

Precision Timing in Smart Meters

Smart meters, whether they be for electric, gas or water, offer tremendous benefits to utility companies. Besides the costs saved by no longer dispatching personnel to read each meter, smart meters enable utility companies to be notified of outages and other problems as they occur.

Key Considerations

- Low power
- Small footprint
- Frequency accuracy
- Immunity to EMI

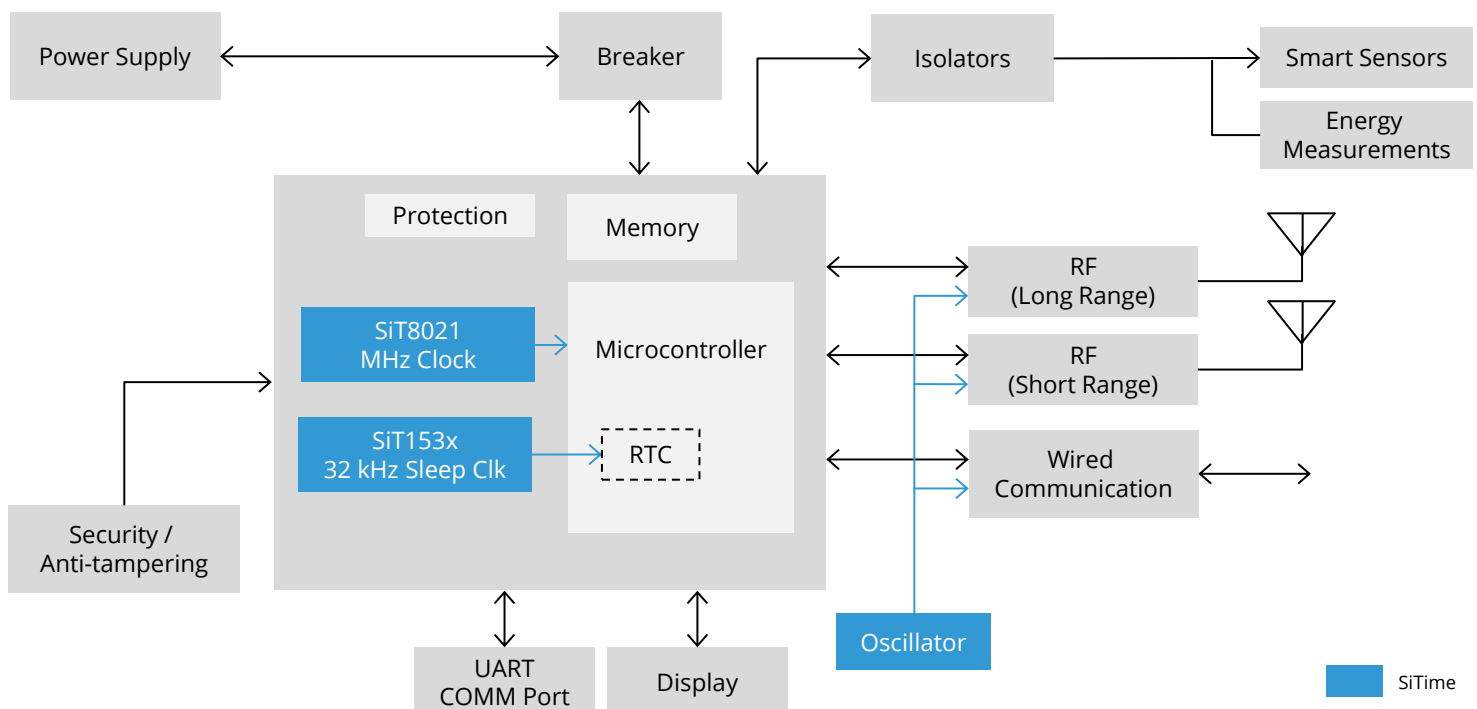
Several clock sources are needed in smart meters.

- **Sleep clock:** Used to keep track of the time and day. For this reason, it is running when the rest of the system is powered down. It usually operates at 32.768 kHz to low power.
- **Oscillators for the communication interfaces:** Various requirements in terms of frequency, signaling (single-ended or differential), jitter limits, etc.
- **Microcontroller clock:** Usually realized with either a crystal resonator or an oscillator in the 16 to 40 MHz range.

SiTime oscillators offer many advantages for smart meters.

- **Small footprint:** Down to 1.5 x 0.8 mm
- **Very low power:** <1 mA for MHz oscillators – actual value depending on frequency; <510 nA for 32.768 kHz oscillators)
- **Immunity to EMI:** Due to the small size of SiTime MEMS resonators compared to traditional crystal resonators. This is particularly important in electricity meters where high currents are common.
- **Frequency accuracy:** Better accuracy of the sleep clock allows longer periods of system standby time between re-syncs of the RTC to network time. This contributes to significant power savings of connected, battery powered devices.

Smart Meter Block Diagram



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Type	Product	Frequency	Key Features	Key Values
32.768 kHz XO	SiT1532 SiT1534	SiT1532: 32.768 kHz SiT1534: 1 to 32,768 Hz	• 900 nA typ. power consumption • 1.2 V to 3.63 V operation • 1.5 x 0.8 mm and 2.0 x 1.2 mm packages	• Saves power, maximizes battery life • Programmable output swing for further power savings • Small footprint saves board space • Internal VDD filtering eliminates external bypass capacitor: BOM cost reduction and further space savings
	SiT1569	1 Hz to 462.5 kHz	• 3.3 μA current consumption at 100 kHz • $\pm$50 ppm stability • 1.5 x 0.8 mm package	
32.768 kHz TCXO	SiT1552	32.768 kHz	• $\pm$5 to $\pm$20 ppm • 990 nA typ. consumption • 1.5 V to 3.65 V supply range • 1.5 x 0.8 mm package	• Low power • High robustness: Immune to small molecular gasses • LVCMOS: Drive multiple loads • Stability: $\pm$5 ppm
	SiT1580		• $\pm$5 to $\pm$20 ppm • 1.8 V supply range • 4.5 μA consumption • 1.5 x 0.8 mm package	
32.768 kHz Oscillator	SiT1811	32.768 kHz	• $\pm$20 stability • 1.35 to 1.98 V supply • 510 nA consumption • Up to -10°C to 85°C • 1.2 x 1.1 mm package • <115 ms startup time	• Low power • Small footprint • Excellent stability • Faster start-up time than 32.768 kHz tuning-fork crystal enables faster system start-up



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