

# ACT 861X Series Radiation Hardened 50 Watt Power Supply Module

*Advanced*

## Features

- Radiation Environment
  - Total Dose 100K Rad (Si)
  - No SEE or SEU to 20 MeV/cm<sup>2</sup>/mg
- -55°C to 85°C Baseplate Mounting Temperature
- 50W Power Output, +5V, +12V, +15V, -12V and -15V Output Versions Available
- 50V Input Bus
- Internal EMI Suppression Circuitry designed to meet the requirements of MIL-STD-461C
- Short Circuit Protected
- Input Undervoltage Shutdown
- Output Overvoltage Shutdown
- Overtemperature Shutdown
- Input Shutdown Control
- Input Synchronization Control
- Output Synchronization Control
- Output Status Signal
- Packaging – Non-Hermetic COB in a 3" x 4" x .9" housing with D connector

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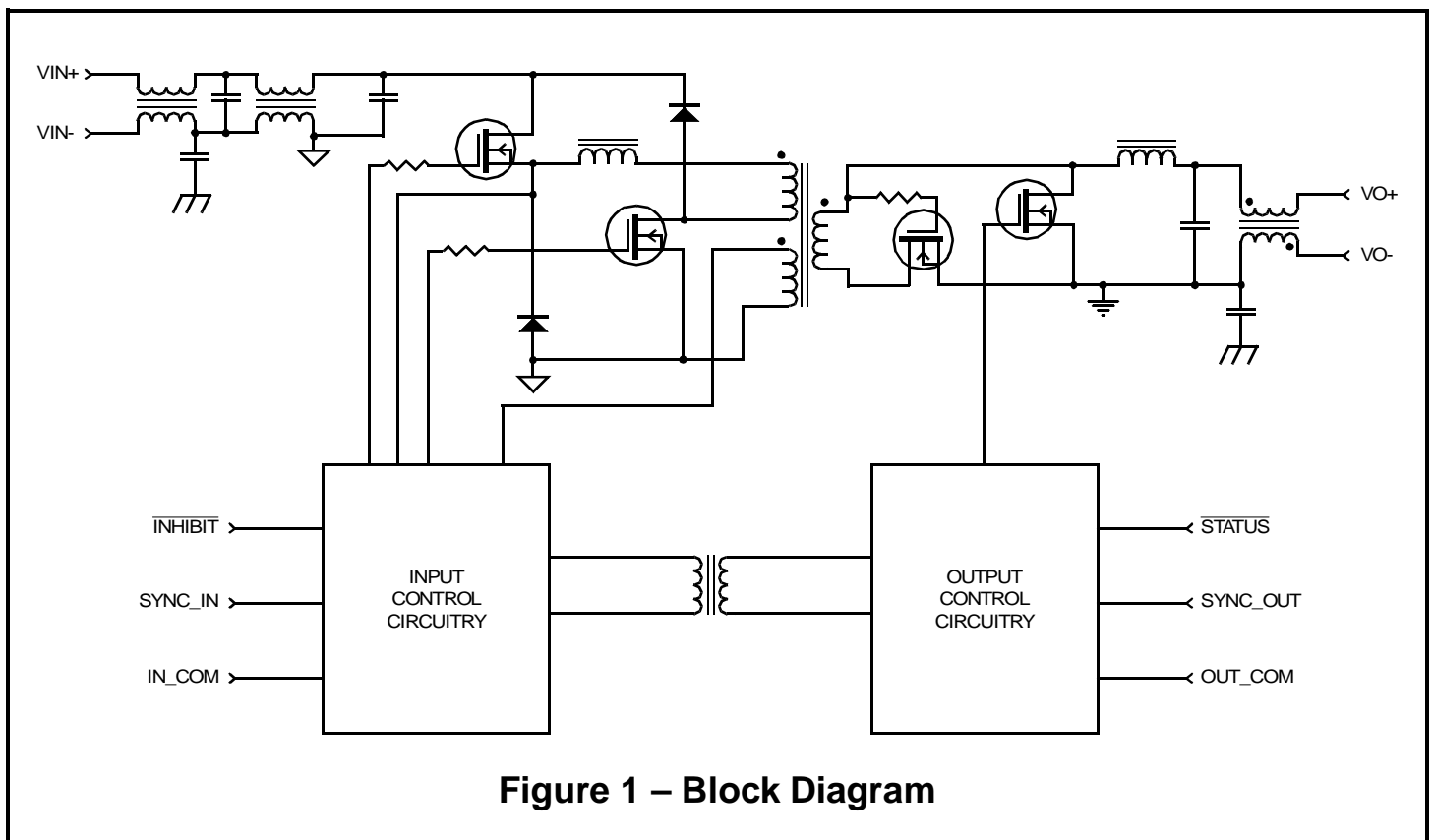


Figure 1 – Block Diagram

## General Description

Aeroflex's ACT861X series of power supply modules are radiation hardened 50 Watt units designed for use in space applications. Using a double ended forward topology with synchronous rectifiers achieves high efficiency, and the use of Chip-On-Board (COB) construction together with planar magnetics allows Aeroflex to provide space quality components at down-to-earth prices.

The ACT861X series are full featured single output converters, with EMI filtering, short circuit protection, input undervoltage shutdown, output overvoltage shutdown, overtemperature shutdown, input shutdown control and synchronization on both input and output sides. Other output voltages are available upon request.

Aeroflex's ACT861X series of power supply modules are radiation hardened 50 Watt units designed for use in space applications. The block diagram shown in Figure 1 uses a two transistor (double ended) forward topology to minimize voltage stresses on the semiconductors, and synchronous rectifiers are used to achieve high efficiency. These full featured converters are intended to be used in the space environment, conduction cooled to a baseplate and interconnected to the system via a D connector. The converter includes features such as input undervoltage shutdown, output overvoltage shutdown, overtemperature shutdown, input shutdown control and synchronization on both input and output sides. No optocouplers are used in the converter to assure long term total dose hardness.

The ACT861X series is fabricated as an encapsulated Chip-On-Board module in an aluminum housing. The Outline Drawing is shown in Figure 2.

The input undervoltage shutdown disables the converter when the input bus is below the minimum specified setpoint. Nominal input current will be the shutdown current specified. This prevents the converter from generating low output voltages in the event of bus undervoltages and drawing high input currents when attempting to power the rated load with these low bus input voltages. When the input bus voltage is above the minimum specified in Table 1 the converter commences operation.

Overtemperature protection is integral to the ACT861X series. An internal temperature sensor mounted near the higher power dissipating components shuts the converter off if the mounting temperature is above the threshold specified in Table 1. When the converter cools off it will turn back on with no cycling of input power required.

The output overvoltage circuit uses a portion of the output voltage derived to power the internal logic (the bootstrap supply) to measure indirectly the output voltage. This voltage is sensed, and if it exceeds a predetermined threshold the converter will cycle at a nominal 100Hz frequency attempting to restart.

Control of the ACT861X is achieved via the **INHIBIT** pin. This pin may be used as both an internal temperature monitor and to control the module. When **INHIBIT** is shorted to the **IN\_COM** pin the module is disabled. Nominal current flowing through the **INHIBIT** line at this time is less than 1mA, and the on/off threshold is 6V above the negative return. When the converter temperature sensor is at -55°C the **INHIBIT** line will be approximately 8.7V; at 85°C it will be approximately 6.7V. This affords the user a convenient way to measure the converter internal temperature.

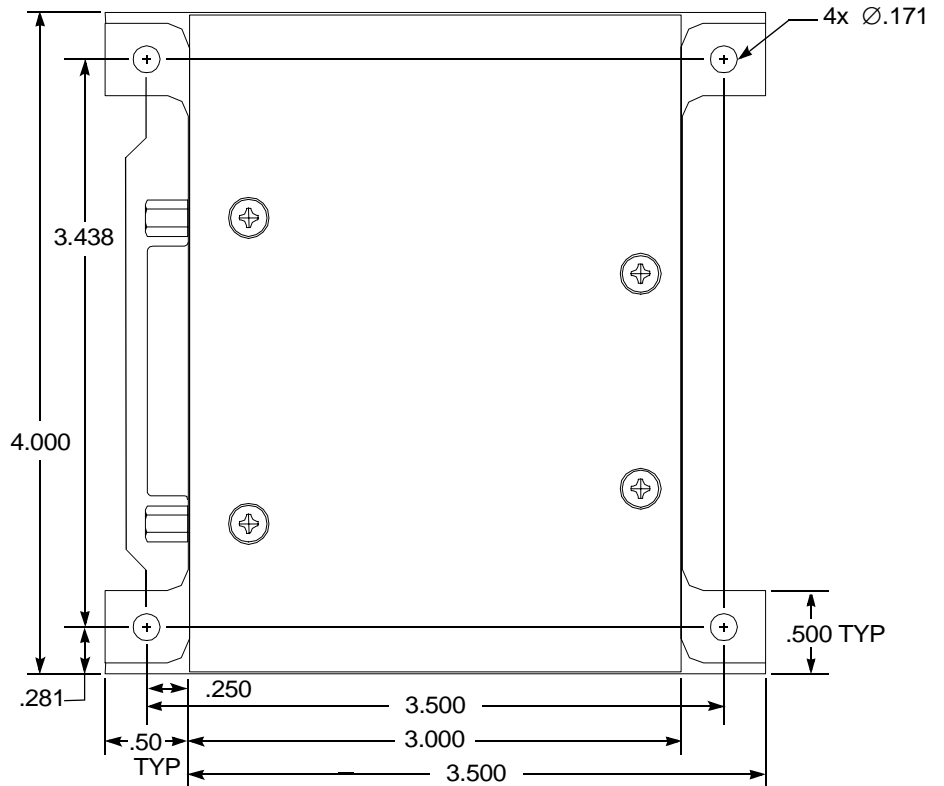
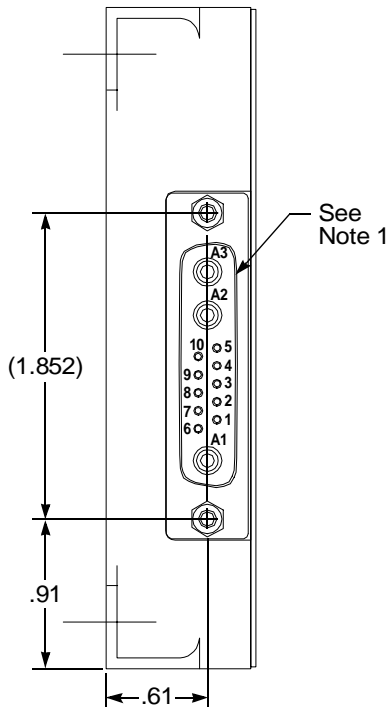
Synchronization may either be referenced to the output ground of the converter or input ground. When synchronization is referenced to the input ground a low impedance clock waveform, approximately 50% duty cycle, TTL compatible between 450 and 500KHz, should be applied to the **SYNC\_IN** terminal and the **IN\_COM** terminal. This will synchronize the switching power converter although not the feedback oscillator. If it is desired to synchronize both the power converter and feedback oscillator a low impedance clock waveform, approximately 50% duty cycle, TTL compatible between 450 and 500KHz, should be applied to the **SYNC\_OUT** terminal and the **OUT\_COM** terminal.

The **STATUS** output is an open collector signal, active low, referenced to **OUT\_COM** that is asserted when the output voltage is within ±10% of the nominal output voltage.

## Table 1 – Performance Specifications

(T<sub>c</sub> = -55°C to +85°C, V<sub>IN</sub> = +50V DC ±5%, CL = 0, Unless otherwise specified)

Parameter	ACT8601	ACT8602	ACT8603	ACT8604	ACT8605	Units
Nominal Output Voltage	+5	+12	+15	-12	-15	Volts
Regulation, No Load to Full Load	0.1	0.05	0.05	0.05	0.05	Volts, Maximum
Stability, Over Operating Temperature	0.1	0.05	0.05	0.05	0.05	Volts, Maximum
Regulation, Over Line Voltage	0.05	0.025	0.025	0.025	0.025	Volts, Maximum
Ripple	50	25	25	25	25	mVolts RMS, Maximum
Output Overvoltage Shutdown	+5.5	+13.2	+16.5	-13.2	-16.5	Volts, Maximum
Efficiency, at Full Load	85	88	88	88	88	%, Minimum
Output Current	10	4.2	3.3	4.2	3.3	Amperes, Maximum
Output Current Limit	12	5	4	5	4	Amperes, Maximum
Output Voltage Accuracy	±2					%
Output Power	50					W, Maximum
Input Voltage	40					Volts, Minimum
Input Voltage	60					Volts, Maximum
Input Voltage, Transient	100					Volts, Maximum for 1 second
Input EMI	Complies with MIL-STD-461C					-
Input Undervoltage Threshold	38.5					Volts, Maximum
Input Current, at Full Load	1.5					Amperes, Maximum
Input Current, at No Load	0.15					Amperes, Maximum
Input Current, Shutdown Asserted	20					mAmperes, Maximum
Input Output Isolation	10MΩ at 250V Minimum					-
Switching Frequency	200					KHz, Nominal
Transient Response	50% load change, 5% Maximum deviation, returns to regulation band in 1msec.					-
Overshoot	At Turn On, Turn Off and Power Failure: None					-
Output Short Circuit Duration	Will Withstand continuous short without damage					-
Radiation, Total Dose	100					KRad (Si), Maximum
Radiation, SEE/SEB	20					MeV/cm <sup>2</sup> /mg, Maximum
Thermal Shutdown, Case	85°C					Minimum
Operating Temperature, Case	-55°C to +85°C					-
Storage Temperature	-65°C to +125°C					-



**Table 2 – Connector Pin Assignments**

Pin	Function
A1	CHASSIS COMMON
A2	VO+
A3	VO-
1	VIN-
2	SYNC_IN
3	NC
4	STATUS
5	OUT_COM
6	VIN+
7	INHIBIT
8	IN_COM
9	NC
10	SYNC_OUT



**Notes:**

1. Input/Output Connector ITT Cannon DBMMMD13H3PJ, mating with DBMM13W3S. Connector pin assignments are listed in Table 1.
2. Dimension Tolerances: 2 Place Decimals.  $\pm 0.15$   
3 Place Decimals.  $\pm 0.005$

**Figure 2 – Package Outline Drawing**



### Ordering Information

Model Number	Output Voltage
ACT 8611	+5V
ACT 8612	+12V
ACT 8613	+15V
ACT 8614	-12V
ACT 8615	-15V

Specifications subject to change without notice

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