*Engineering Development Model*

# Frequency Synthesizer KSN-EDR10970

### Important Note

This model has been designed, built and tested in our engineering department. Performance data represents model capability.
At present it is a non-catalog model. On request, we can supply a final specification sheet, part number and price/delivery information.

Please click "Back", and then click "Contact Us" for Applications support.

**CASE STYLE : DK1042**

Not recommended for new designs. Contact applications and/or your account manager for an alternative.

| ELECTRICAL SPECIFICATIONS 50Ω, over -40°C to +85°C | | | | |
|---|---|---|---|---|
| **Parameter** | **Min.** | **Typ.** | **Max.** | **Units** |
| **Frequency** | 490 | | 490 | MHz |
| **Step size** | | 7000 | | kHz |
| **Settling Time** Within ±1kHz | | 540 | | usec |
| **Output Power** | -4 | 0 | +3 | dBm |
| **Phase Noise** | | | | |
| at 100 Hz offset | | -101 | | dBc/Hz |
| at 1 kHz offset | | -106 | -100 | dBc/Hz |
| at 10 KHz offset | | -108 | -102 | dBc/Hz |
| at 100 KHz offset | | -131 | -125 | dBc/Hz |
| at 1000 kHz offset | | -156 | -151 | dBc/Hz |
| **Integrated SSB Phase Noise** | | -62 | | dBc |
| **Reference Spurious Suppression** | | -80 | | dBc |
| **Comparison Spurious Suppression** | | -26 | | dBc |
| **Non-Harm. Spurious Suppression** | | -90 | | dBc |
| **Harmonic Suppression** | | -35 | | dBc |
| **Supply voltage** VCO | | 5 | | V |
| **Supply voltage** PLL | | 5 | | V |
| **Supply current** VCO | | 40 | 48 | V |
| **Supply current** PLL | | 12 | 20 | V |
| **Reference In (External)** Frequency | | 49 | | MHz |
| **Reference In (External)** Amplitude | | 1 | | Vp-p |
| **Reference In (External)** Impedance | | 100 | | kΩ |
| **Reference In (External)** Ph. N @ 1kHz | | -145 | | dBc/Hz |
| **Digital Lock Detect** Locked | 4.6 | | 5 | V |
| **Digital Lock Detect** Unlocked | | | 0.4 | |
| **Frequency Synthesizer PLL** | Self-programmed (internal microcontroller) | | | |

| ABSOLUTE MAXIMUM RATINGS | |
|---|---|
| **Operating Temperature** | -45°C to 85°C |
| **Storage Temperature** | -55°C to 100°C |
| **VCO Supply Voltage** | 6V |
| **PLL Supply Voltage** | 6V |
| **Reference Frequency voltage** | 5.8Vp-p |
| **Data, Clock & LE levels** | 5.3V |

Power On sequence: Vcc VCO followed by Vcc PLL
Power Off sequence: Vcc PLL followed by Vcc VCO

| PIN CONNECTIONS | | | |
|---|---|---|---|
| **RF OUT** | 7 | **N.C** | 10,11,12 |
| **VCC VCO** | 5 | **GROUND** | 2,4,6,8,13,14 |
| **VCC PLL** | 1 | | |
| **REF IN** | 3 | | |
| **LOCK DETECT** | 9 | | |

Notes
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# Frequency Synthesizer KSN-EDR10970

## *Typical Performance Data*

| FREQ. (MHz) | POWER OUTPUT (dBm) | | | HARMONICS (dBc) | | | | | | VCO CURRENT (mA) | | | PLL CURRENT (mA) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F2 | | | F3 | | | | | | | | |
| | -40°C | +25°C | +85°C | -40°C | +25°C | +85°C | -40°C | +25°C | +85°C | -40°C | +25°C | +85°C | -40°C | +25°C | +85°C |
| 490 | -0.33 | -0.48 | -1.36 | -32.46 | -35.20 | -38.23 | -32.47 | -30.73 | -27.94 | 36.80 | 40.30 | 42.49 | 9.65 | 11.98 | 13.61 |

| FREQ. (MHz) | PHASE NOISE (dBc/Hz) @ OFFSETS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -40°C | | | | | +25°C | | | | | +85°C | | | | |
| | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz | 100Hz | 1kHz | 10kHz | 100kHz | 1MHz |
| 490 | -99.02 | -106.06 | -108.01 | -130.55 | -158.03 | -101.20 | -106.68 | -107.57 | -130.14 | -156.03 | -99.20 | -107.14 | -106.89 | -127.80 | -152.96 |

| REFERENCE & COMPARISON SPURIOUS ORDER | REFERENCE SPURIOUS @Fcarrier 490MHz± (n*Fcomparison) (dBc) NOTE 1 | | | COMPARISON SPURIOUS @Fcarrier 490 MHz± (n*Fcomparison) (dBc) NOTE 2 | | |
|---|---|---|---|---|---|---|
| n | -40°C | +25°C | +85°C | -40°C | +25°C | +85°C |
| -5 | -66.94 | -72.91 | -72.97 | -85.38 | -89.92 | -89.3 |
| -4 | -67.42 | -72.72 | -72.6 | -78.03 | -81.59 | -82.64 |
| -3 | -87.22 | -81.47 | -85.68 | -85.01 | -89.31 | -89.62 |
| -2 | -73.32 | -80 | -85.52 | -87.56 | -88.89 | -89.51 |
| -1 | -69.46 | -70.79 | -73.72 | -81.35 | -82.79 | -84.75 |
| 0 note 3 | - | - | - | - | - | - |
| +1 | -71.99 | -74.93 | -72.36 | -78.61 | -82.63 | -82.85 |
| +2 | -77.24 | -87.43 | -80.91 | -87.96 | -88.61 | -86.09 |
| +3 | -75.45 | -73.8 | -74.36 | -88.21 | -85.77 | -84.32 |
| +4 | -74.05 | -70.44 | -70.13 | -82.34 | -81.45 | -81.2 |
| +5 | -68.65 | -68.88 | -70 | -86.16 | -82.33 | -81.9 |

Note 1: Reference frequency 49 MHz.
Note 2: Comparison frequency 7 MHz.
Note 3: All spurs are referenced to carrier signal (n=0).

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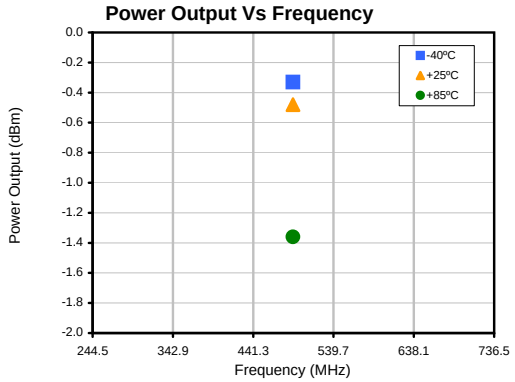
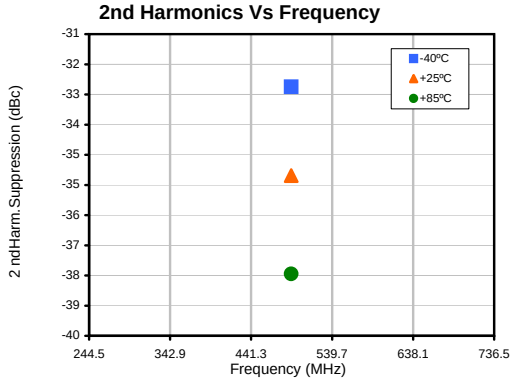
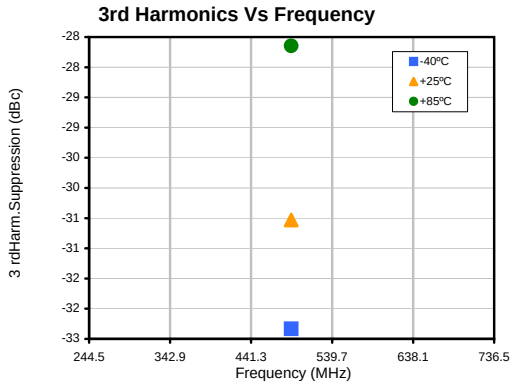
# Frequency Synthesizer KSN-EDR10970

*Typical Performance Data*





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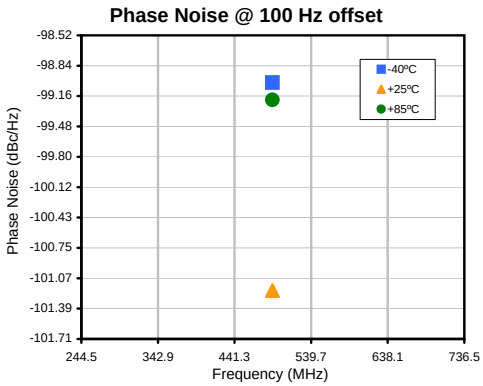
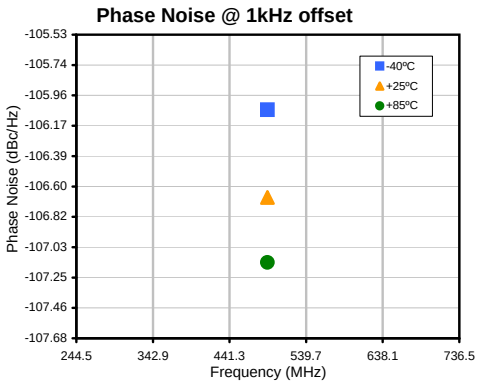
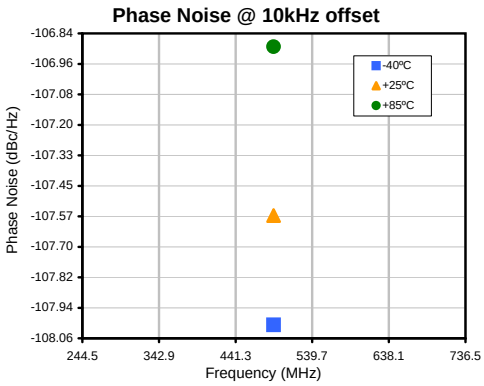
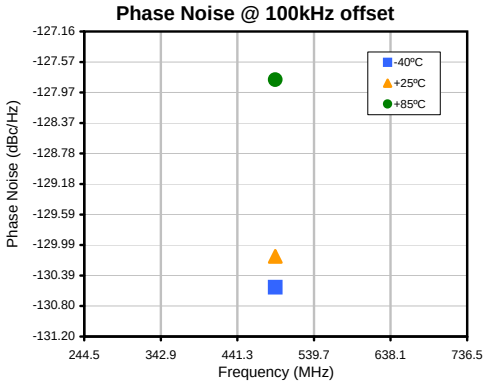
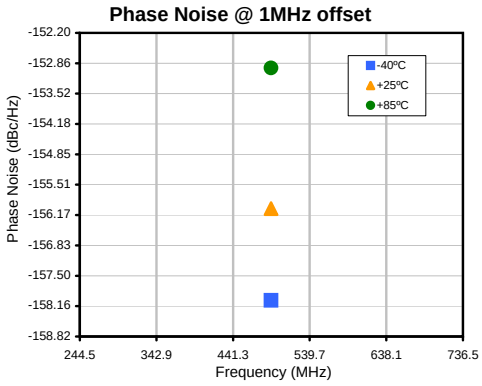
## *Typical Performance Data*

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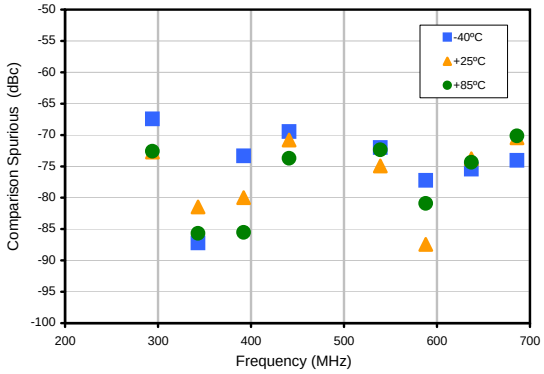
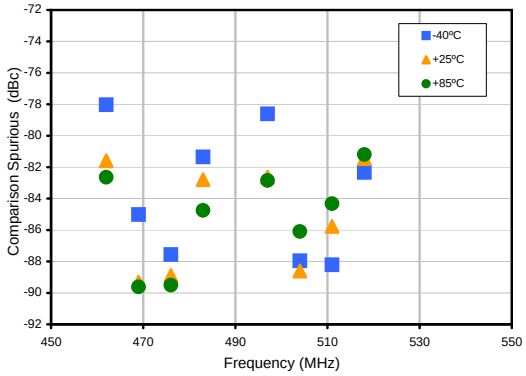
## *Typical Performance Data*

**Reference Spurious**
**Vs Freq.Offset @Fcar = 490 MHz**




**Comparison Spurious**
**Vs Freq.Offset @Fcar = 490 MHz**

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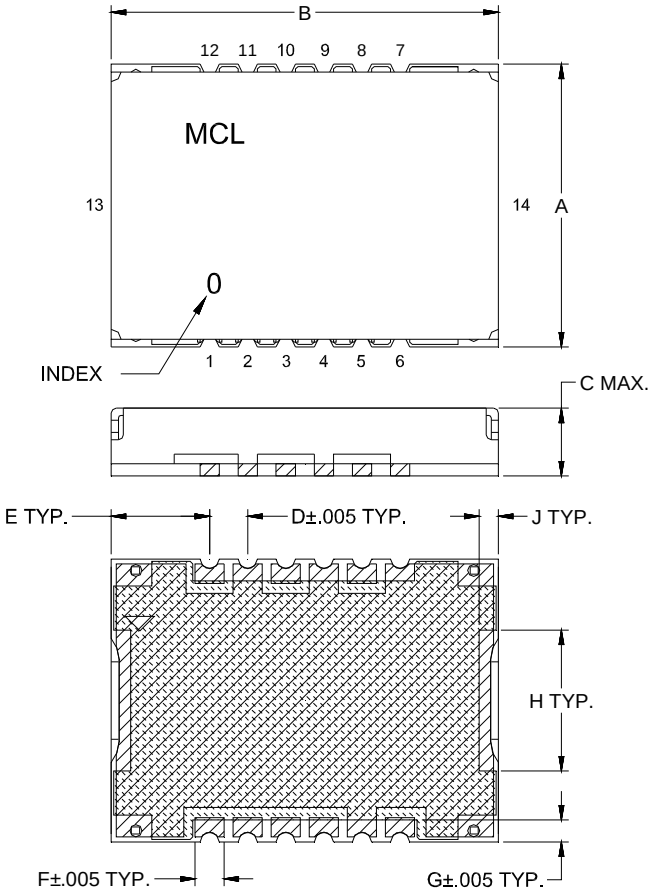
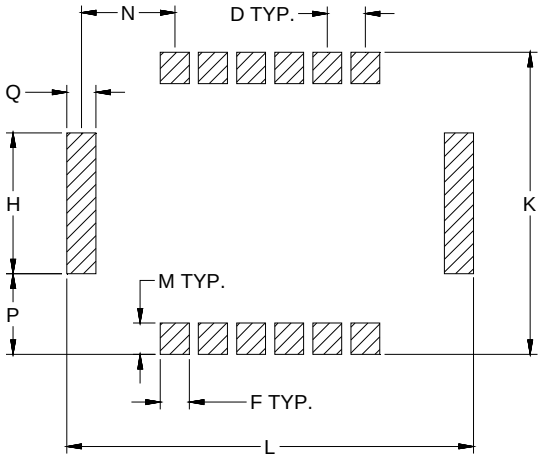
# Case Style DK

**DK1042**

## Outline Dimensions




## Suggested PCB Land Pattern




| CASE# | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | WT. GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DK1042 | .584 (14.83) | .800 (20.32) | .154 (3.91) | .079 (2.01) | .203 (5.16) | .060 (1.52) | .045 (1.14) | .291 (7.39) | .039 (1.0) | .624 (15.85) | .840 (21.34) | .065 (1.65) | .193 (4.90) | .170 (4.32) | .060 (1.52) | 1.6 |

**Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015**

**Notes:**

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

   For RoHS Case Styles: 2-5 µ inch (.05-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.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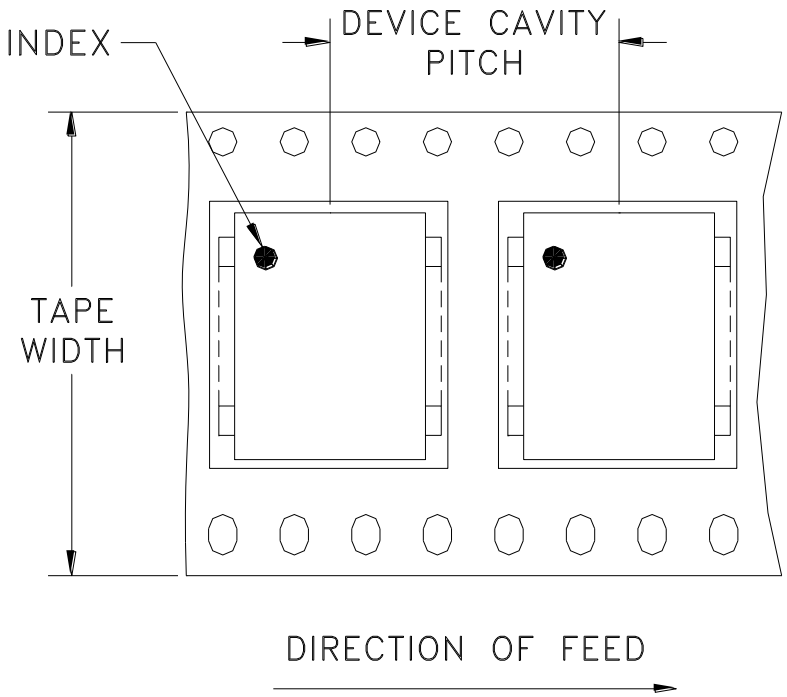
# Tape & Reel Packaging TR-F28

DEVICE ORIENTATION IN T&R




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 32 | 20 | 13 | Small quantity standards (see note) | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | Standard | 500 |

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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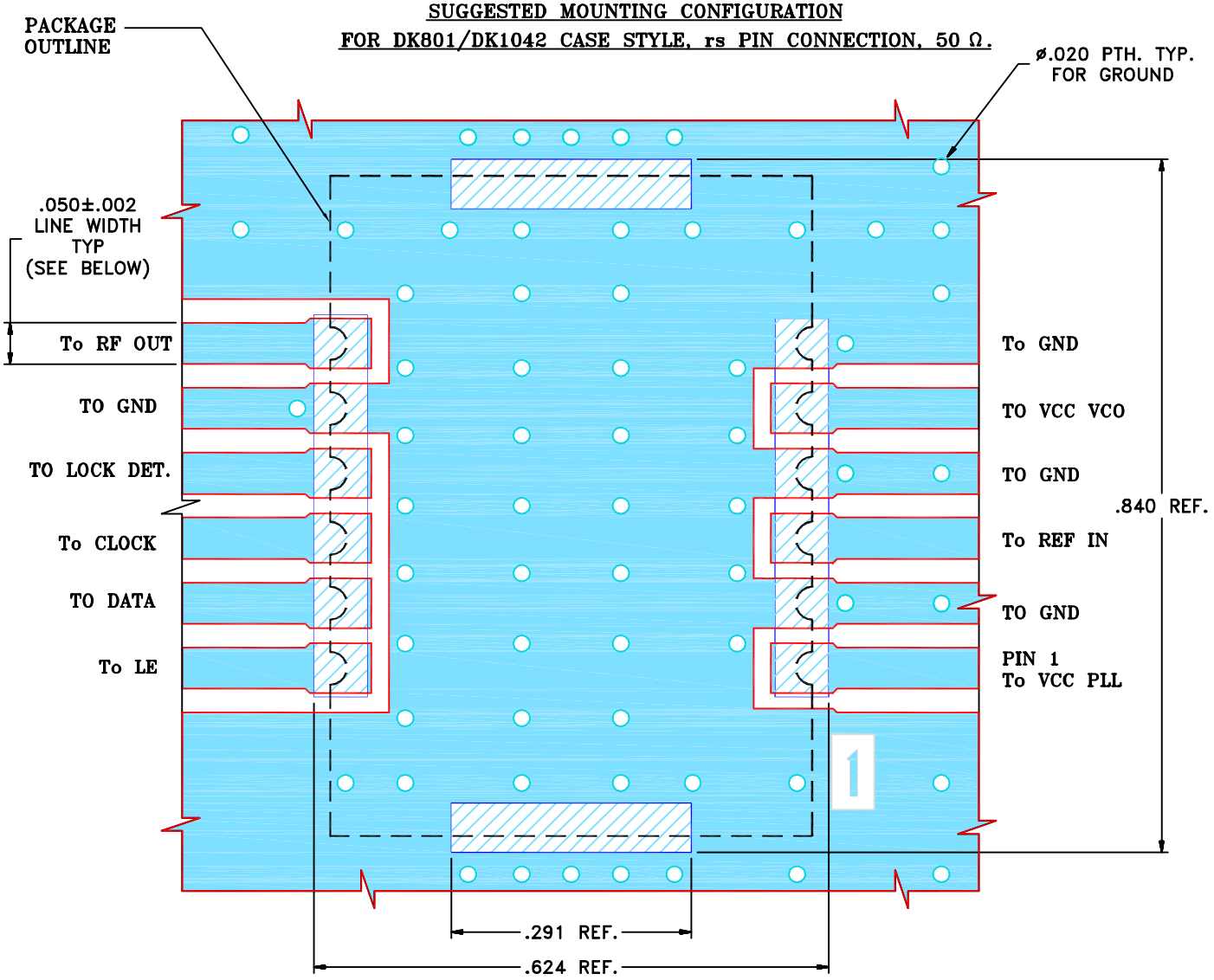
THIRD ANGLE PROJECTION

| 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 ± | | | |

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

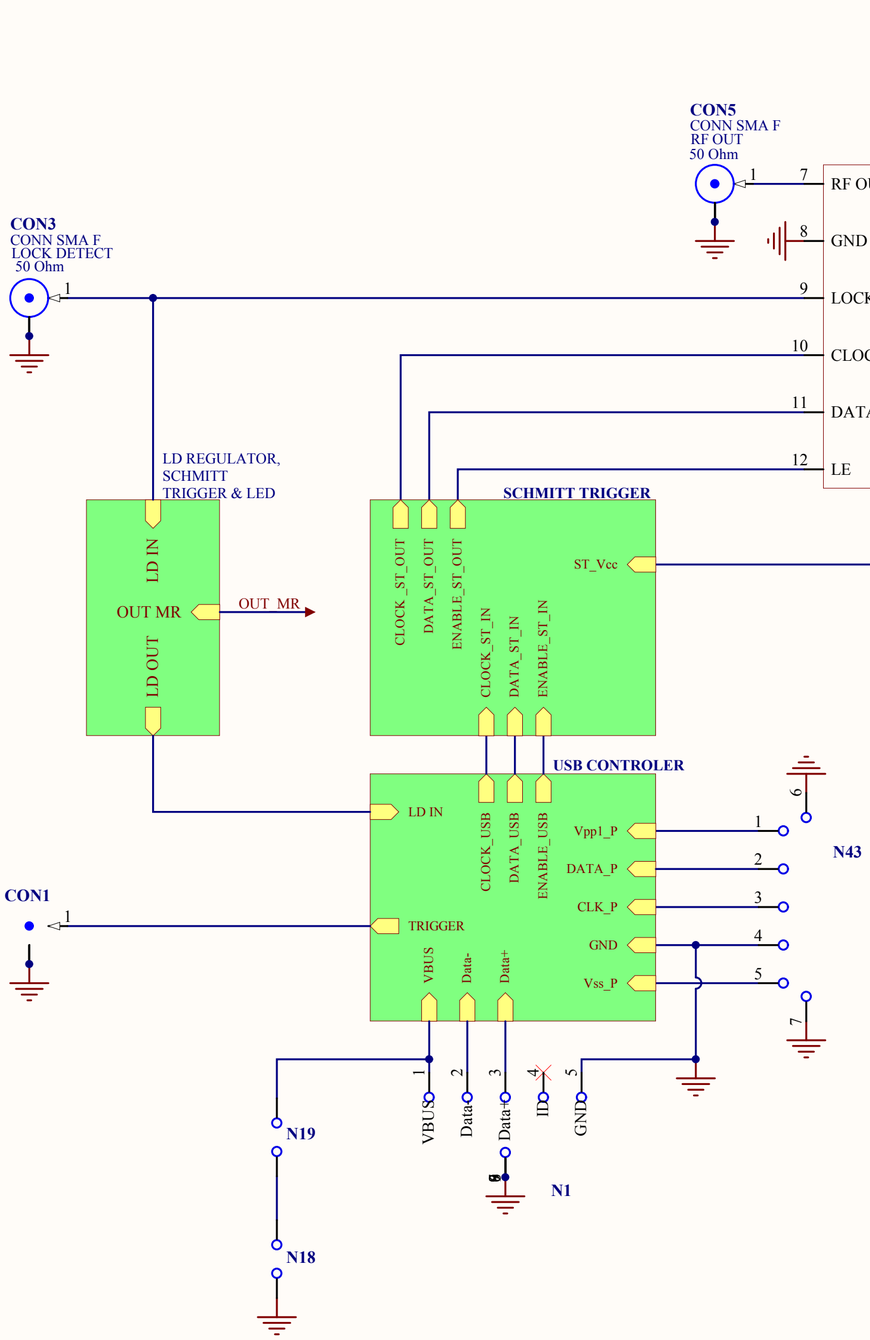
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

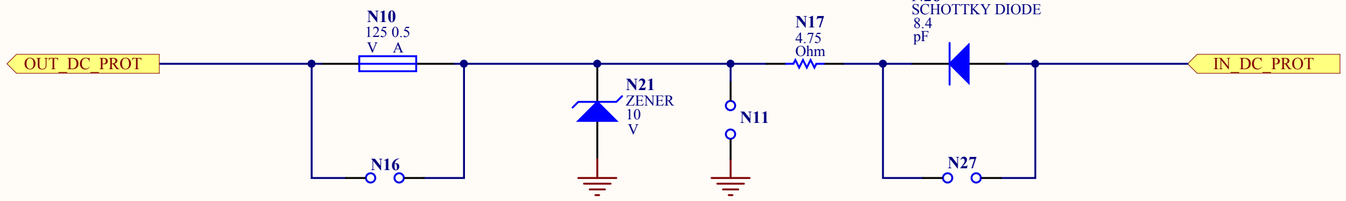
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-249 | B |

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

# ELECTRICAL SCHEME-GENERAL
# (TB for KSN)



# DC PROTECTIONS





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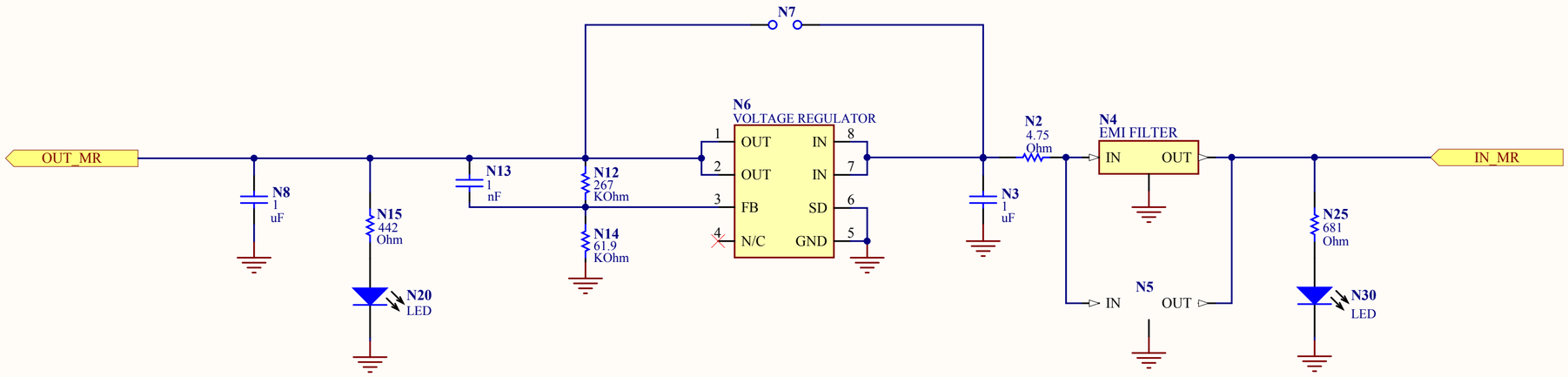
# MAIN REGULATOR







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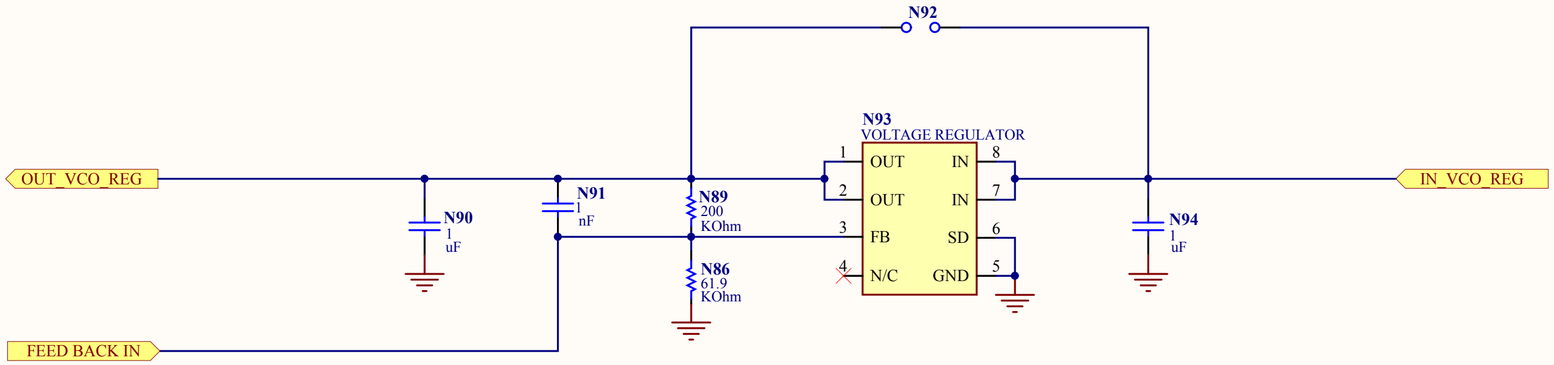
# VCC VCO REGULATOR







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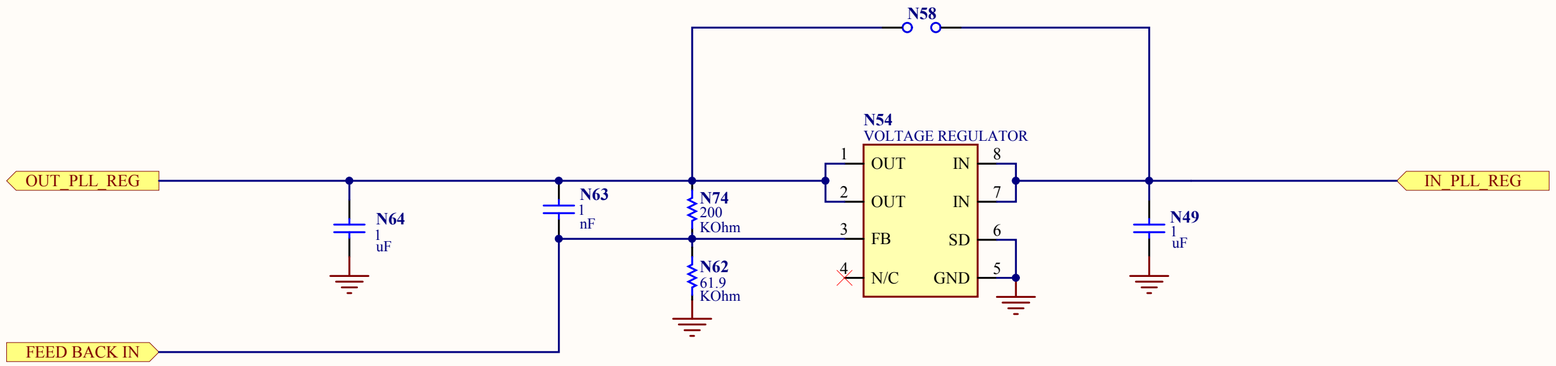
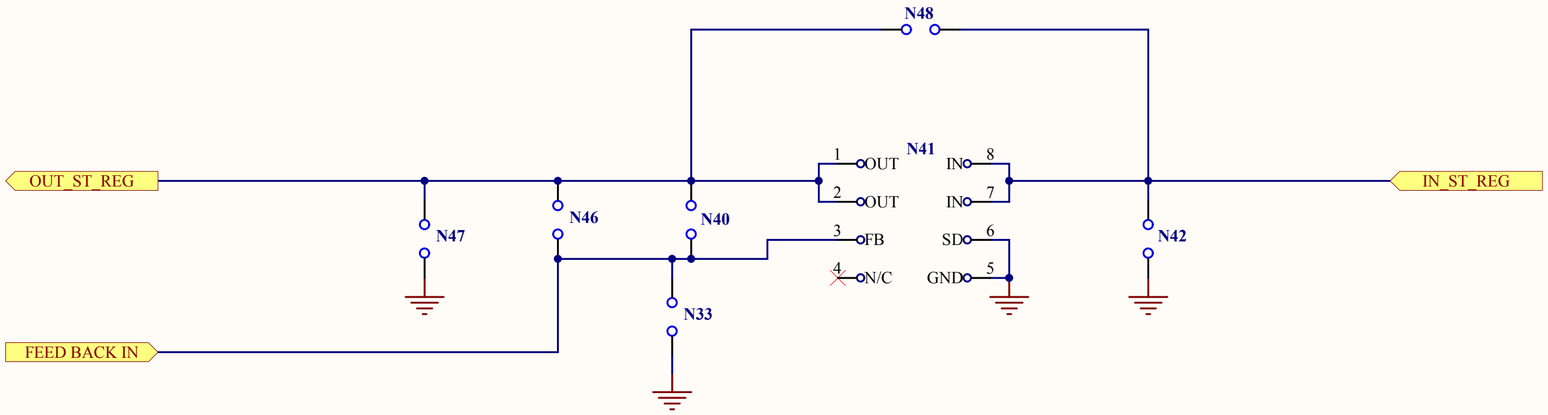
# VCC PLL REGULATOR



# SCHMITT TRIGGER REGULATOR







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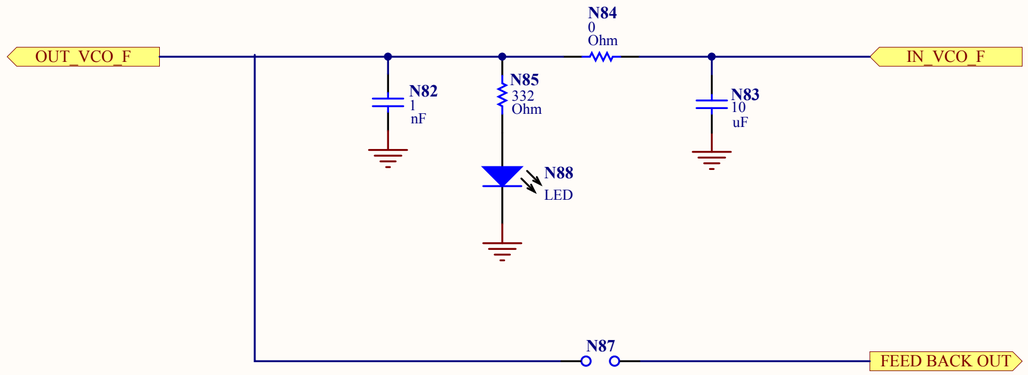
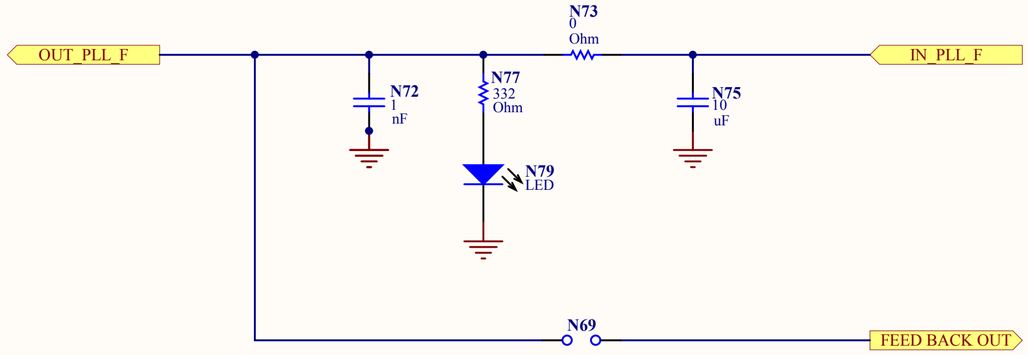
# VCC VCO FILTERING



# VCC PLL FILTERING



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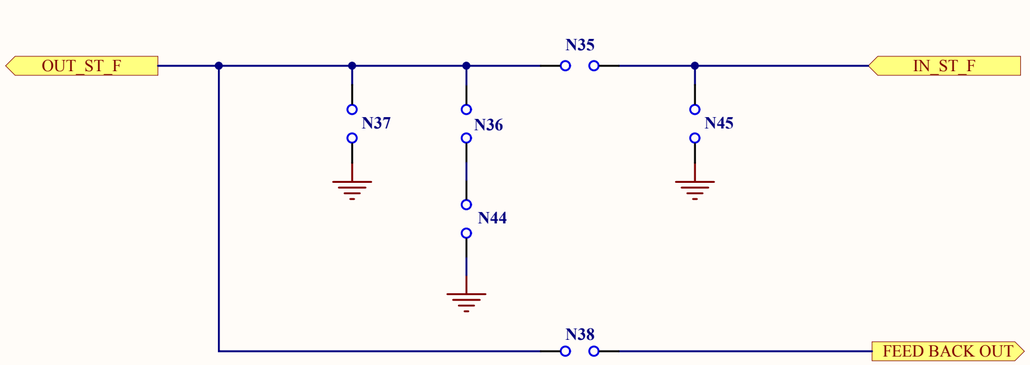



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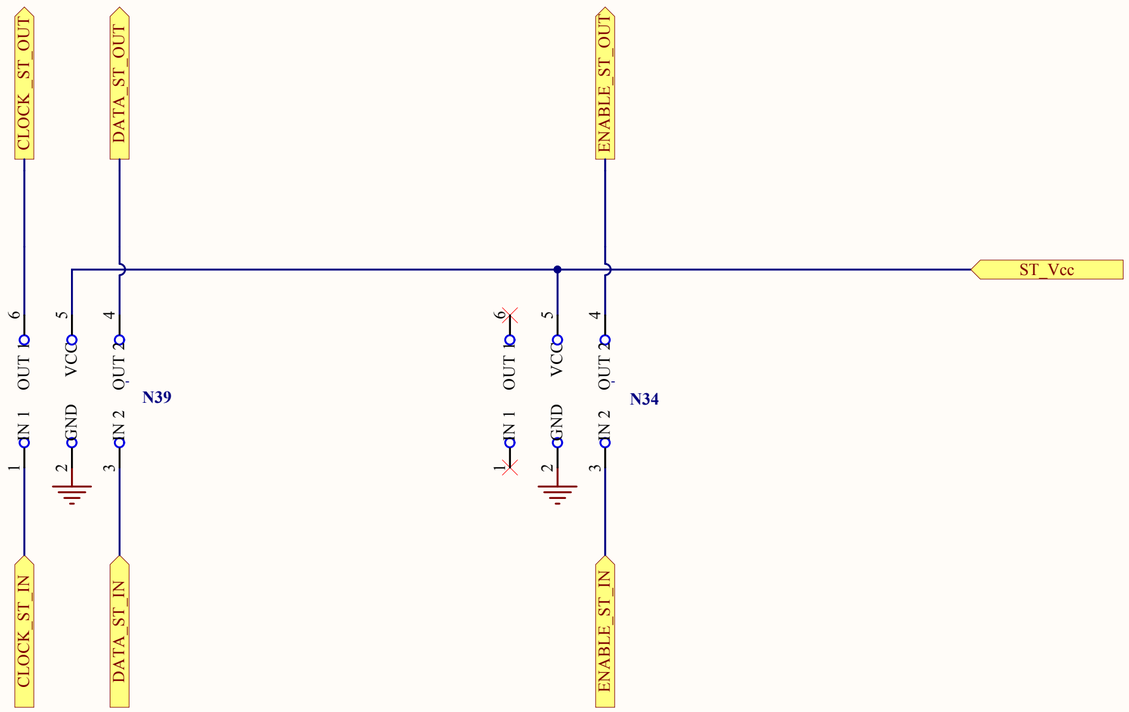
# SCHMITT TRIGGER



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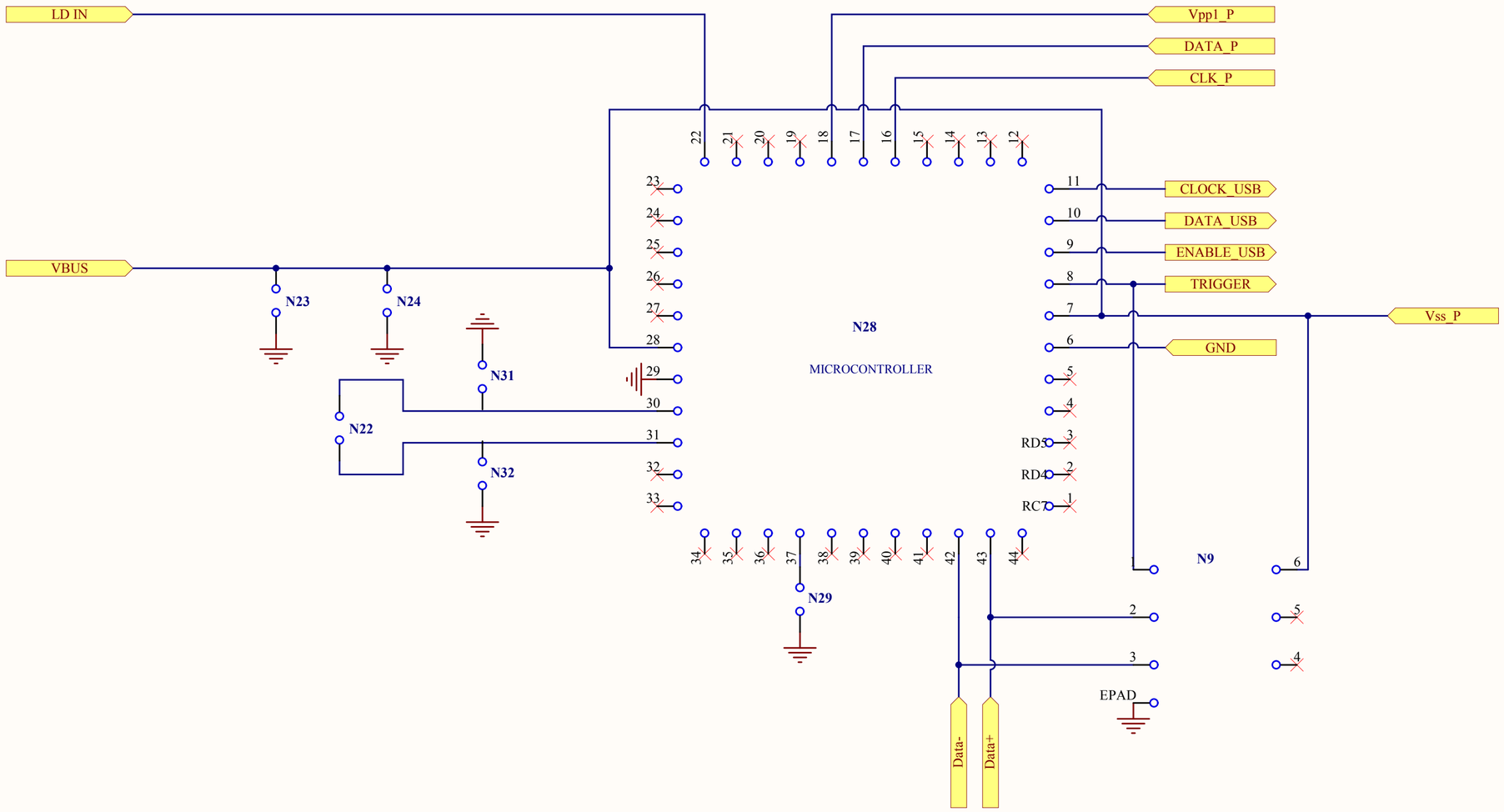
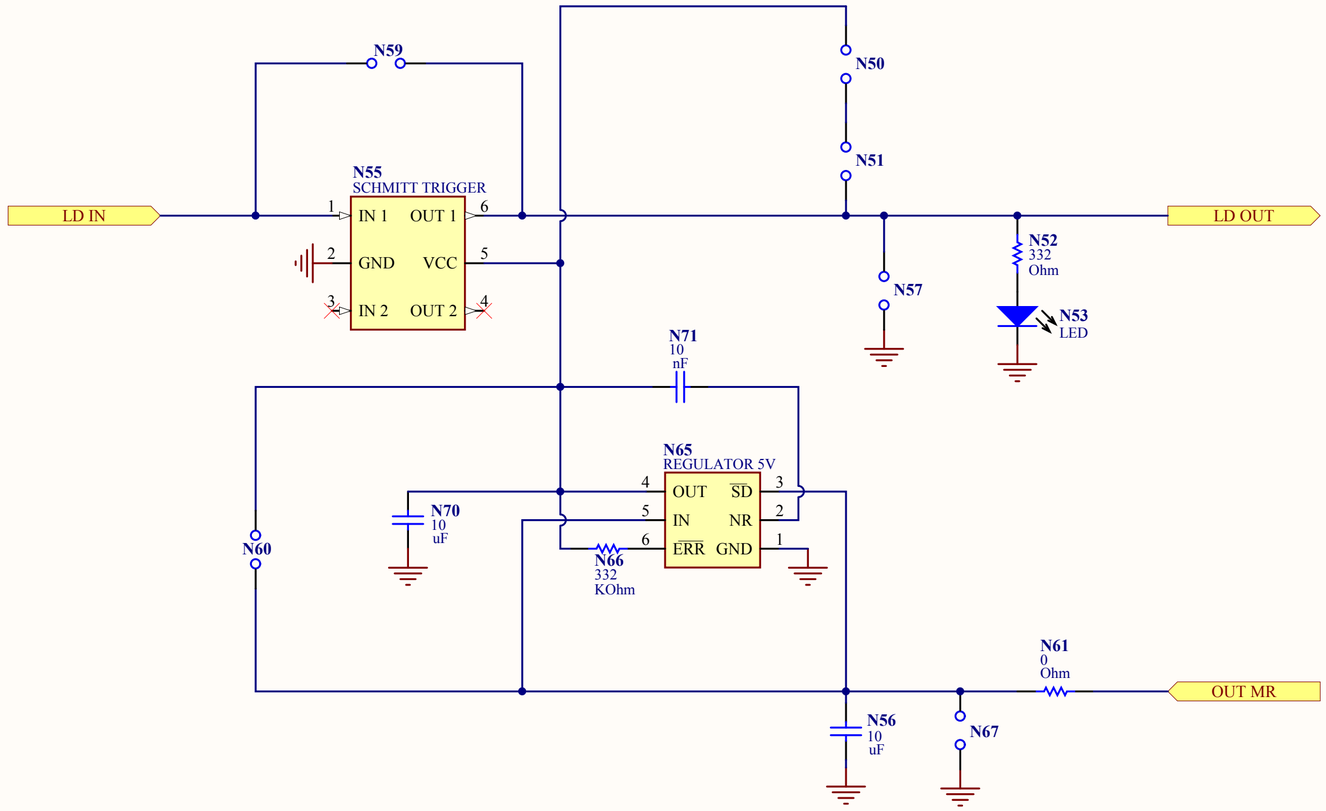
# USB CONTROLER



# LD REGULATOR  SCHMITT TRIGGER AND LED



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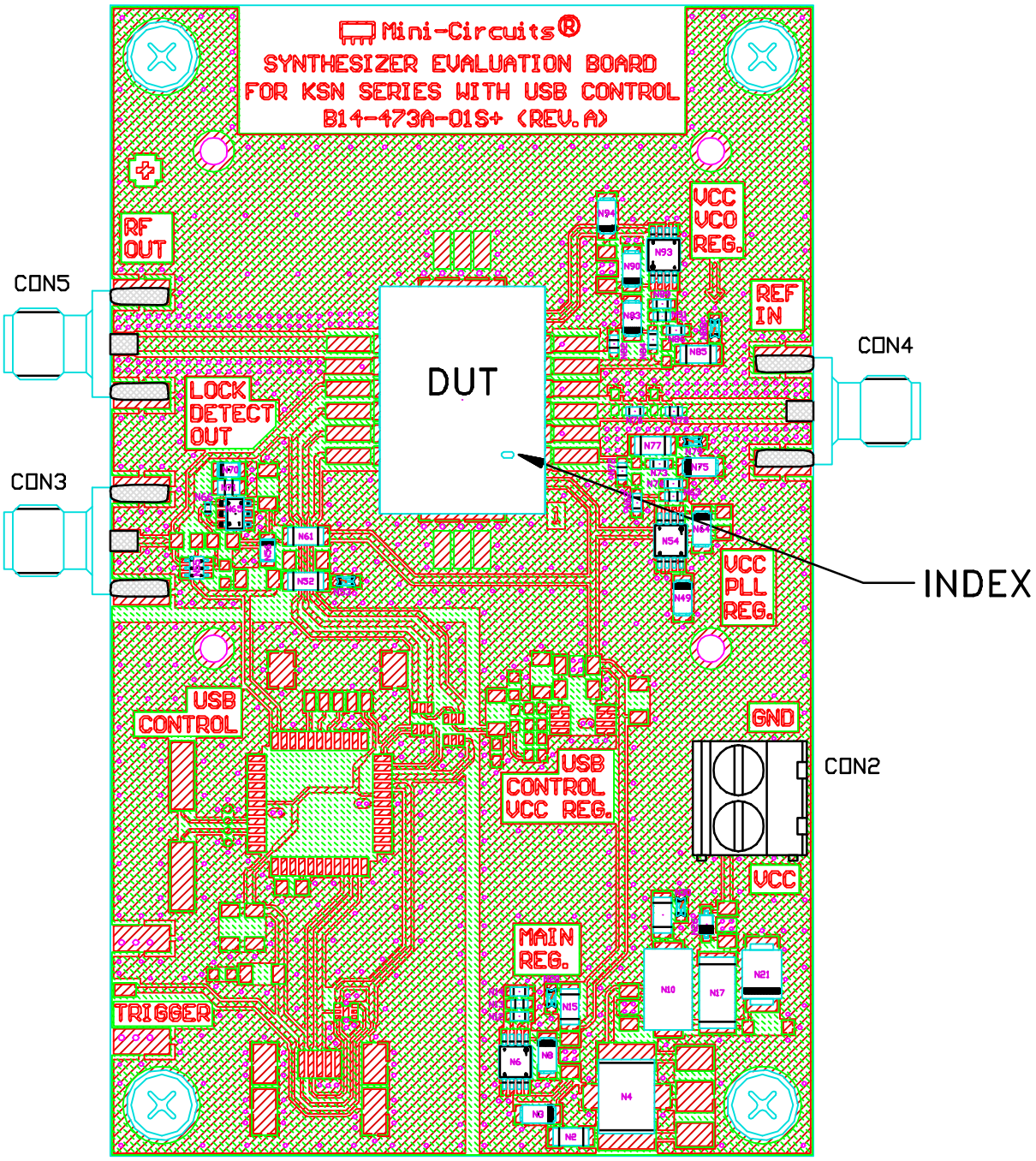
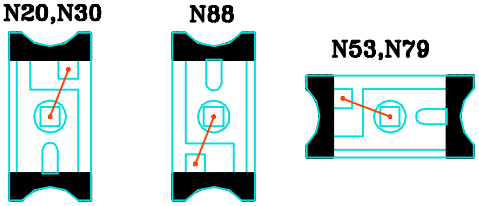
# Evaluation Board and Circuit




TB-567+F




NOTES:

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


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