

## In-Circuit Emulator for 68HC12

[MC68HC812A4](#)  
[MC68HC912B32](#)  
[MC68HC912BC32](#)  
[MC68HC912D60](#)  
[MC68HC912DA128](#)  
[MC68HC912DG128](#)  
[MC68HC912DT128](#)

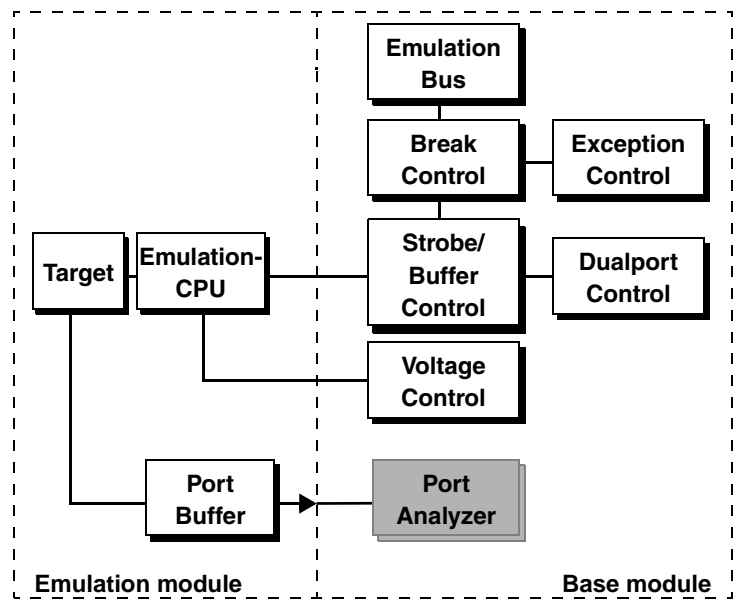
- Works with Cosmic, Metrowerks and IAR Compilers
- Up to 16 MHz no-waitstate emulation
- Support for all derivatives
- Support for all CPU modes
- Support for 3.3V and 5V
- Dual-port access to emulation and target memory
- Dynamic peripheral window
- Programming and emulation of on chip EEPROM and FLASH
- Support for the built in MMU
- Software compatible BDM debugger

The ICE-12 emulation head supports all 68HC12 derivatives from Motorola. The adaption to different probes is done by changing the module. The maximum frequency of the base modul is 8 MHz (ECLK), however the emulation is only possible to the max. speed of the MCU available from the chip manufacturer. All emulation probes support single chip, expanded narrow and expanded wide modes. The probes can be used at any voltage between 2.7 and 5 Volt.

TRACE32 works with the highest variety of host interfaces. The communication link to the host is done by the printer port, a fibre optic interface or ethernet allowing a high-speed transfer.

## Features

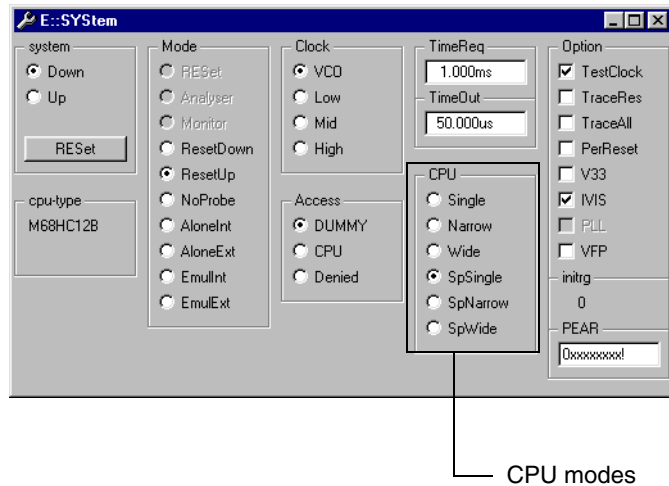
### Basics of Operation



The ICE12 probe is a high performance emulation system for all derivatives of the 68HC12 family. The change between different CPU types is done by changing the emulation module.

An additional slot in the base module allows to use a port analyzer to get time and state trace features for all MCU I/O lines.

## CPU Modes



The emulator can run in Normal Single Chip, in Normal Expanded Narrow, in Normal Expanded Wide, in Special

Single Chip, in Special Expanded Narrow and in Special Expanded Wide Mode.

## Operating Modes

The Emulator can work in stand-alone mode with internal clock or in active mode with internal or the target clock. On power-down of the target system the emulator tristates its output buffers and isolates its internal emulation circuits.

The operation modes are as follows:

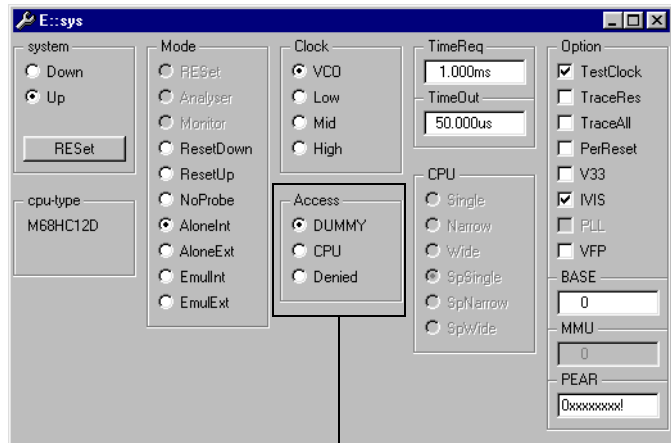
- Reset Down
- Reset Up
- Alone Internal
- Alone External
- Emulation Internal
- Emulation External

## Clock

- Operation with external or internal clock
- 1..35 MHz internal clock

## Clock Fail Detection

## Dual Port Access Modes



Dual port access modes

All TRACE32 memories are dual-ported. The dual-port access makes it possible to display and modify the contents of the overlay memory, to set or delete breakpoints or use the flag memory while the application is running in real-time.

The following dual-port access modes are implemented:

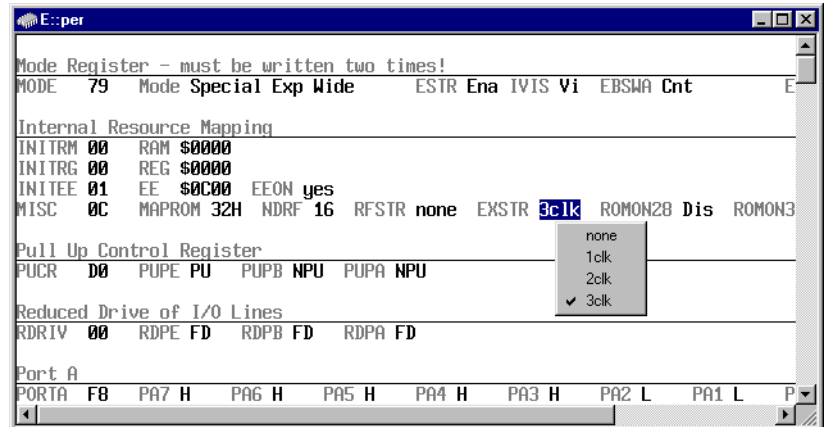
- DUMMY
- CPU
- DENIED

In the **DUMMY mode** the dual port access is made on CPU reads at a certain address, which is stimulated by the BDM. In this mode the contents of the emulation memory is read.

In the **CPU mode** the dual port access is made by the CPU's lite integration module. In this mode, the memory seen by the CPU is read. This means the contents of the internal registers and the target memory can be read while the emulation is running in real-time.

In the **Denied Mode** the dual-port access is switched off.

## Peripheral Window



- Display of onchip peripherals
- User definable display of the onchip peripherals
- Definition is done interactive supported by softkeys
- Pull down menus for settings
- Additional description for each field

The ICE-12 emulation system automatically detects the remapping of the peripherals if IVIS (visibility of internal cycles) is on.

## Programming and Emulation of the on chip EEPROM

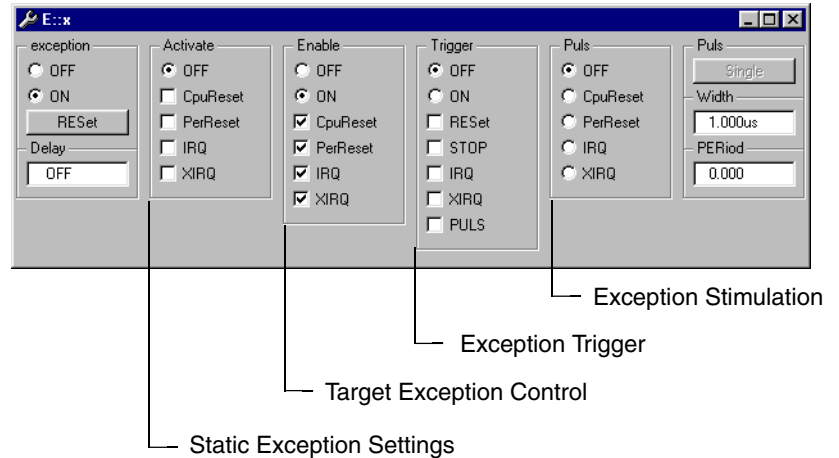
ICE-12 supports the programming of the on chip EEPROM. This means the emulator executes an EEPROM write protocol on write cycles to the EEPROM.

## Programming and Emulation of the on chip FLASH

ICE-12 supports the on chip flash memory to allow 0 waitstates emulation in expanded mode. Therefore the emulator can generate the flash programming voltage.

For the emulation of the on chip flash the internal breakpoints of the CPU are used.

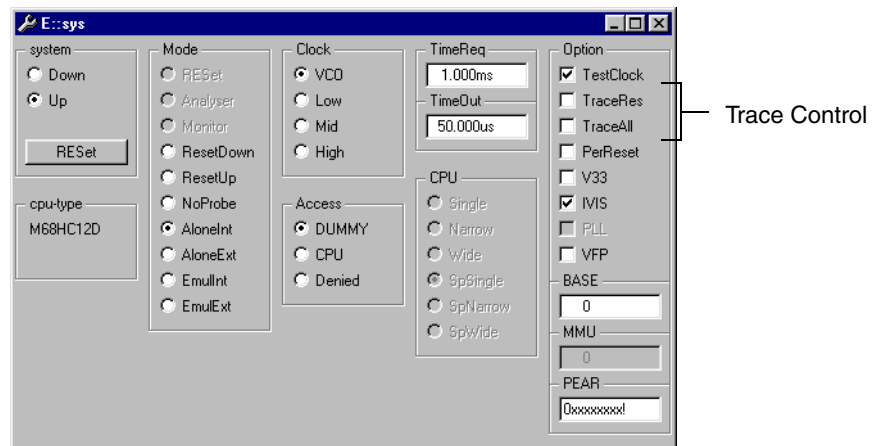
## Exception Control



Exception system is used to control and simulate all special CPU lines like RESET or interrupt inputs. This is especially useful during the develop-

ment phase, allowing to disable CPU input lines, or to simulate certain events.

## Trace Control



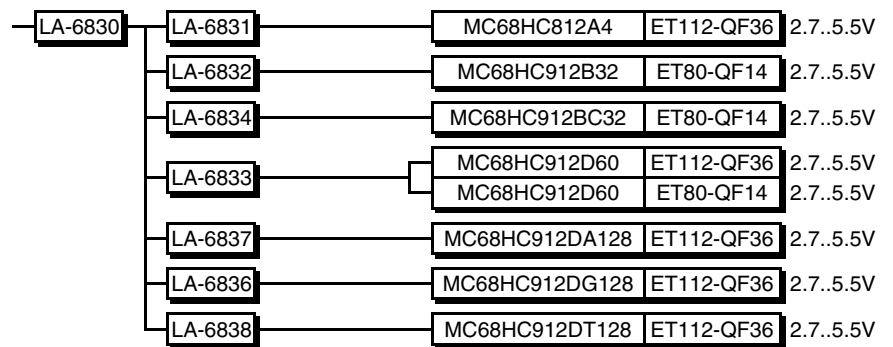
By default dual-port cycles and cycles to the CPU's firmware are not traced by the analyzer.

The following trace control options are available:

- TraceRes
- TraceAll

## Emulation Modules

### Modules Overview



## Debug Interfaces

**TRACE32-PowerView** supports most compilers, realtime operation systems and debuggers.

New integrations are mostly done on customers request. If your compiler or RTOS is not supported now, please ask us !

## Compiler Support

Language	Compiler	Company	Option	Comment
C	CX68HC12	Cosmic Software	COSMIC	
C	HICROSS-HC12	Freescale Semiconductor, Inc.	HICROSS	
C	HICROSS	Freescale Semiconductor, Inc.	ELF/DWARF2	
C	ICC6812	IAR Systems AB	UBROF	

## RTOS Support

Name	Company	Comment
Elektrobit tresos	Elektrobit Automotive GmbH	via ORTI
Erika	Evidence	via ORTI
osCAN	Vector Informatik	via ORTI
OSEK	-	via ORTI
OSEKturbo	Freescale Semiconductor, Inc.	via ORTI/former MetrowerksOSEK
ProOSEK	Elektrobit Automotive GmbH	via ORTI
RTXC 3.2	Quadros Systems Inc.	
uC/OS-II	Micrium Inc.	2.0 to 2.92

## Debugger Support

CPU	Debugger	Company	Host
ALL	X-TOOLS / X32	blue river software GmbH	Windows
ALL	CODEWRIGHT	Borland Software Corporation	Windows
ALL	CODE CONFIDENCE TOOLS	Code Confidence Ltd	Windows
ALL	CODE CONFIDENCE TOOLS	Code Confidence Ltd	Linux
ALL	EASYCODE	EASYCODE GmbH	Windows
ALL	ECLIPSE	Eclipse Foundation, Inc	Windows
ALL	RHAPSODY IN MICROC	IBM Corp.	Windows
ALL	RHAPSODY IN C++	IBM Corp.	Windows
ALL	LDRA TOOL SUITE	LDRA Technology, Inc.	Windows
ALL	ATTOL TOOLS	MicroMax Inc.	Windows
ALL	VISUAL BASIC INTERFACE	Microsoft Corporation	Windows
ALL	LABVIEW	NATIONAL INSTRUMENTS Corporation	Windows
ALL	CODE::BLOCKS	Open Source	-
ALL	C++TEST	Parasoft	Windows
ALL	RAPITIME	Rapita Systems Ltd.	Windows
ALL	DA-C	RistanCASE	Windows
ALL	SIMULINK	The MathWorks Inc.	Windows
ALL	WINDOWS CE PLATF. BUILDER	Windows	Windows



## Operation Voltage and Frequency

The maximum operation frequency of TRACE32-ICE depends on:

- The max. frequency of the CPU
- The access time of the overlay memory (15ns or 35ns)
- The mapper mode (**Slow** or **Fast**)
- The number of waitstates (W0 = 0 waitstates  
W1 = 1 waitstate)
- The dual-port access mode

### Denied, Nodelay Access

tbd

### Operating Voltage

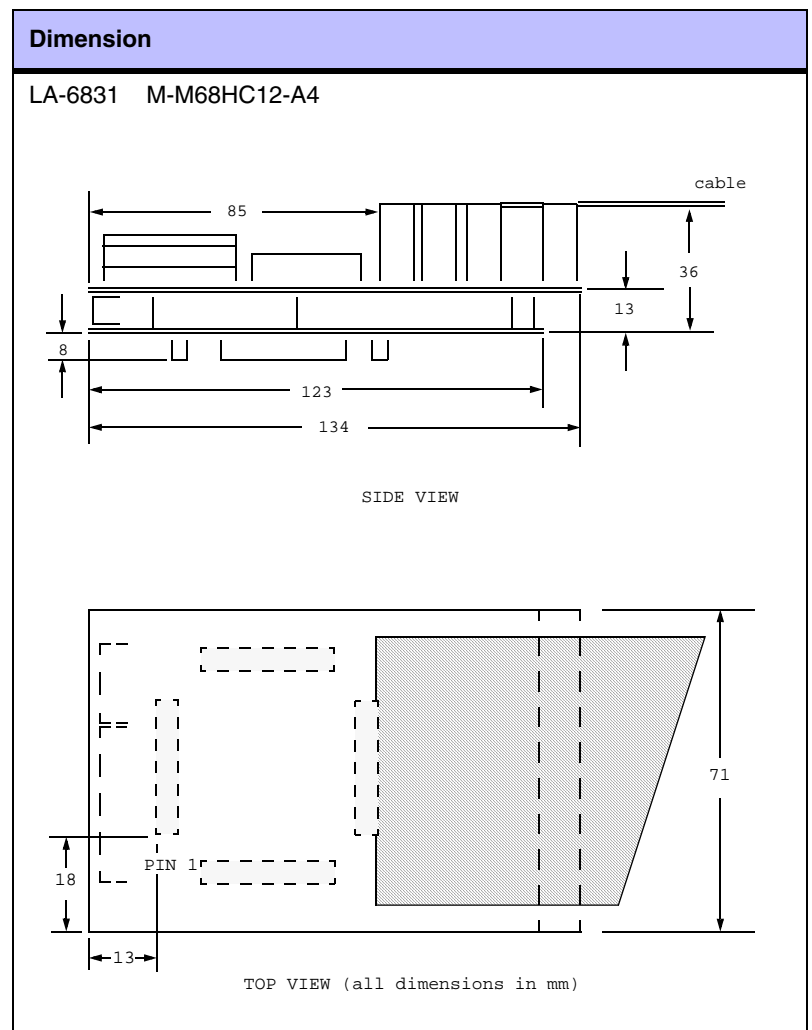
This list contains information on probes available for other voltage ranges.

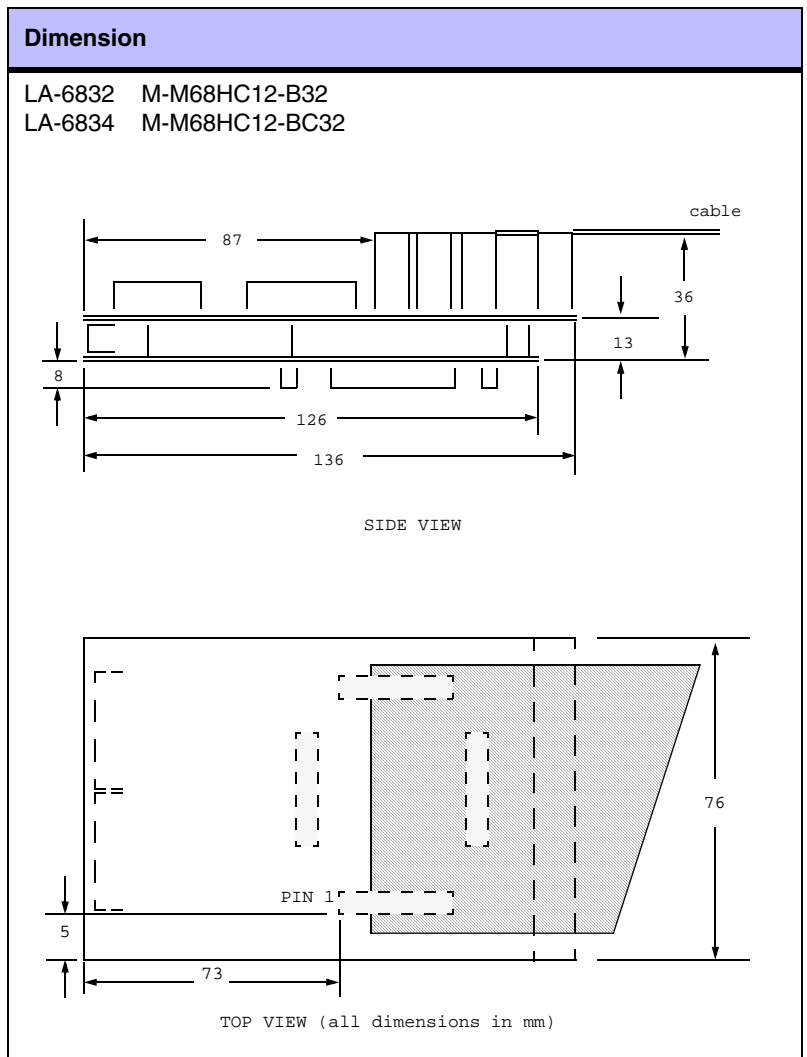
Probes not noted here supply an operation voltage range from 4.5V to 5.5V.

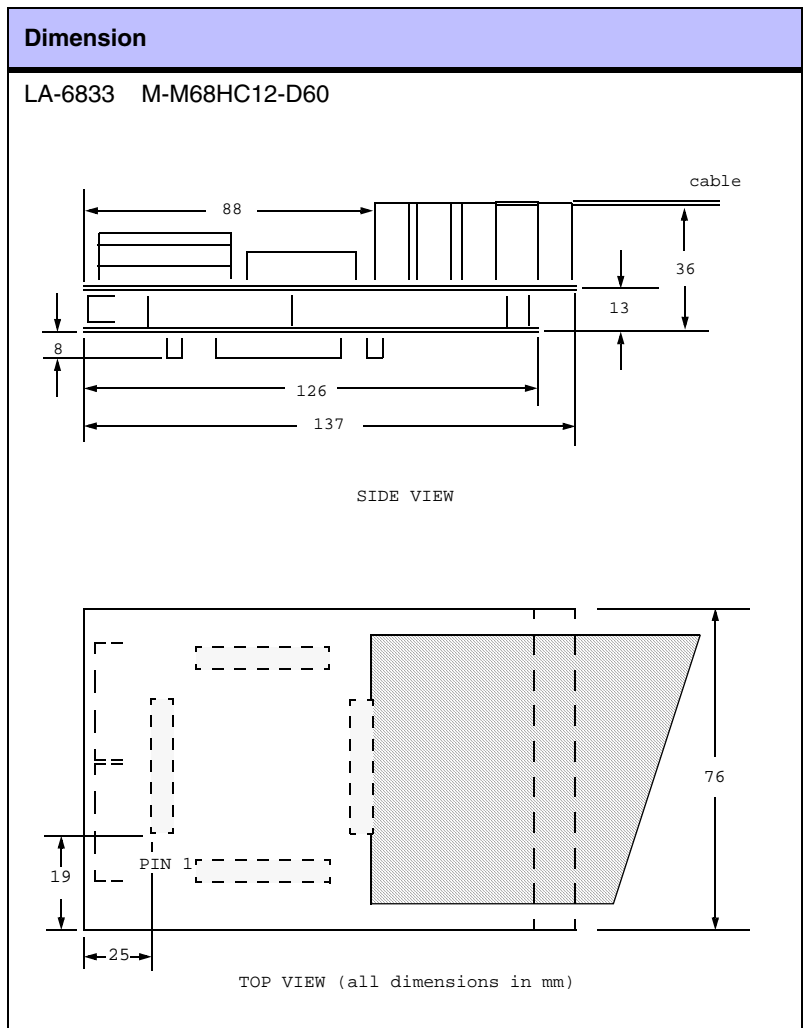
CPU	Module	Adapter	Voltage Range
MC68HC812A4	LA-6831	-	2.7 .. 5.5 V
MC68HC912B32	LA-6832	-	2.7 .. 5.5 V
MC68HC912BC32	LA-6834	-	2.7 .. 5.5 V
MC68HC912D60	LA-6833	-	2.7 .. 5.5 V
MC68HC912DA128	LA-6837	-	2.7 .. 5.5 V
MC68HC912DG128	LA-6836	-	2.7 .. 5.5 V
MC68HC912DT128	LA-6838	-	2.7 .. 5.5 V

## Dimensions

### Module Dimensions



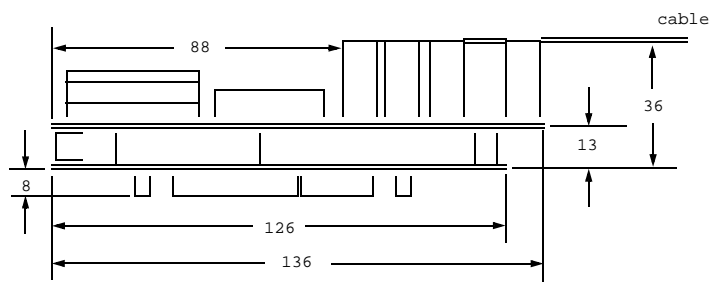




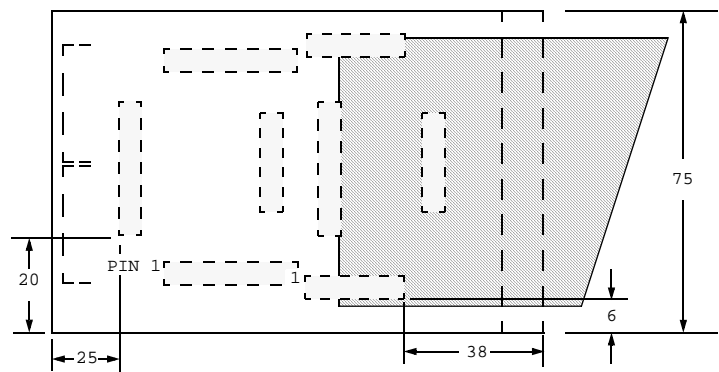
**Dimension**

LA-6836 M-M68HC12-DG128

LA-6837 M-M68HC12-DA128



SIDE VIEW



TOP VIEW (all dimensions in mm)

## Connectors

On each emulation module there are half-size connectors to:

- Connect the emulation module directly to the target by providing the corresponding connectors also on the target hardware

- Connect a standard adapter from Emulation Technology, YAMAICHI, AMP, TOKYO ELETECH etc.

The following table lists the physical dimensions of these connectors.

CPU	Dimension
MC68HC812A4 MC68HC912D60 MC68HC912DA12 8 MC68HC912DG12 8 MC68HC912DT12 8	<b>ET112-QF36</b> <p>112-QF36 TOP-VIEW</p>
MC68HC912B32 MC68HC912BC32 MC68HC912D60	<b>ET80-QF14</b> <p>80-QF14 TOP-VIEW</p>



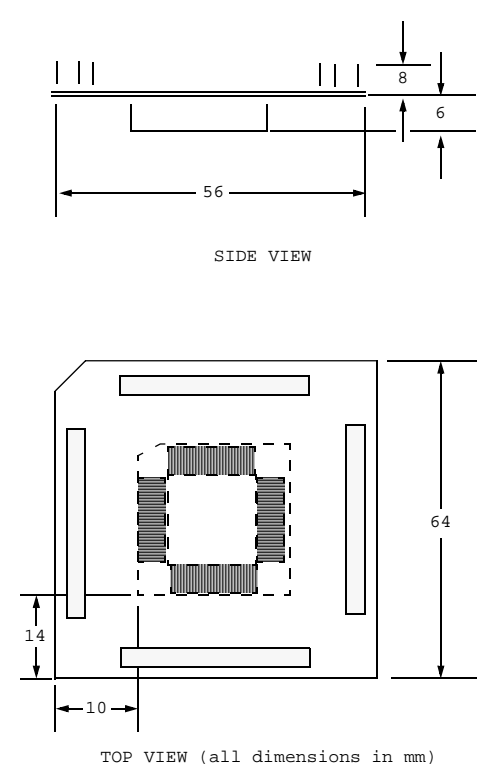
## Adapter

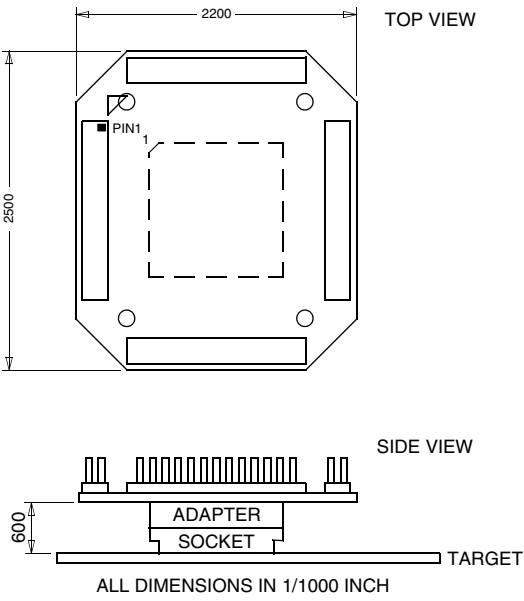
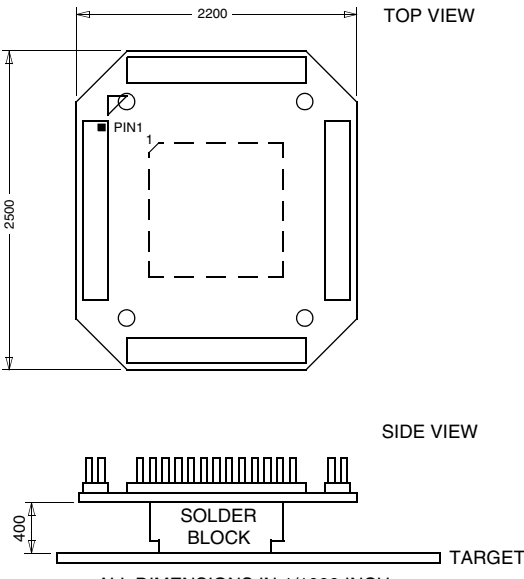
The adapters connect in different ways

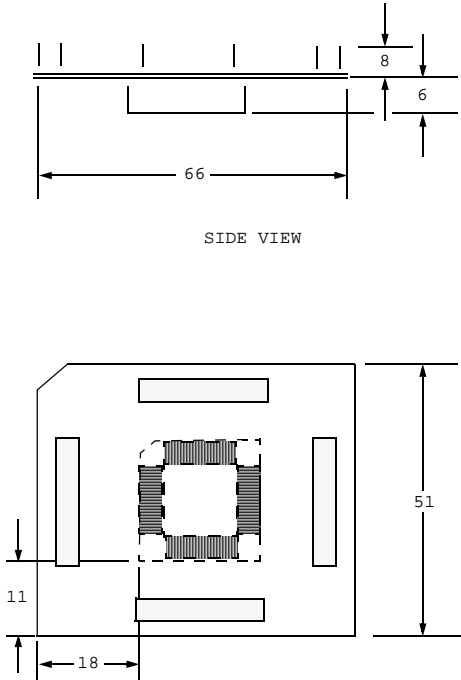
- With Clip-Over Adapters the CPU can stay on the target board.
- With Solder-ON adapters the CPU must be removed

- YAMAICHI and AMP adapters fit to the CPU socket

The following table lists the physical dimensions of these adapters.

Socket CPU	Adapter
<b>ET112-QF36</b>  MC68HC812A4 MC68HC912D60 MC68HC912DA1 28 MC68HC912DG1 28 MC68HC912DT1 28	<b>YA-1101 ET112-EYA-QF36</b> <b>Emul. Adapter for YAMAICHI socket ET112-QF36</b>   <p style="text-align: center;">TOP VIEW (all dimensions in mm)</p>

Socket CPU	Adapter
<p><b>ET112-QF36</b></p> <p>MC68HC812A4 MC68HC912D60 MC68HC912DA1 28 MC68HC912DG1 28 MC68HC912DT1 28</p>	<p><b>TO-1290 ET112-ETO-QF36</b> <b>Emul. Adapter for TO socket ET112-QF36</b></p>  <p>ALL DIMENSIONS IN 1/1000 INCH</p>
<p><b>ET112-QF36</b></p> <p>MC68HC812A4 MC68HC912D60 MC68HC912DA1 28 MC68HC912DG1 28 MC68HC912DT1 28</p>	<p><b>TO-1291 ET112-STO-QF36</b> <b>Emul. Adapter TO-surface mount. ET112-QF36</b></p>  <p>ALL DIMENSIONS IN 1/1000 INCH</p>

Socket CPU	Adapter
<p data-bbox="699 432 826 454"><b>ET80-QF14</b></p> <p data-bbox="699 495 887 600">MC68HC912B32 MC68HC912BC3 2 MC68HC912D60</p>	<p data-bbox="927 432 1422 515"><b>YA-1131 ET80-EYA-QF14</b> Emul. Adapter for YAMAICHI socket ET080-QF14</p>  <p data-bbox="1145 792 1246 810">SIDE VIEW</p> <p data-bbox="1023 1267 1362 1285">TOP VIEW (all dimensions in mm)</p>

## Available Tool Chain

TRACE32 provides a complete set of development tools for this family. This includes:

- The In-Circuit Emulator TRACE32-ICE
- The high speed RISC Emulator TRACE32-FIRE
- The BDM/JTAG/ONCE etc. based In-Circuit Debugger TRACE32-ICD
- The ROM Monitor based In-Circuit Debugger TRACE32-ICD
- The ICD Trace, a trace extension to the BDM/JTAG debuggers or ROM monitors
- Evaluation boards, which can be used until the target hardware is available.
- The Instruction Set Simulator (SIM), a software tool for code test without any hardware

The following list give an overview which development tools are available for the specific derivatives of this family.

CPU	ICE	FIRE	ICD DEBUG	ICD MONITOR	ICD TRACE	POWER INTEGRATOR	INSTRUCTION SIMULATOR
MC68HC812A4	YES		YES				YES
MC68HC912B32	YES		YES				YES
MC68HC912BC32	YES		YES				YES
MC68HC912D60	YES	YES	YES				YES
MC68HC912DA128	YES		YES				YES
MC68HC912DG128	YES	YES	YES				YES
MC68HC912DT128	YES	YES	YES				YES

## Order Information

### Module Description

OrderNo Code	Text
<b>LA-6830</b> ICE-12	<b>ICE-12 Base Module</b> family module for 68HC12 emulation, slot for port analyzer
<b>LA-6831</b> M-M68HC12-A4	<b>Module M68HC12A4</b> supports MC68HC12A4 adaption to ET112-QF36
<b>LA-6832</b> M-M68HC12-B32	<b>Module M68HC12B32</b> supports M68HC12B32 adaption ET80-QF14
<b>LA-6834</b> M-M68HC12-BC32	<b>Module M68HC12BC32</b> supports M68HC12BC32 adaption ET80-QF14
<b>LA-6833</b> M-M68HC12-D60	<b>Module M68HC12D60</b> supports M68HC12D60 Adaption: ET112-QF36, ET80-QF14 supports also M68HC12DA128,DG128 by changing the CPU.
<b>LA-6836</b> M-M68HC12-DG128	<b>Module M68HC12DG128</b> supports M68HC12DG128 Adaption: ET112-QF36 supports also M68HC12DA128,D60 by changing the CPU.
<b>LA-6838</b> M-M68HC12-DT128	<b>Module M68HC12DT128</b> supports M68HC12DT128 Adaption: ET112-QF36
<b>LA-6837</b> M-M68HC12-DA128	<b>Module M68HC12DA128</b> supports M68HC12DA128 Adaption: ET112-QF36 supports also M68HC12DG128,D60 by changing the CPU.

### Detailed Order Information

Order No.	Code	Text
LA-6830	ICE-12	ICE-12 Base Module

Order No.	Code	Text
LA-6831	M-M68HC12-A4	Module M68HC12A4
LA-6832	M-M68HC12-B32	Module M68HC12B32
LA-6834	M-M68HC12-BC32	Module M68HC12BC32
LA-6833	M-M68HC12-D60	Module M68HC12D60
LA-6836	M-M68HC12-DG128	Module M68HC12DG128
LA-6838	M-M68HC12-DT128	Module M68HC12DT128
LA-6837	M-M68HC12-DA128	Module M68HC12DA128
<b>Additional Options</b>		
LA-9648	A-68HC12D60-ET80	Converter ET112-QF36 to ET80-QF14 for 68HC12D
LA-7717	BDM-MCS12	BDM Debugger for MCS12 (ICD)
LA-9547	BGA256-CPU-ADAPTER	CPU Test Adapter for BGA256 (MPC850)
LA-7216	BGA357-CPU-ADAPTER	CPU Test Adapter for BGA357 (MPC860)
LA-1105	ET112-CPU-QF36	CPU Test Adapter for ET112-QF36
LA-9649	ET112-ETO-QF14/D60	Emul. Adap. for T0 sock. ET080-QF14/68HC12D60
TO-1290	ET112-ETO-QF36	Emul. Adapter for TO socket ET112-QF36
YA-1101	ET112-EYA-QF36	Emul. Adapter for YAMAICHI socket ET112-QF36
ET-1100	ET112-SET-QF36	Surface Mountable Adapter for ET112-QF36
TO-1291	ET112-STO-QF36	Emul. Adapter TO-surface mount. ET112-QF36
YA-1142	ET120-EYA-QF56	Emul. Adapter for YAMAICHI socket ET120-QF56
TO-1275	ET80-ETO-QF14	Emul. Adapter for T0 socket ET080-QF14
YA-1131	ET80-EYA-QF14	Emul. Adapter for YAMAICHI socket ET080-QF14
ET-1130	ET80-SET-QF14	Surface Mountable Adapter for ET80-QF14
TO-1276	ET80-STO-QF14	Emul. Adapter TO-surface mount. ET080-QF14
LA-6450	PA64	Port Analyzer
LA-8806	SIM-12	TRACE32 Instruction Set Simulator for HC11/12



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