



### FEATURES

- DIP-24 Plastic Package
- Wide 2:1 Input Range
- Operating Temp. Range -40 to +85°C
- Overload Protection
- No Minimum Load Requirement
- Isolation voltage (optional)  
1500VDC for DN03S/DXXXXA  
3000VDC for DN03S/DXXXXH
- Input Filter meets EN55022, class A and FCC, level A
- Fully compatible with DE03S/D Series
- 3 Years Product Warranty



The DN03S/D series is a range of high performance dc-dc converter modules, designed as a cost optimized replacement for the highly popular DE03S/D series. The converter features wide 2:1 input ranges and tight output voltage regulation. Excellent efficiency allows an operating temperature up to +70°C at full load. The product comes in a DIP-24 plastic package with industry standard footprint. Typical applications for these economical priced dc-dc converters are industrial electronics, instrumentation or communication equipment.

### Model Selection Guide

| Model Number                                                                                                                                                                                                                 | Input Voltage (Range)<br>VDC | Output Voltage<br>VDC | Output Current<br>Max.<br>mA | Input Current          |                      | Reflected Ripple Current<br>mA(typ.) | Max. capacitive Load<br>μF | Efficiency (typ.)<br>@Max. Load<br>% |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|------------------------------|------------------------|----------------------|--------------------------------------|----------------------------|--------------------------------------|
|                                                                                                                                                                                                                              |                              |                       |                              | @Max. Load<br>mA(typ.) | @No Load<br>mA(typ.) |                                      |                            |                                      |
|                                                                                                                                                                                                                              |                              |                       |                              |                        |                      |                                      |                            |                                      |
| DN03S0503A<br>DN03S0503H<br>DN03S0505A<br>DN03S0505H<br>DN03S0512A<br>DN03S0512H<br>DN03S0515A<br>DN03S0515H<br>DN03S0524A<br>DN03S0524H<br>DN03D0505A<br>DN03D0505H<br>DN03D0512A<br>DN03D0512H<br>DN03D0515A<br>DN03D0515H | 5<br>(4.5 ~ 9)               | 3.3                   | 600                          | 514                    | 65                   | 100                                  | 680                        | 77                                   |
|                                                                                                                                                                                                                              |                              | 5                     | 500                          | 641                    |                      |                                      | 470                        | 78                                   |
|                                                                                                                                                                                                                              |                              | 12                    | 250                          | 732                    |                      |                                      | 330                        | 82                                   |
|                                                                                                                                                                                                                              |                              | 15                    | 200                          | 732                    |                      |                                      | 220                        | 82                                   |
|                                                                                                                                                                                                                              |                              | 24                    | 125                          | 741                    |                      |                                      | 100                        | 81                                   |
|                                                                                                                                                                                                                              |                              | ±5                    | ±250                         | 649                    |                      |                                      | 220#                       | 77                                   |
|                                                                                                                                                                                                                              |                              | ±12                   | ±125                         | 741                    |                      |                                      | 150#                       | 81                                   |
|                                                                                                                                                                                                                              |                              | ±15                   | ±100                         | 741                    |                      |                                      | 100#                       | 81                                   |
| DN03S1203A<br>DN03S1203H<br>DN03S1205A<br>DN03S1205H<br>DN03S1212A<br>DN03S1212H<br>DN03S1215A<br>DN03S1215H<br>DN03S1224A<br>DN03S1224H<br>DN03D1205A<br>DN03D1205H<br>DN03D1212A<br>DN03D1212H<br>DN03D1215A<br>DN03D1215H |                              | 3.3                   | 600                          | 209                    |                      |                                      | 680                        | 79                                   |
|                                                                                                                                                                                                                              |                              | 5                     | 500                          | 257                    |                      |                                      | 470                        | 81                                   |
|                                                                                                                                                                                                                              |                              | 12                    | 250                          | 294                    |                      |                                      | 330                        | 85                                   |
|                                                                                                                                                                                                                              |                              | 15                    | 200                          | 294                    |                      |                                      | 220                        | 85                                   |
|                                                                                                                                                                                                                              |                              | 24                    | 125                          | 298                    |                      |                                      | 100                        | 84                                   |
|                                                                                                                                                                                                                              |                              | ±5                    | ±250                         | 260                    |                      |                                      | 220#                       | 80                                   |
|                                                                                                                                                                                                                              |                              | ±12                   | ±125                         | 298                    |                      |                                      | 150#                       | 84                                   |
|                                                                                                                                                                                                                              |                              | ±15                   | ±100                         | 298                    |                      |                                      | 100#                       | 84                                   |

## Model Selection Guide

| Model Number             | Input Voltage (Range) | Output Voltage | Output Current | Input Current |          | Reflected Ripple Current | Max. capacitive Load | Efficiency (typ.) |
|--------------------------|-----------------------|----------------|----------------|---------------|----------|--------------------------|----------------------|-------------------|
|                          |                       |                | Max.           | @Max. Load    | @No Load |                          |                      | @Max. Load        |
|                          | VDC                   | VDC            | mA             | mA(typ.)      | mA(typ.) | mA(typ.)                 | μF                   | %                 |
| DN03S2403A<br>DN03S2403H | 24<br>(18 ~ 36)       | 3.3            | 600            | 104           | 20       | 15                       | 680                  | 79                |
| DN03S2405A<br>DN03S2405H |                       | 5              | 500            | 129           |          |                          | 470                  | 81                |
| DN03S2412A<br>DN03S2412H |                       | 12             | 250            | 147           |          |                          | 330                  | 85                |
| DN03S2415A<br>DN03S2415H |                       | 15             | 200            | 147           |          |                          | 220                  | 85                |
| DN03S2424A<br>DN03S2424H |                       | 24             | 125            | 149           |          |                          | 100                  | 84                |
| DN03D2405A<br>DN03D2405H |                       | ±5             | ±250           | 130           |          |                          | 220#                 | 80                |
| DN03D2412A<br>DN03D2412H |                       | ±12            | ±125           | 149           |          |                          | 150#                 | 84                |
| DN03D2415A<br>DN03D2415H |                       | ±15            | ±100           | 149           |          |                          | 100#                 | 84                |
| DN03S4803A<br>DN03S4803H | 48<br>(36 ~ 75)       | 3.3            | 600            | 52            | 15       | 10                       | 680                  | 79                |
| DN03S4805A<br>DN03S4805H |                       | 5              | 500            | 64            |          |                          | 470                  | 81                |
| DN03S4812A<br>DN03S4812H |                       | 12             | 250            | 74            |          |                          | 330                  | 85                |
| DN03S4815A<br>DN03S4815H |                       | 15             | 200            | 74            |          |                          | 220                  | 85                |
| DN03S4824A<br>DN03S4824H |                       | 24             | 125            | 74            |          |                          | 100                  | 84                |
| DN03D4805A<br>DN03D4805H |                       | ±5             | ±250           | 65            |          |                          | 220#                 | 80                |
| DN03D4812A<br>DN03D4812H |                       | ±12            | ±125           | 74            |          |                          | 150#                 | 84                |
| DN03D4815A<br>DN03D4815H |                       | ±15            | ±100           | 74            |          |                          | 100#                 | 84                |

# For each output

## Input Specifications

| 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 Threshold Voltage        | 5V Input Models  | ---       | ---  | 4.5  |      |
|                                   | 12V Input Models | ---       | ---  | 9    |      |
|                                   | 24V Input Models | ---       | ---  | 18   |      |
|                                   | 48V Input Models | ---       | ---  | 36   |      |
| Under Voltage Shutdown            | 5V Input Models  | ---       | ---  | 4    |      |
|                                   | 12V Input Models | ---       | ---  | 8.5  |      |
|                                   | 24V Input Models | ---       | ---  | 17.5 |      |
|                                   | 48V Input Models | ---       | ---  | 35.5 |      |
| Internal Filter Type              | All Models       | Pi Filter |      |      |      |
| Short Circuit Input Power         |                  | ---       | ---  | 2000 | mW   |
| Internal Power Dissipation        |                  | ---       | ---  | 1200 | mW   |

## Output Specifications

| Parameter                       | Conditions                  | Min. | Typ.  | Max.  | Unit              |
|---------------------------------|-----------------------------|------|-------|-------|-------------------|
| Output Voltage Setting Accuracy |                             | ---  | ---   | ±2.0  | %Vnom.            |
| Output Voltage Balance          | Dual Output, Balanced Loads | ---  | ±0.5  | ±2.0  | %                 |
| Line Regulation                 | Vin=Min. to Max.            | ---  | ±0.3  | ±1.0  | %                 |
| Load Regulation                 | Io=0% to 100%               | ---  | ±0.3  | ±1.0  | %                 |
| Min.Load                        | No minimum Load Requirement |      |       |       |                   |
| Ripple & Noise                  | 0-20 MHz Bandwidth          | ---  | ---   | 70    | mV <sub>p-p</sub> |
| Transient Recovery Time         | 25% Load Step Change        | ---  | 300   | 500   | μsec              |
| Transient Response Deviation    |                             | ---  | ±3    | ±5    | %                 |
| Temperature Coefficient         |                             | ---  | ±0.01 | ±0.02 | %/°C              |
| Over Load Protection            | Foldback                    | 120  | 150   | ---   | %                 |
| Short Circuit Protection        | Continuous                  |      |       |       |                   |

## General Specifications

| Parameter                     | Conditions                                                 |                         | Min.      | Typ. | Max. | Unit  |
|-------------------------------|------------------------------------------------------------|-------------------------|-----------|------|------|-------|
| I/O Isolation Voltage (rated) | 60 Seconds                                                 | Standard                | 1500      | ---  | ---  | VDC   |
|                               |                                                            | Suffix H <sup>(6)</sup> | 3000      | ---  | ---  | VDC   |
| I/O Isolation Resistance      | 500 VDC                                                    |                         | 1000      | ---  | ---  | MΩ    |
| I/O Isolation Capacitance     | 100KHz, 1V                                                 |                         | ---       | ---  | 300  | pF    |
| Switching Frequency           |                                                            |                         | 90        | ---  | ---  | KHz   |
| MTBF (calculated)             | MIL-HDBK-217F@25°C, Ground Benign                          |                         | 1,000,000 |      |      | Hours |
| Safety Approvals (Pending)    | UL/cUL 60950-1 recognition(UL certificate), IEC/EN 60950-1 |                         |           |      |      |       |

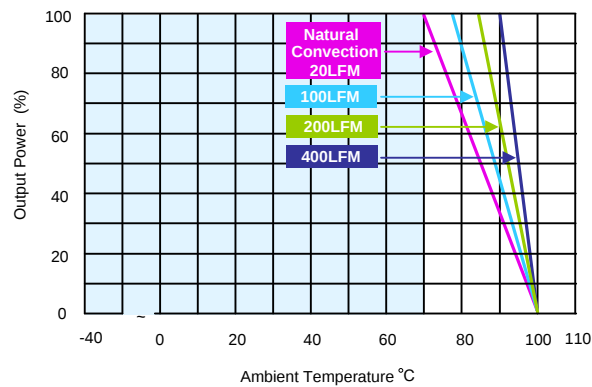
## Environmental Specifications

| Parameter                                                      | Conditions          | Min. | Max. | Unit     |
|----------------------------------------------------------------|---------------------|------|------|----------|
| Operating Ambient Temperature Range (See Power Derating Curve) | Natural Convection  | -40  | +85  | °C       |
| Case Temperature                                               |                     | ---  | +100 | °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       |

## EMC Specifications

| Parameter                     | Standards & Level                                           | Performance      |
|-------------------------------|-------------------------------------------------------------|------------------|
| Conducted EMI                 | Compliance to EN 55022 and FCC part 15                      | Class A          |
| ESD                           | EN61000-4-2 air $\pm 8\text{KV}$ , Contact $\pm 6\text{KV}$ | Perf. Criteria A |
| Radiated immunity             | EN61000-4-3 10V/m                                           | Perf. Criteria A |
| Fast transient <sup>(5)</sup> | EN61000-4-4 $\pm 2\text{KV}$                                | Perf. Criteria A |
| Surge <sup>(5)</sup>          | EN61000-4-5 $\pm 1\text{KV}$                                | Perf. Criteria A |
| Conducted immunity            | EN61000-4-6 10V/m                                           | Perf. Criteria A |

## Power Derating Curve

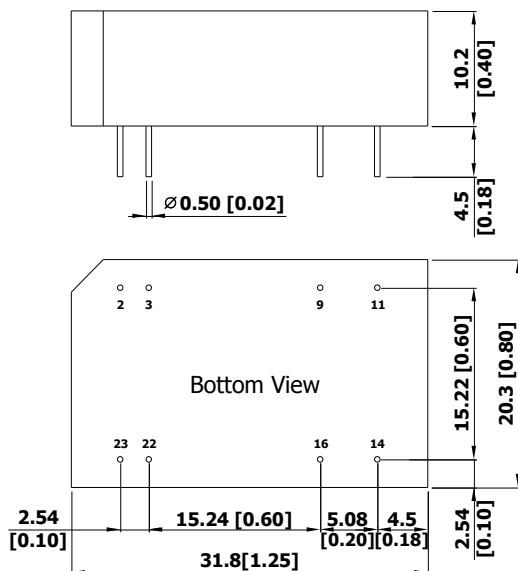


## Notes

- 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 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 4 Other input and output voltage may be available, please contact factory.
- 5 To meet EN61000-4-4 & EN61000-4-5 an external capacitor across the input pins is required. Suggested capacitor: CHEMI-CON KY 220 $\mu\text{F}$ /100V
- 6 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 7 Specifications are subject to change without notice.

## Package Specifications

### Mechanical Dimensions



### Pin Connections

| Pin | Single Output | Dual Output |
|-----|---------------|-------------|
| 2   | -Vin          | -Vin        |
| 3   | -Vin          | -Vin        |
| 9   | No Pin        | Common      |
| 11  | NC            | -Vout       |
| 14  | +Vout         | +Vout       |
| 16  | -Vout         | Common      |
| 22  | +Vin          | +Vin        |
| 23  | +Vin          | +Vin        |

NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.01)
- ▶ Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02±0.002)

## Physical Characteristics

Case Size : 31.8x20.3x10.2mm (1.25x0.80x0.40 inches)

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

Pin Material : Copper Alloy with Gold Plate Over Nickel Subplate

Weight : 12.8g



## Part Numbering System

| D           | N             | 03      | S                 | 05            | 03             | A                  |
|-------------|---------------|---------|-------------------|---------------|----------------|--------------------|
| Product typ | 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 - PCB Mount      |
| P - SIP     |               | 02 - 2W | D - Dual          | 05 - 5V       | 05 - 5V        | H - High Isolation |
| 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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**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331