HA17903, HA17393 Series

Dual Comparator

HITACHI

Description

HA17903 and HA17393 are comparators designed for car use and control system use.

They provide wide voltage range with single power source, and the change of supply current is small, because it is independent of the supply voltage. They can be widely applied, such as limit comparator, simple analog/digital converter, pulse/square wave/time delay generator, wide range VCO, MOS clock timer, multivibrator, high voltage logic gate, etc.

Features

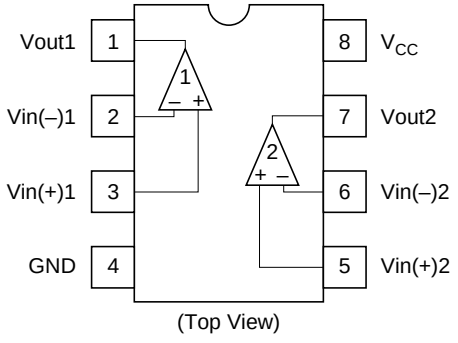
- Wide supply voltage: 2 to 36V
- Very low supply current: 0.8mA
- Small input bias: 25nA
- Small input offset current: 3nA
- Small input offset voltage: 2mV
- Common mode input voltage range including ground.
- Small output saturation voltage: 1mV (5µA)
  70mV (1mA)
- Output voltage is compatible with CMOS logic system.

Ordering Information

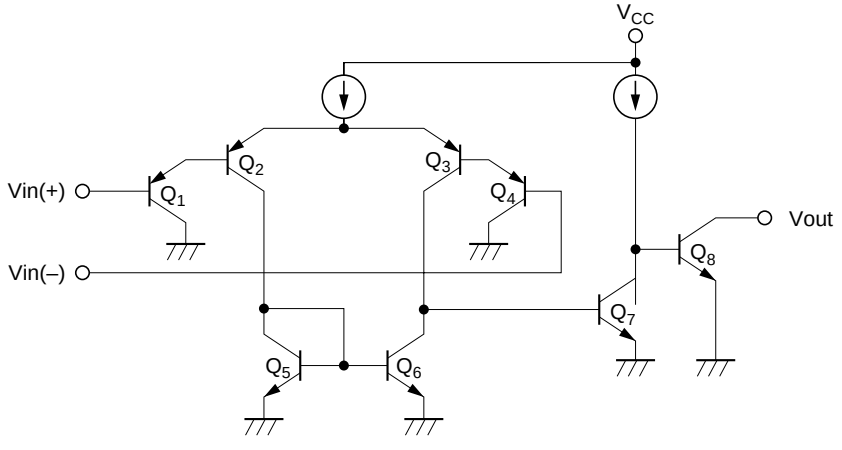
Type No.	Application	Package
HA17903PSJ	Car use	DP-8
HA17903FPJ		FP-8D
HA17903FPK		FP-8D
HA17903PS	Industrial use	DP-8
HA17903FP		FP-8D
HA17393	Commercial use	DP-8
HA17393F		FP-8D

Hitachi semiconductor

Pin Arrangement



Circuit Schematic (1/2)



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings							Unit
		HA17903 PS	HA17903 PSJ	HA17903 FP	HA17903 FPJ	HA17903 FPK	HA17393	HA17393 F	
Supply voltage	V_{CC}	36	36	36	36	36	36	36	V
Dfferential input voltage	$V_{IN(diff)}$	V_{CC}	V_{CC}	V_{CC}	V_{CC}	V_{CC}	V_{CC}	V_{CC}	V
Input voltage	V_{IN}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	–0.3 to + V_{CC}	V
Output short current	I_{OS}*[3]	constant	constant	constant	constant	constant	constant	constant	
Power dissipation	P_T	570*[1]	570*[1]	385*[2]	385*[1]	385*[2]	570*[1]	385*[2]	mW
Operating temperature	Topr	–20 to +75	–40 to +85	–20 to +75	–40 to +85	–40 to +125	–20 to +75	–20 to +75	°C
Storage temperature	Tstg	–55 to +125	–55 to +125	–55 to +125	–55 to +125	–55 to +150	–55 to +125	–55 to +125	°C

Note:
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.
3. Short circuit between the output and VCC will be a cause to destory the circuit. The maximum output current is about 20mA for any supply voltage.

Electrical Characteristics-1 (V_{CC} = 5V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test condition
Input offset voltage*[1]	V_{IO}	—	2.0	5.0	mV	
Input bias current*[2]	I_{IB}	—	25	250	nA	$I_{IN(+)}$ or $I_{IN(-)}$
Input offset current	I_{IO}	—	3	50	nA	$\lvert I_{IN(+)} - I_{IN(-)} \rvert$
Common mode input voltage*[3]	V_{CM}+	3.5	—	—	V	
	V_{CM}–	—	—	0	V	
Supply current	I_{CC}	—	0.8	2.0	mA	All comparators: $R_L = \infty$, All channels on
Voltage gain	A_{VD}	—	200	—	V/mV	V_{CC} = 15V, $R_L \geq 15k\Omega$
Response time*[4]	t_R	—	1.3	—	µs	V_{RL} = 5V, R_L = 5.1kΩ
Large signal response time	t_{RI}	—	300	—	ns	V_{IN} = TTL Threshold width, V_{REF} = 1.4V
Out put sink current	Iosink	6	16	—	mA	$V_{IN(-)} \geq 1V$, $V_{IN(+)} = 0$, $V_O \leq 1.5V$
Output saturation voltage	V_O (sat)	—	—	400	mA	$V_{IN(-)} \geq 1V$, $V_{IN(+)} = 0$, Iosink = 4mA
Output leak current	I_{LO}	—	0.1	—	nA	$V_{IN(-)} = 0$, $V_{IN(+)} \geq 1V$, V_O = 5V

Notes: 1. V_{REF} = 1.4V and R_S = 50Ω, when V_O = 1.4V at output switching point.
2. Under linear operation.
3. Common mode input voltage or each one of the input signal should not be less than –0.3V.
4. This is a value to 100mV input step voltage with 5mV over drive.

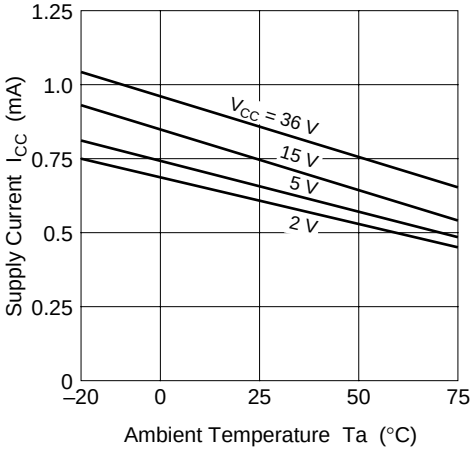
Electrical Characteristics-2 (V_{CC} = 5V, Ta = –40 to +125°C)

Item	Symbol	Min	Typ	Max	Unit	Test condition
Input offset voltage*[1]	V_{IO}	—	—	5.0	mV	
Input offset current	I_{IO}	—	—	200	nA	$\lvert I_{IN(+)} - I_{IN(-)} \rvert$
Input bias current	I_{IB}	—	—	500	nA	Output linear range
Common mode input voltage	V_{CM}	0	—	V_{CC} – 2.0	V	
Output saturation voltage	V_O (sat)	—	—	440	mV	$V_{IN(-)} \geq 1V$, $V_{IN(+)} = 0$, Iosink ≤ 4mA
Output leak current	I_{LO}	—	1.0	—	µA	$V_{IN(-)} = 0$, $V_{IN(+)} \geq 1$ V, V_O = 30V
Supply current	I_{CC}	—	—	4.0	mA	All comparators: $R_L = \infty$, All channels on

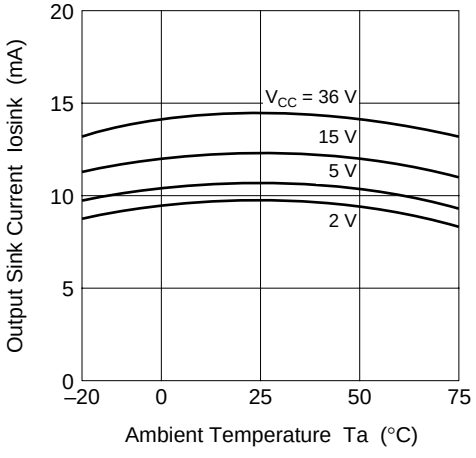
Note: 1. V_{REF} = 1.4V and R_S = 50Ω, when V_O = 1.4V at the output switching point.

Characteristics Curve

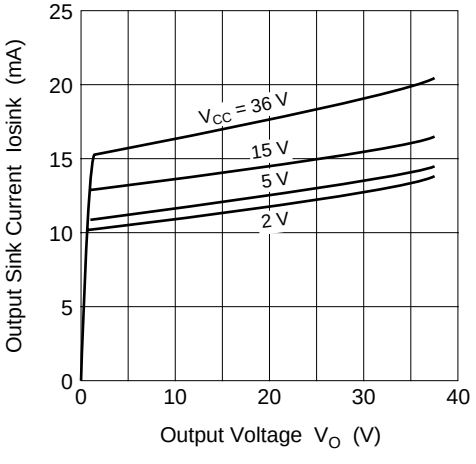
Supply Current vs. Ambient Temperature



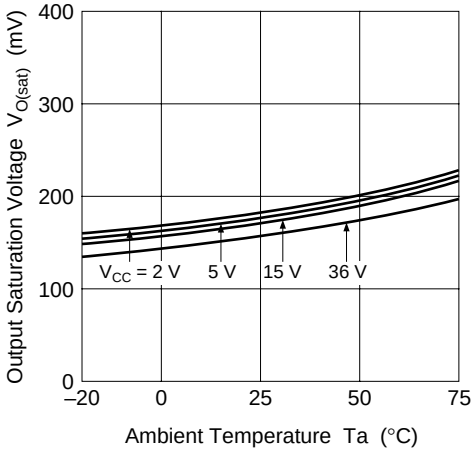
Output Sink Current vs. Ambient Temperature



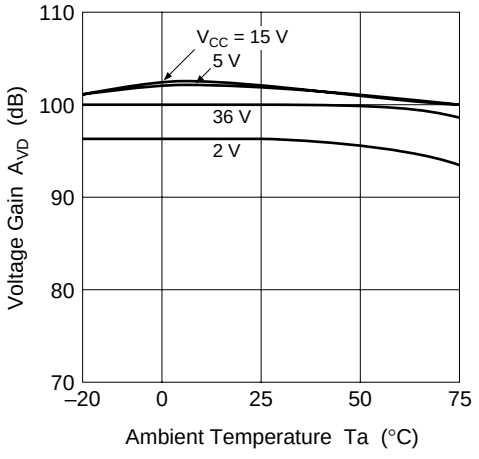
Output Sink Current vs. Output Voltage



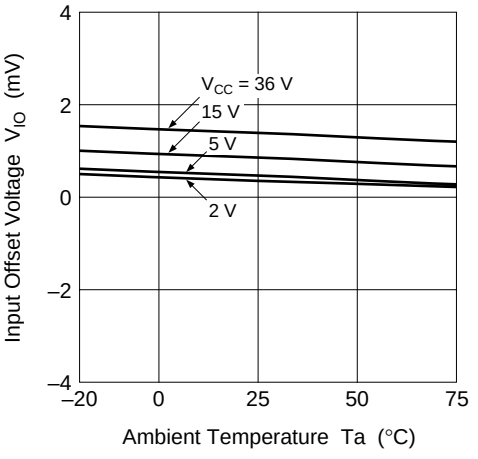
Output Saturation Voltage vs. Ambient Temperature



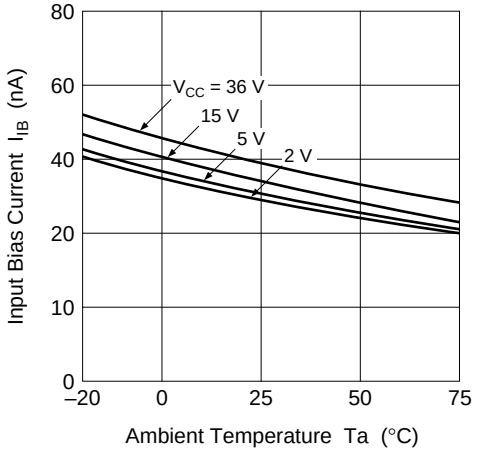
Voltage Gain vs. Ambient Temperature



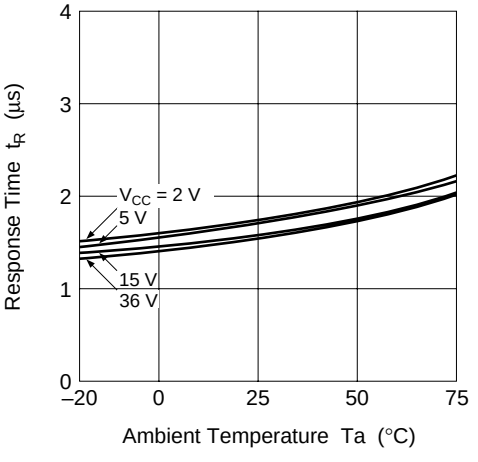
Input Offset Voltage vs. Ambient Temperature



Input Bias Current vs. Ambient Temperature

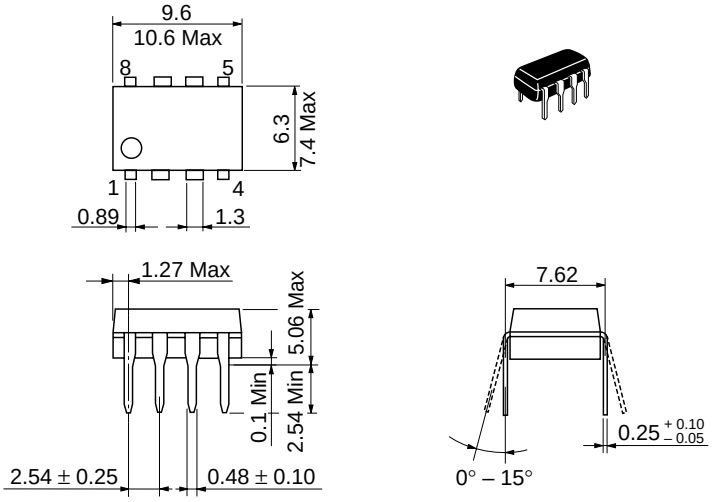


Response Time vs. Ambient Temperature



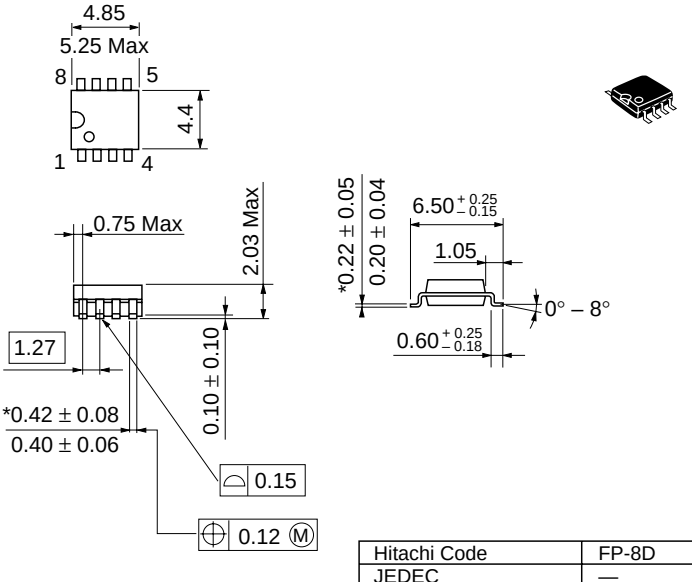
Package Dimensions

Unit: mm



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

Unit: mm



Hitachi Code	FP-8D
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.10 g

*Dimension including the plating thickness
Base material dimension

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