

SN54F350, SN74F350 4-BIT SHIFTER WITH 3-STATE OUTPUTS

SDFS073 - D2932, MARCH 1987 - REVISED JANUARY 1989

- Shifts 4-Bits of Data to 0, 1, 2 or 3 Places Under Control of Two Select Lines
- Three-State Outputs for Bus Organized Systems
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

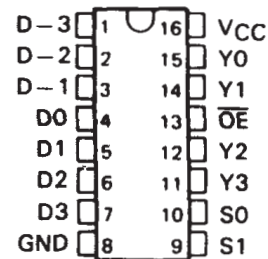
This device is operationally equivalent to a 4-input multiplexer with the inputs connected so that the select code causes shifts of the data word. This makes it possible to perform shifts of 0, 1, 2, or 3 places on words of any length, with suitable interconnection.

A 7-bit data word is introduced at the D inputs and is shifted according to the code applied to the select inputs S0 and S1. Y0 through Y3 are 3-state outputs controlled by an output enable, \overline{OE} . When \overline{OE} is low, the outputs follow the selected data inputs; when \overline{OE} is high, the outputs are in a high-impedance state. This feature allows shifters to be cascaded on the same output lines or to a common bus. The shift function can be logical with zeroes pulled in at either or both ends of the shifting field, arithmetic with the sign bit repeated during a shift down, or end-around with the data word forming a continuous loop.

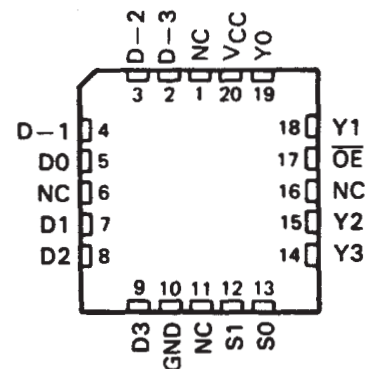
FUNCTION TABLE

INPUTS			OUTPUTS			
\overline{OE}	S1	S0	Y0	Y1	Y2	Y3
H	X	X	Z	Z	Z	Z
L	L	L	D0	D1	D2	D3
L	L	H	D-1	D0	D1	D2
L	H	L	D-2	D-1	D0	D1
L	H	H	D-3	D-2	D-1	D0

SN54F350 . . . J PACKAGE
SN74F350 . . . D OR N PACKAGE
(TOP VIEW)



SN54F350 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

logic equations

$$Y_0 = \overline{S_0} \overline{S_1} D_0 + S_0 \overline{S_1} D_{-1} + \overline{S_0} S_1 D_{-2} + S_0 S_1 D_{-3}$$

$$Y_1 = \overline{S_0} \overline{S_1} D_1 + S_0 \overline{S_1} D_0 + \overline{S_0} S_1 D_{-1} + S_0 S_1 D_{-2}$$

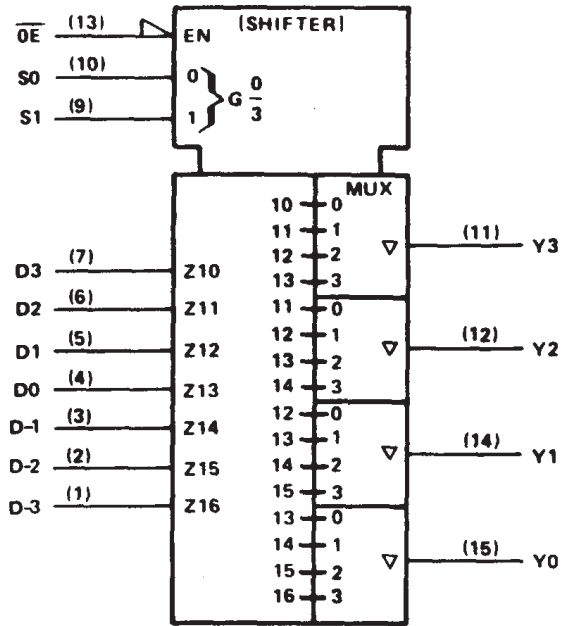
$$Y_2 = \overline{S_0} \overline{S_1} D_2 + S_0 \overline{S_1} D_1 + \overline{S_0} S_1 D_0 + S_0 S_1 D_{-1}$$

$$Y_3 = \overline{S_0} \overline{S_1} D_3 + S_0 \overline{S_1} D_2 + \overline{S_0} S_1 D_1 + S_0 S_1 D_0$$

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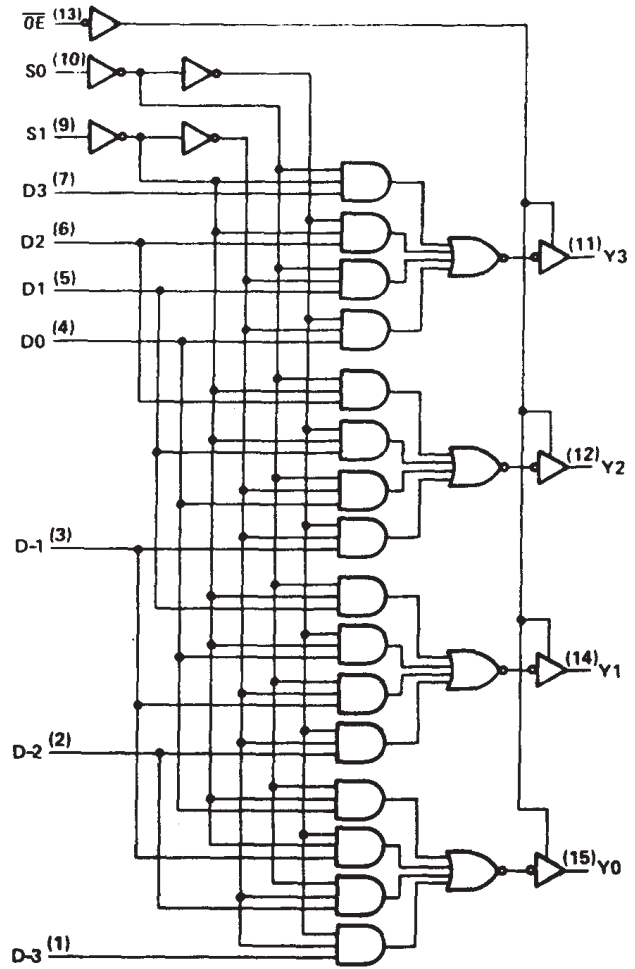
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logic symbol†



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, and N packages.

logic diagram (positive logic)



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

Supply voltage, VCC	-0.5 V to 7 V
Input voltage‡	-1.2 V to 7 V
Input current	-30 mA to 5 mA
Voltage applied to any output in the disabled or power-off state	-0.5 V to 5.5 V
Voltage applied to any output in the high state	-0.5 V to VCC
Current into any output in the low state: SN54F350	40 mA
SN74F350	48 mA
Operating free-air temperature range: SN54F350	-55°C to 125°C
SN74F350	0°C to 70°C
Storage temperature range	-65°C to 150°C

‡The input voltage ratings may be exceeded provided the input current ratings are observed.



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recommended operating conditions

		SN54F350			SN74F350			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			-3			-3	mA
I _{OL}	Low-level output current			20			20	mA
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		SN54F350			SN74F350			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}	Any output	V _{CC} = 4.5 V, I _{OH} = -1 mA	2.5	3.4		2.5	3.4		V	
		V _{CC} = 4.5 V, I _{OH} = -3 mA	2.4	3.3		2.4	3.3			
V _{OL}	Any output	V _{CC} = 4.75 V, I _{OH} = -1 mA to -3 mA				2.7			V	
		V _{CC} = 4.5 V, I _{OL} = 20 mA	0.30	0.5		0.35	0.5			
I _{OZH}		V _{CC} = 5.5 V, V _O = 2.7 V			50			50	μA	
I _{OZL}		V _{CC} = 5.5 V, V _O = 0.5 V			-50			-50	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 = 0.5 V			-1.2			-1.2	mA	
I _{OS} [‡]		V _{CC} = 5.5 V, V _O = 0	-60		-150	-60		-150	mA	
I _{CCH}	Any output	V _{CC} = 5.5 V	Outputs high		22	35	22		35	mA
I _{CCL}			Outputs low		27	41	27		41	
I _{CCZ}			Outputs off		26	42	26		42	

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 25°C			V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX [‡]				UNIT
			'F350			SN54F350		SN74F350		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	Data	Any Y	2.2	4.1	6	3	7.5	2.2	7	ns
t _{PHL}	Any D		1.7	3.6	5.5	2.5	7	1.7	6.5	
t _{PLH}	S0, S1	Any Y	3.2	7.4	10	4	13	3.2	11	ns
t _{PHL}			2.2	6.1	8.5	3	10	2.2	9.5	
t _{PZH}	OE	Any Y	1.7	4.6	7	2.5	8.5	1.7	8	ns
t _{PZL}			3.2	6.6	9	4	11	3.2	10	
t _{PHZ}	OE	Any Y	1.2	3.5	5.5	2	7	1.2	6.5	ns
t _{PLZ}			1.2	3.6	5.5	2	8.5	1.2	6.5	

[†] All typical values are at V_{CC} = 5 V, T_A = 25°C.

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

[§] For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.

NOTE 1: Load circuits and waveforms are shown in Section 1.



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