

Features

- High precision ADC, 18 bits effective resolution, 1 differential or 2 single-ended inputs
- Low noise, high input impedance preamplifier with selectable gain: 1, 12.5, 50, 100, or 200
- 8 bits RISC ultra low power MCU. At 3V, current consumption is 300uA typically, 1.5uA at standby and 32kHz clock, and less than 1uA at sleep
- 8k bytes OTP, 256 bytes SRAM
- ADC output rate: 8SPS-2kSPS
- 9SEG X 4COM LCD drive, LED drivers
- Built-in temperature sensor, supports single point calibration
- Selectable voltage source: 2.4V/2.6V/2.9V/3.3V
- Flexible battery voltage detection: 2.0V~ 3.3V
- Low voltage detection and power on reset circuit
- Operating voltage range: 2.4V~ 3.6V
- Operating temperature range: -40°C~ 85°C

Description

The SD8110 is a CMOS SOC with built-in 24 bits ADC and low programming voltage OTP memory. The OTP can be used for software calibration.

The IC was designed with ultra low power technology. Operating at 2MHz operating clock rate and 3V supply, the MCU itself only consumes 300uA. With ADC active, the total typical operating current is 750uA. Such low current consumption is very suitable for battery powered applications.

Applications

Measuring instrument

Ordering Information

SOP24 package

Pin Diagram and Descriptions

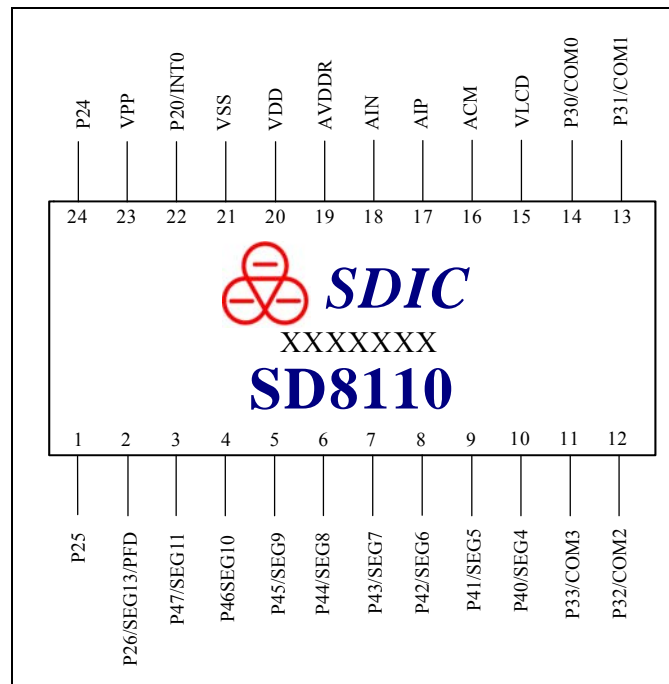


Figure 1. Pad diagram

Table 1. Pad Descriptions

Pad No.	Pin Name	Attribute	Description
1	P25	I/O	Digital port P25
2	P26/SEG13/ PFD	I/O	Digital port P26, LCD segment SEG13, or Programmable Frequency Divider PFD
3-10	P47/SEG11 -- P40/SEG4	I/O	Digital port P47-P40, or LCD SEG11-SEG4
11-14	P33/COM3 -- P30/COM0	I/O	Digital port P33-30 or LCD COM3-0
15	VLCD	Analog	LCD driver power supply, internally connect to VDD or booster output through register setting, connect 1uF filter capacitor to VDD
16	ACM	Analog	1.2V reference output, floating when ACM is shutdown, connect 0.1uF cap to VSS
17	AIP	Analog input	Analog signal differential or two single-ended inputs Should enable the internal pull-down resistor for unused input
18	AIN		
19	AVDDR	Analog	Internal LDO output for IC's analog module, can provide excitation to external transducer, connect 0.1uF filter capacitor to VSS
20	VDD	Power	Power supply voltage, connect 0.1uF capacitor to VSS
21	VSS	Ground	Ground
22	P20/INT0	I/O	Digital port P20 or external interrupt0 INT0
23	VPP	I	OTP high voltage programming pin, connect 1uF capacitor to VDD or VSS
24	P24	I/O	Digital port P24

Remark: All I/O ports Pnn have internal pull-up option (default OFF) and input hysteresis at 0.3VDD/0.7VDD.

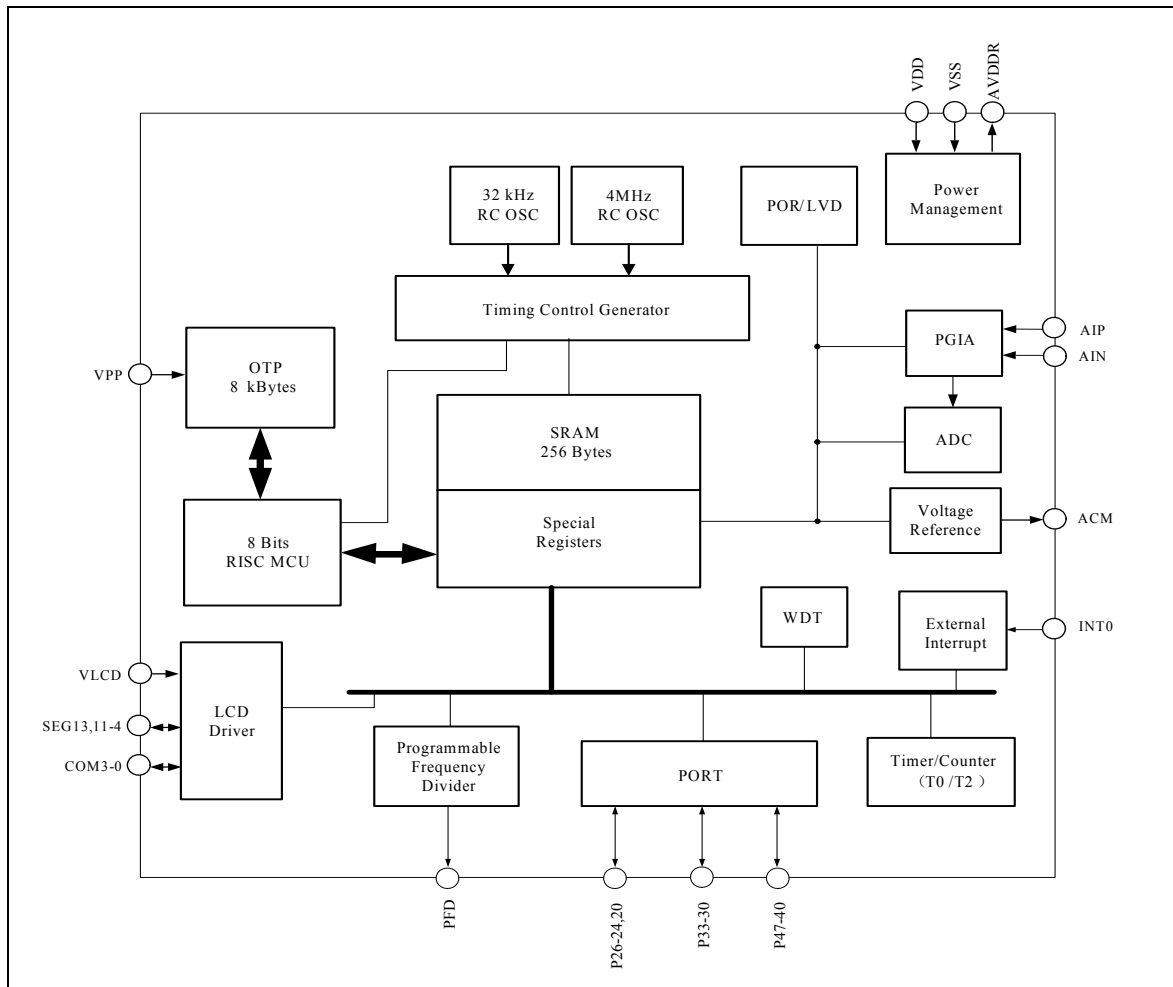
Functional Block


Figure 2. Functional block diagram

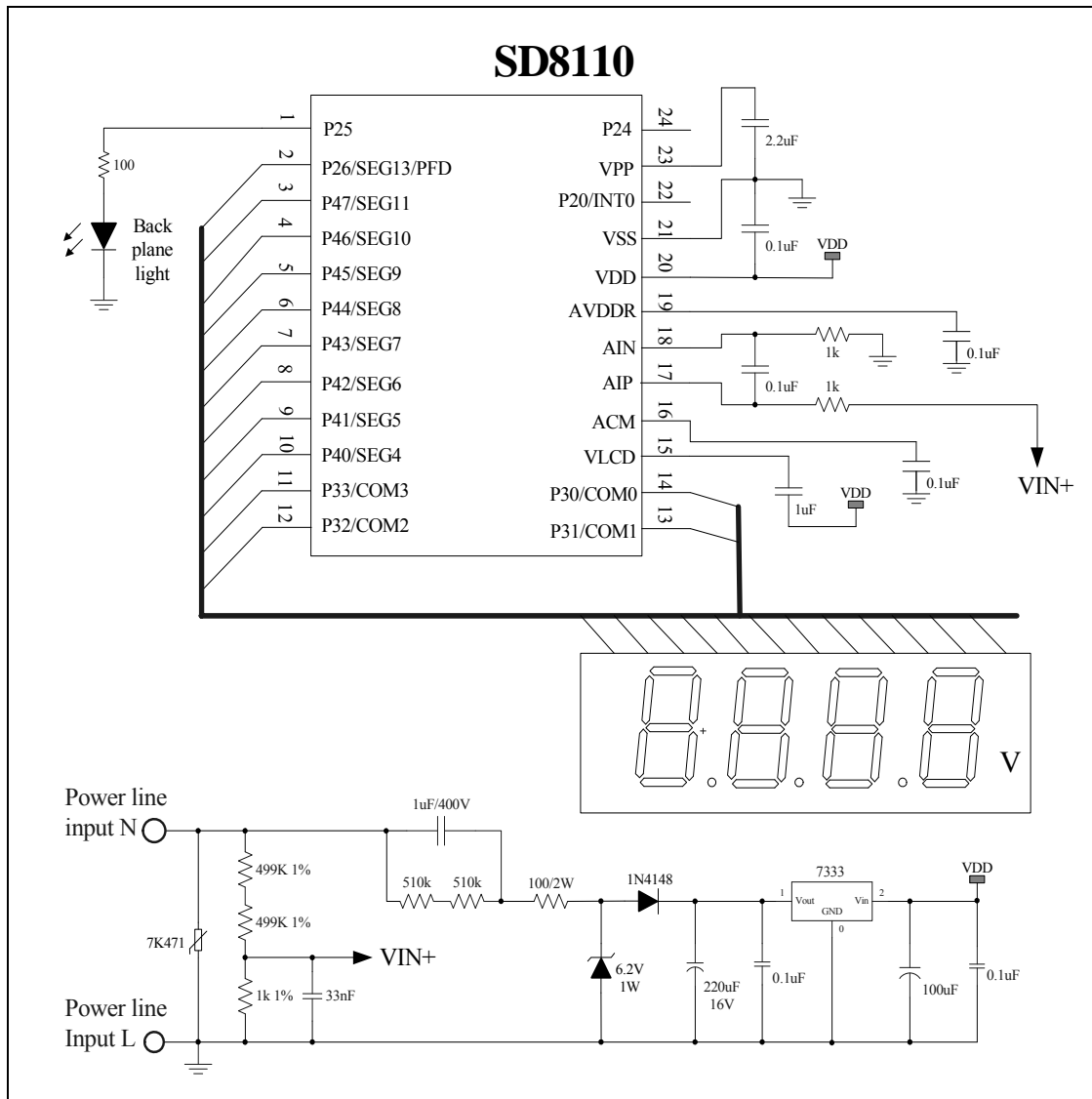
Typical Applications


Figure 3. LCD voltage meter typical application diagram

Electrical Specifications

Table 2. Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit
T_A	Operating temperature	-40	+85	°C
T_S	Storage temperature	-55	+150	°C
V_{DD}	Supply voltage	-0.2	+4.0	V
V_{pp}	Programming voltage	-0.2	+7.5	V
V_{IN}, V_{OUT}	Digital input/output voltage	-0.2	$V_{DD}+0.3$	V
T_L	Reflow temperature profile	Per IPC/JEDECJ-STD-020C		°C

Remarks:

1. CMOS device can easily be damaged by electrostatics. It must be stored in conductive foam, and careful not to exceed the operating voltage range.
2. Turn off power before insert or remove the device.

Table 3. Electrical Specifications ($V_{DD}=3V, T_A=25^\circ C$)

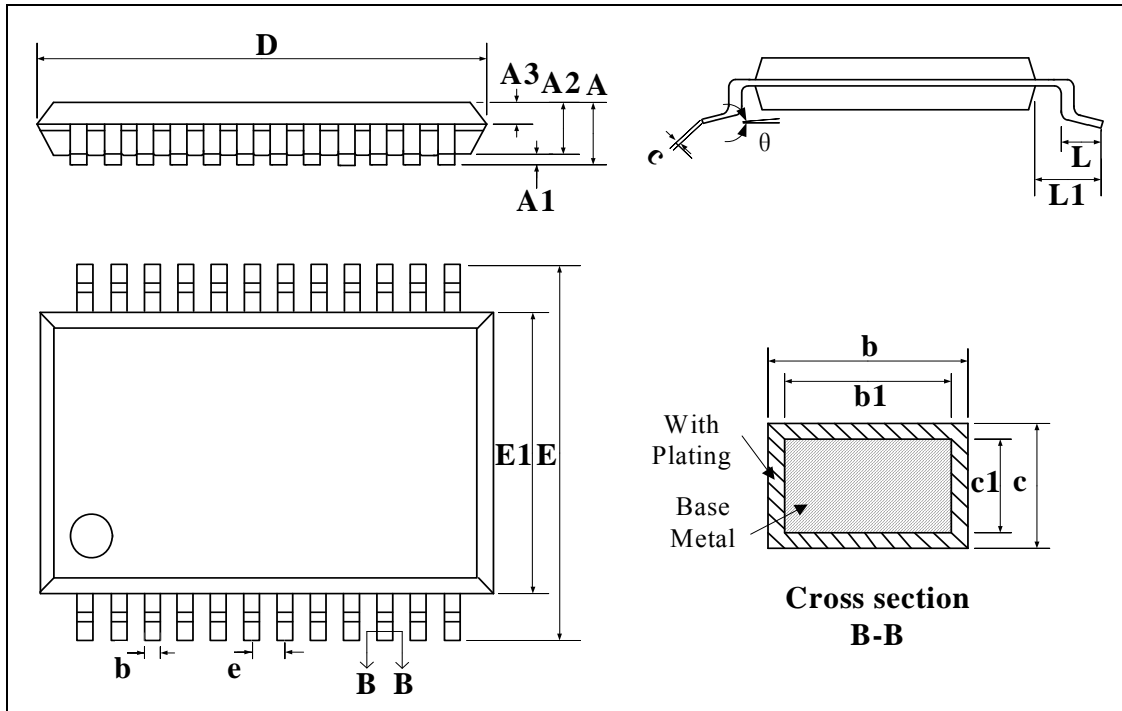
Symbol	Parameter	Minimum	Typical	Maximum	Unit	Conditions/Remarks
VDD	Supply voltage	2.4	3.0	3.6	V	Analog modules operating voltage
		2.0	3.0	3.6	V	Digital modules and MCU operating voltage
FOSC	Operating frequency	16k	2M	4M	Hz	FOSC must be 2MHz when read/write tables in OTP
IHRC	Internal high frequency RC oscillator	3.9	--	4.1	MHz	Frequency after calibration
ILRC	Internal low frequency RC oscillator	28	--	36	kHz	Frequency after calibration
IDD1	Operating current 1	--	750	--	uA	2MHz internal RC oscillator for MCU Analog and digital modules active
IDD2	Operating current 2	--	7	--	uA	32kHz internal RC oscillator for MCU Digital modules active Analog modules inactive
IDD3	Operating current 3	--	1.5	--	uA	32kHz internal RC oscillator for MCU MCU at standby mode Analog modules inactive
IDD4	Operating current 4	--	0.2	1	uA	MCU at sleep mode Analog modules inactive
Fsam	ADC sampling rate	128	--	256	kHz	
OSR	Over sampling rate	128	--	16384		
NFbit	Noise free bits ¹	--	15	--	bits	Gain=1, input FSR= $\pm 800mV$
NMbit	No missing code	--	--	24	bits	
INL	Integral nonlinearity	--	--	0.01	%FSR	
VINdif	PGIA differential input range	--	--	1800	mV	1X gain
		-Vref/12.5	--	Vref/12.5		12.5X gain
		-Vref/50	--	Vref/50		50X gain
		-Vref/100	--	Vref/100		100 X gain
		-Vref/200	--	Vref/200		200 X gain

VIN	PGIA input voltage range ²	-0.3	--	AVDDR		1X gain and buffer is off
		0.3	--	AVDDR-0.7		1X gain and buffer is on, or gain≠1
Nrms	RMSnoise	--	90	--	nVrms	200X gain
Vacm	ACM voltage output	--	1.2	--	V	
IacmSour	ACM current source	--	1	--	mA	
IacmSink	ACM current sink	--	1	--	mA	
PSRacm	ACMPSR	--	100	--	uV/V	
Tgain	Gain tempco	--	±4	--	ppm/°C	-10°C to 40°C
Vavddr	AVDDR Voltage output	--	2.4	--	V	AVDDRX [1:0]=00
		--	2.6	--		AVDDRX [1:0]=01
		--	2.9	--		AVDDRX [1:0]=10
		--	3.3	--		AVDDRX [1:0]=11
Iavddr	AVDDR current	--	10	18	mA	
POR	POR voltage	--	2.0	--	V	
LVD	Low Voltage Detect reset voltage	--	1.9	--	V	
THlbt	LVD hysteresis	--	200	--	mV	
Iled	LCD charge pump current ³	--	--	500	uA	
Digital I/O parameter						
IOL	Output low current sink	--	2	--	mA	VOL=0.3V, PTxSR=0
		--	10	--		VOL=0.3V, PTxSR=1
IOH	High output current source	--	2	--	mA	VOH=VDD-0.3V, PTxSR=0
		--	10	--		VOH=VDD-0.3V, PTxSR=1
VIH	Input high voltage	0.7VDD	--	--	V	
VIL	Input low voltage	--	--	0.3VDD	V	
VOH	Output high voltage	VDD-0.3	--	--	V	
VOL	Output low voltage	--	--	VSS+0.3	V	

Note:

- Noise free bits and effective resolution are both related to the signal's full scale range. Its peak to peak or rms noise plays the decisive role.
- The signal input range is limited by the differential signal input range and the absolute voltage at the input terminals. The first one is the real signal input range. It is affected by the PGIA gain and the ADC voltage reference choice. The second one includes both differential and common mode components and is mainly limited by the circuit.
- The charge pump driving capability is related to the choice of capacitor and the operating frequency.

Packaging Information



Dimensions:mm

Symbol	Min.	Nom.	Max.
A	—	—	2.65
A1	0.10	—	0.30
A2	2.25	2.30	2.35
A3	0.97	1.02	1.07
b	0.39	—	0.48
c	0.25	—	0.32
D	15.2	15.4	15.6
E	10.10	10.30	10.50
E1	7.30	7.50	7.70
e	1.27BSC		
L	0.70	—	1.0
L1	1.00BSC		
θ	0	—	8

Fig 4. SOP24 mechanical specification