

# SN54ACT1284, SN74ACT1284 7-BIT BUS INTERFACES WITH 3-STATE OUTPUTS

SCAS459D – NOVEMBER 1994 – REVISED OCTOBER 2003

- 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

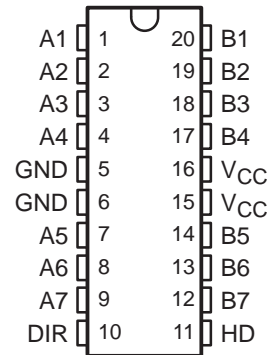
## description/ordering information

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

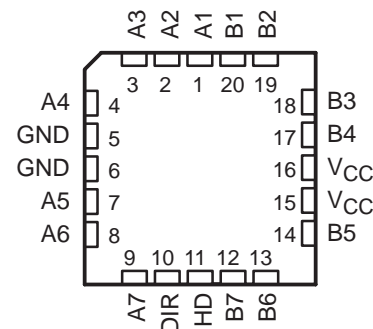
The devices allow data transmission in either the A-to-B or the B-to-A direction for bits 1, 2, 3, and 4, depending on the logic level at the direction-control (DIR) input. Bits 5, 6, and 7, however, always transmit in the A-to-B direction.

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.

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



SN54ACT1284 . . . FK PACKAGE  
(TOP VIEW)



## 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
–55°C to 125°C	TSSOP – PW	Tube	SN74ACT1284PW	AU284
		Tape and reel	SN74ACT1284PWR	
	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](http://www.ti.com/sc/package).



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 **TEXAS  
INSTRUMENTS**

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# SN54ACT1284, SN74ACT1284

## 7-BIT BUS INTERFACES

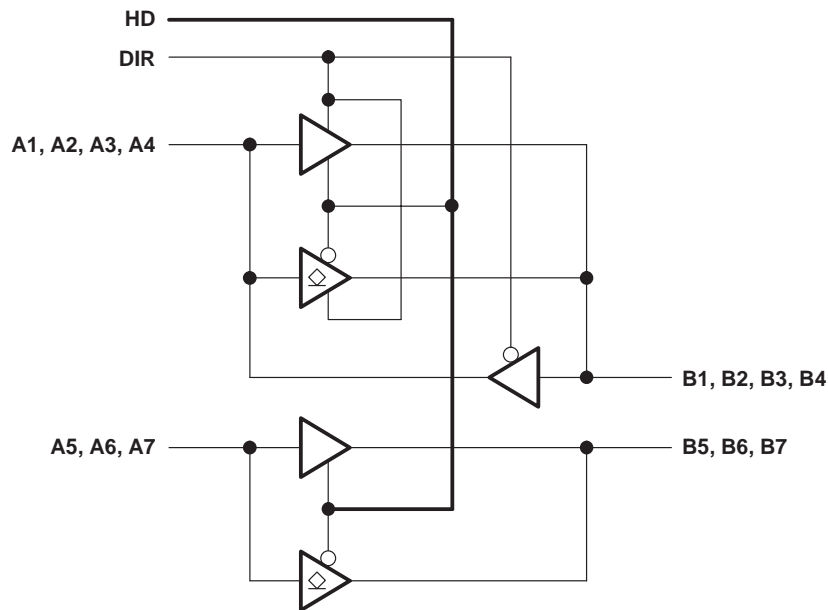
### WITH 3-STATE OUTPUTS

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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)



# SN54ACT1284, SN74ACT1284 7-BIT BUS INTERFACES WITH 3-STATE OUTPUTS

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## 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, $\theta_{JA}$ (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
		B port, HD high		–14		–14	mA
$I_{OH}$	High-level output current	A port		–4		–4	
		B port		14		14	mA
$I_{OL}$	Low-level output current	A port		4		4	
		$T_A$	Operating free-air temperature	–55	125	0	70

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.

# SN54ACT1284, SN74ACT1284

## 7-BIT BUS INTERFACES

### WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub> †	SN54ACT1284			SN74ACT1284			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V <sub>hys</sub>	Input hysteresis	V <sub>IT+</sub> – V <sub>IT-</sub> for all inputs	5 V	0.4			0.4			V
			4.7 V	0.2			0.2			
V <sub>OH</sub>	B port	I <sub>OH</sub> = –14 mA	4.7 V	2.4			2.4			V
	A port	I <sub>OH</sub> = –50 μA	MIN to MAX	V <sub>CC</sub> –0.2			V <sub>CC</sub> –0.2			
		I <sub>OH</sub> = –4 mA	4.7 V	3.7			3.7			
V <sub>OL</sub>	B port	I <sub>OL</sub> = 14 mA	4.7 V				0.4			V
	A port	I <sub>OL</sub> = 50 μA	4.7 V				0.2			
		I <sub>OL</sub> = 4 mA					0.4			
I <sub>I</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V				±1			μA
I <sub>OZ</sub>	A or B ports‡	V <sub>O</sub> = V <sub>CC</sub> or GND	5.5 V				±20			μA
I <sub>off</sub>	B port	V <sub>I</sub> or V <sub>O</sub> ≤ 7 V	0 V				±100			μA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V				1.5			mA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	4			4			pF
C <sub>io</sub>	A or B ports	V <sub>O</sub> = V <sub>CC</sub> or GND	5 V	12			12			pF
Z <sub>O</sub>	B port	I <sub>OH</sub> = –20 mA, I <sub>OH</sub> = –50 mA	5 V	8	30		8	30		Ω

† For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current I<sub>I</sub>.

‡ 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)

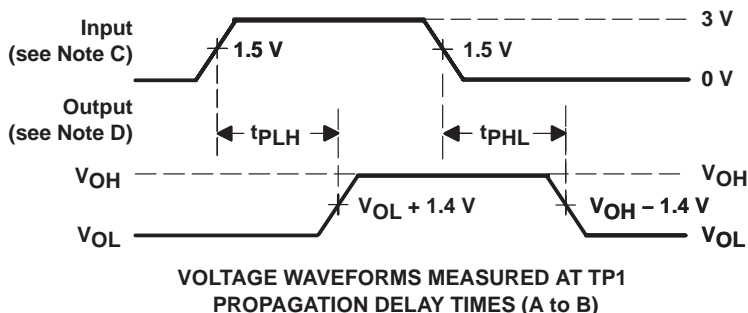
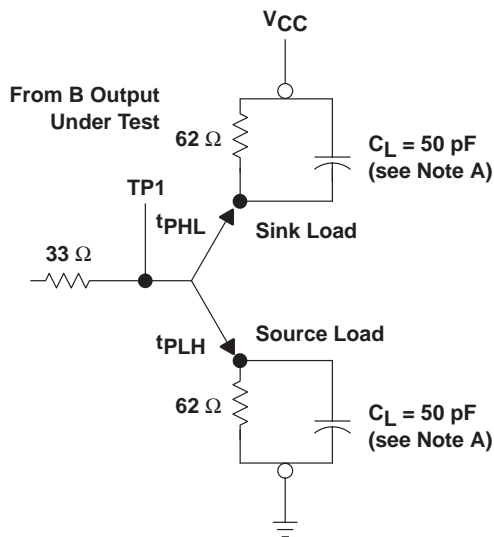
PARAMETER		FROM (INPUT)	TO (OUTPUT)	SN54ACT1284		SN74ACT1284		UNIT
				MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	Totem pole	A or B	B or A	1	20	1	20	ns
t <sub>PHL</sub>				1	20	1	20	
SR	Totem pole	B output		0.05	0.4	0.05	0.4	V/ns
t <sub>pd(EN)</sub>	Totem pole	HD	B	1	20	1	20	ns
t <sub>pd(DIS)</sub>				1	20	1	20	
t <sub>r</sub> , t <sub>f</sub>	Open drain	A	B	120		120		ns

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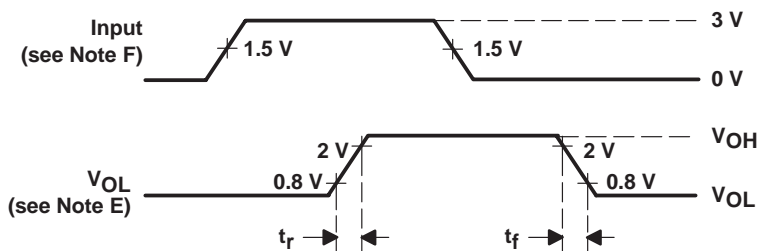
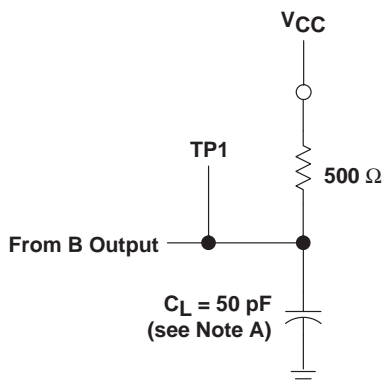


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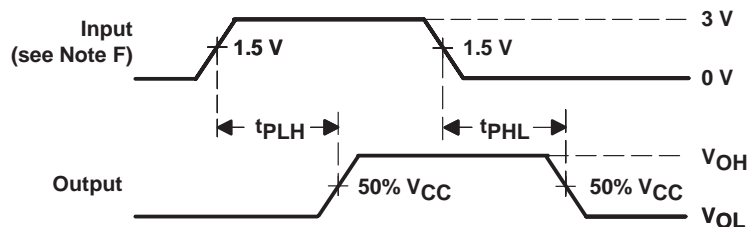
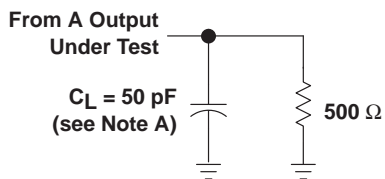
PARAMETER MEASUREMENT INFORMATION



A-TO-B LOAD (totem pole)



A-TO-B LOAD (open drain)



B-TO-A LOAD (totem pole)

- NOTES: A.  $C_L$  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,  $150 \text{ ns} < \text{pulse duration} < 10 \text{ } \mu\text{s}$  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  $< 120 \text{ ns}$ .  
 F. Input rise and fall times are 3 ns.

Figure 1. Load Circuits and Voltage Waveforms

**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
SN74ACT1284DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284	<a href="#">Samples</a>
SN74ACT1284DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284	<a href="#">Samples</a>
SN74ACT1284DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284	<a href="#">Samples</a>
SN74ACT1284DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284	<a href="#">Samples</a>
SN74ACT1284DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284	<a href="#">Samples</a>
SN74ACT1284NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ACT1284	<a href="#">Samples</a>
SN74ACT1284PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	AU284	<a href="#">Samples</a>

(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.

<sup>(5)</sup> 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.

<sup>(6)</sup> 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.

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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
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	SO	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	7.1	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)
SN74ACT1284DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74ACT1284DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ACT1284NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ACT1284PWR	TSSOP	PW	20	2000	367.0	367.0	38.0

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN





- 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.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

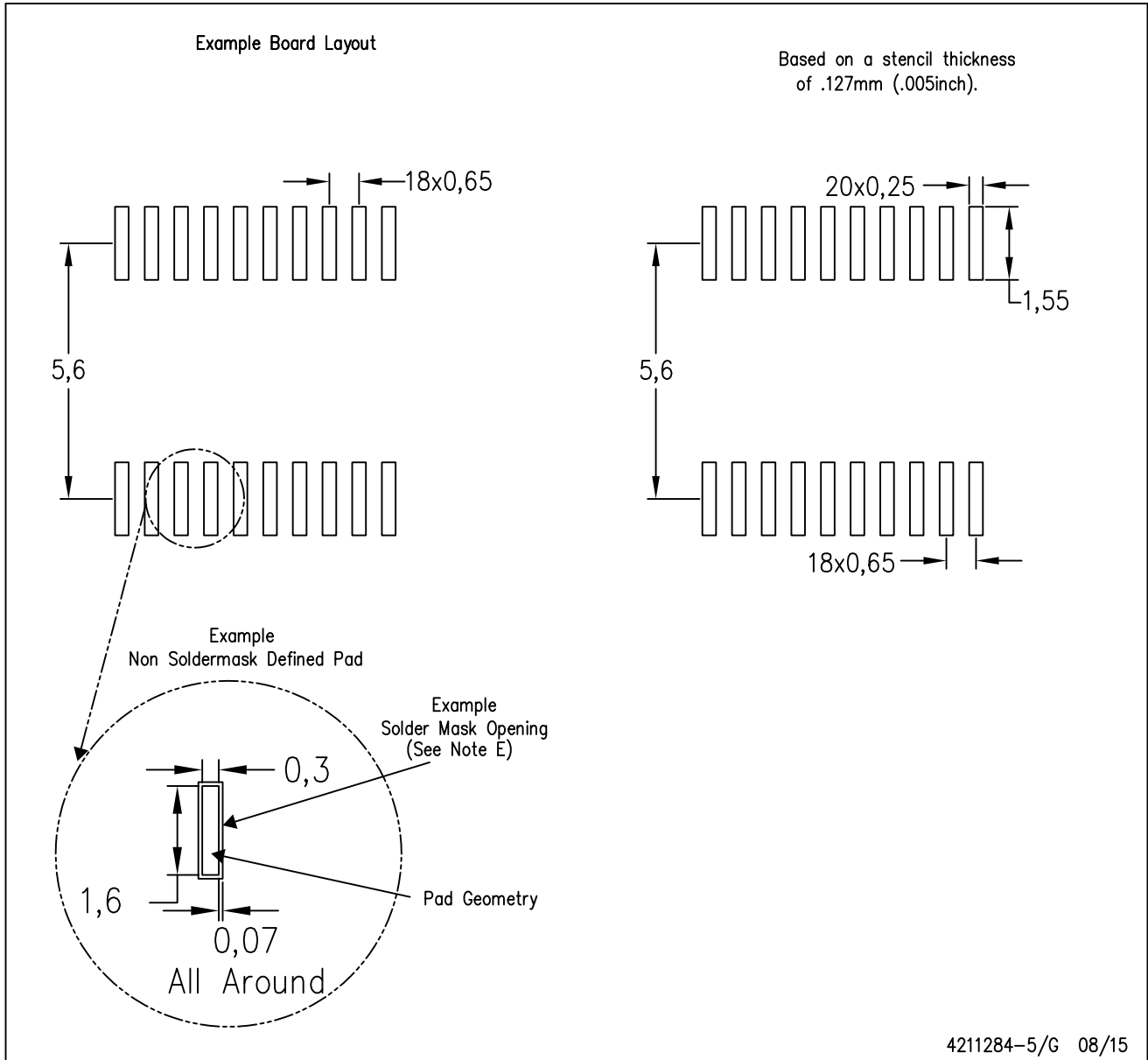


4040064-5/G 02/11

- 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.
  -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  -  Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- 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 design.
  - D. 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 other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- 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.  
 D. Falls within JEDEC MO-150

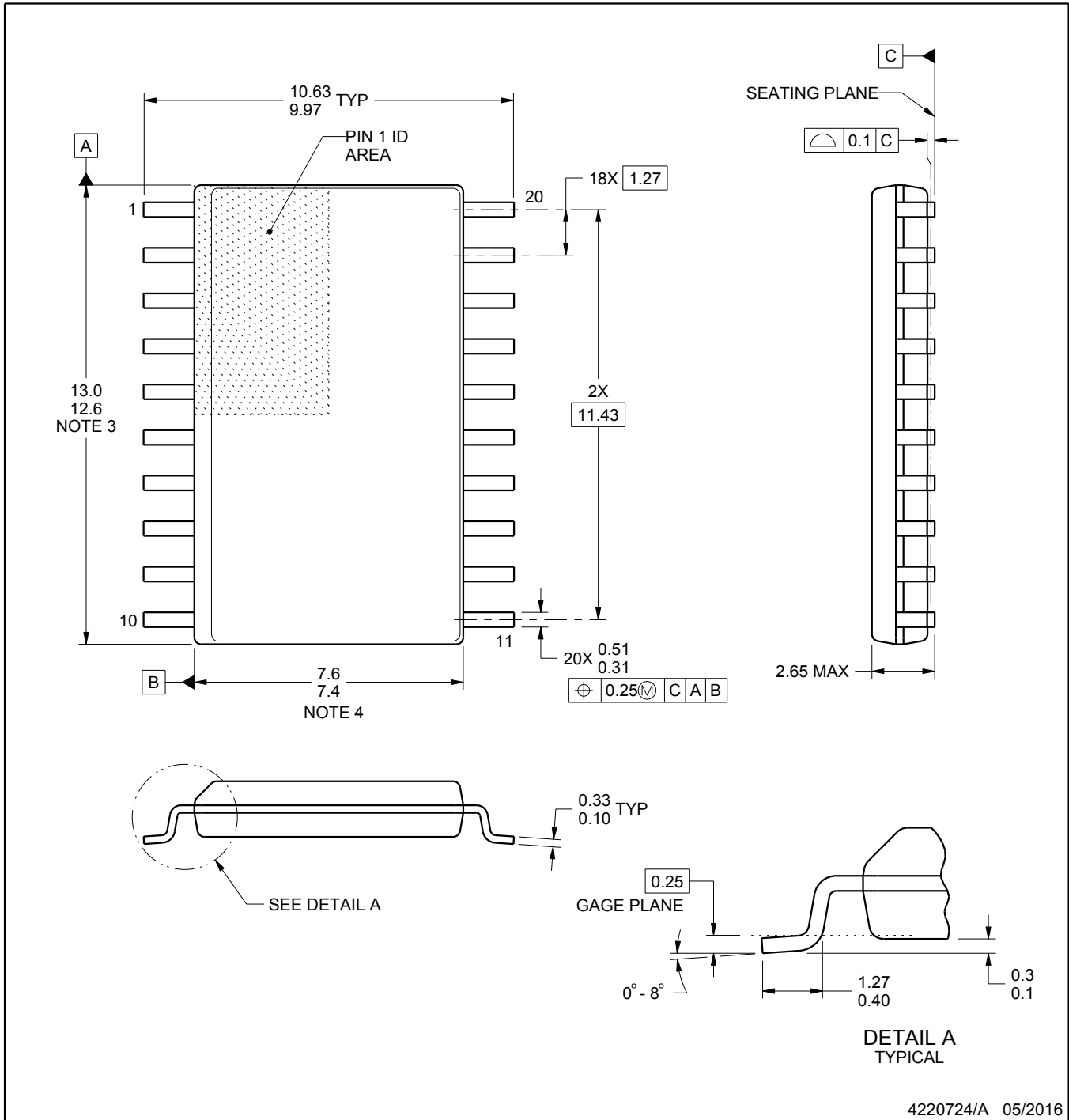
# DW0020A



# 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)

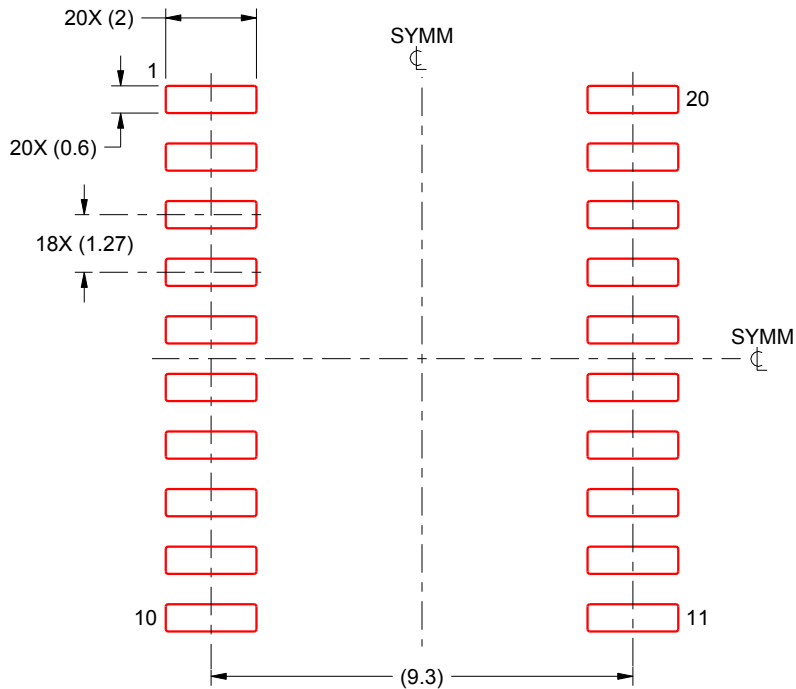
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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.



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