OPTO-VLSI

The WA Centre of Excellence for MicroPhotonic Systems (COMPS), Electron Science Research Institute, is carrying out R&D on the development of Opto-VLSI technology for manipulation of material showing electro-optic effects. This includes the design and fabrication of Opto-VLSI chips featuring low-loss, low polarisation sensitivity, and low switching voltage at near-infrared wavelengths.

An Opto-VLSI processor comprises an array of liquid crystal (LC) cells driven by a Very-Large-Scale-Integrated (VLSI) circuit that generates digital holographic diffraction gratings to steer and/or shape optical beams.

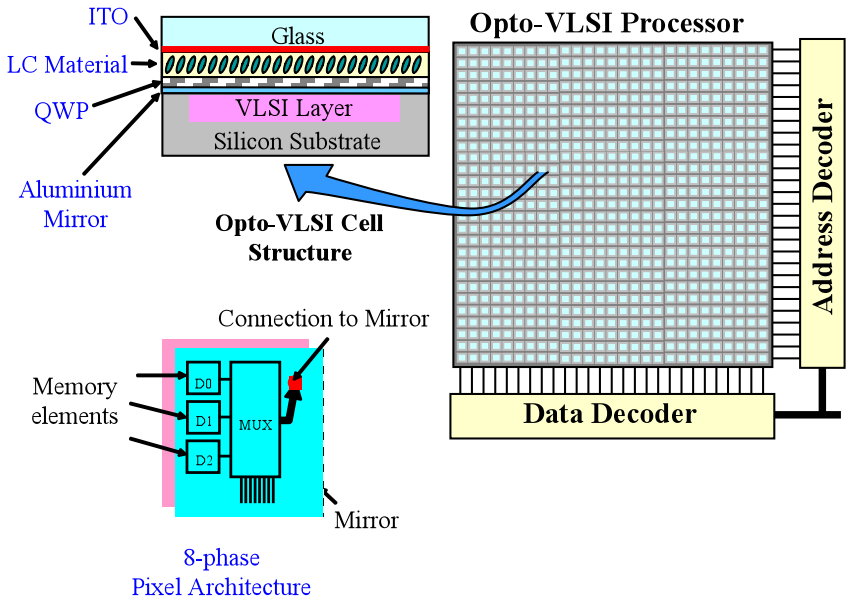

Figure 1. Typical 8-phase Opto-VLSI processor and LC cell structure design.

Each pixel is assigned a few memory elements that store a digital value, and a multiplexer that selects one of the input voltages and applies it to the aluminium mirror plate. Opto-VLSI processors are electronically controlled, software-configured and polarization independent. They are cost effective, because of the high-volume manufacturing capability of VLSI chips; have the capability of controlling multiple fibre ports in one compact Opto-VLSI module; and are very reliable since beam steering is achieved with no mechanically moving parts. Figure 1 shows a typical layout and a cell design of an 8-phase Opto-VLSI processor. Indium-Tin Oxide (ITO) is used as the transparent electrode, and evaporated aluminium is used as the reflective electrode. The ITO layer is generally grounded and a voltage is applied at the reflective electrode by the VLSI circuit below the LC layer.