Demo Circuit 1055
QUICK START GUIDE

LTC3219
250mA Universal Nine Channel LED Driver

DESCRIPTION

WARNING!

Do not look directly at operating LED.
This circuit produces light that can damage eyes.

Demonstration circuit 1055 is a 250mA Universal Nine Channel LED Driver with two RGB displays and three white LEDs featuring the LTC3219.

The LTC3219 is a low noise charge pump designed to drive nine universal LED current sources. The LTC3219 requires only five small ceramic capacitors to form a complete LED power supply and current controller.

The maximum display currents are set with an internal precision current reference. On/Off blinking, gradation, and intensity are achieved via an I^2C serial interface. See the LTC3219 data sheet for more information on this process. There are 64 dimming states available for the universal LEDs.

The 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 part resets to 1x mode whenever a data byte is updated via the I^2C port.

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

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QUICK START PROCEDURE

Demonstration circuit 1055 is easy to set up to evaluate the performance of the LTC3219. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the VBAT and GND terminals. See Figure 2 for proper scope probe technique.

1. Refer to the DC590 Quick Start Guide for QuikEval™ setup and software installation details.
2. Make sure the USB cable is connected between the computer and the DC590 controller board.

   NOTE. If using the DC590B board, a specific DVCC voltage level may be selected. This is done by setting the VCCIO jumper on the DC590 board to one of the following settings: 3.3V, 5V, removed for 2.7V or set to external if use of an external supply is desired.
3. Connect DC1055 to the DC590 USB Serial Controller using the supplied 14-conductor ribbon cable as shown in Figure 1.
4. With power off, connect the input power supply to VBAT and GND with a series ammeter and a voltmeter as shown in Figure 1.
5. Turn on and set the input power supply between 2.9 – 5.5V. The DC1055 has an extra 4.7uF de-coupling capacitor between VBAT and GND to help accommodate long VBAT source lead lengths. The DC590 board gets its power from the USB cable.

   NOTE. Make sure that the input voltage does not exceed 6V.
6. Run the QuikEval program. The program detects the DC1055 and displays the LTC3219 control window (shown in Figure 3).

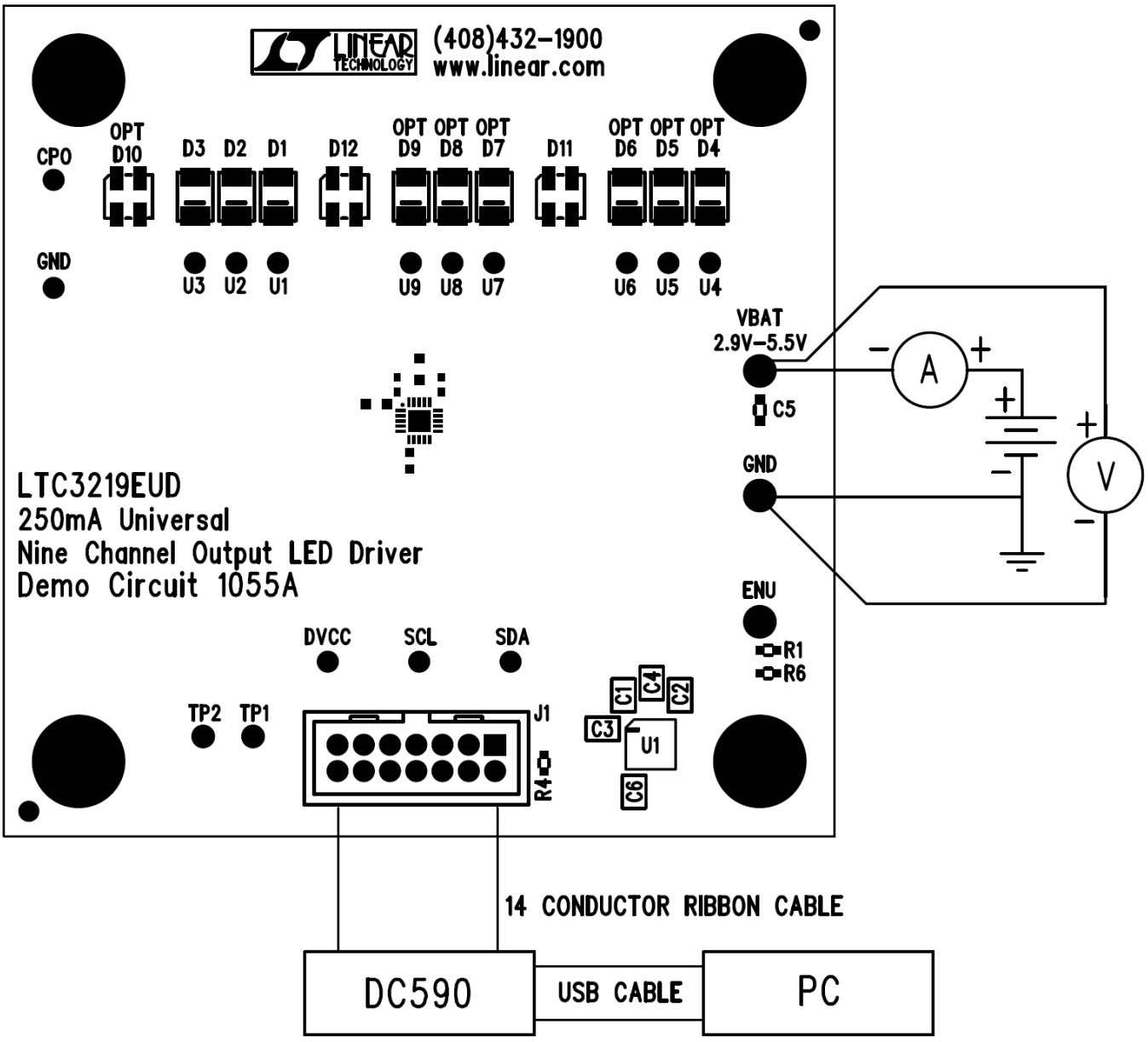


Figure 1. Proper Measurement Equipment Setup

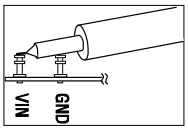


Figure 2. Measuring Input or Output Ripple

USING THE LTC3219 QUIKEVAL SOFTWARE

The LTC3219 program provides brightness controls for the universal LEDs. It also allows the user to gradate the universal LEDs up or down and blink at a selected on-time and period. The LTC3219 also controls the LEDs from an external enable pin. The intensity of the universal LEDs may be set by 1) Selecting the check box for the desired LED, 2) Setting the intensity in the associated vertical slider, 3) Selecting the SET ULEDs button.

VIEW LTC3219 PRODUCT PAGE button opens an internet browser and searches the Linear Technology Corporation web site for information on the LTC3219 when an internet connection is available.

REG 0 through **REG 11** text box windows display the hexadecimal value that has been written to the corresponding registers.

SELECT ALL selects all universal LEDs to change when the SET ULEDs, CLEAR ULEDs, or other LED control buttons are selected.

DESELECT ALL deselects all selected universal LEDs and prevents the universal LEDs from changing intensity or modes.

ULED1 through **ULED9** check boxes are used to individually select or deselect the universal LEDs.

ULEDs 1-3 vertical slide control adjusts the intensity for selected universal LEDs U1 through U3 from 0 to 28mA in 64 steps. The SET ULEDs, BLINK ULEDs, or other LED control buttons need to be selected to illuminate the selected LEDs. The LED intensity slider may be adjusted by clicking on the up or 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 vertical slide control adjusts the intensity for selected universal LEDs U4 and U7 from 0 to 28mA in 64 steps. The SET ULEDs, BLINK ULEDs, or other LED control buttons need to be selected to illuminate the selected LEDs. The LED intensity slider may be adjusted by clicking on the up or 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.

GREEN vertical slide control adjusts the intensity for selected universal LEDs U5 and U8 from 0 to 28mA in 64 steps. The SET ULEDs, BLINK ULEDs, or other LED control buttons need to be selected to illuminate the selected LEDs. The LED intensity slider may be adjusted by clicking on the up or 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.

BLUE vertical slide control adjusts the intensity for selected universal LEDs U6 and U9 from 0 to 28mA in 64 steps. The SET ULEDs , BLINK ULEDs, or other LED control buttons need to be selected to illuminate the selected LEDs. The LED intensity slider may be adjusted by clicking on the up or 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.

SET ULEDs button sets all selected LEDs to the selected intensity settings.

QUICK WRITE button sets all LEDs to the intensity and mode of ULED1 using the LTC3219 Quick Write feature. The intensity of ULED1 is updated to the value indicated on the ULEDs 1-3 vertical slider. All vertical sliders and register text boxes on the LTC3219 control window are updated to match the IC settings. The ULED1 check box does not need to be selected for this button to work.

CLEAR ULEDs button turns off and clears the register of all selected LEDs.

ENU OUTPUT SELECT button sets or unsets the ENU control for the selected LEDs. When a LED ENU output is selected, the ULED register label below the ULED register text box is highlighted in blue. If gradation with ENU control is desired, use the START GRADATION WITH ENU control button.

SET ENU PIN HI button sets the ENU pin high or low and turns on or off the LEDs under ENU control. If the LED is set for gradation or blinking with ENU control, the LED will gradate up/down, or start/stop blinking at the selected intensity.

GRADATION TIME option buttons set the desired time to gradate up to or down from the selected LED intensity

when the GRADATE UP, GRADATE DOWN, START GRADATION WITH ENU or DEMO 1 button is selected. If the DISABLED option button is selected, the universal LEDs will not gradate when any of the GRADATION control buttons are selected.

GRADATE UP button gradates the selected LEDs up to the set intensity at the selected gradation time. Gradation is disabled when done. The ULED check box is highlighted purple to indicate that gradation mode has been enabled.

GRADATE DOWN button gradates the selected LEDs down from the set intensity at the selected gradation time. Gradation is disabled when done. The ULED check box is highlighted purple to indicate that gradation mode has been enabled.

START GRADATION WITH ENU button gradates the selected LEDs up to the set intensity when the ENU pin is high (SET ENU PIN HI button is selected) and down when the ENU pin is low. If this button is selected while in gradation with ENU mode and with the ENU PIN high, gradation and ENU control will be relinquished with the LEDs set. If this button is selected while in gradation with ENU mode and with the ENU PIN low, gradation and ENU control will be relinquished with the LEDs off. During gradation with ENU control, all other ULEDs must remain off and the charge pump must remain in Auto mode (not forced to any mode). The ULED check box is highlighted purple to indicate that gradation mode has been enabled.

NOTE. The gradation time must be set to something other than DISABLED to gradate the LEDs.

BLINK ONt/PERIOD option buttons set the desired blinking on-time and period to blink after the BLINK ULEDs button has been selected.

BLINK ULEDs button blinks or stop blinking the selected LEDs at the on-time and period selected by the BLINK ONt/PERIOD option buttons and at the selected LED intensity. The ULED check box is highlighted green to indicate that blink mode has been enabled.

CHARGE PUMP MODE option buttons allow the user to select between Auto (not forced to any mode), Force 1x, Force 1.5x, and Force 2x charge pump modes.

GPO MODE button disables or enables dropout for the selected LEDs. When dropout is disabled the LEDs will not cause the charge pump to switch into 1.5x or 2x modes and the pin may be used as a general-purpose output (GPO mode). The ULED check box is highlighted orange to indicate that GPO MODE has been selected.

UPDATE ALL REG button updates the data registers to the data displayed in the register text boxes.

LEDs OFF button turns off and resets all LEDs and LED modes, plus stops and resets all demos.

DEMO 1-Rainbow button may be selected to start or stop DEMO 1. This demo cycles through the different colors that the two RGB LEDs can produce using the LTC3219's gradation feature. The default gradation time for this demo is 0.96s, however the 0.48s or 0.24s gradation times may be used by selecting the desired gradation time prior to starting the demo.

DEMO 2-Light Cycle button may be selected to start or stop DEMO 2. This demo gradates up and blinks all universal LEDs starting with ULED1 to ULED9. After all LEDs are up and blinking, the LEDs are gradated off starting with ULED1 to ULED9. This is accomplished using the LTC3219's gradation and blinking modes.

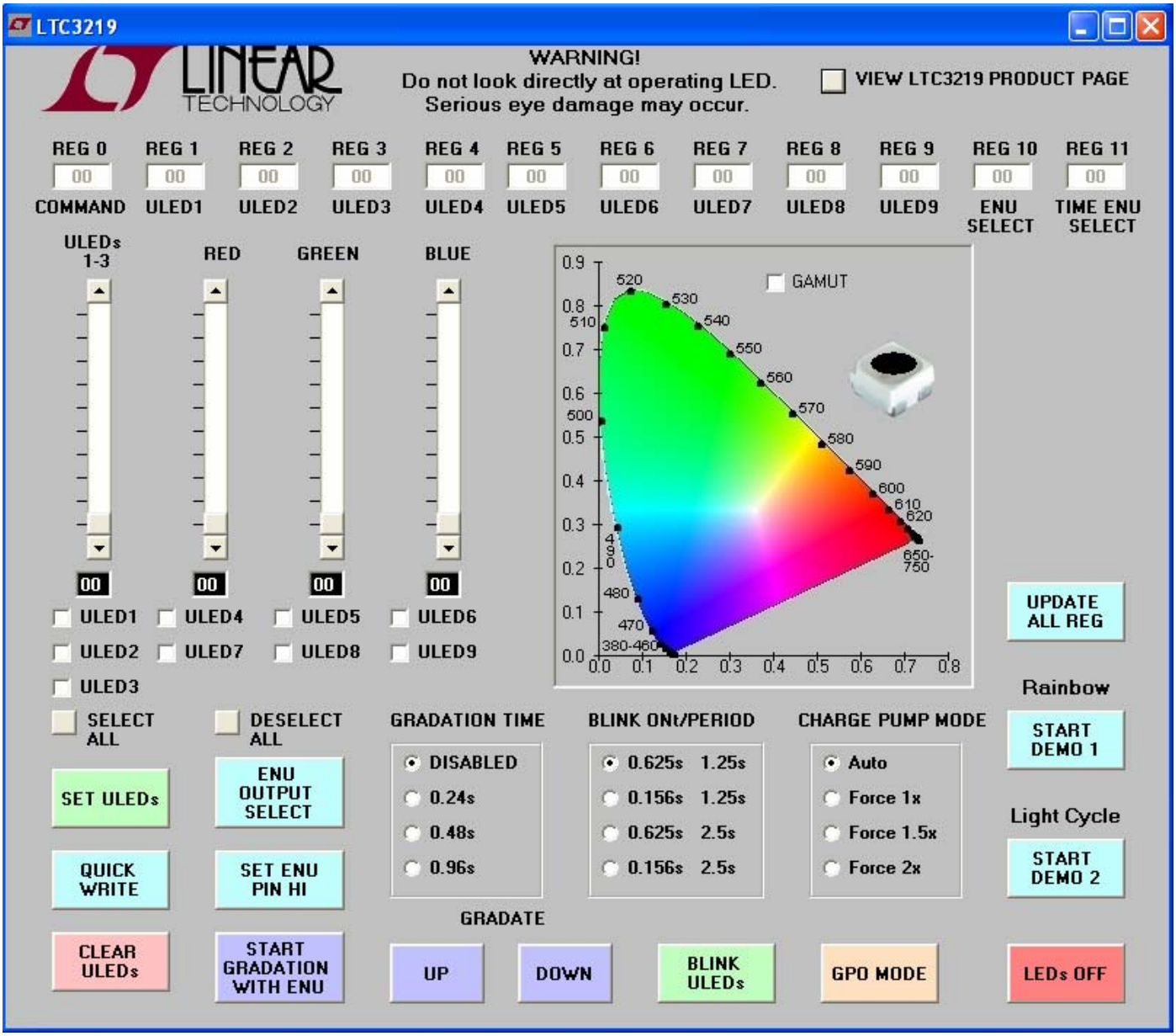
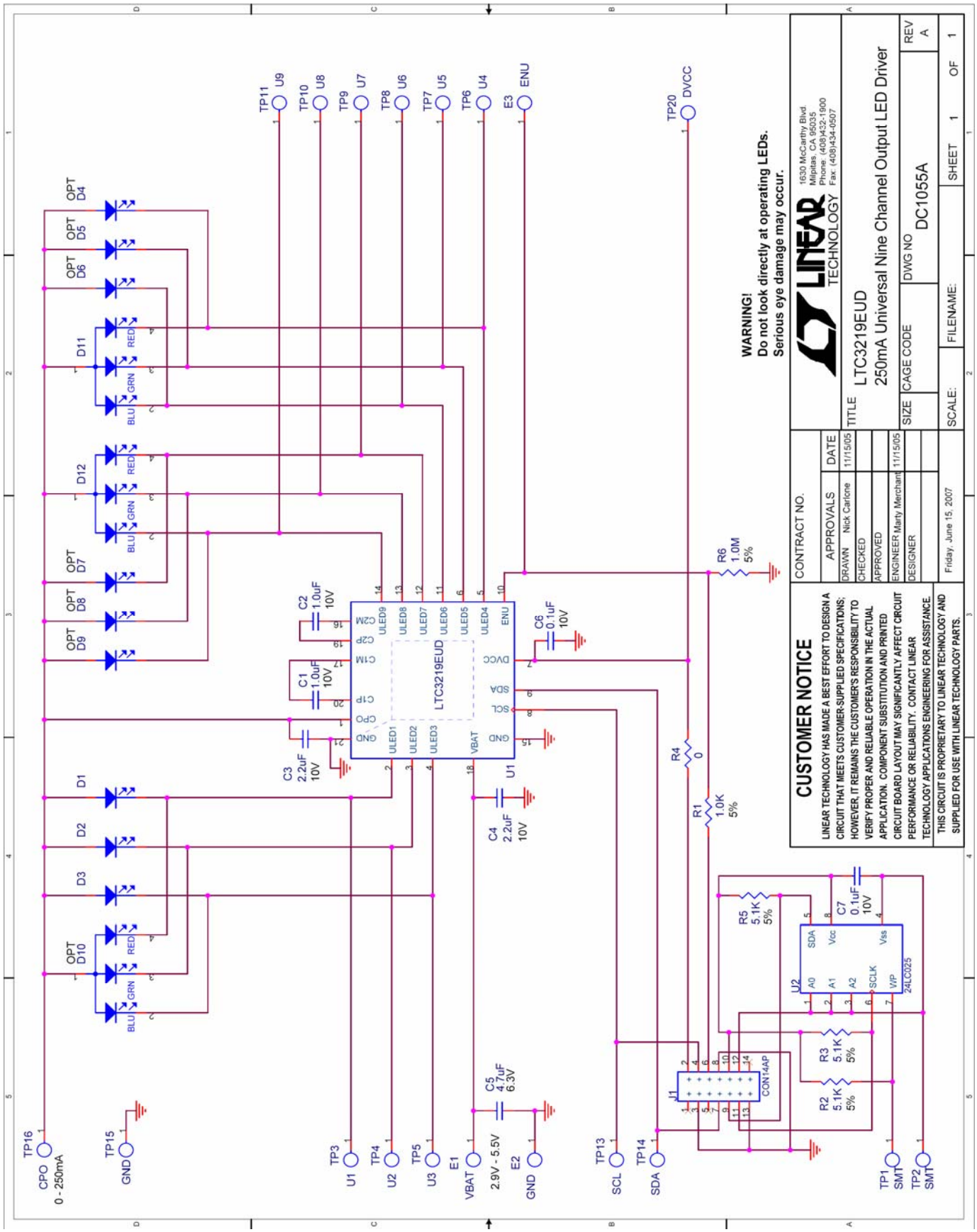


Figure 3. LTC3219 Control Window


LTC3219EUD
250mA Universal Nine Channel Output LED Driver
DC1055A
WARNING!
Do not look directly at operating LEDs.
Serious eye damage may occur.
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.
CPO 0 - 250mA
2.9V - 5.5V
VBAT
SCL
SDA
GND
DVCC
ENU

Linear Technology Corporation
LTC3219EUD

Parts List

DC1055A Rev 1
9/5/2007

Item	Qty	Ref - Des	Desc	Manufacturer's Part Number
		REQUIRED CIRCUIT COMPONENTS:		
1	2	C1, C2	CAP, X5R 1.0uF 10V 10% 0402	MURATA, GRM155R61A105K
2	2	C3, C4	CAP, X5R 2.2uF 10V 10% 0603	MURATA, GRM188R61A225K
3	1	C6	CAP, X5R 0.1uF 10V 10% 0402	MURATA, GRM155R61A104K
4	3	D1, D2, D3	LED, SMT WHITE	NICHIA, NSSW100BT
5	2	D11, D12	LED, SMT RGB	NICHIA, NSCM315CT
6	1	U1	IC, 250mA UNIVERSAL LED DRIVER	LINEAR TECH, LTC3219EUD
		ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:		
1	1	C5	CAP, X5R 4.7uF 6.3V 10% 0603	TDK, C1608X5R0J475K
2	1	C7	CAP, X5R 0.1uF 10V 10% 0402	MURATA, GRM155R61A104K
3	1	R1	RES, 1.0K OHMS 5% 1/16W 0402	VISHAY, CRCW04021K00JNED
4	1	R4	RES, 0 OHMS 1/16W 0402	VISHAY, CRCW04020000Z0ED
5	3	R2,R3,R5	RES, 5.1K OHMS 5% 1/16W 0402	VISHAY, CRCW04025K10JNED
6	1	R6	RES, CHIP 1M OHM 5% 0403	VISHAY, CRCW04021M00JNED
7	1	U2	IC, SERIAL EEPROM	MICROCHIP, 24LC025-I/ST
8	0	D4-D9 (OPT)	LED, SMT WHITE	NICHIA, NSSW100BT
9	0	D10 (OPT)	LED, SMT RGB	NICHIA, NSCM315CT
		HARDWARE FOR DEMO BOARD ONLY:		
1	1	J1	SOCKET, 2X7 2MM STRAIGHT	MOLEX/WALDOM, 87831-1420
2	3	E1-E3	TURRET, TESTPOINT	MILL-MAX, 2308-02
3	4		STANDOFFS	KEYSTONE, 8831
4	1		CABLE ASSY., 8" STRIP	LINEAR RIBBON CABLE, CA-2440