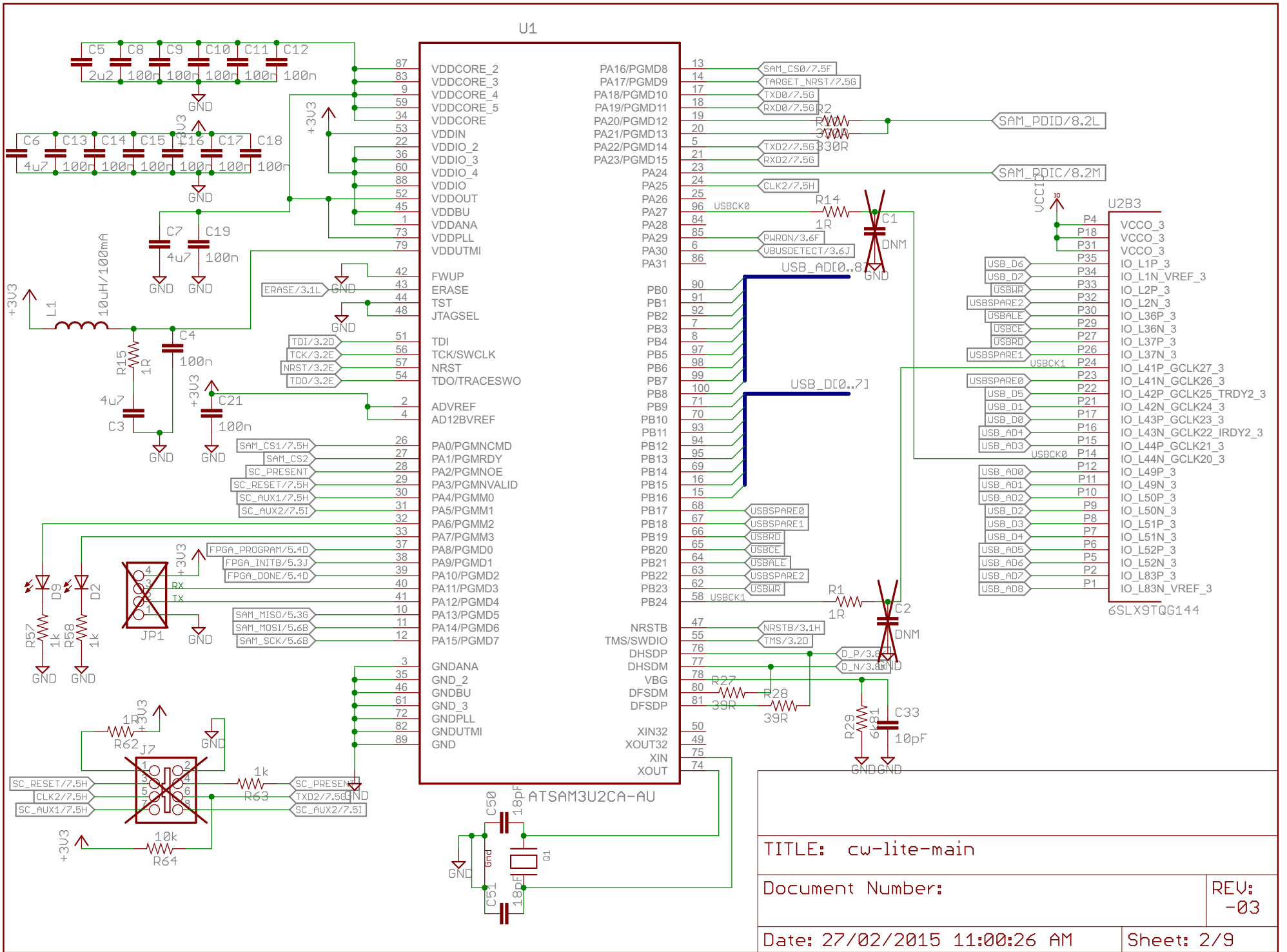# ChipWhisperer-Lite
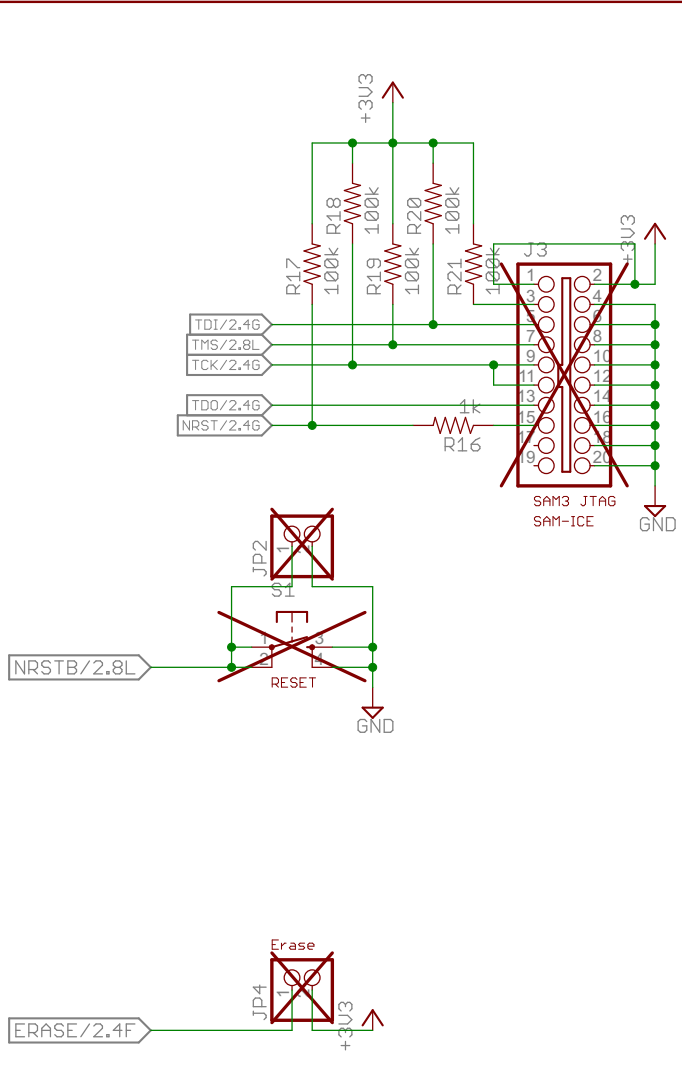
Revision Information

-03: Addition of low-power glitch module, split
target board onto own sheet. Jan 13/2015.

-02: Fixed routing errors, addition of switch for
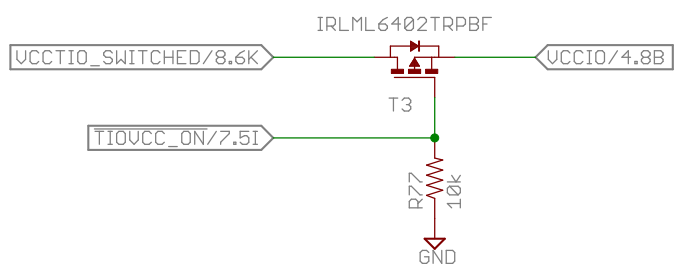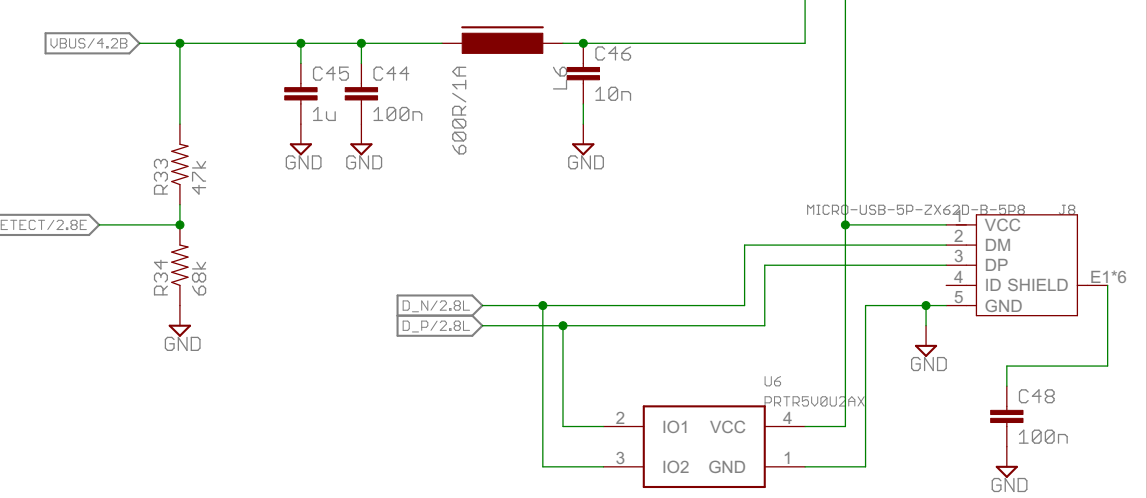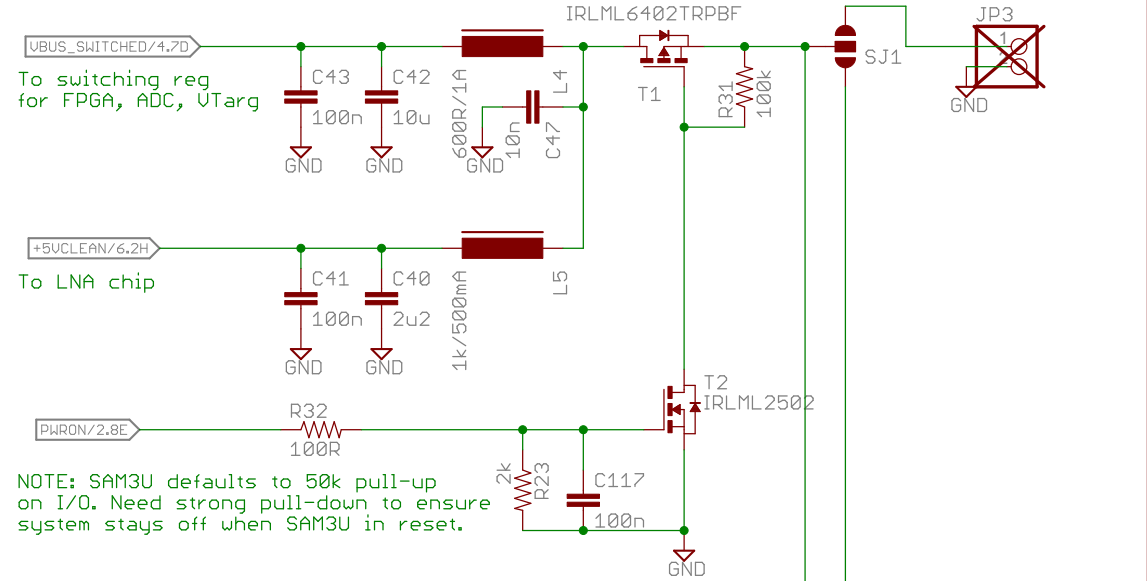 target power supply voltage.

-01: Initial release, prototype.

U1

C5 C8 C9 C10 C11 C12
2u2 100n 100n 100n 100n 100n
GND

C6 C13 C14 C15 C16 C17 C18
4u7 100n 100n 100n 100n 100n 100n
GND

+3V3

87 VDDCORE_2
83 VDDCORE_3
9 VDDCORE_4
59 VDDCORE_5
34 VDDCORE
53 VDDIN
22 VDDIO_2
36 VDDIO_3
60 VDDIO_4
88 VDDIO
52 VDDOUT
45 VDDBU
1 VDDANA
73 VDDPLL
79 VDDUTMI

C7 C19
4u7 100n
GND GND

L1 10uH/100mA
R15 1R
C4 100n
+3V3
C21 100n
4u7
C3
GND GND

42 FWUP
43 ERASE   ERASE/3.1L   GND
44 TST
48 JTAGSEL   GND

51 TDI   TDI/3.2D
56 TCK/SWCLK TCK/3.2E
57 NRST   NRST/3.2E
54 TDO/TRACESWO TDO/3.2E

2 ADVREF
4 AD12BVREF

26 PA0/PGMNCMD   SAM_CS1/7.5H
27 PA1/PGMRDY   SAM_CS2
28 PA2/PGMNOE   SC_PRESENT
29 PA3/PGMNVALID SC_RESET/7.5H
30 PA4/PGMM0   SC_AUX1/7.5H
31 PA5/PGMM1   SC_AUX2/7.5I
32 PA6/PGMM2
33 PA7/PGMM3
37 PA8/PGMD0   FPGA_PROGRAM/5.4D
38 PA9/PGMD1   FPGA_INITB/5.3J
39 PA10/PGMD2   FPGA_DONE/5.4D
40 PA11/PGMD3   RX
41 PA12/PGMD4   TX
10 PA13/PGMD5   SAM_MISO/5.3G
11 PA14/PGMD6   SAM_MOSI/5.6B
12 PA15/PGMD7   SAM_SCK/5.6B

D9 D2
R57 1k R58 1k
JP1
+3V3
GND

R62 1R +3V3
J7
SC_RESET/7.5H
CLK2/7.5H
SC_AUX1/7.5I
+3V3
10k R64
R63 1k
SC_PRESENT
TXD2/7.5G GND
SC_AUX2/7.5I

3 GNDANA
35 GND_2
46 GNDBU
61 GND_3
72 GNDPLL
82 GNDUTMI
89 GND

PA16/PGMD8   13   SAM_CS0/7.5F
PA17/PGMD9   14   TARGET_NRST/7.5G
PA18/PGMD10 17   TXD0/7.5G
PA19/PGMD11 18   RXD0/7.5G
PA20/PGMD12 19   R2
PA21/PGMD13 20
PA22/PGMD14 5   TXD2/7.5G 330R
PA23/PGMD15 21   RXD2/7.5G
PA24   23   SAM_PDID/8.2L
PA25   24   CLK2/7.5H
PA26   96   USBCK0
PA27   27
PA28   84
PA29   85   PWRON/3.6F
PA30   6   VBUSDETECT/3.6J
PA31   86

SAM_PDIC/8.2M

R14 1R
C1 DNM
GND
USB_AD[0..8]

PB0   90
PB1   91
PB2   92
PB3   7
PB4   8
PB5   97
PB6   98
PB7   99
PB8   100
PB9   71
PB10 70
PB11 93
PB12 94
PB13 95
PB14 69
PB15 16
PB16 15
USB_D[0..7]

PB17 68   USBSPARE0
PB18 67   USBSPARE1
PB19 66   USBRD
PB20 65   USBCE
PB21 64   USBALE
PB22 63   USBSPARE2
PB23 62   USBWR
PB24 58   USBCK1

NRSTB   47   NRSTB/3.1H
TMS/SWDIO 55   TMS/3.2D
DHSDP   76   D_P/3.8
DHSDM   77   D_N/3.8 GND
VBG   78
DFSDM   80   R27 39R
DFSDP   81   R28 39R
R1 1R
C2 DNM
GND
R29 681
C33 10pF
GNDGND

XIN32   50
XOUT32 49
XIN   75
XOUT   74

ATSAM3U2CA-AU

C50 18pF
Gnd
G1
C51 18pF
GND

VCCI
IO
U2B3
P4   VCCO_3
P18 VCCO_3
P31 VCCO_3
P35 IO_L1P_3
P34 IO_L1N_VREF_3
P33 IO_L2P_3
P32 IO_L2N_3
P30 IO_L36P_3
P29 IO_L36N_3
P27 IO_L37P_3
P26 IO_L37N_3
USBCK1
P24 IO_L41P_GCLK27_3
P23 IO_L41N_GCLK26_3
P22 IO_L42P_GCLK25_TRDY2_3
P21 IO_L42N_GCLK24_3
P17 IO_L43P_GCLK23_3
P16 IO_L43N_GCLK22_IRDY2_3
USBCK0
P14 IO_L44P_GCLK21_3
P15 IO_L44N_GCLK20_3
P12 IO_L49P_3
P11 IO_L49N_3
P10 IO_L50P_3
P9   IO_L50N_3
P8   IO_L51P_3
P7   IO_L51N_3
P6   IO_L52P_3
P5   IO_L52N_3
P2   IO_L83P_3
P1   IO_L83N_VREF_3

USB_D6   USB_D7   USBWR   USBSPARE2   USBALE   USBCE   USBRD   USBSPARE1
USBSPARE0   USB_D5   USB_D1   USB_D0   USB_AD4   USB_AD3
USB_AD0   USB_AD1   USB_AD2   USB_D2   USB_D3   USB_D4   USB_AD5   USB_AD6   USB_AD7   USB_AD8

6SLX9TQG144

Switched supplies (required for USB suspend + meeting inrush current limits)

IRLML6402TRPBF

VBUS_SWITCHED/4.7D

To switching reg
for FPGA, ADC, VTarg

C43 100n
C42 10u
600R/1A
10n C47
GND
GND
GND

T1
R31 100k

JP3
GND
SJ1

+5VCLEAN/6.2H

To LNA chip

C41 100n
C40 2u2
1k/500mA
L5
GND
GND

T2
IRLML2502

PWRON/2.8E
R32 100R

NOTE: SAM3U defaults to 50k pull-up
on I/O. Need strong pull-down to ensure
system stays off when SAM3U in reset.

2k R23
C117 100n
GND

+3V3

R17 100k
R18 100k
R19 100k
R20 100k
R21 100k
100k

J3
3V3

1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20

SAM3 JTAG
SAM-ICE
GND

TDI/2.4G
TMS/2.8L
TCK/2.4G

TDO/2.4G
NRST/2.4G
1k
R16

JP2
S1
RESET
GND

NRSTB/2.8L

VBUS/4.2B

C45 1u
C44 100n
600R/1A
L6
C46 10n
GND
GND
GND

R33 47k

VBUSDETECT/2.8E

R34 68k

GND

MICRO-USB-5P-ZX62D-B-5P8   J8

1 VCC
2 DM
3 DP
4 ID SHIELD
5 GND

E1*6

D_N/2.8L
D_P/2.8L

GND

C48 100n
GND

U6
PRTR5V0U2AX

2 IO1   VCC 4
3 IO2   GND 1

Erase

JP4
+3V3

ERASE/2.4F

IRLML6402TRPBF

VCCTIO_SWITCHED/8.6K
VCCIO/4.8B

T3

TIOVCC_ON/7.5I

R77 10k
GND

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VBUS/3.6H

C39
2u2
GND

IN   OUT
GND
U7
TC1262-3.3VDBTR

+3V3

C38
2u2
GND

GND

LDO Regulator active during USB Suspend

U5
2   RUN1   SW1 4
9   RUN2
                VFB1 1
3   MODE
7   VIN
                SW2   8
5   GND
6   GND   VFB2 10
LTC3419EMS

VBUS_SWITCHED/3.7A

C36
22u
GND

R24
1k5

R26
1k5
GND

L2 3.3uH   +3V3 Switched
R25 6k81
C34
22u
GND

GND

L3 3.3uH   +1V2 Switched
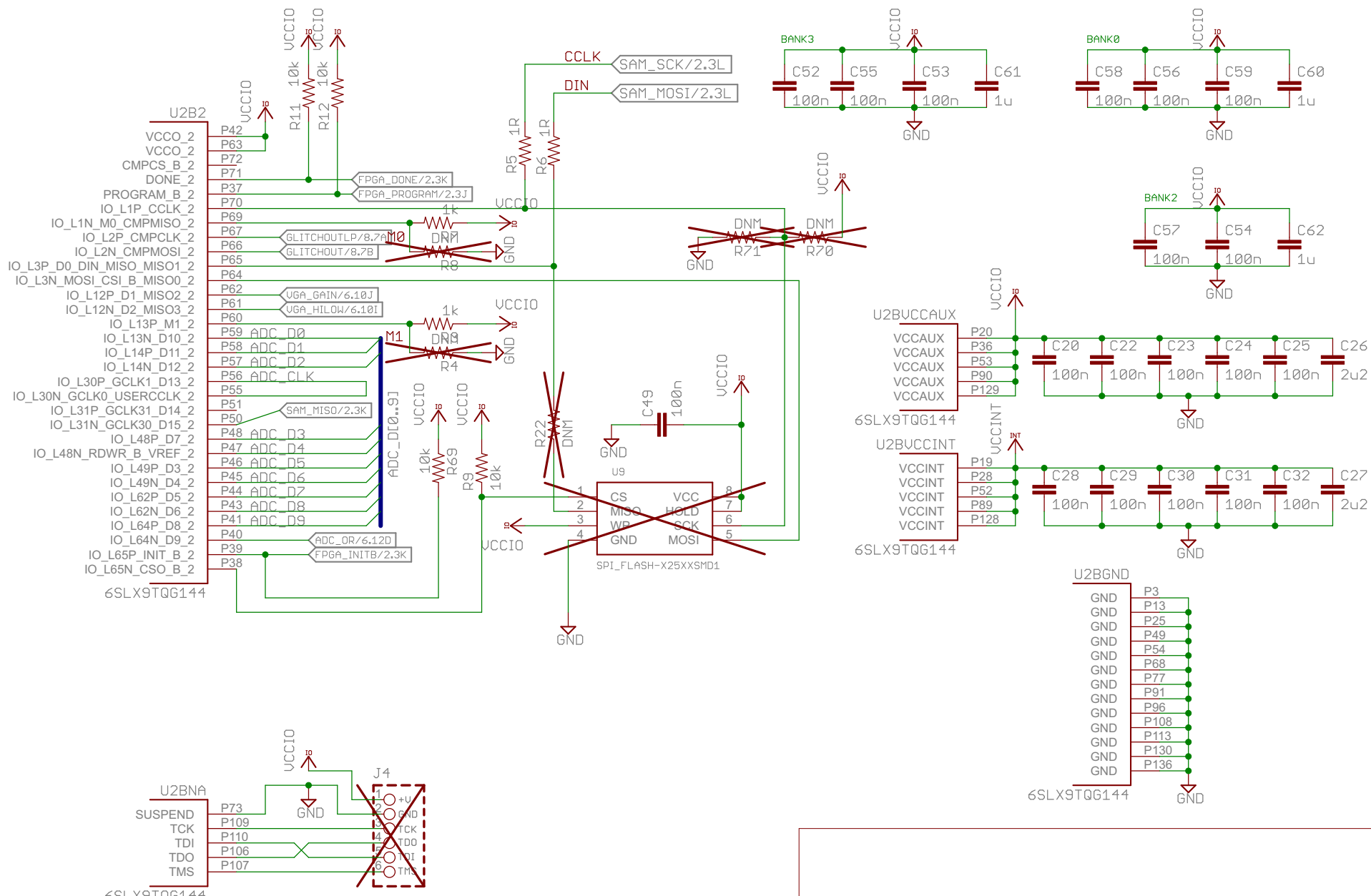R30 1k5
C35
22u
GND

VCCIO
IO

VCCINT
INT
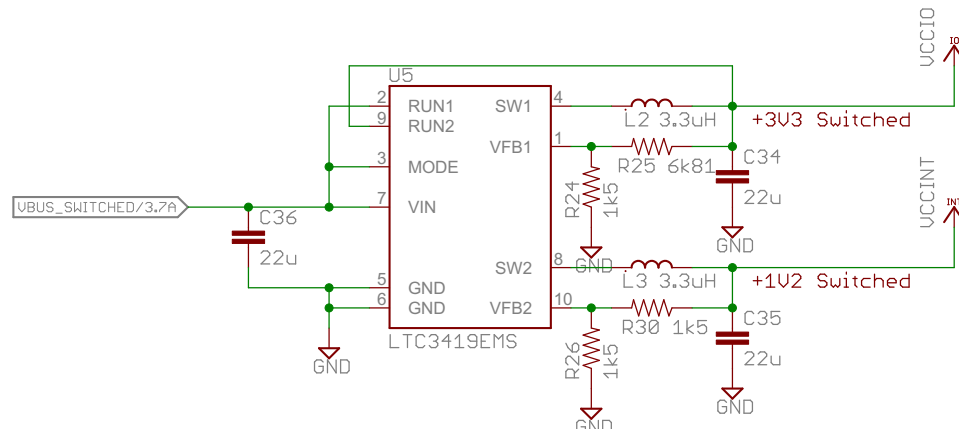
Switching regulator turned off during USB suspend

Shutdown pins not used as require switching +5V
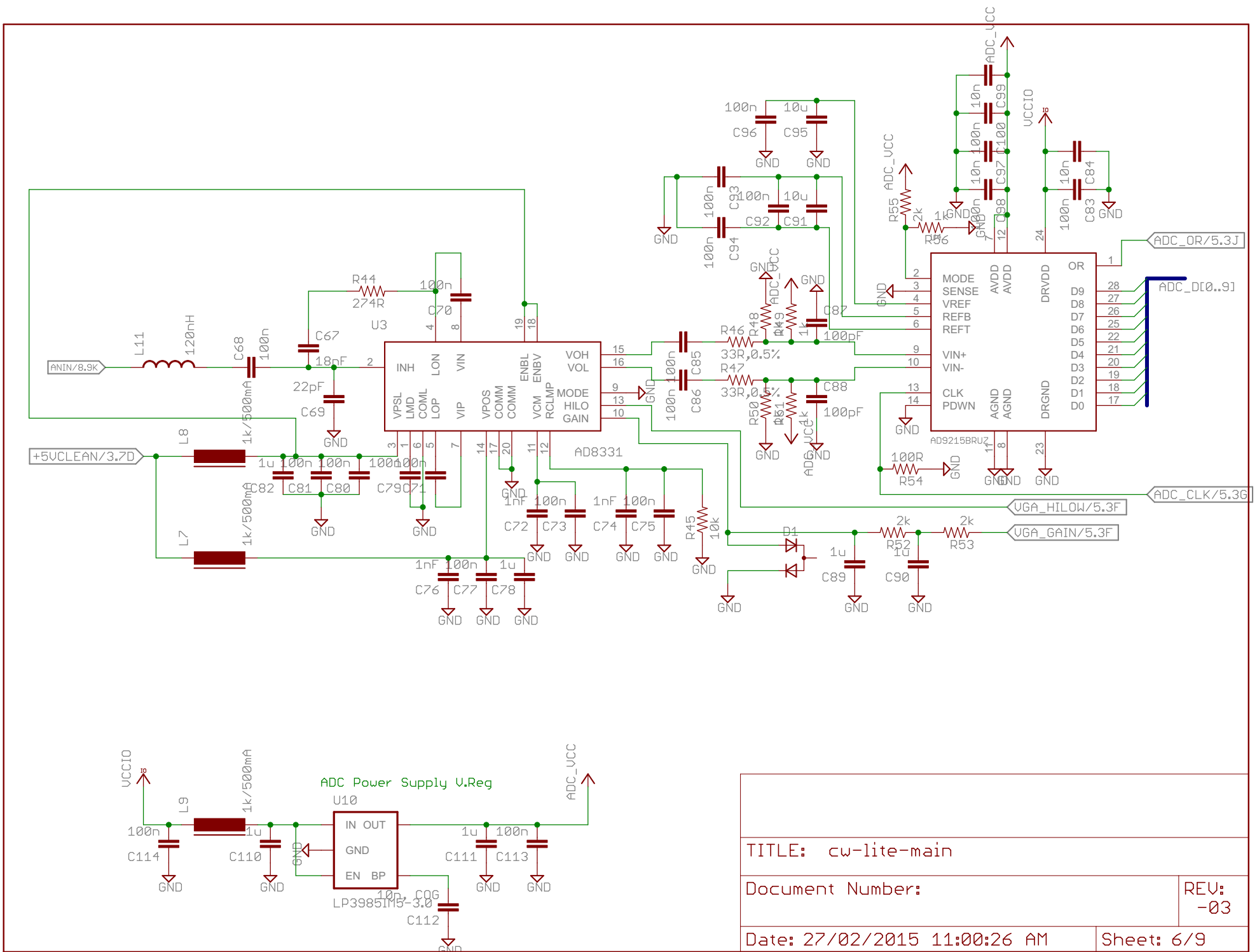supply anyway for LNA chip, so simply switch off
input to this chip.

H1
MOUNT-PAD-ROUND2.8
H2
MOUNT-PAD-ROUND2.8
H3
MOUNT-PAD-ROUND2.8
H4
MOUNT-PAD-ROUND2.8

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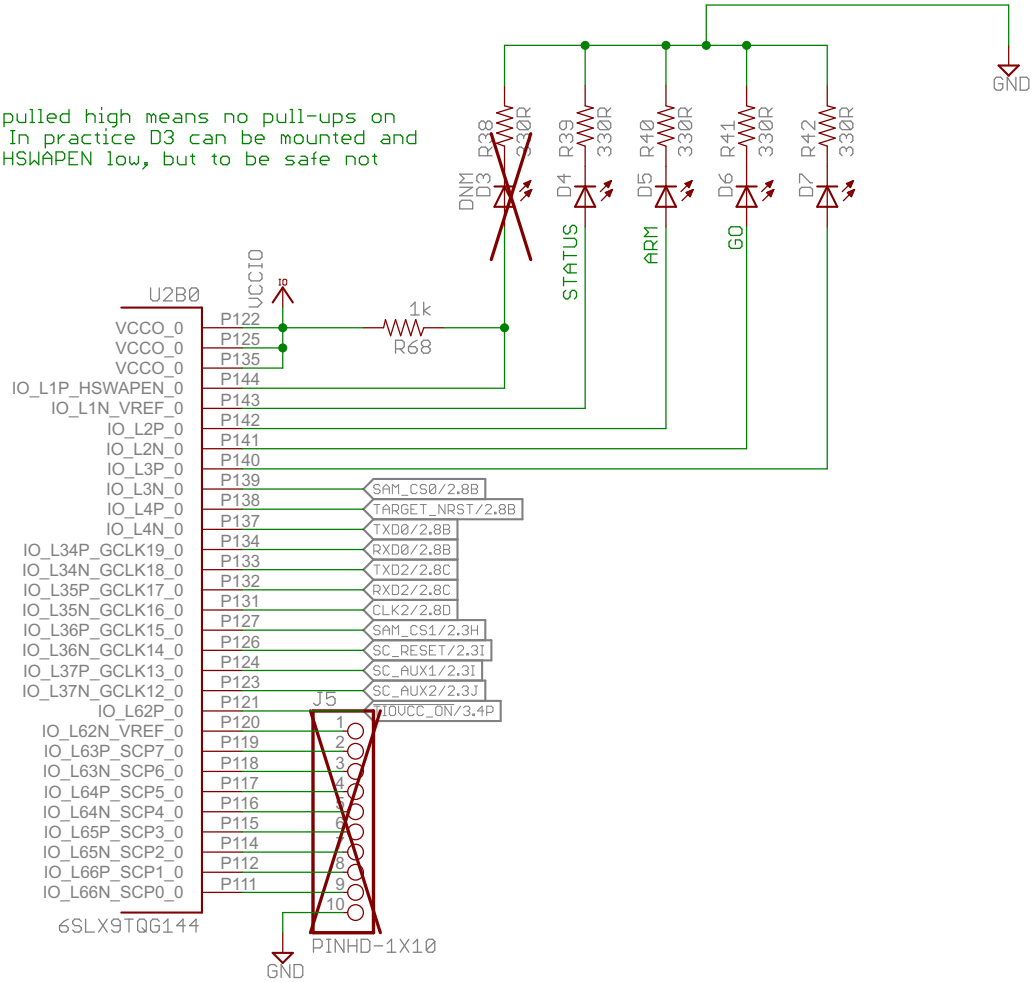
U2B2

Pin	Signal
VCCO_2	P42
VCCO_2	P63
CMPCS_B_2	P72
DONE_2	P71
PROGRAM_B_2	P37
IO_L1P_CCLK_2	P70
IO_L1N_M0_CMPMISO_2	P69
IO_L2P_CMPCLK_2	P67
IO_L2N_CMPMOSI_2	P66
IO_L3P_D0_DIN_MISO_MISO1_2	P65
IO_L3N_MOSI_CSI_B_MISO0_2	P64
IO_L12P_D1_MISO2_2	P62
IO_L12N_D2_MISO3_2	P61
IO_L13P_M1_2	P60
IO_L13N_D10_2	P59 ADC_D0
IO_L14P_D11_2	P58 ADC_D1
IO_L14N_D12_2	P57 ADC_D2
IO_L30P_GCLK1_D13_2	P56 ADC_CLK
IO_L30N_GCLK0_USERCCLK_2	P55
IO_L31P_GCLK31_D14_2	P51
IO_L31N_GCLK30_D15_2	P50
IO_L48P_D7_2	P48 ADC_D3
IO_L48N_RDWR_B_VREF_2	P47 ADC_D4
IO_L49P_D3_2	P46 ADC_D5
IO_L49N_D4_2	P45 ADC_D6
IO_L62P_D5_2	P44 ADC_D7
IO_L62N_D6_2	P43 ADC_D8
IO_L64P_D8_2	P41 ADC_D9
IO_L64N_D9_2	P40
IO_L65P_INIT_B_2	P39
IO_L65N_CSO_B_2	P38

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CCLK — SAM_SCK/2.3L
DIN — SAM_MOSI/2.3L

FPGA_DONE/2.3K
FPGA_PROGRAM/2.3J

GLITCHOUTLP/8.7A M0 DNM
GLITCHOUT/8.7B R8

VGA_GAIN/6.10J
VGA_HILOW/6.10I

1k R3
1k R4 DNM

SAM_MISO/2.3K

ADC_OR/6.12D
FPGA_INITB/2.3K

M1 ADC_D[0..9]

R11 10k R12 10k VCCIO VCCIO

R5 1R R6 1R

DNM R71 DNM R70

R22 DNM

C49 100n

U9 SPI_FLASH-X25XXSMD1

1	CS	VCC	8
2	MISO	HOLD	7
3	WP	SCK	6
4	GND	MOSI	5

10k R69 10k R9

GND

BANK3 VCCIO
| C52 | C55 | C53 | C61 |
| 100n | 100n | 100n | 1u |
GND

BANK0 VCCIO
| C58 | C56 | C59 | C60 |
| 100n | 100n | 100n | 1u |
GND

BANK2 VCCIO
| C57 | C54 | C62 |
| 100n | 100n | 1u |
GND

U2BVCCAUX VCCIO
VCCAUX	P20
VCCAUX	P36
VCCAUX	P53
VCCAUX	P90
VCCAUX	P129

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| C20 | C22 | C23 | C24 | C25 | C26 |
| 100n | 100n | 100n | 100n | 100n | 2u2 |
GND

U2BVCCINT VCCINT
VCCINT	P19
VCCINT	P28
VCCINT	P52
VCCINT	P89
VCCINT	P128

6SLX9TQG144

| C28 | C29 | C30 | C31 | C32 | C27 |
| 100n | 100n | 100n | 100n | 100n | 2u2 |
GND

U2BGND
GND	P3
GND	P13
GND	P25
GND	P49
GND	P54
GND	P68
GND	P77
GND	P91
GND	P96
GND	P108
GND	P113
GND	P130
GND	P136

6SLX9TQG144
GND

U2BNA
SUSPEND	P73
TCK	P109
TDI	P110
TDO	P106
TMS	P107

6SLX9TQG144

J4
1	+V
2	GND
3	TCK
4	TDO
5	TDI
6	TMS

VCCIO GND

JTAG Programming/Debug for FPGA

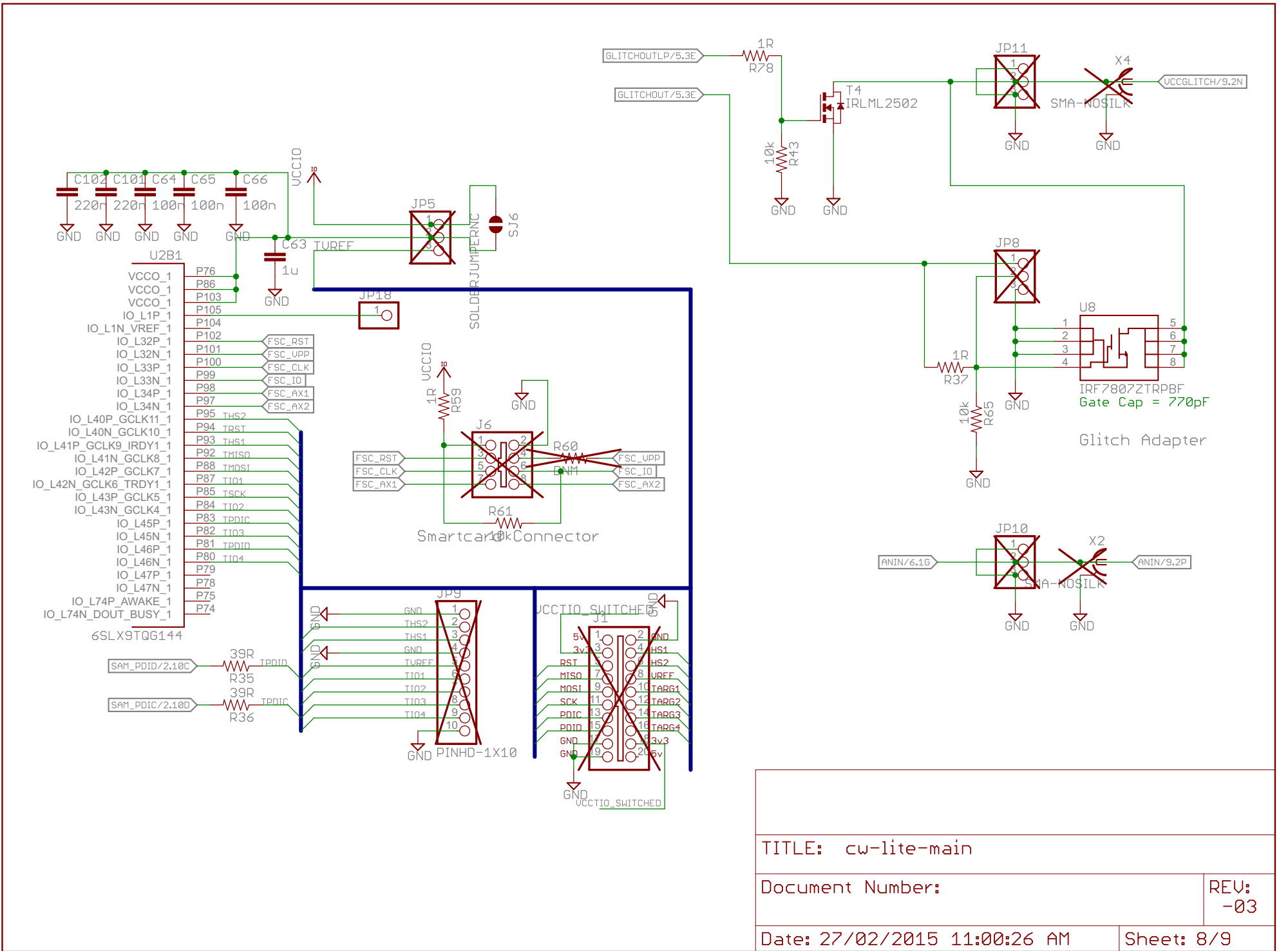**ADC Power Supply V.Reg**

U10 — LP3985IM5-3.0

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HSWAPEN pulled high means no pull-ups on
all pins. In practice D3 can be mounted and
not pull HSWAPEN low, but to be safe not
mounted

DNM
D3 R38 330R
D4 R39 330R STATUS
D5 R40 330R ARM
D6 R41 330R GO
D7 R42 330R

GND

U2B0

VCCO_0	P122	
VCCO_0	P125	
VCCO_0	P135	
IO_L1P_HSWAPEN_0	P144	
IO_L1N_VREF_0	P143	
IO_L2P_0	P142	
IO_L2N_0	P141	
IO_L3P_0	P140	
IO_L3N_0	P139	SAM_CS0/2.8B
IO_L4P_0	P138	TARGET_NRST/2.8B
IO_L4N_0	P137	TXD0/2.8B
IO_L34P_GCLK19_0	P134	RXD0/2.8B
IO_L34N_GCLK18_0	P133	TXD2/2.8C
IO_L35P_GCLK17_0	P132	RXD2/2.8C
IO_L35N_GCLK16_0	P131	CLK2/2.8D
IO_L36P_GCLK15_0	P127	SAM_CS1/2.3H
IO_L36N_GCLK14_0	P126	SC_RESET/2.3I
IO_L37P_GCLK13_0	P124	SC_AUX1/2.3I
IO_L37N_GCLK12_0	P123	SC_AUX2/2.3J
IO_L62P_0	P121	IOVCC_ON/3.4P
IO_L62N_VREF_0	P120	
IO_L63P_SCP7_0	P119	
IO_L63N_SCP6_0	P118	
IO_L64P_SCP5_0	P117	
IO_L64N_SCP4_0	P116	
IO_L65P_SCP3_0	P115	
IO_L65N_SCP2_0	P114	
IO_L66P_SCP1_0	P112	
IO_L66N_SCP0_0	P111	

6SLX9TQG144

VCCIO
IO

1k
R68

J5
1
2
3
4
5
6
7
8
9
10
PINHD-1X10

GND

GLITCHOUTLP/5.3E

1R
R78

GLITCHOUT/5.3E

T4
IRLML2502

JP11

X4
SMA-NOSILK

VCCGLITCH/9.2N

10k
R43

GND   GND   GND   GND

C102 C101 C64 C65 C66
220n 220n 100n 100n 100n

GND   GND   GND   GND   GND

VCCIO

IO

JP5

SJ6

SOLDERJUMPERNC

JP8

U8
1   5
2   6
3   7
4   8

IRF7807ZTRPBF
Gate Cap = 770pF

Glitch Adapter

1R
R37

10k
R65

GND

GND

U2B1
VCCO_1   P76
VCCO_1   P86
VCCO_1   P103
IO_L1P_1   P105
IO_L1N_VREF_1   P104
IO_L32P_1   P102   FSC_RST
IO_L32N_1   P101   FSC_VPP
IO_L33P_1   P100   FSC_CLK
IO_L33N_1   P99   FSC_IO
IO_L34P_1   P98   FSC_AX1
IO_L34N_1   P97   FSC_AX2
IO_L40P_GCLK11_1   P95   THS2
IO_L40N_GCLK10_1   P94   TRST
IO_L41P_GCLK9_IRDY1_1   P93   THS1
IO_L41N_GCLK8_1   P92   TMISO
IO_L42P_GCLK7_1   P88   TMOSI
IO_L42N_GCLK6_TRDY1_1   P87   TIO1
IO_L43P_GCLK5_1   P85   TSCK
IO_L43N_GCLK4_1   P84   TIO2
IO_L45P_1   P83   TPDIC
IO_L45N_1   P82   TIO3
IO_L46P_1   P81   TPDID
IO_L46N_1   P80   TIO4
IO_L47P_1   P79
IO_L47N_1   P78
IO_L74P_AWAKE_1   P75
IO_L74N_DOUT_BUSY_1   P74

6SLX9TQG144

C63
1u

GND

TVREF

JP18
1

1R   VCCIO
R59   IO

GND

J6
1   2
3   4
5   6
FSC_RST   FSC_VPP
FSC_CLK   R60   FSC_IO
FSC_AX1   DNM   FSC_AX2

R61
10k

Smartcard Connector

39R
R35
SAM_PDID/2.10C   TPDID

39R
R36
SAM_PDIC/2.10D   TPDIC

JP9
GND   1
THS2   2
THS1   3
GND   4
TVREF   5
TIO1   6
TIO2   7
TIO3   8
TIO4   9
10

GND   PINHD-1X10

VCCTIO_SWITCHED
J1
5v   1   2   GND
3v3   3   4   HS1
RST   5   6   HS2
MISO   7   8   VREF
MOSI   9   10   TARG1
SCK   11   12   TARG2
PDIC   13   14   TARG3
PDID   15   16   TARG4
GND   17   18   3v3
GND   19   20   5v

GND
VCCTIO_SWITCHED

JP10

X2
SMA-NOSILK

ANIN/6.1G   ANIN/9.2P

GND   GND
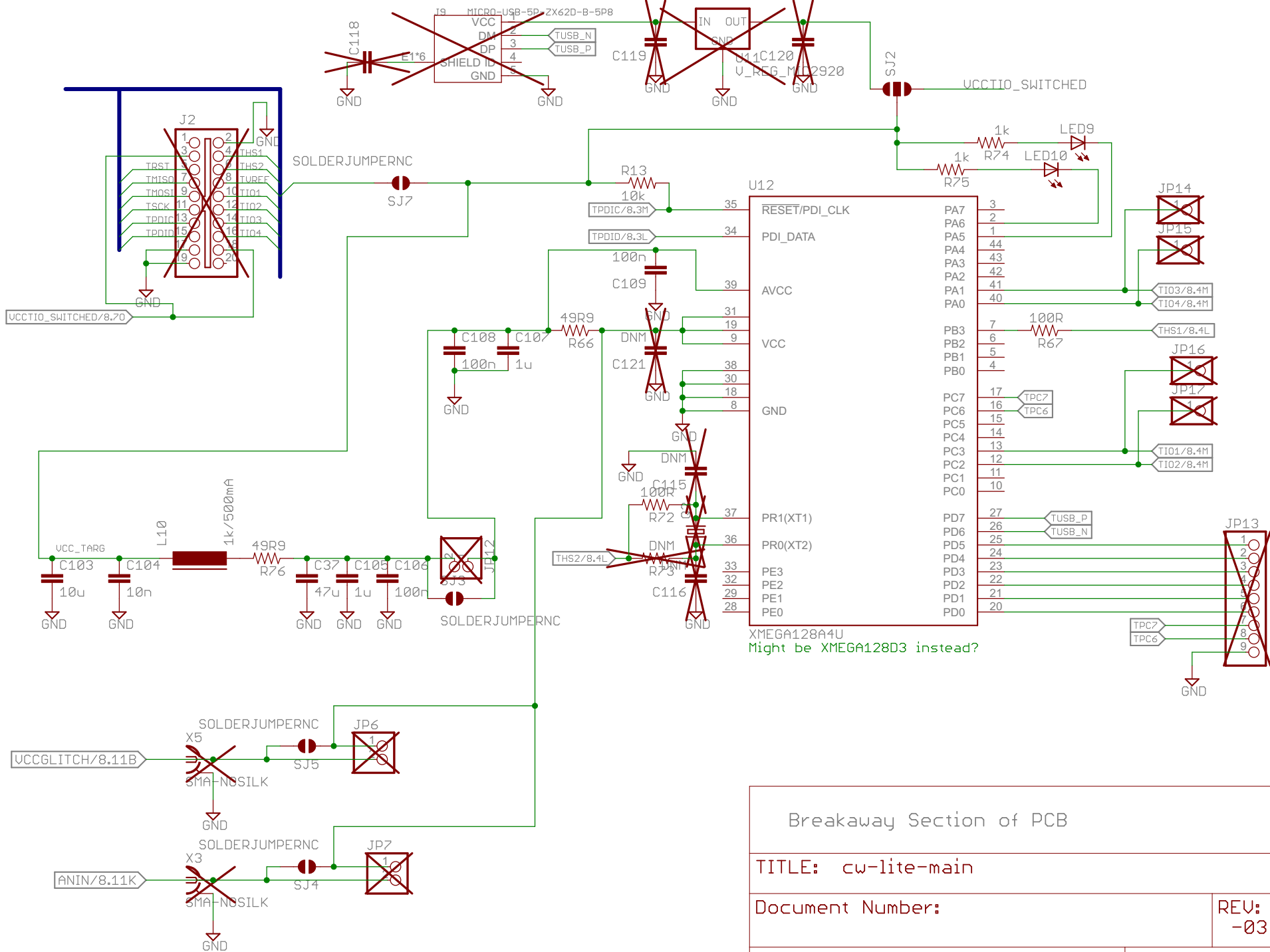
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Breakaway Section of PCB

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