

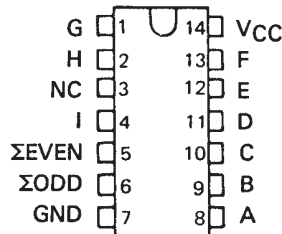
# SN54LS280, SN54S280, SN74LS280, SN74S280 9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

SDLS152 – DECEMBER 1972 – REVISED MARCH 1988

- Generates Either Odd or Even Parity for Nine Data Lines
- Cascadable for n-Bits
- Can Be Used to Upgrade Existing Systems using MSI Parity Circuits
- Typical Data-to-Output Delay of Only 14 ns for 'S280 and 33 ns for 'LS280
- Typical Power Dissipation:  
'LS280 . . . 80 mW  
'S280 . . . 335 mW

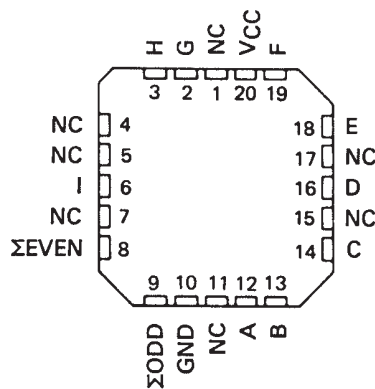
SN54LS280, SN54S280 . . . J OR W PACKAGE  
SN74LS280, SN74S280 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS280, SN54S280 . . . FK PACKAGE

(TOP VIEW)



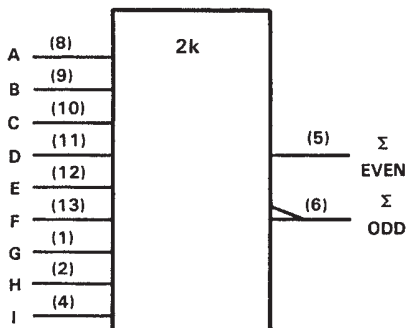
NC - No internal connection

FUNCTION TABLE

| NUMBER OF INPUTS A<br>THRU I THAT ARE HIGH | OUTPUTS |       |
|--|---------|-------|
|  | Σ EVEN  | Σ ODD |
| 0, 2, 4, 6, 8                              | H       | L     |
| 1, 3, 5, 7, 9                              | L       | H     |

H = high level, L = low level

logic symbol†



†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

## description

These universal, monolithic, nine-bit parity generators/checkers utilize Schottky-clamped TTL high-performance circuitry and feature odd/even outputs to facilitate operation of either odd or even parity application. The word-length capability is easily expanded by cascading as shown under typical application data.

Series 54LS/74LS and Series 54S/74S parity generators/checkers offer the designer a trade-off between reduced power consumption and high performance. These devices can be used to upgrade the performance of most systems utilizing the '180 parity generator/checker. Although the 'LS280 and 'S280 are implemented without expander inputs, the corresponding function is provided by the availability of an input at pin 4 and the absence of any internal connection at pin 3. This permits the 'LS280 and 'S280 to be substituted for the '180 in existing designs to produce an identical function even if 'LS280's and 'S280's are mixed with existing '180's.

These devices are fully compatible with most other TTL circuits. All 'LS280 and 'S280 inputs are buffered to lower the drive requirements to one Series 54LS/74LS or Series 54S/74S standard load, respectively.



# SN54LS280, SN54S280, SN74LS280, SN74S280 9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

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## recommended operating conditions

|   | SN54LS280 |     |      | SN74LS280 |     |      | UNIT |
|---|-----------|-----|------|-----------|-----|------|------|
|   | MIN       | NOM | MAX  | MIN       | NOM | MAX  |      |
| V <sub>CC</sub> Supply voltage                | 4.5       | 5   | 5.5  | 4.75      | 5   | 5.25 | V    |
| V <sub>IH</sub> High-level input voltage      | 2         |     |      | 2         |     |      | V    |
| V <sub>IL</sub> Low-level input voltage       |           |     | 0.7  |           |     | 0.8  | V    |
| I <sub>OH</sub> High-level output current     |           |     | -0.4 |           |     | -0.4 | mA   |
| I <sub>OL</sub> Low-level output current      |           |     | 4    |           |     | 8    | mA   |
| T <sub>A</sub> Operating free-air temperature | -55       |     | 125  | 0         |     | 70   | °C   |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER         | TEST CONDITIONS   | SN54LS280 |      | SN74LS280 |      | UNIT |      |     |
|-------------------|---|-----------|------|-----------|------|------|------|-----|
|                   |   | MIN       | TYP† | MAX       | MIN  |      | TYP‡ | MAX |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA  |           |      | -1.5      |      | -1.5 | V    |     |
| V <sub>OH</sub>   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = MAX, I <sub>OH</sub> = -0.4 mA | 2.5       | 3.4  |           | 2.7  | 3.4  | V    |     |
| V <sub>OL</sub>   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = MAX, I <sub>OL</sub> = 4 mA    | 0.25      | 0.4  |           | 0.25 | 0.4  | V    |     |
|                   | I <sub>OL</sub> = 8 mA  |           |      |           | 0.35 | 0.5  |      |     |
| I <sub>I</sub>    | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V   |           |      | 0.1       |      | 0.1  | mA   |     |
| I <sub>IH</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V   |           |      | 20        |      | 20   | μA   |     |
| I <sub>IL</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V   |           |      | -0.4      |      | -0.4 | mA   |     |
| I <sub>OS</sub> § | V <sub>CC</sub> = MAX   | -20       |      | -100      | -20  | -100 | mA   |     |
| I <sub>CC</sub>   | V <sub>CC</sub> = MAX, See Note 2   |           | 16   | 27        |      | 16   | 27   | mA  |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

§ Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

NOTE 2: I<sub>CC</sub> is measured with all inputs grounded and all outputs open.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

| PARAMETER¶       | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS   | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|---|-----|-----|-----|------|
| t <sub>PLH</sub> | Data         | Σ Even      | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ,<br>Inputs not under test at 0 V,<br>See Note 3 |     | 33  | 50  | ns   |
| t <sub>PHL</sub> |              |             |   |     | 29  | 45  |      |
| t <sub>PLH</sub> | Data         | Σ Odd       |   |     | 23  | 35  | ns   |
| t <sub>PHL</sub> |              |             |   |     | 31  | 50  |      |

¶ t<sub>PLH</sub> ≡ propagation delay time, low-to-high-level output; t<sub>PHL</sub> ≡ propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



# SN54LS280, SN54S280, SN74LS280, SN74S280 9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

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## recommended operating conditions

|                                       | SN54S280 |     |     | SN74S280 |     |      | UNIT |
|---------------------------------------|----------|-----|-----|----------|-----|------|------|
|                                       | MIN      | NOM | MAX | MIN      | NOM | MAX  |      |
| Supply voltage, $V_{CC}$              | 4.5      | 5   | 5.5 | 4.75     | 5   | 5.25 | V    |
| High-level output current, $I_{OH}$   |          |     | -1  |          |     | -1   | mA   |
| Low-level output current, $I_{OL}$    |          |     | 20  |          |     | 20   | mA   |
| Operating free-air temperature, $T_A$ | -55      |     | 125 | 0        |     | 70   | °C   |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER                                    | TEST CONDITIONS†   | MIN       | TYP‡ | MAX  | UNIT |
|--|--|-----------|------|------|------|
| $V_{IH}$ High-level input voltage            |  | 2         |      |      | V    |
| $V_{IL}$ Low-level input voltage             |  |           |      | 0.8  | V    |
| $V_{IK}$ Input clamp voltage                 | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$  |           |      | -1.2 | V    |
| $V_{OH}$ High-level output voltage           | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OH} = -1 \text{ mA}$ | SN54S'    | 2.5  | 3.4  | V    |
|  |  | SN74S'    | 2.7  | 3.4  |      |
| $V_{OL}$ Low-level output voltage            | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OL} = 20 \text{ mA}$ |           |      | 0.5  | V    |
| $I_I$ Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$   |           |      | 1    | mA   |
| $I_{IH}$ High-level input current            | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$   |           |      | 50   | μA   |
| $I_{IL}$ Low-level input current             | $V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$   |           |      | -2   | mA   |
| $I_{OS}$ Short-circuit output current§       | $V_{CC} = \text{MAX}$  | -40       |      | -100 | mA   |
| $I_{CC}$ Supply current                      | $V_{CC} = \text{MAX},$ See Note 2  | SN54S280  | 67   | 99   | mA   |
|  |  | SN74S280  | 67   | 105  |      |
|  | $V_{CC} = \text{MAX}, T_A = 125^\circ \text{C},$<br>See Note 2                                   | SN54S280N |      | 94   | mA   |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$ .

§ Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

NOTE 2:  $I_{CC}$  is measured with all inputs grounded and all outputs open.

## switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

| PARAMETER¶ | FROM (INPUT) | TO (OUTPUT)   | TEST CONDITIONS  | MIN | TYP  | MAX | UNIT |
|------------|--------------|---------------|--|-----|------|-----|------|
| $t_{PLH}$  | Data         | $\Sigma$ Even | $C_L = 15 \text{ pF}, R_L = 280 \Omega,$<br>See Note 3 |     | 14   | 21  | ns   |
| $t_{PHL}$  |              |               |  |     | 11.5 | 18  |      |
| $t_{PLH}$  | Data         | $\Sigma$ Odd  |  |     | 14   | 21  | ns   |
| $t_{PHL}$  |              |               |  |     | 11.5 | 18  |      |

¶  $t_{PLH}$  = propagation delay time, low-to-high-level output;  $t_{PHL}$  = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



# SN54LS280, SN54S280, SN74LS280, SN74S280 9-BIT ODD/EVEN PARITY GENERATORS/CHECKERS

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logic diagram (positive logic)

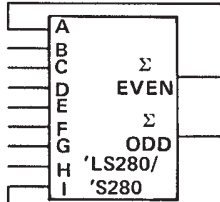


Pin numbers shown are for D, J, N, and W packages.

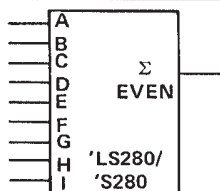
## TYPICAL APPLICATION DATA

### 25-LINE PARITY/GENERATOR CHECKER

Three 'LS280's or 'S280's can be used to implement a 25-line parity generator/checker. This arrangement will provide parity in typically 75 or 25 nanoseconds respectively.



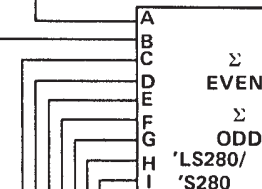
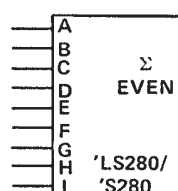
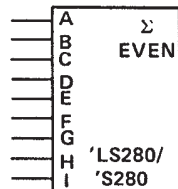
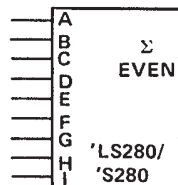
H = EVEN  
L = ODD  
H = ODD  
L = EVEN



As an alternative, the outputs of two or three parity generators/checkers can be decoded with a 2-input ('S86 or 'LS86) or 3-input ('S135) exclusive-OR gate for 18- or 27-line parity applications.

### 81-LINE PARITY/GENERATOR CHECKER

Longer word lengths can be implemented by cascading 'LS280's or 'S280's. As shown here, parity can be generated for word lengths up to 81 bits in typically 75 or 25 nanoseconds respectively.



TO OTHER  
'LS280/  
'S280

H = EVEN  
L = ODD  
H = ODD  
L = EVEN



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| Telephony          | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
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**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| JM38510/32901B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| JM38510/32901BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/32901BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/32901BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| JM38510/32901BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SN54LS280J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54LS280J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54S280J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54S280J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN74LS280D       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280D       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DE4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DE4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DG4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DG4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DR      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DR      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DRE4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DRE4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DRG4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280DRG4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280J       | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS280J       | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS280N       | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS280N       | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS280N3      | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS280N3      | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS280NE4     | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS280NE4     | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS280NSR     | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LS280NSR     | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280NSRE4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280NSRE4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280NSRG4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS280NSRG4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280D        | OBSOLETE              | SOIC         | D               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74S280D        | OBSOLETE              | SOIC         | D               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74S280N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S280N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S280N3       | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74S280N3       | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74S280NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S280NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S280NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280NSRE4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280NSRE4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280NSRG4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S280NSRG4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SNJ54LS280FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54LS280FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54LS280J      | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54LS280J      | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54LS280W      | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SNJ54LS280W      | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SNJ54S280FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54S280FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54S280J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54S280J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54S280W       | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SNJ54S280W       | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |

<sup>(1)</sup> The marketing status values are defined as follows:  
**ACTIVE:** Product device recommended for new designs.

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**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.

<sup>(2)</sup> 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)

<sup>(3)</sup> 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 BOX INFORMATION**



|    |   |
|----|---|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



| Device       | Package | Pins | Site    | Reel Diameter (mm) | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------|------|---------|--------------------|-----------------|---------|---------|---------|---------|--------|---------------|
| SN74LS280DR  | D       | 14   | SITE 41 | 330                | 16              | 6.5     | 9.0     | 2.1     | 8       | 16     | Q1            |
| SN74LS280NSR | NS      | 14   | SITE 41 | 330                | 16              | 8.2     | 10.5    | 2.5     | 12      | 16     | Q1            |
| SN74S280NSR  | NS      | 14   | SITE 41 | 330                | 16              | 8.2     | 10.5    | 2.5     | 12      | 16     | Q1            |



**TAPE AND REEL BOX DIMENSIONS**



| Device       | Package | Pins | Site    | Length (mm) | Width (mm) | Height (mm) |
|--------------|---------|------|---------|-------------|------------|-------------|
| SN74LS280DR  | D       | 14   | SITE 41 | 346.0       | 346.0      | 33.0        |
| SN74LS280NSR | NS      | 14   | SITE 41 | 346.0       | 346.0      | 33.0        |
| SN74S280NSR  | NS      | 14   | SITE 41 | 346.0       | 346.0      | 33.0        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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



4040083/F 03/03

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

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

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.

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.

## 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.

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