



DEVELOPMENT

ESSENTIALS & EDUCATION

COMMUNITY

ARCHIVES

ABOUT US

Search



Home

Development Centers

Design How-To

Logarithmic LED panel display has 72-dB range

Alfredo H. Saab and
Tamer Mogannam,
Maxim Integrated Products Inc

OCTOBER 30, 2006



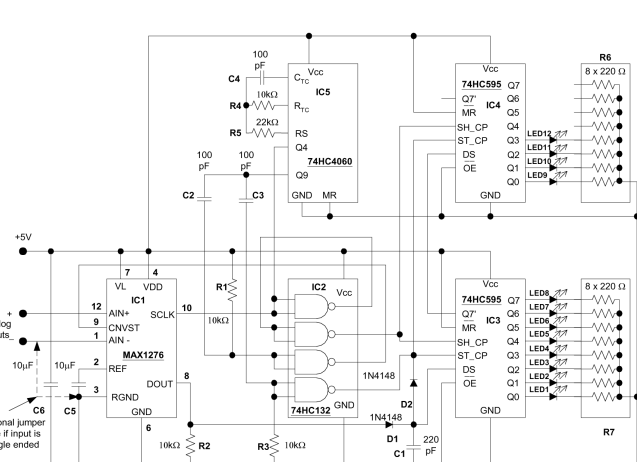
G+1 0

f Like 0



Panel-level logarithmic-column displays are usually built around an analog logarithmic converter and a column-display ADC, or the combination of a high-resolution ADC, a processor-controlled logarithmic algorithm, and an LED or LCD column driver.

A simpler, all-digital alternative consists of a serial-output ADC and some timing and display electronics, **Figure 1**.



(Click to Enlarge Image)

Figure 1: This stand-alone panel-display circuit drives a 12-LED logarithmic column, whose height changes by one LED for each 6.02 dB change in the input voltage.

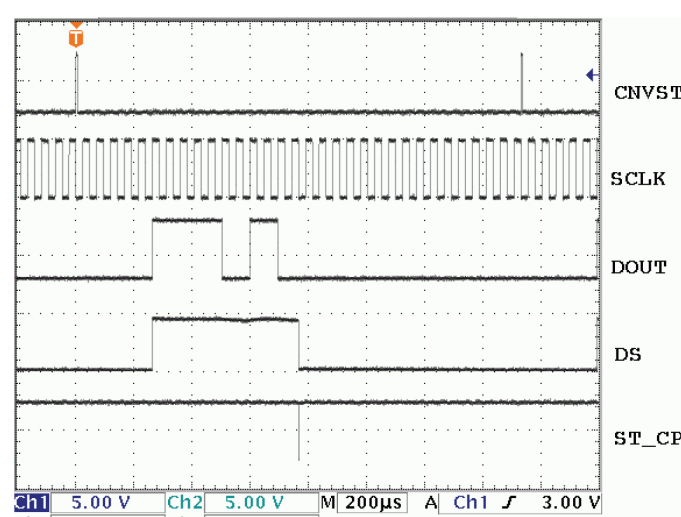
A stand-alone circuit, it requires no trimming (as analog versions do), no microcontroller, and no software. The signal to be displayed is applied to a 12-bit ADC (IC1). For the circuit shown, that signal can range from zero (no LED ON) to +2.048 V (all LEDs ON), with the first LED coming ON at +1 mV.

When triggered by a short positive pulse at CNVST, IC1 begins a conversion, clocked by the signal at SCLK. Its output (DOUT) is clocked by the rising edge of SCLK and starts with four leading zeros, followed by the 12-bit conversion result, MSB first. Thus, one conversion result requires 16 clock pulses at SCLK.

The display is a vertical stack of 12 LEDs in which the top LED represents the MSB. During operation, the circuit scans each conversion result as it is generated (MSB first, as described above), notes the first bit with value "1," and then proceeds to illuminate that LED and all those below it. The result is a logarithmic column in which the input-voltage change necessary to move the column one step up or down is double or half the current input value (a 6.02 dB step). The number of steps available equals the ADC resolution (12 bits in this case).

At DOUT, the first output bit with a value of "1" charges C1 (via D1) to the logic-one level. The voltage on C1 connects to the data input (DS) of the first of two cascaded 74HC595 ICs, which together form a 16-bit shift register. The signal that clocks the ADC, slightly delayed, also clocks the shift register, and thereby inserts into the shift register the value presented at its input. At the end of the conversion, all bits following the first one to exhibit a "1" value are also forced to "1" by the voltage stored on C1.

After each conversion is finished, a negative pulse applied to the SC_TP inputs of both the 74HC595 ICs (**Figure 2**) transfers the internal shift-register contents to an internal parallel-output register.



(Click to Enlarge Image)

Figure 2: Timing for the Figure 1 circuit. CNVST is MAX1276 Conversion trigger signal; SCLK is MAX1276 Conversion clock, and 74HC595 shift clock; DOUT is MAX1276 Conversion data out; DS is 74HC595 shift data input; ST_CP is 74HC595 Shift register to parallel register transfer clock pulse.

The same pulse discharges the storage capacitor through diode D2, leaving the circuit ready for the next conversion scan. The parallel-register outputs then serve as the column LED drivers. A 74HC4060 IC serves as clock and timing sequence generator, and a 74HC132 provides some necessary glue logic.

Thus, the LED column is a 12-step log indicator with 6-dB step height, forming a total column range of 72 dB. Its accuracy and stability are defined by the specifications for IC1. The sampling rate for the display is about 2.5 kHz, with the component values shown.

About the authors

Both **Alfredo H. Saab** and **Tamer Mogannam** are with [Maxim Integrated Products](#), Sunnyvale, CA.



G+1 0

f Like 0



Sponsored Content



Win an R&S@Scope Rider or one of 10 GoPro cameras in our two step competition!

How would you use the R&S@Scope Rider? Tell us your most innovative and unusual idea of how you would use the R&S@Scope

Rider. If your case is among the 10 most inspired, you'll get the chance to show us your idea in a 2-minute video. 10 runners-up will each receive a GoPro camera to keep and a loan R&S@Scope Rider to create a video...

Sponsored By Rohde & Schwarz

LM5165 - 65 V ultra-low IQ buck regulators

150 mA synchronous DC/DC converters optimize light load efficiency.

For more information, visit [Digi-Key](#) today!



TEXAS INSTRUMENTS

BUY NOW

MOST READ

02.24.2005

Understanding analog to digital converter specifications

01.17.2011

Case study of PID control in an FPGA

03.31.2005

Understanding cascaded integrator-comb filters

EMBEDDED TV

video library

OrCAD

Spice Up Your Virtual Prototyping

Visit [PSpice.com](#)

MOST COMMENTED

Currently no items

RELATED CONTENT

06.20.2007 | TECHNICAL PAPER

Integrated DC Logarithmic Amplifiers

06.13.2007 | TECHNICAL PAPER

Using the MAXQ2000 with the MAX6960 to Create a Stock Quote Display System

06.13.2007 | TECHNICAL PAPER

Getting Started with Rowley CrossWorks and the MAXQ2000 Evaluation Kit

05.18.2007 | TECHNICAL PAPER

Why and How to Implement a Frequency Boost During a CCFL Lamp Strike on the DS3881/DS3882

05.22.2007 | TECHNICAL PAPER

Using the LCD Simulator with MAX-IDE and IAR Embedded Workbench Development Environments

PARTS SEARCH

Datasheets.com

powered by DataSheets.com



185 MILLION SEARCHABLE PARTS

SPONSORED BLOGS

1 COMMENTS

WRITE A COMMENT



Selinz POSTED: MAY 24, 2011 10:56 AM EDT

What is the target application?

REPLY

Subscribe to RSS updates

all articles

or

category

DEVELOPMENT CENTERS

All Articles

Configurable Systems

Connectivity

Debug & Optimization

MCUs, Processors & SoCs

Operating Systems

Power Optimization

Programming Languages & Tools

Prototyping & Development

ESSENTIALS & EDUCATION

Products

News

Source Code Library

Webinars

Courses

Tech Papers

COMMUNITY

Insights

Forums

Events

ARCHIVES

Embedded Systems

Programming /

Embedded Systems

Design Magazine

Newsletters

Videos

Collections

ABOUT US

About Embedded

Contact Us

Newsletters

Advertising

Editorial Contributions

Site Map

Real-time &
Performance
Real-world Applications
Safety & Security
System Integration

GLOBAL NETWORK | [EE Times Asia](#) | [EE Times China](#) | [EE Times Europe](#) | [EE Times India](#) | [EE Times Japan](#) | [EE Times Korea](#) | [EE Times Taiwan](#) | [EDN Asia](#) | [EDN China](#) | [EDN Japan](#) | [ESC Brazil](#)



UBM Communities

[EE Times](#) | [EDN](#) | [EBN](#) | [DataSheets.com](#) | [Embedded](#) | [TechOnline](#) | [Design News](#) | [DesignCon](#) | [ESC](#)

Working With Us: [About](#) | [Contact Us](#) | [Media Kits](#)

[Terms of Service](#) | [Privacy Statement](#) | Copyright ©2016 UBM All Rights Reserved

Contact