Cyclone V SoC Development & Education Board (DE0-Nano-SoC)

Title: **DE0-Nano-SoC Board**

Size	Document Number	Rev
B	Cover Page	A1

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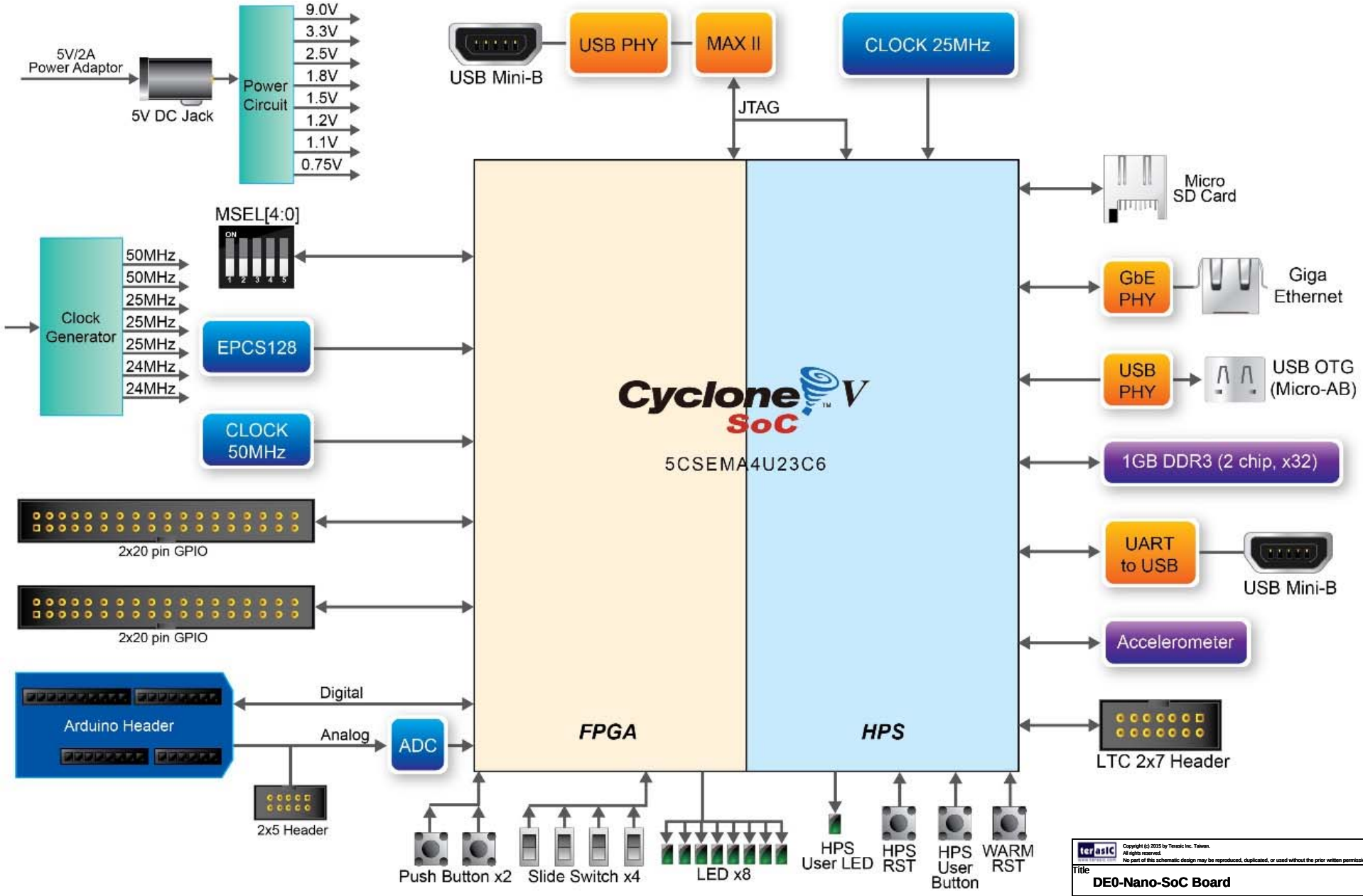

Title
DE0-Nano-SoC Board

Size	Document Number	Rev
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CYCLONE V SoC BANK 3

Bank 3A
VCCIO = 3.3V

Y11	IO_3A/PR_ERROR/DIFFIO_RX_B7P	
AA11	IO_3A/PR_DONE/DIFFIO_RX_B7N	
AD5	IO_3A/DIFFIO_TX_B8P/DQ1B	
AE6	IO_3A/PR_READY/DIFFIO_TX_B8N/DQ1B	

Bank 3B
VCCIO = 3.3V

GPIO_0_D21	AE4	IO_3B/DIFFIO_TX_B9P/B_WEN/DQ2B	IO_3B/DIFFIO_TX_B17P/B_BA_0/DQ3B	AF7	GPIO_0_D1
GPIO_0_D18	AF4	IO_3B/DIFFIO_TX_B9N/GND	IO_3B/DIFFIO_TX_B17N/GND	AG6	GPIO_0_D19
GPIO_0_D28	AD10	IO_3B/DIFFIO_RX_B10P/B_A_14/DQ2B	IO_3B/DIFFIO_RX_B18P/B_BA_1/DQ3B	AF11	GPIO_0_D34
GPIO_0_D29	AE9	IO_3B/DIFFIO_RX_B10N/B_A_15/DQ2B	IO_3B/DIFFIO_RX_B18N/B_BA_2/DQ3B	AF10	GPIO_0_D31
GPIO_0_D23	T11	IO_3B/DIFFIO_RX_B11P/B_CSN_0/DQS2B	IO_3B/DIFFIO_RX_B19P/B_CK/DQS3B	T13	GPIO_0_D22
GPIO_0_D9	U11	IO_3B/DIFFIO_RX_B11N/B_CSN_1/DQSN2B	IO_3B/DIFFIO_RX_B19N/B_CKN/DQSN3B	T12	GPIO_0_D11
GPIO_0_D24	AE7	IO_3B/DIFFIO_TX_B12P/B_A_12	IO_3B/DIFFIO_TX_B20P/B_A_6	AH3	GPIO_0_D16
GPIO_0_D3	AF8	IO_3B/DIFFIO_TX_B12N/B_A_13/DQ2B	IO_3B/DIFFIO_TX_B20N/B_A_7/DQ3B	AH2	GPIO_0_D17
GPIO_0_D27	AE8	IO_3B/DIFFIO_TX_B13P/B_A_10/DQ2B			
GPIO_0_D26	AF9	IO_3B/DIFFIO_TX_B13N/B_A_11/DQ2B			
GPIO_0_D30	AD11	IO_3B/DIFFIO_RX_B14P/B_A_8/DQ2B	IO_3B/DIFFIO_RX_B22P/B_A_4/DQ3B	AE12	GPIO_0_D35
GPIO_0_D33	AE11	IO_3B/DIFFIO_RX_B14N/B_A_9/DQ2B	IO_3B/DIFFIO_RX_B22N/B_A_5/DQ3B	AD12	GPIO_0_D32
GPIO_0_D20	AF5	IO_3B/DIFFIO_TX_B16P/B_CASN/DQ2B	IO_3B/DIFFIO_TX_B24P/B_A_0/DQ3B	AH6	GPIO_0_D13
GPIO_0_D25	AF6	IO_3B/DIFFIO_TX_B16N/B_RASN/DQ2B	IO_3B/DIFFIO_TX_B24N/B_A_1/DQ3B	AH5	GPIO_0_D12

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CYCLONE V SoC BANK 5

Bank 5A
VCCIO = 3.3V

LED4	AF26	IO_5A/RZQ_1/DIFFIO_TX_R1P/DQ1R			
LED5	AE26	IO_5A/PR_REQUEST/DIFFIO_TX_R1N/DQ1R			
			IO_5A/DIFFIO_RX_R6P/DQS1R	Y16	LED6
			IO_5A/DIFFIO_RX_R6N/DQSN1R	W15	LED0
			IO_5A/DIFFIO_TX_R7P/DQ1R	AA24	LED1
	AD26			AA23	LED7
	Y17	IO_5A/CVP_CONFDONE/DIFFIO_TX_R3N/DQ1R	IO_5A/DIFFIO_TX_R7N	V16	LED2
	Y18	IO_5A/DIFFIO_RX_R4P/DQ1R	IO_5A/DIFFIO_RX_R8P/DQ1R	V15	LED3
		IO_5A/DIFFIO_RX_R4N/DQ1R	IO_5A/DIFFIO_RX_R8N/DQ1R		

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User Interface (FPGA)

20	KEY[1..0]	
20	SW[3..0]	
20	LED[7..0]	

GPIO

6,7,19	GPIO_0_D[35..0]
6,19	GPIO_1_D[35..0]

Arduino Digital Interface

19	Arduino_IO[15..0]
19	Arduino_Reset_n

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CYCLONE V SoC BANK 4

Bank 4A
VCCIO = 3.3V

Arduino_Reset_n	AH7	IO_4A/RZQ_0/DIFFIO_TX_B25N			
Arduino_IO6	AG8	IO_4A/DIFFIO_TX_B25P/B_DQ_2/DQ4B	IO_4A/DIFFIO_TX_B41P/B_DQ_18/DQ6B	AF18	GPIO_1_D21
Arduino_IO0	AG13	IO_4A/DIFFIO_RX_B26P/B_DQ_1/DQ4B	IO_4A/DIFFIO_RX_B42P/B_DQ_17/DQ6B	AE19	GPIO_1_D20
Arduino_IO1	AF13	IO_4A/DIFFIO_RX_B26N/B_DQ_0/DQ4B	IO_4A/DIFFIO_RX_B42N/B_DQ_16/DQ6B	AD19	GPIO_1_D22
Arduino_IO4	U14	IO_4A/DIFFIO_RX_B27P/B_DQS_0/DQS4B	IO_4A/DIFFIO_RX_B43P/B_DQS_2/DQS6B	AA19	GPIO_1_D15
Arduino_IO5	U13	IO_4A/DIFFIO_RX_B27N/B_DQSN_0/DQSN4B	IO_4A/DIFFIO_RX_B43N/B_DQSN_2/DQSN6B	AA18	GPIO_1_D34
Arduino_IO3	AG9	IO_4A/DIFFIO_TX_B28P/B_ODT_0	IO_4A/DIFFIO_TX_B44P/B_RESETN	AG18	GPIO_1_D13
Arduino_IO7	AH8	IO_4A/DIFFIO_TX_B28N/B_DQ_3/DQ4B	IO_4A/DIFFIO_TX_B44N/B_DQ_19/DQ6B	AH18	GPIO_1_D31
Arduino_IO2	AG10	IO_4A/DIFFIO_TX_B29P/B_DQ_6/DQ4B	IO_4A/DIFFIO_TX_B45P/B_DQ_22/DQ6B	AG19	GPIO_1_D10
Arduino_IO14	AH9	IO_4A/DIFFIO_TX_B29N/B_ODT_1/DQ4B	IO_4A/DIFFIO_TX_B45N/GND/DQ6B	AH19	GPIO_1_D28
Arduino_IO10	AF15	IO_4A/DIFFIO_RX_B30P/B_DQ_5/DQ4B	IO_4A/DIFFIO_RX_B46P/B_DQ_21/DQ6B	AE20	GPIO_1_D23
Arduino_IO9	AE15	IO_4A/DIFFIO_RX_B30N/B_DQ_4/DQ4B	IO_4A/DIFFIO_RX_B46N/B_DQ_20/DQ6B	AD20	GPIO_1_D25
Arduino_IO15	AG11	IO_4A/DIFFIO_TX_B32P/B_DM_0/DQ4B	IO_4A/DIFFIO_TX_B48P/B_DM_2/DQ6B	AF20	GPIO_1_D11
Arduino_IO12	AH11	IO_4A/DIFFIO_TX_B32N/B_DQ_7/DQ4B	IO_4A/DIFFIO_TX_B48N/B_DQ_23/DQ6B	AG20	GPIO_1_D9
Arduino_IO13	AH12	IO_4A/DIFFIO_TX_B33P/B_DQ_10/DQ5B	IO_4A/DIFFIO_TX_B49P/B_DQ_26/DQ7B	AG21	GPIO_1_D30
Arduino_IO8	AF17			AF22	GPIO_1_D26
Arduino_IO11	AG16	IO_4A/DIFFIO_RX_B34P/B_DQ_9/DQ5B	IO_4A/DIFFIO_RX_B50P/B_DQ_25/DQ7B	AF21	GPIO_1_D8
	W14	IO_4A/DIFFIO_RX_B34N/B_DQ_8/DQ5B	IO_4A/DIFFIO_RX_B50N/B_DQ_24/DQ7B	AD23	GPIO_1_D32
	V13	IO_4A/DIFFIO_RX_B35P/B_DQS_1/DQS5B	IO_4A/DIFFIO_RX_B51P/B_DQS_3/DQS7B	AE22	GPIO_1_D7
	AG14	IO_4A/DIFFIO_RX_B35N/B_DQSN_1/DQSN5B	IO_4A/DIFFIO_RX_B51N/B_DQSN_3/DQSN7B		
	AH13	IO_4A/DIFFIO_TX_B36P/B_CKE_1			
	AG15	IO_4A/DIFFIO_TX_B36N/B_DQ_11/DQ5B	IO_4A/DIFFIO_TX_B52N/B_DQ_27/DQ7B	AH21	GPIO_1_D29
	AH14	IO_4A/DIFFIO_TX_B37P/B_DQ_14/DQ5B	IO_4A/DIFFIO_TX_B53P/B_DQ_30/DQ7B	AH23	GPIO_1_D18
	AD17	IO_4A/DIFFIO_TX_B37N/B_CKE_0/DQ5B	IO_4A/DIFFIO_TX_B53N/GND/DQ7B	AH22	GPIO_1_D27
	AE17	IO_4A/DIFFIO_RX_B38P/B_DQ_13/DQ5B	IO_4A/DIFFIO_RX_B54P/B_DQ_29/DQ7B	AG23	GPIO_1_D19
		IO_4A/DIFFIO_RX_B38N/B_DQ_12/DQ5B	IO_4A/DIFFIO_RX_B54N/B_DQ_28/DQ7B	AF23	GPIO_1_D6
KEY0	AH17	IO_4A/DIFFIO_TX_B40P/B_DM_1/DQ5B	IO_4A/DIFFIO_TX_B56P/B_DM_3/DQ7B	AG24	GPIO_1_D16
KEY1	AH16	IO_4A/DIFFIO_TX_B40N/B_DQ_15/DQ5B	IO_4A/DIFFIO_TX_B56N/B_DQ_31/DQ7B	AH24	GPIO_1_D5
			IO_4A/DIFFIO_TX_B57P/B_DQ_34/DQ8B	AG26	GPIO_1_D4
			IO_4A/DIFFIO_RX_B58P/B_DQ_33/DQ8B	AE24	GPIO_1_D24
			IO_4A/DIFFIO_RX_B58N/B_DQ_32/DQ8B	AE23	GPIO_1_D33
			IO_4A/DIFFIO_RX_B59P/B_DQS_4/DQS8B	AC22	GPIO_1_D35
			IO_4A/DIFFIO_RX_B59N/B_DQSN_4/DQSN8B	AC23	GPIO_1_D12
			IO_4A/DIFFIO_TX_B60N/B_DQ_35/DQ8B	AH26	GPIO_1_D14
			IO_4A/DIFFIO_TX_B61P/B_DQ_38/DQ8B	AG28	GPIO_1_D1
			IO_4A/DIFFIO_TX_B61N/GND/DQ8B	AH27	GPIO_1_D3
			IO_4A/DIFFIO_RX_B62P/B_DQ_37/DQ8B	AF25	GPIO_1_D17
			IO_4A/DIFFIO_RX_B62N/B_DQ_36/DQ8B	AG25	
			IO_4A/DIFFIO_TX_B64P/B_DM_4/DQ8B	AF27	
			IO_4A/DIFFIO_TX_B64N/B_DQ_39/DQ8B	AF28	

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CYCLONE V SoC BANK 8

Bank 8A
VCCIO = 3.3V

SW0	L10	IO_8A/DIFFIO_RX_T21P	IO_8A/DIFFIO_RX_T23P	L8	
SW1	L9	IO_8A/DIFFIO_RX_T21N	IO_8A/DIFFIO_RX_T23N	K8	
SW2	H6	IO_8A/DIFFIO_TX_T22P			
SW3	H5	IO_8A/DIFFIO_TX_T22N	IO_8A/DIFFIO_TX_T24N	H4	

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Title: **DE0-Nano-SoC Board**

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DDR3 Interface (HPS)

12 HPS_DDR3_ADDR[14..0]
12 HPS_DDR3_BA[2..0]
12 HPS_DDR3_DM[3..0]
12 HPS_DDR3_DQ[31..0]
12 HPS_DDR3_DQS_P[3..0]
12 HPS_DDR3_DQS_N[3..0]
12 HPS_DDR3_RESET_N
12 HPS_DDR3_CK_P
12 HPS_DDR3_CK_N
12 HPS_DDR3_CAS_N
12 HPS_DDR3_RAS_N
12 HPS_DDR3_CS_N
12 HPS_DDR3_WE_N
12 HPS_DDR3_ODT
12 HPS_DDR3_CKE
12 HPS_DDR3_CS1_N
12 HPS_DDR3_CKE1
12 HPS_DDR3_ODT1

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CYCLONE V SoC BANK 6 (HPS)

Bank 6A
VCCIO = 1.5V

R117 100 HPS_DDR3_RZQ D25
HPS_RZQ_0

HPS_DDR3_ADDR0	C28	HPS_DDR/HPS_A_0	
HPS_DDR3_ADDR1	B28	HPS_DDR/HPS_A_1	
HPS_DDR3_ADDR2	E26	HPS_DDR/HPS_A_2	
HPS_DDR3_ADDR3	D26	HPS_DDR/HPS_A_3	
HPS_DDR3_ADDR4	J21	HPS_DDR/HPS_A_4	
HPS_DDR3_ADDR5	J20	HPS_DDR/HPS_A_5	
HPS_DDR3_ADDR6	C26	HPS_DDR/HPS_A_6	
HPS_DDR3_ADDR7	B26	HPS_DDR/HPS_A_7	
HPS_DDR3_ADDR8	F26	HPS_DDR/HPS_A_8	
HPS_DDR3_ADDR9	F25	HPS_DDR/HPS_A_9	
HPS_DDR3_ADDR10	A24	HPS_DDR/HPS_A_10	
HPS_DDR3_ADDR11	B24	HPS_DDR/HPS_A_11	
HPS_DDR3_ADDR12	D24	HPS_DDR/HPS_A_12	
HPS_DDR3_ADDR13	C24	HPS_DDR/HPS_A_13	
HPS_DDR3_ADDR14	G23	HPS_DDR/HPS_A_14	
	F24	HPS_DDR/HPS_A_15	
HPS_DDR3_CK_P	N21	HPS_DDR/HPS_CK	
HPS_DDR3_CK_N	N20	HPS_DDR/HPS_CKn	
HPS_DDR3_CKE	L28	HPS_DDR/HPS_CKE_0	
HPS_DDR3_CKE1	K28	HPS_DDR/HPS_CKE_1	
HPS_DDR3_BA0	A27	HPS_DDR/HPS_BA_0	
HPS_DDR3_BA1	H25	HPS_DDR/HPS_BA_1	
HPS_DDR3_BA2	G25	HPS_DDR/HPS_BA_2	
HPS_DDR3_RAS_N	A25	HPS_DDR/HPS_RASn	
HPS_DDR3_CAS_N	A26	HPS_DDR/HPS_CASn	
HPS_DDR3_WE_N	E25	HPS_DDR/HPS_WEn	
HPS_DDR3_CS_N	L21	HPS_DDR/HPS_CSn_0	
HPS_DDR3_CS1_N	L20	HPS_DDR/HPS_CSn_1	
HPS_DDR3_ODT	D28	HPS_DDR/HPS_ODT_0	
HPS_DDR3_ODT1	G26	HPS_DDR/HPS_ODT_1	

HPS_DDR/HPS_DQ_0	J25	HPS_DDR3_DQ0	
HPS_DDR/HPS_DQ_1	J24	HPS_DDR3_DQ1	
HPS_DDR/HPS_DQ_2	E28	HPS_DDR3_DQ2	
HPS_DDR/HPS_DQ_3	D27	HPS_DDR3_DQ3	
HPS_DDR/HPS_DQ_4	J26	HPS_DDR3_DQ4	
HPS_DDR/HPS_DQ_5	K26	HPS_DDR3_DQ5	
HPS_DDR/HPS_DQ_6	G27	HPS_DDR3_DQ6	
HPS_DDR/HPS_DQ_7	F28	HPS_DDR3_DQ7	
HPS_DDR/HPS_DQS_0	R17	HPS_DDR3_DQS_P0	
HPS_DDR/HPS_DQSn_0	R16	HPS_DDR3_DQS_N0	
HPS_DDR/HPS_DM_0	G28	HPS_DDR3_DM0	
HPS_DDR/HPS_DQ_8	K25	HPS_DDR3_DQ8	
HPS_DDR/HPS_DQ_9	L25	HPS_DDR3_DQ9	
HPS_DDR/HPS_DQ_10	J27	HPS_DDR3_DQ10	
HPS_DDR/HPS_DQ_11	J28	HPS_DDR3_DQ11	
HPS_DDR/HPS_DQ_12	M27	HPS_DDR3_DQ12	
HPS_DDR/HPS_DQ_13	M26	HPS_DDR3_DQ13	
HPS_DDR/HPS_DQ_14	M28	HPS_DDR3_DQ14	
HPS_DDR/HPS_DQ_15	N28	HPS_DDR3_DQ15	
HPS_DDR/HPS_DQS_1	R19	HPS_DDR3_DQS_P1	
HPS_DDR/HPS_DQSn_1	R18	HPS_DDR3_DQS_N1	
HPS_DDR/HPS_DM_1	P28	HPS_DDR3_DM1	
HPS_GPI10	U15		
HPS_GPI11	U16		
HPS_GPI12	AC27		
HPS_GPI13	V24		

Bank 6B
VCCIO = 1.5V

HPS_DDR3_DQ16	N24	HPS_DDR/HPS_DQ_16	
HPS_DDR3_DQ17	N25	HPS_DDR/HPS_DQ_17	
HPS_DDR3_DQ18	T28	HPS_DDR/HPS_DQ_18	
HPS_DDR3_DQ19	U28	HPS_DDR/HPS_DQ_19	
HPS_DDR3_DQ20	N26	HPS_DDR/HPS_DQ_20	
HPS_DDR3_DQ21	N27	HPS_DDR/HPS_DQ_21	
HPS_DDR3_DQ22	R27	HPS_DDR/HPS_DQ_22	
HPS_DDR3_DQ23	V27	HPS_DDR/HPS_DQ_23	
HPS_DDR3_DQS_P2	T19	HPS_DDR/HPS_DQS_2	
HPS_DDR3_DQS_N2	T18	HPS_DDR/HPS_DQSn_2	
HPS_DDR3_DM2	W28	HPS_DDR/HPS_DM_2	
HPS_DDR3_DQ24	R26	HPS_DDR/HPS_DQ_24	
HPS_DDR3_DQ25	R25	HPS_DDR/HPS_DQ_25	
HPS_DDR3_DQ26	AA28	HPS_DDR/HPS_DQ_26	
HPS_DDR3_DQ27	W26	HPS_DDR/HPS_DQ_27	
HPS_DDR3_DQ28	R24	HPS_DDR/HPS_DQ_28	
HPS_DDR3_DQ29	T24	HPS_DDR/HPS_DQ_29	
HPS_DDR3_DQ30	Y27	HPS_DDR/HPS_DQ_30	
HPS_DDR3_DQ31	AA27	HPS_DDR/HPS_DQ_31	
HPS_DDR3_DQS_P3	U19	HPS_DDR/HPS_DQS_3	
HPS_DDR3_DQS_N3	T20	HPS_DDR/HPS_DQSn_3	
HPS_DDR3_DM3	AB28	HPS_DDR/HPS_DM_3	

HPS_DDR/HPS_DQ_32	T26		
HPS_DDR/HPS_DQ_33	U25		
HPS_DDR/HPS_DQ_34	AC28		
HPS_DDR/HPS_DQ_35	V25		
HPS_DDR/HPS_DQ_36	V19		
HPS_DDR/HPS_DQ_37	V20		
HPS_DDR/HPS_DQ_38	AE27		
HPS_DDR/HPS_DQ_39	AD28		
HPS_DDR/HPS_DQS_4	V18		
HPS_DDR/HPS_DQSn_4	V17		
HPS_DDR/HPS_DM_4	AE28		
HPS_GPI0	M25		
HPS_GPI1	K27		
HPS_GPI2	R20		
HPS_GPI3	R21		
HPS_GPI4	R28		
HPS_GPI5	P26		
HPS_GPI6	T17		
HPS_GPI7	T16		
HPS_GPI8	Y28		
HPS_GPI9	Y26		
HPS_DDR/HPS_RESETn	V28	HPS_DDR3_RESET_N	

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UBS PHY Interface (ULPI)

14 HPS_USB_DATA[7..0]
14 HPS_USB_CLKOUT
14 HPS_USB_NXT
14 HPS_USB_DIR
14 HPS_USB_STP
10,14 HPS_USB_RESET

Ethernet PHY Interface (RGMII)

15 HPS_ENET_TX_DATA[3..0]
15 HPS_ENET_GTX_CLK
15 HPS_ENET_TX_EN
15 HPS_ENET_RX_DATA[3..0]
15 HPS_ENET_RX_CLK
15 HPS_ENET_RX_DV
15 HPS_ENET_INT_N
15 HPS_ENET_MDC
15 HPS_ENET_MDIO
10,15,17 HPS_ENET_RESET_N

SD Card Interface

13 HPS_SD_DATA[3..0]
13 HPS_SD_CMD
13 HPS_SD_CLK

UART Interface

13 HPS_UART_RX
13 HPS_UART_TX
13 HPS_CONV_USB_N

HPS Reset

10,17 HPS_WARM_RST_N
10,17 HPS_RESET_N

HPS Clock

6 HPS_CLK1_25
6 HPS_CLK2_25

HPS JTAG INTERFACE

11 HPS_TCK
11 HPS_TMS
11 HPS_TDI
11 HPS_TDO
10 JTAG_TRST

Accelerometer Interface

16 HPS_I2C0_SDAT
16 HPS_I2C0_SCLK
16 HPS_GSENSOR_INT

LTC Interface

16 HPS_I2C1_SDAT
16 HPS_I2C1_SCLK
16 HPS_SPIM_MOSI
16 HPS_SPIM_MISO
16 HPS_SPIM_CLK
16 HPS_SPIM_SS
16 HPS_LTC_GPIO

HPS Key and LED

17 HPS_KEY
17 HPS_LED

VCC3P3
R143 4.7K HPS_PORSEL
R118 4.7K JTAG_TRST
R119 0 DNI HPS_TCK HPS_TMS HPS_TDI HPS_TDO
C89 33p 50V DNI

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CYCLONE V SoC BANK 7 (HPS)

Bank 7A
VCCIO = 3.3V

HPS_WARM_RST_N A23
HPS_RESET_N H19
HPS_CLK1_25 E20
HPS_CLK2_25 D20
HPS_PORSEL E18
JTAG_TRST C22
HPS_TCK K19
HPS_TMS C23
HPS_TDI D22
HPS_TDO B23

HPS_NRST
HPS_NPOR
HPS_CLK1
HPS_CLK2
HPS_PORSEL
HPS_TRST
HPS_TCK
HPS_TMS
HPS_TDI
HPS_TDO

TRACE_CLK/ - / - /HPS_GPIO48 C21
TRACE_D0/SPIS0_CLK/UART0_RX/HPS_GPIO49 A22 HPS_UART_RX
TRACE_D1/SPIS0_MOSI/UART0_TX/HPS_GPIO50 B21 HPS_UART_TX
TRACE_D2/SPIS0_MISO/I2C1_SDA/HPS_GPIO51 A21 HPS_I2C1_SDAT
TRACE_D3/SPIS0_SS0/I2C1_SCL/HPS_GPIO52 K18 HPS_I2C1_SCLK
TRACE_D4/SPIS1_CLK/CAN1_RX/HPS_GPIO53 A20 HPS_LED
TRACE_D5/SPIS1_MOSI/CAN1_TX/HPS_GPIO54 J18 HPS_KEY
TRACE_D6/SPIS1_SS0/I2C0_SDA/HPS_GPIO55 A19 HPS_I2C0_SDAT
TRACE_D7/SPIS1_MISO/I2C0_SCL/HPS_GPIO56 C18 HPS_I2C0_SCLK
SPIM0_CLK/I2C1_SDA/UART0_CTS/HPS_GPIO57 A18
SPIM0_MOSI/I2C1_SCL/UART0_RTS/HPS_GPIO58 C17
SPIM0_MISO/CAN1_RX/UART1_CTS/HPS_GPIO59 B18
SPIM0_SS0,BOOTSEL0/CAN1_TX/UART1_RTS/HPS_GPIO60 J17 HPS_BOOTSEL0
UART0_RX/CAN0_RX/SPIM0_SS1/HPS_GPIO61 A17 HPS_GSENSOR_INT
UART0_TX,CLKSEL1/CAN0_TX/SPIM1_SS1/HPS_GPIO62 H17 HPS_CLOCKSEL1
I2C0_SDA/UART1_RX/SPIM1_CLK/HPS_GPIO63 C19 HPS_SPIM_CLK
I2C0_SCL/UART1_TX/SPIM1_MOSI/HPS_GPIO64 B16 HPS_SPIM_MOSI
CAN0_RX/UART0_RX/SPIM1_MISO/HPS_GPIO65 B19 HPS_SPIM_MISO
CAN0_TX,CLKSEL0/UART0_TX/SPIM1_SS0/HPS_GPIO66 C16 HPS_SPIM_SS

Bank 7B
VCCIO = 3.3V

HPS_ENET_GTX_CLK J15
HPS_ENET_TX_DATA0 A16
HPS_ENET_TX_DATA1 J14
HPS_ENET_TX_DATA2 A15
HPS_ENET_TX_DATA3 D17
HPS_ENET_RX_DATA0 A14
HPS_ENET_MDIO E16
HPS_ENET_MDC A13
HPS_ENET_RX_DV J13
HPS_ENET_TX_EN A12
HPS_ENET_RX_CLK J12
HPS_ENET_RX_DATA1 A11
HPS_ENET_RX_DATA2 C15
HPS_ENET_RX_DATA3 A9
HPS_BOOTSEL2 D15

NAND_ALE/RGMII1_TX_CLK/QSPI_SS3/HPS_GPIO14
NAND_CE/RGMII1_TXD0/USB1_D0/HPS_GPIO15
NAND_CLE/RGMII1_TXD1/USB1_D1/HPS_GPIO16
NAND_RE/RGMII1_TXD2/USB1_D2/HPS_GPIO17
NAND_RB/RGMII1_TXD3/USB1_D3/HPS_GPIO18
NAND_DQ0/RGMII1_RXD0/ - /HPS_GPIO19
NAND_DQ1/RGMII1_MDIO/I2C3_SDA/HPS_GPIO20
NAND_DQ2/RGMII1_MDC/I2C3_SCL/HPS_GPIO21
NAND_DQ3/RGMII1_RX_CTL/USB1_D4/HPS_GPIO22
NAND_DQ4/RGMII1_TX_CTL/USB1_D5/HPS_GPIO23
NAND_DQ5/RGMII1_RX_CLK/USB1_D6/HPS_GPIO24
NAND_DQ6/RGMII1_RXD1/USB1_D7/HPS_GPIO25
NAND_DQ7/RGMII1_RXD2/ - /HPS_GPIO26
NAND_WP/RGMII1_RXD3/QSPI_SS2/HPS_GPIO27
NAND_WE,BOOTSEL2/QSPI_SS1/ - /HPS_GPIO28

QSPI_IO0/ - /USB1_CLK/HPS_GPIO29 A8
QSPI_IO1/ - /USB1_STP/HPS_GPIO30 H16
QSPI_IO2/ - /USB1_DIR/HPS_GPIO31 A7
QSPI_IO3/ - /USB1_NXT/HPS_GPIO32 J16
QSPI_SS0,BOOTSEL1/ - / - /HPS_GPIO33 A6 HPS_BOOTSEL1
QSPI_CLK/ - / - /HPS_GPIO34 C14
QSPI_SS1/ - / - /HPS_GPIO35 B14 HPS_ENET_INT_N

Bank 7C
VCCIO = 3.3V

HPS_SD_CMD D14
HPS_SD_DATA0 C13
HPS_SD_DATA1 B6
HPS_SD_DATA2 B11
HPS_SD_DATA3 B9
B12

SDMMC_CMD/USB0_D0/ - /HPS_GPIO36
SDMMC_D0/USB0_D2/ - /HPS_GPIO38
SDMMC_D1/USB0_D3/ - /HPS_GPIO39
SDMMC_D2/USB0_DIR/ - /HPS_GPIO46
SDMMC_D3/USB0_NXT/ - /HPS_GPIO47
SDMMC_FB_CLK_IN/USB0_CLK/ - /HPS_GPIO44

SDMMC_PWREN/USB0_D1/ - /HPS_GPIO37 A5
SDMMC_D4/USB0_D4/ - /HPS_GPIO40 H13 HPS_LTC_GPIO
SDMMC_D5/USB0_D5/ - /HPS_GPIO41 A4
SDMMC_D6/USB0_D6/ - /HPS_GPIO42 H12 R120 0 DNI HPS_USB_RESET
SDMMC_D7/USB0_D7/ - /HPS_GPIO43 B4 R121 0 DNI HPS_ENET_RESET_N
SDMMC_CCLK_OUT/USB0_STP/ - /HPS_GPIO45 B8 HPS_SD_CLK

Bank 7D
VCCIO = 3.3V

HPS_USB_DATA4 C8
HPS_USB_STP C5
HPS_USB_DIR E5
HPS_USB_NXT D5
HPS_USB_CLKOUT G4
HPS_USB_DATA7 F4
HPS_USB_DATA5 D4
HPS_USB_DATA6 C7

RGMII0_RXD0/USB1_D4/ - /HPS_GPIO5
RGMII0_RXD1/USB1_STP/ - /HPS_GPIO11
RGMII0_RXD2/USB1_DIR/ - /HPS_GPIO12
RGMII0_RXD3/USB1_NXT/ - /HPS_GPIO13
RGMII0_RX_CLK/USB1_CLK/ - /HPS_GPIO10
RGMII0_RX_CTL/USB1_D7/ - /HPS_GPIO8
RGMII0_MDIO/USB1_D5/I2C2_SDA/HPS_GPIO6
RGMII0_MDC/USB1_D6/I2C2_SCL/HPS_GPIO7

RGMII0_TXD0/USB1_D0/ - /HPS_GPIO1 C10 HPS_USB_DATA0
RGMII0_TXD1/USB1_D1/ - /HPS_GPIO2 F5 HPS_USB_DATA1
RGMII0_TXD2/USB1_D2/ - /HPS_GPIO3 C9 HPS_USB_DATA2
RGMII0_TXD3/USB1_D3/ - /HPS_GPIO4 C4 HPS_USB_DATA3
RGMII0_TX_CTL/ - / - /HPS_GPIO9 C6 HPS_CONV_USB_N
RGMII0_TX_CLK/ - / - /HPS_GPIO0 E4

5CSEMA4U23C6N

Default Setting: BOOTSEL[2:0]=101 (Boot from SD CARD)
CLKSEL[1:0] =00

VCC3P3
DNI R127 1K HPS_BOOTSEL0 (BOOTSEL0) R140 10K
R126 1K HPS_BOOTSEL1 (BOOTSEL1) R139 10K DNI
DNI R125 1K HPS_BOOTSEL2 (BOOTSEL2) R138 10K
R124 1K HPS_SPIM_SS (CLOCKSEL0) R137 10K DNI
R123 1K HPS_CLOCKSEL1 (CLOCKSEL1) R135 10K DNI

Title: DE0-Nano-SoC Board
Size: B | Document Number: FPGA Bank 7 | Rev: A1
Date: Tuesday, January 06, 2015 | Sheet 5 of 23

GPIO

3,7,19 — GPIO_0_D[35..0]

3,19 — GPIO_1_D[35..0]

U1B

CYCLONE V SoC Clock

Bank 3B

FPGA_CLK1_50	V11	IO_3B/CLK0P,FPLL_BL_FBP/DIFFIO_RX_B15P
	W11	IO_3B/CLK0N,FPLL_BL_FBN/DIFFIO_RX_B15N
GPIO_0_D0	V12	IO_3B/CLK1P/DIFFIO_RX_B23P
GPIO_0_D2	W12	IO_3B/CLK1N/DIFFIO_RX_B23N

IO_3B/FPLL_BL_CLKOUT0,FPLL_BL_CLKOUTP,FPLL_BL_FB/DIFFIO_TX_B21P/B_A_2/DQ3B — AG5 — GPIO_0_D15

IO_3B/FPLL_BL_CLKOUT1,FPLL_BL_CLKOUTN/DIFFIO_TX_B21N/B_A_3/DQ3B — AH4 — GPIO_0_D14

Bank 4A

FPGA_CLK2_50	Y13	IO_4A/CLK2P/DIFFIO_RX_B31P
	AA13	IO_4A/CLK2N/DIFFIO_RX_B31N
GPIO_1_D0	Y15	IO_4A/CLK3P/DIFFIO_RX_B39P
GPIO_1_D2	AA15	IO_4A/CLK3N/DIFFIO_RX_B39N

Bank 8A

FPGA_CLK1_50 — R159 0 — FPGA_CLK3_50

	E11	IO_8A/CLK6P,FPLL_TL_FBP/DIFFIO_RX_T9P
	D11	IO_8A/CLK6N,FPLL_TL_FBN/DIFFIO_RX_T9N
	D12	IO_8A/CLK7P/DIFFIO_RX_T1P
	C12	IO_8A/CLK7N/DIFFIO_RX_T1N

IO_8A/FPLL_TL_CLKOUT0,FPLL_TL_CLKOUTP,FPLL_TL_FB/DIFFIO_TX_T4P — E8

IO_8A/FPLL_TL_CLKOUT1,FPLL_TL_CLKOUTN/DIFFIO_TX_T4N — D8

5CSEMA4U23C6N

Factory Default Configuration:
50MHz x2
25MHz x3
24MHz x2

Clock Generator

5	HPS_CLK1_25
5	HPS_CLK2_25
15	CLK_ENET_25
10	CLK_UB2_24
14	CLK_USB_24

CAD Note: Place near pin 3 and 5 (C3 & C322)

CAD Note: Place near IC power pin

VCC1P8 — L4 220 ohm, 0.3A — C247 4.7u 6.3V — C49 0.01u 50V — C50 1n 50V

L17 220 ohm, 0.3A — VCC3P3

C253 0.1u 10V — C244 0.1u 10V — C246 0.1u 10V — C252 4.7u 6.3V

U15 CDCE937PWRG4

C236 4p 6.3V DNI — C245 4p 6.3V DNI — Y1 24.00MHz

1	Xin/Clk	Y1	17	R47 18.2 CLK_UB2_24 — Default: 24MHz
20	Xout	Y2	15	R48 18.2 CLK_ENET_25 — Default: 25MHz
2	S0	Y3	14	R49 18.2 CLK_USB_24 — Default: 24MHz
19	S1/SDA	Y4	7	R54 18.2 HPS_CLK1_25 — Default: 25MHz
18	S2/SCL	Y5	8	R55 18.2 HPS_CLK2_25 — Default: 25MHz
4	Vctrl	Y6	12	R56 18.2 FPGA_CLK1_50 — Default: 50MHz
		Y7	11	R57 18.2 FPGA_CLK2_50 — Default: 50MHz

CLK_I2C_SDA — R174 4.7K — VCC3P3

CLK_I2C_SCL — R175 4.7K — VCC3P3

Default : I2C Address 0xDA/0xDB

Title: **DE0-Nano-SoC Board**

Size: B | Document Number: FPGA Clock and Clock Generator | Rev: A1

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FPGA JTAG INTERFACE

11 FPGA_TCK
11 FPGA_TMS
11 FPGA_TDI
11 FPGA_TDO

USB Blaster

10 FPGA_NCONFIG
10 FPGA_CONF_DONE

GPIO

3,6,19 GPIO_0_D[35..0]

ADC

18 ADC_CONVST
18 ADC_SCK
18 ADC_SDO
18 ADC_SDI

R171 0 DNI FPGA_TCK
C35 33p 50V DNI
R169 1K
VCC3P3
R176 10K DNI
R178 0 DNI EPCQ_DCLK
C237 12p 50V DNI
R177 1K DNI

Design Note:
Optional termination resistor for DCLK

CAD Note:
Place near FPGA DCLK pin

U1A

CYCLONE V SoC Configuration

Bank 3A

FPGA_TCK	AB5	TCK
FPGA_TMS	AC7	TMS
FPGA_TDI	W10	TDI
FPGA_TDO	Y9	TDO
EPCQ_DCLK	AA8	DCLK
EPCQ_AS_DATA0	AD7	AS_DATA0,ASDO/DATA0
EPCQ_AS_DATA1	AC6	AS_DATA1/DATA1
EPCQ_AS_DATA2	AC5	AS_DATA2/DATA2
EPCQ_AS_DATA3	AB6	AS_DATA3/DATA3
EPCQ_nCSO	AA6	NCSO/DATA4
GPIO_0_D7	Y4	IO_3A/DATA5/DIFFIO_TX_B2N
GPIO_0_D4	Y8	IO_3A/DATA6/DIFFIO_RX_B1N/DQ1B
GPIO_0_D8	Y5	IO_3A/DATA7/DIFFIO_TX_B2P/DQ1B
GPIO_0_D6	W8	IO_3A/DATA8/DIFFIO_RX_B1P/DQ1B
GPIO_0_D5	AB4	IO_3A/DATA9/DIFFIO_TX_B4N/DQ1B
GPIO_0_D10	T8	IO_3A/DATA10/DIFFIO_RX_B3N/DQSN1B
	AA4	IO_3A/DATA11/DIFFIO_TX_B4P
ADC_CONVST	U9	IO_3A/DATA12/DIFFIO_RX_B3P/DQS1B
ADC_SDO	AD4	IO_3A/DATA13/DIFFIO_TX_B6N/DQ1B
ADC_SCK	V10	IO_3A/DATA14/DIFFIO_RX_B5N/DQ1B
ADC_SDI	AC4	IO_3A/DATA15/DIFFIO_TX_B6P/DQ1B
U10		IO_3A/CLKUSR/DIFFIO_RX_B5P/DQ1B

Bank 5A

AA20	IO_5A/INIT_DONE/DIFFIO_RX_R2P
AC24	IO_5A/DEV_OE/DIFFIO_TX_R5P
AB23	IO_5A/DEV_CLRn/DIFFIO_TX_R5N/DQ1R
Y19	IO_5A/CRC_ERROR/DIFFIO_RX_R2N
AE25	IO_5A/nCEO/DIFFIO_TX_R3P/DQ1R

Bank 9A

CONF_DONE	J8	FPGA_CONF_DONE	R147 10K
nSTATUS	H8	FPGA_NSTATUS	R144 10K
nCONFIG	F7	FPGA_NCONFIG	R136 10K
nCE	E6		
MSEL0	J10	MSEL0	
MSEL1	H9	MSEL1	
MSEL2	G6	MSEL2	
MSEL3	K10	MSEL3	
MSEL4	K9	MSEL4	

5CSEMA4U23C6N

VCC3P3

VCC3P3
C40 0.1u 10V
U28
NC01 NC02 NC03 NC04 NC05 NC06 NC07 NC08
VCC
GND
DATA0 DATA1 DATA2 DATA3 DCLK nCS
EPCQ_AS_DATA0 EPCQ_AS_DATA1 EPCQ_AS_DATA2 EPCQ_AS_DATA3 EPCQ_DCLK EPCQ_NCSO
S25FL128

Default Setup MSEL[4:0] = 10010, AS Fast Mode

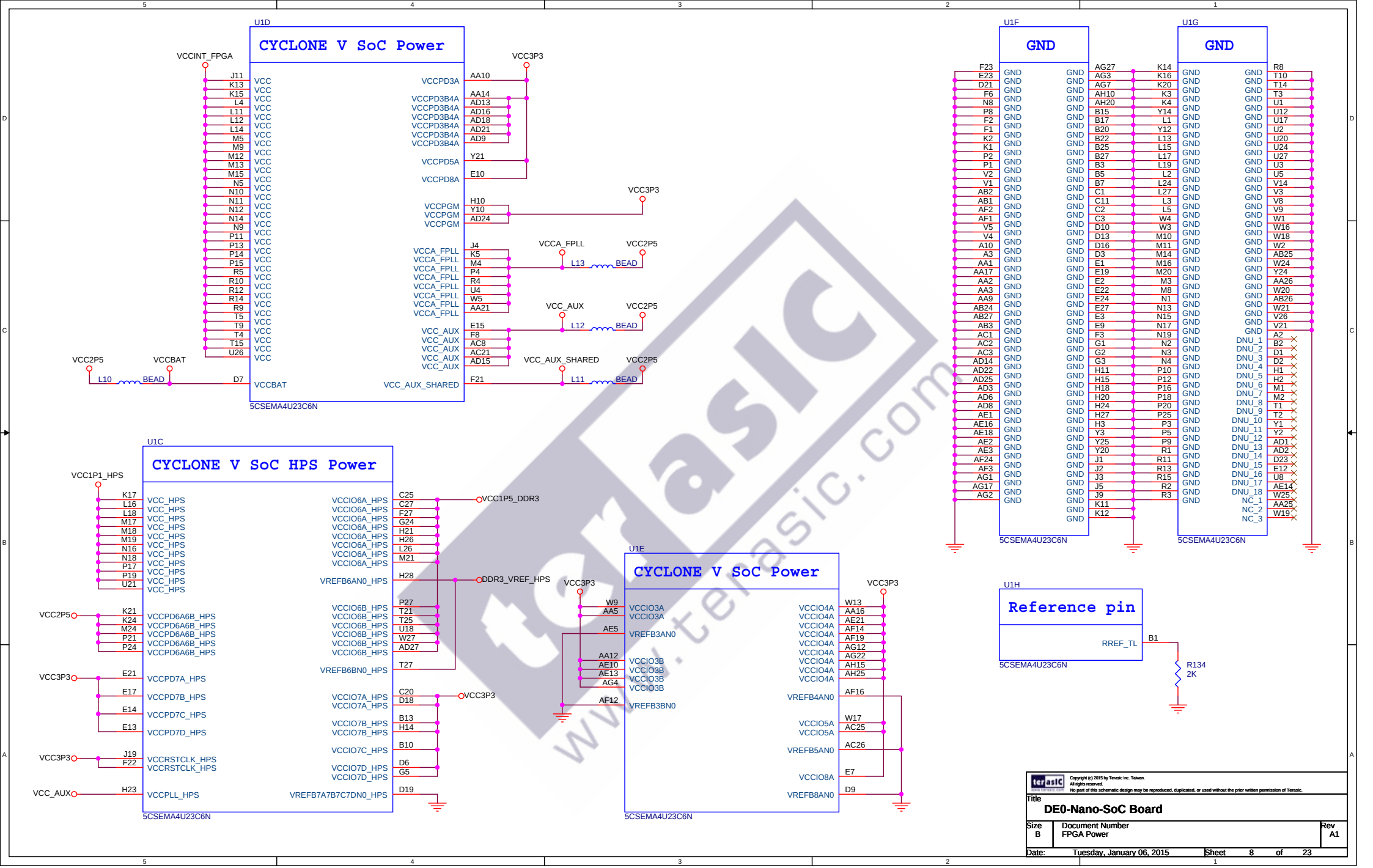
VCC3P3
SW10
1 2 3 4 5 6
12 MSEL0 R8 1K
11 MSEL1 R9 1K
10 MSEL2 R10 1K
9 MSEL3 R11 1K
8 MSEL4 R12 1K
7
SW-DIP12

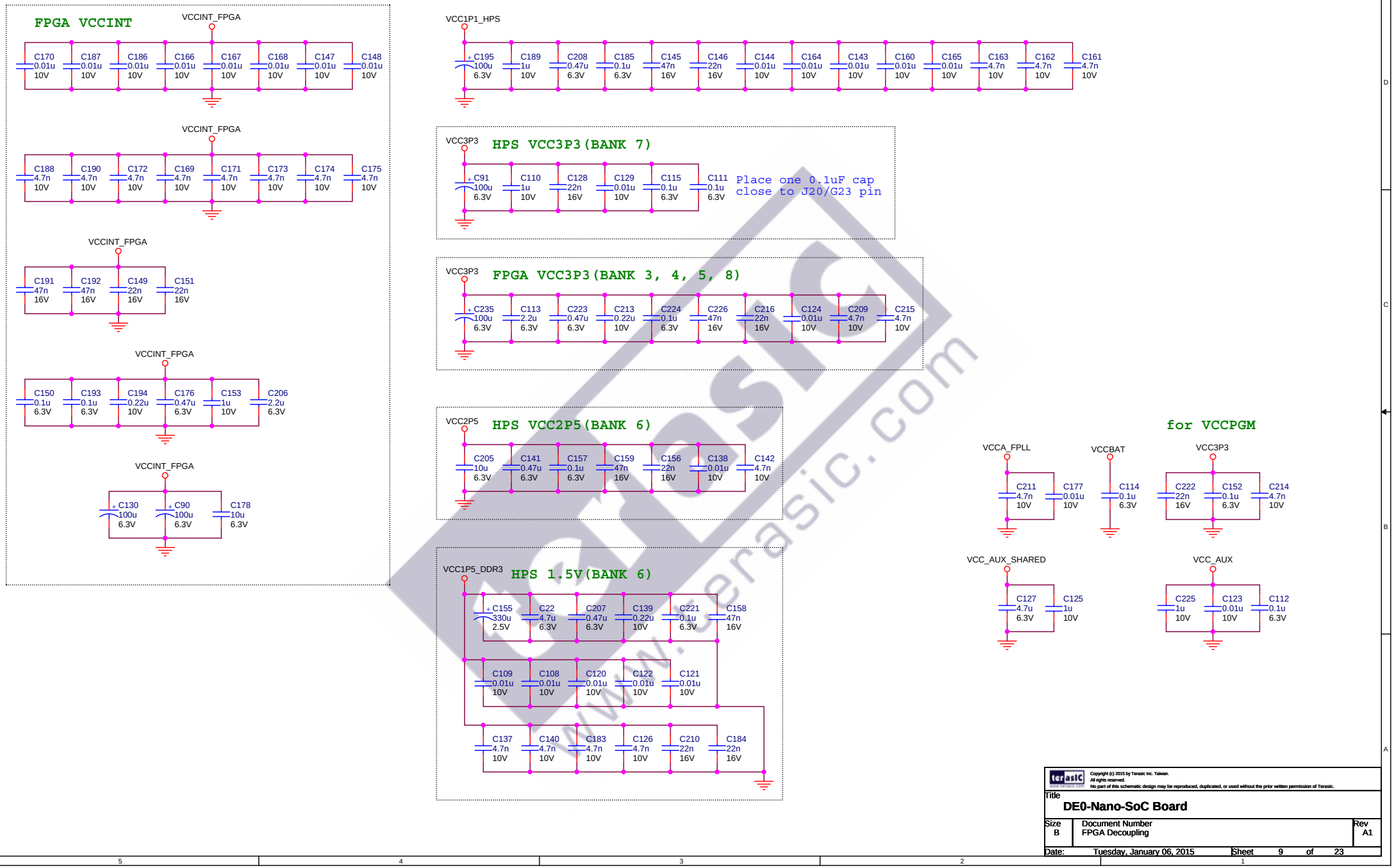
R3 0 DNI MSEL0
R4 0 DNI MSEL1
R5 0 DNI MSEL2
R6 0 DNI MSEL3
R7 0 DNI MSEL4

Title: DE0-Nano-SoC Board

Size	Document Number	Rev
B	FPGA Configuration and EPCS	A1

Date: Tuesday, January 06, 2015 Sheet 7 of 23


U1D
CYCLONE V SoC Power
5CSEMA4U23C6N
VCCINT_FPGA
VCC3P3
VCC2P5
VCCBAT
VCCA_FPLL
L13
BEAD
VCC_AUX
L12
VCC_AUX_SHARED
L11
L10
D7
U1F
GND
U1G
GND
U1C
CYCLONE V SoC HPS Power
VCC1P1_HPS
VCC_HPS
VCCPD6A6B_HPS
VCCPD7A_HPS
VCCPD7B_HPS
VCCPD7C_HPS
VCCPD7D_HPS
VCCRSTCLK_HPS
VCCPLL_HPS
VCCIO6A_HPS
VCCIO6B_HPS
VCCIO7A_HPS
VCCIO7B_HPS
VCCIO7C_HPS
VCCIO7D_HPS
VREFB6AN0_HPS
VREFB6BN0_HPS
VREFB7A7B7C7DN0_HPS
VCC1P5_DDR3
DDR3_VREF_HPS
U1E
CYCLONE V SoC Power
VCCIO3A
VCCIO3B
VREFB3AN0
VREFB3BN0
VCCIO4A
VCCIO5A
VREFB4AN0
VREFB5AN0
VCCIO8A
VREFB8AN0
U1H
Reference pin
RREF_TL
B1
R134
2K
Title
DE0-Nano-SoC Board
Size
B
Document Number
FPGA Power
Rev
A1
Date:
Tuesday, January 06, 2015
Sheet
8
of
23



Title: **DE0-Nano-SoC Board**

Size	Document Number	Rev
B	FPGA Decoupling	A1

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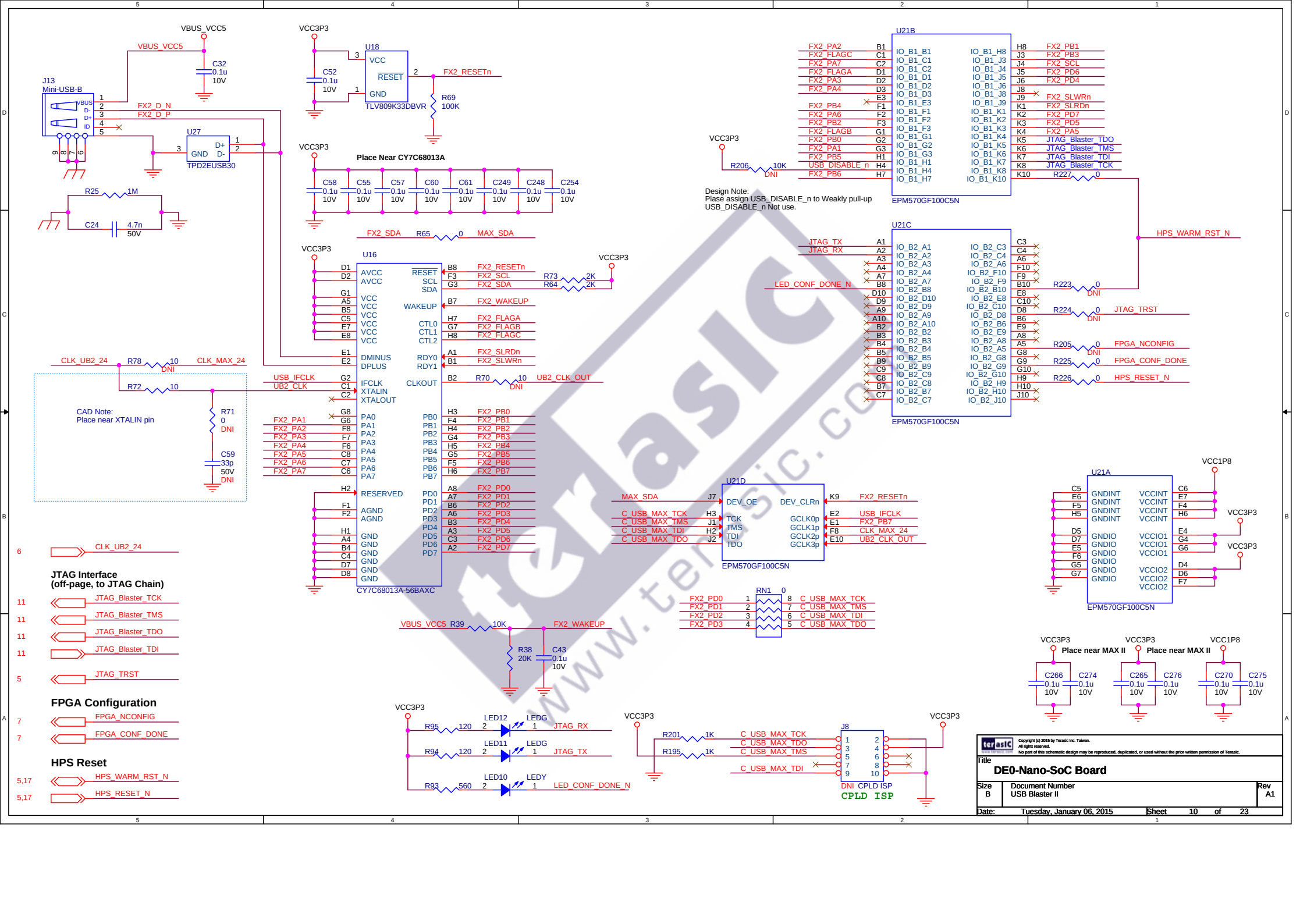
VBUS_VCC5
VCC3P3
J13
Mini-USB-B
U18
TLV809K33DBVR
U27
TPD2EUSB30
Place Near CY7C68013A
U16
CY7C68013A-56BAXC
U21B
U21C
U21D
U21A
EPM570GF100C5N
CAD Note:
Place near XTALIN pin
Design Note:
Plase assign USB_DISABLE_n to Weakly pull-up
USB_DISABLE_n Not use.
JTAG Interface
(off-page, to JTAG Chain)
FPGA Configuration
HPS Reset
Place near MAX II
CPLD ISP
DE0-Nano-SoC Board
Document Number
USB Blaster II
Tuesday, January 06, 2015
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USB Blaster

10 JTAG_Blaster_TCK
10 JTAG_Blaster_TMS
10 JTAG_Blaster_TDO
10 JTAG_Blaster_TDI

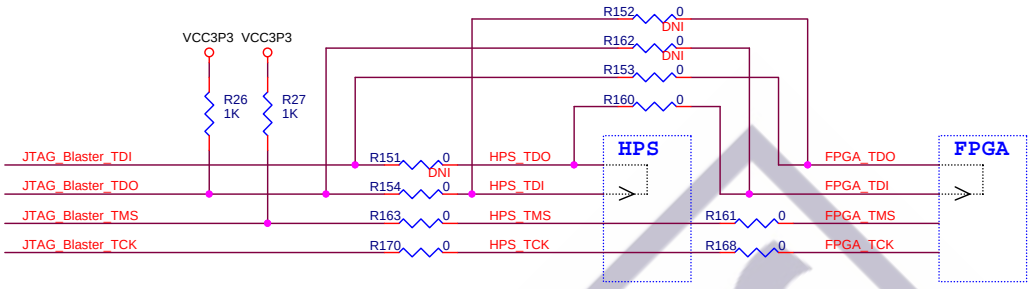
FPGA JTAG INTERFACE

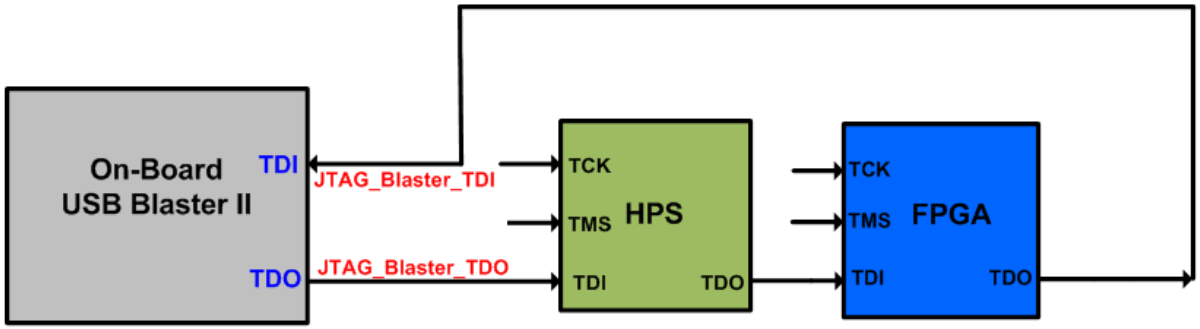
7 FPGA_TCK
7 FPGA_TMS
7 FPGA_TDI
7 FPGA_TDO

HPS JTAG INTERFACE

5 HPS_TCK
5 HPS_TMS
5 HPS_TDI
5 HPS_TDO

JTAG Chain





Title: **DE0-Nano-SoC Board**

Size	Document Number	Rev
B	JTAG Chain	A1

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DDR3 Interface (HPS)

HPS_DDR3_ADDR[14..0]
HPS_DDR3_DQ[31..0]
HPS_DDR3_BA[2..0]
HPS_DDR3_DM[3..0]
HPS_DDR3_DQS_P[3..0]
HPS_DDR3_DQS_N[3..0]
HPS_DDR3_CK_P
HPS_DDR3_CK_N
HPS_DDR3_CKE
HPS_DDR3_CS_N
HPS_DDR3_RESET_N
HPS_DDR3_WE_N
HPS_DDR3_RAS_N
HPS_DDR3_CAS_N
HPS_DDR3_ODT
HPS_DDR3_CS1_N
HPS_DDR3_CKE1
HPS_DDR3_ODT1

Note :
you can only swap the DQ signals
within x8 group (e.g. 0-7,8-15,16-23,24-31)
on the DDR3 chips

Note : you can swap the signals on the OCT resistor array
(include NC pin)

VCC1P5_DDR3 — R22 2K — HPS_DDR3_RESET_N — V30
V1 — HPS_DDR3_CK_P — R132 100 — HPS_DDR3_CK_N — V2

CAD Note:
Place close to DDR3 chip

DDR3_VTT_HPS — CN3 0.1u
DDR3_VTT_HPS — CN2 0.1u
DDR3_VTT_HPS — CN1 0.1u

DDR3_VTT_HPS — RN5: HPS_DDR3_ADDR11 V11, HPS_DDR3_ADDR14 V13, HPS_DDR3_CAS_N V16, HPS_DDR3_WE_N V18, HPS_DDR3_ADDR0 V23, HPS_DDR3_ADDR9 V27, HPS_DDR3_ADDR13 V29, HPS_DDR3_ADDR2 V25 — 51
DDR3_VTT_HPS — RN4: HPS_DDR3_ADDR10 V4, HPS_DDR3_ADDR12 V7, HPS_DDR3_BA1 V6, HPS_DDR3_ADDR1 V9, HPS_DDR3_ADDR4 V8, HPS_DDR3_ADDR6 V10, HPS_DDR3_RAS_N V14, HPS_DDR3_ADDR8 V12 — 51
DDR3_VTT_HPS — RN6: HPS_DDR3_ADDR7 V28, HPS_DDR3_ADDR5 V26, HPS_DDR3_ADDR3 V24, HPS_DDR3_BA2 V21, HPS_DDR3_BA0 V22, HPS_DDR3_CS_N V19, HPS_DDR3_ODT V17, HPS_DDR3_ODT1 V15 — 51
R21 51 DNI — HPS_DDR3_CS1_N V20

R146 4.7K DNI — HPS_DDR3_CKE1 V5
R149 4.7K — HPS_DDR3_CKE V3

VCC1P5_DDR3 — U11 — DDR3_VREF_HPS — IS43TR16256A-15HBL

B2	VDD	VSS	J2		
D9	VDD	VSS	J8		
G7	VDD	VSS	A9		
K2	VDD	VSS	M1		
K8	VDD	VSS	M9		
N1	VDD	VSS	B3		
N9	VDD	VSS	P1		
R1	VDD	VSS	P9		
R9	VDD	VSS	E1		
	VDD	VSS	T1		
		VSS	T9		
A1	VDDQ	VSS	G8		
A8	VDDQ	VSS			
C1	VDDQ				
C9	VDDQ		B1		
D2	VDDQ	VSSQ	B9		
E9	VDDQ	VSSQ	D1		
F1	VDDQ	VSSQ	D8		
H2	VDDQ	VSSQ	E2		
H9	VDDQ	VSSQ	E8		
		VSSQ	F9		
H1	VREFDQ	VSSQ	G1		
M8	VREFCA	VSSQ	G9		
N3	A0	DQ0	E3	HPS_DDR3_DQ16	
P7	A1	DQ1	F7	HPS_DDR3_DQ17	
P3	A2	DQ2	F2	HPS_DDR3_DQ18	
N2	A3	DQ3	F8	HPS_DDR3_DQ19	
P8	A4	DQ4	H3	HPS_DDR3_DQ20	
P2	A5	DQ5	H8	HPS_DDR3_DQ21	
R8	A6	DQ6	G2	HPS_DDR3_DQ22	
R2	A7	DQ7	H7	HPS_DDR3_DQ23	
T8	A8	DQ8	D7	HPS_DDR3_DQ24	
R3	A9	DQ9	C3	HPS_DDR3_DQ25	
L7	A10/AP	DQ10	C8	HPS_DDR3_DQ26	
R7	A11	DQ11	C2	HPS_DDR3_DQ27	
N7	A12/BC_n	DQ12	A7	HPS_DDR3_DQ28	
T3	A13	DQ13	A2	HPS_DDR3_DQ29	
T7	A14	DQ14	B8	HPS_DDR3_DQ30	
J7	CLK	DQ15	A3	HPS_DDR3_DQ31	
K7	CLK_n				
K9	CKE				
L2	CS				
T2	RESET	LDQS	F3	HPS_DDR3_DQS_P2	
L3	WE	LDQSn	G3	HPS_DDR3_DQS_N2	
J3	RAS	UDQS	C7	HPS_DDR3_DQS_P3	
K3	CAS	UDQSn	B7	HPS_DDR3_DQS_N3	
M2	BA0				
N8	BA1	NC1	J1	HPS_DDR3_ODT1	
M3	BA2	NC2	J9	HPS_DDR3_CKE1	
		NC3	L1	HPS_DDR3_CS1_N	
E7	LDM	NC4	L9	HPS_DDR3_ZQ11	R150 240 DNI
D3	UDM	NC5	M7		
K1	ODT	ZQ	L8	HPS_DDR3_ZQ10	R28 240

VCC1P5_DDR3 — U6 — DDR3_VREF_HPS — IS43TR16256A-15HBL

B2	VDD	VSS	J2		
D9	VDD	VSS	J8		
G7	VDD	VSS	A9		
K2	VDD	VSS	M1		
K8	VDD	VSS	M9		
N1	VDD	VSS	B3		
N9	VDD	VSS	P1		
R1	VDD	VSS	P9		
R9	VDD	VSS	E1		
	VDD	VSS	T1		
		VSS	T9		
A1	VDDQ	VSS	G8		
A8	VDDQ	VSS			
C1	VDDQ				
C9	VDDQ		B1		
D2	VDDQ	VSSQ	B9		
E9	VDDQ	VSSQ	D1		
F1	VDDQ	VSSQ	D8		
H2	VDDQ	VSSQ	E2		
H9	VDDQ	VSSQ	E8		
		VSSQ	F9		
H1	VREFDQ	VSSQ	G1		
M8	VREFCA	VSSQ	G9		
N3	A0	DQ0	E3	HPS_DDR3_DQ0	
P7	A1	DQ1	F7	HPS_DDR3_DQ1	
P3	A2	DQ2	F2	HPS_DDR3_DQ2	
N2	A3	DQ3	F8	HPS_DDR3_DQ3	
P8	A4	DQ4	H3	HPS_DDR3_DQ4	
P2	A5	DQ5	H8	HPS_DDR3_DQ5	
R8	A6	DQ6	G2	HPS_DDR3_DQ6	
R2	A7	DQ7	H7	HPS_DDR3_DQ7	
T8	A8	DQ8	D7	HPS_DDR3_DQ8	
R3	A9	DQ9	C3	HPS_DDR3_DQ9	
L7	A10/AP	DQ10	C8	HPS_DDR3_DQ10	
R7	A11	DQ11	C2	HPS_DDR3_DQ11	
N7	A12/BC_n	DQ12	A7	HPS_DDR3_DQ12	
T3	A13	DQ13	A2	HPS_DDR3_DQ13	
T7	A14	DQ14	B8	HPS_DDR3_DQ14	
J7	CLK	DQ15	A3	HPS_DDR3_DQ15	
K7	CLK_n				
K9	CKE				
L2	CS				
T2	RESET	LDQS	F3	HPS_DDR3_DQS_P0	
L3	WE	LDQSn	G3	HPS_DDR3_DQS_N0	
J3	RAS	UDQS	C7	HPS_DDR3_DQS_P1	
K3	CAS	UDQSn	B7	HPS_DDR3_DQS_N1	
M2	BA0				
N8	BA1	NC1	J1	HPS_DDR3_ODT1	
M3	BA2	NC2	J9	HPS_DDR3_CKE1	
		NC3	L1	HPS_DDR3_CS1_N	
E7	LDM	NC4	L9	HPS_DDR3_ZQ01	R114 240 DNI
D3	UDM	NC5	M7		
K1	ODT	ZQ	L8	HPS_DDR3_ZQ00	R115 240

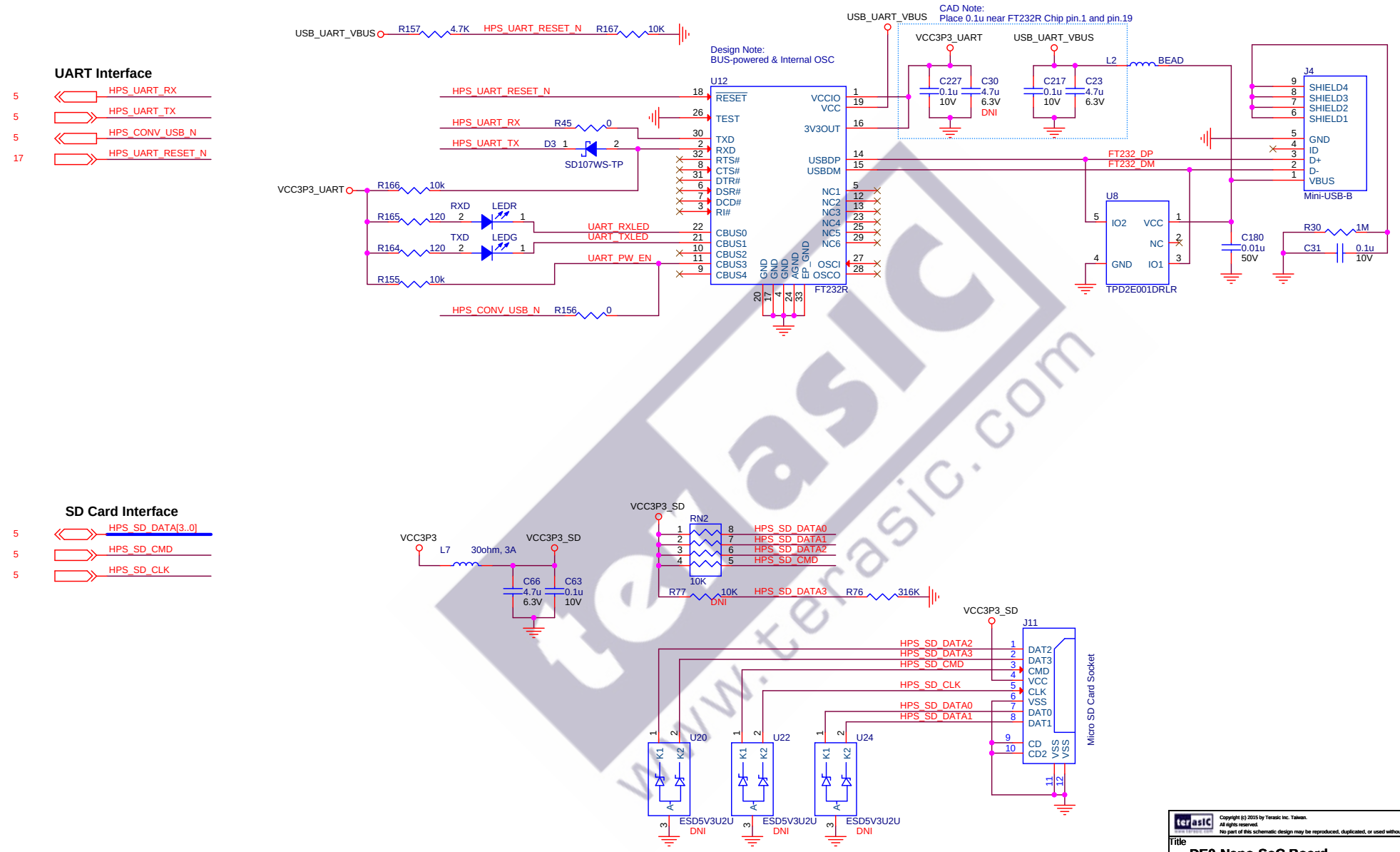
VCC1P5_DDR3 — C204 2.2n 50V, C203 2.2n 50V, C201 2.2n 50V, C181 2.2n 50V, C199 2.2n 50V, C200 2.2n 50V, C198 3.3n 50V, C202 4.7n 50V, C182 0.01u 50V, C233 0.01u 50V, C220 0.01u 50V

VCC1P5_DDR3 — C105 2.2n 50V, C104 2.2n 50V, C103 2.2n 50V, C101 2.2n 50V, C102 2.2n 50V, C100 2.2n 50V, C99 3.3n 50V, C97 4.7n 50V, C135 0.01u 50V, C134 0.01u 50V, C133 0.01u 50V

VCC1P5_DDR3 — C219 0.1u 10V, C232 0.1u 10V, C231 0.1u 10V, C218 0.47u 10V, C228 0.47u 10V, C229 0.47u 10V
DDR3_VREF_HPS — C230 0.1u 10V, C197 0.1u 10V

VCC1P5_DDR3 — C117 0.1u 10V, C154 0.1u 10V, C131 0.1u 10V, C119 0.47u 10V, C118 0.47u 10V, C87 0.47u 10V
DDR3_VREF_HPS — C98 0.1u 10V, C132 0.1u 10V

Title: DE0-Nano-SoC Board
Size: B | Document Number: HPS : DDR3 SDRAM | Rev: A1
Date: Tuesday, January 06, 2015 | Sheet 12 of 23


UART Interface
HPS_UART_RX
HPS_UART_TX
HPS_CONV_USB_N
HPS_UART_RESET_N
USB_UART_VBUS
R157 4.7K HPS_UART_RESET_N R167 10K
Design Note:
BUS-powered & Internal OSC
CAD Note:
Place 0.1u near FT232R Chip pin.1 and pin.19
U12
RESET
TEST
TXD
RXD
RTS#
CTS#
DTR#
DSR#
DCD#
RI#
CBUS0
CBUS1
CBUS2
CBUS3
CBUS4
VCCIO
VCC
3V3OUT
USBDP
USBDM
NC1
NC2
NC3
NC4
NC5
NC6
OSCI
OSCO
GND
AGND
EP
FT232R
R45 0
D3
SD107WS-TP
R166 10k
R165 120
R164 120
R155 10k
RXD
TXD
LEDR
LEDG
UART_RXLED
UART_TXLED
UART_PW_EN
R156 0
VCC3P3_UART
C227 0.1u 10V
C30 4.7u 6.3V DNI
C217 0.1u 10V
C23 4.7u 6.3V
L2 BEAD
FT232_DP
FT232_DM
J4
SHIELD4
SHIELD3
SHIELD2
SHIELD1
GND
ID
D+
D-
VBUS
Mini-USB-B
U8
IO2
VCC
NC
GND
IO1
TPD2E001DRLR
C180 0.01u 50V
R30 1M
C31 0.1u 10V
SD Card Interface
HPS_SD_DATA[3..0]
HPS_SD_CMD
HPS_SD_CLK
VCC3P3
L7 30ohm, 3A
VCC3P3_SD
C66 4.7u 6.3V
C63 0.1u 10V
RN2
HPS_SD_DATA0
HPS_SD_DATA1
HPS_SD_DATA2
HPS_SD_CMD
10K
R77 10K DNI
HPS_SD_DATA3
R76 316K
J11
DAT2
DAT3
CMD
VCC
CLK
VSS
DAT0
DAT1
CD
CD2
VSS
Micro SD Card Socket
U20
U22
U24
K1
K2
A
ESD5V3U2U
DNI
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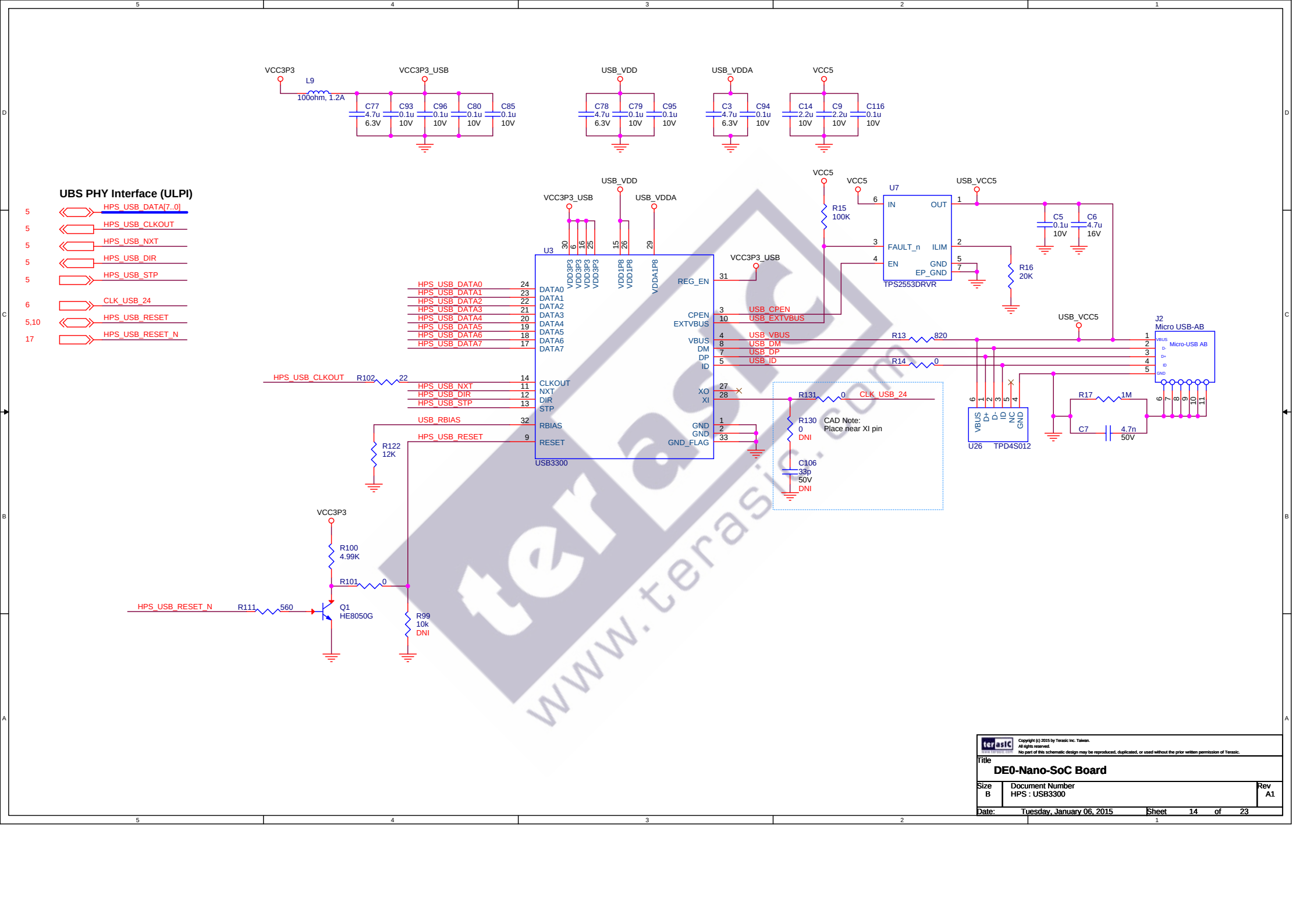
Title
DE0-Nano-SoC Board
Size B
Document Number
HPS : UART to USB & SD CARD
Rev A1
Date: Tuesday, January 06, 2015
Sheet 13 of 23


UBS PHY Interface (ULPI)
HPS_USB_DATA[7..0]
HPS_USB_CLKOUT
HPS_USB_NXT
HPS_USB_DIR
HPS_USB_STP
CLK_USB_24
HPS_USB_RESET
HPS_USB_RESET_N
VCC3P3
L9
100ohm, 1.2A
VCC3P3_USB
C77 4.7u 6.3V
C93 0.1u 10V
C96 0.1u 10V
C80 0.1u 10V
C85 0.1u 10V
USB_VDD
C78 4.7u 6.3V
C79 0.1u 10V
C95 0.1u 10V
USB_VDDA
C3 4.7u 6.3V
C94 0.1u 10V
VCC5
C14 2.2u 10V
C9 2.2u 10V
C116 0.1u 10V
U3
USB3300
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
CLKOUT
NXT
DIR
STP
RBIAS
RESET
REG_EN
CPEN
EXTVBUS
VBUS
DM
DP
ID
XO
XI
GND
GND_FLAG
R102 22
R122 12K
R100 4.99K
R101 0
R111 560
Q1 HE8050G
R99 10k DNI
R15 100K
U7
TPS2553DRVR
IN
OUT
FAULT_n
ILIM
EN
GND
EP_GND
R16 20K
C5 0.1u 10V
C6 4.7u 16V
R13 820
R14 0
J2
Micro USB-AB
U26 TPD4S012
R17 1M
C7 4.7n 50V
R131 0
R130 0 DNI
CAD Note:
Place near XI pin
C106 33p 50V DNI
Title
DE0-Nano-SoC Board
Size B
Document Number HPS : USB3300
Rev A1
Date: Tuesday, January 06, 2015
Sheet 14 of 23

Ethernet PHY Interface (RGMII)

HPS_ENET_TX_DATA[3..0]
HPS_ENET_GTX_CLK
HPS_ENET_TX_EN
HPS_ENET_RX_DATA[3..0]
HPS_ENET_RX_CLK
HPS_ENET_RX_DV
HPS_ENET_INT_N
HPS_ENET_MDC
HPS_ENET_MDIO
HPS_ENET_RESET_N
CLK_ENET_25

U17 — KSZ9031RNX

ENET_PLL, ENET_VCCA, ENET_DVDDL, ENET_AVDD, ENET_DVDDH
HPS_ENET_LDO_O

HPS_ENET_GTX_CLK	GTX_CLK
HPS_ENET_TX_EN	TX_EN
HPS_ENET_TX_DATA0	TXD0
HPS_ENET_TX_DATA1	TXD1
HPS_ENET_TX_DATA2	TXD2
HPS_ENET_TX_DATA3	TXD3
HPS_ENET_RX_CLK	RX_CLK/PHYAD2
HPS_ENET_RX_DV	RX_DV/CLK125_EN
HPS_ENET_RX_DATA0	RXD0/MODE0
HPS_ENET_RX_DATA1	RXD1/MODE1
HPS_ENET_RX_DATA2	RXD2/MODE2
HPS_ENET_RX_DATA3	RXD3/MODE3
CLK125_NDO_LED_MODE	CLK125_NDO/LED_MODE
HPS_ENET_INT_N	INT_N
HPS_ENET_RESET_N	RESET_N
HPS_ENET_MDC	MDC
HPS_ENET_MDIO	MDIO

TXRXP_A / TXRXM_A	MDI_HPS_P0 / MDI_HPS_N0
TXRXP_B / TXRXM_B	MDI_HPS_P1 / MDI_HPS_N1
TXRXP_C / TXRXM_C	MDI_HPS_P2 / MDI_HPS_N2
TXRXP_D / TXRXM_D	MDI_HPS_P3 / MDI_HPS_N3
LED1/PHYAD0	LED2_DUAL_1
LED2/PHYAD1	LED2_DUAL_2
ISET	R84 12.1K
XI	R82 0 CLK_ENET_25
XO	R83 0 DNI; C64 33p 50V DNI

CAD Note: Place near XI pin

VSS, VSS_PS, PADDLE

J10 — 8207S-810X4372

GND1, GND2, SHIELD_1, SHIELD_2
R46 10; C47 0.01u 50V
LEDG+ / LEDG- / LEDY+ / LEDY-
R88 220 — LED2_DUAL_2
R43 220 — LED2_DUAL_1
VCC3P3

VCC3P3
R202 4.7K HPS_ENET_INT_N
R74 4.7K HPS_ENET_MDC
R203 4.7K HPS_ENET_MDIO
R81 4.7K HPS_ENET_RESET_N

C65 10n 50V DNI — R86 49.9 DNI MDI_HPS_P0; R85 49.9 DNI MDI_HPS_N0
C62 10n 50V DNI — R75 49.9 DNI MDI_HPS_P1; R68 49.9 DNI MDI_HPS_N1
C56 10n 50V DNI — R63 49.9 DNI MDI_HPS_P2; R62 49.9 DNI MDI_HPS_N2
C51 10n 50V DNI — R53 49.9 DNI MDI_HPS_P3; R52 49.9 DNI MDI_HPS_N3

PHY Address is 00001

ENET_DVDDH
R173 4.7K LED2_DUAL_1 — R181 1K DNI
R220 4.7K DNI LED2_DUAL_2 — R228 1K DNI
R67 4.7K DNI HPS_ENET_RX_CLK — R197 1K DNI

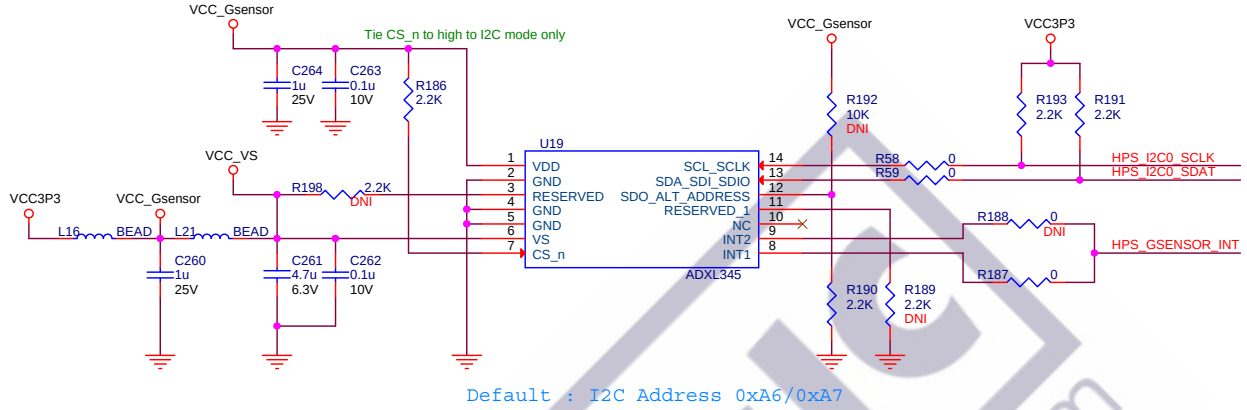
VCC3P3
R80 4.7K DNI CLK125_NDO_LED_MODE — R79 4.7K DNI
R66 4.7K DNI HPS_ENET_RX_DV — R196 4.7K DNI
R41 4.7K DNI HPS_ENET_GTX_CLK — R42 4.7K DNI
R61 4.7K DNI HPS_ENET_RX_DATA0 — R185 4.7K DNI
R60 4.7K DNI HPS_ENET_RX_DATA1 — R184 4.7K DNI
R51 4.7K DNI HPS_ENET_RX_DATA2 — R183 4.7K DNI
R50 4.7K DNI HPS_ENET_RX_DATA3 — R182 4.7K DNI

VCC3P3 — L18 100ohm, 1.2A — ENET_AVDD: C255 0.22u 50V; C239 1u 10V; C267 10u 6.3V
VCC1P2 — L15 100ohm, 1.2A — ENET_VCCA: C251 0.22u 50V; C250 1u 10V; C240 10u 6.3V
VCC3P3 — L20 100ohm, 1.2A — ENET_DVDDH: C258 0.22u 50V; C259 1u 10V; C269 10u 6.3V
VCC1P2 — L19 100ohm, 1.2A — ENET_PLL: C257 0.22u 50V; C256 1u 10V; C268 10u 6.3V
VCC1P2 — L14 100ohm, 1.2A — ENET_DVDDL: C241 0.22u 50V; C243 1u 10V; C242 10u 6.3V

ENET_AVDD — Q5 AO3415 DNI — VCC1P2
HPS_ENET_LDO_O

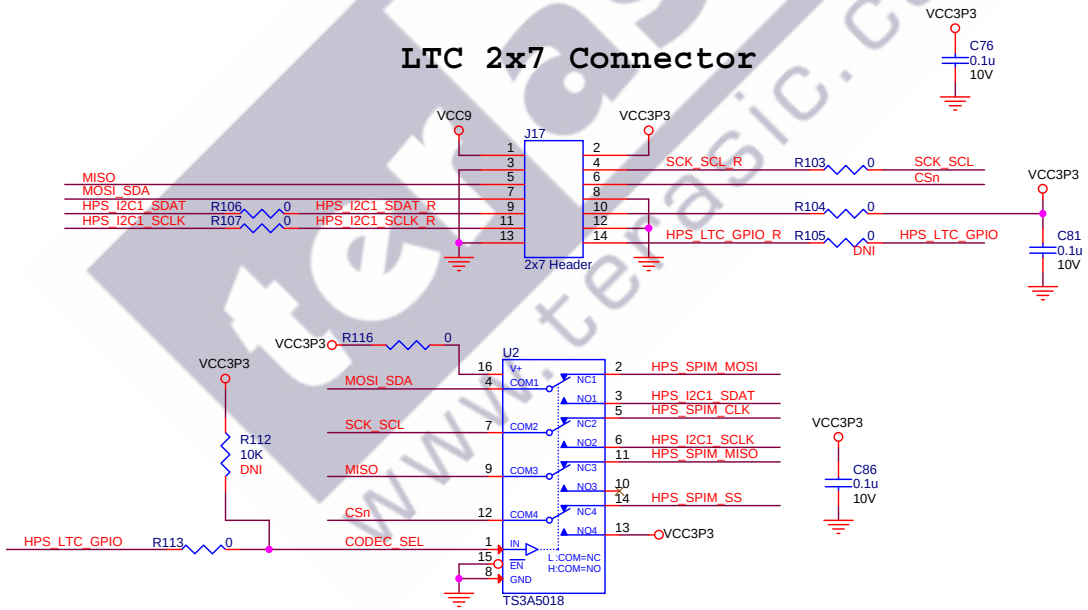
Title: DE0-Nano-SoC Board
Size: B | Document Number: HPS : Gagabit Ethernet | Rev: A1
Date: Tuesday, January 06, 2015 | Sheet 15 of 23

Digital Accelerometer



Default : I2C Address 0xA6/0xA7

LTC 2x7 Connector

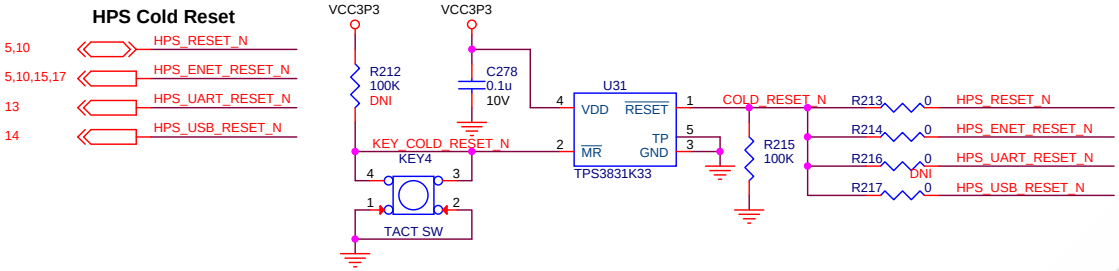


Title: **DE0-Nano-SoC Board**

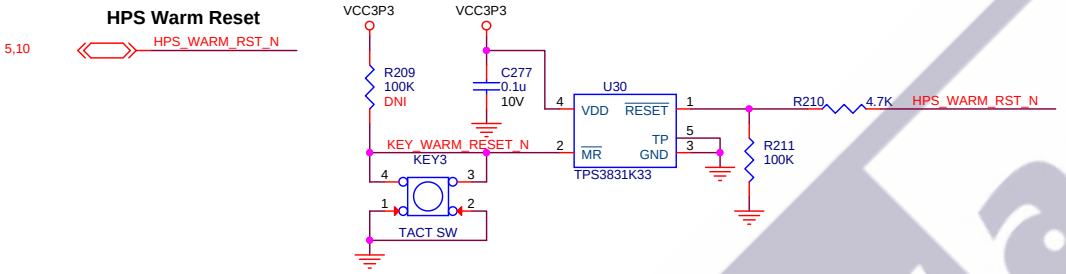
Size	Document Number	Rev
B	HPS : Accelerometer, LTC Connector	A1

Date: Tuesday, January 06, 2015 Sheet 16 of 23

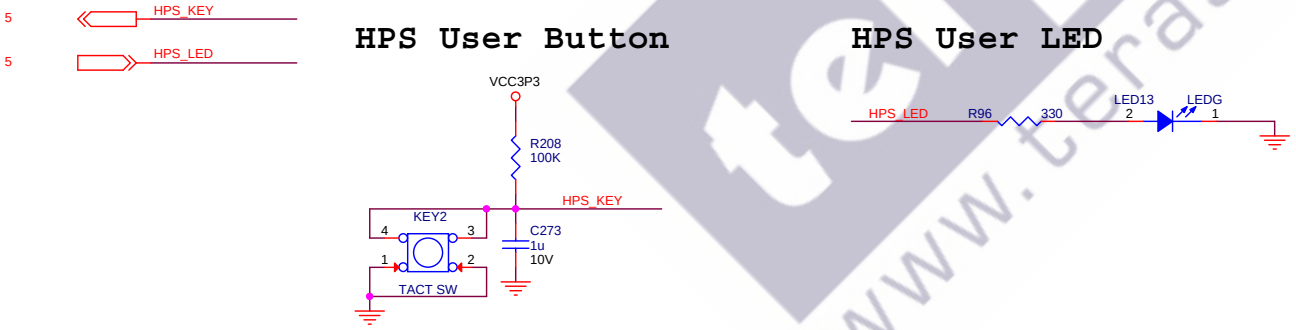
HPS Cold Reset



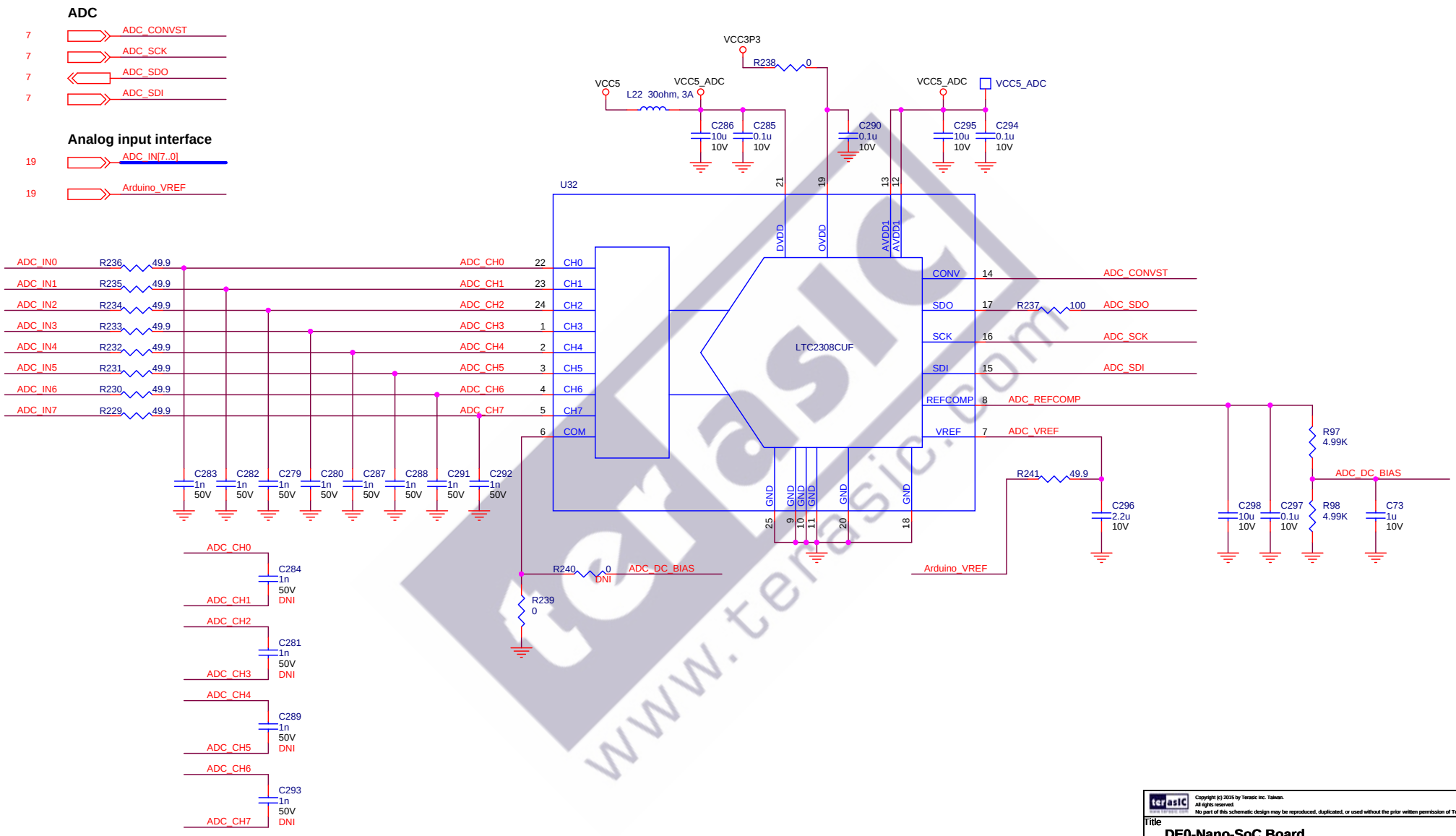
HPS Warm Reset



HPS Key and LED



Title	DE0-Nano-SoC Board	
Size: B	Document Number: HPS : BUTTON and LED	Rev: A1
Date: Tuesday, January 06, 2015	Sheet 17 of 23	



Title: **DE0-Nano-SoC Board**

Size	Document Number	Rev
B	FPGA : ADC1 - LTC2308 for ADC Header Analog input	A1

Date: Tuesday, January 06, 2015 Sheet 18 of 23

GPIO

3,6,7 — GPIO_0_D[35..0]

3,6 — GPIO_1_D[35..0]

Arduino Digital Interface

3 — Arduino_IO[15..0]

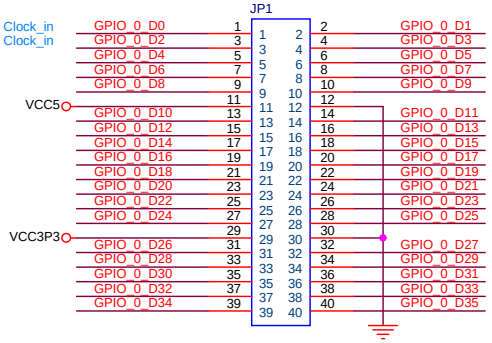
3 — Arduino_Reset_n

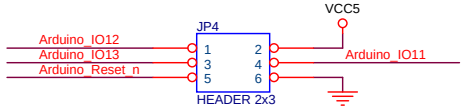
Analog input interface

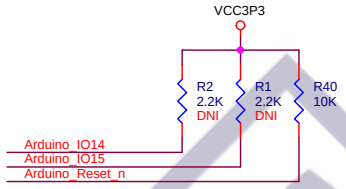
18 — ADC_IN[7..0]

18 — Arduino_VREF

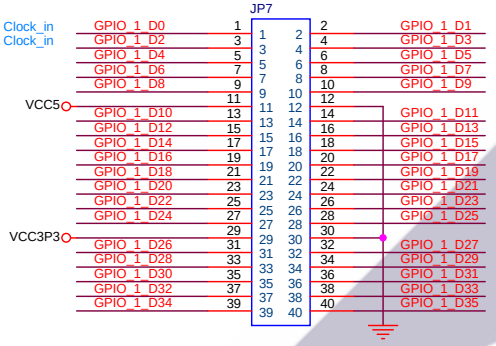
GPIO 0 Header



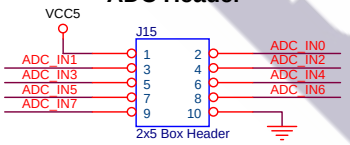




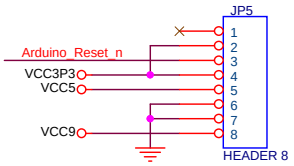
GPIO 1 Header

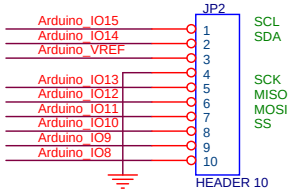


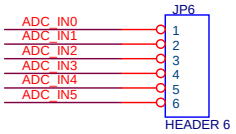
ADC Header

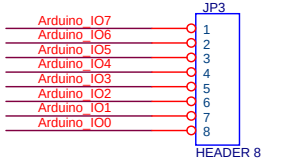


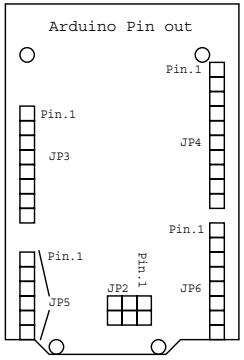
Arduino UNO Rev3







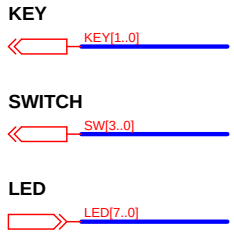


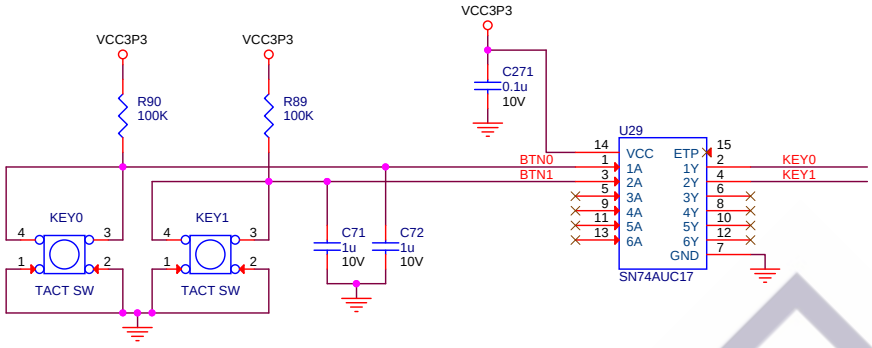


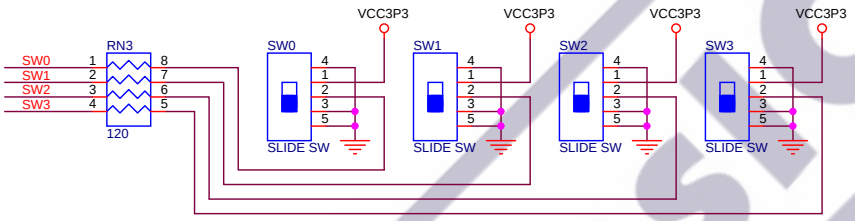
Title: **DE0-Nano-SoC Board**

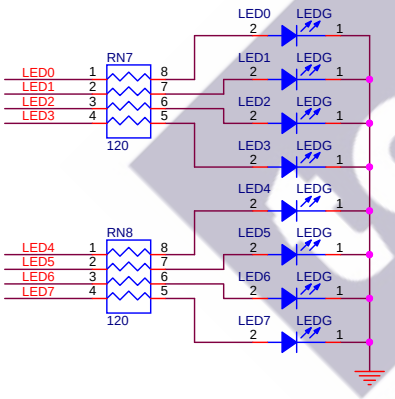
Size	Document Number	Rev
B	FPGA : GPIO, ADC & Arduino Expansion Header	A1

Date: Tuesday, January 06, 2015 — Sheet 19 of 23









Title	DE0-Nano-SoC Board	
Size B	Document Number FPGA : LED, KEY, SW	Rev A1
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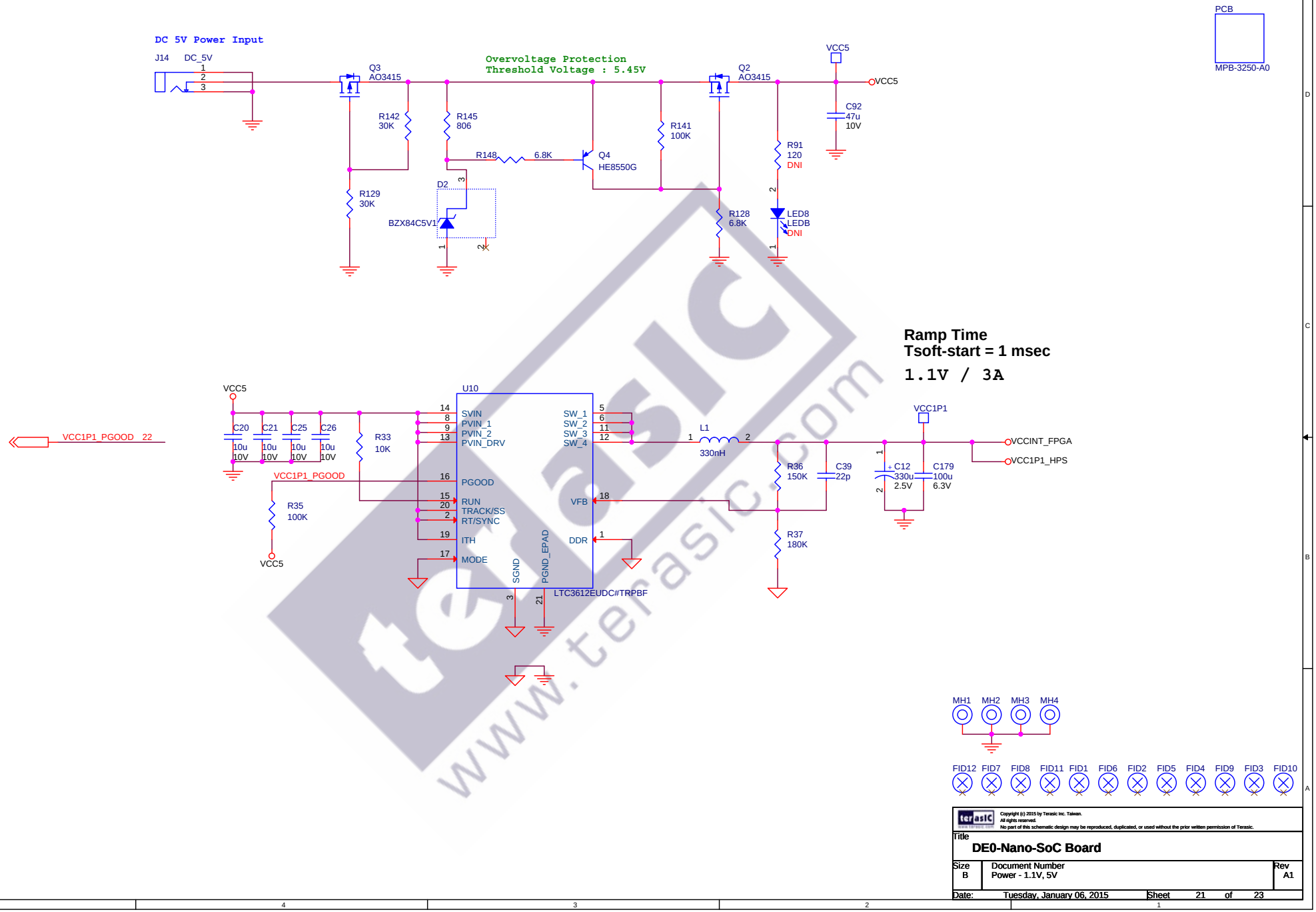

Title
DE0-Nano-SoC Board

Size	Document Number	Rev
B	Power - 1.1V, 5V	A1

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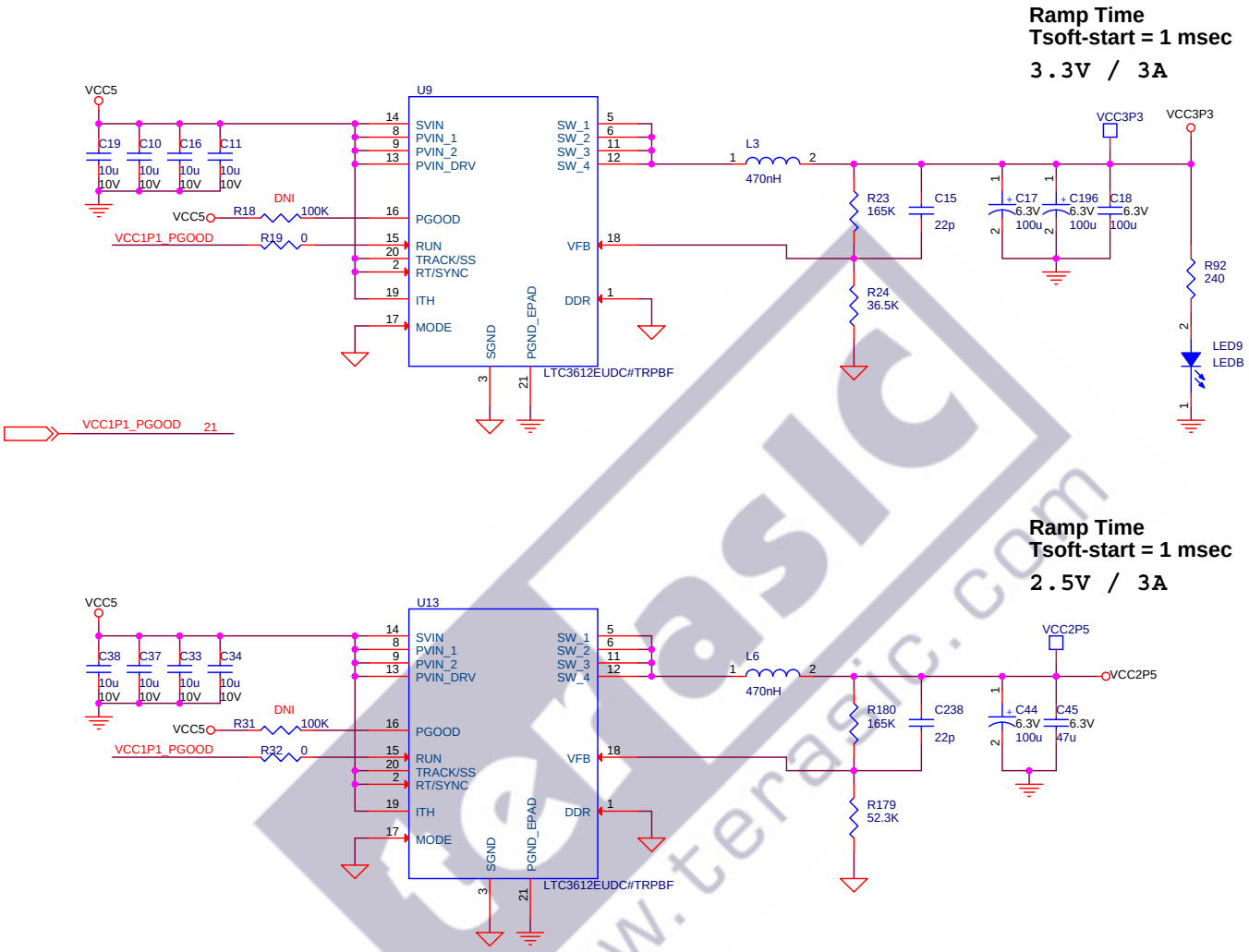

Title
DE0-Nano-SoC Board

Size	Document Number	Rev
B	Power - 2.5V, 3.3V	A1

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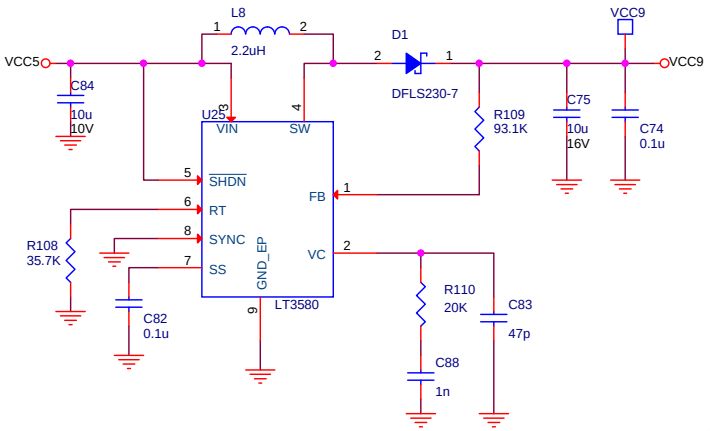
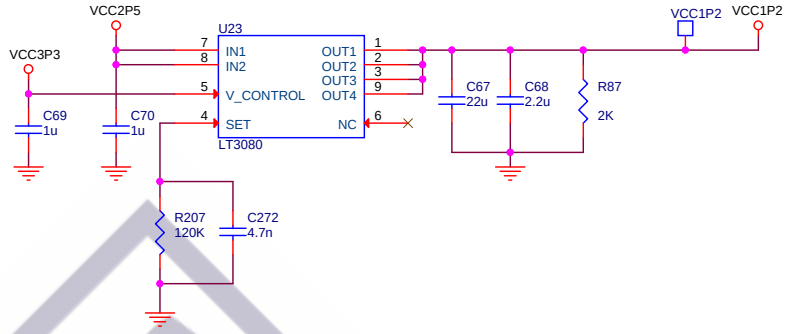
9V / 1A



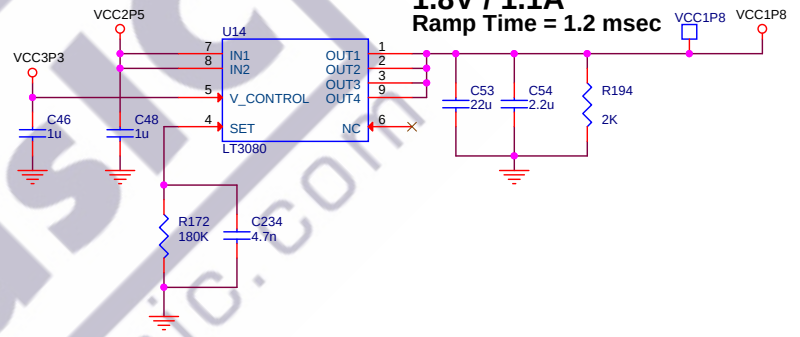
1.2V / 1.1A

Ramp Time = 0.8msec



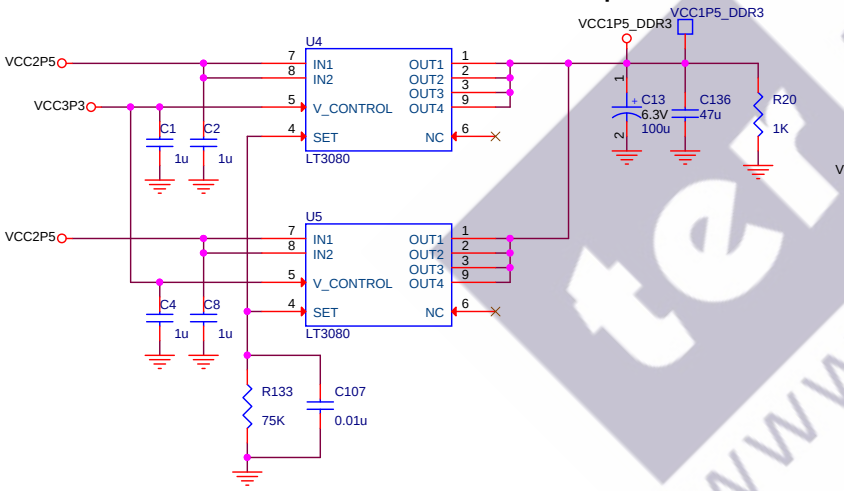
1.8V / 1.1A

Ramp Time = 1.2 msec

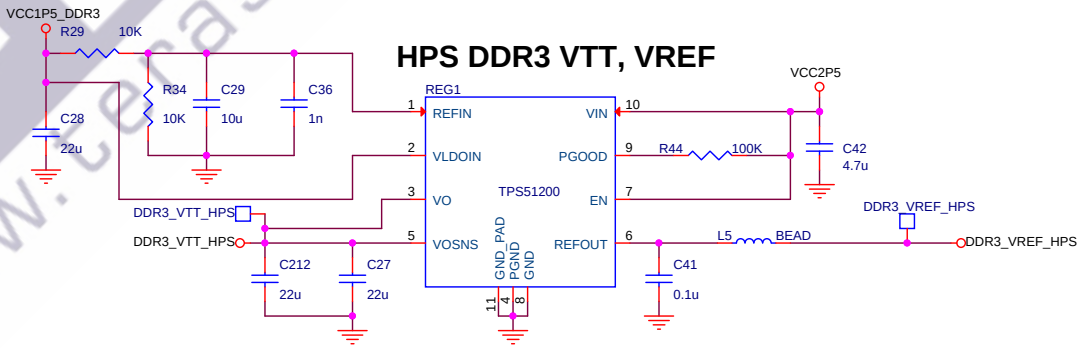


1.5V / 2.2A

Ramp Time = 1.27 msec



HPS DDR3 VTT, VREF



Title	DE0-Nano-SoC Board	
Size B	Document Number: Power - 1.2V, 1.5V, 1.8V, 9V	Rev A1
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