

**SONY**

# CX20116/CXA1066K

## 8 bit, 100 MHz Flash A/D Converter

### Description

The CX20116/CXA1066K are the 8 bit ultra high speed A/D Converter IC capable of digitizing analog signals at rates from DC to 110 MSPS. These A/Ds can be utilized in many varied applications. A wide analog input band width satisfies the characteristics for high definition television systems.

### Features

- Resolution at 8 bit  $\pm 1/2$  LSB
- Ultra high speed operation with maximum conversion rate of 110 MSPS
- Full scale input band width of: 60 MHz (-1dB)  
90 MHz (-3dB)
- Low input capacitance at 35 pF (Typ.)
- Low power consumption at 1.2W (Typ.)

### Structure

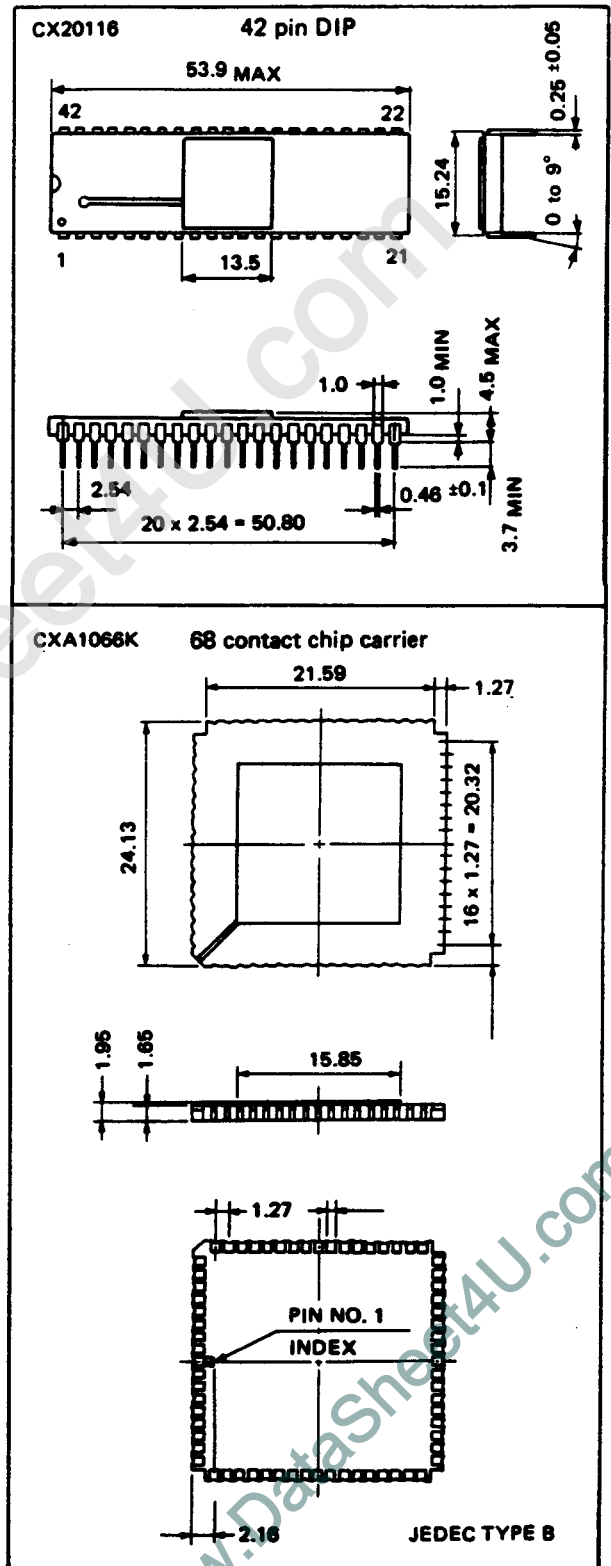
Bipolar silicon monolithic IC

### Applications

- High speed signal processing
- High definition video system

### Package Outline

Unit mm



**Absolute Maximum Ratings (Ta=25°C)**

• Supply voltage	V <sub>EE</sub>	0 to -7	V
• Analog input voltage	V <sub>IN</sub>	0.5 to V <sub>EE</sub>	V
• Reference input voltage	V <sub>RT</sub> , V <sub>RB</sub> , V <sub>RM</sub>	0.5 to V <sub>EE</sub>	V
	V <sub>RT</sub> -V <sub>RB</sub>	2.5	V
• Digital input voltage	CLK, $\overline{\text{CLK}}$ , MINV, LINV	0.5 to -4	V
• V <sub>RM</sub> pin input current	I <sub>VRM</sub>	-3 to +3	mA
• Digital output current	ID <sub>0</sub> to ID <sub>7</sub>	0 to -10	mA
• Operating temperature	T <sub>a</sub> CX20116	-25 to +100	°C
	T <sub>c</sub> CXA1066K	-25 to +125	°C*1
• Storage temperature	T <sub>stg</sub>	-55 to +150	°C
• Allowable power dissipation	P <sub>d</sub> CX20116	3.1	W
	CXA1066K	2.3	W

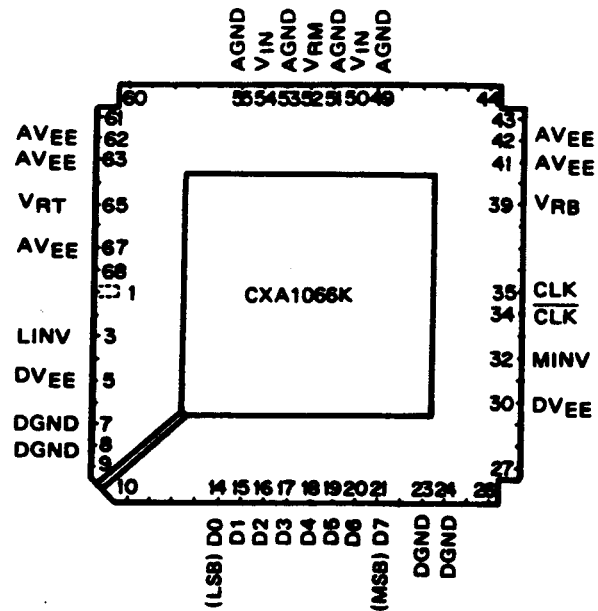
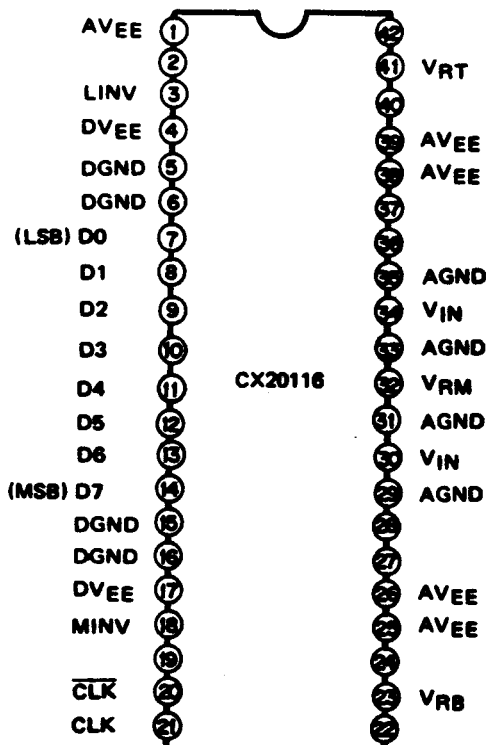
\*1 Heat sinking is required above 54°C ambient.

**Recommended Operating Conditions**

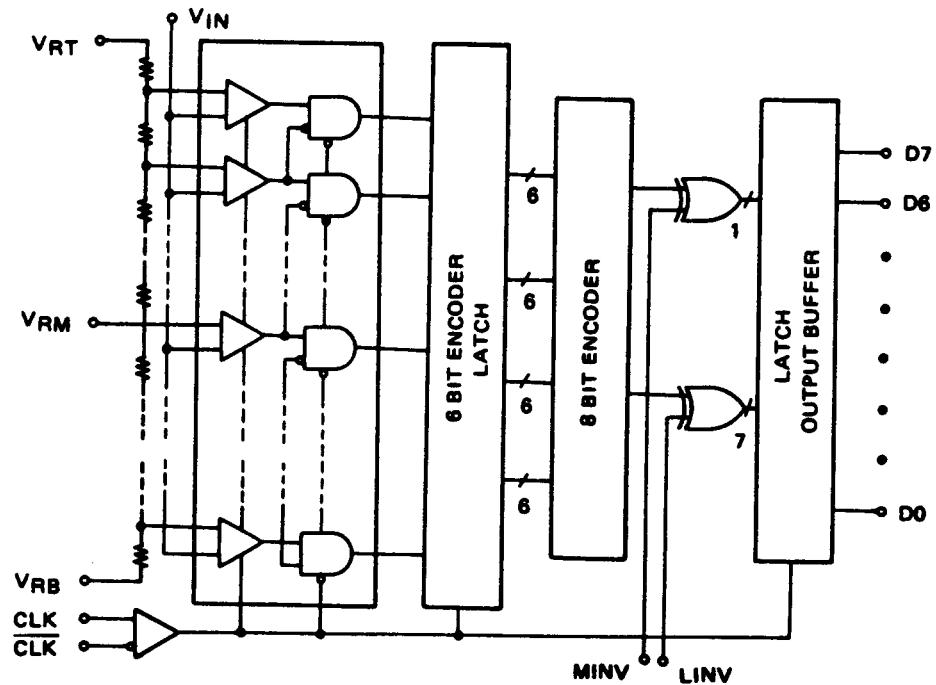
		Min	Typ.	Max.	Unit.
• Supply voltage	A <sub>VEE</sub> , D <sub>VEE</sub>	-5.7	-5.2	-5.0	V
	A <sub>VEE</sub> -D <sub>VEE</sub>	-0.05	0	0.05	V
	A <sub>GND</sub> -D <sub>GND</sub>	-0.05	0	0.05	V
• Reference input voltage	V <sub>RT</sub>	-0.1	0	0.1	V
	V <sub>RB</sub>	-2.2	-2	-1.8	V
	V <sub>IN</sub>			V <sub>RB</sub>	
• Analog input voltage				V <sub>RT</sub>	
• Clock pulse width	T <sub>pw1</sub>	7.5			ns
	T <sub>pw0</sub>	2.5			ns

**Pin Configuration (Top View)**

The pin numbers without indication are empty pins. (not connected)



## Block Diagram



## Pin Description

No.		Symbol	Function
CX20116	CXA1066K		
1, 25, 26, 38, 39	41, 42, 62, 63, 67	AVEE	Analog VEE, -5.2V (Typ.). Coupled with about 6Ω between DVEE.
3	3	LINV	Input pin for output polarity inversion of Do (LSB) to D6. (See the Code Table)
4, 17	5, 30	DVEE	Digital VEE, -5.2V (Typ.).
5, 6, 15, 16	7, 8, 23, 24	DGND	Digital GND, which is separated from the Analog GND.
7 to 14	14 to 21	Do to D7	Digital data output pin, ECL level. Do: LSB to D7: MSB. Pull-down resistors are necessary externally.
18	32	MINV	Input pin for output polarity inversion of D7 (MSB) (See the Code Table). ECL level. "0" level is held when it is released.
20	34	CLK-bar	Inverse clock input pin, ECL level.
21	35	CLK	Clock input pin, ECL level.
23	39	VRB	Reference voltage (bottom), -2V (Typ.).
29, 31, 33, 35	49, 51, 53, 55	AGND	Analog GND
30, 34	50, 54	VIN	Analog input, input voltage range is VRT to VRB
32	52	VRM	Middle point of the reference voltage, it can be used as a linearity correction pin.
41	65	VRT	Reference voltage (Top), 0V (Typ.).
2, 19, 22, 24, 27, 28, 36, 37, 40, 42	1, 2, 4, 6, 9 to 13, 22, 25 to 29, 31, 33, 36 to 38, 40, 43 to 48, 56 to 61, 64, 66, 68		Empty pins (not connected), 2 and 19 are used to be grounded to DGND, the others are used to be grounded to AGND.

## Electrical Characteristics

(Ta=25°C, VEE=-5.2V, VRT=0V, VRB=-2V)

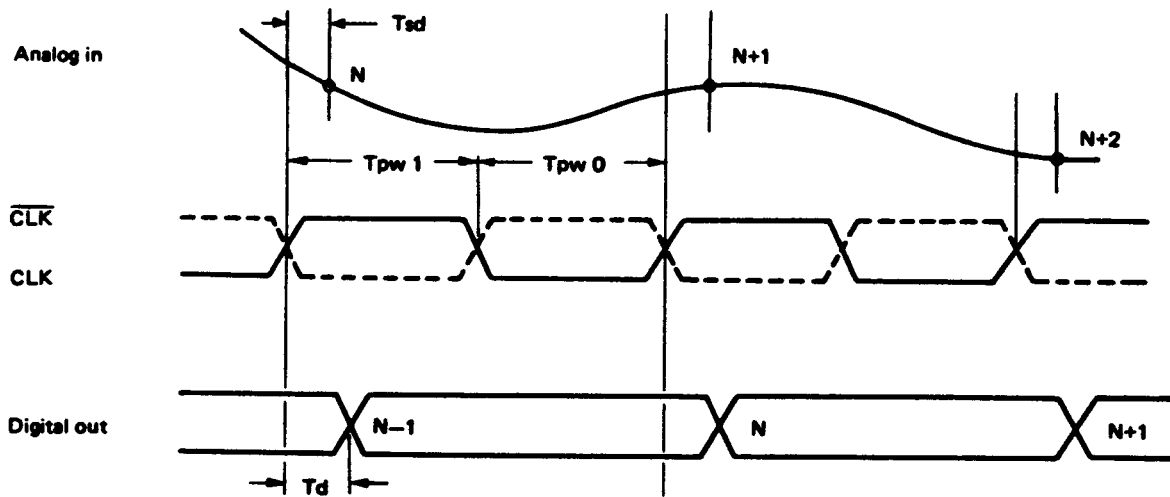
Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Maximum conversion rate	Fc	VIN=0 to -2V, fin=1 kHz, ramp	110			MSPS
Supply current	IEE		-180	-220	-260	mA
Analog input capacitance	CIN	VIN=-1V+0.07 Vrms		35	40	pF
Analog input bias current	IIN	VIN=-1V		150	220	μA
Reference resistor	Rr (VRT to VRB)		70	80	100	Ω
Offset voltage	VRT		14	17	20	mV
	VRB		6	9	12	mV
Digital input voltage	VIH		-1.0	-0.9	-0.7	V
	VIL		-1.9	-1.75	-1.6	V
Digital input current	IiH	VIH=-0.9V	0		0.4	mA
	IiL	VIL=-1.75V	-0.05		0.35	mA
Digital output voltage	VOH	RL=620Ω to VEE	-1.0			V
	VOL				-1.6	V
Output data delay	Td	RL=620Ω to VEE	3.0	3.5	4.2	ns
Non-linearity error		Fc=110 MSPS			±1/2	LSB
Differential non-linearity error		Fc=35 MSPS			±1/2	LSB
Differential gain	DG	NTSC 40 IRE mod. ramp, Fc=110 MSPS			1.5	%
Differential phase	DP				0.5	deg.
Aperture jitter	Taj			15		ps
Sampling delay	Tsd		1.9	2.2	2.5	ns

Output Coding

MINV LINV	0 0	0 1	1 0	1 1
0V	111...11	100...00	011...11	000...00
.	111...10	100...01	011...10	000...01
.	.	.	.	.
.	.	.	.	.
V <sub>IN</sub>	100...00	111...11	000...00	011...11
.	011...11	000...00	111...11	100...00
.	.	.	.	.
.	.	.	.	.
.	000...01	011...10	100...01	111...10
-2V	000...00	011...11	100...00	111...11

1: V<sub>IH</sub>, V<sub>OH</sub>  
0: V<sub>IL</sub>, V<sub>OL</sub>

Timing Chart

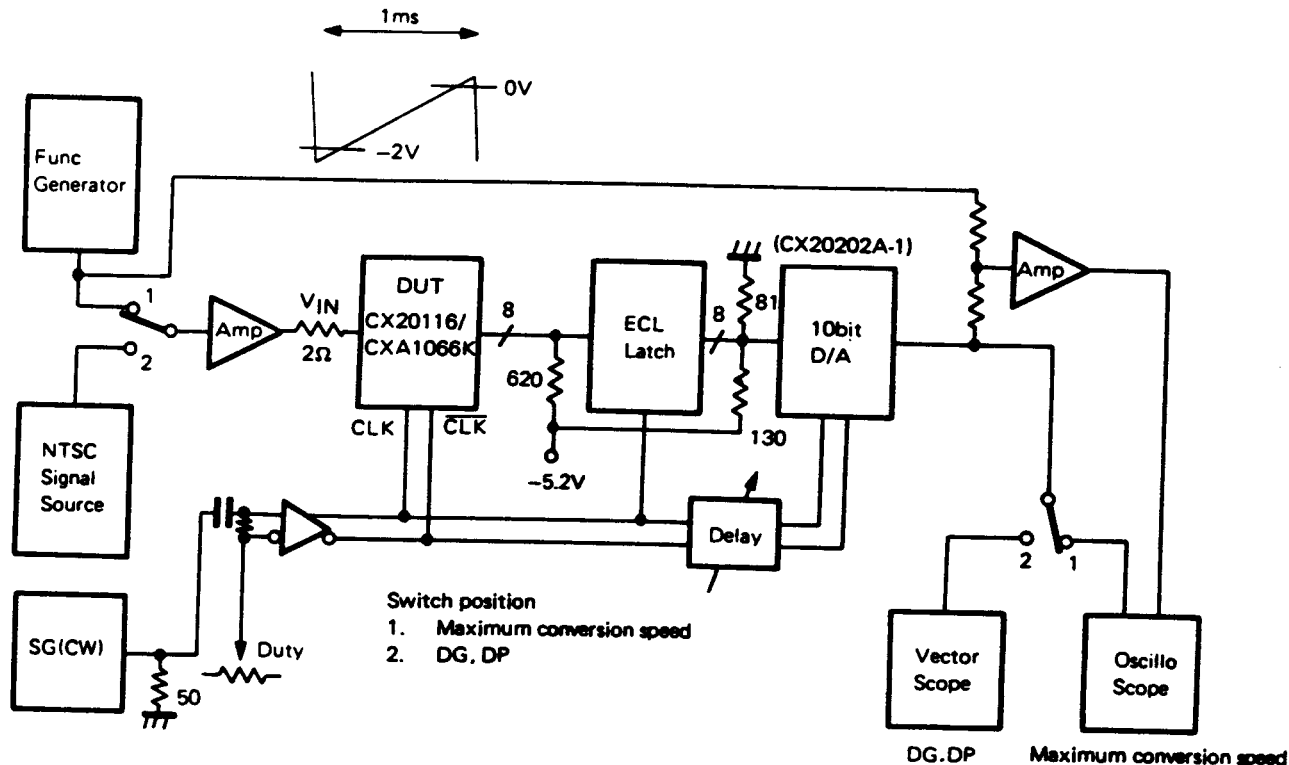


### Electrical Characteristics Test Circuit

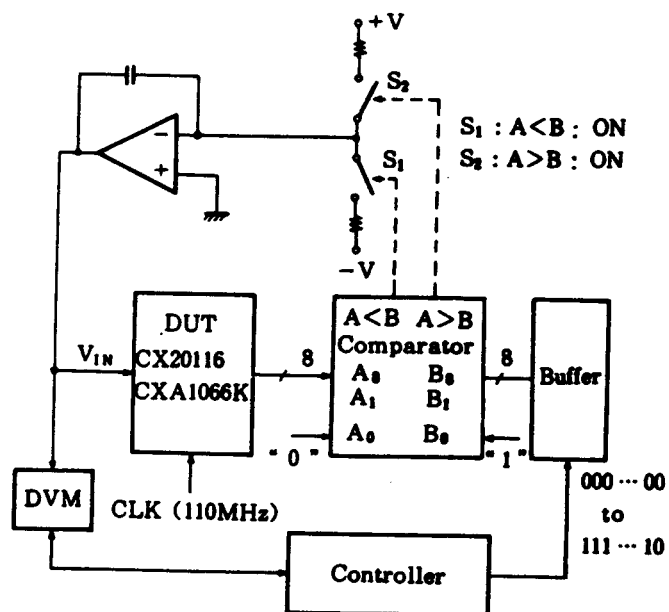
Maximum conversion speed test circuit

Differential gain error test circuit

Differential phase error test circuit

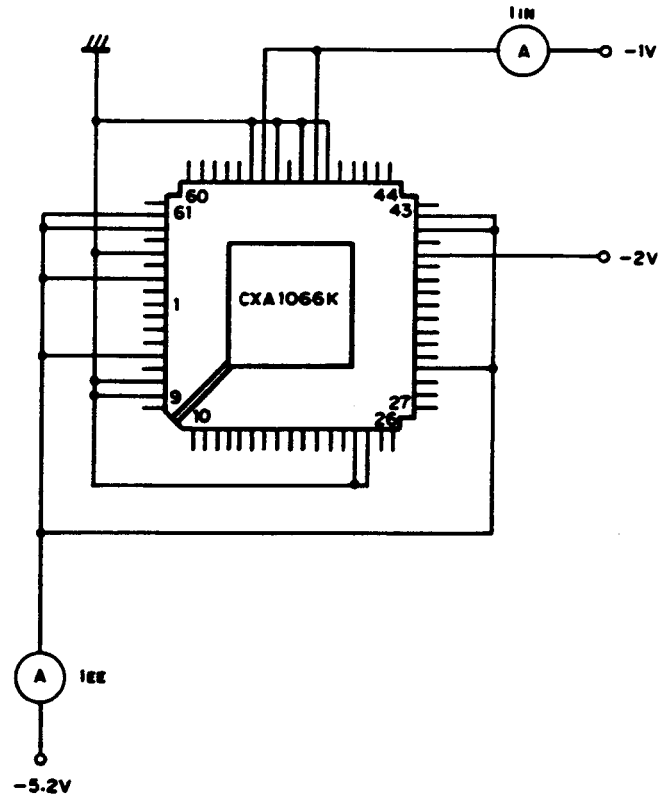
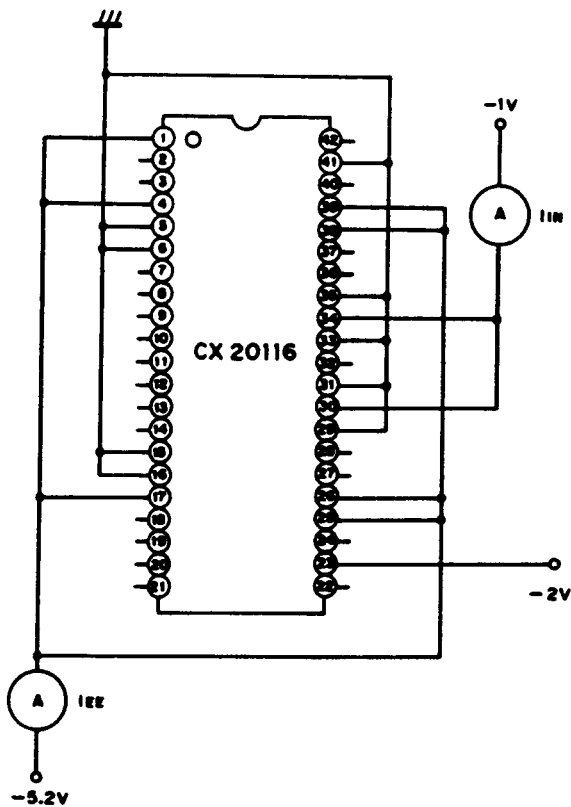


### Differential Non-linearity Test Circuit

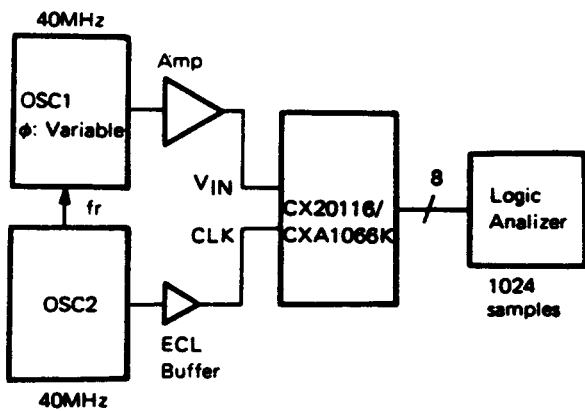


**Power Supply Current Test Circuit**

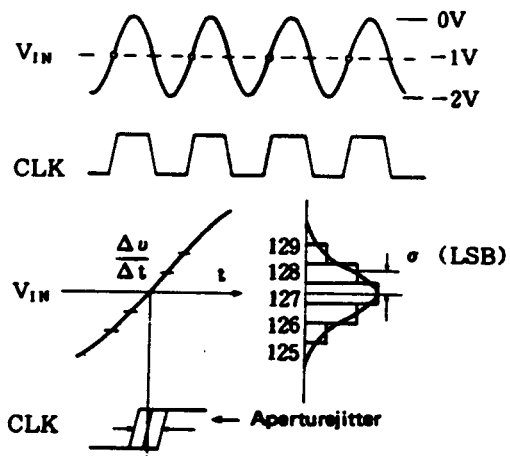
**Analog input bias current test circuit**



**Sampling Delay Test Circuit**  
**Aperture jitter test circuit**



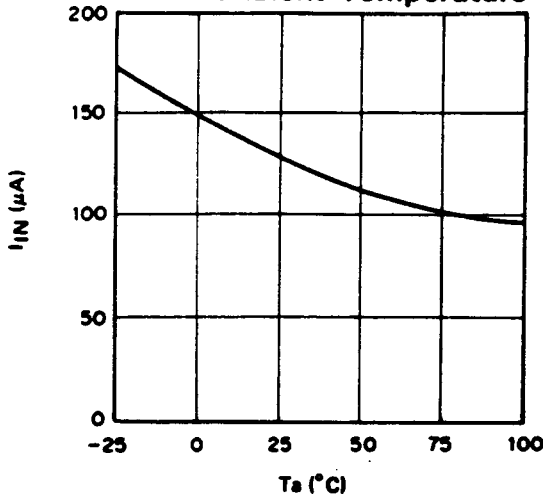
**Aperture jitter test method**



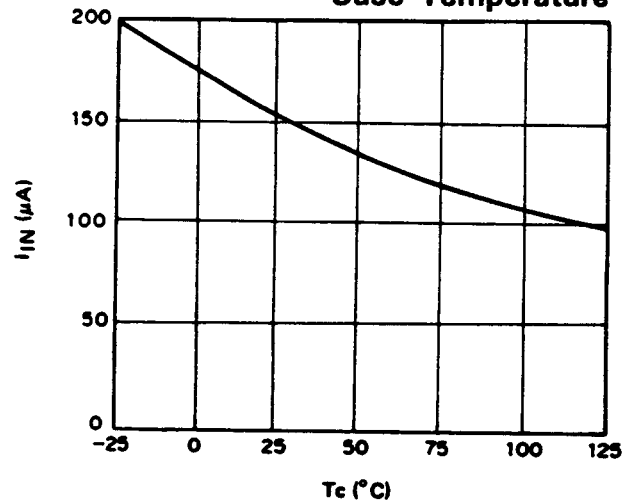
If the output distribution code is  $\sigma$  (LSB), when the maximum slew rate point is sampled at the analog input signal and the equivalent frequency clock, the aperture jitter  $T_{aj}$  becomes:

$$T_{aj} = \sigma / \frac{\Delta v}{\Delta t} = \sigma / \left( \frac{256}{2} \times 2\pi f \right)$$

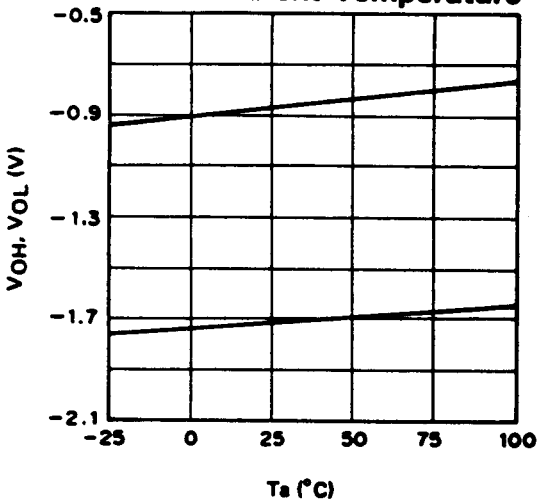
**CX20116**  
**Input Bias Current vs.**  
**Ambient Temperature**



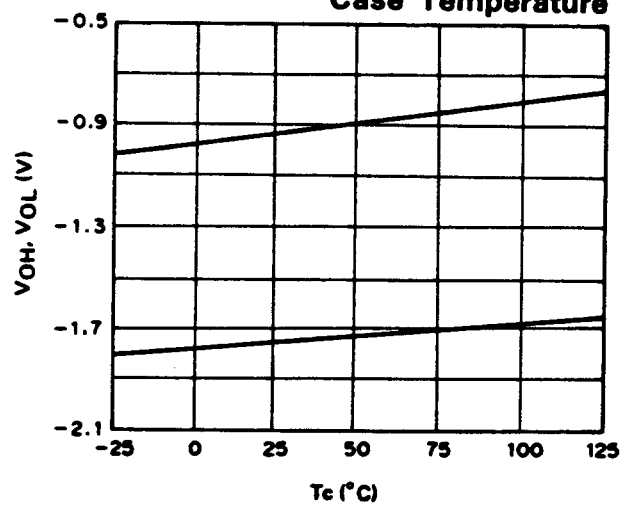
**CXA1066K**  
**Input Bias Current vs.**  
**Case Temperature**



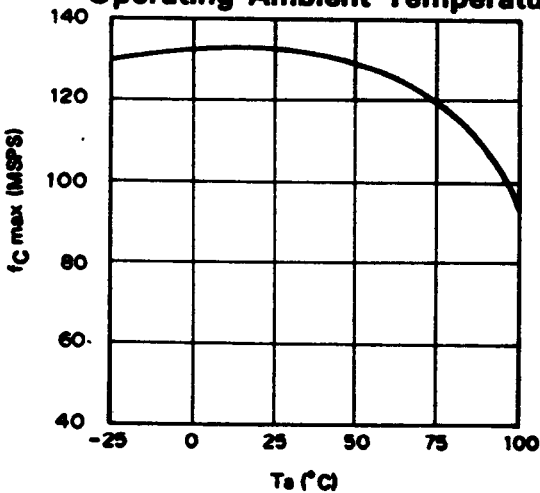
**CX20116**  
**Digital Output Voltage vs.**  
**Ambient Temperature**



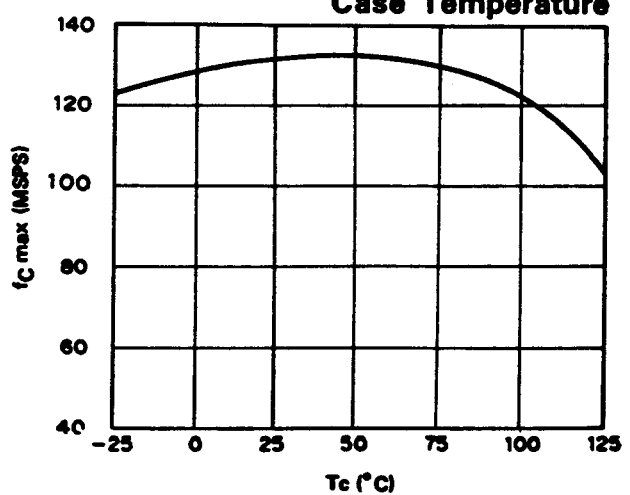
**CXA1066K**  
**Digital Output Voltage vs.**  
**Case Temperature**



**CX20116**  
**Maximum Conversion Rate vs.**  
**Operating Ambient Temperature**

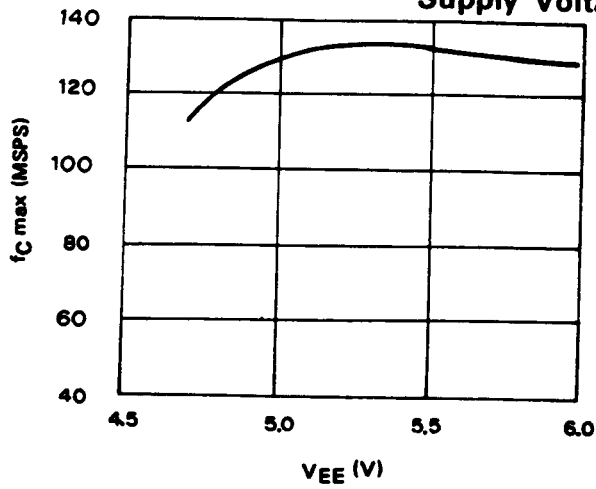


**CXA1066K**  
**Maximum Conversion Rate vs.**  
**Case Temperature**

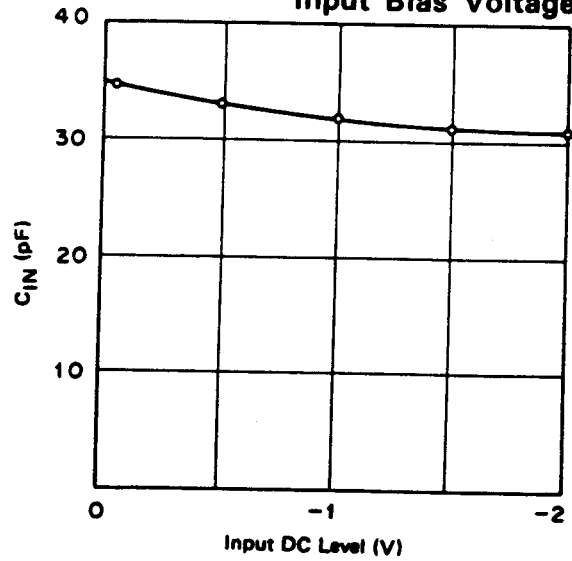




**CX20116/CXA1066K**  
**Maximum Conversion Frequency vs.**  
**Supply Voltage**



**CX20116/CXA1066K**  
**Analog Input Capacitance vs.**  
**Input Bias Voltage**



T-90-20

**Sony Package Product Name**

Type	Package name		Package	Features				
	Symbol	Description		Material*	Lead pitch	Lead shape	Lead pull out direction	
Inserted	Standard	DIP	DUAL IN LINE PACKAGE		P C	2.54mm (100MIL)	Through Hole Lead	2-direction
		SIP	SINGLE IN LINE PACKAGE		P	2.54mm (100MIL)	Through Hole Lead	1-direction
		ZIP	ZIG ZAG IN LINE PACKAGE		P	2.54mm (100MIL) Zig Zag inline	Through Hole Lead	1-direction
		PGA	PIN GRID ARRAY		C	2.54mm (100MIL)	Through Hole Lead	4-direction
		PIGGY BACK	PIGGY BACK		C	2.54mm (100MIL)	Through Hole Lead	2-direction
Shrink	SDIP	SHRINK DUAL IN LINE PACKAGE		P	1.778mm (70MIL)	Through Hole Lead	2-direction	
Surface mounted	Standard flat package	QFP	QUAD FLAT PACKAGE		P	1.0mm 0.8mm	Gull-Wing	4-direction
		SOP	SMALL-OUTLINE PACKAGE		P	1.27mm (50MIL)	Gull-Wing	2-direction
	Shrink flat package	VQFP	VERY SMALL QUAD FLAT PACKAGE		P	0.5mm	Gull-Wing	4-direction
		VSOP	VERY SMALL OUTLINE PACKAGE		P	0.65mm	Gull Wing	2-direction
	Standard chip carrier	PLCC	PLASTIC LEADED CHIP CARRIER		P	1.27mm (50MIL)	J-bend	4-direction
		LCC	LEAD LESS CHIP CARRIER		C	1.27mm (50MIL)	Lead less	Package side
	Shrink chip carrier	SPLCC (PLCC)	SHRINK PLASTIC LEADED CHIP CARRIER		P	1.27mm Max. (50MIL Max.)	J-bend	4-direction
	Standard 2-direction chip carrier	SOJ	SMALL OUTLINE J-LEAD PACKAGE		P	1.27mm (50MIL)	J-bend	2-direction



\*P.....Plastic, C.....Ceramic