

# Quad 2-input NAND buffer (open collector)

74F38

## FEATURE

- Industrial temperature range available (-40°C to +85°C)

| TYPE  | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|-------|---------------------------|--------------------------------|
| 74F38 | 7.0ns                     | 13mA                           |

## ORDERING INFORMATION

| DESCRIPTION        | ORDER CODE   |  |
|--------------------|--|--|
|                    | COMMERCIAL RANGE<br>$V_{CC} = 5V \pm 10\%$ ,<br>$T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$ | INDUSTRIAL RANGE<br>$V_{CC} = 5V \pm 10\%$ ,<br>$T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$ |
| 14-pin plastic DIP | N74F38N  | I74F38N  |
| 14-pin plastic SO  | N74F38D  | I74F38D  |

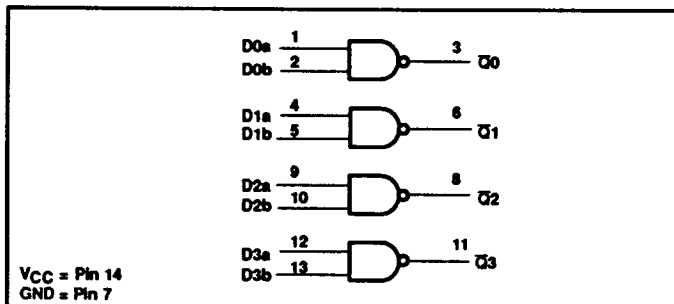
## INPUT AND OUTPUT LOADING AND FAN OUT TABLE

| PINS        | DESCRIPTION | 74F (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-------------|-------------|---------------------|---------------------|
| Dna, Dnb    | Data inputs | 1.0/2.0             | 20µA/1.2mA          |
| $\bar{Q}_n$ | Data output | OC/106.7            | OC/64mA             |

### Notes to input and output loading and fan out table

- One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.
- OC = open collector

## LOGIC DIAGRAM



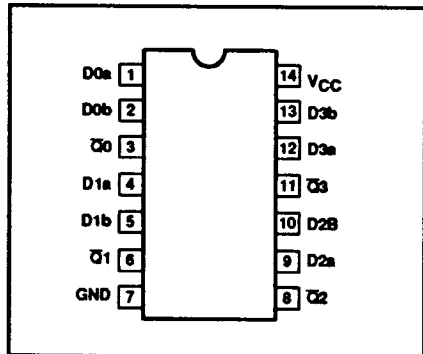
## FUNCTION TABLE

| INPUTS |     | OUTPUT      |
|--------|-----|-------------|
| Dna    | Dnb | $\bar{Q}_n$ |
| L      | L   | H           |
| L      | H   | H           |
| H      | L   | H           |
| H      | H   | L           |

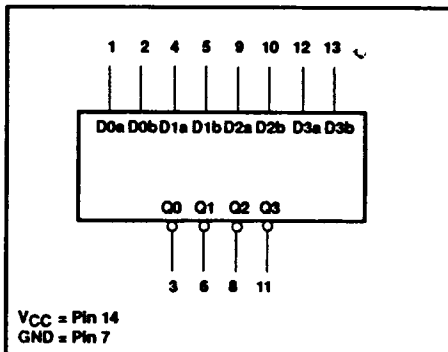
### Notes to function table

- H = High voltage level
- L = Low voltage level

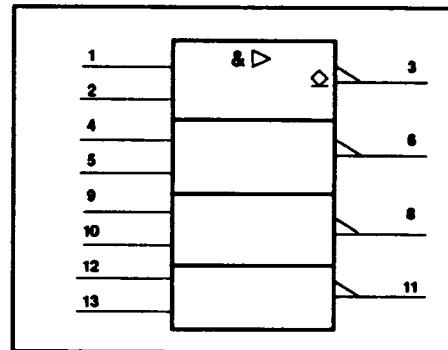
## PIN CONFIGURATION



## LOGIC SYMBOL



## IEC/IEEE SYMBOL



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## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit 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       |    |
|-----------|--|------------------|------------|----|
| $V_{CC}$  | Supply voltage                                 | -0.5 to +7.0     | V          |    |
| $V_{IN}$  | Input voltage                                  | -0.5 to +7.0     | V          |    |
| $I_{IN}$  | Input current                                  | -30 to +5        | mA         |    |
| $V_{OUT}$ | Voltage applied to output in high output state | -0.5 to $V_{CC}$ | V          |    |
| $I_{OUT}$ | Current applied to output in low output state  | 128              | mA         |    |
| $T_{amb}$ | Operating free air temperature range           | Commercial range | 0 to +70   | °C |
|           |  | Industrial range | -40 to +85 | °C |
| $T_{stg}$ | Storage temperature range                      | -65 to +150      | °C         |    |

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL    | PARAMETER                            | LIMITS           |     |     | UNIT |
|-----------|--------------------------------------|------------------|-----|-----|------|
|           |                                      | MIN              | NOM | 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   |
| $V_{OH}$  | High-level output voltage            |                  |     | 4.5 | V    |
| $I_{OL}$  | Low-level output current             |                  |     | 64  | mA   |
| $T_{amb}$ | Operating free air temperature range | Commercial range | 0   | +70 | °C   |
|           |                                      | Industrial range | -40 | +85 | °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  |               |
| $I_{OH}$ | High-level output current              | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{IH} = \text{MIN}, V_{OH} = \text{MAX}$ |                        |                  | 250  | $\mu\text{A}$ |
| $V_{OL}$ | Low-level output voltage               | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$   |                        |                  | 0.55 | V             |
|          |  | $V_{IH} = \text{MIN}, I_{OL} = \text{MAX}$   | $\pm 10\%V_{CC}$       |                  | 0.42 | 0.55          |
| $V_{IK}$ | Input clamp voltage                    | $V_{CC} = \text{MIN}, I_1 = I_{IK}$  |                        | -0.73            | -1.2 | V             |
| $I_1$    | Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_1 = 7.0\text{V}$   |                        |                  | 100  | $\mu\text{A}$ |
| $I_{IH}$ | High-level input current               | $V_{CC} = \text{MAX}, V_1 = 2.7\text{V}$   |                        |                  | 20   | $\mu\text{A}$ |
| $I_{IL}$ | Low-level input current                | $V_{CC} = \text{MAX}, V_1 = 0.5\text{V}$   |                        |                  | -1.2 | mA            |
| $I_{CC}$ | Supply current (total)                 | $I_{CCH}$ $V_{CC} = \text{MAX}$  | $V_{IN} = \text{GND}$  | 4.0              | 7.0  | mA            |
|          |  | $I_{CCL}$ $V_{CC} = \text{MAX}$  | $V_{IN} = 4.5\text{V}$ | 22               | 30   | mA            |

## Notes to DC electrical characteristics

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5\text{V}, T_{amb} = 25^\circ\text{C}$ .

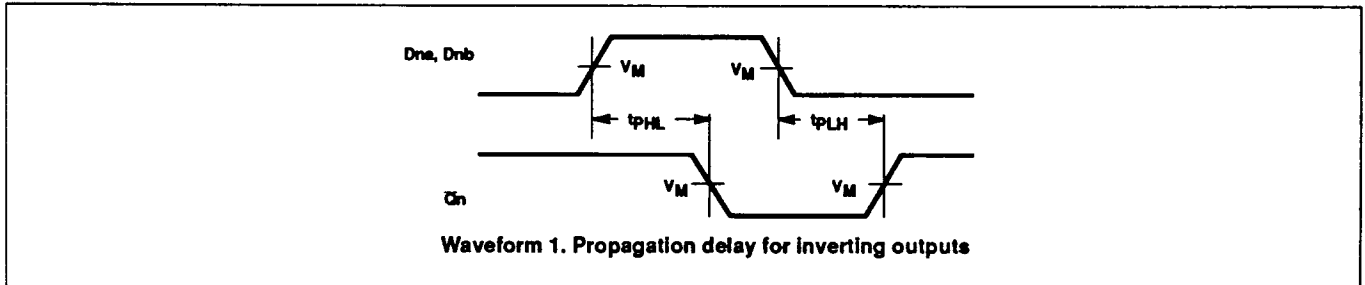
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## AC ELECTRICAL CHARACTERISTICS

| SYMBOL                 | PARAMETER                                    | TEST CONDITION | LIMITS  |      |      |   |      |   | UNIT |     |
|------------------------|--|----------------|---|------|------|---|------|---|------|-----|
|                        |  |                | $T_{amb} = +25^{\circ}C$<br>$V_{CC} = +5.0V$<br>$C_L = 50pF$<br>$R_L = 500\Omega$ |      |      | $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$<br>$V_{CC} = +5.0V \pm 10\%$<br>$C_L = 50pF$<br>$R_L = 500\Omega$ |      | $T_{amb} = -40^{\circ}C \text{ to } +85^{\circ}C$<br>$V_{CC} = +5.0V \pm 10\%$<br>$C_L = 50pF$<br>$R_L = 500\Omega$ |      |     |
|                        |  |                | MIN   | TYP  | MAX  | MIN   | MAX  | MIN   |      | MAX |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>Dna, Dnb to $\bar{C}_n$ | Waveform 1     | 7.5   | 10.0 | 12.5 | 7.5   | 13.0 | 7.5   | 14.5 | ns  |
|                        |  |                | 1.5   | 3.0  | 5.0  | 1.5   | 5.5  | 1.5   | 6.0  |     |

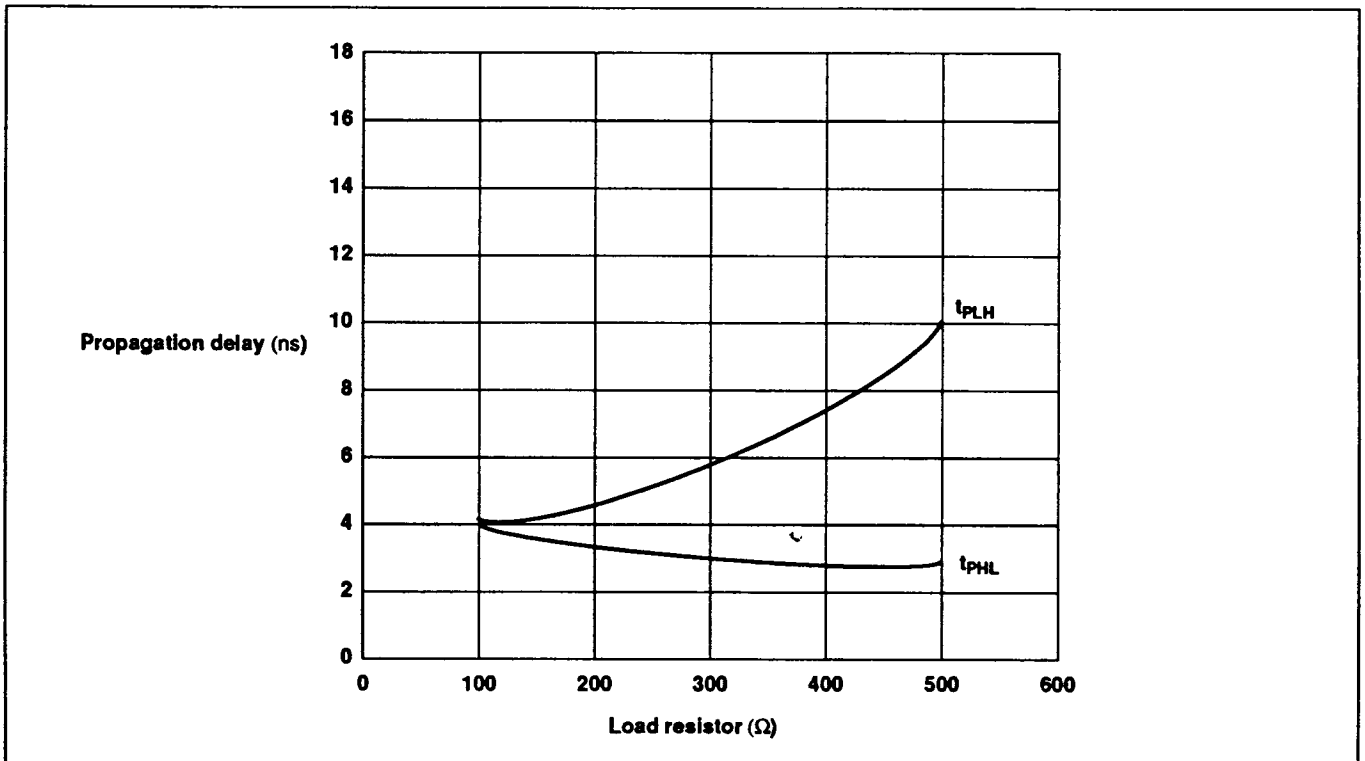
## AC WAVEFORMS



### Note to AC Waveforms

- For all waveforms,  $V_M = 1.5V$ .

## TYPICAL PROPAGATION DELAYS VERSUS LOAD FOR OPEN COLLECTOR OUTPUTS



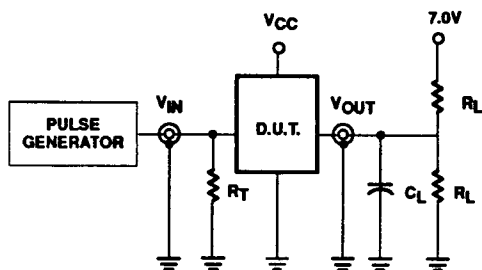
### Note to typical propagation delays versus load for open collector outputs

- When using open collector parts, the value of the pull-up resistor greatly affects the value of the  $t_{PLH}$ . For example, changing the specified pull-up resistor value from 500 ohm to 100 ohm will improve the  $t_{PLH}$  up to 50% with only a slight increase in the  $t_{PHL}$ . However, if the value of the pull-up resistor is changed, the user must make certain that the total  $I_{OL}$  current through the resistor and the total  $I_{IL}$ 's of the receivers does not exceed the  $I_{OL}$  minimum specification.

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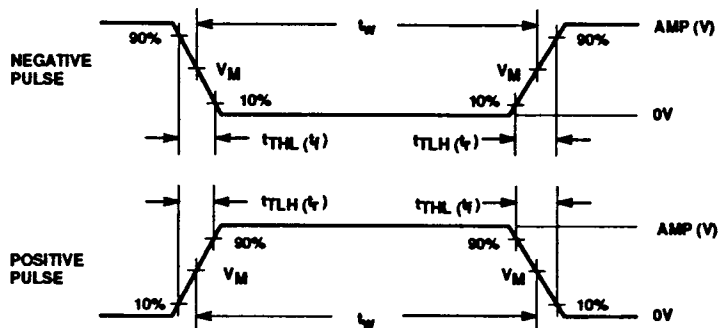
## TEST CIRCUIT AND WAVEFORM



Test circuit for open collector outputs

**DEFINITIONS:**

- $R_L$  = Load resistor; see AC electrical characteristics for value.
- $C_L$  = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
- $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.



Input pulse definition

| family | INPUT PULSE REQUIREMENTS |       |           |       |           |           |
|--------|--------------------------|-------|-----------|-------|-----------|-----------|
|        | amplitude                | $v_M$ | rep. rate | $t_w$ | $t_{TLH}$ | $t_{THL}$ |
| 74F    | 3.0V                     | 1.5V  | 1MHz      | 500ns | 2.5ns     | 2.5ns     |

## VI. COMMERCIAL PRODUCT SPECIAL PROCESSING T-90-20

### SUPR II LEVEL B PRICING ADDERS

#### SUPR II LEVEL B

Signetics Upgraded Product Reliability (SUPR) program is designed to provide customers whose systems require an infant mortality level less than that of our non-burned-in products (which is typically below 1000 PPM).

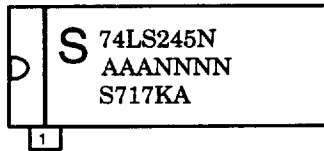
#### DEVICE AVAILABILITY

Products available for Level B processing are identified in the Price Book with a "B" suffix to the basic part number.

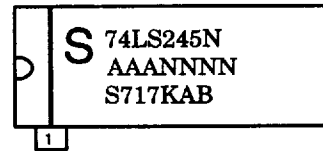
| PRODUCT FAMILY | SUGGESTED RESALE ADDERS     |         |           |
|----------------|-----------------------------|---------|-----------|
|                | 1-99                        | 100-999 | OVER 1000 |
| LIN            | .14                         | .14     | .11       |
| LOG (TTL)      |                             |         |           |
| (SSI)          | .12                         | .10     | .08       |
| (MSI)          | .16                         | .14     | .11       |
| (OCT)          | .16                         | .14     | .11       |
| (CTM)          | .16                         | .14     | .11       |
| LOG (ECL)      |                             |         |           |
| (SSI)          | .25                         | .23     | .20       |
| (MSI)          | .25                         | .23     | .20       |
| LOG (LSI)      | Consult Factory for Pricing |         |           |
| (RAM)          |                             |         |           |
| MIC (8X)       | Consult Factory for Pricing |         |           |
| PLD            |                             |         |           |
| MCG            | Consult Factory for Pricing |         |           |
| DAT            | Not Available               |         |           |
| MIC            |                             |         |           |

#### MARKING FORMAT EXAMPLES

Standard (no Burn-In) Products (Dual-in-line)



SUPR II (Burned-In) Products (Dual-in-line)



**NOTE:** The "B" in the 7<sup>th</sup> position on the 3<sup>rd</sup> line, when present, is the SUPR II Burn-In indicator.

#### TAPE AND REEL PACKAGING

#### SPECIFICATIONS

Tape and Reel specifications conform to Electronic Industries Association (EIA) Proposed Specification #EIA-481-A using 13 inch reels. Current incremental quantities reflect the quantities per reel. As more customers are able to handle a larger quantity per reel, this quantity will be increased.

#### DEVICE AVAILABILITY

Products available in tape and reel packaging are identified in the Price Book with a "T" suffix to the basic part number and are only offered as a product for sale by the reel. Return of product is limited to full reels with unbroken quality seals.

#### TAPE AND REEL PRICING ADDERS

| PRODUCT FAMILY | SUGGESTED RESALE ADDER   |
|----------------|--|
| MCG            | .07  |
| LIN            | .07  |
| LOG            | .07  |
| DAT            | PACKAGE A28 = .20<br>A44 = .25<br>A52 = .30<br>A68 = .40<br>A84 = .45<br>D24 = .17 |
| MIC            |  |

**VII. PACKING QUANTITY INFORMATION**

T-90-20

**CERAMIC DUAL IN-LINE (CERDIP)**

| PACKAGE CODE           | PIN COUNT        | QUANTITIES       |                 |
|------------------------|------------------|------------------|-----------------|
|                        |                  | DEVICES PER TUBE | DEVICES PER BOX |
| F/FE, BPA, PA          | 8-pin (300-mil)  | 48               | 1920            |
| F, BCA, CA             | 14-pin (300-mil) | 25               | 1000            |
| F, BEA, EA             | 16-pin (300-mil) | 25               | 1000            |
| F, BVA, MVA            | 18-pin (300-mil) | 21               | 840             |
| F/FA, BRA, RA          | 20-pin (300-mil) | 20               | 800             |
| F, BWA, WA             | 22-pin (400-mil) | 17               | 544             |
| F/FA/F6, BJA, JA       | 24-pin (600-mil) | 15               | 360             |
| F/FA/F3/F24, BLA, LA   | 24-pin (300-mil) | 15               | 600             |
| F, BXA, XA             | 24-pin (400-mil) | 15               | 480             |
| F/FA/F28, BXA, XA      | 28-pin (600-mil) | 13               | 312             |
| FA                     | 32-pin (600-mil) | 11               | 264             |
| F/FA/F40, BQA, MQA, QA | 40-pin (600-mil) | 9                | 216             |

**CERPAC**

| PACKAGE CODE | PIN COUNT | QUANTITIES       |
|--------------|-----------|------------------|
|              |           | DEVICES PER TUBE |
| BDA/DAW      | 14-pin    | 145              |
| BFA/FAW      | 16-pin    | 145              |
| BXA/BYAW     | 18-pin    | 100              |
| BSA/SAW/WB   | 20-pin    | 100              |
| BKA/KAW      | 24-pin    | 120              |
| BYA/YAW      | 28-pin    | 50               |

**CERQUAD**

| PACKAGE CODE | PIN COUNT | QUANTITIES       |                 |
|--------------|-----------|------------------|-----------------|
|              |           | DEVICES PER TRAY | DEVICES PER BOX |
| KA/K44       | 44-pin    | 6                | 6               |
| KA/K68       | 68-pin    | 4                | 4               |
| KA           | 84-pin    | 42               | 210             |

**LEADLESS CHIP CARRIER**

| PACKAGE CODE            | PIN COUNT | QUANTITIES       |
|-------------------------|-----------|------------------|
|                         |           | DEVICES PER TUBE |
| B2A/2A/GA               | 20-pin    | 55               |
| B3A/3A/GA/GC1           | 28-pin    | 43               |
| YA/YA/GC2               | 32-pin    | 35               |
| BUA/MXA/MUA/UA/XA/GA/GC | 44-pin    | 27               |
| BZA/BUA/UA/ZA/GA/GC     | 68-pin    | 19               |

QUANTITIES SHOWN IN GRAY REQUIRE PURCHASE TO BE MADE IN EXACT MULTIPLES OF THAT QUANTITY.

**VII. PACKING QUANTITY INFORMATION**

T-90-20

**PLASTIC DUAL IN-LINE**

| PACKAGE CODE | PIN COUNT            | QUANTITIES       |                 |
|--------------|----------------------|------------------|-----------------|
|              |                      | DEVICES PER TUBE | DEVICES PER BOX |
| N/N8         | 8-pin (300-mil)      | 50               | 2000            |
| N/N14/N16    | 14- 16-pin (300-mil) | 25               | 1000            |
| N            | 18-pin (300-mil)     | 20               | 800             |
| N/N20        | 20-pin (300-mil)     | 18               | 720             |
| N            | 22-pin (400-mil)     | 17               | 544             |
| N/N6         | 24-pin (600-mil)     | 15               | 360             |
| N/N3/N24     | 24-pin (300-mil)     | 15               | 600             |
| N/N24        | 24-pin (400-mil)     | 15               | 480             |
| N/N28        | 28-pin (600-mil)     | 13               | 312             |
| N/N3         | 28-pin (300-mil)     | 13               | 520             |
| N            | 32-pin (600-mil)     | 11               | 264             |
| N/N40        | 40-pin (600-mil)     | 9                | 216             |
| NB (Shrink)  | 42-pin (600-mil)     | 12               | 288             |
| N/N48        | 48-pin (600-mil)     | 7                | 168             |
| N            | 50-pin (900-mil)     | 7                | 112             |
| N/N64        | 64-pin (900-mil)     | 5                | 80              |

**PLASTIC LEADED CHIP CARRIER (PLCC)**

| PACKAGE CODE | PIN COUNT | QUANTITIES       |                 |                  |
|--------------|-----------|------------------|-----------------|------------------|
|              |           | DEVICES PER TUBE | DEVICES PER BOX | DEVICES PER REEL |
| A            | 20-pin    | 46               | 3680            | 1000             |
| A/A28        | 28-pin    | 37               | 2368            | 750              |
| A            | 32-pin    | 31               | 2232            | 750              |
| A/A44        | 44-pin    | 26               | 1248            | 500              |
| A/A52        | 52-pin    | 23               | 1012            | 500              |
| A/A68        | 68-pin    | 18               | 648             | 250              |
| A/A84        | 84-pin    | 15               | 420             | 250              |

QUANTITIES SHOWN IN GRAY REQUIRE PURCHASE TO BE MADE IN EXACT MULTIPLES OF THAT QUANTITY.

**VII. PACKING QUANTITY INFORMATION**

T-90-20

**PLASTIC SMALL OUTLINE (SO)**

| PACKAGE CODE | PIN COUNT        | QUANTITIES       |                 |                        |
|--------------|------------------|------------------|-----------------|------------------------|
|              |                  | DEVICES PER TUBE | DEVICES PER BOX | DEVICES PER REEL       |
| D/D8         | 8-pin (150-mil)  | 100              | 10000           | 2500                   |
| D            | 8-pin (300-mil)  | 64               | 2560            | 1000 - 13"<br>700 - 7" |
| D/D14        | 14-pin (150-mil) | 57               | 5700            | 2500                   |
| D            | 16-pin (150-mil) | 50               | 5000            | 2500                   |
| D            | 16-pin (300-mil) | 48               | 1920            | 1000                   |
| DK(SSOP)     | 20-pin (170-mil) | 75               | 6750            | 2500                   |
| D            | 20-pin (300-mil) | 38               | 1520            | 1000                   |
| D/D24        | 24-pin (300-mil) | 32               | 1280            | 1000                   |
| D            | 28-pin (300-mil) | 27               | 1080            | 1000                   |
| D            | 40-pin (VSO-40)  | 31               | 1240            | 1000 - 13"<br>300 - 7" |
| D            | 56-pin (VSO-56)  | 22               | 616             | 1000                   |

**QUAD FLAT PACK\***

| PACKAGE CODE | PIN COUNT                | QUANTITIES       |                 |
|--------------|--------------------------|------------------|-----------------|
|              |                          | DEVICES PER TRAY | DEVICES PER BOX |
| B/B44        | 44-pin                   | 50               | 500             |
| B/B44        | 44-pin                   | 96               | 480             |
| B            | 52-pin                   | 119              | 595             |
| B            | 80-pin                   | 66               | 330             |
| B            | 100-pin                  | 50               | 250             |
| B            | 120-pin                  | 24               | 120             |
| B            | 120-pin (Philips source) | 30               | 150             |

\* Quad Flat Pack parts require dry pack handling according to EIA Standard - 583. These parts are identified in part list section with DRY PACK in the Cross Ref Part No field.

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