

54AC/74AC378 Parallel D Register with Enable

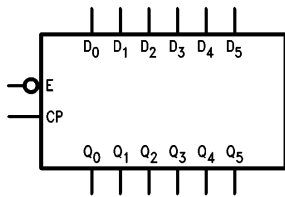
General Description

The 'AC378 is a 6-bit register with a buffered common Enable. This device is similar to the 'AC174, but with common Enable rather than common Master Reset.

Features

- 6-bit high-speed parallel register
- Positive edge-triggered D-type inputs
- Fully buffered common clock and enable inputs
- Input clamp diodes limit high-speed termination effects
- Standard Military Drawing (SMD) — 'AC378: 5962-91605

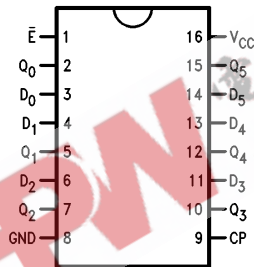
Logic Symbols



TL/F/10231-1

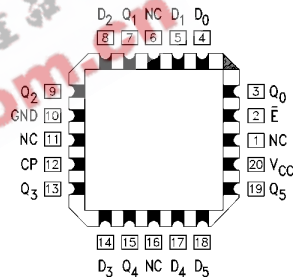
Connection Diagrams

Pin Assignment for
DIP, SOIC and Flatpak



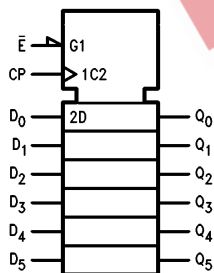
TL/F/10231-2

Pin Assignment
for LCC



TL/F/10231-3

IEEE/IEC



TL/F/10231-4

| Pin Names | Description |
|--------------------------------|--|
| \bar{E} | Enable Input (Active LOW) |
| D ₀ -D ₅ | Data Inputs |
| CP | Clock Pulse Input (Active Rising Edge) |
| Q ₀ -Q ₅ | Outputs |

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Functional Description

The 'AC378 consists of six edge-triggered D-type flip-flops with individual D inputs and Q outputs. The Clock (CP) and Enable (\bar{E}) inputs are common to all flip-flops.

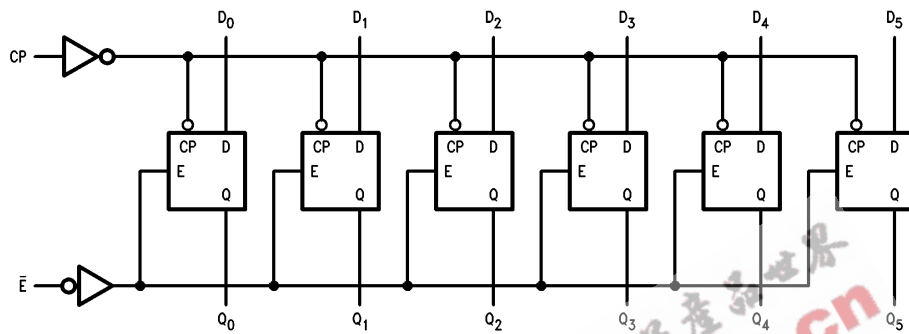
When the \bar{E} input is LOW, new data is entered into the register on the LOW-to-HIGH transition of the CP input. When the \bar{E} input is HIGH the register will retain the present data independent of the CP input.

Truth Table

| Inputs | | | Output |
|-----------|----|-------|-----------|
| \bar{E} | CP | D_n | Q_n |
| H | ↗ | X | No Change |
| L | ↗ | H | H |
| L | ↗ | L | L |

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 ↗ = LOW-to-HIGH Clock Transition

Logic Diagram



TL/F/10231-5

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.

| | |
|--|--------------------------|
| Supply Voltage (V_{CC}) | -0.5V to +7.0V |
| DC Input Diode Current (I_{IK}) | |
| $V_I = -0.5V$ | -20 mA |
| $V_I = V_{CC} + 0.5V$ | +20 mA |
| DC Input Voltage (V_I) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Diode Current (I_{OK}) | |
| $V_O = -0.5V$ | -20 mA |
| $V_O = V_{CC} + 0.5V$ | +20 mA |
| DC Output Voltage (V_O) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source or Sink Current (I_O) | ± 50 mA |
| DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND}) | ± 50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Junction Temperature (T_J) | |
| CDIP | 175°C |
| PDIP | 140°C |

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

Recommended Operating Conditions

| | |
|---|-----------------|
| Supply Voltage (V_{CC}) | 2.0V to 6.0V |
| 'AC | |
| Input Voltage (V_I) | 0V to V_{CC} |
| Output Voltage (V_O) | 0V to V_{CC} |
| Operating Temperature (T_A) | |
| 74AC | -40°C to +85°C |
| 54AC | -55°C to +125°C |
| Minimum Input Edge Rate ($\Delta V/\Delta t$) | |
| 'AC Devices | |
| V_{IN} from 30% to 70% of V_{CC} | |
| V_{CC} @ 3.3V, 4.5V, 5.5V | 125 mV/ns |

DC Characteristics for 'AC Family Devices

| Symbol | Parameter | V_{CC} (V) | 74AC | | | 54AC | 74AC | Units | Conditions |
|----------|-----------------------------------|--------------|---------------------------|-------------------|-----------|--|---|--|--|
| | | | $T_A = +25^\circ\text{C}$ | | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | |
| | | | Typ | Guaranteed Limits | | | | | |
| V_{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | 2.1 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 3.15 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | 3.85 | | | |
| V_{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | 0.9 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 1.35 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | 1.65 | | | |
| V_{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | 2.9 | V | $I_{OUT} = -50 \mu\text{A}$ | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | 5.4 | | | |
| | | | 3.0 | | 2.56 | 2.4 | 2.46 | V | * $V_{IN} = V_{IL}$ or V_{IH} -12 mA I_{OH} -24 mA -24 mA |
| | | | 4.5 | | 3.86 | 3.7 | 3.76 | | |
| | | | 5.5 | | 4.86 | 4.7 | 4.76 | | |
| V_{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | 0.1 | V | $I_{OUT} = 50 \mu\text{A}$ | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | | 3.0 | | 0.36 | 0.5 | 0.44 | V | * $V_{IN} = V_{IL}$ or V_{IH} 12 mA I_{OL} 24 mA 24 mA |
| | | | 4.5 | | 0.36 | 0.5 | 0.44 | | |
| | | | 5.5 | | 0.36 | 0.5 | 0.44 | | |
| I_{IN} | Maximum Input Leakage Current | 5.5 | | ± 0.1 | ± 1.0 | ± 1.0 | μA | $V_I = V_{CC}, \text{GND}$ | |

*All outputs loaded; thresholds on input associated with output under test.

DC Characteristics for 'AC Family Devices (Continued)

| Symbol | Parameter | V _{CC} (V) | 74AC | | 54AC | | 74AC | | Units | Conditions |
|------------------|----------------------------------|------------------------|------------------------|-------------------|----------------------------------|--|---------------------------------|--|-------|--|
| | | | T _A = +25°C | | T _A = -55°C to +125°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | | | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | | 50 | | 75 | | mA | V _{OLD} = 1.65V Max |
| I _{OHD} | | 5.5 | | | -50 | | -75 | | mA | V _{OHD} = 3.85V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 80.0 | | 40.0 | | μA | V _{IN} = V _{CC} or GND |

†Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 54AC | | 74AC | | Units |
|------------------|--|--------------------------|--|------------|-------------|---|-------------|--|-------------|-------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -55°C to +125°C C _L = 50 pF | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| f _{max} | Maximum Clock Frequency | 3.3 5.0 | 125 160 | 160 200 | | 95 95 | | 110 145 | MHz | |
| t _{PLH} | Propagation Delay CP to Q _n | 3.3 5.0 | 2.5 1.5 | 8.5 6.0 | 11.0 8.0 | 1.5 1.5 | 12.0 9.0 | 2.5 1.5 | 12.5 9.0 | ns |
| t _{PHL} | Propagation Delay CP to Q _n | 3.3 5.0 | 2.5 1.5 | 8.0 5.5 | 10.5 7.5 | 1.5 1.5 | 12.0 9.0 | 2.5 1.5 | 11.0 8.0 | ns |

*Voltage Range 3.3 is 3.3V ±0.3V

Voltage Range 5.0 is 5.0V ±0.5V

AC Operating Requirements

| Symbol | Parameter | V _{CC} * (V) | 74AC | | 54AC | | 74AC | | Units |
|----------------|--|--------------------------|--|--------------------|---|------------|--|------------|-------|
| | | | T _A = +25°C C _L = 50 pF | | T _A = -55°C to +125°C C _L = 50 pF | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Typ | Guaranteed Minimum | | | | | |
| t _s | Setup Time, HIGH or LOW D _n to CP | 3.3 5.0 | 1.5 1.0 | 3.0 2.0 | 4.0 4.0 | 4.0 4.0 | 3.5 2.5 | 2.5 2.0 | ns |
| t _h | Hold Time, HIGH or LOW D _n to CP | 3.3 5.0 | 1.0 1.0 | 2.0 2.0 | 4.0 4.0 | 4.0 4.0 | 2.0 2.0 | 2.0 2.0 | ns |
| t _s | Setup Time, HIGH or LOW, \bar{E} to CP | 3.3 5.0 | 0 0 | 2.0 2.0 | 2.5 2.5 | 2.5 2.0 | 2.0 2.0 | 2.0 2.0 | ns |
| t _h | Hold Time, HIGH or LOW, \bar{E} to CP | 3.3 5.0 | 1.0 1.0 | 2.0 2.0 | 4.0 4.0 | 4.0 4.0 | 2.0 2.0 | 2.0 2.0 | ns |
| t _w | CP Pulse Width HIGH or LOW | 3.3 5.0 | 3.0 2.0 | 4.5 3.5 | 6.5 6.5 | 6.5 6.5 | 5.5 4.0 | 5.5 4.0 | ns |

*Voltage Range 3.3 is 3.3V ±0.3V

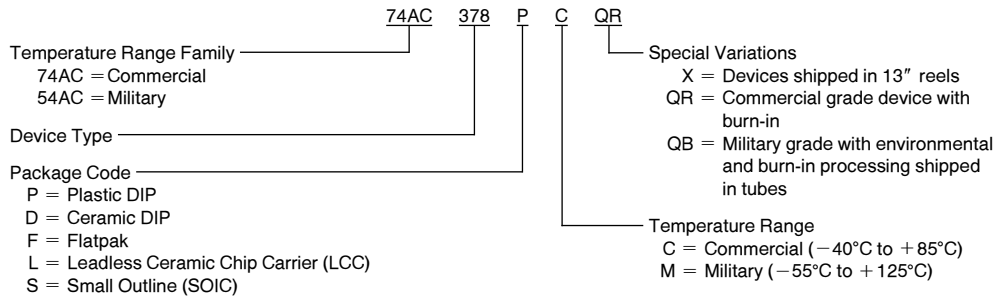
Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

| Symbol | Parameter | Typ | Units | Conditions |
|-----------------|-------------------------------|-----|-------|------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = OPEN |
| C _{PD} | Power Dissipation Capacitance | 28 | pF | V _{CC} = 5.0V |

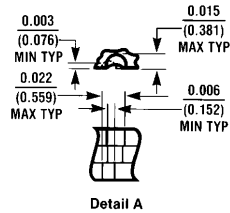
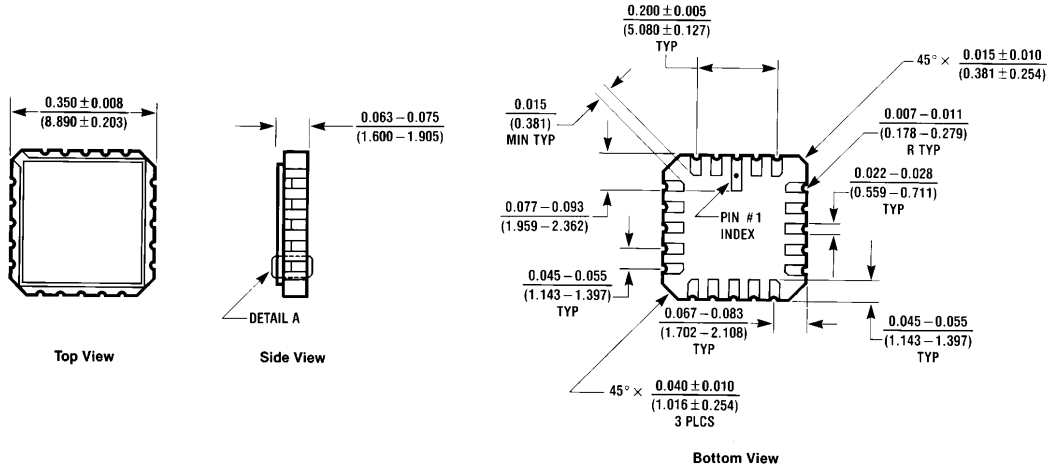
Ordering Information

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



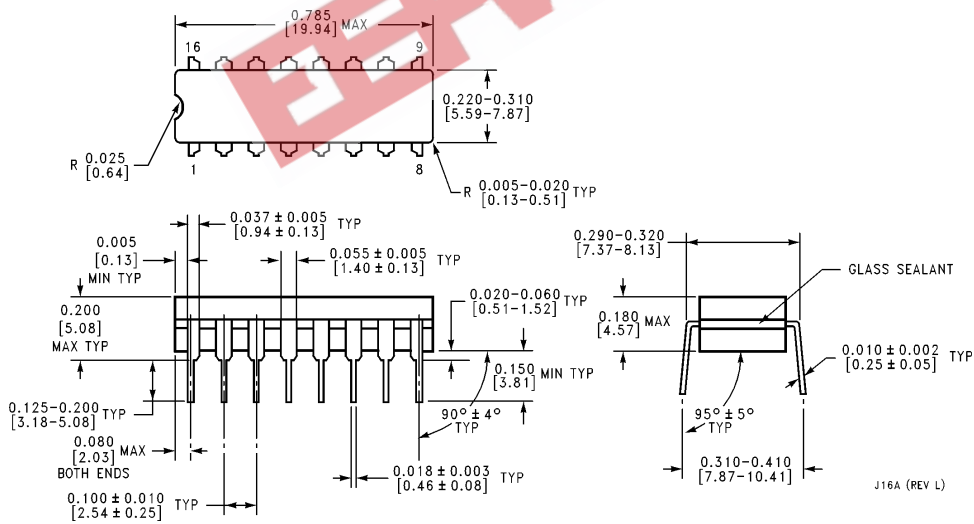
EEPW 电子产品世界
.com.cn

Physical Dimensions inches (millimeters)



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

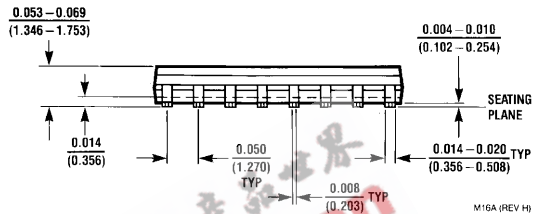
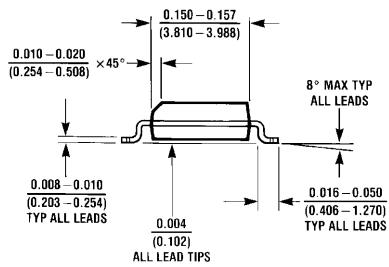
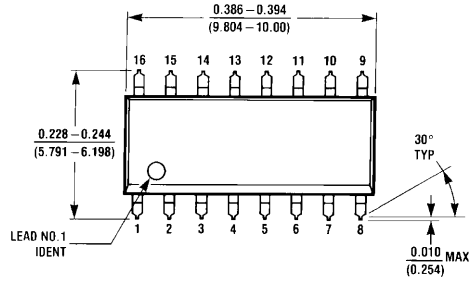
E20A (REV D)



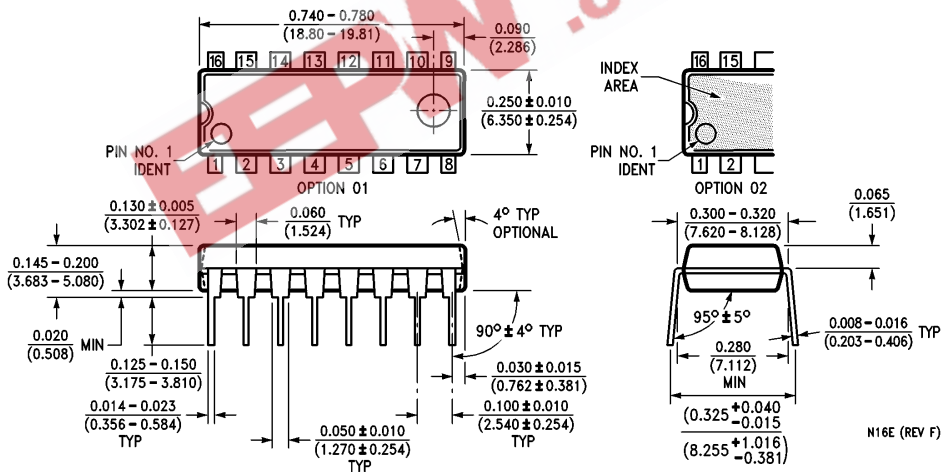
16-Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J16A

J16A (REV L)

Physical Dimensions inches (millimeters) (Continued)



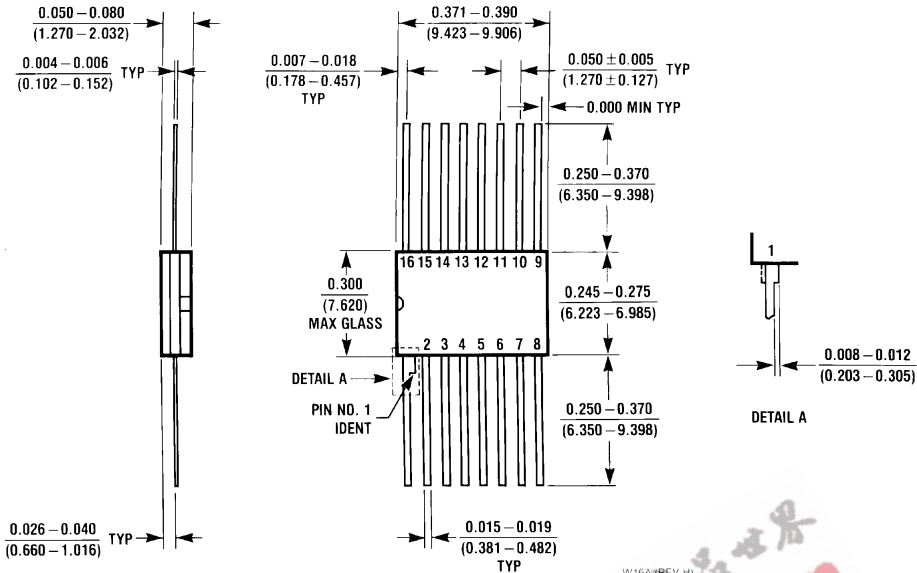
16-Lead Small Outline Integrated Circuit (S)
NS Package Number M16A



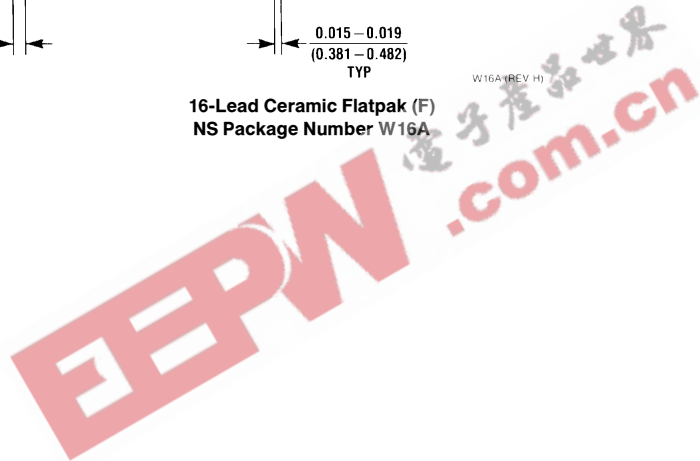
16-Lead Plastic Dual-In-Line Package (P)
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)

Lit. # 114805



**16-Lead Ceramic Flatpak (F)
NS Package Number W16A**



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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

| | | | | | |
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