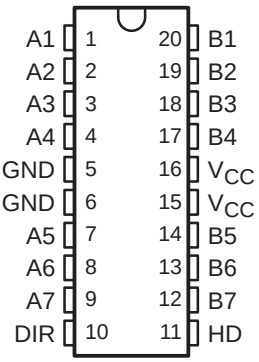
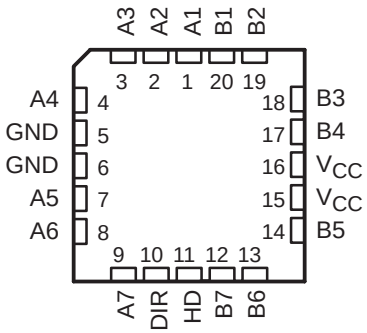
- **4.5-V to 5.5-V V_{CC} Operation**
- **Inputs Accept Voltages to 5.5 V**
- **Max t_{pd} of 20 ns at 5 V**
- **3-State Outputs Directly Drive Bus Lines**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise**
- **ESD Protection Exceeds JESD 22**
  - **2000-V Human-Body Model (A114-A)**
  - **200-V Machine Model (A115-A)**
- **Designed for the IEEE 1284-I (Level-1 Type) and IEEE 1284-II (Level-2 Type) Electrical Specifications**

SN54ACT1284 . . . J OR W PACKAGE
SN74ACT1284 . . . DB, DW, NS, OR PW PACKAGE
(TOP VIEW)



SN54ACT1284 . . . FK PACKAGE
(TOP VIEW)



description/ordering information

The ’ACT1284 devices are designed for asynchronous two-way communication between data buses. The control function minimizes external timing requirements.

The devices allow data transmission in either the A-to-B or the B-to-A direction for bits 1, 2, 3, and 4, depending on the logic level at the direction-control (DIR) input. Bits 5, 6, and 7, however, always transmit in the A-to-B direction.

The output drive for each mode is determined by the high-drive (HD) control pin. When HD is high, the high drive is delivered by the totem-pole configuration, and when HD is low, the outputs are open drain. This meets the drive requirements as specified in the IEEE 1284-I (level-1 type) and the IEEE 1284-II (level-2 type) parallel peripheral-interface specification.

ORDERING INFORMATION

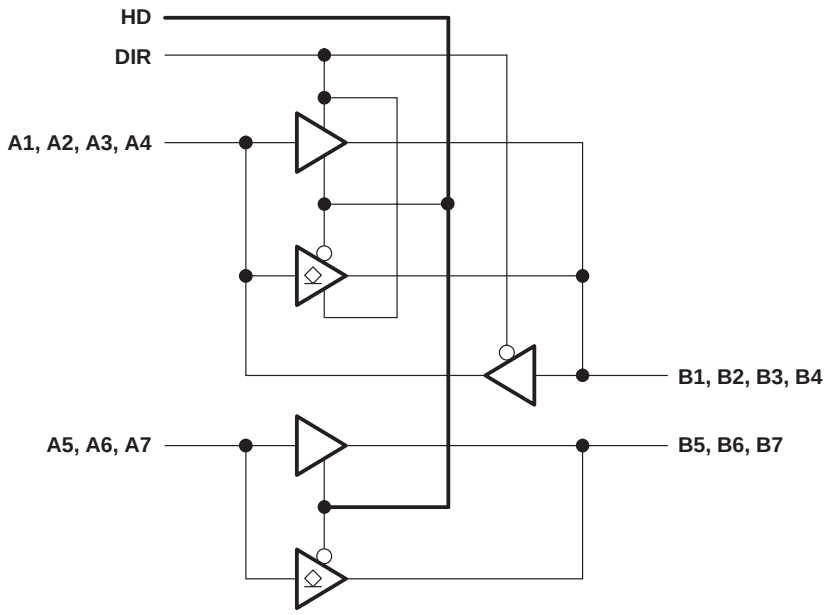
T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	SOIC − DW	Tube	SN74ACT1284DW	ACT1284
		Tape and reel	SN74ACT1284DWR	
	SOP − NS	Tape and reel	SN74ACT1284NSR	ACT1284
	SSOP − DB	Tape and reel	SN74ACT1284DBR	AU284
	TSSOP − PW	Tube	SN74ACT1284PW	AU284
		Tape and reel	SN74ACT1284PWR	
−55°C to 125°C	CDIP − J	Tube	SNJ54ACT1284J	SNJ54ACT1284J
	CFP − W	Tube	SNJ54ACT1284W	SNJ54ACT1284W
	LCCC − FK	Tube	SNJ54ACT1284FK	SNJ54ACT1284FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

INPUTS		OUTPUT	MODE
DIR	HD		
L	L	Open drain	A to B: Bits 5, 6, 7
		Totem pole	B to A: Bits 1, 2, 3, 4
L	H	Totem pole	B to A: Bits 1, 2, 3, 4 and A to B: Bits 5, 6, 7
H	L	Open drain	A to B: Bits 1, 2, 3, 4, 5, 6, 7
H	H	Totem pole	A to B: Bits 1, 2, 3, 4, 5, 6, 7

logic diagram (positive logic)



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

Supply voltage range, V_{CC} . . . . . −0.5 V to 7 V
B-port input and output voltage range, V_I and V_O (see Notes 1 and 2) . . . . . −2 V to 7 V
A-port input and output voltage range, V_I and V_O (see Note 1) . . . . . −0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} (V_I < 0 or V_I > V_{CC}) . . . . . ±20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{CC}) . . . . . ±50 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±50 mA
Continuous current through V_{CC} or GND . . . . . ±200 mA
Package thermal impedance, θ_{JA} (see Note 3): DB package . . . . . 70°C/W
DW package . . . . . 58°C/W
NS package . . . . . 60°C/W
PW package . . . . . 83°C/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: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The ac input voltage pulse duration is limited to 20 ns if the input voltage goes more negative than −0.5 V.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

			SN54ACT1284		SN74ACT1284		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		4.7	5.5	4.7	5.5	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		0	V_{CC}	0	V_{CC}	V
V_O	Open-drain output voltage	HD low	0	5.5	0	5.5	V
I_{OH}	High-level output current	B port, HD high		−14		−14	mA
		A port		−4		−4	
I_{OL}	Low-level output current	B port		14		14	mA
		A port		4		4	
T_A	Operating free-air temperature		−55	125	0	70	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended ranges of operating free-air temperature and supply voltage (unless otherwise noted)

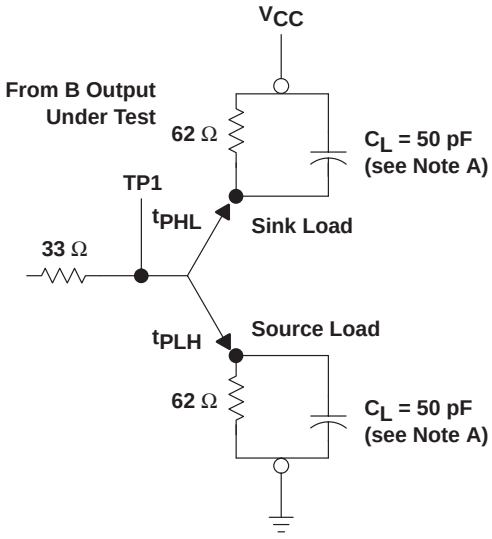
PARAMETER		TEST CONDITIONS	V_{CC}†	SN54ACT1284			SN74ACT1284			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{hys}	Input hysteresis	$V_{IT+} - V_{IT-}$ for all inputs	5 V	0.4			0.4			V
			4.7 V	0.2			0.2			
V_{OH}	B port	I_{OH} = −14 mA	4.7 V	2.4			2.4			V
	A port	I_{OH} = −50 µA	MIN to MAX	V_{CC}−0.2			V_{CC}−0.2			
		I_{OH} = −4 mA	4.7 V	3.7			3.7			
V_{OL}	B port	I_{OL} = 14 mA	4.7 V			0.4			0.4	V
	A port	I_{OL} = 50 µA				0.2			0.2	
		I_{OL} = 4 mA				0.4			0.4	
I_I		$V_I = V_{CC}$ or GND	5.5 V			±1			±1	µA
I_{OZ}	A or B ports‡	$V_O = V_{CC}$ or GND	5.5 V			±20			±20	µA
I_{off}	B port	V_I or $V_O \le 7$ V	0 V			±100			±100	µA
I_{CC}		$V_I = V_{CC}$ or GND, I_O = 0	5.5 V			1.5			1.5	mA
C_i	Control inputs	$V_I = V_{CC}$ or GND	5 V		4			4		pF
C_{io}	A or B ports	$V_O = V_{CC}$ or GND	5 V		12			12		pF
Z_O	B port	I_{OH} = −20 mA, I_{OH} = −50 mA	5 V	8		30	8		30	Ω

† For I/O ports, the parameter I_{OZ} includes the input leakage current I_I.
‡ For conditions shown as MIN or MAX, use the appropriate values under recommended operating conditions.

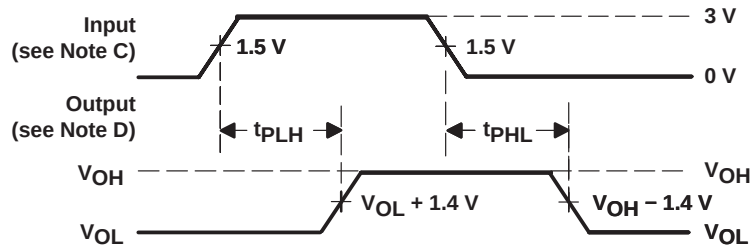
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	SN54ACT1284		SN74ACT1284		UNIT
				MIN	MAX	MIN	MAX	
t_{PLH}	Totem pole	A or B	B or A	1	20	1	20	ns
t_{PHL}				1	20	1	20	
SR	Totem pole	B output		0.05	0.4	0.05	0.4	V/ns
t_{pd}(EN)	Totem pole	HD	B	1	20	1	20	ns
t_{pd}(DIS)				1	20	1	20	
t_r, t_f	Open drain	A	B		120		120	ns

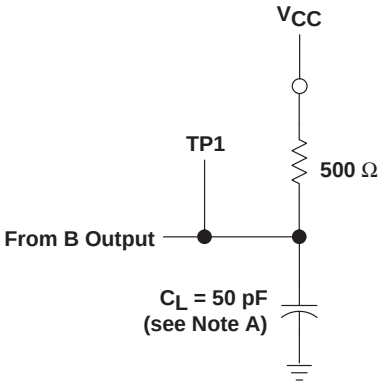
PARAMETER MEASUREMENT INFORMATION



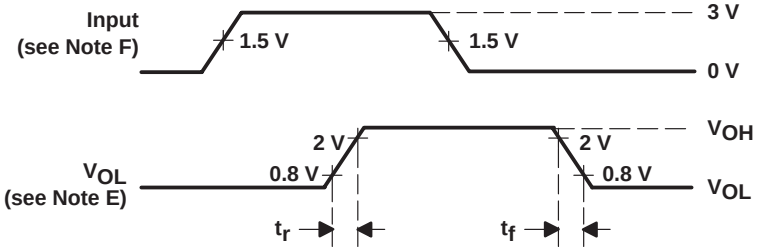
A-TO-B LOAD (totem pole)



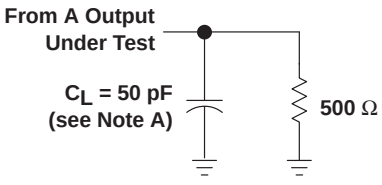
VOLTAGE WAVEFORMS MEASURED AT TP1
PROPAGATION DELAY TIMES (A to B)



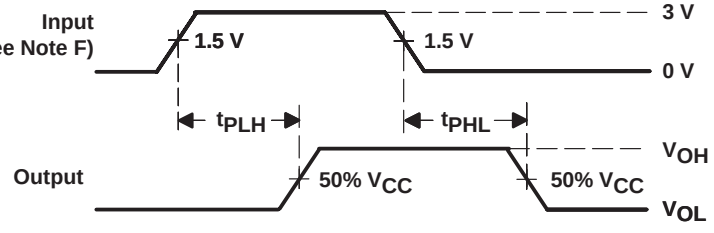
A-TO-B LOAD (open drain)



VOLTAGE WAVEFORMS MEASURED AT TP1 (B SIDE)



B-TO-A LOAD (totem pole)



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES (B to A)

NOTES: A. CL includes probe and jig capacitance.
B. The outputs are measured one at a time with one transition per measurement.
C. Input rise and fall times are 3 ns, 150 ns < pulse duration <10 μs for both low-to-high and high-to-low transitions.
D. Slew rate is defined as 10% and 90% of the transition times.
E. Rise and fall times, open drain, are <120 ns.
F. Input rise and fall times are 3 ns.

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)
SN74ACT1284DBR	Active	Production	SSOP (DB) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284
SN74ACT1284DBR.A	Active	Production	SSOP (DB) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284
SN74ACT1284DW	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284DW.A	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284DWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284
SN74ACT1284PWR	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284
SN74ACT1284PWR.A	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284

(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.

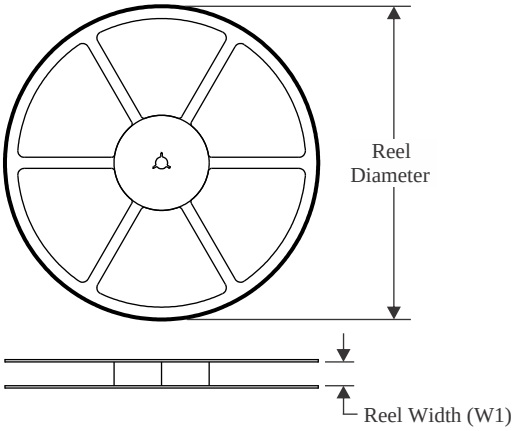
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

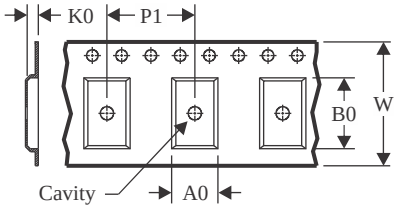
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

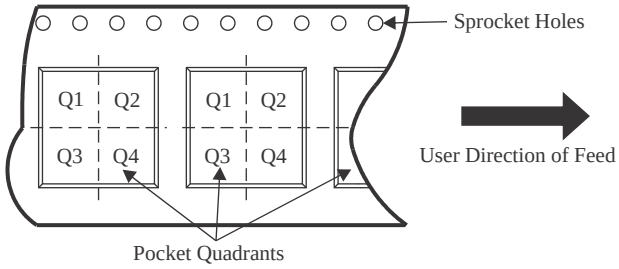


TAPE DIMENSIONS



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

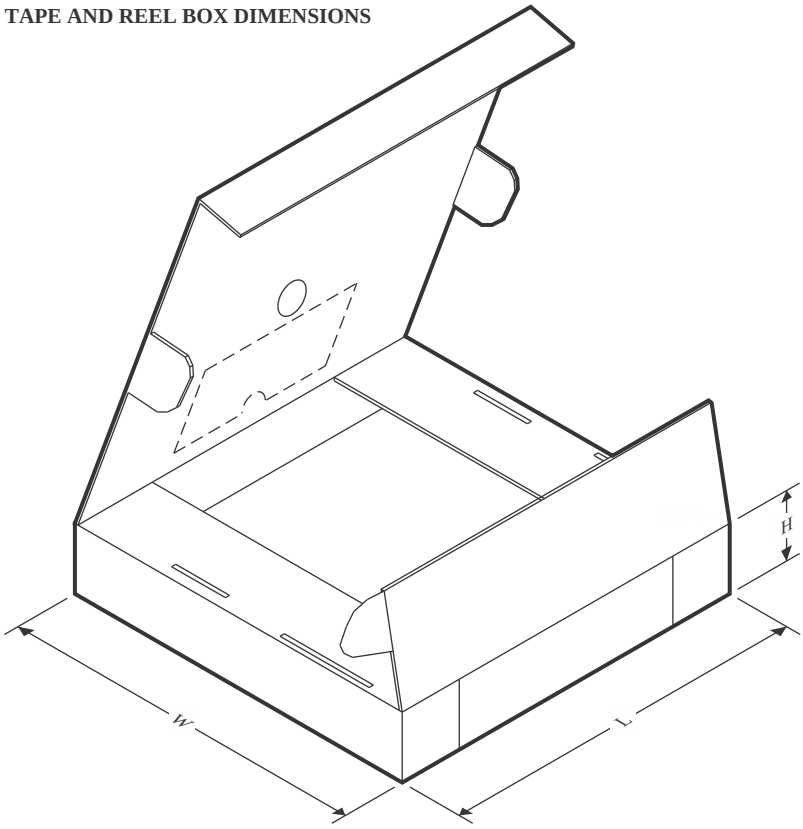
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74ACT1284DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ACT1284DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ACT1284NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ACT1284PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

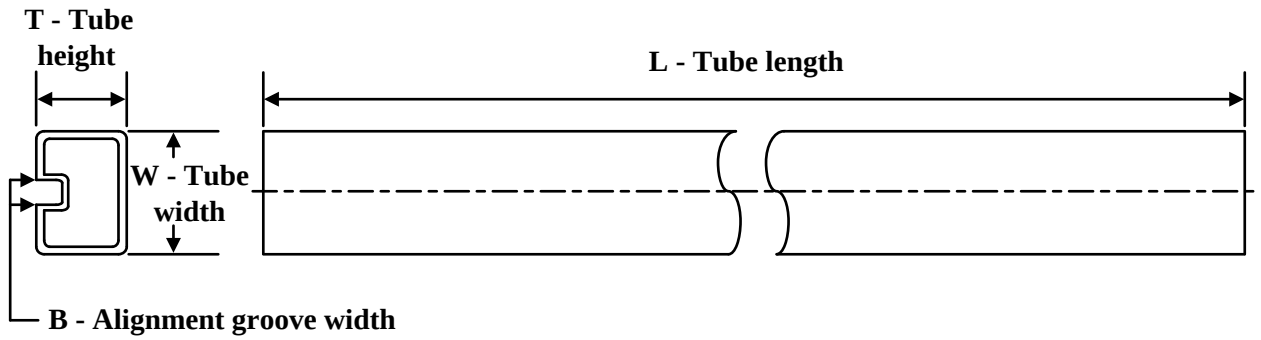
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ACT1284DBR	SSOP	DB	20	2000	353.0	353.0	32.0
SN74ACT1284DWR	SOIC	DW	20	2000	356.0	356.0	45.0
SN74ACT1284NSR	SOP	NS	20	2000	356.0	356.0	45.0
SN74ACT1284PWR	TSSOP	PW	20	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

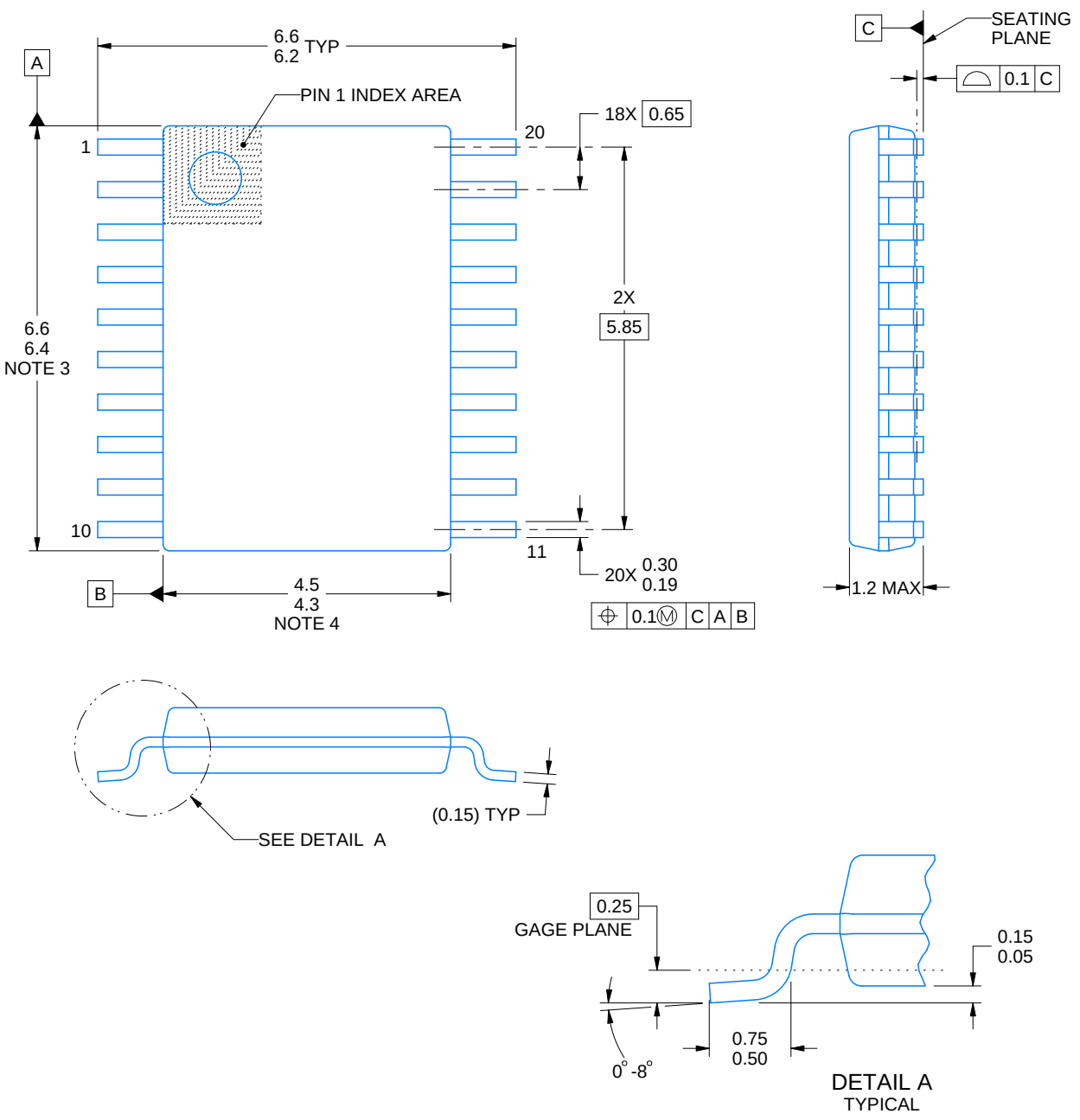
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN74ACT1284DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74ACT1284DW.A	DW	SOIC	20	25	507	12.83	5080	6.6

PACKAGE OUTLINE

PW0020A

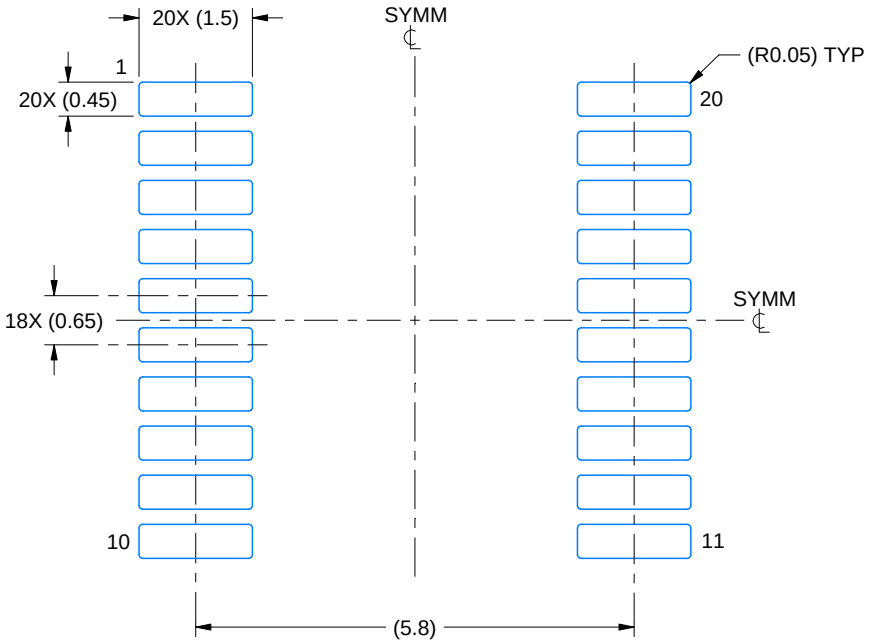
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

1. All linear dimensions are in millimeters. Any 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 0.25 mm per side.
5. Reference JEDEC registration MO-153.



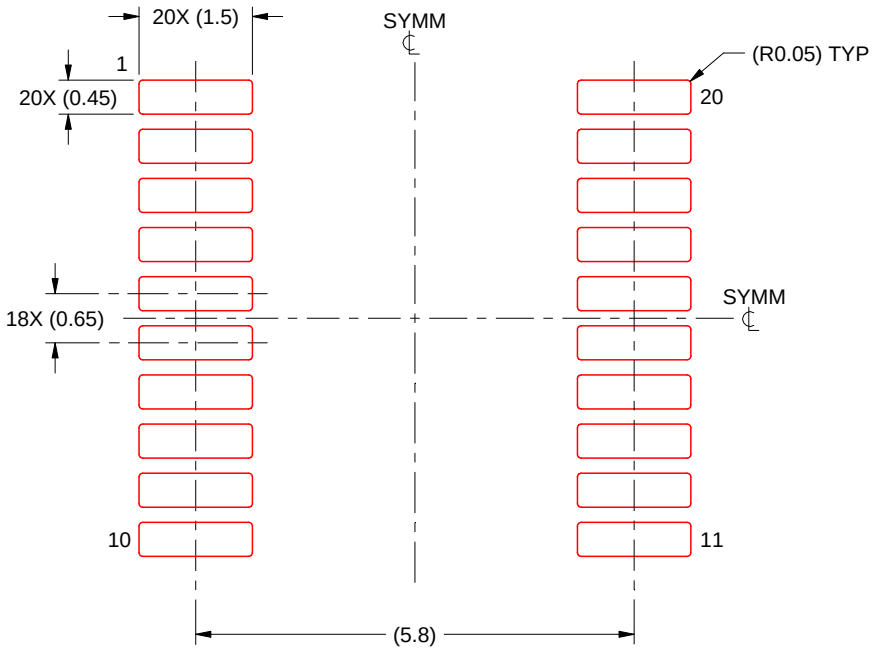
LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

SOLDER MASK DETAILS

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.



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

4220206/A 02/2017

NOTES: (continued)

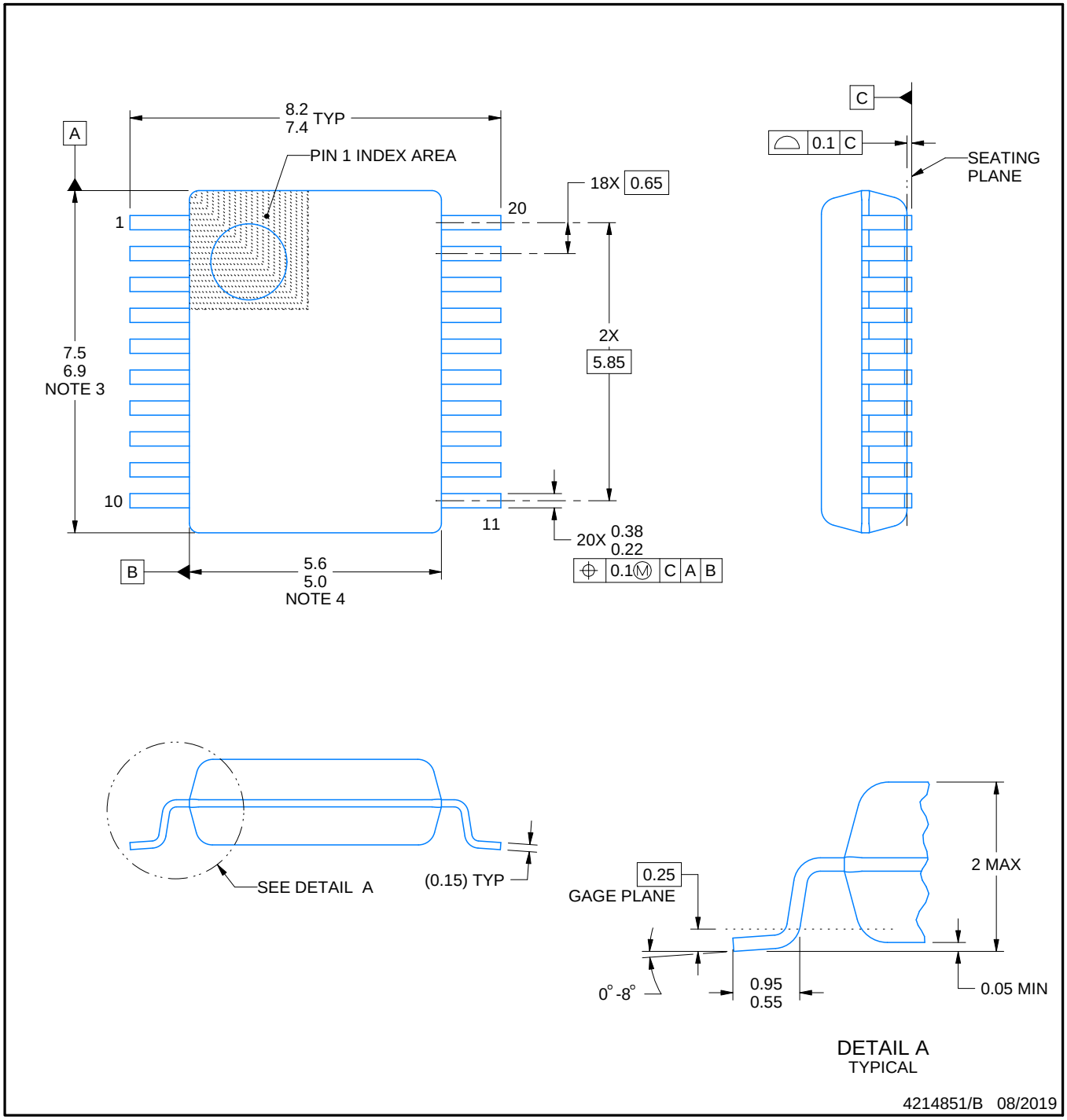
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PACKAGE OUTLINE

DB0020A

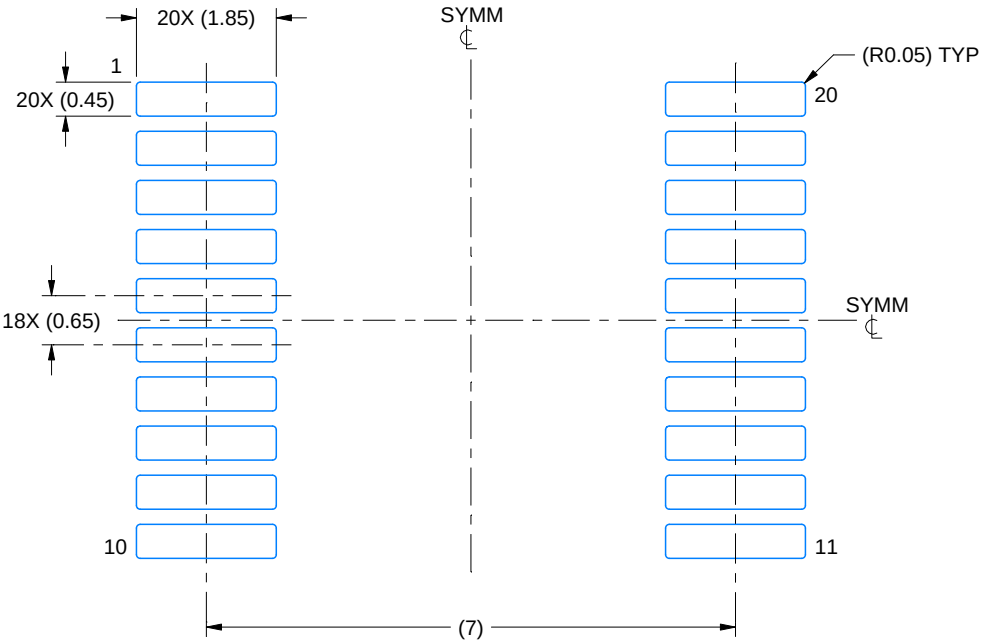
SSOP - 2 mm max height

SMALL OUTLINE PACKAGE

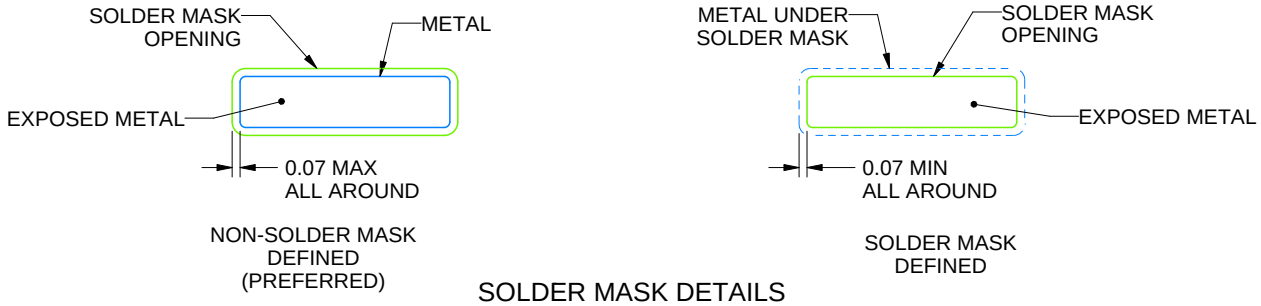


NOTES:

1. All linear dimensions are in millimeters. Any 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 0.25 mm per side.
5. Reference JEDEC registration MO-150.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4214851/B 08/2019

NOTES: (continued)

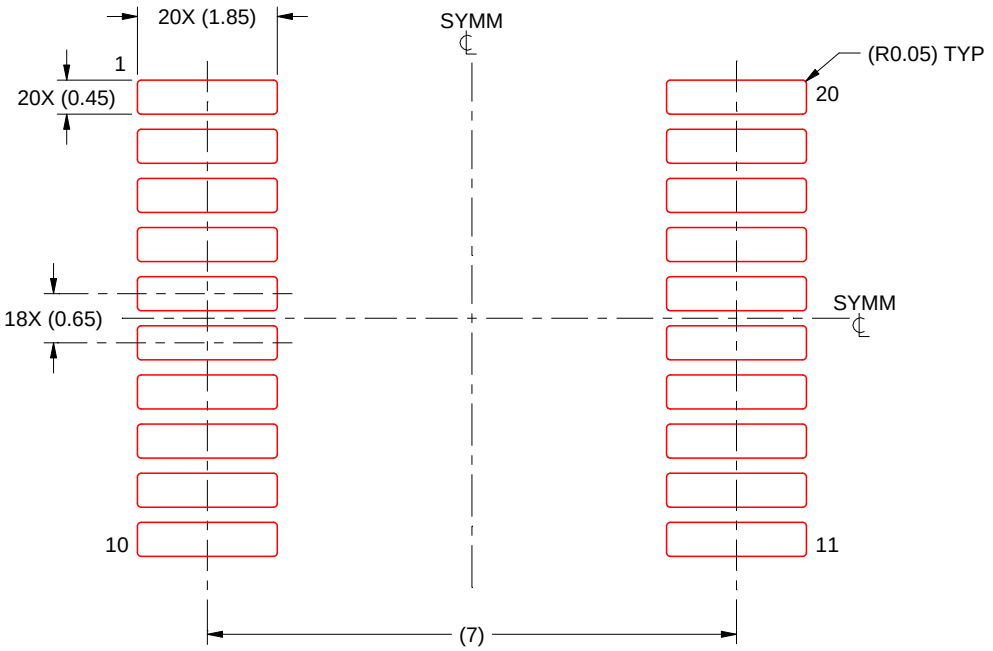
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4214851/B 08/2019

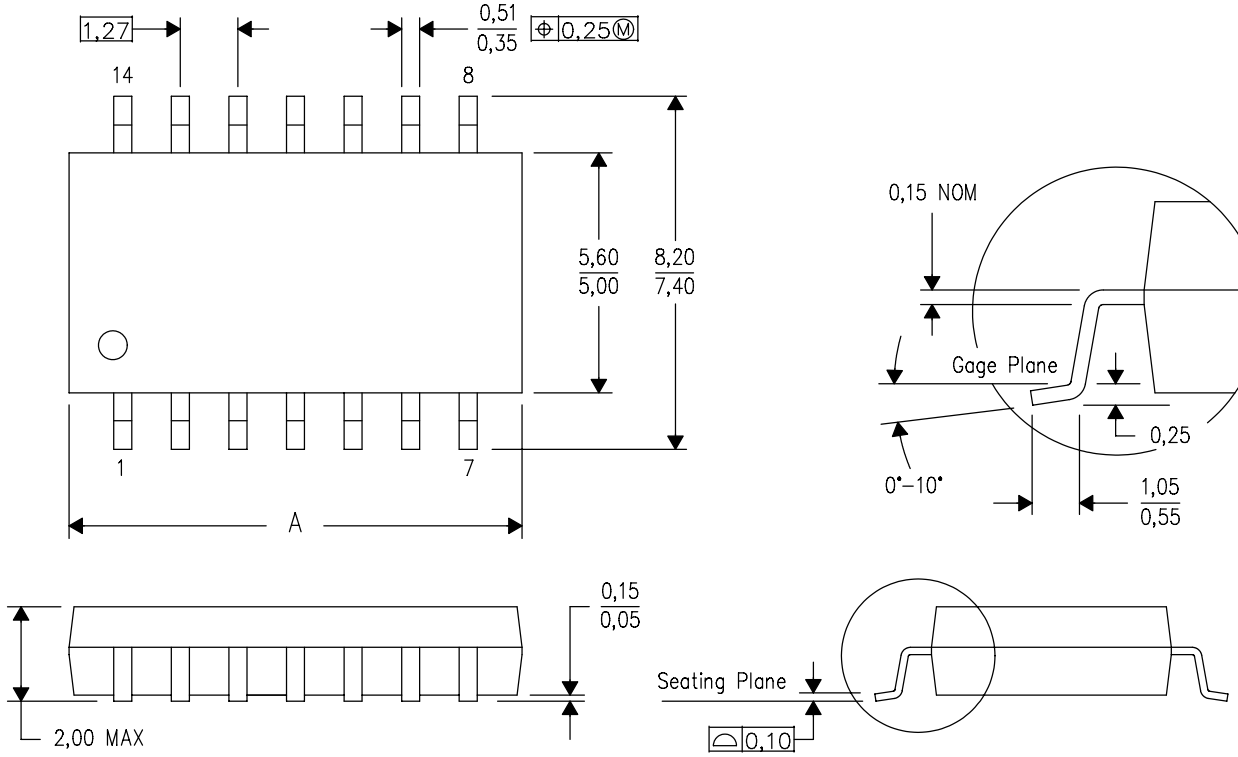
NOTES: (continued)

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.

MECHANICAL DATA

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

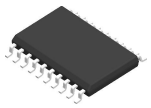
14-PINS SHOWN



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.

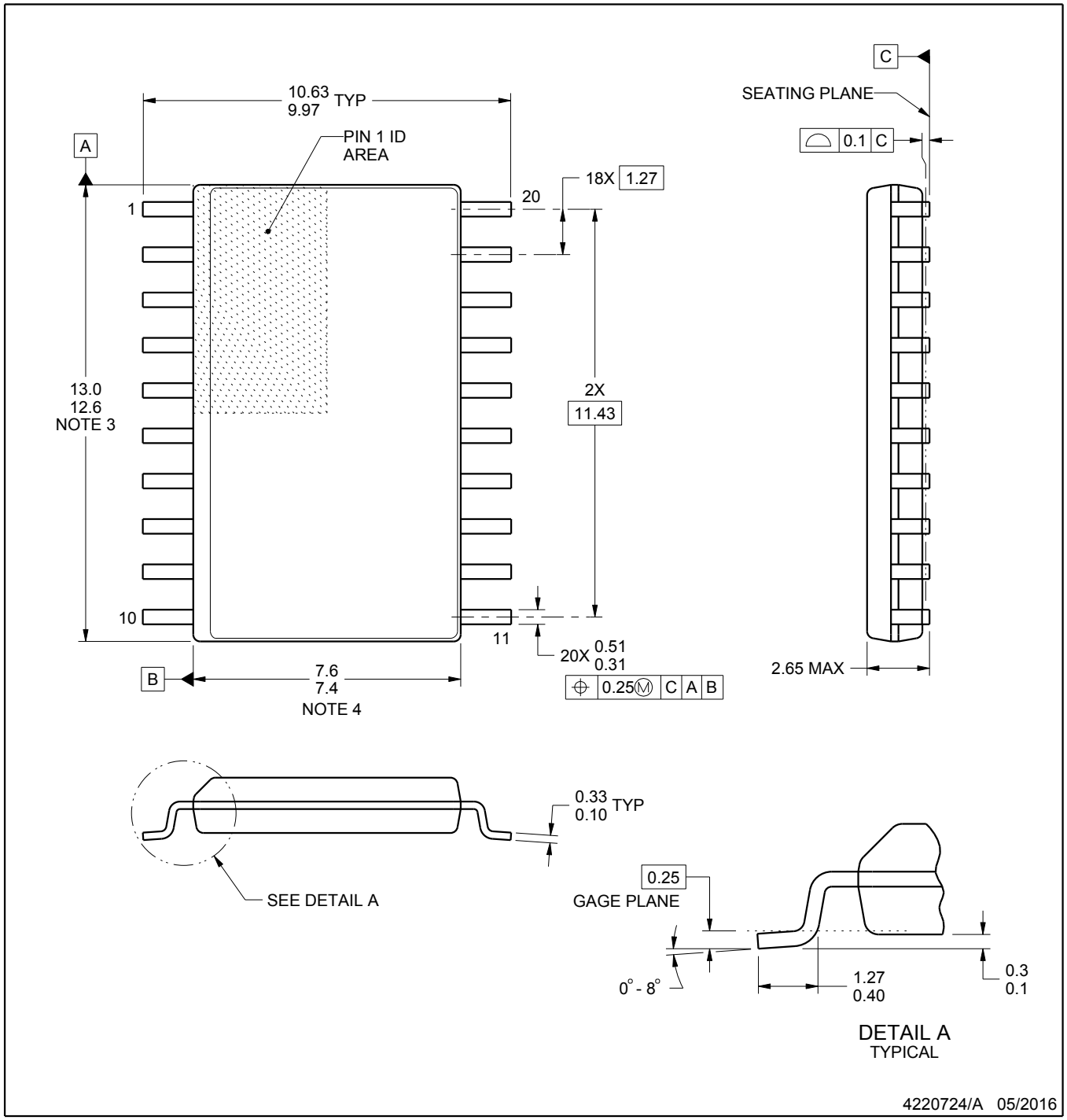


PACKAGE OUTLINE

DW0020A

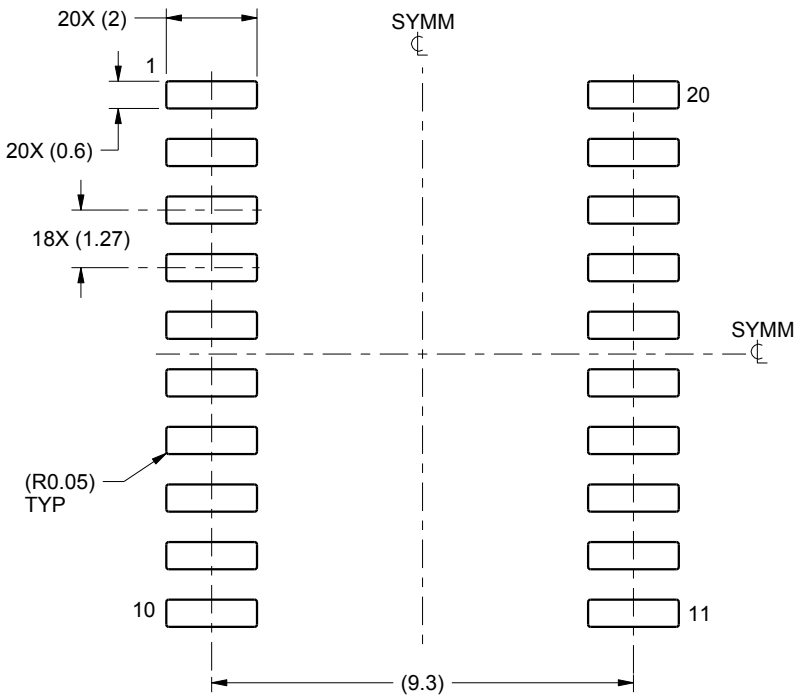
SOIC - 2.65 mm max height

SOIC

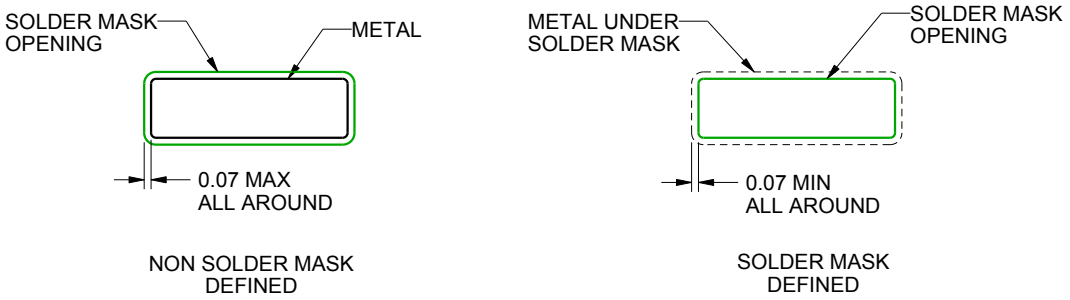


NOTES:

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

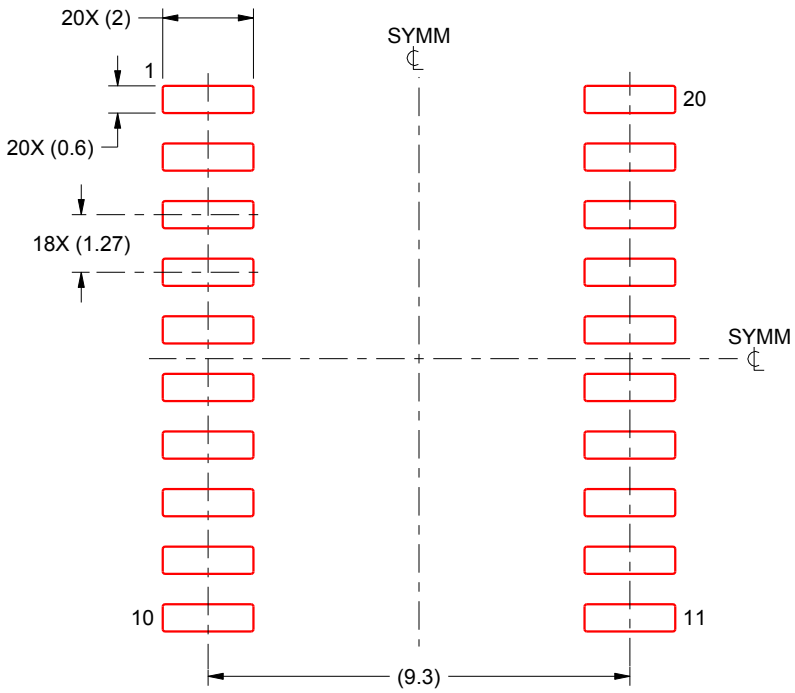


SOLDER MASK DETAILS

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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