Advance Data Sheet
May 1999

Lucent Technologies
Bell Labs Innovations

JAW050A and JAW075A Power Modules: dc-dc Converters; 36 to 75 Vdc Input, 5 Vdc Output; 50 W to 75 W

The JAW Series Power Modules use surface-mount technology and deliver efficient and compact dc-dc conversion.

Applications

- Distributed power architectures

Options

- Heat sinks available for extended operation
- Choice of remote on/off logic configuration

Features

- Small size: 61.0 mm x 57.9 mm x 12.7 mm (2.40 in. x 2.28 in. x 0.50 in.)
- High power density
- High efficiency: 84% typical
- Low output noise
- Constant frequency
- Industry-standard pinout
- Metal case
- 2:1 input voltage range
- Overtemperature protection
- Remote sense
- Remote on/off
- Adjustable output voltage
- Overvoltage and overcurrent protection
- Case ground pin
- 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 JAW050A and JAW075A Power Modules are dc-dc converters that operate over an input voltage range of 36 Vdc to 75 Vdc and provide a regulated dc output. The outputs are fully isolated from the inputs, allowing versatile polarity configurations and grounding connections. The modules have maximum power ratings from 50 W to 75 W at a typical full-load efficiency of 84%.

The sealed modules offer a metal baseplate for improved thermal performance. Threaded-through holes are provided to allow easy mounting or addition of a heat sink for high-temperature applications. The standard feature set includes remote sensing, output trim, and remote on/off for convenient flexibility in distributed power applications.

* *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.)

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	—	80	Vdc
Transient (100 ms)	$V_{I, trans}$	—	100	V
Operating Case Temperature (See Thermal Considerations section.)	T_C	–40	100	°C
Storage Temperature	T_{stg}	–55	125	°C
I/O Isolation Voltage	—	—	1500	Vdc

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; $I_O = I_{O, max}$):					
JAW050A1 (See Figure 1.)	$I_{I, max}$	—	—	3.0	A
JAW075A1 (See Figure 2.)	$I_{I, max}$	—	—	3.5	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 9.)	—	—	5	—	mAp-p
Input Ripple Rejection (120 Hz)	—	—	60	—	dB

Fusing Considerations

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

This encapsulated 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 = 48 V; $I_O = I_{O,\,max}$; T_C = 25 °C)	All	$V_{O,\,set}$	4.92	5.0	5.08	Vdc
Output Voltage (Over all operating input voltage, resistive load, and temperature conditions until end of life. See Figure 11.)	All	V_O	4.85	—	5.15	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_C = –40 °C to +100 °C)	All	—	—	15	50	mV
Output Ripple and Noise Voltage (See Figure 10.):						
RMS	All	—	—	—	40	mVrms
Peak-to-peak (5 Hz to 20 MHz)	All	—	—	—	150	mVp-p
External Load Capacitance	All	—	0	—	—*	µF
Output Current (At $I_O < I_{O,\,min}$, the modules may exceed output ripple specifications.)	JAW050A1	I_O	0.5	—	10	A
	JAW075A1	I_O	0.5	—	15	A
Output Current-limit Inception (V_O = 90% of $V_{O,\,nom}$)	JAW050A1	$I_{O,\,cli}$	—	12.0	14†	A
	JAW075A1	$I_{O,\,cli}$	—	18.0	21†	A
Output Short-circuit Current (V_O = 250 mV)	All	—	—	170	—	%$I_{O,\,max}$
Efficiency (V_I = 48 V; $I_O = I_{O,\,max}$; T_C = 70 °C)	JAW050A1	η	—	84	—	%
	JAW075A1	η	—	84	—	%
Switching Frequency	All	—	—	320	—	kHz
Dynamic Response ($\Delta I_O/\Delta t$ = 1 A/10 µs, V_I = 48 V, T_C = 25 °C; tested without any load capacitance.):						
Load Change from I_O = 50% to 75% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	5	—	%$V_{O,\,set}$
Settling Time (V_O < 10% of peak deviation)	All	—	—	300	—	µs
Load Change from I_O = 50% to 25% of $I_{O,\,max}$:						
Peak Deviation	All	—	—	5	—	%$V_{O,\,set}$
Settling Time (V_O < 10% of peak deviation)	All	—	—	300	—	µs

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

Table 3. Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	—	2500	—	pF
Isolation Resistance	10	—	—	MΩ

General Specifications

Parameter	Min	Typ	Max	Unit
Calculated MTBF (I_O = 80% of $I_{O, max}$; T_C = 40 °C)		3,000,000		hours
Weight	—	—	100 (3.5)	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	Symbol	Min	Typ	Max	Unit
Remote On/Off Signal Interface (V_I = 0 V to 75 V; open collector or equivalent compatible; signal referenced to V_I(–) terminal; see Figure 12 and Feature Descriptions.):					
JAWxxxA1 Preferred Logic:					
Logic Low—Module On					
Logic High—Module Off					
JAWxxxA Optional Logic:					
Logic Low—Module Off					
Logic High—Module On					
Logic Low:					
At $I_{on/off}$ = 1.0 mA	$V_{on/off}$	0	—	1.2	V
At $V_{on/off}$ = 0.0 V	$I_{on/off}$	—	—	1.0	mA
Logic High:					
At $I_{on/off}$ = 0.0 µA	$V_{on/off}$	—	—	15	V
Leakage Current	$I_{on/off}$	—	—	50	µA
Turn-on Time (See Figure 8.) (I_O = 80% of $I_{O, max}$; V_O within ±1% of steady state)	—	—	40	80	ms
Output Voltage Adjustment (See Feature Descriptions.):					
Output Voltage Remote-sense Range	—	—	—	0.5	V
Output Voltage Set-point Adjustment Range (trim)	—	60	—	110	%$V_{O, nom}$
Output Overvoltage Protection (shutdown)	$V_{O, sd}$	5.9*	6.0	7.0*	V
Overtemperature Protection (shutdown)	T_C	—	105	—	°C

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

Characteristic Curves

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

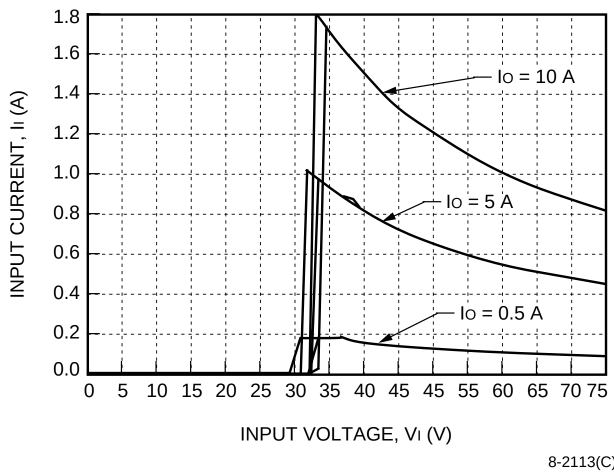


Figure 1. Typical JAW050A1 Input Characteristics at Room Temperature

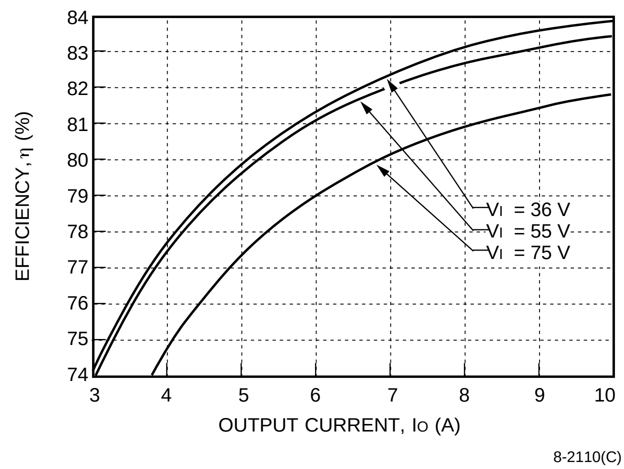


Figure 3. Typical JAW050A1 Converter Efficiency vs. Output Current at Room Temperature

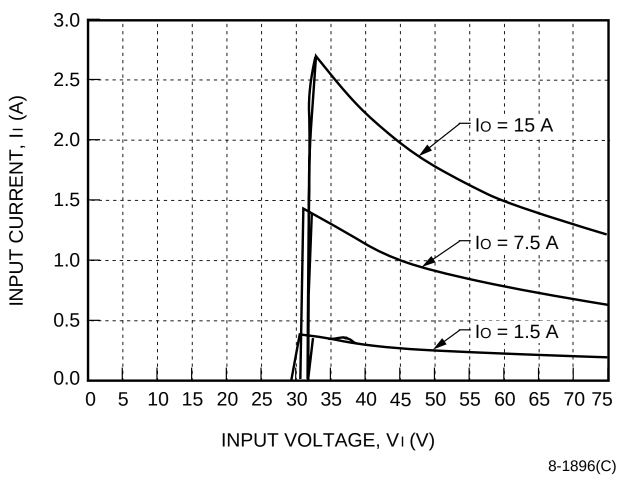


Figure 2. Typical JAW075A1 Input Characteristics at Room Temperature

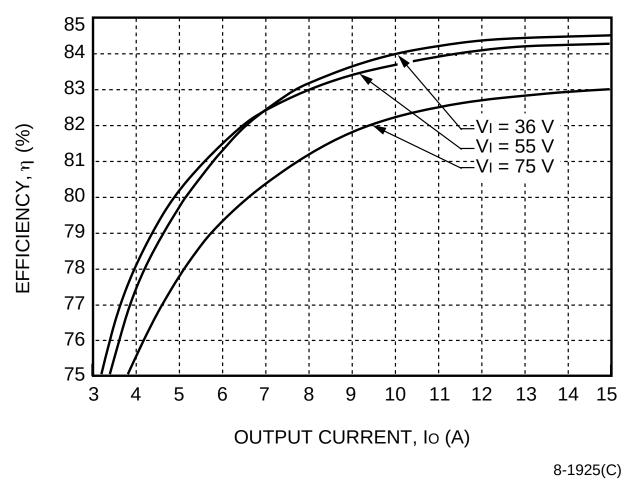


Figure 4. Typical JAW075A1 Converter Efficiency vs. Output Current at Room Temperature

Characteristic Curves (continued)

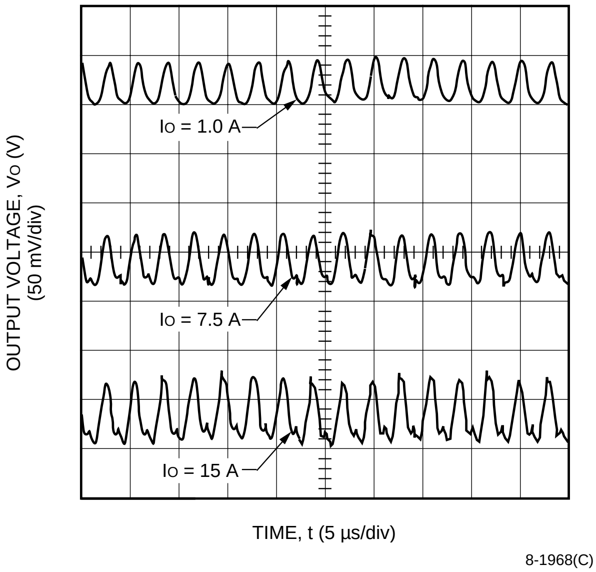
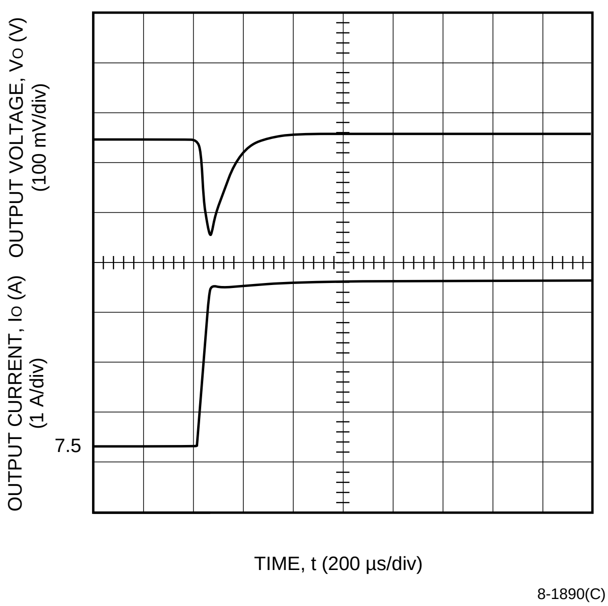
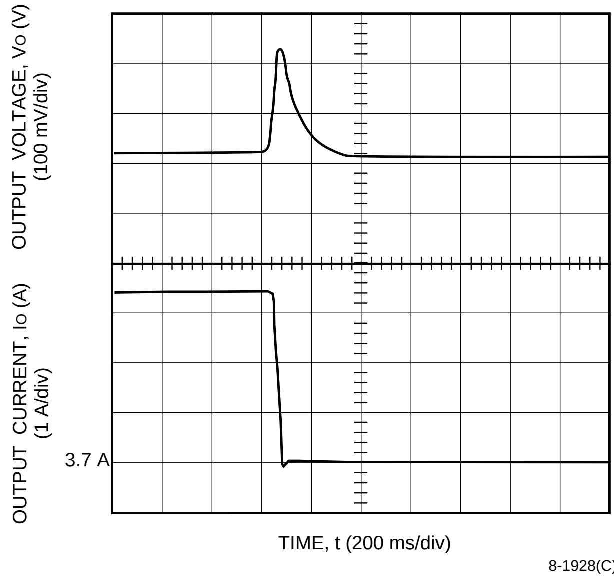


Figure 5. Typical JAW075A1 Output Ripple Voltage at Room Temperature and 48 Vdc Input



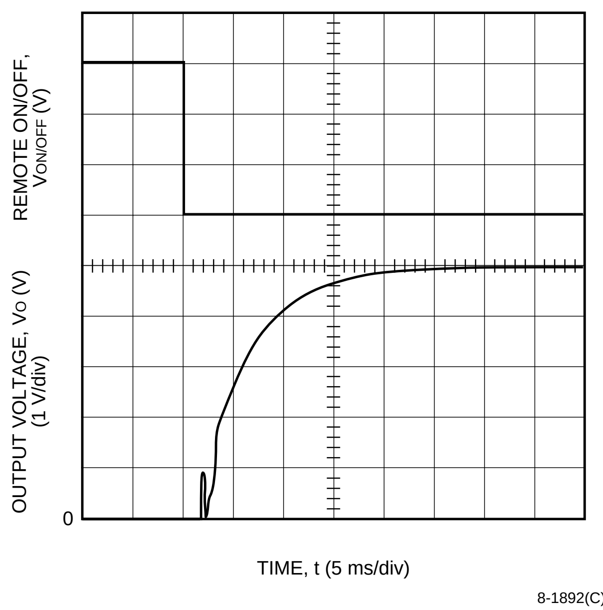
Note: Tested without any load capacitance.

Figure 6. Typical JAW075A1 Transient Response to Step Increase in Load from 50% to 75% of Full Load at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)



Note: Tested without any load capacitance.

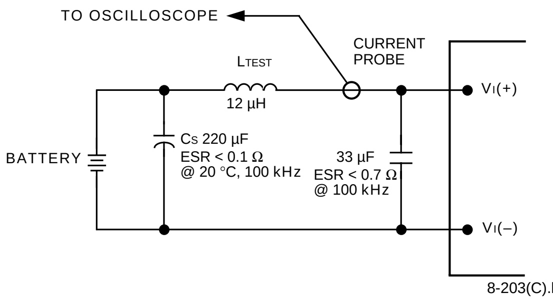
Figure 7. Typical JAW075A1 Transient Response to Step Decrease in Load from 50% to 25% of Full Load at Room Temperature and 48 Vdc Input (Waveform Averaged to Eliminate Ripple Component.)



Note: Tested without any load capacitance.

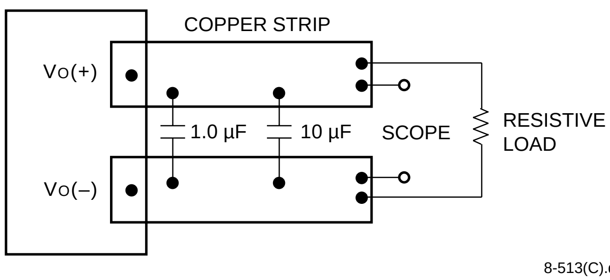
Figure 8. JAW075A1 Typical Start-Up from Remote On/Off; $I_O = I_{O,\,max}$

Test Configurations



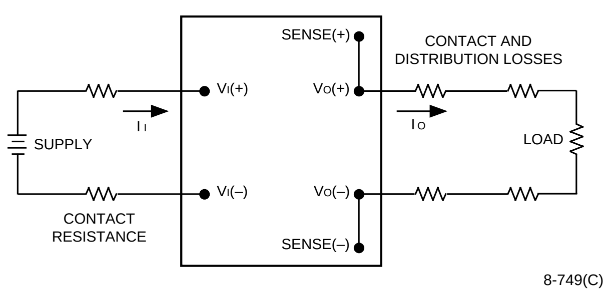
Note: Measure input reflected-ripple current with a simulated source inductance (L_{TEST}) of 12 µH. Capacitor C_S offsets possible battery impedance. Measure current as shown above.

Figure 9. 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 10. 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 11. 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 9, 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 other hazardous voltages, including the ac mains; and
- 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; and
- The input pins of the module are not operator accessible; and
- 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 pins and ground.

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 an overcurrent condition indefinitely.

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 will try to restart after an overcurrent shut down. If the output overload condition still exists when the unit restarts, it will shut down again. This operation will continue indefinitely until the overcurrent condition is corrected.

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 12). 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 15 V. The maximum allowable leakage current of the switch at $V_{on/off}$ = 15 V is 50 µA.

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.

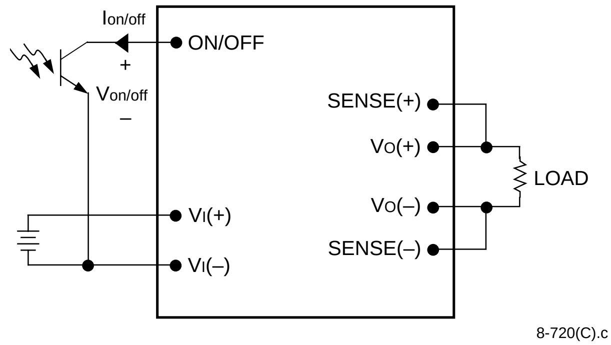


Figure 12. Remote On/Off Implementation

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.:

$$[V_O(+) – V_O(–)] – [SENSE(+) – SENSE(–)] \leq 0.5\ V$$

The voltage between the $V_O(+)$ and $V_O(–)$ terminals must not exceed the minimum output overvoltage protection 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 13.

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.

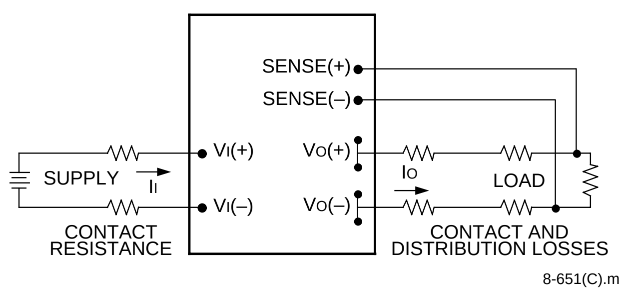


Figure 13. Effective Circuit Configuration for Single-Module Remote-Sense Operation

Feature Descriptions (continued)

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

$$R_{adj\text{-}down} = \left(\frac{1000}{\Delta\%} - 11\right) k\Omega$$

The test results for this configuration are displayed in Figure 15. 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 16).

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

$$R_{adj\text{-}up} = \left(\frac{(V_{O,\,nom})\left(1 + \frac{\Delta\%}{100}\right) - 1.225}{1.225\Delta\%}1000 - 11\right) k\Omega$$

The test results for this configuration are displayed in Figure 17.

The voltage between the V_O(+) and V_O(–) terminals must not exceed the minimum output overvoltage protection 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 13.

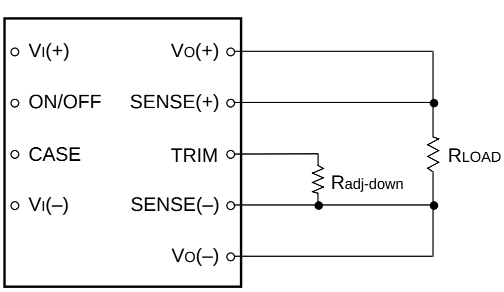


Figure 14. Circuit Configuration to Decrease Output Voltage

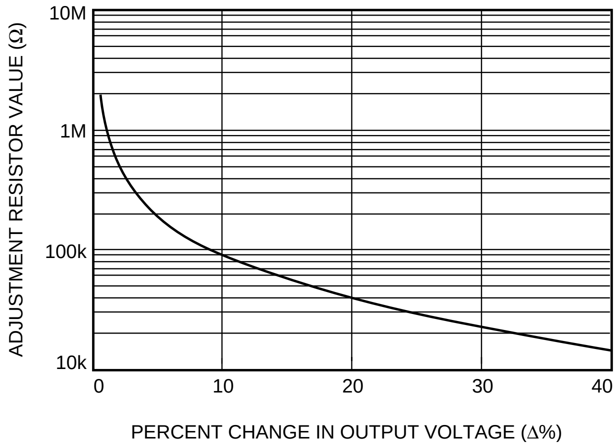


Figure 15. Resistor Selection for Decreased Output Voltage

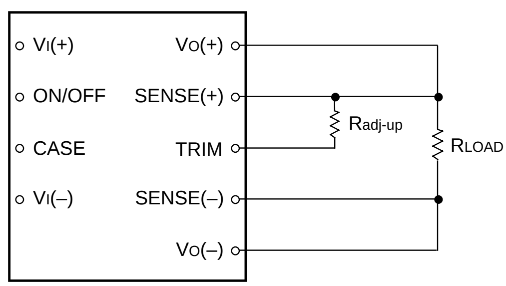


Figure 16. Circuit Configuration to Increase Output Voltage

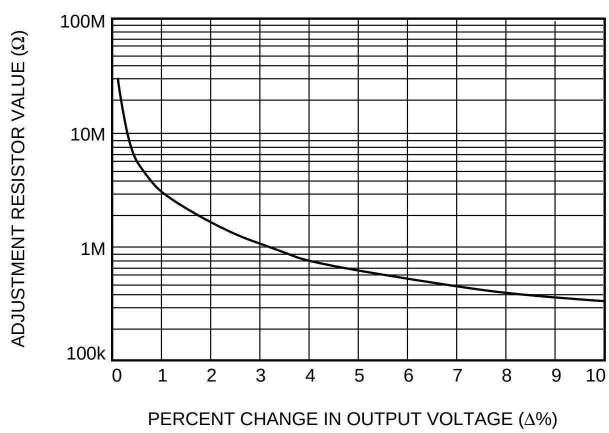


Figure 17. Resistor Selection for Increased Output Voltage

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 try to restart. The unit will continue in this condition until the cause of the overvoltage condition is removed.

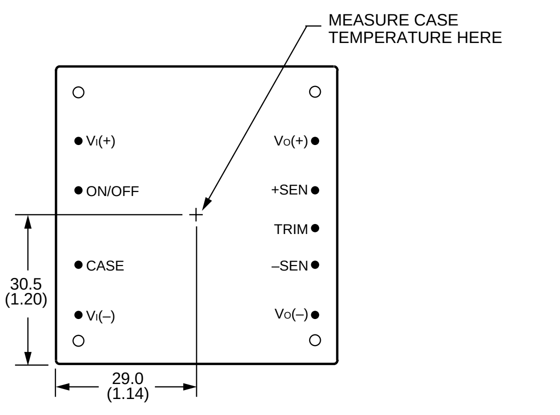
Overtemperature Protection

These modules feature an overtemperature protection circuit to safeguard against thermal damage. The circuit shuts down when the maximum case temperature is exceeded. The module will automatically restart when the case temperature cools sufficiently.

Thermal Considerations

Introduction

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-dissipating components inside the unit are thermally coupled to the case. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the case temperature. Peak temperature (T_C) occurs at the position indicated in Figure 18.



Note: Top view, pin locations are for reference only. Measurements shown in millimeters and (inches).

Figure 18. Case Temperature Measurement Location

The temperature at this location should not exceed 100 °C. The output power of the module should not exceed the rated power for the module as listed in the Ordering Information table.

Although the maximum case temperature of the power modules is 100 °C, you can limit this temperature to a lower value for extremely high reliability.

Heat Transfer Without Heat Sinks

Increasing airflow over the module enhances the heat transfer via convection. Figures 21 and 22 show the maximum power that can be dissipated by the module without exceeding the maximum case temperature versus local ambient temperature (T_A) for natural convection through 4 m/s (800 ft./min.). Note that the thermal performance is orientation dependent. Longitudinal orientation occurs when the long direction of the module is parallel to the airflow, whereas transverse orientation occurs when the short direction of the module is parallel to the airflow.

Note that the natural convection condition was measured at 0.05 m/s to 0.1 m/s (10 ft./min. to 20 ft./min.); however, systems in which these power modules may be used typically generate natural convection airflow rates of 0.3 m/s (60 ft./min.) due to other heat-dissipating components in the system. The use of Figure 21 is shown in the following example.

Example

What is the minimum airflow necessary for a JAW075A1 operating at V_I = 55 V, an output current of 15 A, longitudinal orientation, and a maximum ambient temperature of 55 °C?

Solution

Given: V_I = 55 V
I_O = 15 A
T_A = 55 °C

Determine P_D (Use Figure 20.):

P_D = 14 W

Determine airflow (v) (Use Figure 21.):

v = 2.3 m/s (460 ft./min.)

Thermal Considerations (continued)

Heat Transfer Without Heat Sinks (continued)

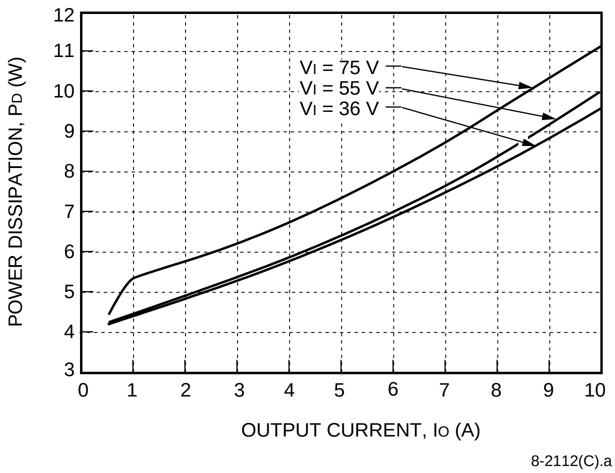


Figure 19. JAW050A1 Power Dissipation vs. Output Current

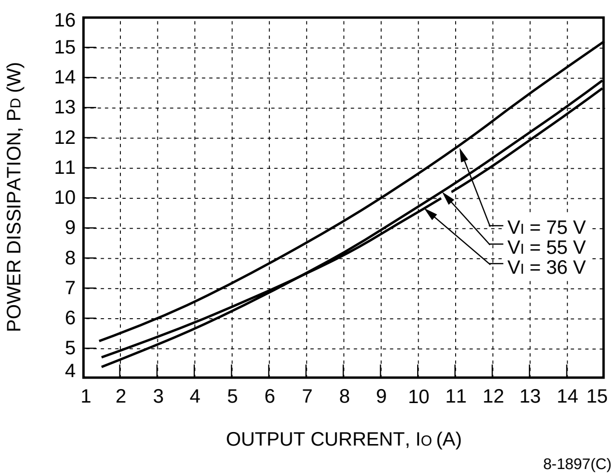


Figure 20. JAW075A1 Power Dissipation vs. Output Current

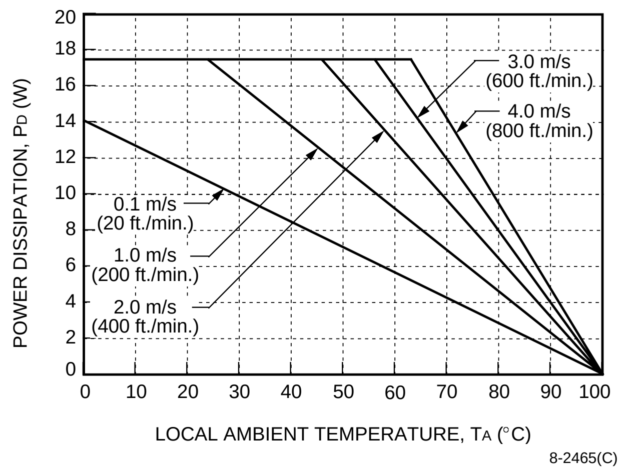


Figure 21. Forced Convection Power Derating with No Heat Sink; Longitudinal Orientation

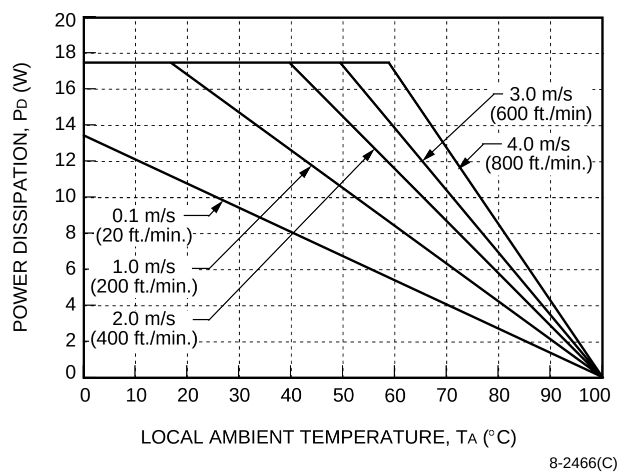


Figure 22. Forced Convection Power Derating with No Heat Sink; Transverse Orientation

Thermal Considerations (continued)

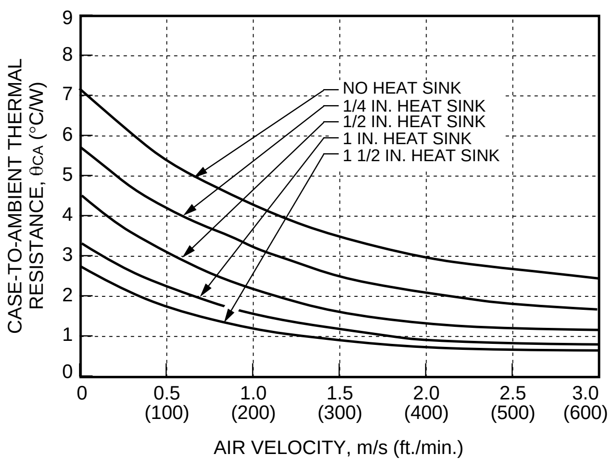
Heat Transfer with Heat Sinks

The power modules have through-threaded, M3 x 0.5 mounting holes, which enable heat sinks or cold plates to attach to the module. The mounting torque must not exceed 0.56 N-m (5 in.-lb.).

Thermal derating with heat sinks is expressed by using the overall thermal resistance of the module. Total module thermal resistance (θca) is defined as the maximum case temperature rise ($\Delta T_{C,\,max}$) divided by the module power dissipation (P_D):

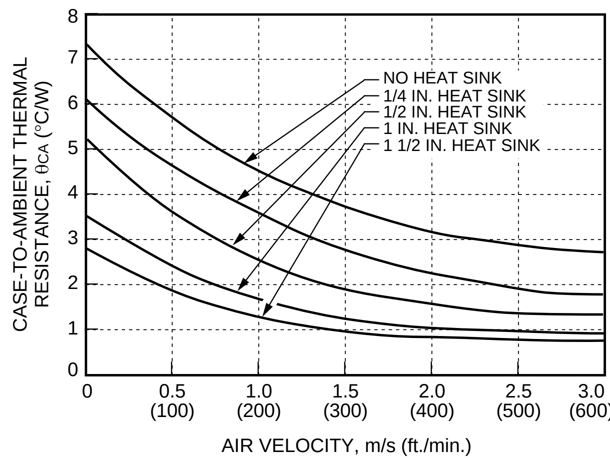
$$\theta ca = \left[\frac{\Delta T_{C,\,max}}{P_D}\right] = \left[\frac{(T_C - T_A)}{P_D}\right]$$

The location to measure case temperature (T_C) is shown in Figure 18. Case-to-ambient thermal resistance vs. airflow is shown, for various heat sink configurations and heights, in Figures 23 and 24. These curves were obtained by experimental testing of heat sinks, which are offered in the product catalog.



8-2164(C).a

Figure 23. Case-to-Ambient Thermal Resistance Curves; Longitudinal Orientation



8-2165(C).a

Figure 24. Case-to-Ambient Thermal Resistance Curves; Transverse Orientation

These measured resistances are from heat transfer from the sides and bottom of the module as well as the top side with the attached heat sink; therefore, the case-to-ambient thermal resistances shown are generally lower than the resistance of the heat sink by itself. The module used to collect the data in Figures 23 and 24 had a thermal-conductive dry pad between the case and the heat sink to minimize contact resistance. The use of Figure 23 is shown in the following example.

Example

If an 82 °C case temperature is desired, what is the minimum airflow necessary? Assume the JAW075A1 module is operating at V_I = 55 V, an output current of 15 A, longitudinal orientation, maximum ambient air temperature of 40 °C, and the heat sink is 1/4 inch.

Thermal Considerations (continued)

Heat Transfer with Heat Sinks (continued)

Solution

Given: $V_I = 55$ V
$I_O = 15$ A
$T_A = 40$ °C
$T_C = 82$ °C
Heat sink = 1/4 in.

Determine P_D by using Figure 20:

$P_D = 14$ W

Then solve the following equation:

$$\theta ca = \left[\frac{(T_C - T_A)}{P_D}\right]$$

$$\theta ca = \left[\frac{(82 - 40)}{14}\right]$$

$$\theta ca = 3.0 \text{ °C/W}$$

Use Figure 23 to determine air velocity for the 1/4 inch heat sink.

The minimum airflow necessary for this module is 1.1 m/s (220 ft./min.).

Custom Heat Sinks

A more detailed model can be used to determine the required thermal resistance of a heat sink to provide necessary cooling. The total module resistance can be separated into a resistance from case-to-sink (θcs) and sink-to-ambient (θsa) as shown in Figure 25.

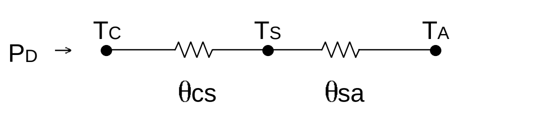


Figure 25. Resistance from Case-to-Sink and Sink-to-Ambient

For a managed interface using thermal grease or foils, a value of θcs = 0.1 °C/W to 0.3 °C/W is typical. The solution for heat sink resistance is:

$$\theta sa = \left[\frac{(T_C - T_A)}{P_D}\right] - \theta cs$$

This equation assumes that all dissipated power must be shed by the heat sink. Depending on the user-defined application environment, a more accurate model, including heat transfer from the sides and bottom of the module, can be used. This equation provides a conservative estimate for such instances.

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 Lucent Technologies *Board-Mounted Power Modules: Soldering and Cleaning* Application Note (AP97-021EPS).

EMC Considerations

For assistance with designing for EMC compliance, refer to the *FLTR100V10 Filter Module* Data Sheet (DS98-152EPS).

Layout Considerations

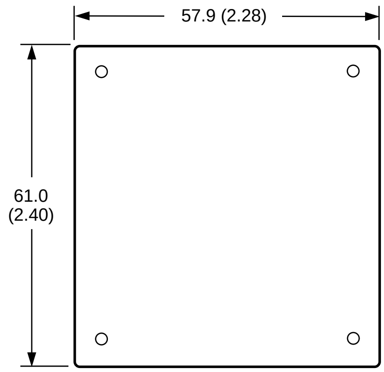
Copper paths must not be routed beneath the power module standoffs. For additional layout guidelines, refer to the *FLTR100V10 Filter Module* Data Sheet (DS98-152EPS).

Outline Diagram

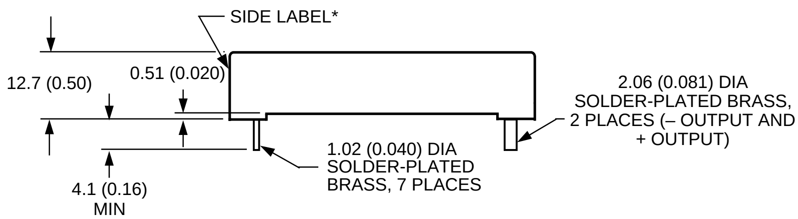
Dimensions are in millimeters and (inches).

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.)

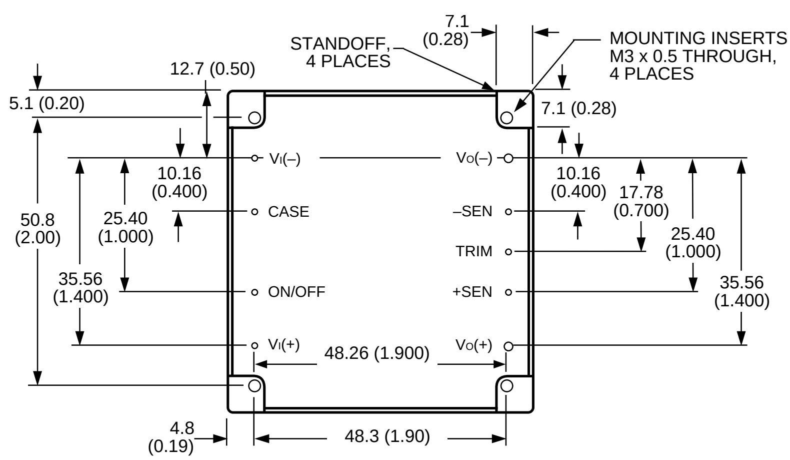
Top View



Side View



Bottom View



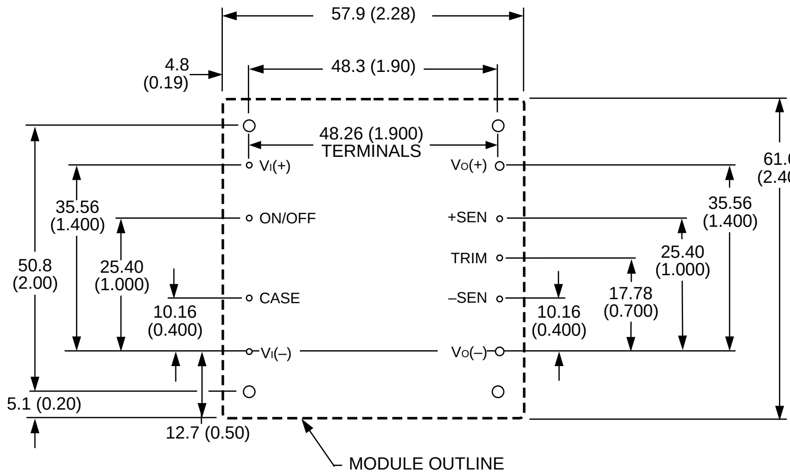
8-716(C).i

* Side label includes Lucent logo, product designation, safety agency markings, input/output voltage and current ratings, and bar code.

Recommended Hole Pattern

Component-side footprint.

Dimensions are in millimeters and (inches).



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Ordering Information

Table 4. Device Codes

Input Voltage	Output Voltage	Output Power	Remote On/ Off Logic	Device Code	Comcode
48 V	5.0 V	50 W	Negative	JAW050A1	108209974
48 V	5.0 V	75 W	Negative	JAW075A1	108064353
48 V	5.0 V	50 W	Positive	JAW050A	TBD
48 V	5.0 V	75 W	Positive	JAW075A	TBD

Ordering Information (continued)

Table 5. Device Accessories

Accessory	Comcode
1/4 in. transverse kit (heat sink, thermal pad, and screws)	407243989
1/4 in. longitudinal kit (heat sink, thermal pad, and screws)	407243997
1/2 in. transverse kit (heat sink, thermal pad, and screws)	407244706
1/2 in. longitudinal kit (heat sink, thermal pad, and screws)	407244714
1 in. transverse kit (heat sink, thermal pad, and screws)	407244722
1 in. longitudinal kit (heat sink, thermal pad, and screws)	407244730
1 1/2 in. transverse kit (heat sink, thermal pad, and screws)	407244748
1 1/2 in. longitudinal kit (heat sink, thermal pad, and screws)	407244755

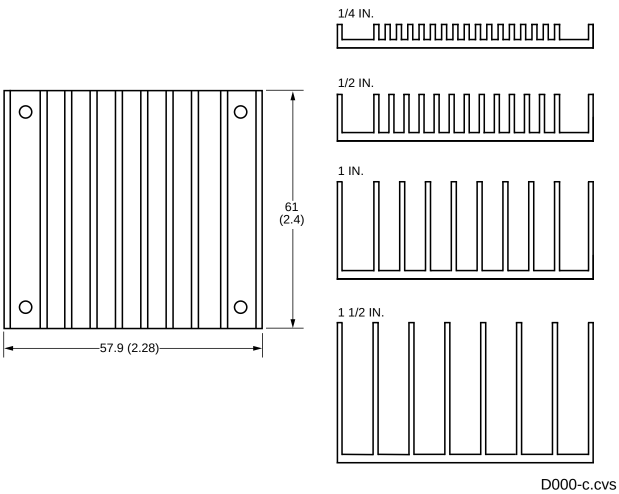

Figure 26. Longitudinal Heat Sink

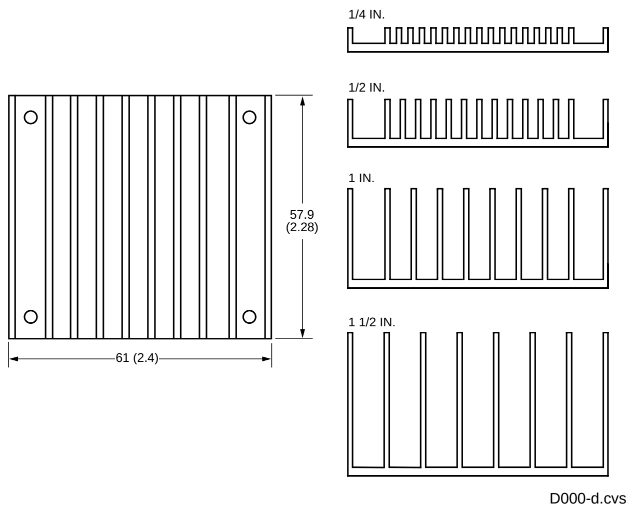

Figure 27. Transverse Heat Sink

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