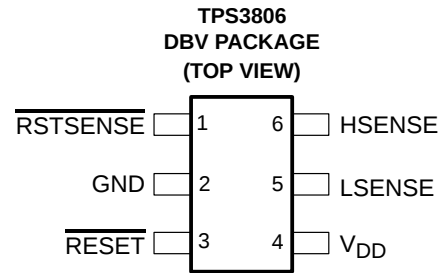


TPS3806J20, TPS3806I33 DUAL VOLTAGE DETECTOR WITH ADJUSTABLE HYSTERESIS

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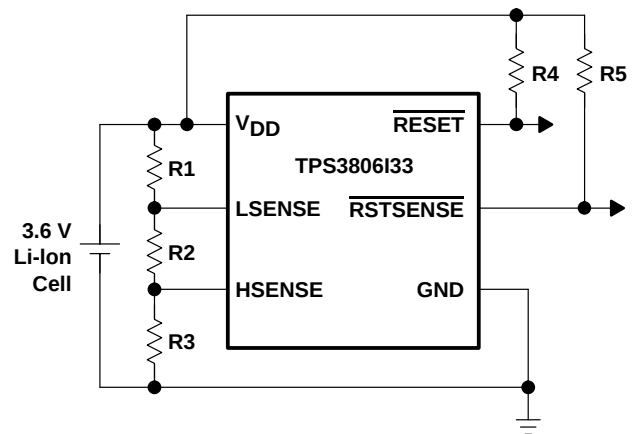
- Dual Voltage Detector With Adjustable Hysteresis 3.3-V/Adjustable and 2-V/Adjustable
- Assured Reset at $V_{DD} = 0.8\text{ V}$
- Supply Current: $3\text{ }\mu\text{A}$ Typical at $V_{DD} = 3.3\text{ V}$
- Independent Open-Drain Reset Outputs
- Temperature Range . . . -40°C to 85°C
- Six-Pin SOT-23 Package



description

The TPS3806 integrates two independent voltage detectors for battery voltage monitoring. During power-on, $\overline{\text{RESET}}$ and $\overline{\text{RSTSENSE}}$ are asserted when supply voltage V_{DD} or the voltage at LSENSE input become higher than 0.8 V . Thereafter, the supervisory circuit monitors V_{DD} and LSENSE, keeping $\overline{\text{RESET}}$ and $\overline{\text{RSTSENSE}}$ active as long as V_{DD} and LSENSE remain below the threshold voltage V_{IT} . As soon as V_{DD} or LSENSE rise above the threshold voltage V_{IT} , $\overline{\text{RESET}}$ or $\overline{\text{RSTSENSE}}$ is deasserted, respectively. The TPS3806 device has a fixed-sense threshold voltage V_{IT} set by an internal voltage divider at V_{DD} and an adjustable second-LSENSE input. In addition, an upper voltage threshold can be set at HSENSE to allow a wide adjustable hysteresis window.

typical operating circuit



The devices are available in a 6-pin SOT-23 package. The TPS3806 device is characterized for operation over a temperature range of -40°C to 85°C .

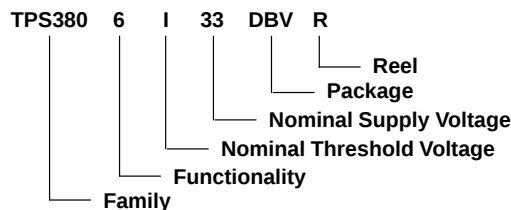
PACKAGE INFORMATION

T_A	DEVICE NAME		THRESHOLD VOLTAGE		MARKING
			V_{DD}	SENSE	
-40°C to 85°C	TPS3806J20DBVR [†]	TPS3806J20DBVT [‡]	1.8 V	1.207 V	PGQI
	TPS3806I33DBVR [†]	TPS3806I33DBVT [‡]	3 V	1.207 V	PGPI

[†] The DBVR passive indicates tape and reel containing 3000 parts.

[‡] The DBVT passive indicates tape and reel containing 250 parts.

ordering information



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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TPS3806J20, TPS3806I33

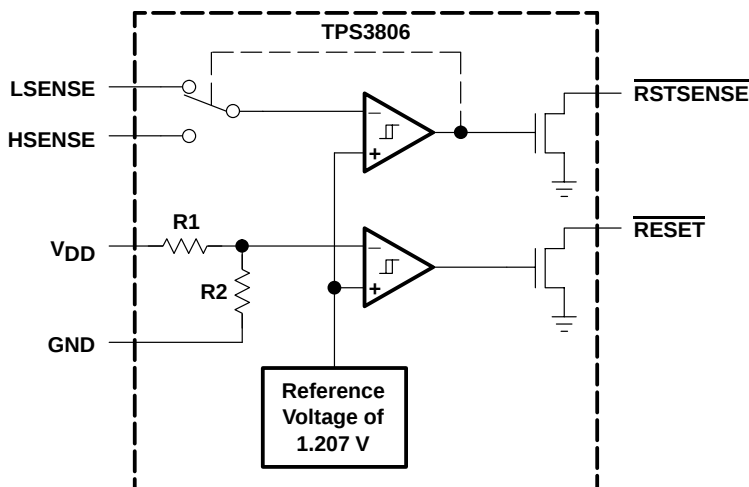
DUAL VOLTAGE DETECTOR WITH ADJUSTABLE HYSTERESIS

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Function/Truth Tables

TPS3806			
$V_{DD} > V_{IT}$	$\overline{RESET}$	$LSENSE > V_{IT}$	$\overline{RSTSENSE}$
0	L	0	L
1	H	1	H

functional block diagram



detailed description

operation

The TPS3806 is used for monitoring battery voltage and asserting $\overline{RESET}$ when battery gets discharged below a certain threshold voltage. The battery voltage is monitored by a comparator via an external resistor divider. When the voltage at the LSENSE input drops below the internal reference voltage the $\overline{RSTSENSE}$ output pulls low. The output remains low until the battery is replaced, or recharged above a second higher trip-point, set at HSENSE. A second voltage can be monitored at V_{DD} . The independent $\overline{RESET}$ output pulls low when the voltage at V_{DD} drops below the fixed threshold voltage. Because the TPS3806 outputs are open-drain MOSFETs, most applications may require a pullup resistor.

programming the threshold voltage levels

The low-voltage threshold at LSENSE is calculated as follows:

$$V_{(LSENSE)} = V_{ref} \left(\frac{R1 + R2 + R3}{R2 + R3} \right)$$

where $V_{ref} = 1.207 \text{ V}$

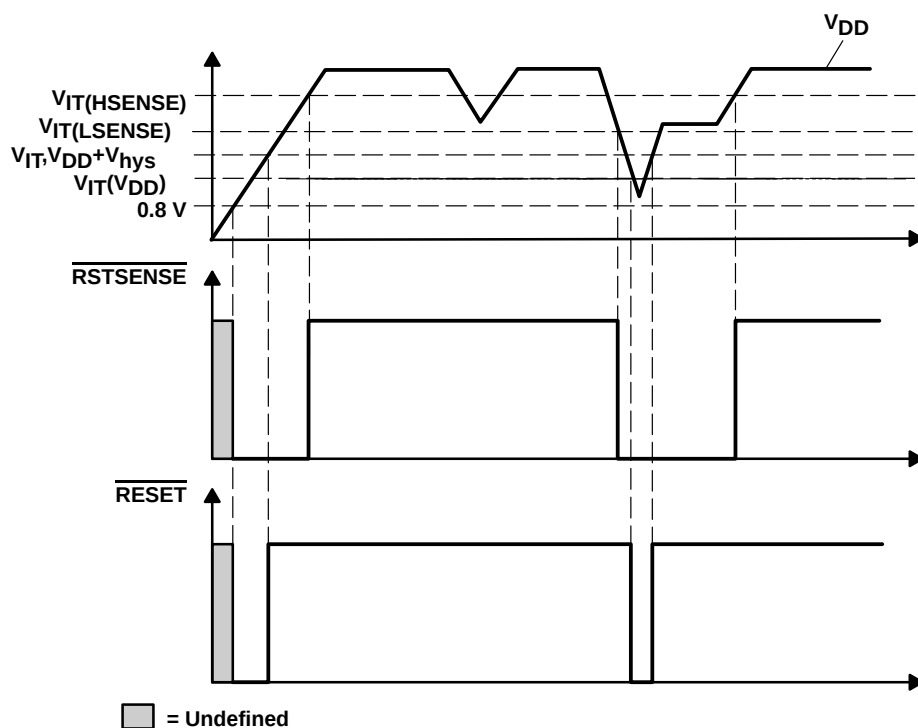
The high-voltage threshold at HSENSE is calculated as follows:

$$V_{(HSENSE)} = V_{ref} \left(\frac{R1 + R2 + R3}{R3} \right)$$

where $V_{ref} = 1.207 \text{ V}$

To minimize battery current draw it is recommended to use $1\text{-M}\Omega$ as the total resistor value $R_{(tot)} = R1 + R2 + R3$.

timing requirements



Terminal Functions

TERMINAL NAME	NO.	I/O	DESCRIPTION
GND	2	I	Ground
HSENSE	6	I	Adjustable hysteresis input
LSENSE	5	I	Adjustable sense input
$\overline{RESET}$	3	O	Active-low open drain reset output (from V_{DD})
$\overline{RSTSENSE}$	1	O	Active-low open-drain reset output (from LSENSE)
V_{DD}	4	I	Input supply voltage and fixed sense input

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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 $V_I > V_{DD}$)	± 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

[†] 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 must 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
DBV	437 mW	3.5 mW/°C	280 mW	227 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



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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT	
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 (see Note 2)			V _{DD} ≥ 0.8 V, I _{OL} = 50 μA			0.2	V	
V _{IT}	Negative-going input threshold voltage (see Note 3)	LSENSE	T _A = 25°C		1.198	1.207	1.216	V
		TPS3806J20			1.787	1.8	1.813	
		TPS3806I33			2.978	3	3.022	
		LSENSE	T _A = −40°C to 85°C		1.183	1.207	1.231	V
		TPS3806J20			1.764	1.8	1.836	
		TPS3806I33			2.94	3	3.06	
V _{hys}	Hysteresis		1.2 V < V _{IT} < 2.5 V			60	mV	
			2.5 V < V _{IT} < 3.5 V			90		
I _I	Input current	LSENSE, HSENSE			−25	25	nA	
I _{OH}	High-level output current		V _{DD} = V _{IT} + 0.2 V, V _{OH} = V _{DD}			300	nA	
I _{DD}	Supply current		V _{DD} = 3.3 V, Output unconnected		3	5	μA	
			V _{DD} = 6 V, Output unconnected		4	6		
C _i	Input capacitance		V _I = 0 V to V _{DD}		1		pF	

NOTES: 2. The lowest supply voltage at which RESET becomes active. t_rV_{DD} ≥ 15 µs/V
3. To ensure 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, T_A = -40°C to 85°C

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

switching characteristics at R_L = 1 MΩ, C_L = 50 pF, T_A = -40°C to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PHL}	Propagation (delay) time, high-to-low-level output	V _{DD} to RESET delay	V _{IH} = 1.05 × V _{IT} , V _{IL} = 0.95 × V _{IT}	5	100	µs
		LSENSE to RSTSENSE delay				
t _{PLH}	Propagation (delay) time, low-to-high-level output	V _{DD} to RESET delay	V _{IH} = 1.05 × V _{IT} , V _{IL} = 0.95 × V _{IT}	5	100	µs
		HSENSE to RSTSENSE delay				



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TYPICAL CHARACTERISTICS

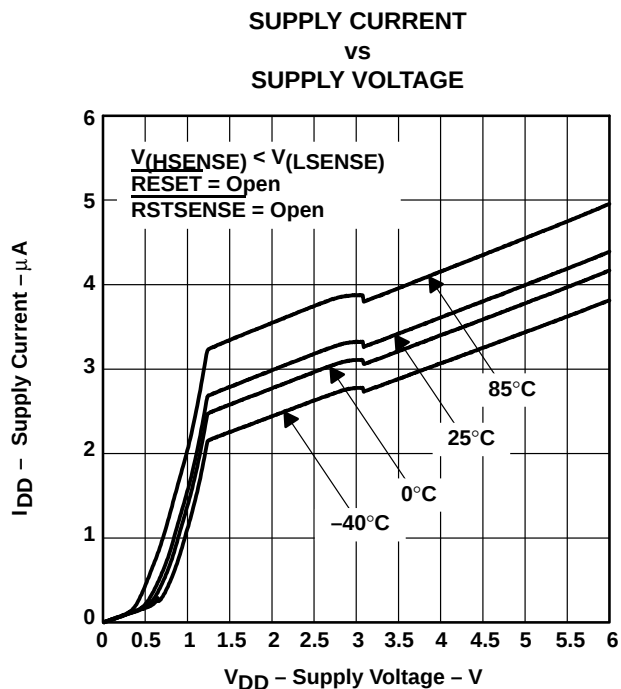


Figure 1

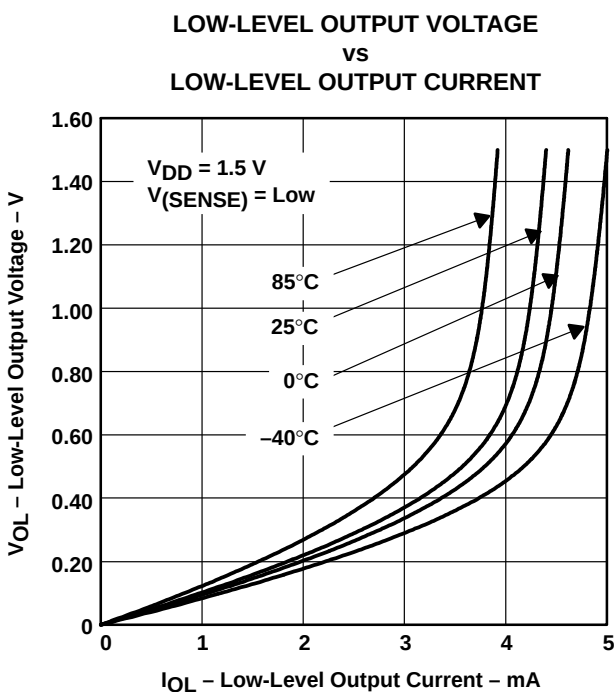


Figure 2

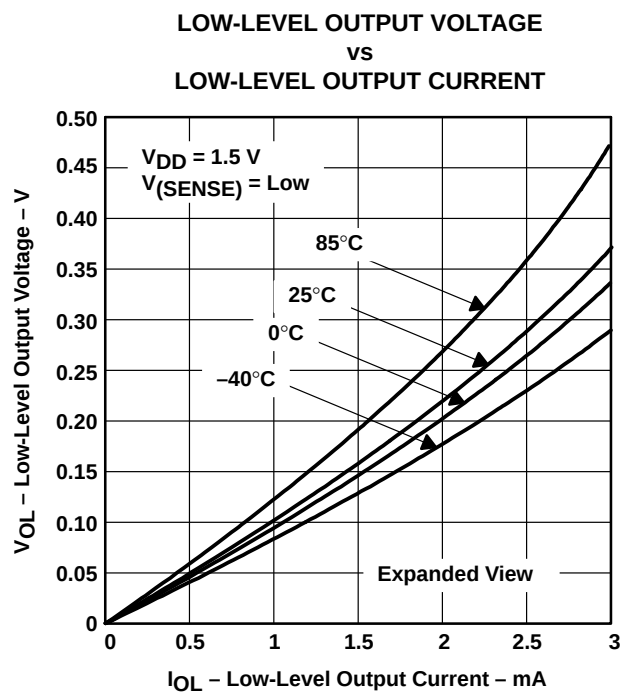


Figure 3

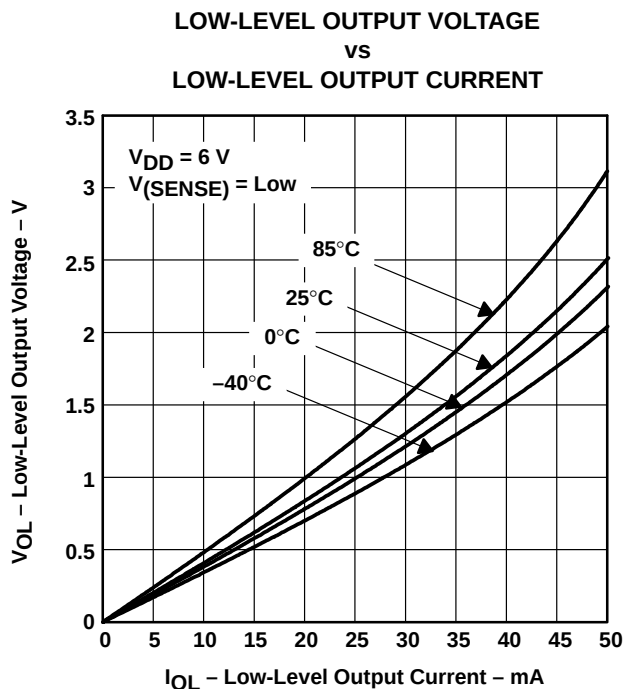


Figure 4

TYPICAL CHARACTERISTICS

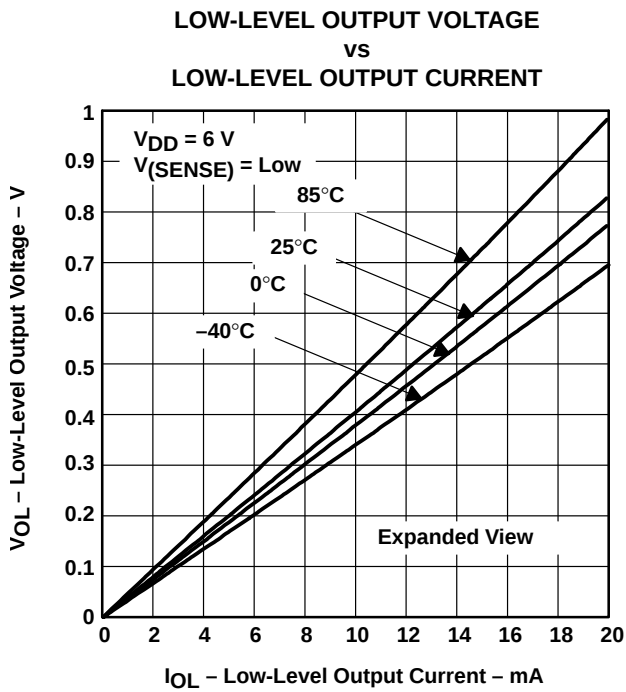


Figure 5

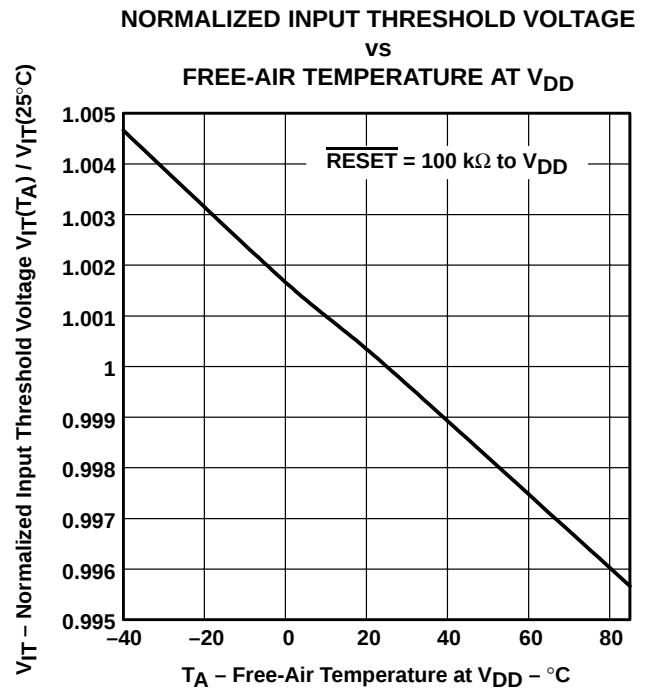


Figure 6

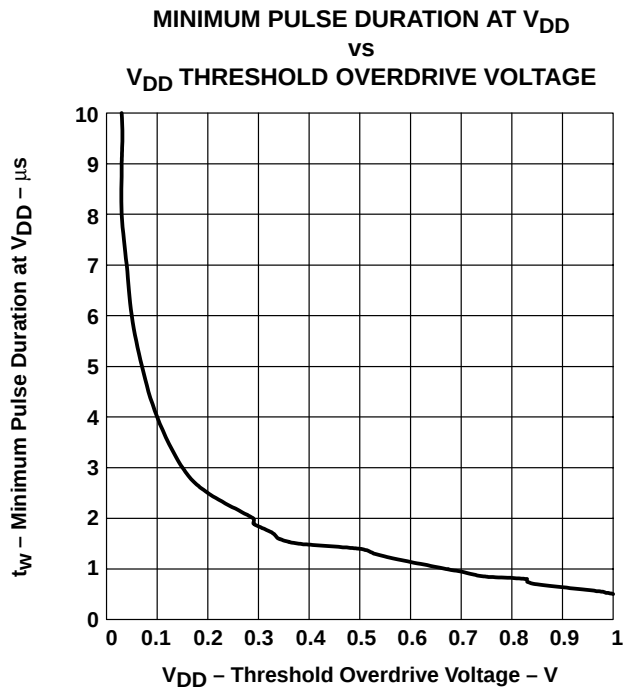


Figure 7

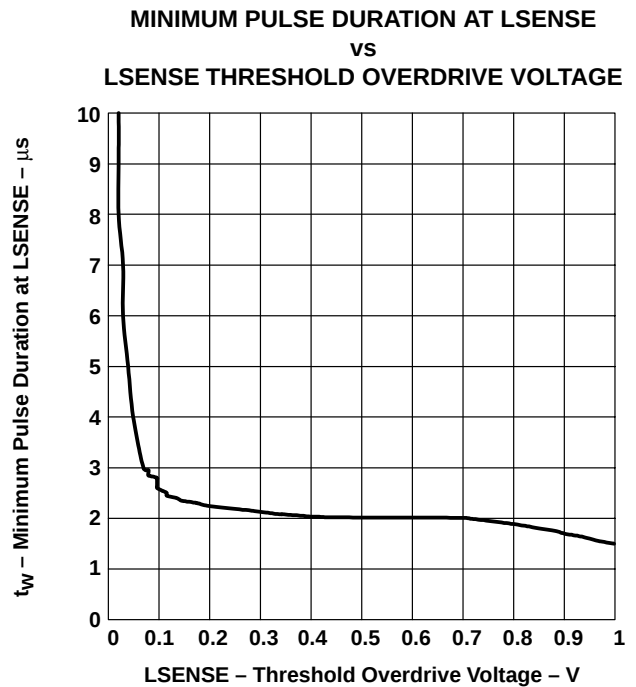


Figure 8

TPS3806J20, TPS3806I33

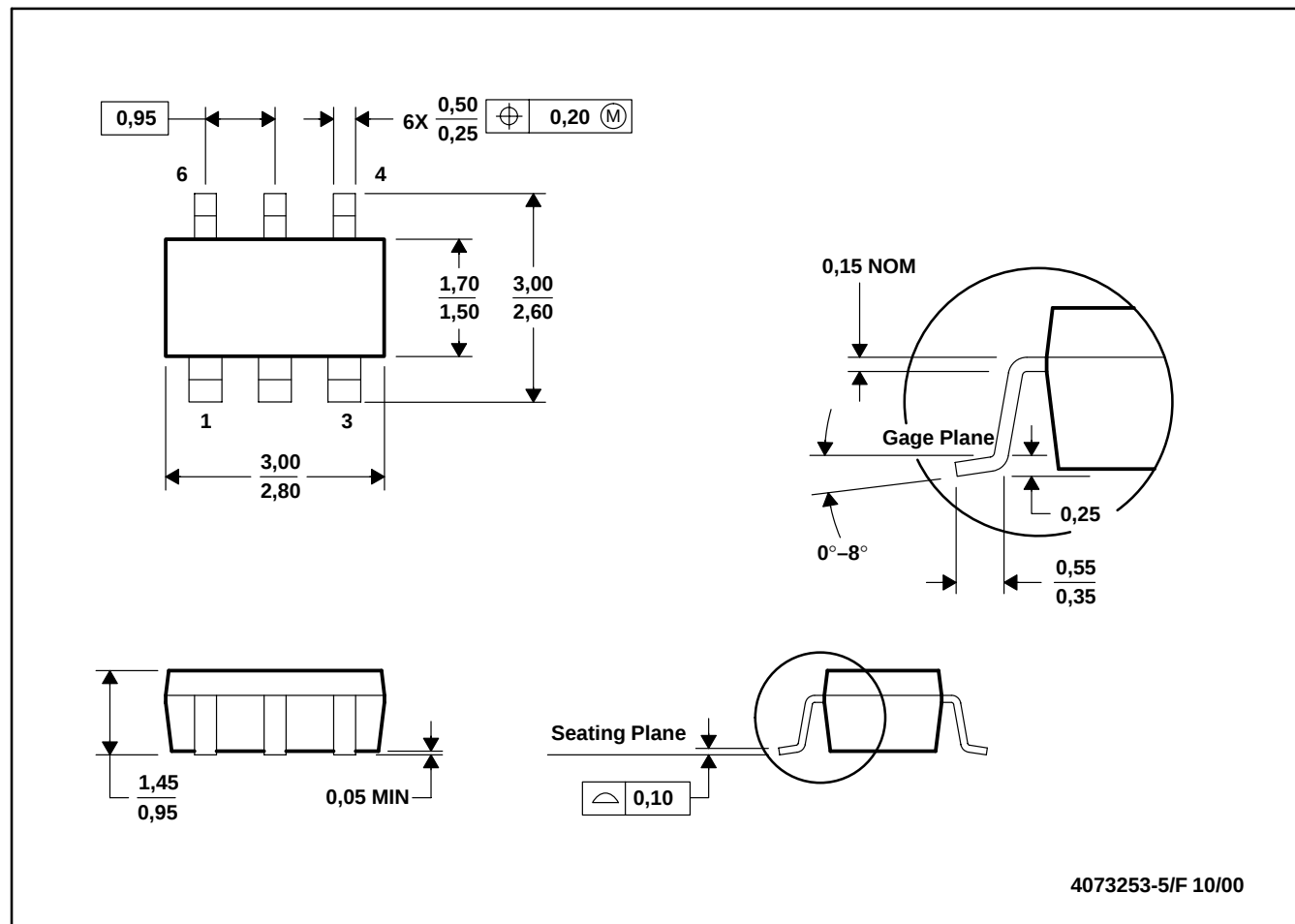
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MECHANICAL DATA

DBV (R-PDSO-G6)

PLASTIC SMALL-OUTLINE



- 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.
 - D. Leads 1, 2, 3 are wider than leads 4, 5, 6 for package orientation.

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