Advance Data Sheet
December 1993

AT&T Microelectronics

RE003-Series Power Modules: 28 Vdc to 60 Vdc Inputs; 3 W

Features

- Small size: 1.75 in. x 0.43 in. x 0.81 in.
- Low output noise
- Constant frequency
- High efficiency: 77% to 83% typical
- UL recognized

Options

- Right angle leads

Applications

- Distributed power architectures
- Telecommunications

The RE003-Series Power Modules use advanced, surface-mount technology and deliver high-quality, compact, dc-dc conversion at an economical price.

Description

The RE003A, B, C, BK, and CL Power Modules are dc-dc converters that operate over an input-voltage range of 28 Vdc to 60 Vdc and provide precisely regulated 5 V, 12 V, 15 V, ±12 V, and ±15 V outputs respectively. The outputs are isolated from the inputs, allowing versatile polarity configurations and grounding connections. The modules have maximum power ratings of 3 W at a typical full-load efficiency of 77% to 83%.

The RE003-Series is available with standard straight terminals or with a 90° bend in the terminals for lower profile mounting. This right angle lead form option is shown in the Outline Diagram and the part numbers are listed in the Ordering Information section at the end of this data sheet.

The modules are PC board mountable and encapsulated in nonconductive cases. The modules are rated to full load at 50 °C case temperature with no external filtering.

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	—	100	V
I/O Isolation Voltage	—	—	500	V
Operating Case Temperature	T_C	–10	50	°C
Storage Temperature	T_{stg}	–30	80	°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	28	48	60	Vdc
Maximum Input Current (V_I = 0 V to 60 V; I_O = $I_{O, max.}$)	$I_{I, max}$	—	—	0.09	A
Inrush Transient	i^2t	—	—	TBD	A^2s
Input Reflected-ripple Current, Peak-to-peak (5 Hz to 20 MHz, 12 µH source impedance; T_C = 25 °C)	—	—	TBD	—	mA p-p
Input Ripple Rejection (120 Hz)	—	—	TBD	—	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 *Underwriters Laboratories Conditions of Acceptability* requires a normal-blow, dc fuse with a maximum rating of 1 A in series with the input. 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 (Over all operating input voltage, resistive load, and temperature conditions until end of life.)	RE003A	V_O	4.75	—	5.25	Vdc
	RE003B	V_O	11.40	—	12.60	Vdc
	RE003C	V_O	14.25	—	15.75	Vdc
	RE003BK	V_1	11.40	—	12.60	Vdc
		V_2	−11.40	—	−12.60	Vdc
	RE003CL	V_1	14.25	—	15.75	Vdc
		V_2	−14.25	—	−15.75	Vdc
Output Voltage Set Point (V_I = 48 V; I_O = $I_{O,max}$; T_C = 25 °C)	RE003A	$V_{O,set}$	4.80	5.0	5.20	Vdc
	RE003B	$V_{O,set}$	11.45	12.0	12.36	Vdc
	RE003C	$V_{O,set}$	14.30	15.0	15.45	Vdc
	RE003BK	$V_{1,set}$	11.45	12.0	12.55	Vdc
		$V_{2,set}$	−11.45	−12.0	−12.55	Vdc
	RE003CL	$V_{1,set}$	14.30	15.00	15.50	Vdc
		$V_{2,set}$	−14.30	−15.00	−15.50	Vdc
Output Regulation:						
Line (V_I = 28 V to 60 V)	all	—	—	0.01	0.1	%
Load (I_O = $I_{O,min}$ to $I_{O,max}$)	all	—	—	0.05	0.1	%
Temperature	RE003A	—	—	15	50	mV
(T_C = −10 °C to +50 °C)	RE003B, C	—	—	50	150	mV
Output Ripple and Noise Peak-to-peak (5 Hz to 20 MHz)	RE003A	—	—	—	100	mV p-p
	RE003B	—	—	—	120	mV p-p
	RE003C	—	—	—	150	mV p-p
	RE003BK	—	—	—	120	mV p-p
	RE003CL	—	—	—	150	mV p-p
Output Current (At I_O < $I_{O,min}$, the modules may exceed output ripple specifications.)	RE003A	I_O	30	—	600	mA
	RE003B	I_O	10	—	250	mA
	RE003C	I_O	10	—	200	mA
	RE003BK	I_{O1}	6	—	125	mA
		I_{O2}	6	—	125	mA
	RE003CL	I_{O1}	5	—	100	mA
		I_{O2}	5	—	100	mA
Output Current-limit Inception (V_O = 90% of $V_{O,nom}$)	RE003A	—	—	1000	—	mA
	RE003B	—	—	460	—	mA
	RE003C	—	—	360	—	mA
	RE003BK	—	—	220	—	mA
	RE003CL	—	—	180	—	mA
Output Short-circuit Current (V_O = 250 mV)	RE003A	—	—	100	—	mA
	RE003B	—	—	100	—	mA
	RE003C	—	—	100	—	mA
	RE003BK	—	—	75	—	mA
	RE003CL	—	—	75	—	mA
Efficiency (V_I = 48 V; I_O = $I_{O,max}$; T_C = 25 °C)	RE003A	η	68	80	—	%
	RE003B	η	70	83	—	%
	RE003C	η	70	83	—	%
	RE003BK	η	66	77	—	%
	RE003CL	η	66	77	—	%

Electrical Specifications (continued)

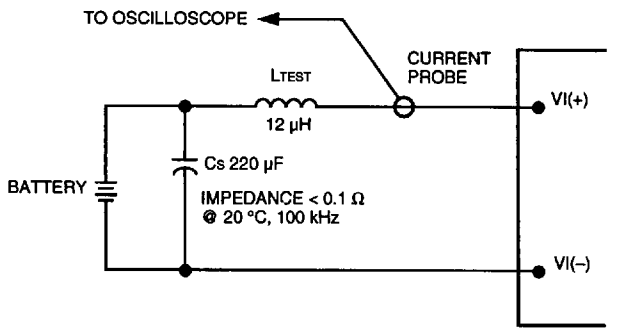
Table 3. Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	—	50	—	pF
Isolation Resistance	100	—	—	MΩ

General Specifications

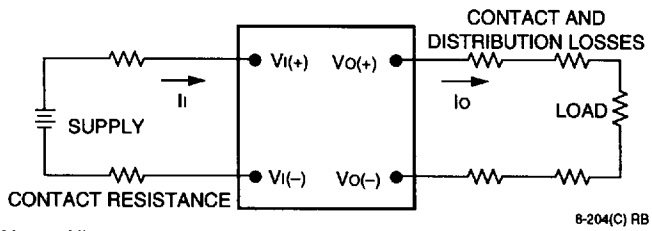
Parameter	Min	Typ	Max	Unit
Calculated MTBF (I_O = 80% of $I_{O,max}$; T_C = 40 °C)		TBD		hours
Weight	—	—	TBD	oz.(g)

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: 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 2. 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.

Feature Descriptions

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 exhibits foldback characteristics (output-current decreases). The unit operates normally once the output current is brought back into its specified range.

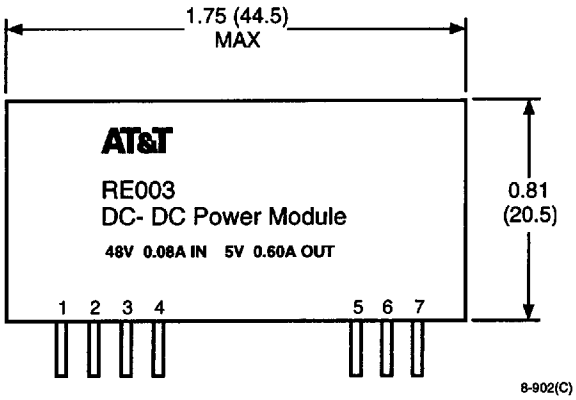
Outline Diagram

Dimensions are in inches and (millimeters).

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

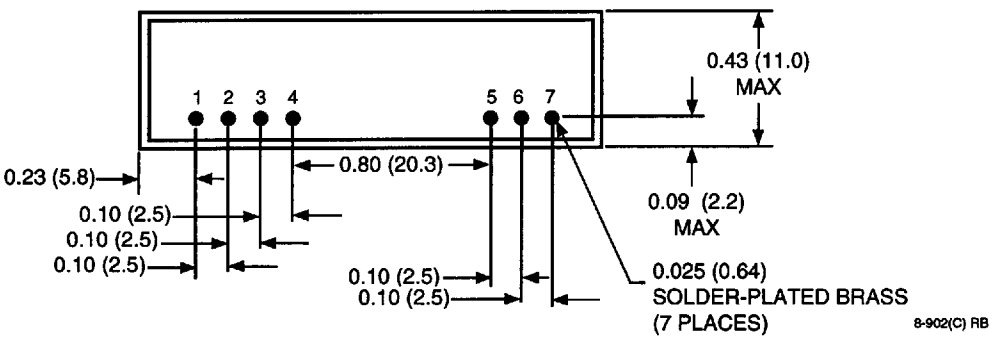
Tolerances: x.xx ± 0.02 in. (0.5 mm), x.xxx ± 0.010 in. (0.25 mm)

Front View



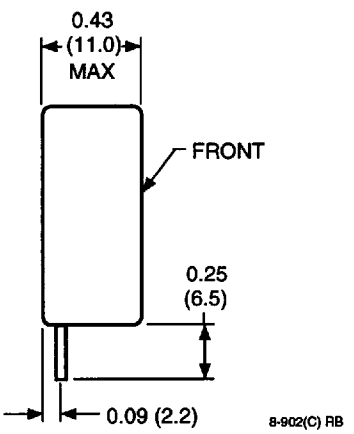
Pin	Single Output	Dual Output
1	$V_I(+)$	$V_I(+)$
2	$V_I(+)$	$V_I(+)$
3	$V_I(-)$	$V_I(-)$
4	$V_I(-)$	$V_I(-)$
5	$V_o(+)$	$V_{o1}(+)$
6	$V_o(-)$	Common
7	No Connection	$V_{o2}(-)$

Bottom View

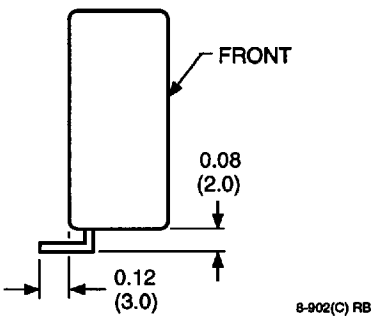


Edge View

Straight Lead



Right Angle Lead



Ordering Information

For assistance in ordering options, please contact your AT&T Account Manager or Application Engineer.

Input Voltage	Output Voltage	Lead Option	Output Power	Device Code	Comcode
48 V	5 V	Straight	3 W	RE003A	106965056
48 V	12 V	Straight	3 W	RE003B	106965064
48 V	15 V	Straight	3 W	RE003C	106965072
48 V	+12 V, –12 V	Straight	3 W	RE003BK	106965080
48 V	+15 V, –15 V	Straight	3 W	RE003CL	106965098
48 V	5 V	Right Angle	3 W	RE003A3	107040651
48 V	12 V	Right Angle	3 W	RE003B3	107040669
48 V	15 V	Right Angle	3 W	RE003C3	107040685
48 V	+12 V, –12 V	Right Angle	3 W	RE003BK3	107040677
48 V	+15 V, –15 V	Right Angle	3 W	RE003CL3	107040693