TEB0707 MAX10 CPLD

Table of contents

Overview

TEB0707 SC CPLD design for MAX10 with designator U6: 10M08SAU169C8G.

Feature Summary

- Levelshifting/MUX of Signals
  - CRUVI Low Speed (J13)
  - CRUVI 3.3V signals on High Speed CA, CB, CC (J10, J11, J12)
- JTAG/ UART forward to 4x5 module
- Module control pins
- USR LEDs
- Button and Dips
- Power sequenzing
- IO Voltage selection

Firmware Revision and supported PCB Revision

See Document Change History.

Product Specification

Port Description

VHDL Port name	Direction	Pin	Pullup/Down	Bank Power	Bank	Connected to	Function
X7	in	C2		3.3 V	1A	J13-2	CRUVI CA LS signals
X1	in	D1		3.3 V	1A	J13-5	
X3	in	E4		3.3 V	1A	J13-9	
X4	out	E3		3.3 V	1A	J13-4	
X6	out	B1		3.3 V	1A	J13-1	
X0	out	C1		3.3 V	1A	J13-3	
X2	out	E1		3.3 V	1A	J13-7	
X5	in	F1		3.3 V	1A	J13-8	
JTAGEN	---	E5	down (external)	3.3V	1B	S1-4	Select between Max10 CPLD JTAG ('high', ON) or JTAG forwarding to SoM ('low', OFF).
TCK	in	G2	down (external)	3.3 V	1B	U8-12	JTAG from FTDI to MAX10
TMS	in	G1	up (external)	3.3 V	1B	U8-15	
TDO	out	F6		3.3 V	1B	U8-14	
TDI	in	F5	up (external)	3.3 V	1B	U8-13	
DIP1	in	G4	up (external)	3.3 V	1B	S1-1	User Dip
EN_C5VIN	out	F4	down (external)	3.3 V	1B	Q2-5	Enable 5V on CRUVI connectors (C5VIN rail).
CB_SMB_SCL		H3		3.3 V	1B	J11-7	CRUVI CB HS, currently not used
CB_SMB_ALERT		H2		3.3 V	1B	J11-3	CRUVI CB HS, currently not used
LED5	out	H6		3.3 V	2	D5	User LED
CB_SMB_SDA		G5		3.3 V	2	J11-5	CRUVI CB HS, currently not used
CB_DI		J2		3.3 V	2	J11-51	CRUVI CB HS, currently not used
CB_REFCLK		J1		3.3 V	2	J11-11	CRUVI CB HS, currently not used
OSCI_CPLD		H4		3.3 V	2	U7-3	currently not used
CB_MODE		M2		3.3 V	2	J11-57	CRUVI CB HS, currently not used
CB_DO		M1		3.3 V	2	J11-53	CRUVI CB HS, currently not used
CA_DO		N3		3.3 V	2	J10-53	CRUVI CA HS, currently not used
CA_SCK		N2		3.3 V	2	J10-59	CRUVI CA HS, currently not used
CA_MODE		L3		3.3 V	2	J10-57	CRUVI CA HS, currently not used
CA_SEL		M3		3.3 V	2	J10-55	CRUVI CA HS, currently not used
CB_SEL		K2		3.3 V	2	J11-55	CRUVI CB HS, currently not used
DIP2	in	K1		3.3 V	2	S1-3	IOV voltage selection (firmware dependent)/User Dip
CB_SCK		L2		3.3 V	2	J11-59	CRUVI CB HS, currently not used
DIP3	in	L1	up (external)	3.3 V	2	S1-5	SoM CPLD selection (firmware dependent)/User Dip
LED8	out	L4		3.3 V	3	D8	System status LED (firmware dependent)/User LED
BUTTON1	in	L5	down (external)	3.3 V	3	S3	User Button
CA_SMB_SCL		M5		3.3 V	3	J10-7	CRUVI CA HS, currently not used
CA_SMB_SDA		M4		3.3 V	3	J10-5	CRUVI CA HS, currently not used
LED7	out	K5		3.3 V	3	D7	Power status LED (firmware dependent)/User LED
CA_SMB_ALERT		N5		3.3 V	3	J10-3	CRUVI CA HS, currently not used
CA_DI		N4		3.3 V	3	J10-51	CRUVI CA HS, currently not used
CA_REFCLK		N6		3.3 V	3	J10-11	CRUVI CA HS, currently not used

VS1	out	N8	up (external)	3.3 V	3	U3-18	IOV voltage selection pin
ETH_LED1	out	K6		3.3 V	3	J2B	Integrated Ethernet Jack LED, currently tied to GND. Using as ETH status depends on attached SoM and is therefore not implemented.
LED4	out	J6		3.3 V	3	D4	User LED
EN_C3_3V	out	M9	down (external)	3.3 V	3	Q1-5	Enable 5V on CRUVI connectors (C5VIN rail).
VS2	out	M8	down (external)	3.3 V	3	U3-17	IOV voltage selection pin
PGOOD	in	J7	up	3.3 V	3	JB1-29	SoM power good signal
F_UART_TX	in	M12		3.3 V	3	U8-32	UART TX connected to FTDI
SD_CD	in	M13	up	3.3 V	3	J8-9	
VS0	out	N9	down (external)	3.3 V	3	U3-19	IOV voltage selection pin
EN_IOV	out	N10	down (external)	3.3 V	3	Q1-5	Enable 5V on CRUVI connectors (C5VIN rail).
ETH_LED2	out	L11		3.3 V	3	J2C	Integrated Ethernet Jack LED, currently tied to GND. Using as ETH status depends on attached SoM and is therefore not implemented.
USB_OC	in	M11	up (external)	3.3 V	3	U5-5	USB over current alert pin ('low' when overcurrent is detected)
EN1	out	K8		3.3 V	3	JB1-27	SoM enable control pin (depnds on attached SoM)
MODE	out	J8		3.3 V	3	JB1-31	SoM Mode control pin (depnds on attached SoM)
RESIN	out	L10		3.3 V	3	JB2-17	SoM reset input
F_UART_RX	out	M10		3.3 V	3	U8-33	UART RX, connected to FTDI
M3_3VOUT	in	N12	down (external)	3.3 V	3	JB2-9	SoM 3.3V, used as SoM power good
M_TDO	in	J10		VCCJTAG	5	JB2-98	SoM JTAG
M_TMS	out	L12		VCCJTAG	5	JB2-94	
M_TCK	out	H8		VCCJTAG	5	JB2-100	
M_TDI	out	L13		VCCJTAG	5	JB2-96	
M_G1_20	out	G9		VCCIO_CC	6	JB1-32	SoM signal to/from CPLD
M_G1_02	in	G10		VCCIO_CC	6	JB1-35	SoM signal to/from CPLD
M_G1_05	out	F13		VCCIO_CC	6	JB1-45	SoM signal to/from CPLD
M_G1_07	out	E13		VCCIO_CC	6	JB1-49	SoM signal to/from CPLD
M_G1_06	out	F12		VCCIO_CC	6	JB1-47	SoM signal to/from CPLD
M_G1_08	out	E12		VCCIO_CC	6	JB1-51	SoM signal to/from CPLD
M_G1_01	in	F9		VCCIO_CC	6	JB1-37	SoM signal to/from CPLD
M_G1_04	in	F10		VCCIO_CC	6	JB1-41	SoM signal to/from CPLD
M_G1_15		E9		VCCIO_CC	6	JB1-34	SoM signal to/from CPLD, currently not used
M_G1_13		B12		VCCIO_CC	6	JB1-65	SoM signal to/from CPLD, currently not used
M_G1_18	in	B11		VCCIO_CC	6	JB1-42	SoM signal to/from CPLD
M_G1_11		C12		VCCIO_CC	6	JB1-59	SoM signal to/from CPLD, currently not used
M_G1_17	in	C11		VCCIO_CC	6	JB1-44	SoM signal to/from CPLD
M_G1_12		B13		VCCIO_CC	6	JB1-61	SoM signal to/from CPLD, currently not used
M_G1_14		A12		VCCIO_CC	6	JB1-67	SoM signal to/from CPLD, currently not used
M_G1_19	in	E10		VCCIO_CC	6	JB1-39	SoM signal to/from CPLD
M_G1_16	out	D9		VCCIO_CC	6	JB1-38	SoM signal to/from CPLD
M_G1_09		D12		VCCIO_CC	6	JB1-55	SoM signal to/from CPLD, currently not used
M_G1_03	in	D11		VCCIO_CC	6	JB1-36	SoM signal to/from CPLD
M_G1_10		C13		VCCIO_CC	6	JB1-57	SoM signal to/from CPLD, currently not used
LED3	out	C10		3.3 V	8	D3	User LED
NOSEQ	out	C9		3.3 V	8	JB1-8	SoM control pin for power sequenzing (SoM dependent)
M_G6_07	in	A8		3.3 V	8	JB1-98	SoM signal to/from CPLD

PROGMODE	out	A9		3.3 V	8	JB1-90	
M_G6_06		B10	(pullup not fitted)	3.3 V	8	JB1-96	SoM signal to/from CPLD, currently not used,
M_G6_05		B9	(pullup not fitted)	3.3 V	8	JB1-94	SoM signal to/from CPLD, currently not used
M_G6_04	in	A10		3.3 V	8	JB1-92	SoM signal to/from CPLD
M_G6_03		A11		3.3 V	8	JB1-88	SoM signal to/from CPLD, currently not used
LED2	out	D8		3.3 V	8	D2	User LED
LED1	out	E8		3.3 V	8	D1	User LED
M_G6_08	in	A7		3.3 V	8	JB1-100	SoM signal to/from CPLD
CC_SMB_ALERT		A6		3.3 V	8	J12-3	CRUVI CC HS, currently not used
M_G6_02	in	B6		3.3 V	8	JB1-86	SoM signal to/from CPLD
CC_REFCLK		B5		3.3 V	8	J12-11	CRUVI CC HS, currently not used
CC_SMB_SDA		A4		3.3 V	8	J12-5	CRUVI CC HS, currently not used
CC_SMB_SEL		A3		3.3 V	8	J12-55	CRUVI CC HS, currently not used
M_G6_01	out	D6		3.3 V	8	JB1-91	SoM signal to/from CPLD
CC_SCK		B3		3.3 V	8	J12-59	CRUVI CC HS, currently not used
CC_DI		B4		3.3 V	8	J12-51	CRUVI CC HS, currently not used
CC_DO		A2		3.3 V	8	J12-53	CRUVI CC HS, currently not used
CC_MODE		B3		3.3 V	8	J12-57	CRUVI CC HS, currently not used
CC_SMB_SCL		A5		3.3 V	8	J12-7	CRUVI CC HS, currently not used
LED6	out	B7		3.3 V	8	D6	User LED
BUTTON0	in	E7	up (external)	3.3 V	8	S2	SoM reset button/User button

Port Description

Level shifting/MUX

In this Firmware Version CRUVI Low Speed connector CA has four signals configured as input and another four as output. Depending on the connectors and signals used/needed this can be changed by customizing and updateing the firmware. Also the 3.3V signals on the three CRUVI High Speed connectors can be utilized in that way. See TEB0707 CPLD Firmware.

```
X0 <= M_G1_01 ;
X2 <= M_G1_02 ;
X4 <= M_G1_03 ;
X6 <= M_G1_04 ;

M_G1_05 <= X1;
M_G1_06 <= X3;
M_G1_07 <= X5;
M_G1_08 <= X7;
```

JTAG/ UART forward to 4x5 module

JTAG

Switch with hard wired JTAGEN Dip4 between user mode of pins, which corresponds due to the lines below to SoM JTAG ("OFF", open, 'low') and Max10 CPLD ("ON", closed, 'high')

```
TDO <= M_TDO;
M_TMS <= TMS;
M_TCK <= TCK;
M_TDI <= TDI;
```

UART

M_G6_01 <= F_UART_TX; --TX UART to SoM
F_UART_RX <= M_G6_02; --RX UART from SoM

Module control pins

RESIN <= BUTTON0; -- reset SoM
NOSEQ <= net_gnd; -- powermanagement by CPLD is NOT disabled
PROGMODE <= not(DIP3); -- select between CPLD (low, closed, on) on SoM or FPGA/SoC (high, open, off)
EN1 <= net_vcc; --module power always enabled
MODE <= SD_CD ; -- select SD boot mode when card installed ('low'), else QSPI ('high')

Button and Dips

User Button

User button on PL is debounced:
M_G1_20 <= Button1_db;

User Dips:

Dip1 is directly forwarded to a PL IO:
M_G1_16 <= not(DIP1);

Dip2 is used for IO Voltage selection, see IO Voltage selection.
Dip3 is used for JTAG selection, see Module control pins.

LEDs

Status LEDs

The LED D7 and D8 are utilized for board status and power information in the following way:

Sequenz		Description D7 (red)	Description D8 (green)
OFF	LED OFF	Power OK	currently not used
*ooooooo	1 times blinking with a break	SoM Power error (PGOOD 'low' or M3_3VOUT 'low')	currently not used
**oooooo to ****oo	2, 3, 4 times blinking with a break	currently not used	currently not used
*****ooo	5 times blinking with a break	USB power errror (USB_OC 'low)	SoM CPLD JTAG enabled
******oo to ********	6, 7, 8 times blinking with a break	currently not used	currently not used
ON	LED ON	currently not used	System OK

Status LEDs description

USR LEDs

User LEDs D1, D2, D3 (green) are connected to PL IOs:

LED3 <= M_G1_19;
LED2 <= M_G1_18;
LED1 <= M_G1_17;

User LEDs D4, D5, D6 (red) are connected to IOs which are located at PL or PS depending on SoM.

LED4 <= M_G6_04;
LED5 <= M_G6_07;
LED6 <= M_G6_08;

ETH LEDs

Ethernet Jack LEDs are not used in this firmware and are therefore tied to GND.

ETH_LED2 <= net_gnd;
ETH_LED1 <= net_gnd;

Power sequenzing

The M3.3VOUT signal of the SoM is used to Enable CRUVI power rails and the SOM IO Voltage:

EN_C5VIN <= M3_3VOUT;
EN_C3_3V <= M3_3VOUT;
EN_IOV <= M3_3VOUT;

IO Voltage selection

Select IOV Voltage of DCDC U3:

VS0 <= not(DIP2);
VS1 <= DIP2;
VS2 <= net_gnd;

"010" selects 1.8V (Dip2 open, "OFF", 'high').
"001" selects 2.5V (Dip2 closed, "ON", 'low').

Appx. A: Change History and Legal Notices

Document Change History

To get content of older revision go to "Change History" of this page and select older document revision number.

Revision Changes

Date	Document Revision	CPLD Firmware Revision	Supported PCB Revision	Authors	Description
		REV01	REV01, REV02	Error rendering macro 'page-info'	initial version

Error rendering macro 'page-info' Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]	**Error rendering macro 'page-info'** Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]			Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.	

				String, class com. atlassian. confluenc e.core. ContentEn tityObject] [interface com. atlassian. user. User, class java. lang. String, class com. atlassian. confluenc e.core. ContentEn tityObject]	
	All			**Error rendering macro 'page-info'** Ambiguou s method overloadin g for method jdk. proxy241. $Proxy349	

6#hasCon
tentLevelP
ermission.
Cannot
resolve
which
method to
invoke for
[null,
class java.
lang.
String,
class com.
atlassian.
confluenc
e.pages.
Page]
due to
overlappin
g
prototypes
between:
[interface
com.
atlassian.
confluenc
e.user.
Confluenc
eUser,
class java.
lang.
String,
class com.
atlassian.
confluenc
e.core.
ContentEn
tityObject]
[interface

				com. atlassian. user. User, class java. lang. String, class com. atlassian. confluenc e.core. ContentEn tityObject]	

Legal Notices

Data Privacy

Please also note our data protection declaration at https://www.trenz-electronic.de/en/Data-protection-Privacy

Document Warranty

The material contained in this document is provided “as is” and is subject to being changed at any time without notice. Trenz Electronic does not warrant the accuracy and completeness of the materials in this document. Further, to the maximum extent permitted by applicable law, Trenz Electronic disclaims all warranties, either express or implied, with regard to this document and any information contained herein, including but not limited to the implied warranties of merchantability, fitness for a particular purpose or non infringement of intellectual property. Trenz Electronic shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein.

Limitation of Liability

In no event will Trenz Electronic, its suppliers, or other third parties mentioned in this document be liable for any damages whatsoever (including, without limitation, those resulting from lost profits, lost data or business interruption) arising out of the use, inability to use, or the results of use of this document, any documents linked to this document, or the materials or information contained at any or all such documents. If your use of the materials or information from this document results in the need for servicing, repair or correction of equipment or data, you assume all costs thereof.

Copyright Notice

Technology Licenses

The hardware / firmware / software described in this document are furnished under a license and may be used /modified / copied only in accordance with the terms of such license.

Environmental Protection

To confront directly with the responsibility toward the environment, the global community and eventually also oneself. Such a resolution should be integral part not only of everybody's life. Also enterprises shall be conscious of their social responsibility and contribute to the preservation of our common living space. That is why Trenz Electronic invests in the protection of our Environment.

REACH, RoHS and WEEE

REACH

Trenz Electronic is a manufacturer and a distributor of electronic products. It is therefore a so called downstream user in the sense of REACH. The products we supply to you are solely non-chemical products (goods). Moreover and under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not release any substance. For that, Trenz Electronic is obliged to neither register nor to provide safety data sheet. According to present knowledge and to best of our knowledge, no SVHC (Substances of Very High Concern) on the Candidate List are contained in our products. Furthermore, we will immediately and unsolicited inform our customers in compliance with REACH - Article 33 if any substance present in our goods (above a concentration of 0,1 % weight by weight) will be classified as SVHC by the European Chemicals Agency (ECHA).

RoHS

Trenz Electronic GmbH herewith declares that all its products are developed, manufactured and distributed RoHS compliant.

WEEE

Information for users within the European Union in accordance with Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Users of electrical and electronic equipment in private households are required not to dispose of waste electrical and electronic equipment as unsorted municipal waste and to collect such waste electrical and electronic equipment separately. By the 13 August 2005, Member States shall have ensured that systems are set up allowing final holders and distributors to return waste electrical and electronic equipment at least free of charge. Member States shall ensure the availability and accessibility of the necessary collection facilities. Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment in the European Union. Consumers have to actively contribute to the success of such collection and the return of waste electrical and electronic equipment. Presence of hazardous substances in electrical and electronic equipment results in potential effects on the environment and human health. The symbol consisting of the crossed-out wheeled bin indicates separate collection for waste electrical and electronic equipment.

Trenz Electronic is registered under WEEE-Reg.-Nr. DE97922676.

Error rendering macro 'page-info'

Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]