HA17L431 Series

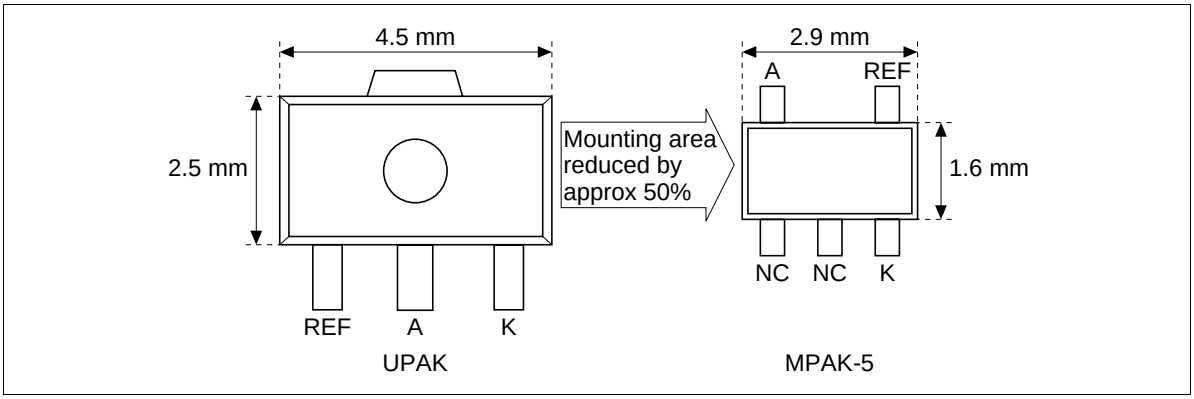
High-Precision Variable Shunt Regulators

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

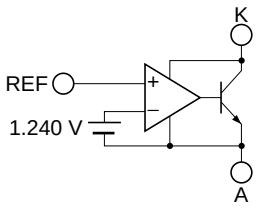
- On-chip high-precision reference voltage source: 1.240 V ± 1.5% (Ta = 25°C)
- Small reference voltage temperature coefficient: 30 ppm/°C Typ
- Maximum cathode voltage: 16 V
- Maximum cathode current: 50 mA
- Minimum cathode current: 200 μA Typ
- Operating temperature range: –20 to +85°C

Application Example

- Reference voltage generation circuits, etc.

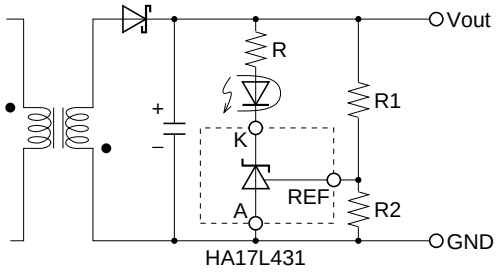
Hitachi semiconductor

Block Diagram



Application Circuit Example

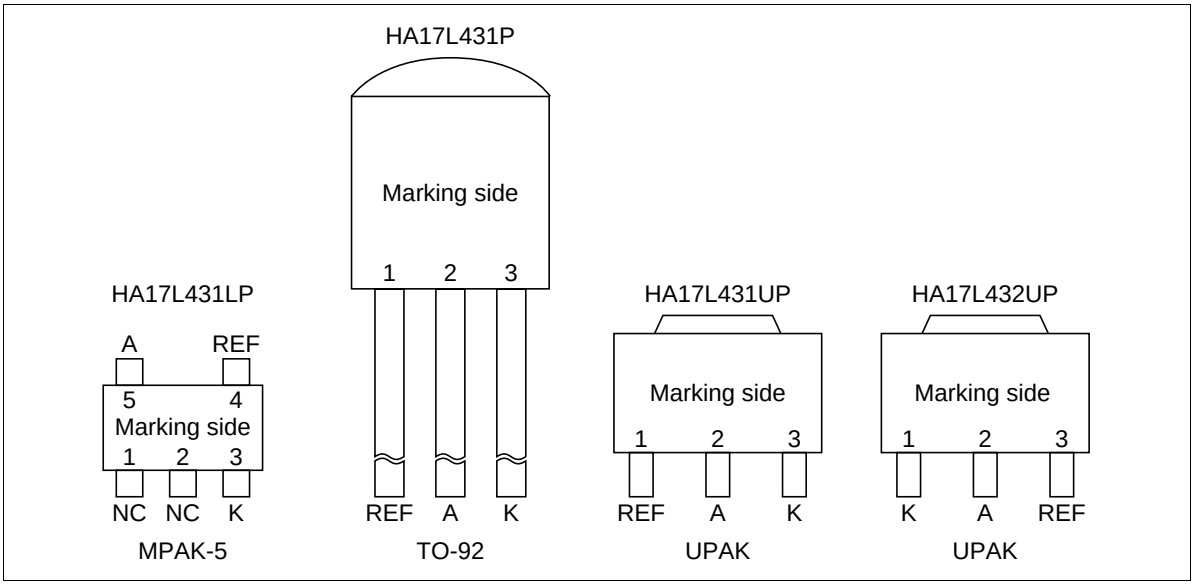
Switching Power Supply Secondary-Side
Error Amplification Circuit



Product Lineup

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

Pin Arrangement



Absolute Maximum Ratings

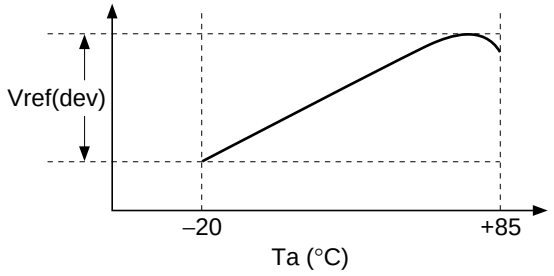
Item	Symbol	Rated Value				Unit	Note
		HA17L431LP	HA17L431P	HA17L431UP	HA17L432UP		
Cathode voltage	V_{KA}	16	16	16	16	V	1
Continuous cathode current	I_K	–30 to +50	–30 to +50	–30 to +50	–30 to +50	mA	
Reference input current	Iref	–0.05 to +5	–0.05 to +5	–0.05 to +5	–0.05 to +5	mA	
Power dissipation	P_T	150	500	800	800	mW	2
Operating temperature	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. The anode pin is used as the reference for voltage values.
2. These values apply when Ta ≤ 25°C.

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

Item	Symbol	Min	Typ	Max	Unit	Test Condition	Note
Reference voltage	Vref	1.222	1.240	1.258	V	V_{KA} = Vref	
Reference voltage deviation	Vref(dev)	—	5	—	mV	V_{KA} = Vref, Ta = –20°C to +85°C	1
Reference voltage temperature coefficient	ΔVref/ΔTa	—	±30	—	ppm/°C	V_{KA} = Vref, 0°C to 50°C gradient	
Reference voltage regulation	ΔVref/ΔV_{KA}	—	1.0	2.0	mV/V	V_{KA} = Vref to 16V	
Reference input current	Iref	—	2	6	µA	R1 = 10 kΩ, R2 = ∞	
Reference current temperature deviation	Iref(dev)	—	0.5	—	µA	R1 = 10 kΩ, R2 = ∞, Ta = –20°C to +85°C	
Minimum cathode current	Imin	—	0.2	1.0	mA	V_{KA} = Vref	2
Off cathode current	Ioff	—	0.001	1.0	µA	V_{KA} = 16 V, Vref = 0 V	
Dynamic impedance	Z_{KA}	—	0.2	0.5	Ω	V_{KA} = Vref, I_K = 1 mA to 50 mA	

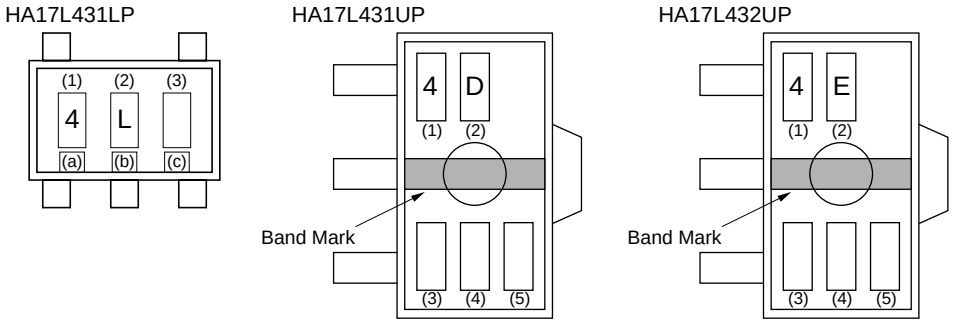
Notes: 1. Vref(dev) = (Vref maximum value at Ta = –20°C to +85°C) – (Vref minimum value at Ta = –20°C to +85°C)



2. Definition of minimum cathode current.
   Imin is the cathode current value at which Vref = $Vref_{(Ik = 10 mA)}$ – 15 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.



Note: The boxes shown for (1) to (5) and (a) to (c) in the figure are only to indicate the position of the characters, and are not actually marked on the package.

Markings

• HA17L431LP

	Type of Marking	Meaning
(1), (2)	Characters	Model code: 4L
(3)		Production month code:

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:

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

Notes: 1. 1 indicates a bar, and 0 indicates no bar.
2. Repeated every 8 years from 2006 on.

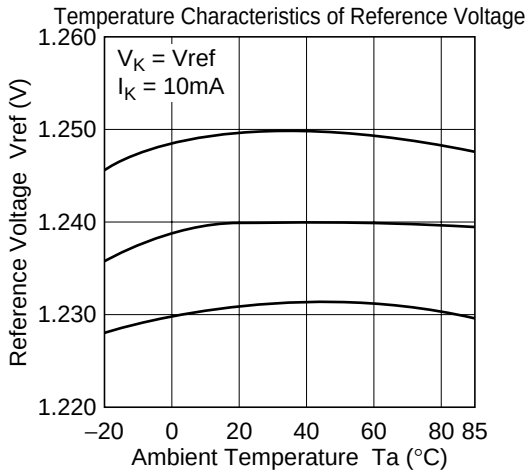
• HA17L431UP, HA17L432UP

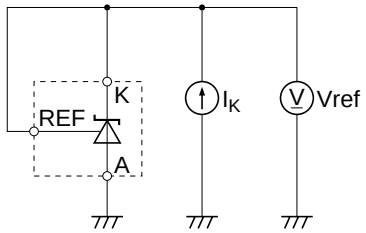
	Type of Marking	Meaning
(1), (2)	Characters	Model code: 4D (HA17L431UP), 4E (HA17L432UP)
(3)		Production year code: The last digit of the year.
(4)		Production month code:

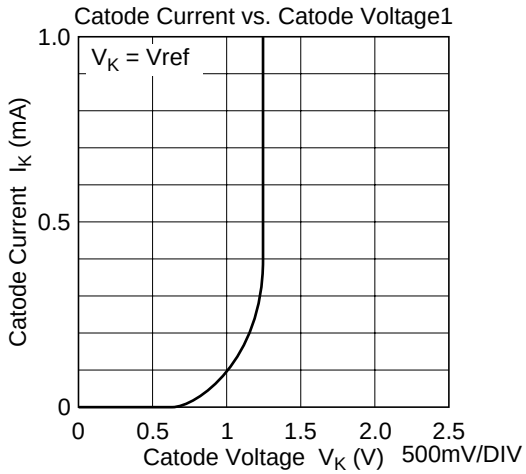
Production month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Code	A	B	C	D	E	F	G	H	J	K	L	M

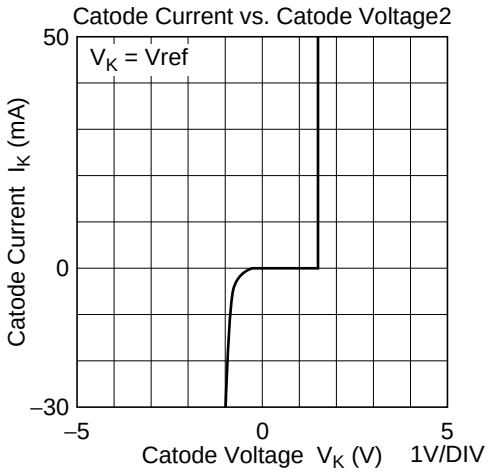
(5)		HITACHI management code

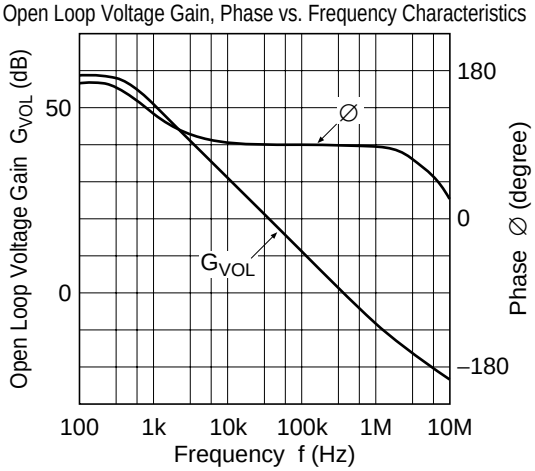
Characteristic Curves

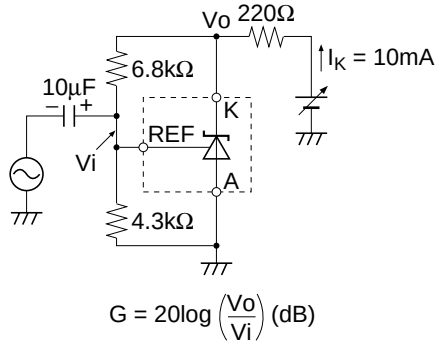








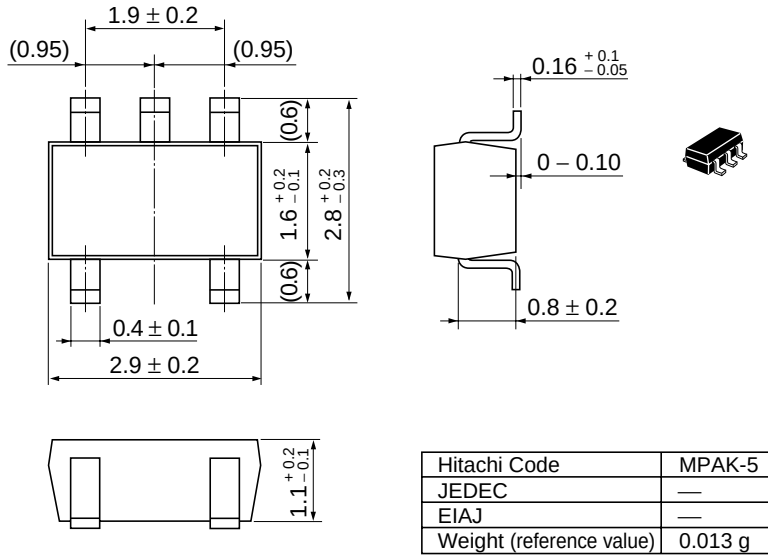




Package Dimension

• HA17L431LP

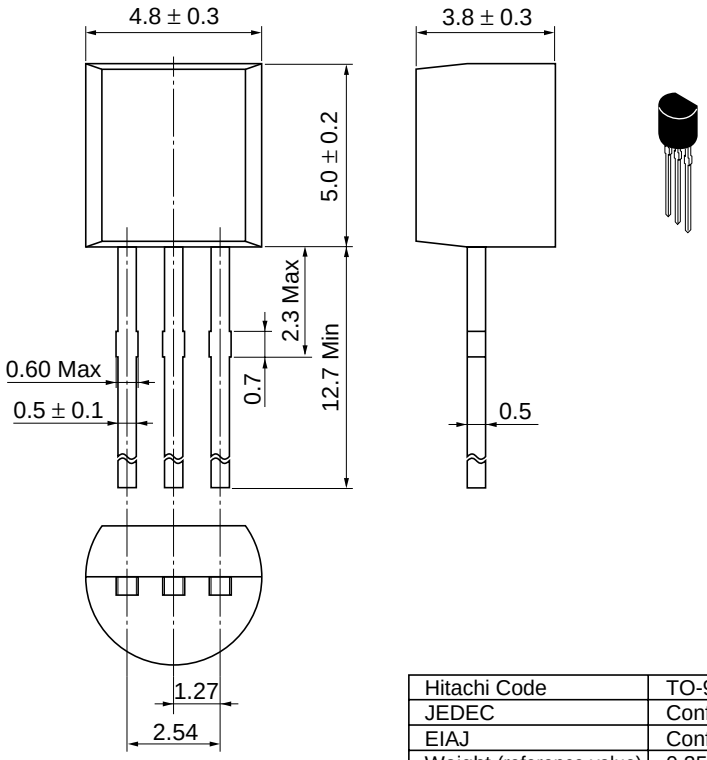
Unit: mm



Hitachi Code	MPAK-5
JEDEC	—
EIAJ	—
Weight (reference value)	0.013 g

• HA17L431P

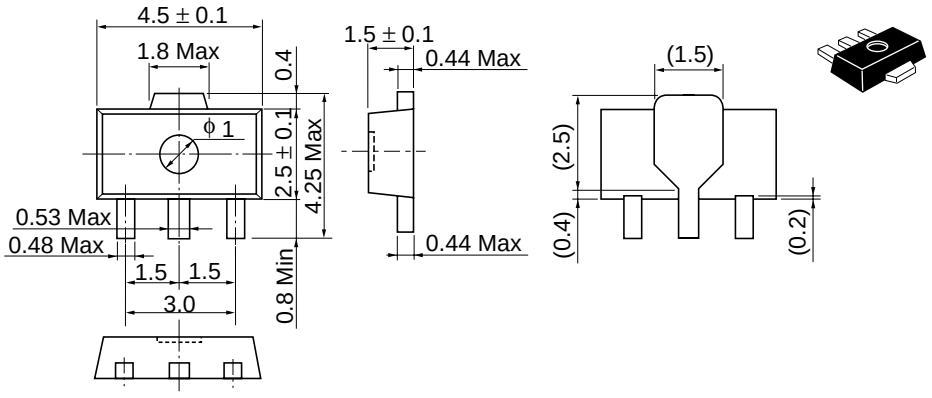
Unit: mm



Hitachi Code	TO-92 (1)
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.25 g

- HA17L431UP
- HA17L432UP

Unit: mm

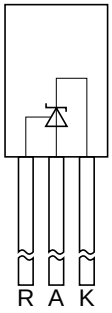
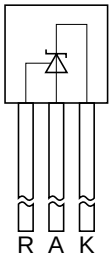
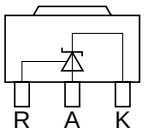
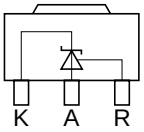
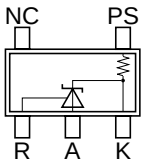
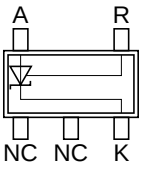
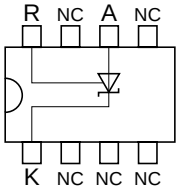


Hitachi Code	UPAK
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.050 g

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

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	

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