# Frequency Synthesizer

**KSN-1935A+**

**50Ω 1915 to 1935 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-1935A+ is a Frequency Synthesizer, designed to operate from 1915 to 1935 MHz for Cable TV application. The KSN-1935A+ 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:<br>• Phase Noise: -107 dBc/Hz typ. @ 10 kHz offset<br>• Comparison Spurious: -85 dBc typ.<br>• Reference Spurious: -110 dBc typ. | Low phase noise and spurious improve system EVM (Error Vector Magnitude). |
| Robust design and construction | To enhance the robustness of KSN-1935A+, 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-1935A+ to be used in compact designs. |

*Surface Mount*

# Frequency Synthesizer

## KSN-1935A+

50Ω 1915 to 1935 MHz

CASE STYLE: DK1042
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.*

### 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

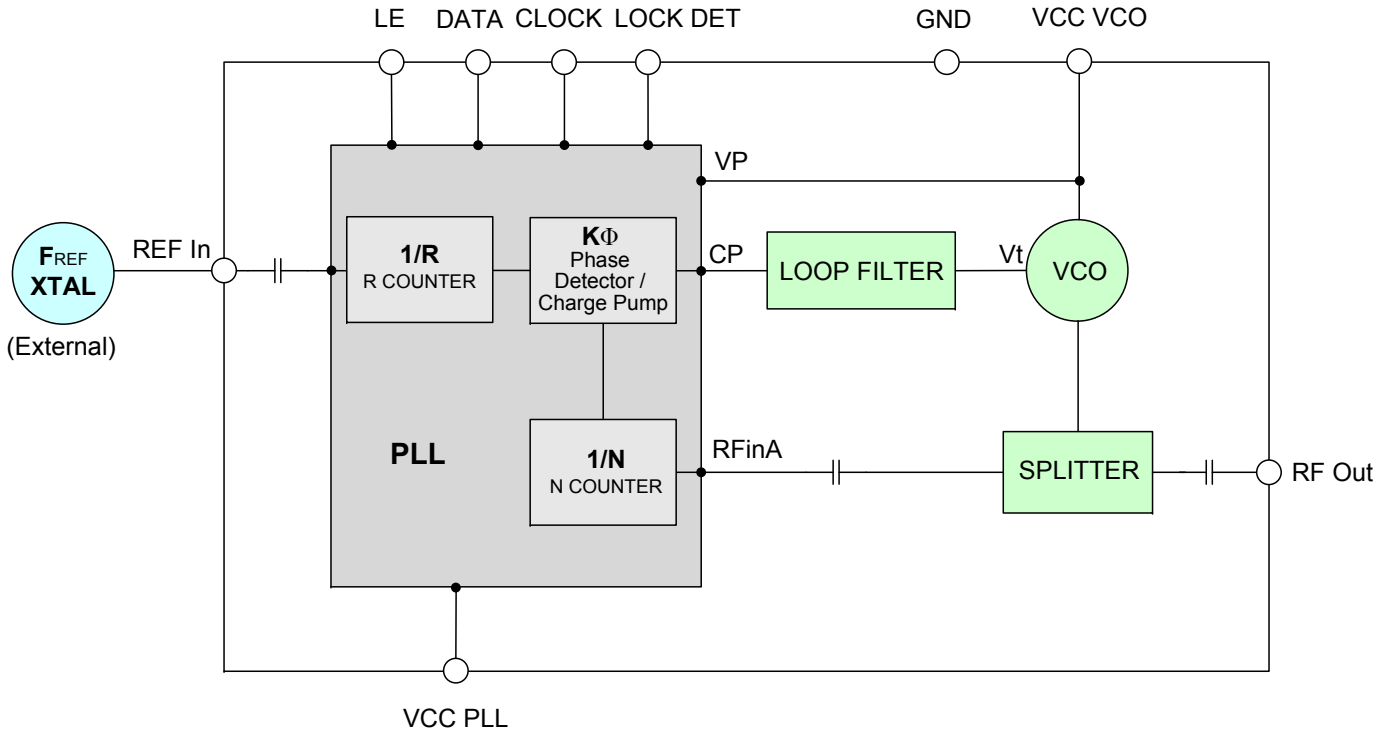
### Applications

- Cable TV

### General Description

The KSN-1935A+ is a Frequency Synthesizer, designed to operate from 1915 to 1935 MHz for Cable TV application. The KSN-1935A+ 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-1935A+, 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









REV. OR
M128051
EDR-9540F1
KSN-1935A+
Category-A1
RAV
100721

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

| Parameters | | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Frequency Range | | - | 1915 | - | 1935 | MHz |
| Step Size | | - | - | 125 | - | kHz |
| Settling Time | | Within ± 1 kHz | - | 20 | - | mSec |
| Output Power | | - | +0.5 | +3.5 | +6.5 | dBm |
| SSB Phase Noise | | @ 100 Hz offset | - | -62 | - | dBc/Hz |
| | | @ 1 kHz offset | - | -78 | -68 | |
| | | @ 10 kHz offset | - | -107 | -102 | |
| | | @ 100 kHz offset | - | -130 | -126 | |
| | | @ 1 MHz offset | - | -150 | -146 | |
| Integrated SSB Phase Noise | | @ 100Hz to 1MHz | - | -32 | - | dBc |
| Reference Spurious Suppression | | Ref. Freq. 20 MHz | - | -110 | -90 | dBc |
| Comparison Spurious Suppression | | Step Size 125 kHz | - | -85 | -75 | |
| Non - Harmonic Spurious Suppression | | - | - | -90 | - | |
| Harmonic Suppression | | - | - | -25 | -18 | |
| 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 | | - | - | 48 | 55 | mA |
| PLL Supply Current | | - | - | 8 | 14 | |
| Reference Input (External) | Frequency | 20 ( square wave) | - | 20 | - | MHz |
| | Amplitude | 1.0 | - | 1.0 | - | $V_{P-P}$ |
| | Input impedance | - | - | 100 | - | KΩ |
| | 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 | - | 3.85 | V |
| | Unlocked | - | - | - | 0.40 | V |
| Frequency Synthesizer PLL | | - | ADF4118 | | | |
| PLL Programming | | - | 3-wire serial 3.3V CMOS | | | |
| Register Map @ 1935 MHz | F_Register | - | (MSB) 00000000000010010010 (LSB) | | | |
| | N_Register | - | (MSB) 10000111000111100001 (LSB) | | | |
| | R_Register | - | (MSB) 10000000001010000000 (LSB) | | | |

## Absolute Maximum Ratings

| Parameters | Ratings |
|---|---|
| VCO Supply Voltage | 6V |
| PLL Supply Voltage | 6V |
| VCO Power Supply to PLL Power Supply | -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

## 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 |
| 1915 | 3.42 | 3.92 | 3.82 | 44.83 | 47.55 | 48.87 | 5.65 | 7.57 | 9.03 |
| 1916 | 3.41 | 3.92 | 3.81 | 44.83 | 47.55 | 48.87 | 5.64 | 7.56 | 9.02 |
| 1925 | 3.36 | 3.87 | 3.76 | 44.79 | 47.48 | 48.81 | 5.65 | 7.57 | 9.03 |
| 1934 | 3.28 | 3.80 | 3.69 | 44.74 | 47.40 | 48.74 | 5.66 | 7.57 | 9.04 |
| 1935 | 3.27 | 3.79 | 3.68 | 44.74 | 47.39 | 48.73 | 5.66 | 7.58 | 9.05 |

| FREQUENCY (MHz) | HARMONICS (dBc) | | | | | |
|---|---|---|---|---|---|---|
| | F2 | | | F3 | | |
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| 1915 | -37.45 | -48.72 | -37.34 | -22.41 | -24.66 | -26.60 |
| 1916 | -37.50 | -48.67 | -37.22 | -22.53 | -24.80 | -26.86 |
| 1925 | -37.94 | -45.86 | -36.95 | -23.53 | -25.86 | -28.12 |
| 1934 | -36.83 | -42.79 | -36.27 | -23.52 | -26.38 | -28.75 |
| 1935 | -36.71 | -42.51 | -36.24 | -23.51 | -26.40 | -28.41 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS +25°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1915 | -62.86 | -80.63 | -108.03 | -130.14 | -150.59 |
| 1916 | -60.83 | -78.83 | -108.06 | -130.33 | -150.59 |
| 1925 | -61.05 | -78.23 | -107.78 | -130.22 | -150.09 |
| 1934 | -65.19 | -77.73 | -107.66 | -129.82 | -150.36 |
| 1935 | -66.08 | -77.61 | -107.57 | -129.84 | -150.67 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS -45°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1915 | -62.92 | -79.84 | -108.24 | -130.16 | -150.39 |
| 1916 | -63.67 | -79.40 | -107.10 | -130.23 | -150.45 |
| 1925 | -61.78 | -78.06 | -107.44 | -130.32 | -150.92 |
| 1934 | -64.01 | -77.87 | -107.16 | -130.23 | -150.48 |
| 1935 | -61.87 | -77.73 | -106.39 | -130.37 | -150.14 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS +85°C | | | | |
|---|---|---|---|---|---|
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 1915 | -60.48 | -76.46 | -107.87 | -129.78 | -149.97 |
| 1916 | -62.42 | -78.55 | -106.83 | -129.66 | -149.69 |
| 1925 | -59.92 | -76.41 | -106.94 | -129.56 | -149.81 |
| 1934 | -59.18 | -78.24 | -106.85 | -129.32 | -149.54 |
| 1935 | -59.39 | -76.89 | -107.20 | -129.53 | -149.52 |

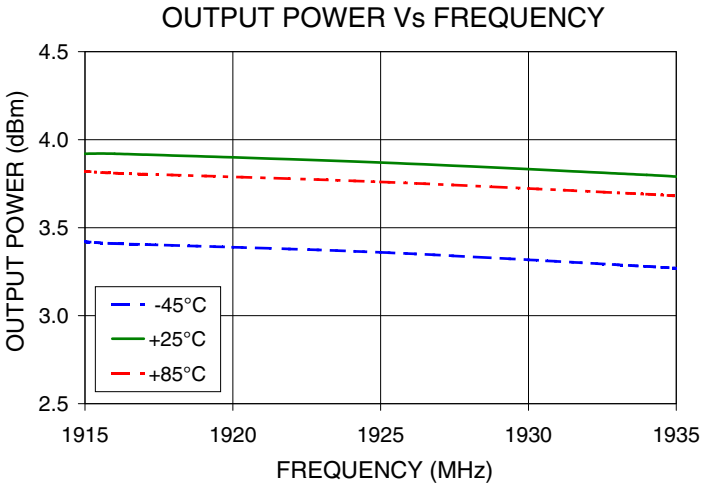
| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @Fcarrier 1915MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 1925MHz+(n*Fcomparison) (dBc) note 1 | | | COMPARISON SPURIOUS @Fcarrier 1935MHz+(n*Fcomparison) (dBc) note 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -5 | -108.69 | -114.02 | -114.91 | -110.85 | -107.63 | -114.74 | -111.22 | -113.32 | -113.90 |
| -4 | -110.74 | -112.61 | -108.85 | -108.83 | -108.71 | -112.11 | -109.36 | -111.57 | -110.06 |
| -3 | -102.95 | -106.03 | -106.70 | -104.57 | -107.59 | -108.91 | -103.59 | -105.41 | -107.86 |
| -2 | -97.42 | -99.64 | -98.02 | -97.44 | -99.46 | -98.52 | -92.49 | -100.89 | -98.31 |
| -1 | -88.58 | -88.94 | -86.37 | -89.61 | -88.19 | -85.70 | -88.42 | -88.33 | -85.46 |
| 0 note 2 | - | - | - | - | - | - | - | - | - |
| +1 | -89.16 | -89.46 | -86.99 | -90.44 | -86.91 | -85.44 | -87.99 | -86.21 | -87.94 |
| +2 | -95.75 | -102.35 | -100.66 | -99.07 | -100.18 | -98.36 | -95.90 | -99.75 | -99.55 |
| +3 | -105.65 | -105.87 | -104.86 | -101.63 | -107.70 | -107.38 | -105.43 | -108.42 | -103.22 |
| +4 | -109.35 | -110.06 | -112.49 | -112.47 | -111.31 | -113.02 | -111.47 | -108.41 | -109.30 |
| +5 | -113.93 | -112.43 | -112.76 | -110.03 | -116.04 | -112.75 | -113.06 | -110.94 | -115.19 |

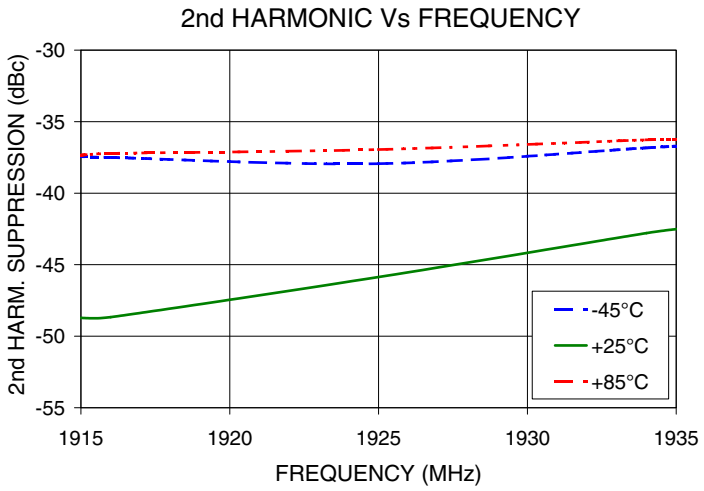
Note 1: Comparison frequency 125 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

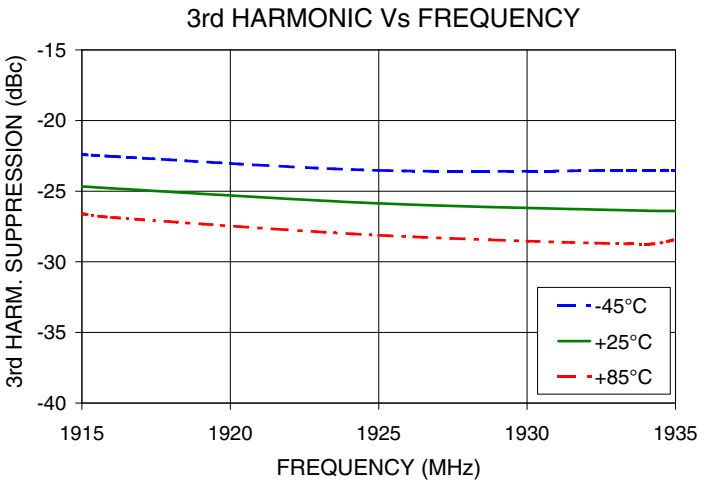
| REFERENCE SPURIOUS ORDER | REFERENCE SPURIOUS @Fcarrier 1915MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 1925MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @Fcarrier 1935MHz+(n*Freference) (dBc) note 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -5 | -127.03 | -118.61 | -123.07 | -126.96 | -125.18 | -123.96 | -121.18 | -122.56 | -123.46 |
| -4 | -128.45 | -127.61 | -130.40 | -126.39 | -128.62 | -127.31 | -127.78 | -123.55 | -129.30 |
| -3 | -125.40 | -128.69 | -121.98 | -124.05 | -120.44 | -123.58 | -123.36 | -126.23 | -126.89 |
| -2 | -121.95 | -123.07 | -120.92 | -118.65 | -120.73 | -119.91 | -120.21 | -122.44 | -120.22 |
| -1 | -115.36 | -117.51 | -125.06 | -115.83 | -118.40 | -121.43 | -113.67 | -118.45 | -120.57 |
| 0 note 4 | - | - | - | - | - | - | - | - | - |
| +1 | -107.16 | -116.41 | -110.39 | -108.87 | -118.79 | -111.42 | -107.66 | -114.22 | -111.26 |
| +2 | -123.76 | -124.07 | -122.60 | -125.41 | -123.21 | -122.41 | -121.67 | -119.32 | -120.86 |
| +3 | -128.22 | -121.25 | -130.56 | -128.32 | -121.88 | -128.37 | -126.88 | -123.83 | -128.29 |
| +4 | -124.32 | -126.47 | -131.29 | -127.68 | -127.66 | -128.71 | -123.75 | -126.37 | -126.62 |
| +5 | -124.85 | -123.36 | -121.98 | -122.68 | -121.72 | -118.91 | -121.78 | -123.19 | -120.46 |

Note 3: Reference frequency 20 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

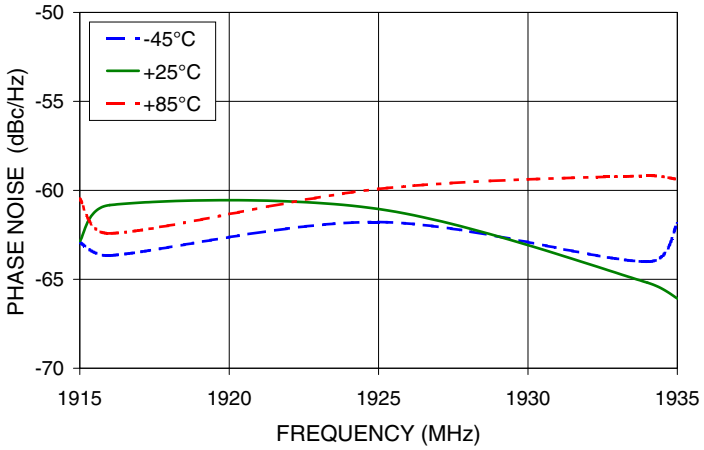
## Typical Performance Curves



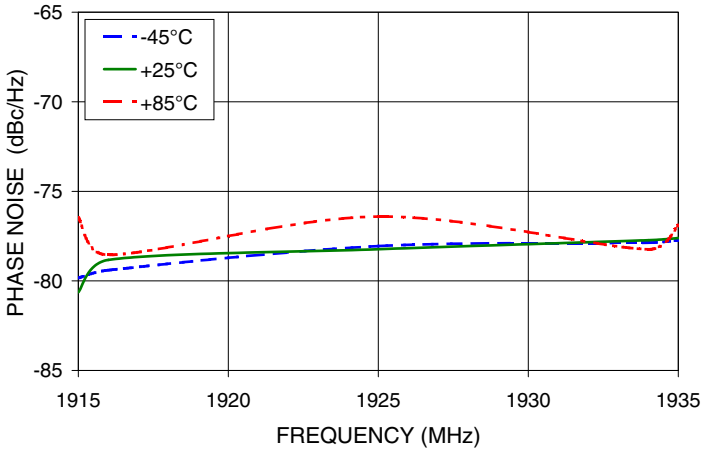



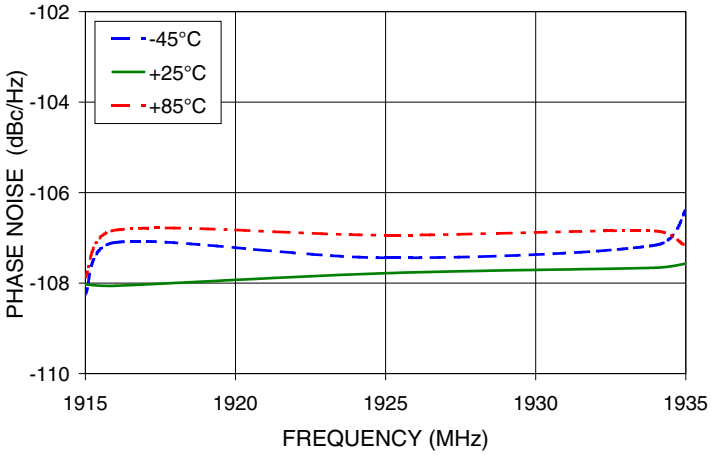
PHASE NOISE @100Hz offset



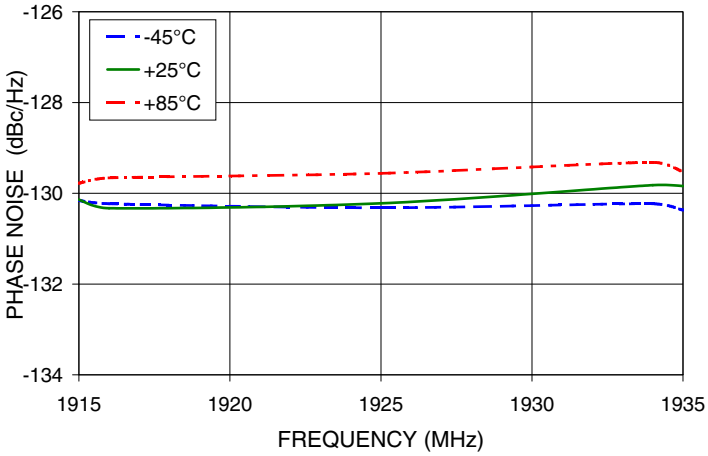

PHASE NOISE @1kHz offset



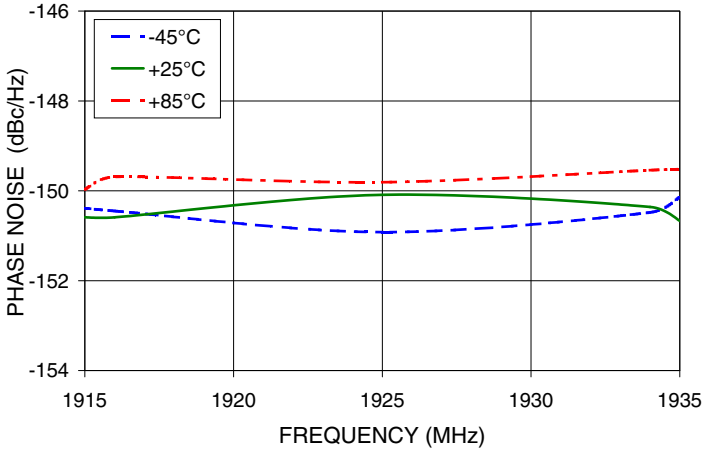

PHASE NOISE @10 kHz offset



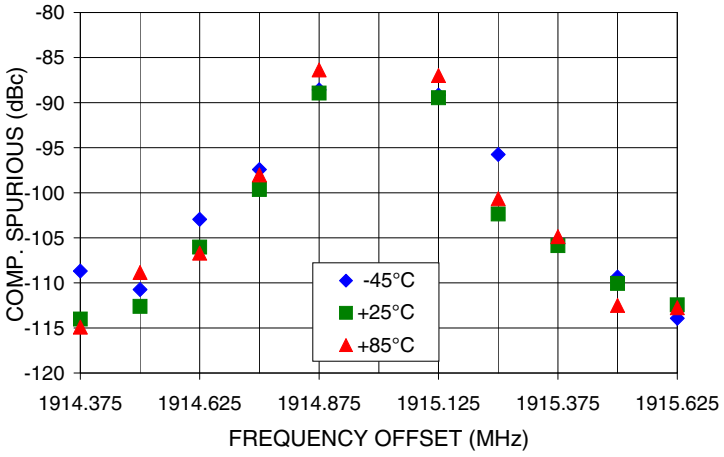

PHASE NOISE @100 kHz offset



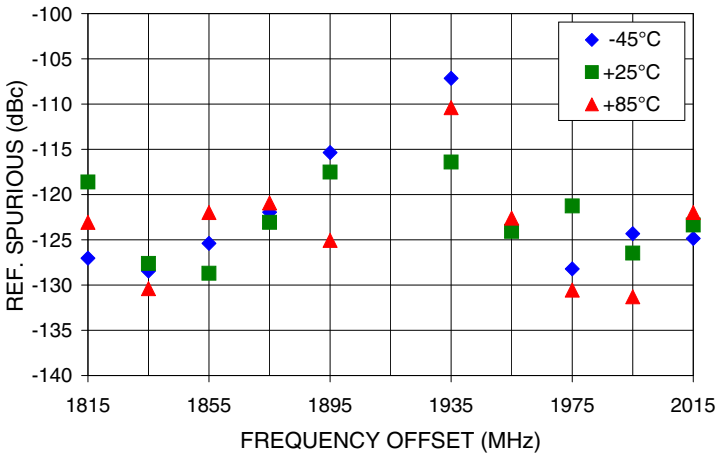

PHASE NOISE @1MHz offset



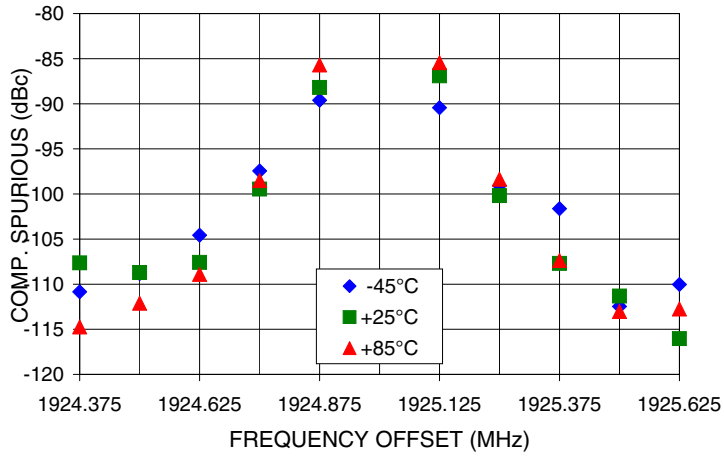
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1915MHz



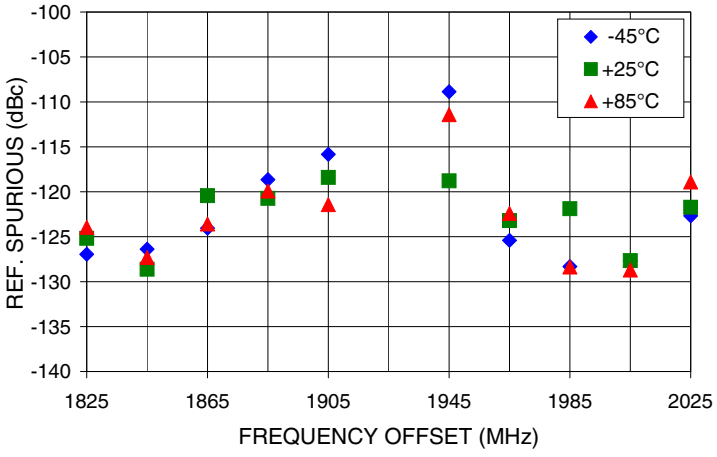

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1915MHz



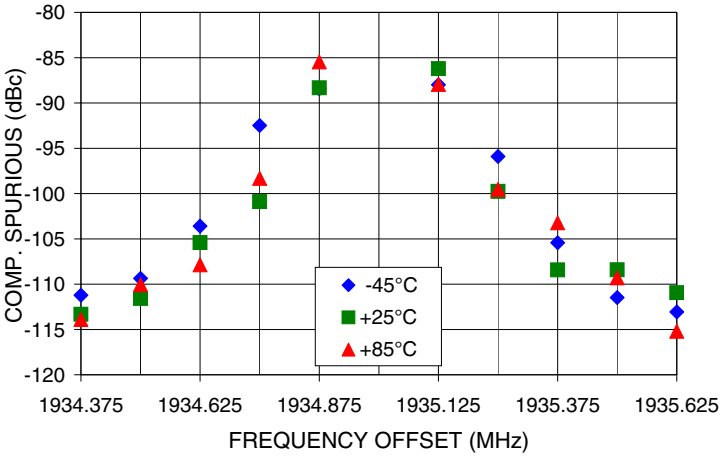

COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1925MHz



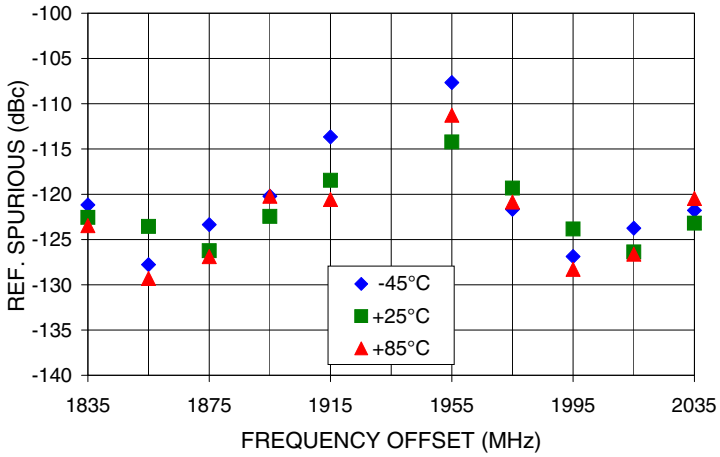

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1925MHz



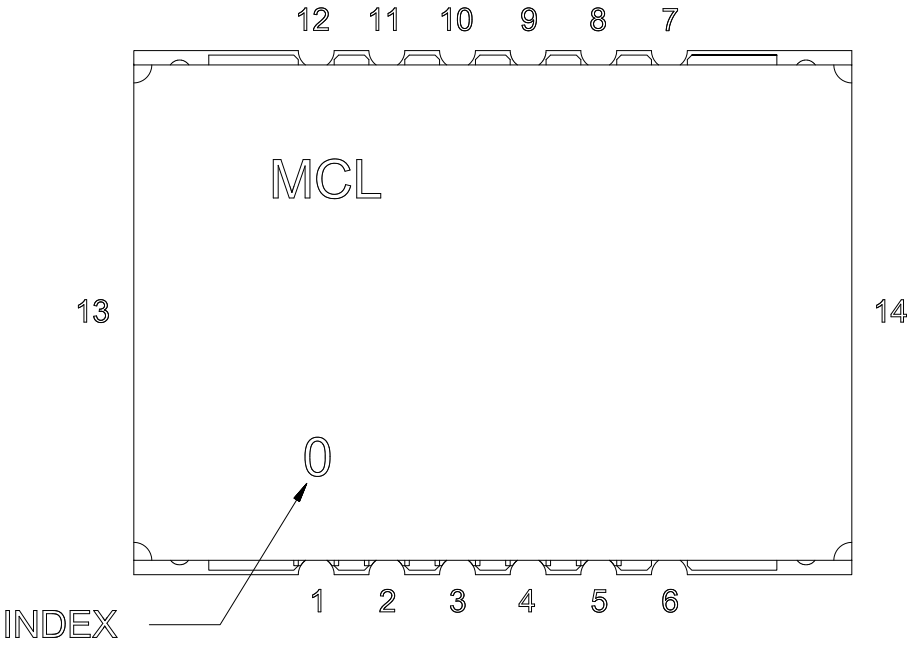

COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1935MHz




REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1935MHz



## Pin Configuration

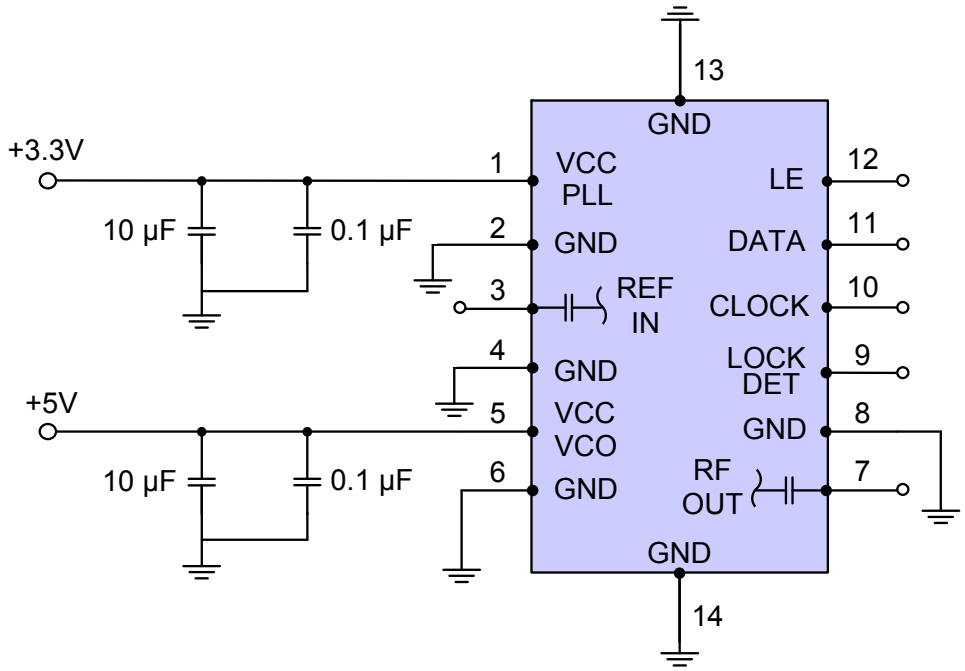



## Pin Connection

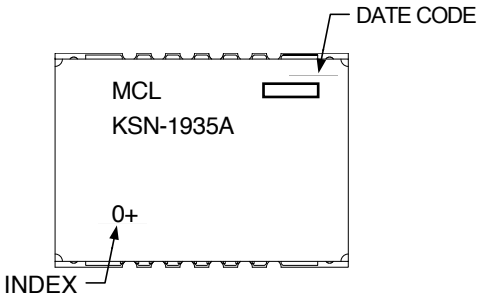
| Pin Number | Function |
|---|---|
| 1 | VCC PLL |
| 2 | GND |
| 3 | REF IN |
| 4 | GND |
| 5 | VCC VCO |
| 6 | GND |
| 7 | RF OUT |
| 8 | GND |
| 9 | LOCK DET |
| 10 | CLOCK |
| 11 | DATA |
| 12 | LE |
| 13 | GND |
| 14 | GND |

## Recommended Application Circuit

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



## 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