

Today's plan

Announcements

Solution to activity 3

Test C

Sensors - continuation

Serial ports

Most likely next week

Analog outputs

Driving loads

Motors, Step motors and servos

Op-amps

Activity 3

1) Find the values of x after each of the following C commands (run on an MSP430). Answer in hexadecimal.

unsigned int x = 6;

a) `x %= 4;` x = 0x2 % is modulus (remainder)

b) `x = 96 >> 2;` 96 is 0x60 x = 0x18 (= 96/4) >> bit shift right twice of 0110 0000

c) `x = ~65280;` Hint: 65280 = 0xFF00 x = 0x00FF bitwise not

d) `x = 32769 << 4;` Hint: 32769 = 0x8001 x = 0x0010 bit shift left 4 times

2) Write the lines of C code needed to:

a) set P1.0 to P1.3 to be outputs and P1.4 to P1.7 to be inputs

b) starts a for loop that continuously copies the values on the inputs to the values of the outputs (ie P1.4 -> P1.0, P1.5 -> P1.1 etc).

c) if all four of the inputs are 0, exit the loop.

P1DIR = 0x0F;

for(;; (P1IN << 4) != 0 ; P1OUT = P1IN << 4)

for(P1DIR = 0x0F; (P1IN << 4) != 0 ; P1OUT = P1IN << 4)

Projects with **MAX30102**

The modul is in your kit.

It can work as a heart beat monitor and Blood Oxygenation sensor. Info on our web page.

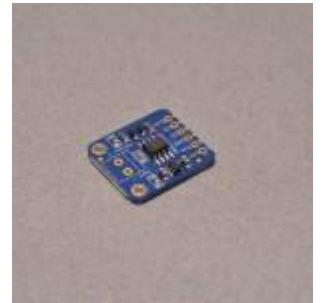


Also:

.Thermocouples

.Thermistors

.IR no contact sensor



MLX90614:

Infrared camera sensor

0640 FIR Sensor

size, low cost 32 pixel x 24 pixel IR

o integrate

y-standard 4 lead TO39 package

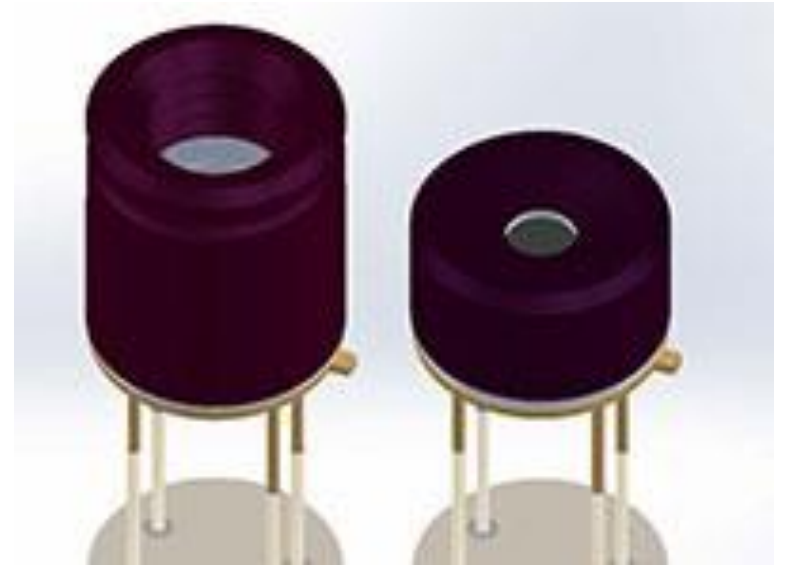
y calibrated

mpatible digital interface

mmable frame rate 0.5 Hz to 32 Hz

upply voltage

options: 55° x 35° and 110° x 75°



Distance Sensors:

.Optical:

short range QRD1114,
medium range GP2D12



.Ultrasonic



Magnetic Field Sensors:

- Hall effect
- on-off vs field measurement
- magneto-resistive
- magneto-inductive

eg: Devantech CMPS03 compass module



Position Sensor:

- Potentiometers (3/4 turn, 10 turn)
- Rotation sensor (unlimited turns)
- Linear potentiometers



Accelerometers, Gyroscopes:

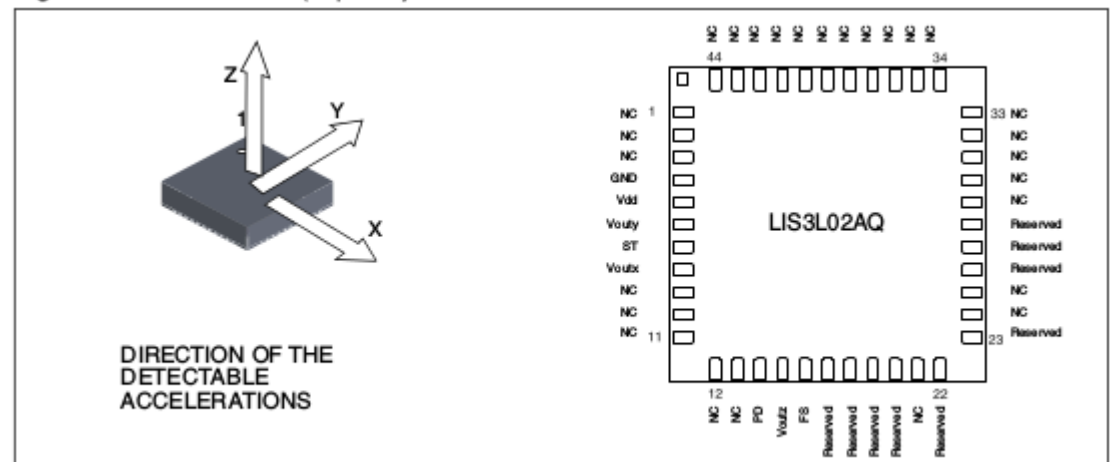
.1 axis, 2 axis, 3 axis

EG: MPU9150: 3 axis gyroscope,
3 axis accelerometer+ 3 axis magnetic field
I²C interface for ~\$10.

EG: LIS3L02AQ – 3 axis accelerometer
with analog outputs.



Figure 6-1. Pin connections (top view)



Pressure Sensors

- Gas or liquid (MPX5100)
- Mechanical (IESF-R-5L)

Motors, Servos, etc

- .Servo motors
- .AC and DC motors
- .Stepper motors
- .Solenoids
- .Relays
- .Solid-state relays