



## 9311/DM9311 4-Line to 16-Line Decoders/Demultiplexers

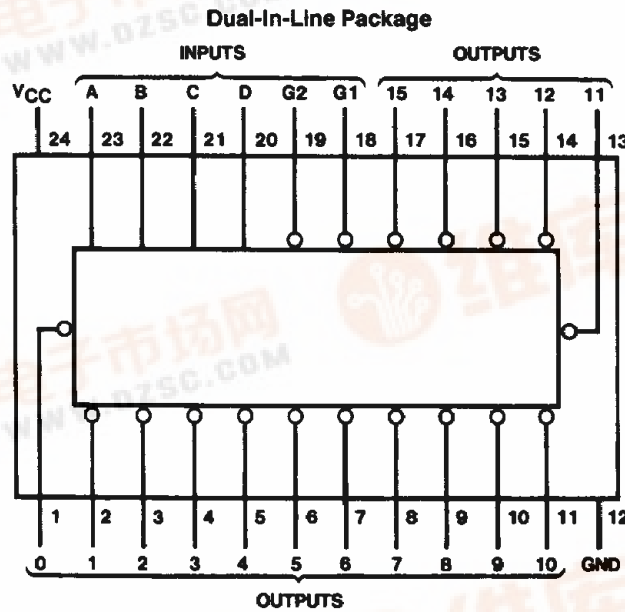
### General Description

Each of these 4-line-to-16-line decoders utilizes TTL circuitry to decode four binary-coded inputs into one of sixteen mutually exclusive outputs when both the strobe inputs, G1 and G2, are low. The demultiplexing function is performed by using the 4 input lines to address the output line, passing data from one of the strobe inputs with the other strobe input low. When either strobe input is high, all outputs are high. These demultiplexers are ideally suited for implementing high-performance memory decoders. All inputs are buffered and input clamping diodes are provided to minimize transmission-line effects and thereby simplify system design.

### Features

- Pin for pin with popular DM54154/74154
- Decodes 4 binary-coded inputs into one of 16 mutually exclusive outputs
- Performs the demultiplexing function by distributing data from one input line to any one of 16 outputs
- Input clamping diodes simplify system design
- High fan-out, low-impedance, totem-pole outputs
- Typical propagation delay 19 ns
- Typical power dissipation 170 mW
- Alternate Military/Aerospace device (9311) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

### Connection Diagram



TL/F/6604-1



### 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	
Military	−55°C to +125°C
Commercial	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	Military			Commercial			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.8			0.8	V
I <sub>OH</sub>	High Level Output Current			−0.8			−0.8	mA
I <sub>OL</sub>	Low Level Output Current			16			16	mA
T <sub>A</sub>	Free Air Operating Temperature	−55		125	0		70	°C

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units	
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = −12 mA			−1.5	V	
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max V <sub>IL</sub> = Max, V <sub>IH</sub> = Min	2.4	3.4		V	
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max V <sub>IH</sub> = Min, V <sub>IL</sub> = Max		0.25	0.4	V	
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V			1	mA	
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V			40	μA	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			−1.6	mA	
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	MIL	−20	−55	mA	
			COM	−18	−57		
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max (Note 3)	MIL		34	49	mA
			COM		34	56	

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

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

Note 3: I<sub>CC</sub> is measured with all inputs grounded and all outputs open.

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

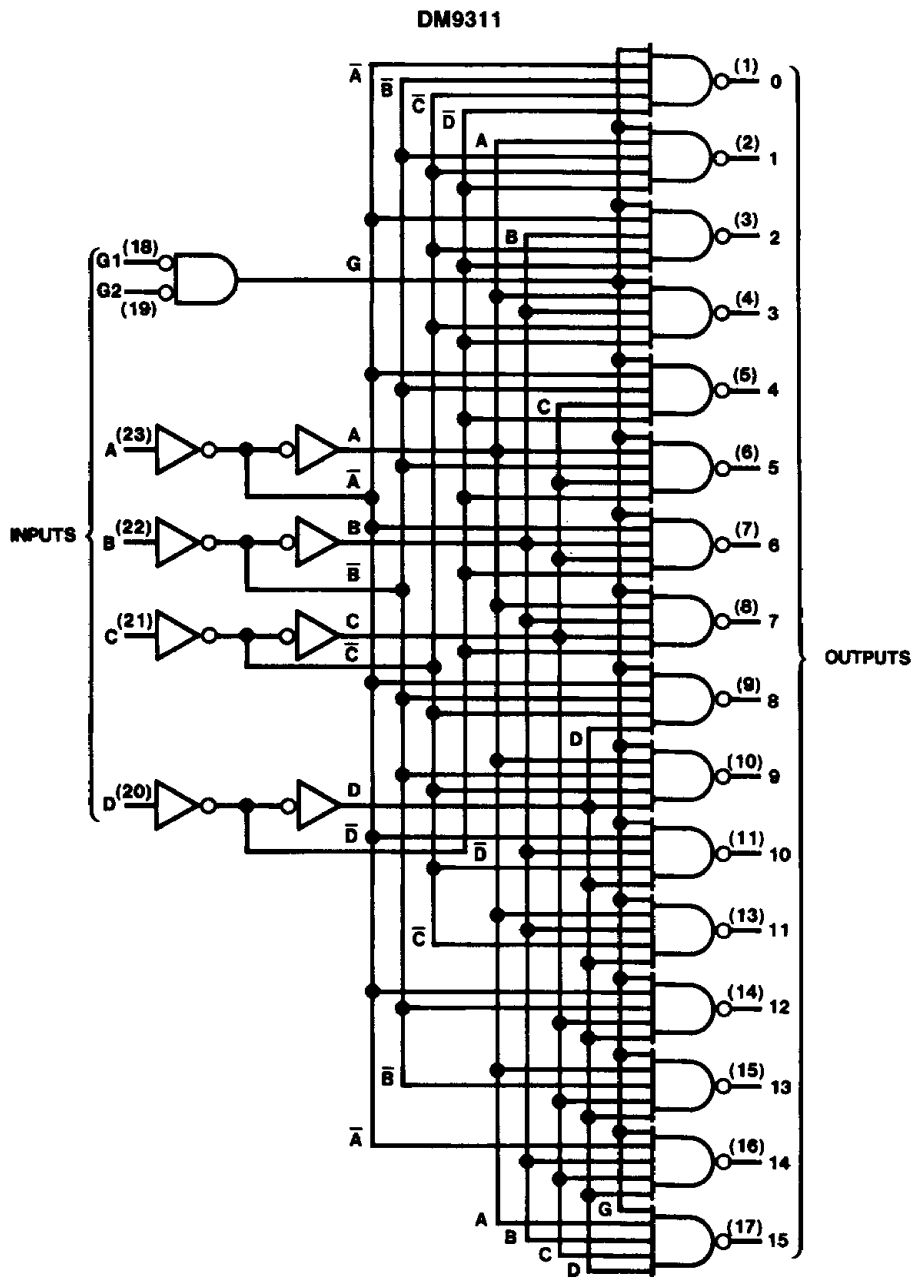
Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega, C_L = 15\text{ pF}$		Units
			Min	Max	
$t_{PLH}$	Propagation Delay Time Low to High Level Output	Data to Output		27	ns
$t_{PHL}$	Propagation Delay Time High to Low Level Output	Data to Output		30	ns
$t_{PLH}$	Propagation Delay Time Low to High Level Output	Strobe to Output		25	ns
$t_{PHL}$	Propagation Delay Time High to Low Level Output	Strobe to Output		27	ns

**Function Table**

Inputs					Outputs																	
G1	G2	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	L	L	H	H	L	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

H = High Level, L = Low Level, X = Don't Care.

# Logic Diagram



TL/F/6604-2