TPS3803-01-EP
TPS3803G15-EP
TPS3805H33-EP

SGLS227C − DECEMBER 2003 − REVISED JUNE 2007

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**

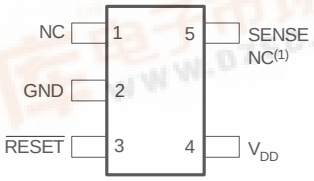
DESCRIPTION

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}.

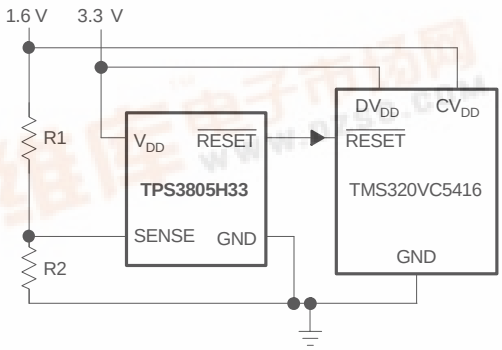
During power on, $\overline{\text{RESET}}$ is asserted when supply voltage V_{DD} becomes higher than 0.8 V. Thereafter, the supervisory circuit monitors V_{DD} (and/or SENSE) and keeps $\overline{\text{RESET}}$ active as long as V_{DD} or SENSE remains below the threshold voltage V_{IT}. As soon as 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.

DCK PACKAGE
(Top View)
TPS3803-01, TPS3803G15, TPS3805



(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.

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.

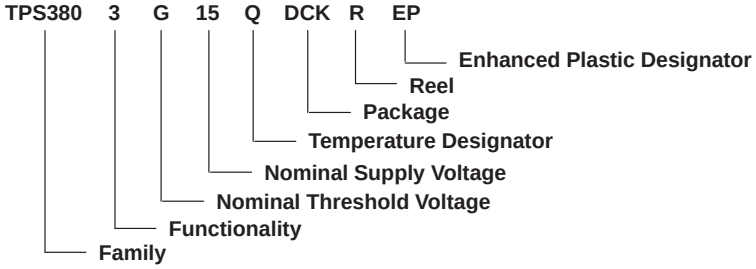
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

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

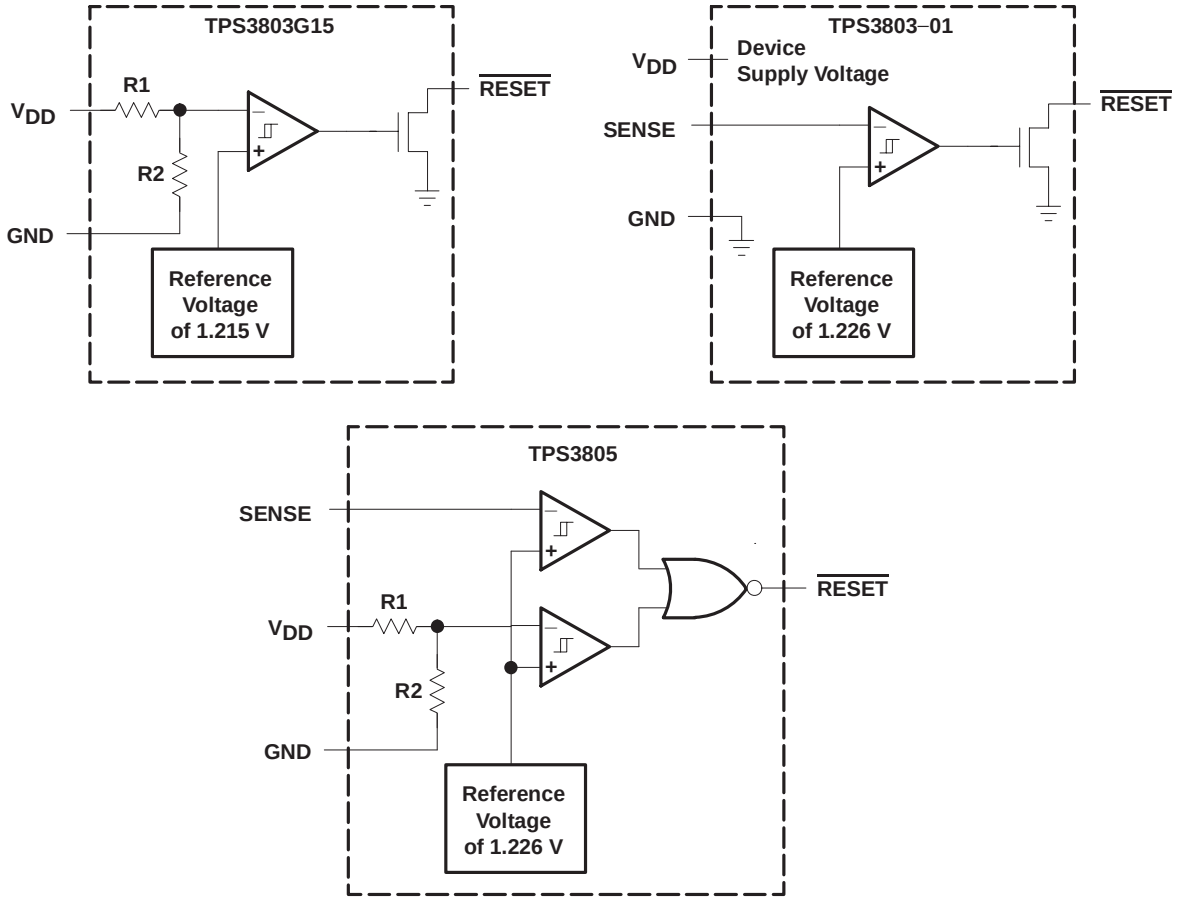


Function/Truth Tables

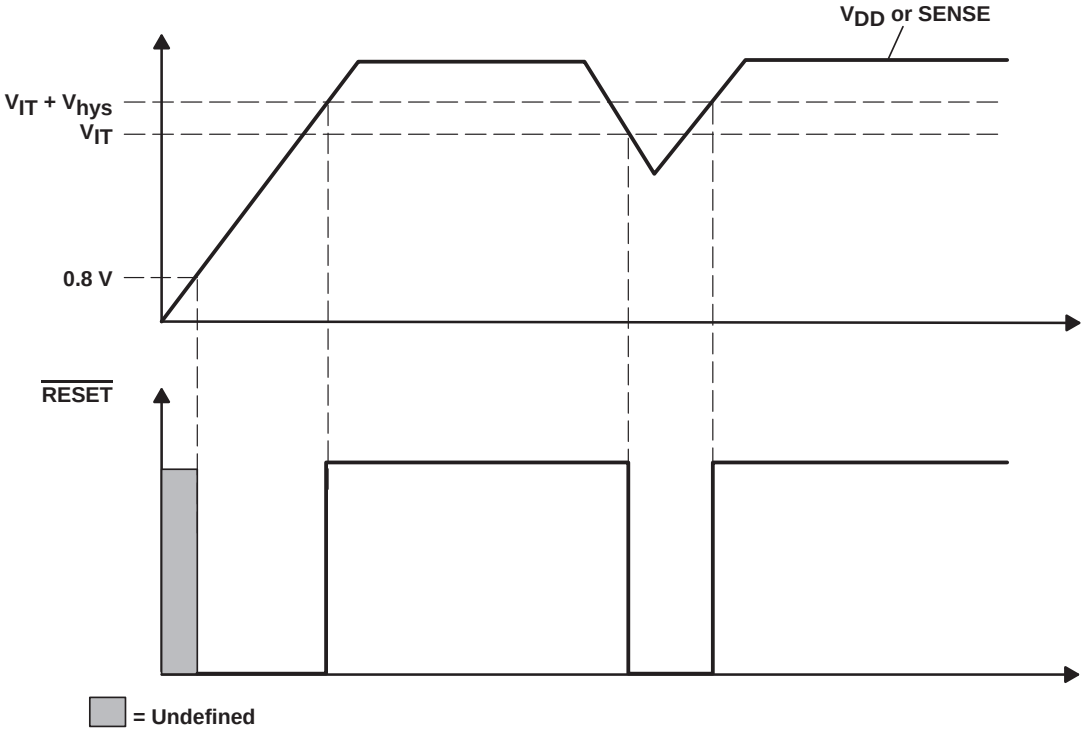
TPS3803-01		TPS3803G15	
SENSE > V_{IT}	$\overline{\text{RESET}}$	V_{DD} > V_{IT}	$\overline{\text{RESET}}$
0	L	0	L
1	H	1	H

TPS3805H33		
V_{DD} > V_{IT}	SENSE > V_{IT}	$\overline{\text{RESET}}$
0	0	L
0	1	L
1	0	L
1	1	H

FUNCTIONAL BLOCK DIAGRAM



TIMING REQUIREMENTS



Terminal Functions

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
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, 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°C POWER RATING	DERATING FACTOR ABOVE T_A = +25°C	T_A = +70°C POWER RATING	T_A = +85°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
		$V_{IT} \leq$ 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 $\overline{RESET}$	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	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 $\overline{RESET}$ (V_{OL}(max) = 0.2 V, I_{OL} = 50 μA) becomes active. $t_{r(VDD)} \geq$ 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	Pulse width	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 $\overline{RESET}$ delay	V_{IH} = 1.05 x V_{IT}, V_{IL} = 0.95 x V_{IT}		5	100	μs
		SENSE to $\overline{RESET}$ delay					
t_{PLH}	Propagation (delay) time, low-to-high-level output	V_{DD} to $\overline{RESET}$ delay			5	100	
		SENSE to $\overline{RESET}$ delay					

TYPICAL CHARACTERISTICS

TPS3805H33
SUPPLY CURRENT
vs
SUPPLY VOLTAGE

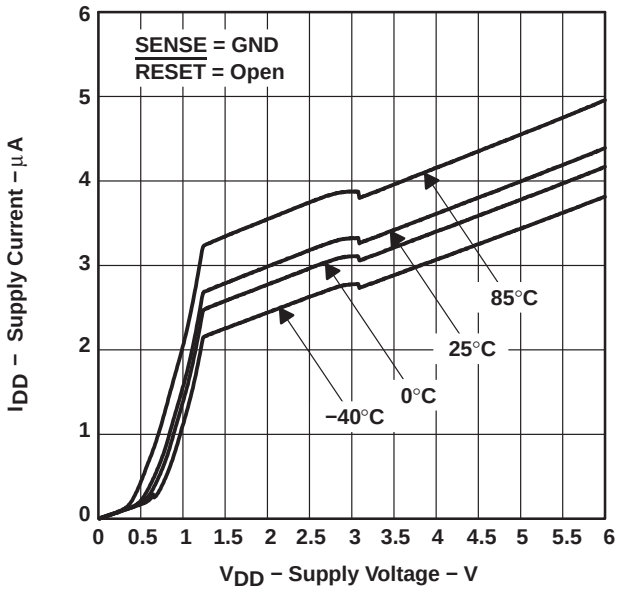


Figure 1

TPS3803−01
SUPPLY CURRENT
vs
SUPPLY VOLTAGE

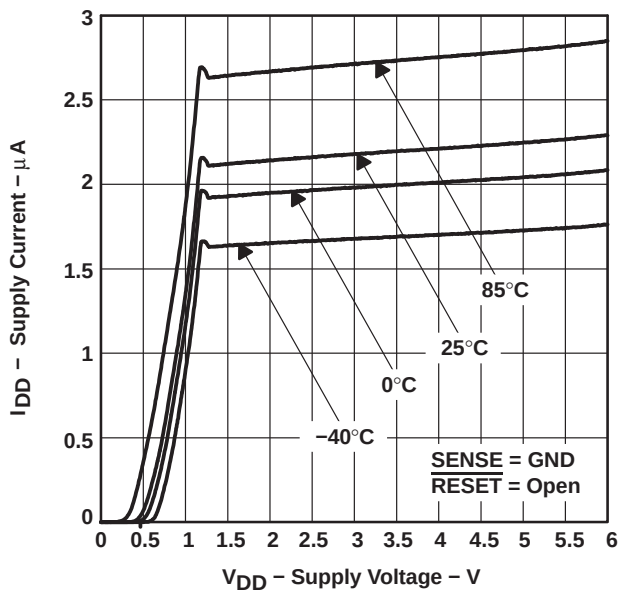


Figure 2

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

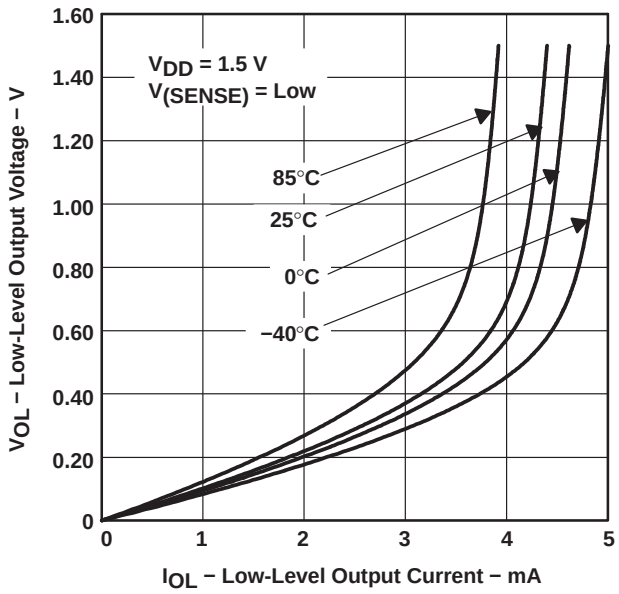


Figure 3

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

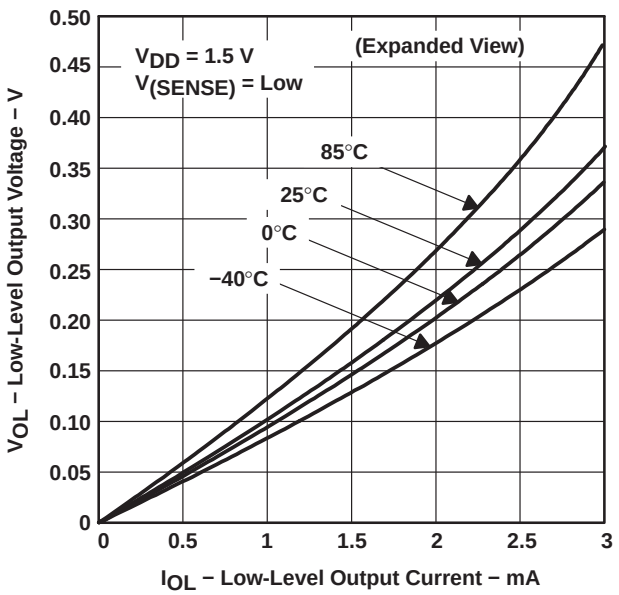


Figure 4

TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

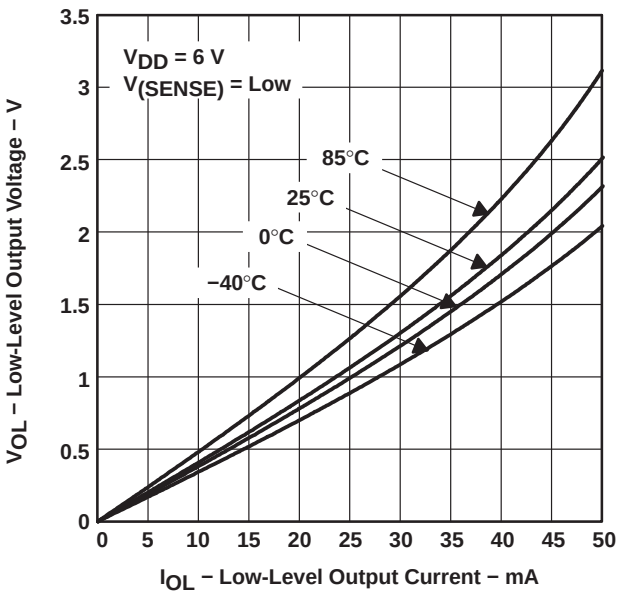


Figure 5

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

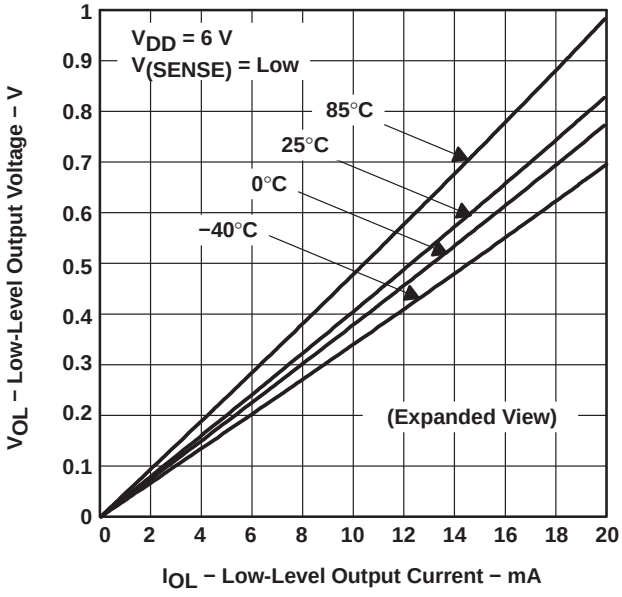


Figure 6

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

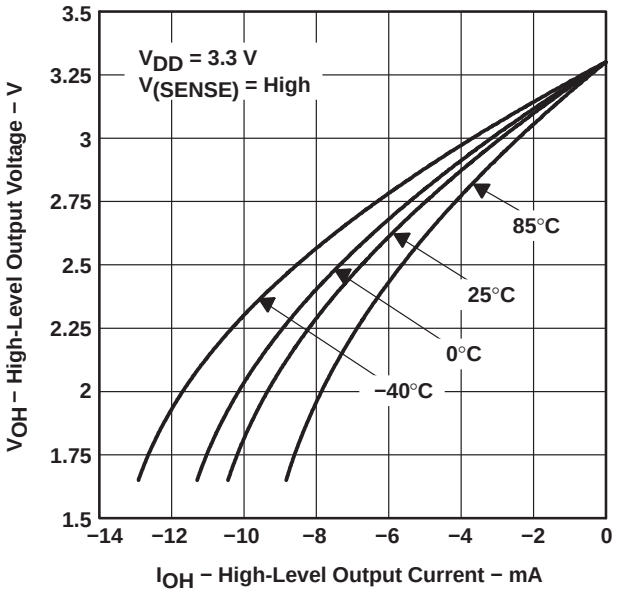


Figure 7

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

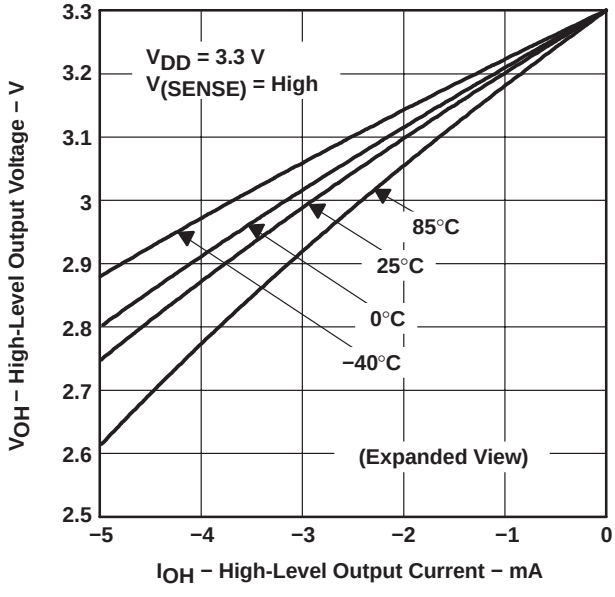


Figure 8

TYPICAL CHARACTERISTICS

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

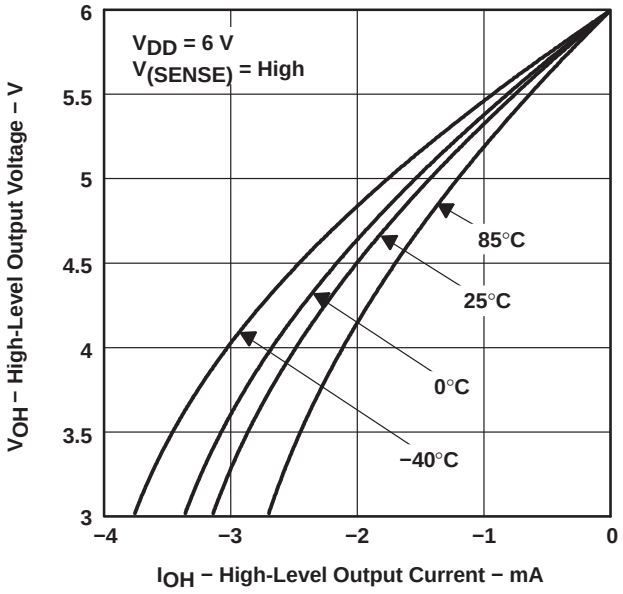


Figure 9

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

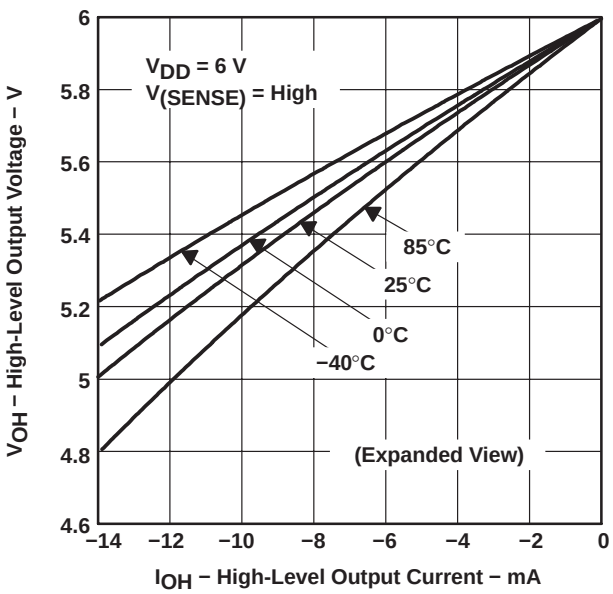


Figure 10

TPS3803−01
NORMALIZED INPUT THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE AT SENSE

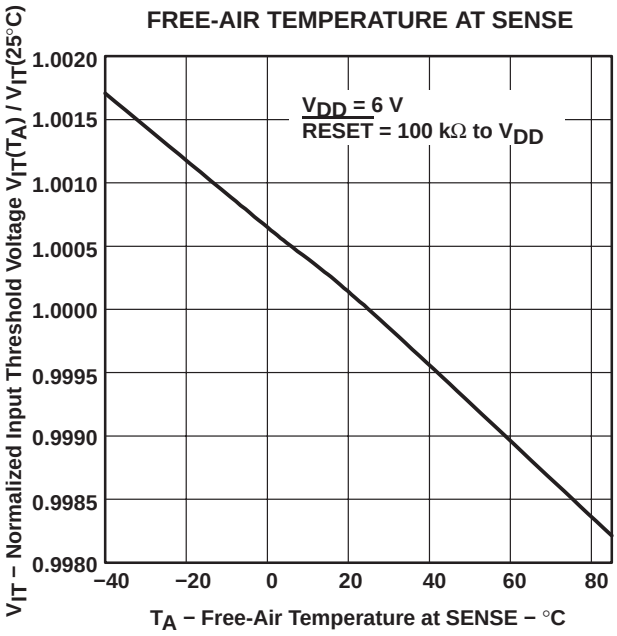


Figure 11

MINIMUM PULSE DURATION AT V_{DD}
vs
V_{DD} THRESHOLD OVERDRIVE VOLTAGE

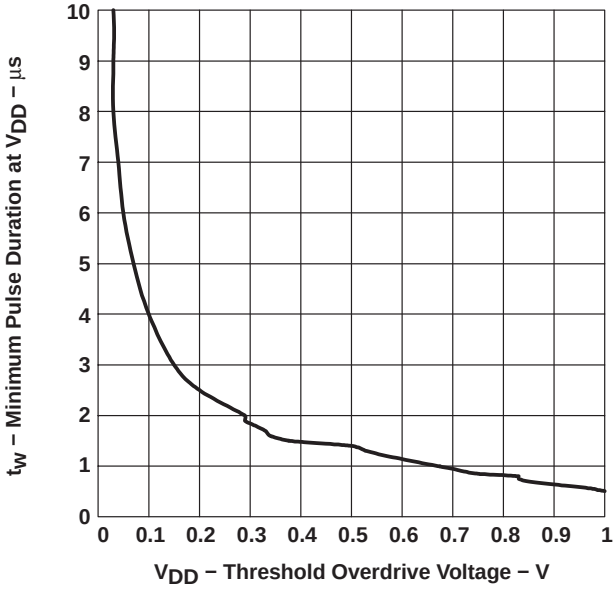


Figure 12

TYPICAL CHARACTERISTICS

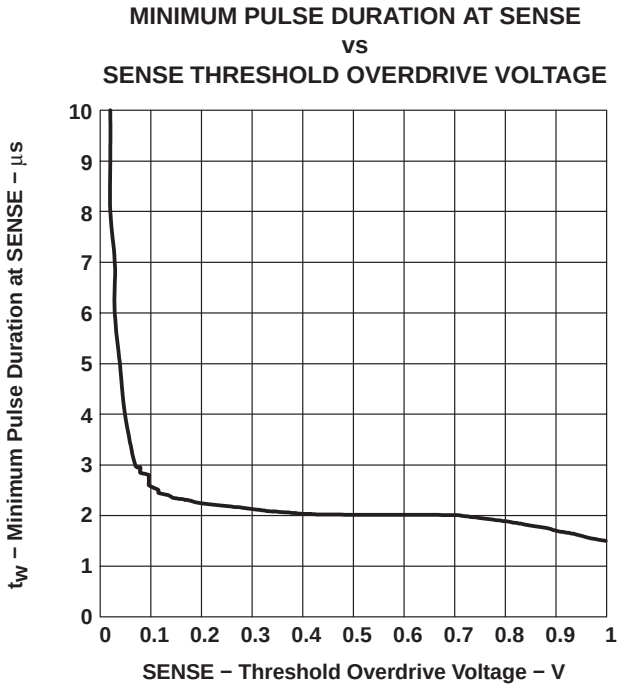


Figure 13

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/Ball Finish	MSL Peak Temp (3)
TPS3803-01MDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3803-01QDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3803G15MDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3803G15QDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3805H33MDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3805H33QDCKREP	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-01XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-02XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-03XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-04XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-05XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/04648-06XE	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-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.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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

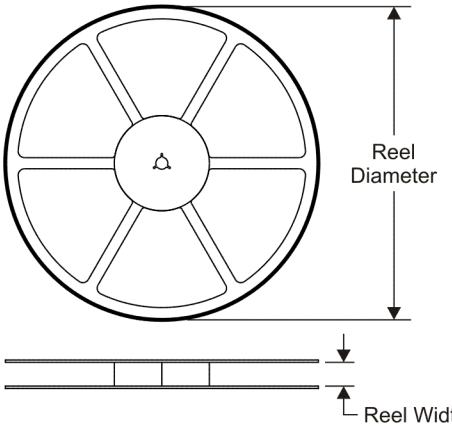
- Catalog: TPS3803-01, TPS3803G15, TPS3805H33
- Automotive: TPS3803-01-Q1, TPS3803G15-Q1, TPS3805H33-Q1

NOTE: Qualified Version Definitions:

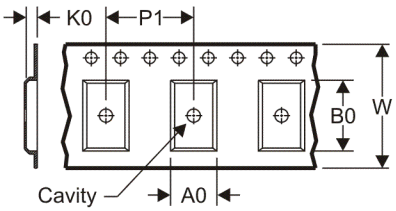
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

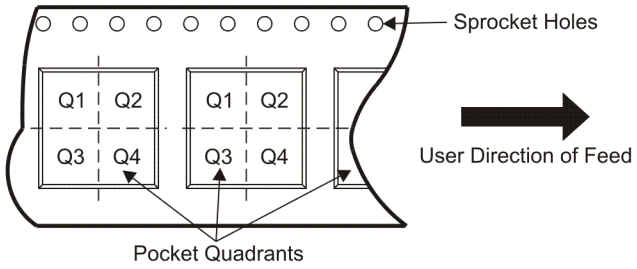


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

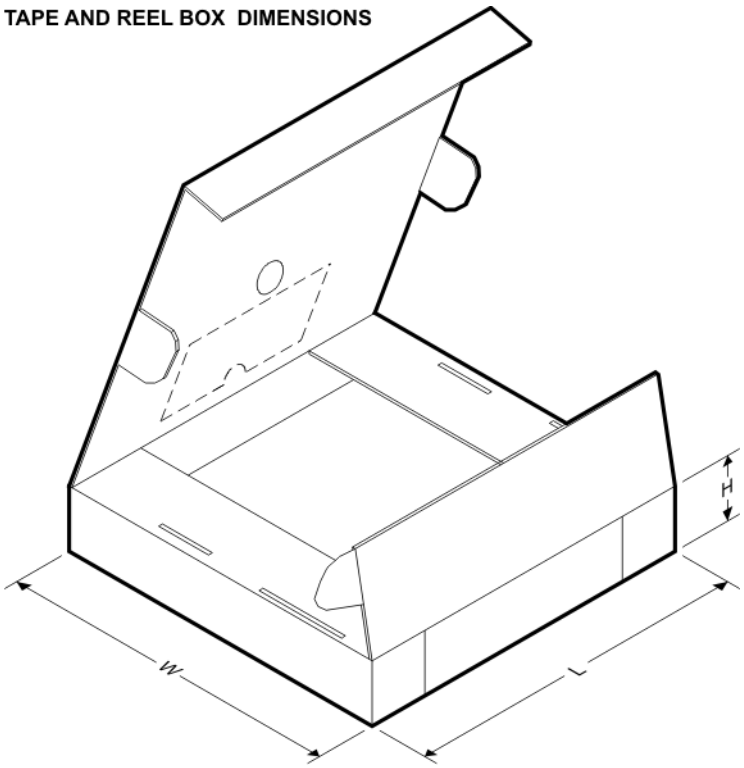
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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	9.2	2.24	1.22	2.34	4.0	8.0	Q3
TPS3803-01QDCKREP	SC70	DCK	5	3000	180.0	9.2	2.24	1.22	2.34	4.0	8.0	Q3
TPS3803G15MDCKREP	SC70	DCK	5	3000	180.0	9.2	2.24	1.22	2.34	4.0	8.0	Q3
TPS3803G15QDCKREP	SC70	DCK	5	3000	180.0	9.2	2.24	1.22	2.34	4.0	8.0	Q3
TPS3805H33MDCKREP	SC70	DCK	5	3000	180.0	9.2	2.24	1.22	2.34	4.0	8.0	Q3
TPS3805H33QDCKREP	SC70	DCK	5	3000	180.0	9.2	2.24	1.22	2.34	4.0	8.0	Q3

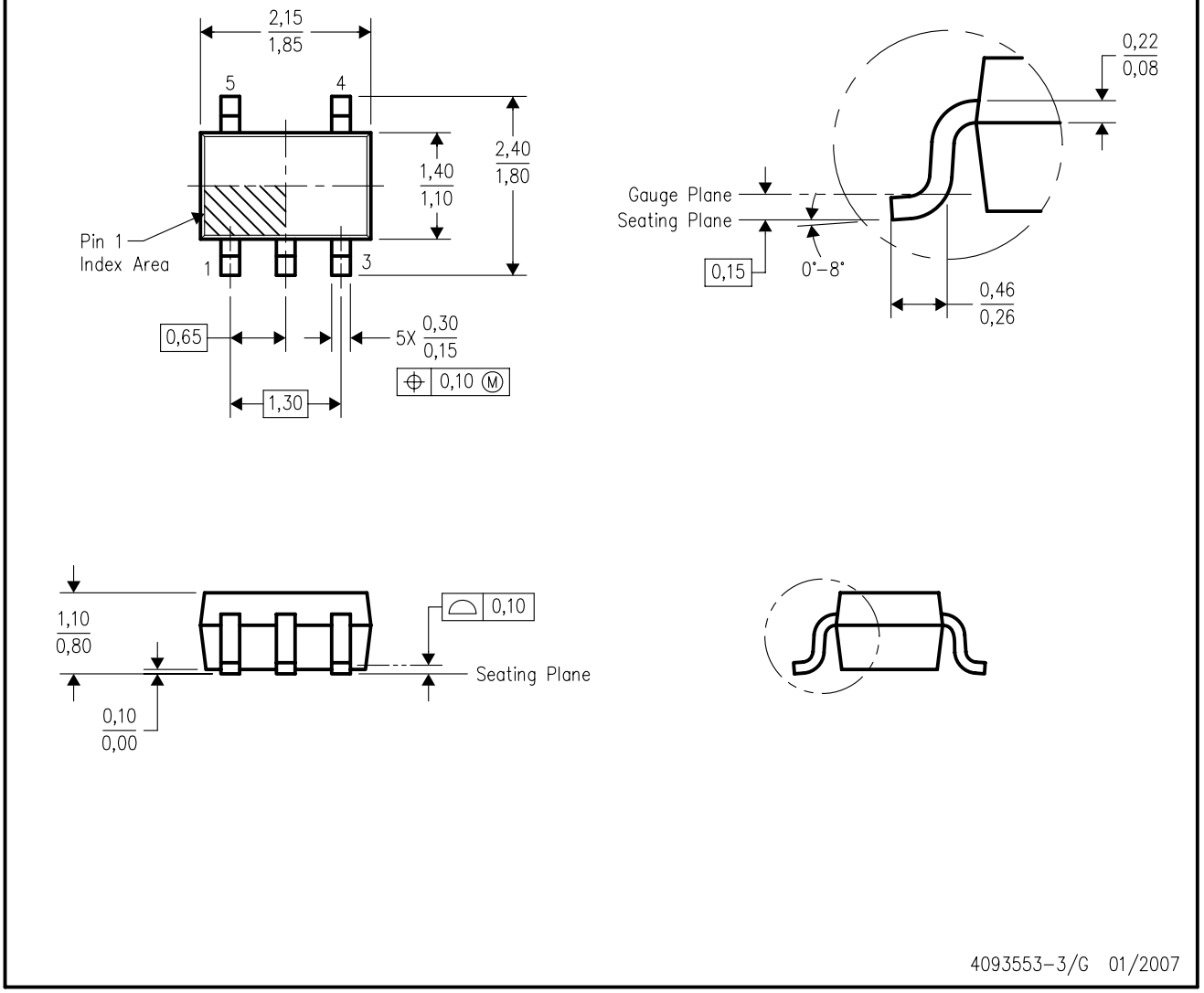
TAPE AND REEL BOX DIMENSIONS



*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.

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