

# DSP1S Series

## Single Output DC-DC Converters

The DSP1 Series is specifically designed to convert a nominal 5 Volt input into an isolated output voltage.

The semi-regulated output voltages were designed to allow analog circuits and three terminal regulators to operate within their most efficient input voltage range.

This series achieves high power densities through the use of 350 kHz fixed-frequency switching converters.

### Key Features & Benefits

- RoHS lead solder exemption compliant
- Up to 1 Watt unregulated output power
- Single-In-Line package
- Four-terminal operation
- Efficiencies to 75%
- Output Voltages: 5V, 7V, 12V, 14V, 15V, 17V
- 700 V isolation
- -40 °C to +85 °C operation



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## 1. MODEL SELECTION

| MODEL     | INPUT RANGE [VDC] |     |       | OUTPUT |           |
|-----------|-------------------|-----|-------|--------|-----------|
|           | MIN               | MAX | [VDC] | [mA]   | POWER [W] |
| DSP1N5S5  | 4.5               | 5.5 | 5     | 150    | 0.75      |
| DSP1N5S7  | 4.5               | 5.5 | 7     | 140    | 1         |
| DSP1N5S12 | 4.5               | 5.5 | 12    | 80     | 1         |
| DSP1N5S14 | 4.5               | 5.5 | 14    | 70     | 1         |
| DSP1N5S15 | 4.5               | 5.5 | 15    | 65     | 1         |
| DSP1N5S17 | 4.5               | 5.5 | 17    | 60     | 1         |

## 2. GENERAL SPECIFICATIONS<sup>1</sup>

| PARAMETER   | CONDITIONS / DESCRIPTION   | MIN | TYP                    | MAX | UNITS     |
|---|----------------------------|-----|------------------------|-----|-----------|
| <b>Isolation</b>                                    |                            |     |                        |     |           |
| Isolation Voltage                                   | Input to Output 10 $\mu$ A | 700 |                        |     | VDC       |
| Capacitance   | Input to Output            |     | 25                     |     | pF        |
| <b>Environmental</b>                                |                            |     |                        |     |           |
| Case Operating Range (T <sub>c</sub> ) <sup>2</sup> |                            | -40 |                        | 85  | °C        |
| Storage Range                                       |                            | -55 |                        | 105 | °C        |
| Thermal Impedance <sup>3</sup>                      |                            |     | 58                     |     | °C / Watt |
| <b>General</b>                                      |                            |     |                        |     |           |
| MTBF  | Calculated                 |     | 700,000                |     | hrs       |
| Weight  |                            |     | 0.1/28                 |     | oz/g      |
| Case Material                                       |                            |     | Non Conductive Plastic |     |           |

### NOTES

- <sup>1</sup> All parameters measured at T<sub>c</sub> = 25 °C, nominal input voltage and full rated load unless otherwise noted.
- <sup>2</sup> Derate output power linearly to 0.6 watts from 70 °C to 85 °C.
- <sup>3</sup> The case Thermal Impedance is specified as the case temperature rise over ambient per package dissipated.

## 3. INPUT SPECIFICATIONS<sup>1</sup>

| PARAMETER                     | CONDITIONS / DESCRIPTION  | MIN | TYP   | MAX        | UNITS |
|-------------------------------|---|-----|---|------------|-------|
| Voltage Range                 |   | 4.5 |   | 5.5        | VDC   |
| Reflected Ripple <sup>2</sup> | DSP1N5S5 / DSP1N5S7 / DSP1N5S12 / DSP1N5S14 / DSP1N5S15 / DSP1N5S17 |     | 50<br>65                                      |            | mApp  |
| Input Current                 | Full Load   |     | DSP1N5S5<br>DSP1N5S7                          | 221<br>280 | mA    |
|                               |   |     | DSP1N5S12<br>DSP1N5S14                        | 263<br>268 |       |
|                               |   |     | DSP1N5S15<br>DSP1N5S17                        | 267<br>279 |       |
|                               |   |     |   | 20         |       |
|                               |   |     | No Load (all models)                          |            |       |
| Efficiency                    |   |     | DSP1N5S5<br>DSP1N5S7                          | 68<br>70   | %     |
|                               |   |     | DSP1N5S12 / DSP1N5S14 / DSP1N5S15 / DSP1N5S17 | 73         |       |
|                               |   |     |   | 350        |       |

## 4. OUTPUT SPECIFICATIONS<sup>1</sup>

| PARAMETER                                       | CONDITIONS / DESCRIPTION | MIN   | TYP       | MAX   | UNITS  |
|---|--------------------------|-------|-----------|-------|--------|
| Output Voltage                                  | DSP1N5S5                 |       | 5         |       | VDC    |
|   | DSP1N5S7                 |       | 7         |       |        |
|   | DSP1N5S12                |       | 12        |       |        |
|   | DSP1N5S14                |       | 14        |       |        |
|   | DSP1N5S15                |       | 15        |       |        |
|   | DSP1N5S17                |       | 17        |       |        |
| Output Voltage Accuracy <sup>3</sup>            | DSP1N5S5                 | 4.75  | 5.00      | 5.25  | VDC    |
|   | DSP1N5S7                 | 6.65  | 7.00      | 7.35  |        |
|   | DSP1N5S12                | 11.40 | 12.00     | 12.60 |        |
|   | DSP1N5S14                | 13.30 | 14.00     | 14.70 |        |
|   | DSP1N5S15                | 14.25 | 15.00     | 15.75 |        |
|   | DSP1N5S17                | 16.15 | 17.00     | 17.85 |        |
| Output Voltage, No Load                         | DSP1N5S5                 |       | 7         |       | VDC    |
|   | DSP1N5S7                 |       | 10        |       |        |
|   | DSP1N5S12                |       | 16        |       |        |
|   | DSP1N5S14                |       | 19        |       |        |
|   | DSP1N5S15                |       | 21        |       |        |
|   | DSP1N5S17                |       | 24        |       |        |
| Rated Load Range                                | DSP1N5S5                 |       |           | 150   | mA     |
|   | DSP1N5S7                 |       |           | 140   |        |
|   | DSP1N5S12                | 0     |           | 80    |        |
|   | DSP1N5S14                |       |           | 70    |        |
|   | DSP1N5S15                |       |           | 65    |        |
|   | DSP1N5S17                |       |           | 60    |        |
| Load Regulation <sup>4</sup>                    | 75% - 20% Load           |       | +8        |       | %      |
|   | 75% - 100% Load          |       | -5        |       |        |
| Line Regulation <sup>5</sup>                    |                          |       | 1.6       |       | %      |
| Noise, Peak – Peak <sup>2</sup>                 |                          |       | 70        |       | mVpp   |
| Temperature Coefficient                         |                          |       | 400       |       | ppm/°C |
| Short Circuit Protection to Common <sup>6</sup> |                          |       | Momentary |       |        |

### NOTES

- All parameters measured at Tc= 25 °C, nominal input voltage and full rated load unless otherwise noted.
- Noise measurement bandwidth is 20 MHz. Input Reflected Ripple and output noise are measured with an external 10µF/25V tantalum capacitor connected across the input and output pins.
- Output Voltage Accuracy measured at 75% of maximum Rated Load.
- Load Regulations measured relative to 75% of maximum Rated Load Current.
- Line Regulation is for a 1.0% change in input Voltage.
- Use input fuse for protection. See Applying the input.

## 5. DSP1 SERIES APPLICATION NOTES

### EXTERNAL CAPACITANCE REQUIREMENTS

Output filtering is required for operation. A minimum of 10 F is specified for optimal performance. Output capacitance may be increased for additional filtering, not to exceed 400 F. To meet the reflected ripple requirements of the converter, an input impedance of less than 0.5 Ohms from DC to 350 kHz is required. If a capacitive input source is farther than 2" from the converter, it is recommended to use a 10 F, 25 V solid tantalum capacitor.

### REGULATION

This converter uses a semi-regulated design. The output will vary as the load is changed, with output decreasing with increasing load. See Output Voltage vs. Output Load curves. Additionally, output voltage will change in proportion to a change in input voltage. The typical output voltage will change 1.2% for each 1% change in input voltage.

### NEGATIVE OUTPUTS

A negative output voltage may be obtained by connecting the +OUT to circuit ground and connecting -OUT as the negative output.



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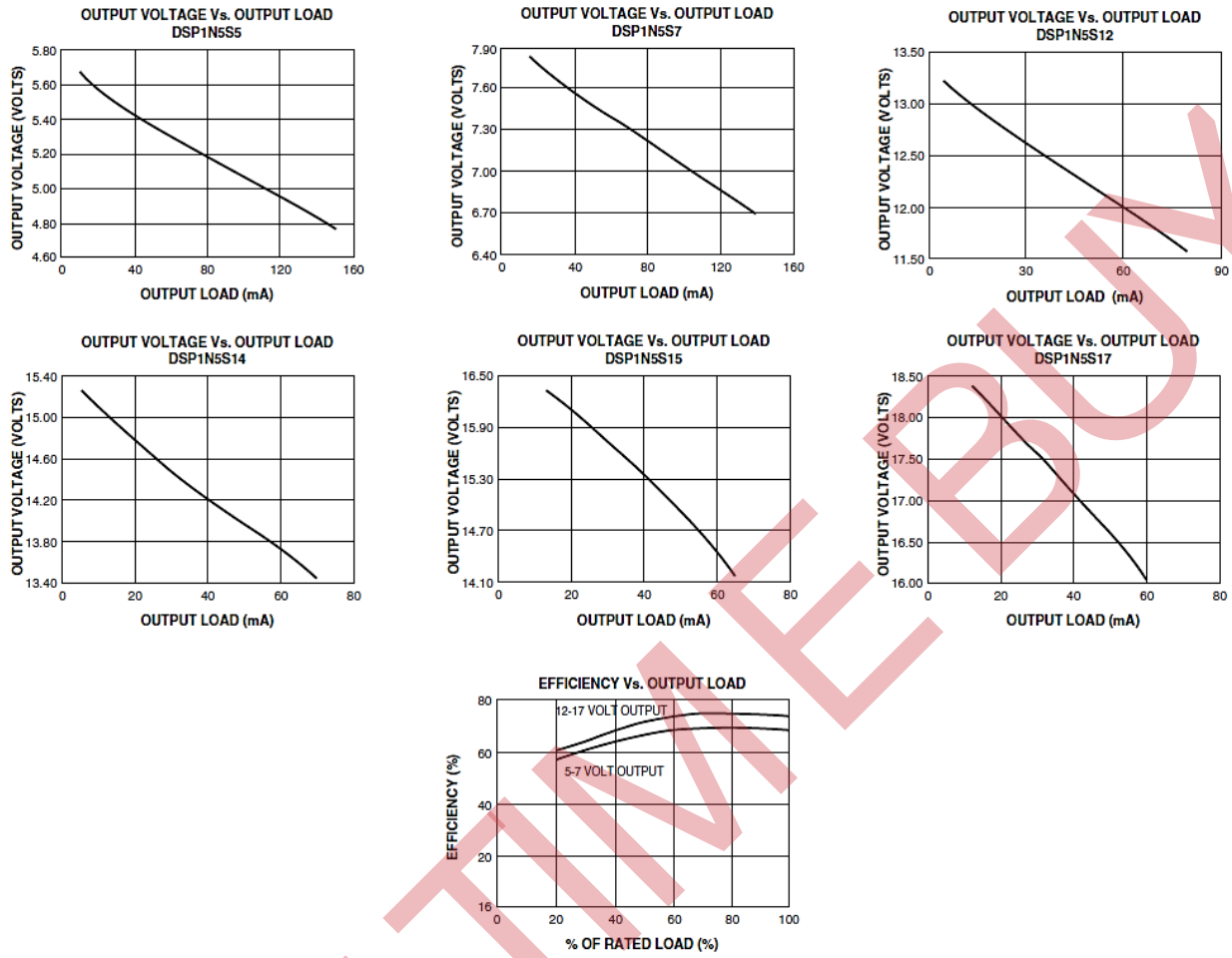


Figure 1. Typical Performance ( $T_c = 25^\circ\text{C}$ )

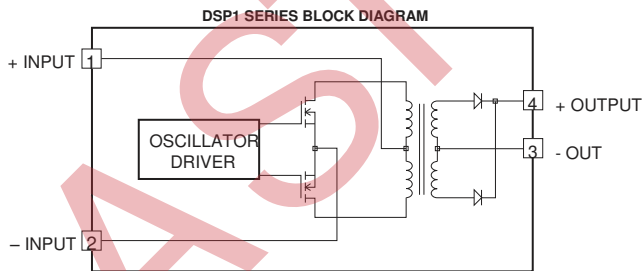
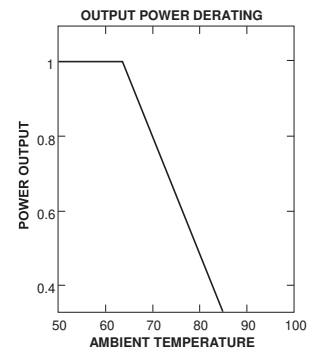


Figure 2. Block Diagram



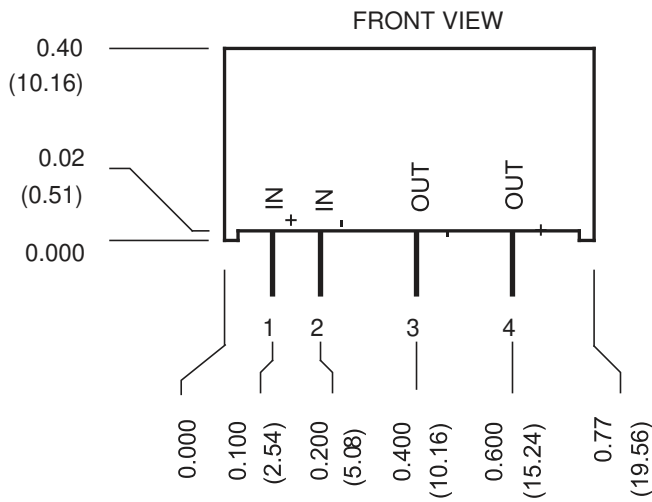


Figure 3. Mechanical Dimensions

| PIN | FUNCTION |
|-----|----------|
| 1   | +INPUT   |
| 2   | -INPUT   |
| 3   | - OUT    |
| 4   | +OUT     |

Mechanical tolerances unless otherwise noted:

X.XX dimensions:  $\pm 0.020$  inches  
 X.XXX dimensions:  $\pm 0.010$  inches

\* This dimension to decrease to  $0.24 \pm 0.01$ " ( $6.09 \pm 0.25$ ) in 1998

\*\* This dimension to decrease to  $0.035 \pm 0.015$ " ( $0.89 \pm 0.38$ ) in 1998

For more information on these products consult: [tech.support@psbel.com](mailto:tech.support@psbel.com)

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