

SN54ALS569A, SN74ALS568A, SN74ALS569A SYNCHRONOUS 4-BIT UP/DOWN DECADE AND BINARY COUNTERS WITH 3-STATE OUTPUTS

SDAS229A – APRIL 1982 – REVISED JANUARY 1995

- 3-State Q Outputs Drive Bus Lines Directly
- Counter Operation Independent of 3-State Output
- Fully Synchronous Clear, Count, and Load
- Asynchronous Clear Is Also Provided
- Fully Cascadable
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

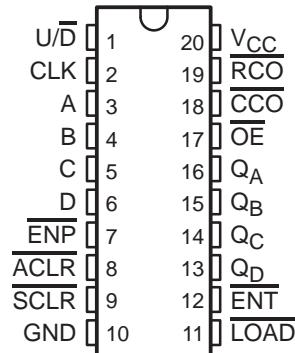
The SN74ALS568A decade counter and 'ALS569A binary counters are programmable, count up or down, and offer both synchronous and asynchronous clearing. All synchronous functions are executed on the positive-going edge of the clock (CLK) input.

The clear function is initiated by applying a low level to either asynchronous clear (ACLR) or synchronous clear (SCLR). Asynchronous (direct) clearing overrides all other functions of the device, while synchronous clearing overrides only the other synchronous functions. Data is loaded from the A, B, C, and D inputs by holding load (LOAD) low during a positive-going clock transition. The counting function is enabled only when enable P (ENP) and enable T (ENT) are low and ACLR, SCLR, and LOAD are high. The up/down (U/D) input controls the direction of the count. These counters count up when U/D is high and count down when U/D is low.

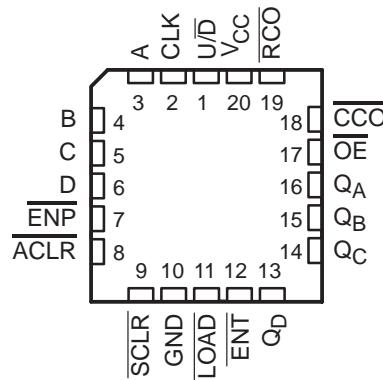
A high level at the output-enable (\overline{OE}) input forces the Q outputs into the high-impedance state, and a low level enables those outputs. Counting is independent of \overline{OE} . ENT is fed forward to enable the ripple-carry output (RCO) to produce a low-level pulse while the count is zero (all Q outputs low) when counting down or maximum (9 or 15) when counting up. The clocked carry output (\overline{CCO}) produces a low-level pulse for a duration equal to that of the low level of the clock when RCO is low and the counter is enabled (both ENP and ENT are low); otherwise, CCO is high. CCO does not have the glitches commonly associated with a ripple-carry output. Cascading is normally accomplished by connecting RCO or CCO of the first counter to ENT of the next counter. However, for very high-speed counting, RCO should be used for cascading since CCO does not become active until the clock returns to the low level.

The SN54ALS569A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS568A and SN74ALS569A are characterized for operation from 0°C to 70°C .

SN54ALS569A . . . J PACKAGE
SN74ALS568A, SN74ALS569A . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS569A . . . FK PACKAGE
(TOP VIEW)



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FUNCTION TABLE

INPUTS								OPERATION
\overline{OE}	\overline{ACLR}	\overline{SCLR}	LOAD	ENT	\overline{ENP}	U/D	CLK	
H	X	X	X	X	X	X	X	Q outputs disabled
L	L	X	X	X	X	X	X	Asynchronous clear
L	H	L	X	X	X	X	\uparrow	Synchronous clear
L	H	H	L	X	X	X	\uparrow	Load
L	H	H	H	L	L	H	\uparrow	Count up
L	H	H	H	L	L	L	\uparrow	Count down
L	H	H	H	H	X	X	X	Inhibit count
L	H	H	H	X	H	X	X	Inhibit count

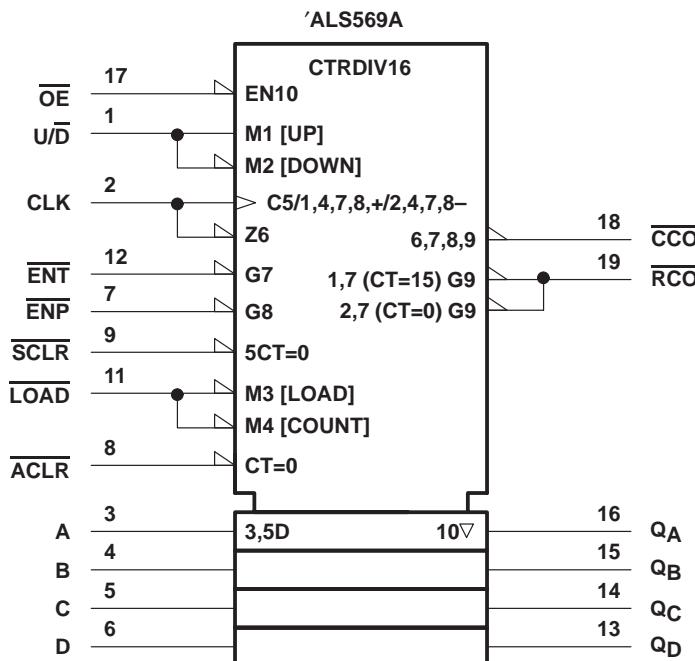
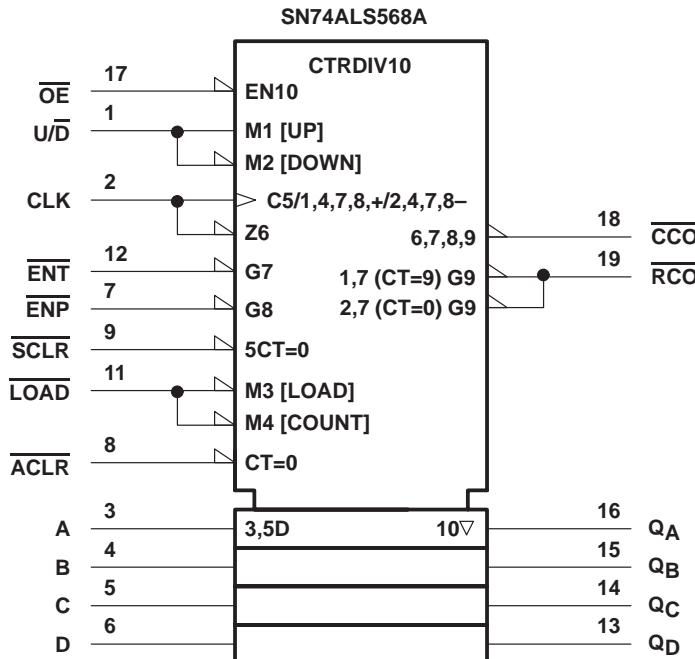


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logic symbols[†]

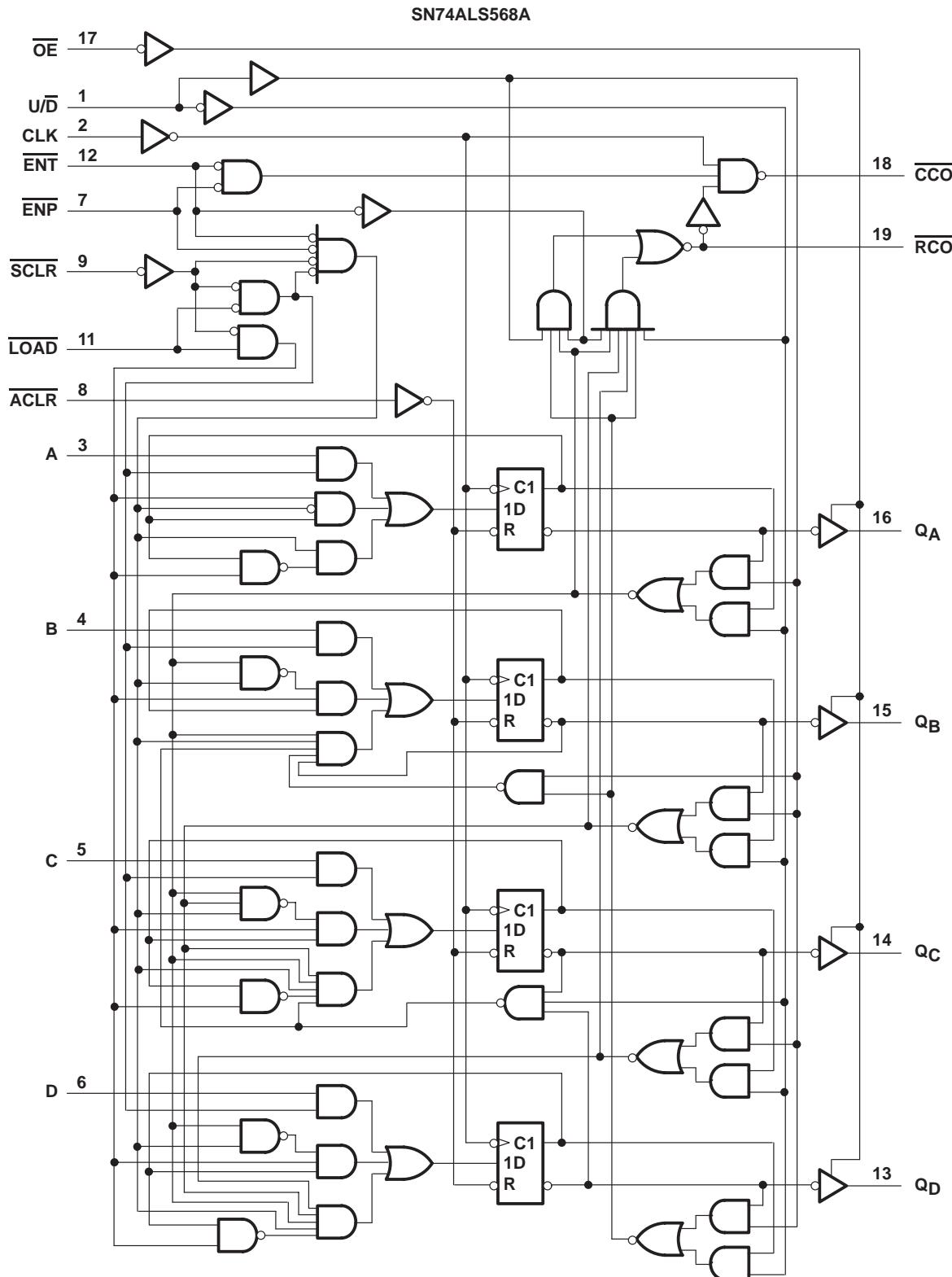


[†] These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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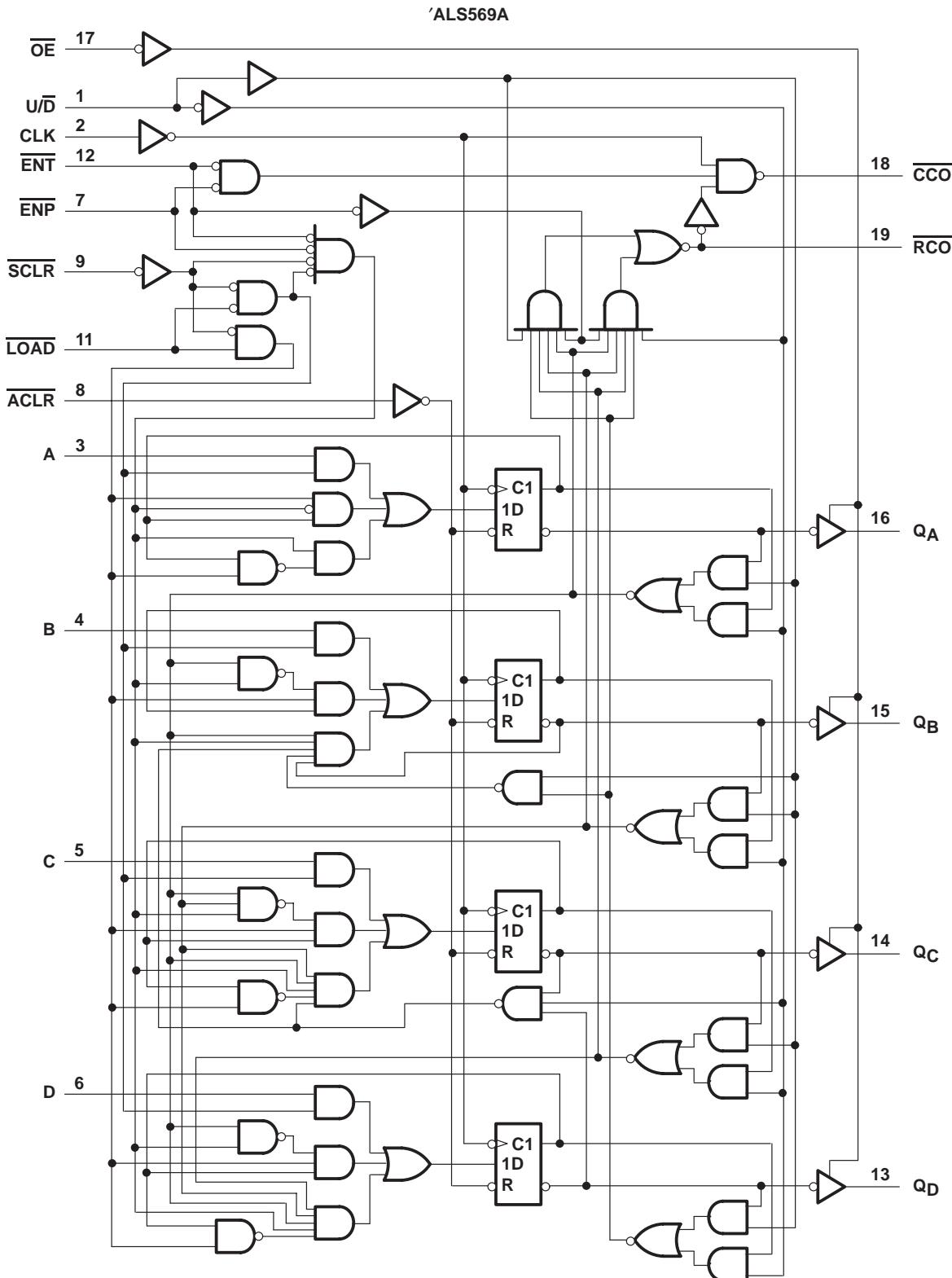
logic diagrams (positive logic)



SN54ALS569A, SN74ALS568A, SN74ALS569A SYNCHRONOUS 4-BIT UP/DOWN DECADE AND BINARY COUNTERS WITH 3-STATE OUTPUTS

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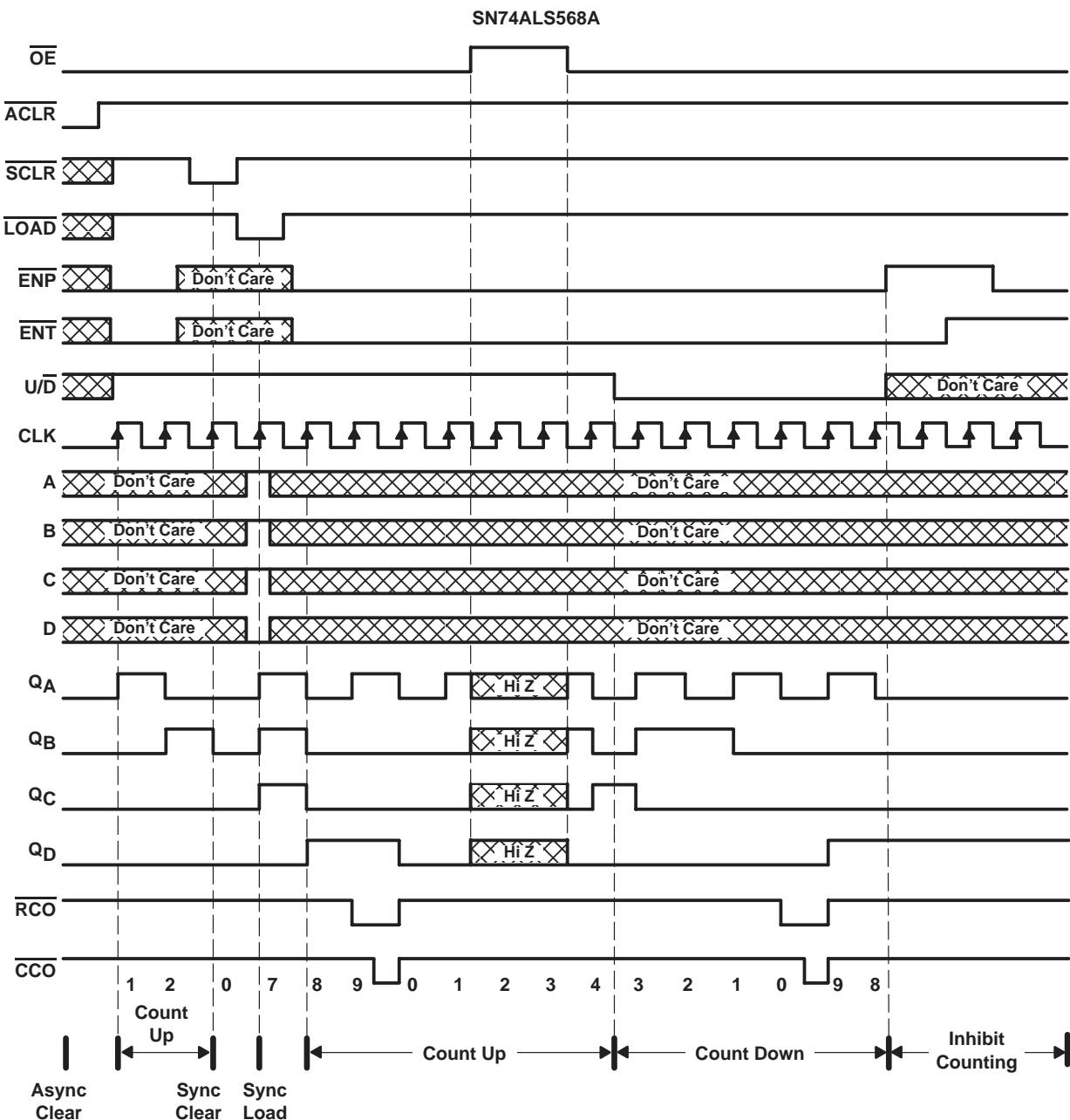
logic diagrams (positive logic) (continued)



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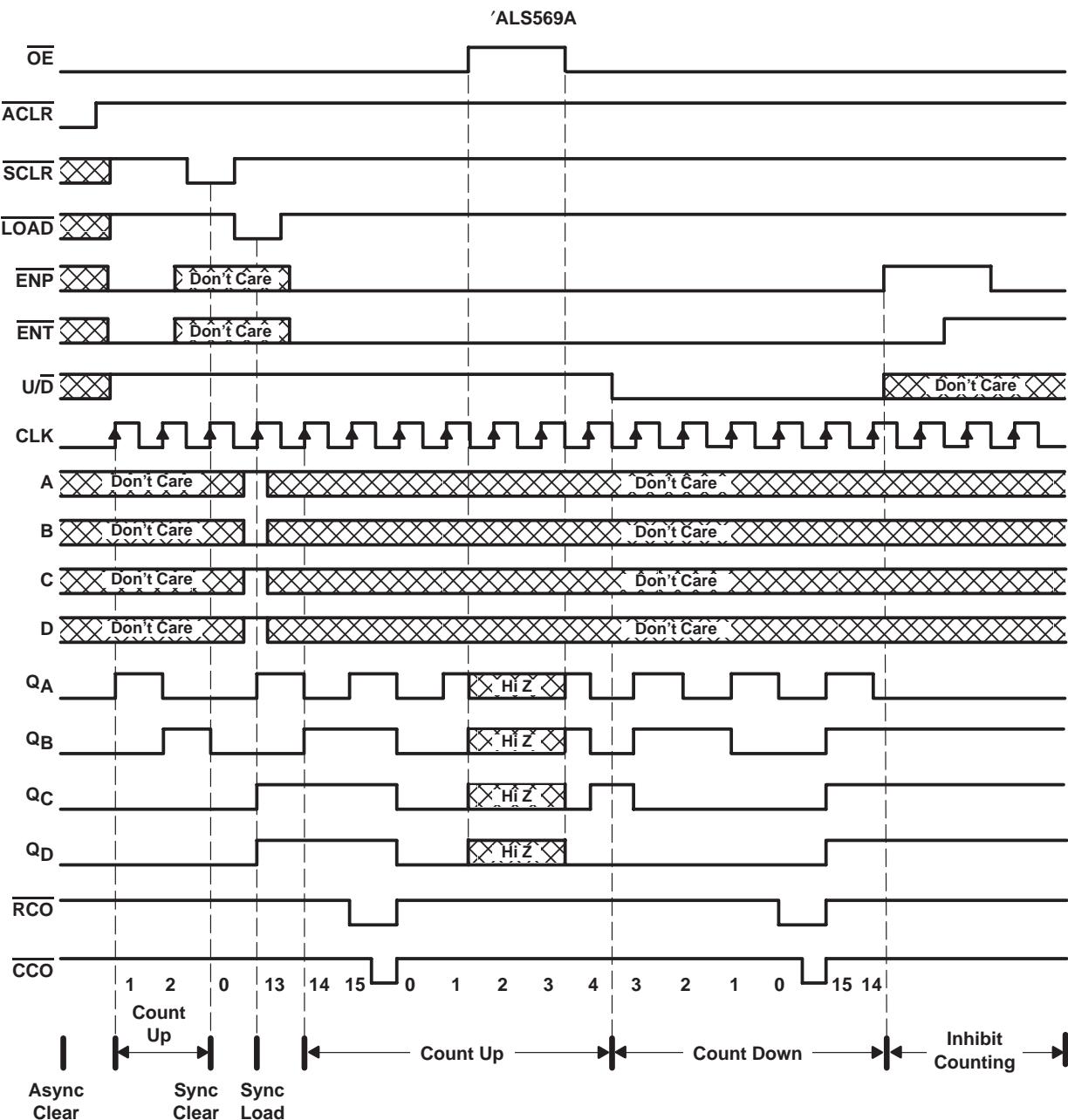
typical load, count, and inhibit sequences



SN54ALS569A, SN74ALS568A, SN74ALS569A
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typical load, count, and inhibit sequences (continued)



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

Supply voltage, V_{CC}	7 V
Input voltage, V_I	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, T_A : SN54ALS569A	–55°C to 125°C
SN74ALS568A, SN74ALS569A	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

		SN54ALS569A			SN74ALS568A SN74ALS569A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.7			0.8	V
I_{OH}	High-level output current	Q outputs			–1		–2.6	mA
		CCO and RCO			–0.4		–0.4	
I_{OL}	Low-level output current	Q outputs			12		24	mA
		CCO and RCO			4		8	
f_{clock}	Clock frequency	SN74ALS568A					0	MHz
		'ALS569A			0	22	0	
t_w	Pulse duration	ACLR or LOAD low			20		15	ns
		SN74ALS568A	CLK high				25	
			CLK low				25	
		'ALS569A	CLK high	20			16.5	
			CLK low	23			16.5	
		Data at A, B, C, D			25		20	
t_{su}	Setup time before CLK^\uparrow	\overline{ENP} , \overline{ENT}	High	35			30	ns
			Low	25			20	
		\overline{SCLR}	Low	20			15	
			High (inactive)	35			30	
		\overline{LOAD}	Low	20			15	
			High (inactive)	35			30	
		U/\overline{D}			35		30	
		ACLR inactive			10		10	
		t_h Hold time after CLK^\uparrow for any input			0		0	
		T_A Operating free-air temperature			–55	125	0	70 °C



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

PARAMETER	TEST CONDITIONS	SN54ALS569A			SN74ALS568A SN74ALS569A			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}	$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$			-1.5			-1.5	V
V_{OH}	All outputs	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $I_{OH} = -0.4 \text{ mA}$	$V_{CC} - 2$		$V_{CC} - 2$			V
	Q outputs	$V_{CC} = 4.5 \text{ V}$	$I_{OH} = -1 \text{ mA}$	2.4	3.3			
			$I_{OH} = -2.6 \text{ mA}$			2.4	3.2	
V_{OL}	Q outputs	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 12 \text{ mA}$	0.25	0.4	0.25	0.4	V
			$I_{OL} = 24 \text{ mA}$			0.35	0.5	
	\overline{CCO} and \overline{RCO}	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4	
			$I_{OL} = 8 \text{ mA}$			0.35	0.5	
I_{OZH}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.7 \text{ V}$			20		20		μA
I_{OZL}	$V_{CC} = 5.5 \text{ V}$, $V_O = 0.4 \text{ V}$			-20		-20		μA
I_I	$V_{CC} = 5.5 \text{ V}$, $V_I = 7 \text{ V}$			0.1		0.1		mA
I_{IH}	$V_{CC} = 5.5 \text{ V}$, $V_I = 2.7 \text{ V}$			20		20		μA
I_{IL}	$V_{CC} = 5.5 \text{ V}$, $V_I = 0.4 \text{ V}$			-0.2		-0.2		mA
I_O^{\ddagger}	\overline{CCO} and \overline{RCO} Q outputs	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$		-15	-70	-15	-70	mA
				-20	-112	-30	-112	
I_{CC}		$V_{CC} = 5.5 \text{ V}$	Outputs high	16	26	16	26	mA
			Outputs low	20	32	20	32	
			Outputs disabled	20	32	20	32	

† All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

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switching characteristics (see Figure 1)

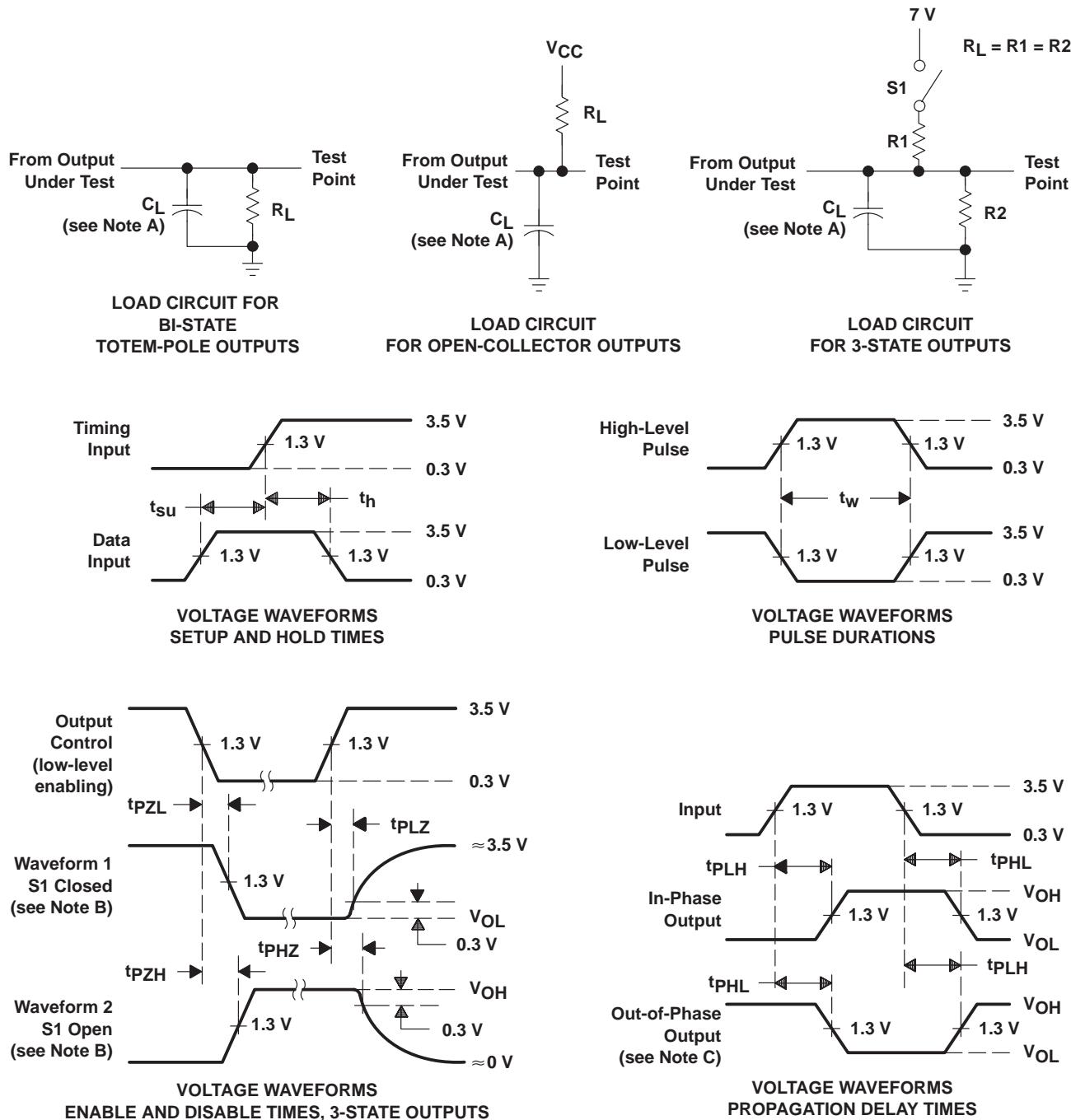
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R1 = 500\text{ }\Omega,$ $R2 = 500\text{ }\Omega,$ $T_A = \text{MIN to MAX}^{\dagger}$				UNIT	
			SN54ALS569A		SN74ALS568A SN74ALS569A			
			MIN	MAX	MIN	MAX		
f_{max}	SN74ALS568A				20		MHz	
	'ALS569A			22		30		
t_{PLH}	CLK	Any Q	4	21	4	13	ns	
t_{PHL}			7	19	7	16		
t_{PLH}	CLK	$\overline{\text{RCO}}$	12	37	12	28	ns	
t_{PHL}			10	28	10	19		
t_{PLH}	CLK	$\overline{\text{CCO}}$	5	17	5	13	ns	
t_{PHL}			6	30	6	25		
t_{PLH}	U/ \overline{D}	$\overline{\text{RCO}}$	9	31	9	23	ns	
t_{PHL}			9	33	9	19		
t_{PLH}	$\overline{\text{ENT}}$	$\overline{\text{RCO}}$	6	21	6	15	ns	
t_{PHL}			4	20	4	13		
t_{PLH}	$\overline{\text{ENT}}$	$\overline{\text{CCO}}$	5	18	5	13	ns	
t_{PHL}			9	32	9	23		
t_{PLH}	$\overline{\text{ENP}}$	$\overline{\text{CCO}}$	4	18	4	12	ns	
t_{PHL}			5	18	5	14		
t_{PHL}	$\overline{\text{ACLR}}$	Any Q	9	25	9	20	ns	
t_{PZH}	$\overline{\text{OE}}$	Any Q	6	23	6	18	ns	
t_{PZL}			6	29	6	24		
t_{PHZ}	$\overline{\text{OE}}$	Any Q	1	12	1	10	ns	
t_{PLZ}			3	29	3	13		

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

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



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: $PRR \leq 1 \text{ MHz}$, $t_r = t_f = 2 \text{ ns}$, 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 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
83025022A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	83025022A SNJ54ALS 569AFK	Samples
8302502RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302502RA SNJ54ALS569AJ	Samples
SN54ALS569AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54ALS569AJ	Samples
SN74ALS569ADWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS569A	Samples
SN74ALS569AN	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS569AN	Samples
SN74ALS569ANE4	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS569AN	Samples
SNJ54ALS569AFK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	83025022A SNJ54ALS 569AFK	Samples
SNJ54ALS569AJ	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302502RA SNJ54ALS569AJ	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) **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.

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.

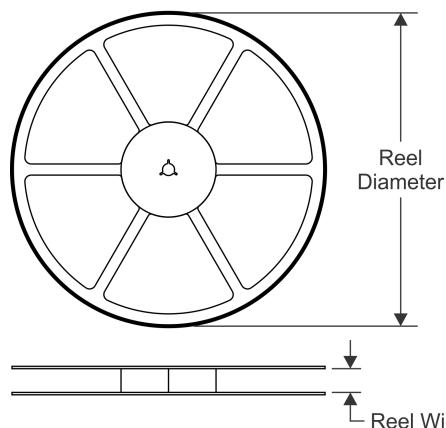
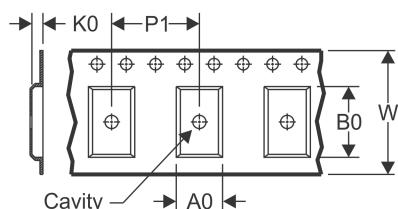
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54ALS569A, SN74ALS569A :

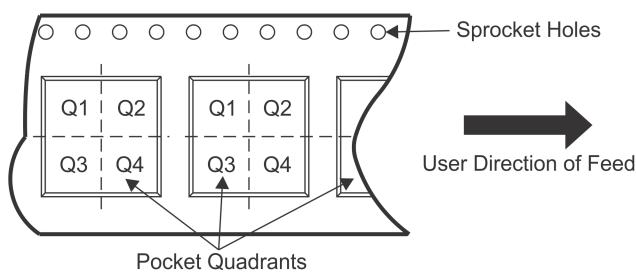
- Catalog : [SN74ALS569A](#)
- Military : [SN54ALS569A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

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


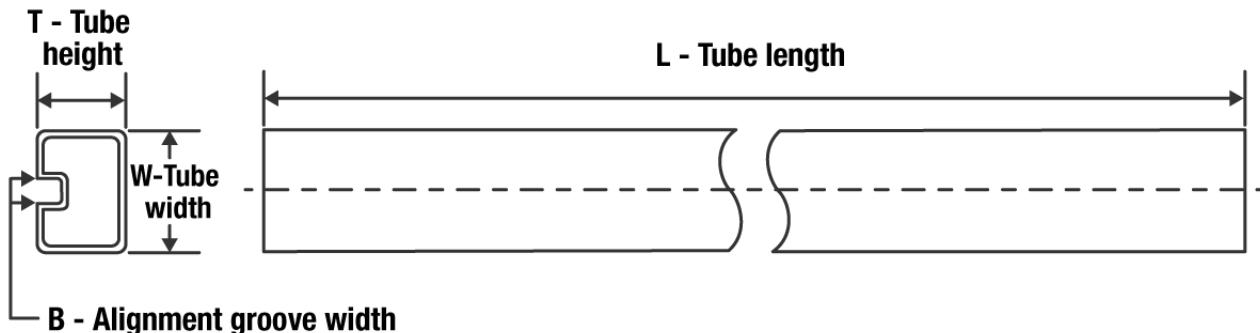
*All dimensions are nominal

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
SN74ALS569ADWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	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)
SN74ALS569ADWR	SOIC	DW	20	2000	367.0	367.0	45.0

TUBE


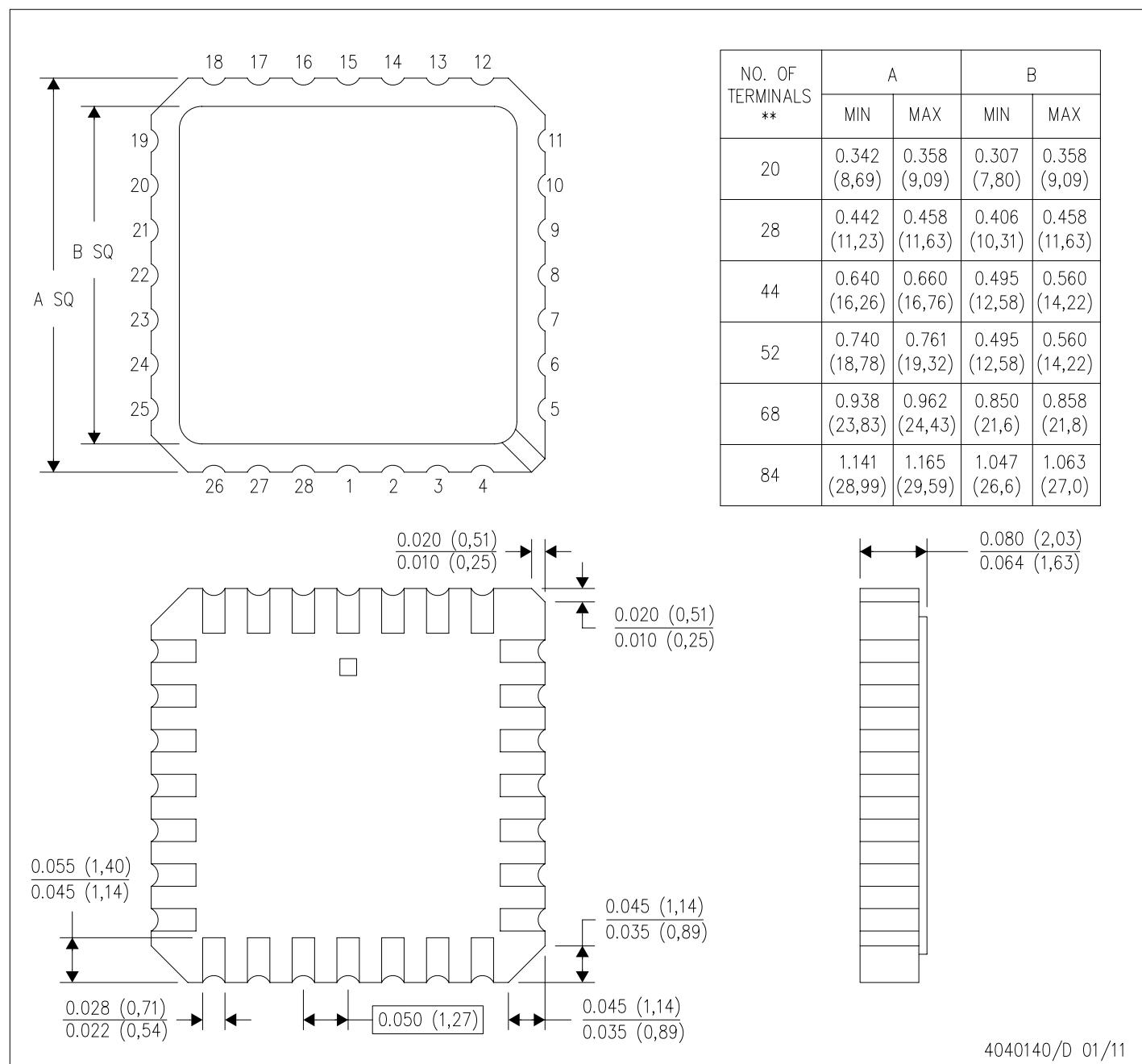
*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μ m)	B (mm)
83025022A	FK	LCCC	20	1	506.98	12.06	2030	NA
SN74ALS569AN	N	PDIP	20	20	506	13.97	11230	4.32
SN74ALS569ANE4	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54ALS569AFK	FK	LCCC	20	1	506.98	12.06	2030	NA

FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



NOTES:

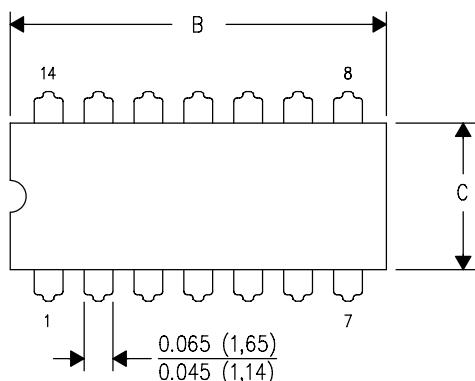
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004

4040140/D 01/11

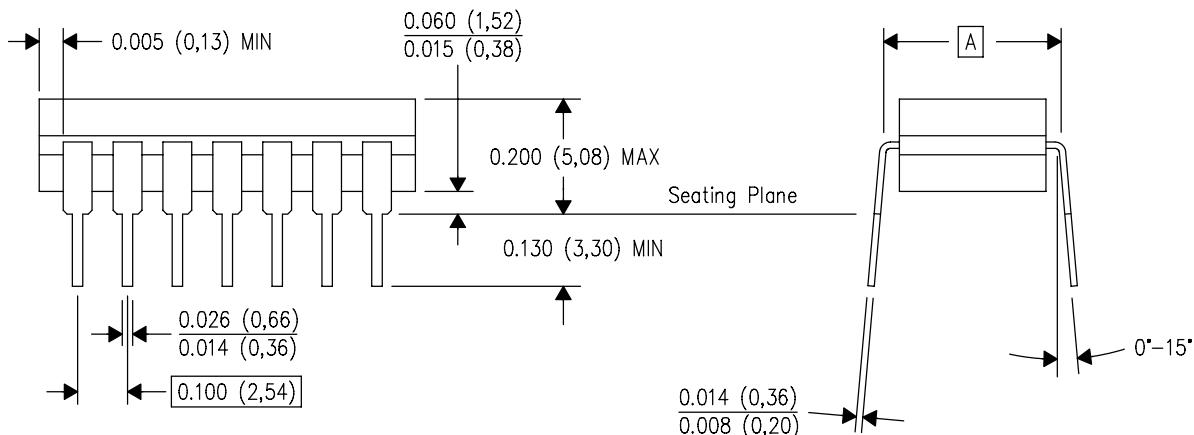
J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



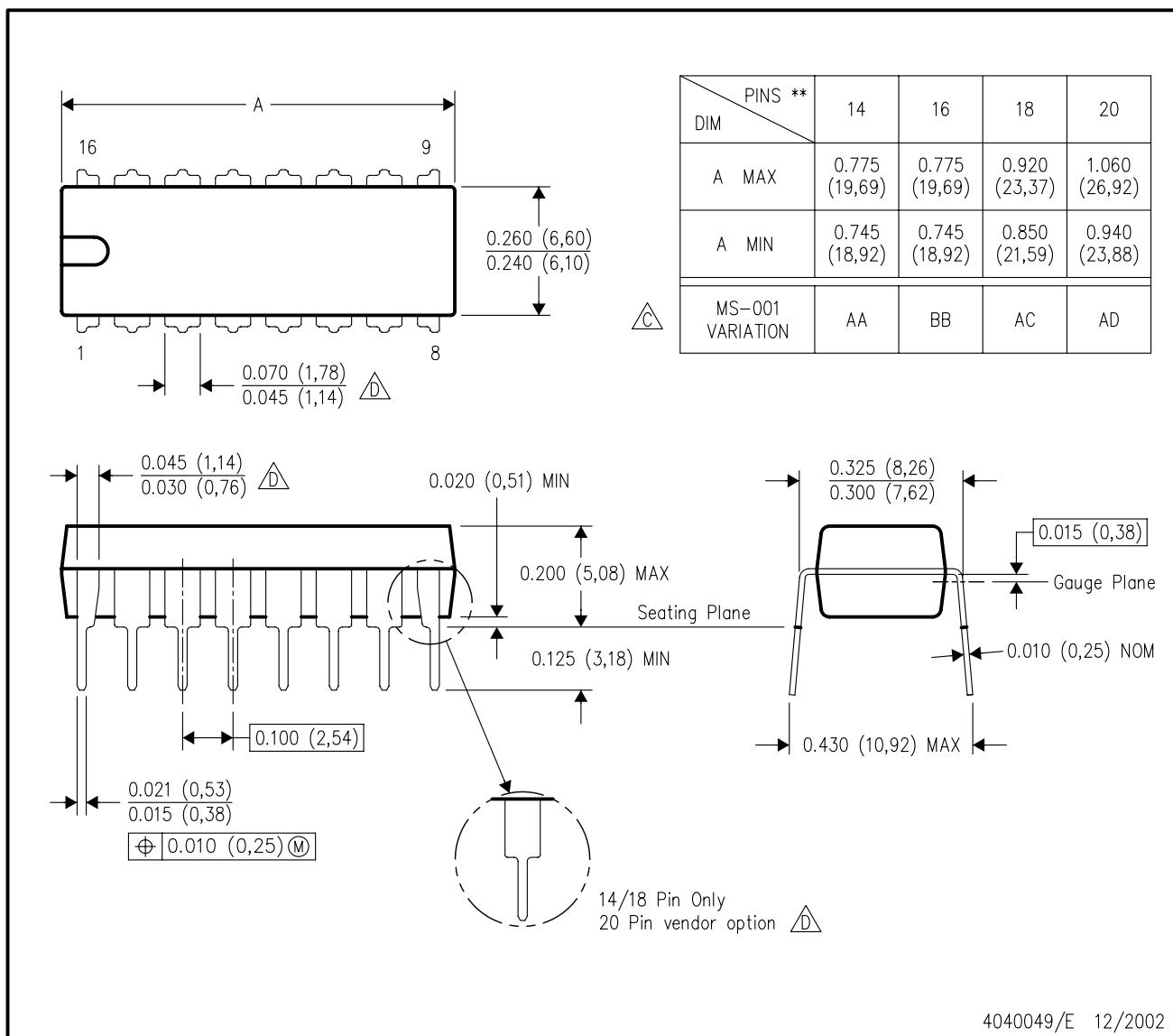
4040083/F 03/03

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.

△ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).

△ The 20 pin end lead shoulder width is a vendor option, either half or full width.

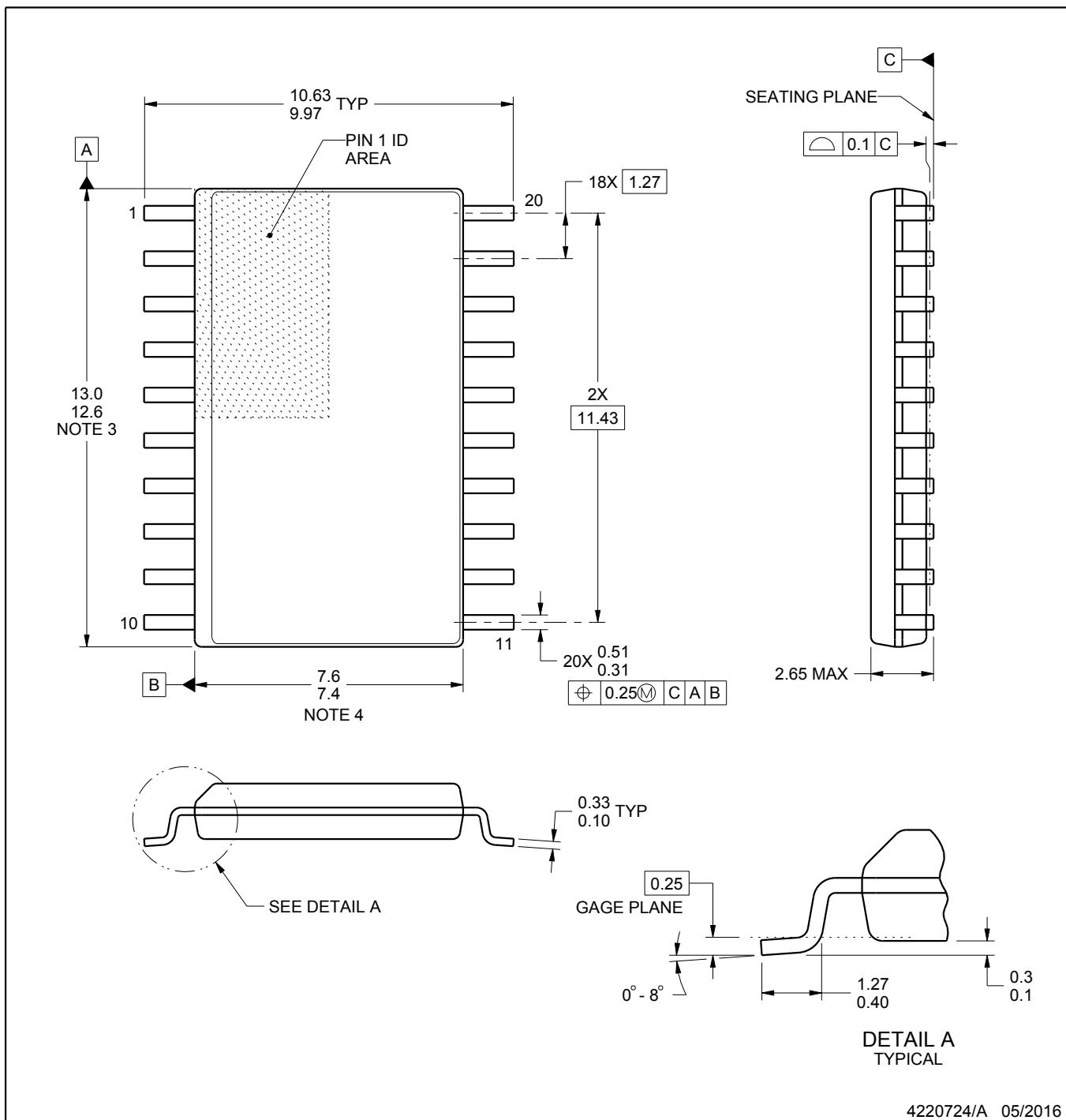
PACKAGE OUTLINE

DW0020A



SOIC - 2.65 mm max height

SOIC



NOTES:

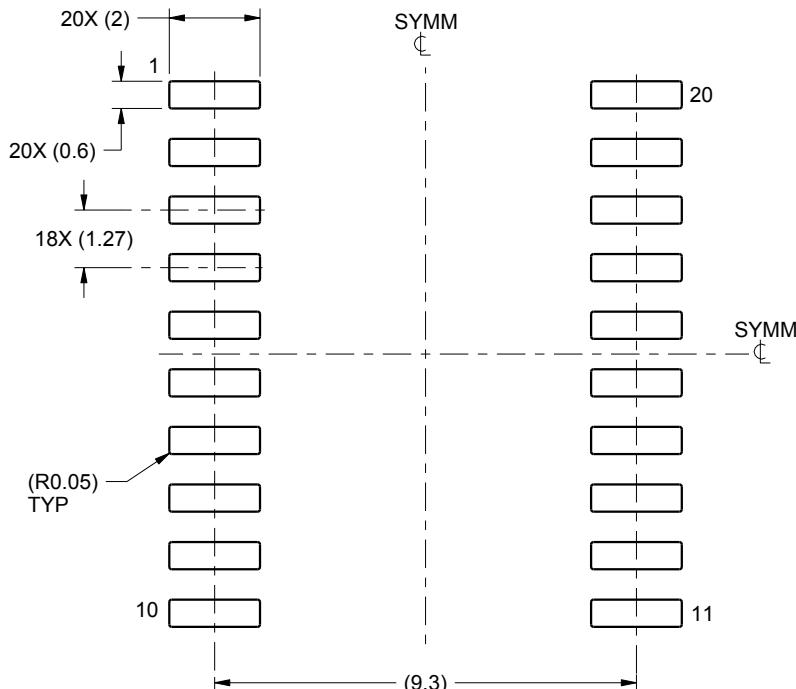
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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.

EXAMPLE BOARD LAYOUT

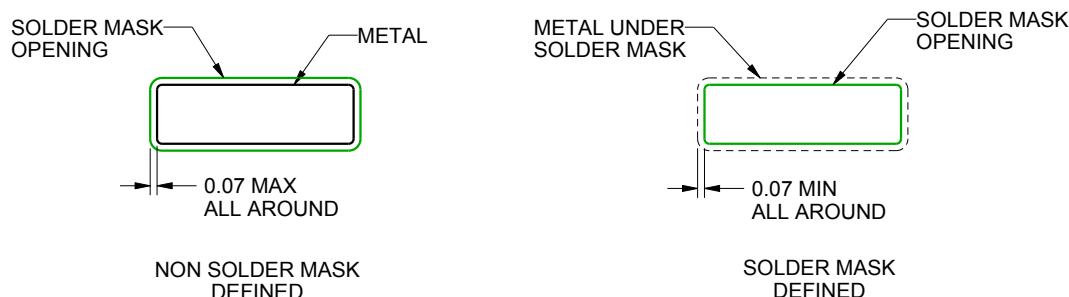
DW0020A

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.

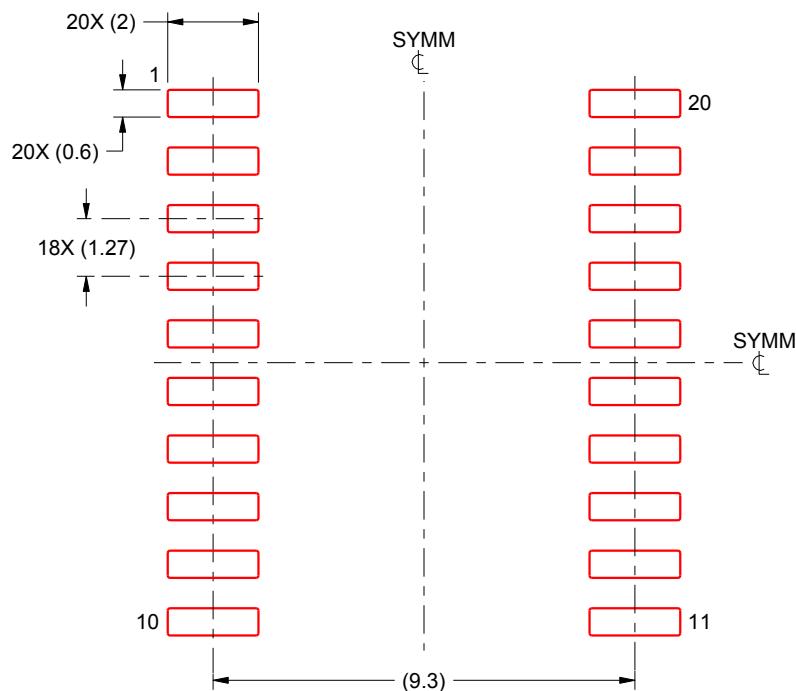
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



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

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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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