

Precision Timing in Energy Storage Systems

Energy storage systems (ESS) sometimes also referred to as battery energy storage Systems (BESS), are devices that enable energy from renewables, like solar and wind, to be stored and then released on demand. A typical ESS consists of a battery pack, an inverter, a power optimizer, plus a battery management system (BMS) to monitor the health of the cells.

Key Considerations

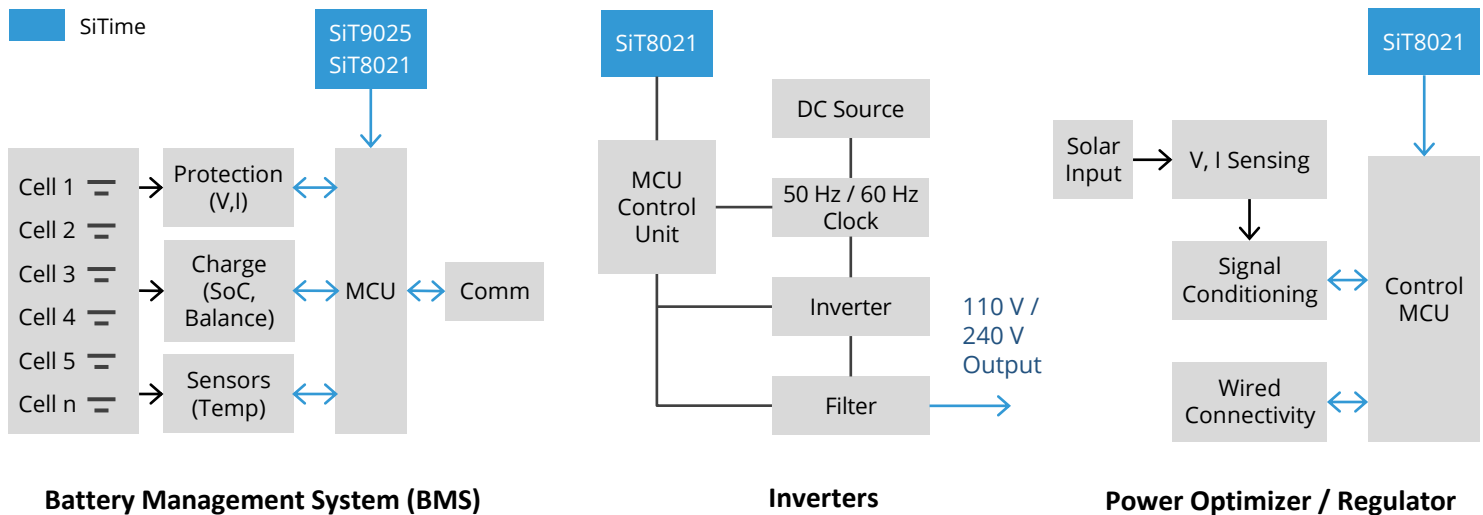
- Small form factor
- Wide temp range
- EMI resilience
- Temp stability

ESS systems can be configured in four ways depending on whether they operate off grid or with a grid tie-in. The four general configurations are:

- Off-Grid: AC coupled
- Off-Grid: DC coupled
- Grid Tie-In: AC coupled
- Grid Tie-In: DC coupled

These systems need to withstand the elements as they are subjected to temperature variations, which can be extreme depending on where they are deployed. This requires designs to be rugged. SiTime timing solutions, with temperature stability and extended temp capability, are an ideal solution whether you're designing a BMS, an inverter, or power optimizer as shown below.

Block Diagrams



SiTime advantages:

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

- Factory programmable to any frequency
- No activity dip or cold start issues
- Higher reliability than quartz
- Wide operating temp (-40°C to 105°C)

Featured products – please refer to [SiTime.com](https://www.sitime.com) or [contact us](#) for more options.

Type	Product	Frequency	Key Features	Key Values
Single-ended oscillator	SiT8021	1 to 26 MHz	<ul style="list-style-type: none"> -40°C to +85°C ±20 ppm stability 1.5 x 0.8 package 	<ul style="list-style-type: none"> High reliability Extended temperature range Small footprint
	SiT9025	1 to 150 MHz	<ul style="list-style-type: none"> Up to -55°C to +125°C Spread spectrum Configurable rise / fall times 2016, 2520, 3225 packages 	<ul style="list-style-type: none"> High reliability Extended temperature range EMI Reduction
Differential oscillator	SiT9376	1 to 220 MHz	<ul style="list-style-type: none"> Low jitter: < 150 fs RMS¹ ±30 or ±50 ppm stability LVPECL, LVDS, HCSL, Low-power HCSL, FlexSwing™ 	<ul style="list-style-type: none"> High reliability Low jitter
	SiT9377	220 to 920 MHz	<ul style="list-style-type: none"> -40°C to +125°C 2016, 2520, 3225 packages 	
Super-TCXO DCXO/ VCXO	SiT5356	1 to 60 MHz	<ul style="list-style-type: none"> ±0.1, ±0.2, ±0.25 ppm stability ±1 ppb/°C frequency slope -40°C to 105°C 	<ul style="list-style-type: none"> High accuracy Excellent frequency stability even with fast temperature gradients
	SiT5357	60 to 220 MHz	<ul style="list-style-type: none"> Low jitter: 0.31 ps RMS¹ Optional voltage or digital frequency control 	
32.768 kHz oscillator	SiT1811	32.768 kHz	<ul style="list-style-type: none"> ±20, ±50, ±100 ppm stability 1.14 to 3.63 V supply < 490 nA consumption Up to -40°C to +105°C 1.2 x 1.1 mm < 115 ms startup time 	<ul style="list-style-type: none"> Low power Small footprint Excellent stability Faster startup time than 32.768 kHz tuning-fork crystal enables faster system startup

¹ 12 kHz to 20 MHz integration range



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