

### FEATURES

- Efficiency up to 80%
- SMD Package with Industry Standard Pinout
- Operating Temperature Range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Moisture sensitivity level (MSL) 2
- Isolation Voltage 1500 VDC
- High Accuracy of Pin Planarity
- Lead free, RoHS Compliant
- 3 Years Product Warranty



The SH01S/D series is miniature, SMD Package, isolated 1W DC/DC converters with 1,500VDC isolation. It allows a wide operating temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . These isolated DC/DC converters are the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc

### Model List

| Model Number | Input Voltage (Range)<br>VDC | Output Voltage<br>VDC | Output Current |            | Input Current          |                      | Load Regulation<br>% (max.) | Max. capacitive Load<br>uF | Efficiency (typ.) |    |    |
|--------------|------------------------------|-----------------------|----------------|------------|------------------------|----------------------|-----------------------------|----------------------------|-------------------|----|----|
|              |                              |                       | Max.<br>mA     | Min.<br>mA | @Max. Load<br>mA(typ.) | @No Load<br>mA(typ.) |                             |                            | @Max. Load<br>%   |    |    |
| SH01S0503A   | 5<br>(4.5 ~ 5.5)             | 3.3                   | 300            | 6          | 271                    | 30                   | 10                          | 33                         | 73                |    |    |
| SH01S0505A   |                              | 5                     | 200            | 4          | 256                    |                      | 10                          |                            | 78                |    |    |
| SH01S0509A   |                              | 9                     | 110            | 2          | 254                    |                      | 10                          |                            | 78                |    |    |
| SH01S0512A   |                              | 12                    | 84             | 1.5        | 259                    |                      | 8                           | 78                         |                   |    |    |
| SH01S0515A   |                              | 15                    | 67             | 1          | 254                    |                      | 7                           | 79                         |                   |    |    |
| SH01D0505A   |                              | $\pm 5$               | $\pm 100$      | $\pm 2$    | 270                    |                      | 10                          | 74                         |                   |    |    |
| SH01D0512A   |                              | $\pm 12$              | $\pm 42$       | $\pm 0.8$  | 259                    |                      | 8                           | 33*                        | 78                |    |    |
| SH01D0515A   |                              | $\pm 15$              | $\pm 33$       | $\pm 0.7$  | 254                    |                      | 7                           | 78                         |                   |    |    |
| SH01S1203A   |                              | 12<br>(10.8 ~ 13.2)   | 3.3            | 300        | 6                      |                      | 112                         | 15                         | 8                 | 33 | 74 |
| SH01S1205A   |                              |                       | 5              | 200        | 4                      |                      | 109                         |                            | 8                 |    | 76 |
| SH01S1209A   | 9                            |                       | 110            | 2          | 106                    | 8                    | 78                          |                            |                   |    |    |
| SH01S1212A   | 12                           |                       | 84             | 1.5        | 106                    | 5                    | 79                          |                            |                   |    |    |
| SH01S1215A   | 15                           |                       | 67             | 1          | 105                    | 5                    | 80                          |                            |                   |    |    |
| SH01D1205A   | $\pm 5$                      |                       | $\pm 100$      | $\pm 2$    | 113                    | 8                    | 74                          |                            |                   |    |    |
| SH01D1212A   | $\pm 12$                     |                       | $\pm 42$       | $\pm 0.8$  | 108                    | 5                    | 33*                         |                            | 78                |    |    |
| SH01D1215A   | $\pm 15$                     |                       | $\pm 33$       | $\pm 0.7$  | 104                    | 5                    | 79                          |                            |                   |    |    |
| SH01S1512A   | 15<br>(13.5 ~ 16.5)          |                       | 12             | 84         | 1.5                    | 86                   | 14                          |                            | 5                 | 33 | 78 |
| SH01S1515A   |                              |                       | 15             | 67         | 1                      | 86                   |                             |                            | 5                 |    | 78 |
| SH01S2403A   |                              | 3.3                   | 300            | 6          | 58                     | 8                    |                             | 72                         |                   |    |    |
| SH01S2405A   |                              | 5                     | 200            | 4          | 54                     | 8                    |                             | 78                         |                   |    |    |
| SH01S2409A   |                              | 9                     | 110            | 2          | 54                     | 8                    |                             | 33                         | 77                |    |    |
| SH01S2412A   |                              | 12                    | 84             | 1.5        | 55                     | 5                    |                             | 77                         |                   |    |    |
| SH01S2415A   |                              | 15                    | 67             | 1          | 53                     | 5                    |                             | 79                         |                   |    |    |
| SH01D2405A   |                              | $\pm 5$               | $\pm 100$      | $\pm 2$    | 57                     | 8                    |                             | 73                         |                   |    |    |
| SH01D2412A   |                              | $\pm 12$              | $\pm 42$       | $\pm 0.8$  | 54                     | 5                    |                             | 33*                        | 78                |    |    |
| SH01D2415A   |                              | $\pm 15$              | $\pm 33$       | $\pm 0.7$  | 53                     | 5                    |                             | 78                         |                   |    |    |

\* For each output



## Input Characteristics

| Parameter                         | Model            | Min.               | Typ. | Max. | Unit |
|-----------------------------------|------------------|--------------------|------|------|------|
| Input Voltage Range               | 5V Input Models  | 4.5                | 5    | 5.5  | VDC  |
|                                   | 12V Input Models | 10.8               | 12   | 13.2 |      |
|                                   | 15V Input Models | 13.5               | 15   | 16.5 |      |
|                                   | 24V Input Models | 21.6               | 24   | 26.4 |      |
| Input Surge Voltage (1 sec. max.) | 5V Input Models  | -0.7               | ---  | 9    |      |
|                                   | 12V Input Models | -0.7               | ---  | 18   |      |
|                                   | 15V Input Models | -0.7               | ---  | 20   |      |
|                                   | 24V Input Models | -0.7               | ---  | 30   |      |
| Reverse Polarity Input Current    | All Models       | ---                | ---  | 0.3  | A    |
| Input Filter                      |                  | Internal Capacitor |      |      |      |
| Internal Power Dissipation        |                  | ---                | ---  | 450  | mW   |

## Output Characteristics

| Parameter                | Conditions                  | Min.                      | Typ.  | Max.  | Unit              |
|--------------------------|-----------------------------|---------------------------|-------|-------|-------------------|
| Output Voltage Balance   | Dual Output, Balanced Loads | ---                       | ±0.1  | ±1.0  | %                 |
| Line Regulation          | For Vin Change of 1%        | ---                       | ±1.2  | ±1.5  | %                 |
| Load Regulation          | Io=20% to 100%              | See Model Selection Guide |       |       |                   |
| Ripple & Noise (20MHz)   |                             | ---                       | 60    | 120   | mV <sub>P-P</sub> |
| Ripple & Noise (20MHz)   | Over Line, Load & Temp.     | ---                       | ---   | 150   | mV <sub>P-P</sub> |
| Ripple & Noise (20MHz)   |                             | ---                       | ---   | 15    | mV rms            |
| Temperature Coefficient  |                             | ---                       | ±0.01 | ±0.02 | %/°C              |
| Short Circuit Protection |                             | 0.5 Second Max.           |       |       |                   |

## General Characteristics

| Parameter                        | Conditions                        | Min.      | Typ. | Max. | Unit  |
|----------------------------------|-----------------------------------|-----------|------|------|-------|
| I/O Isolation Voltage (rated)    | 60 Seconds                        | 1500      | ---  | ---  | VDC   |
| I/O Isolation Resistance         | 500 VDC                           | 1000      | ---  | ---  | MΩ    |
| I/O Isolation Capacitance        | 100KHz, 1V                        | ---       | 40   | 100  | pF    |
| Switching Frequency              |                                   | 50        | 100  | 140  | KHz   |
| MTBF (calculated)                | MIL-HDBK-217F@25°C, Ground Benign | 2,000,000 | ---  | ---  | Hours |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D              | Level 2   |      |      |       |

## Recommended Input Fuse

| 5V Input Models      | 12V Input Models     | 15V Input Models     | 24V Input Models     |
|----------------------|----------------------|----------------------|----------------------|
| 500mA Slow-Blow Type | 200mA Slow-Blow Type | 150mA Slow-Blow Type | 100mA Slow-Blow Type |

## Environmental Specifications

| Parameter                                     | Conditions          | Min. | Max. | Unit     |
|---|---------------------|------|------|----------|
| Operating Temperature Range (with Derating)   | Ambient             | -40  | +85  | °C       |
| Case Temperature                              |                     | ---  | +90  | °C       |
| Storage Temperature Range                     |                     | -50  | +125 | °C       |
| Humidity (non condensing)                     |                     | ---  | 95   | % rel. H |
| Cooling                                       | Free-Air convection |      |      |          |
| Lead Temperature (1.5mm from case for 10Sec.) |                     | ---  | 260  | °C       |

## Output Voltage Tolerance



(3.3V & 5V Output)



(All other Output)

## Power Derating Curve

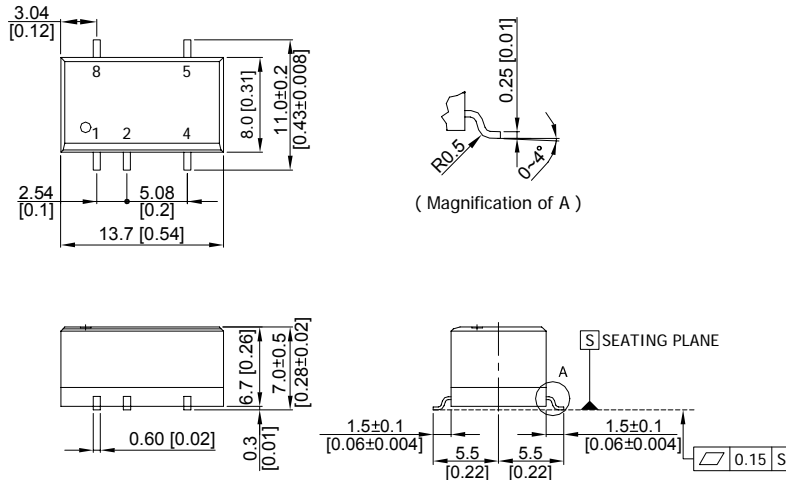


## Notes

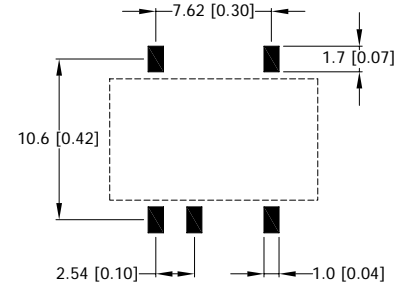
- 1 Specifications typical at  $T_a=+25^{\circ}\text{C}$ , resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 Ripple & Noise measurement bandwidth is 0-20MHz.
- 3 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.
- 4 All DC/DC converters should be externally fused at the front end for protection.
- 5 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 6 Specifications subject to change without notice.
- 7 It is not recommended to use water-washing process on SMT units.

## Mechanical Drawing

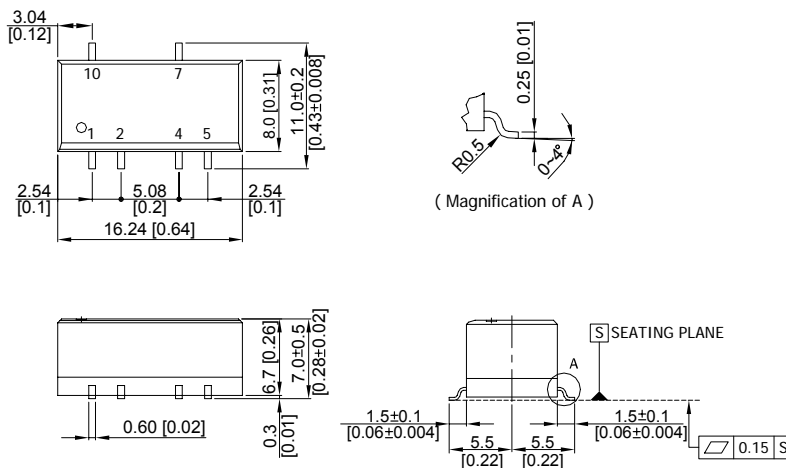
### Mechanical Dimensions (Single Output)



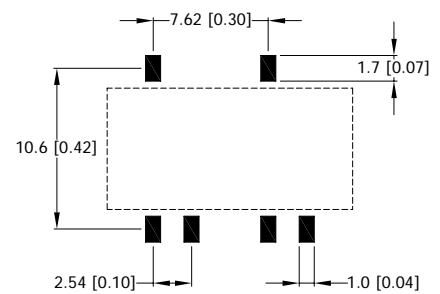
### Connecting Pin Patterns



### Mechanical Dimensions (Dual Output)



### Connecting Pin Patterns



- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.25 (X.XX±0.01)  
X.XX±0.13 (X.XXX±0.005)
- ▶ Pins ±0.05 (±0.002)

### Pin Connections

| Pin | Single Output | Dual Output |
|-----|---------------|-------------|
| 1   | -Vin          | -Vin        |
| 2   | +Vin          | +Vin        |
| 3   | No Pin        | No Pin      |
| 4   | -Vout         | Common      |
| 5   | +Vout         | -Vout       |
| 6   | No Pin        | No Pin      |
| 7   | No Pin        | +Vout       |
| 8   | NA            | No Pin      |
| 9   | ---           | No Pin      |
| 10  | ---           | NA          |

NA : Not Available for Electrical Connection

### Physical Outline

Case Size (Single Output) : 13.7x8.0x6.7mm (0.54x0.31x0.26 Inches)  
Output)

Case Size (Dual Output) : 16.24x8.0x6.7mm (0.64x0.31x0.26 Inches)

Case Material : Non-Conductive Black Plastic (flammability to UL 94V-0 rated)

Weight (Single Output) : 1.7g

Weight (Dual Output) : 2.0g



## Part Numbering System

| S           | H             | 01    | S                 | 05            | 05             | A                  |
|-------------|---------------|-------|-------------------|---------------|----------------|--------------------|
| Form factor | Family series | Watt  | Number of Outputs | Input Voltage | Output Voltage | Option Code        |
| D-DIP       | A~Z           | 01:1W | S - Single        | 03:3.3V       | 03:3.3V        | A - Std. Functions |
| P-SIP       |               | 02:2W | D- Dual           | 05: 5V        | 05: 5V         |                    |
| S-SMD       |               | 03:3W |                   | 12:12V        | 12:12V         |                    |
|             |               | 04:4W |                   | 24: 24V       | 15: 15V        |                    |
|             |               | 06:6W |                   | 48:48V        | 24: 24V        |                    |

### WARRANTY

Delta offers a three(3) years limited warranty. Complete warranty information is listed on our web site or is available upon request from Delta.

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