

**FEATURES**

- RF input/output frequency range: 24 GHz to 29.5 GHz**
- Two upconversion modes**
  - Direct conversion from differential baseband I/Q**
  - Single-ended, complex IF to RF, single-sideband upconversion**
- Two downconversion modes**
  - Direct conversion from RF to differential baseband I/Q downconversion**
  - Single-ended complex IF image rejection conversion**
- LO input frequency range: 5 GHz to 15 GHz**
- LO doubler or quadrupler for up to 30 GHz**
- Matched, 50  $\Omega$ , single-ended RF input and output**
- Matched, 50  $\Omega$  single-ended LO input**
- Temperature compensation circuits to minimize temperature variations**
- Programmable baseband I/Q common mode-voltage**
- Receiver and transmitter gain and power control through fast settling DSA**
- Low phase variation vs. gain control**
- Fast TDD switching time via external pins**
- Upconversion mode**
  - Sideband rejection and carrier feedthrough optimization**
  - Envelope detector for LO feedthrough calibration**
- Downconversion mode**
  - Image rejection and IQ imbalance optimization**
  - Baseband I/Q dc offset correction**
- Receiver mixer power detector for receiver gain setting**
- LO chain features**
  - $\times 2$  and  $\times 4$  modes**
  - Variable gain to accommodate various LO drive strength values**
- $>360^\circ$  phase control shifter for LO synchronization, separate settings for receiver and transmitter modes**
- Programmable via a 3-wire SPI interface**
- 60-terminal, 9 mm  $\times$  8 mm, LGA packaging**
- Common-mode input pin to track desired common mode to ADC, 0.75 V to 2.15 V voltage range**

**APPLICATIONS**

- 5G applications**
- Point to point microwave radios**
- Radar and electronic warfare systems**
- Instrumentation and automatic test equipment (ATE)**

**GENERAL DESCRIPTION**

The ADMV1017 is a silicon germanium (SiGe), microwave, upconverter and downconverter optimized for 5G radio designs operating in the 24 GHz to 29.5 GHz frequency range.

The upconverter offers two modes of frequency translation. The device is capable of direct conversion to radio frequency (RF) from differential baseband I/Q input signals, as well as single-sideband (SSB) upconversion from complex intermediate frequency (IF) inputs. Alternatively, the differential baseband I/Q input path can be disabled and a modulated, single-ended, complex IF signals from 3 GHz to 10.5 GHz can be fed to the IF path. These signals can then be upconverted to 24 GHz to 29.5 GHz while rejecting the unwanted sideband by typically better than 25 dBc. The serial port interface (SPI) provides adjustment of the quadrature phase to allow optimum sideband rejection. In addition, the SPI interface allows powering down the output envelope detector to reduce power consumption when carrier feed through optimization is not necessary.

The downconverter offers two modes of frequency translation. The device is capable of direct quadrature demodulation to differential baseband I/Q output signals, as well as image rejection downconversion to a single-ended complex IF output carrier frequency. The differential baseband outputs can be dc-coupled. More typically, however, the I/Q outputs are ac-coupled with a sufficiently low high-pass corner frequency to ensure adequate demodulation accuracy. The I/Q baseband output common-mode voltage is programmable between 0.75 V and 2.15 V. The SPI interface provides fine adjustment of the quadrature phase to optimize I/Q demodulation performance. Alternatively, the baseband I/Q outputs can be disabled, and the I/Q signals can be passed through an on-chip, active balun to provide two, single-ended, complex IF outputs between 3 GHz and 10.5 GHz. When the device is used as an image rejecting down-converter, the unwanted image term is typically rejected to better than 25 dBc below the desired sideband. The ADMV1017 offers a square law power detector to allow monitoring of the power levels at the mixer inputs. The detector output provides closed-loop control of the RF digital step attenuator via an external automatic gain control (AGC) loop.

The ADMV1017 upconverter and downconverter is housed in a compact, thermally enhanced, 9 mm  $\times$  8 mm, land grid array (LGA) package. The ADMV1017 operates over the  $-40^\circ\text{C}$  to  $+95^\circ\text{C}$  case temperature range. Throughout the figures in this data sheet, Rx means receiver and Tx means transmitter.

For more information about the [ADMV1017](#), contact Analog Devices, Inc., at [mmWave5G@analog.com](mailto:mmWave5G@analog.com).

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