General

QRBG121 quantum non-deterministic random number (or random bits) generator is based on the **photon emission** in semiconductor LED diodes and subsequent detection of photons via the **photoelectric effect**. Thanks to our patented extraction method and state of the art technology, this device produces binary random bits which are virtually free of bias and correlations at the rate of 12 million bits per second. Main feature of this generator is non-determinism meaning that it can not accept any seed or initial state that would determine future output and that it is not possible to control or predict their output.

Both processes, namely the *photon emission* and the *photoelectric effect*, are random, unpredictable and largely insensitive to environmental or electromagnetic influences. Time intervals between subsequently detected photons form a random Poissonian variable used to generate random bits according to our original patented method. In essence this method looks at pairs of random intervals and generates logic "0" if the first interval in the pair is greater than the second, and logic "1" if the first interval in the pair is smaller than the second. Because independent random events are used to produce different bits, each bit produced by this generator is independent of any other bit produced in the past or in the future.

OEM port

OEM port is realized with a 10-pin IEC jack and can be used for the serial output of the random bits and powering of the unit. With the OEM port the QRBG121 generator can be used as a standalone unit in applications which do not require the USB2.0 interface. One can read random bits at a full device speed from the OEM port.

The outputs are standard 5V CMOS compatible and can be used to directly drive 74HC, 74AC and 7LVC family logic.

Random data appear at the OEM port in the serial manner. There are three output lines (outputs): **Data**, **Clock** and **Strobe**. At each positive going edge of the Clock the corresponding Data value (logic 0 or 1) is already present at the Data output (see Fig. 1). Furthermore, the Strobe pulse appears just after every eighth Clock and can be used to trigger the data latching in a serial-in-parallel-out shift register, as shown on the Fig 2. If the standard 10-wire flat computer cable is used (Fig 3) it is important that the serial terminating resistances of 100 Ohm are deployed, or a devastating "ringing" may occur and deteriorate both the speed and the randomness quality. Fig. 1 shows the timing diagram of the three outputs, as measured at the end of 20 cm long flat cable with 100 Ohm serial termination.

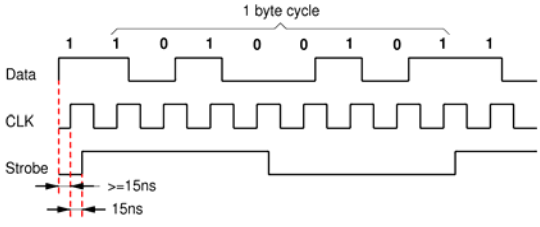

Fig. 1. Timing diagram of QRBG121 random number generator, OEM port

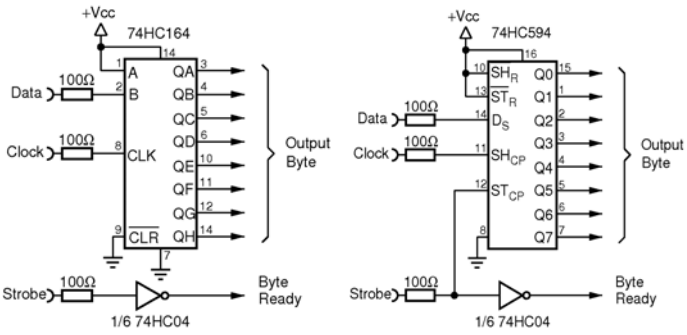

Fig. 2. Unlatched (left) and latched (right) examples of serial-to-parallel conversion for QRBG121 random number generator

Fig. 3. OEM port cable

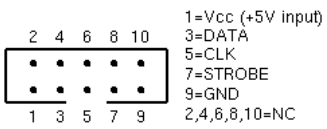

Fig. 4. OEM port IDC 10-pin connector pinout