ature of 300 degrees centigrade), the matrix plate is far less challenging than a 64K-GRAM die. Of course, every TFT on the matrix plate must be functional, just as every transistor on a 64K RAM must be functional. Therefore, in general, the yield of matrix plates should be comparable to the yield of 64K-GRAM dies, which is now estimated at 70 percent. Detailed analysis and experience have confirmed these estimates.

Similarly, the cost per plate in high volume can be estimated on the basis of the wafer cost in the semiconductor industry. Generally, the cost per yielded wafer is about $8 per layer per wafer out. Since our process has no high-temperature steps, we anticipate a slightly lower figure. In high volume, the matrix-plate manufacturing cost is estimated at $35. This estimate, too, has been confirmed by detailed analysis.

Thus, we believe that the use of an amorphous silicon TFT active matrix driving a standard liquid crystal material is a technologically and economically viable method for providing flat panel displays to the portable computer industry.

The challenge

The entrance fee for pursuing these opportunities is not inconsequential by traditional venture capital standards. A semiconductor fabrication line must be established and operated with all of the necessary procedures and disciplines common in that industry. Unfortunately, when 20-micron particulates can reduce the yield to zero, it is impossible to start small or as a "garage operation" with hopes of expanding at some later date.

Potential competition must be considered. Little active work is being done in the US by the industry giants in high-density liquid crystal displays. Several major foreign companies, however, have expressed a commitment to the flat panel display area. Domestic companies must therefore follow aggressive but realistic paths to ensure themselves a substantial market share.

The challenge is multifaceted, largely because this is not an established technology being applied to a new product area. Indeed, successful commercialization of flat panel displays has been hampered to date by the limitations of established technology. A new technological approach has been needed, and, as with any new technology, the seemingly limitless commercial potential is accompanied by inherent risks.

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References


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