



**FEATURES**

- High Efficiency to 86%
- Power Density up to 1.5kW/L (24W/in<sup>3</sup>)
- 1.5kV Input to Output Isolation
- Industry Standard Pinout
- Surge Rating to 12W
- Non Latching Current Limit
- Fixed Frequency
- Versatile Control Options
- Continuous Rating to 10W at 72°C Without Heatsink
- Operation to Zero Load
- Protected Against Load Faults
- Internal Over Temperature Protection
- Uses No Electrolytic Capacitors
- UL 94V-0 Package Materials

**DESCRIPTION**

The NPH10S series of DC-DC Converters combines ease of application with versatility. The pin pattern is based on the popular industry standard, but two additional pins may optionally be fitted to provide a variety of features not commonly found on units of this type. High efficiency enables full rating to be achieved in a small package without heatsinking. Thermally protected against sustained overload. The copper case achieves efficient heat transfer and screening. The product range has been recognised by Underwriters Laboratory (UL) to UL 1950 for operational insulation, file number E179522 applies.



**UL 1950 RECOGNISED**  
File Number E179522.

**SELECTION GUIDE**

	Nominal Input Voltage	Output Voltage	Output Current	Current Limit <sup>2</sup> (Typ)	Efficiency	Max Load Capacitance
Order Code <sup>1</sup>	(V)	(V)	(A)	(A)	(%)	(µF)
<b>NPH10S2403i</b>	24	3.4	2.94	4.5	79	470
<b>NPH10S2405i</b>	24	5.1	1.96	3.0	83	470
<b>NPH10S2412i</b>	24	12.1	0.83	1.2	86	100
<b>NPH10S2415i</b>	24	15.1	0.67	1.1	86	47
<b>NPH10S4803i</b>	48	3.4	2.94	4.1	80	470
<b>NPH10S4805i</b>	48	5.1	1.96	2.8	83	470
<b>NPH10S4812i</b>	48	12.1	0.83	1.2	86	56
<b>NPH10S4815i</b>	48	15.1	0.67	1.0	87	22

**INPUT CHARACTERISTICS**

Parameter	Conditions	MIN	NOM	MAX	Units
Voltage Range	Continuous operation, 24V input types	18	24	36	V
	Continuous operation, 48V input types <sup>3</sup>	36	48	75	V

**OUTPUT CHARACTERISTICS**

Parameter	Conditions	MIN	TYP	MAX	Units
Voltage Set Point Error	50% load after 30 mins at nominal supply voltage			0.5	%
Overall Voltage Error	Case temperature -40°C to 110°C Load 0% - 100% Input specified range		1	2.5	%
Temperature Coefficient of Output Voltage (slope)	Over any 10°C span within the specified temperature range		50	250	ppm°C
Deviation of Output Voltage	Specified over temperature MIN-MAX		0.5	1	%
Line Regulation	Operating voltage range, 50% load		0.05	0.1	%
Load Regulation	0% - 100% rated load <sup>4</sup>			0.5	%
Ripple	rms		70		mV

**CONTROL CHARACTERISTICS**

Parameter	Conditions	MIN	TYP	MAX	Units
Voltage Trimming Range	At rated load, Trim control at either output	±10			%
Remote Switch Input <sup>5</sup> (voltage relative to input negative)	Not operating	-15	0	1.5	V
	Operating, open circuit voltage	9	10	11	
Start Delay	Time from application of valid input voltage to output being in specification		25		mS
Synchronisation <sup>5</sup>	Specified drive signal	320		440	kHz
Switching Frequency		330	350	395	kHz

**ABSOLUTE MAXIMUM RATINGS**

Input voltage, 24V input types	-0.5V to 40V <sup>6</sup>
Input voltage, 48V input types	-0.5V to 80V <sup>6</sup>
Output Voltage	-0.3V to controlled output voltage (operating or non-operating)
Output trim control	-1V to +30V
Synchronisation/shutdown control	±15V relative to input return

**ISOLATION CHARACTERISTICS**

Parameter	Conditions	MIN	TYP	MAX	Units
Isolation Voltage	Flash tested for 1 second	1500			VDC
Resistance	Viso=500VDC	1			GΩ
Capacitance	3.3V and 5V output		50		pF
	12V and 15V output		90		

1 If optional pins ADJ and SS are required (as indicated in the pin connections diagram) prefix the ending "i" with an E when ordering, e.g. NPH10S4803Ei.  
 2 Current is quoted when output is 95% of regulated voltage.  
 3 For applications requiring UL1950 recognition, input voltage must not exceed 60VDC.  
 4 A minimum load of 10% of rating is recommended for typical applications ; see application notes.  
 5 Optional - Where fitted.  
 6 Absolute maximum value for 30 seconds. Prolonged operation may damage the product.  
 All specifications typical at T<sub>A</sub>=25°C, nominal input voltage and rated output current unless otherwise specified.

# NPH10S SERIES

Isolated 10W Single Output DC-DC Converters

## ENVIRONMENTAL

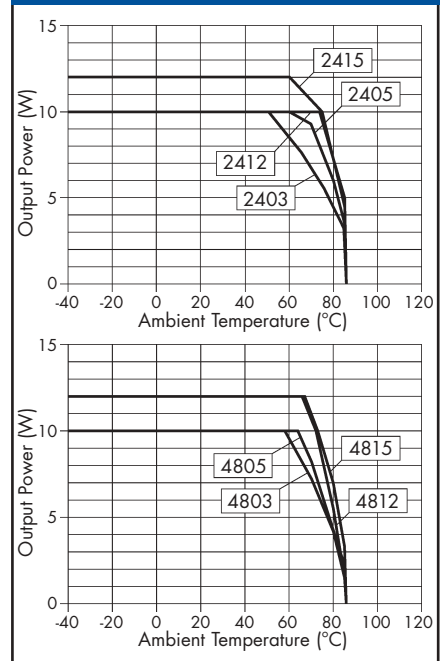
Parameter	Conditions	MIN	TYP	MAX	Units
Case Temperature	Full load	-40		110	°C
Storage	Absolute MAX internal temperature	-40		125	°C
Relative Humidity	Non condensing 85°C			85	%
Thermal Protection	Operates at case temperature	110			°C

## THERMAL CHARACTERISTICS

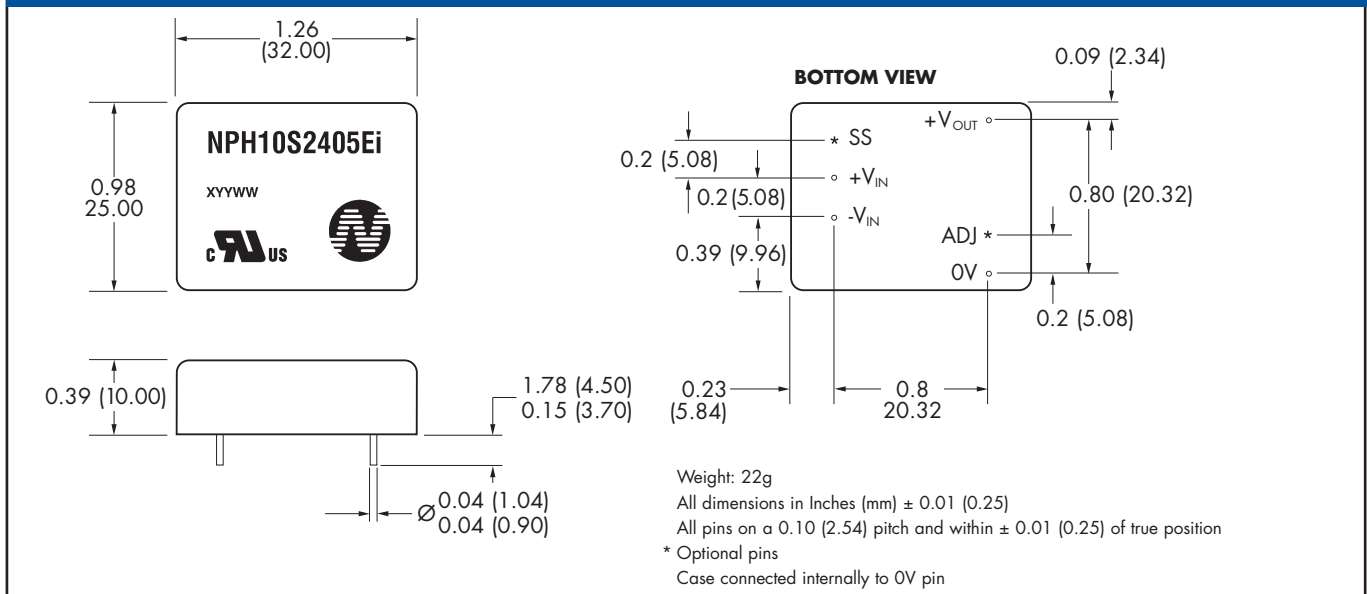
**MAX power rating** with case temperature maintained by external means (eg forced air cooling)

Part Number	Case Temperature			Units
	100°C	105°C	110°C	
<b>NPH10S2403</b>	10	7.0	2.3	W
<b>NPH10S2405</b>	10	8.2	3	
<b>NPH10S2412</b>	10	9.5	4	
<b>NPH10S2415</b>	12	9.5	4	
<b>NPH10S4803</b>	10	7.0	1	W
<b>NPH10S4805</b>	10	4.7	1	
<b>NPH10S4812</b>	12	8.0	0	
<b>NPH10S4815</b>	12	7.5	0	

## THERMAL PERFORMANCE



## MECHANICAL DIMENSIONS



C&D Technologies (NCL) Limited reserve the right to alter or improve the specification, internal design or manufacturing process at any time, without notice. Please check with your supplier or visit our web site to ensure that you have the current and complete specification for your product before use. For information and instructions on use, please consult the NPH SERIES APPLICATION NOTES.

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