

Frequency Synthesizer

KSN-2346A+

50Ω 2286 to 2346 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: DK801

Product Overview

The KSN-2346A+ is a Frequency Synthesizer, designed to operate from 2286 to 2346 MHz for LTE base station application. The KSN-2346A+ 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: -88 dBc/Hz typ. @ 10 kHz offset• Comparison Spurious: -92 dBc typ.• Reference Spurious: -106 dBc typ. | Low phase noise and spurious improve system EVM (Error Vector Magnitude). |
| Robust design and construction | To enhance the robustness of KSN-2346A+, 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-2346A+ to be used in compact designs. |



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- 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 0.15"



CASE STYLE: DK801
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.

- LTE base station

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REV. OR
M128015
EDR-9640/2F1
KSN-2346A+
Category-A1
RAV
100701
Page 2 of 10

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

| Parameters | | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|----------------------------|--------------------|-------------------------------------|------|-------|------------------|
| Frequency Range | | - | 2286 | - | 2346 | MHz |
| Step Size | | - | - | 1000 | - | kHz |
| Settling Time | | Within ± 1 kHz | - | 1.1 | - | mSec |
| Output Power | | - | -2.5 | -0.3 | +2.5 | dBm |
| SSB Phase Noise | | @ 100 Hz offset | - | -83 | - | dBc/Hz |
| | | @ 1 kHz offset | - | -86 | -80 | |
| | | @ 10 kHz offset | - | -88 | -83 | |
| | | @ 100 kHz offset | - | -122 | -116 | |
| | | @ 1 MHz offset | - | -143 | -137 | |
| Integrated SSB Phase Noise | | @100 Hz to 1MHz | - | -45 | - | dBc |
| Reference Spurious Suppression | | Ref. Freq. 15 MHz | - | -106 | -80 | dBc |
| Comparison Spurious Suppression | | Step Size 1000 kHz | - | -92 | -70 | |
| Non - Harmonic Spurious Suppression | | - | - | -90 | - | |
| Harmonic Suppression | | - | - | -30 | -20 | |
| 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 | | - | - | 24 | 30 | mA |
| PLL Supply Current | | - | - | 13 | 20 | |
| Reference Input (External) | Frequency | 15 (square wave) | - | 15 | - | MHz |
| | Amplitude | 1.0 | 0.8 | 1.0 | 1.2 | V _{P-P} |
| | Input impedance | - | - | 100 | - | K Ω |
| | Phase Noise @ 1 kHz offset | - | - | -145 | - | dBc/Hz |
| RF Output port Impedance | | - | - | 50 | - | Ω |
| Input Logic Level | Input high voltage | - | 4.20 | - | - | V |
| | Input low voltage | - | - | - | 0.95 | V |
| Digital Lock Detect | Locked | - | 4.35 | - | 5.65 | V |
| | Unlocked | - | - | - | 0.40 | V |
| Frequency Synthesizer PLL | | - | ADF4113 | | | |
| PLL Programming | | - | 3-wire serial 5V CMOS | | | |
| Register Map @ 2346 MHz | F_Register | - | (MSB) 10111111000000010010010 (LSB) | | | |
| | N_Register | - | (MSB) 1000001001001000101001 (LSB) | | | |
| | R_Register | - | (MSB) 100000000000000111100 (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 |
| | | | | | | | | | |
| 2286 | -0.15 | -0.13 | -0.15 | 23.07 | 24.25 | 25.03 | 9.95 | 12.41 | 14.51 |
| 2295 | -0.20 | -0.23 | -0.19 | 23.05 | 24.23 | 25.01 | 9.91 | 12.36 | 14.46 |
| 2310 | -0.21 | -0.17 | -0.22 | 23.03 | 24.22 | 24.99 | 9.92 | 12.37 | 14.46 |
| 2325 | -0.22 | -0.18 | -0.29 | 22.98 | 24.19 | 24.95 | 9.92 | 12.38 | 14.48 |
| 2340 | -0.30 | -0.27 | -0.34 | 22.90 | 24.12 | 24.89 | 9.93 | 12.39 | 14.49 |
| 2346 | -0.31 | -0.29 | -0.36 | 22.88 | 24.10 | 24.85 | 9.99 | 12.44 | 14.55 |

| FREQUENCY (MHz) | HARMONICS (dBc) | | | | | |
|--------------------|-----------------|--------|--------|--------|--------|--------|
| | F2 | | | F3 | | |
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| 2286 | -33.48 | -31.72 | -31.73 | -45.15 | -48.70 | -48.58 |
| 2295 | -34.25 | -31.16 | -31.52 | -46.84 | -48.67 | -49.75 |
| 2310 | -31.85 | -30.05 | -29.50 | -49.01 | -52.38 | -52.30 |
| 2325 | -29.78 | -28.86 | -29.48 | -54.42 | -53.66 | -52.29 |
| 2340 | -26.90 | -26.61 | -27.98 | -55.95 | -56.06 | -52.78 |
| 2346 | -26.09 | -25.72 | -27.63 | -58.88 | -57.31 | -53.86 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | +25°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 2286 | -84.86 | -87.03 | -89.47 | -122.84 | -144.68 |
| 2295 | -86.32 | -87.87 | -88.79 | -122.63 | -144.35 |
| 2310 | -85.86 | -86.30 | -89.14 | -122.68 | -144.49 |
| 2325 | -85.16 | -85.90 | -87.49 | -122.08 | -144.19 |
| 2340 | -83.48 | -86.43 | -86.47 | -121.51 | -143.89 |
| 2346 | -85.59 | -85.28 | -87.00 | -121.55 | -143.72 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | -45°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 2286 | -83.57 | -84.00 | -88.50 | -124.23 | -146.82 |
| 2295 | -84.94 | -86.57 | -89.33 | -123.73 | -146.44 |
| 2310 | -81.73 | -86.14 | -88.41 | -123.26 | -146.28 |
| 2325 | -82.31 | -86.59 | -88.51 | -123.14 | -145.80 |
| 2340 | -84.14 | -86.28 | -88.06 | -122.40 | -145.12 |
| 2346 | -83.06 | -85.24 | -86.87 | -122.34 | -145.13 |

| FREQUENCY (MHz) | PHASE NOISE (dBc/Hz) @OFFSETS | | | | |
|--------------------|-------------------------------|--------|--------|---------|---------|
| | +85°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 2286 | -82.95 | -88.05 | -88.16 | -121.17 | -142.81 |
| 2295 | -81.91 | -85.95 | -87.68 | -120.91 | -142.72 |
| 2310 | -81.37 | -85.13 | -87.07 | -120.76 | -142.80 |
| 2325 | -85.12 | -84.89 | -86.39 | -120.39 | -142.07 |
| 2340 | -81.99 | -86.33 | -86.65 | -120.18 | -142.08 |
| 2346 | -83.98 | -86.34 | -86.72 | -119.99 | -141.32 |



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| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @ Fcarrier 2286MHz+(n*Freference) (dBc) note 1 | | | COMPARISON SPURIOUS @ Fcarrier 2316MHz+(n*Freference) (dBc) note 1 | | | COMPARISON SPURIOUS @ Fcarrier 2346MHz+(n*Freference) (dBc) note 1 | | |
|---------------------------------|---|---------|---------|---|---------|---------|---|---------|---------|
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| n | | | | | | | | | |
| -5 | -123.87 | -110.95 | -102.84 | -103.40 | -114.80 | -114.22 | -101.62 | -109.45 | -103.02 |
| -4 | -107.19 | -103.79 | -102.93 | -108.95 | -115.60 | -103.42 | -104.85 | -111.60 | -102.05 |
| -3 | -104.94 | -101.32 | -100.61 | -106.71 | -118.82 | -102.27 | -103.17 | -107.74 | -101.18 |
| -2 | -96.60 | -98.32 | -95.78 | -107.04 | -111.53 | -96.02 | -106.72 | -108.16 | -94.86 |
| -1 | -90.49 | -92.26 | -91.26 | -100.77 | -104.97 | -89.76 | -99.00 | -102.58 | -89.41 |
| 0 ^{note 2} | - | - | - | - | - | - | - | - | - |
| +1 | -88.83 | -92.62 | -90.66 | -96.43 | -99.88 | -89.54 | -94.43 | -98.82 | -88.76 |
| +2 | -95.34 | -97.79 | -95.01 | -100.90 | -104.68 | -94.78 | -104.13 | -109.22 | -93.51 |
| +3 | -99.87 | -101.07 | -100.85 | -102.12 | -116.50 | -100.96 | -107.67 | -107.94 | -99.74 |
| +4 | -105.26 | -104.65 | -104.33 | -106.85 | -117.19 | -102.66 | -107.22 | -112.01 | -100.31 |
| +5 | -107.88 | -105.48 | -103.18 | -104.68 | -106.32 | -108.57 | -101.22 | -113.46 | -104.21 |

Note 1: Comparison frequency 1000 kHz

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

| REFERENCE SPURIOUS ORDER | REFERENCE SPURIOUS @ Fcarrier 2286MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @ Fcarrier 2316MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @ Fcarrier 2346MHz+(n*Freference) (dBc) note 3 | | |
|--------------------------------|--|---------|---------|--|---------|---------|--|---------|---------|
| | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| n | | | | | | | | | |
| -5 | -115.10 | -126.60 | -116.04 | -117.31 | -114.85 | -119.26 | -116.91 | -117.03 | -119.52 |
| -4 | -116.83 | -123.42 | -117.54 | -120.37 | -118.83 | -116.87 | -120.32 | -116.24 | -124.91 |
| -3 | -115.57 | -122.81 | -115.09 | -119.28 | -117.07 | -115.10 | -115.94 | -114.59 | -117.35 |
| -2 | -111.77 | -113.45 | -113.50 | -112.72 | -112.98 | -118.55 | -110.09 | -113.67 | -118.43 |
| -1 | -109.04 | -108.01 | -113.27 | -109.38 | -117.43 | -117.04 | -98.95 | -106.22 | -112.71 |
| 0 ^{note 4} | - | - | - | - | - | - | - | - | - |
| +1 | -106.52 | -106.39 | -114.45 | -112.11 | -120.00 | -122.20 | -106.69 | -112.16 | -116.50 |
| +2 | -110.48 | -111.83 | -117.44 | -112.53 | -119.86 | -116.72 | -109.84 | -112.19 | -117.96 |
| +3 | -116.78 | -117.87 | -116.02 | -116.56 | -116.24 | -117.86 | -113.59 | -113.02 | -113.79 |
| +4 | -117.88 | -123.24 | -121.64 | -122.15 | -123.29 | -116.84 | -118.74 | -116.43 | -118.53 |
| +5 | -117.56 | -123.72 | -118.34 | -116.34 | -117.79 | -117.49 | -115.40 | -114.86 | -117.56 |

Note 3: Reference frequency 15 MHz

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



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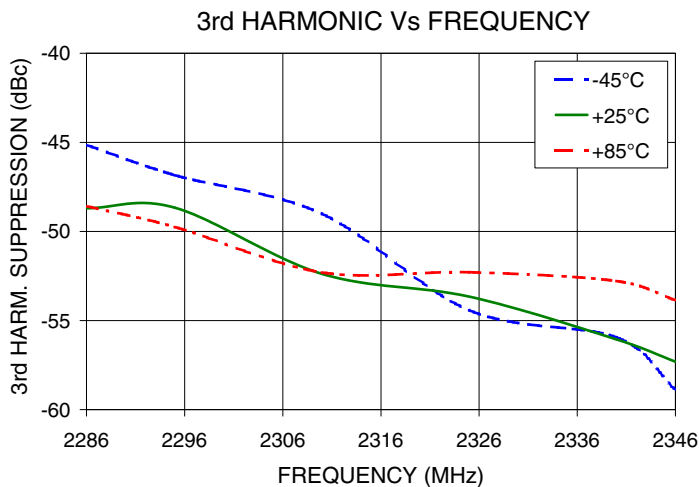
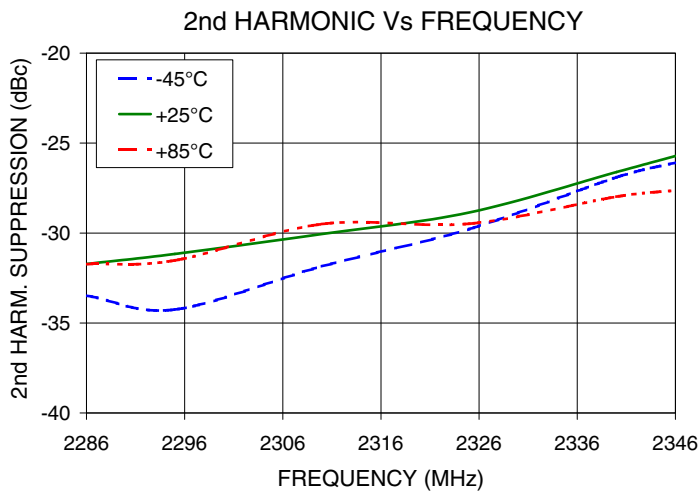
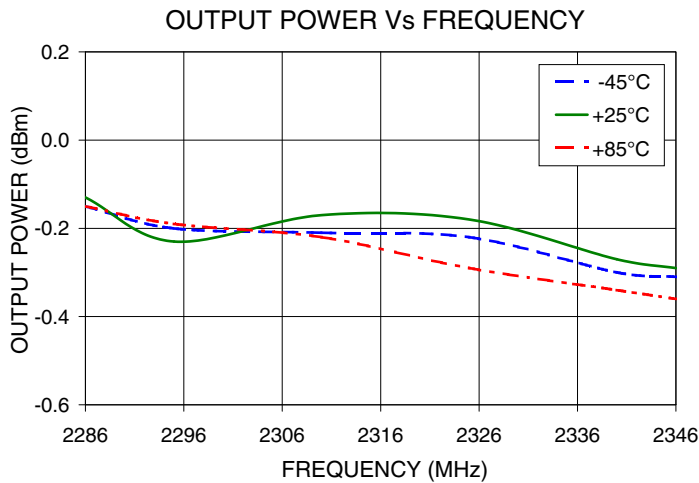


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Typical Performance Curves



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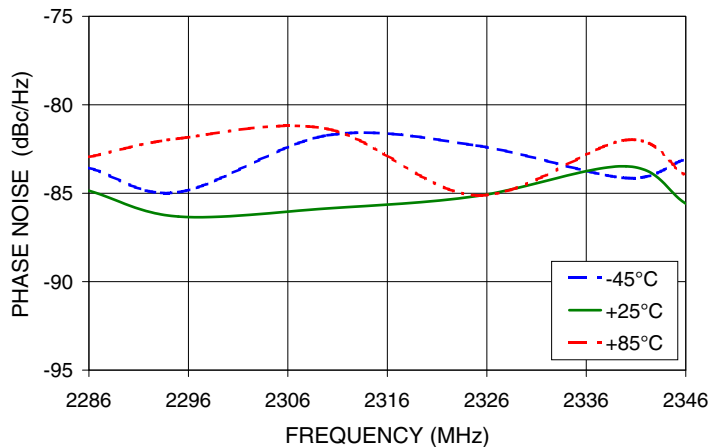


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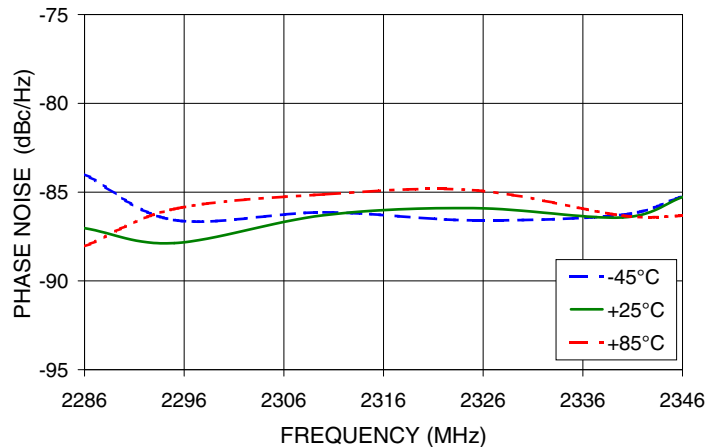


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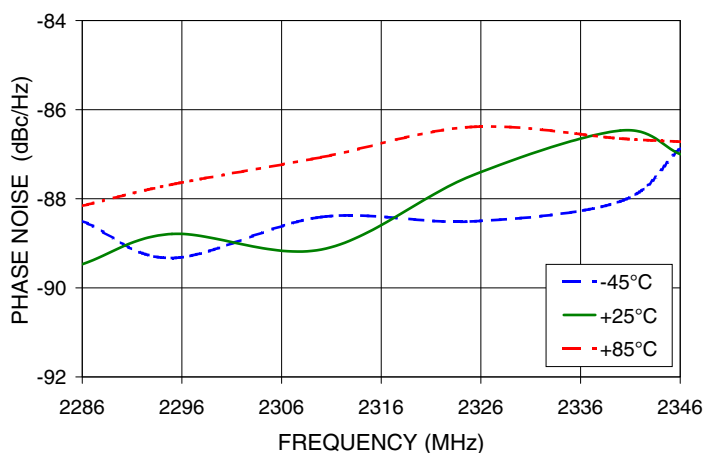
PHASE NOISE @ 100Hz offset



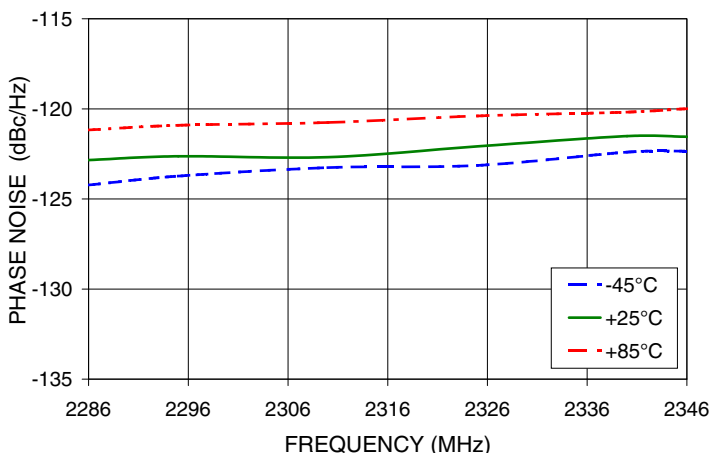
PHASE NOISE @ 1kHz offset



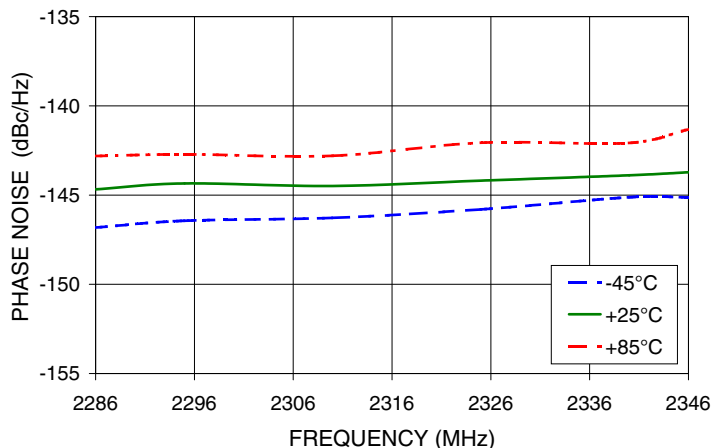
PHASE NOISE @ 10kHz offset



PHASE NOISE @ 100kHz offset



PHASE NOISE @ 1MHz offset



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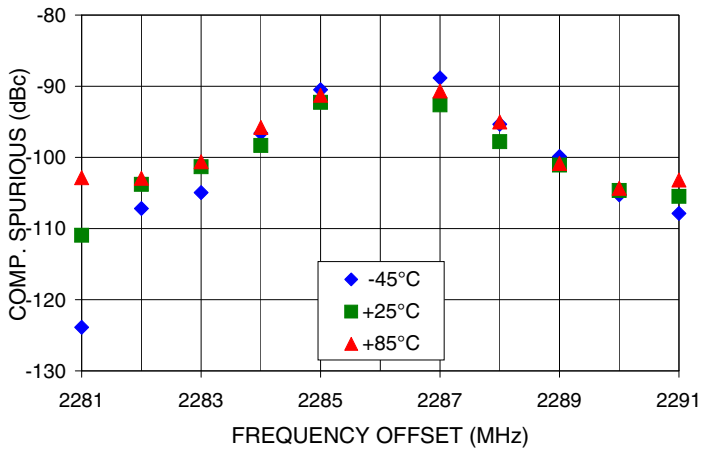


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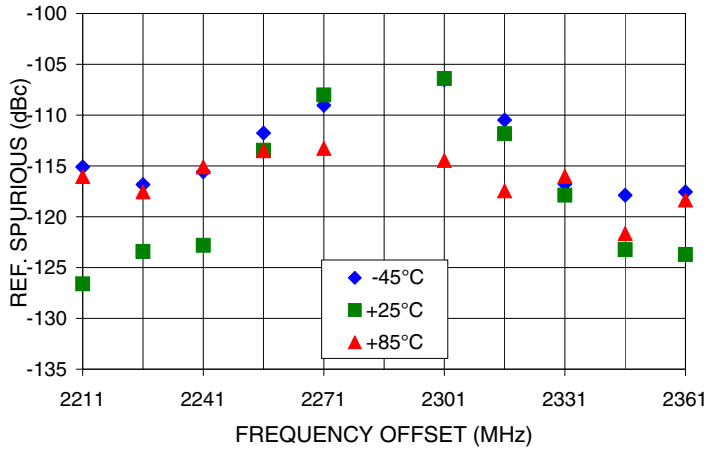


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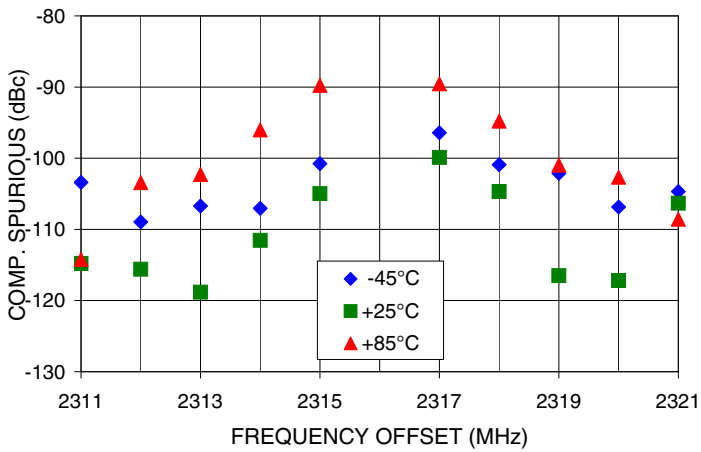
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2286MHz



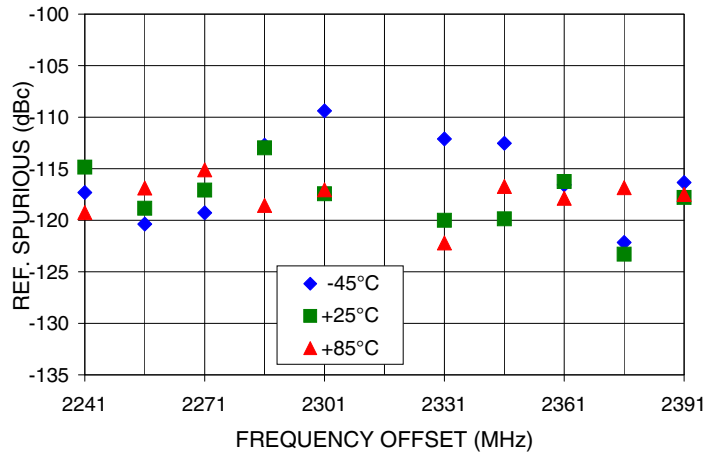
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2286MHz



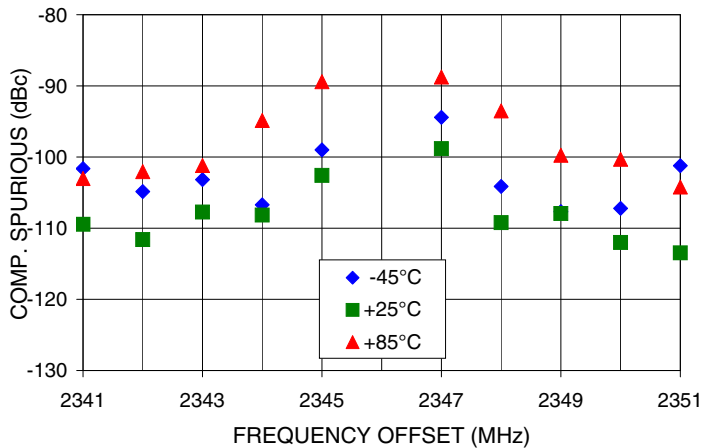
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2316MHz



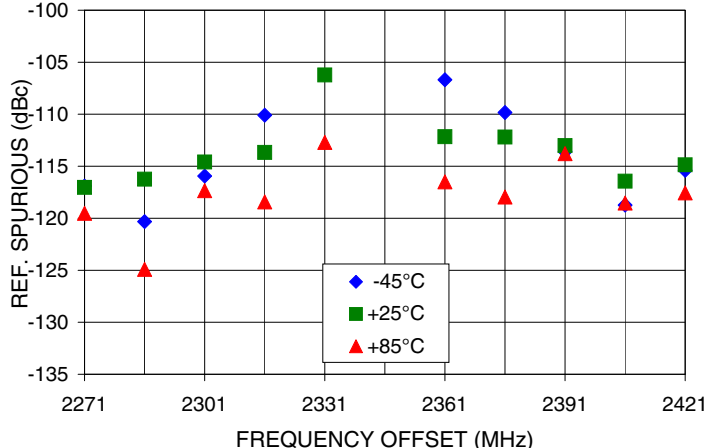
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2316MHz



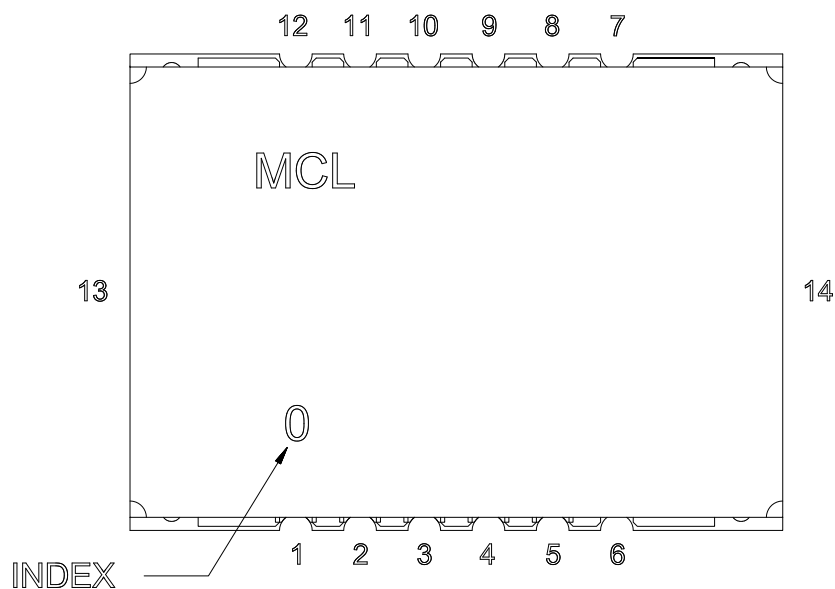
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2346MHz



REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2346MHz



Pin Configuration

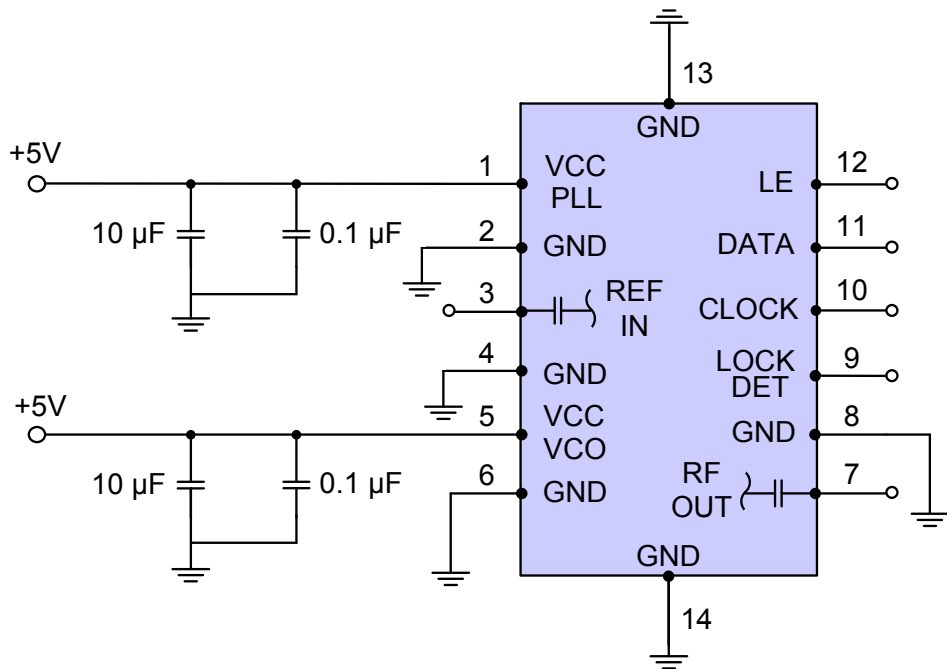


Pin Connection

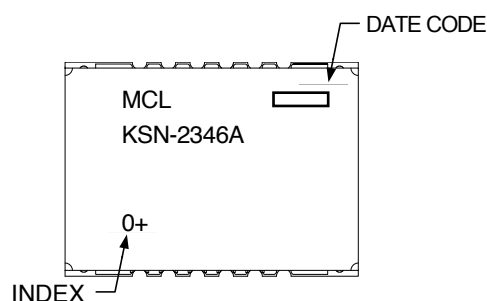
| Pin Number | Function |
|------------|----------|
| 1 | VCC PLL |
| 2 | GND |
| 3 | REF IN |
| 4 | GND |
| 5 | VCC VCO |
| 6 | GND |
| 7 | RF OUT |
| 8 | GND |
| 9 | LOCK DET |
| 10 | CLOCK |
| 11 | DATA |
| 12 | LE |
| 13 | GND |
| 14 | GND |

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: DK801

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567+

Environment Ratings: ENV03T2



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