



**THE DATASHEET OF  
LP5524TM-5EV**



## **AN-1702 LP5524 Evaluation Kit**

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### **1 LP5524 Overview**

The LP5524 is a highly integrated dual-zone LED driver that can drive up to four LEDs in parallel with a total output current of 100 mA. Regulated high side internal current sources deliver excellent current and brightness matching in all LEDs. Extremely low minimum headroom voltage allows the use of operating voltages that are close to LED forward voltages.

LED driver current sources are split into two independently controlled banks for driving secondary displays, keypads and indicator LEDs. Brightness control is achieved by applying PWM signals to each enable pin. Default LED current is 5mA and an optional external resistor can be used to set initial brightness to user required values. LP5524 is available in TI's tiny 9-bump DSBGA package.

### **2 Evaluation Kit Overview**

LP5524 evaluation kit enables designers an easy way to evaluate the performance of the device. The evaluation board has jumpers for each enable pin for easy on/off type control. These inputs can also be fed with external PWM source. Jumpers on LED outputs allow easy LED current measuring. ISET pin has a jumper for selecting between two LED current levels.

The kit supports complete functional evaluation of the circuit. The evaluation kit consists of:

- LP5524 Evaluation Board
- *LP5524 Parallel LED Driver With PWM Brightness Control in DSBGA Package Data Sheet* ([SNVS500](#))
- Evaluation Kit document (this document)

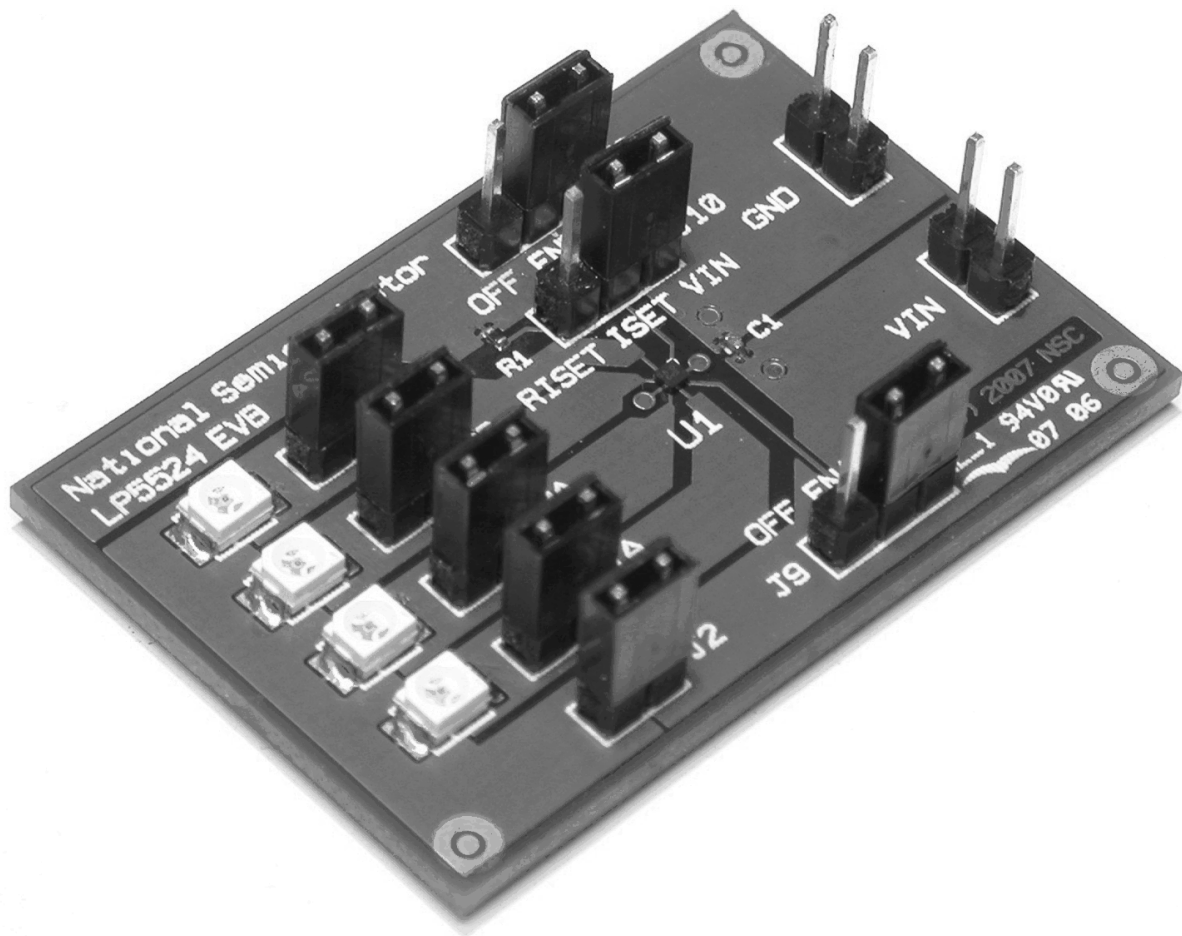


Figure 1. LP5524 Evaluation Board

### 3 Jumper Description

This describes the jumpers and the connectors on the LP5524 evaluation board.

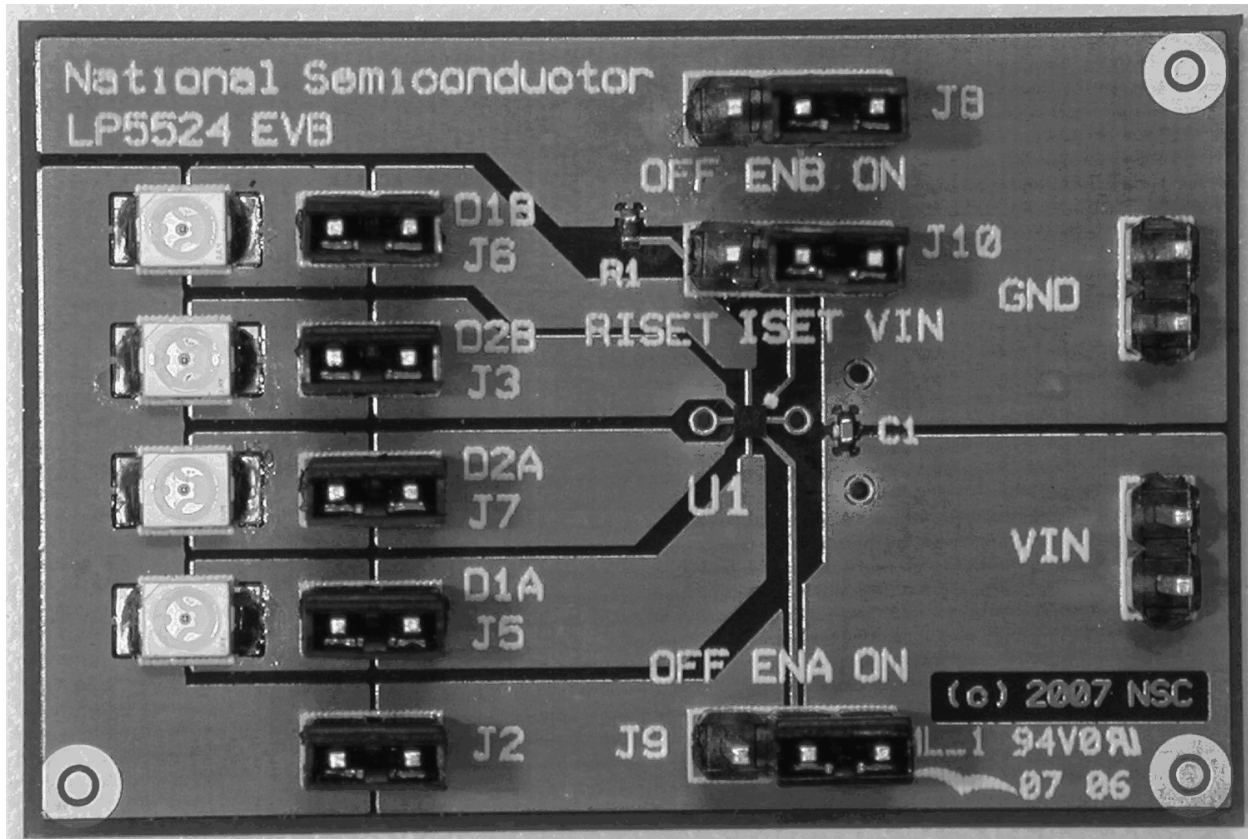


Figure 2. LP5524 Evaluation Board Top View

#### VIN – J1

This connector is the positive input for power supply. The evaluation board can operate with supply voltages from 2.7 V to 5.5 V. The input leads from power supply should be twisted and kept as short as possible. There is an input capacitor (C1) on board to smooth the input voltage.

#### GND – J4

This is the negative input for power supply.

#### J2

This jumper disconnects all LED cathodes from the GND. This can be used to separate the LED currents from the circuit current.

#### D1B – J6

This jumper can be used to disconnect the D1B output from the LED anode. This can be used to measure the D1B current.

#### D2B - J3

This jumper can be used to disconnect the D2B output from the LED anode. This can be used to measure the D2B current.

#### D2A – J7

This jumper can be used to disconnect the D2A output from the LED anode. This can be used to measure the D2A current.

**D1A – J5**

This jumper can be used to disconnect the D1A output from the LED anode. This can be used to measure the D1A current.

**D2A – J7**

This jumper can be used to disconnect the D2A output from the LED anode. This can be used to measure the D2A current.

**ENB – J8**

This is the ENB input. A three pin connector is applied to allow ENB to be connected either to  $V_{IN}$  or to GND. The center pin is connected directly to ENB pin. This pin can be used to connect external PWM signal. Smaller than 300 Hz PWM frequency is recommended.

**ISET – J10**

ISET pin jumper. This can be used to connect the ISET pin either to  $V_{IN}$  or to onboard RISE resistor. Connecting ISET to  $V_{IN}$  sets the LED current to default 5mA and connecting it to RISE sets the current to 15.6 mA. Center pin is connected directly to ISET pin and it can be used to connect external current set resistors.

**ENA – J9**

This is the ENA input. A three pin connector is applied to allow ENA to be connected either to  $V_{IN}$  or to GND. The center pin is connected directly to ENA pin. This pin can be used to connect external PWM signal. Smaller than 300 Hz PWM frequency is recommended.

## 4 Getting Started

The following instructions show how to set up and use the LP5524 evaluation kit. Use ESD protection to prevent any unwanted damaging ESD events.

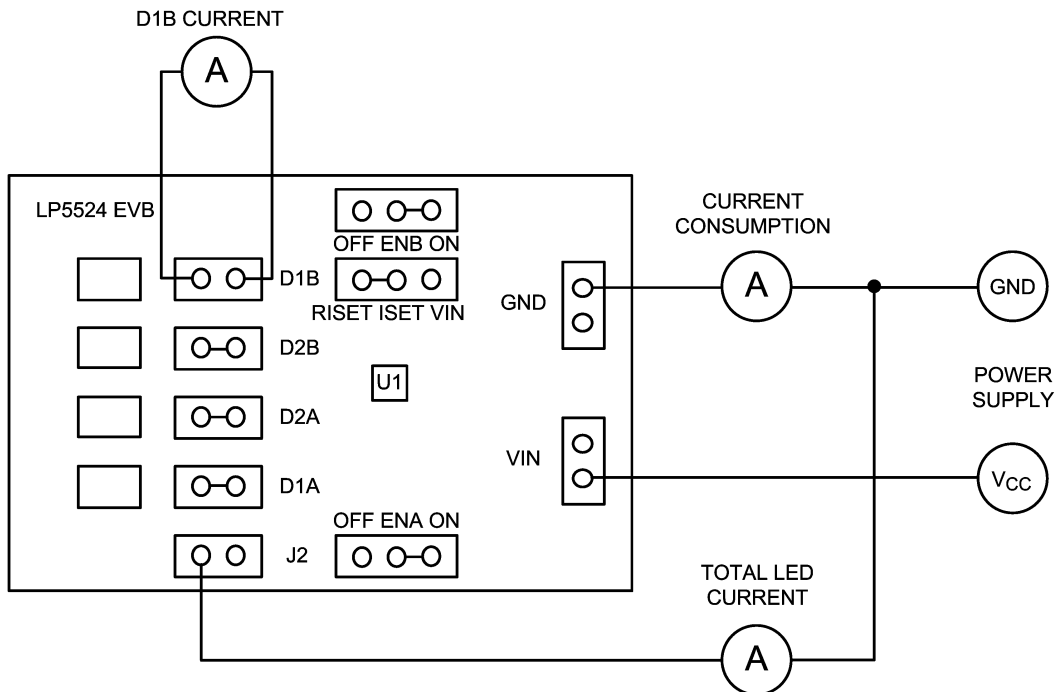
1. Check the onboard jumpers. Jumpers on the LED outputs (J3, J5-J7) and the jumper from LED cathodes to gnd (J2) should be on. Remove jumpers from enables (J8 and J9). ISET can be connected either to  $V_{DD}$  or RISE.
2. Connect evaluation board to a power supply. Check that operation voltage is between 2.7 V to 5.5 V.
3. Set the enable jumpers to ON position. ENA jumper enables drivers D1A and D2A and ENB jumper enables drivers D1B and D2B.
4. The Evaluation Kit is now ready to use.

### 4.1 Current Measurements

To measure the current of a single LED driver remove the jumper from that driver's output and connect current meter to jumper's pins. To measure the current of all LEDs remove the J2 jumper and connect current meter to J2 pins. To measure the current consumption of the device separate the LED ground current from the board's ground current by removing the J2 jumper and connecting the LED ground to power supply ground with separated wire. Then connect the current meter to evaluation board's ground wire. [Figure 3](#) illustrates how to measure different currents.

## 4.2 PWM Dimming

To dim the LEDs, feed a proper PWM signal to ENx pin. Less than 300 Hz PWM frequency is recommended. Ensure that the PWM signals are high and that the low levels are adequate.



**Figure 3. LP5524 Evaluation Board Current Measurements**

## 5 Board Layout

A four layer board was used to enable the use of micro-VIAs. Micro VIA is required for routing the center pad of the LP5524. The evaluation board layers are:

- Top, component side, signal
- Layer 2,  $V_{IN}$  plane (signal)
- Layer 3, GND plane
- Bottom, GND plane

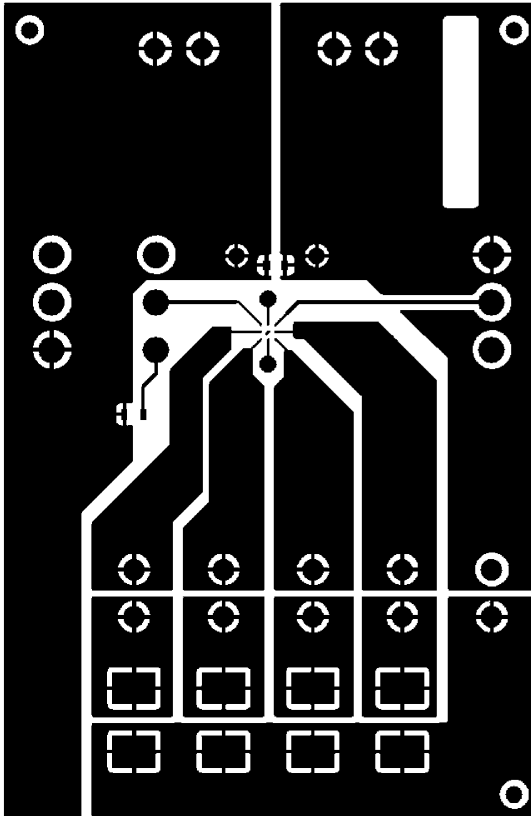


Figure 4. LP5524 Evaluation Board Layer 1 (Top).

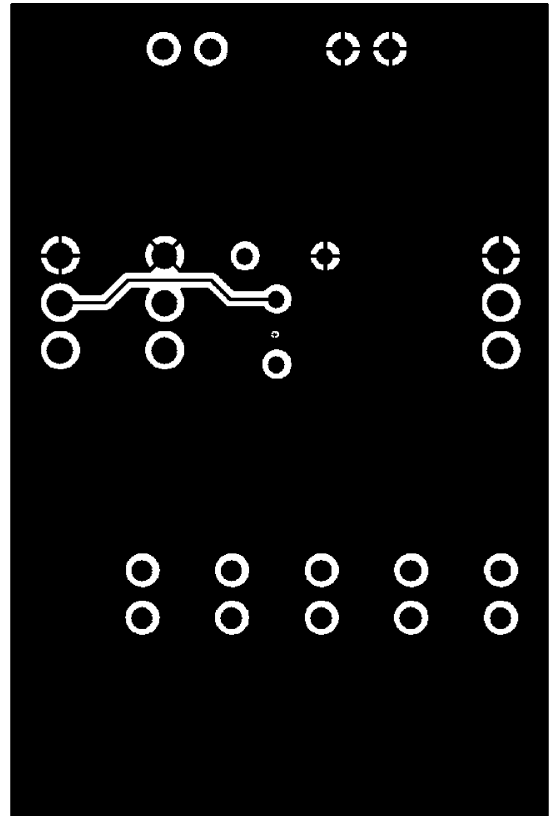


Figure 5. LP5524 Evaluation Board Layer 2.

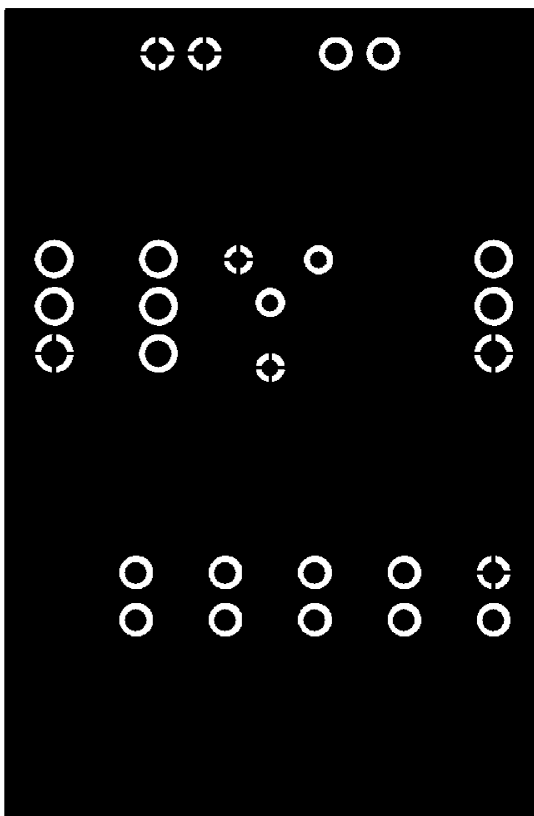


Figure 6. LP5524 Evaluation Board Layer 3.

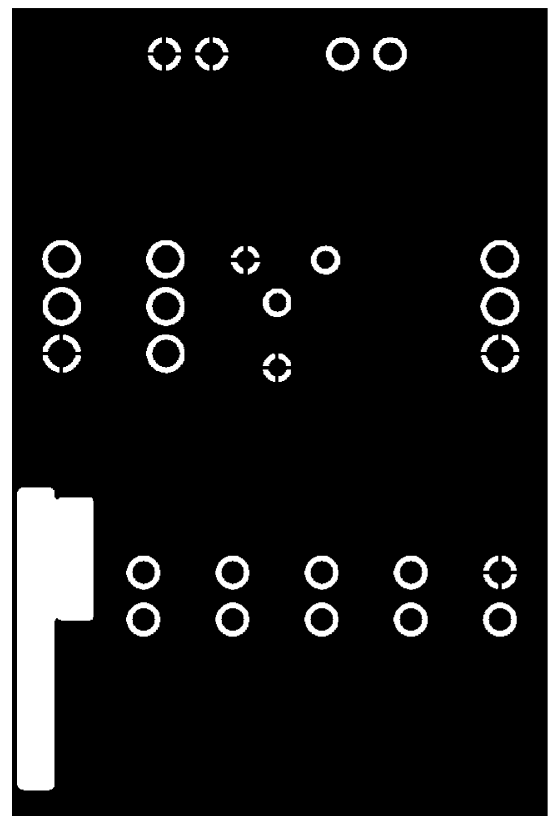


Figure 7. LP5524 Evaluation Board Layer 4 (Bottom)

## 6 Schematic

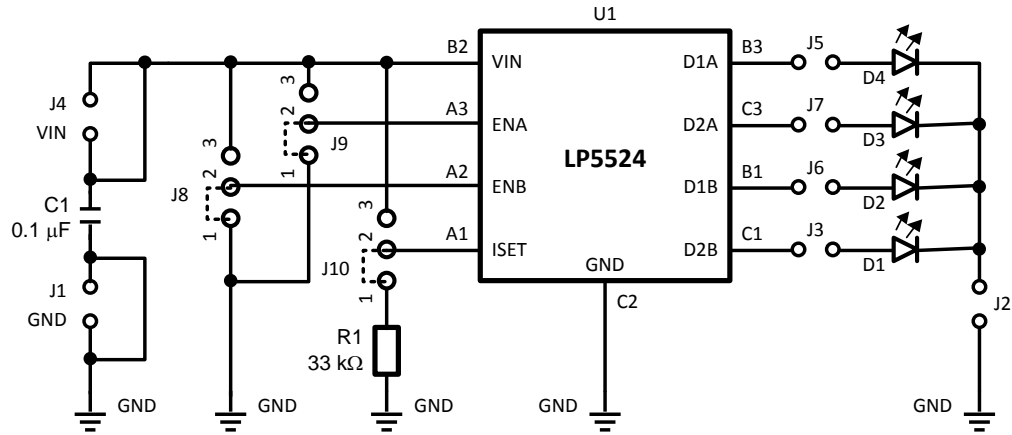


Figure 8. LP5524 Evaluation Board Schematic

## 7 List of Components

Reference	Model	Type	Vendor	Size
C1	100 nF 10 V	Ceramic X5R	TDK	0402 (1005)
R1	33kΩ 1%	-	-	0402 (1005)
D1 -D4	LS T676	LED Red	Osram	3.0 mm x 3.4 mm x 2.1 mm
U1	LP5524	-	TI	1.215 mm x 1.215 mm x 0.6 mm

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- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
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-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management