MAS9184A

12 X 8-bit D to A Converter

- **12-bit serial data input**
- **Highly stable output buffer**
- **Serial data output for Daisy-Chaining**

DESCRIPTION

The MAS9184 is a CMOS structured integrated circuit with 12 built-in D to A converter channels and 12 corresponding output buffer operational amplifiers. A simple 3-wire serial interface transfers digital data from the micro controller. The output buffers operate in the entire voltage range from ground to the positive power supply rail.

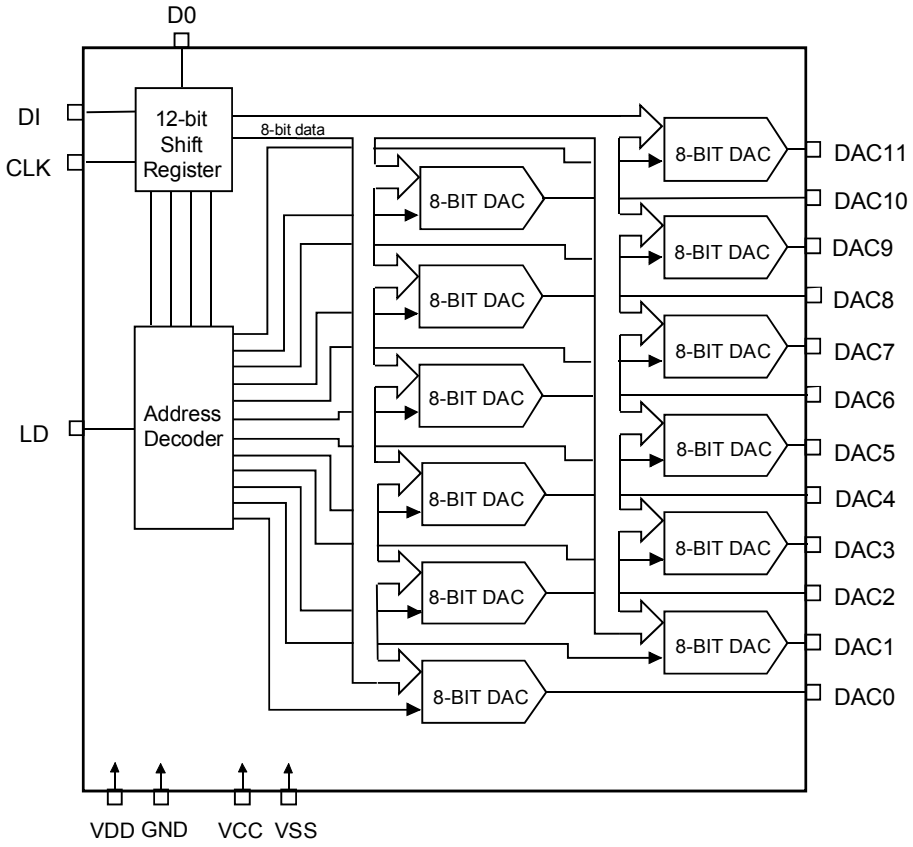
FEATURES

- Twelve 8-bit DACs on a single monolithic chip
- Voltage level output
- SO 20 package
- Single +5V supply
- Power-on reset

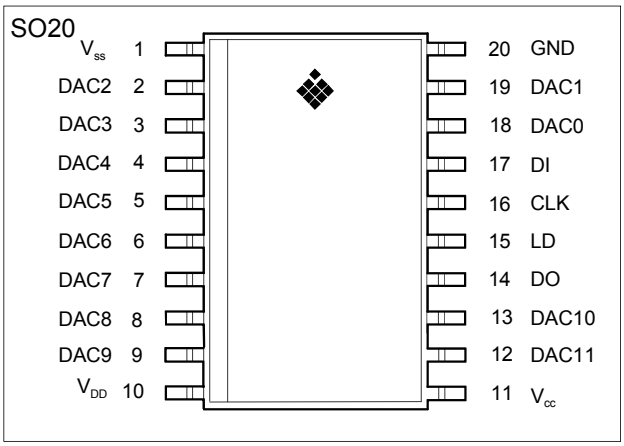
APPLICATION

- High resolution monitors
- Automatic gain control
- Trimmer replacement

BLOCK DIAGRAM



PIN CONFIGURATION



PIN DESCRIPTION

Pin name	SO	Function
V_{SS}	1	D/A converter low level reference voltage input terminal
DAC2	2	8-bit D/A converter output terminal
DAC3	3	8-bit D/A converter output terminal
DAC4	4	8-bit D/A converter output terminal
DAC5	5	8-bit D/A converter output terminal
DAC6	6	8-bit D/A converter output terminal
DAC7	7	8-bit D/A converter output terminal
DAC8	8	8-bit D/A converter output terminal
DAC9	9	8-bit D/A converter output terminal
V_{DD}	10	D-A converter high level reference voltage input terminal
V_{CC}	11	Power supply terminal
DAC10	12	8-bit D/A converter output terminal
DAC11	13	8-bit D/A converter output terminal
DO	14	Serial data output terminal
LD	15	Latch data terminal
CLK	16	Serial clock input terminal
DI	17	Serial data input terminal
DAC0	18	8-bit D/A converter output terminal
DAC1	19	8-bit D/A converter output terminal
GND	20	Digital and analog ground

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	V_{CC}		-0.3	7.0	V
High level reference voltage	V_{DD}		-0.3	7.0	V
Digital input voltage	Vin		-0.3	V_{CC}+0.3	V
Output voltage	Vout		-0.3	V_{CC}+0.3	V
Power dissipation	P_D			150	mW
Operating temperature	T_{amb}		-20	+85	^oC
Storage temperature	T_S		-55	+125	^oC

RECOMMENDED OPERATION CONDITIONS

(V_{CC} =V_{DD} = 5V±10%, GND = V_{SS} = 0V, Ta = -20 ^oC to +85 ^oC, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{CC}		4.5	5.0	5.5	V
Supply current	I_{CC}	CLK = 1MHz		2.5		mA
Input leakage current	I_{ILK}	Vin = 0V to V_{CC}	-10		10	uA

ELECTRICAL CHARACTERISTICS

◆ Digital inputs

(V_{CC} =V_{DD} = 5V±10%, GND = V_{SS} = 0V, Ta = -20 °C to +85 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input low voltage	V_{IL}				$3.0V_{CC}$	V
Input high voltage	V_{IH}		$0.7V_{CC}$			V

◆ Digital outputs

(V_{CC} =V_{DD} = 5V±10%, GND = V_{SS} = 0V, Ta = -20 °C to +85 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output low voltage	V_{OL}	I_{OL} = 400uA			0.4	V
Output high voltage	V_{OH}	I_{OH} = -400uA	V_{CC}-0.4			V

◆ Analog outputs

(V_{CC} =V_{DD} = 5V±10%, GND = V_{SS} = 0V, Ta = -20 °C to +85 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference voltage pin current	I_{DD}		30	50	80	uA
D/A high level reference voltage range	V_{DD}		3.0		V_{CC}	V
D/A low level reference voltage range	V_{SS}		GND		V_{CC}-3.0	V
Buffer amplifier output voltage range	V_{AO}	I_{AO} = 100uA	0.1		V_{CC}-0.1	V
		I_{AO} = 500uA	0.2		V_{CC}-0.2	V
Buffer amplifier output drive range	I_{AO}		-5.0		5.0	mA
Differential nonlinearity	S_{DL}		-1.0		1.0	LSB
Nonlinearity	S_L		-1.5		1.5	LSB
Zero code error	S_{ZERO}		-1.0		1.0	LSB
Full scale error	S_{FULL}		-1.0		1.0	LSB
Output capacitive load	C_L				0.1	uF
Buffer amplifier output impedance	R_O			5		Ω

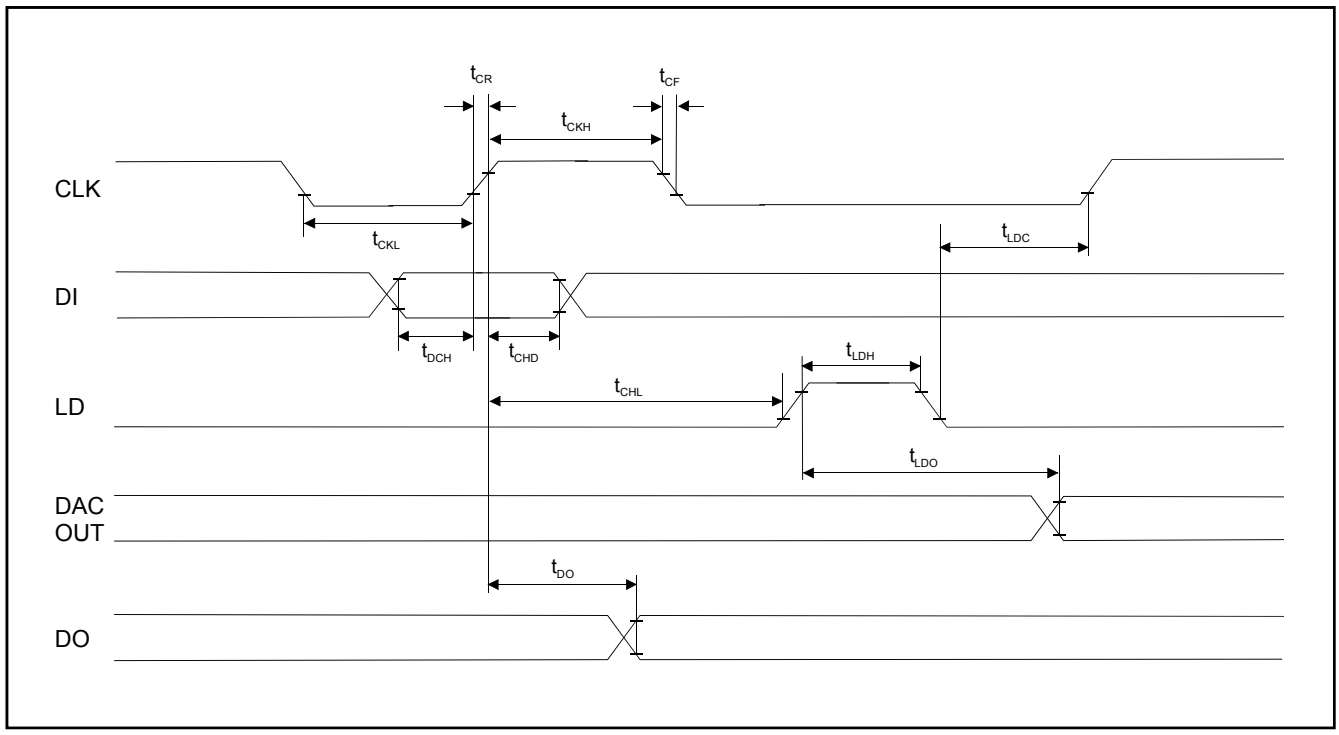
ELECTRICAL CHARACTERISTICS

◆ AC Characteristics

(V_{CC} =V_{DD} = 5V±10%, GND = V_{SS} = 0V, Ta = -20 °C to +85 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Clock 'L' pulse width	t_{CKL}		100			ns
Clock 'H' pulse width	t_{CKH}		100			ns
Rise time	t_{CR}				200	ns
Fall time	t_{CF}				200	ns
Data setup time	t_{DCH}		30			ns
data hold time	t_{CHD}		70			ns
LD setup time	t_{CHL}		200			ns
LD hold time	t_{LDC}		100			ns
LD 'H' pulse width	t_{LDH}		100			ns
Data output delay time	t_{DO}		70		350	ns
D/A output settling time	t_{LDD}				300	ns
Power-on reset level	V_{CC}		2.4	3.0	3.3	V

◆ Timing diagram



TIMING

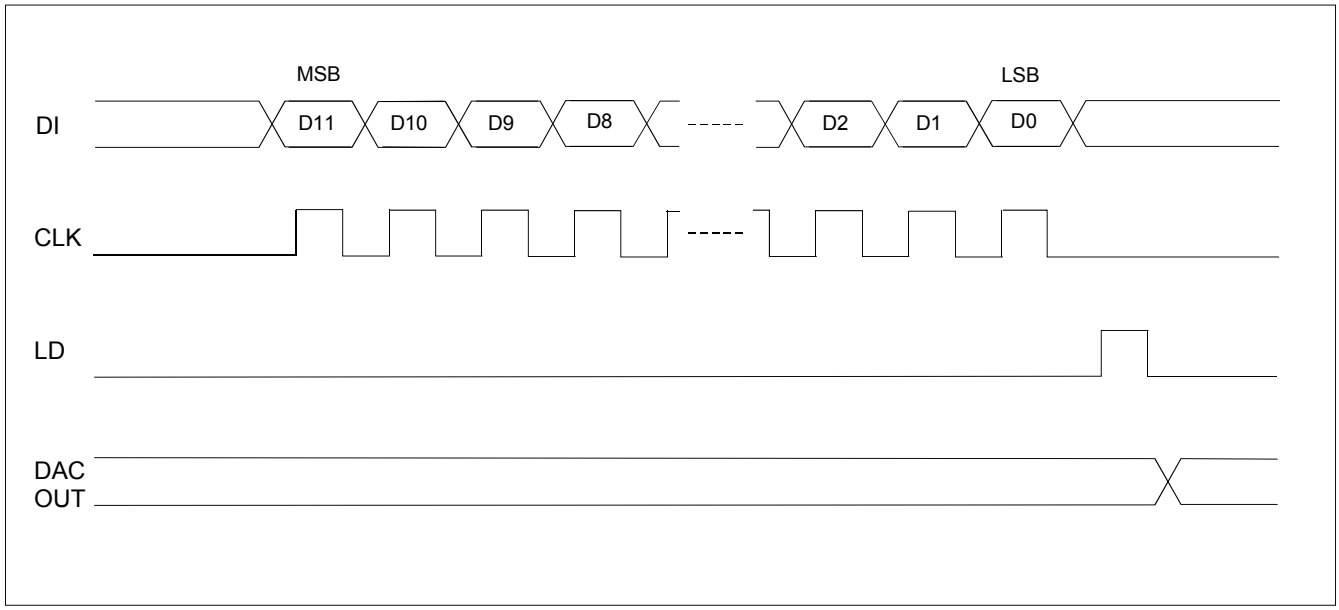
◆ Data format

Address Data				Selected
D11	D10	D9	D8	DAC
0	0	0	0	X
1	0	0	0	DAC0
0	1	0	0	DAC1
1	1	0	0	DAC2
0	0	1	0	DAC3
1	0	1	0	DAC4
0	1	1	0	DAC5
1	1	1	0	DAC6
0	0	0	1	DAC7
1	0	0	1	DAC8
0	1	0	1	DAC9
1	1	0	1	DAC10
0	0	1	1	DAC11
1	0	1	1	X
0	1	1	1	X
1	1	1	1	X

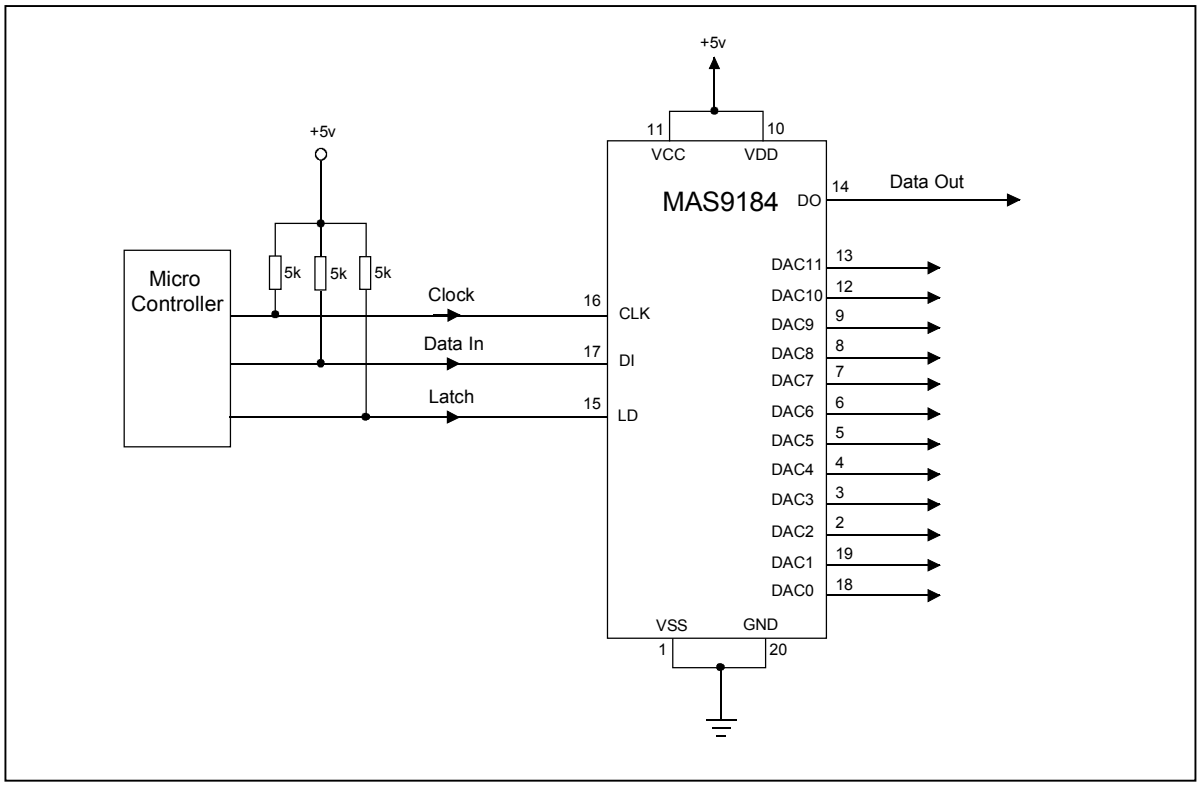
X = Don't care condition

DAC Data								DAC Output Level
D7	D6	D5	D4	D3	D2	D1	D0	
0	0	0	0	0	0	0	0	V_{SS}
0	0	0	0	0	0	0	1	$(V_{DD}-V_{SS})/256x1+V_{SS}$
0	0	0	0	0	0	1	0	$(V_{DD}-V_{SS})/256x2+V_{SS}$
0	0	0	0	0	0	1	1	$(V_{DD}-V_{SS})/256x3+V_{SS}$
0	0	0	0	0	1	0	0	$(V_{DD}-V_{SS})/256x4+V_{SS}$
0	0	0	0	0	1	0	1	$(V_{DD}-V_{SS})/256x5+V_{SS}$
0	0	0	0	0	1	1	0	$(V_{DD}-V_{SS})/256x6+V_{SS}$
:	:	:	:	:	:	:	:	:
:	:	.	:	:	:	:	:	:
1	1	1	1	1	0	0	1	$(V_{DD}-V_{SS})/256x249+V_{SS}$
1	1	1	1	1	0	1	0	$(V_{DD}-V_{SS})/256x250+V_{SS}$
1	1	1	1	1	0	1	1	$(V_{DD}-V_{SS})/256x251+V_{SS}$
1	1	1	1	1	1	0	0	$(V_{DD}-V_{SS})/256x252+V_{SS}$
1	1	1	1	1	1	0	1	$(V_{DD}-V_{SS})/256x253+V_{SS}$
1	1	1	1	1	1	1	0	$(V_{DD}-V_{SS})/256x254+V_{SS}$
1	1	1	1	1	1	1	1	$(V_{DD}-V_{SS})/256x255+V_{SS}$

◆ Data format Timing

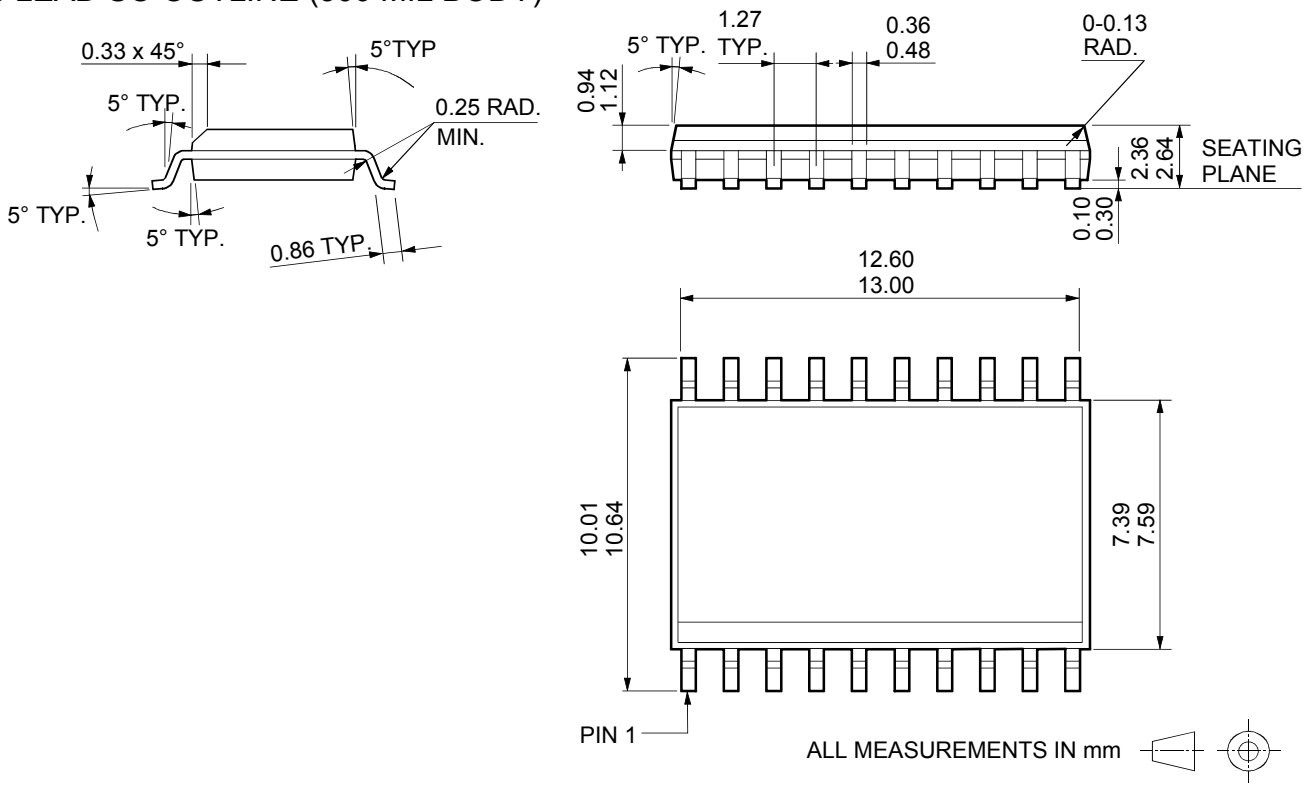


APPLICATION AND TEST CIRCUIT INFORMATION



PACKAGE OUTLINES

20 LEAD SO OUTLINE (300 MIL BODY)



ORDERING INFORMATION

Product Code	Product	Package	Comments
MAS9184AS	12 x 8-bit D to A Converter	20 Pin SO 0.3”	
MAS9184AS-T	12 x 8-bit D to A Converter	20 Pin SO 0.3”	T&R

LOCAL DISTRIBUTOR

MICRO ANALOG SYSTEMS OY CONTACTS

Micro Analog Systems Oy Kamreerintie 2, P.O. Box 51 FIN-02771 Espoo, FINLAND	Tel. +358 9 80 521 Fax +358 9 805 3213 http://www.mas-oy.com