

## What is a MultiVolt Oscillator?

The ECS Inc. International MultiVolt™ quartz-based oscillators utilize a cutting-edge small form factor high-performance ASIC. The oscillator circuit stage uses a low-current linear voltage regulator. This significantly reduces current consumption compared to traditional oscillator designs. This regulation allows MultiVolt™ oscillators to operate over a wide deteriorating battery supply or a traditional fixed supply which all but eliminated the traditional characteristic of oscillator supply voltage dependency.

MultiVolt™ oscillators offer better jitter and phase noise performance compared to SAW or MEMS-based oscillators, and traditionally they do this at a lower cost point. These MultiVolt™ oscillators can serve multiple platforms to aid your design efforts. Most MultiVolt™ oscillator lines will operate across supply voltages of 1.6V ~ 3.6V and on a static supply compatible with 1.8V, 2.5V, 3.0V, and 3.3V. They come in industry standard packages and footprints from 1.6 x 1.2 mm up to 7.0 x 5.0 mm.

ECS Inc. International offers a wide variety of MultiVolt™ oscillator classifications:

- MV
- SMV
- LMV
- MVLC
- MVQ
- TXO-MV / TXO-CSMV

### Standard MultiVolt™ - MV

The ECS Inc. standard MultiVolt™ HCMOS oscillators are the most flexible oscillator parts available on the market today with frequency range options from 32.738 kHz ~ 160 MHz. MultiVolt™ oscillators can operate across supply voltages of 1.6V ~ 3.6V and on a static supply compatible with 1.8V, 2.5V, 3.0V, and 3.3V. These quartz-based oscillators offer better jitter and better performance than MEMS oscillators at a lower cost. They are available in a wide range of industry standard packages with stabilities of  $\pm 20$ ppm,  $\pm 25$ ppm,  $\pm 50$ ppm, or  $\pm 100$ ppm and temperature ranges of  $-10^{\circ}\text{C}$  ~  $+105^{\circ}\text{C}$  or  $-40^{\circ}\text{C}$  ~  $+85^{\circ}\text{C}$ .

### High Performance MultiVolts™ - SMV, LMV, and MVLC

The ECS Inc. International high performance MultiVolt™ oscillators are designed and manufactured to have specific superior characteristics compared to the standard MV. The SMV and MVLC oscillators can operate across the supply voltage of 1.6V ~ 3.6V and on a static supply compatible with 1.8V, 2.5V, 3.0V, and 3.3V. The SMV line offers an industry leading tight stability down to  $\pm 5$ ppm and a frequency range of 8~ 60 MHz. The MVLC line offers an incomparable current draw of 1.5mA and frequency range of 1~75 MHz. The LMV oscillators can operate on a supply of 2.375V ~ 3.6V and on a static supply compatible with 2.5V, 3.0V, and 3.3V. The LMV oscillator offers industry leading jitter of  $<50$ pS with an LVDS output. These quartz-based oscillators are ideal for networking and communications, data storage, and battery powered operations.

### **AEC-Q200 MultiVolt™ Oscillator – MVQ**

The MVQ MultiVolt™ oscillators are designed and manufactured for the automotive industry in our IATF 16949 certified factories to AEC-Q200 qualifications. For more on understanding these quality management systems, click [here](#). They are the most flexible automotive grade oscillator available on the market today. These MultiVolt™ oscillators can operate across a 1.7V ~ 3.6V supply voltage and on a static supply compatible with 1.8V, 2.5V, 3.0V, and 3.3V. They are available in industry standard packages with stabilities of  $\pm 25$ ppm, temperature ranges of -40 ~ 125°C and frequencies of 32.768 kHz and 0.72 ~ 160 MHz. These quartz-based automotive grade oscillators offer better jitter and overall better performance than MEMS oscillators at a lower cost.

### **MultiVolt™ TCXO's – TXO-MV, TXO-CSMV**

MultiVolt™ temperature compensated crystal oscillators are available with stabilities of  $\pm 2.5$ ppm for the HCMOS TXO-MV and  $\pm 0.5$ ppm for the clipped sine wave TXO-CSMV. These oscillators can operate across a supply voltage of 1.7V ~ 3.6V and on a static supply compatible with 1.8V, 2.5V, 3.0V, and 3.3V. The HCMOS TXO-MV offers a  $\pm 2$ ppm stability with a frequency range of 10 ~ 60MHz. The clipped sine wave TXO-CSMV offers a  $\pm 0.5$ ppm stability with a frequency range of 10 ~ 52 MHz. These quartz-based oscillators offer low-jitter and low phase noise. MultiVolt™ TCXOs are ideal for GPS, wireless, satellite, IoT, and RF communication applications.

### **Choosing a MultiVolt™ Oscillator vs. MEMS Oscillator**

When designing in any oscillator, it is important to keep in mind a variety of performance characteristics such as jitter, phase noise, stability, and power consumption. Based on these specific characteristics, quartz-based oscillators will have the advantage over MEMS based oscillators. Traditionally, crystal oscillators have a much lower power consumption, consistently better jitter, lower phase noise, and a much more stable frequency over time.

See below for two case studies from 2020 on MEMS vs. crystal MultiVolt™ oscillators comparing cost and performance advantages.

For more general information on Quartz Crystal and MEMS Oscillators Performance Based On Real Applications, click [here](#).

For ECS Inc.'s full MultiVolt Oscillator catalog, click [here](#).

For ECS Inc.'s full product catalog, click [here](#).

For additional video resources, click [here](#).

Cost and Performance Advantage Case Study:

# MEMS vs. Crystal MultiVolt™ Oscillators



Technology	MEMS	Advantage	MultiVolt™	Advantage
Part Number/ Description	ASEMB-50.000MHz-LC-T <sup>(1)</sup> 3.2 x 2.5mm, ±50ppm, -40°C ~ +85°C, 50MHz		ECS-3225MV-500-BN-TR <sup>(3)</sup> 3.2 x 2.5mm, ±50ppm, -40°C ~ +85°C, 50MHz	▲
	ASDMB-24.000MHz-LC-T <sup>(2)</sup> 2.5 x 2.0, ±50ppm, -40°C ~ +85°C, 50MHz		ECS-2520MV-240-BN-TR <sup>(4)</sup> 2.5 x 2.0mm, ±50ppm, -40°C ~ +85°C, 50MHz	▲
Vendor	Abracon		ECS Inc. International	
Manufacturing Technology	Silicon MEMS		Crystal / ASIC	
Operating Temp. Compensation	-40°C ~ +85°C		-40°C ~ +85°C	
Technical Comps	Operating Temp. Range	Blank: 0°C ~ +70°C E: -20°C ~ +70°C L: -40°C ~ +85°C X: -40°C ~ +105°C	M: -20°C ~ +70°C N: -40°C ~ +85°C See ECS-3225MVQ for AEC-Q200 & Extended Temperature to S: -40°C ~ +125°C	▲
	Current	16mA Max.	5mA Max.	▲
	Standby Current	15uA Max.	10uA Max.	▲
	Voltage Range	+1.8V to +3.3V	+1.62V to +3.63V	▲
	Jitter	5pS to 10pS (Max) Period Jitter (1.7pS) Phase Jitter 12KHz- 20MHz	1pS (Max) Phase Jitter 12KHz-20MHz	▲
	Rt/Ft	2-3nS (Max)	7nS (Max)	▲
	Aging	±5ppm / 1 <sup>st</sup> Year	Stability Inclusive of Aging	▲
	Output Load	15/25 or 40pF	15pF	▲
	Resistance to Shock	High Shock	N/A	▲
	Supply Base	Narrow	Wide	▲
Price Comparison*	1,000 - \$1.246 <sup>(1)</sup>		1,000 - \$0.510 <sup>(3)</sup>	
	1,000 - \$1.246 <sup>(2)</sup>		1,000 - \$0.577 <sup>(4)</sup>	▲

\*Price comparison completed 12<sup>th</sup> Aug 2020

Cost and Performance Advantage Case Study:  
**MEMS vs. Crystal MultiVolt™ Oscillators**



Technology	MEMS	Advantage	MultiVolt™	Advantage	
<b>Part Number/ Description</b>	ASDMB-25.000MHz-XY-T <sup>(1)</sup> 2.5 x 2.0mm, ±10ppm, -40°C ~ +105°C		ECS-2520SMV-250-FP-TR <sup>(2)</sup> 2.5 x 2.0mm, ±10ppm, -40°C ~ +105°C	▲	
			ECS-2520MV-250-GP-TR <sup>(3)</sup> 2.5 x 2.0mm, ±5ppm, -40°C ~ +105°C	▲	
<b>Vendor</b>	Abracon		ECS Inc. International		
<b>Manufacturing Technology</b>	Silicon MEMS		Crystal / ASIC		
<b>Operating Temp. Compensation</b>	-40°C ~ +105°C		-40°C ~ +105°C		
<b>Technical Comps</b>	Operating Temp. Range	Blank: 0°C ~ +70°C E: -20°C ~ +70°C L: -40°C ~ +85°C X: -40°C ~ +105°C	N: -40°C ~ +85°C P: -40°C ~ +105°C	▲	
	Current	16mA Max.	10mA Max.	▲	
	Standby Current	15uA Max.	10uA Max.	▲	
	Voltage Range	+1.8V to +3.3V	+1.6V to +3.63V	▲	
	Jitter	5pS to 10pS (Max) Period Jitter (1.7pS) Phase Jitter 12KHz-20MHz	1pS (Max) Phase Jitter 12KHz-20MHz	▲	
	Rt/Ft	2-3nS (Max)	7nS (Max)		
	Aging	±5ppm / 1 <sup>st</sup> Year	Stability Inclusive of Aging	▲	
	Output Load	15/25 or 40pF	▲	15pF	
	Resistance to Shock	High Shock	▲	N/A	
	Supply Base	Narrow		Wide	▲
	<b>Price Comparison*</b>	1,000 - \$1.957 <sup>(1)</sup>		1,000 - \$0.98 <sup>(2)</sup>	▲
				1,000 - \$1.22 <sup>(3)</sup>	

\*Price comparison completed 12<sup>th</sup> Aug 2020