Standard Products

ACT8601/2/3/4 Rad Hard Dual Adjustable Positive & Negative Voltage Regulator

Preliminary

www.aeroflex.com/POWER

February 18, 2005

Common Features

- Radiation Total Dose
  - 100KRad - ACT8601/2
  - 30KRad - ACT8603/4
- 1.5A output current
- Current limited
- Line regulation .01% typ
- Output short circuit protected
- Thermal Shutdown
- Packaging – Hermetic Metal
  - Thru-Hole or Surface Mount
  - 6 Leads, .65" x .42" x .200"
  - Power Package
  - Weight - 5 gm max
- Military and Space Temperature Range
- DESC SMD: Pending

Positive Regulator Features

- Output voltage adjustable from 1.2V to 37V
- Load regulation 0.1% typ
- Ripple rejection 80dB typ

Negative Regulator Features

- Output voltage adjustable range
  -ACT8601/2 -1.2V to -27V
  -ACT8603/4 -1.2V to -37V
- Load regulation 0.3% typ
- Ripple rejection 77dB typ

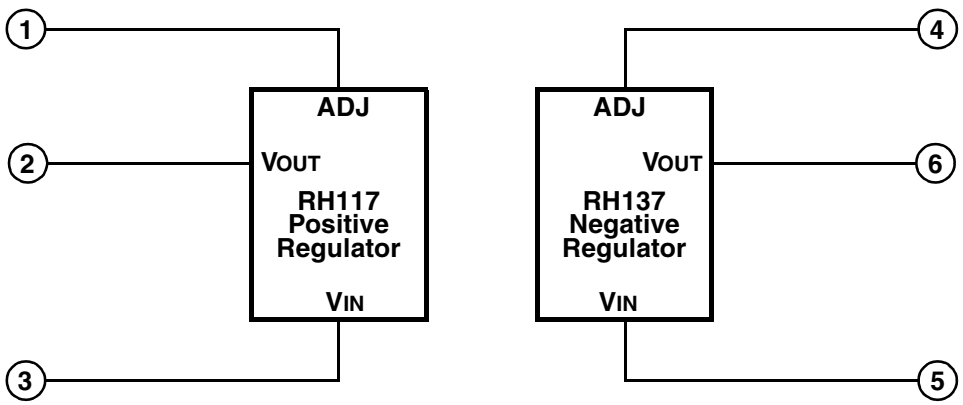
NOTE: Aeroflex Plainview does not currently have a DSCC certified Radiation Hardened Assurance Program

DESCRIPTION

The positive (RH117) and a negative (RH137) voltage regulator are capable of supplying in excess of 1.5Amps over the output voltage range as defined under recommended operating conditions. Each regulator is exceptionally easy to set-up, requiring only 2 external resistors to set the output voltage. The module design has been optimized for excellent regulation and low thermal transients. There is full electrical isolation between positive and negative regulators and each to the package.

Further, the ACT8601/2/3/4 features internal current limiting, thermal shutdown and safe-area compensation, making them virtually blowout-proof against overloads. The ACT8601/2/3/4 serves a wide variety of applications including local on-card regulation, programmable output voltage regulation or precision current regulation.

The ACT8601/2/3/4 has been specifically designed to meet exposure to radiation environments. The ACT8601/3 is configured for a Thru-Hole 6 lead metal power package and the ACT8602/4 is configured for a Surface Mount 6 lead metal power package. It is guaranteed operational from -55°C to +125°C. Available screened to MIL-STD-883, the ACT8601/2/3/4 is ideal for demanding military and space applications.



BLOCK DIAGRAM / SCHEMATIC

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RANGE		UNITS
	ACT8601/2	ACT8603/4	
Operating (Junction) Temperature Range	-55 to +150		°C
Lead Temperature (soldering, 10 sec)	300		°C
Storage Temperature Range	-65 to +150		°C
Input-Output Voltage Differential	40 (Pos) 30 (Neg)	40	V
Thermal Resistance (junction to case Θ_{JC}) each, Pos. & Neg.	5		°C/W
ESD Rating	2		KV

NOTICE: Stresses above those listed under "Absolute Maximums Rating" may cause permanent damage to the device. These are stress rating only; functional operation beyond the "Operation Conditions" is not recommended and extended exposure beyond the "Operation Conditions" may effect device reliability.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	RANGE		UNITS
	ACT8601/2	ACT8603/4	
Output Voltage Range			
Positive Voltage Regulator	1.2 to 37		V_{DC}
Negative Voltage Regulator	-1.2 to -22	-1.2 to -37	V_{DC}
Case Operating Temperature Range	-55 to +125		°C

POSITIVE REGULATOR – ELECTRICAL PERFORMANCE CHARACTERISTICS 1/

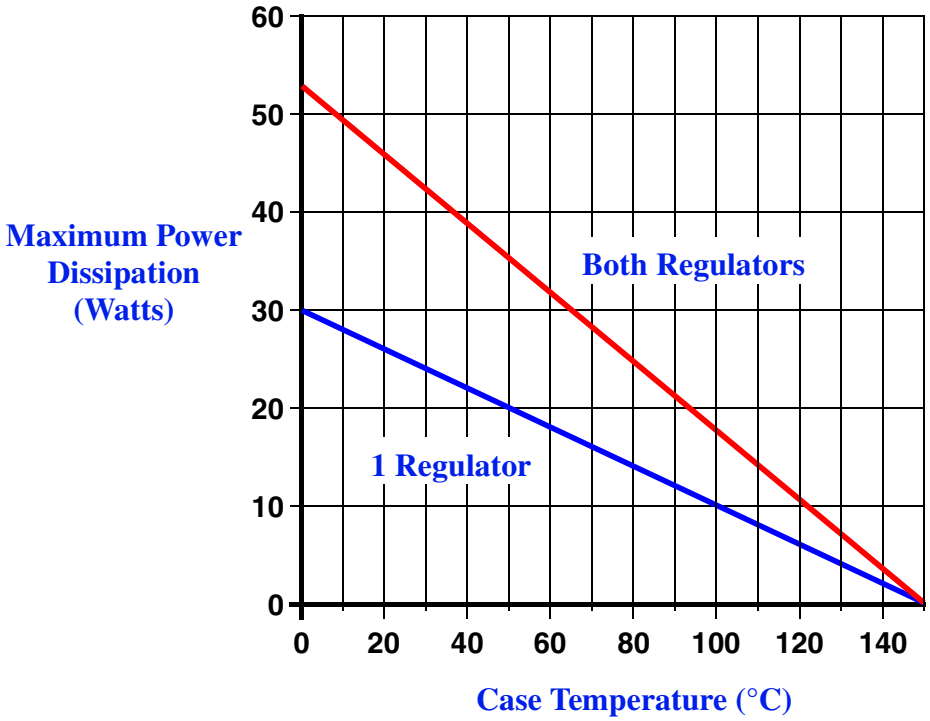
PARAMETER	SYM	CONDITIONS	ACT8601/2		ACT8603/4		UNITS
			MIN	MAX	MIN	MAX	
Reference Voltage	V_{REF}	$3V \le (V_{IN} - V_{OUT}) \le V_{DIFF\ MAX}$, $10mA \le I_{OUT} \le I_{MAX}$	1.20	1.30	1.20	1.30	V
Line Regulation 2/	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$3V \le (V_{IN} - V_{OUT}) \le V_{DIFF\ MAX}$, I_{OUT} = 10mA	-	0.02	-	0.05	%/V
Load Regulation 2/	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10mA \le I_{OUT} \le I_{MAX}$, $V_{OUT} \le 5V$ $10mA \le I_{OUT} \le I_{MAX}$, $V_{OUT} \ge 5V$	- -	15 0.3	- -	15 0.3	mV %
Thermal Regulation		I_{OUT} = 1.5A, (V_{IN} - V_{OUT}) = 13.3V, 20ms Pulse, 20W	-	0.07	-	0.07	%/W
Ripple Rejection Ratio		V_{OUT} = 10V, f = 120Hz, C_{ADJ} = 10µF	66	-	66	-	dB
Adjustment Pin Current	I_{ADJ}		-	100	-	100	µA
Adjustment Pin Current Change	ΔI_{ADJ}	$10mA \le I_{OUT} \le I_{MAX}$	-	5	-	5	µA
		$3.0V \le (V_{IN} - V_{OUT}) \le 40V$, I_{OUT} = 10mA	-	5	-	5	µA
Minimum Load Current 3/	I_{MIN}	(V_{IN} - V_{OUT}) = 40V	-	5	-	5	mA
Current Limit	I_{MAX}	(V_{IN} - V_{OUT}) ≤ 15V (V_{IN} - V_{OUT}) = 40V, T_C = +25°C	- -	1.5 0.30	- -	1.5 0.30	A
Long Term Stability 3/	$\frac{\Delta V_{OUT}}{\Delta TIME}$	T_A = +125°C	-	1	-	1	%
Thermal Resistance, each Regulator (Junction to Case) 3/	Θ_{JC}		-	5	-	5	°C/W

NEGATIVE REGULATOR – ELECTRICAL PERFORMANCE CHARACTERISTICS 1/

PARAMETER	SYM	CONDITIONS	ACT8601/2		ACT8603/4		UNITS
			MIN	MAX	MIN	MAX	
Reference Voltage	V_{REF}	$3V \le (V_{IN} - V_{OUT}) \le V_{DIFF\ MAX}$ $10mA \le I_{OUT} \le I_{MAX}$	-1.200	-1.300	-1.200	-1.300	V
Line Regulation 2/	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$3V \le (V_{IN} - V_{OUT}) \le 30V$,	-	0.02	-	-	%/V
		$3V \le (V_{IN} - V_{OUT}) \le 40V$,	-	-	-	0.05	
Load Regulation 2/	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10mA \le I_{OUT} \le I_{MAX}$, $V_{OUT} \le 5V$	-	25	-	25	mV
		$10mA \le I_{OUT} \le I_{MAX}$, $V_{OUT} \ge 5V$	-	0.5	-	1	%
Thermal Regulation		$I_{OUT} = 1.5A$, $(V_{IN} - V_{OUT}) = 13.3V$, 20ms Pulse, 20W	-	0.02	-	0.02	%/W
Ripple Rejection		$V_{OUT} = -10V$, f = 120Hz, $C_{ADJ} = 10\mu F$	66	-	66	-	dB
Adjustment Pin Current	I_{ADJ}		-	100	-	100	µA
Adjustment Pin Current Change	ΔI_{ADJ}	$10mA \le I_{OUT} \le I_{MAX}$	-	5	-	5	
		$3V \le (V_{IN} - V_{OUT}) \le 30V$	-	5	-	-	
		$3V \le (V_{IN} - V_{OUT}) \le 40V$, $T_C = +25°C$	-	-	-	5	µA
Minimum Load Current 3/	I_{MIN}	$(V_{IN} - V_{OUT}) = 30V$	-	5	-	-	mA
		$(V_{IN} - V_{OUT}) \le 10V$	-	3	-	3	
		$(V_{IN} - V_{OUT}) = 40V$	-	-	-	5	
Current Limit	I_{MAX}	$(V_{IN} - V_{OUT}) \le 15V$	-	1.5	-	1.5	A
		$(V_{IN} - V_{OUT}) = 30V$	-	0.24	-	0.24	
		$(V_{IN} - V_{OUT}) = 40V$, $T_C = +25°C$	-	-	0.24	-	
Long Term Stability 3/	$\frac{\Delta V_{OUT}}{\Delta TIME}$	$T_A = +125°C$	-	1	-	1	%
Thermal Resistance, each Regulator (Junction to Case) 3/	Θ_{JC}		-	5	-	5	°C/W

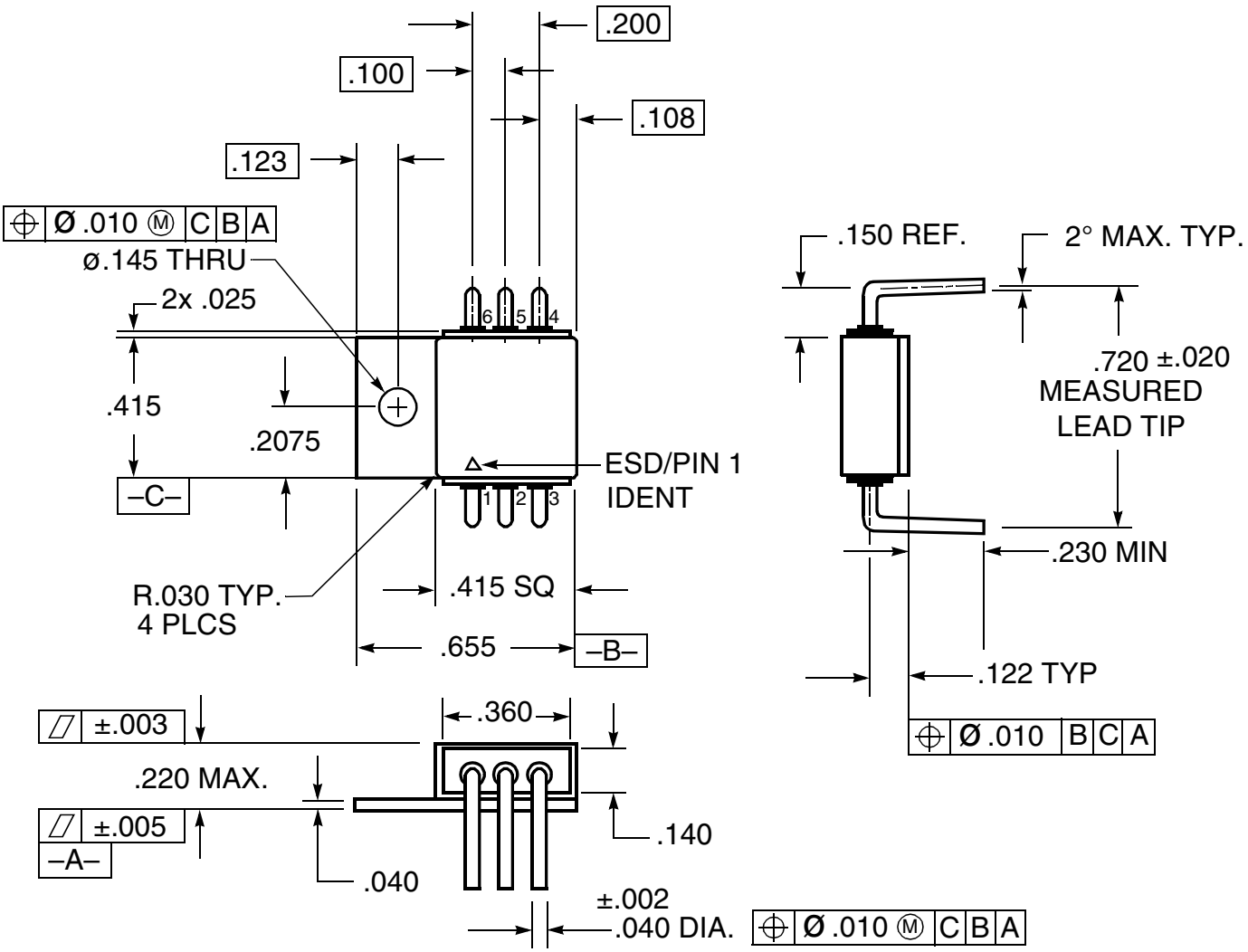
Notes:
1. Unless otherwise specified, these specificvations apply for post radiation, (Vin - Vout) = 5V, Vout = 1.25V, Iout = 0.5A and -55°C < Tc < +125°C.
2. Regulation is measured at a constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation. Measurements taken at the output lead must be adjusted for lead resistance.
3. Not tested. Shall be guaranteed to the specified limits.

MAXIMUM POWER vs CASE TEMPERATURE



The maximum Power dissipation is limited by the thermal shutdown function of each regulator chip in the ACT860X. The graph above represents the achievable power before the chip shuts down. The first line in the graph represents the maximum power dissipation of the ACT860X with one regulator on (the other off) and the other line represents both regulators on dissipating equal power. If both regulators are on and one regulator is dissipating more power that the other, the maximum power dissipation of the ACT860X will fall between the two lines. This graph is based on the maximum junction temperature of 150°C and a thermal resistance (Θ_{JC}) of 5°C/W.

PACKAGE OUTLINE — THRU-HOLE POWER PACKAGE

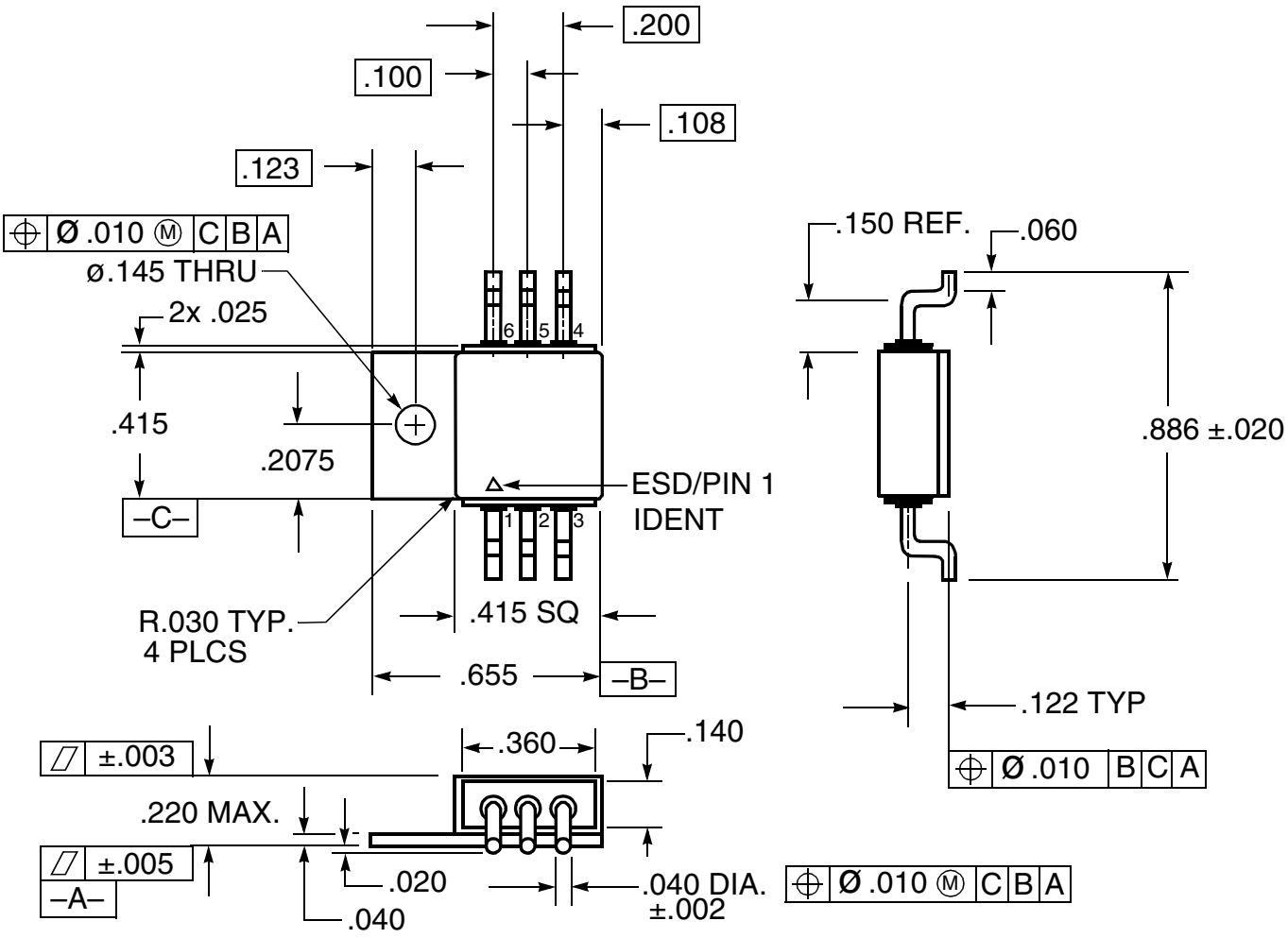


Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

PIN NUMBERS vs FUNCTION

Pin	Function
1	Positive ADJ
2	Positive VOUT
3	Positive VIN
4	Negative ADJ
5	Negative VIN
6	Negative VOUT

PACKAGE OUTLINE — SURFACE MOUNT POWER PACKAGE



Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

PIN NUMBERS vs FUNCTION

Pin	Function
1	Positive ADJ
2	Positive VOUT
3	Positive VIN
4	Negative ADJ
5	Negative VIN
6	Negative VOUT

ORDERING INFORMATION

MODEL	SCREENING	PACKAGE
ACT8601-S	Military Temperature, -55°C to +125°C, Screened to the individual test methods of MIL-STD-883. Space Applications.	6 Lead Thru-Hole Power Pkg
ACT8601-7	Commercial Flow, +25°C testing only	
ACT8602-S	Military Temperature, -55°C to +125°C, Screened to the individual test methods of MIL-STD-883. Space Applications.	6 Lead Surface Mount Power Pkg
ACT8602-7	Commercial Flow, +25°C testing only	
ACT8603-S	Military Temperature, -55°C to +125°C, Screened to the individual test methods of MIL-STD-883. Space Applications.	6 Lead Thru-Hole Power Pkg
ACT8603-7	Commercial Flow, +25°C testing only	
ACT8604-S	Military Temperature, -55°C to +125°C, Screened to the individual test methods of MIL-STD-883. Space Applications.	6 Lead Surface Mount Power Pkg
ACT8604-7	Commercial Flow, +25°C testing only	

PLAINVIEW, NEW YORK
Toll Free: 800-THE-1553
Fax: 516-694-6715

INTERNATIONAL
Tel: 805-778-9229
Fax: 805-778-1980

NORTHEAST
Tel: 603-888-3975
Fax: 603-888-4585

SE AND MID-ATLANTIC
Tel: 321-951-4164
Fax: 321-951-4254

WEST COAST
Tel: 949-362-2260
Fax: 949-362-2266

CENTRAL
Tel: 719-594-8017
Fax: 719-594-8468

www.aeroflex.com info-ams@aeroflex.com