
HA17408P

8-Bit Multiplying Digital-to-Analog Converter

HITACHI

ADE-204-061 (Z)

Rev. 0

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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.

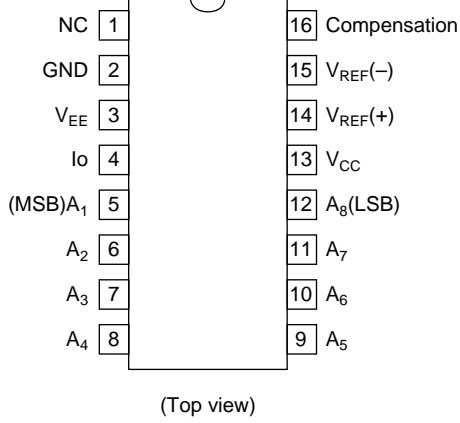
The reference current is distributed to the current value for each bit by the R-2R resistor ladder, and thus the maximum output current is 255/256 times the reference current. For example, the largest output current that can be acquired for a reference input current of 2.0 mA is 1.992 mA.

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

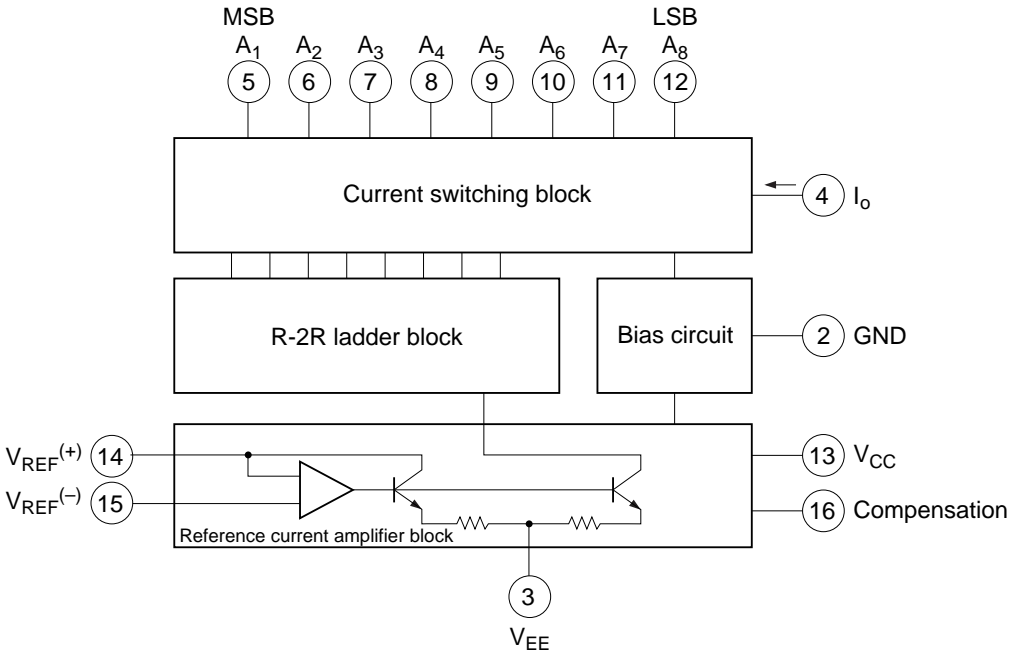
Features

- A linearity of $\pm 0.19\%$ ($\pm 1/2$ LSB) is guaranteed.
- Short settling 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

Pin Arrangement



Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rating	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
Power dissipation	P_T	625	mW
Operating temperature	Topr	-20 to +75	°C
Storage temperature	Tstg	-55 to +125	°C

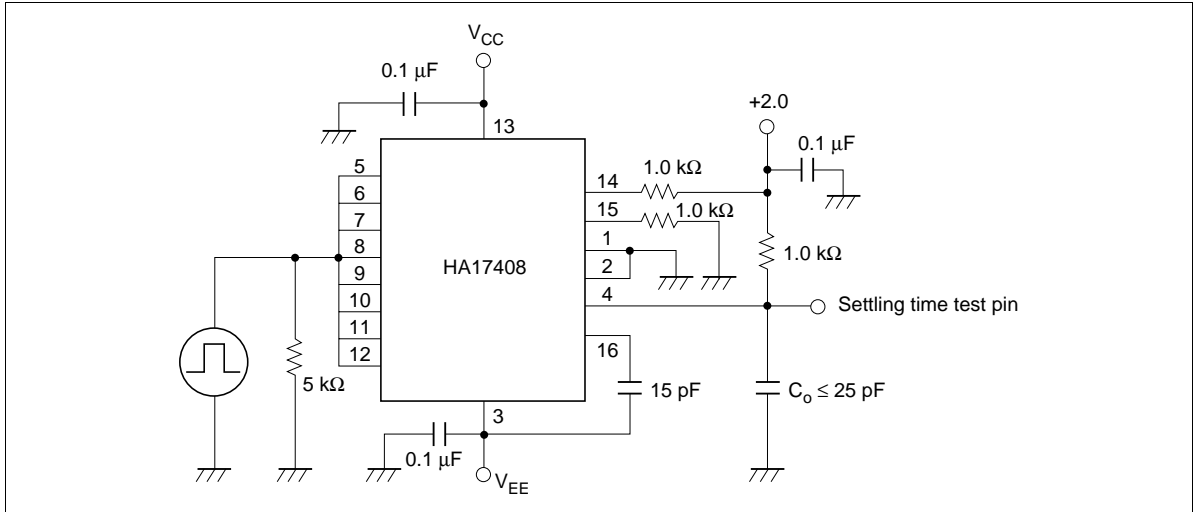
Electrical Characteristics ($V_{CC} = 5.0$ V, $V_{EE} = -15$ V, $I_{ref} = 2$ mA, Ta = 25°C)

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

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)

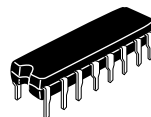
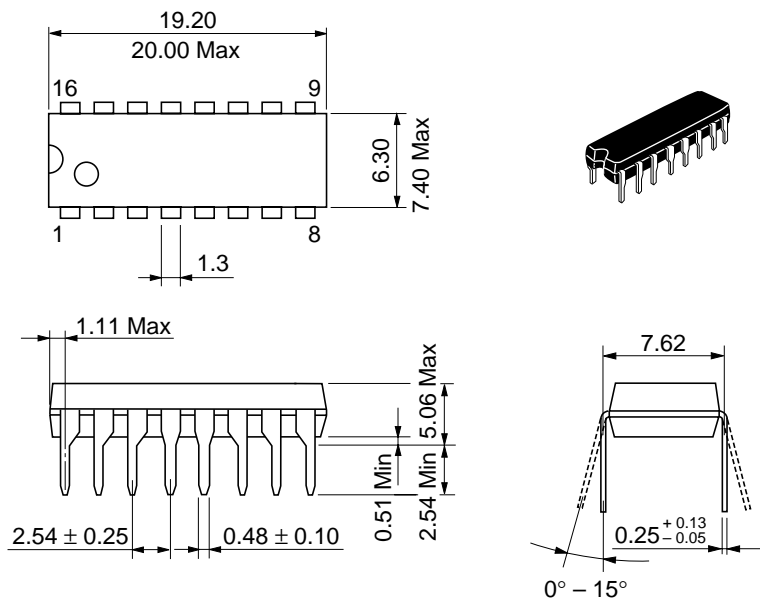
Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Power supply current	I_{CC}	—	1.9	14	mA		
	I_{EE}	-13	-5.8	—	mA		
Power-supply voltage	V_{CC}	4.5	5.0	5.5	V		
	V_{EE}	-16.5	-15	-4.5	V		
Power dissipation	P_T	—	34	136	mW	All bits	$V_{EE} = -5.0\text{ V}$
		—	97	265	mW	low	$V_{EE} = -15\text{ V}$
	—	34	—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

Settling Time Test Circuit



Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

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