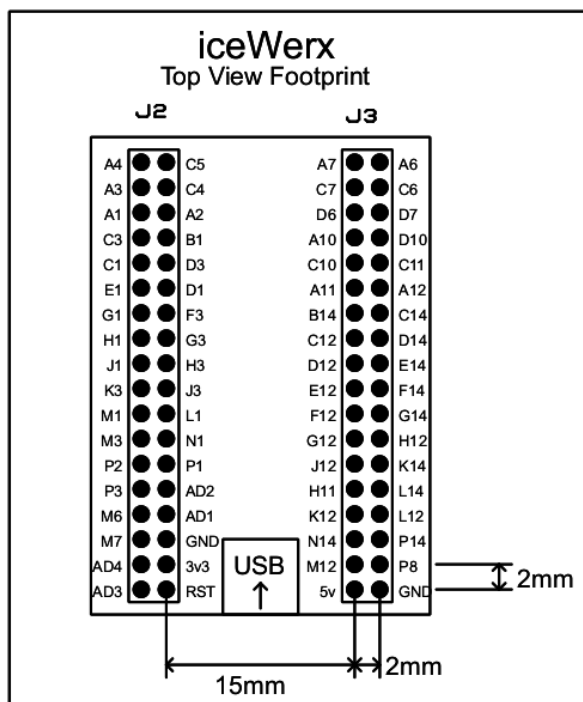# iceWerx iCE40 HX8K FPGA module

By taking care of all the multiple power supply, sequencing and bitstream support, iceWerx provides an easy to use FPGA module ready to integrate into your own project.

The iceWerx Module may be soldered directly to your PCB or mounted in sockets such as the samtec SQW-118-01-L-D

Uses Lattice ICE40HX8K-CB132
7680 LUT's
128 Kbits RAM (32 x 4Kbit blocks)
2 PLL's
63 FPGA I/O's on module
4 10-bit A/D inputs (via PIC CPU)

Lattice ICE40HX8K documentation is here:
www.latticesemi.com/Products/FPGAandCPLD/iCE40

Oscillator

An on-board 12MHz oscillator feeds pin P7 (GBIN5)

LEDs

Red LED on A5
Green LED on M4

10-bit A/D converters

Accessed via serial commands to PIC CPU
250k baud, 1 start, 8 data, 1 stop, no parity
Tx on in P4, Rx on pin P5
AD1 - send command 0xA1
AD2 - 0xA2
AD3 - 0xA3
AD4 - 0xA4
Receive 2 bytes, high byte first.
Combine for 10 bit right justified result.

8Mb (1MB) SPI Flash

CS – P13
SCK – P12
SDI – P11 (SDO on flash chip)
SDO – M11 (SDI on flash chip)
First three 64k sectors reserved for FPGA configuration.

The iceFUN module is powered from USB or an external 5v supply. There are on-board 3.3v and 1.2v regulators.

All PIC and FPGA I/O pins are 3.3v, do not connect these to 5v devices.

IceFun is programmed using iceFUNprog.
Linux users can download the source from our github at
https://github.com/devantech/iceFUNprog
A Windows version (.exe and c# source) is available at from www.robot-electronics.co.uk/files/iceFUNprog.zip

Any toolchain which generates a binary bit-stream may be used, such as lattice iCEcube2. Linux users also have the icestorm tools with yosys and nextpnr.
http://www.clifford.at/icestorm/

iceWerx.pdsprj — Schematic

PL1 — USB-MINI-B

Pin	Signal
1	Vcc
2	USBDM / D-
3	USBDP / D+
4	ID
5	Ground
6	

IC3 — PIC16LF1459

- 18 Vdd
- 14 Vusb
- 15 D-
- 16 D+
- 17 Vss
- RA3/M — 1 → RESET
- RC0/D/AN4 — 13 → AD1
- RC1/C/AN5 — 12 → AD2
- RC2 — 11
- RC3 — 4
- RC4 — 3
- RC5 — 2
- RA4 — 20 → CLK
- RA5 — 19 → CRESET
- RC6/AN8 — 5
- RC7/AN9 — 6 → AD3
- RB4/AN10 — 10 → AD4
- RB5/AN11 — 9 → CDONE
- RB6 — 8 → Rx
- RB7 — 7 → Tx

R3 47K **R4** 47K

R5 100 → TX
R6 100 → RX

IC1:E — HX8K_CB132
- L11 VCC_SPI
- SPI
- SDO — M11
- SDI — P11
- SCK — P12
- SS — P13

IC2 — AT25SF081
- 8 Vdd
- 3 WP
- 7 HOLD
- 4 Vss
- SI — 5 — IO0
- SO — 2 — IO1
- SCK — 6
- CS — 1
- IO2, IO3

U2 — XC6210B332MR
- 1 VIN, 3 SHDN, VOUT 5, VSS 2
- C18 10uF
- C17 10uF, C16 100N, C15 100N, C14 10uF, C13 100N, C12 100N

U1 — XC6210B122M
- 1 VIN, 3 SHDN, VOUT 5, VSS 2
- C11 10uF, C10 100N, C9 100N
- C8 10uF, C6 100N, C5 100N, C7 100N

IC1:F — Power — HX8K_CB132
- F8 VCC, G6 VCC, H9 VCC, J4 VCC, J7 VCC
- A14 VPP_2V5
- M8 VCCPLL0
- C8 VCCPLL1
- D8 GNDPLL1
- L7 GNDPLL0
- A9, F1, F7, G7, G8, G9, H6, H7, H8, J8, J14, L3, P6 — GND

R1 100 **R2** 100
C1 100N, C2 10uF, C3 100N, C4 10uF

L33 Blue — R17 240
L1 Red — R7 1k — A5
L2 Green — R8 1k — M4

IC1:A — Bank0 — HX8K_CB132
- A8, F6 VCCIO_0
- P225 A1, P223 A2, P222 A3, P219 A4, P208 A5, GBIN0 A6, GBIN1 A7, P181 A10, P179 A11, P170 A12, P221 C4, P212 C5, P206 C6, P200 C7, P190 C9, P186 C10, P174 C11, P172 C12, P211 D5, P207 D6, P202 D7, P188 D9, P177 D10, P178 D11

IC1:B — Bank1 — HX8K_CB132
- F9, H14 VCCIO_1
- P161 B14, P154 C14, P160 D12, P152 D14, P146 E11, P147 E12, P148 E14, P144 F11, P137 F12, GBIN3 F14, P136 G11, GBIN2 G12, P128 G14, P120 H11, P119 H12, P118 J12, P116 K11, P115 K12, P117 K14, P111 L12, P114 L14, P109 M12, P112 N14, P110 P14

IC1:C — Bank2 — HX8K_CB132
- J9, M5 VCCIO_2
- PIO/CBSEL0 L9/P10, PIO/CBSEL1
- CRESET_B L10, CDONE M10
- P72 L4, P71 L5, P78 L6, P87 L8, P64 M3, P63 M4, P77 M6, P79 M7, P91 M9, P56 P2, P59 P3, P73 P4, P74 P5, P57 P7, P8, P89 P9
- M3, M4, M6, M7, M9
- P2, P3, P4 TX, P5 RX, CLK, P8, IO3

IC1:D — Bank3 — HX8K_CB132
- J6, K1, E3 VCCIO_3
- P2A B1, P2B C1, P4A C3, P5A D1, P4B D3, P8A D4, P5B E1, P8B E4, P9B F3, P9A F4, GBIN7 G1, P13A G3, P10B G4, GBIN6 H1, P14B H3, P10A J1, P12B J3, P12A K3, P18A K4, P18B L1, P23A L3, P23B M1, P25A N1, P25B P1

PL2 — SM2X18

AD3 1	2 RESET
AD4 3	4 3.3v
M7 5	6 AD1
M6 7	8 AD2
P3 9	10 P1
P2 11	12 N1
M3 13	14 L1
M1 15	16 J3
K3 17	18 H3
J1 19	20 G3
H1 21	22 F3
G1 23	24 D1
E1 25	26 A12
C1 27	28 C11
C3 29	30 D10
A1 31	32 D7
A3 33	34 C6
A4 35	36 C5

PL3 — SM2X18

5v 1	2 GND
M12 3	4 P8
N14 5	6 P14
K12 7	8 L12
H11 9	10 L14
J12 11	12 K14
G12 13	14 H12
F12 15	16 G14
E12 17	18 F14
D12 19	20 E14
C12 21	22 D14
B14 23	24 C14
A11 25	26 A12
C10 27	28 C11
A10 29	30 D10
D6 31	32 D7
C7 33	34 C6
A7 35	36 A6