# Frequency Synthesizer KSN-4261A-119+

## 50Ω 4152 to 4261 MHz

## The Big Deal

- Low phase noise and spurious
- Robust design and construction
- Small size 0.80" x 0.58" x 0.24"

CASE STYLE: DK1182

## Product Overview

The KSN-4261A-119+ is a Frequency Synthesizer, designed to operate from 4152 to 4261 MHz for digital radio application. The KSN-4261A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") to shield against unwanted signals and noise.

## Key Features

| Feature | Advantages |
|---|---|
| Low phase noise and spurious:<br>• Phase Noise: -98 dBc/Hz typ. @ 10 kHz offset<br>• Comparison Spurious: -90 dBc typ.<br>• Reference Spurious: -97 dBc typ. | Low phase noise and spurious improve system EVM (Error Vector Magnitude). |
| Robust design and construction | To enhance the robustness of KSN-4261A-119+, each internal component is secured to the substrate with chip bonder, thereby eliminating the risk of tombstoning during subsequent solder reflow operations by the customer. |
| Small size, 0.80" x 0.58" x 0.24" | The small size enables the KSN-4261A-119+ to be used in compact designs. |



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

*Surface Mount*

# Frequency Synthesizer

## KSN-4261A-119+

50Ω 4152 to 4261 MHz

### Features

- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+5V)
- Small size 0.80" x 0.58" x 0.24"

CASE STYLE: DK1182
PRICE: $29.95 ea. QTY (1-9)

*+ RoHS compliant in accordance with EU Directive (2002/95/EC)*

*The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.*

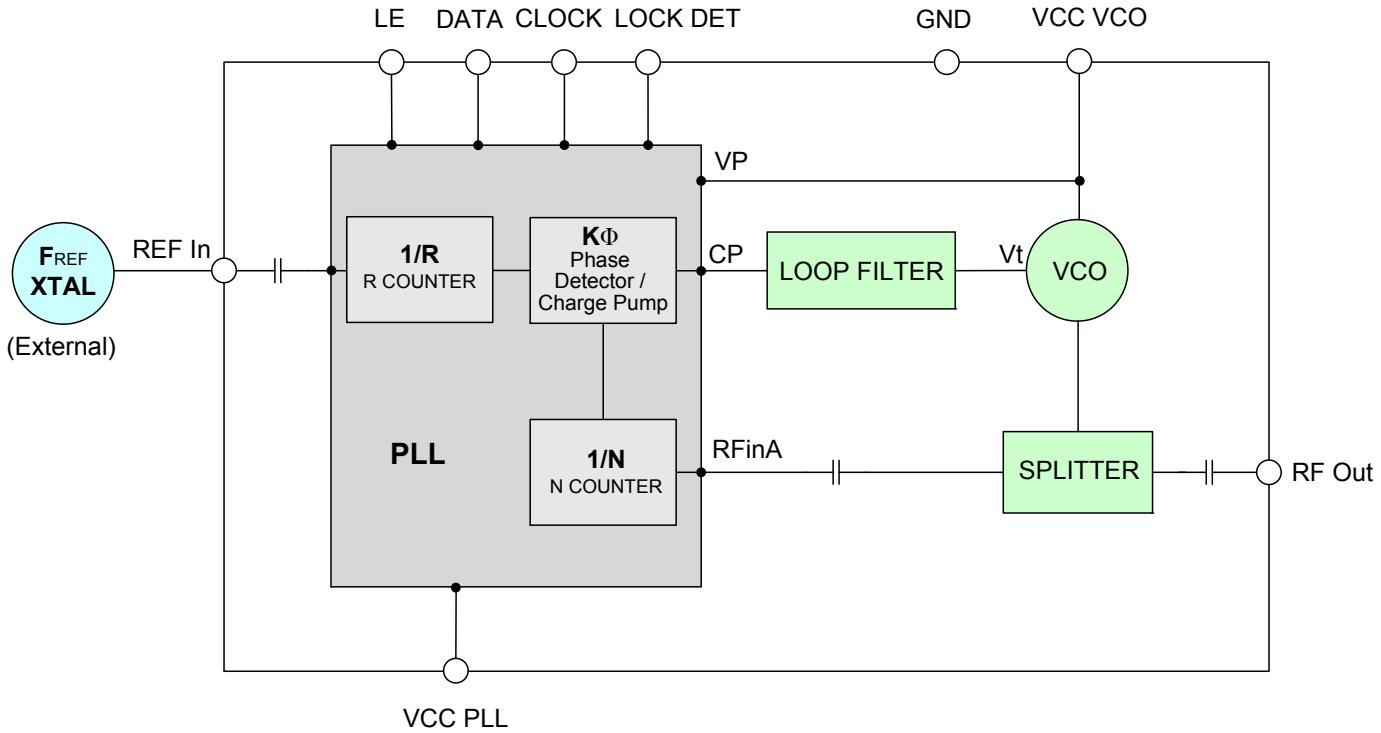
### Applications

- Digital radio

### General Description

The KSN-4261A-119+ is a Frequency Synthesizer, designed to operate from 4152 to 4261 MHz for digital radio application. The KSN-4261A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") to shield against unwanted signals and noise. To enhance the robustness of KSN-4261A-119+, each internal component is secured to the substrate with chip bonder, thereby eliminating the risk of tombstoning during subsequent solder reflow operations by the customer.

### Simplified Schematic







Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

## Electrical Specifications *(over operating temperature -40°C to +85°C)*

| Parameters | | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Frequency Range | | - | 4152 | - | 4261 | MHz |
| Step Size | | - | - | 250 | - | kHz |
| Settling Time | | Within ± 1 kHz | - | 5 | - | mSec |
| Output Power | | - | +1.0 | +4.5 | +7.0 | dBm |
| SSB Phase Noise | | @ 100 Hz offset | - | -70 | - | dBc/Hz |
| | | @ 1 kHz offset | - | -71 | -64 | |
| | | @ 10 kHz offset | - | -98 | -93 | |
| | | @ 100 kHz offset | - | -122 | -117 | |
| | | @ 1 MHz offset | - | -142 | -136 | |
| Reference Spurious Suppression | | Ref. Freq. 10 MHz | - | -97 | -70 | dBc |
| Comparison Spurious Suppression | | Step Size 250 kHz | - | -90 | -70 | |
| Non - Harmonic Spurious Suppression | | - | - | -90 | - | |
| Harmonic Suppression | | - | - | -24 | -18 | |
| VCO Supply Voltage | | 5.00 | 4.75 | 5.00 | 5.25 | V |
| PLL Supply Voltage | | 5.00 | 4.75 | 5.00 | 5.25 | |
| VCO Supply Current | | - | - | 34 | 41 | mA |
| PLL Supply Current | | - | - | 16 | 22 | |
| Reference Input (External) | Frequency | 10 (sine wave) | - | 10 | - | MHz |
| | Amplitude | 1 | - | 1 | - | $V_{P-P}$ |
| | Input impedance | - | - | 100 | - | KΩ |
| | Phase Noise @ 1 kHz offset | - | - | -140 | - | dBc/Hz |
| RF Output port Impedance | | - | - | 50 | - | Ω |
| Input Logic Level | Input high voltage | - | 2.55 | - | - | V |
| | Input low voltage | - | - | - | 0.55 | V |
| Digital Lock Detect | Locked | - | 2.40 | - | 3.20 | V |
| | Unlocked | - | - | - | 0.40 | V |
| Frequency Synthesizer PLL | | - | ADF4106 | | | |
| PLL Programming | | - | 3-wire serial 3V CMOS | | | |
| Register Map @ 4261 MHz | F_Register | - | (MSB) 10011111100000010010011 (LSB) | | | |
| | N_Register | - | (MSB) 00100010000101000101001 (LSB) | | | |
| | R_Register | - | (MSB) 00010000000000010100000 (LSB) | | | |

## Absolute Maximum Ratings

| Parameters | Ratings |
|---|---|
| VCO Supply Voltage | 5.4V |
| PLL Supply Voltage | 5.8V |
| VCO Supply Voltage to PLL Supply Voltage | -0.3V to +5.8V |
| Reference Frequency Voltage | -0.3Vmin, +3.2Vmax |
| Data, Clock, LE Levels | -0.3Vmin, +3.2Vmax |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -55°C to +100°C |

Permanent damage may occur if any of these limits are exceeded



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

## Typical Performance Data

| FREQUENCY (MHz) | POWER OUTPUT (dBm) | | | VCO CURRENT (mA) | | | PLL CURENT (mA) | | |
|---|---|---|---|---|---|---|---|---|---|
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| 4152 | 5.12 | 4.21 | 3.73 | 32.47 | 34.84 | 36.27 | 15.02 | 16.03 | 17.13 |
| 4156 | 5.10 | 4.22 | 3.71 | 32.47 | 34.83 | 36.27 | 15.03 | 16.05 | 17.14 |
| 4174 | 5.10 | 4.42 | 3.65 | 32.43 | 34.79 | 36.26 | 15.04 | 16.06 | 17.15 |
| 4192 | 5.32 | 4.58 | 3.77 | 32.38 | 34.77 | 36.23 | 15.03 | 16.05 | 17.14 |
| 4210 | 5.48 | 4.51 | 3.92 | 32.35 | 34.75 | 36.22 | 15.04 | 16.06 | 17.14 |
| 4228 | 5.41 | 4.41 | 3.91 | 32.34 | 34.73 | 36.22 | 15.05 | 16.06 | 17.15 |
| 4246 | 5.35 | 4.46 | 3.76 | 32.30 | 34.69 | 36.21 | 15.05 | 16.07 | 17.16 |
| 4261 | 5.40 | 4.63 | 3.72 | 32.25 | 34.66 | 36.20 | 15.05 | 16.07 | 17.16 |

| FREQUENCY (MHz) | HARMONICS (dBc) | | | | | |
|---|---|---|---|---|---|---|
| | F2 | | | F3 | | |
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| 4152 | -36.37 | -30.95 | -30.29 | -23.67 | -24.93 | -28.54 |
| 4156 | -36.24 | -30.95 | -30.44 | -23.67 | -25.31 | -28.88 |
| 4174 | -34.69 | -32.27 | -30.53 | -24.30 | -24.69 | -28.97 |
| 4192 | -36.57 | -30.67 | -31.16 | -24.74 | -26.00 | -31.21 |
| 4210 | -33.31 | -31.28 | -30.57 | -25.36 | -25.86 | -31.66 |
| 4228 | -35.48 | -31.51 | -31.90 | -25.80 | -25.15 | -31.36 |
| 4246 | -35.80 | -31.17 | -32.11 | -25.10 | -27.10 | -32.44 |
| 4261 | -34.53 | -32.56 | -31.75 | -26.53 | -27.25 | -32.28 |



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS +25°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 4152 | -72.33 | -71.82 | -99.53 | -123.54 | -143.25 |
| 4156 | -69.63 | -71.48 | -99.75 | -123.37 | -143.19 |
| 4174 | -69.30 | -71.14 | -99.19 | -122.88 | -142.88 |
| 4192 | -68.57 | -71.20 | -98.35 | -122.24 | -142.45 |
| 4210 | -73.70 | -71.89 | -98.73 | -122.32 | -142.27 |
| 4228 | -72.54 | -70.17 | -98.82 | -122.09 | -142.46 |
| 4246 | -70.30 | -70.50 | -98.50 | -121.54 | -140.93 |
| 4261 | -69.87 | -71.39 | -97.84 | -120.79 | -140.21 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS -45°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 4152 | -67.15 | -70.94 | -97.38 | -121.84 | -140.71 |
| 4156 | -66.88 | -69.89 | -97.25 | -122.06 | -141.14 |
| 4174 | -66.55 | -71.27 | -97.57 | -122.06 | -141.63 |
| 4192 | -70.04 | -72.04 | -97.17 | -121.88 | -141.87 |
| 4210 | -69.14 | -71.31 | -97.30 | -121.80 | -142.25 |
| 4228 | -68.65 | -71.18 | -97.69 | -121.73 | -142.37 |
| 4246 | -70.73 | -71.94 | -97.64 | -122.04 | -142.28 |
| 4261 | -67.71 | -71.71 | -97.65 | -121.52 | -141.98 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS +85°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 4152 | -68.44 | -71.64 | -98.47 | -122.91 | -143.04 |
| 4156 | -70.99 | -71.15 | -98.24 | -122.87 | -143.09 |
| 4174 | -71.11 | -70.40 | -98.33 | -122.71 | -142.82 |
| 4192 | -71.24 | -69.61 | -98.09 | -122.10 | -141.87 |
| 4210 | -70.13 | -69.80 | -97.49 | -121.02 | -141.05 |
| 4228 | -70.04 | -68.91 | -97.30 | -120.49 | -140.85 |
| 4246 | -67.84 | -67.68 | -97.65 | -120.34 | -140.30 |
| 4261 | -67.99 | -68.36 | -97.45 | -120.08 | -140.10 |



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @Fcarrier 4152MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 4207MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 4261MHz+(n*Fcomparison) (dBc) note 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -5 | -109.39 | -111.01 | -113.65 | -108.78 | -110.66 | -117.84 | -115.16 | -106.25 | -109.68 |
| -4 | -106.31 | -106.73 | -112.04 | -106.75 | -108.84 | -116.35 | -110.41 | -104.78 | -108.55 |
| -3 | -101.27 | -102.89 | -108.04 | -103.76 | -106.58 | -113.97 | -107.03 | -101.82 | -104.68 |
| -2 | -93.75 | -97.32 | -102.74 | -102.09 | -101.28 | -105.68 | -100.85 | -97.25 | -100.50 |
| -1 | -80.27 | -83.54 | -90.12 | -91.64 | -95.84 | -94.97 | -88.33 | -86.52 | -89.04 |
| 0 note 2 | - | - | - | - | - | - | - | - | - |
| +1 | -80.81 | -83.93 | -92.11 | -94.98 | -94.57 | -93.22 | -87.70 | -86.59 | -88.68 |
| +2 | -94.71 | -97.53 | -104.71 | -104.78 | -101.22 | -103.53 | -100.10 | -97.20 | -98.41 |
| +3 | -101.75 | -104.62 | -110.20 | -106.50 | -105.19 | -110.22 | -107.22 | -102.21 | -102.69 |
| +4 | -106.90 | -107.93 | -114.01 | -108.53 | -108.54 | -111.84 | -110.18 | -105.54 | -104.40 |
| +5 | -110.62 | -113.53 | -117.32 | -110.16 | -110.04 | -114.98 | -114.22 | -107.14 | -107.62 |

Note 1: Comparison frequency 250 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

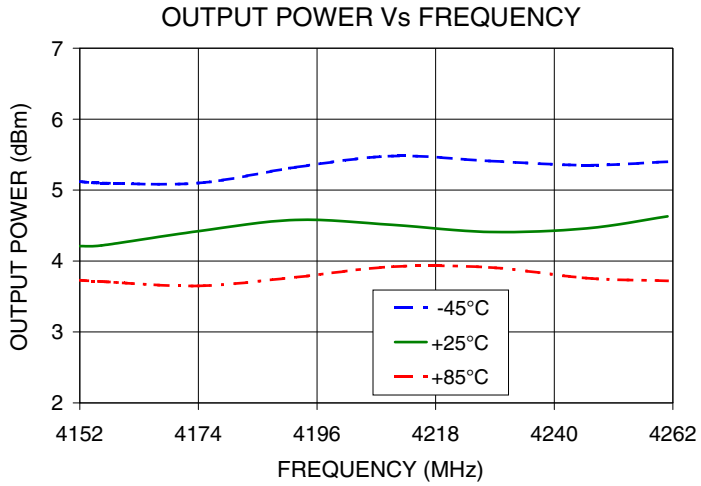
| REFERENCE SPURIOUS ORDER | REFERENCE SPURIOUS @Fcarrier 4152MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 4207MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 4261MHz+(n*Freference) (dBc) note 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -5 | -126.00 | -130.43 | -124.65 | -128.96 | -126.12 | -130.42 | -125.01 | -122.88 | -126.81 |
| -4 | -122.03 | -120.28 | -122.34 | -121.33 | -124.65 | -124.01 | -120.86 | -122.33 | -123.85 |
| -3 | -131.31 | -130.54 | -128.61 | -129.72 | -132.02 | -127.83 | -131.50 | -129.70 | -130.78 |
| -2 | -104.42 | -107.79 | -109.54 | -103.37 | -108.98 | -110.01 | -102.68 | -103.96 | -107.81 |
| -1 | -97.18 | -95.83 | -96.17 | -95.36 | -92.97 | -93.19 | -95.11 | -92.13 | -94.08 |
| 0 note 4 | - | - | - | - | - | - | - | - | - |
| +1 | -103.23 | -102.05 | -96.59 | -101.53 | -99.77 | -96.09 | -100.95 | -97.48 | -97.27 |
| +2 | -99.85 | -101.73 | -103.72 | -100.13 | -102.40 | -103.63 | -101.07 | -101.53 | -104.46 |
| +3 | -125.30 | -122.56 | -124.50 | -124.54 | -121.71 | -126.27 | -128.13 | -124.83 | -126.49 |
| +4 | -115.21 | -115.99 | -116.41 | -117.36 | -119.54 | -131.66 | -118.02 | -117.46 | -117.51 |
| +5 | -123.40 | -124.36 | -124.55 | -123.21 | -121.27 | -131.88 | -123.95 | -126.35 | -127.84 |

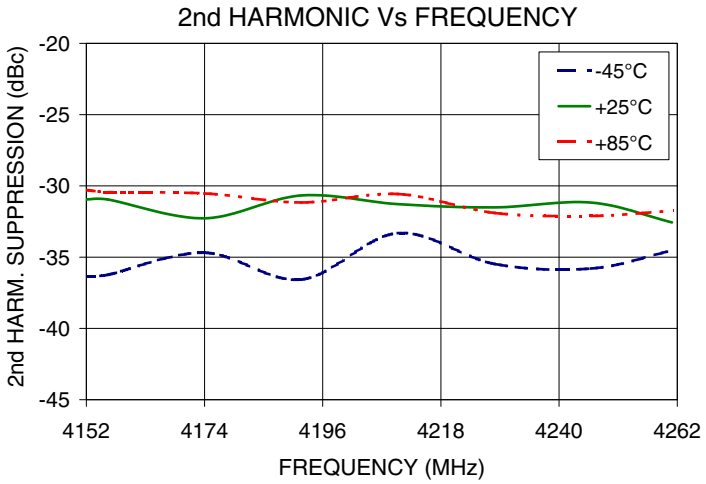
Note 3: Reference frequency 10 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

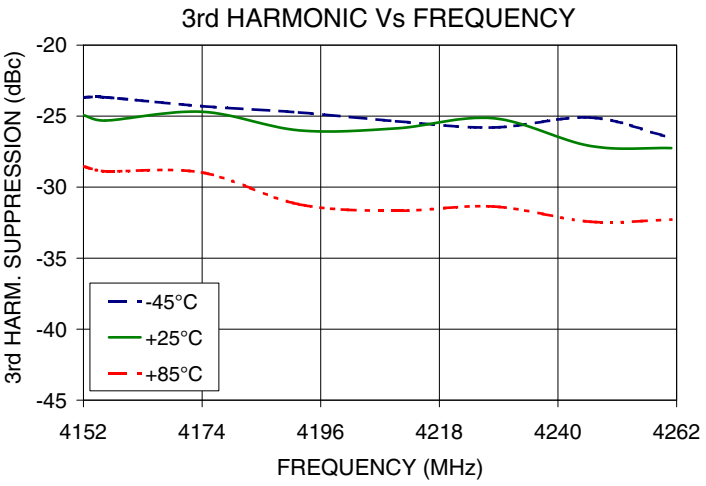


Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

## Typical Performance Curves



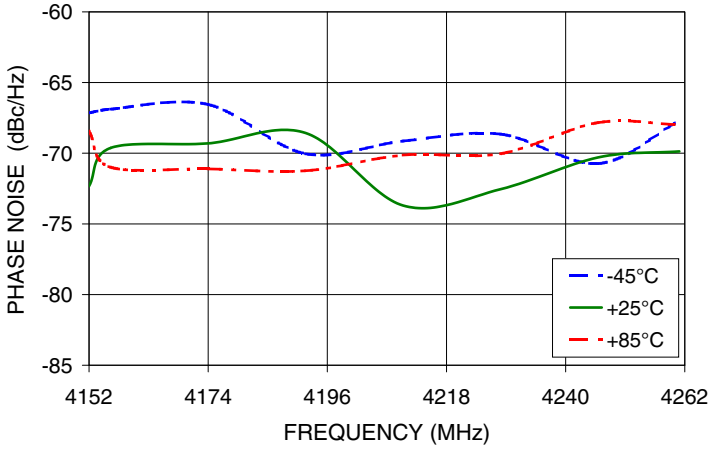



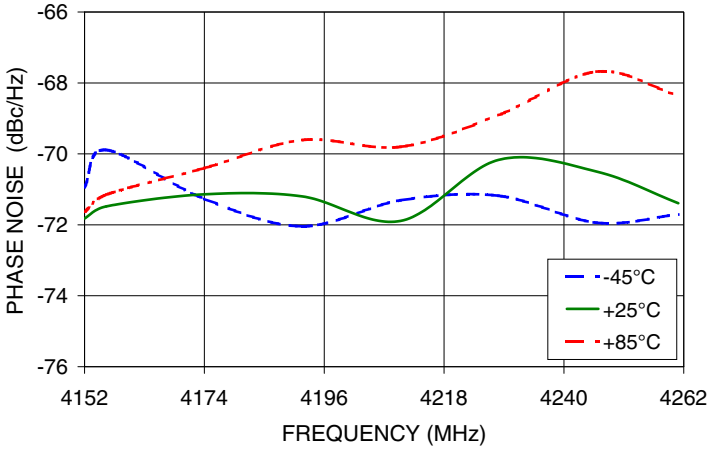



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

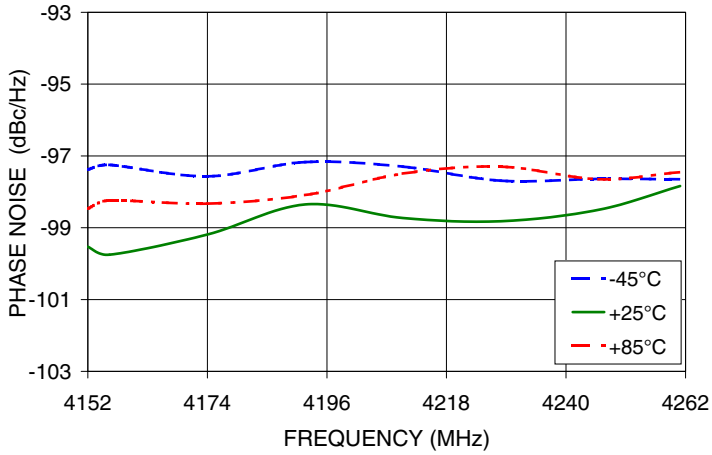
PHASE NOISE @100Hz offset



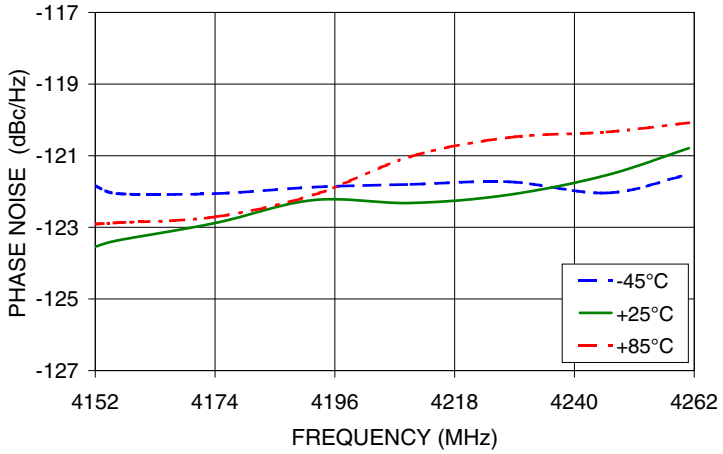

PHASE NOISE @1kHz offset



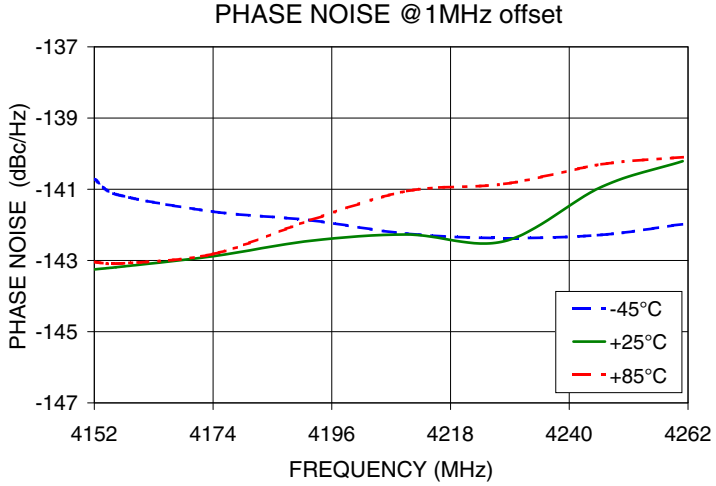

PHASE NOISE @10 kHz offset




PHASE NOISE @100 kHz offset



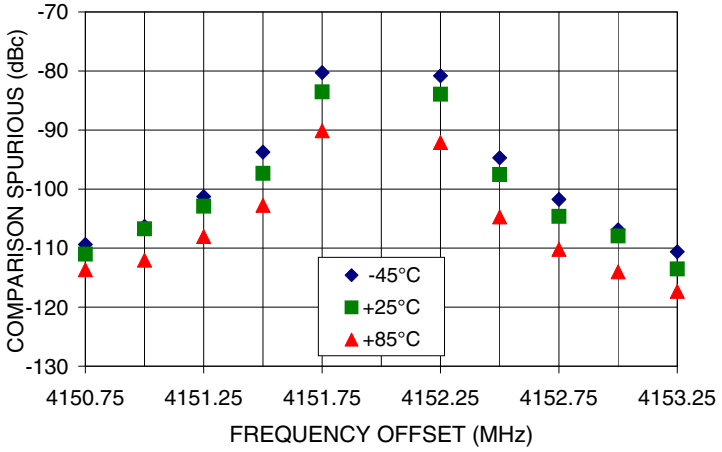

PHASE NOISE @1MHz offset



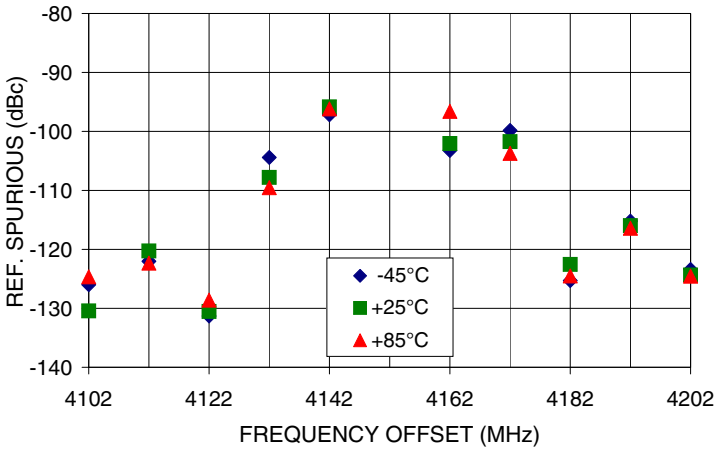



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

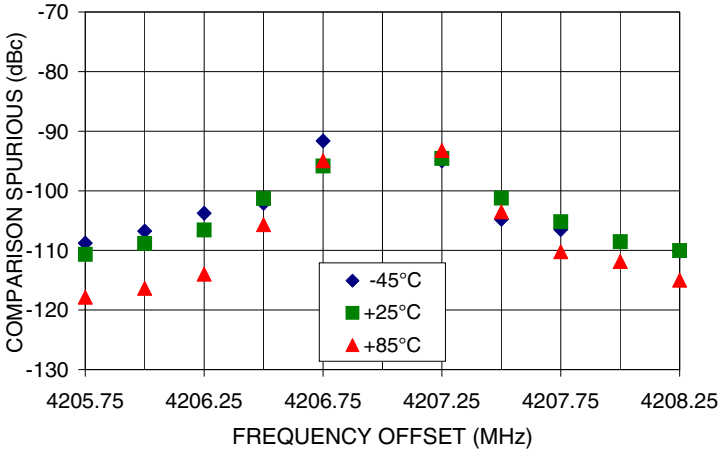
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4152MHz



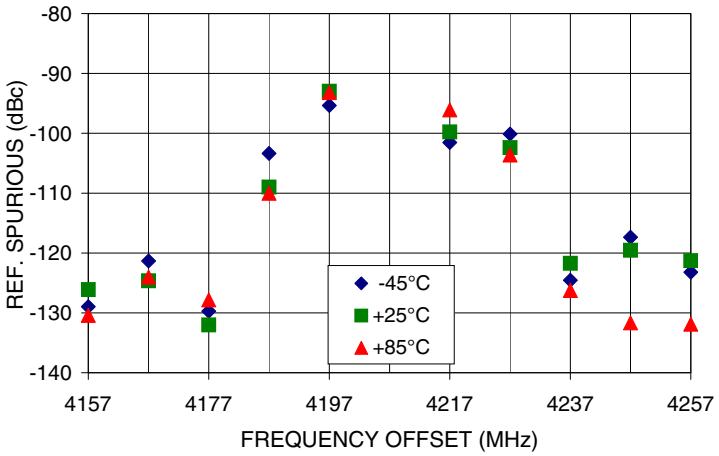

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4152MHz



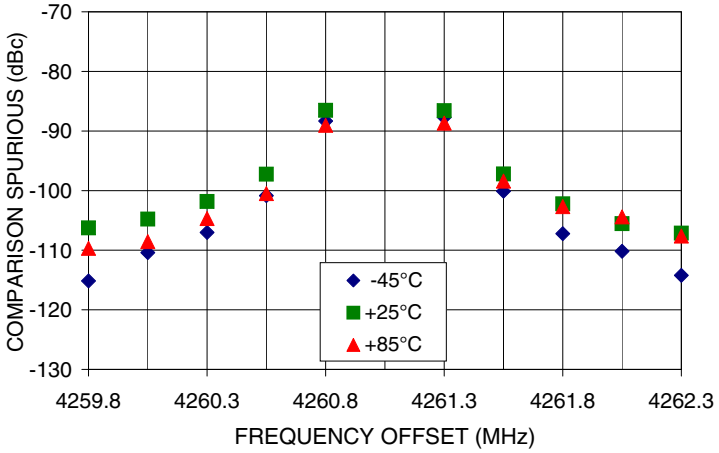

COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4207MHz



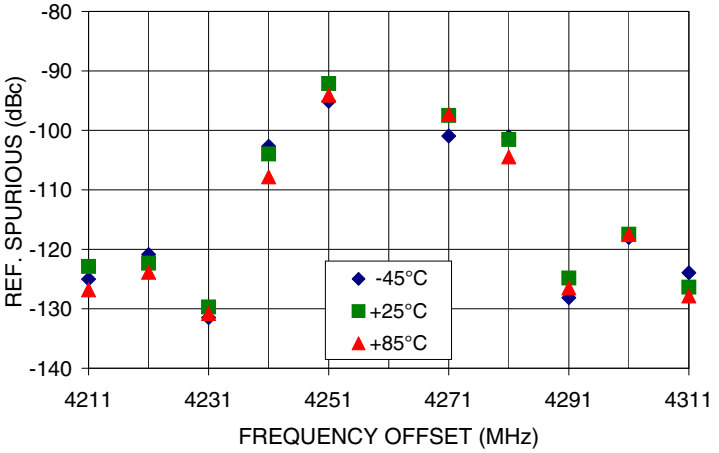

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4207MHz




COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4261MHz



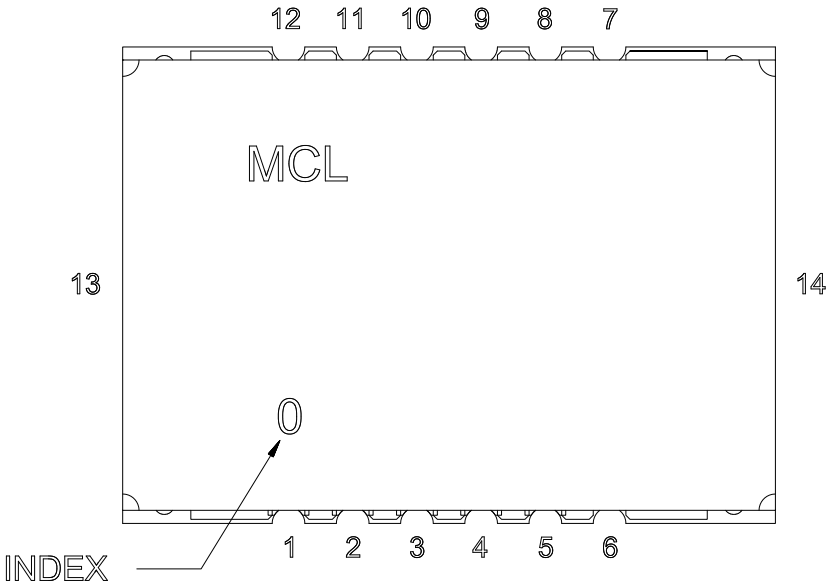

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 4261MHz






Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

## Pin Configuration

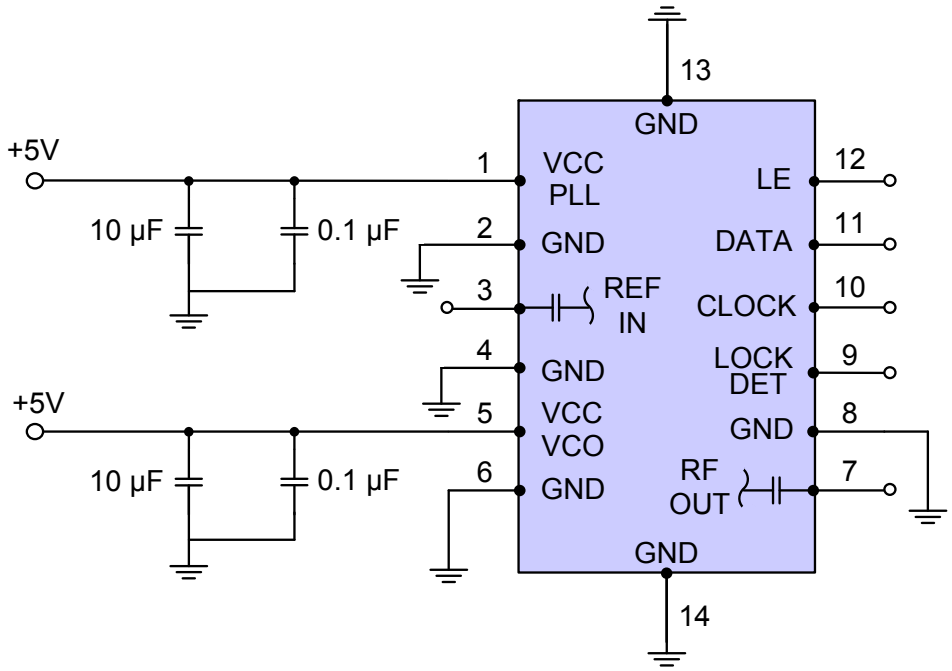



## Pin Connection

| Pin Number | Function |
|---|---|
| 1 | VCC PLL |
| 2 | GND |
| 3 | REF IN |
| 4 | GND |
| 5 | VCC VCO |
| 6 | GND |
| 7 | RF OUT |
| 8 | GND |
| 9 | LOCK DET |
| 10 | CLOCK |
| 11 | DATA |
| 12 | LE |
| 13 | GND |
| 14 | GND |

## Recommended Application Circuit

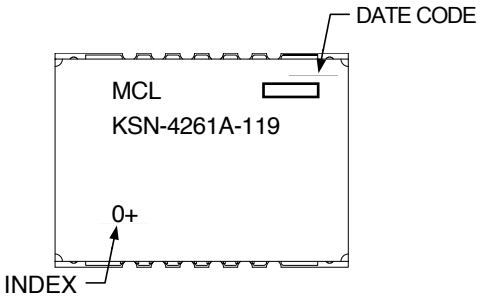
Note: REF IN and RF OUT ports are internally AC coupled.






Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

## Device Marking




## Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

**Case Style:** DK1182

**Tape & Reel:** TR-F28

**Suggested Layout for PCB Design:** PL-249

**Evaluation Board:** TB-567+

**Environment Ratings:** ENV03T2



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.