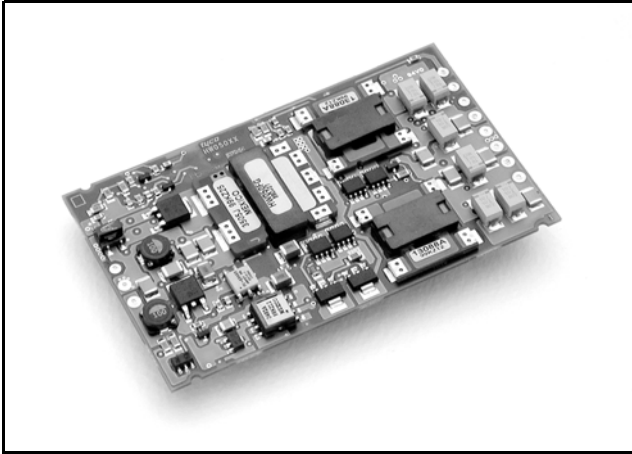


## HC050FG Power Module: dc-dc Converter: 18 to 36 Vdc Input, 3.3 and 2.5 Vdc Dual Output; 50 W



The HC050FG Dual-Output Power Modules use advanced surface-mount technology and deliver high-quality, efficient, and compact dc-dc conversion.

### Applications

- Distributed power architectures
- Communications equipment
- Computer equipment

### Options

- Remote on/off logic choice (positive or negative)

### Description

The HC050FG Dual-Output Power Modules are open frame (no case, no potting) dc-dc converters that operate over an input voltage range of 18 Vdc to 36 Vdc and provide two precisely regulated dc outputs. The module has a maximum power rating of 50 W, and uses synchronous rectification on both outputs to achieve a typical full-load efficiency of 86%.

### Features

- Dual outputs with tight regulation
- Low profile
- Small size: 99.1 mm x 60.0 mm x 8.5 mm (3.90 in. x 2.36 in. x 0.33 in.)
- High efficiency: 86% typical
- Flexible loading between outputs
- Fixed frequency
- Open frame design; no case or potting
- Overcurrent protection
- Output overvoltage protection
- Remote on/off
- Wide output voltage adjustment
- Overtemperature protection
- Wide operating temperature range
- ISO\* 9001 Certified manufacturing facilities
- UL† 60950 Recognized, CSA‡ 22.2 No. 60950-00 Certified, and VDE§ 0805 (IEC60950) Licensed

\* ISO is a registered trademark of the International Organization for Standardization.

† UL is a registered trademark of Underwriters Laboratories, Inc.

‡ CSA is a registered trademark of Canadian Standards Association.

§ VDE is a trademark of Verband Deutscher Elektrotechniker e.V.

## 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	$V_I$	—	40	Vdc
Transient (2 ms)	$V_{I, trans}$	—	50	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

\* 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	$V_I$	18	24	36	Vdc
Maximum Input Current	$I_{I, max}$	—	—	5.6	A
Inrush Transient	—	—	—	1.0	A <sup>2</sup> s
Input Reflected-ripple Current, Peak-to-peak (5 Hz to 20 MHz, 12 $\mu$ H source impedance)	—	—	15	—	mAp-p
Input Ripple Rejection (100 Hz—120 Hz)	—	—	60	—	dB
EMC, EN55022 ( $V_I, nom$ , full load)	See EMC Consideration section.				

## Fusing Considerations

**CAUTION: This power module is not internally fused. An input line fuse must always be used.**

This power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. To preserve maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a normal-blow, fuse with a maximum rating of 6 A (see Safety Considerations section). Based on the information provided in this data sheet on inrush energy and maximum dc input current, the same type of fuse with a lower rating can be used. Refer to the fuse manufacturer's data for further information.

**Electrical Specifications** (continued)

**Table 2. Output Specifications**

Parameter	Device	Symbol	Min	Typ	Max	Unit
Output Voltage Set Point ( $V_I = 24\text{ V}$ ; $I_O = I_{O, \max}$ ; $T_A = 25\text{ }^\circ\text{C}$ )	All	$V_{O1, \text{set}}$	3.25	3.30	3.35	Vdc
	All	$V_{O2, \text{set}}$	2.46	2.50	2.54	Vdc
Output Voltage (Over all operating input voltage, resistive load, and temperature conditions until end of life. See Figure 12.)	All	$V_{O1}$	3.16	—	3.44	Vdc
	All	$V_{O2}$	2.42	—	2.58	Vdc
Output Regulation: Line ( $V_I = 18\text{ V to } 36\text{ V}$ ) Load ( $I_O = I_{O, \min}$ to $I_{O, \max}$ ) Temperature ( $T_A = -40\text{ }^\circ\text{C to } +70\text{ }^\circ\text{C}$ )	All	—	—	0.05	0.2	% $V_O$
	All	—	—	0.03	0.2	% $V_O$
	All	—	—	0.3	1.0	% $V_O$
Output Ripple and Noise Voltage (see Figure 11): RMS (5 Hz to 20 MHz bandwidth) ( $V_I = 24\text{ V}$ ) Peak-to-peak (5 Hz to 20 MHz bandwidth) Temperature ( $T_A = -25\text{ }^\circ\text{C to } +70\text{ }^\circ\text{C}$ )	All	—	—	—	30	mVrms
	All	—	—	—	100	mVp-p
External Load Capacitance	All	—	0	—	10,000	$\mu\text{F}$
Output Current (At $I_O < I_{O, \min}$ , the modules may exceed output ripple specifications.) <b>Note:</b> The maximum combined output current must not exceed 16 A.	All	$I_{O1}$	0.5	—	12.0	Adc
	All	$I_{O2}$	0.5	—	12.0	Adc
Output Current-limit Inception ( $V_O = 90\%$ of $V_{O, \text{nom}}$ ; 4 A load on other output)	All	$I_{O, \text{cli}}$	—	15.0	18.0*	A
Output Short-circuit Current ( $V_O = 250\text{ mV}$ )	All	—	—	30	—	% $I_{O, \max}$
Efficiency (for $V_I = 24\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , $I_{O1} = 8\text{ A}$ , $I_{O2} = 8\text{ A}$ ) When Trimmed to Lowest Voltages: Trimmed to $V_{O1} = 2.5\text{ V}$ , $V_{O2} = 1.5\text{ V}$ , $I_{O1} = I_{O2} = 8\text{ A}$	HC050FG	$\eta$	—	86.0	—	%
	HC050FG (trimmed down)	$\eta$	—	83.0	—	%
Switching Frequency	All	—	—	200	—	kHz

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

## Electrical Specifications (continued)

Table 2. Output Specifications (continued)

Parameter	Device	Symbol	Min	Typ	Max	Unit
Dynamic Response ( $\Delta I_o/\Delta t = 1 \text{ A}/10 \mu\text{s}$ , $V_I = 24 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ ; tested without any load capacitance. Adding load capacitance will improve performance.):						
Load Change from $I_{o1} = 50\%$ to $75\%$ of $I_{o1, \text{max}}$ , $I_{o2} = 30\%$ of $I_{o2, \text{max}}$ :						
Peak Deviation	All	—	—	200	—	mV
Settling Time ( $V_o < 10\%$ of peak deviation)	All	—	—	800	—	$\mu\text{s}$
Load Change from $I_o = 50\%$ to $25\%$ of $I_{o1, \text{max}}$ , $I_{o2} = 30\%$ of $I_{o2, \text{max}}$ :						
Peak Deviation	All	—	—	200	—	mV
Settling Time ( $V_o < 10\%$ of peak deviation)	All	—	—	800	—	$\mu\text{s}$

## Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	—	40	—	nF
Isolation Resistance	10	—	—	$M\Omega$

## General Specifications

Parameter	Min	Typ	Max	Unit
Calculated MTBF ( $I_o = 80\%$ of $I_{o, \text{max}}$ ; $T_A = 20 \text{ }^\circ\text{C}$ )		2,000,000		hours
Weight	—	—	60 (2.1)	g (oz.)

## 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 ( $V_I = 0\text{ V}$ to $36\text{ V}$ ; open collector or equivalent compatible; signal referenced to $V_I(-)$ terminal; see Figure 13 and Feature Descriptions.): HC050FG1 Preferred Logic: Logic Low—Module On Logic High—Module Off HC050FG Optional Logic: Logic Low—Module Off Logic High—Module On Logic Low: At $I_{on/off} = 1.0\text{ mA}$ At $V_{on/off} = 0.0\text{ V}$ Logic High: At $I_{on/off} = 0.0\text{ }\mu\text{A}$ Leakage Current Turn-on Time ( $I_o = 80\%$ of $I_{o, max}$ ; $V_o$ within $\pm 1\%$ of steady state; see Figure 9.)	— — — — All	$V_{on/off}$ $I_{on/off}$ $V_{on/off}$ $I_{on/off}$ —	0 — — — —	— — — — 30	1.2 1.0 15 50 45	V mA V $\mu\text{A}$ ms
Output Voltage Set-point Adjustment (trim), Each Output: <b>Note:</b> There are trim restrictions based on output voltage combinations. Refer to the Feature Description section for details.	All All	for $V_{O1}$ for $V_{O2}$	2.50 1.50	— —	3.46 2.50	V V
Output Overvoltage Protection (shutdown)	All	$V_{O1}$ & $V_{O2}$	—	—	4.6*	V

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

## 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).

## Solder, Cleaning, and Drying Considerations

Post solder cleaning is usually the final circuit-board assembly process prior to electrical board 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 the *Board-Mounted Power Modules Soldering and Cleaning Application Note* (AP97-021EPS.)

## Characteristic Curves

The following figures provide typical characteristics for the power modules. The figures are identical for both on/off configurations.

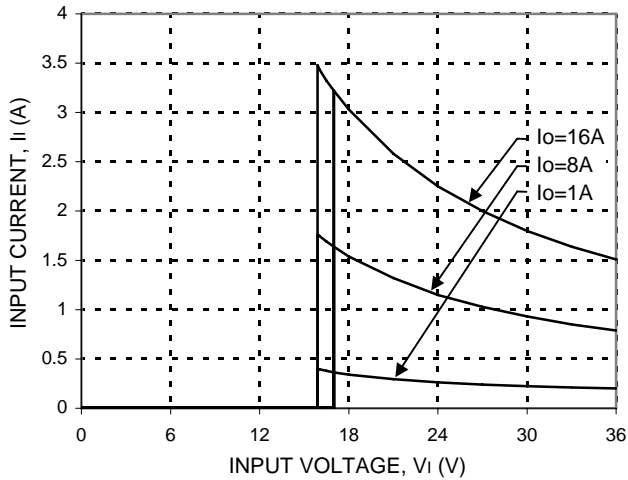
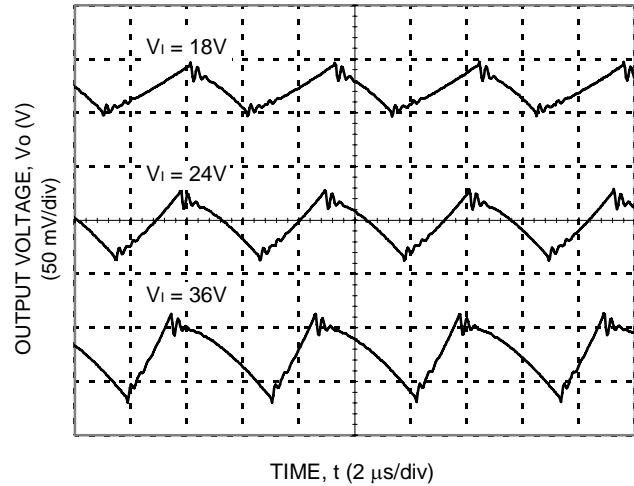


Figure 1. Typical HC050FG Input Characteristics at Room Temperature



1-0159

Figure 3. Typical HC050FG Output Ripple Voltage 3.3 V Output at Room Temperature and  $I_o = I_{o, max}$ , Different Input Voltage

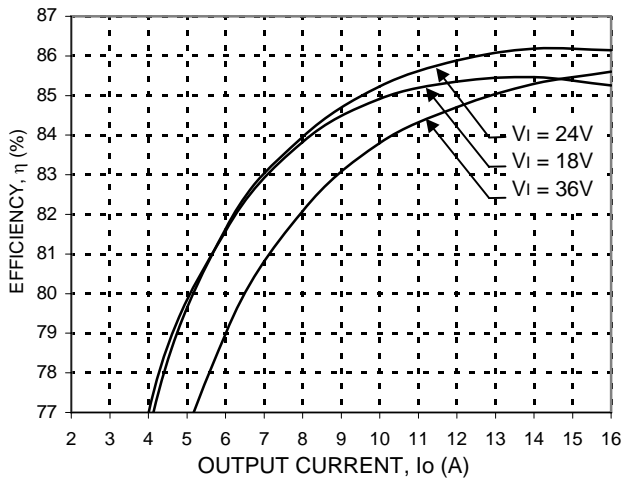
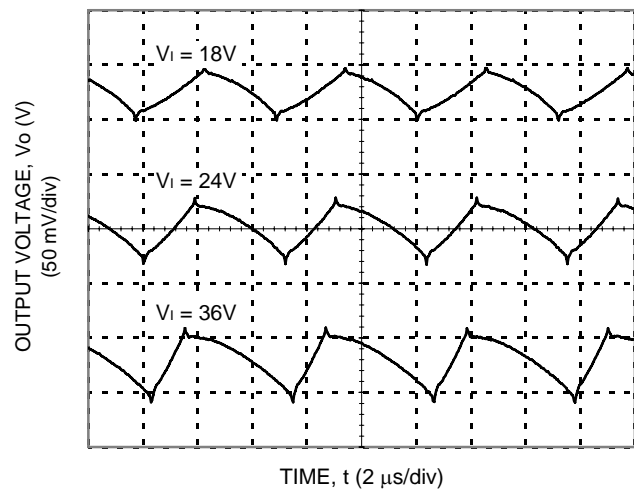


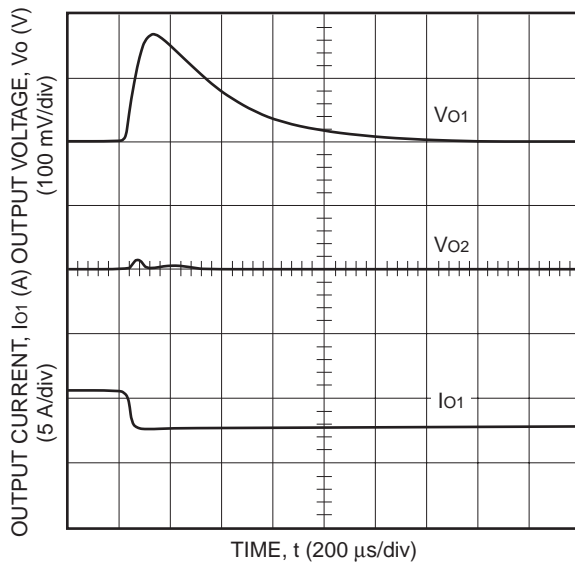
Figure 2. Typical HC050FG Converter Efficiency vs. Output Current at Room Temperature



1-0160

Figure 4. Typical HC050FG Output Ripple Voltage 2.5 V Output at Room Temperature and  $I_o = I_{o, max}$ , Different Input Voltage

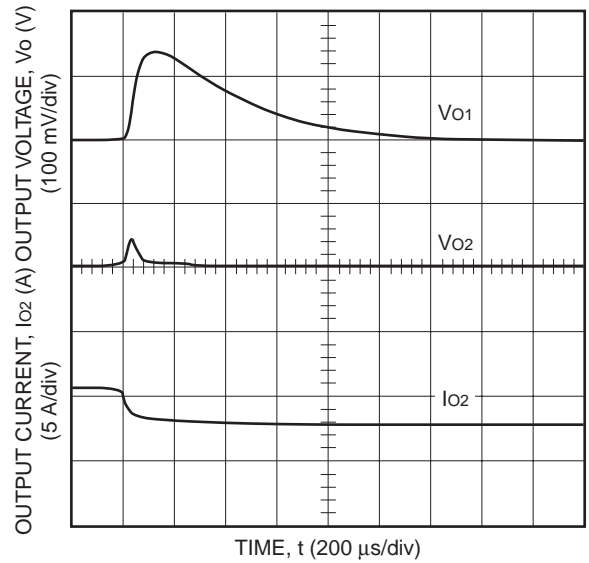
Characteristic Curves (continued)



Note: Tested without any load capacitance. Adding Load Capacitance will improve performance.

**Figure 5. Typical HC050FG Transient Response to Step Decrease in Load,  $I_{O1} = 50\%$  to  $25\%$  of  $I_{O1, max}$ ,  $I_{O2} = 30\%$  of  $I_{O2, max}$ , at Room Temperature and 24 V Input (Waveform Averaged to Eliminate Ripple Component.)**

1-0161

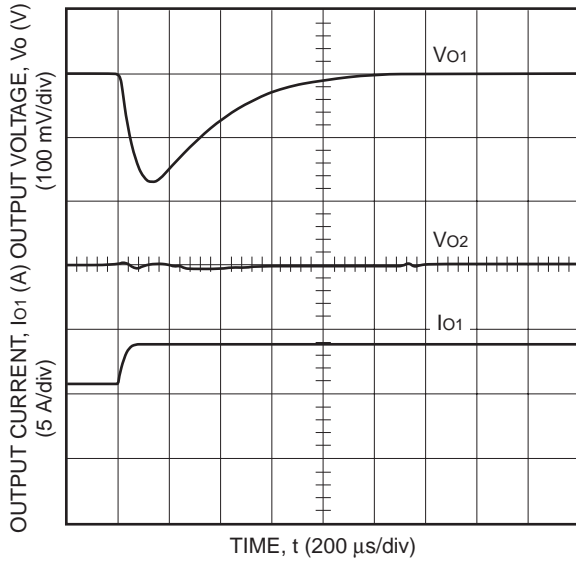


1-0162

Note: Tested without any load capacitance. Adding Load Capacitance will improve performance.

**Figure 6. Typical HC050FG Transient Response to Step Decrease in Load,  $I_{O2} = 50\%$  to  $25\%$  of  $I_{O2, max}$ ,  $I_{O1} = 30\%$  of  $I_{O1, max}$ , at Room Temperature and 24 V Input (Waveform Averaged to Eliminate Ripple Component.)**

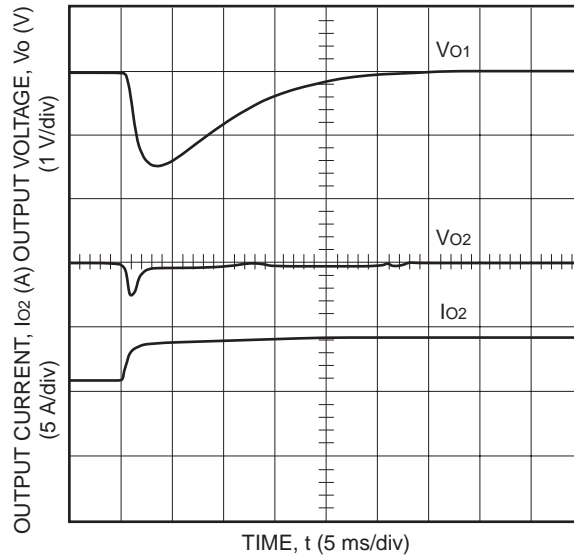
Characteristic Curves (continued)



1-0163

Note: Tested without any load capacitance. Adding Load Capacitance will improve performance.

**Figure 7. Typical HC050FG Transient Response to Step Increase in Load,  $I_{O1} = 50\%$  to  $75\%$  of  $I_{O1, max}$ ,  $I_{O2} = 30\%$  of  $I_{O2, max}$ , at Room Temperature and 24 V Input (Waveform Averaged to Eliminate Ripple Component.)**

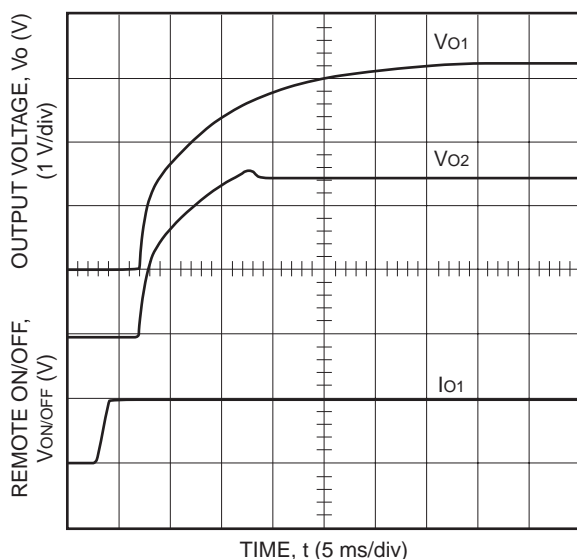


1-0164

Note: Tested without any load capacitance. Adding Load Capacitance will improve performance.

**Figure 8. Typical HC050FG Transient Response to Step Increase in Load,  $I_{O2} = 50\%$  to  $75\%$  of  $I_{O2, max}$ ,  $I_{O1} = 30\%$  of  $I_{O1, max}$ , at Room Temperature and 24 V Input (Waveform Averaged to Eliminate Ripple Component.)**

### Characteristic Curves (continued)

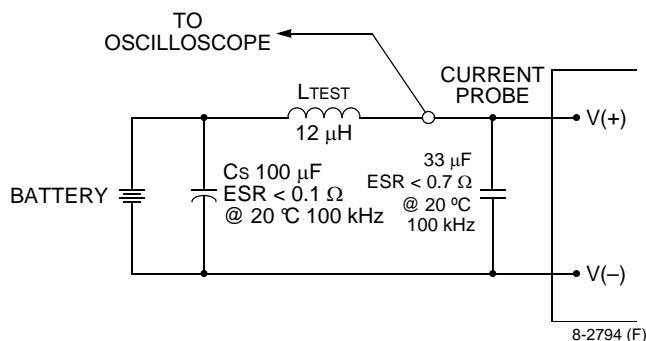


1-0165

Note: Tested without any load capacitance.

**Figure 9. Typical Start-Up from Remote On/Off**  
HC050FG:  $I_o = I_{o, max}$

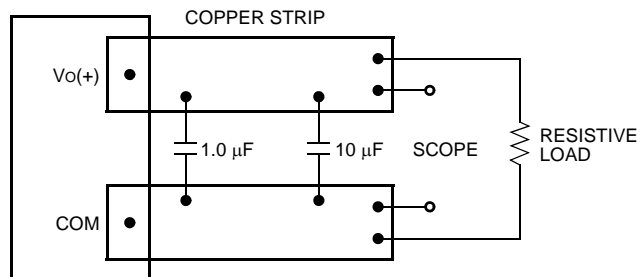
### Test Configurations



8-2794 (F)

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

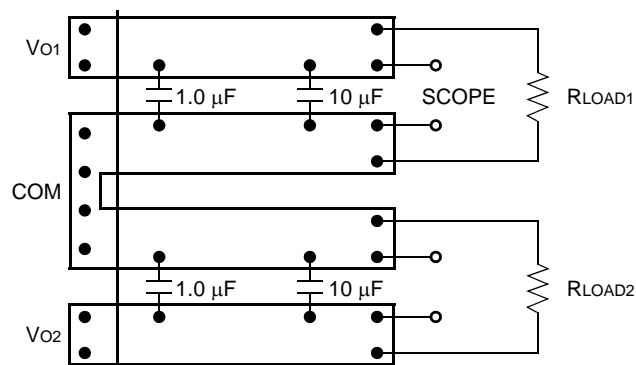
**Figure 10. Input Reflected-Ripple Test Setup**



8-2795 (F)

Note: Use a 1.0  $\mu$ F ceramic capacitor and a 10  $\mu$ F 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 11. Peak-to-Peak Output Noise Measurement Test Setup**



8-2796 (F)

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.

$$\eta = \left( \frac{[V_{O1(+)} - V_{O1(-)}]I_o + [V_{O2(+)} - V_{O2(-)}]I_o}{[V_{I(+)} - V_{I(-)}]I_i} \right) \times 100$$

**Figure 12. 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 10, a 33  $\mu$ F electrolytic capacitor (ESR < 0.7  $\Omega$  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 60950*, *CSA C22.2 No. 60950-00*, *VDE 0805 (IEC60950)*.

For the converter output to be considered meeting the requirements of safety extra-low voltage (SELV), the input must meet SELV requirements.

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

The input to these units is to be provided with a maximum 6 A normal-blow fuse in the ungrounded lead.

## 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 continuously. At the point of current-limit inception, the unit shifts from voltage control to current control. The form of current-limit used is hiccup mode. The unit operates normally once the output current is brought back into its specified range. Average output current during hiccup mode is 30% of  $I_{O, \max}$ .

### Remote On/Off

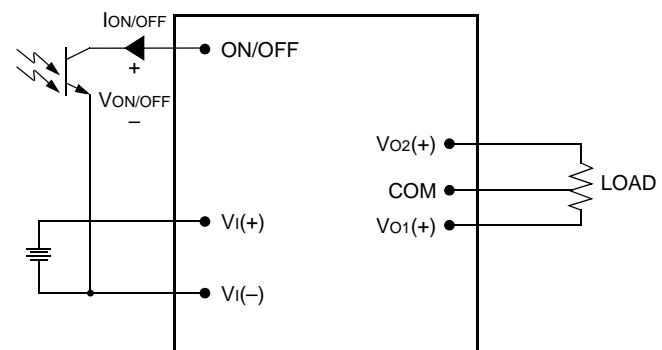
Two remote on/off options are available. Positive logic remote on/off turns the module on during a logic-high voltage on the ON/OFF pin, and off during a logic low. Negative logic remote on/off turns the module off during a logic high and on during a logic low. Negative logic, device code suffix "1," is the factory-preferred configuration.

To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the  $V_I(-)$  terminal ( $V_{On/off}$ ). The switch can be an open collector or equivalent (see Figure 13). A logic low is  $V_{On/off} = 0$  V to 1.2 V. The maximum  $I_{On/off}$  during a logic low is 1 mA. The switch should maintain a logic-low voltage while sinking 1 mA.

During a logic high, the maximum  $V_{On/off}$  generated by the power module is 6.1 V. The maximum allowable leakage current of the switch at  $V_{On/off} = 6.1$  V is 50  $\mu$ A.

If not using the remote on/off feature, do one of the following:

- For negative logic, short ON/OFF pin to  $V_I(-)$ .
- For positive logic, leave ON/OFF pin open.



8-2800 (F)

Figure 13. Remote On/Off Implementation

## Feature Descriptions (continued)

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

Output voltage set point adjustment (trim) allows the output voltage set point to be increased or decreased. There are two trim pins, one for each output. The adjustment (trim) is accomplished by connecting an external resistor between the TRIM pin and either the Vo(+) pin or COM pin of the output to be adjusted. In order to maintain the output voltage set-point percentage accuracy, the trim resistor tolerance should be  $\pm 0.1\%$ . The trim resistor should be positioned close to the module.

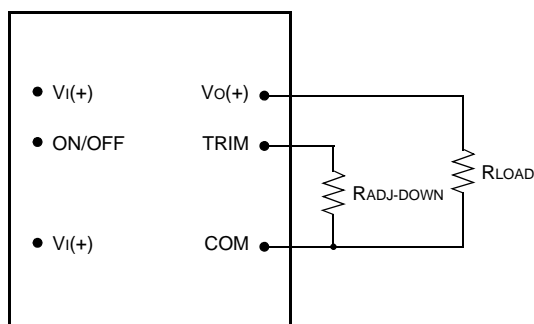
If not using the trim feature, leave the TRIM pin(s) open.

Connecting an external resistor ( $R_{\text{trim-down}}$ ) between the TRIM pin of the desired output and COM pin decreases the output voltage set point (see Figure 14). The following equations determine the required external-resistor value to obtain a percentage output voltage change of  $\Delta\%$ .

$$V_{O1} \quad R_{\text{adj-down}} = \left( \frac{511}{\Delta\%} - 6.11 \right) \text{ k}\Omega$$

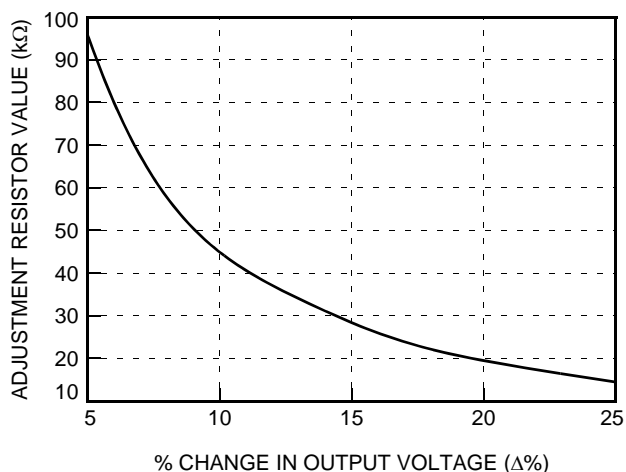
$$V_{O2} \quad R_{\text{adj-down}} = \left( \frac{100}{\Delta\%} - 1.33 \right) \text{ k}\Omega$$

The test results for these configurations are displayed in Figure 15 and Figure 16.



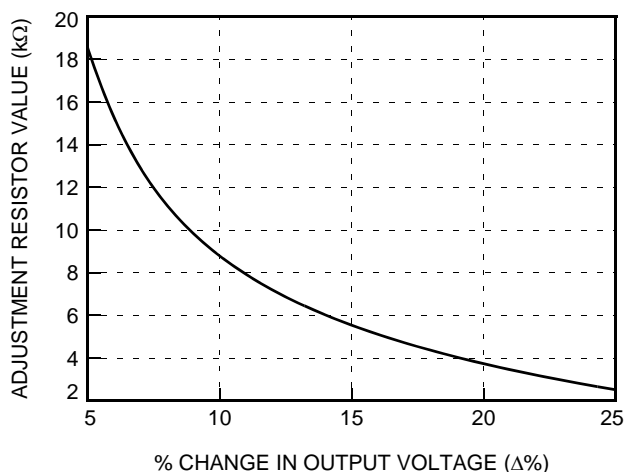
8-2798 (F)

Figure 14. Circuit Configuration to Decrease Output Voltage



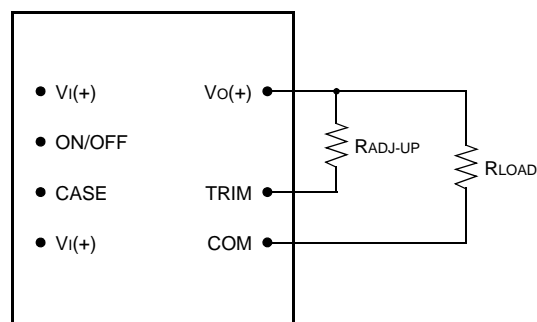
8-2680 (F)

Figure 15. Resistor Selection for Decreased Output Voltage for V<sub>O1</sub>



8-2681 (F)

Figure 16. Resistor Selection for Decreased Output Voltage for V<sub>O2</sub>



8-2797 (F)

Figure 17. Circuit Configuration to Increase Output Voltage

## Feature Descriptions (continued)

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

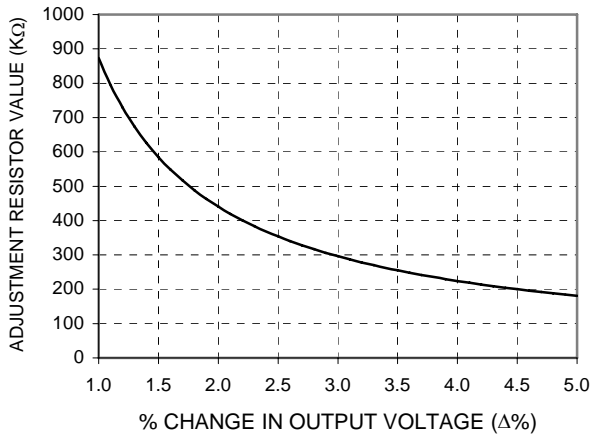


Figure 18. Resistor Selection for Increased Output Voltage for  $V_{O1}$

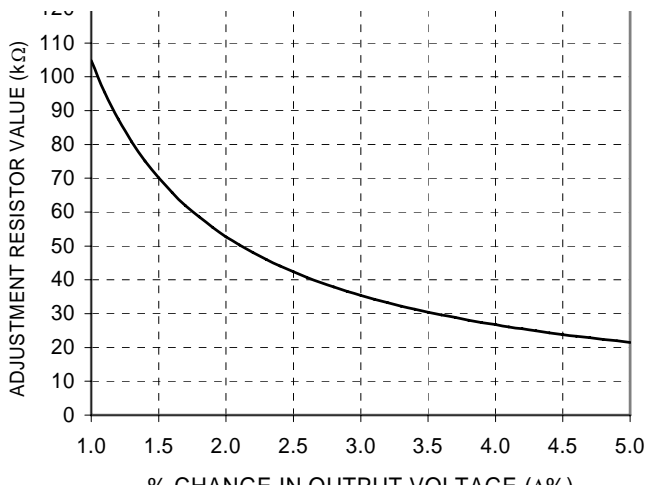


Figure 19. Resistor Selection for Increased Output Voltage for  $V_{O2}$

Connecting an external resistor ( $R_{trim-up}$ ) between the TRIM pin and  $V_{O(+)}$  pin of the desired output increases the output voltage set point (see Figure 17).

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

$$V_{O1} R_{trim-up} = \left( \frac{5.11V_o(100 + \Delta\%)}{1.225\Delta\%} - \frac{511}{\Delta\%} - 6.11 \right) \text{ k}\Omega$$

$$V_{O2} R_{trim-up} = \left( \frac{V_o(100 + \Delta\%)}{1.225\Delta\%} - \frac{100}{\Delta\%} - 1.33 \right) \text{ k}\Omega$$

The test results for these configurations are displayed in Figure 18 and Figure 19.

**Note:** The following voltage range restrictions apply:

For  $V_{O1}$  set to 3.3 V  
 $V_{O2}$  range is 1.5 V to 2.5 V

For  $V_{O1}$  set to 2.5 V  
 $V_{O2}$  range is 1.5 V to 1.8 V

**Note:** The voltage between the  $V_{O(+)}$  and COM terminals must not exceed the minimum output over-voltage shutdown voltage as indicated in the Feature Specifications table. 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 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.

### 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 ON/OFF pin for one second.

## Feature Descriptions (continued)

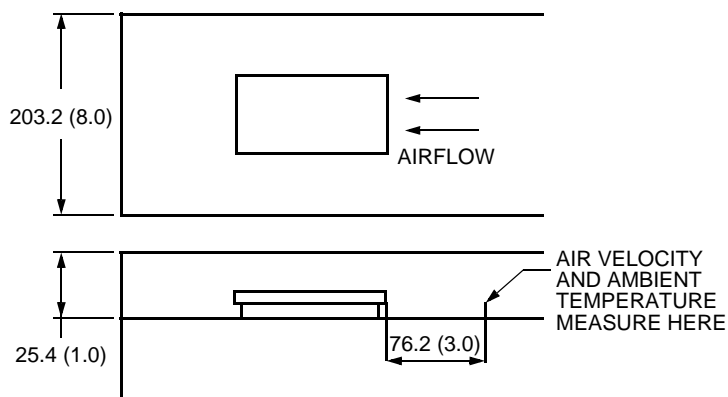
### Overtemperature Protection

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 primary referenced on/off signal 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 20 was used to collect data for Figure 23 through Figure 25. Note that the orientation of the module with respect to airflow affects thermal performance. Two orientations are shown in Figure 21 and Figure 22.

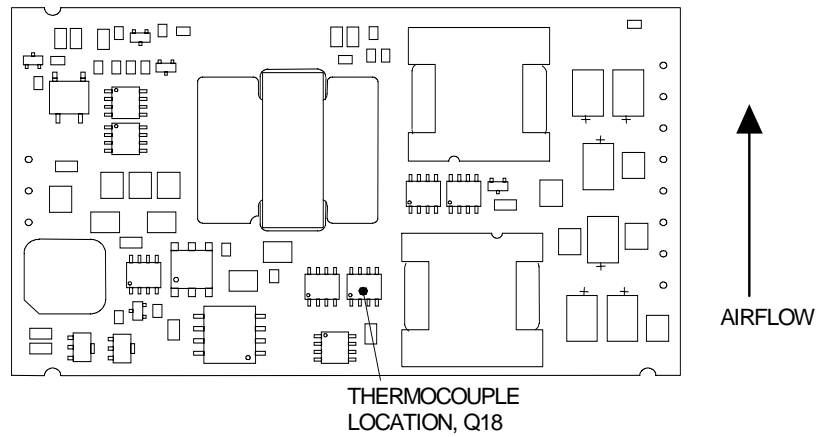


Note: Dimensions are in millimeters and (inches).

8-2603 (F)

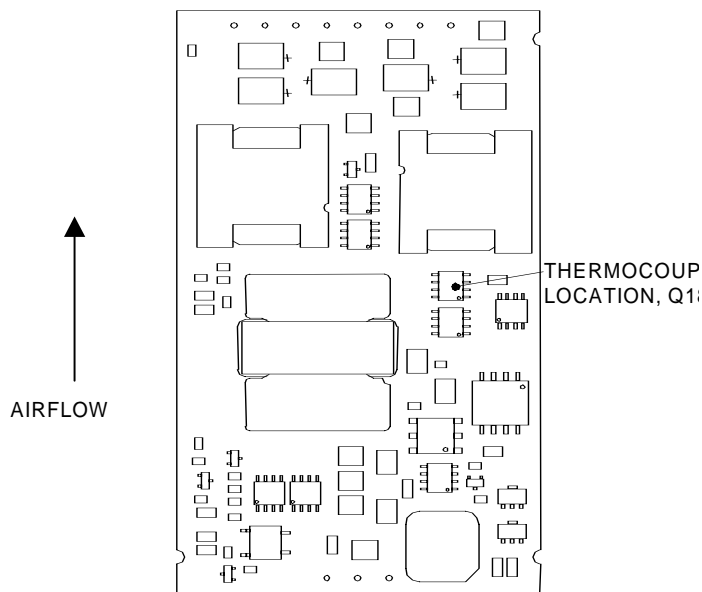
Figure 20. Thermal Test Setup

Thermal Considerations (continued)



1-0169

Figure 21. Best Orientation (Top View)



1-0170

Figure 22. Worst Orientation (Top View)

Proper cooling can be verified by measuring the power modules temperature at the top center of the case of the body of Q18 as shown in Figure 22.

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.

## Thermal Considerations (continued)

### 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. Figure 23 shows typical heat dissipation for the module over a range of output currents.  $I_{O1} = I_{O2} = \frac{1}{2} I_O$ .

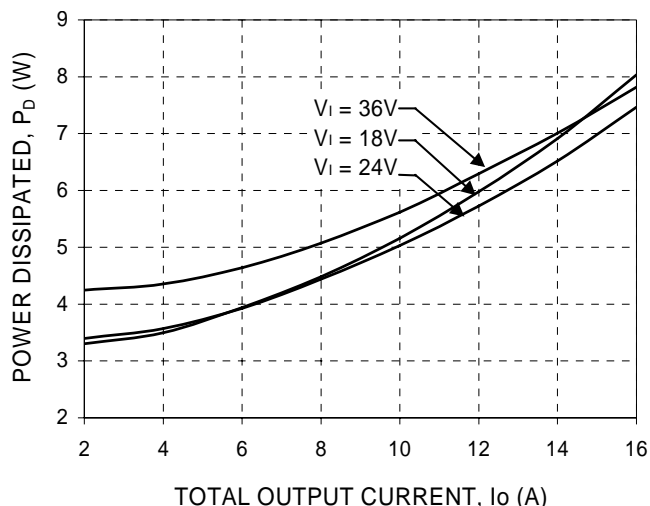


Figure 23. HC050FG Power Dissipation vs. Output Current,  $T_A = 25^\circ\text{C}$

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 Figure 24 through Figure 25.

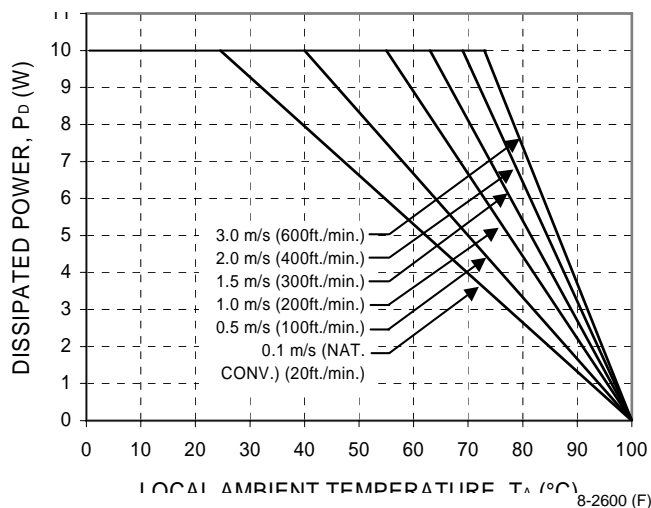


Figure 24. HC050FG Power Derating vs. Local Ambient Temperature and Air Velocity; Best Orientation

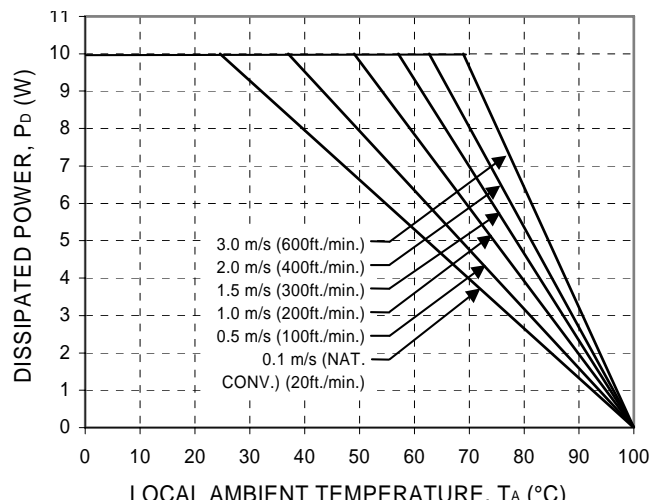


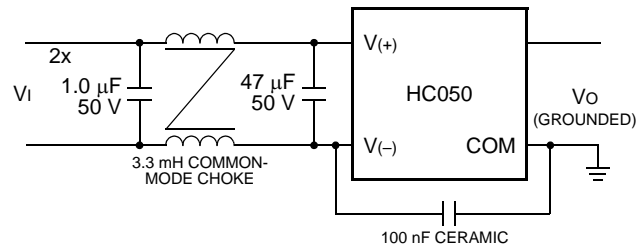
Figure 25. HC050FG Power Derating vs. Local Ambient Temperature and Air Velocity; Worst Orientation

For example, if the HC050FG dissipates 7.5 W of heat at 16 A full load, the minimum airflow for best module orientation in a  $65^\circ\text{C}$  environment is 1 m/s (200 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 to make sure it does not exceed  $100^\circ\text{C}$ .

## EMC Considerations

Figure 26 shows the suggested configuration to meet conducted limits of EN55022 Class B.



**Figure 26. Suggested Configuration for EN55022**

For assistance with designing for EMC compliance, please refer to the FLTR100V10 data sheet (DS99-294EPS).

## Layout Considerations

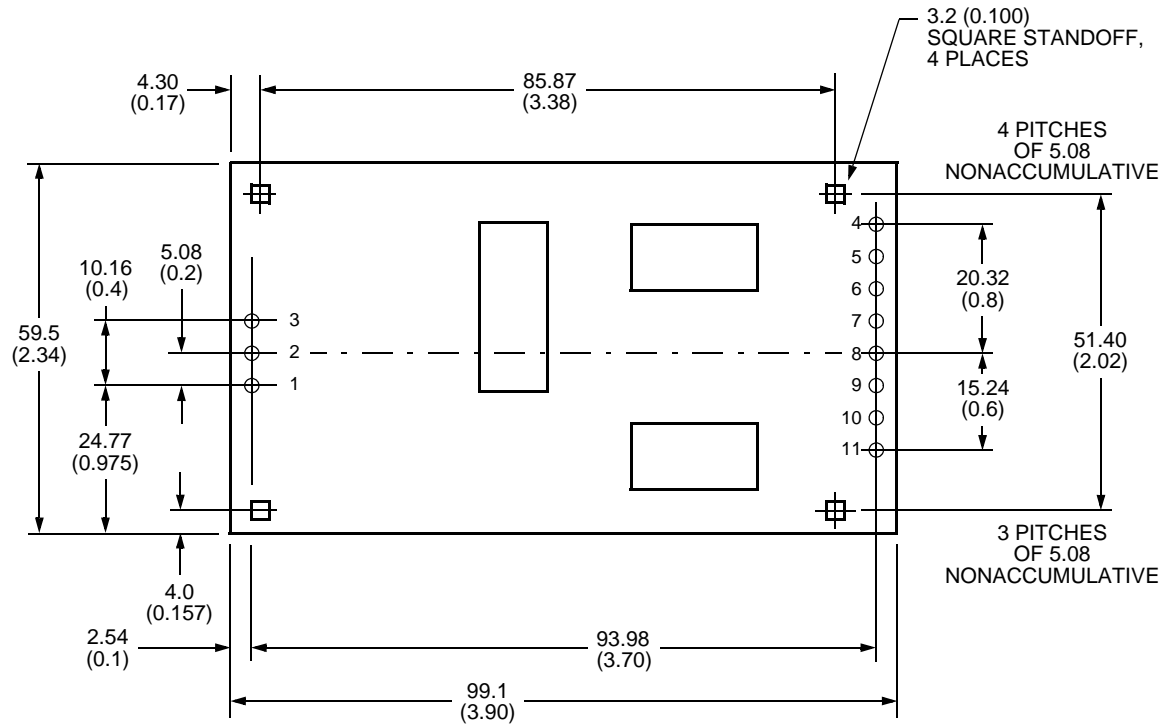
Copper paths must not be routed beneath the power module mounting inserts. For additional layout guidelines, refer to FLTR100V10 data sheet (DS99-294EPS).



## Recommended Hole Pattern

Component-side footprint.

Dimensions are in millimeters and (inches).



8-2607 (F)

**Table 3. Pin Function**

Pin	Function
1	V <sub>I</sub> (+)
2	V <sub>I</sub> (-)
3	ON/OFF
4	V <sub>O1</sub> TRIM
5	V <sub>O2</sub> TRIM
6	V <sub>O1</sub>
7	V <sub>O1</sub>
8	COM
9	COM
10	V <sub>O2</sub>
11	V <sub>O2</sub>

## Ordering Information

Please contact your Lineage Power Account Manager or Field Application Engineer for pricing and availability.

Input Voltage	Output Voltage	Output Power	Remote On/Off Logic	Device Code	Comcode
24 V	3.3 V and 2.5 V	49.6 W	Negative	HC050FG1	TBD
24 V	3.3 V and 2.5 V	49.6 W	Positive	HC050FG	108844580

## **Notes**



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