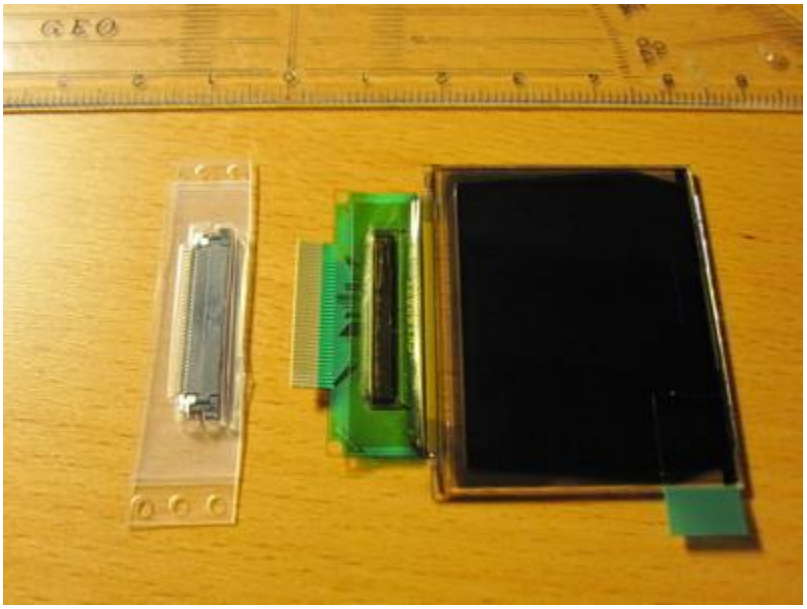
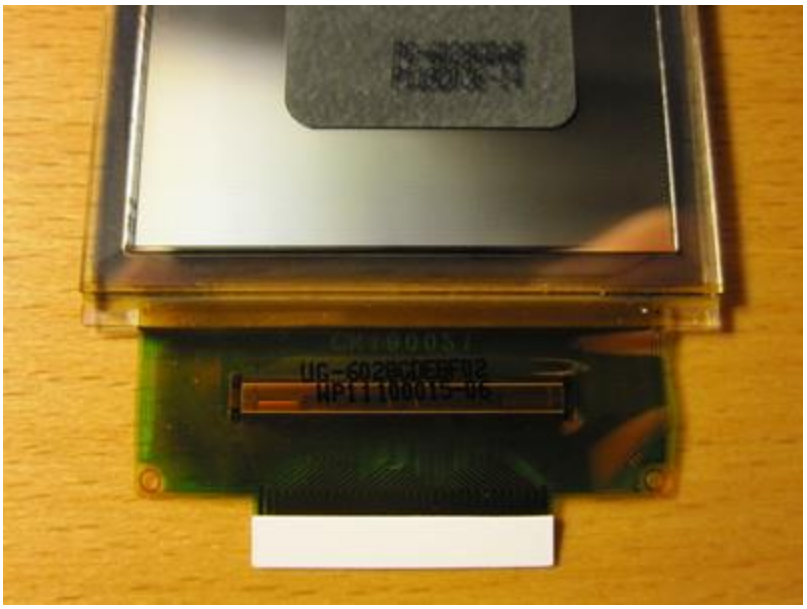
ORGANIC DISPLAY

Recently I got another gadget to play with from Farnell as part of their road testing program. If you remember last year I picked a pair of 433 MHz RF modules, which I put into some good use.

This time I choose something a bit more colorful: a small, passive matrix OLED display, not unlike the screens you find on small solid-state music players.



This is Densitron DD-160128FC-2B (original manufacturer's site). It's an 1.69 inch color dot-matrix display using organic LEDs on a glass substrate driven by a passive matrix. This means that you get 160 x 128 pixels with 18 bits of color resolution in a viewable area of around 36 x 29 mm (making for 110 DPI).



On the electronic side it's controlled by a Syncoam SEPS525 driver IC. By the way, that's the elongated bar on the front side of the display bonded to the flexible PCB tail - you can actually see the structure on the silicon through the transparent substrate. This chip supports quite a few possibilities of interconnect, although not all are usable with this particular display since some pins of the chip aren't available on the connector.

Probably the most interesting one is the single channel serial 10 MHz SPI bus which requires only 4 pins. You also get the possibility of using an 8- or 9-bit parallel bus in an either a Motorola 6800 or Intel 8080 flavor, which is somewhat surprising since I haven't seen a bare CPU bus exposed on highly integrated devices that would use a display like this. More likely these modes can be used through some kind of emulation of these CPU buses as they allow faster writes to the frame buffer compared to SPI. The fourth possibility is a direct RGB interface that uses a dot clock and h- and v-sync signals to transfer subpixel values through a 6-bit parallel bus. The chip also supports parallel buses wider than 9 bits, but as I mentioned above, they appear to be unusable, as data lines D9 through D0 aren't connected.

My plan is to put this display on a shield for an Arduino Duemilanove, as it is just about the right size to fit nicely. And here's the catch that is the reason why so far I'm writing all of this from theory and I haven't yet actually turned the display on.

First, the OLED display requires a 14 V, 40 mA power supply. This is not something you will usually find on microcontroller boards which means using a micropower step-up converter. Thankfully, these requirements are quite similar to those of LCD panels, which means that you can get cheap DC/DC converter chips in this power and voltage range (I'm currently looking into National Semiconductor LM 2703). To complicate things just a little bit more though, you apparently need to be able to turn this voltage on and off from software, since the datasheet specifies a turn-on sequence that involves turning on the driver voltage some time after the digital part gets its supply.

The said digital part however, only works with supply voltages between 2.8 and 3.3 V (with I/O pins capable of also using 1.6 V digital levels). This presents another inconvenience on a 5 V board like the Arduino, since you have to do level shifting for digital lines. Thankfully, there's a 3.3 V supply already available on the Duemilanove shield connector that should be capable of powering SEPS525.

Lastly, the display sports a flat flexible cable with a 0.5 mm pitch. Even with a matching SMD connector this is quite impossible to manually solder without a PCB break-out board that puts somewhat more space between the pins. 0.5 mm pitch (I'm guessing requiring minimum feature length around 6 mil) is also somewhat stretching the limit of what I can do with my home-brew PCB process. I have yet to try it, but it's not unlikely I will have to get this board professionally made.

In conclusion, none of the problems I mentioned above are show stoppers if you want to use this display. However they make it quite inconvenient to use in a home workshop or with the cheaper microcontroller development boards and I haven't even started looking into the software side of the things. Guessing from the datasheet talking with SEPS525 won't be trivial either and from some initial searching I haven't been able to find any free libraries that support it. So, unless you are looking for the flexibility that only a bare display can offer, I would suggest trying some of the display modules that already come with all the tidbits required for mating them with a microcontroller development board.

Source : https://www.tablix.org/~avian/blog/archives/2012/02/organic_display/