

# KodeKLIX for PUP

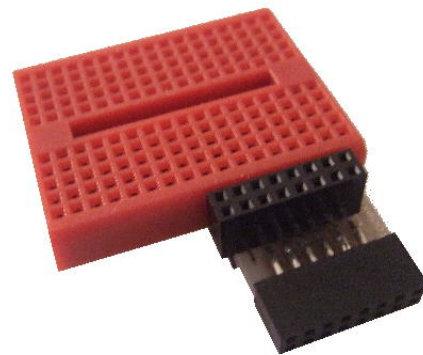
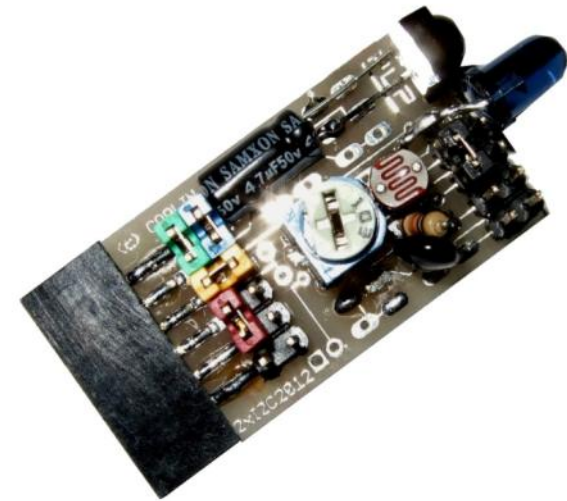
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## Hardware Interfacing & Expansion

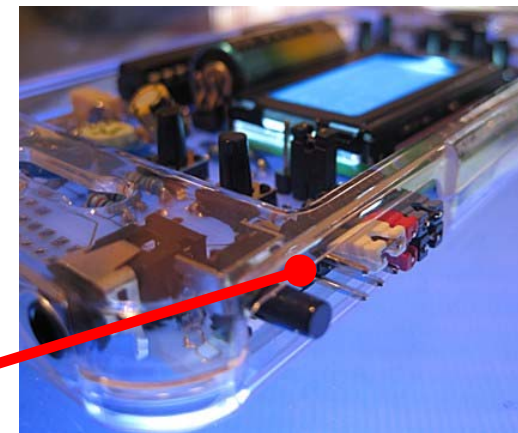


# Hardware Interfacing

- Project Ideas
- PICAXE Chip I/O
- Expansion Options
- "Personality Cards"
- ProjPort12 Expansion
- ProjPort12 Boards and Kits



ProjPort12





# Project Ideas

#1

- LED torch
- Touch pad inputs
- Button expansion, via C.2
- InfraRed (IR) controller
- Light detection (LDR or PhotoCell)
- Additional I2C EEPROM memory
- I2C Input/Output expansion
- Real Time Clock (RTC)
- TiltPack / RumblePack / ForceFeedback

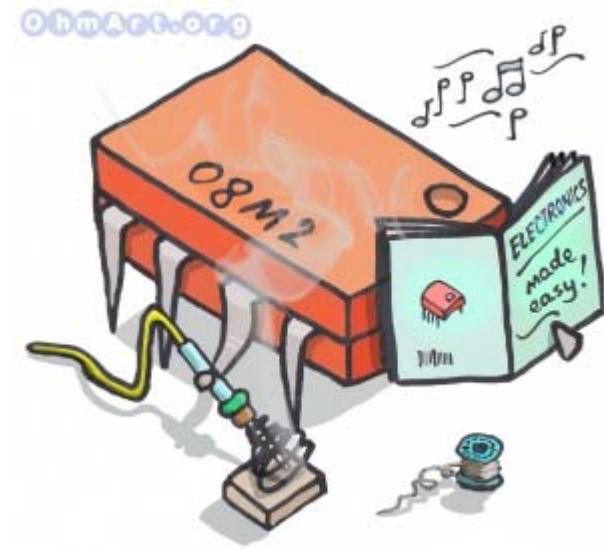


# Project Ideas

#2

- Link Cable – 2player serial link
- WiFi or RF communications
- Microphone sound detection
- I2C Camera
- I2C GPS

and lots, lots,  
more...





# PICAXE 20M2 Chip

- PICAXE pins have multiple purposes
- Default assignment is:
  - Port B for output
  - Port C for input
  - Port A.0 for LCD Back Light and Download

1



**PICAXE-20M2**

+V	1	20	0V
Serial In	2	19	Serial Out (DAC)
(Touch / ADC / Out / In) C.7	3	18	B.0 (In / Out / ADC / Touch / SRI)
(In) C.6	4	17	B.1 (In / Out / ADC / Touch / SRQ / pwm)
(hpwm A / pwm / Out / In) C.5	5	16	B.2 (In / Out / ADC / Touch)
(hpwm B / Out / In) C.4	6	15	B.3 (In / Out / ADC / Touch)
(hpwm C / pwm / Touch / ADC / Out / In) C.3	7	14	B.4 (In / Out / ADC / Touch / hpwm D)
(kb clk / pwm / Touch / ADC / Out / In) C.2	8	13	B.5 (In / Out / ADC / Touch / hi2c sda)
(kb data / Touch / ADC / Out / In) C.1	9	12	B.6 (In / Out / ADC / Touch / hserin)
(hserout / Out / In) C.0	10	11	B.7 (In / Out / hi2c scl)



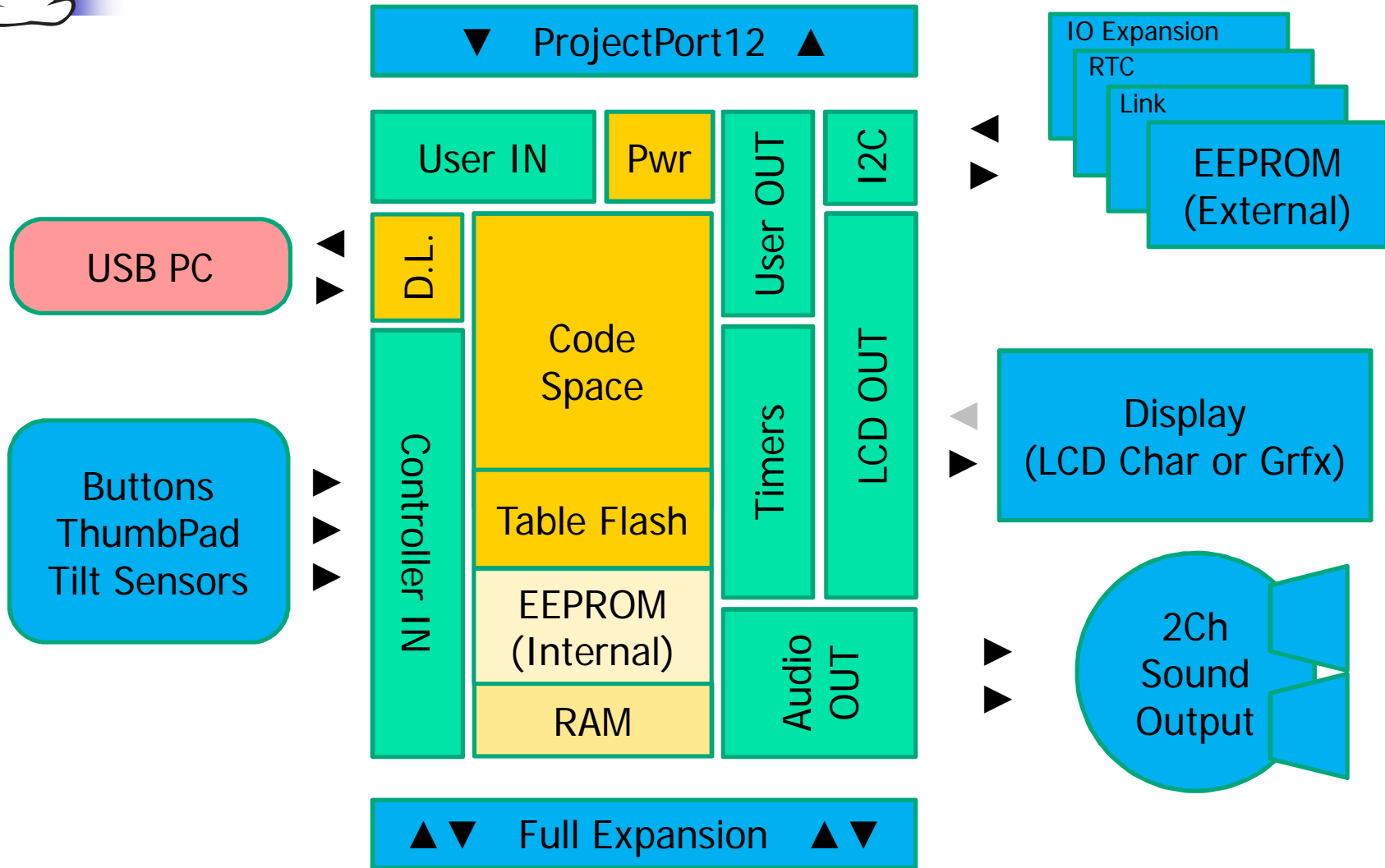
# PICAXE Pin Assignment: 20M2

- Pins selected for greatest flexibility and upwards/backwards compatibility with other 20pin PICAXE Chips (20M and 20X2)

Pins Definitions – PICAXE20M2						
Power Vcc	+ve	1	20	-ve	GND Power	
Prog.SerialIn	SerIn	2	19	A.0	S/O	Prog.SerialOut:LED
PadUp:Thumb-x	I/A	C.7	3	B.0	O	LCD_E:I2Cwp
PadLeft	I	C.6	4	B.1	O/A	Sound (fr.pwm)
Sound (bk.pwm)	O/I	C.5	5	B.2	O	LCD_RS:GLCD
PadRight	I	C.4	6	B.3	I/O/A	User free
PadDn:Thumb-y	I/A	C.3	7	B.4	O	LCD_DB4:GLCD
PadA:Multi:Kbc:User	I/A/O	C.2	8	B.5	O/S	LCD_DB5:I2C:User
User:Kbd:GLCD	S/I/A/O	C.1	9	B.6	O	LCD_DB6:GLCD
User free	S/I/O	C.0	10	B.7	O/S	LCD_DB7:I2C:GLCD:U
O = Output, I = Input, A = Analog Input, S = System, U = User						
Thumb X-Y: analog thumbpad (where fitted)						
LCD_xx: HD44780 compatible I/O						
GLCD: Nokia 5110 compatible I/O						
Sound: foreground and background channels are blended into mono output Note: sound pins can also be used as input(s)						
User: ProjPort12 routed input/output pins; C.0, C.1, C.2, B.3						
LED: Backlight LED for LCD displays						
KB c+d: PS2 Keyboard support, routed to ProjPort12						



# PUP – Block Diagram





# Expansion Options

#1

- 3.5mm connection
  - (Default) Audio Out
  - (Alt.) use as dataport for digital/analog IN
- Download port
  - Serial data communications, eg to PC
- Use LCD's RAM as expansion memory
- On-board EEPROM expansion memory
  - Retains contents even when powered off
  - Uses: high scores, saved state, etc

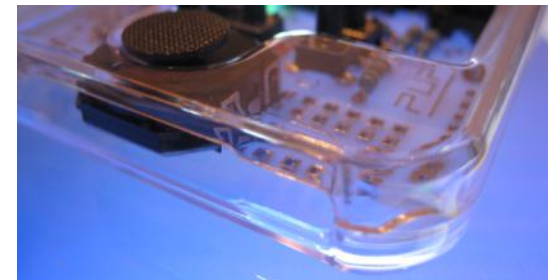
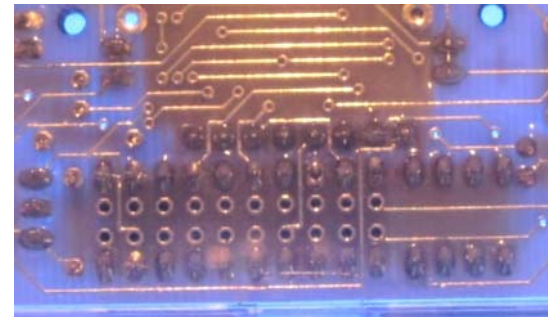
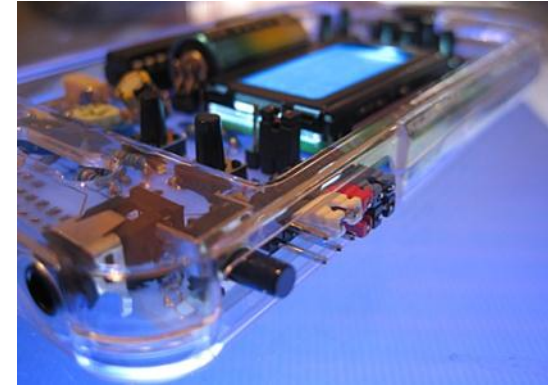




# Expansion Options

#2

- ProjectPort12
  - "Personality Cards"
  - Expansion port for mini-projects
- Full access expansion port
  - 20pin access port under PICAXE chip
- Spare solder points distributed around the PCB



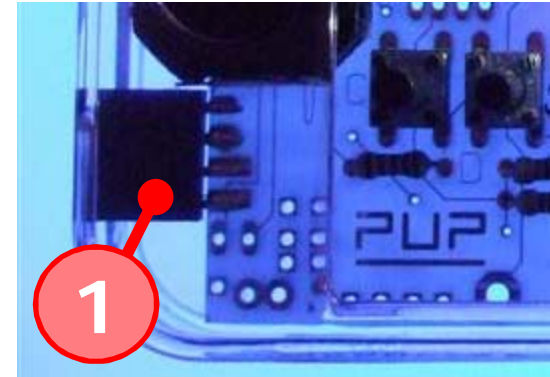


# Expansion Options

#3

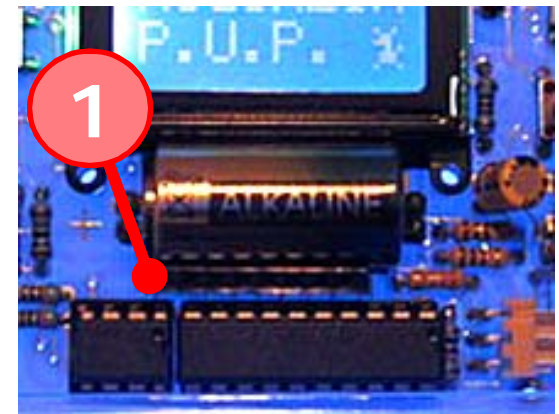
- I2C mini-port
  - 4pin\*, v1.2+

SCL	SDA	Vcc	Gnd
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- Full access expansion port
  - 8pin# (used on PUP™gfx)

Vcc	Gnd	SCE	RES	D/C	SDIN	SCLK	LED
		B.6	B.4	B.2	C.1 hspi sdo	B.7 Hspi sck	A.0



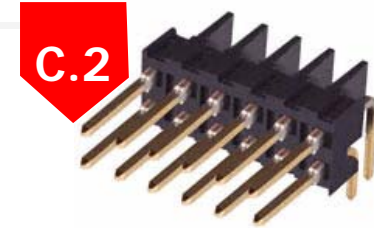
\* As viewed looking into PUP connector  
 # hspi pins only available on PICAXE 20X2 chip



# "Personality Cards"

#1

- Looking into ProjectPort12 from outside the PUP™ casing:



C.2	Vbattery	Vcircuit	GND	I2C-sda	DB5
C.0	C.1	B.3	LCD R/W	I2C-scl	DB7

- By default four jumpers are installed as shown shaded above. The jumpers configure PUP™ as having:
  - Switch power "on" only (that is, not controlled by the PICAXE);
  - Write-Only mode for the LCD;
  - Multiplexed LCD and I2C PICAXE pins.



# "Personality Cards"

#2

- Users can however reconfigure the port using jumpers or "personality cards"
- Four user control pins available
  - C.0, C.1, C.2 and B.3
- Uses:
  - Control the power up/down operation of PUP™ using the PICAXE processor
  - Allow the LCD to be controlled in Read/Write mode (eg. use its RAM)
  - User I/O for interface / expansion projects



# "Personality Cards"

#3

- Power up/down controlled by PICAXE B.3 pin. Note:
  - \_LCDInitialise required when power up
  - LCD Library Code holds this pin "on"
  - LCD contrast setting may need adjustment

C.2	Vbattery	Vcircuit	GND	I2C-sda	DB5
C.0	C.1	B.3	LCD R/W	I2C-scl	DB7

- LCD with both read & write control
  - Read/write to RAM within LCD module
  - Customisation of LCD library required

C.2	Vbattery	Vcircuit	GND	I2C-sda	DB5
C.0	C.1	B.3	LCD R/W	I2C-scl	DB7



# ProjectPort12 Expansion

- Pin C.0:
  - Output, Input, hSerialOut
- Pin C.1:
  - Output, Input, ADC, kbData, Touch
- Pin C.2:
  - Output, Input, ADC, kbClk, PWM
- Pin B.3:
  - Output, Input, ADC, Touch
  - Note: B.3 affected by LCD Library Code





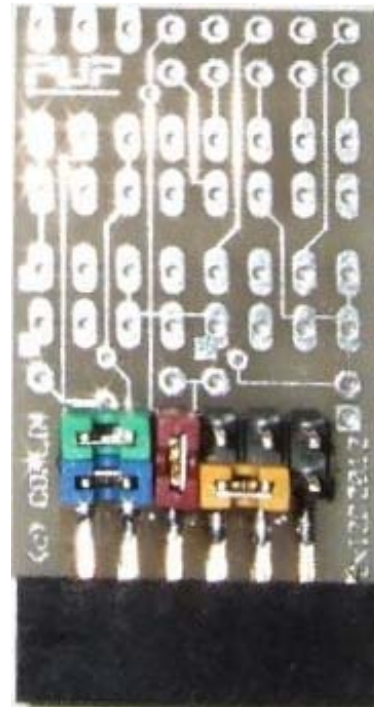
# ProjPort12 Boards & Kits #1



Blank



Project



Personality



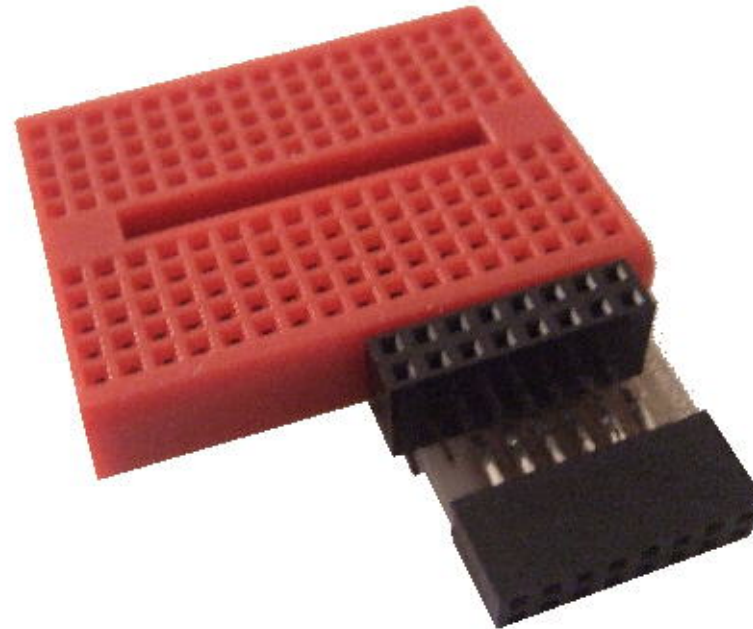
I2C Card



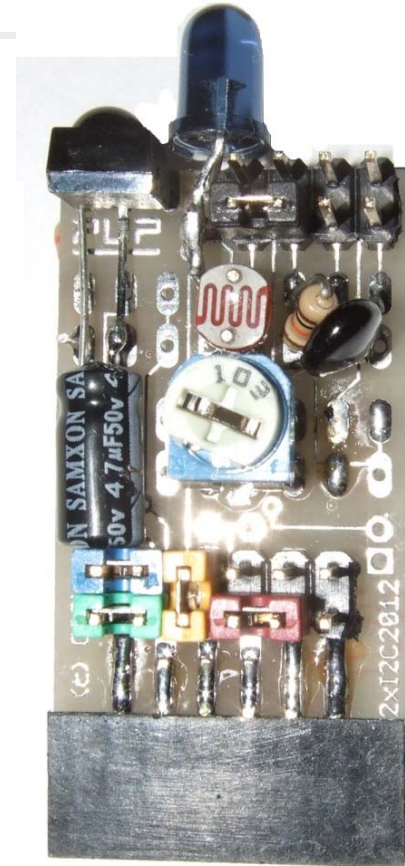
# ProjPort12 Boards & Kits #2



I/O Expander



BreadBoard



Experimenter



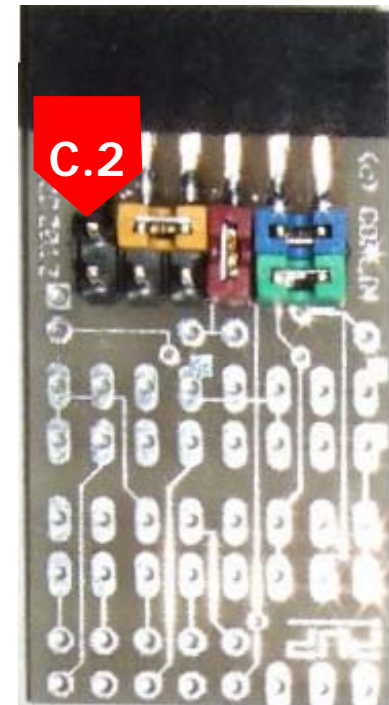


# ProjPort12 Board Config

- ProjPort12 boards replicate the config jumper block.

C.2	Vbattery	Vcircuit	GND	I2C-sda	DB5
C.0	C.1	B.3	LCD R/W	I2C-scl	DB7

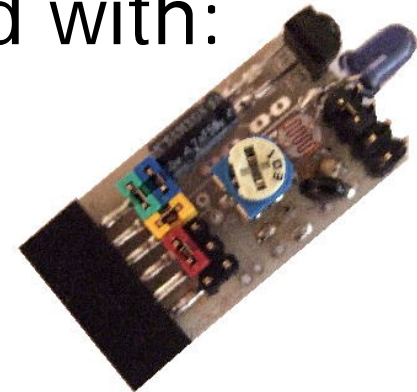
- Jumper orientation same as on the PUP when viewed with positioned as shown.
- Instead of jumpers, dedicated projects can opt to hardwire the configuration settings.





# ProjPort12 Experimenter

- ProjPort12 board pre-populated with:
  - InfraRed Transmitter (output)
  - InfraRed Receiver (input)
  - Selectable analog device
    - Variable resistor (user potentiometer)
    - Light dependent resistor (light sensor)
    - Thermistor (temperature sensor)



- Analog selection by Jumper Block  
(1 at a time)

VR-a	VR-b	free	free
LDR-a	LDR-b	Therm-a	Therm-b

- Sample applet "ProjPort12- Experimenter" included as a coding demonstrator



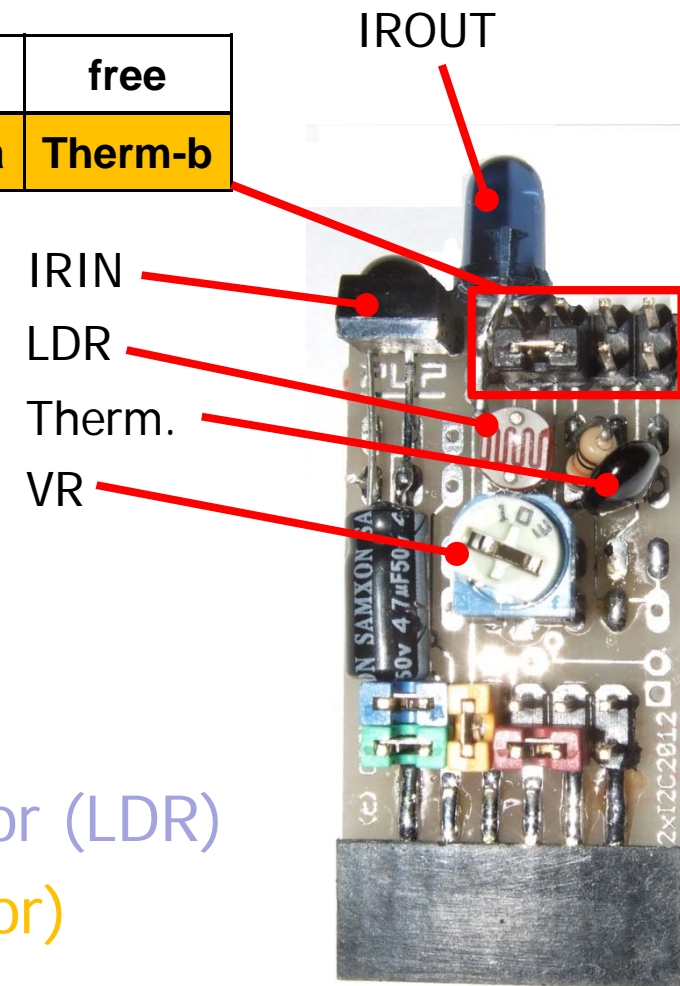
# ProjPort12 - Experimenter

## ■ Environ-Sensors

GND	VR-a	VR-b	free	free
VCC	LDR-a	LDR-b	Therm-a	Therm-b

## ■ Includes:

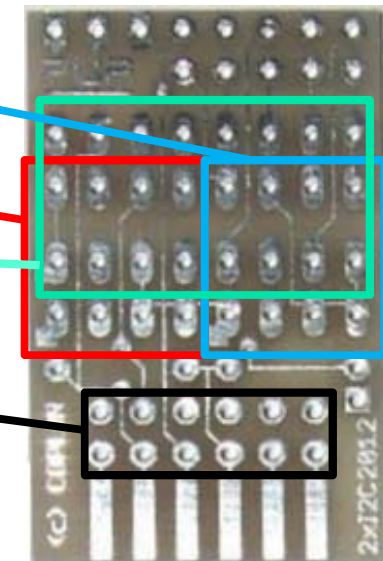
- IROUT (B.3)
- IRIN (C.0)
- Analog Inputs (C.1)
  - Variable Resistor (VR)
  - Light Dependent Resistor (LDR)
  - Temperature (Thermistor)





# ProjPort12 Boards

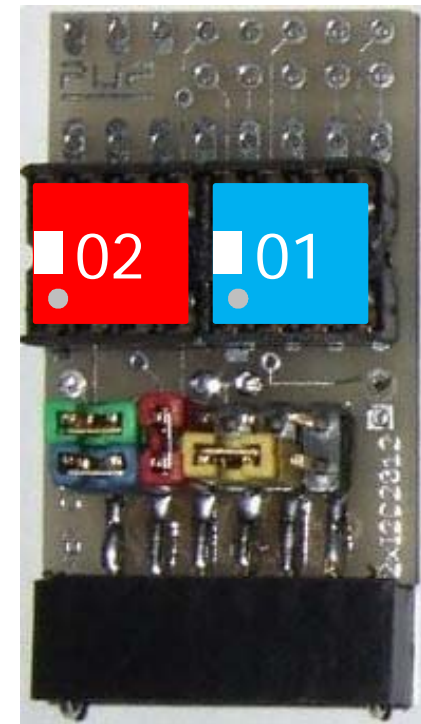
- Universal I2C and IO-Expander
  - 2x EEPROM sockets
  - 1x PCF8574 IO chip
- Addressing
  - 01 = EEPROM
  - 02 = EEPROM
  - 03 = IO Expander
- ProjPort12 Replicator





# ProjPort12 I2C EEPROM Exp.

- ProjPort12 board pre-populated with:
  - 2x 8pin I2C Sockets (optional: EEPROMs)
- Address is 0100aaa0. where
  - aaa=address 01 (001)
  - aaa=address 02 (010)
- READI2C = reads data
- WRITEI2C = writes data
- Sample applet included as a coding demonstrator





# ProjPort12 I/O Expander

- Universal IO-Expander

GND	D0	D1	D2	D3
VCC	D7	D6	D5	D4

- PCF8574 IO chip allows bus to be expanded to 8 inputs or outputs
- Address is 0100aaa0. where
  - aaa=address 03 (011)
- READI2C = get inputs
- WRITEI2C = set outputs



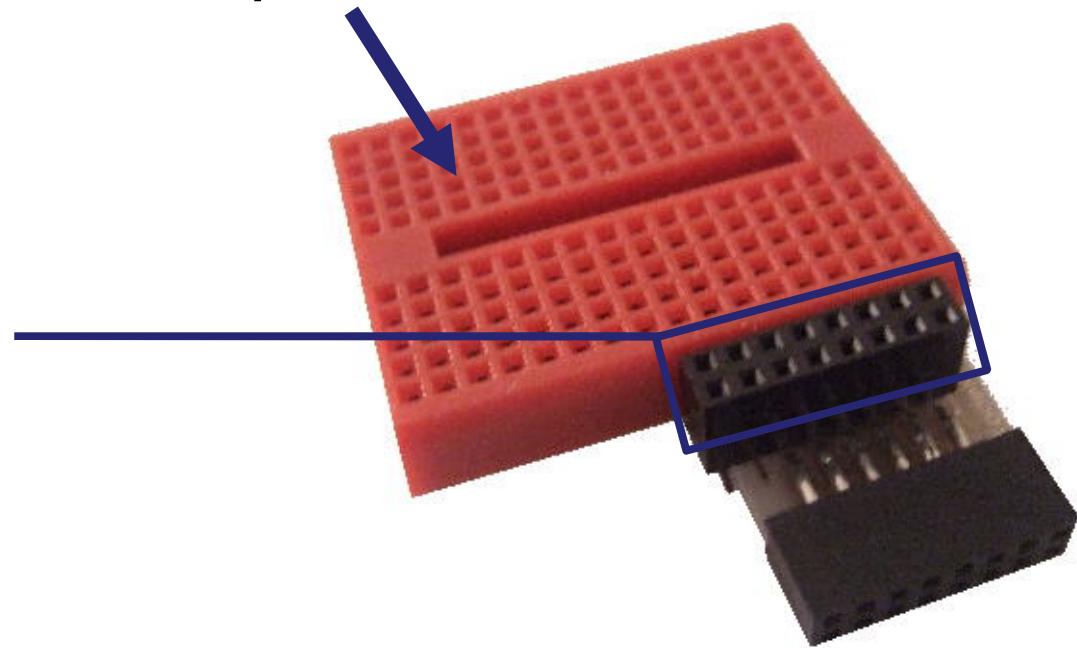




# ProjPort12 Breadboard

- Mini-breadboard for completely customisable experimentation
- Supporting DIP chips and a range of active/passive components

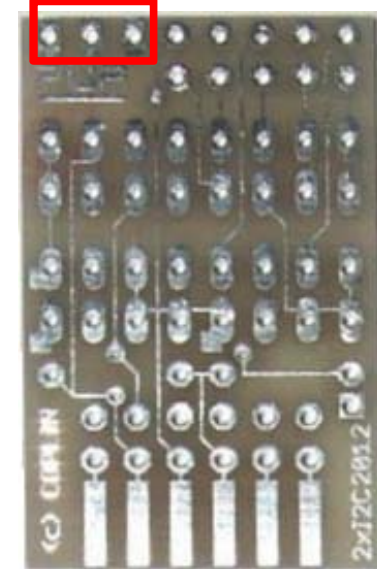
- Projport12 Replicator





# ProjPort12 Blank Boards

- Uncommitted 3pin header
  - User connects device, then wires pins to device
- Typical uses:
  - IR detector
  - IR transmitter
  - RS232 link
  - I2C link







# Using Spare PCB Solder Points

- The PUP circuit board contains lots of uncommitted “through-hole” solder points which have been provided for users to add their own mods within the iPhone case
- Examples:
  - Light sensor
  - Status LEDs
  - Tilt switches

Solder Pts.

