

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

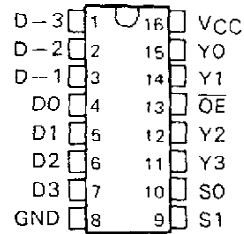
This device is operationally equivalent to a 4-input multiplexer with the inputs connected so that the select code causes shifts of the data word. This makes it possible to perform shifts of 0, 1, 2, or 3 places on words of any length, with suitable interconnection.

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.

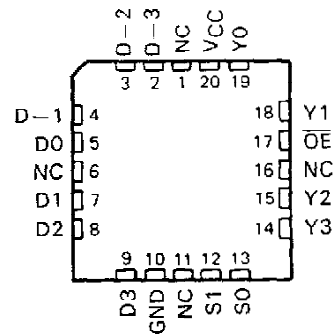
FUNCTION TABLE

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

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

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

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

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

PRODUCTION DATA documents contain information 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.

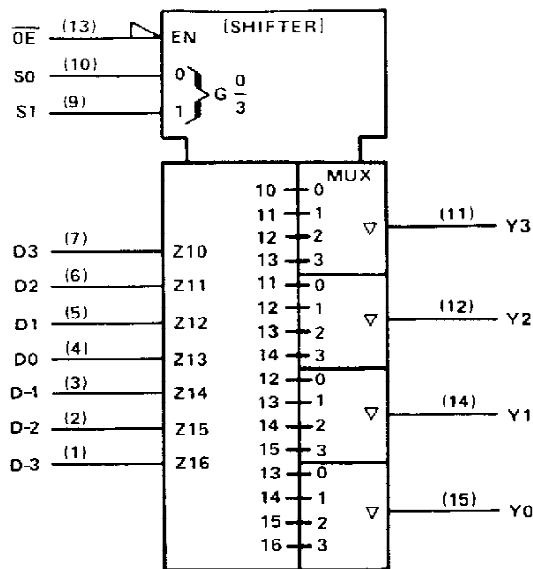


POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

Copyright © 1987, Texas Instruments Incorporated

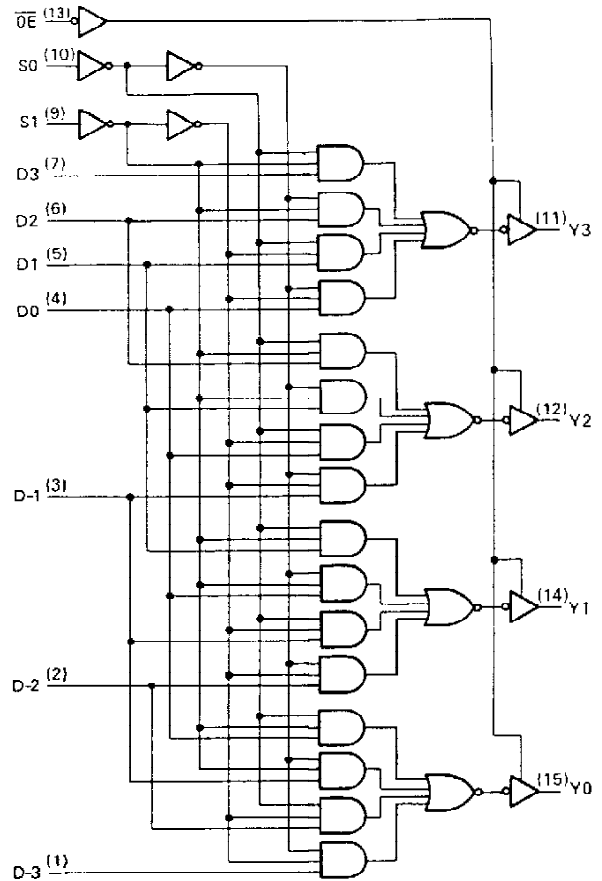
SN54F350, SN74F350 4-BIT SHIFTER WITH 3-STATE OUTPUTS

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.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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

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 _{CC} = 4.75 V, I _{OH} = -1 mA to -3 mA				2.7				
V _{OL}	Any output	V _{CC} = 4.5 V, I _{OL} = 20 mA		0.30	0.5				V	
		V _{CC} = 4.5 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}	Any output	V _{CC} = 5.5 V	Outputs high		22	35	Outputs high		22	35
I _{CCL}			Outputs low		27	41	Outputs low		27	41
I _{CCZ}			Outputs off		26	42	Outputs off		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.



IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.