



## Si9181DB/Si9182DB

Vishay Siliconix

### Si9181DB/Si9182DB Demonstration Board

#### FEATURES

- 2-V to 6-V Input Voltages Range
- Uses Low-ESR Ceramic Capacitors At The Input and Output
- Fast Load and Line Transient Response
  - On Board Load Transient Response Test Circuit
- 100- $\mu$ Vrms Noise With Noise Bypass Capacitor
  - Probe Clip Provision For Accurate Noise Measurement
- 1- $\mu$ A Maximum Shutdown Current.
- Built In Short Circuit and Thermal Protection
- Out of Regulation Error Flag
- Fixed 1.5-V, 1.8-V, 2.0-V, 2.5-V, 2.8-V, 3.0-V 3.8-V, 5.0-V, Or Adjustable Voltage Versions Available
- Provision To Measure The Ground Current
- Si9181—Low 150-mV Dropout At 350-mA Load
  - 500-mA Peak Current Capability
  - TSSOP-8 Package With 833-mW Power Dissipation
- Si9182—Low 105 mV Dropout At 250-mA Load
  - 500-mA Peak Current Capability
  - Space Saving MSOP-8 Package With 666-mW Power Dissipation

#### DESCRIPTION

The Si9181DQ/Si9182DH are the extremely low drop CMOS linear regulator ICs operating from 2-V to 6-V input. These devices offer ultra-low ground current and low dropout to extend the battery life in portable electronics.

The demo boards are designed to verify different features easily and quickly. The input and output capacitors are selected to meet the specified noise and transient requirement. The device features the use of low ESR, low cost multi-layer ceramic capacitors. The Si9181DB/Si9182DB are provided with a MOSFET switch along with other components to measure the load transient response. The slew-rate of the

switching load can be adjusted easily to simulate the actual load conditions. Provisions are made to measure the ground current and output noise accurately.

The demonstration board uses surface mount and through-hole components and is fully assembled and tested for quick evaluation. The test points are provided for the closed-loop response measurement.

Included in this document are the Bill-Of-Materials, Schematics, PCB Layout of the Demo Boards and actual waveforms/graphs.

*The demonstration board layout is available in Gerber file format. Please contact your Vishay Siliconix sales representative or distributor for a copy.*

#### ORDERING INFORMATION:

|                       |       |                     |
|-----------------------|-------|---------------------|
| Si9181DB-A/Si9182DB-A | ..... | (Adjustable Output) |
| Si9181DB-B/Si9182DB-B | ..... | (2.0- $V_{OUT}$ )   |
| Si9181DB-C/Si9182DB-C | ..... | (2.5- $V_{OUT}$ )   |
| Si9181DB-D/Si9182DB-D | ..... | (3.0- $V_{OUT}$ )   |
| Si9181DB-E/Si9182DB-E | ..... | (3.3- $V_{OUT}$ )   |
| Si9181DB-F/Si9182DB-F | ..... | (5.0- $V_{OUT}$ )   |
| Si9181DB-G/Si9182DB-G | ..... | (1.8- $V_{OUT}$ )   |



## POWER UP CHECK LIST AND OPERATION

Visually inspect the PCB to be sure that all the components are intact and no foreign substance is lying on the board.

- 1 Insert jumper JP2 and remove jumper JP3.
- 2 Insert JP1 to EN position.
- 3 Load the output to the rated load current.
- 4 Increase the input from 0 V slowly, while monitoring the output. Note the regulated output voltage.
- 5 Increase the input to 6 V and check the line regulation. Vary the load from 0 to 350 mA (Si9181DB) and 0 to 250 mA (Si9182DB) and check the load regulation.
- 6 Follow the "Typical Waveforms and Performance" to verify the dropout, transient response ground current and output noise.

## DROPOUT VOLTAGE

The dropout voltage is defined as the input to output voltage differential measured, when the output drops by 100 mV from its normal value. The output voltage is nominal at  $V_{IN}$  equal to  $V_{OUT} + 1$ . The dropout voltage is different at different output. Plots in Figure 1 and Figure 3 show the typical dropouts measured on bench at 25°C ambient temperature.

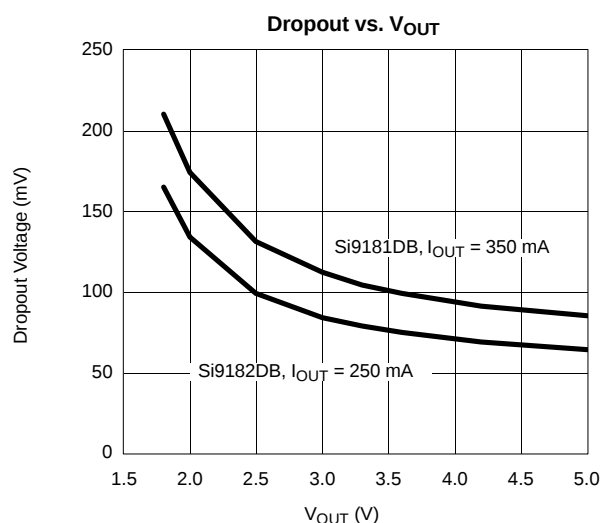


FIGURE 1. Dropout Voltage Si9181DB/Si9182DB

## LOAD TRANSIENT RESPONSE

The Si9181DB and Si9182DB are provided with additional circuit to measure the load step response from 1 to 150 mA with 2- $\mu$ Sec load rise/fall times. The load step and slew-rate can be easily changed by selecting R4, R5, R7 and R8.

Remove the external load from the output, insert the jumper JP3 and apply 5- $V_{pk-pk}$ /5-kHz square wave signal at P5 (TRAN). Remove the oscilloscope probe-cap and insert the probe into the probe-clip. Set the oscilloscope to 10 mV/div and 5- $\mu$ Sec/div. Refer to Figures 3 through 5 for typical load transient waveform.

## GROUND CURRENT

Remove the jumper JP2 and insert micro-ampere meter. Use thick and short wires to connect the meter. Vary the load to measure the ground current at all loads. (See Figure 2.)

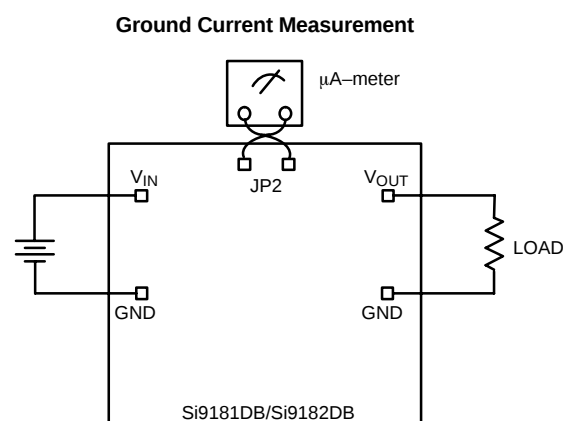


FIGURE 2. Ground Current Measurement



### TYPICAL WAVEFORMS

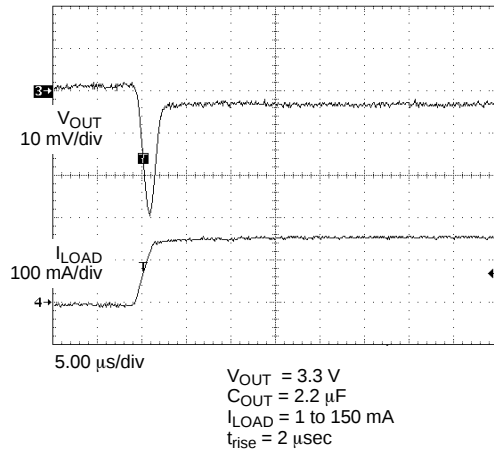


FIGURE 3. Load Transient Response-1 (Si9181DB)

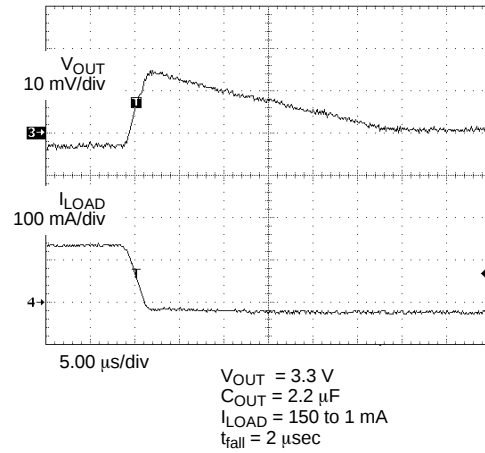


FIGURE 4. Load Transient Response-2 (Si9181DB)

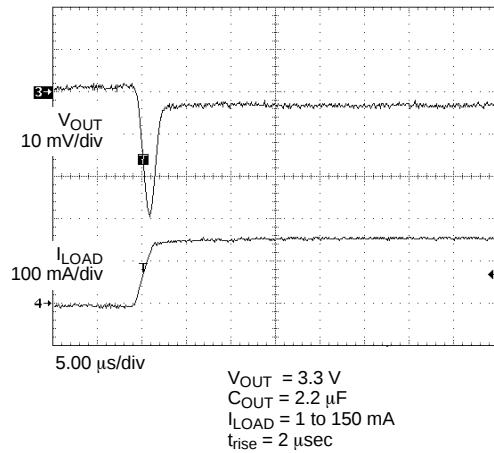


FIGURE 5. Load Transient Response-1 (Si9182DB)

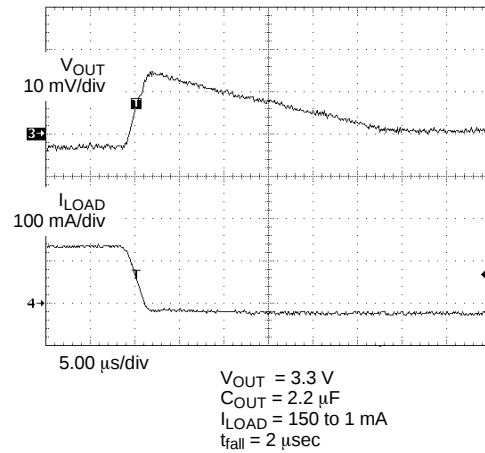


FIGURE 6. Load Transient Response-2 (Si9182DB)

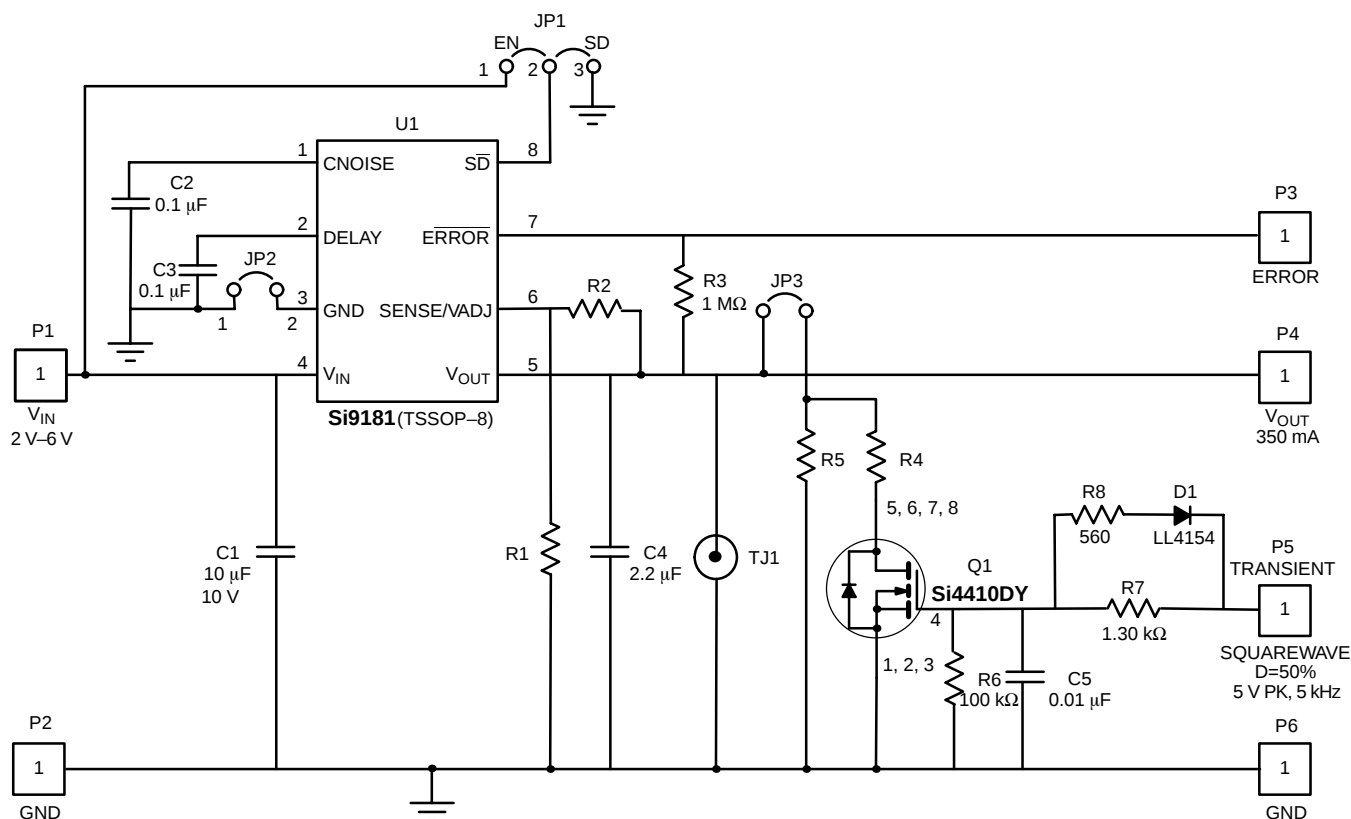
# Si9181DB/Si9182DB

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## SCHEMATIC, PCB LAYOUT AND BILL OF MATERIAL (SI9181)

Si9181 DEMO BOARD



| LDO Version | Output     | R1    | R2  | R4   | R5     |
|-------------|------------|-------|-----|------|--------|
| A           | Adjustable | 124 k | TBD | TBD  | TBD    |
| B           | 2.0 V      | Open  | 0   | 13.5 | 2.0 k  |
| C           | 2.5 V      | Open  | 0   | 16.9 | 2.49 k |
| D           | 3.0 V      | Open  | 0   | 20.0 | 3.01 k |
| E           | 3.3 V      | Open  | 0   | 22.1 | 3.32 k |
| F           | 5.0 V      | Open  | 0   | 33.5 | 4.99 k |
| G           | 1.8 V      | Open  | 0   | 12.1 | 1.82 k |

FIGURE 7. Demo Board—Si9181



# Si9181DB/Si9182DB

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## BILL-OF-MATERIALS—Si9181

| Item | Qty | Designator | Part Type      | Description               | Footprint | Vendor Part #       | Manufacturer     |
|------|-----|------------|----------------|---------------------------|-----------|---------------------|------------------|
| 1    | 1   | R1         | TBD*           | RES, 1%, 1/8 W            | 0805      | TBD                 | Vishay Dale      |
| 2    | 1   | R2         | TBD*           | RES, 1%, 1/8 W            | 0805      | CRCW08051004FRT1    | Vishay Dale      |
| 3    | 1   | R3         | 1 M            | RES, 1%, 1/8 W            | 0805      | TBD                 | Vishay Dale      |
| 4    | 1   | R4         | TBD*           | RES, 1%, 1/4 W            | 1206      | TBD                 | Vishay Dale      |
| 5    | 1   | R5         | TBD*           | RES, 1%, 1/8 W            | 0805      | TBD                 | Vishay Dale      |
| 6    | 1   | R6         | 100 k          | RES, 1%, 1/8 W            | 0805      | CRCW08051003FRT1    | Vishay Dale      |
| 7    | 1   | R7         | 1.30 k         | RES, 1%, 1/8 W            | 0805      | CRCW08051301FRT1    | Vishay Dale      |
| 8    | 1   | R8         | 560            | RES, 1%, 1/8 W            | 0805      | CRCW08055600FRT1    | Vishay Dale      |
| 9    | 1   | C1         | 10 $\mu$ F     | CAP, CER, X5R, 10 V, 10%  | 1210      | GRM42-2 X5R 106K 10 | Murata           |
| 10   | 2   | C2, C3     | 0.1 $\mu$ F    | CAP, CER, X7R, 50 V, 10%  | 0805      | VJ0805Y104KXAAT     | Vishay Vitramon  |
| 11   | 1   | C4         | 2.2 $\mu$ F    | CAP, CER, X5R, 6.3 V, 10% | 0805      | GRM40X5R225K6.3     | Murata           |
| 12   | 1   | C5         | 0.01 $\mu$ F   | CAP, CER, X7R, 50 V, 10%  | 0805      | VJ0805Y102KXAAT     | Vishay Vitramon  |
| 13   | 1   | Q1         | Si4410DY       | n-MOSFET, 30 V            | SO-8      | Si4410DY            | Vishay Siliconix |
| 14   | 1   | U1         | Si9181         | Power IC                  | TSSOP-8   | Si9181              | Vishay Siliconix |
| 15   | 1   | D1         | LL4154         | Diode, 35 V, 150 mA       | MINIMELF  | LL4154              | VISHAY LITEON    |
| 16   | 1   | TJ1        | Test Jack      | For 0.135" Dia Probe      | TJ        | 131-4244-00         | Jensen           |
| 17   | 1   | JP1        | Jumper         | 3-Pin Header              | SIP3      |                     | Multi-Source     |
| 18   | 2   | JP2, JP3   | Jumper         | 2-Pin Header              | SIP2      |                     | Multi-Source     |
| 19   | 6   | P1 TO P6   | Power, GND, TP | 1-Pin Header              | TP1       |                     | Multi-Source     |

\*Refer to Si9181 Schematic, Figure 7.

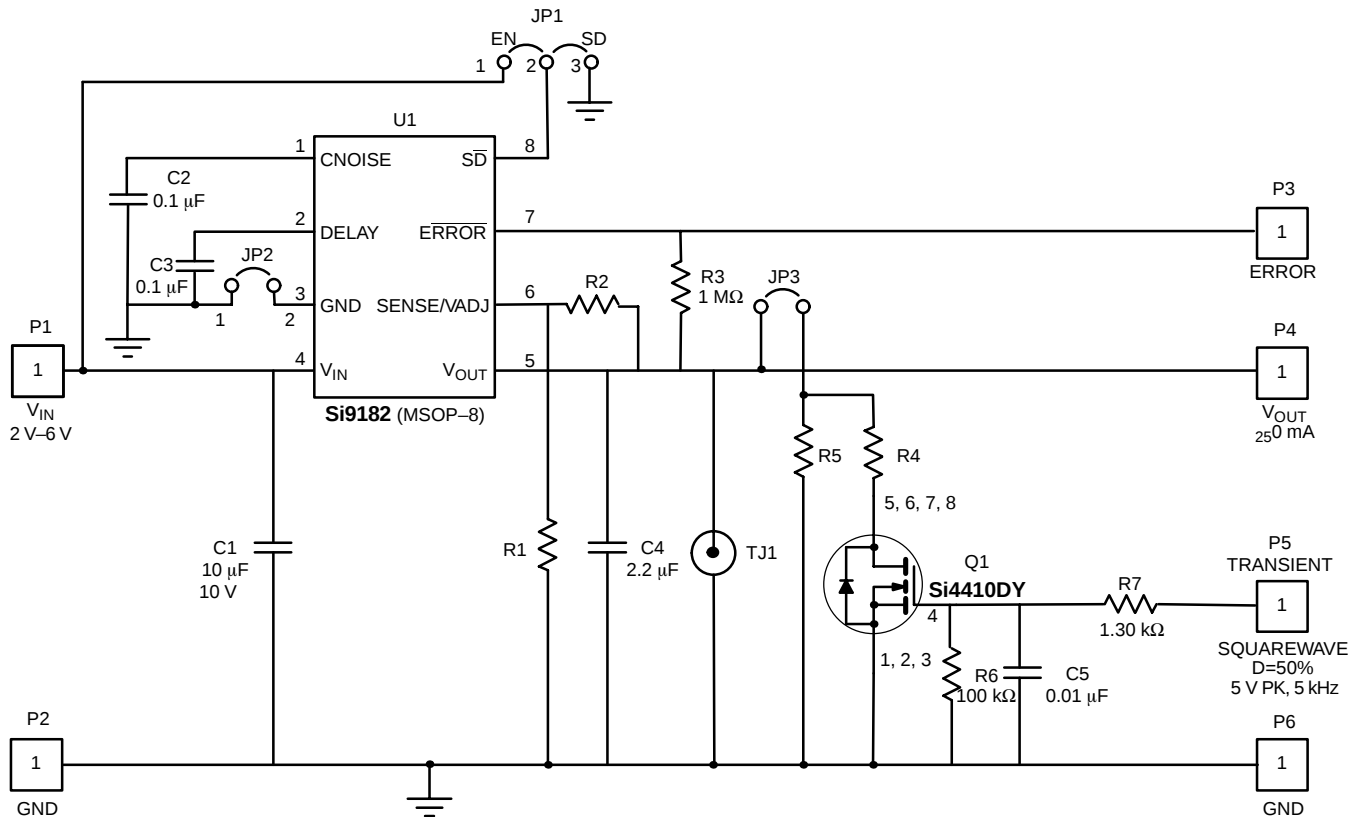


# Si9181DB/Si9182DB

## Vishay Siliconix

### SCHEMATIC, PCB LAYOUT AND BILL OF MATERIAL (Si9182)

Si9182 DEMO BOARD



| LDO Version | Output     | R1    | R2  | R4   | R5     |
|-------------|------------|-------|-----|------|--------|
| A           | Adjustable | 124 k | TBD | TBD  | TBD    |
| B           | 2.0 V      | Open  | 0   | 13.5 | 2.0 k  |
| C           | 2.5 V      | Open  | 0   | 16.9 | 2.49 k |
| D           | 3.0 V      | Open  | 0   | 20.0 | 3.01 k |
| E           | 3.3 V      | Open  | 0   | 22.1 | 3.32 k |
| F           | 5.0 V      | Open  | 0   | 33.5 | 4.99 k |
| G           | 1.8 V      | Open  | 0   | 12.1 | 1.82 k |

FIGURE 11. Demo Board—Si9182

# Si9181DB/Si9182DB

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## BILL-OF-MATERIALS—Si9182

| Item | Qty | Designator | Part Type      | Description               | Footprint | Vendor Part #    | Manufacturer     |
|------|-----|------------|----------------|---------------------------|-----------|------------------|------------------|
| 1    | 1   | R1         | TBD*           | RES, 1%, 1/8 W            | 0805      | TBD              | Vishay Dale      |
| 2    | 1   | R2         | TBD*           | RES, 1%, 1/8 W            | 0805      | TBD              | Vishay Dale      |
| 3    | 1   | R3         | 1 M            | RES, 1%, 1/8 W            | 0805      | CRCW08051005FRT1 | Vishay Dale      |
| 4    | 1   | R4         | TBD*           | RES, 1%, 1/4 W            | 1206      | TBD              | Vishay Dale      |
| 5    | 1   | R5         | TBD*           | RES, 1%, 1/8 W            | 0805      | TBD              | Vishay Dale      |
| 6    | 1   | R6         | 100 k          | RES, 1%, 1/8 W            | 0805      | CRCW08051003FRT1 | Vishay Dale      |
| 7    | 1   | R7         | 1.30 k         | RES, 1%, 1/8 W            | 0805      | CRCW08051301FRT1 | Vishay Dale      |
| 8    | 1   | C1         | 10 $\mu$ F     | CAP, CER, X5R, 10 V, 10%  | 1210      | GRM42-2X5R106K10 | Murata           |
| 9    | 2   | C2, C3     | 0.1 $\mu$ F    | CAP, CER, X7R, 50 V, 10%  | 0805      | VJ0805Y104KXAAT  | Vishay Vitramon  |
| 10   | 1   | C4         | 2.2 $\mu$ F    | CAP, CER, X5R, 6.3 V, 10% | 0805      | GRM40X5R225K6.3  | Murata           |
| 11   | 1   | C5         | 0.01 $\mu$ F   | CAP, CER, X7R, 50 V, 10%  | 0805      | VJ0805Y102KXAAT  | Vishay Vitramon  |
| 12   | 1   | Q1         | Si4410DY       | n-MOSFET, 30 V            | SO-8      | Si4410DY         | Vishay Siliconix |
| 13   | 1   | U1         | Si9182         | 300 mA LDO                | MSOP-8    | Si9182           | Vishay Siliconix |
| 14   | 1   | TJ1        | Test Jack      | For 0.135" Dia Probe      | TJ        | 131-4244-00      | Jensen           |
| 15   | 1   | JP1        | Jumper         | 3-Pin Header              | SIP3      |                  | Multi-Source     |
| 16   | 2   | JP2, JP3   | Jumper         | 2-Pin Header              | SIP2      |                  | Multi-Source     |
| 17   | 6   | P1 to P6   | Power, GND, TP | 1-Pin Header              | TP1       |                  | Multi-Source     |

\*Refer to Si9182 Schematic, Figure 11.

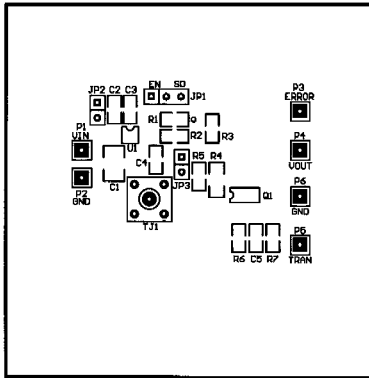


FIGURE 12. Silk Screen—Si9182

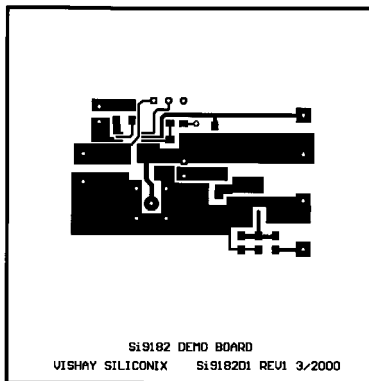


FIGURE 13. Top Layer—Si9182

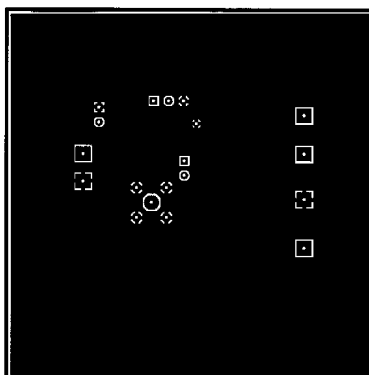


FIGURE 14. Bottom Layer—Si9182