

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# HA17904 Series

## Dual Operational Amplifier

REJ03D0688-0100  
(Previous: ADE-204-046)  
Rev.1.00  
Jun 15, 2005

### Description

HA17904 is dual operational amplifier which, provide internal phase compensation and high gain, and mono power source operation is possible. It can be widely applied to control equipment and to general use.

### Features

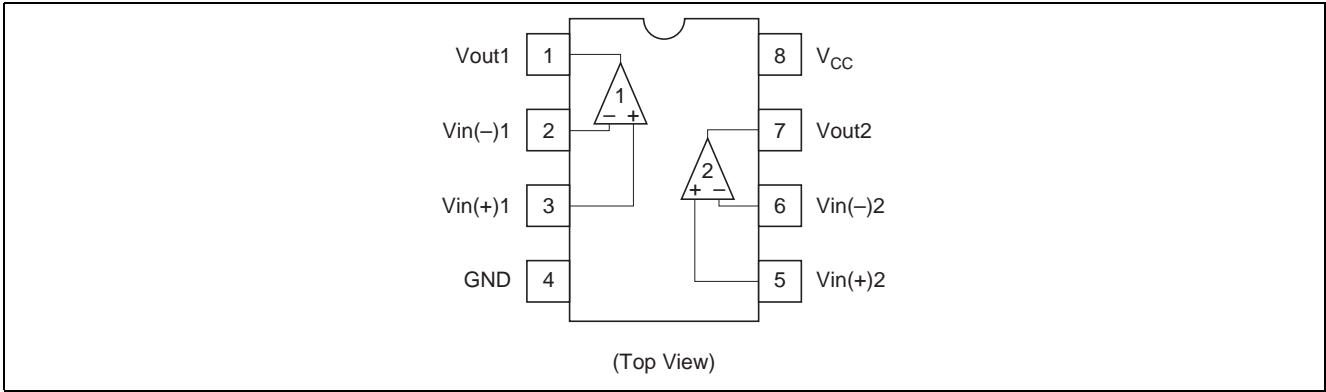
- Wide range of operating supply voltage and mono power source operation is possible.
- Wide range of common mode input voltage possible to operate with an input around 0V, and output around 0V is available.
- Frequency characteristics and input bias current are temperature compensated.

### Ordering Information

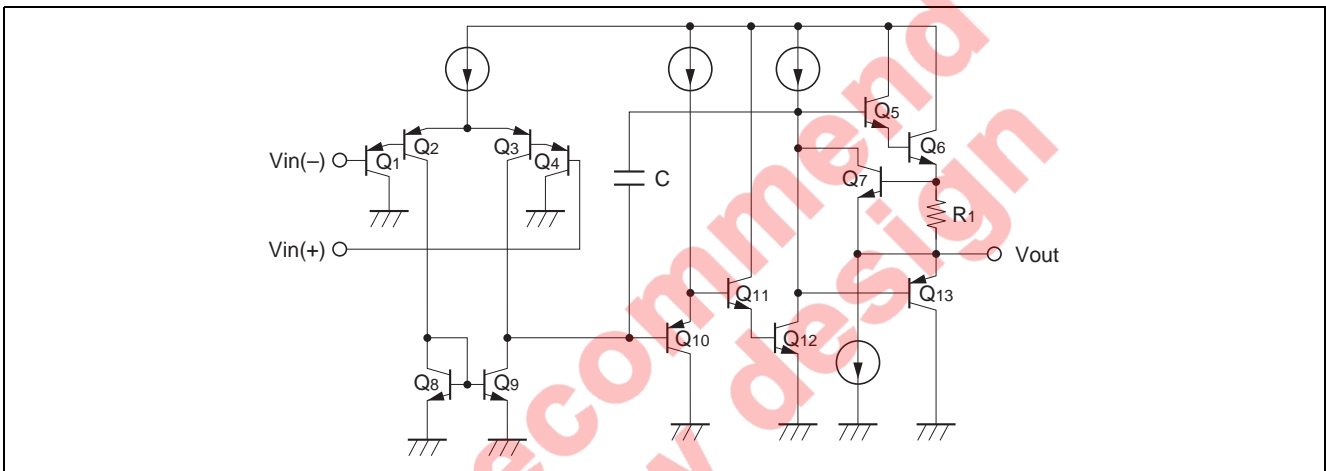
Type No.	Application	Package Code (Previous Code)
HA17904PSJ	Car use	PRDP0008AF-A (DP-8B)
HA17904FPJ		PRSP0008DE-B (FP-8DGV)
HA17904FPK		PRSP0008DE-B (FP-8DGV)

Not recommended  
for new design

### Pin Arrangement



### Circuit Schematic (1/2)



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings			Unit
		HA17904PSJ	HA17904FPJ	HA17904FPK	
Supply voltage	V <sub>CC</sub>	32	32	32	V
Output sink current	I <sub>O sink</sub>	50	50	50	mA
Common-mode input voltage	V <sub>CM</sub>	-0.3 to V <sub>CC</sub>	-0.3 to V <sub>CC</sub>	-0.3 to V <sub>CC</sub>	V
Common-mode differential voltage	V <sub>IN(diff)</sub>	±V <sub>CC</sub>	±V <sub>CC</sub>	±V <sub>CC</sub>	V
Power dissipation	P <sub>T</sub>	570* <sup>1</sup>	385* <sup>2</sup>	385* <sup>2</sup>	mW
Operating temperature range	Topr	-40 to +85	-40 to +85	-40 to +125	°C
Storage temperature range	Tstg	-55 to +125	-55 to +125	-55 to +150	°C

Notes: 1. These are the allowable values up to Ta = 55 °C. Derate by 8.3mW/°C above that temperature.

2. These are the allowable values up to Ta = 45 °C mounting on 30% wiring density glass epoxy board. Derate by 7.14mW/°C above that temperature.

## Electrical Characteristics 1

(V<sub>CC</sub> = +15V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	V <sub>IO</sub>	—	3	7	mV	V <sub>CM</sub> = 7.5V, R <sub>S</sub> = 50Ω, R <sub>f</sub> = 50kΩ
Input offset current	I <sub>IO</sub>	—	5	50	nA	V <sub>CM</sub> = 7.5V, I <sub>IO</sub> =  I <sub>I(+)</sub> - I <sub>I(-)</sub>
Input bias current	I <sub>IB</sub>	—	30	250	nA	V <sub>CM</sub> = 7.5V
Power source rejection ratio	PSRR	—	93	—	dB	R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
Voltage gain	A <sub>VD</sub>	75	90	—	dB	R <sub>L</sub> = ∞, R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
Common mode rejection ratio	CMR	—	80	—	dB	R <sub>S</sub> = 50Ω, R <sub>f</sub> = 5kΩ
Common mode input voltage range	V <sub>CM(+)</sub>	13.5	—	—	V	R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
	V <sub>CM(-)</sub>	—	—	-0.3	V	R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
Peak-to-peak output voltage	V <sub>op-p</sub>	—	13.6	—	V	f = 100Hz, R <sub>L</sub> = 20kΩ, R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
Output source current	I <sub>osource</sub>	20	40	—	mA	V <sub>IN+</sub> = 1V, V <sub>IN-</sub> = 0V, V <sub>OH</sub> = 10V
Output sink current	I <sub>osink</sub>	10	20	—	mA	V <sub>IN-</sub> = 1V, V <sub>IN+</sub> = 0V, V <sub>OL</sub> = 2.5V
Output sink current	I <sub>osink</sub>	15	50	—	μA	V <sub>IN-</sub> = 1V, V <sub>IN+</sub> = 0V, V <sub>out</sub> = 200mV
Supply current	I <sub>CC</sub>	—	0.8	2	mA	V <sub>IN</sub> = GND, R <sub>L</sub> = ∞
Slew rate	SR	—	0.2	—	V/μs	R <sub>L</sub> = ∞, V <sub>CM</sub> = 7.5V, f = 1.5kHz
Channel separation	CS	—	120	—	dB	f = 1kHz

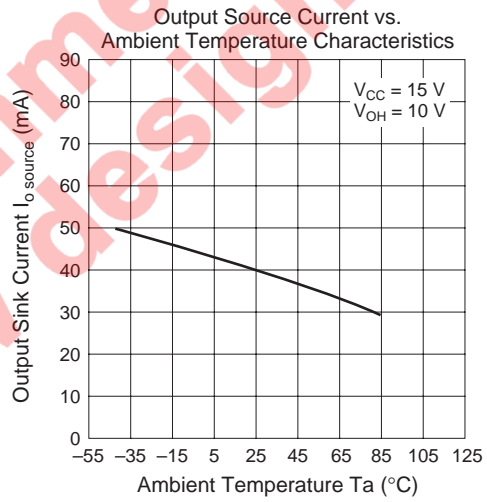
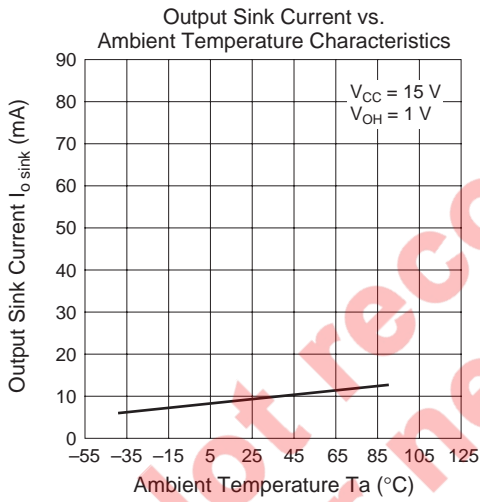
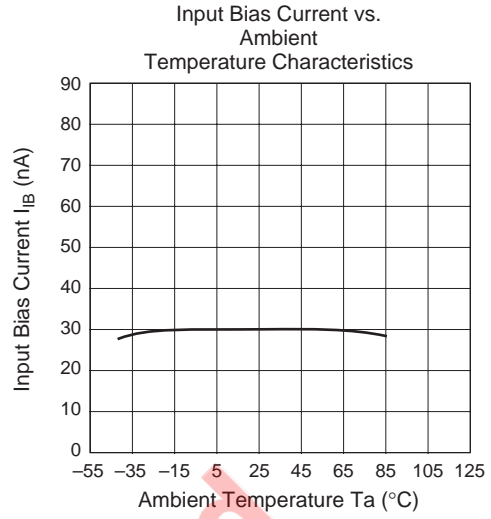
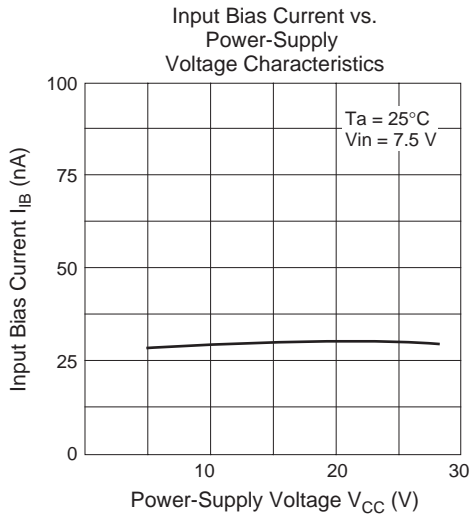
## Electrical Characteristics 2

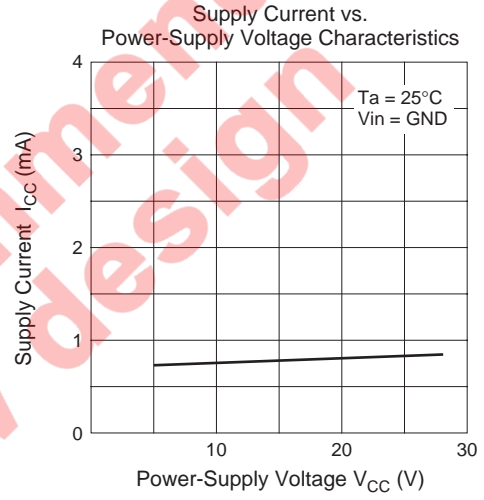
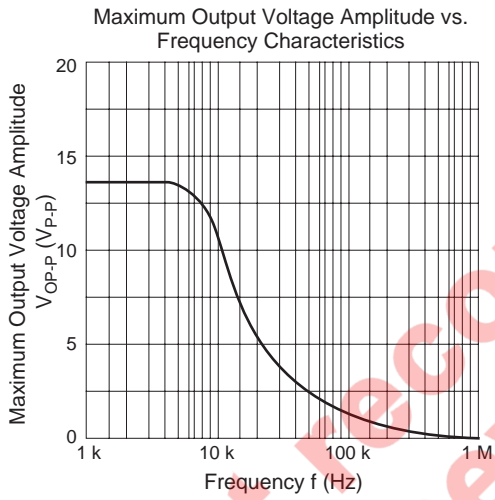
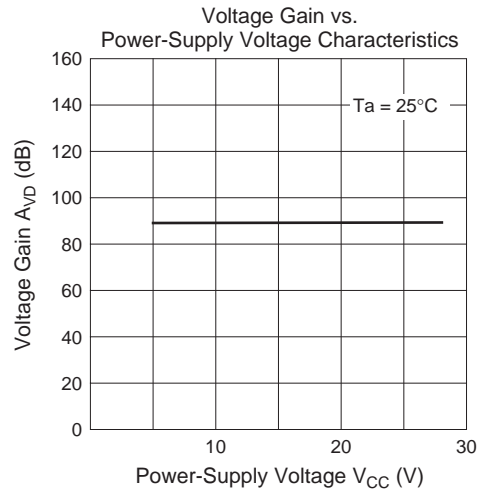
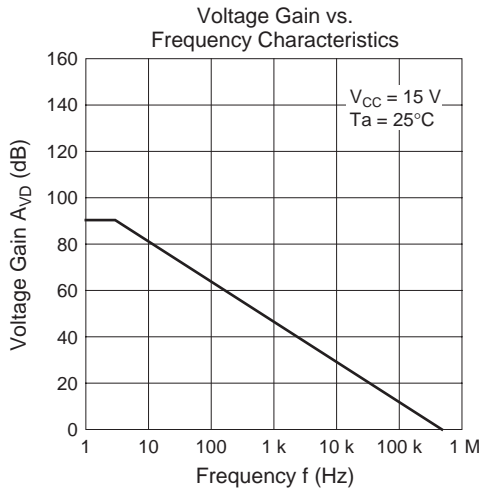
(V<sub>CC</sub> = +15V, Ta = -40 to +125°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	V <sub>IO</sub>	—	—	7	mV	V <sub>CM</sub> = 7.5V, R <sub>S</sub> = 50Ω, R <sub>L</sub> = 50kΩ
Input offset current	I <sub>IO</sub>	—	—	200	nA	V <sub>CM</sub> = 7.5V, I <sub>IO</sub> =  I <sub>I(+)</sub> - I <sub>I(-)</sub>
Input bias current	I <sub>IB</sub>	—	—	500	nA	V <sub>CM</sub> = 7.5V
Common mode input voltage range	V <sub>CM</sub>	0	—	13.0	V	R <sub>S</sub> = 1kΩ, R <sub>f</sub> = 100kΩ
Supply current	I <sub>CC</sub>	—	—	4	mA	V <sub>IN</sub> = GND, R <sub>L</sub> = ∞

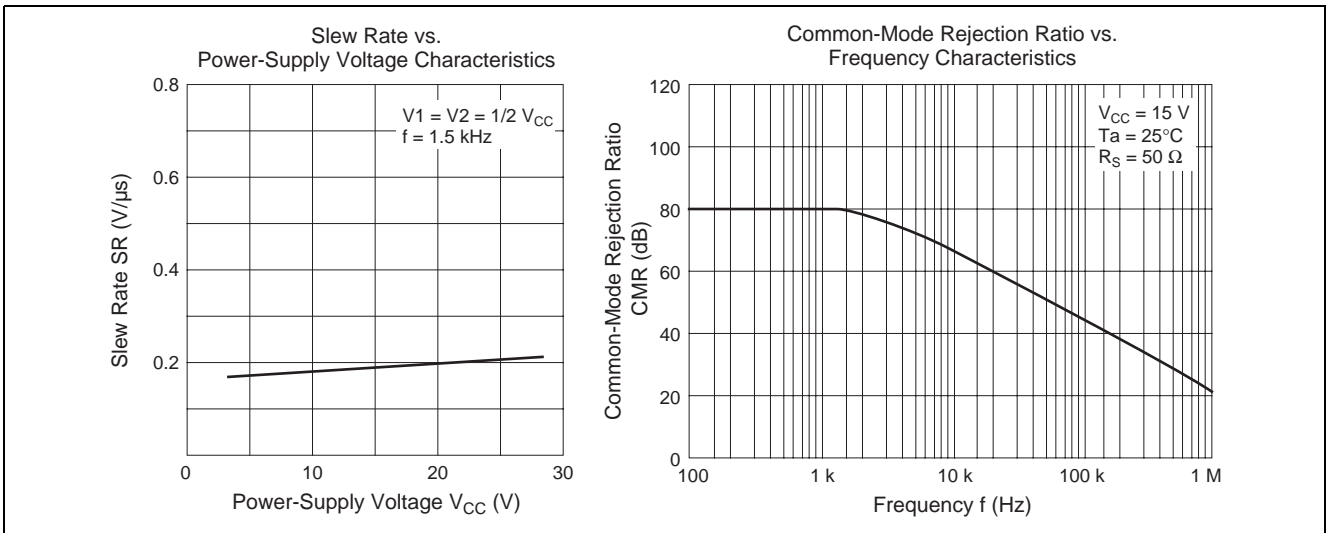
Note: As for the characteristic curve, refer to HA17904FPK.

Characteristic Curves





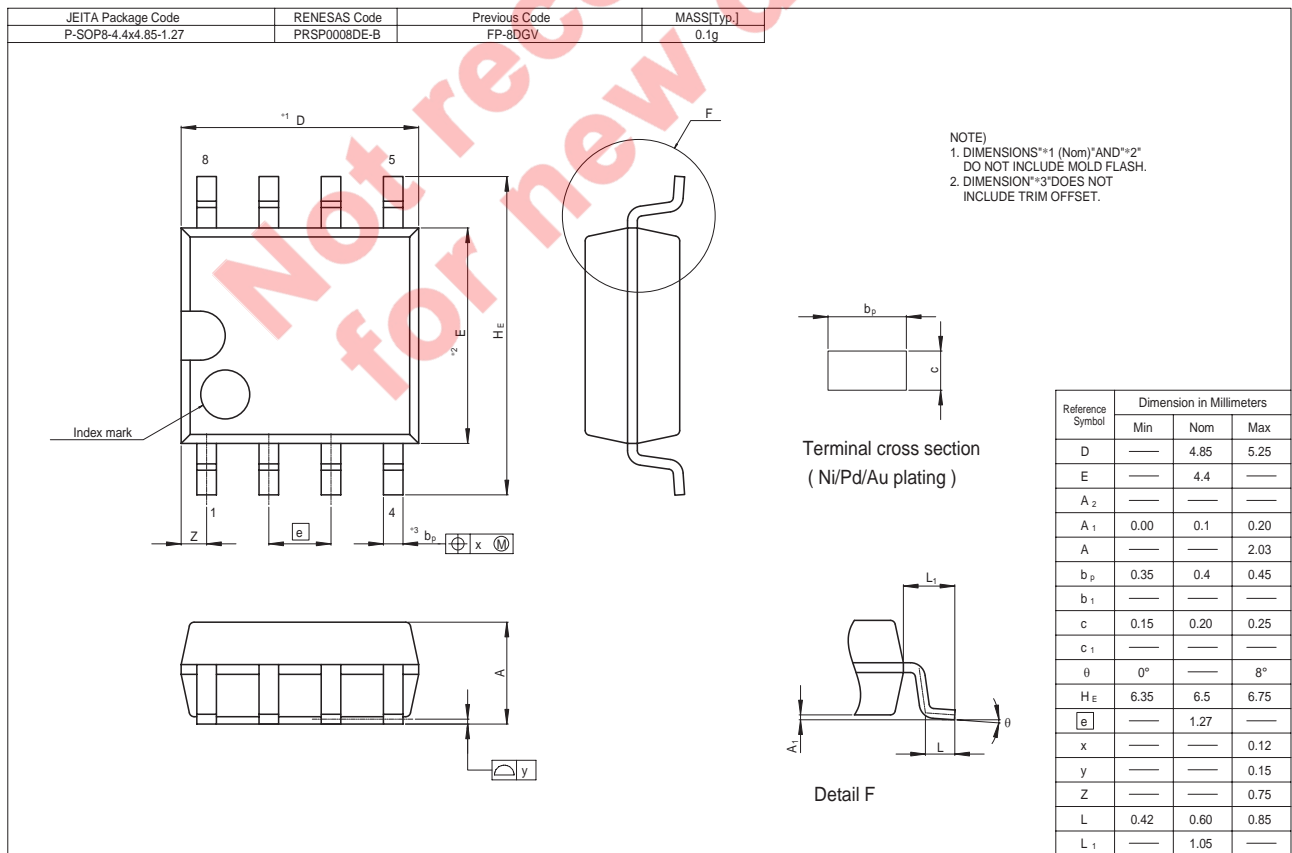
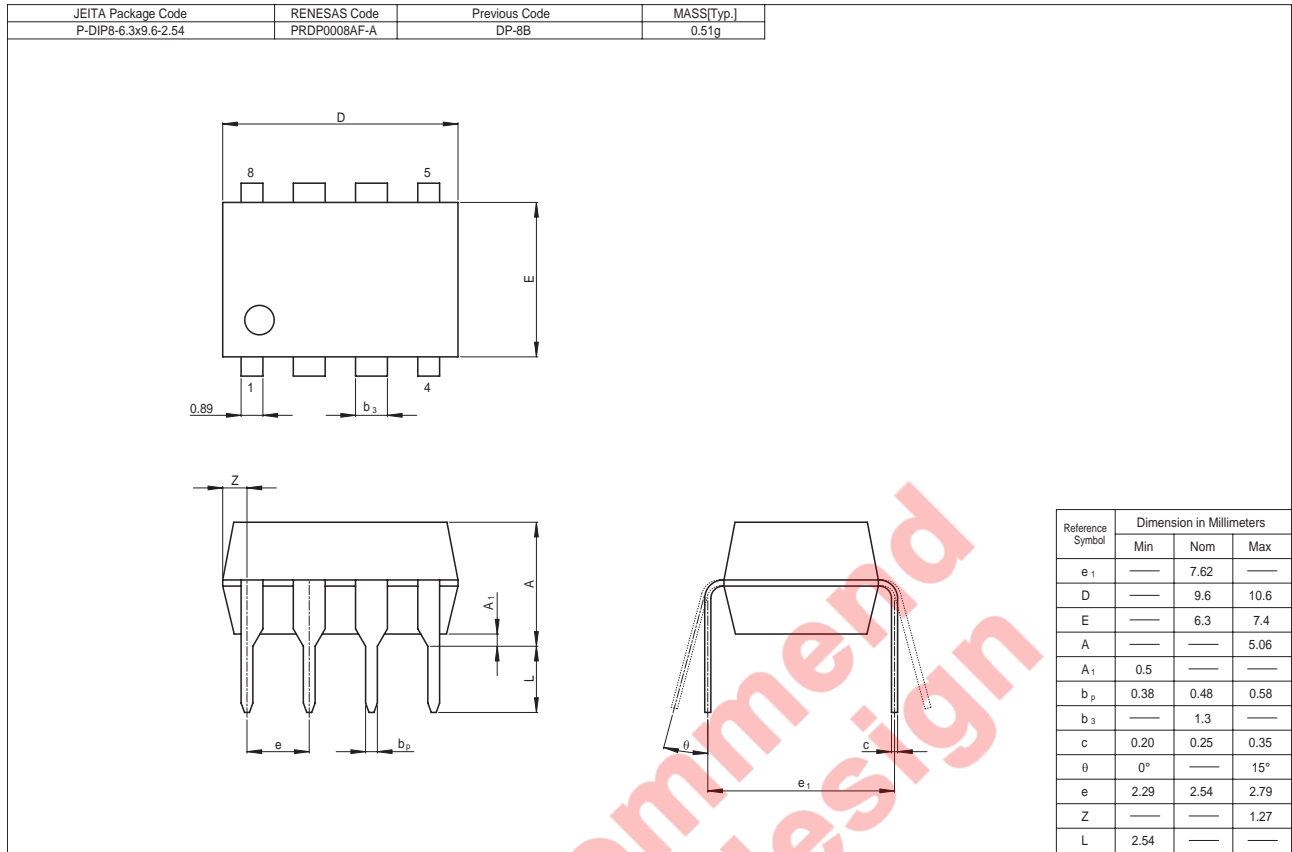
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Package Dimensions



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