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

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HA17L431/HA17L431A Series

Shunt Regulator

ADE-204-029E (Z)

Rev.5
Sep. 2002

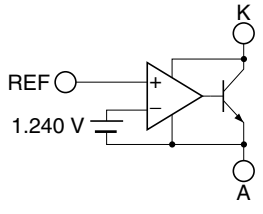
Description

The HA17L431 series and the HA17L431A series are temperature-compensated variable shunt regulators. These ICs can operate at about half voltage in comparison with HA17431 series. They can be replaced for simple Zener diode and they can also be used for switching power supply secondary-side error amplification circuit.

Features

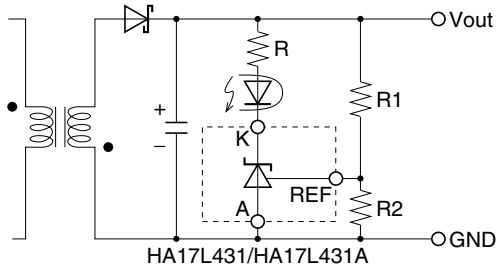
- On-chip high-precision reference voltage source : 1.240 V ± 1.0% at Ta = 25°C (HA17L431A)
  : 1.240 V ± 1.5% at Ta = 25°C (HA17L431)
- Small reference voltage temperature coefficient: 30 ppm/°C Typ
- Maximum cathode voltage: 16 V
- Maximum cathode current: 50 mA
- Minimum cathode current: 200 µA Typ
- Operating temperature range: −20 to +85°C

Block Diagram



Application Circuit Example

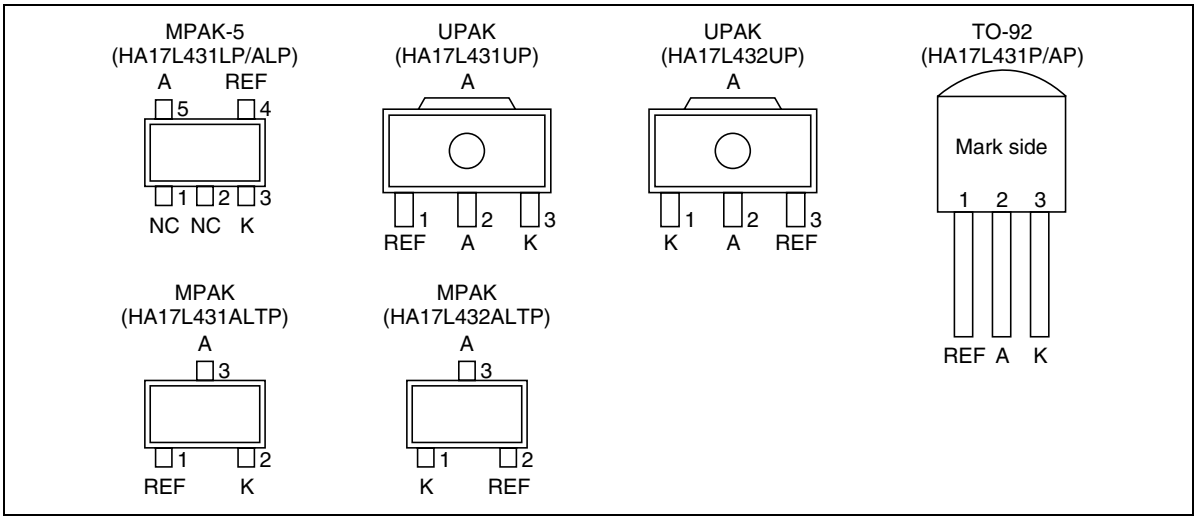
Switching Power Supply Secondary-Side
Error Amplification Circuit



Product Lineup

Item		Version		Package	Operating Temperature Range
		A Version	Normal Version		
Reference voltage (at 25°C)	Accuracy	±1.0%	±1.5%		
	Max	1.253V	1.258V		
	Typ	1.240V	1.240V		
	Min	1.227V	1.222V		
Industrial use		HA17L431ALTP		MPAK	–20 to +85°C
		HA17L432ALTP			
		HA17L431ALP		MPAK-5	
			HA17L431LP		
			HA17L431UP	UPAK	
			HA17L432UP		
		HA17L431AP		TO-92	
			HA17L431P		

Pin Arrangement

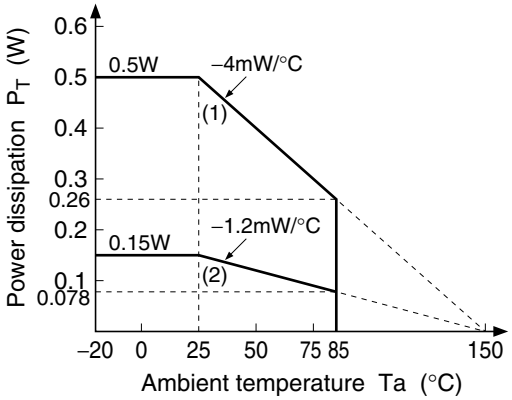


Absolute Maximum Ratings

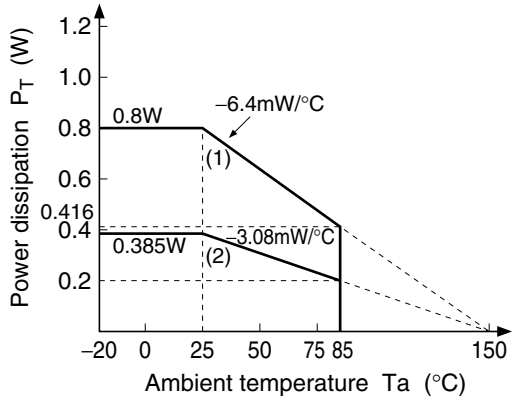
(Ta = 25°C)

Item	Symbol	Rated Value				Unit	Note
		HA17L431LP/ HA17L431ALP	HA17L431P/ HA17L431AP	HA17L431UP/ HA17L432UP	HA17L431ALTP/ HA17L432ALTP		
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	150	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. If Ta ≥ 25°C, derate by below figure.



(1): HA17L431P/AP
(2): HA17L431LP/ALP/ALTP/432ALTP



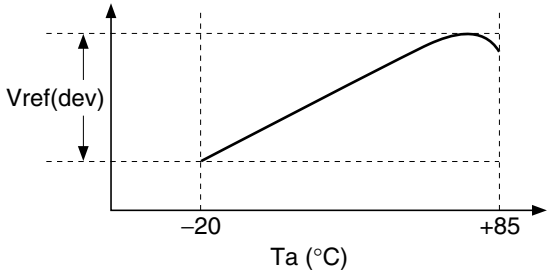
HA17L431UP/432UP
(1): With 15mm × 25mm × 0.7mm alumina ceramic board
(2): Without printed circuit board

Electrical Characteristics

($Ta = 25°C$, $I_K = 10$ mA)

Item	Symbol	Min	Typ	Max	Unit	Test Condition	Remark
Reference voltage	Vref	1.222	1.240	1.258	V	V_{KA} = Vref	HA17L431
		1.227	1.240	1.253			HA17L431A
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	$\Delta Vref/\Delta V_{KA}$	—	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	

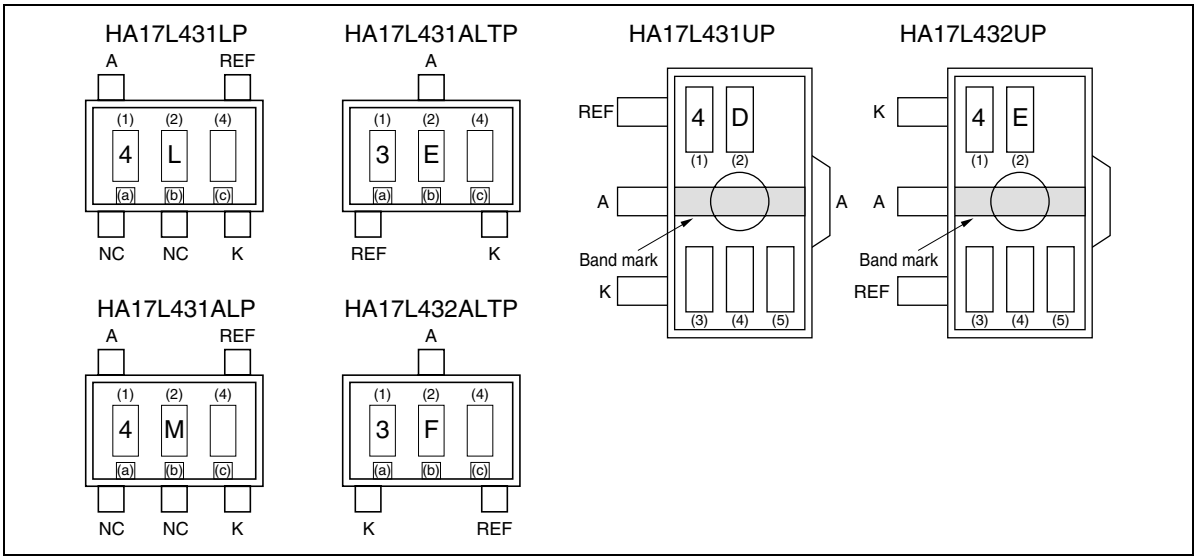
Notes: 1. Vref(dev) = (Vref maximum value at Ta = –20°C to +85°C) – (Vref minimum value at Ta = –20°C to +85°C)



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

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)
HA17L431LP	4	L
HA17L431ALP	4	M
HA17L431ALTP	3	E
HA17L432ALTP	3	F
HA17L431UP	4	D
HA17L432UP	4	E

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.

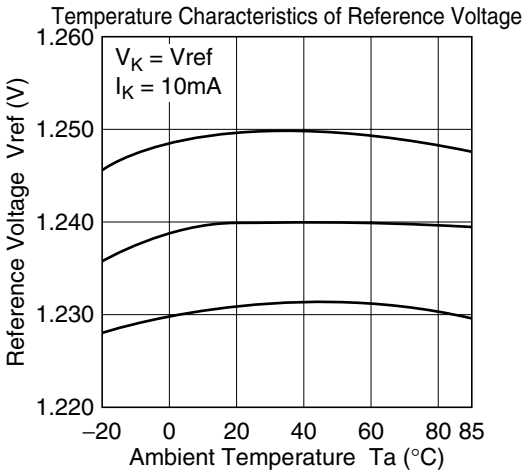
Year	2002	2003	2004	2005	2006	2007	2008	2009
(a)	None	None	None	Bar	Bar	Bar	Bar	None
(b)	None	Bar	Bar	None	None	Bar	Bar	None
(c)	Bar	None	Bar	None	Bar	None	Bar	None

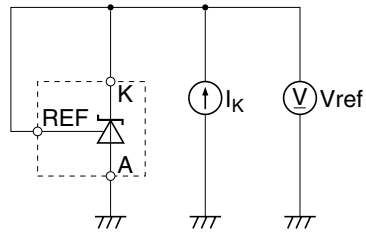
5. The letter (4) shows the production month code (see table below).

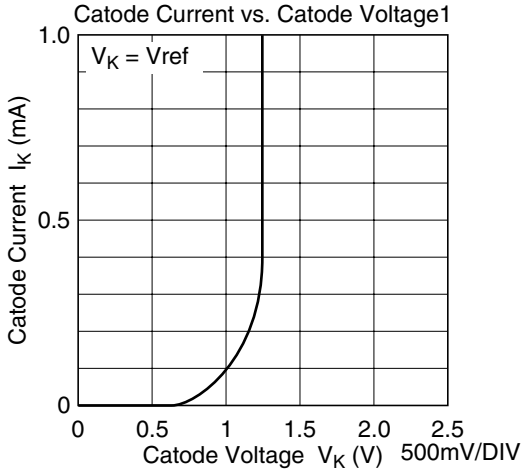
Production month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Marked code	A	B	C	D	E	F	G	H	J	K	L	M

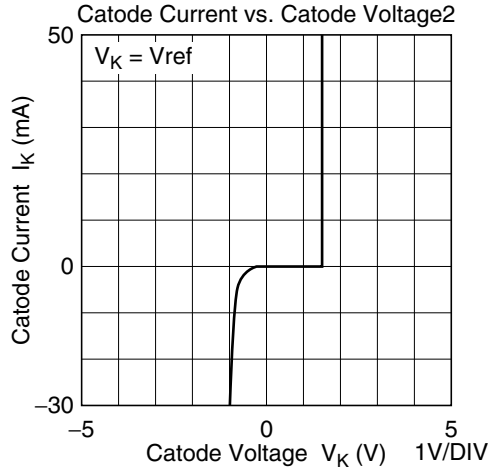
6. The letter (5) shows manufacturing code. For UPAK products.

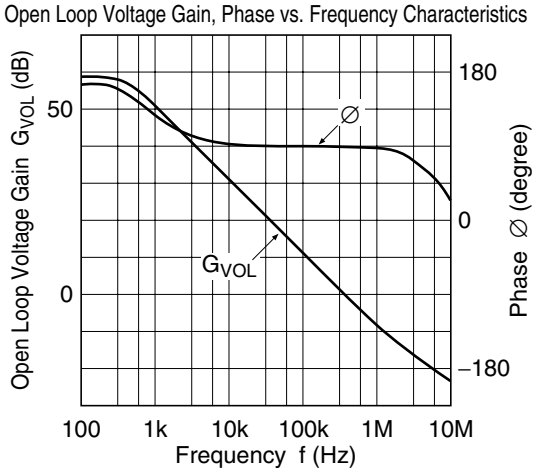
Characteristic Curves

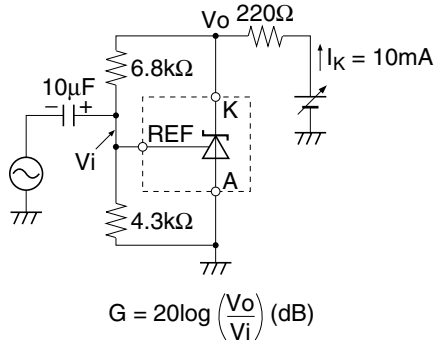












Noise Recovery Characteristics of HA17L431A and HA17L431

The HA17L431A bettered V_{KA} and Vref recovery time against the HA17L431 when it was inputted noise.

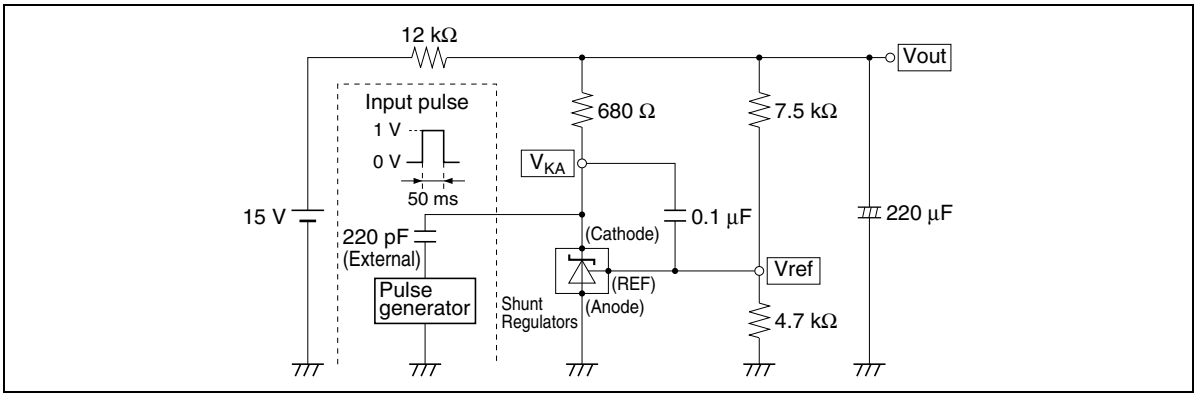


Figure 1 Noise Response Characteristics Measurement Circuit

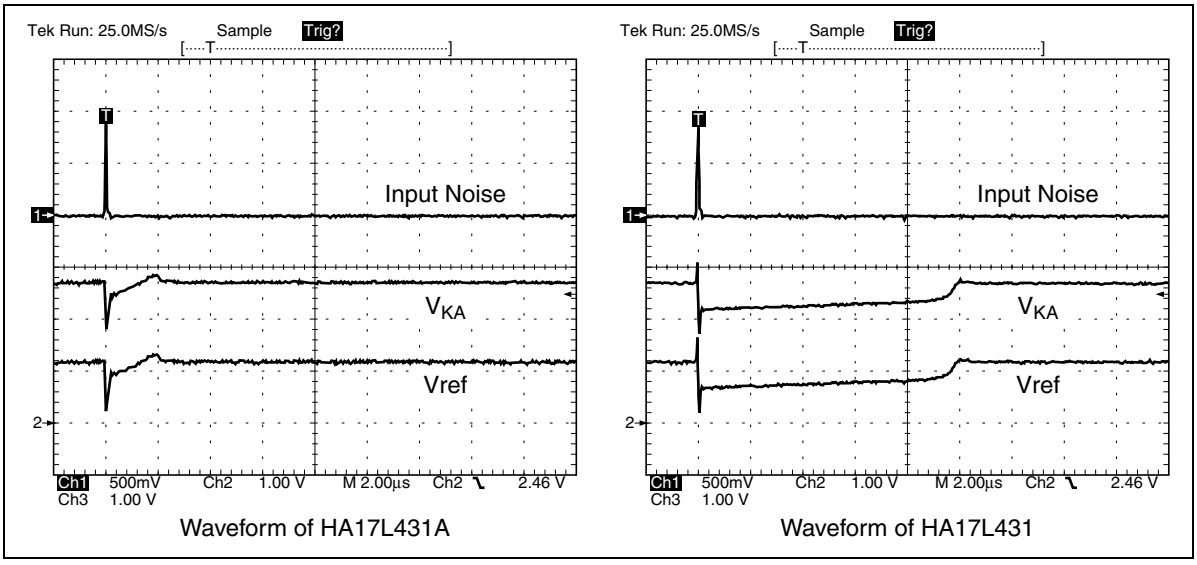
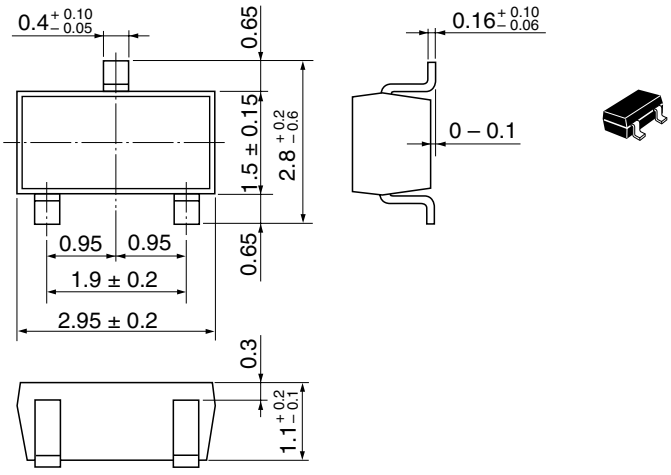


Figure 2 Noise Recovery Characteristics

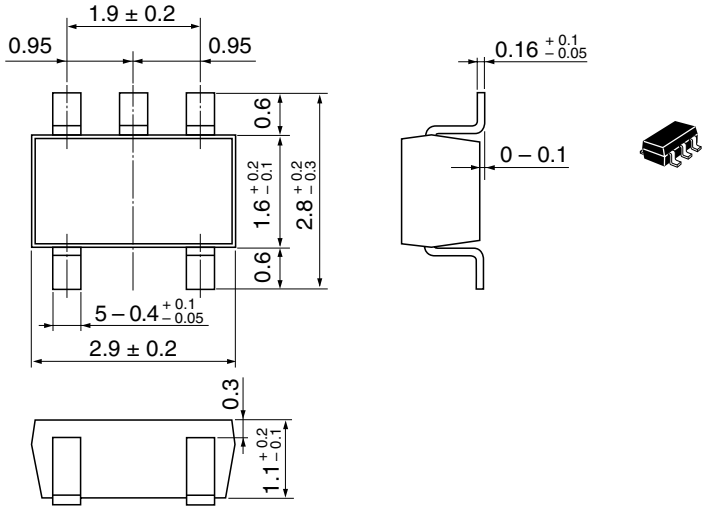
Package Dimension

As of January, 2002
Unit: mm



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

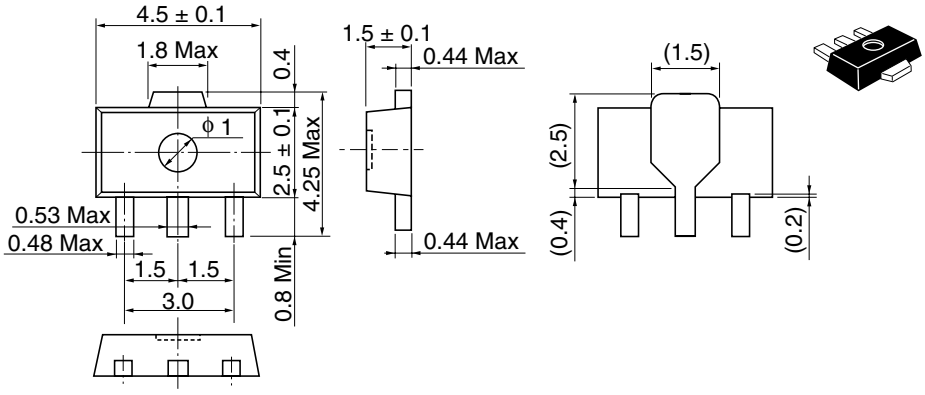
As of January, 2002
Unit: mm



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

As of January, 2002

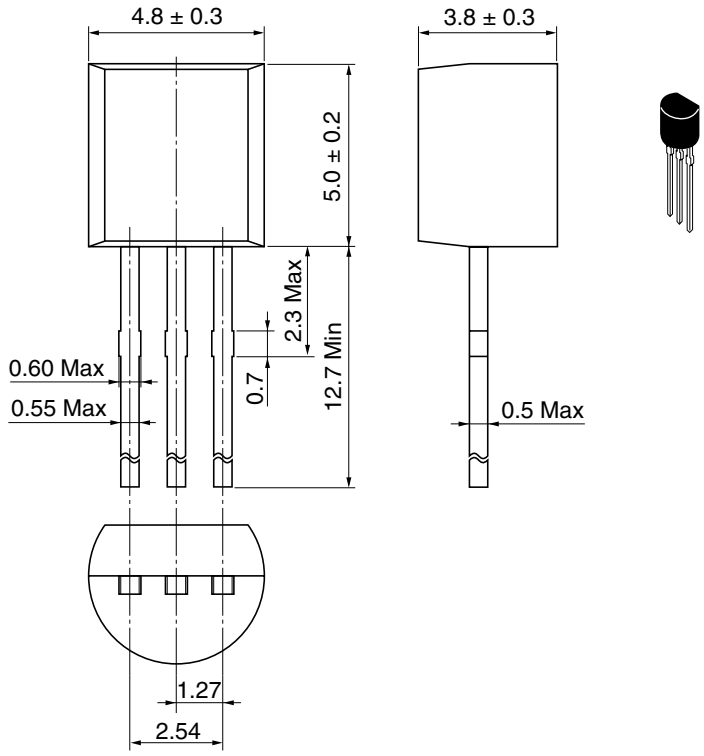
Unit: mm



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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