GENERAL DESCRIPTION

EM19101 is a 8-bit CMOS A/D converter for scanner use. The adoption of a 2-step parallel system achieves low consumption at a maximum conversion speed of 7 MSPS.

FEATURES

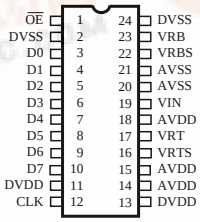
- 7MSPS maximum conversion speed
- Build-in sampling and hold circuit
- Internal self-bias reference voltage
- 45 mW very low power dissipation at 5MSPS
- +5V single power supply
- Available in 24 pin SOP
- Series
  EM19101M for 300 mil SOP
  EM19101S for 209 mil SOP

APPLICATION

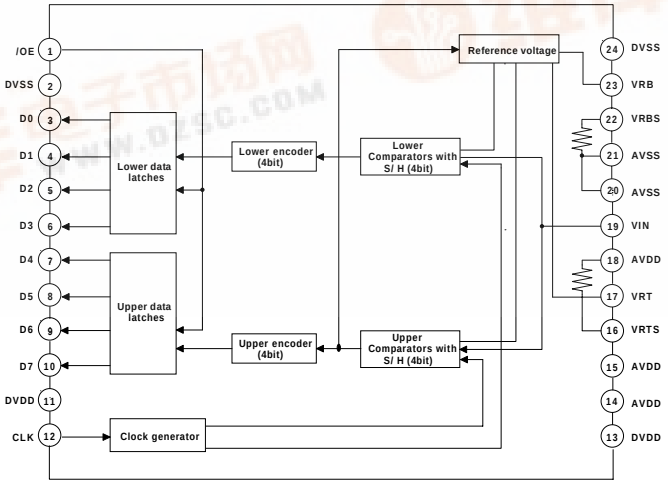
Scanner and a wide range of fields where high speed A/D conversion is required in the digital communication.

PIN ASSIGNMENT

EM19101



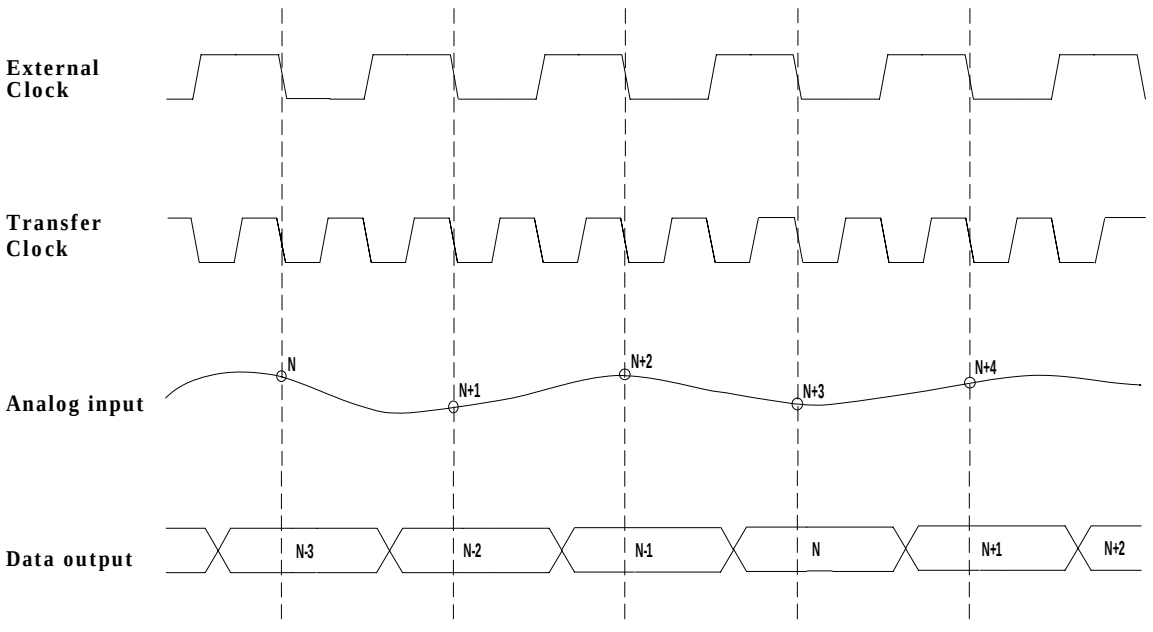
FUNCTIONAL BLOCK DIAGRAM



PIN DESCRIPTIONS

Symbol	Function
$\overline{OE}$	Output enable
DVSS	Digital ground
D0	Data output bit 0 (LSB)
D1	Data output bit 1
D2	Data output bit 2
D3	Data output bit 3
D4	Data output bit 4
D5	Data output bit 5
D6	Data output bit 6
D7	Data output bit 7 (MSB)
DVDD	Digital power supply
CLK	Clock input
DVDD	Digital power supply
AVDD	Analog power supply
AVDD	Analog power supply
VRTS	Top internal reference voltage
VRT	Top reference voltaget
AVDD	Analog power supply
VIN	Analog input voltage
AVSS	Analog ground
AVSS	Analog ground
VRBS	Bottom internal reference voltage
VRB	Bottom reference voltage
DVSS	Digital ground

TIMING DIAGRAM



OUTPUT CODING

Step	Analog Input (V)	Digital Output Code	Conditions
0	0.607815	00000000	VRB=0.6V
1	0.607815~0.6156250	00000001	VRT=2.6V
2	0.6156250~0.6234375	00000010	1LSB=7.8125mV
....	....	....	
124	1.6000000~1.6078125	10000000	
125	1.6078125~1.6156250	10000001	
....	....	....	
254	2.5843750~2.5921875	11111110	
255	2.5921875~	11111111	

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Items	Sym.	Rating	Unit
Supply voltage	V_{DD}	7	V
Operating temperature	T_{OPR}	-20 to +65	°C
Input voltage	V_{IN}	V_{SS} to V_{DD}	V
Ref, Input voltage	V_{RT},V_{RB}	V_{SS} to V_{DD}	V

Recommended Poerating Conditions

Items	Sym.	Rating	Unit
Supply voltage	AV_{DD},AV_{SS}	4.75 TO 5.25	V
	DV_{DD},DV_{SS}		
	|DGND-AGND|	0 to 100	mV
Reference input voltage	V_{RB}	0 and above	V
	V_{RT}	V_{DD} and below	V
	V_{RT} - V_{RB}	1.0 to 3.0	V
Analog input voltage	V_{IN}	V_{RB} to V_{RT}	V

(F_C=5MPS,V_{DD}=5V,V_{RB}=0.5V,V_{RT}=2.5V,Ta=25°C External clock duty=40 to 60%)

Parameter	Sym.	Conditions		Min.	Typ.	Max.	Unit
Maximum Conversion Speed	F_C	Vin=0.6V to 2.6V fin=1kHz ramp			5		MSPS
Supply current	I_{DD}	F_C=5MSPS NTSC ramp wave input			10	15	mA
Reference pin current	I_{REF}			5.7	8.0	9.1	mA
Analog input bandwidth	BW				1		MHz
Analog input capacitance	C_{IN}	V_{IN}=1.5V+0.07Vrms			11		pF
Reference resistance	R_{REF}			220	250	350	Ω
Internal bias	V_{RB}	Short V_{RB} and V_{RBS}		0.55	0.6	0.65	V
	V_{RT}-V_{RB}	Short V_{RT} and V_{RTS}		1.9	2.0	2.1	
Offset Voltage	E_{OT}			-10	-35	-60	mV
	E_{OB}			0	15	45	
Digital input voltage	V_{IH}			4.0			V
	V_{IL}					1.0	
Digital input current	I_{IH}	V_{DD}=max.	V_{IH}=V_{DD}			5	uA
	I_{IL}		V_{IL}=0V			5	

Parameter	Sym.	Conditions		Min.	Typ.	Max.	Unit
Digital output current	I_{OH}	$\overline{OE}$=V_{SS},	V_{OH}=V_{DD}-0.5V	-1.1			mA
	I_{OL}	V_{DD}=min.	V_{OL}=0.4V	3.7			
Digital output current	I_{OZH}	$\overline{OE}$=V_{DD},	V_{OH}=V_{DD}			16	uA
			V_{OL}=0V			16	
Output data delay	T_{DL}				25	40	ns
Integral nonlinearity	EL	F_C=5MSPS V_{IN}=0.6V to 2.6V			0.5	1.3	LSB
Differential nonlinearity	ED	F_C=5MSPS V_{IN}=0.6V to 2.6V			±0.3	±0.5	LSB
Differential gain error	DG	NTSC 40 IRE mod ramp, F_C=14.3MSPS			1.0		%
Differential phase error	D_P				0.5		°C
Aperture jitter	t_{AJ}				30		ps
Sampling delay	t_{DS}				4		ns

Application Note

V_{DD},V_{SS}

To reduce noise effects, separate the analog and digital systems close to the device. For both the digital and analog V_{DD} pins, use a ceramic capacitor of about 0.1uF set as close as possible to the pin to bypass to the respective GND's.

Analog input

Compared with the flash type A/D converter, the input capacitance of the analog input is rather small. However it is necessary to conduct the drive with an amplifier featuring sufficient band and drive capability. When driving with an amplifier of low output impedance, parasite oscillation may occur. That may be prevented by inserting a resistance of about 100Ω in series between the amplifier output and A/D input.

Clock input

The clock line wiring should be as short as possible also, to avoid any interference with other signals, separate it from other circuits

Reference input

Voltage between V_{RT} to V_{RB} is compatible with the dynamic range of the analog input. Bypassing V_{RT} and V_{RB} pins to GND, by means of a capacitor about 0.1μF, stable characteristics are obtained. By shorting V_{RT} and V_{RTS}, V_{RB} and VRBS, the self bias function that generates V_{RT}=2.6V and V_{RB}=0.6V, is activated.

Timing

Analog input is sampled with the falling edge of external clock and output as digital data with a delay of 2.5 clocks and with the following rising edge. The delay from the clock rising edge to the data output is about 25ns.

$\overline{OE}$ pin

By connecting $\overline{OE}$ to GND output mode is obtained. By connecting to V_{DD} high impedance is obtained.

About latch up

It is necessary that AV_{DD} and DV_{DD} pins be the common source of power supply. This is to avoid latch up due to the voltage difference between AV_{DD} and DV_{DD} pins when power is ON.

Application Circuit