

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

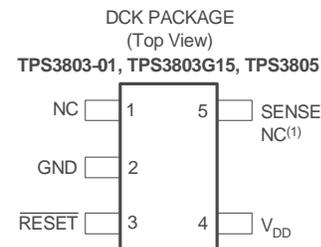
- **Applications Using DSPs, Microcontrollers, or Microprocessors**
- **Wireless Communication Systems**
- **Portable/Battery-Powered Equipment**
- **Programmable Controls**
- **Intelligent Instruments**
- **Industrial Equipment**
- **Notebook/Desktop Computers**
- **Automotive Systems**

DESCRIPTION

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

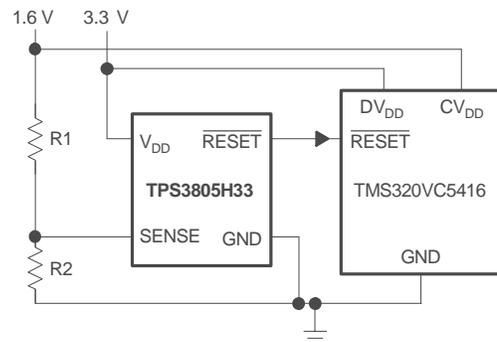
The TPS3803G15 device has a fixed-sense threshold voltage V_{IT} set by an internal voltage divider, whereas the TPS3803–01 has an adjustable SENSE input that can be configured by two external resistors. In addition to the fixed sense threshold monitored at V_{DD} , the TPS3805 devices provide a second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

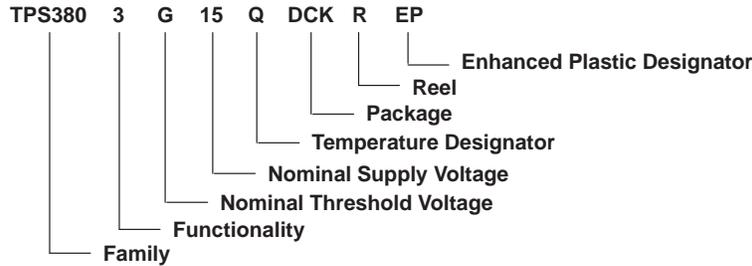
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

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

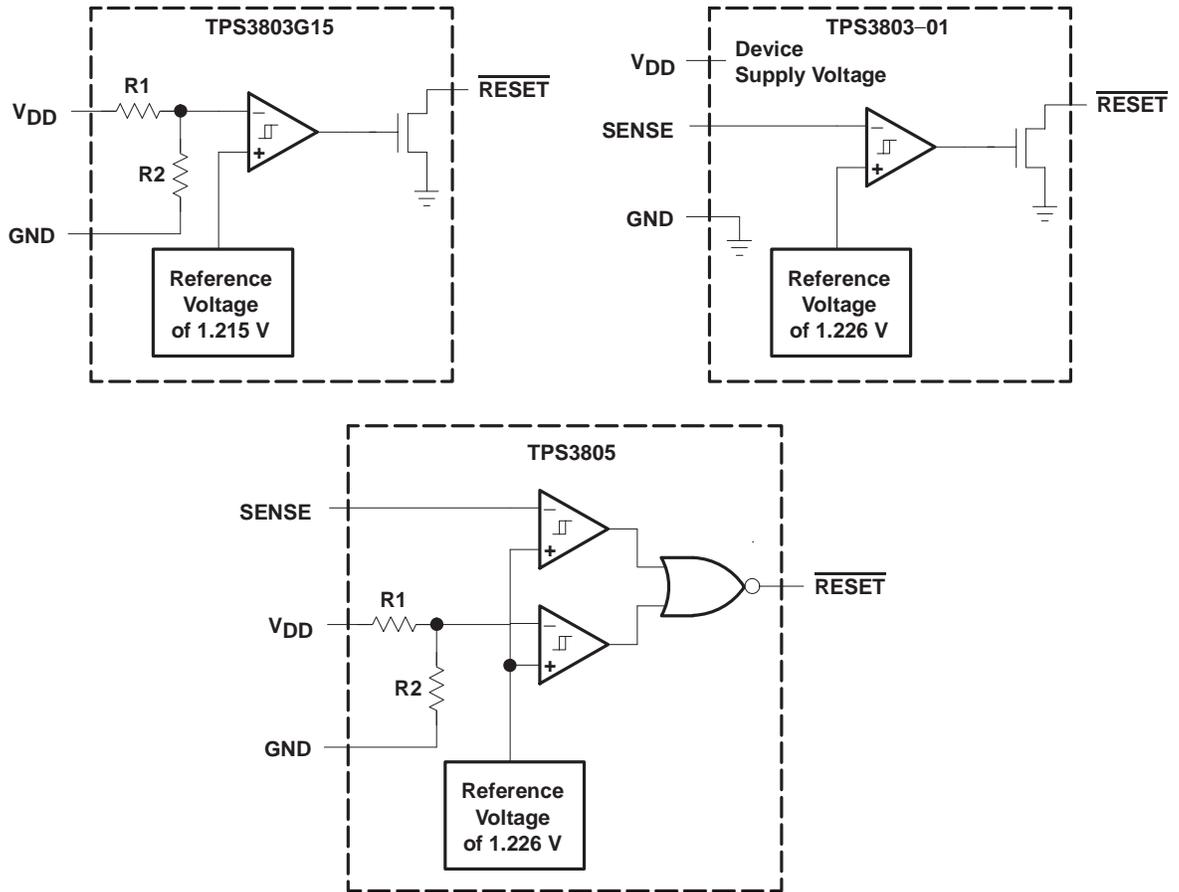


Function/Truth Tables

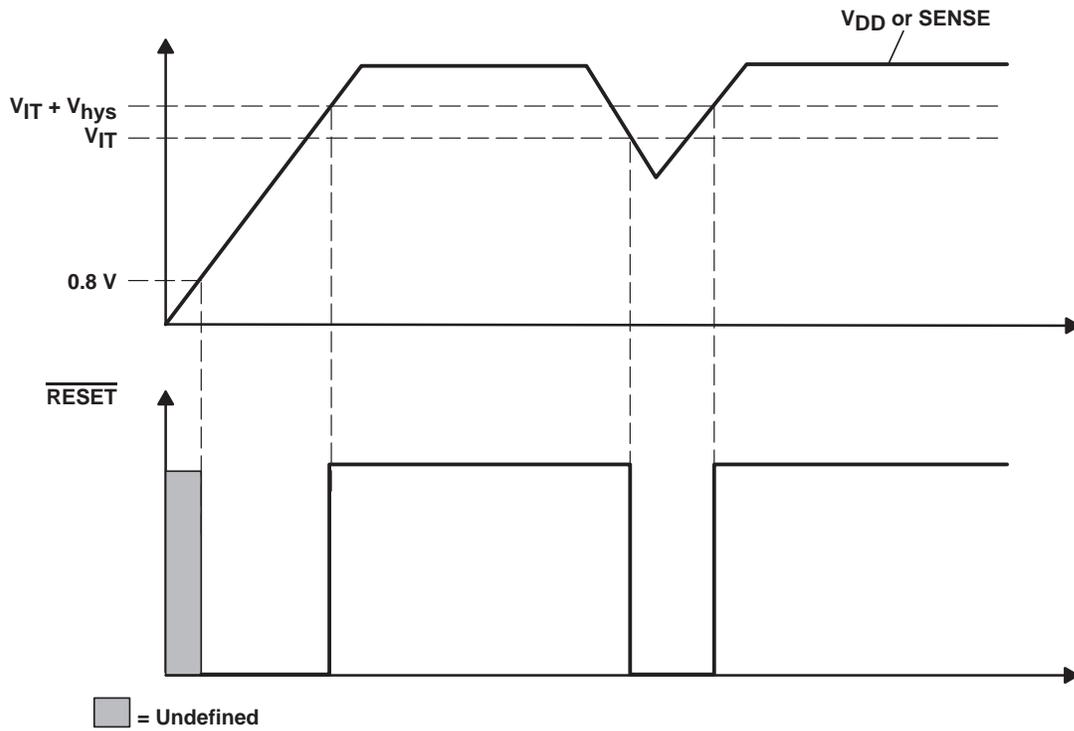
TPS3803-01		TPS3803G15	
SENSE > V _{IT}	RESET	V _{DD} > V _{IT}	RESET
0	L	0	L
1	H	1	H

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
$\overline{\text{RESET}}$	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	$T_A < +25^\circ\text{C}$ 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	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 $\overline{\text{RESET}}$ (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.

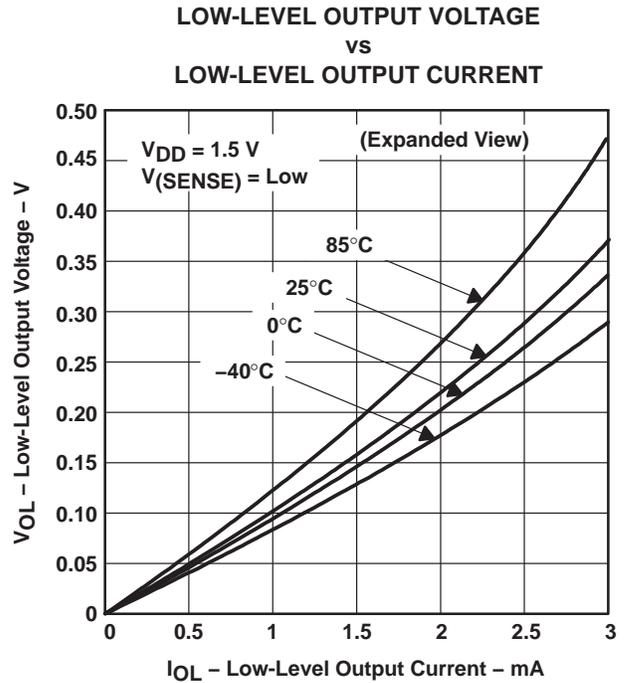
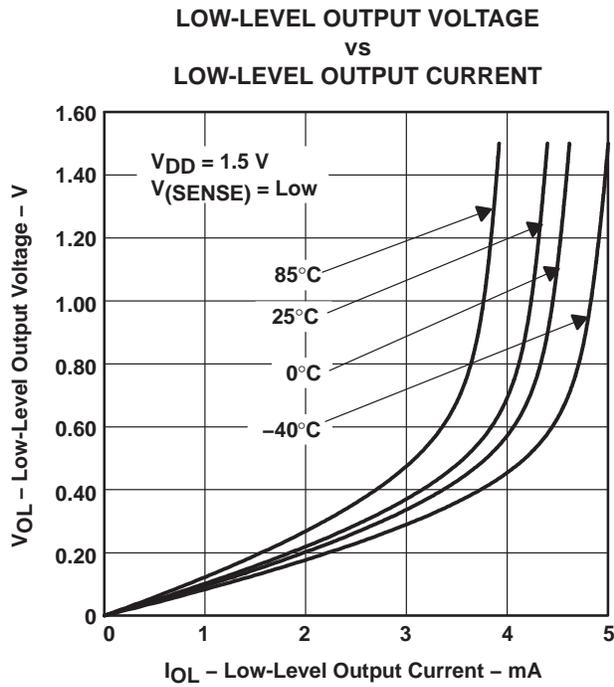
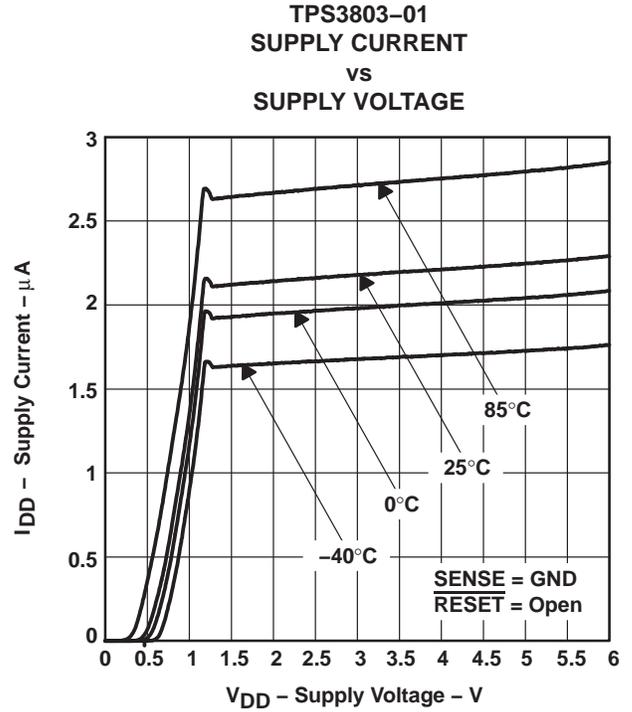
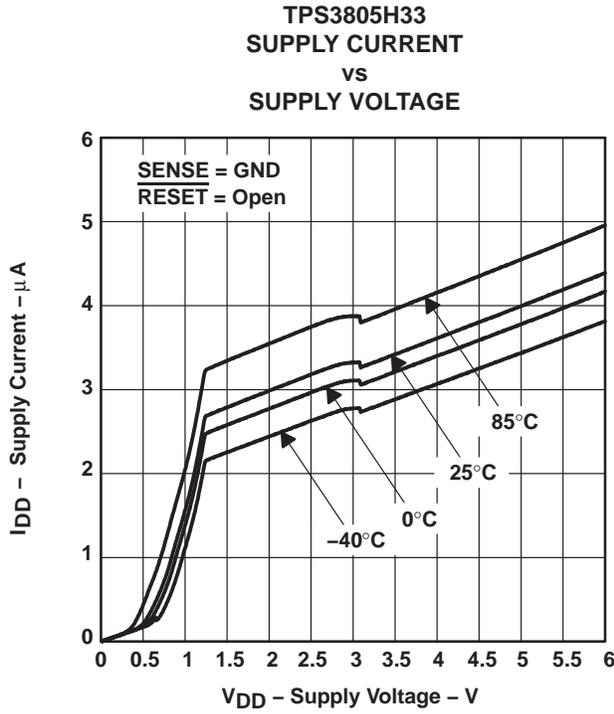
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _w	At V _{DD}	V _{IH} = 1.05 x V _{IT} , V _{IL} = 0.95 x V _{IT}	5.5			μs
	At SENSE					

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

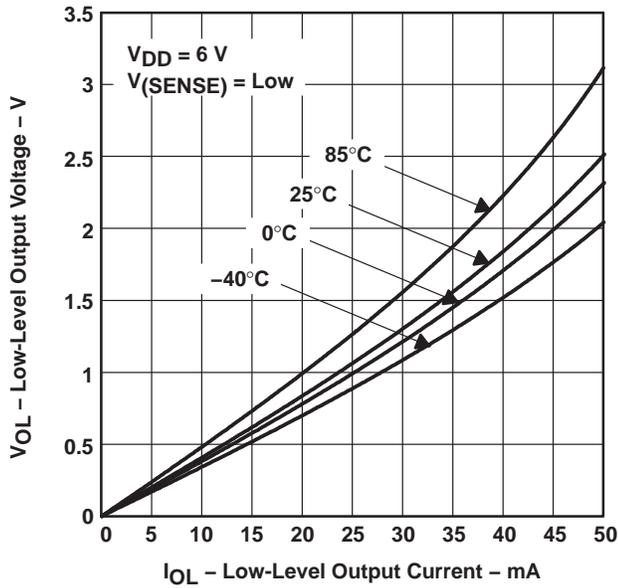


Figure 5

LOW-LEVEL OUTPUT VOLTAGE
 vs
 LOW-LEVEL OUTPUT CURRENT

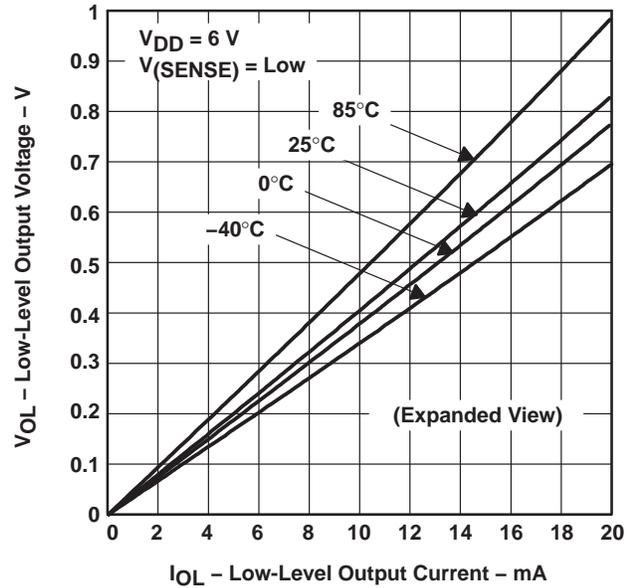


Figure 6

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

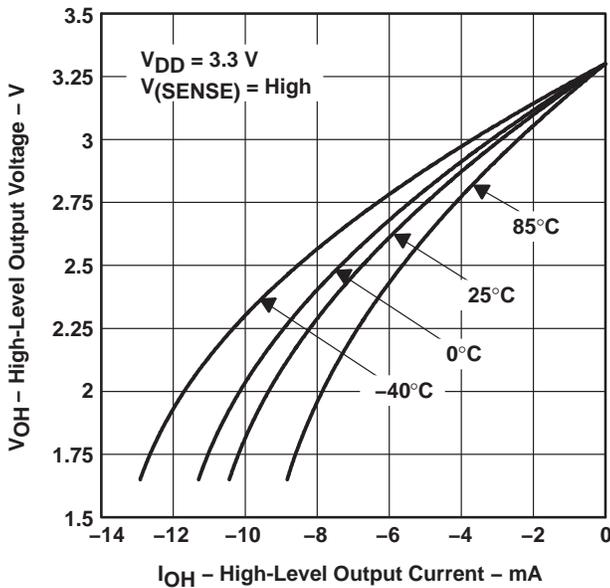


Figure 7

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

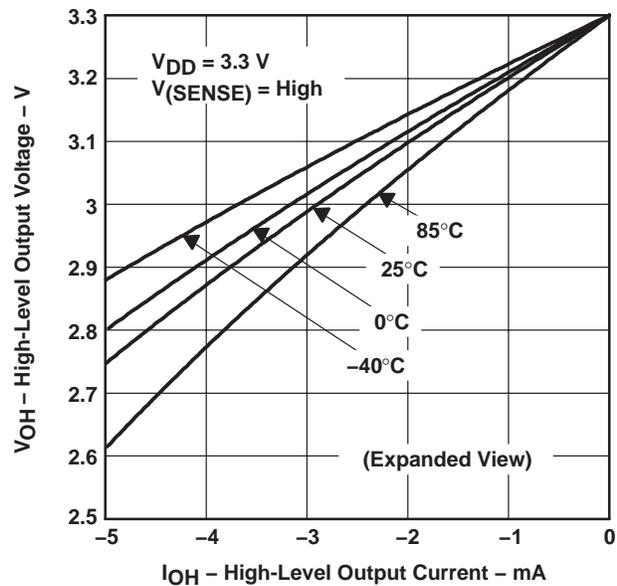


Figure 8

TYPICAL CHARACTERISTICS

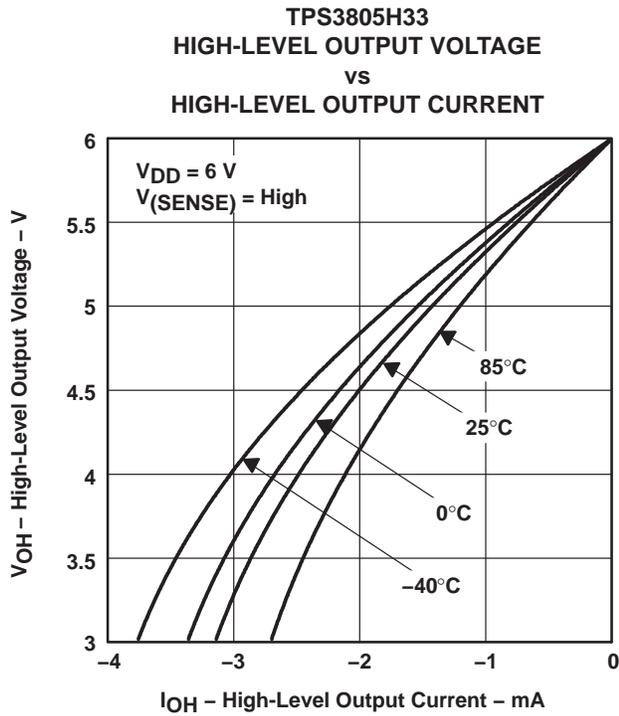


Figure 9

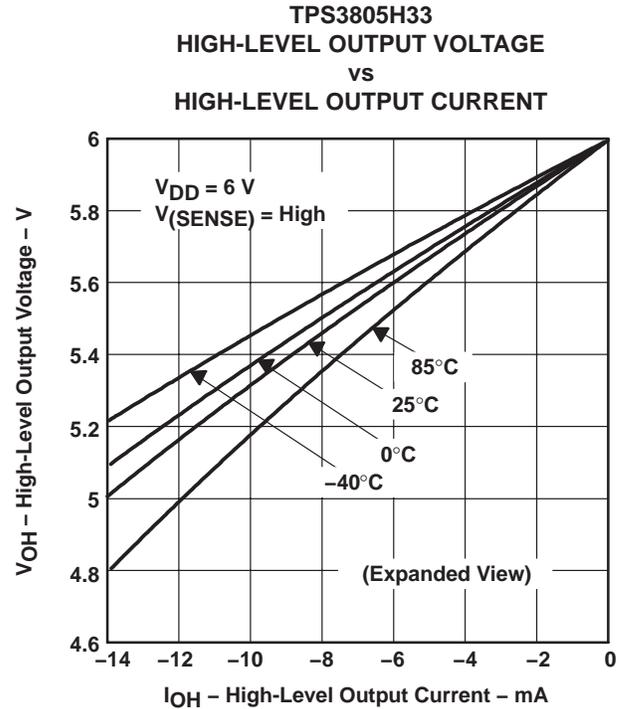


Figure 10

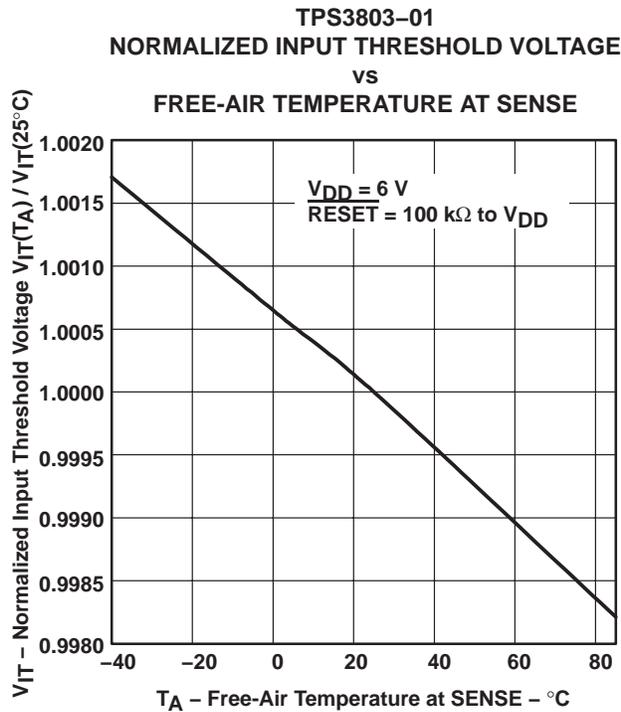


Figure 11

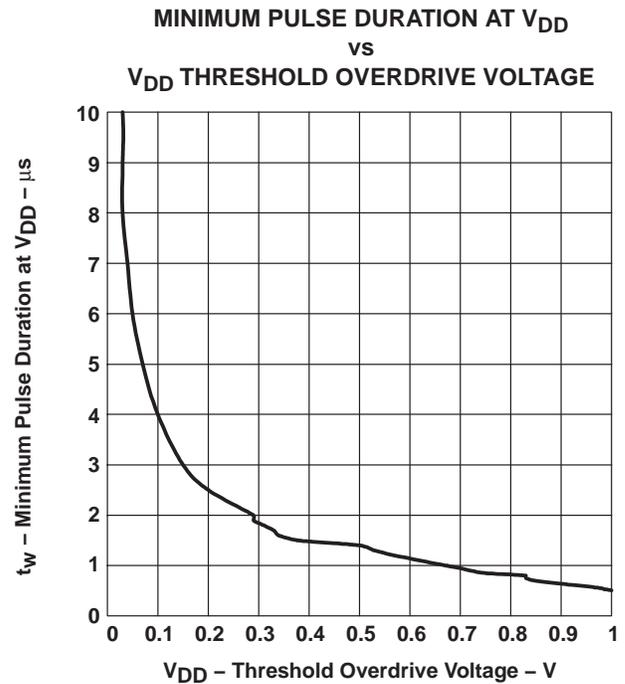


Figure 12

TYPICAL CHARACTERISTICS

MINIMUM PULSE DURATION AT SENSE
vs
SENSE THRESHOLD OVERDRIVE VOLTAGE

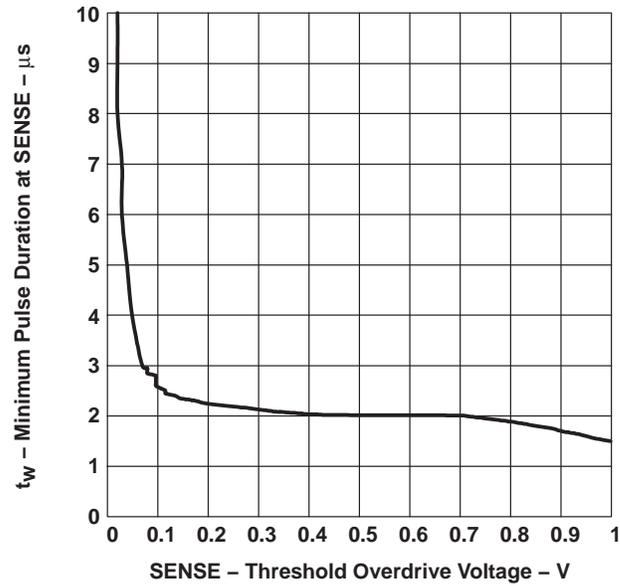


Figure 13

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 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)
TPS3803-01MDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	BAY
TPS3803-01QDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AWH
TPS3803G15MDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-55 to 125	ARH
TPS3803G15QDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	AXT
TPS3805H33MDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-55 to 125	ARJ
TPS3805H33QDCKREP	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	AWY
V62/04648-01XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AWH
V62/04648-02XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	AXT
V62/04648-03XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	AWY
V62/04648-04XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	BAY
V62/04648-05XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-55 to 125	ARH
V62/04648-06XE	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-55 to 125	ARJ

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

(2) **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.

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

(4) **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.

(5) **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.

(6) **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-EP, TPS3805H33-EP :

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

NOTE: Qualified Version Definitions:

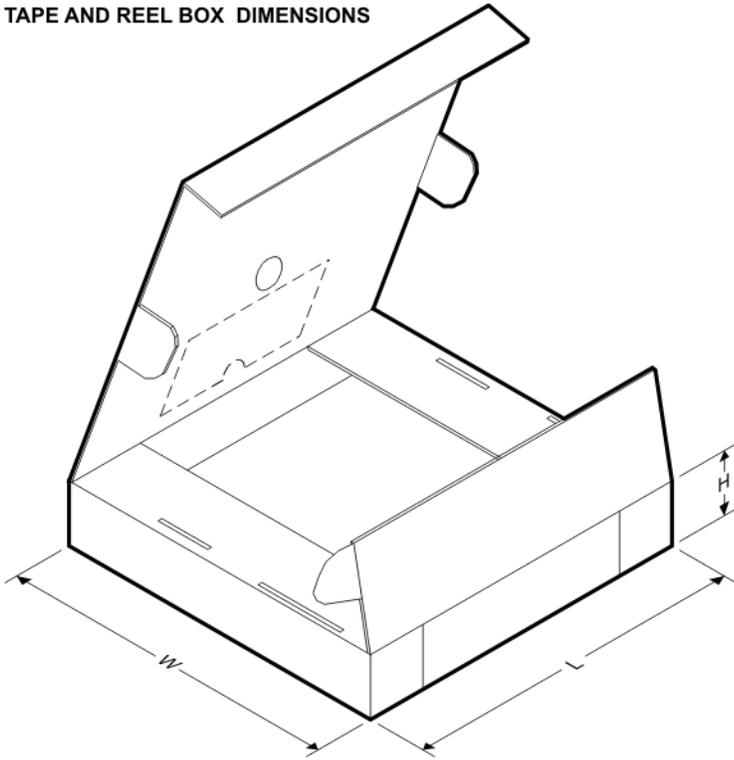
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

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

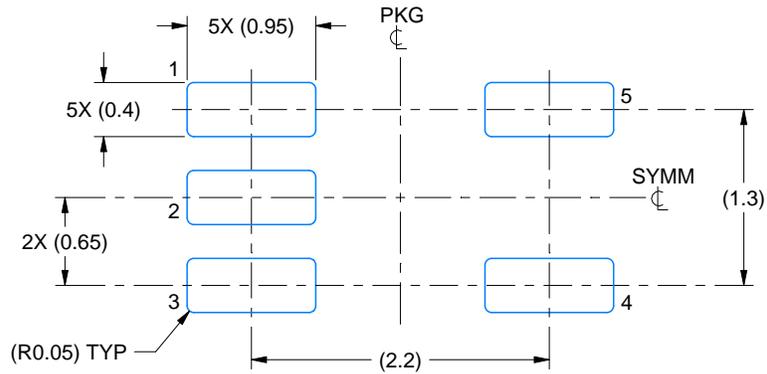
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3803-01MDCKREP	SC70	DCK	5	3000	202.0	201.0	28.0
TPS3803-01QDCKREP	SC70	DCK	5	3000	202.0	201.0	28.0
TPS3803G15MDCKREP	SC70	DCK	5	3000	202.0	201.0	28.0
TPS3803G15QDCKREP	SC70	DCK	5	3000	202.0	201.0	28.0
TPS3805H33MDCKREP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

EXAMPLE BOARD LAYOUT

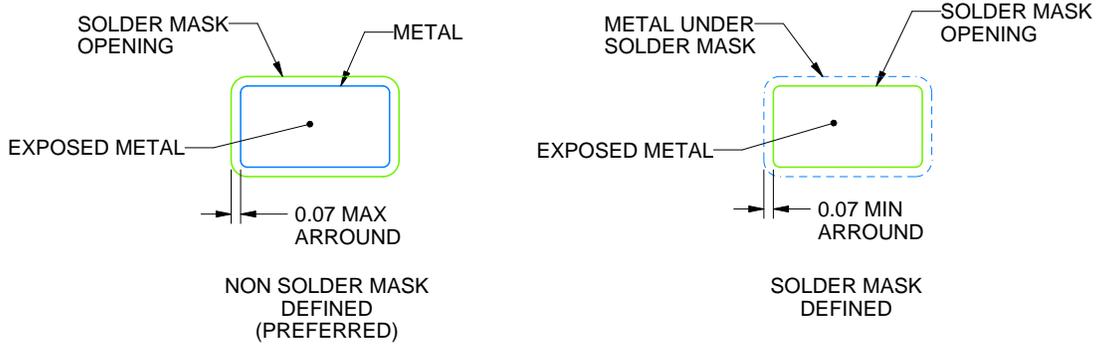
DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4214834/G 11/2024

NOTES: (continued)

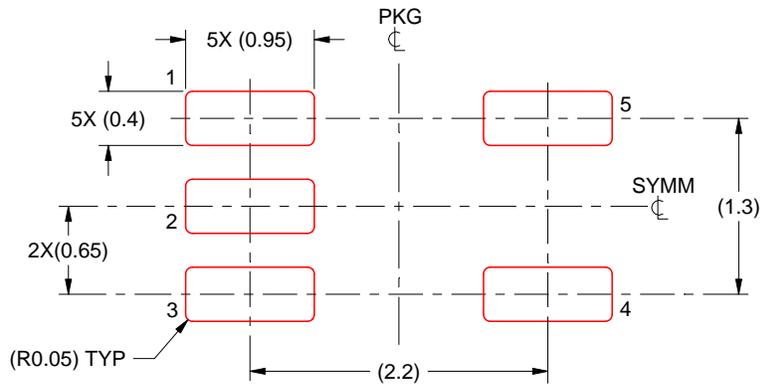
- 7. Publication IPC-7351 may have alternate designs.
- 8. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



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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