

## VOLTAGE DETECTOR

### FEATURES

- 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  $\mu\text{A}$  Typical at  $V_{DD} = 3.3\text{ V}$
- Push/Pull Reset Output (TPS3805) Open-Drain Reset Output (TPS3803)
- Temperature Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 5-Pin SC-70 Package

### DESCRIPTION

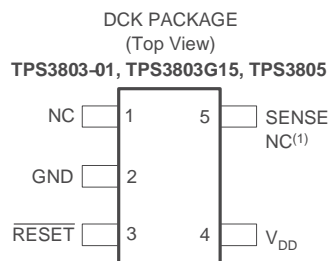
The TPS3803 and TPS3805 families of supervisory circuits provide circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

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 any of the two voltages drops below  $V_{IT}$ .

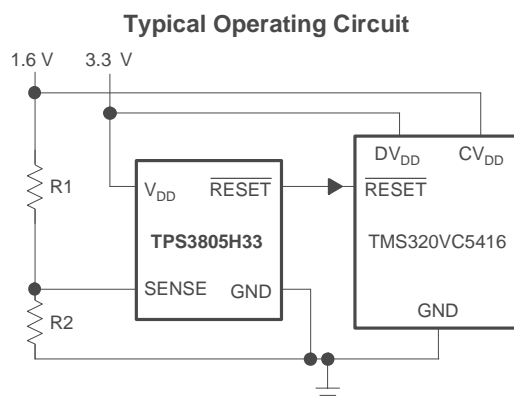
During power on,  $\overline{\text{RESET}}$  is asserted when supply voltage  $V_{DD}$  becomes higher than 0.8 V. Thereafter, the supervisory circuit monitors  $V_{DD}$  (and/or SENSE) and keeps  $\overline{\text{RESET}}$  active as long as  $V_{DD}$  or SENSE remains below the threshold voltage  $V_{IT}$ . 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. The TPS3803 and TPS3805 devices are characterized for operation over a temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

### 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



(1) NC = No Connection on TPS3803G15



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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.

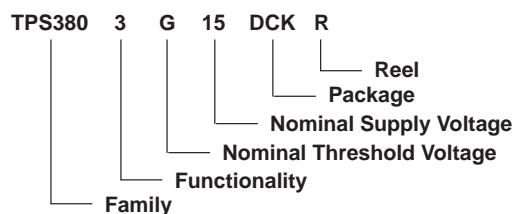
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

#### PACKAGE INFORMATION

T <sub>A</sub>	DEVICE NAME	THRESHOLD VOLTAGE		MARKING
		V <sub>DD</sub>	SENSE	
-40°C to +85°C	TPS3803-01DCKR <sup>(1)</sup>	NA	1.226 V	AWG
	TPS3803G15DCKR <sup>(1)</sup>	1.40 V	NA	AWI
	TPS3805H33DCKR <sup>(1)</sup>	3.05 V	1.226 V	AWK

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

#### ORDERING INFORMATION

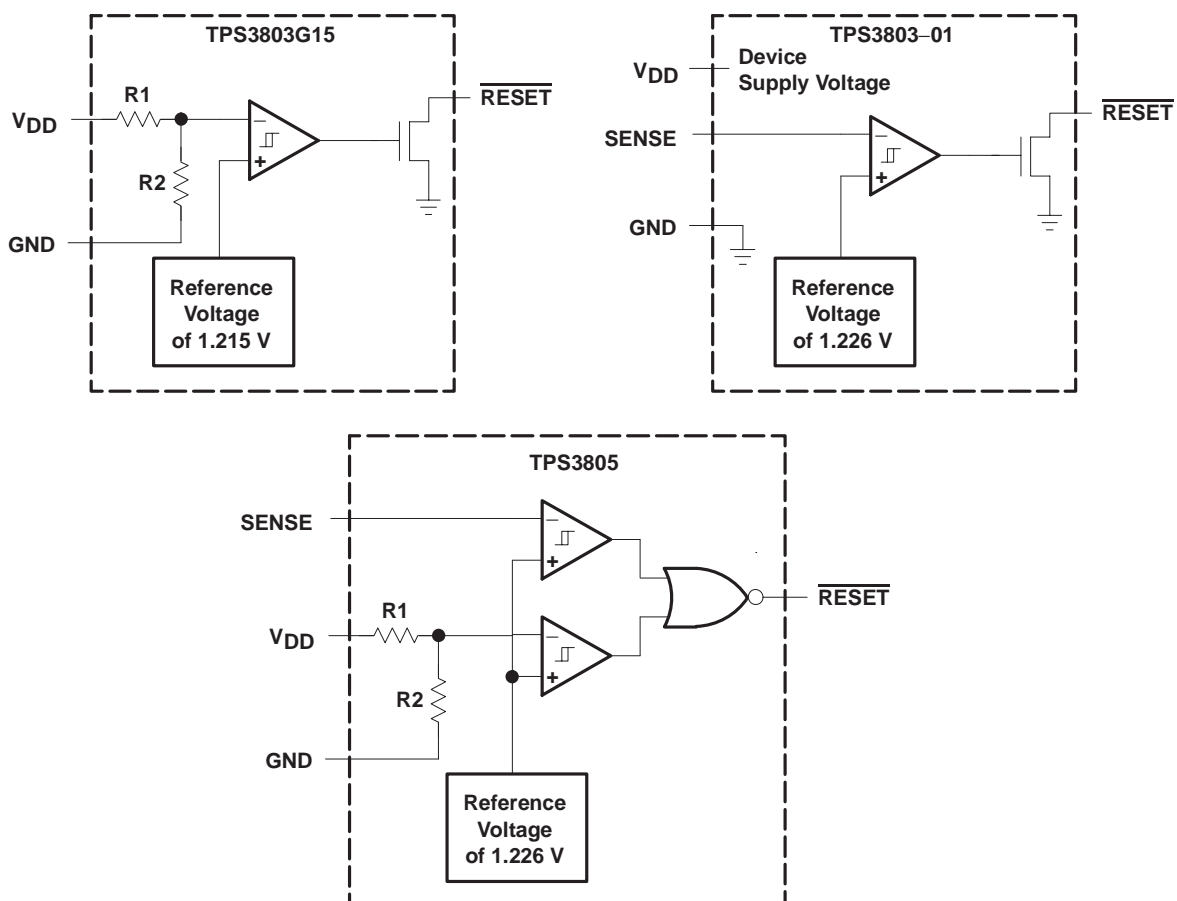


#### Function/Truth Tables

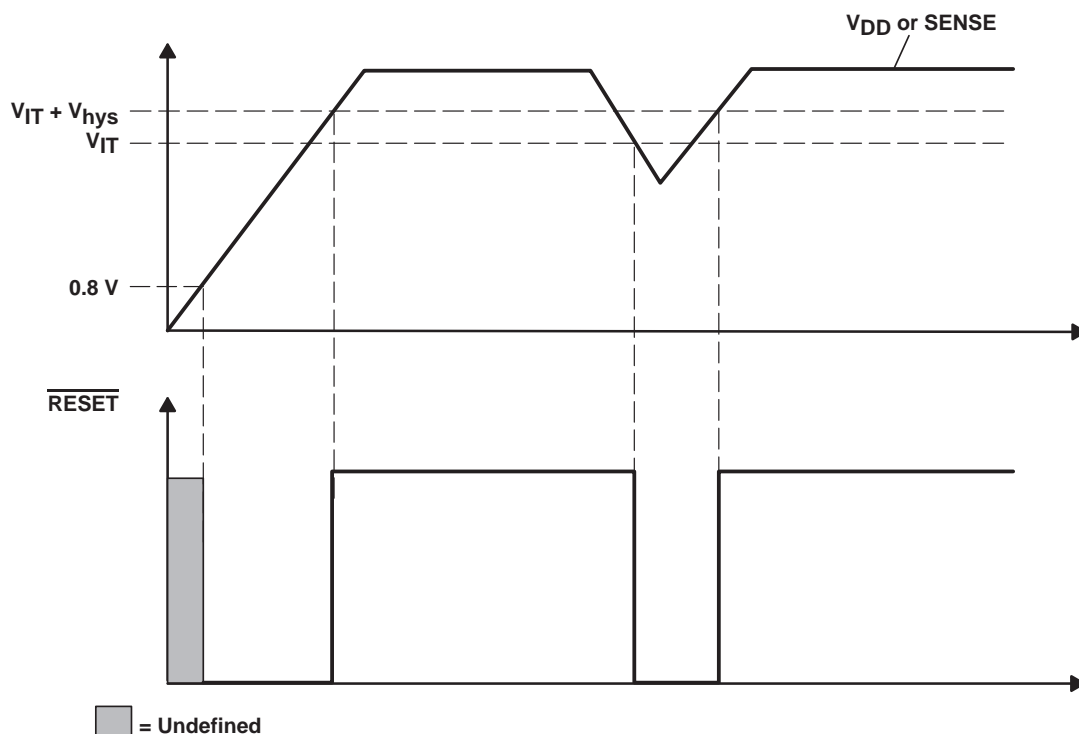
TPS3803-01		TPS3803G15	
SENSE > V <sub>IT</sub>	RESET	V <sub>DD</sub> > V <sub>IT</sub>	RESET
0	L	0	L
1	H	1	H

TPS3805H33		
V <sub>DD</sub> > V <sub>IT</sub>	SENSE > V <sub>IT</sub>	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<sup>(1)</sup>

Over operating free-air temperature range, unless otherwise noted.

Supply voltage, $V_{DD}$ <sup>(2)</sup>	+7 V
All other pins <sup>(2)</sup>	–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, $T_A$	–40°C to +85°C
Storage temperature range, $T_{stg}$	–65°C to +150°C
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 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, $T_A$	–40	85	°C

## ELECTRICAL CHARACTERISTICS

Over recommended operating free-air temperature range, unless otherwise noted.

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT	
V <sub>OH</sub>	High-level output voltage (TPS3805 only)		V <sub>DD</sub> = 1.5 V, I <sub>OH</sub> = −0.5 mA		0.8 x V <sub>DD</sub>			V	
			V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = −1.0 mA						
			V <sub>DD</sub> = 6 V, I <sub>OH</sub> = −1.5 mA						
V <sub>OL</sub>	Low-level output voltage		V <sub>DD</sub> = 1.5 V, I <sub>OL</sub> = 1.0 mA		0.3			V	
			V <sub>DD</sub> = 3.3 V, I <sub>OL</sub> = 2 mA						
			V <sub>DD</sub> = 6 V, I <sub>OL</sub> = 3 mA						
Power-up reset voltage <sup>(1)</sup>		V <sub>IT</sub> > 1.5 V, T <sub>A</sub> = 25°C		0.8			V		
		V <sub>IT</sub> ≤ 1.5 V, T <sub>A</sub> = 25°C		1.0			V		
V <sub>IT</sub>	Negative-going input threshold voltage <sup>(2)</sup>	SENSE	T <sub>A</sub> = −40°C to +85°C		1.208	1.226	1.244	V	
		TPS3803G15			1.379	1.4	1.421		
		TPS3805H33			3.004	3.05	3.096		
V <sub>hys</sub>	Hysteresis		1.2 V < V <sub>IT</sub> < 2.5 V		15			mV	
			2.5 V < V <sub>IT</sub> < 3.5 V		30				
I <sub>I</sub>	Input current	SENSE			−25			25	nA
I <sub>OH</sub>	High-level output current at <u>RESET</u>	Open drain only	V <sub>DD</sub> = V <sub>IT</sub> + 0.2V, V <sub>OH</sub> = V <sub>DD</sub>		300			nA	
I <sub>DD</sub>	Supply current		TPS3803−01	V <sub>DD</sub> = 3.3 V, output unconnected	2			4	μA
			TPS3805, TPS3803G15		3			5	
			TPS3803−01	V <sub>DD</sub> = 6 V, output unconnected	2			4	
			TPS3805, TPS3803G15		4			6	
C <sub>I</sub>	Input capacitance		V <sub>I</sub> = 0 V to V <sub>DD</sub>		1			pF	

(1) The lowest supply voltage at which  $\overline{\text{RESET}}$  (V<sub>OL(max)</sub> = 0.2 V, I<sub>OL</sub> = 50 μA) becomes active. t<sub>r</sub>(V<sub>DD</sub>) ≥ 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<sub>L</sub> = 1 MΩ, C<sub>L</sub> = 50 PF, T<sub>A</sub> = -40°C TO +85°C.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>w</sub>	Pulse width	At V <sub>DD</sub> At SENSE	V <sub>IH</sub> = 1.05 x V <sub>IT</sub> , V <sub>IL</sub> = 0.95 x V <sub>IT</sub>		5.5	μs

## SWITCHING CHARACTERISTICS

AT R<sub>L</sub> = 1 MΩ, C<sub>L</sub> = 50 PF, T<sub>A</sub> = -40°C TO +85°C.

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

## TYPICAL CHARACTERISTICS

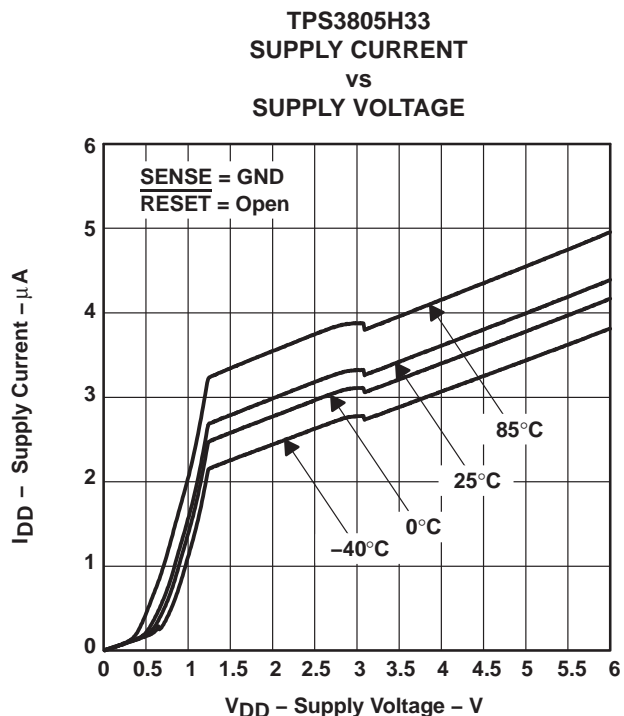


Figure 1

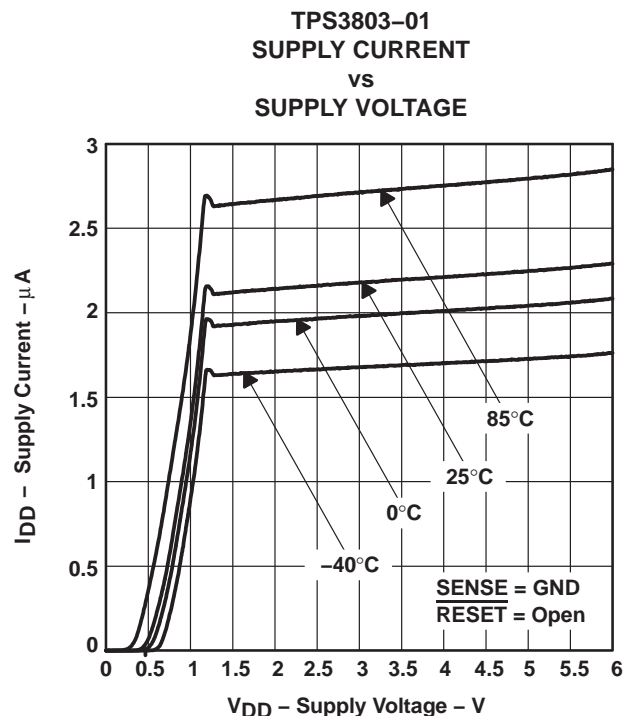


Figure 2

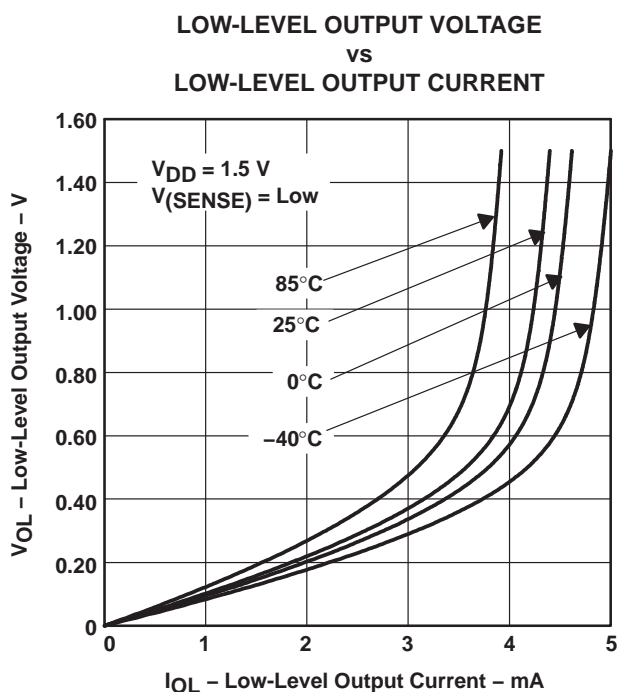


Figure 3

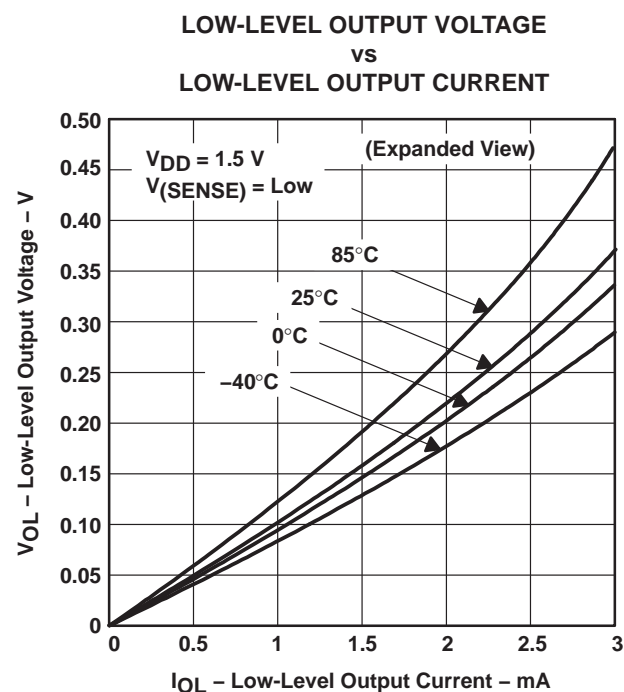


Figure 4

# TYPICAL CHARACTERISTICS (continued)

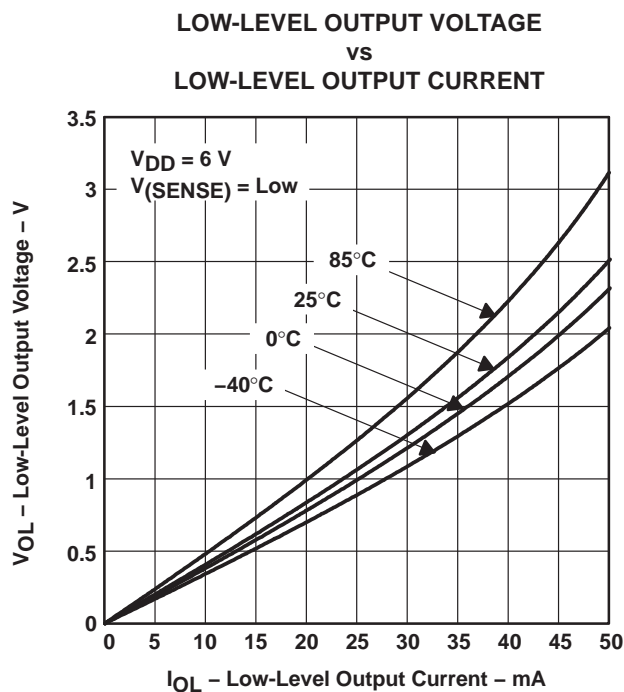


Figure 5

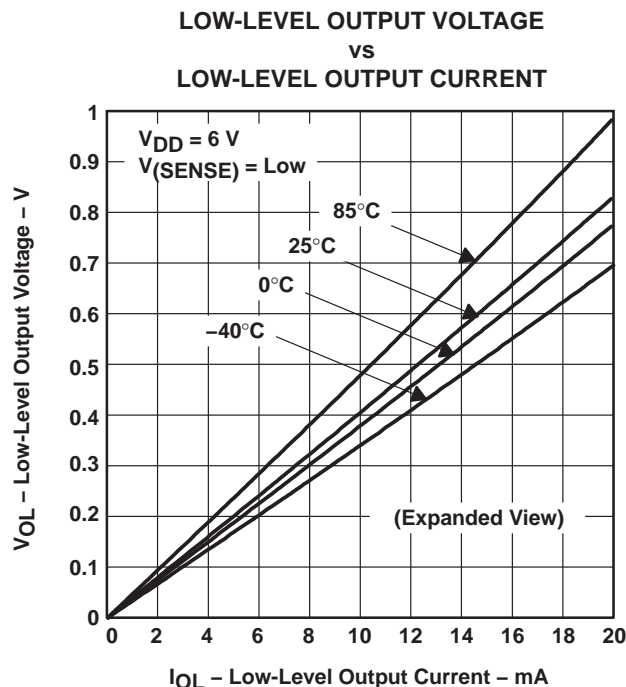


Figure 6

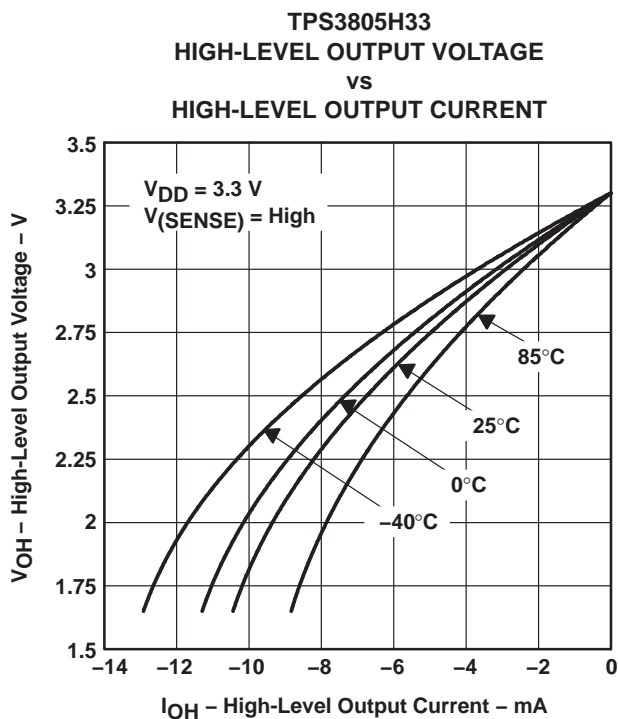


Figure 7

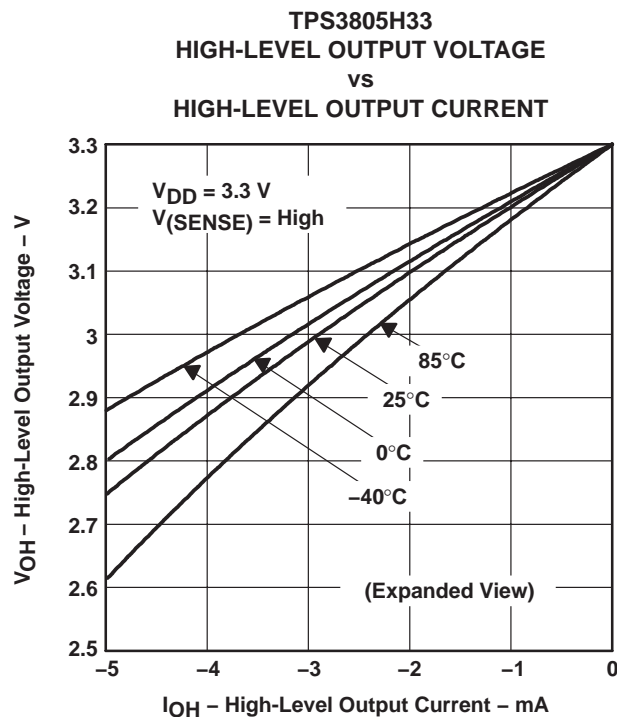


Figure 8



# TYPICAL CHARACTERISTICS (continued)

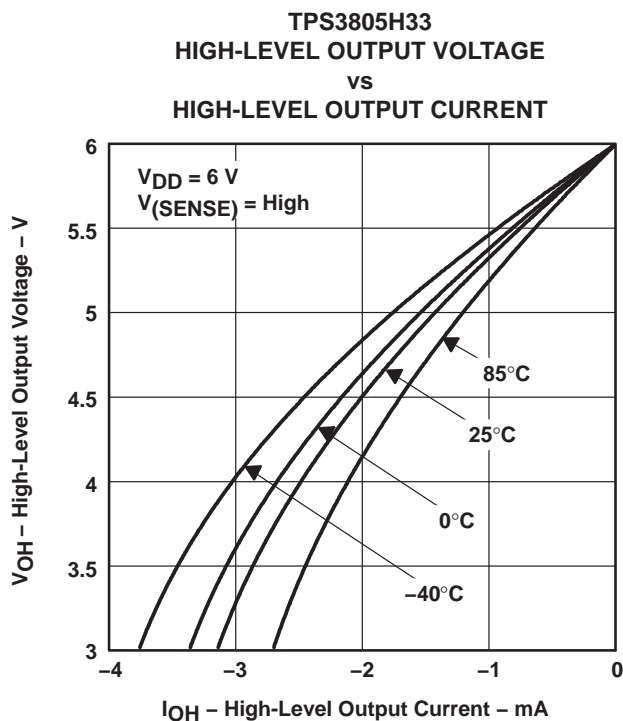


Figure 9

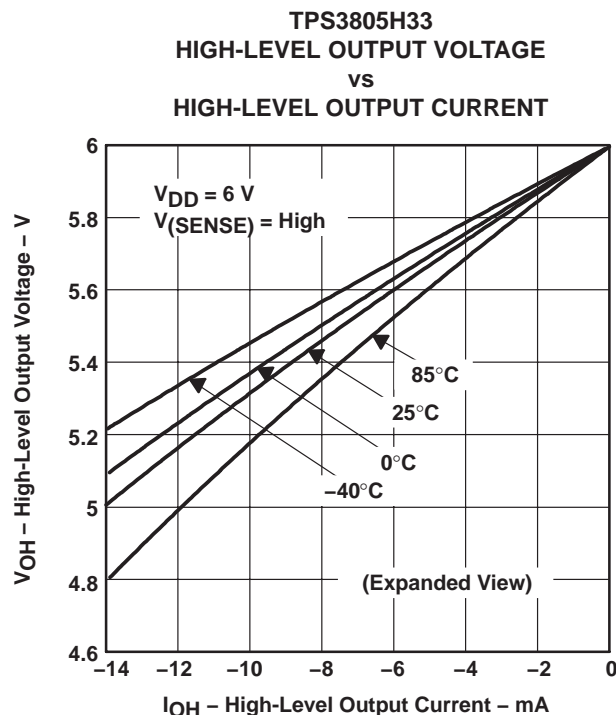


Figure 10

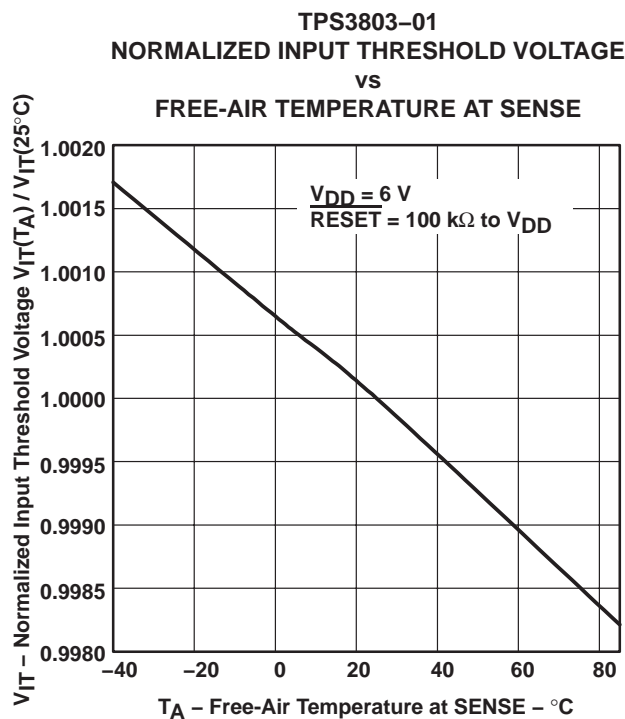


Figure 11

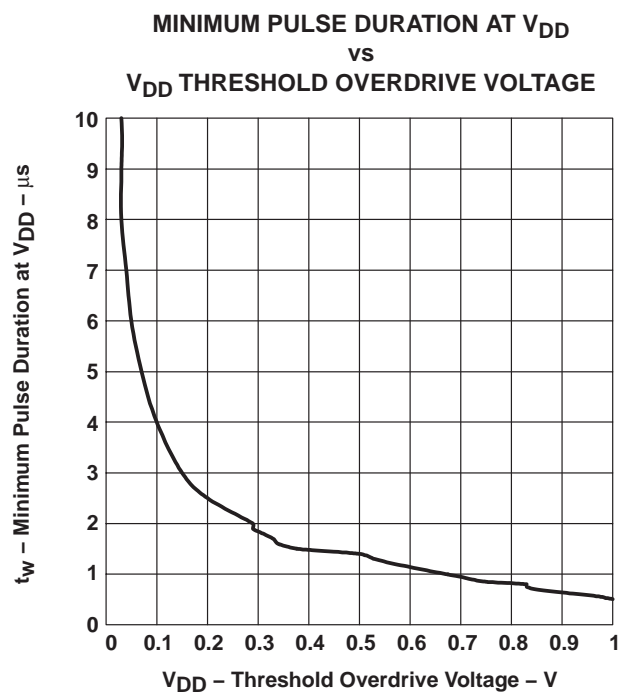


Figure 12

## TYPICAL CHARACTERISTICS (continued)

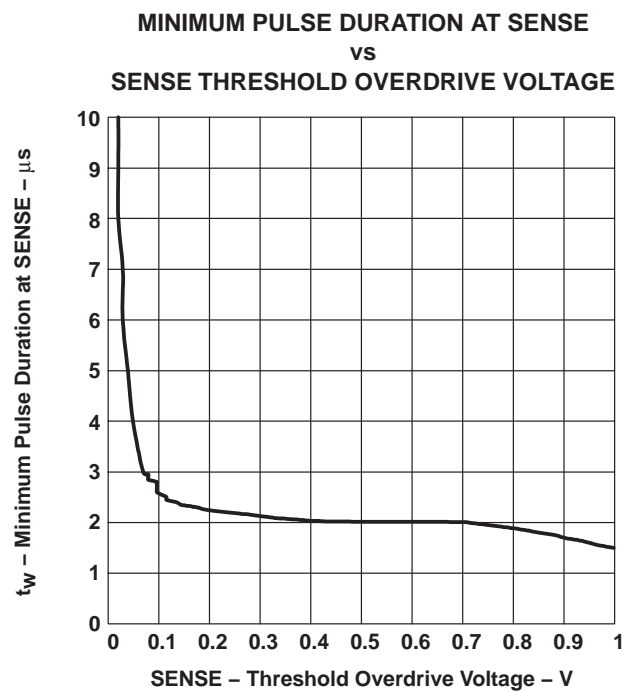


Figure 13

Revision History

DATE	REV	PAGE	SECTION	DESCRIPTION
6/07	A	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 part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">TPS3803-01DCKR</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	AWG
TPS3803-01DCKR.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	AWG
<a href="#">TPS3803G15DCKR</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-	AWI
TPS3803G15DCKR.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	AWI
<a href="#">TPS3805H33DCKR</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	AWK
TPS3805H33DCKR.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	AWK

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts 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.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**OTHER QUALIFIED VERSIONS OF TPS3803, TPS3805H33 :**

- Automotive : [TPS3803-Q1](#), [TPS3805H33-Q1](#)
- Enhanced Product : [TPS3803-EP](#), [TPS3805H33-EP](#)

## NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

## 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
TPS3803-01DCKR	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
TPS3803G15DCKR	SC70	DCK	5	3000	180.0	8.4	2.41	2.41	1.2	4.0	8.0	Q3
TPS3805H33DCKR	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	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)
TPS3803-01DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
TPS3803G15DCKR	SC70	DCK	5	3000	183.0	183.0	20.0
TPS3805H33DCKR	SC70	DCK	5	3000	180.0	180.0	18.0

DCK0005A



## PACKAGE OUTLINE

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR

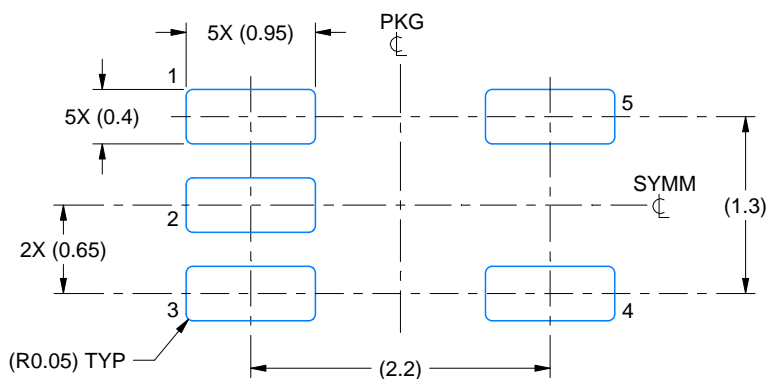


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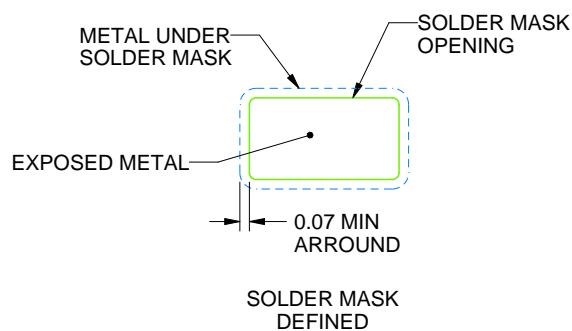
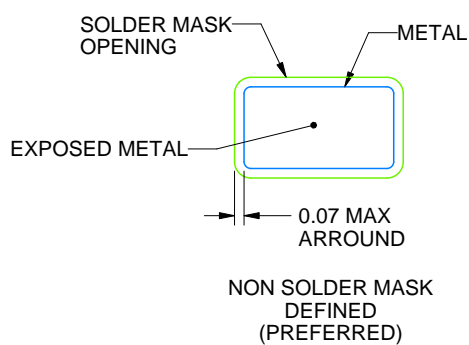
### NOTES:

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. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side





LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X



SOLDER MASK DETAILS

4214834/G 11/2024

NOTES: (continued)

7. Publication IPC-7351 may have alternate designs.

8. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE  
BASED ON 0.125 THICK STENCIL  
SCALE:18X

4214834/G 11/2024

NOTES: (continued)

9. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
10. Board assembly site may have different recommendations for stencil design.

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