

# 50-200 Watts

## ICH/IFH Series



- 2:1 & 4:1 Input Ranges
- Efficiency up to 90%
- Single Output
- -40 °C to +100 °C Operating Temperature
- Continuous Short Circuit Protection
- Five-sided Metal Case
- 3 Year Warranty

### Specification

#### Input

- |                                  |  |
|----------------------------------|--|
| Input Voltage Range              | • See tables   |
| Input Current (no load)          | • See tables   |
| Input Reverse Voltage Protection | • None   |
| Input Filter                     | • Pi network   |
| Undervoltage Lockout             | • 2:1 Input Models:<br>12 Vin, power up 8.8 V, down 8.0 V<br>24 Vin, power up 17.0 V, down 16.0 V<br>48 Vin, power up 34.0 V, down 32.5 V<br><br>4:1 Input Models:<br>24 Vin, power up 8.8 V, down 8.0 V<br>48 Vin, power up 17.0 V, down 16.0 V |

#### Output

- |                          |  |
|--------------------------|--|
| Output Voltage Trim      | • $\pm 10\%$   |
| Initial Set Accuracy     | • $\pm 1\%$ max (ICH100: $\pm 1.5\%$ )   |
| Line Regulation          | • $\pm 0.2\%$ max measured from high line to low line  |
| Load Regulation          | • $\pm 0.2\%$ max measured from 0-100% load  |
| Transient Response       | • 5% max deviation, recovery to within 1% in 500 $\mu$ s, 25% step load change   |
| Ripple & Noise           | • 2.5, 3.3 & 5 V models: 100 mV pk-pk<br>12 & 15 V models: 150 mV pk-pk<br>24, 28 & 48 V models: 1% max pk-pk<br>ICH50/75 - 2.5 V, 3.3 V, 5 V models: 75mV<br>12 V, 15 V models: 100 mV<br>20 MHz bandwidth (see note 3)                                     |
| Overvoltage Protection   | • 115-140%   |
| Short Circuit Protection | • ICH50/75/100W/IFH200-: Trip & restart (hiccup mode) with auto recovery<br>ICH50W/75W/100/150 & IFH200: Current limit, auto recovery  |
| Temperature Coefficient  | • $\pm 0.03\%/^{\circ}\text{C}$  |
| Current Limit            | • IFH200: 110-150% nominal output, all other models: 110-160% nominal output   |
| Remote On/Off            | • See note 1 & 2   |
| Thermal Shutdown         | • ICH50/50W/75/75W/100/150:<br>Thermal shutdown when case temperature reaches 100 °C, auto recovery when case temperature < +60 °C<br>ICH100W/IFH200:<br>Thermal shutdown when case temperature reaches 105 °C, auto recovery when case temperature < +90 °C |

#### General

- |                      |  |
|----------------------|--|
| Efficiency           | • See tables   |
| Isolation Voltage    | • 1500 VDC Input to Output<br>1500 VDC Input to Case<br>1500 VDC Output to Case  |
| Isolation Resistance | • 10 <sup>7</sup> ohms min   |
| Switching Frequency  | • ICH50/75 12-24V models: 400 kHz typical<br>ICH50/75 48 V models: 300 kHz typical<br>ICH50W/75W: 300 kHz typical<br>ICH100/ICH150: 500 kHz typical<br>ICH100W: 250 kHz typical<br>IFH200: 350 kHz typical |
| Power Density        | • ICH50: 18.3 W/in <sup>3</sup><br>ICH75: 27.4 W/in <sup>3</sup><br>ICH100: 36.6 W/in <sup>3</sup><br>ICH150: 54.8 W/in <sup>3</sup><br>IFH200: 34.8 W/in <sup>3</sup>                                     |
| MTBF                 | • $\geq 790$ kWhrs to MIL-HDBK-217F at 25 °C, GB   |

#### Environmental

- |                            |  |
|----------------------------|--|
| Operating Case Temperature | • -40 °C to +100 °C, see derating curve  |
| Storage Temperature        | • ICH50/75: -55 °C to +105 °C<br>ICH100/150 & IFH200: -40 °C to +105 °C                  |
| Shock                      | • 30 g pk, half sine wave for 18 ms, 3 pulses per face, all 6 faces tested on all 3 axes |
| Vibration                  | • 5-500 Hz at 3 g, 10 mins per axis  |

#### EMC & Safety

- |                    |   |
|--------------------|---|
| Emissions          | • EN55022, level A conducted with external components |
| ESD Immunity       | • EN61000-4-2, level 2 Perf Criteria A                |
| EFT/Burst          | • EN61000-4-4, level 1, Perf Criteria A               |
| Surge              | • EN61000-4-5, installation class 1, Perf Criteria A  |
| Conducted Immunity | • EN61000-4-6, 3 V rms Perf Criteria A                |
| Magnetic Field     | • EN61000-4-8, 1 A/m, Perf Criteria A                 |
| Safety Approvals   | • UL60950-1 (ICH100W not UL approved)                 |

# Models and Ratings

# ICH/IFH Series

| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2,5)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-------------------------------|
|                             |                |                | No Load                      | Full Load |            |                               |
| 9-18 VDC<br>(12 V nominal)  | 2.5 V          | 10.00 A        | 50 mA                        | 2740 mA   | 76%        | ICH5012S2V5                   |
|                             | 3.3 V          | 10.00 A        | 50 mA                        | 3525 mA   | 78%        | ICH5012S3V3                   |
|                             | 5.0 V          | 10.00 A        | 50 mA                        | 5145 mA   | 81%        | ICH5012S05                    |
|                             | 12.0 V         | 4.16 A         | 50 mA                        | 4950 mA   | 84%        | ICH5012S12                    |
|                             | 15.0 V         | 3.33 A         | 50 mA                        | 4950 mA   | 84%        | ICH5012S15                    |
|                             | 24.0 V         | 2.08 A         | 50 mA                        | 4950 mA   | 84%        | ICH5012S24                    |
| 18-36 VDC<br>(24 V nominal) | 2.5 V          | 10.00 A        | 50 mA                        | 1353 mA   | 77%        | ICH5024S2V5                   |
|                             | 3.3 V          | 10.00 A        | 50 mA                        | 1740 mA   | 79%        | ICH5024S3V3                   |
|                             | 5.0 V          | 10.00 A        | 50 mA                        | 2540 mA   | 82%        | ICH5024S05                    |
|                             | 12.0 V         | 4.16 A         | 50 mA                        | 2450 mA   | 85%        | ICH5024S12                    |
|                             | 15.0 V         | 3.33 A         | 50 mA                        | 2450 mA   | 85%        | ICH5024S15                    |
|                             | 24.0 V         | 2.08 A         | 50 mA                        | 2419 mA   | 86%        | ICH5024S24                    |
| 36-75 VDC<br>(48 V nominal) | 2.5 V          | 10.00 A        | 50 mA                        | 676 mA    | 77%        | ICH5048S2V5                   |
|                             | 3.3 V          | 10.00 A        | 50 mA                        | 870 mA    | 79%        | ICH5048S3V3                   |
|                             | 5.0 V          | 10.00 A        | 50 mA                        | 1250 mA   | 83%        | ICH5048S05                    |
|                             | 12.0 V         | 4.16 A         | 50 mA                        | 1220 mA   | 85%        | ICH5048S12                    |
|                             | 15.0 V         | 3.33 A         | 50 mA                        | 1220 mA   | 85%        | ICH5048S15                    |
|                             | 24.0 V         | 2.08 A         | 50 mA                        | 1209 mA   | 86%        | ICH5048S24                    |

| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                             |                |                | No Load                      | Full Load |            |                             |
| 9-36 VDC<br>(24 V nominal)  | 3.3 V          | 10.00 A        | 50 mA                        | 1785 mA   | 77%        | ICH5024WS3V3                |
|                             | 5.0 V          | 10.00 A        | 50 mA                        | 2570 mA   | 81%        | ICH5024WS05                 |
|                             | 12.0 V         | 4.16 A         | 50 mA                        | 2510 mA   | 83%        | ICH5024WS12                 |
|                             | 15.0 V         | 3.33 A         | 50 mA                        | 2510 mA   | 83%        | ICH5024WS15                 |
|                             | 24.0 V         | 2.08 A         | 50 mA                        | 2510 mA   | 83%        | ICH5024WS24                 |
| 18-75 VDC<br>(48 V nominal) | 3.3 V          | 10.00 A        | 50 mA                        | 880 mA    | 78%        | ICH5048WS3V3                |
|                             | 5.0 V          | 10.00 A        | 50 mA                        | 1270 mA   | 82%        | ICH5048WS05                 |
|                             | 12.0 V         | 4.16 A         | 50 mA                        | 1240 mA   | 84%        | ICH5048WS12                 |
|                             | 15.0 V         | 3.33 A         | 50 mA                        | 1240 mA   | 84%        | ICH5048WS15                 |
|                             | 24.0 V         | 2.08 A         | 50 mA                        | 1240 mA   | 84%        | ICH5048WS24                 |

| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2,5)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-------------------------------|
|                             |                |                | No Load                      | Full Load |            |                               |
| 9-18 VDC<br>(12 V nominal)  | 2.5 V          | 15.00 A        | 50 mA                        | 4110 mA   | 76%        | ICH7512S2V5                   |
|                             | 3.3 V          | 15.00 A        | 50 mA                        | 5290 mA   | 78%        | ICH7512S3V3                   |
|                             | 5.0 V          | 15.00 A        | 50 mA                        | 7715 mA   | 81%        | ICH7512S05                    |
|                             | 12.0 V         | 6.25 A         | 50 mA                        | 7440 mA   | 84%        | ICH7512S12                    |
|                             | 15.0 V         | 5.00 A         | 50 mA                        | 7440 mA   | 84%        | ICH7512S15                    |
|                             | 24.0 V         | 3.13 A         | 50 mA                        | 7440 mA   | 84%        | ICH7512S24                    |
| 18-36 VDC<br>(24 V nominal) | 2.5 V          | 15.00 A        | 50 mA                        | 2029 mA   | 77%        | ICH7524S2V5                   |
|                             | 3.3 V          | 15.00 A        | 50 mA                        | 2610 mA   | 79%        | ICH7524S3V3                   |
|                             | 5.0 V          | 15.00 A        | 50 mA                        | 3810 mA   | 82%        | ICH7524S05                    |
|                             | 12.0 V         | 6.25 A         | 50 mA                        | 3675 mA   | 85%        | ICH7524S12                    |
|                             | 15.0 V         | 5.00 A         | 50 mA                        | 3675 mA   | 85%        | ICH7524S15                    |
|                             | 24.0 V         | 3.13 A         | 50 mA                        | 3640 mA   | 86%        | ICH7524S24                    |
| 36-75 VDC<br>(48 V nominal) | 2.5 V          | 15.00 A        | 50 mA                        | 1015 mA   | 77%        | ICH7548S2V5                   |
|                             | 3.3 V          | 15.00 A        | 50 mA                        | 1305 mA   | 79%        | ICH7548S3V3                   |
|                             | 5.0 V          | 15.00 A        | 50 mA                        | 1883 mA   | 83%        | ICH7548S05                    |
|                             | 12.0 V         | 6.25 A         | 50 mA                        | 1838 mA   | 85%        | ICH7548S12                    |
|                             | 15.0 V         | 5.00 A         | 50 mA                        | 1838 mA   | 85%        | ICH7548S15                    |
|                             | 24.0 V         | 3.13 A         | 50 mA                        | 1820 mA   | 86%        | ICH7548S24                    |

| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                             |                |                | No Load                      | Full Load |            |                             |
| 9-36 VDC<br>(24 V nominal)  | 3.3 V          | 15.00 A        | 50 mA                        | 2611 mA   | 79%        | ICH7524WS3V3                |
|                             | 5.0 V          | 15.00 A        | 50 mA                        | 3811 mA   | 82%        | ICH7524WS05                 |
|                             | 12.0 V         | 6.25 A         | 50 mA                        | 3765 mA   | 83%        | ICH7524WS12                 |
|                             | 15.0 V         | 5.00 A         | 50 mA                        | 3720 mA   | 84%        | ICH7524WS15                 |
|                             | 24.0 V         | 3.12 A         | 50 mA                        | 3720 mA   | 84%        | ICH7524WS24                 |
| 18-75 VDC<br>(24 V nominal) | 3.3 V          | 15.00 A        | 50 mA                        | 1289 mA   | 80%        | ICH7548WS3V3                |
|                             | 5.0 V          | 15.00 A        | 50 mA                        | 1883 mA   | 83%        | ICH7548WS05                 |
|                             | 12.0 V         | 6.25 A         | 50 mA                        | 1860 mA   | 84%        | ICH7548WS12                 |
|                             | 15.0 V         | 5.00 A         | 50 mA                        | 1838 mA   | 85%        | ICH7548WS15                 |
|                             | 24.0 V         | 3.12 A         | 50 mA                        | 1835 mA   | 85%        | ICH7548WS24                 |



| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                             |                |                | No Load                      | Full Load |            |                             |
| 18-36 VDC<br>(24 V nominal) | 2.5 V          | 20.00 A        | 50 mA                        | 2705 mA   | 77%        | ICH10024S2V5                |
|                             | 3.3 V          | 20.00 A        | 50 mA                        | 3480 mA   | 79%        | ICH10024S3V3                |
|                             | 5.0 V          | 20.00 A        | 50 mA                        | 5020 mA   | 83%        | ICH10024S05                 |
|                             | 12.0 V         | 8.30 A         | 50 mA                        | 4880 mA   | 85%        | ICH10024S12                 |
|                             | 15.0 V         | 6.70 A         | 50 mA                        | 4925 mA   | 85%        | ICH10024S15                 |
|                             | 24.0 V         | 4.17 A         | 50 mA                        | 4905 mA   | 85%        | ICH10024S24                 |
| 36-75 VDC<br>(48 V nominal) | 2.5 V          | 20.00 A        | 50 mA                        | 1335 mA   | 78%        | ICH10048S2V5                |
|                             | 3.3 V          | 20.00 A        | 50 mA                        | 1720 mA   | 80%        | ICH10048S3V3                |
|                             | 5.0 V          | 20.00 A        | 50 mA                        | 2480 mA   | 84%        | ICH10048S05                 |
|                             | 12.0 V         | 8.30 A         | 50 mA                        | 2442 mA   | 85%        | ICH10048S12                 |
|                             | 15.0 V         | 6.70 A         | 50 mA                        | 2463 mA   | 85%        | ICH10048S15                 |
|                             | 24.0 V         | 4.17 A         | 50 mA                        | 2463 mA   | 85%        | ICH10048S24                 |

| Input Voltage              | Output Voltage              | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|----------------------------|-----------------------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                            |                             |                | No Load                      | Full Load |            |                             |
| 9-36 VDC<br>(24 V nominal) | 3.3 V                       | 20.00 A        | 35 mA                        | 3374 mA   | 81%        | ICH10024WS3V3               |
|                            | 5.0 V                       | 20.00 A        | 35 mA                        | 4990 mA   | 83%        | ICH10024WS05                |
|                            | 12.0 V                      | 8.30 A         | 35 mA                        | 4902 mA   | 85%        | ICH10024WS12                |
|                            | 15.0 V                      | 6.70 A         | 35 mA                        | 4817 mA   | 86%        | ICH10024WS15                |
|                            | 24.0 V                      | 4.17 A         | 35 mA                        | 4849 mA   | 86%        | ICH10024WS24                |
|                            | 18-75 VDC<br>(48 V nominal) | 3.3 V          | 20.00 A                      | 30 mA     | 1708 mA    | 80%                         |
| 5.0 V                      |                             | 20.00 A        | 30 mA                        | 2422 mA   | 86%        | ICH10048WS05                |
| 12.0 V                     |                             | 8.30 A         | 30 mA                        | 2408 mA   | 86%        | ICH10048WS12                |
| 15.0 V                     |                             | 6.70 A         | 30 mA                        | 2381 mA   | 87%        | ICH10048WS15                |
| 24.0 V                     |                             | 4.17 A         | 30 mA                        | 2367 mA   | 88%        | ICH10048WS24                |

| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                             |                |                | No Load                      | Full Load |            |                             |
| 36-75 VDC<br>(48 V nominal) | 2.5 V          | 30.00 A        | 25 mA                        | 2.10 A    | 74%        | ICH15048S2V5                |
|                             | 3.3 V          | 30.00 A        | 25 mA                        | 2.60 A    | 79%        | ICH15048S3V3                |
|                             | 5.0 V          | 30.00 A        | 25 mA                        | 3.70 A    | 83%        | ICH15048S05                 |
|                             | 12.0 V         | 12.50 A        | 25 mA                        | 3.60 A    | 85%        | ICH15048S12                 |
|                             | 15.0 V         | 10.00 A        | 25 mA                        | 3.60 A    | 85%        | ICH15048S15                 |
|                             | 24.0 V         | 6.25 A         | 25 mA                        | 3.60 A    | 85%        | ICH15048S24                 |

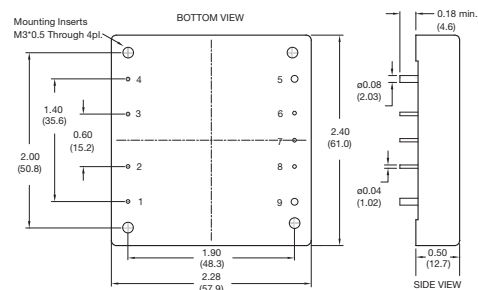
| Input Voltage               | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|-----------------------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|                             |                |                | No Load                      | Full Load |            |                             |
| 36-75 VDC<br>(48 V nominal) | 2.5 V          | 40.00 A        | 25 mA                        | 2.8 A     | 74%        | IFH20048S2V5                |
|                             | 3.3 V          | 40.00 A        | 25 mA                        | 3.5 A     | 79%        | IFH20048S3V3                |
|                             | 5.0 V          | 40.00 A        | 25 mA                        | 5.0 A     | 83%        | IFH20048S05                 |
|                             | 12.0 V         | 17.00 A        | 25 mA                        | 5.0 A     | 85%        | IFH20048S12                 |
|                             | 15.0 V         | 13.30 A        | 25 mA                        | 5.0 A     | 85%        | IFH20048S15                 |
|                             | 24.0 V         | 8.33 A         | 25 mA                        | 5.0 A     | 85%        | IFH20048S24                 |
|                             | 28.0 V         | 7.14 A         | 25 mA                        | 4.7 A     | 89%        | IFH20048S28                 |
|                             | 48.0 V         | 4.20 A         | 25 mA                        | 4.7 A     | 90%        | IFH20048S48                 |

**Notes**

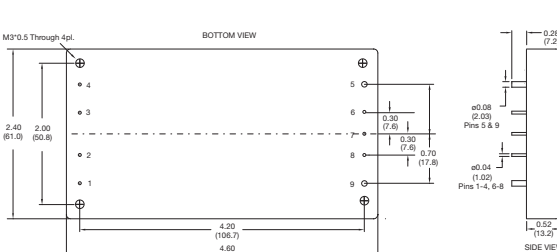
- Logic compatibility: Module On = Open circuit (or >3.5 VDC for ICH100 W models). Module Off = <0.8 VDC (<1.8 VDC for ICH100 W models).
- Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
- Ripple & noise is measured with a 10 µF tantalum capacitor and 0.1 µF ceramic capacitor across output.
- Input current specified at 24 V for 18-36 & 9-36 VDC and 48 V for 36-75 & 18-75 VDC models.
- For dual output models available, contact sales.

**Mechanical Details**

**ICH50 to ICH150**



**IFH200**



| PIN CONNECTIONS |          |
|-----------------|----------|
| Pin             | Function |
| 1               | +Vin     |
| 2               | On/Off   |
| 3               | Case*    |
| 4               | -Vin     |
| 5               | -Vout    |
| 6               | -Sense   |
| 7               | Trim     |
| 8               | +Sense   |
| 9               | +Vout    |

\* IFH200: N.C.

**Notes**

- All dimensions are in inches (mm)
- Weight: ICH50: 0.194 lbs (88 g)  
ICH50W: 0.207 lbs (94 g)  
ICH75: 0.202 lbs (92 g)  
ICH75W: 0.207 lbs (94 g)  
ICH100: 0.209 lbs (95 g)  
ICH150: 0.220 lbs (100 g)  
IFH200: 0.425 lbs (193 g)
- Case tolerance: ±0.02 (±0.50)
- Pin diameter tolerance: ICH series ±0.002 (±0.05), ±0.004 (±0.1),  
IFH series ±0.006 (±0.15)
- Case Material: ICH50/75/100/150 - Aluminium  
IFH200 - Aluminium baseplate with plastic case
- Pin pitch tolerance: ±0.01 (±0.25)

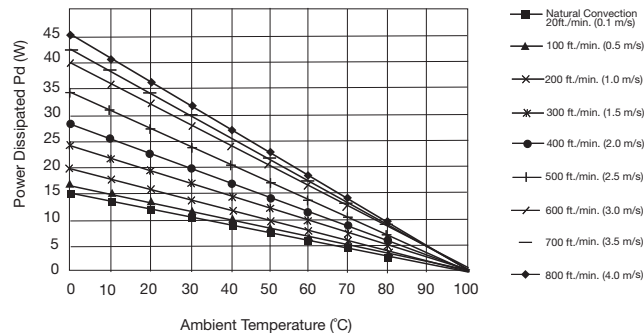


| THERMAL RESISTANCE vs AIR FLOW          |                 |                 |
|---|-----------------|-----------------|
| Air Flow Rate                           | ICH Typical Rca | IFH Typical Rca |
| Natural Convection 20 ft./min (0.1 m/s) | 7.12 °C/W       | 3.82 °C/W       |
| 100 ft./min (0.5 m/s)                   | 6.21 °C/W       | 3.23 °C/W       |
| 200 ft./min (1.0 m/s)                   | 5.17 °C/W       | 2.71 °C/W       |
| 300 ft./min (1.5 m/s)                   | 4.29 °C/W       | 2.28 °C/W       |
| 400 ft./min (2.0 m/s)                   | 3.64 °C/W       | 1.92 °C/W       |
| 500 ft./min (2.5 m/s)                   | 2.96 °C/W       | 1.68 °C/W       |
| 600 ft./min (3.0 m/s)                   | 2.53 °C/W       | 1.50 °C/W       |
| 700 ft./min (3.5 m/s)                   | 2.37 °C/W       | 1.35 °C/W       |
| 800 ft./min (4.0 m/s)                   | 2.19 °C/W       | 1.23 °C/W       |

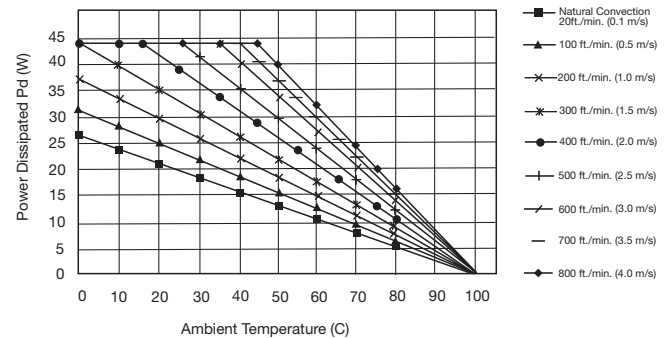
Temperature Rise = Pd x Rca, Where Pd = Pin - Pout or Pout (1-η) / η, Where η= efficiency

Maximum Power Dissipation vs Ambient Temperature and Air Flow (without Heatsink)

ICH50-150S

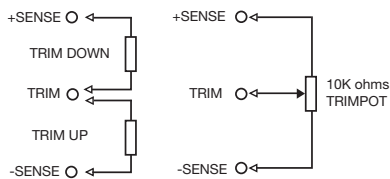


IFH200S



Application Notes

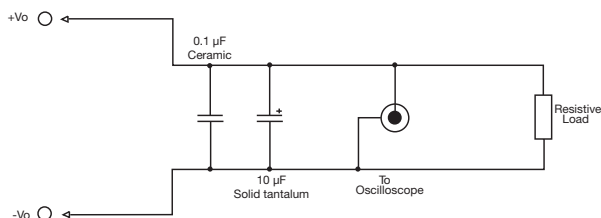
External Output Trimming



| LOGIC TABLE             |                |                     |
|-------------------------|----------------|---------------------|
| Logic State (Pin 2)     | Positive Logic | Negative Logic (-N) |
| Logic Low Switch Closed | Module Off     | Module On           |
| Logic High Switch Open  | Module On      | Module Off          |

Output may be trimmed by ±10% (±5% for dual output models) with a fixed resistor or an external trimpot as shown. Contact sales for details.

Output Noise



Output noise is measured with a 10 µF tantalum capacitor and 0.1 µF ceramic capacitor across output. Oscilloscope limited to 20 MHz bandwidth