NOTES:

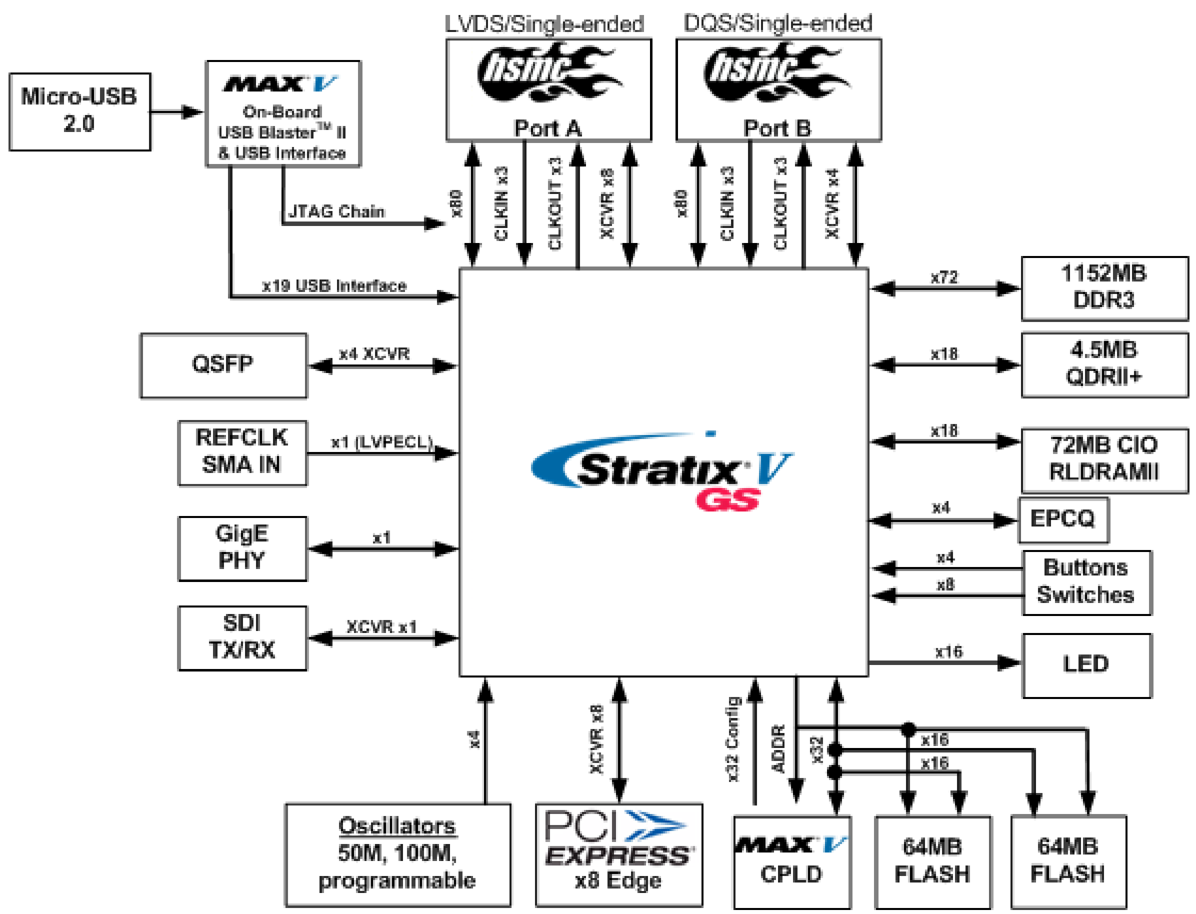
1. Project Drawing Numbers:

Raw PCB	100-0320202-C1
Gerber Files	110-0320202-C1
PCB Design Files	120-0320202-C1
Assembly Drawing	130-0320202-C1
Fab Drawing	140-0320202-C1
Schematic Drawing	150-0320202-C1
PCB Film	160-0320202-C1
Bill of Materials	170-0320202-C1
Schematic Design Files	180-0320202-C1
Functional Specification	210-0320202-C1
PCB Layout Guidelines	220-0320202-C1
Assembly Rework	320-0320202-C1

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

REV	DATE	PAGES	DESCRIPTION
C1	05/01/2012	All	INITIAL REVISION C RELEASE

DSP Development Kit, Stratix V Edition



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

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 1 of 34

FPGA Package Top View

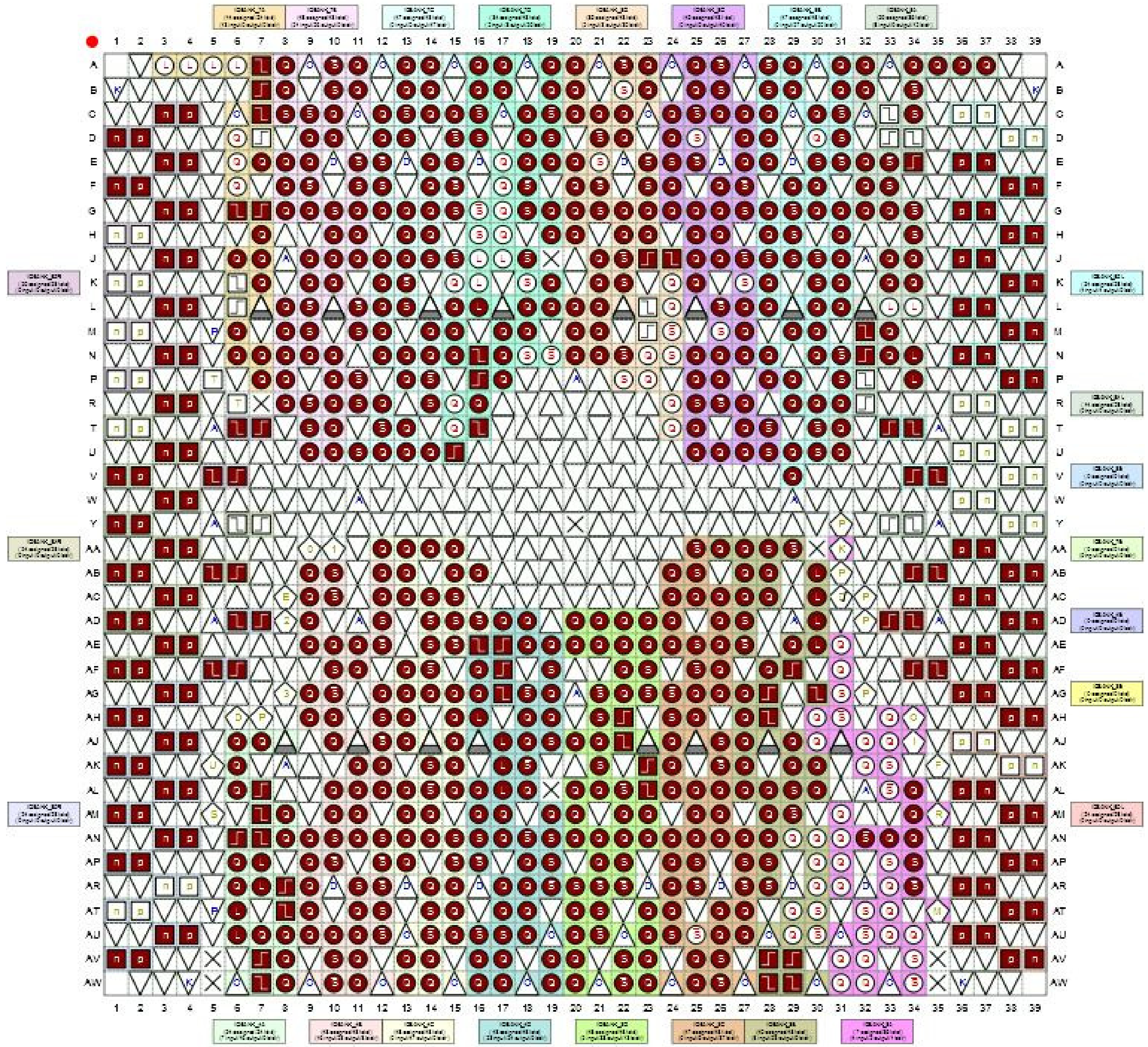
BANK 7B **VCCIO = 2.5V**
HSMA, QSFP CTL, DisplayPort CTL

BANK 7A
BANK 7C **VCCIO = 2.5V default/Variable**
HSMB, USER IO
BANK 7D

Top View - Flip Chip
Stratix V - 5SGSMD5K2F40C2

BANK 8A
BANK 8B **VCCIO = 1.5V**
DDR3, Embedded USB Blaster II
BANK 8C
BANK 8D

XCVR BANK QR2
HSMC Port B x2 (of 4 XCVRS)
DisplayPort (x4)



XCVR BANK QR3
QSFP
SDI

XCVR BANKS QR0, QR1
HSMC Port A x8
HSMC Port B x2 (of 4 XCVRS)

XCVR BANKS QR0, QR2
PCI Express x8

BANK 4B **VCCIO = 2.5V**
HSMA, USER IO
BANK 4A FLASH, USER IO **VCCIO = 1.8V**

BANK 4C QDRII+, FLASH **VCCIO = 1.8V**
BANK 4D

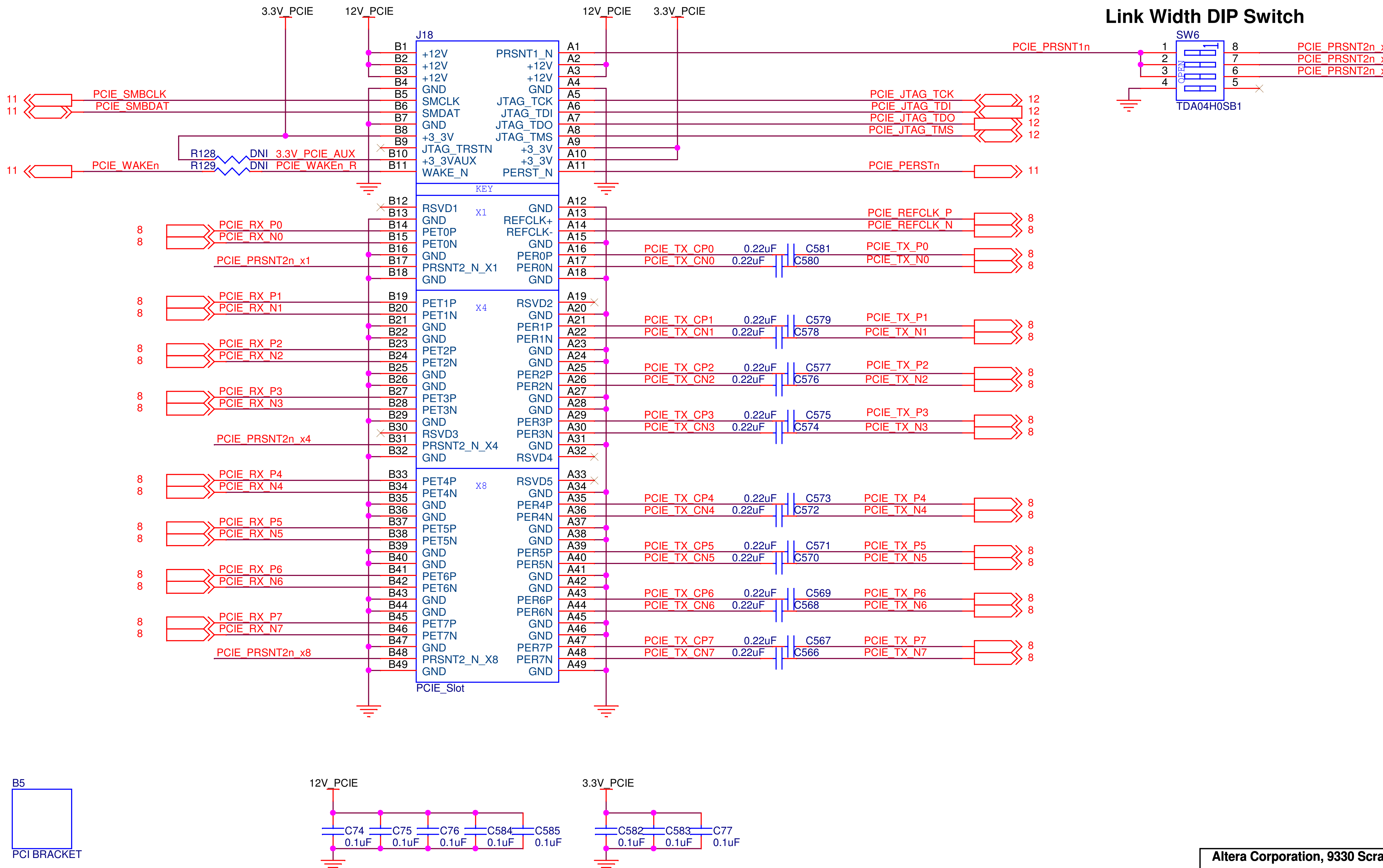
BANK 3A **VCCIO = 2.5V**
BANK 3B CONFIG, ENET, USER IO

BANK 3C **VCCIO = 1.8V**
BANK 3D RLDRAM II, FLASH

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

Title	DSP Development Kit, Stratix V Edition	
	Copyright (c) 2012, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 2 of 34	

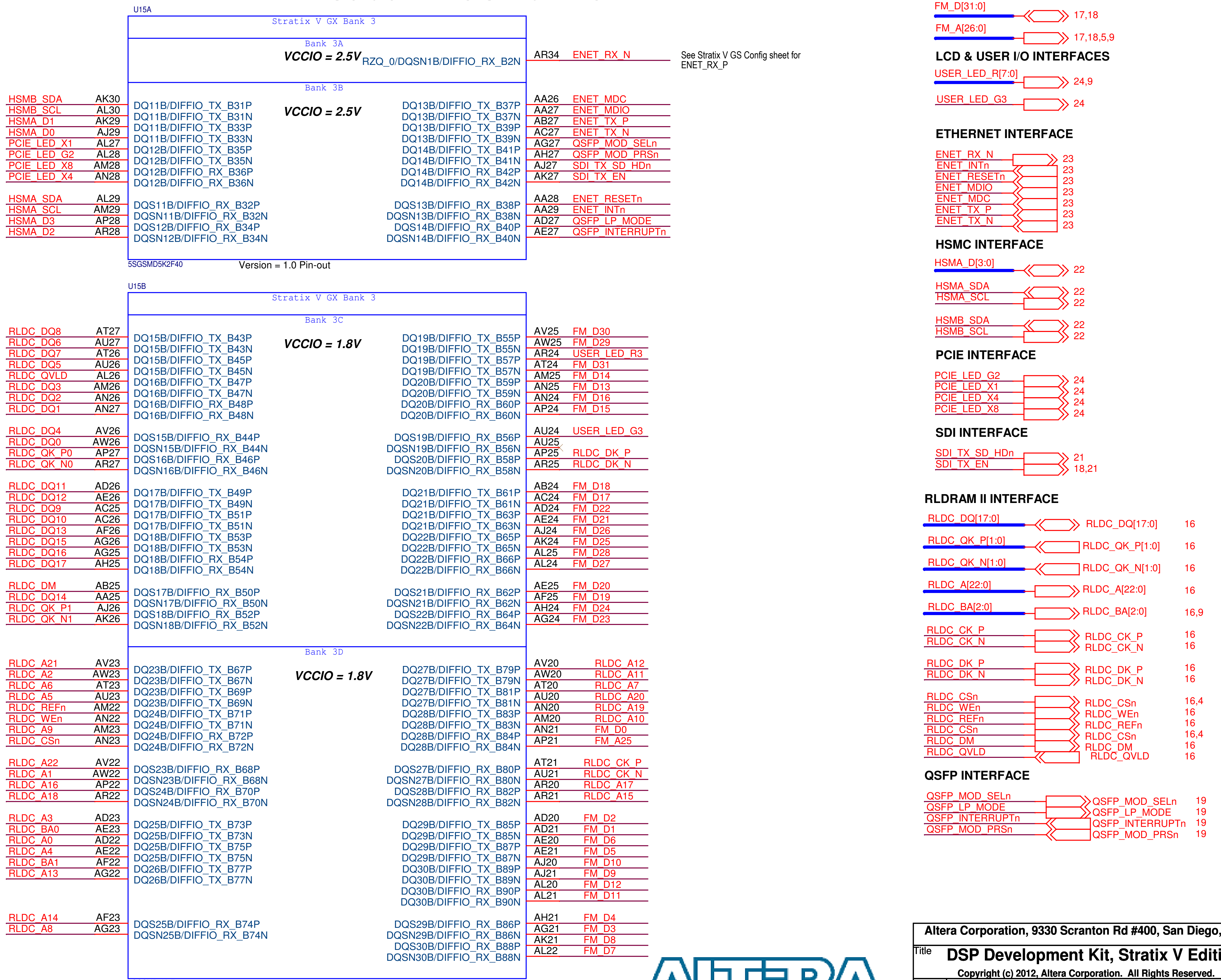
PCI Express Edge Connector



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

Title	DSP Development Kit, Stratix V Edition	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 3 of 34	

Stratix V GS Bank 3



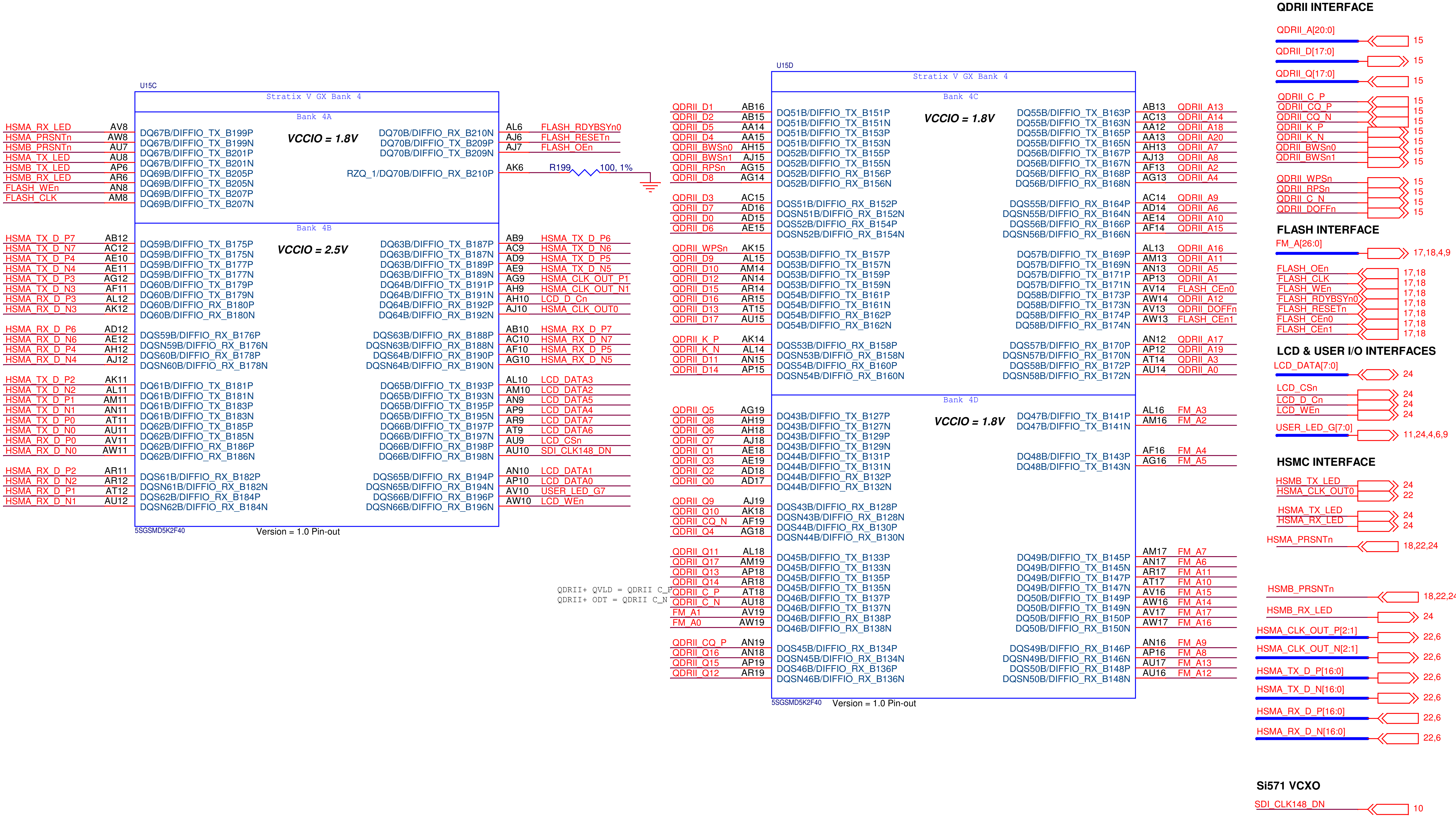
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 4 of 34

Stratix V GS Bank 4



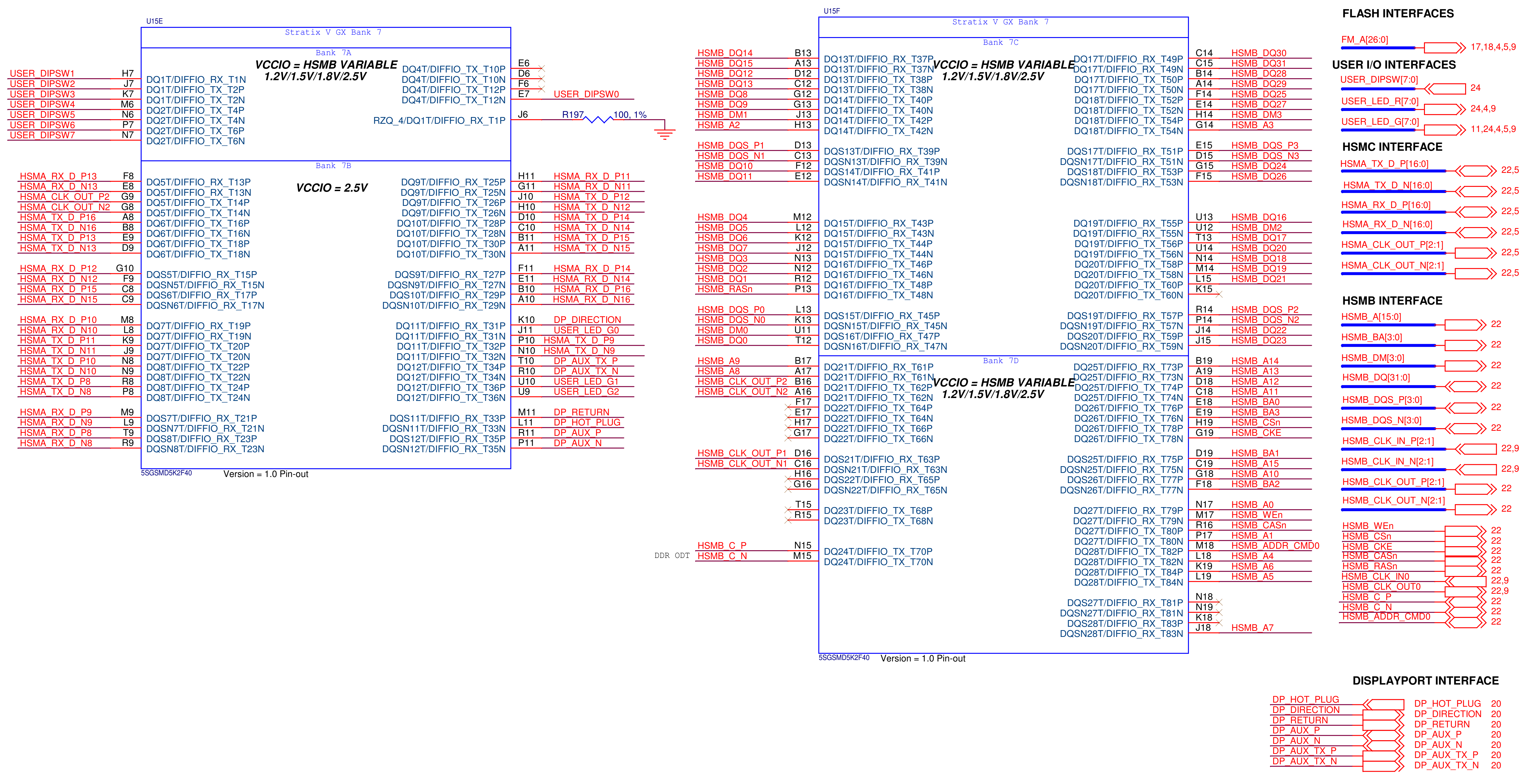
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012

Stratix V GS Bank 7



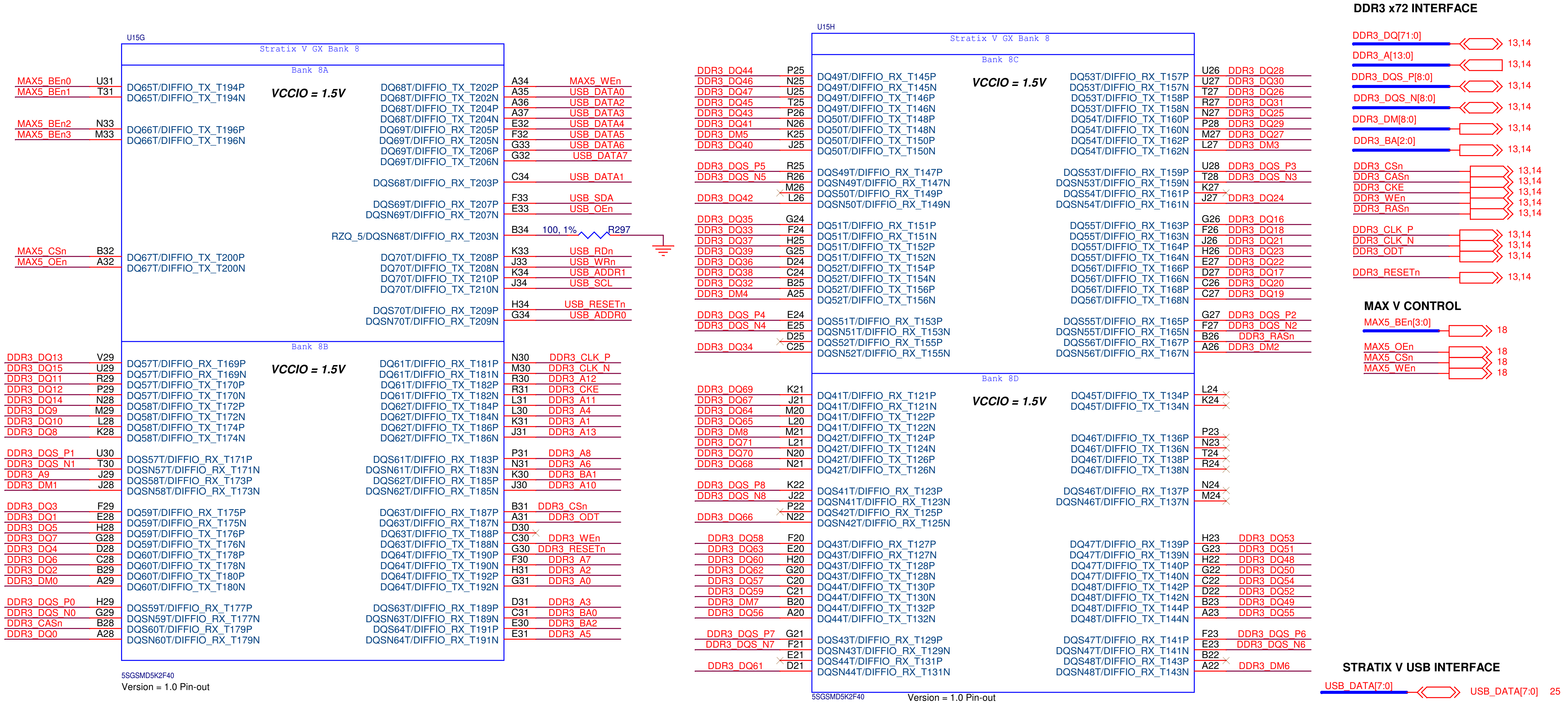
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012

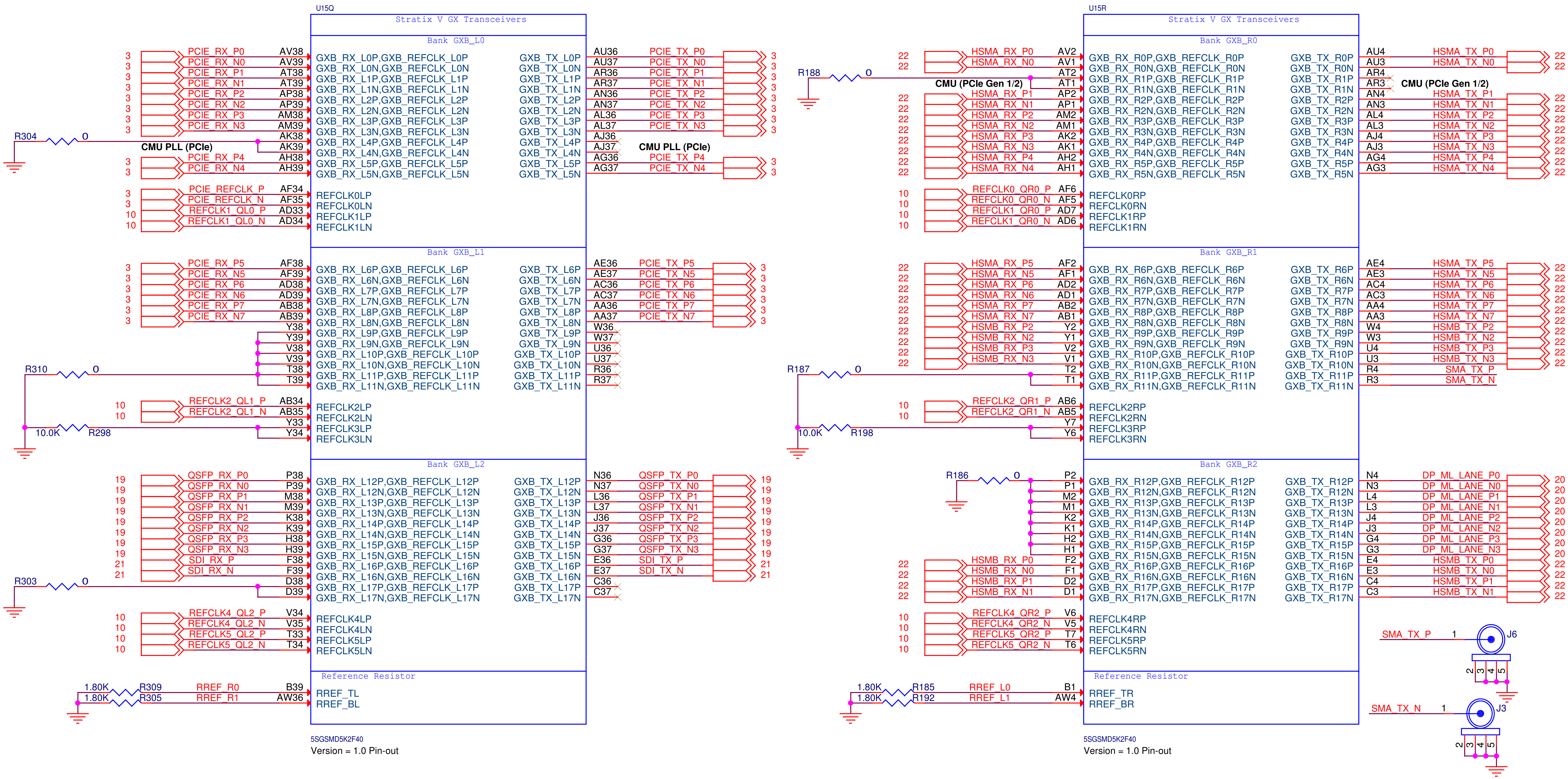
Stratix V GS Bank 8



In order to operate DDR3 at 1066MHz Altera requires all DDR3 address and command signals to be in the same sub-bank. With the current DDR3 pin out this board only supports DDR3 up to 800MHz. In order to support DDR3 at 1066MHz in the future DDR3_RASn would need to move to sub-bank 8B, pin U15.D30.

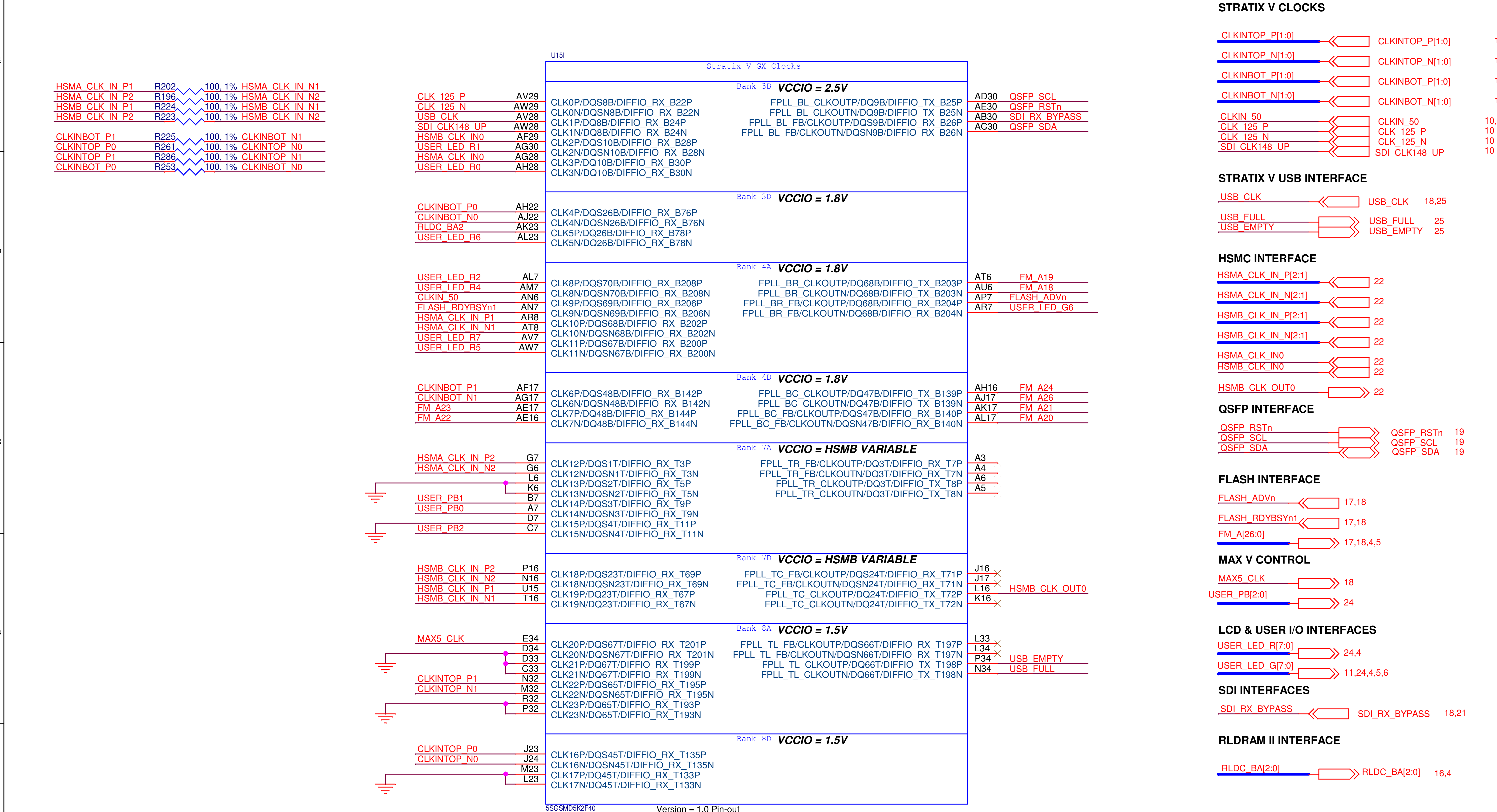
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121		
Title	**DSP Development Kit, Stratix V Edition**	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 7 of 34	

Stratix V GS Transceivers and Power



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121			
Title: **DSP Development Kit, Stratix V Edition**			
Size: B	Document Number: 150-0320202-C1 (6XX-44144R)		Rev: C1
Date: Monday, May 07, 2012		Sheet 8 of 34	

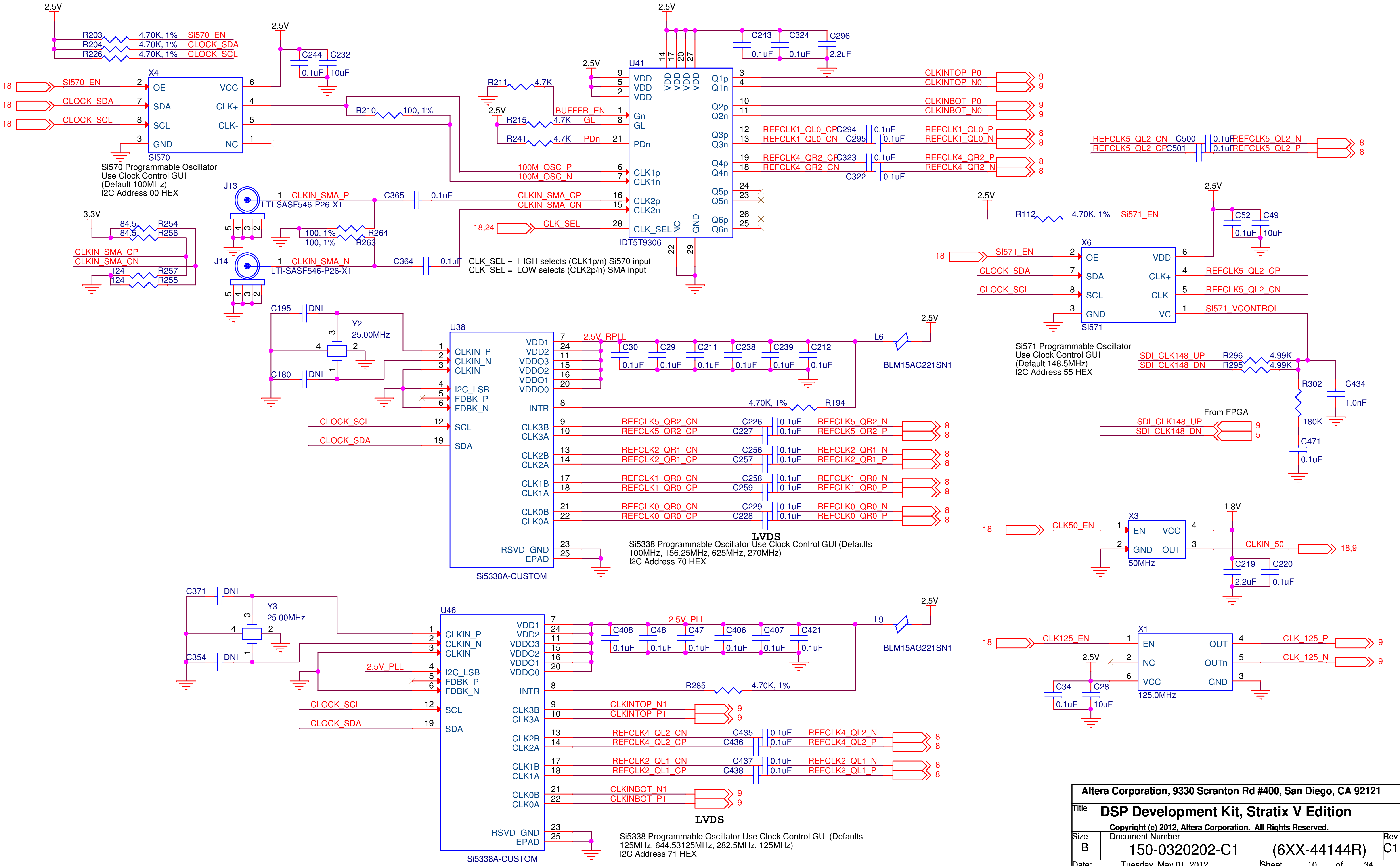
Stratix V GS Clocks



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

Title	DSP Development Kit, Stratix V Edition		
Size B	Document Number 150-0320202-C1	(6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012		Sheet 9 of 34	

PLL



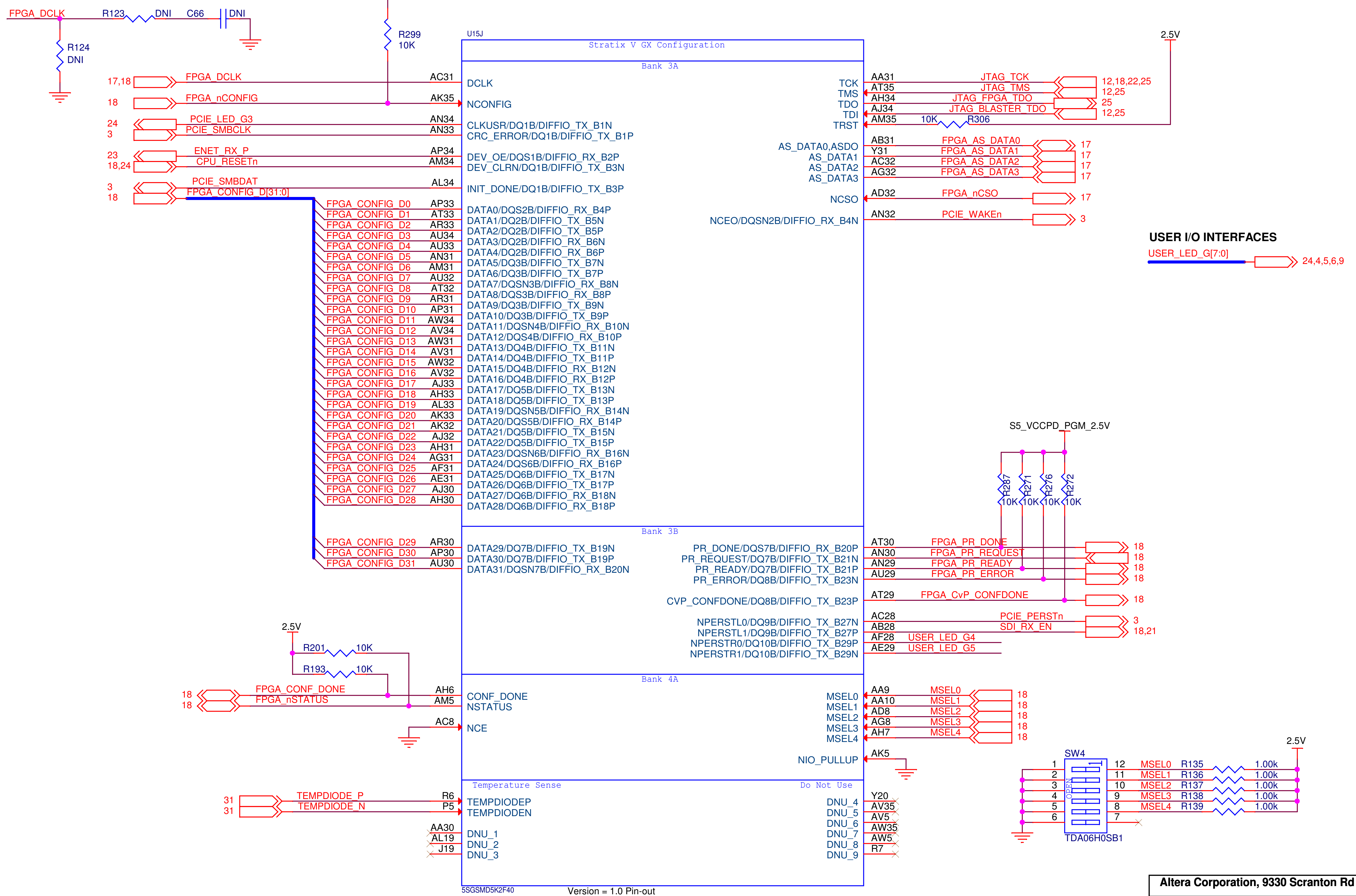
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 10 of 34

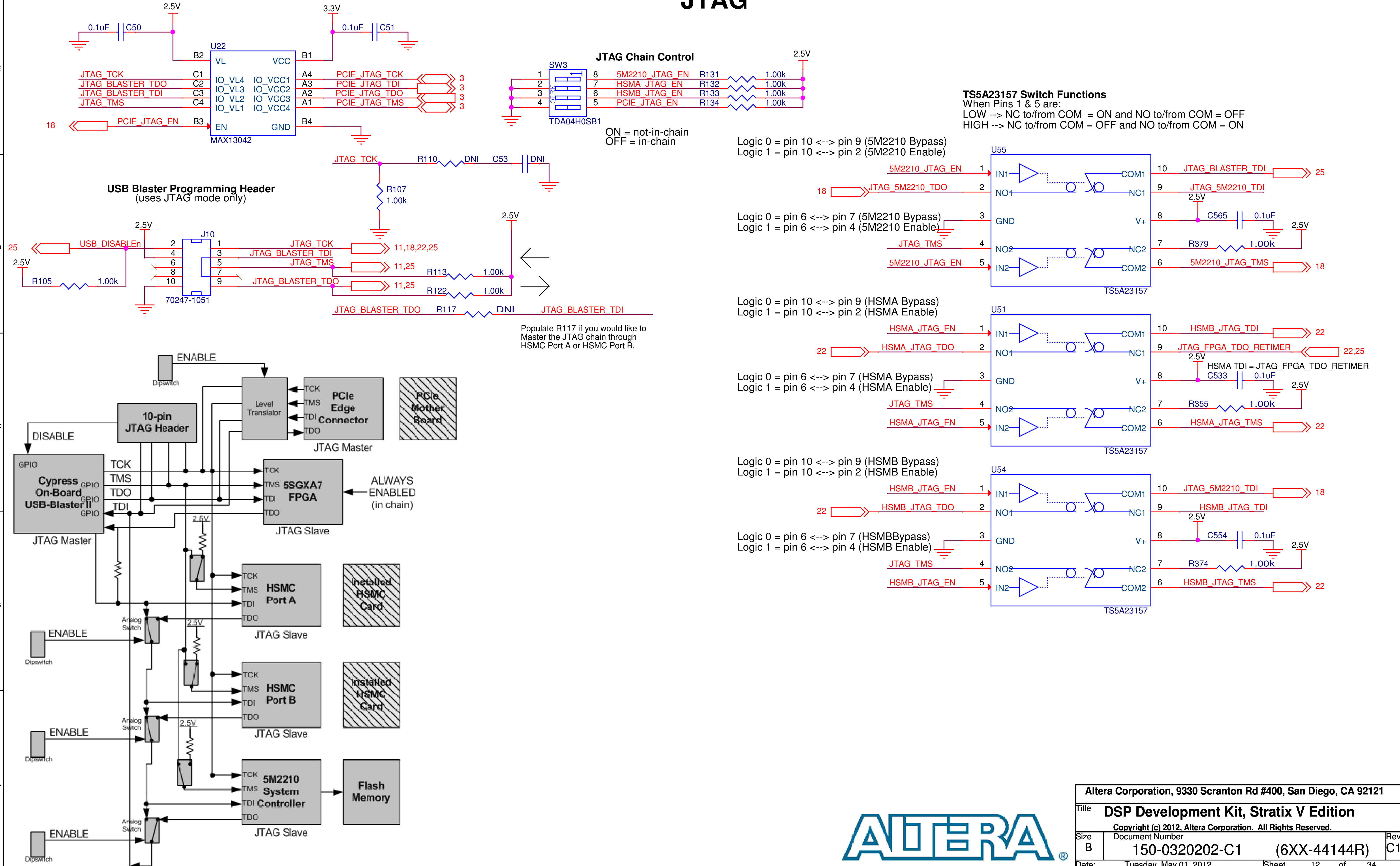
Stratix V GS Configuration



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

Title	DSP Development Kit, Stratix V Edition		
Size B	Document Number 150-0320202-C1	(6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012		Sheet 11 of 34	

JTAG



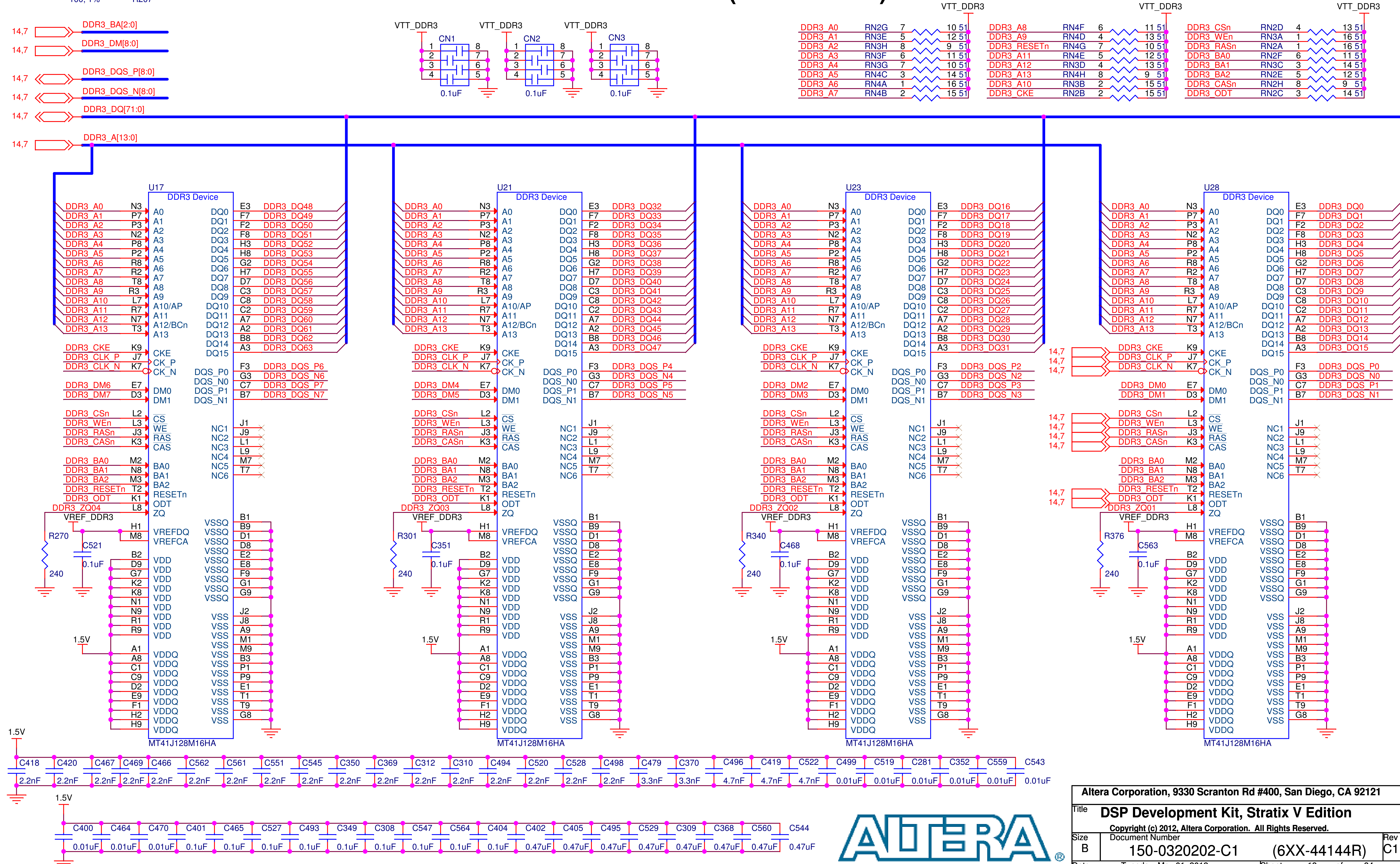
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **DSP Development Kit, Stratix V Edition**

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 12 of 34

512MB DDR3 (x72 devices) - Part 1 of 2



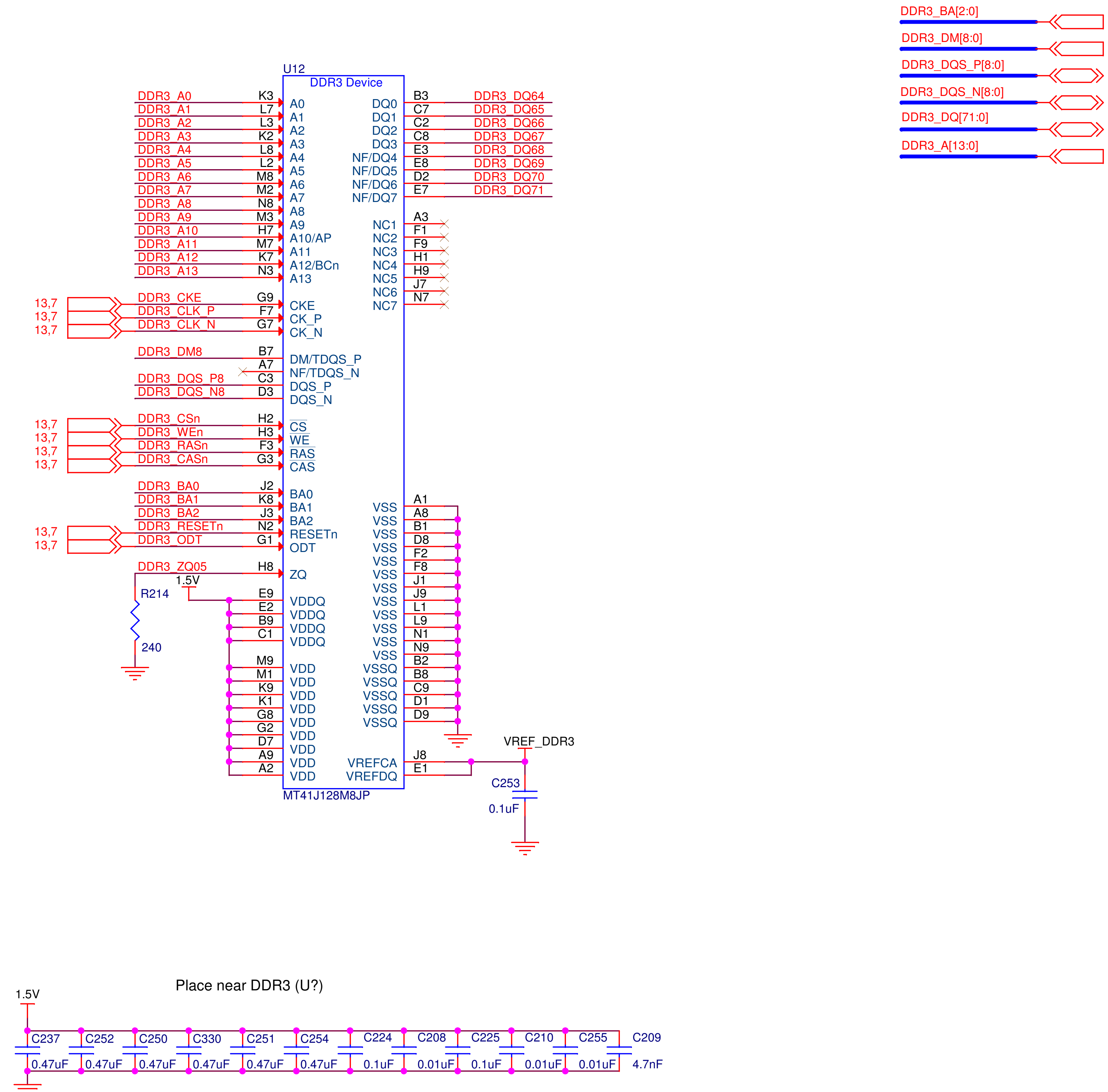
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 13 of 34

1152MB DDR3 - Part 2 of 2



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

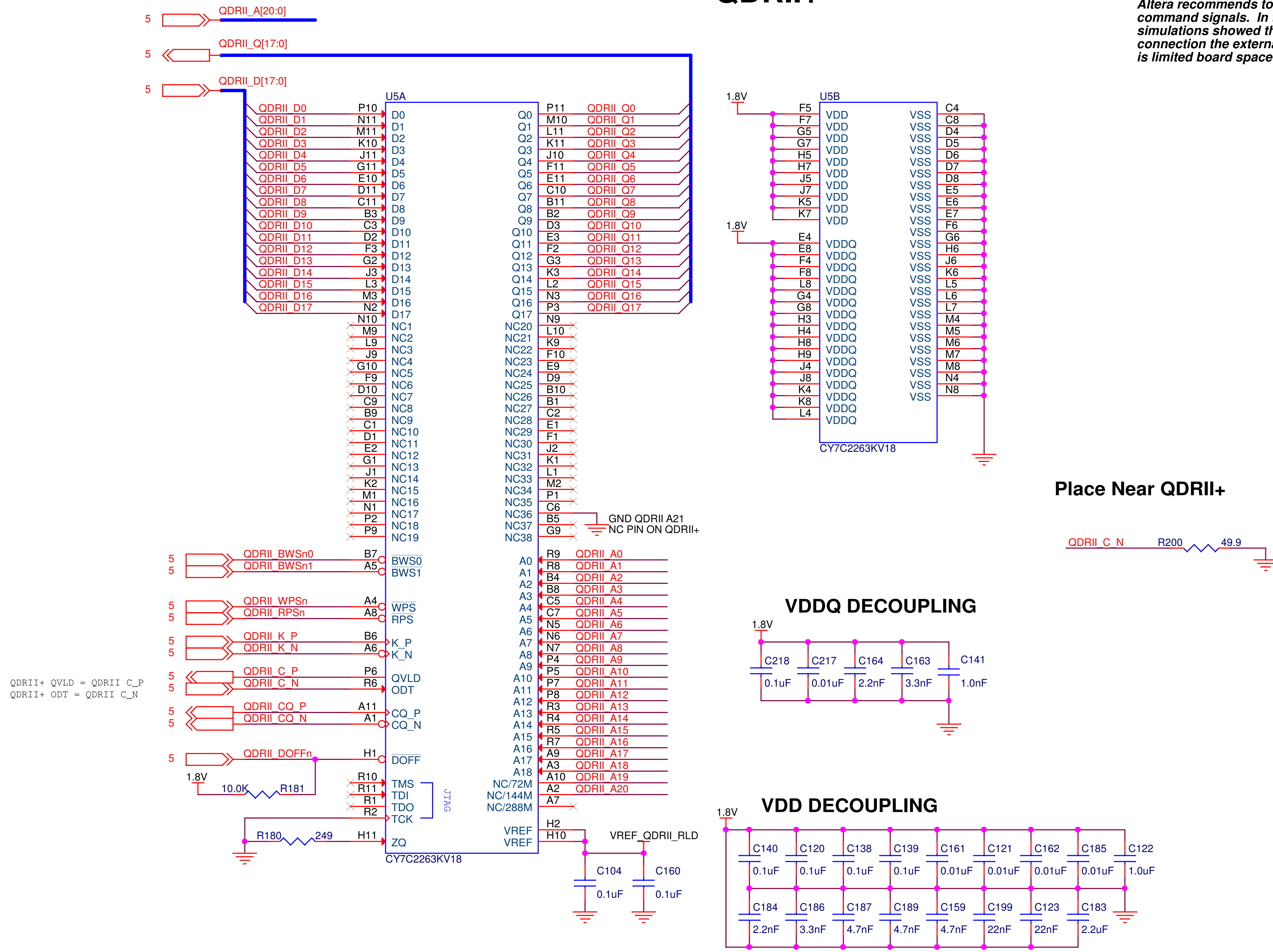
Title **DSP Development Kit, Stratix V Edition**

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012

QDRII+

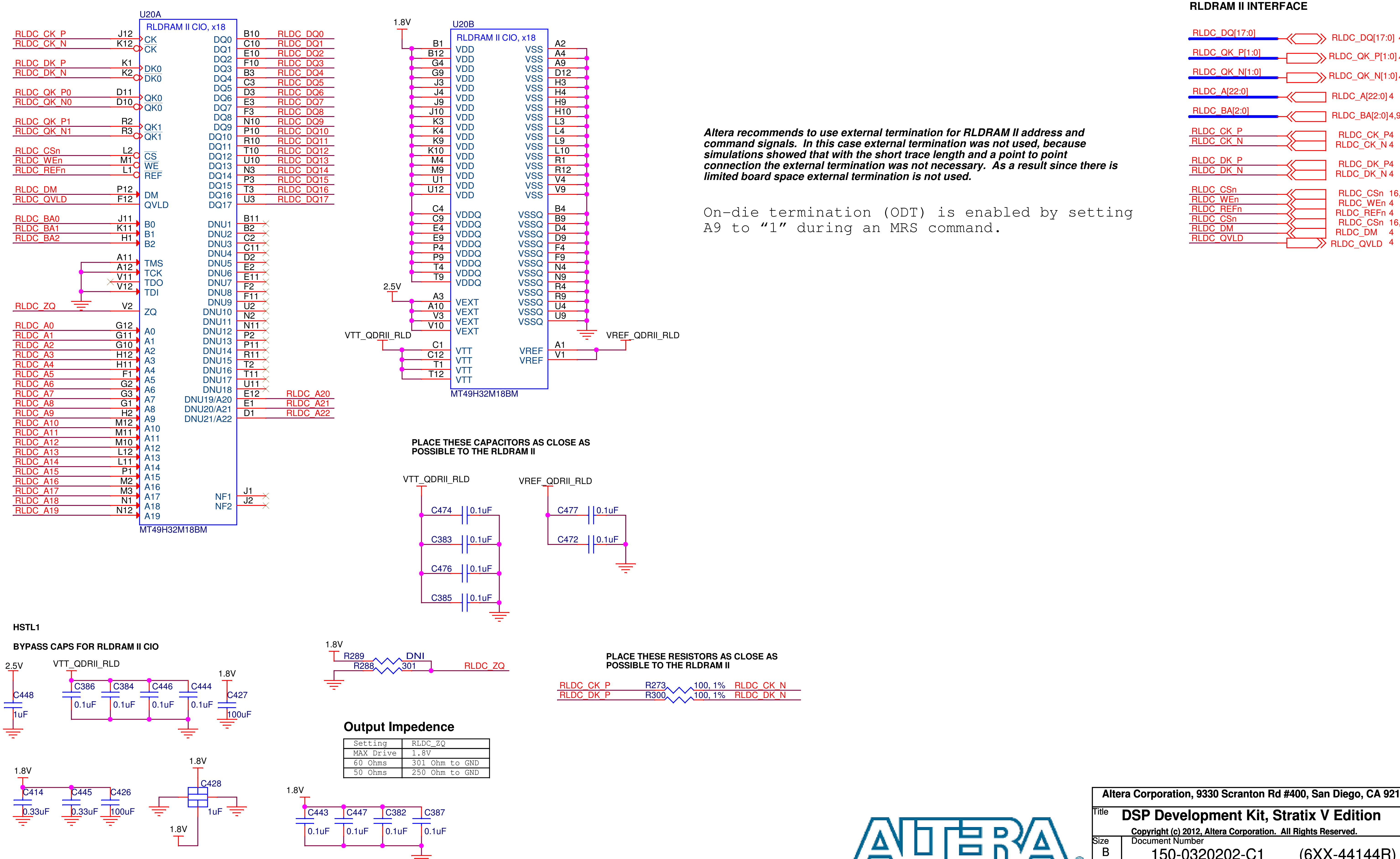
Altera recommends to use external termination for QDRII/+ address and command signals. In this case external termination was not used, because simulations showed that with the short trace length and a point to point connection the external termination was not necessary. As a result since there is limited board space external termination is not used.



ALTERA

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121		
Title	DSP Development Kit, Stratix V Edition	
	Copyright (c) 2012, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 15 of 34	

RLDRAM II, CIO



Altera recommends to use external termination for RLDRAM II address and command signals. In this case external termination was not used, because simulations showed that with the short trace length and a point to point connection the external termination was not necessary. As a result since there is limited board space external termination is not used.

On-die termination (ODT) is enabled by setting A9 to "1" during an MRS command.

Output Impedence

Setting	RLDC_ZQ
MAX Drive	1.8V
60 Ohms	301 Ohm to GND
50 Ohms	250 Ohm to GND

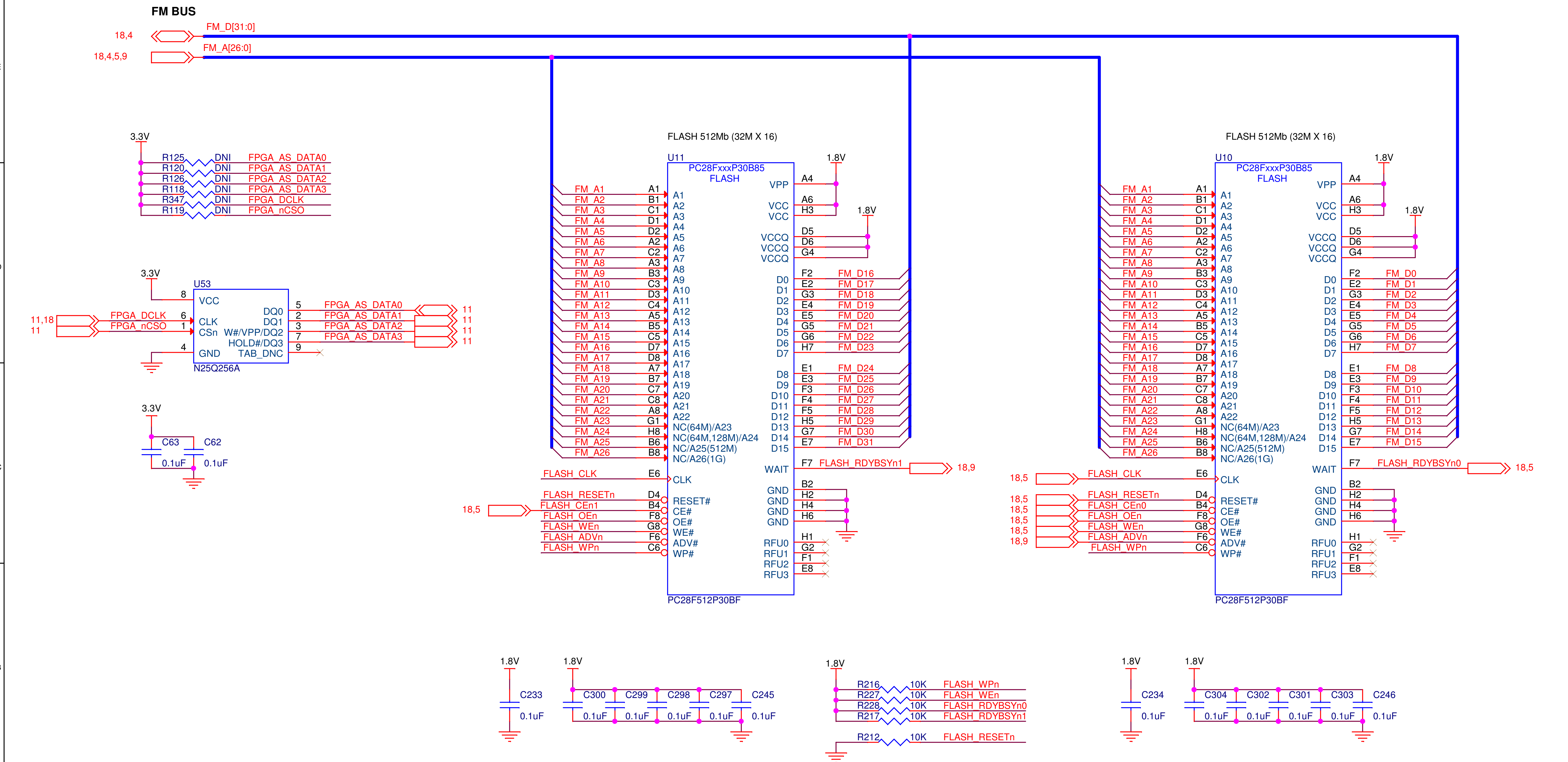
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size: B | Document Number: 150-0320202-C1 (6XX-44144R) | Rev: C1

Date: Tuesday, May 01, 2012 | Sheet 16 of 34

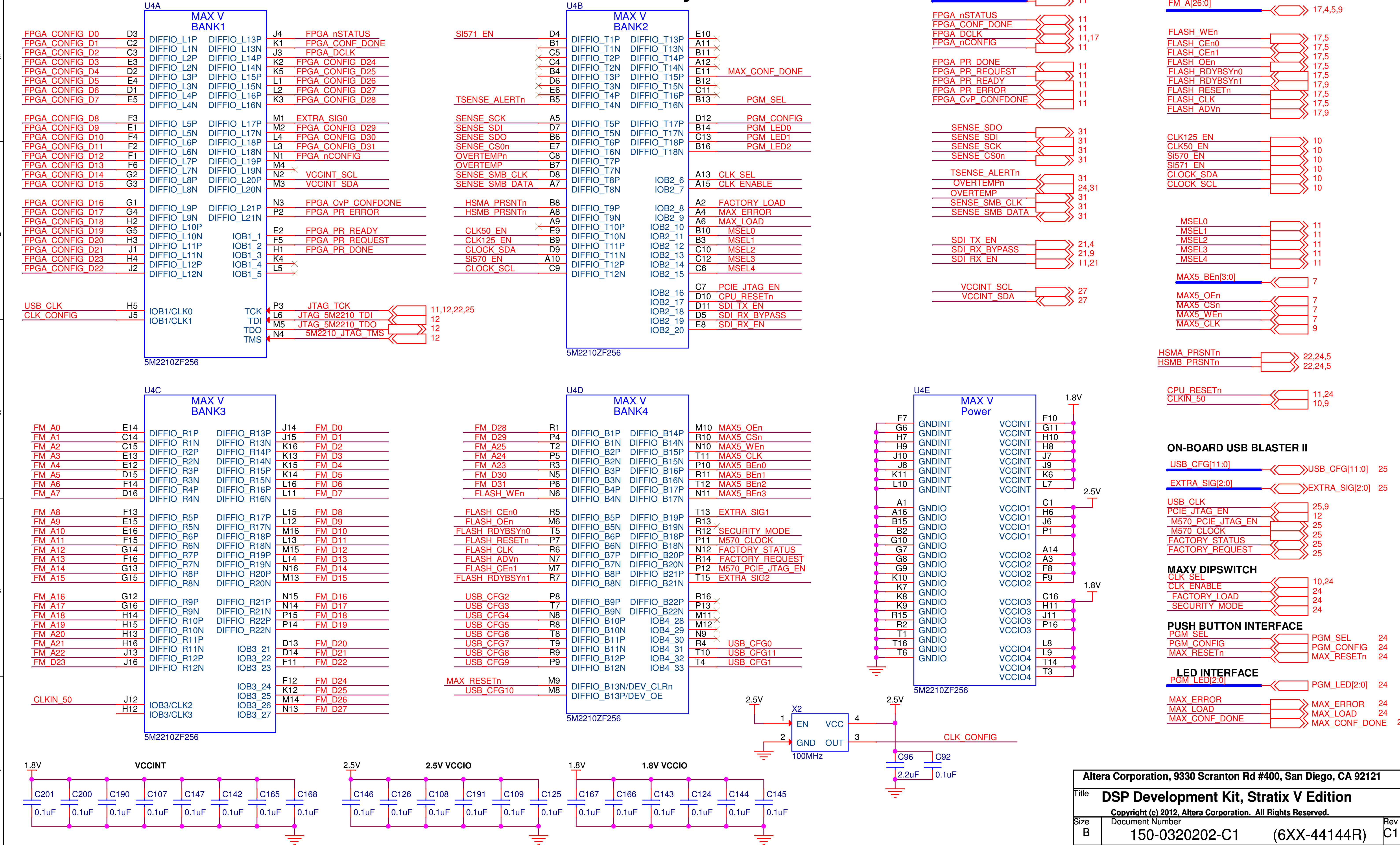
FLASH



- 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.
- When using dual x16 flash devices for an equivalent x32 (x16||x16) flash device a word consists of 32 data bits so addressing starts with FM_A1 mapped to address bit 2 in software.

Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	DSP Development Kit, Stratix V Edition
Size B	Document Number 150-0320202-C1 (6XX-44144R) — Rev C1
Date: Tuesday, May 01, 2012	Sheet 17 of 34

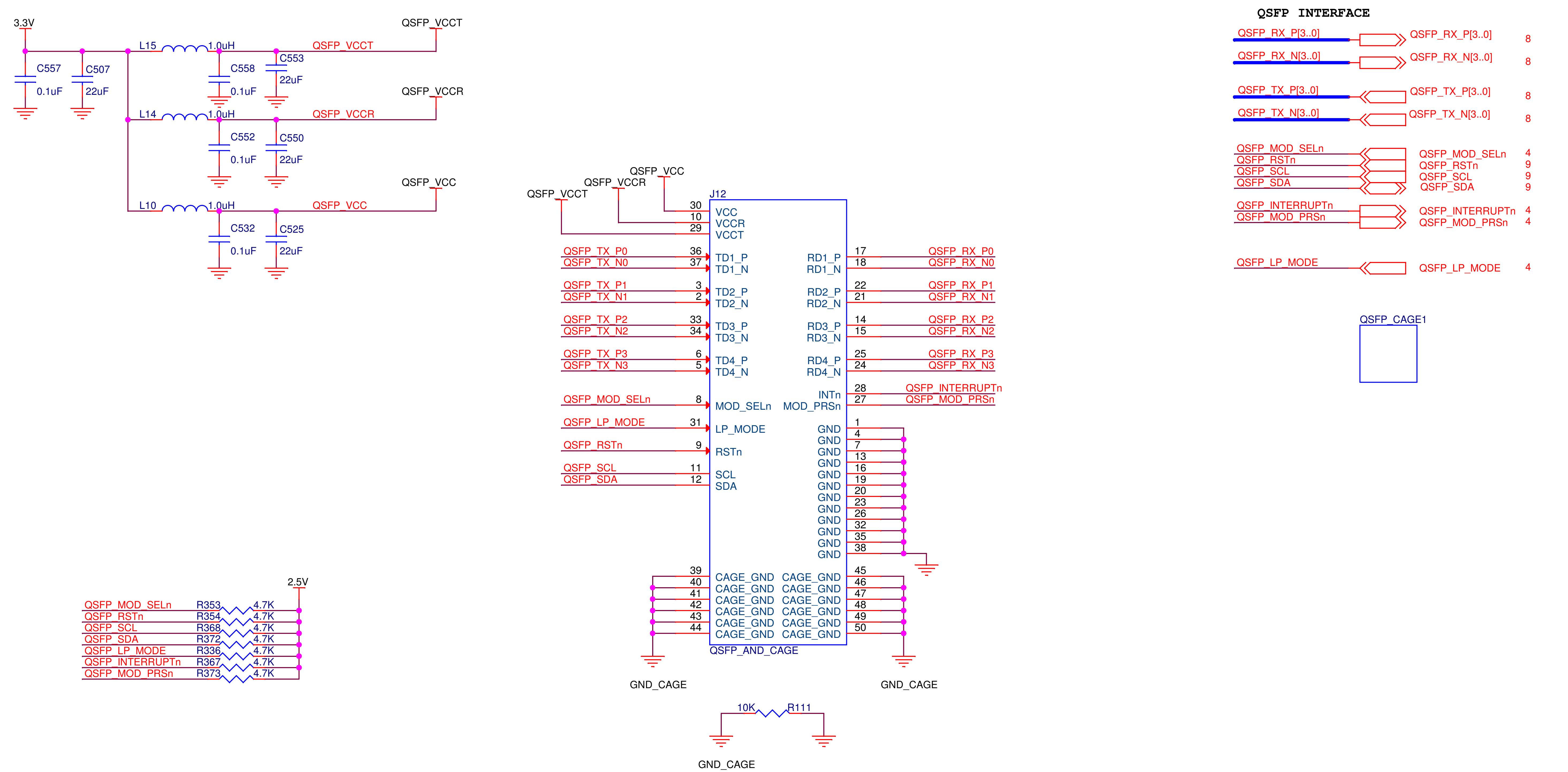
5M2210 System Controller



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

Title	DSP Development Kit, Stratix V Edition	
	Copyright (c) 2012, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 18 of 34	

Quad Small Form-factor Pluggable (QSFP) Interface



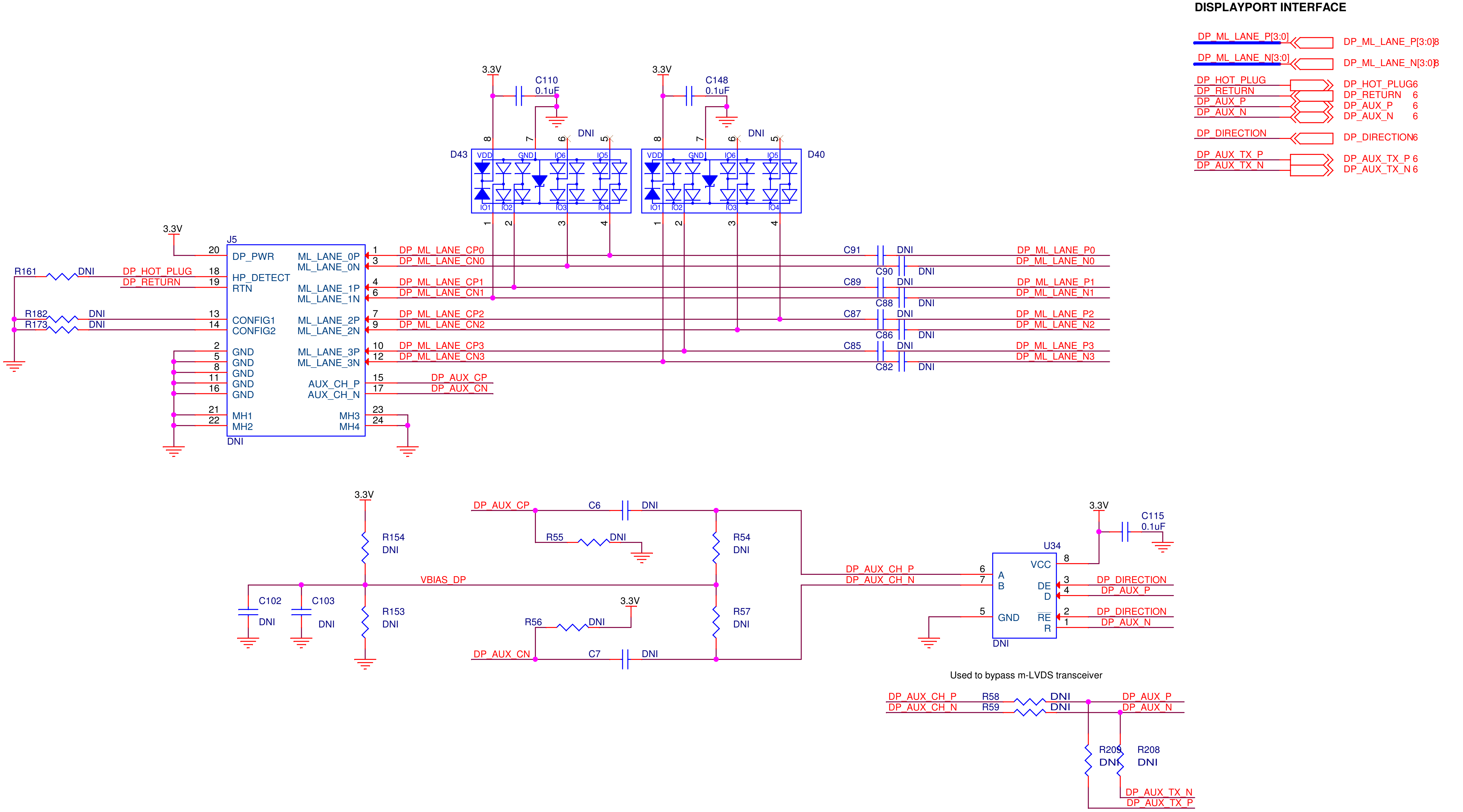
ALTERA®

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

Title	DSP Development Kit, Stratix V Edition	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 19 of 34	

Display Port (x4)

UNTESTED AND UNPOPULATED.



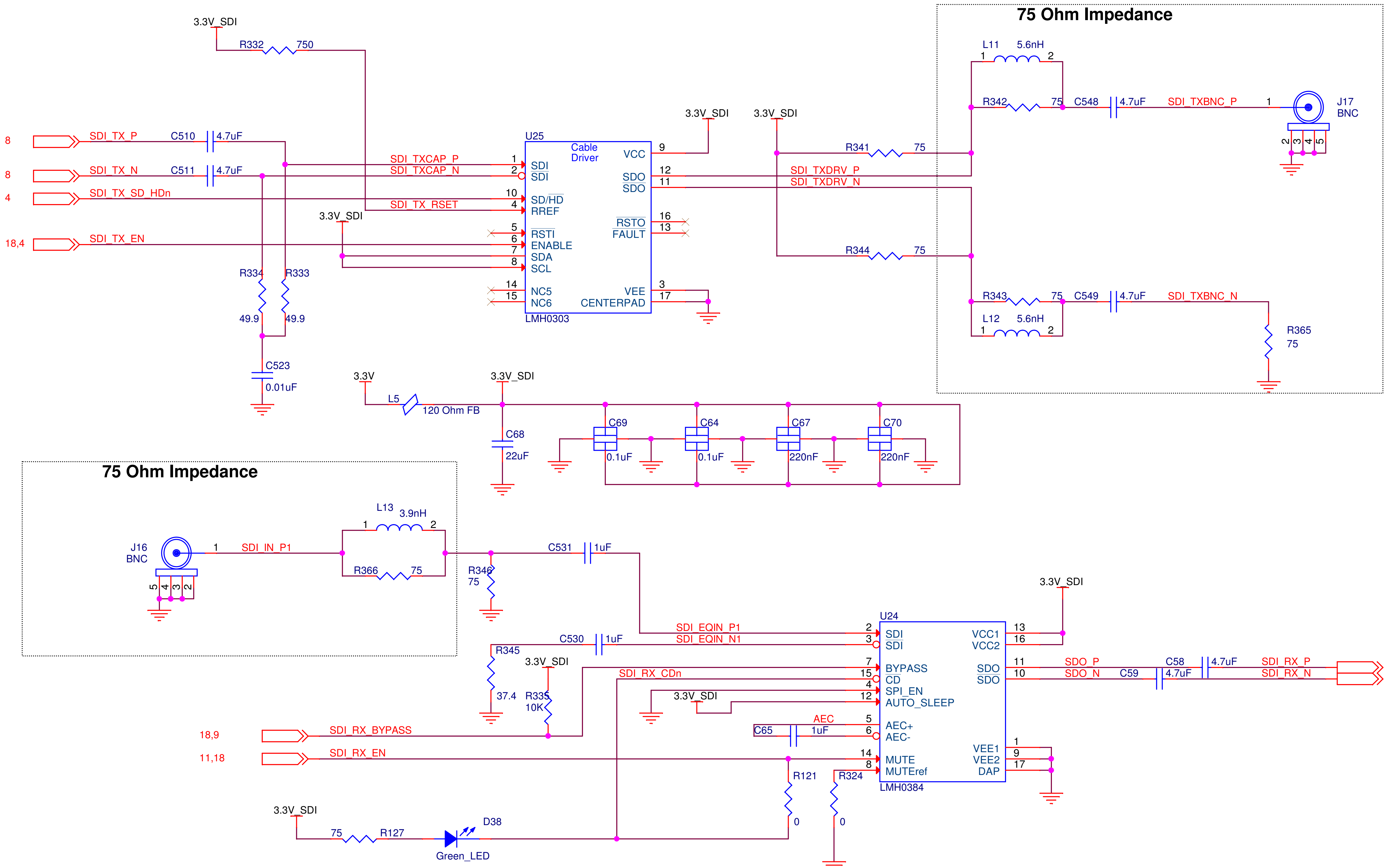
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012

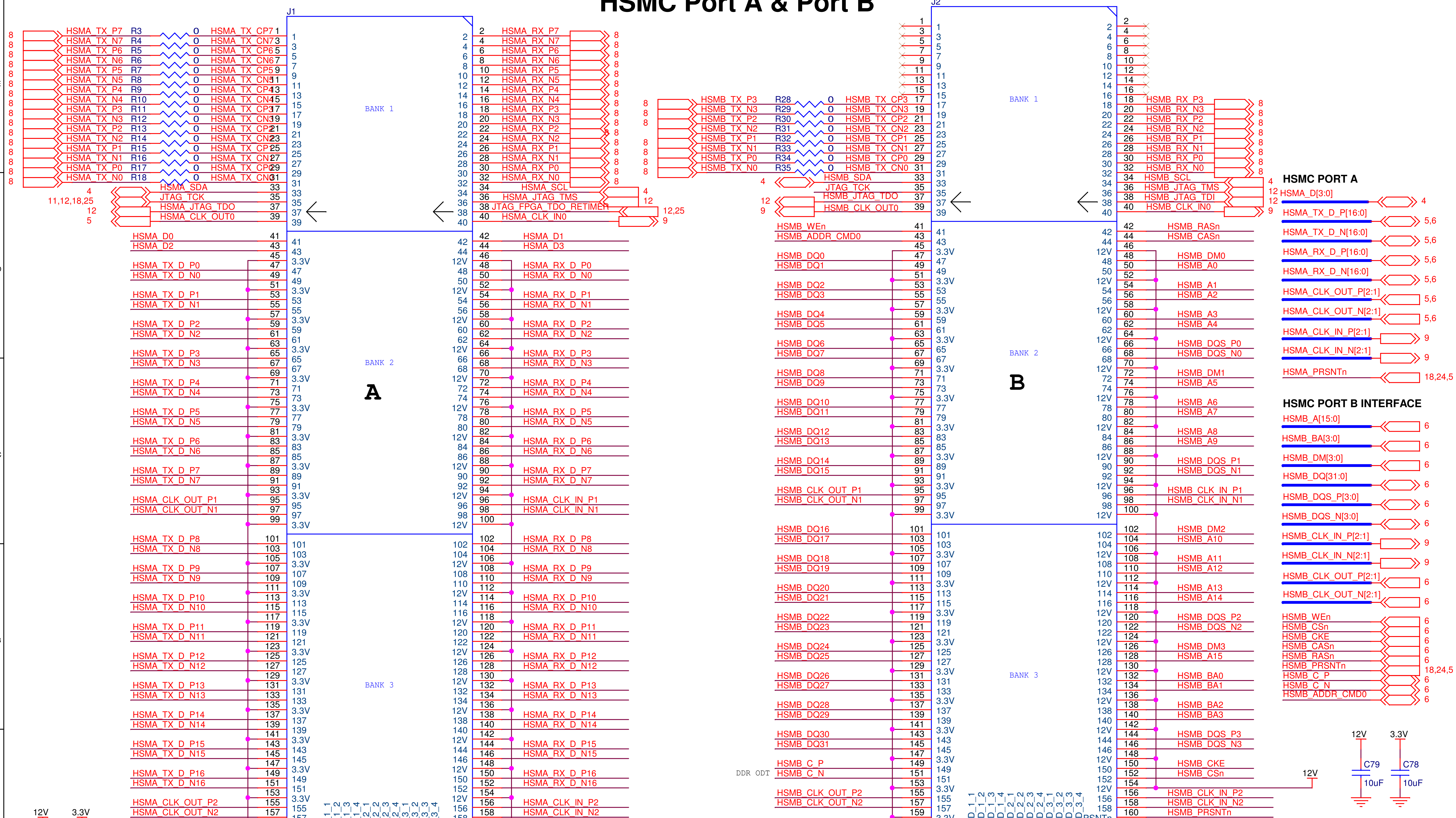
SDI Cable Driver, Equalizer, and SMB



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

Title	DSP Development Kit, Stratix V Edition	
	Copyright (c) 2012, Altera Corporation. All Rights Reserved.	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 21 of 34	

HSMC Port A & Port B



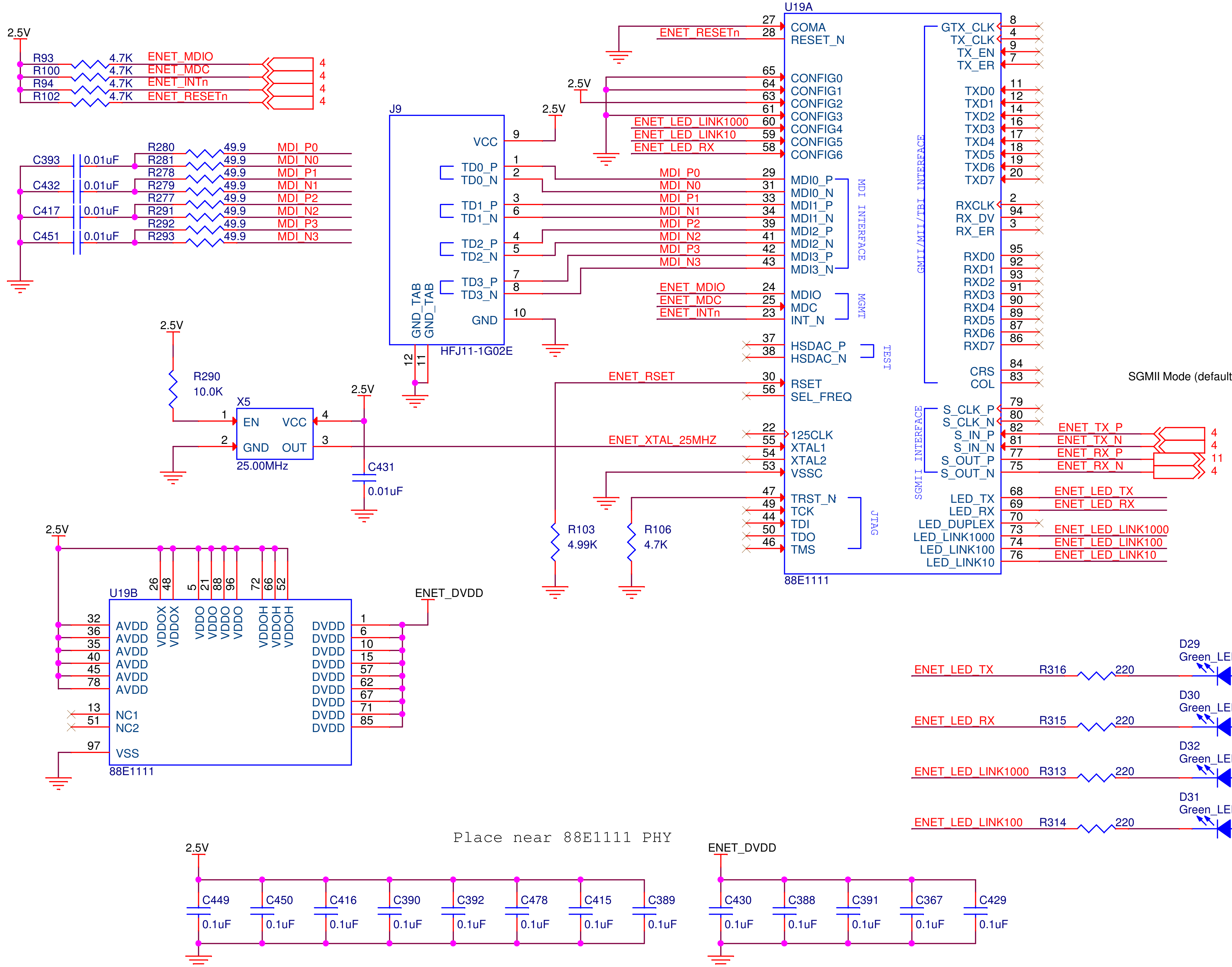
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 22 of 34

10/100/1000 Ethernet



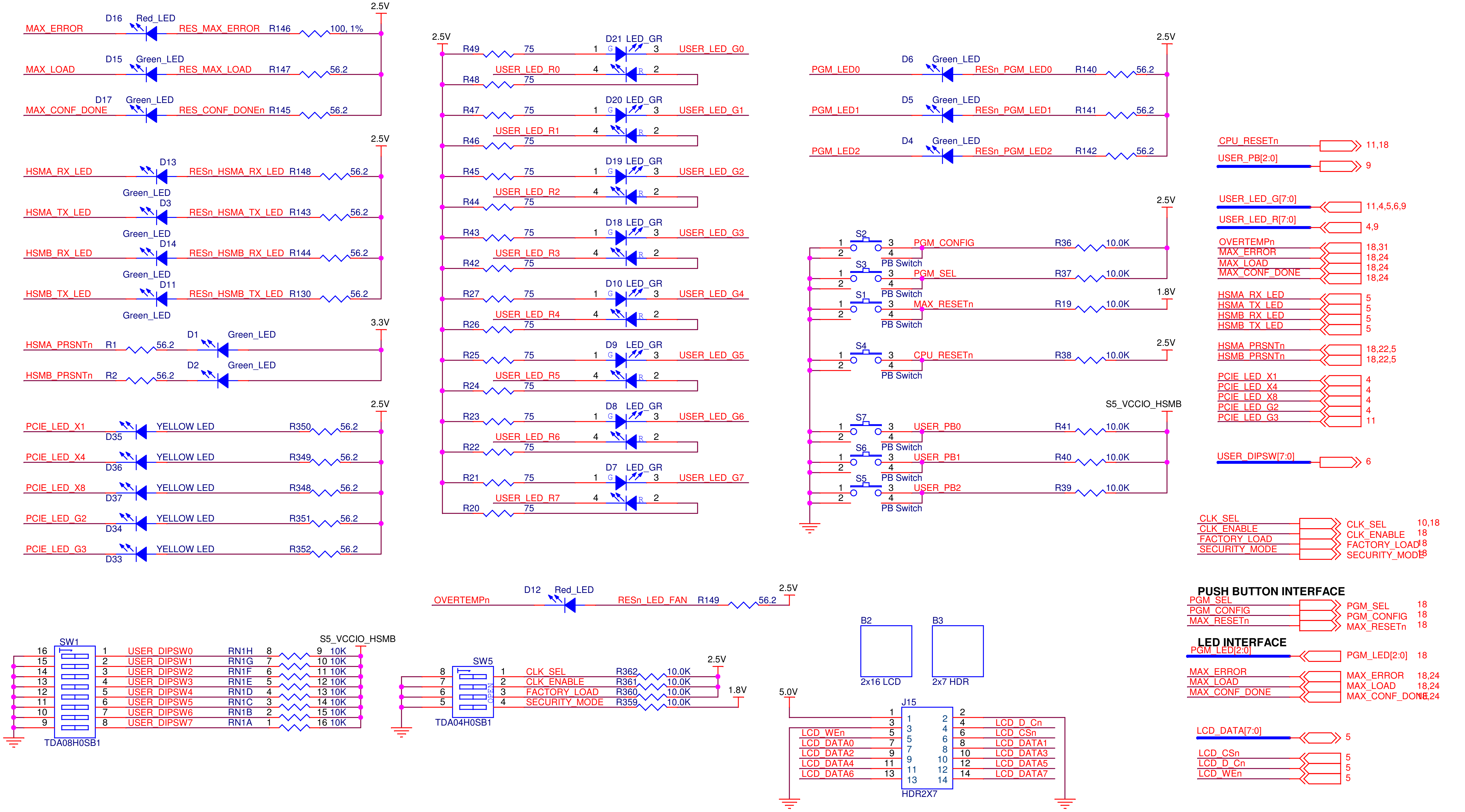
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 23 of 34

User I/O



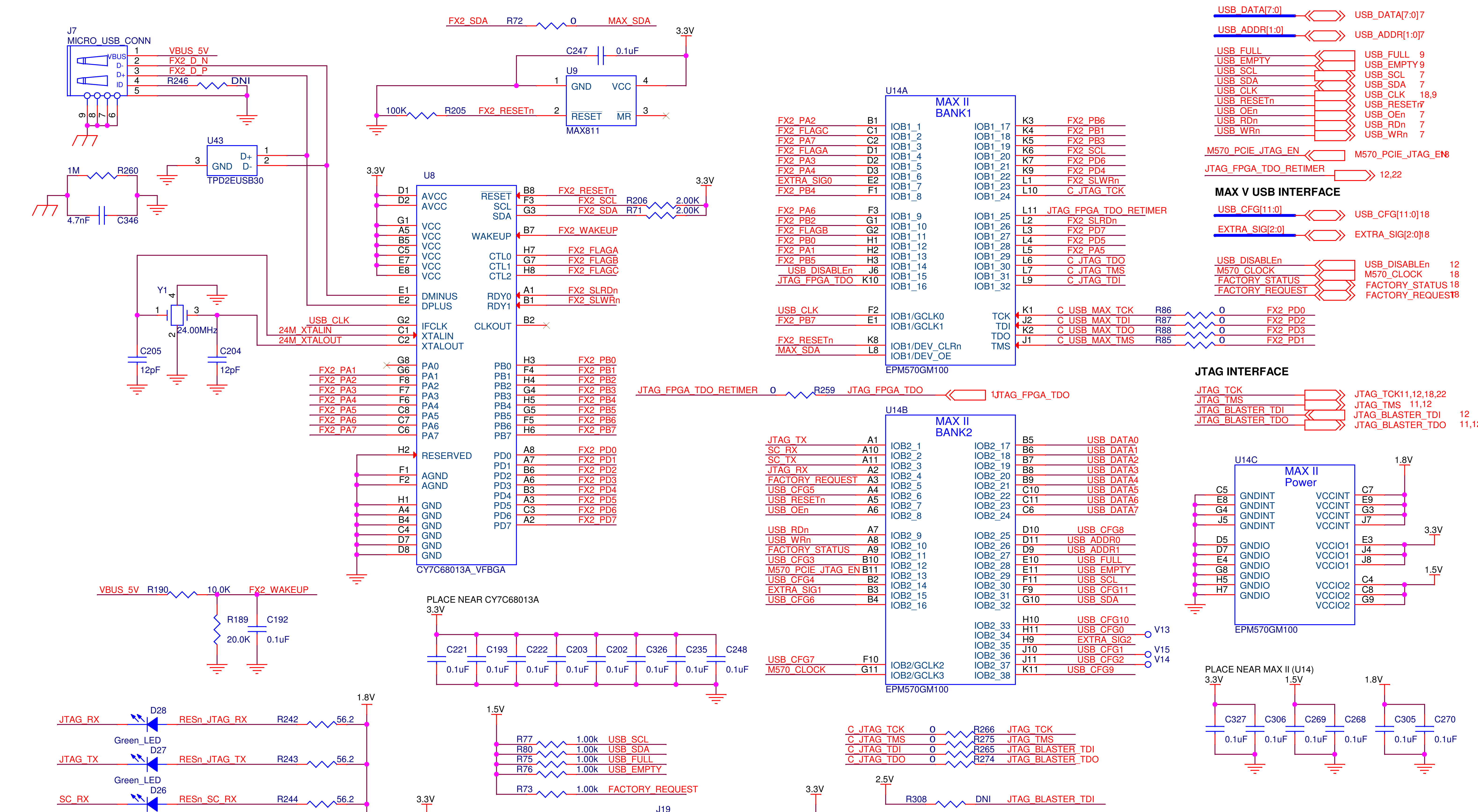
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 24 of 34

On-Board USB Blaster II



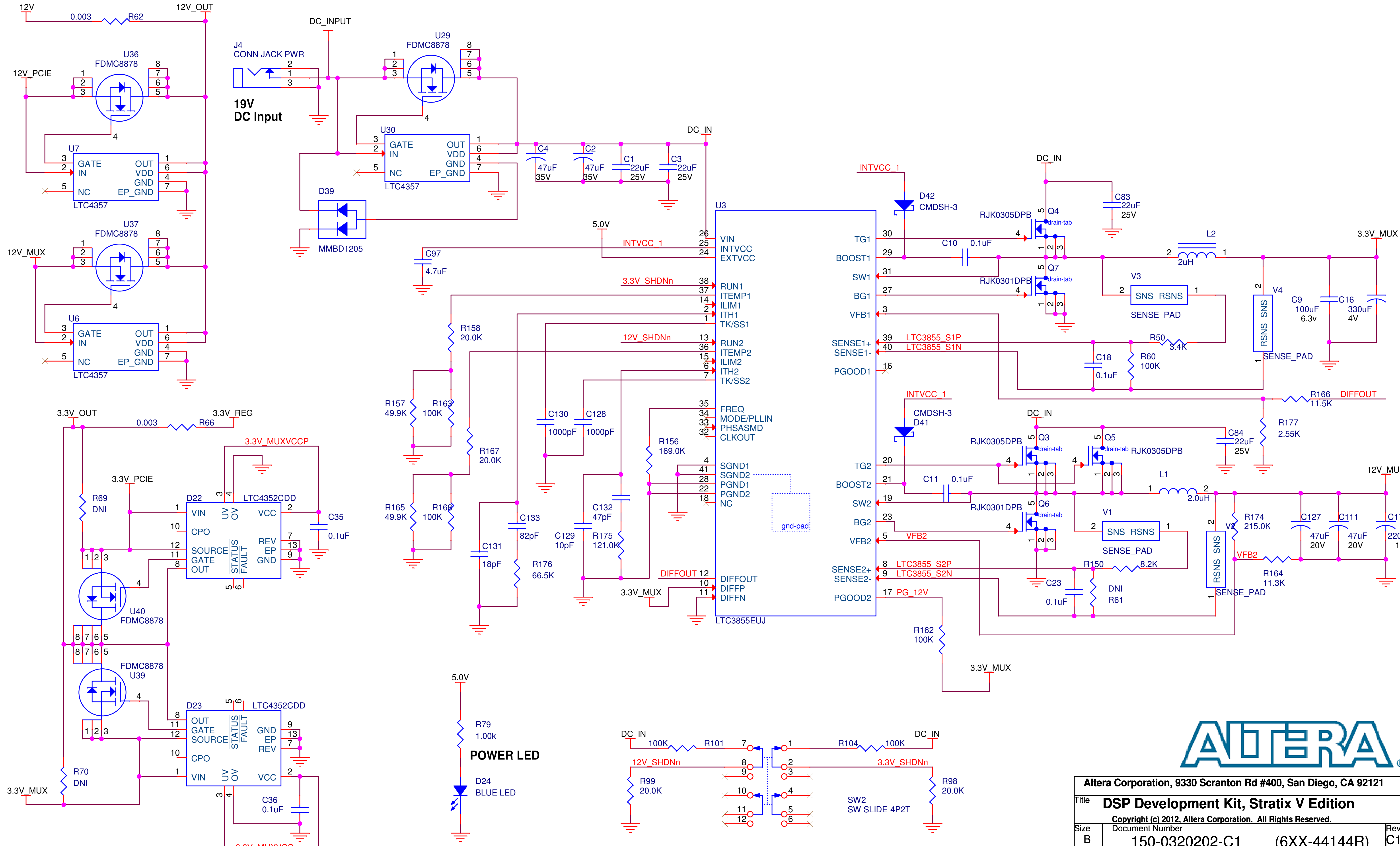
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012 Sheet 25 of 34

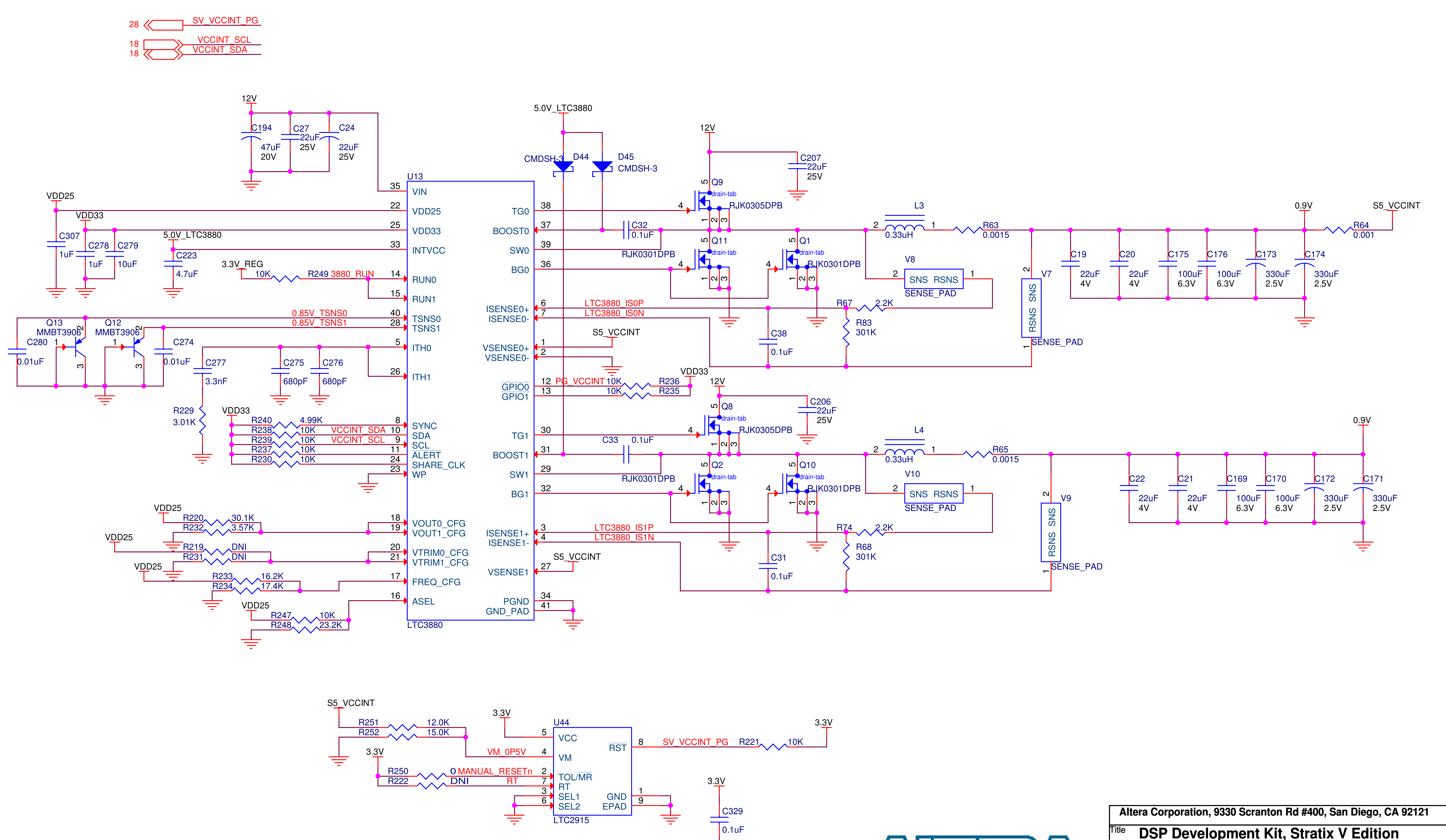
Power 1 - DC Input & 12V, 3.3V Output



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

Title	DSP Development Kit, Stratix V Edition		
Size B	Document Number 150-0320202-C1	(6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012		Sheet 26 of 34	

Power 2 - 0.90V



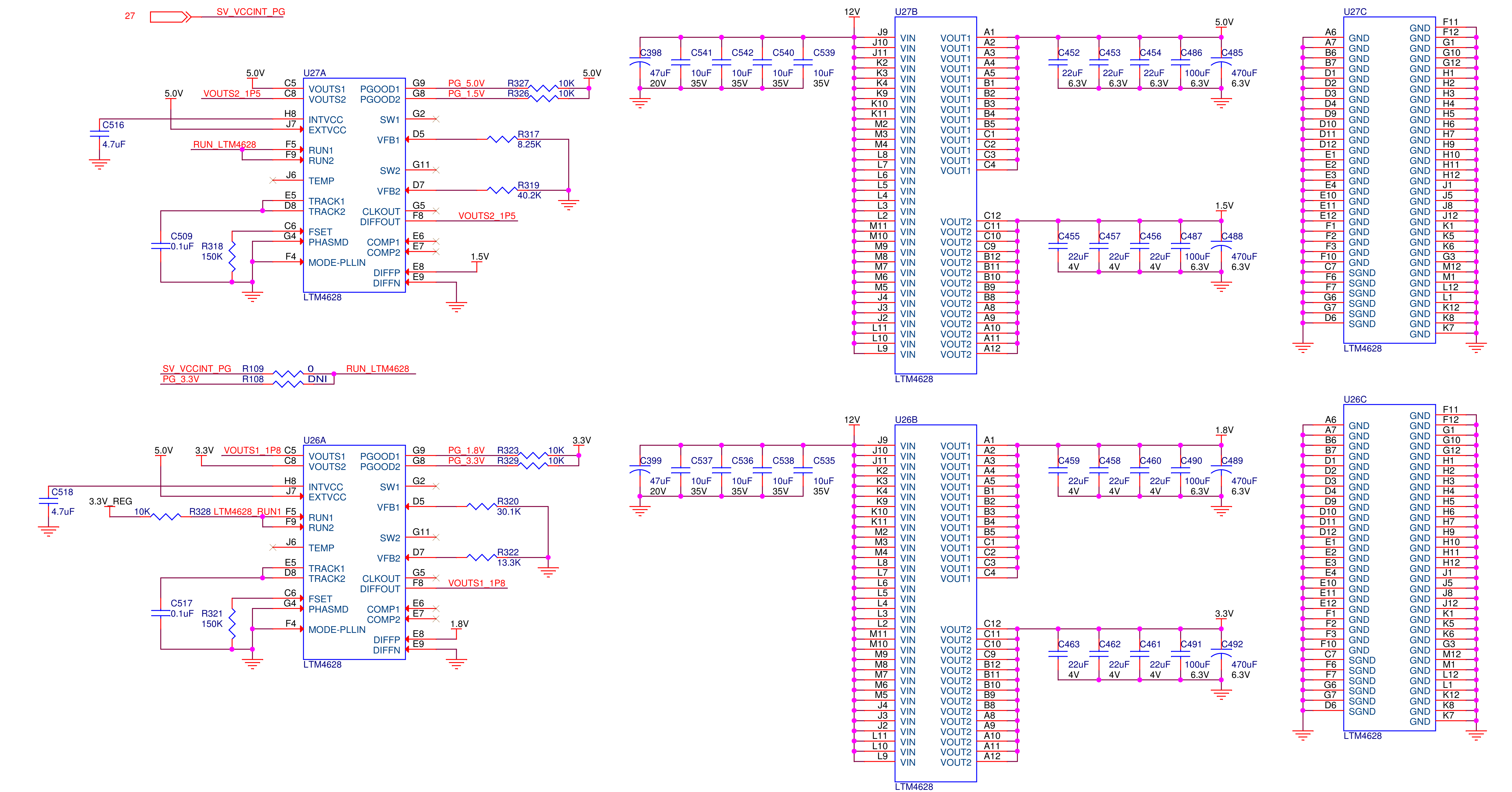
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

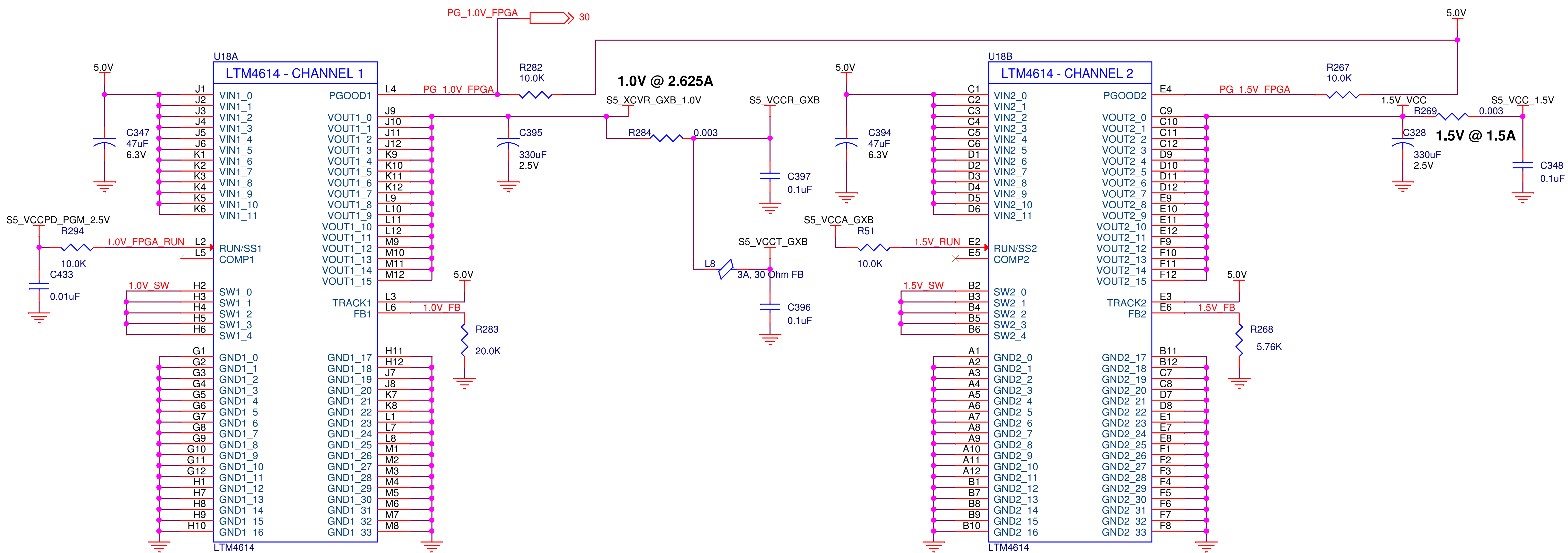
Date: Tuesday, May 01, 2012 Sheet 27 of 34

Power 3 - 5.0V, 1.5V, 1.8V and 3.3V



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	DSP Development Kit, Stratix V Edition
	Copyright (c) 2012, Altera Corporation. All Rights Reserved.
Size B	Document Number 150-0320202-C1 (6XX-44144R) Rev C1
Date: Tuesday, May 01, 2012	Sheet 28 of 34

Power 3 - 1.0V (GXB), 1.5V (VCCD_FPLL, VCCH_GXB, VCCPT)

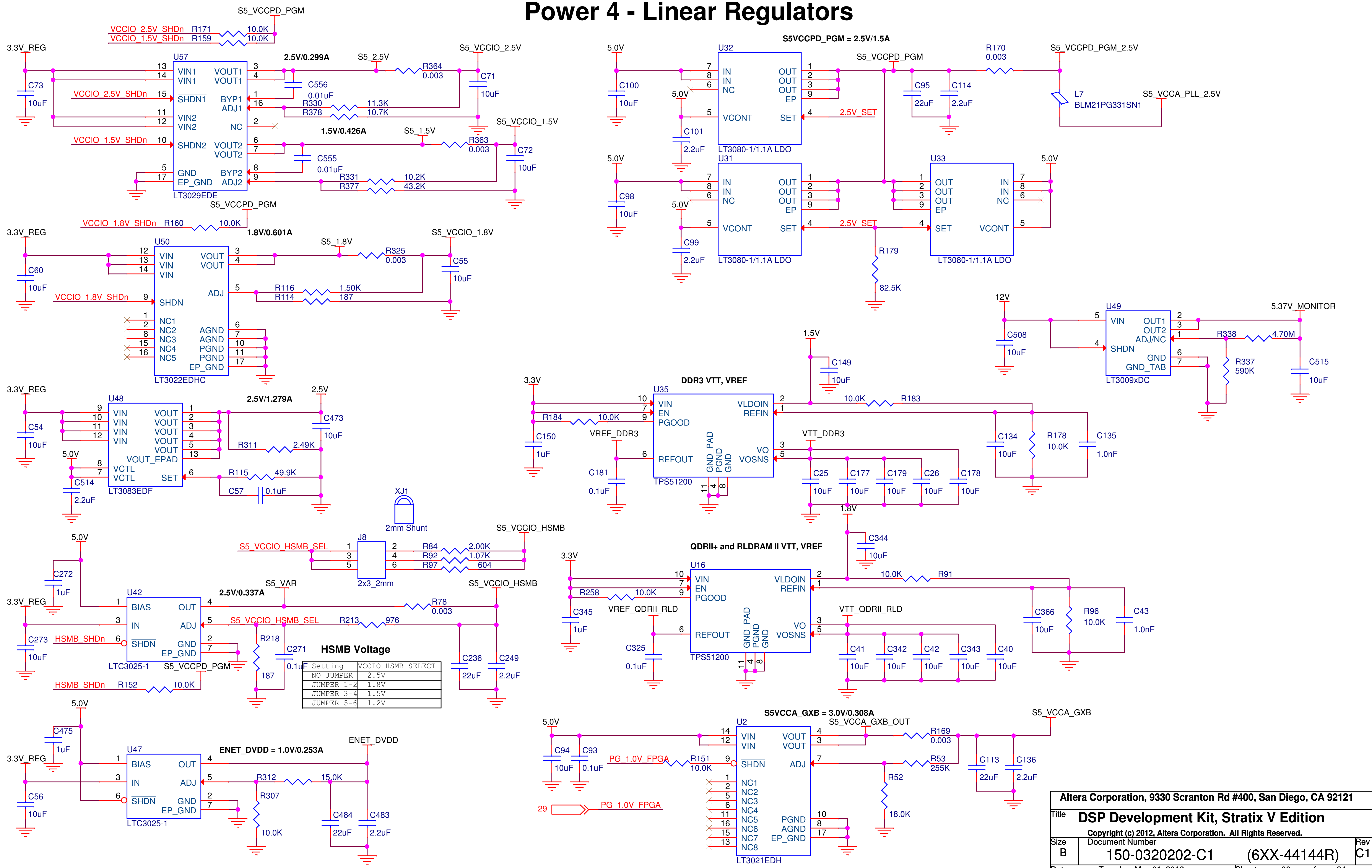


ALTERA

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

Title	DSP Development Kit, Stratix V Edition
Size	B
Document Number	150-0320202-C1 (6XX-44144R)
Rev	C1
Date:	Tuesday, May 01, 2012
Sheet	29 of 34

Power 4 - Linear Regulators



HSMB Voltage

Setting	VCCIO HSMB SELECT
NO JUMPER	2.5V
JUMPER 1-2	1.8V
JUMPER 3-4	1.5V
JUMPER 5-6	1.2V

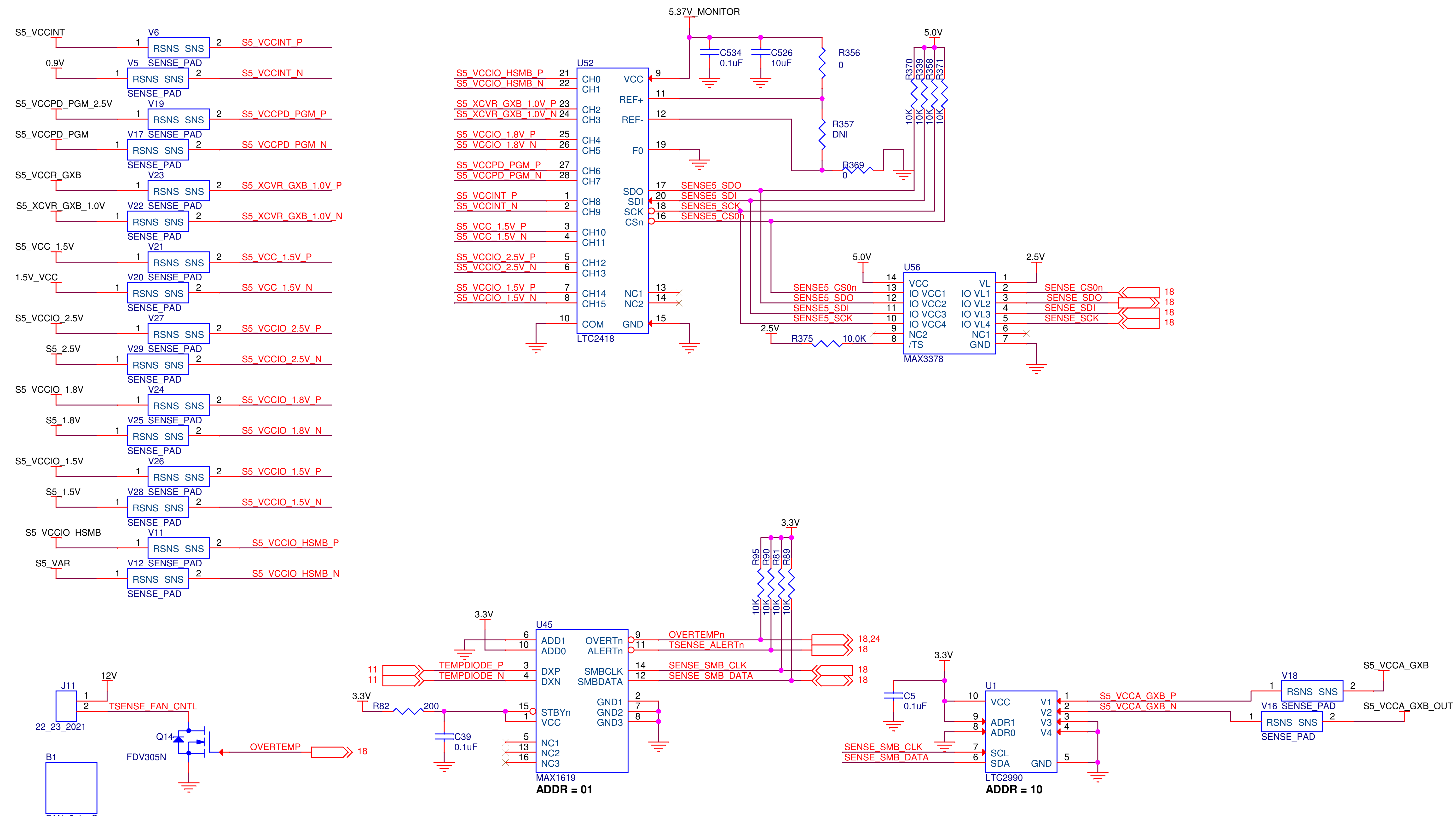
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title: DSP Development Kit, Stratix V Edition

Size	Document Number	Rev
B	150-0320202-C1 (6XX-44144R)	C1

Date: Tuesday, May 01, 2012

Power 6 - Power & Temperature Monitor



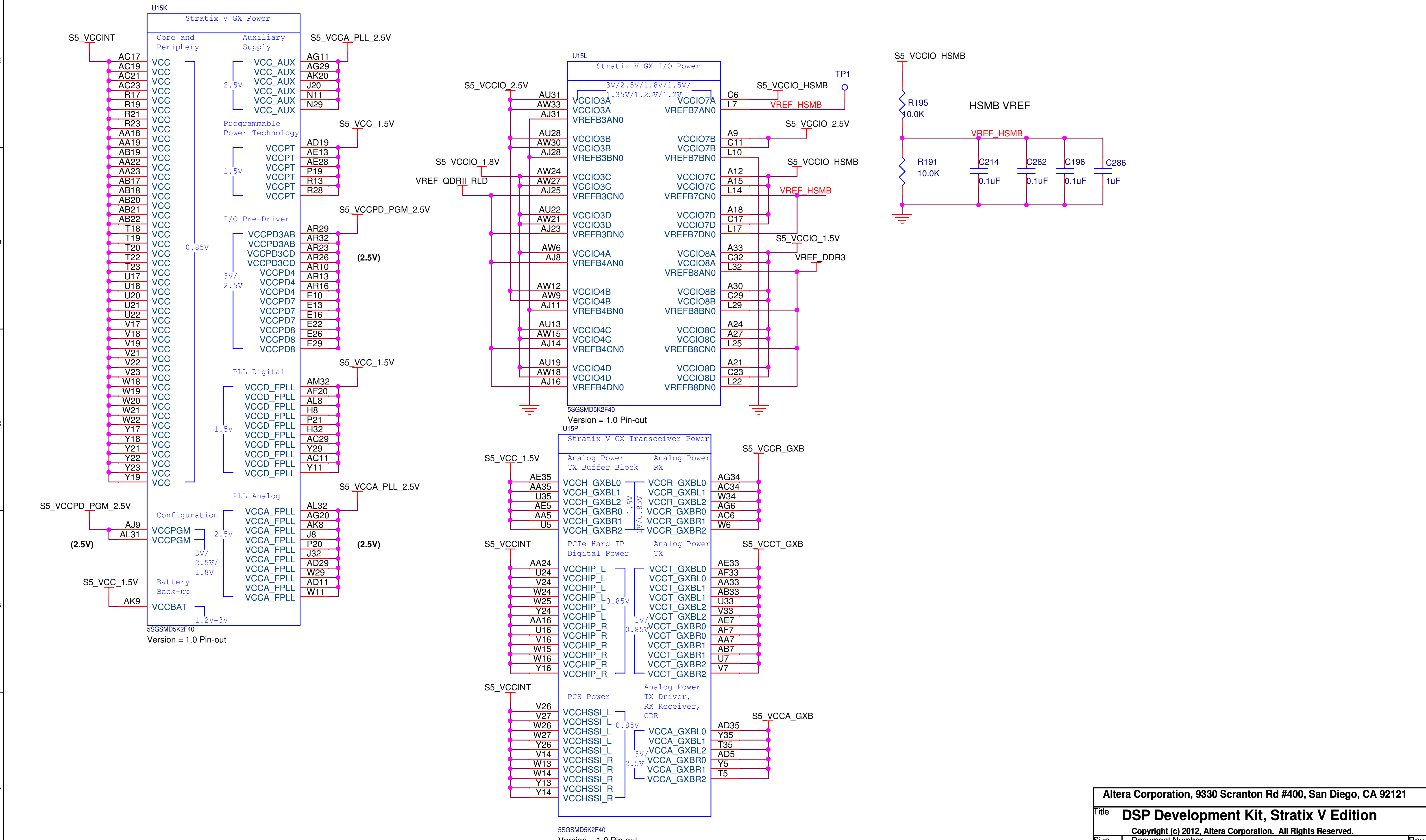
Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title **DSP Development Kit, Stratix V Edition**

Size	Document Number		Rev
B	150-0320202-C1	(6XX-44144R)	C1

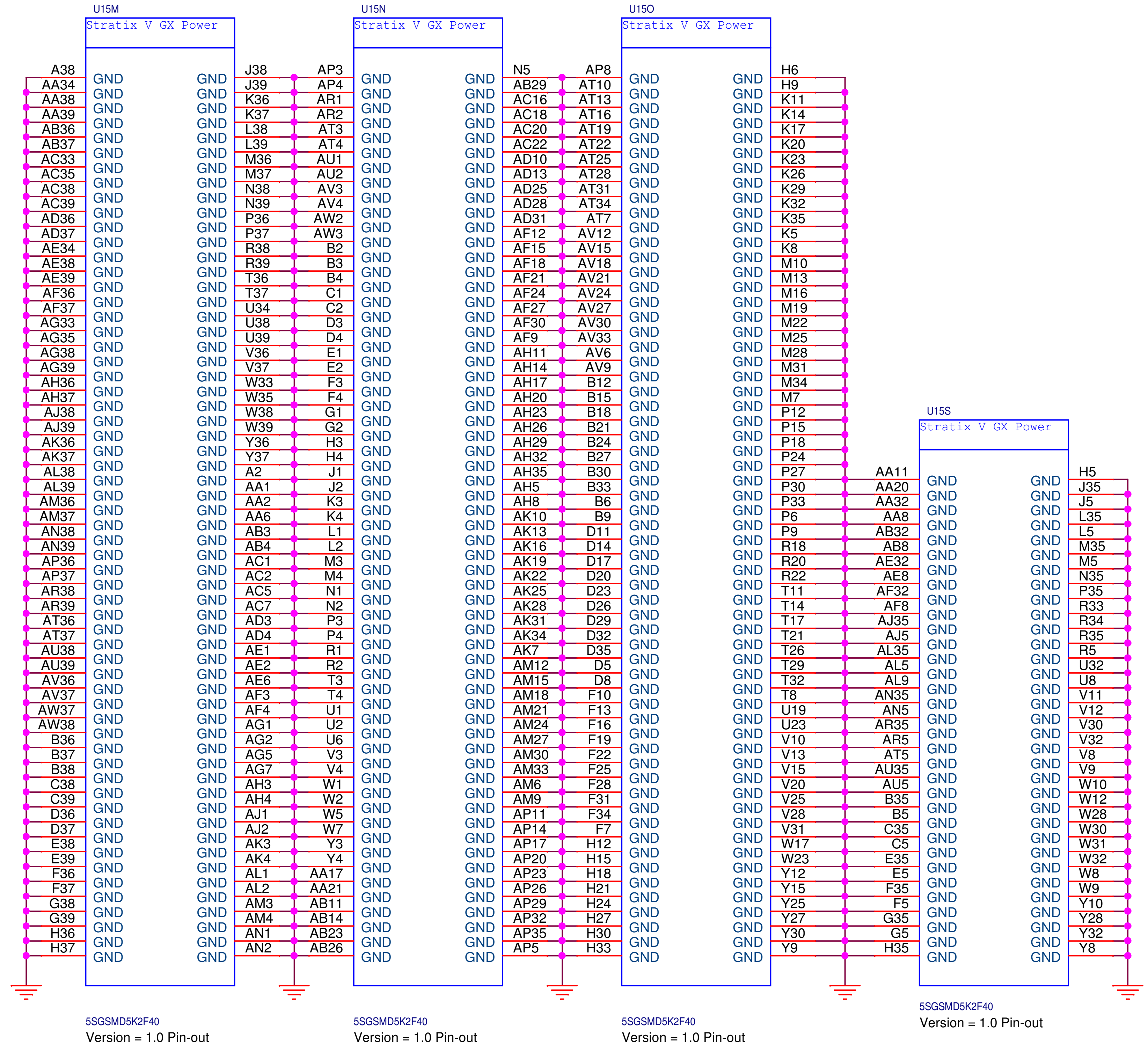
Date: Tuesday, May 01, 2012 Sheet 31 of 34

Power 7 - Stratix V GS Power



Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121	
Title	**DSP Development Kit, Stratix V Edition**
Size B	Document Number 150-0320202-C1 (6XX-44144R) Rev C1
Date: Tuesday, May 01, 2012	Sheet 32 of 34

Power 8 - Stratix V GS Ground

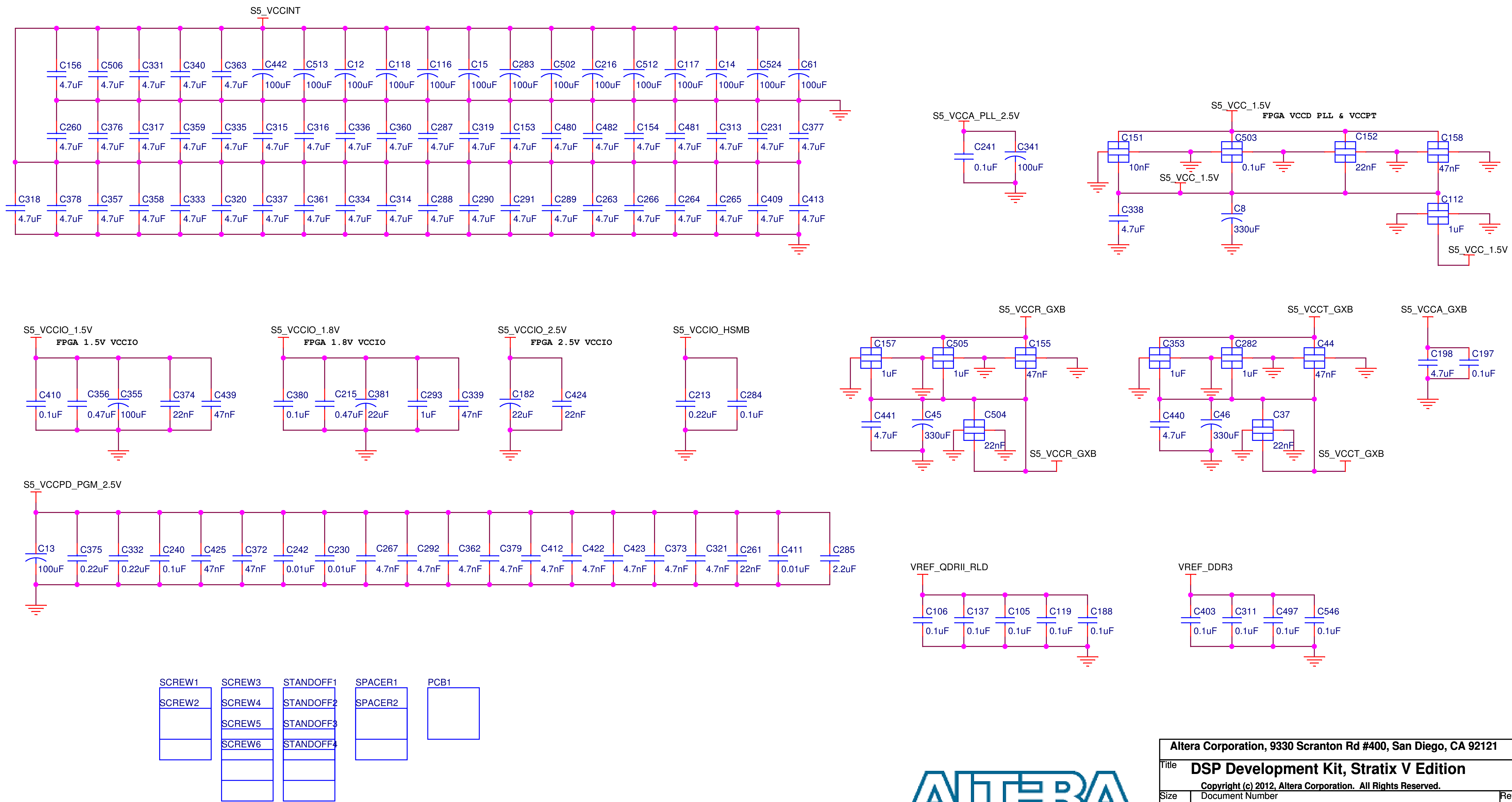


Altera Corporation, 9330 Scranton Rd #400, San Diego, CA 92121

Title	**DSP Development Kit, Stratix V Edition**	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 33 of 34	

Decoupling

Place 6 vias minimum on each X2Y cap.



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

Title	DSP Development Kit, Stratix V Edition	
Size B	Document Number 150-0320202-C1 (6XX-44144R)	Rev C1
Date: Tuesday, May 01, 2012	Sheet 34 of 34	