ANALOG DEVICES

ADP5520 LED Driver

Reference Design PRD1164

FEATURES

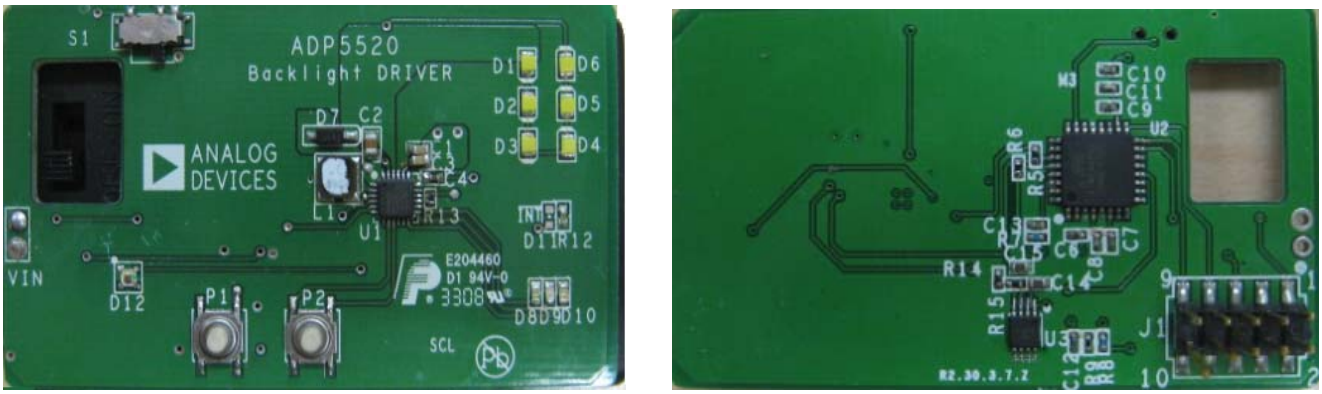
- Backlight fade in/out
- Backlight dim
- Backlight off
- Backlight ambient light sensing
- RGB Fun-lighting
- I2C compatible interface for all programming

PRD1164 OVERVIEW

The demo board in this PRD demonstrates one application of the ADP5520 LED Driver. The ADP5520 drives up to 6 LEDs in series and a RGB LED. The toggle switch S1 specifies one of two modes of operations for the demo board on GPIO (PC0) of a micro controller. When PB0 transitions from low to high via the push button, the microcontroller is triggered to send an associated I2C signal to the ADP5520 to show backlight fade in/out, backlight dim, ambient light sensing, and RGB fun-lighting features.

Figure 1 shows the front and back side demo board overview.

Figure 1. Demo Board Front and Back Side)



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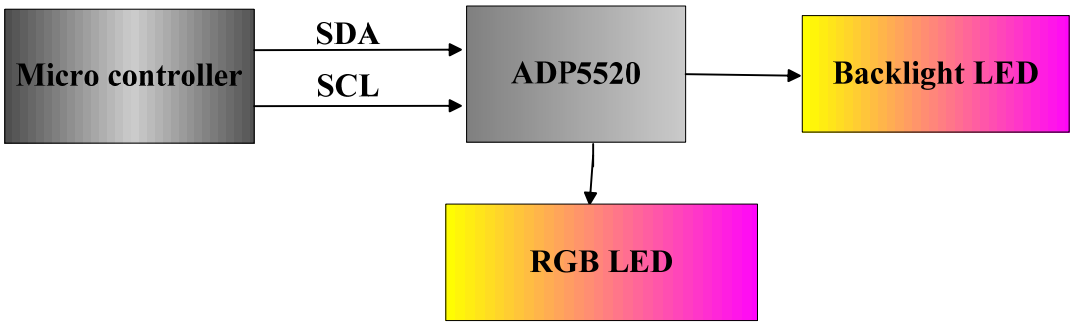
REVISION HISTORY

14/10/2009—Revision 1: Initial Version

DESCRIPTION

Figure 2 shows the block diagram for the demo board. The micro controller is the host that sends signal to the ADP5520, which drives flash, torch, and indicator LED. The two different functions of groups are set with a toggle switch S1 and demonstrate what can be accomplished using the ADP5520.

Figure 2. Demo Board Block



DEMONSTRATION OVERVIEW

The components of the demo board were placed on both sides of the PCB. Figure 3 shows the placement of components on the front side of the PCB, which are:

- the ADP5520 block,
- backlight LEDs,
- indictor and interrupt LEDs,
- a toggle switch,
- a mode select key, and backlight reactive key
- other necessary components.

Figure 4 shows the placement of components on the back side of the PCB, which are:

- the microcontroller block
- other passive components.

Figure 3. Demo Board Front Side

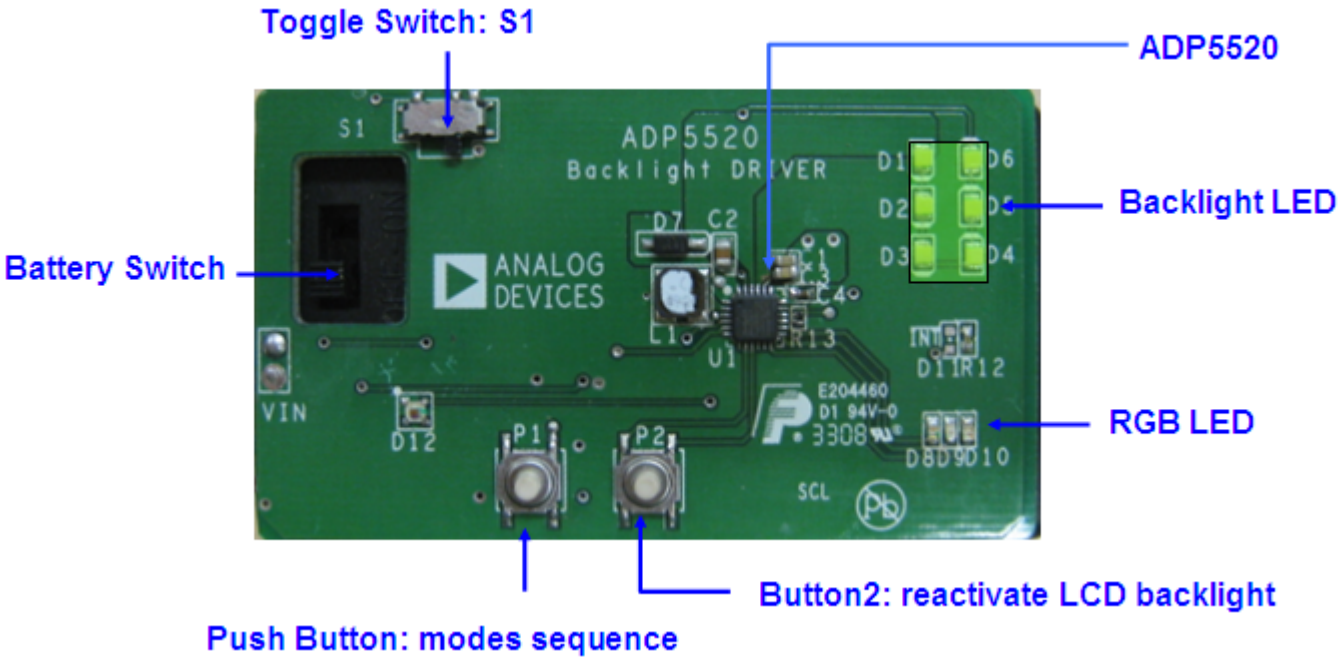
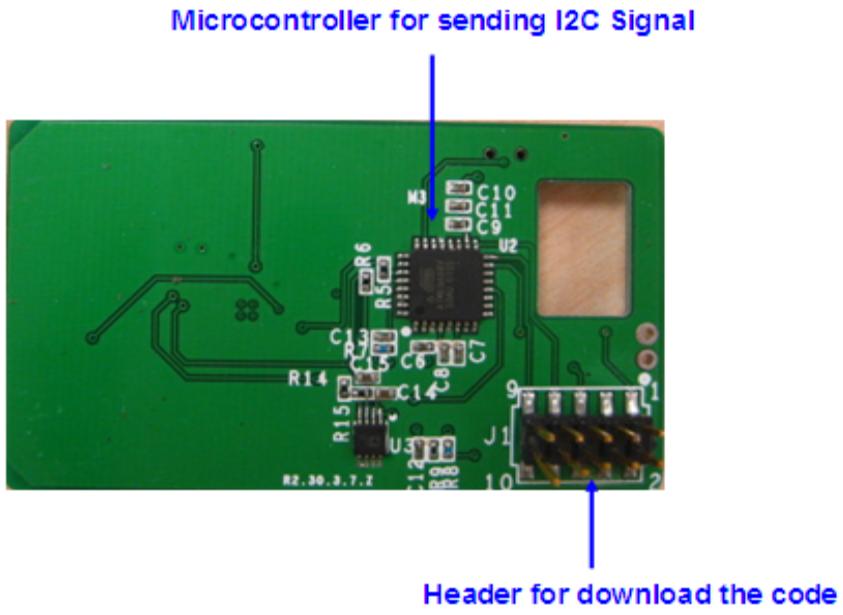


Figure 4. Demo Board Back Side



GETTING STARTED

1. Install the battery in the battery holder at the back side of the PCB.
2. Turn on the switch on the battery holder to power up the system.
3. Set S1 to the left side or right side position to select a function group.

4. Press P1 multiple times to select the different modes for each function group.

Refer to Table 1 for more information about the modes.

DEMONSTRATE GROUP 1 FUNCTIONS

1. Set S1 to the right side position to demonstrate function group 1.

   Refer to **Error! Reference source not found.** to determine the results from pressing P1 various times. The various backlight effects include:

   - Backlight fade in/out
   - Backlight dimming
   - Backlight ambient light sensing (ALS)

2. Press P1 (1st time).

   - LED turns ON
   - LED automatically adjusts according to environmental lighting changes. Dark, office, and outdoor modes have been preset on the demo board.with appropriate constant currents.

3. Press P1 again (2nd time). The LED turns off.
4. Press P1 again (3rd time).

   - LED turns on with linear fade in and fade off
   - LED automatically adjusts to environmental lighting changes. Dark, office, and outdoor modes have been preset in the demo board.

5. Press P1 again (4th time). The LEDs turn off.

Refer to **Error! Reference source not found.** to determine the results from pressing P1 more times.

Note: When P1 is pressed the 7th time (and the 9th and 11th times), the backlight goes dim after 10 seconds and after 10 seconds at dim turns off. When the backlight is off, press button P2 to reactive backlight.

DEMONSTRATE GROUP 2 FUNCTIONS

1. Set S1 to the left position to demonstrate function group 2.

   Refer to Table 1 to determine the results from pressing P1 various times. The various effects include:

   - RGB LEDs turn on (15mA) without fade in/off
   - RGB LEDs flash on and off (15mA) in SYNC without fade in/off
   - RGB LEDs flash on and off (15mA) in SYNC with fade in/off
   - RGB LEDs turn on in sequence using Square Law DAC

Table 1. Demo Functions

Group1 S1→right side position:six LED						
BackLight						
Press P1 Button	LCD	Fade In/Out	Dim	OFF	ALS	Press P2 Button
1st keypress	ON	No	No	No	Yes	No
2nd keypress	LCD OFF					No

3rd keypress	ON	Linear	No	No	Yes	No
4th keypress	LCD OFF					No
5th keypress	ON	Cubic1	No	No	Yes	No
6th keypress	LCD OFF					No
7th keypress	ON	No	10s	10s	No	Yes
8th keypress	LCD OFF					No
9th keypress	ON	Linear	10s	10s	No	Yes
10th keypress	LCD OFF					No
11th keypress	ON	Cubic1	10s	10s	No	Yes
12th keypress	LCD OFF					No
13th keypress	ON(dark default)	No	No	No	No	No
14th keypress	ON(office default)	No	No	No	No	No
15th keypress	ON(outdoor default)	No	No	No	No	No
16th keypress	LCD OFF					
Group2 S1→left side position: RGB fun-lighting						
RGB LEDs for fun-lighting						
1st keypress	RGB turn on(15mA) constanly without fade in/off					
2nd keypress	RGB LEDs are off					
3rd keypress	RGB blink flash(15mA) in SYNC without fade in/off					
4th keypress	RGB LEDs off					
5th keypress	RGB blink flash(15mA) in SYNC with fade in/off					
6th keypress	RGB LEDs off					
7th keypress	RGB in sequence using Square Law DAC					
8th keypress	RGB LEDs off					

DEMO PARAMETER SETTING

LED AND BACKLIGHT LED SETUP

Daylight Max Current	22mA
Daylight Dim Current	2mA
Office Max Current	5mA
Office Dim Current	0.75mA
Dark Max Current	1mA
Dark Dim Current	0.25mA
Backlight Off Timeout	15s
Backlight Dim Timeout	10s
Backlight Fade-In Time	4.5s
Backlight Fade-Out Time	1.5s

RGB LED CURRENT SET UP

RGB0 Current	15mA
RGB1 Current	15mA
RGB2 Current	15mA
RGB0 on period	0.58s
RGB1 on period	0.58s
RGB2 on period	1s
RGB Fade In Time	1s
RGB Fade Out Time	1s

SCHEMATIC

Figure 5. Schematic of ADP5520

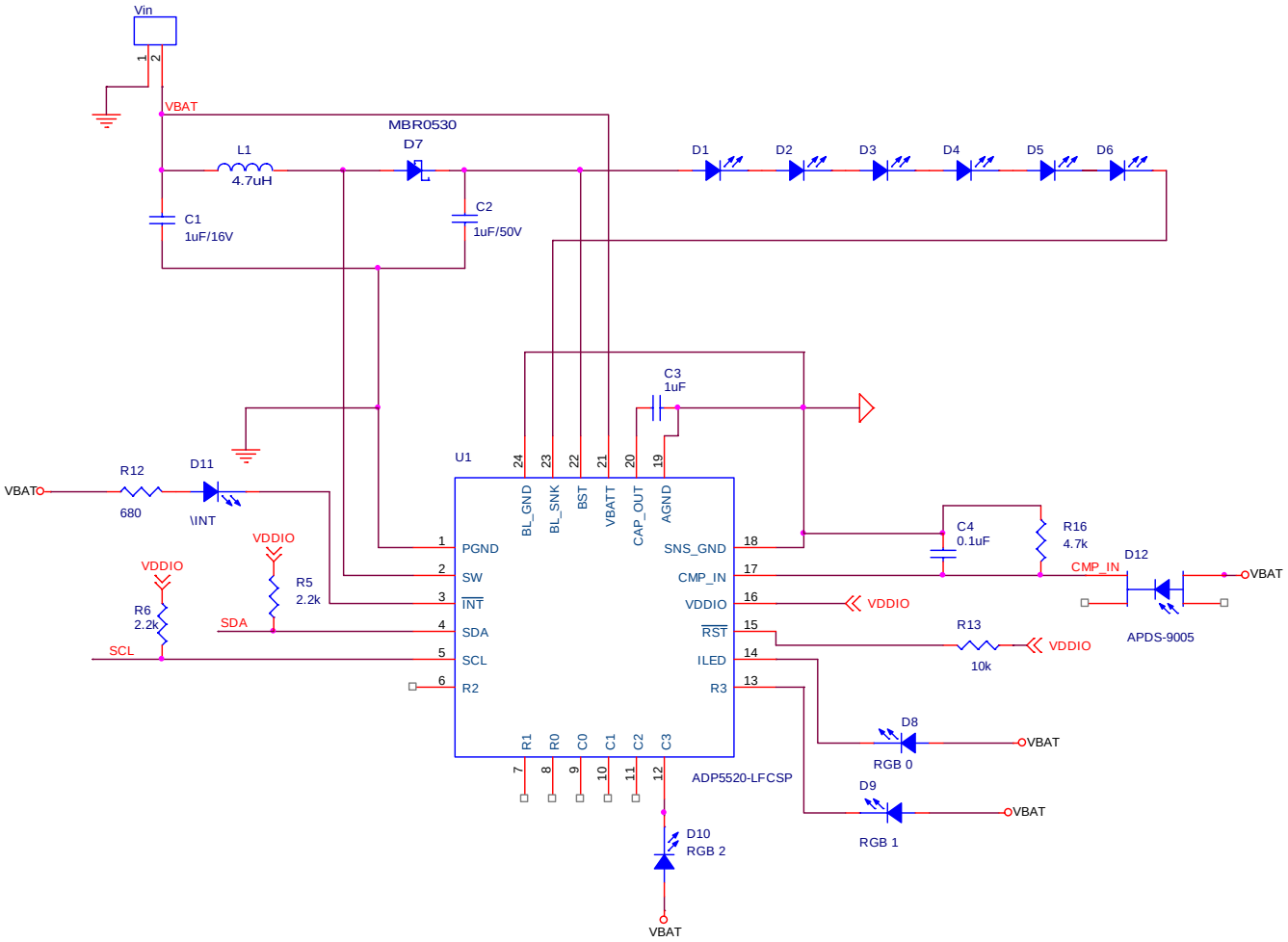
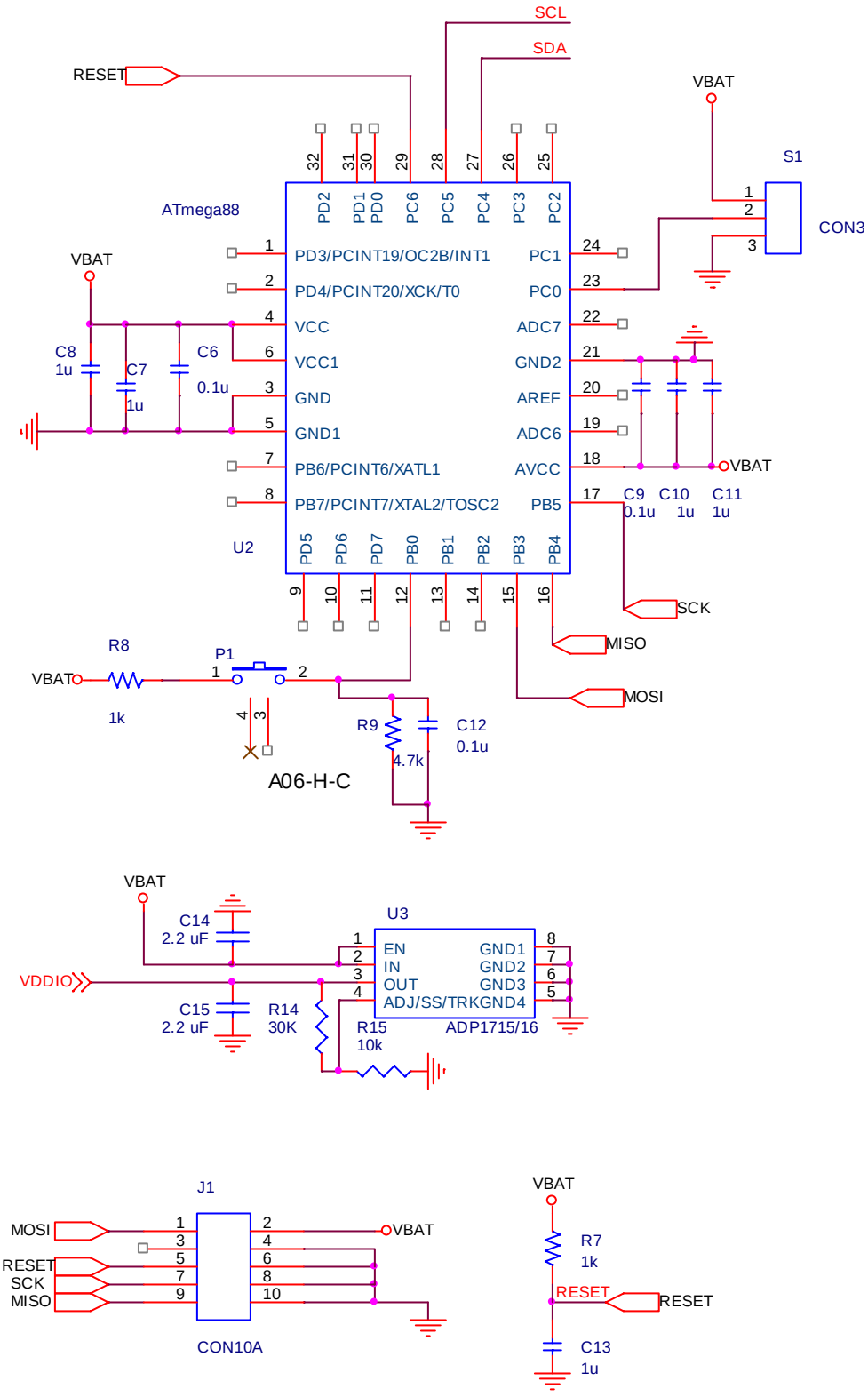


Figure 6. ADP5520 control circuit



BILL OF MATERIALS

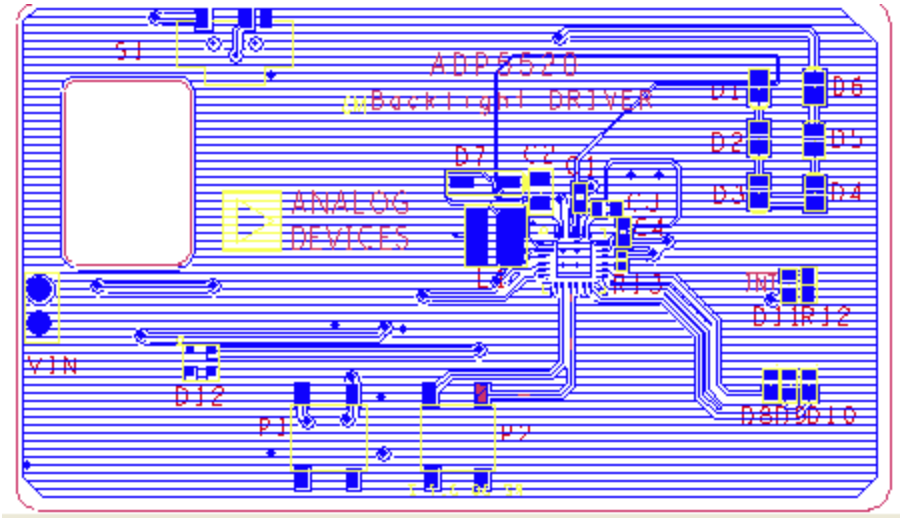
Table 2. Bill of Materials

Item	*Part Reference*	*Description*	*Qty*	*Manufacturer*	Manuf./Vendor P/N
1	C4,C6,C9,C12	Capacitor, Ceramic, 0.1uF,0402,10V,X5R	4	Murata	GRM155R61A104KA01
2	C5	Capacitor, Ceramic, 0.01uF,0402,16V,X7R	1	Murata	GRM155R71C103KA01
3	C7,C8,C10,C11, C13	Capacitor, Ceramic, 1uF,0402,10V,X5R	5	Murata	GRM155R61A105KE15
4	C1,C3	Capacitor, Ceramic, 1uF,16V,0603	2	Murata	GRM185R61C105KE44
5	C2	Capacitor, Ceramic, 1uF,25V,0805	1	Murata	GRM188R61E105KA12
6	C14,C15	Capacitor, Ceramic, 2.2uF, 16V, 0603	2	Murata	GRM188R61C225KE15
7	D1,D2,D3,D4,D5, D6	Backlght White LED,30mA, 0805,Vf<3.2	6	everlight	65-11-UTC-S933-TR8
8	D8	RED LED,30mA,0603	1	everlight	19-21-R6C-FP2Q2L-3T
9	D9	BLUE LED,30mA,0603	1	everlight	19-21-BHC-AN1P2-3T
10	D10	GRN LED,30mA,0603	1	everlight	19-21-GHC-YR1S2-3T
11	D11	RED LED,30mA,0603	1	everlight	19-21-R6C-FP2Q2L-3T
12	D7	Diode, Schottky,SOD123	1	Onsemi	MBR0530
13	D12	photosense	1	Avago	APDS-9005
14	L1	Inductor, 4.7uH/1.1Apeak，DCR0.15ohm	1	TDK	VLF4012AT-4R7M1R1
15	R5,R6	Resistor,2.2K,1/10W, 1%, 0402	2	Vishay or equiv	CRCW04022K2FKED
16	R7,R8	Resistor,1K,1/10W, 1%, 0402	2	Vishay or equiv	CRCW04021KFKED
17	R9,R16	Resistor,4.7K,1/10W, 1%, 0402	2	Vishay or equiv	CRCW04024K7FKED
18	R10	Resistor,20K,1/10W, 1%, 0402	1	Vishay or equiv	CRCW040220KFKED
19	R11	Resistor, 0ohm, 1/10W, 1%, 0402	1	Vishay or equiv	CRCW04020RFKED
20	R12	Resistor, 680ohm, 1/10W, 1%, 0402	1	Vishay or equiv	CRCW0402680RFKED
21	R13	Resistor,10K,1/10W, 1%, 0402	1	Vishay or equiv	CRCW04024K7FKED
22	R14	Resistor,24.3K,1/10W, 1%, 0402	1	Vishay or equiv	CRCW04024K7FKED
23	R15	Resistor,10K,1/10W, 1%, 0402	1	Vishay or equiv	CRCW040210KFKED
24	J1	SMT headers,10pin	1	Sullins Electronics	PEC36DAAN
25	PUSHBUTTON	PUSHBUTTON	1	Weixin	TSS4433

Item	Part Reference	Description	Qty	Manufacturer	Manuf./Vendor P/N
26	S1	Mini slide switch	1	ALPS	SSSS810701
27	U1	Backlight driver	1	ADI	ADP5520
28	U2	Micro Controller	1	ATMEL	ATmega88V-10U
29	U3	LDO	1	ADI	ADP1715_ADJ

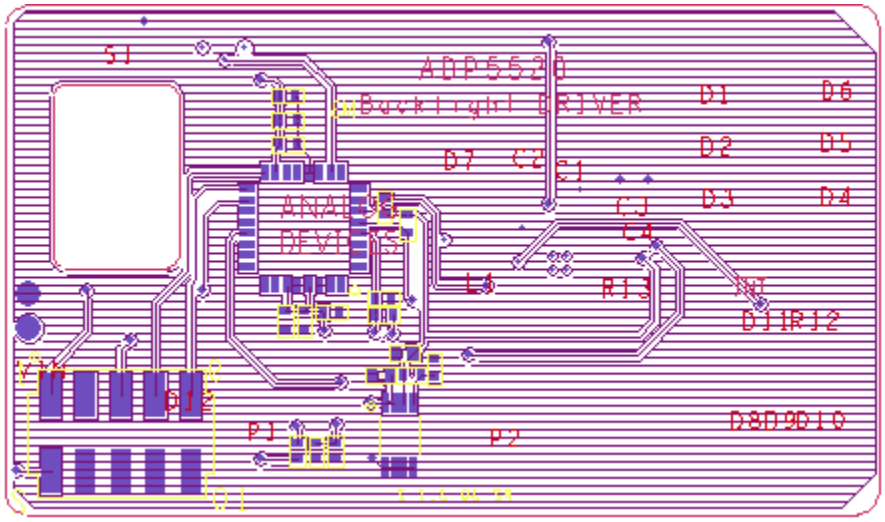
LAYOUT

Figure 7. Top View



J1 = S1 on schematic

Figure 8. Bottom View



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