
HA17L431 Series

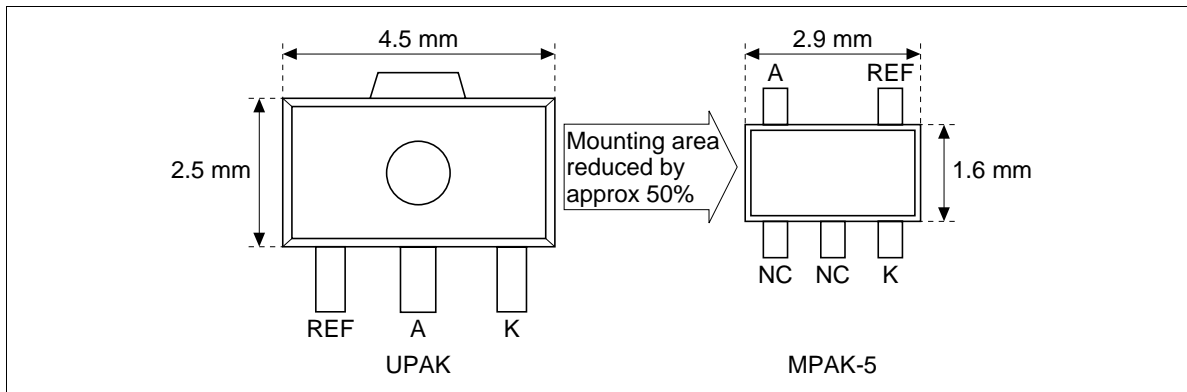
High-Precision Variable Shunt Regulators

HITACHI

ADE-204-029B (Z)
3rd Edition
Apr. 1999

Description

The HA17L431LP(MPAK-5) / P(TO-92) / UP(UPAK) are temperature-compensated variable shunt regulators. These ICs can operate at about half voltage in comparison with HA17431V series. They can be replaced for simple Zener diode and they can also be used for switching power supply secondary-side error amplification circuit. MPAK-5, TO-92 and UPAK packages are available. The MPAK-5 package, in particular, is suitable for high-density mounting, with a mounting area approximately half that of Hitachi's UPAK products.



Features

- On-chip high-precision reference voltage source: $1.240\text{ V} \pm 1.5\%$ ($T_a = 25^\circ\text{C}$)
- Small reference voltage temperature coefficient: $30\text{ ppm}/^\circ\text{C}$ Typ
- Maximum cathode voltage: 16 V
- Maximum cathode current: 50 mA
- Minimum cathode current: $200\text{ }\mu\text{A}$ Typ
- Operating temperature range: -20 to $+85^\circ\text{C}$

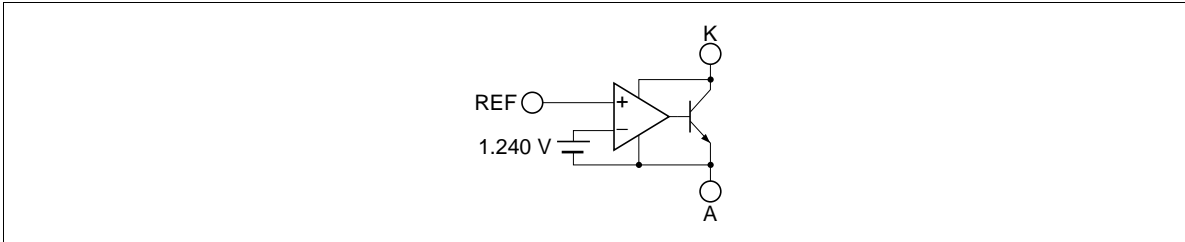
Application Example

- Reference voltage generation circuits, etc.

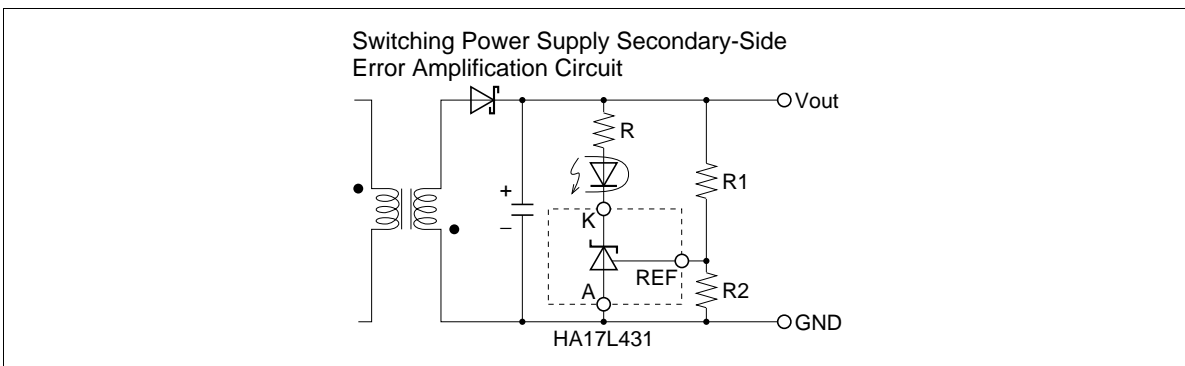


HA17L431 Series

Block Diagram



Application Circuit Example

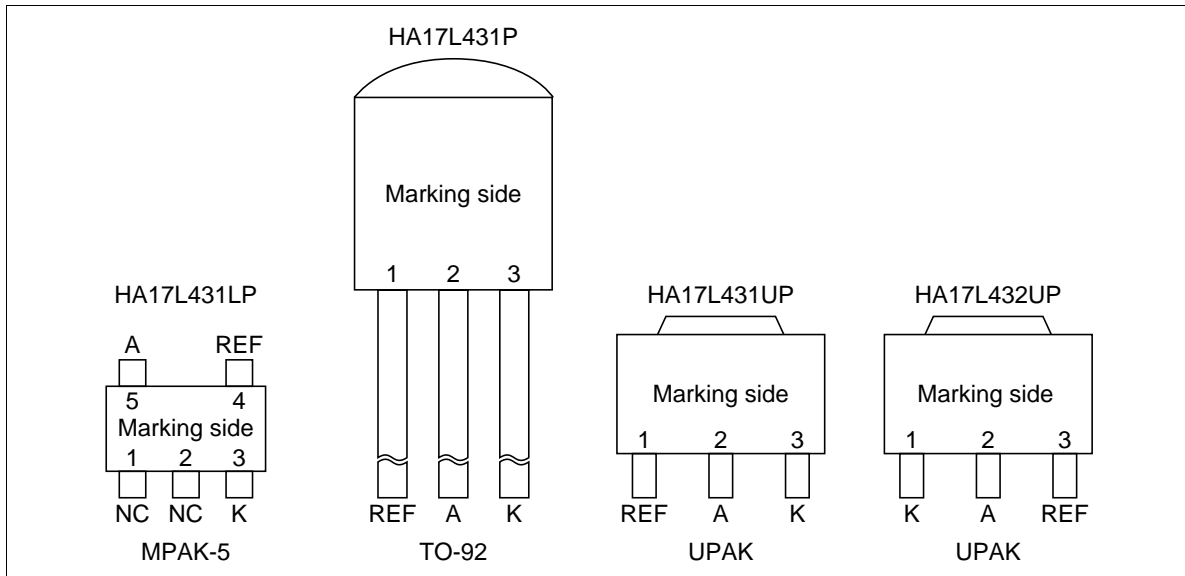


Product Lineup

Product Name	Package	Application
HA17L431LP	MPAK-5	Industrial use
HA17L431P	TO-92	
HA17L431UP	UPAK	
HA17L432UP		

HITACHI

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Rated Value				Unit	Note
		HA17L431LP	HA17L431P	HA17L431UP	HA17L432UP		
Cathode voltage	V_{KA}	16	16	16	16	V	1
Continuous cathode current	I_K	-30 to +50	-30 to +50	-30 to +50	-30 to +50	mA	
Reference input current	I_{ref}	-0.05 to +5	-0.05 to +5	-0.05 to +5	-0.05 to +5	mA	
Power dissipation	P_T	150	500	800	800	mW	2
Operating temperature	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	

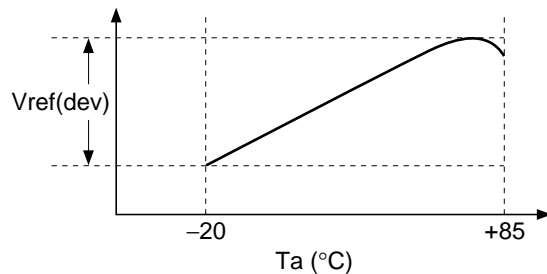
- Notes: 1. The anode pin is used as the reference for voltage values.
 2. These values apply when $T_a \leq 25^\circ\text{C}$.

HA17L431 Series

Electrical Characteristics (Ta = 25°C, I_K = 10 mA)

Item	Symbol	Min	Typ	Max	Unit	Test Condition	Note
Reference voltage	V _{ref}	1.222	1.240	1.258	V	V _{KA} = V _{ref}	
Reference voltage deviation	V _{ref} (dev)	—	5	—	mV	V _{KA} = V _{ref} , Ta = -20°C to +85°C	1
Reference voltage temperature coefficient	ΔV _{ref} /ΔTa	—	±30	—	ppm/°C	V _{KA} = V _{ref} , 0°C to 50°C gradient	
Reference voltage regulation	ΔV _{ref} /ΔV _{KA}	—	1.0	2.0	mV/V	V _{KA} = V _{ref} to 16V	
Reference input current	I _{ref}	—	2	6	μA	R1 = 10 kΩ, R2 = ∞	
Reference current temperature deviation	I _{ref} (dev)	—	0.5	—	μA	R1 = 10 kΩ, R2 = ∞, Ta = -20°C to +85°C	
Minimum cathode current	I _{min}	—	0.2	1.0	mA	V _{KA} = V _{ref}	2
Off cathode current	I _{off}	—	0.001	1.0	μA	V _{KA} = 16 V, V _{ref} = 0 V	
Dynamic impedance	Z _{KA}	—	0.2	0.5	Ω	V _{KA} = V _{ref} , I _K = 1 mA to 50 mA	

Notes: 1. $V_{ref}(dev) = (V_{ref} \text{ maximum value at } Ta = -20^{\circ}C \text{ to } +85^{\circ}C) - (V_{ref} \text{ minimum value at } Ta = -20^{\circ}C \text{ to } +85^{\circ}C)$

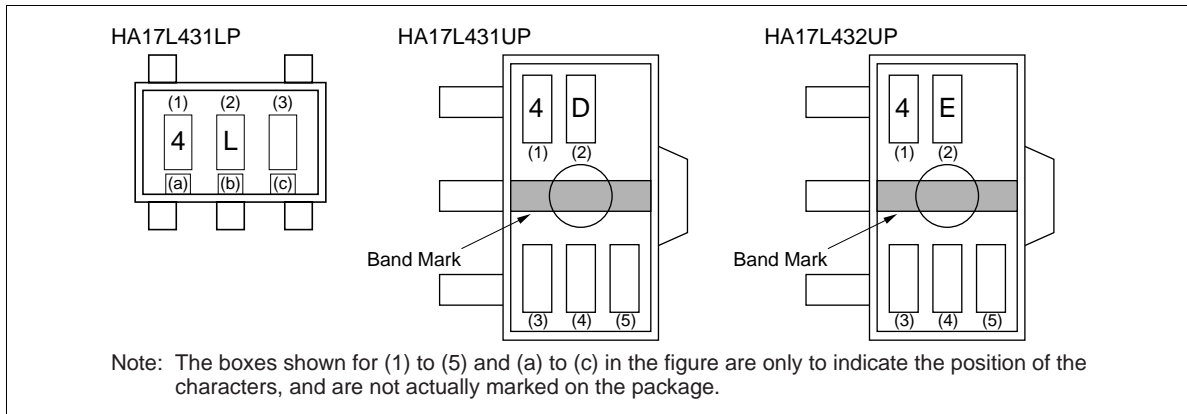


2. Definition of minimum cathode current.

I_{min} is the cathode current value at which $V_{ref} = V_{ref}(I_K = 10 \text{ mA}) - 15 \text{ mV}$.

Marking Pattern on MPAK-5 Models (HA17L431LP) and UPAK Models (HA17L431UP, HA17L432UP)

Because of the small package size, the following marking patterns are used on MPAK-5 and UPAK models. Note that the product code and marking pattern are different. The patterns are laser-marked.



Markings

• HA17L431LP

	Type of Marking	Meaning																																				
(1), (2)	Characters	Model code: 4L																																				
(3)		Production month code: <table border="1"> <thead> <tr> <th>Production month</th> <th>JAN</th> <th>FEB</th> <th>MAR</th> <th>APR</th> <th>MAY</th> <th>JUN</th> <th>JUL</th> <th>AUG</th> <th>SEP</th> <th>OCT</th> <th>NOV</th> <th>DEC</th> </tr> </thead> <tbody> <tr> <td>Code</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> <td>G</td> <td>H</td> <td>J</td> <td>K</td> <td>L</td> <td>M</td> </tr> </tbody> </table>	Production month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Code	A	B	C	D	E	F	G	H	J	K	L	M										
Production month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC																										
Code	A	B	C	D	E	F	G	H	J	K	L	M																										
(a), (b), (c)	Bar mark	Production year code: <table border="1"> <thead> <tr> <th>Production year</th> <th>'98</th> <th>'99</th> <th>2000</th> <th>2001</th> <th>2002</th> <th>2003</th> <th>2004</th> <th>2005</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>(b)</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>(c)</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>Notes: 1. 1 indicates a bar, and 0 indicates no bar. 2. Repeated every 8 years from 2006 on.</p>	Production year	'98	'99	2000	2001	2002	2003	2004	2005	(a)	1	1	1	0	0	0	0	1	(b)	0	1	1	0	0	1	1	0	(c)	1	0	1	0	1	0	1	0
Production year	'98	'99	2000	2001	2002	2003	2004	2005																														
(a)	1	1	1	0	0	0	0	1																														
(b)	0	1	1	0	0	1	1	0																														
(c)	1	0	1	0	1	0	1	0																														

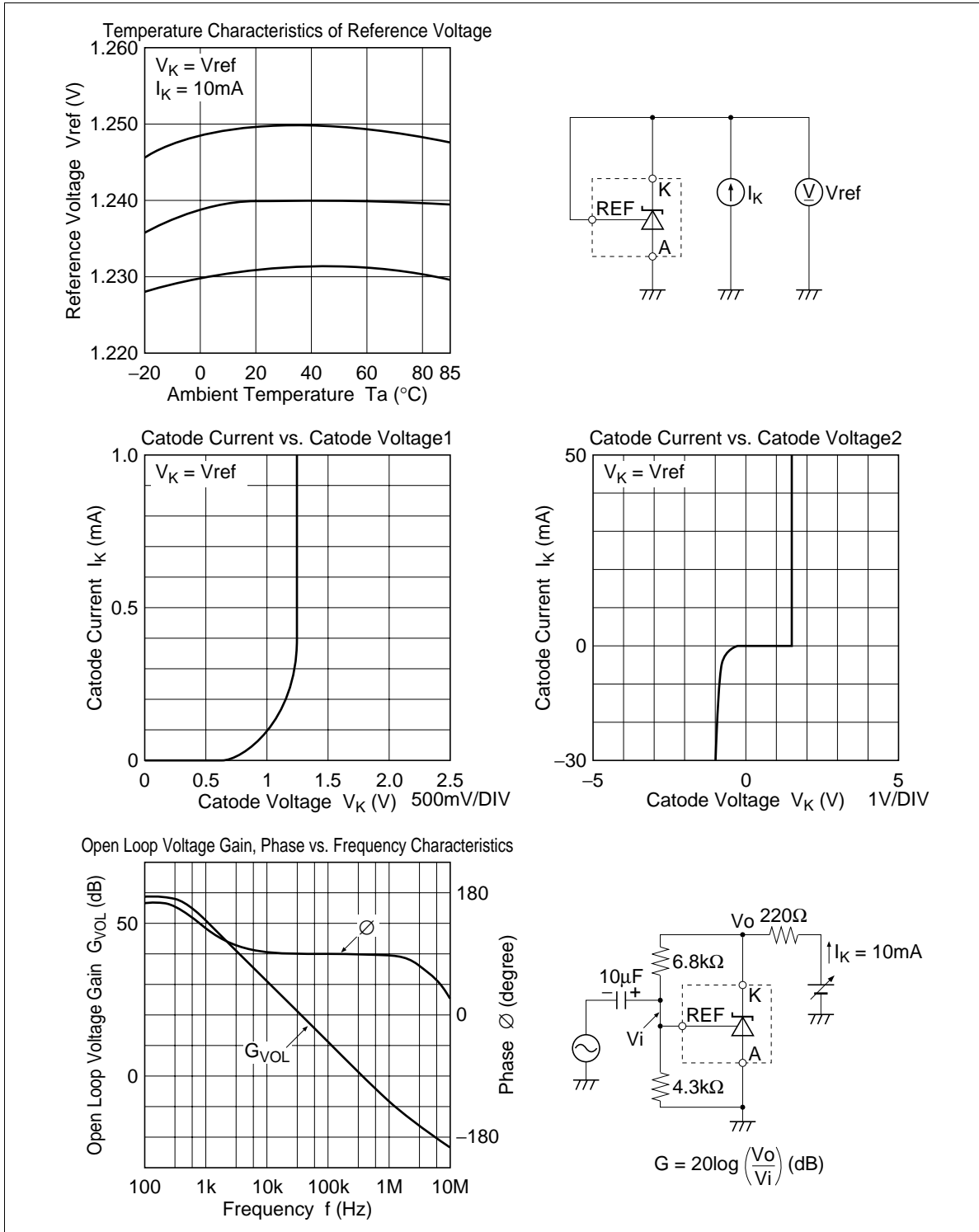
• HA17L431UP, HA17L432UP

	Type of Marking	Meaning																										
(1), (2)	Characters	Model code: 4D (HA17L431UP), 4E (HA17L432UP)																										
(3)		Production year code: The last digit of the year.																										
(4)		Production month code: <table border="1"> <thead> <tr> <th>Production month</th> <th>JAN</th> <th>FEB</th> <th>MAR</th> <th>APR</th> <th>MAY</th> <th>JUN</th> <th>JUL</th> <th>AUG</th> <th>SEP</th> <th>OCT</th> <th>NOV</th> <th>DEC</th> </tr> </thead> <tbody> <tr> <td>Code</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> <td>G</td> <td>H</td> <td>J</td> <td>K</td> <td>L</td> <td>M</td> </tr> </tbody> </table>	Production month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Code	A	B	C	D	E	F	G	H	J	K	L	M
Production month		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC															
Code	A	B	C	D	E	F	G	H	J	K	L	M																
(5)	HITACHI management code																											

HITACHI

HA17L431 Series

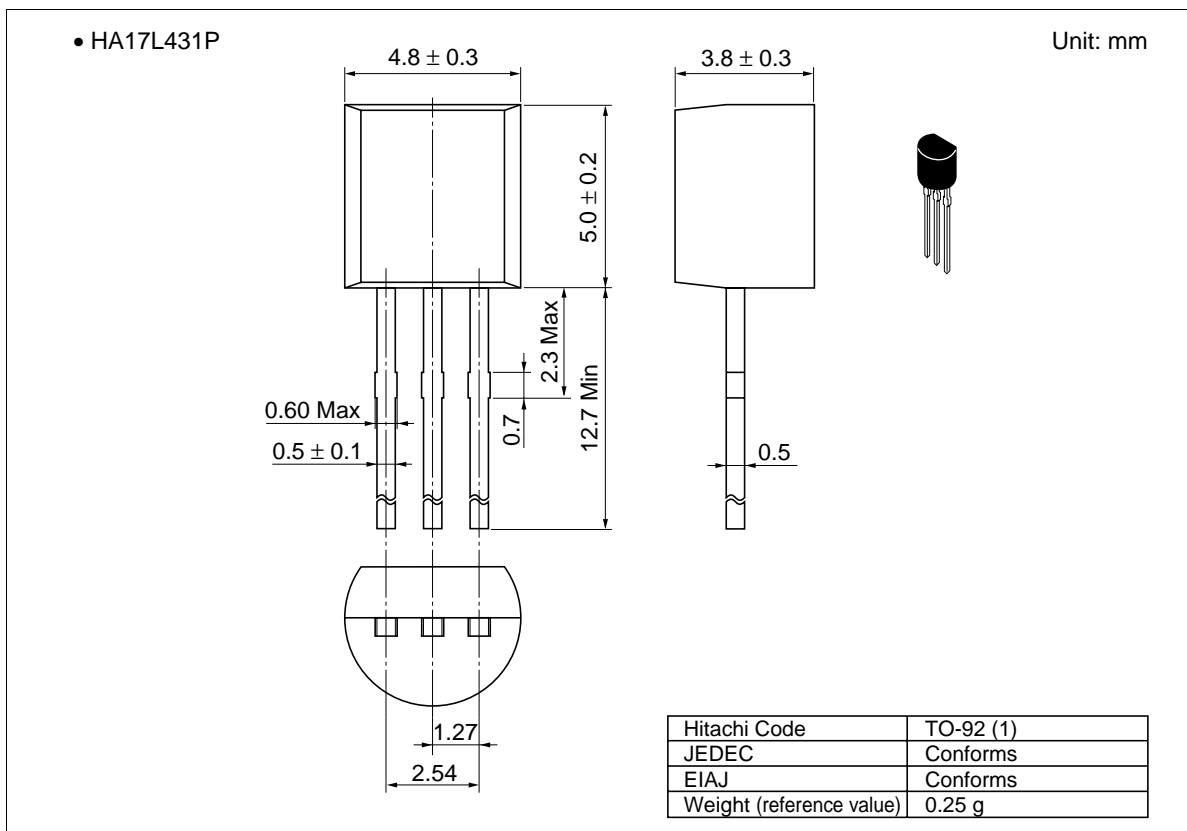
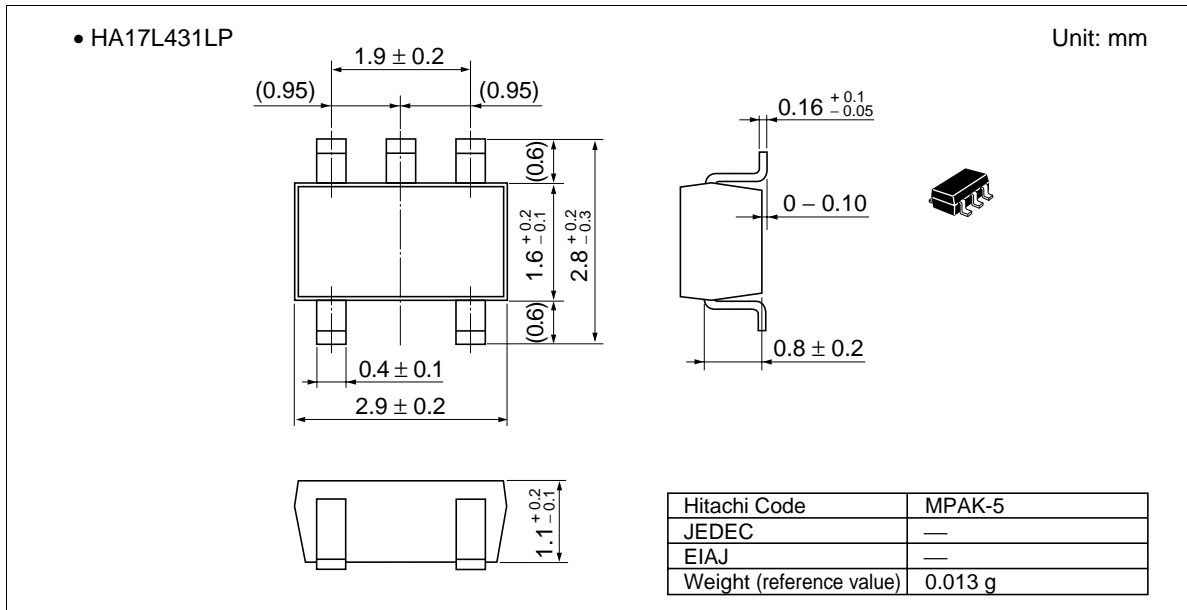
Characteristic Curves



HITACHI

HA17L431 Series

Package Dimension

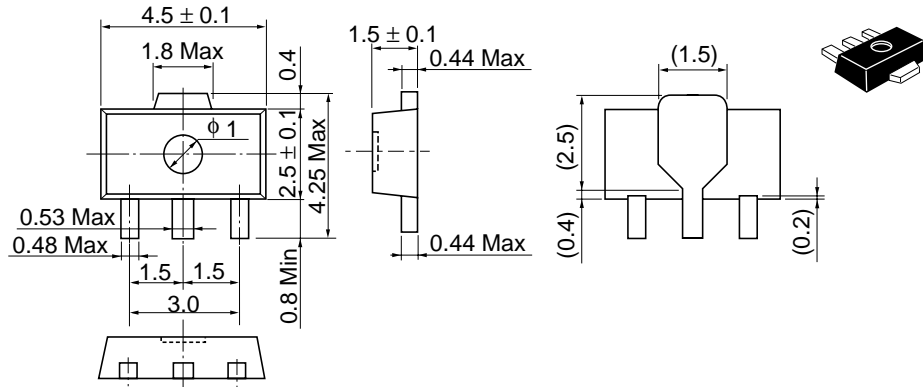


HITACHI

HA17L431 Series

- HA17L431UP
- HA17L432UP

Unit: mm



Hitachi Code	UPAK
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.050 g

HITACHI

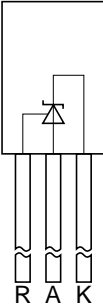
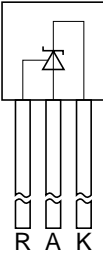
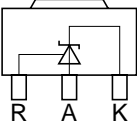
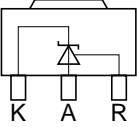
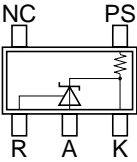
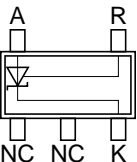
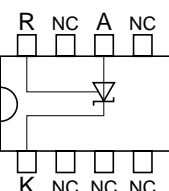
HA17L431 Series

Shunt Regulator Selection Guide

Package	Vref/Tolerance	I_k max (mA)	V_k max (V)	Topr (°C)	Product Name
TO-92	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17431PNA
	2.5 V ± 1.0%	-50 to 50	16	-20 to 85	HA17431VP
	1.24 V ± 1.5%	-30 to 50	16	-20 to 85	HA17L431P
TO-92MOD	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17431PA
UPAK	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17431UA
	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17431UPA
	1.24 V ± 1.5%	-30 to 50	16	-20 to 85	HA17L431UP
	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17432UA
	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17432UPA
	1.24 V ± 1.5%	-30 to 50	16	-20 to 85	HA17L432UP
MPAK-5	2.5 V ± 1.0%	-50 to 50	16	-20 to 85	HA17431VLP
	1.24 V ± 1.5%	-30 to 50	16	-20 to 85	HA17L431LP
SOP-8	2.5 V ± 2.2%	-100 to 150	40	-20 to 85	HA17431FPA

HA17L431 Series

Pin Arrangement by Product

Product Name	Package	Pin Arrangement
HA17431PA	TO-92MOD	
HA17431VP (2.5 V series) HA17431PNA (2.5 V series) HA17L431P (1.24 V series)	TO-92	
HA17431UA HA17431UPA HA17L431UP	UPAK	
HA17432UA HA17432UPA HA17L432UP	UPAK	
HA17431VLP (2.5 V series)	MPAK-5	
HA17L431LP (1.24 V series)	MPAK-5	
HA17431FPA	SOP-8	

HITACHI

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL NorthAmerica : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
 Asia (Singapore) : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>
 Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
 Asia (HongKong) : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>
 Japan : <http://www.hitachi.co.jp/Sicd/indx.htm>

For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00
Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

Copyright © Hitachi, Ltd., 1998. All rights reserved. Printed in Japan.

HITACHI