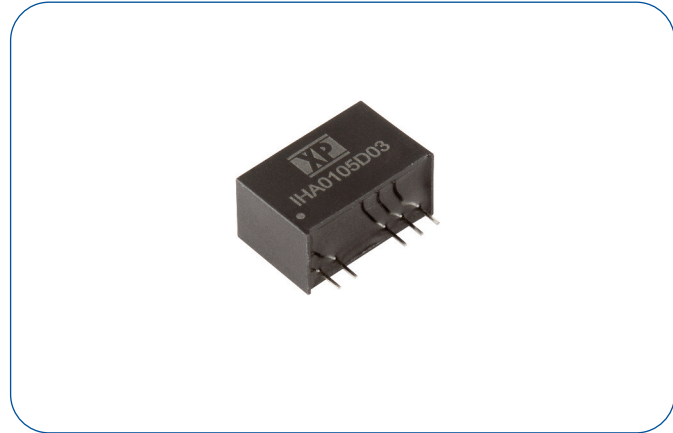


### 1 Watt

- High Isolation, 6000 V
- 250 VAC Working Voltage
- Single and Dual Outputs
- Bipolar Outputs for MOSFET and IGBT Drives
- SIP7 Package
- -40 °C to +85 °C Operation
- Full Load at 85 °C Ambient
- MTBF 2.5 Mhrs
- 3 Year Warranty



#### Dimensions:

**IHA01:**  
0.77 x 0.39 x 0.49" (19.5 x 9.8 x 12.5 mm)

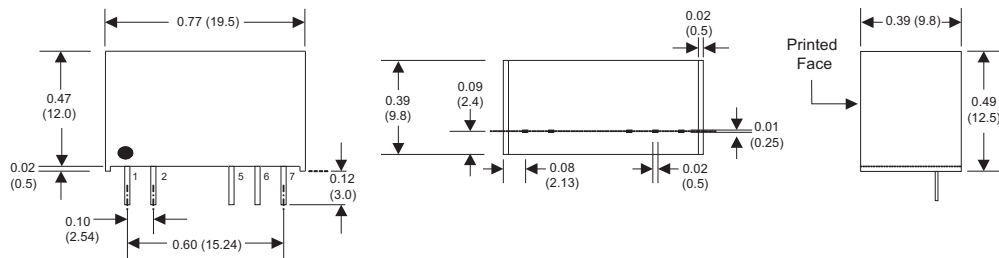
#### Input

| Characteristic                 | Minimum | Typical | Maximum | Units          | Notes & Conditions                                   |
|--------------------------------|---------|---------|---------|----------------|--|
| Input Voltage Range            | 4.5     |         | 5.5     | VDC            | 5 V nominal  |
|                                | 8.1     |         | 9.9     |                | 9 V nominal  |
|                                | 10.8    |         | 13.2    |                | 12 V nominal   |
|                                | 13.5    |         | 16.5    |                | 15 V nominal   |
|                                | 21.6    |         | 26.4    |                | 24 V nominal   |
| Input Reflected Ripple Current |         | 20      |         | mA pk-pk       | Through 12 $\mu$ H inductor and 47 $\mu$ F capacitor |
| Input Surge                    |         |         | 7       | VDC for 100 ms | 5 V nominal  |
|                                |         |         | 12      |                | 9 V nominal  |
|                                |         |         | 15      |                | 12 V nominal   |
|                                |         |         | 18      |                | 15 V nominal   |
|                                |         |         | 28      |                | 24 V nominal   |

#### Output

| Characteristic           | Minimum | Typical | Maximum   | Units    | Notes & Conditions  |
|--------------------------|---------|---------|-----------|----------|---|
| Output Voltage           | 3.3     |         | 30        | VDC      | See Models and Ratings table  |
| Initial Set Accuracy     |         |         | $\pm 3$   | %        | At full load  |
| Minimum Load             | 10      |         |           | %        | Minimum load required to meet specified regulation  |
| Line Regulation          |         |         | $\pm 1.2$ | %/1%     | Output changes by max of 1.2% for each 1% change in input voltage                                       |
| Load Regulation          |         |         | 10        | %        | From 10% to full load, see application note   |
| Cross Regulation         |         | $\pm 4$ |           | %        | On dual output models, when one output is at 25% load and other is varied from 10% load to full load    |
| Ripple & Noise           |         |         | 200       | mV pk-pk | 20 MHz bandwidth. Measured using 10 $\mu$ F electrolytic in parallel with 0.1 $\mu$ F ceramic capacitor |
| Short Circuit Protection |         |         |           |          | Continuous  |
| Maximum Capacitive Load  |         |         |           |          | See Models and Ratings table  |
| Temperature Coefficient  |         |         | 0.03      | %/°C     |   |

#### Mechanical Details



| Pin Connections |        |        |
|-----------------|--------|--------|
| Pin             | Single | Dual   |
| 1               | +Vin   | +Vin   |
| 2               | -Vin   | -Vin   |
| 5               | -Vout  | -Vout  |
| 6               | No Pin | Common |
| 7               | +Vout  | +Vout  |

#### Notes

1. All dimensions are in inches (mm)
2. Weight: 0.009 lbs (4.3 g) approx.
3. Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)

4. Pin pitch and length tolerance:  $\pm 0.014$  ( $\pm 0.35$ )
5. Case tolerance:  $\pm 0.02$  ( $\pm 0.5$ )

### Models & Ratings

| Input Voltage | Output Voltage | Output Current  | Input current |           | Max. capacitive load | Efficiency | Model Number |
|---------------|----------------|-----------------|---------------|-----------|----------------------|------------|--------------|
|               |                |                 | No Load       | Full Load |                      |            |              |
| 4.5-5.5 V     | 3V3            | 303 mA          | 30 mA         | 280 mA    | 220 µF               | 71%        | IHA0105S3V3  |
|               | 5 V            | 200 mA          | 30 mA         | 265 mA    | 220 µF               | 75%        | IHA0105S05   |
|               | 9 V            | 111 mA          | 30 mA         | 260 mA    | 220 µF               | 77%        | IHA0105S09   |
|               | 12 V           | 83 mA           | 45 mA         | 265 mA    | 220 µF               | 76%        | IHA0105S12   |
|               | 15 V           | 67 mA           | 40 mA         | 260 mA    | 220 µF               | 77%        | IHA0105S15   |
|               | ±3V3           | ±151 mA         | 30 mA         | 275 mA    | ±100 µF              | 73%        | IHA0105D03   |
|               | ±5 V           | ±100 mA         | 30 mA         | 265 mA    | ±100 µF              | 75%        | IHA0105D05   |
|               | ±9 V           | ±56 mA          | 30 mA         | 260 mA    | ±100 µF              | 77%        | IHA0105D09   |
|               | ±12 V          | ±42 mA          | 45 mA         | 265 mA    | ±100 µF              | 76%        | IHA0105D12   |
|               | ±15 V          | ±33 mA          | 40 mA         | 260 mA    | ±100 µF              | 77%        | IHA0105D15   |
|               | +15 V / -9 V   | +33 mA / -55 mA | 40 mA         | 265 mA    | ±100 µF              | 76%        | IHA0105D1509 |
| 8.1-9.9 V     | 3V3            | 303 mA          | 20 mA         | 155 mA    | 220 µF               | 72%        | IHA0109S3V3  |
|               | 5 V            | 200 mA          | 25 mA         | 145 mA    | 220 µF               | 77%        | IHA0109S05   |
|               | 9 V            | 111 mA          | 25 mA         | 140 mA    | 220 µF               | 79%        | IHA0109S09   |
|               | 12 V           | 83 mA           | 25 mA         | 145 mA    | 220 µF               | 77%        | IHA0109S12   |
|               | 15 V           | 67 mA           | 25 mA         | 140 mA    | 220 µF               | 79%        | IHA0109S15   |
|               | ±3V3           | ±151 mA         | 25 mA         | 155 mA    | ±100 µF              | 73%        | IHA0109D03   |
|               | ±5 V           | ±100 mA         | 25 mA         | 150 mA    | ±100 µF              | 75%        | IHA0109D05   |
|               | ±9 V           | ±56 mA          | 25 mA         | 140 mA    | ±100 µF              | 79%        | IHA0109D09   |
|               | ±12 V          | ±42 mA          | 25 mA         | 145 mA    | ±100 µF              | 77%        | IHA0109D12   |
|               | ±15 V          | ±33 mA          | 25 mA         | 140 mA    | ±100 µF              | 79%        | IHA0109D15   |
|               | +15 V / -9 V   | +33 mA / -55 mA | 25 mA         | 140 mA    | ±100 µF              | 78%        | IHA0109D1509 |
| 10.8-13.2 V   | 3V3            | 303 mA          | 20 mA         | 120 mA    | 220 µF               | 70%        | IHA0112S3V3  |
|               | 5 V            | 200 mA          | 20 mA         | 115 mA    | 220 µF               | 73%        | IHA0112S05   |
|               | 9 V            | 111 mA          | 20 mA         | 110 mA    | 220 µF               | 77%        | IHA0112S09   |
|               | 12 V           | 83 mA           | 20 mA         | 115 mA    | 220 µF               | 73%        | IHA0112S12   |
|               | 15 V           | 67 mA           | 20 mA         | 110 mA    | 220 µF               | 76%        | IHA0112S15   |
|               | ±3V3           | ±151 mA         | 20 mA         | 115 mA    | ±100 µF              | 72%        | IHA0112D03   |
|               | ±5 V           | ±100 mA         | 20 mA         | 115 mA    | ±100 µF              | 73%        | IHA0112D05   |
|               | ±9 V           | ±56 mA          | 20 mA         | 110 mA    | ±100 µF              | 77%        | IHA0112D09   |
|               | ±12 V          | ±42 mA          | 20 mA         | 115 mA    | ±100 µF              | 74%        | IHA0112D12   |
|               | ±15 V          | ±33 mA          | 20 mA         | 110 mA    | ±100 µF              | 76%        | IHA0112D15   |
|               | +15 V / -9 V   | +33 mA / -55 mA | 20 mA         | 110 mA    | ±100 µF              | 76%        | IHA0112D1509 |
| 13.5-16.5 V   | 3V3            | 303 mA          | 15 mA         | 91 mA     | 220 µF               | 73%        | IHA0115S3V3  |
|               | 5 V            | 200 mA          | 15 mA         | 87 mA     | 220 µF               | 77%        | IHA0115S05   |
|               | 9 V            | 111 mA          | 15 mA         | 83 mA     | 220 µF               | 80%        | IHA0115S09   |
|               | 12 V           | 83 mA           | 15 mA         | 83 mA     | 220 µF               | 80%        | IHA0115S12   |
|               | 15 V           | 67 mA           | 15 mA         | 84 mA     | 220 µF               | 79%        | IHA0115S15   |
|               | ±3V3           | ±151 mA         | 15 mA         | 89 mA     | ±100 µF              | 75%        | IHA0115D03   |
|               | ±5 V           | ±100 mA         | 15 mA         | 84 mA     | ±100 µF              | 79%        | IHA0115D05   |
|               | ±9 V           | ±56 mA          | 15 mA         | 82 mA     | ±100 µF              | 81%        | IHA0115D09   |
|               | ±12 V          | ±42 mA          | 15 mA         | 83 mA     | ±100 µF              | 80%        | IHA0115D12   |
|               | ±15 V          | ±33 mA          | 15 mA         | 83 mA     | ±100 µF              | 80%        | IHA0115D15   |
|               | +15 V / -9 V   | +33 mA / -55 mA | 12 mA         | 79 mA     | ±100 µF              | 84%        | IHA0115D1509 |
| 21.6-26.4 V   | 3V3            | 303 mA          | 15 mA         | 60 mA     | 220 µF               | 70%        | IHA0124S3V3  |
|               | 5 V            | 200 mA          | 15 mA         | 59 mA     | 220 µF               | 71%        | IHA0124S05   |
|               | 9 V            | 111 mA          | 15 mA         | 60 mA     | 220 µF               | 70%        | IHA0124S09   |
|               | 12 V           | 83 mA           | 15 mA         | 58 mA     | 220 µF               | 72%        | IHA0124S12   |
|               | 15 V           | 67 mA           | 15 mA         | 57 mA     | 220 µF               | 73%        | IHA0124S15   |
|               | ±3V3           | ±151 mA         | 10 mA         | 61 mA     | ±100 µF              | 68%        | IHA0124D03   |
|               | ±5 V           | ±100 mA         | 15 mA         | 60 mA     | ±100 µF              | 69%        | IHA0124D05   |
|               | ±9 V           | ±56 mA          | 15 mA         | 57 mA     | ±100 µF              | 73%        | IHA0124D09   |
|               | ±12 V          | ±42 mA          | 15 mA         | 58 mA     | ±100 µF              | 72%        | IHA0124D12   |
|               | ±15 V          | ±33 mA          | 15 mA         | 56 mA     | ±100 µF              | 75%        | IHA0124D15   |
|               | +15 V / -9 V   | +33 mA / -55 mA | 15 mA         | 56 mA     | ±100 µF              | 74%        | IHA0124D1509 |

### Notes

Input currents measured at nominal input voltage.

### General

| Characteristic             | Minimum         | Typical     | Maximum | Units             | Notes & Conditions           |
|----------------------------|-----------------|-------------|---------|-------------------|------------------------------|
| Efficiency                 |                 | 77          |         | %                 | See Models and Ratings table |
| Isolation: Input to Output | 6000            |             |         | VDC               |                              |
| Isolation Working Voltage  |                 |             | 250     | VAC               |                              |
| Isolation Resistance       | 10 <sup>9</sup> |             |         | Ω                 |                              |
| Isolation Capacitance      |                 |             | 10      | pF                |                              |
| Switching Frequency        | 20              |             | 50      | kHz               |                              |
| Power Density              |                 |             | 6.8     | W/in <sup>3</sup> |                              |
| Mean Time Between Failure  | 2.39            |             |         | MHrs              | MIL-HDBK-217F, +25 °C GB     |
| Weight                     |                 | 0.009 (4.2) |         | lb (g)            |                              |

### Environmental

| Characteristic        | Minimum | Typical | Maximum | Units | Notes & Conditions  |
|-----------------------|---------|---------|---------|-------|---------------------|
| Operating Temperature | -40     |         | +85     | °C    | No thermal derating |
| Storage Temperature   | -40     |         | +125    | °C    |                     |
| Case Temperature      |         |         | +100    | °C    |                     |
| Humidity              | 2.5     |         | 95      | %RH   | Non-condensing      |
| Cooling               |         |         |         |       | Natural convection  |

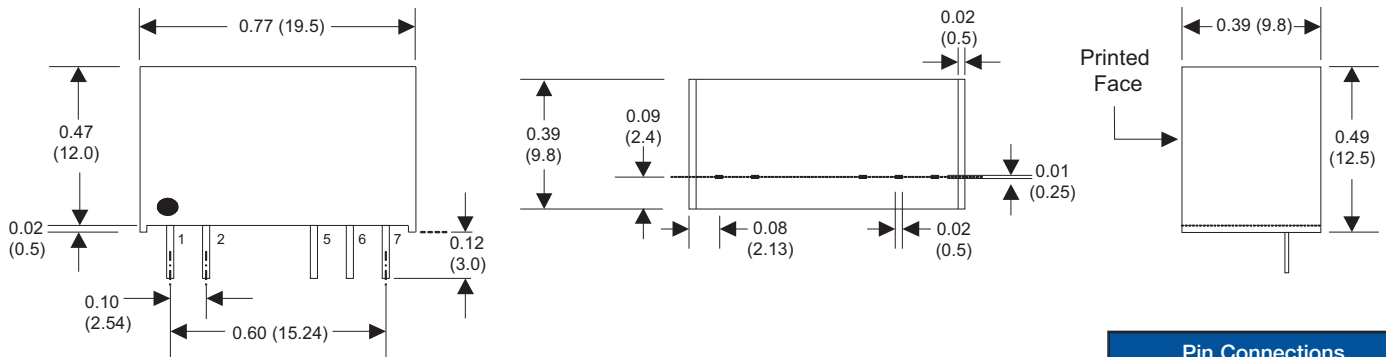
### EMC: Emissions

| Phenomenon | Standard | Test Level | Notes & Conditions   |
|------------|----------|------------|----------------------|
| Conducted  | EN55022  | Class B    | See Application Note |
| Radiated   | EN55022  | Class B    |                      |

### EMC: Immunity

| Phenomenon         | Standard    | Test Level       | Criteria | Notes & Conditions                                  |
|--------------------|-------------|------------------|----------|---|
| ESD Immunity       | EN61000-4-2 | $\pm 6/\pm 8$ kV | A        | Contact/Air Discharge                               |
| Radiated Immunity  | EN61000-4-3 | 10 Vrms          | A        |   |
| EFT/Burst          | EN61000-4-4 | 2 kV             | A        | External components required, see application notes |
| Conducted Immunity | EN61000-4-6 | 10 V rms         | A        |   |
| Magnetic Fields    | EN61000-4-8 | 1 A/m            | A        |   |

### Mechanical Details



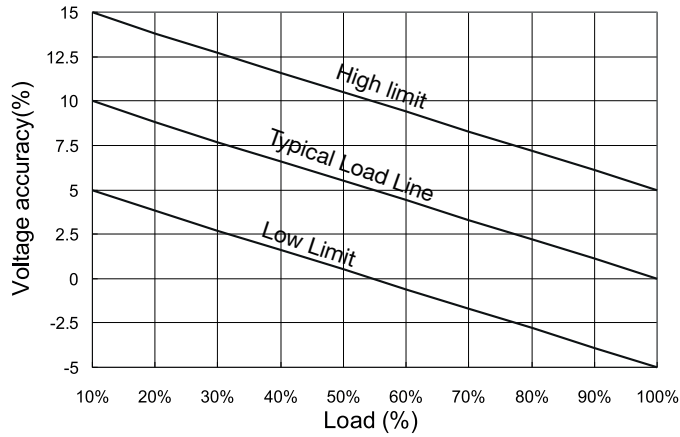
### Notes

- All dimensions are in inches (mm)
- Weight: 0.009 lbs (4.3 g) approx.
- Pin diameter:  $0.02 \pm 0.002$  (0.5  $\pm$  0.05)
- Pin pitch and length tolerance:  $\pm 0.014$  ( $\pm 0.35$ )
- Case tolerance:  $\pm 0.02$  ( $\pm 0.5$ )

| Pin Connections |        |        |
|-----------------|--------|--------|
| Pin             | Single | Dual   |
| 1               | +Vin   | +Vin   |
| 2               | -Vin   | -Vin   |
| 5               | -Vout  | -Vout  |
| 6               | No Pin | Common |
| 7               | +Vout  | +Vout  |

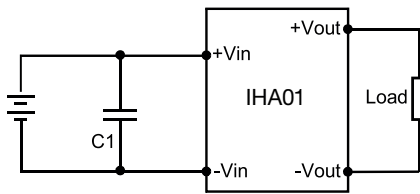
### Application Note

#### Regulation



#### EFT Filter

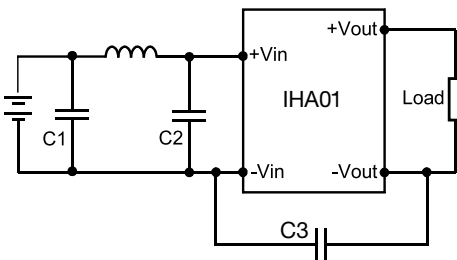
Input component C1 is used to help meet EFT test requirements for the module.



|             | C1               |
|-------------|------------------|
| IHA0105XXXX | 470 $\mu$ F/35 V |
| IHA0109XXXX | 470 $\mu$ F/35 V |
| IHA0112XXXX | 470 $\mu$ F/35 V |
| IHA0115XXXX | 470 $\mu$ F/35 V |
| IHA0124XXXX | 470 $\mu$ F/35 V |

#### EMI Filter

Input filter components (C1,C2, C3 and L) are used to help meet conducted emissions requirements for the module. These components should be mounted as close as possible to the module, and all leads should be minimised to decrease radiated noise.



|             | C1                      | L          | C2                       | C3                 |
|-------------|-------------------------|------------|--------------------------|--------------------|
| IHA0105XXXX | 1206, 4.7 $\mu$ F/ 50 V | 18 $\mu$ H |                          |                    |
| IHA0109XXXX | 1206, 4.7 $\mu$ F/ 50 V | 18 $\mu$ H |                          |                    |
| IHA0112XXXX | 1206, 4.7 $\mu$ F/ 50 V | 18 $\mu$ H |                          |                    |
| IHA0115XXXX | 1206, 4.7 $\mu$ F/ 50 V | 18 $\mu$ H |                          |                    |
| IHA0124XXXX | 1206, 4.7 $\mu$ F/ 50 V | 18 $\mu$ H | 1210, 2.2 $\mu$ F/ 100 V | 1206, 470 pF/ 2 kV |

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