

54F/74F240•54F/74F241•54F/74F244 Octal Buffers/Line Drivers with TRI-STATE® Outputs

General Description

The 'F240, 'F241 and 'F244 are octal buffers and line drivers designed to be employed as memory and address drivers, clock drivers and bus-oriented transmitters/receivers which provide improved PC and board density.

Features

- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs sink 64 mA (48 mA mil)
- 12 mA source current
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

Ordering Code: See Section 11

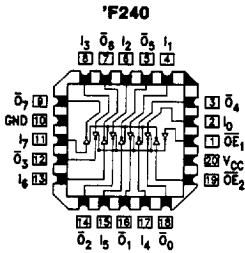
| Commercial | Military | Package Number | Package Description |
|--------------------|-------------------|----------------|---|
| 74F240PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F240DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F240SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F240SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| | 54F240FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F240LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |
| 74F241PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F241DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F241SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F241SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| | 54F241FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F241LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |
| 74F244PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F244DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F244SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F244SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| 74F244MSA (Note 1) | | MSA20 | 20-Lead Molded Shrink Small Outline, EIAJ Type II |
| | 54F244FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F244LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

Note 1: Devices also available in 13" reel. Use Suffix = SCX, SJX and MSAX.

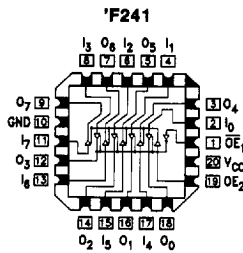
Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMOQB, FMOQB and LMOQB.

Connection Diagrams

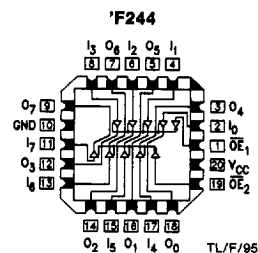
Pin Assignment for LCC



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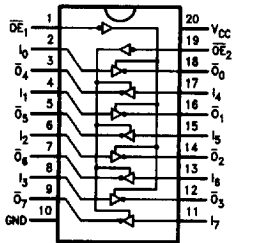


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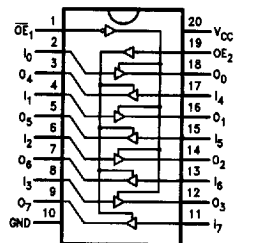


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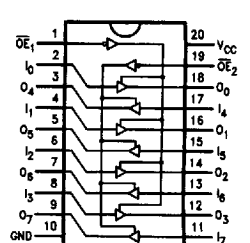
Pin Assignment for DIP, SOIC, SSOP and Flatpak



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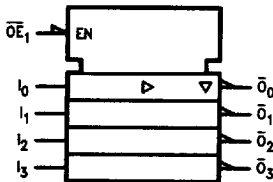
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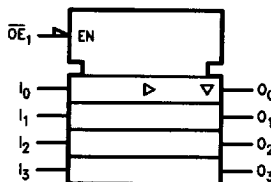
Logic Symbols

IEEE/IEC
'F240



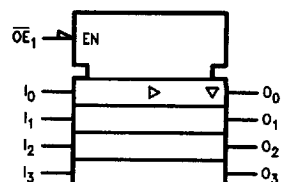
TL/F/9501-7

IEEE/IEC
'F241

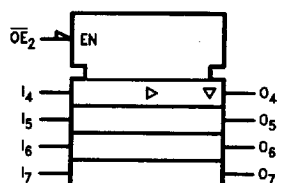
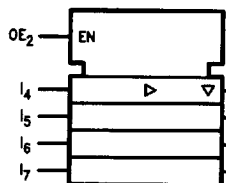
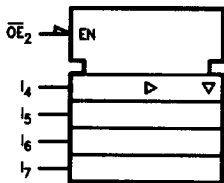


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IEEE/IEC
'F244



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Unit Loading/Fan Out: See Section 2 for U.L. Definitions

| Pin Names | Description | 54F/74F | |
|------------------------------------|---|------------------|---|
| | | U.L. HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
| $\overline{OE}_1, \overline{OE}_2$ | TRI-STATE Output Enable Input (Active LOW) | 1.0/1.667 | 20 μ A/ -1 mA |
| OE_2 | TRI-STATE Output Enable Input (Active HIGH) | 1.0/1.667 | 20 μ A/ -1 mA |
| I_0-I_7 | Inputs ('F240) | 1.0/1.667* | 20 μ A/ -1 mA |
| I_0-I_7 | Inputs ('F241, 'F244) | 1.0/2.667* | 20 μ A/ -1.6 mA |
| O_0-O_7, O_0-O_7 | Outputs | 600/106.6 (80) | -12 mA/64 mA (48 mA) |

*Worst-case 'F240 enabled; 'F241, 'F244 disabled

Truth Tables

'F240

| \overline{OE}_1 | D_{1n} | O_{1n} | \overline{OE}_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|-------------------|----------|----------|
| H | X | Z | H | X | Z |
| L | H | L | L | H | L |
| L | L | H | L | L | H |

'F241

| \overline{OE}_1 | D_{1n} | O_{1n} | OE_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|--------|----------|----------|
| H | X | Z | L | X | Z |
| L | H | H | H | H | H |
| L | L | L | H | L | L |

'F244

| \overline{OE}_1 | D_{1n} | O_{1n} | \overline{OE}_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|-------------------|----------|----------|
| H | X | Z | H | X | Z |
| L | H | H | L | H | H |
| L | L | L | L | L | L |

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance

Absolute Maximum Ratings (Note 1)

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

| | |
|---|--------------------------------------|
| Storage Temperature | -65°C to +150°C |
| Ambient Temperature under Bias | -55°C to +125°C |
| Junction Temperature under Bias | -55°C to +175°C |
| Plastic | -55°C to +150°C |
| V _{CC} Pin Potential to Ground Pin | -0.5V to +7.0V |
| Input Voltage (Note 2) | -0.5V to +7.0V |
| Input Current (Note 2) | -30 mA to +5.0 mA |
| Voltage Applied to Output in HIGH State (with V _{CC} = 0V) | |
| Standard Output | -0.5V to V _{CC} |
| TRI-STATE Output | -0.5V to +5.5V |
| Current Applied to Output in LOW State (Max) | twice the rated I _{OL} (mA) |
| ESD Last Passing Voltage (Min) | 4000V |

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

| | |
|------------------------------|-----------------|
| Free Air Ambient Temperature | |
| Military | -55°C to +125°C |
| Commercial | 0°C to +70°C |
| Supply Voltage | |
| Military | +4.5V to +5.5V |
| Commercial | +4.5V to +5.5V |

DC Electrical Characteristics

| Symbol | Parameter | | 54F/74F | | | Units | V _{CC} | Conditions |
|------------------|-----------------------------------|--|---------------------------------|--------------|-----|-------|-----------------|--|
| | | | Min | Typ | Max | | | |
| V _{IH} | Input HIGH Voltage | | 2.0 | | | V | | Recognized as a HIGH Signal |
| V _{IL} | Input LOW Voltage | | | | | V | | Recognized as a LOW Signal |
| V _{CD} | Input Clamp Diode Voltage | | | | | V | Min | I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54F 10% V _{CC} 54F 10% V _{CC} 74F 10% V _{CC} 74F 10% V _{CC} 74F 5% V _{CC} | 2.4 2.0 2.4 2.0 2.7 | | | V | Min | I _{OH} = -3 mA I _{OH} = -12 mA I _{OH} = -3 mA I _{OH} = -15 mA I _{OH} = -3 mA |
| V _{OL} | Output LOW Voltage | 54F 10% V _{CC} 74F 10% V _{CC} | | 0.55 0.55 | | V | Min | I _{OL} = 48 mA I _{OL} = 64 mA |
| I _{IH} | Input HIGH Current | 54F 74F | | 20.0 5.0 | | μA | Max | V _{IN} = 2.7V |
| I _{BVI} | Input HIGH Current Breakdown Test | 54F 74F | | 100 7.0 | | μA | Max | V _{IN} = 7.0V |
| I _{CEX} | Output HIGH Leakage Current | 54F 74F | | 250 50 | | μA | Max | V _{OUT} = V _{CC} |
| V _{ID} | Input Leakage Test | 74F | 4.75 | | | V | 0.0 | I _{ID} = 1.9 μA All Other Pins Grounded |
| I _{OD} | Output Leakage Circuit Current | 74F | | 3.75 | | μA | 0.0 | V _{IOD} = 150 mV All Other Pins Grounded |
| I _{IL} | Input LOW Current | | | -1.0 -1.6 | | mA | Max | V _{IN} = 0.5V (OE ₁ , OE ₂ , OE ₂ , D _n ('F240)) V _{IN} = 0.5V (D _n ('F241', 'F244)) |
| I _{OZH} | Output Leakage Current | | | 50 | | μA | Max | V _{OUT} = 2.7V |
| I _{OZL} | Output Leakage Current | | | -50 | | μA | Max | V _{OUT} = 0.5V |
| I _{OS} | Output Short-Circuit Current | | -100 | -225 | | mA | Max | V _{OUT} = 0V |
| I _{ZZ} | Bus Drainage Test | | | 500 | | μA | 0.0V | V _{OUT} = 5.25V |

DC Electrical Characteristics (Continued)

| Symbol | Parameter | 54F/74F | | | Units | V _{CC} | Conditions |
|-------------------|-------------------------------------|---------|-----|-----|-------|-----------------|-------------------------|
| | | Min | Typ | Max | | | |
| I _{CC} H | Power Supply Current ('F240) | | 19 | 29 | mA | Max | V _O = HIGH |
| I _{CC} L | Power Supply Current ('F240) | | 50 | 75 | mA | Max | V _O = LOW |
| I _{CC} Z | Power Supply Current ('F240) | | 42 | 63 | mA | Max | V _O = HIGH Z |
| I _{CC} H | Power Supply Current ('F241, 'F244) | | 40 | 60 | mA | Max | V _O = HIGH |
| I _{CC} L | Power Supply Current ('F241, 'F244) | | 60 | 90 | mA | Max | V _O = LOW |
| I _{CC} Z | Power Supply Current ('F241, 'F244) | | 60 | 90 | mA | Max | V _O = HIGH Z |

AC Electrical Characteristics: See Section 2 for Waveforms and Load Configurations

| Symbol | Parameter | 74F | | | 54F | | 74F | | Units | Fig. No. |
|------------------|--|---|-----|-----|--|------|--|------|-------|----------|
| | | T _A = +25°C V _{CC} = +5.0V C _L = 50 pF | | | T _A , V _{CC} = Mil C _L = 50 pF | | T _A , V _{CC} = Com C _L = 50 pF | | | |
| | | Min | Typ | Max | Min | Max | Min | Max | | |
| t _{PLH} | Propagation Delay Data to Output ('F240) | 3.0 | 5.1 | 7.0 | 3.0 | 9.0 | 3.0 | 8.0 | ns | 2-3 |
| t _{PHL} | | 2.0 | 3.5 | 4.7 | 2.0 | 6.0 | 2.0 | 5.7 | | |
| t _{PZH} | Output Enable Time ('F240) | 2.0 | 3.5 | 4.7 | 2.0 | 6.5 | 2.0 | 5.7 | ns | 2-5 |
| t _{PZL} | | 4.0 | 6.9 | 9.0 | 4.0 | 10.5 | 4.0 | 10.0 | | |
| t _{PHZ} | Output Disable Time ('F240) | 2.0 | 4.0 | 5.3 | 2.0 | 6.5 | 2.0 | 6.3 | ns | 2-3 |
| t _{PLZ} | | 2.0 | 6.0 | 8.0 | 2.0 | 12.5 | 2.0 | 9.5 | | |
| t _{PLH} | Propagation Delay Data to Output ('F241, 'F244) | 2.5 | 4.0 | 5.2 | 2.0 | 6.5 | 2.5 | 6.2 | ns | 2-3 |
| t _{PHL} | | 2.5 | 4.0 | 5.2 | 2.0 | 7.0 | 2.5 | 6.5 | | |
| t _{PZH} | Output Enable Time ('F241, 'F244) | 2.0 | 4.3 | 5.7 | 2.0 | 7.0 | 2.0 | 6.7 | ns | 2-5 |
| t _{PZL} | | 2.0 | 5.4 | 7.0 | 2.0 | 8.5 | 2.0 | 8.0 | | |
| t _{PHZ} | Output Disable Time ('F241, 'F244) | 2.0 | 4.5 | 6.0 | 2.0 | 7.0 | 2.0 | 7.0 | ns | 2-5 |
| t _{PLZ} | | 2.0 | 4.5 | 6.0 | 2.0 | 7.5 | 2.0 | 7.0 | | |