

Ashling Product Brief APB165

NEXUS-standard Debug and Trace Connectors for use with Motorola's MPC56x Microprocessors

References

1. "IEEE-ISTO 5001™-1999, the Nexus 5001 Forum™ Standard for a Global Embedded Processor Debug Interface", 15th Dec 1999, from <http://www.ieee-isto.org/Nexus5001>.
2. Motorola Semiconductor Application Note AN2298/D "Nexus Interface Connector Options for MPC56x Devices", Rev. 0, 12/2002, Randy Dees, TECD Applications.
3. Ashling Product Brief APB160 "Vitra, Genia and Opella Emulator and Debugger Product Selection Guide".
4. http://www.glenair.com/html/twistpin/pdf/cots_printed_vertical75.pdf

1 Introduction: The NEXUS Standard Embedded Debugging Interface

The NEXUS Forum, an industry group whose membership includes vendors of embedded microprocessors, suppliers of emulation, debugging and calibration tools, users and developers of embedded systems and experts on embedded development, published a global standard debug interface for embedded microprocessors in 1999 (Ref. [1]). NEXUS Forum members include Motorola Semiconductors, who recently introduced the MPC565 microprocessor, the first such NEXUS-compliant device; and Ashling Microsystems, who introduced the first NEXUS-based emulation and trace tools for the MPC565.

The current published NEXUS IEEE-ISTO 5001™-1999 Standard includes a range of debug connector options. In addition, the Nexus Forum is currently finalizing an update to the Standard (Ver. 1.5), to be published shortly, that modifies the range of connectors and pin-configurations.

This Ashling Product Brief describes the connectors and pin-configurations that are best suited for NEXUS-standard debugging and trace on Motorola's MPC565 microprocessor family (including MPC561 and MPC563).

2 Ashling's range of NEXUS emulator probe assemblies

Currently, Ashling offers a range of debug and trace probe assemblies to operate with Ashling's "Vitra-MPC56x" Networked Emulator with Real-Time Trace, "Genia-MPC56x" Networked high-speed MPC565 NEXUS Emulator and "Opella-MPC56x" entry-level emulator (Ref. [1]).

Probe-cables are available to suit the current Axiom/Motorola MPC565 evaluation boards with 50-pin NEXUS connectors, the initial Axiom/Motorola MPC565 evaluation board with 40-pin NEXUS 8MDO/2MDI connector, and the NEXUS 51-pin Robust connector.

Ashling's recommendations on selecting the right NEXUS debug connector configuration and probe-assembly are:

- For MPC56x NEXUS debugging applications in a normal laboratory environment, and in particular for use with Axiom's current Evaluation Board for the MPC56x family, use the NEXUS 50-pin Connector C, Option 2.
- For MPC56x NEXUS debugging or calibration in an extreme environment (in particular, for use under the hood of an automobile), use the 51-pin NEXUS Robust Connector C, Option 2.
- For MPC56x NEXUS debugging with the original Axiom MPC565 Evaluation Boards, use the initial Motorola 40-pin 8MDO/2MDI connector. This configuration is now obsolescent,

and will be dropped from the NEXUS standard (current Axiom MPC56x Evaluation Boards use the NEXUS 50-pin Connector C, Option 2).

3 50-pin NEXUS Connector C, Option 2 Definition

The following table shows Ashling's target connector recommendation for 50-pin NEXUS debug of MPC56x systems using Ashling tools. This is Connector C, Option 2 as defined in the draft update to the NEXUS specification (Ref. [2]).

The recommended connector for your target is a 50-pin AMP AMPMODU System 50 0.05" centerline board-to-board connector, AMP Part Number #104549-7.

Table 1 MPC56x Nexus 50-pin Connector C, Option 2 Definition (Full Port Mode)

<i>MPC56x Signal</i>	<i>Nexus Auxiliary Signal</i>	<i>Dirn. Note 3</i>	<i>Pin</i>	<i>Pin</i>	<i>Dirn. Note 3</i>	<i>Nexus Auxiliary Signal</i>	<i>MPC56x Signal</i>
-	UBATT	OUT	1	2	OUT	UBATT	-
VSTBY2.6	VSTBY	OUT	3	4	IN or OUT	TOOL_IO0	-
-	TOOL_IO1	IN or OUT	5	6	IN or OUT	TOOL_IO2	-
/HRESET	/RESET	IN ¹	7	8	OUT	VREF	VDD2.6
/EVTI	/EVTI	IN ¹	9	10	-	GND	GND
/RSTI	/RSTI	IN ²	11	12	-	GND	GND
/MSEI	/MSEI	IN ¹	13	14	-	GND	GND
MDI[0]	MDI0	IN ¹	15	16	-	GND	GND
MCKI	MCKI	IN ¹	17	18	-	GND	GND
MDO[0]	MDO0	OUT	19	20	-	GND	GND
MCKO	MCKO	OUT	21	22	-	GND	GND
LWP[1]	/EVTO	OUT	23	24	-	GND	GND
/MSEO	/MSEO0	OUT	25	26	IN or OUT	VENDOR_IO0	LWP[0]
MDO[1]	MDO1	OUT	27	28	-	GND	GND
MDO[2]	MDO2	OUT	29	30	-	GND	GND
MDO[3]	MDO3	OUT	31	32	-	GND	GND
MDI[1]	MDI1	IN ¹	33	34	-	GND	GND
-	/MSEO1	OUT	35	36	-	GND	GND
MDO[4]	MDO4	OUT	37	38	-	GND	GND
MDO[5]	MDO5	OUT	39	40	-	GND	GND
MDO[6]	MDO6	OUT	41	42	-	GND	GND
MDO[7]	MDO7	OUT	43	44	-	GND	GND
-	MDI2	IN ¹	45	46	-	GND	GND
-	MDI3	IN ¹	47	48	-	GND	GND
EPEE & B0EPEE	VENDOR_IO1	IN or OUT	49	50	-	GND	GND

Notes:

1. The Nexus standard recommends that inputs should have 10KO pull-up resistors to V_{REF}.
2. The Nexus standard recommends that inputs should have 10KO pull-up resistors to VREF. This has been changed in the new revision of the standard to state that /RSTI should be pulled down. The /RSTI input however requires a pull-up value of less than 6.1KO; this is in line with the proposed new standard.
3. Signal Direction: OUT means From Target-device To instrument; IN means Into Target-device From Instrument.

4 51-pin NEXUS Robust Connector C, Option 2 Definition

The following Table, MPC56x Nexus 51-Pin Robust Connector, shows the signal names and pinning for the Nexus 51-pin Robust Auxiliary Port Connector C, Option 2 (Ref. [2]). The recommended connector for your target is Glenair MR7580-51P2BNU Micro-D Twist-pin (Ref. [Error! Reference source not found.]).

Table 2 MPC56x MPC56x Nexus 51-Pin Robust Connector

	19	1
	MDO0	UBATT
36		2
GND	20	UBATT
	GND	
37	21	3
MDO4	MCKO	VSTBY
		4
38	22	TOOL_IO0
GND	GND	
	23	5
39	/EVTO	TOOL_IO1
MDO5		
	24	6
40	GND	TOOL_IO2
GND		
	25	7
41	/MSEO0	/RESET
MDO6		
	26	8
42	VEN_IO0	VREF
GND		
	27	9
43	MDO1	EVTI
MDO7		
	28	10
44	GND	GND
GND		
	29	11
45	MDO2	/RSTI
MDI2		
	30	12
46	GND	GND
GND		
	31	13
47	MDO3	/MSEI
MDI3		
	32	14
48	GND	GND
GND		
	33	15
49	MDI1	MDIO
VEN_IO1		
	34	16
50	GND	GND
GND		
	35	17
51	/MSEO1	MCKI
PORT0		
		18
		GND

5 Initial Motorola 40-pin NEXUS 8MDO/2MDI Connector Definition

The following table shows Ashling's target connector layout for Motorola's initial Motorola NEXUS 8MDO/2MDI 40-pin connector, as used on the earlier Axiom MPC565 Evaluation Boards with 40-pin NEXUS connector (Ref. [1]).

The connector on this target is a 40-pin AMP AMPMODU System 50 0.05" line-line board-to-board connector (AMP Part Number 147377-4).

This configuration is now obsolescent, and will be dropped from the NEXUS standard (current Axiom MPC56x Evaluation Boards use the NEXUS 50-pin Connector C, Option 2).

Table 3 Initial Motorola NEXUS MPC565 8MDO/2MDI Connector Definition

Pin No.	Function	Pin No.	Function
1	!HRSET	21	VF[1] / MPIO32B[1] / MCKO
2	VREF	22	GND
3	TMS / !EVTI	23	TDO / DSDO / MDO[0]
4	NC	24	GND
5	JCOMP / !RSTI	25	VF[0]/MPIO32B[0] / MDO[1]
6	NC	26	GND
7	VF[2] / MPIO32B[2] / !MSEI	27	MPWM[1] / MDO[2]
8	GND	28	GND
9	TCL / DSCK / MCKI	29	MPWM[17] / MDO[3]
10	GND	30	GND
11	TDI / DSDI / MDI[0]	31	!IRQ[0] / SGPIOC[0] / MDO[4]
12	GND	32	GND
13	NC	33	MPIO32B[5] / MDO[5]
14	GND	34	GND
15	NC	35	MPIO32B[6] / MPWM[4] / MDO[6]
16	NC	36	GND
17	EVTO	37	MPWM[19] / MDO[7]
18	GND	38	GND
19	VFLS[0] / MPIO32B[3] / !MSEO	39	MPWM[0] / MDI[1]
20	GND	40	GND

6 Motorola BDM PowerPC MPC5xx Connector Definition

To complete this document, **Table 4** below shows Ashling's 10-pin target connector pinout for BDM debugging on Motorola's MPC5xx microprocessors.

Table 4 MPC5xx BDM 10-pin connector definition

<i>MPC5xx Pin</i>	<i>Signal</i>	<i>Dirn. See Note</i>	<i>Pin</i>	<i>Pin</i>	<i>Dirn. See Note</i>	<i>Signal</i>	<i>MPC5xx Pin</i>
VFLS0	Visible History Buffer Flush Status 0	OUT	1	2	IN and OUT	Soft Reset	/SRESET
GND		-	3	4	IN	Development Serial Clock	DSCK
GND		-	5	6	OUT	Visible History Buffer Flush Status 1	VFLS1
/HRESET	Hard Reset	IN and OUT	7	8	IN	Development Serial Data In	DSDI
Vcc	Target power sense	OUT	9	10	OUT	Development Serial Data Out	DSDO

Signal Direction: OUT means From Target-device To instrument; IN means Into Target-device From Instrument.

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