

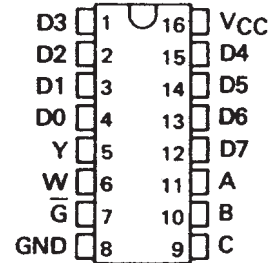
SN54251, SN54LS251 SN54S251, SN74251, SN74LS251, (TIM9905), SN74S251 DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SDLS085 – DECEMBER 1972 – REVISED MARCH 1988

- Three-State Versions of '151, 'LS151, 'S151
- Three-State Outputs Interface Directly with System Bus
- Perform Parallel-to-Serial Conversion
- Permit Multiplexing from N-lines to One Line
- Complementary Outputs Provide True and Inverted Data
- Fully Compatible with Most TTL Circuits

SN54251, SN54LS251, SN54S251 . . . J OR W PACKAGE
SN74251 . . . N PACKAGE
SN74LS251, SN74S251 . . . D OR N PACKAGE

(TOP VIEW)



TYPE	MAX NO. OF COMMON OUTPUTS	TYPICAL AVG PROP DELAY TIME (D TO Y)	TYPICAL POWER DISSIPATION
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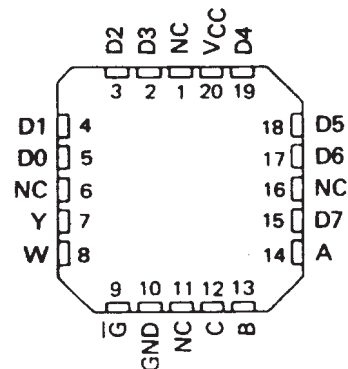
SN54251	49	17 ns	250 mW
SN74251	129	17 ns	250 mW
SN54LS251	49	17 ns	35 mW
SN74LS251	129	17 ns	35 mW
SN54S251	39	8 ns	275 mW
SN74S251	129	8 ns	275 mW

description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select one-of-eight data sources and feature a strobe-controlled three-state output. The strobe must be at a low logic level to enable these devices. The three-state outputs permit a number of outputs to be connected to a common bus. When the strobe input is high, both outputs are in a high-impedance state in which both the upper and lower transistors of each totem-pole output are off, and the output neither drives nor loads the bus significantly. When the strobe is low, the outputs are activated and operate as standard TTL totem-pole outputs.

To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output control circuitry is designed so that the average output disable time is shorter than the average output enable time. The SN54251 and SN74251 have output clamp diodes to attenuate reflections on the bus line.

SN54LS251, SN54S251 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

FUNCTION TABLE

INPUTS				OUTPUTS	
SELECT			ENABLE	Y	W
C	B	A	$\bar{G}$		
X	X	X	H	Z	Z
L	L	L	L	D0	$\bar{D0}$
L	L	H	L	D1	$\bar{D1}$
L	H	L	L	D2	$\bar{D2}$
L	H	H	L	D3	$\bar{D3}$
H	L	L	L	D4	$\bar{D4}$
H	L	H	L	D5	$\bar{D5}$
H	H	L	L	D6	$\bar{D6}$
H	H	H	L	D7	$\bar{D7}$

H = high logic level, L = low logic level

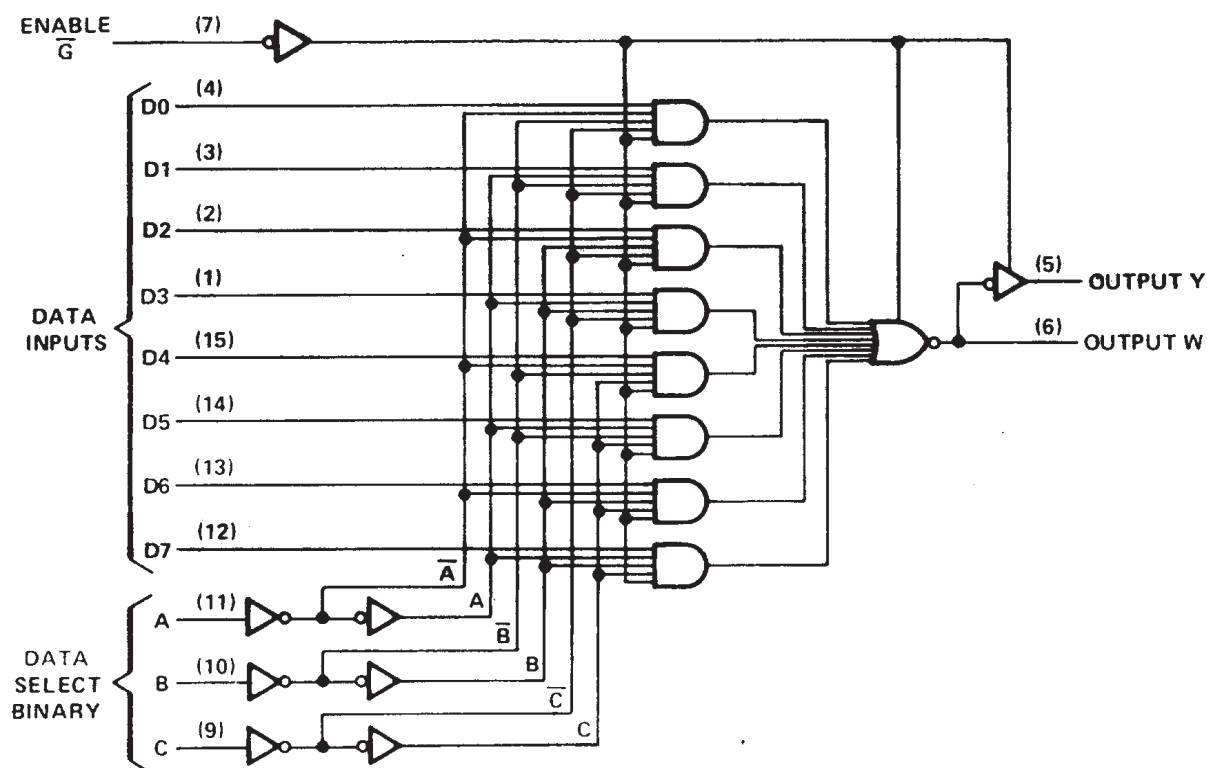
X = irrelevant, Z = high impedance (off)

D0, D1 . . . D7 = the level of the respective D input

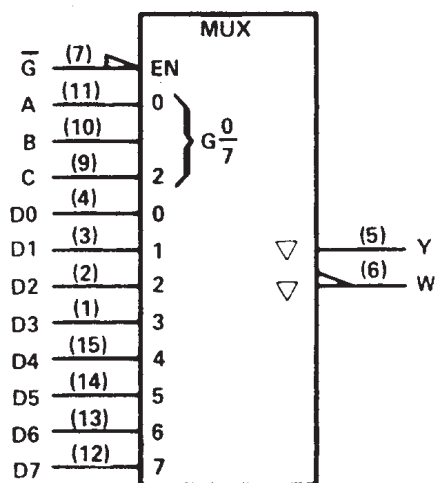
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logic diagram (positive logic)



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, N, and W packages.

SN54251 SN74251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54251	–55°C to 125°C
SN74251	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54251			SN74251			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			–2			–5.2	mA
Low-level output current, I_{OL}			16			16	mA
Operating free-air temperature, T_A	–55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IH}	High-level input voltage			2			V
V_{IL}	Low-level input voltage					0.8	V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN},$ $I_I = -12 \text{ mA}$				–1.5	V
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8 \text{ V},$ $I_{OH} = \text{MAX}$		2.4	3.2		V
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8 \text{ V},$ $I_{OL} = 16 \text{ mA}$			0.2	0.4	V
I_{OZ}	Off-state (high-impedance-state) output current	$V_{CC} = \text{MAX},$ $V_{IH} = 2 \text{ V}$	$V_O = 2.4 \text{ V}$ $V_O = 0.4 \text{ V}$			40 –40	μA
V_O	Output clamp voltage	$V_{CC} = \text{MAX},$ $V_{IH} = 4.5 \text{ V}$	$I_O = -12 \text{ mA}$ $I_O = 12 \text{ mA}$			–1.5 $V_{CC}+1.5$	V
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX},$ $V_I = 5.5 \text{ V}$				1	mA
I_{IH}	High-level input current	$V_{CC} = \text{MAX},$ $V_I = 2.4 \text{ V}$				40	μA
I_{IL}	Low-level input current	$V_{CC} = \text{MAX},$ $V_I = 0.4 \text{ V}$				–1.6	mA
I_{OS}	Short-circuit output current §	$V_{CC} = \text{MAX}$		–18		–55	mA
I_{CC}	Supply current	$V_{CC} = \text{MAX},$ All inputs at 4.5 V, All outputs open			38	62	mA

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

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

§ Not more than one output should be shorted at a time.

SN54251 SN74251,
DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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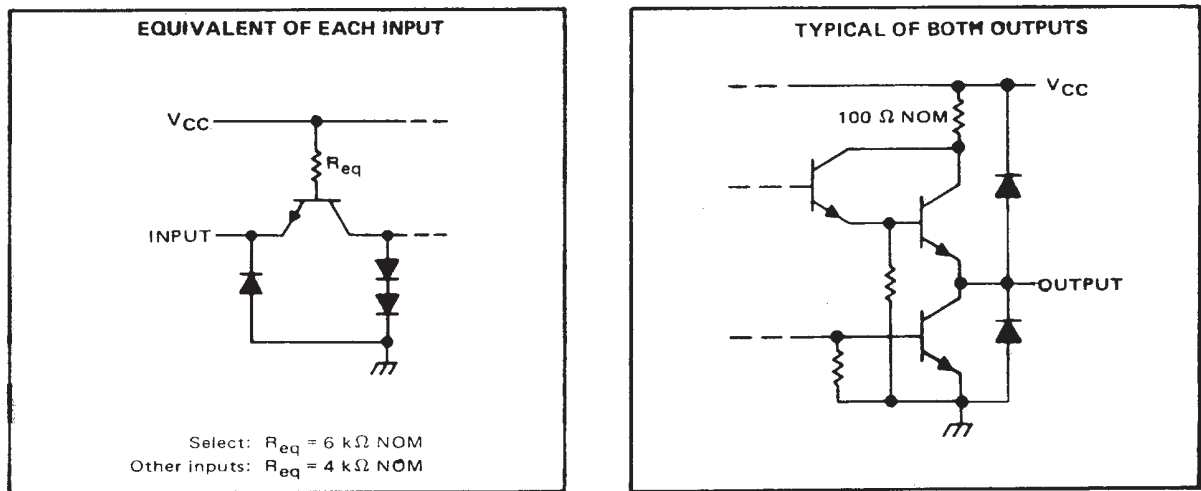
switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	A, B, or C (4 levels)	Y	CL = 50 pF, RL = 400 Ω, See Note 2	29	45	ns	
tPHL				28	45		
tPLH	A, B, or C (3 levels)	W		20	33	ns	
tPHL				21	33		
tPLH	Any D	Y		17	28	ns	
tPHL				18	28		
tPLH	Any D	W		10	15	ns	
tPHL				9	15		
tPZH	G̅	Y		17	27	ns	
tPZL				26	40		
tPZH	G̅	W		17	27	ns	
tPZL				24	40		
tPHZ	G̅	Y	CL = 5 pF, RL = 400 Ω, See Note 2	5	8	ns	
tPLZ				15	23		
tPHZ	G̅	W		5	8	ns	
tPLZ				15	23		

†tPLH = Propagation delay time, low-to-high-level output
tPHL = Propagation delay time, high-to-low-level output
tPZH = Output enable time to high level
tPZL = Output enable time to low level
tPHZ = Output disable time from high level
tPLZ = Output disable time from low level

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



SN54LS251 SN74LS251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS251	55°C to 125°C
SN74LS251	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54LS251			SN74LS251			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage			0.7			0.8	V
I_{OH} High-level output current			– 1			– 2.6	mA
I_{OL} Low-level output current			4			8	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†		SN54LS251		SN74LS251		UNIT
				MIN	TYP ‡	MAX	MIN	
V _{IK}		V _{CC} = MIN, I _I = – 18 mA		– 1.5		– 1.5		V
V _{OH}		V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX I _{OH} = MAX		2.4	3.4	2.4	3.1	V
V _{OL}		V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX		I _{OL} = 4 mA		0.25 0.4		V
				I _{OL} = 8 mA		0.35 0.5		
I _{OZ}		V _{CC} = MAX, V _{IH} = 2 V		V _O = 2.7 V		20		μA
				V _O = 0.4 V		– 20		
I _I		V _{CC} = MAX, V _I = 7 V		0.1		0.1		mA
I _{IH}		V _{CC} = MAX, V _I = 2.7 V		20		20		μA
I _{IL}	Enable $\overline{G}$	V _{CC} = MAX, V _I = 0.4		– 0.2		– 0.2		mA
	All other			– 0.4		– 0.4		
I _{OS} §		V _{CC} = MAX		– 30	– 130	– 30	– 130	mA
I _{CC}		V _{CC} = MAX, See Note 3		Condition A		6.1	10	mA
				Condition B		7.1	12	

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

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

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

NOTE 3: I_{CC} is measured with the outputs open and all data and select inputs at 4.5 V under the following conditions:

- A. Enable grounded.
- B. Strobe at 4.5 V.



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SN54LS251 SN74LS251, (TIM9905),
DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

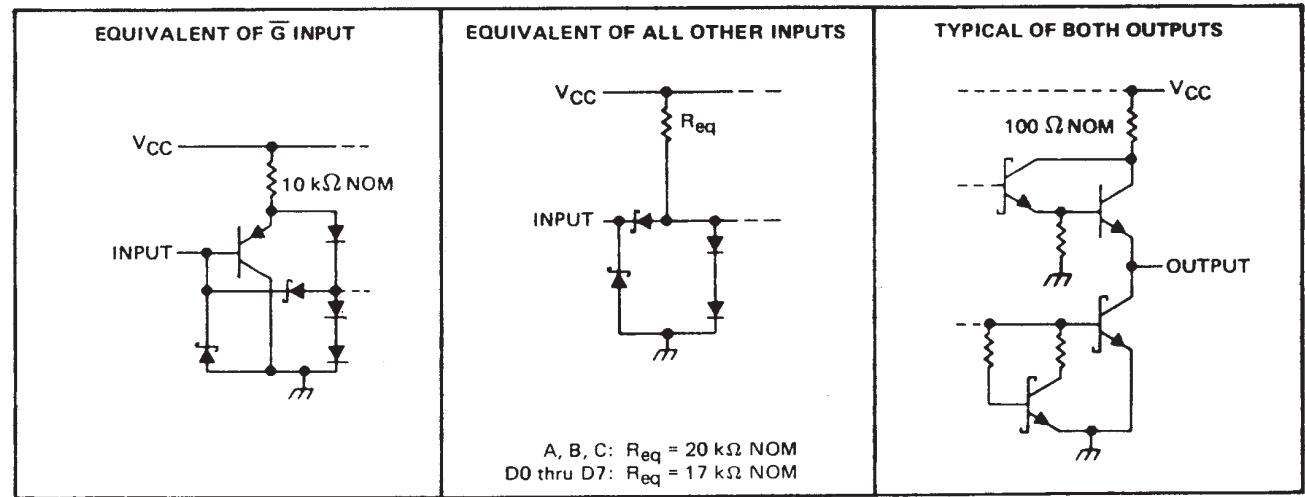
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switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	A, B, or C (4 levels)	Y	C _L = 15 pF, R _L = 2 kΩ, See Note 2	29	45	ns	
tPHL				28	45		
tPLH	A, B, or C (3 levels)	W		20	33	ns	
tPHL				21	33		
tPLH	Any D	Y		17	28	ns	
tPHL				18	28		
tPLH	Any D	W		10	15	ns	
tPHL				9	15		
tPZH	G̅	Y		30	45	ns	
tPZL				26	40		
tPZH	G̅	W		17	27	ns	
tPZL				24	40		
tPHZ	G̅	Y	C _L = 5 pF, R _L = 2 kΩ, See Note 2	30	45	ns	
tPLZ				15	25		
tPHZ	G̅	W		37	55	ns	
tPLZ				15	25		

†tPLH = Propagation delay time, low-to-high-level output
tPHL = Propagation delay time, high-to-low-level output
tPZH = Output enable time to high level
tPZL = Output enable time to low level
tPHZ = Output disable time from high level
tPLZ = Output disable time from low level
NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



SN54S251 SN74S251, DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54S251	–55°C to 125°C
SN74S251	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54S251			SN74S251			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			–2			–6.5	mA
Low-level output current, I_{OL}			20			20	mA
Operating free-air temperature, T_A	–55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IH} High-level input voltage			2			V
V_{IL} Low-level input voltage					0.8	V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN},$	$I_I = -18 \text{ mA}$			–1.2	V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8 \text{ V},$	$V_{IH} = 2 \text{ V},$ $I_{OH} = \text{MAX}$	SN54S'	2.4	3.4	V
			SN74S'	2.4	3.2	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8 \text{ V},$	$V_{IH} = 2 \text{ V},$ $I_{OL} = 20 \text{ mA}$			0.5	V
I_{OZ} Off-state (high-impedance-state) output current	$V_{CC} = \text{MAX},$ $V_{IH} = 2 \text{ V}$	$V_O = 2.4 \text{ V}$			50	μA
		$V_O = 0.5 \text{ V}$			–50	
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX},$	$V_I = 5.5 \text{ V}$			1	mA
I_{IH} High-level input current	$V_{CC} = \text{MAX},$	$V_I = 2.7 \text{ V}$			50	μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX},$	$V_I = 0.5 \text{ V}$			–2	mA
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$		–40		–100	mA
I_{CC} Supply current	$V_{CC} = \text{MAX},$ All inputs at 4.5 V, All outputs open			55	85	mA

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

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

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

SN54S251 SN74S251,
DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

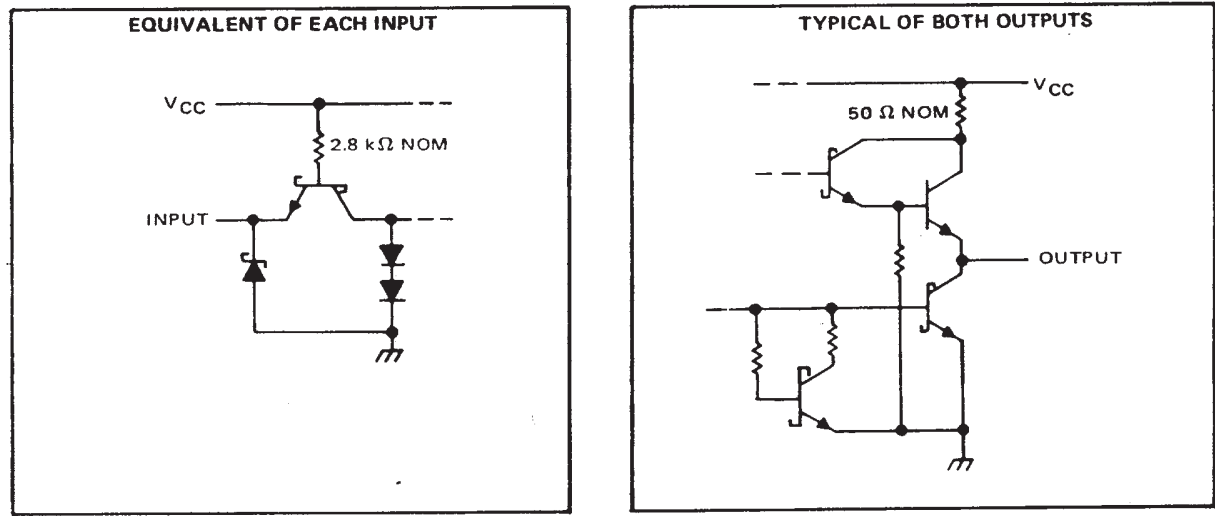
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switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	A, B, or C (4 levels)	Y	CL = 15 pF, RL = 280 Ω, See Note 2	12	18	ns	
tPHL				13	19.5		
tPLH	A, B, or C (3 levels)	W		10	15	ns	
tPHL				9	13.5		
tPLH	Any D	Y		8	12	ns	
tPHL				8	12		
tPLH	Any D	W		4.5	7	ns	
tPHL				4.5	7		
tPZH	G	Y	CL = 50 pF, RL = 280 Ω, See Note 2	13	19.5	ns	
tPZL				14	21		
tPZH	G	W		13	19.5	ns	
tPZL				14	21		
tPHZ	G	Y	CL = 5 pF, RL = 280 Ω, See Note 2	5.5	8.5	ns	
tPLZ				9	14		
tPHZ	G	W		5.5	8.5	ns	
tPLZ				9	14		

†t_{PLH} = Propagation delay time, low-to-high-level output
t_{PHL} = Propagation delay time, high-to-low-level output
t_{PZH} = Output enable time to high level
t_{PZL} = Output enable time to low level
t_{PHZ} = Output disable time from high level
t_{PLZ} = Output disable time from low level
NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
7601601EA	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
7601601FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
7601601FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
80022012A	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
80022012A	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
8002201EA	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
8002201EA	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
8002201FA	OBSOLETE	CFP	W	16		TBD	Call TI	Call TI
8002201FA	OBSOLETE	CFP	W	16		TBD	Call TI	Call TI
JM38510/07905BEA	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
JM38510/07905BEA	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
JM38510/30905B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/30905B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
JM38510/30905BEA	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
JM38510/30905BEA	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
JM38510/30905BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
JM38510/30905BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
SN54251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN54251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN54LS251J	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
SN54LS251J	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
SN54S251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN54S251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN74251N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74251N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74LS251D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS251N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74LS251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74LS251NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS251NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS251NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS251NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74S251D	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
SN74S251D	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
SN74S251N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74S251N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74S251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SN74S251N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
SNJ54251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SNJ54251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SNJ54LS251FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54LS251FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ54LS251J	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ54LS251J	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ54LS251W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
SNJ54LS251W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type
SNJ54S251FK	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
SNJ54S251FK	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
SNJ54S251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SNJ54S251J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SNJ54S251W	OBSOLETE	CFP	W	16		TBD	Call TI	Call TI
SNJ54S251W	OBSOLETE	CFP	W	16		TBD	Call TI	Call TI

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements

for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD 1835 GDFP1-F16 and JEDEC MO-092AC

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - The terminals are gold plated.
 - Falls within JEDEC MS-004

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



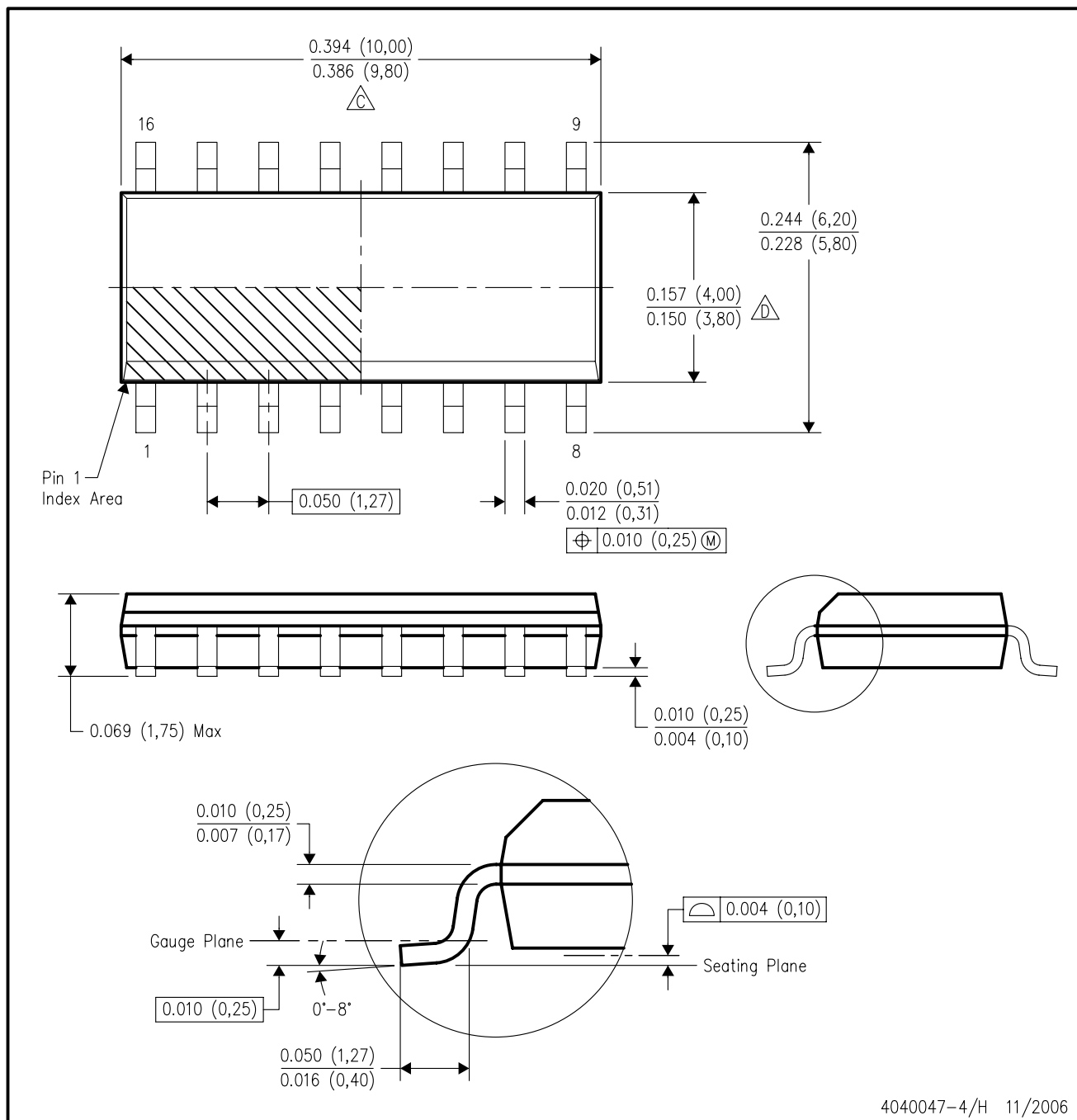
4040049/E 12/2002

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.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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