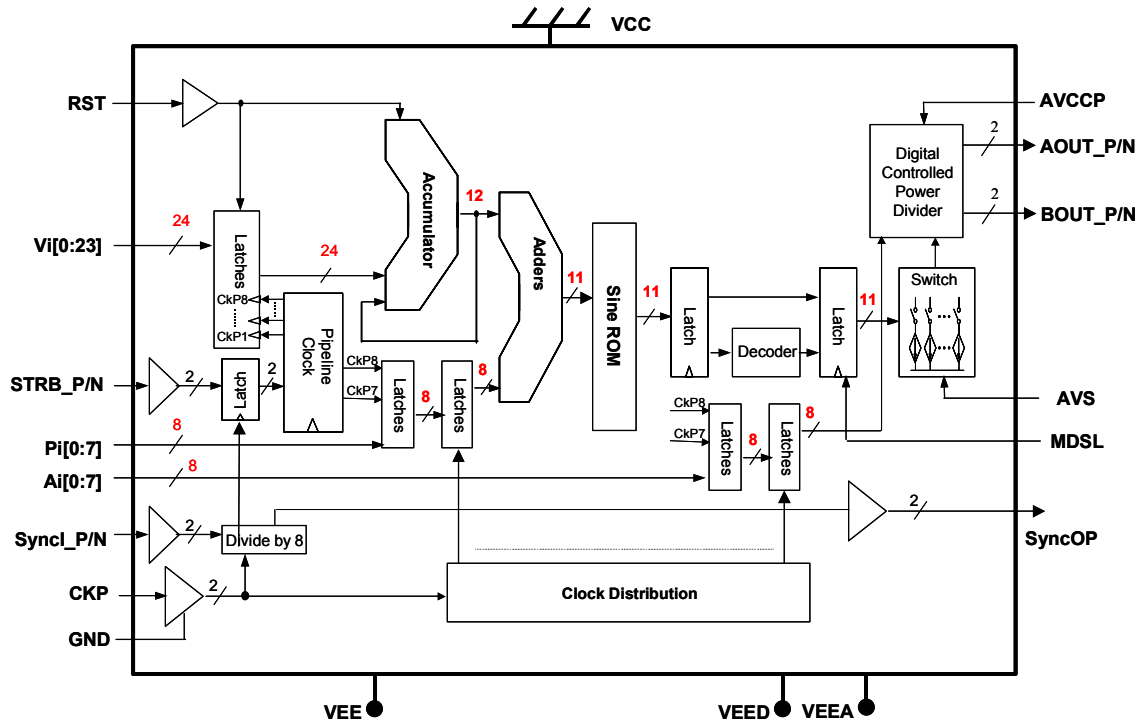


## DS875A – Direct Digital Synthesizer with Phase and Amplitude Modulation Ports



### KEY FEATURES

- Integrated FM, PM and AM functions in one chip suitable for direct polar modulation or QAM applications
- 24-bit frequency tuning word
- 8-bit phase modulation inputs synchronized with frequency/amplitude word inputs
- 8-bit amplitude modulation inputs synchronized with frequency/phase word inputs
- 12-bit ROM phase address resolution
- On chip DAC with 11 bit linearity
- Clock rate up to 2.5 GHz
- Analog outputs selectable between Normal-Hold format and Return-to-Zero format.
- Sine wave generation up to 1.2 GHz 1<sup>st</sup> Nyquist band for Normal-Hold mode or 3.7 GHz 3<sup>rd</sup> Nyquist band for Return-to-Zero mode.
- Broadband worst SFDR > 50 dBc (DC to 1.2-GHz 1<sup>st</sup> Nyquist Bandwidth) at a 2.5 GHz clock rate
- Complementary analog waveform outputs with 50 Ω back terminations
- **SyncI\_P/N** synchronizes multiple chip applications
- **SyncOP** provides reference for data loading and synchronizes STROBE signals.
- LVTTTL/CMOS frequency word and phase modulation word digital inputs
- Asynchronous Reset (**RST**) pin to initiate starting phase state set by phase bit inputs
- Strobe inputs (**STRB\_P/N**) to update the frequency word, phase word and amplitude word of DAC outputs

- Wide data loading window allow **DS875A** to be controlled by memory, micro-controller, FPGA or DSP chips to update frequency word and/or phase word as fast as 8 clock cycles without clock slipping or glitches during frequency or phase transition
- 3.9 W power consumption with a single -5V power supply
- 64-pin QFN package

## **Description**

The **DS875A** is a high-speed Direct Digital Synthesizer (DDS) with both phase modulation and amplitude modulation input ports designed for direct polar modulation or QAM applications. It has frequency tuning resolution of 24 bits, phase modulation input of 8-bits and amplitude modulation input of 8 bits. The internal ROM has phase resolution of 12-bit and the internal DAC has amplitude resolution of 11 bits. The analog outputs of DAC can be selected between Normal-Hold mode (for the 1<sup>st</sup> Nyquist band ) and Return-to-Zero mode (for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Nyquist band) operation. Sine waves can be generated up to 1<sup>st</sup> Nyquist band near 1.2 GHz (at a 2.5-GHz clock rate) with Normal-Hold mode of DAC or up to 3<sup>rd</sup> Nyquist band around 3.7 GHz with Return-to-Zero mode of DAC. The initial phase can be reset to any degree, determined by phase bit inputs, to start with. The chip has a pair of complementary analog outputs with 50-Ω back terminations. The DAC analog output was digitally controlled to 256 levels by 8-bit digital inputs. The frequency of output waveforms can be controlled by the 24 frequency control bits, **Vi[0:23]**. The phase of output waveforms can be modulated by the 8-bit **Pi[0:7]** phase modulation inputs and the analog outputs can be modulated by the 8-bit **Ai[0:7]**. Amplitude modulation inputs. The **DS875A** accepts a single-ended clock input and features 50-Ω on-chip back terminations to ground. Both the frequency word, phase word and amplitude word inputs accept LVTTTL/CMOS input levels. Differential synchronization input **SyncI\_P/N** provides synchronization for multiple chip applications and start each chip with the same phase of synchronization outputs **SyncOP** ready to accept frequency word, phase word, amplitude word and strobe inputs. The synchronous Strobe inputs are latched by internal generated divide-by-8 clocks which were also sent to the output pin **SyncOP**. **SyncOP** can be used as a reference to synchronize the frequency word, phase word, amplitude word and strobe signal input timing alignment to the internal divide-by-8 clock to latch all the inputs properly. The Reset is asynchronous to minimize clock latencies of effectiveness on the analog outputs. The internal timing was optimized to avoid clock slipping during frequency word and/or phase, amplitude word transition or after reset. The analog outputs of DAC can be selected between Normal-Hold mode (for the 1<sup>st</sup> Nyquist band ) or Return-to-Zero mode (for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Nyquist band) operation. Combining with selectable filters, effectively ultra-broadband signals from DC to the 3<sup>rd</sup> Nyquist band can be generated. Only a single -5V power supply is required.