

54150/DM54150/DM74150, 54151A/DM54151A/DM74151A Data Selectors/Multiplexers

General Description

These data selectors/multiplexers contain full on-chip decoding to select the desired data source. The 150 selects one-of-sixteen data sources; the 151A selects one-of-eight data sources. The 150 and 151A have a strobe input which must be at a low logic level to enable these devices. A high level at the strobe forces the W output high and the Y output (as applicable) low.

The 151A features complementary W and Y outputs, whereas the 150 has an inverted (W) output only.

The 151A incorporates address buffers which have symmetrical propagation delay times through the complementary paths. This reduces the possibility of transients occurring at the output(s) due to changes made at the select inputs, even when the 151A outputs are enabled (i.e., strobe low).

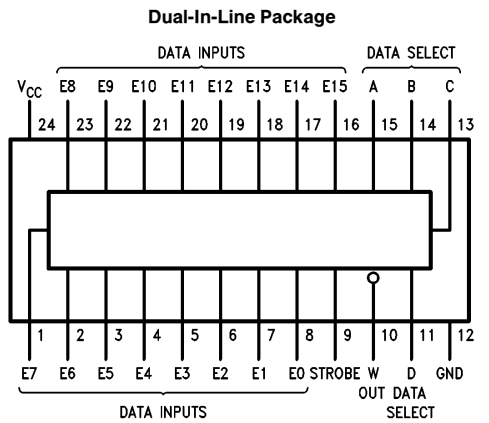
Features

- 150 selects one-of-sixteen data lines
- 151A selects one-of-eight data lines
- Performs parallel-to-serial conversion
- Permits multiplexing from N lines to one line
- Also for use as Boolean function generator
- Typical average propagation delay time, data input to W output

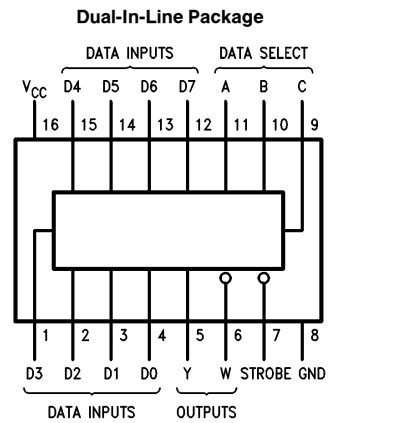
150	11 ns
151A	9 ns
- Typical power dissipation

150	200 mW
151A	135 mW
- Alternate Military/Aerospace device (54150, 54151A) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagrams



Order Number 54150DQMB, 54150FMQB,
DM54150J or DM74150N
See NS Package Number J24A, N24A or W24C



Order Number 54151ADMQB, 54151AFMQB,
DM54151AJ, DM54151AW or DM74151AN
See NS Package Number J16A, N16E or W16A

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54 and 54	–55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	–65°C to +150°C

Note: The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the “Electrical Characteristics” table are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	DM54150			DM74150			Units
		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			0.8			0.8	V
I _{OH}	High Level Output Current			–0.8			–0.8	mA
I _{OL}	Low Level Output Current			16			16	mA
T _A	Free Air Operating Temperature	–55		125	0		70	°C

’150 Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = –12 mA			–1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	2.4			V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max			0.4	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.4V			40	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V			–1.6	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54	–20	–55	mA
			DM74	–18	–55	
I _{CC}	Supply Current	V _{CC} = Max, (Note 3)		40	68	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC} is measured with the strobe and data select inputs at 4.5V, all other inputs and outputs open.

'150 Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega, C_L = 15\text{ pF}$		Units
			Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	Select to W		35	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select to W		33	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Strobe to W		24	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Strobe to W		30	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	E0-E15 to W		20	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	E0-E15 to W		14	ns

Recommended Operating Conditions

Symbol	Parameter	DM54151A			DM74151A			Units
		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			0.8			0.8	V
I_{OH}	High Level Output Current			-0.8			-0.8	mA
I_{OL}	Low Level Output Current			16			16	mA
T_A	Free Air Operating Temperature	-55		125	0		70	$^\circ C$

'151A Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -12 \text{ mA}$			-1.5	V
V_{OH}	High Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	2.4			V
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			0.4	V
I_I	Input Current @ Max 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	$V_{CC} = \text{Max}$ (Note 2)	DM54	-20	-55	mA
			DM74	-18	-55	
I_{CC}	Supply Current	$V_{CC} = \text{Max},$ (Note 3)		27	48	mA

Note 1: All typicals are at $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC} is measured with the strobe and data select inputs at 4.5V, all other inputs and outputs open.

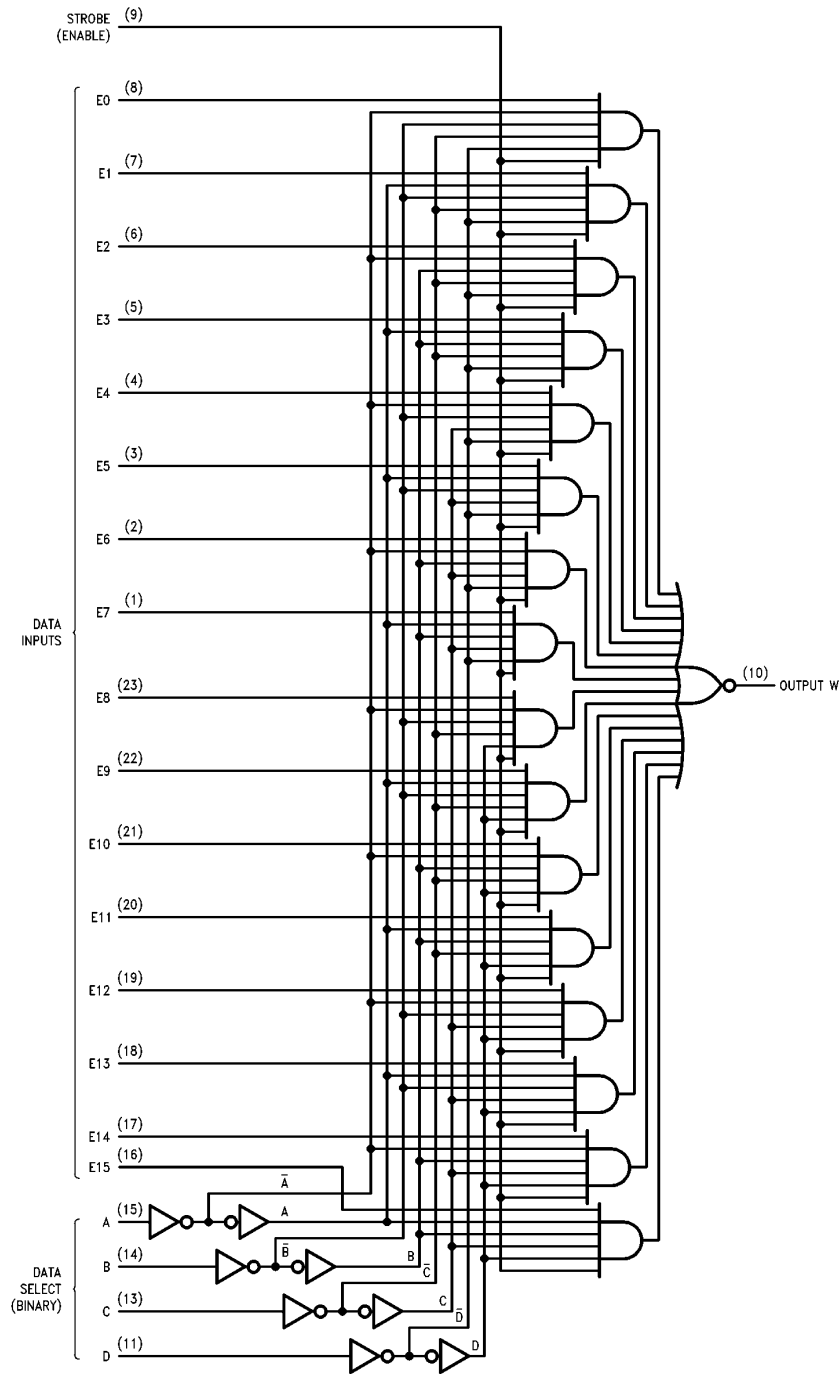
'151A Switching Characteristics

at $V_{CC} = 5\text{V}$ and $T_A = 25^\circ\text{C}$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega, C_L = 15 \text{ pF}$		Units
			Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	Select (4 Levels) to Y		38	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select (4 Levels) to Y		30	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Select (3 Levels) to W		26	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select (3 Levels) to W		30	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Strobe to Y		33	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Strobe to Y		30	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Strobe to W		21	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Strobe to W		25	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	D0-D7 to Y		24	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	D0-D7 to Y		24	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	D0-D7 to W		14	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	D0-D7 to W		14	ns

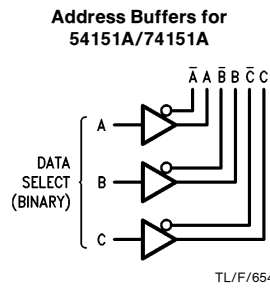
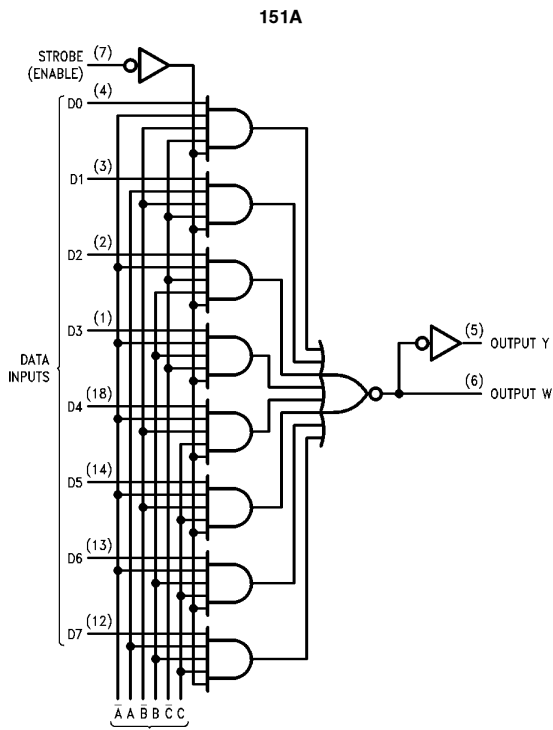
Logic Diagrams

150



TL/F/6546-3

Logic Diagrams



See Address Buffers Below

TL/F/6546-4

Function Tables

54150/74150

Inputs					Strobe S	Outputs W
Select						
D	C	B	A			
X	X	X	X	H	H	
L	L	L	L	L	$\overline{E0}$	
L	L	L	H	L	$\overline{E1}$	
L	L	H	L	L	$\overline{E2}$	
L	L	H	H	L	$\overline{E3}$	
L	H	L	L	L	$\overline{E4}$	
L	H	L	H	L	$\overline{E5}$	
L	H	H	L	L	$\overline{E6}$	
L	H	H	H	L	$\overline{E7}$	
H	L	L	L	L	$\overline{E8}$	
H	L	L	H	L	$\overline{E9}$	
H	L	H	L	L	$\overline{E10}$	
H	L	H	H	L	$\overline{E11}$	
H	H	L	L	L	$\overline{E12}$	
H	H	L	H	L	$\overline{E13}$	
H	H	H	L	L	$\overline{E14}$	
H	H	H	H	L	$\overline{E15}$	

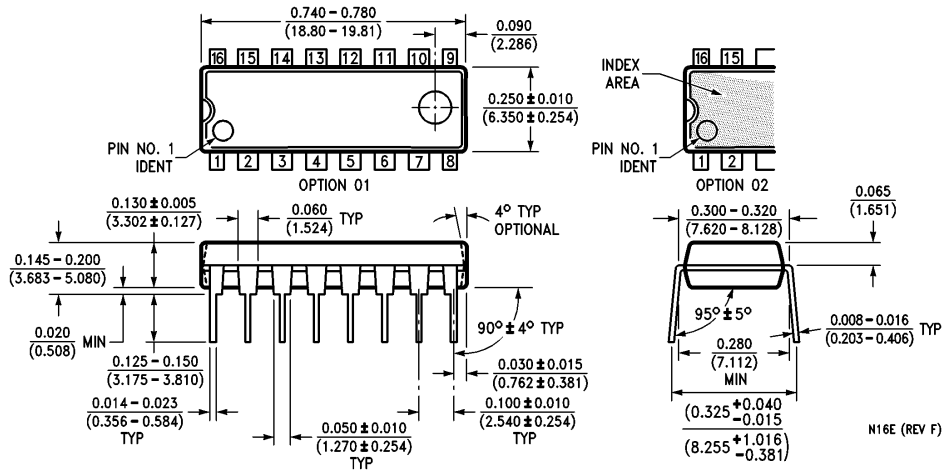
H = High Level, L = Low Level, X = Don't Care
 $\overline{E0}, \overline{E1} \dots \overline{E15}$ = the complement of the level of the respective E input

54151A/75151A

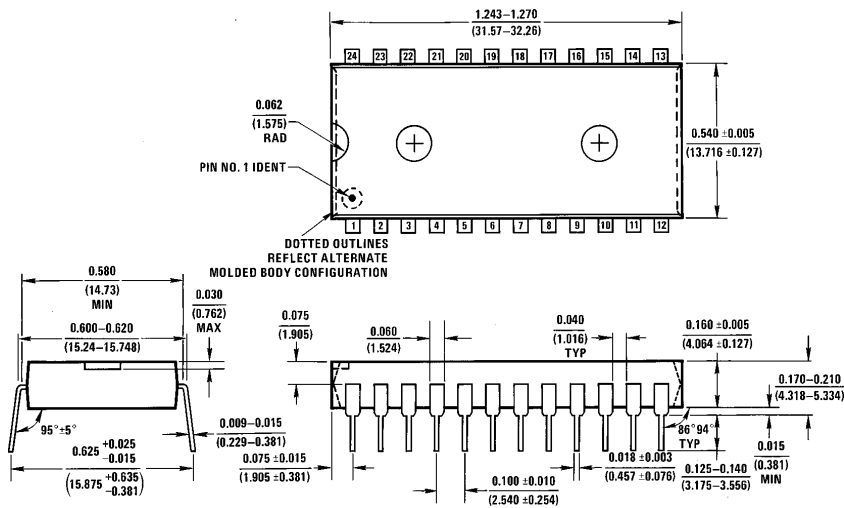
Inputs				Outputs	
Select			Strobe S	Y	W
C	B	A			
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

H = High Level, L = Low Level, X = Don't Care
D0, D1 ... D7 = the level of the respective D input

Physical Dimensions inches (millimeters) (Continued)

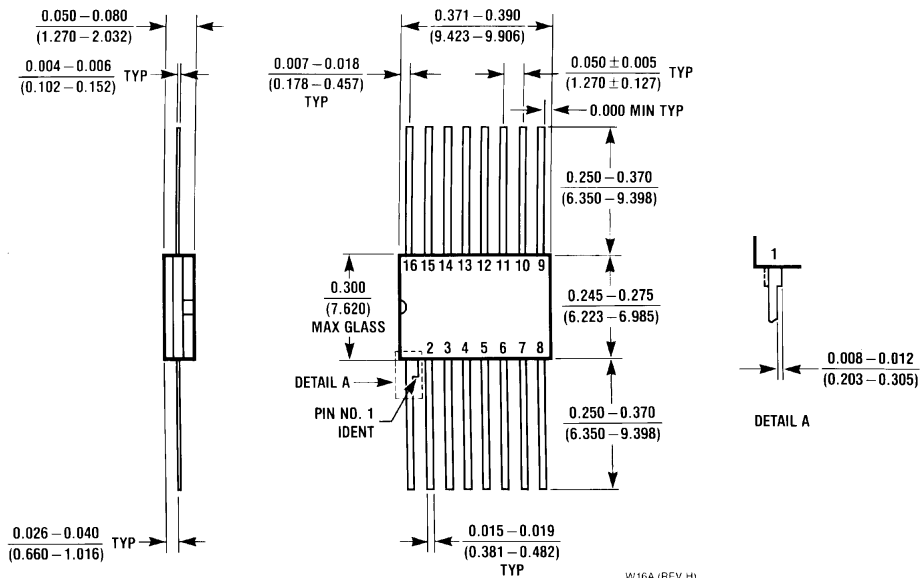


16-Lead Molded Dual-In-Line Package (N)
Order Number DM74151AN
NS Package Number N16E



24-Lead Molded Dual-In-Line Package (N)
Order Number DM74150N
NS Package Number N24A

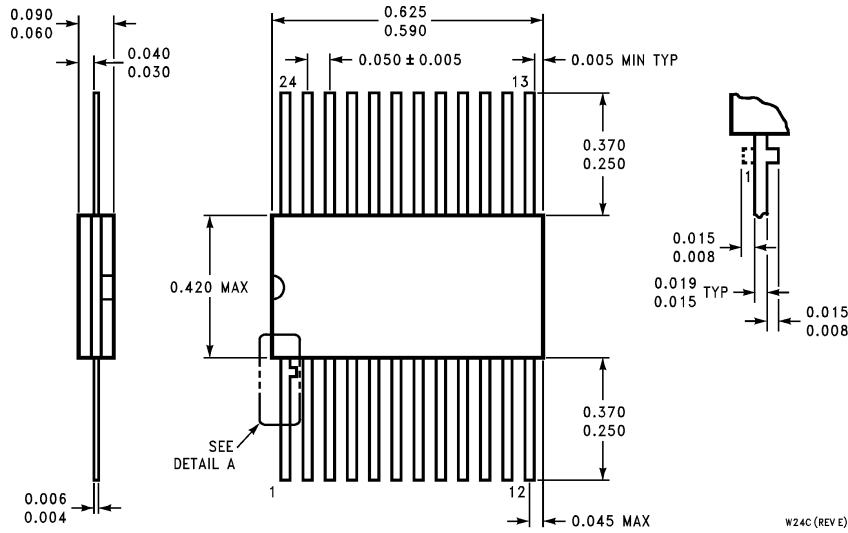
Physical Dimensions inches (millimeters) (Continued)



16-Lead Ceramic Flat Package (W)
Order Number 54151AFMQB or DM54151AW
NS Package Number W16A

W16A (REV H)

Physical Dimensions inches (millimeters) (Continued)



24-Lead Ceramic Flat Package (W)
Order Number 54150FMQB
NS Package Number W24C

W24C (REV E)

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.