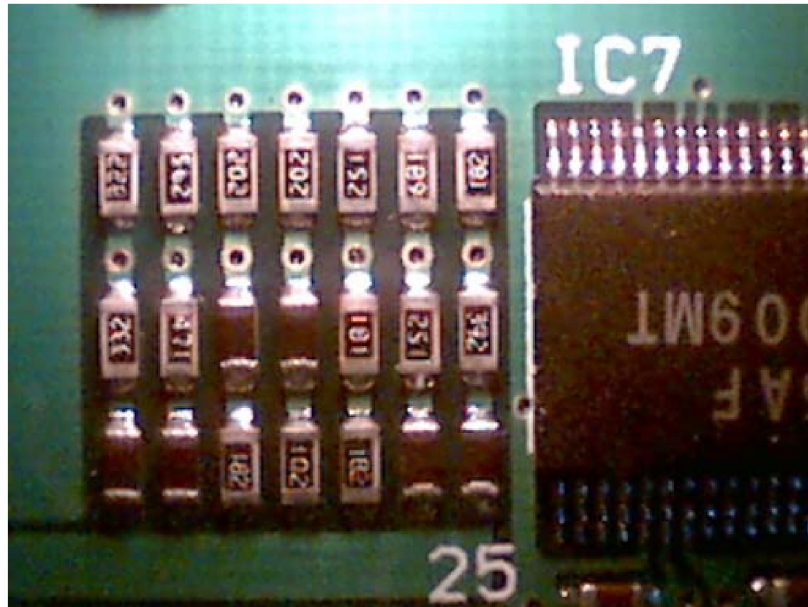


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Date Last Modified : 6/5/2003 11:17:17 AM

# Alta Gamma Trimster for Gamma Reference Voltage Generation for TFT Flat Panel Displays



## Introduction

Gamma Correction has long been a problem for the manufacturers of TFT Flat Panel Displays. The Gamma Correction curve becomes more complex as the display resolution increases. In addition, each display often has a different response to the gamma correction reference voltages, resulting in the need to generate specific gamma reference voltages for each model of display as well as compensating for display to display variation due to manufacturing process variations.

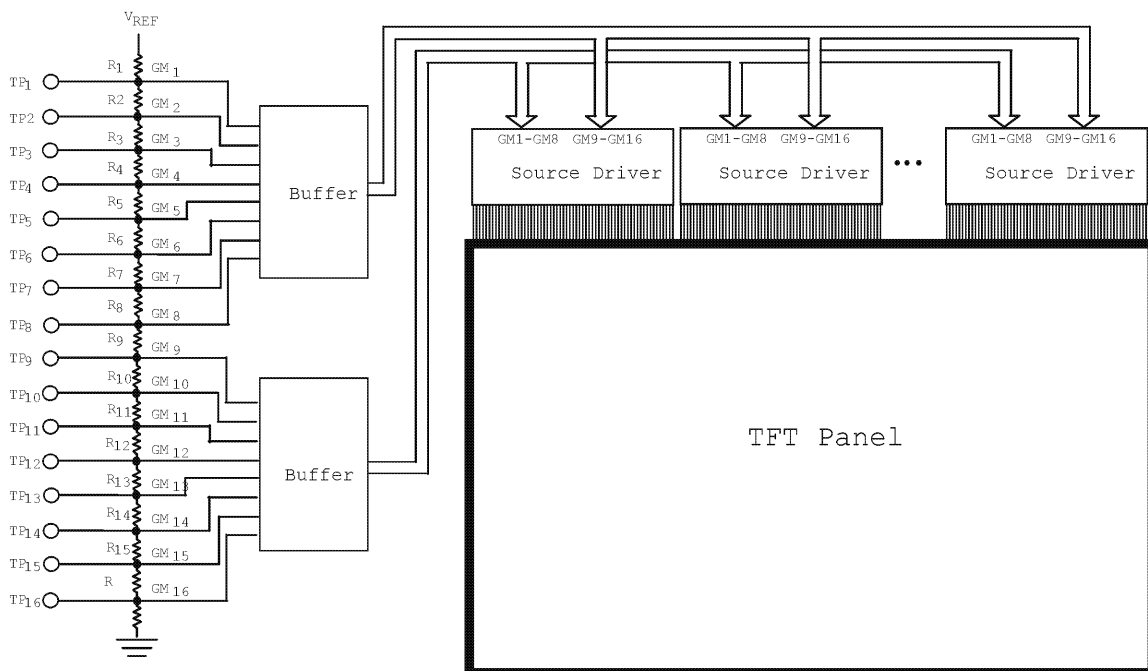
The traditional approach to the Gamma Reference Generation problem has been to use Select-On-Test Resistors such as shown in the picture above. These resistors allow the reference voltages to be fine-tuned to the requirements of the individual display. The testing, selection and mounting of these resistors has become a major production problem since the process is a manual one and prohibits automated assembly and test. In addition, once the resistors are mounted on the display PC board, they cannot be easily changed to meet the growing requirements of individual customers for a specific Gamma characteristic.

Of course, even with the manual labor involved, Select-On-Test resistors are still the least expensive solution to this problem. Devices such as potentiometers, E2POTS, DCPs and DACs all could perform this function in some ways better than the Select-On-Test resistors, but the cost is prohibitive.

Alta Analog is developing a family of Gamma Trimesters to address this application. In many cases, the cost will be equivalent to the Select-On-Test resistors used today with the additional benefits:

1. Automated Assembly of Entire PC Board
2. Automated Test and Gamma Adjustment
3. Smaller, thinner physical size
4. Lower Power consumption
5. Elimination of Buffer Ics
6. Reprogramable Settings
7. Stand Alone Solution, No MCU needed

### Select-On-Test-Resistors

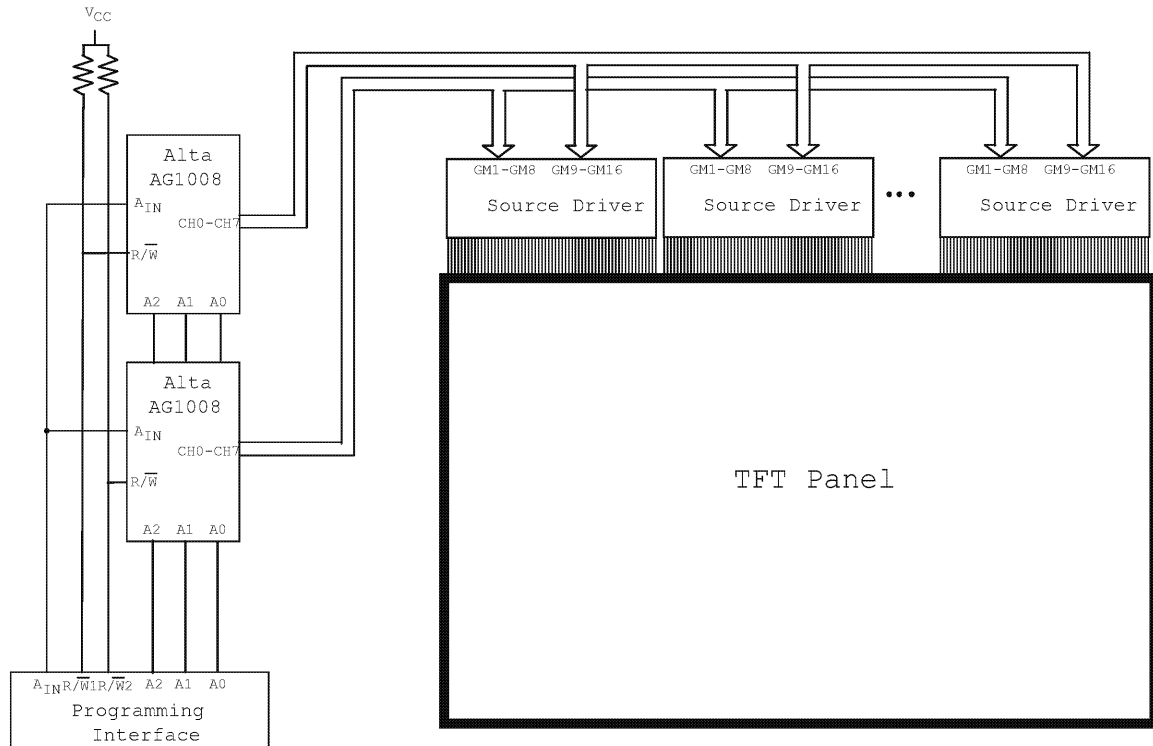


The above figure shows a typical gamma reference circuit for a TFT display. In this case, the source drivers require a total of 16 gamma reference voltages. These voltages are derived by a resistive divider of 17 resistors connected between a reference voltage and ground. Since the loading of the source drivers changes dynamically, it is not possible to simply connect the resistive divider to the inputs of the source drivers, and some type of buffering must be used, usually a gamma reference buffer IC.

Initially the PC board is assembled without the resistors. An external test apparatus drives the test points TP1-TP16 until the desired Gamma correction is

achieved. The values of the TP voltages are then used to calculate the resistors needed for the particular display under test(DUT) and the resistors are mounted on the PC board.

### Alta Gamma Trimster Solution



In the above example, the resistive divider and buffers are replaced with Alta AG1008 device, each driving 8 of the gamma reference voltages.

The Programming Interface consists of a common Analog Input which will be used to set the reference voltage level, three address inputs to determine which reference level we are writing to and a R/W control signal for each of the AG1008s, in this case two, that are on the board.

During normal operation, the R/W pin is pulled High and the reference voltage outputs will reflect the value last programmed into the nonvolatile memory cells.

The writing or programming operation is accomplished by first selecting the output or channel of the device to be programmed with the A2-A0 inputs. At this point, R/W on the device to be written is driven low and the device enters Tracking Mode. During Tracking Mode, the output of the selected channel tracks the input voltage on the Analog Input. (An optional internal voltage multiplier converts the 0-3V Analog Input to a 0-10Volt output.)

Once the desired voltage is found by varying the Analog Input for a particular channel, the R/W signal is driven high and the value on the Analog

Input is written into the nonvolatile memory for the output channel selected by the A2-A0 inputs.

In this manner, each of the gamma reference voltages can be written in a sequential manner during display testing.

An alternative method would be to pre-load the contents of the AG1008 with a default configuration, which will be close to being correct for the majority of displays. In this approach, only those parameters that need to be adjusted are changed in testing.

### **Conclusion**

The AG100X family of Gamma Trimsters provides the manufacturers of TFT displays a solution to the setting of the gamma reference voltages. Automated testing of the displays and re-programming of the gamma characteristics is enabled, even after the display is completed. AG100X devices provide reduced overall implementation costs, reduced power consumption, reduced physical size and flexibility over the traditional Select-On-Test resistor techniques.