Advance Data Sheet
March 1994

Lucent Technologies
Bell Labs Innovations

JC075-Series Power Modules: 18 Vdc to 36 Vdc Input; 75 W

The JC075-Series Power Modules use advanced, surface-mount technology and deliver high-quality, efficient, and compact dc-dc conversion.

Features

- Small size: 2.40 in. x 2.28 in. x 0.50 in.
- High power density (18 W/in.^{3})
- High efficiency: 84% typical
- Low output noise
- Constant frequency
- Industry-standard pinout
- Metal baseplate
- 2:1 input voltage range
- Remote sense
- Remote on/off
- Adjustable output voltage: 60% to 110% of $V_{O,\ nom}$
- Case ground pin

Options

- Choice of on/off configuration
- Heat sink available for extended operation

Applications

- Distributed power architectures
- Workstations
- EDP equipment
- Telecommunications

Description

The JW075-Series Power Modules are dc-dc converters that operate over an input voltage range of 18 Vdc to 36 Vdc and provide precisely regulated dc outputs. The outputs are fully isolated from the inputs, allowing versatile polarity configurations and grounding connections. The modules have maximum power ratings of 75 W at a typical full-load efficiency of 84%.

The sealed modules offer a metal baseplate for excellent 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.

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	—	50	V
I/O Isolation Voltage	—	—	500	Vdc
Operating Case Temperature	T_C	–40	100	°C
Storage Temperature	T_{stg}	–40	110	°C

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	28	36	Vdc
Maximum Input Current (V_I = 0 V to 36 V; $I_O = I_{O,\,max}$)	$I_{I,\,max}$	—	—	6.0	A
Inrush Transient	i^2t	—	—	2.0	A^2s
Input Reflected-ripple Current, Peak-to-peak (5 Hz to 20 MHz, 12 µH source impedance; T_C = 25 °C; see Figure 1 and Design Considerations section.)	—	—	—	150	mA p-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. To aid in the proper fuse selection for the given application, information on inrush and maximum dc input current is provided. 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 (Over all operating input voltage, resistive load, and temperature conditions until end of life.)	JC075A JC075B	V_O V_O	4.85 11.64	— —	5.15 12.36	Vdc Vdc
Output Voltage Set Point (V_I = 28 V; $I_O = I_{O,\,max}$; T_C = 25 °C)	JC075A JC075B	$V_{O,\,set}$ $V_{O,\,set}$	4.92 11.82	5.0 12.0	5.08 12.18	Vdc Vdc
Output Regulation: Line (V_I = 18 V to 36 V) Load ($I_O = I_{O,\,min}$ to $I_{O,\,max}$) Temperature (T_C = –40 °C to +100 °C)	 all all JC075A JC075B	 — — — —	 — — — —	 0.01 0.05 15 50	 0.1 0.2 50 150	 % % mV mV
Output Ripple and Noise (See Figure 1.): RMS Peak-to-peak (5 Hz to 20 MHz) 	 JC075A JC075B JC075A JC075B	 — — — —	 — — — —	 — — — —	 40 50 150 200	 mV rms mV rms mV p-p mV p-p
Output Current (At $I_O < I_{O,\,min}$, the modules may exceed output ripple specifications.)	 JC075A JC075B	 I_O I_O	 0.5 0.3	 — —	 15 6.3	 A A
Output Current-limit Inception: V_O = 90% of $V_{O,\,nom}$	JC075A JC075B	— —	— —	18.0 7.6	— —	A A
Output Short-circuit Current (V_O = 250 mV)	JC075A JC075B	— —	— —	TBD TBD	— —	A A
Efficiency (V_I = 28 V; $I_O = I_{O,\,max}$; T_C = 70 °C; see Figure 1.)	JC075A JC075B	η η	80 82	82 84	— —	% %
Dynamic Response ($\Delta I_O/\Delta t$ = 1 A/10 µs, V_I = 28 V, T_C = 25 °C): Load Change from I_O = 50% to 75% of $I_{O,\,max}$: Peak Deviation Settling Time (V_O < 10% of peak deviation) Load Change from I_O = 50% to 25% of $I_{O,\,max}$: Peak Deviation Settling Time (V_O < 10% of peak deviation)	 all all all all	 — — — —	 — — — —	 2 0.3 2 0.3	 — — — —	 $\%V_{O,\,set}$ ms $\%V_{O,\,set}$ ms

Electrical Specifications (continued)

Table 3. Isolation Specifications

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

General Specifications

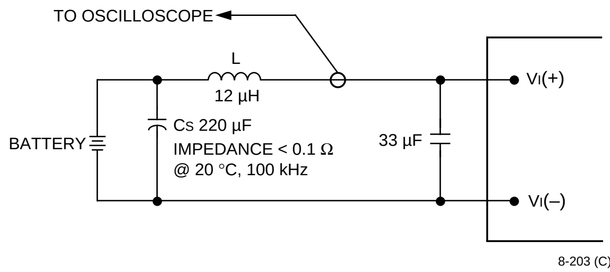
Parameter	Min	Typ	Max	Unit
Calculated MTBF (I_O = 80% of $I_{O,\ max}$; T_C = 40 °C)		2,600,000		hours
Weight	—	—	35 (100)	oz. (g)

Feature Specifications

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

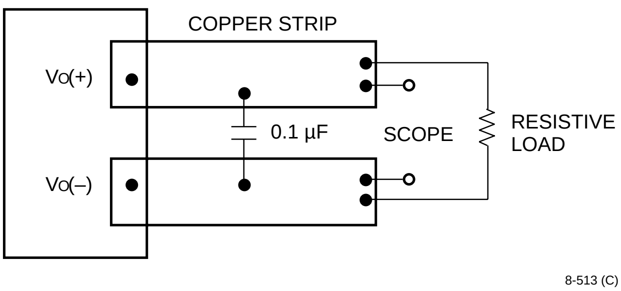
Parameter	Device	Symbol	Min	Typ	Max	Unit
Remote On/Off (V_I = 18 V to 36 V; open collector or equivalent compatible; signal referenced to V_I(–) terminal. See Figure 8 and Feature Descriptions.):						
Module Specifications:						
On/Off Current—Logic Low	all	$I_{on/off}$	—	—	1.0	mA
On/Off Voltage:						
Logic Low	all	$V_{on/off}$	0	—	1.2	V
Logic High ($I_{on/off}$ = 0)	all	$V_{on/off}$	—	—	15	V
Open Collector Switch Specifications:						
Leakage Current During Logic High ($V_{on/off}$ = 10 V)	all	$I_{on/off}$	—	—	50	µA
Output Low Voltage During Logic Low ($I_{on/off}$ = 1 mA)	all	$V_{on/off}$	—	—	1.2	V
Turn-on Time (@ 80% of $I_{O,\ max}$; T_C = 25 °C; V_O within ±1% of steady state)	all	—	—	20	—	ms
Output Voltage Sense Range	all	—	0.5	—	—	V
Output Voltage Set Point Adjustment Range (See Feature Descriptions.)	all	—	60	—	110	%$V_{O,\ nom}$
Output Overvoltage Clamp	JC075A	$V_{O,\ clamp}$	5.6	—	7.0	V
	JC075B	$V_{O,\ clamp}$	13.5	—	16.0	V

Test Configurations



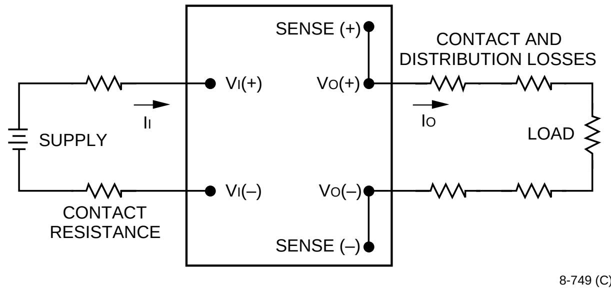
Note: Input reflected-ripple current is measured with a simulated source impedance of 12 µH. Capacitor Cs offsets possible battery impedance. Current is measured at the input of the module.

Figure 1. Input Reflected-Ripple Test Setup



Note: Use a 1.0 µF ceramic capacitor. Scope measurement should be made using a BNC socket. Position the load between 2 in. and 3 in. from the module.

Figure 2. 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.

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

Figure 3. 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 1, 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.

Feature Descriptions

Output Overvoltage Clamp

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the shutdown has a higher voltage set point than the primary loop (see Feature Specifications table). In a fault condition, the overvoltage clamp ensures that the output voltage does not exceed $V_{O,\ clamp,\ max}$. This provides a redundant voltage-control that reduces the risk of output overvoltage.

Current Limit

To provide protection in a fault (output overload) condition, the unit is equipped with internal current-limiting circuitry and can endure current limiting for an unlimited duration. 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.

Output Voltage 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. 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 4). The following equation determines the required external resistor value to obtain a percentage output voltage change of $\Delta\%$.

$$R_{adj\text{-}down} = \left(\frac{100}{\Delta\%} - 2\right)\ \text{k}\Omega$$

The test results for this configuration are displayed in Figure 5. 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 6).

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

$$R_{adj\text{-}up} = \left(\frac{V_O(100 + \Delta\%)}{1.225\Delta\%} - \frac{(100 + 2\Delta\%)}{\Delta\%}\right)\ \text{k}\Omega$$

The test results for this configuration are displayed in Figure 7.

The combination of the output voltage adjustment and sense range and the output voltage given in the Feature Specifications table cannot exceed 110% of the nominal output voltage between the $V_O(+)$ and $V_O(–)$ terminals.

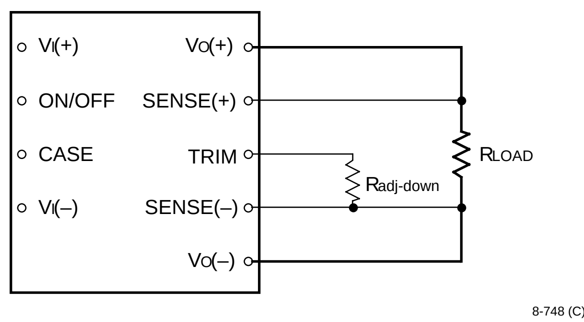


Figure 4. Circuit Configuration to Decrease Output Voltage

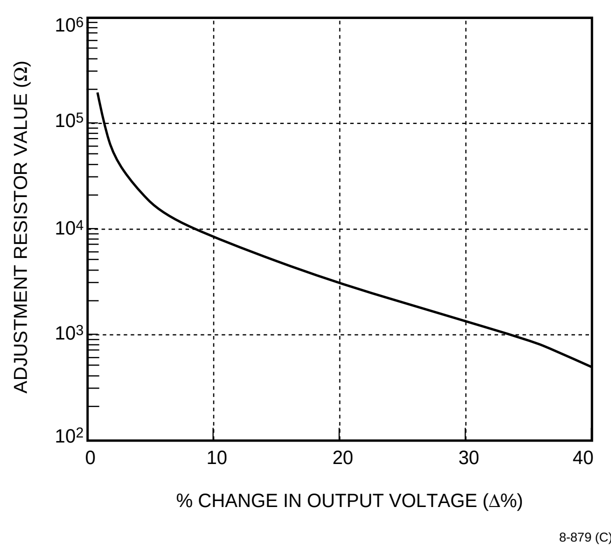


Figure 5. Resistor Selection for Decreased Output Voltage

Feature Descriptions (continued)

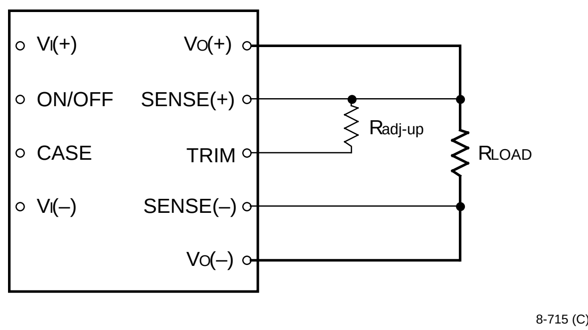


Figure 6. Circuit Configuration to Increase Output Voltage

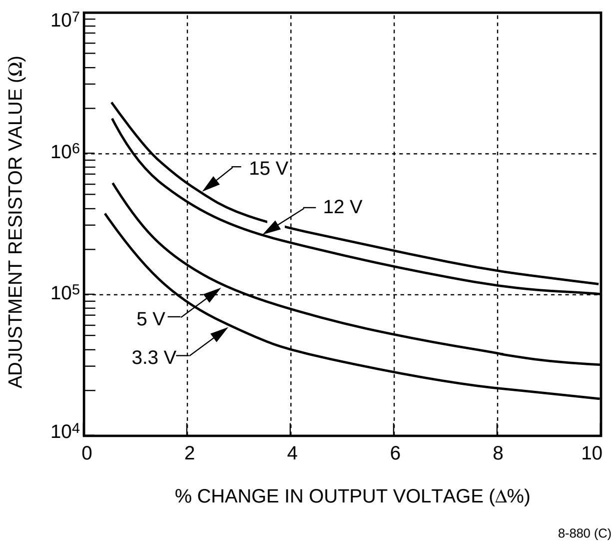


Figure 7. Resistor Selection for Increased Output Voltage

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 remote 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 (code suffix of 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 8). 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.

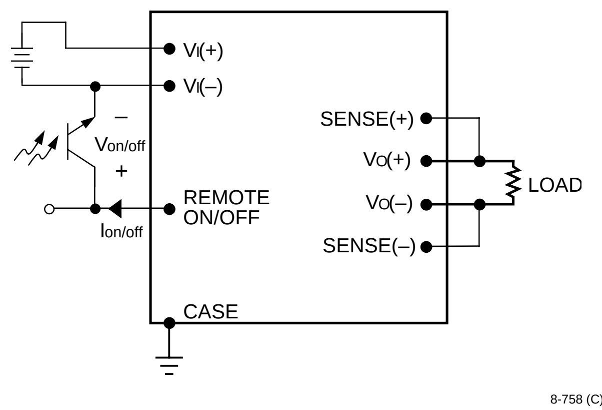


Figure 8. Remote On/Off Implementation

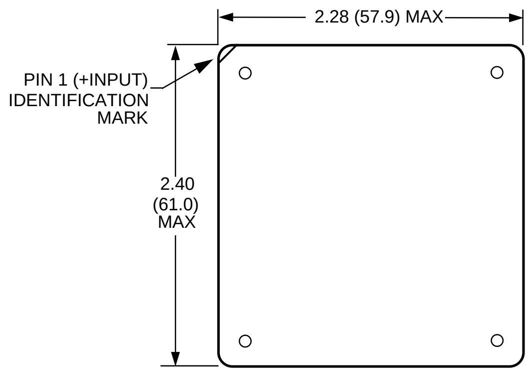
Outline Diagram

Dimensions are in inches and (millimeters).

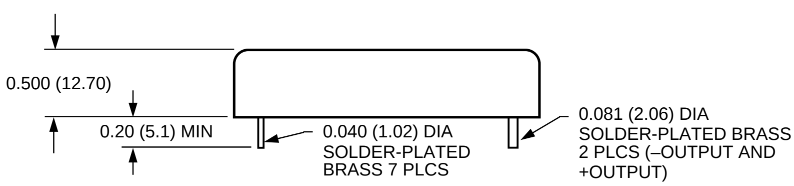
Copper paths must not be routed beneath the power module standoffs.

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

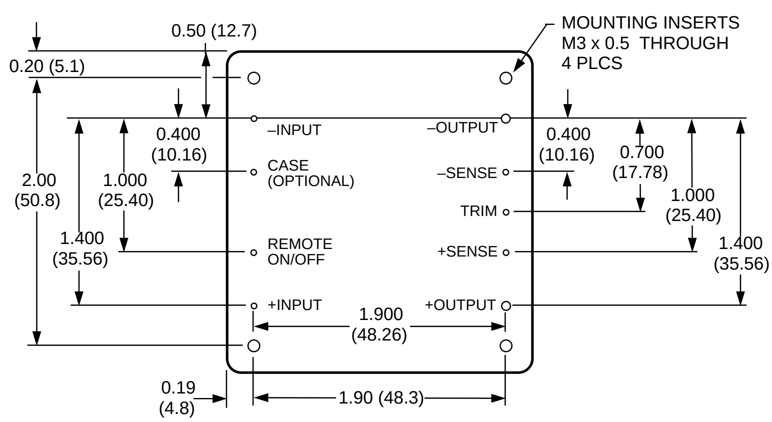
Top View



Side View



Bottom View



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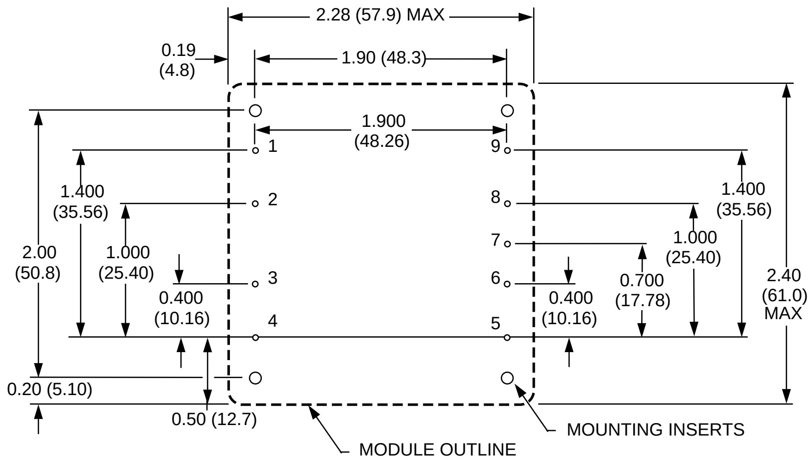
Recommended Hole Pattern

Component-side footprint.

Dimensions are in inches and (millimeters).



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Ordering Information

For assistance in ordering options, please contact your Lucent Technologies Account Manager or Applications Engineer.

Input Voltage	Output Voltage	Output Power	Remote On/ Off Logic*	Device Code	Comcode
28 V	5 V	75 W	negative	JC075A1	TBD
28 V	12 V	75 W	negative	JC075B1	TBD

* For an explanation of remote on/off, see the Feature Descriptions section on page 7.

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 +1-888-315-5182) (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., 750D Chai Chee Road #07-06, Chai Chee Industrial Park, Singapore 469004
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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), ITALY: **(39) 02 6608131** (Milan), SPAIN: **(34) 91 807 1441** (Madrid)

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