# Frequency Synthesizer KSN-2346A+

## 50Ω 2286 to 2346 MHz

## The Big Deal

- Low phase noise and spurious
- Robust design and construction
- Small size 0.800" x 0.584" x 0.154"

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 0.800" x 0.584" x 0.154") to shield against unwanted signals and noise.

## Key Features

| Feature | Advantages |
|---|---|
| Low phase noise and spurious:<br>• Phase Noise: -88 dBc/Hz typ. @ 10 kHz offset<br>• Comparison Spurious: -92 dBc typ.<br>• 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, 0.800" x 0.584" x 0.154" | The small size enables the KSN-2346A+ to be used in compact designs. |

*Surface Mount*

# Frequency Synthesizer

## KSN-2346A+

50Ω 2286 to 2346 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 0.800" x 0.584" x 0.154"

CASE STYLE: DK801

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

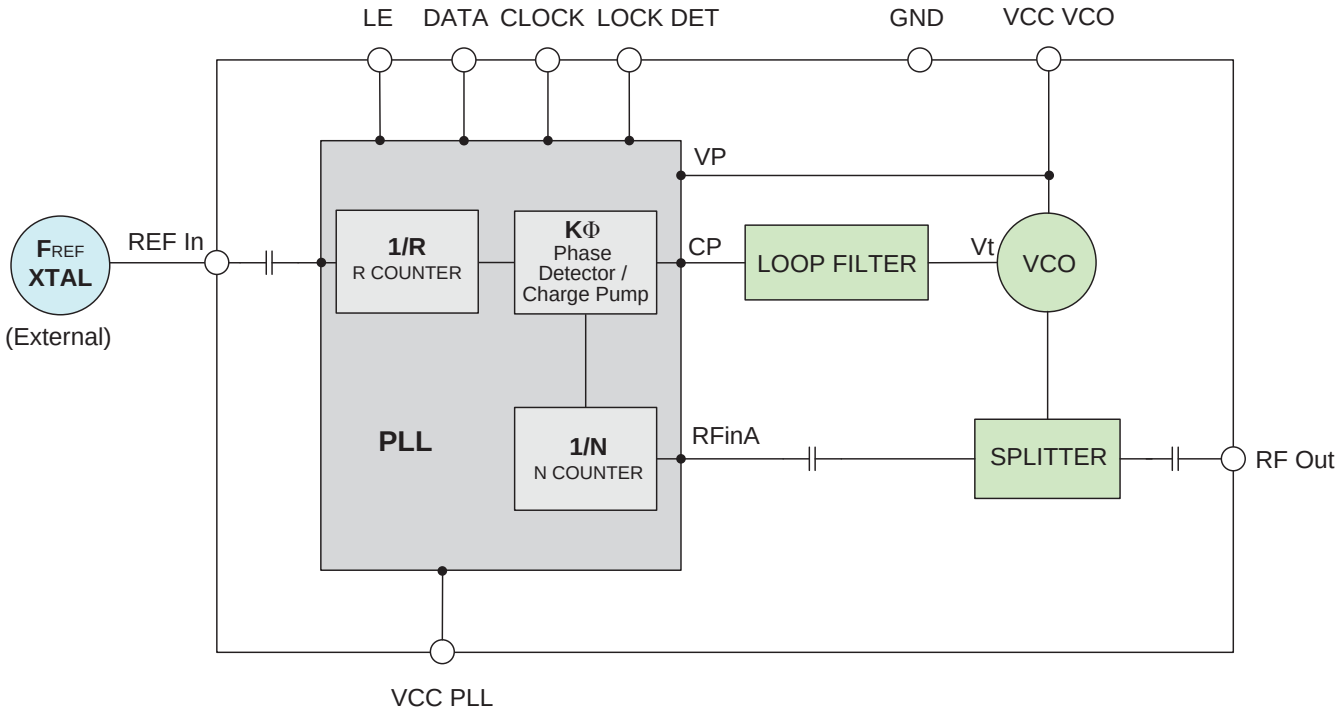
### Applications

- LTE base station

### General Description

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 0.800" x 0.584" x 0.154") to shield against unwanted signals and noise. 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.

### Simplified Schematic

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## 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 | - | KΩ |
| | 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 | - | 5.25 | V |
| | Unlocked | - | - | - | 0.40 | V |
| Frequency Synthesizer PLL | | - | ADF4113 | | | |
| PLL Programming | | - | 3-wire serial 5V CMOS | | | |

Register Map NOTE 1

| | Prescaler Value | Power-Down 2 | Current Setting 2 | Current Setting 1 | Timer Counter Control | Fastlock Mode | Fastlock Enable | CP Three-State | PD Polarity | Muxout Control | Power-Down 1 | Counter Reset | Control Bits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F_Register NOTE 2 | 01 | 0 | 111 | 111 | 0000 | 0 | 0 | 0 | 1 | 001 | 0 | 0 | 10 |

| | Reserved | CP Gain | 13-Bit B Counter | 6-Bit A Counter | Control Bits |
|---|---|---|---|---|---|
| N_Register @ 2346MHz | 00 | 1 | 0000010010010 | 001010 | 01 |

| | Reserved | DLY | SYNC | Lock Detect Precision | Test Mode Bits | Anti-Backlash Width | 14-BIT Reference Counter, R | Control Bits |
|---|---|---|---|---|---|---|---|---|
| R_Register | 0 | 0 | 0 | 1 | 00 | 00 | 00000000001111 | 00 |

**Note 1**: Registers Load Sequence: Initialization Register, F Register, R Register , N Register.
**Note 2**: For the Initialization Register use Register F with Control Bits 11.

## Absolute Maximum Ratings

| Parameters | Ratings |
|---|---|
| VCO Supply Voltage NOTE 3 | 6V |
| PLL Supply Voltage NOTE 3 | 6V |
| VCO Supply Voltage to PLL Supply Voltage NOTE 3 | -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

**Note 3**: Power on/off Sequence:
Power on: VCO Supply Voltage, followed by PLL Supply Voltage.
Power off: PLL Supply Voltage, followed by VCO Supply Voltage.

## Typical Performance Data

| FREQUENCY (MHz) | POWER OUTPUT (dBm) | | | VCO CURRENT (mA) | | | PLL CURRENT (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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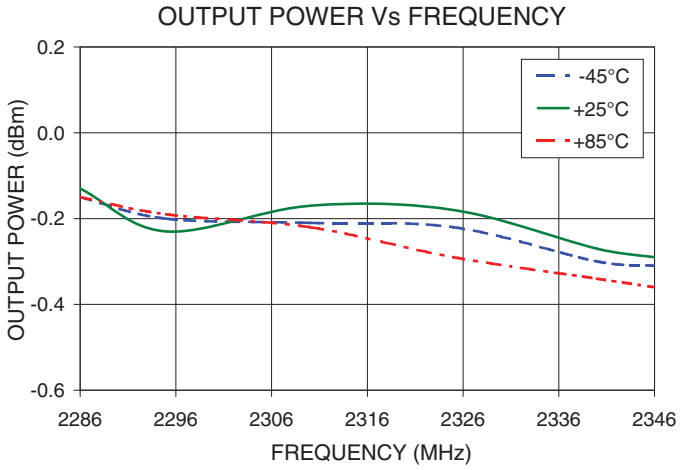
| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @ Fcarrier 2286MHz+(n*Freference) (dBc) note 1 | | | COMPARISON SPURIOUS @ Fcarrier 2316MHz+(n*Freference) (dBc) note 1 | | | COMPARISON SPURIOUS @ Fcarrier 2346MHz+(n*Freference) (dBc) note 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -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 |

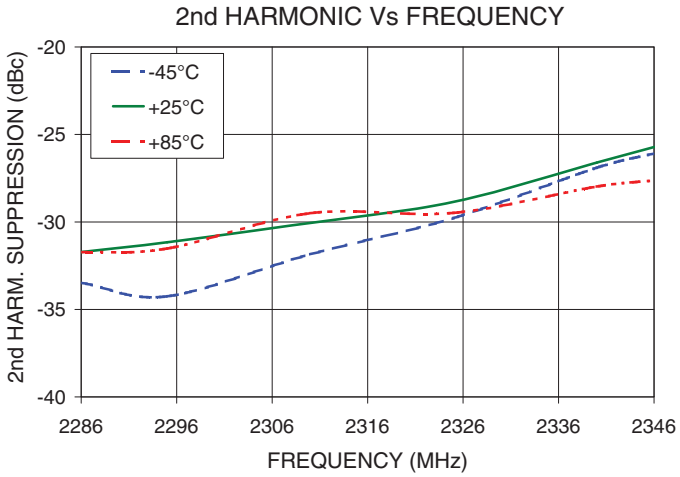
Note 1: Comparison frequency 1000 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

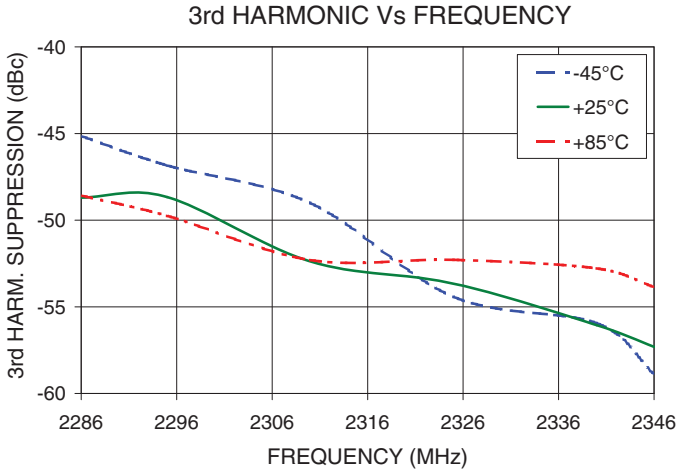
| REFERENCE SPURIOUS ORDER | REFERENCE SPURIOUS @ Fcarrier 2286MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @ Fcarrier 2316MHz+(n*Freference) (dBc) note 3 | | | REFERENCE SPURIOUS @ Fcarrier 2346MHz+(n*Freference) (dBc) note 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C | -45°C | +25°C | +85°C |
| -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).

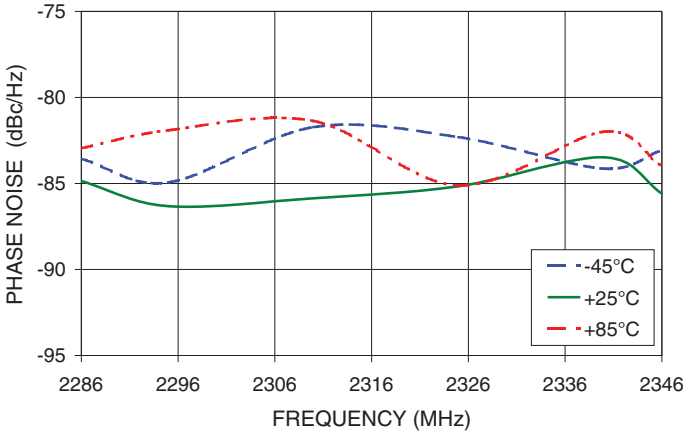
## *Typical Performance Curves*



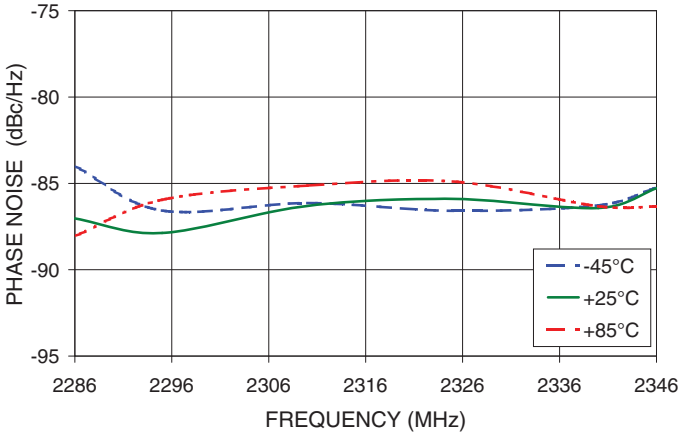



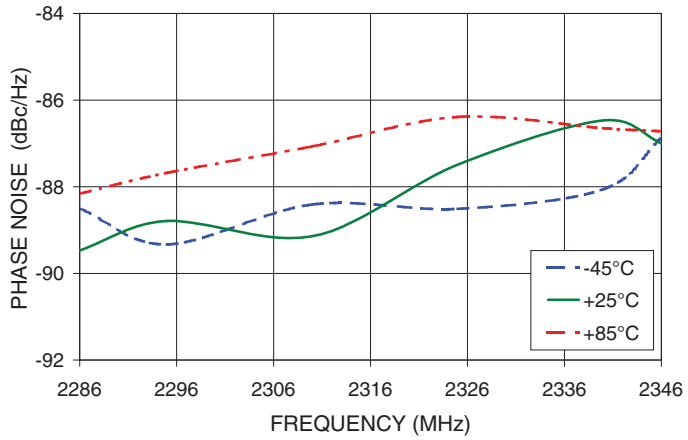
PHASE NOISE @100Hz offset



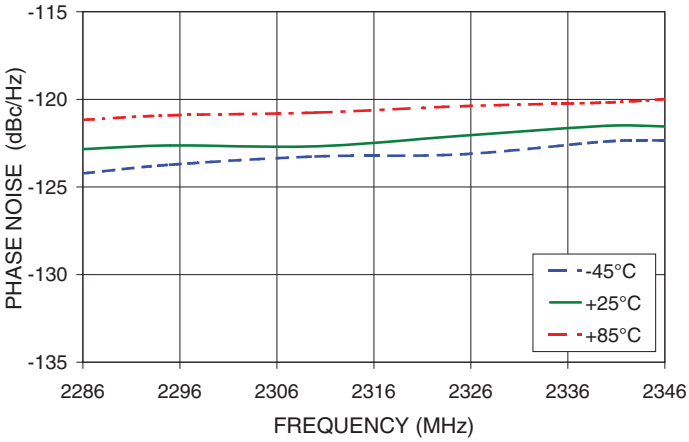

PHASE NOISE @1kHz offset



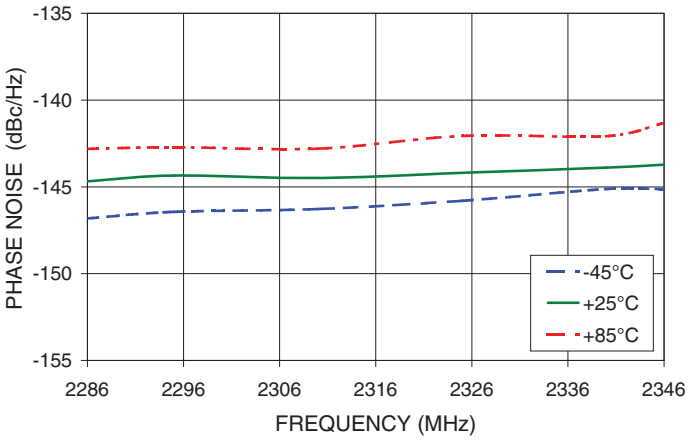

PHASE NOISE @10kHz offset




PHASE NOISE @100kHz offset




PHASE NOISE @1MHz offset

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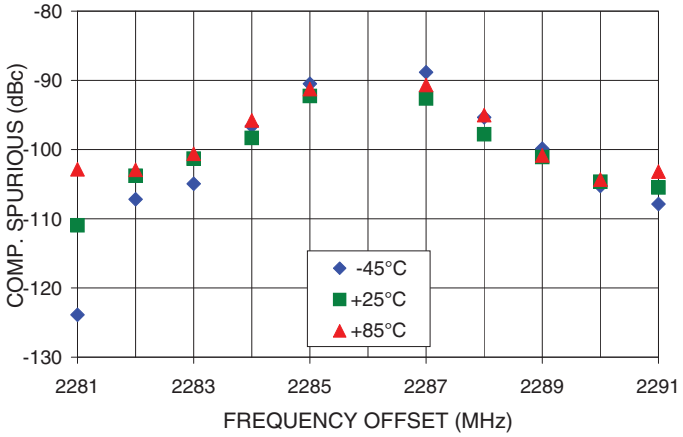
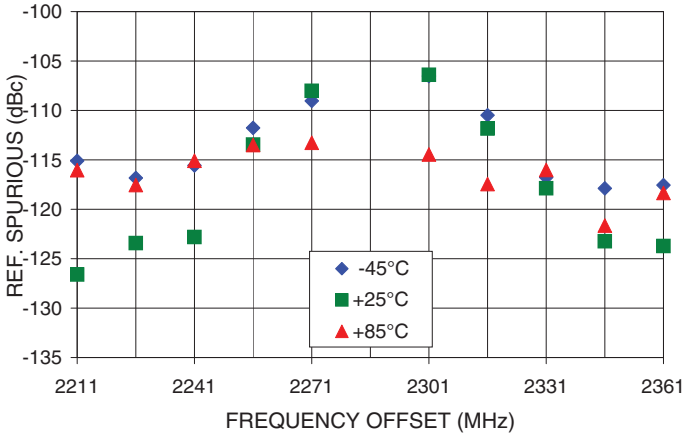
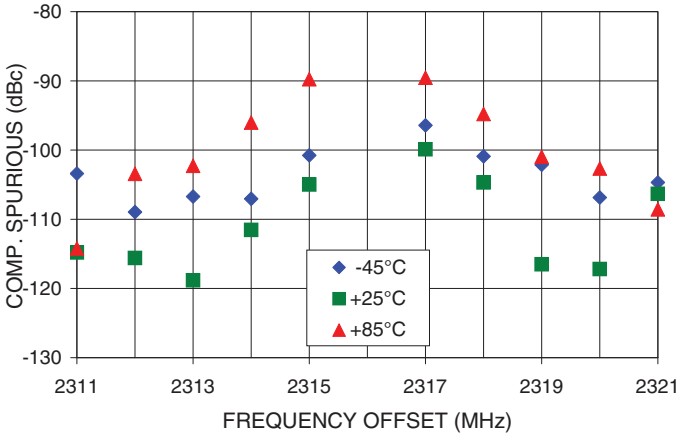
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2286MHz



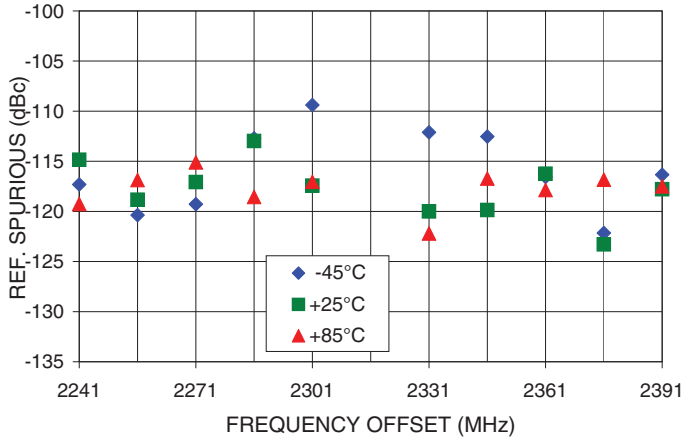

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2286MHz



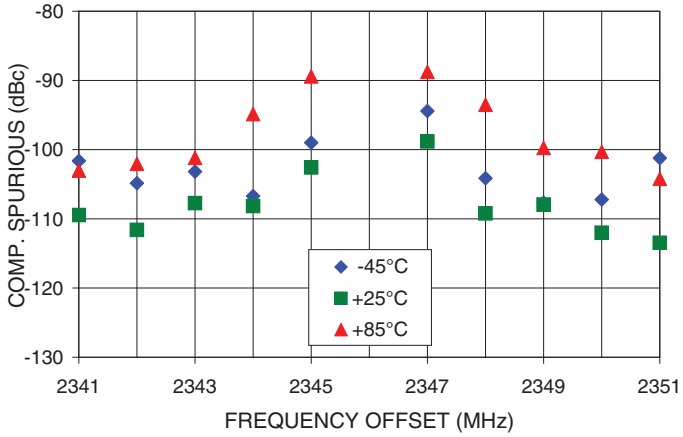

COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2316MHz



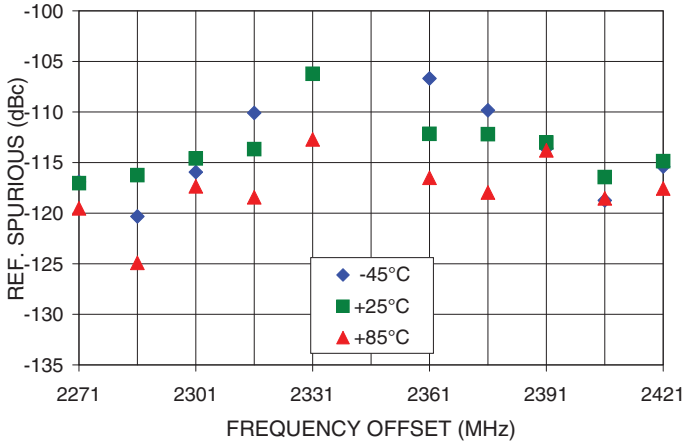

REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2316MHz




COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2346MHz




REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2346MHz

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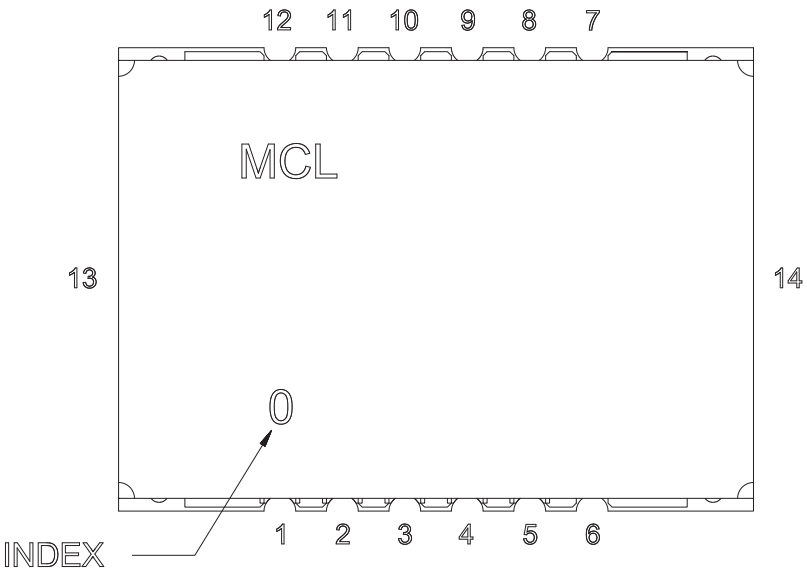
## Pin Configuration

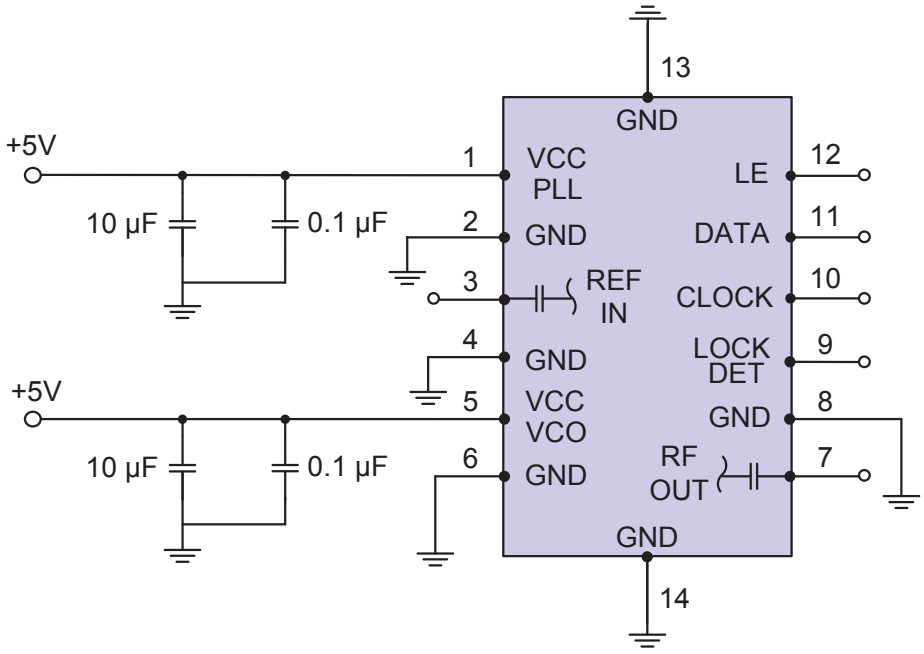



## Pin Connection

| 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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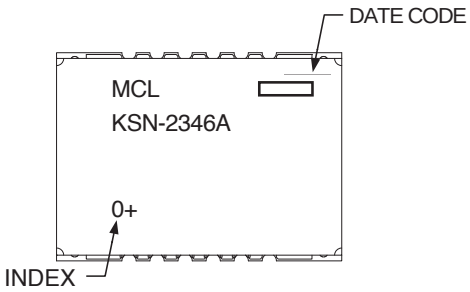
## Device Marking




## 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:** DK801

**Tape & Reel:** TR-F28

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

**Evaluation Board:** TB-567+

**Environment Ratings:** ENV03T2

# Frequency Synthesizer KSN-2346A+

## *Typical Performance Data*

| FREQ. (MHz) | POWER OUTPUT (dBm) | | | HARMONICS (dBc) | | | | | | VCO CURRENT (mA) | | | PLL CURENT (mA) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F2 | | | F3 | | | | | | | | |
| | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC |
| 2286 | -0.15 | -0.13 | -0.15 | -33.48 | -31.72 | -31.73 | -45.15 | -48.70 | -48.58 | 23.07 | 24.25 | 25.03 | 9.95 | 12.41 | 14.51 |
| 2295 | -0.20 | -0.23 | -0.19 | -34.25 | -31.16 | -31.52 | -46.84 | -48.67 | -49.75 | 23.05 | 24.23 | 25.01 | 9.91 | 12.36 | 14.46 |
| 2310 | -0.21 | -0.17 | -0.22 | -31.85 | -30.05 | -29.50 | -49.01 | -52.38 | -52.30 | 23.03 | 24.22 | 24.99 | 9.92 | 12.37 | 14.46 |
| 2325 | -0.22 | -0.18 | -0.29 | -29.78 | -28.86 | -29.48 | -54.42 | -53.66 | -52.29 | 22.98 | 24.19 | 24.95 | 9.92 | 12.38 | 14.48 |
| 2340 | -0.30 | -0.27 | -0.34 | -26.90 | -26.61 | -27.98 | -55.95 | -56.06 | -52.78 | 22.90 | 24.12 | 24.89 | 9.93 | 12.39 | 14.49 |
| 2346 | -0.31 | -0.29 | -0.36 | -26.09 | -25.72 | -27.63 | -58.88 | -57.31 | -53.86 | 22.88 | 24.10 | 24.85 | 9.99 | 12.44 | 14.55 |

| FREQ. (MHz) | PHASE NOISE (dBc/Hz) @ OFFSETS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -45ºC | | | | | +25ºC | | | | | +85ºC | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 2286 | -83.57 | -84.00 | -88.50 | -124.23 | -146.82 | -84.86 | -87.03 | -89.47 | -122.84 | -144.68 | -82.95 | -88.05 | -88.16 | -121.17 | -142.81 |
| 2295 | -84.94 | -86.57 | -89.33 | -123.73 | -146.44 | -86.32 | -87.87 | -88.79 | -122.63 | -144.35 | -81.91 | -85.95 | -87.68 | -120.91 | -142.72 |
| 2310 | -81.73 | -86.14 | -88.41 | -123.26 | -146.28 | -85.86 | -86.30 | -89.14 | -122.68 | -144.49 | -81.37 | -85.13 | -87.07 | -120.76 | -142.80 |
| 2325 | -82.31 | -86.59 | -88.51 | -123.14 | -145.80 | -85.16 | -85.90 | -87.49 | -122.08 | -144.19 | -85.12 | -84.89 | -86.39 | -120.39 | -142.07 |
| 2340 | -84.14 | -86.28 | -88.06 | -122.40 | -145.12 | -83.48 | -86.43 | -86.47 | -121.51 | -143.89 | -81.99 | -86.33 | -86.65 | -120.18 | -142.08 |
| 2346 | -83.06 | -85.24 | -86.87 | -122.34 | -145.13 | -85.59 | -85.28 | -87.00 | -121.55 | -143.72 | -83.98 | -86.34 | -86.72 | -119.99 | -141.32 |

## *Typical Performance Data*

| COMPARISON SPURIOUS ORDER | COMPARISON SPURIOUS @Fcarrier 2286MHz± (n*Fcomparison) (dBc) NOTE 1 | | | COMPARISON SPURIOUS @Fcarrier 2316MHz± (n*Fcomparison) (dBc) NOTE 1 | | | COMPARISON SPURIOUS @Fcarrier 2346MHz± (n*Fcomparison) (dBc) NOTE 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC |
| -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 |

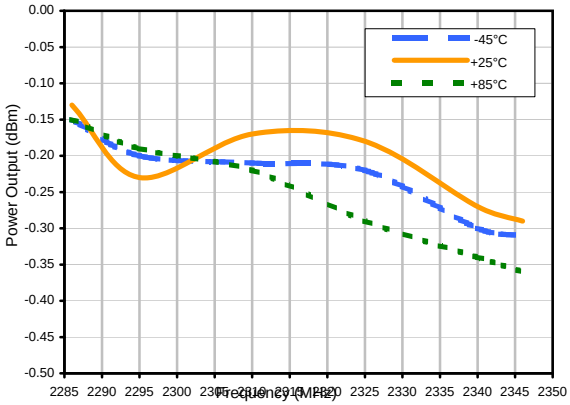
Note 1: Comparison frequency 1000 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

| 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 | | |
|---|---|---|---|---|---|---|---|---|---|
| n | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC | -45ºC | +25ºC | +85ºC |
| -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 |

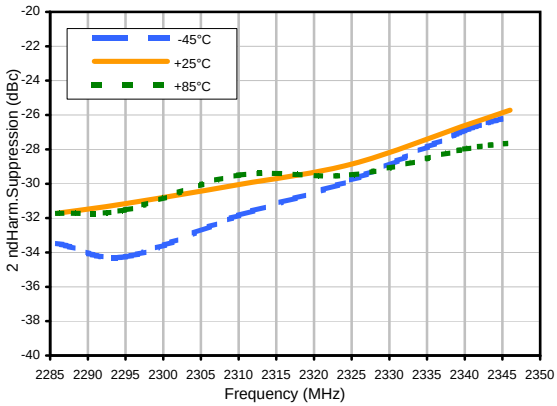
Note 3: Reference frequency 15 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

## *Typical Performance Data*

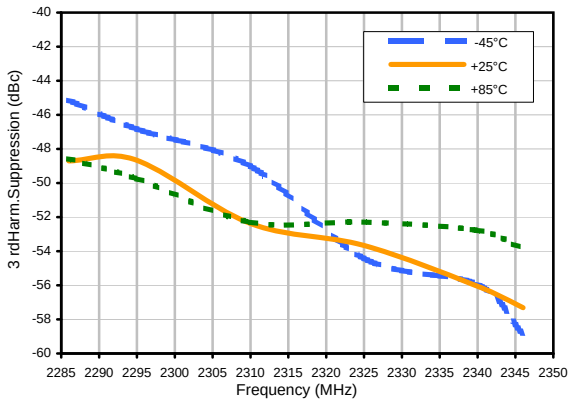
**Power Output Vs Frequency**




**2nd Harmonics Vs Frequency**

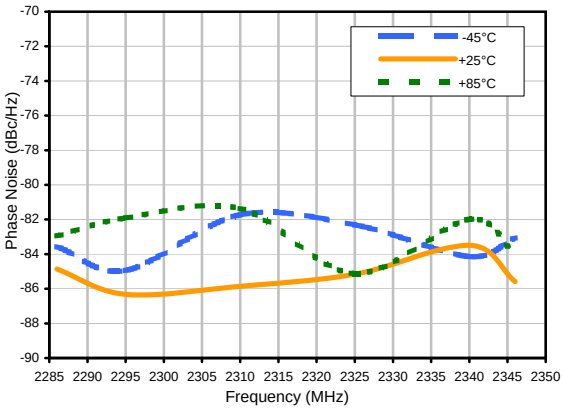



**3rd Harmonics Vs Frequency**

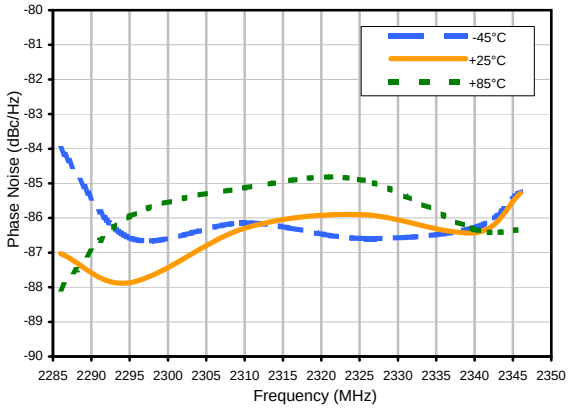


## *Typical Performance Data*

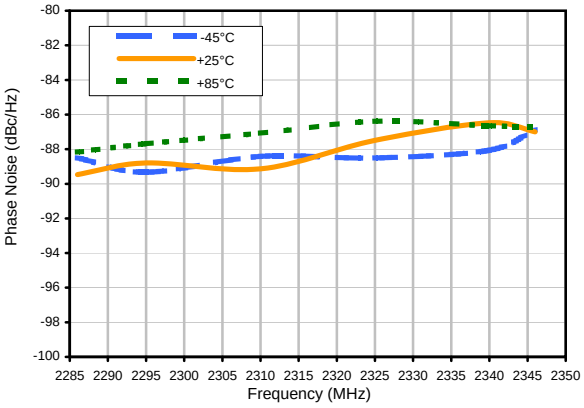
**Phase Noise @ 100 Hz offset**



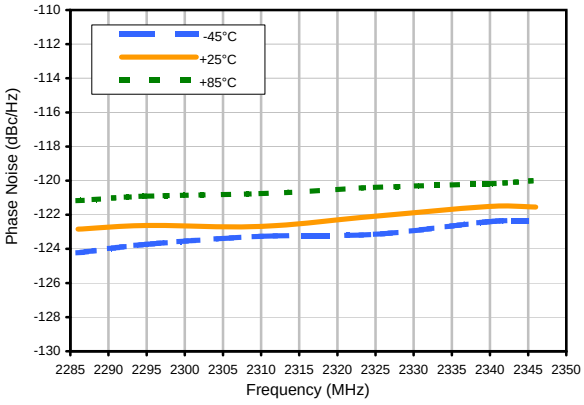

**Phase Noise @ 1 kHz offset**



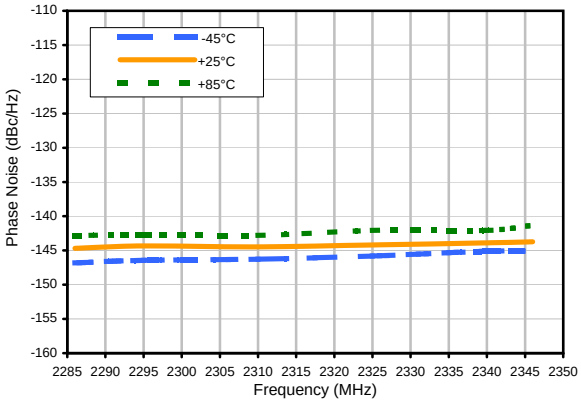

**Phase Noise @ 10 kHz offset**




**Phase Noise @ 100 kHz offset**

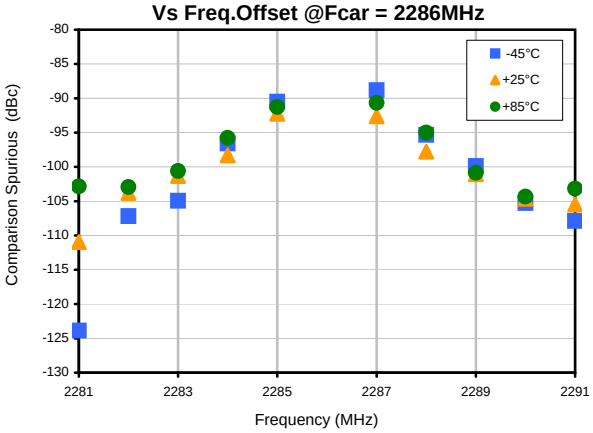



**Phase Noise @ 1 MHz offset**

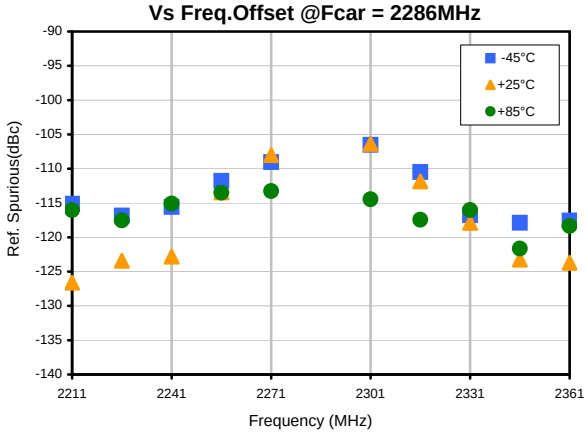


## *Typical Performance Data*

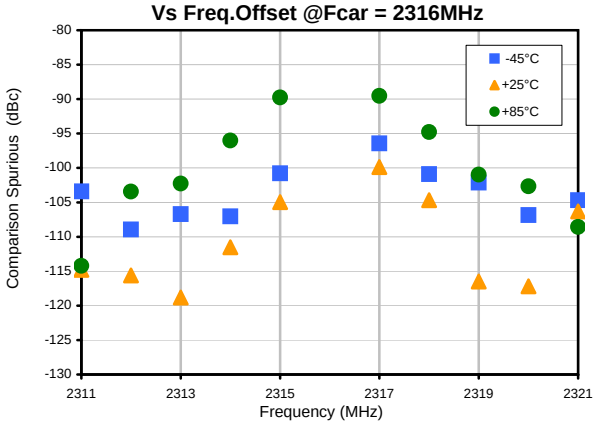
**Comparison Spurious**
**Vs Freq.Offset @Fcar = 2286MHz**



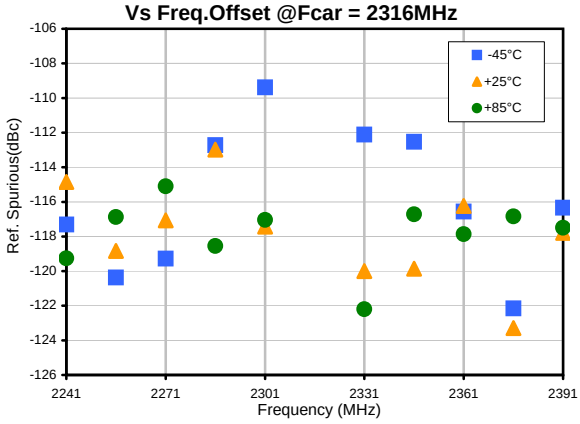

**Reference Spurious**
**Vs Freq.Offset @Fcar = 2286MHz**



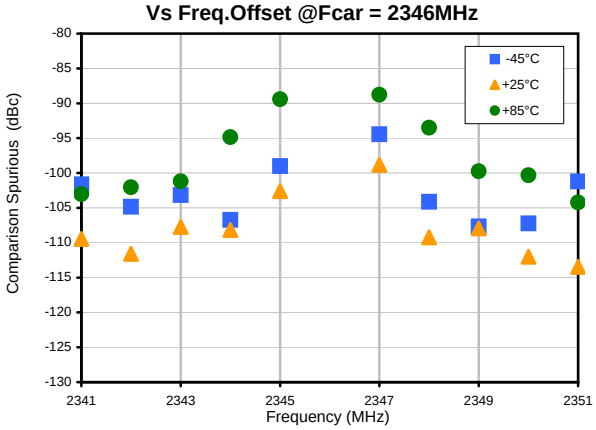

**Comparison Spurious**
**Vs Freq.Offset @Fcar = 2316MHz**



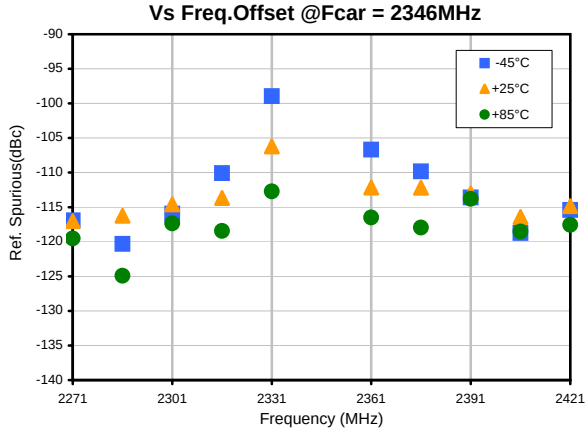

**Reference Spurious**
**Vs Freq.Offset @Fcar = 2316MHz**




**Comparison Spurious**
**Vs Freq.Offset @Fcar = 2346MHz**



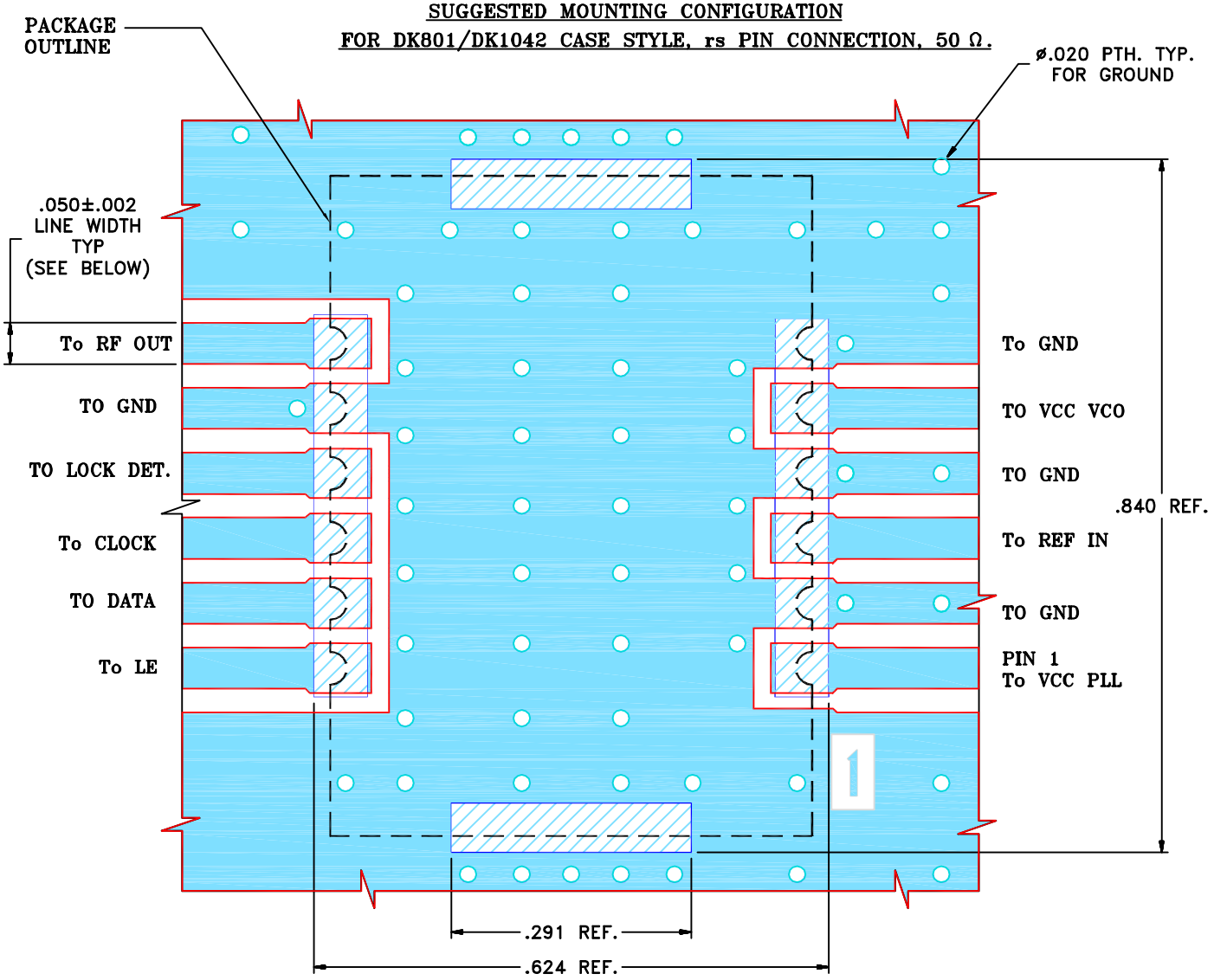

**Reference Spurious**
**Vs Freq.Offset @Fcar = 2346MHz**



THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M108069 | NEW RELEASE | 11/06 | DK | HH |
| A | M110535 | MODIFY GROUND PADS | 03/07 | DK | HH |
| B | M126537 | DELETE CHIP COMP. & TABLE OF VALUES | 03/10 | DK | HH |
| B | R78979 | DELETE CHIP COMP. & TABLE OF VALUES | 03/10 | DK | HH |

## SUGGESTED MOUNTING CONFIGURATION
## FOR DK801/DK1042 CASE STYLE, rs PIN CONNECTION, 50 Ω.




NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS. .025"±.002". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

| UNLESS OTHERWISE SPECIFIED | | INITIALS | DATE |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | DK (RAVON) | 27 MAR 07 |
| TOLERANCES ON: | CHECKED | RZ (RAVON) | 27 MAR 07 |
| 2 PL DECIMALS ± | APPROVED | HH (RAVON) | 27 MAR 07 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



ASHEETA1.DWG REV:A DATE:01/12/95

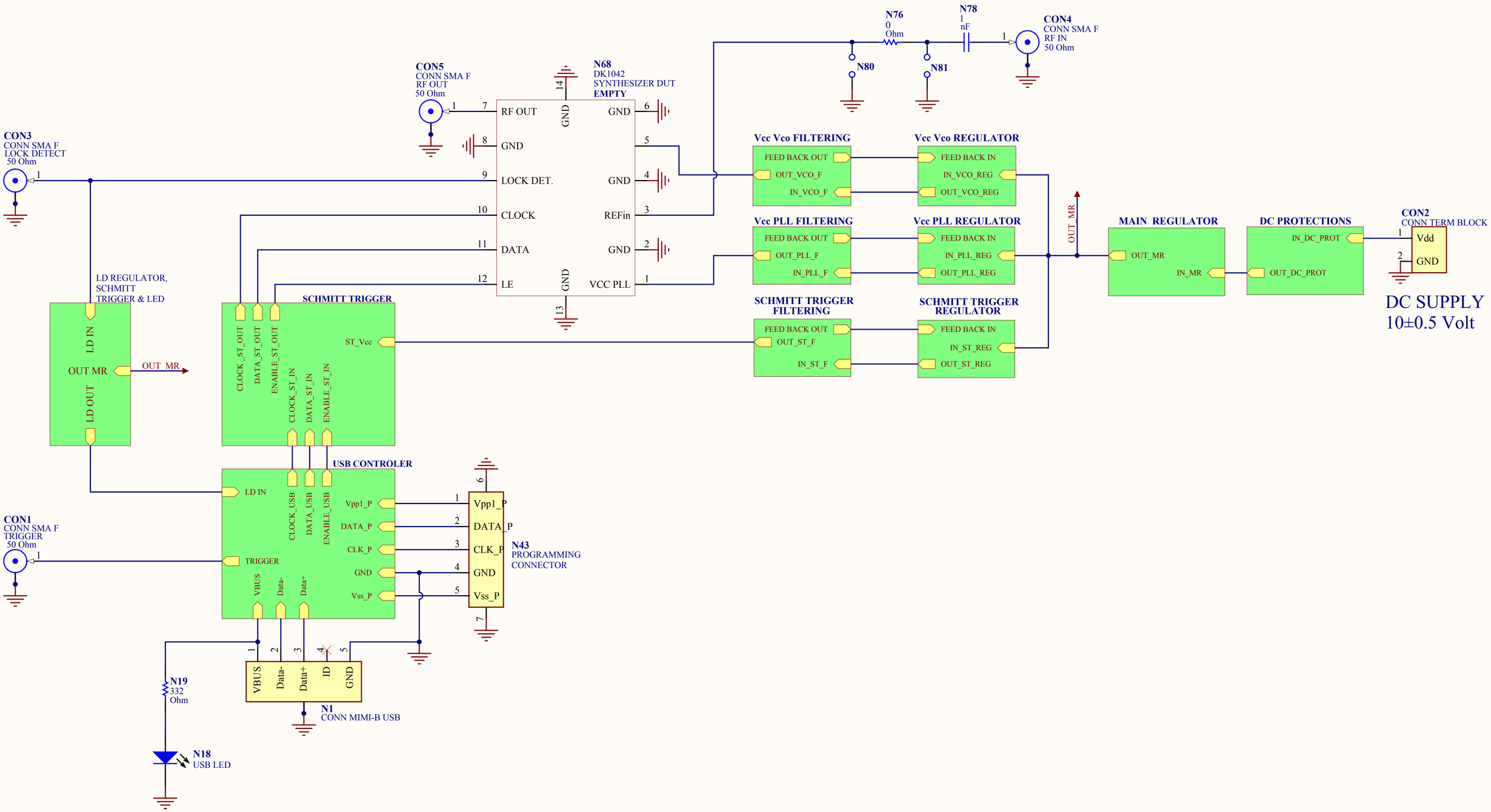
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

# PL, rs ,DK801/DK1042, KSN
# TB-567+ (50 Ω)

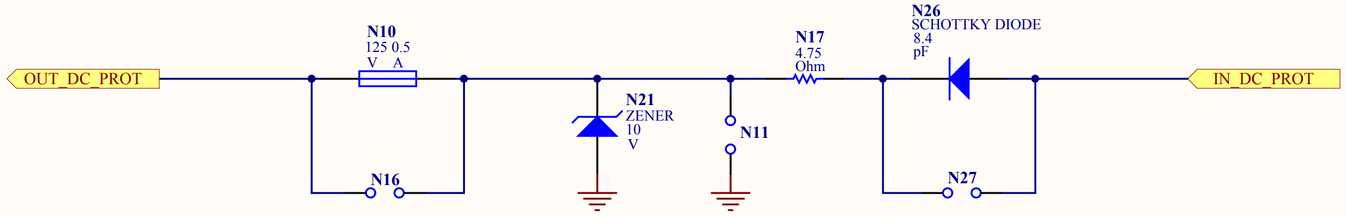
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-249 | B |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL249 | 5:1 | 1 OF 1 |

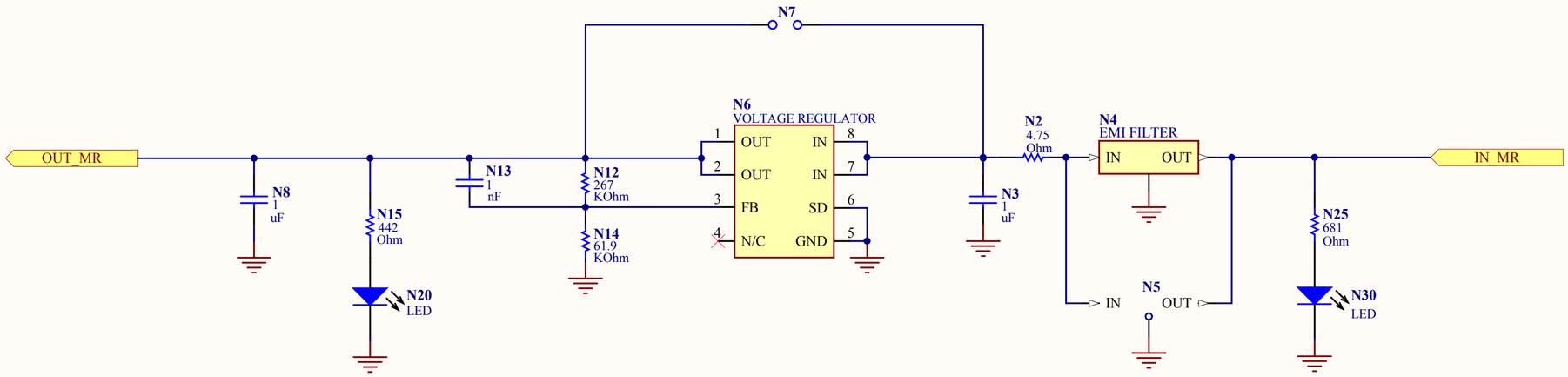
# ELECTRICAL SCHEME-GENERAL
# (TB for KSN)



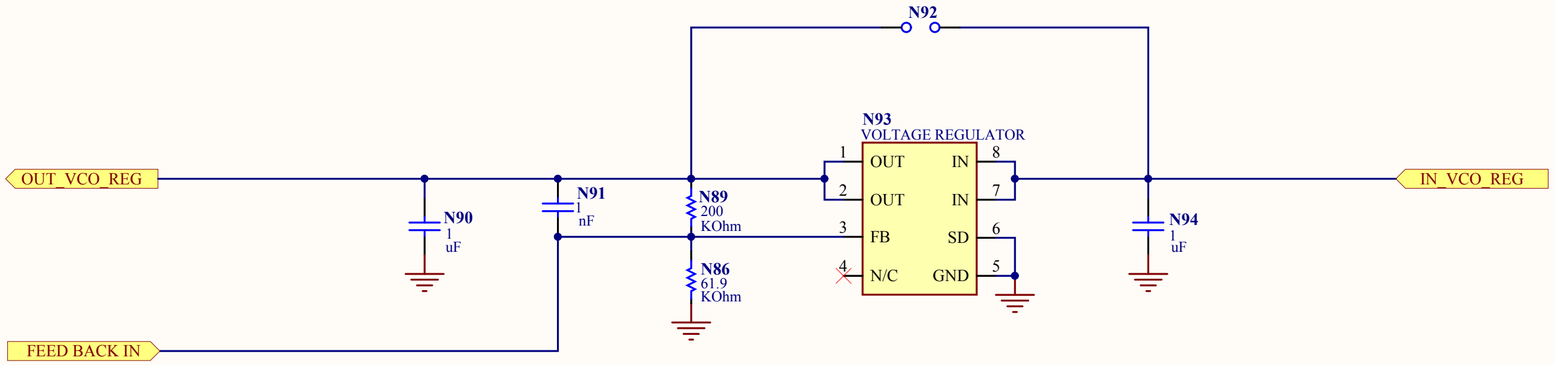
# DC PROTECTIONS



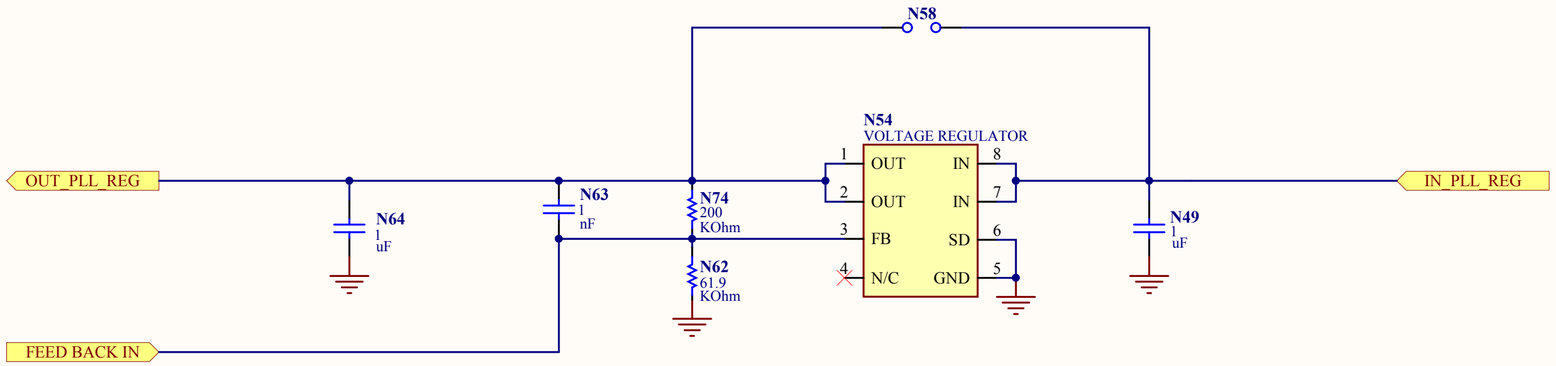
# MAIN REGULATOR



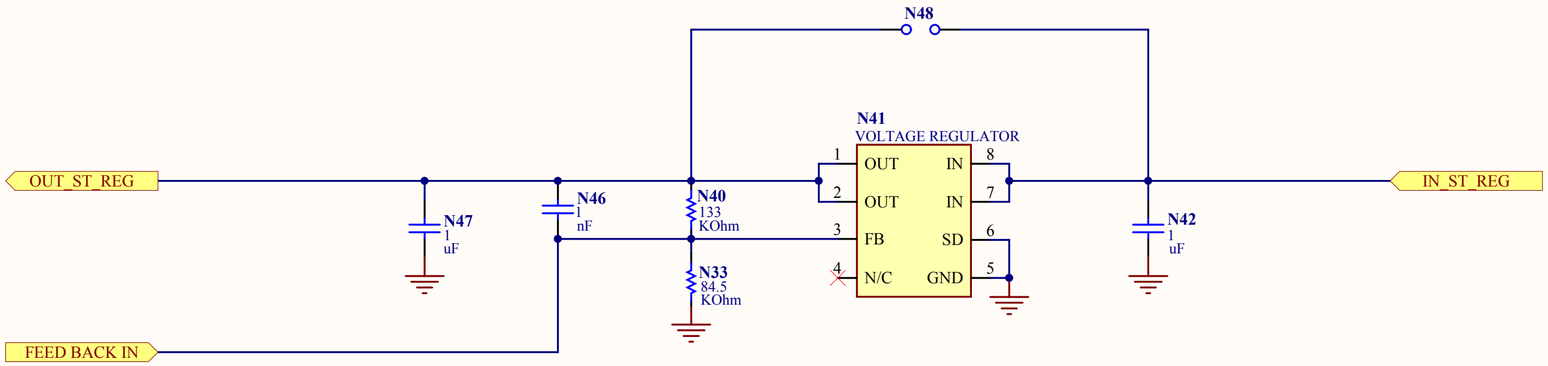
# VCC VCO REGULATOR



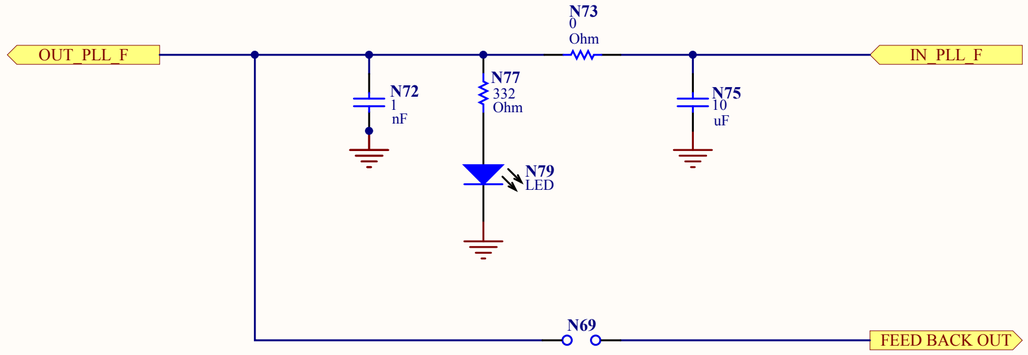
# VCC PLL REGULATOR



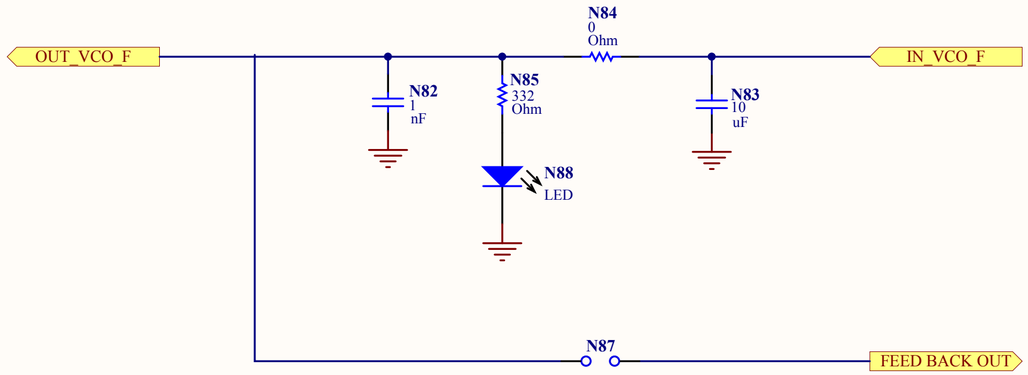
# SCHMITT TRIGGER REGULATOR



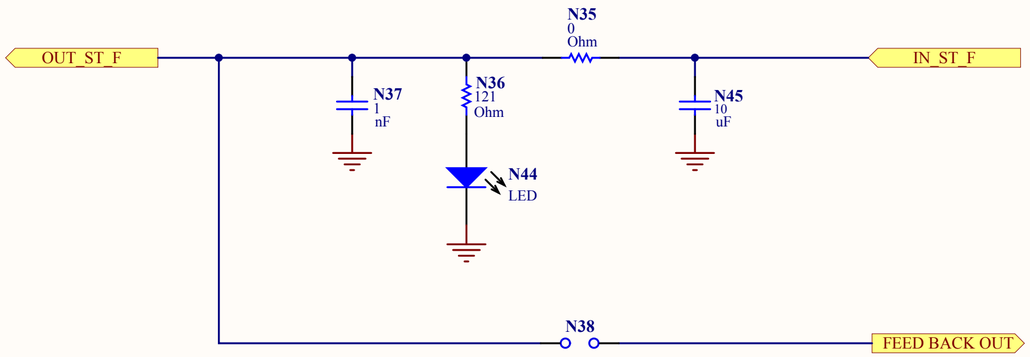
# VCC PLL FILTERING



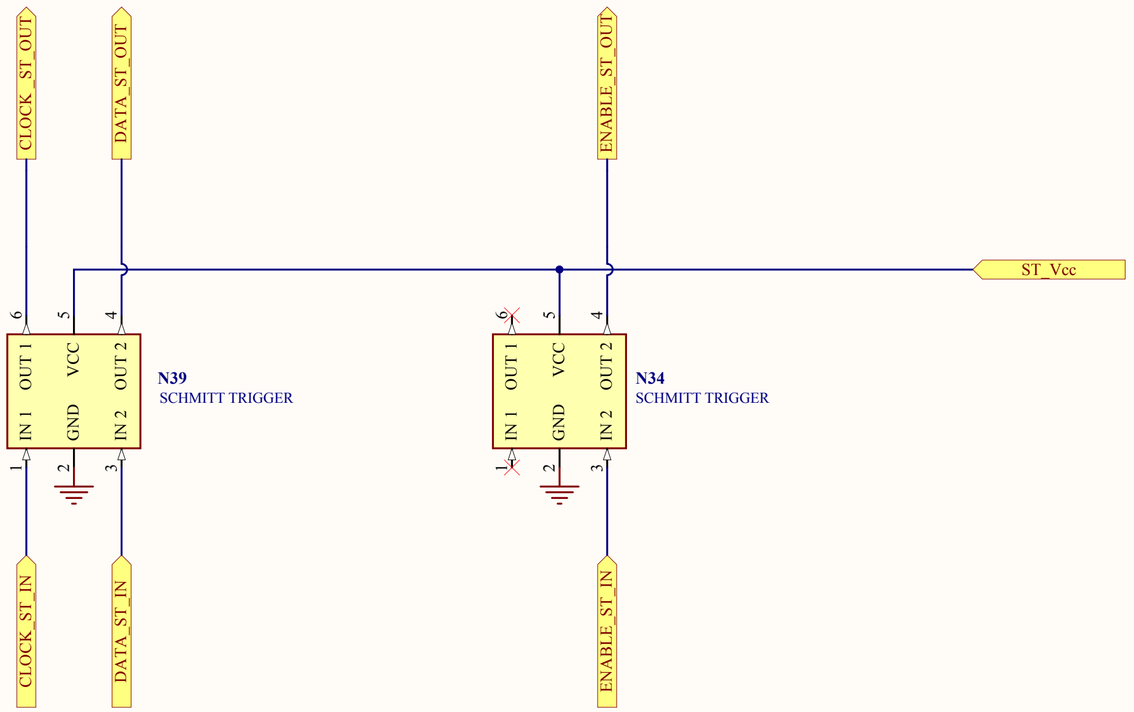
# VCC VCO FILTERING



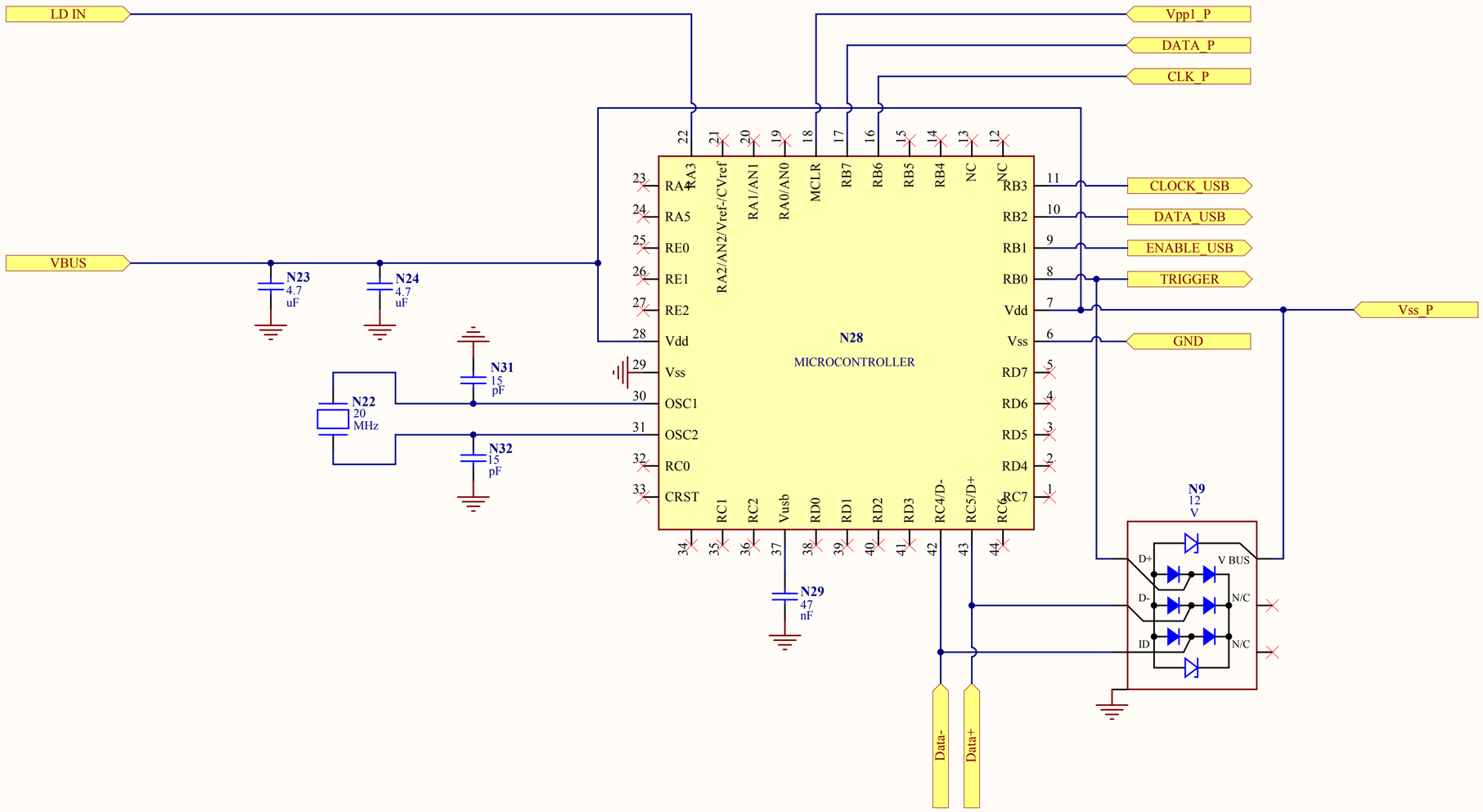
# SCHMITT TRIGGER FILTERING



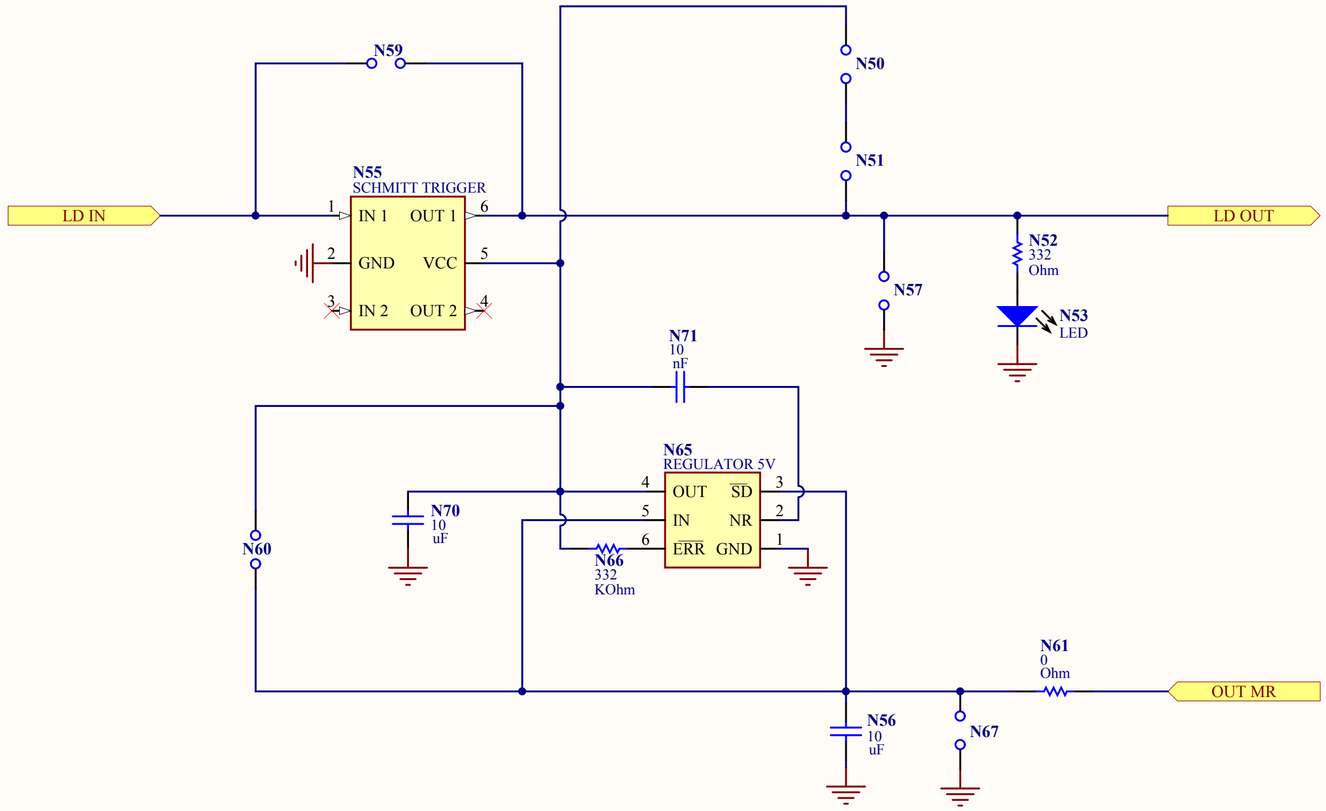
# SCHMITT TRIGGER



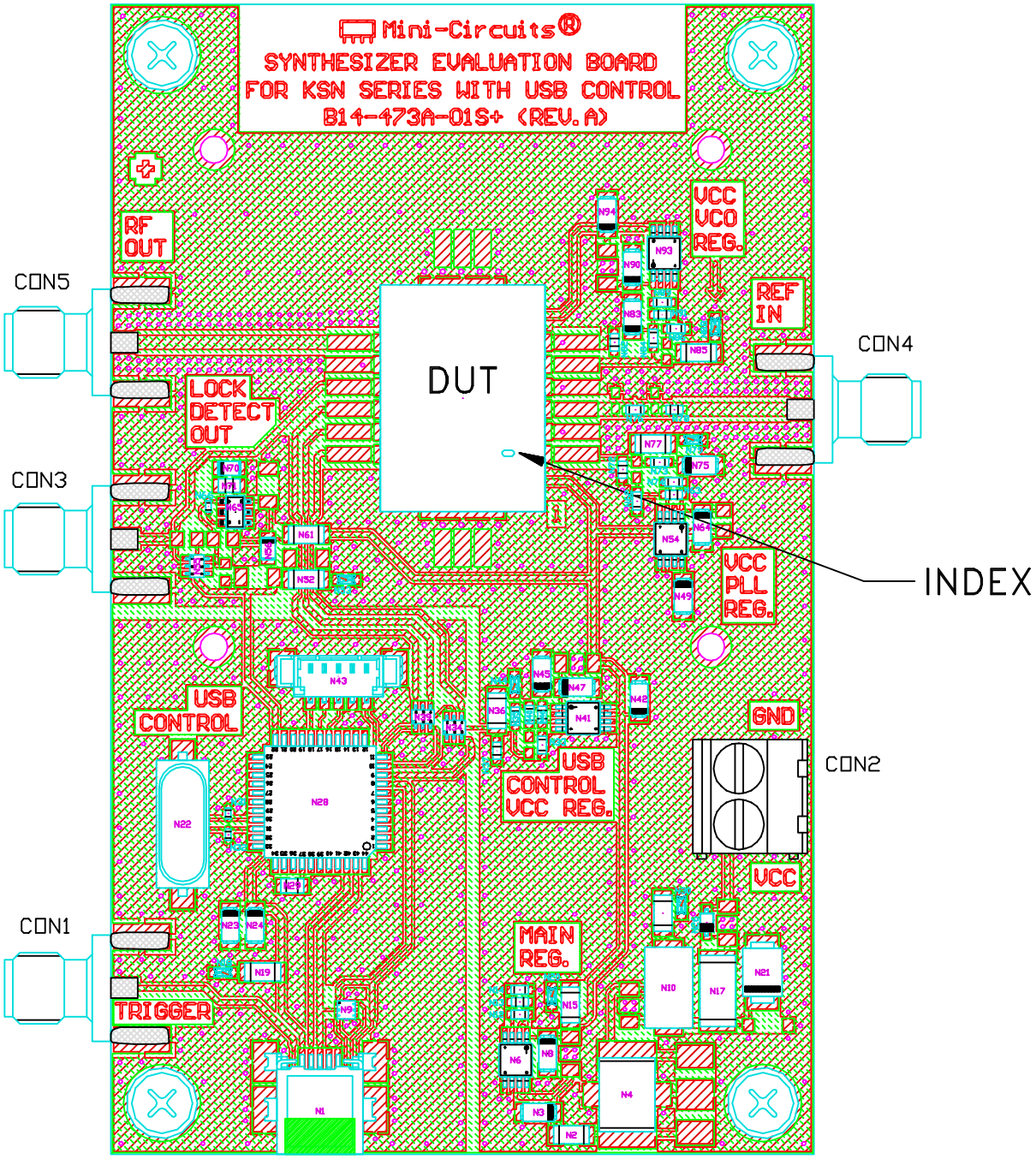
# USB CONTROLER



# LD REGULATOR  SCHMITT TRIGGER AND LED



# Evaluation Board and Circuit




TB-567+

NOTES:

1. SMA F JACK CONNECTORS.
2. PCB MATERIAL: FR4 OR EQUIVALENT, DIALECTRIC CONSTANT=4.7, DIALECTRIC THICKNESS=.059 INCH.

Mini-Circuits

# Environmental Specifications ENV65T2

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification | Test/Inspection Condition | Reference/Spec |
|---|---|---|
| Operating Temperature | -40° to 85°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Humidity | 90 to 95% RH, 240 hours, 50°C | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Solder Reflow Heat | Sn-Pb Eutectic Process: 225°C peak<br>Pb-Free Process, 245°C peak | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1 |
| Solderability | 10X Magnification | J-STD-002, Para 4.2.5, Test S, 95% Coverage |
| Vibration (High Frequency) | 20g peak, 20-2000 Hz, 4 times in each of three axes (total 12) | MIL-STD-883, Method 2007.3, Condition A |
| Mechanical Shock | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes | MIL-STD-202, Method 213, Condition A |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |