Semiconductor Products Sector
Application Note

AN2200

Converting HC908AZ60 Code for the HC08AZ32

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1 Introduction

The purpose of this document is to help customers who have developed their code on the HC908AZ60 and require to convert it to run on the HC08AZ32. It highlights the differences between the Flash and the ROM devices and provides a checklist to help with code development.

This application note is also applicable to the HC08AZ16/24 and the HC08AB16/24/32 devices. The reader can assume all references to the HC08AZ32 also apply to these devices unless otherwise stated.

2 Differences between the HC908AZ60 and the HC08AZ32

This section describes the differences between the HC908AZ60 and the HC08AZ32. Each affected module is listed along with a summary of the changes.

2.1 ROM versus FLASH

On the HC08AZ32 device, code is stored in static, factory masked Read Only Memory (ROM) whereas on the HC908AZ60, code is stored in non-volatile electrically erasable and programmable memory (Flash EEPROM). There is no difference when reading from either ROM or Flash memories however it should be noted that the HC908AZ60 has 60k of Flash whereas the HC08AZ32 has only 32k of ROM. It should be noted that the HC08AZ16 and the HC08AB16 have 16k of ROM and that the HC08AZ24 and the HC08AB24 have 24k of ROM.

The user is advised to consult the latest HC908AZ60 specification for details on programming the Flash module.

2.2 Mask Options

The HC08AZ32 uses mask option registers (MORA and MORB) to set up various options. The contents of MORA and MORB are selected by the user at ROM submission. Alternatively, the HC908AZ60 uses configuration registers (Config-1 and Config-2) that can be programmed by the user to select their required options. The configuration registers are write-once registers. Out of reset the configuration registers will read their default values. Once these registers have been written to, further writes will have no effect until a reset occurs. It is important that the user checks the bit polarities of these registers to ensure the correct options are set up.

2.2.1 Mask Option Register A versus Config-1 Register

MORA and Config-1 registers are located at address $001F however the polarity of several bits in these registers is different and are listed below -

MORA	Bit-7	6	5	4	3	2	1	0
$001F	LVISTOP	ROMSEC	LVIRSTD	LVIPWRD	SSREC	COPRS	STOP	COPD
Reset:	Unaffected By Reset							

Config-1	Bit-7	6	5	4	3	2	1	0
$001F	LVISTOP	R	LVIRST	LVIPWR	SSREC	COPL	STOP	COPD
Reset:	0	1	1	1	0	0	0	0

Bit-2 on the HC08AZ32 is defined as a COP Rate Select (COPRS) bit to determine the timeout period of the COP and when selected as a ‘1’ enables a long COP timeout period of 262128 cycles. Conversely, this bit is defined as a COP Long Timeout (COPL) bit on the HC908AZ60 and when selected as a ‘1’ enables a short COP timeout period of 8176 cycles.

Bit-4 on the HC08AZ32 is defined as the LVI Power Disable (LVIPWRD) bit and when selected as a ‘1’ disables the LVI module power. However, this bit is defined as a LVI Power Enable (LVIPWR) bit on the HC908AZ60 and when set to a ‘1’ enables the LVI module power.

Bit-5 on the HC08AZ32 is defined as a LVI Reset Disable (LVIRSTD) bit and when selected as a ‘1’ disables LVI module resets. Again, on the HC908AZ60 this bit is defined as a LVI reset enable (LVIRST) bit and when set to a ‘1’ enables the reset signal from the LVI module.

Bit-6 of MORA on the HC08AZ16 is defined as a ROM security bit (SEC) however this is a reserved bit in the HC908AZ60 Config-1 register

2.2.2 Mask Option Register B versus Config-2 Register

MORB, a HC08AZ32 register, is located at address $003F and contains only one active bit. The HC908AZ60 has a Config-2 register instead which is located at address $FE09 and has 2 active bits (bit 4, MSCAND and bit 0, AZxx) which are used to correctly set up the HC908AZ60. It should be noted that the MSCAN module is always enabled on the HC08AZ16/24/32.

MORB	Bit-7	6	5	4	3	2	1	0
$003F			EESEC					
Reset:		Unaffected	By	Reset				

= Unimplemented

Config-2	Bit-7	6	5	4	3	2	1	0
$FE09	R	R	R	MSCAND	R	R	R	AZxx
Reset:	0	0	0	1	0	0	0	0

R = Reserved

The following bit descriptions refer to Config-2 (address $FE09) of the HC908AZ60.

Bit-0 (AZxx) is used to configure the device as a ‘AZ’ device and should be set to a ‘1’ by the user.

Bit-4 (MSCAND) is used to disable the MSCAN module. When set to a ‘1’ the MSCAN module is disabled.

2.3 Analogue to Digital Converter

The user is required to select 15-channels versus 8-channels at ROM submission for the HC08AZ32, however, the user should note that the HC908AZ60 is always configured with a 15-channel analog to digital converter.

CAUTION: *The user should note that for devices configured with a 15 channel ADC, the pins used for ADC channels 12 and 14 also share their functions with timer clock inputs as well as general purpose I/O. Therefore, do not use channels 14 or 12 if using TACLK or TBCLK pins as the clock inputs for the 16-bit timers.*

2.4 Timer Interface Module A

TIMA on the HC08AZ32 is a 4-channel timer whereas the HC908AZ60's TIMA module is a 6-channel timer. The additional vectors for the HC908AZ60 are located at $FFCC – $FFCF which is ROM area on the HC08AZ32. For code compatibility these extra timer channels should not be used although the user should be aware of their existence.

2.5 PLL Lock Time

The PLL module on the HC08AZ32 is an older revision than the PLL module on the HC908AZ60 and as a result can take longer to lock. It is important, therefore, if a short COP reset time has been selected that the user services the COP whilst waiting for the PLL to lock.

3 Differences Guide

The flowchart shown in figure 1 highlights the main differences between the HC908AZ60 and HC08AZ32.

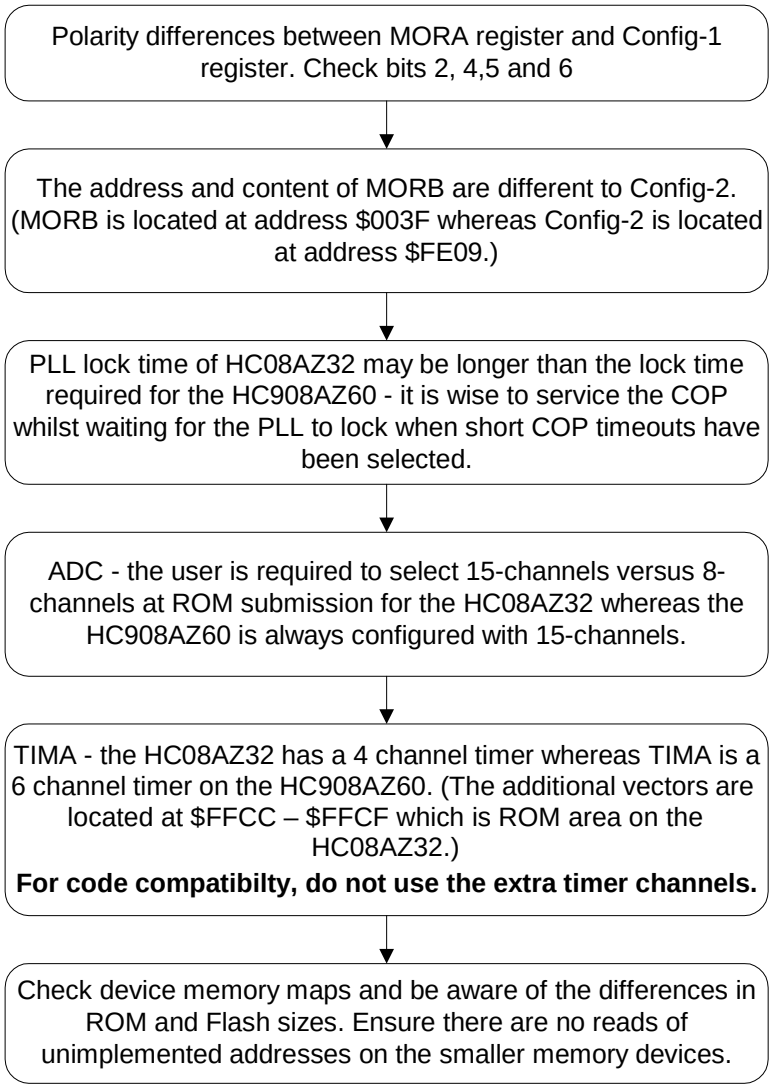

Figure 1 HC08AZ32/HC908AZ60 Differences Guide

4 Conclusion

All of the differences discussed above should be taken into account when developing code that can be used on both the HC908AZ60 and the HC08AZ32.

In particular, it is important to gain familiarity with the polarity differences of several bits in the HC08AZ32 MORA register versus the HC908AZ60 Config-1 register. This will ensure that the various options are set up correctly regardless of what device is present (either the ROM HC08AZ32 or the Flash HC908AZ60).

Finally, the user is advised to read the relevant chapters of the latest HC08AZ32 and HC908AZ60 specifications to ensure all differences have been fully captured.

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