8-Input Data Selector/ Multiplexer with 3-State Outputs

High-Performance Silicon-Gate CMOS

The MC54/74HC251 is identical in pinout to the LS251. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

This device selects one of the eight binary Data Inputs, as determined by the Address Inputs. The Output Enable pin must be a low level for the selected data to appear at the outputs. If Output Enable is high, both the Y and the \overline{Y} outputs are in the high-impedance state. This 3-state feature allows the HC251 to be used in bus-oriented systems.

The HC251 is similar in function to the HC251 which does not have 3-state outputs.

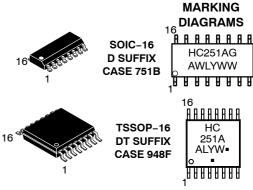
Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μA
- High Noise Immunity Characteristic of CMOS Devices
- These are Pb-Free Devices



ON Semiconductor®

http://onsemi.com



A = Assembly Location

WL, L = Wafer Lot YY, Y = Year WW, W = Work Week G or = Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT

D3 [1 ●	16	v _{cc}
D2 [2	15	D4
D1 [3	14	D5
D0 [4	13	D6
Υ[5	12	D7
₹ [6	11	A0
OUTPUT ENABLE	7	10	A1
GND [8	9	A2

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

DATA INPUTS $\begin{cases} D0 & \frac{4}{01} \\ D1 & \frac{3}{3} \\ D2 & \frac{2}{2} \\ D3 & \frac{1}{1} \\ D4 & \frac{15}{14} \\ D5 & \frac{14}{12} \\ D6 & \frac{13}{12} \\ D7 & \frac{12}{12} \end{cases}$ ADDRESS And 11 And 10 And 10

Figure 1. Logic Diagram

FUNCTION TABLE

	ı	Out	outs		
A2	A 1	Α0	Output Enabled	Y	7
X L L H H	X L H H L H	X L H L H L	H L L L L	Z D0 D1 D2 D3 D4 D5 D6	Z D0 D1 D2 D3 D4 D5 D6 D7

Z = high impedance

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

MAXIMUM RATINGS

Symbol	Parameter	Parameter		Unit
V _{CC}	DC Supply Voltage (Referenced	-0.5 to + 7.0	V	
V _{in}	DC Input Voltage (Referenced to	GND)	-1.5 to V _{CC} + 1.5	V
V _{out}	DC Output Voltage (Referenced	DC Output Voltage (Referenced to GND)		
I _{in}	DC Input Current, per Pin	±25	mA	
l _{out}	DC Output Current, per Pin	DC Output Current, per Pin		
I _{CC}	DC Supply Current, V _{CC} and GN	urrent, V _{CC} and GND Pins		mA
P _D	Power Dissipation in Still Air	in Still Air SOIC Package TSSOP Package		mW
T _{stg}	Storage Temperature		-65 to + 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high–impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND \leq (V_{in} or V_{out}) \leq V_{CC} .

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter			Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)			6.0	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Referenced to GND)			V _{CC}	V
T _A	Operating Temperature, All Package Types			+125	°C
t _r , t _f	Input Rise and Fall Time $ \begin{array}{c} V_{CC} = 2.0 \ V \\ (\text{Figure 2}) \end{array} $ $ \begin{array}{c} V_{CC} = 4.5 \ V \\ V_{CC} = 6.0 \ V \end{array} $		0 0 0	1000 500 400	ns

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

				Gu	aranteed Li	mit	
Symbol	Parameter	Test Conditions	V _{CC}	– 55 to 25°C	≤ 85 °C	≤ 125°C	Unit
V _{IH}	Minimum High-Level Input Voltage	V_{out} = 0.1 V or V_{CC} - 0.1 V $ I_{out} \le 20 \mu A$	2.0 4.5 6.0	1.5 3.15 4.2	1.5 3.15 4.2	1.5 3.15 4.2	V
V _{IL}	Maximum Low-Level Input Voltage	V_{out} = 0.1 V or V_{CC} – 0.1 V $ I_{out} \le 20 \mu A$	2.0 4.5 6.0	0.3 0.9 1.2	0.3 0.9 1.2	0.3 0.9 1.2	٧
V _{OH}	Minimum High-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \le 20 \mu\text{A}$	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	٧
		$V_{in} = V_{IH} \text{ or } V_{IL} \qquad \begin{vmatrix} I_{out} \end{vmatrix} \le 4.0 \text{ mA} \\ I_{out} \le 5.2 \text{ mA} \end{vmatrix}$	4.5 6.0	3.98 5.48	3.84 5.34	3.70 5.20	
V _{OL}	Maximum Low-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \le 20 \mu A$	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		$V_{in} = V_{IH} \text{ or } V_{IL} \qquad \begin{vmatrix} I_{out} \end{vmatrix} \le 4.0 \text{ mA} \\ I_{out} \le 5.2 \text{ mA} \end{vmatrix}$	4.5 6.0	0.26 0.26	0.33 0.33	0.40 0.40	
l _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μΑ
I _{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State $V_{in} = V_{IL}$ or V_{IH} $V_{out} = V_{CC}$ or GND	6.0	± 0.5	± 5.0	± 10	μΑ
I _{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC}$ or GND $I_{out} = 0 \mu A$	6.0	8	80	160	μΑ

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

			Guaranteed Limit			
Symbol	Parameter	V _{CC}	– 55 to 25°C	≤ 85 °C	≤ 125°C	Unit
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input D to Output Y or ₹ (Figures 2, 3 and 6)	2.0 4.5 6.0	185 37 31	230 46 39	280 56 48	ns
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A to Output Y or ₹ (Figures 3 and 6)	2.0 4.5 6.0	205 41 35	255 51 43	310 62 53	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 5 and 7)	2.0 4.5 6.0	195 39 33	245 49 42	295 59 50	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 5 and 7)	2.0 4.5 6.0	145 29 25	180 36 31	220 44 38	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to Output ₹ (Figures 5 and 7)	2.0 4.5 6.0	220 44 37	275 55 47	330 66 56	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Output \overline{Y} (Figures 5 and 7)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 2 and 6)	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
C _{in}	Maximum Input Capacitance	-	10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	-	15	15	15	pF

		Typical @ 25°C, V _{CC} = 5.0 V	
C_{PD}	Power Dissipation Capacitance (Per Package)	36	pF

PIN DESCRIPTIONS

INPUTS

D0, D1, ..., D7 (Pins 4, 3, 2, 1, 15, 14, 13, 12)

Data inputs. Data on one of these eight binary inputs may be selected to appear on the output.

CONTROL INPUTS

A0, A1, A2 (Pins 11, 10, 9)

Address inputs. The data on these pins are the binary address of the selected input (see the Function Table).

Output Enable (Pin 7)

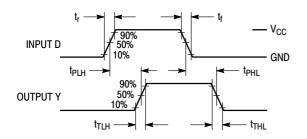
Output Enable. This input pin must be at a low level for the selected data to appear at the outputs. If the Output Enable pin is high, both the Y and \overline{Y} outputs are taken to the high–impedance state.

OUTPUTS

Y, ₹ (Pins 5, 6)

Data outputs. The selected data is presented at these pins in both true (Y output) and complemented (\overline{Y} output) forms.

SWITCHING WAVEFORMS



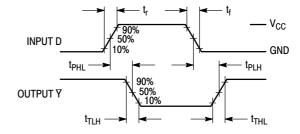
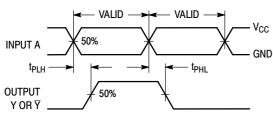
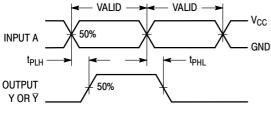


Figure 2.

Figure 3.

 V_{CC}



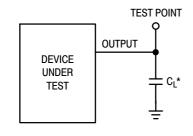


OUTPUT 50% **ENABLE** GND t_{PZL} t_{PLZ} HIGH **IMPEDANCE** 50% Y OR \(\overline{Y} \) 10% V_{OL} -t_{PZH} t_{PHZ} - V_{OH} 90% **∀** OR Y 50% HIGH **IMPEDANCE**

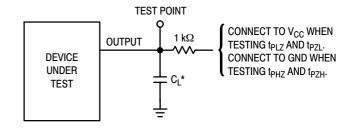
Figure 4.

Figure 5.

TEST CIRCUITS



*Includes all probe and jig capacitance



*Includes all probe and jig capacitance

Figure 6. Figure 7.

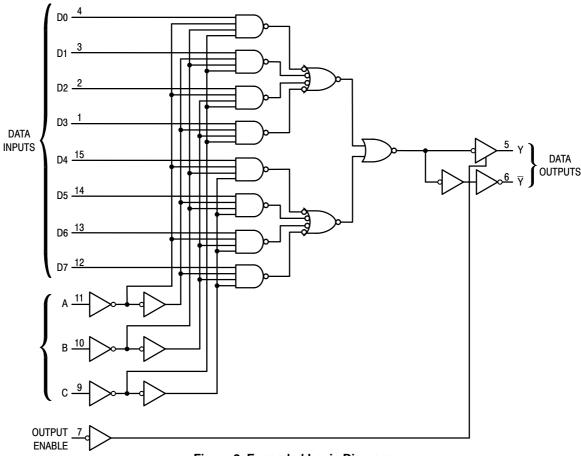


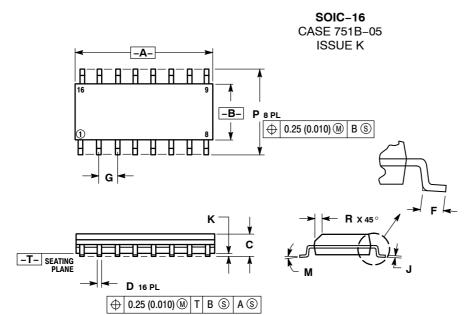
Figure 8. Expanded Logic Diagram

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HC251ADG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74HC251ADR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74HC251ADTR2G	TSSOP-16*	2500 Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D. *This package is inherently Pb–Free.

PACKAGE DIMENSIONS



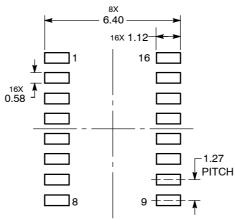
- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTECTION OF THE PROTECTION OF THE PROTECTION OF THE PROTECTION OF THE PROT

- DIMENSIONS A MAID B DO NOT INCLUDE MOLD PROTRUSION.

 MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	9.80	10.00	0.386	0.393
В	3.80	4.00	0.150	0.157
С	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27	BSC	0.050	BSC
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT*

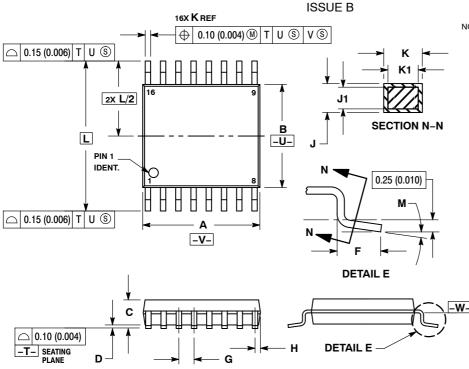


DIMENSIONS: MILLIMETERS

^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

TSSOP-16 **DT SUFFIX** CASE 948F-01



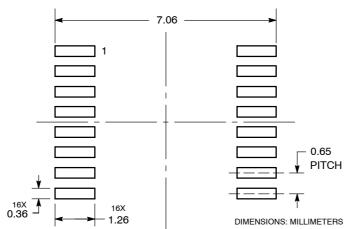
- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS.
- FLASH. PROTRUSIONS OR GATE BURRS.
 MOLD FLASH OR GATE BURRS SHALL NOT
 EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE
 INTERLEAD FLASH OR PROTRUSION.
 INTERLEAD FLASH OR PROTRUSION SHALL
 NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE
 DAMBAR BROTTUSION ALL OWARLE
- DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR
- REFERENCE ONLY.

 7. DIMENSION A AND B ARE TO BE

 DETERMINED AT DATUM PLANE—W

DETE	MILLIN	IETERS		HES .
DIM	MIN	MAX	MIN	MAX
Α	4.90	5.10	0.193	0.200
В	4.30	4.50	0.169	0.177
С		1.20		0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65	BSC	0.026	BSC
Н	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40	BSC	0.252 BSC	
М	0 °	8°	0 °	8°

SOLDERING FOOTPRINT*



*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor P.O. Box 5163, Denver, Colorado 80217 USA Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada Email: orderlit@onsemi.com N. American Technical Support: 800-282-9855 Toll Free USA/Canada

Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910 Japan Customer Focus Center Phone: 81-3-5773-3850 ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative