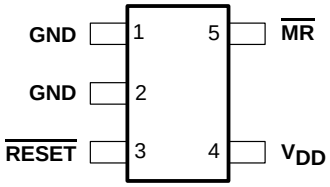
features

- 5-Pin SC-70 (SOT-323) Package
- Supply Current of 9 μA (Typ)
- Power-On Reset Generator With Fixed Delay Time
  - TPS3800 = 100 ms
  - TPS3801 = 200 ms
  - TPS3802 = 400 ms
- Precision Supply Voltage Monitor 1.8 V, 2.5 V, 2.7 V, 3 V, 3.3 V, 5 V, and Adjustable
- Manual Reset Input (Except TPS3801–01)
- Temperature Range . . . –40°C to 85°C

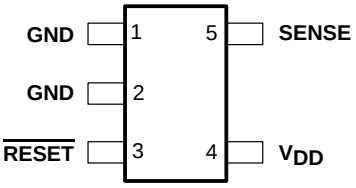
applications

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

TPS380x . . . DCK PACKAGE
(TOP VIEW)



TPS3801–01 . . . DCK PACKAGE
(TOP VIEW)



description

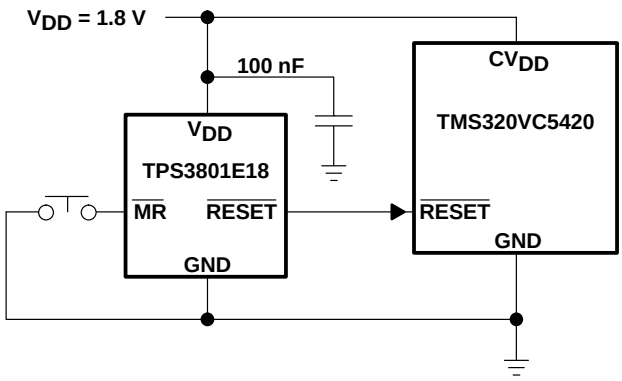
The TPS380x family of supervisory circuits provide circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

During power-on, $\overline{\text{RESET}}$ is asserted when the supply voltage V_{DD} becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} (or SENSE) and keeps $\overline{\text{RESET}}$ active as long as V_{DD} (or SENSE) remains below the threshold voltage (V_{IT}). An internal timer delays the return of the output to the inactive state (high) to ensure proper system reset. The delay time (t_d) starts after V_{DD} (or SENSE) has risen above the threshold voltage (V_{IT}). When the supply voltage drops below the threshold voltage (V_{IT}) the output becomes active (low) again. No external components are required. All the devices of this family have a fixed sense-threshold voltage (V_{IT}) set by an internal voltage divider, except for the TPS3801–01, which can be customized with two external resistors at the SENSE input.

The TPS380x devices, except the TPS3801–01, incorporate a manual reset input ($\overline{\text{MR}}$). A low level at $\overline{\text{MR}}$ causes $\overline{\text{RESET}}$ to become active.

The product spectrum is designed for supply voltages of 1.8 V, 2.5 V, 2.7 V, 3 V, 3.3 V, and 5 V. The circuits are available in a 5-pin SC-70 (SOT-323) package, which is only about half the size of a 5-pin SOT-23 package.

typical applications



The TPS3801–01 can monitor voltages as low as 1.14 V, depending on the configuration of the external resistor divider.

The TPS380x devices are characterized for operation over a temperature range of –40°C to 85°C.

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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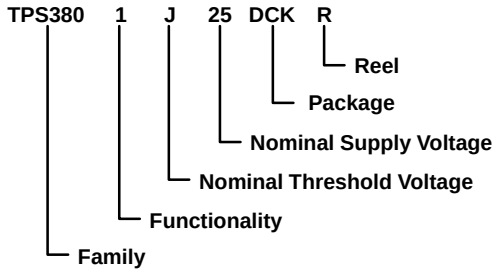
AVAILABLE OPTIONS

T_A	DEVICE NAME	THRESHOLD VOLTAGE	TYP DELAY TIME	MARKING
–40°C to 85°C	TPS3801-01DCK	1.14 V	200 ms	ARF
	TPS3801E18DCK	1.71 V	200 ms	ARE
	TPS3801J25DCK	2.25 V	200 ms	NJA
	TPS3800G27DCK	2.5 V	95 ms	ARI
	TPS3801L30DCK	2.64 V	200 ms	NPA
	TPS3801K33DCK	2.93 V	200 ms	NWA
	TPS3802L30DCK	2.64 V	380 ms	ASA
	TPS3802K33DCK	2.93 V	380 ms	ARK
	TPS3801T50DCK	4 V	25 ms	AVI
	TPS3801I50DCK	4.55 V	200 ms	NSA

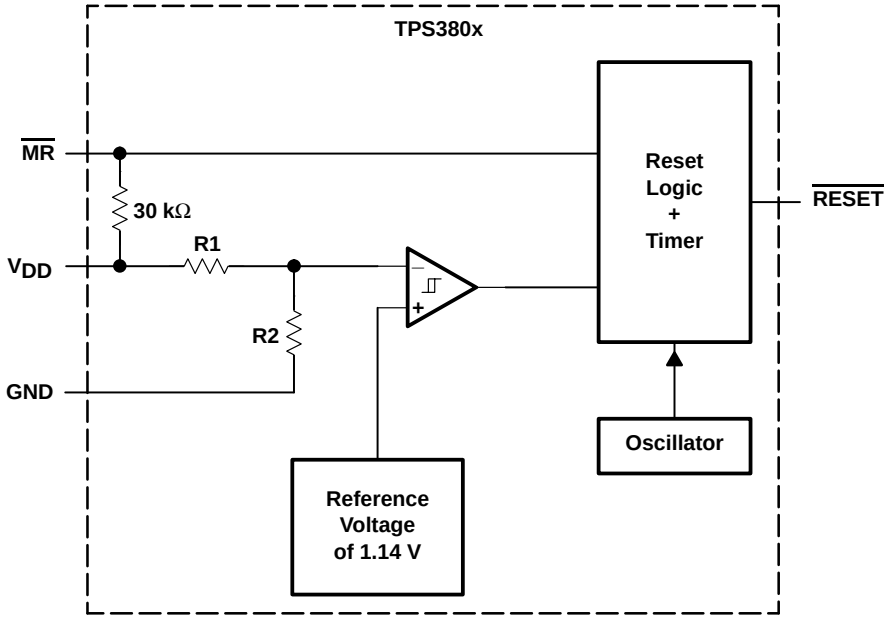
FUNCTION/TRUTH TABLE, TPS380x

$\overline{MR}$	$V_{DD}>V_{IT}$	$\overline{RESET}$
L	0	L
L	1	L
H	0	L
H	1	H

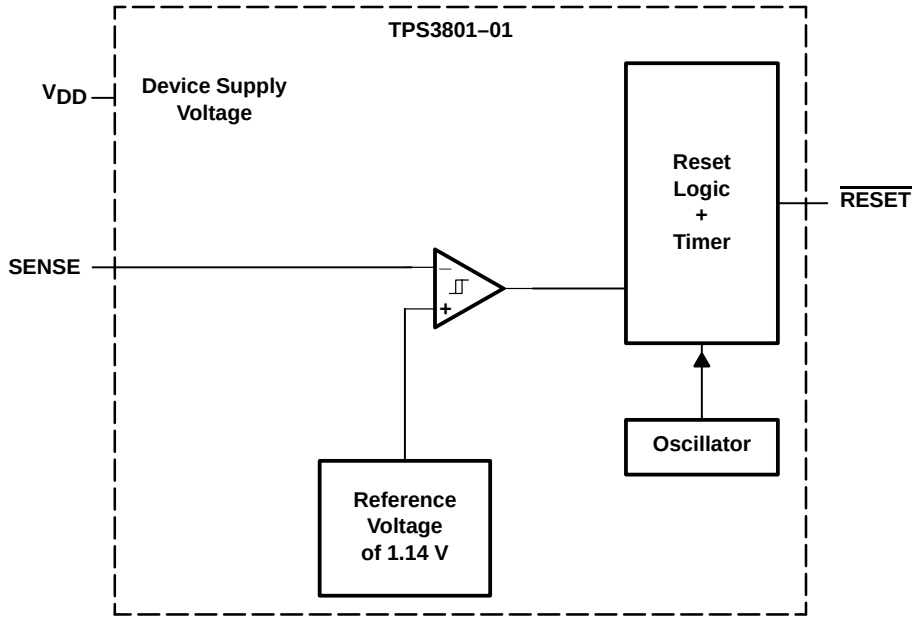
ORDERING INFORMATION



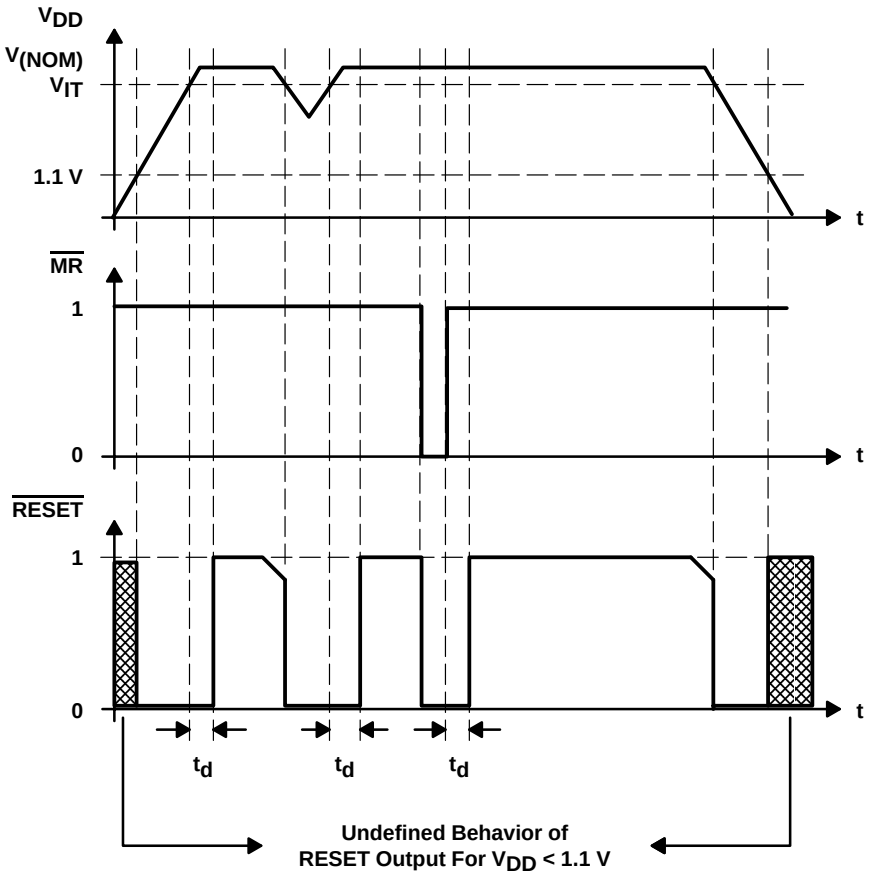
functional block diagram



functional block diagram (continued)



timing diagram



NOTE: $\overline{\text{RESET}}$ should not be forced high during the power-up sequence (until $V_{DD} > 1.1$ V).

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V_{DD} (see Note1) . . . . . 7 V
All other pins (see Note 1) . . . . . –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 $V_I > V_{DD}$) . . . . . ±20 mA
Output-clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{DD}$) . . . . . ±20 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

† 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.

NOTE 1: All voltage values are with respect to GND. For reliable operation, the device should not be operated at 7 V for more than t=1000h continuously.

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 at specified temperature range

		MIN	MAX	UNIT
Supply voltage, V_{DD}	TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, TPS3801T50	2	6	V
	All other devices	1.6	4	
Input voltage, V_I		0	V_{DD}+0.3	V
High-level input voltage, V_{IH}		0.7×V_{DD}		V
Low-level input voltage, V_{IL}			0.3×V_{DD}	V
Input transition rise and fall rate at $\overline{MR}$, $\Delta t/\Delta V$			100	ns/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_{OH}	High-level output voltage		V_{DD} = 1.6 V to 6 V, I_{OH} = –500 µA	V_{DD} –0.2			V
			V_{DD} = 3.3 V, I_{OH} = –2 mA	V_{DD} –0.4			
			V_{DD} = 6 V, I_{OH} = –4 mA (see Note 4)	V_{DD} –0.4			
V_{OL}	Low-level output voltage		V_{DD} = 1.6 V to 6 V, I_{OL} = 500 µA			0.2	V
			V_{DD} = 3.3 V, I_{OL} = 2 mA			0.4	
			V_{DD} = 6 V, I_{OL} = 4 mA (see Note 4)			0.4	
	Power-up reset voltage (see Note 2)		V_{DD} ≥ 1.1 V, I_{OL} = 50 µA			0.2	V
$V_{IT–}$	Negative-going input threshold voltage (see Note 3)	TPS380x-01	T_A = –40°C to 85°C	1.117	1.14	1.163	V
		TPS380xE18		1.67	1.71	1.75	
		TPS380xJ25		2.2	2.25	2.3	
		TPS380xG27		2.45	2.5	2.55	
		TPS380xL30		2.58	2.64	2.7	
		TPS380xK33		2.87	2.93	2.99	
		TPS380xI50		4.45	4.55	4.65	
		TPS380xT50		3.92	4	4.08	
V_{hys}	Hysteresis	TPS380x-01			15		mV
		TPS380xx18			25		
		TPS380xx25			30		
		TPS380xx27			35		
		TPS380xx30			35		
		TPS380xx33			40		
		TPS380xx50			60		
I_{IH}	High-level input current	$\overline{MR}$	$\overline{MR}$ = 0.7×V_{DD}, V_{DD} = 6 V	–40	–60	–100	µA
I_{IL}	Low-level input current		$\overline{MR}$ = 0 V, V_{DD} = 6 V	–130	–200	–340	
I_I	Input current	SENSE		–25		25	nA
I_{DD}	Supply current	TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, TPS3801T50	V_{DD} = 2 V, $\overline{MR}$ and output unconnected		9	12	µA
			V_{DD} = 6 V, $\overline{MR}$ and output unconnected		20	25	
		TPS3801-01	V_{DD} = 1.6 V, SENSE = 0 V to V_{DD}, output unconnected		7	10	
			V_{DD} = 4 V, SENSE = 0 V to V_{DD}, output unconnected		9	12	
		TPS3801E18, TPS3800G27, TPS3802K33, TPS3802L30	V_{DD} = 1.6 V, $\overline{MR}$ and output unconnected		8	11	
			V_{DD} = 4 V, $\overline{MR}$ and output unconnected		13	18	
C_i	Input capacitance		V_I = 0 V to V_{DD}		5		pF

NOTES: 2. The lowest supply voltage at which $\overline{RESET}$ becomes active. $t_{r,\ VDD}$ ≥ 15 µs/V.
3. To ensure the best stability of the threshold voltage, a bypass capacitor (0.1-µF ceramic) should be placed near the supply terminals.
4. Only valid for the TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, and TPS3801T50.

timing requirements at R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w	Pulse width	at SENSE	V_{DD} = 1.6 V, $V_{IH} = 1.1 \times V_{IT-}$, $V_{IL} = 0.9 \times V_{IT-}$	1			µs
		at V_{DD}	$V_{DD} = V_{IT-} + 0.2$ V, $V_{DD} = V_{IT-} - 0.2$ V	3			
		at $\overline{MR}$	$V_{DD} \geq V_{IT-} + 0.2$ V, $V_{IL} = 0.3 \times V_{DD}$, $V_{IH} = 0.7 \times V_{DD}$	100			ns

switching characteristics at R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_d	Delay time	TPS3801T50	$V_{DD} \geq V_{IT-} + 0.2$ V, $\overline{MR} \geq 0.7 \times V_{DD}$ See timing diagram	15	25	35	ms
		TPS3800		60	95	140	
		TPS3801		120	200	280	
		TPS3802		240	380	560	
t_{PHL}	Propagation (delay) time, high-to-low-level output	$\overline{MR}$ to $\overline{RESET}$ delay	$V_{DD} \geq V_{IT-} + 0.2$ V, $V_{IL} = 0.3 \times V_{DD}$, $V_{IH} = 0.7 \times V_{DD}$		15		ns
		V_{DD} to $\overline{RESET}$ delay	$V_{IL} = V_{IT-} - 0.2$ V, $V_{IH} = V_{IT-} + 0.2$ V		1		µs
		SENSE to $\overline{RESET}$					

TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

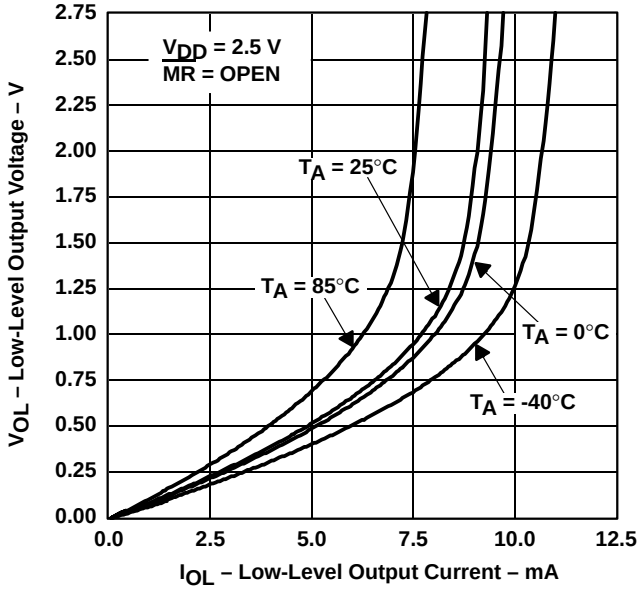


Figure 1

SUPPLY CURRENT vs SUPPLY VOLTAGE

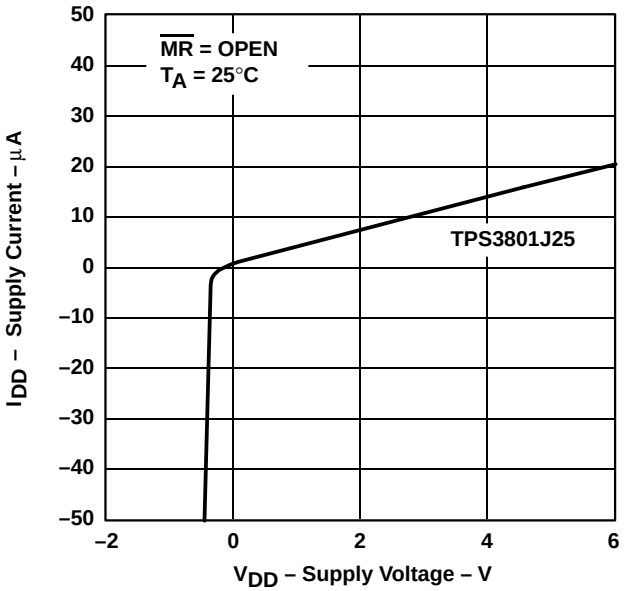


Figure 2

TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

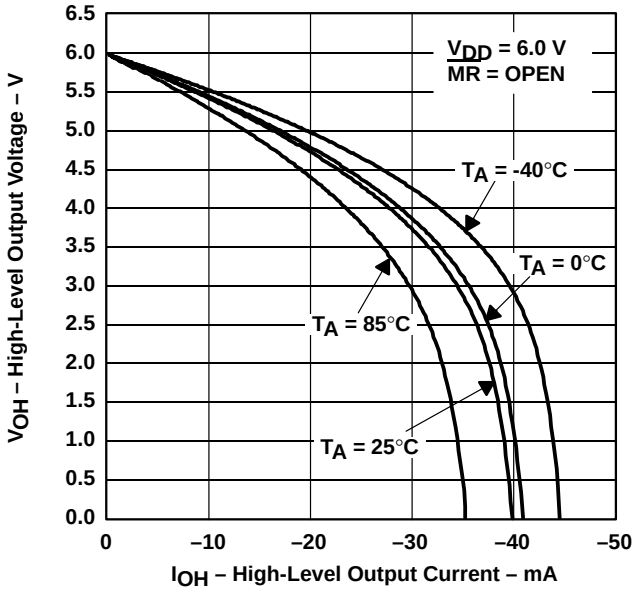


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

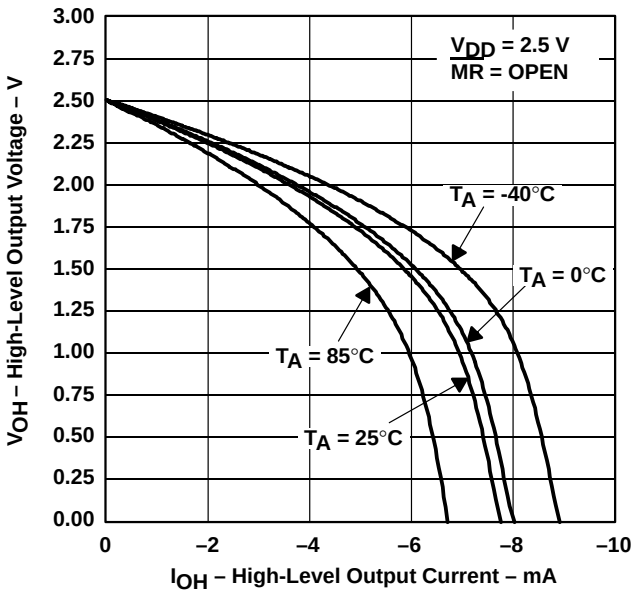


Figure 4

INPUT CURRENT
vs
INPUT VOLTAGE AT $\overline{MR}$

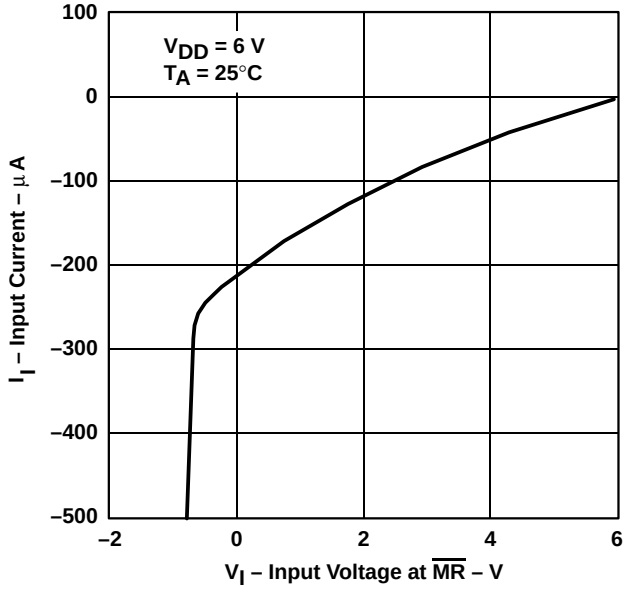


Figure 5

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

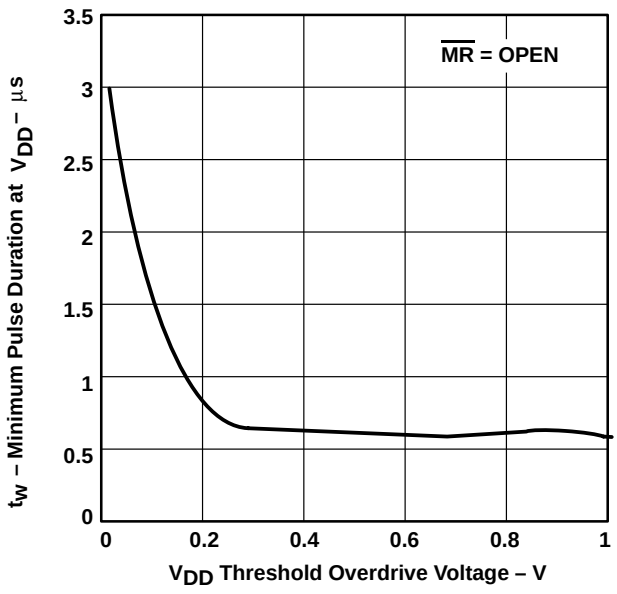


Figure 6

TYPICAL CHARACTERISTICS

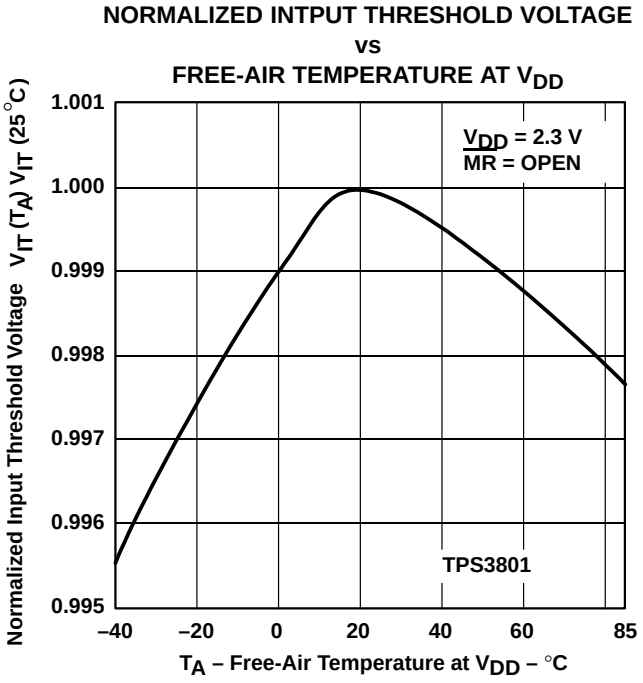


Figure 7

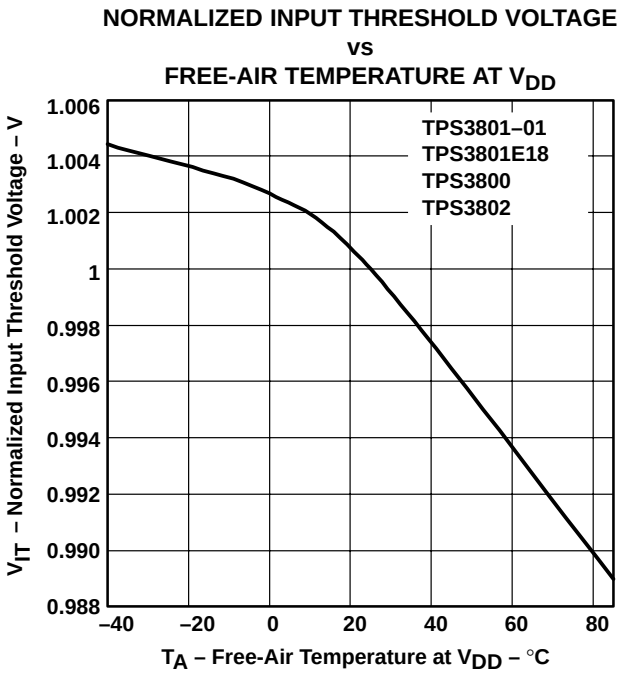
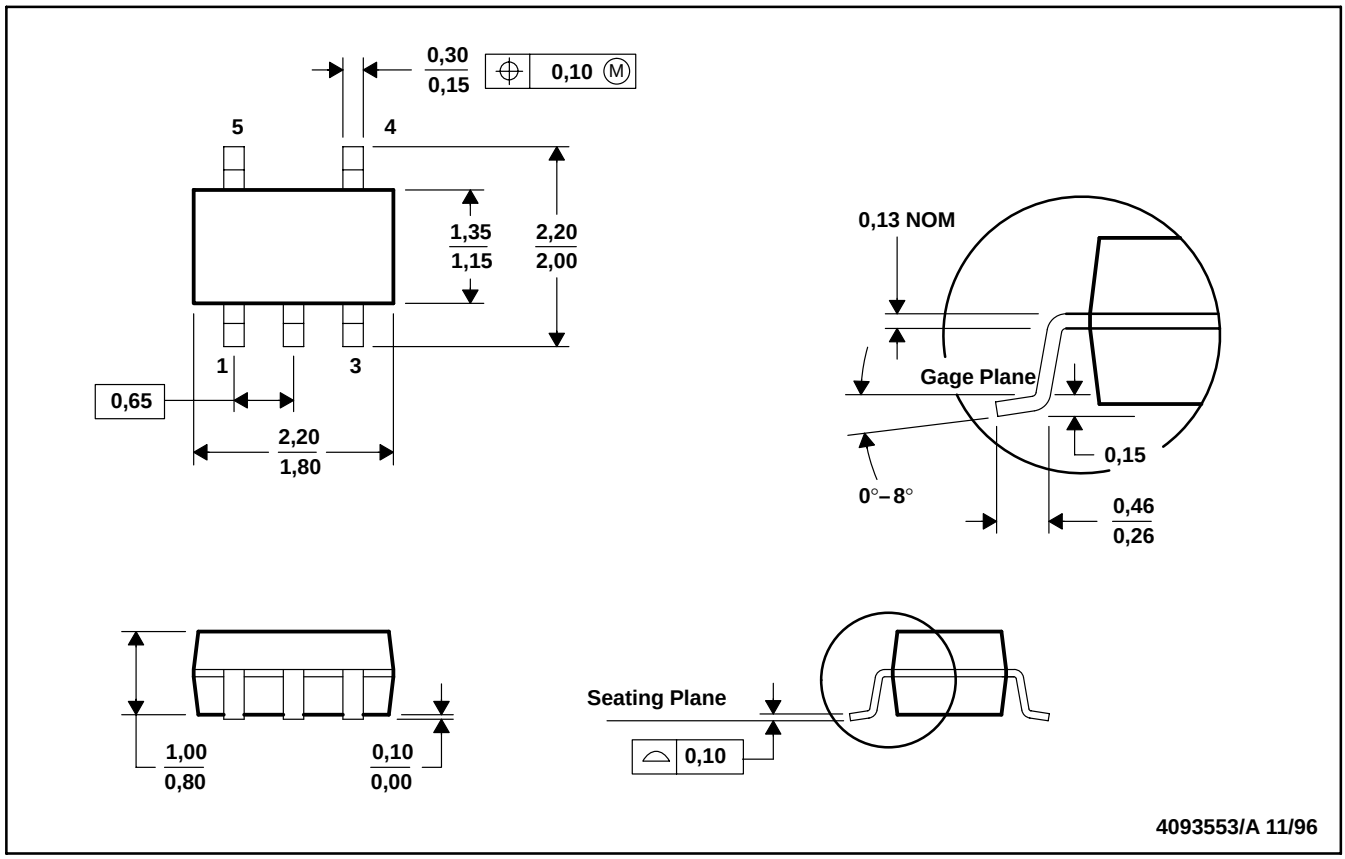


Figure 8

MECHANICAL DATA

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 include mold flash or protrusion.

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Texas Instruments
Post Office Box 655303
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