

**FEATURES**

- 12-Bit ADC with 4-wire resistive touch screen interface
- 62.5 kSPS sampling rate
- Low power dissipation – 1.5 mW
- Ratio-metric conversion capability
- Shutdown feature
- Flexible serial interface
- Auxiliary inputs
- 2.7 V to 5.5 V supply

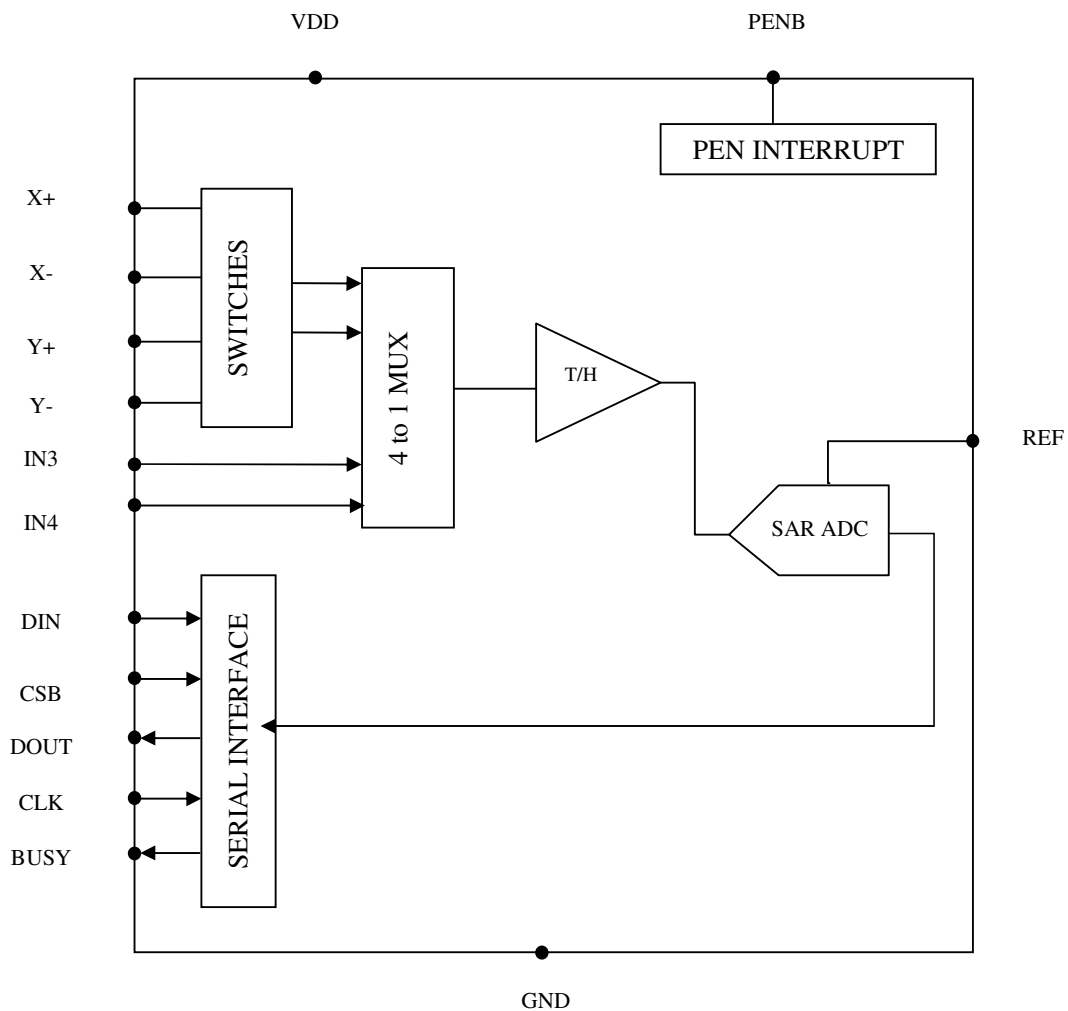
**APPLICATIONS**

- PDA's
- Touch screen monitors
- Hand held devices

**OVERVIEW**

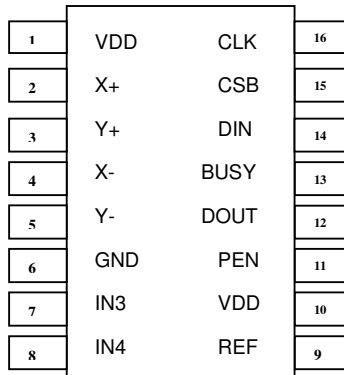
The KTF7792, is a 12-bit 62.5 kSPS throughput rate Analog-to-Digital Sampling Converter. It includes low on resistance switches to drive resistive touch screens. Absolute or ratio-metric measurements are possible and two auxiliary inputs are also included.

**BLOCK DIAGRAM**



**PACKAGE**

**16-Pin QSOP**



**PIN DESCRIPTION**

Pin No	Symbol	Description
1,10	VDD	Power Supply Input. Range is from 2.7V to 5.5V
2	X+	X+ Position Input
3	Y+	Y+ Position Input
4	X-	X- Position Input
5	Y-	Y- Position Input
6	GND	Ground
7	IN3	Analog Input (+)
8	IN4	Analog Input (-)
9	REF	Reference input
11	PENB	Pen Interrupt. CMOS logic open drain output requires ext. pull-up
12	DOUT	Serial Data output, clocked out on falling edge of CLK
13	BUSY	BUSY output. DOUT can be read after this goes low.
14	DIN	Digital input for the control register. Clocked in on rising edge of CLK
15	CSB	Chip Select input Active Low. Initiates conversion and enables serial data.
16	CLK	External CLK Input and it is used by the SAR ADC as well.

**ABSOLUTE MAXIMUM RATING**

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Supply Voltage	-0.3 to 6.0	V
I <sub>IN</sub>	Input Current	+/- 100.0	mA
V <sub>IN_</sub>	Digital Input Voltage	-0.3 to 6.0	V
V <sub>IN_REF</sub>	Reference Input Voltage	-0.3 to 6.0	V
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
T <sub>SOL</sub>	Soldering Temperature	300	°C

**Note:** Stress greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

**ORDERING INFORMATION**

Part	Temperature Range	Package
KTF7792	-40 °C to 85 °C	16-Pin QSOP

**DC ELECTRICAL CHARACTERISTICS**

(VDD = 3V, Maximum Sample Rate, REF = 2.5V; all specifications T<sub>MIN</sub> to T<sub>MAX</sub> unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>DC PERFORMANCE</b>						
N	Resolution	(Note 1)		12		Bits
No Missing Codes		(Note 1)		11		Bits
INL	Integral Nonlinearity	(Note 1)			0.25	% of FSR
GE	Gain Error	(Note 1)			1	% of FS
OE	Offset Error	(Note 1)			30	mV
<b>POWER REQUIREMENTS</b>						
VDD	Supply Voltage	(Note 2)	2.7		5.5	V
I <sub>VDD</sub>	Supply Current	(Note 1)		400		μA
I <sub>SHTDOWN</sub>	Supply Current	(Note 1)		20		μA

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>LOGIC INPUT/OUTPUT CHARACTERISTICS (VDD = 2.5V)</b>						
VIH			2.4			V
VIL					0.4	V
VOH	IOH = 50 $\mu$ A	(Note 1)	2.4			V
VOL	IOL = 50 $\mu$ A	(Note 1)			0.4	V
<b>SWITCHING SPECIFICATIONS (CLK INPUT)</b>						
Fsample	Maximum Conversion Rate	(Note 2)			62.5	kSPS
	Minimum Conversion Rate	(Note 2)	0.5			kSPS
TCLK	CLK Period	(Note 2)	1000			ns
	Pulse-width High	(Note 2)	500			ns
	Pulse-width Low	(Note 2)	500			ns
T <sub>Delay</sub>	Data out Delay	(Note 2)		5		ns
	Wake-up Time	(Note 2)		20		ms
<b>REFERENCE</b>						
R <sub>IN</sub>	Reference Input Resistance	(Note 1)		32		k $\Omega$
	Reference Input Span		1.0		VDD	V
I <sub>REF</sub>	Reference Input Current			80		$\mu$ A
R <sub>SWITCH</sub>	Switch On Resistance			5		$\Omega$

Note 1: 100 % Production Tested at 25<sup>0</sup> C; guaranteed by design and characterization testing for temperature range.  
 Note 2: Guaranteed by design & characterization testing.  
 Note 3: See Applications Information.

MSB							LSB
START	A2	A1	A0	X	SER/DFRB	X	PD0

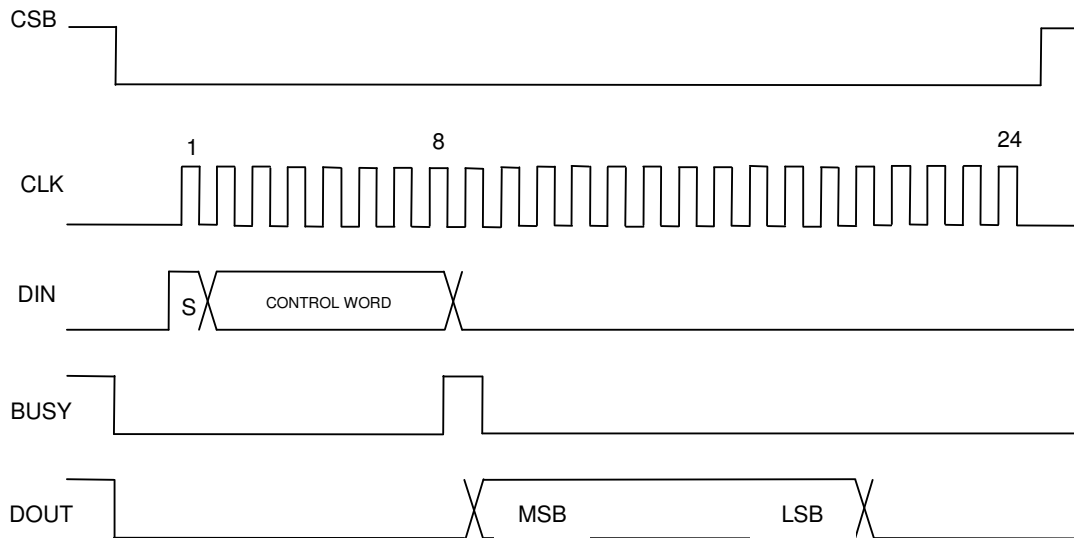
A2	A1	A0	SER/DFRB	Analog Input	X Switches	Y Switches	+REF	-REF
0	0	1	1	X+	OFF	ON	VREF	GND
0	1	0	1	IN3	OFF	OFF	VREF	GND
1	0	1	1	Y+	ON	OFF	VREF	GND
1	1	0	1	IN4	OFF	OFF	VREF	GND
0	0	1	0	X+	OFF	ON	Y+	Y-
1	0	1	0	Y+	ON	OFF	X+	X-

**TABLE 1. CONTROL WORD FORMAT AND COMMANDS**

PD0	Description
0	Pen Interrupt Enable
1	Pen Interrupt Disable

**TABLE 2. PEN INTERRUPT COMMAND**

**TIMING DIAGRAM**



**DETAILED DESCRIPTION**

The KTF7792 is a SAR architecture 12-Bit ADC with support circuitry and interface for touch screen controller application. It operates on a 2.7V to 5.5V single supply and consumes about 400 μA supply current when operating on a 1MHz external clock. The output throughput rate is a maximum of 62 kSPS when operating with a 1 MHz clock.

The ADC is composed of a high performance capacitive DAC and a comparator along with SAR control logic and resistor string segment. The reference input drives the resistor string directly and has an input resistance of around 32 kΩ .

The KTF7792 comes complete with a high performance differential CMOS sample and hold amplifier made up by the capacitive DAC and a low resistance input multiplexer that allows ratiometric or absolute sensing of the resistive touch screen.

There is shutdown capability which is active between conversions when CSB is high. The converter will shut down to under 20 μA of supply current.

There is also a Pen Interrupt feature which is active with PD0 control bit. When this is active the X+ input is live with Y- connected to GND and when the touch screen is touched the PENB signal goes active to initiate a convert command for the micro-controller. To enable Pen Interrupt feature PD0

must be set to 0. This is also the default state in which the converter powers up. To disable Pen interrupt, set PD0 to 1.

**APPLICATIONS INFORMATION**

**ANALOG INPUT**

The KTF7792 has a 4-to-1 multiplexer at its analog inputs. The configuration of this multiplexer is controlled by the serial input control word. As seen in the block diagram this input multiplexer can be configured to read either the X+ input, the Y+ input or one of the auxilliary inputs. An additional bank of switches also configures the driving for the resistive ladder while the input is being sampled and the connection for the reference input of the ADC.

In the single ended configuration the touch screen is connected to VDD and the ADC reference is connected to the REF pin. In the ratio-metric mode both the ADC reference input and the touch screen ladder are connected to VDD through on board switches. This would be a more accurate method for measurement since the touch screen and the ADC are being driven exactly by the same reference voltage.

The KTF7792 uses the CLK as the external clock and this controls all the transfer of information to and from the ADC.

One complete conversion cycle of the KTF7792 will take 24 clock cycles. As CSB is pulled low the ADC powers up and initiates a conversion cycle. The ADC looks for a start bit (high) on the DIN pin. As this is detected the next 7 clock cycles are used to clock in the input control bits. On the falling edge of the 9<sup>th</sup> clock pulse the output data is clocked out and can be read in on the next rising edge. Data is clocked out MSB first. The 21<sup>st</sup> clock rising edge can be used to read in the LSB and then three zeros are clocked out on the trailing 3 cycles. This will complete 24 bits of clock pulses for each conversion.

**PACKAGE INFORMATION**

**16 LEAD QSOP STANDARD PACKAGE**

