

# 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             | • 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>ICH50/75 W:<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                                                                                                                                                                                                                                                   |
| 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: 75 mV<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/150/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: 110-140% 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/150W/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 | • $10^7 \Omega$ 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>IFH200: 350 kHz typical |
| MTBF                 | • $\geq 790$ kHrs 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 3g, 10 mins per axis                                                       |

#### EMC & Safety

- |                    |                                           |
|--------------------|-------------------------------------------|
| Emissions          | • EN55022, level A conducted              |
| ESD Immunity       | • EN61000-4-2, level 2<br>Perf Criteria B |
| Radiated Immunity  | • EN61000-4-3, 3 V/m<br>Perf Criteria B   |
| Conducted Immunity | • EN61000-4-6, 3 V rms<br>Perf Criteria B |
| 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      | 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     | 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     | 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      | 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     | 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      | 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     | 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     | 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      | 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     | 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                   |

† Available from Farnell. See pages 266-269.

^ Available from Newark. See pages 270-272.



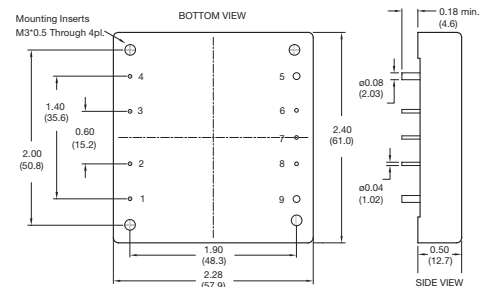
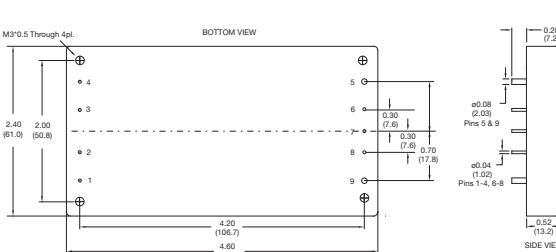
| Input Voltage | Output Voltage | Output Current | Input Current <sup>(4)</sup> |           | Efficiency | Model Number <sup>(2)</sup> |
|---------------|----------------|----------------|------------------------------|-----------|------------|-----------------------------|
|               |                |                | No Load                      | Full Load |            |                             |
| 18-36 VDC     | 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                 |
| 36-75 VDC     | 2.5 V          | 20.00 A        | 50 mA                        | 4905 mA   | 85%        | ICH10024S24                 |
|               | 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                 |
| 36-75 VDC     | 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      | 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     | 3.3 V          | 20.00 A        | 30 mA                        | 1708 mA   | 80%        | ICH10048WS3V3               |
|               | 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     | 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     | 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: open collector ref to -ve input. Module On = open circuit. Module Off = <0.8 VDC.
- Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
- Ripple & noise is measured with a 10  $\mu$ F tantalum capacitor and 0.1  $\mu$ F ceramic capacitor across output.
- Input current specified at 24 V for 18-36 VDC and 48 V for 36-75 & 18-75 VDC models.
- For dual output models, contact sales.

† Available from Farnell. See pages 266-269.

^ Available from Newark. See pages 270-272.

**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.

|               |                   |
|---------------|-------------------|
| Weight: ICH50 | 0.194 lbs (88 g)  |
| ICH50W        | 0.207 (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) |

|                               |                                                                                |
|-------------------------------|--------------------------------------------------------------------------------|
| Dimensions are in inches (mm) |                                                                                |
| Case tolerance:               | ±0.02 (±0.50)                                                                  |
| Pin diameter tolerance:       | ICH series ±0.002 (±0.05), ±0.004 (±0.1),<br>IFH series ±0.006 (±0.15)         |
| Case Material:                | ICH50/75/100/150 - Aluminium<br>IFH200 - Aluminium baseplate with plastic case |
| Pin pitch tolerance:          | ±0.01 (±0.25)                                                                  |

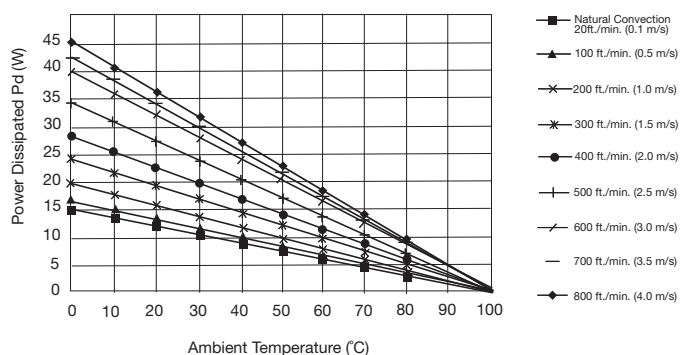
## Derating Curves

ICH/IFH Series **XP**

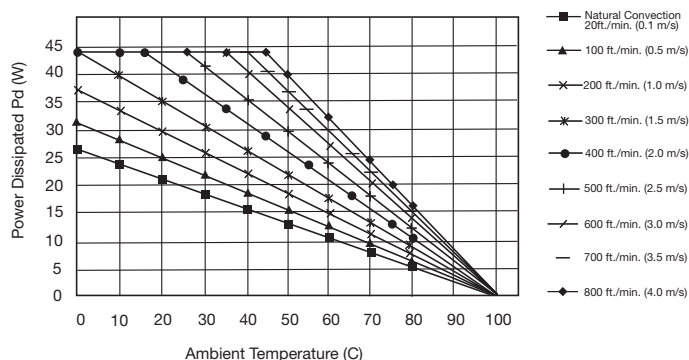
| THERMAL RESISTANCE vs AIR FLOW          |                 |                 |
|-----------------------------------------|-----------------|-----------------|
| Air Flow Rate                           | ICH Typical Rca | IFH Typical Rca |
| Natural Convection 20 ft./min (0.1 m/s) | 7.12 °C/W       | 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 =  $P_d \times R_{ca}$   
 Where  $P_d = P_{in} - P_{out}$  or  $P_{out} (1-\eta) / \eta$

Power Dissipated vs Ambient Temperature And Air Flow - ICH50-150S

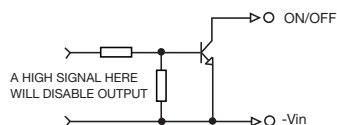


Power Dissipated vs Ambient Temperature And Air Flow - IFH200S

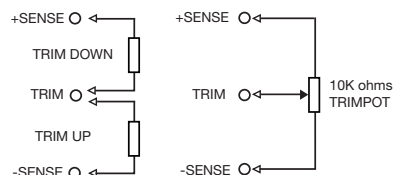


## Application Notes

### Remote On/Off Control



### External Output Trimming

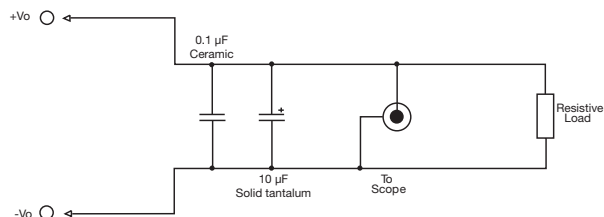


### LOGIC TABLE

| 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  $\pm 10\%$  ( $\pm 5\%$  for dual output models) with a fixed resistor or an external trimpot as shown.

### 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