

## BATTERY-BACKUP SUPERVISOR FOR RAM RETENTION

### FEATURES

- Supply Current of 40  $\mu\text{A}$  (Max)
- Battery Supply Current of 100 nA (Max)
- Precision 5-V Supply Voltage Monitor, Other Voltage Options on Request
- Backup-Battery Voltage Can Exceed  $V_{\text{DD}}$
- Watchdog Timer With 800-ms Time-Out
- Power-On Reset Generator With Fixed 100-ms Reset Delay Time
- Voltage Monitor for Power-Fail or Low-Battery Monitoring
- Battery Freshness Seal (TPS3617 Only)
- 8-Pin MSOP Package
- Temperature Range:  $-40^{\circ}$  to  $+85^{\circ}\text{C}$

### APPLICATIONS

- Fax Machines
- Set-Top Boxes
- Advanced Voice Mail Systems
- Portable Battery Powered Equipment
- Computer Equipment
- Advanced Modems
- Automotive Systems
- Portable Long-Time Monitoring Equipment
- Point-of-Sale Equipment

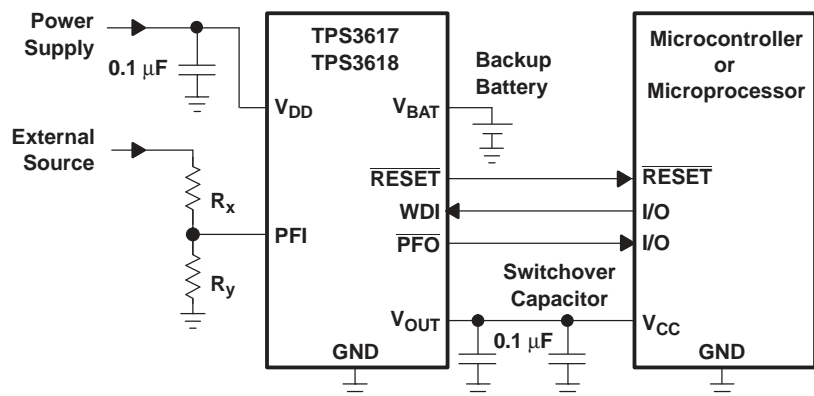
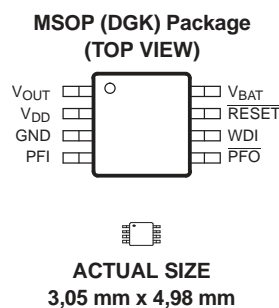
### DESCRIPTION

The TPS3617 and TPS3618 are battery-backup supervisors that monitor 5 V supplies. They provide a battery-backup function ideal for applications that require data retention of CMOS RAM during fault conditions. When the voltage at  $V_{\text{DD}}$  drops below a preset threshold ( $V_{\text{IT}}$ ), the active low push-pull  $\overline{\text{RESET}}$  output asserts, and  $V_{\text{OUT}}$  switches from  $V_{\text{DD}}$  to  $V_{\text{BAT}}$ . When  $V_{\text{DD}}$  rises above the trip threshold,  $V_{\text{OUT}}$  switches immediately from  $V_{\text{BAT}}$  to  $V_{\text{DD}}$ . The  $\overline{\text{RESET}}$  output remains low until the delay time ( $t_d$ ) expires. During power on,  $\overline{\text{RESET}}$  is asserted when the supply voltage ( $V_{\text{DD}}$  or  $V_{\text{BAT}}$ ) goes higher than 1.1 V.

The PFI and  $\overline{\text{PFO}}$  pins are provided if additional voltage monitoring is needed. If the voltage at PFI is less than 1.15 V, the push-pull  $\overline{\text{PFO}}$  pin will assert low. When the voltage at PFI exceeds the threshold voltage,  $\overline{\text{PFO}}$  will go high.

These devices also feature a watchdog timer pin ( $\overline{\text{WDI}}$ ) that monitors processor activity and asserts  $\overline{\text{RESET}}$  if the the processor is inactive longer than the watchdog timeout period. If the watchdog timer is not used, the  $\overline{\text{WDI}}$  pin should be left floating.

The TPS3617 and TPS3618 are available in an 8-pin MSOP package and are characterized for operation over a temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .



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.



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<sup>(1)</sup>

| PRODUCT    | NOMINAL SUPPLY VOLTAGE | THRESHOLD VOLTAGE (V <sub>IT</sub> ) <sup>(2)</sup> | SPECIFIED TEMPERATURE RANGE | PACKAGE MARKING | ORDERING NUMBER | TRANSPORT MEDIA, QUANTITY |
|------------|------------------------|---|-----------------------------|-----------------|-----------------|---------------------------|
| TPS3617-50 | 5V                     | 4.55V   | –40°C to +125°C             | ASD             | TPS3617-50DGK   | Tube, 80                  |
|            |                        |   |                             |                 | TPS3617-50DGKR  | Tape and Reel, 2500       |
| TPS3618-50 |                        |   |                             | ANK             | TPS3618-50DGKT  | Tape and Reel, 250        |
|            |                        |   |                             |                 | TPS3618-50DGKR  | Tape and Reel, 2500       |

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this data sheet, or refer to our web site at [www.ti.com](http://www.ti.com).  
 (2) For other threshold voltages, contact the local TI sales office for availability and lead time.

### ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature (unless otherwise noted)<sup>(1)</sup>

|  | TPS3617, TPS3618                             | UNIT |
|--|--|------|
| Input voltage range, V <sub>DD</sub>                                   | –0.3 to 7                                    | V    |
| Input voltage range, PFI pin   | –0.3 to (V <sub>DD</sub> + 0.3)              | V    |
| WDI pin  | –0.3 to (V <sub>DD</sub> + 0.3)              | V    |
| Continuous output current at V <sub>OUT</sub> , I <sub>O</sub>         | 400  | mA   |
| All other pins, I <sub>O</sub>   | ±10  | mA   |
| Operating junction temperature range, T <sub>J</sub> <sup>(2)</sup>    | –40 to +85                                   | °C   |
| Storage temperature range, T <sub>STG</sub>                            | –65 to +150                                  | °C   |
| Lead temperature soldering 1,6 mm (1/16 inch) from case for 10 seconds | +260   | °C   |
| Continuous total power dissipation                                     | See <a href="#">Dissipation Rating Table</a> |      |

- (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) Due to the low dissipated power in this device, it is assumed that T<sub>J</sub> = T<sub>A</sub>.

### DISSIPATION RATING TABLE

| PACKAGE | T <sub>A</sub> ≤ +25°C<br>POWER RATING | DERATING FACTOR<br>ABOVE T <sub>A</sub> = +25°C | T <sub>A</sub> = +70°C<br>POWER RATING | T <sub>A</sub> = +85°C<br>POWER RATING |
|---------|--|---|--|--|
| DGK     | 470 mW                                 | 3.76 mW/°C                                      | 301 mW                                 | 241 mW                                 |

## ELECTRICAL CHARACTERISTICS

1.65 V ≤ V<sub>DD</sub> ≤ 5.5 V, R<sub>LRESET</sub> = 1 MΩ, C<sub>LRESET</sub> = 50 pF, over operating temperature range (T<sub>J</sub> = –40°C to +85°C), unless otherwise noted. Typical values are at T<sub>J</sub> = +25°C.

| PARAMETER           |   | TEST CONDITIONS  | MIN  | TYP | MAX                   | UNIT                     |      |    |
|---------------------|---|--|--|-----|-----------------------|--------------------------|------|----|
| V <sub>DD</sub>     | Input supply range                                    |  | 1.65   |     | 5.5                   | V                        |      |    |
| I <sub>DD</sub>     | V <sub>DD</sub> supply current                        | V <sub>OUT</sub> = V <sub>DD</sub>                                       |  |     | 40                    | μA                       |      |    |
|                     |   | V <sub>OUT</sub> = V <sub>BAT</sub>                                      |  |     | 40                    |                          |      |    |
| V <sub>BAT</sub>    | Battery supply range                                  |  | 1.5  |     | 5.5                   | V                        |      |    |
| I <sub>BAT</sub>    | V <sub>BAT</sub> supply current                       | V <sub>OUT</sub> = V <sub>DD</sub>                                       |  |     | –0.1                  | μA                       |      |    |
|                     |   | V <sub>OUT</sub> = V <sub>BAT</sub>                                      |  |     | 0.5                   |                          |      |    |
|                     | Slew rate at V <sub>DD</sub> or V <sub>BAT</sub>      |  |  |     | 1                     | V/μs                     |      |    |
| V <sub>I</sub>      | Input voltage, any input                              |  | 0  |     | V <sub>DD</sub> + 0.3 | V                        |      |    |
| V <sub>OH</sub>     | High-level output voltage                             | RESET  | V <sub>DD</sub> = 1.8 V, I <sub>OH</sub> = –400 μA   |     |                       | V <sub>DD</sub> – 0.2    | V    |    |
|                     |   |  | V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = –2 mA,<br>V <sub>DD</sub> = 5 V, I <sub>OH</sub> = –3 mA    |     |                       | V <sub>DD</sub> – 0.4    |      |    |
|                     |   | PFO  | V <sub>DD</sub> = 1.8 V, I <sub>OH</sub> = –20 μA  |     |                       | V <sub>DD</sub> – 0.3    |      |    |
|                     |   |  | V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = –80 μA,<br>V <sub>DD</sub> = 5 V, I <sub>OH</sub> = –120 μA |     |                       | V <sub>DD</sub> – 0.4    |      |    |
| V <sub>OL</sub>     | Low-level output voltage                              | RESET PFO  | V <sub>DD</sub> = 1.8 V, I <sub>OL</sub> = 400 μA  |     |                       | 0.2                      | V    |    |
|                     |   |  | V <sub>DD</sub> = 3.3 V, I <sub>OL</sub> = 2 mA,<br>V <sub>DD</sub> = 5 V, I <sub>OL</sub> = 3 mA      |     |                       | 0.4                      |      |    |
|                     |   |  | V <sub>BAT</sub> > 1.1 V, or V <sub>DD</sub> > 1.1 V,<br>I <sub>OL</sub> = 20 μA                       |     |                       | 0.4                      |      |    |
| V <sub>OUT</sub>    | Normal mode   | I <sub>O</sub> = 8.5 mA, V <sub>DD</sub> = 1.8 V, V <sub>BAT</sub> = 0 V |  |     |                       | V <sub>DD</sub> – 0.050  | V    |    |
|                     |   | I <sub>O</sub> = 125 mA, V <sub>DD</sub> = 3.3 V, V <sub>BAT</sub> = 0 V |  |     |                       | V <sub>DD</sub> – 0.150  |      |    |
|                     |   | I <sub>O</sub> = 200 mA, V <sub>DD</sub> = 5 V, V <sub>BAT</sub> = 0 V   |  |     |                       | V <sub>DD</sub> – 0.200  |      |    |
|                     | Battery-backup mode                                   | I <sub>O</sub> = 0.5 mA, V <sub>BAT</sub> = 1.5 V, V <sub>DD</sub> = 0 V |  |     |                       | V <sub>BAT</sub> – 0.200 |      |    |
|                     |   | I <sub>O</sub> = 7.5 mA, V <sub>BAT</sub> = 3.3 V, V <sub>DD</sub> = 0 V |  |     |                       | V <sub>BAT</sub> – 0.113 |      |    |
| R <sub>DS(on)</sub> | V <sub>DD</sub> to V <sub>OUT</sub> on-resistance     | V <sub>DD</sub> = 5 V  |  |     | 0.6                   | 1                        | Ω    |    |
|                     | V <sub>BAT</sub> to V <sub>OUT</sub> on-resistance    | V <sub>BAT</sub> = 3.3 V   |  |     | 8                     | 15                       |      |    |
| I <sub>O</sub>      | Continuous output current at V <sub>OUT</sub>         |  |  |     |                       | 300                      | mA   |    |
| V <sub>IT</sub>     | Negative-going input threshold voltage <sup>(2)</sup> | TPS3617-50   | T <sub>A</sub> = –40°C to +85°C  |     | 4.46                  | 4.55                     | V    |    |
| V <sub>PFI</sub>    |   | PFI  |  |     | 1.13                  | 1.15                     | 1.17 | V  |
| V <sub>HYS</sub>    | V <sub>IT</sub> hysteresis                            | 1.65 V < V <sub>IT</sub> < 2.5 V   |  |     |                       | 20                       | mV   |    |
|                     |   | 2.5 V < V <sub>IT</sub> < 3.5 V  |  |     |                       | 40                       |      |    |
|                     |   | 3.5 V < V <sub>IT</sub> < 5.5 V  |  |     |                       | 60                       |      |    |
|                     | PFI hysteresis  |  |  |     | 12                    |                          |      |    |
|                     | V <sub>BSW</sub> hysteresis <sup>(3)</sup>            | V <sub>DD</sub> = 1.8 V  |  |     |                       | 55                       |      |    |
| V <sub>IH</sub>     | WDI high-level input voltage                          |  |  |     | 0.7 x V <sub>DD</sub> |                          |      |    |
| V <sub>IL</sub>     | WDI low-level input voltage                           |  |  |     | 0.3 x V <sub>DD</sub> |                          |      |    |
| I <sub>IH</sub>     | WDI high-level input current <sup>(4)</sup>           | WDI = V <sub>DD</sub> = 5 V  |  |     |                       | 150                      | μA   |    |
| I <sub>IL</sub>     | WDI low-level input current <sup>(4)</sup>            | WDI = 0 V, V <sub>DD</sub> = 5 V   |  |     |                       | –150                     | μA   |    |
|                     | WDI input transition rise and fall rate, Δt/ΔV        |  |  |     |                       | 100                      | ns/V |    |
| I <sub>I</sub>      | PFI input current                                     | PFI voltage < V <sub>DD</sub>  |  |     |                       | –25                      | 25   | nA |
| I <sub>OS</sub>     | PFO short-circuit current                             | PFO = 0 V, V <sub>DD</sub> = 1.8 V                                       |  |     |                       | –0.3                     | mA   |    |
|                     |   | PFO = 0 V, V <sub>DD</sub> = 3.3 V                                       |  |     |                       | –1.1                     |      |    |
|                     |   | PFO = 0 V, V <sub>DD</sub> = 5 V   |  |     |                       | –2.4                     |      |    |

(1) The lowest supply voltage at which RESET becomes active. t<sub>r</sub>, V<sub>DD</sub> ≥ 15 μs/V.

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

(3) For V<sub>DD</sub> < 1.6 V, V<sub>OUT</sub> switches to V<sub>BAT</sub> regardless of V<sub>BAT</sub>.

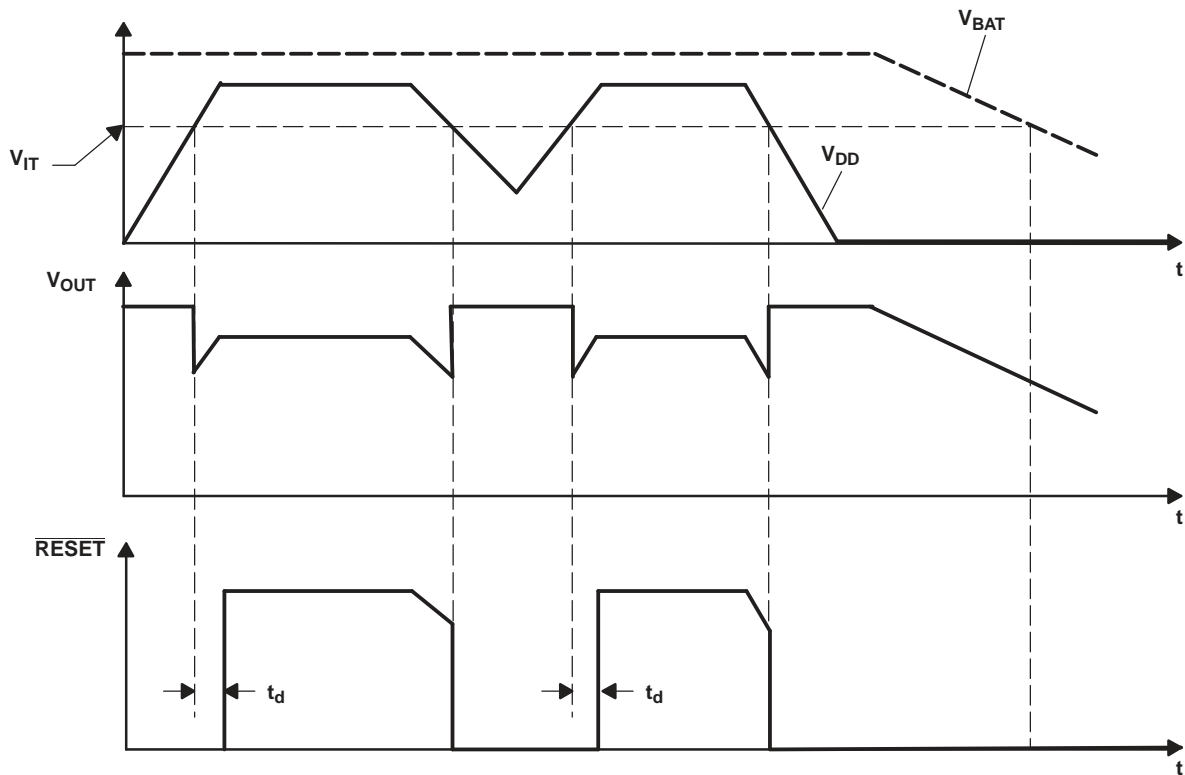
(4) For details on how to optimize current consumption when using WDI, refer to the [Watchdog](#) section of this data sheet.

**ELECTRICAL CHARACTERISTICS (continued)**

1.65 V ≤ V<sub>DD</sub> ≤ 5.5 V, R<sub>LRESET</sub> = 1 MΩ, C<sub>LRESET</sub> = 50 pF, over operating temperature range (T<sub>J</sub> = –40°C to +85°C), unless otherwise noted. Typical values are at T<sub>J</sub> = +25°C.

| PARAMETER           |  | TEST CONDITIONS  | MIN  | TYP | MAX  | UNIT |
|---------------------|--|--|--|-----|------|------|
| C <sub>i</sub>      | Input capacitance, any input                       | V <sub>I</sub> = 0 V to 5 V  |  | 5   |      | pF   |
| t <sub>w</sub>      | Pulse Width  | V <sub>DD</sub>  | V <sub>IH</sub> = V <sub>IT</sub> + 0.2 V, V <sub>IL</sub> = V <sub>IT</sub> – 0.2 V   | 6   |      | μs   |
|                     |  | WDI  | V <sub>DD</sub> > V <sub>IT</sub> + 0.2 V, V <sub>IL</sub> = 0.3 × V <sub>DD</sub> , V <sub>IH</sub> = 0.7 × V <sub>DD</sub> | 100 |      | ns   |
| t <sub>d</sub>      | Delay time   | V <sub>DD</sub> ≥ V <sub>IT</sub> + 0.2 V,<br>See <a href="#">timing diagram</a> | 60   | 100 | 140  | ms   |
| t <sub>(tout)</sub> | Watchdog time-out                                  | V <sub>DD</sub> > V <sub>IT</sub> + 0.2 V,<br>See <a href="#">timing diagram</a> | 0.48   | 0.8 | 1.12 | s    |
| t <sub>PHL</sub>    | Propagation (delay) time, high-to-low-level output | V <sub>DD</sub> to $\overline{\text{RESET}}$                                     | V <sub>IL</sub> = V <sub>IT</sub> – 0.2 V,<br>V <sub>IH</sub> = V <sub>IT</sub> + 0.2 V                                      | 2   | 5    | μs   |
|                     |  | PFI to $\overline{\text{PFO}}$   | V <sub>IL</sub> = V <sub>PFI</sub> – 0.2 V,<br>V <sub>IH</sub> = V <sub>PFI</sub> + 0.2 V                                    | 3   | 5    |      |
| Transition time     |  | V <sub>DD</sub> to V <sub>BAT</sub>  |  |     | 3    | μs   |

**TIMING DIAGRAM**



**Table 1. FUNCTION TABLE**

| V <sub>DD</sub> > V <sub>IT</sub> | V <sub>DD</sub> > V <sub>BAT</sub> | V <sub>OUT</sub> | RESET |
|-----------------------------------|------------------------------------|------------------|-------|
| 0                                 | 0                                  | V <sub>BAT</sub> | 0     |
| 0                                 | 1                                  | V <sub>DD</sub>  | 0     |
| 1                                 | 0                                  | V <sub>DD</sub>  | 1     |
| 1                                 | 1                                  | V <sub>DD</sub>  | 1     |

**Table 2.  $\overline{\text{PFO}}$  FUNCTION TABLE**

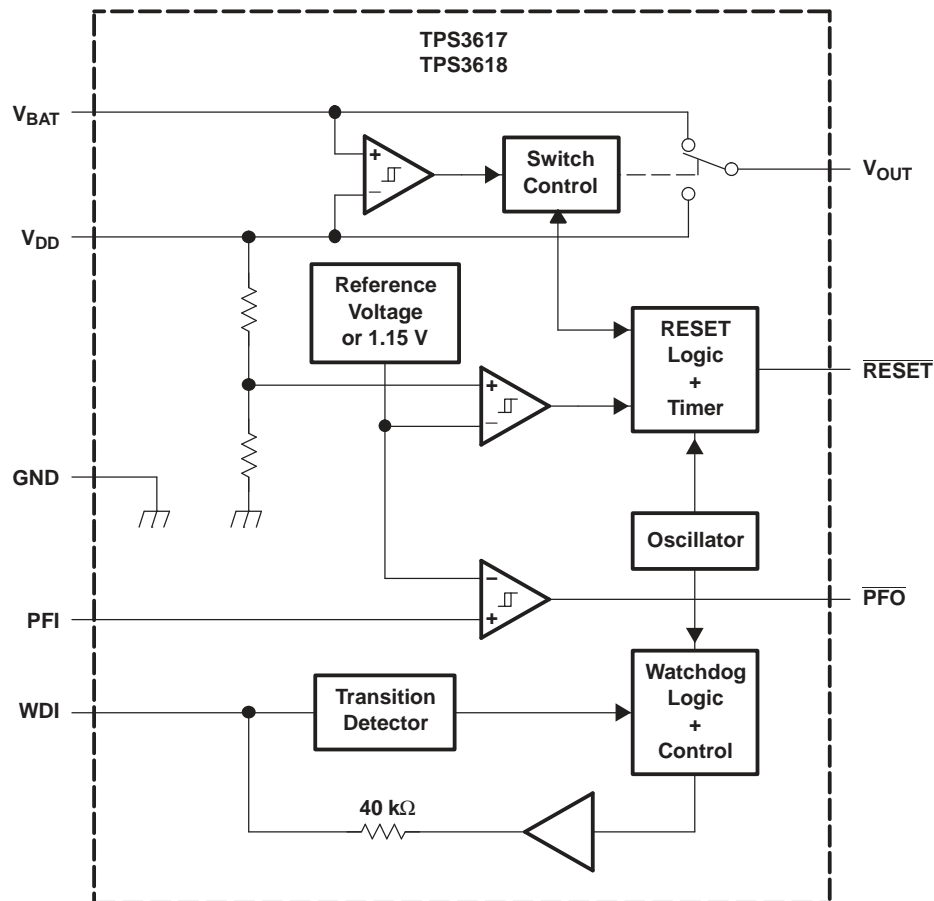
| $\text{PFI} > \text{V}_{\text{PFI}}$ | $\overline{\text{PFO}}$ |
|--------------------------------------|-------------------------|
| 0                                    | 0                       |
| 1                                    | 1                       |

CONDITION:  $\text{V}_{\text{DD}} > \text{V}_{\text{DD}(\text{MIN})}$

**Table 3. TERMINAL FUNCTIONS**

| TERMINAL NAME             | NO. | I/O | DESCRIPTION  |
|---------------------------|-----|-----|--|
| GND                       | 3   | I   | Ground   |
| PFI                       | 4   | I   | Power-fail comparator input  |
| $\overline{\text{PFO}}$   | 5   | O   | Power-fail comparator output; asserts low when $\text{PFI} < 1.15 \text{ V}$ |
| $\overline{\text{RESET}}$ | 7   | O   | Active-low push-pull reset output  |
| $\text{V}_{\text{BAT}}$   | 8   | I   | Backup-battery input   |
| $\text{V}_{\text{DD}}$    | 2   | I   | Input supply voltage   |
| $\text{V}_{\text{OUT}}$   | 1   | O   | Supply output  |
| WDI                       | 6   | I   | Watchdog input. Should be left floating if not used.                         |

**FUNCTIONAL BLOCK DIAGRAM**



TYPICAL CHARACTERISTICS

TABLE OF GRAPHS

|              |  |  | FIGURE |
|--------------|--|--|--------|
| $r_{DS(on)}$ | Static drain-source on-state resistance ( $V_{DD}$ to $V_{OUT}$ )  | vs Output current                          | 3      |
|              | Static drain-source on-state resistance ( $V_{BAT}$ to $V_{OUT}$ ) | vs Output current                          | 4      |
| $I_{DD}$     | Supply current   | vs Supply voltage                          | 5      |
| $V_{IT}$     | Input threshold voltage at $\overline{RESET}$                      | vs Free-air temperature                    | 6      |
| $V_{OH}$     | High-level output voltage at $\overline{RESET}$                    | vs High-level output current               | 7, 8   |
|              | High-level output voltage at $\overline{PFO}$                      |  | 9, 10  |
| $V_{OL}$     | Low-level output voltage at $\overline{RESET}$                     | vs Low-level output current                | 11, 12 |
|              | Minimum pulse duration at $V_{DD}$                                 | vs Threshold voltage overdrive at $V_{DD}$ | 13     |
|              | Minimum pulse duration at PFI                                      | vs Threshold voltage overdrive at PFI      | 14     |

STATIC DRAIN-SOURCE ON-STATE RESISTANCE  
( $V_{DD}$  to  $V_{OUT}$ )  
vs  
OUTPUT CURRENT

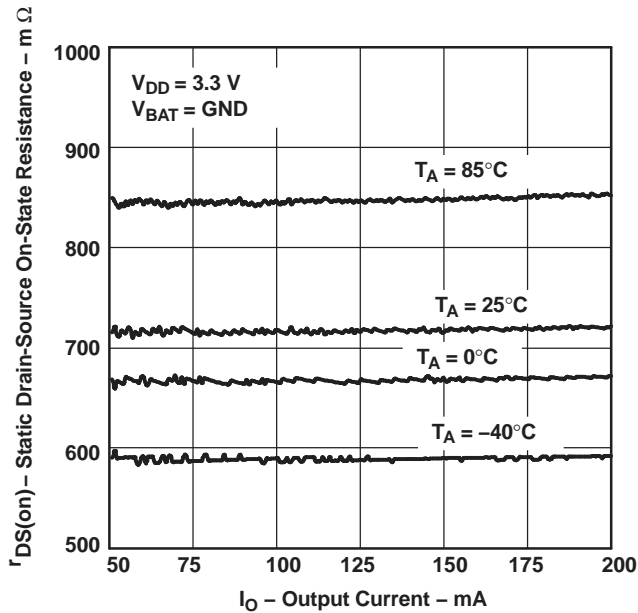


Figure 1.

STATIC DRAIN-SOURCE ON-STATE RESISTANCE  
( $V_{BAT}$  to  $V_{OUT}$ )  
vs  
OUTPUT CURRENT

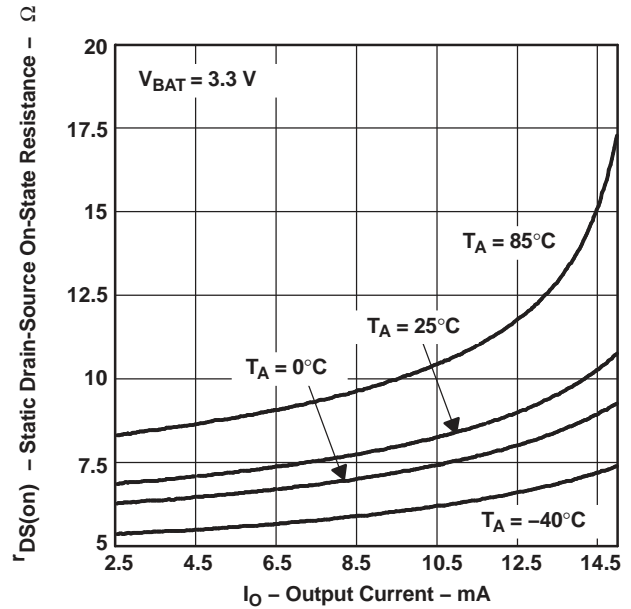


Figure 2.

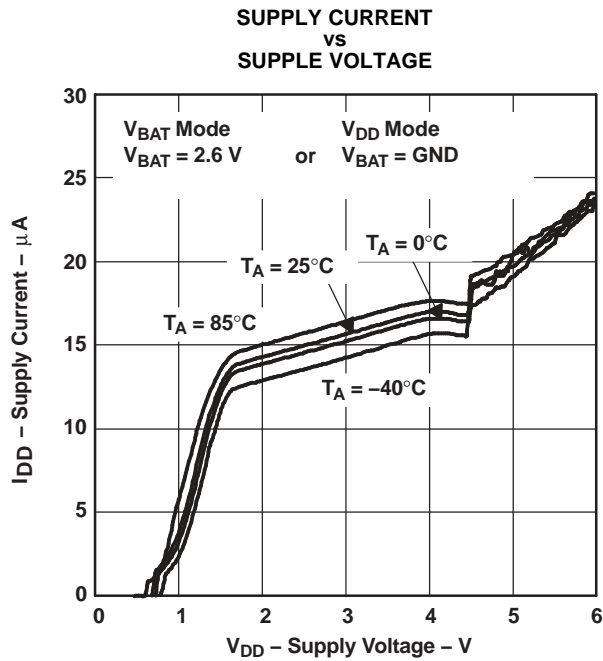


Figure 3.

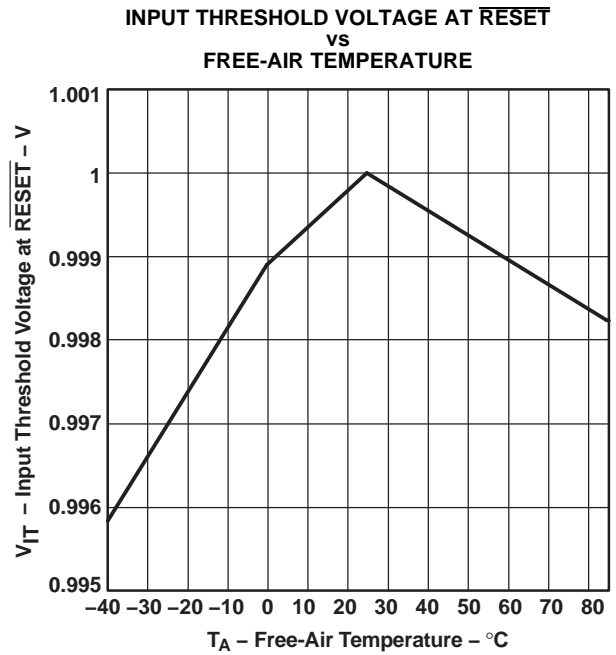


Figure 4.

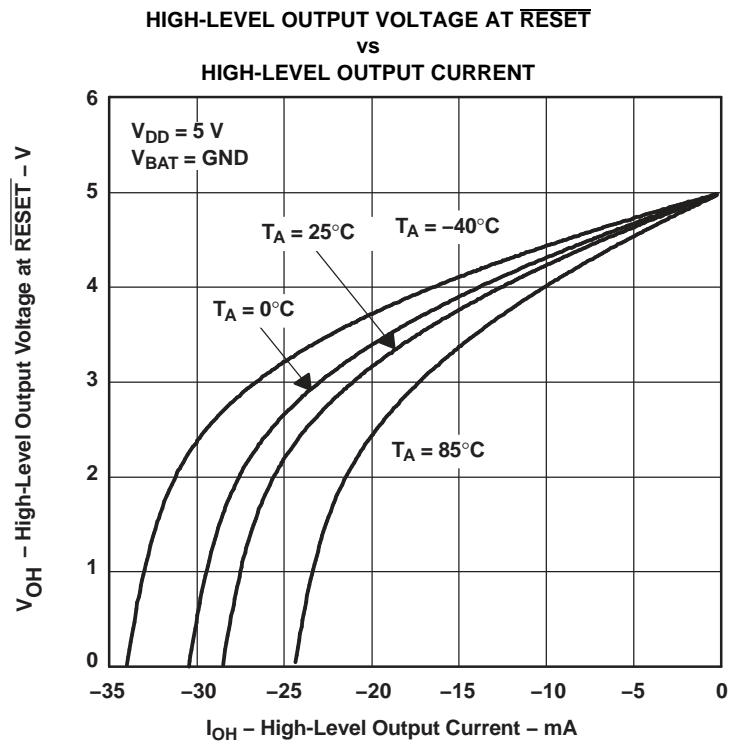


Figure 5.

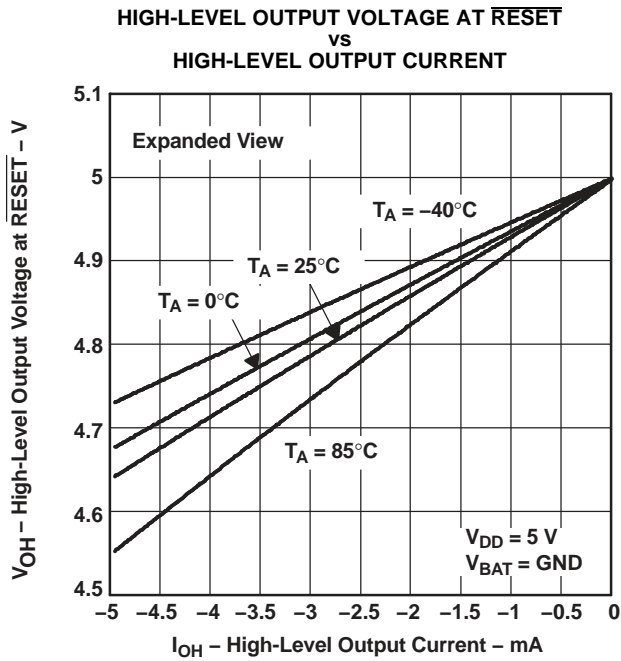


Figure 6.

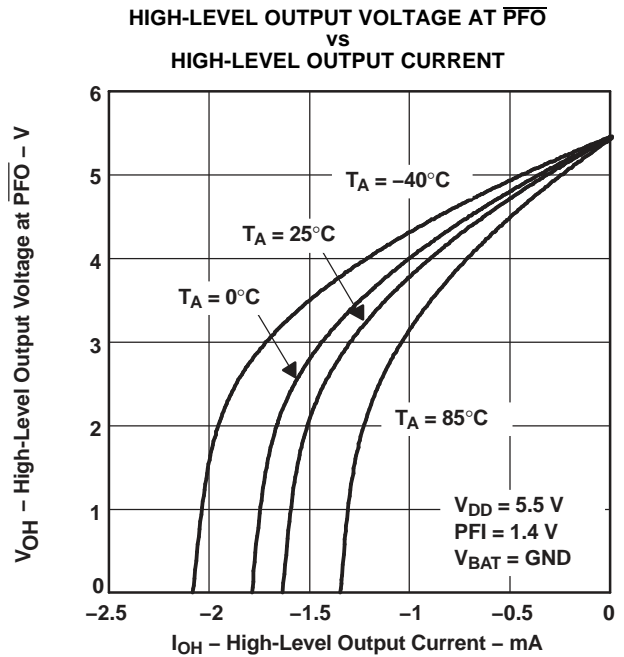


Figure 7.

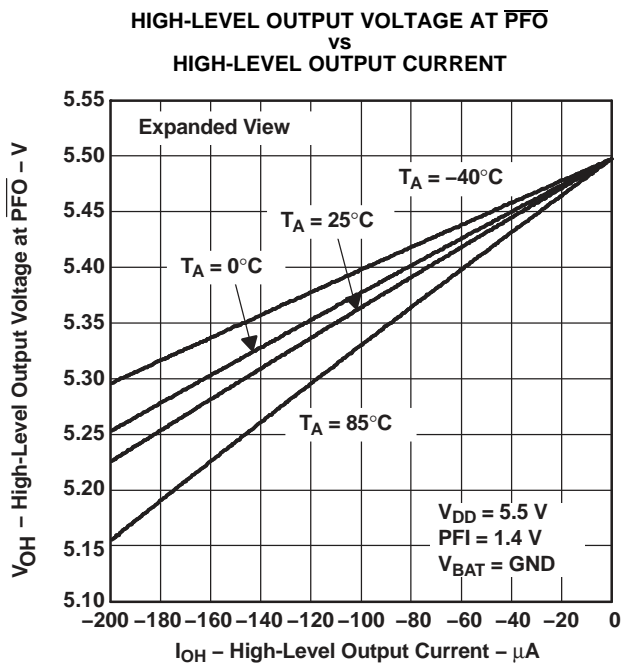


Figure 8.

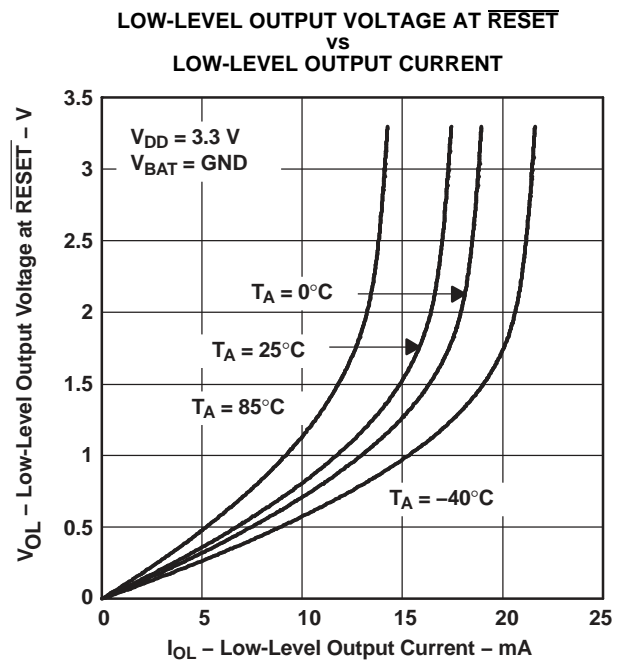


Figure 9.



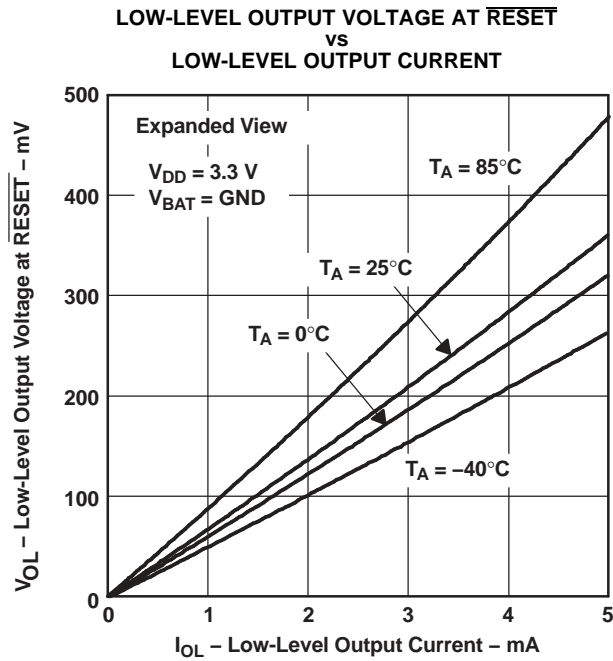


Figure 10.

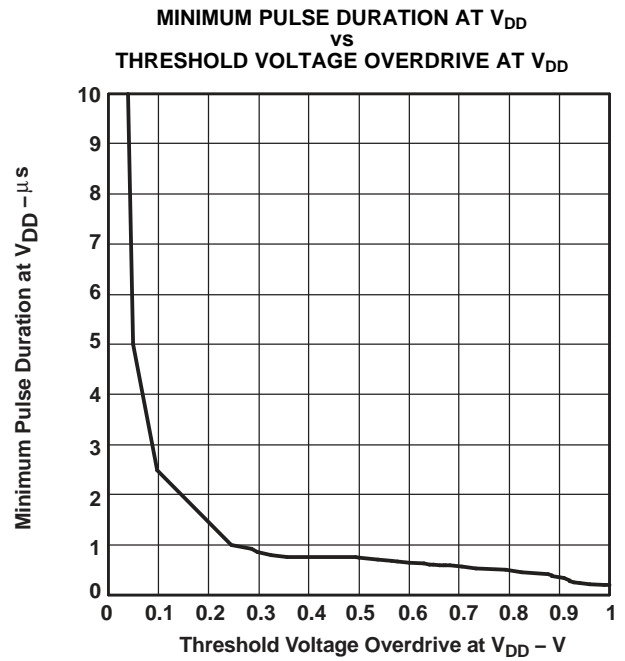


Figure 11.

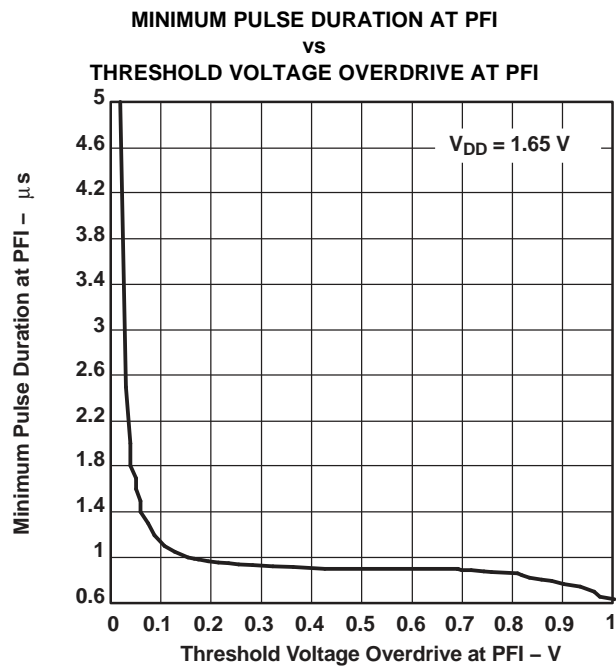


Figure 12.

## DETAILED DESCRIPTION

### BATTERY FRESHNESS SEAL (TPS3617 Only)

The battery freshness seal of the TPS3617 family disconnects the backup battery from the internal circuitry until it is needed. This ensures that the backup battery connected to  $V_{BAT}$  should be fresh when the final product is put to use. The following steps explain how to enable the freshness seal mode:

1. Connect  $V_{BAT}$  ( $V_{BAT} > V_{BAT(min)}$ ).
2. Ground  $\overline{PFO}$ .
3. Connect PFI to  $V_{DD}$  ( $PFI = V_{DD}$ ).
4. Connect  $V_{DD}$  to power supply ( $V_{DD} > V_{IT}$ ) and keep connected for  $5\text{ ms} < t < 35\text{ ms}$ .

The battery freshness seal mode is disabled by the positive-going edge of  $\overline{RESET}$  when  $V_{DD}$  is applied.

### POWER-FAIL COMPARATOR (PFI AND $\overline{PFO}$ )

An additional comparator monitors voltages other than the nominal supply voltage. The power-fail-input (PFI) can be compared with an internal voltage reference of 1.15 V. If the input voltage falls below the power-fail threshold ( $V_{(PFI)}$ ) of 1.15 V typical, the power-fail output ( $\overline{PFO}$ ) goes low. If it goes above  $V_{(PFI)}$  plus about 12-mV hysteresis, the output returns to high. By connecting two external resistors it is possible to supervise any voltages above  $V_{(PFI)}$ . The sum of both resistors should be about 1 M $\Omega$ , to minimize power consumption and also to ensure that the current in the PFI pin can be neglected compared with the current through the resistor network. The tolerance of the external resistors should be not more than 1% to ensure minimal variation of the sensed voltage. If the power-fail comparator is unused, connect PFI to ground and leave the  $\overline{PFO}$  unconnected.

### WATCHDOG

In a microprocessor- or DSP-based system, it is not only important to supervise the supply voltage, it is also important to ensure correct program execution. The task of a watchdog is to ensure that the program is not stalled in an indefinite loop. The microprocessor, microcontroller, or DSP has to toggle the watchdog input within 0.8 s typically, to avoid a timeout from occurring. Either a low-to-high or a high-to-low transition resets the internal watchdog timer. If the input is unconnected, the watchdog is disabled and should be retriggered internally. See Figure 13 for the watchdog timing diagram.

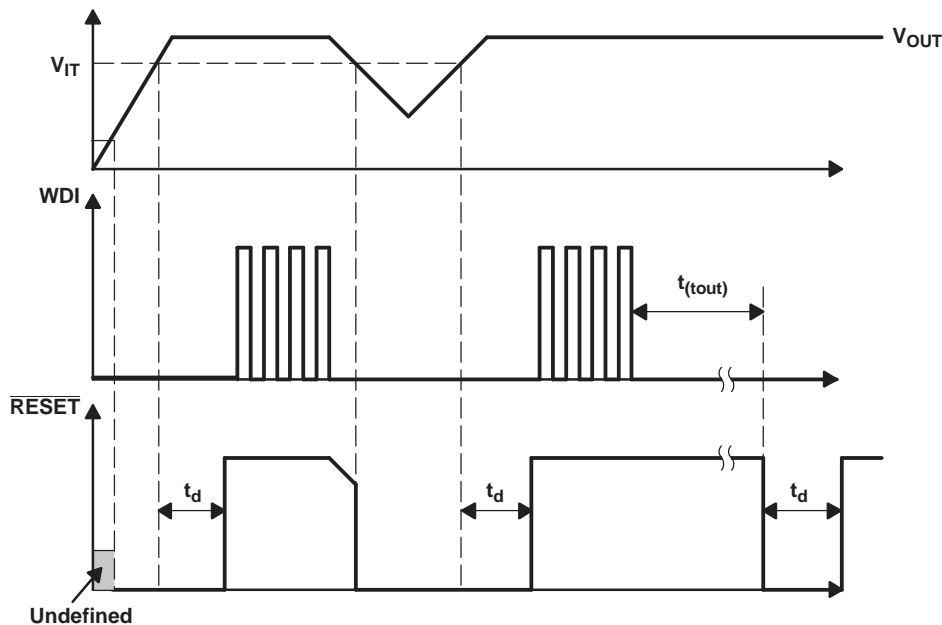


Figure 13. Watchdog Timing

## DETAILED DESCRIPTION (continued)

### SAVING CURRENT WHILE USING THE WATCHDOG

The watchdog input is internally driven low during the first 7/8 of the watchdog time-out period, then momentarily pulses high, resetting the watchdog counter. For minimum watchdog input current (minimum overall power consumption), leave WDI low for the majority of the watchdog time-out period, pulsing it low-high-low once within 7/8 of the watchdog time-out period to reset the watchdog timer. If instead, WDI is externally driven high for the majority of the time-out period, a current of e.g.  $5.0 \text{ V}/40 \text{ k}\Omega \approx 125 \mu\text{A}$  can flow into WDI.

### BACKUP-BATTERY SWITCHOVER

In case of a brownout or power failure, it may be necessary to preserve the contents of RAM. If a backup battery is installed at  $V_{\text{BAT}}$ , the device automatically switches the connected RAM to backup power when  $V_{\text{DD}}$  fails. In order to allow the backup battery (e.g., a 3.6-V lithium cell) to have a higher voltage than  $V_{\text{DD}}$ , these supervisors should not connect  $V_{\text{BAT}}$  to  $V_{\text{OUT}}$  when  $V_{\text{BAT}}$  is greater than  $V_{\text{DD}}$ .  $V_{\text{BAT}}$  only connects to  $V_{\text{OUT}}$  (through a 15- $\Omega$  switch) when  $V_{\text{DD}}$  falls below  $V_{\text{IT}}$  and  $V_{\text{BAT}}$  is greater than  $V_{\text{DD}}$ . When  $V_{\text{DD}}$  recovers, switchover is deferred either until  $V_{\text{DD}}$  crosses  $V_{\text{BAT}}$ , or until  $V_{\text{DD}}$  rises above the reset threshold  $V_{\text{IT}}$ .  $V_{\text{OUT}}$  connects to  $V_{\text{DD}}$  through a 1- $\Omega$  (max) PMOS switch when  $V_{\text{DD}}$  crosses the reset threshold.

| FUNCTION TABLE                   |                                 |                  |
|----------------------------------|---------------------------------|------------------|
| $V_{\text{DD}} > V_{\text{BAT}}$ | $V_{\text{DD}} > V_{\text{IT}}$ | $V_{\text{OUT}}$ |
| 1                                | 1                               | $V_{\text{DD}}$  |
| 1                                | 0                               | $V_{\text{DD}}$  |
| 0                                | 1                               | $V_{\text{DD}}$  |
| 0                                | 0                               | $V_{\text{BAT}}$ |

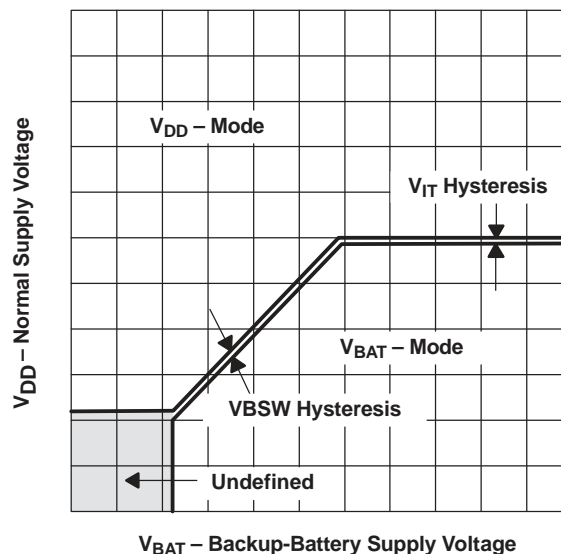


Figure 14.  $V_{\text{DD}} - V_{\text{BAT}}$  Switchover

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| TPS3617-50DGK    | LIFEBUY       | VSSOP        | DGK             | 8    | 80          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | ASD                     |         |
| TPS3617-50DGKR   | LIFEBUY       | VSSOP        | DGK             | 8    | 2500        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | ASD                     |         |
| TPS3618-50DGKT   | LIFEBUY       | VSSOP        | DGK             | 8    | 250         | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 125   | ANK                     |         |

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

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**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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS3617-50DGKR | VSSOP        | DGK             | 8    | 2500 | 330.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| TPS3618-50DGKT | VSSOP        | DGK             | 8    | 250  | 177.8              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |

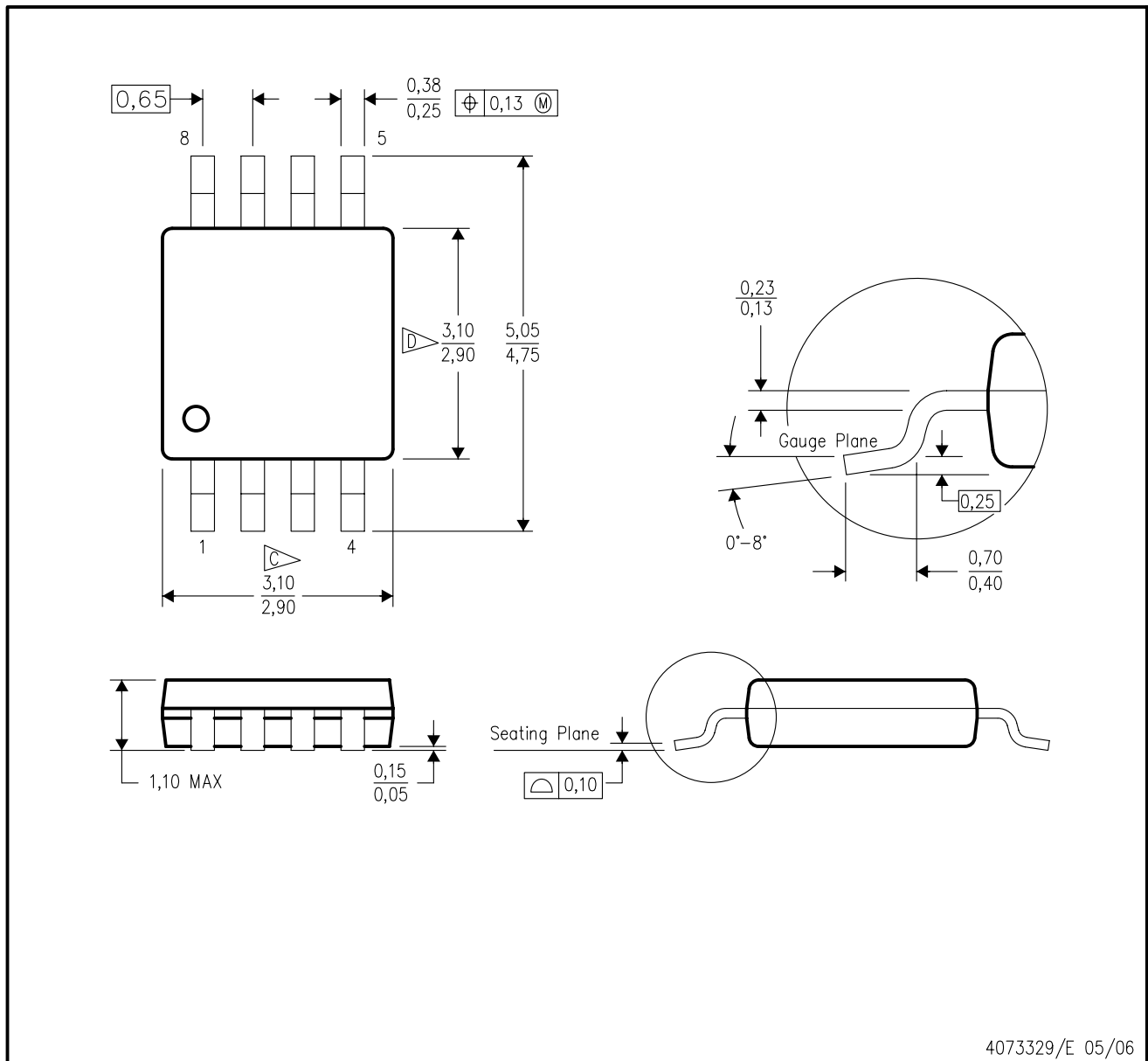
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TPS3617-50DGKR | VSSOP        | DGK             | 8    | 2500 | 358.0       | 335.0      | 35.0        |
| TPS3618-50DGKT | VSSOP        | DGK             | 8    | 250  | 358.0       | 335.0      | 35.0        |

DGK (S-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
  - E. Falls within JEDEC MO-187 variation AA, except interlead flash.





- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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