HA19211B, HA19212 Series

High-Speed, Low-Power 8-bit A/D Flash Converter

The HA19211B/HA19212 series high-speed, low-power 8-bit A/D flash converters require no sampling or polling circuits. The digital outputs and clock inputs of these monolithic bipolar ICs are fully TTL/CMOS compatible.

These devices are suitable for high-speed image processing applications such as video signal digitization.

Features

- 8-bit resolution (with overflow)
- Low power consumption (250mW typ.)
- High conversion rate (30 samples per second (sps) typ)
- Single power supply operation: +5V
- Built-in output latch circuit
- TTL/CMOS compatible digital outputs and clock inputs

Applications

- Digital TV/VCR
- Industrial pattern recognition equipment
- High-speed measuring devices

Differences between the HA19211B and HA19212

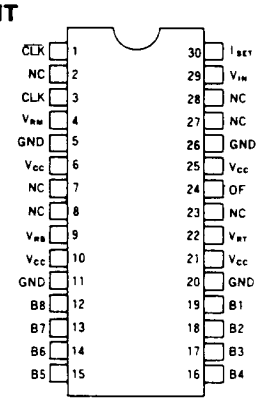
Except for different overflow codes (see table 1), the HA19211B and HA19212 are identical.

Ordering Information

Type No.	Package
HA19211BP	600mil 28-pin plastic DIP (DP-28)
HA19211BNT	400mil 30-pin plastic shrink DIP (DP-30S)
HA19211BMP	44-pin plastic QFI (MP-44)
HA19212P	600mil 28-pin plastic DIP (DP-28)
HA19212NT	400mil 30-pin plastic shrink DIP (DP-30S)
HA19212MP	44-pin plastic QFI (MP-44)

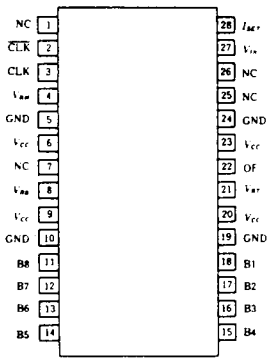
Pin Arrangement

- **HA19211BNT**
  HA19212NT



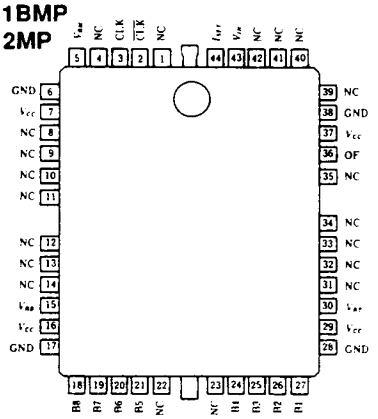
(Top View)

- **HA19211BP**
  HA19212P



(Top View)

- **HA19211BMP**
  HA19212MP



(Top View)

Pin Descriptions

HA19211BP, HA19212P, HA19211BMP, HA19212MP

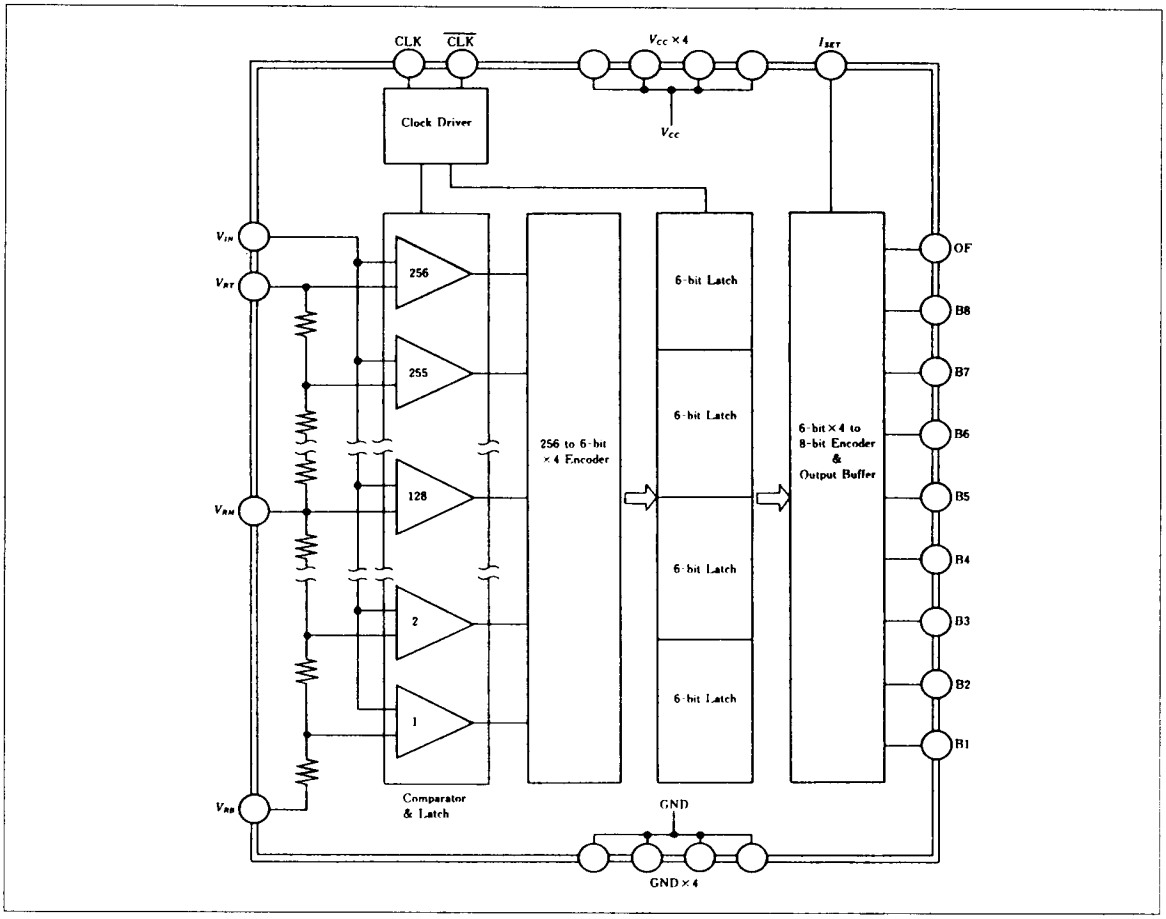
Pin No.	Symbol	Function
1 (1)	NC	No Connected
2 (2)	$\overline{CLK}$	Inverted clock input
3 (3)	CLK	Clock input
4 (5)	V_{RM}	Reference voltage compensation input
5 (6)	GND	Ground
6 (7)	V_{CC}	Power supply (+5V)
7 (8)	NC	No Connected
8 (15)	V_{RB}	Low-level reference voltage input
9 (16)	V_{CC}	Power supply (+5V)
10 (17)	GND	Ground
11 (18)	B8	Digital output (MSB)
12 (19)	B7	Digital output
13 (20)	B6	Digital output
14 (21)	B5	Digital output
15 (24)	B4	Digital output
16 (25)	B3	Digital output
17 (26)	B2	Digital output
18 (27)	B1	Digital output (LSB)
19 (28)	GND	Ground
20 (29)	V_{CC}	Power Supply (+5V)
21 (30)	V_{RT}	High-level reference voltage input
22 (36)	OF	Overflow output
23 (37)	V_{CC}	Power supply (+5V)
24 (38)	GND	Ground
25 (39)	NC	No connected
26 (40)	NC	No connected
27 (43)	V_{IN}	Analog input
28 (44)	I_{SET}	Output current setting input

Note: Pin numbers in parentheses are for the HA19211BMP and HA19212MP. For these chips pins 4, 9-14, 22, 23, 31-35, 41 and 42 are no connected.

HA19211BNT, HA19212NT

Pin No.	Symbol	Function
1	$\overline{CLK}$	Inverted clock input
2	NC	No connected
3	CLK	Clock input
4	V_{RM}	Reference voltage compensation input
5	GND	Ground
6	V_{CC}	Power supply (+5V)
7	NC	No connected
8	NC	No connected
9	V_{RB}	Low-level reference voltage input
10	V_{CC}	Power supply (+5V)
11	GND	Ground
12	B8	Digital output (MSB)
13	B7	Digital output
14	B6	Digital output
15	B5	Digital output
16	B4	Digital output
17	B3	Digital output
18	B2	Digital output
19	B1	Digital output (LSB)
20	GND	Ground
21	V_{CC}	Power Supply (+5V)
22	V_{RT}	High-level reference voltage input
23	NC	No connected
24	OF	Digital output (overflow)
25	V_{CC}	Power Supply (+5V)
26	GND	Ground
27	NC	No connected
28	NC	No connected
29	V_{IN}	Analog input
30	I_{SET}	Output current setting input

Block Diagram



Absolute Maximum Ratings (Ta = 25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit
Power supply voltage	V_{CC}	+7.0	V
Analog Input voltage*1	V_{IN}	0 to V_{CC}	V
Reference voltage*1	V_R	0 to V_{CC}	V
Clock input voltage*2	V_{CLK}	0 to V_{CC}	V
Power dissipation	P_T	800	mW
Operating temperature*3	T_{opr}	0 to +70	°C
Storage temperature	T_{stg}	−55 to +125	°C

Notes:

*1 V_{IN} and V_R should never be below 1.2V at the same time.

*2 V_{CLK} and $V_{\overline{CLK}}$ should never be below 1.5V at the same time.

*3 HA19211B series: −20 to +85°C

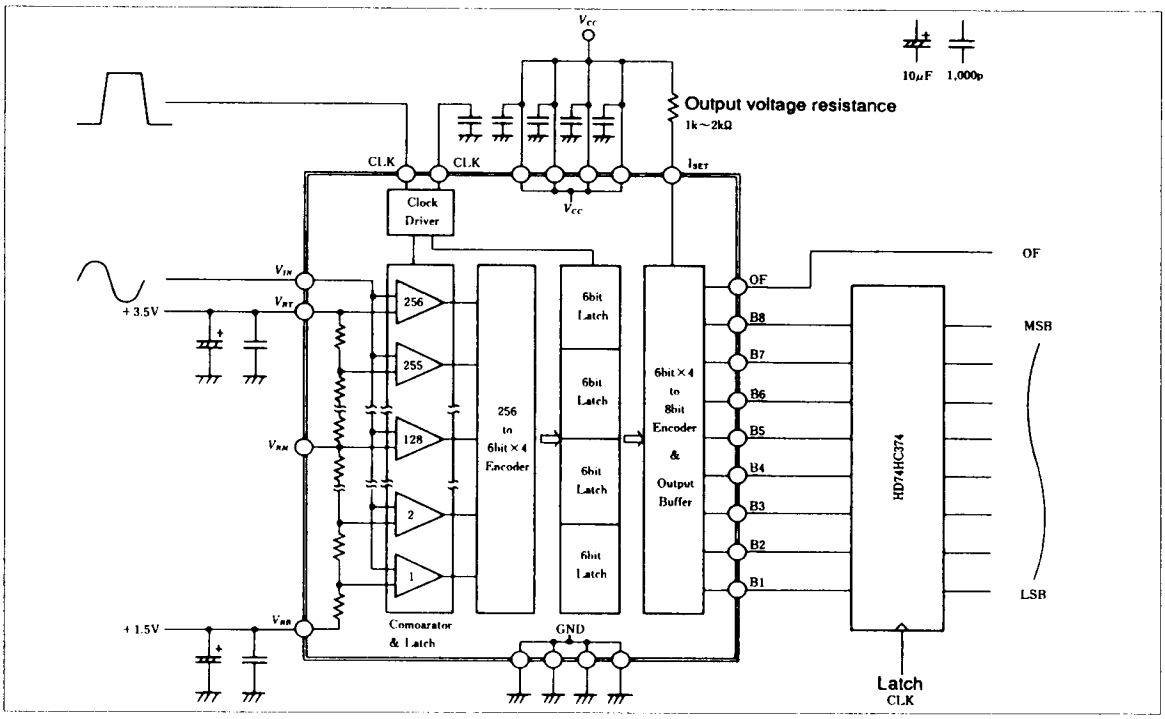
Electrical Characteristics (Ta = 25°C, V_{CC} = 5V, V_{RT} = 3.5V, V_{RB} = 1.5V, unless otherwise specified)

Parameter		Symbol	Min	Typ	Max	Unit	Test Conditions
Resolution			8	8	8	bits	
Power supply voltage		V_{CC}	4.75	5.0	5.25	V	
Reference voltage	RT	V_{RT}	V_{RB}	3.5	V_{CC} – 0.9	V	V_{CC} = 5.0 V
	RB	V_{RB}	1.2	1.5	V_{RT}	V	V_{CC} = 5.0 V
	RM	V_{RM}	2.4	2.5	2.6	V	Needed for external compensation only
Analog input voltage		V_{IN}	V_{RB} – 0.1	—	V_{RT} + 0.1	V	V_{CC} = 5.0 V
Analog input amplitude		$V_{RT} - V_{RB}$	—	2.0	2.1	Vp – p	
Power supply current		I_{CC}	—	50	75	mA	V_{CC} = 5.0 V, f_{CLK} = 20 Msps
Reference current (+)		I_{RT}	—	11	14.5	mA	
Reference current (–)		I_{RB}	–14.5	–11	—	mA	
Input current		I_{IN}	—	70	200	µA	V_{IN} = 4.1 V
Input capacitance		C_{IN}	—	40	—	pF	f_{IN} = 1 MHz, $V_{RB} < V_{IN} < V_{RT}$
Digital output high voltage		V_{OH1}	4.0	4.2	—	V	I_{OH} = –400 µA
		V_{OH2}	3.5	3.8	—	V	I_{OH} = –5 mA
Digital output low voltage		V_{OL}	—	0.6	0.70	V	I_{OL} = 400 µA, I_{SET} = 2 mA
Clock input current		I_I	—	—	100	µA	V_{CLK}: 0 V to 2.7 V
Clock input high voltage		V_{IH}	2.0	—	V_{CC}	V	
Clock input low voltage		V_{IL}	0	—	0.8	V	
Static non-linear precision		N.L.	—	±0.5	—	LSB	
Maximum conversion rate		f_{CLK}	20	30	—	Msps	f_{IN} = 3.58 MHz
Differential gain		DG	—	1.0	—	%	f_{CLK} = 20 Msps, NTSC,
Differential phase		DP	—	0.5	—	deg	40 IRE UNLOCKED
Clock pulse width		t_{WH}	25	30	—	ns	f_{CLK} = 20 Msps
		t_{WL}	15	20	—	ns	I_{SET} = 5 mA
Digital output delay time		t_{PD}	—	35	46	ns	I_{SET} = 5 mA
Digital output rise time		t_{TLH}	—	10	—	ns	C_L = 10 pF
Digital output fall time		t_{THL}	—	15	—	ns	I_{SET} = 5 mA

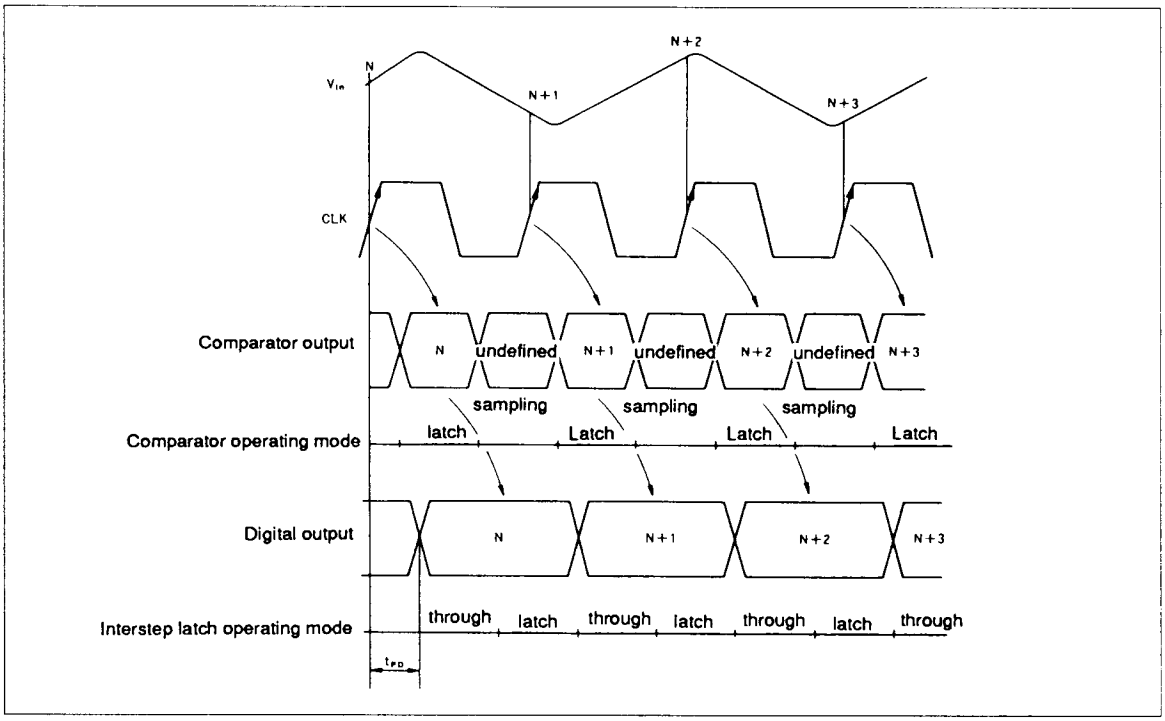
Output Code Table

Input Voltage \ Output Code	HA19211B						HA19212					
	OF	B8	B7	···	B2	B1	OF	B8	B7	···	B2	B1
V_{RB}	0	0	0	...	0	0	0	0	0	...	0	0
V_{RB} +1LSB	0	0	0	...	0	1	0	0	0	...	0	1
V_{RB} + 2LSB	0	0	0	...	1	0	0	0	0	...	1	0
.	.	.	.	...	.	.	.	.	.	...	.	.
.	.	.	.	...	.	.	.	.	.	...	.	.
.	.	.	.	...	.	.	.	.	.	...	.	.
V_{RB} +127LSB	0	0	1	...	1	1	0	0	1	...	1	1
V_{RB} +128LSB	0	1	0	...	0	0	0	1	0	...	0	0
.	.	.	.	...	.	.	.	.	.	...	.	.
.	.	.	.	...	.	.	.	.	.	...	.	.
.	.	.	.	...	.	.	.	.	.	...	.	.
V_{RT} – 2LSB	0	1	1	...	1	0	0	1	1	...	1	0
V_{RT} –1LSB	0	1	1	...	1	1	0	1	1	...	1	1
V_{RT}	1	1	1	...	1	1	1	0	0	...	0	0

Application Example



Timing Chart

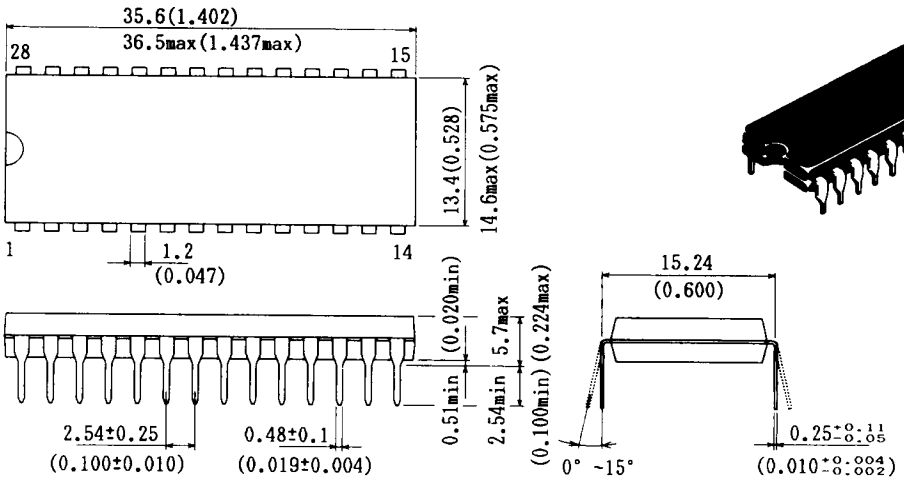


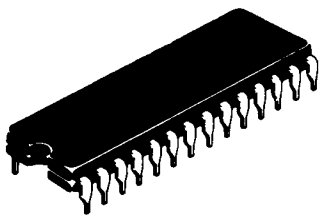
Package Outline

Unit: mm (inch)

HA19211BP, HA19212P

28Pin

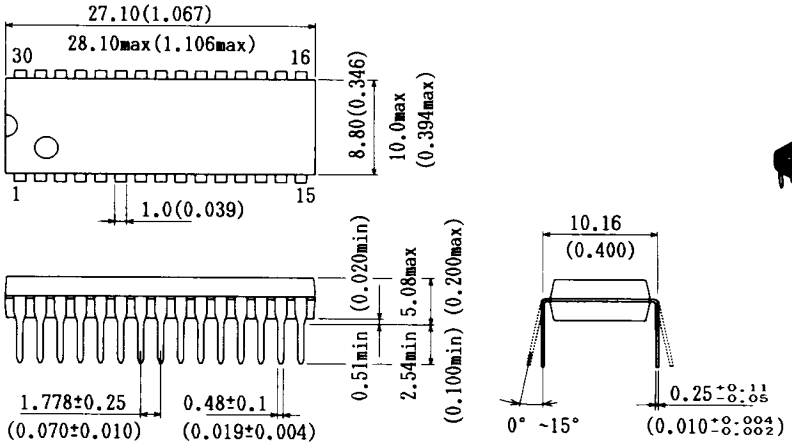


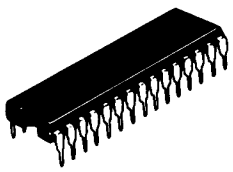


Hitachi Code	DP-28
EIAJ	SC-510-28E
JEDEC	—

HA19211BNT, HA19212NT

30pin



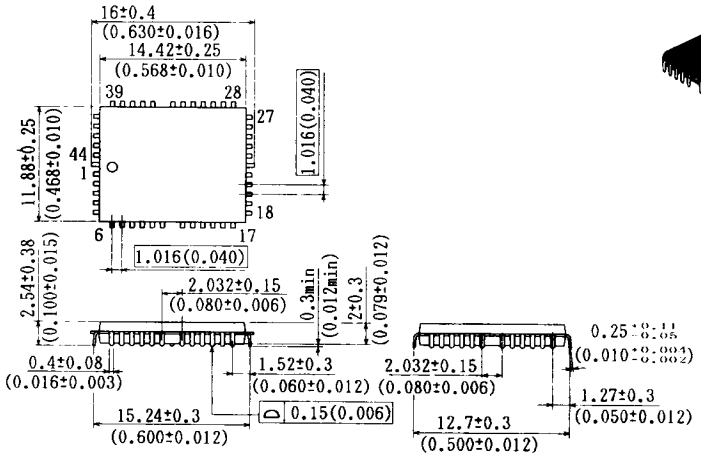


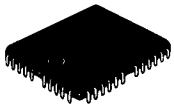
Hitachi Code	DP-30S
EIAJ	SC-549-30
JEDEC	—

Unit: mm (inch)

HA19211BMP, HA19212MP

44Pin





Hitachi Code	MP-44/44T
EIAJ	—
JEDEC	—