SiTime™

15 min SiTime Turbo Webinars

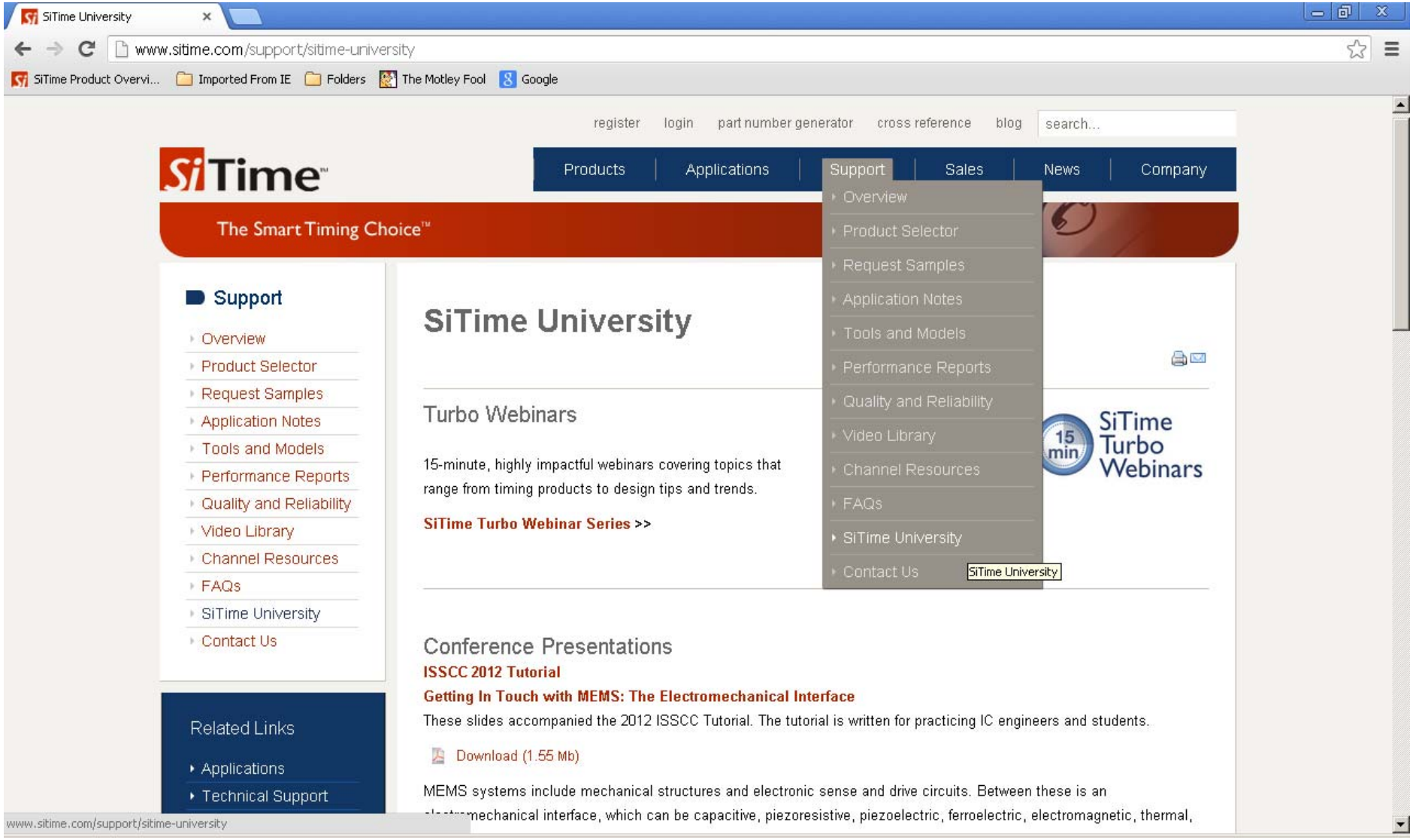
SiTime University Turbo Seminar Series

Optimize System Design with Low Power MEMS Oscillators

March 11-12, 2013

The Smart Timing Choice™

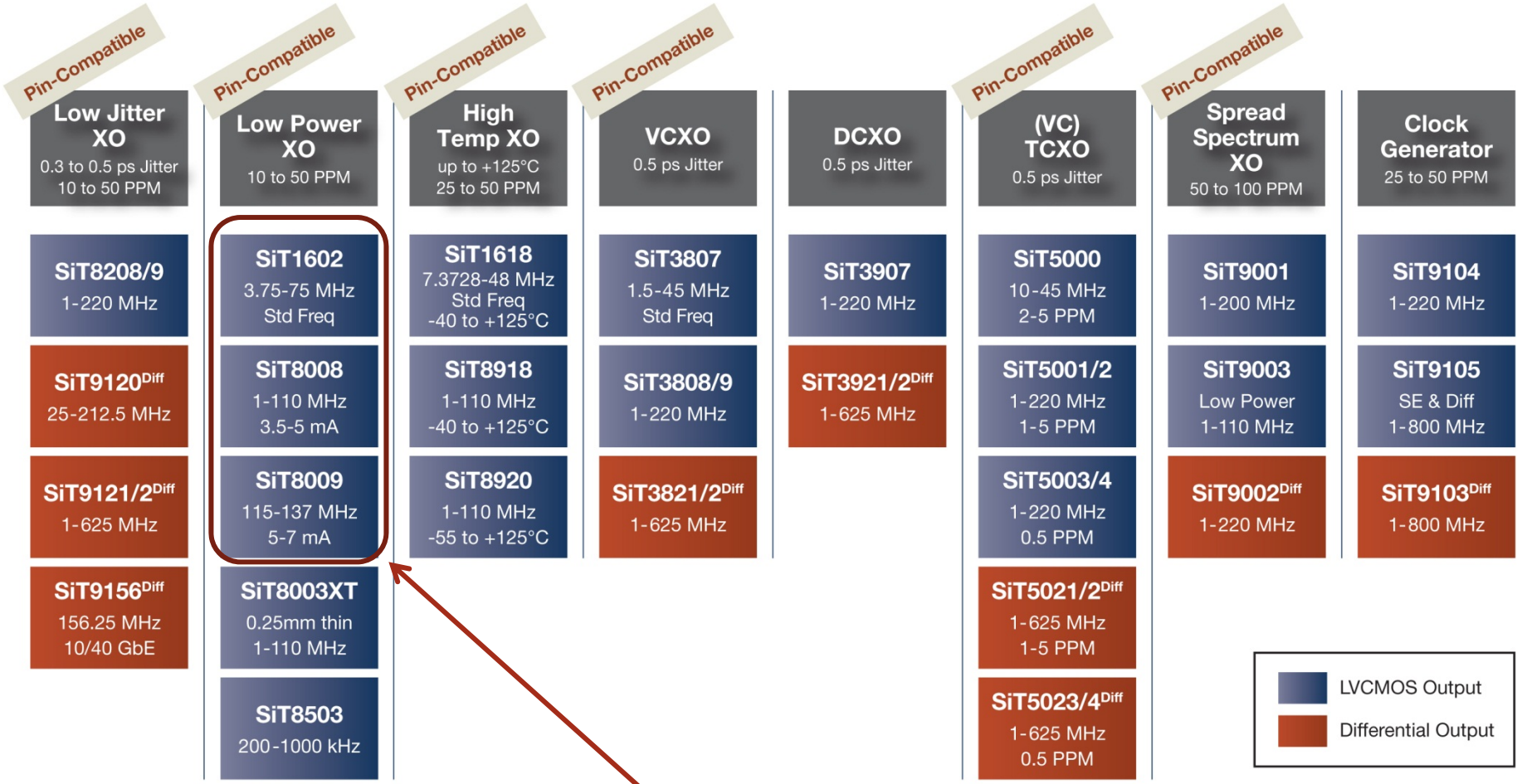
Turbo Webinars On the SiTime Web Site



Agenda

- Introduction of the New Low Power MEMS Oscillator Family
- New Features and Enhancements that Enable Better System Designs and Supply Chain Management
- Advantages Over Quartz
- Product Selection Guide

Three Low Power MEMS Oscillators Enhance Industry's Broadest MEMS Timing Portfolio

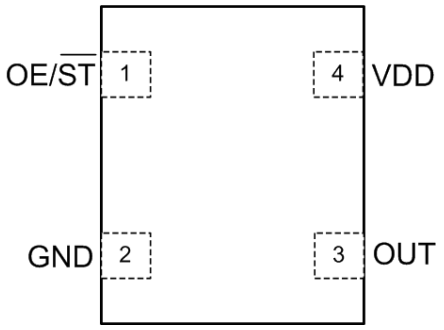


New Generation of Low Power Oscillators With Enhanced Features and Performance

Low Power Oscillator Family Highlights

- **Wide frequency coverage with 6 decimal places of accuracy**
- **Excellent total frequency stability as low as ±20 PPM**
- **Choice of industrial (-40 to 85°C) or commercial (-20 to 70°C)**
- **Flexible supply voltages, 1.8 V and 2.5 to 3.3 V**
- **Best power consumption at high frequency**
- **Rise/fall time control for best EMI**
- **Industrial standard footprint in 5 package sizes**

4-pin
2016/2520/3225
5032/7050



A Broad Range of Applications

SiT1602
50 Std Freq
3.57 to 77.76 MHz

Consumer, Networking

SiT8008
Programmable
1 to 110 MHz

Computing, Industrial

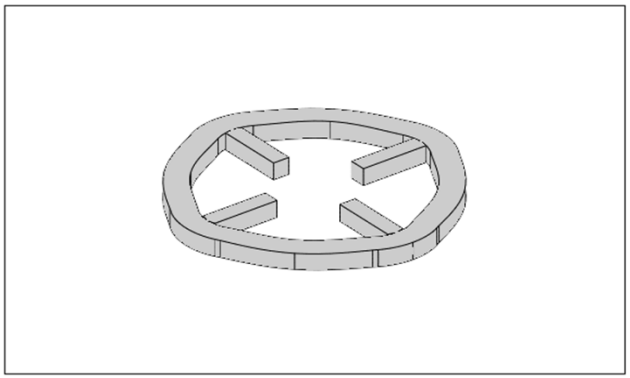
SiT8009
Programmable
115 to 137 MHz

High Frequency)

Better MEMS Timing Technology
More Features, Enhanced Performance
More Benefits to System ODM/OEM

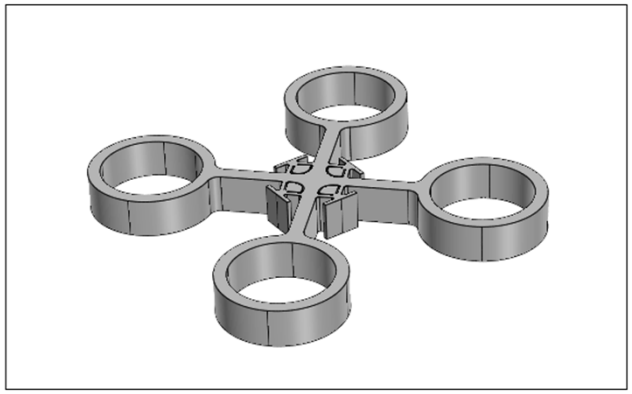
Higher Performance MEMS Resonator Enhances Oscillator Performance

5 MHz Resonator
For SiT8003/8103



- First generation MEMS
- In production since 2007

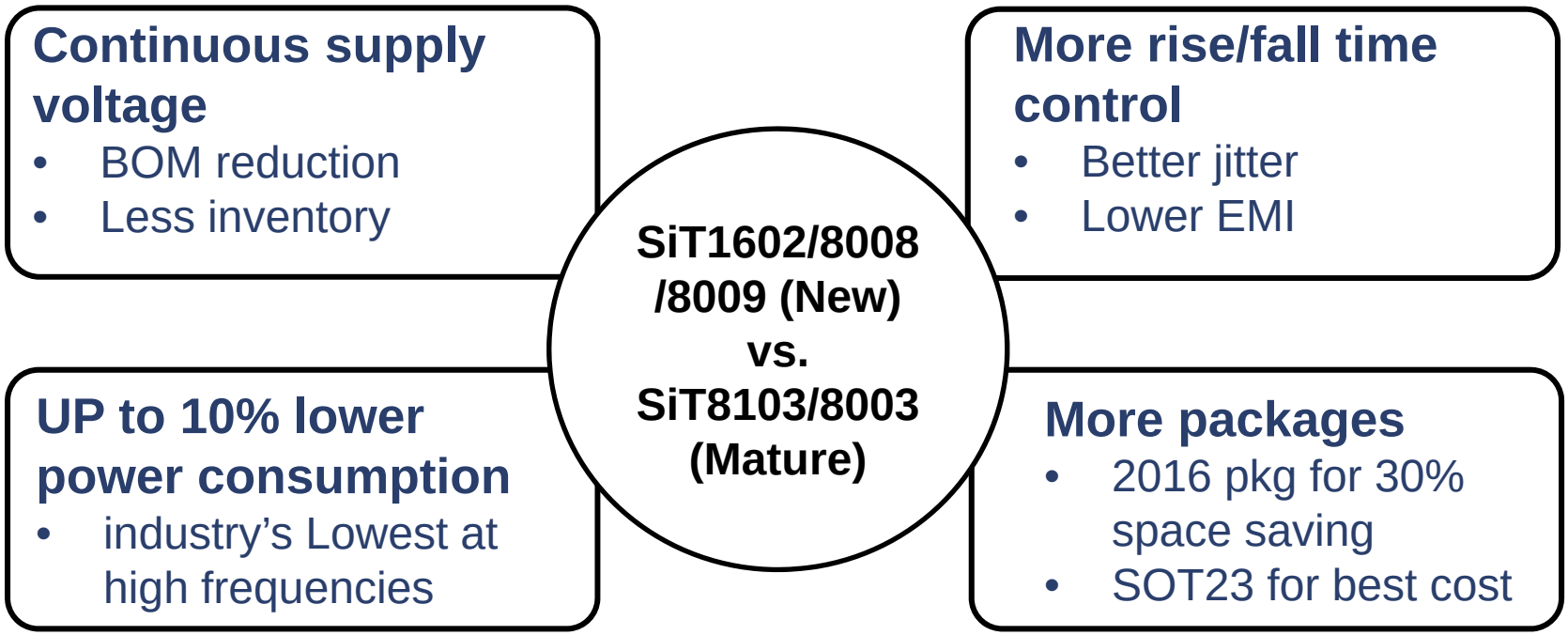
48 MHz Resonator
ForSiT1602/8008/8009



- Second generation
- In production since 2011
- Enable better phase noise & jitter

- **CMOS enhancement enables more features and high performance**
  - **Improved temperature compensation**
  - **Improved output driver**
  - **Improved regulator design**

Feature Enhancements and Benefits

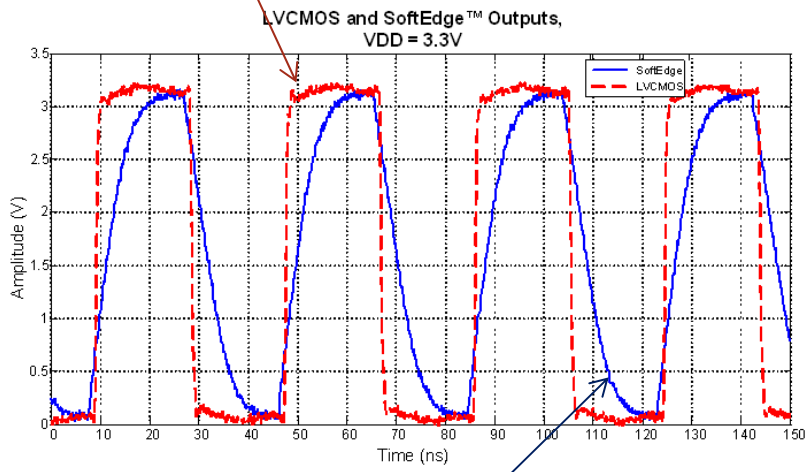


- **Other enhancements**
  - **Faster startup time**
  - **Better jitter for video**
  - **less aging**

- **More product details at http://www.sitime.com/products/low-power-oscillators**

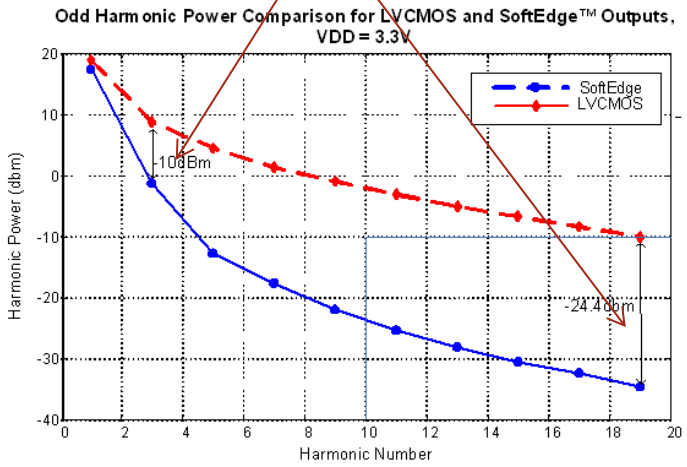
SoftEdge™ Rise/Fall Time Control to Reduce EMI

Standard Rise/fall time



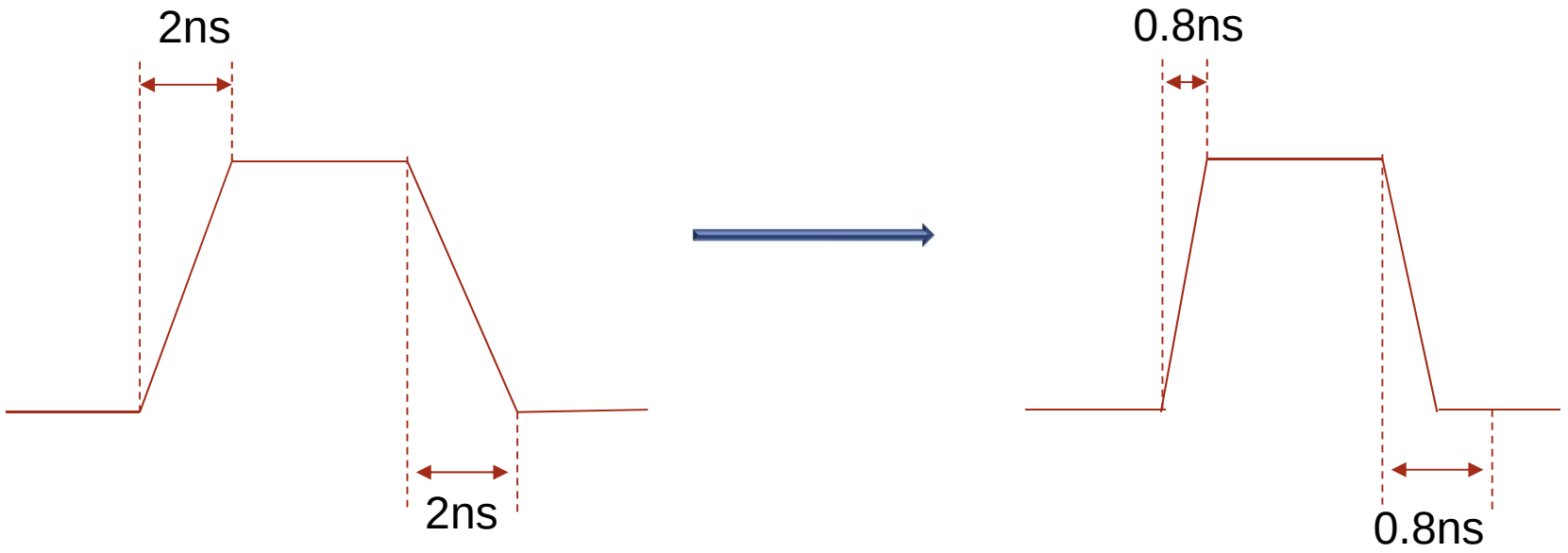
SoftEdge Rise/fall time

Up to 24 dBmEMI Reduction w SoftEdge™



- Multiple rise/fall time options are available on any given device
- Appnote: http://www.sitime.com/support2/documents/AN10022-rise-and-fall-time-rev1.1.pdf

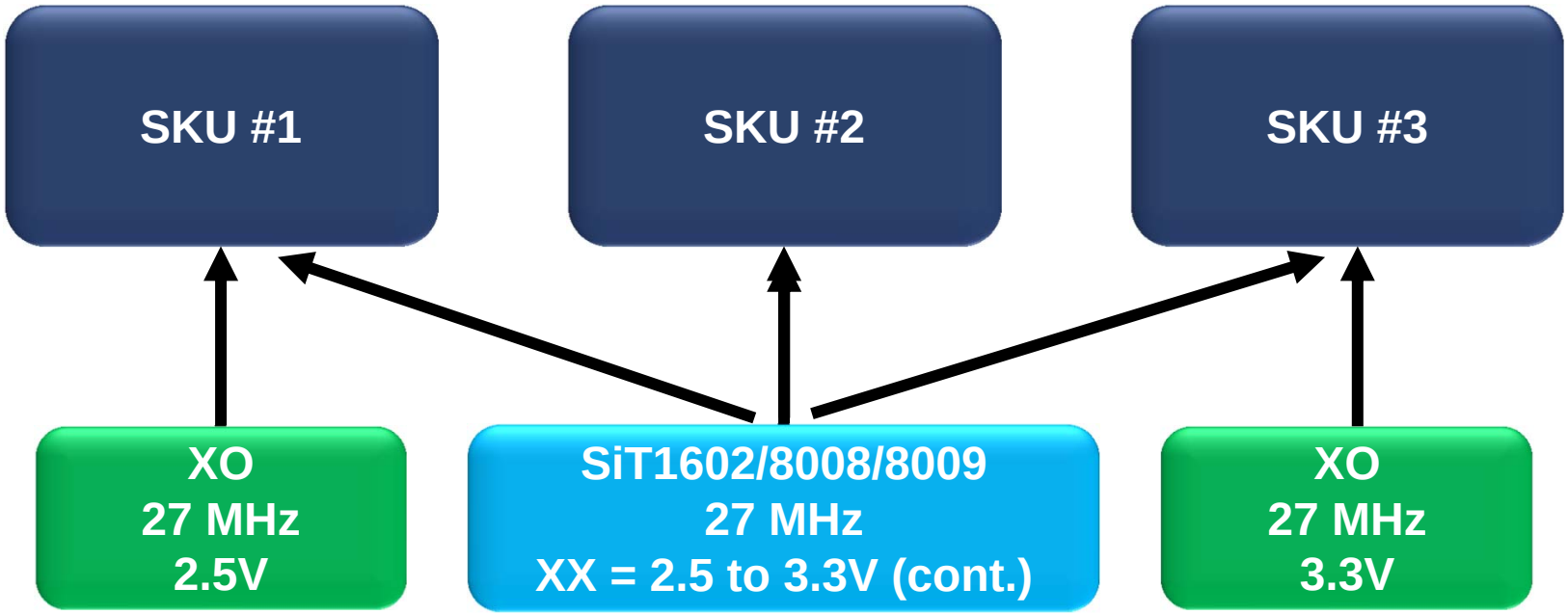
Faster Edge Rates Reduce System Jitter



- Typical rise/fall time
- Good EMI
- Larger jitter due to sensitivity to voltage

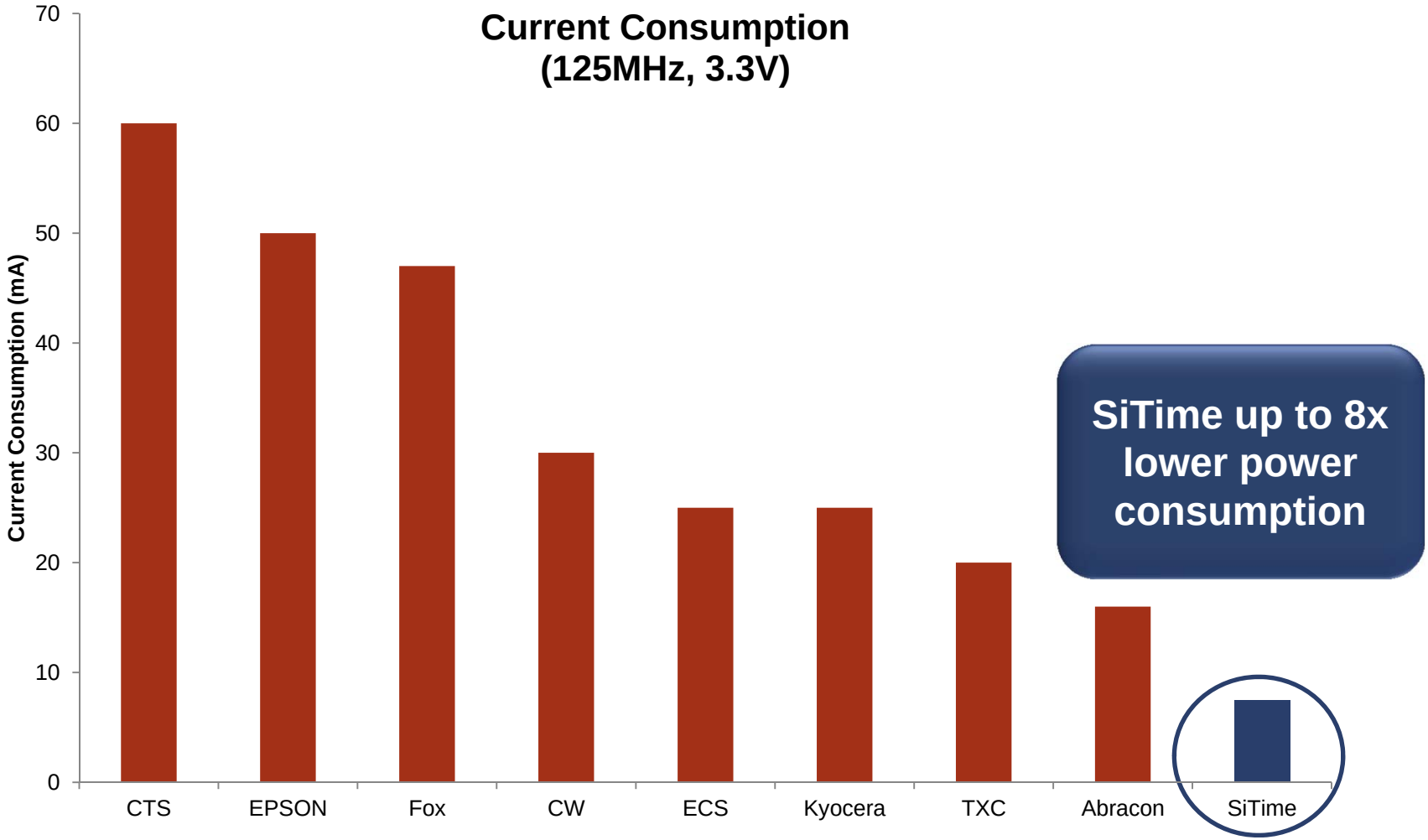
- Faster rise/fall time
- **Reduced jitter, less sensitive to voltage**
- Potential EMI Increase can be reduced with good design practice

Continuous Supply Voltage Simplifies Inventory Management



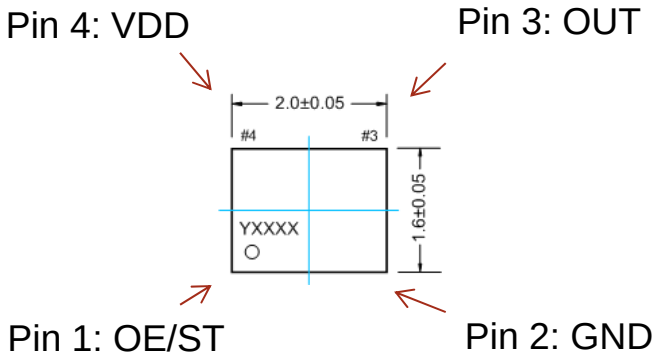
- Example: SiT1602AI-12-**xx**S-27.000000 where xx = 2.5 to 3.3V
- Result: Single SiTime device replaces 3 quartz oscillators
- Benefits: Fewer parts to manage, more flexibility in meeting demand

Lowest Power Consumption at High Frequency for Greener Electronics

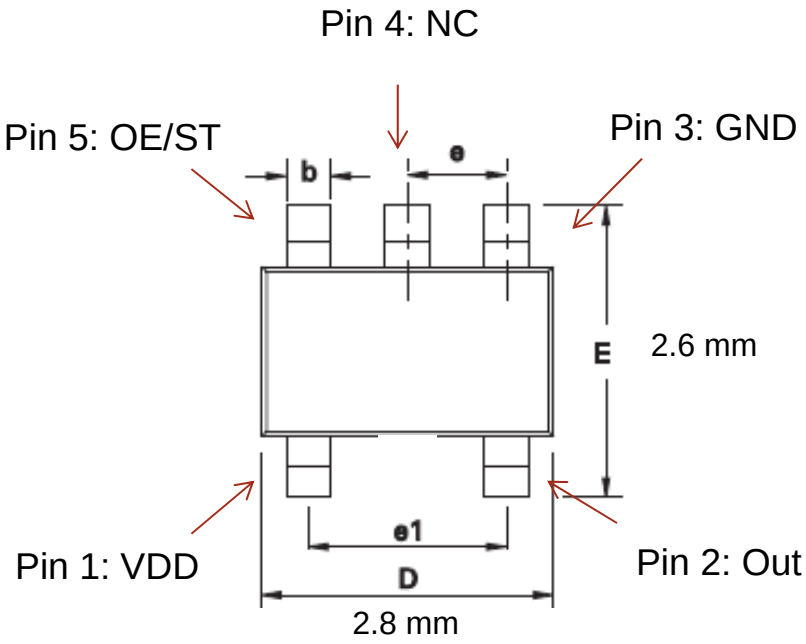


Source: DigiKey product search

More Package Options Increase Design Flexibility



- 36% smaller than 2520 package
- Compatible with quartz
- Available for any combination of freq, voltage and stability



- Industry's first Leaded package for oscillators
- Most cost effective
- Resistant to PCB flex
- Ideal for high temp apps

MEMS Advantages over Quartz
Flexibility, Reliability, Quality

Silicon MEMS Delivers More Features and Better Reliability than Quartz

	SiTime MEMS XO	Quartz XO
Core technology	All-Silicon MEMS	Crystals
Product coverage	Any combination of voltage, frequency, package	Limited options for 1.8V, small package, stability
Frequency stability over-temp	±20 PPM	±25 PPM
Lower power consumption at High Frequency	6.4 mA @ 125 MHz	>10 mA @ 125 MHz
Rise/fall time control	1 – 6 ns	Not Available
Long term reliability (MTBF)	500 Million Hours	<50 Million Hours

Programmability Enables Optimal Clocks and Fastest Time-to-Market

Configure and request samples from SiTime

Summary | Features & Benefits | Part No. Generator | Ordering Information | Models | Quality Docs

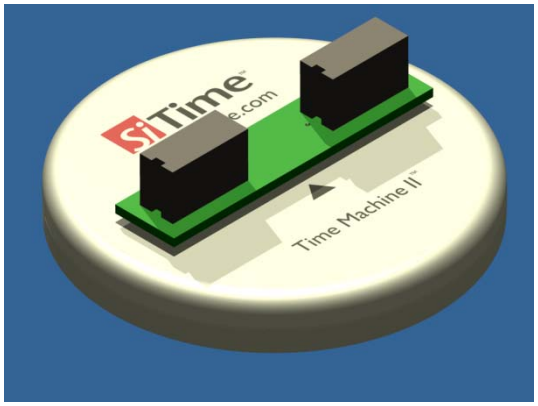
SiT8008 Part Number Generator

Frequency (MHz)	77.123456
Frequency Stability (PPM)	◉ ±20 ○ ±25 ○ ±50
Temperature Range (°C)	○ -20 to 70 ◉ -40 to 85
Supply Voltage (V)	○ 3.3 ◉ 3.0 ○ 2.8 ○ 2.5 ○ 1.8 ○ 2.25V-3.63V(any voltage)
Package Size (mm)	○ 2.0×1.6 ○ 2.5×2.0 ◉ 3.2×2.5 ○ 5.0×3.2 ○ 7.0×5.0
Control Pin	◉ ST ○ OE
Packaging	◉ Bulk ○ 250U Reel ○ 3KU ○ 1KU

SiTime Part number is:

SiT8008AI-21-30S-77.123456

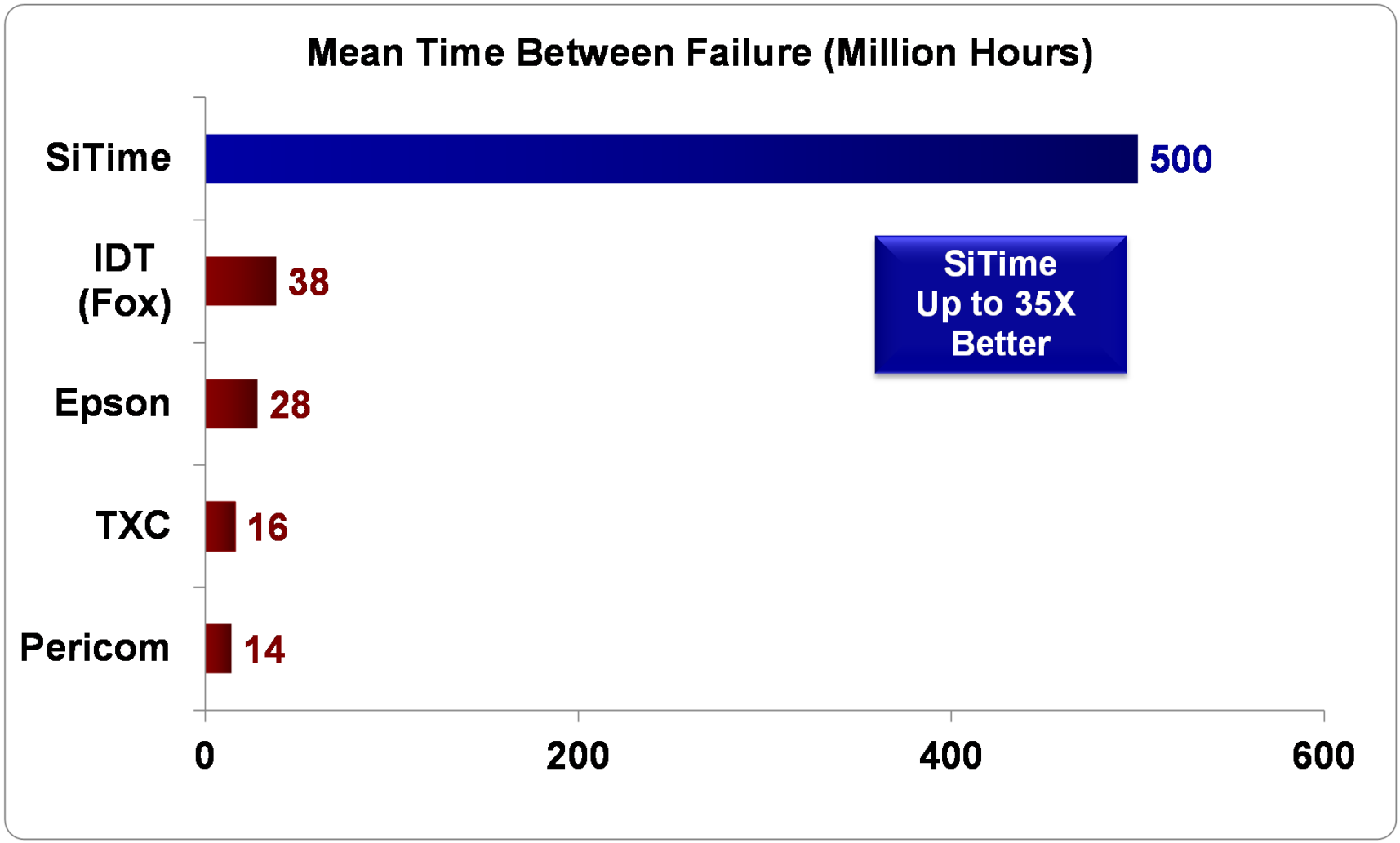
Reset | Copy | Request Free Samples



Or Program samples with Time Machine II

Express samples at http://www.sitime.com/support/request-samples

“Reliability is the New Power”



For more info, check out “Resilience and Reliability of Silicon MEMS” and “Reliability Calculations of SiTime Oscillators” at http://www.sitime.com/support/application-notes

Different MEMS Oscillator Family for Different Applications

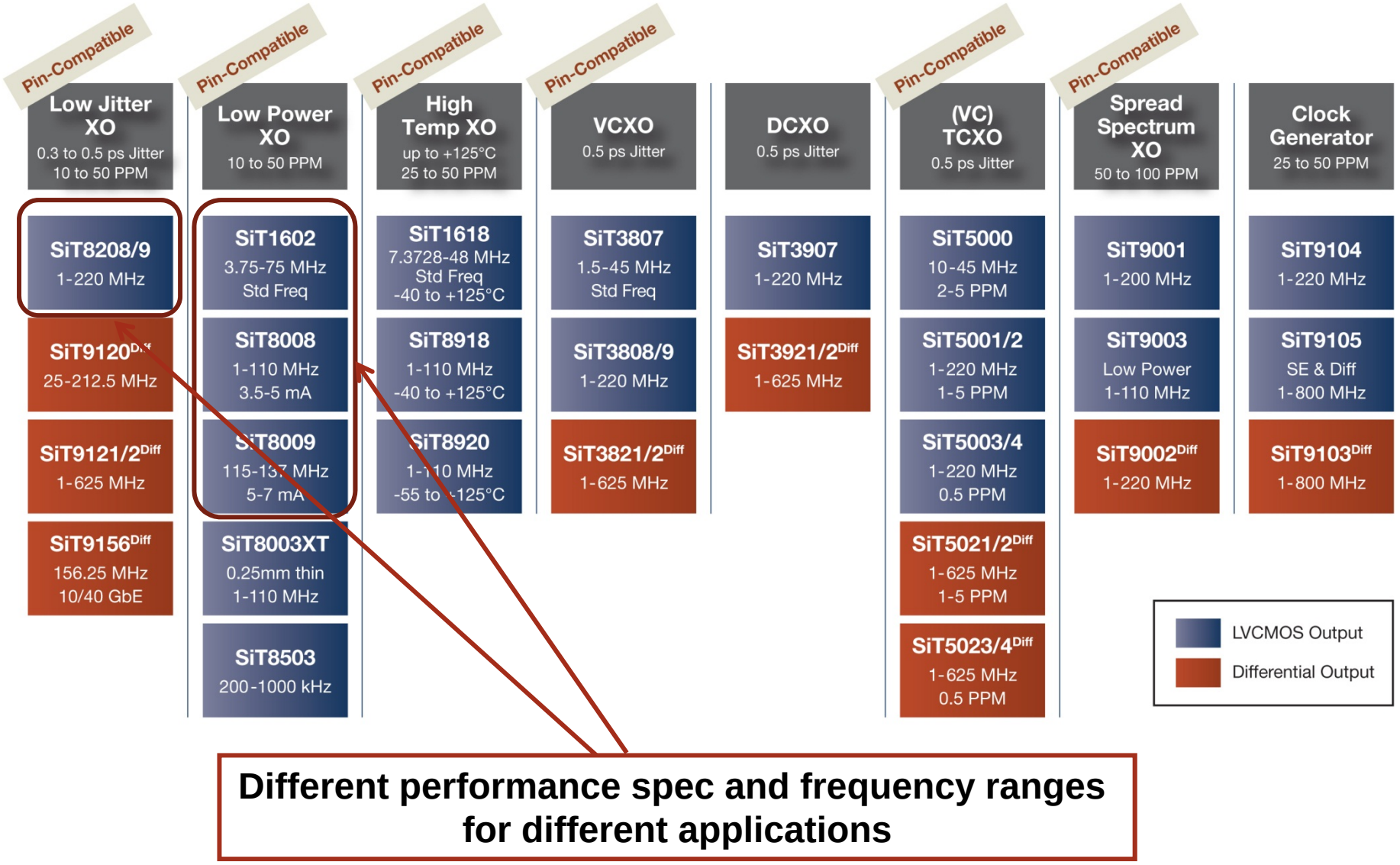
Product Selection Guideline – Low Power MEMS Oscillators

- SiT1602/8008/8009 are Recommended for all new designs
- SiT8103/8003/8004 are NOT recommended for new designs
- SiT8103/8003/8004 will continue to be available in production volumes

Recommended Devices	Mature Devices
SiT1602 SiT8008	SiT8103 SiT8003
SiT8009	SiT8004

- More details at http://www.sitime.com/products/low-power-oscillators

Product Selection Guide – Low Power vs. Low Jitter



Different performance spec and frequency ranges for different applications

Product Selection Guide – Low Power vs. Low Jitter Continued..

- Key differences

	Low Jitter SiT8208/8209	Low Power SiT1602/8008/8009
Frequency	1-220 MHz	1 – 137 MHz
Jitter	0.5 ps	~1.3 ps
Target applications	Jitter sensitive Networking & Telecom	Portable device Low end networking Computing Consumer

- How to select--
  - Go with SiT1602/8008/8009 as the default for most applications
  - Go with SiT8208/8209 for high end applications in networking and telecom where jitter is important

- For more information, visit http://www.sitime.com/support/product-selector

Summary

Lowest Power, Drop-in Replacement
Up to 8x lower than quartz, standard footprints

More Features, Most Flexibility
Rise/fall time control, Continuous voltage, 6 package options

Industry-Best Reliability
FIT Rate: 2, 500M Hours MTBF

Availability: Any Frequency, Supply Voltage, Package
Samples shipped within 48-hours, shortest production leadtime

Contact Information

- **For Questions, contact SiTime Technical Support**
  Technicalsupport@sitime.com

- **For *Turbo Webinar* pdf Downloads on SiTime's Web Site**
  www.sitime.com/support/sitime-u/turbo-webinars

  - All new webinars will be posted within 24-hours

- **For Low Power Oscillator datasheets and other info, visit**
  http://www.sitime.com/products/low-power-oscillators

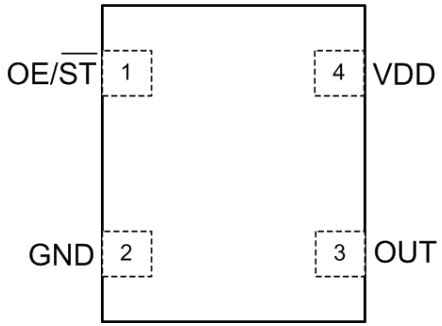
SiT1602 Standard Frequency, Low Power MEMS XO

Frequency Range	Frequency Stability	Supply Voltage	Packages	Temp. Range	Active Current (typical)	Startup Time	Output Load	Signaling Type
3.75 to 77.6 MHz	± 20 PPM ± 25 PPM ± 50 PPM	1.8 V 2.5 to 3.3V	2016 2520 3225 5032 7050	-40 to +85 C -20 to +70 C	3.4 mA (no load)	5 ms	15pF	LVCMOS

- 50 standard frequencies
- 100% drop-in replacement of quartz
- Package as small as 2016
- Excellent jitter for digital non-RF applications
- Excellent long term jitter (30ps over 10 µs interval) for video
- Faster startup time with gated output

Production Now

4-pin
2016/2520/3225
5032/7050



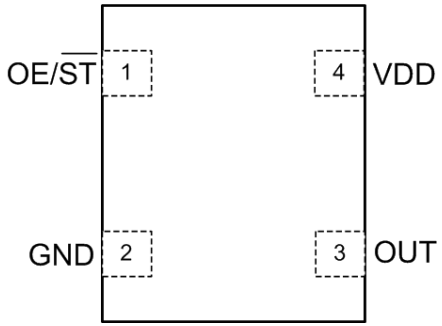
SiT8008 Programmable, Low Power MEMS XO

Frequency Range	Frequency Stability	Supply Voltage	Packages	Temp. Range	Active Current (typical)	Startup Time	Output Load	Signaling Type
1 to 110 MHz	± 20 PPM ± 25 PPM ± 50 PPM	1.8 V 2.5 to 3.3V	2016 2520 3225 5032 7050	-40 to +85 C -20 to +70 C	3.4 mA (no load)	5 ms	15pF	LVCMOS

- Any frequency between 1 to 110 MHz with 6 decimal places of accuracy
- 100% drop-in replacement of quartz
- Package as small as 2016
- Excellent jitter for digital non-RF applications
- Excellent long term jitter (30ps over 10 µs interval) for video
- Faster startup time with gated output

Production Now

4-pin
2016/2520/3225
5032/7050



SiT8009 High Frequency, Low Power MEMS XO

Frequency Range	Frequency Stability	Supply Voltage	Packages	Temp. Range	Active Current (typical)	Startup Time	Output Load	Signaling Type
115 to 137 MHz	± 20 PPM ± 25 PPM ± 50 PPM	1.8 V 2.5 to 3.3V	2016 2520 3225 5032 7050	-40 to +85 C -20 to +70 C	3.4 mA (no load)	5 ms	15pF	LVCMOS

- Any frequency between 115 to 137 MHz with 6 decimal places of accuracy
- Lowest power consumption for high frequency oscillators
- 100% drop-in replacement of quartz
- Package as small as 2016
- Excellent jitter for Ethernet, PCIe and other digital non-RF applications

Production Now

4-pin
2016/2520/3225
5032/7050