



### FEATURES

- Efficiency up to 84%
- DIP Package with Industry Standard Pinout
- Ultra-wide 4:1 Input Range
- Isolation Voltage 1500VDC
- Operating Temperature Range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Complies with EN55022 Class A
- Short Circuit Protection
- CSA 60950-1 Safety Approval
- 3 Years Product Warranty

The DL03S/D series are miniature, DIP Package, isolated 3W DC/DC converters with 1,500VDC isolation. The DL03S/D series feature fully regulated output and ultra wide 4:1 input voltage ranges. It offers short circuit protection and 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. With creative design technology and optimization of component placement, these converters possess outstanding electrical and thermal performance, as well as extremely high reliability under highly stressful operating conditions.

### Model List

| Model Number | Input Voltage (Range) | Output Voltage | Output Current |          | Input Current |          | Reflected Ripple Current | Max. capacitive Load | Efficiency (typ.) |
|--------------|-----------------------|----------------|----------------|----------|---------------|----------|--------------------------|----------------------|-------------------|
|              |                       |                | Max.           | Min.     | @Max. Load    | @No Load |                          |                      | @Max. Load        |
|              |                       | VDC            | mA             | mA       | mA(typ.)      | mA(typ.) |                          | $\mu\text{F}$        | %                 |
| DL03S2403A   | 24<br>(9 ~ 36)        | 3.3            | 750            | 93       | 138           | 20       | 15                       | 680                  | 75                |
| DL03S2405A   |                       | 5              | 600            | 75       | 158           |          |                          | 470                  | 79                |
| DL03S2412A   |                       | 12             | 250            | 32       | 154           |          |                          | 330                  | 81                |
| DL03S2415A   |                       | 15             | 200            | 25       | 152           |          |                          | 220                  | 82                |
| DL03D2412A   |                       | $\pm 12$       | $\pm 125$      | $\pm 16$ | 156           |          |                          | 150*                 | 80                |
| DL03D2415A   |                       | $\pm 15$       | $\pm 100$      | $\pm 13$ | 156           |          |                          | 100*                 | 80                |
| DL03S4803A   | 48<br>(18 ~ 75)       | 3.3            | 750            | 93       | 68            | 10       | 10                       | 680                  | 76                |
| DL03S4805A   |                       | 5              | 600            | 75       | 78            |          |                          | 470                  | 80                |
| DL03S4812A   |                       | 12             | 250            | 32       | 75            |          |                          | 330                  | 83                |
| DL03S4815A   |                       | 15             | 200            | 25       | 74            |          |                          | 220                  | 84                |
| DL03D4812A   |                       | $\pm 12$       | $\pm 125$      | $\pm 16$ | 76            |          |                          | 150*                 | 82                |
| DL03D4815A   |                       | $\pm 15$       | $\pm 100$      | $\pm 13$ | 76            |          |                          | 100*                 | 82                |

\* For each output

### Input Characteristics

| Parameter                         | Model            | Min.                                                     | Typ. | Max. | Unit |
|-----------------------------------|------------------|----------------------------------------------------------|------|------|------|
| Input Surge Voltage (1 sec. max.) | 24V Input Models | -0.7                                                     | ---  | 50   | VDC  |
|                                   | 48V Input Models | -0.7                                                     | ---  | 100  |      |
| Start-Up Threshold Voltage        | 24V Input Models | 6                                                        | 7.5  | 9    |      |
|                                   | 48V Input Models | 12                                                       | 15   | 18   |      |
| Under Voltage Shutdown            | 24V Input Models | ---                                                      | ---  | 8.5  |      |
|                                   | 48V Input Models | ---                                                      | ---  | 16   |      |
| Reverse Polarity Input Current    | All Models       | ---                                                      | ---  | 0.5  | A    |
| Short Circuit Input Power         |                  | ---                                                      | ---  | 2000 | mW   |
| Internal Power Dissipation        |                  | ---                                                      | ---  | 2500 | 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 Setting Accuracy | At 50% Load and Nominal Vin | ---  | ---   | ±2.0  | %Vom.             |
| Output Voltage Balance          | Dual Output, Balanced Loads | ---  | ±0.5  | ±3.0  | %                 |
| Line Regulation                 | Vin=Min. to Max.            | ---  | ±0.2  | ±1.0  | %                 |
| Load Regulation                 | Io=Min. to Max.             | ---  | ±0.3  | ±1.0  | %                 |
| Ripple & Noise (20MHz)          |                             | ---  | 40    | 75    | mV <sub>P-P</sub> |
| Transient Recovery Time         | 25% Load Step Change        | ---  | 150   | 500   | μsec              |
| Transient Response Deviation    |                             | ---  | ±3    | ---   | %                 |
| Temperature Coefficient         |                             | ---  | ±0.01 | ±0.02 | %/°C              |
| Over Load Protection            | Foldback                    | 110  | 300   | ---   | %                 |
| 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                                                  | ---       | 380  | 500  | pF    |
| Switching Frequency           |                                                             | ---       | 350  | ---  | KHz   |
| MTBF (calculated)             | MIL-HDBK-217F@25°C, Ground Benign                           | 1,000,000 | ---  | ---  | Hours |
| Safety Approvals              | UL/cUL 60950-1 recognition(CSA certificate), IEC/EN 60950-1 |           |      |      |       |

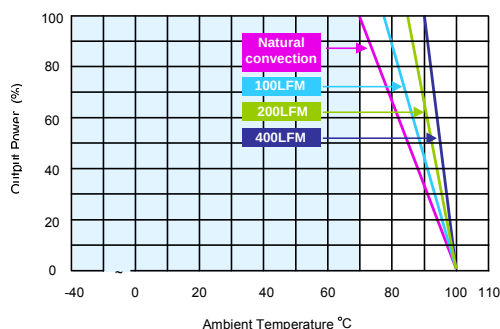
## Recommended Input Fuse

| 24V Input Models      | 48V Input Models     |
|-----------------------|----------------------|
| 1000mA Slow-Blow Type | 500mA Slow-Blow Type |

## Environmental Characteristics

| Parameter                                                      | Conditions          | Min. | Max. | Unit     |
|----------------------------------------------------------------|---------------------|------|------|----------|
| Operating Ambient Temperature Range (See Power Derating Curve) | Natural Convection  | -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 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 7 Specifications subject to change without notice.

## Package Specifications

Mechanical Dimensions

The diagram shows the mechanical dimensions of the DCDC module. The top view shows a rectangular component with a mounting hole diameter of 10.2 mm [0.40] and a pin diameter of 0.50 mm [0.02]. The bottom view shows the component with pins 2, 3, 9, 11, 14, 16, 22, and 23. The dimensions are as follows:

- Overall width: 20.3 mm [0.80]
- Overall length: 31.8 mm [1.25]
- Pin 2/3 spacing: 2.54 mm [0.10]
- Pin 9/11 spacing: 15.24 mm [0.60]
- Pin 16/14 spacing: 5.08 mm [0.20]
- Pin 23/22 spacing: 4.5 mm [0.18]
- Pin 2/3 to Pin 9/11 spacing: 15.24 mm [0.60]
- Pin 9/11 to Pin 16/14 spacing: 5.08 mm [0.20]
- Pin 16/14 to Pin 23/22 spacing: 4.5 mm [0.18]
- Pin 2/3 to Pin 23/22 spacing: 31.8 mm [1.25]
- Pin 9/11 to Pin 23/22 spacing: 20.3 mm [0.80]
- Pin 2/3 to Pin 9/11 spacing: 15.24 mm [0.60]
- Pin 9/11 to Pin 23/22 spacing: 5.08 mm [0.20]
- Pin 16/14 to Pin 23/22 spacing: 4.5 mm [0.18]
- Pin 2/3 to Pin 23/22 spacing: 31.8 mm [1.25]

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±0.25 (X.XX±0.01)  
X.XX±0.13 (X.XXX±0.005)
- ▶ Pin diameter ⇔ 0.5 ±0.05 (0.02±0.002)

## Physical Outline

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 : phosphor bronze

Weight : 12.2g

| Part Numbering System |               |       |                   |               |                |                    |
|-----------------------|---------------|-------|-------------------|---------------|----------------|--------------------|
| D                     | L             | 03    | S                 | 24            | 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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