



# Low Output Levels on Output Pins

By Charles Melear



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By Charles Melear  
Austin, Texas

#### Introduction

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A problem occasionally reported is that an output level on a particular pin or small group of pins, such as address or data bus pins, will have a logic high level of about 3 volts. This problem can actually happen to any output pin. The pins with low output high levels are usually adjacent to one another.

#### General Information

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Providing that there are no shorts or that pin loading does not exceed specifications, the problem almost always centers around a power pin that does not have power applied to it. This can result because of a cold or broken solder joint. Other causes are due to socket problems, such as misalignment of the device in the socket or weak socket pins.


Note that there are 13  $V_{SS}$  and 13  $V_{DD}$  pins on the MC68332. In fact, all of the M683XX and M68HC16 MCUs have a large number of power and ground pins. These pins are not always connected together within the device. Internal power buses may serve only about eight to 10 pins each.

When one  $V_{DD}$  pin is floating due to no external voltage being applied, the floating  $V_{DD}$  pin can receive power from internal circuitry (such as



internal protection diodes). However, the internal sources providing power to the floating  $V_{DD}$  pin will usually be of very limited current sourcing capability and the current path usually will have several diode drops, resulting in a low output high voltage on associated output pins.

As a side note, a problem in testing the M683XX and M68HC16 devices is created when the test drivers are not disconnected from the device before the power is switched off from  $V_{DD}$ . The MC68332 can power up from the voltage applied to an input pin. Therefore, all power and ground pins must be connected to power sources to avoid low output high voltage levels.

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