

LM636x5-Q1 3.5-V to 36-V, 2.5-A Step-down voltage converter with spread spectrum

1 Features

- AEC-Q100-Qualified for automotive applications
 - Device temperature grade 1: -40°C to $+125^{\circ}\text{C}$, T_A
- Configured for rugged automotive applications
 - Input voltage range: 3.5 V to 36 V
 - Output voltage options: 3.3 V, 5 V, adjustable 1 V to 24 V
 - Output current options: 1.5 A, 2.5 A, 3.5 A
 - Peak-current-mode control
 - Short minimum on-time of 50 ns
 - Frequency options: 400 kHz, 2.1 MHz, adjustable 250 kHz to 2200 kHz
 - Low shutdown quiescent current of 3 μA
 - Low operating quiescent current of 25 μA
 - Junction temperature range -40°C to $+150^{\circ}\text{C}$

2 Applications

- Automotive infotainment: telematics control unit
- Automotive body: gateway
- Automotive ADAS: mirror replacement/CMS

3 Description

The LM636x5-Q1 regulators are a family of easy-to-use, synchronous, step-down DC/DC converters designed for rugged automotive applications. The LM636x5-Q1 drive up to 2.5-A of load current from an input of up to 36 V. The converter has high light load efficiency and output accuracy in a small solution size. Features such as a power-good flag and precision enable provide both flexible and easy-to-use solutions for a wide range of applications. Automatic frequency foldback at light load improves efficiency while maintaining tight load regulation. Integration eliminates many external components and provides a pinout designed for simple PCB layout. Protection features include thermal shutdown, input undervoltage lockout, cycle-by-cycle current limit, and hiccup short-circuit protection. The LM636x5-Q1 is available in a PowerPAD™ HTSSOP 16-pin power package.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LM636x5-Q1	HTSSOP (16)	5.00 mm x 4.40 mm

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

Simplified Schematic

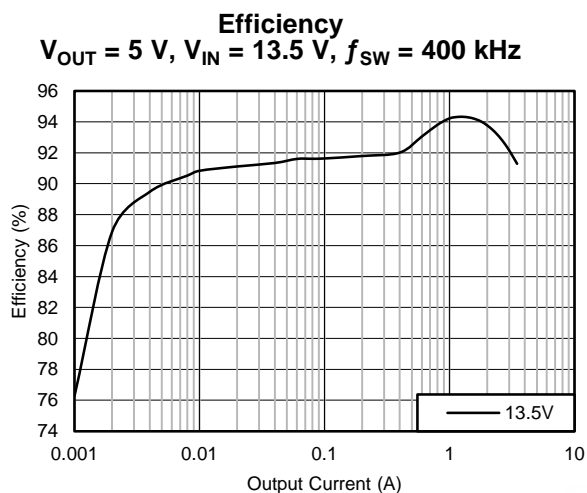
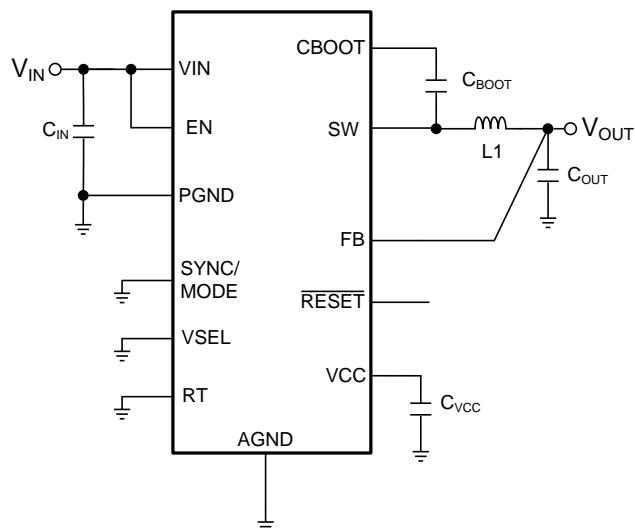


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4 Revision History

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

DATE	REVISION	NOTES
January 2019	*	Initial release

ADVANCE INFORMATION

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation see the following:

- [Thermal design by insight not hindsight](#)
- [A guide to board layout for best thermal resistance for exposed pad packages](#)
- [Semiconductor and IC package thermal metrics](#)
- [Thermal design made simple with LM43603 and LM43602](#)
- [SBVA025 Using new thermal metrics](#)
- [Layout guidelines for switching power supplies](#)
- [Simple switcher PCB layout guidelines](#)
- [Constructing your power supply-layout considerations](#)
- [Low radiated EMI layout made simple with LM4360x and LM4600x](#)

5.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* 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.

5.3 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

5.4 Trademarks

PowerPAD, E2E are trademarks of Texas Instruments.
All other trademarks are the property of their respective owners.

5.5 Electrostatic Discharge Caution



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.

5.6 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM63625DQPWPRQ1	PREVIEW	HTSSOP	PWP	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 125	63625DQ	
PLM63615DQA0PWPRQ1	PREVIEW	HTSSOP	PWP	16	2000	TBD	Call TI	Call TI	-40 to 125		
PLM63625DQA0PWPRQ1	ACTIVE	HTSSOP	PWP	16	2000	TBD	Call TI	Call TI	-40 to 125		Samples
PLM63635DQA0PWPRQ1	PREVIEW	HTSSOP	PWP	16	2000	TBD	Call TI	Call TI	-40 to 125		

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

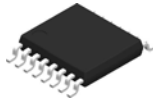
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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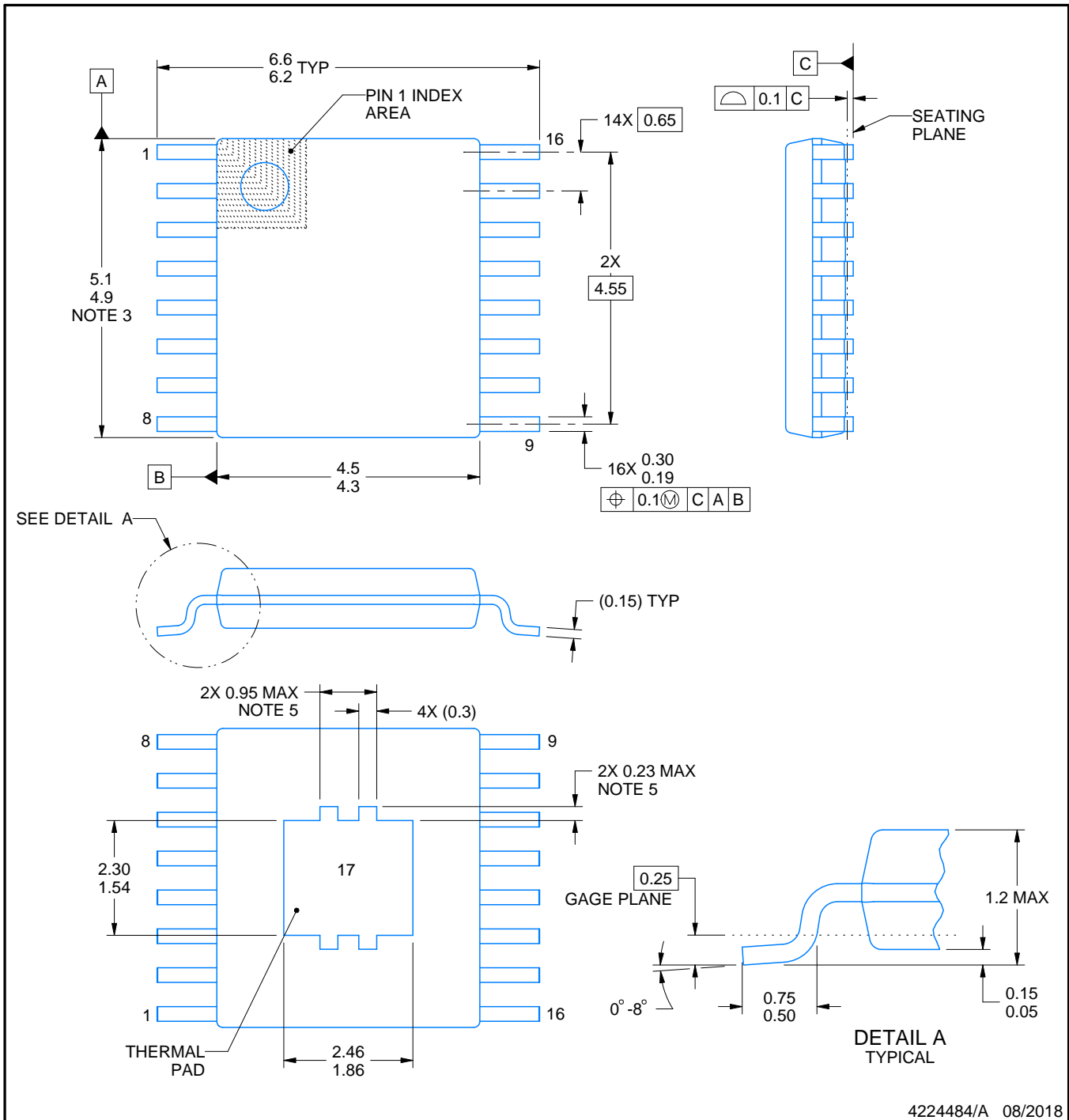
PWP0016K



PACKAGE OUTLINE

PowerPAD™ TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4224484/A 08/2018

NOTES:

PowerPAD is a trademark of Texas Instruments.

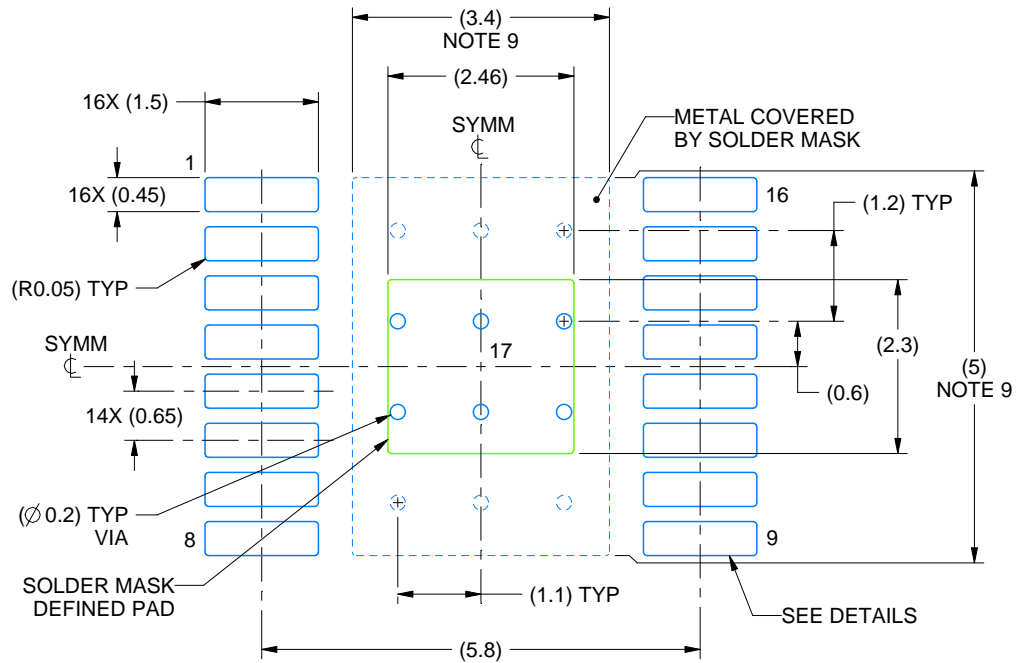
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-153.
5. Features may differ or may not be present.

EXAMPLE BOARD LAYOUT

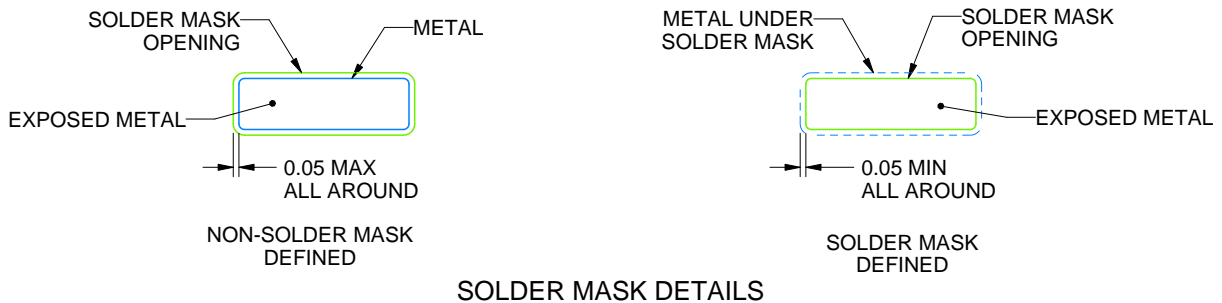
PWP0016K

PowerPAD™ TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

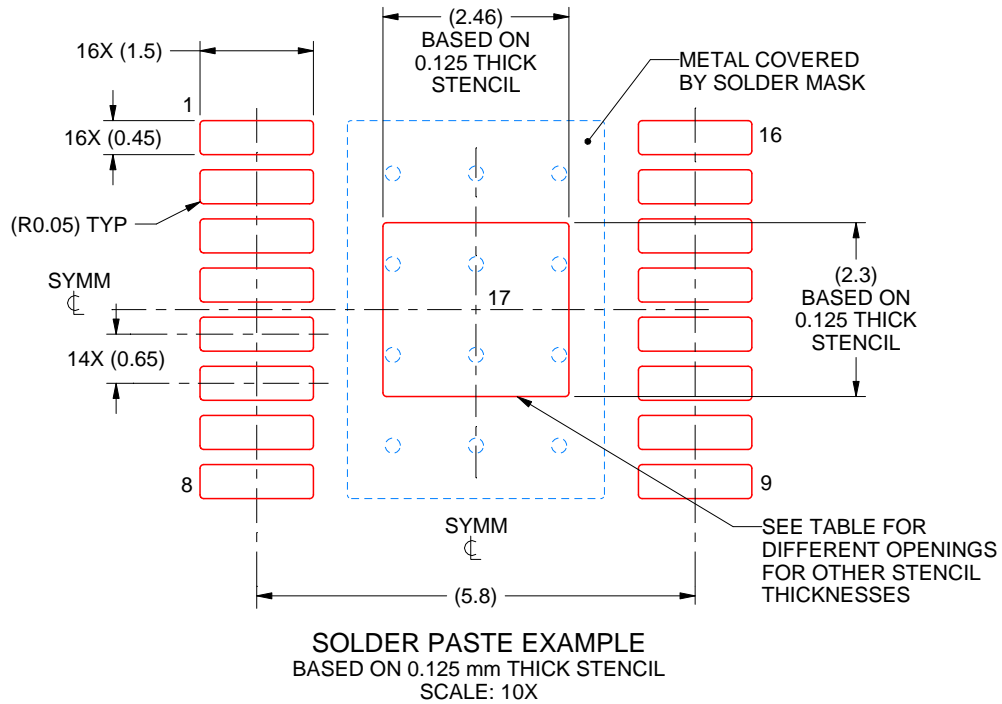
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature numbers SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Size of metal pad may vary due to creepage requirement.
10. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

PWP0016K

PowerPAD™ TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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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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