QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 824
MULTIDISPLAY LED CONTROLLER

LTC3208

WARNING: The LEDs on this demo board produce very bright light. Do not look directly at LEDs when power is applied. Serious eye damage may occur.

DESCRIPTION

Demonstration circuit 824 is a multi-display LED controller featuring the LTC3208.

The LTC3208 is a highly integrated multi-display LED controller. This device contains a high efficiency, low noise charge pump to provide power for a MAIN, SUB, and auxiliary (AUX) white LED displays, an RGB color display, and a camera (CAM) display with flash capabilities. The four auxiliary LEDs may be individually configured to the MAIN, SUB, CAM, or AUX display. The LTC3208 requires only four small ceramic capacitors plus one resistor to form a complete 5-panel LED power supply and current controller.

The maximum display currents are set with a single 24.3K ohm resistor. Current for each LED is controlled with a precision internal current source. Dimming and ON/OFF control for all displays are achieved via a 2-wire I^2C interface. The RGB or SUB panel may be disabled via the ENRGB/S pin. 256 dimming states exist for the MAIN and SUB panels. 16 states are available for the RGB, CAM, and AUX displays. The RGB LED may display up to 4096 color combinations.

The LTC3208 charge pump optimizes efficiency based on the voltage across the LED current sources. The part powers up in 1X mode and will automatically switch to boost mode whenever any enabled LED current source begins to drop out. The first dropout switches the part to 1.5X mode and a subsequent dropout switches the part into 2X mode. The charge pump can also be programmed to 1.5X mode or 2X mode via the I^2C interface.

Design files for this circuit board are available. Call the LTC factory.

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QUICK START PROCEDURE

Demonstration circuit 824 is easy to setup to evaluate the performance of the LTC3208. Refer to Figure 1 and Figure 2 for proper measurement equipment setup and follow the procedure below.

1. Refer to the DC590 Quick Start guide for DC590 and QuickEval™ setup and software installation details.
2. Make sure the USB cable is connected between the computer and the DC590 controller board.
3. Connect DC824 to the DC590 USB Serial Controller using the supplied 14-conductor ribbon cable as shown in Figure 1.
4. Attach a 2.9 – 4.5V power source to the Vin and GND turrets of the DC824 demo circuit as shown in Figure 2. This is the Vin power supply for the LTC3208 (see application schematic). DC824 has an extra 4.7uF de-coupling capacitor on Vin to help accommodate long lead lengths. DC590 gets its power from the USB cable.
5. Run the QuickEval™ program. The program detects the DC824 and displays the LTC3208 control window (shown in Figure 3).

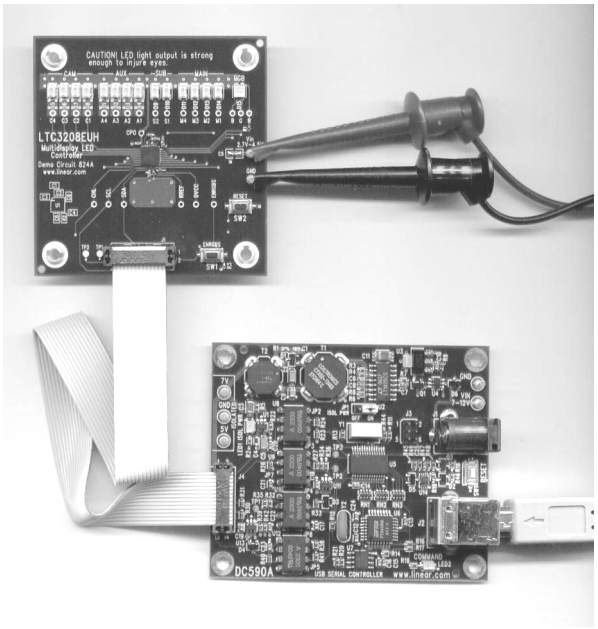


Figure 1. Proper Serial Interface Connection

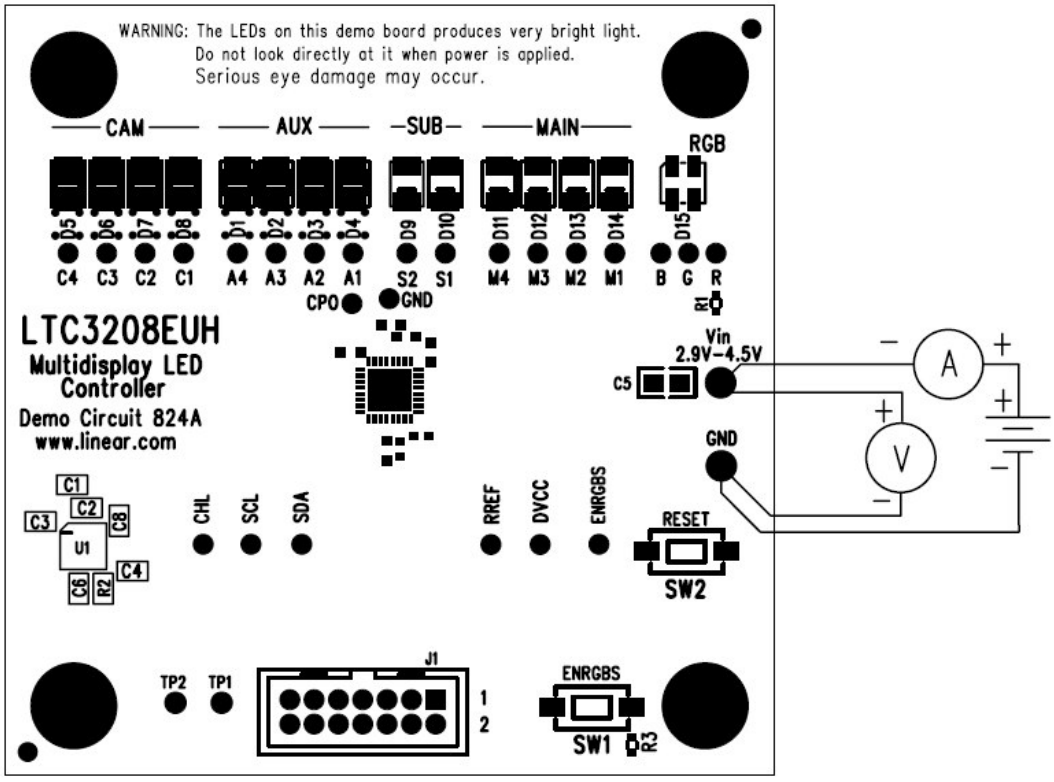


Figure 2. Proper Measurement and Equipment Setup

USING THE LTC3208 QUICKEVAL SOFTWARE

The program provides brightness controls for the MAIN, SUB, CAM, AUX, and RGB LEDs. The **UPDATE ALL REG** button updates all registers in the LTC3208 to the current settings on the LTC3208 demo panel. The **CAM FLASH** button flashes the CAM LEDs from the CAM Low register to the CAM High register for the time selected in the FLASH TIME drop-down window. The **FLASH TIME** drop-down window allows the user to select the flash time from 50ms to 200ms in 50ms increments. The **CAM FLASH Select** option buttons allow the user to flash the CAM LEDs using the CAMHL pin or via the I^2C port. The **Enable RGB AUX4** check box allows the user to enable the RGB and AUX4 dropout signals when checked and disable these dropout signals when not checked. **The Charge Pump Mode** option buttons allow the user to select between **Auto** switching, **Force 1.5X**, or **Force 2X** Charge Pump modes. The **ENRGBS** option buttons allow the user to select either the RGB or SUB panel to be disabled with the ENRGB/S pin. The **ENRGBS** button on the DC824A board controls the ENRGB/S pin. The **AUX1** through **AUX4** option buttons are used to configure the AUX LEDs to the MAIN, SUB, CAM, or AUX displays. There are two demo buttons that briefly illustrate how the LTC3208 may be used. A CIE Chromaticity diagram allows direct selection of colors. The **LEDS OFF** button resets all LEDs to zero, stops and resets any demonstration in progress.

VIEW LTC3208 PRODUCT PAGE Button – This button opens an internet browser and searches the Linear Technology Corporation web site for information on the LTC3208 when an internet connection is available.

MAIN and SUB Control – These are vertical slide controls that adjust the MAIN and SUB displays from 0 to 25mA in 256 steps. This is accomplished by clicking on the up and down arrows to increment by one LSB, by clicking and dragging the slide pointer, or by clicking in the vertical scroll bar to increment by 10 hex LSBs. The hex code is displayed in the box below each slider.

AUX Control – This vertical slide control adjust the AUX display from 0 to 27mA in 16 steps. The LED intensity may be adjusted by clicking on the up and down arrows to increment by one LSB or by clicking and dragging the slide pointer. The hex code is displayed in the box below each slider.

CAMH and CAML Controls – The CAMH vertical slide control adjusts the CAM display from 0 to 100mA in 16 steps when the CAMH register is selected. Since the Nichia NSCW100 is limited to 30mA continuous current, the CAML vertical slide control is limited in software to 25mA. In normal operation the CAM display illuminates at the intensity set by the CAML register. When the CAM FLASH button is selected, the CAM display illuminates at the intensity set by the CAMH register on the release of the mouse button for the length of time selected in the FLASH TIME drop-down window. The LED intensity may be adjusted by clicking on the up and down arrows to increment by one LSB or by clicking and dragging the slide pointer. The hex code is displayed in the box below the slider.

RED, GREEN, and BLUE Controls – These are vertical slide controls which allow individual adjustment of the RED, GREEN, and BLUE LEDs from 0 to 27mA each in 16 exponential steps to make any of the 4096 available colors. The hex code and color are displayed in small boxes below each of the sliders. They are adjusted by clicking on the up and down arrows or by clicking and dragging the slide pointer.

CIE Chromaticity Diagram – Colors can be selected by clicking on a specific color in the diagram. The Gamut box, when checked, displays the Chromaticity coordinates or *gamut* of all the

colors that can be produced by the Nichia NSCM315C RGB diode.

UPDATE ALL REG Button – When this button is selected, all seven of the LTC3208 registers are updated to the present settings on the demo control window. This is beneficial when power is initially applied to the demo board, the ribbon cable has been disconnected, or when the RESET push button has been depressed.

CAM FLASH Select Option Buttons – These buttons allow the user to select the method in which the CAM display is flashed. When the CAMHL PIN option button is selected, the CAM display is flashed by applying a pulse on the CAMHL Pin. If the I2C option button is selected, the CAM display is flashed by momentarily setting the $S_{CAMHILO}$ bit in the G register via the I^2C bus.

CAMHL FLASH Button – When this button is selected and released, the CAM LEDs will flash at the intensity selected in the CAMH register for a period selected in the FLASH TIME drop-down window. This is accomplished by applying a pulse on the CAMHL pin or by setting the $S_{CAMHILO}$ bit in the G register via the I^2C interface.

FLASH TIME Drop-Down Window – This window allows the user to select a flash time from 50ms to 200ms in 50ms increments. The flash time is the time the program selects the CAMH register when the CAMHL FLASH button is selected.

Enable RGB AUX4 Dropout Check Box – When this box is selected, the RGB and AUX4 dropout signals are enabled. When it is deselected, the RGB and AUX4 dropout signals are disabled and these outputs may then be used as open drain logic signals.

Demo Buttons – These buttons can be selected to run 2 different demonstrations. Demo 1 cycles through the RGB colors. Demo 2 cycles through the brightness levels of all the LEDs and flashes between various CAMH and CAML intensities using the I^2C serial port.

LEDS OFF Button – This button will turn off all the LEDs and will turn off and reset any active demo.

Force Charge Pump Option Buttons – These buttons allow the user to select between auto switching, forced 1.5X, or forced 2X Charge Pump modes.

ENRGBS Option Buttons – If RGB Control is selected, the RGB display will be disabled until the ENRGBS push button on the DC824A board is depressed. If the SUB Control is selected, the SUB panel will be disabled until the ENRGBS push button on the DC824A board is depressed.

AUX1 - AUX4 Option Buttons – These buttons allow the user to configure each of the AUX LEDs to the MAIN, SUB, CAM or AUX displays. The intensity of each LED will be controlled by the corresponding register and slide control selected. If the MAIN button is selected, the corresponding LED will change illumination with the MAIN brightness control.

REGA – REGG Hex Display Boxes – These boxes display the hex value last written to the corresponding register from the DC590A board.

ENRGBS Push Button – This button is located on the DC824A board and enables either the RGB display or the SUB display when depressed, depending on which ENGRBS option button is selected on the demo control window.

RESET Push Button – This button is located on the DC824A board and clears the seven registers in the LTC3208 when depressed. The reset button will not update or change the demo control window. The UPDATE ALL REG button may be used to update the registers to the current demo control window settings.

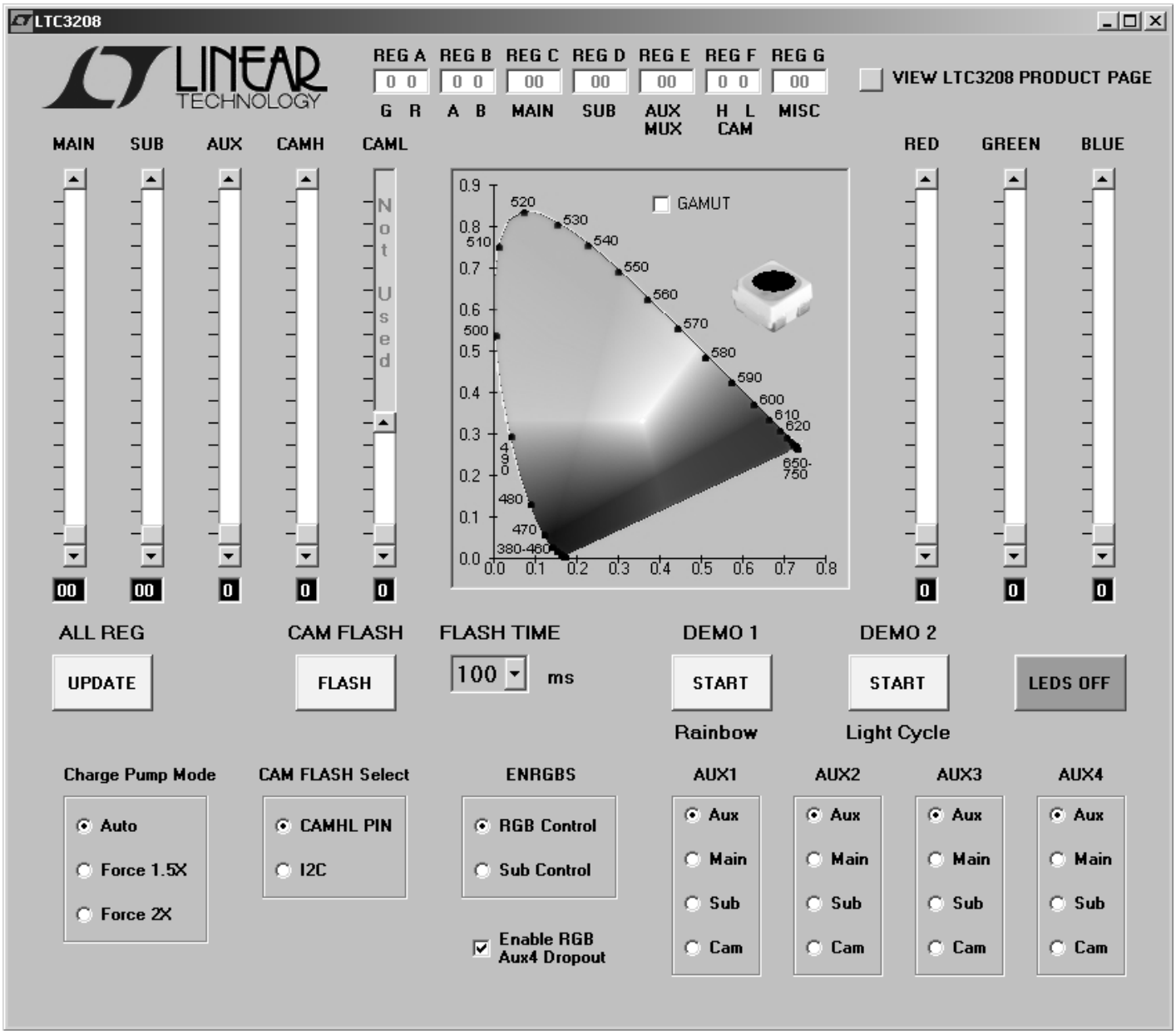
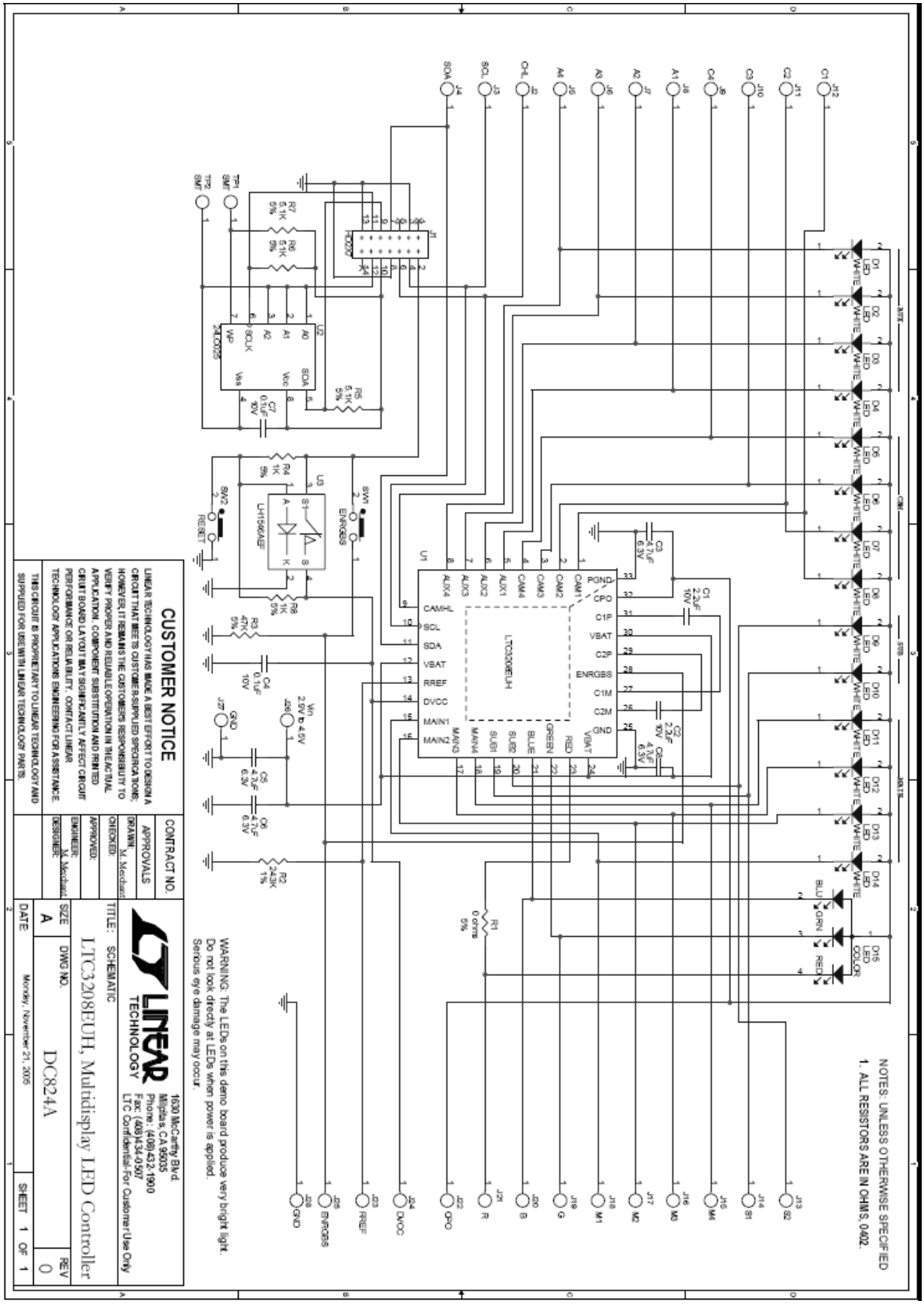


Figure 3. LTC3208 Control Window


NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 0402.
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CUSTOMER NOTICE
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
CONTRACT NO.
APPROVALS
DRAWN: M. Merchant
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APPROVED:
ENGINEER:
DESIGNER: M. Merchant
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LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
LTC3208EUH, Multidisplay LED Controller
SIZE A
DWG NO. DC824A
REV 0
DATE Monday, November 21, 2005
SHEET 1 OF 1