ZK-HC08EY-A
Starter Kit for Freescale MC68HC908EY Family (32-Pin QFP ZIF Socket)

User's Manual

1. Introduction

Overview

The ZK-HC08EY-A Starter Kit has been designed for the evaluation of the Freescale MC68HC908EY family and the debugging of user applications. The ZK-HC08EY-A Starter Kit can be used as a standalone application, or via its built-in USB to MON08 bridge, or together with an external debugger through a MON08-compatible connection.

Starter Kit Features

The ZK-HC08EY-A Starter Kit features the following sections.

1. An "MCU" section containing:

    - An MC68HC908EY16 microcontroller (in 32-pin QFP package, already programmed with a demo application—in addition, you can also use any other pin-to-pin-compatible device);

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- ZIF socket for the microcontroller;
- A connector area to access the I/O pins of the microcontroller for expansion prototyping;
- Two clock sources: a 16 MHz clock module, a 8 MHz crystal and a provision to use PTC3 and PTC4 as normal I/O, selectable via the **"OSC SEL"** jumper;
- A connector (J105) with RST_IN# and RST_OUT# signals.

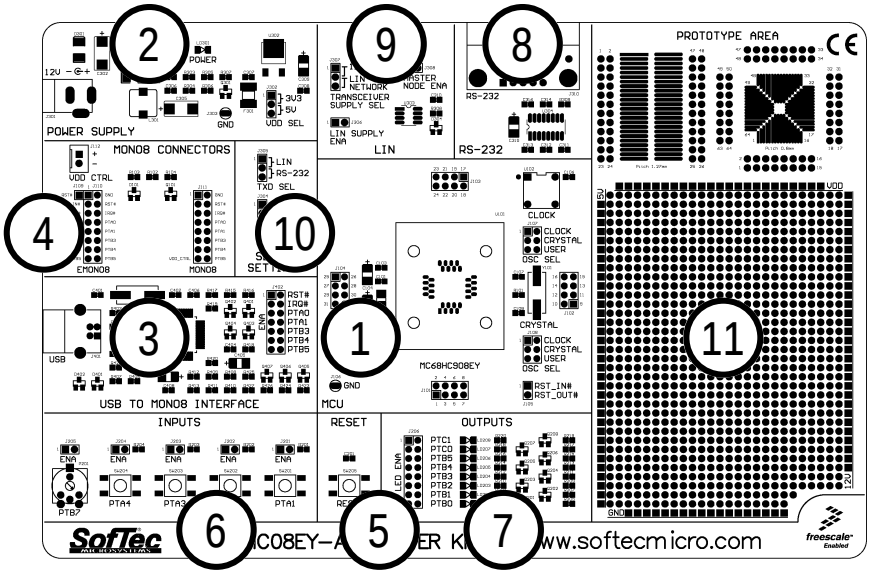
2. A "POWER SUPPLY" section which accepts a 12 V DC voltage (used for the LIN transceiver) and provides a regulated VDD voltage for the rest of the board. A jumper (**"VDD SEL"**) allows two different microcontroller VDD voltages (3.3 V or 5.0 V) to be selected. A circuitry (driven by the "MON08 CONNECTORS" and "USB TO MON08 INTERFACE" sections of the board) is present which allows the automatic power on and off of the board for entering the "monitor mode". An additional linear power supply regulator provides the 5.0 V voltage required by the "USB TO MON08 INTERFACE" section.
3. A built-in "USB TO MON08 INTERFACE" section which allows the host PC to communicate with the microcontroller through a standard USB interface. USB 2.0 is fully supported. When using an external in-circuit debugger (via the **"MON08"** or **"EMON08"** connectors), the "USB TO MON08 INTERFACE" circuitry must be bypassed by removing all of the **"ENA"** jumpers in this area.
4. Two connectors for external in-circuit debugging/programming. Even though the Starter Kits feature a built-in USB to MON08 interface, two additional, separate MON08 connectors are present which allow an external in-circuit debugger to be used. The **"EMON08"** (Enhanced MON08) connector is used by in-circuit debugging tools such the Freescale ICS system or the SofTec Microsystems inDART-HC08; other tools, instead, use the **"MON08"** connector. If you use an external in-circuit debugger/programmer, an additional **"VDD CTRL"** connector allows you to control the Starter Kit's VDD voltage using the external tool's power control. The output impedance (both low and high) of the external tool driving the **"VDD CTRL"** connector's VDD_CTRL signal is not important.
5. A "RESET" section containing the push-button connected to the MCU's reset pin through a basic RC network.
6. An "INPUTS" section containing:

   - Four push-buttons, together with jumpers to connect/disconnect them to/from the microcontroller's PTA[4..1] lines;
   - A potentiometer, together with a jumper to connect/disconnect it to/from the microcontroller's PTB7/AD7 pin.

7. An "OUTPUTS" section containing eight high-efficiency (low-current) LEDs connected to PTB[5..0] and PTC[1..0] lines, together with eight jumpers to connect/disconnect each of the eight LEDs to/from their respective PTB or PTC pins.
8. A "RS-232" section providing one RS-232 channel connected to the microcontroller's SCI serial communication interface. The microcontroller's PTE0/TXD and PTE1/RXD lines used by the RS-232 channel are shared with the LIN transceiver's RX and TX lines. Use the **"RXD SEL"** and **"TXD SEL"** jumpers in the "SERIAL SETTINGS" section of the board to select whether to use the RS-

232, LIN, or to free the microcontroller's PTE0/TXD and PTE1/RXD lines. A 9-pin, D-Sub female connector is provided for the RS-232 channel.

9. The "LIN" section contains one LIN transceiver, capable of a speed of up to 100 Kbps in fast mode. The LIN node can be configured as a master node via the **"MASTER NODE ENA"** jumper, which inserts a 3.3 KOhm resistor between the LIN bus line and the LIN transceiver power supply line. The LIN transceiver can be powered either by the Starter Kit's internal 12 V DC reference, or by the LIN network itself, via the **"TRANSCEIVER SUPPLY SEL"** jumper. Analogously, the LIN network can be supplied by the Starter Kit's internal 12 V DC reference via the **"LIN SUPPLY ENA"** jumper. The microcontroller's PTE0/TXD and PTE1/RXD lines used by the LIN transceiver are shared with the RS-232 transceiver's TXD and RXD line. Use the **"TXD SEL"** and **"RXD SEL"** jumpers in the "SERIAL SETTINGS" section of the board to select whether to use the RS-232, LIN, or to free the microcontroller's PTE0/TXD and PTE1/RXD lines. A 3x1 male header connector is provided to interface to an external LIN bus.
10. The "SERIAL SETTINGS" section has two jumpers (**"TXD SEL"** and **"RXD SEL"**) that allow the use of the SCI peripheral of the microcontroller to be chosen. The SCI peripheral can be connected to the LIN node or to the RS-232 channel , or can be freed by removing all jumpers.
11. A prototype area features both a standard, thru-hole area (for mounting traditional components) and a SMD area (for soldering SMD components). Additionally, all of the board's supply lines (12 V, 5V, VDD and GND lines) are provided.



The ZK-HC08EY-A Starter Kit

Supported Devices

The ZK-HC08EY-A Starter Kit supports the following devices:

- MC68HC908EY family;
- And any future pin-to-pin compatible device.

Recommended Reading

- Freescale HC08 microcontroller-specific datasheets;
- SK-HC08 and ZK-HC08 Series Starter Kit User's Manual;
- ZK-HC08EY-A Schematic.

2. The "RST_IN/RST_OUT" Connector

Introduction

All of the HC08 family devices feature a monitor code resident in ROM which, through a serial communication line, allows the programming and the in-circuit debugging of the user application. The monitor code is executed in "monitor mode"; the user application is executed in "user mode".

To enter the monitor mode some microcontroller lines must be properly driven. In the case of the MC68HC908EY family, these lines are PTA0 (serial communication line), PTA1, PTB3, PTB4 and PTB5.

Additionally, to enter the monitor mode, a high-level voltage signal (VTST) must be generated on the IRQ and RST pins of the microcontroller. In the case of the MC68HC908EY family, the VTST voltage is typically 9.1 V.

The "RST_IN#/RST_OUT#" Connector

The **"RST_IN#/RST_OUT#"** connector, in the "MCU" section of the board, features the RST_IN# and RST_OUT# signals.

Depending on what in-circuit debugger/programmer you are using (built-in USB to MON08 interface, external tool connected to the **"EMON08"** connector or external tool connected to the **"MON08"** connector) the RST_IN# and RST_OUT# signals assume different meanings.

Using the "EMON08" Connector

Interfacing an external in-circuit debugger/programmer via the **"EMON08"** connector allows the number of wasted lines required to enter the monitor mode and executing the monitor code to be reduced.

In addition to the RST# line, the **"EMON08"** connector features two special lines, RST_IN# and RST_OUT#, which allow your target application to be interfaced to the target microcontroller's reset line without worrying about the high voltage that is generated on the RST# line.

When using the **"EMON08"** connector:

- The RST_OUT# signal in the **"RST_IN#/RST_OUT#"** connector is the reset signal generated by the external in-circuit debugger/programmer to the target system: it can be GND or open drain.
- The RST_IN# signal is the reset signal generated by your target application: it is adapted by the external in-circuit debugger/programmer which properly drives the microcontroller's RST# line.

Using the “MON08” Connector

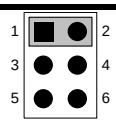
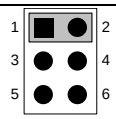
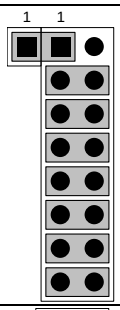
When using the **“MON08”** connector, the RST_IN# and RST_OUT# signals in the **“RST_IN#/RST_OUT#”** connector coincide with the microcontroller’s RST# signal.

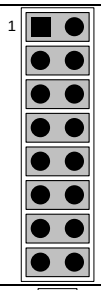
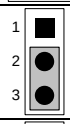
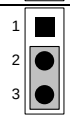
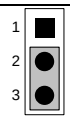
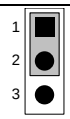
Using the Built-In USB to MON08 Interface

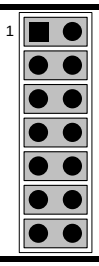
When using the built-In USB to MON08 Interface, the RST_IN# and RST_OUT# signals in the **“RST_IN#/RST_OUT#”** connector coincide with the microcontroller’s RST# signal.

3. Summary of Jumper and Connector Settings

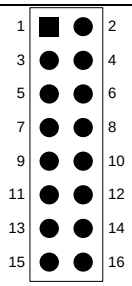
Jumpers Summary

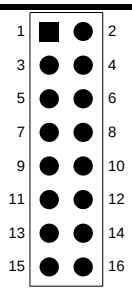
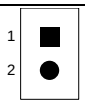
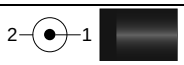
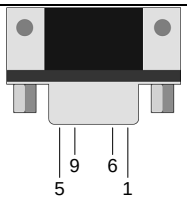
Name	Reference	Description/Pinout
J107		**OSCILLATOR SELECTION** **1-2 (CLOCK) Clock selected (default)** 2-3 (CRYSTAL) Crystal configuration selected 4-5 (USER) PTC4 configured as normal I/O
J108		**OSCILLATOR SELECTION** **1-2 (CLOCK) Clock selected (default)** 2-3 (CRYSTAL) Crystal configuration selected 4-5 (USER) PTC3 configured as normal I/O
J109 J110		**EMON08 CONNECTOR** **Installed When using the built-in USB to MON08 interface or an external in-circuit debugger/programmer connected to the “MON08” connector (default)** Not Installed When using an external in-circuit debugger/programmer connected to this connector
J201		**PTA1 PUSH-BUTTON ENABLE** **Installed The PTA1 push-button is connected to the microcontroller’s PTA1 pin (default)** Not Installed The PTA1 push-button is not connected to the microcontroller
J202		**PTA2 PUSH-BUTTON ENABLE** **Installed The PTA2 push-button is connected to the microcontroller’s PTA2 pin (default)** Not Installed The PTA2 push-button is not connected to the microcontroller
J203		**PTA3 PUSH-BUTTON ENABLE** **Installed The PTA3 push-button is connected to the microcontroller’s PTA3 pin (default)** Not Installed The PTA3 push-button is not connected to the microcontroller

Name	Reference	Description/Pinout
J204		**PTA4 PUSH-BUTTON ENABLE** **Installed** — **The PTA4 push-button is connected to the microcontroller's PTA4 pin (default)** Not Installed — The PTA4 push-button is not connected to the microcontroller
J205		**POTENTIOMETER ENABLE** **Installed** — **The potentiometer is connected to the microcontroller's PTB7 pin (default)** Not Installed — The potentiometer is not connected to the microcontroller
J206		**LED ENABLE** **Installed** — **Each jumper, when installed, connects a LED to the respective microcontroller's pin (default)** Not Installed — The LEDs are not connected to the microcontroller.
J302		**VDD SELECTION** 1-2 (3V3) — VDD = 3.3 V **2-3 (5V)** — **VDD = 5 V (default)**
J304		**RXD SELECTION** 1-2 (LIN) — Microcontroller's PTE1/RXD pin connected to LIN transceiver **2-3 (RS-232)** — **Microcontroller's PTE1/RXD pin connected to RS-232 transceiver (default)**
J305		**TXD SELECTION** 1-2 (LIN) — Microcontroller's PTE0/TXD pin connected to LIN transceiver **2-3 (RS-232)** — **Microcontroller's PTE0/TXD pin connected to RS-232 transceiver (default)**
J306		**LIN SUPPLY ENABLE** **Installed** — **LIN bus is powered by the Starter Kit's internal 12 V DC voltage (default)** Not Installed — LIN bus is self-powered
J307		**LIN TRANSCEIVER SUPPLY SELECTION** **1-2 (12V)** — **LIN transceiver is supplied by the Starter Kit's internal 12 V DC voltage (default)** 2-3 (LIN NETWORK) — LIN transceiver is supplied by the LIN bus' VBAT line
J308		**LIN MASTER NODE ENABLE** **Installed** — **LIN master node (default)** Not Installed — LIN slave node

Name	Reference	Description/Pinout
J402		**USB TO MON08 ENABLE** **Installed** — **The USB to MON08 interface is enabled** Not Installed — The USB to MON08 interface is disabled

Connectors Summary/Pinout

Name	Reference	Description/Pinout
J101, J102, J103, J104		**MCU I/O Connectors** See schematic for pin explanation
J105		**RST_IN# and RST_OUT#** 1. RST_IN# 2. RST_OUT#
J106		**Ground Test Point**
J109		**EMON08 Connector** 1. RST#
J110		**EMON08 Connector** 1. RST_OUT# 2. GND 3. RST_IN# 4. RST# 5. TGT_IRQ# 6. IRQ# 7. TGT_PTA0 8. PTA0 9. TGT_PTA1 10. PTA1 11. TGT_PTB3 12. PTB3 13. TGT_PTB4 14. PTB4 15. TGT_PTB5 16. PTB5

Name	Reference	Description/Pinout
J111		**MON08 Connector** 1. N.C. 2. GND 3. N.C. 4. RST# 5. N.C. 6. IRQ# 7. N.C. 8. PTA0 9. N.C. 10. PTA1 11. N.C. 12. PTB3 13. N.C. 14. PTB4 15. VDD_CTRL 16. PTB5
J112		**VDD CTRL** 1. VDD_CTRL 2. GND
J301		**12 V DC Power Supply Input Connector** 1. 12 V DC 2. GND
J303		**Ground Test Point**
J309		**LIN Connector** 1. VBAT – LIN Bus Power Supply 2. LIN – LIN Signal 3. GND
J310		**RS-232 Connector** 1. N.C. 2. TX 3. RX 4. N.C. 5. GND 6. N.C. 7. N.C. 8. N.C. 9. N.C.
J401		**USB Connector** 1. 5 V DC USB Bus Power Supply Line 2. USB D- 3. USB D+ 4. GND