

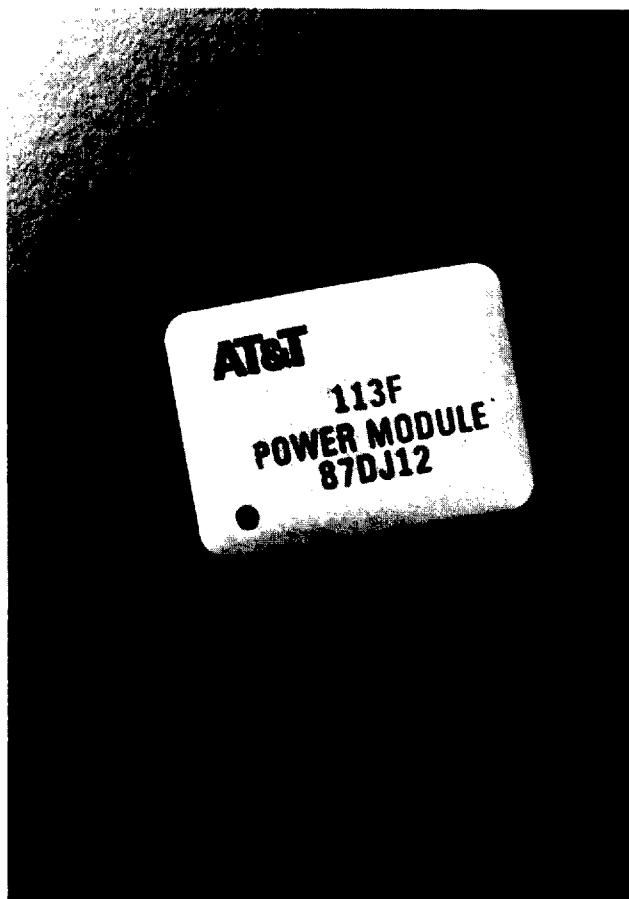
Data Sheet



T-57-11

113F Power Module: DC-DC Converter; +5 Vdc Input, - 5 Vdc Output, 1.5 W

The AT&T 113F Power Module delivers highly reliable dc-dc conversion in less than one square inch of footprint area.



Features

- High reliability: MTBF > 4,500,000 hours at 40 °C
- Low profile
- Small size: 0.96" x 0.70" x 0.47"
(24.4 mm x 17.8 mm x 11.9 mm)
- Printed circuit board mountable
- Operating ambient temperature range: 0 °C to 70 °C
- No minimum load

Applications

- Telecommunications
- Digital circuitry
- Distributed power architecture

Description

The AT&T 113F Power Module features high reliability for digital and telecommunication applications. This non-isolated switching regulator is built on a ceramic substrate and generates a negative output voltage from a positive input voltage. Low power dissipation makes it possible to operate the 113F Power Module from no load to full load over an ambient temperature range of 0 °C to 70 °C with no derating.

With the addition of minimal external filtering components, the 113F Power Module provides 1.5 W of regulated - 5 Vdc output power from a nominal +5 Vdc input. The module is fully encapsulated in a 16-pin dual in-line package (DIP), which uses less than one square inch of a printed circuit board.

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Absolute Ratings

Exceeding these values can damage the module.

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_I	—	7.0	Vdc
Output Resistive Load		16	—	Ω
Operating Ambient Temperature (natural convection)	T_A	0	70	$^{\circ}\text{C}$
Storage Temperature		– 40	+125	$^{\circ}\text{C}$

Electrical Specifications

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

Parameter	Symbol	Min	Typ	Max	Unit
Input					
Operating Input Voltage	V_I	4.5	5.0	5.5	Vdc
Maximum Input Current (see Figure 1)	$I_{I\max}$	—	—	800	mA
Input Reflected Ripple Current, Peak-to-Peak (5 Hz to 20 MHz and 12 μH source impedance)		—	75	—	mA p-p
Required Input Filter (see Figure 4): Capacitance	C_I	$100 \pm 20\%$			μF
Capacitor Equivalent Series Resistance (at 100 kHz)	ESR (C_I)	—	—	125	m Ω

Parameter	Symbol	Min	Typ	Max	Unit
Output					
Output Voltage (over all operating input voltage, resistive load, and temperature conditions until end of life)	V_O	- 4.75	—	- 5.25	Vdc
Output Voltage Set Point ($V_I = 5\text{ V}$, I_O at full load, and $T_A = 25\text{ }^\circ\text{C}$)	$V_{O\text{ set}}$	- 4.90	- 5.00	- 5.10	Vdc
Output Regulation: Temperature (see Figure 2)		—	—	60	mV
Output Ripple and Noise: RMS Peak-to-Peak (5 Hz to 20 MHz)		— —	— —	85 300	mV rms mV p-p
Output Current	I_O	0	—	300	mA
Efficiency (see Figure 3) ($V_I = 5\text{ V}$, I_O at full load, and $T_A = 25\text{ }^\circ\text{C}$)	η	60	65	—	%
Required Output Filter (see Figure 4): Capacitance	C_O	$100 \pm 20\%$			μF
Capacitor Equivalent Series Resistance (at 100 kHz)	ESR (C_O)	—	—	125	m Ω

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Calculated MTBF (80% full load and case temperature = $40\text{ }^\circ\text{C}$)		4,500,000			hours
Weight		—	—	0.3	oz.

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Characteristics

Input and output filters are required (see Figure 4).

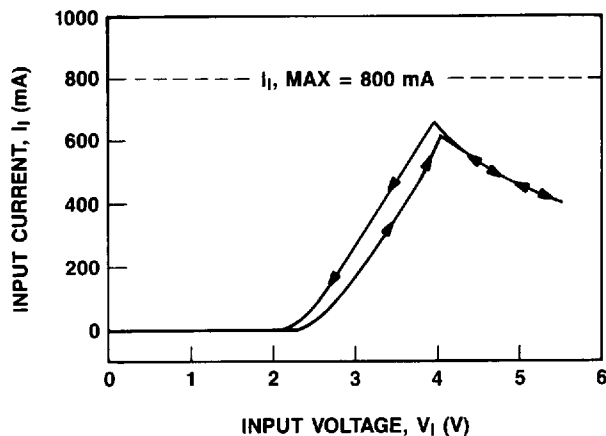


Figure 1. Typical Input Characteristic With a Resistive Load of $I_o = \text{Full Load}$ and $T_A = 25^\circ\text{C}$ (Arrows Indicate Hysteresis)

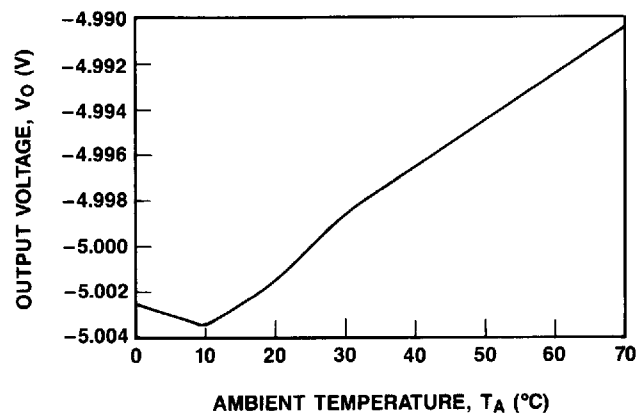


Figure 2. Typical Output Voltage Variation Over Operating Ambient Temperature Range at Full Load With $V_i = 5\text{ Vdc}$

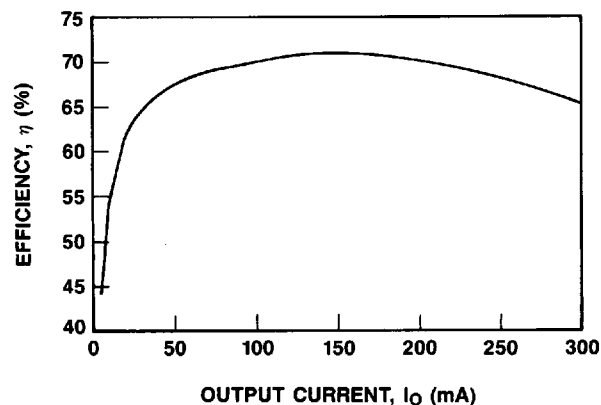
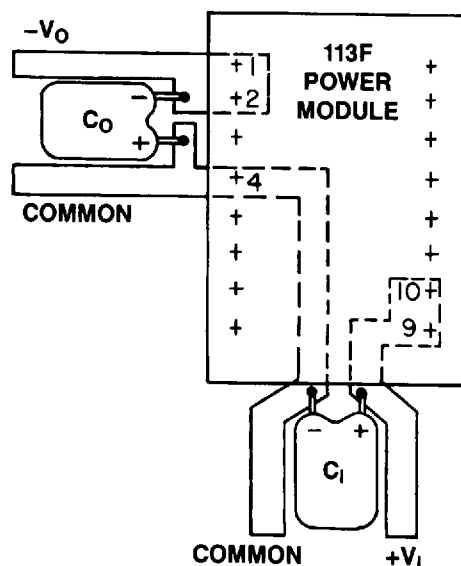
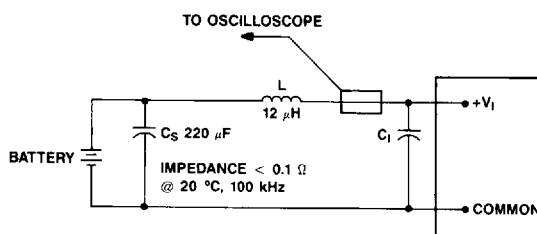


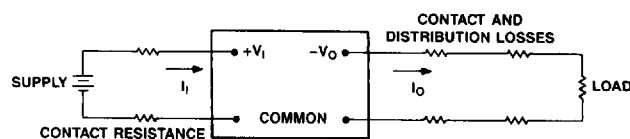
Figure 3. Typical Converter Efficiency as a Function of Output Current With $V_i = 5\text{ Vdc}$ and $T_A = 25^\circ\text{C}$

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Connection Diagram


Note: Input and output filter components should be placed as close as possible to the module leads. To further enhance the filtering capabilities of the filter capacitor, connect module leads directly to the capacitor terminals.

Figure 4. Filter Connection Diagram
Test Configurations


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

Figure 5. Input Reflected Ripple Test Set-Up


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.

$$\eta = \frac{[-V_O - (V_{com})] I_O}{[+V_I - (V_{com})] I_I}$$

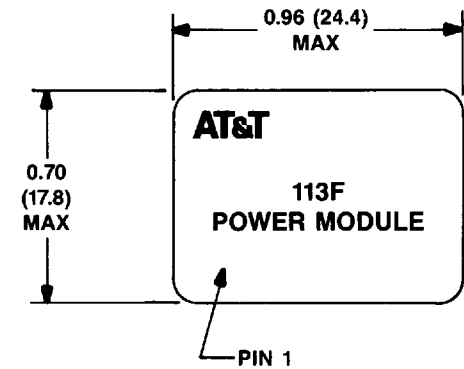
**Figure 6. Output Voltage and Efficiency
Measurement Test Set-Up**

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Module Dimensions

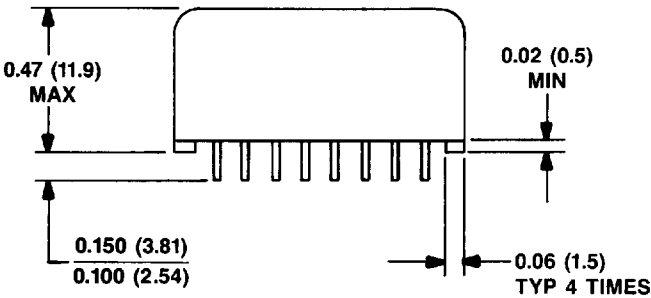
Dimensions are in inches and (millimeters).
Module tolerances: unless otherwise indicated, x.xx ± 0.02 inch (0.5 mm), x.xxx ± 0.005 inch (0.13 mm).

Top View

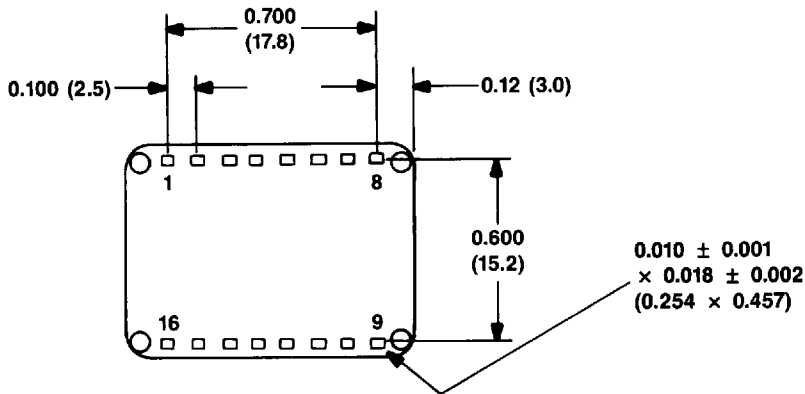


Pin	Description
1	- V _O
2	- V _O
3	NC
4	Common
5	NC
6	NC
7	NC
8	NC
9	+V _I
10	+V _I
11	NC
12	NC
13	NC
14	NC
15	NC
16	NC

Side View



Bottom View



Note: All unused pins must be soldered to the printed circuit board with no electrical connections.

Recommended Hole Pattern (Component-Side Footprint)

Dimensions are in inches and (millimeters).

