

## DESCRIPTION

Demonstration circuit 629 is a multi-display LED controller featuring the LTC3205.

The LTC3205 is a highly integrated multi-display LED controller. This device contains a high efficiency, low noise fractional step-up/step-down charge pump to provide power for a main and sub white LED display, plus an RGB color LED display. The LTC3205 requires only four small ceramic capacitors plus two resistors to form a complete 3-panel LED power supply and a current controller.

Maximum currents for the main/sub and RGB displays are set independently with a single resistor. Current for each LED is controlled with an internal current source.

Dimming and ON/OFF control for all displays is achieved via a 3-wire serial interface. Four dimming states exist for the main and sub panel displays and 16 dimming states are available via internal PWM for the red, green, and blue LEDs resulting in up to 4096 color combinations.

The LTC3205 charge pump optimizes efficiency based on  $V_{IN}$  and LED forward voltage conditions. The part powers up in step-down mode and automatically switches to step-up mode once the first LED current source begins to enter dropout. Internal circuitry prevents inrush current and excess input noise during start-up and mode switching.

## QUICK START PROCEDURE

Demonstration circuit 629 is easy to set up to evaluate the performance of the LTC3205. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Connect DC629 to the DC590 USB Serial Controller using the supplied 14-conductor ribbon cable as shown in Figure 1. Refer to the DC590 Quick Start guide for software installation details.
2. Attach the supplied USB cable into your computer and then into the DC590 controller board.

3. Run the QuickEval™ program. The program detects the DC629 and displays the LTC3205 control window (shown in Figure 2).
4. Attach a 2.7V–4.5V power source to the  $V_{IN}$  and GND turrets of the DC629 demo board. This is the  $V_{IN}$  power supply for the LTC3205 (see attached schematic).

**NOTE:** The LTC3205's maximum current settings for Main, Sub, and RGB are set by R2 and R3 (see the attached DC629 schematic.)  $R2 = R3 = 32.4k$ , which set the maximum current to 15mA.

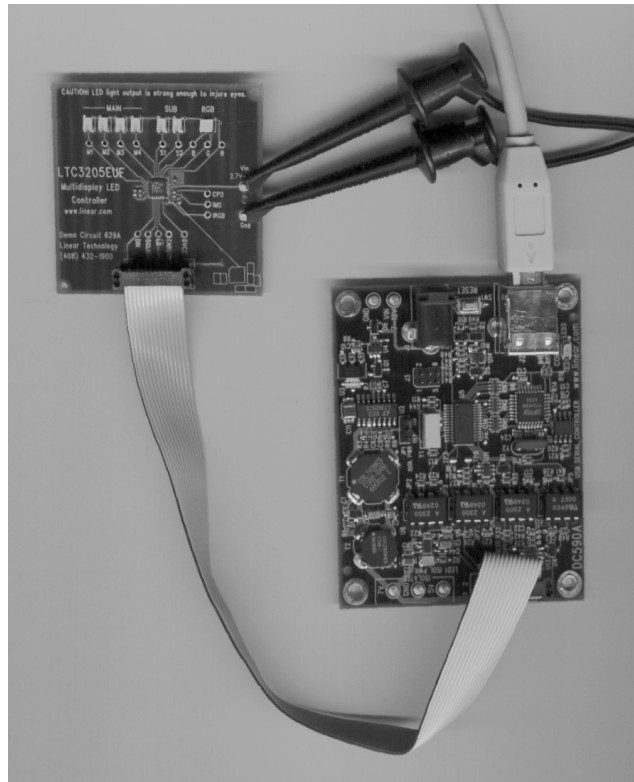


Figure 1. Proper Measurement Equipment Setup

## USING THE LTC3205 QUICKVAL SOFTWARE

The program provides brightness controls for the Main, Sub, and RGB LEDs, an OFF/ON button which controls output to the DC629 demo board, three demo buttons, and a CIE Chromaticity diagram which allows direct selection of colors.

**OFF/ON** — Click this button to begin outputting data to the LTC3205. The default state is **OFF**. The 16-bit hex code transmitted to the LTC3205 is shown in the **HEX OUT** box when this button is on.

**MAIN and SUB control** — These are vertical slide controls which adjust the main and sub LED output from 0 to 100% by clicking on the up and down arrows, a higher or lower tick, or by clicking and dragging the slide pointer.

**RED, GREEN, and BLUE controls** — These are horizontal slide controls which allow individual adjustment of

the red, green, and blue LEDs to make any of the 4096 colors available. The hex code and color are displayed in small boxes to the right of each slider. They too are adjusted by clicking on the left and right arrows, a higher or lower tick, 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 of the Nichia NSCM315C RGB diode forming a triangle or *gamut* of all the colors which can be produced by that diode.

**BRIGHTNESS** — This is a horizontal slider used to adjust the intensity of a color that has been chosen. It is also adjusted by clicking on the left and right arrows, a

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 629

## MULTI-DISPLAY LED CONTROLLER

higher or lower tick or by clicking and dragging the slide pointer.

**DEMO 1, 2, and 3** – These buttons can be selected to run 3 different demonstrations. The OFF/ON button must be **ON** to see the demonstrations.

**Quick Start Guide, LTC3205 Data Sheet** – These buttons will open this document and the LTC3205 data sheet, respectively. This requires Adobe Acrobat reader and either an internet connection or copies of these documents in the local documentation directory.

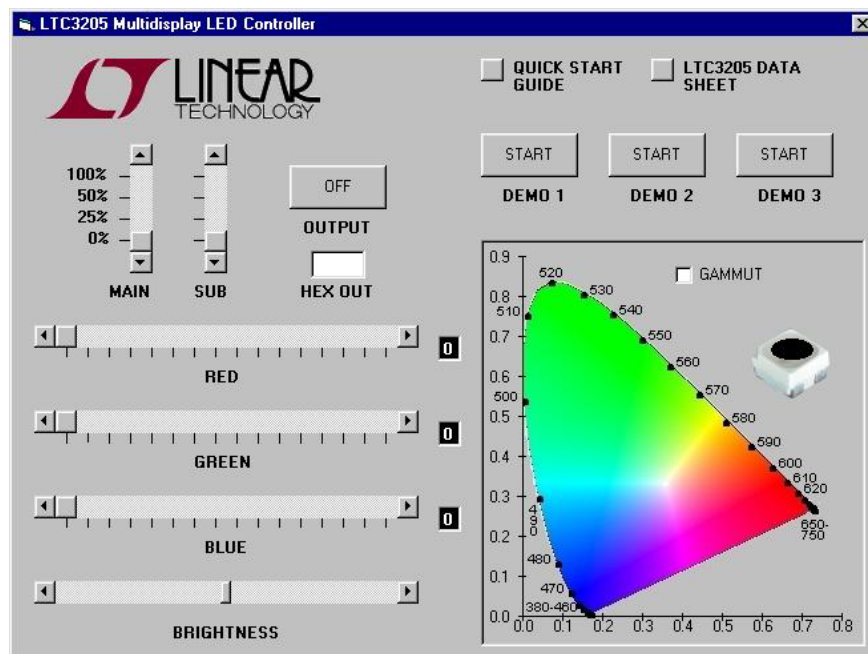


Figure 2. LTC3205 Control Window

NOTES: UNLESS OTHERWISE SPECIFIED

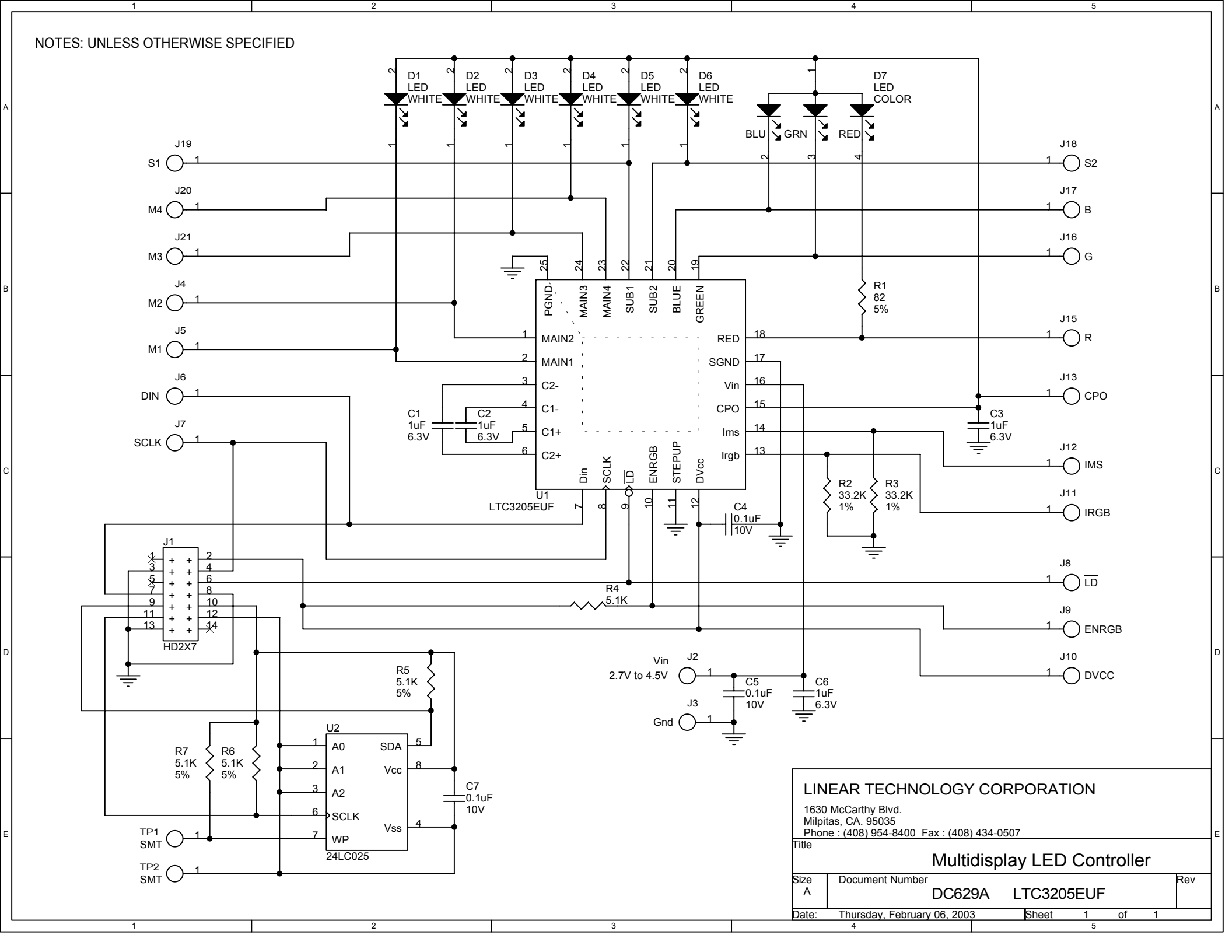
The schematic diagram illustrates the Multidisplay LED Controller circuit. The central component is the LTC3205EUF (U1), which is configured to drive seven LEDs (D1-D6, D7) and a color LED (D7). The circuit includes an HD2X7 connector (J1) for input signals (S1, M4, M3, J4, M2, J5, M1, J6, DIN, J7, SCLK), a 24LC025 EEPROM (U2) for configuration, and an LTC3205EUF LED driver (U1) for output signals (J18, J17, J16, G, J15, R, J13, CPO, J12, IMS, J11, IRGB, J8, LD, J9, ENRGB, J10, DVCC). The driver controls seven LEDs (D1-D6, D7) and a color LED (D7). The circuit also includes various passive components like resistors (R1-R7), capacitors (C1-C6), and a voltage divider (R2, R3).

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Title  
Multidisplay LED Controller

| Size | Document Number   | Rev |
|------|-------------------|-----|
| A    | DC629A LTC3205EUF |     |

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NOTES: UNLESS OTHERWISE SPECIFIED

The schematic diagram illustrates the Multidisplay LED Controller (LTC3205EUF) and its associated components. The controller is a central IC with various pins for power, control, and LED driving. Key components and connections include:

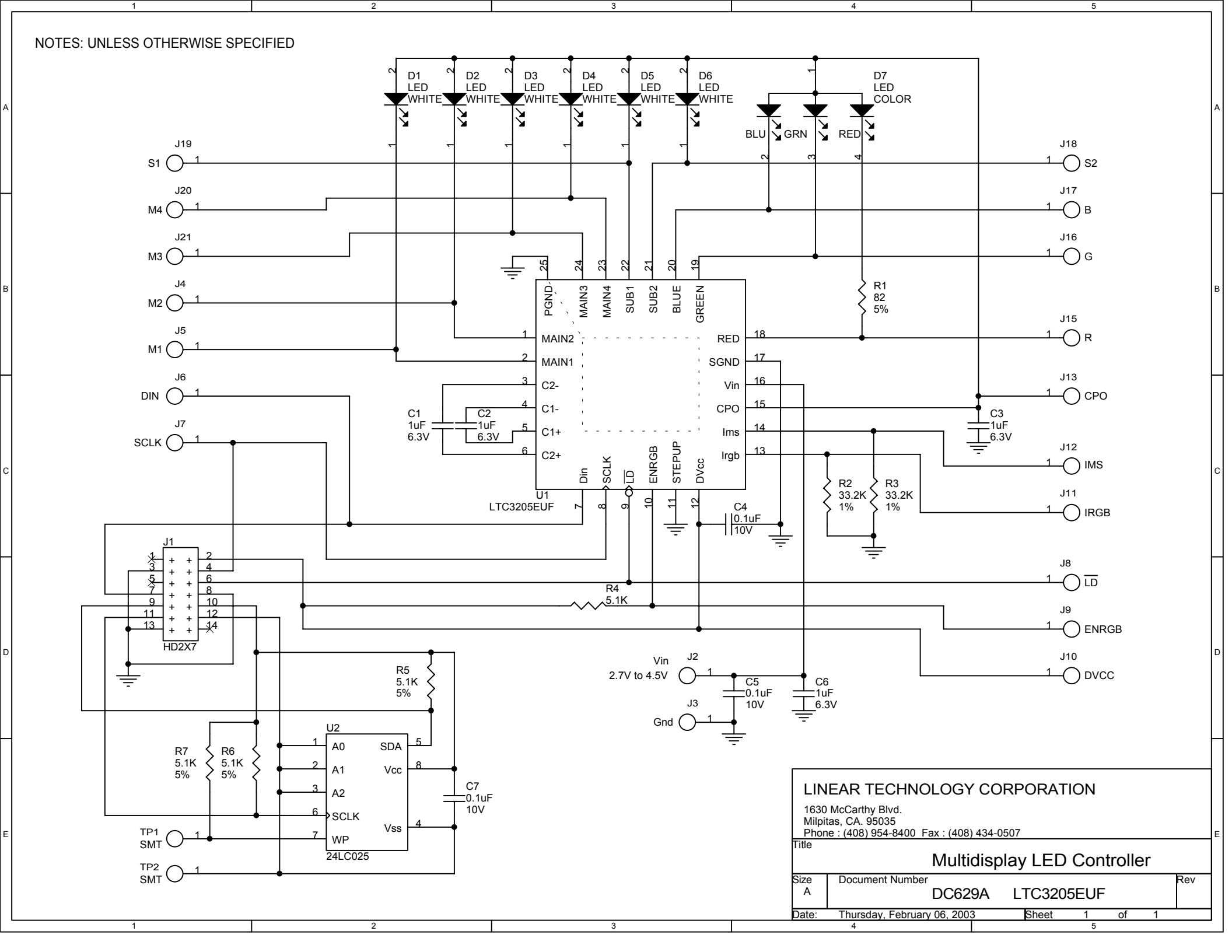
- LEDs:** Seven white LEDs (D1-D6) and one color LED (D7) are connected to the controller's output pins. D1-D6 are connected to MAIN1, MAIN2, SUB1, SUB2, BLUE, and GREEN pins, respectively. D7 is connected to the RED pin.
- Capacitors:** C1 (1uF, 6.3V) is connected to C2- and C2+. C2 (1uF, 6.3V) is connected to C1- and C1+. C3 (1uF, 6.3V) is connected to CPO and ground. C4 (0.1uF, 10V) is connected to DVCC and ground. C5 (0.1uF, 10V) is connected to Vin and ground. C6 (1uF, 6.3V) is connected to CPO and ground.
- Resistors:** R1 (82, 5%) is connected to RED and ground. R2 (33.2K, 1%) and R3 (33.2K, 1%) are connected to Irgb and ground. R4 (5.1K) is connected to LD and ground. R5 (5.1K, 5%) is connected to SDA and ground. R6 (5.1K, 5%) and R7 (5.1K, 5%) are connected to A0, A1, and A2 pins, respectively.
- Control and Status:** The controller has pins for PGND, MAIN3, MAIN4, SUB1, SUB2, BLUE, GREEN, RED, SGND, Vin, CPO, Ims, Irgb, LD, ENRGB, STEPUP, and DVCC. It also has pins for D1, D2, D3, D4, D5, D6, and D7.
- Inputs/Outputs:** J19 (S1), J20 (M4), J21 (M3), J4 (M2), J5 (M1), J6 (DIN), J7 (SCLK), J18 (S2), J17 (B), J16 (G), J15 (R), J13 (CPO), J12 (IMS), J11 (IRGB), J8 (LD), J9 (ENRGB), and J10 (DVCC) are connected to the controller's pins.

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| <i>Item</i> | <i>Qty</i> | <i>Reference</i> | <i>Part Description</i>          | <i>Manufacture / Part #</i>     |
|-------------|------------|------------------|----------------------------------|---------------------------------|
| 1           | 3          | C4,C5,C7         | CAP., CHIP X5R 0.1uF 10V         | AVX, 0402ZD104K 0402            |
| 2           | 4          | C1,C2,C3,C6      | CAP., CHIP X5R 1uF 6.3V          | TAIYO YUDEN, JMK107BJ105MA 0603 |
| 3           | 2          | J2,J3            | TURRET TESTPOINT .064"           | MILL-MAX, 2308-02               |
| 4           | 6          | D1-D6            | LED, SMT WHITE                   | NICHIA, NSCW100                 |
| 5           | 1          | D7               | LED, SMT COLOR RGB               | NICHIA, NSCM315C                |
| 6           | 1          | J1               | SOCKET, 2X7 2MM STRAIGHT         | MOLEX/WALDOM 87331-1420         |
| 7           | 1          | R1               | RES., CHIP 82 Ohm 5%             | AAC CR05-820JM 0402             |
| 8           | 4          | R4,R5,R6,R7      | RES., CHIP 5.1K 5%               | AAC CR05-512JM 0402             |
| 9           | 2          | R2,R3            | RES., CHIP 32.4K 1%              | PANASONIC ERJ-2RKF3242X 0402    |
| 10          | 1          | U2               | IC., SERIAL EEPROM               | MICROCHIP 24LC025 TSSOP8        |
| 11          | 1          | U1               | IC., MULTIDISPLAY LED CONTROLLER | LINEAR TECHNOLOGY, LTC3205EUF   |
| 12          | 0          | TP1,TP2          | OPT.                             | OPT.                            |