

# NCP1521BEVB

## NCP1521B Adjustable Output Voltage Step-Down Converter Evaluation Board User's Manual



ON Semiconductor®

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### EVAL BOARD USER'S MANUAL

#### Overview

The NCP1521B step-down PWM DC-DC converter is optimized for portable applications powered from one cell Li-ion or three cell Alkaline/NiCd/NiMH batteries.

The part is available in adjustable output voltage versions ranging from 0.9 V to 3.3 V. It uses synchronous rectification to increase efficiency and reduce external part count. The device also has a built-in 1.5 MHz (nominal) oscillator

which reduces component size by allowing smaller inductors and capacitors. Automatic switching PWM/PFM mode offers improved system efficiency.

Additional features include integrated soft-start, cycle-by-cycle current limiting and thermal shutdown protection. The NCP1521B is available in space saving, low profile TSOP5 and UDFN6 packages.

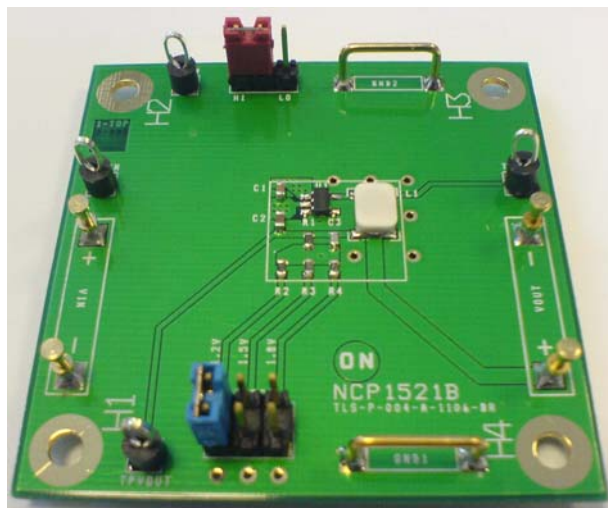


Figure 1. Board Picture in TSOP-5

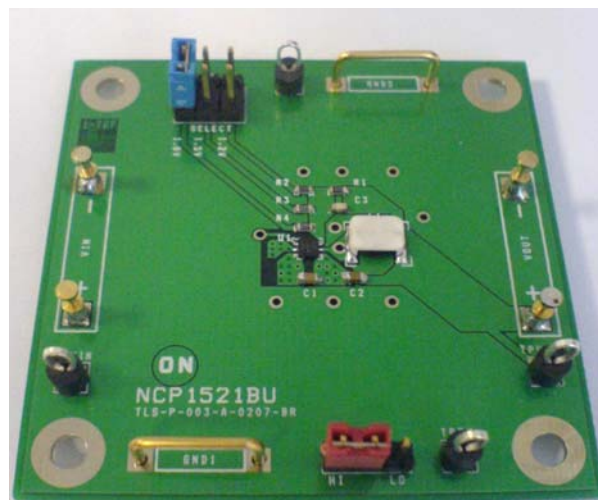


Figure 2. Board Picture in μDFN-6

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## MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions (Note 1).

| Rating   | Symbol          | Value          | Unit    |
|--|-----------------|----------------|---------|
| Minimum Voltage All Pins   | $V_{min}$       | -0.3           | V       |
| Maximum Voltage All Pins (Note 2)  | $V_{max}$       | 7.0            | V       |
| Maximum Voltage EN1, EN2, FB, LX   | $V_{max}$       | $V_{IN} + 0.3$ | V       |
| Thermal Resistance Junction-to-Air<br>TSOP-5<br>UDFN-6                       | $R_{\theta ja}$ | 300<br>260     | °C/W    |
| Operating Ambient Temperature Range  | $T_A$           | -40 to 85      | °C      |
| Storage Temperature Range  | $T_{stg}$       | -55 to 150     | °C      |
| Junction Operating Temperature   | $T_J$           | -40 to 125     | °C      |
| Latch-up current maximum rating $T_a=85^{\circ}\text{C}$ (Note 4) other pins | $I_u$           | $\pm 100$      | mA      |
| ESD Withstand Voltage (Note 3)<br>Human Body Model<br>Machine Model          | $V_{esd}$       | 2.0<br>200     | kV<br>V |
| Moisture Sensitivity Level (Note 5)  | MSL             | 1              | per IPC |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Maximum electrical ratings are defined as those values beyond which damage to the device may occur at  $T_A = 25^{\circ}\text{C}$
2. According JEDEC standard JESD22-A108B
3. This device series contains ESD protection and exceeds the following tests:  
Human Body Model (HBM) per JEDEC standard: JESD22-A114  
Machine Model (MM) per JEDEC standard: JESD22-A115
4. Latchup current maximum rating per JEDEC standard: JESD78.
5. JEDEC Standard: J-STD-020A.

## ELECTRICAL CHARACTERISTICS

For Electrical Characteristic, please see our NCP1521B datasheet available at <http://www.onsemi.com/PowerSolutions/product.do?id=NCP1521B>

## NCP1521B – BOARD CONNECTIONS

| Symbol | Switch Descriptions |
|--------|---------------------|
|--------|---------------------|

### INPUT POWER

|            |  |
|------------|--|
| $V_{IN+}$  | This is the positive connection for power supply.  |
| $V_{IN-}$  | This is the return connection for the power supply |
| GND1, GND2 | Ground clip  |

### SETUP

|        |   |
|--------|---|
| ENABLE | To enable the buck converter, connect a shorting jumper between ENABLE-1 and ENABLE-2.<br>To disable the buck converter, connect a shorting jumper between ENABLE-3 and ENABLE-2. |
| SELECT | A shorting jumper must be used to select an output voltage of 1.2 V, 1.5 V or 1.8 V   |

### OUTPUT POWER

|            |  |
|------------|--|
| $V_{OUT+}$ | This is the positive connection of the output voltage. |
| $V_{OUT-}$ | This is the return connection of the output voltage.   |

### TEST POINT

|             |   |
|-------------|---|
| $T_{PVIN}$  | This is the test point of the input voltage.    |
| $T_{PEN}$   | This is the test point of the enable pin.       |
| $T_{PLX}$   | This is the test point of the inductor voltage. |
| $T_{PVOUT}$ | This is the test point of the output voltage.   |

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## NCP1521B – BOARD SCHEMATIC

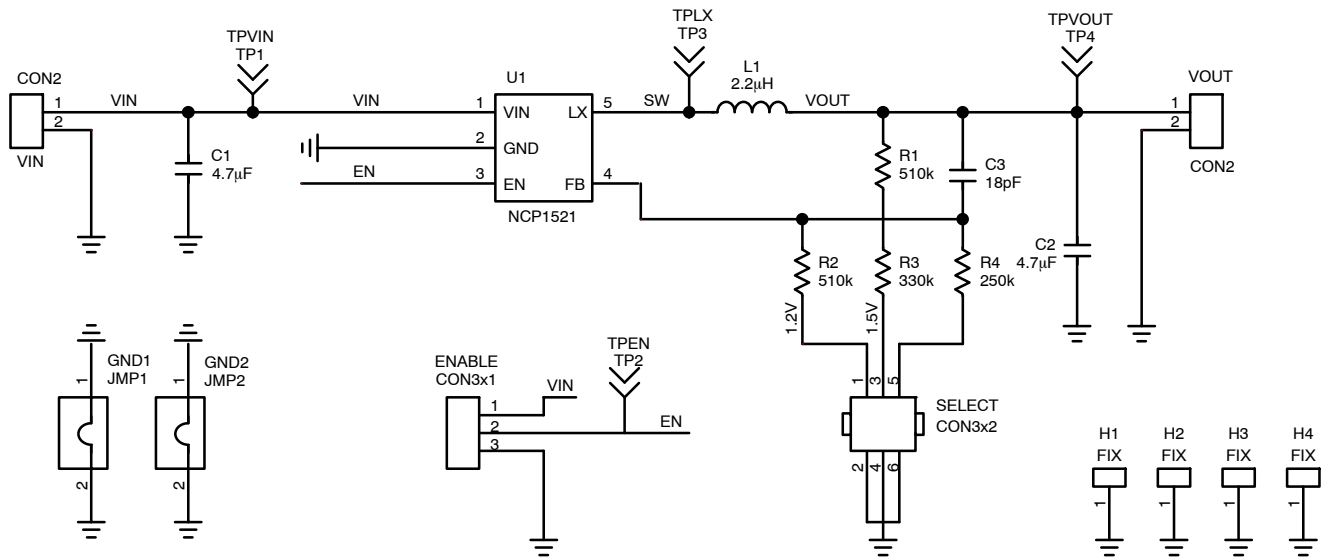


Figure 3. Board Schematic in TSOP-5

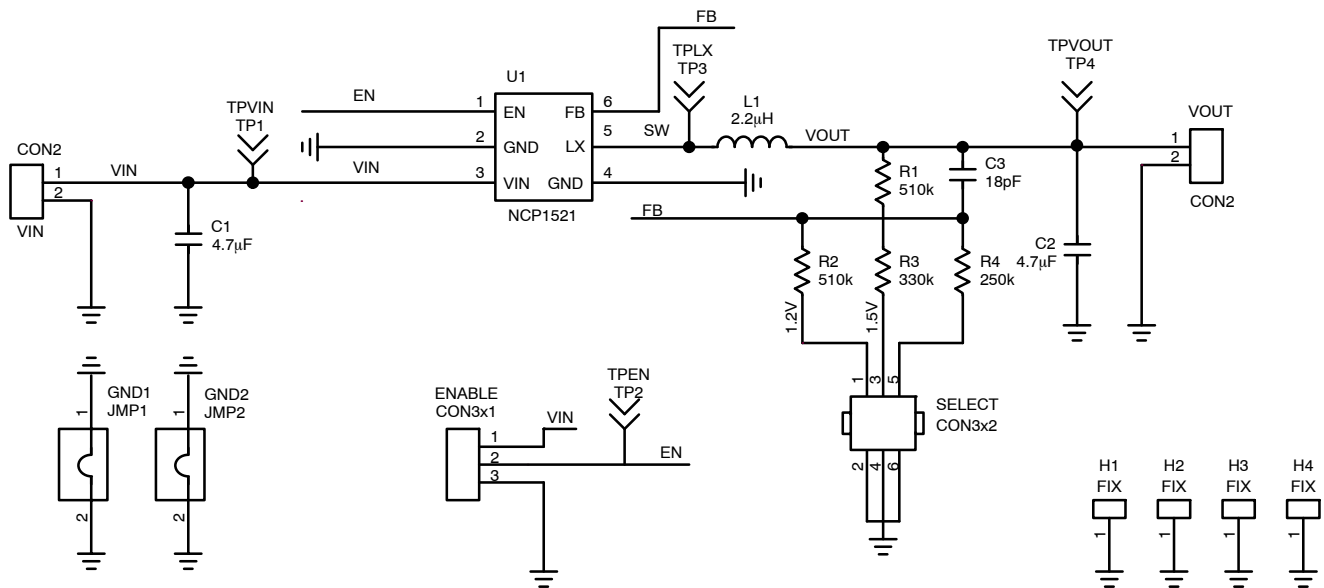


Figure 4. Board Schematic in μDFN-6

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## NCP1521B – TEST PROCEDURE

### Equipment needed

- 10 pt. Times (*list:bull2*)
- Power supply
- Digital Volt Meter
- Digital Amp Meter

### Test

1. Jumper ENABLE should be open.
2. Jumper SELECT should be closed to 1.2 V.
3. Set the power supply to 3.6 V and the current limit of at least 800 mA.
4. Connect the power supply connector to connectors  $V_{IN+}$  and  $V_{IN-}$ . The DC current measurement on  $V_{IN}$  line should be around 0.3  $\mu A$ .
5. Close ENABLE connector. The DC current measurement on  $V_{IN}$  line should be around 40  $\mu A$ .
6. Measure the output voltage between  $V_{OUT+}$  and  $V_{OUT-}$  connectors. You should see around 1.2 V voltage operation.
7. Remove the ENABLE jumper. The DC current measurement on  $V_{IN}$  line should be back around 0.3  $\mu A$ .

## NCP1521B – BILL OF MATERIAL

| Designator                | Qty | Description                          | Value                   | Tolerance | Foot-print    | Manufacturer               | Manufacturer Part Number                   |
|---------------------------|-----|--------------------------------------|-------------------------|-----------|---------------|----------------------------|--|
| U1                        | 1   | IC, Converter, DC/DC                 | NA                      | NA        | TSOP5 UDFN    | ON Semiconductor           | NCP1521B<br>NCP1521BU                      |
| C1                        | 1   | Ceramic capacitor                    | 4.7 $\mu F$ , 10 V, X5R | 10%       | 0805          | TDK                        | C1608X5R1A475                              |
| C2                        | 1   | Ceramic capacitor                    | 10 $\mu F$ , 6.3 V, X5R | 10%       | 0603          | TDK                        | C1608X5R0J105                              |
| C3                        | 1   | Ceramic capacitor                    | 18 pF, 50 V, COG        | 5%        | 0603          | TDK                        | C1608C0G1H180                              |
| R1, R2                    | 2   | SMD resistor                         | 510k                    | 1%        | 0603          | std                        | std  |
| R3                        | 1   | SMD resistor                         | 330k                    | 1%        | 0603          | std                        | std  |
| R4                        | 1   | SMD resistor                         | 240k                    | 1%        | 0603          | std                        | std  |
| L1                        | 1   | Inductor                             | 2.2 $\mu H$             | 30%       | 1210          | Coilcraft                  | LPS3008-222NL                              |
| VIN, VOUT                 | 4   | Connector                            | NA                      | NA        | NA            | Kontek Comatel<br>Cambion  | 3110014000500<br>160-1724-02-05-00         |
| ENABLE                    | 1   | 3 Pin Jumper Header                  | NA                      | NA        | 2.54mm        | TYCO/AMP<br>Molex / Waldom | 5-826629-0<br>90120-0160                   |
| SELECT                    | 1   | 3x2 Pin Jumper Header                | NA                      | NA        | 2.54mm        | TYCO/AMP<br>Molex / Waldom | 4731955180470<br>90131-0140                |
| GND1, GND2                | 2   | Jumper for GND                       | NA                      | NA        | 10.16mm       | Harwin<br>Molex / Waldom   | D3082-01<br>90120-0160                     |
| TPEN, TPLX, TPVIN, TPVOUT | 4   | Test point type 3                    | NA                      | NA        | $\phi 1.60mm$ | Keystone                   | 5010                                       |
| PCB                       | 1   | 50.8mm x 50.8mm x 1.0 mm<br>4 Layers | NA                      | NA        | NA            | Any                        | TLS-P-004-A-1106-BR<br>TLS-P-003-A-0207-BR |

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## NCP1521B – PCB LAYOUT

Board Reference: TLS-P-004-A-1106-BR

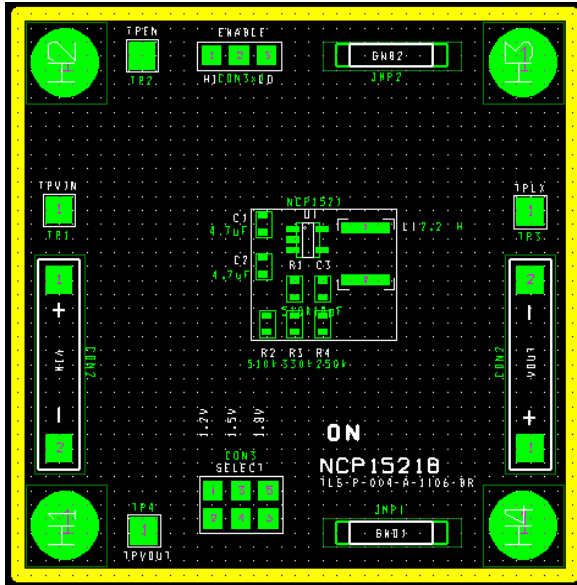


Figure 5. Assembly Layer in TSOP-5

Board Reference: TLS-P-003-A-0207-BR

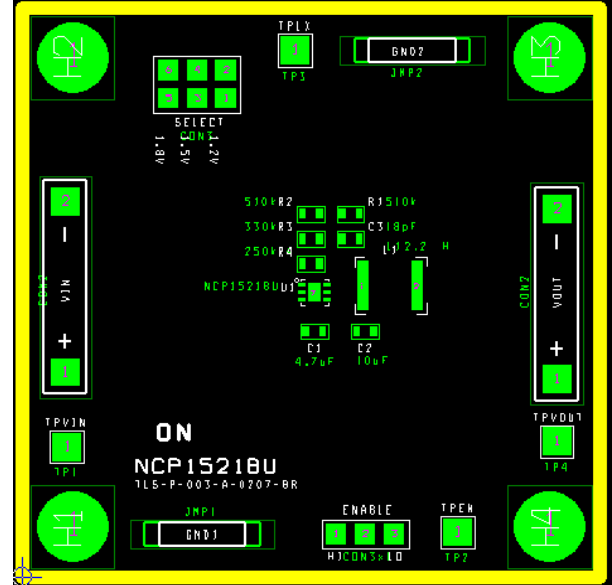


Figure 6. Assembly Layer in μDFN-6

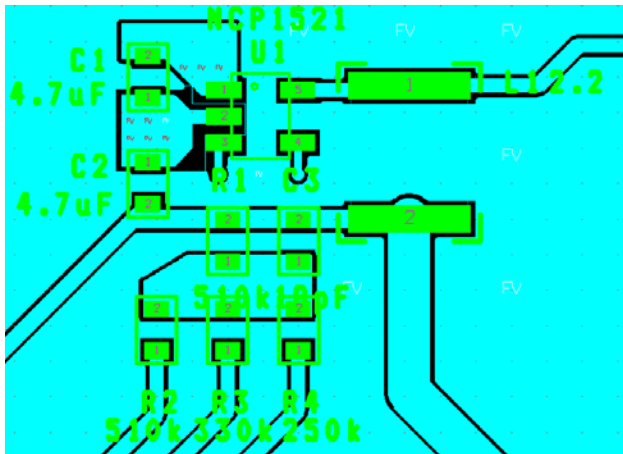


Figure 7. Part Layout in TSOP-5

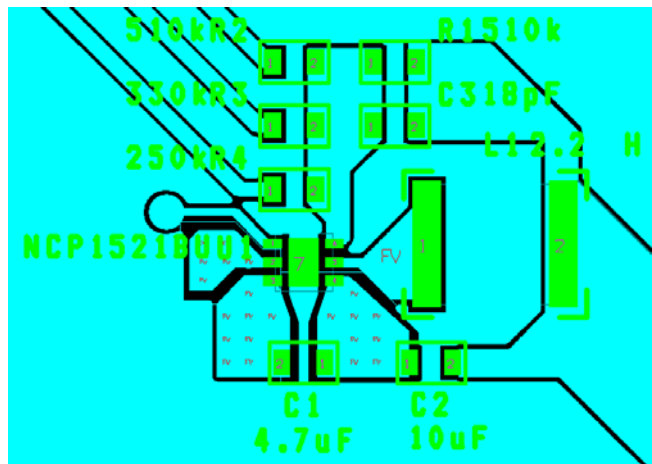


Figure 8. Part Layout in μDFN-6

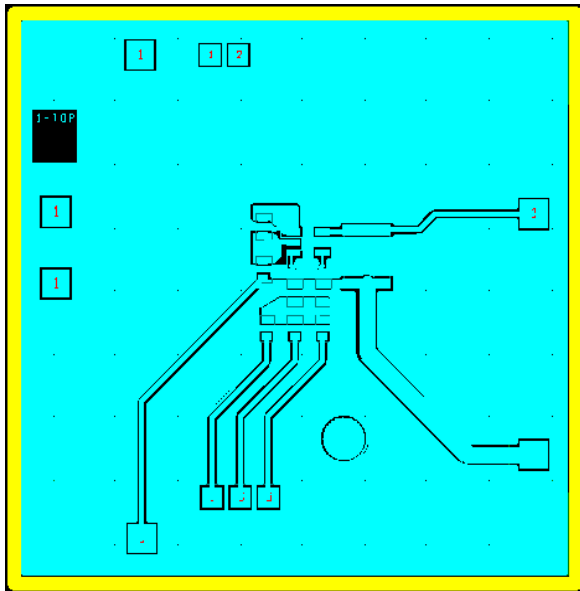


Figure 9. Top Layer Routing in TSOP-5

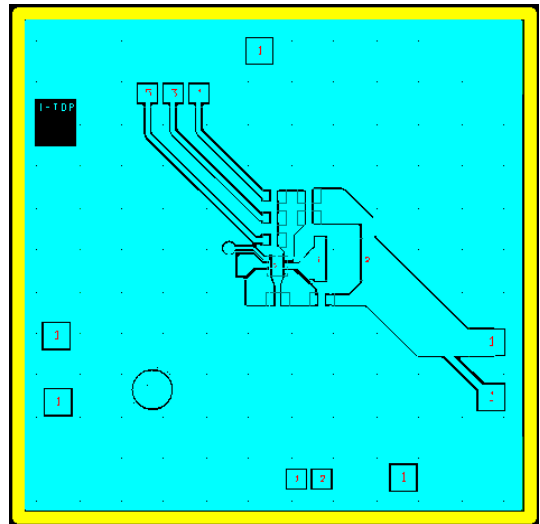


Figure 10. Top Layer Routing in  $\mu$ DFN-6

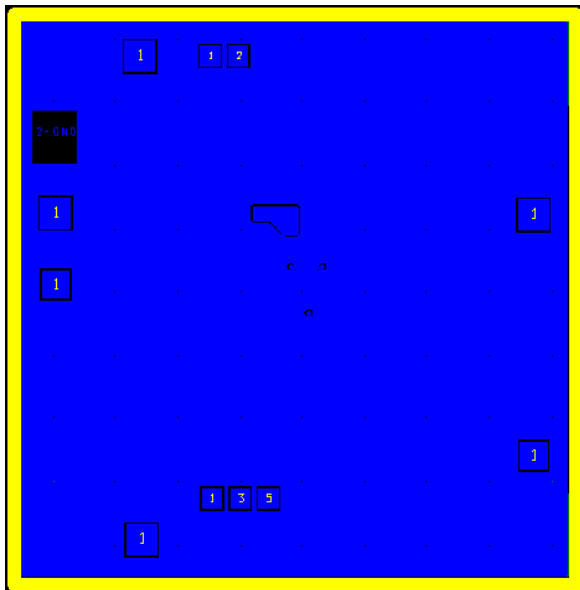


Figure 11. Ground Layer Routing in TSOP-5

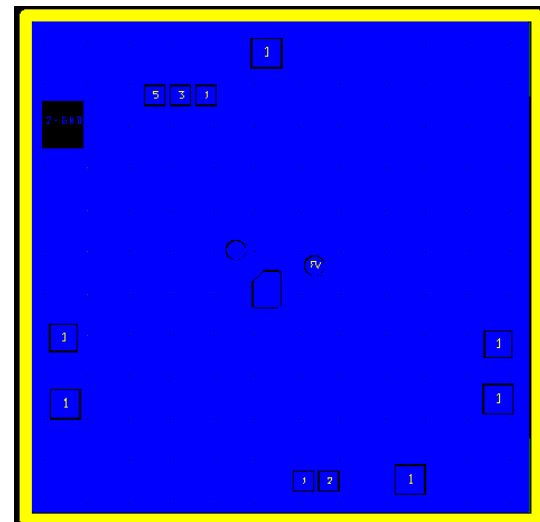


Figure 12. Ground Layer Routing in  $\mu$ DFN-6

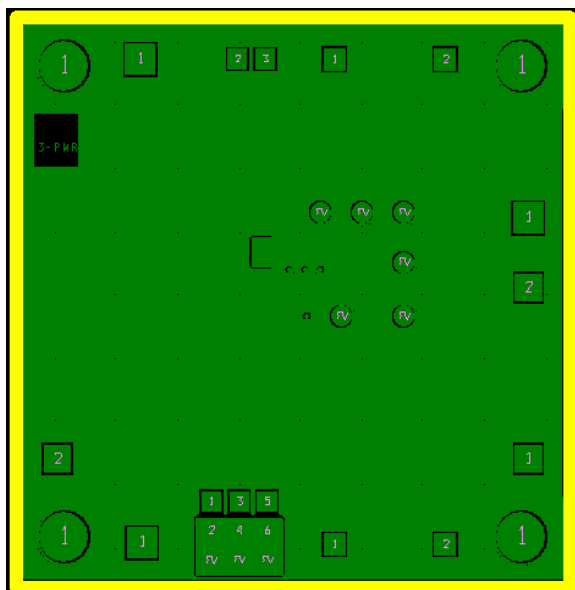


Figure 13. Power Layer Routing in TSOP-5

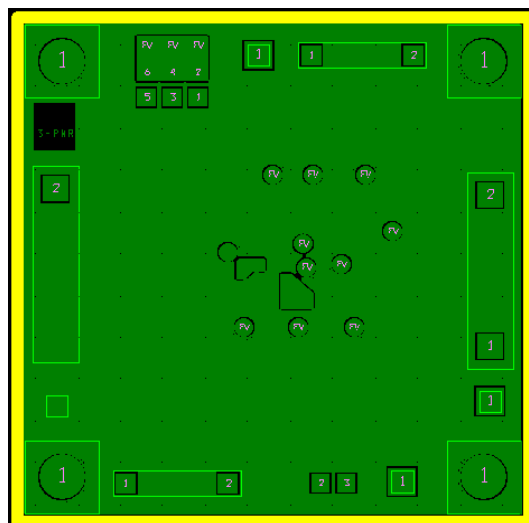


Figure 14. Power Layer Routing in  $\mu$ DFN-6

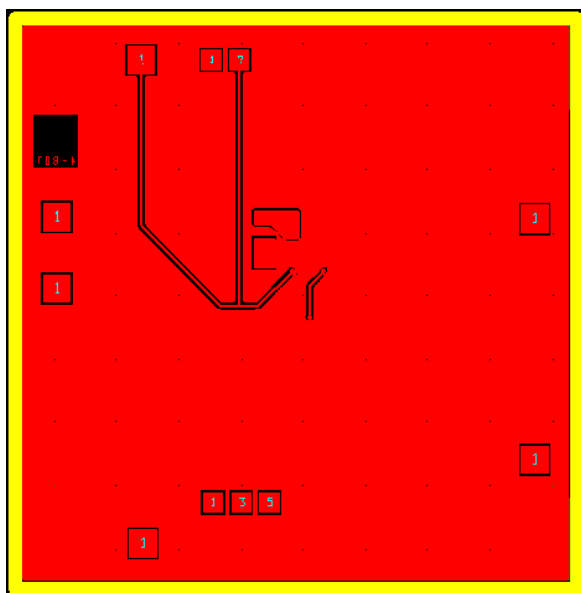


Figure 15. Bottom Layer Routing in TSOP-5

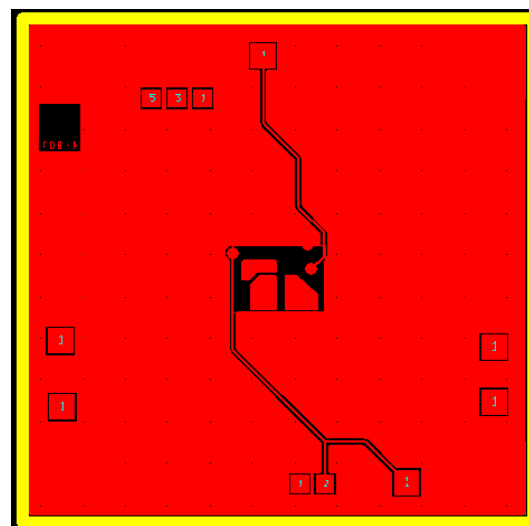



Figure 16. Bottom Layer Routing in  $\mu$ DFN-6

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