SONY

CXD1170M

6-bit 40MSPS High Speed D/A Converter

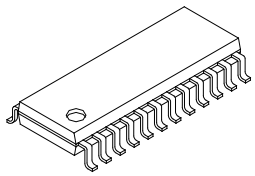
For the availability of this product, please contact the sales office.

Description

The CXD1170M is a 6-bit 40MHz high speed D/A converter. The adoption of a current output system reduces power consumption to 80mW (200Ω load at 2Vp-p output).

This IC is suitable for digital TV and graphic display applications.

24 pin SOP (Plastic)



Features

- Resolution 6-bit
- Max. conversion speed 40MSPS
- Non linearity error within ±0.1LSB
- Low glitch noise
- TTL CMOS compatible input
- +5V single power supply
- Low power consumption 80mW
  (200Ω load at 2Vp-p output)

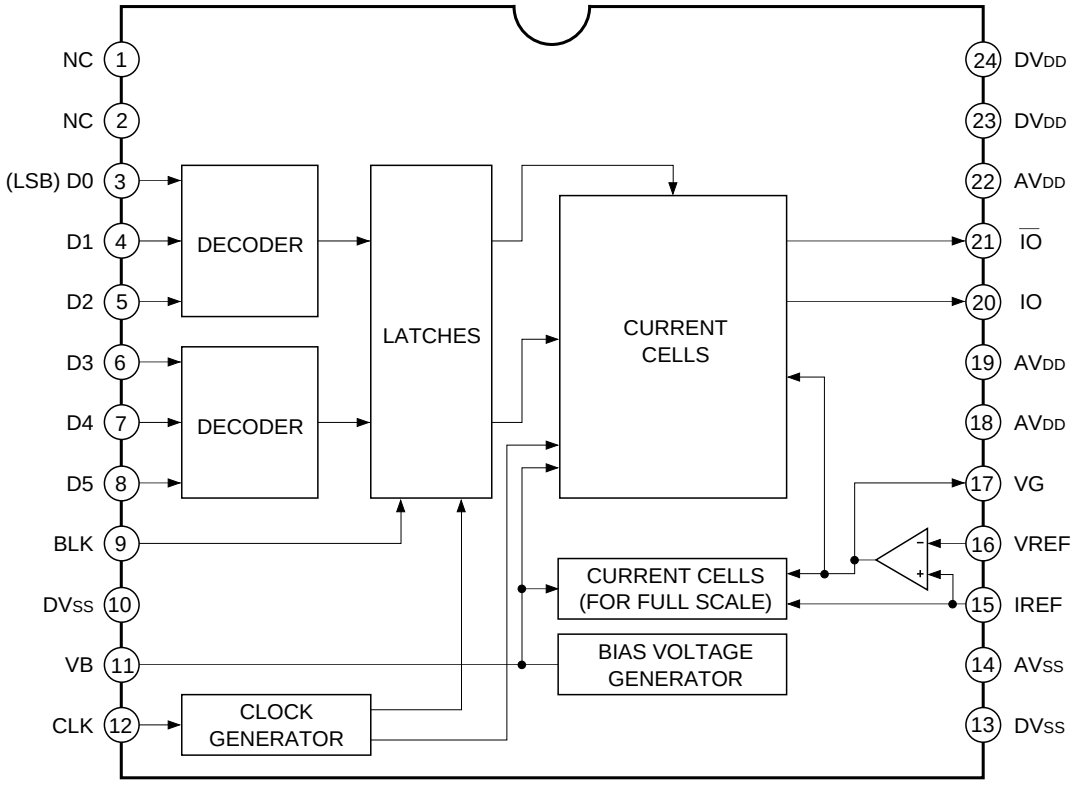
Structure

Silicon gate CMOS IC

Function

6-bit 40MHz D/A converter

Block Diagram and Pin Configuration



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E89X37B6X-PS

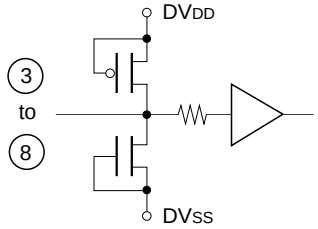
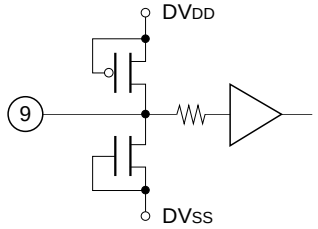
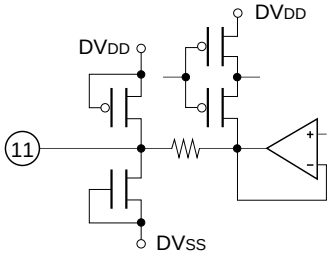
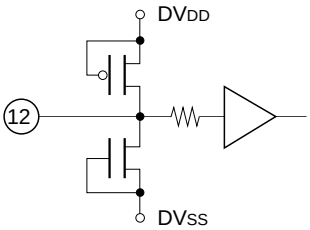
Absolute Maximum Ratings (Ta = 25°C)

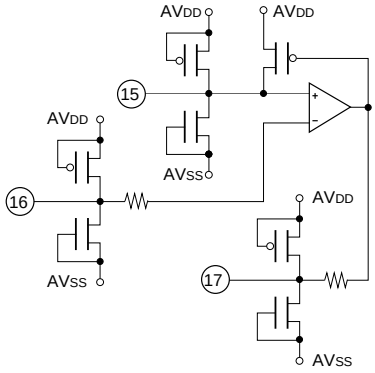
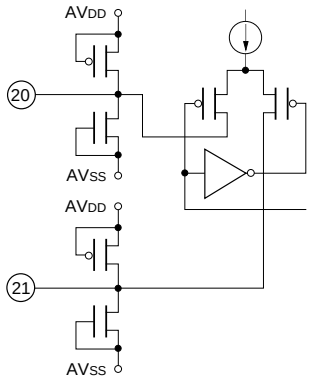
• Supply voltage	V_{DD}	7	V
• Input voltage	V_{IN}	V_{DD} to V_{SS}	V
• Output current	I_{OUT}	15	mA
• Storage temperature	Tstg	–55 to +150	°C

Recommended Operating Conditions

• Supply voltage	AV_{DD}, AV_{SS}	4.75 to 5.25	V
	DV_{DD}, DV_{SS}	4.75 to 5.25	V
• Reference input voltage	V_{REF}	2.0	V
• Clock pulse width	Tpw_1	12.5 (Min)	ns
	Tpw_0	12.5 (Min)	ns
• Operating temperature	Topr	–20 to +75	°C

Pin Description and I/O Pins Equivalent Circuit

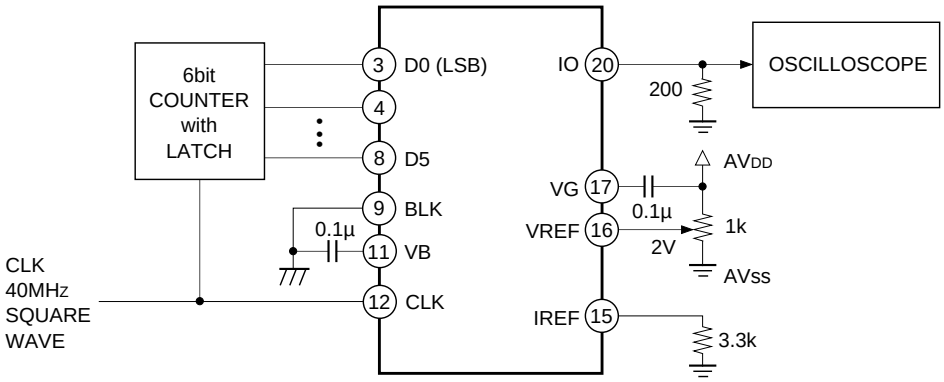
No.	Symbol	Equivalent circuit	Description
3 to 8	D0 to D5		Digital input
9	BLK		Blanking pin No signal at "H" (Output 0V) Output condition at "L"
11	VB		Connect a capacitor of about 0.1µF
12	CLK		Clock pin Moreover all input pins are TTL-CMOS compatible
10, 13	DV_{SS}		Digital GND
14	AV_{SS}		Analog GND

No.	Symbol	Equivalent circuit	Description
15	IREF		Connect a resistance 16 times "16R" that of output resistance value "R"
16	VREF		Set full scale output value
17	VG		Connect a capacitor of about 0.1µF
18, 19, 22	AVDD		Analog VDD
20	IO		Current output pin Voltage output can be obtained by connecting a resistance
21	$\overline{IO}$		Inverted current output pin Normally dropped to analog GND
23, 24	DVDD		Digital VDD

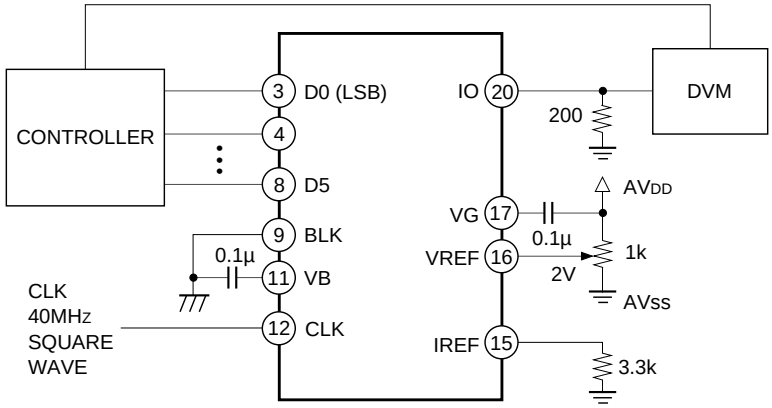
Eleoctrical Characteristics (f_{CLK} = 40MHz, V_{DD} = 5V, R_{OUT} = 200Ω, V_{REF} = 2.0V, Ta = 25°C)

Item		Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Resolution		n			6		bit
Maximum conversion speed		f_{MAX}				40	MSPS
Minimum conversion speed		f_{MIN}		0.5			MHz
Linearity error		E_L		–0.3		0.5	LSB
Differential linear error		E_D		–0.1		0.1	LSB
Full scale output voltage		V_{FS}		1.85	1.95	2.05	V
Full scale output current		I_{FS}			10	15	mA
Offset output voltage		V_{OS}				1	mV
Power supply current		I_{DD}	14.3MHz, at COLOR BAR DATA input	13	14.5	16	mA
Digital input current	High level	I_{IH}				5	µA
	Low level	I_{IL}		–5			µA
Setup time		t_S		5			ns
Hold time		t_H		10			ns
Propagation delay time		t_{PD}			10		ns
Glitch energy		GE	R_{OUT} = 75Ω		30		pV-s

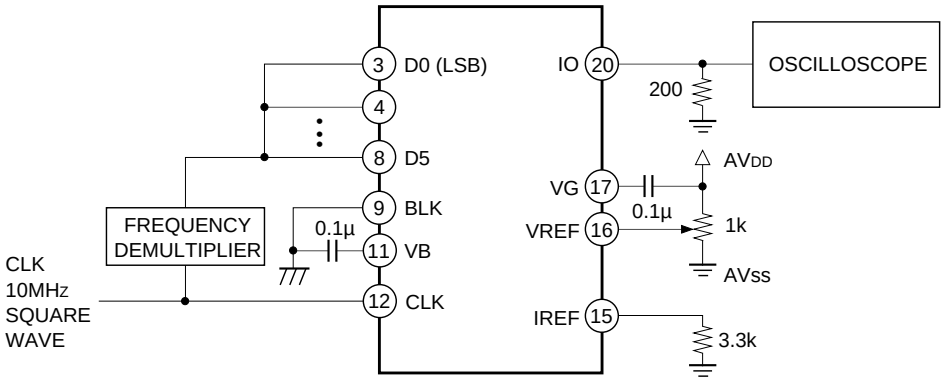
Maximum conversion speed test circuit



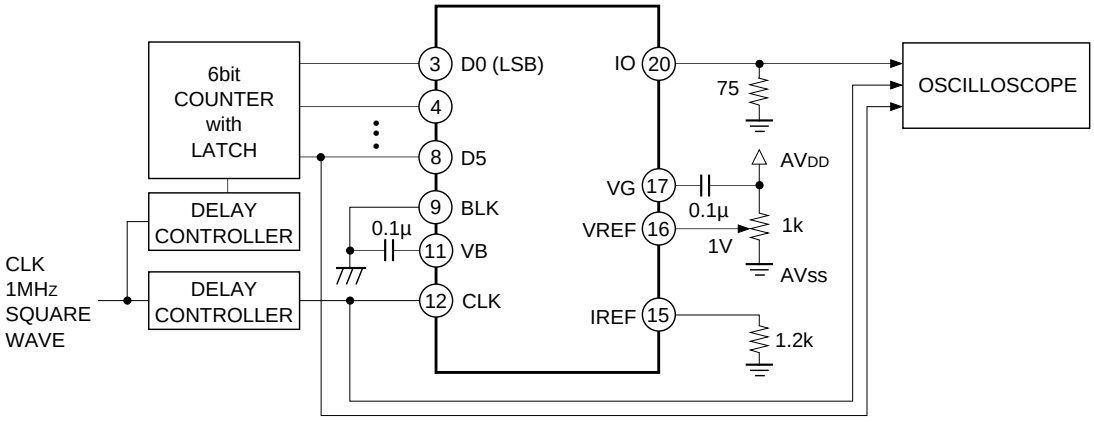
DC characteristics test circuit



Propagation delay time test circuit

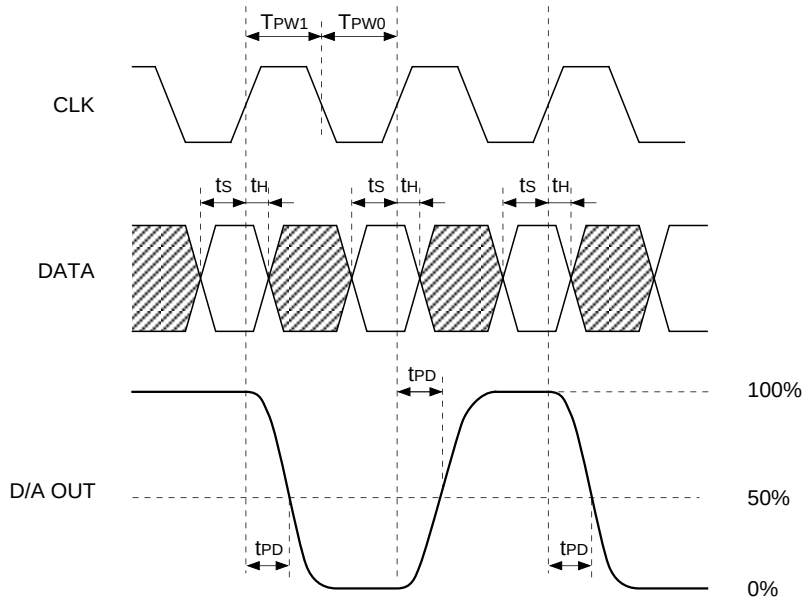


Setup hold time and glitch energy test circuit

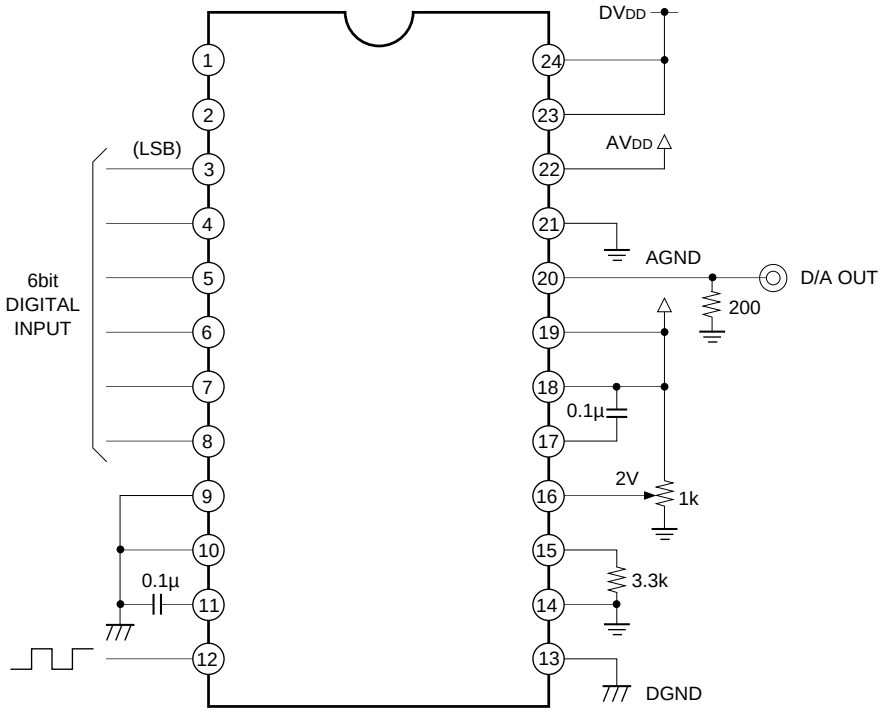


Operation

Timing Chart



Application Circuit



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

I/O Chart (when full scale output voltage at 2.00V)

Input code	Output voltage
MSB LSB	
1 1 1 1 1 1	2.0V
:	
1 0 0 0 0 0	1.0V
:	
0 0 0 0 0 0	0V

Notes on Operation

- How to select the output resistance

  The CXD1170M is a D/A converter of the current output type. To obtain the output voltage connect the resistance to IO pin. For specifications we have:

  Output full scale voltage V_{FS} = less than 2.0 [V]

  Output full scale current I_{FS} = less than 15 [mA]

  Calculate the output resistance value from the relation of $V_{FS} = I_{FS} \times R$. Also, 16 times resistance of the output resistance is connected to reference current pin I_{REF}. In some cases, however, this turns out to be a value that does not actually exist. In such a case a value close to it can be used as a substitute. Here please note that V_{FS} becomes $V_{FS} = V_{REF} \times 16R/R'$. R is the resistance connected to IO while R' is connected to I_{REF}. Increasing the resistance value can curb power consumption. On the other hand glitch energy and data settling time will inversely increase. Set the most suitable value according to the desired application.

- Phase relation between data and clock

  To obtain the expected performance as a D/A converter, it is necessary to set properly the phase relation between data and clock applied from the exterior. Be sure to satisfy the provisions of the setup time (t_S) and hold time (t_H) as stipulated in the Electrical Characteristics.

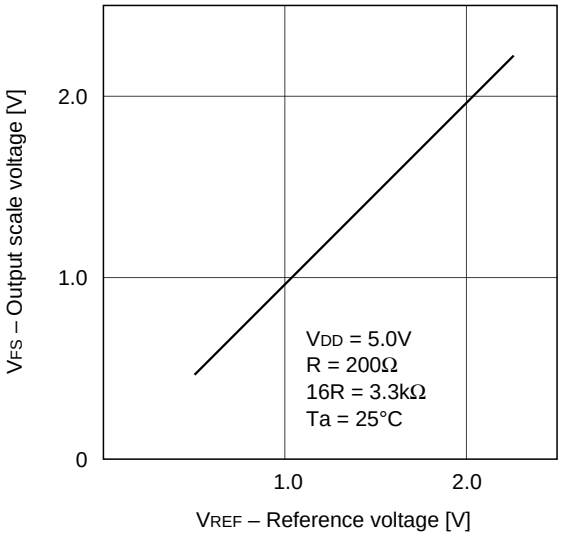
- V_{DD}, V_{SS}

  To reduce noise effects separate analog and digital systems in the device periphery. For V_{DD} pins, both digital and analog, bypass respective GNDs by using a ceramic capacitor of about 0.1µF, as close as possible to the pin.

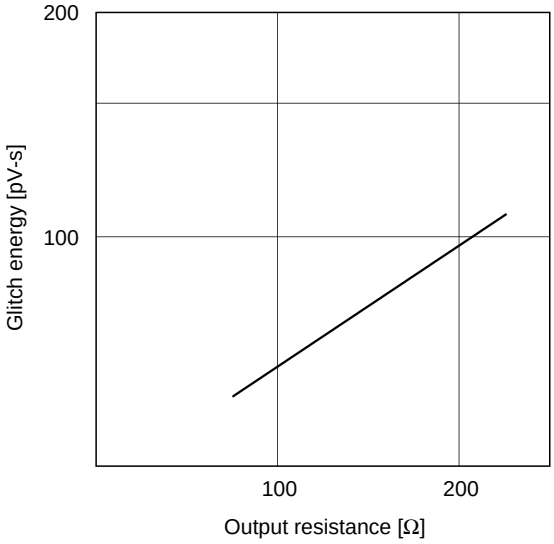
- Latch up

  AV_{DD} and DV_{DD} have to be common at the PCB power supply source. This is to prevent latch up due to voltage difference between AV_{DD} and DV_{DD} pins when power supply is turned ON.

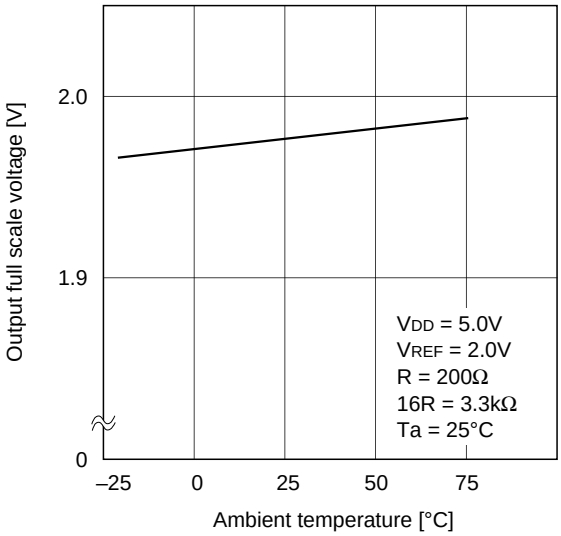
Output full scale voltage vs. Reference voltage



Output resistance vs. Glitch energy

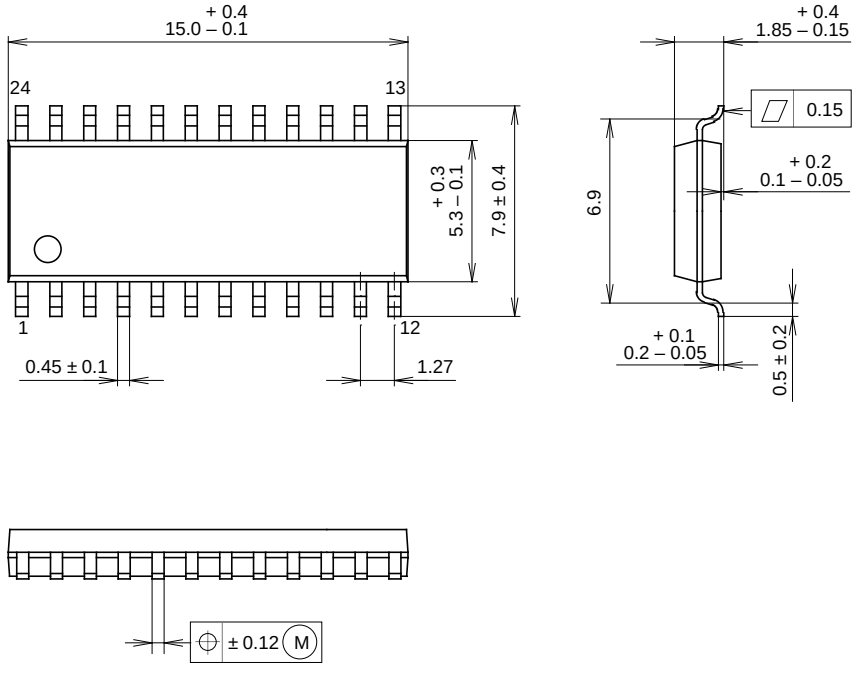


Output full scale voltage vs. Ambient temperature



Package Outline Unit: mm

24PIN SOP (PLASTIC)



SONY CODE	SOP-24P-L01
EIAJ CODE	∗SOP024-P-0300-A
JEDEC CODE	————

PACKAGE STRUCTURE

MOLDING COMPOUND	EPOXY/PHENOL RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY / 42ALLOY
PACKAGE WEIGHT	0.3g