

About the ToPSync® ACS9522T

This is the datasheet for the ToPSync® ASSP ACS9522T. The datasheet should be read in conjunction with the ACS9522T user guide, API documentation and other information available at the ToPSync® Resource Center.

There are many applications in which it is necessary to lock a remote clock signal to a central frequency source, and there are other applications which require the alignment of a clock to a central source of time. The ACS9522T combines Semtech's synchronous equipment timing source (SETS) functionality and ToPSync® packet timing technology and can therefore be used for both applications. In this datasheet, the words SETS and TDM Block are synonymous, and both terms are used.

SETS functionality is used for frequency-locking applications in SDH/SONET and Ethernet equipment. ToPSync® technology combines the IEEE 1588 v2 protocol with Semtech's patented packet delay filtering algorithms, which allow a reference clock to be transported across a packet switched network without special adaptations of switches or routers in the network. It is ideal for carrying timing across a legacy packet switched network. IEEE 1588 is often known as precision time protocol (PTP), the acronym that is generally used in this document. The ACS9522T supports:

Timebase derived from:

PTP slave, SONET/SDH recovered clock, BITS/SSU input, SyncE recovered clock, GPS, 1PPS, precision holdover. Physical layer clock sources are jitter and wander attenuated according to G.812, G.813, G.8261, G.8262, GR-1244-CORE, GR253 etc.

Technology bridging:

Derive timing from one input technology (SONET, SDH, SyncE, PTP) and provide timing to all output technologies simultaneously.

PTP Grandmaster:

PTP Grandmaster functions provided based on the timebase, including support for UTC, TAI, GPS time epochs.

PTP Slave:

Acting as a PTP Ordinary Clock in Slave mode, the ACS9522T can lock to BCs or TCs, or it can use sophisticated packet delay filters and adaptation algorithms to lock to a remote PTP Grandmaster over a multi-hop legacy network which has no PTP support.

TDM/clocks:

Includes all Semtech SETS family functions for physical layer input and output synchronization.

SyncE:

Integrates Semtech eSETS technology for the physical layer input and output synchronization of ethernet PHY devices.

Self test - the device self-checks for consistency and performs rudimentary checks of the external Ethernet PHYs.

Features

PTP timing features

- **PTP Grandmaster selection** - automatic or manual PTP master/slave mode selection.
- **Powerful network delay analysis** - full time-alignment in the slave over hostile networks (Layer 2 or layer 3 networks).
- **Dynamic adaptation** - to network delay variations. Network loading change tolerant (e.g., ramps and steps).
- **Time alignment** - better than $\pm 1 \mu\text{s}$ on a managed 10-switch GbE network under G.8261 test conditions.*
- **Frequency alignment** - better than $\pm 10 \text{ ppb}$ on a managed 10-switch GbE network under G.8261 test conditions.*

TDM timing features

- **Programmable TDM timing bandwidth** - for wander and jitter tracking/attenuation, 0.1 Hz to 70 Hz in 10 steps.
- **Automatic hit-less source switchover** - on loss of input.
- **Output clock phase adjustment** - in 6 ps steps to $\pm 200 \text{ ns}$.

Device features

- **Fully integrated** - Integrates hardware precision timestamping with on-the-fly insertion. Powerful integrated processor and clock recovery algorithm for PTP.
- **Ultra low noise clock generation** - Interface to the Semtech ACS1790 Ultra low noise frequency synthesizer.
- **Timing synchronization on a chip** - supporting transitions from legacy circuit networks to new packet technology.
- **Suitable applications** - Stratum 3, 3E, 4E, 4, SONET Minimum Clock (SMC) or SONET/SDH Equipment Clock (SEC) or Ethernet, IEEE1588 PTP, Synchronous Ethernet, Ethernet Equipment Clock.
- **Clocks** - 18 clock inputs and 11 clock outputs.
- **Precision holdover** - in all modes.
- **Ports** - 2 x SGMII, serial interface and JTAG.
- **Time-of-day** - PPnS top-of-second signal plus current-time-since-epoch message on a UART.
- **Output characteristics:**
 - Time-aligned output pair:*
1 PPS and 125 MHz divided by n (n = 4 to 125000).
 - Frequency-aligned outputs:*
1 Hz and programmable frequency 1 kHz to 180 MHz.
 - Low jitter frequency-aligned outputs:*
SONET and SDH OC-n rates: 3.84 MHz to 155.52 MHz.
SyncE rates: 25 MHz, 50 MHz, 62.5 MHz and 125 MHz
- **Local oscillator:** $\pm 20 \text{ ppm}$ or better.
- **LPGA package:** 324 pin, 19 mm x 19 mm. Lead-free - RoHS and WEEE compliant.
- **External RAM** not required.

A simplified system diagram is shown in [Figure 1](#).

* This is an indication of Semtech tested performance and is not guaranteed across all types of switches and network conditions. Please contact Semtech ToPSync® support for further details.

System diagram

Clock reference sources
 UTC time reference (ToD Info + 1 PPS clock)
 GPS (ToD Info + 1 PPS clock)
 ARB (ToD Info + 1 Hz clock)

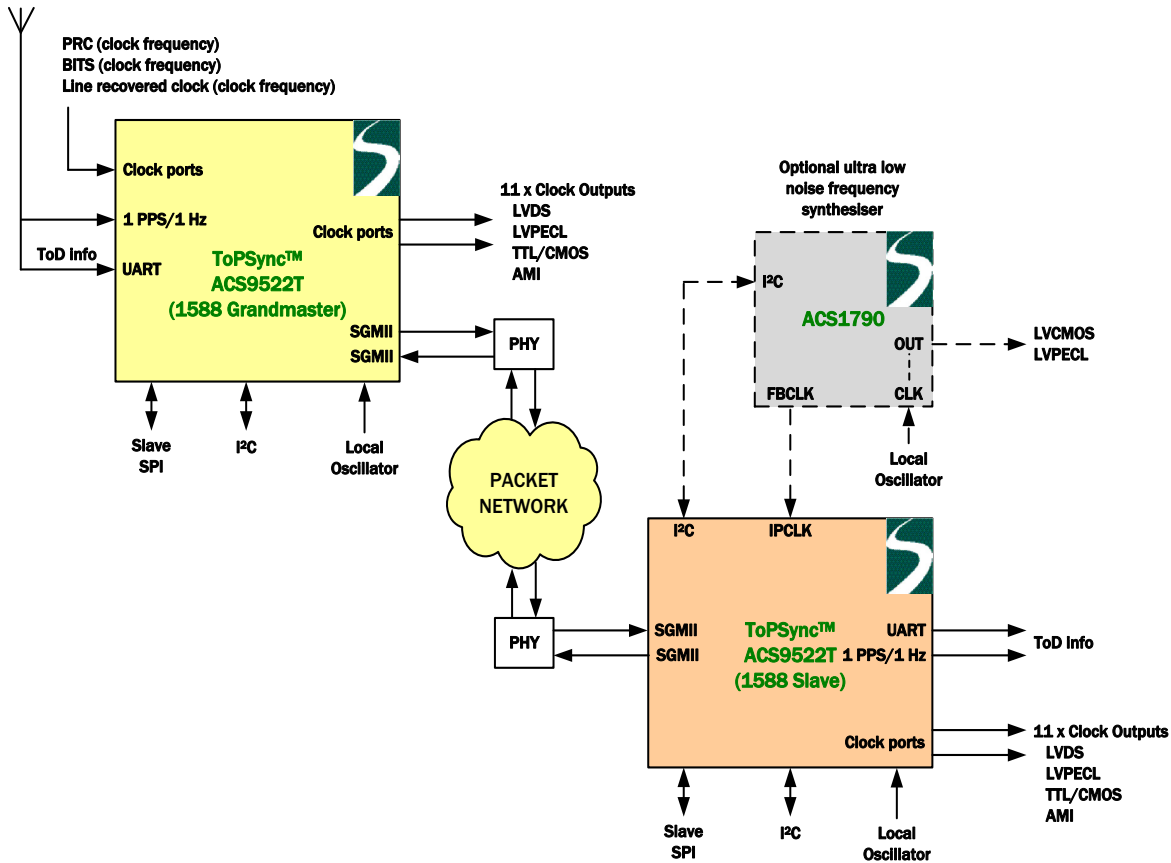


Figure 1 Simplified system diagram - ACS9522 ToPSync® in PTP Grandmaster and Slave modes

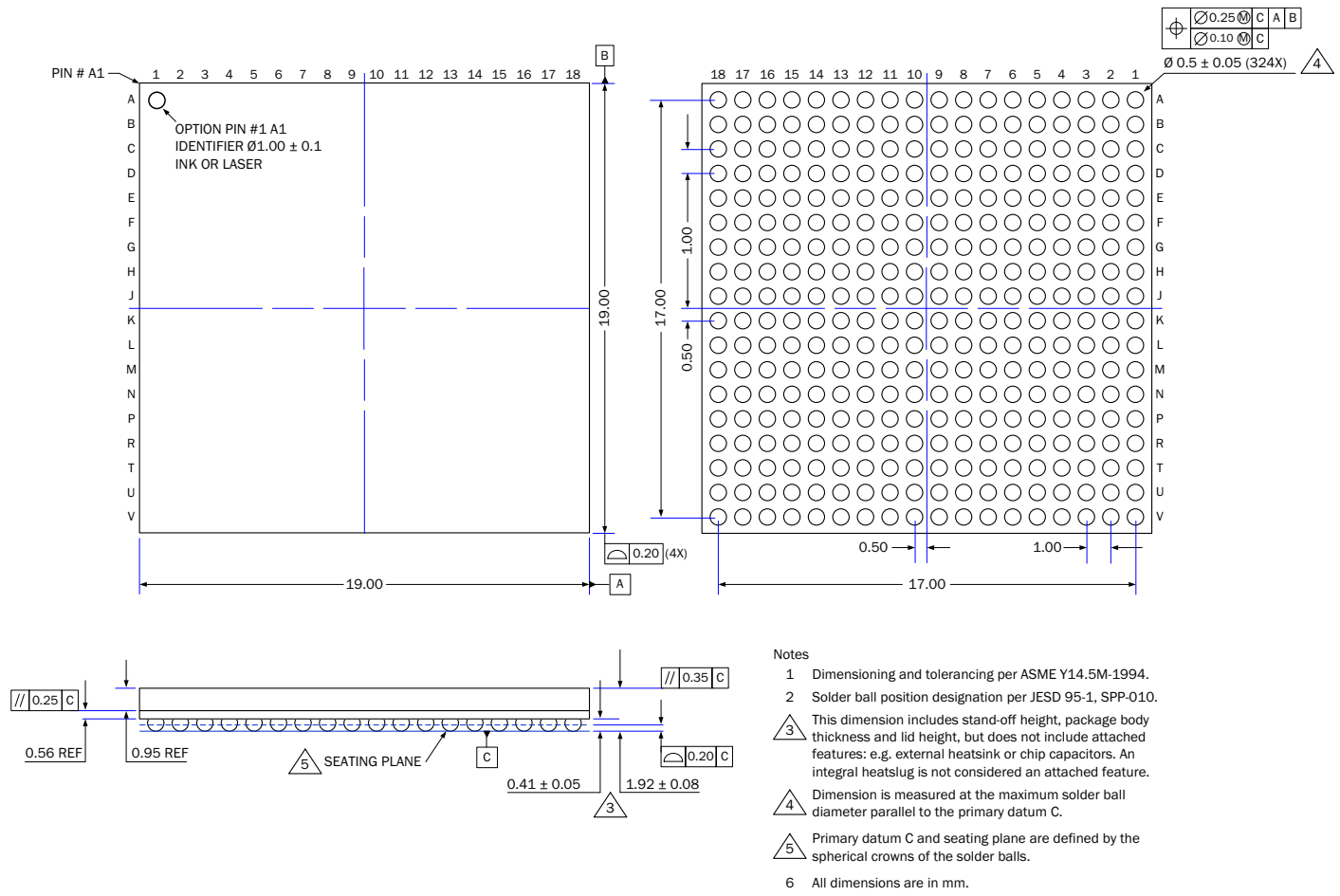


Figure 2 LPGA package, 1.0 mm pitch, 19 mm x 19 mm x 1.92 mm, 324 balls

Thermal conditions

The ACS9522T is rated for full temperature range when this package is used with a PCB of eight layers or more.

Copper coverage must exceed 50%.

All balls must be soldered to the PCB.

Maximum operating temperature must be reduced, or an airflow of 1 m/s must be used, when the ACS9522T is used with a PCB that does not meet these requirements.

Disclaimers

Life support - this product is not designed or intended for use in life support equipment, devices or systems, or other critical applications, and is not authorized or warranted for such use.

Right to change - changes may be made to this product without notice. Customers are advised to obtain the latest version of the relevant information before placing orders.

Compliance to relevant standards - operation of this device is subject to the user's implementation and design practices. It is the responsibility of users to ensure that equipment using this device is compliant to all relevant standards.

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