# 54F378,74F378

***54F378 74F378 Parallel D Register with Enable***

Literature Number: SNOS192A

National Semiconductor

January 1995

# 54F/74F378
# Parallel D Register with Enable

## General Description

The 'F378 is a 6-bit register with a buffered common Enable. This device is similar to the 'F174, but with common Enable rather than common Master Reset.

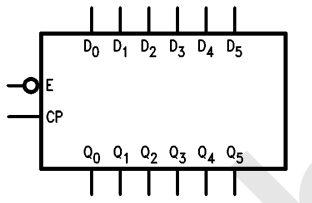
## Features

- 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
- Full TTL and CMOS compatible

| Commercial | Military | Package Number | Package Description |
|---|---|---|---|
| 74F378PC | | N16E | 16-Lead (0.300″ Wide) Molded Dual-In-Line |
| | 54F378DM (QB) | J16A | 16-Lead Ceramic Dual-In-Line |
| 74F378SC (Note 1) | | M16A | 16-Lead (0.150″ Wide) Molded Small Outline, JEDEC |
| 74F378SJ (Note 1) | | M16D | 16-Lead (0.300″ Wide) Molded Small Outline, EIAJ |
| | 54F378FM (QB) | W16A | 16-Lead Cerpack |
| | 54F378LM (QB) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

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

## Logic Symbols

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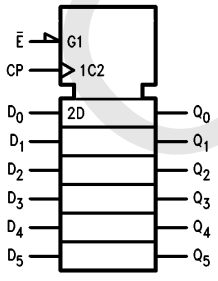
**IEEE/IEC**

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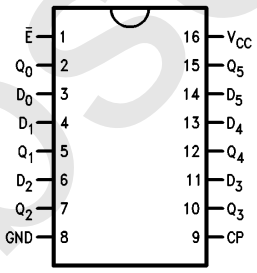
## Connection Diagrams

**Pin Assignment for DIP, SOIC and Flatpak**

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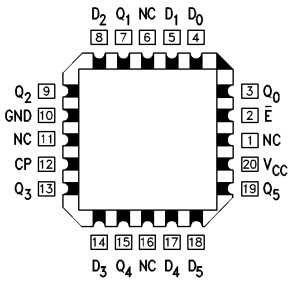
**Pin Assignment for LCC**

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## Unit Loading/Fan Out

| Pin Names | Description | 54F/74F | |
|---|---|---|---|
| | | U.L. HIGH/LOW | Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$ |
| $\overline{E}$ | Enable Input (Active LOW) | 1.0/1.0 | 20 $\mu$A/−0.6 mA |
| $D_0$–$D_5$ | Data Inputs | 1.0/1.0 | 20 $\mu$A/−0.6 mA |
| CP | Clock Pulse Input (Active Rising Edge) | 1.0/1.0 | 20 $\mu$A/−0.6 mA |
| $Q_0$–$Q_5$ | Outputs | 50/33.3 | −1 mA/20 mA |

## Functional Description

The 'F378 consists of six edge-triggered D-type flip-flops with individual D inputs and Q inputs. The Clock (CP) and Enable ($\overline{E}$) inputs are common to all flip-flops.

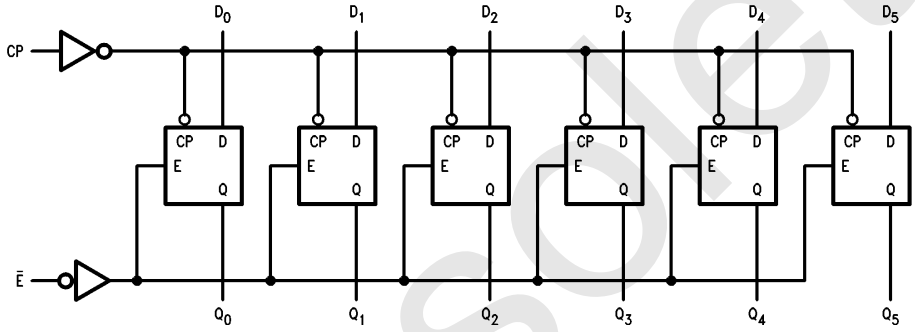
When the $\overline{E}$ input is LOW, new data is entered into the register on the LOW-to-HIGH transition of the CP input. When the $\overline{E}$ input is HIGH the register will retain the present data independent of the CP input.

## Truth Table

| Inputs | | | Output |
|---|---|---|---|
| $\overline{E}$ | 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

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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) | |
| 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) |

**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 Min | 54F/74F Typ | 54F/74F Max | Units | $V_{CC}$ | Conditions |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IH}$ | 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% $V_{CC}$ | 2.5 | | | V | Min | $I_{OH}$ = −1 mA |
| | | 74F | 10% $V_{CC}$ | 2.5 | | | | | $I_{OH}$ = −1 mA |
| | | 74F | 5% $V_{CC}$ | 2.7 | | | | | $I_{OH}$ = −1 mA |
| $V_{OL}$ | Output LOW Voltage | 54F | 10% $V_{CC}$ | | | 0.5 | V | Min | $I_{OL}$ = 20 mA |
| | | 74F | 10% $V_{CC}$ | | | 0.5 | | | $I_{OL}$ = 20 mA |
| $I_{IH}$ | Input HIGH Current | 54F | | | | 20.0 | μA | Max | $V_{IN}$ = 2.7V |
| | | 74F | | | | 5.0 | | | |
| $I_{BVI}$ | Input HIGH Current Breakdown Test | 54F | | | | 100 | μA | Max | $V_{IN}$ = 7.0V |
| | | 74F | | | | 7.0 | | | |
| $I_{CEX}$ | Output HIGH Leakage Current | 54F | | | | 250 | μA | Max | $V_{OUT}$ = $V_{CC}$ |
| | | 74F | | | | 50 | | | |
| $V_{ID}$ | 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 | | | | | −0.6 | mA | Max | $V_{IN}$ = 0.5V |
| $I_{OS}$ | Output Short-Circuit Current | | | −60 | | −150 | mA | Max | $V_{OUT}$ = 0V |
| $I_{CCL}$ | Power Supply Current | | | | 30 | 45 | mA | Max | $V_O$ = LOW |

## AC Electrical Characteristics

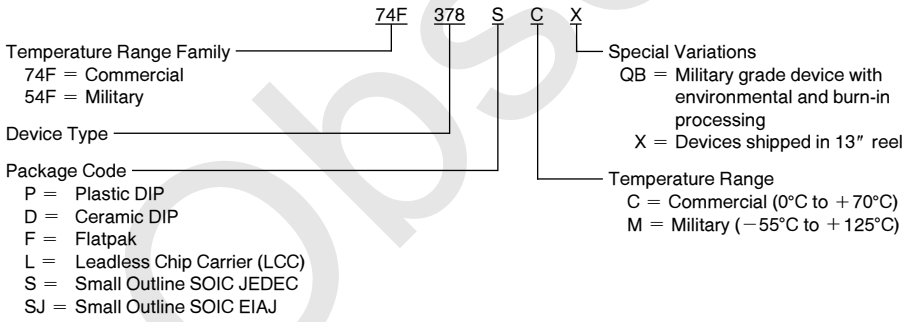
| Symbol | Parameter | 74F $T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF | | | 54F $T_A$, $V_{CC}$ = Mil, $C_L = 50$ pF | | 74F $T_A$, $V_{CC}$ = Com, $C_L = 50$ pF | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | Min | Max | |
| $f_{max}$ | Maximum Input Frequency | 80 | 100 | | 70 | | 80 | | MHz |
| $t_{PLH}$ | Propagation Delay | 3.0 | 5.5 | 7.5 | 3.0 | 10.0 | 3.0 | 8.5 | ns |
| $t_{PHL}$ | CP to $Q_n$ | 3.5 | 6.0 | 8.5 | 3.5 | 10.5 | 3.5 | 9.5 | |

## AC Operating Requirements

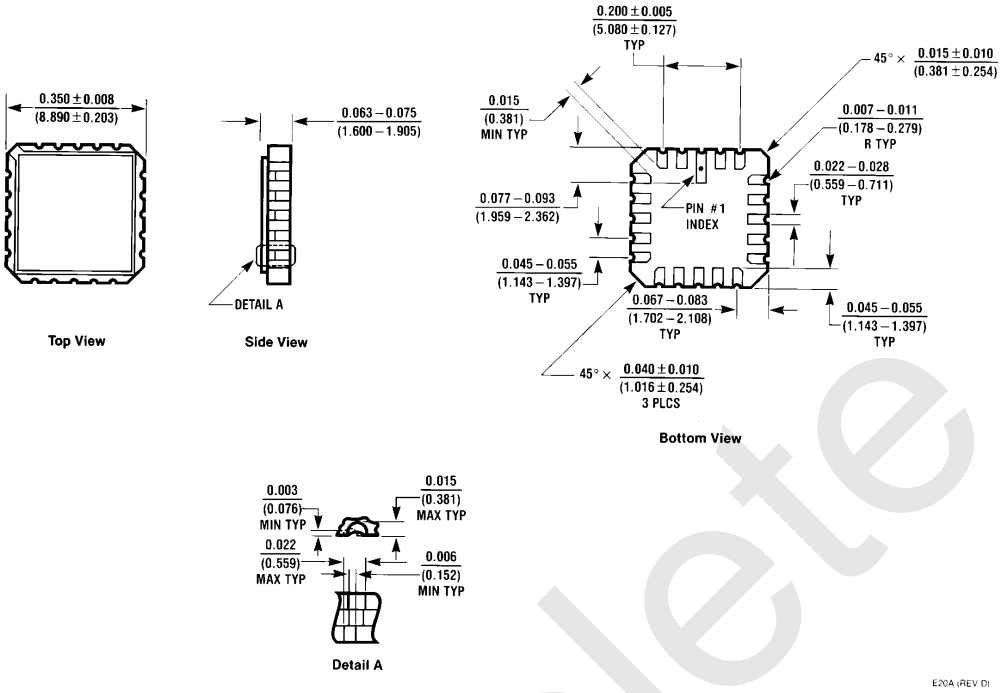
| Symbol | Parameter | 74F $T_A = +25°C$, $V_{CC} = +5.0V$ | | 54F $T_A$, $V_{CC}$ = Mil | | 74F $T_A$, $V_{CC}$ = Com | | Units |
|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | |
| $t_s(H)$ | Setup Time, HIGH or LOW | 4.0 | | 5.0 | | 4.0 | | ns |
| $t_s(L)$ | $D_n$ to CP | 4.0 | | 5.0 | | 4.0 | | |
| $t_h(H)$ | Hold Time, HIGH or LOW | 0 | | 2.0 | | 0 | | |
| $t_h(L)$ | $D_n$ to CP | 0 | | 2.0 | | 0 | | |
| $t_s(H)$ | Setup Time, HIGH or LOW | 6.0 | | 4.5 | | 6.0 | | ns |
| $t_s(L)$ | $\overline{E}$ to CP | 10.0 | | 13.0 | | 10.0 | | |
| $t_h(H)$ | Hold Time, HIGH or LOW | 0 | | 0 | | 0 | | |
| $t_h(L)$ | $\overline{E}$ to CP | 0 | | 0 | | 0 | | |
| $t_w(H)$ | CP Pulse Width | 4.0 | | 5.0 | | 4.0 | | ns |
| $t_w(L)$ | HIGH or LOW | 6.0 | | 7.5 | | 6.0 | | |

## Ordering Information

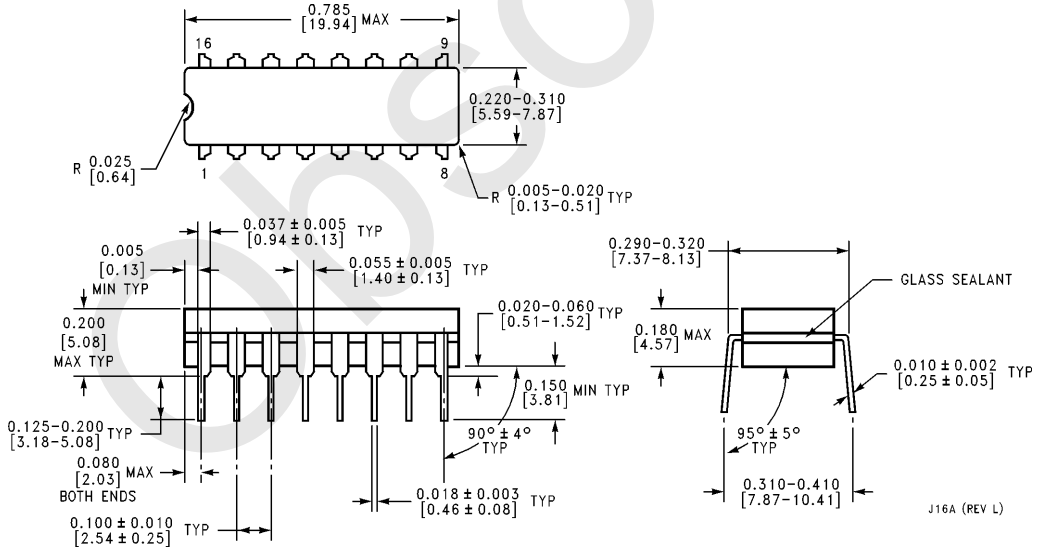
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



## Physical Dimensions inches (millimeters)

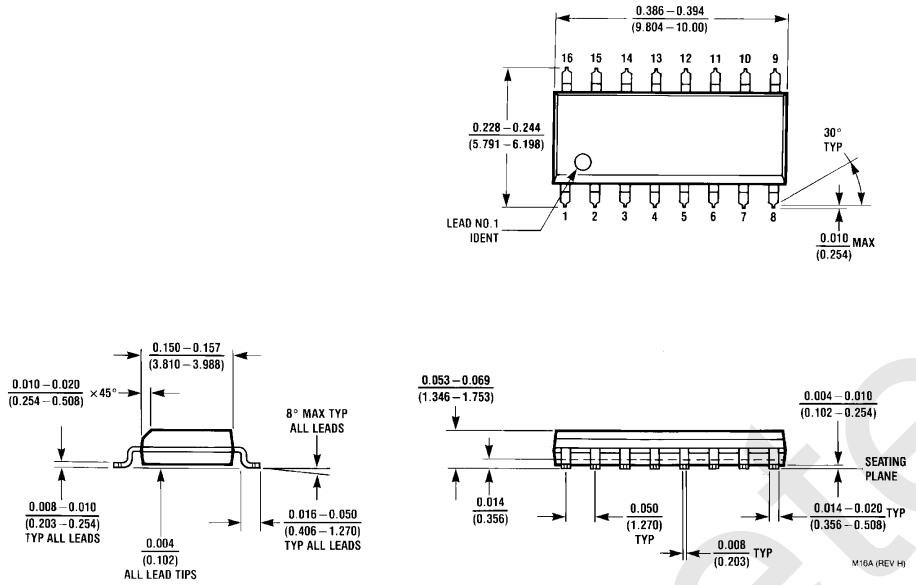



**20-Lead Ceramic Leadless Chip Carrier (L)**
**NS Package Number E20A**

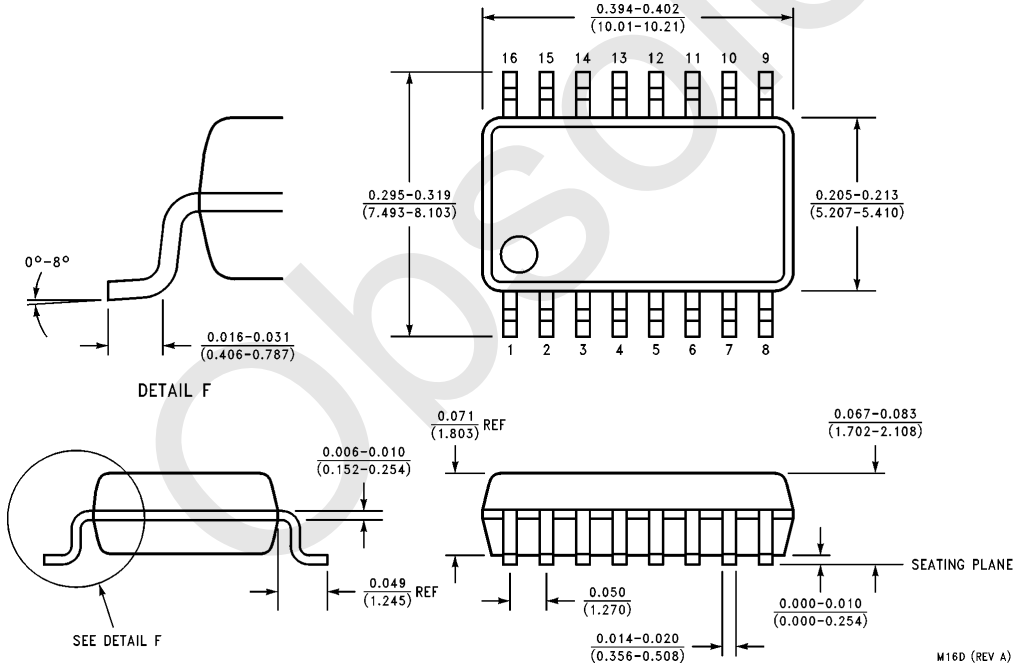



**16-Lead Ceramic Dual-In-Line Package (D)**
**NS Package Number J16A**

## Physical Dimensions inches (millimeters) (Continued)

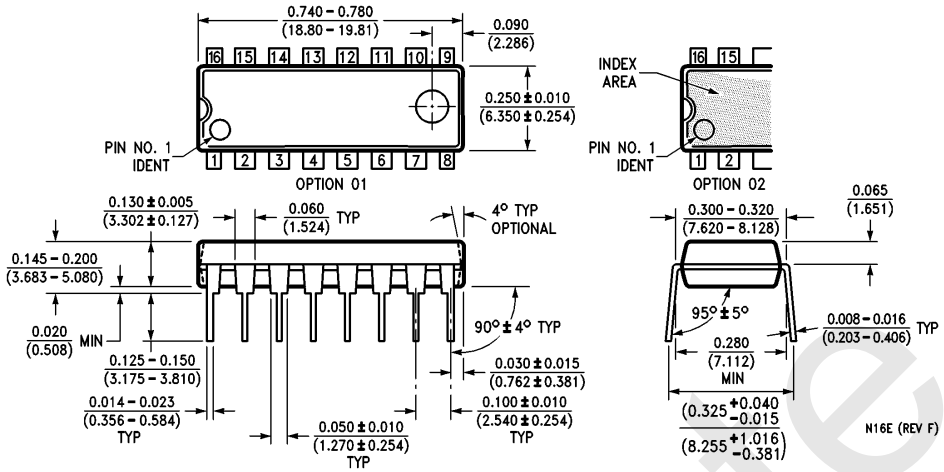



**16-Lead (0.150″ Wide) Molded Small Outline Package, JEDEC**
**NS Package Number M16A**



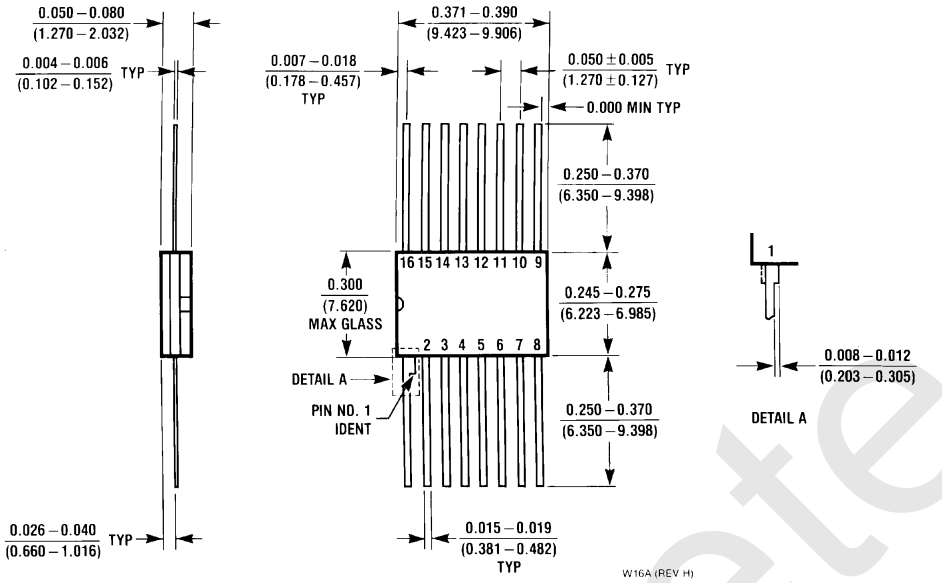

**16-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ (SJ)**
**NS Package Number M16D**

## Physical Dimensions inches (millimeters) (Continued)




**16-Lead (0.300″ Wide) Molded Dual-In-Line Package (P)**
**NS Package Number N16E**

## Physical Dimensions inches (millimeters) (Continued)




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



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