

- Qualified for Automotive Applications
 - Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
 - ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
 - Supply Current of 220 nA (Typ)
 - Precision Supply Voltage Supervision Range: 1.8 V, 2.5 V, 3.0 V, 3.3 V
 - Power-On Reset Generator With Selectable Delay Time of 10 ms or 200 ms
 - Push/Pull $\overline{\text{RESET}}$ Output (TPS3836), RESET Output (TPS3837), or Open-Drain $\overline{\text{RESET}}$ Output (TPS3838)
 - Manual Reset
 - 5-Pin SOT-23 Package
 - Temperature Range: -40°C to 125°C
- Applications Include
 - Applications Using Automotive Low-Power DSPs, Microcontrollers, or Microprocessors
 - Battery-Powered Equipment
 - Intelligent Instruments
 - Wireless Communication Systems
 - Automotive Systems

description

The TPS3836, TPS3837, TPS3838 families of supervisory circuits provide circuit initialization and timing supervision, primarily for DSP 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 $\overline{\text{RESET}}$ output 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 starts after V_{DD} has risen above the threshold voltage V_{IT} .

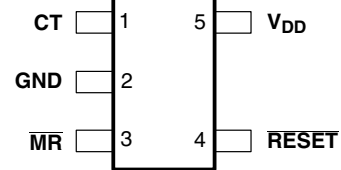
When CT is connected to GND a fixed delay time of typical 10 ms is asserted. When connected to V_{DD} the delay time is typically 200 ms.

When the supply voltage drops below the threshold voltage V_{IT} , the output becomes active (low) again.

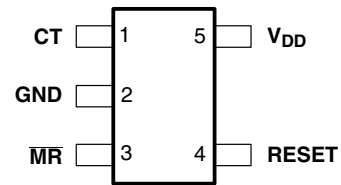
All the devices of this family have a fixed-sense threshold voltage V_{IT} set by an internal voltage divider.

The TPS3836 has an active-low push-pull $\overline{\text{RESET}}$ output. The TPS3837 has active-high push-pull RESET, and TPS3838 integrates an active-low open-drain $\overline{\text{RESET}}$ output.

TPS3836, TPS3838
 DBV PACKAGE
 (TOP VIEW)



TPS3837
 DBV PACKAGE
 (TOP VIEW)



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.

 **TEXAS
 INSTRUMENTS**

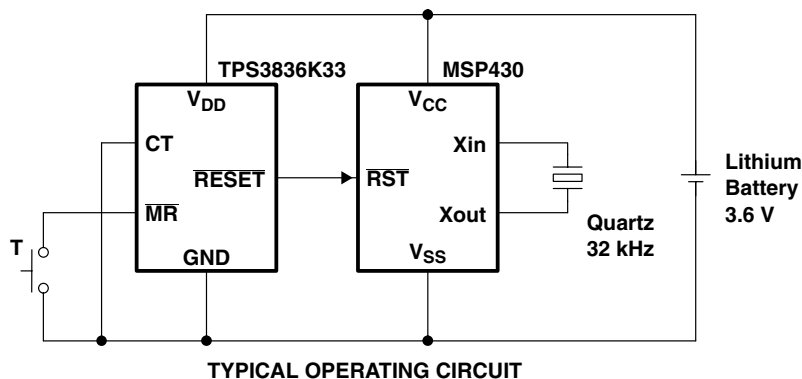
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TPS3836E18-Q1 / J25-Q1 / H30-Q1 / L30-Q1 / K33-Q1
TPS3837E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1, TPS3838E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1
NANOPOWER SUPERVISORY CIRCUITS

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description (continued)



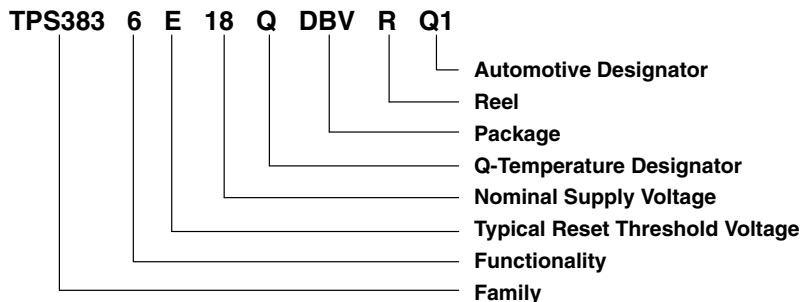
The product spectrum is designed for supply voltages of 1.8 V, 2.5 V, 3 V, and 3.3 V. The circuits are available in a 5-pin SOT-23 package. The TPS3836-Q-Q1, TPS3837-Q-Q1, TPS3838-Q-Q1 families are characterized for operation over a temperature range of -40°C to 125°C .

PACKAGE INFORMATION

| T_A | DEVICE NAME | THRESHOLD VOLTAGE | SYMBOL |
|--|--------------------|-------------------|--------|
| -40°C to 125°C | TPS3836E18QDBVRQ1† | 1.71 V | PDNQ |
| | TPS3836J25QDBVRQ1† | 2.25 V | PDSQ |
| | TPS3836H30QDBVRQ1† | 2.79 V | PHRQ |
| | TPS3836L30QDBVRQ1† | 2.64 V | PCAQ |
| | TPS3836K33QDBVRQ1† | 2.93 V | PDTQ |
| | TPS3837E18QDBVRQ1† | 1.71 V | PDOQ |
| | TPS3837J25QDBVRQ1† | 2.25 V | PDRQ |
| | TPS3837L30QDBVRQ1† | 2.64 V | PCBQ |
| | TPS3837K33QDBVRQ1† | 2.93 V | PDUQ |
| | TPS3838E18QDBVRQ1† | 1.71 V | PDQQ |
| | TPS3838J25QDBVRQ1† | 2.25 V | PDPQ |
| | TPS3838L30QDBVRQ1† | 2.64 V | PCCQ |
| | TPS3838K33QDBVRQ1† | 2.93 V | PDVQ |

† DBVR indicates tape and reel of 3000 parts.

ORDERING INFORMATION



TPS3836E18-Q1 / J25-Q1 / H30-Q1 / L30-Q1 / K33-Q1
TPS3837E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1, TPS3838E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1
NANOPOWER SUPERVISORY CIRCUITS

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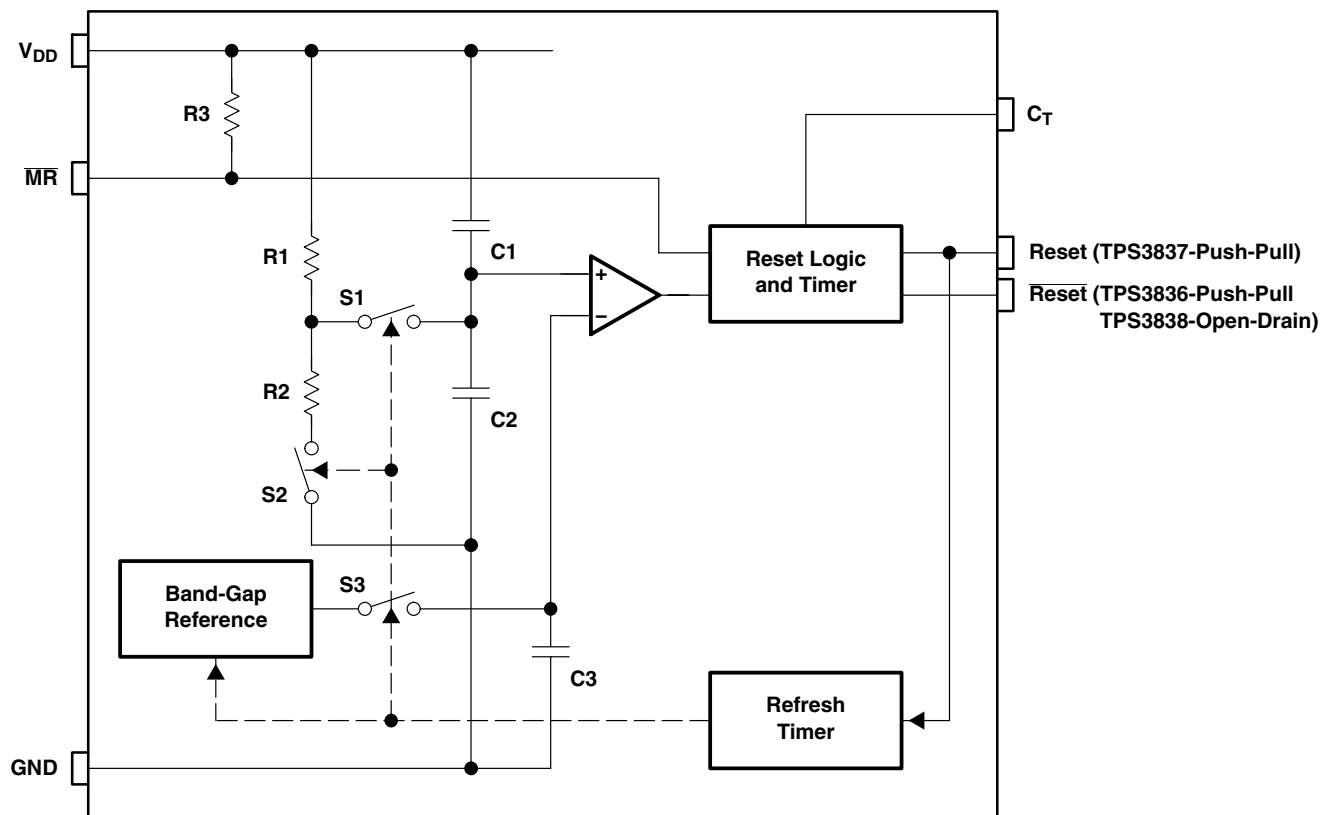
FUNCTION TABLE TPS3836, TPS3837, TPS3838

| MR | $V_{DD} > V_{IT}$ | RESET [†] | RESET [‡] |
|----|-------------------|--------------------|--------------------|
| L | 0 | L | H |
| L | 1 | L | H |
| H | 0 | L | H |
| H | 1 | H | L |

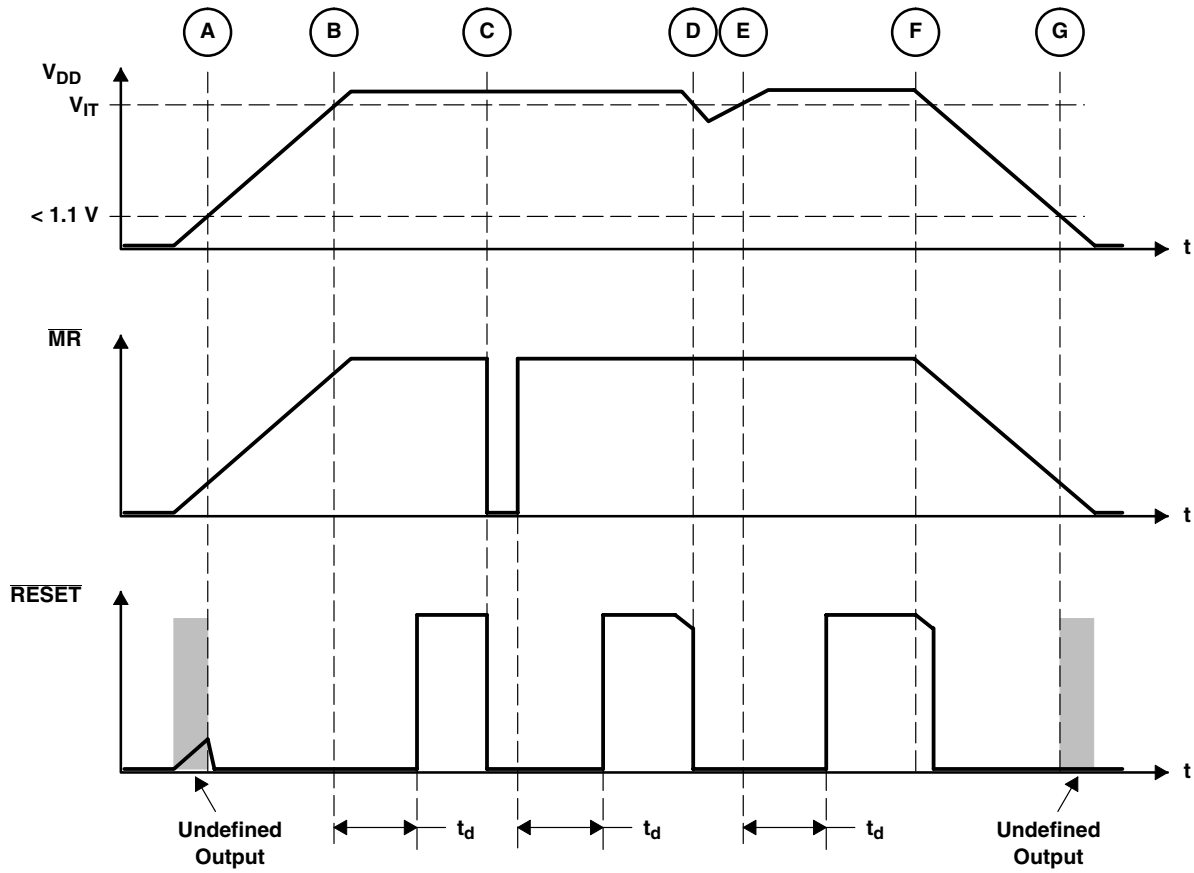
† TPS3836 and TPS3838

‡ TPS3837

functional block diagram



timing diagram



TPS3836E18-Q1 / J25-Q1 / H30-Q1 / L30-Q1 / K33-Q1
TPS3837E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1, TPS3838E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1
NANOPOWER SUPERVISORY CIRCUITS

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absolute maximum ratings over operating free-air temperature range (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 $V_I > V_{DD}$) | ± 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 125°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 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 | $T_A = 125^\circ\text{C}$ POWER RATING |
|---------|--|---|--|--|---|
| DBV | 437 mW | 3.5 mW/°C | 280 mW | 227 mW | 87 mW |

recommended operating conditions at specified temperature range

| | MIN | MAX | UNIT |
|--|---------------------|---------------------|------|
| Supply voltage, V_{DD} | 1.6 | 6 | V |
| Input voltage, V_I | 0 | $V_{DD} + 0.3$ | V |
| High-level input voltage, 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} , $\Delta t/\Delta V$ | | 100 | ns/V |
| Operating free-air temperature range, T_A | -40 | 125 | °C |



TPS3836E18-Q1 / J25-Q1 / H30-Q1 / L30-Q1 / K33-Q1
TPS3837E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1, TPS3838E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1
NANOPOWER SUPERVISORY CIRCUITS

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electrical characteristics over recommended operating conditions (unless otherwise noted)

| PARAMETER | | TEST CONDITION | | MIN | TYP | MAX | UNIT |
|--|---|----------------------|--|-----------------------|------|------|------|
| V _{OH} | High-level output voltage | RESET (TPS3836) | V _{DD} = 3.3 V, I _{OH} = -2 mA | 0.8 × V _{DD} | | | V |
| | | | V _{DD} = 6 V, I _{OH} = -3 mA | | | | |
| | | RESET (TPS3837) | V _{DD} = 1.8 V, I _{OH} = -1 mA | | | | |
| | | | V _{DD} = 3.3 V, I _{OL} = -2 mA | | | | |
| V _{OL} | Low-level output voltage | RESET (TPS3836/8) | V _{DD} = 1.8 V, I _{OL} = 1 mA | | | 0.4 | V |
| | | | V _{DD} = 3.3 V, I _{OL} = 2 mA | | | | |
| | | RESET (TPS3837) | V _{DD} = 3.3 V, I _{OL} = 2 mA | | | | |
| | | | V _{DD} = 6 V, I _{OL} = 3 mA | | | | |
| Power-up reset voltage (see Note 2) | | TPS3836/8 | V _{DD} ≥ 1.1 V, I _{OL} = 50 μA | | | 0.2 | V |
| | | TPS3837 | V _{DD} ≥ 1.1 V, I _{OH} = -50 μA | 0.8 × V _{DD} | | | |
| V _{IT} | Negative-going input threshold voltage (see Note 3) | TPS383xE18 | | 1.64 | 1.71 | 1.76 | V |
| | | TPS383xJ25 | | 2.16 | 2.25 | 2.30 | |
| | | TPS383xH30 | | 2.70 | 2.79 | 2.85 | |
| | | TPS383xL30 | | 2.54 | 2.64 | 2.71 | |
| | | TPS383xK33 | | 2.82 | 2.93 | 3.10 | |
| V _{hys} | Hysteresis at V _{DD} input | | 1.7 V < V _{IT} < 2.5 V | | | 30 | mV |
| | | | 2.5 V < V _{IT} < 3.5 V | | | 40 | |
| | | | 3.5 V < V _{IT} < 5 V | | | 50 | |
| I _{IH} | High-level input current | MR̄ (see Note 4) | MR̄ = 0.7 × V _{DD} , V _{DD} = 6 V | -40 | -60 | -100 | μA |
| | | CT | CT = V _{DD} = 6 V | -25 | | 25 | nA |
| I _{IL} | Low-level input current | MR̄ (see Note 4) | MR̄ = 0 V, V _{DD} = 6 V | -130 | -200 | -340 | μA |
| | | CT | CT = 0 V, V _{DD} = 6 V | -25 | | 25 | nA |
| I _{OH} | High-level output current | TPS3838 | V _{DD} = V _{IT} + 0.2 V, V _{OH} = V _{DD} | | | 25 | nA |
| I _{DD} | Supply current | | V _{DD} > V _{IT} , V _{DD} < 3 V | | 220 | 500 | nA |
| | | | V _{DD} > V _{IT} , V _{DD} > 3 V | | 250 | 550 | |
| | | | V _{DD} < V _{IT} | | 10 | 25 | μA |
| Internal pullup resistor at MR̄ | | | | | 30 | | kΩ |
| C _I | Input capacitance at MR̄, CT | | V _I = 0 V to V _{DD} | | 5 | | pF |

- NOTES: 2. The lowest voltage at which RESET output becomes active. t_r, V_{DD} ≥ 15 μs/V
3. To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 μF) should be placed near the supply terminal.
4. If manual reset is unused, MR should be connected to V_{DD} to minimize current consumption.



TPS3836E18-Q1 / J25-Q1 / H30-Q1 / L30-Q1 / K33-Q1
TPS3837E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1, TPS3838E18-Q1 / J25-Q1 / L30-Q1 / K33-Q1
NANOPOWER SUPERVISORY CIRCUITS

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timing requirements at $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|-------------|--|-----|-----|-----|---------------|
| t_w | Pulse width | at V_{DD} $V_{IH} = V_{IT} + 0.2\text{ V}$, $V_{IL} = V_{IT} - 0.2\text{ V}$ | 6 | | | μs |
| | | at $\overline{\text{MR}}$ $V_{DD} \geq V_{IT} + 0.2\text{ V}$, $V_{IH} = 0.7 \times V_{DD}$, $V_{IL} = 0.7 \times V_{DD}$ | 1 | | | μs |

switching characteristics at $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|--|--|-----|-----|-----|---------------|
| t_d | Delay time | $V_{DD} \geq V_{IT} + 0.2\text{ V}$, $\overline{\text{MR}} = 0.7 \times V_{DD}$, $\text{CT} = \text{GND}$, See timing diagram | 5 | 10 | 15 | ms |
| | | $V_{DD} \geq V_{IT} + 0.2\text{ V}$, $\overline{\text{MR}} = 0.7 \times V_{DD}$, $\text{CT} = V_{DD}$, See timing diagram | 100 | 200 | 300 | |
| t_{PHL} | Propagation (delay) time, high-to-low-level output | V_{DD} to $\overline{\text{RESET}}$ delay (TPS3836, TPS3838) $V_{IL} = V_{IT} - 0.2\text{ V}$, $V_{IH} = V_{IT} + 0.2\text{ V}$ | | | 10 | μs |
| | | $V_{IL} = 1.6\text{ V}$ | | | 50 | |
| t_{PLH} | Propagation (delay) time, low-to-high-level output | V_{DD} to $\overline{\text{RESET}}$ delay (TPS3837) $V_{IL} = V_{IT} - 0.2\text{ V}$, $V_{IH} = V_{IT} + 0.2\text{ V}$ | | | 10 | μs |
| | | $V_{IL} = 1.6\text{ V}$ | | | 50 | |
| t_{PHL} | Propagation (delay) time, high-to-low-level output | $\overline{\text{MR}}$ to $\overline{\text{RESET}}$ delay (TPS3836, TPS3838) $V_{DD} \geq V_{IT} + 0.2\text{ V}$, $V_{IL} = 0.3 \times V_{DD}$ | | | 0.1 | μs |
| t_{PLH} | Propagation (delay) time, low-to-high-level output | $\overline{\text{MR}}$ to $\overline{\text{RESET}}$ delay (TPS3837) $V_{IL} = 0.7 \times V_{DD}$ | | | 0.1 | μs |

TYPICAL CHARACTERISTICS

Table of Graphs

| | | | FIGURE |
|----------|------------------------------------|---------------------------------|--------|
| I_{DD} | Supply current | vs Supply voltage | 1 |
| I_{MR} | Manual reset current | vs Manual reset voltage | 2 |
| V_{OL} | Low-level output voltage | vs Low-level output current | 3 |
| V_{OH} | High-level output voltage | vs High-level output current | 4 |
| | Normalized reset threshold voltage | vs Free-air temperature | 5 |
| | Minimum pulse duration at V_{DD} | vs V_{DD} Threshold overdrive | 6 |



TYPICAL CHARACTERISTICS

SUPPLY CURRENT
 vs
 SUPPLY VOLTAGE

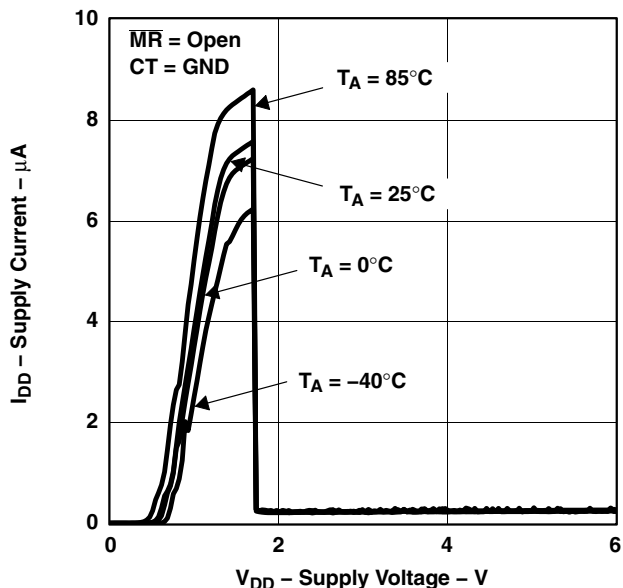


Figure 1

MANUAL RESET CURRENT
 vs
 MANUAL RESET VOLTAGE

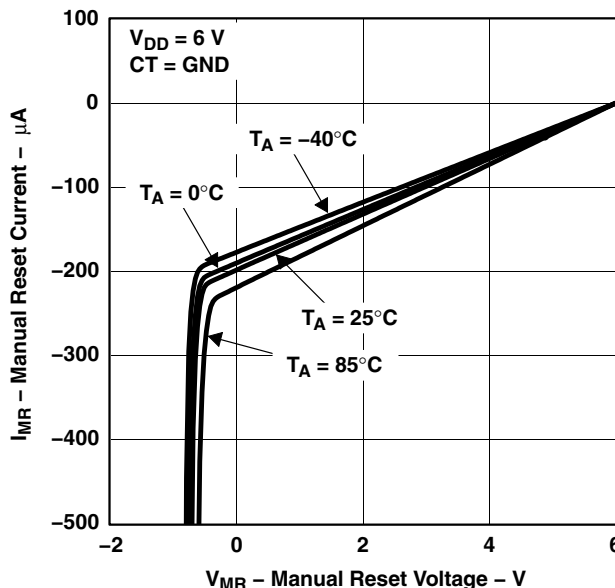


Figure 2

LOW-LEVEL OUTPUT VOLTAGE
 vs
 LOW-LEVEL OUTPUT CURRENT

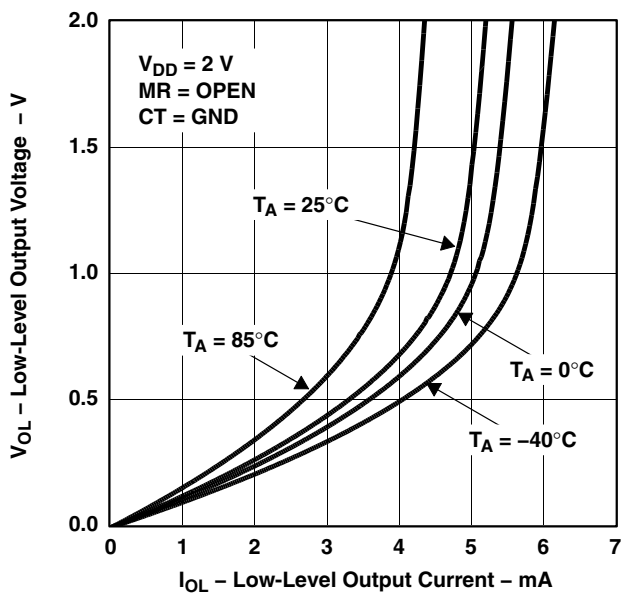


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE
 vs
 HIGH-LEVEL OUTPUT CURRENT

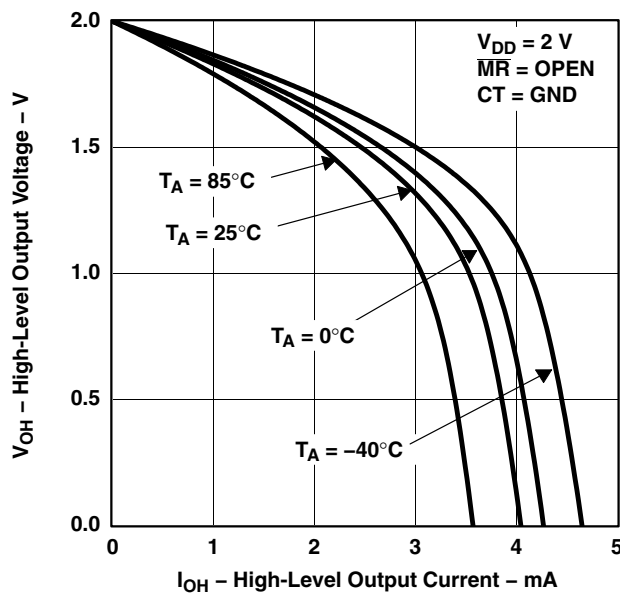


Figure 4

TYPICAL CHARACTERISTICS

**NORMALIZED RESET THRESHOLD VOLTAGE
 vs
 FREE-AIR TEMPERATURE**

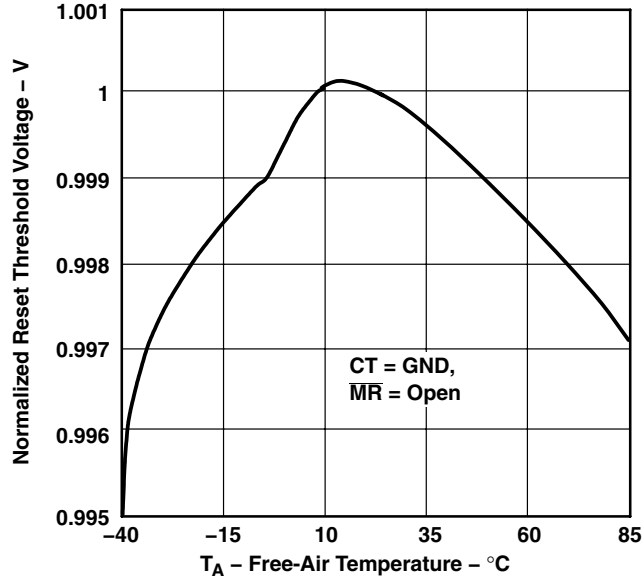


Figure 5

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

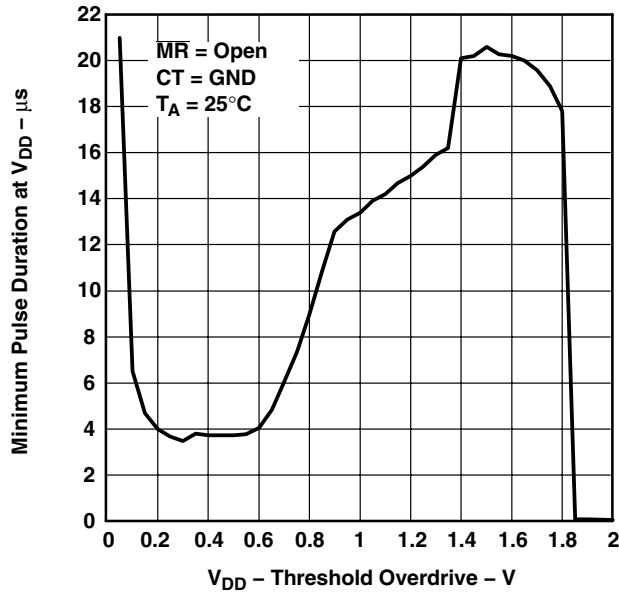


Figure 6

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Top-Side Markings (4) | Samples |
|--------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| 2U3836E18QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDNQ | Samples |
| 2U3836H30QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PHRQ | Samples |
| 2U3836J25QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDSQ | Samples |
| 2U3836K33QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDTQ | Samples |
| 2U3836L30QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCAQ | Samples |
| 2U3837E18QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDOQ | Samples |
| 2U3837J25QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDRQ | Samples |
| 2U3837K33QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDUQ | Samples |
| 2U3837L30QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCBQ | Samples |
| 2U3838E18QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDQQ | Samples |
| 2U3838J25QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDPQ | Samples |
| 2U3838K33QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDVQ | Samples |
| 2U3838L30QDBVRG4Q1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCCQ | Samples |
| TPS3836E18QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDNQ | Samples |
| TPS3836H30QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PHRQ | Samples |
| TPS3836J25QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDSQ | Samples |
| TPS3836K33QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDTQ | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Top-Side Markings (4) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|-------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| TPS3836L30QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCAQ | Samples |
| TPS3837E18QDBVRQ1 | OBSOLETE | SOT-23 | DBV | 5 | | TBD | Call TI | Call TI | -40 to 125 | | |
| TPS3837J25QDBVRQ1 | OBSOLETE | SOT-23 | DBV | 5 | | TBD | Call TI | Call TI | -40 to 125 | | |
| TPS3837K33QDBVRQ1 | OBSOLETE | SOT-23 | DBV | 5 | | TBD | Call TI | Call TI | -40 to 125 | | |
| TPS3837L30QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCBQ | Samples |
| TPS3838E18QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDQQ | Samples |
| TPS3838J25QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDPQ | Samples |
| TPS3838K33QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PDVQ | Samples |
| TPS3838L30QDBVRQ1 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | PCCQ | Samples |

(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.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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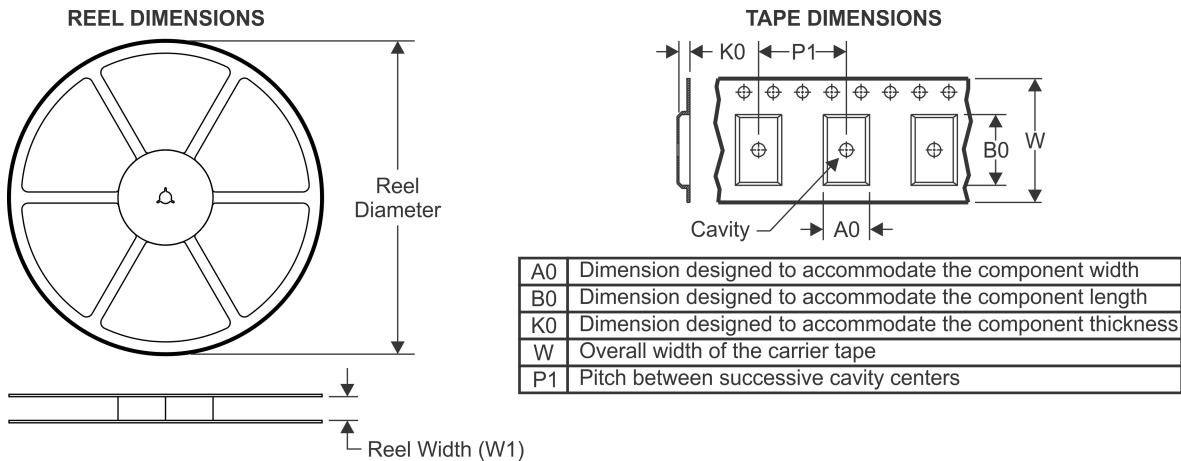
OTHER QUALIFIED VERSIONS OF TPS3836E18-Q1, TPS3836H30-Q1, TPS3836J25-Q1, TPS3836K33-Q1, TPS3836L30-Q1, TPS3837E18-Q1, TPS3837J25-Q1, TPS3837K33-Q1, TPS3837L30-Q1, TPS3838E18-Q1, TPS3838J25-Q1, TPS3838K33-Q1, TPS3838L30-Q1 :

- Catalog: [TPS3836E18](#), [TPS3836H30](#), [TPS3836J25](#), [TPS3836K33](#), [TPS3836L30](#), [TPS3837E18](#), [TPS3837J25](#), [TPS3837K33](#), [TPS3837L30](#), [TPS3838E18](#), [TPS3838J25](#), [TPS3838K33](#), [TPS3838L30](#)
- Enhanced Product: [TPS3836J25-EP](#), [TPS3836L30-EP](#), [TPS3837K33-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION



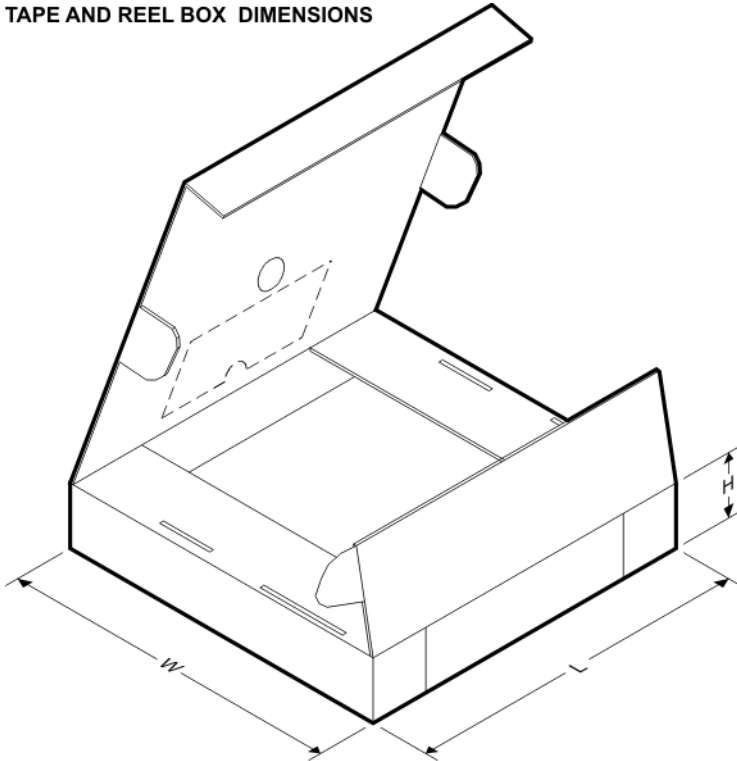
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 2U3836E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3836H30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3836J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3836K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3836L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3837E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3837J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3837K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3837L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3838E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3838J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3838K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| 2U3838L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3836E18QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3836H30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3836J25QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3836K33QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3836L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TPS3837L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3838E18QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3838J25QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3838K33QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |
| TPS3838L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.0 | 3.15 | 3.2 | 1.4 | 4.0 | 8.0 | Q3 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

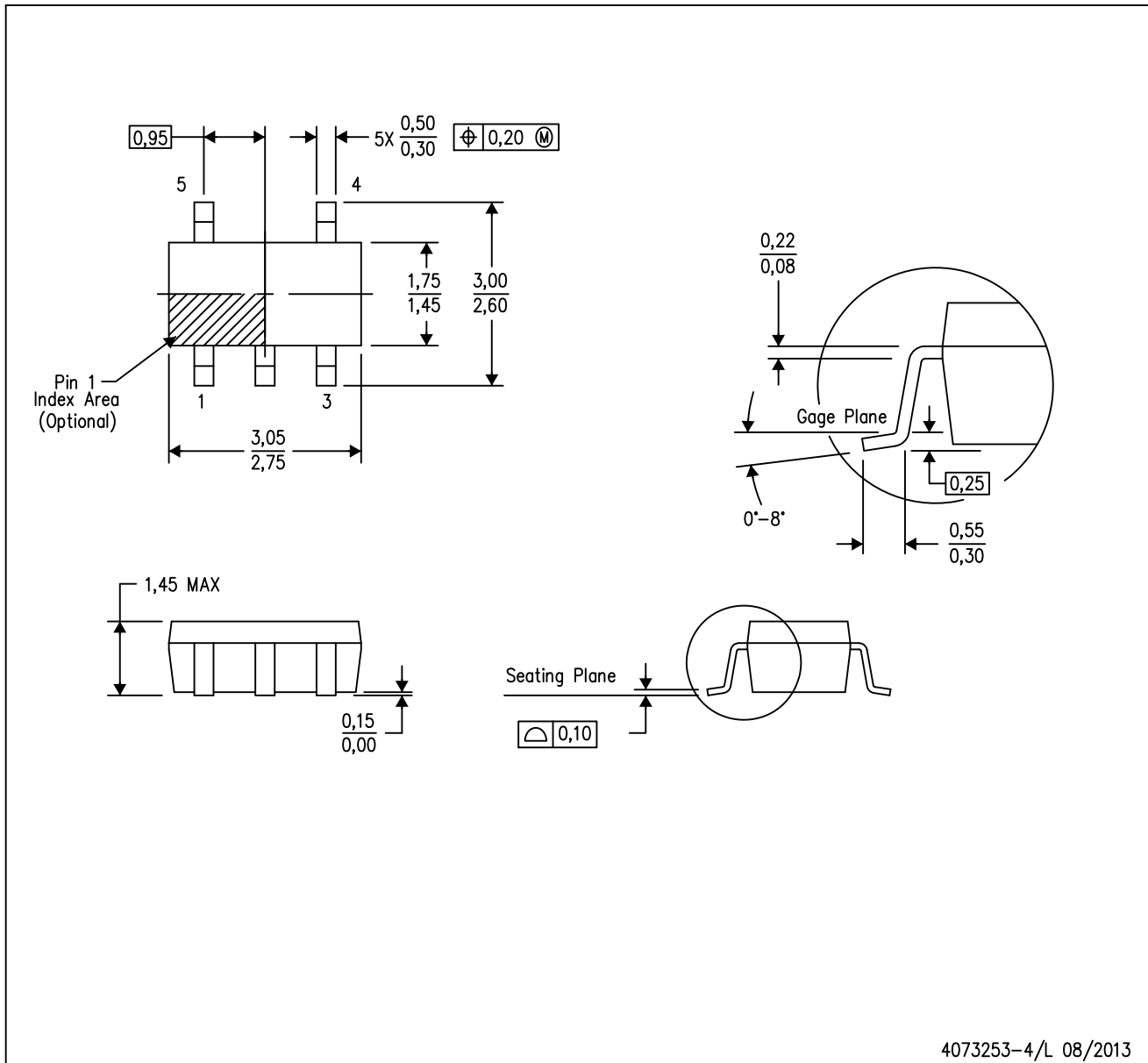
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 2U3836E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3836H30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3836J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3836K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3836L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3837E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3837J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3837K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3837L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3838E18QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3838J25QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| 2U3838K33QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 2U3838L30QDBVRG4Q1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3836E18QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3836H30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3836J25QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3836K33QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3836L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3837L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3838E18QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3838J25QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3838K33QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |
| TPS3838L30QDBVRQ1 | SOT-23 | DBV | 5 | 3000 | 182.0 | 182.0 | 20.0 |

MECHANICAL DATA

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.

DBV (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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