



## 93L21

### Dual 1-of-4 Decoder

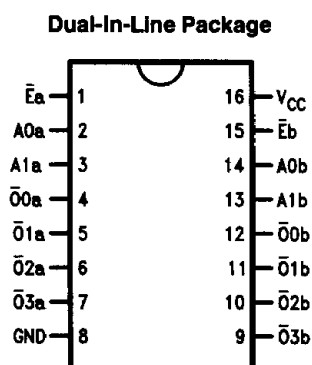
#### General Description

The 93L21 consists of two independent multipurpose decoders, each designed to accept two inputs and provide four mutually exclusive outputs. In addition an active LOW enable input, which gives demultiplexing capability, is provided for each decoder.

#### Features

- Multifunction capability
- Mutually exclusive outputs
- Demultiplexing capability
- Active low enable for each decoder

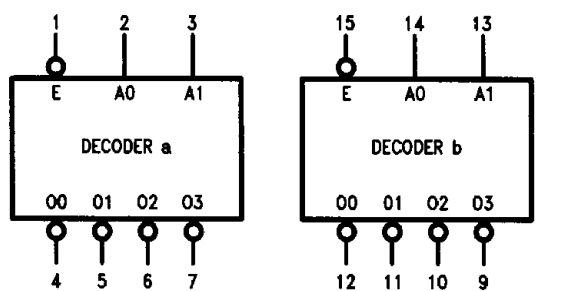
#### Connection Diagram



TL/F/10197-1

Order Number 93L21DMQB or 93L21FMQB  
See NS Package Number J16A or W16A

#### Logic Symbol



VCC = Pin 16  
GND = Pin 8

TL/F/10197-2

| Pin Names              | Description                  |
|------------------------|------------------------------|
| $\bar{E}_a, \bar{E}_b$ | Enable Inputs (Active LOW)   |
| A0a, A1a, A0b, A1b     | Address Inputs               |
| $\bar{O}0a-\bar{O}3a$  | Decoder Outputs (Active LOW) |
| $\bar{O}0b-\bar{O}3b$  |                              |

**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 |                 |
| MIL                                  | −55°C to +125°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                 | 93L12 (MIL) |     |      | Units |
|-----------------|---------------------------|-------------|-----|------|-------|
|                 |                           | Min         | Nom | Max  |       |
| V <sub>CC</sub> | Supply Voltage            | 4.5         | 5   | 5.5  | V     |
| V <sub>IH</sub> | High Level Input Voltage  | 2           |     |      | V     |
| V <sub>IL</sub> | Low Level Input Voltage   |             |     | 0.7  | V     |
| I <sub>OH</sub> | High Level Output Current |             |     | −400 | μA    |
| I <sub>OL</sub> | Low Level Output Current  |             |     | 4.8  | mA    |
| T <sub>A</sub>  | Free Air Operating        | −55         |     | 125  | °C    |

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

| Symbol          | Parameter                         | Conditions                                                                                    | Min  | Typ<br>(Note 1) | Max  | Units |
|-----------------|-----------------------------------|-----------------------------------------------------------------------------------------------|------|-----------------|------|-------|
| V <sub>I</sub>  | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = −10 mA                                                |      |                 | −1.5 | V     |
| V <sub>OH</sub> | High Level Output Voltage         | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max,<br>V <sub>IL</sub> = Max, V <sub>IH</sub> = Min | 2.4  |                 |      | V     |
| V <sub>OL</sub> | Low Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max,<br>V <sub>IH</sub> = Min, V <sub>IL</sub> = Max |      |                 | 0.3  | 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                                                  |      |                 | 20   | μA    |
| I <sub>IL</sub> | Low Level Input Current           | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.3V                                                  |      |                 | −400 | μA    |
| I <sub>OS</sub> | Short Circuit Output Current      | V <sub>CC</sub> = Max<br>(Note 2)                                                             | −2.5 |                 | −25  | mA    |
| I <sub>CC</sub> | Supply Current                    | V <sub>CC</sub> = Max (Note 3)                                                                |      |                 | 13.2 | mA    |

**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, and the duration should not exceed one second.

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

Functional Description

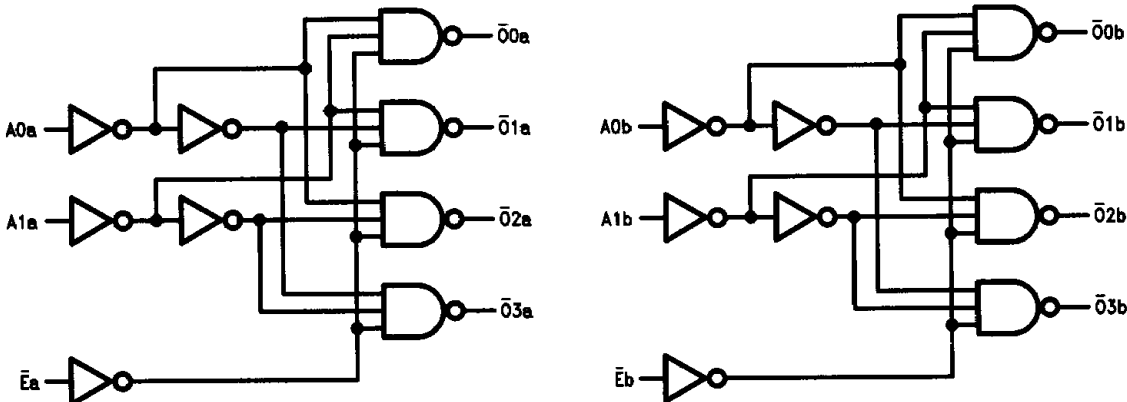
The 93L21 consists of two separate decoders each designed to accept two binary weighted inputs and provide four mutually exclusive active LOW outputs as shown in the logic symbol. Each decoder can be used as a 4-output demultiplexer by using the enable as a data input.

Truth Table (Each Decoder)

| Inputs    |    |    | Outputs    |            |            |            |
|-----------|----|----|------------|------------|------------|------------|
| $\bar{E}$ | A0 | A1 | $\bar{O}0$ | $\bar{O}1$ | $\bar{O}2$ | $\bar{O}3$ |
| L         | L  | L  | L          | H          | H          | H          |
| L         | H  | L  | H          | L          | H          | H          |
| L         | L  | H  | H          | H          | L          | H          |
| L         | H  | H  | H          | H          | H          | L          |
| H         | X  | X  | H          | H          | H          | H          |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

Logic Diagram



TL/F/10197-3

Switching Characteristics  $V_{CC} = +5.0V, T_A = +25^{\circ}C$  (See Section 1 for test waveforms and output load.)

| Symbol       | Parameter                                     | $C_L = 15\text{ pF}$ |          | Units |
|--------------|-----------------------------------------------|----------------------|----------|-------|
|              |                                               | Min                  | Max      |       |
| tPLH<br>tPHL | Propagation Delay<br>An to $\bar{O}n$         |                      | 50<br>65 | ns    |
| tPLH<br>tPHL | Propagation Delay<br>$\bar{E}n$ to $\bar{O}n$ |                      | 40<br>52 | ns    |