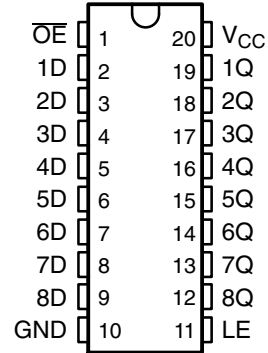


SN54LVT573, SN74LVT573 3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

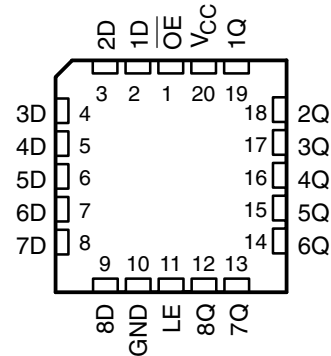
SCBS138D – MAY 1992 – REVISED JULY 1995

- State-of-the-Art Advanced BiCMOS Technology (ABT) Design for 3.3-V Operation and Low Static Power Dissipation
- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V V_{CC})
- Support Unregulated Battery Operation Down to 2.7 V
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ($C = 200$ pF, $R = 0$)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Bus-Hold Data Inputs Eliminate the Need for External Pullup Resistors
- Support Live Insertion
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flat (W) Packages, and Ceramic (J) DIPs

SN54LVT573 . . . J OR W PACKAGE
SN74LVT573 . . . DB, DW, OR PW PACKAGE
(TOP VIEW)



SN54LVT573 . . . FK PACKAGE
(TOP VIEW)



description

These octal latches are designed specifically for low-voltage (3.3-V) V_{CC} operation, but with the capability to provide a TTL interface to a 5-V system environment.

The eight latches of the 'LVT573 are transparent D-type latches. While the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is taken low, the Q outputs are latched at the logic levels set up at the D inputs.

A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without need for interface or pullup components. \overline{OE} does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74LVT573 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54LVT573 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74LVT573 is characterized for operation from -40°C to 85°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.

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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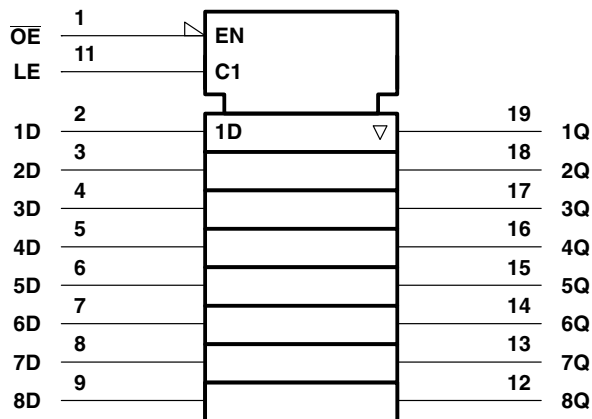
SN54LVT573, SN74LVT573 3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCBS138D – MAY 1992 – REVISED JULY 1995

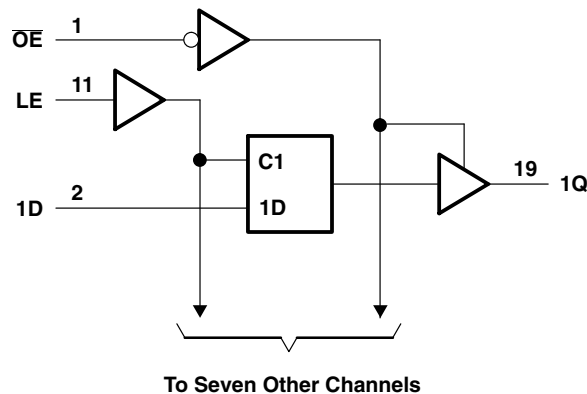
FUNCTION TABLE
(each latch)

INPUTS			OUTPUT
OE	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	Q ₀
H	X	X	Z

logic symbol†



logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage range, V_{CC}	-0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	-0.5 V to 7 V
Voltage range applied to any output in the high state or power-off state, V_O (see Note 1)	-0.5 V to 7 V
Current into any output in the low state, I_O : SN54LVT573	96 mA
SN74LVT573	128 mA
Current into any output in the high state, I_O (see Note 2): SN54LVT573	48 mA
SN74LVT573	64 mA
Input clamp current, I_{IK} ($V_I < 0$)	-50 mA
Output clamp current, I_{OK} ($V_O < 0$)	-50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 3): DB package	0.6 W
DW package	1.6 W
PW package	0.7 W
Storage temperature range, T_{stg}	-65°C to 150°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.

- NOTES:
- The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 - This current flows only when the output is in the high state and $V_O > V_{CC}$.
 - The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note in the 1994 *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002B.

SN54LVT573, SN74LVT573
3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES
WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 4)

		SN54LVT573		SN74LVT573		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	2.7	3.6	2.7	3.6	V
V_{IH}	High-level input voltage	2		2		V
V_{IL}	Low-level input voltage		0.8		0.8	V
V_I	Input voltage		5.5		5.5	V
I_{OH}	High-level output current		-24		-32	mA
I_{OL}	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
T_A	Operating free-air temperature	-55	125	-40	85	°C

NOTE 4: Unused control inputs must be held high or low to prevent them from floating.

SN54LVT573, SN74LVT573

3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES

WITH 3-STATE OUTPUTS

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS			SN54LVT573		SN74LVT573		UNIT
				MIN	TYP†	MAX	MIN	
V_{IK}	$V_{CC} = 2.7\text{ V}$, $I_I = -18\text{ mA}$			-1.2		-1.2		V
V_{OH}	$V_{CC} = \text{MIN to MAX}^\ddagger$, $I_{OH} = -100\ \mu\text{A}$			$V_{CC} - 0.2$		$V_{CC} - 0.2$		V
	$V_{CC} = 2.7\text{ V}$, $I_{OH} = -8\text{ mA}$			2.4		2.4		
	$V_{CC} = 3\text{ V}$	$I_{OH} = -24\text{ mA}$		2		2		
V_{OL}	$V_{CC} = 2.7\text{ V}$	$I_{OL} = 100\ \mu\text{A}$		0.2		0.2		V
		$I_{OL} = 24\text{ mA}$		0.5		0.5		
	$V_{CC} = 3\text{ V}$	$I_{OL} = 16\text{ mA}$		0.4		0.4		
		$I_{OL} = 32\text{ mA}$		0.5		0.5		
		$I_{OL} = 48\text{ mA}$		0.55		0.55		
		$I_{OL} = 64\text{ mA}$				0.55		
I_I	$V_{CC} = 0\text{ or MAX}^\ddagger$, $V_I = 5.5\text{ V}$			50		10		μA
	$V_{CC} = 3.6\text{ V}$	$V_I = V_{CC}\text{ or GND}$	Control inputs	± 1		± 1		
		$V_I = V_{CC}$	Data inputs	1		1		
		$V_I = 0$		-5		-5		
I_{off}	$V_{CC} = 0$, $V_I\text{ or }V_O = 0\text{ to }4.5\text{ V}$					± 100		μA
$I_{I(\text{hold})}$	$V_{CC} = 3\text{ V}$	$V_I = 0.8\text{ V}$	Data inputs	75		75		μA
		$V_I = 2\text{ V}$		-75		-75		
I_{OZH}	$V_{CC} = 3.6\text{ V}$, $V_O = 3\text{ V}$			1		1		μA
I_{OZL}	$V_{CC} = 3.6\text{ V}$, $V_O = 0.5\text{ V}$			-1		-1		μA
I_{CC}	$V_{CC} = 3.6\text{ V}$, $V_I = V_{CC}\text{ or GND}$, $I_O = 0$		Outputs high	0.13	0.39	0.13	0.19	mA
			Outputs low	8.6	14	8.6	12	
			Outputs disabled	0.13	0.39	0.13	0.19	
ΔI_{CC}^\S	$V_{CC} = 3\text{ V to }3.6\text{ V}$, One input at $V_{CC} - 0.6\text{ V}$, Other inputs at $V_{CC}\text{ or GND}$			0.3		0.2		mA
C_i	$V_I = 3\text{ V or }0$			4		4		pF
C_o	$V_O = 3\text{ V or }0$			8		8		pF

† All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		SN54LVT573		SN74LVT573		UNIT				
		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$			$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 2.7\text{ V}$	
		MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
t_w	Pulse duration, LE high	3.3		3.3		3.3		3.3		ns
t_{su}	Setup time, data before LE↓	1		0.9		0.7		0.6		ns
t_h	Hold time, data after LE↓	1.8		2		1.6		1.8		ns



SN54LVT573, SN74LVT573
3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES
WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

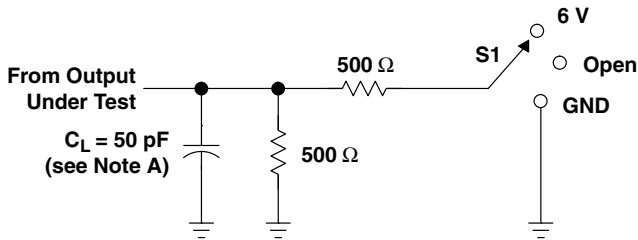
PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVT573				SN74LVT573				UNIT	
			$V_{CC} = 3.3$ V ± 0.3 V		$V_{CC} = 2.7$ V		$V_{CC} = 3.3$ V ± 0.3 V			$V_{CC} = 2.7$ V		
			MIN	MAX	MIN	MAX	MIN	TYP†	MAX	MIN		MAX
t_{PLH}	D	Q	0.5	4.7	4.9		1	2.5	4.2	4.7		ns
t_{PHL}			0.5	4.9	5.4		1	2.7	4.3	5.2		
t_{PLH}	LE	Q	1	6	6.9		1.6	3.5	5.6	6.3		ns
t_{PHL}			1.4	6.9	7.6		2.5	4.3	6.5	7.2		
t_{PZH}	$\bar{O}E$	Q	0.5	5.3	6.4		1	2.8	5.1	6.2		ns
t_{PZL}			0.7	5.7	7.2		1.3	3.3	5.5	6.6		
t_{PHZ}	$\bar{O}E$	Q	1.2	5.9	6.9		2	3.7	5.7	6.7		ns
t_{PLZ}			1	5.4	5.5		1.5	3	4.6	5.1		

† All typical values are at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$.

SN54LVT573, SN74LVT573 3.3-V ABT OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

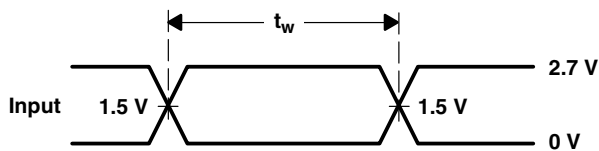
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PARAMETER MEASUREMENT INFORMATION

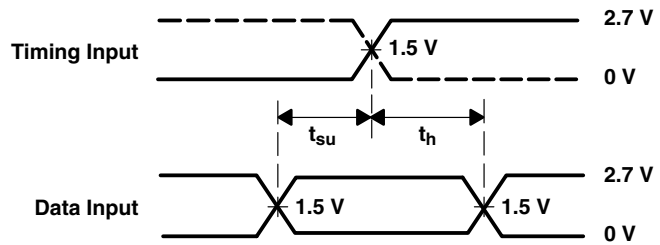


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6 V
t_{PHZ}/t_{PZH}	GND

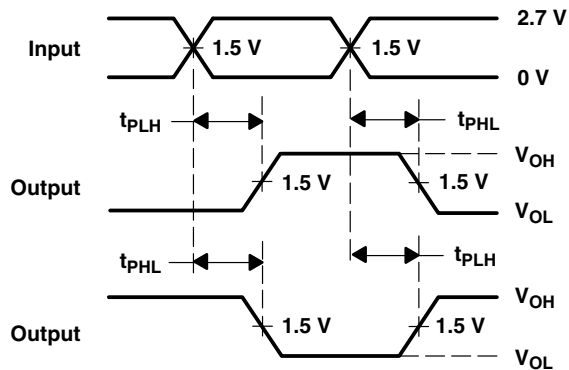
LOAD CIRCUIT FOR OUTPUTS



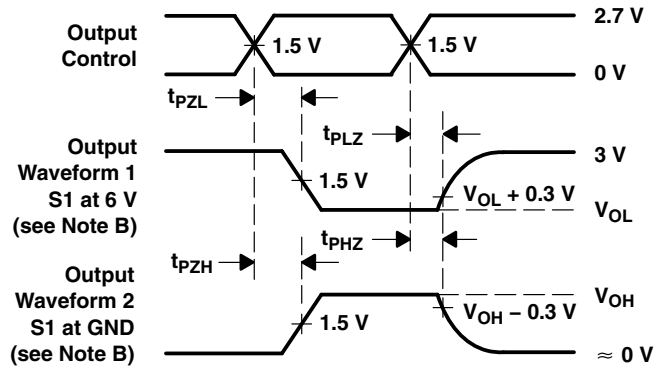
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LVT573DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT573	Samples
SN74LVT573PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX573	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.

OBSELETE: 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
SN74LVT573PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVT573PWR	TSSOP	PW	20	2000	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74LVT573DW	DW	SOIC	20	25	507	12.83	5080	6.6

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

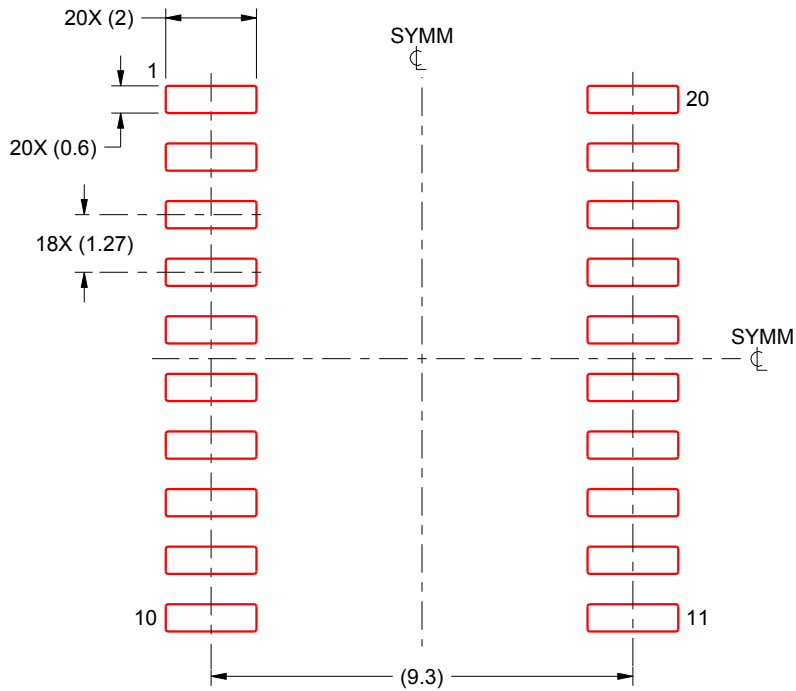
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PW0020A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220206/A 02/2017

NOTES:

- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220206/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220206/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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