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4-Channel 3.2/6.4-Gbps Dual-rate Transmitter

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I. INTRODUCTION

As the speed of A/V streaming increases, the transmission-speed requirement of many serial links is continuously increasing. With this, providing flexibility between previous and new versions of serial links for many commercial standards becomes important. This paper demonstrates 4-channel 3.2/ 6.4 Gbps transmitter, in which different amounts of pre-emphasis as well as output swings can be selected. The prototype chip was fabricated using 0.13 μ m CMOS process.

II. DESCRIPTION

The block diagram of the transmitter is shown in Fig. 1. Each of 4 transmitters consists of parallel pattern generator, 16:2 serializer, and pre-emphasis circuit. All 4 transmitters share one PLL as a clock generator, which provides clocks having frequencies of $f/16$, $f/8$, $f/4$, and $f/2$. The desired clock frequency can be selected by an external control signal. The parallel pattern generator offers 16-bit random data having $f/16$ data rate. 16:2 serializer converts 16-bit data into 2-bit data using clocks of $f/16$, $f/8$, and $f/4$ frequencies. Pre-emphasis circuit serializes 2-bit data to 1-bit data using $f/2$ frequency clock, and controls the amount of output swing and pre-emphasis.

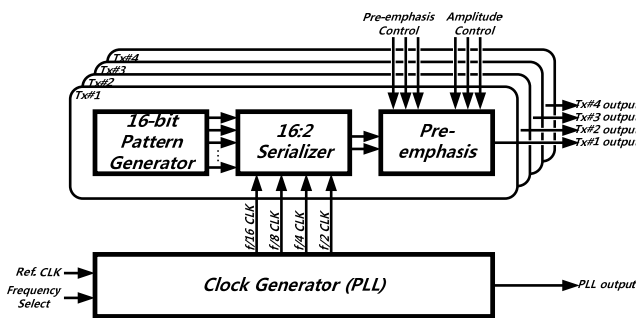


Fig. 1. Block diagram of transmitter

III. CHIP IMPLEMENTAION AND RESULTS

The prototype chip was fabricated using Samsung 0.13 μ m CMOS process. The area of each transmitter is 300 \times 300 μ m² and the area of PLL is 300 \times 400 μ m². Fabricated chip is assembled on board with COB (chip on board) packaging and consumes 600mW from 1.2V supply. PLL operates at 3.2GHz with 7.573ps_{rms} of jitter. Fig. 2 shows measurement results of pre-emphasis and output swing control.

Table 1. Performance of fabricated chip

Process	Samsung 0.13 μ m CMOS
Data Rate	3.2 / 6.4 Gbps
Supply Voltage	1.2 V
Power Consumption	600mW (4ch. Tx + PLL)
Pre-emphasis	1x / 1.5x / 2x / 3x
Output Swing	200 / 300 / 400 / 600 mV _{diff,p2p}
PLL jitter	7.573 ps _{rms}
Area	300 \times 400 μ m ² (Tx 1ch.) 300 \times 300 μ m ² (PLL) 2500 \times 900 μ m ² (including pads)
Transmitter Jitter	31.9 ps _{p2p} (3.2Gb/s) 44.3 ps _{p2p} (6.4Gb/s)

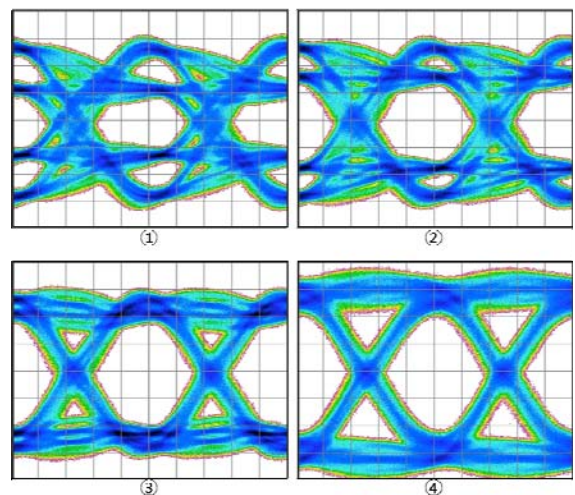


Fig. 2. Measured transmitter output; (1) pre-emphasis 3x, 200mV_{diff,p2p} (2) pre-emphasis 2x, 300mV_{diff,p2p} (3) pre-emphasis 1.5x, 400mV_{diff,p2p} (4) without pre-emphasis 600mV_{diff,p2p}

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