

Frequency Synthesizer

KSN-1645A-119+

50Ω 1570 to 1645 MHz

The Big Deal

- Low phase noise and spurious
- Robust design and construction
- Small size 0.80" x 0.58" x 0.15"



CASE STYLE: DK1042

Product Overview

The KSN-1645A-119+ is a Frequency Synthesizer, designed to operate from 1570 to 1645 MHz for W-CDMA application. The KSN-1645A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.15") to shield against unwanted signals and noise.

Key Features

| Feature | Advantages |
|--|--|
| Low phase noise and spurious: <ul style="list-style-type: none">• Phase Noise: -97 dBc/Hz typ. @ 10 kHz offset• Comparison Spurious: -96 dBc typ.• Reference Spurious: -105 dBc typ. | Low phase noise and spurious improve system EVM (Error Vector Magnitude). |
| Robust design and construction | To enhance the robustness of KSN-1645A-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 0.15" | The small size enables the KSN-1645A-119+ to be used in compact designs. |

Notes

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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Surface Mount

Frequency Synthesizer

KSN-1645A-119+

50Ω 1570 to 1645 MHz



CASE STYLE: DK1042

Features

- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+3.3V)
- Small size 0.80" x 0.58" x 0.15"

+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

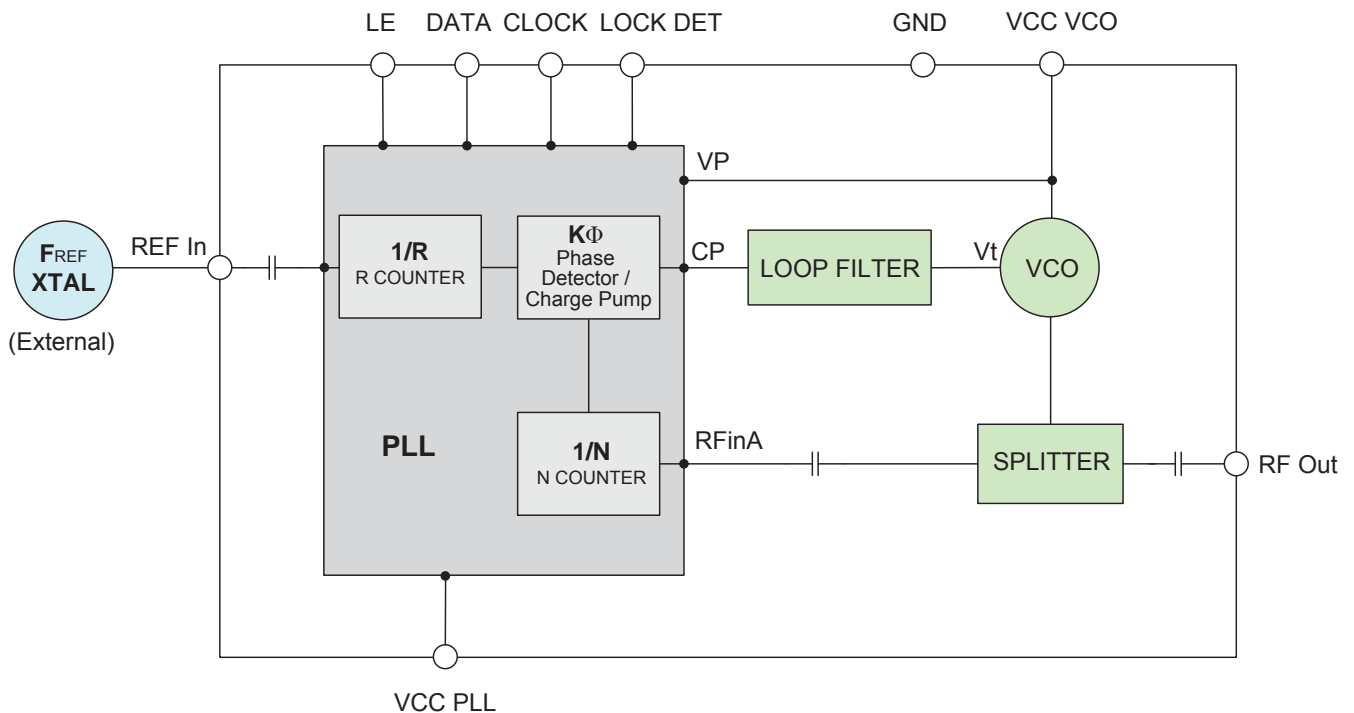
Applications

- W-CDMA

General Description

The KSN-1645A-119+ is a Frequency Synthesizer, designed to operate from 1570 to 1645 MHz for W-CDMA application. The KSN-1645A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.15") to shield against unwanted signals and noise. To enhance the robustness of KSN-1645A-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



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REV. A
M151108
EDR-8797F1
KSN-1645A-119+
Category-A1
RAV
151006
Page 2 of 10

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

| Parameters | Test Conditions | Min. | Typ. | Max. | Units | |
|-------------------------------------|----------------------------|-------------------------|-----------------------------------|-------|----------|------------------|
| Frequency Range | - | 1570 | - | 1645 | MHz | |
| Step Size | - | - | 200 | - | kHz | |
| Settling Time | Within ± 1 kHz | - | 10 | - | mSec | |
| Output Power | - | +1 | +4 | +7 | dBm | |
| SSB Phase Noise | @ 100 Hz offset | - | -75 | - | dBc/Hz | |
| | @ 1 kHz offset | - | -77 | -71 | | |
| | @ 10 kHz offset | - | -97 | -91 | | |
| | @ 100 kHz offset | - | -124 | -118 | | |
| | @ 1 MHz offset | - | -144 | -138 | | |
| Reference Spurious Suppression | Ref. Freq. 26 MHz | - | -105 | -85 | dBc | |
| Comparison Spurious Suppression | Step Size 200 kHz | - | -96 | -75 | | |
| Non - Harmonic Spurious Suppression | - | - | -90 | - | | |
| Harmonic Suppression | - | - | -27 | -21 | | |
| VCO Supply Voltage | +5.00 | +4.75 | +5.00 | +5.25 | V | |
| PLL Supply Voltage | +3.30 | +3.15 | +3.30 | +3.45 | | |
| VCO Supply Current | - | - | 46 | 52 | mA | |
| PLL Supply Current | - | - | 7 | 15 | | |
| Reference Input (External) | Frequency | 26 (square wave) | - | 26 | - | MHz |
| | Amplitude | 1 | - | 1 | - | V _{P-P} |
| | Input impedance | - | - | 100 | - | K Ω |
| | Phase Noise @ 1 kHz offset | - | - | -135 | - | dBc/Hz |
| RF Output port Impedance | - | - | 50 | - | Ω | |
| Input Logic Level | Input high voltage | - | 2.80 | - | - | V |
| | Input low voltage | - | - | - | 0.60 | V |
| Digital Lock Detect | Locked | - | 2.75 | - | 3.45 | V |
| | Unlocked | - | - | - | 0.40 | V |
| Frequency Synthesizer PLL | - | ADF4118 | | | | |
| PLL Programming | - | 3-wire serial 3.3V CMOS | | | | |
| Register Map @ 1645 MHz | F_Register | - | (MSB) X0XXX00000X0010010010 (LSB) | | | |
| | N_Register | - | (MSB) 100001000000010000101 (LSB) | | | |
| | R_Register | - | (MSB) 0XXX0000001000001000 (LSB) | | | |

Absolute Maximum Ratings

| Parameters | Ratings |
|--|----------------------------|
| VCO Supply Voltage | 6V |
| PLL Supply Voltage | 6V |
| VCO Supply Voltage to PLL Supply Voltage | -0.3V to +5.5V |
| Reference Frequency Voltage | -0.3Vmin, VCC PLL +0.3Vmax |
| Data, Clock, LE Levels | -0.3Vmin, VCC PLL +0.3Vmax |
| 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

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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 |
| | 1570 | 4.23 | 4.46 | 4.48 | 43.73 | 45.66 | 46.83 | 5.42 | 6.97 |
| 1582 | 4.26 | 4.47 | 4.49 | 43.68 | 45.63 | 46.83 | 5.42 | 6.96 | 8.31 |
| 1596 | 4.30 | 4.51 | 4.53 | 43.63 | 45.61 | 46.82 | 5.43 | 6.97 | 8.33 |
| 1610 | 4.44 | 4.67 | 4.69 | 43.59 | 45.59 | 46.81 | 5.44 | 7.00 | 8.34 |
| 1624 | 4.38 | 4.65 | 4.70 | 43.56 | 45.58 | 46.82 | 5.45 | 7.00 | 8.36 |
| 1638 | 4.09 | 4.38 | 4.46 | 43.53 | 45.57 | 46.82 | 5.46 | 7.02 | 8.37 |
| 1645 | 3.93 | 4.22 | 4.32 | 43.51 | 45.56 | 46.82 | 5.43 | 6.98 | 8.34 |

| FREQUENCY (MHz) | HARMONICS (dBc) | | | | | |
|--------------------|-----------------|--------|--------|--------|--------|--------|
| | F2 | | | F3 | | |
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| 1570 | -25.84 | -27.64 | -30.76 | -28.47 | -29.25 | -29.06 |
| 1582 | -25.60 | -27.08 | -29.79 | -27.70 | -28.57 | -28.52 |
| 1596 | -25.42 | -26.80 | -29.27 | -27.66 | -28.22 | -28.11 |
| 1610 | -25.60 | -26.98 | -29.29 | -27.77 | -28.64 | -28.67 |
| 1624 | -25.45 | -26.75 | -28.78 | -26.46 | -27.23 | -27.17 |
| 1638 | -24.74 | -25.90 | -27.70 | -27.63 | -28.54 | -28.60 |
| 1645 | -24.68 | -25.75 | -27.41 | -27.57 | -28.51 | -28.82 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | +25°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1570 | -79.96 | -78.56 | -97.34 | -124.53 | -144.29 |
| 1582 | -79.61 | -78.63 | -97.16 | -124.31 | -144.39 |
| 1596 | -80.94 | -78.80 | -96.94 | -124.25 | -144.25 |
| 1610 | -79.22 | -79.10 | -97.35 | -124.07 | -144.28 |
| 1624 | -82.39 | -79.02 | -97.44 | -123.77 | -143.64 |
| 1638 | -77.88 | -78.17 | -97.22 | -123.53 | -143.35 |
| 1645 | -79.81 | -77.09 | -97.25 | -123.34 | -143.19 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | -45°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1570 | -77.97 | -79.10 | -96.89 | -125.88 | -146.10 |
| 1582 | -80.49 | -76.91 | -96.79 | -125.75 | -146.05 |
| 1596 | -79.13 | -79.24 | -95.60 | -125.42 | -145.51 |
| 1610 | -80.97 | -79.74 | -96.33 | -125.45 | -145.55 |
| 1624 | -79.20 | -77.75 | -96.94 | -125.03 | -144.99 |
| 1638 | -79.75 | -77.39 | -97.63 | -124.91 | -145.00 |
| 1645 | -80.82 | -78.22 | -97.30 | -124.84 | -145.05 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | +85°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1570 | -80.08 | -78.90 | -95.91 | -123.14 | -143.13 |
| 1582 | -84.15 | -77.16 | -95.50 | -122.92 | -142.81 |
| 1596 | -80.60 | -77.84 | -95.76 | -122.62 | -142.75 |
| 1610 | -80.21 | -75.97 | -96.39 | -122.60 | -142.55 |
| 1624 | -80.54 | -75.94 | -95.96 | -122.29 | -142.00 |
| 1638 | -79.35 | -76.01 | -96.04 | -121.71 | -141.85 |
| 1645 | -79.59 | -75.73 | -95.93 | -121.67 | -141.85 |

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| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @Fcarrier 1570MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 1607.4MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 1645MHz+(n*Fcomparison) (dBc) note 1 | | |
|---------------------------|--|---------|---------|--|---------|---------|--|---------|---------|
| | n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C |
| -5 | -116.35 | -117.33 | -118.66 | -117.31 | -119.60 | -113.87 | -116.93 | -109.57 | -117.20 |
| -4 | -112.87 | -111.17 | -115.00 | -111.04 | -118.00 | -109.51 | -115.73 | -106.68 | -115.75 |
| -3 | -109.98 | -110.18 | -113.07 | -111.74 | -116.12 | -108.37 | -112.17 | -105.50 | -116.18 |
| -2 | -104.40 | -108.85 | -105.54 | -107.33 | -108.23 | -104.60 | -108.92 | -106.82 | -104.23 |
| -1 | -94.68 | -96.66 | -95.52 | -94.66 | -97.90 | -97.71 | -95.90 | -96.84 | -94.82 |
| 0 ^{note 2} | - | - | - | - | - | - | - | - | - |
| +1 | -96.06 | -95.18 | -97.59 | -96.49 | -94.68 | -97.65 | -94.20 | -97.05 | -97.64 |
| +2 | -107.01 | -105.91 | -107.78 | -110.96 | -107.14 | -104.81 | -105.87 | -105.76 | -106.64 |
| +3 | -112.09 | -106.74 | -111.67 | -111.96 | -113.23 | -111.29 | -110.29 | -103.12 | -111.85 |
| +4 | -115.15 | -112.20 | -116.82 | -112.31 | -117.32 | -112.43 | -117.33 | -106.00 | -119.22 |
| +5 | -118.03 | -115.31 | -117.39 | -116.99 | -121.25 | -112.44 | -116.24 | -110.55 | -117.31 |

Note 1: Comparison frequency 200 kHz

Note 2: All spurs are referenced to carrier signal (n=0).

| REFERENCE SPURIOUS ORDER | REFERENCE SPURIOUS @Fcarrier 1570MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 1607.4MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 1645MHz+(n*Freference) (dBc) note 3 | | |
|--------------------------|--|---------|---------|--|---------|---------|--|---------|---------|
| | n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C |
| -5 | -133.98 | -133.58 | -130.63 | -129.83 | -132.10 | -130.41 | -132.88 | -130.51 | -129.83 |
| -4 | -129.70 | -131.15 | -126.78 | -126.83 | -127.19 | -126.93 | -118.49 | -121.74 | -119.88 |
| -3 | -125.18 | -134.75 | -130.69 | -126.55 | -129.83 | -135.76 | -132.30 | -131.05 | -130.17 |
| -2 | -114.85 | -117.99 | -117.94 | -115.45 | -118.42 | -118.24 | -116.09 | -117.59 | -118.72 |
| -1 | -109.30 | -106.18 | -105.58 | -108.66 | -105.25 | -105.24 | -109.41 | -104.98 | -104.64 |
| 0 ^{note 4} | - | - | - | - | - | - | - | - | - |
| +1 | -109.60 | -105.56 | -104.76 | -107.63 | -104.44 | -103.90 | -108.14 | -103.85 | -104.40 |
| +2 | -119.78 | -126.99 | -126.17 | -120.20 | -126.34 | -126.19 | -119.11 | -122.75 | -124.78 |
| +3 | -129.37 | -134.01 | -129.42 | -129.23 | -133.76 | -133.80 | -130.33 | -130.12 | -135.38 |
| +4 | -128.32 | -126.68 | -122.90 | -122.90 | -126.25 | -126.93 | -118.73 | -119.10 | -119.81 |
| +5 | -129.62 | -130.27 | -125.82 | -130.34 | -125.84 | -126.60 | -131.34 | -127.38 | -132.21 |

Note 3: Reference frequency 26 MHz

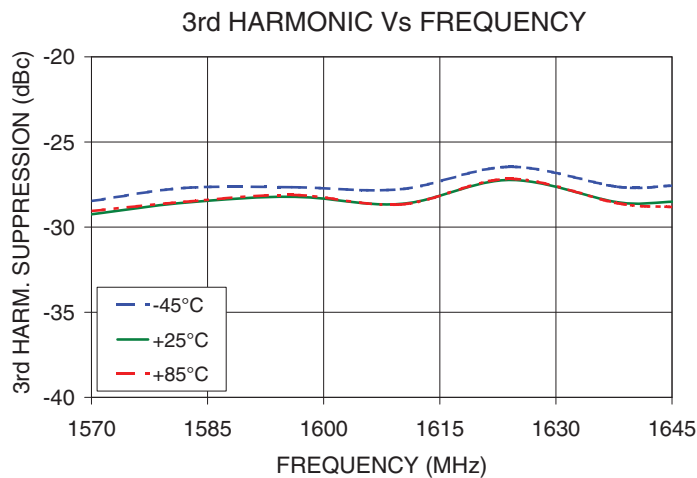
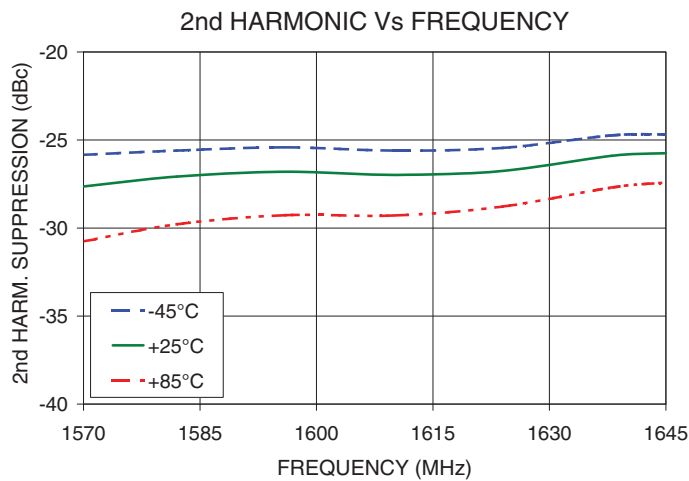
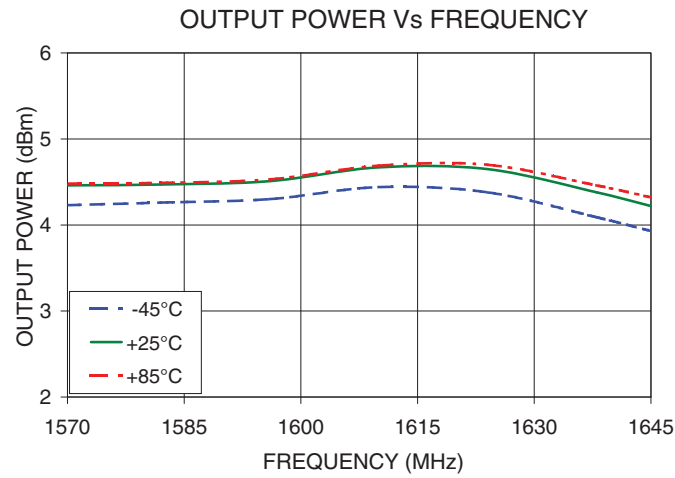
Note 4: All spurs are referenced to carrier signal (n=0).

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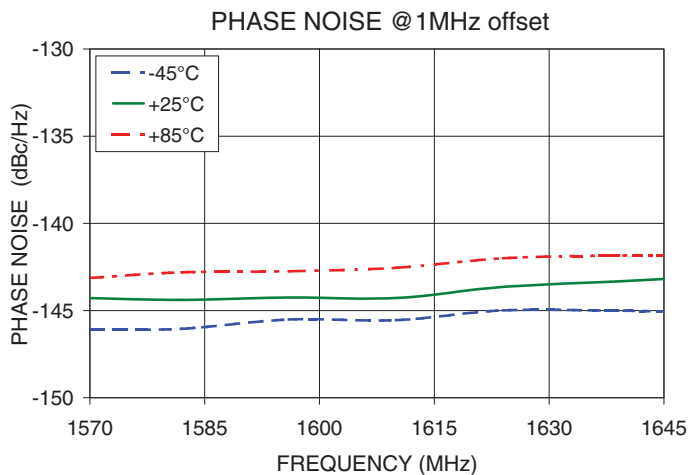
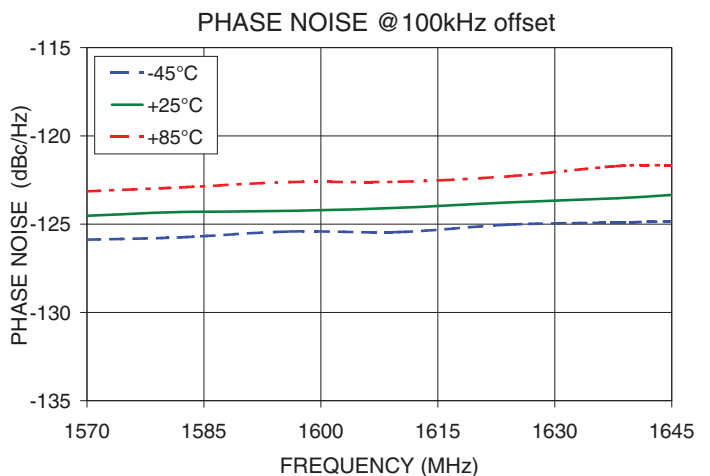
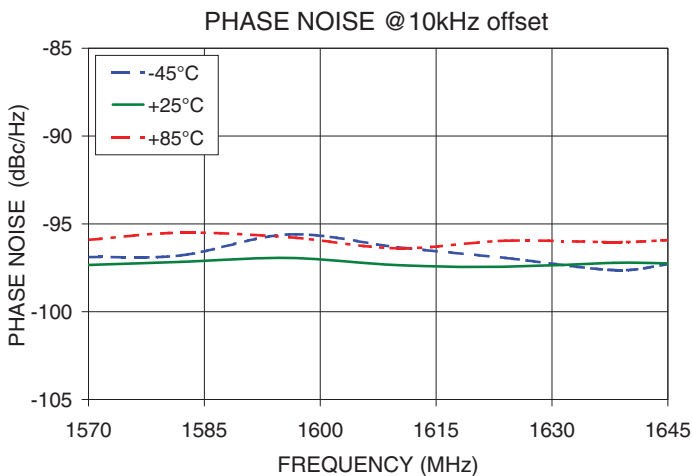
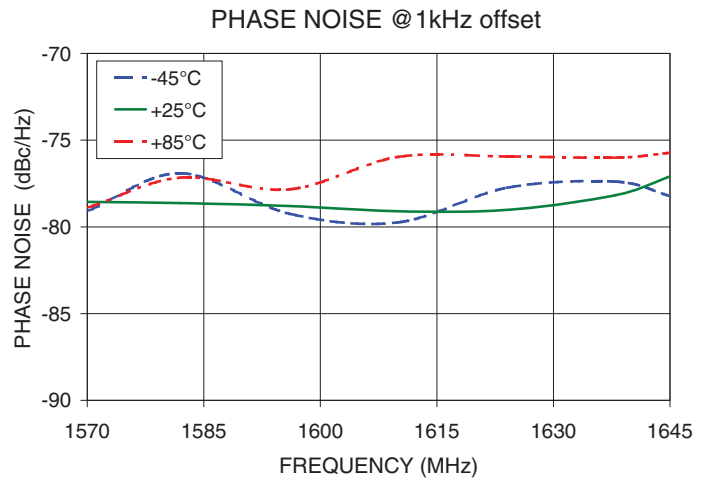
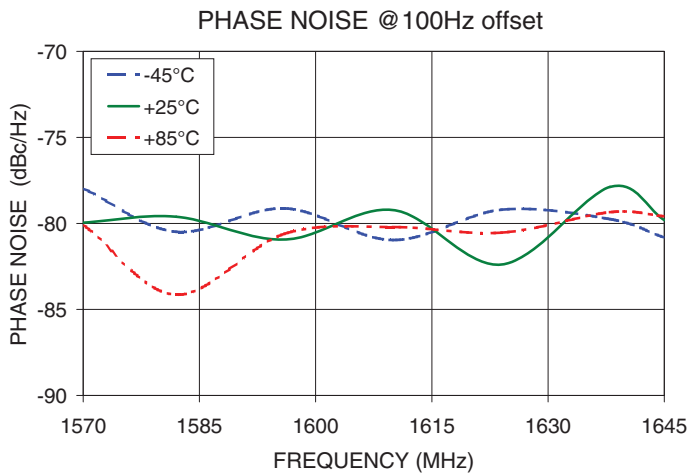
Typical Performance Curves



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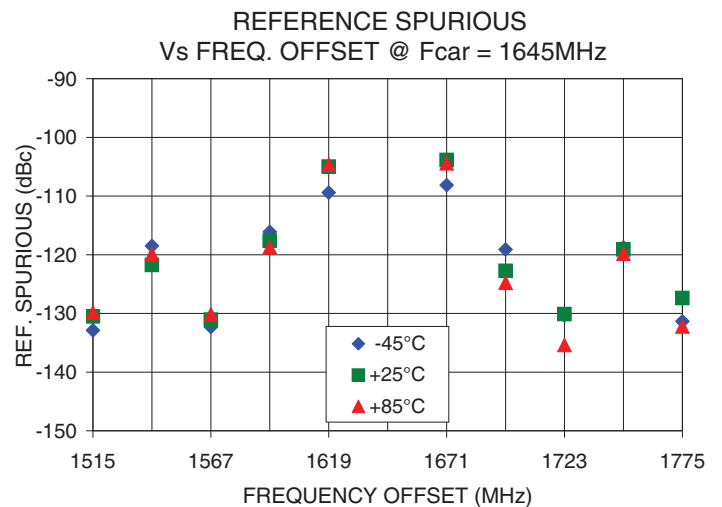
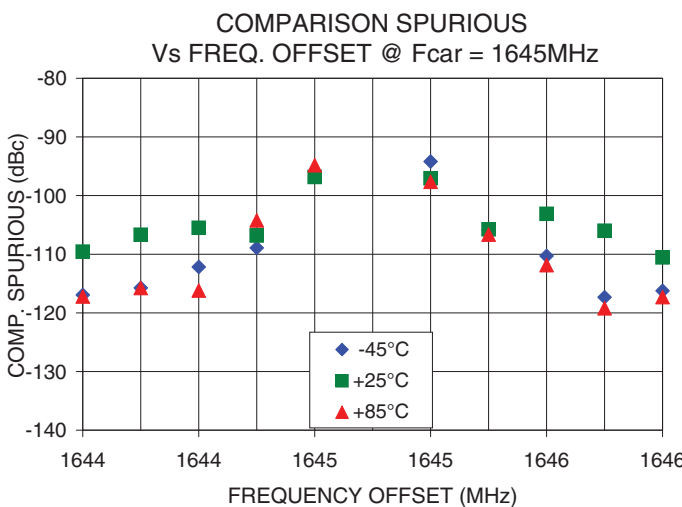
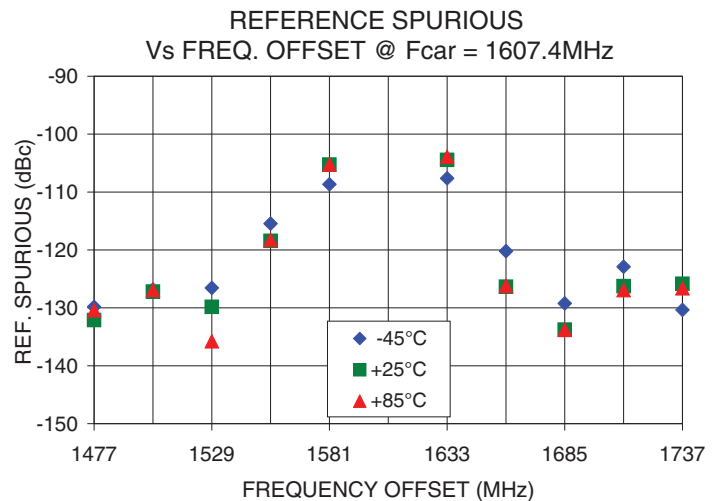
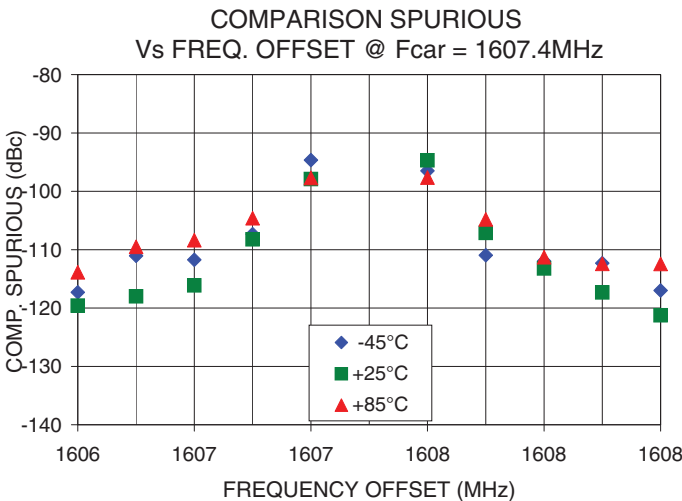
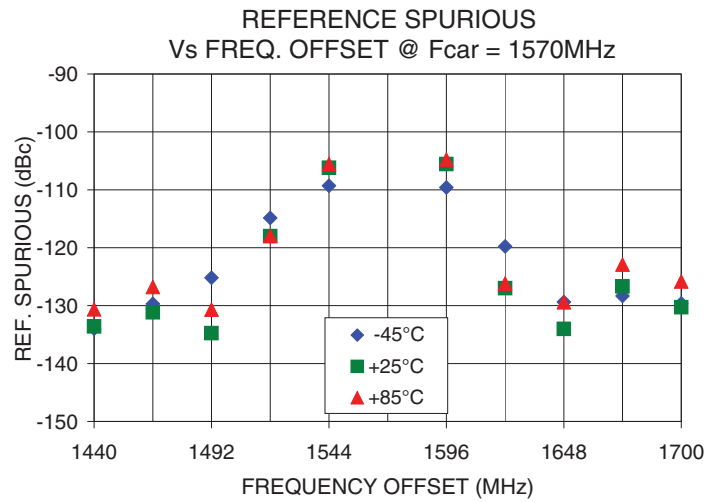
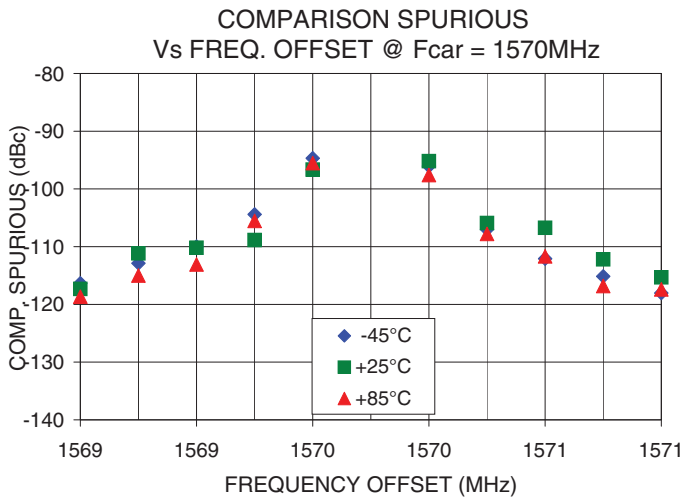




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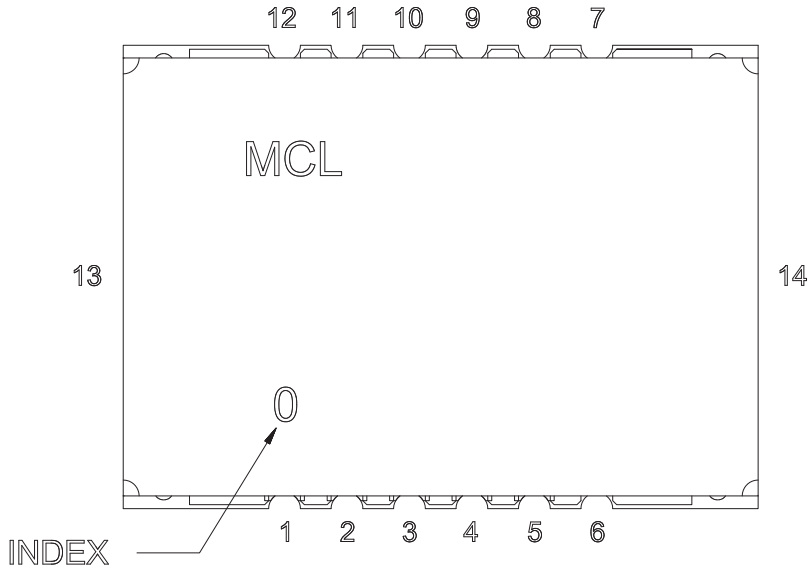




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Pin Configuration

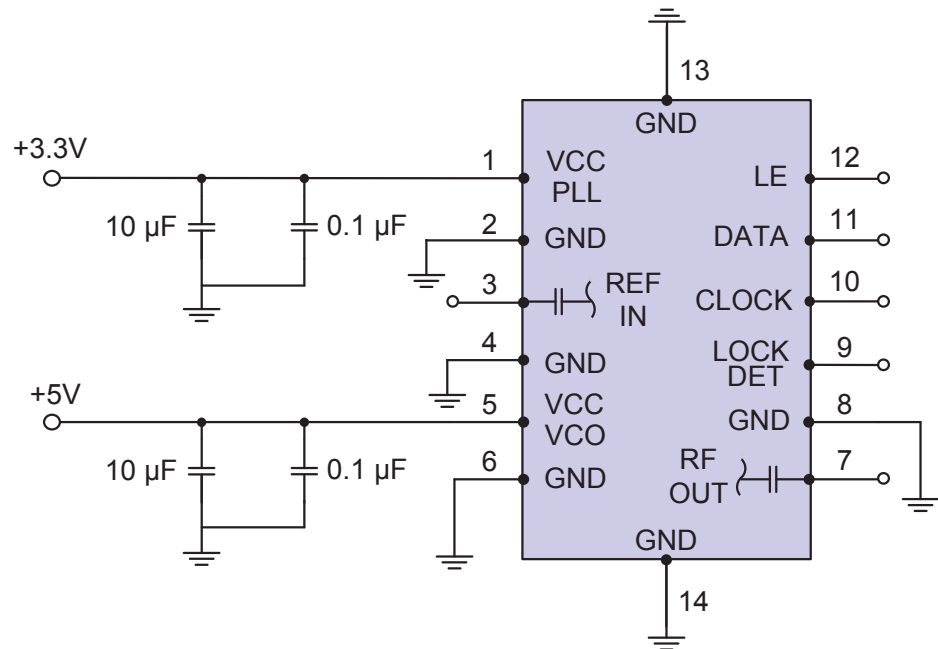


Pin Connection

| 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.

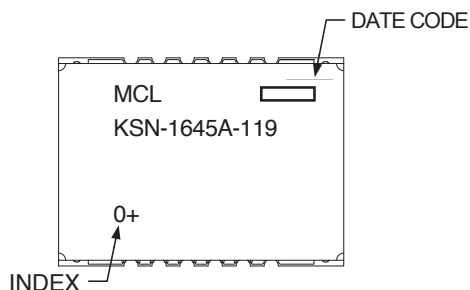


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Device Marking



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: DK1042

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567-1+

Environment Ratings: ENV03T2

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