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The TROPHY (Talented Role-playing Technology with a Dual Polarity Sustainer in Hybrid Mono Board) Driving Method

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Abstract

We have developed a new driving method named TROPHY(Talented Role-playing Technology with Dual Polarity sustainer in Hybrid Mono board). In this method, the sustain voltage is partially compared to the conventional method and the number of power sources is reduced by voltage level unification during the reset, address and sustain period. The hybrid mono board was especially developed to implement those technologies. Through this, we can lower the cost with the TROPHY compared to the conventional one. It is a suitable technology to improve the reliability of circuit and image sticking problem. We can also reduce the number of driving boards and the EMI problem compared with those of the conventional method.

Keywords : TROPHY driving, hybrid mono board, dual polarity sustain, single sustain, low voltage driving, low cost driver, lower EMI, half sustain

1. Introduction

Recent studies of PDP have been focused on developing larger size, higher definition, higher luminance, higher contrast ratio, etc. The larger display size and the higher definition entail the need for higher power consumption, worse image sticking and more severe EMI problem. The low voltage driving is one of the solutions to minimize the problems above. Therefore, we propose the TROPHY method, of which merits include low cost, low power consumption, and image sticking. In addition, this method, using the low voltage switching devices by lowering the driving voltage, is recommended to reduce the EMI problem theoretically [1]. Contrary to the conventional sustain driving scheme, the TROPHY waveform, half level with reverse phase and dual polarity, is applied to scan and sustain (Y) electrode and common sustain (Z) electrode during the sustain period, alternately [2]. We realized the hybrid mono board as shown in Fig. 6.

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2. Results

The new driving method of AC PDP, called TROPHY, which has lower driving voltage, lower cost driver, and lower EMI characteristic than those of conventional methods has been developed without changing the panel structure. The new driving waveforms having dual polarity with half level were applied to the Y and Z electrodes for sustain operation as shown in Fig. 1. The conventional Energy Recovery Circuit (ERC) block was used [3]. However, the operation of ERC in TROPHY was adopted with a unique switching control scheme. In this method, sustain pulses with the same voltage level and the reversed phase were applied to Y and Z electrodes. Using proposed waveforms, it is possible to reduce the number of switching devices and DC power supplies. It has been tested on 42-inch XGA AC PDP.

To minimize the number of DC voltage sources, a total setup level was added to +Vs/2, -Vs/2 and $V_{set\ up}$ during the reset period. In the address period, scan voltage, -Vy, was also set to − Vs/2 while +Vs/2 was applied to Z electrode. In the sustain period, sustain pulses having +Vs/2 and − Vs/2 levels with the reverse phase were applied to each sustain electrode, respectively. As a result, only four kinds of DC power sources, +Vs/2, -Vs/2, $V_{set\ up}$, and V_{scan}, were

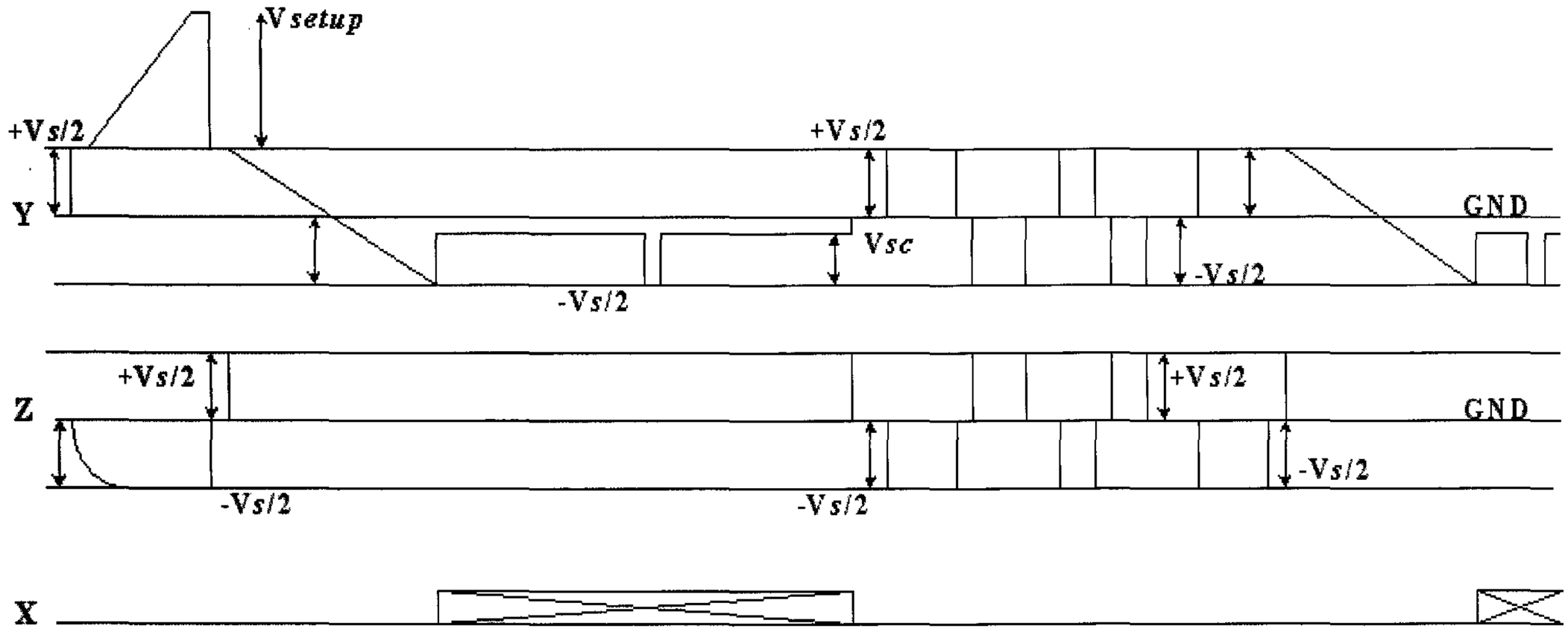
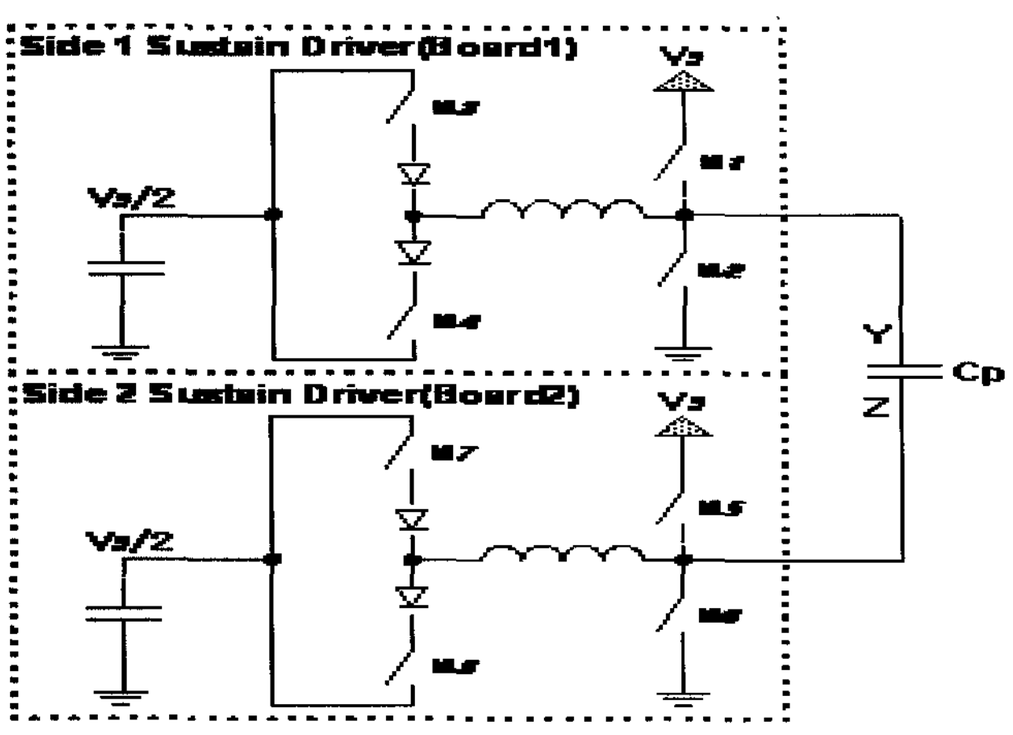


Fig. 1. Waveform for operating the proposed circuit.



Fig, 2. Block diagram of conventional sustain circuits.

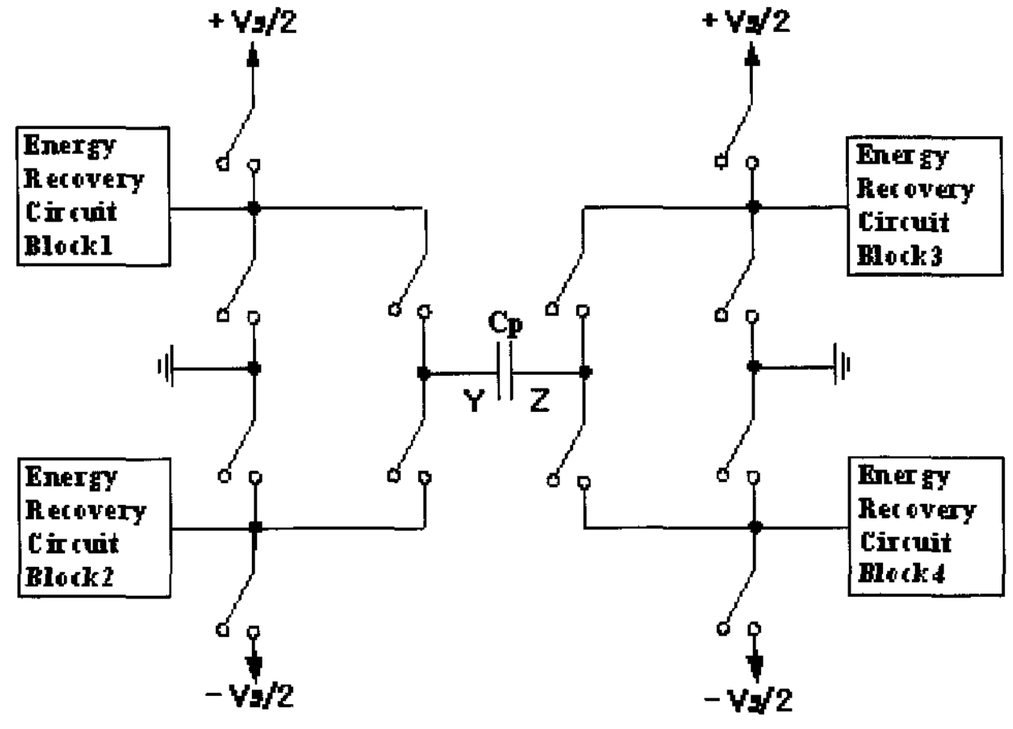


Fig. 3. Sustain block diagram of the first invention of TROPHY method.

needed.

Fig. 2 shows a block diagram of conventional sustain circuits. It has two sustain blocks with Vs level. Fig. 3 shows a sustain block diagram of the first invention of this method. It consists of four sustain blocks.

Fig. 4 shows a sustain block diagram and waveform of the second invention of this method. In order to generate proposed sustain pulse waveforms, only two sustain blocks were sufficient Fig. 5.

Therefore, this method has many advantages like low cost, switching loss and improved system reliability including EMI and image sticking.

Also, the electric field between sustain (Y & Z) electrodes and address (X) electrode was lower than the conventional one during the sustain period. Therefore, it is helpful for reducing the image sticking problem.

The proposed circuits are composed of driving parts A and B as shown in Fig. 4. These parts were integrated with the concept of hybrid mono board. Consequently, the hybrid mono board driving is suitable for decreasing noise and driving loss. Furthermore, both simple design and high space flexibility have been successfully achieved as shown in Fig. 6.

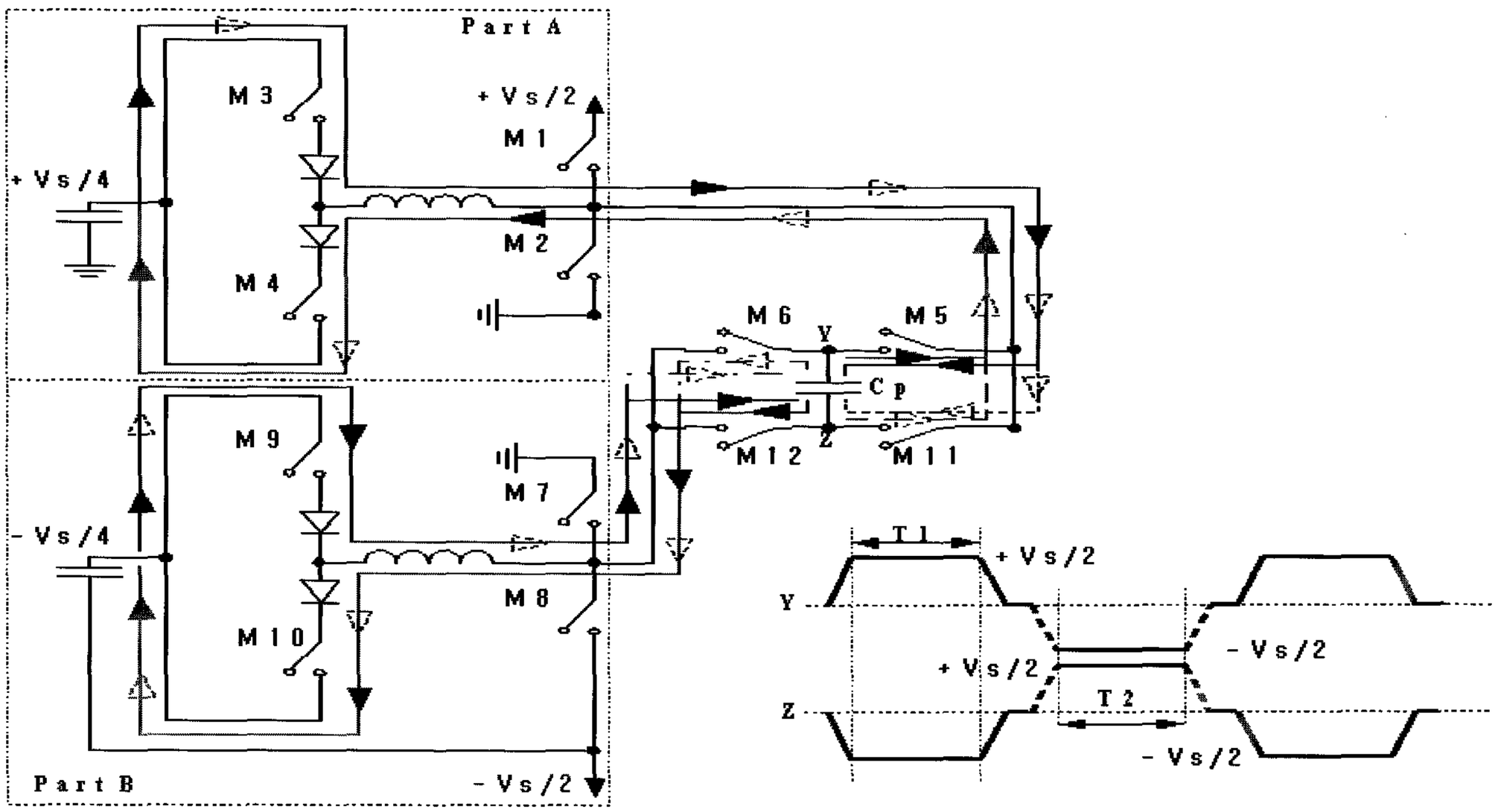


Fig. 4. Sustain block diagram and waveform of the second invention of this method.

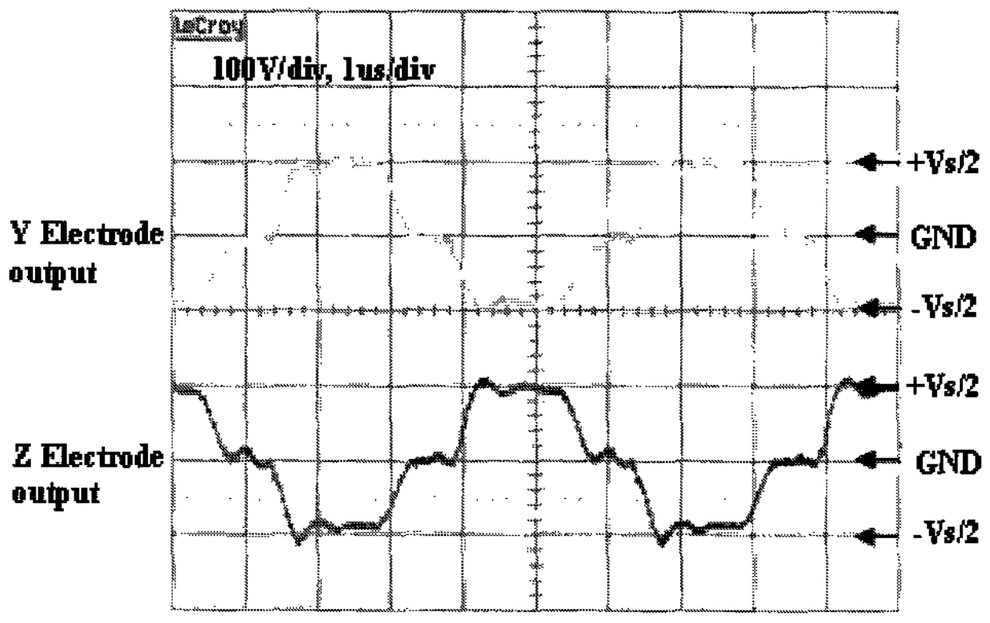


Fig. 5. Experimental waveforms of sustain pulse. (4% window pattern)

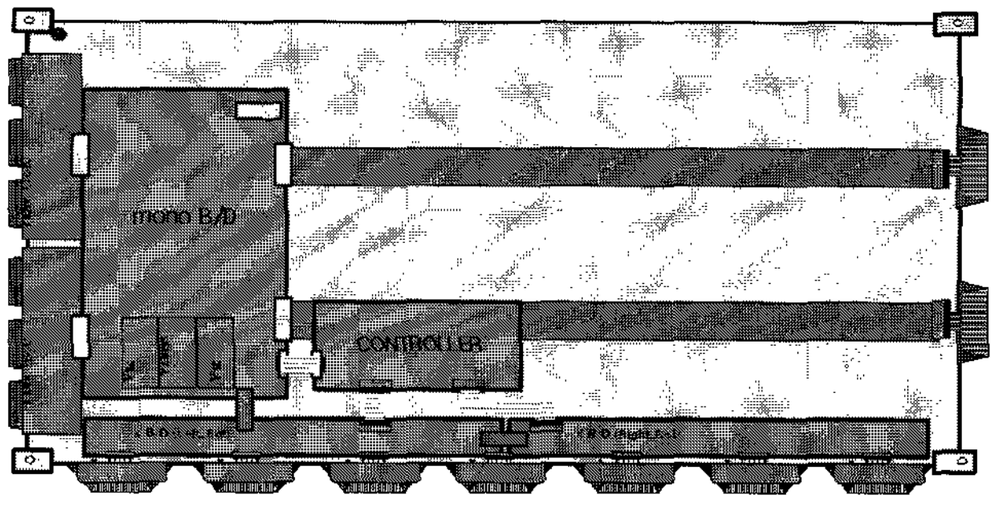


Fig. 6. The concept of Hybrid mono board.

3. Impact

The new driving method, called TROPHY, was applied to 42-inch XGA. We were able to achieve higher system reliability (EMI, image sticking, etc.), higher luminous efficacy, lower power consumption, and lower circuit cost than those of the conventional one with the new driving method.

4. References

[1] "New Driving Method and High Efficient energy Recovery Circuit of AC PDPs", S. H. Moon, E. H. Yoo, G. S. Lim, H. Y. Kim and S. K. See, in *5th Annual Flat Panel Display Strategy and Technology Symp.* (1998), p. 101.

[2] "A New Driving Technology for PDPs with Cost Effective Sustain Circuit", T. Kishi, T. Sakamoto, S. Tomio, K. Kariya, and T. Hirose, in *SID'01* (2001), p. 1236.

[3] "Energy Recovery Sustain Circuit for the AC Plasma Display", Larry F. Weber, in *SID'87* (1987), p. 92.