

# **HA17431H Series**

# **Shunt Regulator**

R03DS0088EJ0300 Rev.3.00 Jan 10, 2014

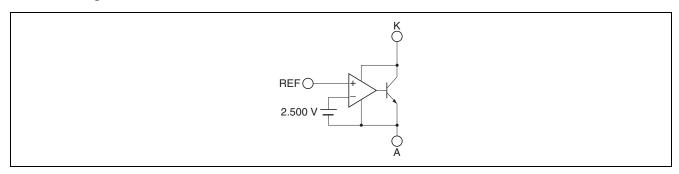
# **Description**

The HA17431H series is temperature-compensated variable shunt regulators. The main application of these products is in voltage regulators that provide a variable output voltage. The on-chip high-precision reference voltage source can provide  $\pm 1\%$  accuracy, which have a  $V_{KA}$  max of 36 volts.

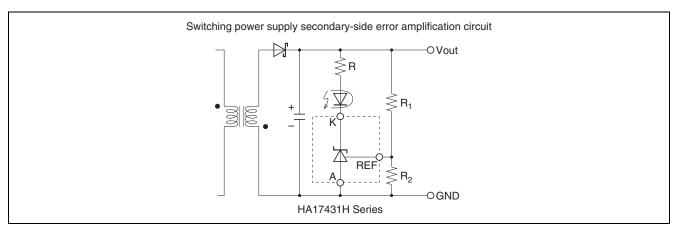
#### **Features**

- The reference voltage provide  $2.500 \text{ V} \pm 1\%$  at Ta =  $25^{\circ}\text{C}$
- The reference voltage has a low temperature coefficient
- The MPAK-5V (5 pin), MPAKV (3 pin) and UPAKV miniature packages are optimal for use on high mounting density circuit boards

### **Block Diagram**



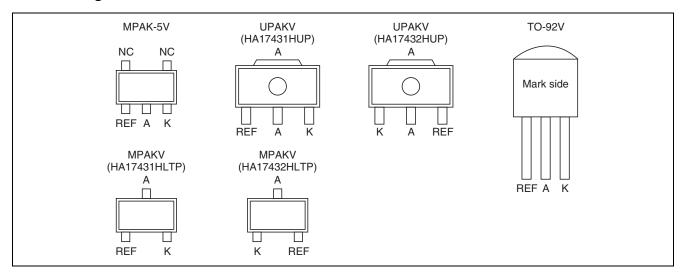
# **Application Circuit Example**



# **Ordering Information**

Item		Package Code (Previous Code)	Temp. Range
Industrial use	HA17431HLTP	PLSP0003ZB-A (MPAKV)	−20 to +85°C
	HA17432HLTP		
	HA17431HLP	PLSP0005ZB-A (MPAK-5V)	
	HA17431HP	PRSS0003DA-A (TO-92V)	
	HA17431HUP	PLZZ0004CA-A (UPAKV)	
	HA17432HUP		

# **Pin Arrangement**



# **Absolute Maximum Ratings**

 $(Ta = 25^{\circ}C)$ 

Item	Symbol	HA17431HLP	HA17431HP	HA17431HUP/ HA17432HUP	HA17431HLTP/ HA17432HLTP	Unit	Notes
Cathode voltage	$V_{KA}$	36	36	36	36	٧	1
Continuous cathode current	I <sub>K</sub>	-50 to +50	-50 to +50	-50 to +50	-50 to +50	mA	
Reference input current	Iref	-0.05 to +6	-0.05 to +6	-0.05 to +6	-0.05 to +6	mA	
Power dissipation	P <sub>T</sub>	150 * <sup>2</sup>	500 * <sup>3</sup>	800 * <sup>4</sup>	150 * <sup>2</sup>	mW	2,3,4
Operating temperature range	Topr	-20 to +85	-20 to +85	-20 to +85	-20 to +85	°C	
Storage temperature	Tstg	-55 to +150	-55 to +150	-55 to +150	-55 to +150	°C	

Notes: 1. Voltages are referenced to anode.

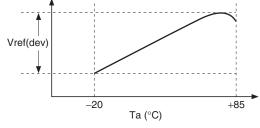
- 2. Ta  $\leq$  25°C. If Ta > 25°C, derate by 1.2 mW/°C.
- 3. Ta  $\leq$  25°C. If Ta > 25°C, derate by 4.0 mW/°C.
- 4.  $15 \text{ mm} \times 25 \text{ mm} \times 0.7 \text{mmt}$  alumina ceramic board,  $Ta \le 25^{\circ}C$ . If  $Ta > 25^{\circ}C$ , derate by 6.4 mW/°C.

#### **Electrical Characteristics**

 $(Ta = 25^{\circ}C, I_K = 10 \text{ mA})$ 

Item	Symbol	Min	Тур	Max	Unit	Test Conditions	Notes
Reference voltage	Vref	2.475	2.500	2.525	V	V <sub>KA</sub> = Vref	
Reference voltage temperature deviation	Vref(dev)	_	10	_	mV	$V_{KA} = Vref,$ $Ta = -20$ °C to +85°C	1
Reference voltage temperature coefficient	ΔVref/ΔTa	_	±30	_	ppm/°C	V <sub>KA</sub> = Vref, 0°C to 50°C gradient	
Reference voltage regulation	$\Delta Vref/\Delta V_{KA}$	_	2.0	3.7	mV/V	V <sub>KA</sub> = Vref to 36 V	
Reference input current	Iref	_	0.6	3	μΑ	$R_1 = 10 \text{ k}\Omega, R_2 = \infty$	
Reference current temperature deviation	Iref(dev)	_	0.5	_	μΑ	$R_1 = 10 \text{ k}\Omega, R_2 = \infty,$ $Ta = -20^{\circ}\text{C to } +85^{\circ}\text{C}$	
Minimum cathode current	Imin	_	0.06	0.2	mA	V <sub>KA</sub> = Vref	2
Off state cathode current	loff	_	0.001	1.0	μΑ	V <sub>KA</sub> = 36 V, Vref = 0 V	
Dynamic impedance	Z <sub>KA</sub>	_	0.2	0.5	Ω	$V_{KA} = Vref,$ $I_K = 1 \text{ mA to } 50 \text{ mA}$	

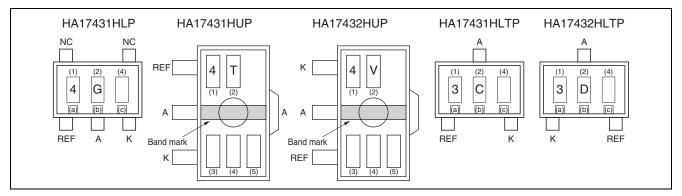
Notes: 1. Vref(dev) = Vref(max) - Vref(min)



2. Imin is given by the cathode current at  $Vref = Vref_{(IK=10mA)} - 15 \text{ mV}$ .

# MPAK-5V (5 pin), MPAKV (3 pin) and UPAKV Marking Patterns

The marking patterns shown below are used on MPAK-5V, MPAKV and UPAKV products. Note that the product code and mark pattern are different. The pattern is laser-printed.



Notes: 1. Boxes (1) to (5) in the figures show the position of the letters or numerals, and are not actually marked on the package.

2. The letters (1) and (2) show the product specific mark pattern.

Product	(1)	(2)					
HA17431HLP	4	G					
HA17431HUP	4	Т					
HA17432HUP	4	V					
HA17431HLTP	3	С					
HA17432HLTP	3	D					

- 3. The letter (3) shows the production year code (the last digit of the year) for UPAKV products.
- 4. The bars (a), (b) and (c) show a production year code for MPAK-5V and MPAKV products as shown below. After 2010 the code is repeated every 8 years.

Year	2002	2003	2004	2005	2006	2007	2008	2009
(a)	None	None	None	Bar	Bar	Bar	Bar	None
(b)	None	Bar	Bar	None	None	Bar	Bar	None
(c)	Bar	None	Bar	None	Bar	None	Bar	None

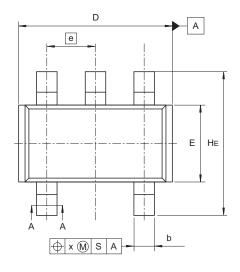
5. The letter (4) shows the production month code (see table below).

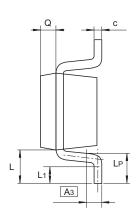
Production month	Jan.	Feb.	Mar.	Apr.	Мау.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Marked code	Α	В	С	D	Е	F	G	Н	J	K	L	М

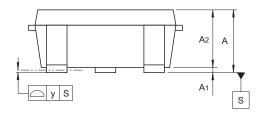
6. The letter (5) shows manufacturing code. For UPAKV products.

# **Package Dimensions**

JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
SC-74A	PLSP0005ZB-A	MPAK-5 / MPAK-5V	0.015





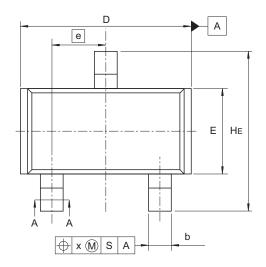


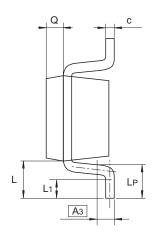


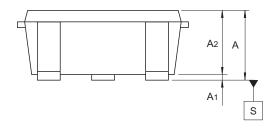
Reference	Dimensi	ons in mi	llimeters
Symbol	Min	Nom	Max
Α	1.0		1.4
A <sub>1</sub>	0		0.1
A <sub>2</sub>	1.0	1.1	1.3
$A_3$		0.25	_
b	0.35	0.4	0.5
С	0.11	0.16	0.26
D	2.8	2.95	3.1
E	1.5	1.6	1.8
е	_	0.95	_
HE	2.5	2.8	3.0
L	0.3	_	0.7
L <sub>1</sub>	0.1	_	0.5
Lp	0.2	_	0.6
Х			0.05
У	_	_	0.05
Q		0.3	

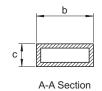
© 2013 Renesas Electronics Corporation. All rights reserved.

JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
SC-59A	PLSP0003ZB-A	MPAK(T) / MPAK(T)V	0.011



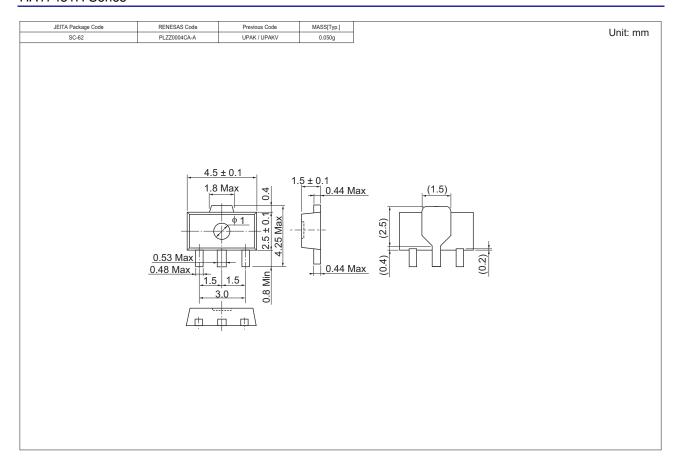


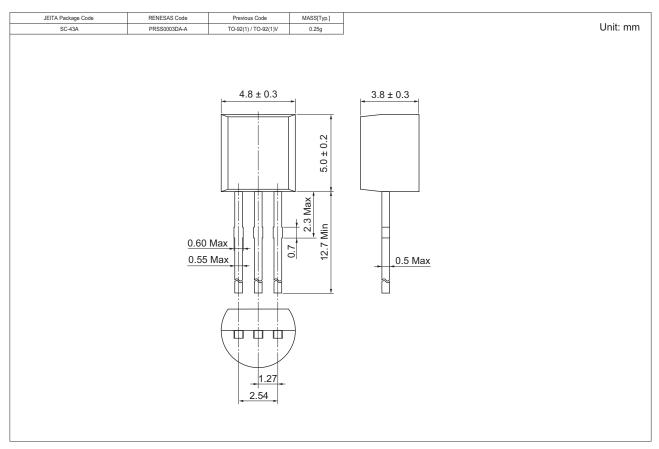




Reference	Dimensions in millimeters				
Symbol	Min	Nom	Max		
Α	1.0	_	1.3		
A <sub>1</sub>	0	_	0.1		
A <sub>2</sub>	1.0	1.1	1.2		
A <sub>3</sub>		0.25	_		
b	0.35	0.4	0.5		
С	0.1	0.16	0.26		
D	2.7	_	3.1		
E	1.35	1.5	1.65		
е	_	0.95	_		
HE	2.2	2.8	3.0		
L	0.35	_	0.75		
L <sub>1</sub>	0.15	_	0.55		
Lp	0.25	_	0.65		
Х	_	_	0.05		
Q		0.3			

 $\hbox{@\,}2013$  Renesas Electronics Corporation. All rights reserved.





#### **Notice**

- 1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
- 2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein
- 3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or
- 4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
- 5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.

Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or loss incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics

- 6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the ise of Renesas Electronics products beyond such specified ranges.
- 7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
- 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
- 9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations
- 10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
- 11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics
- 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries. (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics



#### SALES OFFICES

#### Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information

Renesas Electronics America Inc. 2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A. Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited 1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K Tel: +44-1628-651-709, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd. 7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China Tel: +86-10-2035-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 LanGao Rd., Putuo District, Shanghai, China
Tel: +86-21-2226-088, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 161F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd. 13F, No. 363, Fu Shing North Road, Taipei, Taiv Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd. 80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre Singapore 339949 Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd. 12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea Tel: +82-2-558-3737, Fax: +82-2-558-5141

© 2014 Renesas Electronics Corporation. All rights reserved.