

VOLTAGE DETECTORS

FEATURES

- Qualified for Automotive Applications
- Single Voltage Detector (TPS3803):
Adjustable/1.5 V
- Dual Voltage Detector (TPS3805):
Adjustable/3.3 V
- High $\pm 1.5\%$ Threshold Voltage Accuracy
- Supply Current: 3 μA Typical at $V_{\text{DD}} = 3.3 \text{ V}$
- Push/Pull Reset Output (TPS3805),
Open-Drain Reset Output (TPS3803)
- Temperature Range: -40°C to 125°C
- 5-Pin SC-70 Package

DESCRIPTION

The TPS3803 and TPS3805 families of supervisory circuits provide circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

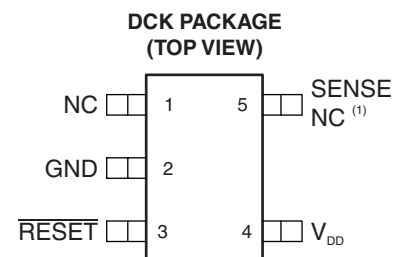
The TPS3803G15 device has a fixed-sense threshold voltage V_{IT} set by an internal voltage divider, whereas the TPS3803-01 has an adjustable SENSE input that can be configured by two external resistors. In addition to the fixed sense threshold monitored at V_{DD} , the TPS3805 devices provide a second adjustable SENSE input. $\overline{\text{RESET}}$ is asserted in case either of the two voltages drops below V_{IT} .

During power on, $\overline{\text{RESET}}$ is asserted when supply voltage V_{DD} becomes higher than 0.8 V. Thereafter, the supervisory circuit monitors V_{DD} (and/or SENSE) and keeps $\overline{\text{RESET}}$ active as long as V_{DD} or SENSE remains below the threshold voltage V_{IT} . As soon as V_{DD} (SENSE) rises above the threshold voltage V_{IT} , $\overline{\text{RESET}}$ is deasserted again. The product spectrum is designed for 1.5 V, 3.3 V, and adjustable supply voltages.

The devices are available in a 5-pin SC-70 package. The TPS3803 and TPS3805 devices are characterized for operation over a temperature range of -40°C to 125°C .

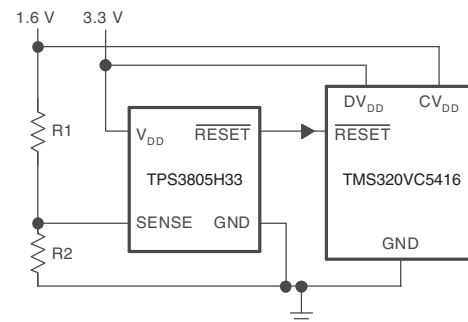
APPLICATIONS

- Applications Using DSPs, Microcontrollers, or Microprocessors
- Wireless Communication Systems
- Portable/Battery-Powered Equipment
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- Notebook/Desktop Computers
- Automotive Systems



NC – No connection

(1) SENSE on TPS3803-01, TPS3805H33
NC on TPS3803G15



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



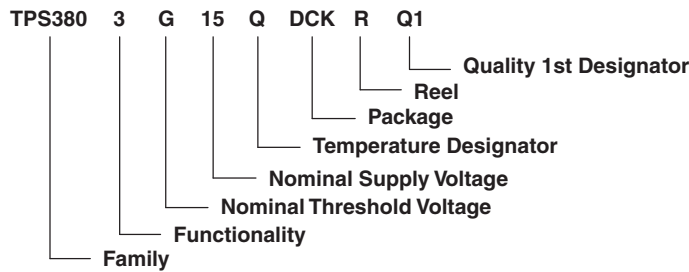
This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

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.

ORDERING INFORMATION⁽¹⁾

| T _A | THRESHOLD VOLTAGE | | PACKAGE ⁽²⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------------|---------|------------------------|--------------|-----------------------|------------------|
| | V _{DD} | SENSE | | | | |
| –40°C to 125°C | NA | 1.226 V | SC-70 – DCK | Reel of 3000 | TPS3803-01QDCKRQ1 | AWJ |
| | 1.4 V | NA | | | TPS3803G15QDCKRQ1 | AXU |
| | 3.05 V | 1.226 V | | | TPS3805H33QDCKRQ1 | AWZ |

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
- (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.



FUNCTION/TRUTH TABLE

| TPS3803-01 | |
|-------------------------|-------|
| SENSE > V _{IT} | RESET |
| 0 | L |
| 1 | H |

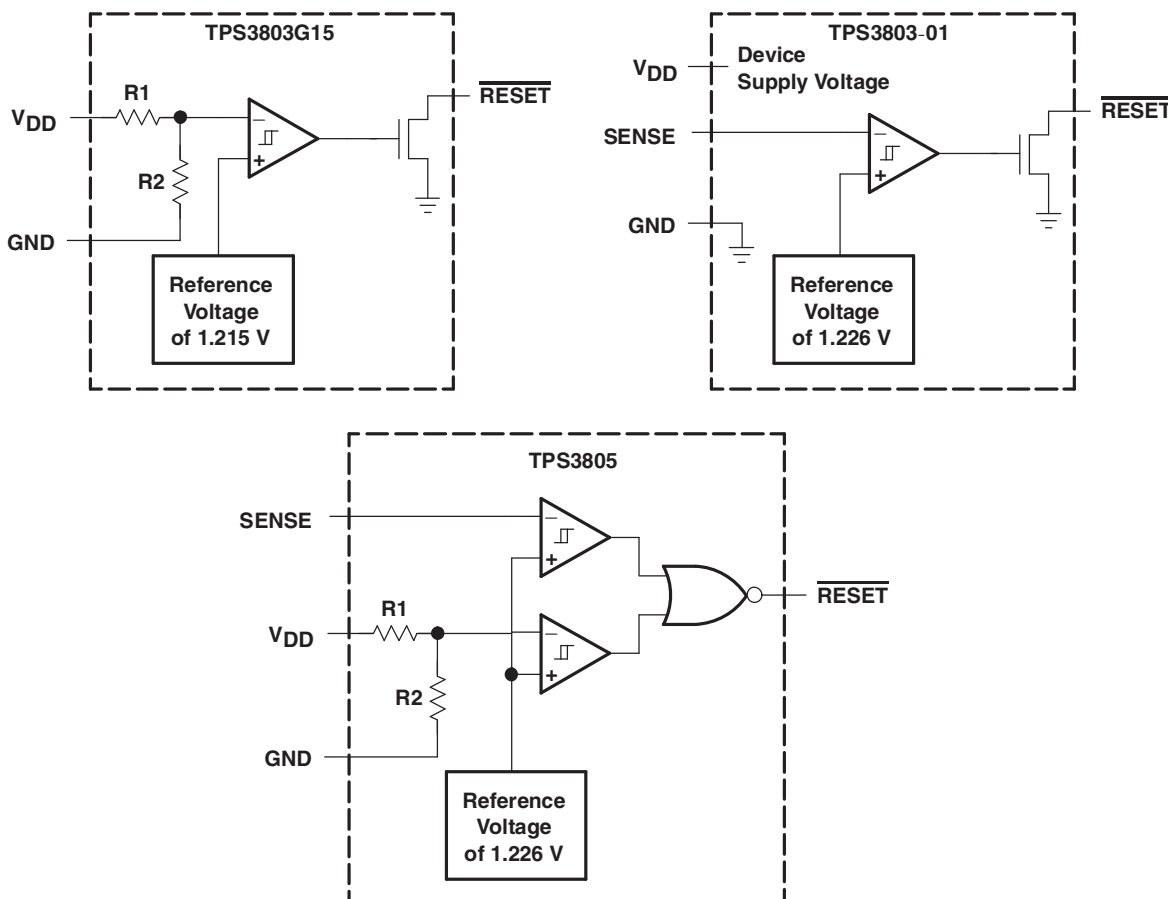
FUNCTION/TRUTH TABLE

| TPS3803G15 | |
|-----------------------------------|-------|
| V _{DD} > V _{IT} | RESET |
| 0 | L |
| 1 | H |

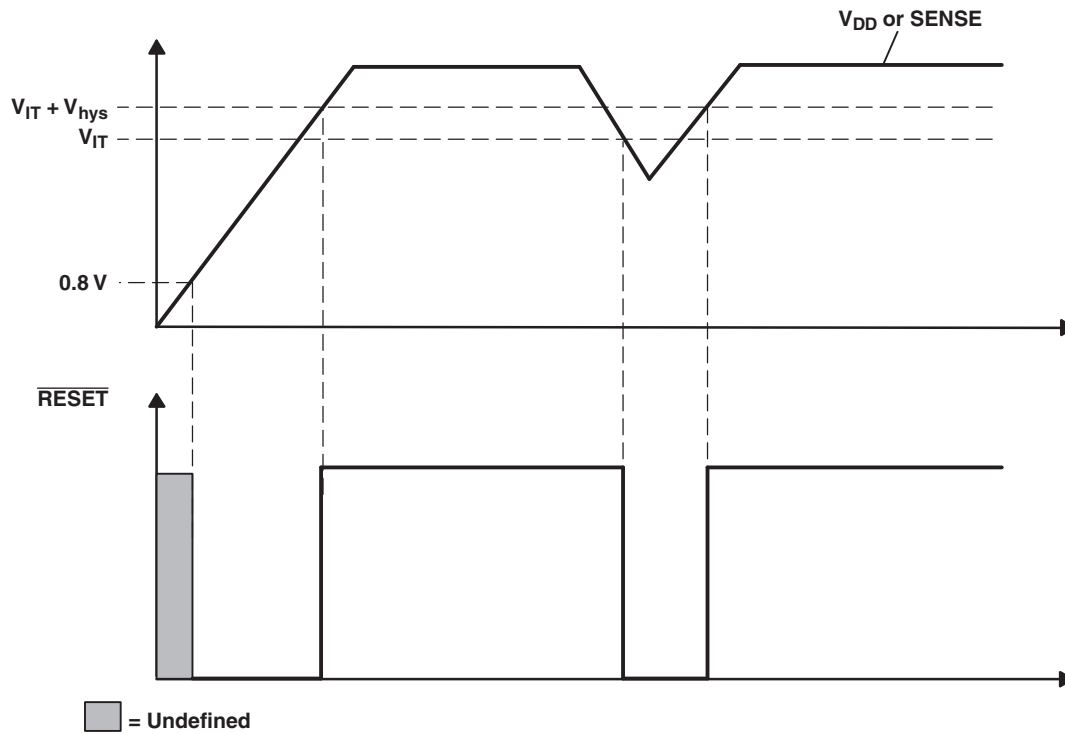
FUNCTION/TRUTH TABLE

| TPS3805H33 | | |
|-----------------------------------|-------------------------|-------|
| V _{DD} > V _{IT} | SENSE > V _{IT} | RESET |
| 0 | 0 | L |
| 0 | 1 | L |
| 1 | 0 | L |
| 1 | 1 | H |

FUNCTIONAL BLOCK DIAGRAM



TIMING REQUIREMENTS



TERMINAL FUNCTIONS

| TERMINAL | | I/O | DESCRIPTION |
|---------------------------|-----|-----|--|
| NAME | NO. | | |
| GND | 2 | I | Ground |
| $\overline{\text{RESET}}$ | 3 | O | Active-low reset output (TPS3803: open drain, TPS3805: push/pull) |
| SENSE | 5 | I | Adjustable sense input |
| NC | 1 | | No internal connection |
| NC (TPS3803G15) | 5 | | No internal connection |
| V_{DD} | 4 | I | Input supply voltage, fixed sense input for TPS3803G15 and TPS3805 |

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

over operating free-air temperature range (unless otherwise noted)

| | | VALUE | |
|---------------------|--|--|--------|
| V _{DD} | Supply voltage ⁽²⁾ | 7 V | |
| | Voltage applied to all other pins ⁽²⁾ | –0.3 V to 7 V | |
| I _{OL} | Maximum low-level output current | 5 mA | |
| I _{OH} | Maximum high-level output current | –5 mA | |
| I _{IK} | Input clamp current | V _I < 0 or V _I > V _{DD} | ±10 mA |
| I _{OK} | Output clamp current | V _O < 0 or V _O > V _{DD} | ±10 mA |
| P _D | Continuous total power dissipation | See Dissipation Rating Table | |
| T _A | Operating free-air temperature range | –40°C to 125°C | |
| T _{stg} | Storage temperature range | –65°C to 150°C | |
| T _{solder} | Soldering temperature | 260°C | |

- (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 continuously operated at 7 V for more than t = 1000 h.

DISSIPATION RATINGS

| PACKAGE | POWER RATING T _A < 25°C | DERATING FACTOR ABOVE T _A = 25°C | POWER RATING T _A = 70°C | POWER RATING T _A = 85°C |
|---------|---------------------------------------|--|---------------------------------------|---------------------------------------|
| DCK | 321 mW | 2.6 mW/°C | 206 mW | 167 mW |

RECOMMENDED OPERATING CONDITIONS

| | | MIN | MAX | UNIT |
|-----------------|--------------------------------|-----|-----------------------|------|
| V _{DD} | Supply voltage | 1.3 | 6 | V |
| V _I | Input voltage | 0 | V _{DD} + 0.3 | V |
| T _A | Operating free-air temperature | –40 | 125 | °C |

ELECTRICAL CHARACTERISTICS

over operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|---------------------------------------|---|--|--|-------|-------|------|----|
| V _{OH} | High-level output voltage (TPS3805 only) | V _{DD} = 1.5 V, I _{OH} = –0.5 mA | 0.8 × V _{DD} | | | V | |
| | | V _{DD} = 3.3 V, I _{OH} = –1 mA | | | | | |
| | | V _{DD} = 6 V, I _{OH} = –1.5 mA | | | | | |
| V _{OL} | Low-level output voltage | V _{DD} = 1.5 V, I _{OL} = 1 mA | | | 0.3 | V | |
| | | V _{DD} = 3.3 V, I _{OL} = 2 mA | | | | | |
| | | V _{DD} = 6 V, I _{OL} = 3 mA | | | | | |
| Power-up reset voltage ⁽¹⁾ | | V _{IT} > 1.5 V, T _A = 25°C | 0.8 | | | V | |
| | | V _{IT} ≤ 1.5 V, T _A = 25°C | 1 | | | | |
| V _{IT} | Negative-going input threshold voltage ⁽²⁾ | SENSE | 1.2 | 1.226 | 1.244 | V | |
| | | TPS3803G15 | 1.379 | 1.4 | 1.421 | | |
| | | TPS3805H33 | 3.004 | 3.05 | 3.096 | | |
| V _{hys} | Hysteresis | 1.2 V < V _{IT} < 2.5 V | 15 | | mV | | |
| | | 2.5 V < V _{IT} < 3.5 V | 30 | | | | |
| I _I | Input current | SENSE | –25 | | 25 | nA | |
| I _{OH} | High-level output current at RESET | Open drain only | V _{DD} = V _{IT} + 0.2 V, V _{OH} = V _{DD} | | 300 | nA | |
| I _{DD} | Supply current | TPS3803-01 | V _{DD} = 3.3 V, Output unconnected | | 2 | 4 | μA |
| | | TPS3805, TPS3803G15 | | | 3 | 5 | |
| | | TPS3803-01 | V _{DD} = 6 V, Output unconnected | | 2 | 4 | |
| | | TPS3805, TPS3803G15 | | | 4 | 6 | |
| C _I | Input capacitance | V _I = 0 V to V _{DD} | 1 | | pF | | |

(1) The lowest supply voltage at which RESET (V_{OL(max)} = 0.2 V, I_{OL} = 50 μA) becomes active. t_r(V_{DD}) ≥ 15 μs/V.

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

TIMING REQUIREMENTS

R_L = 1 MΩ, C_L = 50 pF, T_A = –40°C to 125°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | MAX | UNIT |
|----------------|----------------|---|-----|-----|------|
| t _w | Pulse duration | V _{DD} | 5.5 | | μs |
| | | SENSE | | | |
| | | V _{IH} = 1.05 × V _{IT} , V _{IL} = 0.95 × V _{IT} | | | |

SWITCHING CHARACTERISTICS

R_L = 1 MΩ, C_L = 50 pF, T_A = –40°C to 125°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--|---|-----|-----|-----|------|
| t _{PHL} | Propagation (delay) time, high-to-low-level output | V _{DD} to RESET delay | 5 | 100 | μs | |
| | | SENSE to RESET delay | | | | |
| t _{PLH} | Propagation (delay) time, low-to-high-level output | V _{DD} to RESET delay | 5 | 100 | μs | |
| | | SENSE to RESET delay | | | | |
| | | V _{IH} = 1.05 × V _{IT} , V _{IL} = 0.95 × V _{IT} | | | | |

TYPICAL CHARACTERISTICS

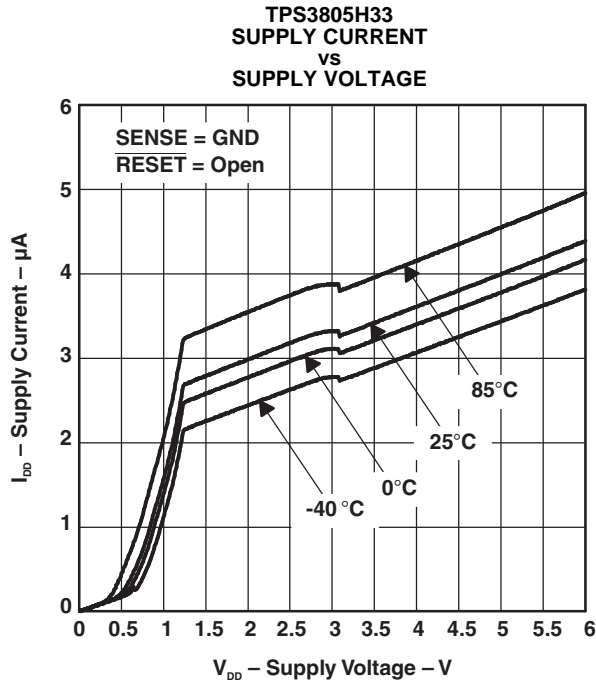


Figure 1.

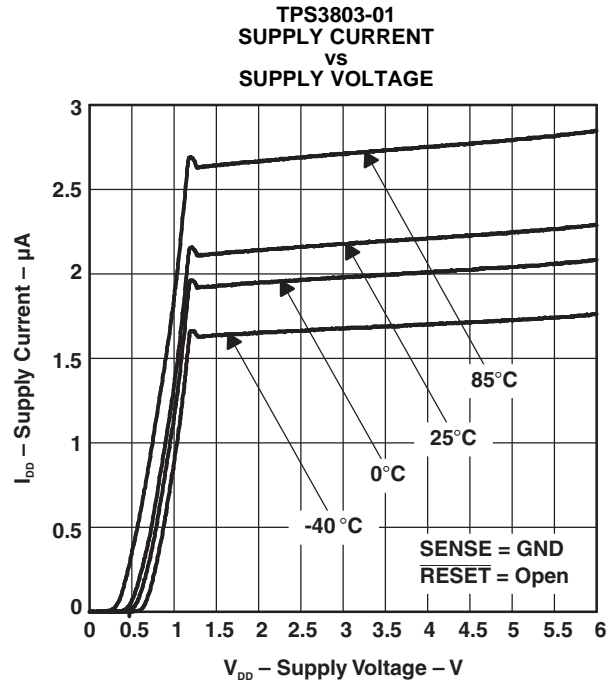


Figure 2.

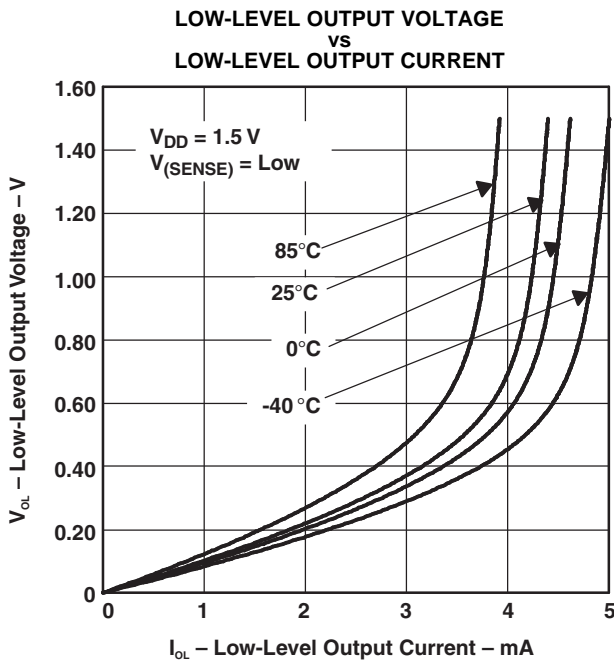


Figure 3.

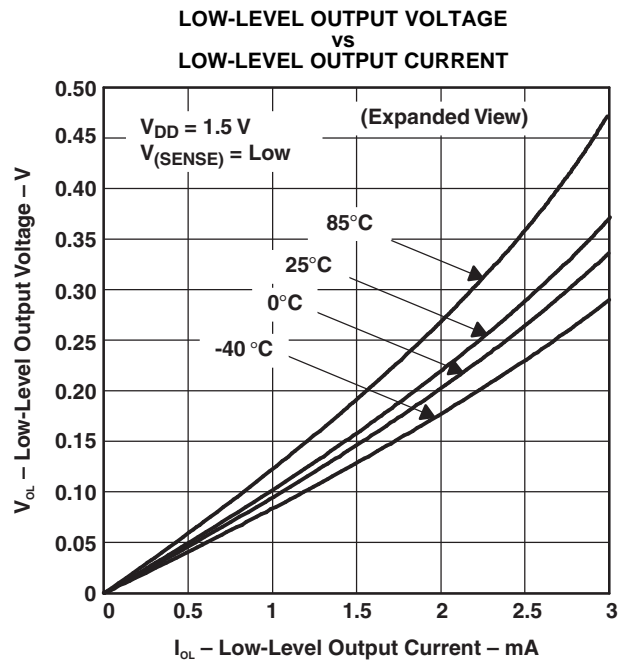


Figure 4.

TYPICAL CHARACTERISTICS (continued)

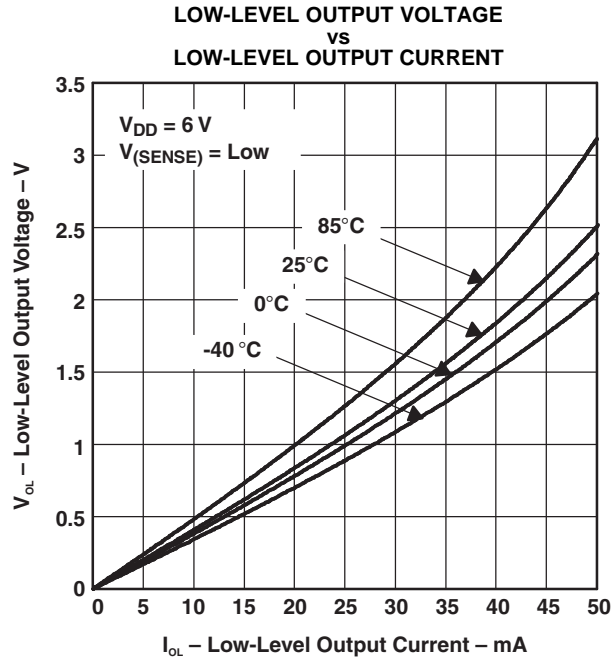


Figure 5.

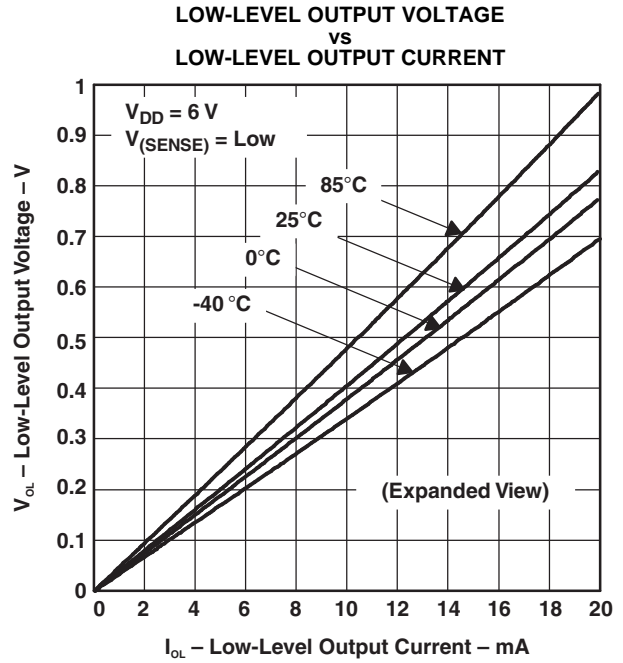


Figure 6.

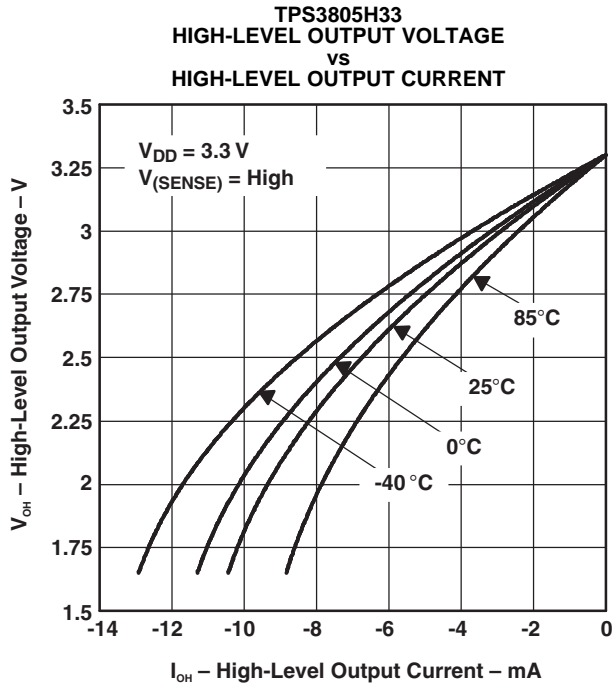


Figure 7.

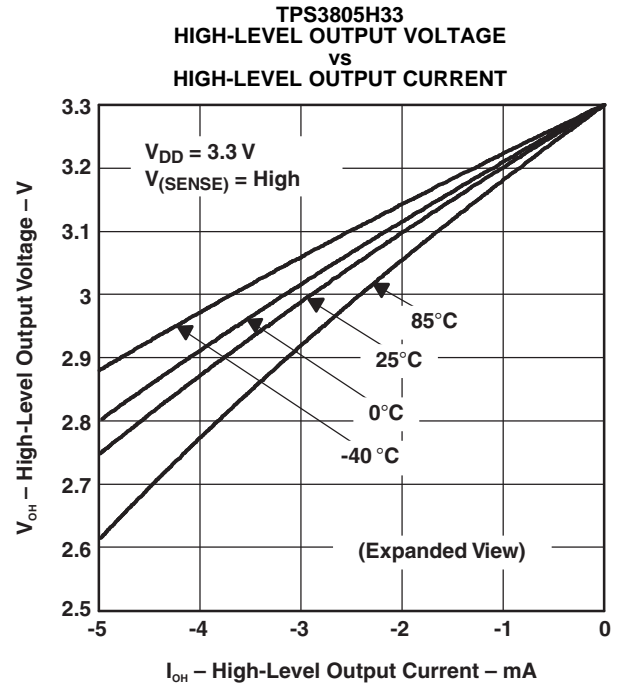


Figure 8.

TYPICAL CHARACTERISTICS (continued)

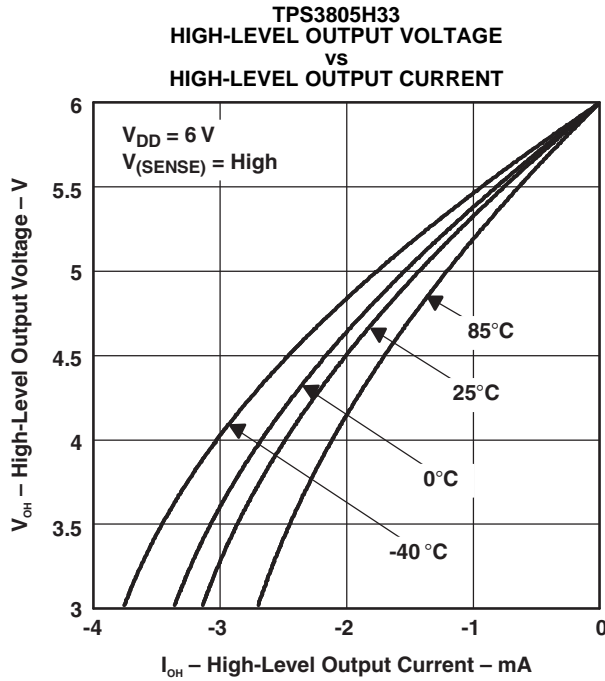


Figure 9.

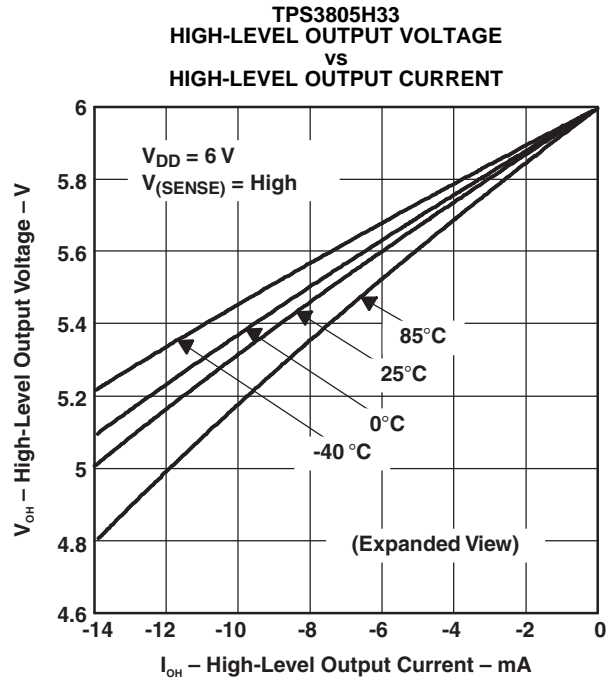


Figure 10.

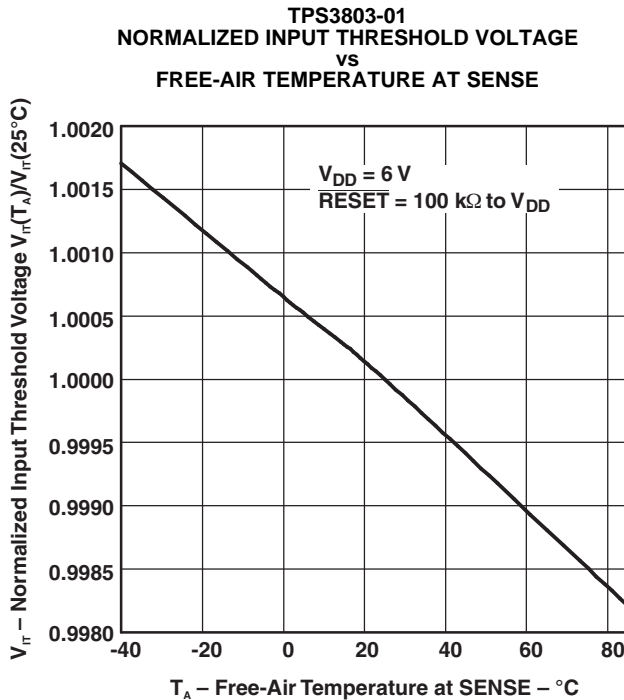


Figure 11.

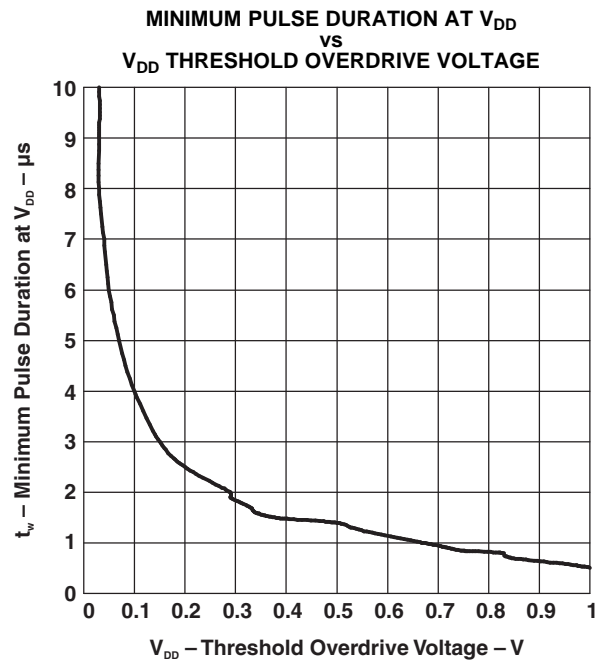


Figure 12.

TYPICAL CHARACTERISTICS (continued)

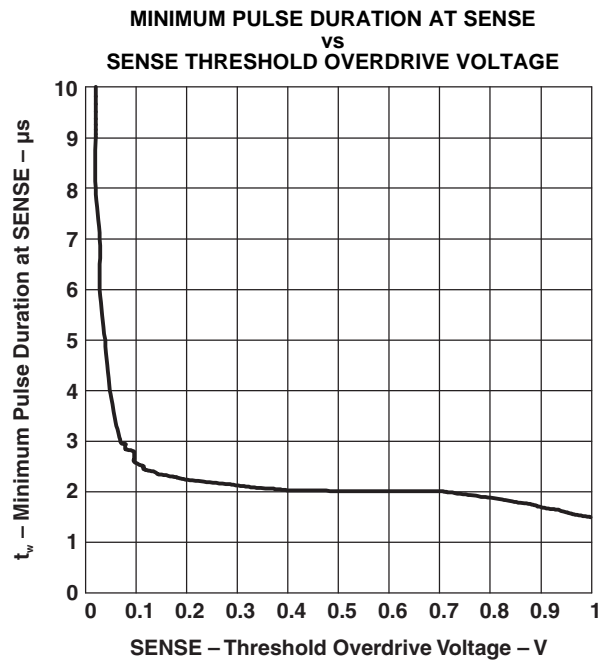


Figure 13.

Revision History

| REVISION | PAGE ⁽¹⁾ | DESCRIPTION |
|----------|---------------------|---------------------------------|
| SGLS228 | | Initial release |
| SGLS228A | 1 | Update features and description |
| | 3 | Update functional block diagram |
| SGLS228B | 1 | Update features |

(1) Page numbers for previous revisions may differ from page numbers in the current version.

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 2T03-01QDCKRG4Q1 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 2T03G15QDCKRG4Q | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 2T05H33QDCKRG4Q | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | Call TI | Level-1-260C-UNLIM |
| TPS3803-01QDCKRQ1 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3803G15QDCKRQ1 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3805H33QDCKRQ1 | ACTIVE | SC70 | DCK | 5 | 3000 | TBD | CU NIPDAU | Level-1-220C-UNLIM |

⁽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.

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OTHER QUALIFIED VERSIONS OF TPS3803-01-Q1, TPS3803G15-Q1, TPS3805H33-Q1 :

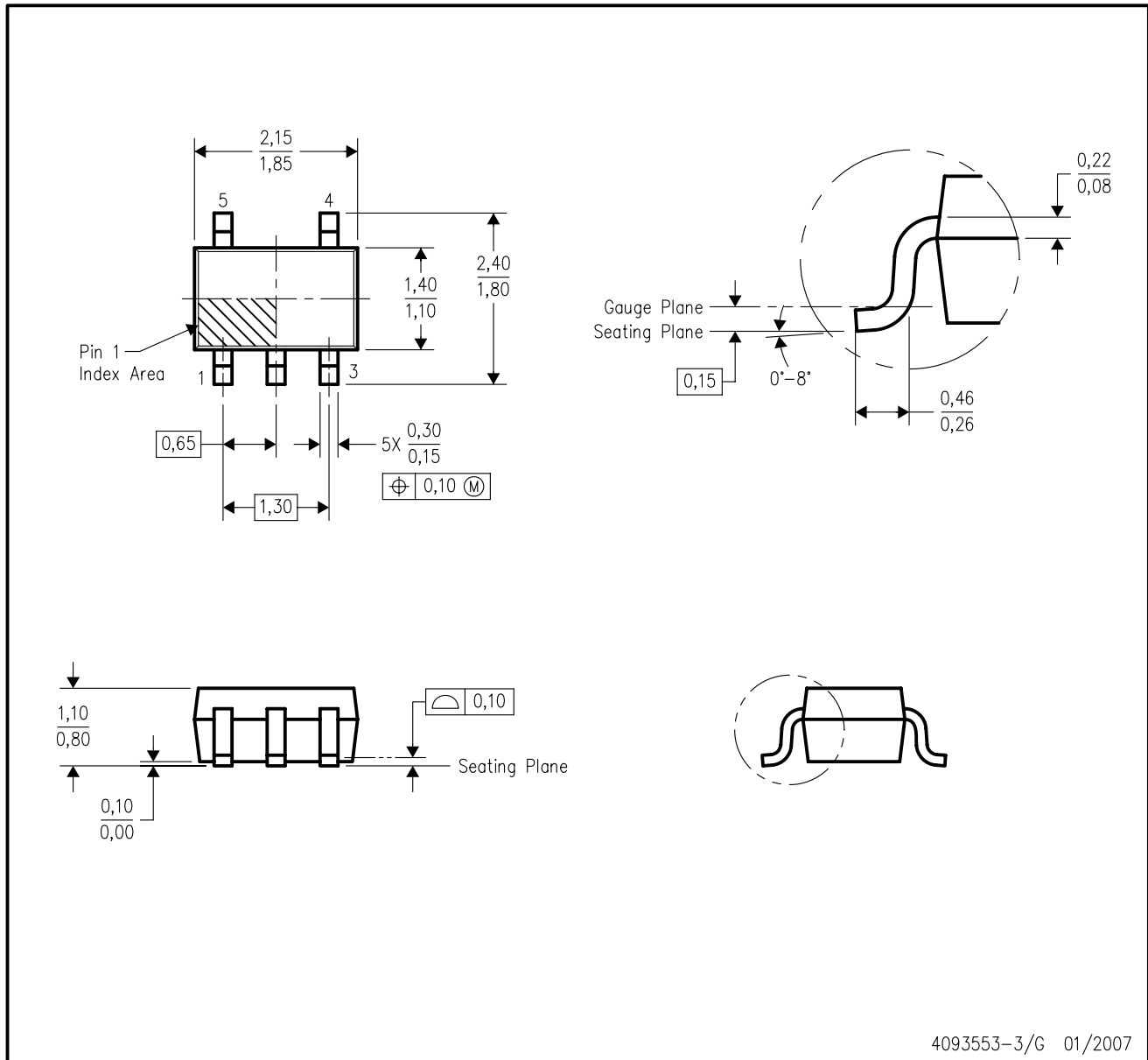
- Catalog: [TPS3803-01](#), [TPS3803G15](#), [TPS3805H33](#)
- Enhanced Product: [TPS3803-01-EP](#), [TPS3803G15-EP](#), [TPS3805H33-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-203 variation AA.

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