

NanoPower Supervisory Circuits

Check for Samples: [TPS3836](#), [TPS3837](#), [TPS3838](#)

FEATURES

- Supply Current: 220 nA (typical)
- Precision Supply Voltage Supervision Range: 1.8 V, 2.5 V, 3.0 V, and 3.3 V
- Power-On Reset Generator With Selectable Delay Time: 10 ms or 200 ms
- Push/Pull $\overline{\text{RESET}}$ Output (TPS3836), Push/Pull RESET Output (TPS3837), or Open-Drain RESET Output (TPS3838)
- Manual Reset
- SOT23-5 and 2x2 SON-6 Packages
- Temperature Range: -40°C to $+85^{\circ}\text{C}$

APPLICATIONS

- Applications Using Low-Power DSPs, Microcontrollers, or Microprocessors
- Portable- and Battery-Powered Equipment
- Intelligent Instruments
- Wireless Communication Systems
- Notebook Computers
- Automotive Systems
- Applications Using the MSP430™

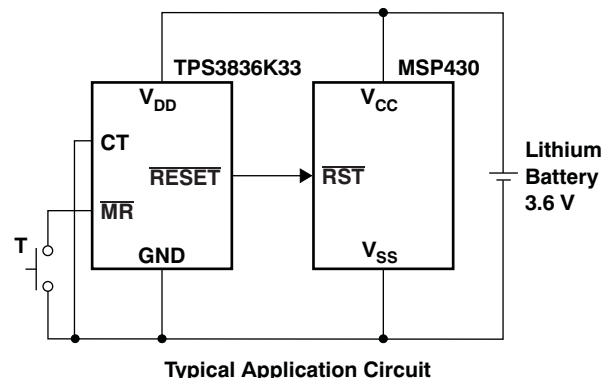
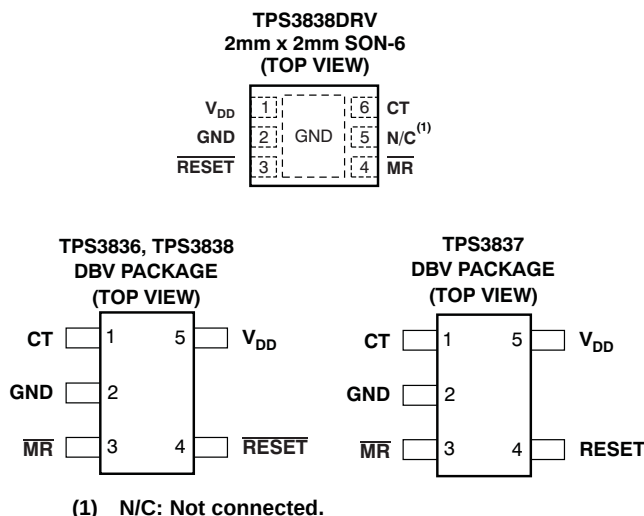
DESCRIPTION

The TPS3836, TPS3837, and 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 the RESET output active as long as V_{DD} remains below the threshold voltage of 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 an active-high, push-pull RESET, and the TPS3838 integrates an active-low, open-drain RESET output. The product spectrum is designed for supply voltages of 1.8 V, 2.5 V, 3.0 V, and 3.3 V. The circuits are available in either a SOT23-5 or 2x2 SON-6 package. The TPS3836, TPS3837, and TPS3838 families are characterized for operation over a temperature range of -40°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.

MSP430 is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.



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.

Table 1. ORDERING INFORMATION⁽¹⁾

PRODUCT	NOMINAL SUPPLY VOLTAGE	THRESHOLD VOLTAGE (V_{IT}) ⁽²⁾
TPS383xE18	1.8 V	1.71 V
TPS383xJ25	2.5 V	2.25 V
TPS383xH30	3.0 V	2.79 V
TPS383xL30	3.0 V	2.64 V
TPS383xK33	3.3 V	2.93 V

- (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) Custom threshold voltages are available. Minimum order quantities apply. Contact factory for details and availability.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

	TPS383xx	UNIT
Supply voltage, V_{DD} ⁽²⁾	7	V
All other pins ⁽²⁾ ⁽³⁾	–0.3 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 Ratings Table	
Operating temperature range, T_A	–40 to +85	°C
Storage temperature range, T_{STG}	–65 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.
 (3) If RESET or RESET are pulled above V_{DD} , the internal ESD structure will present an effective 1.5 kΩ resistor between these pins, causing leakage current to flow into the RESET or RESET pin.

DISSIPATION RATINGS

PACKAGE	$T_A < +25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = +25^\circ\text{C}$	$T_A = +70^\circ\text{C}$ POWER RATING	$T_A = +85^\circ\text{C}$ POWER RATING
DBV	437 mW	3.5 mW/°C	280 mW	227 mW
DRV Low-K ⁽¹⁾	715 mW	7.1 mW/°C	395 mW	285 mW
DRV High-K ⁽²⁾	1540 mW	15.4 mW/°C	845 mW	615 mW

- (1) The JEDEC low-K (1s) board used to derive this data was a 3in x 3in, two-layer board with 2-ounce copper traces on top of the board.
 (2) The JEDEC high-K (2s2p) board used to derive this data was a 3in x 3in, multilayer board with 1-ounce internal power and ground planes and 2-ounce copper traces on the top and bottom of the board.

RECOMMENDED OPERATING CONDITIONS

	MIN	MAX	UNIT
Supply voltage, V_{DD}	1.6	6	V
Voltage range, CT, $\overline{MR}$, RESET, and $\overline{RESET}$ pins	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 temperature range, T_A	–40	+85	°C
Pull-up resistor value, $\overline{RESET}$ pin (TPS3838 only)	$\frac{V_{PULL-up}}{50 \mu A}$		Ω

ELECTRICAL CHARACTERISTICS

Over recommended operating conditions, unless otherwise noted.

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
V _{OH}	High-level output voltage	$\overline{\text{RESET}}$ (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	$\overline{\text{RESET}}$ (TPS3836, TPS3838)	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 ⁽¹⁾	TPS3836, TPS3838	V _{DD} ≥ 1.1 V, I _{OL} = 50 μA	0.8 × V _{DD}		0.2	V
		TPS3837	V _{DD} ≥ 1.1 V, I _{OL} = −50 μA				
V _{IT}	Negative-going input threshold voltage ⁽²⁾	TPS383xE18	T _A = −40°C to +85°C	1.66	1.71	1.74	V
		TPS383xJ25		2.18	2.25	2.29	
		TPS383xH30		2.70	2.79	2.85	
		TPS383xL30		2.56	2.64	2.69	
		TPS383xK33		2.84	2.93	2.99	
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	$\overline{\text{MR}}$ ⁽³⁾	$\overline{\text{MR}}$ = 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	$\overline{\text{MR}}$ ⁽³⁾	$\overline{\text{MR}}$ = 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	400	nA	
			V _{DD} > V _{IT} , V _{DD} > 3 V	250	450		
			V _{DD} < V _{IT}	10	15		μA
	Internal pull-up resistor at $\overline{\text{MR}}$			30		kΩ	
C _I	Input capacitance at $\overline{\text{MR}}$ and CT		V _I = 0 V to V _{DD}	5		pF	

(1) The lowest voltage at which the $\overline{RESET}$ output becomes active. t_R , $V_{DD} \geq 15 \mu s/V$.

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

(3) If manual reset is unused, $\overline{MR}$ should be connected to V_{DD} to minimize current consumption.

SWITCHING CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $R_L = 1\text{ M}\Omega$, and $C_L = 50\text{ pF}$, unless otherwise noted.

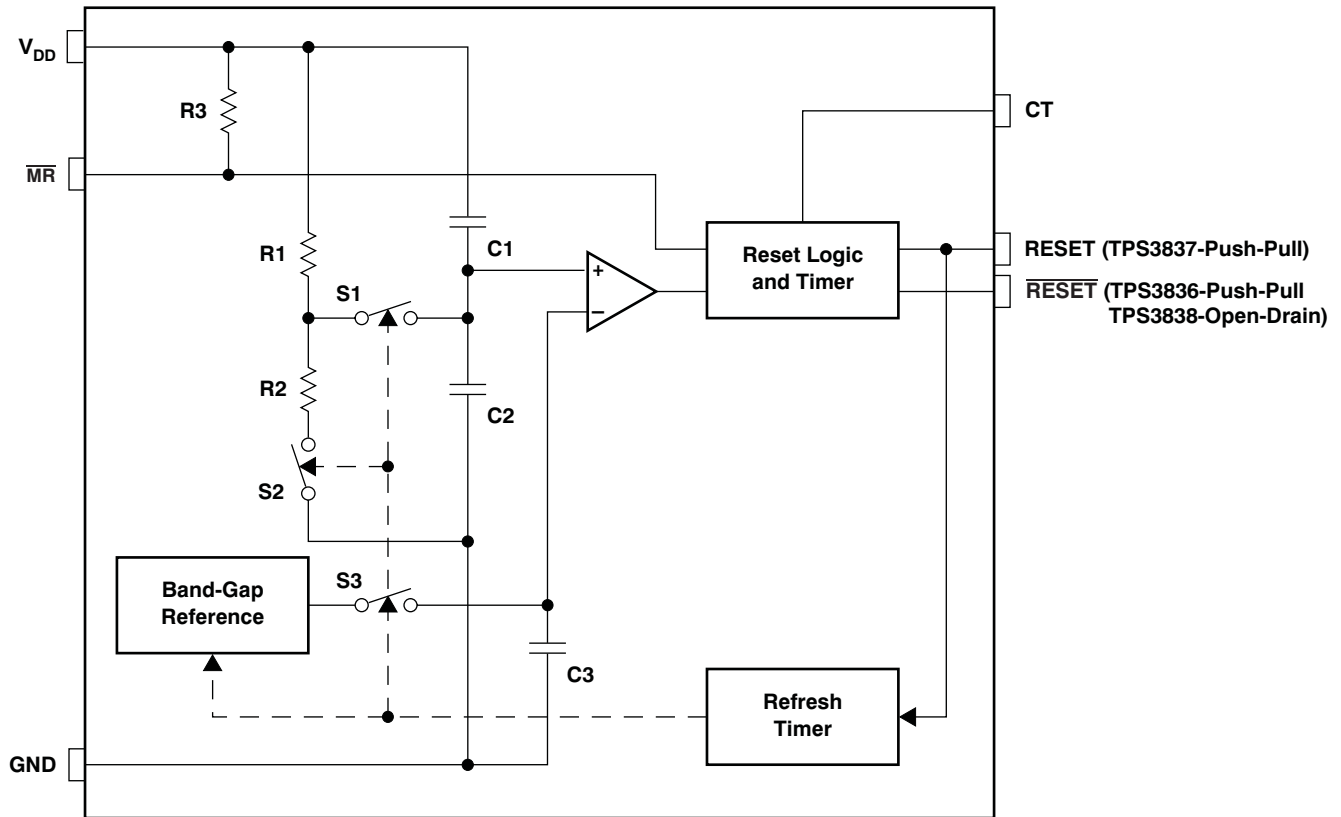
PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_D	Delay time		$V_{DD} \geq V_{IT} + 0.2\text{ V}$, $\overline{MR} = 0.7 \times V_{DD}$, CT = GND, (See Timing Diagram)	5	10	15	ms
			$V_{DD} \geq V_{IT} + 0.2\text{ V}$, $\overline{MR} = 0.7 \times V_{DD}$, CT = V_{DD} , (See Timing Diagram)	100	200	300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

TIMING REQUIREMENTS

At $T_A = +25^\circ\text{C}$, $R_L = 1\text{ M}\Omega$, and $C_L = 50\text{ pF}$, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _W	Pulse width	at V _{DD}	V _{IH} = V _{IT} + 0.2 V, V _{IL} = V _{IT} – 0.2 V			μs
		at $\overline{\text{MR}}$	V _{DD} ≥ V _{IT} + 0.2 V, V _{IL} = 0.3 × V _{DD} , V _{IH} = 0.7 × V _{DD}			

FUNCTIONAL BLOCK DIAGRAM



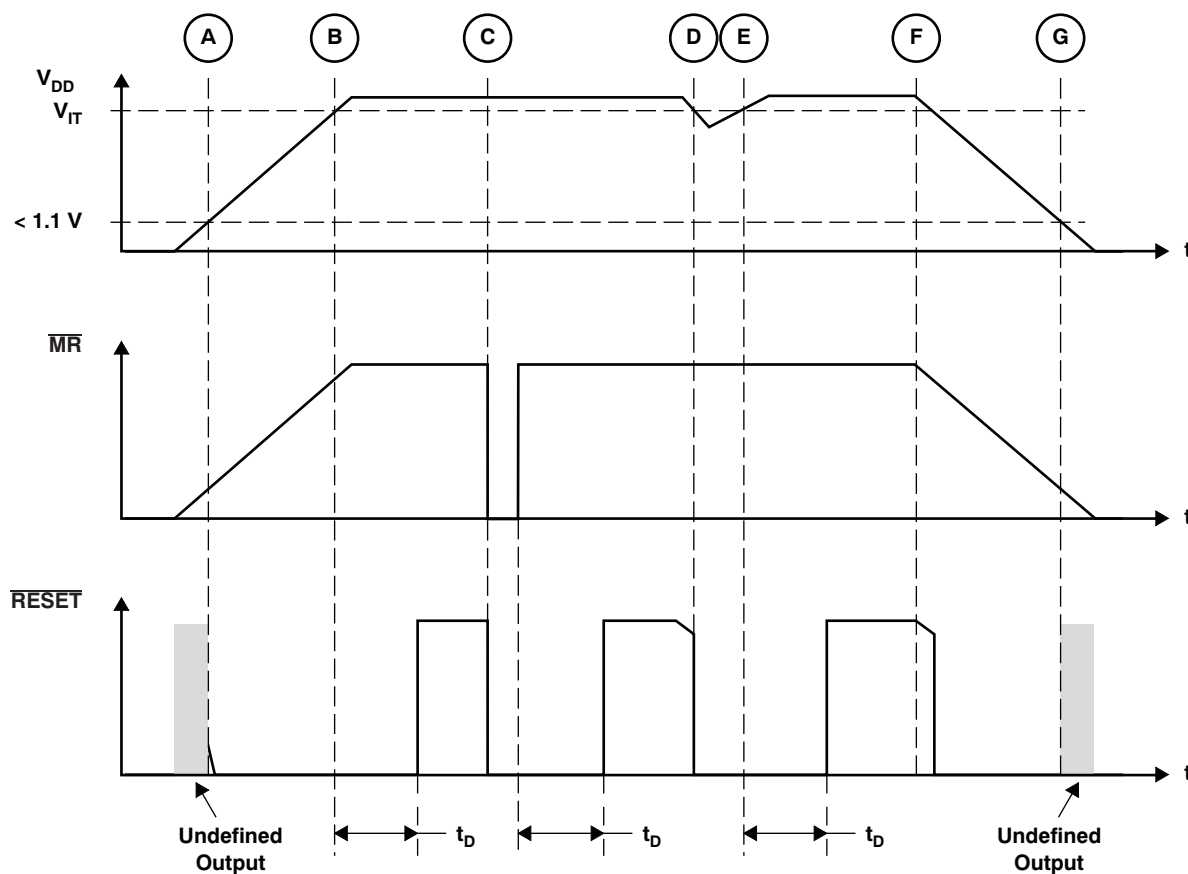
FUNCTION TABLE

$\overline{MR}$	$V_{DD} > V_{IT}$	$\overline{RESET}^{(1)}$	$RESET^{(2)}$
L	0	L	H
L	1	L	H
H	0	L	H
H	1	H	L

(1) TPS3836 and TPS3838.

(2) TPS3837.

TIMING DIAGRAM



TYPICAL CHARACTERISTICS

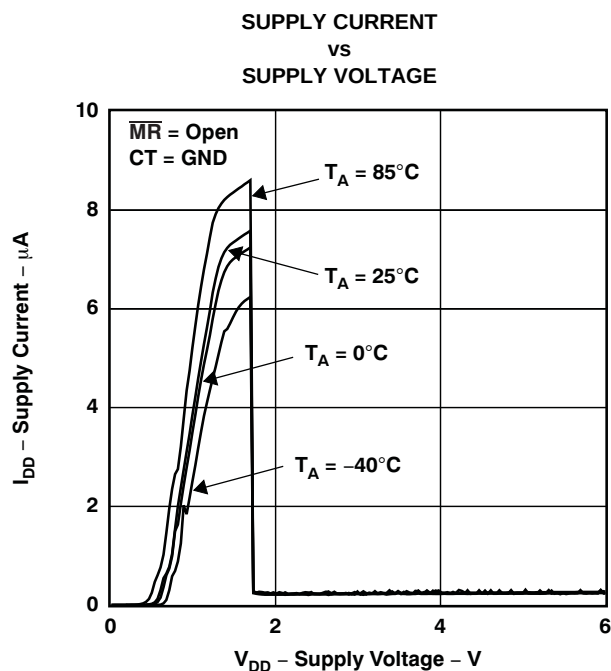


Figure 1.

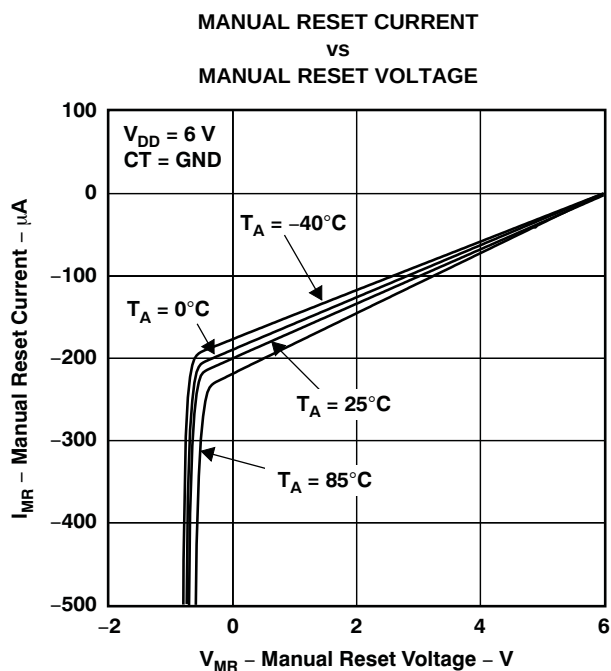
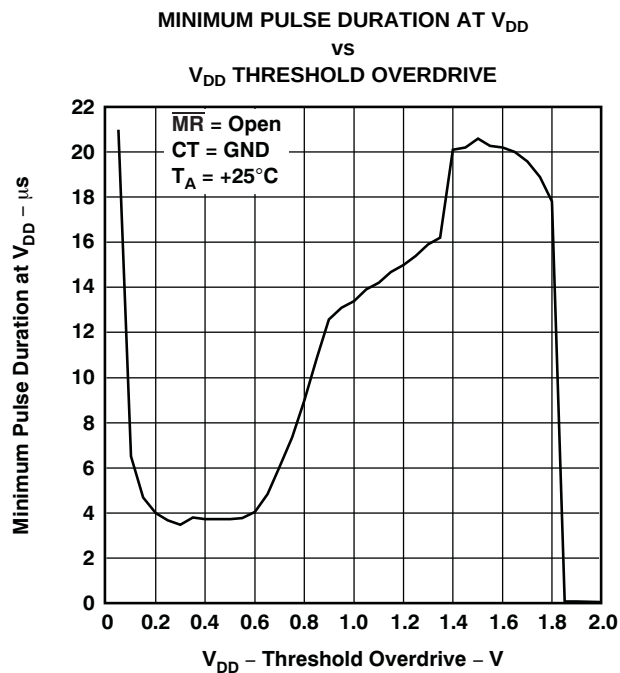
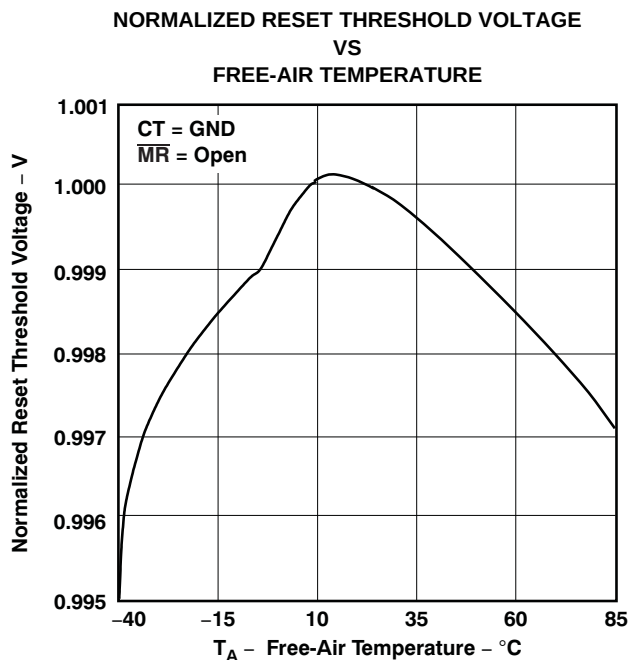
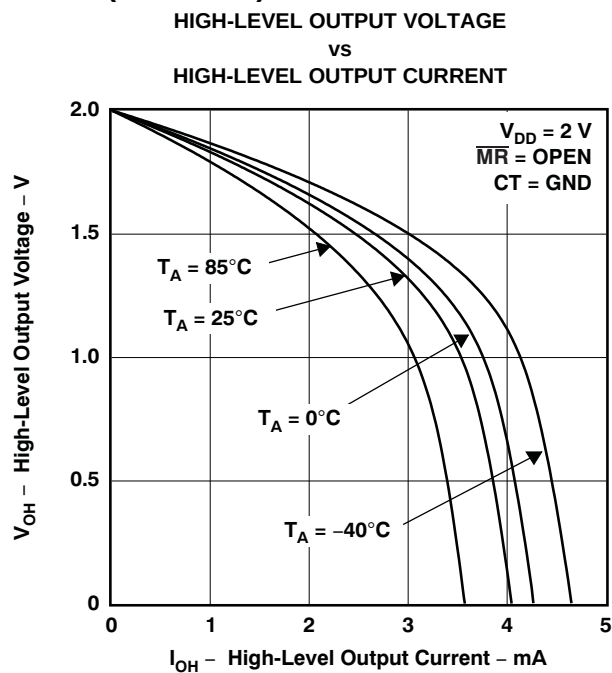
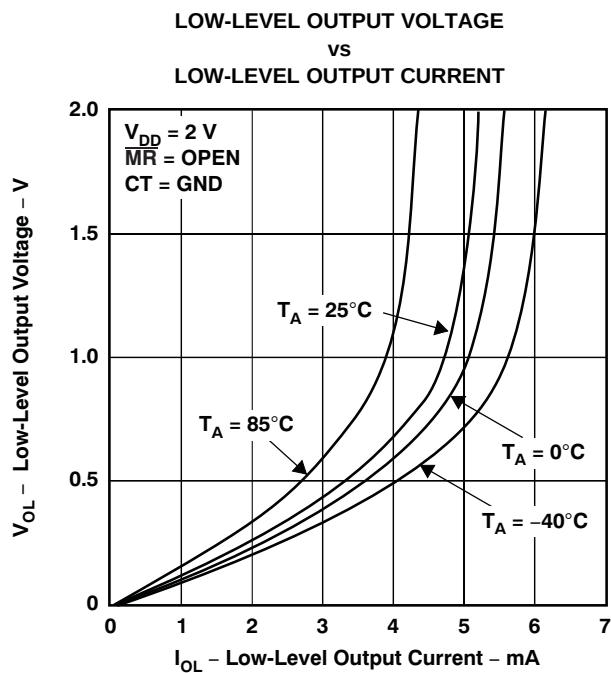


Figure 2.

TYPICAL CHARACTERISTICS (continued)



PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3836E18DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDNI	Samples
TPS3836E18DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDNI	Samples
TPS3836E18DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDNI	Samples
TPS3836E18DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDNI	Samples
TPS3836H30DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PHRI	Samples
TPS3836H30DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PHRI	Samples
TPS3836H30DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PHRI	Samples
TPS3836H30DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PHRI	Samples
TPS3836J25DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDSI	Samples
TPS3836J25DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDSI	Samples
TPS3836J25DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDSI	Samples
TPS3836J25DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDSI	Samples
TPS3836K33DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDTI	Samples
TPS3836K33DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDTI	Samples
TPS3836K33DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDTI	Samples
TPS3836K33DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDTI	Samples
TPS3836L30DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCAI	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3836L30DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCAI	Samples
TPS3836L30DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCAI	Samples
TPS3836L30DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCAI	Samples
TPS3837E18DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDOI	Samples
TPS3837E18DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDOI	Samples
TPS3837J25DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDRI	Samples
TPS3837J25DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDRI	Samples
TPS3837J25DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDRI	Samples
TPS3837K33DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDUI	Samples
TPS3837K33DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDUI	Samples
TPS3837K33DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDUI	Samples
TPS3837K33DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDUI	Samples
TPS3837L30DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCBI	Samples
TPS3837L30DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCBI	Samples
TPS3837L30DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCBI	Samples
TPS3837L30DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCBI	Samples
TPS3838E18DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDQI	Samples
TPS3838E18DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDQI	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3838E18DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDQI	Samples
TPS3838E18DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDQI	Samples
TPS3838J25DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDPI	Samples
TPS3838J25DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDPI	Samples
TPS3838J25DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDPI	Samples
TPS3838J25DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDPI	Samples
TPS3838K33DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDVI	Samples
TPS3838K33DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDVI	Samples
TPS3838K33DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDVI	Samples
TPS3838K33DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDVI	Samples
TPS3838K33DRVR	ACTIVE	SON	DRV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CCS	Samples
TPS3838K33DRVRG4	ACTIVE	SON	DRV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CCS	Samples
TPS3838K33DRVVT	ACTIVE	SON	DRV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CCS	Samples
TPS3838K33DRVVTG4	ACTIVE	SON	DRV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	CCS	Samples
TPS3838L30DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCCI	Samples
TPS3838L30DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCCI	Samples
TPS3838L30DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCCI	Samples
TPS3838L30DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCCI	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⁾ 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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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

• Automotive: [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](#)

- Enhanced Product: [TPS3836J25-EP](#), [TPS3836L30-EP](#), [TPS3837K33-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

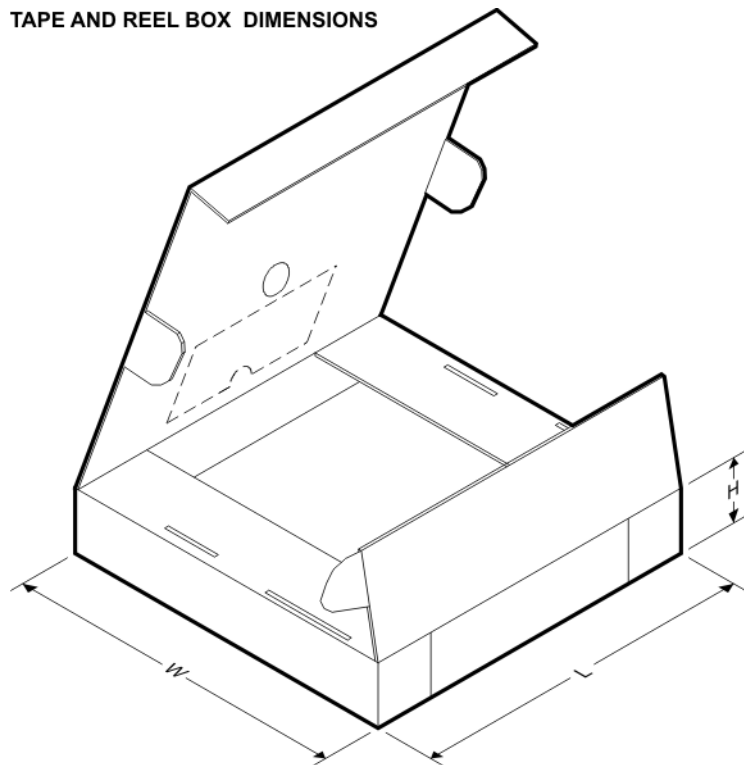
TAPE AND REEL INFORMATION


*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
TPS3836E18DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836E18DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836H30DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836H30DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836J25DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836J25DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836K33DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836K33DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3836L30DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3836L30DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3837E18DBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3837E18DBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS3837J25DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3837J25DBVT	SOT-23	DBV	5	250	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3837K33DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3837K33DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3837L30DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3837L30DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	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
TPS3838E18DBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838E18DBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838J25DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3838J25DBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838J25DBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838J25DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3838K33DBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838K33DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3838K33DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3838K33DBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838K33DRVVR	SON	DRV	6	3000	179.0	8.4	2.2	2.2	1.2	4.0	8.0	Q2
TPS3838K33DRVVT	SON	DRV	6	250	179.0	8.4	2.2	2.2	1.2	4.0	8.0	Q2
TPS3838L30DBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838L30DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3838L30DBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3838L30DBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



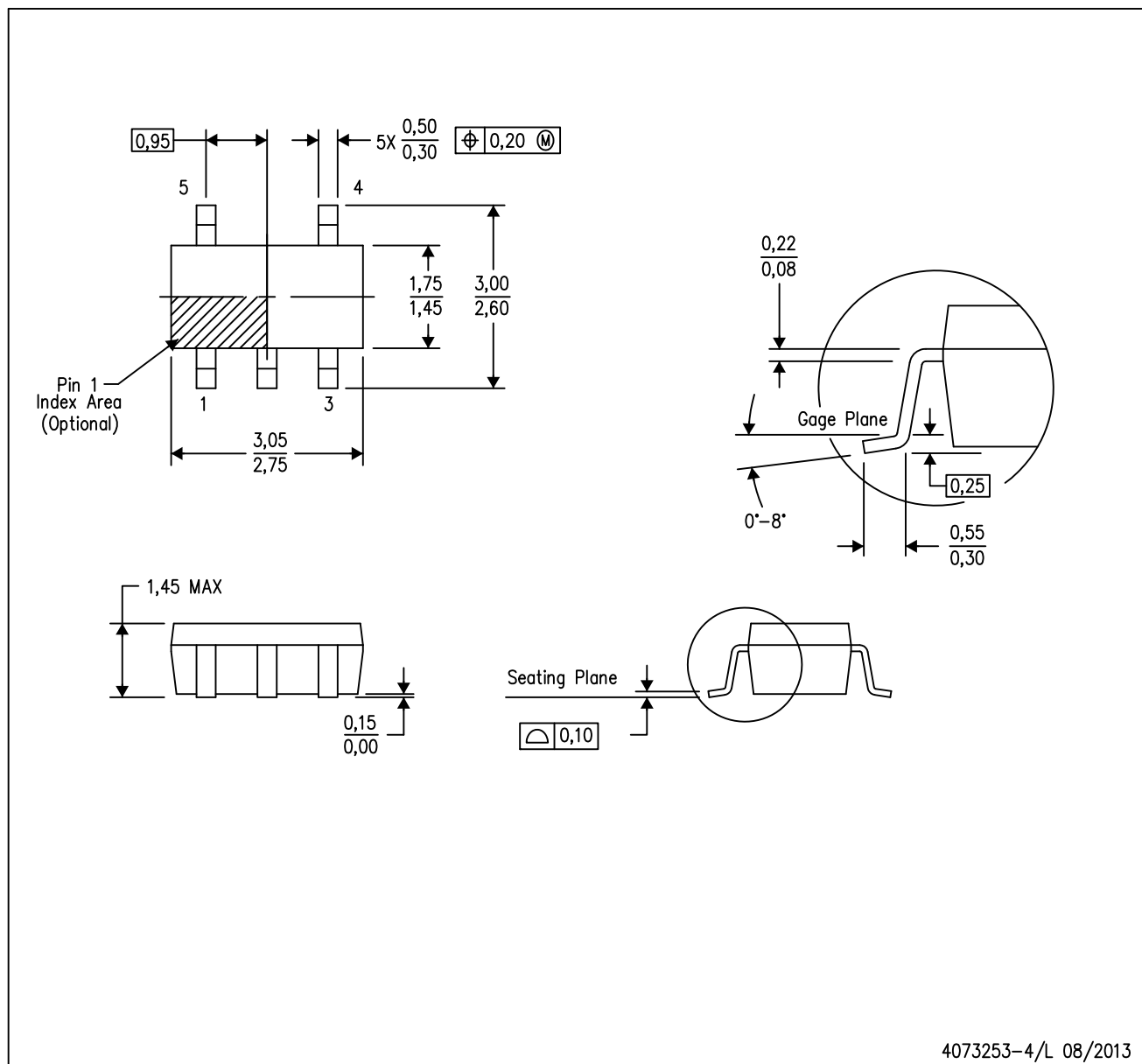
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3836E18DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3836E18DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3836H30DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3836H30DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3836J25DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3836J25DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3836K33DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3836K33DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3836L30DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3836L30DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3837E18DBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TPS3837E18DBVT	SOT-23	DBV	5	250	182.0	182.0	20.0
TPS3837J25DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3837J25DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3837K33DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3837K33DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3837L30DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3837L30DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3838E18DBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TPS3838E18DBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TPS3838J25DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3838J25DBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TPS3838J25DBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TPS3838J25DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3838K33DBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TPS3838K33DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3838K33DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TPS3838K33DBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TPS3838K33DRV	SON	DRV	6	3000	203.0	203.0	35.0
TPS3838K33DRVT	SON	DRV	6	250	203.0	203.0	35.0
TPS3838L30DBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TPS3838L30DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TPS3838L30DBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TPS3838L30DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0

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.

DBV (R-PDSO-G5)

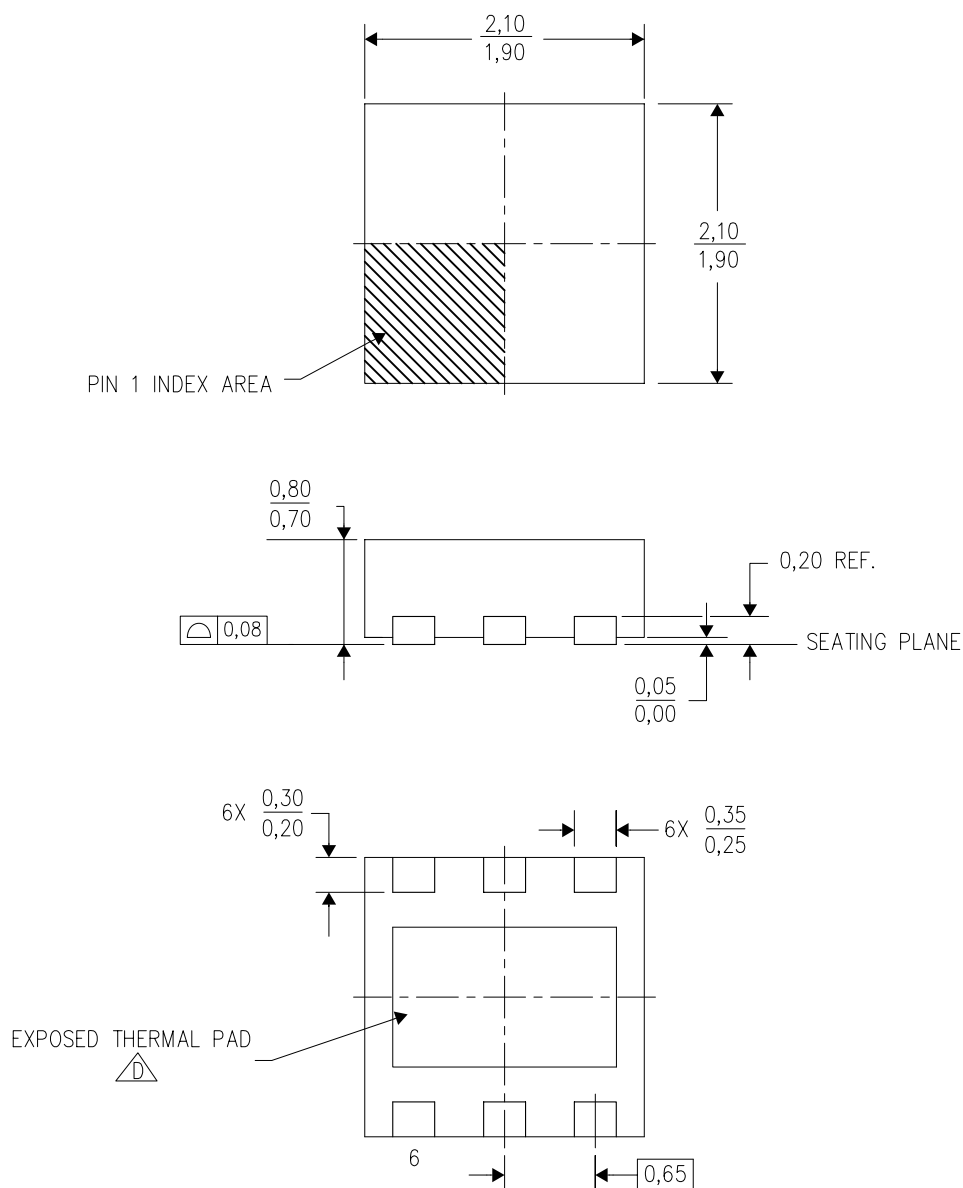
PLASTIC SMALL OUTLINE



- 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.

DRV (S-PWSON-N6)

PLASTIC SMALL OUTLINE NO-LEAD



4206925/E 10/10

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Small Outline No-Lead (SON) package configuration.
 -  D. The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.

THERMAL PAD MECHANICAL DATA

DRV (S-PWSON-N6)

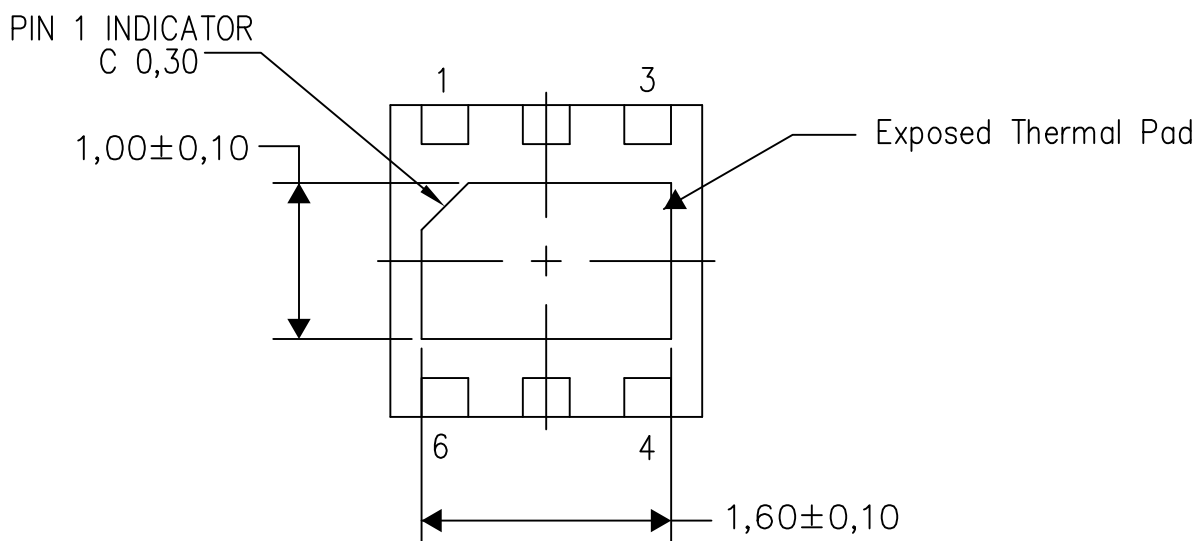
PLASTIC SMALL OUTLINE NO-LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

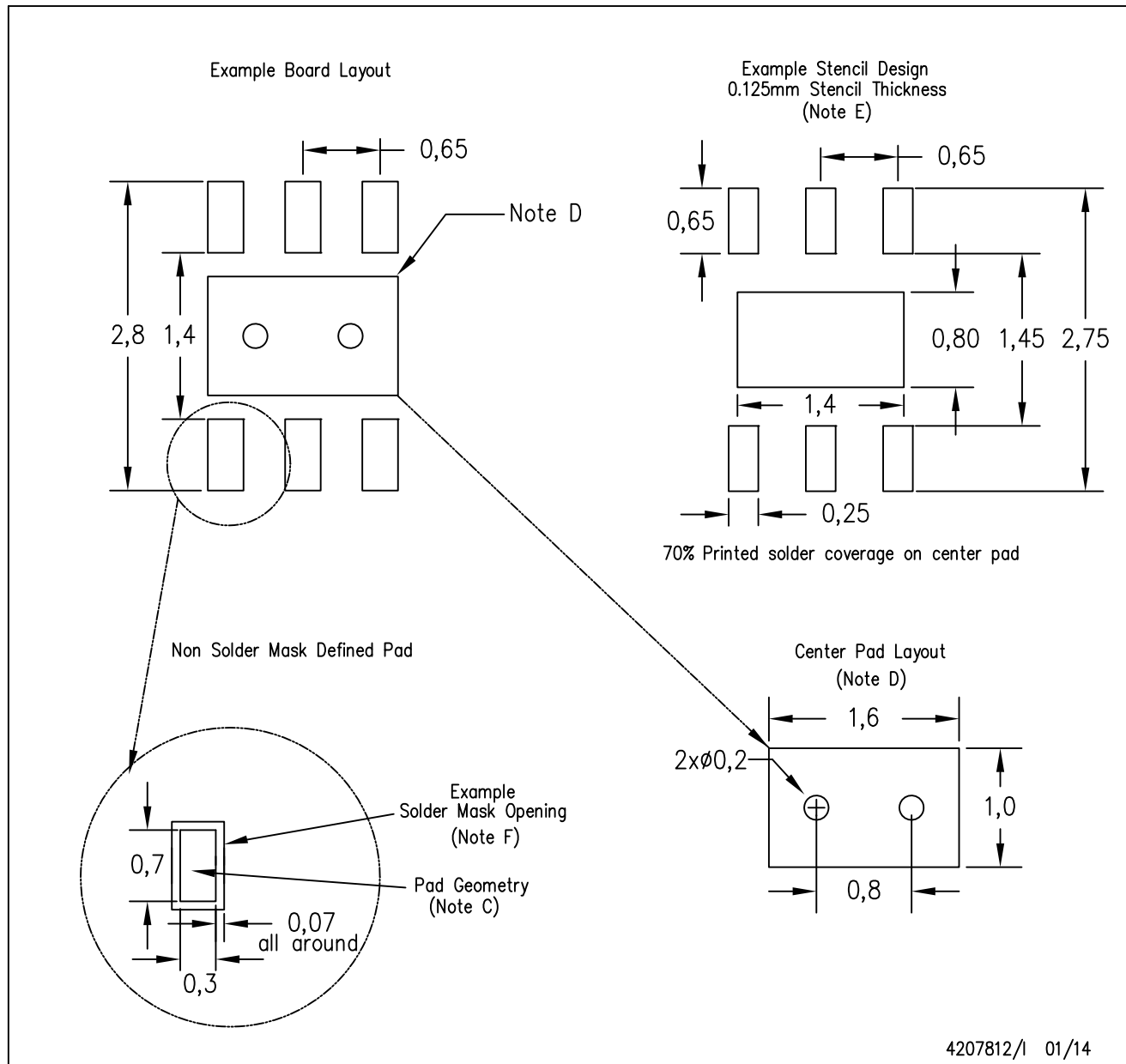
Exposed Thermal Pad Dimensions

4206926/0 01/14

NOTE: All linear dimensions are in millimeters

DRV (S-PWSON-N6)

PLASTIC SMALL OUTLINE NO-LEAD



- 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. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - 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. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for solder mask tolerances.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com