

BSODomizer:  
Mischievous hardware for  
mischievous people

BY:

JOE GRAND

AND

ZOZ

- (1) Hardware
- (2) Firmware
- (3) Results

\*\*\* COMPLETELY OPEN SOURCE

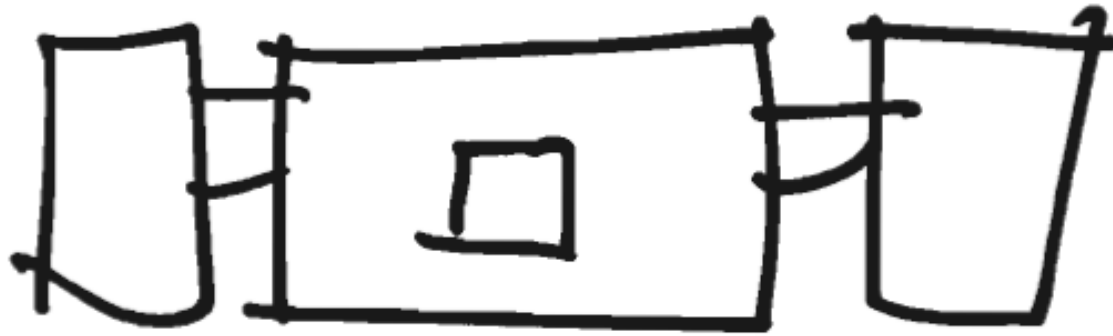
\*\*\* ALL DESIGN DOCUMENTATION HERE:

<http://www.bsodomizer.com>

or

<http://www.grandideastudio.com/portfolio/bsodomizer>

# Early Design Notes



DB15

IN

analog  
switch?  
pass thru

DB15

OUT

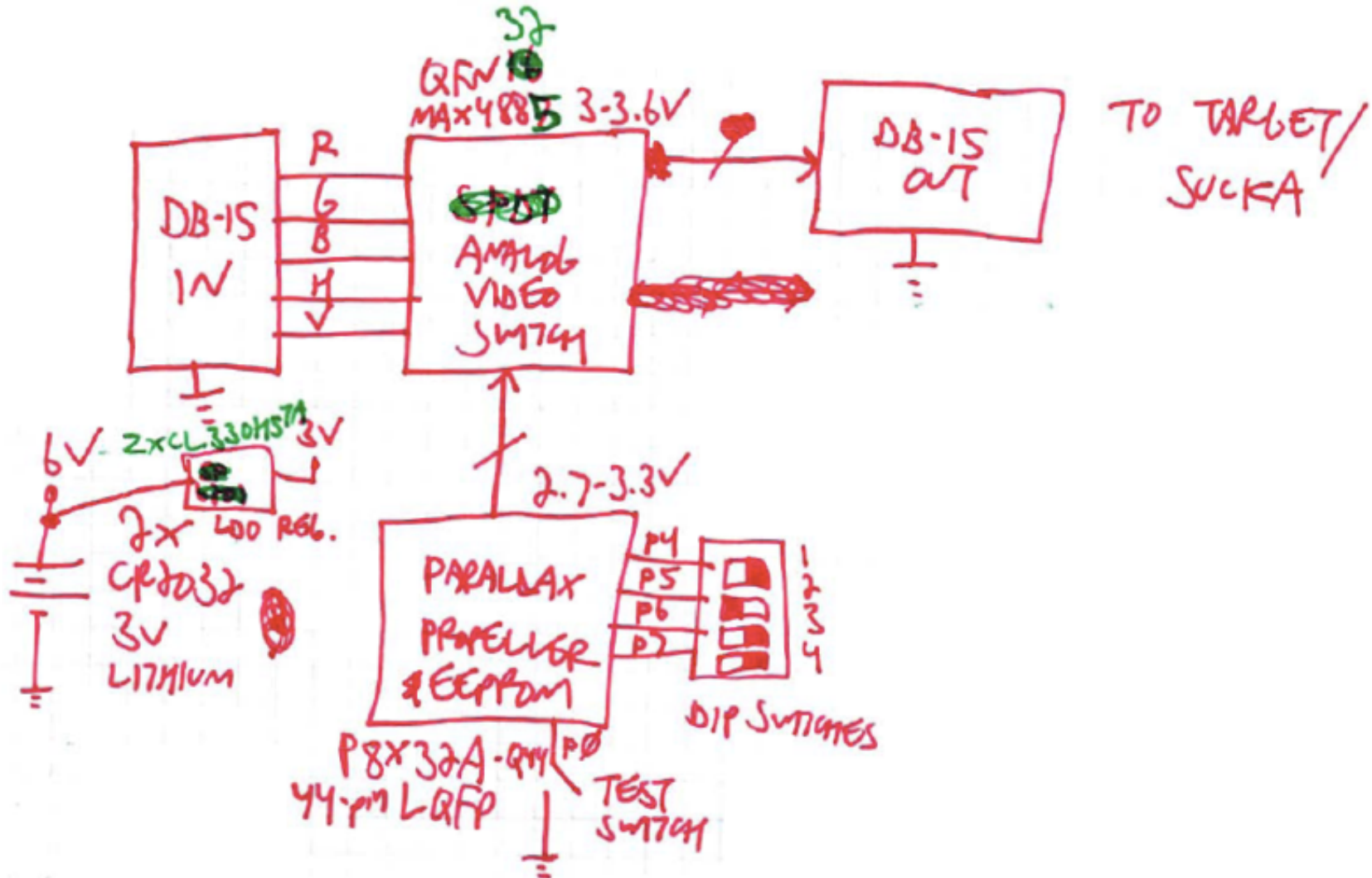
- detect ~~output~~ input video

- dip switches - Mac or PC versions

- time for BIOS

# Early Design Notes 2

## BSODomizer SYSTEM BLOCK DIAGRAM 5/22/08



# The Propeller

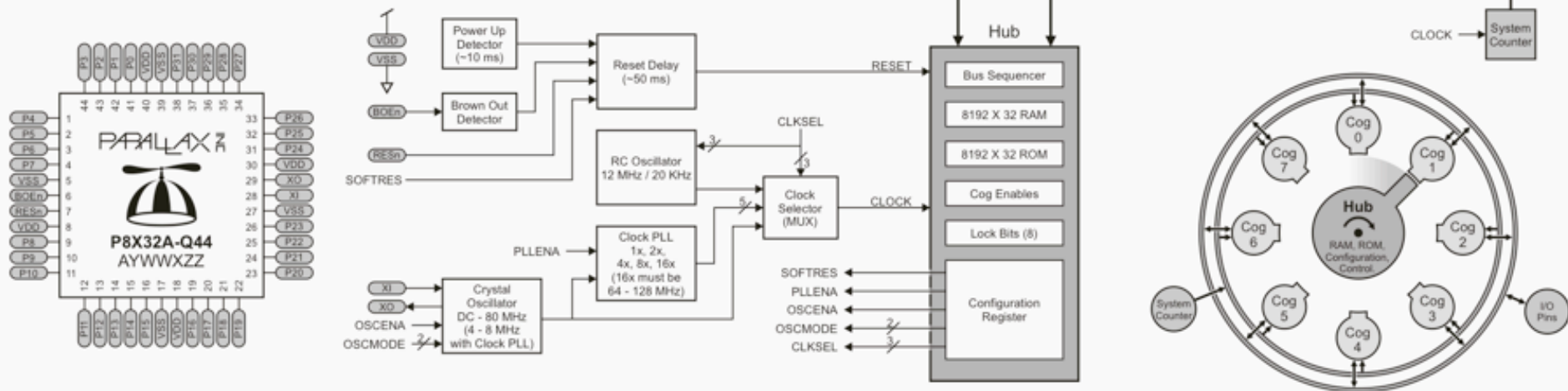
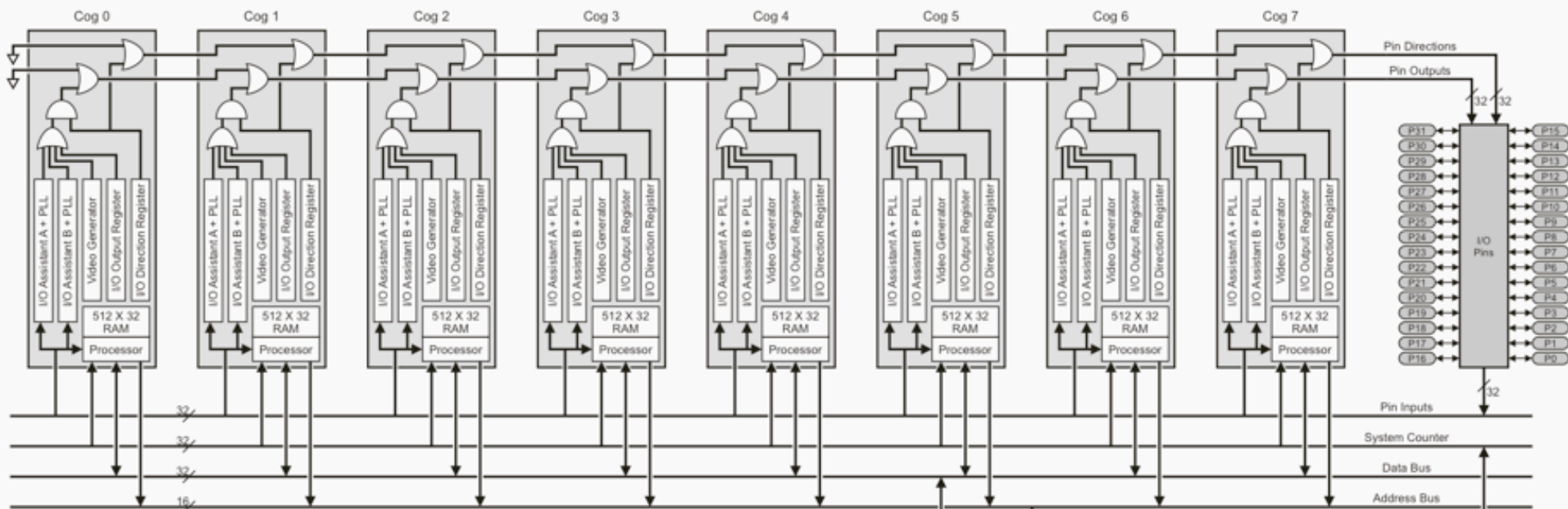


- \*\*\* COMPLETELY CUSTOM, GROUND UP DESIGN BY CHIP GRACEY/PARALLAX
- \*\*\* ALL ON-CHIP STRUCTURES BUILT FROM SCRATCH
- \*\*\* EIGHT YEARS OF DEVELOPMENT/TESTING, RELEASED IN 2006
  
- \*\*\* CAN BE PROGRAMMED IN SPIN, ASSEMBLY, OR C
- \*\*\* EIGHT INDEPENDENT COGS (20 MIPS EACH)
  
- \*\*\* INFORMATION: <http://www.parallax.com/propeller/>
- \*\*\* DISCUSSION FORUMS: <http://forums.parallax.com/forums>
- \*\*\* OBJECT EXCHANGE: <http://obex.parallax.com>



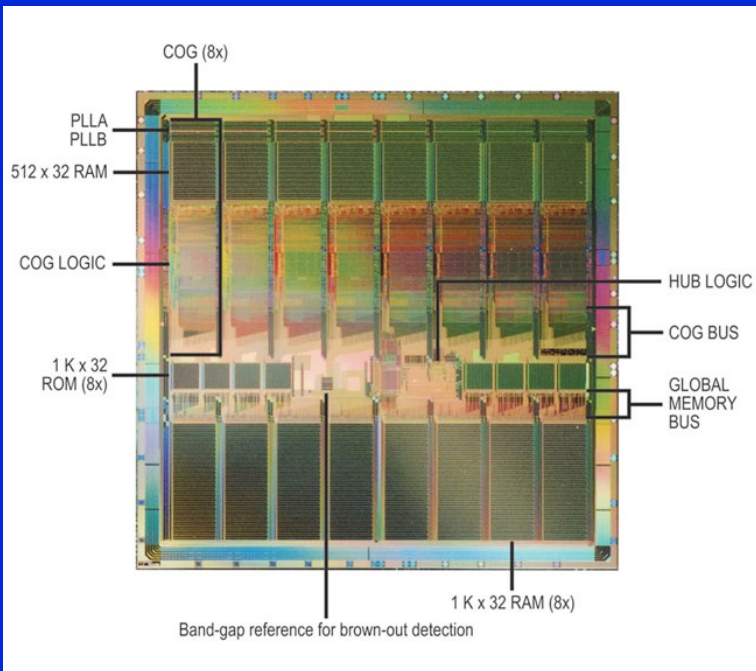
\*\*\* DIP-40, QFP-44, QFN-44

# The Propeller 2



# The Propeller 3

- \*\*\* POWER REQUIREMENT = 3.3V DC
- \*\*\* EXTERNAL CLOCK SPEED = DC to 80 MHz
- \*\*\* INTERNAL RC OSCILLATOR = 12 MHz or 20 KHz
- \*\*\* GLOBAL/HUB MEMORY = 32KB ROM, 32KB RAM
- \*\*\* COG MEMORY = 2KB RAM
- \*\*\* I/O PINS = 32 (40mA SINK/SOURCE PER PIN)
- \*\*\* PROGRAM CODE LOADED FROM EXTERNAL EEPROM ON POWER-UP



```
Propeller Tool - bsdomizer
File Edit Run Help
bsdomizer
Full Source Condensed Summary Documentation

BS0Domizer
By Kingpin and Zoz
July 2008

CON
_clknode = xtall + pll16x
_xinfreq = 5_000_000

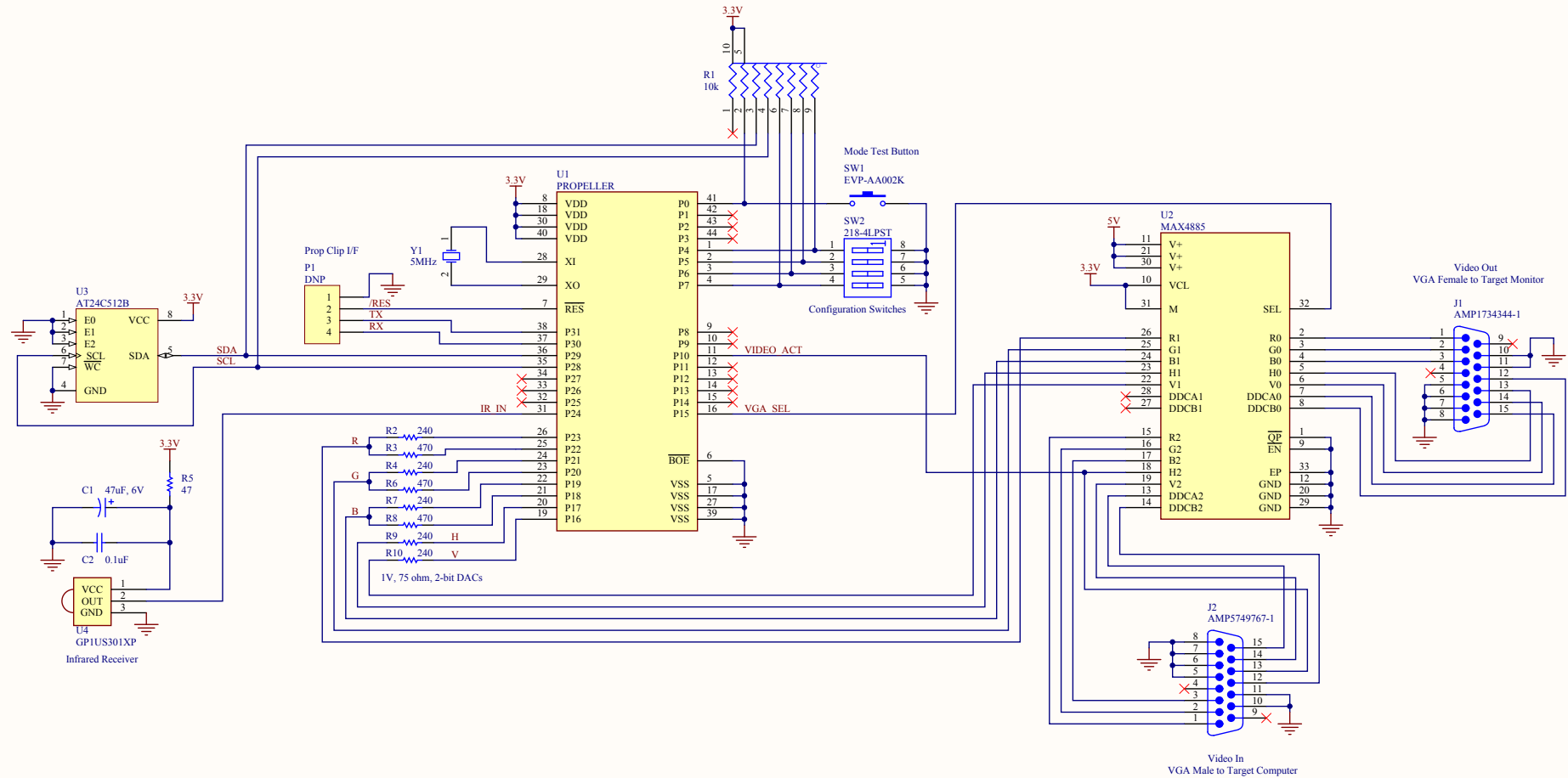
ButtonPin = 0
Dip1Pin = 4
Dip2Pin = 5
Dip3Pin = 6
Dip4Pin = 7
ModeSelectPin = 15

cols = vgaText#cols
rows = vgaText#rows
chr = cols * rows

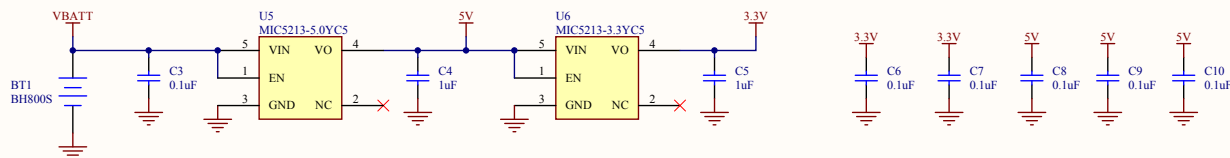
VAR
'sync long - written to -1 by VGA driver after each screen refresh
long sync
'screen buffer - could be bytes, but longs allow more efficient scrolling
long screen[cols*rows/4]
'row colors
word colors[rows]
'cursor control bytes
byte cx0, cy0, cm0, cx1, cy1, cm1

OBJ
cLock : "Clock"
vgaText : "vga_hires_text"
```

# Schematic



2x CR2032 Lithium Coin Cells (6V nominal)



NOTE: RESISTORS ARE IN OHMS +/- 5% AND CAPACITORS ARE IN MICROFARADS, X7R UNLESS OTHERWISE NOTED. SEE BOM FOR ACTUAL VOLTAGE AND SPECIFICATION.



TITLE  
DEFCON 16: BSODomizer

| DATE     | FILENAME | SIZE | SHT | OF | DRAWN BY  | REV |
|----------|----------|------|-----|----|-----------|-----|
| 9/8/2008 |          | B    | 1   | 1  | Joe Grand | 1.1 |



# Bill-of- Materials

## BSODomizer

### Bill-of-Materials

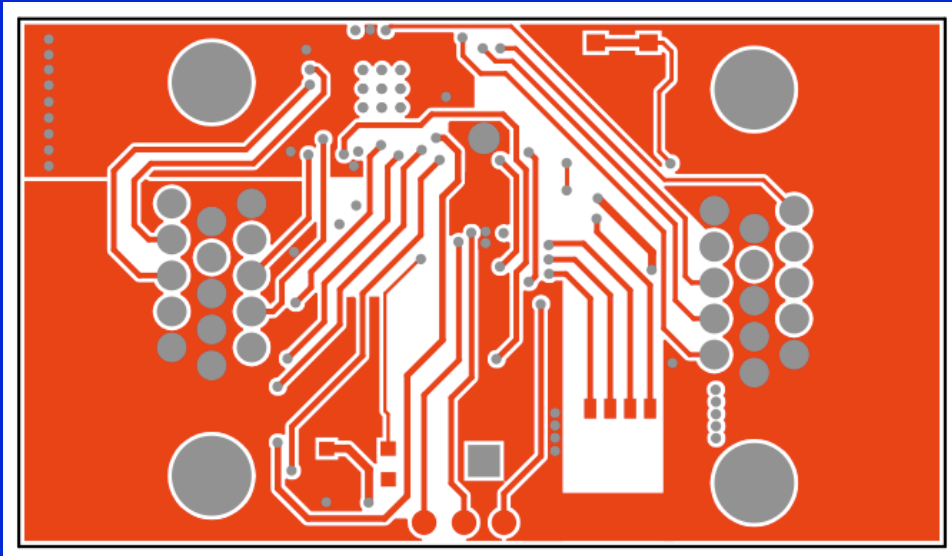
Document Version 1.1, December 1, 2009

| Item | Quantity | Reference             | Manufacturer | Manuf. Part #     | Distributor | Distrib. Part #   | Description   |
|------|----------|-----------------------|--------------|-------------------|-------------|-------------------|---|
| 1    | 1        | BT1                   | MPD          | BH800S            | Digi-Key    | BH800S-ND         | Battery holder for 2 (two) CR2032 cells                   |
| 2    | 1        | C1                    | Kemet        | T494A476M006AT    | Digi-Key    | 399-3828-1-ND     | 47uF tantalum capacitor, 6.3V, 20%, size A                |
| 3    | 7        | C2,C3,C6,C7,C8,C9,C10 | Kemet        | C0603C104K4RACTU  | Digi-Key    | 399-1096-2-ND     | 0.1uF bypass capacitor, 16V, X7R, 0603                    |
| 4    | 2        | C4,C5                 | Kemet        | C0805C105K8RACTU  | Digi-Key    | 399-1172-1-ND     | 1uF ceramic capacitor, X7R, 10V, 0805                     |
| 5    | 1        | J1                    | Tyco/AMP     | 1734344-1         | Digi-Key    | A35119-ND         | Connector, HD-22 VGA 15-pin, R/A, female                  |
| 6    | 1        | J2                    | Tyco/AMP     | 5749767-1         | Digi-Key    | A31927-ND         | Connector, HD-22 VGA 15-pin, R/A, male                    |
| 7    | 1        | R1                    | Panasonic    | EXB-A10P103J      | Digi-Key    | U7103CT-ND        | 10k ohm 8-resistor network, 5%, 1/16W, SMD                |
| 8    | 5        | R2,R4,R7,R9,R10       | Panasonic    | ERJ-3GEYJ241V     | Digi-Key    | P240GCT-ND        | 240 ohm, 5%, 1/10W, 0603                                  |
| 9    | 3        | R3,R6,R8              | Panasonic    | ERJ-3GEYJ471V     | Digi-Key    | P470GCT-ND        | 470 ohm, 5%, 1/10W, 0603                                  |
| 10   | 1        | R5                    | Panasonic    | ERJ-3GEYJ470V     | Digi-Key    | P47GCT-ND         | 47 ohm, 5%, 1/10W, 0603                                   |
| 11   | 1        | SW1                   | Panasonic    | EVP-AA002K        | Digi-Key    | P13347SCT-ND      | Switch, SPST tactile momentary, 100gf, 3.5mm x 2.9mm, SMD |
| 12   | 1        | SW2                   | CTS          | 218-4LPST         | Digi-Key    | CT2184LPST-ND     | Switch, 4-position SPST DIP, half-pitch, SMD              |
| 13   | 1        | U1                    | Parallax     | P8X32A-Q44        | N/A         | N/A               | Microcontroller, Propeller, TQFP-44                       |
| 14   | 1        | U2                    | Maxim        | MAX4885ETJ+       | N/A         | N/A               | VGA 2-to-1 Multiplexer, QFN-32                            |
| 15   | 1        | U3                    | Atmel        | AT24C512B-TH-B    | Digi-Key    | AT24C512B-TH-B-ND | Memory, Serial EEPROM, 64KB, TSSOP-8                      |
| 16   | 1        | U4                    | Sharp        | GP1US301XP        | N/A         | N/A               | Receiver Module, Infrared (IR), 38kHz, 2.4V-5.5V, SMD     |
| 17   | 1        | U5                    | Micrel       | MIC5213-5.0YC5    | Digi-Key    | 576-2755-1-ND     | Linear Regulator, LDO, 5V, 80mA, SC70-5                   |
| 18   | 1        | U6                    | Micrel       | MIC5213-3.3YC5    | Digi-Key    | 576-2753-1-ND     | Linear Regulator, LDO, 3.3V, 80mA, SC70-5                 |
| 19   | 1        | Y1                    | Citizen      | CS20 5.000MABJ-UT | Digi-Key    | 300-8121-1-ND     | Crystal, 5MHz, 18pF, SMD                                  |
| 20   | 1        | PCB                   | N/A          | BSOD 1.0          | N/A         | N/A               | PCB, Fabrication & Assembly                               |

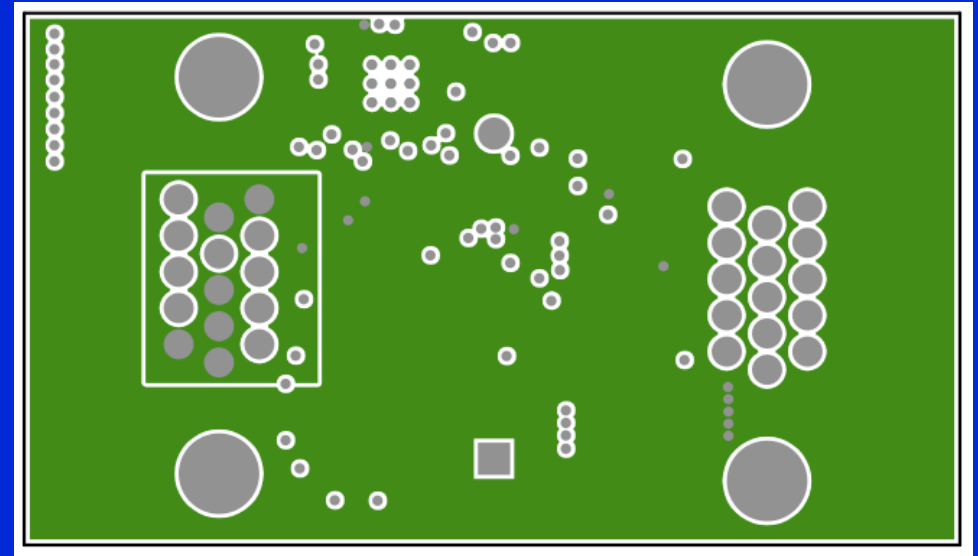
\*\*\* APPROXIMATE COST: \$40 IN SMALL QUANTITIES  
\$23 FOR 1K

# PCB Layout

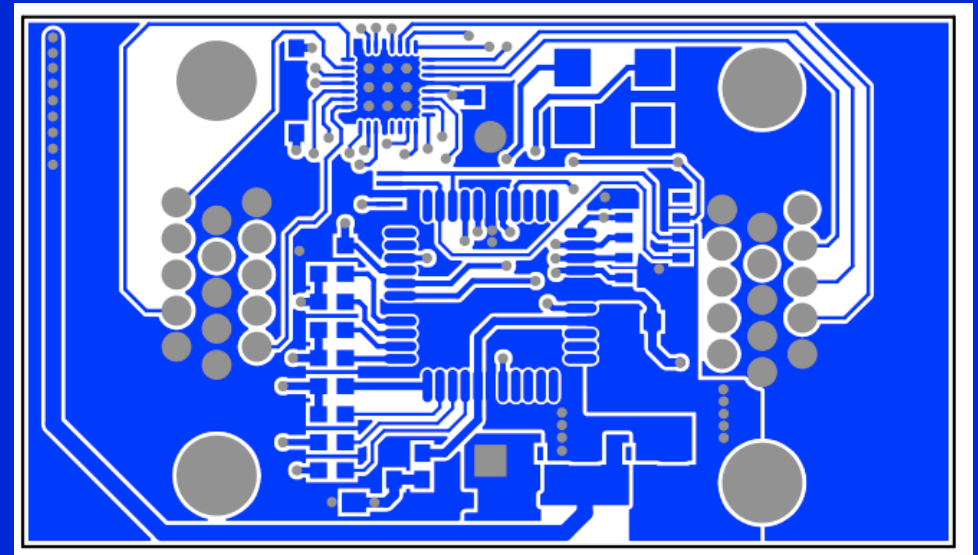
Inner



Top

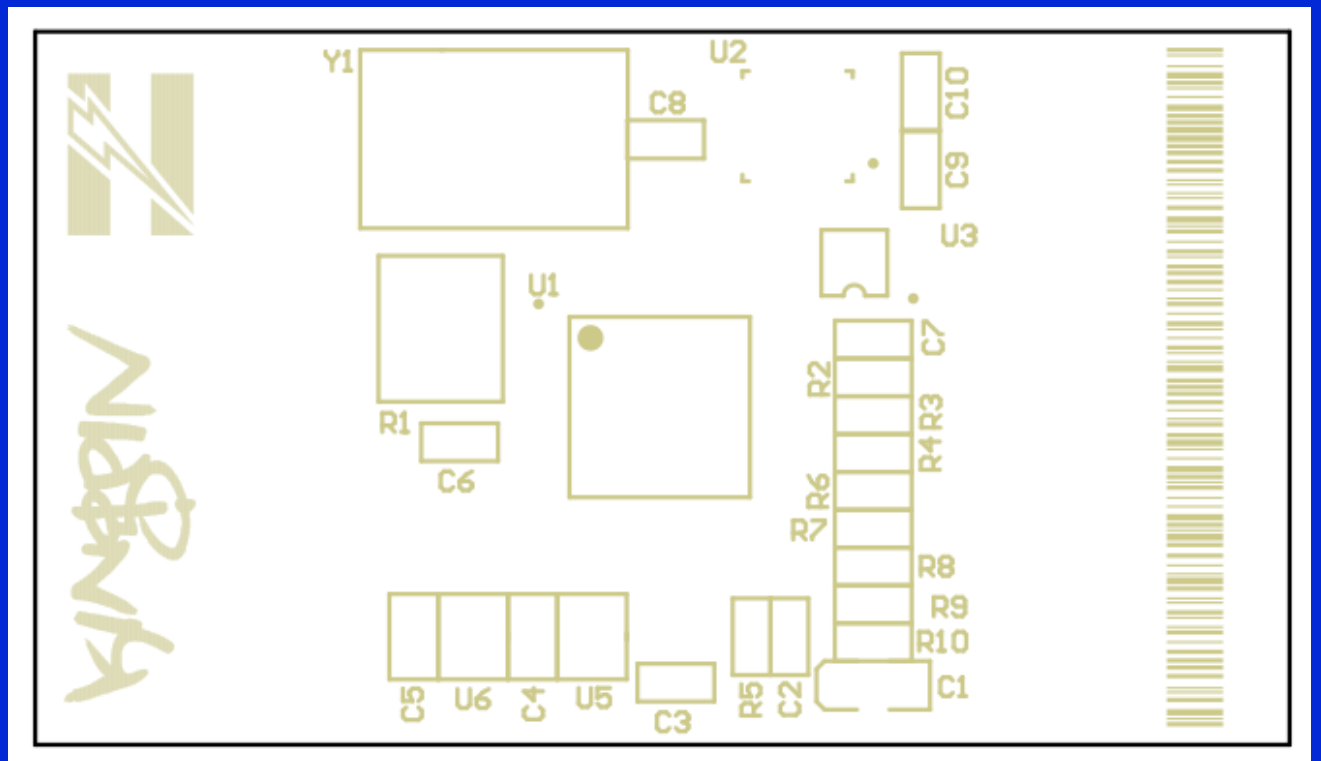
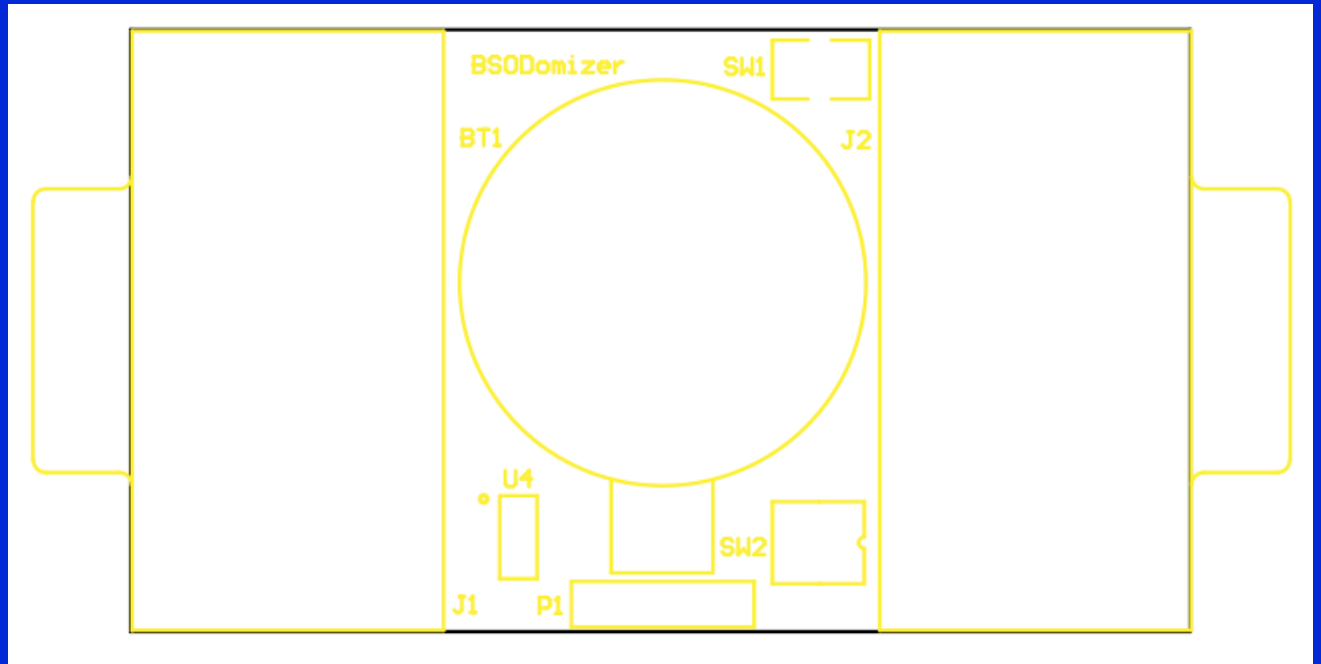


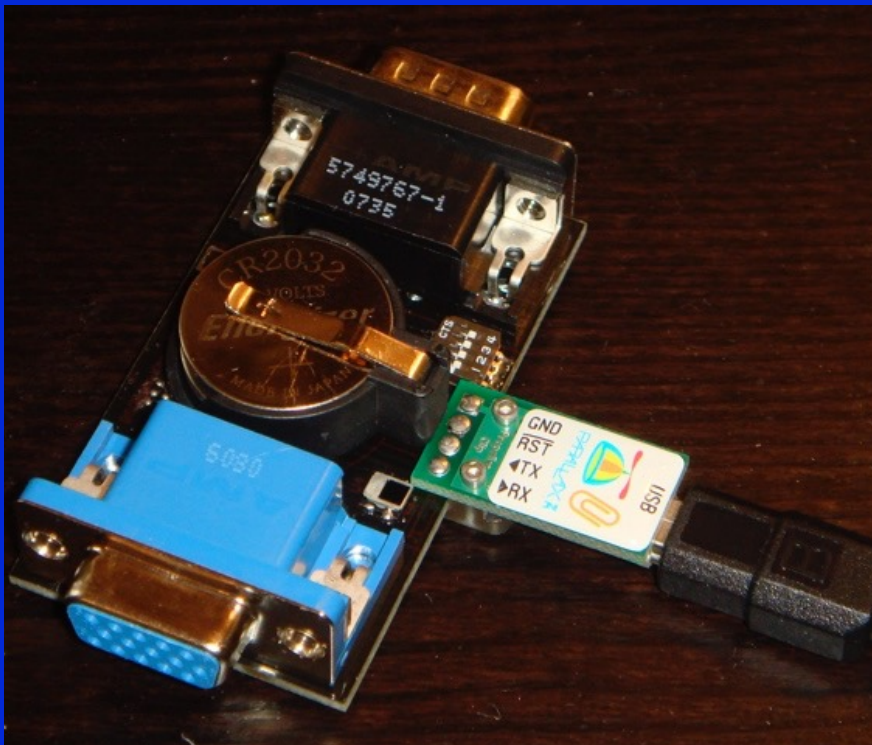
Bottom



- \*\*\* FOUR LAYER PCB, THREE USED
- \*\*\* ROUTED BY HAND W/ ALTIUM DXP
- \*\*\* DESIGNED FOR SMALLEST FOOTPRINT
- \*\*\* 2.32" X 1.32"

# Assembly Drawings





# Firmware

\*\*\* VGA DRIVER: 2 COGS  
1024x768 XGA TEXT OUTPUT

\*\*\* IR DECODER: 1 COG  
“THREAD” FILLS FIFO WITH IR CODES RECEIVED

^^ (BOTH FROM THE PARALLAX OBJECT EXCHANGE)

\*\*\* CUSTOM:  
2 Hz MAIN LOOP  
VGA DRIVER & IR DECODER REQUIRE 80 MHz  
50 ms @ 80 MHz TO ACCEPT IR CODES  
REST OF VIDEO PASSTHROUGH MODE @ 5 MHz

AVERAGE CURRENT: ~43mA AT 80 MHz,  $\pi$  mA AT 5 MHz  
(APPROX. 78 HOUR RUNTIME W/ CR2032 CELLS)

PROPELLER CAN SWITCH OSCILLATORS/PLL ON THE FLY  
10 ms FOR OSCILLATOR TO RAMP UP  
75  $\mu$ s TO PERFORM CLOCK SWITCH

# Firmware 2

## \*\*\* BSOD TIMER

32 BIT SYSTEM COUNTER - WRAPS IN 53 SECONDS AT 80 MHz  
COUNT SECONDS OFF SYSTEM COUNTER IN MAIN LOOP

## \*\*\* REBOOT BEHAVIOR MIMICRY

MONITOR TARGET COMPUTER'S VIDEO HSYNC  
DEPENDING ON RESOLUTION, EITHER ACTIVE HIGH OR ACTIVE LOW  
ASSERTS EVERY 20  $\mu$ s  
SAMPLE 3 TIMES 10  $\mu$ s & 5  $\mu$ s SEPARATED

## \*\*\* DIP SWITCH SETTINGS

1: WINDOWS/MAC BSODs  
2,3: TIMEOUTS: (mins) INF, 5, 10, 30 [extra sadism mode]  
4: BGOD MODE (blue goatse of death)

## \*\*\* IR COMMANDS (SONY TV REMOTE CONTROL)

POWER: BSOD (FROM PASSTHROUGH)  
CH UP: PASSTHROUGH (FROM BSOD)  
CH DN: BGOD OVERLAY (FROM BSOD)

# Other Uses

- \*\*\* JUST MODIFY THE FIRMWARE AND REPROGRAM WITH THE PROP CLIP
- \*\*\* GENERIC DEVELOPMENT PLATFORM FOR PROPELLER/VGA/IR
- \*\*\* MONITOR CALIBRATION TOOL (DISPLAY COLOR BARS)
- \*\*\* TIMER (REPLACE BSOD WITH A REMINDER TO TAKE A BREAK FROM SITTING IN FRONT OF THE COMPUTER)

Insert funny video here...



# The Future of BSODomy

\*\*\* PARASITIC MODULES THAT CAN...  
STORE SCREENSHOTS  
TRANSMIT IMAGES/VIDEO ON DEMAND  
SURVIVE ON MICROAMPS OF MONITOR SIGNAL POWER  
BE SMALLER THAN A CONNECTOR

NEVER TRUST A CABLE AGAIN