

CD4070B, CD4077B

CMOS Quad Exclusive-OR and Exclusive-NOR Gate

Features

- High-Voltage Types (20V Rating)
- CD4070B - Quad Exclusive-OR Gate
- CD4077B - Quad Exclusive-NOR Gate
- Medium Speed Operation
 - $t_{PHL}, t_{PLH} = 65\text{ns}$ (Typ) at $V_{DD} = 10\text{V}$, $C_L = 50\text{pF}$
- 100% Tested for Quiescent Current at 20V
- Standardized Symmetrical Output Characteristics
- 5V, 10V and 15V Parametric Ratings
- Maximum Input Current of $1\mu\text{A}$ at 18V Over Full Package Temperature Range
 - 100nA at 18V and 25°C
- Noise Margin (Over Full Package Temperature Range)
 - 1V at $V_{DD} = 5\text{V}$, 2V at $V_{DD} = 10\text{V}$, 2.5V at $V_{DD} = 15\text{V}$
- Meets All Requirements of JEDEC Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Applications

- Logical Comparators
- Adders/Subtractors
- Parity Generators and Checkers

Description

The Harris CD4070B contains four independent Exclusive-OR gates. The Harris CD4077B contains four independent Exclusive-NOR gates.

The CD4070B and CD4077B provide the system designer with a means for direct implementation of the Exclusive-OR and Exclusive-NOR functions, respectively.

Ordering Information

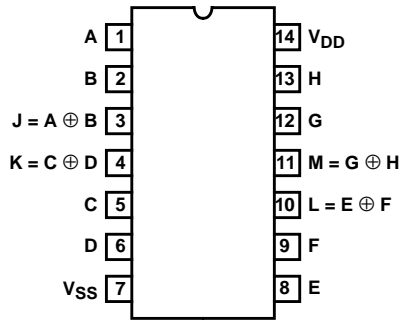
| PART NUMBER | TEMP. RANGE (°C) | PACKAGE |
|-------------|------------------|--------------|
| CD4070BE | -55 to 125 | 14 Ld PDIP |
| CD4070BF3A | -55 to 125 | 14 Ld CERDIP |
| CD4070BM | -55 to 125 | 14 Ld SOIC |
| CD4070BMT | -55 to 125 | 14 Ld SOIC |
| CD4070BM96 | -55 to 125 | 14 Ld SOIC |
| CD4070BNSR | -55 to 125 | 14 Ld SOP |
| CD4070BPW | -55 to 125 | 14 Ld TSSOP |
| CD4070BPWR | -55 to 125 | 14 Ld TSSOP |
| CD4077BE | -55 to 125 | 14 Ld PDIP |
| CD4077BF3A | -55 to 125 | 14 Ld CERDIP |
| CD4077BM | -55 to 125 | 14 Ld SOIC |
| CD4077BMT | -55 to 125 | 14 Ld SOIC |
| CD4077BM96 | -55 to 125 | 14 Ld SOIC |
| CD4077BNSR | -55 to 125 | 14 Ld SOP |
| CD4077BPW | -55 to 125 | 14 Ld TSSOP |
| CD4077BPWR | -55 to 125 | 14 Ld TSSOP |

NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

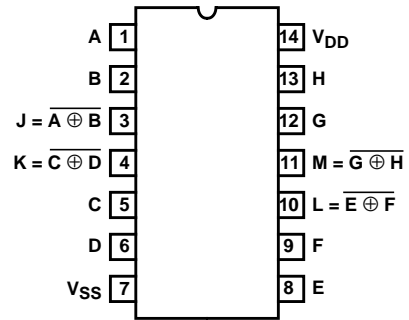
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Pinouts

CD4070B
(PDIP, Cerdip, SOIC, SOP, TSSOP)
TOP VIEW

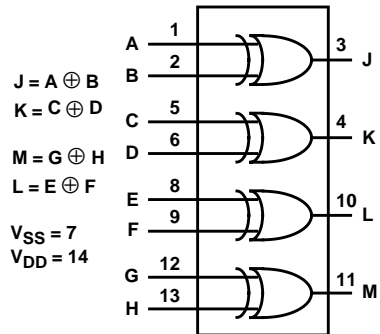


CD4077B
(PDIP, Cerdip, SOIC, SOP, TSSOP)
TOP VIEW

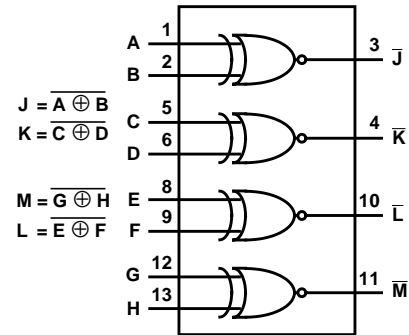


Functional Diagrams

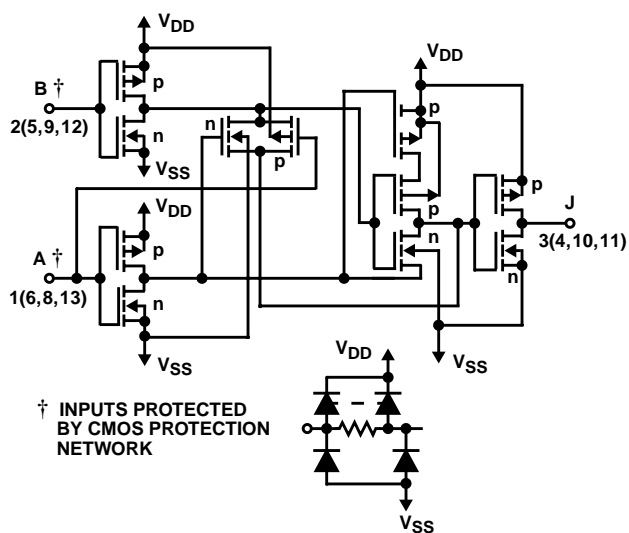
CD4070B



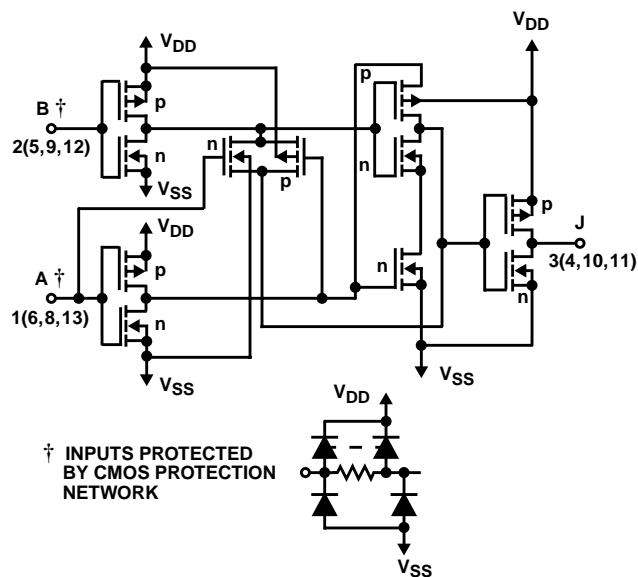
CD4077B



CD4070B, CD4077B



**FIGURE 1. SCHEMATIC DIAGRAM FOR CD4070B
(1 OF 4 IDENTICAL GATES)**



**FIGURE 2. SCHEMATIC DIAGRAM FOR CD4077B
(1 OF 4 IDENTICAL GATES)**

CD4070B TRUTH TABLE (1 OF 4 GATES)

| A | B | J |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |

NOTE:
 1 = High Level
 0 = Low Level
 J = A ⊕ B

CD4077B TRUTH TABLE (1 OF 4 GATES)

| A | B | J |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 1 |

NOTE:
 1 = High Level
 0 = Low Level
 J = A ⊕ B

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Absolute Maximum Ratings

DC Supply Voltage Range (V_{DD}) -0.5V to 20V
 Input Voltage Range, All Inputs -0.5V to V_{DD} 0.5V
 DC Input Current $\pm 10\text{mA}$

Operating Conditions

Temperature Range (T_A) -55°C to 125°C
 Supply Voltage Range (Typical) 3V to 18V

Thermal Information

Package Thermal Impedance, θ_{JA} (see Note 1):
 E (PDIP) Package 80°C/W
 M (SOIC) Package 86°C/W
 NS (SOP) Package 76°C/W
 PW (TSSOP) Package 113°C/W
 Maximum Junction Temperature (Hermetic Package or Die) . 175°C
 Maximum Junction Temperature (Plastic Package) 150°C
 Maximum Storage Temperature Range -65°C to 150°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. The package thermal impedance is calculated in accordance with JESD 51-7.

DC Electrical Specifications

| PARAMETER | CONDITIONS | | | LIMITS AT INDICATED TEMPERATURES (°C) | | | | | | | UNITS |
|--|--------------|-----------------|-----------------|---------------------------------------|-----------|---------|---------|-------|---------------|-----------|---------------|
| | | | | -55 | -40 | 85 | 125 | 25 | | | |
| | V_O (V) | V_{IN} (V) | V_{DD} (V) | | | | | MIN | TYP | MAX | |
| Quiescent Device Current I_{DD} Max | - | 0, 5 | 5 | 0.25 | 0.25 | 7.5 | 7.5 | - | 0.01 | 0.25 | μA |
| | - | 0, 10 | 10 | 0.5 | 0.5 | 15 | 15 | - | 0.01 | 0.5 | μA |
| | - | 0, 15 | 15 | 1 | 1 | 30 | 30 | - | 0.01 | 1 | μA |
| | - | 0, 20 | 20 | 5 | 5 | 150 | 150 | - | 0.02 | 5 | μA |
| Output Low (Sink) Current I_{OL} Min | 0.4 | 0, 5 | 5 | 0.64 | 0.61 | 0.42 | 0.36 | 0.51 | 1 | - | mA |
| | 0.5 | 0, 10 | 10 | 1.6 | 1.5 | 1.1 | 0.9 | 1.3 | 2.6 | - | mA |
| | 1.5 | 0, 15 | 15 | 4.2 | 4 | 2.8 | 2.4 | 3.4 | 6.8 | - | mA |
| Output High (Source) Current I_{OH} Min | 4.6 | 0, 5 | 5 | -0.64 | -0.61 | -0.42 | -0.36 | -0.51 | -1 | - | mA |
| | 2.5 | 0, 5 | 5 | -2 | -1.8 | -1.3 | -1.15 | -1.6 | -3.2 | - | mA |
| | 9.5 | 0, 10 | 10 | -1.6 | -1.5 | -1.1 | -0.9 | -1.3 | -2.6 | - | mA |
| | 13.5 | 0, 15 | 15 | -4.2 | -4 | -2.8 | -2.4 | -3.4 | -6.8 | - | mA |
| Output Voltage: Low Level, V_{OL} Max | - | 0, 5 | 5 | 0.05 | 0.05 | 0.05 | 0.05 | - | 0 | 0.05 | V |
| | - | 0, 10 | 10 | 0.05 | 0.05 | 0.05 | 0.05 | - | 0 | 0.05 | V |
| | - | 0, 15 | 15 | 0.05 | 0.05 | 0.05 | 0.05 | - | 0 | 0.05 | V |
| Output Voltage: High Level, V_{OH} Min | - | 0, 5 | 5 | 4.95 | 4.95 | 4.95 | 4.95 | 4.95 | 5 | - | V |
| | - | 0, 10 | 10 | 9.95 | 9.95 | 9.95 | 9.95 | 9.95 | 10 | - | V |
| | - | 0, 15 | 15 | 14.95 | 14.95 | 14.95 | 14.95 | 14.95 | 15 | - | V |
| Input Low Voltage, V_{IL} Max | 0.5, 4.5 | - | 5 | 1.5 | 1.5 | 1.5 | 1.5 | - | - | 1.5 | V |
| | 1, 9 | - | 10 | 3 | 3 | 3 | 3 | - | - | 3 | V |
| | 1.5, 13.5 | - | 15 | 4 | 4 | 4 | 4 | - | - | 4 | V |
| Input High Voltage, V_{IH} Min | 0.5, 4.5 | - | 5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | - | - | V |
| | 1, 9 | - | 10 | 7 | 7 | 7 | 7 | 7 | - | - | V |
| | 1.5, 13.5 | - | 15 | 11 | 11 | 11 | 11 | 11 | - | - | V |
| Input Current, I_{IN} Max | - | 0, 18 | 18 | ± 0.1 | ± 0.1 | ± 1 | ± 1 | - | $\pm 10^{-5}$ | ± 0.1 | μA |

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AC Electrical Specifications

$T_A = 25^\circ\text{C}$, Input $t_r, t_f = 20\text{ns}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$

| PARAMETER | SYMBOL | TEST CONDITIONS | LIMITS ON ALL TYPES | | UNITS |
|------------------------|--------------------|-----------------|---------------------|-----|-------|
| | | V_{DD} (V) | TYP | MAX | |
| Propagation Delay Time | t_{PHL}, t_{PLH} | 5 | 140 | 280 | ns |
| | | 10 | 65 | 130 | ns |
| | | 15 | 50 | 100 | ns |
| Transition Time | t_{THL}, t_{TLH} | 5 | 100 | 200 | ns |
| | | 10 | 50 | 100 | ns |
| | | 15 | 40 | 80 | ns |
| Input Capacitance | C_{IN} | Any Input | 5 | 7.5 | pF |

Typical Performance Curves



FIGURE 3. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS



FIGURE 4. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS



FIGURE 5. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

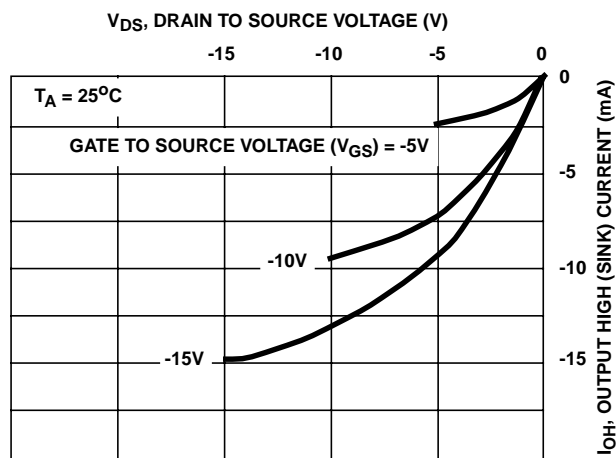


FIGURE 6. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

Typical Performance Curves (Continued)

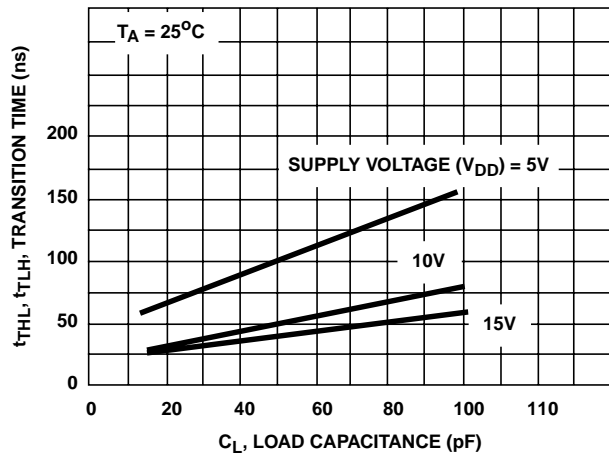


FIGURE 7. TYPICAL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

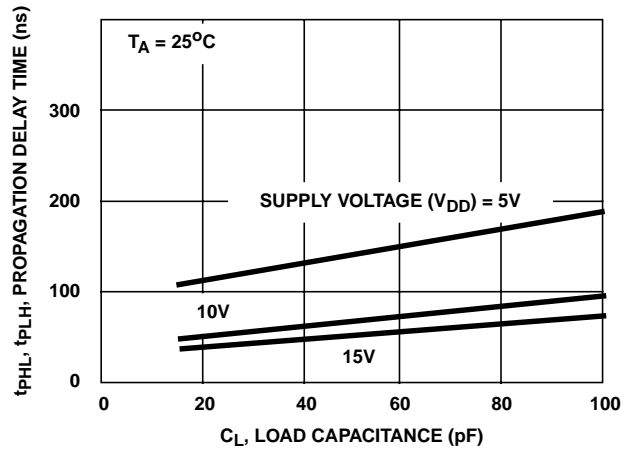


FIGURE 8. TYPICAL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

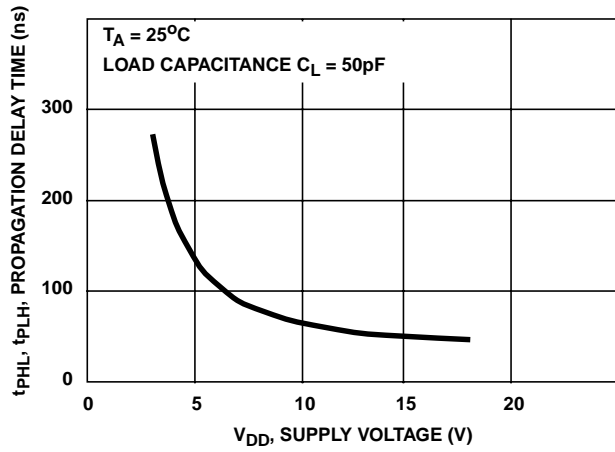


FIGURE 9. TYPICAL PROPAGATION DELAY TIME AS A FUNCTION OF SUPPLY VOLTAGE

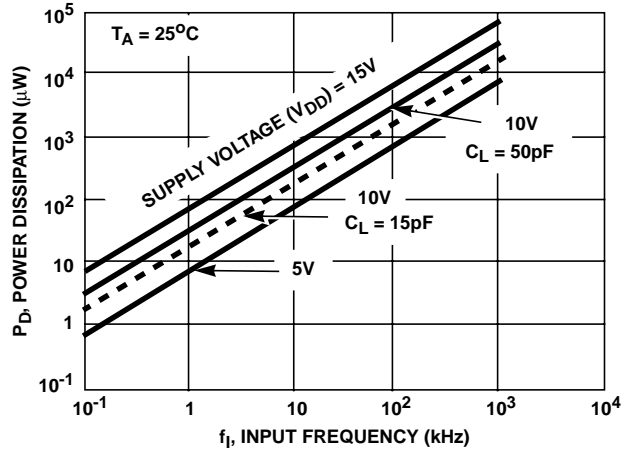


FIGURE 10. TYPICAL DYNAMIC POWER DISSIPATION AS A FUNCTION OF INPUT FREQUENCY

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD4070BE | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| CD4070BEE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| CD4070BF | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| CD4070BF3A | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| CD4070BF3AS2534 | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI |
| CD4070BM | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BM96 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BM96E4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BM96G4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BME4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BMG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BMT | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BMTE4 | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BMTG4 | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BNSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BNSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BNSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4070BPWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BE | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| CD4077BEE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| CD4077BF | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |
| CD4077BF3A | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD4077BM | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BM96 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BM96E4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BM96G4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BME4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BMG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BMT | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BMTE4 | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BMTG4 | ACTIVE | SOIC | D | 14 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BNSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BNSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BNSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CD4077BPWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| JM38510/17203BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS

compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4070BM96 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4070BNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| CD4070BPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 7.0 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| CD4077BM96 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4077BNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| CD4077BPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 7.0 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4070BM96 | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| CD4070BNSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| CD4070BPWR | TSSOP | PW | 14 | 2000 | 346.0 | 346.0 | 29.0 |
| CD4077BM96 | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| CD4077BNSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| CD4077BPWR | TSSOP | PW | 14 | 2000 | 346.0 | 346.0 | 29.0 |

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AB.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4070BE | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -55 to 125 | CD4070BE | Samples |
| CD4070BEE4 | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -55 to 125 | CD4070BE | Samples |
| CD4070BF | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4070BF | Samples |
| CD4070BF3A | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4070BF3A | Samples |
| CD4070BM | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | -55 to 125 | CD4070BM | |
| CD4070BM96 | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4070BM | Samples |
| CD4070BM96E4 | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4070BM | Samples |
| CD4070BMT | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | -55 to 125 | CD4070BM | |
| CD4070BNSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4070B | Samples |
| CD4070BPW | OBSOLETE | TSSOP | PW | 14 | | TBD | Call TI | Call TI | -55 to 125 | CM070B | |
| CD4070BPWR | ACTIVE | TSSOP | PW | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CM070B | Samples |
| CD4077BE | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -55 to 125 | CD4077BE | Samples |
| CD4077BF | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4077BF | Samples |
| CD4077BF3A | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4077BF3A | Samples |
| CD4077BM | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | -55 to 125 | CD4077BM | |
| CD4077BM96 | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4077BM | Samples |
| CD4077BMT | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | -55 to 125 | CD4077BM | |
| CD4077BNSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4077B | Samples |
| CD4077BPW | ACTIVE | TSSOP | PW | 14 | 90 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CM077B | Samples |
| JM38510/17203BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 17203BCA | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| M38510/17203BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 17203BCA | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF CD4070B, CD4070B-MIL, CD4077B, CD4077B-MIL :

- Catalog : [CD4070B](#), [CD4077B](#)
- Military : [CD4070B-MIL](#), [CD4077B-MIL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4070BM96 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4070BNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| CD4070BPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| CD4077BM96 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4077BNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4070BM96 | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| CD4070BNSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| CD4070BPWR | TSSOP | PW | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| CD4077BM96 | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| CD4077BNSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD4070BE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4070BE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4070BEE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4070BEE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4077BE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4077BE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4077BPW | PW | TSSOP | 14 | 90 | 530 | 10.2 | 3600 | 3.5 |

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

J 14

GENERIC PACKAGE VIEW
CDIP - 5.08 mm max height
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040083-5/G

J0014A



PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

EXAMPLE BOARD LAYOUT

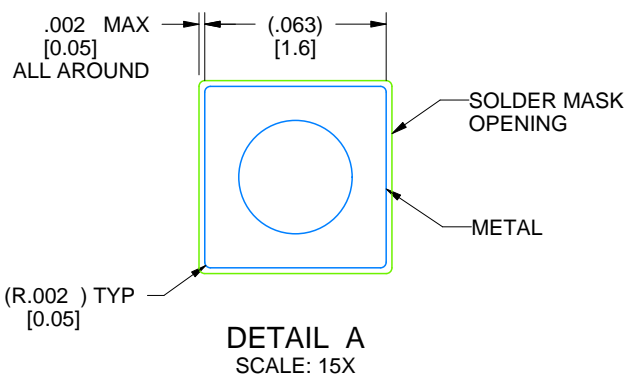
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 5X



4214771/A 05/2017

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - D The 20 pin end lead shoulder width is a vendor option, either half or full width.

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