PRODUCT SELECTION GUIDE

FREQUENCY GENERATION & SIGNAL CONVERSION SOLUTIONS

25 YEARS OF EXCELLENCE
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<td>GDX Series</td>
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<td>500 MHz</td>
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<td>MI Series</td>
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<td>6 GHz</td>
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<td>LCO Series</td>
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<td>1.4 GHz</td>
<td>5 GHz</td>
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<tr>
<td>MRO Series</td>
<td></td>
<td>2 GHz</td>
<td>12 GHz</td>
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</tr>
</tbody>
</table>
FREQUENCY GENERATION

Signal quality, reliability and performance across a broad spectrum of frequency bands set our solutions apart.
REFERENCE OSCILLATORS

REF Series

SPECIFICATIONS
Frequency Range: 5 to 50 MHz
Bandwidth: Fixed
Internal Reference: ≤±3.0 ppm, Stability
Aging: <1.0 ppm, 1st year @ +40° C
Power Output: Up to +10 dBm
Supply Options: +5, +8, +12 VDC
Current: ≤100 mA
Package Size: 0.9” x 0.9” x 0.21”, (22.9 x 22.9 x 5.3)mm

FEATURES
- Available Frequencies of 5 to 50 MHz
- Low Phase Noise
- Output Power to +10 dBm Available
- Small, Surface-Mount Package (0.9” x 0.9” x 0.21”)

0.9” Surface-Mount, Free-Running Reference Oscillator 5 to 50 MHz

Phase Noise (dBc/Hz) 10 MHz 50 MHz
1 KHz Offset <-141 <-127
10 KHz Offset <-150 <-145
100 KHz Offset <-152 <-155

REF Series

SPECIFICATIONS
Frequency Range: 5 to 50 MHz
Bandwidth: Fixed
Internal Reference: ≤±2.5 ppm, Stability
Aging: <1.0 ppm, 1st year @ +40° C
Power Output: Up to +12 dBm
Spurs: <70 dBc
Supply Options: +5, +8, +12 VDC
Current: ≤100 mA
Package Size: 1.5” x 1.5” x 0.6”, (38.1 x 38.1 x 15.2)mm

FEATURES
- Available Frequencies of 5 to 50 MHz
- Low Phase Noise
- Output Power to +12 dBm Available
- Small, Connectorized Package (1.5” x 1.5” x 0.6”)

Connectorized, Free-Running Reference Oscillator 5 to 50 MHz

Phase Noise (dBc/Hz) 10 MHz 50 MHz
1 KHz Offset <-141 <-127
10 KHz Offset <-150 <-145
100 KHz Offset <-152 <-155
Note: All specifications are typical unless otherwise specified and subject to change without notice. Not all performance parameters are available in combination with certain specifications. (i.e. Phase noise may vary depending on frequency and other parameters.)

RUGGEDIZATION  |  MINIATURIZATION  |  CUSTOMIZATION

**RDS Series**

**SPECIFICATIONS**

- **Frequency Range:** 10 to 100 MHz
- **External Reference:** 10 to 100 MHz
- **Internal Reference Available:**
  - Standard (TCXO): ≤±2.5 ppm, Stability
  - Optional (TCXO): ≤±90 ppb, Stability
- **Power Output:** Up to +10 dBm
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤200 mA
- **Package Size:** 1.5” x 1.5” x 0.6”, (38.1 x 38.1 x 15.2)mm

**FEATURES**

- Internal / External Reference Detect Switch
- Standard Internal TCXO (±2.5 ppm, Stability)
- Optional Internal OCXO (±90 ppb, Stability)
- Fixed Frequencies to 100 MHz

<table>
<thead>
<tr>
<th>Connectorized Reference Detect Switch, 10 to 100 MHz</th>
<th>Phase Noise (dBc/Hz)</th>
<th>10 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 KHz Offset</td>
<td>&lt;-150</td>
</tr>
<tr>
<td></td>
<td>10 KHz Offset</td>
<td>&lt;-155</td>
</tr>
<tr>
<td></td>
<td>100 KHz Offset</td>
<td>&lt;-160</td>
</tr>
</tbody>
</table>
# Reference Multipliers

## M10X Series

### Specifications
- **Frequency Input:** 10 MHz
- **Frequency Output:** 100 MHz
- **Conversion Gain:** +3 dB
- **RF Input Level:** Up to +10 dBm
- **RF Output Level:** Up to +10 dBm
- **Harmonics:** <-20 dBc
- **Spurs:** <-60 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤150 mA
- **Package Size:** 1.3” x 1.1” x 0.4”, (33 x 27.9 x 10.2)mm

### Features
- 10 MHz Input to 100 MHz Output (x10 Multiplication)
- Ruggedized, Modular-Mount Package (1.3” x 1.1” x 0.4”)
- Removable SMA Connectors for Surface-Mountability
- Extreme Shock and Vibration Tolerance

### Connectorized, x10 Frequency Multiplier 10 MHz (Input), 100 MHz (Output)

## M10X Series

### Specifications
- **Frequency Input:** 10 MHz
- **Frequency Output:** 100 MHz
- **Conversion Gain:** 0 dB
- **RF Input Level:** Up to +10 dBm
- **RF Output Level:** Up to +10 dBm
- **Harmonics:** <-20 dBc
- **Spurs:** <-50 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤150 mA
- **Package Size:** 0.9” x 0.9” x 0.21”, (22.9 x 22.9 x 5.3)mm

### Features
- 10 MHz Input to 100 MHz Output (x10 Multiplication)
- Small, Surface-Mount Package (0.9” Square)

### Surface-Mount, x10 Frequency Multiplier 10 MHz (Input), 100 MHz (Output)
AEROSPACE
FULL SPECTRUM EXPLORATION
The past 25 years have seen countless advancements in the capabilities of aerospace systems, from low-orbit satellites to unmanned aerial vehicles, to military and commercial aviation. EM Research products are critical components to these complex systems, both in the air and on the ground.
PHASE-LOCKED CRYSTAL OSCILLATORS

PLXO Series

**SPECIFICATIONS**
- **Frequency Range:** 5 to 500 MHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Power Output:** Up to +10 dBm
- **Harmonics:** < -30 dBc
- **Spurs:** < -70 dBc
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤ 200 mA
- **Package Size:** 0.9” x 0.9” x 0.25”, (22.9 x 22.9 x 6.3)mm

**FEATURES**
- Fixed Frequencies to 500 MHz
- Small, Surface-Mount Package (0.9” x 0.9” x 0.25”)

---

**Phase Noise (dBc/Hz) | 120 MHz | 300 MHz**

<table>
<thead>
<tr>
<th>Offset</th>
<th>120 MHz</th>
<th>300 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt; -135</td>
<td>&lt; -116</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt; -155</td>
<td>&lt; -143</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt; -160</td>
<td>&lt; -146</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt; -160</td>
<td>&lt; -150</td>
</tr>
</tbody>
</table>

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Surface-Mount, Phase-Locked Crystal Oscillator, 5 to 500 MHz

Connectorized, Phase-Locked Crystal Oscillator, 5 to 500 MHz

PLXO Series

**SPECIFICATIONS**
- **Frequency Range:** 5 to 500 MHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Power Output:** Up to +15 dBm
- **Harmonics:** < -30 dBc
- **Spurs:** < -70 dBc
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤ 200 mA
- **Package Size:** 1.5” x 1.5” x 0.6”, (38.1 x 38.1 x 15.2)mm

**FEATURES**
- Fixed Frequencies to 500 MHz
- Small, Connectorized Package (1.5” x 1.5” x 0.6”)

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**Phase Noise (dBc/Hz) | 120 MHz | 500 MHz**

<table>
<thead>
<tr>
<th>Offset</th>
<th>120 MHz</th>
<th>500 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt; -135</td>
<td>&lt; -113</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt; -135</td>
<td>&lt; -144</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt; -160</td>
<td>&lt; -150</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt; -160</td>
<td>&lt; -150</td>
</tr>
</tbody>
</table>
**ZFR Series**

**SPECIFICATIONS**

- **Frequency Range:** 250 MHz to 20 GHz
- **Bandwidth:** Up to 4 Octaves
- **Step Size:** Down to 1 kHz
- **External Reference:** 10, 100 MHz
- **Internal Reference (Optional):** ≤±2.5 ppm, Stability
- **Power Output:** Up to +18 dBm
- **Supply Options:** +5, +8, +12, +15 VDC
- **Current:** ≤1500 mA
- **Package Size:** 4.5” x 2.5” x 0.6”, (88.9 x 63.5 x 15.2)mm

**FEATURES**

- Programmable Frequencies to 20 GHz
- Small Step Sizes (Down to 1 kHz)
- Broadband Designs Available (Up to 4 Octaves)
- Low Phase Noise
- Fast Switching Units Available (<100 μSec.)

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>10000 MHz</th>
<th>18000 MHz</th>
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</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-96</td>
<td>&lt;-90</td>
</tr>
<tr>
<td>100 KHz Offset</td>
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<td>&lt;-90</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-106</td>
<td>&lt;-100</td>
</tr>
</tbody>
</table>

**UPN Series**

**SPECIFICATIONS**

- **Frequency Range:** 50 MHz to 10 GHz
- **Bandwidth:** ≤67%
- **Step Size:** Down to 100 kHz
- **External Reference:** 5 to 200 MHz
- **Power Output:** Up to +14 dBm
- **Spurs:** <-60 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤200 mA
- **Package Size:** 0.9” x 0.9” x 0.21”, (22.9 x 22.9 x 5.3)mm

**FEATURES**

- Exceptionally Low Phase Noise
- Programmable Frequencies to 6 GHz
- Programmable Frequencies to 10 GHz
- Robust Designs for Extended Temperature and High Vibration Environments Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>6000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-97</td>
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<tr>
<td>100 KHz Offset</td>
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<td>&lt;-91</td>
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<tr>
<td>1 MHz Offset</td>
<td>&lt;-124</td>
<td>&lt;-120</td>
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</tbody>
</table>
FREQUENCY SYNTHESIZERS

THOR Series

**SPECIFICATIONS**

- **Frequency Range:** 1 to 18 GHz
- **Bandwidth:** ≤33%
- **Step Size:** 100 KHz to 10 MHz
- **Switching Speed:** Down to 100 μSec
- **External Reference:** 5 to 200 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability
- **Power Output:** Up to +18 dBm
- **Harmonics:** <−25 dBc
- **Spurs:** <−60 dBc
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤300 mA
- **Package Size:** 2.5” x 1.1” x 0.4”, (63.5 x 27.9 x 10.2)mm

**FEATURES**

- Programmable Frequencies to 18 GHz
- Ruggedized, Modular-Mount Package
- Removable SMA Connectors for Surface Mountability
- Low Power Consumption
- Optionally Hermetically Sealed per MIL-STD-883
- High Shock and Vibration Tolerance
- Fast Switching Units Available (≤100 μSec)

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>4000 MHz</th>
<th>18 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;−95</td>
<td>&lt;−80</td>
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<td>10 KHz Offset</td>
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<td>&lt;−90</td>
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<tr>
<td>1 MHz Offset</td>
<td>&lt;−118</td>
<td>&lt;−122</td>
</tr>
</tbody>
</table>

Hi-Rel, Programmable Frequency Synthesizer 1 to 18 GHz (In-Bands)

SLS Series

**SPECIFICATIONS**

- **Frequency Range:** 10 MHz to 12 GHz
- **Bandwidth:** ≤133%
- **Step Size:** Down to 25 KHz
- **External Reference:** 5 to 100 MHz
- **Internal Reference (Optional):** ≤±2.5 ppm, Stability
- **Power Output:** Up to +18 dBm
- **Supply Options:** +5, +8, +12, +15 VDC
- **Current:** ≤200 mA
- **Package Size:** 1.5” x 1.5” x 0.6”, (38.1 x 38.1 x 15.2)mm

**FEATURES**

- Programmable Frequencies to 12 GHz
- Output Power to +18 dBm Available
- Optional Internal Reference
- Small, Connectorized Package (1.5” x 1.5” x 0.6”)

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>1000 MHz</th>
<th>6000 MHz</th>
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<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;−95</td>
<td>&lt;−80</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;−120</td>
<td>&lt;−85</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;−140</td>
<td>&lt;−115</td>
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</table>

Connectorized, Programmable Frequency Synthesizer 10 MHz to 12 GHz (In-Bands)
“The thing that strikes me most about EM Research is good communication. When I’m looking for a component for a new project, they’re always ready to help. Great products and great customer service.”

– CLIENT, AEROSPACE
SBC Series

**SPECIFICATIONS**

- **Frequency Range:** 10 MHz to 8 GHz
- **Bandwidth:** Up to 3 Octaves
- **Step Size:** 1 Hz to 100 KHz
- **External Reference:** 5 to 200 MHz
- **Internal Reference (Optional):** ≤±2.5 ppm, Stability
- **Power Output:** Up to +10 dBm
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤800 mA
- **Package Size:** 3.5” x 2.5” x 1”, (88.9 x 63.5 x 25.4)mm

**FEATURES**

- Fine Resolution Design (Step Sizes Down to 1 Hz)
- Broadband Designs Available (Up to 3 Octaves)
- Low Phase Noise
- Ultra-Low Spurs
- Programmable Frequencies to 8 GHz

### Phase Noise (dBc/Hz)

<table>
<thead>
<tr>
<th>Frequency Offset</th>
<th>4000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-99</td>
<td>&lt;-92</td>
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<td>10 KHz Offset</td>
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<td>&lt;-95</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-123</td>
<td>&lt;-120</td>
</tr>
</tbody>
</table>

**Small Step Size, Low Phase Noise Frequency Synthesizer**

10 MHz to 8 GHz (In-Bands)
COMMUNICATIONS

FULL SPECTRUM COMMUNICATION

Imagine a world without LTE internet, GPS or streaming video. It wasn’t all that long ago that such a world existed. Customer demands have driven new technologies, that have in turn driven increasingly complex requirements. EM Research continues to expand the possibilities of commercial wireless communications through continuous innovation in size, power consumption and performance. We’re working hard to keep your customers connected, yet unplugged.
0.5” Programmable Frequency Synthesizer, 50 MHz to 6 GHz (In-Bands)

### SPECIFICATIONS
- **Frequency Range:** 50 MHz to 6 GHz
- **Bandwidth:** ≤67%
- **Step Size:** Down to 25 KHz
- **External Reference:** 5 to 100 MHz
- **Power Output:** Up to +13 dBm
- **Spurs:** < -50 dBc
- **Supply Options:** +3, +3.3, +5 VDC
- **Current:** ≤ 65 mA
- **Package Size:** 0.5” x 0.5” x 0.15”, (12.7 x 12.7 x 3.8)mm

### FEATURES
- Sub-Miniature, SMT Package (0.5” Square)
- Programmable Frequencies to 6 GHz
- Buffered Output Power Available
- Low Power Consumption

### Phase Noise (dBc/Hz)

<table>
<thead>
<tr>
<th>Offset</th>
<th>SLX Series 2000 MHz</th>
<th>SLX Series 4000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-85</td>
<td>&lt;-75</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-98</td>
<td>&lt;-95</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-120</td>
<td>&lt;-115</td>
</tr>
</tbody>
</table>

### MRO Series

#### SPECIFICATIONS
- **Step Size:** 1 KHz
- **Stability:** ≤±1 ppm (-10°C to +70°C)
- **Power Output:** Up to +7 dBm
- **Spurs:** < -70 dBc Typ
- **Supply:** +5, +8, +12 VDC
- **Current:** ≤ 300 mA
- **Package Size:** 3.05” x 2.02” x 1.62”
- **Programming Interface:** 3-Wire, Serial / Fine Freq. Adjust Tuning Screw

#### FEATURES
- Designed to Replace Obsolete Cavity Oscillators in Analog and Digital (T1/E1) Microwave Radios
- Serially Programmable / Manually Fine-Tuned
- High Stability, ≤±1ppm (-10°C to +70°C)
- Non-Volatile Memory

### Microwave Radio Oscillators

#### Phase Noise (dBc/Hz)

<table>
<thead>
<tr>
<th>Offset</th>
<th>MRO Series 5900 MHz</th>
<th>MRO Series 6400 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-83</td>
<td>&lt;-77</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-95</td>
<td>&lt;-95</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-123</td>
<td>&lt;-120</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-143</td>
<td>&lt;-142</td>
</tr>
</tbody>
</table>
Note: All specifications are typical unless otherwise specified and subject to change without notice. Not all performance parameters are available in combination with certain specifications. (i.e. Phase noise may vary depending on frequency and other parameters.)
FREQUENCY SYNTHESIZERS

LX Series

SPECIFICATIONS

**Frequency Range:** 50 MHz to 8 GHz  
**Bandwidth:** ≤ 67%  
**Step Size:** Down to 25 KHz  
**External Reference:** 5 to 100 MHz  
**Internal Reference (Optional):** ≤2.5 ppm, Stability  
**Spurs:** < -60 dBc  
**Supply Options:** +3, +3.3, +5 VDC  
**Current:** ≤100 mA  
**Package Size:** 0.75” x 0.75” x 0.15”, (19 x 19 x 3.8)mm

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>4000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt; -95</td>
<td>&lt; -80</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt; -97</td>
<td>&lt; -100</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt; -120</td>
<td>&lt; -120</td>
</tr>
</tbody>
</table>

FEATURES

- Programmable Frequencies to 8 GHz  
- Miniature, SMT Package (0.75” Square)  
- Optional Internal Reference  
- Output Power to +10 dBm Available

Hi-Rel, Programmable Frequency Synthesizer 50 MHz to 8 GHz (In-Bands)

LT Series

SPECIFICATIONS

**Frequency Range:** 50 MHz to 8 GHz  
**Bandwidth:** ≤ 33%  
**Step Size:** Down to 25 KHz  
**Switching Speed:** Down to 100 μSec  
**External Reference:** 5 to 100 MHz  
**Power Output:** Up to +10 dBm  
**Harmonics:** < -20 dBc  
**Spurs:** < -60 dBc  
**Supply Options:** +3.3, +5 VDC  
**Current:** ≤150 mA  
**Package Size:** 1.3” x 1.1” x 0.2”, (33 x 27.9 x 5.1)mm

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>6000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt; -85</td>
<td>&lt; -80</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt; -95</td>
<td>&lt; -90</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt; -105</td>
<td>&lt; -108</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt; -140</td>
<td>&lt; -141</td>
</tr>
</tbody>
</table>

FEATURES

- Ruggedized, Modular-Mount Package  
- Programmable Frequencies to 8 GHz  
- Optionally Hermetically Sealed per MIL-STD-883  
- Extreme Shock and Vibration Tolerance  
- Fast Switching Units Available (≤100 μSec)
KB Series

**SPECIFICATIONS**

**Frequency Range:** 18 to 40 GHz

**Bandwidth:** ≤15%

**Step Size:** Down to 1 KHz

**External Reference:** 5 to 200 MHz

**Internal Reference (Optional):** ≤±2.5 ppm, Stability

**Power Output:** Up to +20 dBm

**Harmonics:** <-15 dBc

**Spurs:** <-50 dBc

**Supply Options:** +5, +8, +12 VDC

**Current:** ≤750 mA

**Package Size:** 5” x 2.5” x 1.25”, (127 x 63.5 x 31.75)mm

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>40 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-82</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-83</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-90</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-116</td>
</tr>
</tbody>
</table>

**FEATURES**

- Programmable Frequencies from 18 to 40 GHz (In-Bands)
- Output Power to +20 dBm Available
- Optional Internal Reference

K / Ka-Band, Programmable Frequency Synthesizer
18 to 40 GHz (In-Bands)

HLX Series

**SPECIFICATIONS**

**Frequency Range:** 50 MHz to 12 GHz

**Bandwidth:** ≤65%

**Step Size:** Down to 100 KHz

**Switching Speed:** Down to 100 μSec.

**External Reference:** 5 to 100 MHz

**Power Output:** Up to +13 dBm

**Spurs:** <-60 dBc

**Supply Options:** +3.3, +5 VDC

**Current:** ≤100 mA

**Package Size:** 0.8” x 0.8” x 0.15”, (20.3 x 20.3 x 3.8)mm

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>4200 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-85</td>
<td>&lt;-80</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-100</td>
<td>&lt;-80</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-125</td>
<td>&lt;-110</td>
</tr>
</tbody>
</table>

**FEATURES**

- Ruggedized, Surface-Mount Package (0.8” Square)
- Programmable Frequencies to 12Hz (In-Bands)
- Hermetically Sealed per MIL-STD-883
- Extreme Shock and Vibration Tolerance

0.8” Hi-Rel, Programmable Frequency Synthesizer
50 MHz to 12 GHz (In-Bands)
FREQUENCY SYNTHESIZERS

FST Series

SPECIFICATIONS

- **Frequency Range**: 10 to 4000 MHz
- **Bandwidth**: ≤15%
- **Step Size**: Down to 100 nSec
- **External Reference**: 100 MHz
- **Internal Reference (Optional)**: ≤±2.5 ppm, Stability
- **Power Output**: Up to +10 dBm
- **Harmonics**: ≤-20 dBc
- **Spurs**: ≤-65 dBc
- **Supply Options**: +15 VDC
- **Current**: ≤1200 mA
- **Package Size**: 5” x 2.5” x 0.69” (Typical), (11.3 x 63.5 x 17.5)mm

FEATURES

- Fast-Switching Designs (Down to 500 nSec)
- Programmable Frequencies to 4 GHz
- Narrow Bandwidths (≤15%)
- Low Phase Noise
- Optional Internal Reference

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>3000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-115</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-118</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-126</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-145</td>
</tr>
</tbody>
</table>

HFS Series

SPECIFICATIONS

- **Frequency Range**: 50 MHz to 15 GHz
- **Bandwidth**: ≤133%
- **Step Size**: Down to 25 KHz
- **External Reference**: 5 to 200 MHz
- **Internal Reference (Optional)**: ≤±5 ppm, Stability
- **Power Output**: Up to +14 dBm
- **Spurs**: ≤-60 dBc
- **Supply Options**: +3.3, +5 VDC
- **Current**: ≤200 mA
- **Package Size**: 1.25” x 1” x 0.25”, (31.8 x 25.4 x 6.4)mm

FEATURES

- Sub-Miniature, SMT Package (0.5” Square)
- Programmable Frequencies to 6 GHz
- Buffered Output Power Available
- Low Power Consumption

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-100</td>
<td>&lt;-95</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-120</td>
<td>&lt;-95</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-140</td>
<td>&lt;-120</td>
</tr>
</tbody>
</table>
**ZLX Series**

**SPECIFICATIONS**
- **Frequency Range:** 50 MHz to 4.5 GHz
- **Bandwidth:** Fixed
- **External Reference:** 50 to 100 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability
- **Power Output:** Up to +10 dBm
- **Spurs:** <−60 dBC
- **Supply Options:** +3, +3.3, +5 VDC
- **Current:** ≤100 mA
- **Package Size:** 0.6” x 0.6” x 0.15”, (15.2 x 15.2 x 3.8)mm

**FEATURES**
- Excellent Phase Noise
- Industry Standard SMT Package (0.6” Square)
- Optional Internal Reference
- Output Power to +10 dBm Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>4000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-103</td>
<td>&lt;-92</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-128</td>
<td>&lt;-118</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-150</td>
<td>&lt;-140</td>
</tr>
</tbody>
</table>

**UPN Series**

**SPECIFICATIONS**
- **Frequency Range:** 50 MHz to 10 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 200 MHz
- **Power Output:** Up to +17 dBm
- **Harmonics:** <−20 dBC
- **Spurs:** <−60 dBC
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤200 mA
- **Package Size:** 0.9” x 0.9” x 0.21”, (22.9 x 22.9 x 5.3)mm

**FEATURES**
- Exceptionally Low Phase Noise
- Fixed Frequencies to 10 GHz
- Robust Designs for Extended Temperature and High Vibe Environments Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>4000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-108</td>
<td>&lt;-100</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-115</td>
<td>&lt;-111</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-136</td>
<td>&lt;-138</td>
</tr>
</tbody>
</table>
In research, often the most challenging task isn’t testing the hypothesis. It’s the quest to obtain the funding necessary to do so. EM Research designs frequency synthesizers that can replace expensive test equipment, enabling researchers to obtain critical data at a far more economical cost.
PHASE-LOCKED OSCILLATORS

THOR Series

**SPECIFICATIONS**

- **Frequency Range:** 1 to 18 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 200 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability
- **Power Output:** Up to +18 dBm
- **Harmonics:** <-30 dBc
- **Spurs:** <-70 dBc
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤350 mA
- **Package Size:** 2.5” x 1.1” x 0.4”, (63.5 x 27.9 x 10.2)mm

**FEATURES**

- Fixed Frequencies to 18 GHz
- Ruggedized, Modular-Mount Package (2.5” x 1.1” x 0.4”)
- Removable SMA Connectors for Surface Mountability
- Optionally Hermetically Sealed per MIL-STD-883
- High Shock and Vibration Tolerance

**Phase Noise (dBc/Hz)**

<table>
<thead>
<tr>
<th>Offset</th>
<th>12 GHz</th>
<th>16 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-70</td>
<td>&lt;-86</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-89</td>
<td>&lt;-88</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-115</td>
<td>&lt;-94</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-135</td>
<td>&lt;-120</td>
</tr>
</tbody>
</table>

SLX Series

**SPECIFICATIONS**

- **Frequency Range:** 50 MHz to 8 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Power Output:** Up to +7 dBm
- **Harmonics:** <-15 dBc
- **Spurs:** <-50 dBc (<-60 dBc Optional)
- **Supply Options:** +3, +3.3, +5 VDC
- **Current:** ≤75 mA
- **Package Size:** 0.5” x 0.5” x 0.15”, (12.7 x 12.7 x 3.8)mm

**FEATURES**

- Sub-Miniature, SMT Package (0.5” Square)
- Fixed Frequencies to 8 GHz
- Buffered Output Power Available
- Low Power Consumption

**Phase Noise (dBc/Hz)**

<table>
<thead>
<tr>
<th>Offset</th>
<th>1000 MHz</th>
<th>4000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-106</td>
<td>&lt;-90</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-110</td>
<td>&lt;-103</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-130</td>
<td>&lt;-121</td>
</tr>
</tbody>
</table>

Hi-Rel, Fixed-Frequency Synthesizer, 1 to 18 GHz

**0.5” Fixed-Frequency Synthesizer, 50 MHz to 8 GHz**
**SLFS Series**

**SPECIFICATIONS**
- **Frequency Range:** 10 MHz to 12 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Internal Reference (Optional):** ≤±2.5 ppm, Stability
- **Power Output:** Up to +20 dBm
- **Spurs:** <-70 dBc
- **Supply Options:** +5, +8, +12, +15 VDC
- **Current:** ≤250 mA
- **Package Size:** 1.5” x 1.5” x 0.6”, (38.1 x 38.1 x 15.2)mm

**FEATURES**
- Fixed Frequencies to 12 GHz
- Output Power to +20 dBm Available
- Optional Internal Reference
- Small, Connectorized Package (1.5” x 1.5” x 0.6”)

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>1000 MHz</th>
<th>6000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-110</td>
<td>&lt;-90</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-116</td>
<td>&lt;-114</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-146</td>
<td>&lt;-134</td>
</tr>
</tbody>
</table>

**Connectizerized, Fixed-Frequency Synthesizer, 10 MHz to 12 GHz**

**LX Series**

**SPECIFICATIONS**
- **Frequency Range:** 50 MHz to 8 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Internal Reference (Optional):** ≤±2.5 ppm, Stability
- **Power Output:** Up to +10 dBm
- **Spurs:** <-60 dBc
- **Supply Options:** +3, +3.3, +5 VDC
- **Current:** ≤100 mA
- **Package Size:** 0.75” x 0.75” x 0.15”, (19 x 19 x 3.8)mm

**FEATURES**
- Miniature, SMT Package (0.75” Square)
- Optional Internal Reference
- Fixed Frequencies to 8 GHz
- Output Power to +10 dBm Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>4000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-95</td>
<td>&lt;-89</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-106</td>
<td>&lt;-100</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-129</td>
<td>&lt;-128</td>
</tr>
</tbody>
</table>

**0.75” Fixed-Frequency Synthesizer, 50 MHz to 8 GHz**
**LT Series**

**SPECIFICATIONS**

- **Frequency Range:** 50 MHz to 12 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 200 MHz
- **Power Output:** Up to +14 dBm
- **Harmonics:** <-25 dBc
- **Spurs:** <-60 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤200 mA
- **Package Size:** 1.3” x 1.1” x 0.4”, (33 x 27.9 x 10.2)mm

**FEATURES**

- Ruggedized, Modular-Mount Package (1.3” x 1.1” x 0.4”)
- Removable SMA Connectors for Surface Mountability
- Fixed Frequencies to 12 GHz
- Optionally Hermetically Sealed per MIL-STD-883
- Extreme Shock and Vibration Tolerance

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>10 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-97</td>
<td>&lt;-81</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-117</td>
<td>&lt;-91</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-143</td>
<td>&lt;-112</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-152</td>
<td>&lt;-132</td>
</tr>
</tbody>
</table>

**Hi-Rel, Fixed-Frequency Synthesizer, 50 MHz to 12 GHz**

**HLX Series**

**SPECIFICATIONS**

- **Frequency Range:** 50 MHz to 14 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Power Output:** Up to +14 dBm
- **Harmonics:** <-20 dBc
- **Spurs:** <-60 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤100 mA
- **Package Size:** 0.8” x 0.8” x 0.15”, (20.3 x 20.3 x 3.8)mm

**FEATURES**

- Ruggedized, Surface-Mount Package (0.8” Square)
- Hermetically Sealed per MIL-STD-883
- Extreme Shock and Vibration Tolerance
- Output Power to +14 dBm Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>4000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-97</td>
<td>&lt;-90</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-111</td>
<td>&lt;-100</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-134</td>
<td>&lt;-125</td>
</tr>
</tbody>
</table>

**0.8” Hi-Rel, Fixed-Frequency Synthesizer, 50 MHz to 14 GHz**

**PHASE-LOCKED OSCILLATORS**
MILITARY
FULL SPECTRUM
DEFENSE
The U.S. military’s ongoing mission to protect American lives depends on reliable communications technology. From the front lines to command centers, to the unmanned aircraft soaring above, much of our nation’s most advanced military technology is able to do its job thanks to EM Research innovations.
# HFS Series

**Specifications**
- **Frequency Range:** 50 MHz to 15 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 200 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability
- **Power Output:** Up to +18 dBm
- **Spurs:** <-70 dBc
- **Supply Options:** +3.3, +5 VDC
- **Current:** ≤250 mA
- **Package Size:** 1.25” x 1” x 0.25”, (31.8 x 25.4 x 6.4)mm

**Features**
- Fixed Frequencies to 15 GHz
- Optional Internal Reference
- Optional Reference Detect Switch

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000 MHz</th>
<th>8000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-105</td>
<td>&lt;-95</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-125</td>
<td>&lt;-110</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-145</td>
<td>&lt;-130</td>
</tr>
</tbody>
</table>

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# LCO Series

**Specifications**
- **Frequency Range:** 1400 MHz to 5 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability
- **Power Variation:** ±0.05 dB over 0°C to +85°C, ±0.1 dB w/ power cycle off/on
- **Supply Options:** +5, +8, +12 VDC
- **Current:** ≤200 mA
- **Package Size:** 3.5” x 2.5” x 0.6”, (88.9 x 88.9 x 15.2)mm

**Features**
- Extremely Low Output Power Variation (±0.05 dB) over Temp
- Fixed Frequencies to 5 GHz
- Output Power to +10 dBm Available

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-100</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-125</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-145</td>
</tr>
</tbody>
</table>
**Note:** All specifications are typical unless otherwise specified and subject to change without notice. Not all performance parameters are available in combination with certain specifications, i.e. Phase noise may vary depending on frequency and other parameters.

---

### GDX Series

**SPECIFICATIONS**

- **Frequency Range:** 5 to 500 MHz, Up to 4 RF Outputs
- **Bandwidth:** Fixed
- **External Reference:** 5 to 100 MHz
- **Reference Output:** 1 Pulse/Sec
- **Power Output:** Up to +10 dBm
- **Spurs:** <-70 dBc
- **Supply Options:** +5, +8, +12 VDC
- **Warm-Up Time:** 2 Minutes @ +25°C to Lock
- **Current:** ≤350 mA
- **Package Size:** 3.5" x 2.5" x 0.6", (88.9 x 88.9 x 15.2)mm

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>100 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KHz Offset</td>
<td>&lt;-131</td>
</tr>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-151</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-154</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-154</td>
</tr>
</tbody>
</table>

**FEATURES**

- 1 PPS Input from GPS Receiver
- Up to Four Fixed-Frequency RF Outputs (5 MHz to 4 GHz)
- Optional Loss of Lock and Holdover Alarm Outputs
- Extremely Low Phase Noise

---

### ESP Series

**SPECIFICATIONS**

- **Frequency Range:** 50 MHz to 40 GHz
- **Bandwidth:** Fixed
- **External Reference:** 5 to 500 MHz
- **Internal Reference (Optional):** ≤±5 ppm, Stability (TCXO), ≤±0.2 ppm, Stability (OCXO)
- **Power Output:** Up to +30 dBm
- **Supply Options:** +5, +8, +12, +15 VDC
- **Current:** ≤250 mA
- **Package Size:** 2.25" x 2.25" x 0.6", (57.2 x 57.2 x 15.2)mm

**FEATURES**

- Exceptionally Low Phase Noise
- Optional Internal Reference (TCXO and OCXO Available)
- Optionally Hermetically Sealed per MIL-STD-883

---

### GPS Disciplined Oscillator 5 to 500 MHz

**Phase Noise (dBc/Hz)**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>100 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 MHz to 500 MHz</td>
<td>&lt;-116</td>
</tr>
<tr>
<td>50 MHz to 400 MHz</td>
<td>&lt;-121</td>
</tr>
<tr>
<td>500 MHz to 4 GHz</td>
<td>&lt;-140</td>
</tr>
</tbody>
</table>

**ESP Series**

**Phase Noise (dBc/Hz)**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>6000 MHz</th>
<th>16 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-116</td>
<td>&lt;-103</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-121</td>
<td>&lt;-109</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-140</td>
<td>&lt;-130</td>
</tr>
</tbody>
</table>
CLX Series

SPECIFICATIONS

Frequency Range: 200 MHz to 4.5 GHz
Bandwidth: Fixed
External Reference: 5 to 100 MHz
Power Output: Up to +20 dBm
Harmonics: <-25 dBc
Spurs: <-60 dBc
Supply Options: +3.3, +5 VDC
Current: ≤175 mA
Package Size: 0.75” x 0.75” x 0.25”, (19 x 19 x 6.4)mm

FEATURES

- Exceptionally Low Phase Noise
- Miniature, SMT Package (0.75” Square)
- Fixed Frequencies to 4.5 GHz

0.75” Phase-Locked Oscillator
200 MHz to 4.5 GHz

<table>
<thead>
<tr>
<th>Phase Noise (dBc/Hz)</th>
<th>1000 MHz</th>
<th>4000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 KHz Offset</td>
<td>&lt;-110</td>
<td>&lt;-100</td>
</tr>
<tr>
<td>100 KHz Offset</td>
<td>&lt;-135</td>
<td>&lt;-126</td>
</tr>
<tr>
<td>1 MHz Offset</td>
<td>&lt;-155</td>
<td>&lt;-145</td>
</tr>
</tbody>
</table>
SIGNAL CONVERSION

Consistency, versatility and industry-leading quality ensure optimal signal conversion in the most demanding conditions.
BDC Series

70 MHz IF to L-Band
140 MHz IF to L-Band
L-Band to C-Band
L-Band to X-Band
L-Band to Dual Ka-Band
Custom Designs Available

FEATURES

- Wide Choice of Frequency Ranges (IF to Ka-Band Solutions Available)
- Integrated Filters
- Gain Control
- USB, RS232 or SPI Control
- Internal / External References
- Low Power Consumption
- Low Phase Noise
- Low Spurs
BUC Series

L-Band to 70 MHz IF
L-Band to 140 MHz IF
C-Band to L-Band
X-Band to L-Band
Ku-Band to L-Band
Ka-Band to L-Band

FEATURES

- Wide Choice of Frequency Ranges (IF to Ka-Band Solutions Available)
- Integrated Filters
- Gain Control
- USB, RS232 or SPI Control
- Internal / External References
- Low Power Consumption
- Low Phase Noise
- Low Spurs

Block Up-Converter
UPCV Series

Channels:
- 70 MHz IF to L-Band
- 140 MHz IF to L-Band
- L-Band to C-Band
- L-Band to X-Band
- L-Band to Ku-Band

Custom Designs Available

FEATURES
- Wide Choice of Frequency Ranges (IF to Ka-Band Solutions Available)
- Integrated Filters
- Gain Control
- USA, RS232 or SPI Control
- Internal / External References
- Low Power Consumption
- Low Phase Noise
- Low Spurs

Channelized Up-Converter
CHANNELIZED DOWN-CONVERTER

DCV Series

L-Band to 70 MHz IF
L-Band to 140 MHz IF
C-Band to L-Band
X-Band to L-Band
Ku-Band to L-Band

Custom Designs Available

FEATURES

- Wide Choice of Frequency Ranges (IF to Ka-Band Solutions Available)
- Integrated Filters
- Gain Control
- USA, RS232 or SPI Control
- Internal / External References
- Low Power Consumption
- Low Phase Noise
- Low Spurs
Customers can purchase programming kits (demo boards, programming modules and reference modules) to assist in system design utilizing EM Research synthesizers and phase-locked oscillators. Integrate your existing breadboard for quick system performance demonstrations. Use demo boards to view layout and by-passing techniques for your PCB design.

Consult the factory or visit www.emresearch.com for more details.

### 1 Demo Boards
- Available for all modular and surface-mount products
- Products factory-mounted to demo boards
- CD-ROM with PC-executable programming software available
- PC-to-demo board programming cable included

![Demo Board with LX Series Frequency Synthesizer Mounted on Card.](image1)

### 2 Reference Modules
- Low phase noise, 10 MHz frequency references
- Female SMA connector
- CD-ROM with PC-executable programming software available
- Reference modules with integrated +9V battery available (includes selectable +3.3V, +5V or +9V DC supply)

![Reference Module](image2)

### 3 Programming Modules
- Preconfigured to demonstrate device communications and control
- Integrated up/down buttons simplify frequency control
- Selectable multiplier scales frequency steps
- Plugs directly into demo board via DB9 cable
- Requires +6V to +15V source
- Easy step-by-step instructions included
- LED version available (shown below)

![Programming Module](image3)
Consumers today often take for granted just how easy it is to connect and share data, nearly anywhere in the world. Connection between satellites and terrestrial stations is faster, easier and more reliable than ever before. This level of global connectivity is made possible by innovative signal conversion and frequency generation products, and EM Research is leading the charge.
EM Research, Inc. offers the most complete lineup of standard and custom-designed signal control products in the wireless industry. The company specializes in miniature surface-mount, modular and connectorized phase-locked oscillators and frequency synthesizers from 5 MHz to over 40 GHz. Founded in 1991, EM Research has been delivering high performance semi-custom signal sources to a broad range of applications worldwide. Since its inception, EM Research has developed a library of over 30,000 individual products.