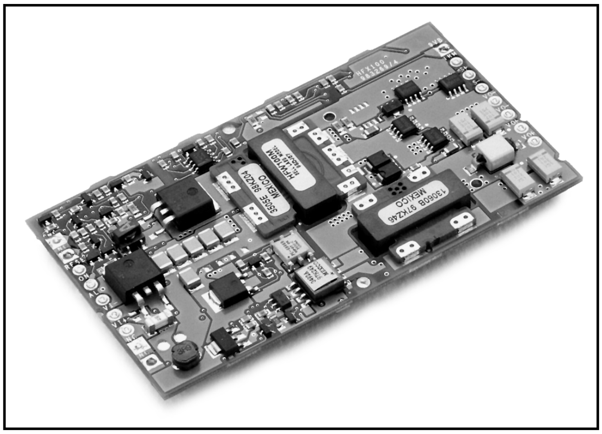
Data Sheet
July 1999

Lucent Technologies
Bell Labs Innovations

HFW100F and HFW100M Power Modules: dc-dc Converters; 36 Vdc to 75 Vdc Input, 3.3 Vdc or 1.5 Vdc Output; 66 W and 30 W



The HFW Series Power Modules use advanced surface-mount technology and deliver high-quality, efficient, and compact dc-dc conversion.

Applications

- Distributed power architectures
- Workstations
- Communications equipment
- Computer equipment

* *UL* is a registered trademark of Underwriters Laboratories, Inc.
† *CSA* is a registered trademark of Canadian Standards Assn.
‡ This product is intended for integration into end-use equipment. All the required procedures for CE marking of end-use equipment should be followed. (The CE mark is placed on selected products.)

Features

- Designed to support the Japanese Telecom Market
- Low profile: 8.5 mm (0.335 in.)
- Small size: 107 mm x 60 mm x 8.5 mm (4.20 in. x 2.35 in. x 0.335 in.)
- High power density
- High efficiency: 88% typical
- Low noise, low EMI
- 2:1 input voltage range
- Constant frequency
- Open frame design; no case or potting
- Poke Yoke pins to prevent assembly errors
- Output overcurrent, overvoltage, and undervoltage protection
- Remote on/off and remote sense
- Adjustable output voltage
- Alarm signal and reset signal
- Inrush current limited
- Input undervoltage and overvoltage protection
- Overtemperature protection
- ISO9001 and ISO14001 Certified manufacturing facilities
- *UL** 1950 Recognized, *CSA*† C22.2 No. 950-95 Certified, VDE 0805 (EN60950, IEC950) Licensed
- CE mark meets 73/23/EEC and 93/68/EEC directives‡

Description

The HFW100F and HFW100M Power Modules are open frame (no case, no potting) dc-dc converters that operate over an input voltage range of 36 Vdc to 75 Vdc and provide a precisely regulated dc output. The outputs are fully isolated from the inputs, allowing versatile polarity configurations and grounding connections. The modules have a maximum power rating of 66 W at a typical full-load efficiency of 88%. The feature set is designed to support the requirements of Japanese Telecom equipment.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage:				
Continuous	V_I	—	75	Vdc
Transient (100 µs)	$V_{I, trans}$	—	100	V
Operating Ambient Temperature (See Thermal Considerations section.)	T_A	–40	85*	°C
Storage Temperature	T_{stg}	–55	125	°C
I/O Isolation Voltage	—	—	1500	Vdc

* Note: With derated output power. See Thermal Considerations section.

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions.

Table 1. Input Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Operating Input Voltage	V_I	36	48	75	Vdc
Maximum Input Current (V_I = 0 V to 75 V; $I_O = I_{O, max}$; see Figures 1—2.)	$I_{I, max}$	—	—	3	A
Inrush Transient	i^2t	—	—	1.0	A^2s
Input Reflected-ripple Current, Peak-to-peak (5 Hz to 20 MHz, 12 µH source impedance; see Figure 13.)	—	—	—	100	mAp-p
Input Ripple Rejection (120 Hz)	—	—	60	—	dB

Fusing Considerations

This power module is internally fused in the V_I(+) leg.

Electrical Specifications (continued)

Table 2. Output Specifications

Parameter	Device	Symbol	Min	Typ	Max	Unit
Output Voltage Set Point (V_I = 48 V; $I_O = I_{O,\,max}$; T_A = 25 °C)	HFW100M HFW100F	$V_{O,\,set}$ $V_{O,\,set}$	1.47 3.25	1.5 3.3	1.52 3.35	Vdc Vdc
Output Voltage (Over all operating input voltage, resistive load, and temperature conditions until end of life. See Figure 15.)	HFW100M HFW100F	V_O V_O	1.45 3.20	— —	1.55 3.40	Vdc Vdc
Output Regulation:						
Line (V_I = 36 V to 75 V)	All	—	—	0.01	0.1	%V_O
Load ($I_O = I_{O,\,min}$ to $I_{O,\,max}$)	All	—	—	0.05	0.2	%V_O
Temperature (T_A = –40 °C to +50 °C)	All	—	—	15	50	mV
Output Ripple and Noise Voltage (See Figure 14.):						
RMS	HFW100M HFW100F	— —	— —	— —	20 40	mVrms mVrms
Peak-to-peak (5 Hz to 20 MHz)	HFW100M HFW100F	— —	— —	— —	30 50	mVp-p mVp-p
External Load Capacitance	All	—	0	—	†	µF
Output Current (At $I_O < I_{O,\,min}$, the modules may exceed output ripple specifications.)	HFW100M HFW100F	I_O I_O	0.5 0.5	— —	20 20	A A
Output Current-limit Inception (Shutdown threshold; see Electrical Descriptions section.)	HFW100M HFW100F	$I_{O,\,cli}$ $I_{O,\,cli}$	— —	— —	30* 30*	A A
Efficiency (V_I = 48 V; $I_O = I_{O,\,max}$; T_A = 70 °C)	HFW100M HFW100F	η η	— —	79 88	— —	% %
Switching Frequency	All	—	—	300	—	kHz
Dynamic Response ($\Delta I_O/\Delta t$ = 1 A/10 µs, V_I = 48 V, T_A = 25 °C; tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.):						
Load Change from I_O = 50% to 75% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	150	—	mV
Settling Time (V_O < 10% of peak deviation)	All	—	—	200	—	µs
Load Change from I_O = 50% to 25% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	150	—	mV
Settling Time (V_O < 10% of peak deviation)	All	—	—	200	—	µs

* These are manufacturing test limits. In some situations, results may differ.
† Please consult your sales representative or the factory.

Electrical Specifications (continued)

Table 3. Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	—	1,500	—	pF
Isolation Resistance	10	—	—	MΩ

General Specifications

Parameter	Min	Typ	Max	Unit
Calculated MTBF (I_O = 80% of $I_{O,\,max}$; T_A = 20 °C)		2,000,000		hours
Weight	—	—	60 (2.2)	g (oz.)

Solder Ball and Cleanliness Requirements

The open frame (no case or potting) power module will meet the solder ball requirements per J-STD-001B. These requirements state that solder balls must neither be loose nor violate the power module minimum electrical spacing.

The cleanliness designator of the open frame power module is C00 (per J specification).

Feature Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions. See Feature Descriptions for additional information.

Parameter	Device	Symbol	Min	Typ	Max	Unit
Remote On/Off Signal Interface (V_I = 0 V to 75 V; signal referenced to $V_I(+)$ terminal; see Feature Descriptions section.):						
Logic High—Module On						
Logic Low—Module Off						
Open Circuit—Module Off						
Logic High:						
$V_{on/off}$	All	—	$V_I(+)$ – 1 V	—	$V_I(+)$ + 1 V	Vdc
$I_{on/off}$	All	—	—	—	1.0	mA
Logic Low:						
$V_{on/off}$	All	—	$V_I(–)$	—	$V_I(–)$ + 1 V	Vdc
$I_{on/off}$	All	—	—	—	1.0	mA
Turn-on Time (I_O = 80% of $I_{O, max}$; V_O within ±1% of steady state; see Figures 11 and 12.)	All	—	—	35	50	ms
Output Voltage Adjustment (See Feature Descriptions.):						
Output Voltage Remote-sense Range	All	—	—	—	0.2	V
Output Voltage Set-point Adjustment Range (trim)	HFW100M	—	90	—	110	$\%V_{O, nom}$
	HFW100F	—	0	—	110	$\%V_{O, nom}$
Output Overvoltage Protection (shutdown)	HFW100M	$V_{O, sd}$	1.8*	—	2.5*	Vdc
	HFW100F	$V_{O, sd}$	4.0*	—	4.5*	Vdc
Output Undervoltage Protection (shutdown)	HFW100M	$V_{O, uvsd}$	2.5	—	2.7	Vdc
	HFW100F	$V_{O, uvsd}$	1.0	—	1.2	Vdc
Alarm Signal (Resistance between signal and $V_I(+)$):						
Alarm On	All	—	—	—	100	Ω
Alarm Off	All	—	100	—	—	kΩ
Reset Signal Interface (V_I = 0 V to 75 V; signal referenced to $V_I(+)$ terminal.)						
Note: Reset occurs at transition from logic high to logic low. (See Feature Descriptions section.):						
Logic High—Signal Active						
Logic Low—Signal Inactive						
Open Circuit—Signal Inactive						
Logic High:						
$V_{on/off}$	All	—	$V_I(+)$ – 1 V	—	$V_I(+)$ + 1 V	Vdc
$I_{on/off}$	All	—	—	—	1.0	mA
Logic Low:						
$V_{on/off}$	All	—	$V_I(–)$	—	$V_I(–)$ + 1 V	Vdc
$I_{on/off}$	All	—	—	—	1.0	mA
Overtemperature Protection (shutdown)	All	T_A	—	120	—	°C

* These are manufacturing test limits. In some situations, results may differ.

Characteristic Curves

The following figures provide typical characteristics for the power modules.

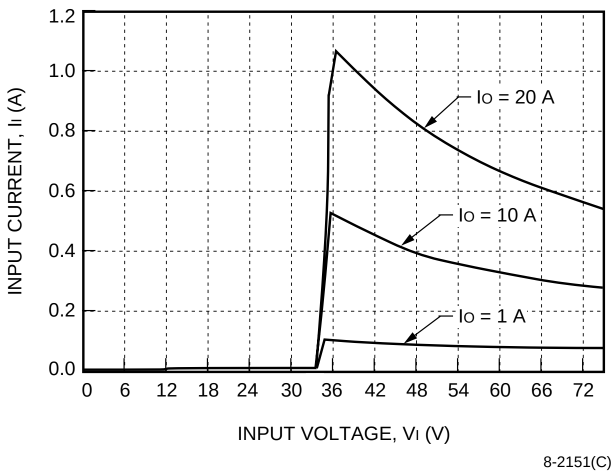


Figure 1. Typical HFW100M Input Characteristics at Room Temperature

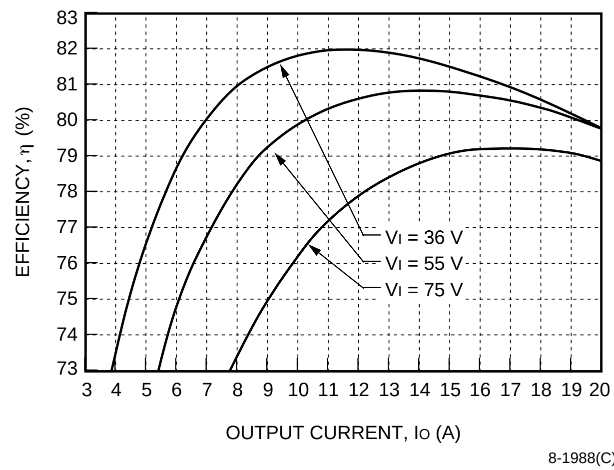


Figure 3. Typical HFW100M Converter Efficiency vs. Output Current at Room Temperature

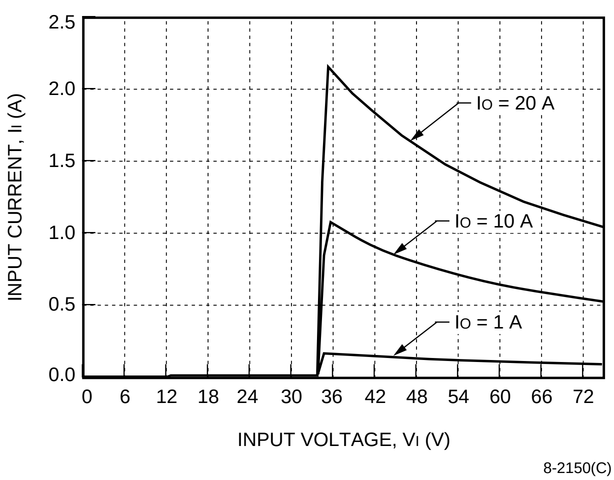


Figure 2. Typical HFW100F Input Characteristics at Room Temperature

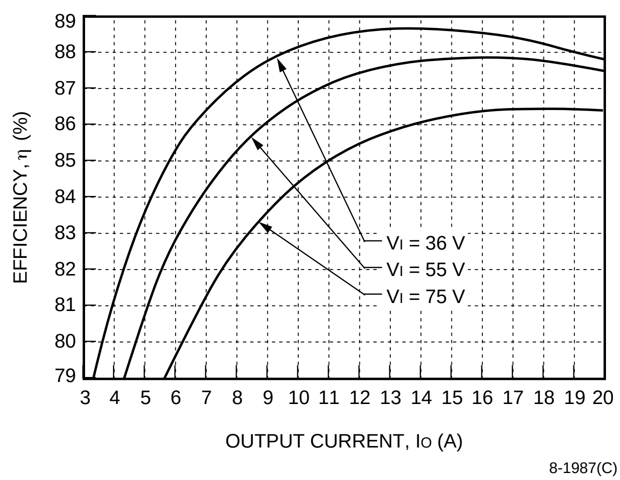


Figure 4. Typical HFW100F Converter Efficiency vs. Output Current at Room Temperature

Characteristic Curves (continued)

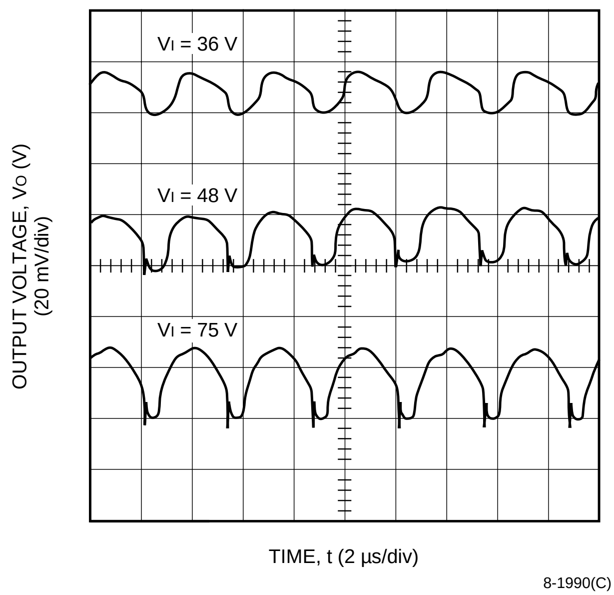


Figure 5. Typical HFW100M Output Ripple Voltage at Room Temperature and $I_O = I_{O,\,max}$

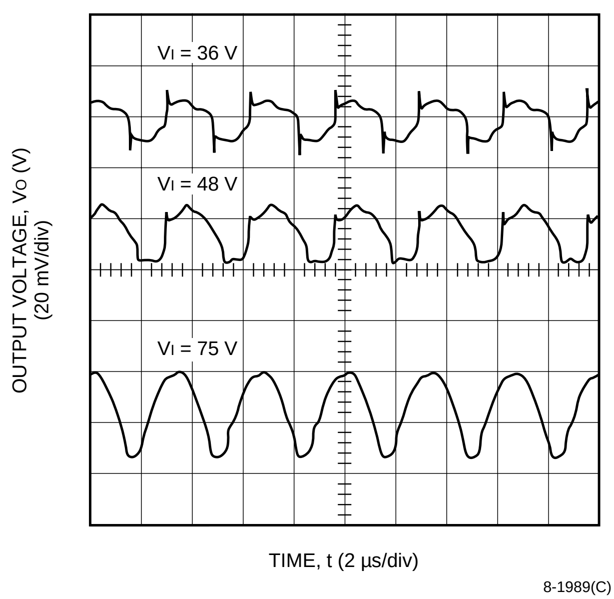
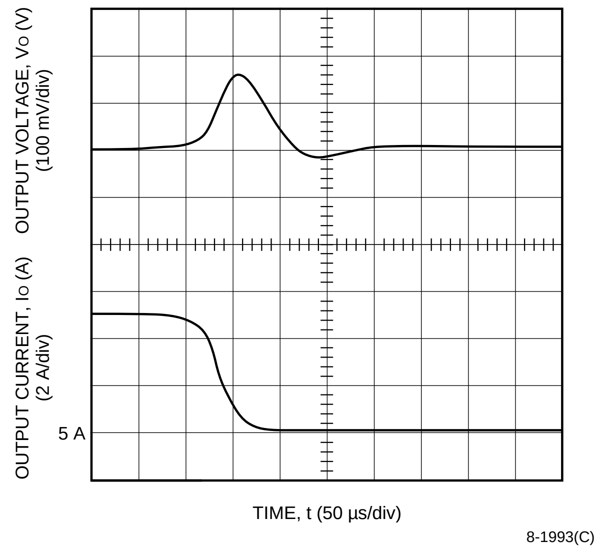
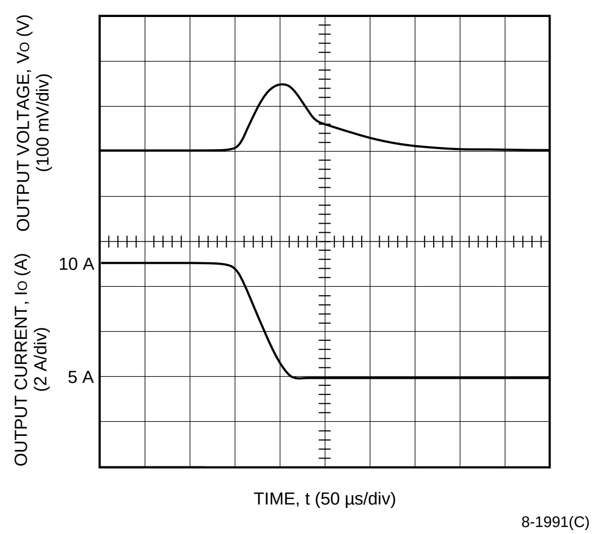


Figure 6. Typical HFW100F Output Ripple Voltage at Room Temperature and $I_O = I_{O,\,max}$



Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

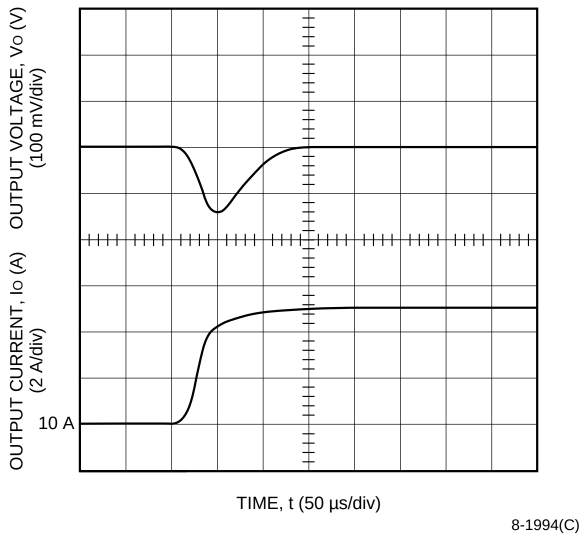
Figure 7. Typical HFW100M Transient Response to Step Decrease in Load from 50% to 25% of $I_O = I_{O,\,max}$ at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)



Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

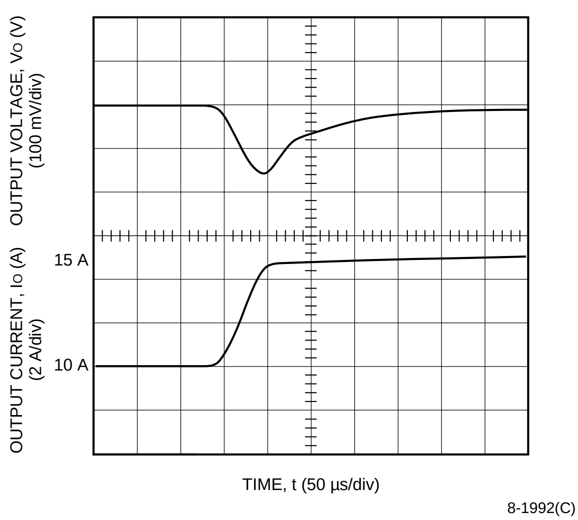
Figure 8. Typical HFW100F Transient Response to Step Decrease in Load from 50% to 25% of $I_O = I_{O,\,max}$ at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)

Characteristic Curves (continued)



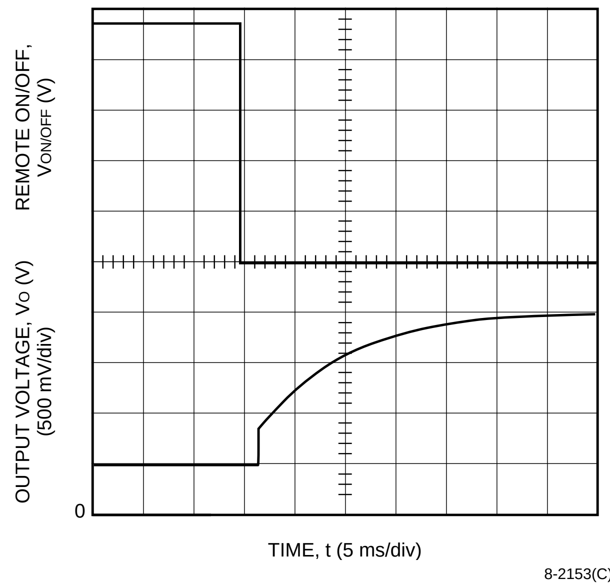
Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

Figure 9. Typical HFW100M Transient Response to Step Increase in Load from 50% to 75% of $I_O = I_{O, max}$ at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)



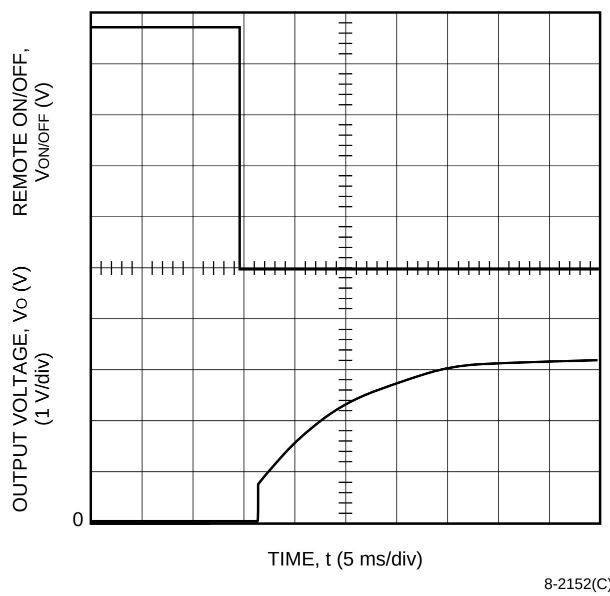
Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

Figure 10. Typical HFW100F Transient Response to Step Increase in Load from 50% to 75% of $I_O = I_{O, max}$ at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)



Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

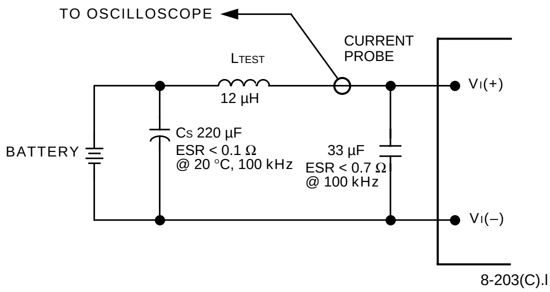
Figure 11. Typical HFW100M Start-Up from Remote On/Off; $I_O = I_{O, max}$



Note: Tested with a 10 µF tantalum and a 1.0 µF ceramic capacitor across the load.

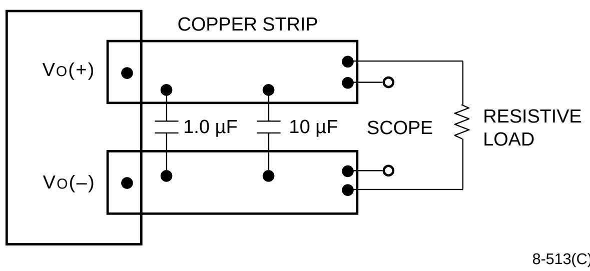
Figure 12. Typical HFW100F Start-Up from Remote On/Off; $I_O = I_{O, max}$

Test Configurations



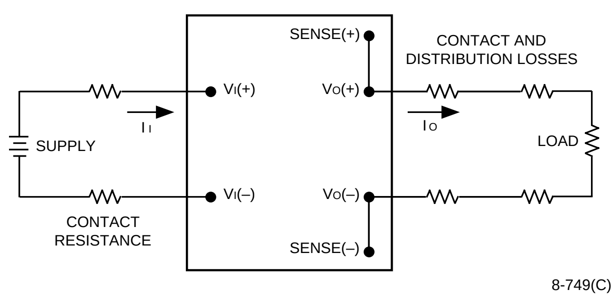
Note: Measure input reflected-ripple current with a simulated source inductance (L_{TEST}) of 12 µH. Capacitor C_S offsets possible battery impedance. Measure current as shown above.

Figure 13. Input Reflected-Ripple Test Setup



Note: Use a 1.0 µF ceramic capacitor and a 10 µF aluminum or tantalum capacitor. Scope measurement should be made using a BNC socket. Position the load between 51 mm and 76 mm (2 in. and 3 in.) from the module.

Figure 14. Peak-to-Peak Output Noise Measurement Test Setup



Note: All measurements are taken at the module terminals. When socketing, place Kelvin connections at module terminals to avoid measurement errors due to socket contact resistance.

$$\eta = \left(\frac{[V_O(+) - V_O(-)]I_O}{[V_I(+) - V_I(-)]I_I}\right) \times 100 \qquad \%$$

Figure 15. Output Voltage and Efficiency Measurement Test Setup

Design Considerations

Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. For the test configuration in Figure 13, a 33 µF electrolytic capacitor (ESR < 0.7 Ω at 100 kHz) mounted close to the power module helps ensure stability of the unit. For other highly inductive source impedances, consult the factory for further application guidelines.

Safety Considerations

For safety-agency approval of the system in which the power module is used, the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standard, i.e., *UL*1950, *CSA* C22.2 No. 950-95, and VDE 0805 (EN60950, IEC950).

If the input source is non-SELV (ELV or a hazardous voltage greater than 60 Vdc and less than or equal to 75 Vdc), for the module's output to be considered meeting the requirements of safety extra-low voltage (SELV), all of the following must be true:

- The input source is to be provided with reinforced insulation from any hazardous voltages, including the ac mains.
- One V_I pin and one V_O pin are to be grounded or both the input and output pins are to be kept floating.
- The input pins of the module are not operator accessible.
- Another SELV reliability test is conducted on the whole system, as required by the safety agencies, on the combination of supply source and the subject module to verify that under a single fault, hazardous voltages do not appear at the module's output.

Note: Do not ground either of the input pins of the module without grounding one of the output pins. This may allow a non-SELV voltage to appear between the output pin and ground.

The power module has extra-low voltage (ELV) outputs when all inputs are ELV.

Feature Descriptions

Overcurrent Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current-limiting circuitry and can endure current limiting for up to one second. If overcurrent exists for more than one second, the unit will latch in an off condition. The overcurrent latch is reset by either cycling the input power or by toggling the RESET pin for one second. At the point of current-limit inception, the unit shifts from voltage control to current control. If the output voltage is pulled very low during a severe fault, the current-limit circuit can exhibit either foldback or tailout characteristics (output current decrease or increase). The unit operates normally once the output current is brought back into its specified range, provided the overcurrent shutdown was not activated.

Remote On/Off

The power module has an input signal pin, remote on/off, referenced to $V_I(+)$, which enables or disables the module power stage. The remote ON/OFF pin turns the module on when the remote ON/OFF pin is pulled up to $V_I(+)$. The remote ON/OFF pin turns the module off when the remote ON/OFF pin is open circuited, or pulled down to $V_I(–)$. An open circuit on the remote ON/OFF pin, or a short to $V_I(–)$, has the same effect.

Remote Sense

Remote sense minimizes the effects of distribution losses by regulating the voltage at the remote-sense connections. The voltage between the remote-sense pins and the output terminals must not exceed the output voltage sense range given in the Feature Specifications table, i.e.:

$$[V_O(+) - V_O(-)] - [SENSE(+) - SENSE(-)] \leq 0.2\ V$$

The voltage between the $V_O(+)$ and $V_O(–)$ terminals must not exceed the minimum output overvoltage shutdown voltage as indicated in the Feature Specifications table. This limit includes any increase in voltage due to remote-sense compensation and output voltage set-point adjustment (trim). See Figure 16.

If not using the remote-sense feature to regulate the output at the point of load, then connect SENSE(+) to $V_O(+)$ and SENSE(–) to $V_O(–)$ at the module.

Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim. Consult the factory if you need to increase the output voltage more than the above limitation.

The amount of power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. When using remote sense and trim, the output voltage of the module can be increased, which at the same output current would increase the power output of the module. Care should be taken to ensure that the maximum output power of the module remains at or below the maximum rated power.

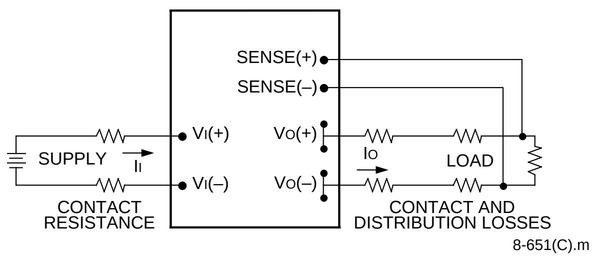


Figure 16. Effective Circuit Configuration for Single-Module Remote-Sense Operation

Output Voltage Set-Point Adjustment (Trim)

Output voltage trim allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the SENSE(+) or SENSE(–) pins. The trim resistor should be positioned close to the module.

If not using the trim feature, leave the TRIM pin open.

With an external resistor between the TRIM and SENSE(–) pins ($R_{adj\text{-}down}$), the output voltage set point ($V_{O,\ adj}$) decreases (see Figure 17). The following equation determines the required external-resistor value to obtain a percentage output voltage change of Δ%.

$$R_{adj\text{-}down} = \left(\frac{510}{\Delta\%} - 10.2\right)\ k\Omega$$

The test results for this configuration are displayed in Figure 18. This figure applies to all output voltages.

With an external resistor connected between the TRIM and SENSE(+) pins ($R_{adj\text{-}up}$), the output voltage set point ($V_{O,\ adj}$) increases (see Figure 19).

Feature Descriptions (continued)

Output Voltage Set-Point Adjustment (Trim) (continued)

The following equation determines the required external-resistor value to obtain a percentage output voltage change of Δ%.

$$R_{adj\text{-}up} = \left(\frac{5.1V_O(100 + \Delta\%)}{1.225\Delta\%} - \frac{510}{\Delta\%} - 10.2\right)\ \text{k}\Omega$$

The test results for this configuration are displayed in Figure 20.

The voltage between the $V_O(+)$ and $V_O(–)$ terminals must not exceed the minimum output overvoltage shutdown voltage as indicated in the Feature Specifications table. This limit includes any increase in voltage due to remote-sense compensation and output voltage set-point adjustment (trim). See Figure 16.

Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim. Consult the factory if you need to increase the output voltage more than the above limitation.

The amount of power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. When using remote sense and trim, the output voltage of the module can be increased, which at the same output current would increase the power output of the module. Care should be taken to ensure that the maximum output power of the module remains at or below the maximum rated power.

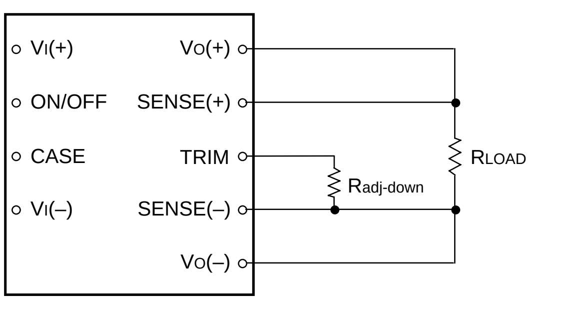


Figure 17. Circuit Configuration to Decrease Output Voltage

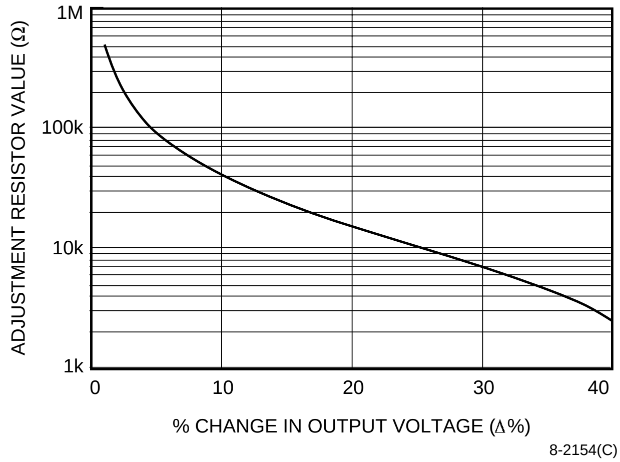


Figure 18. Resistor Selection for Decreased Output Voltage

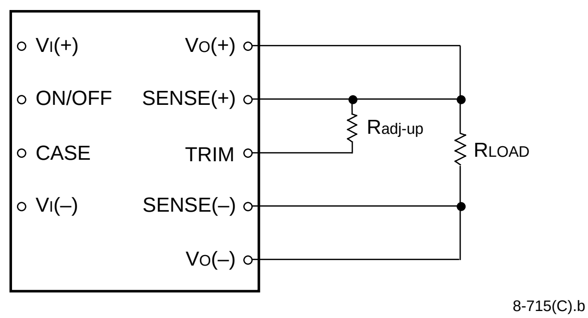


Figure 19. Circuit Configuration to Increase Output Voltage

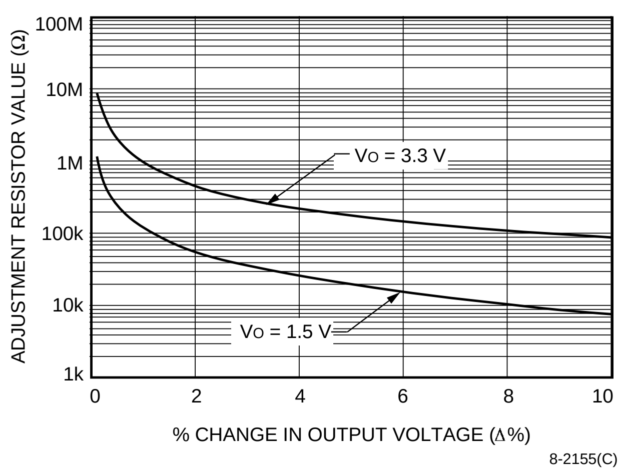


Figure 20. Resistor Selection for Increased Output Voltage

Feature Descriptions (continued)

Output Overvoltage Protection

The output overvoltage protection consists of circuitry that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the overvoltage protection threshold, then the module will shut down and latch off. The overvoltage latch is reset by either cycling the input power for one second or by toggling the RESET pin for one second.

Output Undervoltage Protection

The output undervoltage protection consists of circuitry that monitors the voltage on the output terminals. If the voltage on the output terminals drops below the undervoltage protection threshold, then the module will shut down and latch off. The undervoltage latch is reset by either cycling the input power for one second or by toggling the RESET pin for one second.

Alarm Signal

The power module has an output alarm signal to indicate that the module is operating out of specification. The alarm signal is an open collector (PNP) signal referenced to $V_I(+)$. An alarm has been indicated (alarm active) when the impedance between the ALARM pinand $V_I(+)$ is less than 100 Ω. The ALARM pin is inactive when the impedance between the ALARM pin and $V_I(+)$ is greater than 100 kΩ. There is no internal current limit on the ALARM pin, therefore the user must ensure that the impedance between the ALARM pin and $V_I(–)$ is always greater than 20 kΩ. The following conditions will trigger the ALARM pin active:

- The overcurrent latch is engaged.
- The output overvoltage latch is engaged.
- The output undervoltage latch is engaged.
- The overtemperature latch is engaged.
- The input fuse is blown.

Reset Signal

The reset signal is used to reset the internal protection latches, allowing the power module to restart following a fault induced latched shutdown. The power module can also be reset by removing input power from the module for a minimum of 1 second.

The reset signal is defined as active when the RESET pin is pulled up to $V_I(+)$. The reset signal is defined as inactive when the RESET pin is open circuited, or pulled down to $V_I(–)$. An open circuit on the RESET pin, or a short to $V_I(–)$, has the same effect.

The process for using the reset signal to reset the module is as follows. During normal operation (e.g., no internal protection latches are active), the reset signal is normally inactive. To reset an internal latch after a fault condition, the reset signal is made active for 1 second minimum, and then transitioned to an inactive condition. The module must restart only after the reset signal has transitioned from an active state to an inactive state. The RESET pin can thus be considered to be a negative edge-triggered input, such that the module latches are reset during the transition from the active state to the inactive state.

The reset signal should only affect the module when an internal protection latch is engaged. During normal operation, the state of the reset signal, either active or inactive, should have no effect whatsoever on the normal operation of the module.

Inrush Current Protection

The power module has an input inrush current protection which limits the input current during hot plug-in to less than 1 A. The inrush protection circuit should reset itself if the input voltage is removed for a minimum of 1 second.

Input Fuse

The power module has an input fuse which opens in the event of an input short internal to the module. If the input fuse is open circuited, the alarm signal shall become active if the input voltage is within the limits specified in Table 1 of the Electrical Specifications section.

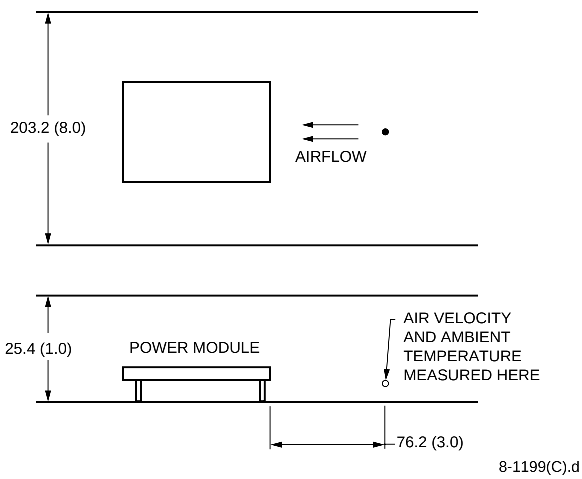
Overtemperature Protection

To provide protection in a fault condition, the unit is equipped with a thermal shutdown circuit. The shutdown circuit will not engage unless the unit is operated above the maximum device temperature. Recovery for the thermal shutdown is accomplished by cycling the dc input power off for at least one second or toggling the RESET pin for at least one second.

Thermal Considerations

The power modules operate in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by convection and radiation to the surrounding environment.

The thermal data presented is based on measurements taken in a wind tunnel. The test setup shown in Figure 21 was used to collect data for Figures 27 and 28. Note that the orientation of the module with respect to airflow affects thermal performance. Two orientations are shown in Figures 22 and 23.



Note: Dimensions are in millimeters and (inches).

Figure 21. Thermal Test Setup

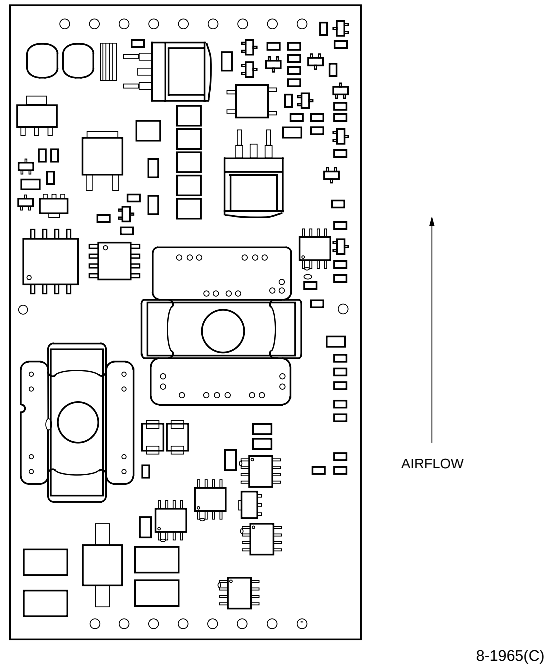


Figure 22. Worst Orientation (Top View)

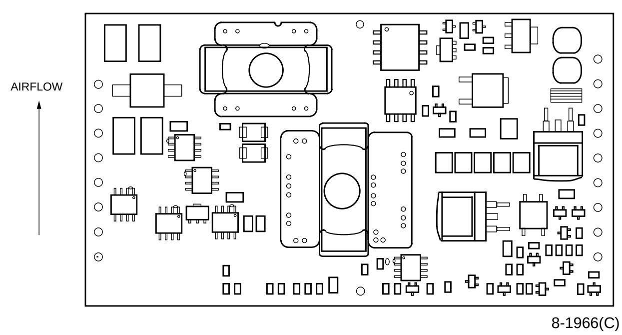
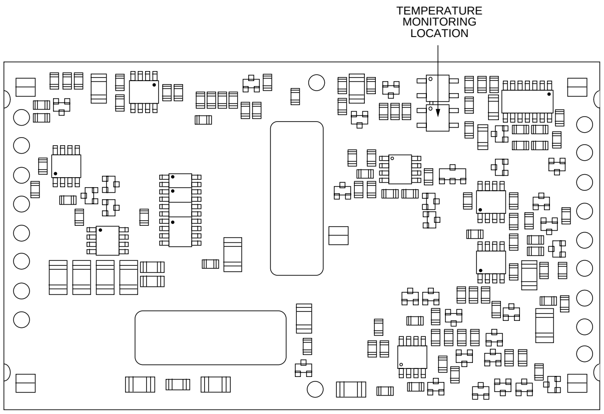


Figure 23. Best Orientation (Top View)

Proper cooling can be verified by measuring the power module's temperature at the top of the case of the optocoupler as shown in Figure 24.

Thermal Considerations (continued)



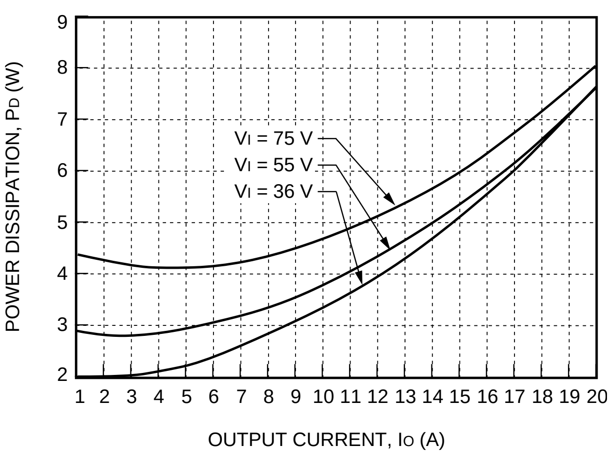
8-1995(C)

Figure 24. Temperature Measurement Location (Bottom View)

The temperature at this location should not exceed 100 °C at full power. The output power of the module should not exceed the rated power.

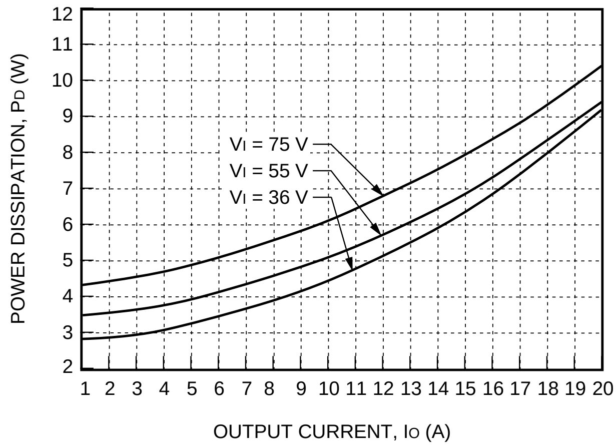
Convection Requirements for Cooling

To predict the approximate cooling needed for the module, determine the power dissipated as heat by the unit for the particular application. Figures 25 and 26 show typical heat dissipation for the module over a range of output currents.



8-1997(C)

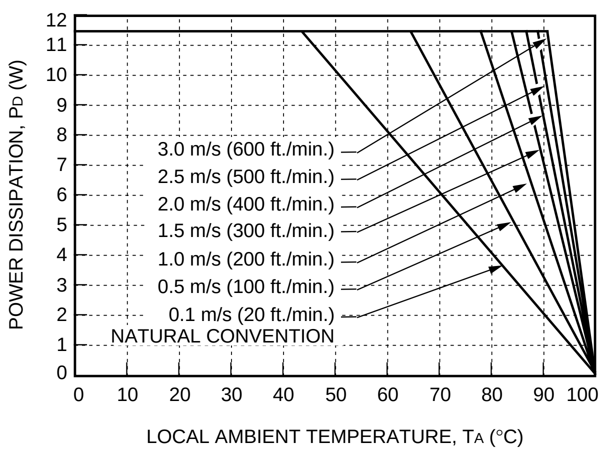
Figure 25. HFW100M Power Dissipation vs. Output Current, T_A = 25 °C



8-1996(C)

Figure 26. HFW100F Power Dissipation vs. Output Current, T_A = 25 °C

With the known heat dissipation, module orientation with respect to airflow, and a given local ambient temperature, the minimum airflow can be chosen from the derating curves in Figures 27 and 28.



8-2156(C)

Figure 27. Power Derating vs. Local Ambient Temperature and Air Velocity; Best Orientation

Thermal Considerations (continued)

Convection Requirements for Cooling (continued)

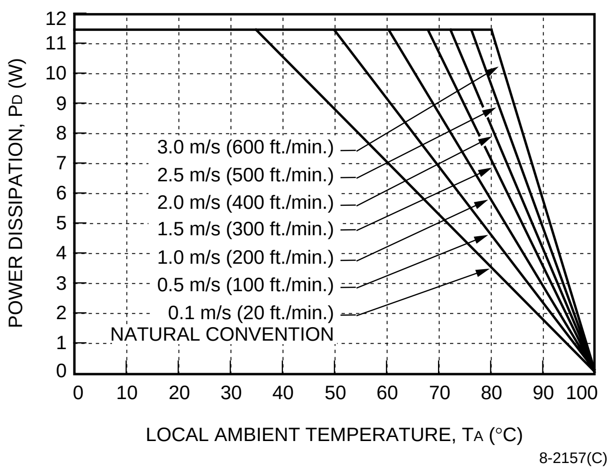


Figure 28. Power Derating vs. Local Ambient Temperature and Air Velocity; Worst Orientation

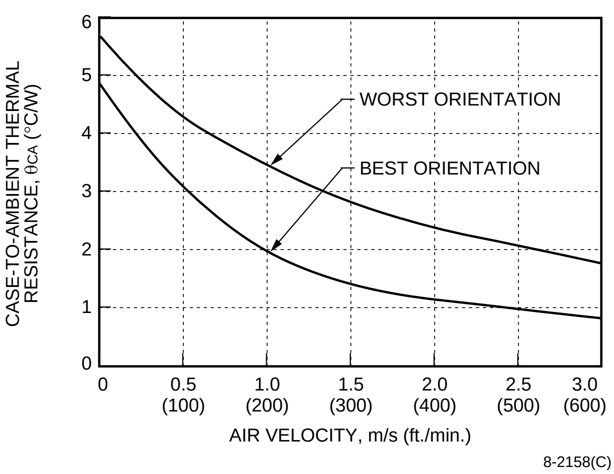


Figure 29. Module-to-Ambient Thermal Resistance Curves

For example, if the HFW100F dissipates 9.4 W of heat at $I_O = I_{O,\,max}$, the minimum airflow for best module orientation in an 85 °C environment is 1.25 m/s (250 ft./min.).

Keep in mind that these derating curves are approximations of the ambient temperatures and airflows required to keep the power module temperature below its maximum rating. Once the module is assembled in the actual system, the module's temperature should be checked as shown in Figure 24 to ensure it does not exceed 100 °C.

Solder, Cleaning, and Drying Considerations

Post solder cleaning is usually the final circuit-board assembly process prior to electrical testing. The result of inadequate circuit-board cleaning and drying can affect both the reliability of a power module and the testability of the finished circuit-board assembly. For guidance on appropriate soldering, cleaning, and drying procedures, refer to Lucent Technologies *Board-Mounted Power Modules Soldering and Cleaning* Application Note (AP97-021EPS).

EMC Considerations

For assistance with designing for EMC compliance, please refer to the FLTR100V10 data sheet (DS98-152EPS).

Layout Considerations

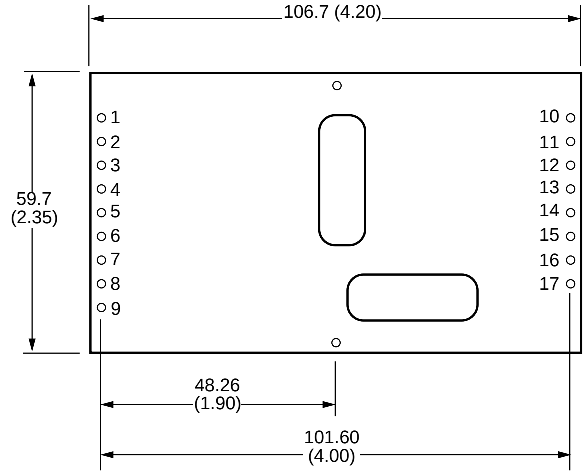
Copper paths must not be routed beneath the power module mounting inserts. For additional layout guidelines, refer to the FLTR100V10 data sheet (DS98-152EPS).

Outline Diagram

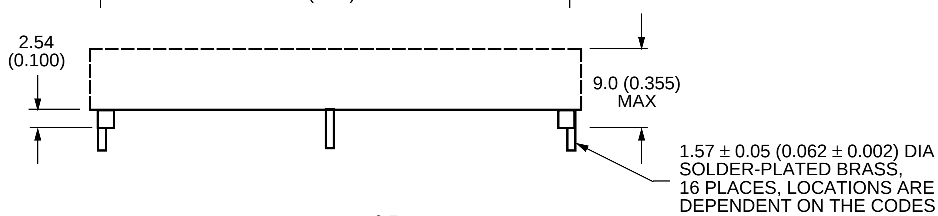
Dimensions are in millimeters and (inches).

Tolerances: x.x mm ± 0.5 mm (x.xx in. ± 0.02 in.)
x.xx mm ± 0.25 mm (x.xxx in. ± 0.010 in.)

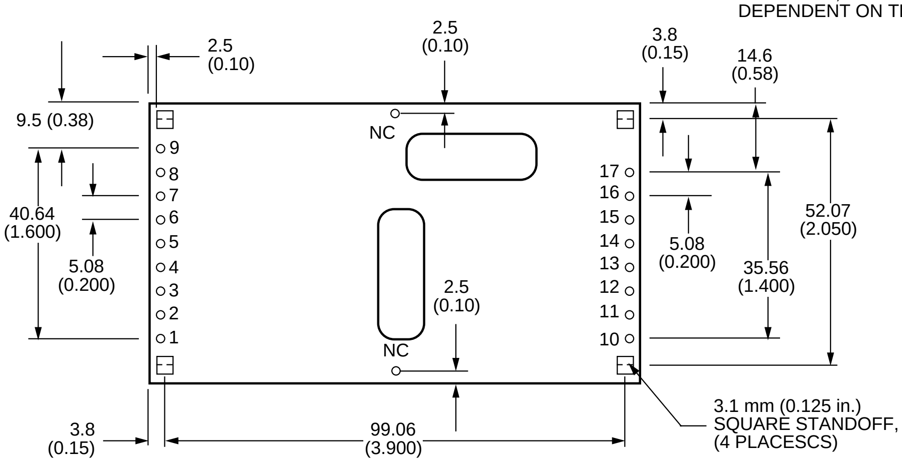
Top View



Side View



Bottom View



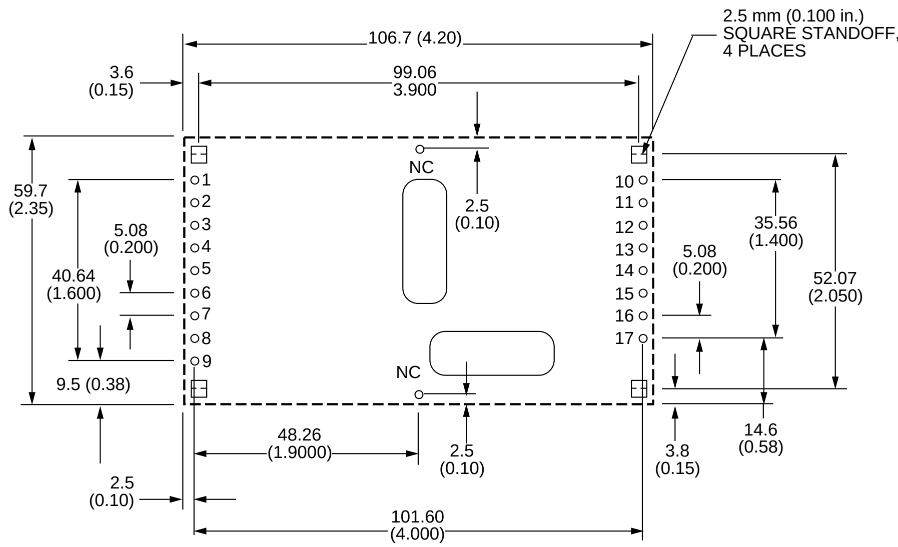
8-1967(C)

Pin	Function	Pin	Function	Pin	Function
1	V–1 (No Connection)	7	VI(+)	13	SENSE–
2	V–2 (No Connection)	8	V–3 (No Connection)	14	VO(–)
3	RESET	9	V–4 (No Connection)	15	VO(–)
4	ON/OFF	10	V–5 (No Connection)	16	VO(+)
5	ALARM	11	TRIM	17	VO(+)
6	VI(–)	12	SENSE+		

Recommended Hole Pattern

Component-side footprint. Refer to previous page for pin function table.

Dimensions are in millimeters and (inches).



8-1967(C)

Ordering Information

For assistance in ordering, call the Lucent Technologies Power Systems Technical Hotline (1-800-526-7819 or 972-284-2626).

Input Voltage	Output Voltage	Output Power	Device Code	Comcode
48 V	1.5 V	30 W	HFW100M	108032491
48 V	3.3 V	66 W	HFW100F	108032483

Notes

Notes

For additional information, contact your Lucent Technologies Account Manager or the following:
POWER SYSTEMS UNIT: Network Products Group, Lucent Technologies Inc., 3000 Skyline Drive, Mesquite, TX 75149, USA
+1-800-526-7819 (Outside U.S.A.: **+1-972-284-2626**, FAX +1-972-284-2900) (product-related questions or technical assistance)
INTERNET: **http://www.lucent.com/networks/power**
E-MAIL: **techsupport@lucent.com**
ASIA PACIFIC: Lucent Technologies Singapore Pte. Ltd., 750A Chai Chee Road #05-01, Chai Chee Industrial Park, Singapore 469001
Tel. (65) 240 8041, FAX (65) 240 8053
CHINA: Lucent Technologies (China) Co. Ltd., SCITECH Place No. 22 Jian Guo Man Wai Avenue, Beijing 100004, PRC
Tel. (86) 10-6522 5566 ext. 4187, FAX (86) 10-6512 3694
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LATIN AMERICA: Lucent Technologies Inc., Room 416, 2333 Ponce de Leon Blvd., Coral Gables, FL 33134, USA
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FRANCE: **(33) 1 40 83 68 00** (Paris), SWEDEN: **(46) 8 594 607 00** (Stockholm), FINLAND: **(358) 9 4354 2800** (Helsinki),
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