Data Sheet

AT&T

T-57-11

912A Power Module: DC-DC Converter; 48 Vdc Input, 12 Vdc Output, 12 W

10-15 WATTS

The 912A Power Module uses advanced surface mount technology and delivers high-quality, compact dc-dc conversion at an economical price.

Features

- Small size: 2.2" × 3.0" × 0.7"
- UL recognized: Standard 1012 (to 40°C)
- Meets FCC Class A requirements
- Output overvoltage clamp
- Short-circuit protection
- Input-to-output isolation
- Complete input and output filtering
- Remote on/off
- No heat sink required; no derating
- Printed circuit board mountable

Applications

- Telecommunications 48 V systems
- Local power distribution
- Digital circuits
- Distributed power architecture

Full Power With No Derating To 70°C

The 912A Power Module is a dc-dc converter that is suitable for a wide variety of applications. The module converts 48 Vdc to 12 Vdc and delivers up to 12 W of power at a minimum full load efficiency of 78%. The precisely regulated output is fully isolated from the input, allowing versatile polarity configurations and grounding connections.

The 912A Power Module is potted in a nonconductive case designed for mounting on a printed circuit board. No external filtering components are required. No heat sink is required, and the module is rated to full load at 70°C in a natural convection environment.

Absolute Ratings

Exceeding these values can damage the module.

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_I	—	60	V
I/O Isolation Voltage		—	500	V
Operating Ambient Temperature (natural convection)	T_A	0	70	°C
Storage Temperature		−40	+100	°C

Electrical Specifications

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

Parameter	Symbol	Min	Typ	Max	Unit
Input					
Operating Input Voltage	V_I	40	48	60	V
Maximum Input Current (see Figure 1)	$I_{I, max}$	—	—	675	mA
Inrush Transient	i^2t	—	—	0.54	A^2s
Input Reflected Ripple Current, Peak-to-Peak (5 Hz to 20 MHz, 12 μH source impedance) (see Figure 8)		—	17	—	mA p-p
Input Ripple Rejection (120 Hz)		—	75	—	dB

Fusing Considerations

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 comply with UL Conditions of Acceptability and to achieve maximum safety and system protection, an input line fuse should always be used. This data sheet provides information on inrush energy, maximum dc input current, and the fuse type and rating specified in the UL report. The same type of fuse with a lower rating may be used, but under no circumstances should the dc rating of the fuse exceed the maximum value stated in the "Conditions of Acceptability" for UL recognition. Refer to the fuse manufacturer's data for further information.

Electrical Specifications (Continued)

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	11.4	—	12.6	Vdc
Output Voltage Set Point (V_I = 48 V, I_O at full load, and T_A = 25°C)	$V_{O\,set}$	11.55	12.0	12.45	Vdc
Output Regulation					
Line (V_I = 40 to 60 V)		—	0.025	0.05	%
Load (I_O = 0.2 to 2.0 A)		—	0.075	0.25	%
Temperature (T_A = 0 to 70°C) (see Figure 2)		—	—	100	mV
Output Ripple and Noise					
RMS		—	6	20	mV rms
Peak-to-Peak (5 Hz to 20 MHz)		—	50	100	mV p-p
Output Current	I_O	0.150	—	1.0	A
Output Current Limit Inception (V_O = 10.8 V) (see Figure 3)		—	1.3	—	A
Output Current Limit (V_I = 60 V, V_O = 1.0 V) (see Figure 3)		1.5	1.95	3.5	A
Output Short-Circuit Current (V_O = 250 mV) (see Figure 3)		—	2.45	—	A
Efficiency (V_I = 48 V, I_O at full load, and T_A = 25°C) (see Figure 4)	η	78	81	—	%
Dynamic Response ($\Delta I_O/\Delta t$ = 1 A/10 μs, V_I = 48 V, and T_A = 25°C)					
Load Change from I_O = 0.5 A to 0.75 A					
Peak Deviation		—	80	—	mV
Settling Time (V_O < 10% of peak deviation) (see Figure 5)		—	3	—	ms
Load Change from I_O = 0.5 A to 0.25 A					
Peak Deviation		—	80	—	mV
Settling Time (V_O < 10% of peak deviation) (see Figure 6)		—	3	—	ms
Isolation					
Isolation Capacitance		—	1265	—	pF
Isolation Resistance		10	—	—	MΩ

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Calculated MTBF (80% full load and case temperature = 40°C)		—	0.76	—	10^6 hours
Weight		—	—	4.5	oz.

Feature Specifications

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

Parameter	Symbol	Min	Typ	Max	Unit
Remote On/Off (40 V < V_I < 60 V)					
Switch Controlled					
Open — Unit Off	$V_{ON/OFF}$	—	—	60	V
Leakage Current		—	—	0.1	mA
Closed — Unit On	$V_{ON/OFF}$	—	—	2.0	V
Current Sink		0.25	—	0.61	mA
Turn On Time (80% full load and V_O within ±10% of steady state) (see Figure 7)		—	12	87	ms
Output Overvoltage Clamp		13.0	14.5	16.0	V

Note for UL Application

The Underwriters Laboratories Conditions of Acceptability for using the 912A Power Module as a UL-recognized component require a 5 A, normal blow, dc fuse in series with the input of the module.

Characteristics

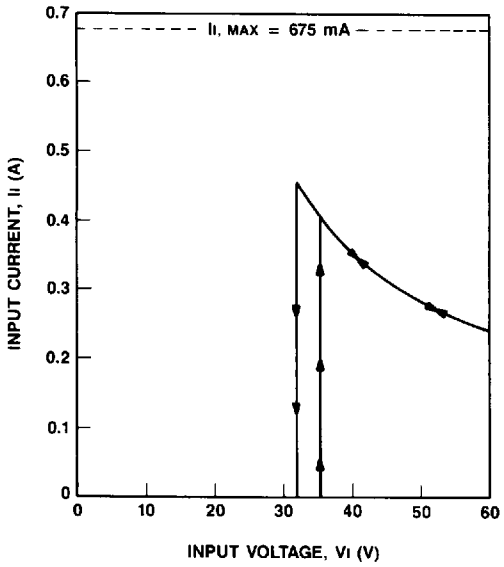


Figure 1. Typical Input Characteristic (I_O = 1.0 A and T_A = 25°C) (Arrows Indicate Hysteresis)

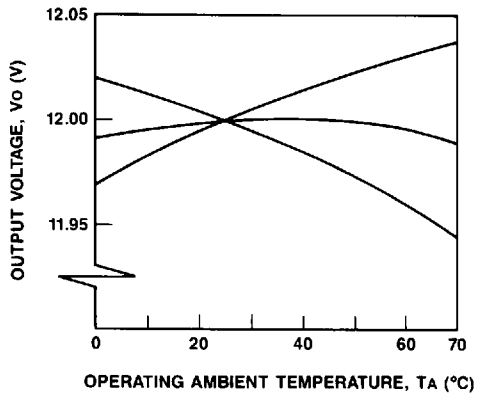


Figure 2. Typical Output Voltage Variations Over Operating Ambient Temperature Range (At Full Load and V_I = 48 V)

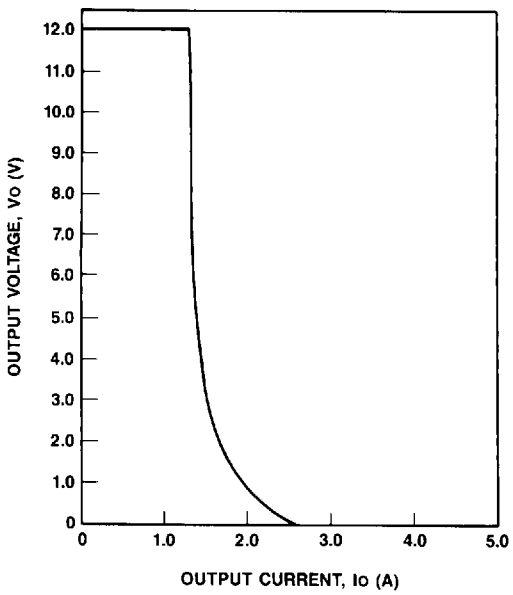


Figure 3. Typical Output Characteristic (V_I = 48 V and T_A = 25°C)

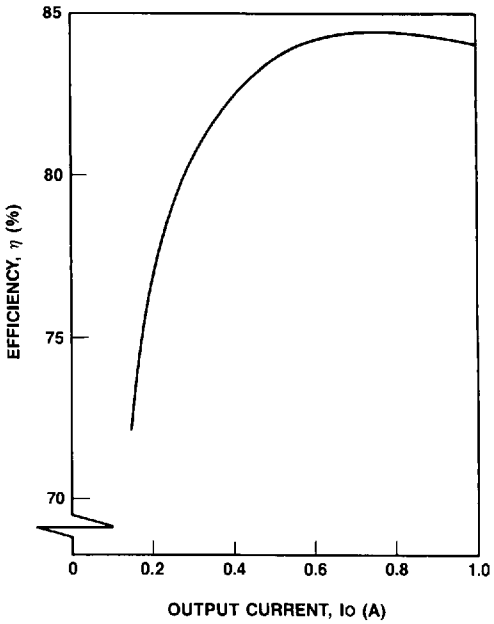


Figure 4. Typical Converter Efficiency as a Function of Output Current (V_I = 48 V and T_A = 25°C)

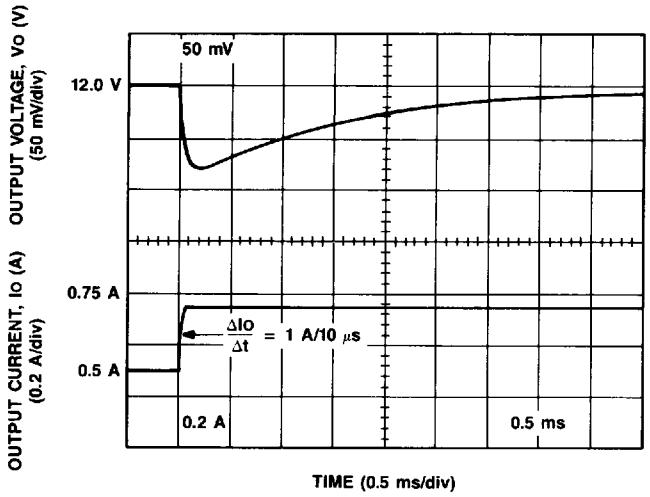


Figure 5. Typical Output Voltage Waveform for a Step Load Change from 50% to 75% of Full Output Power (V_I = 48 V and T_A = 25°C)

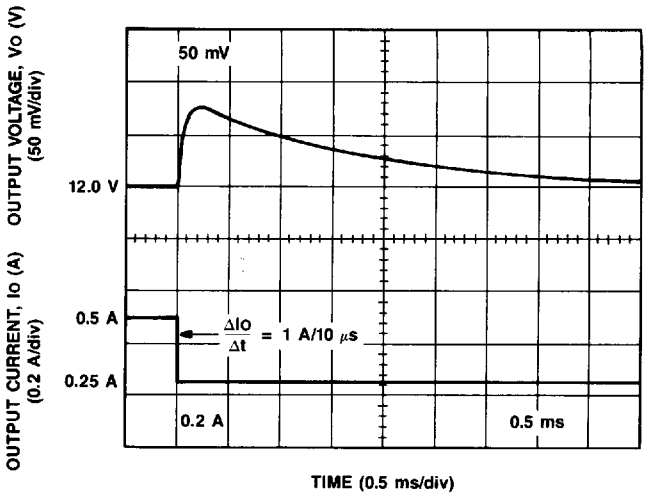


Figure 6. Typical Output Voltage Waveform for a Step Load Change from 50% to 25% of Full Output Power (V_I = 48 V and T_A = 25°C)

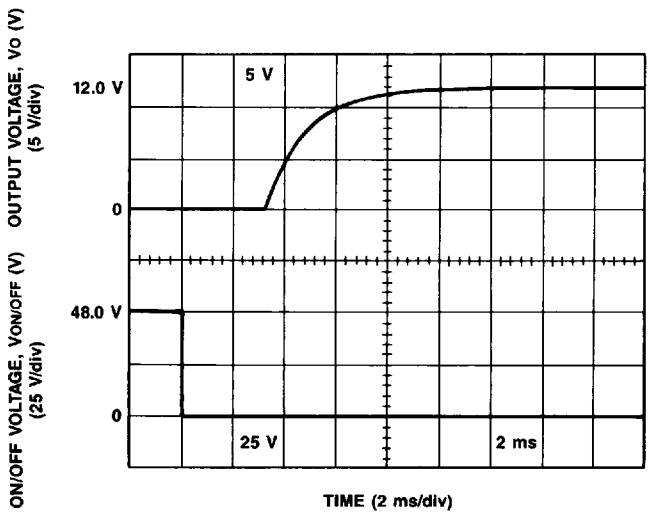
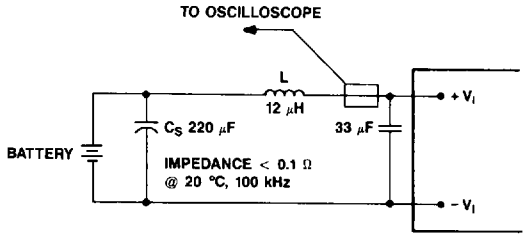


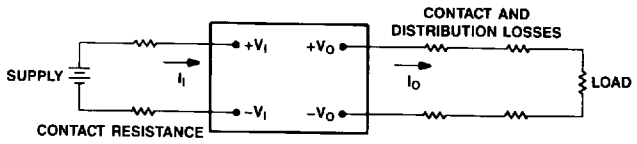
Figure 7. Typical Output Voltage Start-Up Waveform Once Remote On/Off is Removed (V_I = 48 V, Io = 800 mA, and T_A = 25°C)

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 8. 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.

$$\eta = \frac{[+Vo - (-Vo)]\ Io}{[+Vi - (-Vi)]\ Ii}$$

Figure 9. Output Voltage and Efficiency Measurement Test Set-up

Feature Descriptions

Remote On/Off

The voltage potential of the ON/OFF terminal turns the power unit on and off. A switch must be supplied by the user to control the voltage between the +Vi and ON/OFF terminals. This function requires a switch with both a high-impedance and a low-impedance state. The switch must be optically or mechanically isolated. Failure to do so may compromise noise immunity. When the switch is in the high state, less than 0.1 mA should flow into the ON/OFF terminal, thus keeping the ON/OFF terminal less than 8 V above the −Vi terminal voltage and causing the unit to turn off. When the switch is in the low state, causing a voltage of 2 V or less between the ON/OFF and +Vi terminals, the unit turns on. To keep the module on, the switch needs to sink a minimum of 0.25 mA and up to a maximum current of 0.61 mA (see Figure 10).

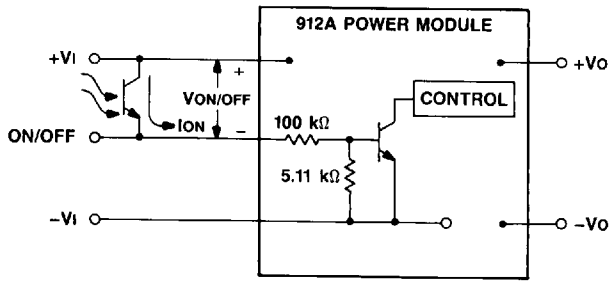


Figure 10. Remote On/Off Implementation

Output Overvoltage Clamp

The output overvoltage clamp provides a redundant voltage control capability that reduces the risk of output overvoltage. The clamp consists of control circuitry that monitors the voltage on the output terminals. This circuitry includes a totally independent second control loop with a higher set point of 14.5 V.

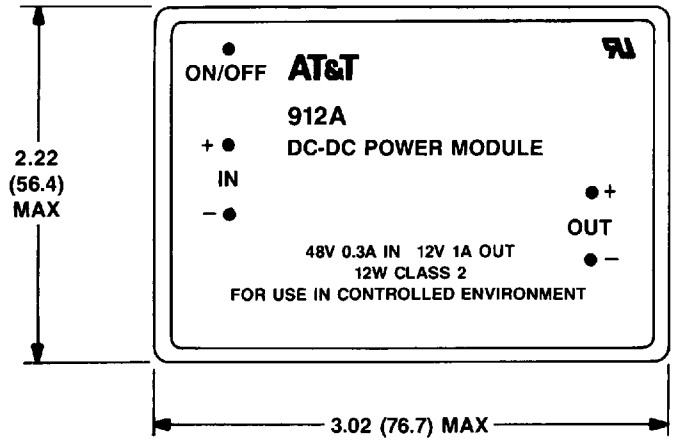
Current Limit

The 912A Power Module is designed to endure current limiting for an unlimited duration. The module will operate normally once the output current is brought back into its specified range.

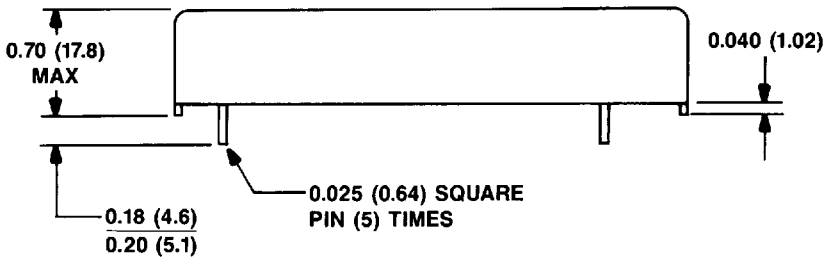
Outline Diagram

Dimensions in inches and (millimeters)

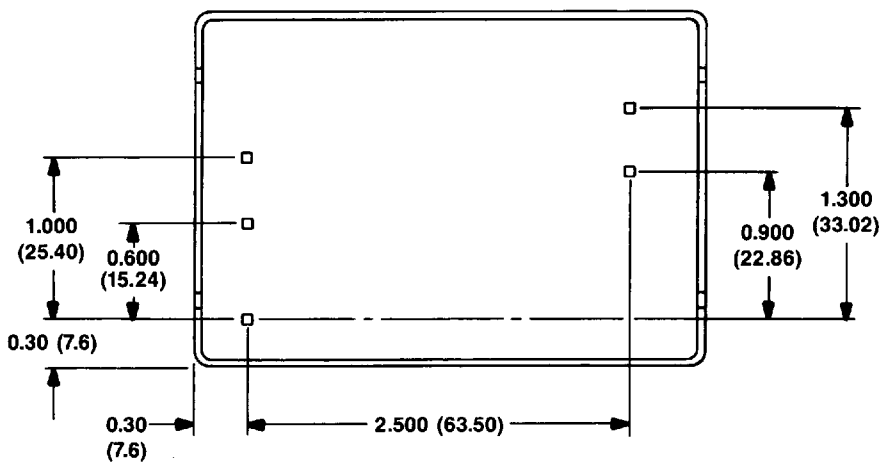
Top View



Side View

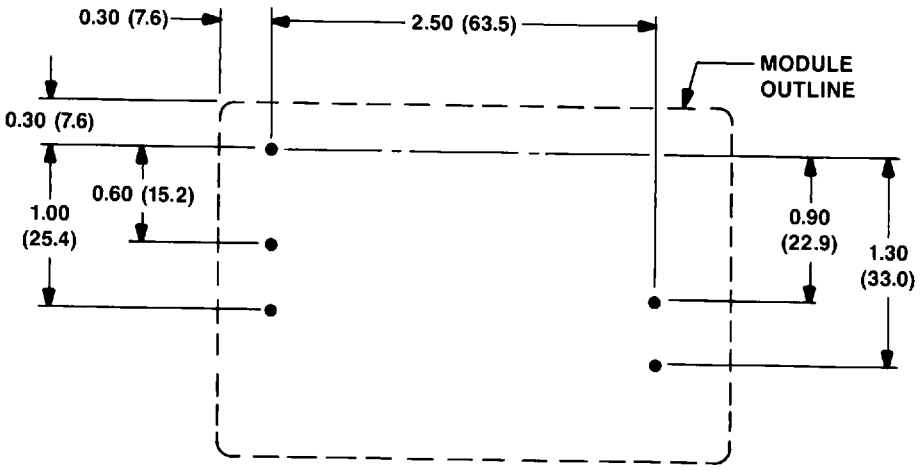


Bottom View



Footprint *(View-Through from Top)*

Dimensions in inches and (millimeters)



Tolerances: x.xx ±0.020 inch (0.51 mm), x.xxx ±0.005 inch (0.13 mm)

AT&T Comcode 104386131