## Introduction

This module is equipped with a high resolution image sensor to provide high quality photo and video, TV for display, and an advanced backend processor for performing fast image operations and customizable features, to suit for different lighting condition, and usage. It is good for microscope and industrial applications.

## Key Features

- ✓ Interface to 9MP high resolution image sensor
  - ■ JPEG: VGA, 1.3MP, 5MP, 9MP
  - ■ AVI: MJPEG, 320x240@24fps, 640x480@24fps
- ✓ Capture mode:
  - ■ Manual – photo snap / video record by keypad
  - ■ Time-lapse – automatic photo snap at a configurable time interval
- ✓ Real time video display
- ✓ Video output to TV
- ✓ Store to SD card, up to 16G
- ✓ USB mass storage
- ✓ Image brightness/color/contrast/saturation adjustment
- ✓ Image mirror/flip
- ✓ Image freeze
- ✓ Photo playback zoom
- ✓ Date-time stamp
- ✓ RTC, OSD

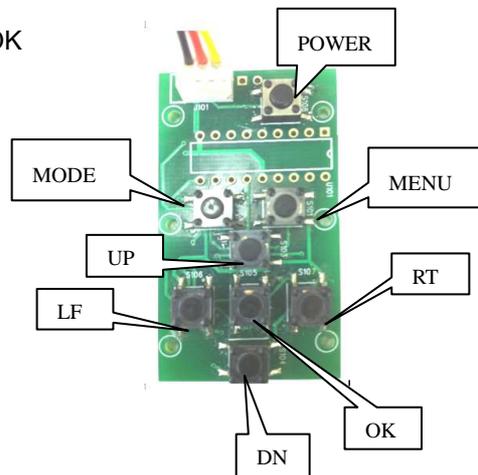## System Block Diagram
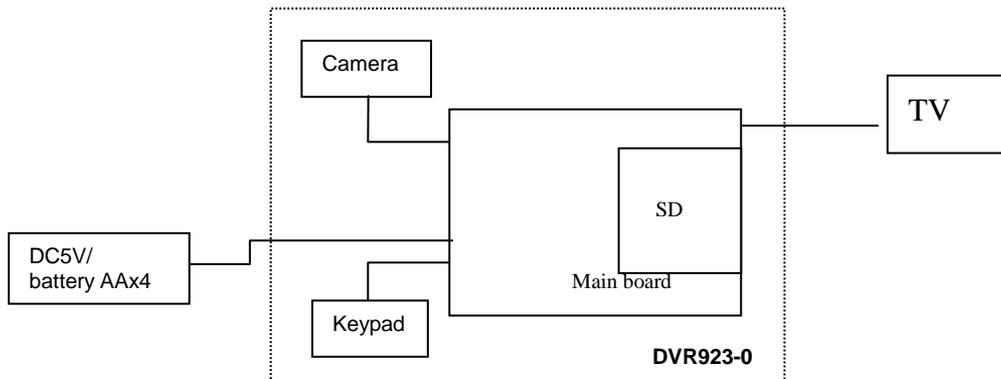


## Keyboard Design

8-Key design: power/mode/menu/UP/DN/LF/RT/OK

1. Power: power on/off the module
2. Mode: toggle playback or preview
3. Menu: for setup or quit the setup
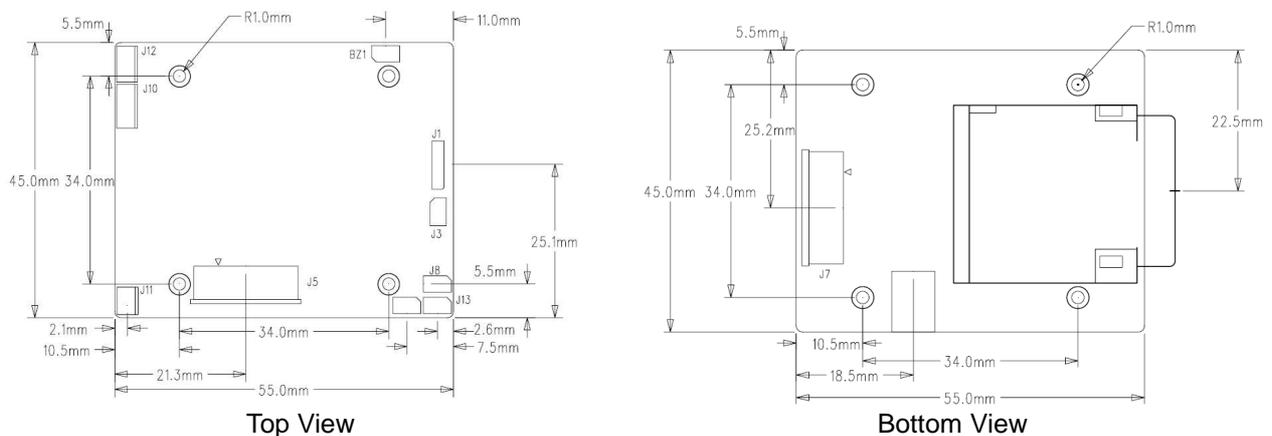4. LF/RT/UP/DN for item select
5. OK to confirm

## Module Specifications

| Board Dimension | 55x45mm |
|---|---|
| Storage | External SDHC card up to 16GB |
| Video Capture | 640x480, MJPEG format<br>Max. 60mins or 4GB file size |
| Photo Resolution | Max. 9MP JPEG format |
| USB Interface | Mass storage mode USB 2.0 |
| Power | DC 5V/AAx4 |

## Electrical Characteristics

| Parameter | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Operation Voltage | | 3.7 | 5 | 6 | V |
| Operation current @5VDC | Preview | 260 | 275 | 290 | mA |
| | Capture JPG (Peak @ capturing) | 210 | 280 | 310 | mA |
| | Capture AVI (Peak @ recording) | 350 | 365 | 380 | mA |
| | Playback | 220 | 230 | 300 | mA |

## Mechanical Dimension



Top View



Bottom View

## Keyboard Circuit

## Setup summary

```
┌──────────────┐      ┌──────────────┐      ┌─────────────────────────────────────┐
│ Preview menu │ ───► │ Video setup  │ ───► │ Photo size: VGA / 1.3M / 5M / 9M    │
└──────────────┘      └──────────────┘      │ Photo quality: 1 – 10 levels        │
                                            │ Video size: VGA / QVGA              │
                                            │ Video quality: 1 – 10 levels        │
                                            │ Contrast: 1 – 10 levels             │
                                            │ Saturation: 1 – 10 levels           │
                                            │ Color – Auto / 6500K / 9300K / Manual│
                                            │ Brightness: 1 – 10 levels           │
                                            │ Mirror: On / Off                    │
                                            │ Flip: On / Off                      │
                                            │ Time lapse: On / Off                │
                                            │ Time stamp: On / Off                │
                                            └─────────────────────────────────────┘

                      ┌──────────────┐      ┌─────────────────────────────────────┐
                 ───► │ Audio setup  │ ───► │ Audio In: On / Off                  │
                      └──────────────┘      │ Volume: 1 – 7 levels                │
                                            └─────────────────────────────────────┘

┌──────────────┐                            ┌─────────────────────────────────────┐
│ System menu  │ ─────────────────────────► │ TV: NTSC/PAL                        │
└──────────────┘                            │ Date/Time                           │
                                            │ Factory default                     │
                                            │ Format                              │
                                            │ Version                             │
                                            └─────────────────────────────────────┘

┌──────────────┐                            ┌─────────────────────────────────────┐
│ Delete menu  │ ─────────────────────────► │ Delete one                          │
└──────────────┘                            │ Delete all                          │
                                            │ Volume: 1 – 7 levels                │
                                            └─────────────────────────────────────┘
```

## Operation:

### Power on/off the module
Press once PWR key, the module will power on. By default it enters preview mode. Note the module need to have the SD card for image recording. It will display a "?" logo if the card is not present. It does not support hot-plug.
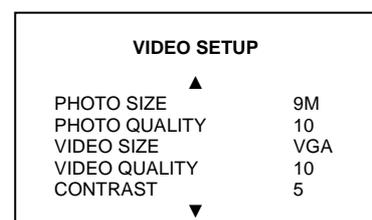
### Preview mode
1. Press MODE to toggle between preview mode and playback mode.
2. Press LF to take a JPG picture.
3. Press RT to start recording AVI, and press it again to stop recording. When memory is full, it will show "Memory Full". Max duration is 60mins or 4GB file size.
4. Press OK to freeze / unfreeze the preview video. When image frozen, one can press LF to store that image but the quality is VGA, not good as snap shot as 9MP
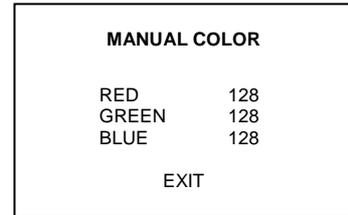5. Press UP to turn OSD on and off.

### Menu
Press MENU to enter video/audio setup. Use UP/DN to select item, LF/RT to toggle value. Press MENU again to exit
1    VIDEO
    1.1    Photo Size: VGA / 1.3M / 5M / 9M. By default it is set to 9M.
    1.2    Photo Quality: Level 1 – 10. By default it is set to level 10.
    1.3    Video Size: VGA / QVGA. By default it is set to VGA.
    1.4    Video Quality: Level 1 – 10. By default it is set to level 10.
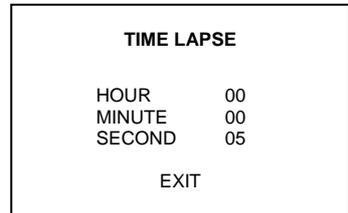    1.5    Contrast: Level 1 – 10. By default it is set to level 5.

```
┌─────────────────────────────┐
│        VIDEO SETUP          │
│             ▲               │
│ PHOTO SIZE          9M      │
│ PHOTO QUALITY       10      │
│ VIDEO SIZE          VGA     │
│ VIDEO QUALITY       10      │
│ CONTRAST            5       │
│             ▼               │
└─────────────────────────────┘
```

1.6 Saturation: Level 1 – 10. By default it is set to level 4.
1.7 Color: Auto / 6500K / 9300K / Manual. By default it is set to Auto.
When the manual mode is selected, user can enter manual color sub-menu by pressing the OK key to set the RGB scales manually.
   1.7.1 Manual Color Submenu:
      Red: Level 0 – 255. By default it is set to level 128.
      Green: Level 0 – 255. By default it is set to level 128.
      Blue: Level 0 – 255. By default it is set to level 128.
1.8 Brightness: Level 1 – 10. By default it is set to level 3.
1.9 Mirror: Left/right mirror. By default it is set to off.
1.10 Flip: Up/down flip. By default it is set to off.
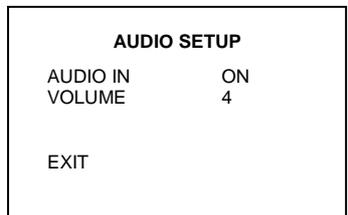1.11 Time lapse: Capture a photo automatically in every time interval.
When time lapse mode is ON, user can enter time lapse sub-menu by pressing OK key to set the time interval. By default it is set to off.
   1.11.1 Time Lapse Submenu:
      Hour: 00 – 23. By default it is set to 00.
      Minute: 00 – 59. By default it is set to 00.
      Second: 00 – 59. By default it is set to 10.
   1.11.2 The limitation: The min time lapse is 10 sec.
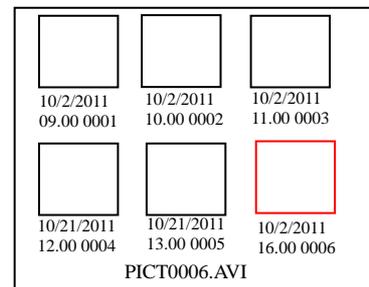1.12 Time Stamp: Adding a date/time stamp on the saved photo during photo capturing. By default it is set to off.
2 AUDIO
   2.1 Audio In: Select to record the AVI with or without audio. By default it is set to ON.
   2.2 Volume: Level 1-7.Volume of audio input. By default it is set to level4.

```
          MANUAL COLOR

   RED           128
   GREEN         128
   BLUE          128

          EXIT
```

```
           TIME LAPSE

   HOUR          00
   MINUTE        00
   SECOND        05

          EXIT
```

```
          AUDIO SETUP

   AUDIO IN         ON
   VOLUME           4

   EXIT
```

**Playback Operation**
1. Press mode to toggle between preview mode and playback mode.
2. Files are displayed in thumbnail of 6 photos. Press LF/RT to move to previous or next file, press OK to display current file in full screen.
3. When file is selected, press UP to turn OSD on and off. Press OK to start playing AVI.
4. At playing AVI, LF for backward, OK to stop. Use DN to pause/resume.
5. When backward playing, press RT to forward playing.
6. Delete file: press MENU to select delete one or delete all, confirmation is required.

```
  ┌──┐   ┌──┐   ┌──┐
  │  │   │  │   │  │
  └──┘   └──┘   └──┘
 10/2/2011  10/2/2011  10/2/2011
 09.00 0001 10.00 0002 11.00 0003
  ┌──┐   ┌──┐   ┌──┐
  │  │   │  │   │  │
  └──┘   └──┘   └──┘
 10/21/2011 10/21/2011 10/2/2011
 12.00 0004 13.00 0005 16.00 0006
          PICT0006.AVI
```

**Menu**
1. Use UP/DN key to select, use OK to confirm select
2. Sub-menu will prompt for confirmation before deleting. Always set default value to Cancel, use UP/DN to move cursor, OK to confirm and quit.
3. In the volume, use LF/RT key to select the volume of audio output.

```
 Playback           Delete One

 Delete One            Cancel
 Delete All            Confirm
 Volume      4
 Exit
```
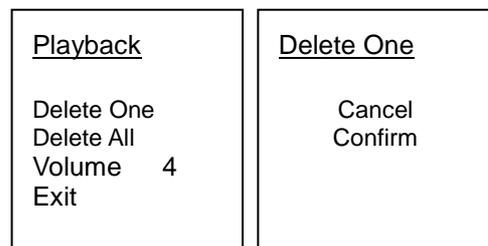
**Note**: All photo/AVI files are saved under the folder DCIM. DCIM contains the sub-folder 100IMAGE, 101IMAGE and so on. Each sub-folder can contain up to 1000 files. The files are named as PICT0001.JPG, PICT0002.AVI, etc.

**PC Connection**
The module can be connected to PC through USB as a mass storage device. When connected, the display will show "PC Connected"

## System Setup

1. Press and hold the MENU key for 5 seconds until system setup menu pops-up. Use UP/DN key to select, use LF/RT key to toggle the selection, use OK to confirm.

2. Setup
   2.1 TV System: NTSC or PAL.
   2.2 Date Time: the system has built-in real time clock, and time stamping to the image, enter the correct date time is essential for the system. Press OK to enter date time setting. Use UP/DN to increase/decrease digit, LF/RT to shift next field, OK to confirm.
   2.3 Factory default: restore factory default settings.
   2.4 Format: format the SD card.
   2.5 Version: check current HW/FW version.

```
SETUP - SYSTEM

TV SYSTEM    PAL
DATE/TIME
FACTORY DEFAULT
FORMAT
VERSION

EXIT
```

```
DATE/TIME

   YYYY / MM / DD
    2011   12   24
   HH : MM : SS
     22   46   59

      EXIT
```

## Keys Operation matrix

|  | Preview | Playback (Thumbnail) | Playback single file |
|---|---|---|---|
| Mode | Change to playback | Change to preview | Playback (thumbnail) |
| Menu | Enter setup Menu | - | Enter delete menu |
| UP | Turn on/off OSD | Previous 3 file | Turn on/off OSD |
| DN | - | Next 3 file | - |
| LF | Capture JPG | Previous file | Previous file |
| RT | Start/stop AVI | Next file | Next file |
| OK | Freeze / unfreeze image | Select current file | Photo: Zoom in<br>AVI : Start playing AVI |

|  | Playback AVI | Set up Menu | Date time setting |
|---|---|---|---|
| Mode | playback mode | playback mode | playback mode |
| Menu | - | Quit menu mode | Quit menu mode |
| UP | Turn on/off OSD | Select item | Increase digit |
| DN | Pause/resume | Select item | Decrease digit |
| LF | Backward | Select setting | shift to previous |
| RT | Fast forward (x2) | Select setting | shift to next |
| OK | Forward (x1) / stop / resume | Confirm and quit | Confirm and quit |

|  | Photo playback zoom |
|---|---|
| Mode | Zoom out |
| Menu | Full screen & exit zooming function |
| UP | Scroll up |
| DN | Scroll down |
| LF | Scroll left |
| RT | Scroll right |
| OK | Zoom in |