



ALPHA DATA

**XRM-IO146 User
Manual**

Revision: V2.0

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1 Introduction



Figure 1 : XRM-IO146

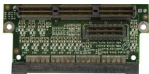


Figure 2 : XRM-IO146-ROCKET

The XRM-IO146 provides 146 I/O signals on a front panel MICTOR connector with a wide range of options to support GPIO requirements. Signals are driven / received by the FPGA for total user programmability and can be used single ended (i.e. LVTTTL) or in pairs (i.e. LVDS). Micro-coax cable assemblies for this adapter can support signals up to 2GHz (also available from Alpha Data). For positive locking cable retention, an optional cable clamp assembly is available.

Each pair of I/O signals is routed as shown below using optional fit resistors. The default manufacturing option is $R_s=0R$ and R_t not fitted, so that the signals pass straight through to an FPGA. Other options are available by contacting Alpha-Data and requesting a custom part ordering code. Alpha Data can also provide further information to rework the termination resistors at customer sites if IPC-A-610 specialists are available. R_s can be used to provide series dampening for point to point applications, or current limiting, but for LVDS is typically $0R$. R_t can be used for LVDS inputs to provide the termination voltage from the line current, or parallel termination; although Xilinx FPGAs from Virtex-4 onward have this termination available internally.

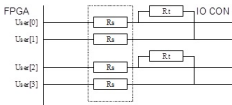


Figure 3 : XRM-IO146 Termination Options

Each single ended signal is routed via a series resistor. These are $33R0$ by default, but can be customized by Alpha Data or at customer sites.

1.1 Specifications

The XRM-IO146 provides multiple channels of bidirectional I/O capability with complete programmability from the FPGA.

- Standard XRM format module (Alpha Data standard)
- Compatible with all Alpha Data boards featuring an XRM site
- 64 differential (LVDS, LVPECL, etc.) pairs + 4 clock capable pairs (LVDS, LVPECL, etc.) + 10 single ended (LVTTTL, LVCMOS, etc.)
- All signals can be used single ended (up to 146 LVTTTL, LVCMOS, etc.)
- XRM VCCIO selectable from the FPGA board at 1.2V to 3.3V (depending on limits of FPGA family)
- Battery holders to provide power for FPGA encryption key memory
- Option for 5V power output - fused at 1.0 amp
- Option for 7x RocketIO lanes (7x Tx/Rx pairs) in lieu of 13 LVDS pairs and 2 - 5V output pins
- Option for positive locking cable clamp assembly

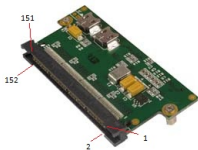


Figure 4 : XRM-IO146 Pin Diagram

2 Installation

2.1 Fitting

The XRM-IO146 is designed to plug in to the front panel connector (SAMTEC QSH series) on Alpha Data cards with an XRM site. Note that Virtex-6 and newer boards key this connector 180deg from Virtex-5 and earlier boards. For Virtex-6 and up, the XRM2 version is required and can't be interchanged with the XRM version for Virtex-5 and earlier boards. The retaining screws should be tightened to secure the XRM-IO146.

Note:

This operation should not be performed while the card is powered up.

2.2 Handling instructions

Observe precautions for preventing damage to components by electrostatic discharge. Personnel handling the board should take ESD precautions.

Note:

Avoid flexing the board.

2.3 Voltage Settings

Note:

This board will pass signals directly to the FPGA unless termination options are specified; users should ensure that the VIO setting on the FPGA card is set to suit the appropriate signaling level to ensure no damage can occur. Also ensure that the signals applied to this module are within the limits of the FPGA IOBs.

2.4 Battery Installation

The XRM-IO146 has 2 battery holders for supplying the VBATT power supply to maintain the encryption key memory within the Xilinx FPGA. If the encryption feature of the FPGA isn't used, then no batteries need to be installed. Use 1.5V SR60 coin cell batteries, 6.8mm, silver oxide such as Duracell D364 (not included by Alpha Data). When replacing the batteries, ensure one is always installed while replacing the other and the VBATT supply will continuously keep the encryption key backed up. Refer to the Xilinx configuration user guide for further information.

3 XRM-IO146 Interface Connector

The XRM-IO146 signal interface is a MICTOR 152-way receptacle connector, AMP/TYCO part number 5767044-4 (or equivalent).

Suggested mating part is AMP/TYCO 1-5767007-1 152 pin Mictor Plug (or similar).

Cable assemblies are available from Alpha Data or directly from Micro Interconnects (www.microinterconnects.com). Alpha Data can provide standard cable assemblies for 152M to 152M (50cm), 152M to 4 x 38M (50cm), or custom cabling solutions as requested.

4 XRM-IO146 Interface - Pinout Tables

The front panel MICTOR connector is broken up into 4 banks, which can be used for a single function or split up as required for an application (see coloring of banks in diagrams below). Cabling can be used to break off each bank to it's own connector, connected to another 152-pin MICTOR, or customized for a specific application. The following table shows the MICTOR connector pins, connection to the Samtec XRM connector and signal description. See the Alpha Data SDK for the UCF files to map each pin to the FPGA pad, or contact Alpha Data for further support.

- The first letter in the signal name (d or s) represents differential or single ended routing. RocketIO signals begin with (gtp).
- The second letter (a,b,c,d) represent the bank of the MICTOR connector. RocketIO signals specify the direction relative to the FPGA (tx or rx).
- Each pair is represented by `_p / _n` indicating polarity and a pair number.
- Clock capable signals (cc in name) can be used for differential clocks, single ended clocks, or data. Additional clock capable signals may be available depending on the main FPGA board allocation.
- Data signals can be used for differential pairs or single ended signals.

Options	Signal	Sanitize	Mux	Sanitize	Signal	Options
	da_p0b	3	3	6	da_p0b	
	da_n0b	1	1	8	da_n0b	
	da_p1b	7	7	4	da_p1b	
	da_n1b	5	5	2	da_n1b	
	da_p0b	11	11	12	da_p0b	
	da_n0b	9	9	10	da_n0b	
	da_p0b	15	15	18	da_p0b	
	da_n0b	13	13	14	da_n0b	
DO VM	da_p0b	17	17	18	da_p0b	
DO VM	da_n0b	19	19	20	da_n0b	
	da_p10b	23	23	24	da_p10b	
	da_n10b	21	21	22	da_n10b	
	da_p12b	27	27	26	da_p12b	
	da_n12b	25	25	28	da_n12b	
	da_p14b	31	31	30	da_p14b	
	da_n14b	29	29	32	da_n14b	
	da0b	37	37	38	da_ct_p	
	da1b	39	39	40	da_ct_n	
+5V Fused	N/C	47	47	50	da2b	
	da_p0b	35	35	36	da_p1b	
	da_n0b	33	33	34	da_n1b	
	da_p2b	44	44	44	da_p0b	
	da_n2b	41	41	42	da_n0b	
	da_p0b	47	47	48	da_p0b	
	da_n0b	45	45	46	da_n0b	
	da_p0b	71	71	72	da_p0b	
	da_n0b	69	69	70	da_n0b	
	da_p0b	75	75	74	da_p0b	
	da_n0b	73	73	76	da_n0b	
	da_p10b	77	77	80	da_p10b	
	da_n10b	79	79	78	da_n10b	
	da_p12b	83	83	82	da_p12b	
	da_n12b	81	81	84	da_n12b	
	da_p14b	87	87	88	da_p14b	
	da_n14b	85	85	86	da_n14b	
	da0b	105	105	89	da_ct_p	
	da1b	107	107	91	da_ct_n	
+5V Fused	N/C	115	115	95	da2b	
	da_p0b	103	103	100	da_p1b	
	da_n0b	101	101	98	da_n1b	
	da_p2b	121	121	122	da_p0b	
	da_n2b	123	123	124	da_n0b	
	da_p0b	127	127	126	da_p0b	
	da_n0b	125	125	128	da_n0b	
	da_p0b	129	129	140	da_p0b	
	da_n0b	131	131	132	da_n0b	
	da_p0b	135	135	136	da_p0b	
	da_n0b	133	133	134	da_n0b	
	da_p10b	137	137	140	da_p10b	
	da_n10b	139	139	138	da_n10b	
	da_p12b	143	143	144	da_p12b	
	da_n12b	141	141	142	da_n12b	
	da_p14b	147	147	152	da_p14b	
	da_n14b	145	145	150	da_n14b	
	da0b	92	100	132	da_ct_p	
	da1b	94	110	132	da_ct_n	
+5V Fused	N/C	119	119		N/C	+5V Fused
	da_p0b	149	149	146	da_p1b	
	da_n0b	151	151	148	da_n1b	
DO VM	da_p2b	153	153	154	da_p0b	
DO VM	da_n2b	155	155	154	da_n0b	
	da_p0b	159	159	160	da_p0b	
	da_n0b	157	157	158	da_n0b	
	da_p0b	165	170	164	da_p0b	
	da_n0b	163	170	162	da_n0b	
	da_p0b	167	170	168	da_p0b	
	da_n0b	165	170	166	da_n0b	
	da_p10b	171	170	172	da_p10b	
	da_n10b	169	170	170	da_n10b	
	da_p12b	175	170	176	da_p12b	
	da_n12b	173	170	174	da_n12b	
	da_p14b	179	170	180	da_p14b	
	da_n14b	177	170	178	da_n14b	
	da0b	96	140	102	da_ct_p	
	da1b	106	140	104	da_ct_n	
+5V Fused	N/C	152	152		N/C	+5V Fused

Figure 5 : XRM-IO146 / XRM2-IO146 Pinout

Options	Signal	Source	Wक्टर	Source	Signal	Options
	da_p0b0	3	0	6	da_p0b	
	da_p0b1	1	0	8	da_p0b1	
	da_p0b2	7	0	4	da_p0b2	
	da_p0b3	5	0	2	da_p0b3	
	da_p0b4	11	0	12	da_p0b4	
	da_p0b5	9	0	10	da_p0b5	
	da_p0b6	15	0	16	da_p0b6	
	da_p0b7	13	0	14	da_p0b7	
	da_p0b8	67	0	18	da_p0b8	
	da_p0b9	65	0	20	da_p0b9	
	da_p0b10	23	0	24	da_p0b10	
	da_p0b11	21	0	22	da_p0b11	
	da_p0b12	27	0	26	da_p0b12	
	da_p0b13	25	0	28	da_p0b13	
	da_p0b14	31	0	30	da_p0b14	
	da_p0b15	29	0	32	da_p0b15	
	da_p0b16	149	0	38	da_p0b16	
	da_p0b17	151	0	40	da_p0b17	
vDV fused	N/C	37	0	37	ua0b	
	db_p0b0	35	0	36	db_p0b	
	db_p0b1	33	0	34	db_p0b1	
	db_p0b2	64	0	64	db_p0b2	
	db_p0b3	61	0	62	db_p0b3	
	db_p0b4	110	0	68	db_p0b4	
	db_p0b5	112	0	66	db_p0b5	
	db_p0b6	71	0	72	db_p0b6	
	db_p0b7	69	0	70	db_p0b7	
	db_p0b8	75	0	74	db_p0b8	
	db_p0b9	73	0	76	db_p0b9	
	db_p0b10	77	0	80	db_p0b10	
	db_p0b11	79	0	78	db_p0b11	
	db_p0b12	83	0	82	db_p0b12	
	db_p0b13	81	0	84	db_p0b13	
	db_p0b14	87	0	88	db_p0b14	
	db_p0b15	85	0	86	db_p0b15	
	db_p0b16	144	0	89	db_p0b16	
	db_p0b17	148	0	91	db_p0b17	
vDV fused	N/C	38	0	154	db_p0b18	
	dc_p0b0	103	0	100	dc_p0b	
	dc_p0b1	101	0	98	dc_p0b1	
	dc_p0b2	121	0	122	dc_p0b2	
	dc_p0b3	123	0	124	dc_p0b3	
	dc_p0b4	127	0	126	dc_p0b4	
	dc_p0b5	125	0	128	dc_p0b5	
	dc_p0b6	129	0	130	dc_p0b6	
	dc_p0b7	131	0	132	dc_p0b7	
	dc_p0b8	135	0	134	dc_p0b8	
	dc_p0b9	133	0	136	dc_p0b9	
	dc_p0b10	137	0	140	dc_p0b10	
	dc_p0b11	139	0	138	dc_p0b11	
	dc_p0b12	143	0	144	dc_p0b12	
	dc_p0b13	141	0	142	dc_p0b13	
	dc_p0b14	147	0	152	dc_p0b14	
	dc_p0b15	145	0	150	dc_p0b15	
	dc_p0b16	95	0	152	dc_p0b16	
	dc_p0b17	93	0	150	dc_p0b17	
vDV fused	N/C	118	0	118	N/C	vDV fused
	fpv_n_p0b0	CN0-04	117	114	CN0-25	fpv_n_p0b0
	fpv_n_p0b1	CN0-08	117	114	CN0-27	fpv_n_p0b1
	fpv_n_p0b2	CN0-02	118	114	CN0-21	fpv_n_p0b2
	fpv_n_p0b3	CN0-04	117	112	CN0-23	fpv_n_p0b3
	ud0b0	92	101	96	ud0b0	
	ud0b1	90	100	94	ud0b1	
	fpv_n_p0b4	CN0-08	117	112	CN0-27	fpv_n_p0b4
	fpv_n_p0b5	CN0-04	118	112	CN0-29	fpv_n_p0b5
	fpv_n_p0b6	CN0-04	117	112	CN0-25	fpv_n_p0b6
	fpv_n_p0b7	CN0-04	117	112	CN0-21	fpv_n_p0b7
	fpv_n_p0b8	CN0-04	117	112	CN0-21	fpv_n_p0b8
	fpv_n_p0b9	CN0-04	117	112	CN0-21	fpv_n_p0b9
	fpv_n_p0b10	CN0-04	117	112	CN0-21	fpv_n_p0b10
	fpv_n_p0b11	CN0-04	117	112	CN0-21	fpv_n_p0b11
	fpv_n_p0b12	CN0-04	117	112	CN0-21	fpv_n_p0b12
	fpv_n_p0b13	CN0-04	117	112	CN0-21	fpv_n_p0b13
	fpv_n_p0b14	CN0-04	117	112	CN0-21	fpv_n_p0b14
	fpv_n_p0b15	CN0-04	117	112	CN0-21	fpv_n_p0b15
	ud0b0	108	101	102	ud0b0	
	ud0b1	106	100	104	ud0b1	
	ud0b2	102	100	106	ud0b2	

Figure 6 : XRM-IO146-ROCKET / XRM2-IO146-ROCKET Pinout

5 Positive Locking / Cable Clamp Assembly

The XRM-IO146 uses a MICTOR connector with a minimum retention force of 4.75lbs. For applications requiring positive locking on this connector or further strain relief, an optional locking assembly is available. This clamp interfaces with the housing on the cable assembly to lock it in place, and also provides strain relief to the cable itself by clamping it with protective material.

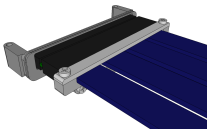


Figure 7 : MET-BEZEL-IO146-LOCK Top View

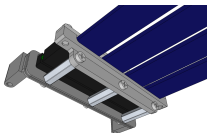


Figure 8 : MET-BEZEL-IO146-LOCK Bottom View

6 Product Codes

The following table describes the standard product codes and some of the available build options. Contact Alpha Data for further options, customizations, conformal coating, etc.

Product Code	Description
XRM-IO146	Standard module for Virtex-5 and earlier Alpha Data boards
XRM2-IO146	Standard module for Virtex-6 and later Alpha Data boards
XRM-IO146A	Standard module for ADM-XRC-4 board only
XRM-IO146-G	DCI enabled option for Virtex-4 and earlier
XRM(2)-IO146-ROCKET	High Speed Serial Lanes Option
XRM(2)-IO146-LOCK	Includes cable retention / positive locking assembly
XRM(2)-IO146-ROCKET-LOCK	HSS and includes cable retention / positive locking assembly
XRM(2)-IO146-[code]	Other build options as assigned by Alpha Data
Product Code	Accessory Description
XRM-IO146-LOOPBACK	Test adapter to loop back signals (not compatible with -ROCKET)
CAB-MICTOR-152	Cable assembly - 152M to 152M, 50cm
CAB-MICTOR-152M-4X38	Cable assembly - 152M split out to 4 x 38M, 50cm
MET-BEZEL-IO146-LOCK	Spare cable retention / positive locking assembly

Table 1 : Ordering Options

Revision History

Date	Revision	Nature of Change
2008	1.0	Initial Release
Nov 2012	2.0	Converted to XML, included XRM2 options, updated Mictor cable source, added cable retention option, added ROCKET option, created new pinout tables