

PROCESSOR SUPERVISORY CIRCUITS

FEATURES

- Power-On Reset Generator With Fixed Delay Time of 200 ms (TPS3823/4/5/8) or 25 ms (TPS3820)
- Manual Reset Input (TPS3820/3/5/8)
- Reset Output Available in Active-Low (TPS3820/3/4/5), Active-High (TPS3824/5) and Open-Drain (TPS3828)
- Supply Voltage Supervision Range: 2.5 V, 3 V, 3.3 V, 5 V
- Watchdog Timer (TPS3820/3/4/8)
- Supply Current of 15 μ A (Typ)
- SOT23-5 Package
- Temperature Range: -40°C to $+85^{\circ}\text{C}$

APPLICATIONS

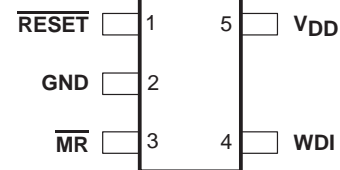
- Applications Using DSPs, Microcontrollers, or Microprocessors
- Industrial Equipment
- Programmable Controls
- Automotive Systems
- Portable/Battery-Powered Equipment
- Intelligent Instruments
- Wireless Communications Systems
- Notebook/Desktop Computers

DESCRIPTION

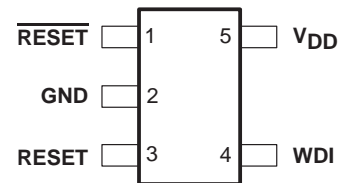
The TPS382x family of supervisors provide circuit initialization and timing supervision, primarily for DSP and processor-based systems. During power-on, $\overline{\text{RESET}}$ asserts when the supply voltage V_{DD} becomes higher than 1.1 V. Thereafter, the supply voltage supervisor monitors V_{DD} and keeps $\overline{\text{RESET}}$ active as long as V_{DD} remains below the threshold voltage, $V_{\text{IT-}}$. 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} has risen above the threshold voltage, $V_{\text{IT-}}$. When the supply voltage drops below the threshold voltage $V_{\text{IT-}}$, the output becomes

active (low) again. No external components are required. All the devices of this family have a fixed-sense threshold voltage, $V_{\text{IT-}}$, set by an internal voltage divider.

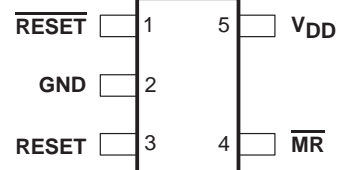
TPS3820, TPS3823, TPS3828: DBV PACKAGE
(TOP VIEW)



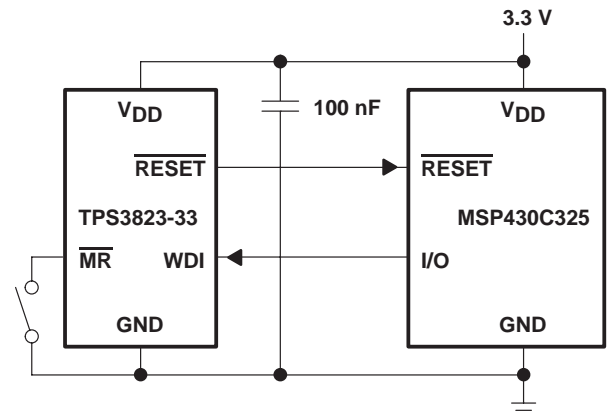
TPS3824: DBV PACKAGE
(TOP VIEW)



TPS3825: DBV PACKAGE
(TOP VIEW)



TYPICAL APPLICATION



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DESCRIPTION (Continued)

The TPS3820/3/5/8 devices incorporate a manual reset input, \overline{MR} . A low level at \overline{MR} causes \overline{RESET} to become active. The TPS3824/5 devices include a high-level output RESET. TPS3820/3/4/8 have a watchdog timer that is periodically triggered by a positive or negative transition at WDI. When the supervising system fails to retrigger the watchdog circuit within the time-out interval, t_{out} , \overline{RESET} becomes active for the time period t_d . This event also reinitializes the watchdog timer. Leaving WDI unconnected disables the watchdog. In applications where the input to the WDI pin may be active (transitioning high and low) when the TPS3820/3/4/8 is asserting \overline{RESET} , the TPS3820/3/4/8 does not return to a non-reset state when the input voltage is above V_T . If the application requires that input to WDI is active when \overline{RESET} is asserted, WDI must be decoupled from the active signal. This decoupling can be accomplished by using an N-channel FET in series with the WDI pin, with the gate of the FET connected to the \overline{RESET} output as shown in Figure 1.

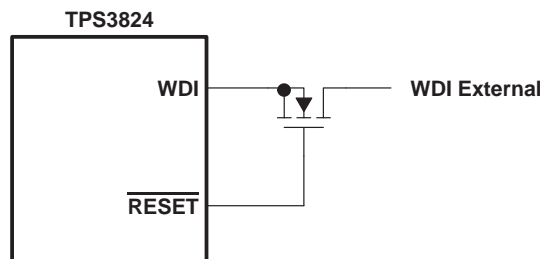


Figure 1

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 an SOT23-5 package. The TPS382x devices are characterized for operation over a temperature range of -40°C to $+85^{\circ}\text{C}$.

PACKAGE INFORMATION(1)

| DEVICE NAME | DEVICE NAME | THRESHOLD VOLTAGE(2) | MARKING |
|-------------------|-------------------|----------------------|---------|
| TPS3820-33DBVT(3) | TPS3820-33DBVR(4) | 2.93 V | PDEI |
| TPS3820-50DBVT(3) | TPS3820-50DBVR(4) | 4.55 V | PDDI |
| TPS3823-25DBVT(3) | TPS3823-25DBVR(4) | 2.25 V | PAPI |
| TPS3823-30DBVT(3) | TPS3823-30DBVR(4) | 2.63 V | PAQI |
| TPS3823-33DBVT(3) | TPS3823-33DBVR(4) | 2.93 V | PARI |
| TPS3823-50DBVT(3) | TPS3823-50DBVR(4) | 4.55 V | PASI |
| TPS3824-25DBVT(3) | TPS3824-25DBVR(4) | 2.25 V | PATI |
| TPS3824-30DBVT(3) | TPS3824-30DBVR(4) | 2.63 V | PAUI |
| TPS3824-33DBVT(3) | TPS3824-33DBVR(4) | 2.93 V | PAVI |
| TPS3824-50DBVT(3) | TPS3824-50DBVR(4) | 4.55 V | PAWI |
| TPS3825-33DBVT(3) | TPS3825-33DBVR(4) | 2.93 V | PDGI |
| TPS3825-50DBVT(3) | TPS3825-50DBVR(4) | 4.55 V | PDFI |
| TPS3828-33DBVT(3) | TPS3828-33DBVR(4) | 2.93 V | PDII |
| TPS3828-50DBVT(3) | TPS3828-50DBVR(4) | 4.55 V | PDHI |

(1) For the most current package and ordering information see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

(2) For other threshold voltage versions, please contact the local TI sales office.

(3) The DBVT package indicates tape and reel of 250 parts.

(4) The DBVR package indicates tape and reel of 3000 parts.

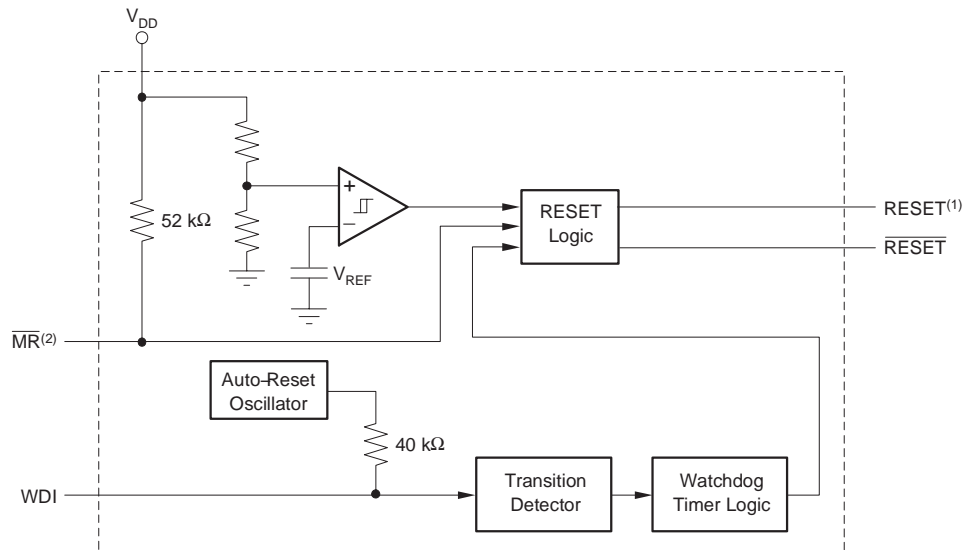
FUNCTION/TRUTH TABLE

| INPUTS | | OUTPUTS | |
|------------------------------|---------------------------|---------------------------|----------------------|
| $\overline{\text{MR}}^{(1)}$ | $\text{VDD} > \text{VIT}$ | $\overline{\text{RESET}}$ | $\text{RESET}^{(2)}$ |
| L | 0 | L | H |
| L | 1 | L | H |
| H | 0 | L | H |
| H | 1 | H | L |

(1) TPS3820/3/5/8

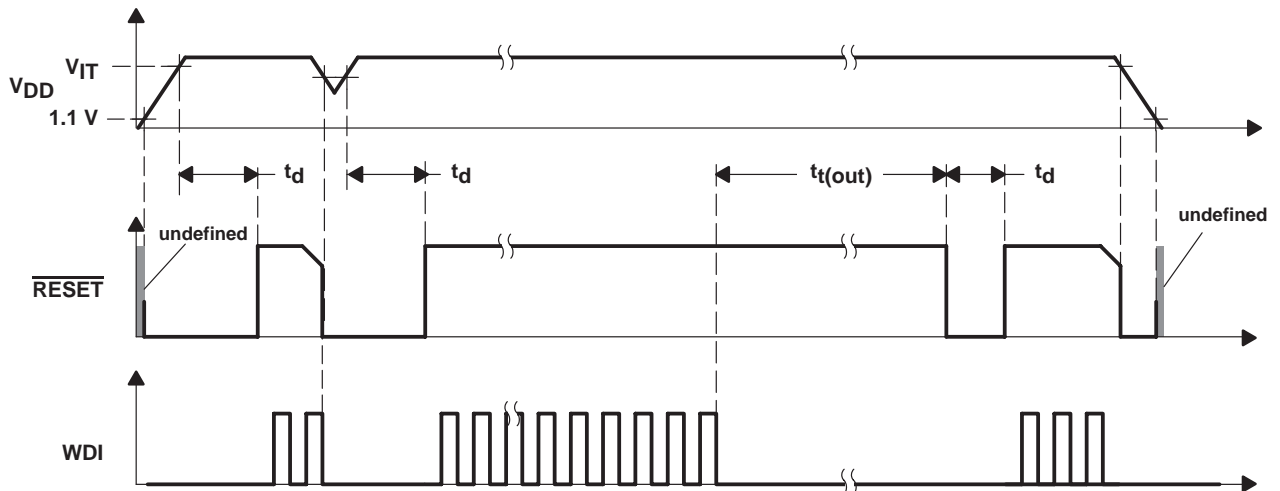
(2) TPS3824/5

FUNCTIONAL BLOCK DIAGRAM



NOTES: (1) TPS3824/5
(2) TPS3820/3/5/8

TIMING DIAGRAM





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.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

| | |
|--|-------------------------------|
| Supply voltage, V_{DD} ⁽¹⁾ | +6 V |
| RESET, \overline{RESET} , MR, WDI ⁽¹⁾ | -0.3 V to ($V_{DD} + 0.3$ V) |
| Maximum low output current, I_{OL} | +5 mA |
| Maximum high output current, I_{OH} | -5 mA |
| Input clamp current range, I_{IK} ($V_I < 0$ or $V_I > V_{DD}$) | ± 10 mA |
| Output clamp current range, 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.

DISSIPATION RATING TABLE

| PACKAGE | $T_A \leq +25^\circ\text{C}$ POWER RATING | OPERATING 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} | 1.1 | 5.5 | V |
| Input voltage, V_I | 0 | $V_{DD} + 0.3$ | V |
| High-level input voltage at \overline{MR} and WDI, V_{IH} | $0.7 \times V_{DD}$ | | V |
| Low-level input voltage, V_{IL} | | $0.3 \times V_{DD}$ | V |
| Input transition rise and fall rate at \overline{MR} or WDI, $\Delta t/\Delta V$ | | 100 | ns/V |
| Operating free-air temperature range, T_A | -40 | +85 | °C |

ELECTRICAL CHARACTERISTICS

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|---------------------------------------|---|--|-------------------------------|---------------------------------|-----|------|----|
| V _{OH} | High-level output voltage | TPS382x-25 | 0.8 × V _{DD} | | | V | |
| | | TPS382x-30 | | | | | |
| | | TPS382x-33 | | | | | |
| | | TPS382x-50 | V _{DD} – 1.5 V | | | | |
| | | RESET | TPS3824-25 | 0.8 × V _{DD} | | | V |
| | TPS3824-30 | | | | | | |
| TPS3824-33 | | | | | | | |
| TPS3824-50 | | | | | | | |
| | | TPS3825-25 | | | | | |
| | | TPS3825-30 | | | | | |
| | | TPS3825-33 | | | | | |
| | | TPS3825-50 | | | | | |
| V _{OL} | Low-level output voltage | TPS3824-25 | | 0.4 | | V | |
| | | TPS3824-30 | | | | | |
| | | TPS3824-33 | | | | | |
| | | TPS3824-50 | | | | | |
| | | RESET | TPS3825-25 | | | | |
| | | | TPS3825-30 | | | | |
| | | | TPS3825-33 | | | | |
| | | | TPS3825-50 | | | | |
| | RESET | TPS382x-25 | | 0.4 | | V | |
| | | TPS382x-30 | | | | | |
| | | TPS382x-33 | | | | | |
| | | TPS382x-50 | | | | | |
| Power-up reset voltage ⁽¹⁾ | | V _{DD} ≥ 1.1 V, I _{OL} = 20 μA | | | 0.4 | V | |
| V _{IT-} | Negative-going input threshold voltage ⁽²⁾ | TPS382x-25 | T _A = 0°C to +85°C | | | V | |
| | | TPS382x-30 | | | | | |
| | | TPS382x-33 | | | | | |
| | | TPS382x-50 | | | | | |
| | | RESET | TPS382x-25 | T _A = –40°C to +85°C | | | V |
| | | | TPS382x-30 | | | | |
| | | | TPS382x-33 | | | | |
| | | | TPS382x-50 | | | | |
| V _{hys} | Hysteresis at V _{DD} input | TPS382x-25 | | 30 | | mV | |
| | | TPS382x-30 | | | | | |
| | | TPS382x-33 | | | | | |
| | | TPS382x-50 | | | | | 50 |

(1) The lowest supply voltage at which RESET becomes active. t_r, V_{DD} ≥ 15 μs/V.

(2) To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 μF) should be placed near the supply terminals.

ELECTRICAL CHARACTERISTICS (continued)

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------|--|--|---|---|-----------|------|
| I _{IH(AV)} | Average high-level input current | WDI | WDI = V _{DD} , time average (dc = 88%) | | 120 | μA |
| | I _{IL(AV)} | | Average low-level input current | WDI = 0.3 V, V _{DD} = 5.5 V time average (dc = 12%) | | |
| I _{IH} | High-level input current | WDI | WDI = V _{DD} | | 140 190 | |
| | | $\overline{\text{MR}}$ | $\overline{\text{MR}} = V_{DD} \times 0.7$, V _{DD} = 5.5 V | | -40 -60 | |
| I _{IL} | Low-level input current | WDI | WDI = 0.3 V, V _{DD} = 5.5 V | | 140 190 | |
| | | $\overline{\text{MR}}$ | $\overline{\text{MR}} = 0.3 \text{ V}$, V _{DD} = 5.5 V | | -110 -160 | |
| I _{OS} | Output short-circuit current ⁽¹⁾ | $\overline{\text{RESET}}$ | TPS382x-25 | V _{DD} = V _{IT, max} + 0.2 V, V _O = 0 V | | μA |
| | | | TPS382x-30 | | | |
| | | | TPS382x-33 | | | |
| | | | TPS382x-50 | | | |
| I _{DD} | Supply current | WDI and $\overline{\text{MR}}$ unconnected, Outputs unconnected | | 15 25 | μA | |
| | Internal pullup resistor at $\overline{\text{MR}}$ | | | 52 | kΩ | |
| C _i | Input capacitance at $\overline{\text{MR}}$, WDI | V _I = 0 V to 5.5 V | | 5 | pF | |

(1) The $\overline{\text{RESET}}$ short-circuit current is the maximum pullup current when $\overline{\text{RESET}}$ is driven low by a μP bidirectional reset pin.

TIMING REQUIREMENTS AT R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

At R_L = 1 MΩ, C_L = 50 pF, T_A = +25°C.

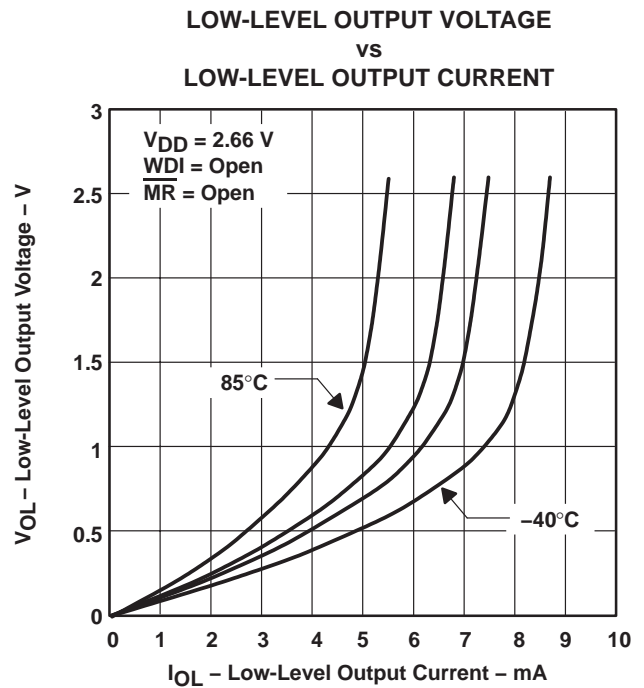
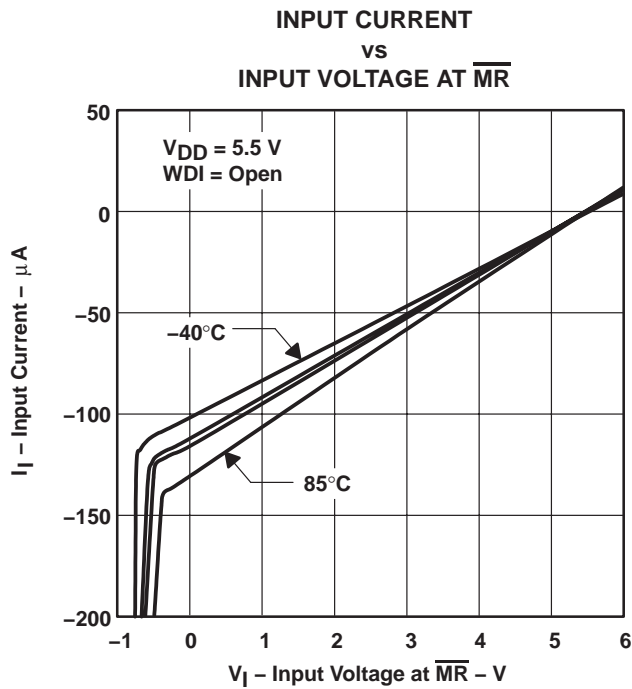
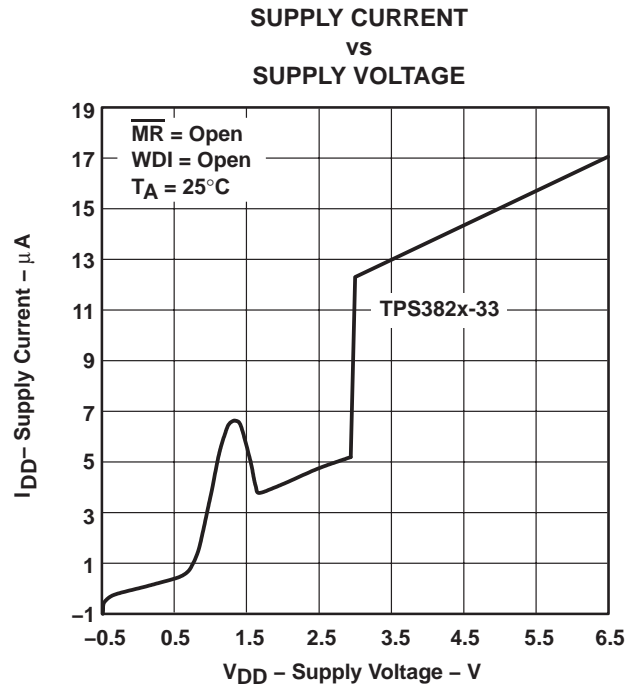
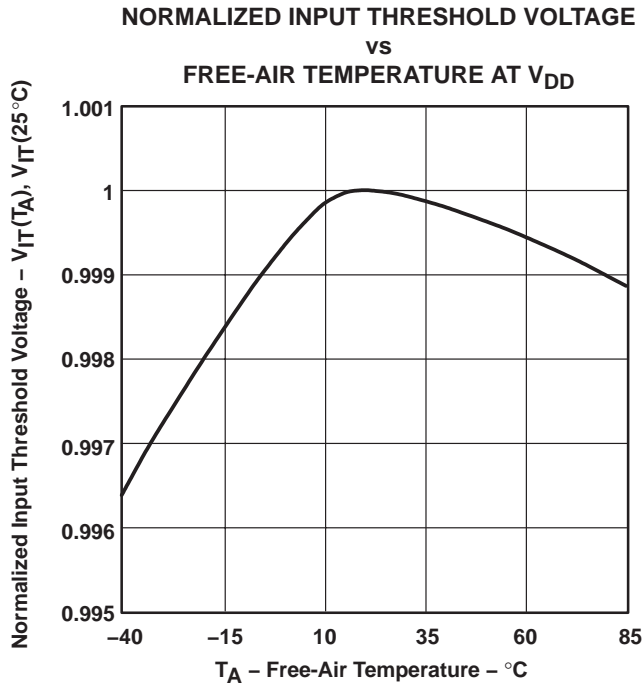
| PARAMETER | | TEST CONDITIONS | MIN | MAX | UNIT | |
|----------------|-------------|---------------------------|---|-----|------|----|
| t _w | Pulse width | at V _{DD} | V _{DD} = V _{IT-} + 0.2 V, V _{DD} = V _{IT-} - 0.2 V | | 6 | μs |
| | | at $\overline{\text{MR}}$ | V _{DD} ≥ V _{IT-} + 0.2 V, V _{IL} = 0.3 × V _{DD} , V _{IH} = 0.7 × V _{DD} | | 1 | μs |
| | | at WDI | V _{DD} ≥ V _{IT-} + 0.2 V, V _{IL} = 0.3 × V _{DD} , V _{IH} = 0.7 × 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 _{tout} | Watchdog time out | TPS3820 | 112 | 200 | 310 | ms |
| | | TPS3823/4/8 | 0.9 | 1.6 | 2.5 | s |
| t _d | Delay time | TPS3820 | 15 | 25 | 37 | ms |
| | | TPS3823/4/5/8 | 120 | 200 | 300 | |
| t _{PHL} | Propagation (delay) time, high-to-low-level output | $\overline{\text{MR}}$ to $\overline{\text{RESET}}$ delay (TPS3820/3/5/8) | V _{DD} ≥ V _{IT-} + 0.2 V, V _{IL} = 0.3 × V _{DD} , V _{IH} = 0.7 × V _{DD} | | 0.1 | μs |
| | | V _{DD} to $\overline{\text{RESET}}$ delay | V _{IL} = V _{IT-} - 0.2 V, V _{IH} = V _{IT-} + 0.2 V | | 25 | |
| t _{PLH} | Propagation (delay) time, low-to-high-level output | $\overline{\text{MR}}$ to RESET delay (TPS3824/5) | V _{DD} ≥ V _{IT-} + 0.2 V, V _{IL} = 0.3 × V _{DD} , V _{IH} = 0.7 × V _{DD} | | 0.1 | μs |
| | | V _{DD} to RESET delay (TPS3824/5) | V _{IL} = V _{IT-} - 0.2 V, V _{IH} = V _{IT-} + 0.2 V | | 25 | |

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

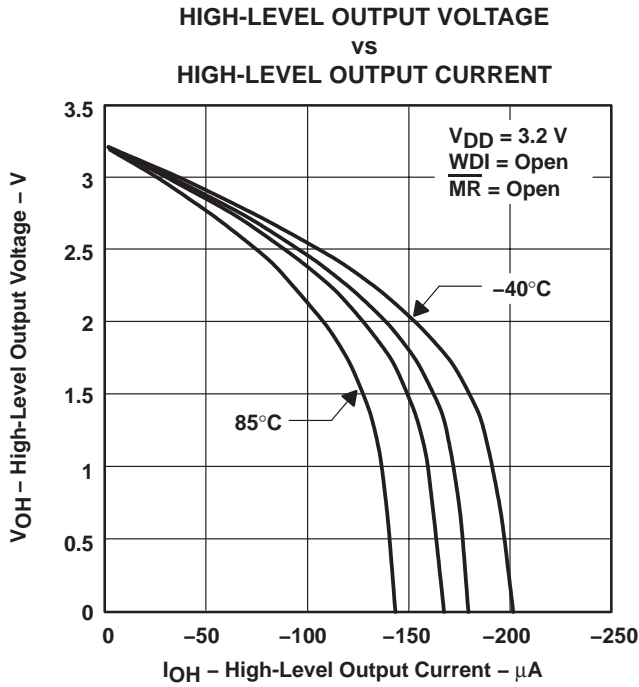


Figure 6

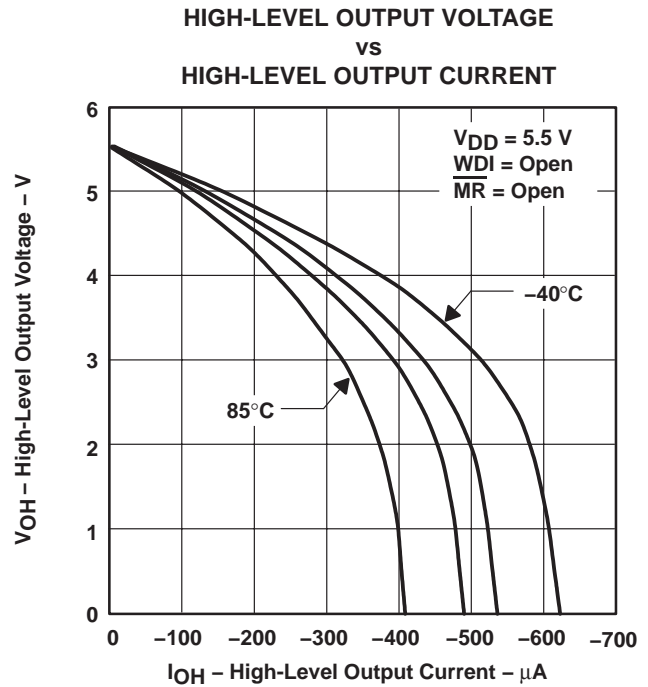


Figure 7

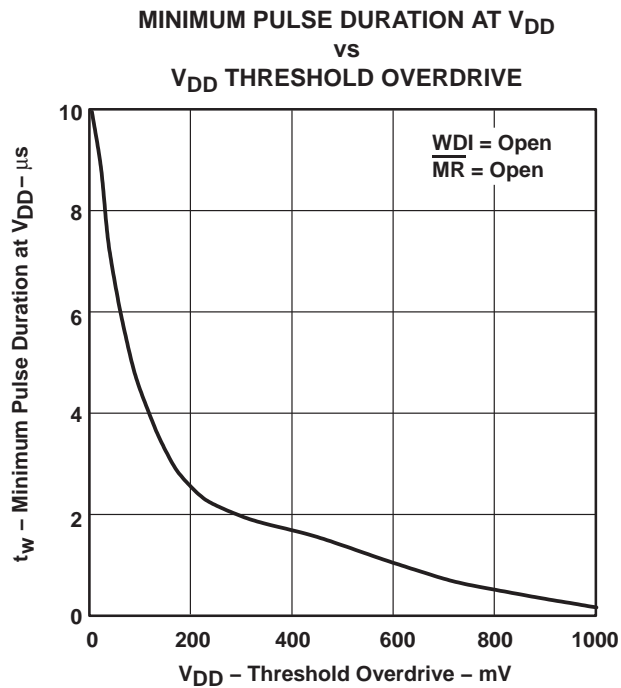


Figure 8

Revision History

| DATE | REV | PAGE | SECTION | DESCRIPTION |
|------|-----|------------|--------------------------|--|
| 1/08 | G | 2 | Description | Deleted last paragraph. |
| | | 3 | Functional Block Diagram | Replaced diagram. |
| 6/07 | F | Front Page | — | Updated front page. |
| | | 3 | Function/Truth Table | Corrected Note (2) from PS3820/3/5/8 to TPS3824/5. |

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TPS3820-33DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-33DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-33DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-33DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-50DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-50DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-50DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3820-50DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-25DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-25DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-25DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-25DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-30DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-30DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-30DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-30DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-33DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-33DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-33DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-33DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-50DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-50DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3823-50DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
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| TPS3824-25DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TPS3824-25DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-25DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-25DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-30DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-30DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-30DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-30DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-33DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-33DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-33DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-33DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-50DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-50DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-50DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3824-50DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-33DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-33DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-33DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-33DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-50DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-50DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-50DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3825-50DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-33DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-33DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-33DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TPS3828-33DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-50DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-50DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-50DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TPS3828-50DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBsolete: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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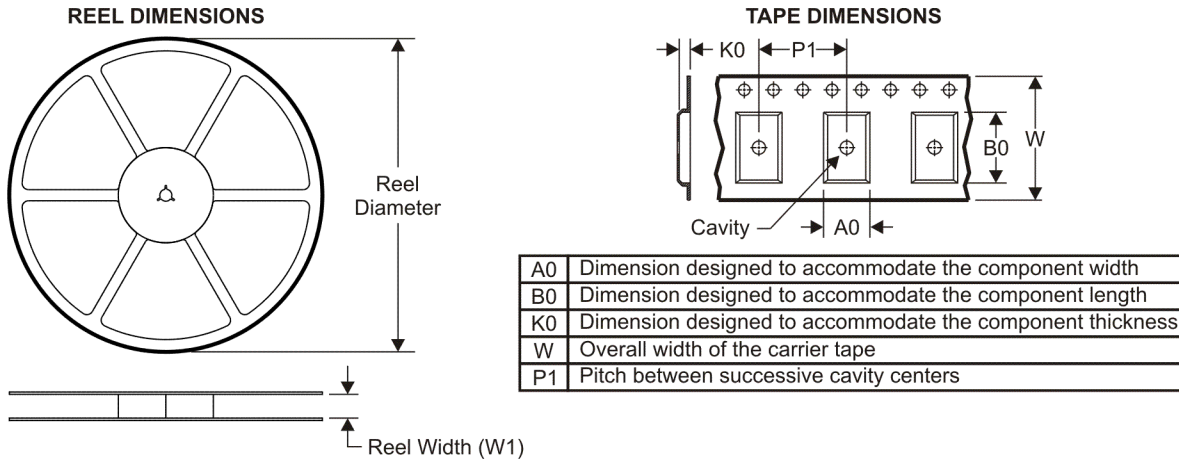
OTHER QUALIFIED VERSIONS OF TPS3820-33, TPS3820-50, TPS3823-25, TPS3823-30, TPS3823-33, TPS3823-50, TPS3824-25, TPS3824-30, TPS3824-33, TPS3824-50, TPS3825-33, TPS3825-50, TPS3828-33, TPS3828-50 :

● Automotive: [TPS3820-33-Q1](#), [TPS3820-50-Q1](#), [TPS3823-25-Q1](#), [TPS3823-30-Q1](#), [TPS3823-33-Q1](#), [TPS3823-50-Q1](#), [TPS3824-25-Q1](#), [TPS3824-30-Q1](#), [TPS3824-33-Q1](#), [TPS3824-50-Q1](#), [TPS3825-33-Q1](#), [TPS3825-50-Q1](#), [TPS3828-33-Q1](#), [TPS3828-50-Q1](#)

NOTE: Qualified Version Definitions:

● Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

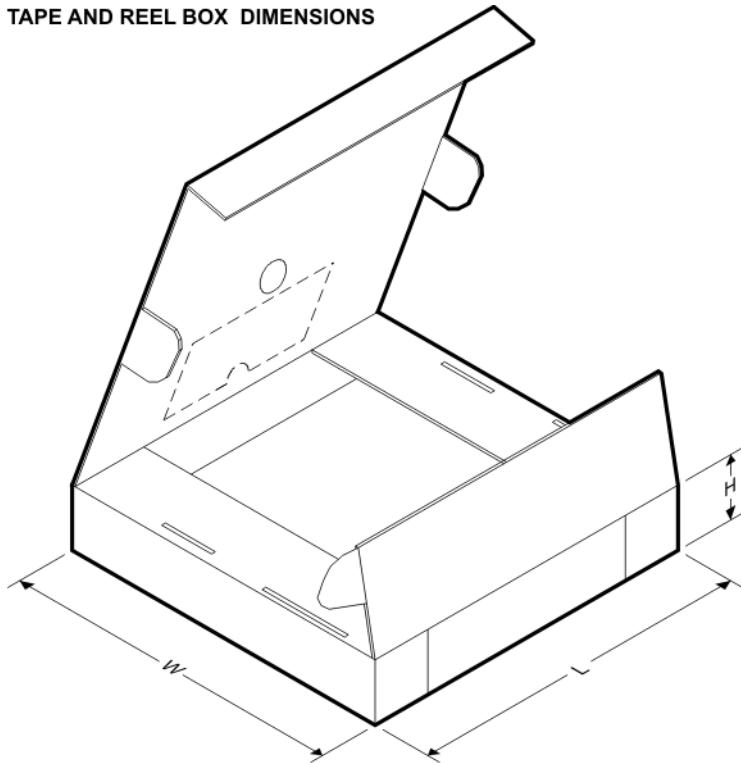


*All dimensions are nominal

| 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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS3820-33DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3820-33DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3820-33DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3820-33DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3820-50DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3820-50DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-25DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-25DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-25DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-30DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-30DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-33DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-33DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-33DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-33DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-50DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3823-50DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-25DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |

| 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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS3824-25DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-30DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-30DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-33DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-33DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-50DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3824-50DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-33DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-33DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-50DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-50DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-50DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3825-50DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3828-33DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3828-33DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3828-50DBVR | SOT-23 | DBV | 5 | 3000 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3828-50DBVT | SOT-23 | DBV | 5 | 250 | 179.0 | 8.4 | 3.2 | 3.2 | 1.4 | 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) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TPS3820-33DBVR | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3820-33DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3820-33DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3820-33DBVT | SOT-23 | DBV | 5 | 250 | 182.0 | 182.0 | 20.0 |
| TPS3820-50DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3820-50DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3823-25DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3823-25DBVR | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3823-25DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3823-30DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3823-30DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3823-33DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3823-33DBVR | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3823-33DBVT | SOT-23 | DBV | 5 | 250 | 182.0 | 182.0 | 20.0 |
| TPS3823-33DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3823-50DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3823-50DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3824-25DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3824-25DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3824-30DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3824-30DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3824-33DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3824-33DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3824-50DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3824-50DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3825-33DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3825-33DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3825-50DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3825-50DBVR | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3825-50DBVT | SOT-23 | DBV | 5 | 250 | 182.0 | 182.0 | 20.0 |
| TPS3825-50DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3828-33DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3828-33DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |
| TPS3828-50DBVR | SOT-23 | DBV | 5 | 3000 | 195.0 | 200.0 | 45.0 |
| TPS3828-50DBVT | SOT-23 | DBV | 5 | 250 | 195.0 | 200.0 | 45.0 |

DBV (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 do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-178 Variation AA.

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