HA17080 Series

J-FET Input Operational Amplifiers

HITACHI

Description

Since J-FET input operational amplifiers are formed from a pair of J-FET transistors, they provide superlative characteristics, including a high input impedance and a low input bias current. Thus they can be used in a wide range of applications, from general-purpose control equipment to medical applications. In particular, they are optimal for processing signals from high-impedance sensors.

Hitachi J-FET input operational amplifiers are available in single, dual, and quad versions. Other than the HA17080, all products are internal phase compensation types and include a built-in phase compensation capacitor. The HA17080 and the HA17083 allow offset adjustment. These products are also available in "A" grade versions with superlative electrical characteristics to allow the selection of an operational amplifier appropriate for the application.

Features

- Wide operating power supply voltage range: ±5 V to ±18 V
- Low input bias current: 30 pA
- Low input offset current: 5 pA
- High input impedance: 10^{12} Ω
- High slew rate: 13 V/μs
- Wide common mode input voltage range with operation possible near the power-supply voltage (V_{CC}).
- High voltage gain: 106 dB
- The HA17080 and HA17083 support offset adjustment.
- Pin compatible with the Texas Instruments TL080 series.

Notes: 1. Since these products are high input impedance operational amplifiers, contamination may cause the input bias and input offset currents to increase if they are handled with bare hands.
Avoid contamination when handling these devices.

2. Since these products provide a high slew rate, oscillation may occur due to load capacitances.
(C_L < 100 pF: voltage follower mode)

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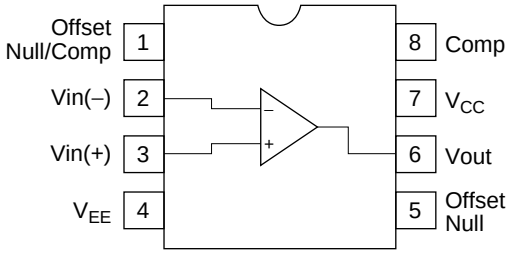
Ordering Information

Item	Type No. HA17080	HA17082	HA17083	HA17084
Number of operational amplifiers (number of channels)	Single	Dual	Dual	Quad
Offset adjustment pin	Yes	No	Yes	No
Phase compensation type	External	Internal	Internal	Internal

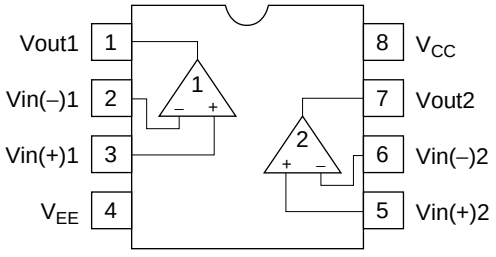
Pin Arrangement

HA17080



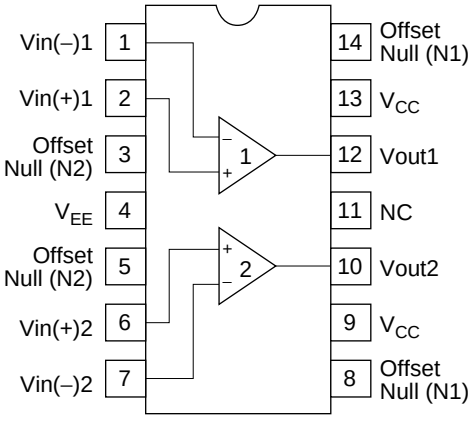
(Top view)

HA17082



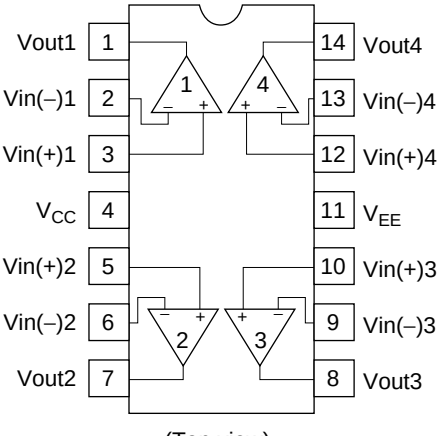
(Top view)

HA17083



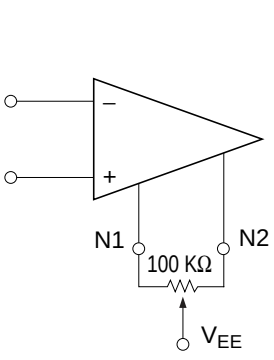
(Top view)

HA17084

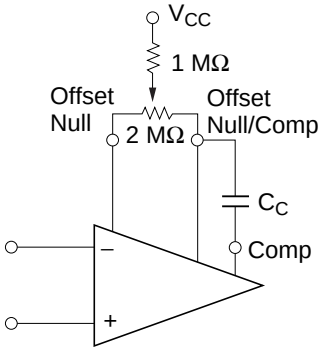


(Top view)

Voltage Offset Test Circuit

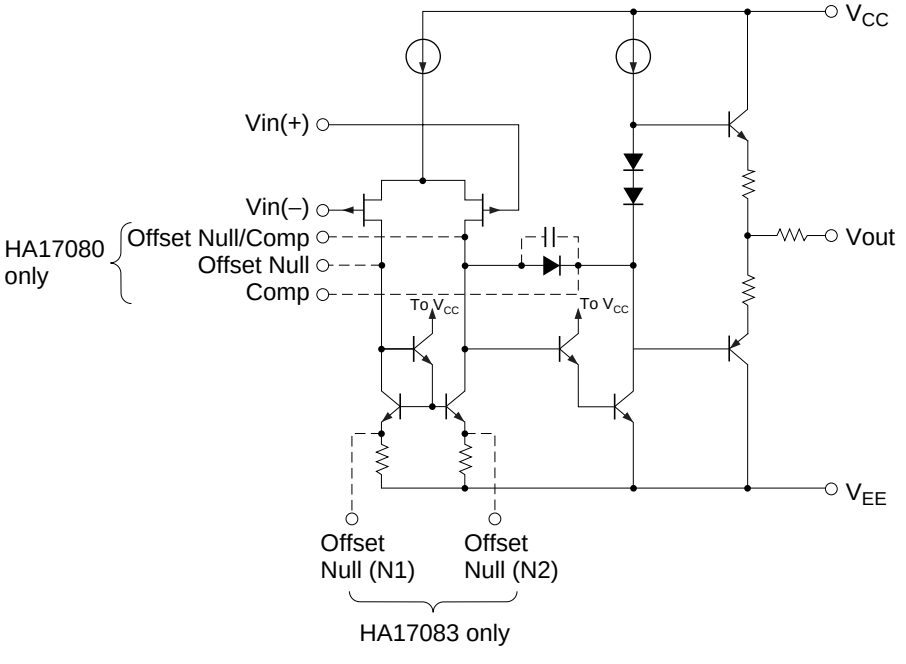


HA17083



HA17080

Circuit Structure



Note: The HA17080 does not have an internal phase compensation capacitor.

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings (P, PS Series)	Unit	Notes
Power-supply voltage	V_{CC}	+18	V	
	V_{EE}	–18	V	
Differential input voltage	Vin(diff)	±30	V	
Input voltage	Vin	±15	V	1
Allowable power dissipation	P_T	625	mW	2
Operating temperature	Topr	–20 to +75	°C	
Storage temperature	Tstg	–55 to +125	°C	

Notes: 1. When the power-supply voltage is less than ±15 V, the input voltage must fall within the power-supply voltage range.

2. These are the allowable values up to Ta = 50°C for the P and PS series. Derate by 8.3 mW/°C above that temperature.

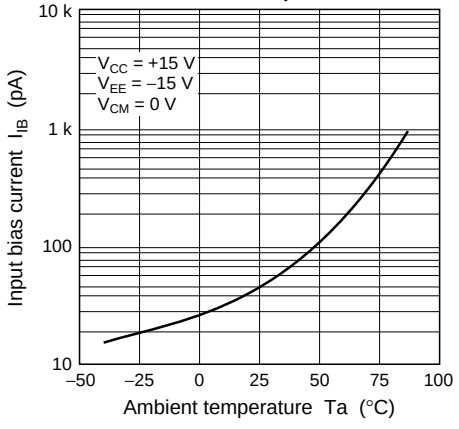
Electrical Characteristics (V_{CC} = –V_{EE} = 15 V, Ta = 25°C)

		HA17080 Series			HA17080A Series					
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**	**Notes**
Input offset voltage	V_{IO}	—	5	15	—	3	6	mV	R_S = 50 Ω	1
Input offset current	I_{IO}	—	5	200	—	5	100	pA	I_{IO} = | $I_{IB(+)}$ – $I_{IB(–)}$ |	1
Input bias current	I_{IB}	—	30	400	—	30	200	pA		1, 2
Common-mode input voltage range	V_{CM}	±10	—	—	±11	—	—	V		1
Maximum output voltage amplitude	Vop-p	24	27	—	24	27	—	V	R_L ≥ 10 kΩ	
		20	24	—	20	24	—		R_L ≥ 2 kΩ	
Voltage Gain	A_{VD}	88	106	—	94	106	—	dB	R_L ≥ 2 kΩ, V_O = ±10 V	1
Common-mode rejection ratio	CMR	70	86	—	80	86	—	dB	R_S ≤ 10 kΩ	1
Power supply rejection ratio	PSRR	70	86	—	80	86	—	dB	R_S ≤ 10 kΩ	1
Supply current	I_{CC}	—	1.4	2.8	—	1.4	2.8	mA		3
Bandwidth	BW	—	3	—	—	3	—	MHz	A_{VD} = 1	
Slew rate	SR	—	13	—	—	13	—	V/µs	Vin = 10 V, R_L = 2 kΩ, C_L = 100 pF, A_{VD} = 1	
Channel separation	CS	—	120	—	—	120	—	dB	A_{VD} = 100	
Rise time	t_r	—	0.1	—	—	0.1	—	µs	Vin = 20 mV, R_L = 2 kΩ	
Overshoot	Vover	—	10	—	—	10	—	%	C_L = 100 pF, A_{VD} = 1	
Input resistance	Rin	—	10^{12}	—	—	10^{12}	—	Ω		
Input noise voltage	Vn	—	35	—	—	35	—	nV/√Hz	R_S = 100 Ω, f = 1 kHz	

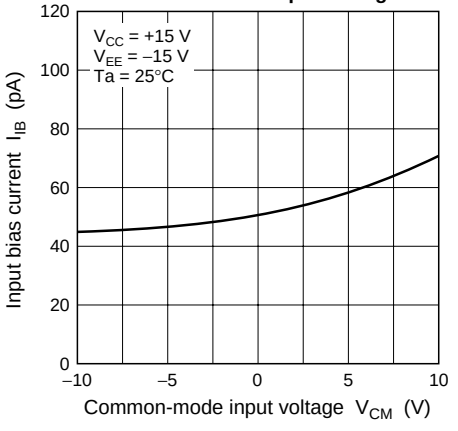
Notes: 1. The non-A ratings apply to the HA17080, HA17082, HA17083, and HA17084.
The A version ratings apply to the HA17080A, HA17082A, HA17083A, and HA17084A.
2. This is the J-FET gate leakage current, which is temperature dependent. The junction temperature must be held near room temperature when measuring this parameter.
3. This is the per-channel value.

Characteristic Curves

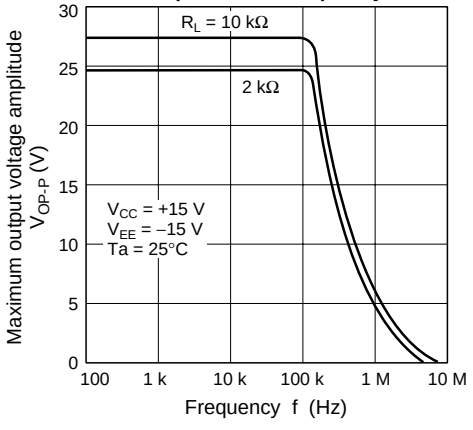
Input Bias Current vs. Ambient Temperature



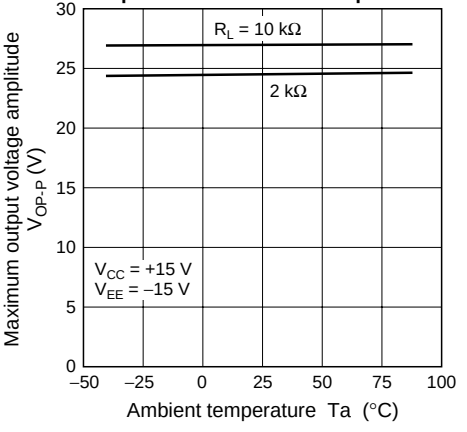
Input Bias Current vs. Common-Mode Input Voltage



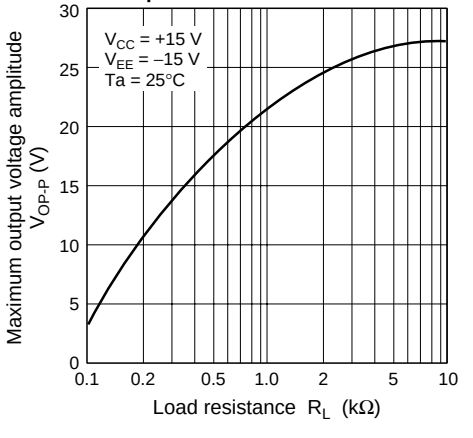
Maximum Output Voltage Amplitude vs. Frequency



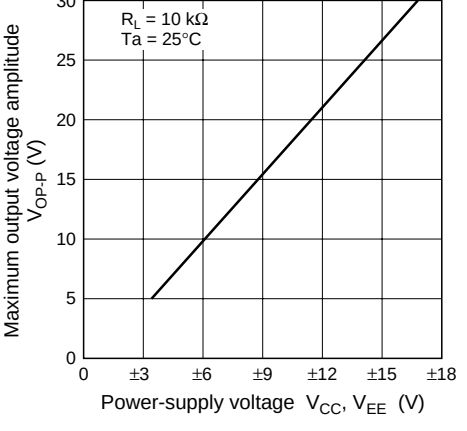
Maximum Output Voltage Amplitude vs. Ambient Temperature



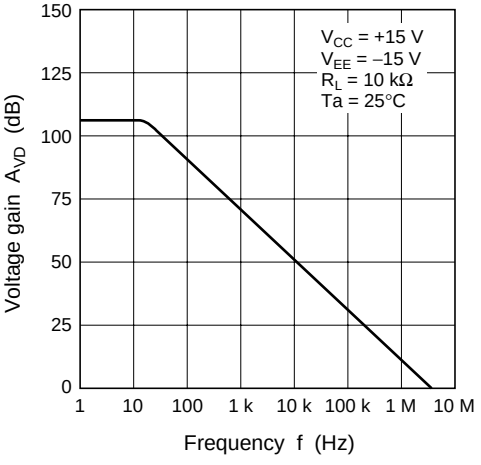
Maximum Output Voltage Amplitude vs. Load Resistance



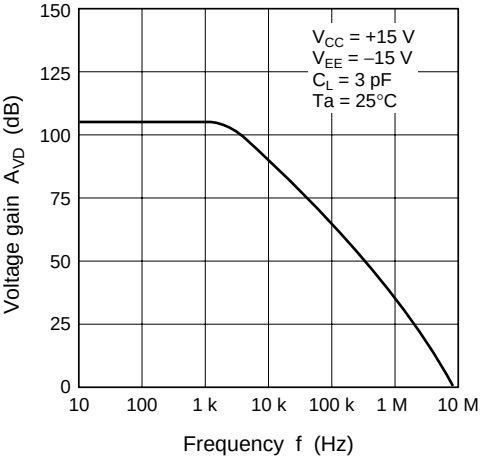
Maximum Output Voltage Amplitude vs. Power-Supply Voltage



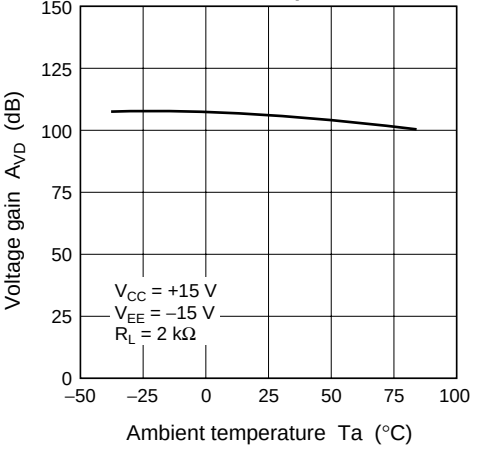
Voltage Gain vs. Frequency (1)



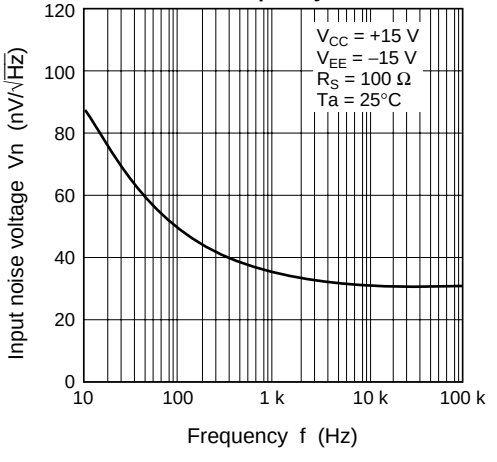
Voltage Gain vs. Frequency (2)



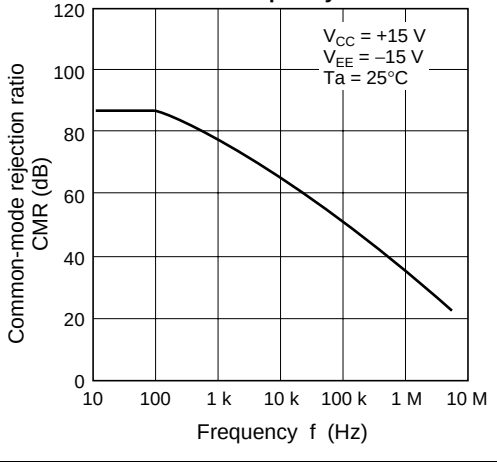
Voltage Gain vs. Ambient Temperature



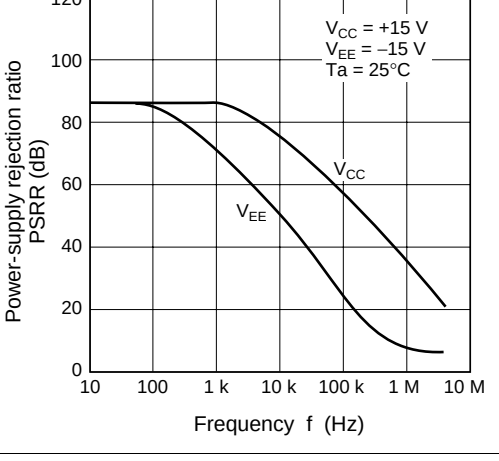
Input Noise Voltage vs. Frequency



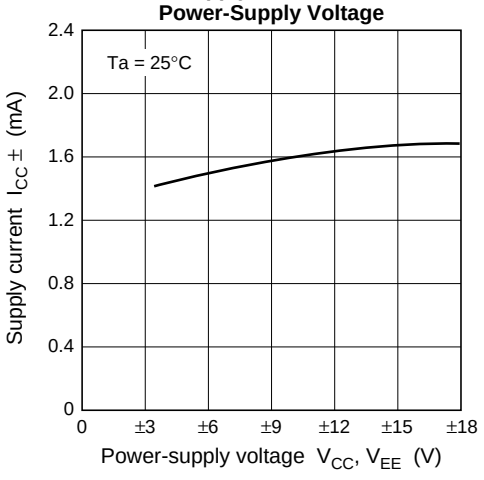
Common-Mode Rejection Ratio vs. Frequency



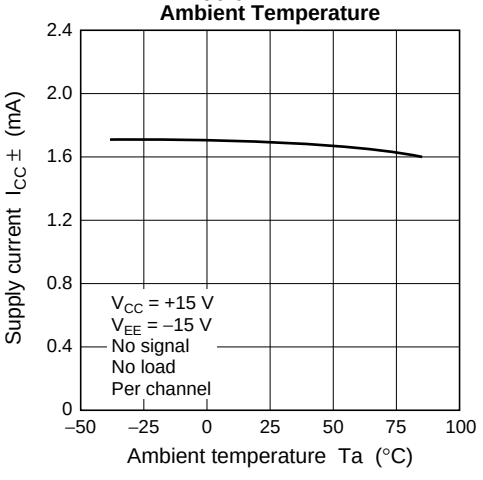
Power-Supply Rejection Ratio vs. Frequency



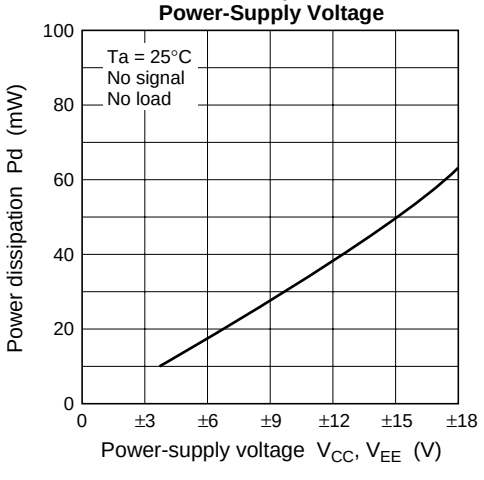
Supply current vs. Power-Supply Voltage



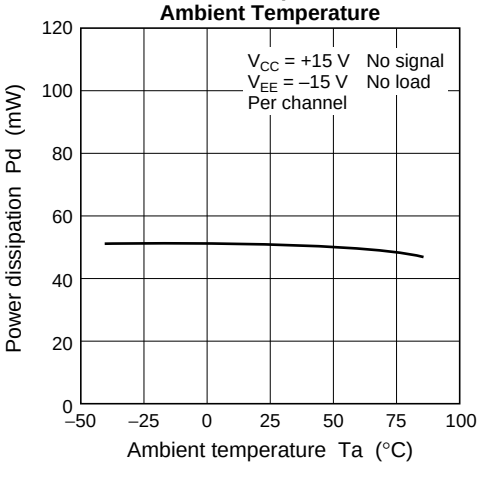
Supply current vs. Ambient Temperature



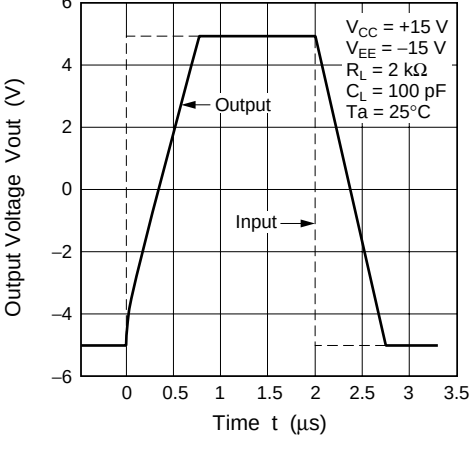
Power Dissipation vs. Power-Supply Voltage



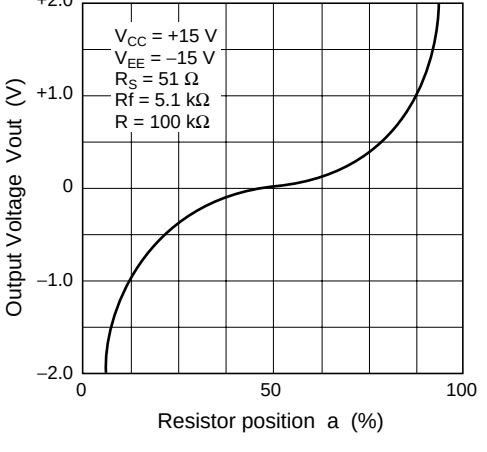
Power Dissipation vs. Ambient Temperature



Voltage Follower Large Signa Pulse Response

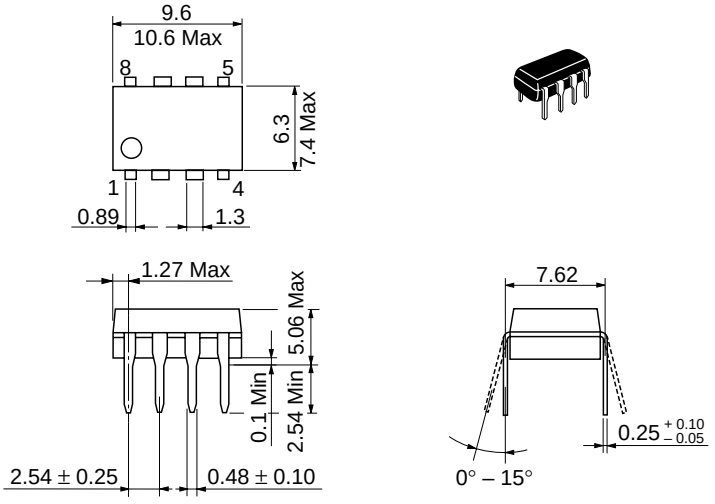


HA17083 Offset Adjustment



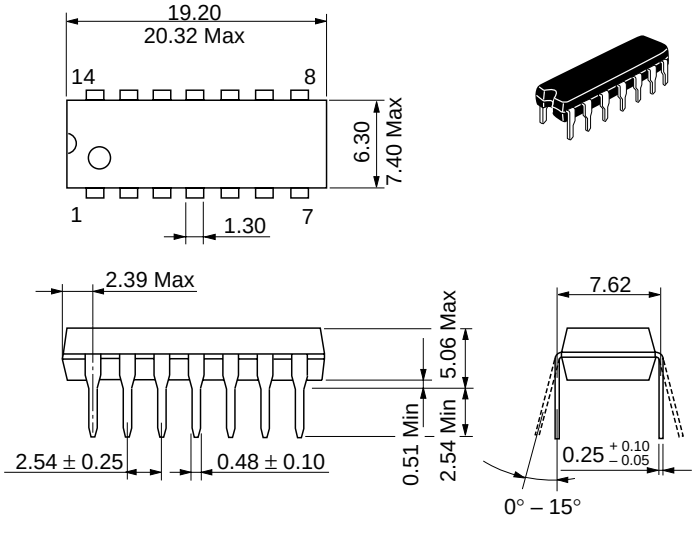
Package Dimensions

Unit: mm



Hitachi Code	DP-8
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.54 g

Unit: mm



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.97 g

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