

## LP8501 PRODUCT BRIEF Multi-Purpose 9-Output LED Driver

Check for Samples: [LP8501](#)

### FEATURES

- Three independent program execution engines for user defined programs with large SRAM memory for storing lighting programs
- 9 programmable source (high side) driver outputs with 25.5 mA full-scale current, 8-bit current setting resolution and 12-bit PWM control resolution
- Flexible grouping possibility for all 9 outputs including GPO into three groups with group PWM and Fade in/ Fade out controls
- Built-in LED test
- Adaptive charge pump with 1x and 1.5x gain provides up to 95% LED drive efficiency and with soft start and overcurrent/short circuit protection

- Automatic power save mode;  $I_{VDD} = 10 \mu\text{A}$  (typ.)
- Two wire, I<sup>2</sup>C-compatible, control interface
- Small application circuit
- Pin-configured LED powering for LEDs 1 to 6 and for LEDs 7 to 9
- Solution area <18 mm<sup>2</sup>

### APPLICATIONS

- Fun lights and indicator lights
- LED backlighting and color keypad lighting
- Programmable current source
- Haptic feedback driver and GPIO expander

### DESCRIPTION

The LP8501 is a LED driver with 9 outputs, designed to produce versatile lighting effects for mobile devices. The device is equipped with an internal program memory, which allows operation without processor control. Internal program memory is used by three independent program execution engines to produce user defined lighting effects for the outputs.

A high-efficiency charge pump enables LED driving over full Li-Ion battery voltage range. The excellent efficiency over a wide operating range is achieved by autonomously selecting the best charge pump gain based on LED forward voltage requirements. LP8501 is able to automatically enter power-save mode when LED outputs are not active, thus lowering idle current consumption down to 10  $\mu\text{A}$  (typ.)

The device has a flexible General Purpose Output (GPO), which can be used for example as a digital control pin for other devices. INT pin (interrupt function), which can be used to notify processor. Trigger input interface, which allows program execution start without I<sup>2</sup>C write.

The device requires only four small and low-cost ceramic capacitors. The LP8501 is available in a tiny 25–bump 2.27 mm x 2.27 mm x 0.60 mm micro SMD package (0.4 mm pitch).

**Notice: This document is not a full datasheet. For more information regarding this product or to order samples, please contact your local National Semiconductor sales office or visit <http://www.national.com/support/dir.html>**



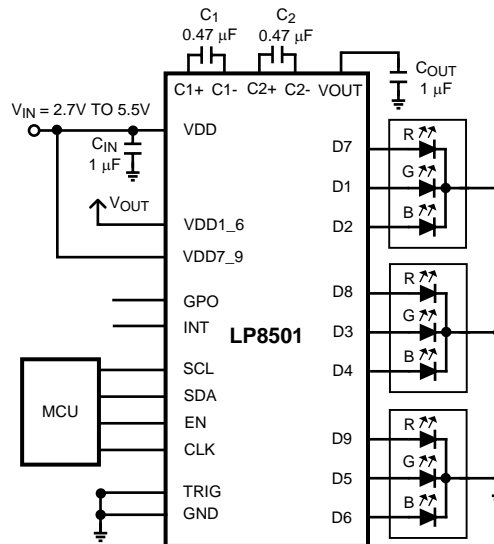
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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### Typical Application



## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LP8501TME/NOPB	ACTIVE	DSBGA	YFQ	25	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-30 to 85	8501	<a href="#">Samples</a>
LP8501TMX/NOPB	ACTIVE	DSBGA	YFQ	25	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-30 to 85	8501	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

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## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

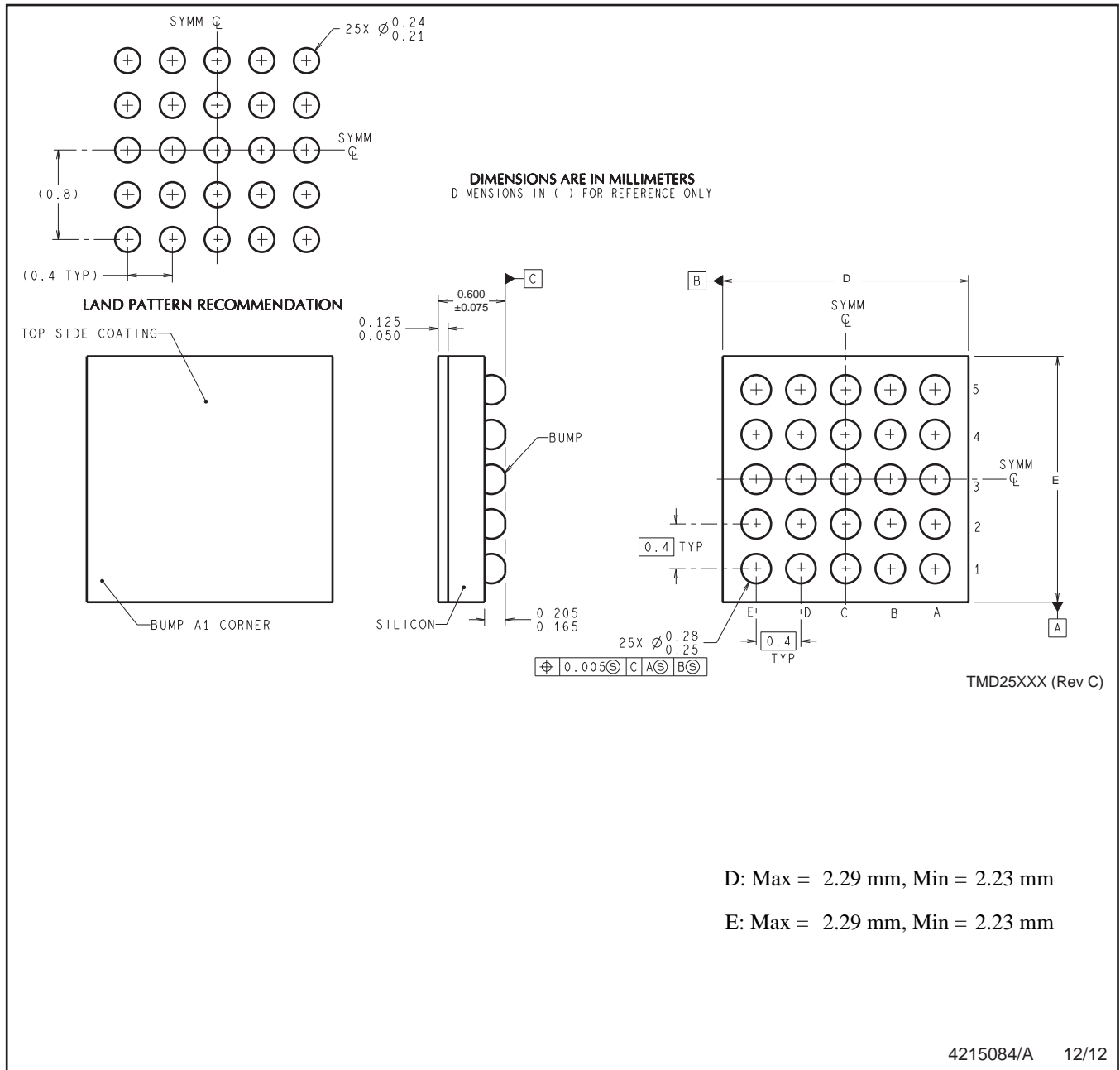
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LP8501TME/NOPB	DSBGA	YFQ	25	250	178.0	8.4	2.43	2.48	0.75	4.0	8.0	Q1
LP8501TMX/NOPB	DSBGA	YFQ	25	3000	178.0	8.4	2.43	2.48	0.75	4.0	8.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LP8501TME/NOPB	DSBGA	YFQ	25	250	210.0	185.0	35.0
LP8501TMX/NOPB	DSBGA	YFQ	25	3000	210.0	185.0	35.0

YFQ0025



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.  
B. This drawing is subject to change without notice.

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