MEMS Timing Solutions

ADAS Computer / Sensor Fusion

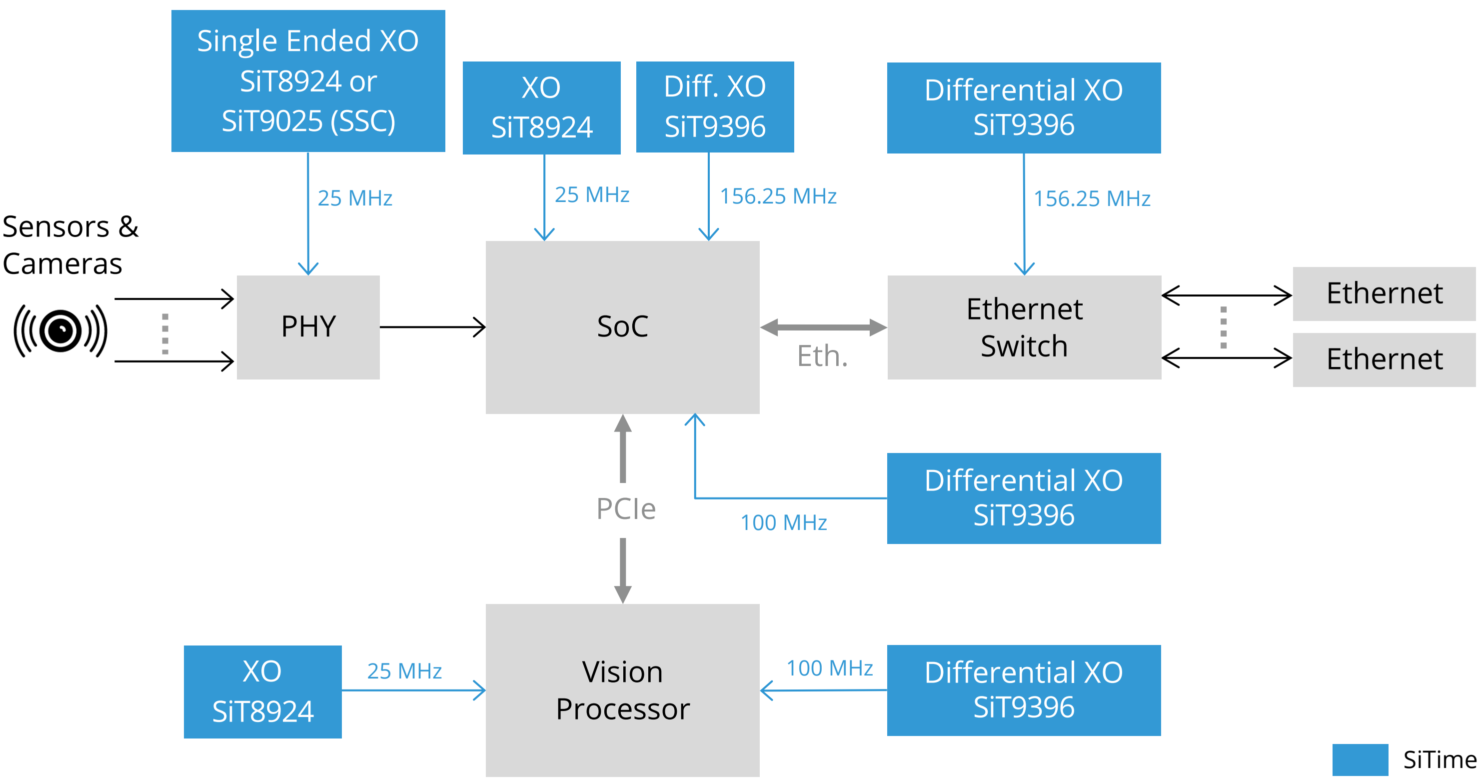
Precision Timing in ADAS Computers

ADAS (advanced driver assistance system) computers are the brains of tomorrow's self driving cars. They collect data from various sensors such as Radar, Lidar and Camera systems. The data is processed, "driving" decisions are made, and control commands are issued to the various systems of the vehicle (powertrain, steering, brakes, etc.)

Key Considerations

- Reliability, Functional Safety
- Low jitter
- High temperature
- Fast system start-up
- EMI

Block Diagram



ADAS computers require many clocks:

- A low jitter clock is essential to ensure proper PHY operation since data input usually occurs through a PHY (such as MIPI A-PHY, FPDLink, GMSL, etc.).
- PCI-Express is widely used for on-board, device-to-device data exchange. This requires 100-MHz differential clocks, possibly with spread spectrum – the SiT9025 is perfect for EMI reduction.
- Multi-GB Ethernet for communications require 156.25-MHz differential, low jitter clocks.
- SoC, processors and other devices require general purpose clocks.

See also the Application Brief on Automotive Cameras.

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Featured products – please refer to the Selector Guide for more options

Type	Product	Frequency	Key Features	Key Values
Single-ended oscillator	SiT8924	1 to 110 MHz	• Up to -55°C to +125°C • ±20 ppm stability • 2016, 2520, 3225 packages	• High reliability • Extended temperature range • EMI reduction features • Small footprint • Low power • Low jitter enables highest speed links
	SiT9025	1 to 150 MHz	• Up to -55°C to +125°C • Spread spectrum • Configurable rise / fall times • 2016, 2520, 3225 packages	
	SiT1625	44 standard frequencies incl. 25 MHz (SiT1625A) for FPD-Link IV ADAS	• -40°C to +125°C • ±25, ±30, ±50 ppm stability • 1612, 2016, 2520, 3225 packages • 500 fs RMS jitter[1] • 2.3 mA typ. current consumption	
Differential oscillator	SiT9396	1 to 220 MHz	• Low jitter: < 150 fs RMS[1] • ±30 ppm or ±50 ppm stability • LVPECL, LVDS, HCSL, Low-power HCSL, FlexSwing™ • -40°C to +125°C • 2016, 2520, 3225 packages	• High reliability • Low jitter • Enables interfaces with demanding jitter requirements, such as PCI-Express and 10 GB Ethernet
	SiT9397	220 to 920 MHz		
Super-TCXO DCXO/ VCXO	SiT5386	1 to 60 MHz	• 1 to 220 MHz • ±0.1, ±0.2, ±0.25 ppm stability • ±1 ppb/°C frequency slope • -40°C to 105°C • Low jitter: 0.31 ps RMS[1] • Optional voltage or digital frequency control	• High accuracy • Excellent frequency stability even with fast temperature gradients • No GNSS signal loss or V2X disconnect, as the MEMS resonator is not subject to "micro-jump" like crystal oscillators
	SiT5387	60 to 220 MHz		

[1] 12 kHz to 20 MHz integration range

Key concerns of designers:

- Reliability
- Functional safety
- High temperature requirements
- Fast system startup time required (usually < 100 ms)
- EMI

SiTime advantages:

All SiTime devices offer the following advantages over quartz crystals, which are particularly important for automotive applications:

- Up to 50x better reliability: Apart from reducing the amount of field failures, the better reliability translates into a lower FIT rate. This provides better Hardware Safety metrics in an FMEDA, the quantitative analysis required as part of a Functional Safety assessment.
- Up to 100x better resilience to shock, vibration and electromagnetic interference, due to the smaller size (0.4 x 0.4 mm) and lower mass of MEMS resonators compared to crystals.
- Better frequency stability (down to ±100 ppb) and frequency response to temperature changes dF/dT (down to < 3.5 ppb/°C). These characteristics provide better locking to GNSS and V2X, and reduced connection drops.
- Silicon MEMS oscillators typically have a faster start-up time than crystal oscillators.
- SiT9025 features EMI reduction features: spread spectrum and configurable rise/fall times