

The SN54F299 is obsolete and no longer supplied.

SN54F299, SN74F299 8-BIT UNIVERSAL SHIFT/STORAGE REGISTERS WITH 3-STATE OUTPUTS

SDFS071B – MARCH 1987 – REVISED APRIL 2004

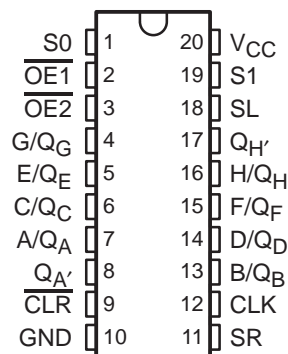
- **Four Modes of Operation:**
 - Hold (Store)
 - Shift Right
 - Shift Left
 - Load Data
- **Operates With Outputs Enabled or at High Impedance**
- **3-State Outputs Drive Bus Lines Directly**
- **Can Be Cascaded for N-Bit Word Lengths**
- **Direct Overriding Clear**
- **Applications:**
 - Stacked or Pushdown Registers
 - Buffer Storage
 - Accumulator Registers

description/ordering information

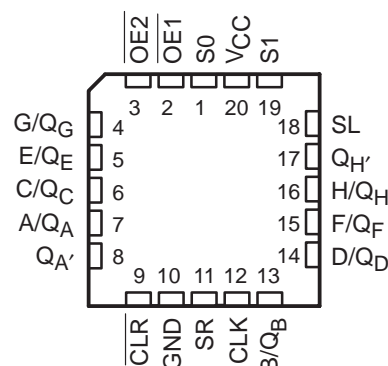
These 8-bit universal shift/storage registers feature multiplexed I/O ports to achieve full 8-bit data handling in a single 20-pin package. Two function-select (S_0 , S_1) inputs and two output-enable ($\overline{OE1}$, $\overline{OE2}$) inputs can be used to choose the modes of operation listed in the function table.

Synchronous parallel loading is accomplished by taking both S_0 and S_1 high. This places the 3-state outputs in a high-impedance state and permits data that is applied on the I/O ports to be clocked into the register. Reading out of the register can be accomplished while the outputs are enabled in any mode. Clearing occurs when the clear (\overline{CLR}) input is low. Taking either $\overline{OE1}$ or $\overline{OE2}$ high disables the outputs but has no effect on clearing, shifting, or storage of data.

SN54F299 . . . J PACKAGE
SN74F299 . . . DW, N, OR NS PACKAGE
(TOP VIEW)



SN54F299 . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube of 20	SN74F299N	SN74F299N
	SOIC – DW	Tube of 25	SN74F299DW	F299
		Reel of 2000	SN74F299DWR	
	SOP – NS	Reel of 2000	SN74F299NSR	74F299

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



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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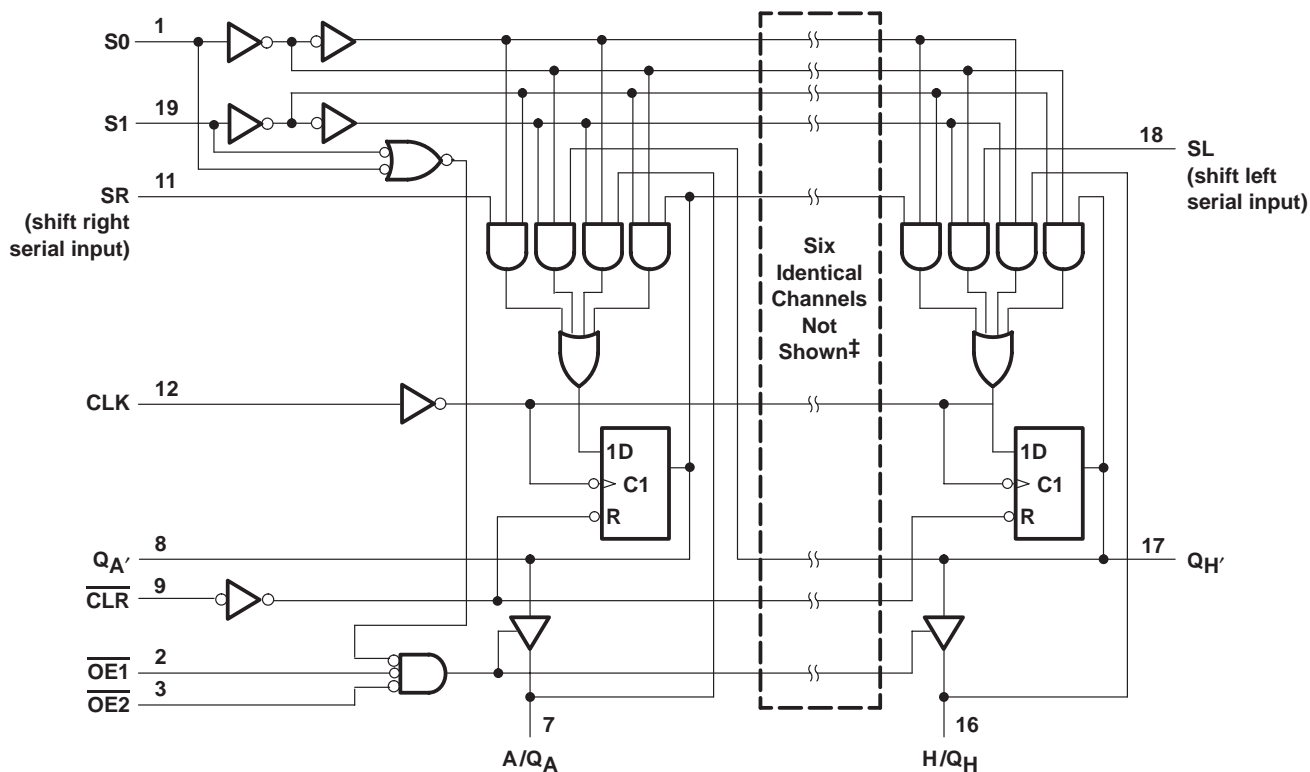
FUNCTION TABLE

MODE	INPUTS								I/O PORTS								OUTPUTS	
	CLR	S1	S0	$\overline{OE1}$ †	$\overline{OE2}$ †	CLK	SL	SR	A/Q _A	B/Q _B	C/Q _C	D/Q _D	E/Q _E	F/Q _F	G/Q _G	H/Q _H	Q _A '	Q _H '
Clear	L	X	L	L	L	X	X	X	L	L	L	L	L	L	L	L	L	L
	L	L	X	L	L	X	X	X	L	L	L	L	L	L	L	L	L	L
	L	H	H	X	X	X	X	X	X	X	X	X	X	X	X	X	L	L
Hold	H	L	L	L	L	X	X	X	Q _{A0}	Q _{B0}	Q _{C0}	Q _{D0}	Q _{E0}	Q _{F0}	Q _{G0}	Q _{H0}	Q _{A0}	Q _{H0}
	H	X	X	L	L	L	X	X	Q _{A0}	Q _{B0}	Q _{C0}	Q _{D0}	Q _{E0}	Q _{F0}	Q _{G0}	Q _{H0}	Q _{A0}	Q _{H0}
Shift Right	H	L	H	L	L	↑	X	H	H	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	H	Q _{Gn}
	H	L	H	L	L	↑	X	L	L	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	L	Q _{Gn}
Shift Left	H	H	L	L	L	↑	H	X	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	Q _{Hn}	H	Q _{Bn}	H
	H	H	L	L	L	↑	L	X	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	Q _{Hn}	L	Q _{Bn}	L
Load	H	H	H	X	X	↑	X	X	a	b	c	d	e	f	g	h	a	h

NOTE: a . . . h = the level of the steady-state input at inputs A through H, respectively. This data is loaded into the flip-flops while the flip-flop outputs are isolated from the I/O terminals.

† When one or both output-enable inputs are high, the eight I/O terminals are disabled to the high-impedance state; however, sequential operation or clearing of the register is not affected.

logic diagram (positive logic)



‡ I/O ports not shown: B/Q_B (13), C/Q_C (6), D/Q_D (14), E/Q_E (5), F/Q_F (15), and G/Q_G (4).

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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
Input voltage range, V_I (see Note 1)	–1.2 V to 7 V
Input current range	–30 mA to 5 mA
Voltage range applied to any output in the disabled or power-off state	–0.5 V to 5.5 V
Voltage range applied to any output in the high state	–0.5 V to V_{CC}
Current into any output in the low state: Q_A' or Q_H'	40 mA
SN54F299 (Q_A thru Q_H)	40 mA
SN74F299 (Q_A thru Q_H)	48 mA
Package thermal impedance, θ_{JA} (see Note 2): DW package	58°C/W
N package	69°C/W
NS package	60°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 voltage ratings may be exceeded provided the input current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		SN54F299			SN74F299			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_{IK}	Input clamp current			–18			–18	mA
I_{OH}	High-level output current			Q_A' or Q_H'			Q_A' or Q_H'	mA
				Q_A thru Q_H			Q_A thru Q_H	
I_{OL}	Low-level output current			Q_A' or Q_H'			Q_A' or Q_H'	mA
				Q_A thru Q_H			Q_A thru Q_H	
T_A	Operating free-air temperature	–55		125	0		70	°C

NOTE 3: 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.

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

PARAMETER		TEST CONDITIONS		SN54F299			SN74F299			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V _{IK}		V _{CC} = 4.5 V, I _I = − 18 mA		− 1.2			− 1.2			V
V _{OH}	Q _A ' or Q _H '	V _{CC} = 4.5 V	I _{OH} = − 1 mA	2.5	3.4		2.5	3.4		V
	Q _A thru Q _H		I _{OH} = − 1 mA	2.5	3.4		2.5	3.4		
			I _{OH} = − 3 mA	2.4	3.3		2.4	3.3		
	Any output	V _{CC} = 4.75 V, I _{OH} = − 1 mA to − 3 mA				2.7				
V _{OL}	Q _A ' or Q _H '	V _{CC} = 4.5 V	I _{OL} = 20 mA	0.3	0.5		0.3	0.5		V
	Q _A thru Q _H		I _{OL} = 20 mA	0.3	0.5					
			I _{OL} = 24 mA				0.35	0.5		
I _I	A thru H	V _{CC} = 5.5 V	V _I = 5.5 V	1			1			mA
	Any other		V _I = 7 V	0.1			0.1			
I _{IH} ‡	A thru H	V _{CC} = 5.5 V, V _I = 2.7 V		70			70			μA
	Any other		20			20				
I _{IL} ‡	A thru H	V _{CC} = 5.5 V, V _I = 0.5 V		− 0.65			− 0.65			mA
	S0 or S1		− 1.2			− 1.2				
	Any other		− 0.6			− 0.6				
I _{OS} §		V _{CC} = 5.5 V, V _O = 0		− 60	− 150		− 60	− 150		mA
I _{CC}		V _{CC} = 5.5 V, See Note 4		68	95		68	95		mA

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

‡ For I/O ports (Q_A thru Q_H), the parameters I_{IH} and I_{IL} include the off-state output current.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 4: I_{CC} is measured with $\overline{OE}1$, $\overline{OE}2$, and CLK at 4.5 V.

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

				$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$		SN54F299		SN74F299		UNIT			
				'F299									
				MIN	MAX	MIN	MAX	MIN	MAX				
f_{clock}	Clock frequency			70		65		70		MHz			
t_w	Pulse duration		CLK high or low		7		8		7		ns		
			$\overline{\text{CLR}}$ low		7		8		7				
t_{su}	Setup time before CLK↑	S0 or S1		High or low		8.5		9.5		8.5		ns	
		A/QA thru H/QH, SR, or SL		High or low		5.5		6.5		5.5			
	Inactive-state setup time before CLK↑†	$\overline{\text{CLR}}$		High		7		13		7			
t_h	Hold time after CLK↑		S0 or S1		High or low		0		0		0		ns
			A/QA thru H/QH, SR, or SL		High or low		2		2		2		

† Inactive-state setup time also is referred to as recovery time.



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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R _L = 500 Ω, T _A = 25°C			V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX†				UNIT
			'F299			SN54F299		SN74F299		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			70	100		65		70		MHz
t _{PLH}	CLK	Q _A ' or Q _H '	3.2	6.6	9	2.7	10.5	3.2	10	ns
t _{PHL}			2.7	6.1	8.5	2.2	10	2.7	9.5	
t _{PLH}	CLK	Q _A thru Q _H	3.2	6.6	9	2.7	11	3.2	10	ns
t _{PHL}			4.2	8.1	11	3.7	12.5	4.2	12	
t _{PHL}	$\overline{\text{CLR}}$	Q _A ' or Q _H '	3.7	7.1	9.5	3.2	11.5	3.7	10.5	ns
		Q _A thru Q _H	5.7	10.6	14	5	15.5	5.7	15	
t _{PZH}	$\overline{\text{OE1}}$ or $\overline{\text{OE2}}$	Q _A thru Q _H	2.7	5.6	8	2.2	10.5	2.7	9	ns
t _{PZL}			3.2	6.6	10	2.7	12	3.2	11	
t _{PHZ}	$\overline{\text{OE1}}$ or $\overline{\text{OE2}}$	Q _A thru Q _H	1.7	4.1	6	1.7	9	1.7	7	ns
t _{PLZ}			1.2	3.6	5.5	1.2	7.5	1.2	6.5	

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



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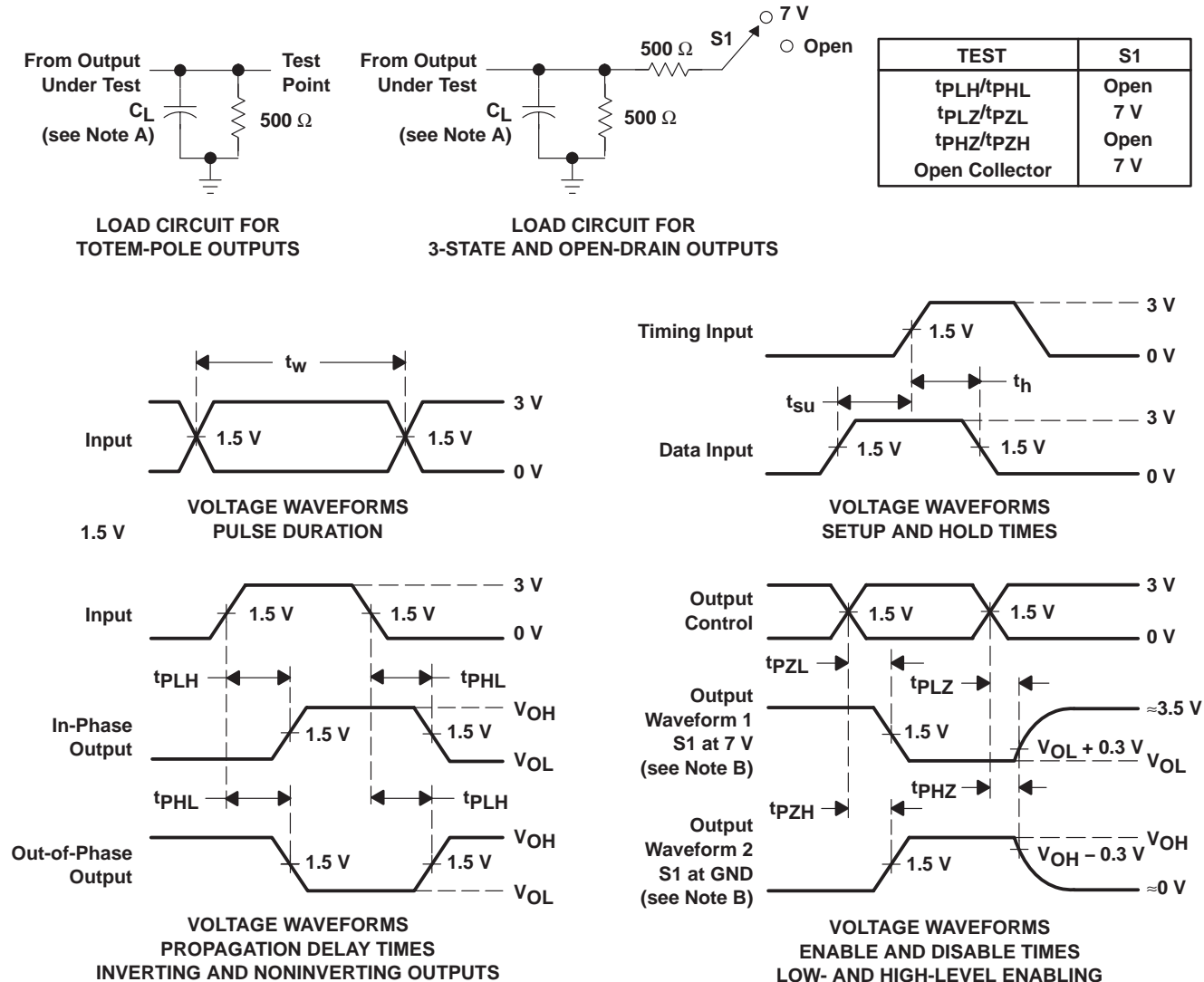
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PARAMETER MEASUREMENT INFORMATION



- 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. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns, duty cycle = 50%.
- D. The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuit 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
SN74F299DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	F299	Samples
SN74F299DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	0 to 70	F299	Samples
SN74F299N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	NIPDAU	N / A for Pkg Type	0 to 70	SN74F299N	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/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


*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
SN74F299DWR	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)
SN74F299DWR	SOIC	DW	20	2000	367.0	367.0	45.0

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	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	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.
-  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.



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

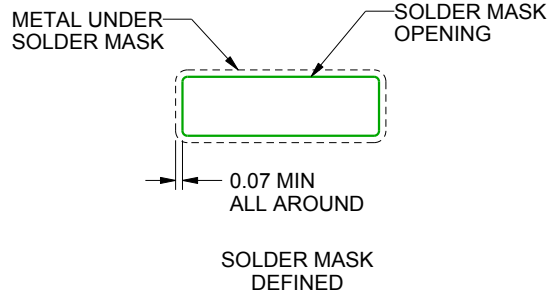
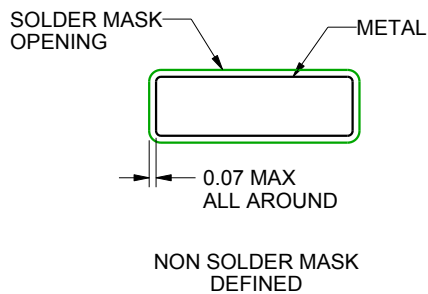
DW0020A

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

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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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