

VOLTAGE DETECTOR

FEATURES

- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of Up to –55°C to +125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree⁽¹⁾**
- **Single Voltage Detector (TPS3803): Adjustable/1.5 V**
- **Dual Voltage Detector (TPS3805): Adjustable/3.3 V**
- **High ±1.5% Threshold Voltage Accuracy**
- **Supply Current: 3 μA Typical at V_{DD} = 3.3 V**
- **Push/Pull Reset Output (TPS3805) Open-Drain Reset Output (TPS3803)**
- **5-Pin SC–70 Package**

(1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

APPLICATIONS

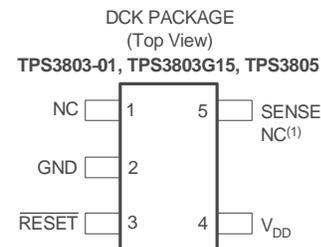
- **Applications Using DSPs, Microcontrollers, or Microprocessors**
- **Wireless Communication Systems**
- **Portable/Battery-Powered Equipment**
- **Programmable Controls**
- **Intelligent Instruments**
- **Industrial Equipment**
- **Notebook/Desktop Computers**
- **Automotive Systems**

DESCRIPTION

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

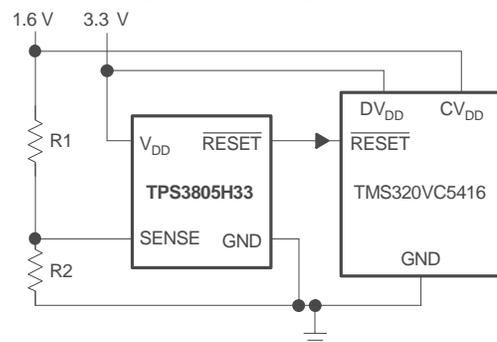
The TPS3803G15 device has a fixed-sense threshold voltage V_{IT} set by an internal voltage divider, whereas the TPS3803–01 has an adjustable SENSE input that can be configured by two external resistors. In addition to the fixed sense threshold monitored at V_{DD} , the TPS3805 devices provide a second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



(1) NC = No Connection on TPS3803G15

Typical Operating Circuit



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.

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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.

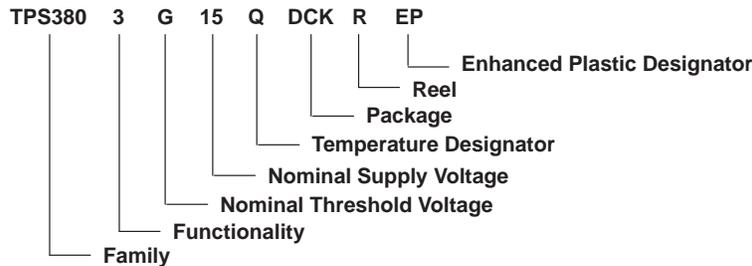
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

PACKAGE INFORMATION

| T _A | DEVICE NAME | THRESHOLD VOLTAGE | | MARKING |
|-----------------|----------------------|-------------------|---------|---------|
| | | V _{DD} | SENSE | |
| -40°C to +125°C | TPS3803-01QDCKREP(2) | NA | 1.226 V | AWH |
| | TPS3803G15QDCKREP(2) | 1.4 V | NA | AXT |
| | TPS3805H33QDCKREP(2) | 3.05 V | 1.226 V | AWY |
| -55°C to +125°C | TPS3803-01MDCKREP(2) | NA | 1.226 V | BAY |
| | TPS3803G15MDCKREP(2) | 1.40 V | NA | ARH |
| | TPS3805H33MDCKREP(2) | 3.05 V | 1.226 V | ARJ |

(2) The DCKR passive indicates tape and reel containing 3000 parts.

ORDERING INFORMATION

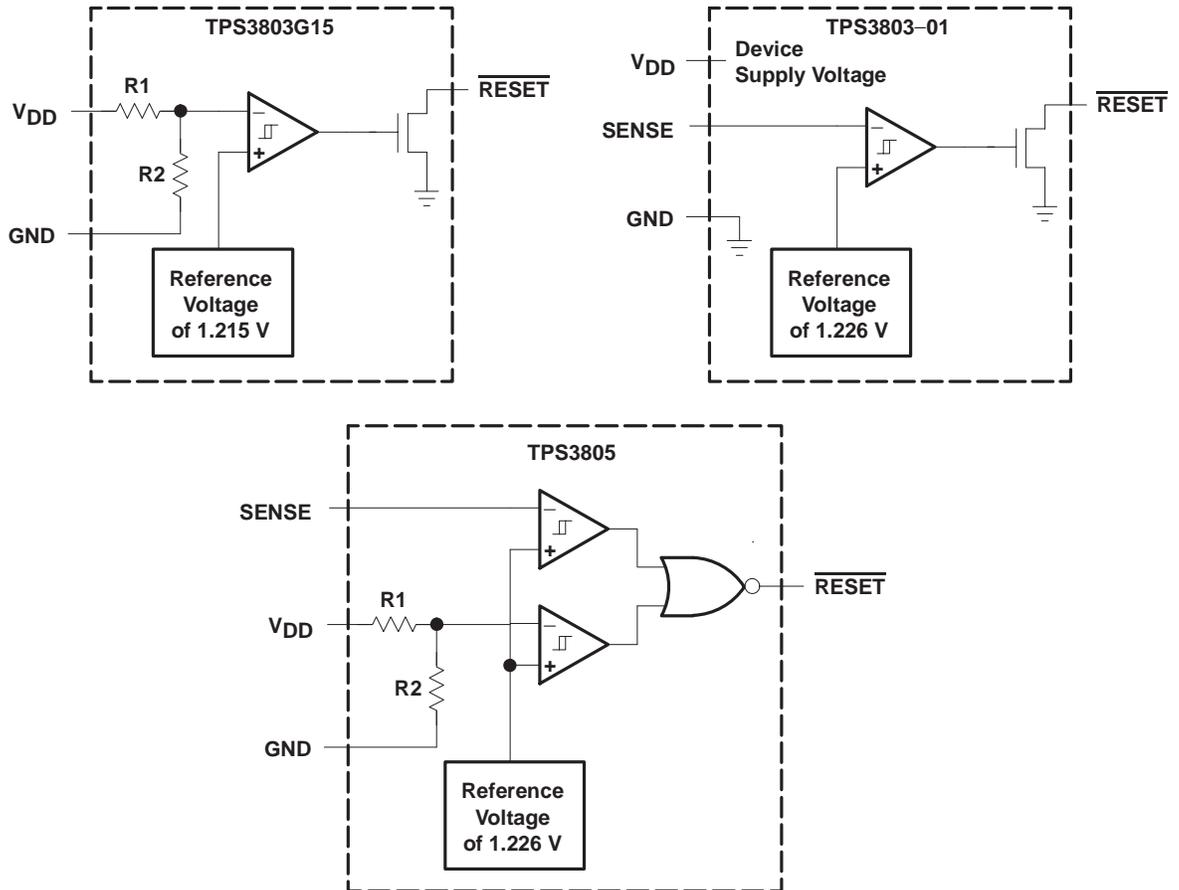


Function/Truth Tables

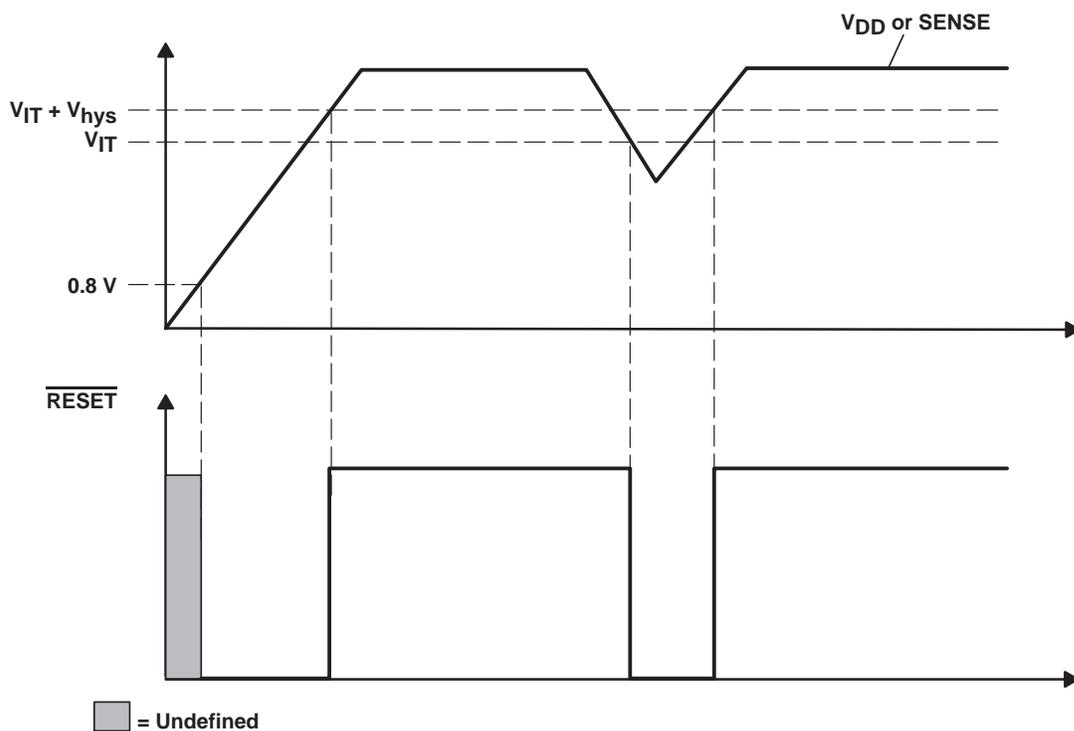
| TPS3803-01 | | TPS3803G15 | |
|-------------------------|-------|-----------------------------------|-------|
| SENSE > V _{IT} | RESET | V _{DD} > V _{IT} | RESET |
| 0 | L | 0 | L |
| 1 | H | 1 | H |

| 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 NAME | NO. | I/O | DESCRIPTION |
|-----------------|-----|-----|--|
| GND | 2 | I | Ground |
| 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, unless otherwise noted.

| | |
|--|------------------------------|
| Supply voltage, V_{DD} ⁽²⁾ | +7 V |
| All other pins ⁽²⁾ | -0.3 V to +7 V |
| Maximum low-output current, I_{OL} | +5 mA |
| Maximum high-output current, I_{OH} | -5 mA |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{DD}$) | ± 10 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{DD}$) | ± 10 mA |
| Continuous total power dissipation | See Dissipation Rating Table |
| Operating free-air temperature range, T_A | -55°C to +125°C |
| Storage temperature range, T_{stg} ⁽³⁾ | -65°C to +150°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.

(3) Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See www.ti.com/ep_quality for additional information on enhanced plastic packaging.

DISSIPATION RATING TABLE

| PACKAGE | $T_A < +25^\circ\text{C}$ POWER RATING | DERATING FACTOR ABOVE $T_A = +25^\circ\text{C}$ | $T_A = +70^\circ\text{C}$ POWER RATING | $T_A = +85^\circ\text{C}$ POWER RATING |
|---------|---|--|---|---|
| DCK | 321 mW | 2.6 mW/°C | 206 mW | 167 mW |

RECOMMENDED OPERATING CONDITIONS

| | | MIN | MAX | UNIT |
|---|------------------|-----|----------------|------|
| Supply voltage, V_{DD} | | 1.3 | 6 | V |
| Input voltage, V_I | | 0 | $V_{DD} + 0.3$ | V |
| Operating free-air temperature range, T_A | Q suffix devices | -40 | +125 | °C |
| | M suffix devices | -55 | +125 | |

ELECTRICAL CHARACTERISTICS

Over recommended 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 x 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 |
| 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 $\overline{\text{RESET}}$ | Open-drain only | V _{DD} = V _{IT} + 0.2V, 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 | 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 $\overline{\text{RESET}}$ (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

AT R_L = 1 MΩ, C_L = 50 PF, over recommended operating free-air temperature range.

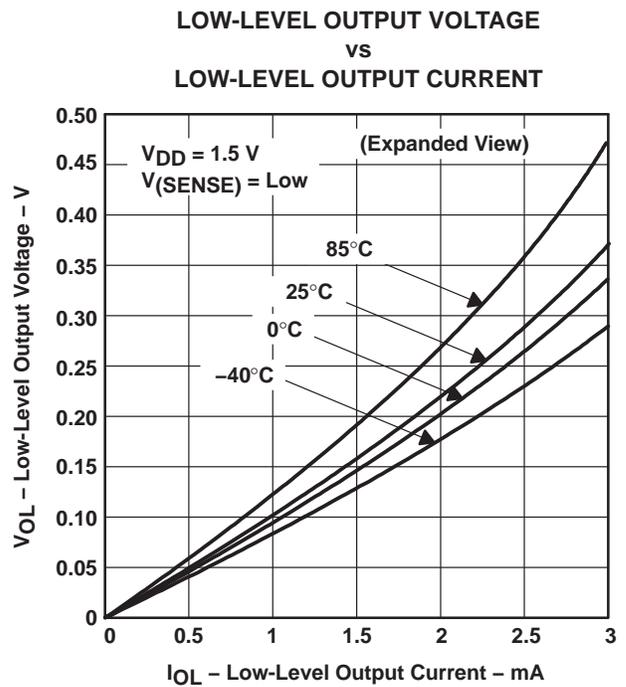
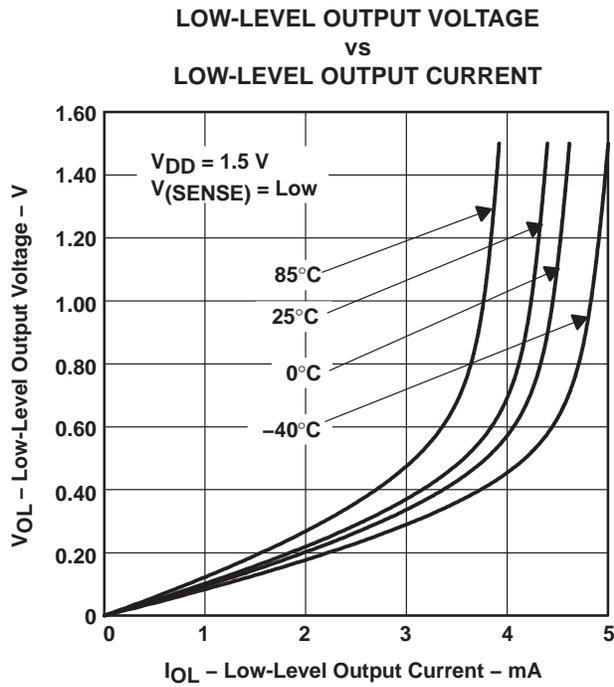
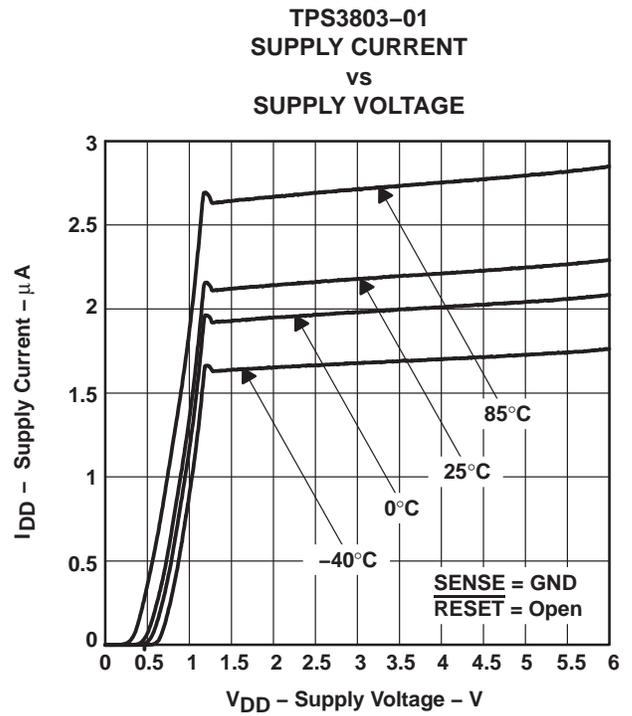
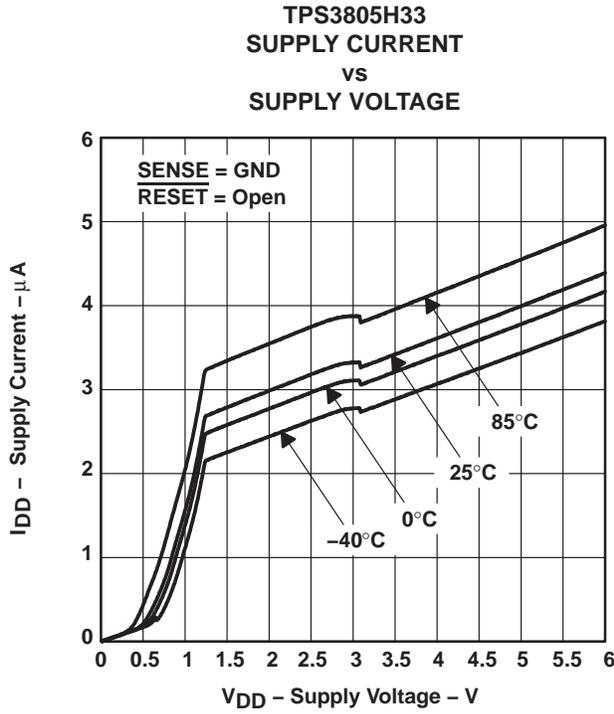
| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------|--------------------|---|-----|-----|-----|------|
| t _w | At V _{DD} | V _{IH} = 1.05 x V _{IT} , V _{IL} = 0.95 x V _{IT} | 5.5 | | | μs |
| | At SENSE | | | | | |

SWITCHING CHARACTERISTICS

AT R_L = 1 MΩ, C_L = 50 PF, over recommended operating free-air temperature range.

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

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
 vs
 LOW-LEVEL OUTPUT CURRENT

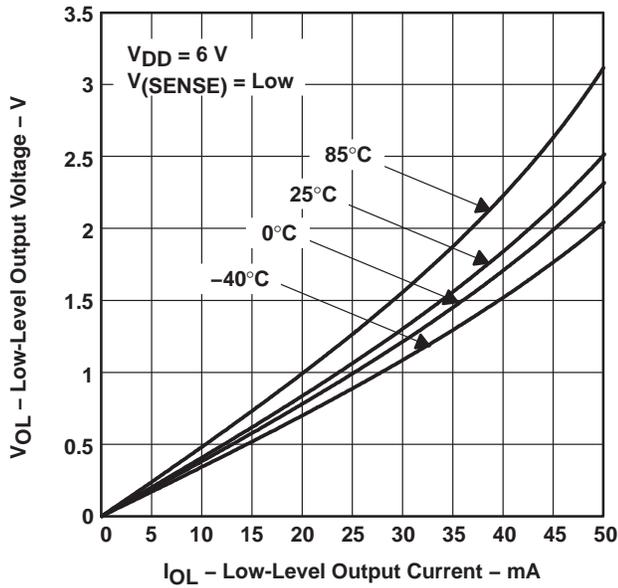


Figure 5

LOW-LEVEL OUTPUT VOLTAGE
 vs
 LOW-LEVEL OUTPUT CURRENT

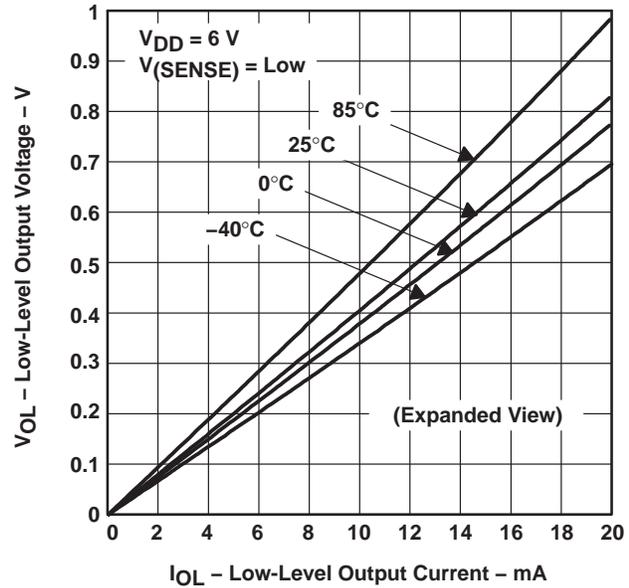


Figure 6

TPS3805H33
 HIGH-LEVEL OUTPUT VOLTAGE
 vs
 HIGH-LEVEL OUTPUT CURRENT

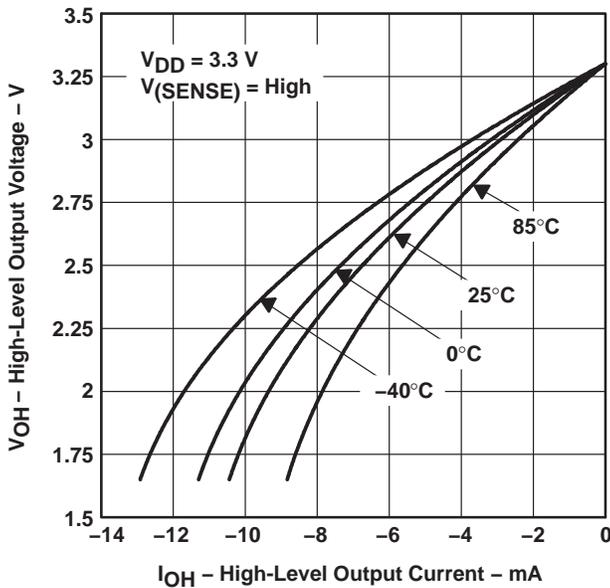


Figure 7

TPS3805H33
 HIGH-LEVEL OUTPUT VOLTAGE
 vs
 HIGH-LEVEL OUTPUT CURRENT

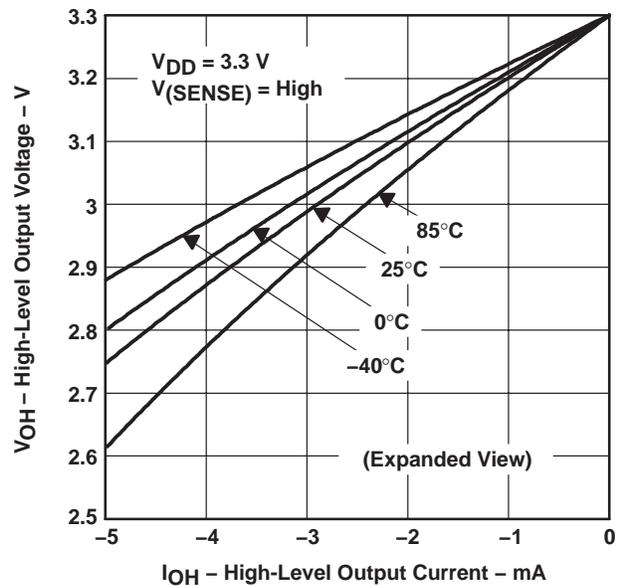


Figure 8

TYPICAL CHARACTERISTICS

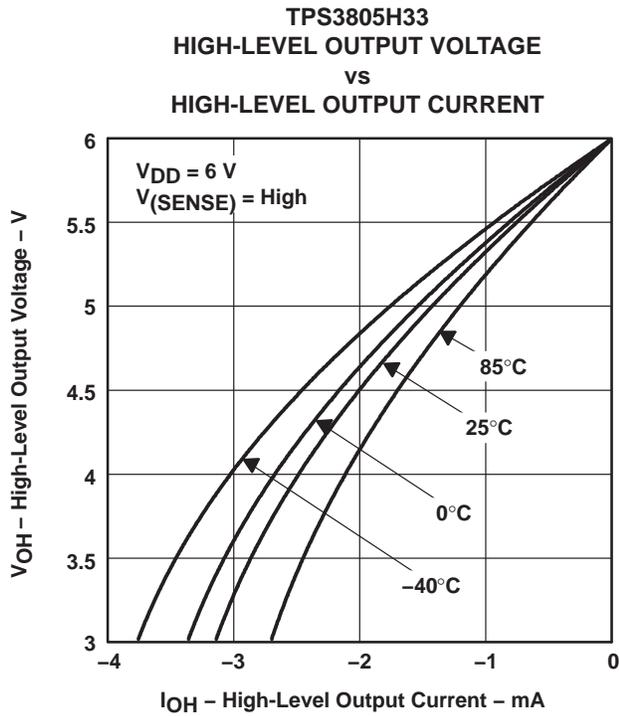


Figure 9

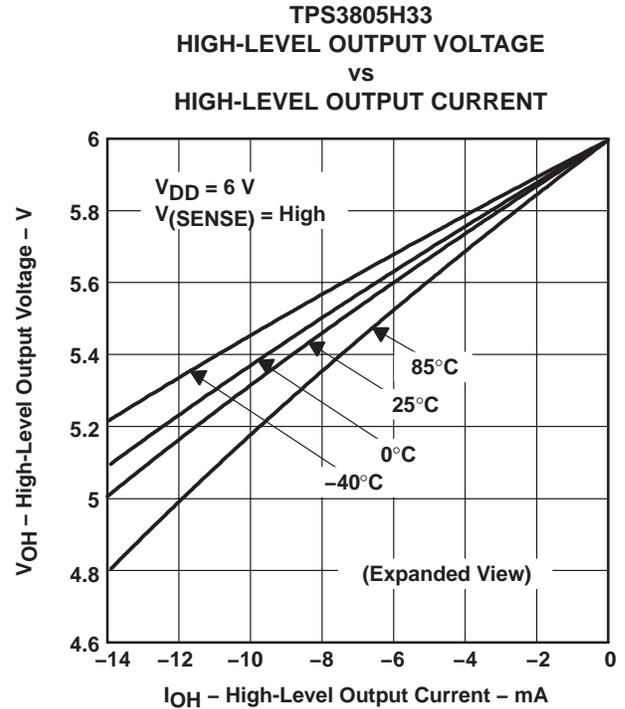


Figure 10

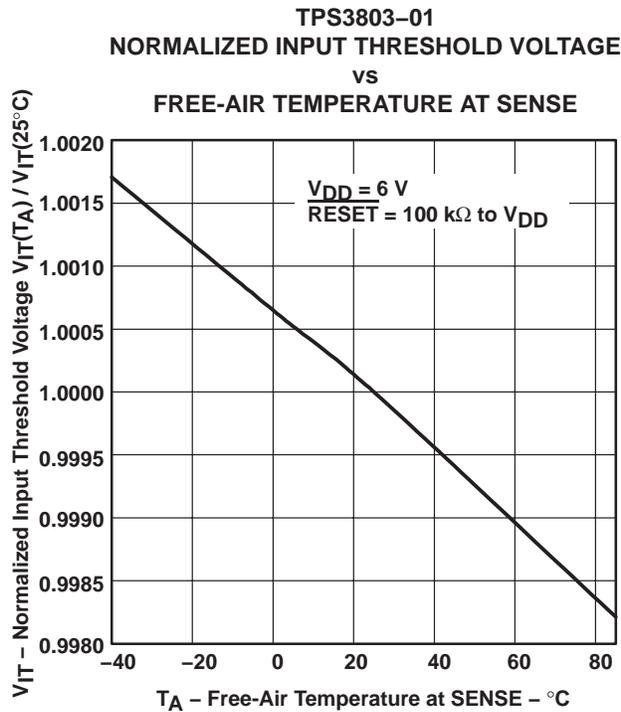


Figure 11

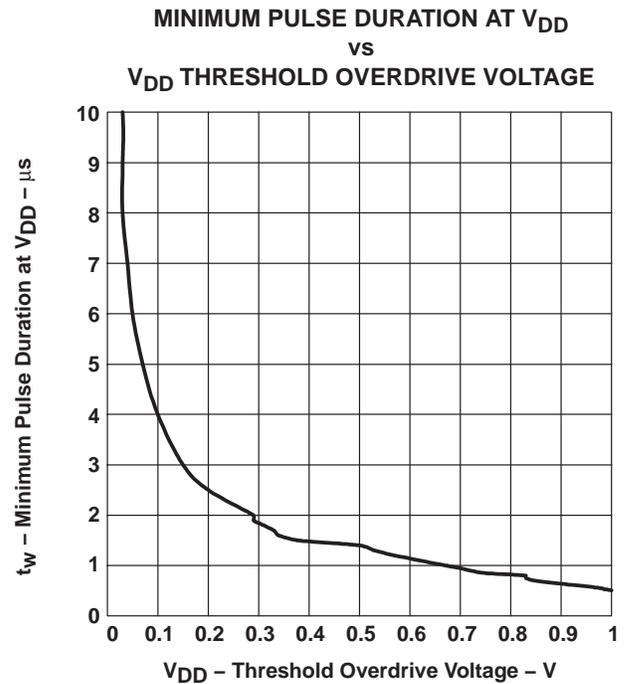


Figure 12

TYPICAL CHARACTERISTICS

MINIMUM PULSE DURATION AT SENSE
vs
SENSE THRESHOLD OVERDRIVE VOLTAGE

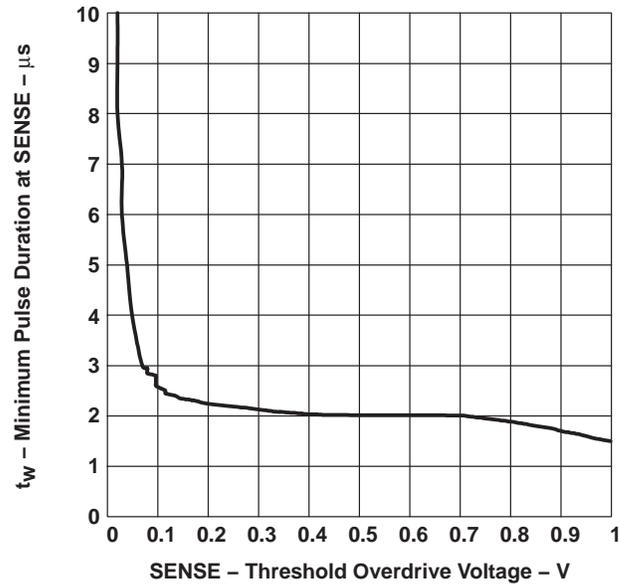


Figure 13

Revision History

| DATE | REV | PAGE | SECTION | DESCRIPTION |
|------|-----|------------|---------|----------------------------------|
| 6/07 | C | Front Page | — | Updated front page. |
| | | 3 | — | Functional block diagram change. |

NOTE: 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 finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| TPS3803-01MDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | BAY | Samples |
| TPS3803-01QDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | AWH | Samples |
| TPS3803G15MDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -55 to 125 | ARH | Samples |
| TPS3803G15QDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | AXT | Samples |
| TPS3805H33MDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -55 to 125 | ARJ | Samples |
| TPS3805H33QDCKREP | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | AWY | Samples |
| V62/04648-01XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | AWH | Samples |
| V62/04648-02XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | AXT | Samples |
| V62/04648-03XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | AWY | Samples |
| V62/04648-04XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | BAY | Samples |
| V62/04648-05XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -55 to 125 | ARH | Samples |
| V62/04648-06XE | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAUAG | Level-1-260C-UNLIM | -55 to 125 | ARJ | 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.

OBSELETE: 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 finish/Ball material - Orderable Devices 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.

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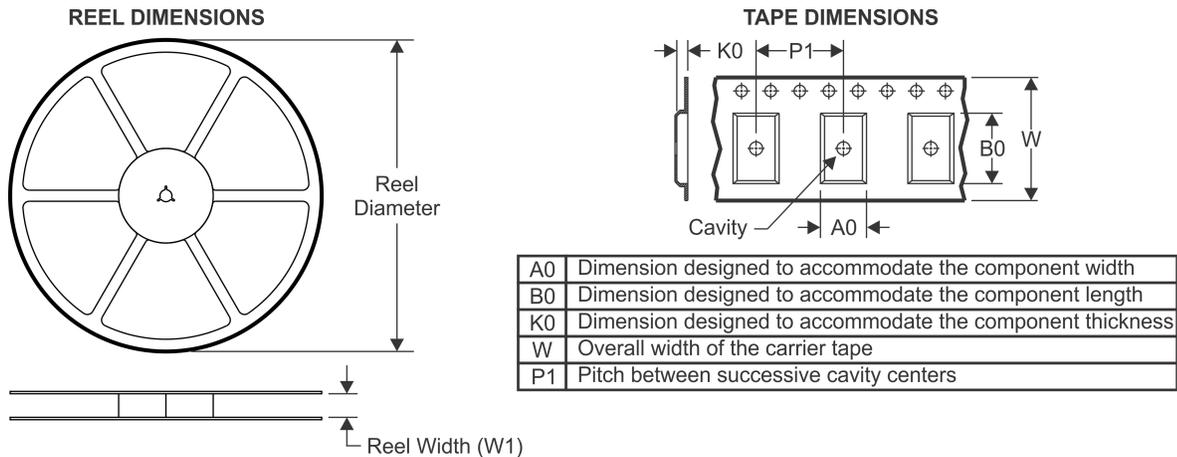
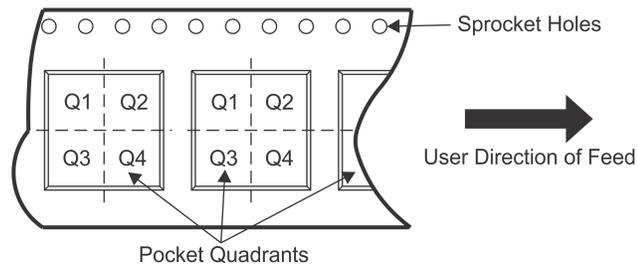
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OTHER QUALIFIED VERSIONS OF TPS3803-EP, TPS3805H33-EP :

- Catalog: [TPS3803](#), [TPS3805H33](#)
- Automotive: [TPS3803-Q1](#), [TPS3805H33-Q1](#)

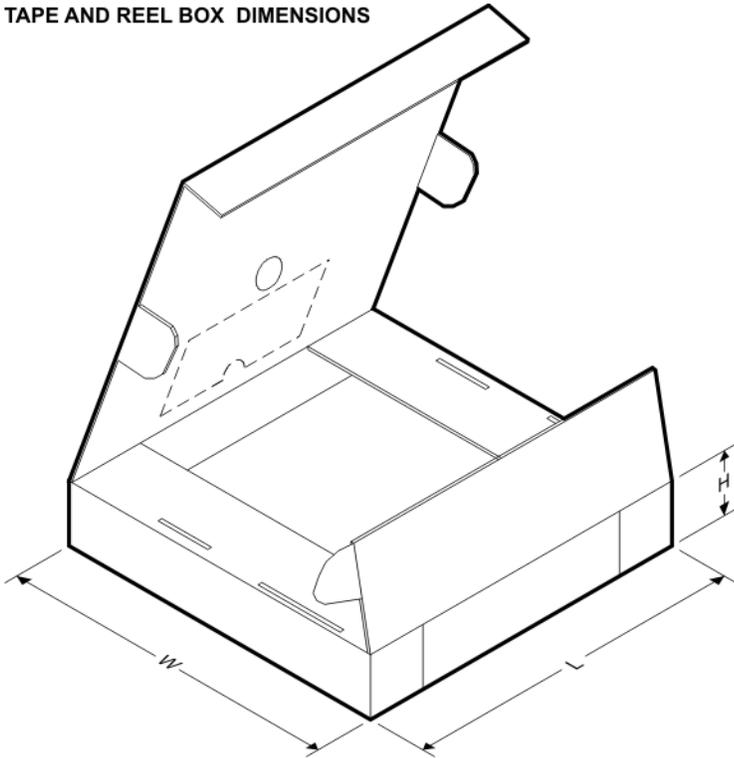
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS3803-01MDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| TPS3803-01QDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| TPS3803G15MDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.41 | 2.41 | 1.2 | 4.0 | 8.0 | Q3 |
| TPS3803G15QDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.41 | 2.41 | 1.2 | 4.0 | 8.0 | Q3 |
| TPS3805H33MDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.41 | 2.41 | 1.2 | 4.0 | 8.0 | Q3 |
| TPS3805H33QDCKREP | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.41 | 2.41 | 1.2 | 4.0 | 8.0 | Q3 |

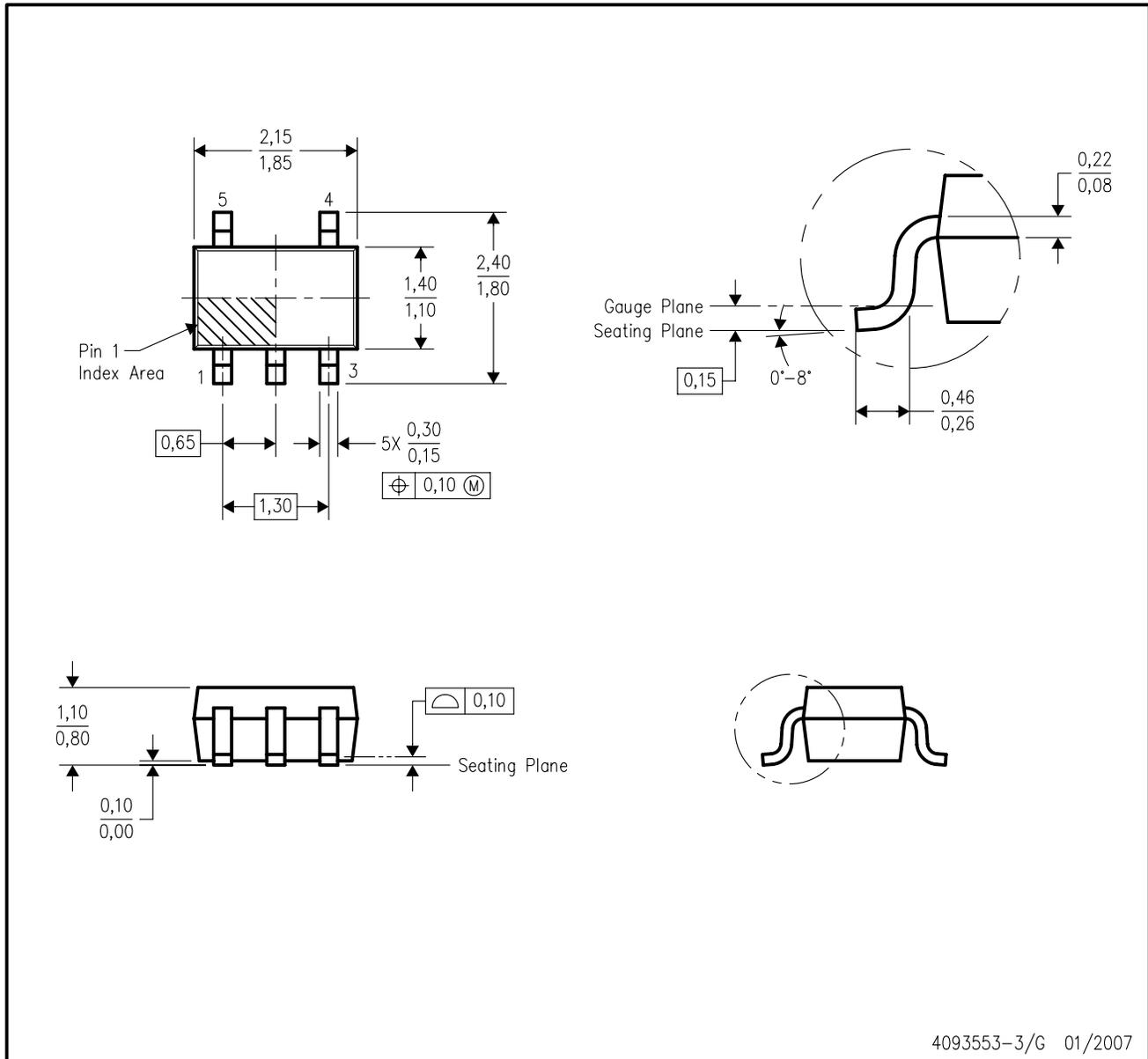
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TPS3803-01MDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| TPS3803-01QDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| TPS3803G15MDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| TPS3803G15QDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| TPS3805H33MDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| TPS3805H33QDCKREP | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |

DCK (R-PDSO-G5)

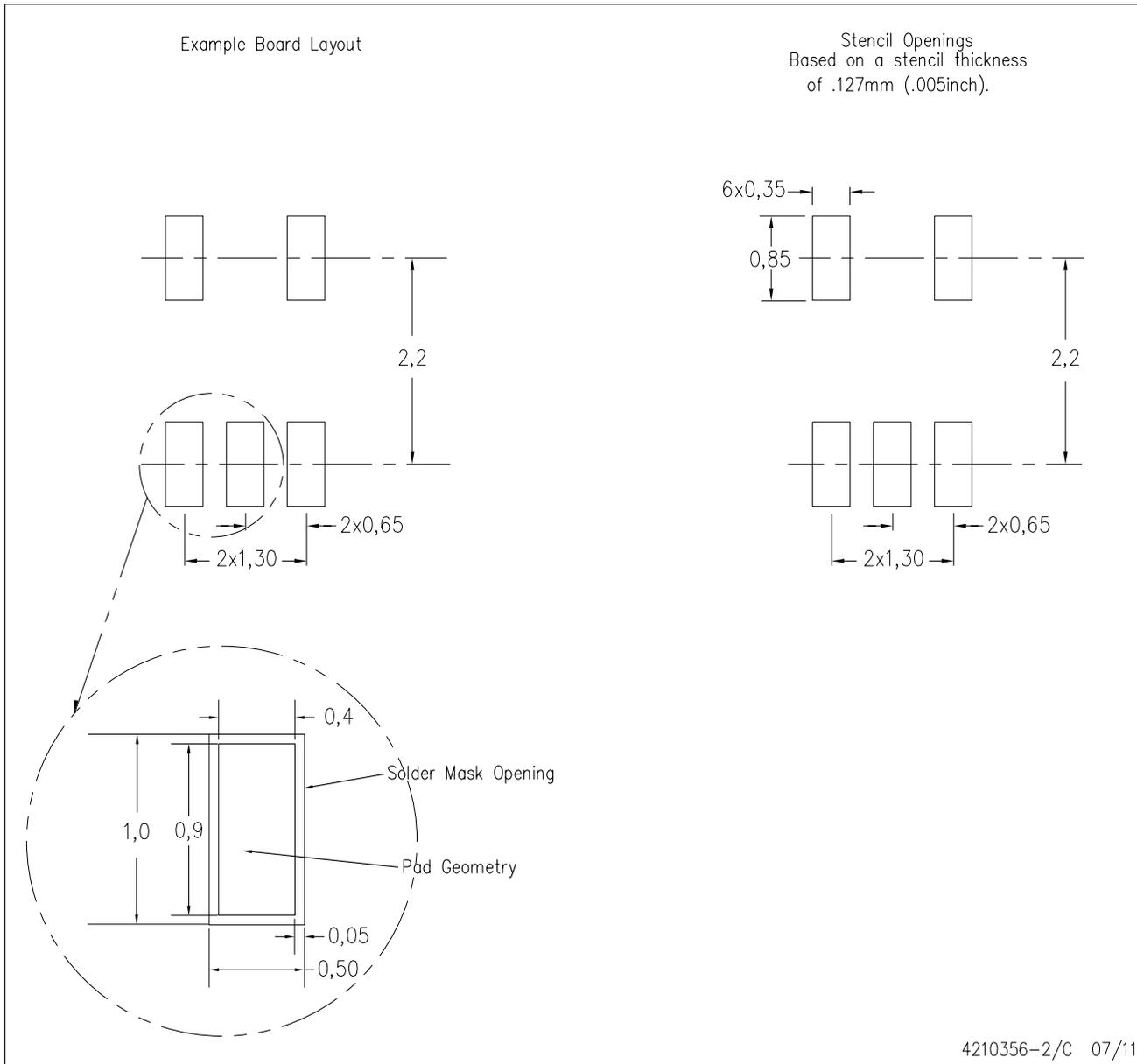
PLASTIC SMALL-OUTLINE PACKAGE



- 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.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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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