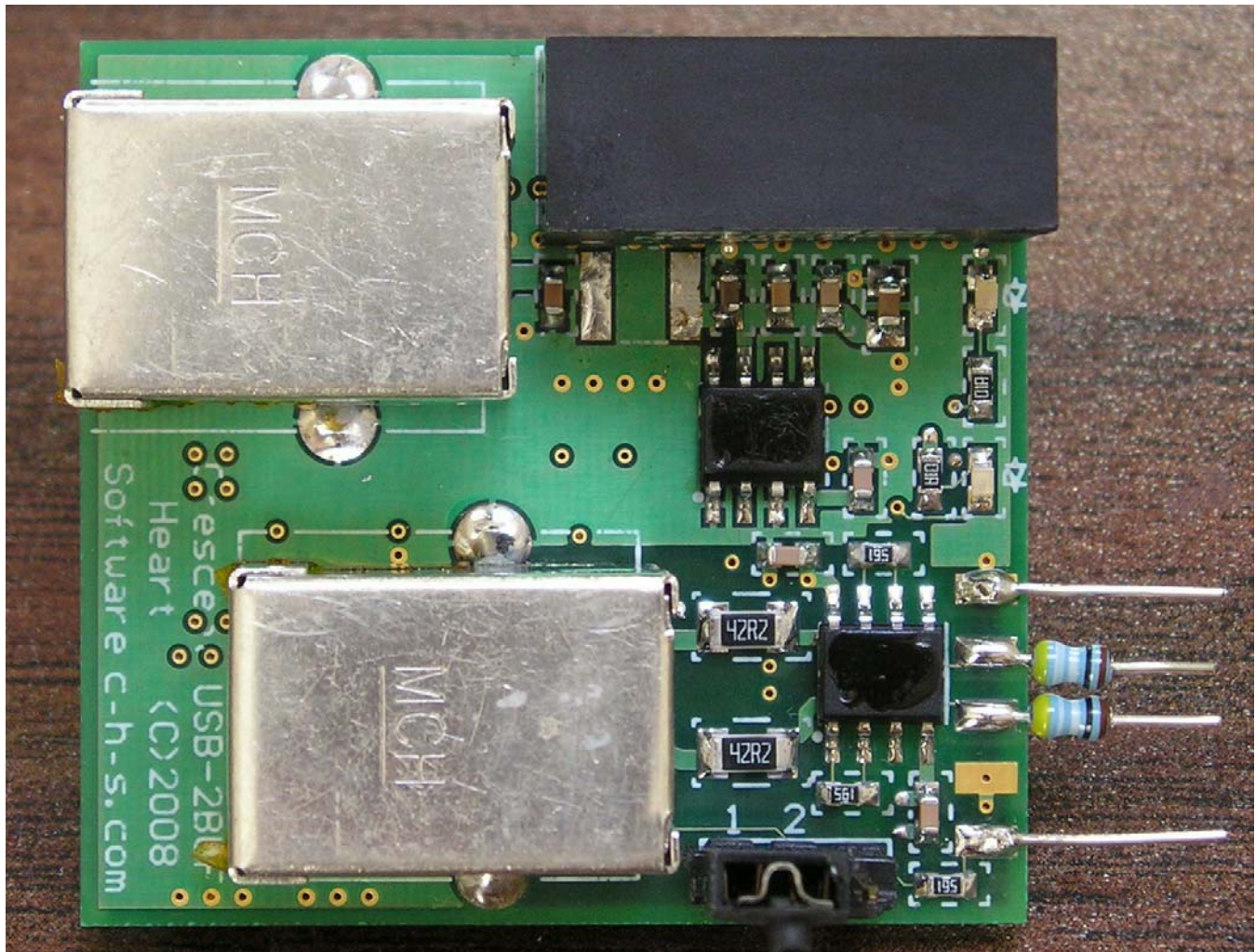


## USB-2BUF

### BUFFER FOR EMBEDDED USB2.0 SYSTEMS



### USB-2BUF Features

- Buffers embedded USB2.0 signals, facilitating their examination by test equipment
- Intended for use with USB protocol analyzer, logic analyzer preprocessor, or oscilloscope
- Attaches to signal points in the embedded system through soldered D+, D- and Ground signal connections
- Supports optional attachment to the embedded system's Vbus (USB power) signal
- Provides analog buffering of all types of USB2.0 signals: high-speed (HS), full-speed (FS) or low-speed (LS)
- Analog bandwidth of nominally 250 MHz (LS/FS signals) and minimally 750 MHz (HS signals)
- Minimal embedded LS/FS signal loading due to 700K Ohm nominal input impedance
- Minimal embedded HS signal loading due to 150 Ohm input resistance and nominal 2.5 pF capacitance
- Signal output via type-B USB connector (the lower connector in the photo), limited to -0.5V to +5V range
- Back-terminated output drives an unterminated standard USB2.0 highspeed A-B cable (1-meter cable provided)
- Capable of driving a terminated cable (90 Ohms differentially or dual 45 Ohms to ground) with half amplitude output
- Output Vbus signal derived from onboard voltage source (4V through 560 Ohm resistor), with jumper set at 1-2 (photo)
- Alternatively uses embedded system's Vbus signal (through 710 Ohms), with jumper set at 2-3
- System Vbus (or surrogate) signal output allows analyzer or oscilloscope to track embedded system's USB power state
- Requires 5V power at 125 mA nominally, supplied via type-B USB connector (the upper connector in the photo)
- A second standard USB2.0 highspeed 1-meter A-B cable is provided for power connection to USB system or hub
- Two LEDs indicate power present and unit functioning
- Compact form factor: 1.5" x 1.4" x 0.65" (3,8cm x 3,6cm x 1,7cm); height including jumper: 0.9" (2,3cm)

## Usage Considerations

- USB bandwidth extends to down DC, therefore use cannot be made of series coupling capacitors in making connection to the D+/D- embedded signals
- USB communication is quasi-differential, therefore connection to the embedded system's ground is critical
- Two pads are provided for connection to ground; at least one must be used, both need not be used
- Underside markings identify the five input signal pads: Gnd, D+, D-, Gnd, Vbus (top to bottom, as seen in the photo)
- Leaded 150 Ohm resistors are provided for D+ and D- connections to the embedded system signals (see photo)
- Optional connection to Vbus also uses a leaded 150 Ohm resistor (photo shows instead a bare lead)
- Use of resistors having different values at D+/D- permits tradeoffs between system loading and buffer bandwidth
- Resistor values ranging from 0 Ohms through 1K Ohms (or higher) are viable for buffering LS/FS bus signaling
- Resistor values ranging from 0 Ohms through 150 Ohms are viable for buffering HS bus signaling
- Resistor values greater than 150 Ohms may be viable for HS buffering (must be less than 500 Ohms however (not extensively tested))
- Embedded system D+/D-/Gnd connections should be as physically short as possible
- Embedded system D+/D- connections should be made next to each other, anywhere along the embedded USB signal traces
- Embedded system USB signal traces being probed can be any USB spec-allowed length for HS (dual-end terminated) and LS (single-end terminated) signaling; probing lengthy FS (single-end terminated) traces may result in waveforms being output which are electrically confusing to the downstream analyzer
- Means such as tape should be utilized and applied to the USB-2BUF as necessary to prevent shorting of the internal USB-2BUF circuitry to the embedded circuitry under test

## USB-2BUF Ordering Summary

- Includes USB-2BUF unit and two USB2.0 1-meter highspeed A-B cables

## Contact Crescent Heart Software

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- Crescent Heart Software, a Tektronix® Embedded Systems Tools Partner and a member of the Tektronix® Logic Analyzer Third Party Developer team, is headquartered in Portland, Oregon USA.
- Crescent Heart Software has been a member of the USB Implementer's Forum (USB-IF), and has provided technical consultation and feedback regarding electrical signaling issues to the Version 1.1 and 2.0 USB specification definers.
- Information presented herein is subject to change without notice (datasheet Rev. A, August 2008)