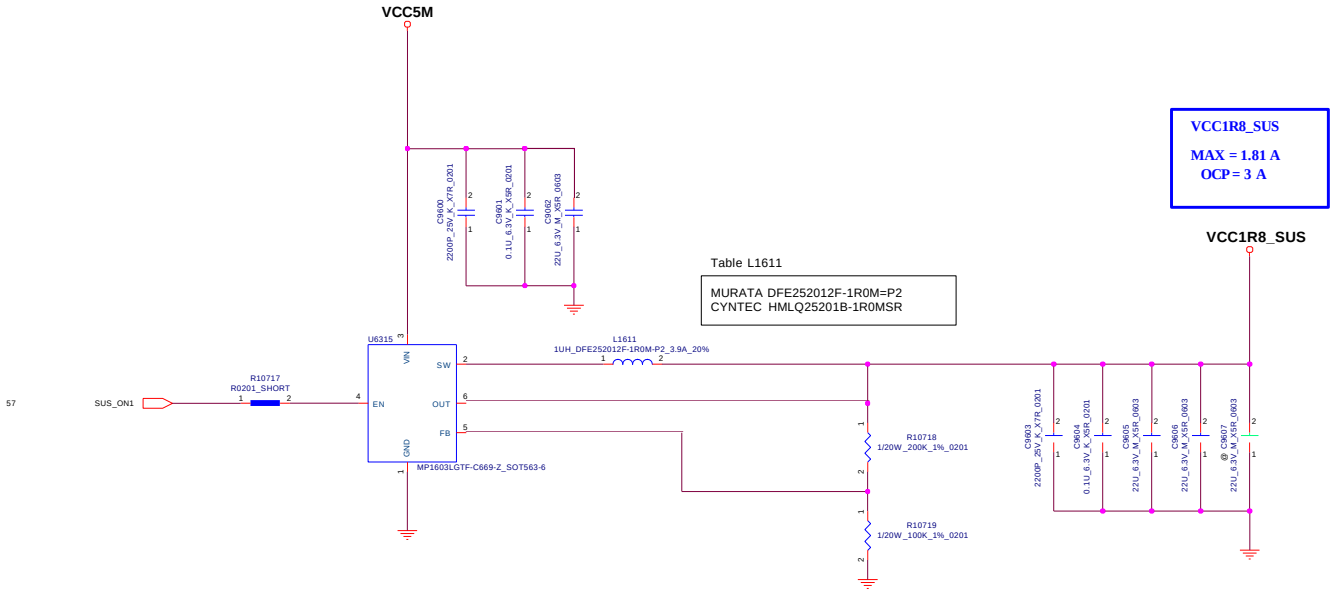
Lenovo

Project Name : Ratchet-1	Title : LOAD SW VCCPLL_OC
Size : C	Document Number :
Rev : 0.01	
Date : Monday, April 01, 2019	Sheet 89 of 98



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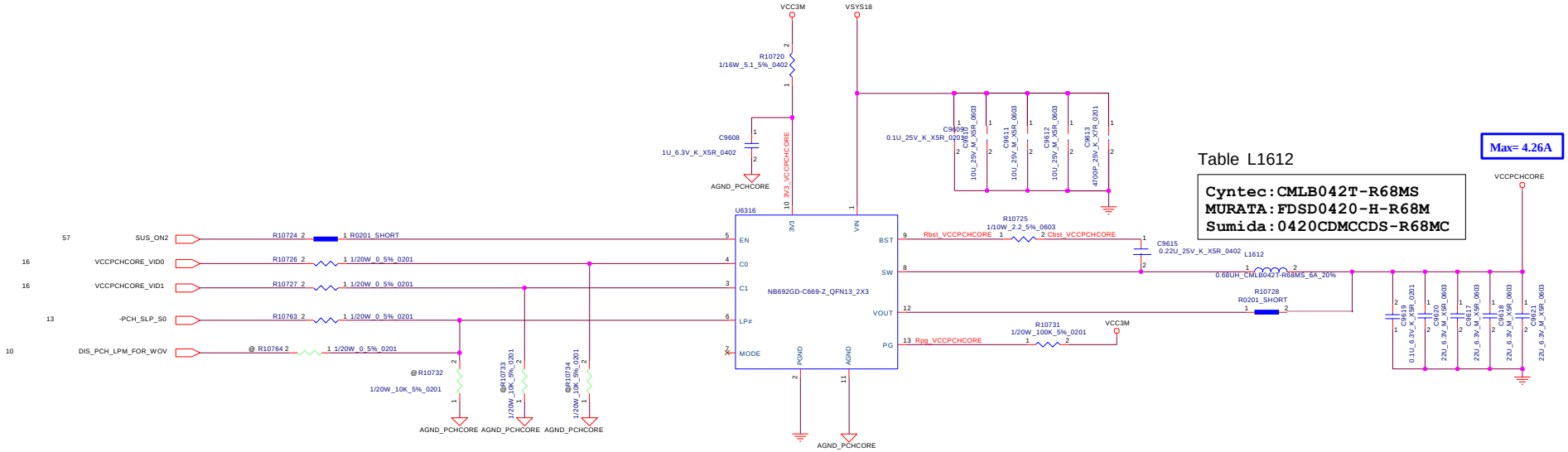
Lenovo

Project Name : Ratchet-1	Title : DC/DC VCC1R8_SUS (MP1603L)
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 90 of 98



Max= 4.26A

Table L1612

Cyntec:CMLB042T-R68MS
MURATA:FDSD0420-H-R68M
Sumida:0420CDMCCDS-R68MC

TABLE : NB692 MODE M2 (Float)

LP#	C1	C0	VOUT	
0	X	X	0.75V	← SLP_S0#
1	0	0	0.90V	
1	0	1	0.95V	
1	1	0	1.00V	
1	1	1	1.05V	← DEFAULT

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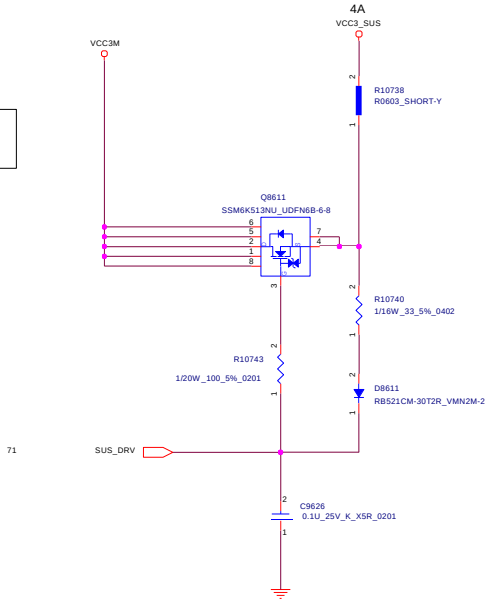
Lenovo

Project Name : Ratchet-1	Title: DC/DC VCCPCHCORE(NB692)
Size: C	Document Number : Rev : 0.01
Date: Monday, April 01, 2019	Sheet 91 of 98

Q8611

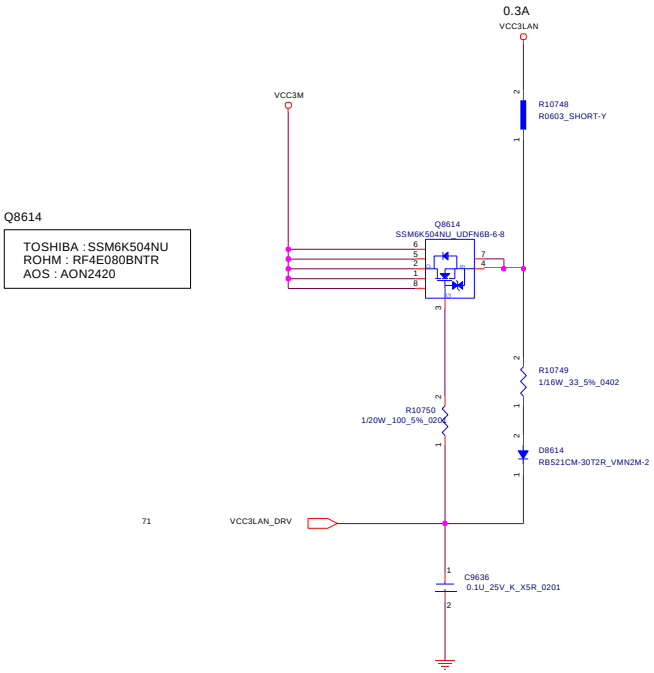
TOSHIBA : SSM6K513NU
AOS : AON2420
FAIRCHILD : FDMA8878



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : LOAD SW PCH SUS
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 93 of 98



Q8614

TOSHIBA : SSM6K504NU
ROHM : RF4E080BNTR
AOS : AON2420

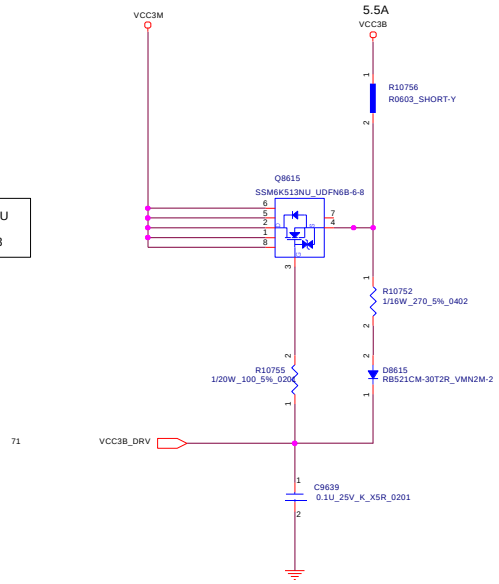
https://vinafix.com

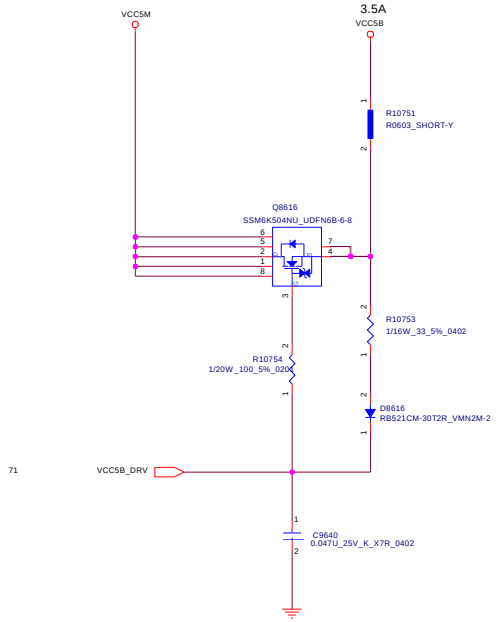
Lenovo

Project Name : Ratchet-1	Title : LOAD SW LAN
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 94 of 98

Q8615

TOSHIBA : SSM6K513NU
AOS : AON2420
FAIRCHILD : FDMA8878





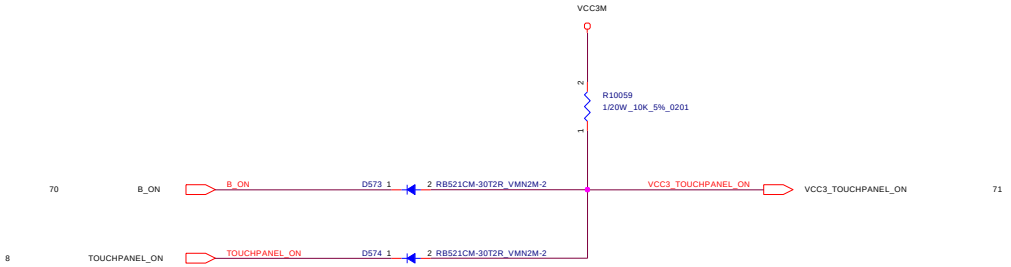
Q8616

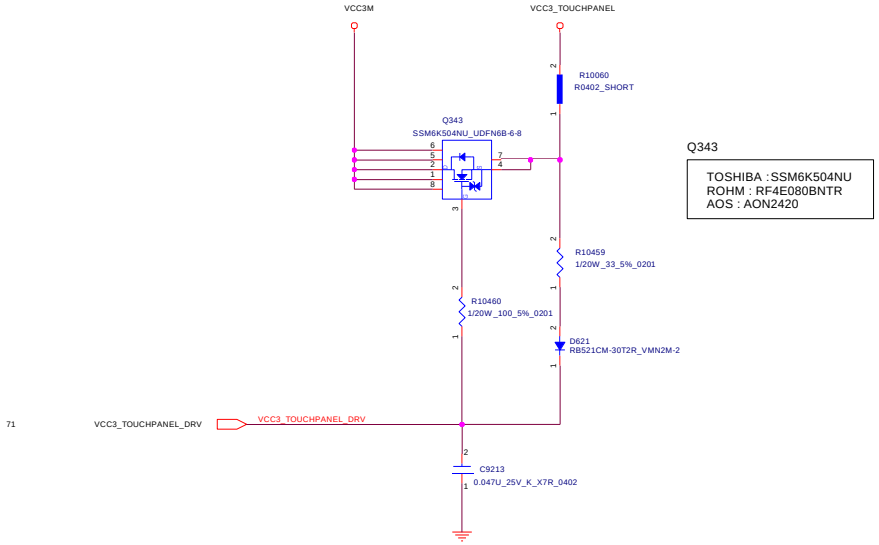
TOSHIBA : SSM6K504NU
ROHM : RF4E080BNTR
AOS : AON2420

https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : LOAD SW B
Size :	Document Number : Rev : 0.01
Date : Monday, April 01, 2019	Sheet 95 of 98





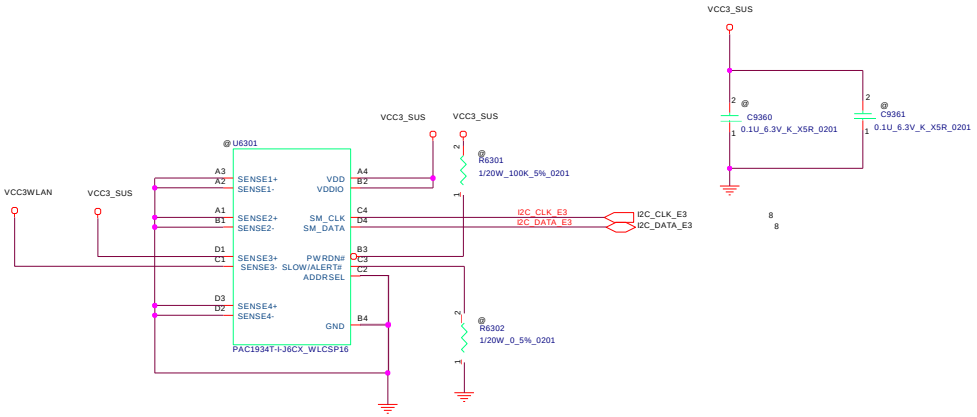
Q343

TOSHIBA :SSM6K504NU
ROHM : RF4E080BNTR
AOS : AON2420

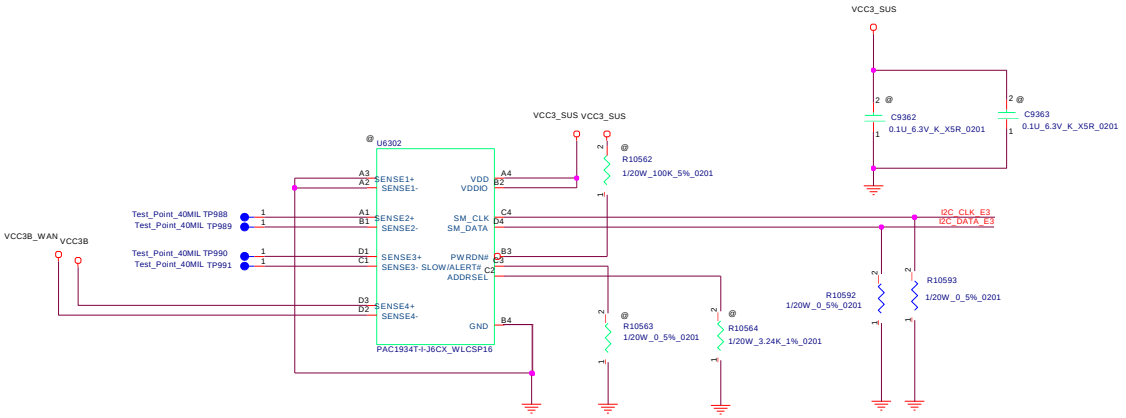
https://vinafix.com

Lenovo

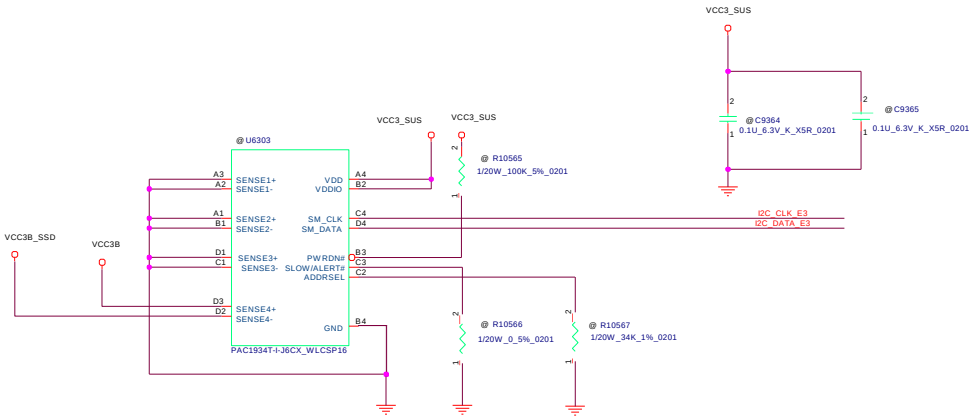
Project Name : Ratchet-1	Title : LOAD SW TOUCH PANEL
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet 96 of 98



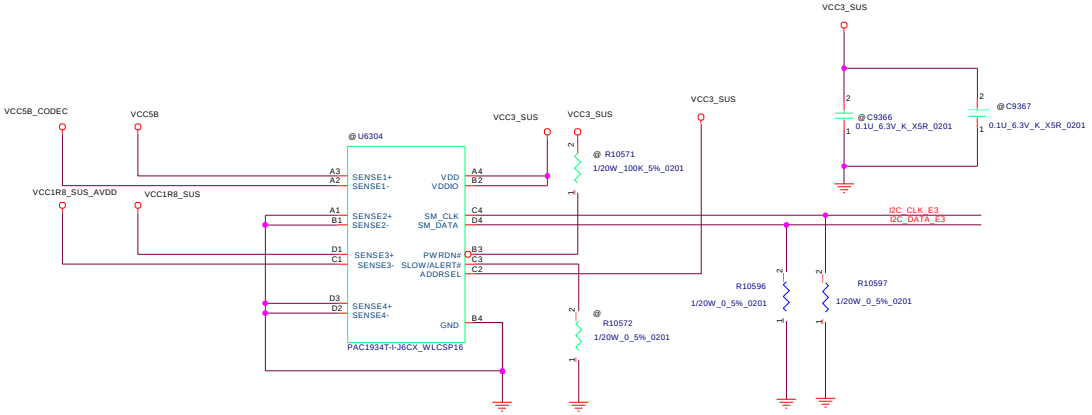
For WLAN I2C Address:0010_000(ADDRSEL=0 (Tie to GND))



For WWAN I2C Address:0010_101(ADDRSEL=3,240)



For Storage I2C Address:0011_010(ADDRSEL=34,000)



For Audio I2C Address:0011_111(ADDRSEL=Tied to VDD)

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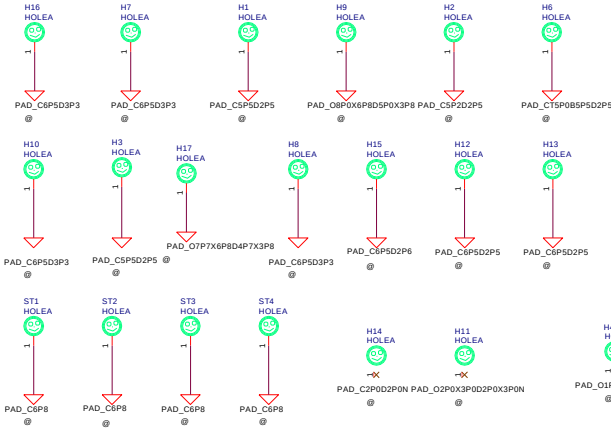
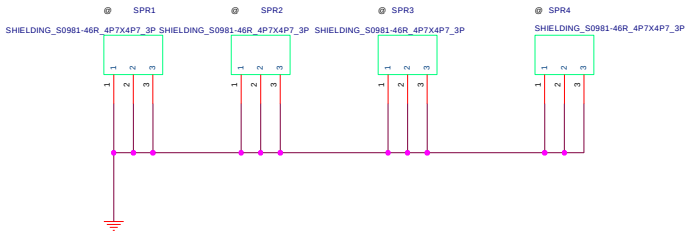
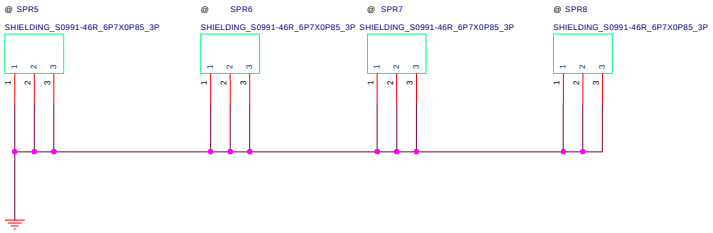
Lenovo

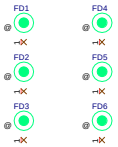
Project Name: Ratchet-1	Title: ENERGY ESTIMATION ENGINE
Size: C	Document Number:
Date: Monday, April 01, 2019	Sheet: 97 of 98







FID
Board Area



https://vinafix.com

Lenovo

Project Name : Ratchet-1	Title : PTH FOR SCREW HOLES
Size : C	Document Number :
Date : Monday, April 01, 2019	Sheet : 98 of 98
	Rev : 0.01