

SN54ALS576B, SN54AS576
SN74ALS576B, SN74ALS577A, SN74AS576
OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS WITH 3-STATE OUTPUTS

SDAS065B – DECEMBER 1982 – REVISED JANUARY 1995

Function Tables

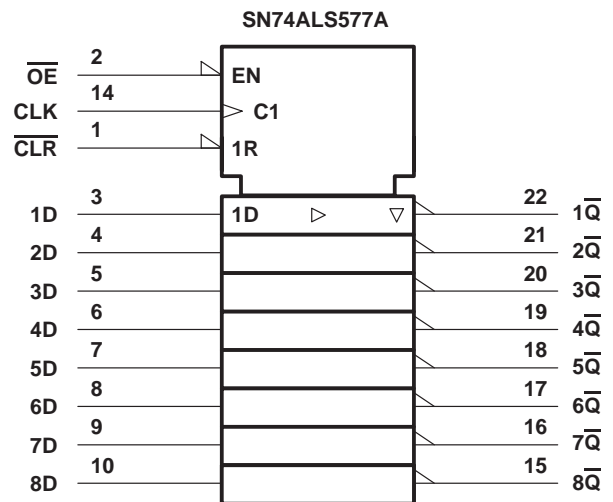
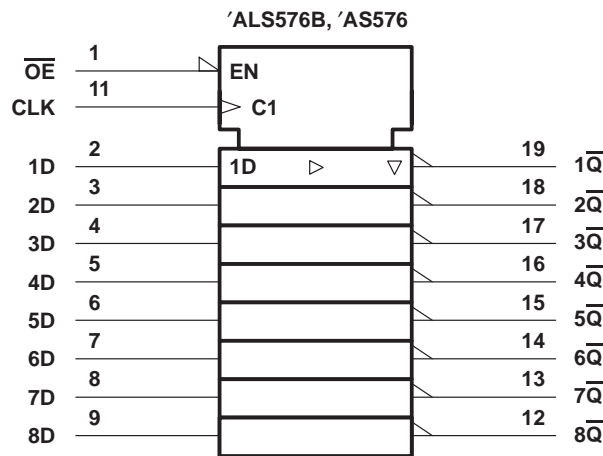
'ALS576B, 'AS576
(each flip-flop)

INPUTS			OUTPUT
\overline{OE}	CLK	D	\overline{Q}
L	↑	H	L
L	↑	L	H
L	L	X	\overline{Q}_0
H	X	X	Z

SN74ALS577A
(each flip-flop)

INPUTS				OUTPUT
\overline{OE}	\overline{CLR}	CLK	D	\overline{Q}
L	L	↑	X	H
L	H	↑	H	L
L	H	↑	L	H
L	H	L	X	\overline{Q}_0
H	X	X	X	Z

logic symbols†



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

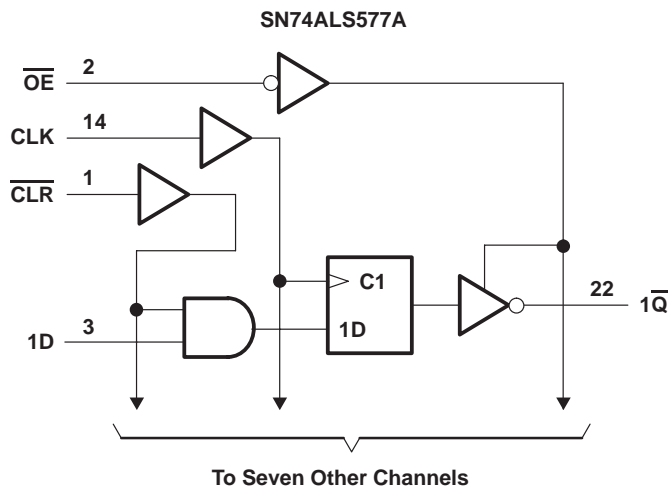
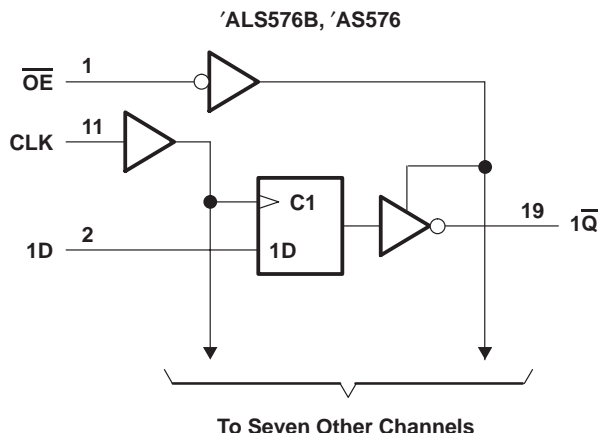
Pin numbers shown for the 'ALS576B and 'AS576 are for the DW, J, N, and W packages.

Pin numbers shown for the SN74ALS577A are for the DW and NT packages.

SN54ALS576B, SN54AS576
SN74ALS576B, SN74ALS577A, SN74AS576
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logic diagrams (positive logic)



Pin numbers shown are for the DW, J, N, and W packages.

Pin numbers shown are for the DW and NT packages.

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 : SN54ALS576B	-55°C to 125°C
SN74ALS576B, SN74ALS577A	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

		SN54ALS576B			SN74ALS576B SN74ALS577A			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			-1			-2.6	mA
I_{OL}	Low-level output current			12			24	mA
f_{clock}	Clock frequency	'ALS576B	0	22	0	30		MHz
		SN74ALS577A			0	30		
t_w	Pulse duration	'ALS576B, CLK high or low	25		16.5			ns
		SN74ALS577A, CLK high or low			16.5			
t_{su}	Setup time before CLK↑	Data	15		15			ns
		SN74ALS577A \overline{CLR}			15			
t_h	Hold time after CLK↑	Data	4		0			ns
		SN74ALS577A \overline{CLR}			0			
T_A	Operating free-air temperature		-55	125		0	70	°C



SN54ALS576B, SN54AS576
SN74ALS576B, SN74ALS577A, SN74AS576
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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		SN54ALS576B			SN74ALS576B SN74ALS577A			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}	$V_{CC} = 4.5\text{ V}$,	$I_I = -18\text{ mA}$	-1.2			-1.2			V
V_{OH}	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$,	$I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -1\text{ mA}$	2.4	3.3					
V_{OL}	$V_{CC} = 4.5\text{ V}$	$I_{OL} = -2.6\text{ mA}$				2.4	3.2		
		$I_{OL} = 12\text{ mA}$	0.25	0.4	0.25	0.4			
		$I_{OL} = 24\text{ mA}$				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
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.25\text{ V}$	-20	-112	-30	-112			mA
I_{CC}	$V_{CC} = 5.5\text{ V}$	Outputs high	10	18	10	18			mA
		Outputs low	15	24	15	24			
		Outputs disabled	16	30	16	30			

† 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} .

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$, $T_A = \text{MIN to MAX}\S$						UNIT
			SN54ALS576B		SN74ALS576B		SN74ALS577A		
			MIN	MAX	MIN	MAX	MIN	MAX	
f_{max}			22		30		30		MHz
t_{PLH}	CLK	Any \bar{Q}	4	24	3	14	4	14	ns
t_{PHL}			4	20	4	14	4	14	
t_{PZH}	\overline{OE}	Any \bar{Q}	4	24	3	18	4	18	ns
t_{PZL}			3	23	4	18	4	18	
t_{PHZ}	\overline{OE}	Any \bar{Q}	2	14	1	10	2	10	ns
t_{PLZ}			3	29	2	15	3	15	

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



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SN74ALS576B, SN74ALS577A, SN74AS576
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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 : SN54AS576	–55°C to 125°C
SN74AS576	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

		SN54AS576			SN74AS576			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			0.8			0.8	V
I_{OH}	High-level output current			–12			–15	mA
I_{OL}	Low-level output current			32			48	mA
f_{clock}^*	Clock frequency	0		100	0		125	MHz
t_w^*	Pulse duration	CLK high		5	4		ns	
		CLK low		4	2			
t_{su}^*	Setup time, data before CLK↑	3			2			ns
t_h^*	Hold time, data after CLK↑	3			2			ns
T_A	Operating free-air temperature	–55		125	0		70	°C

* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.



SN54ALS576B, SN54AS576
SN74ALS576B, SN74ALS577A, SN74AS576
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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		SN54AS576		SN74AS576		UNIT
			MIN	TYP†	MAX	MIN	
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$		-1.2		-1.2		V
V_{OH}	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $I_{OH} = -2\text{ mA}$		$V_{CC} - 2$		$V_{CC} - 2$		V
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -12\text{ mA}$	2.4	3.2	2.4	3.3	
V_{OL}	$V_{CC} = 4.5\text{ V}$		0.29 0.5		0.33 0.5		V
	$I_{OL} = 32\text{ mA}$						
	$I_{OL} = 48\text{ mA}$						
I_{OZH}	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.7\text{ V}$	50		50		μA
I_{OZL}	$V_{CC} = 5.5\text{ V}$,	$V_O = 0.4\text{ V}$	-50		-50		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}	D	$V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$	-3		-2		mA
	All others		-0.5		-0.5		
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.25\text{ V}$	-30	-112	-30	-112	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$		77 125		77 125		mA
	Outputs high						
	Outputs low		84 135		84 135		
	Outputs disabled		84 135		84 135		

† 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} .

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$, $T_A = \text{MIN to MAX}\S$				UNIT
			SN54AS576		SN74AS576		
			MIN	MAX	MIN	MAX	
f_{max}^*			100		125	MHz	
t_{PLH}	CLK	Any \bar{Q}	3	11	3	8	ns
t_{PHL}			4	11	4	9	
t_{PZH}	\overline{OE}	Any \bar{Q}	2	7	2	6	ns
t_{PZL}			3	11	3	10	
t_{PHZ}	\overline{OE}	Any \bar{Q}	2	7	2	6	ns
t_{PLZ}			2	7	2	6	

* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.

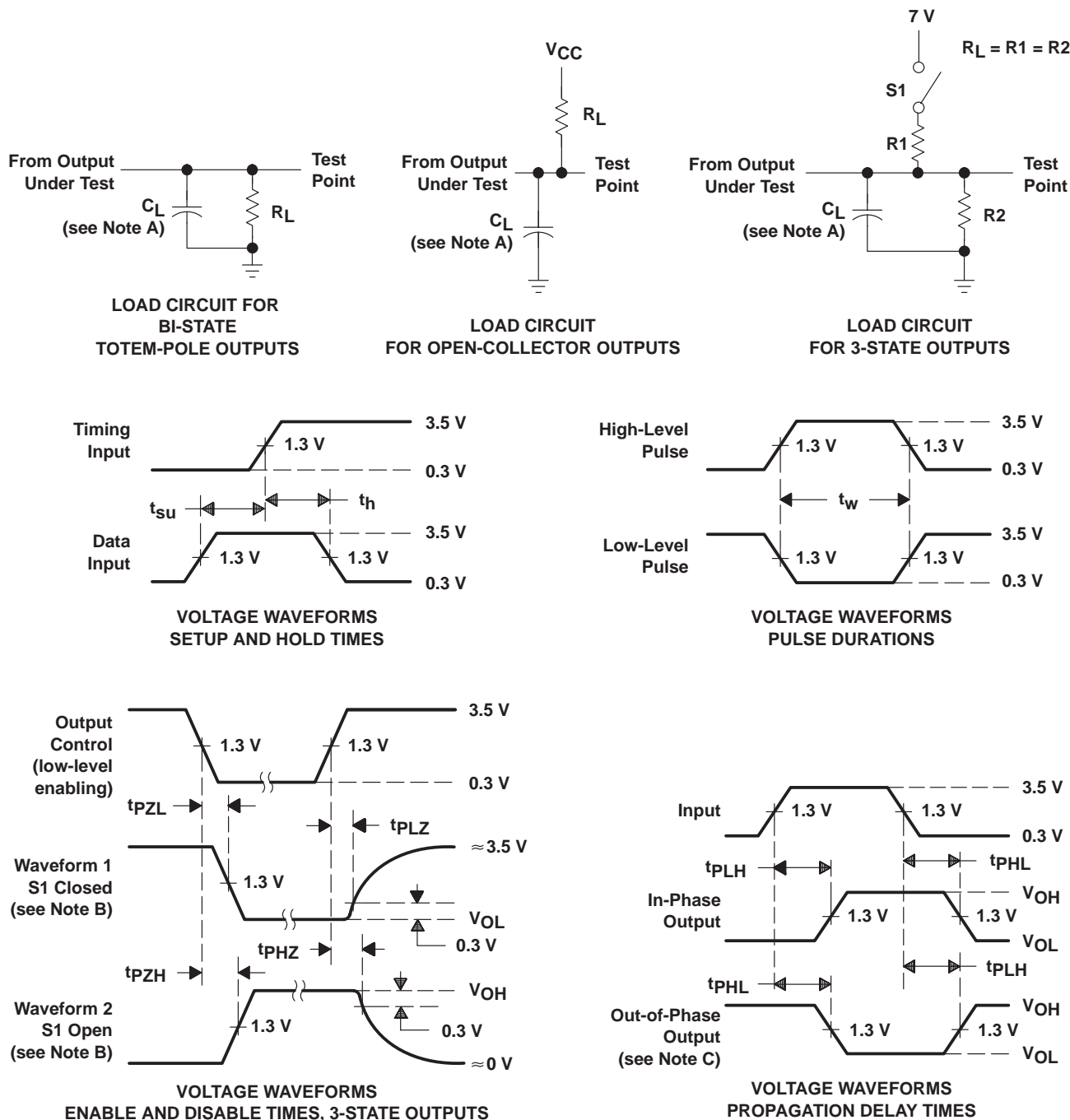
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SN74ALS576B, SN74ALS577A, SN74AS576
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**PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES**



- 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: $PRR \leq 1$ 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
84001022A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84001022A SNJ54ALS 576BFK	Samples
8400102RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8400102RA SNJ54ALS576BJ	Samples
SN74ALS576BDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS576B	Samples
SN74ALS576BDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS576B	Samples
SN74ALS576BN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS576BN	Samples
SN74ALS576BNSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS576B	Samples
SN74ALS577ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS577A	Samples
SN74ALS577ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS577A	Samples
SN74AS576N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	NIPDAU	N / A for Pkg Type	0 to 70	SN74AS576N	Samples
SNJ54ALS576BFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84001022A SNJ54ALS 576BFK	Samples
SNJ54ALS576BJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8400102RA SNJ54ALS576BJ	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.

OBSELETE: 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 ≤ 1000 ppm threshold. Antimony trioxide based flame retardants must also meet the ≤ 1000 ppm 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/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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OTHER QUALIFIED VERSIONS OF SN54ALS576B, SN74ALS576B :

● Catalog: [SN74ALS576B](#)

● Military: [SN54ALS576B](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

● Military - QML certified for Military and Defense Applications

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
SN74ALS576BDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ALS576BNSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74ALS577ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	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)
SN74ALS576BDWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ALS576BNSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ALS577ADWR	SOIC	DW	24	2000	350.0	350.0	43.0

DW (R-PDSO-G24)

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 AD.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

4040049/E 12/2002

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

NOTES:

- All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- 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.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
- 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.

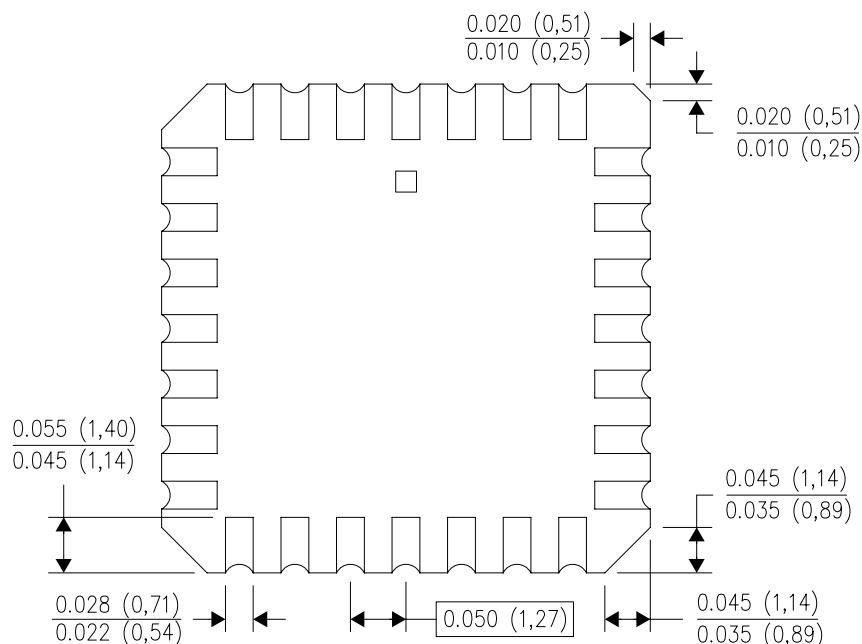
FK (S-CQCC-N**)

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

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.

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