

5-~~13~~
96

RES

ORIG

004190

-4190

T1

TTL
SSI

SERIES 29000 TRANSISTOR-TRANSISTOR LOGIC

BULLETIN NO. DL-S 7211869, DECEMBER 1972

description

Series 29000 devices are designed to be used in existing systems as replacements for 9000-type circuits. Series 29000 circuits offer several significant advantages over 9000 type circuits, some of which are:

- Output short-circuit current specified to guarantee the high-level impedance.
- Power dissipation of Series 29000 circuits is in most cases lower than that for the equivalent 9000 type.

Series 29000 circuits are characterized for operation over the industrial temperature range of 0°C to 75°C.

For new designs, the 54/74 families of TTL circuits offer the industry's broadest choice of high-performance digital circuits. Included are ten series of compatible TTL circuits offering a choice of specific performance ranges. All 54/74 family circuits are entirely compatible and are designed to serve any application from industrial numerical controllers or high-speed computers to sophisticated high-reliability aerospace and defense systems. Series 54/74 pin-for-pin equivalents are available for the following Series 29000 SSI types:

| SERIES | EQUIVALENT |
|----------|-------------|
| 29000 | SERIES 74 |
| SN29002✓ | SN7400J, N |
| SN29003✓ | SN7410J, N |
| SN29004✓ | SN7420J, N |
| SN29005✓ | SN7450J, N |
| SN29009✓ | SN7440J, N |
| SN29012✓ | SN7403J, N |
| SN29016✓ | SN7404J, N |
| SN29024✓ | SN74109J, N |

4

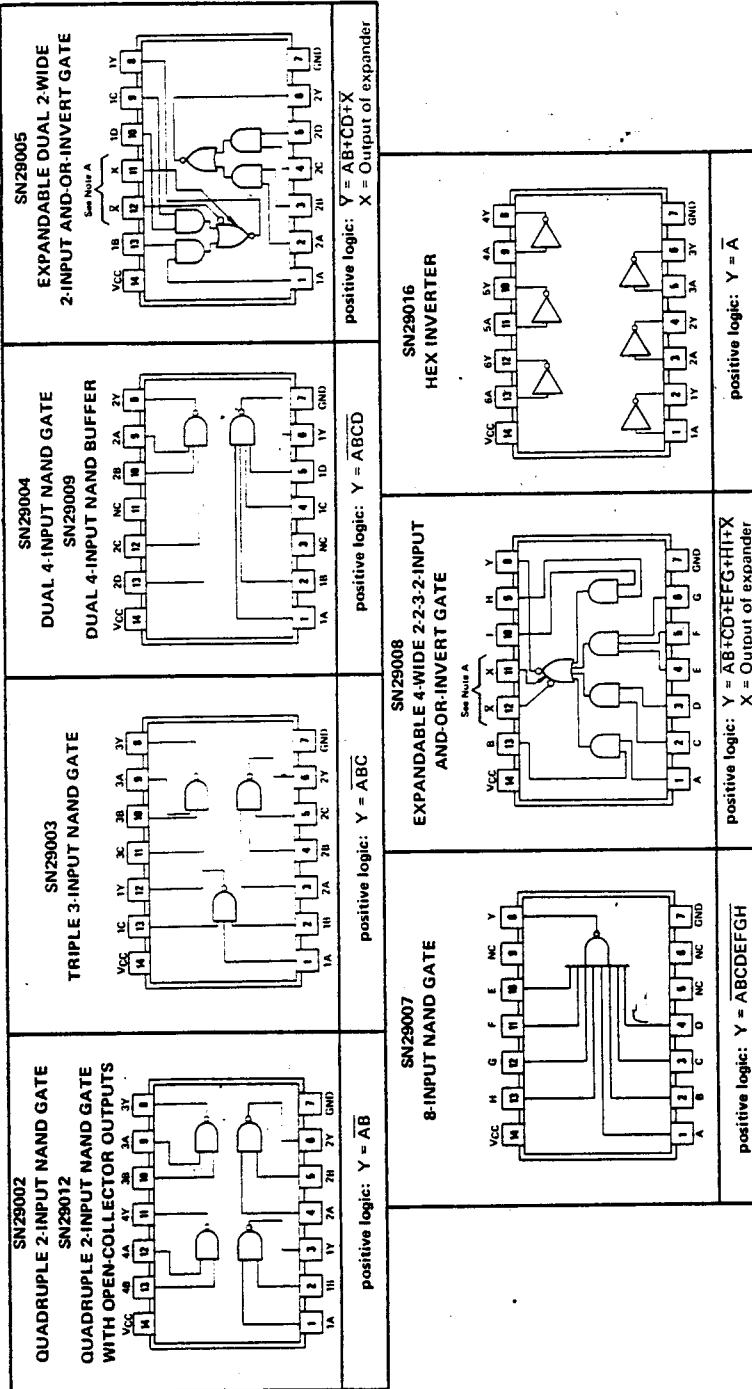
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

| | |
|---|-----------------|
| Supply voltage, V _{CC} (see Notes 1 and 2) | 8 V |
| Input voltage | 5.5 V |
| Interemitter voltage (see Note 3) | 5.5 V |
| Steady-state input current range | -30 mA to 5 mA |
| High-level output voltage | V _{CC} |
| Low-level output current: SN29009 | 100 mA |
| Other circuit types | 50 mA |
| Operating free-air temperature range | 0°C to 75°C |
| Storage temperature range | -65°C to 150°C |

- NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
2. The maximum V_{CC} value of 8 volts is not the primary factor in determining the maximum V_{CC} which may be applied to a number of interconnected devices. The voltage at a high output is approximately two forward-biased-diode drops below the V_{CC} voltage, so the primary limit on V_{CC} is that the voltage at any input may not go above 5.5 volts. This effectively limits the system V_{CC} to approximately 7 volts.
3. This is the voltage between two emitters of a multiple-emitter transistor. For these SSI circuits, this rating applies between inputs that go directly into the same AND or NAND gate in the functional block diagram.

TYPES SN29002, SN29003, SN29004, SN29005,
SN29007, SN29008, SN29009, SN29012, SN29016
GATES AND INVERTERS

SERIES 29000 GATES AND INVERTERS
J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



NOTE A: X is the emitter terminal and \overline{X} is the collector terminal of the expander circuit (e.g. SN5460/SN7460).
recommended operating conditions

| Supply voltage, VCC | SN29002, SN29003, SN29004, SN29005, SN29007, SN29008, SN29016 | | SN29009 | | SN29012 | | UNIT |
|--|---|-----|---------|------|---------|------|------|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| High-level output voltage, VOH | 4.75 | 5 | 5.25 | 4.75 | 5 | 5.25 | V |
| Low-level output voltage, VOL | 0 | 0 | 0 | 0 | 0 | 0 | V |
| Normalized fan-out from each output, N | 20 | 10 | 75 | 75 | 10 | 10 | |
| Operating free-air temperature, TA | 0 | 75 | 0 | 75 | 0 | 75 | °C |

**TYPES SN29002, SN29003, SN29004, SN29005,
SN29007, SN29008, SN29009, SN29012, SN29016
GATES AND INVERTERS**

electrical characteristics at specified free-air temperature

| PARAMETER | TEST CONDITIONS | SN29002 | | SN29005 | | SN29008 | | SN29009 | | SN29012 | | UNIT |
|---|---|---------|-------|-------------------------|---------------------------------|---------|-------|---------|-------|---------|-------|------|
| | | MIN | MAX | EXPAND- ABLE GATE | NON- EXPAND- ABLE GATE | MIN | MAX | MIN | MAX | MIN | MAX | |
| V _{IH} High-level input voltage | 0°C | 1.5 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | V |
| | 25°C | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | |
| | 75°C | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | |
| V _{IL} Low-level input voltage | 0°C to 75°C | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | V |
| V _I Input clamp voltage | V _{CC} = 4.75 V, I _I = -12 mA | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | -1.5 | V |
| | V _{CC} = 4.75 V, I _{OH} = -1.2 mA | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | V |
| V _{OH} High-level output voltage | V _{IH} = 0.85 V | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| | V _{IH} = 0.85 V, I _{OL} = -3.6 mA | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| V _{OL} Low-level output voltage | V _{IH} = V _{IH} min | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| | V _{CC} = 4.75 V, I _{OL} = 14.1 mA | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| | V _{IH} = V _{IH} min, I _{OL} = 42.3 mA | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| | V _{CC} = 4.75 V, V _{IL} = 0.85 V, V _{OH} = 5.5 V | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | V |
| I _{OH} High-level output current | V _{CC} = 5.25 V, V _I = 4.5 V, Other inputs at ground | 60 | 90 | 60 | 90 | 60 | 90 | 60 | 90 | 60 | 90 | μA |
| I _{IH} High-level input current | V _I = 0.45 V, V _{CC} = 5.25 V | -1.6 | -2.4 | -1.6 | -2.4 | -1.6 | -2.4 | -1.6 | -2.4 | -1.6 | -2.4 | mA |
| | Other inputs at 5.25 V, V _{CC} = 4.75 V | -1.41 | -2.12 | -1.41 | -2.12 | -1.41 | -2.12 | -1.41 | -2.12 | -1.41 | -2.12 | mA |
| I _{OS} Short-circuit output current† | V _{CC} = 5.25 V | -18 | -55 | -20 | -70 | -18 | -55 | -20 | -70 | -18 | -55 | mA |
| I _{CC} Supply current, all outputs high (average per gate) | V _{CC} = 5 V, See Figure 7 on page 145 | 1.7 | 5.1 | 3.4 | 8 | 3.4 | 8 | 3.4 | 8 | 3.4 | 8 | mA |
| | V _{CC} = 5 V, See Figure 7 on page 145 | 5.5 | 13.6 | 7.7 | 13.6 | 7.7 | 13.6 | 7.7 | 13.6 | 7.7 | 13.6 | mA |

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

| PARAMETER | TEST CONDITIONS | SN29002 | | SN29005 | | SN29008 | | SN29009 | | SN29012 | | UNIT |
|---|---|---------|-----|-------------------------|---------------------------------|---------|-----|---------|-----|---------|-----|------|
| | | MIN | MAX | EXPAND- ABLE GATE | NON- EXPAND- ABLE GATE | MIN | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} Propagation delay time, low-to-high-level output | C _L = 15 pF, R _L = 400 Ω, † See Note 4 | 3 | 13 | 15 | 12 | 15 | 12 | 15 | 12 | 15 | 12 | ns |
| | | 3 | 15 | 12 | 14 | 12 | 14 | 13 | 12 | 13 | 15 | |
| t _{PHL} Propagation delay time, high-to-low-level output | | 3 | 15 | 12 | 14 | 12 | 14 | 13 | 12 | 13 | 15 | ns |

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

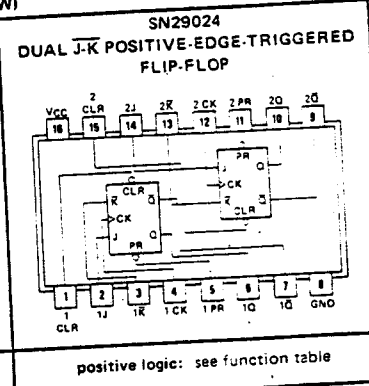
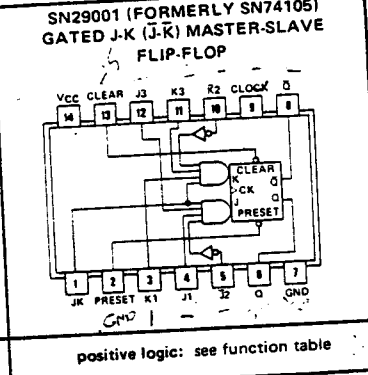
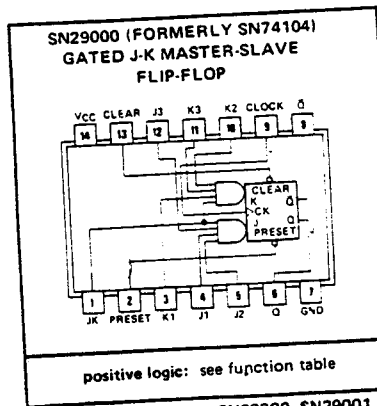
‡ For testing t_{PLH} of SN29012, R_L = 4 kΩ.

NOTE 4: Expander inputs of SN29009 and SN29008 are open. Load circuit, input characteristics, and voltage waveforms are the same as those shown for Series 54/74, page 14B.

3

TYPES SN29000, SN29001, SN29024 FLIP-FLOPS

SERIES 29000 FLIP-FLOPS J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



positive logic: see function table

positive logic: see function table

positive logic: see function table

SN29000, SN29001
FUNCTION TABLE

| INPUTS | | | | | | OUTPUTS | |
|--------|-------|-------|---|---|----|----------------|-----------------|
| PRESET | CLEAR | CLOCK | J | K | JK | Q | Q̄ |
| L | H | X | X | X | X | H | L |
| H | L | X | X | X | X | L | H |
| L | L | X | X | X | X | H* | H* |
| L | L | X | X | X | L | Q ₀ | Q̄ ₀ |
| H | H | ⌋ | X | X | L | Q ₀ | Q̄ ₀ |
| H | H | ⌋ | L | L | X | H | L |
| H | H | ⌋ | H | L | H | H | L |
| H | H | ⌋ | L | H | H | L | H |
| H | H | ⌋ | H | H | H | TOGGLE | TOGGLE |

SN29024
FUNCTION TABLE

| INPUTS | | | | | OUTPUTS | |
|--------|-------|-------|---|----|----------------|-----------------|
| PRESET | CLEAR | CLOCK | J | K̄ | Q | Q̄ |
| L | H | X | X | X | H | L |
| H | L | X | X | X | L | H |
| L | L | X | X | X | H* | H* |
| L | L | X | L | L | L | H |
| H | H | ↑ | L | L | L | H |
| H | H | ↑ | H | L | TOGGLE | TOGGLE |
| H | H | ↑ | L | H | Q ₀ | Q̄ ₀ |
| H | H | ↑ | H | H | H | L |
| H | H | ↑ | H | H | H | L |
| H | H | L | X | X | Q ₀ | Q̄ ₀ |

SN29000: J = J1·J2·J3; K = K1·K2·K3
 SN29001: J = J1·J2·J3; K = K1·K2·K3
 H = high level (steady state), L = low level (steady state), X = irrelevant
 ⌋ = low-level pulse; other inputs should be held constant while clock is low.
 ↑ = transition from low to high level
 Q₀ = the level of Q before the indicated input conditions were established.
 TOGGLE: Each output changes to the complement of its previous level on each active transition of the clock.
 * This configuration is nonstable. That is, it will not persist when preset and clear inputs return to their inactive (high) level.

recommended operating conditions

| | SN29000 | | | SN29001 | | | SN29024 | | |
|--|------------------|-----|------|---------|-----|------|---------|-----|------|
| | MIN | NOM | MAX | MIN | NOM | MAX | MIN | NOM | MAX |
| Supply voltage, V _{CC} | 4.75 | 5 | 5.25 | 4.75 | 5 | 5.25 | 4.75 | 5 | 5.25 |
| Normalized fan-out from each output, N | High logic level | | | 20 | | | 20 | | |
| | Low logic level | | | 10 | | | 10 | | |
| Clock frequency, f _{clock} | 0 | | | 15 | | | 0 | | |
| Width of clock pulse, t _w | High level | | | 30 | | | 18 | | |
| | Low level | | | 35 | | | 15 | | |
| Width of preset or clear pulse, t _w | 25 | | | 25 | | | 20 | | |
| | 35 | | | 35 | | | 15 | | |
| Input setup time, t _{setup} | J, K, or JK | | | 35 | | | 15 | | |
| | J or K | | | | | | 10 | | |
| | J or K | | | | | | 17 | | |
| Input hold time, t _{hold} | | | | | | | 1 | | |
| | J, K, or JK | | | 10 | | | 4 | | |
| Input release time, t _{release} | J or K | | | | | | 75 | | |
| | | | | | | | 0 | | |
| Operating free-air temperature, T _A | 0 | | | 75 | | | 0 | | |

TYPES SN29000, SN29001, SN29024 FLIP-FLOPS

electrical characteristics at specified free-air temperature

| PARAMETER | | TEST CONDITIONS | | SN29000 | | SN29001 | | SN29024 | | UNIT | | | |
|-----------------|---------------------------|--|---|--------------------------|-------------|--------------------------|-------------|---------|-------|-------|--------|-------|-------|
| | | | | MIN | MAX | MIN | MAX | MIN | MAX | | | | |
| V _{IH} | High-level input voltage | 0°C | | 1.9 | | 1.9 | | 1.9 | | V | | | |
| | | 25°C | | 1.8 | | 1.8 | | 1.8 | | | | | |
| | | 75°C | | 1.6 | | 1.6 | | 1.6 | | | | | |
| V _{IL} | Low-level input voltage | 0°C to 75°C | | | 0.85 | | 0.85 | | 0.85 | V | | | |
| V _I | Input clamp voltage | V _{CC} = 4.75 V, I _I = -12 mA | | 0°C to 75°C | | | -1.5 | | -1.5 | V | | | |
| V _{OH} | High-level output voltage | V _{CC} = 4.75 V, V _{IH} = V _{IH} min, V _{IL} = 0.85 V, I _{OH} = -1.2 mA | | 0°C to 75°C | | 2.4 | | 2.4 | | V | | | |
| V _{OL} | Low-level output voltage | V _{CC} = 4.75 V, V _{IH} = V _{IH} min, V _{IL} = 0.85 V, I _{OL} = 14.1 mA | | 0°C to 75°C | | | 0.45 | | 0.45 | V | | | |
| | | V _{CC} = 5.25 V, V _{IH} = V _{IH} min, V _{IL} = 0.85 V, I _{OL} = 16 mA | | 0°C to 75°C | | | 0.45 | | 0.45 | | | | |
| I _{IH} | High-level input current | J, K, J̄ or K̄ | | | | 60 | | 60 | | μA | | | |
| | | JK | | | | 120 | | 120 | | | | | |
| | | Clock | V _{CC} = 5.25 V, V _I = 4.5 V | -25°C and | | | 60 | | 60 | | | | |
| | | Preset | Other inputs at ground | 75°C | | | 160 | | 160 | | | | |
| | | Clear | | | | | 160 | | 160 | | 240 | | |
| I _{IL} | Low-level input current | J, K, J̄, or K̄ | V _I = 0.45 V, Other inputs at 5.25 V | V _{CC} = 5.25 V | 0°C to 75°C | | | -1.6 | | -1.6 | mA | | |
| | | JK | | | | | | | -3.2 | | | -3.2 | |
| | | Clock | | | | | | | -1.6 | | | -1.6 | -3.2 |
| | | Preset | | | | | | | -4.32 | | | -4.32 | -3.2 |
| | | Clear | | | | | | | -4.32 | | | -4.32 | -6.4† |
| | | J, K, J̄, or K̄ | | | | V _{CC} = 4.75 V | 0°C to 75°C | | | -1.41 | | | -1.41 |
| | | JK | | | | | | -2.82 | | -2.82 | | | |
| | | Clock | | | | | | -1.41 | | -1.41 | -2.82 | | |
| | | Preset | | | | | | -3.78 | | -3.78 | -2.82 | | |
| | | Clear | | | | | | -3.78 | | -3.78 | -4.96‡ | | |
| | | | | | | | | | | | | | |
| | | I _{OS} | Short-circuit output current § | V _{CC} = 5.25 V | | 0°C to 75°C | | -30 | -100 | -30 | -100 | -30 | -100 |
| I _{CC} | Supply current | V _{CC} = 5 V, See Note 5 | | 0°C to 75°C | | | 28 | | 33 | | 28 | mA | |

† This current will be a maximum of -4.8 mA if J or K̄ input is grounded.

‡ This current will be a maximum of -3.72 mA if J or K̄ input is grounded.

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

NOTE 5: I_{CC} is measured with all outputs open, first with preset at 4.5 V and all other inputs grounded, then with clear at 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 | SN29000 | | | SN29001 | | | SN29024 | | | UNIT |
|------------------|--------------|-------------|--|---------|-----|-----|---------|-----|-----|---------|-----|-----|------|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| f _{max} | | | | 15 | 20 | | 30 | 50 | | 25 | 32 | | MHz |
| t _{PLH} | Clock | Q or Q̄ | C _L = 15 pF, R _L = 400 Ω, See Note 6 | 12 | 20 | | 12 | 30 | | 4 | 10 | 16 | ns |
| t _{PHL} | | | | 20 | 30 | | 20 | 30 | | 9 | 18 | 28 | |
| t _{PLH} | Preset | Q | | 12 | 20 | | 12 | 20 | | 10 | 15 | | ns |
| t _{PHL} | | | | Q̄ | | | 35 | | 35 | | 23 | 35 | |
| t _{PLH} | Clear | Q̄ | | 12 | 20 | | 12 | 20 | | 10 | 15 | | ns |
| t _{PHL} | | | | Q | | | 35 | | 35 | | 17 | 25 | |

§ f_{max} ≡ maximum clock frequency

t_{PLH} ≡ propagation delay time, low-to-high-level output

t_{PHL} ≡ propagation delay time, high-to-low-level output

NOTE 6: Load circuit, input characteristics, and voltage waveforms are the same as those shown for Series 54/74, page 148.

TEXAS INSTRUMENTS
INCORPORATED

POST OFFICE BOX 5012 • DALLAS, TEXAS 75222

5

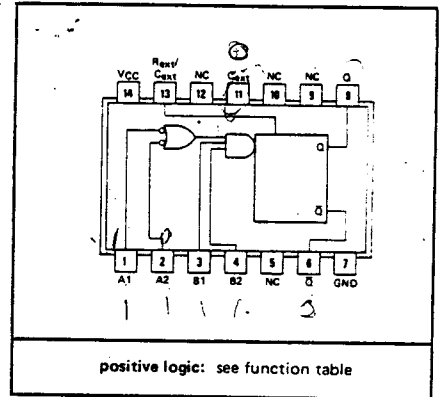
TYPE SN29601 MONOSTABLE MULTIVIBRATOR

- Direct Replacement for Fairchild 9601C • For New Designs, SN74122 Is Recommended

FUNCTION TABLE
(See Note A)

| INPUTS | | | | OUTPUTS | |
|--------|----|----|----|---------|-----------|
| A1 | A2 | B1 | B2 | Q | \bar{Q} |
| H | H | X | X | L | H |
| X | X | L | X | L | H |
| X | X | X | L | L | H |
| L | X | H | H | L | H |
| X | X | ↑ | H | | |
| X | X | H | ↑ | | |
| X | L | H | H | L | H |
| X | L | ↑ | H | | |
| X | L | H | ↑ | | |
| H | ↓ | H | H | | |
| ↓ | ↓ | H | H | | |
| ↓ | H | H | H | | |

JORN DUAL-IN-LINE
PACKAGE (TOP VIEW)
(See Notes B and C)



- NOTES: A. H = high level (steady state), L = low level (steady state), ↑ = transition from low to high level, ↓ = transition from high to low level, = one high-level pulse, = one low-level pulse, X = irrelevant (any input, including transitions).
B. NC = No internal connection.
C. An external timing capacitor may be connected between C_{ext} and R_{ext}/C_{ext} (positive).

recommended operating conditions

| | MIN | NOM | MAX | UNIT |
|---|------------------|-----|------|------|
| Supply voltage, V _{CC} | 4.75 | 5 | 5.25 | V |
| Normalized fan-out from each output, N | High logic level | | 20 | |
| | Low logic level | | 10 | |
| Input data setup time, t _{setup} | 40° | | | ns |
| Input data hold time, t _{hold} | 40° | | | ns |
| Width of clear pulse, t _{w(clear)} | 40° | | | ns |
| External timing resistance | 5 | | 50 | kΩ |
| External capacitance | No restriction | | | |
| Wiring capacitance at R _{ext} /C _{ext} terminal | | | 50 | pF |
| Operating free-air temperature, T _A | 0 | 75 | | °C |

°These conditions are recommended for use at V_{CC} = 5 V, T_A = 25°C.

TYPE SN29601 MONOSTABLE MULTIVIBRATOR

electrical characteristics over 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 _I | Input clamp voltage | V _{CC} = MIN, I _I = -12 mA | | | -1.5 | V |
| V _{OH} | High-level output voltage | V _{CC} = MIN, I _{OH} = -800 μA, See Note 7 | 2.4 | 3.4 | | V |
| V _{OL} | Low-level output voltage | V _{CC} = MIN, I _{OL} = 16 mA, See Note 7 | 0.2 0.4 | | | V |
| I _I | Input current at maximum input voltage | V _{CC} = MAX, V _I = 5.5 V | | | 1 | mA |
| I _{IH} | High-level input current | data inputs | V _{CC} = MAX, V _I = 2.4 V | | 40 | |
| | | clear input | | | | |
| I _{IL} | Low-level input current | data inputs | V _{CC} = MAX, V _I = 0.4 V | | -1.6 | |
| | | clear input | | | | |
| I _{OS} | Short-circuit output current‡ | V _{CC} = MAX, See Note 7 | -10 | -40 | | mA |
| I _{CC} | Supply current (quiescent or triggered) | V _{CC} = MAX, See Notes 8 and 9 | 23 | 28 | | mA |

† For conditions shown as MIN or MAX, use the 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.

NOTES: 7. Ground C_{ext} to measure V_{OH} at Q, V_{OL} at \bar{Q} , or I_{OS} at Q. C_{ext} is open to measure V_{OH} at \bar{Q} , V_{OL} at Q, or I_{OS} at \bar{Q} .

8. Quiescent I_{CC} is measured (after clearing) with 2.4 V applied to all clear and A inputs, B inputs grounded, C_{ext} = 0.02 μF, R_{ext} = 25 kΩ, R_{int} and all outputs open.

9. I_{CC} is measured in the triggered state with 2.4 V applied to all clear and B inputs, A inputs grounded, C_{ext} = 0.02 μF, R_{ext} = 25 kΩ, R_{int} and all outputs open.

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------|---|--|--|------|------|------|
| t _{PLH} | Propagation delay time, low-to-high-level Q output, from either A input | C _{ext} = 0, R _{ext} = 5 kΩ, C _L = 15 pF, R _L = 400 Ω, See Note 10 | | 22 | 33 | ns |
| t _{PLH} | Propagation delay time, low-to-high-level Q output, from either B input | | | 19 | 28 | ns |
| t _{PHL} | Propagation delay time, high-to-low-level Q output, from either A input | | | 30 | 40 | ns |
| t _{PHL} | Propagation delay time, high-to-low-level \bar{Q} output, from either B input | | | 27 | 36 | ns |
| t _{w(min)} | Minimum width of Q output pulse | | | 45 | 65 | ns |
| t _w | Width of Q output pulse | | C _{ext} = 1000 pF, R _{ext} = 10 kΩ, C _L = 15 pF, R _L = 400 Ω | 3.08 | 3.42 | 3.76 |

NOTE 10: Load circuit, input characteristics, and voltage waveforms are the same as those shown for Series 54/74, page 148.