1 General Description:

This MOT is a motion tracing ASIC with high quality CMOS image sensor, DSP and UART protocol. The sensor can track object smartly with sub-pixel accuracy and output the object features including center coordinate, object size, object border, object shape, object vector, object aspect ratio, object label, object brightness sum, object movement etc…. These object features can be transferred to external processor through UART interface.

MOT performs gain and exposure setting and can be programmed by setting internal registers via UART. By programming these internal register sets, we can change the function in CIS, DSP and UART, such as frame rate, exposure control, object center resolution, and UART speed…etc.

2 Features:

- Sensor color type: black and white
- Pixel size: 11um * 11um
- Optical Format: 1/10”
- Pixel depth: 8 bits
- Number of array elements: 128*96
- S/N ratio: 40dB @940nm, Gain=3.25X
- Sensitivity: 3364 uW*sec/cm^2 @940nm, Gain=3.25X
- Programmable object center coordinate resolution: up to 1024*768
- Scan mode: progressive
- Programmable exposure-gain control
- AE(Auto Exposure): Semi-Auto -AE, Automatic-AE
- System clock: 16Mhz~40MHZ (external clock)
- Interface: UART
- Programmable UART baud rate, baud rate up to 5Mbps
- Early rejection mode
- Object number: up to 8
- Programmable frame rate control: 10fps~200fps under enough luminance
- Object features: Object center coordinate, object size, object brightness sum, object movement (active in nearest distance mode), object shape, object boundary, object label, object vector, object aspect ratio etc…
- Object tracking mode: No assignment mode, Nearest Distance Mode
- Three modes for power management
  - ✧ Fast mode (200 fps): Current consumption typical 15mA, (maximum 20mA) @27MHz @DDMAIN=3.6V

- ✧ Skip mode (100 fps is 1 skipped) Current consumption typical 10mA, (maximum 13mA) @27MHz @VDDMAIN=3.6V
- ✧ Power Down: Typical 20uA, Max. 60μA (wake up by UART) @27MHz @VDDMAIN=2.8V

Current consumption estimate for operating at 16MHz @VDDMAIN=3.6V:

Power management mode	Frame rate (fps)	Current consumption (mA)
Fast Mode	120 fps	10.7mA
Skip Mode	60 fps (skip 1 frame)	7.9mA

Skip mode: User can set how many frame data to ignore to save power based on fast mode frame rate. However, Vsync signal is keeping ouput based on the Fast mode frame rate. For example, when user set skip n frames, the current consumption will become: ((10.5*x/27 + 4.5) + (1*x/27 + 4.5)*n)/(1+n). And sensor will output 1st frame data, then skip n frame data w/o data output. Where n= skip frame number; x = system clock (Mhz)

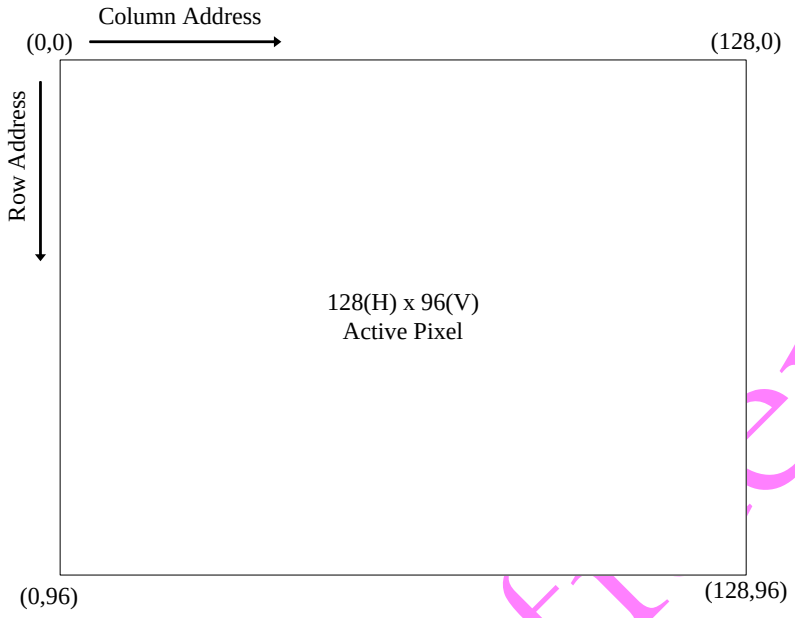
- ➢ Power supply and IO voltage
  - ✧ (Main power voltage, IO voltage)=(2.0V~3.6V)
- ➢ Package: CSP

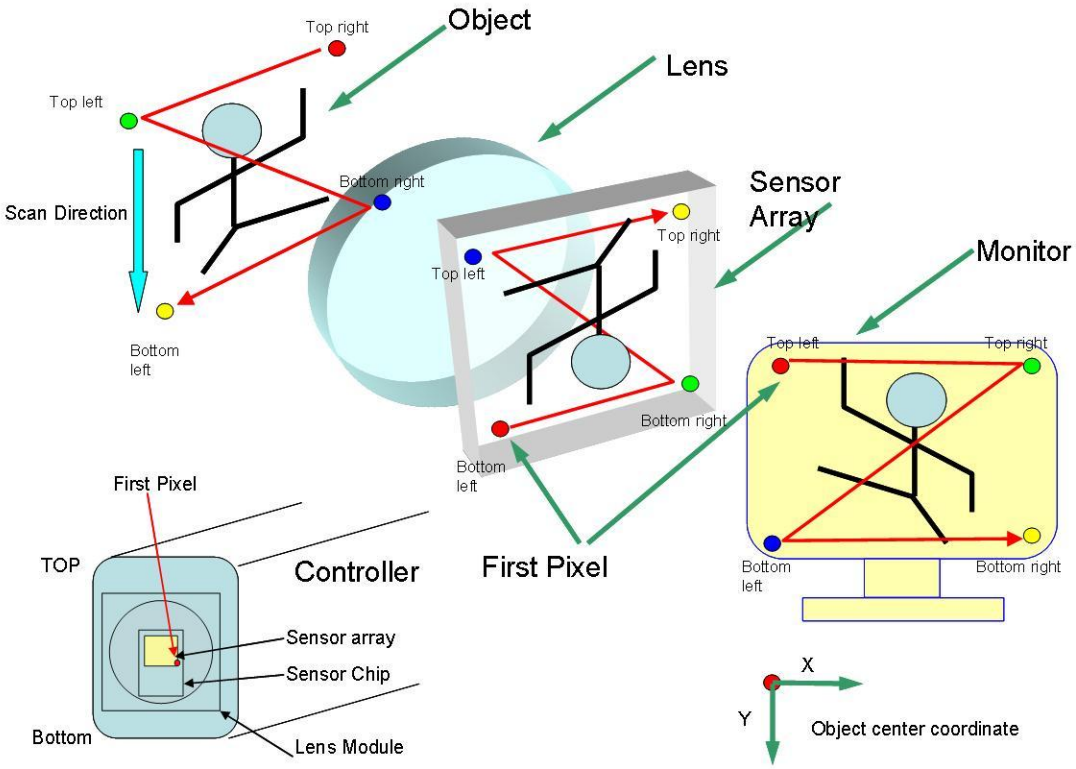
3 Ball Description:

✧ **14-Balls CSP**

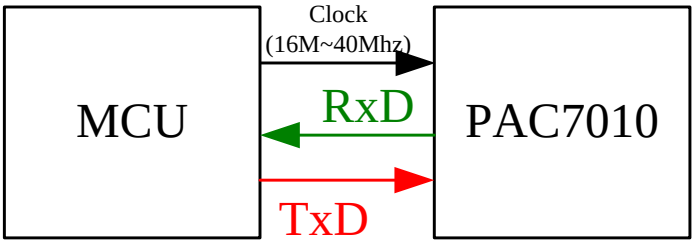
Ball No.	Name	Type	Definition
A1	RSTN	IN	Reset pin, low active
A3	ATPG	IN	Test Mode Select; active high
A4	VDDAY	IN	Internal voltage reference
B1	CLKEN	OUT	Control External Oscillator enable pin; if high ➔CLK input
B2	RXD	IN	RXD for UART
B3	VDDA18V	PWR	Regulator output for Analog power
B4	VSSA	GND	Analog ground
C1	VSYNC	OUT	Sensor Vsync
C2	OMDO/GPO	OUT	Reg_0x28 Bit[7]: If Reg_0x28 bit0=1; bit7=0➔ output low, bit7=1➔output high Reg_0x28 Bit[0] defined OMDO/GPO pin as: 0: OMDO output➔ object motion detect output pin. 1: GPO➔ generation purpose output (defined by Reg_0x28 bit[4:0])
C3	VDDMAIN	PWR	2.0V ~ 3.6V External provide for PAC7010 regulator power
C4	VDDD18V	PWR	Regulator output for Digital power
D1	VSSD	GND	Digital ground
D3	TXD	OUT	TXD for UART
D4	CLK	IN	Oscillator input for system clock,

4 Sensor Array Format (coordinates 0,0 in upper left of array)





5 UART interface:



5.1 Baud Rate Control

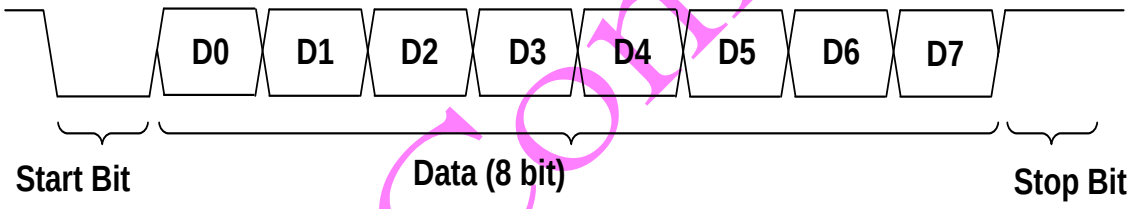
Baud Rate (bps) = Sysclk/Reg_Div, which Reg_Div is a 12 bits divider.

Default baud rate is 19200bps @27Mhz system clock.

Maximum baud rate = 5Mbps

The minimum bit rate is limited by the formula, object data count * object number * frame rate * 12 bps.

5.2 UART Timing Diagram:



◆**Start bit: 1 bit**

◆**Stop bit: 1 bit**

◆**Data: 8 bit**

◆**Non use parity bit**

Note: Host write registers by UART command. The interval timing between byte to next byte must be wait two bits.