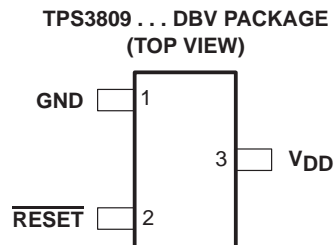


- 3-Pin SOT-23 Package
- Supply Current of 9 μ A (Typical)
- Precision Supply Voltage Monitor
2.5 V, 3 V, 3.3 V, 5 V
- Power-On Reset Generator With Fixed
Delay Time of 200 ms
- Pin-For-Pin Compatible With MAX 809
- Temperature Range . . . -40°C to 85°C



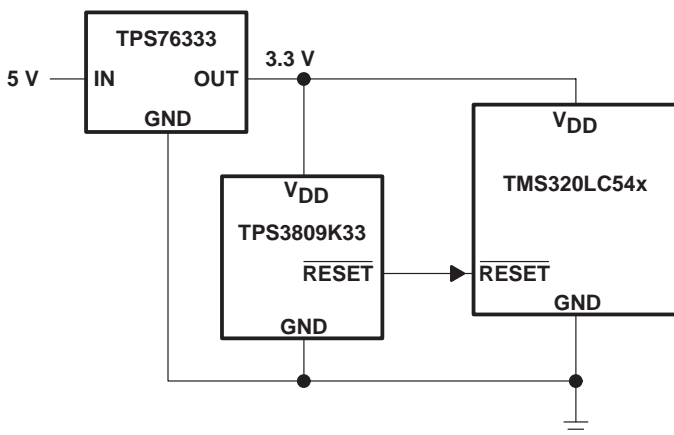
description

The TPS3809 family of supervisory circuits provides 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} and keeps $\overline{\text{RESET}}$ active as long as V_{DD} 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, $t_{\text{d(typ)}} = 200$ ms, starts after V_{DD} 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.

The product spectrum is designed for supply voltages of 2.5 V, 3 V, 3.3 V, and 5 V. The circuits are available in a 3-pin SOT-23. The TPS3809 devices are characterized for operation over a temperature range of -40°C to 85°C .

typical 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



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.

TPS3809J25, TPS3809L30, TPS3809K33, TPS3809I50 3-PIN SUPPLY VOLTAGE SUPERVISORS

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AVAILABLE OPTIONS

| T _A | DEVICE NAME | | THRESHOLD VOLTAGE | MARKING |
|----------------|-----------------|-----------------|-------------------|---------|
| -40°C to 85°C | TPS3809J25DBVR† | TPS3809J25DBVT‡ | 2.25 V | PCZI |
| | TPS3809L30DBVR† | TPS3809L30DBVT‡ | 2.64 V | PDAI |
| | TPS3809K33DBVR† | TPS3809K33DBVT‡ | 2.93 V | PDBI |
| | TPS3809I50DBVR† | TPS3809I50DBVT‡ | 4.55 V | PDCI |

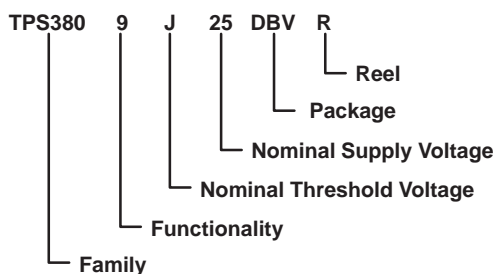
† The DBVR passive indicates tape and reel of 3000 parts.

‡ The DBVT passive indicates tape and reel of 250 parts.

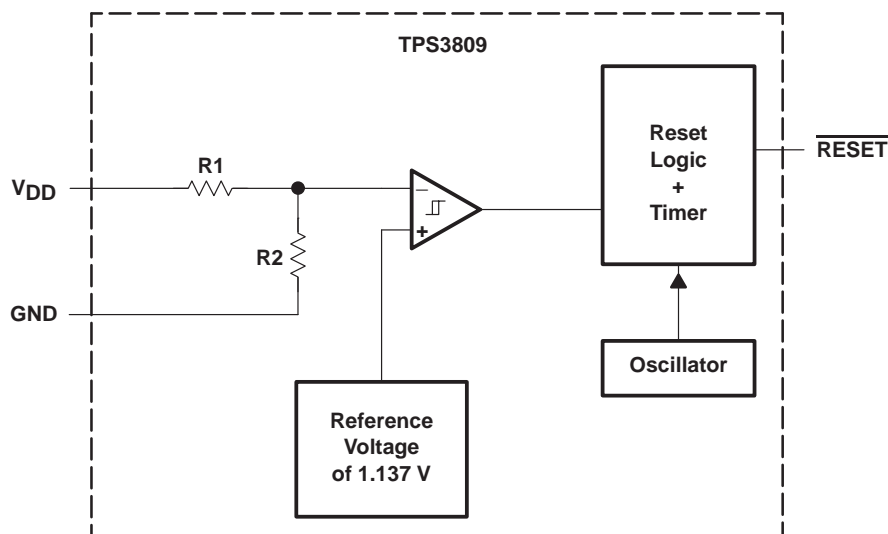
FUNCTION/TRUTH TABLE, TPS3809

| V _{DD} >V _{IT} | $\overline{\text{RESET}}$ |
|----------------------------------|---------------------------|
| 0 | L |
| 1 | H |

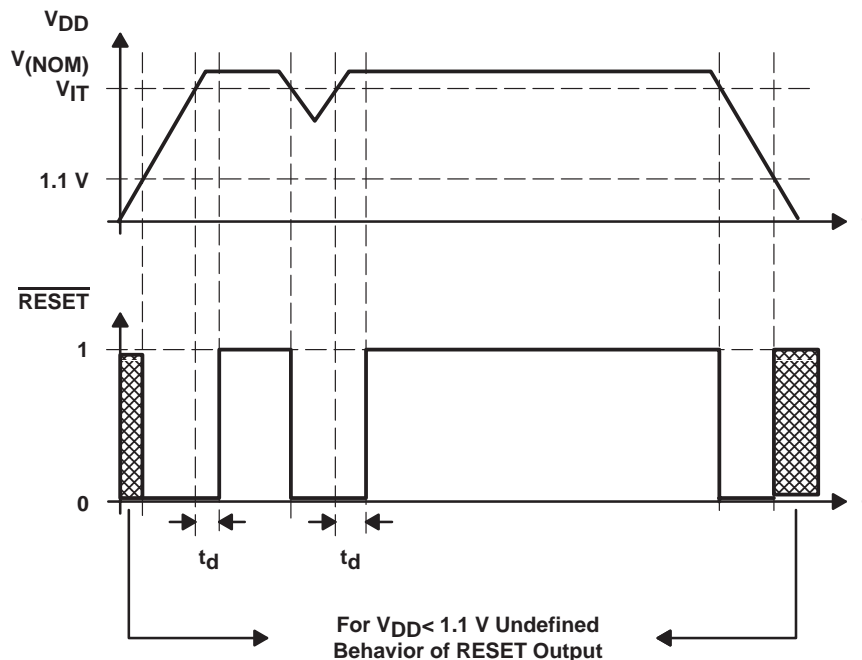
ORDERING INFORMATION



functional block diagram



timing diagram



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

| | |
|--|------------------------------|
| Supply voltage, V_{DD} (see Note 1) | 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 $t=1000$ h continuously.

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 at specified temperature range

| | MIN | MAX | UNIT |
|---|-----|-----|------|
| Supply voltage, V_{DD} | 2 | 6 | V |
| Operating free-air temperature range, T_A | -40 | 85 | °C |

TPS3809J25, TPS3809L30, TPS3809K33, TPS3809I50

3-PIN SUPPLY VOLTAGE SUPERVISORS

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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} = 2.5 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 | V _{DD} - 0.4 | | | | |
| V _{OL} | Low-level output voltage | V _{DD} = 2 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 | 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) | T _A = 40°C to 85°C | TPS3809J25 | 2.20 | 2.25 | 2.30 | V |
| | | | TPS3809L30 | 2.58 | 2.64 | 2.70 | |
| | | | TPS3809K33 | 2.87 | 2.93 | 2.99 | |
| | | | TPS3809I50 | 4.45 | 4.55 | 4.65 | |
| V _{hys} | Hysteresis | | TPS3809J25 | 30 | | mV | |
| | | | TPS3809L30 | 35 | | | |
| | | | TPS3809K33 | 40 | | | |
| | | | TPS3809I50 | 60 | | | |
| I _{DD} | Supply current | V _{DD} = 2 V, Output unconnected | 9 | | 12 | μA | |
| | | V _{DD} = 6 V, Output unconnected | 20 | | 25 | | |
| C _i | Input capacitance | V _I = 0 V to V _{DD} | 5 | | | pF | |

NOTES: 2. The lowest supply voltage at which $\overline{\text{RESET}}$ becomes active. $t_r, V_{DD} \geq 15 \mu\text{s/V}$.
 3. To ensure best stability of the threshold voltage, a bypass capacitor (0.1 μF ceramic) should be placed near the supply terminals.

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 V _{DD} , V _{DD} = V _{IT-} + 0.2 V, V _{DD} = V _{IT-} - 0.2 V | 3 | | | μs |

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 | V _{DD} ≥ V _{IT-} + 0.2 V, See timing diagram | 120 | 200 | 280 | ms |
| t _{PHL} | Propagation (delay) time, high-to-low-level output | V _{DD} to $\overline{\text{RESET}}$ delay, V _{IL} = V _{IT-} - 0.2 V, V _{IH} = V _{IT-} + 0.2 V | 1 | | | μs |



TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

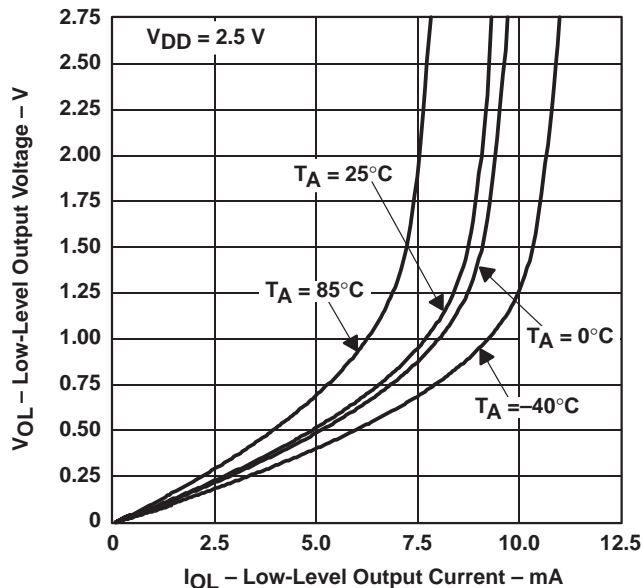


Figure 1

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

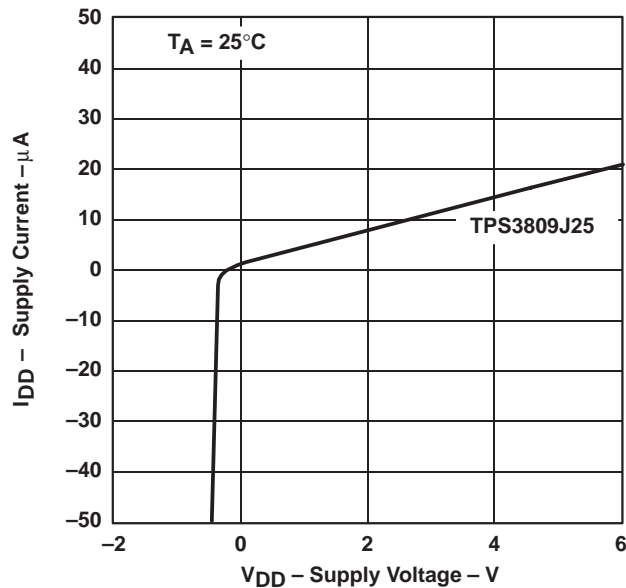


Figure 2

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

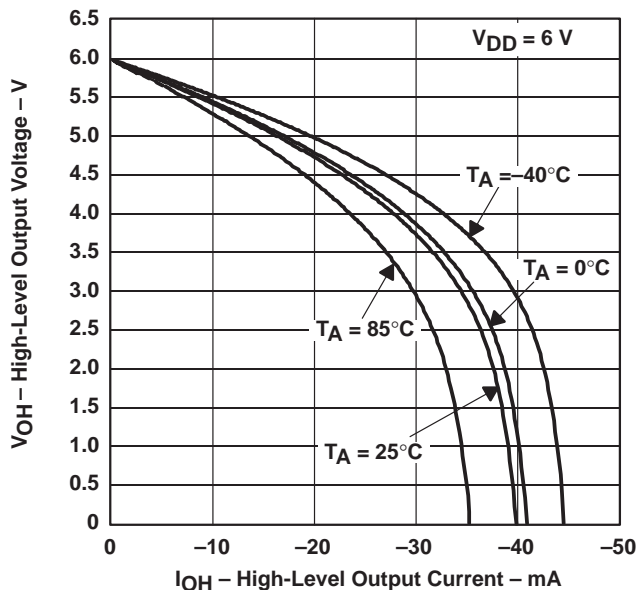


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

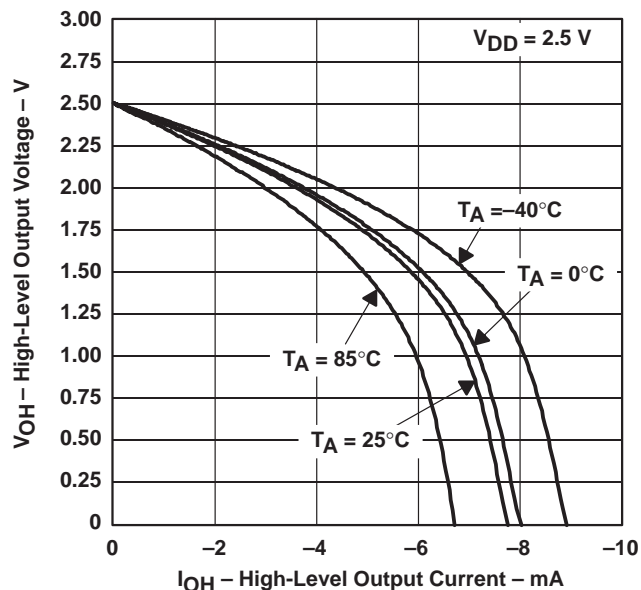


Figure 4

TYPICAL CHARACTERISTICS

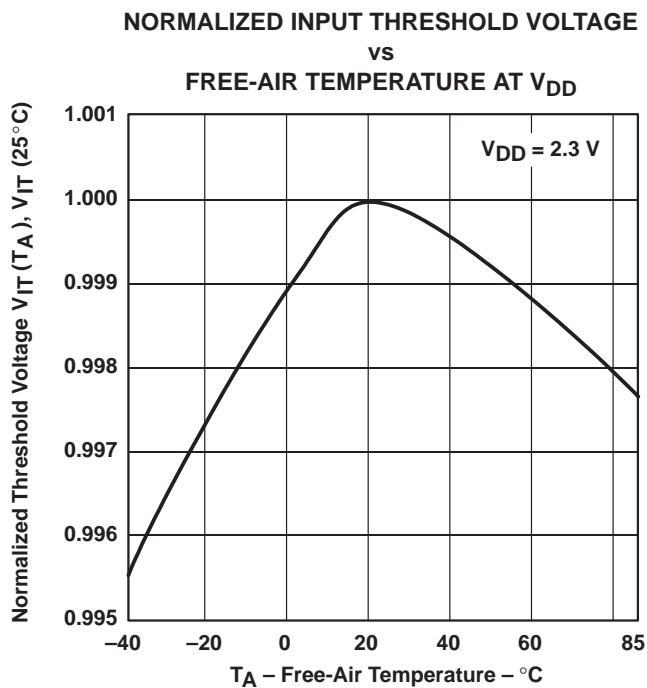


Figure 5

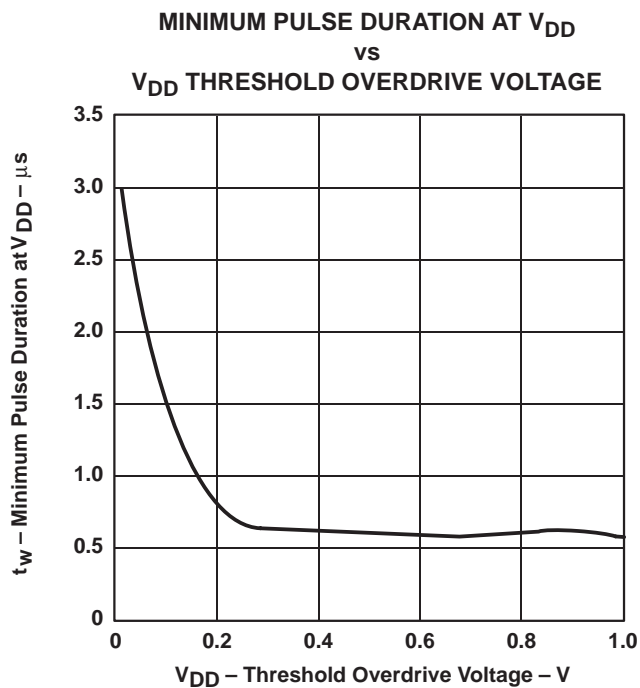
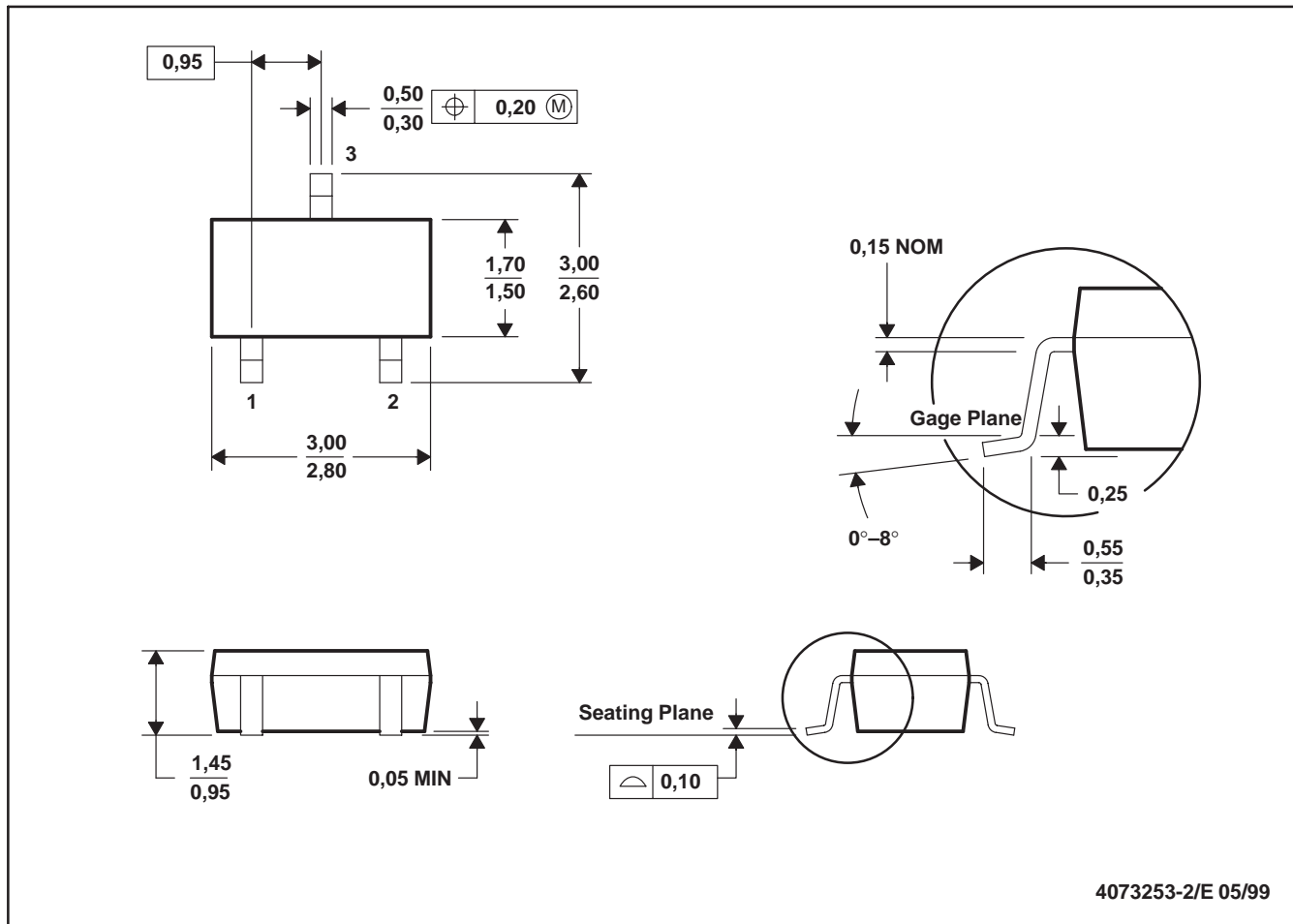


Figure 6

MECHANICAL DATA

DBV (R-PDSO-G3)

PLASTIC SMALL-OUTLINE



4073253-2/E 05/99

- 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.

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