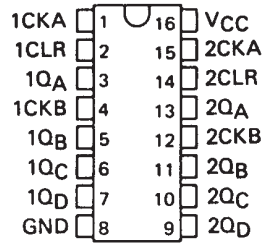
- Dual Versions of the Popular '90A, 'LS90 and '93A, 'LS93
- '390, 'LS390 . . . Individual Clocks for A and B Flip-Flops Provide Dual ÷ 2 and ÷ 5 Counters
- '393, 'LS393 . . . Dual 4-Bit Binary Counter with Individual Clocks
- All Have Direct Clear for Each 4-Bit Counter
- Dual 4-Bit Versions Can Significantly Improve System Densities by Reducing Counter Package Count by 50%
- Typical Maximum Count Frequency . . . 35 MHz
- Buffered Outputs Reduce Possibility of Collector Commutation

## description

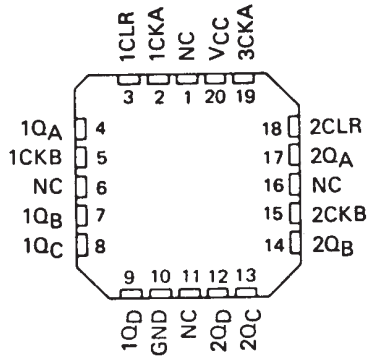
Each of these monolithic circuits contains eight master-slave flip-flops and additional gating to implement two individual four-bit counters in a single package. The '390 and 'LS390 incorporate dual divide-by-two and divide-by-five counters, which can be used to implement cycle lengths equal to any whole and/or cumulative multiples of 2 and/or 5 up to divide-by-100. When connected as a bi-quinary counter, the separate divide-by-two circuit can be used to provide symmetry (a square wave) at the final output stage. The '393 and 'LS393 each comprise two independent four-bit binary counters each having a clear and a clock input. N-bit binary counters can be implemented with each package providing the capability of divide-by-256. The '390, 'LS390, '393, and 'LS393 have parallel outputs from each counter stage so that any submultiple of the input count frequency is available for system-timing signals.

Series 54 and Series 54LS circuits are characterized for operation over the full military temperature range of −55°C to 125°C; Series 74 and Series 74LS circuits are characterized for operation from 0°C to 70°C.

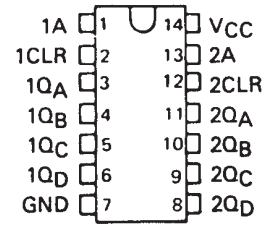
**SN54390, SN54LS390 . . . J OR W PACKAGE**
**SN74390 . . . N PACKAGE**
**SN74LS390 . . . D OR N PACKAGE**
**(TOP VIEW)**



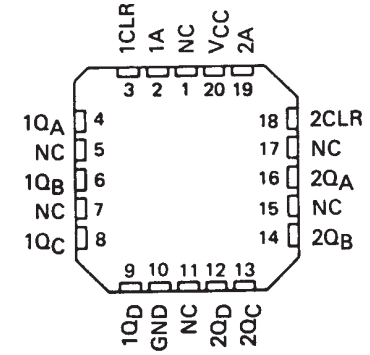

**SN54LS390 . . . FK PACKAGE**
**(TOP VIEW)**




**SN54393, SN54LS393 . . . J OR W PACKAGE**
**SN74393 . . . N PACKAGE**
**SN74LS393 . . . D OR N PACKAGE**
**(TOP VIEW)**




**SN54LS393 . . . FK PACKAGE**
**(TOP VIEW)**




NC - No internal connection

## FUNCTION TABLES

### '390, 'LS390 BCD COUNT SEQUENCE (EACH COUNTER) (See Note A)

| COUNT | OUTPUT | | | |
|---|---|---|---|---|
| | $Q_D$ | $Q_C$ | $Q_B$ | $Q_A$ |
| 0 | L | L | L | L |
| 1 | L | L | L | H |
| 2 | L | L | H | L |
| 3 | L | L | H | H |
| 4 | L | H | L | L |
| 5 | L | H | L | H |
| 6 | L | H | H | L |
| 7 | L | H | H | H |
| 8 | H | L | L | L |
| 9 | H | L | L | H |

### '390, 'LS390 BI-QUINARY (5-2) (EACH COUNTER) (See Note B)

| COUNT | OUTPUT | | | |
|---|---|---|---|---|
| | $Q_A$ | $Q_D$ | $Q_C$ | $Q_B$ |
| 0 | L | L | L | L |
| 1 | L | L | L | H |
| 2 | L | L | H | L |
| 3 | L | L | H | H |
| 4 | L | H | L | L |
| 5 | H | L | L | L |
| 6 | H | L | L | H |
| 7 | H | L | H | L |
| 8 | H | L | H | H |
| 9 | H | H | L | L |

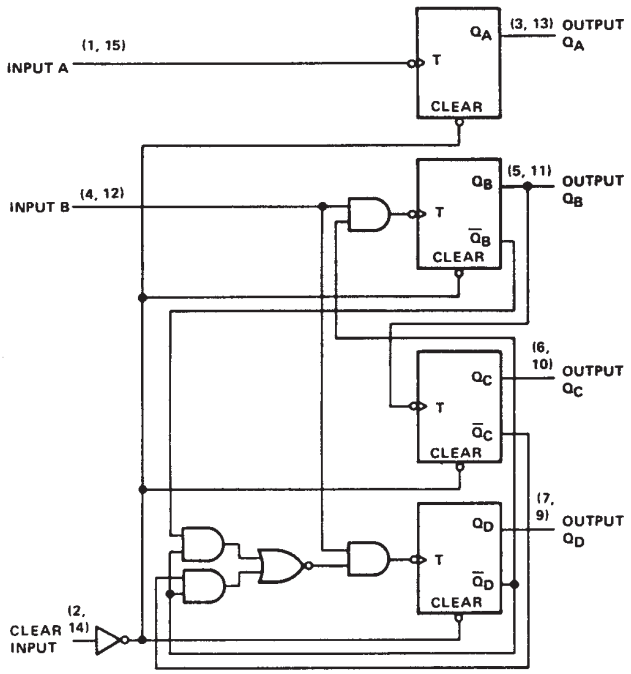
### '393, 'LS393 COUNT SEQUENCE (EACH COUNTER)

| COUNT | OUTPUT | | | |
|---|---|---|---|---|
| | $Q_D$ | $Q_C$ | $Q_B$ | $Q_A$ |
| 0 | L | L | L | L |
| 1 | L | L | L | H |
| 2 | L | L | H | L |
| 3 | L | L | H | H |
| 4 | L | H | L | L |
| 5 | L | H | L | H |
| 6 | L | H | H | L |
| 7 | L | H | H | H |
| 8 | H | L | L | L |
| 9 | H | L | L | H |
| 10 | H | L | H | L |
| 11 | H | L | H | H |
| 12 | H | H | L | L |
| 13 | H | H | L | H |
| 14 | H | H | H | L |
| 15 | H | H | H | H |

NOTES: A. Output $Q_A$ is connected to input B for BCD count.
B. Output $Q_D$ is connected to input A for bi-quinary count.
C. H = high level, L = low level.

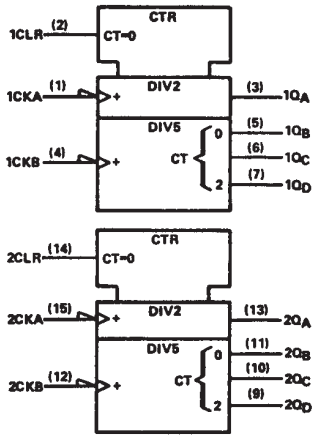
## logic diagrams (positive logic)

'390, 'LS390

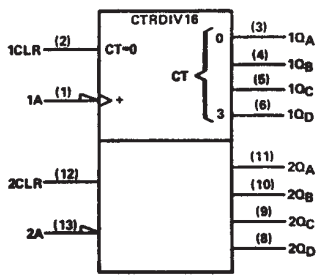



## logic symbols†

'390, 'LS390




'393, 'LS393

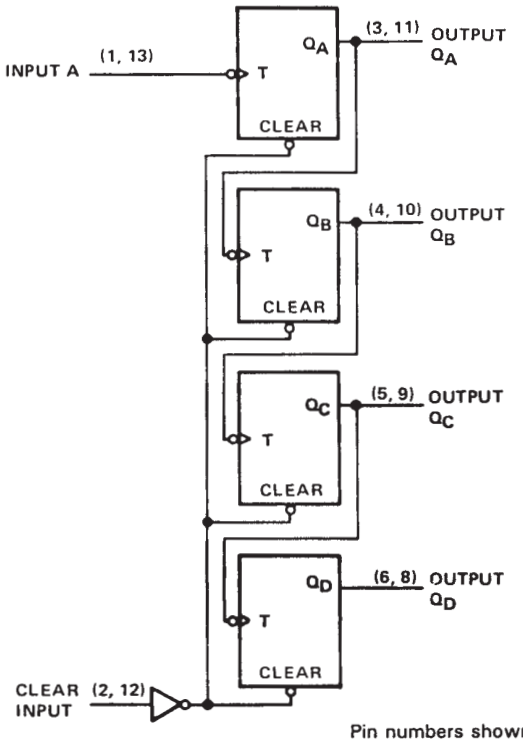



†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

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

## logic diagrams (continued)

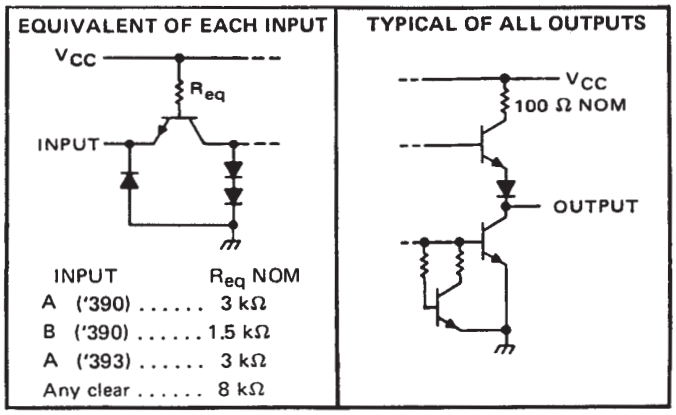
'393, 'LS393




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

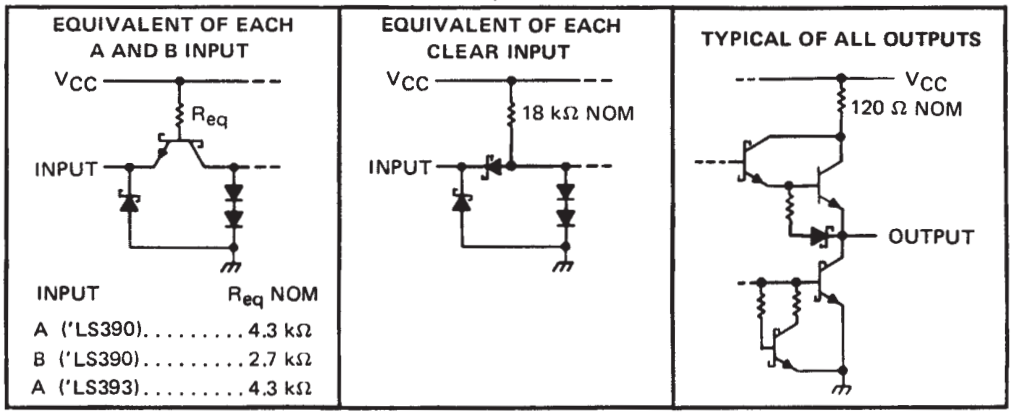
## schematics of inputs and outputs

'390, '393




| INPUT | $R_{eq}$ NOM |
|---|---|
| A ('390) | 3 kΩ |
| B ('390) | 1.5 kΩ |
| A ('393) | 3 kΩ |
| Any clear | 8 kΩ |

'LS390, 'LS393




| INPUT | $R_{eq}$ NOM |
|---|---|
| A ('LS390) | 4.3 kΩ |
| B ('LS390) | 2.7 kΩ |
| A ('LS393) | 4.3 kΩ |

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1) . . . . . 7 V
Input voltage . . . . . 5.5 V
Operating free-air temperature range: SN54390, SN54393 . . . . . −55°C to 125°C
SN74390, SN74393 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

## recommended operating conditions

| | | SN54390 SN54393 | | | SN74390 SN74393 | | | 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, $I_{OH}$ | | | | −800 | | | −800 | μA |
| Low-level output current, $I_{OL}$ | | | | 16 | | | 16 | mA |
| Count frequency, $f_{count}$ | A input | 0 | | 25 | 0 | | 25 | MHz |
| | B input | 0 | | 20 | 0 | | 20 | |
| Pulse width, $t_w$ | A input high or low | 20 | | | 20 | | | ns |
| | B input high or low | 25 | | | 25 | | | |
| | Clear high | 20 | | | 20 | | | |
| Clear inactive-state setup time, $t_{su}$ | | 25↓ | | | 25↓ | | | ns |
| Operating free-air temperature, $T_A$ | | −55 | | 125 | 0 | | 70 | °C |

↓ The arrow indicates that the falling edge of the clock pulse is used for reference.

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

| PARAMETER | | | TEST CONDITIONS† | | '390 MIN | '390 TYP‡ | '390 MAX | '393 MIN | '393 TYP‡ | '393 MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IH}$ | High-level input voltage | | | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | | | 0.8 | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | | $V_{CC}$ = MIN, $I_I$ = −12 mA | | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | High-level output voltage | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OH}$ = −800 μA | | 2.4 | 3.4 | | 2.4 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OL}$ = 16 mA¶ | | | 0.2 | 0.4 | | 0.2 | 0.4 | V |
| $I_I$ | Input current at maximum input voltage | | $V_{CC}$ = MAX, $V_I$ = 5.5 V | | | | 1 | | | 1 | mA |
| $I_{IH}$ | High-level input current | Clear | $V_{CC}$ = MAX, $V_I$ = 2.4 V | | | | 40 | | | 40 | μA |
| | | Input A | | | | | 80 | | | 80 | |
| | | Input B | | | | | 120 | | | | |
| $I_{IL}$ | Low-level input current | Clear | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | | | −1 | | | −1 | mA |
| | | Input A | | | | | −3.2 | | | −3.2 | |
| | | Input B | | | | | −4.8 | | | | |
| $I_{OS}$ | Short-circuit output current§ | | $V_{CC}$ = MAX | SN54' | −20 | | −57 | −20 | | −57 | mA |
| | | | | SN74' | −18 | | −57 | −18 | | −57 | |
| $I_{CC}$ | Supply current | | $V_{CC}$ = MAX, See Note 2 | | | 42 | 69 | | 38 | 64 | mA |

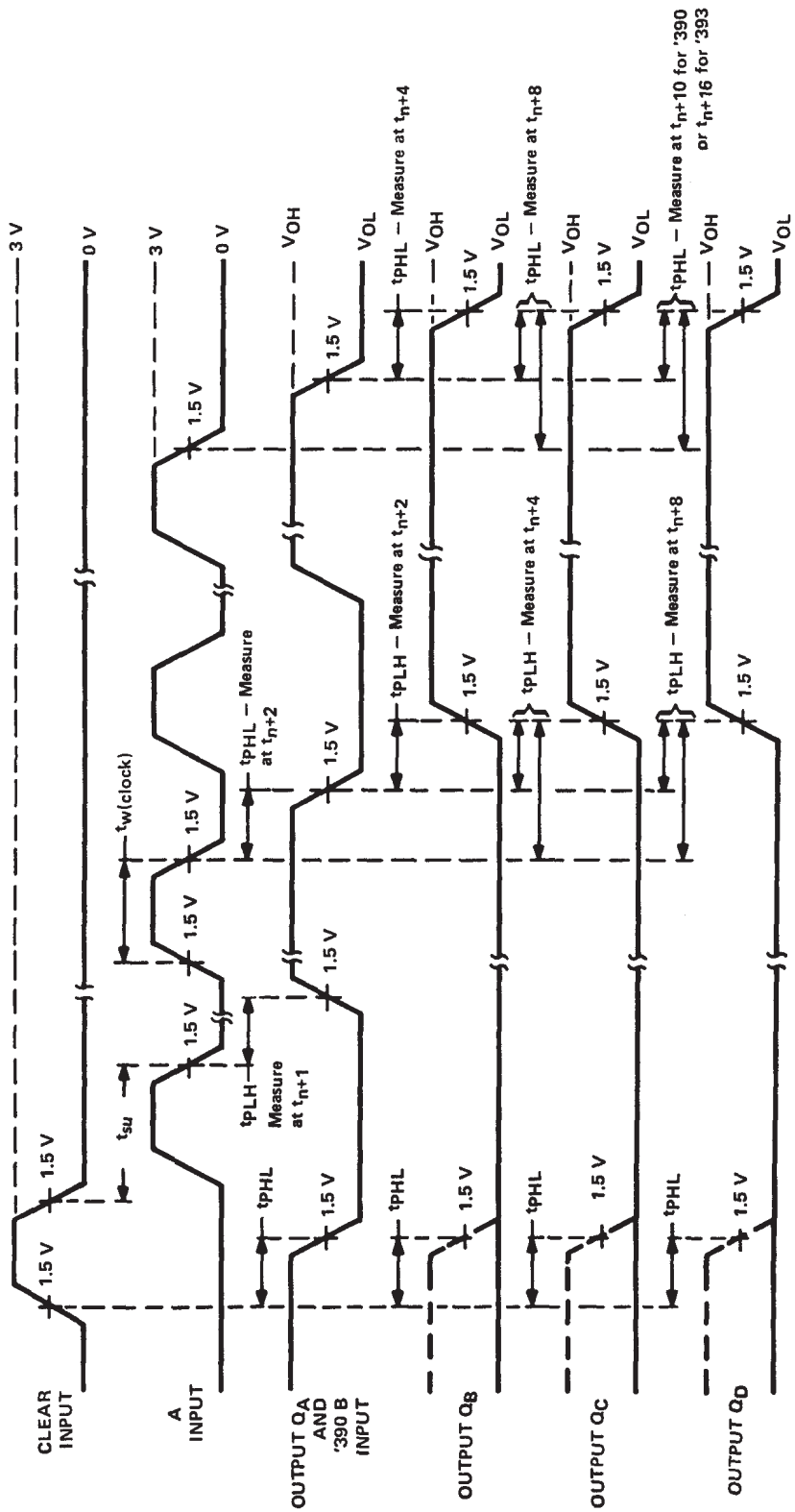
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time.
¶ The $Q_A$ outputs of the '390 are tested at $I_{OL}$ = 16 mA plus the limit value for $I_{IL}$ for the B input. This permits driving the B input while maintaining full fan-out capability.
NOTE 2: $I_{CC}$ is measured with all outputs open, both clear inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | '390 | | | '393 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $f_{max}$ | A | $Q_A$ | $C_L$ = 15 pF, $R_L$ = 400 Ω, See Note 3 and Figure 1 | 25 | 35 | | 25 | 35 | | MHz |
| | B | $Q_B$ | | 20 | 30 | | | | | |
| $t_{PLH}$ | A | $Q_A$ | | | 12 | 20 | | 12 | 20 | ns |
| $t_{PHL}$ | | | | | 13 | 20 | | 13 | 20 | |
| $t_{PLH}$ | A | $Q_C$ of '390 $Q_D$ of '393 | | | 37 | 60 | | 40 | 60 | ns |
| $t_{PHL}$ | | | | | 39 | 60 | | 40 | 60 | |
| $t_{PLH}$ | B | $Q_B$ | | | 13 | 21 | | | | ns |
| $t_{PHL}$ | | | | | 14 | 21 | | | | |
| $t_{PLH}$ | B | $Q_C$ | | | 24 | 39 | | | | ns |
| $t_{PHL}$ | | | | | 26 | 39 | | | | |
| $t_{PLH}$ | B | $Q_D$ | | | 13 | 21 | | | | ns |
| $t_{PHL}$ | | | | | 14 | 21 | | | | |
| $t_{PHL}$ | Clear | Any | | | 24 | 39 | | 24 | 39 | ns |

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

## PARAMETER MEASUREMENT INFORMATION




NOTE A: Input pulses are supplied by a generator having the following characteristics $t_r \leq 5$ ns, $t_f \leq 5$ ns, PRR = 1 MHz, duty cycle = 50%, $Z_{out} \approx 50$ ohms.

FIGURE 1

### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1) . . . . . 7 V
Clear input voltage . . . . . 7 V
Any A or B clock input voltage . . . . . 5.5 V
Operating free-air temperature range: SN54LS390, SN54LS393 . . . . . −55°C to 125°C
SN74LS390, SN74LS393 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

### recommended operating conditions

| | | SN54LS390 SN54LS393 | | | SN74LS390 SN74LS393 | | | 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, $I_{OH}$ | | | | −400 | | | −400 | μA |
| Low-level output current, $I_{OL}$ | | | | 4 | | | 8 | mA |
| Count frequency, $f_{count}$ | A input | 0 | | 25 | 0 | | 25 | MHz |
| | B input | 0 | | 12.5 | 0 | | 12.5 | |
| Pulse width, $t_w$ | A input high or low | 20 | | | 20 | | | ns |
| | B input high or low | 40 | | | 40 | | | |
| | Clear high | 20 | | | 20 | | | |
| Clear inactive-state setup time, $t_{su}$ | | 25↓ | | | 25↓ | | | ns |
| Operating free-air temperature, $T_A$ | | −55 | | 125 | 0 | | 70 | °C |

↓ The arrow indicates that the falling edge of the clock pulse is used for reference.

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

| PARAMETER | | | TEST CONDITIONS† | | SN54LS' | | | SN74LS' | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IH}$ | High-level input voltage | | | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | | | 0.7 | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | | $V_{CC}$ = MIN, $I_I$ = −18 mA | | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | High-level output voltage | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = $V_{IL}$max, $I_{OH}$ = −400 μA | | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, | $I_{OL}$ = 4 mA¶ | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | | | $I_{OL}$ = 8 mA¶ | | | | | 0.35 | 0.5 | |
| $I_I$ | Input current at maximum input voltage | Clear | $V_{CC}$ = MAX | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| | | Input A | | $V_I$ = 5.5 V | | | 0.2 | | | 0.2 | |
| | | Input B | | | | | 0.4 | | | 0.4 | |
| $I_{IH}$ | High-level input current | Clear | $V_{CC}$ = MAX, $V_I$ = 2.7 V | | | | 0.02 | | | 0.02 | mA |
| | | Input A | | | | | 0.1 | | | 0.1 | |
| | | Input B | | | | | 0.2 | | | 0.2 | |
| $I_{IL}$ | Low-level input current | Clear | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | | | −0.4 | | | −0.4 | mA |
| | | Input A | | | | | −1.6 | | | −1.6 | |
| | | Input B | | | | | −2.4 | | | −2.4 | |
| $I_{OS}$ | Short-circuit output current§ | | $V_{CC}$ = MAX | | −20 | | −100 | −20 | | −100 | mA |
| $I_{CC}$ | Supply current | | $V_{CC}$ = MAX, See Note 2 | 'LS390 | | 15 | 26 | | 15 | 26 | mA |
| | | | | 'LS393 | | 15 | 26 | | 15 | 26 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.
¶ The $Q_A$ outputs of the 'LS390 are tested at $I_{OL}$ = MAX plus the limit value for $I_{IL}$ for the clock B input. This permits driving the clock B input while maintaining full fan-out capability.

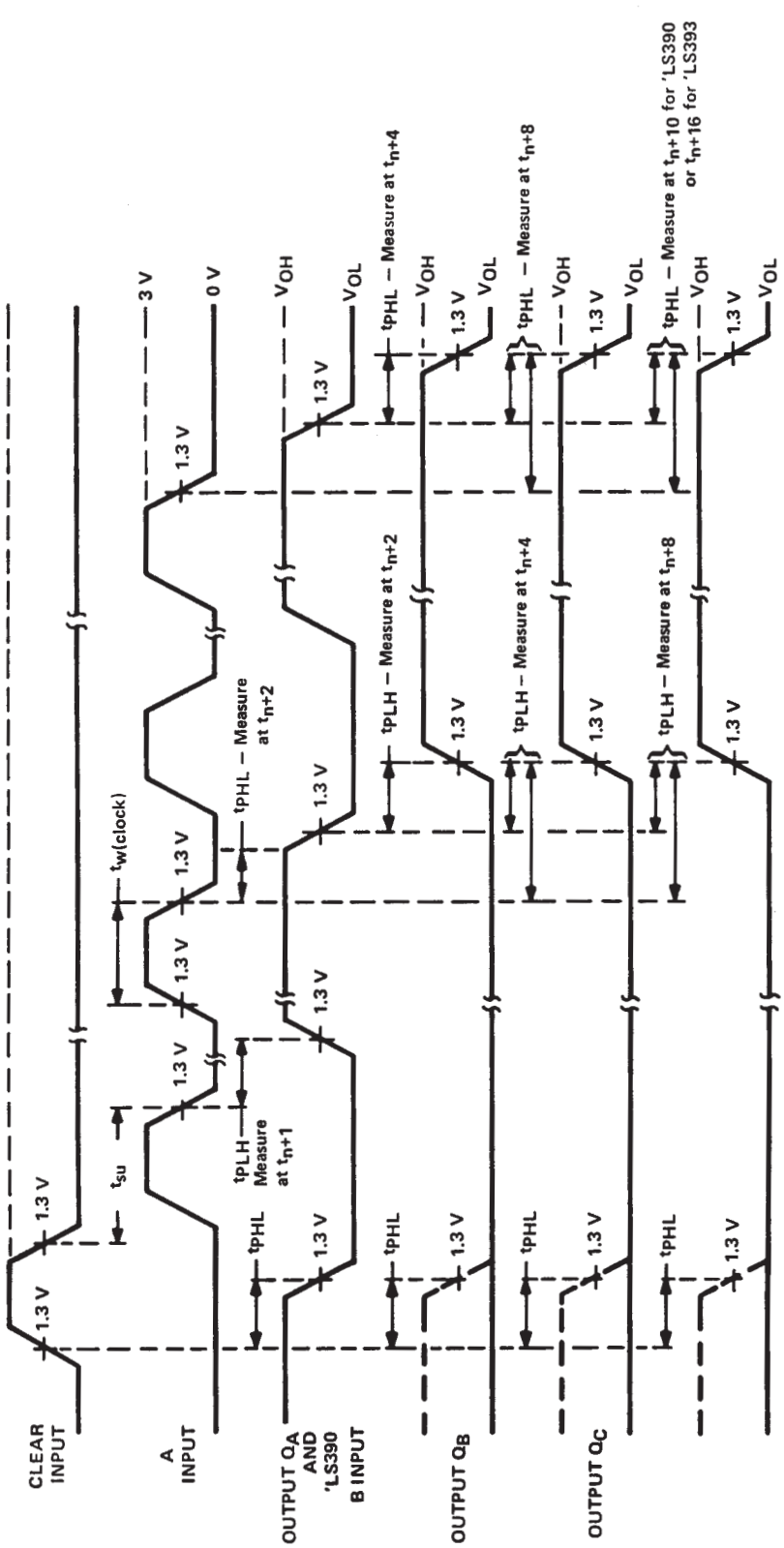
NOTE 2: $I_{CC}$ is measured with all outputs open, both clear inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | 'LS390 | | | 'LS393 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $f_{max}$ | A | $Q_A$ | $C_L$ = 15 pF, $R_L$ = 2 kΩ, See Note 4 and Figure 2 | 25 | 35 | | 25 | 35 | | MHz |
| | B | $Q_B$ | | 12.5 | 20 | | | | | |
| $t_{PLH}$ | A | $Q_A$ | | | 12 | 20 | | 12 | 20 | ns |
| $t_{PHL}$ | | | | | 13 | 20 | | 13 | 20 | |
| $t_{PLH}$ | A | $Q_C$ of 'LS390 $Q_D$ of 'LS393 | | | 37 | 60 | | 40 | 60 | ns |
| $t_{PHL}$ | | | | | 39 | 60 | | 40 | 60 | |
| $t_{PLH}$ | B | $Q_B$ | | | 13 | 21 | | | | ns |
| $t_{PHL}$ | | | | | 14 | 21 | | | | |
| $t_{PLH}$ | B | $Q_C$ | | | 24 | 39 | | | | ns |
| $t_{PHL}$ | | | | | 26 | 39 | | | | |
| $t_{PLH}$ | B | $Q_D$ | | | 13 | 21 | | | | ns |
| $t_{PHL}$ | | | | | 14 | 21 | | | | |
| $t_{PHL}$ | Clear | Any | | | 24 | 39 | | 24 | 39 | ns |

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

## PARAMETER MEASUREMENT INFORMATION




VOLTAGE WAVEFORMS

NOTE A: Input pulses are supplied by a generator having the following characteristics $t_r \leq 15$ ns, $t_f \leq 6$ ns, PRR = 1 MHz, duty cycle = 50 %, $Z_{out} \approx 50$ ohms.

FIGURE 2

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7802601EA | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601EA SNJ54LS390J | Samples |
| 7802601FA | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601FA SNJ54LS390W | Samples |
| 7802601FA | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601FA SNJ54LS390W | Samples |
| JM38510/32701B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32701B2A | Samples |
| JM38510/32701B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32701B2A | Samples |
| JM38510/32701BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32701BEA | Samples |
| JM38510/32701BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32701BEA | Samples |
| JM38510/32702B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32702B2A | Samples |
| JM38510/32702B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32702B2A | Samples |
| JM38510/32702BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BCA | Samples |
| JM38510/32702BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BCA | Samples |
| JM38510/32702BDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BDA | Samples |
| JM38510/32702BDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BDA | Samples |
| JM38510/32702SCA | ACTIVE | CDIP | J | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SCA SNV54LS393J | Samples |
| JM38510/32702SCA | ACTIVE | CDIP | J | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SCA SNV54LS393J | Samples |
| JM38510/32702SDA | ACTIVE | CFP | W | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SDA SNV54LS393W | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| JM38510/32702SDA | ACTIVE | CFP | W | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SDA SNV54LS393W | Samples |
| M38510/32701B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32701B2A | Samples |
| M38510/32701B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32701B2A | Samples |
| M38510/32701BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32701BEA | Samples |
| M38510/32701BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32701BEA | Samples |
| M38510/32702B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32702B2A | Samples |
| M38510/32702B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | JM38510/ 32702B2A | Samples |
| M38510/32702BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BCA | Samples |
| M38510/32702BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BCA | Samples |
| M38510/32702BDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BDA | Samples |
| M38510/32702BDA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702BDA | Samples |
| M38510/32702SCA | ACTIVE | CDIP | J | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SCA SNV54LS393J | Samples |
| M38510/32702SCA | ACTIVE | CDIP | J | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SCA SNV54LS393J | Samples |
| M38510/32702SDA | ACTIVE | CFP | W | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SDA SNV54LS393W | Samples |
| M38510/32702SDA | ACTIVE | CFP | W | 14 | 25 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510/ 32702SDA SNV54LS393W | Samples |
| SN54393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| SN54393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SN54LS390J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SN54LS390J | Samples |
| SN54LS390J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SN54LS390J | Samples |
| SN54LS393J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SN54LS393J | Samples |
| SN54LS393J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SN54LS393J | Samples |
| SN74390N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74390N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74393N | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74393N | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74393N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74393N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS390D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390DG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390DG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS390 | Samples |
| SN74LS390N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS390N | Samples |
| SN74LS390N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS390N | Samples |
| SN74LS390N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS390N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS390NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS390N | Samples |
| SN74LS390NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS390N | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74LS390NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS390NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS390NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS390NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS390NSRG4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS390NSRG4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS390 | Samples |
| SN74LS393D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |
| SN74LS393DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS393 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74LS393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS393N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS393N | Samples |
| SN74LS393N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS393N | Samples |
| SN74LS393N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS393N3 | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| SN74LS393NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS393N | Samples |
| SN74LS393NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS393N | Samples |
| SN74LS393NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SN74LS393NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SN74LS393NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SN74LS393NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SN74LS393NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SN74LS393NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS393 | Samples |
| SNJ54393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| SNJ54393J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| SNJ54393W | OBSOLETE | CFP | W | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| SNJ54393W | OBSOLETE | CFP | W | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| SNJ54LS390FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | SNJ54LS 390FK | Samples |
| SNJ54LS390FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | SNJ54LS 390FK | Samples |
| SNJ54LS390J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601EA SNJ54LS390J | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SNJ54LS390J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601EA SNJ54LS390J | Samples |
| SNJ54LS390W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601FA SNJ54LS390W | Samples |
| SNJ54LS390W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 7802601FA SNJ54LS390W | Samples |
| SNJ54LS393FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | SNJ54LS 393FK | Samples |
| SNJ54LS393FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | SNJ54LS 393FK | Samples |
| SNJ54LS393J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SNJ54LS393J | Samples |
| SNJ54LS393J | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SNJ54LS393J | Samples |
| SNJ54LS393W | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SNJ54LS393W | Samples |
| SNJ54LS393W | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | SNJ54LS393W | 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) 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.

(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.



**OTHER QUALIFIED VERSIONS OF SN54393, SN54LS390, SN54LS393, SN54LS393-SP, SN74393, SN74LS390, SN74LS393 :**

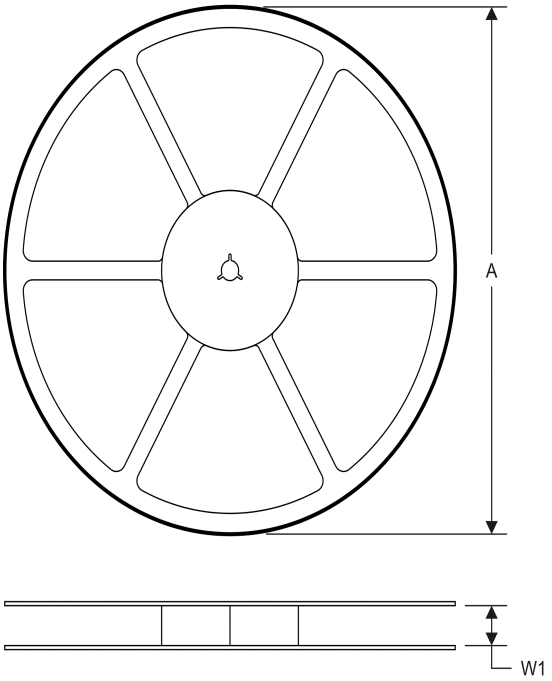
- Catalog: SN74393, SN74LS390, SN74LS393, SN54LS393
- Military: SN54393, SN54LS390, SN54LS393
- Space: SN54LS393-SP

NOTE: Qualified Version Definitions:

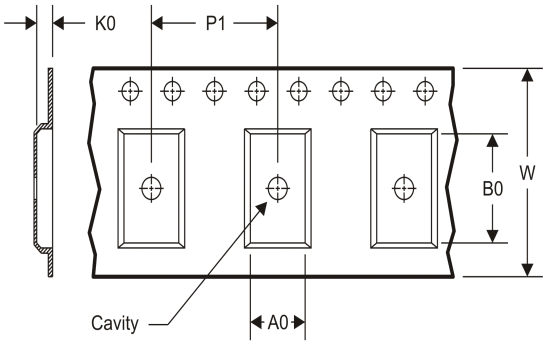
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**




**TAPE DIMENSIONS**



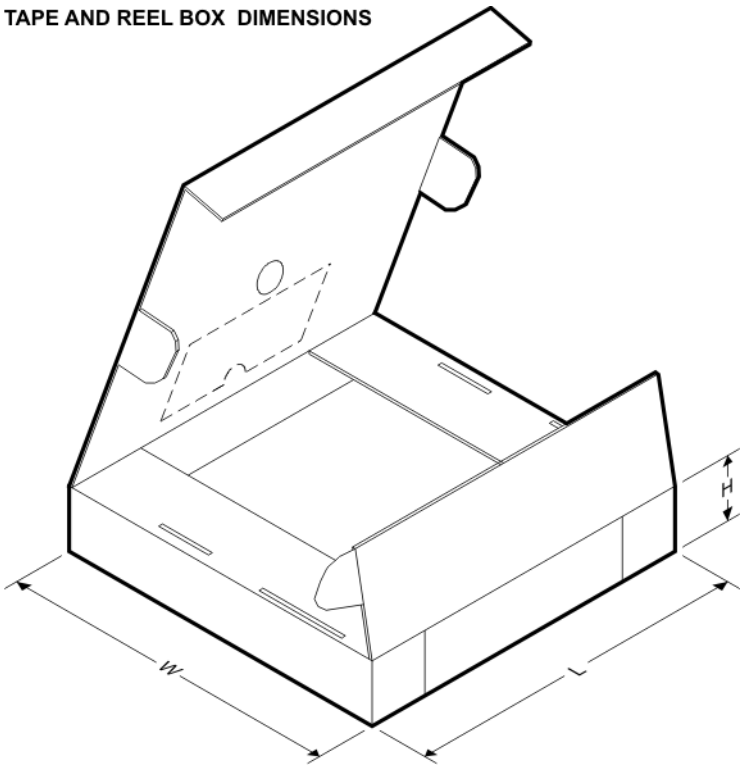

| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

**TAPE AND REEL INFORMATION**

*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74LS390NSR | SO | NS | 16 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74LS393DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74LS393NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



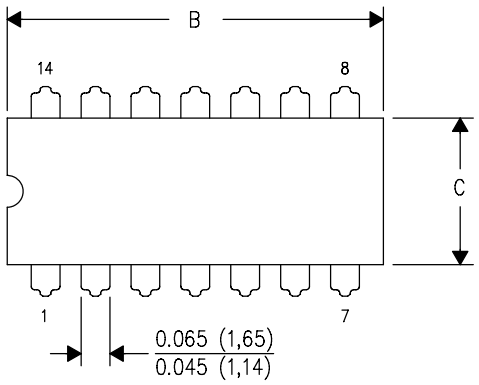

*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74LS390NSR | SO | NS | 16 | 2000 | 367.0 | 367.0 | 38.0 |
| SN74LS393DR | SOIC | D | 14 | 2500 | 367.0 | 367.0 | 38.0 |
| SN74LS393NSR | SO | NS | 14 | 2000 | 367.0 | 367.0 | 38.0 |

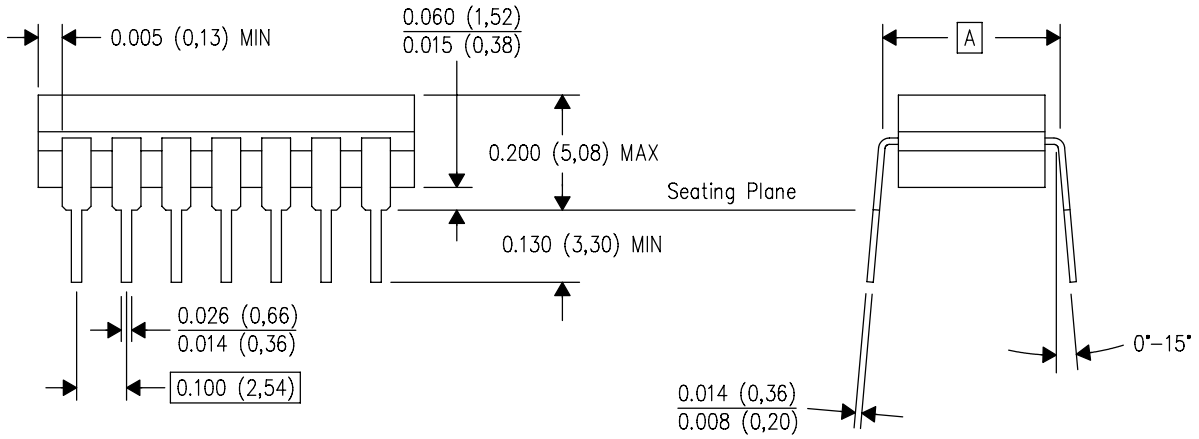
J (R–GDIP–T**)

14 LEADS SHOWN

# CERAMIC DUAL IN–LINE PACKAGE



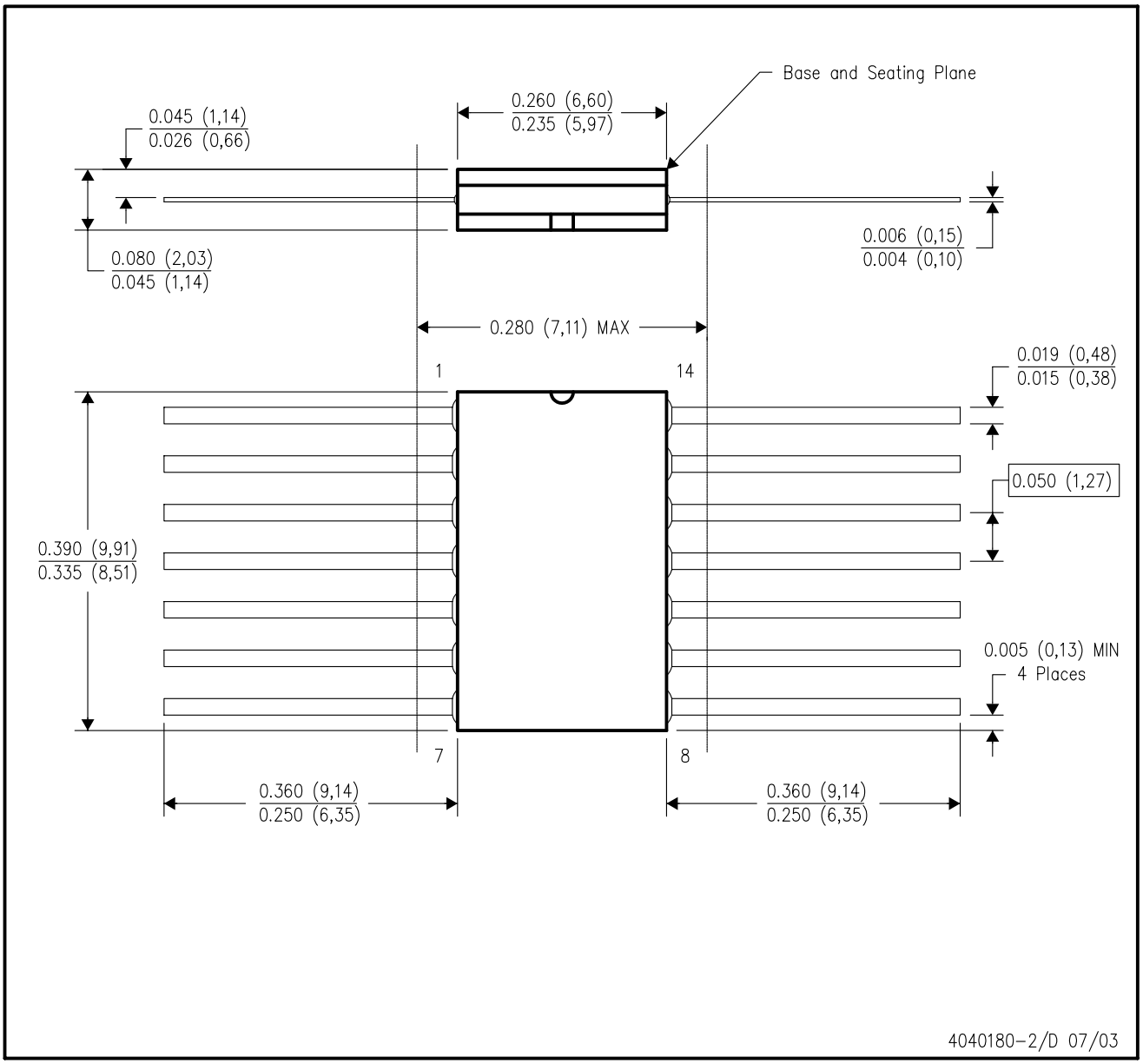

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300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




4040083/F 03/03

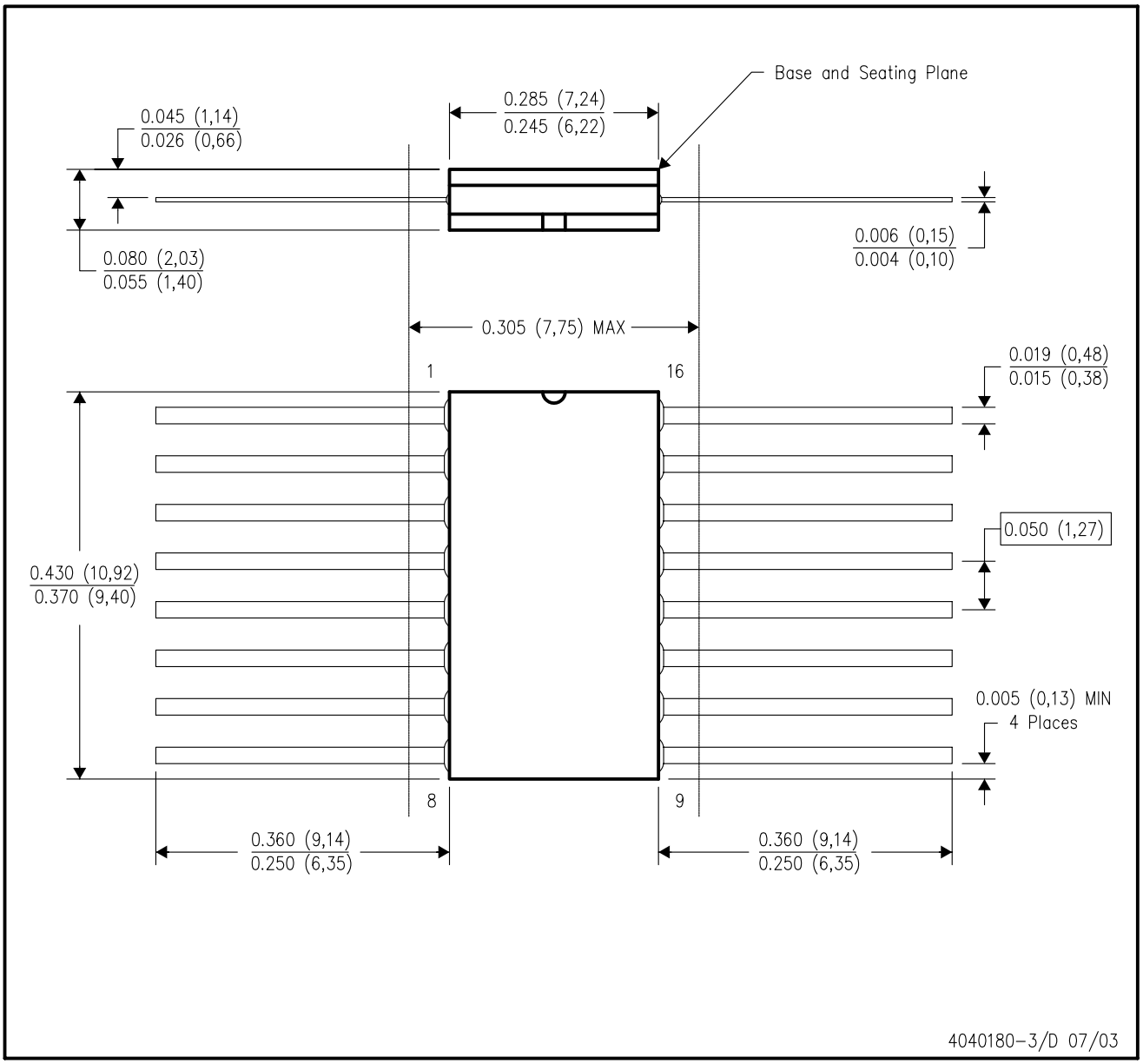
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls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

## 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

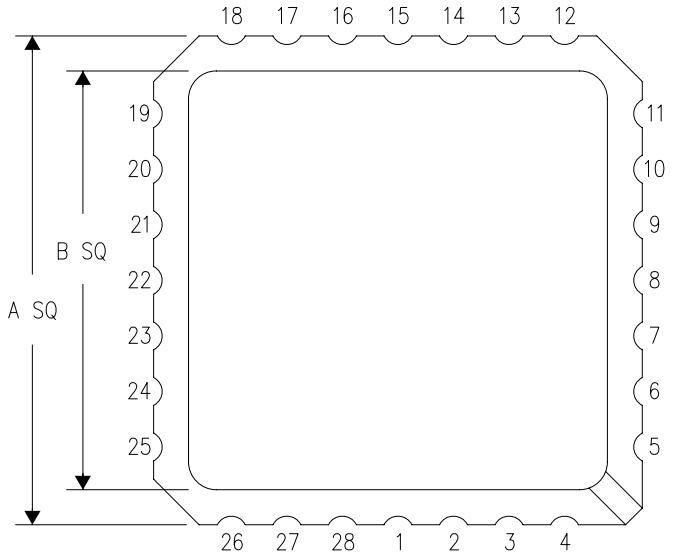
## W (R–GDFP–F16) CERAMIC DUAL FLATPACK



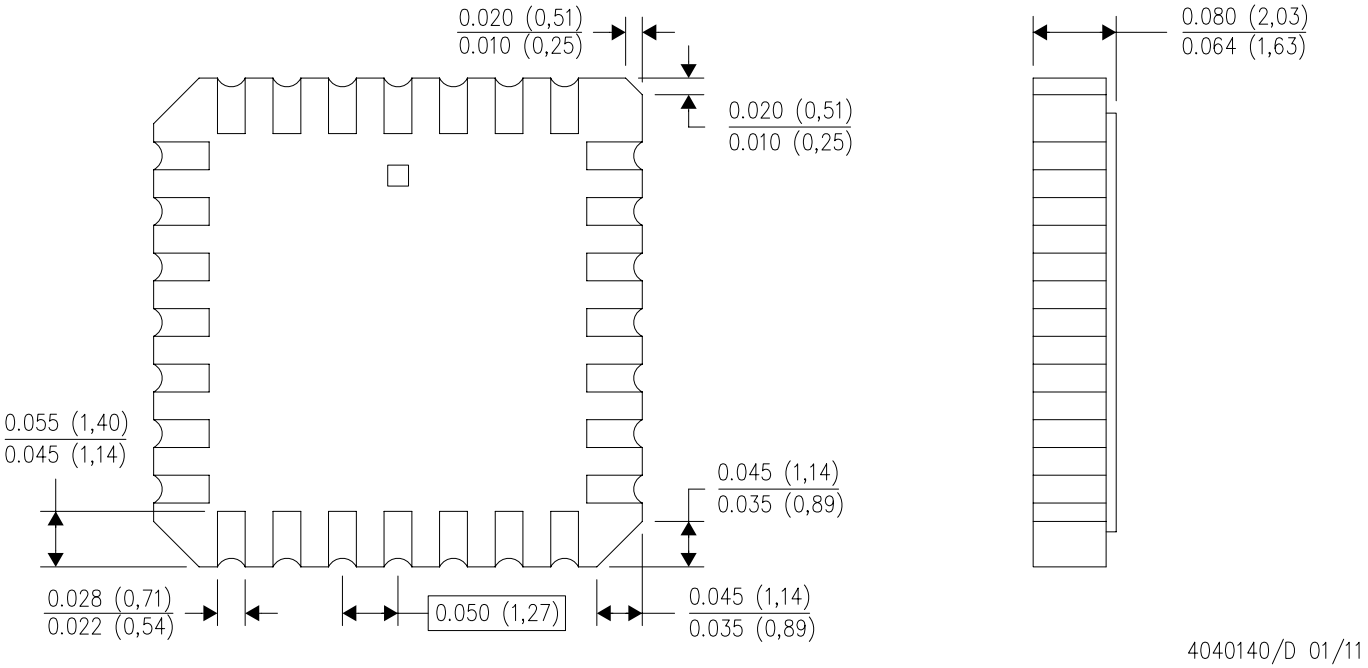

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F16 and JEDEC MO–092AC

FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN




| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.740 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |



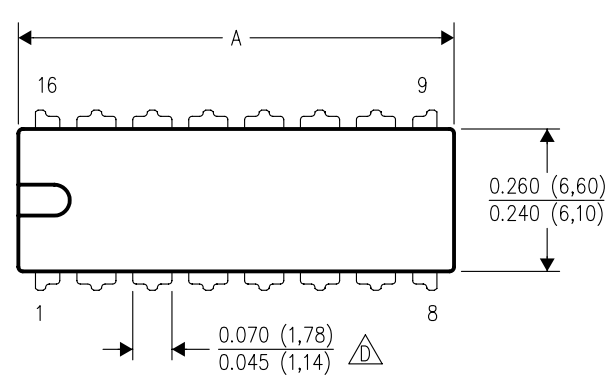

4040140/D 01/11

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. Falls within JEDEC MS–004

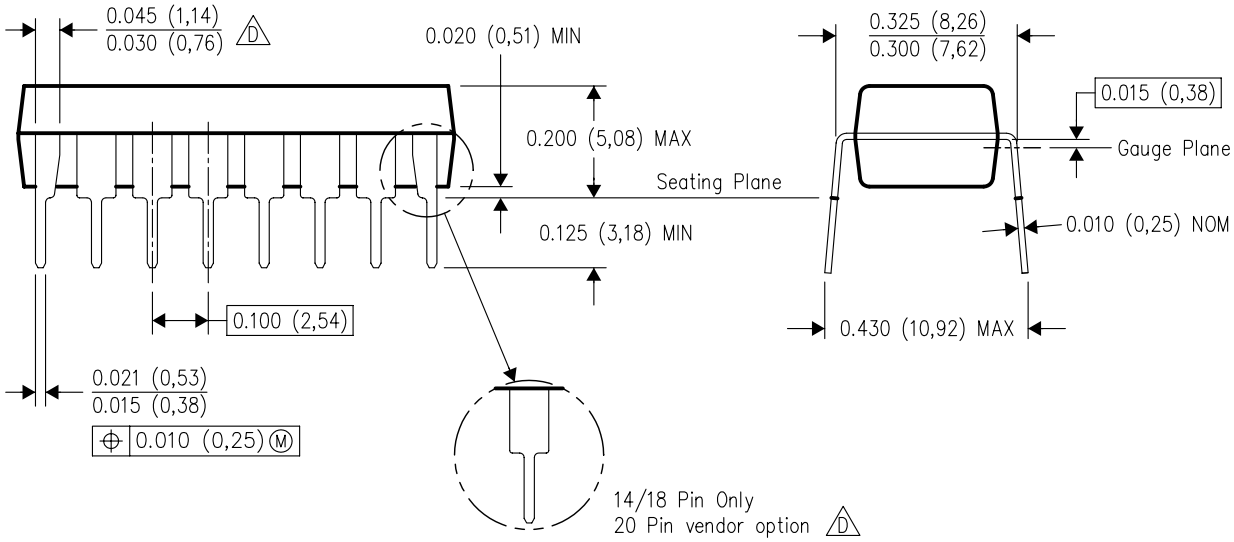
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



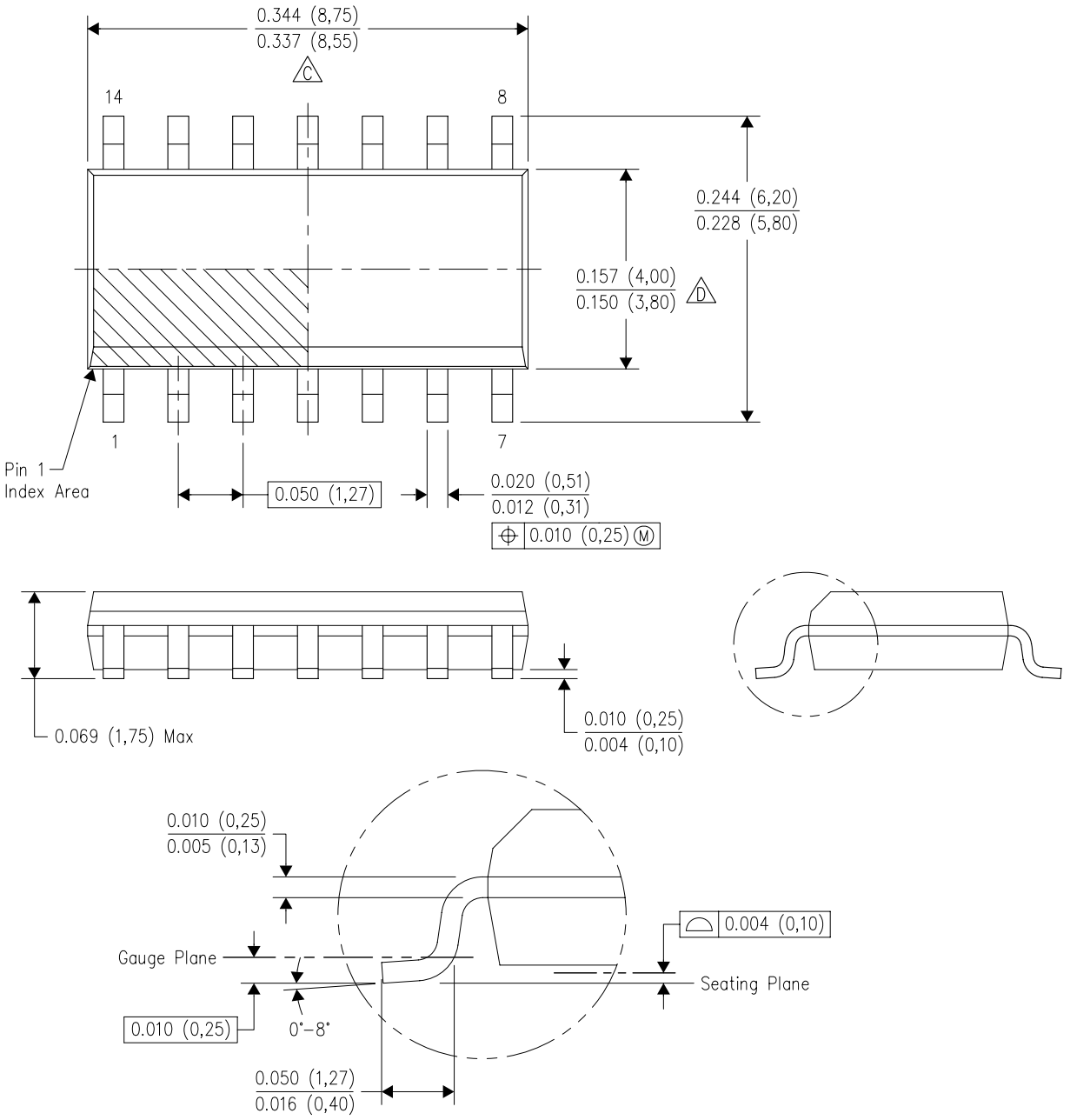

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




4040049/E 12/2002

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.

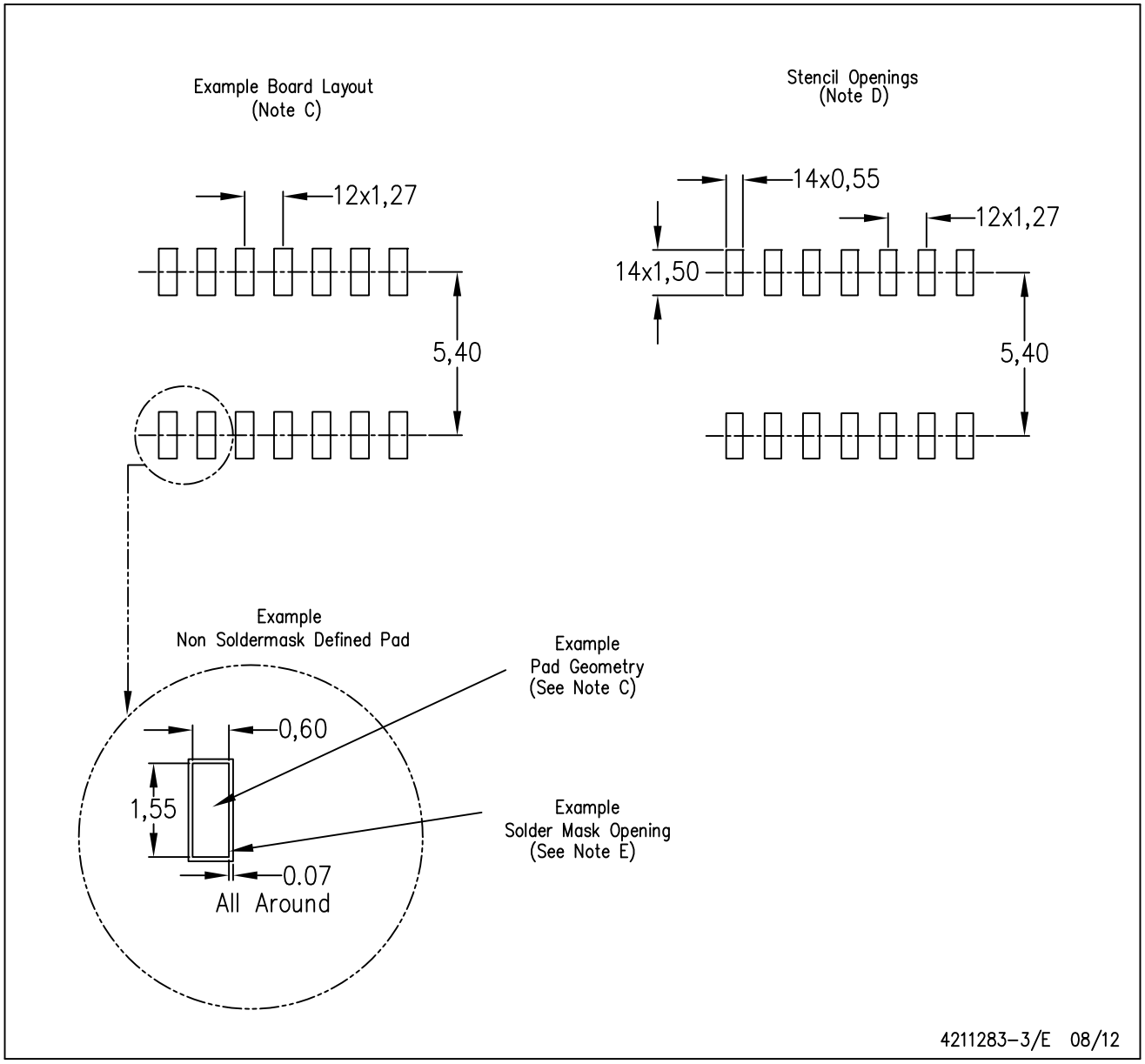
D (R–PDSO–G14) PLASTIC SMALL OUTLINE




4040047–5/M 06/11

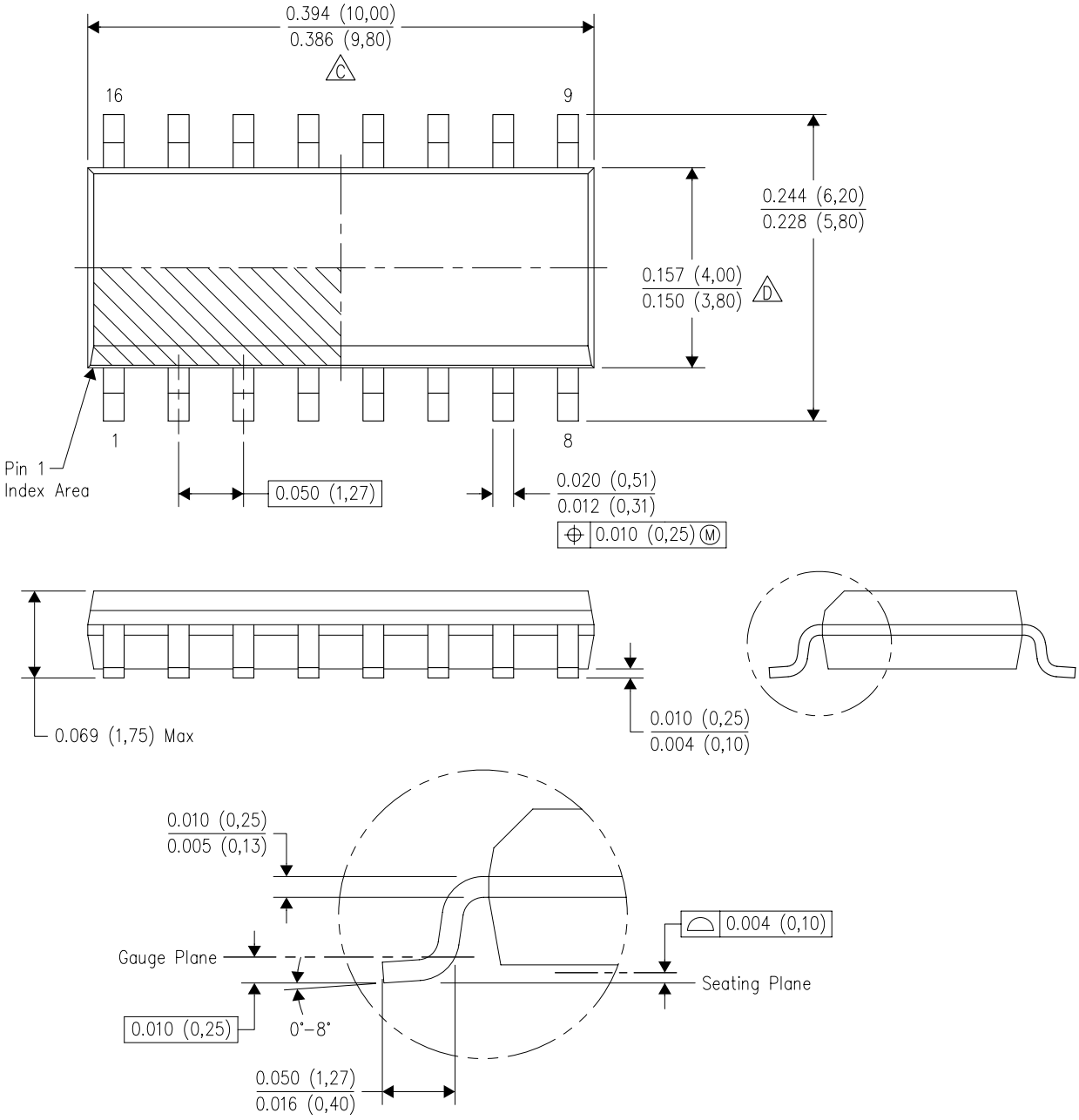
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead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



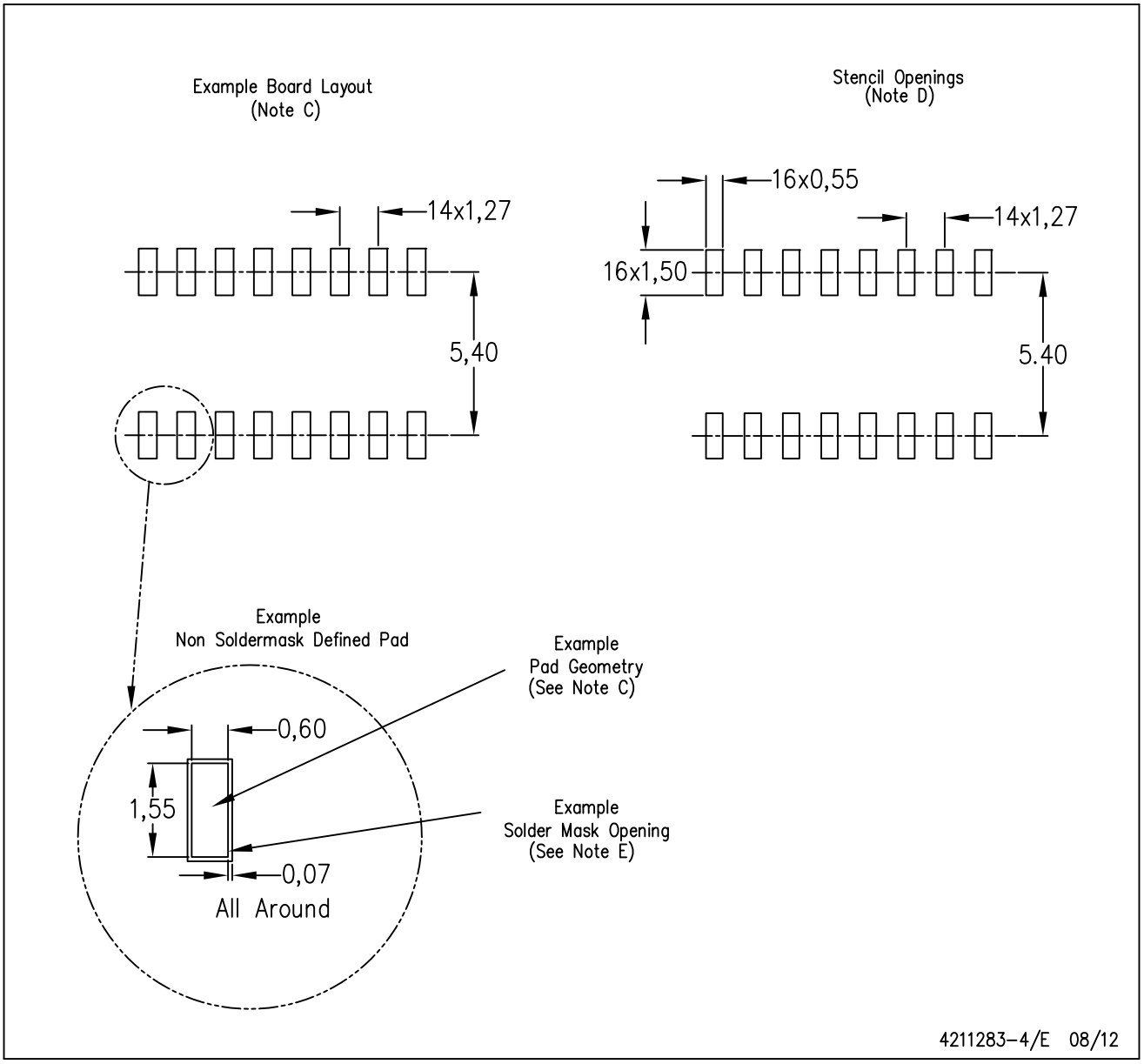

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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

D (R–PDSO–G16) 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 AC.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE

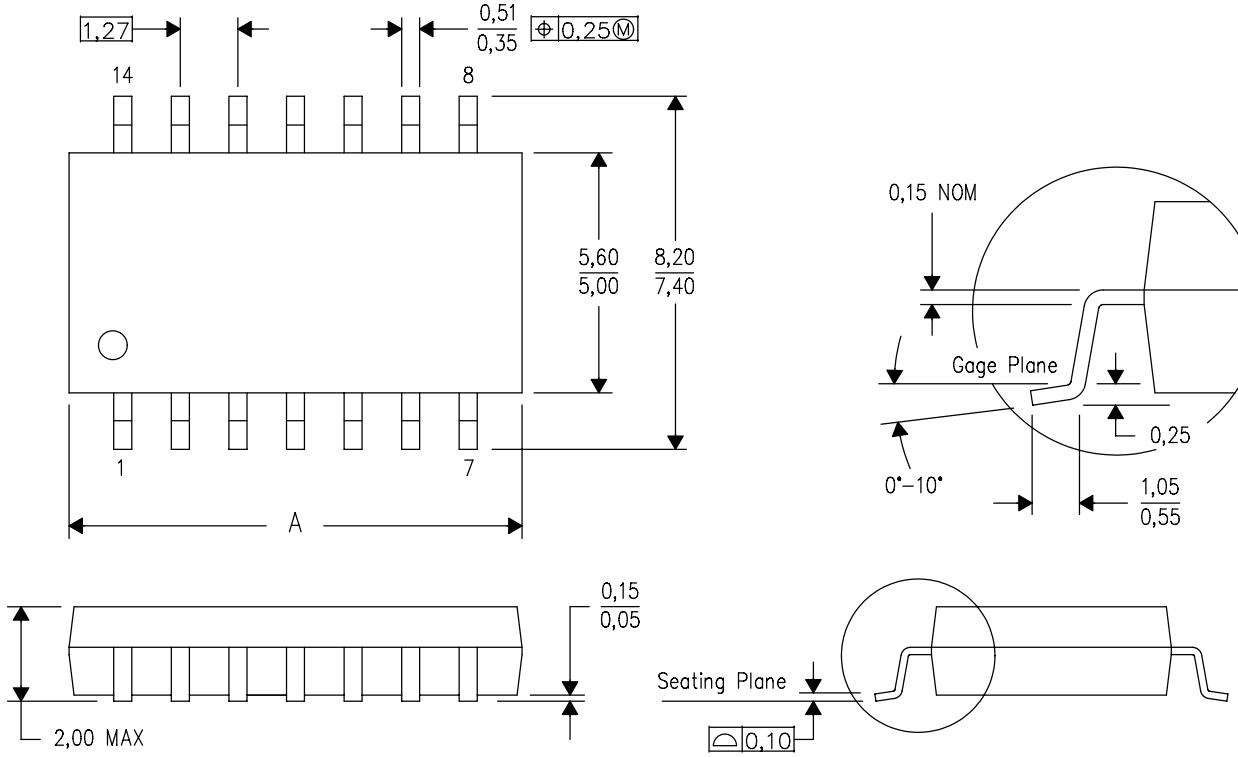



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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

## MECHANICAL DATA

**NS (R-PDSO-G**)** **PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**




| DIM \ PINS ** | 14 | 16 | 20 | 24 |
|---|---|---|---|---|
| A MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN | 9,90 | 9,90 | 12,30 | 14,70 |

4040062/C 03/03

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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