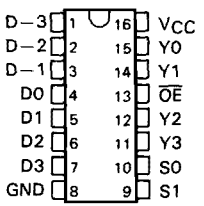
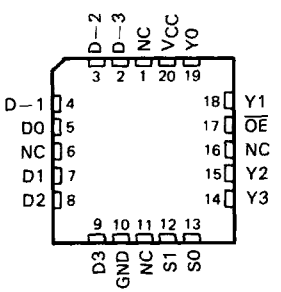
D2932, MARCH 1987 – REVISED JANUARY 1989

- **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**

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



SN54F350 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

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

logic equations

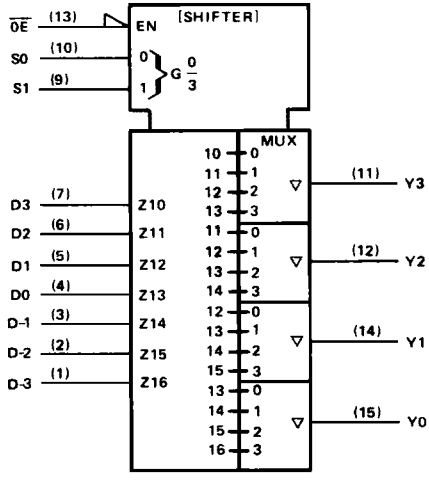
$$Y0 = \overline{S0}\,\overline{S1}\,D0 + S0\,\overline{S1}\,D{-}1 + \overline{S0}\,S1\,D{-}2 + S0\,S1\,D{-}3$$

$$Y1 = \overline{S0}\,\overline{S1}\,D1 + S0\,\overline{S1}\,D0 + \overline{S0}\,S1\,D{-}1 + S0\,S1\,D{-}2$$

$$Y2 = \overline{S0}\,\overline{S1}\,D2 + S0\,\overline{S1}\,D1 + \overline{S0}\,S1\,D0 + S0\,S1\,D{-}1$$

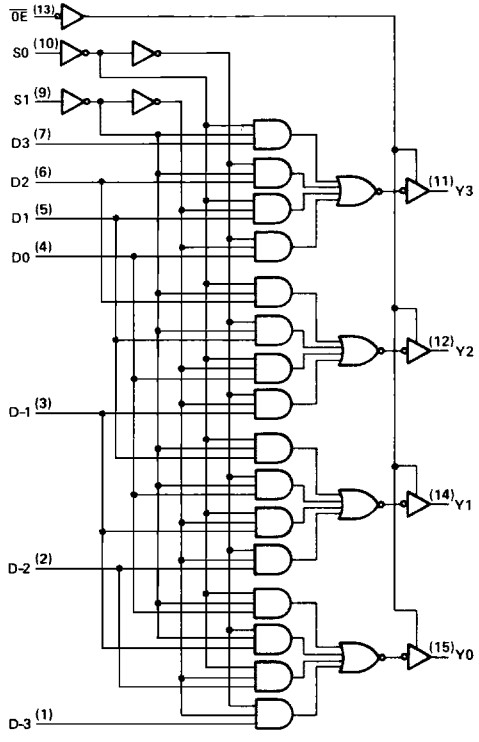
$$Y3 = \overline{S0}\,\overline{S1}\,D3 + S0\,\overline{S1}\,D2 + \overline{S0}\,S1\,D1 + S0\,S1\,D0$$

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, V_{CC} . . . . . −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 V_{CC}
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.

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 characterisitcs 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}		V_{CC} = 4.5 V	I_{OH} = −1 mA	2.5	3.4		2.5	3.4		V
			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}		V_{CC} = 4.5 V	I_{OL} = 20 mA		0.30	0.5				V
			I_{OL} = 24 mA					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}		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, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C			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
			'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}	$\overline{OE}$	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}	$\overline{OE}$	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.