

ZisWorks

“ZisWorks X28”

“ZisWorks X28 KIT”

“ZisWorks X39 KIT”

GENERAL INFORMATION

Document version : 18 August 2017

The latest version of this document and others can be found at:
zisworks.com/downloads

CHANGELOG

Version 1.0 : 26 July 2017 : Original release

Version 1.1 : 18 August 2017 : Minor changes for public posting

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DISCLAIMER

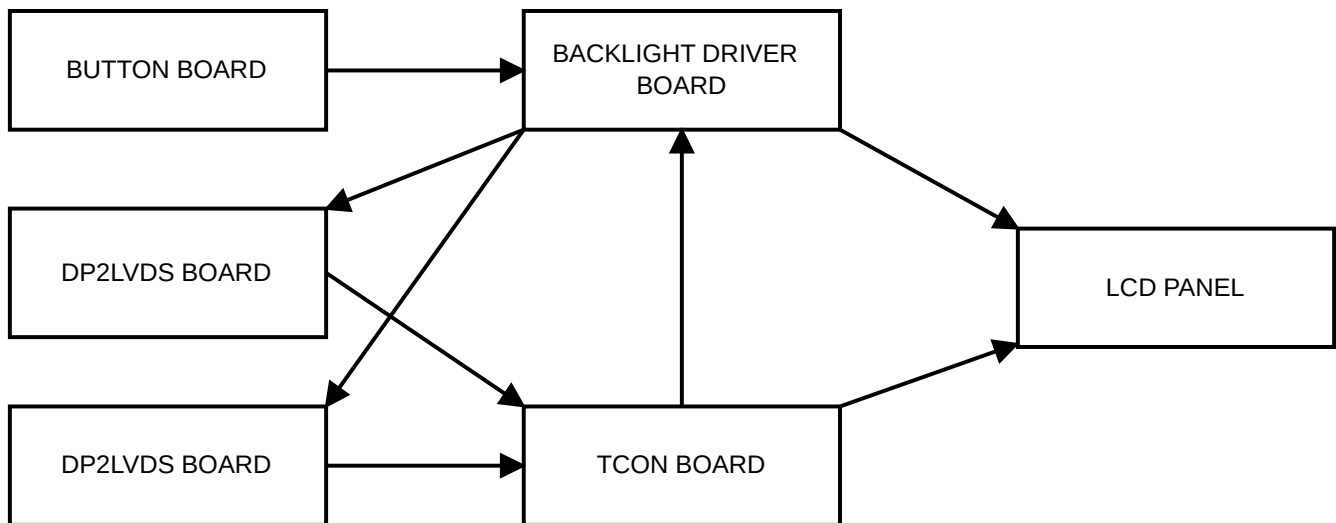
The ZWS UHD TCON is a timing controller board for select models of UHD panels from the Innolux corporation. ZWS has no relationship with Innolux and has independently developed these products. Use of the ZWS TCON may violate some Innolux design specifications, and as such, will void any warranties of the panels.

OVERVIEW

The ZWS X series displays and kits contain an assortment of boards, each with one or more programmable devices. ZWS X series displays offer the unique aspects of modularity and user reconfiguration to allow advanced users to modify the operation of the displays. To accommodate for this functionality, user upgradability of the various firmwares is needed. A separate firmware update guide details the update process.

At the heart of the system is a ZWS UHD TCON, an advanced timing controller board for select models of UHD panels from the Innolux corporation. With a high-performance Artix7 series FPGA from Xilinx, the ZWS UHD TCON offers system flexibility with some unique advantages over traditional TCONs. for the same panels. High refresh rate support, an integrated latency-free integer scaling, and

SYSTEM BLOCK DIAGRAM



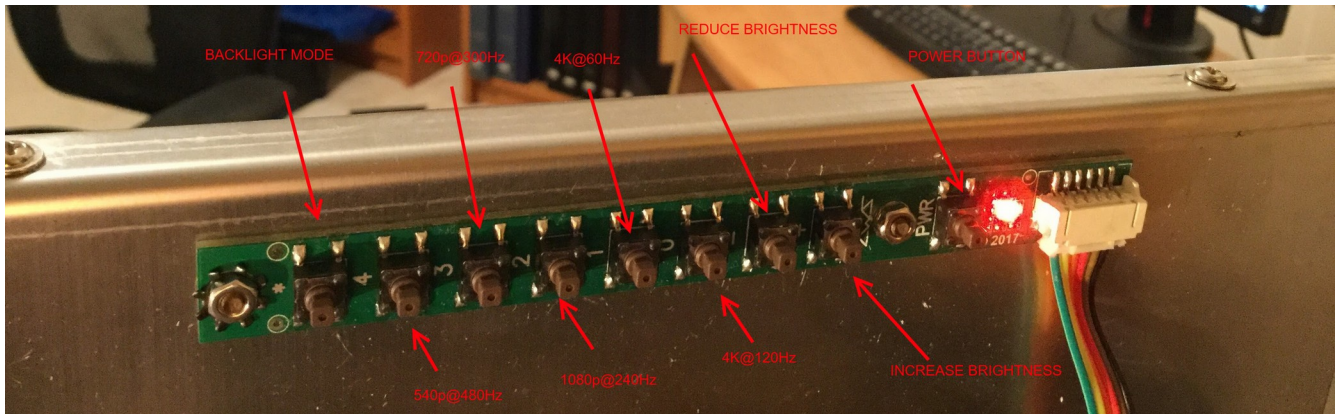
FEATURES AND SPECIFICATIONS

- Input-to-panel latency of ~30 microseconds by design
- Two DP1.2 5.4Gbit input ports
- Flexible input configuration with built-in integer scaling
- 3840*2160 @ 120Hz (two input groups)
- 3840*2160 @ 60Hz (one input group)
- 3840*1080 @ 240Hz (two input groups)
- 1920*1080 @ 240Hz (one input group)
- 3840*720 @ 300Hz (two input groups)
- 1280*720 @ 300Hz (one input group)
- 3840*540 @ 480Hz (two input groups)
- 960*540 @ 480Hz (one input group)
- Up to 540MHz Pixel clock per input group
- Up to 276KHz maximum line-rate
- DE-Only video timing simplifies driving requirements
- Dynamic PLL reconfiguration for a wide range of video input frequencies
- Onscreen display shows an autoscaling scrolling realtime graph of framerates
- 10 bit input (temporal dithering + 8bit panel)
- 10~14V Input voltage
- High-quality power supplies with all-ceramic capacitor design
- Firmware controlled power supplies enable support of multiple panels of varying types.
- Six layer controlled impedance PCB for highest signal integrity
- Output video synchronization signal for use with ZWS backlight drivers
- Clearly labeled UART and JTAG connections for firmware update
- Additional connection for dynamic rear-illuminating RGB LED strips (SK6812 type) **(NOT IMPLEMENTED YET)**

PANEL COMPATIBILITY

PANEL COMPATIBILITY		
M238DCJ-E50	23.8" 9.5ms AAS	WILL NOT WORK
M280DGJ-L30	28" 1ms TN	FULLY SUPPORTED
V390DK1-LS1	39" 6.5ms MVA	FULLY SUPPORTED
M315DJJ-K30	31.5" 9.5ms MVA	WILL NOT WORK
V420DK*	42" 9.5ms MVA	UNTESTED
V500DK2	50" 6.5ms MVA	UNTESTED
V580DK2	58" 6.5ms MVA	UNTESTED

BUTTON CONTROL



With so many operational modes, it is important to not confuse the user and the host system. Our solution to this problem is to provide five preset modes, each with a dedicated button. When one of the mode buttons is pressed, the EDIDs will be reprogrammed . If it is not used, the secondary board will be fully disconnected from the host system. Each mode has an EDID which presents support for only one resolution at two refresh rates.

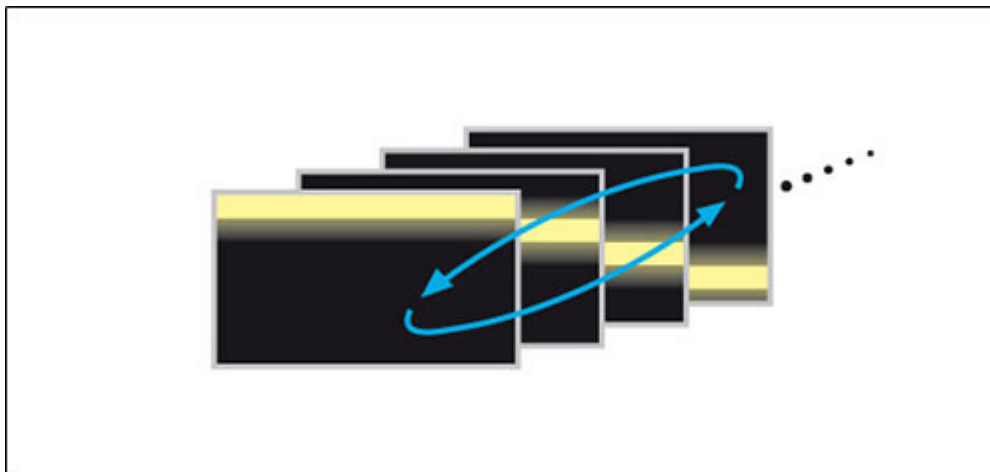
BACKLIGHT OPERATIONAL MODES

OFF : The system is off. Boost controller is disabled, backlight is off.

STABLE : The system is operating in either constant-current or high-frequency PWM mode, depending on brightness level.

STROBE : All LEDs are simultaneously pulsed at high current levels and brief active times. Pulses are timed to end with the falling edge of the pulse input. Brightness control adjusts the pulse duration and current level. Strobe mode is only available if the pulse input signal (vertical blanking indicator) is active for a sufficient amount of time.

SCAN : LED strings are pulsed individually with high current levels and brief active times. Pulses are sequential and aligned to be active immediately before the corresponding part of the display is updated. In the case of the ZWS X series displays, there are four scanning segments. Each illuminates one quarter of the screen. Using scanning mode maximizes the time available for pixel response without requiring a long vertical blanking period, a particularly important property at high refresh rates.



INPUT BEHAVIOR

Input to the TCON is handled by two identical DP2LVDS boards. If two inputs are simultaneously active, the primary group will be displayed on the left hand side of the screen with the secondary on the right. If only one group is active, it will occupy the entire screen. If two groups are used simultaneously, it is absolutely critical that the input streams be vertically synchronized within +/- 3 lines of each other.

Integer scaling of 1:1, 1:2, 1:3, and 1:4 is supported. Only exact 1:1, 1:2, 1:3, and 1:4 mappings are allowed vertically. Video streams which are not exactly 2160, 1080, 720, or 540 lines tall will be replaced with a test pattern and warning. Video streams with excessive width will be displayed with a warning. Nonexact horizontal scaling will result in a horizontally centered image with unused display area blacked-out.

Horizontal and vertical scaling are independent of each other, so non-square pixels are allowed. This situation can be useful, for example, in a 3840*1080@240Hz scenario, if the host system is made aware of the pixel aspect ratio.

If the input is detected as invalid or partially invalid, a test pattern or overlaid warning will be shown on the screen to alert the user to the problem.

DE-Only timing mode is supported, with the HSYNC and VSYNC signals ignored internally. Any duration of DE being low for more than 8 clocks is considered the end of the current line, and any duration of DE staying low for more than 510 clocks is considered the end of the current frame. There is no set limit for the maximum vertical blanking duration. The system does not require a consistent blanking interval, variable blanking intervals are accepted.

ON SCREEN DISPLAY

An on-screen-display shows the selected panel, firmware version, and a realtime autoscaling scrolling graph of the framerate of the most recent 253 frames, with minimum and maximum values shown. The OSD is alpha-blended with the video stream and overlaid in the upper left corner of the display. DP2LVDS boards do not support dynamic refresh rates, but the TCON does. This feature will be useful in the future.

