

## PPG40

## 40-Gb/s Pulse Pattern Generator

## KEY FEATURES

- Data rate ranges up to 40+ Gb/s
- Programmable PRBS 7, 15, 23, and 31
- Typical rise/fall time of 13 ps (20% - 80%)
- Programmable error injection rate:  $10^{-3}$ ,  $10^{-6}$ ,  $10^{-9}$ , and 0
- Low data jitter: 500 fs,rms and 3.3 ps,pp @ 32 Gb/s
- Programmable pre-emphasis up to 9-dB boosting
- Compact size: 90 mm x 70 mm x 100 mm
- Differential output swing of 800 mV

## APPLICATIONS

- SerDes and data link testing for 25/28/32 Gb/s
- Tests of 25/28/32-Gb/s TOSA/ROSA
- CFP testing

## DESCRIPTION

The pulse pattern generator (PPG) shows in Fig.1. **PPG40** provides high-quality differential data up to 32 Gb/s and beyond. Driven by external half-rate clocks (i.e., 16-GHz clock input for 32-Gb/s data output), **PPG40** generates true pseudo-random bit sequence (PRBS) of length  $2^7-1$ ,  $2^{15}-1$ ,  $2^{23}-1$ , and  $2^{31}-1$  with programmable injection error rate of  $10^{-3}$ ,  $10^{-6}$ ,  $10^{-9}$ , and 0. **PPG40** achieves differential output magnitude of 800 mV, rms data jitter of 0.5 ps, and peak-to-peak data jitter of 3.3 ps. Typical 20% to 80% rise/fall time is 13 ps. **PPG40** consumes only 5.09 W from a 12-V<sub>DC</sub> supply. The decent performance, compact size, and affordable price makes **PPG40** a great choice of serial-link tester for industrial and research-oriented purposes.

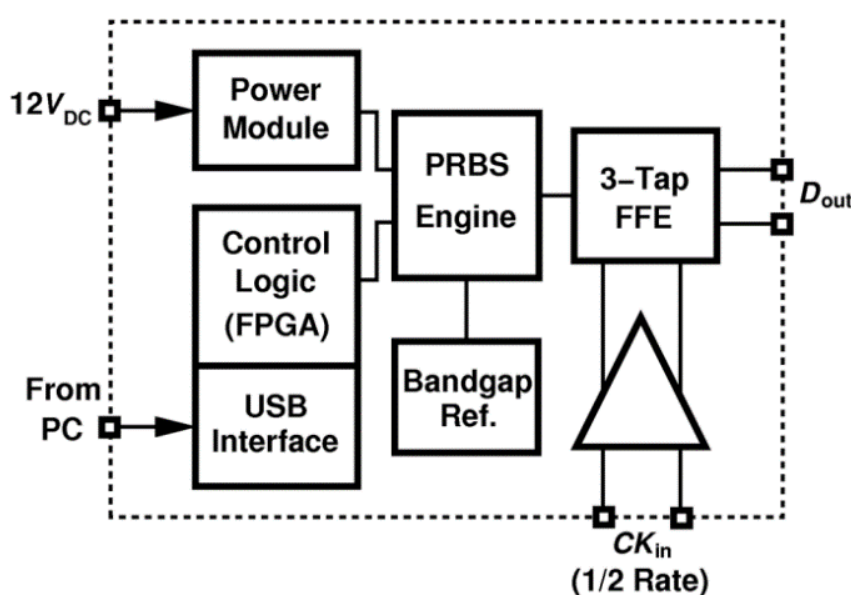


Fig. 1. Functional Block Diagram

## SPECIFICATIONS

| PARAMETER                                                | MIN                                                                                                                    | TYP        | MAX | UNIT             | CONDITIONS/NOTES                            |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------|-----|------------------|---------------------------------------------|
| PPG Overall                                              |                                                                                                                        |            |     |                  |                                             |
| Data Rate                                                |                                                                                                                        |            | 40  | Gb/s             |                                             |
| Data Rate Resolution                                     | continuous, depending on clock input                                                                                   |            |     |                  |                                             |
| Function                                                 | 50Ω output driver, programmable pattern, programmable injection error, external clock input, automatic phase alignment |            |     |                  |                                             |
| Pattern                                                  | PRBS length of 2 <sup>7</sup> -1, 2 <sup>15</sup> -1, 2 <sup>23</sup> -1, and 2 <sup>31</sup> -1                       |            |     |                  |                                             |
| Clock Input                                              |                                                                                                                        |            |     |                  |                                             |
| Frequency                                                |                                                                                                                        |            | 20  | GHz              | 1/2 data rate, differential or single-ended |
| Resolution                                               | continuous, depending on clock input                                                                                   |            |     |                  |                                             |
| Input Power Level                                        | -6                                                                                                                     |            | 8   | dBm              | each port                                   |
| Differential, ac-coupled, 50-Ω terminated, SMA female    |                                                                                                                        |            |     |                  |                                             |
| Data Output                                              |                                                                                                                        |            |     |                  |                                             |
| Swing                                                    |                                                                                                                        | 800        |     | mV <sub>pp</sub> | differential                                |
| Jitter                                                   |                                                                                                                        | 0.5<br>3.3 |     | ps,rms<br>ps,pp  | @32 Gb/s                                    |
| Pre-Emphasis                                             | 0                                                                                                                      |            | 9   | dB               | 3-tap FFE, programmable                     |
| Pre-Emphasis Adjust                                      | 6-bit coefficient setting                                                                                              |            |     |                  |                                             |
| Rise/Fall Time (20% to 80%)                              |                                                                                                                        | 13         |     | ps               |                                             |
| Differential, ac-coupled, 50-Ω terminated, 1.85mm female |                                                                                                                        |            |     |                  |                                             |
| Mechanical & Physical                                    |                                                                                                                        |            |     |                  |                                             |
| Operating Temperature                                    | 0                                                                                                                      |            | 40  | °C               |                                             |
| Adapter                                                  | AC100-240V (50/60 Hz)                                                                                                  |            |     |                  |                                             |
| Power Consumption                                        | 5 W                                                                                                                    |            |     |                  |                                             |
| Physical Dimensions                                      | 190 x 145 x 50 (mm <sup>3</sup> )                                                                                      |            |     |                  |                                             |
| PC Interface                                             | USB                                                                                                                    |            |     |                  |                                             |

## TYPICAL PERFORMANCE

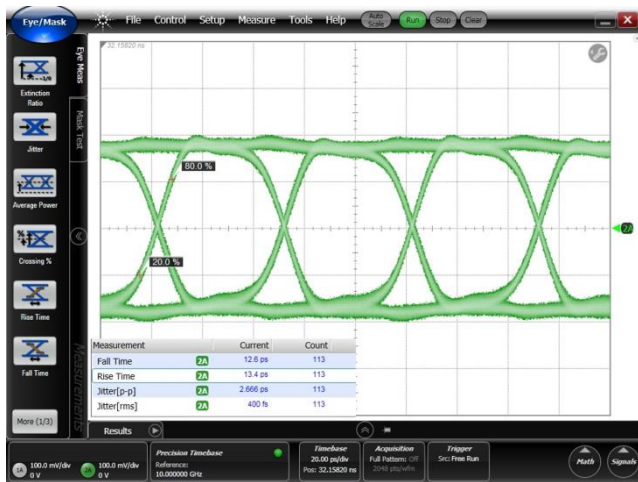


Fig. 2. Output data eye at 20 Gb/s, PRBS 2<sup>31</sup>-1.

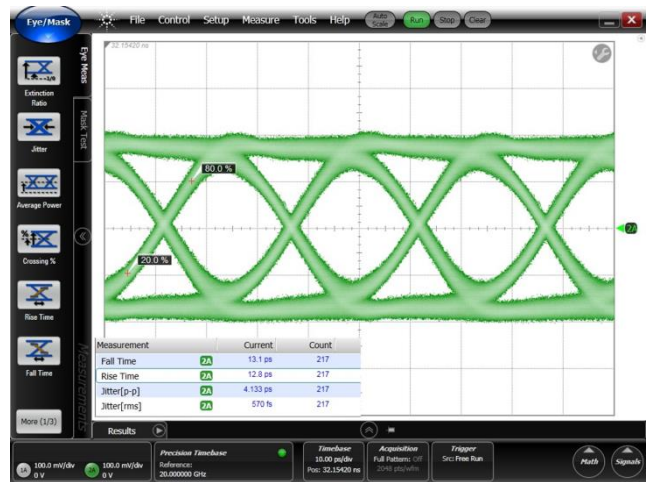


Fig. 5. Output data eye at 40 Gb/s, PRBS 2<sup>31</sup>-1.

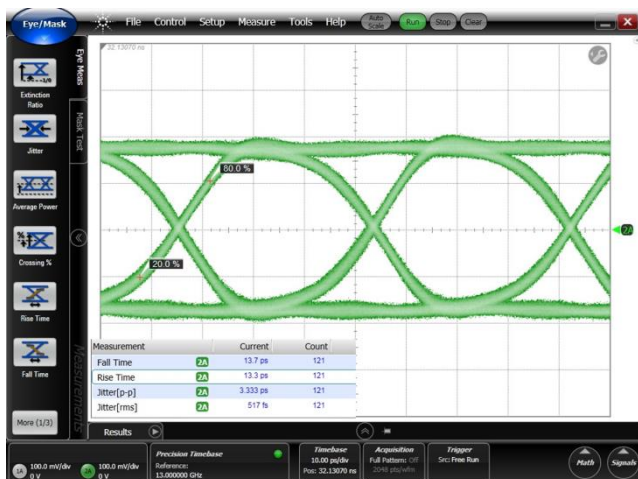


Fig. 3. Output data eye at 26 Gb/s, PRBS 2<sup>31</sup>-1.

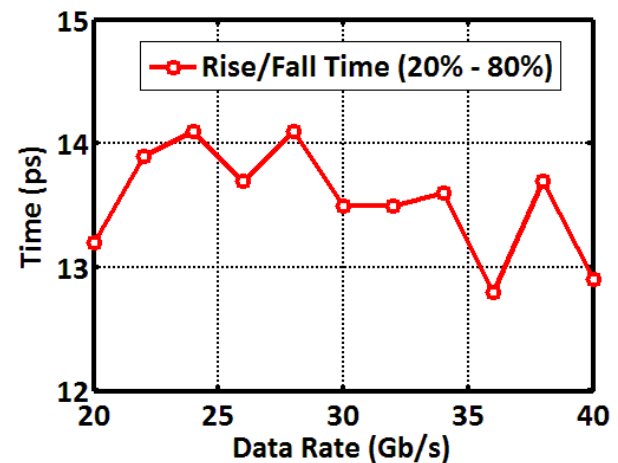


Fig. 6. Rise/fall times.

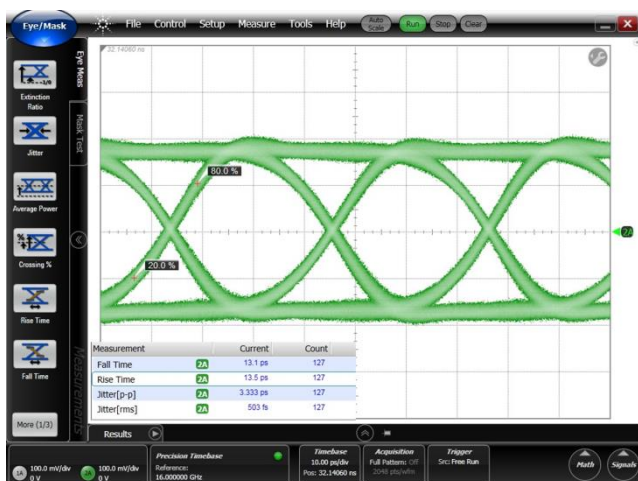


Fig. 4. Output data eye at 32 Gb/s, PRBS 2<sup>31</sup>-1.

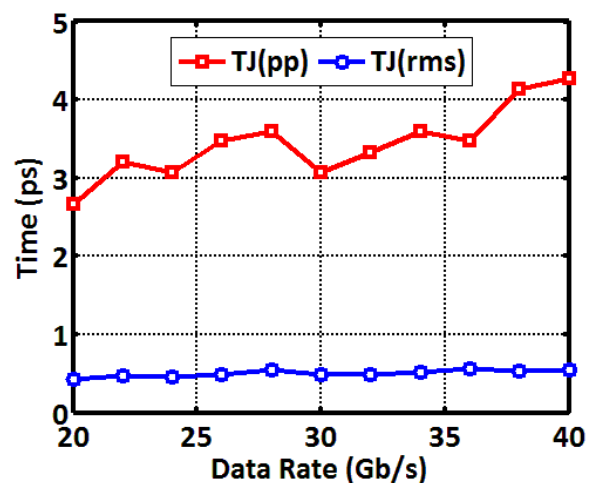


Fig. 7. Output data jitter.

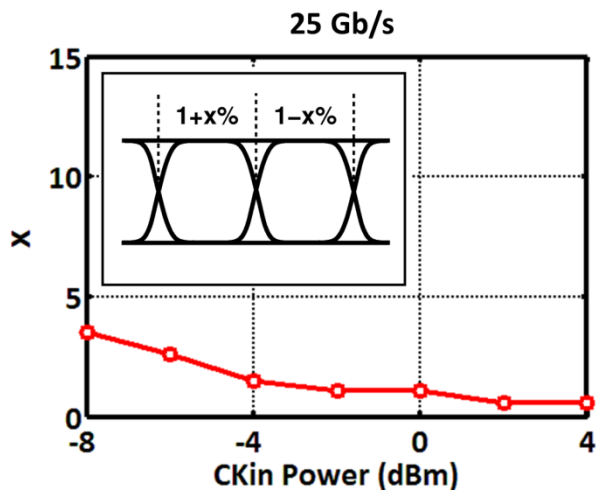


Fig. 8. Bit-width distortion with differential clock input.

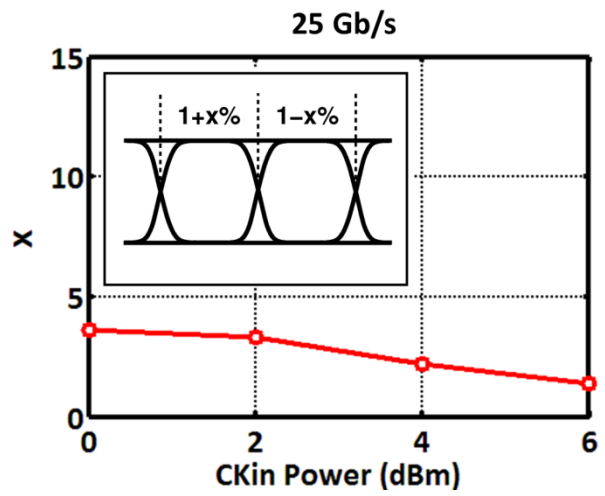


Fig. 9. Bit-width distortion with single-ended clock input.