

## Description

The 8V97003 is a high-performance wideband microwave Synthesizer / Phase Lock Loop (PLL) that generates output frequencies up to 18GHz from an integrated Voltage Controlled Oscillator (VCO) offering an octave of frequency tuning range. The device also offers a high-performance 32-bit fractional feedback divider and an output divider to allow users to fully benefit from the wideband characteristics of the VCO.

The device's figure of merit (FOM) of -237dBc/Hz and the excellent VCO performance allow for very low phase noise and RMS phase jitter.

The 8V97003 offers a very low output-to-output and input-to-output phase skew drift in temperature of  $< 7^\circ$  across the entire ambient temperature range ( $< 1^\circ$  of phase skew drift per degree Celsius of temperature variation, on average), reducing radio path recalibration occurrences in beamforming applications, such as 5G radio card massive MIMO systems.

The output drivers have programmable output power settings and can deliver high single-ended output power up to +13dBm at 6GHz, up to +10dBm at 12GHz, and up to +4dBm at 18GHz when using inductively loaded output terminations, and with the outputs being double terminated. When the outputs are resistively loaded, the output drivers can deliver single-ended output power up to +8dBm at 6GHz, and up to +6dBm at 12GHz. The output power can be further increased when using differential outputs and measuring the output power differentially.

The 8V97003 relies on a single 3.3V power supply and offers low noise integrated LDOs for excellent power supply noise immunity.

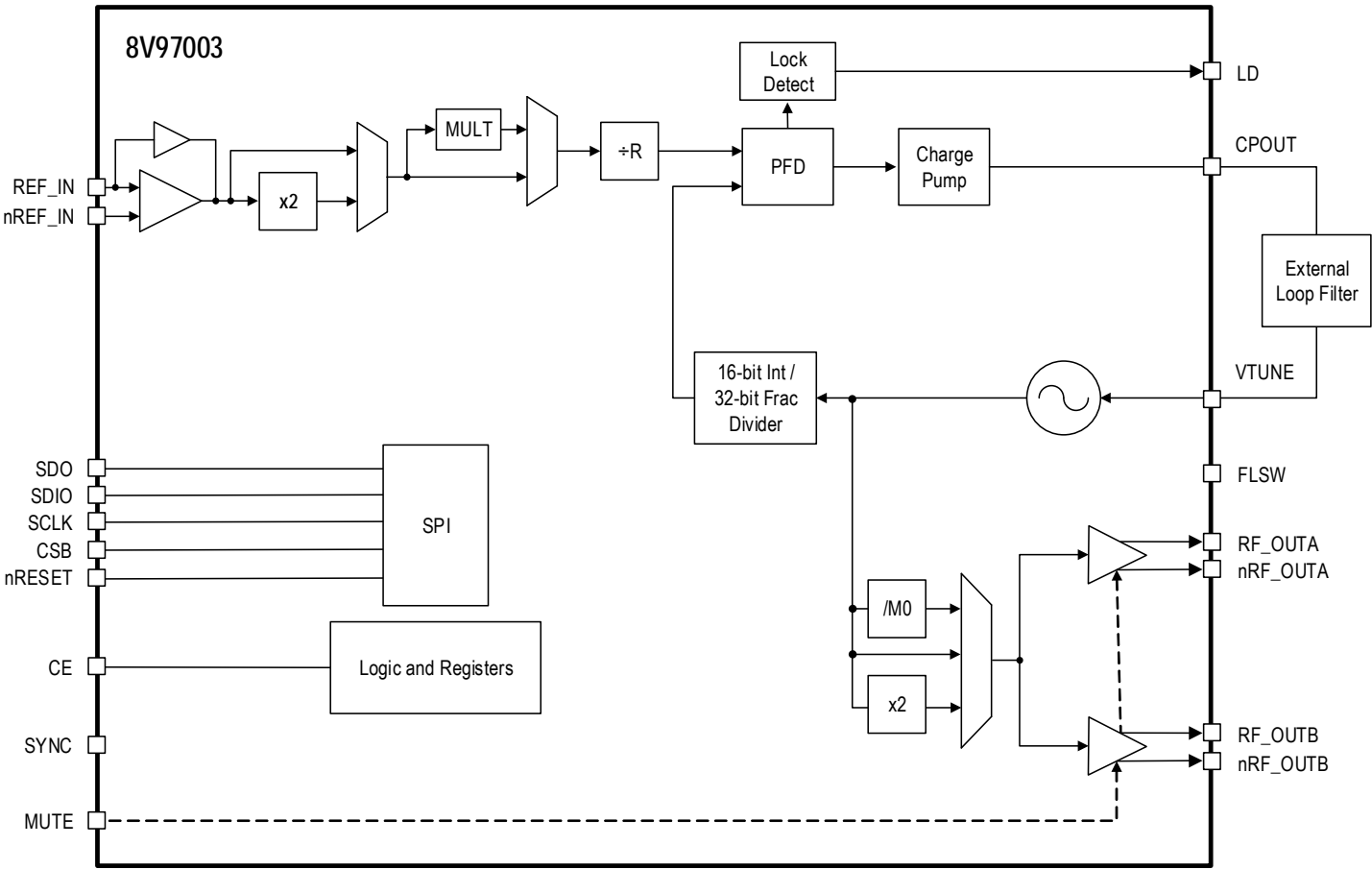
## Typical Applications

- 5G millimeter wave wireless infrastructure
- Massive MIMO
- Phase Array Antennas and beam forming
- Wireless backhaul
- Point-to-point and point-to-multipoint microwave links
- Satellites / VSATs
- Test equipment/instrumentation
- Clock generation
- High-speed RF converters sampling clocks
- Radar

## Features

- Output frequency range: 187.5MHz to 18GHz
- Ultra-low phase noise VCO
  - -60dBc integrated phase jitter (34fs rms jitter) from 20kHz to 100MHz at 6GHz
- Figure of Merit: -237dBc/Hz
- Input reference frequency:
  - 10MHz to 1GHz (LVPECL, LVDS)
  - 10MHz to 250MHz (LVCMOS)
- Fractional-N synthesizer and integer-N synthesizer
- 32-bit of fractional and modulus resolution
- Phase frequency detector (PFD) operation up to 500MHz (Integer mode) or 250MHz (Fractional mode)
- Programmable RF output power levels
- RF output power  $< \text{TBDdBm}$  when in MUTE
- Programmable input multiplier (MULT) to increase PFD frequency when using a low input frequency
- $-40^\circ\text{C}$  to  $+95^\circ\text{C}$  ambient temperature range; and up to  $+105^\circ\text{C}$  case temperature
- 3.3V single power supply operation
- $7 \times 7$  mm 48-VFQFPN package
- SPI interface is compatible with 1.8V logic and tolerant to 3.3V
- Supported in the Timing Commander™ design tool

Block Diagram



## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES ("RENESAS") PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.