NOTES:

1. Project Drawing Numbers:

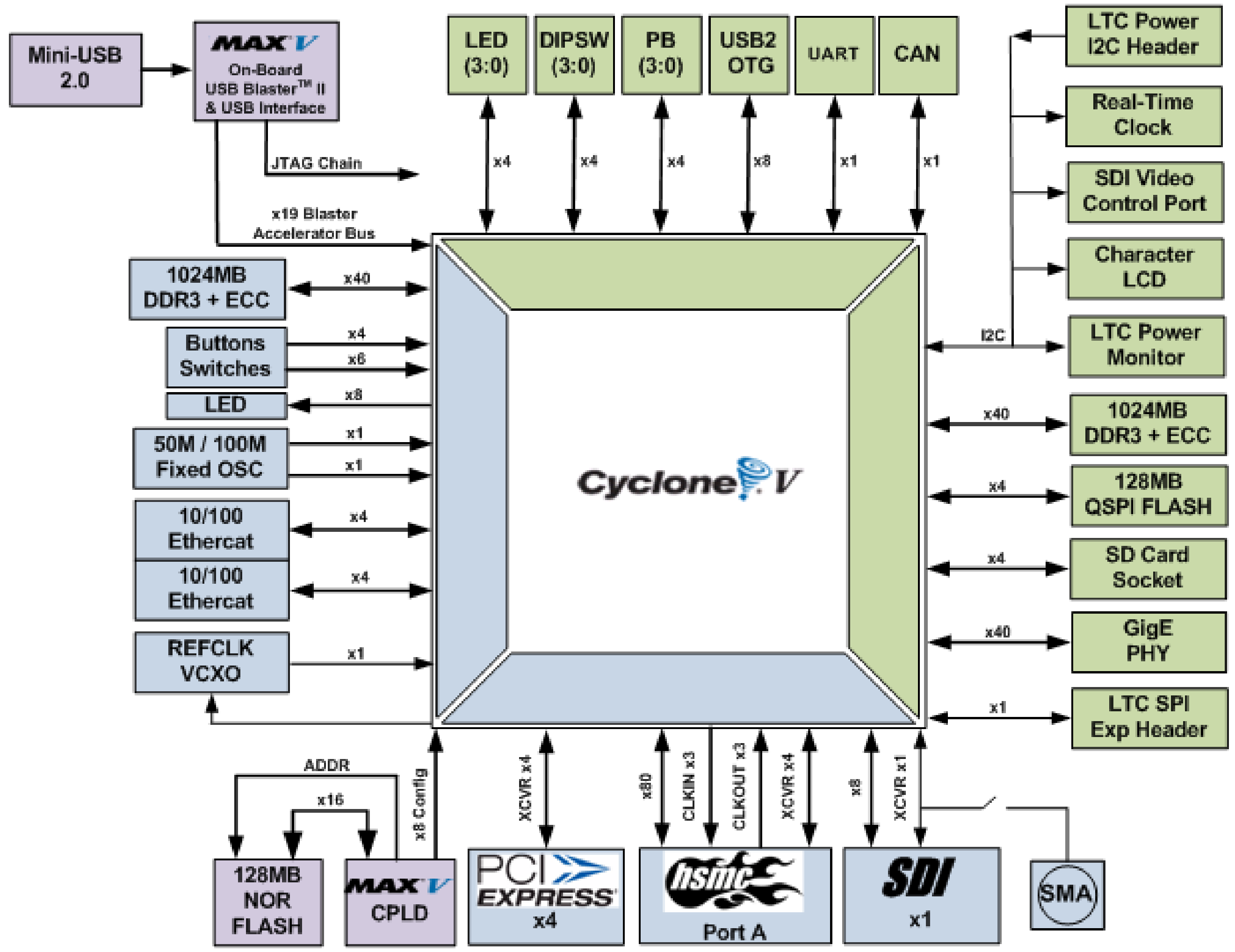
Raw PCB	100-0321003-A1
Gerber Files	110-0321003-A1
PCB Design Files	120-0321003-A1
Assembly Drawing	130-0321003-A1
Fab Drawing	140-0321003-A1
Schematic Drawing	150-0321003-A1
PCB Film	160-0321003-A1
Bill of Materials	170-0321003-A1
Schematic Design Files	180-0321003-A1
Functional Specification	210-0321003-A1
PCB Layout Guidelines	220-0321003-A1
Assembly Rework	320-0321003-A1

2. 1172 Parts, 88 Library Parts, 1330 Nets, 6643 Pins

Preliminary Schematic
DO NOT COPY

REV	DATE	PAGES	DESCRIPTION
A1	09/27/2012	All	INITIAL REVISION A RELEASE

Cyclone V SoC FPGA Development Kit Board



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

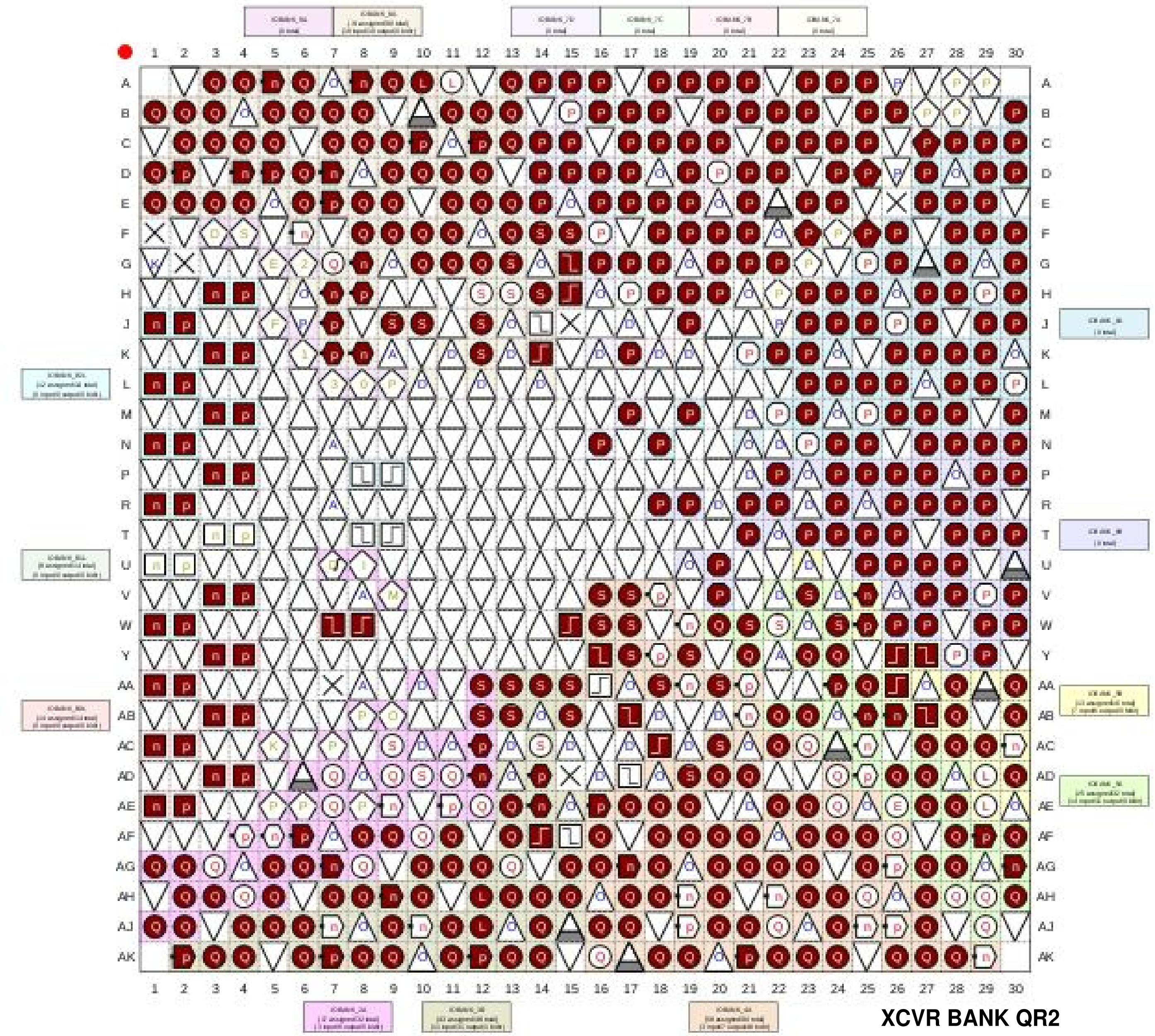
Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 1 of 40

FPGA Package Top View

Top View - Wire Bond

Cyclone V - 5CSXFC6D6F31C7



I/O Bank Usage

	I/O Bank	Usage	VCCIO Voltage	VREF Voltage	VCCPD Voltage
1	B2L	0 / 14 (0 %)	--	--	--
2	B1L	0 / 14 (0 %)	--	--	--
3	B0L	0 / 14 (0 %)	--	--	--
4	3A	28 / 32 (88 %)	2.5V	--	2.5V
5	3B	43 / 48 (90 %)	1.5V	0.75V	2.5V
6	4A	58 / 80 (73 %)	1.5V	0.75V	2.5V
7	5A	25 / 32 (78 %)	2.5V	--	2.5V
8	5B	13 / 16 (81 %)	2.5V	--	2.5V
9	6B	34 / 45 (76 %)	1.5V	0.75V	2.5V
10	6A	48 / 57 (84 %)	1.5V	0.75V	2.5V
11	7A	19 / 19 (100 %)	3.3V	--	3.3V
12	7B	20 / 22 (91 %)	3.3V	--	3.3V
13	7C	12 / 12 (100 %)	3.3V	--	3.3V
14	7D	12 / 14 (86 %)	3.3V	--	3.3V
15	8A	74 / 80 (93 %)	2.5V	--	2.5V

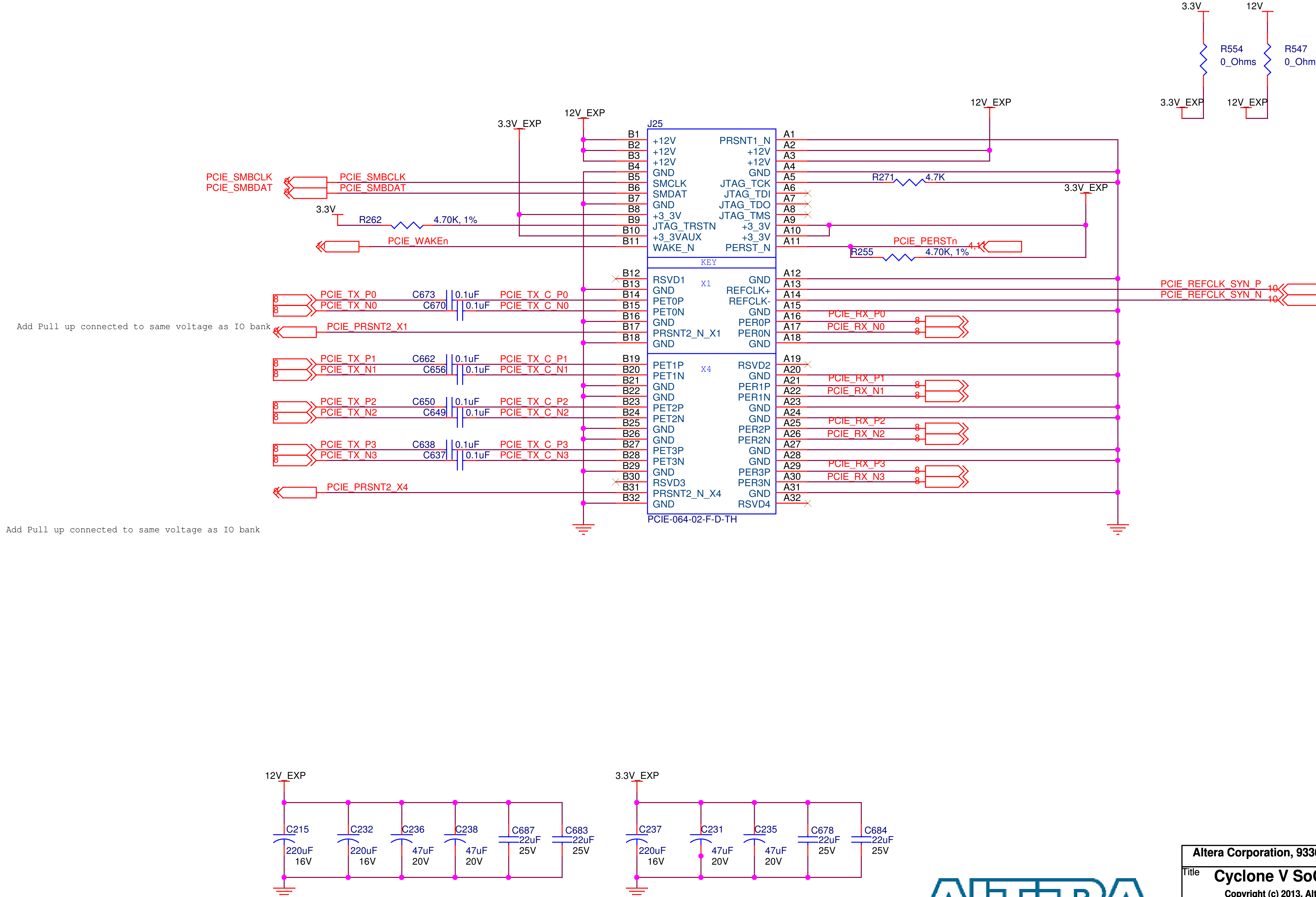
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

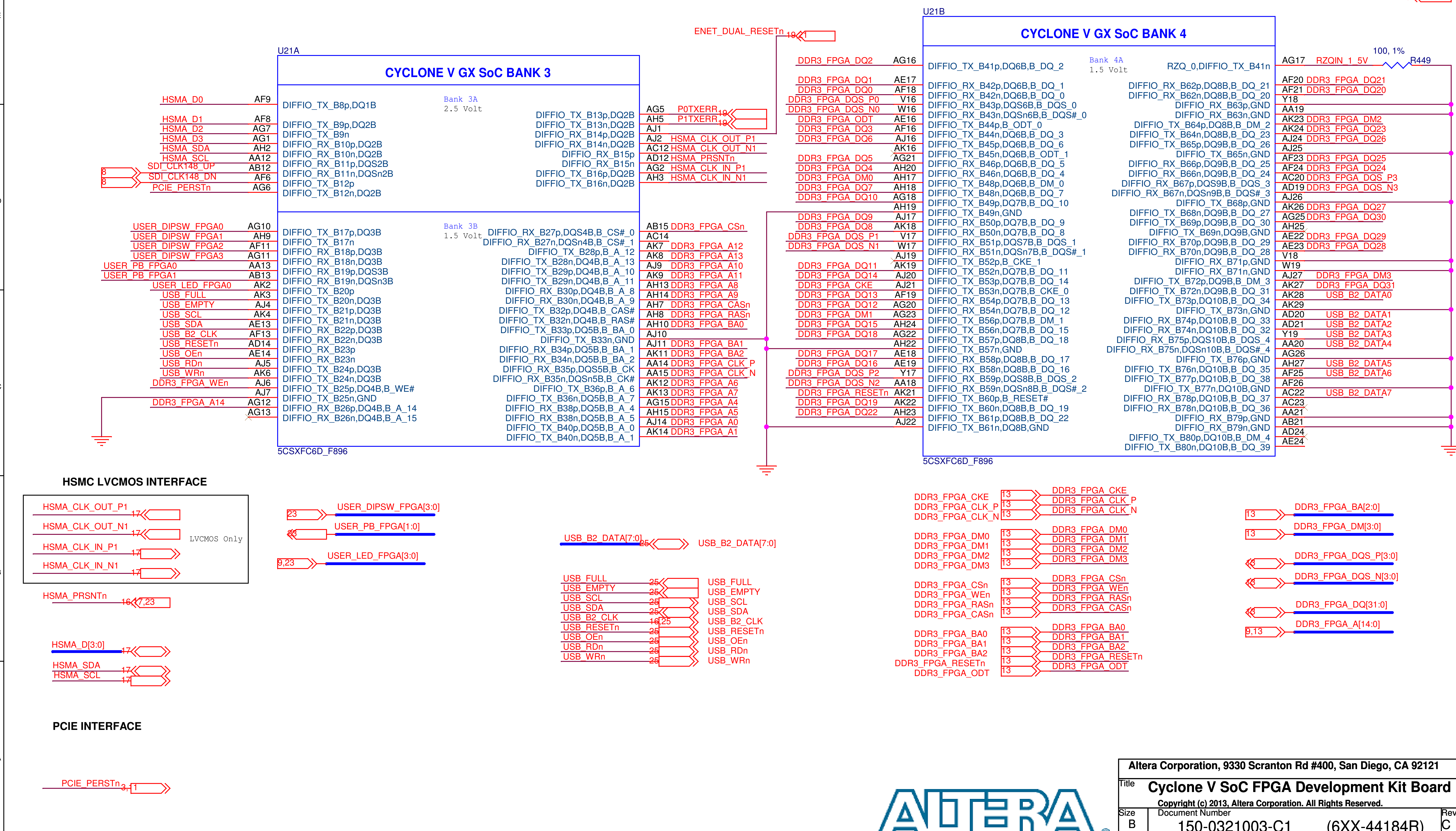
Date: Wednesday, March 20, 2013 Sheet 2 of 40

PCI Express Connector



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121			
Title	**Cyclone V SoC FPGA Development Kit Board**		
Size B	Document Number 150-0321003-C1	(6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013		Sheet 3 of 40	

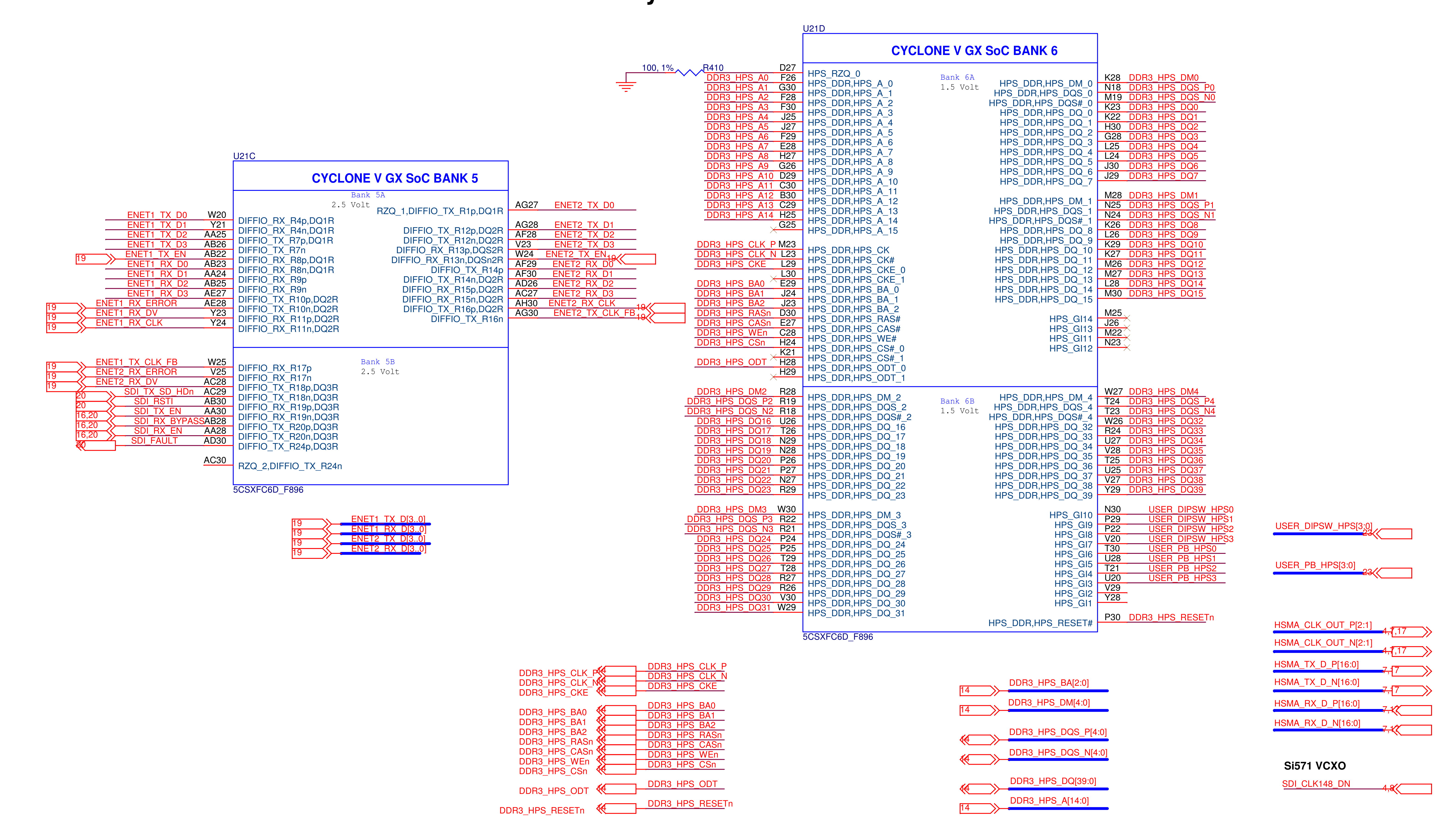
Cyclone V GX SoC Bank 3 & 4



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board		
Size B	Document Number 150-0321003-C1	(6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013		Sheet 4 of 40	

Cyclone V GX SoC Bank 5 & 6



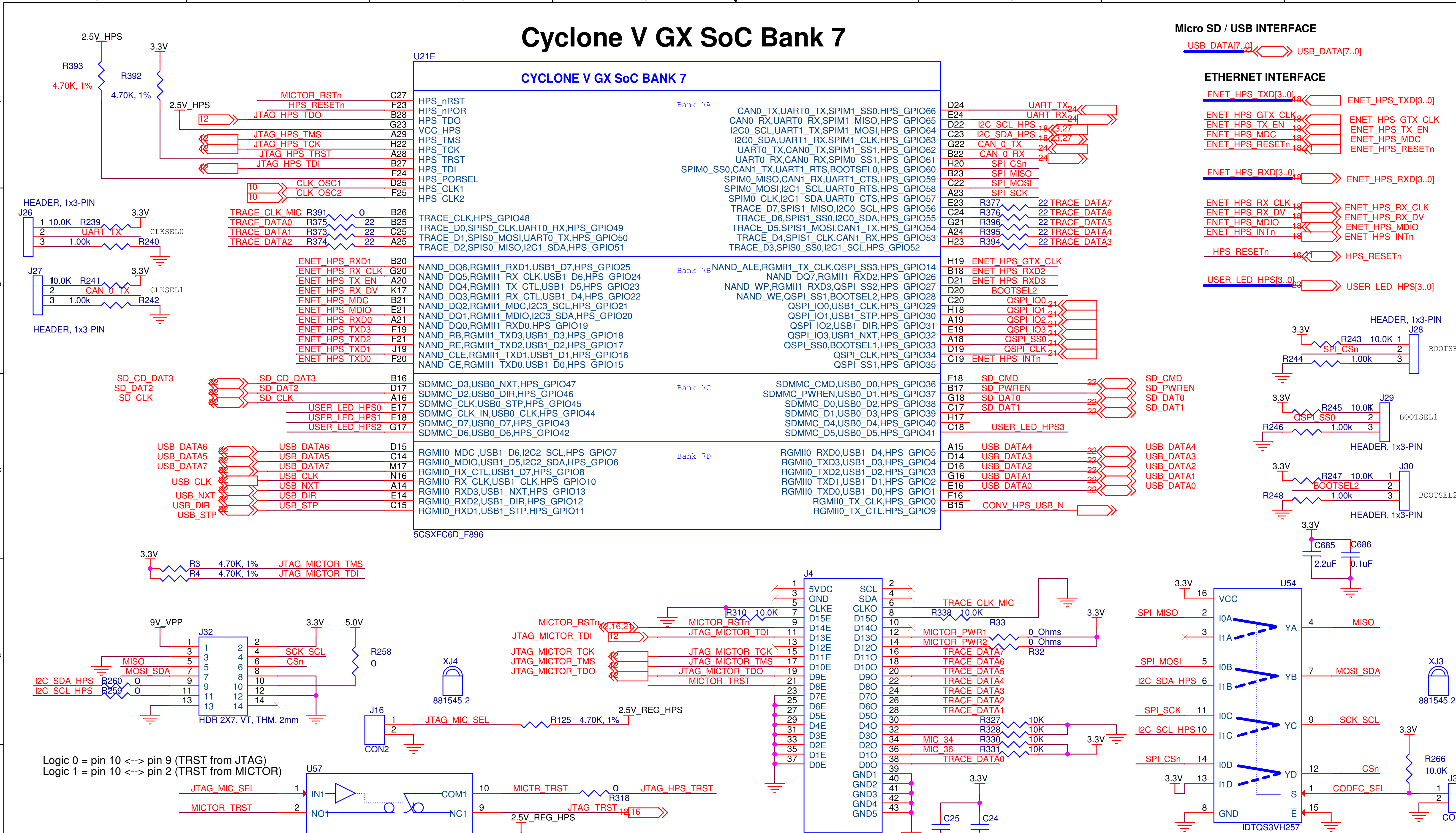
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: Cyclone V SoC FPGA Development Kit Board

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 5 of 40

Cyclone V GX SoC Bank 7



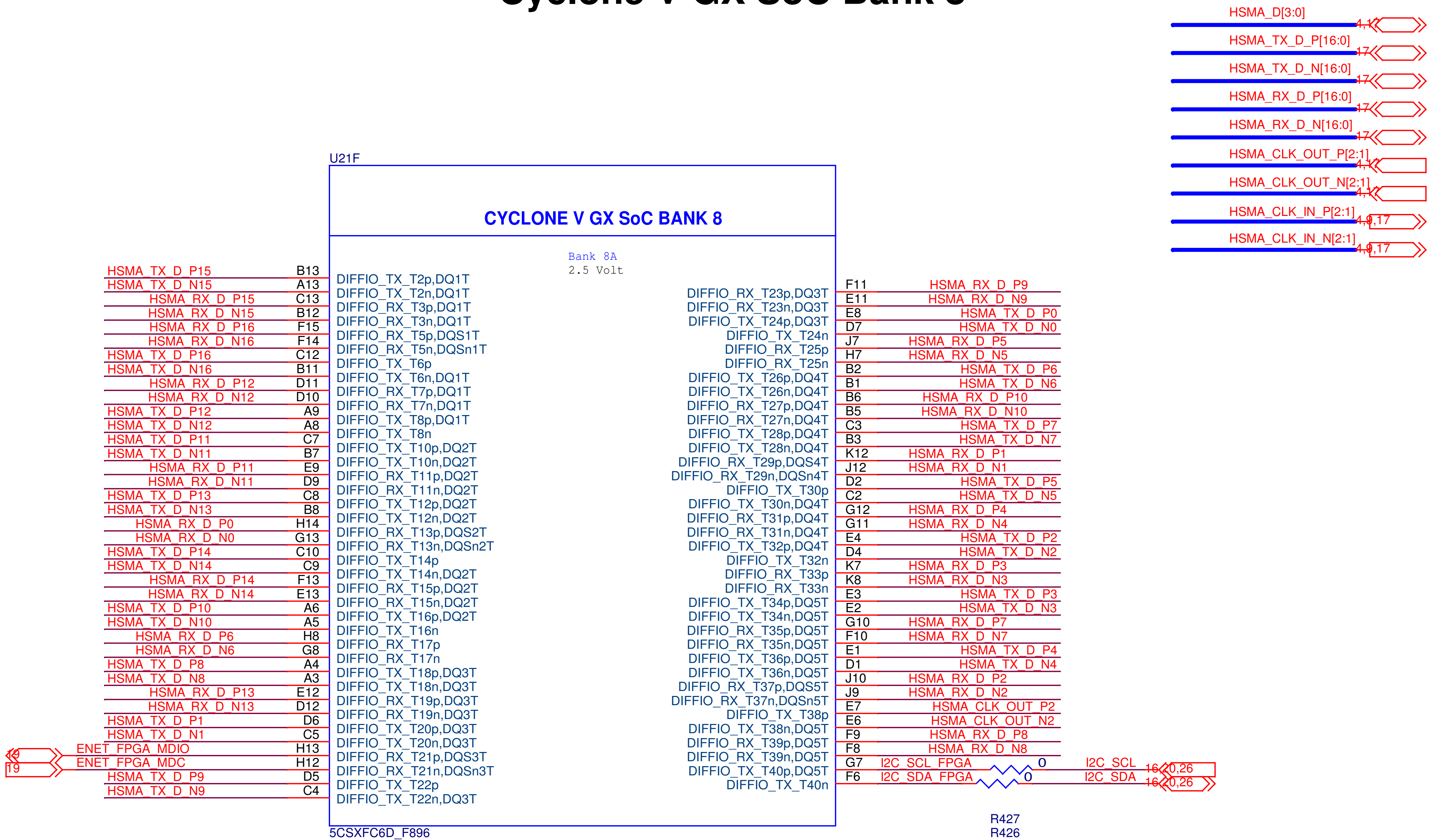
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013

Cyclone V GX SoC Bank 8



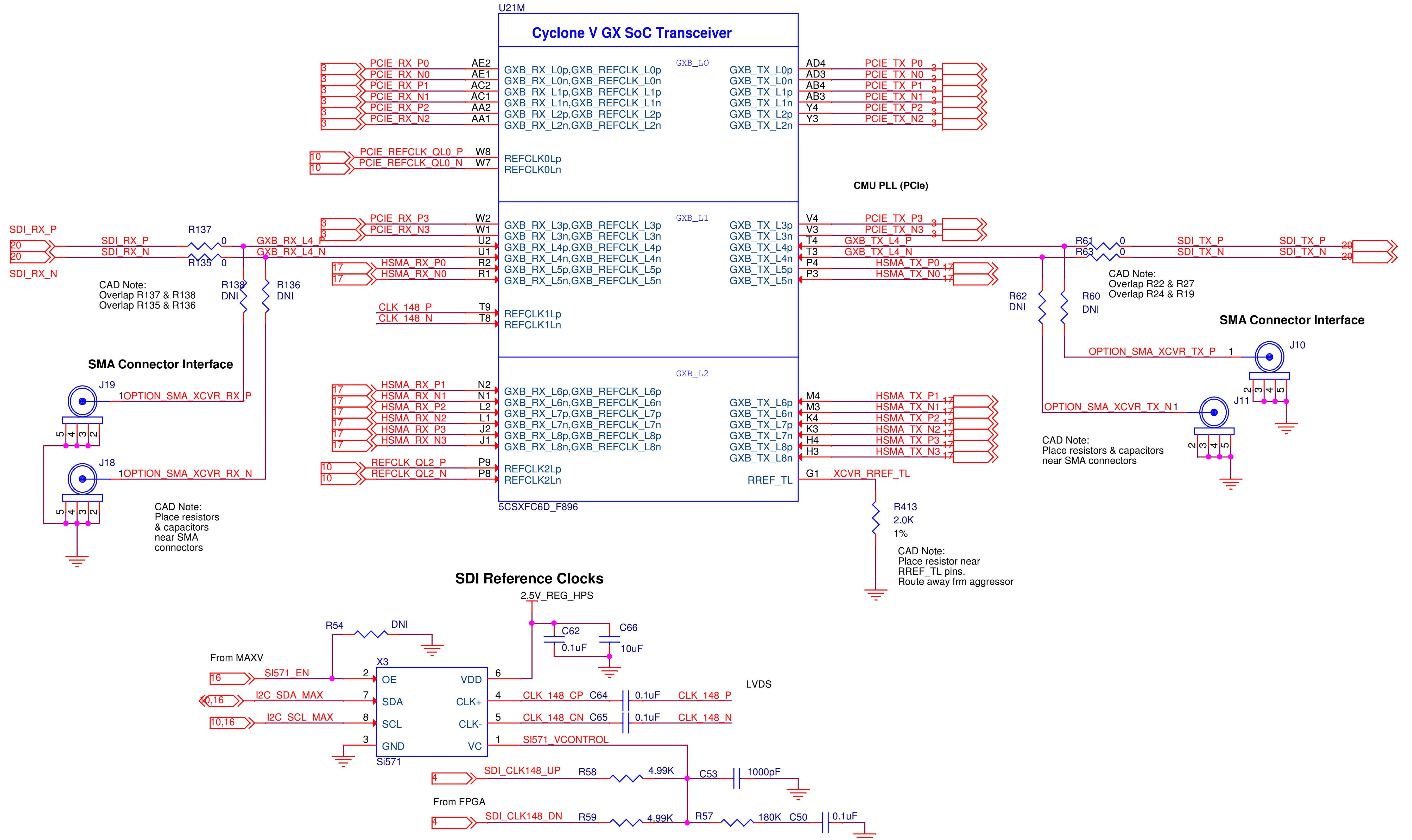
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013

Cyclone V GX SoC Transceivers and Power



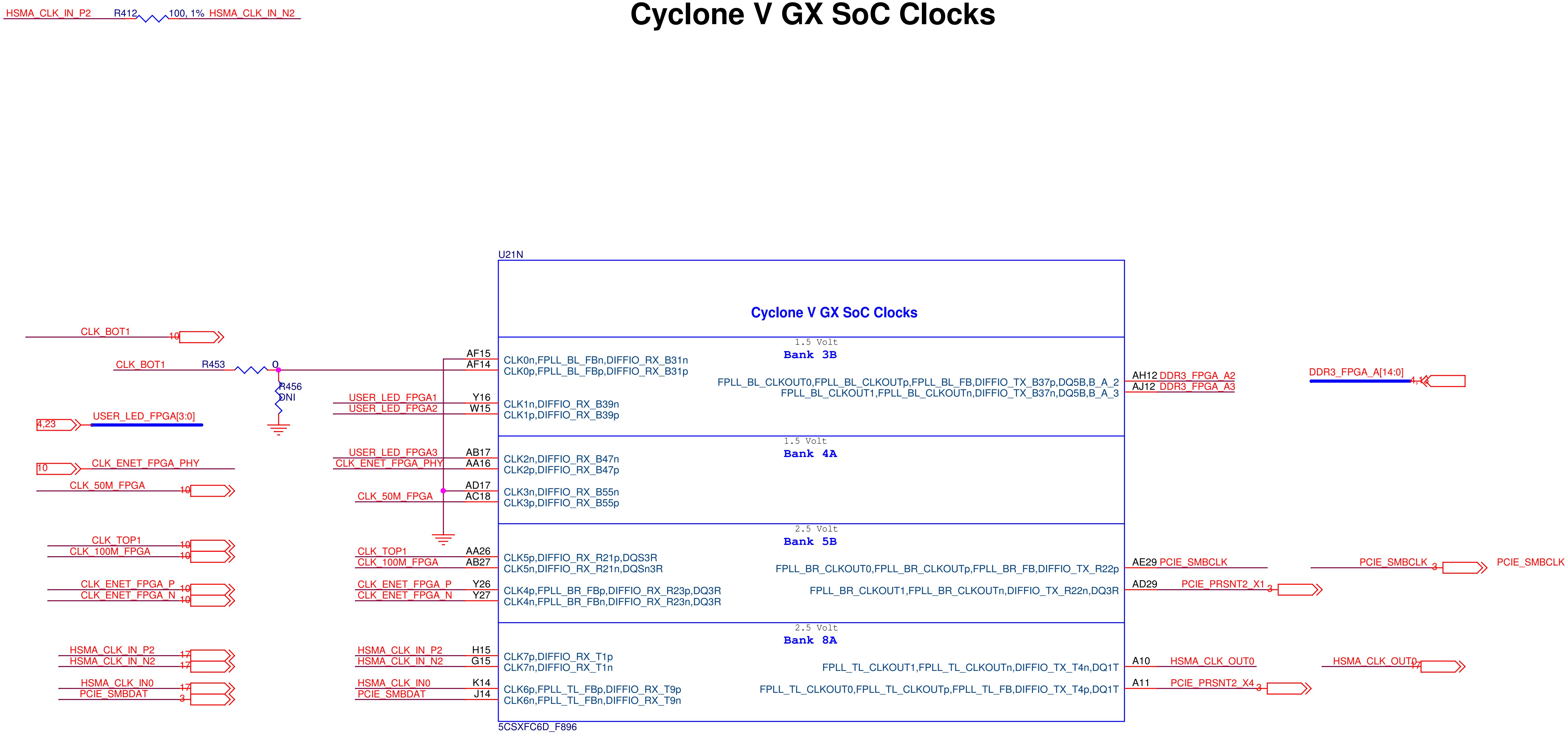
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

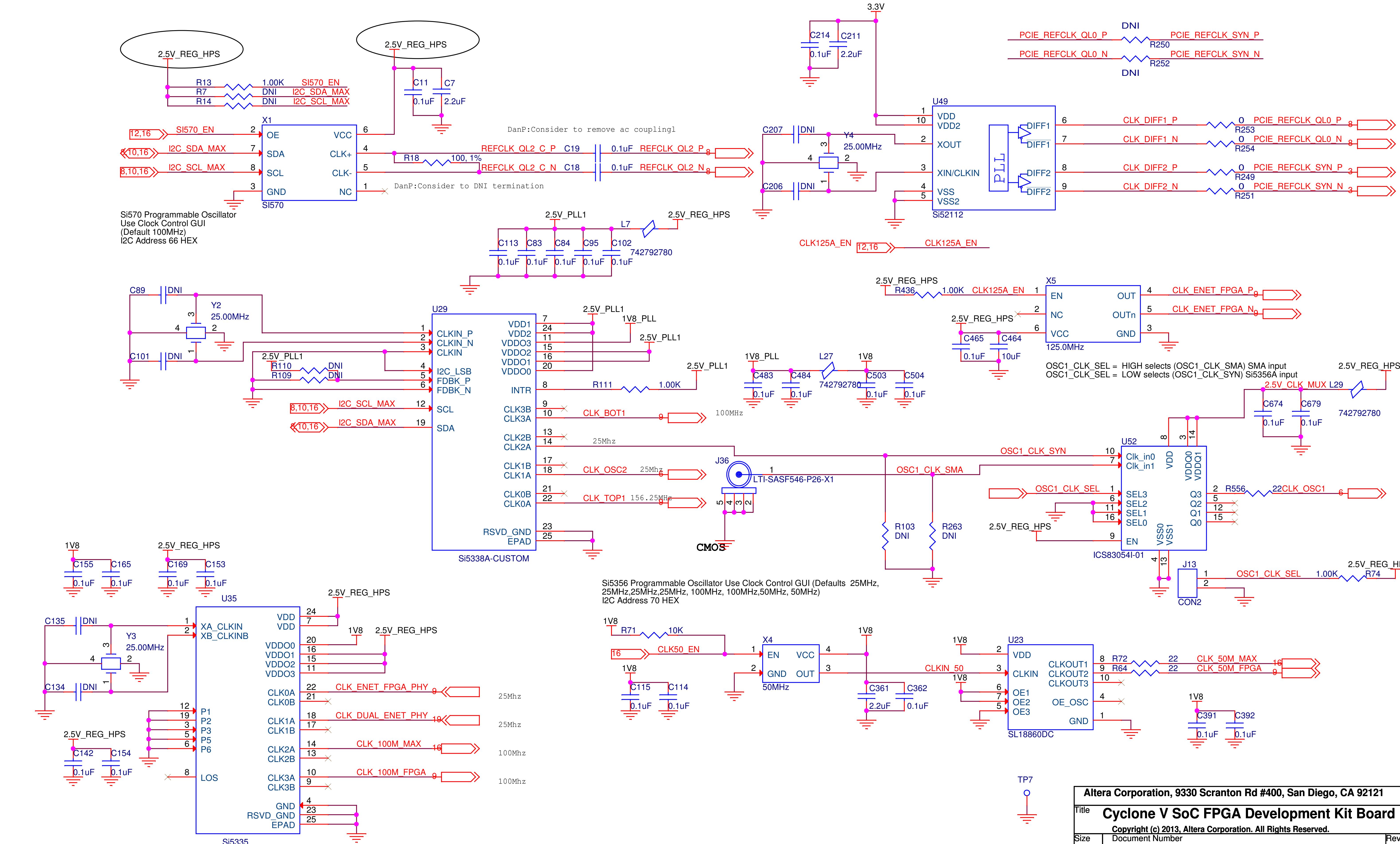
Date: Wednesday, March 20, 2013

Cyclone V GX SoC Clocks



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	**Cyclone V SoC FPGA Development Kit Board**
Size: B	Document Number: 150-0321003-C1 (6XX-44184R) — Rev: C
Date: Wednesday, March 20, 2013	Sheet 9 of 40

PLL



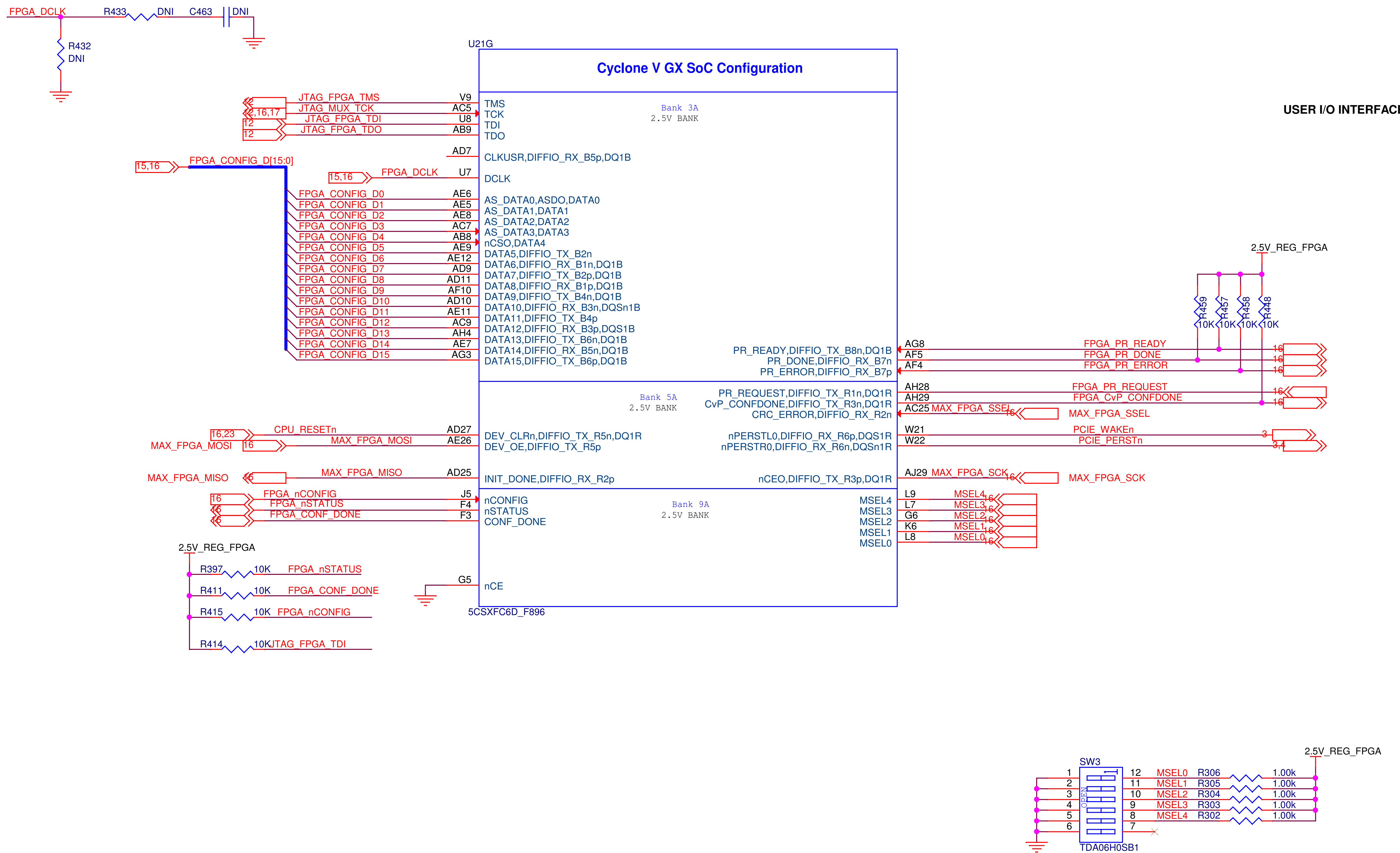
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

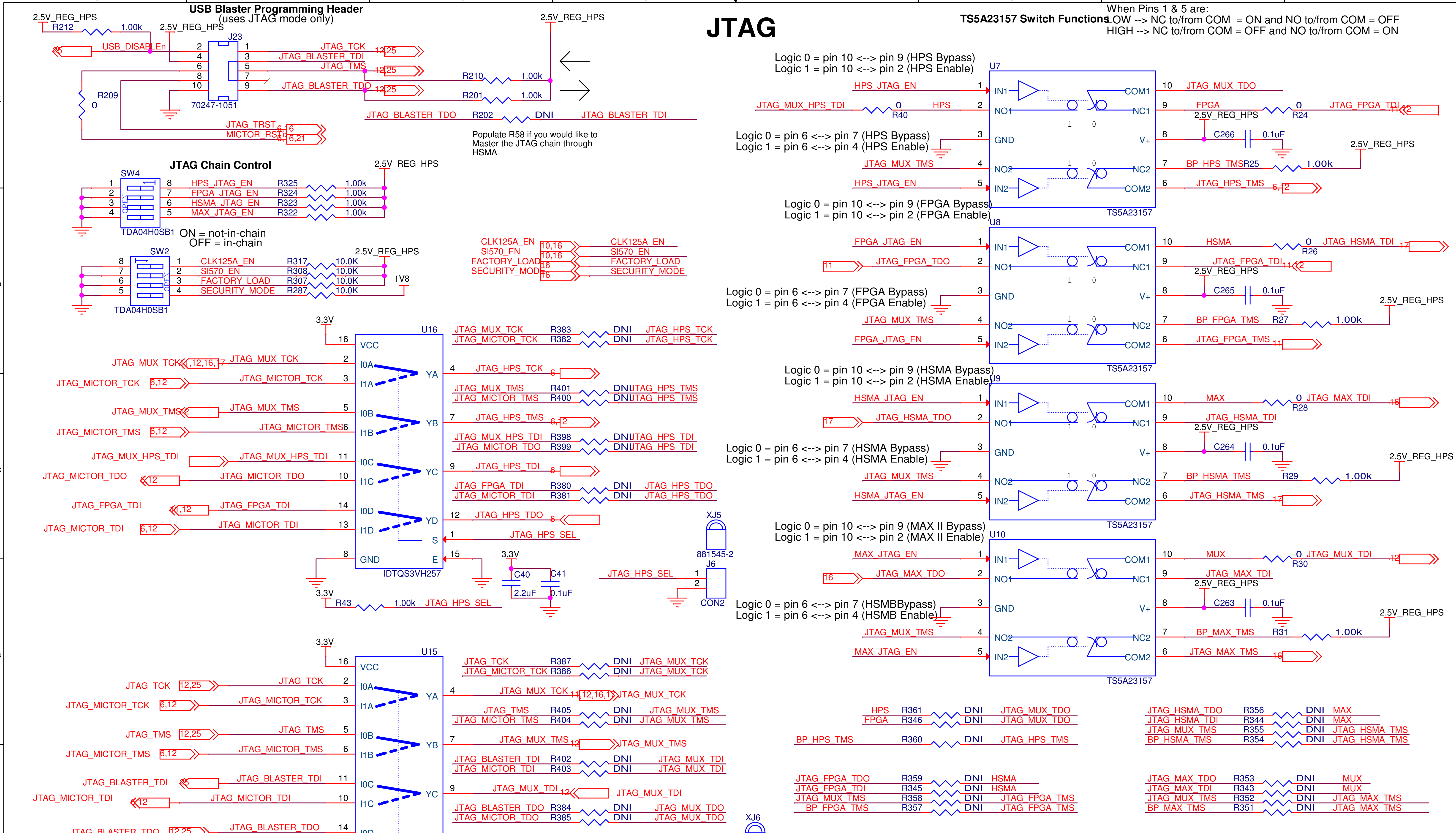
Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013

Cyclone V GX SoC Configuration



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	**Cyclone V SoC FPGA Development Kit Board**
Size B	Document Number 150-0321003-C1 (6XX-44184R) — Rev C
Date: Wednesday, March 20, 2013	Sheet 11 of 40



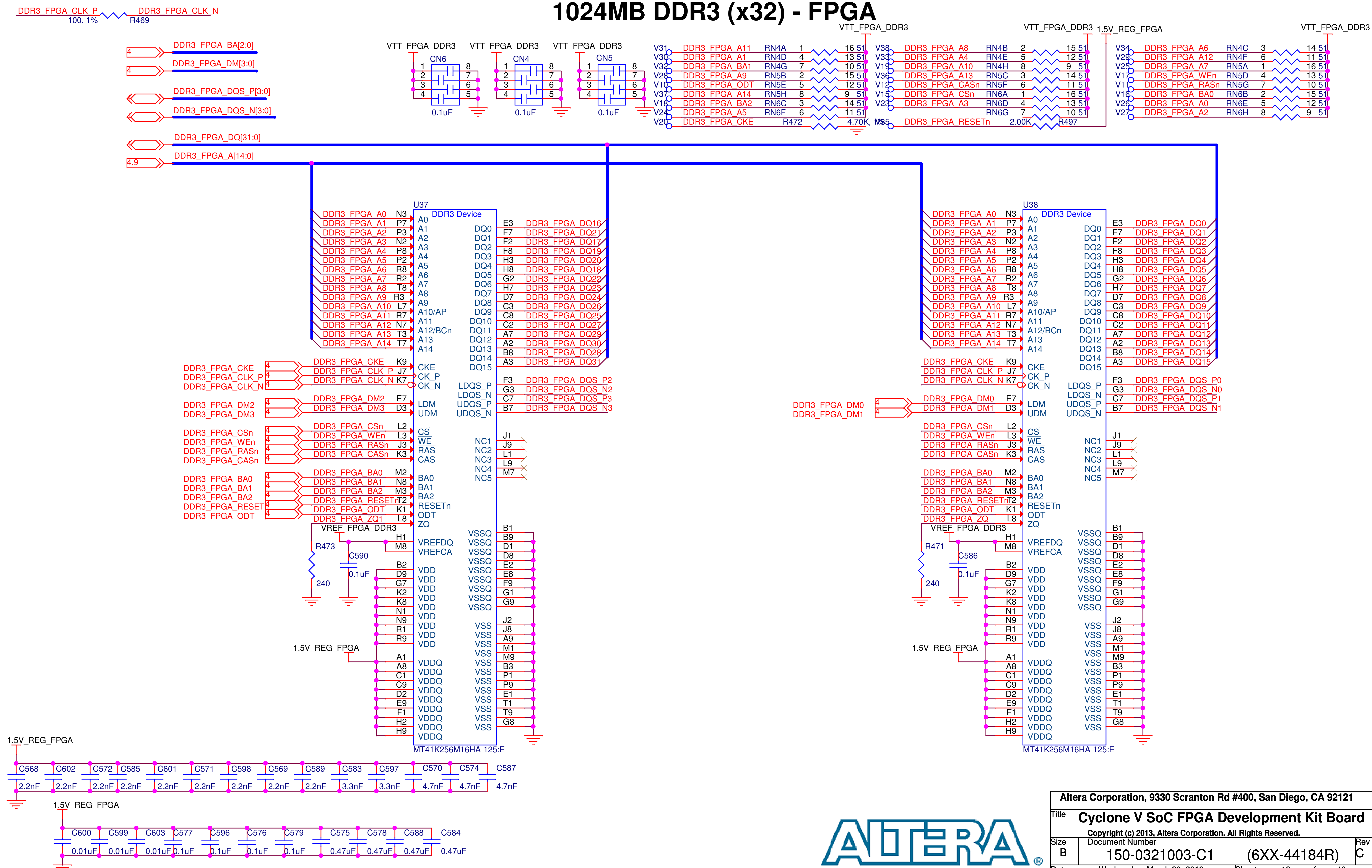
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 12 of 40

1024MB DDR3 (x32) - FPGA



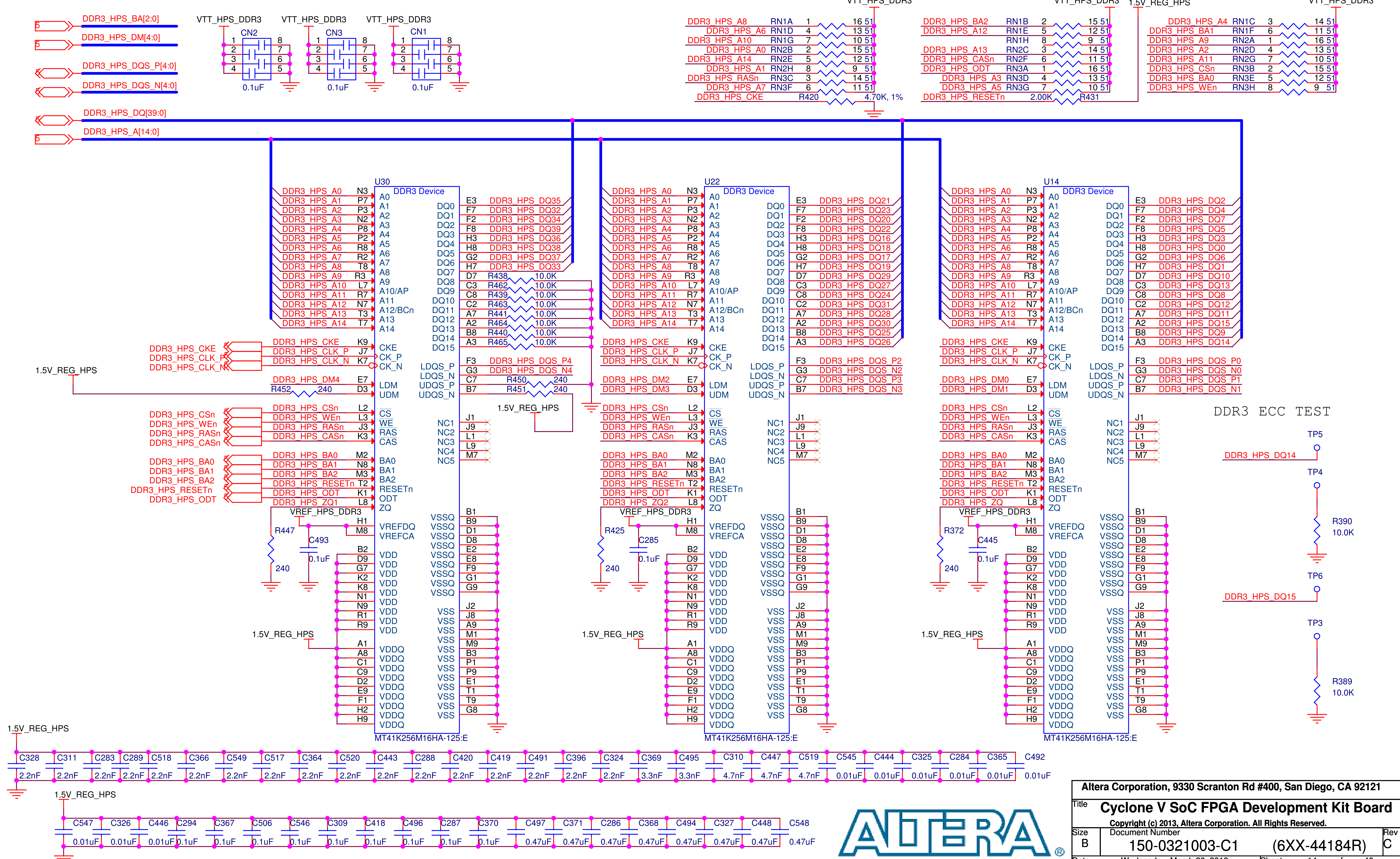
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: Cyclone V SoC FPGA Development Kit Board

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 13 of 40

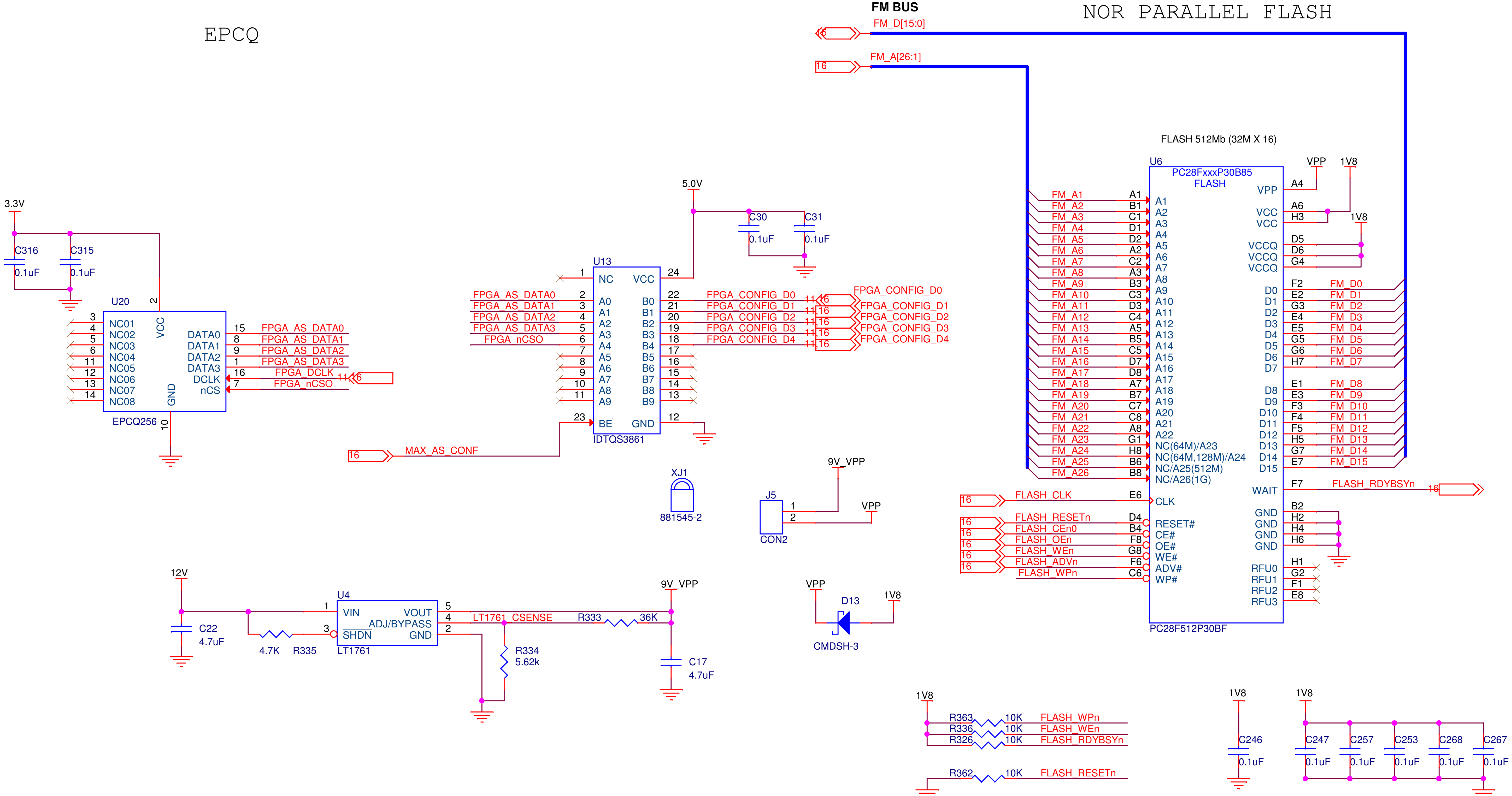
1024MB DDR3 (x32 + ECC) - HPS



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board		
	Copyright (c) 2013, Altera Corporation. All Rights Reserved.		
Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C
Date:	Wednesday, March 20, 2013	Sheet 14 of 40	

FLASH, EPCQ

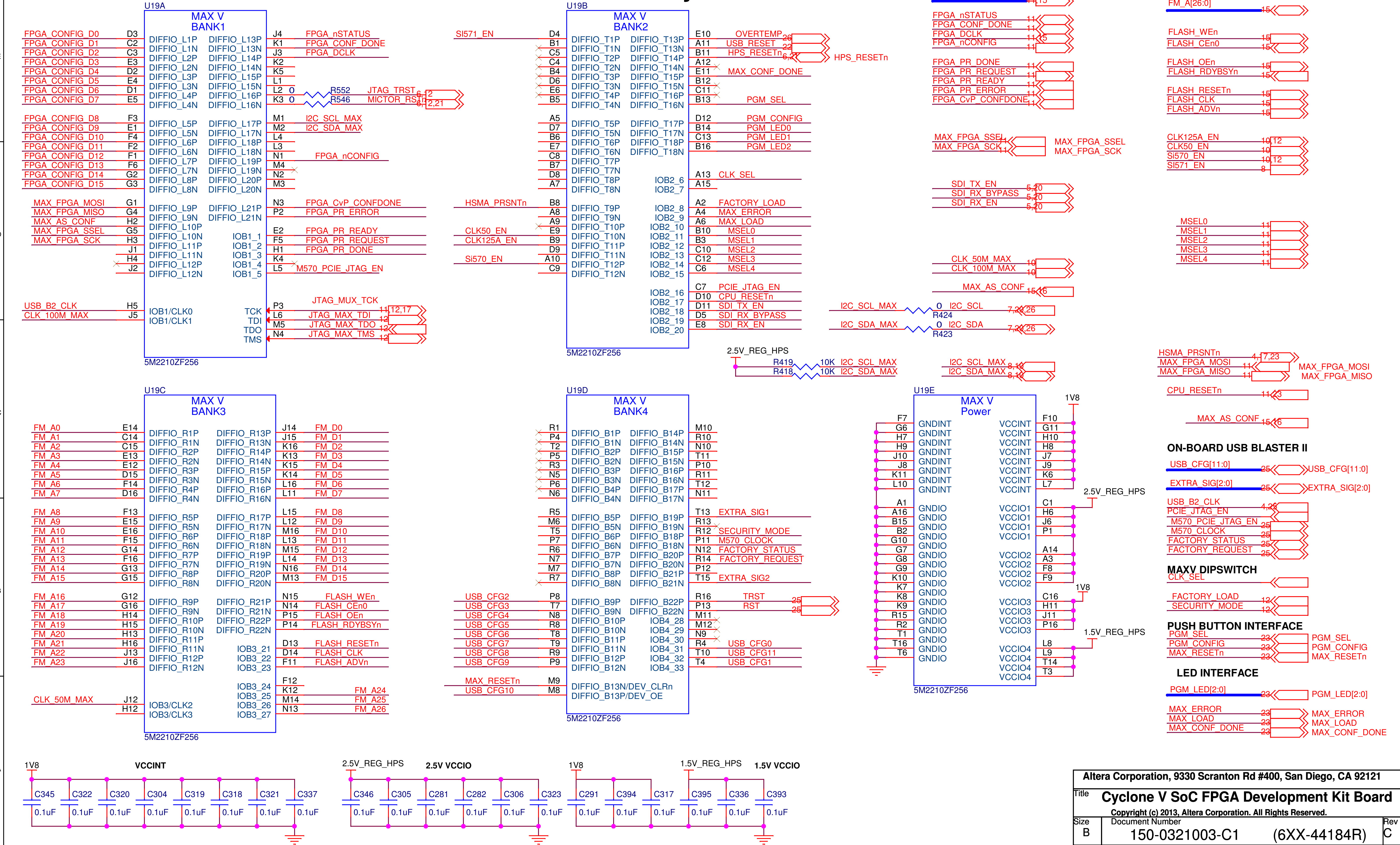


- When using a single x16 flash device a word consists of 16 data bits so addressing starts with FM_A1 mapped to address bit 1 in software.

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board		
Size B	Document Number 150-0321003-C1	(6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013		Sheet 15 of 40	

5M2210 System Controller



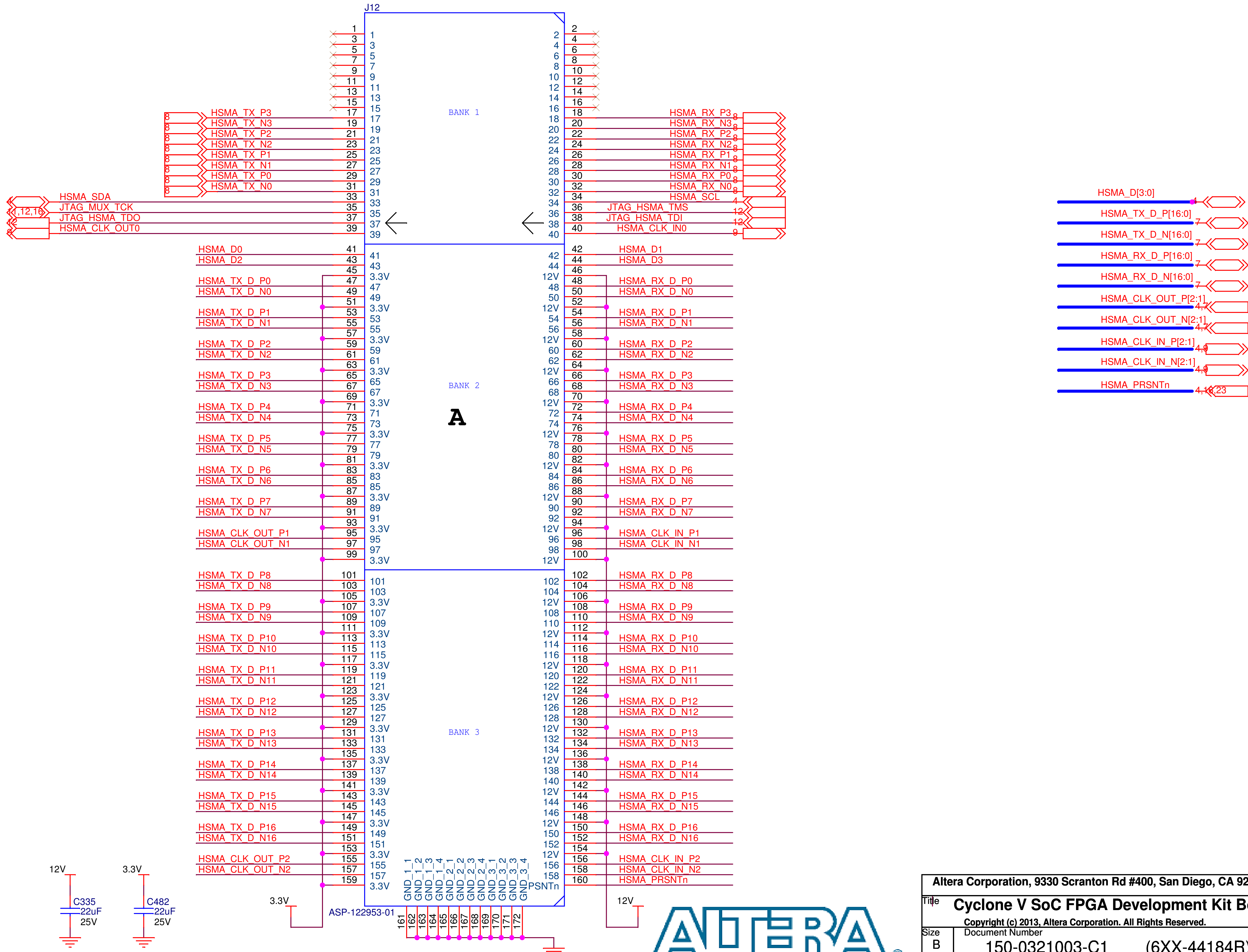
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 16 of 40

HSMC Port A



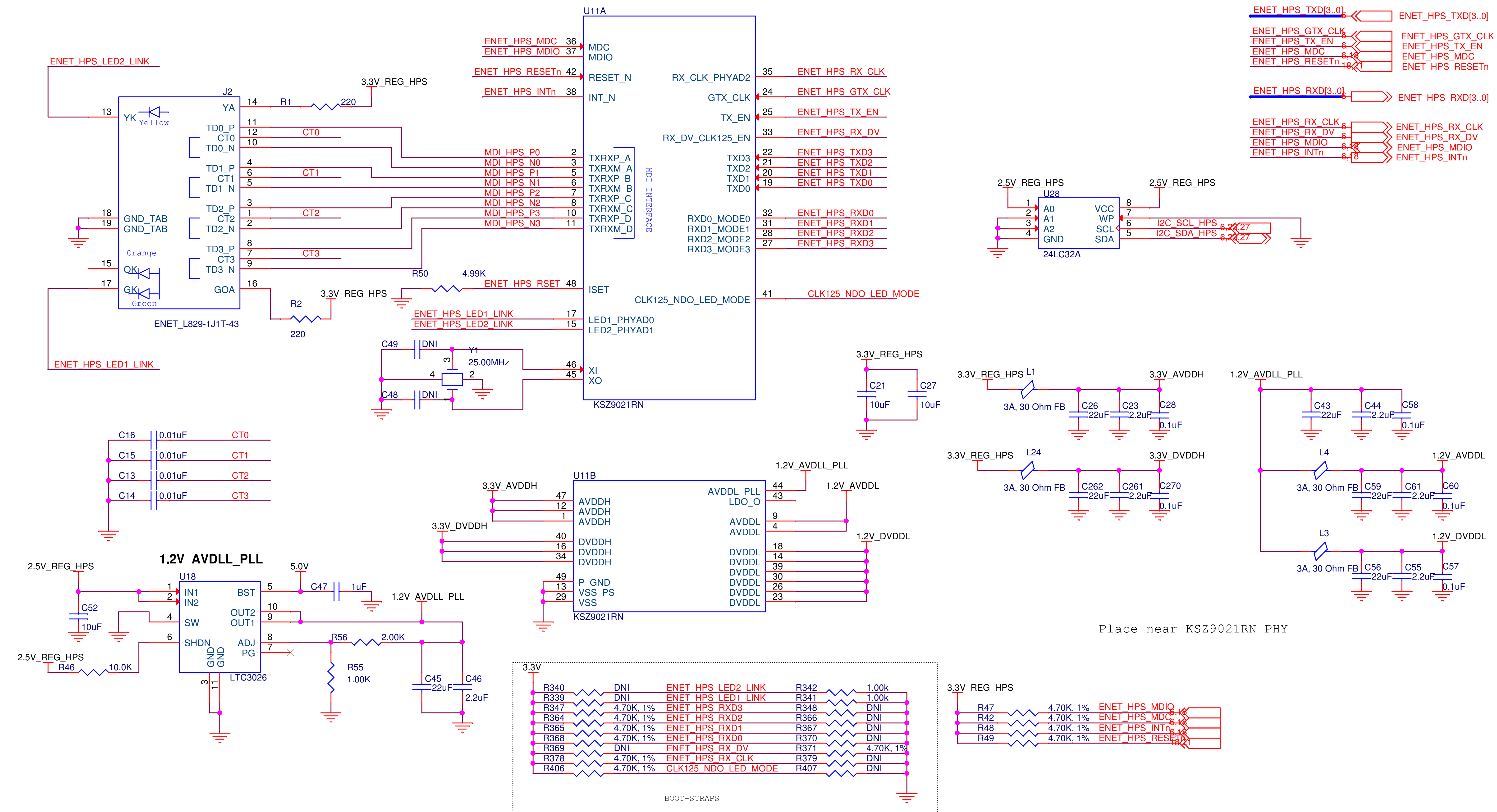
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 — Sheet 17 of 40

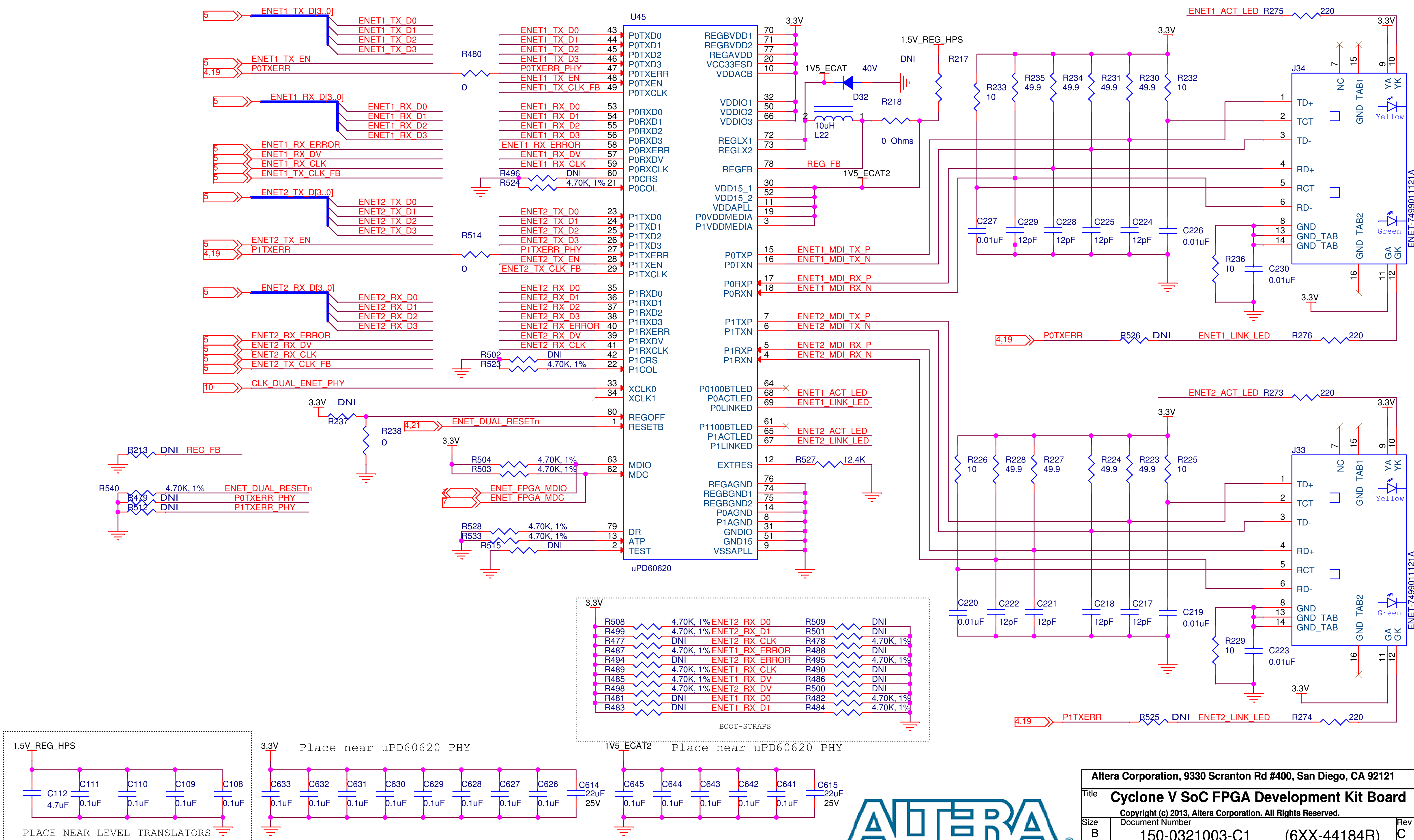
10/100/1000 Ethernet - HPS



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board
Size	B
Document Number	150-0321003-C1 (6XX-44184R)
Rev	C
Date:	Wednesday, March 20, 2013
Sheet	18 of 40

10/100M Ethernet - FPGA

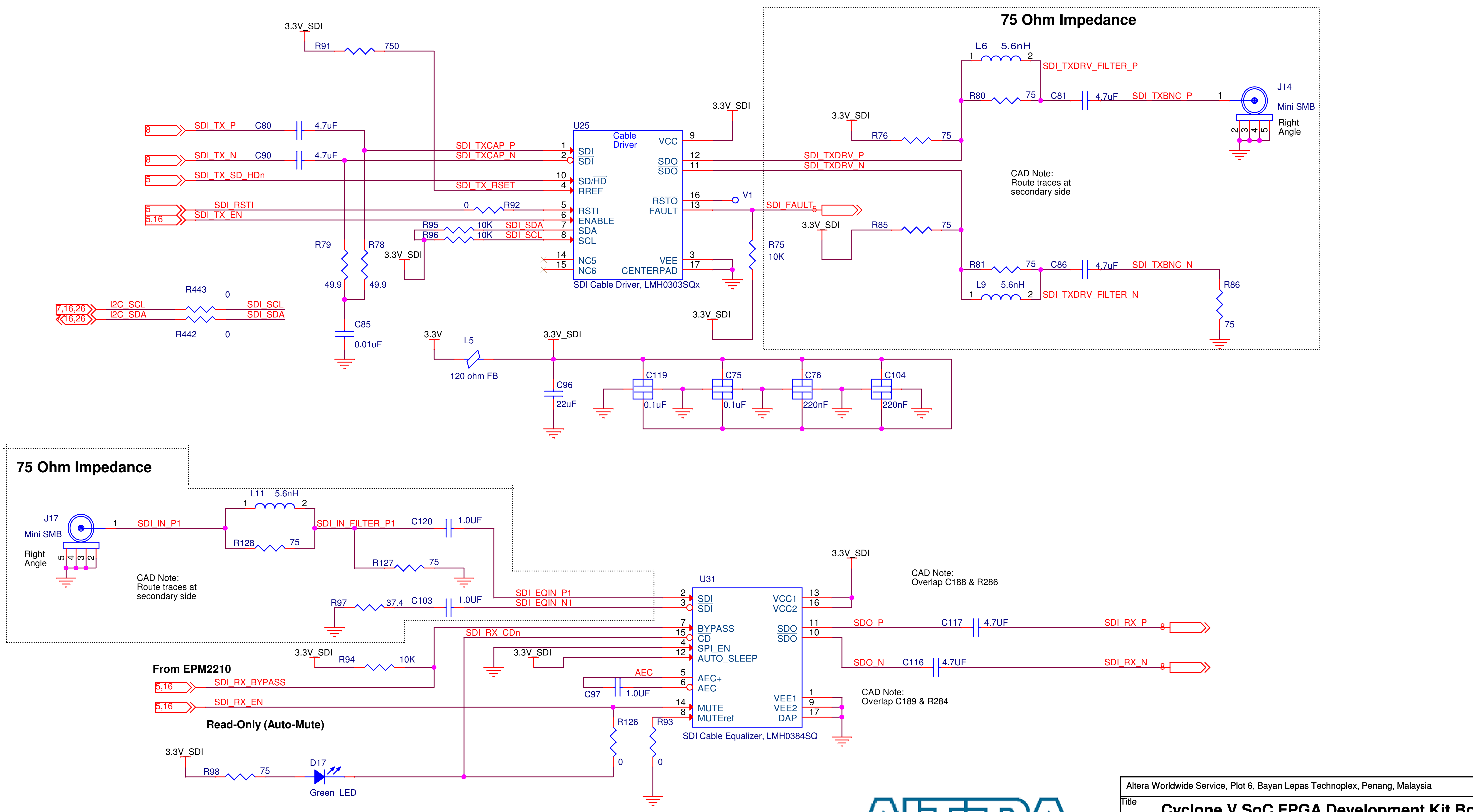


Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board
Size	B
Document Number	150-0321003-C1 (6XX-44184R)
Rev	C
Date:	Wednesday, March 20, 2013
Sheet	19 of 40

ALTERA®

SDI Cable Driver, Equalizer, SMA Option and SMB



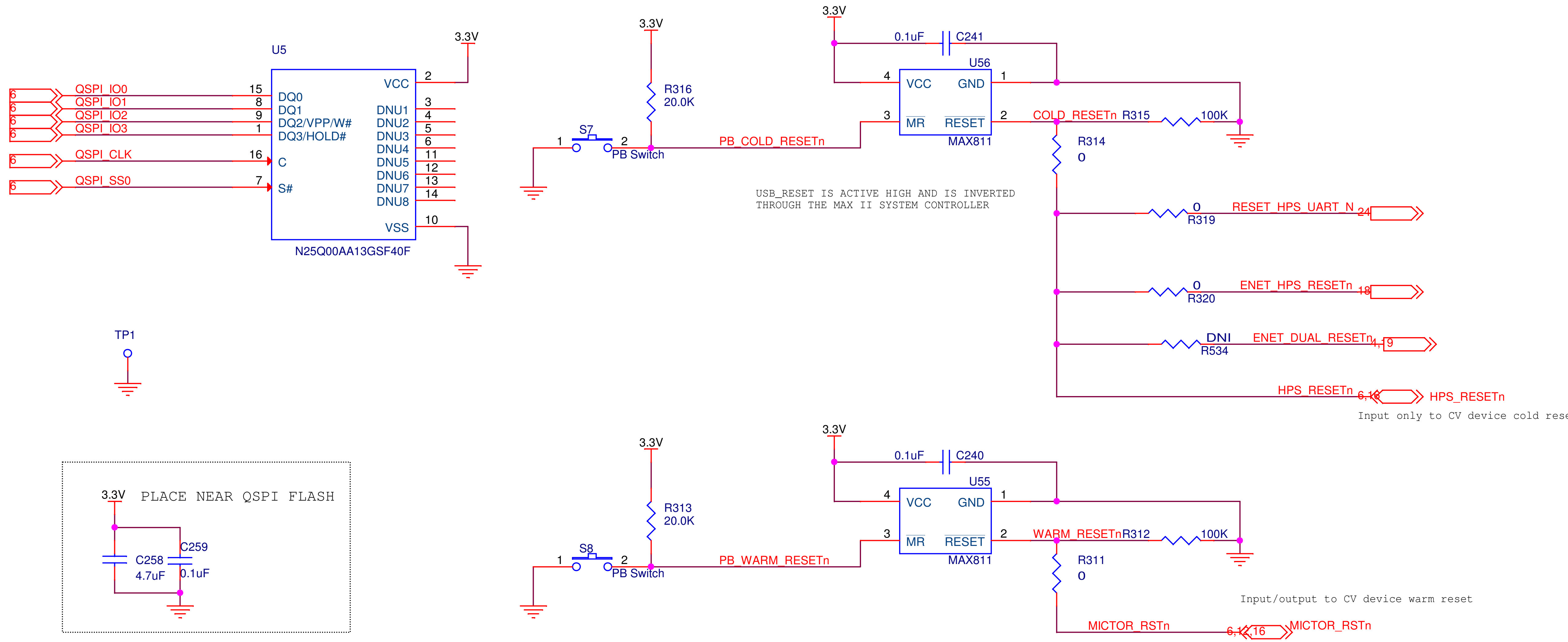
Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia

Title	Cyclone V SoC FPGA Development Kit Board	
Size: B	Document Number: 150-0321003-C1 (6XX-44184R)	Rev: C
Date: Wednesday, March 20, 2013	Sheet 20 of 40	

QSPI Flash & Reset Circuit

QSPI FLASH

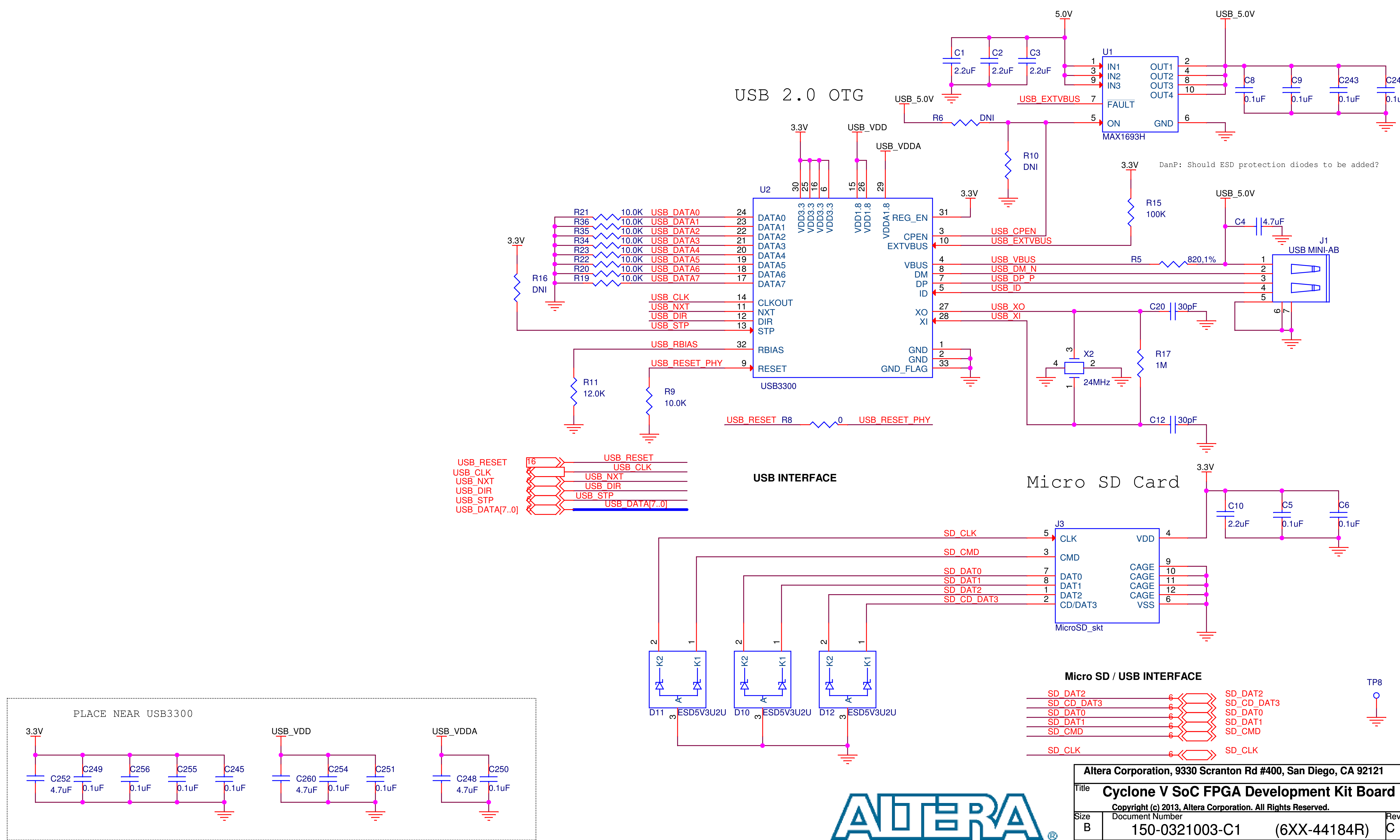
RESET CIRUIT



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121		
Title: **Cyclone V SoC FPGA Development Kit Board**		
Size: B	Document Number: 150-0321003-C1 (6XX-44184R)	Rev: C
Date: Wednesday, March 20, 2013	Sheet 21 of 40	

USB 2.0 OTG , Micro SD Card

DanP Update:
SMSC schematic review reference number is 834654-B1081.
SMSC placement review reference number is 375404-B1082.



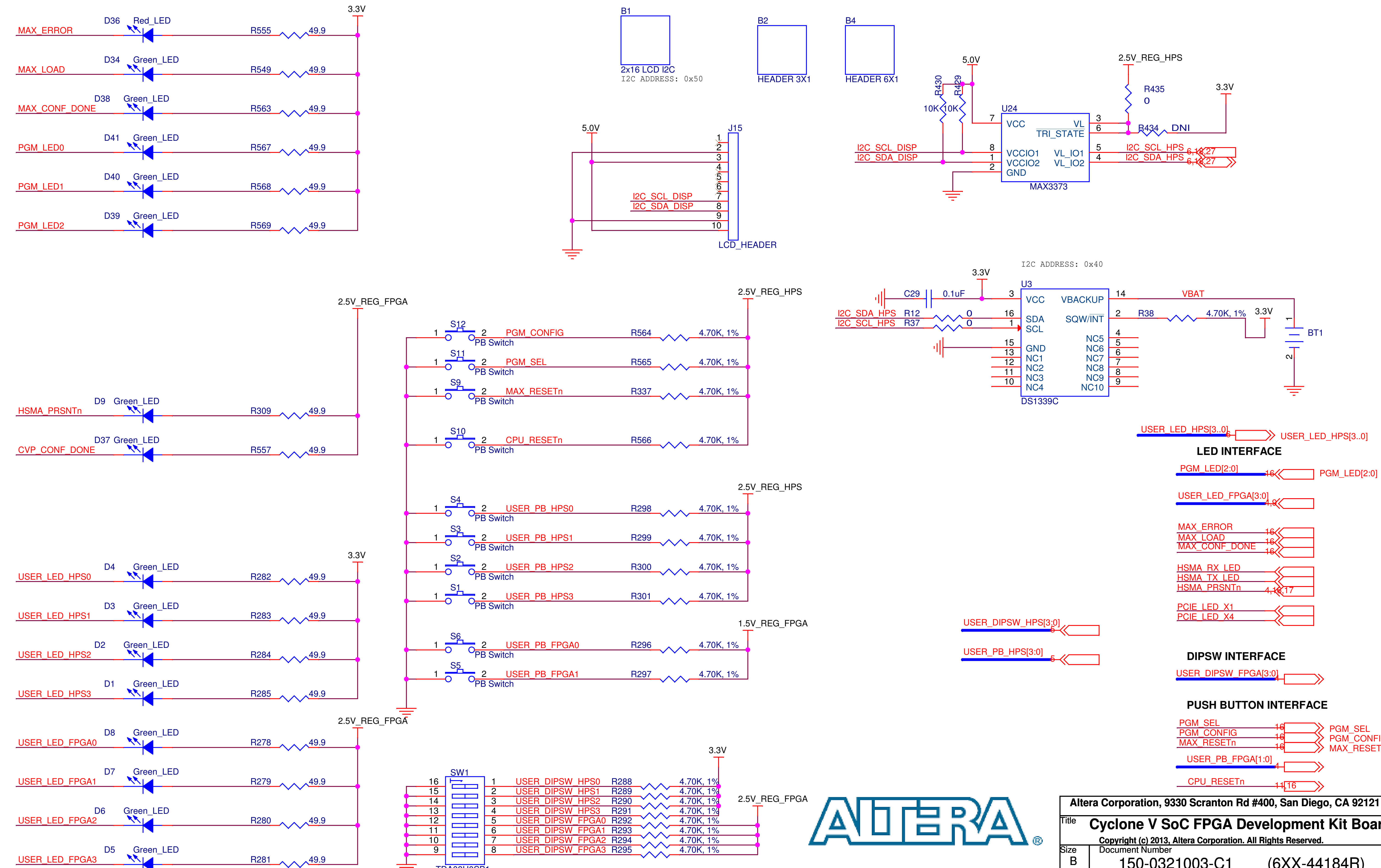
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 22 of 40

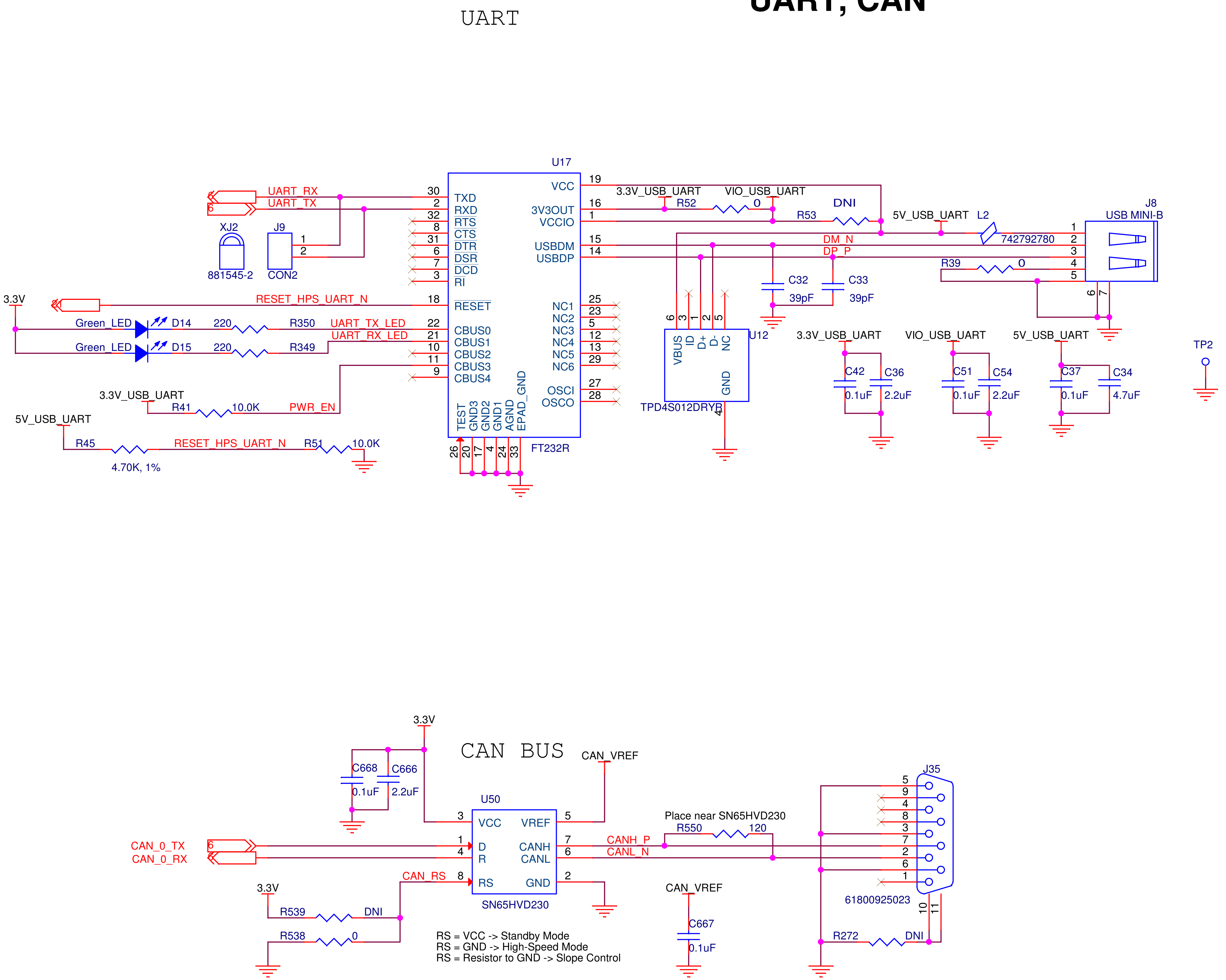
User I/O, RTC



ALTERA

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	Cyclone V SoC FPGA Development Kit Board
Size: B	Document Number: 150-0321003-C1 (6XX-44184R) Rev: C
Date: Wednesday, March 20, 2013	Sheet 23 of 40

UART, CAN

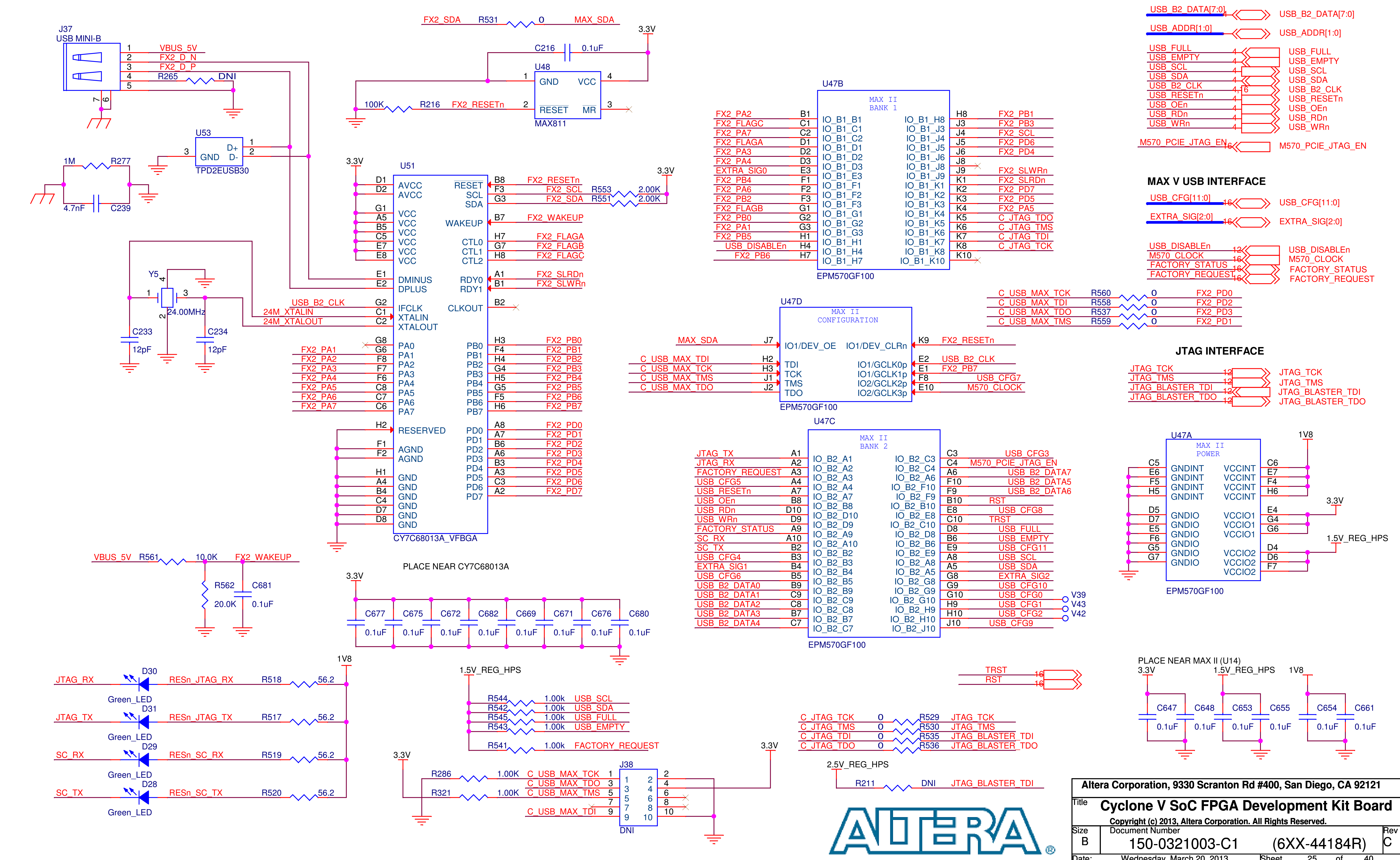


ALTERA®

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 24 of 40	

On-Board USB Blaster II



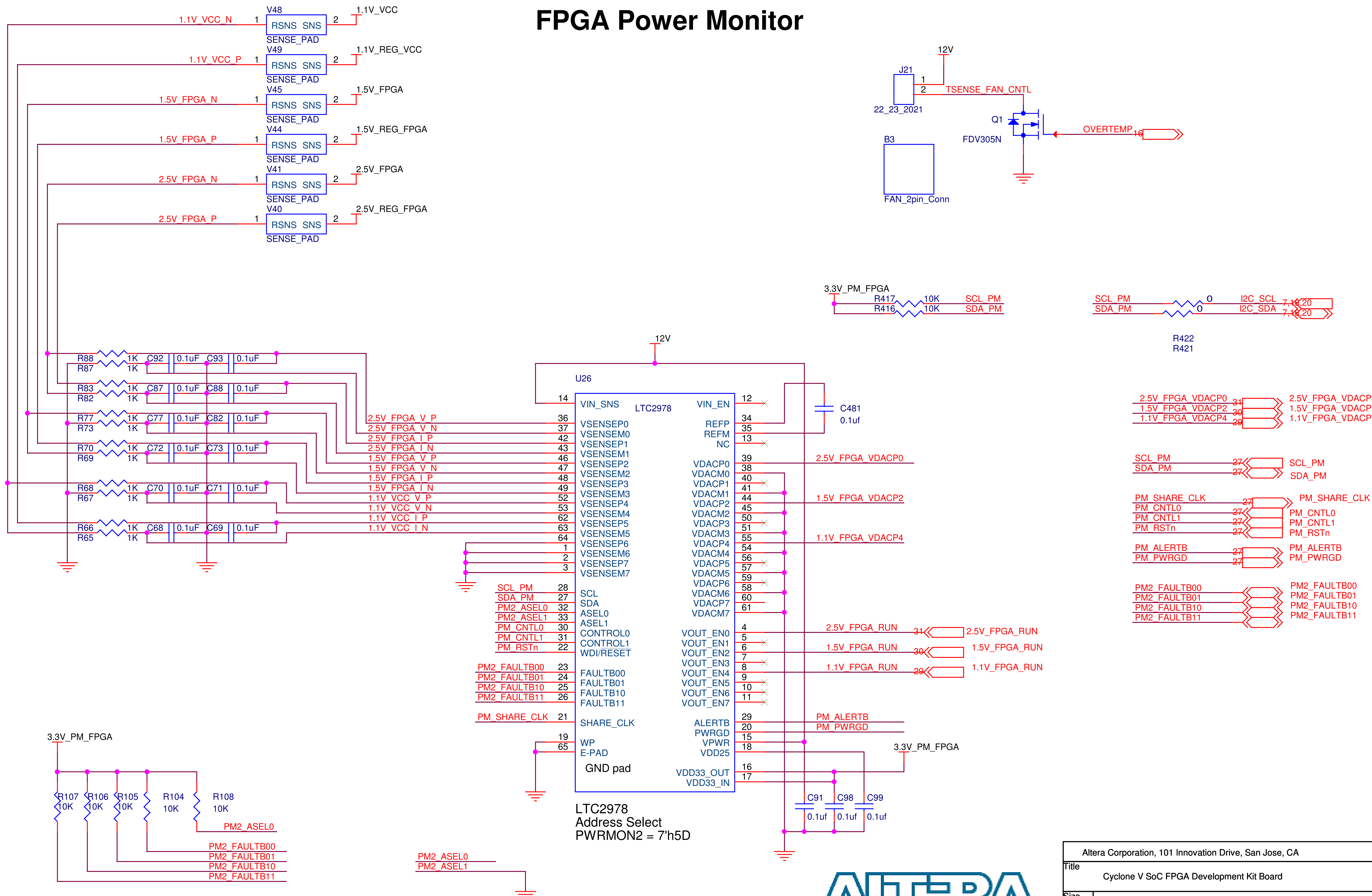
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

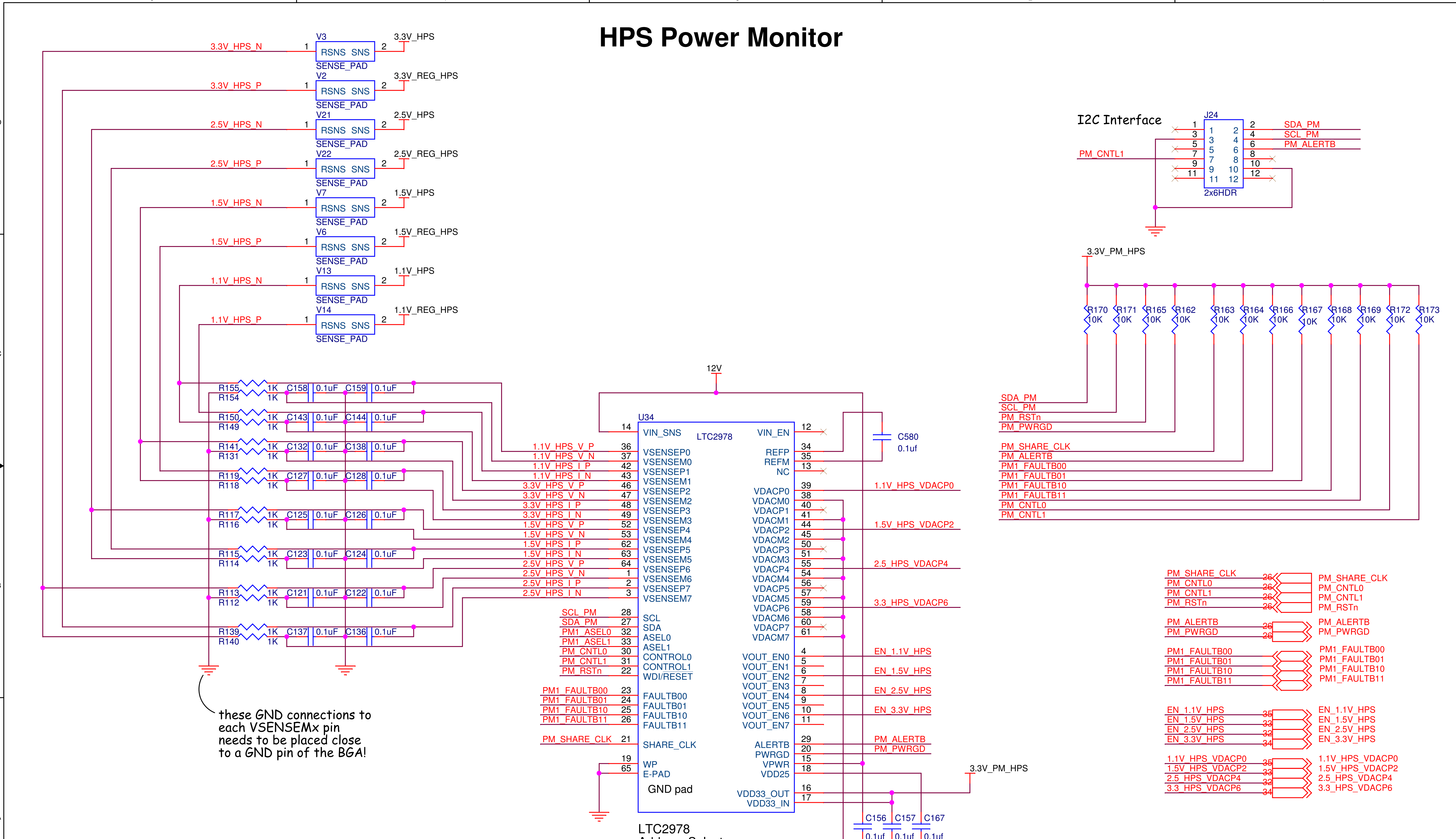
Date: Wednesday, March 20, 2013 Sheet 25 of 40

FPGA Power Monitor



Altera Corporation, 101 Innovation Drive, San Jose, CA	
Title	Cyclone V SoC FPGA Development Kit Board
Size B	Document Number 150-0321003-C1 (6XX-44184R) Rev C
Date: Wednesday, March 20, 2013	Sheet 26 of 40

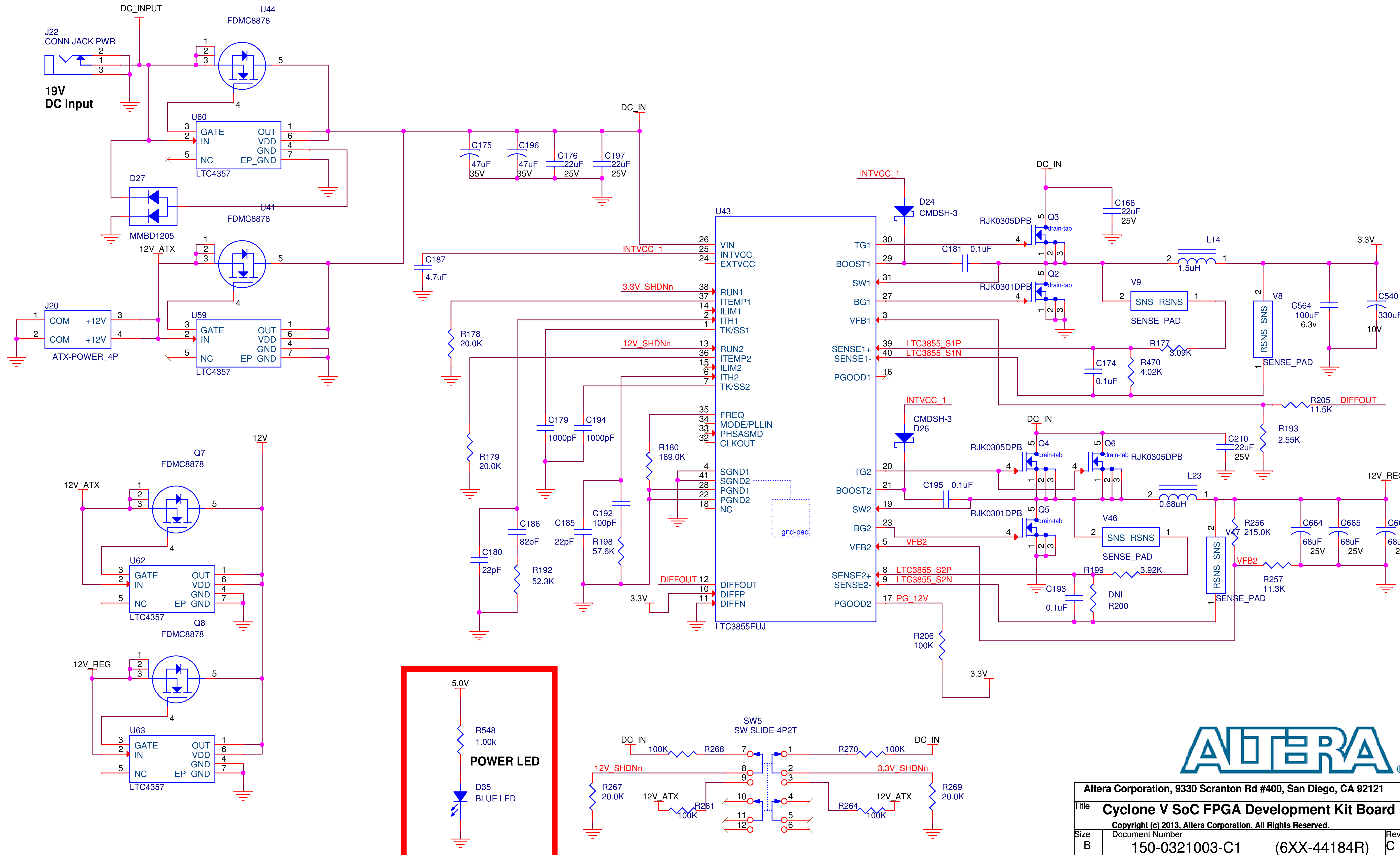
HPS Power Monitor



ALTERA®

	Altera Corporation, 101 Innovation Drive, San Jose, CA
Title	Cyclone V SoC FPGA Development Kit Board
Size B	Document Number 150-0321003-C1 (6XX-44184R) Rev C
Date:	Wednesday, March 20, 2013 Sheet 27 of 40

Power 1 - DC Input & 12V, 3.3V Output

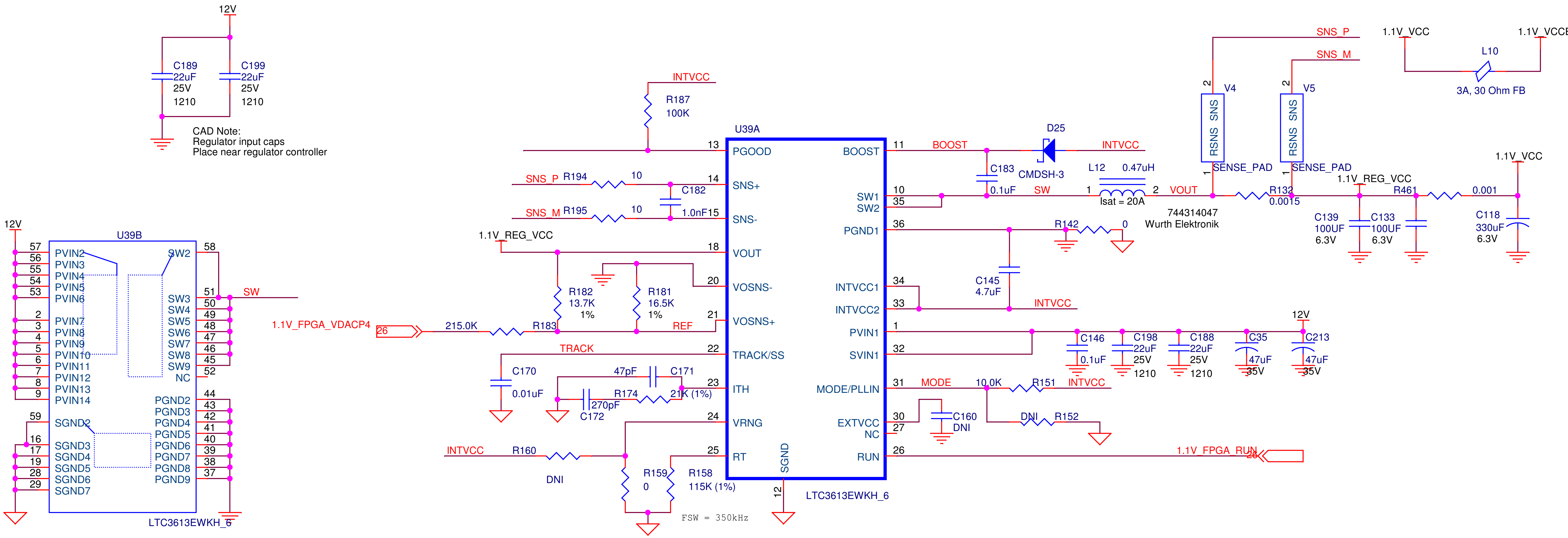


ALTERA®

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board	
	Copyright (c) 2013, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 28 of 40	

Power 2



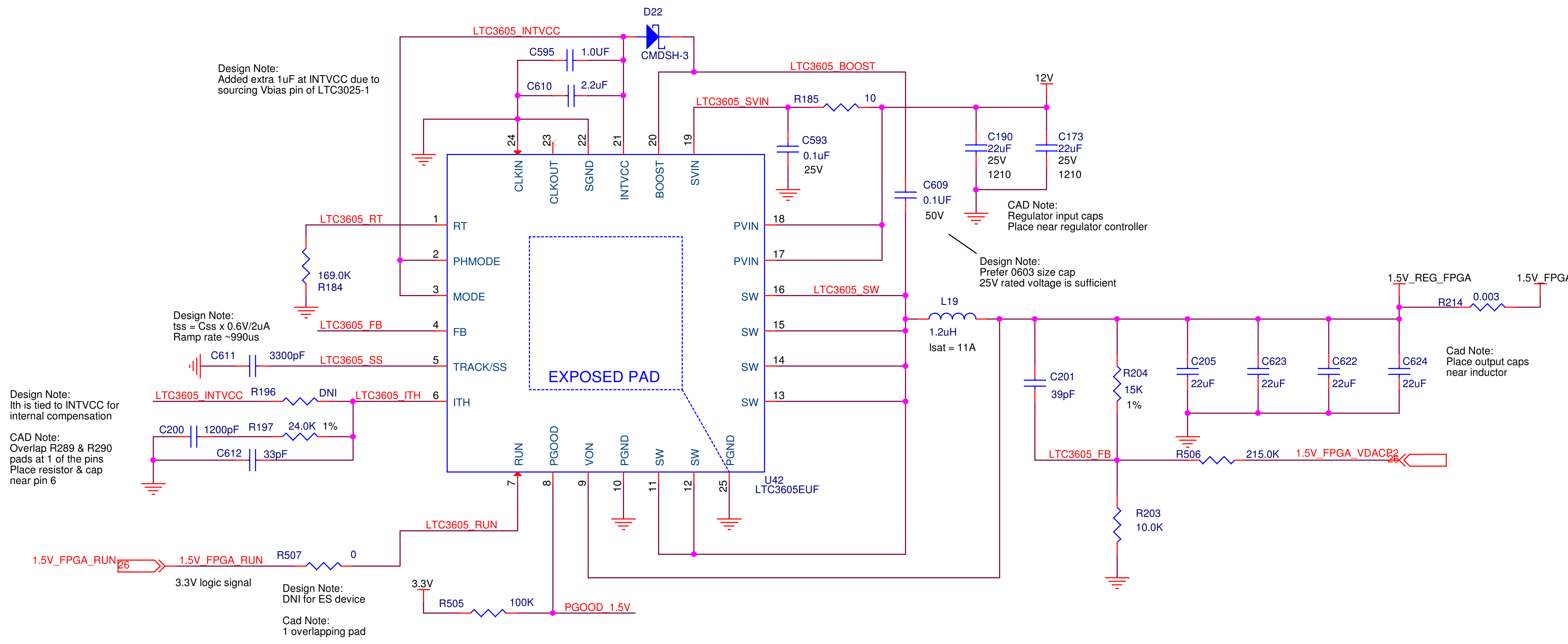
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

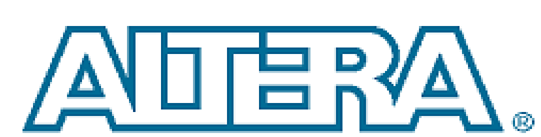
Title: **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 29 of 40

Power 3 - 1.5V FPGA

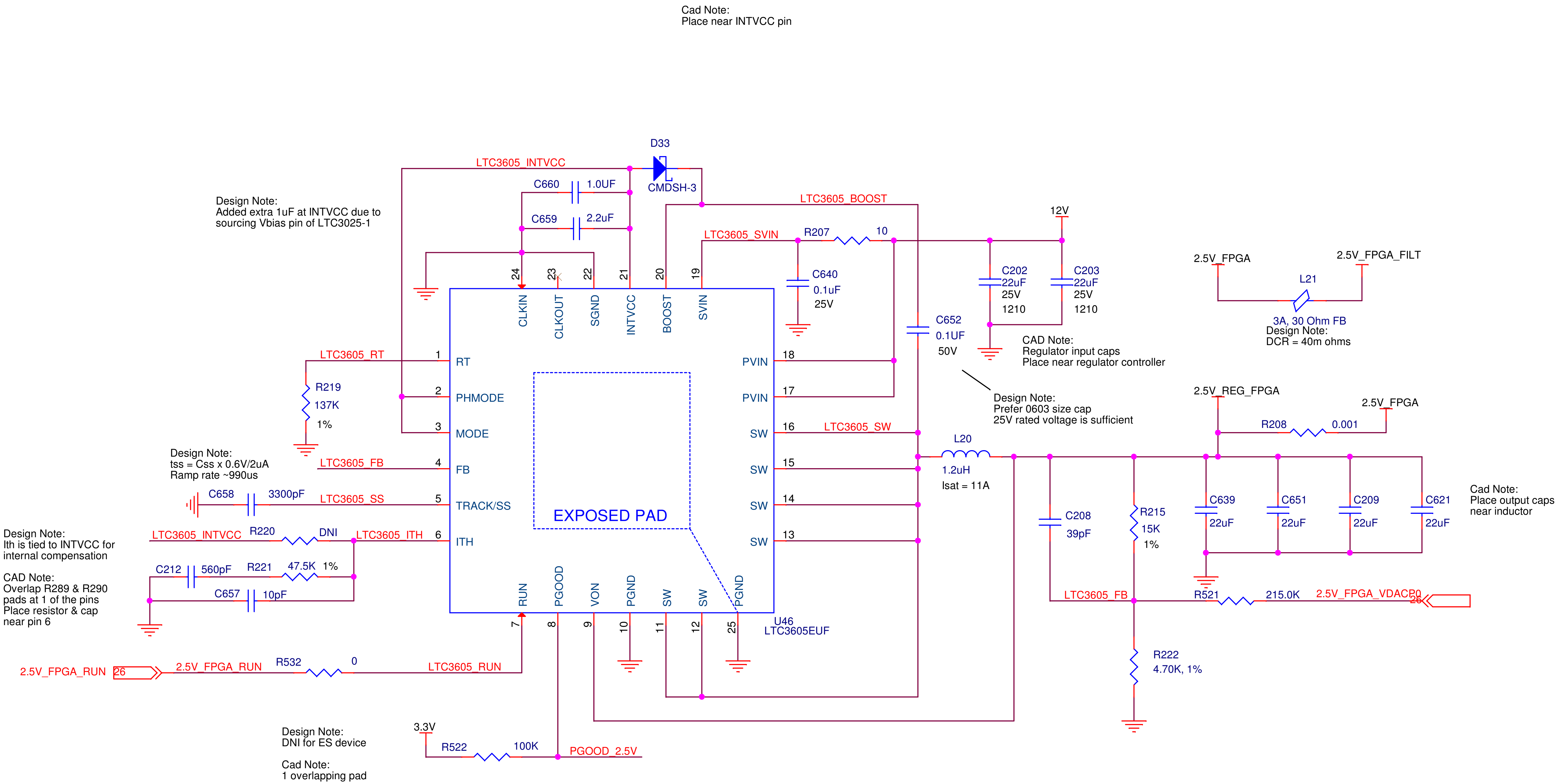




Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia

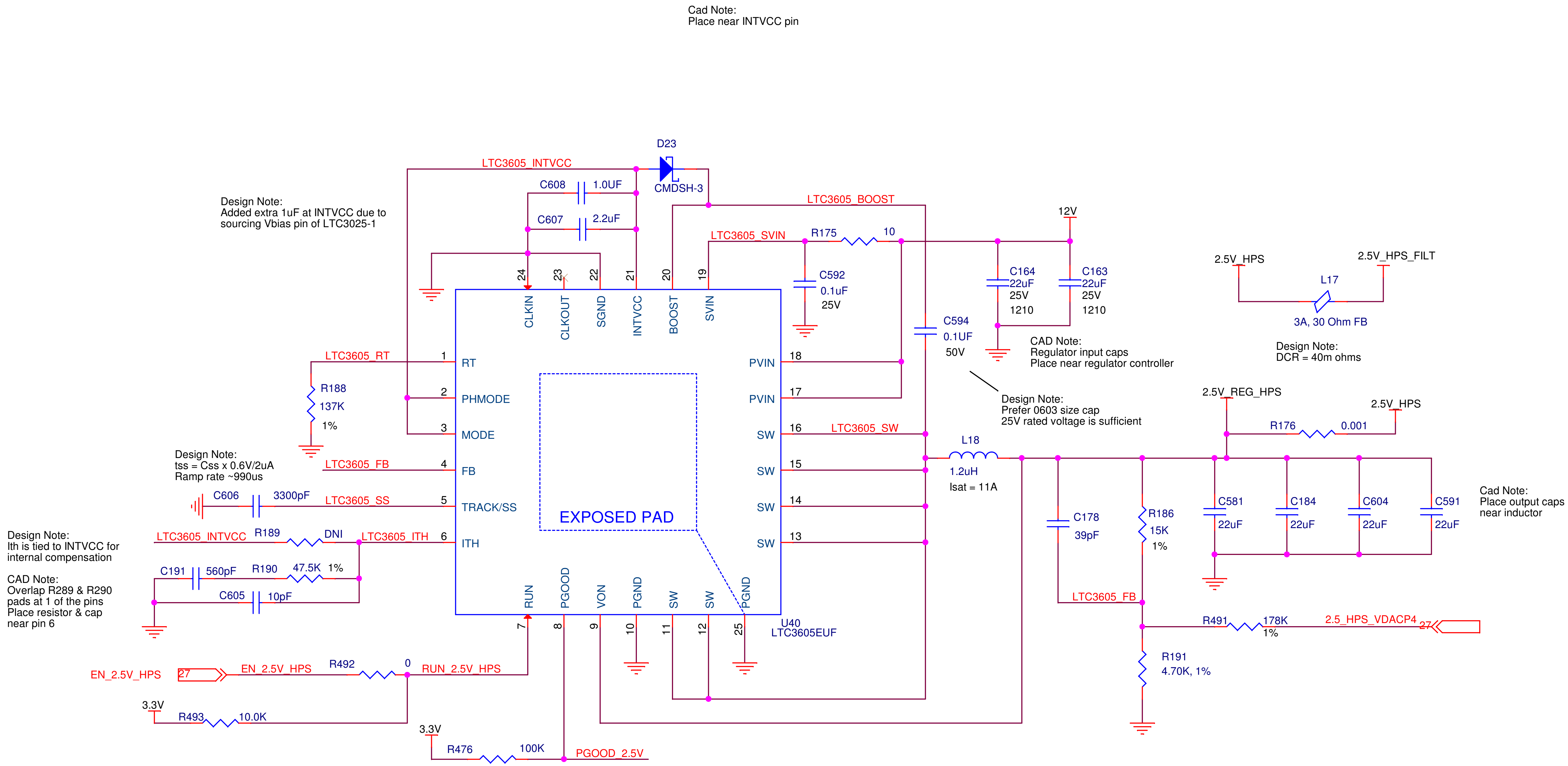
Title	Cyclone V SoC FPGA Development Kit Board	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 30 of 40	

Power 3 - 2.5V FPGA



Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia		
Title	Cyclone V SoC FPGA Development Kit Board	
	Copyright (c) 2013, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 31 of 40	

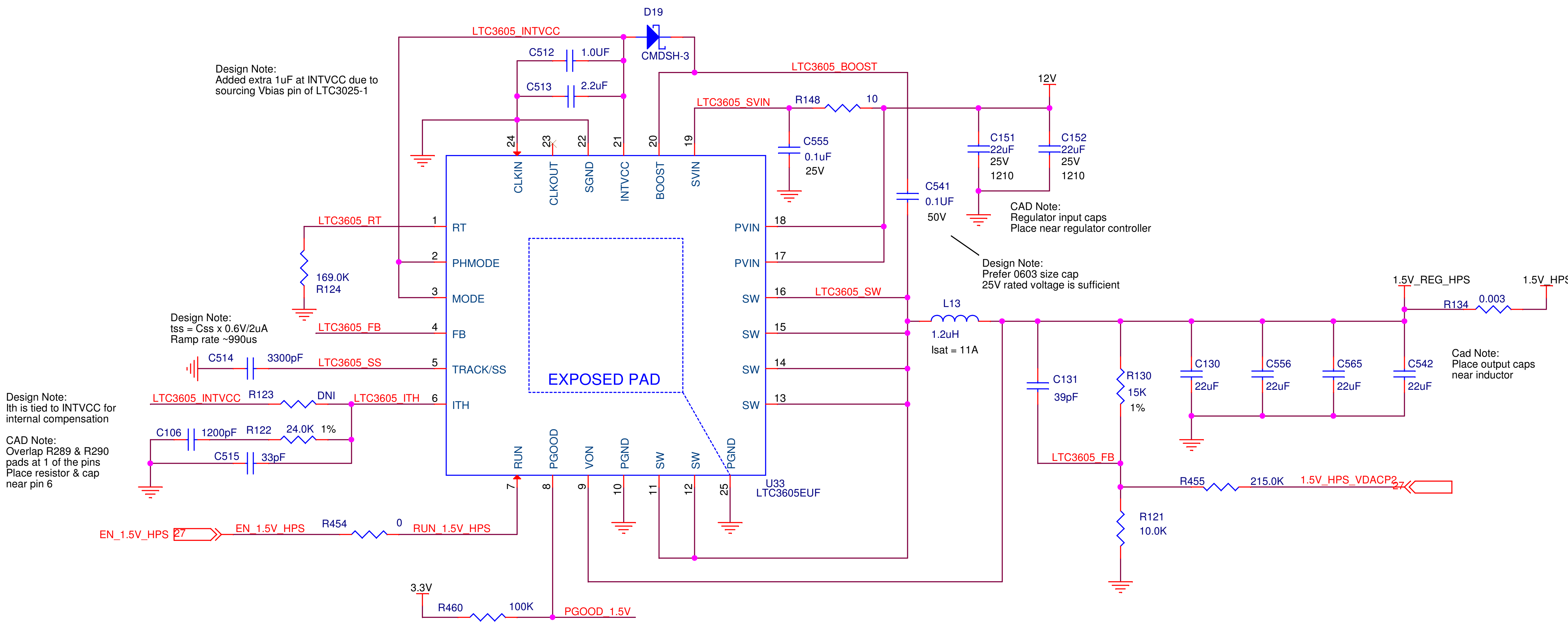
Power 3 - 2.5V HPS



Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia

Title	Cyclone V SoC FPGA Development Kit Board		
Size B	Document Number 150-0321003-C1 (6XX-44184R)		Rev C
Date: Wednesday, March 20, 2013		Sheet 32 of 40	

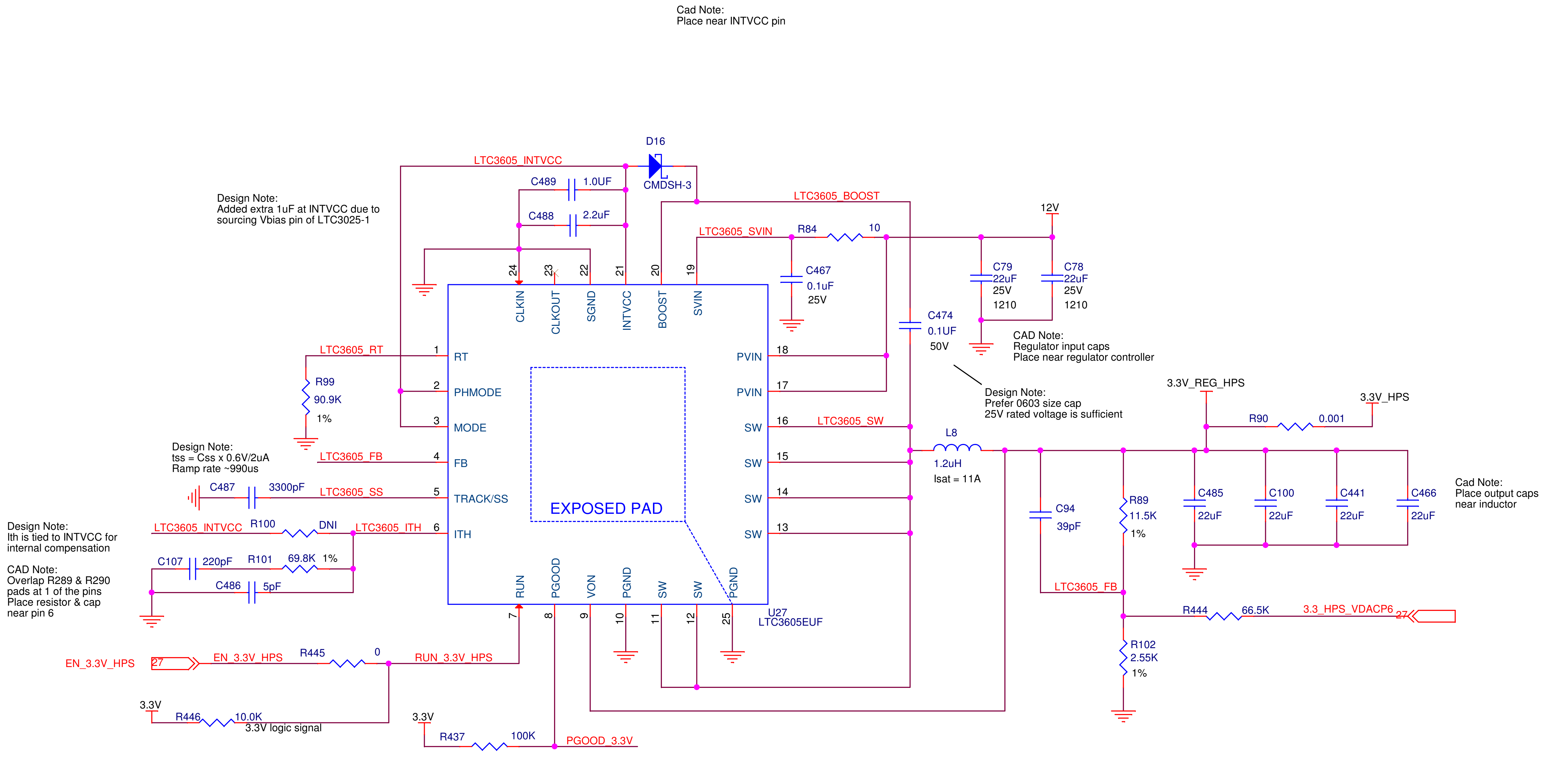
Power 3 - 1.5V & 1.5V FPGA



Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia

Title	Cyclone V SoC FPGA Development Kit Board	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 33 of 40	

Power 3 - 3.3V HPS



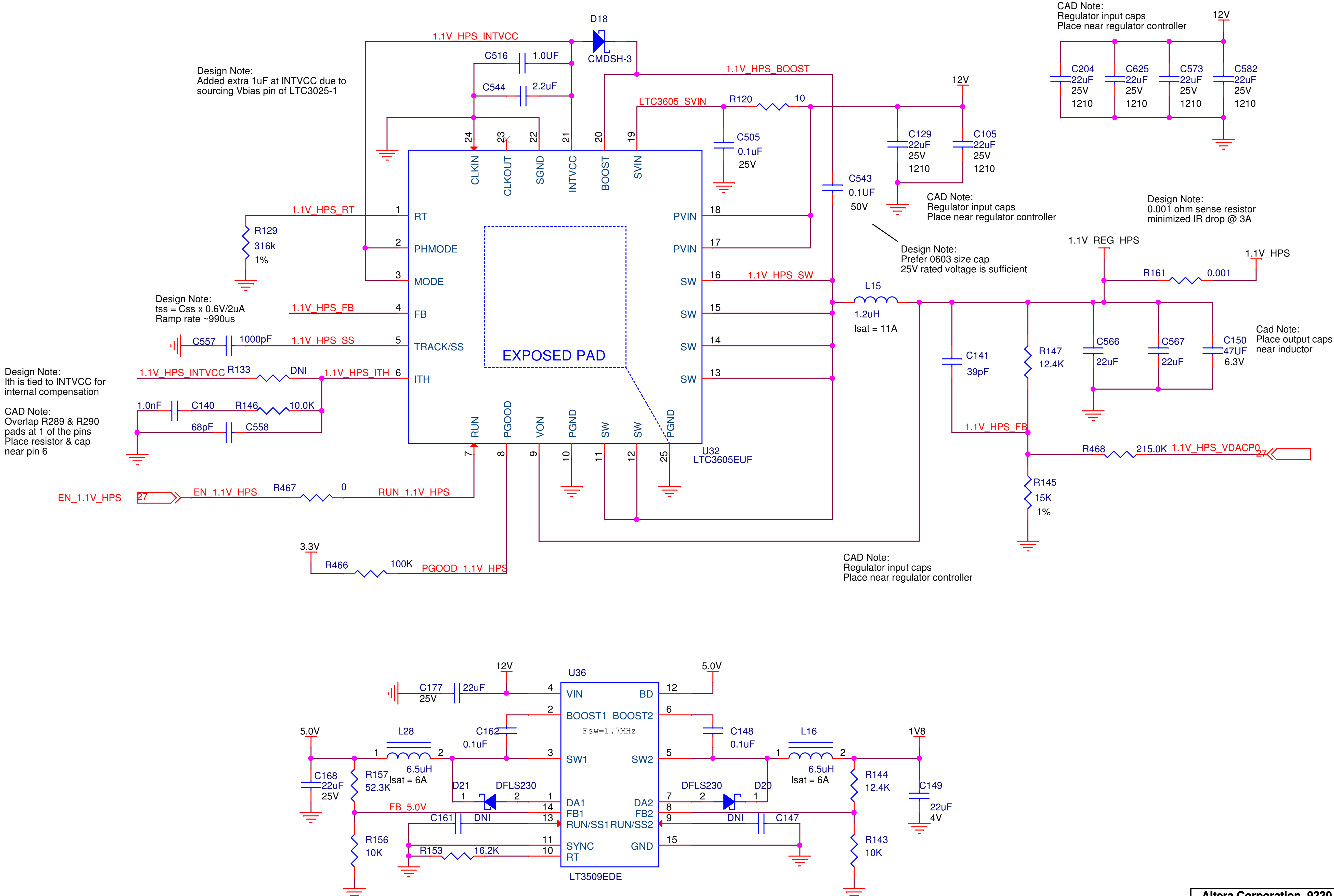
Altera Worldwide Service, Plot 6, Bayan Lepas Technoplex, Penang, Malaysia

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 34 of 40

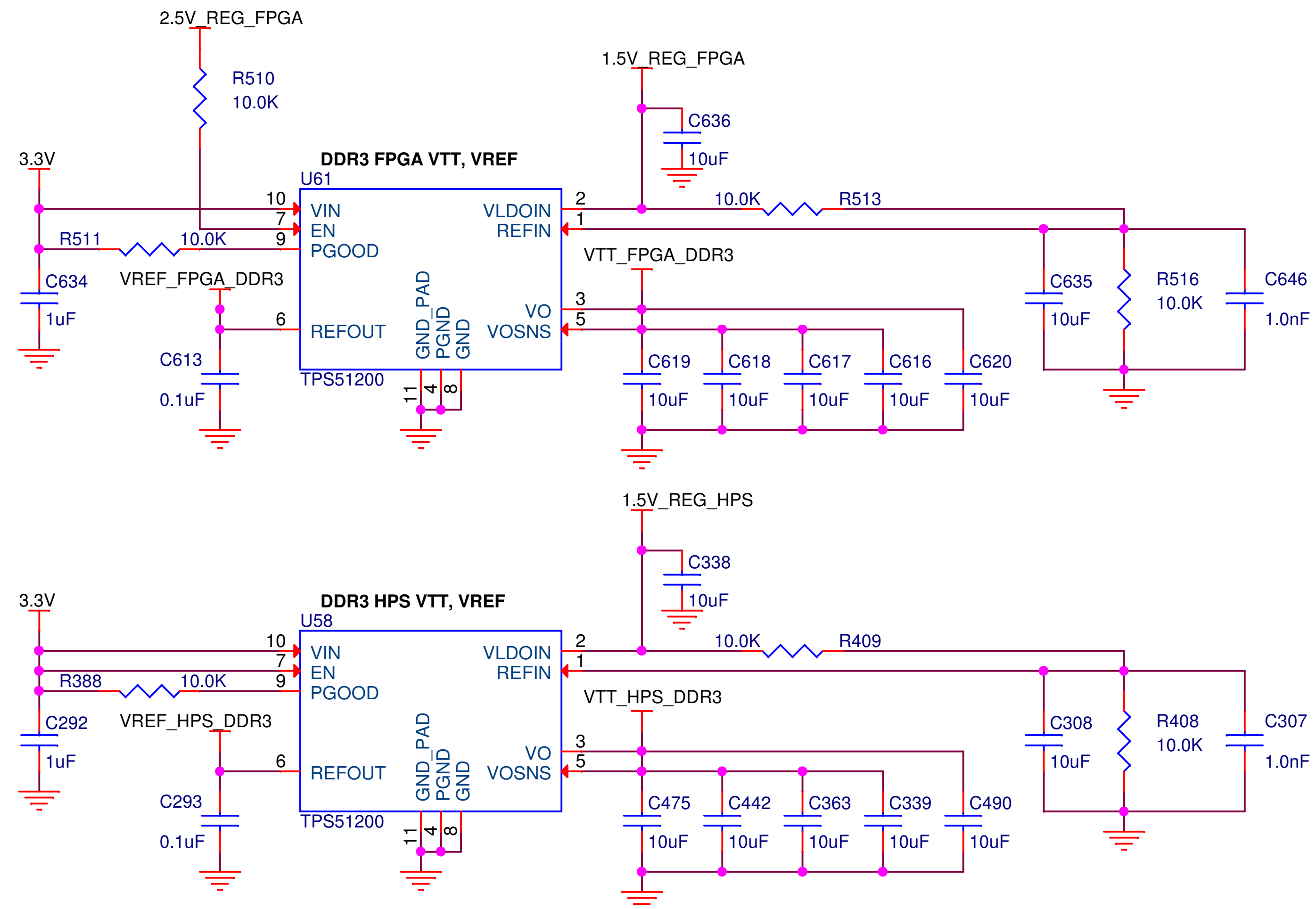
Power - 1.1V_HPS, 5.0V, 1.8V



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	Cyclone V SoC FPGA Development Kit Board	
Size B	Document Number 150-0321003-C1 (6XX-44184R)	Rev C
Date: Wednesday, March 20, 2013	Sheet 35 of 40	

Power 4 - Linear Regulators



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

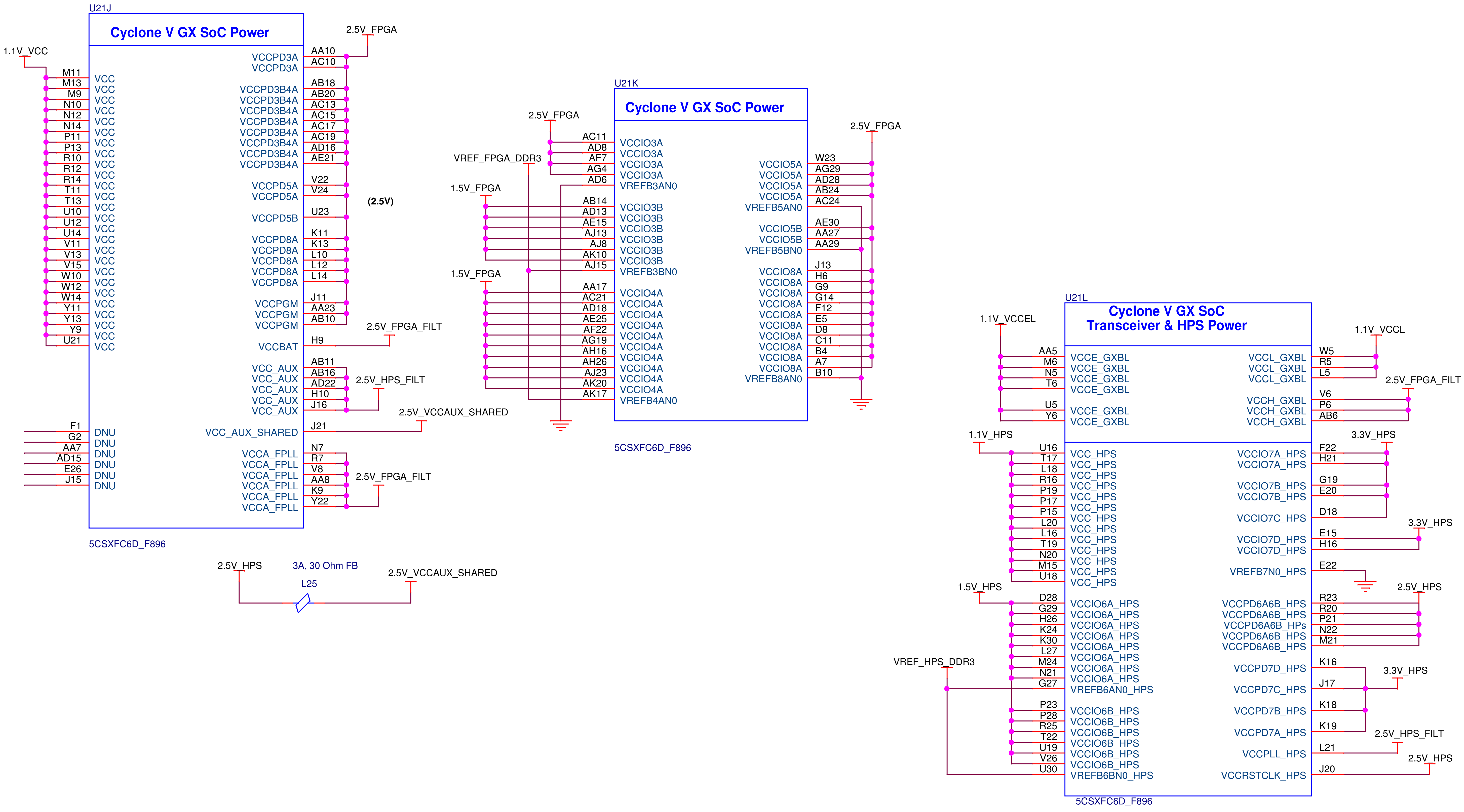
Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013

Power 6 - Power & Temperature Monitor

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121			
Title	Cyclone V SoC FPGA Development Kit Board		
Size B	Document Number 150-0321003-C1 (6XX-44184R)		Rev C
Date: Wednesday, March 20, 2013		Sheet 37 of 40	

Power 7 - Cyclone V GX SoC Power



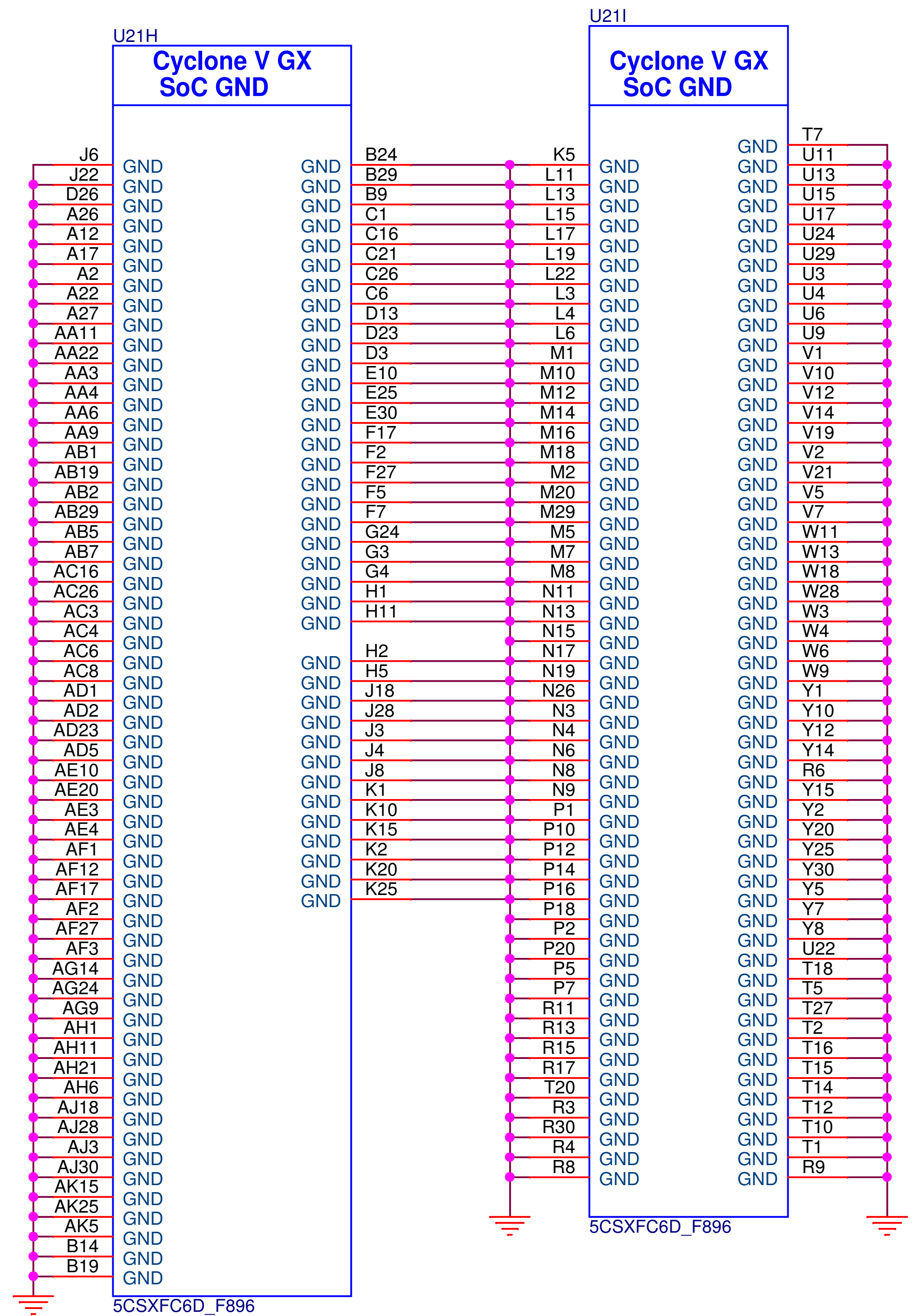
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 38 of 40

Power 8 - Cyclone V GX SoC Ground



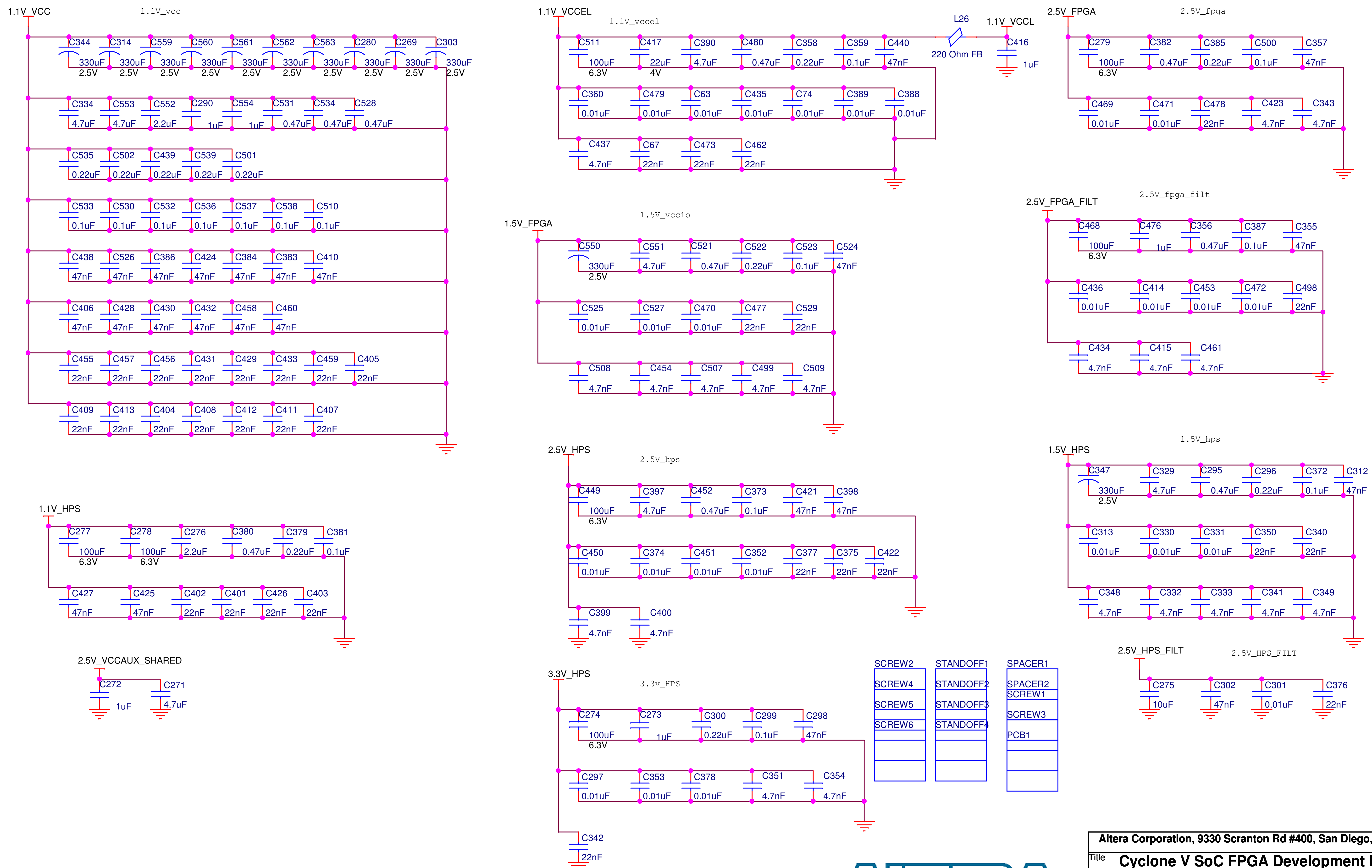
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number	Rev
B	150-0321003-C1 (6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 39 of 40

Decoupling



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **Cyclone V SoC FPGA Development Kit Board**

Size	Document Number		Rev
B	150-0321003-C1	(6XX-44184R)	C

Date: Wednesday, March 20, 2013 Sheet 40 of 40