

54F/74F534 Octal D-Type Flip-Flop with TRI-STATE® Outputs

General Description

The 'F534 is a high speed, low-power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and TRI-STATE outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable (\overline{OE}) are common to all flip-flops. The 'F534 is the same as the 'F374 except that the outputs are inverted.

Features

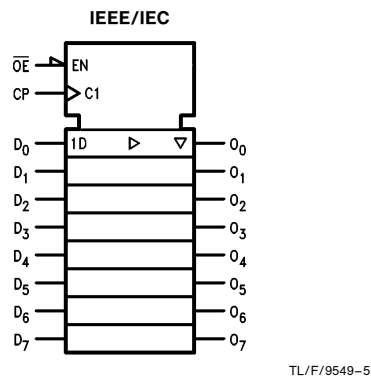
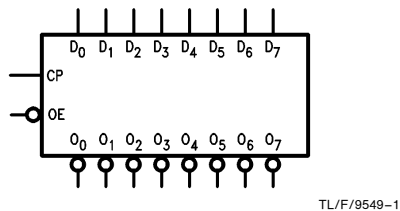
- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- TRI-STATE outputs for bus-oriented applications
- Guaranteed 4000V minimum ESD protection

| Commercial | Military | Package Number | Package Description |
|-------------------|-------------------|----------------|---|
| 74F534PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F534DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F534SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F534SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| | 54F534FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F534LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

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

Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB

Logic Symbols



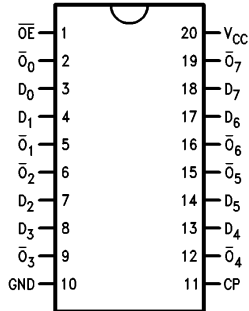
Unit Loading/Fan Out

| Pin Names | Description | 54F/74F | |
|-------------------------------------|--|------------------|---|
| | | U.L. HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
| D_0 - D_7 | Data Inputs | 1.0/1.0 | 20 μ A/ -0.6 mA |
| CP | Clock Pulse Input (Active Rising Edge) | 1.0/1.0 | 20 μ A/ -0.6 mA |
| \overline{OE} | TRI-STATE Output Enable Input (Active LOW) | 1.0/1.0 | 20 μ A/ -0.6 mA |
| \overline{O}_0 - \overline{O}_7 | Complementary TRI-STATE Outputs | 150/40(33.3) | -3 mA/24 mA (20 mA) |

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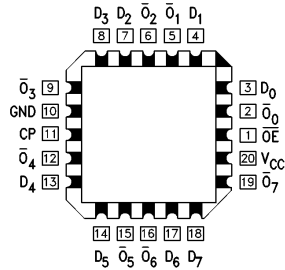
Connection Diagrams

Pin Assignment for
DIP, SOIC and Flatpak



TL/F/9549-2

Pin Assignment
for LCC



TL/F/9549-3

Functional Description

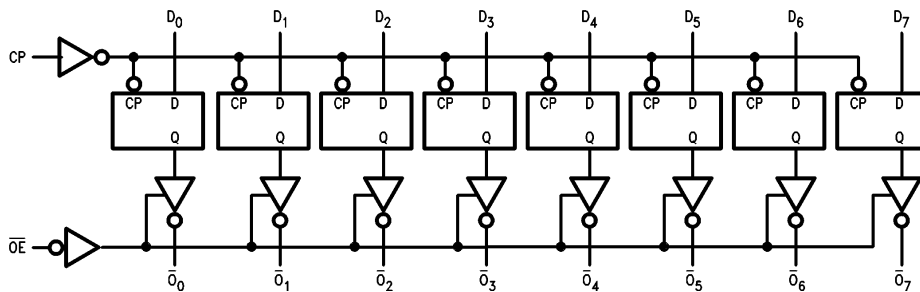
The 'F534 consists of eight edge-triggered flip-flops with individual D-type inputs and TRI-STATE complementary outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that meet the setup and hold times requirements on the LOW-to-HIGH clock (CP) transition. With the Output Enable (\overline{OE}) LOW, the contents of the eight flip-flops are available at the outputs. When the \overline{OE} is HIGH, the outputs go to the high impedance state. Operation of the \overline{OE} input does not affect the state of the flip-flops.

Function Table

| Inputs | | | Output |
|--------|----|---|------------------|
| CP | OE | D | \overline{O} |
| | L | H | L |
| | L | L | H |
| L | L | X | \overline{O}_0 |
| X | H | X | Z |

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 = LOW-to-HIGH Clock Transition
 Z = High Impedance
 \overline{O}_0 = Value stored from previous clock cycle

Logic Diagram



TL/F/9549-4

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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) | -0.5V to V _{CC} |
| Standard Output | -0.5V to +5.5V |
| 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 | -55°C to +125°C |
| Military | 0°C to +70°C |
| Commercial | |
| Supply Voltage | +4.5V to +5.5V |
| Military | +4.5V to +5.5V |
| Commercial | |

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 | | | 0.8 | V | | Recognized as a LOW Signal |
| V _{CD} | Input Clamp Diode Voltage | | | -1.2 | 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} 74F 5% V _{CC} | 2.5 2.4 2.5 2.4 2.7 2.7 | | V | Min | I _{OH} = -1 mA I _{OH} = -3 mA I _{OH} = -1 mA I _{OH} = -3 mA I _{OH} = -1 mA I _{OH} = -3 mA |
| V _{OL} | Output LOW Voltage | 54F 10% V _{CC} 74F 10% V _{CC} | | 0.5 0.5 | V | Min | I _{OL} = 20 mA I _{OL} = 24 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} = 1.50 μA All Other Pins Grounded |
| I _{IL} | Input LOW Current | | | -0.6 | mA | Max | V _{IN} = 0.5V |
| 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 | | | -60 | mA | Max | V _{OUT} = 0V |
| I _{ZZ} | Bus Drainage Test | | | 500 | μA | 0.0V | V _{OUT} = 5.25V |
| I _{CCZ} | Power Supply Current | | 55 | 86 | mA | Max | V _O = HIGH Z |

AC Electrical Characteristics

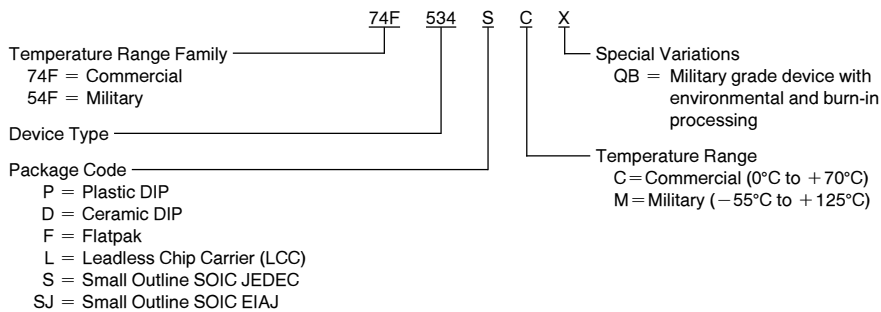
| Symbol | Parameter | 74F | | | 54F | | 74F | | Units |
|--------------------------------------|--|---|-----|------|--|------|--|------|-------|
| | | T _A = +25°C V _{CC} = +5.0V C _L = 50 pF | | | T _A , V _{CC} = Mil C _L = 50 pF | | T _A , V _{CC} = Com C _L = 50 pF | | |
| | | Min | Typ | Max | Min | Max | Min | Max | |
| f _{max} | Maximum Clock Frequency | 100 | | | 60 | | 70 | | MHz |
| t _{PLH} t _{PHL} | Propagation Delay CP to \bar{O}_n | 4.0 | 6.5 | 8.5 | 4.0 | 10.5 | 4.0 | 10.0 | ns |
| t _{PZH} t _{PZL} | Output Enable Time | 2.0 | 9.0 | 11.5 | 2.0 | 14.0 | 2.0 | 12.5 | ns |
| t _{PHZ} t _{PLZ} | Output Disable Time | 1.5 | 5.3 | 7.0 | 1.5 | 8.0 | 1.5 | 8.0 | |
| | | 1.5 | 4.3 | 5.5 | 1.5 | 7.5 | 1.5 | 6.5 | |

AC Operating Requirements

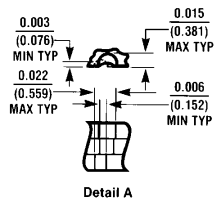
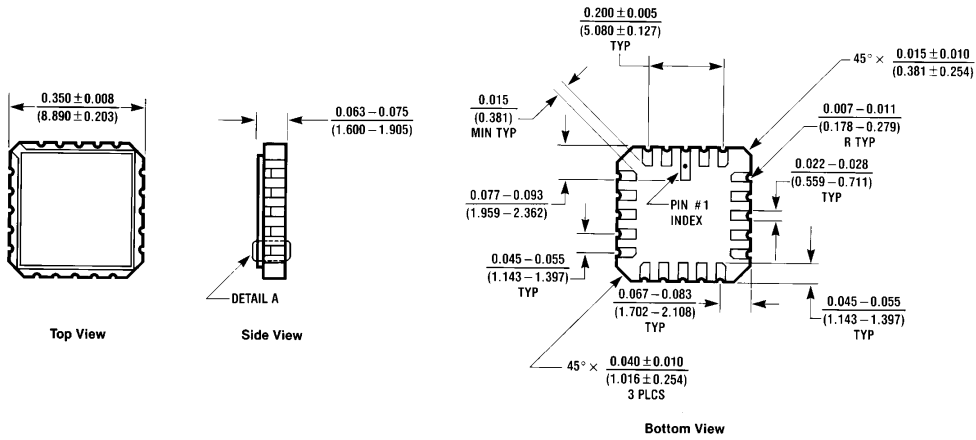
| Symbol | Parameter | 74F | | 54F | | 74F | | Units |
|--|---|---|-----|--|-----|--|-----|-------|
| | | T _A = +25°C V _{CC} = +5.0V | | T _A , V _{CC} = Mil | | T _A , V _{CC} = Com | | |
| | | Min | Max | Min | Max | Min | Max | |
| t _s (H) t _s (L) | Setup Time, HIGH or LOW D _n to CP | 2.0 | | 2.0 | | 2.0 | | ns |
| | | 2.0 | | 2.5 | | 2.0 | | |
| t _h (H) t _h (L) | Hold Time, HIGH or LOW D _n to CP | 2.0 | | 2.0 | | 2.0 | | ns |
| | | 2.0 | | 2.5 | | 2.0 | | |
| t _w (H) t _w (L) | CP Pulse Width HIGH or LOW | 7.0 | | 7.0 | | 7.0 | | ns |
| | | 6.0 | | 6.0 | | 6.0 | | |

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

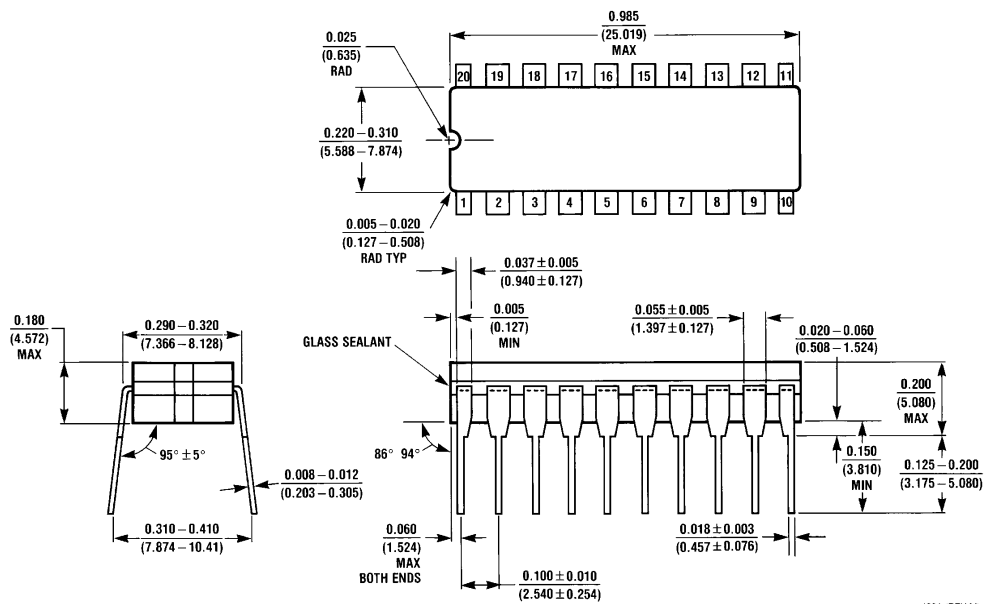


Physical Dimensions inches (millimeters)



20-Lead Ceramic Leadless Chip Carrier (L)
 NS Package Number E20A

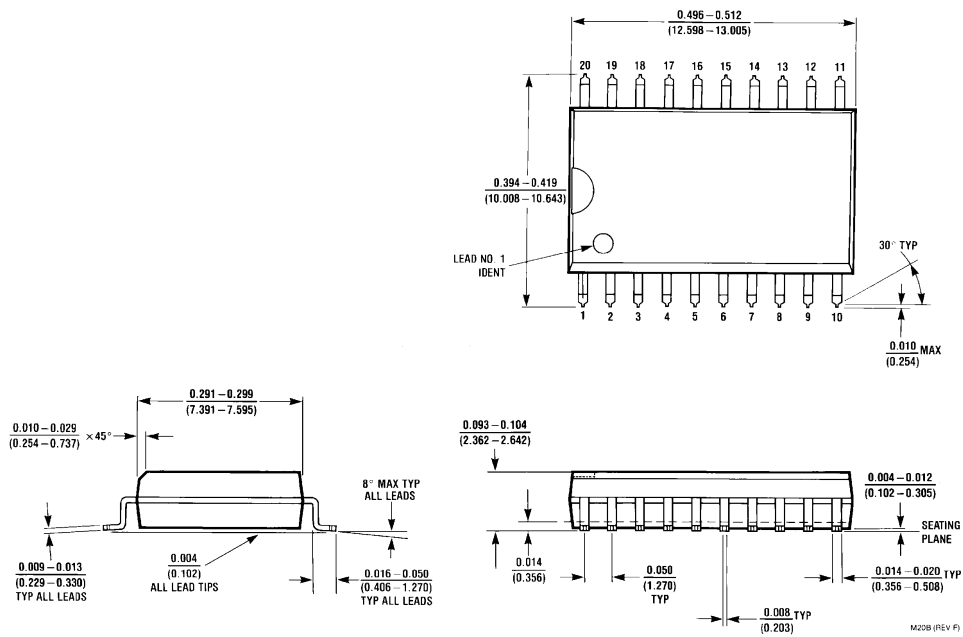
E20A (REV D)



20-Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J20A

J20A (REV M)

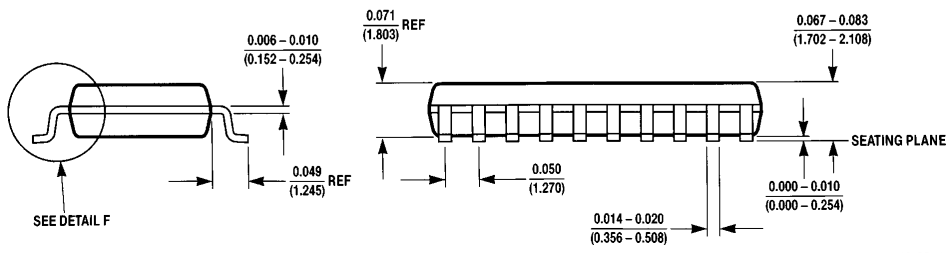
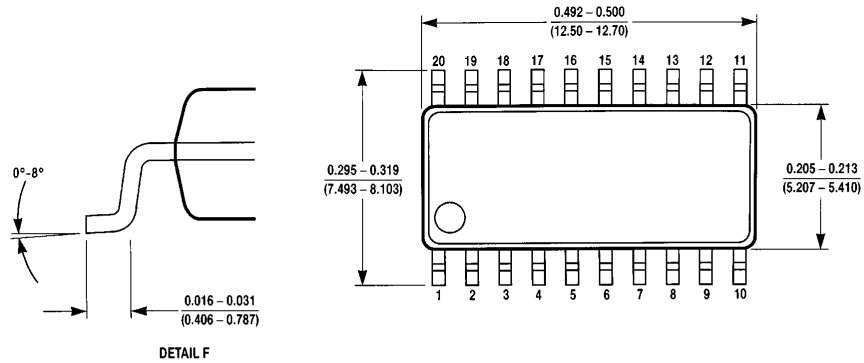
Physical Dimensions inches (millimeters) (Continued)



**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC
NS Package Number M20B**

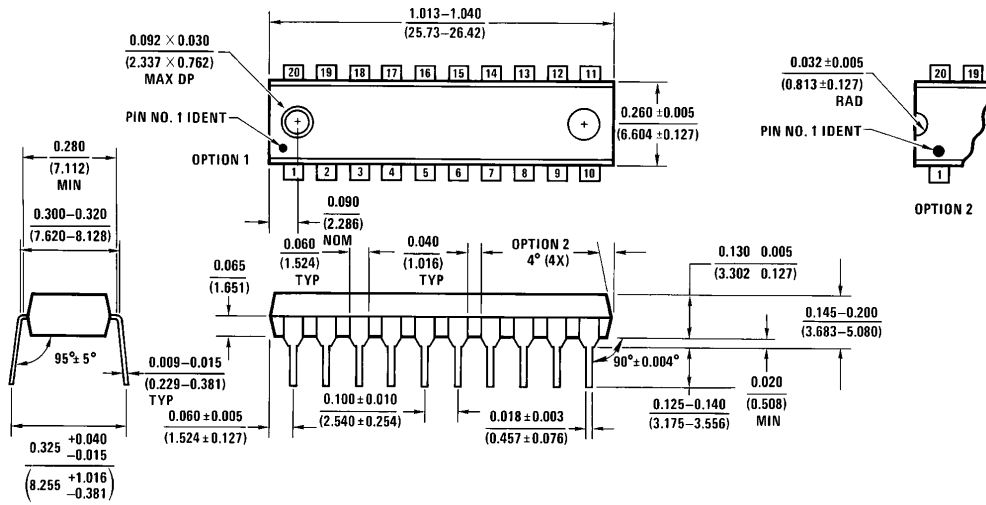
M20B (REV F)

Physical Dimensions inches (millimeters) (Continued)



20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M20D

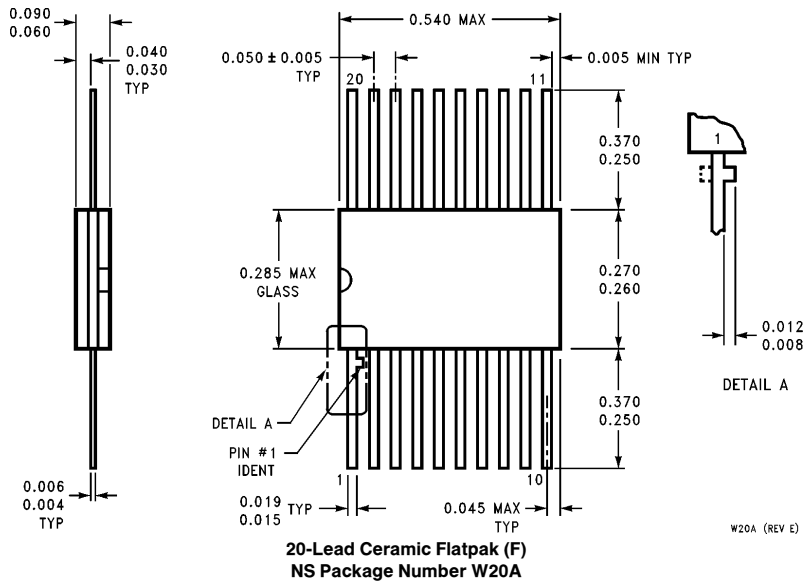
M20D (REV A)



20-Lead (0.300" Wide) Molded Dual-In-Line Package (P)
NS Package Number N20A

N20A (REV G)

Physical Dimensions inches (millimeters) (Continued)



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