

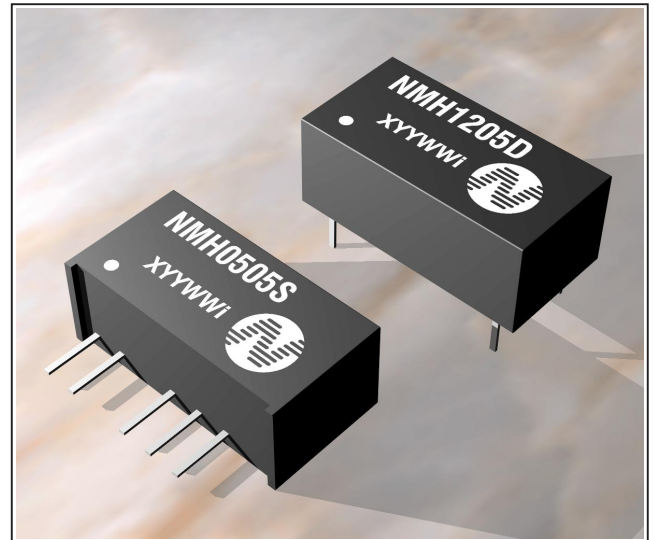
### features

- ☐ Wide Temperature performance at full 2 Watt load,  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- ☐ Dual Output from a Single Input Rail
- ☐ Industry Standard Pinout
- ☐ Power Sharing on Output
- ☐ 1kVDC Isolation
- ☐ Efficiency to 86%
- ☐ Power Density up to  $1.44\text{W}/\text{cm}^3$
- ☐ 5V, 12V, 24V & 48V Input
- ☐ 5V, 9V, 12V and 15V Output
- ☐ Footprint from  $1.46\text{cm}^2$
- ☐ UL 94V-0 Package Material
- ☐ No Heatsink Required
- ☐ Internal SMD Construction
- ☐ Toroidal Magnetics
- ☐ Fully Encapsulated
- ☐ No External Components Required
- ☐ MTF up to 2.0 Million hours
- ☐ Custom Solutions Available
- ☐ No Electrolytic or Tantalum Capacitors

### description

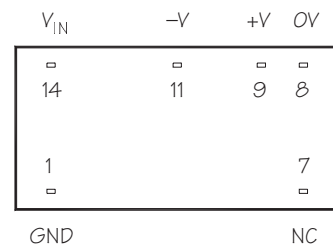
The NMH series of industrial temperature range DC-DC converters are the standard building blocks for on-board point-of-use power systems. They are ideally suited for providing dual rail supplies on single rail boards with the added benefit of galvanic isolation to reduce circuit noise. All of the rated power may be drawn from a single pin provided the total load does not exceed 2W.

Pin compatibility with the NMA 1 watt series ensures minimal effort in upgrading distributed power systems.

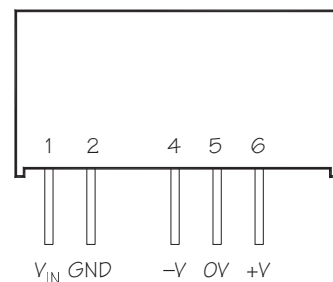


### pin connections

14 Pin DIP (top view)



7 Pin SIP



### PRELIMINARY

Notice : This is not a final specification.  
Some parametric limits may be subject to change.

# NMH SERIES

## Isolated 2W Dual Output DC-DC Converters

### absolute maximum ratings

|   |          |
|---|----------|
| Short circuit duration <sup>1</sup> · · · · ·             | 1 second |
| Internal power dissipation · · · · ·                      | 300mW    |
| Lead temperature 1.5mm from case for 10 seconds · · · · · | 300°C    |
| Input voltage $V_{IN}$ , NMH05 types · · · · ·            | 7V       |
| Input voltage $V_{IN}$ , NMH12 types · · · · ·            | 15V      |
| Input voltage $V_{IN}$ , NMH24 types · · · · ·            | 28V      |
| Input voltage $V_{IN}$ , NMH48 types · · · · ·            | 54V      |

### electrical specifications

#### 5V & 12V input ranges

Specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

| Order Code | Nominal Input Voltage | Rated Output Voltage | Rated Output Current | Input Current at Rated Load | Efficiency | Isolation Capacitance | Package Style |
|------------|-----------------------|----------------------|----------------------|-----------------------------|------------|-----------------------|---------------|
|            | (V)                   | (V)                  | (mA)                 | (mA)                        | (%)        | (pF)                  |               |
| NMH0505D   | 5                     | 5                    | ±200                 | 500                         | 80         | 24                    | 1             |
| NMH0509D   | 5                     | 9                    | ±111                 | 494                         | 81         | 28                    |               |
| NMH0512D   | 5                     | 12                   | ±83                  | 488                         | 82         | 30                    |               |
| NMH0515D   | 5                     | 15                   | ±67                  | 476                         | 84         | 33                    |               |
| NMH0505S   | 5                     | 5                    | ±200                 | 500                         | 80         | 24                    | 2             |
| NMH0509S   | 5                     | 9                    | ±111                 | 494                         | 81         | 28                    |               |
| NMH0512S   | 5                     | 12                   | ±83                  | 488                         | 82         | 30                    |               |
| NMH0515S   | 5                     | 15                   | ±67                  | 476                         | 84         | 33                    |               |
| NMH1205D   | 12                    | 5                    | ±200                 | 208                         | 80         | 35                    | 1             |
| NMH1209D   | 12                    | 9                    | ±111                 | 201                         | 83         | 55                    |               |
| NMH1212D   | 12                    | 12                   | ±83                  | 198                         | 84         | 63                    |               |
| NMH1215D   | 12                    | 15                   | ±67                  | 198                         | 84         | 66                    |               |
| NMH1205S   | 12                    | 5                    | ±200                 | 208                         | 80         | 35                    | 2             |
| NMH1209S   | 12                    | 9                    | ±111                 | 201                         | 83         | 55                    |               |
| NMH1212S   | 12                    | 12                   | ±83                  | 198                         | 84         | 63                    |               |
| NMH1215S   | 12                    | 15                   | ±67                  | 198                         | 84         | 66                    |               |

<sup>1</sup> Supply voltage must be discontinued at the end of the short circuit duration.

# NMH SERIES

## Isolated 2W Dual Output DC-DC Converters

### electrical specifications

#### 24V & 48V input ranges

Specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

| Order Code | Nominal Input Voltage | Rated Output Voltage | Rated Output Current | Input Current at Rated Load | Efficiency | Isolation Capacitance | Package Style |
|------------|-----------------------|----------------------|----------------------|-----------------------------|------------|-----------------------|---------------|
|            | (V)                   | (V)                  | (mA)                 | (mA)                        | (%)        | (pF)                  |               |
| NMH2405D   | 24                    | 5                    | ±200                 | 103                         | 81         | 41                    | 1             |
| NMH2409D   | 24                    | 9                    | ±111                 | 98                          | 85         | 75                    |               |
| NMH2412D   | 24                    | 12                   | ±83                  | 97                          | 86         | 95                    |               |
| NMH2415D   | 24                    | 15                   | ±67                  | 97                          | 86         | 104                   |               |
| NMH2405S   | 24                    | 5                    | ±200                 | 103                         | 81         | 41                    | 2             |
| NMH2409S   | 24                    | 9                    | ±111                 | 98                          | 85         | 75                    |               |
| NMH2412S   | 24                    | 12                   | ±83                  | 97                          | 86         | 95                    |               |
| NMH2415S   | 24                    | 15                   | ±67                  | 97                          | 86         | 104                   |               |
| NMH4805D   | 48                    | 5                    | ±200                 | 51                          | 82         | 45                    | 1             |
| NMH4809D   | 48                    | 9                    | ±111                 | 51                          | 82         | 74                    |               |
| NMH4812D   | 48                    | 12                   | ±83                  | 49                          | 85         | 90                    |               |
| NMH4815D   | 48                    | 15                   | ±67                  | 49                          | 85         | 112                   |               |
| NMH4805S   | 48                    | 5                    | ±200                 | 51                          | 82         | 45                    | 2             |
| NMH4809S   | 48                    | 9                    | ±111                 | 51                          | 82         | 74                    |               |
| NMH4812S   | 48                    | 12                   | ±83                  | 49                          | 85         | 90                    |               |
| NMH4815S   | 48                    | 15                   | ±67                  | 49                          | 85         | 112                   |               |

# NMH SERIES

## Isolated 2W Dual Output DC-DC Converters

### family characteristics - input

Specifications typical at  $T_A=25^{\circ}\text{C}$ , nominal input voltage and rated output current unless otherwise specified.

| Parameter                | Conditions                            | MIN  | NOM | MAX  | Units  |
|--------------------------|---------------------------------------|------|-----|------|--------|
| Voltage Range            | Continuous operation, 5V input types  | 4.5  | 5   | 5.5  | V      |
|                          | Continuous operation, 12V input types | 10.8 | 12  | 13.2 |        |
|                          | Continuous operation, 24V input types | 21.6 | 24  | 26.4 |        |
|                          | Continuous operation, 48V input types | 43.2 | 48  | 52.8 |        |
| Reflected Ripple Current | 5V input types                        |      | 50  |      | mA p-p |
|                          | 12V input types                       |      | 70  |      |        |
|                          | 24V input types                       |      | 130 |      |        |
|                          | 48V input types                       |      | 200 |      |        |

### family characteristics - output

Specifications typical at  $T_A=25^{\circ}\text{C}$ , nominal input voltage and rated output current unless otherwise specified.

| Parameter                | Conditions  | MIN | TYP | MAX | Units  |
|--------------------------|---|-----|-----|-----|--------|
| Rated Power <sup>1</sup> | $T_A = -40^{\circ}\text{C}$ to $85^{\circ}\text{C}$ |     |     | 2   | W      |
| Output Voltage Accuracy  | NMH0505   | -5  |     | 7.5 | %      |
|                          | All other types                                     | -5  |     | 5   |        |
| Line Regulation          | High $V_{IN}$ to low $V_{IN}$                       |     | 1.0 | 1.2 | %/%    |
| Load Regulation          | 10% load to rated load, 5V output types             |     | 5   | 10  | %      |
|                          | 10% load to rated load, 9V, 12V & 15V output types  |     | 3   | 10  |        |
| Ripple and Noise         | BW=DC to 20MHz, 5V output types                     |     | 150 | 200 | mV p-p |
|                          | BW=DC to 20MHz, 9V output types                     |     | 100 | 150 |        |
|                          | BW=DC to 20MHz, 12V output types                    |     | 80  | 150 |        |
|                          | BW=DC to 20MHz, 15V output types                    |     | 70  | 150 |        |

<sup>1</sup> See derating curve.

# NMH SERIES

## Isolated 2W Dual Output DC-DC Converters

### family characteristics - isolation

Specifications typical at  $T_A=25^{\circ}\text{C}$ .

| Parameter         | Conditions                | MIN  | TYP | MAX | Units            |
|-------------------|---------------------------|------|-----|-----|------------------|
| Isolation Voltage | Flash tested for 1 second | 1000 |     |     | VDC              |
| Test Voltage      | 50Hz, 10 seconds          | 1000 |     |     | Vpk              |
| Resistance        | Viso=500V                 | 1    | 10  |     | $\text{G}\Omega$ |

### family characteristics - general

Specifications typical at  $T_A=25^{\circ}\text{C}$ , nominal input voltage and rated output current unless otherwise specified.

| Parameter           | Conditions      | MIN | TYP  | MAX | Units |
|---------------------|-----------------|-----|------|-----|-------|
| Switching Frequency | 5V input types  |     | 95   |     | kHz   |
|                     | 12V input types |     | 90   |     |       |
|                     | 24V input types |     | 80   |     |       |
|                     | 48V input types |     | 80   |     |       |
| Package Weight      | SIL             |     | 2.76 |     | g     |
|                     | DIL             |     | 2.85 |     |       |
| Efficiency          | 100% load       | 70  |      |     | %     |
| Power Consumption   | 0% load         |     | 300  |     | mW    |

### family characteristics - temperature

Specifications typical at  $T_A=25^{\circ}\text{C}$ , nominal input voltage and rated output current unless otherwise specified.

| Parameter                      | Conditions             | MIN | TYP | MAX | Units              |
|--------------------------------|------------------------|-----|-----|-----|--------------------|
| Specification                  | All output types       | -40 |     | 85  | $^{\circ}\text{C}$ |
| Storage                        |                        | -50 |     | 130 | $^{\circ}\text{C}$ |
| Case Temperature above Ambient | 5V output types        |     | 30  |     | $^{\circ}\text{C}$ |
|                                | All other output types |     | 25  |     |                    |

# NMH SERIES

## Isolated 2W Dual Output DC-DC Converters

### family characteristics - mean time to failure (MTTF)<sup>1</sup>

| Part Number | -40°C | 25°C | 85°C | Units |
|-------------|-------|------|------|-------|
| NMH0505     | 2004  | 1574 | 1101 | kHrs  |
| NMH0509     | 812   | 663  | 518  |       |
| NMH0512     | 409   | 338  | 274  |       |
| NMH0515     | 225   | 187  | 154  |       |
| NMA1205     | 599   | 490  | 388  | kHrs  |
| NMH1209     | 416   | 343  | 278  |       |
| NMH1212     | 277   | 229  | 188  |       |
| NMH1215     | 178   | 148  | 123  |       |
| NMH2405     | 386   | 318  | 258  | kHrs  |
| NMH2409     | 301   | 249  | 204  |       |
| NMH2412     | 220   | 183  | 151  |       |
| NMH2415     | 153   | 127  | 106  |       |
| NMH4805     | 285   | 235  | 192  | kHrs  |
| NMH4809     | 236   | 195  | 161  |       |
| NMH4812     | 184   | 152  | 126  |       |
| NMH4815     | 134   | 112  | 93   |       |

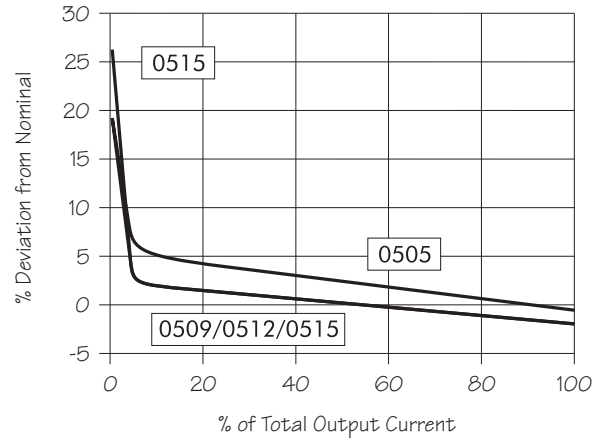
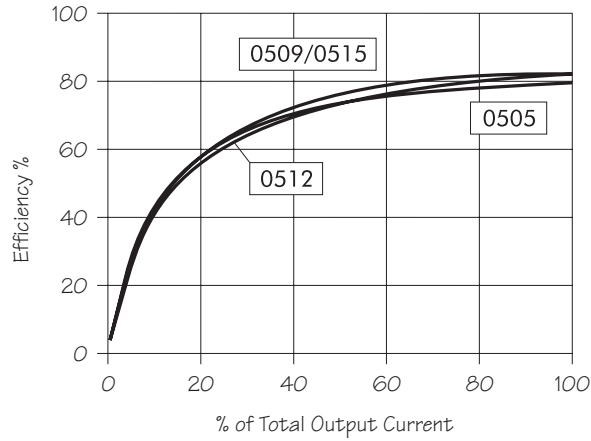
<sup>1</sup> Calculated using MIL-HDBK-217F with nominal input voltage at full load.

# NMH SERIES

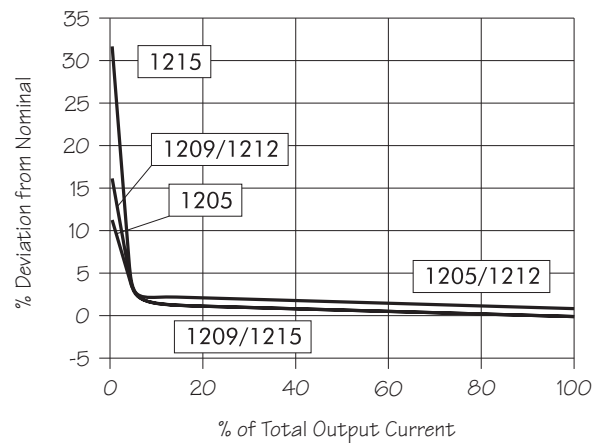
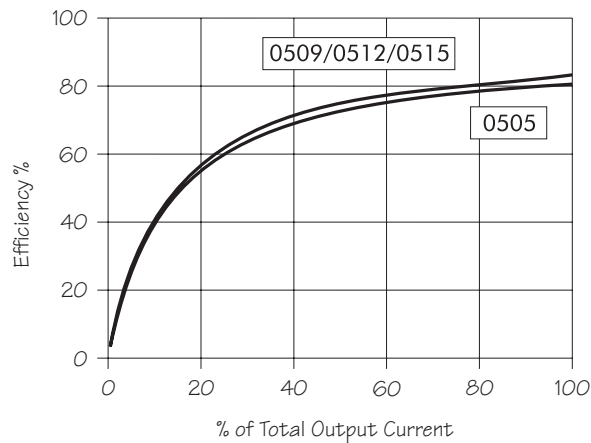
## Isolated 2W Dual Output DC-DC Converters

### typical characteristics<sup>1</sup>

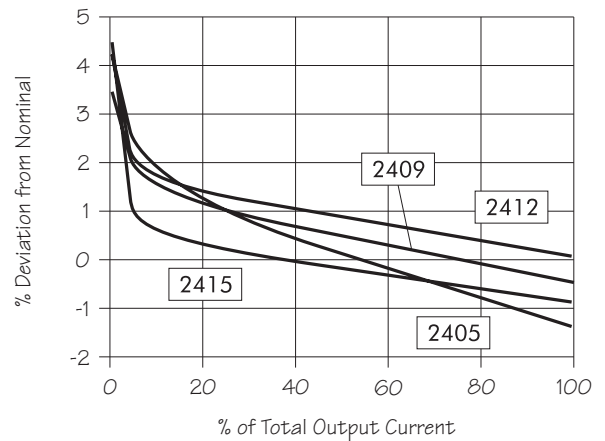
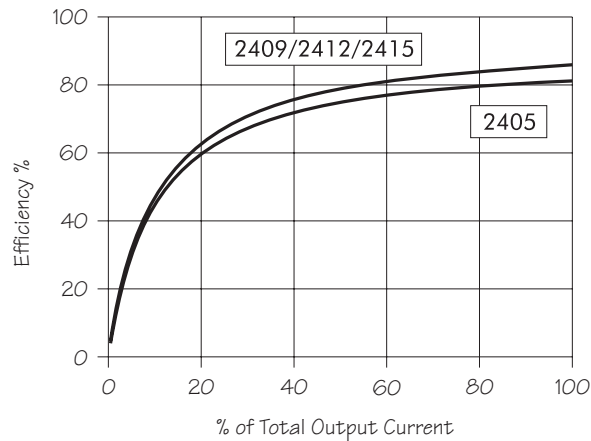
#### NMH05 series



#### NMH12 series



#### NMH24 series



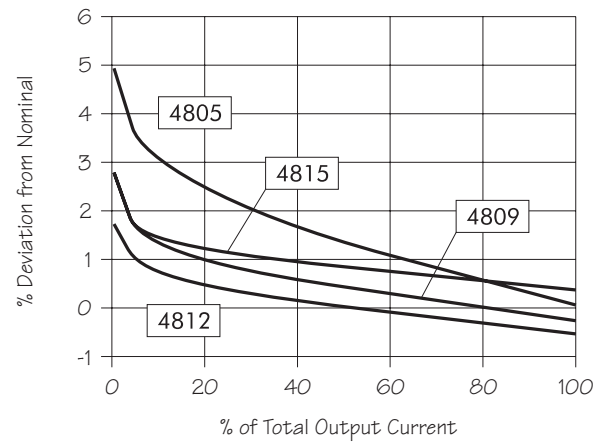
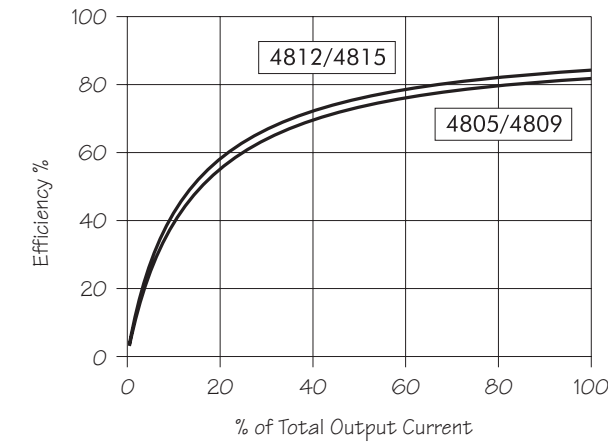
<sup>1</sup> All data taken at  $T_A = 25^\circ\text{C}$ .

# NMH SERIES

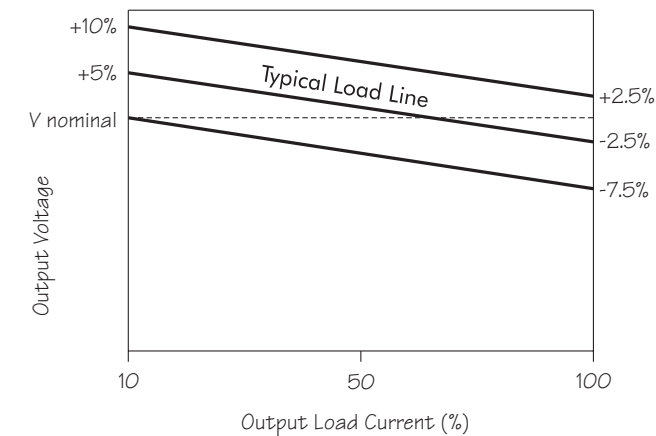
## Isolated 2W Dual Output DC-DC Converters

### typical characteristics<sup>1</sup>

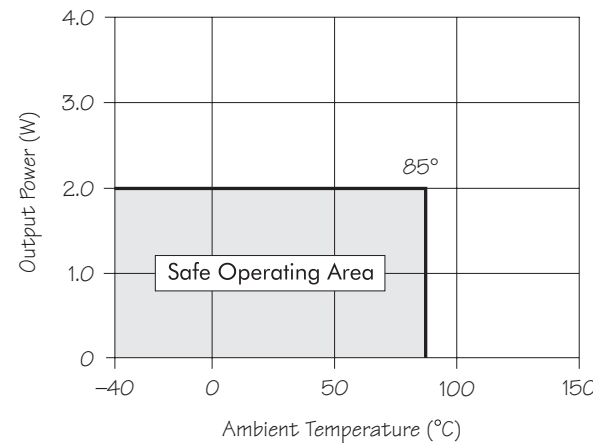
#### NMH48 series



### tolerance envelope



### temperature derating



<sup>1</sup> All data taken at T<sub>A</sub>=25°C.

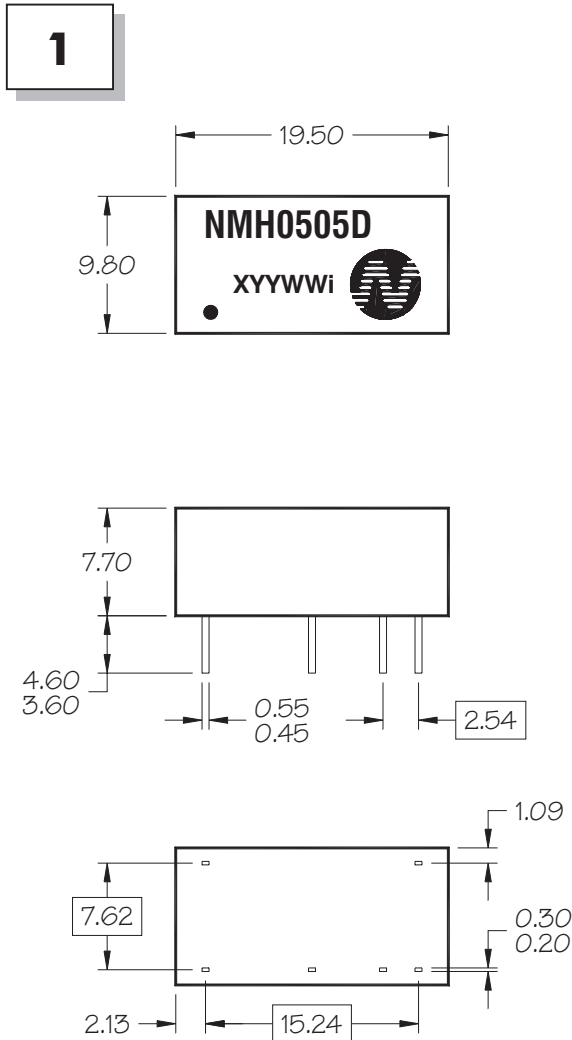


# NMH SERIES

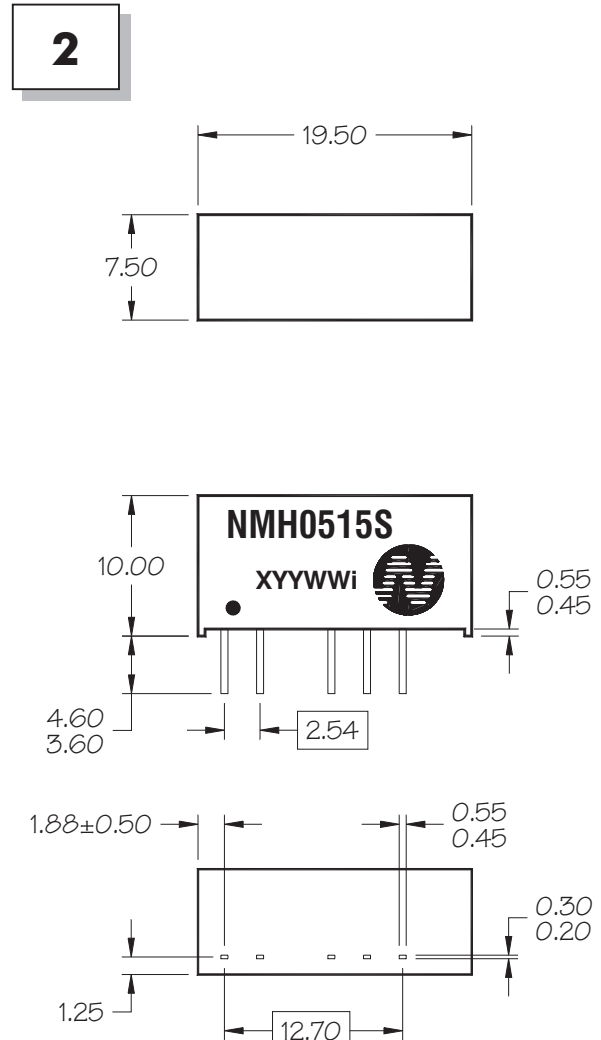
## Isolated 2W Dual Output DC-DC Converters

### outline dimensions<sup>1</sup>

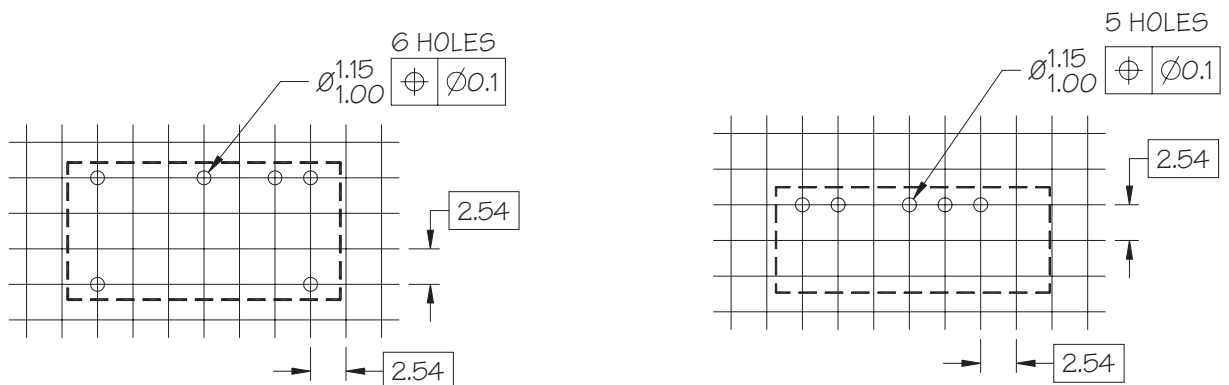
#### 14 Pin DIP Package style



#### 7 Pin SIP package style



### recommended footprint details



<sup>1</sup> All dimensions in mm XX.XX ±0.25mm.  
All pins on a 2.54mm pitch and within Ø0.25mm of true pin pitch position.