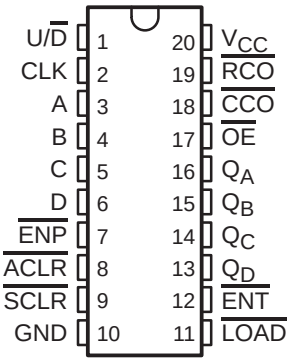
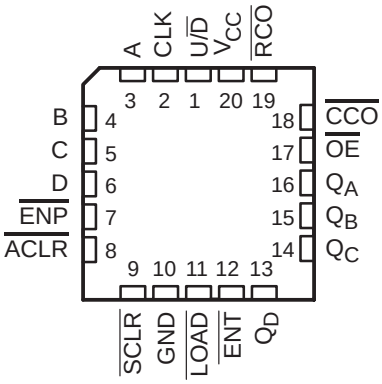
- **3-State Q Outputs Drive Bus Lines Directly**
- **Counter Operation Independent of 3-State Output**
- **Fully Synchronous Clear, Count, and Load**
- **Asynchronous Clear Is Also Provided**
- **Fully Cascadable**
- **Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers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

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



SN54ALS569A . . . FK PACKAGE
(TOP VIEW)



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 ($\overline{\text{ACLR}}$) or synchronous clear ($\overline{\text{SCLR}}$). 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 ($\overline{\text{LOAD}}$) low during a positive-going clock transition. The counting function is enabled only when enable P ($\overline{\text{ENP}}$) and enable T ($\overline{\text{ENT}}$) are low and $\overline{\text{ACLR}}$, $\overline{\text{SCLR}}$, and $\overline{\text{LOAD}}$ are high. The up/down (U/$\overline{\text{D}}$) input controls the direction of the count. These counters count up when U/$\overline{\text{D}}$ is high and count down when U/$\overline{\text{D}}$ is low.

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

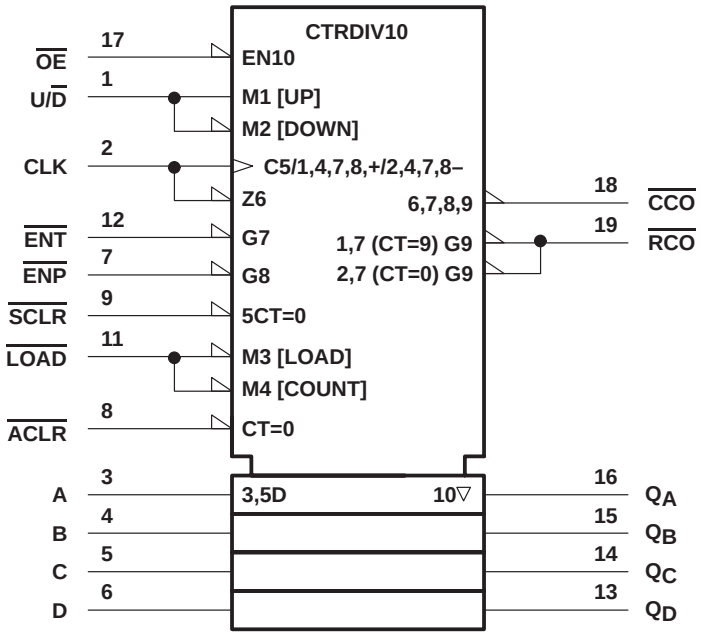
The SN54ALS569A is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74ALS568A and SN74ALS569A are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

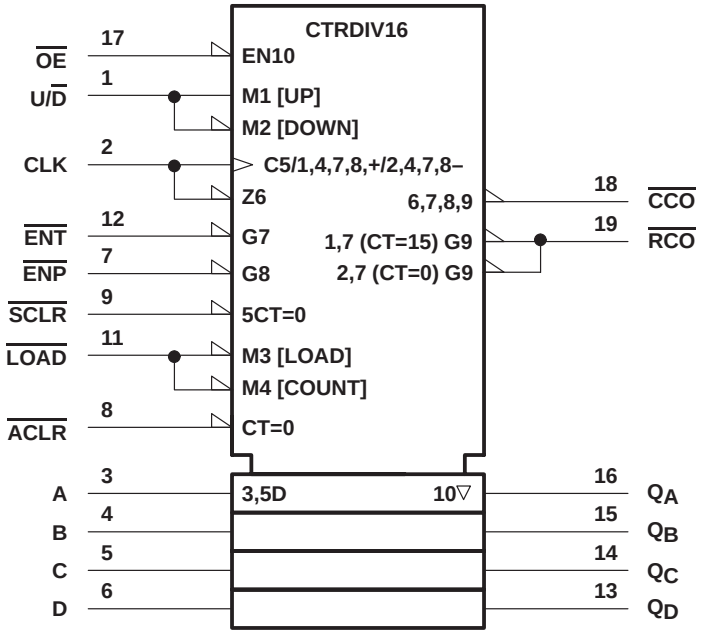
INPUTS								OPERATION
$\overline{OE}$	$\overline{ACLR}$	$\overline{SCLR}$	$\overline{LOAD}$	$\overline{ENT}$	$\overline{ENP}$	U/$\overline{D}$	CLK	
H	X	X	X	X	X	X	X	Q outputs disabled
L	L	X	X	X	X	X	X	Asynchronous clear
L	H	L	X	X	X	X	↑	Synchronous clear
L	H	H	L	X	X	X	↑	Load
L	H	H	H	L	L	H	↑	Count up
L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

logic symbols†

SN74ALS568A



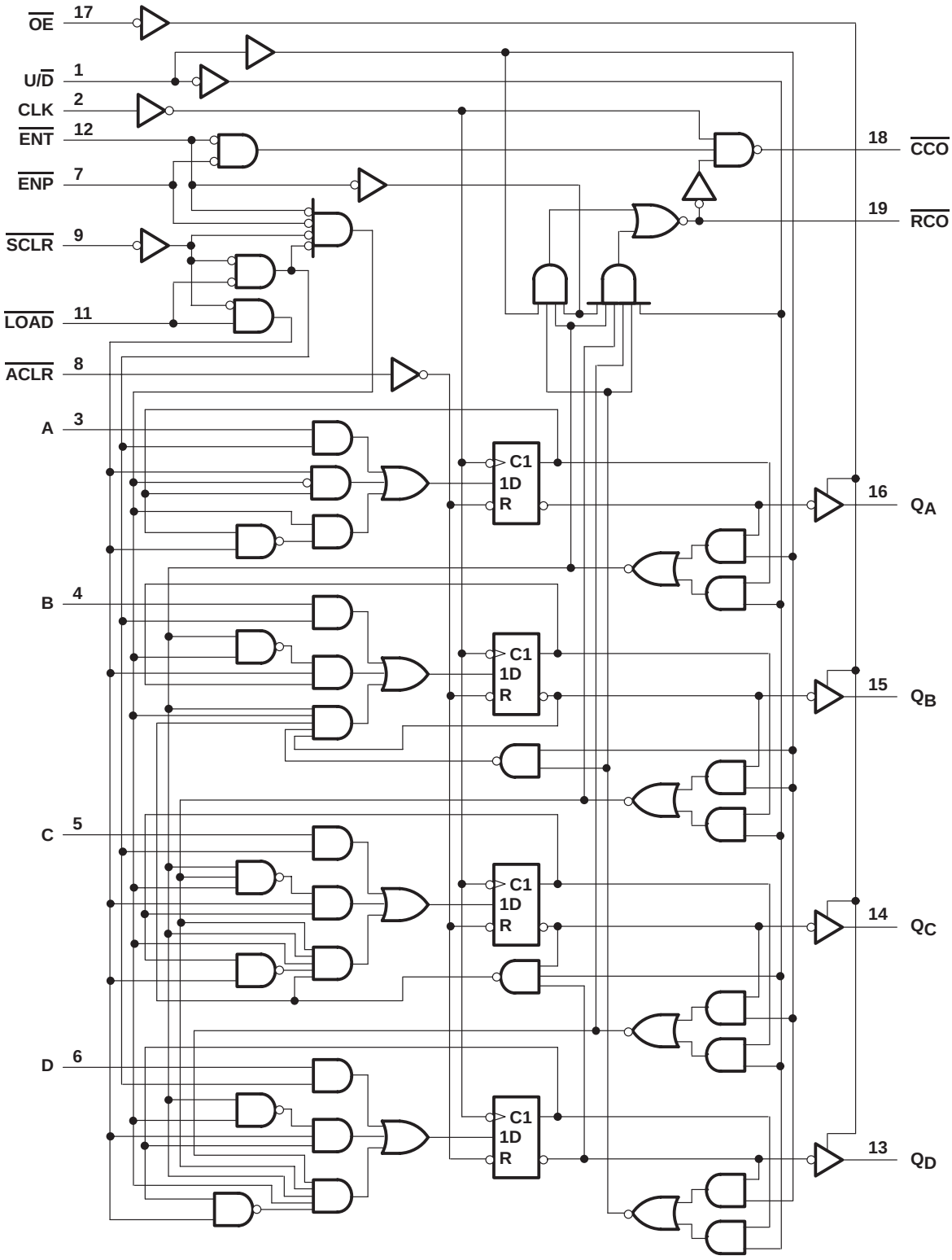
′ALS569A



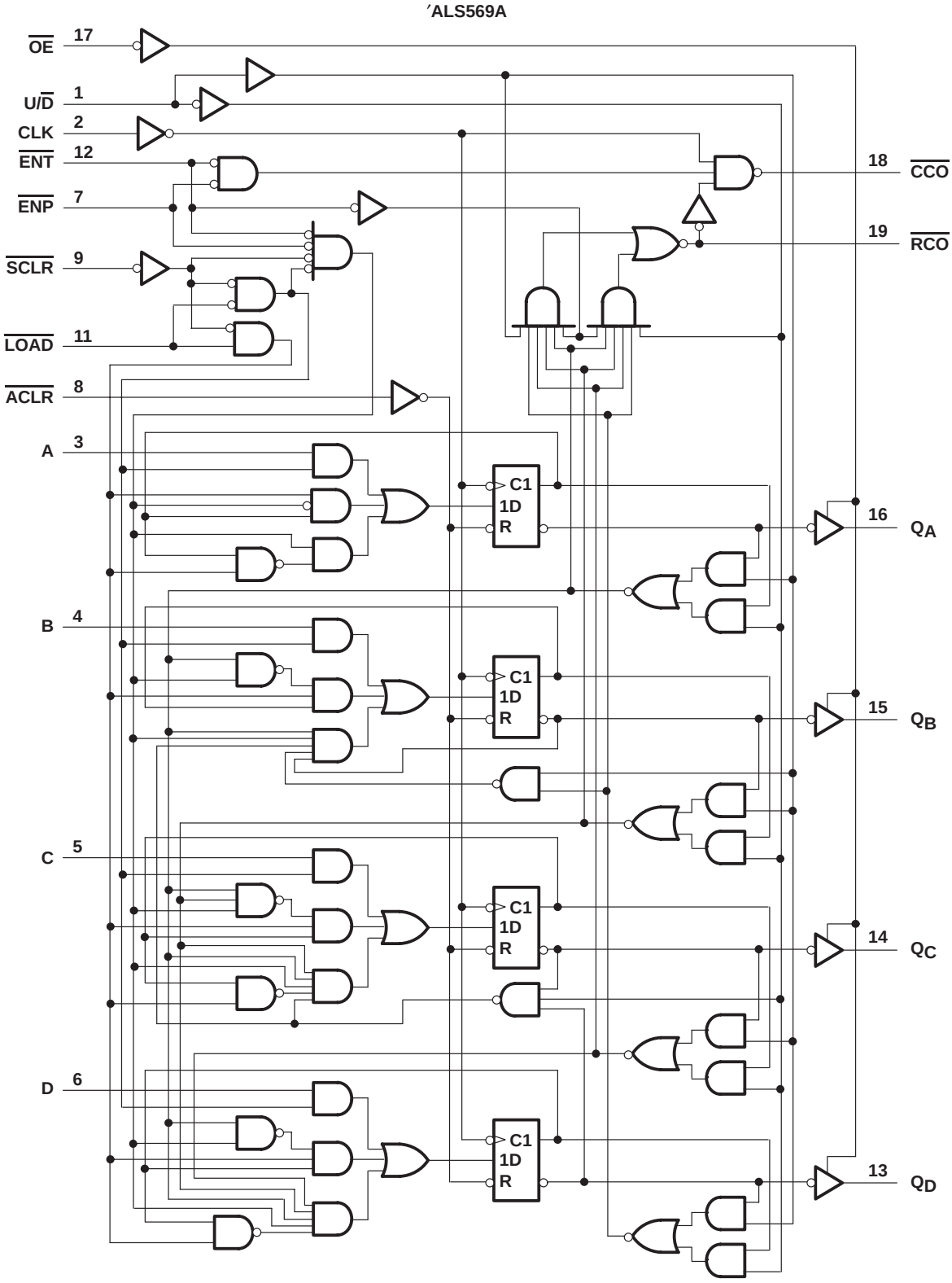
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)

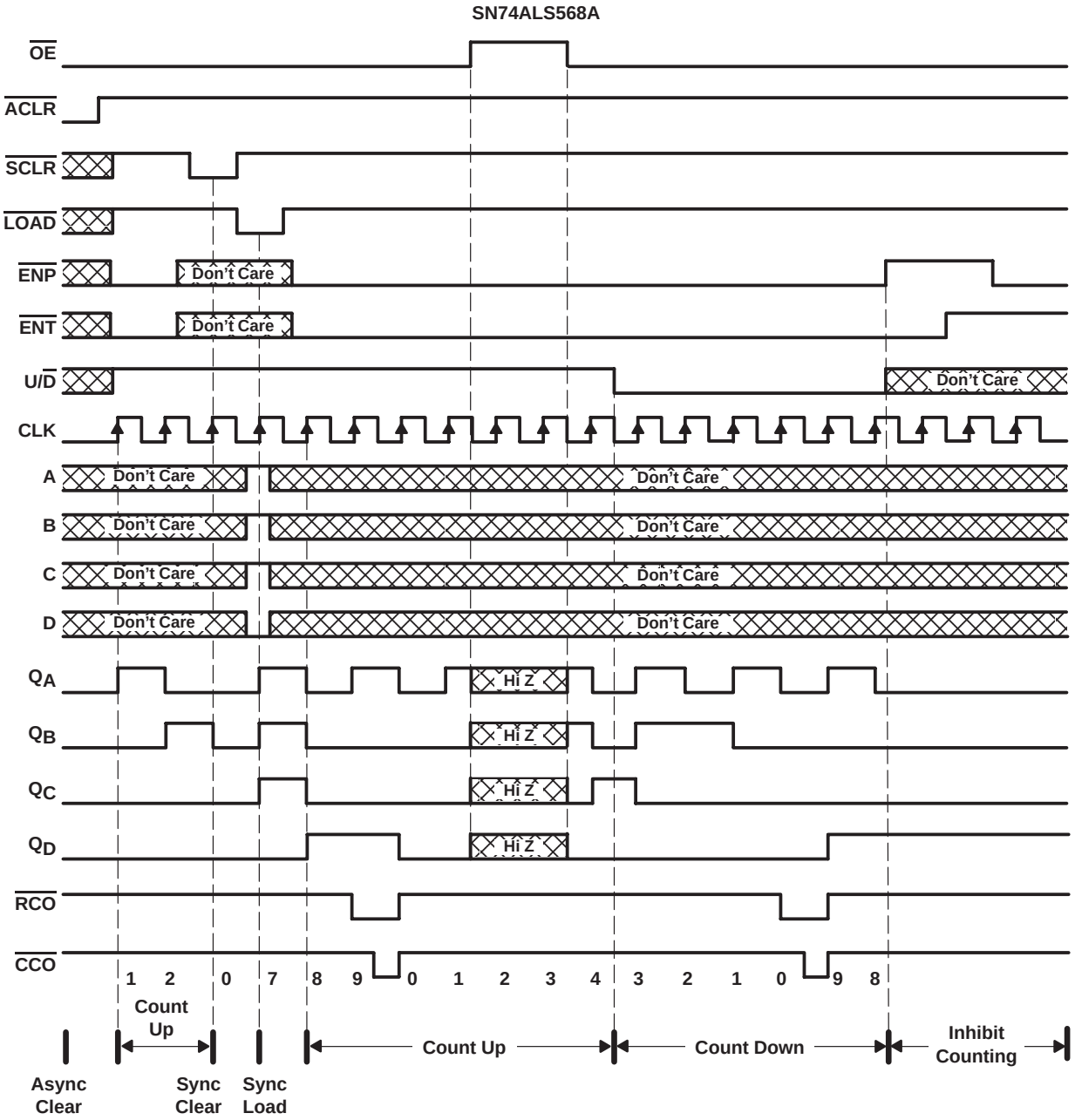
SN74ALS568A



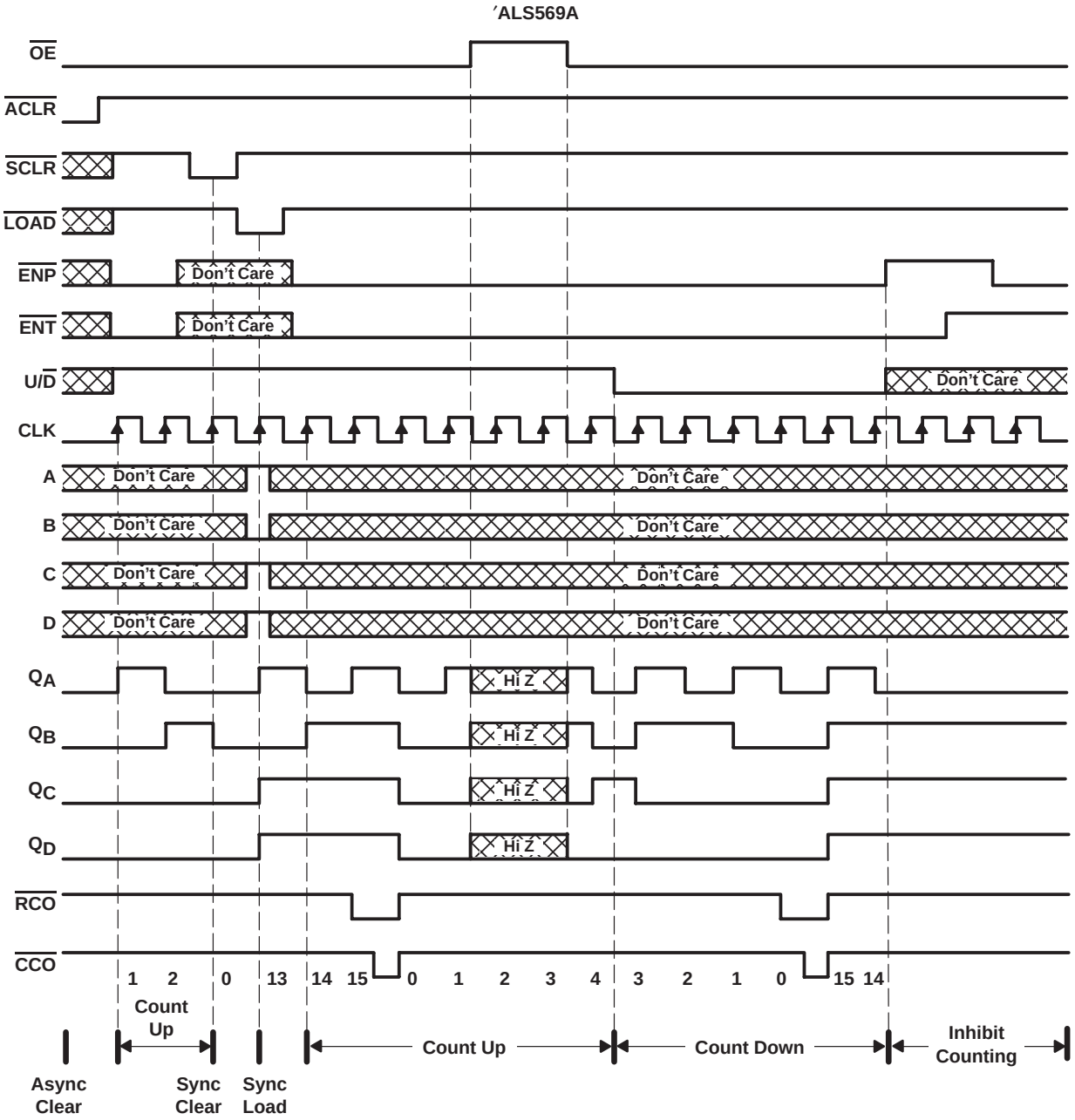
logic diagrams (positive logic) (continued)



typical load, count, and inhibit sequences



typical load, count, and inhibit sequences (continued)



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
		$\overline{CCO}$ and $\overline{RCO}$				–0.4			–0.4	
I_{OL}	Low-level output current	Q outputs				12			24	mA
		$\overline{CCO}$ and $\overline{RCO}$				4			8	
f_{clock}	Clock frequency	SN74ALS568A					0		20	MHz
		′ALS569A		0		22	0		30	
t_w	Pulse duration	$\overline{ACLR}$ or $\overline{LOAD}$ low		20			15			ns
		SN74ALS568A	CLK high				25			
			CLK low				25			
		′ALS569A	CLK high	20			16.5			
			CLK low	23			16.5			
t_{su}	Setup time before CLK↑	Data at A, B, C, D		25			20			ns
		$\overline{ENP}$, $\overline{ENT}$	High	35			30			
			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			
		$\overline{ACLR}$ inactive		10			10			
t_h	Hold time after CLK↑ for any input			0			0			ns
T_A	Operating free-air temperature			–55		125	0		70	°C

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 V,	I_I = –18 mA			–1.5			–1.5	V
V_{OH}	All outputs	V_{CC} = 4.5 V to 5.5 V,	I_{OH} = –0.4 mA	V_{CC} –2			V_{CC} –2			V
	Q outputs	V_{CC} = 4.5 V	I_{OH} = –1 mA	2.4	3.3					
			I_{OH} = –2.6 mA				2.4	3.2		
V_{OL}	Q outputs	V_{CC} = 4.5 V	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
	$\overline{CCO}$ and $\overline{RCO}$	V_{CC} = 4.5 V	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	
			I_{OL} = 8 mA					0.35	0.5	
I_{OZH}		V_{CC} = 5.5 V,	V_O = 2.7 V			20			20	µA
I_{OZL}		V_{CC} = 5.5 V,	V_O = 0.4 V			–20			–20	µA
I_I		V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
I_{IH}		V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	µA
I_{IL}		V_{CC} = 5.5 V,	V_I = 0.4 V			–0.2			–0.2	mA
I_O‡	$\overline{CCO}$ and $\overline{RCO}$	V_{CC} = 5.5 V,	V_O = 2.25 V	–15		–70	–15		–70	mA
	Q outputs			–20		–112	–30		–112	
I_{CC}		V_{CC} = 5.5 V	Outputs high		16	26		16	26	mA
			Outputs low		20	32		20	32	
			Outputs disabled		20	32		20	32	

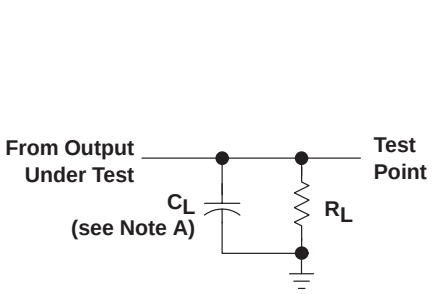
† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

switching characteristics (see Figure 1)

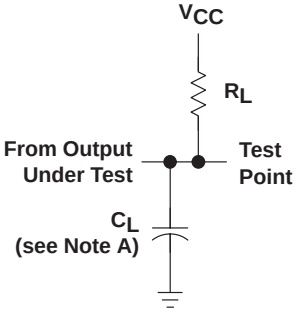
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			SN54ALS569A		SN74ALS568A SN74ALS569A		
			MIN	MAX	MIN	MAX	
f_{max}	SN74ALS568A				20		MHz
	′ALS569A		22		30		
t_{PLH}	CLK	Any Q	4	21	4	13	ns
t_{PHL}			7	19	7	16	
t_{PLH}	CLK	$\overline{RCO}$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

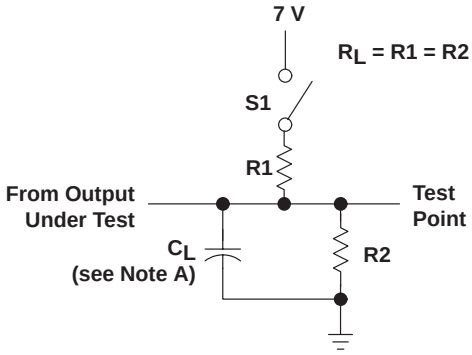
PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



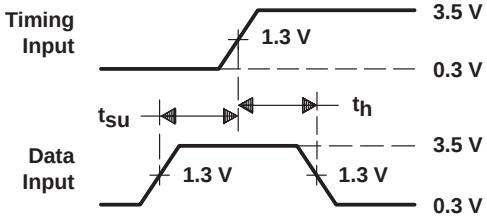
LOAD CIRCUIT FOR
BI-STATE
TOTEM-POLE OUTPUTS



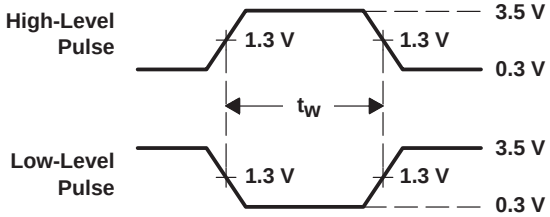
LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS



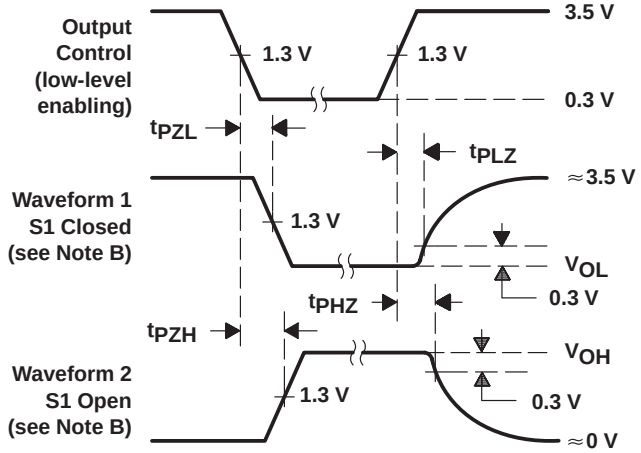
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



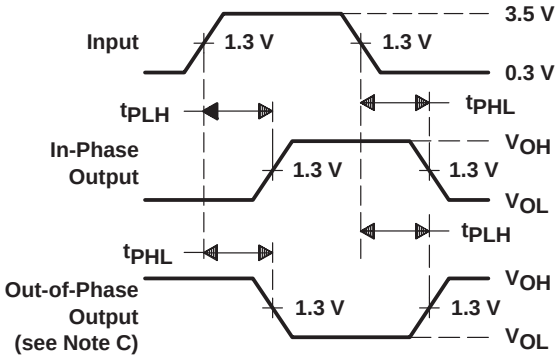
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



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 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
83025022A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	83025022A SNJ54ALS 569AFK	Samples
8302502RA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8302502RA SNJ54ALS569AJ	Samples
8302502SA	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8302502SA SNJ54ALS569AW	Samples
SN54ALS569AJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54ALS569AJ	Samples
SN74ALS568AN	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI	0 to 70		
SN74ALS569ADWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS569A	Samples
SN74ALS569AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS569AN	Samples
SN74ALS569ANE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS569AN	Samples
SNJ54ALS569AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	83025022A SNJ54ALS 569AFK	Samples
SNJ54ALS569AJ	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8302502RA SNJ54ALS569AJ	Samples
SNJ54ALS569AW	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8302502SA SNJ54ALS569AW	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) 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.

(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/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.

OTHER QUALIFIED VERSIONS OF SN54ALS569A, SN74ALS569A :

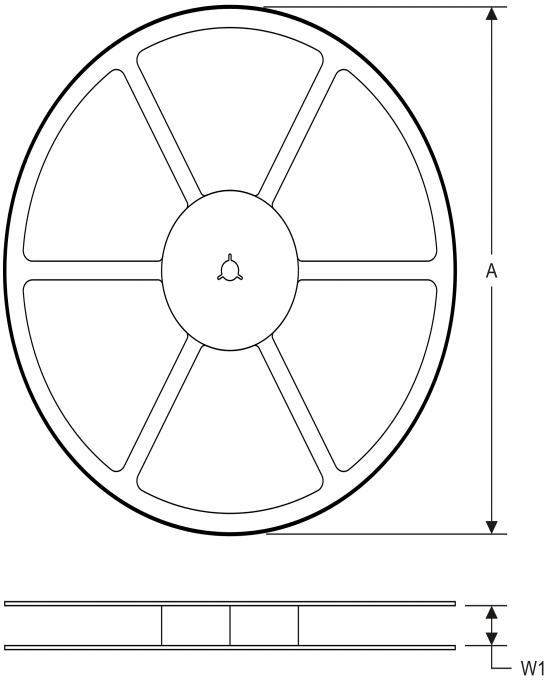
- Catalog: SN74ALS569A
- Military: SN54ALS569A

NOTE: Qualified Version Definitions:

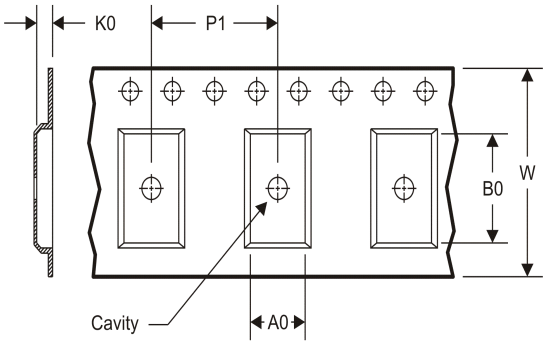
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



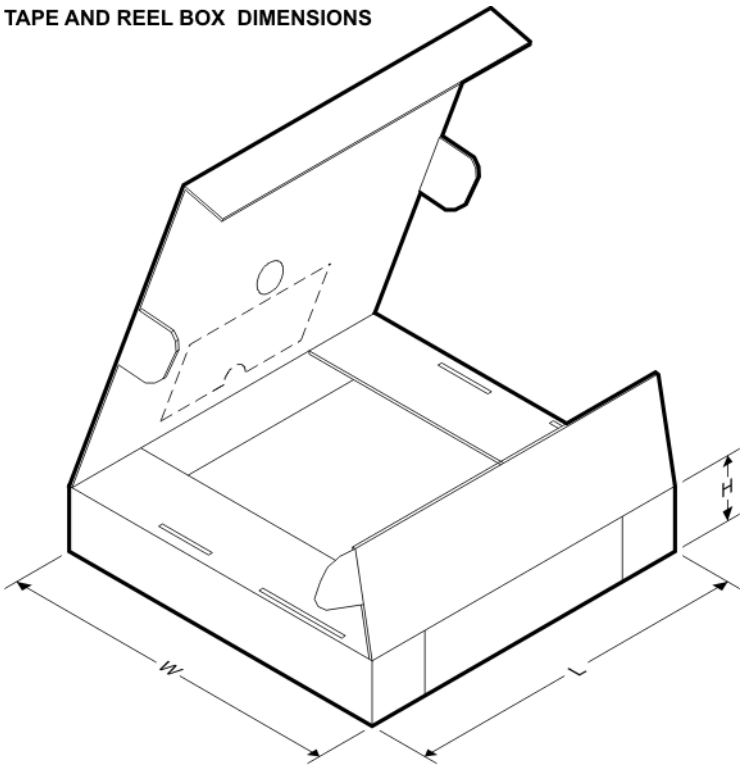
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*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	13.0	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



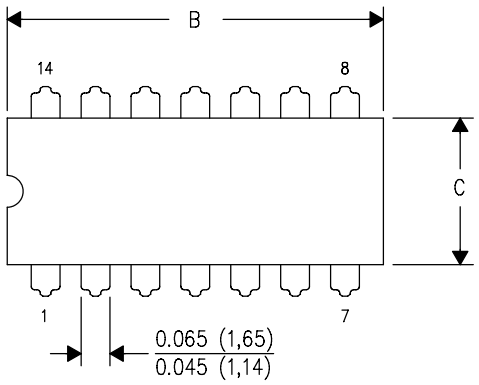
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALS569ADWR	SOIC	DW	20	2000	367.0	367.0	45.0

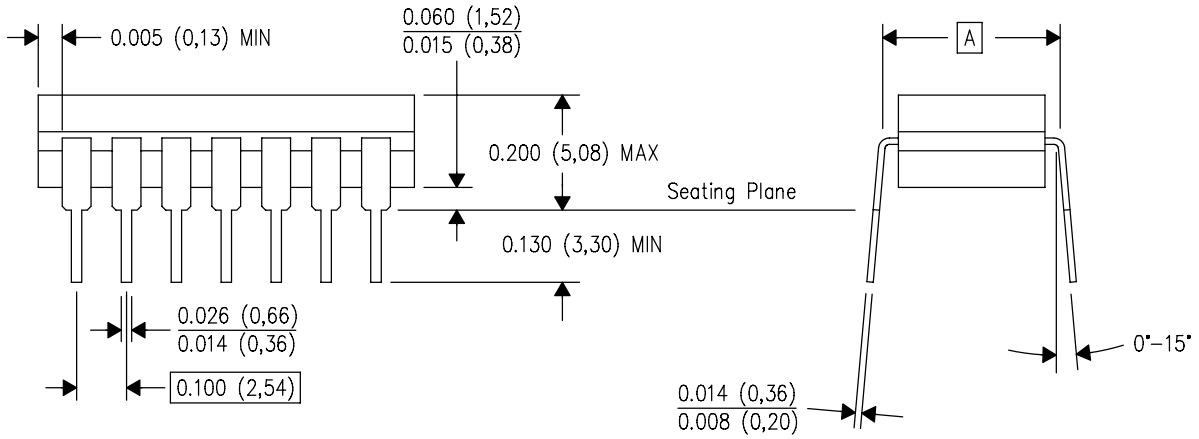
J (R–GDIP–T**)

14 LEADS SHOWN

CERAMIC DUAL IN–LINE PACKAGE



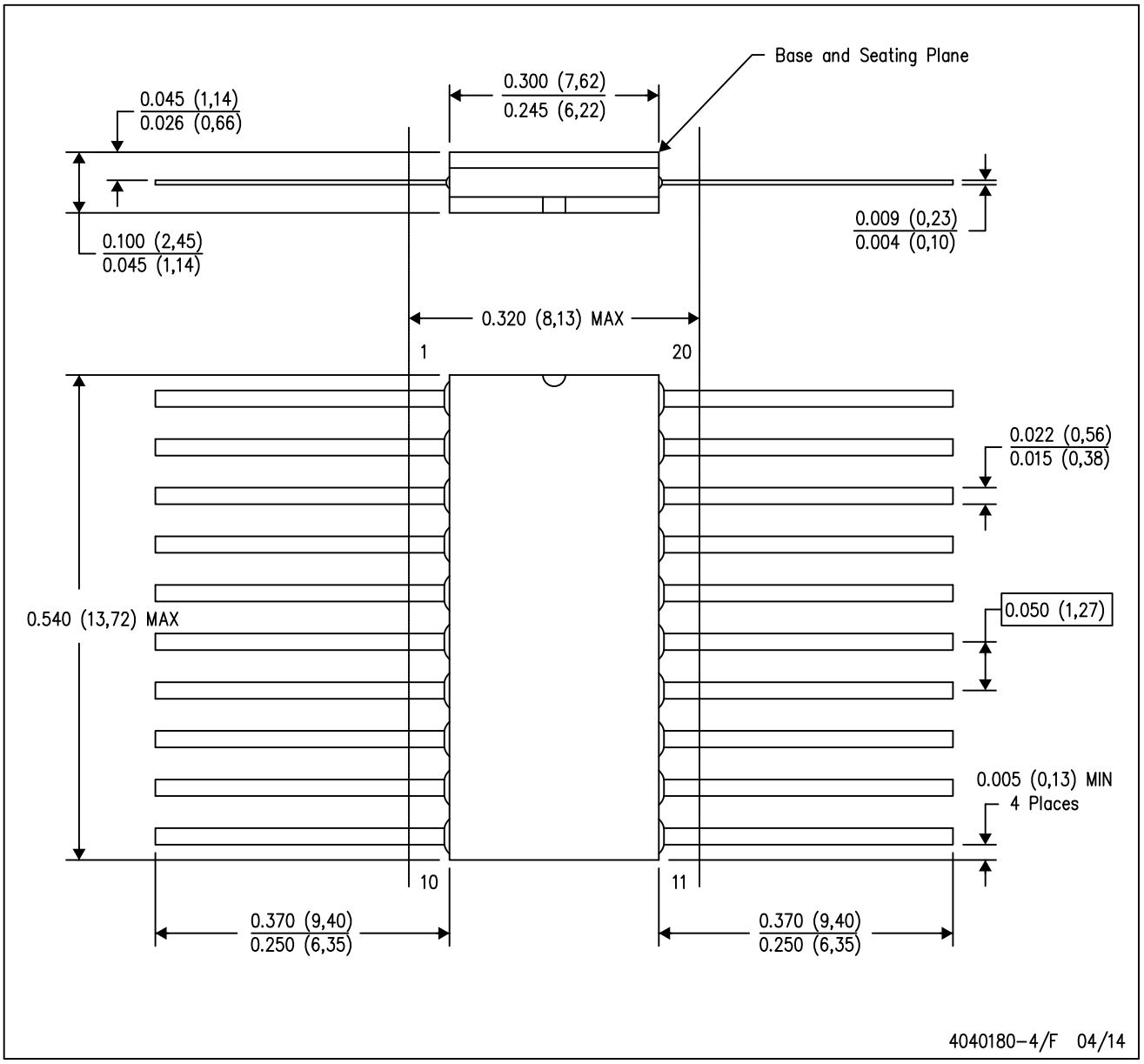
DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



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.

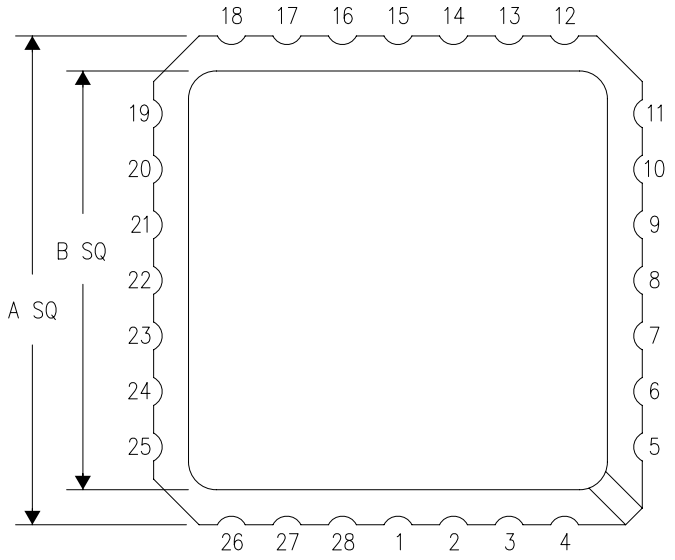
W (R–GDFP–F20) CERAMIC DUAL FLATPACK



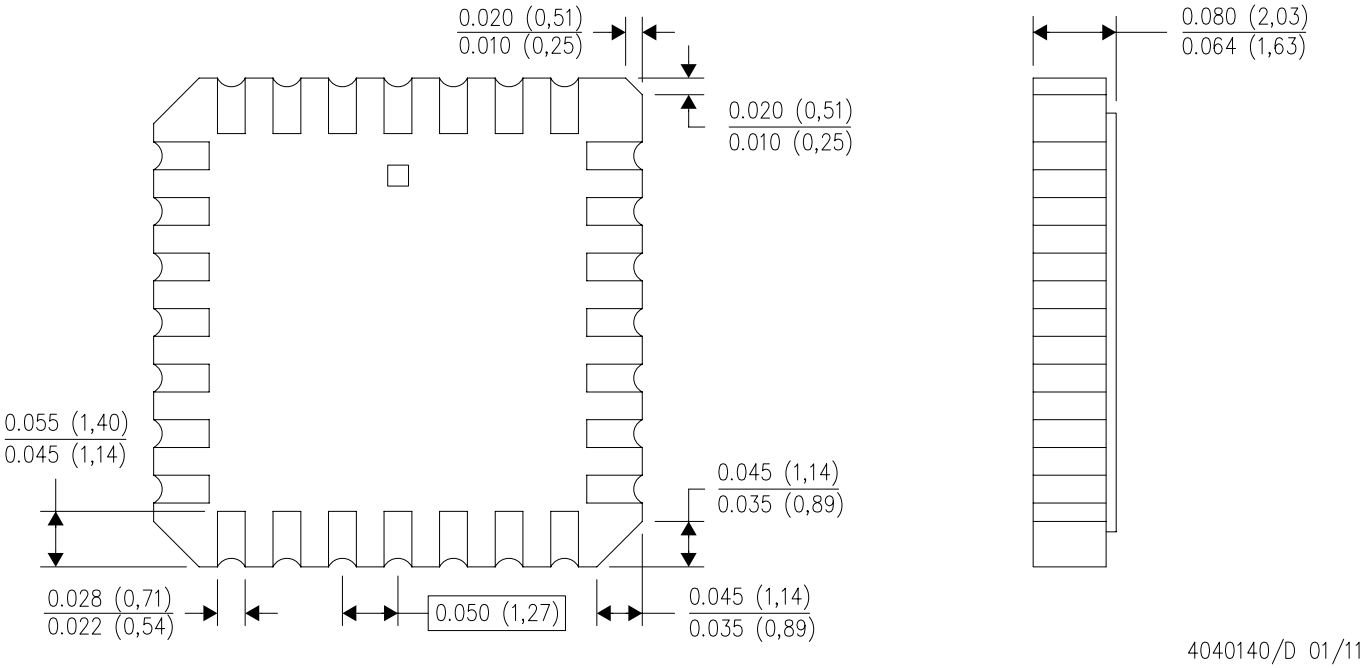
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within Mil–Std 1835 GDFP2–F20

FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



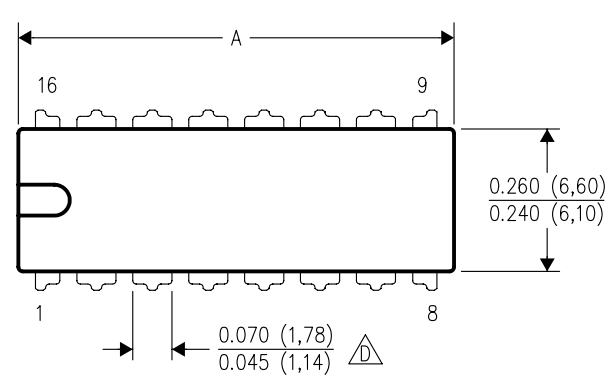
4040140/D 01/11

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

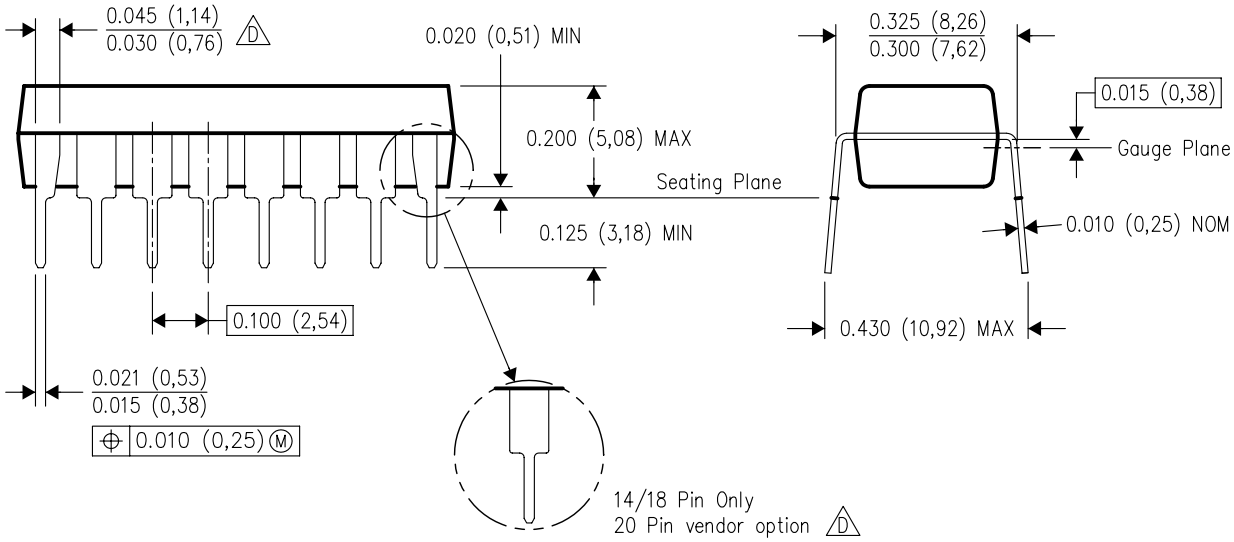
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



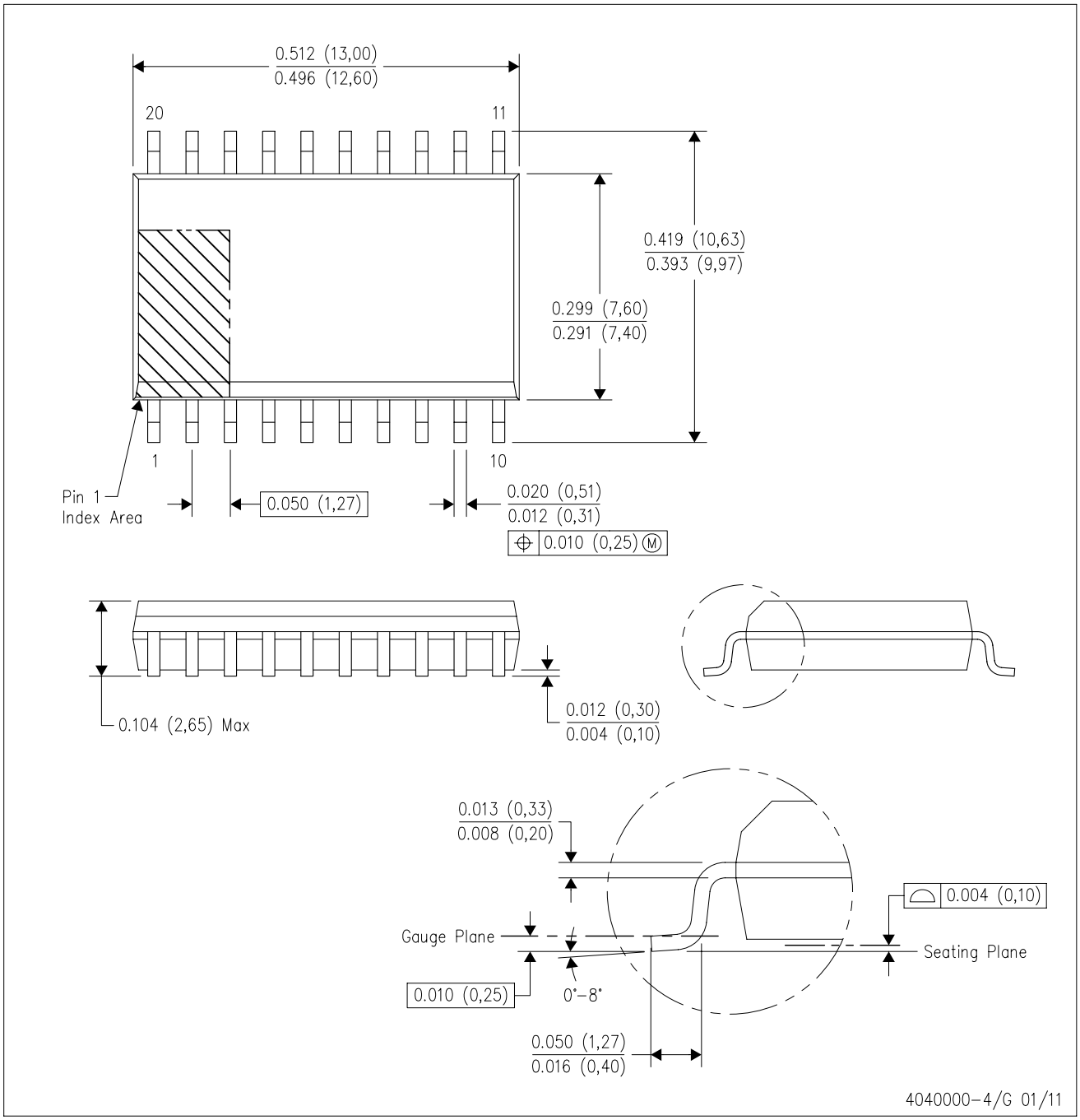
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

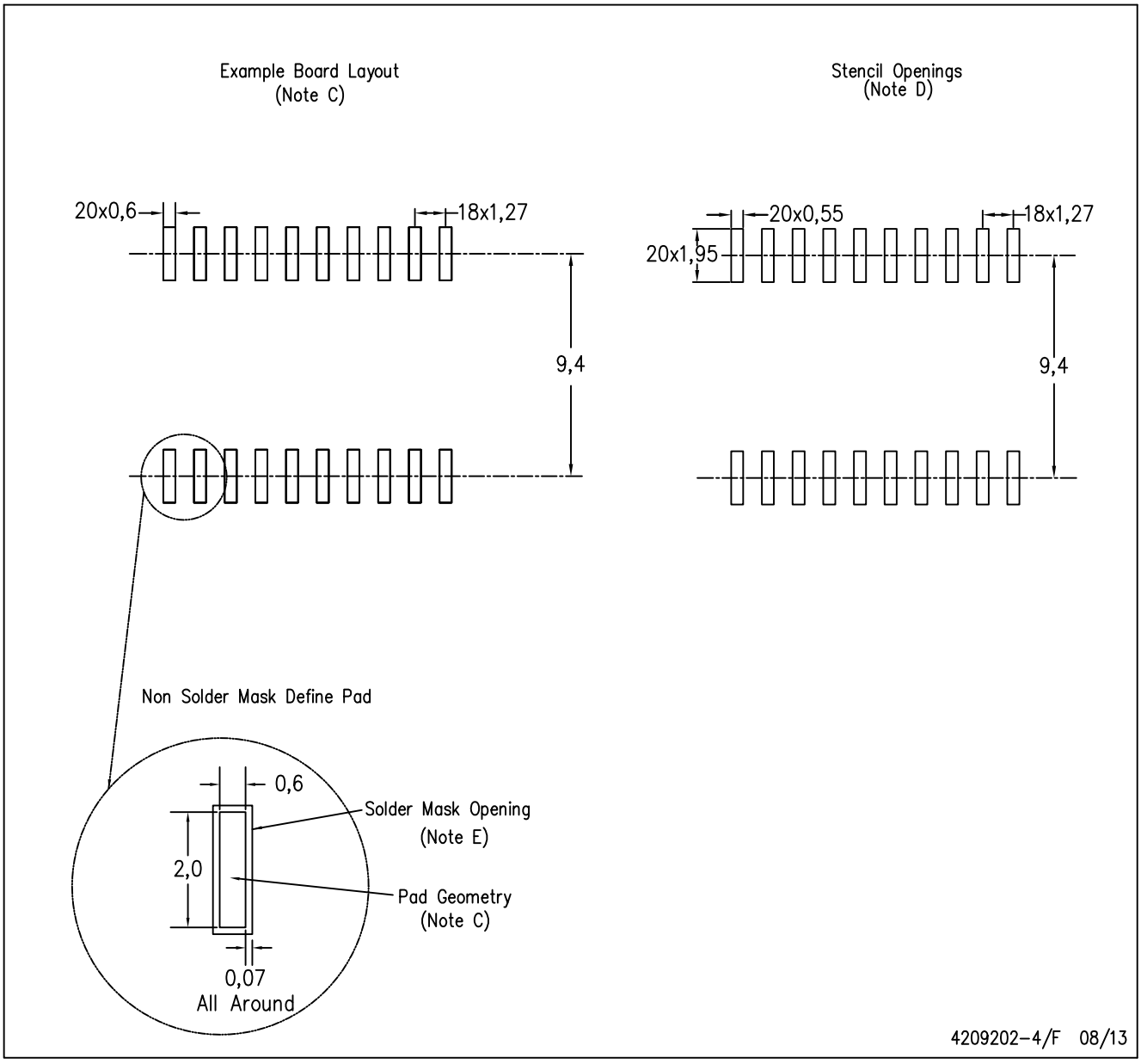
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R–PDSO–G20) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–013 variation AC.

DW (R–PDSO–G20) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Refer to IPC7351 for alternate board 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
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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