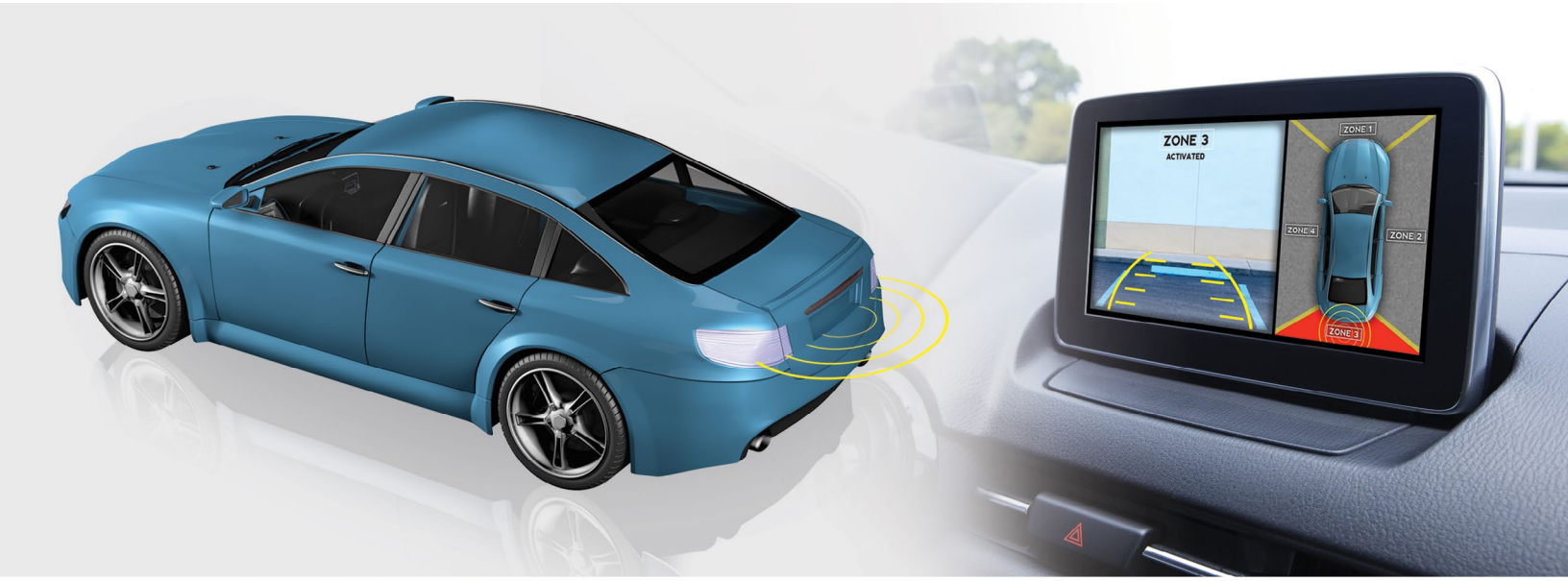
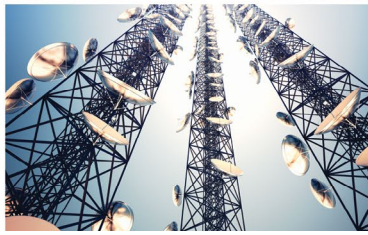
Clock and Timing

MICROCHIP

Oscillators

MEMS and Crystal Solutions





www.microchip.com/oscillators

One-Stop Shop for All Your Timing Needs

Microchip's clock and timing portfolio features a wide range of highly integrated, flexible and easy-to-use oscillators, clocks and clock distribution products to meet many of your development needs.

Our oscillator products offer both low-jitter and low-power configurable products with the option of a Quartz- or MEMS-based resonator inside. The clock generation line offers online configurability, single-chip and multiple frequency clock tree solutions. Our clock and data distribution product line includes one of the industry's largest portfolios of buffers, logic translators and multiplexers, rounding off the portfolio and extends a true total solution for clock and timing products to our customers.

We Deliver the Complete Clock Tree

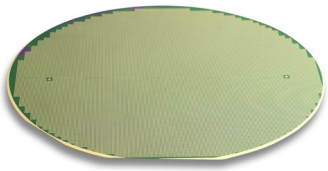
Oscillators	Clock Generators	Clock and Data Distribution
Ultra Low-Power MEMS	Ultra-Low Jitter	Fan Out Buffers
Low-Power MEMS	Low Jitter	Zero-Delay Buffers
Low-Jitter MEMS	Low Power	PCIe Buffers
Ultra-Low Jitter	PCIe Clock Generators	Drivers
High-Frequency TCXO	Clock Conditioning	Multiplexers and Crosspoint Switches
Multi-Output Oscillators	Clock Synthesizers	Logic Translators
Oscillator Die	VCXO	Skew Management
	Timers	Registers and Flip-Flops

Oscillators

MEMS and Crystal-Based Solutions

Microchip has a variety of oscillators to meet the needs of every application. Whether its MEMS-based or Crystal-based, both technologies have advantages to meet specific needs. While crystal-based oscillators have long been preferred for applications that require very accurate and low-jitter timing reference, MEMS-based oscillators are well-suited to low-power applications where small size, high temperature stability, superior shock immunity and shorter production cycle times are a factor.

Microchip MEMS



Semiconductor Manufacturing

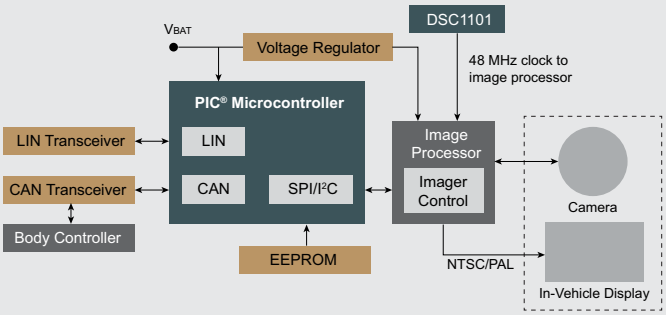
Quartz Crystal

Individually Grown/Cut

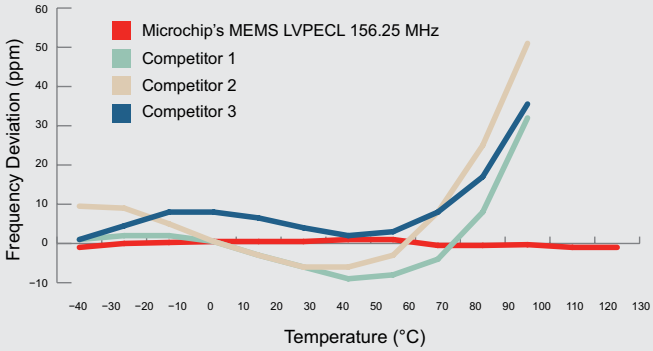
MEMS-Based Oscillators

Microchip has developed unique MEMS-based oscillators that replace traditional quartz solutions. A micrometer-sized polysilicon MEMS resonator is packaged with a CMOS oscillator ASIC, yielding a single-package integrated solution.

Our MEMS-based timing products are ultra-small with exceptional shock resistance, due to the ultra miniature resonator. They also operate with excellent frequency stability over extended temperature ranges. They are an ideal choice in demanding environments where high reliability is key, and performance must be maintained at temperature extremes—such as automotive and many consumer/industrial applications.



Automotive Camera Application,
Using the MEMS DSC1101 Oscillator



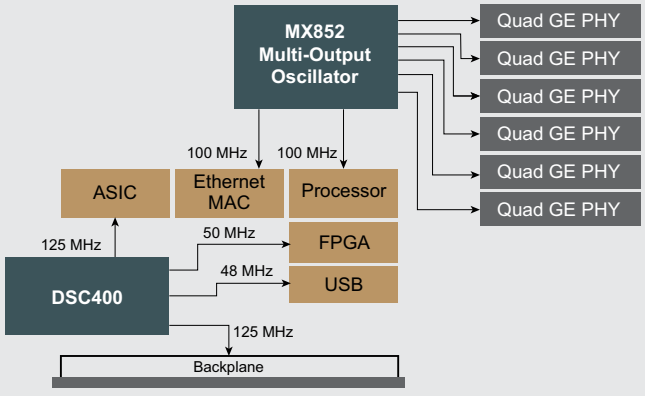
High Stability Over Extended Temperature

Quartz-Based Oscillators

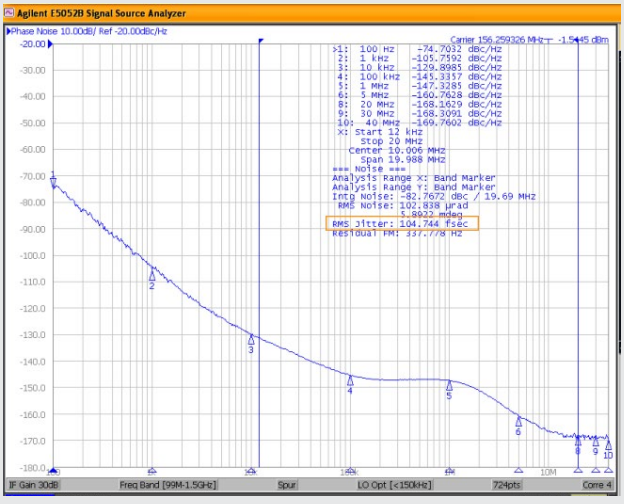
Microchip's quartz-based oscillators are available in single-package fully integrated solutions.

Our assembly process physically isolates the crystal blank from other components, and preserves crystal aging stability and reliability. The oscillator ASIC includes a very low-noise phase lock loop and one or more output buffers, achieving programmability in frequency, output format and OE options.

Ultra-low phase jitter at 100 fs and less makes the MX series of products a perfect choice for demanding high-speed telecommunication/networking applications.



Ethernet 10 Gbps Switch,
Using the MX852 Multi-Output Quartz Oscillator



Ultra-Low Phase Noise: 105 fs at 12 kHz to 20 MHz

Technology	Type	Part Number	Features									
			Frequency Range (MHz)	Number of Outputs	Output Type	Supply Voltage	Frequency Tolerance (±ppm)	Temp. Range (°C)	Jitter (ps RMS, typ.)	Package Size (mm)	Typical IDD (mA)	Functions
MEMS-Based	Ultra-Low Power	DSC60XX	0.002 to 80	1	LVCMOS	1.71 to 3.63	±25/50	–20 to 70 –40 to 85	15	3.2 × 2.5 (4L) 2.5 × 2.0 (4L) 2.0 × 1.6 (4L) 1.6 × 1.2 (4L)	1.5	FS/OE/STDBY, AEC-Q100[2]
		DSC61XX	0.002 to 100						7.5		3	
	Low Power	DSC1001/1003/1004	1 to 150	1	LVCMOS	1.62 to 3.63	±10/25/50[1]	0 to 70 –20 to 70 –40 to 85 –40 to 105	10	7.0 × 5.0 (4L)	5	AEC-Q100, STDBY, DSC1001:15pf, DSC1003:25pf, DSC1004:40pf
		DSC1033	1 to 150	1	LVCMOS	3.3	±25/50	0 to 70 –20 to 70 –40 to 85	20	5.0 × 3.2 (4L) 3.2 × 2.5 (4L) 2.5 × 2.0 (4L)	3	STDBY, AEC-Q100
		DSC1030				3.0						
		DSC1028				2.8						
		DSC1025				2.5						
		DSC1018				1.8						
	Low Jitter	DSC1101/1121	2.3 to 170	1	LVCMOS	2.25 to 3.63	±10/25/50[1]	–20 to 70 –40 to 85 –40 to 105 –55 to 125	0.37 (100k to 20 MHz) 1.5 (12k to 20 MHz)	7.0 × 5.0 (6L) 5.0 × 3.2 (6L) 3.2 × 2.5 (6L) 2.5 × 2.0 (6L)	25	OE/STDBY, AEC-Q100
		DSC2010/11	2.3 to 170	1/2	LVCMOS					3.2 × 2.5 (14L)	30	FS up to 8 freq, OE/STDBY/ AEC-Q100
		DSC2110/11	2.3 to 170	1/2	LVCMOS						30	I²C, OE/STDBY
		DSC2210/11	2.3 to 170	1/2	LVCMOS						30	SPI, OW/STDBY, AEC-Q100
		DSC2311	2.3 to 171	2	LVCMOS					2.5 × 2.0 (6L)	30	OE, AEC-Q100
	Differential	DSC1102/1122	2.3 to 460	1	LVPECL	2.25 to 3.63	±10/25/50[1]	–20 to 70 –40 to 85 –40 to 105	0.37 (100k to 20 MHz) 1.5 (12k to 20 MHz)	7.0 × 5.0 (6L) 5.0 × 3.2 (6L) 3.2 × 2.5 (6L) 2.5 × 2.0 (6L)	40	OE/STDBY, AEC-Q100
		DSC1103/1123			LVDS						25	
		DSC1104/1124			HCSL						30	
		DSC2020/22	2.3 to 460	1/2	LCPECL	2.25 to 3.63	±25/50			3.2 × 2.5 (14L)	30	FS up to 8 freq, OE/STDBY
		DSC2130/33		1/2	LVDS						30	I²C, OE/STDBY
		DSC2240/44		1/2	HCSL						30	SPI, OW/STDBY, AEC-Q100
Crystal-Based	Ultra-Low Jitter	MX57	< 840	1	LVCMOS LVPECL LVDS HCSL	2.25 to 3.63	±50	–20 to 70 –40 to 85	0.2[2]	7.0 × 5.0 (6L)	70	OE on pin 1 or pin 2
		MX55								5.0 × 3.2 (6L)		
		MX85		5						7.0 × 5.0 (38L)	90	2 OE pins
TCXO	Ultra-Low Jitter TCXO	MXT57	< 840	1	LVCMOS LVPECL LVDS HCSL	2.25 to 3.63	±2.5	–20 to 70 –40 to 85	0.2[2]	7.0 × 5.0 (6L)	70	OE on pin 1 or pin 2
		MXT85		5						7.0 × 5.0 (38L)	90	2 OE pins
MEMS-Based	Programmable	DSC60XX-000.0000	0.002 to 80	1	LVCMOS	1.71 to 3.63	±25/50	–20 to 70 –40 to 85	15	3.2 × 2.5 (4L) 2.5 × 2.0 (4L) 2.0 × 1.6 (4L) 1.6 × 1.2 (4L)	1.5	Field-Programmable with TimeFlash Oscillator Programmer
		DSC61XX-000.0000	0.002 to 100						7.5		3	
		DSC8001/8003/8004	1 to 150	1	LVCMOS	1.62 to 3.63	±10/25/50[1]	0 to 70 –20 to 70 –40 to 85 –40 to 105	10	7.0 × 5.0 (4L) 5.0 × 3.2 (4L) 3.2 × 2.5 (4L) 2.5 × 2.0 (4L)	5	
		DSC8002	1 to 150	1	LVCMOS	1.62 to 3.63	±25/50		20		3	
		DSC8101/8121	2.3 to 170	1	LVCMOS	2.25 to 3.63	±10/25/50[1]	–20 to 70 –40 to 85 –40 to 105 –55 to 125	0.37 (100k to 20 MHz) 1.5 (12k to 20 MHz)	7.0 × 5.0 (6L) 5.0 × 3.2 (6L) 3.2 × 2.5 (6L) 2.5 × 2.0 (6L)	25	
		DSC8102/8122	2.3 to 460		LVPECL						40	
		DSC8103/8123			LVDS						25	
		DSC8104/8124			HCSL						30	

Note 1: ±10 ppm supported for up to –40 to 105°C 2: AEC-Q100 Grace 3 qualification will be complete in CYQ4 2016 3: Consumes ~1 mA. Not suitable for low-power RTC function. 4: –40 to 105°C

Applications																		
Embedded and IoT			Server/Storage					Audio/Video				Communication						Automotive
MCU/DSP Reference Clock (12/16/24/26 MHz)	USB 2.0/3.0 (24/48 MHz)	Sensor/RTC (2–999kHz/32.768 kHz)	PCI/PCIX (33.33/66.66/133.33 MHz)	PCI Express Gen 1/2/3 (100/125 MHz)	Fiber Channel (106.25/212.5/75/150 MHz)	SAT/SATA (75/100/150 MHz)	OPI/Omni-Path (100/133.33/200/266.67/ 33.33/400/322.256 MHz)	Audio (2.048/2.8224/12.288/ 16.9344/24.576/33.8668/ 32.768/45.1584 MHz)	Video: SD/HD SDI (27/54/74.25/108 /270 MHz)	Video: 3G/6G/12G SDI (148.5/148.3516/297/ 296.7032 MH)	Video: Display Port (162.27 MHz(	10/100/1000-bit Ethernet 25/100/125 MHz	10 GbE XUAI (156.25 MHz)	40/100 GbE (322.0664/644.1328 MHz)	GPON (155.52 MHz)	SONET (OC-3/12/48/192/768/ 19.44/77.76/155.52/ 622.08 MHz)	Serial Repid IO (125/156.25/312.5 MHz)	25/27/49.5/100 MHz
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Select the Right Oscillator For Your Application

	Traditional Crystal Oscillator	Microchip Quartz-Based Oscillator	Microchip MEMS-Based Oscillator	Features
Frequency Stability Over Temperature	◐	◐	●	• MEMS offers ±10 ppm over wide temperature range • Microchip quartz achieves superior aging
Size	◔	◐	●	• MEMS offers ultra-small footprints (1.6 × 1.2 mm) • Leads industry trend in size reduction
Reliability	◐	◔	●	• MEMS wafer-stage ultra-clean hermetic seal • Microchip quartz separates crystal and ASIC enclosures
Jitter Close-In Phase Noise	◔	●	◐	• Microchip quartz is superior with reduced close-in phase noise • MEMS and quartz comparable at high-frequency offsets
Features	○	◔	●	• Selectable frequencies from one output • OTP programmable at any frequency, anytime
Start-Up	◐	●	●	• MEMS achieves fast start-up time (<2 ms) • Eliminate start-up issue of crystal-based designs
Integration	○	●	●	• Multiple outputs from a single device • Utilizes highly integrated ASIC

● Best ○ Worst

Oscillator Package Options

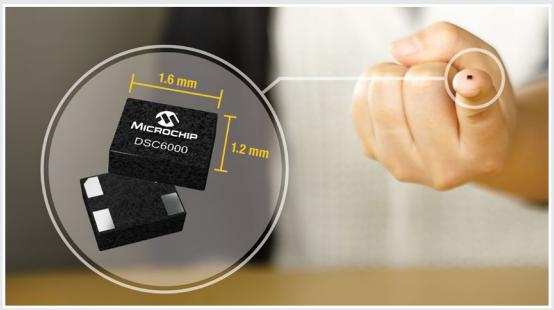
7.0 × 5.0 mm | 5.0 × 3.2 mm | 3.2 × 2.5 mm | 2.5 × 2.0 mm | 2.0 × 1.6 mm | 1.6 × 1.2 mm

DSC6000 Family

Ultra-Low-Power and Ultra-Small MEMS Oscillators

The DSC6000 family of MEMS oscillators combines the industry leading low-power consumption and ultra-small packages with exceptional frequency stability and jitter performance over temperature. These MEMS oscillators are excellent choices for use as clock references in small, battery-powered devices such as wearable and Internet of Things (IoT) devices as well as in under-hood applications where superior shock and vibration resistance is paramount.

- 1.6 × 1.2 mm, 75% broad space saving
- 50% less power consumption than the lowest-power crystal oscillator
- 5× better vibration tolerance, 500× better mechanical shock tolerance
- High stability over a wide temperature range
- (±25 ppm over –40 to 85°C)
- AEC-Q100 reliability capable
- Online and field programmable



Getting started is easy with any of the online and field tools designed to jump start your application development.

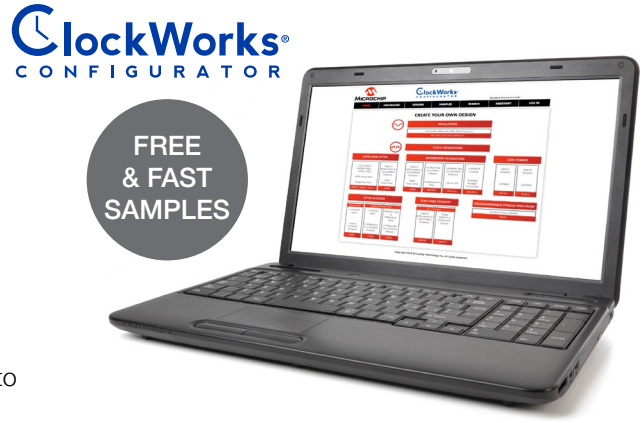
Online

ClockWorks® Configurator

ClockWorks Configurator is an easy-to-use online tool that allows users to create an orderable part number and get samples within a few weeks. Simply go to http://clockworks.microchip.com/timing and start configuring your oscillators and clock generators.

- Intuitive graphical user interface makes device selection easier
- Alerts you of a potential frequency conflict
- Provides instant datasheets
- Dashboard supports sample and device tracking
- Perform search by part number, design ID or sample ID

Need help? Go to www.microchip.com/ClockWorksConfiguratorVideo to watch a short video on ClockWorlds Configurator.



Field

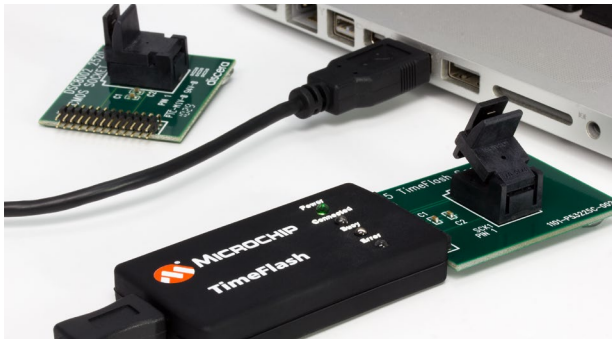
TimeFlash MEMS Oscillators Field Programming Kit

The TimeFlash Programmer allows users to rapidly program Microchip's field-programmable MEMS oscillator to a custom frequency in seconds, minimizing design time by enabling fast prototyping and testing. Our MEMS oscillators are available in industry-standard packages that are drop-in replacements to standard crystal oscillators.

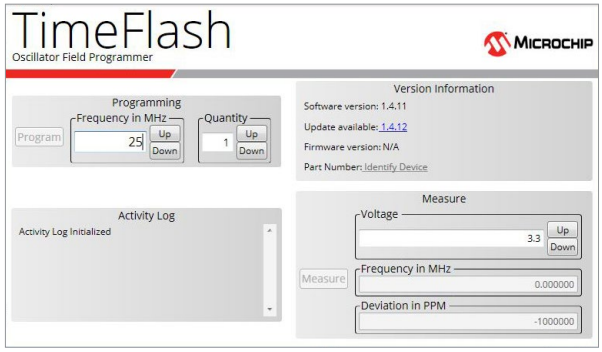
- Custom frequencies in seconds with immediate design verification
- Supports all Microchip MEMS oscillator package sizes
- Supports CMOS, LVPECL, LVDS and HCSL output types
- Easy-to-use interface with auto software update

Blank parts and socket cards are available separately. For more information, please visit www.microchip.com/timeflash.

Need help? Go to www.microchip.com/TimeFlashFieldProgrammingKitVideo to watch a short video on the TimeFlash Programmer.



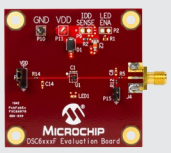
Complete Solution Enables Fast Prototyping



Configure to Any Frequency, Anywhere

Evaluation Boards

Microchip's ROHS evaluation boards are simple, easy to use and provide a reference standard of performance for the product. They come with full documentation. To purchase these boards, visit www.microchipDIRECT.com or contact any Microchip sales representative or authorized distributor.



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If additional training interests you, then Microchip can help. We continue to expand our technical training options, offering a growing list of courses and in-depth curriculum locally, as well as significant online resources.

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