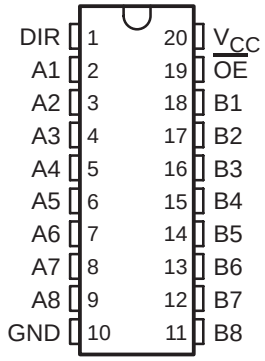
- **Bidirectional Bus Transceivers in High-Density 20-Pin Packages**
- **Choice of True or Inverting Logic**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (N) 300-mil DIPs**

DEVICE	LOGIC
SN74ALS641A, SN74AS641	True
SN74ALS642A	Inverting

DW OR N PACKAGE
(TOP VIEW)



description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. These devices transmit data from the A bus to the B bus or from the B bus to the A bus, depending upon the level at the direction-control (DIR) input. The output-enable ($\overline{OE}$) input disables the device so that the buses are effectively isolated.

The -1 versions of the SN74ALS641A and SN74ALS642A are identical to the standard versions, except that the recommended maximum I_{OL} is increased to 48 mA in the -1 versions.

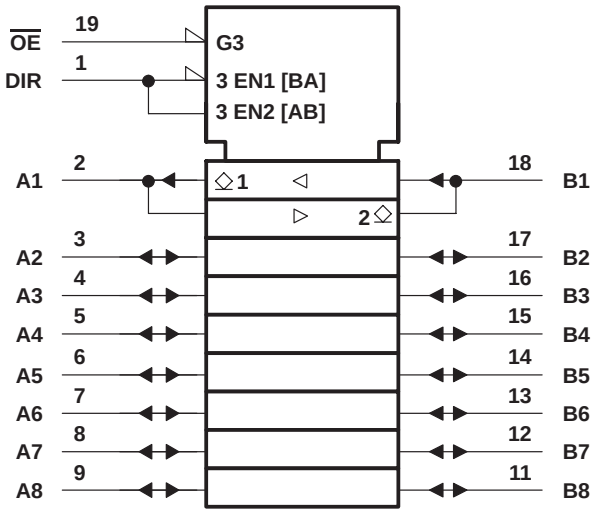
The SN74ALS641A, SN74ALS642A, and SN74AS641 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

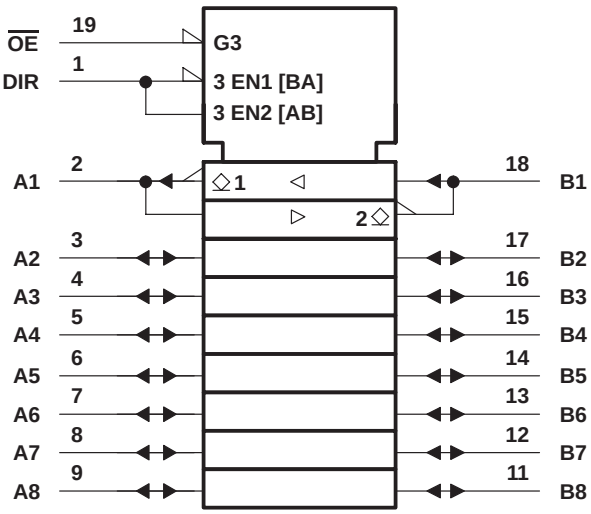
INPUTS		OPERATION	
$\overline{OE}$	DIR	SN74ALS641A SN74AS641	SN74ALS642A
L	L	B data to A bus	$\overline{B}$ data to A bus
L	H	A data to B bus	$\overline{A}$ data to B bus
H	X	Isolation	Isolation

logic symbols†

SN74ALS641A, SN74AS641



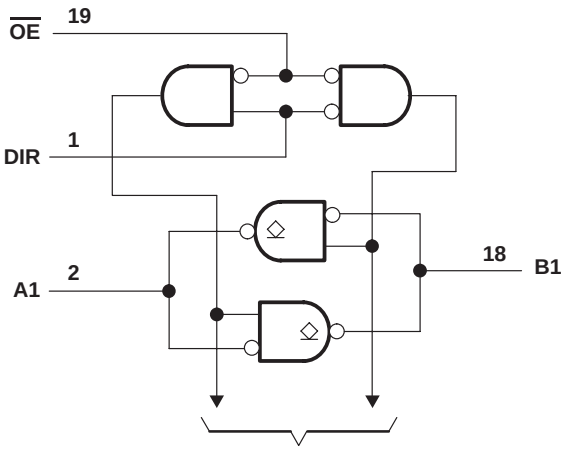
SN74ALS642A



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

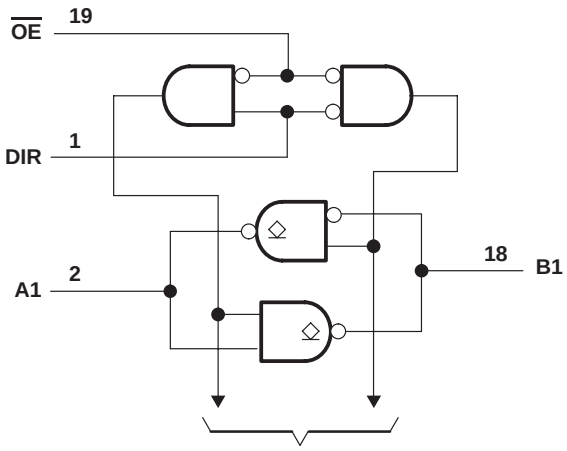
logic diagrams (positive logic)

SN74ALS641A, SN74AS641



To Seven Other Transceivers

SN74ALS642A



To Seven Other Transceivers

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage, V_I: All inputs and I/O ports . . . . . 7 V
Operating free-air temperature range, T_A: SN74ALS641A, SN74ALS642A . . . . . 0°C to 70°C
Storage temperature range . . . . . −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.

recommended operating conditions

		SN74ALS641A SN74ALS642A			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
V_{OH}	High-level output voltage			5.5	V
I_{OL}	Low-level output current			24	mA
				48‡	
T_A	Operating free-air temperature	0		70	°C

‡ Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

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

PARAMETER		TEST CONDITIONS		SN74ALS641A SN74ALS642A			UNIT
				MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.5	V
I_{OH}		V_{CC} = 4.5 V,	V_{OH} = 5.5 V			0.1	mA
V_{OL}		V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4	V
			I_{OL} = 24 mA		0.35	0.5	
			I_{OL} = 48 mA‡		0.35	0.5	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1	mA
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
	A or B ports§					20	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.1	mA
	A or B ports§					−0.1	
I_{CC}	SN74ALS641A	V_{CC} = 5.5 V	Outputs high		25	37	mA
			Outputs low		33	47	
	SN74ALS642A	V_{CC} = 5.5 V	Outputs high		8	15	
			Outputs low		18	28	

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V
§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX¶				UNIT
			SN74ALS641A		SN74ALS642A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	5	25	10	30	ns
t_{PHL}			3	18	5	22	
t_{PLH}	$\overline{OE}$	A or B	8	30	10	30	ns
t_{PHL}			8	30	15	38	
t_{PLH}	DIR	A or B	8	32	10	30	ns
t_{PHL}			8	32	15	38	

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

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage, V_I: All inputs and I/O ports . . . . . 7 V
Operating free-air temperature range, T_A: SN74AS641 . . . . . 0°C to 70°C
Storage temperature range . . . . . −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.

recommended operating conditions

		SN74AS641			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
V_{OH}	High-level output voltage			5.5	V
I_{OL}	Low-level output current			64	mA
T_A	Operating free-air temperature	0		70	°C

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

PARAMETER		TEST CONDITIONS		SN74AS641			UNIT
				MIN	TYP‡	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2	V
I_{OH}		V_{CC} = 4.5 V,	V_{OH} = 5.5 V			0.1	mA
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 64 mA		0.35	0.55	V
I_I	Control inputs	V_{CC} = 5.5 V	V_I = 7 V			0.1	mA
	A or B ports		V_I = 5.5 V			0.1	
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20	µA
	A or B ports§					70	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.5	mA
	A or B ports§					−0.75	
I_{CC}		V_{CC} = 5.5 V	Outputs high		50	82	mA
			Outputs low		84	136	

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

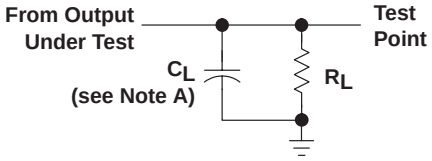
switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX†		UNIT
			SN74AS641		
			MIN	MAX	
t_{PLH}	A or B	B or A	5	21	ns
t_{PHL}			1	7.5	
t_{PLH}	$\overline{OE}$	A or B	5	21	ns
t_{PHL}			1	9	
t_{PLH}	DIR	A or B	5	22	ns
t_{PHL}			1	10	

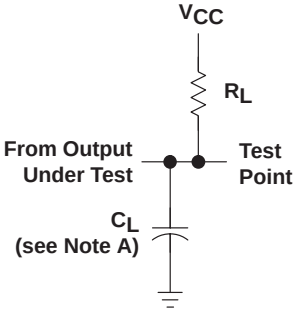
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77251−1443

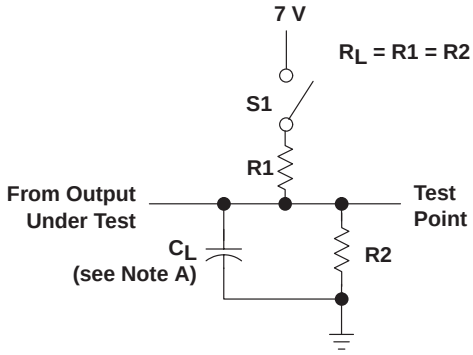
PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



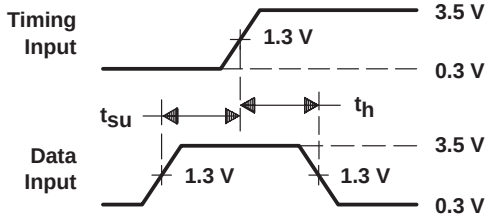
LOAD CIRCUIT FOR
BI-STATE
TOTEM-POLE OUTPUTS



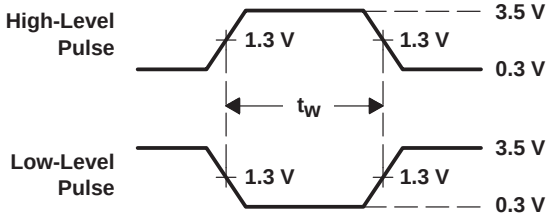
LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS



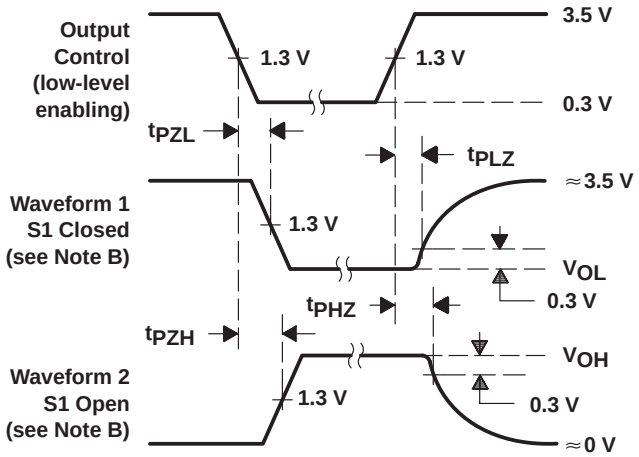
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



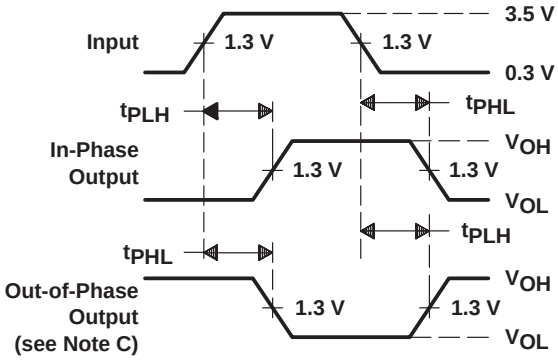
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
D. All input pulses have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f$ = 2 ns, duty cycle = 50%.
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74ALS641A-1DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	ALS641A-1
SN74ALS641A-1DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A-1
SN74ALS641A-1DWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A-1
SN74ALS641A-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS641A-1N
SN74ALS641A-1N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS641A-1N
SN74ALS641A-1NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A-1
SN74ALS641A-1NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A-1
SN74ALS641ADW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	ALS641A
SN74ALS641ADWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A
SN74ALS641ADWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A
SN74ALS641AN	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS641AN
SN74ALS641AN.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS641AN
SN74ALS641ANSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A
SN74ALS641ANSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS641A
SN74ALS642A-1DW	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS642A-1
SN74ALS642A-1DW.A	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS642A-1
SN74ALS642A-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS642A-1N
SN74ALS642A-1N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74ALS642A-1N
SN74ALS642A-1NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS642A-1
SN74ALS642A-1NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS642A-1
SN74AS641DW	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AS641
SN74AS641DW.A	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AS641
SN74AS641N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74AS641N
SN74AS641N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74AS641N

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

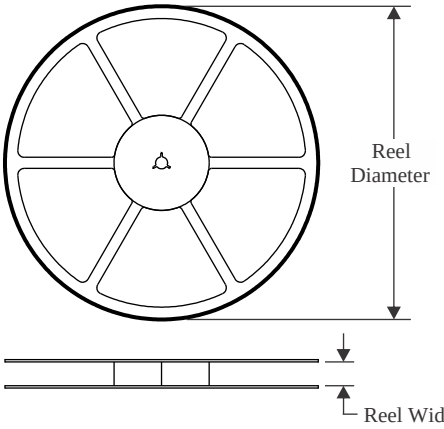
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

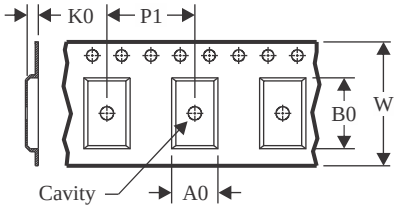
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

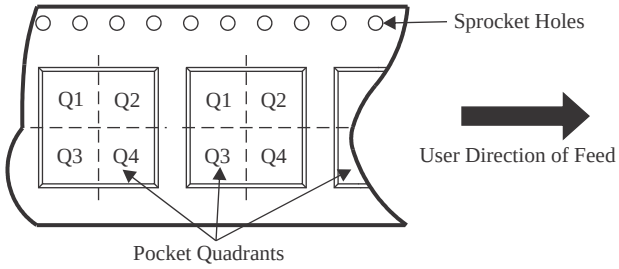


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

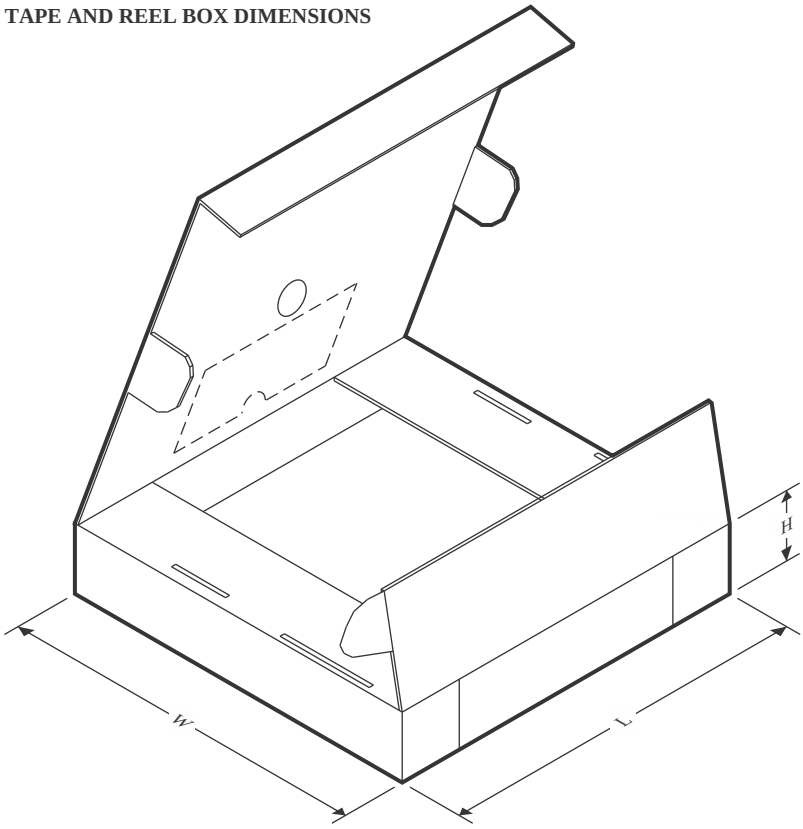
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74ALS641A-1DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS641A-1NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ALS641ADWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS641ANSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ALS642A-1NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1

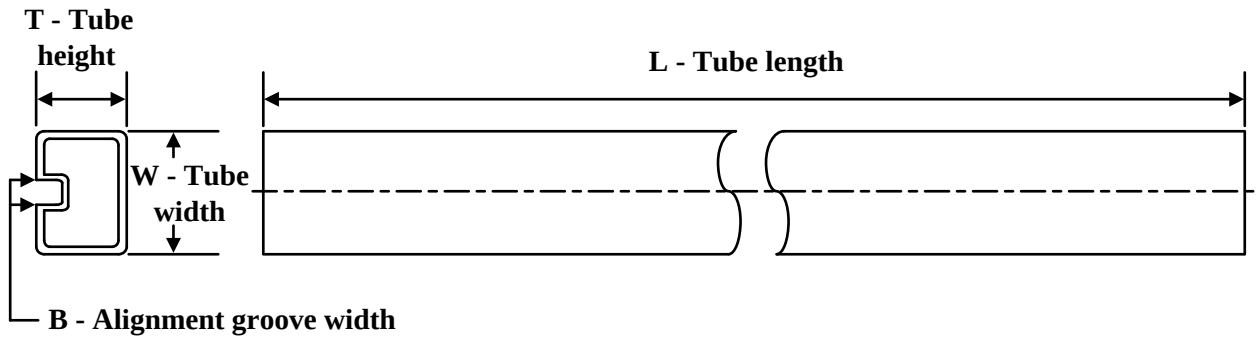
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS641A-1DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS641A-1NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74ALS641ADWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS641ANSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74ALS642A-1NSR	SOP	NS	20	2000	367.0	367.0	45.0

TUBE



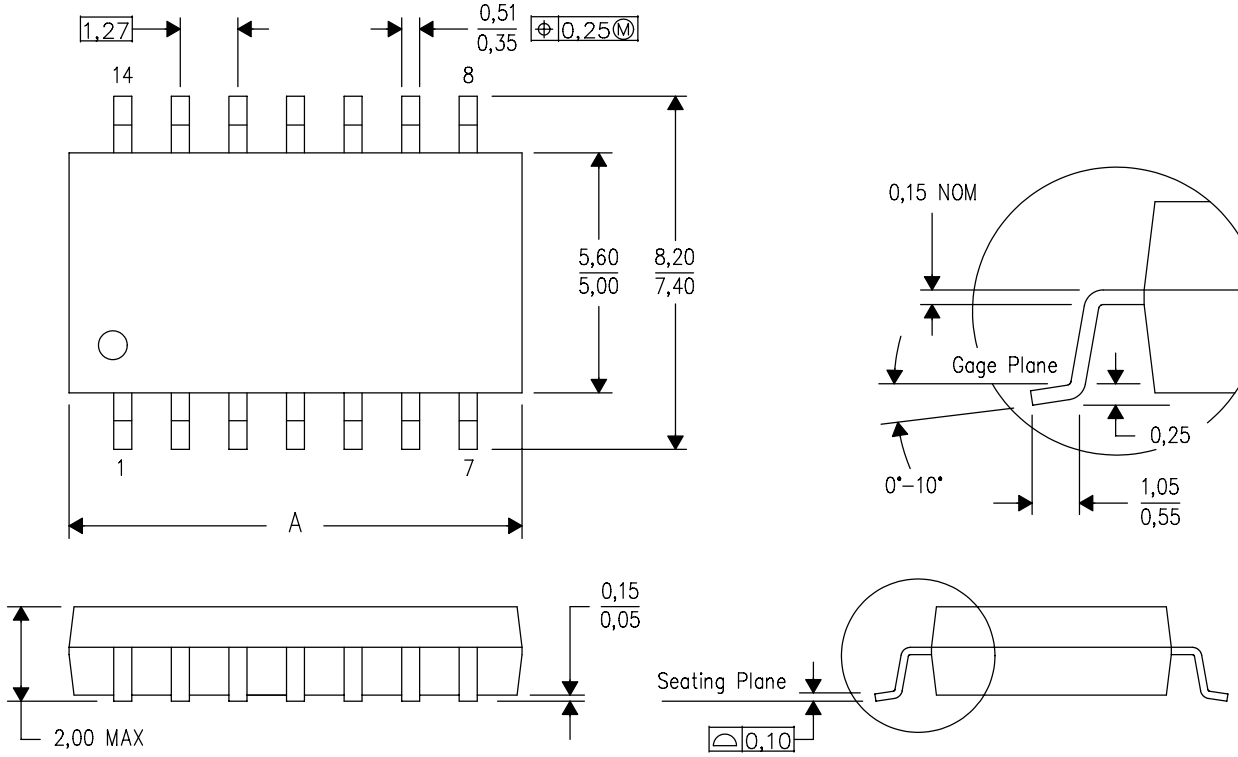
*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN74ALS641A-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS641A-1N.A	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS641AN	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS641AN.A	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS642A-1DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ALS642A-1DW.A	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ALS642A-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS642A-1N.A	N	PDIP	20	20	506	13.97	11230	4.32
SN74AS641DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74AS641DW.A	DW	SOIC	20	25	507	12.83	5080	6.6
SN74AS641N	N	PDIP	20	20	506	13.97	11230	4.32
SN74AS641N.A	N	PDIP	20	20	506	13.97	11230	4.32

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

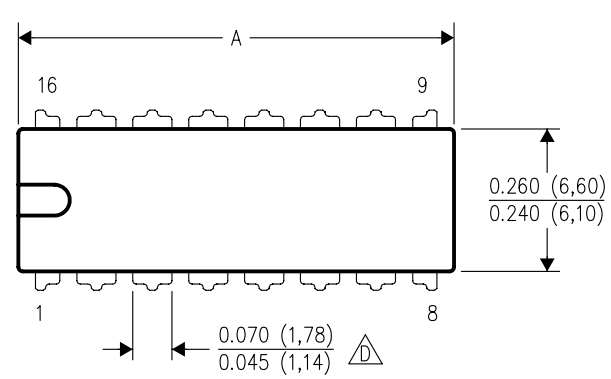
4040062/C 03/03

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, not to exceed 0,15.

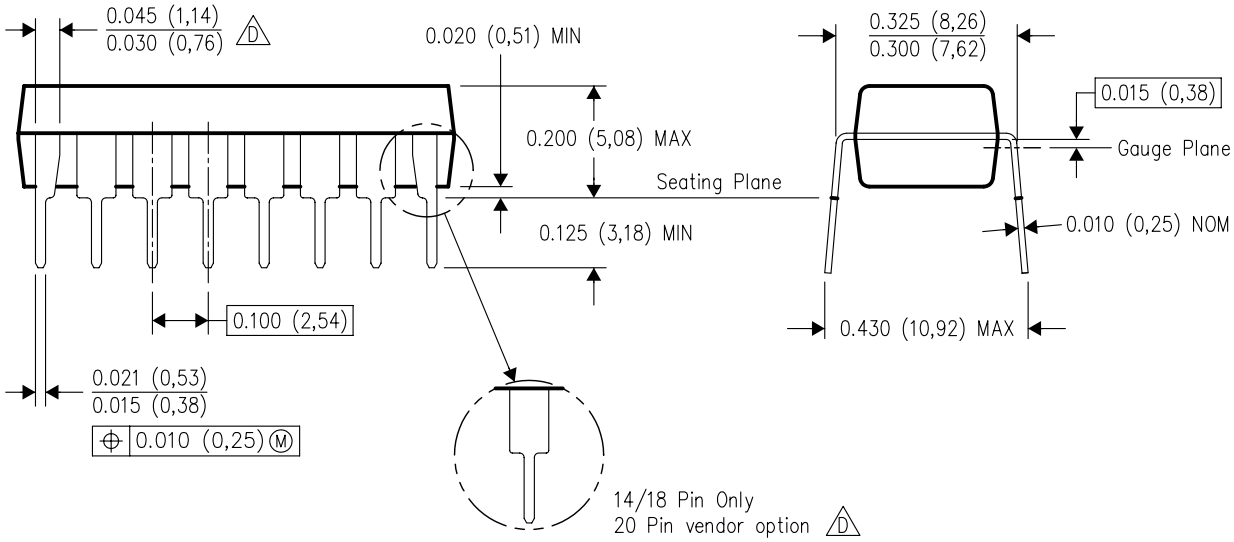
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

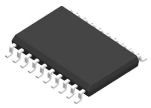


DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

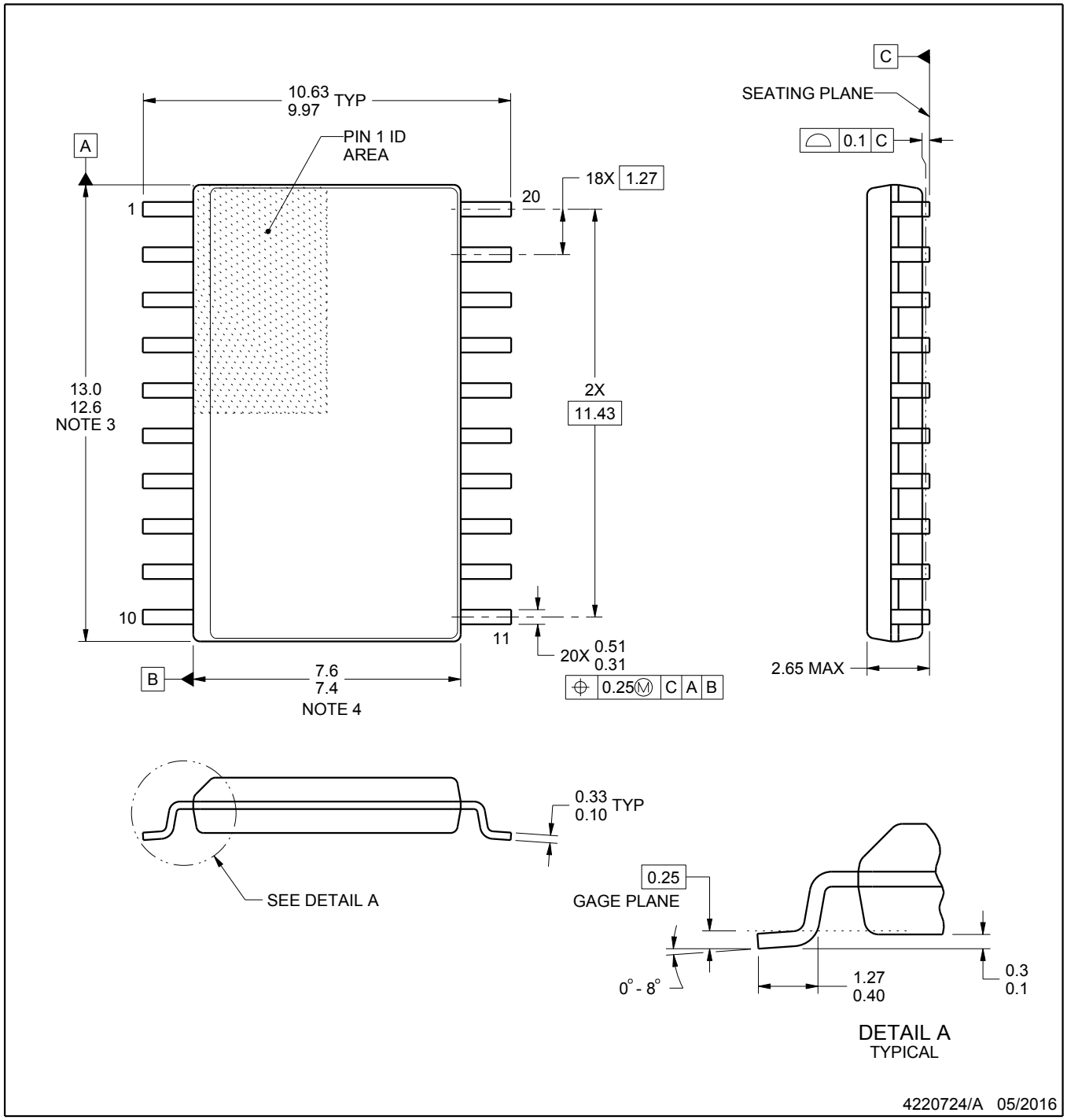


PACKAGE OUTLINE

DW0020A

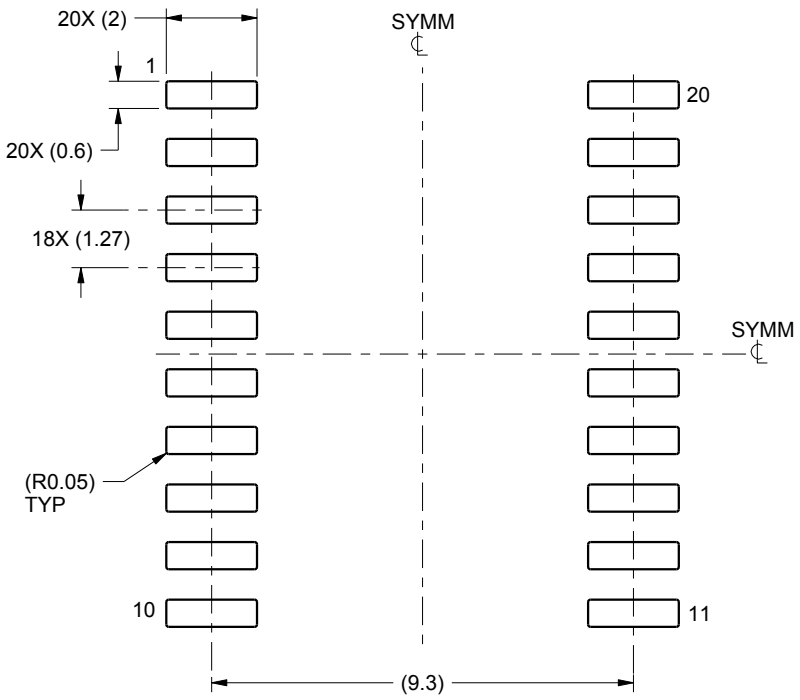
SOIC - 2.65 mm max height

SOIC

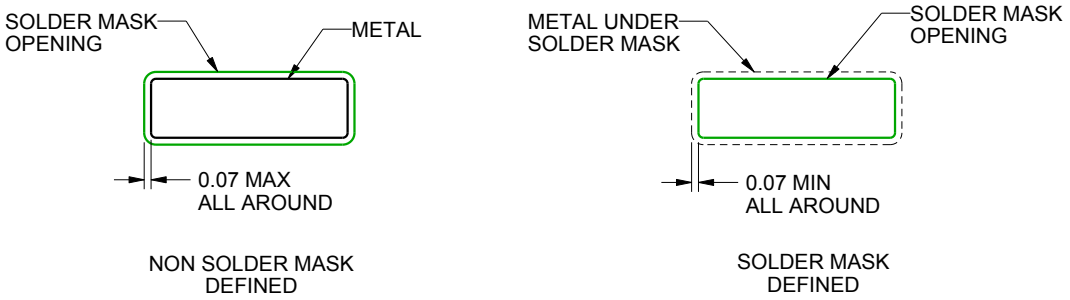


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:6X

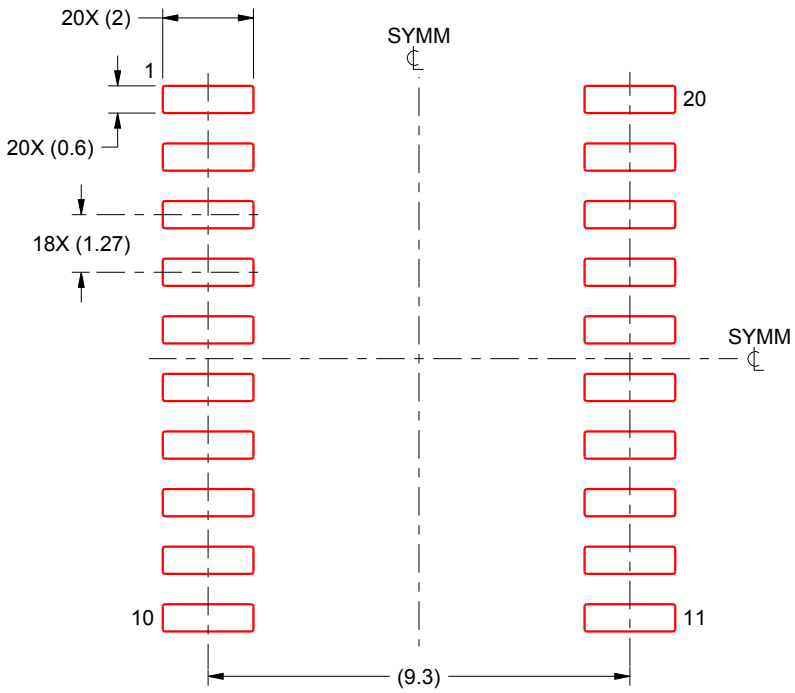


SOLDER MASK DETAILS

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.



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.

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