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Handling Considerations for Avoiding Intermittent Programming and Execution Failures with MC68HC11-Windowed EPROM Devices

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Introduction

If you are experiencing problems with MC68HC11-windowed EPROM devices when attempting to program them or use them in target applications, these problems may be attributable to lead alignment problems. The leads on these devices (identified with the FS package suffix) are more flexible than those on identical EPROM devices packaged in plastic-leaded chip carriers (identified with the FN package suffix). This additional flexibility may cause problems when using these parts in applications where they are handled extensively.

Symptoms

Symptoms of the failures include:

- Devices do not program properly in commercial EPROM programmers. EEPROM and/or EPROM will not program in Motorola M68HC11 evaluation and programmer board products.

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- Devices do not function properly in the target systems using zero insertion force (ZIF) sockets.
- The serial communications interface (SCI) does not function properly in target systems but works properly on development tools.
- Appropriately configured target systems will not operate in special bootstrap mode.

Device Guidelines

These EPROM devices are available in the windowed ceramic leaded chip carrier package.

- MC68HC711D3FS
- MC68HC711E9FS
- MC68HC711E20FS
- MC68HC711G5FS
- MC68HC711K4FS
- MC68HC711KA4FS
- MC68HC711KA2FS
- MC68HC711L6FS
- MC68HC711N4FS

Observe these guidelines when working with these and other similarly packaged devices from Motorola.

- When handling these parts, try to avoid touching their leads. With proper handling, the risk of bending leads is not only minimized, but the possibility of damage by electrostatic discharge is also reduced.

NOTE: *It is always good practice to properly ground yourself when handling any sensitive electronic components.*

- When using ceramic leaded chip carrier devices with zero insertion force sockets (such as those made by Yamaichi and Plastronics), try to lay out your circuit so that these sockets can be used with your parts inserted upside down. Mounting sockets in this fashion has several advantages:
  - You will be able to see if any leads are being pressed together, causing them to short circuit. Several versions of the MC68HC11 have their PD0/RxD and PD1/TxD pins located on or near the corners of the leaded chip carrier package. If these parts are not carefully seated in zero insertion force sockets, the PD0/RxD and PD1/TxD pins may be pressed together. In applications where the MC68HC11 is used in special bootstrap mode, this condition will make the MC68HC11 appear as if it has not come out of reset because there will be no activity on the PD1/TxD line. This is a likely cause of problems if you are experiencing difficulty programming EEPROM or EPROM devices. Most boards which support EEPROM and EPROM programming do so in special bootstrap mode where short-circuited RxD and TxD pins will manifest themselves as device programming failures or errors.
  - Inserting your devices bottom side up also will allow you to see if any of the chip's leads are not making contact with the corresponding socket leads. A continuity tester also can be used to check these connections. This is also a likely cause of problems if you are experiencing difficulty programming EEPROM or EPROM devices. Most boards which support EEPROM and EPROM programming do so in special bootstrap mode where faulty socket connections to the RxD and TxD pins will manifest themselves as device programming failures or errors.
  - When inserted upside down, the leads on your devices will make better contact with the zero insertion force socket's leads and will prolong the lifetime of your socket.

- When planning the design, consider using sockets which require a chip extractor for device removal. Although it may be convenient to use a zero insertion force socket in applications where the MC68HC11 will be removed (perhaps so that it can be reprogrammed with new firmware), semi-permanent sockets (such as those made by AMP) offer greater reliability. These sockets are designed in such a way that their leads are forced to make contact with a device's leads. Always use parts from these sockets. Other means of removal may damage or bend a chip's leads.
- If you find that the leads on your ceramic MC68HC11 devices are bent, you may carefully straighten them out.

NOTE: *Be sure to ground yourself when doing this.*

Slide a fairly strong sewing needle under the J-shaped portion of an entire row of leads. If you are using a fair sized needle, some resistance from the leads should be encountered as they bend outward slightly. Do this with each side of the ceramic leaded chip carrier package. If certain leads are still not making contact, you might consider using a medical dissection probe. This is nothing more than a long, stiff pin with a handle, but it will allow you to apply somewhat more pressure to the leads as they are bent outward.

Alternatives

When possible, consider using one-time programmable versions of MC68HC11 devices.

Most versions of the MC68HC11 are available in plastic leaded chip carrier one-time programmable packages (denoted with the FN packaging suffix), and several devices are available in a new shrink dual in-line one-time programmable package (denoted with the B packaging suffix). As mentioned, the PLCC package has stronger leads than the ceramic package, and it may be cost effective to use one-time programmable devices in applications where you can freeze the final implementation of your code.

If you anticipate making frequent changes to your firmware, it may be better, from a reliability standpoint, to use a socketed FLASH EEPROM or EPROM and a ROM-less HC11 device rather than an EPROM-based HC11 device. Although the single-chip implementation offers greater integration and uses less board space, reliability will be comprised if you must constantly socket and de-socket the HC11.

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