



TLV8x3 3-Pin Voltage Supervisors with Active-Low, Open-Drain Reset

1 Features

- 3-Pin SOT23 Package
- Supply Current: 9 μ A (Typical)
- Precision Supply Voltage Monitor: 2.5 V, 3 V, 3.3 V, 5 V
- Power-On Reset Generator with Fixed Delay Time of 200 ms
- Pin-for-Pin Compatible with MAX803
- Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Open-Drain, $\overline{\text{RESET}}$ Output

2 Applications

- DSPs, Microcontrollers, and Microprocessors
- Portable and Battery-Powered Equipment
- Set-Top Boxes
- Servers
- Appliances
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- Automotive Systems

3 Description

The TLV8x3 family of supervisory circuits provides circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

The TLV803, TLV853, and TLV863 are functionally equivalent. The TLV853 and TLV863 provide an alternate pinout of the TLV803.

During power on, $\overline{\text{RESET}}$ asserts when the supply voltage (V_{DD}) exceeds 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} and keeps $\overline{\text{RESET}}$ active as long as V_{DD} remains below the threshold voltage V_{IT} . An internal timer delays the return of the output to the inactive state (high) to ensure proper system reset. The delay time ($t_{\text{d(typ)}} = 200 \text{ ms}$) starts after V_{DD} exceeds the threshold voltage, V_{IT} . When the supply voltage drops below the V_{IT} threshold voltage, the output is active (low) again. All the devices in this family have a fixed sense-threshold voltage (V_{IT}) set by an internal voltage divider.

The product spectrum is designed for supply voltages of 2.5 V, 3 V, 3.3 V, and 5 V. These devices are available in a 3-pin SOT-23 package. The TLV803 devices are characterized for operation over a temperature range of -40°C to $+125^{\circ}\text{C}$.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
TLV8x3	SOT-23 (3)	2.92 mm x 1.30 mm

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

Typical Application

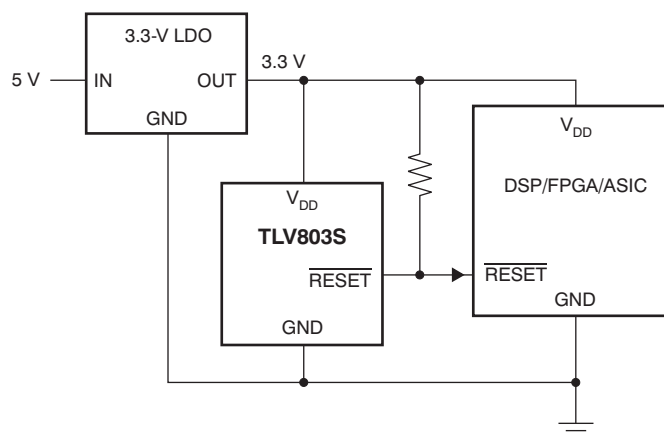


Table of Contents

1 Features	1	8.4 Device Functional Modes.....	8
2 Applications	1	9 Application and Implementation	9
3 Description	1	9.1 Application Information.....	9
4 Revision History	2	9.2 Typical Application	10
5 Device Comparison	3	10 Power Supply Recommendations	11
6 Pin Configuration and Functions	3	11 Layout	11
7 Specifications	4	11.1 Layout Guidelines	11
7.1 Absolute Maximum Ratings	4	11.2 Layout Example	11
7.2 ESD Ratings.....	4	12 Device and Documentation Support	12
7.3 Thermal Information	4	12.1 Device Support	12
7.4 Recommended Operating Conditions.....	4	12.2 Documentation Support	12
7.5 Electrical Characteristics.....	5	12.3 Related Links	12
7.6 Switching Characteristics	5	12.4 Community Resources.....	12
7.7 Typical Characteristics	6	12.5 Trademarks	13
8 Detailed Description	7	12.6 Electrostatic Discharge Caution.....	13
8.1 Overview	7	12.7 Glossary	13
8.2 Functional Block Diagram	7	13 Mechanical, Packaging, and Orderable Information	13
8.3 Feature Description.....	7		

4 Revision History

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

Changes from Revision B (August 2011) to Revision C	Page
• Added TLV853 device to data sheet	1
• Changed device part numbers shown on page header to show single TLV803 device instead of lettered-device versions	1
• Added <i>Device Information</i> and <i>ESD Ratings</i> tables.....	1
• Added <i>Detailed Description</i> , <i>Application and Implementation</i> , <i>Power-Supply Recommendations</i> , <i>Layout</i> , <i>Device and Documentation Support</i> , and <i>Mechanical, Packaging, and Orderable Information</i> sections	1
• Changed <i>Applications</i> section bullets	1
• Deleted pinouts from front page and moved to <i>Pin Configurations and Functions</i> section	1
• Deleted Package/Ordering Information table; for package and ordering information, see the package option addendum at the end of the data sheet.	3
• Changed all "free-air" to "junction" and all "T _A " to "T _J " for all temperature ranges throughout data sheet	4
• Changed "free-air temperature" to "junction temperature" in <i>Absolute Maximum Ratings</i> condition statement	4
• Deleted <i>Soldering temperature</i> from <i>Absolute Maximum Ratings</i> table	4
• Changed <i>Thermal Information</i> table; updated thermal resistance values for all parameters	4
• Changed "free-air temperature" to "junction temperature" in <i>Electrical Characteristics</i> condition statement	5
• Changed temperature noted in <i>Switching Characteristics</i> condition statement	5

Changes from Revision A (June 2011) to Revision B	Page
• Added new paragraph regarding TLV863 to <i>Description</i> section.....	1
• Added TLV863 pinout to front page	1
• Added TLV863M to Package/Ordering Information.....	3
• Added TLV863 to Thermal Information	4
• Added TLV863M to Negative-Going Input Threshold Voltage parameter.....	5
• Added TLV863M to Hysteresis parameter	5
• Added TLV863 to Functional Block Diagram	7

5 Device Comparison

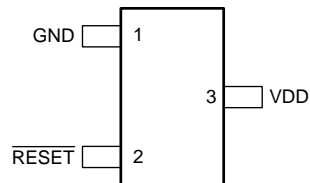
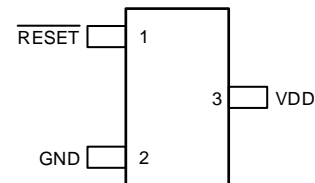
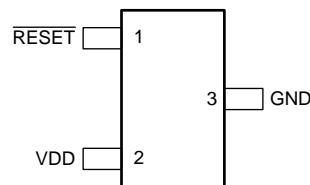
Table 1. Device Threshold Options

DEVICE	THRESHOLD VOLTAGE
TLV803Z	2.25 V
TLV803R	2.64 V
TLV803S	2.93 V
TLV803M	4.38 V
TLV853M	4.38 V
TLV863M	4.38 V

Table 2. Device Family Comparison

DEVICE	FUNCTION
TLV803	Open-Drain, $\overline{\text{RESET}}$ Output
TLV809	Push-Pull, $\overline{\text{RESET}}$ Output
TLV810	Push-Pull, RESET Output

6 Pin Configuration and Functions

**TLV803: DBZ Package
3-Pin SOT-23
Top View**

**TLV853: DBZ Package
3-Pin SOT-23
Top View**

**TLV863: DBZ Package
3-Pin SOT-23
Top View**


Pin Functions

NAME	PIN			I/O	DESCRIPTION
	TLV803	TLV853	TLV863		
GND	1	2	3	—	Ground pin.
$\overline{\text{RESET}}$	2	1	1	O	$\overline{\text{RESET}}$ is an open-drain output that is driven to a low impedance state when $\overline{\text{RESET}}$ is asserted. $\overline{\text{RESET}}$ remains low (asserted) for the delay time (t_d) after V_{DD} exceeds V_{IT-} . Use a 10-k Ω to 1-M Ω pullup resistor on this pin. The pullup voltage is not limited by V_{DD} .
VDD	3	3	2	I	Supply voltage pin. It is good analog design practice to place a 0.1- μF ceramic capacitor close to this pin.

7 Specifications

7.1 Absolute Maximum Ratings⁽¹⁾

over operating junction temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Voltage	VDD ⁽²⁾	0	7	V
	All other pins ⁽²⁾	−0.3	+7	
Current	Maximum low output current, I _{OL}		5	mA
	Maximum high output current, I _{OH}		−5	
	Input clamp current, I _{IK} (V _I < 0 or V _I > V _{DD})		±20	
	Output clamp current, I _{OK} (V _O < 0 or V _O > V _{DD})		±20	
Temperature	Operating junction temperature range, T _J	−40	125	°C
	Storage temperature range, T _{stg}	−65	150	

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values are with respect to GND. For reliable operation the device should not be operated at 7 V for more than t = 1000h continuously

7.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	±500	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Thermal Information

THERMAL METRIC ⁽¹⁾		TLV8x3	UNITS
		DBZ (SOT-23)	
		3 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	328.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	135.4	°C/W
R _{θJB}	Junction-to-board thermal resistance	58.3	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	5.2	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	59.6	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	N/A	°C/W

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

7.4 Recommended Operating Conditions

at specified temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V _{DD}	Supply voltage	1.1	6	V
T _J	Operating junction temperature	−40	125	°C

7.5 Electrical Characteristics

over recommended operating junction temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V _{OL}	Low-level output voltage	V _{DD} = 2 V to 6 V, I _{OL} = 500 μA			0.2	V	
		V _{DD} = 3.3 V, I _{OL} = 2 mA			0.4		
		V _{DD} = 6 V, I _{OL} = 4 mA			0.4		
Power-up reset voltage ⁽¹⁾		I _{OL} = 50 μA, V _{OL} < 0.2 V	1.1			V	
V _{IT-}	Negative-going input threshold voltage ⁽²⁾	T _J = − 40°C to +125°C	TLV803Z	2.20	2.25	2.30	V
			TLV803R	2.58	2.64	2.70	
			TLV803S	2.87	2.93	2.99	
			TLV8x3M	4.28	4.38	4.48	
V _{hys}	Hysteresis	T _J = 25°C, I _{OL} = 50 μA	TLV803Z		30		mV
			TLV803R		35		
			TLV803S		40		
			TLV8x3M		60		
I _{DD}	Supply current	V _{DD} = 2 V, output unconnected		9	15	μA	
		V _{DD} = 6 V, output unconnected		20	30		
I _{OH}	Output leakage current	V _{DD} = 6 V			100	nA	

(1) The lowest supply voltage at which $\overline{\text{RESET}}$ becomes valid. $t_{r,VDD} \leq 66.7$ V/ms.

(2) To ensure best stability of the threshold voltage, place a bypass capacitor (0.1-µF ceramic) near the supply terminals.

7.6 Switching Characteristics

over operating temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _w	Pulse duration at V _{DD}	V _{DD} = 1.08 V _{IT-} to 0.92 V _{IT-}		1		μs
t _d	Delay time	V _{DD} ≥ V _{IT-} + 0.2 V; see Timing Diagram	120	200	280	ms

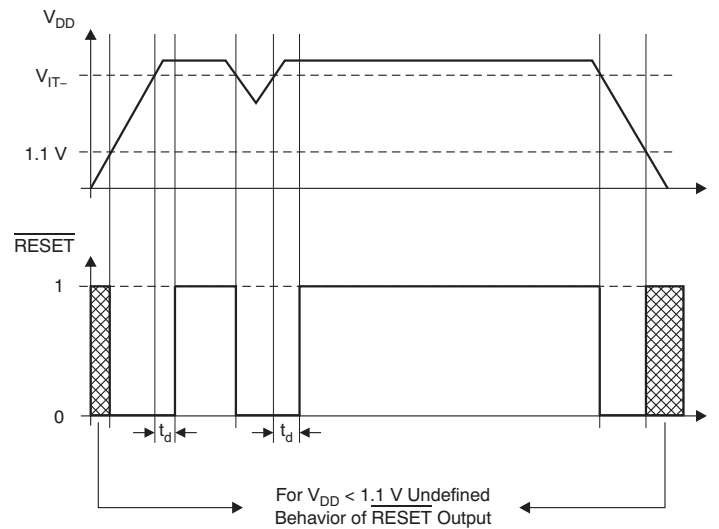


Figure 1. Timing Diagram

7.7 Typical Characteristics

at $T_J = 25^\circ\text{C}$, $V_{IT-} = 4.38\text{ V}$, and $V_{DD} = 5.0\text{ V}$ (unless otherwise noted)

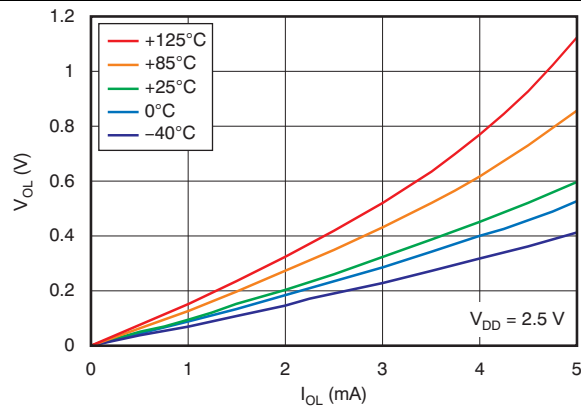


Figure 2. Low-Level Output Voltage vs Low-Level Output Current

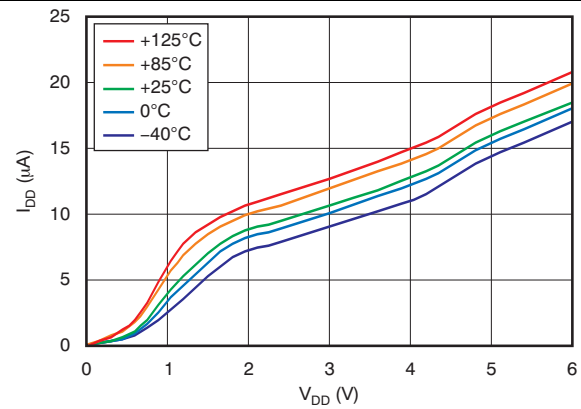


Figure 3. Supply Current vs Supply Voltage

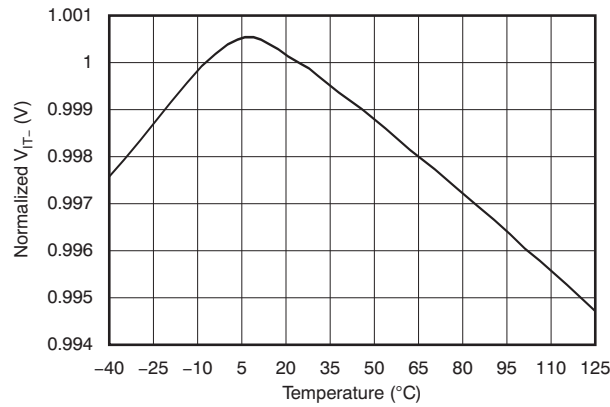


Figure 4. Normalized to 25°C Negative-Going Input Threshold Voltage vs Temperature

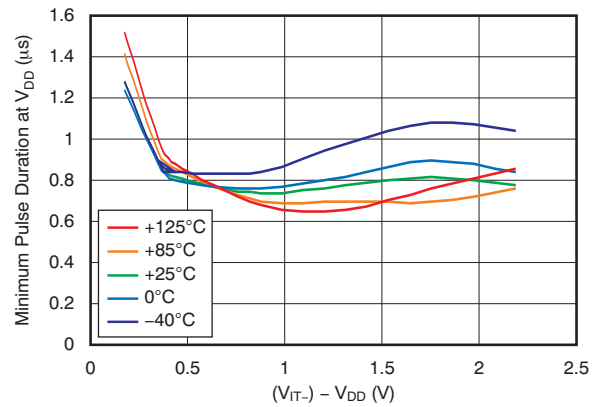


Figure 5. Minimum Pulse Duration At V_{DD} vs Overdrive Voltage

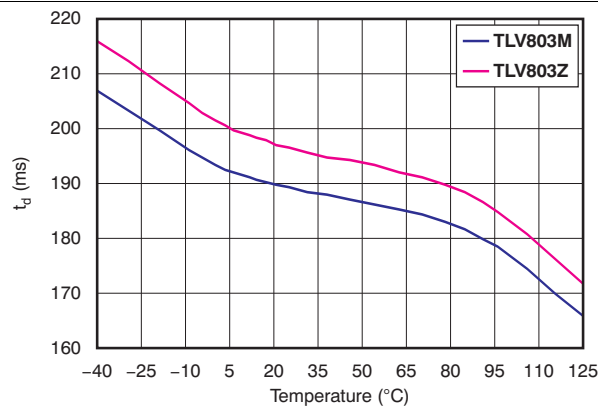


Figure 6. Delay Time vs Temperature

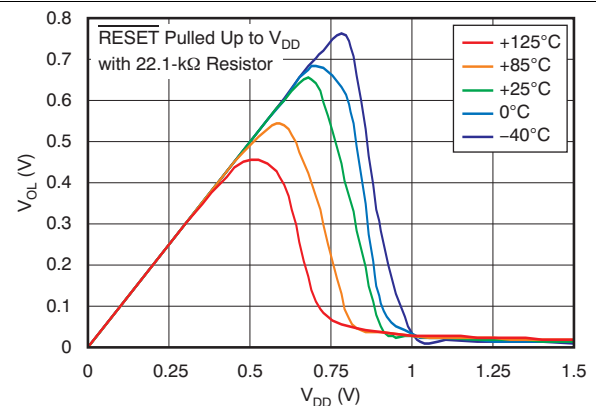


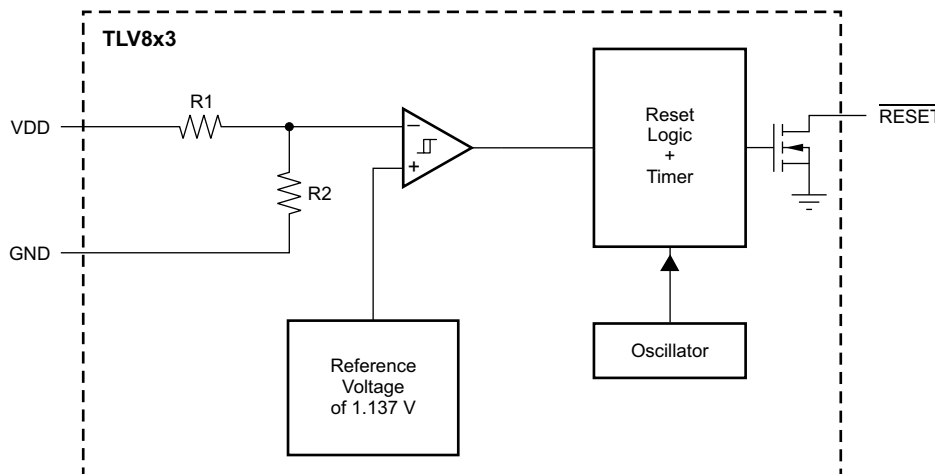
Figure 7. Power-Up Low-Level Output Voltage vs Supply Voltage

8 Detailed Description

8.1 Overview

The TLV803 family of supervisory circuits provides circuit initialization and timing supervision. The TLV853 and TLV863 are both functionally equivalent to the TLV803. These devices output a logic low whenever V_{DD} drops below the negative-going threshold voltage (V_{IT-}). The output, \overline{RESET} , remains low for approximately 200 ms after the V_{DD} voltage exceeds the positive-going threshold voltage ($V_{IT-} + V_{hys}$). These devices are designed to ignore fast transients on the V_{DD} pin.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 V_{DD} Transient Rejection

The TLV803 has built-in rejection of fast transients on the V_{DD} pin. The rejection of transients depends on both the duration and the amplitude of the transient. The amplitude of the transient is measured from the bottom of the transient to the negative threshold voltage of the TLV803, as shown in Figure 8.

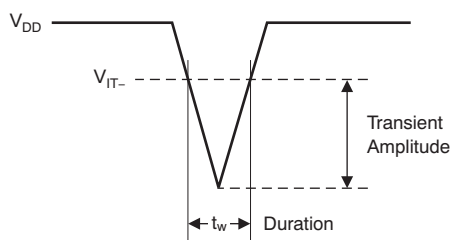


Figure 8. Voltage Transient Measurement

The TLV803 does not respond to transients that are fast duration/low amplitude or long duration/small amplitude. Figure 5 shows the relationship between the transient amplitude and duration needed to trigger a reset. Any combination of duration and amplitude above the curve generates a reset signal.

Feature Description (continued)

8.3.2 Reset During Power Up and Power Down

The TLV803 output is valid when V_{DD} is greater than 1.1 V. When V_{DD} is less than 1.1 V, the output transistor turns off and becomes high impedance. The voltage on the $\overline{\text{RESET}}$ pin rises to the voltage level connected to the pull-up resistor. Figure 9 shows a typical waveform for power-up, assuming the $\overline{\text{RESET}}$ pin has a pull-up resistor connected to the V_{DD} pin.

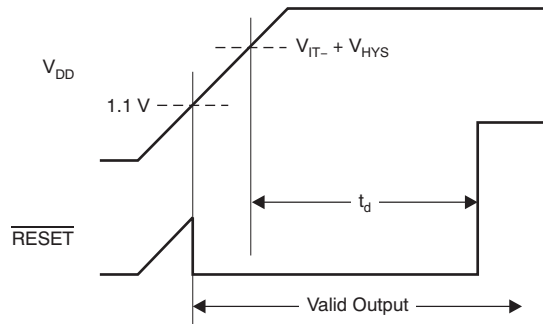


Figure 9. Power-Up Response

8.3.3 Bidirectional Reset Pins

Some microcontrollers have bidirectional reset pins that act as both inputs and outputs. In a situation where the TLV803 is pulling the $\overline{\text{RESET}}$ line low while the microcontroller is trying to force the $\overline{\text{RESET}}$ line high, a series resistor should be placed between the output of the TLV803 and the $\overline{\text{RESET}}$ pin of the microcontroller to protect against excessive current flow. Figure 10 shows the connection of the TLV803 to a microcontroller using a series resistor to drive a bidirectional $\overline{\text{RESET}}$ line.

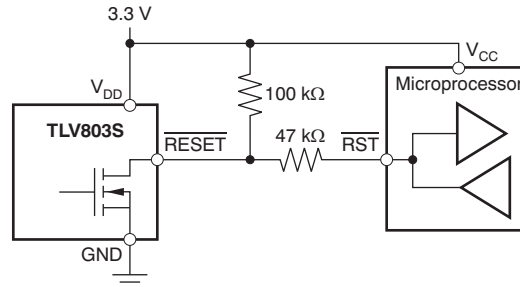


Figure 10. Connection To Bidirectional Reset Pin

8.4 Device Functional Modes

8.4.1 Normal Operation ($V_{DD} > \text{Power-Up Reset Voltage}$)

When the voltage on V_{DD} is greater than 1.1 V, the $\overline{\text{RESET}}$ signal asserts when V_{DD} is less than V_{IT-} and deasserts when V_{DD} is greater than V_{IT-} .

8.4.2 Power On Reset ($V_{DD} < \text{Power-Up Reset Voltage}$)

When the voltage on V_{DD} is lower than the required voltage to internally pull the asserted output to GND (power-up reset voltage), both outputs are in a high-impedance state.

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

9.1.1 Monitoring Multiple Supplies

Because the TLV803 has an open-drain output, multiple TLV803 outputs can be directly tied together to form a logical OR-ing function for the RESET line. Only one pull-up resistor is required for this configuration. Figure 11 shows two TLV803s connected together to provide monitoring of a 3.3-V power rail and a 5.0-V power rail. A reset is generated if either power rail falls below the threshold voltage of its corresponding TLV803.

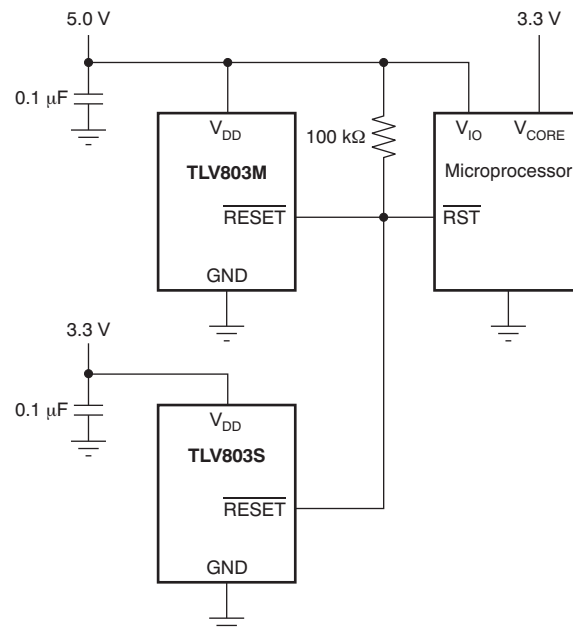


Figure 11. Multiple Voltage Rail Monitoring

9.1.2 Output Level Shifting

The $\overline{\text{RESET}}$ output of the TLV803 can be pulled to a maximum voltage of 6 V and can be pulled higher in voltage than V_{DD} . It is useful to provide level shifting of the output for cases where the monitored voltage is less than the useful logic levels of the load. Figure 12 shows the TLV803Z used to monitor a 2.5-V power rail, with a logic RESET input to a microprocessor that is connected to 5.0 V and has 5.0-V logic levels.

Application Information (continued)

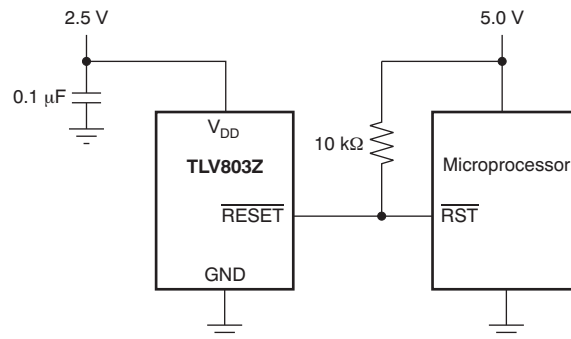


Figure 12. Output Voltage Level Shifting

9.2 Typical Application

Figure 13 shows TLV803S being used to monitor the supply rail for a DSP, FPGA, or ASIC.

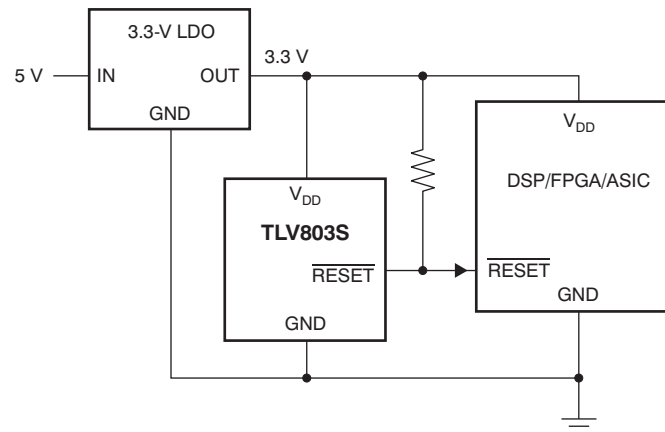


Figure 13. Typical Application

9.2.1 Design Requirements

This design calls for a 3.3-V rail to be monitored. The design resets if the supply rail falls below 2.93 V. The output must satisfy 3.3-V CMOS logic.

9.2.2 Detailed Design Procedure

Select the TLV803S to satisfy the voltage threshold requirement.

Place a pullup resistor on $\overline{\text{RESET}}$ to VDD in order to satisfy the output logic requirement.

Typical Application (continued)

9.2.3 Application Curves

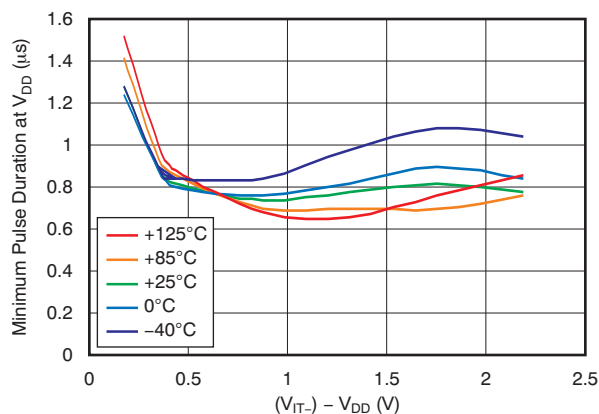


Figure 14. Minimum Pulse Duration At V_{DD} vs Overdrive Threshold Voltage vs Temperature Voltage

10 Power Supply Recommendations

These devices are designed to operate from an input voltage supply range between 1.1 V and 6 V.

11 Layout

11.1 Layout Guidelines

Place the C_{IN} decoupling capacitor close to the device.

11.2 Layout Example

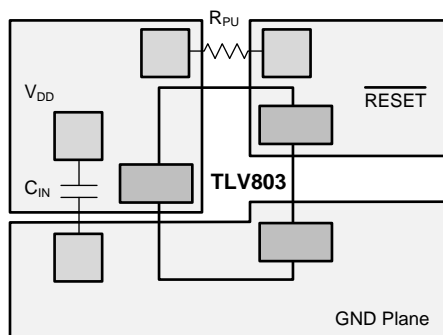


Figure 15. Layout Example (DBZ Package)

12 Device and Documentation Support

12.1 Device Support

12.1.1 Development Support

12.1.1.1 Evaluation Modules

An evaluation module (EVM) is available to assist in the initial circuit performance evaluation using the TLV803. The [TLV803SEVM-019 evaluation module](#) (and [related user guide](#)) can be requested at the Texas Instruments website through the product folders or purchased directly [from the TI eStore](#).

12.1.1.2 Spice Models

Computer simulation of circuit performance using SPICE is often useful when analyzing the performance of analog circuits and systems. SPICE models for the TLV803, TLV853, and TLV863 are available through the respective device product folders under *Tools & Software*.

12.2 Documentation Support

12.2.1 Related Documentation

- TLV803SEVM-019 User's Guide. Literature number [SLVU461](#).

12.3 Related Links

[Table 3](#) lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 3. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
TLV803	Click here	Click here	Click here	Click here	Click here
TLV853	Click here	Click here	Click here	Click here	Click here
TLV863	Click here	Click here	Click here	Click here	Click here

12.4 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.

12.5 Trademarks

E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

12.6 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.

12.7 Glossary

[SLYZ022](#) — *TI Glossary*.

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

13 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
TLV853MDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	ZGM4	Samples
TLV853MDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	ZGM4	Samples

(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) 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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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
TLV853MDBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV853MDBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS

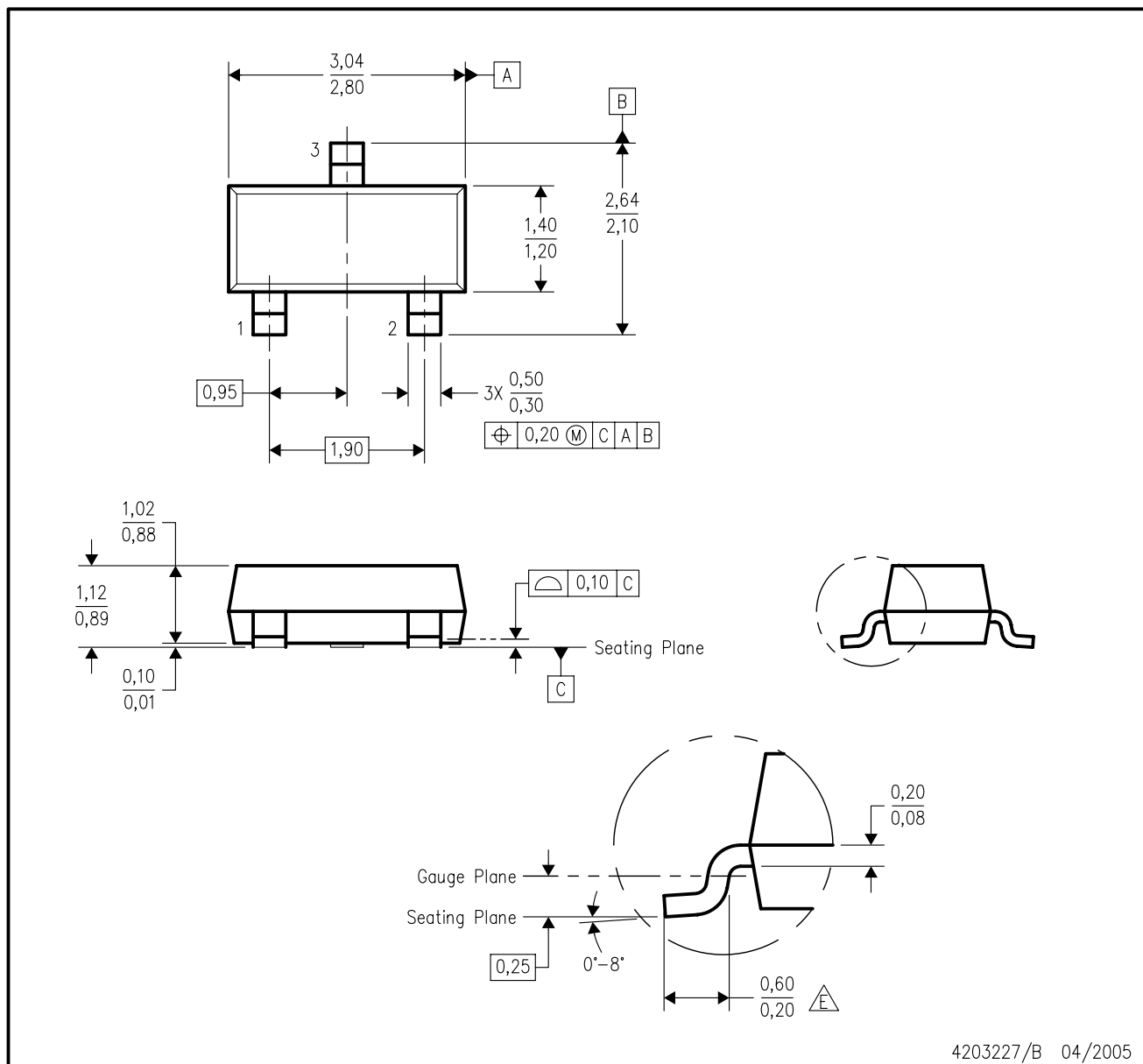


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV853MDBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TLV853MDBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0

DBZ (R-PDSO-G3)

PLASTIC SMALL-OUTLINE



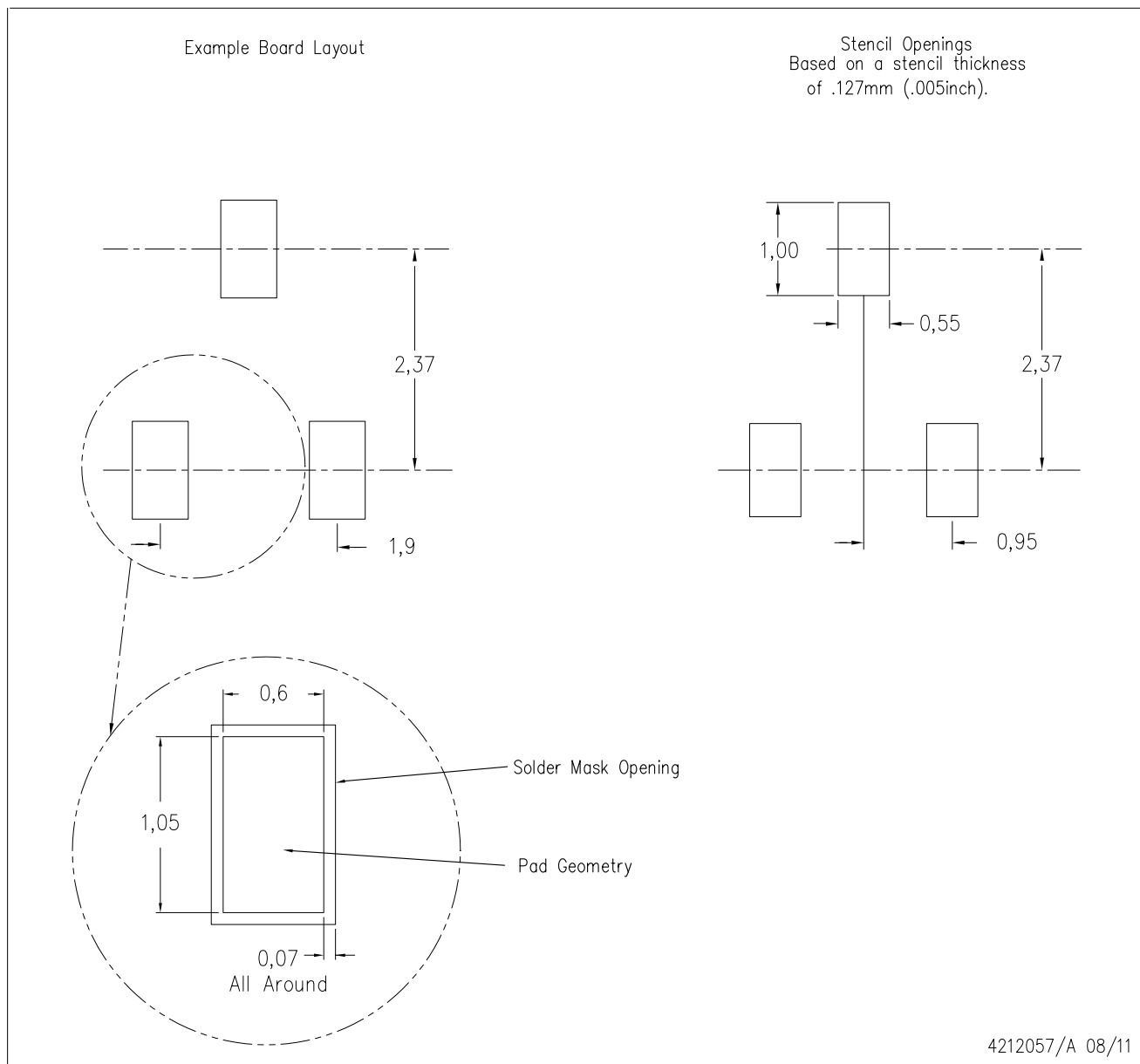
4203227/B 04/2005

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.
- C. Lead dimensions are inclusive of plating.
- D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed 0.25 per side.
- E. Falls within JEDEC TO-236 variation AB, except minimum foot length.

DBZ (R-PDSO-G3)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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