



**THE DATASHEET OF  
SD02S2412A**





### FEATURES

- Efficiency up to 81%
- 2:1 Wide Input Range
- Fully regulated Output
- Operating Temperature Range -40°C to +85°C
- Moisture sensitivity level (MSL) 2
- Isolation Voltage 1500 VDC
- Complies with EN55022, class A
- Lead free, RoHs Compliant
- Short circuit protection
- 3 Years Product Warranty



The SD02S/D series are miniature, SMD Package, isolated 2W DC/DC converters with 1,500VDC isolation. The SD02S/D series features fully regulated output and wide 2:1 input voltage ranges. The most convenient advantage is the modules with a small footprint and low package height of 8.0 mm (0.31 inch) on the PCB. 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       |                   | Reflected Ripple Current<br>mA(typ.) | Max. capacitive Load<br>uF | Efficiency (typ.) |
|--------------|------------------------------|-----------------------|----------------|---------|---------------------|-------------------|--------------------------------------|----------------------------|-------------------|
|              |                              |                       | Max. mA        | Min. mA | @Max. Load mA(typ.) | @No Load mA(typ.) |                                      |                            | @Max. Load %      |
| SD02S0503A   | 5<br>(4.5 ~ 9)               | 3.3                   | 500            | 125     | 471                 | 40                | 100                                  | 2200                       | 70                |
| SD02S0505A   |                              | 5                     | 400            | 100     | 548                 |                   |                                      | 1000                       | 73                |
| SD02S0512A   |                              | 12                    | 167            | 42      | 534                 |                   |                                      | 170                        | 75                |
| SD02S0515A   |                              | 15                    | 134            | 33      | 582                 |                   |                                      | 110                        | 73                |
| SD02D0505A   |                              | ±5                    | ±200           | ±50     | 667                 |                   |                                      | 470*                       | 64                |
| SD02D0512A   |                              | ±12                   | ±83            | ±21     | 615                 |                   |                                      | 100*                       | 69                |
| SD02D0515A   |                              | ±15                   | ±67            | ±17     | 598                 |                   |                                      | 47*                        | 71                |
| SD02S1203A   |                              | 12<br>(9 ~ 18)        | 3.3            | 500     | 125                 |                   |                                      | 184                        | 20                |
| SD02S1205A   | 5                            |                       | 400            | 100     | 217                 | 1000              | 77                                   |                            |                   |
| SD02S1212A   | 12                           |                       | 167            | 42      | 209                 | 170               | 80                                   |                            |                   |
| SD02S1215A   | 15                           |                       | 134            | 33      | 220                 | 110               | 80                                   |                            |                   |
| SD02D1205A   | ±5                           |                       | ±200           | ±50     | 242                 | 470*              | 73                                   |                            |                   |
| SD02D1212A   | ±12                          |                       | ±83            | ±21     | 224                 | 100*              | 78                                   |                            |                   |
| SD02D1215A   | ±15                          |                       | ±67            | ±17     | 226                 | 47*               | 78                                   |                            |                   |
| SD02S2403A   | 24<br>(18 ~ 36)              |                       | 3.3            | 500     | 125                 | 96                | 10                                   | 15                         |                   |
| SD02S2405A   |                              | 5                     | 400            | 100     | 109                 | 1000              |                                      |                            | 77                |
| SD02S2412A   |                              | 12                    | 167            | 42      | 109                 | 170               |                                      |                            | 80                |
| SD02S2415A   |                              | 15                    | 134            | 33      | 108                 | 110               |                                      |                            | 81                |
| SD02D2405A   |                              | ±5                    | ±200           | ±50     | 119                 | 470*              |                                      |                            | 74                |
| SD02D2412A   |                              | ±12                   | ±83            | ±21     | 112                 | 100*              |                                      |                            | 78                |
| SD02D2415A   |                              | ±15                   | ±67            | ±17     | 110                 | 47*               |                                      |                            | 80                |
| SD02S4803A   |                              | 48<br>(36 ~ 75)       | 3.3            | 500     | 125                 | 49                |                                      |                            | 8                 |
| SD02S4805A   | 5                            |                       | 400            | 100     | 57                  | 1000              | 73                                   |                            |                   |
| SD02S4812A   | 12                           |                       | 167            | 42      | 53                  | 170               | 79                                   |                            |                   |
| SD02S4815A   | 15                           |                       | 134            | 33      | 55                  | 110               | 79                                   |                            |                   |
| SD02D4805A   | ±5                           |                       | ±200           | ±50     | 62                  | 470*              | 71                                   |                            |                   |
| SD02D4812A   | ±12                          |                       | ±83            | ±21     | 57                  | 100*              | 77                                   |                            |                   |
| SD02D4815A   | ±15                          |                       | ±67            | ±17     | 57                  | 47*               | 77                                   |                            |                   |

\* For each output

## Input Characteristics

| Parameter                         | Model            | Min.   | Typ. | Max. | Unit |
|-----------------------------------|------------------|--|------|------|------|
| Input Surge Voltage (1 sec. max.) | 5V Input Models  | -0.7   | ---  | 11   | VDC  |
|                                   | 12V Input Models | -0.7   | ---  | 25   |      |
|                                   | 24V Input Models | -0.7   | ---  | 50   |      |
|                                   | 48V Input Models | -0.7   | ---  | 100  |      |
| Start-Up Voltage                  | 5V Input Models  | 3.5  | 4    | 4.5  |      |
|                                   | 12V Input Models | 4.5  | 7    | 9    |      |
|                                   | 24V Input Models | 8  | 12   | 18   |      |
|                                   | 48V Input Models | 16   | 24   | 36   |      |
| Under Voltage Shutdown            | 5V Input Models  | ---  | 3.5  | 4    |      |
|                                   | 12V Input Models | ---  | 6.5  | 8.5  |      |
|                                   | 24V Input Models | ---  | 11   | 17   |      |
|                                   | 48V Input Models | ---  | 22   | 34   |      |
| Reverse Polarity Input Current    | All Models       | ---  | ---  | 1    | A    |
| Short Circuit Input Power         |                  | ---  | ---  | 1500 | mW   |
| Internal Power Dissipation        |                  | ---  | ---  | 1800 | mW   |
| Conducted EMI                     |                  | Compliance to EN 55022,class A and FCC part 15,class A |      |      |      |

## Output Characteristics

| Parameter                    | Conditions                  | Min. | Typ.  | Max.  | Unit              |
|------------------------------|-----------------------------|------|-------|-------|-------------------|
| Output Voltage Accuracy      |                             | ---  | ±1.0  | ±2.0  | %                 |
| Output Voltage Balance       | Dual Output, Balanced Loads | ---  | ±1.0  | ±2.0  | %                 |
| Line Regulation              | Vin=Min. to Max.            | ---  | ±0.3  | ±0.5  | %                 |
| Load Regulation              | Io=25% to 100%              | ---  | ±0.5  | ±0.75 | %                 |
| Ripple & Noise (20MHz)       |                             | ---  | 30    | 50    | mV <sub>P-P</sub> |
| Ripple & Noise (20MHz)       | Over Line, Load & Temp.     | ---  | ---   | 75    | mV <sub>P-P</sub> |
| Ripple & Noise (20MHz)       |                             | ---  | ---   | 15    | mV <sub>rms</sub> |
| Transient Recovery Time      | 25% Load Step Change        | ---  | 100   | 300   | µs                |
| Transient Response Deviation |                             | ---  | ±3    | ±5    | %                 |
| Temperature Coefficient      |                             | ---  | ±0.01 | ±0.02 | %/°C              |
| Short Circuit Protection     | Continuous                  |      |       |       |                   |

## 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                        | ---       | 250  | 420  | pF    |
| Switching Frequency              |                                   | ---       | 300  | ---  | KHz   |
| MTBF (calculated)                | MIL-HDBK-217F@25°C, Ground Benign | 1,000,000 | ---  | ---  | Hours |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D              | Level 2   |      |      |       |

## Recommended Input Fuse

| 5V Input Models       | 12V Input Models     | 24V Input Models     | 48V Input Models     |
|-----------------------|----------------------|----------------------|----------------------|
| 1000mA Slow-Blow Type | 500mA Slow-Blow Type | 250mA Slow-Blow Type | 120mA 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       |

## Power Derating Curve



## Notes

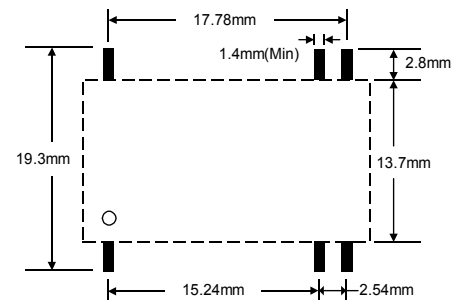
- 1 Specifications typical at  $T_a=+25^{\circ}\text{C}$ , resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%
- 3 Ripple & Noise measurement bandwidth is 0-20MHz.
- 4 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.
- 5 All DC/DC converters should be externally fused at the front end for protection.
- 6 Specifications subject to change without notice.
- 7 It is not recommended to use water-washing process on SMT units.

## Mechanical Drawing

### Mechanical Dimensions



### Connecting Pin Patterns



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

### Pin Connections

| Pin | Single Output | Dual Output |
|-----|---------------|-------------|
| 1   | -Vin          | -Vin        |
| 7   | NC            | NC          |
| 8   | NC            | Common      |
| 9   | +Vout         | +Vout       |
| 10  | -Vout         | -Vout       |
| 16  | +Vin          | +Vin        |

NC : No Connection

### Physical Outline

|               |  |
|---------------|--|
| Case Size     | : 24.0x13.7x8.0mm (0.94x0.54x0.31 Inches)                          |
| Case Material | : Non-Conductive Black Plastic<br>(flammability to UL 94V-0 rated) |
| Weight        | : 5.1g   |



## Part Numbering System

| S           | D             | 02    | 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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