

Agilent W3630-Series

DDR3 DRAM BGA Probes

Installation Guide



Agilent Technologies

Notices

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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1 Introduction

Updated versions of this manual may be available. Go to www.agilent.com and search for W3631A.

This document provides installation information for the following Agilent products:

- W3631A DDR3 x16 BGA address/control/data probe
- W3633A DDR3 x4/x8 BGA address/control/data probe
- E5845A adapter cable for W3631A probe
- E5847A adapter cable for W3633A probe
- W3635A DDR3 oscilloscope probe adapter

DDR3 DRAM BGA Probe Description

The DDR3 DRAM BGA probe enables logic analyzer state and timing measurements of all the DRAM buses, including the DQ, DQS, and clock signals of x4, x8 and x16 DRAMs using the JEDEC standard common DDR3 DRAM footprint.

The probe interposes between the DRAM being probed and the PC board where the DRAM would normally be soldered. The probe is designed to be soldered to the PCB footprint for the DRAM. The DRAM being probed is then soldered to the top side of the probe.

Each DRAM signal in the common footprint (including those defined for x4, x8 and x16 DRAMs) passes directly from the bottom side of the probe to the top side of the probe. Buried probe resistors placed at the DRAM balls connect the probed signals to the rigid flex to mate with an Agilent cable adapter (ZIF probe).

Oscilloscope probing

The W3630-series probes, when used with the W3635A adapter, are also compatible with the Agilent InfiniiMax oscilloscope probes. This allows scope probing of the DRAM signals with an Infiniium 54840- or 80000-series oscilloscope, giving you a DDR3 testing solution covering the clock characterization, electrical and timing parameters of the JEDEC specification.

Fixture Technical Feature Summary

- Probing of DDR3 x4, x8 and x16 DRAMs in BGA packages using one of the JEDEC standard common BGA footprints.
- Logic analyzer (using E5845A/47A single ended ZIF probe) and oscilloscope (using W3635A adapter and InfiniMax solder in probe head) connection to RAS, CAS, WE, DQ, DQS, DQS#, and CK/CK# signals.
- Differential or single ended probing of DQS and CLK signals.
- Interposer design probes signals between DRAM BGA balls and DIMM.
- Use of separate single ended probes for connection to the logic analyzer optimizes use of analyzer channels by allowing assignment of analyzer channels to 8 or 16 bits on each DRAM.
- Gold plating of the DRAM footprint on the top side of the probe is compatible with leaded and no-lead DRAM balls.

Equipment Required

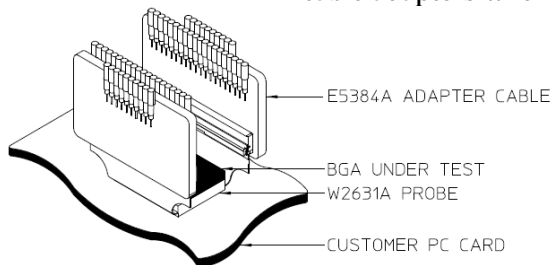
You will need:

- Agilent 16900-series logic analysis system
- Agilent B4621A DDR2/3 decoder software
- (optional) Agilent B4622A DDR2/3 protocol compliance and analysis tool
- An appropriate number of Agilent 16850B, 16960A, or 16962A logic analyzer cards connected together as a module
- One or more W3630-series BGA probes
- One or more E5840-series adapter cables
- (optional) One or more W3635A oscilloscope adapters
- (optional) Oscilloscope with solder-in probes

Mechanical Considerations

Probe Dimensions and Keep Out Volume

The following figures show the KOV of the Agilent logic analyzer cable adapters when connected to the BGA probe.



NOTES:

1. W2631A PROBE AND E5384 ADAPTER CABLE REQUIRE THE X, Y, Z SPACE DEPICTED ON THIS DRAWING.
2. KOV WIDTH DIM IS SPECIFIED PER MINIMUM RECOMMENDED BEND RADIUS OF 1.27MM. IF FLEX IS BENT FLAT TO RIGID PORTION OF THE PROBE, KOV WIDTH WOULD BE 53 mm (2.10 in.).

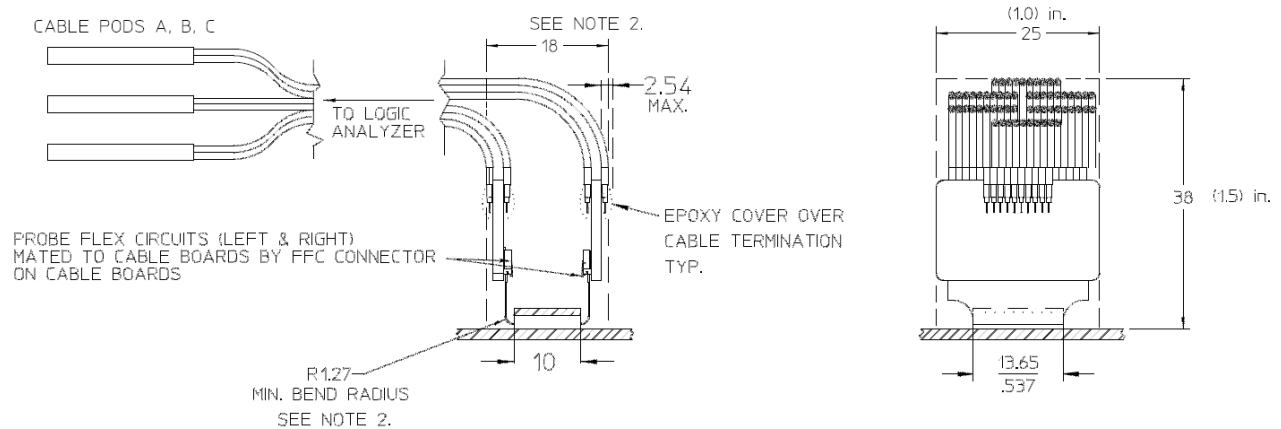


Figure 1 Keep Out Volume for W3631A with E5845A (same as W2631A with E5384A)

The following figures show the dimensions of the BGA probes.

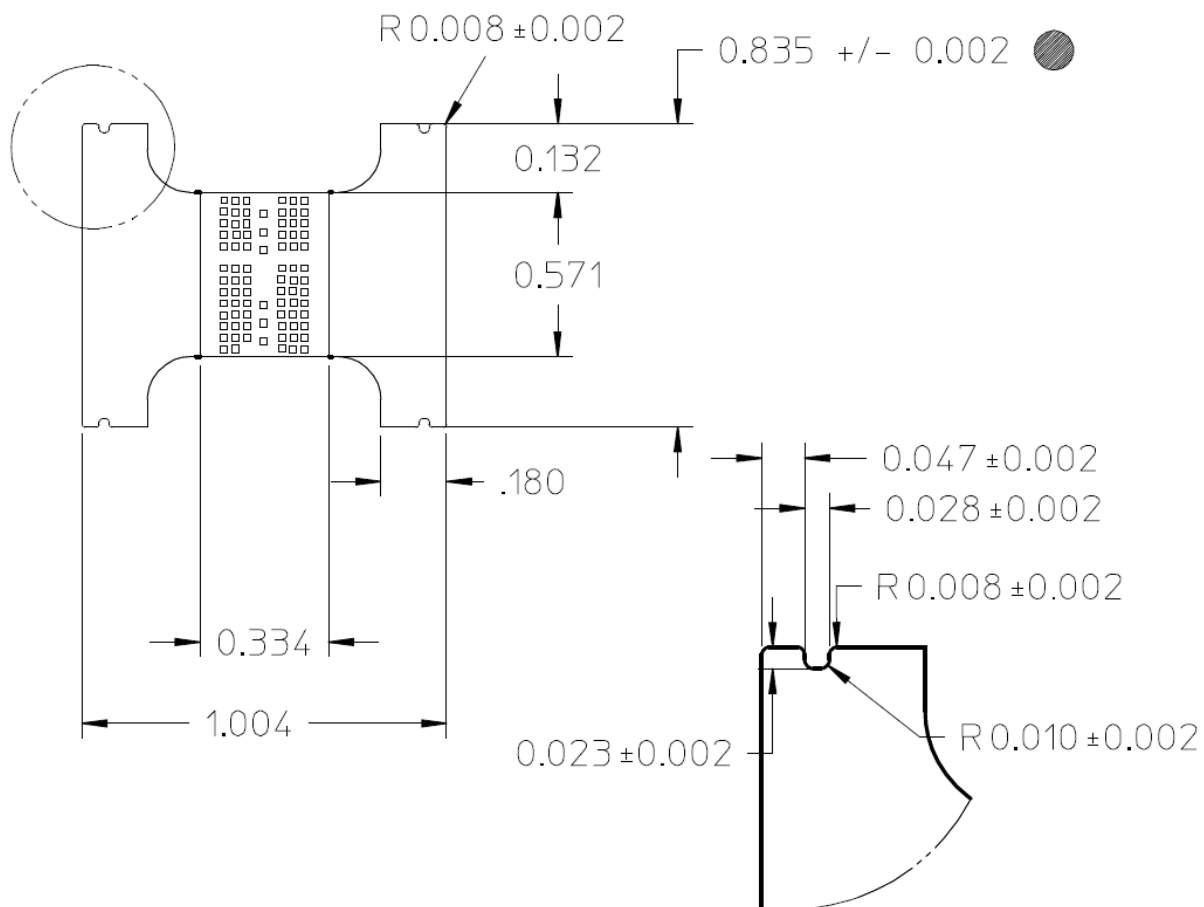


Figure 3 W3631A probe dimensions

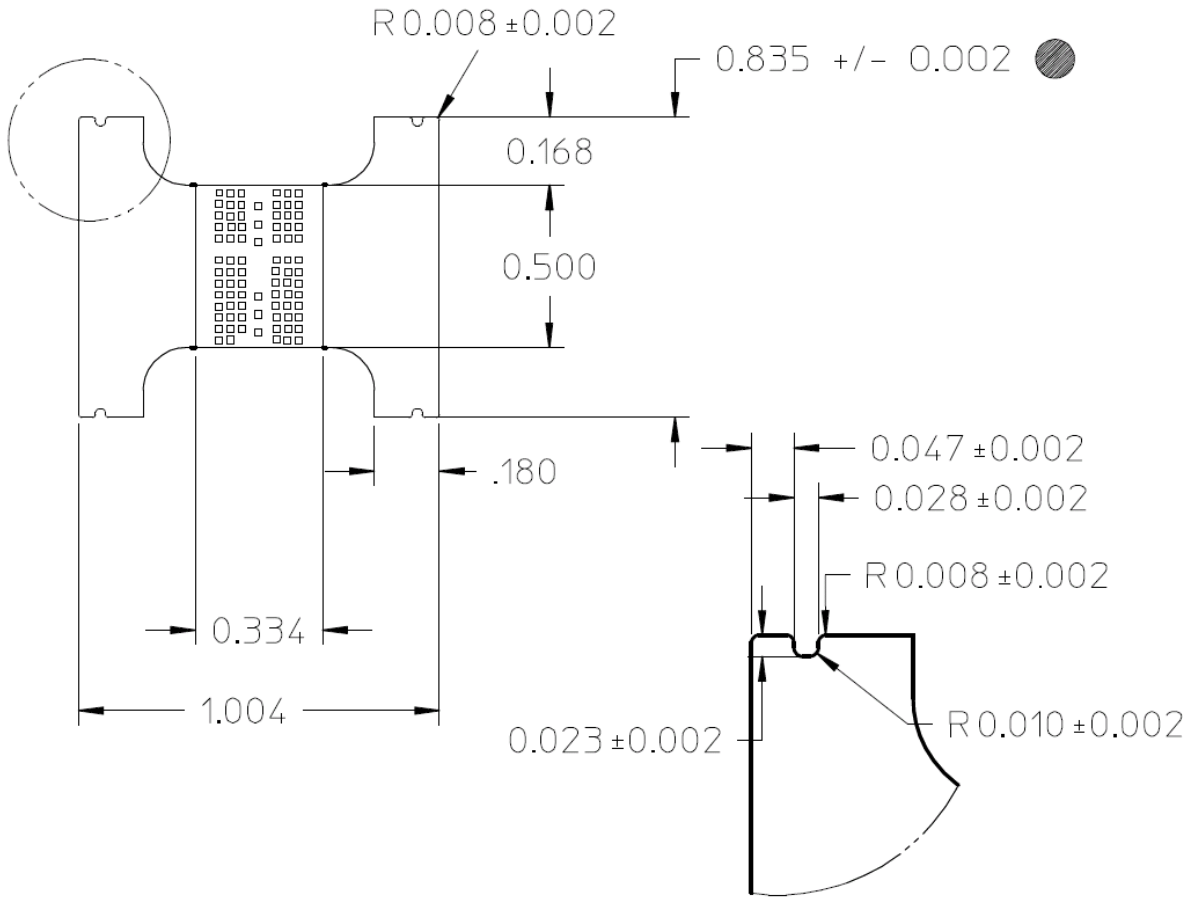


Figure 7 W3633A probe dimensions

DDR2 Probes

Agilent offers equivalent probes for DDR2 memory:

- W2631A DDR2 x16 command and data probe
- W2632A DDR2 x16 BGA data probe
- W2633A DDR2 x8 BGA command and data probe
- W2634A DDR2 x8 BGA data probe
- E5384A adapter cable adapter for 8x16 DRAM BGA
- E5826A adapter cable for 2x16 DRAM BGA
- E5827A adapter cable for 2x8 DRAM BGA

The probes can be distinguished by the color of the printed circuit board: DDR2 probes are green and DDR3 probes are red.

2 Installing the Probe

Soldering the probe

The BGA probes need to be attached to the DRAM PCB footprint on the design to be probed, and the desired DRAM is soldered to the top side of the probe. This attachment may occur in any order (i.e. first solder the probe to the DUT, and then solder the DRAM to the probe, or first solder the DRAM to the probe, and then solder the DRAM+probe assembly to the DUT). The probe is designed to tolerate lead-free soldering temperature profiles. However, it is always recommended to apply the minimum temperature required and the minimum number of heating/cooling cycles to reduce risk of any damage to the probe.

The probe is supplied without solder balls. Depending on the exact attachment order, either leaded or lead-free solder may be preferred to attach the probe to the DUT. The design of the probe supports either choice.

The flexible "wings" on the probe may need to be bent upwards before soldering to avoid mechanical contact with components adjacent to the probe on the DUT. This will also ensure reliable connection when connect to the logic analyzer cable adapters.

If the in-house expertise to attach the BGA probe and DRAM cannot be found, there are Contract Manufacturers with this expertise that may be willing to perform the attachment for a fee. More information on BGA soldering and rework techniques that may be useful in attaching the probe may be found at:

<http://www.circuitrework.com/guides/9-0.shtml>

Recommended soldering guidelines:

1. Maximum temperature that the BGA probe can withstand is 260C.
2. Bake out boards and or components to eliminate moisture entrapment in the boards and components. Normally back for 24 hours at 125C or to the component or board specification.

Connecting to the logic analyzer

CAUTION

Use ESD precautions. Electrostatic discharge can damage components on your board or in the probes. Use a grounded wrist strap and other ESD control measures as appropriate.

The adapter cables (sometimes called probes) are used with the BGA probes to connect the probe to the logic analyzer. The adapter cables plug into the 90-pin logic analyzer pod cable.

Note: Please ensure that the wings on the BGA probe are properly latched to the ZIF connectors on the adapter cables. The ZIF connectors can withstand up to 50 cycles of insertions. Please handle the probe with care.

Table 1 Logic Analyzer Channel Mapping for the E5845A Probe Cable

Data Pod / Pod A		Control Pod / Pod B		Address Pod / Pod C	
LA Channel	Signal Name	LA Channel	Signal Name	LA Channel	Signal Name
0	DQL0	0	BA1	0	-
1	DQL1	1	CKE1	1	A14
2	DQL2	2	DML	2	A13
3	DQL3	3	-	3	A12/BC#
4	DQL4	4	RESET#	4	A11
5	DQL5	5	BA0	5	A10/AP
6	DQL6	6	BA2	6	A9
7	DQL7	7	CS1#	7	A8
8	DQU0	8	CS0#	8	A7
9	DQU1	9	CAS#	9	A6
10	DQU2	10	ODT0	10	A5
11	DQU3	11	RAS#	11	A4
12	DQU4	12	ODT1	12	A3
13	DQU5	13	-	13	A2
14	DQU6	14	-	14	A1
15	DQU7	15	-	15	A0
Clock_P	DQSU	Clock_P	CK	Clock_P	CKE0
Clock_N	DQSU#	Clock_N	CK#	Clock_N	-

Table 2 Logic Analyzer Channel Mapping for the E5847A Probe Cable

Data Pod / Pod A		Control Pod / Pod B		Address Pod / Pod C	
LA Channel	Signal Name	LA Channel	Signal Name	LA Channel	Signal Name
0	DQ0	0	BA1	0	A15
1	DQ1	1	-	1	A14
2	DQ2	2	CKE1	2	A13
3	DQ3	3	-	3	A12/BC#
4	DQ4	4	RESET#	4	A11
5	DQ5	5	BA0	5	A10/AP
6	DQ6	6	BA2	6	A9
7	DQ7	7	CS1#	7	A8
8	DM	8	CS0#	8	A7
9	-	9	WE#	9	A6
10	-	10	ODT0	10	A5
11	-	11	CAS#	11	A4
12	-	12	ODT1	12	A3
13	-	13	RAS#	13	A2
14	-	14	-	14	A1
15	-	15	-	15	A0
Clock_P	DQS	Clock_P	CK	Clock_P	CKE0
Clock_N	DQS#	Clock_N	CK#	Clock_N	-

Table 3 Signals not probed by the logic analyzer

Probe	Signal Name
W3631A	CS2#
	CS3#
	VREFCA
	VREFDQ
	ZQ3..ZQ0
W3633A	BA2
	A15
	CS2#
	CS3#
	VREFCA
	VREFDQ
	ZQ3..ZQ0
	DMU
DQSL, DQSL#	

Note that most of these signals can be with an oscilloscope via the provided test points.

Scope connection to the W3630-series probe

The DDR3 BGA probes may be used is used with solder-in oscilloscope probes such as the Agilent N5381A or E2677A high bandwidth probes.

Most signals may be probed using the W3635A oscilloscope probe adapter, which has a ZIF connector for attachment to the BGA probes.

A few additional signals may be probed by soldering the scope probe directly to a test point on the BGA probe.

The solder-in probe makes a 2GHz bandwidth connection with the test point on the adapter or BGA probe.

Signals probed by the W3635A adapter

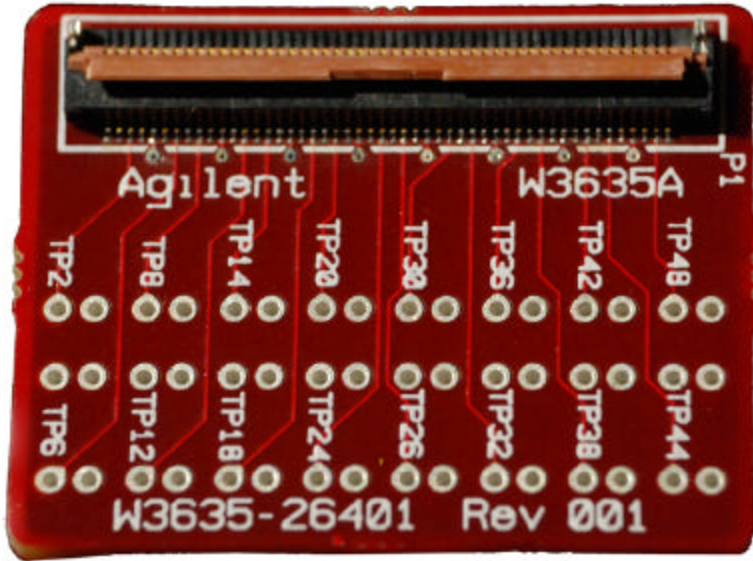


Figure 4 Top view of the W3635A

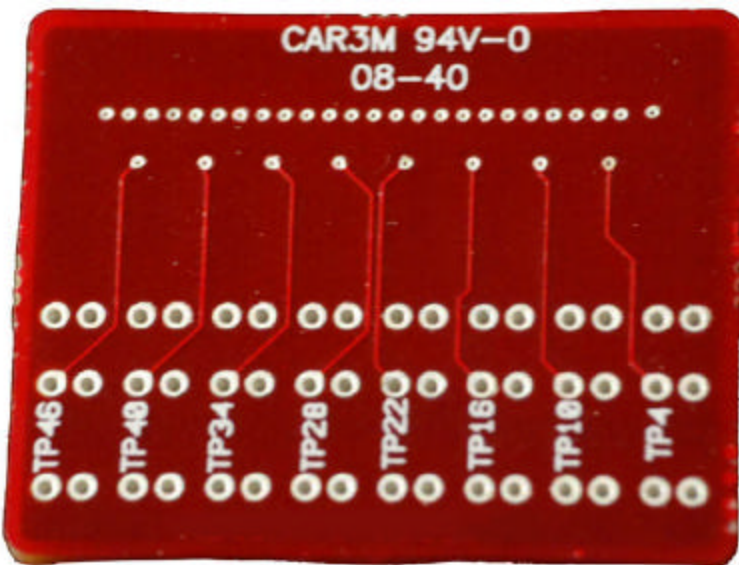


Figure 5 Bottom view of the W3635A

Table 4 W3635A pad numbering for W3631A x16 DDR3 BGA probe

TP6	TP4	TP2
DQU1	GND	DQU7
GND	DQU5	GND
TP12	TP10	TP8
DQL2	GND	DQU3
GND	DQL0	GND
TP18	TP16	TP14
ODT1	GND	DQL6
GND	DQL4	GND
TP24	TP22	TP20
AS#	GND	RAS#
GND	ODT0	GND
TP26	TP28	TP30
CS0#	GND	WE#
GND	CS1#	GND
TP32	TP34	TP36
BA0	GND	A0
GND	A3	GND
TP38	TP40	TP42
A5	GND	A7
GND	A2	GND
TP44	TP46	TP48
A9	GND	A13
GND	RESET#	GND

LEFT SIDE OF THE BGA PROBE FLEX CABLE

TP48	TP46	TP44
GND	DQU6	GND
DQU4	GND	DQSU#
TP42	TP40	TP38
GND	DQU2	GND
DQSU	GND	DQU0
TP36	TP34	TP32
GND	DQL1	GND
DML	GND	DQL3
TP30	TP28	TP26
GND	DQL5	GND
DQL7	GND	CK
TP20	TP22	TP24
GND	CKE1	GND
CKE0	GND	CK#
TP14	TP16	TP18
GND	A12/BC#	GND
BA1	GND	A10/AP
TP8	TP10	TP12
GND	A1	GND
A6	GND	A4
TP2	TP4	TP6
GND	A8	GND
A14	GND	A11

RIGHT SIDE OF THE BGA PROBE FLEX CABLE

Table 5 W3635A pad numbering for W3633A x8 DDR3 BGA probe

TP6	TP4	TP2
DQS	GND	DQ0
GND	DQ2	GND
TP12	TP10	TP8
DQ4	GND	DQS#
GND	DQ6	GND
TP18	TP16	TP14
ODT1	GND	NC
GND	RAS#	GND
TP24	TP22	TP20
WE#	GND	CAS#
GND	ODT0	GND
TP26	TP28	TP30
CS0#	GND	BA2
GND	CS1#	GND
TP32	TP34	TP36
BA0	GND	A3
GND	A0	GND
TP38	TP40	TP42
A5	GND	A7
GND	A2	GND
TP44	TP46	TP48
A9	GND	A13
GND	RESET#	GND

LEFT SIDE OF THE BGA PROBE FLEX CABLE

TP48	TP46	TP44
GND	NC	GND
NC	GND	NC
TP42	TP40	TP38
GND	NC	GND
NC	GND	DM
TP36	TP34	TP32
GND	DQ3	GND
DQ1	GND	DQ7
TP30	TP28	TP26
GND	CK	GND
DQ5	GND	CK#
TP20	TP22	TP24
GND	CKE0	GND
A10/AP	GND	CKE1
TP14	TP16	TP18
GND	A12/BC#	GND
BA1	GND	A15
TP8	TP10	TP12
GND	A1	GND
A6	GND	A4
TP2	TP4	TP6
GND	A8	GND
A14	GND	A11

RIGHT SIDE OF THE BGA PROBE FLEX CABLE

Signals probed directly on the BGA probes

Test points are provided on the BGA probes for some of the signals which are not probed by the logic analyzer and which are not available through the W3635A adapter. The signal names are silkscreened by the test points.

W3631A and W3633A:

- CS2#, CS3#
- VREFCA, VREFDQ
- VDD, VDDQ

3 Setting Up the Logic Analysis System

The mapping of specific signals to logic analyzer channels depends on:

- Which DRAMs on a DIMM are probed
- Which probe you are using
- How the single ended logic analyzer cable adapters are arranged when connecting to the BGA probe

Because of these dependencies, there is no single logic analyzer configuration file setup, and no configuration file is supplied with the probes. The logic analyzer Buses/Signals setup dialog will allow you to assign descriptive labels to each analyzer channel that associate each channel with the particular DRAM and DRAM signal being probed.

To save a configuration file

After you set up the logic analyzer, it is strongly recommended that you save the configuration.

To save your work, select **File>Save As...** and save the configuration as an ALA format file.

ALA format configuration files are more complete and efficient than XML format configuration files. See the logic analyzer online help for more information on these formats.

4 Characteristics, Regulatory, and Safety Information

Operating Characteristics

The following operating characteristics are not specifications, but are typical operating characteristics.

Table 6 Environmental Characteristics (Operating)

Temperature	20° to 40° C (+68° to +104° F)
Altitude	4,600 m (15,000 ft)
Humidity	Up to 50% noncondensing. Avoid sudden, extreme temperature changes which could cause condensation on the circuit board. For indoor use only.

Table 7 Inputs and Outputs

To interposer	Memory bus signals from target system
From interposer	High-density connectors for Agilent logic analyzer cards in an Agilent 16900-series logic analysis system and for an oscilloscope

Safety Notices for the E5845/47A Cable Adapters

This apparatus has been designed and tested in accordance with IEC Publication 61010-1, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

Warnings

Use only the recommended power supply.

If you energize this instrument by an auto transformer (for voltage reduction or mains isolation), the common terminal must be connected to the earth terminal of the power source.

Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do not install substitute parts or perform any unauthorized modification to the instrument.

Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not use the instrument in a manner not specified by the manufacturer.

To clean the instrument

Do not attempt to clean this product.

Safety Symbols



"Caution" or "Warning" risk of danger marked on product. See "Safety Notices" on page 2 and refer to this manual for a description of the specific danger.



Hazardous voltage symbol.



Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

Regulatory Notices

WEEE Compliance



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control Instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

China RoHS

W3631A, W3633A, W3635A, E5845A and E5847A

