Passively Probing a Motorola PowerQUICC II Target System with HP E5346A High-Density Termination Adapters

Product Note

Solutions for Digital System Debug

Passively Probing a Motorola PowerQUICC II Target System with HP E5346A High-Density Termination Adapters

This product note describes how to connect an HP logic analyzer to the BGA package of a Motorola PowerQUICC II target system for use with an inverse assembler.

Signals required for inverse assembly are shown in the pinout information table beginning on page 7 and must be routed to AMP Mictor 38 connectors for connection to the logic analyzer.

Eight, 16-channel logic analyzer pods are required for inverse assembly. These eight pods are connected via the Mictor connectors to four high-density termination adapters. The adapters are not included with the inverse assembler and must be ordered separately.

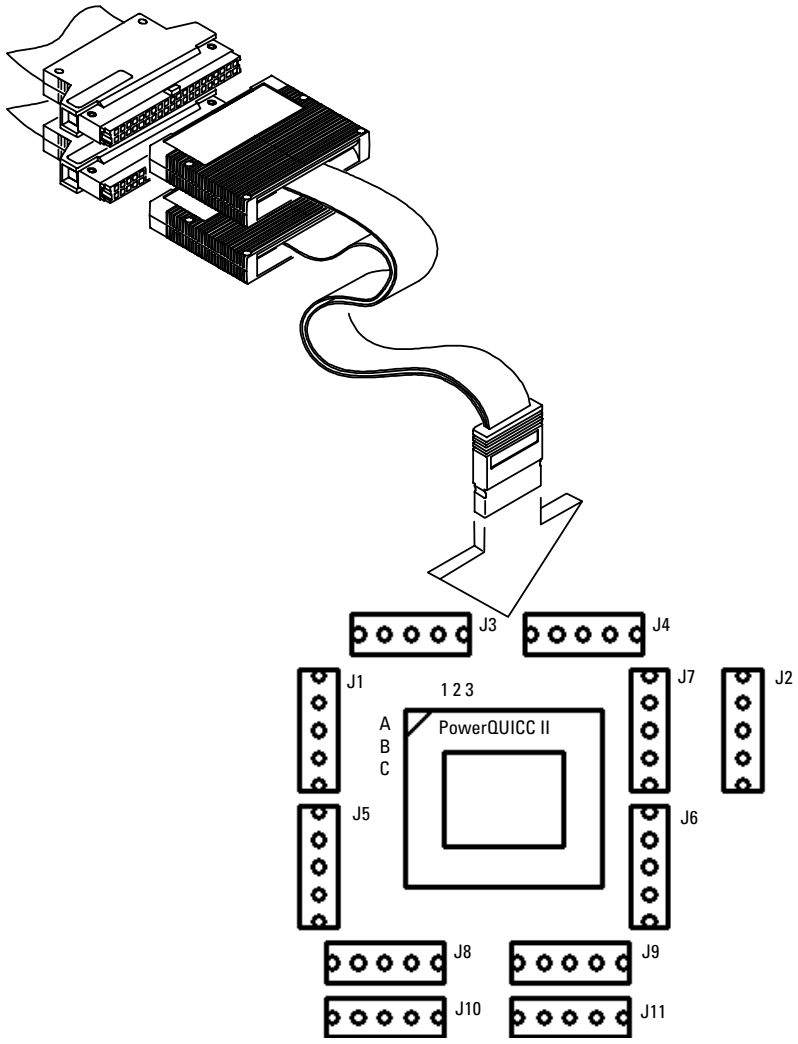

Figure 1. Connector Layout for a Motorola PowerQUICC II BGA Target

Direct Connection through HP E5346A High-Density Adapter Cables

The HP E5346A high-density adapters use a minimal amount of board space. Each high-density adapter connects two logic analyzer pods, providing 32 channels of logic analysis per connector and access to two clock pins, as shown in figure 2.

Grounds need to be connected to pin 3 of the AMP Mictor connector. SCL, +5VDC and SDA are not to be connected to the target system (pins 1, 2, and 4 on the Mictor connector).

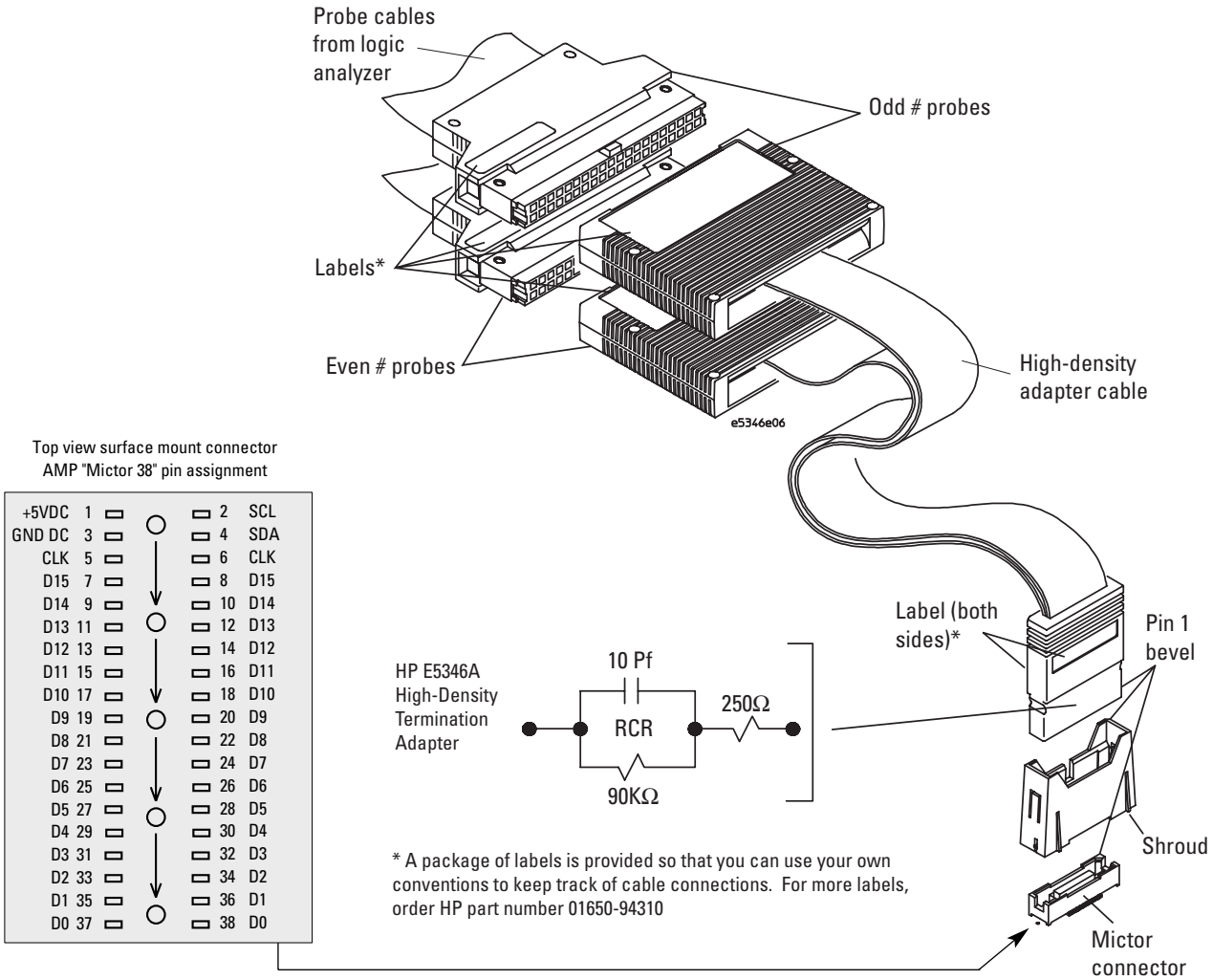

Figure 2. HP E5346A High-Density Termination Adapter

Termination for logic analysis is included at the probe tip of the HP E5346A high-density termination adapter for easy application and use. A schematic of this termination is shown in figure 3.

The AMP Mictor connector must be placed close enough to the target system so that the stub length created is less than 1/5 the Tr (bus rise-time). For PC board material (er=4.9) and Zo in the range of 50-80Ω, use a propagation delay of 160 ps/inch of stub.

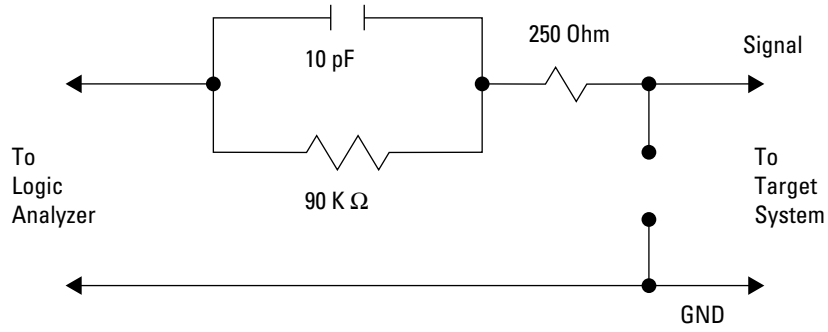

Figure 3. RC Network for Signal Termination

Four HP E5346A adapters and Mictor connectors are needed to probe all the required signals for inverse assembly.

Mictor Connector Placement

Placing the AMP Mictor connectors as close as possible to the signal source will minimize stub length and ensure a reliable measurement. Figure 4 shows the connector layout of J1-J5. J1-J4 are required for inverse assembly. J5 is optional for timing or state analysis of I/O ports.

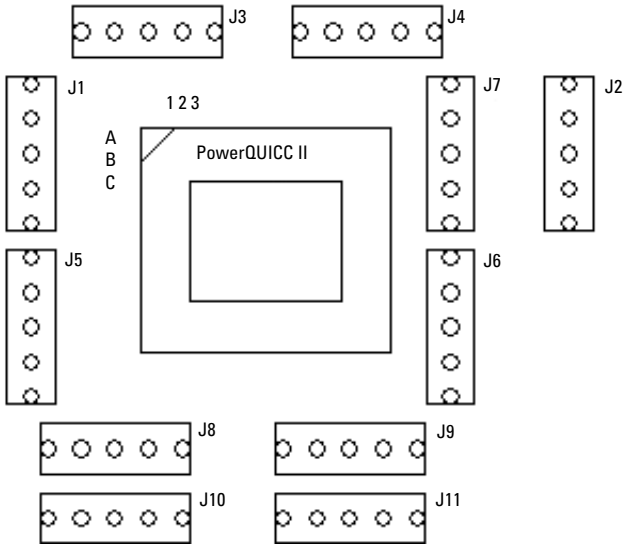

Figure 4. Mictor Connector Placement

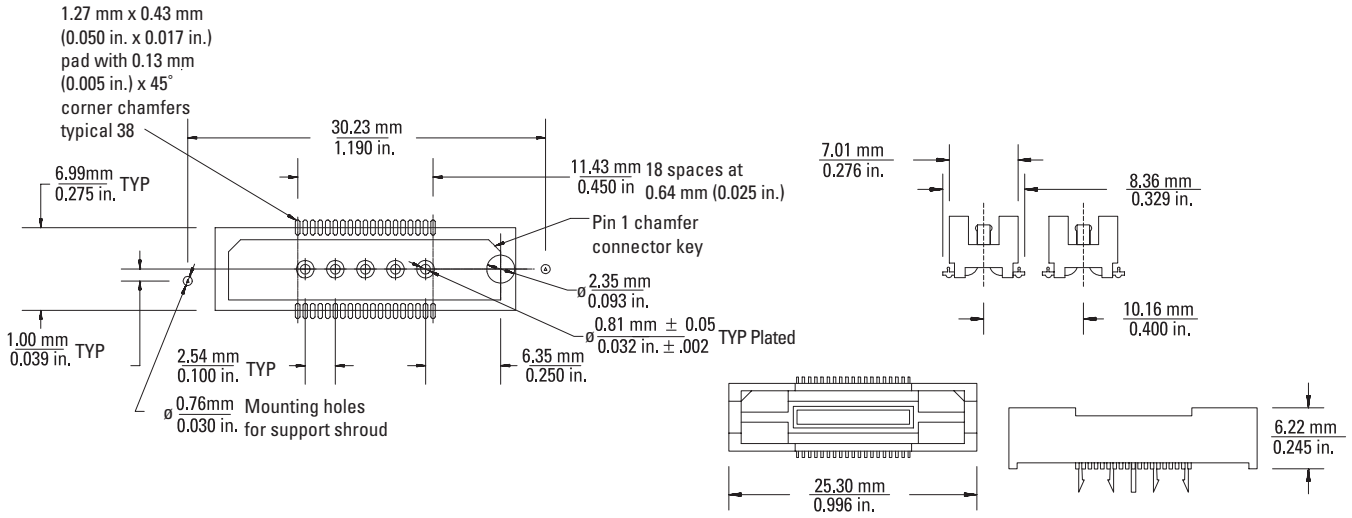

Figure 5. AMP Mictor Connector Dimensions

Mictor Connector

The AMP Mictor connectors are available from AMP (PN 2-767004-2) or from HP (PN E5346-68701). The HP Mictor kit contains five AMP Mictor connectors and five support shrouds. The signals +5 VDC, SCL, and SDA are not used for probing and should not be connected to the target system, as shown in figure 2.

Support Shroud

A support shroud (HP E5346-44701) is recommended to provide additional strain relief between the HP E5346A adapter and the AMP Mictor connector, as shown in figure 6. The shroud fits around the AMP Mictor connector and requires two through-hole connections to the target board. Five shrouds are included with five AMP Mictor connectors in the HP E5346-68701 kit.

Inverse Assembler

An inverse assembler translates logic levels captured by the logic analyzer into PowerQUICC II mnemonics and identifies the microprocessor bus cycles captured, such as memory read/write, interrupt acknowledge, or I/O read/write.

For better visibility of the external bus, the instruction cache should be disabled. If the instruction cache is enabled, many instructions are executed from the cache and do not appear on the external bus.

Source Correlation Tool Set

The inverse assembler can be used with the HP B4620B source correlation tool set. This allows you to time-correlate an acquired trace to written code. The source correlation tool set uses the information provided in your object file to build a database of source files, line numbers and symbol information.

IEEE 695, Elf/Dwarf, and ASCII symbol files are supported.

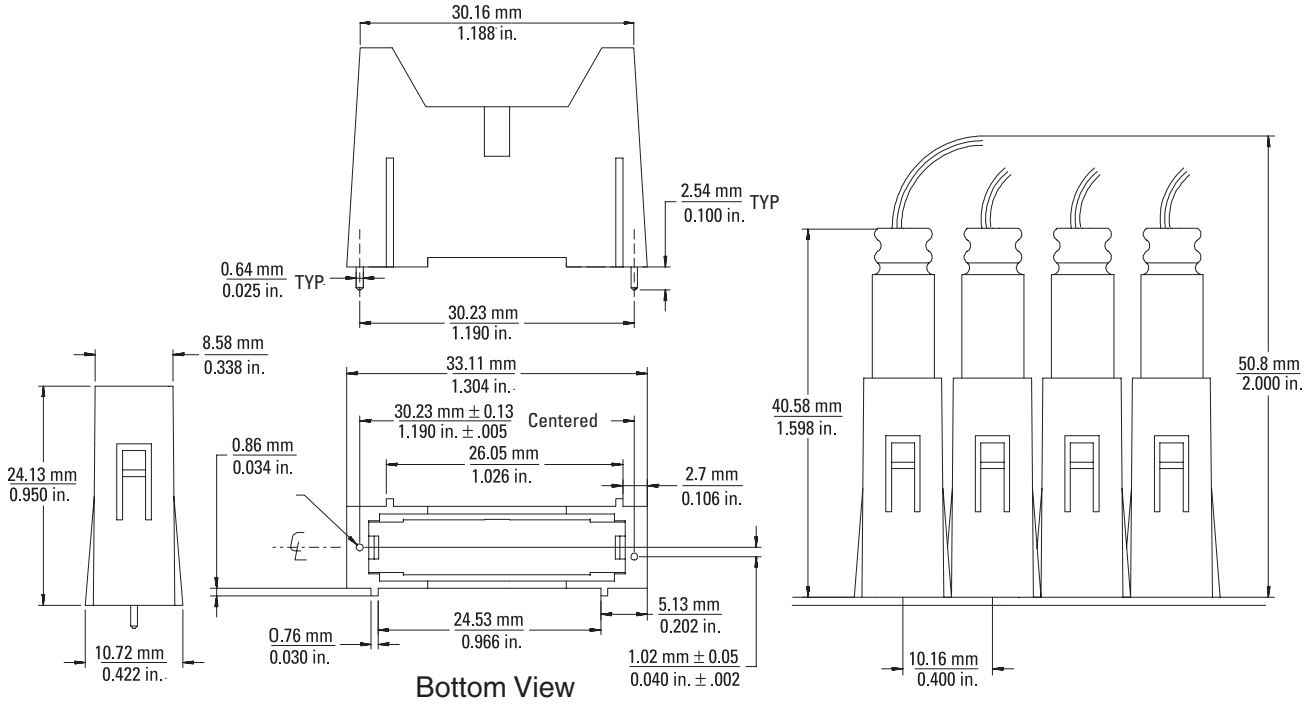

Figure 6. Support Shroud Dimensions

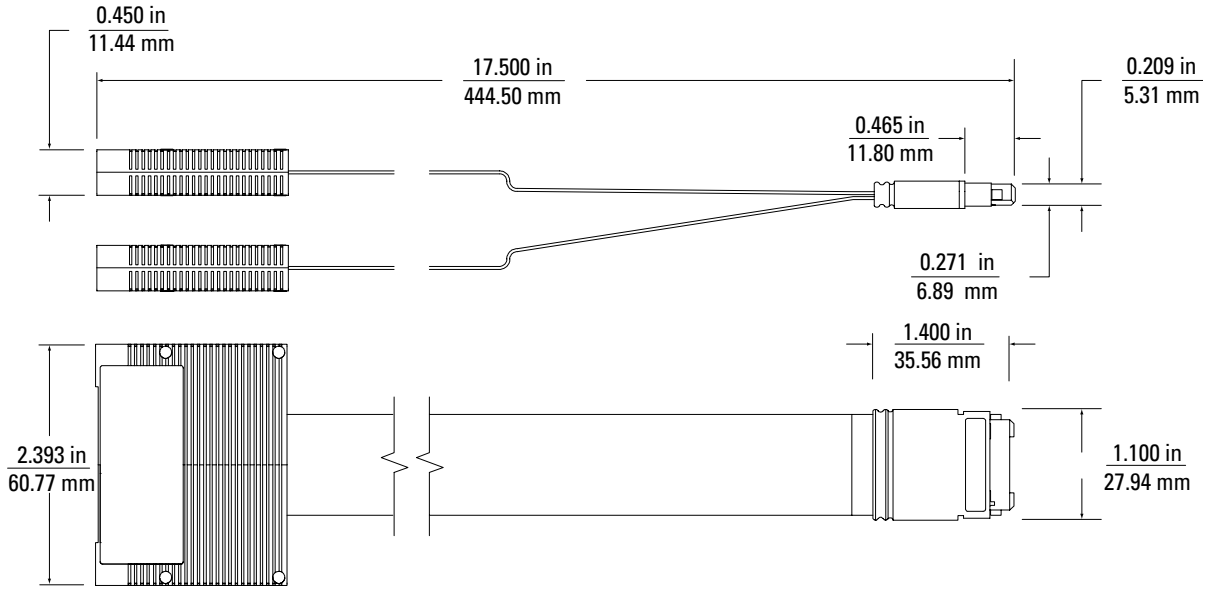

Figure 7. High-Density Termination Adapter Cable Dimensions

Recommended Pinout Information for PowerQUICC II Inverse Assembly

The following tables describe the recommended pinout for full PowerQUICC II analysis. The pinouts are compatible with the inverse assembler and the E5346A high-density termination adapter cables. This is intended to be a guide for placing probing connectors on the target system.

J1-J5 are required for inverse assembly. J6-J7 are required for PCI/local-bus analysis. The remaining connectors are optional.

The recommended pinout is designed for minimal trace lengths. The tradeoff is that a 5th connector/cable is required for inverse assembly. Note that the IA still only requires 8-pods for inverse assembly. The next section has an alternative pinout which requires only four connectors for inverse assembly

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J1 (odd)	38	BADDR31 (LSB)	J1 (even)	37	A15
	36	BADDR30		35	A14
	34	BADDR29		33	A13
	32	BADDR28		31	A12
	30	BADDR27		29	A11
	28	A26		27	A10
	26	A25		25	A9
	24	A24		23	A8
	22	A23		21	A7
	20	A22		19	A6
	18	A21		17	A5
	16	A20		15	A4
	14	A19		13	A3
	12	A18		11	A2
	10	A17		9	A1
	8	A16		7	A0
	6	CLKIN		5	#DVAL
J2 (odd)	38	Reserved	J2 (even)	37	#CS11
	36	Reserved		35	#CS10
	34	Reserved		33	#CS9
	32	DP7/CSE1		31	#CS8
	30	DP6/CSE0		29	#CS7
	28	DP5		27	#CS6
	26	DP4		25	#CS5
	24	DP3		23	#CS4
	22	DP2		21	#PWE7
	20	DP1		19	#PWE6
	18	DP0		17	#PWE5
	16	#BCTL0		15	#PWE4
	14	PSDAMUX		13	#PWE3
	12	#PGTA		11	#PWE2
	10	PSDA10		9	#PWE1
	8	#PSDWE		7	#PWE0
	6	Reserved		5	#PSDCAS

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J3 (odd)	38	D63(LSB)	J3 (even)	37	D47
	36	D62		35	D46
	34	D61		33	D45
	32	D60		31	D44
	30	D59		29	D43
	28	D58		27	D42
	26	D57		25	D41
	24	D56		23	D40
	22	D55		21	D39
	20	D54		19	D38
	18	D53		17	D37
	16	D52		15	D36
	14	D52		13	D35
	12	D50		11	D34
	10	D49		9	D33
	8	D48		7	D32
	6	#CS3		5	#CS2
J4 (odd)	38	D31	J4 (even)	37	D15
	36	D30		35	D14
	34	D29		33	D13
	32	D28		31	D12
	30	D27		29	D11
	28	D26		27	D10
	26	D25		25	D9
	24	D24		23	D8
	22	D23		21	D7
	20	D22		19	D6
	18	D21		17	D5
	16	D20		15	D4
	14	D19		13	D3
	12	D18		11	D2
	10	D17		9	D1
	8	D16		7	D0(MSB)
	6	#CS1		5	#CS0
J5 (odd)	38	TC1	J5 (even)	37	#PORST
	36	TC0		35	#SRESET
	34	#TEA		33	#HRESET
	32	#TA		31	#CPU_BR
	30	TT4		29	#L2
	28	TT3		27	GBL
	26	TT2		25	TC2
	24	TT1		23	#DBB
	22	TT0		21	#DBG
	20	TSIZ3		19	ALE
	18	TSIZ2		17	#BR
	16	TSIZ1		15	#CPU_DBG
	14	TSIZ0		13	#NMI_OUT
	12	#PSDRAS/#POE		11	#BG
	10	#ARTRY		9	#ABB
	8	#TBST		7	#APE
	6	#AACK		5	#TS

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J6 (odd)	38	AD0 (LSB)	J6 (even)	37	AD16
	36	AD1		35	AD17
	34	AD2		33	AD18
	32	AD3		31	AD19
	30	AD4		29	AD20
	28	AD5		27	AD21
	26	AD5		25	AD22
	24	AD7		23	AD23
	22	AD8		21	AD24
	20	AD9		19	AD25
	18	AD10		17	AD26
	16	AD11		15	AD27
	14	AD12		13	AD28
	12	AD13		11	AD29
	10	AD14		9	AD30
	8	AD15		7	AD31(MSB)
	6	PCI_CLK		5	#LSDCAS

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J7 (odd)	38	L_A31	J7 (even)	37	L_A15/#FRAME
	36	L_A30/#LOCK		35	L_A14/#PAR
	34	L_A29/#INTA		33	L_DP3
	32	L_A2/8#RST		31	L_DP2
	30	L_A27		29	L_DP1
	28	L_A26		27	L_DP0
	26	L_A25/#GNT0		25	#LBS3
	24	L_A24		23	#LBS2
	22	L_A23/#REQ0		21	#LBS1
	20	L_A22/#SERR		19	#LBS0
	18	L_A21/#PERR		17	#LSDRAS/#LOE
	16	L_A20/#IDSEL		15	#LWR
	14	L_A19/#DEVSEL		13	LSDA10
	12	L_A18/#STOP		11	#LSDAWE
	10	L_A17/#IRDY		9	LSDAMUX
	8	L_A16/#TRDY		7	
	6	CLKIN		5	#LGTA

J8 (odd)	38	PA31	J8 (even)	37	PA15
	36	PA30		35	PA14
	34	PA29		33	PA13
	32	PA28		31	PA12
	30	PA27		29	PA11
	28	PA26		27	PA10
	26	PA25		25	PA9
	24	PA24		23	PA8
	22	PA23		21	PA7
	20	PA22		19	PA6
	18	PA21		17	PA5
	16	PA20		15	PA4
	14	PA19		13	PA3
	12	PA18		11	PA2
	10	PA17		9	PA1
	8	PA16		7	PA0
	6	NC		5	NC

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J9 (odd)	38	PB31	J9 (even)	37	PB15
	36	PB30		35	PB14
	34	PB29		33	PB13
	32	PB28		31	PB12
	30	PB27		29	PB11
	28	PB26		27	PB10
	26	PB25		25	PB9
	24	PB24		23	PB8
	22	PB23		21	PB7
	20	PB22		19	PB6
	18	PB21		17	PB5
	16	PB20		15	PB4
	14	PB19		13	
	12	PB18		11	
	10	PB17		9	
	8	PB16		7	
	6	NC		5	NC
J10 (odd)	38	PC31	J10 (even)	37	PC15
	36	PC30		35	PC14
	34	PC29		33	PC13
	32	PC28		31	PC12
	30	PC27		29	PC11
	28	PC26		27	PC10
	26	PC25		25	PC9
	24	PC24		23	PC8
	22	PC23		21	PC7
	20	PC22		19	PC6
	18	PC21		17	PC5
	16	PC20		15	PC4
	14	PC19		13	PC3
	12	PC18		11	PC2
	10	PC17		9	PC1
	8	PC16		7	PC0
	6	NC		5	NC
J11 (odd)	38	PD31	J11 (even)	37	PD15
	36	PD30		35	PD14
	34	PD29		33	PD13
	32	PD28		31	PD12
	30	PD27		29	PD11
	28	PD26		27	PD10
	26	PD25		25	PD9
	24	PD24		23	PD8
	22	PD23		21	PD7
	20	PD22		19	PD6
	18	PD21		17	PD5
	16	PD20		15	PD4
	14	PD19		13	
	12	PD18		11	
	10	PD17		9	
	8	PD16		7	
	6	NC		5	NC

Alternative Pinout Information for PowerQUICC II Inverse Assembly

The following tables describe the alternative pinout for full PowerQUICC II analysis. The pinouts are compatible with the inverse assembler and the E5346A high-density termination adapter cables. This is intended to be a guide for placing probing connectors on the target system.

J1-J4 are required for inverse assembly. J6-J7 are required for PCI/local-bus analysis. The remaining connectors are optional.

The alternative pinout is included for those interested in inverse assembly only. This pinout requires four connectors for IA. However, signals must be routed across the chip resulting in longer trace lengths. The recommended pinout in the previous section is the electrically superior configuration.

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J1 (odd)	38	BADDR31 (LSB)	J1 (even)	37	A15
	36	BADDR30		35	A14
	34	BADDR29		33	A13
	.32	BADDR28		31	A12
	30	BADDR27		29	A11
	28	A26		27	A10
	26	A25		25	A9
	24	A24		23	A8
	22	A23		21	A7
	20	A22		19	A6
	18	A21		17	A5
	16	A20		15	A4
	14	A19		13	A3
	12	A18		11	A2
	10	A17		9	A1
	8	A16		7	A0
	6	CLKIN		5	#DVAL
J2 (odd)	38	TC1	J2 (even)	37	#CS11
	36	TC0		35	#CS10
	34	#TEA		33	#CS9
	32	#TA		31	#CS8
	30	TT4		29	#CS7
	28	TT3		27	#CS6
	26	TT2		25	#CS5
	24	TT1		23	#CS4
	22	TT0		21	#PWE7
	20	TSIZ3		19	#PWE6
	18	TSIZ2		17	#PWE5
	16	TSIZ1		15	#PWE4
	14	TSIZ0		13	#PWE3
	12	#PSDRAS/#POE		11	#PWE2
	10	#ARTRY		9	#PWE1
	8	#TBST		7	#PWE0
	6	#AACK		5	#PSDCAS

Mictor Conn. #	AMP Mictor Pin#	Signal Name	Mictor Conn. #	AMP Mictor Pin #	Signal Name
J3 (odd)	38	D63(LSB)	J3 (even)	37	D47
	36	D62		35	D46
	34	D61		33	D45
	32	D60		31	D44
	30	D59		29	D43
	28	D58		27	D42
	26	D57		25	D41
	24	D56		23	D40
	22	D55		21	D39
	20	D54		19	D38
	18	D53		17	D37
	16	D52		15	D36
	14	D52		13	D35
	12	D50		11	D34
	10	D49		9	D33
	8	D48		7	D32
	6	#CS3		5	#CS2
J4 (odd)	38	D31	J4 (even)	37	D15
	36	D30		35	D14
	34	D29		33	D13
	32	D28		31	D12
	30	D27		29	D11
	28	D26		27	D10
	26	D25		25	D9
	24	D24		23	D8
	22	D23		21	D7
	20	D22		19	D6
	18	D21		17	D5
	16	D20		15	D4
	14	D19		13	D3
	12	D18		11	D2
	10	D17		9	D1
	8	D16		7	D0(MSB)
	6	#CS1		5	#CS0
J5 (odd)	38	RESERVED	J5 (even)	37	#[PRST
	36	RESERVED		35	#SRESET
	34	RESERVED		33	#HRESET
	32	DP7/CSE1		31	#CPU_BR
	30	DP6/CSEO		29	#L2_HIT
	28	DP5		27	GBL
	26	DP4		25	TC2
	24	DP3		23	#DBB
	22	DP2		21	#DBG
	20	DP1		19	ALE
	18	DP0		17	#BR
	16	#BCTL0		15	#CPU_DBG
	14	PSDAMUX		13	#NMI_OUT
	12	#PGTA		11	#BG
	10	#PSDA10		9	#ABB
	8	#PSDWE		7	#APE
	6	RESERVED		5	#TS

Note: J6-J11 are the same as the recommended pinout

Related HP Literature

	Pub. Number
HP E5346A and E5351A High-Density Adapters, Product Overview	5965-5475E
Minimizing Intrusion Effects when Probing with a Logic Analyzer, Application Note	5962-8620E
Probing Solutions for HP Logic Analysis Systems	5968-4632E

Product Ordering Information

HP E5346A	High-Density Termination Adapter
HP E5346-68701	Kit of Five Mictor Connectors and Five Support Shrouds
HP E5346-63201	High-Density Right Angle Adapter
HP E5346-44701	High-Density Termination Adapter Support Shroud
HP E9603A Opt. #001	Motorola PowerQUICC II Inverse Assembler
HP B4620B	Source Correlation Tool Set
AMP PN 2-767004-2	AMP Mictor Connector (order from AMP)

Product Warranty

HP hardware products are warranted against defects in materials and workmanship for a period of one year from date of shipment. Some newly manufactured HP product may contain remanufactured parts, which are equivalent to new in performance. If you send notice of defects during the warranty period, HP will either repair or replace hardware products that prove defective.

For more information about Hewlett-Packard test and measurement products, applications, services, and for a current sales office listing, visit our web site: http://www.hp.com/go/tmdir

You can also contact one of the following centers and ask for a test and measurement sales representative.

United States:
Hewlett-Packard Company
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
(tel) 1 800 452 4844

Canada:
Hewlett-Packard (Canada) Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(tel) 1 877 894 4414

Europe:
Hewlett-Packard Company
European Marketing Organisation
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
(tel) (31 20) 547 9999

Japan:
Hewlett-Packard Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192-8510, Japan
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Latin America:
Hewlett-Packard Company
Latin American Region Headquarters
5200 Blue Lagoon Drive
9th Floor
Miami, Florida 33126
U.S.A.
(tel) (305) 267 4245/4220
(fax) (305) 267 4288

Australia/New Zealand:
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Australia
(tel) 1 800 629 485 (Australia)
(tel) 0 800 738 378 (New Zealand)
(fax) (61 3) 9210 5489

Asia Pacific:
Hewlett-Packard Asia Pacific Ltd
17-21/F Shell Tower, Times Square,
1 Matheson Street, Causeway Bay,
Hong Kong, SAR
(tel) (852) 2599 7777
(fax) (852) 2506 9285

Technical data is subject to change

Printed in U.S.A. 4/99
5968-2301E