



## 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> | Efficiency | Load Capacitance |
|-------------------------|-----------------------|----------------|----------------|----------------------------|------------|------------------|
| Order Code <sup>1</sup> | (V)                   | (V)            | (A)            | (A)Min                     | (%)        | (μF Max)         |
| <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<br>Load 0% - 100%<br>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

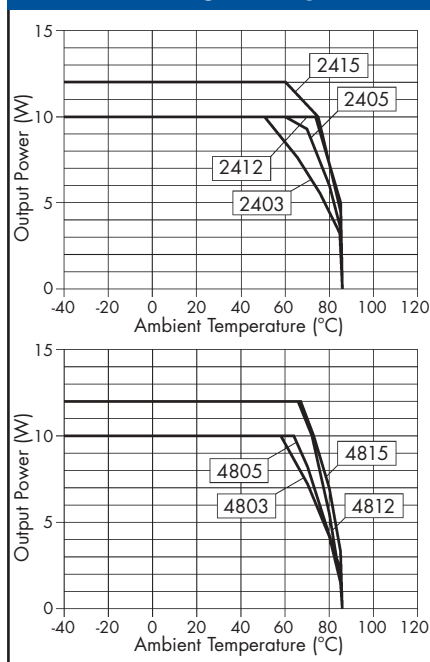
| Parameter          | Conditions                        | MIN | TYP | MAX | Units |
|--------------------|-----------------------------------|-----|-----|-----|-------|
| Case Temperature   | Full load                         | -40 |     | 110 | °C    |
| Storage            | Absolute MAX internal temperature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

### THERMAL CHARACTERISTICS

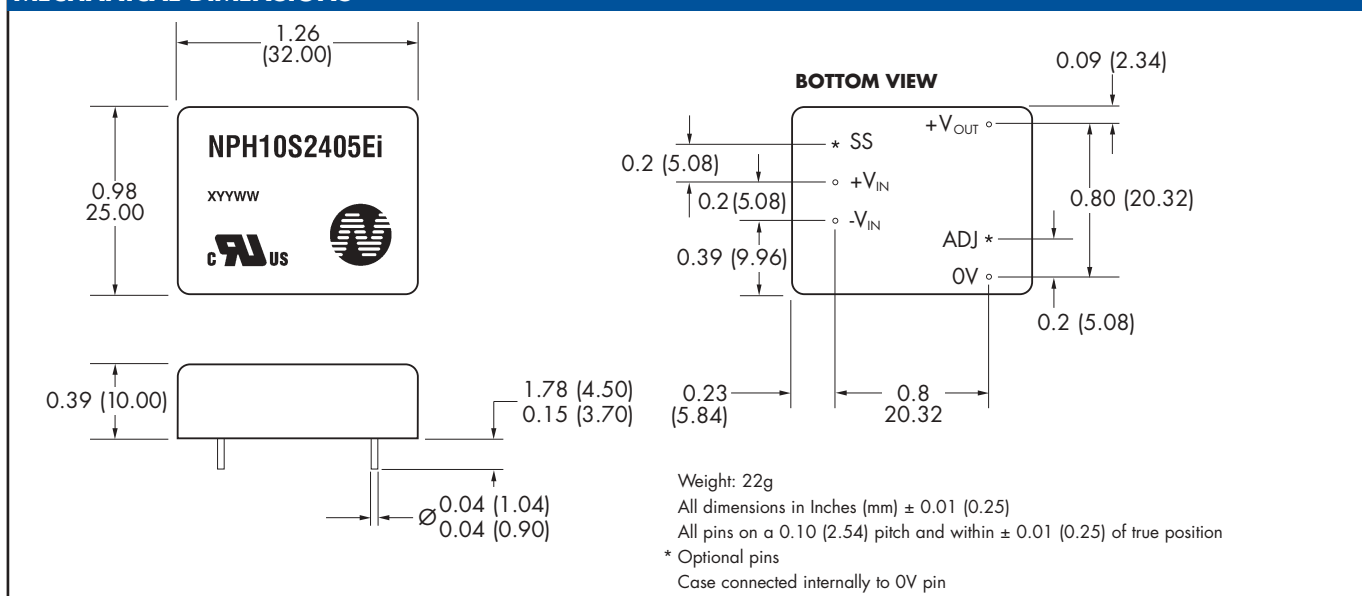
**MAX power rating** with case temperature maintained by external means  
(eg forced air cooling)

| 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



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