OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

D2932, MARCH 1987–REVISED JANUARY 1989

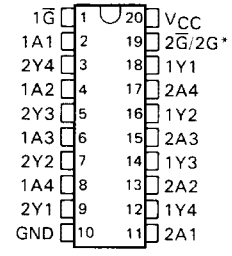
- **3-State Outputs Drive Bus Lines or Buffer Memory Address Registers**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

description

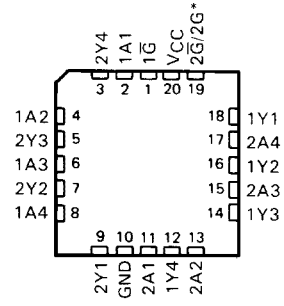
These octal buffers and line drivers are designed specifically to improve both the performance and density of three-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The designer has a choice of selected combinations of inverting and noninverting outputs, symmetrical $\overline{G}$ (active-low output control) inputs, and complementary G and $\overline{G}$ inputs.

The SN54F240 and SN54F241 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74F240 and SN74F241 are characterized for operation from 0°C to 70°C.

SN54F240, SN54F241 . . . J PACKAGE
SN74F240, SN74F241 . . . DW OR N PACKAGE
(TOP VIEW)



SN54F240, SN54F241 . . . FK PACKAGE
(TOP VIEW)



*$2\overline{G}$ for 'F240 or 2G for 'F241

FUNCTION TABLES

'F240

OUTPUT CONTROL $\overline{G}$	DATA INPUT A	OUTPUT Y
H	X	Z
L	L	H
L	H	L

'F241

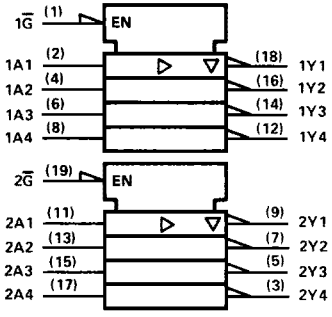
OUTPUT CONTROL $1\overline{G}$	DATA INPUT 1A	OUTPUT 1Y
H	X	Z
L	L	L
L	H	H

'F241

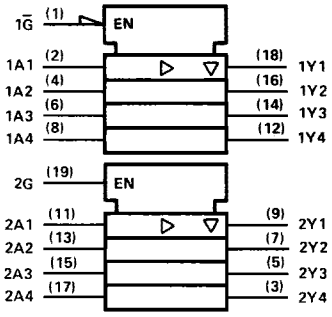
OUTPUT CONTROL 2G	DATA INPUT 2A	OUTPUT 2Y
L	X	Z
H	L	L
H	H	H

logic symbols†

'F240



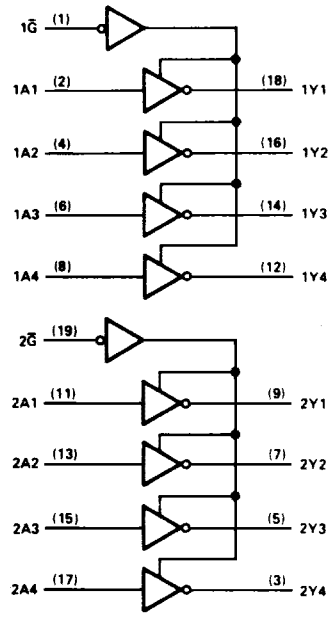
'F241



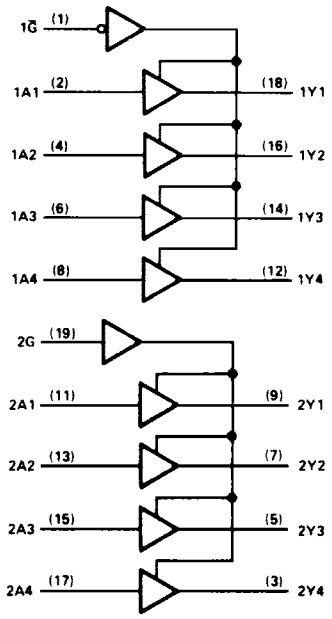
†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)

'F240



'F241



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: SN54F240, SN54F241 . . . . . 96 mA
SN74F240, SN74F241 . . . . . 128 mA
Operating free-air temperature range: SN54F240, SN54F241 . . . . . −55°C to 125°C
SN74F240, SN74F241 . . . . . 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

		SN54F240 SN54F241			SN74F240 SN74F241			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			−12			−15	mA
I_{OL}	Low-level output current			48			64	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		SN54F240			SN74F240			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} = −3 mA	2.4	3.3		2.4	3.3		V
		I_{OH} = −12 mA	2	3.2					
		I_{OH} = −15 mA				2	3.1		
	V_{CC} = 4.75 V,	I_{OH} = −3 mA				2.7			
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.38	0.55				V
		I_{OL} = 64 mA					0.42	0.55	
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			−1	mA
I_{OS}§	V_{CC} = 5.5 V,	V_O = 0	−100		−225	−100		−225	mA
I_{CC}	V_{CC} = 5.5 V	Outputs high		19	29		19	29	mA
		Outputs low		50	75		50	75	
		Outputs disabled		42	63		42	63	

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} = MIN to MAX†, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			'F240			SN54F240		SN74F240		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	Data (Any A)	Y	2.2	4.7	7	2.2	9	2.2	8	ns
t_{PHL}			1.2	3.1	4.7	1.2	6	1.2	5.7	
t_{PZH}	$\overline{G}$	Y	1.2	3.1	5.3	1.2	6.7	1.2	6.1	ns
t_{PZL}			3.2	6.5	9	3.2	10.5	3.2	10	
t_{PHZ}	$\overline{G}$	Y	1.2	3.6	5.3	1.2	6.5	1.2	6.3	ns
t_{PLZ}			1.2	5.6	8	1.2	12.5	1.2	9.5	

† For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.
‡ 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.
NOTE 1: See Section 1 for load circuits and waveforms.

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

PARAMETER		TEST CONDITIONS		SN54F241			SN74F241			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} = −3 mA	2.4	3.3		2.7	3.3		V
			I_{OH} = −12 mA	2	3.2					
			I_{OH} = −15 mA				2	3.1		
		V_{CC} = 4.75 V,	I_{OH} = −3 mA				2.7			
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.38	0.55				V
			I_{OL} = 64 mA					0.42	0.55	
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}	G or $\overline{G}$ input	V_{CC} = 5.5 V,	V_I = 0.5 V			−1			−1	mA
	Any A input					−1.6			−1.6	
I_{OS}§		V_{CC} = 5.5 V,	V_O = 0	−100		−225	−100		−225	mA
I_{CC}		V_{CC} = 5.5 V	Outputs high		40	60		40	60	mA
			Outputs low		60	90		60	90	
			Outputs disabled		60	90		60	90	

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} = MIN to MAX†, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†				UNIT
			'F241			SN54F241		SN74F241		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	Data (Any A)	Y	1.7	3.6	5.2	1.2	6.5	1.7	6.2	ns
t_{PHL}			1.7	3.6	5.2	1.2	7	1.7	6.5	
t_{PZH}	$1\overline{G}$ or 2G	Y	1.2	3.9	5.7	1.2	7	1.2	6.7	ns
t_{PZL}			1.2	5	7	1.2	8.5	1.2	8	
t_{PHZ}	$1\overline{G}$ or 2G	Y	1.2	4.1	6	1.2	7	1.2	7	ns
t_{PLZ}			1.2	4.1	6	1.2	7.5	1.2	7	

† For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.
‡ 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.
NOTE 1: See Section 1 for load circuits and waveforms.