



### FEATURES

- Efficiency up to 80%
- SIP Package with Standard Pinout
- Fully Regulated Output
- Operating Temperature Range -40°C to +85°C
- Ultra-wide 4:1 Input Range
- Isolation Voltage 1500 VDC
- Short circuit protection
- Lead free, RoHs compliant
- 3 Years Product Warranty



The PH02S/D series are miniature, SIP Package, isolated 2W DC/DC converters with 1,500VDC isolation. The PH02S/D series features fully regulated output and wide 4:1 input voltage ranges. The most convenient advantage is the modules with a small footprint occupying only 2.4 cm<sup>2</sup> (0.36 square in.) on the PCB. It offers short circuit protection and allows a wide operating temperature range of -40°C to +85°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) VDC	Output Voltage VDC	Output Current		Input Current		Reflected Ripple Current mA(typ.)	Max. capacitive Load uF	Efficiency (typ.) @Max. Load %
			Max. mA	Min. mA	@Max. Load mA(typ.)	@No Load mA(typ.)			
PH02S2403A	24 (9 ~ 36)	3.3	500	125	97	20	300	2200	71
PH02S2405A		5	400	100	110			1000	76
PH02S2412A		12	167	42	106			170	79
PH02S2415A		15	134	33	105			110	80
PH02D2405A		±5	±200	±50	114			470*	73
PH02D2412A		±12	±83	±21	108			100*	77
PH02D2415A		±15	±67	±17	106			47*	79
PH02S4803A		3.3	500	125	49			15	600
PH02S4805A	5	400	100	58	1000	72			
PH02S4812A	12	167	42	54	170	78			
PH02S4815A	15	134	33	54	110	78			
PH02D4805A	±5	±200	±50	60	470*	70			
PH02D4812A	±12	±83	±21	55	100*	76			
PH02D4815A	±15	±67	±17	55	47*	76			

\* 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 Voltage	24V Input Models	4.5	6	8.5	
	48V Input Models	8.5	12	17	
Under Voltage Shutdown	24V Input Models	---	---	8	
	48V Input Models	---	---	16	
Reverse Polarity Input Current	All Models	---	---	0.5	A
Short Circuit Input Power		---	---	1500	mW
Input Filter		Capacitor type			
Internal Power Dissipation		---	---	2500	mW

## 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
Output Short Circuit	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	500	pF
Switching Frequency		---	300	---	KHz
MTBF (Calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000	---	---	Hours

## Recommended Input Fuse

24V Input Models	48V Input Models
350mA Slow-Blow Type	135mA Slow-Blow Type

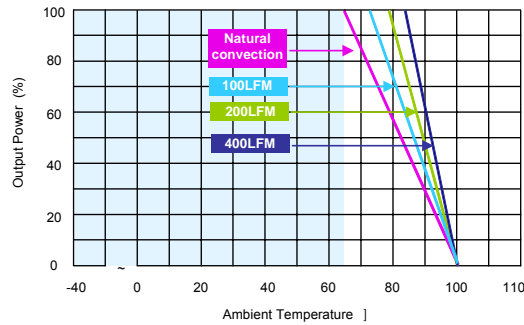
## Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	Under 0.6 VDC or Open Circuit, drops down to 0VDC by 2mV/°C				
Converter Off	2.9 to 15 VDC				
Standby Input Current		---	1	3	mA
Control Input Current ( on )	Vin = 0V	---	---	-1	mA
Control Input Current ( off )	Vin = 5.0V	---	---	1	mA
Control Common	Referenced to Negative Input				

## Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature Range (with Derating)	Ambient	-40	+85	°C
Case Temperature		---	+90	°C
Storage Temperature Range		-55	+105	°C
Humidity (non condensing)		---	95	% rel. H
Cooling	Free-Air convection			
Lead Temperature (1.5mm from case for		---	260	°C

## Power Derating Curve

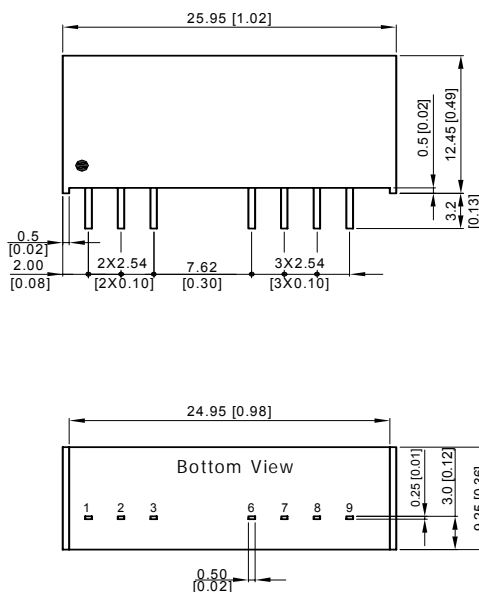


## Notes

- 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 0-20 MHz.
- 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.

## Mechanical Drawing

### Mechanical Dimensions



### Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
2	+Vin	+Vin
3	Remote	Remote
6	+Vout	+Vout
7	NC	Common
8	NC	NC
9	-Vout	-Vout

NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance:  $X.X \pm 0.5$  ( $X.XX \pm 0.02$ )  
 $X.XX \pm 0.25$  ( $X.XXX \pm 0.01$ )
- ▶ Pins  $\pm 0.1$  ( $\pm 0.004$ )

## Physical Outline

Case Size	: 25.95x9.25x12.45 mm (1.02x0.36x0.49 inches)
Case Material	: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Weight	: 6.5g



## Part Numbering System

P	H	02	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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