
HA17408P

8-Bit Multiplying Digital-to-Analog Converter

HITACHI

Description

The HA17408P is an 8-bit monolithic D/A converter that incorporates a reference current amplifier, an R-2R resistor ladder, and eight high-speed current switches.

Circuit designers can set the maximum output current to match the needs of their applications by setting the reference voltage and selecting a resistor value.

The reference current is distributed to the current value for each bit by the R-2R resistor ladder, and thus the maximum output current is 255/256 times the reference current. For example, the largest output current that can be acquired for a reference input current of 2.0 mA is 1.992 mA.

The HA17408P can be used in a wide range of applications including CRT displays, stepping motor control, programmable power supplies, audio equipment, and attenuators.

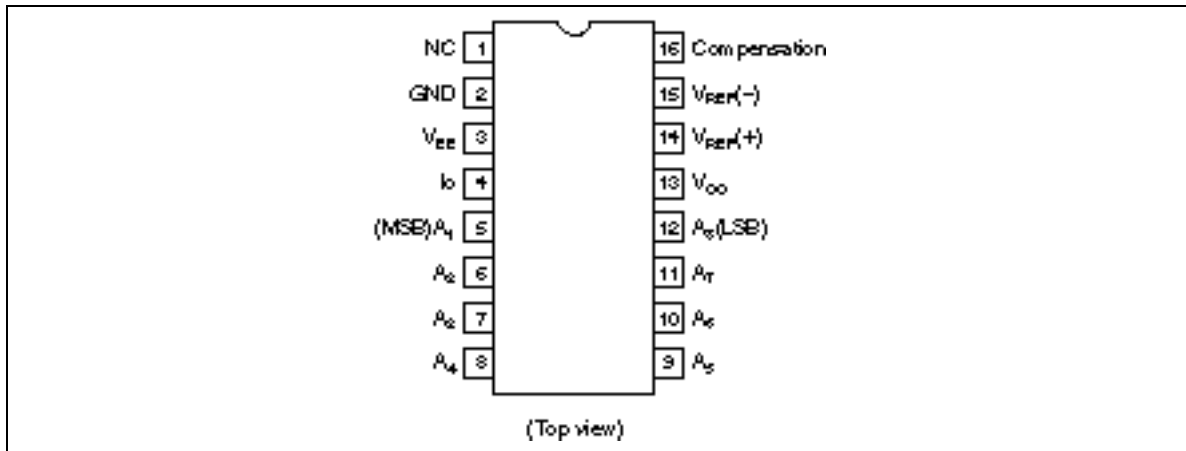
Features

- A linearity of $\pm 0.19\%$ ($\pm 1/2$ LSB) is guaranteed.
- Short centering time (250 ns typical) for rapid conversions
- Low power dissipation: 157 mW typical
- Compatible with TTL and CMOS logic
- Standard supply voltages of $V_{CC} = +5.0$ V, $V_{EE} = -5.0$ V and -15.0 V
- Wide output voltage range: +0.5 to -5.0 V

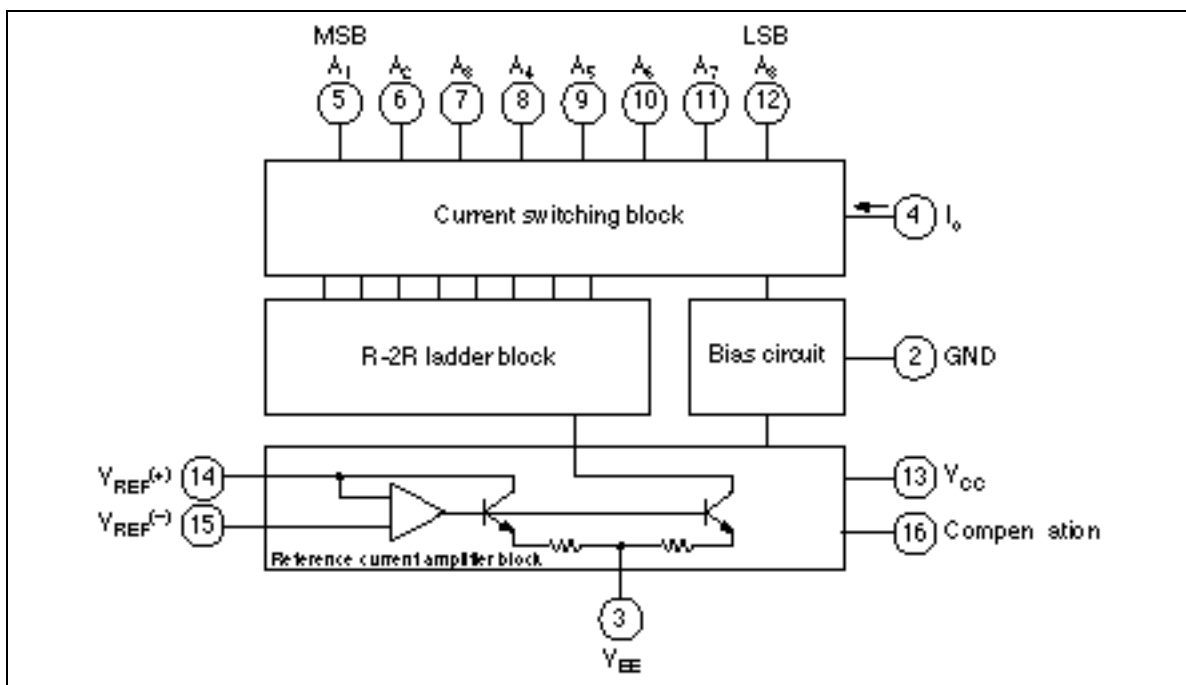


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Pin Arrangement



Block Diagram



Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Item	Symbol	Rated Value	Unit
Power-supply voltage	V_{CC}	5.5	V
	V_{EE}	-16.5	V
Digital input voltage	V_5 to V_{12}	0 to +5.5	V
Output voltage	V_O	0.5 to -5.2	V
Reference current	I_{14}	5.0	mA
Reference amplifier input voltage range	V_{REF}	V_{CC}, V_{EE}	V
Allowable power dissipation	P_T	625	mW
Operating temperature	T_{opr}	-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +125	$^\circ\text{C}$

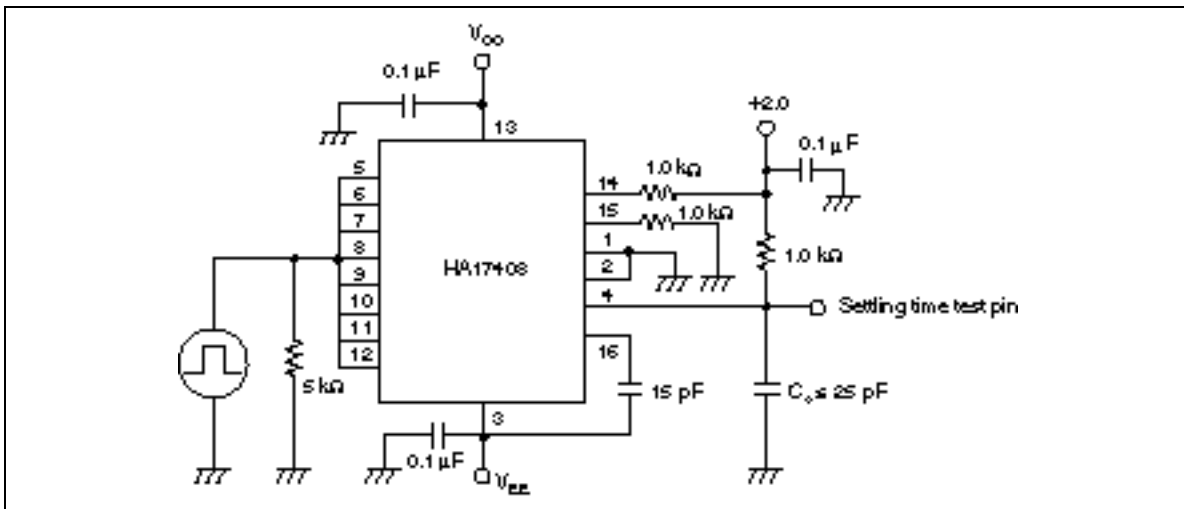
Electrical Characteristics ($V_{CC} = 5.0\text{ V}$, $V_{EE} = -15\text{ V}$, $I_{ref} = 2\text{ mA}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Relative error	E_R	—	—	± 0.19	%FS	
Settling time ($\pm 1/2$ LSB)	t_s	—	250	—	ns	All bits OFF \rightarrow ON
Transmission delay time	t_{PLH}, t_{PHL}	—	30	100	ns	
Maximum output current drift	T_{CIO}	—	± 20	—	ppm/ $^\circ\text{C}$	
Digital input level	V_{IH}	2.0	—	—	V	
	V_{IL}	—	—	0.8	V	
Digital input current	I_{IH}	—	0	0.04	mA	$V_{IH} = 5.0\text{ V}$
	I_{IL}	-0.8	-0.002	—	mA	$V_{IL} = 0.8\text{ V}$
Reference input bias current	I_{15}	-3.0	-1.0	—	μA	
Output current range	I_{OR}	0	2.0	2.1	mA	$V_{EE} = -5.0\text{ V}$
		0	2.0	4.2	mA	$V_{EE} = -7.0$ to -15 V
Output current	I_O	1.9	1.99	2.1	mA	$V_{ref} = 2.000\text{ V}$, $R_{14} = 1.000$
	$I_{O(\min)}$	—	0	4.0	μA	All bits low
Output voltage range	V_O	-0.6	—	+0.5	V	$V_{EE} = -5\text{ V}$
		-5.0	—	+0.5	V	$V_{EE} < -10\text{ V}$
Reference current slew rate	STIref	—	4.0	—	mA/ μs	

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Electrical Characteristics ($V_{CC} = 5.0\text{ V}$, $V_{EE} = -15\text{ V}$, $I_{ref} = 2\text{ mA}$, $T_a = 25^\circ\text{C}$) (cont)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Current drain	I_{CC}	—	1.9	14	mA	
	I_{EE}	-13	-5.8	—	mA	
Power-supply voltage	V_{CC}	4.5	5.0	5.5	V	
	V_{EE}	-16.5	-15	-4.5	V	
Power dissipation	P_T	—	34	136	mW	All bits $V_{EE} = -5.0\text{ V}$
		—	97	265	mW	low $V_{EE} = -15\text{ V}$
	—	34	—	mW	All bits $V_{EE} = -5.0\text{ V}$	
		97	—	mW	high $V_{EE} = -15\text{ V}$	



Settling Time Test Circuit