

TPS92761-Q1 Automotive Constant Voltage Buck with 24-Channel Linear LED Driver

1 Features

- AEC-Q100 qualified for automotive applications
 - Grade 1: -40°C to 125°C ambient operating temperature
- Functional safety targeted
 - Developed for functional safety applications
 - Documentation to aid ISO26262 system design up to ASIL B
- 24 constant current sinks with high precision:
 - 20V maximum voltage capability
 - Up to 90mA channel current set by resistor
 - Low dropout voltage: 400mV (typ) at 90mA
- Flexible dimming control:
 - 6-bit independent current setting
 - 14-bit independent PWM dimming with phase-shift control
 - Programmable slew-rate control
- Integrated synchronous buck regulator
 - Wide input voltage range: 5V to 36V
 - Supports 400kHz and 2.1MHz switching frequency
 - Spread spectrum frequency modulation
 - Dynamic headroom voltage control (DHC)
- UART serial communication
 - Support for up to 2MHz clock frequency
 - Internal oscillator for system clock
 - CAN transceiver compatible
- Internal EEPROM
 - Failsafe default settings
 - Customer calibration data
- Extensive fault diagnostics

2 Applications

- Automotive exterior headlight and rear light
- Tail, stop and sequential (dynamic) turn indicator
- Ambient lighting, grill illumination and dash board lighting functions

3 Description

The TPS92761-Q1 is a 24 channel device with an integrated synchronous Buck regulator and protected linear current sinks. The device is capable of driving current up to 90mA through LEDs with channel-to-channel accuracy of less than $\pm 3.5\%$. Each linear current sink can be individually programmed by a 6-bit current setting value and is independently controlled by pulse width modulation (PWM) using 14-bit registers. Transient behavior is improved by programming uniform phase shifted PWM signals between operating channels.

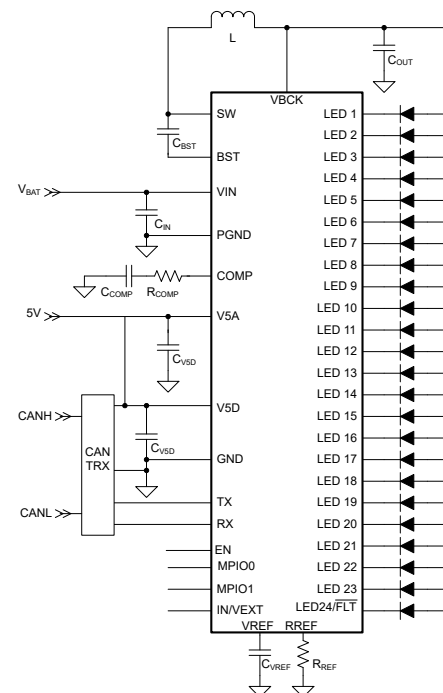
The LEDs can be powered by the voltage rail generated using the wide 5V to 36V input voltage range integrated synchronous Buck regulator. The buck regulator implements an adaptive off-time current mode control enabling low input voltage operation. The device is capable of providing 2.68A current at 2.1MHz switching frequency and 4A current at 400kHz switching frequency with fast transient response. Dynamic headroom control is implemented to optimize system efficiency and reduce thermal dissipation.

The TPS92761-Q1 features an internal oscillator that supports multidrop, universal asynchronous receiver transmitter (UART) serial interface. The internal EEPROM can store system defaults as well as calibration and lighting module data. An on-board ADC with multiplexed inputs samples all LED channels as well as IC die temperature and supply voltages.

Packaging Information

PART NUMBER	PACKAGE ⁽¹⁾	BODY SIZE (NOM)
TPS92761-Q1	48-Pin HTQFP (PHP)	7.00mm x 7.00mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Simplified Schematic



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4 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

4.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

4.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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4.3 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

4.4 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

5 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
June 2026	*	Initial Draft

6 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TPS92761QPHPRQ1	Active	Production	HTQFP (PHP) 48	1000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 125	TPS92761Q

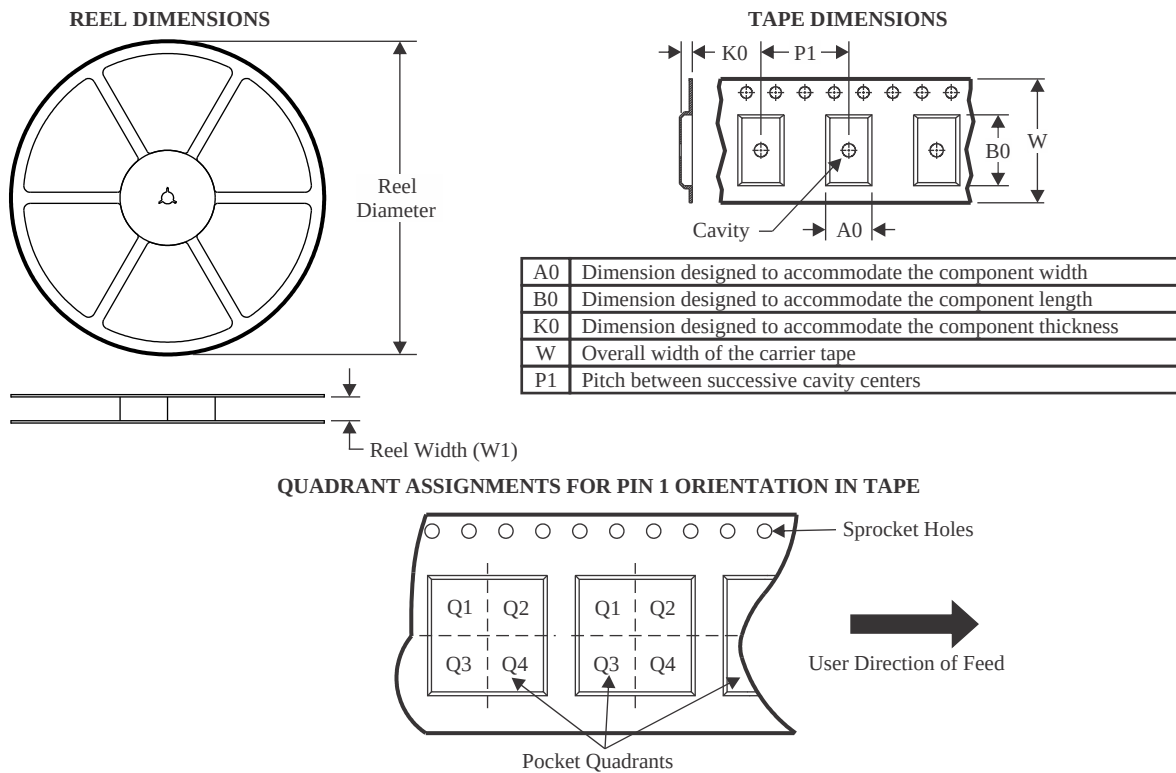
- (1) **Status:** For more details on status, see our [product life cycle](#).
- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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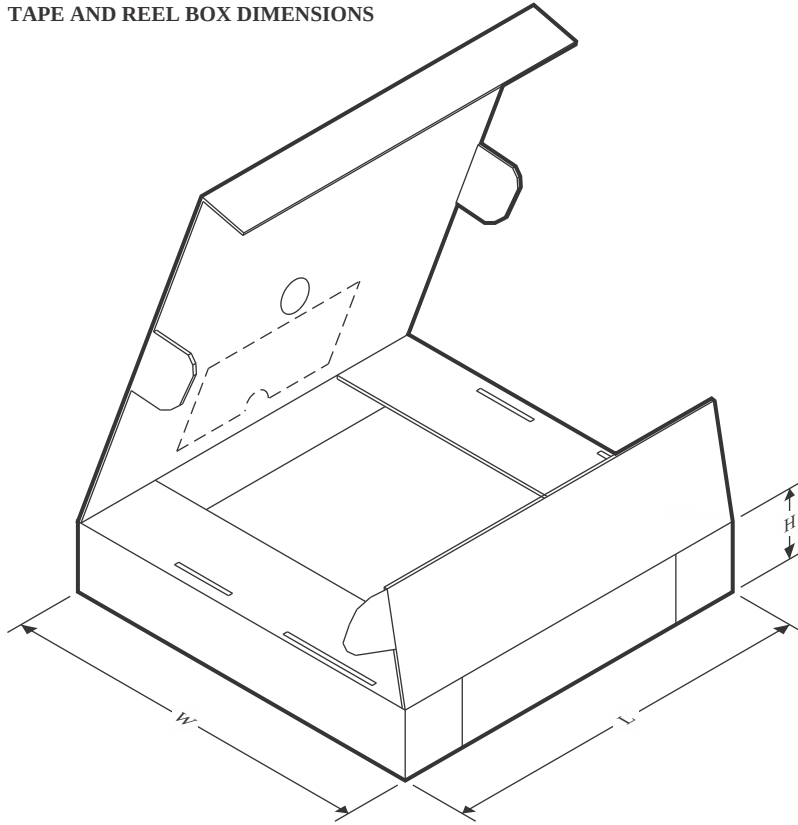
TAPE AND REEL INFORMATION



*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
TPS92761QPHPRQ1	HTQFP	PHP	48	1000	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS92761QPHPRQ1	HTQFP	PHP	48	1000	336.6	336.6	31.8

GENERIC PACKAGE VIEW

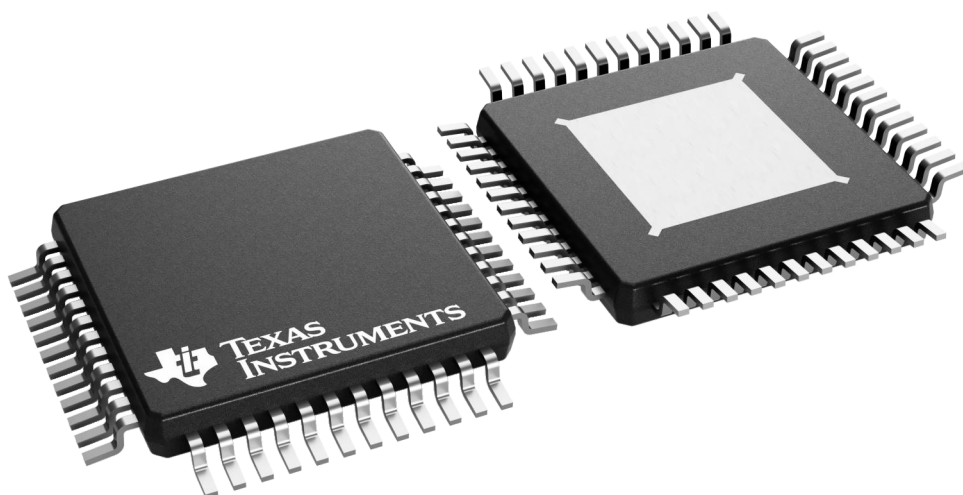
PHP 48

TQFP - 1.2 mm max height

7 x 7, 0.5 mm pitch

QUAD FLATPACK

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



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PowerPAD™ HTQFP - 1.2 mm max height

[illegible]

PowerPAD is a trademark of Texas Instruments.

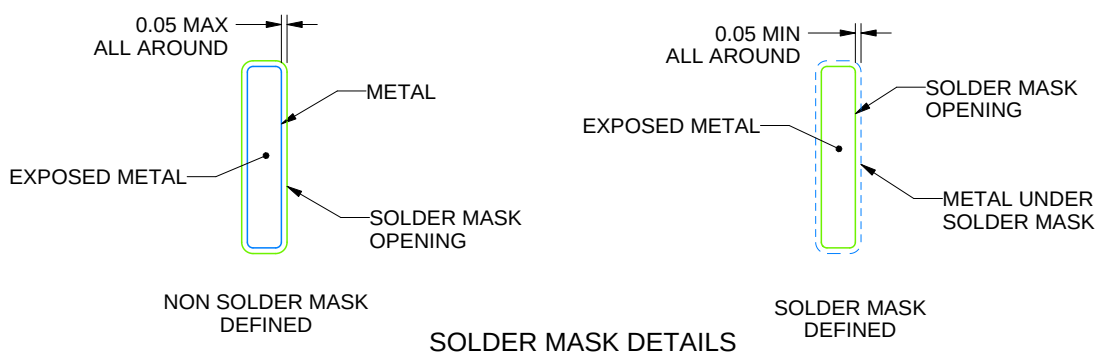
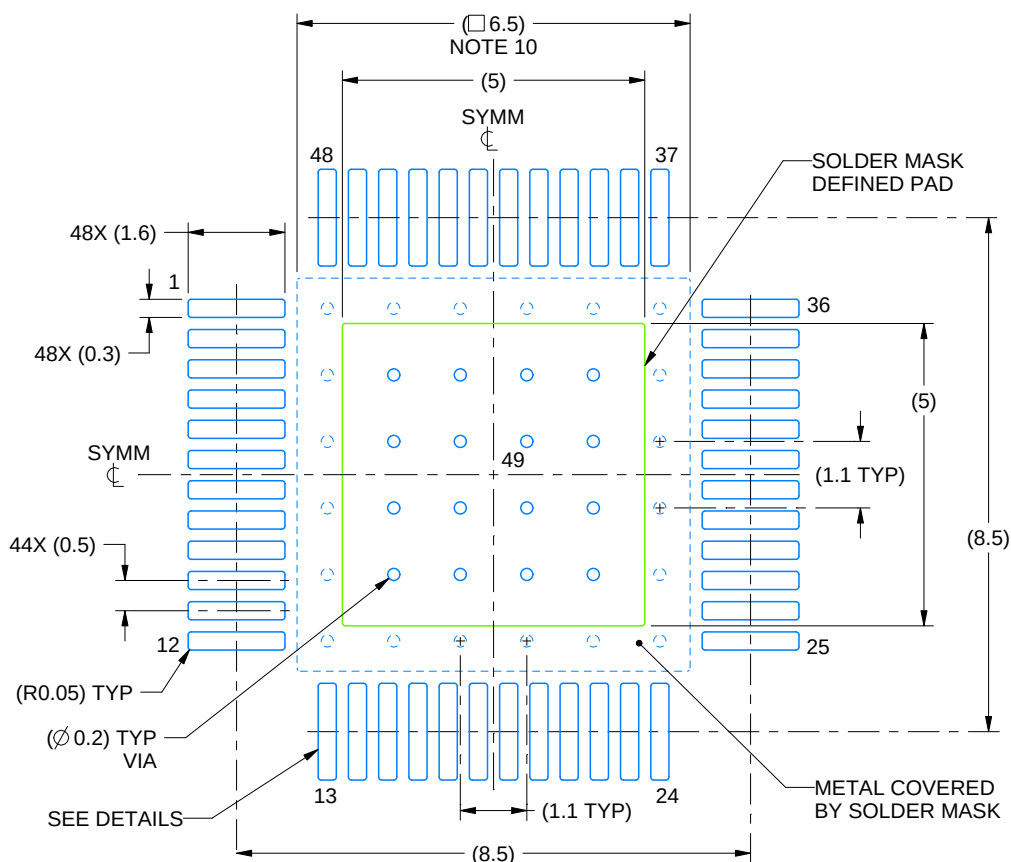
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MS-026.
5. Feature may not be present.

EXAMPLE BOARD LAYOUT

PHP0048L

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



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NOTES: (continued)

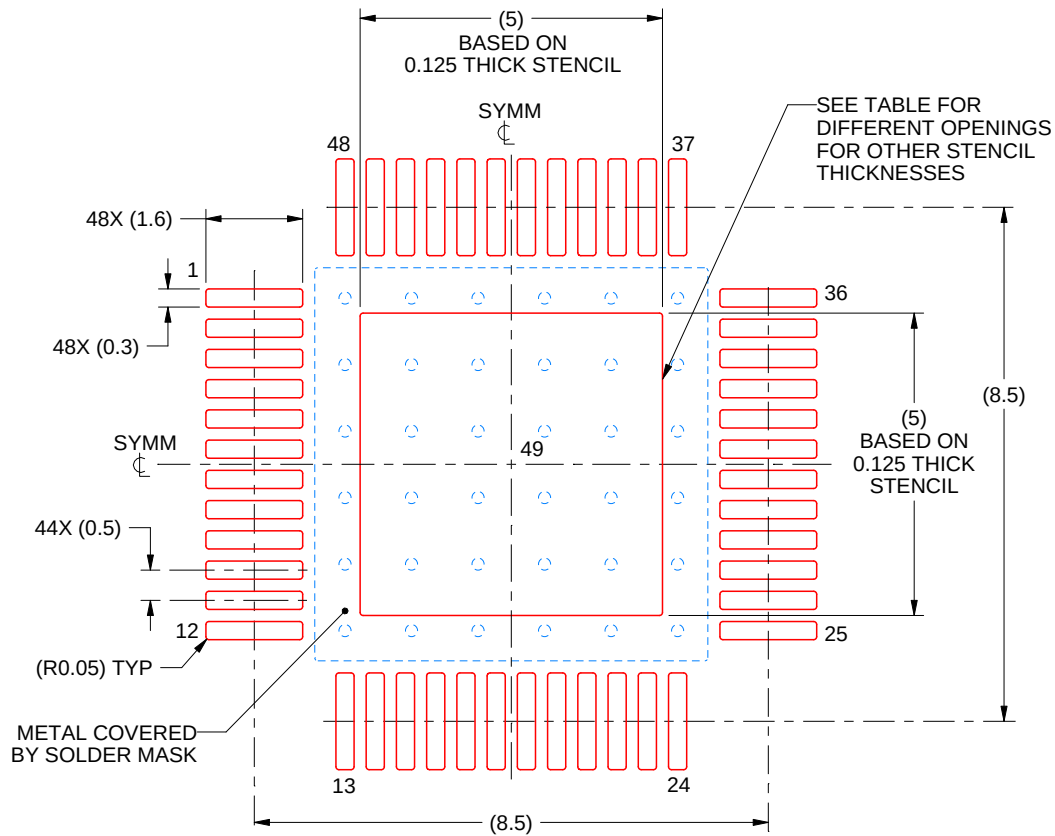
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. This package is designed to be soldered to a thermal pad on the board. See technical brief, Powerpad thermally enhanced package, Texas Instruments Literature No. SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.
10. Size of metal pad may vary due to creepage requirement.

EXAMPLE STENCIL DESIGN

PHP0048L

PowerPAD™ HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK



SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	5.59 X 5.59
0.125	5.00 X 5.00 (SHOWN)
0.150	4.56 X 4.56
0.175	4.23 X 4.23

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NOTES: (continued)

11. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
12. Board assembly site may have different recommendations for stencil design.

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