

## 54F240/54F241 Buffers

54F240 Octal Inverting Buffer, 3-State  
54F241 Octal Buffer, 3-State

### Military Logic Products

### Product Specification

#### DESCRIPTION

The 54F240 and 54F241 are octal buffers that are ideal for driving bus lines or buffer memory address registers. The outputs are all capable of sinking 48mA and sourcing up to 12mA, producing very good capacitive drive characteristics. The device features two output enables, ( $\overline{OE}$ ), each controlling four of the 3-state outputs.

#### FEATURES

- 3-state buffer outputs sink 48mA and source 12mA
- Octal bus interface

#### ORDERING INFORMATION

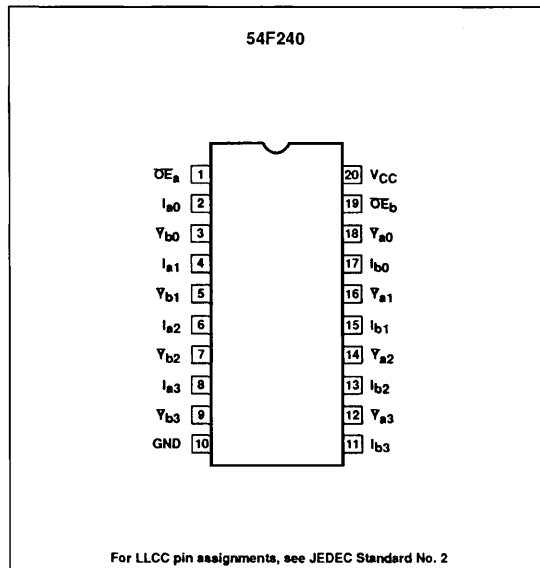
| DESCRIPTION       | ORDER CODE                |
|-------------------|---------------------------|
| Ceramic DIP       | 54F240/BRA,<br>54F241/BRA |
| Ceramic Flat Pack | 54F240/BSA,<br>54F241/BSA |
| Ceramic LLCC      | 54F240/B2A,<br>54F241/B2A |

#### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

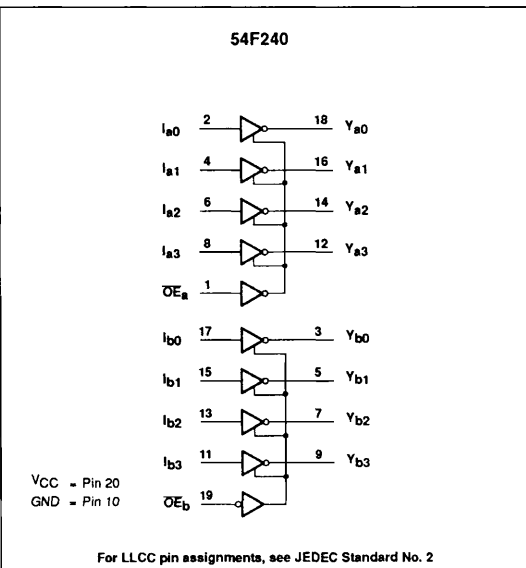
| PINS                                   | DESCRIPTION                              | 54F(U.L.)<br>HIGH/LOW | LOAD VALUE<br>HIGH/LOW |
|----------------------------------------|------------------------------------------|-----------------------|------------------------|
| $I_{aN} - I_{bN}$                      | Data inputs (54F240)                     | 1.0/1.67              | 20 $\mu$ A/1.0mA       |
| $I_{aN} - I_{bN}$                      | Data inputs (54F241)                     | 1.0/2.67              | 20 $\mu$ A/1.6mA       |
| $\overline{OE}_a, \overline{OE}_b$     | Output Enable inputs (Active High)       | 1.0/1.67              | 20 $\mu$ A/1.0mA       |
| $\overline{OE}_b$                      | 3-State Output Enable input (Active Low) | 1.0/1.67              | 20 $\mu$ A/1.0mA       |
| $\overline{Y}_{aN}, \overline{Y}_{bN}$ | Data outputs (54F240)                    | 600/80                | 12mA/48mA              |
| $Y_{aN}, Y_{bN}$                       | Data outputs (54F241)                    | 600/80                | 12mA/48mA              |

NOTE: One (1.0) FAST Unit Load (U.L.) is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.

#### PIN CONFIGURATION



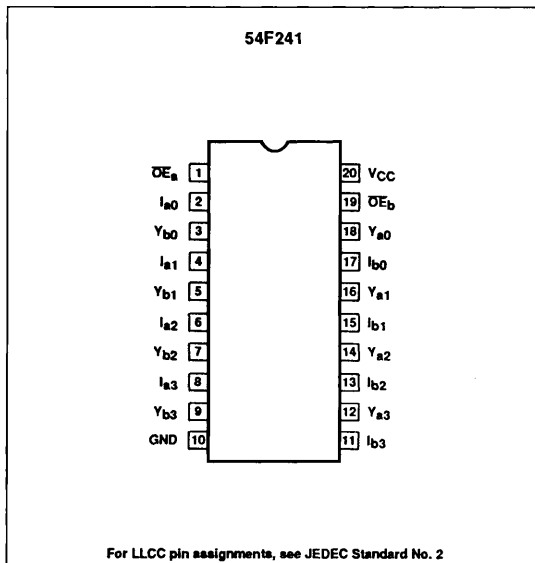
#### LOGIC SYMBOL



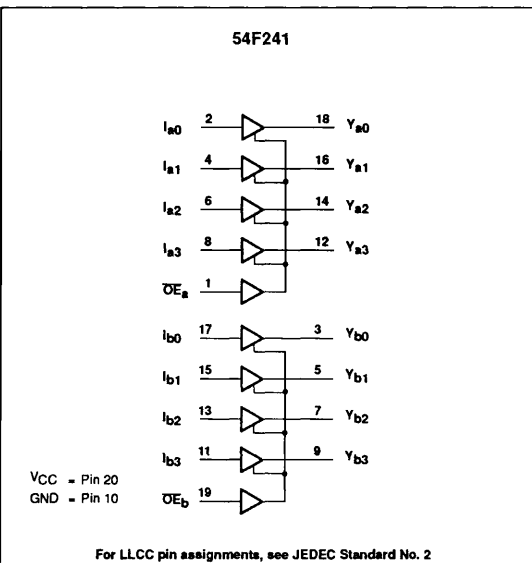
## Buffers

## 54F240, 54F241

## PIN CONFIGURATION



## LOGIC SYMBOL



## FUNCTION TABLE, 54F240

| INPUTS          |                |                 |                | OUTPUTS        |                |
|-----------------|----------------|-----------------|----------------|----------------|----------------|
| OE <sub>a</sub> | I <sub>a</sub> | OE <sub>b</sub> | I <sub>b</sub> | Y <sub>a</sub> | Y <sub>b</sub> |
| L               | L              | L               | L              | H              | H              |
| L               | H              | L               | H              | L              | L              |
| H               | X              | H               | X              | Z              | Z              |

H = High voltage level  
L = Low voltage level  
X = Don't care  
Z = High impedance "OFF" state

## FUNCTION TABLE, 54F241

| INPUTS          |                |                 |                | OUTPUTS        |                |
|-----------------|----------------|-----------------|----------------|----------------|----------------|
| OE <sub>a</sub> | I <sub>a</sub> | OE <sub>b</sub> | I <sub>b</sub> | Y <sub>a</sub> | Y <sub>b</sub> |
| L               | L              | H               | L              | L              | L              |
| L               | H              | H               | H              | H              | H              |
| H               | X              | L               | X              | Z              | Z              |

H = High voltage level  
L = Low voltage level  
X = Don't care  
Z = High impedance "OFF" state

**ABSOLUTE MAXIMUM RATINGS** (Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

| SYMBOL           | PARAMETER                                            | RATING                  | UNIT |
|------------------|------------------------------------------------------|-------------------------|------|
| V <sub>CC</sub>  | Supply voltage range                                 | -0.5 to +7.0            | V    |
| V <sub>I</sub>   | Input voltage range                                  | -0.5 to +7.0            | V    |
| I <sub>I</sub>   | Input current range                                  | -30 to +5               | mA   |
| V <sub>O</sub>   | Voltage applied to output in High output state range | -0.5 to V <sub>CC</sub> | V    |
| I <sub>O</sub>   | Current applied to output in Low output state        | 96                      | mA   |
| T <sub>STG</sub> | Storage temperature range                            | -65 to +150             | °C   |

**Buffers****54F240, 54F241****RECOMMENDED OPERATING CONDITIONS**

| SYMBOL    | PARAMETER                            | LIMITS |     |      | UNIT |
|-----------|--------------------------------------|--------|-----|------|------|
|           |                                      | Min    | Typ | Max  |      |
| $V_{CC}$  | Supply voltage                       | 4.5    | 5.0 | 5.5  | V    |
| $V_{IH}$  | High-level input voltage             | 2.0    |     |      | V    |
| $V_{IL}$  | Low-level input voltage              |        |     | 0.8  | V    |
| $I_{IK}$  | Input clamp current                  |        |     | -18  | mA   |
| $I_{OH1}$ | High-level output current            |        |     | -1   | mA   |
| $I_{OH2}$ | High-level output current            |        |     | -3   | mA   |
| $I_{OH3}$ | High-level output current            |        |     | -12  | mA   |
| $I_{OL}$  | Low-level output current             |        |     | 48   | mA   |
| $T_A$     | Operating free-air temperature range | -55    |     | +125 | °C   |

**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL    | PARAMETER                                 | TEST CONDITIONS <sup>1</sup>                                                         | LIMITS |                  |      | UNIT |
|-----------|-------------------------------------------|--------------------------------------------------------------------------------------|--------|------------------|------|------|
|           |                                           |                                                                                      | Min    | Typ <sup>2</sup> | Max  |      |
| $V_{OH}$  | High-level output voltage                 | $V_{CC} = \text{Min}, I_{OH1} = -1\text{mA}$                                         | 2.5    |                  |      | V    |
|           |                                           | $V_{IL} = \text{Max}, I_{OH2} = -3\text{mA}$                                         | 2.4    |                  |      | V    |
|           |                                           | $V_{IH} = \text{Min}, I_{OH3} = -12\text{mA}$                                        | 2.0    |                  |      | V    |
| $V_{OL}$  | Low-level output voltage                  | $V_{CC} = \text{Min}, V_{IL} = \text{Max}, I_{OL} = \text{Max}, V_{IH} = \text{Min}$ |        | 0.35             | 0.50 | V    |
| $V_{IK}$  | Input clamp voltage                       | $V_{CC} = \text{Min}, I_I = I_{IK}$                                                  |        | -0.73            | -1.2 | V    |
| $I_{IH2}$ | Input current at maximum input voltage    | $V_{CC} = \text{Max}, V_I = 7.0\text{V}$                                             |        |                  | 0.1  | mA   |
| $I_{IH1}$ | High-level input current                  | $V_{CC} = \text{Max}, V_I = 2.7\text{V}$                                             |        | 1                | 20   | μA   |
| $I_{IL}$  | Low-level input current                   | <sup>1</sup> F240 All inputs<br><sup>1</sup> F241 $\overline{OE}_A, \overline{OE}_B$ |        | -0.6             | -1.0 | mA   |
|           |                                           | <sup>1</sup> F241 $I_{An}, I_{Bn}$                                                   |        | -0.6             | -1.6 | mA   |
| $I_{OZH}$ | Off-state output current                  | $V_{CC} = \text{Max}, V_{IH} = \text{Min}, V_O = 2.7\text{V}$                        |        | 2                | 50   | μA   |
| $I_{OZL}$ | Off-state output current                  | $V_{CC} = \text{Max}, V_{IH} = \text{Min}, V_O = 0.5\text{V}$                        |        | -2               | -50  | μA   |
| $I_{OS}$  | Short-circuit output current <sup>3</sup> | $V_{CC} = \text{Max}, V_O = 0.0\text{V}$                                             | -100   | -150             | -225 | mA   |
| $I_{CC}$  | Supply current <sup>4</sup> (total)       | $I_{CCH}$                                                                            |        | 12               | 29   | mA   |
|           |                                           | $I_{CCL}$                                                                            |        | 50               | 75   | mA   |
|           |                                           | $I_{CCZ}$                                                                            |        | 35               | 63   | mA   |
|           |                                           | $I_{CCH}$                                                                            |        | 40               | 60   | mA   |
|           |                                           | $I_{CCL}$                                                                            |        | 60               | 90   | mA   |
|           |                                           | $I_{CCZ}$                                                                            |        | 60               | 90   | mA   |

Buffers

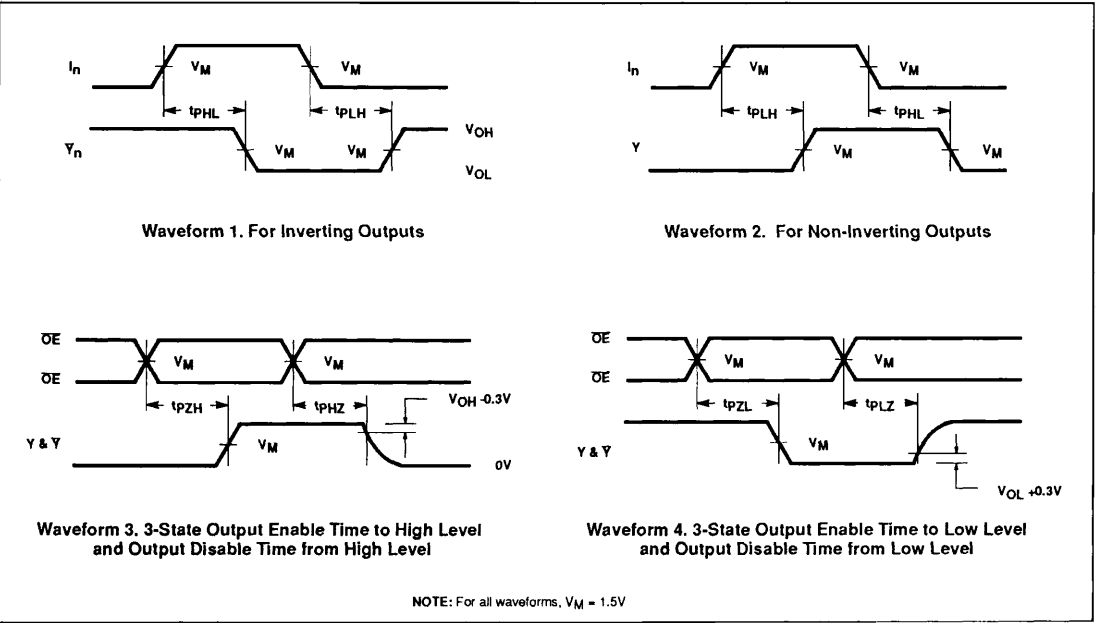
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AC ELECTRICAL CHARACTERISTICS

| SYMBOL                               | PARAMETER                                    | TEST CONDITIONS          | LIMITS                                                                                            |            |            |                                                                                                                   |             |          | UNIT |
|--------------------------------------|----------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------|------------|------------|-------------------------------------------------------------------------------------------------------------------|-------------|----------|------|
|                                      |                                              |                          | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω |            |            | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = +5.0V ± 10%<br>C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω |             |          |      |
|                                      |                                              |                          | Min                                                                                               | Typ        | Max        | Min                                                                                                               | Max         |          |      |
|                                      |                                              |                          |                                                                                                   |            |            |                                                                                                                   |             |          |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>Data to output (54F240) | Waveform 1               | 3.0<br>2.0                                                                                        | 4.5<br>3.0 | 6.5<br>4.5 | 3.0<br>1.5                                                                                                        | 9.0<br>5.5  | ns<br>ns |      |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable time<br>(54F240)               | Waveform 3<br>Waveform 4 | 3.0<br>4.5                                                                                        | 5.0<br>6.5 | 7.5<br>8.5 | 2.0<br>4.0                                                                                                        | 9.5<br>10.5 | ns<br>ns |      |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable time<br>(54F240)              | Waveform 3<br>Waveform 4 | 3.0<br>3.0                                                                                        | 5.5<br>5.0 | 7.0<br>7.0 | 2.5<br>2.5                                                                                                        | 8.0<br>8.5  | ns<br>ns |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>Data to output (54F241) | Waveform 2               | 2.5<br>2.5                                                                                        | 4.0<br>4.0 | 5.2<br>5.2 | 2.5<br>2.5                                                                                                        | 6.5<br>7.0  | ns<br>ns |      |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable time<br>(54F241)               | Waveform 3<br>Waveform 4 | 2.0<br>2.0                                                                                        | 4.0<br>5.0 | 5.7<br>7.0 | 2.0<br>2.0                                                                                                        | 7.0<br>8.5  | ns<br>ns |      |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable time<br>(54F241)              | Waveform 3<br>Waveform 4 | 2.0<br>2.0                                                                                        | 4.0<br>4.0 | 6.0<br>6.0 | 2.0<br>2.0                                                                                                        | 7.0<br>7.5  | ns<br>ns |      |

- NOTES:
- 1. For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type and the functional table for the applicable operating mode.
  - 2. All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.
  - 3. Not more than one output should be shorted at a time.
  - 4. I<sub>CC</sub> is measured with outputs open.

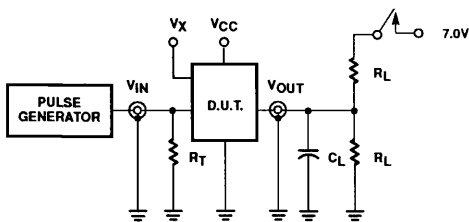
AC WAVEFORMS



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TEST CIRCUIT AND WAVEFORMS



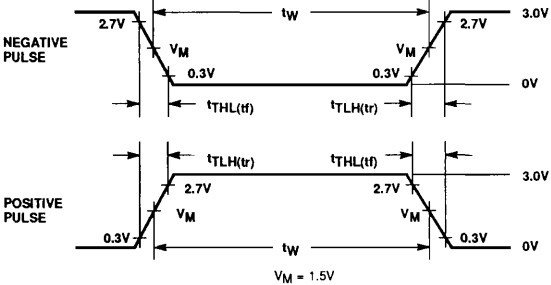
Test Circuit for 3-State Outputs

SWITCH POSITION

| TEST      | SWITCH |
|-----------|--------|
| $t_{PLZ}$ | closed |
| $t_{pZL}$ | closed |
| All other | open   |

DEFINITIONS:

- $R_L$  = Load Resistor; see AC Characteristics for value.  
 $C_L$  = Load capacitance includes jig and probe capacitance; see AC Characteristics for value.  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.  
 $V_X$  = Unlocked pins must be held at:  $\leq 0.8V$ ;  $\geq 2.7V$  or open per Function Table.



Input Pulse Definitions

| INPUT PULSE CHARACTERISTICS |           |             |              |              |
|-----------------------------|-----------|-------------|--------------|--------------|
| Family                      | Rep. Rate | Pulse Width | $t_{TLH}$    | $t_{THL}$    |
| 54F                         | 1MHz      | 500ns       | $\leq 2.5ns$ | $\leq 2.5ns$ |