

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# HA17431H Series

## Shunt Regulator

**RENESAS**

ADE-204-070A (Z)

Rev.1  
Sep. 2002

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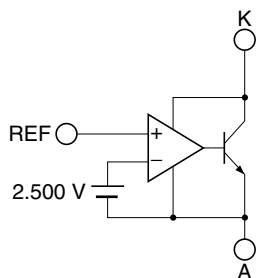
### Description

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.

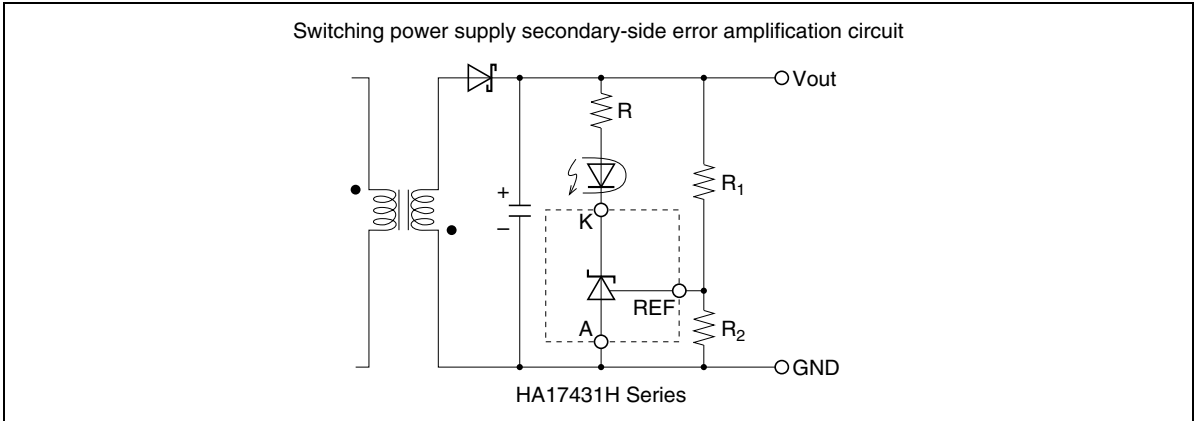
### Features

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

### Block Diagram



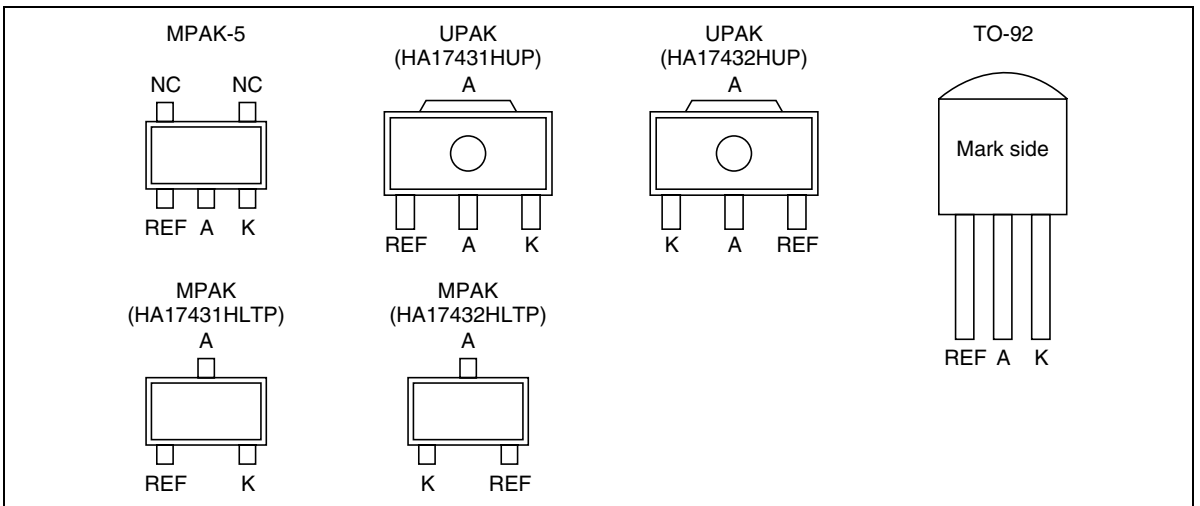
## Application Circuit Example



## Ordering Information

Item		Package	Temp. Range
Industrial use	HA17431HLTP	MPAK	-20 to +85°C
	HA17432HLTP		
	HA17431HLP	MPAK-5	
	HA17431HP	TO-92	
	HA17431HUP	UPAK	
	HA17432HUP		

## Pin Arrangement



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings				Unit	Notes
		HA17431HLP	HA17431HP	HA17431HUP/ HA17432HUP	HA17431HLTP/ HA17432HLTP		
Cathode voltage	$V_{KA}$	36	36	36	36	V	1
Continuous cathode current	$I_K$	-50 to +50	-50 to +50	-50 to +50	-50 to +50	mA	
Reference input current	$I_{ref}$	-0.05 to +6	-0.05 to +6	-0.05 to +6	-0.05 to +6	mA	
Power dissipation	$P_T$	150 <sup>*2</sup>	500 <sup>*3</sup>	800 <sup>*4</sup>	150 <sup>*2</sup>	mW	2,3,4
Operating temperature range	$T_{opr}$	-20 to +85	-20 to +85	-20 to +85	-20 to +85	°C	
Storage temperature	$T_{stg}$	-55 to +150	-55 to +150	-55 to +150	-55 to +150	°C	

Notes: 1. Voltages are referenced to anode.

2. Ta ≤ 25°C. If Ta > 25°C, derate by 1.2 mW/°C.

3. Ta ≤ 25°C. If Ta > 25°C, derate by 4.0 mW/°C.

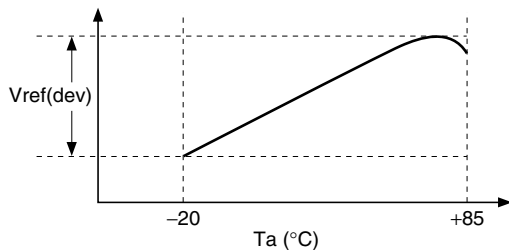
4. 15 mm × 25 mm × 0.7mm alumina ceramic board, Ta ≤ 25°C. If Ta > 25°C, derate by 6.4 mW/°C.

## Electrical Characteristics

( $T_a = 25^\circ\text{C}$ ,  $I_k = 10\text{ mA}$ )

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	Notes
Reference voltage	Vref	2.475	2.500	2.525	V	$V_{KA} = \text{Vref}$	
Reference voltage temperature deviation	Vref(dev)	—	10	—	mV	$V_{KA} = \text{Vref}$ , $T_a = -20^\circ\text{C}$ to $+85^\circ\text{C}$	1
Reference voltage temperature coefficient	$\Delta\text{Vref}/\Delta T_a$	—	$\pm 30$	—	ppm/ $^\circ\text{C}$	$V_{KA} = \text{Vref}$ , $0^\circ\text{C}$ to $50^\circ\text{C}$ gradient	
Reference voltage regulation	$\Delta\text{Vref}/\Delta V_{KA}$	—	2.0	3.7	mV/V	$V_{KA} = \text{Vref}$ to 36 V	
Reference input current	Iref	—	0.6	3	$\mu\text{A}$	$R_1 = 10\text{ k}\Omega$ , $R_2 = \infty$	
Reference current temperature deviation	Iref(dev)	—	0.5	—	$\mu\text{A}$	$R_1 = 10\text{ k}\Omega$ , $R_2 = \infty$ , $T_a = -20^\circ\text{C}$ to $+85^\circ\text{C}$	
Minimum cathode current	Imin	—	0.06	0.2	mA	$V_{KA} = \text{Vref}$	2
Off state cathode current	Ioff	—	0.001	1.0	$\mu\text{A}$	$V_{KA} = 36\text{ V}$ , $\text{Vref} = 0\text{ V}$	
Dynamic impedance	$Z_{KA}$	—	0.2	0.5	$\Omega$	$V_{KA} = \text{Vref}$ , $I_k = 1\text{ mA}$ to $50\text{ mA}$	

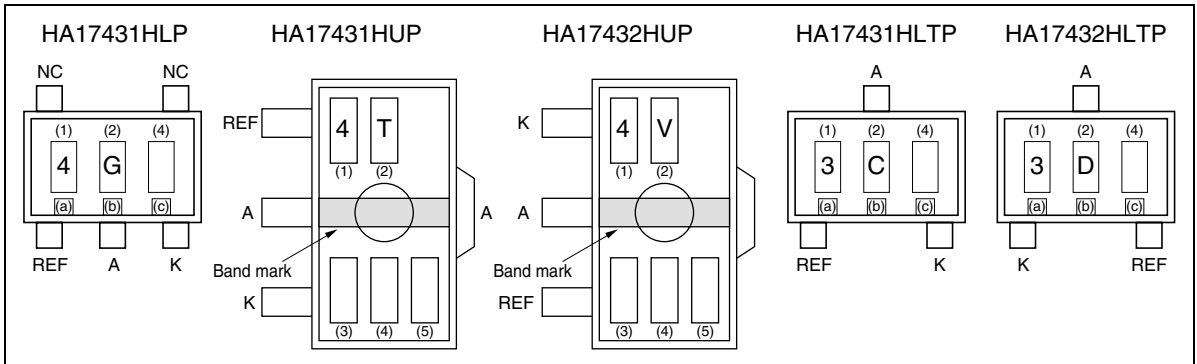
Notes: 1.  $\text{Vref(dev)} = \text{Vref(max)} - \text{Vref(min)}$



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

## MPAK-5 (5 pin), MPAK (3 pin) and UPAK Marking Patterns

The marking patterns shown below are used on MPAK-5, MPAK and UPAK 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	T
HA17432HUP	4	V
HA17431HLTP	3	C
HA17432HLTP	3	D

3. The letter (3) shows the production year code (the last digit of the year) for UPAK products.  
 4. The bars (a), (b) and (c) show a production year code for MPAK-5 and MPAK 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

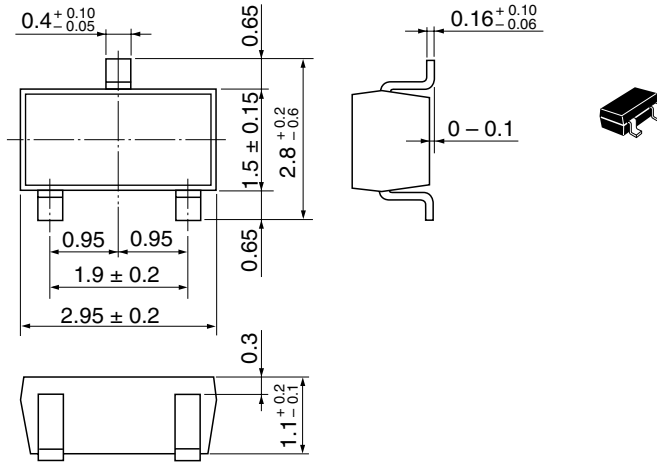
5. The letter (4) shows the production month code (see table below).

Production month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Marked code	A	B	C	D	E	F	G	H	J	K	L	M

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

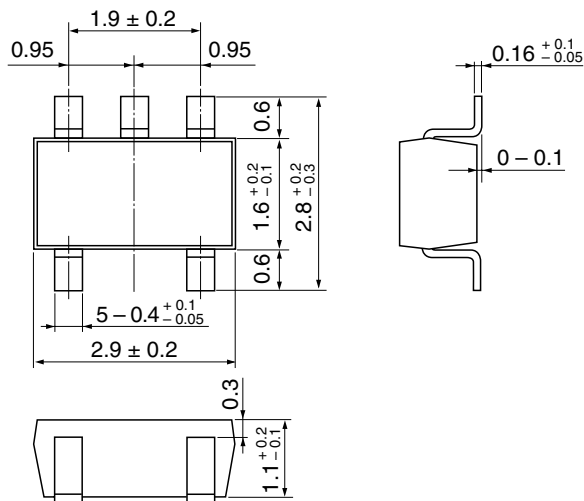
## Package Dimensions

As of January, 2002  
Unit: mm



Hitachi Code	MPAK
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.011 g

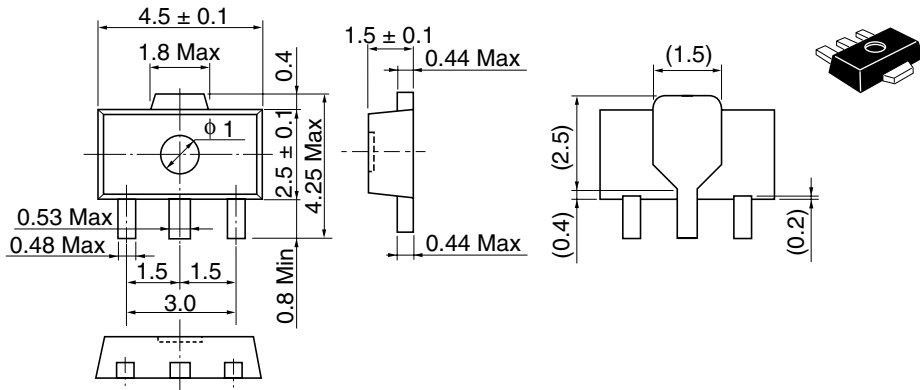
As of January, 2002  
Unit: mm



Hitachi Code	MPAK-5
JEDEC	—
JEITA	—
Mass (reference value)	0.015 g

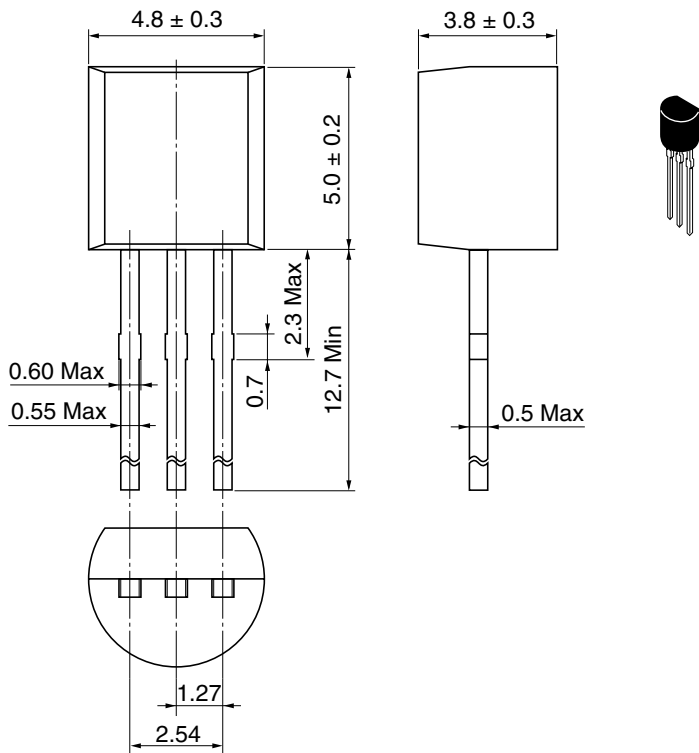


As of January, 2002  
Unit: mm



Hitachi Code	UPAK
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.050 g

As of January, 2002  
Unit: mm



Hitachi Code	TO-92 (1)
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	0.25 g

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