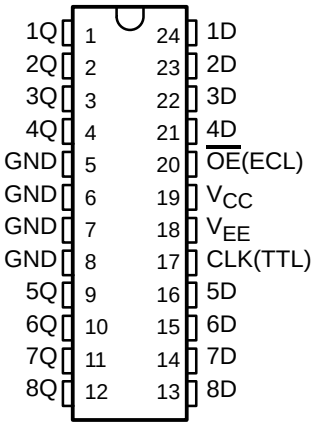
- **10KH Compatible**
- **TTL Clock and ECL Control Inputs**
- **Noninverting Outputs**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Center Pin $V_{CC}$, $V_{EE}$, and GND Configurations Minimize High-Speed Switching Noise**
- **Package Options Include "Small Outline" Packages and Standard Plastic DIPs**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015**

**DW OR NT PACKAGE**

**(T0P VIEW)**




## description

This octal TTL-to-ECL translator is designed to provide efficient translation between a TTL signal environment and a 10KH ECL signal environment. This device is designed specifically to improve the performance and density of TTL-to-ECL CPU/bus-oriented functions such as memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The eight flip-flops of the '5578 are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs are set to the logic levels that were set up at the D inputs.

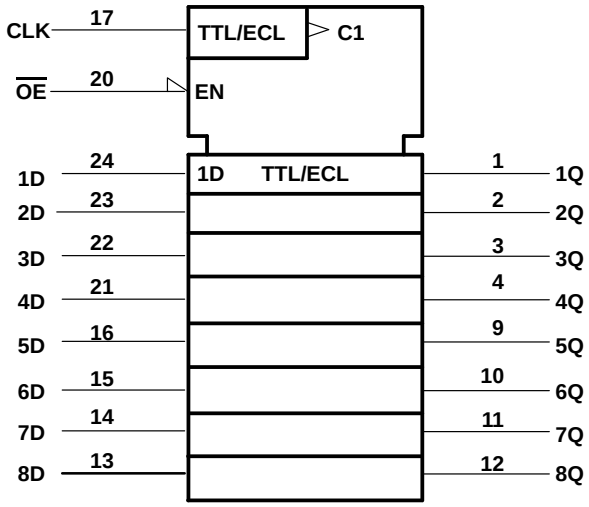
The output-control input $\overline{OE}$ does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are off.

The SN10KHT5578 is characterized for operation from 0°C to 75°C.

**FUNCTION TABLE**

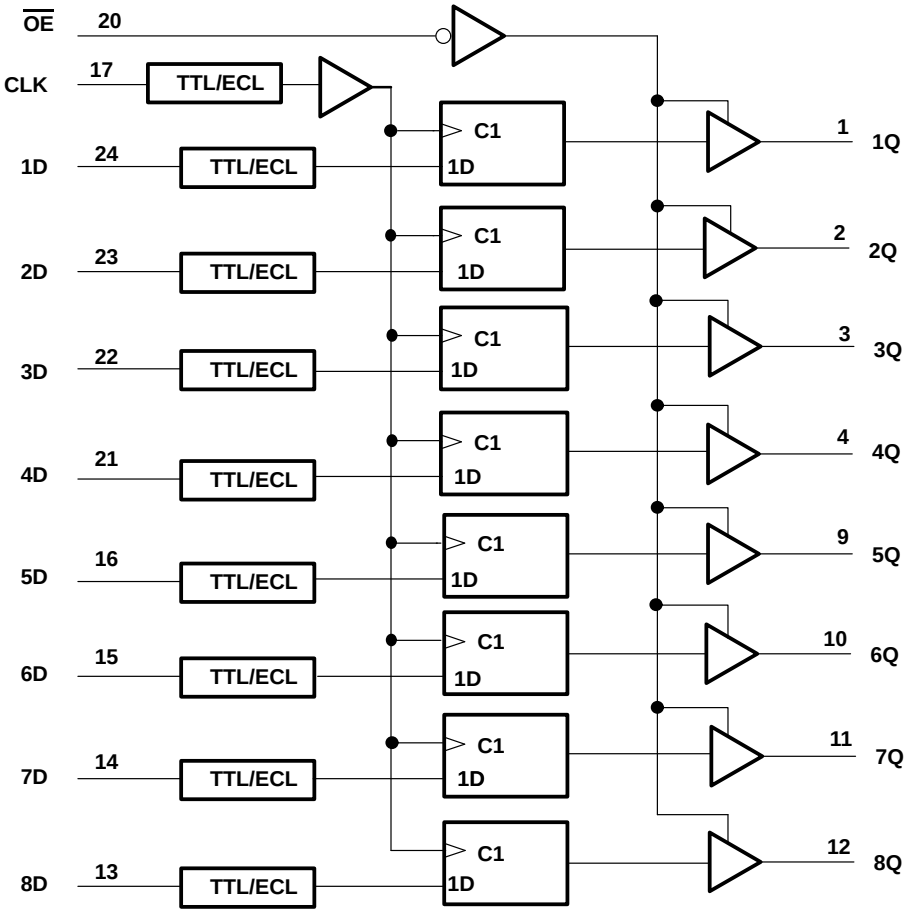
| INPUTS | | | OUTPUT (ECL) |
|---|---|---|---|
| $\overline{OE}$ | CLK | D | Q |
| L | ↑ | L | L |
| L | ↑ | H | H |
| L | L | X | $Q_0$ |
| H | X | X | L |

## logic symbol†




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

## logic diagram (positive logic)




## absolute maximum ratings over operating ambient temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$ . . . . . –0.5 V to 7 V
Supply voltage range, $V_{EE}$ . . . . . –8 V to 0 V
Input voltage range (TTL) (see Note 1) . . . . . –1.2 V to 7 V
Input voltage range (ECL) . . . . . $V_{EE}$ to 0 V
Input current range (TTL) . . . . . –30 mA to 5 mA
Current out of any output . . . . . 50 mA
Operating ambient temperature range . . . . . 0°C to 75°C
Storage temperature range . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The TTL input voltage ratings may be exceeded provided the input current ratings are observed.

## recommended operating conditions

| | | | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{CC}$ | TTL supply voltage | | 4.5 | 5 | 5.5 | V |
| $V_{EE}$ | ECL supply voltage | | –4.94 | –5.2 | –5.46 | V |
| $V_{IH}$ | TTL high-level input voltage | | 2 | | | V |
| $V_{IH}$ | ECL high-level input voltage† | 0°C | –1170 | | –840 | mV |
| | | 25°C | –1130 | | –810 | mV |
| | | 75°C | –1070 | | –735 | mV |
| $V_{IL}$ | TTL low-level input voltage | | | | 0.8 | V |
| $V_{IL}$ | ECL low-level input voltage† | 0°C | –1950 | | –1480 | mV |
| | | 25°C | –1950 | | –1480 | mV |
| | | 75°C | –1950 | | –1450 | mV |
| $I_{IK}$ | TTL input clamp current | | | | –18 | mA |
| $T_A$ | Operating ambient temperature (see Note 2) | | 0 | | 75 | °C |

## electrical characteristics over recommended operating ambient temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | | | MIN | TYP‡ | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IK}$ | D inputs and CLK | $V_{CC}$ = 4.5 V, | $V_{EE}$ = –4.94 V, | $I_I$ = –18 mA | | | | –1.2 | V |
| $I_I$ | D inputs and CLK | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = 7 V | | | | 0.1 | mA |
| $I_{IH}$ | D inputs and CLK | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = 2.7 V | | | | 20 | µA |
| $I_{IL}$ | D inputs and CLK | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = 0.5 V | | | | –0.5 | mA |
| $I_{IH}$ | $\overline{OE}$ only | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = –840 V | 0°C | | | 350 | µA |
| | | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = –810 V | 25°C | | | 350 | |
| | | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = –735 V | 75°C | | | 350 | |
| $I_{IL}$ | $\overline{OE}$ only | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V, | $V_I$ = –1950 V | 0°C | 0.5 | | | µA |
| | | | | | 25°C | 0.5 | | | |
| | | | | | 75°C | 0.5 | | | |
| $V_{OH}$† | | $V_{CC}$ = 4.5 V, | $V_{EE}$ = –5.2 V ± 5%, | See Note 3 | 0°C | –1020 | | –840 | mV |
| | | | | | 25°C | –980 | | –810 | |
| | | | | | 75°C | –920 | | –735 | |
| $V_{OL}$† | | $V_{CC}$ = 4.5 V, | $V_{EE}$ = –5.2 V ± 5%, | See Note 3 | 0°C | –1950 | | –1630 | mV |
| | | | | | 25°C | –1950 | | –1630 | |
| | | | | | 75°C | –1950 | | –1600 | |
| $I_{CCH}$ | | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V | | | | 17.5 | 25 | mA |
| $I_{CCL}$ | | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V | | | | 15 | 22 | mA |
| $I_{EE}$ | | $V_{CC}$ = 5.5 V, | $V_{EE}$ = –5.46 V | | | | –104 | –149 | mA |
| $C_i$ | | $V_{CC}$ = 5 V, | $V_{EE}$ = –5.2 V, | f = 10 MHz | | | 4 | | pF |

† The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic levels only.
‡ All typical values are at $V_{CC}$ = 5 V, $V_{EE}$ = –5.2 V, $T_A$ = 25°C.

NOTES: 2. Each 10KH series circuit has been designed to meet the dc specifications shown in the electrical characteristics table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board, and transverse air flow greater than 500 linear ft/min is maintained.
3. Outputs are terminated through a 50-Ω resistor to –2 V.

## timing requirements

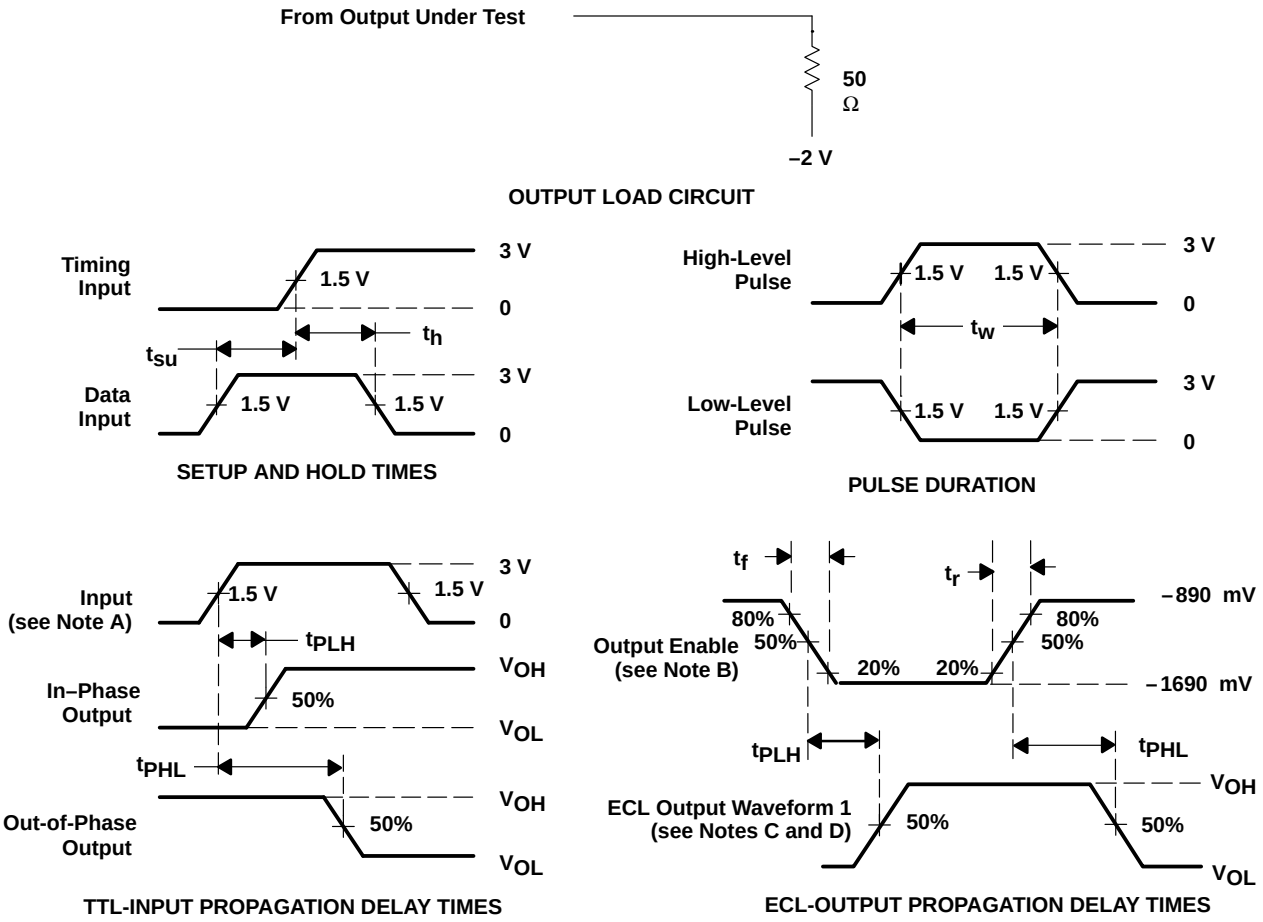
| | | | $V_{CC}$ = 4.5 V to 5.5 V, $V_{EE}$ = −4.94 V to −5.46 V, $T_A$ = MIN to MAX† | | UNIT |
|---|---|---|---|---|---|
| | | | MIN | MAX | |
| $f_{clock}$ | Clock frequency | | 0 | 180 | MHz |
| $t_w$ | Pulse duration, CLK | High | 4 | | ns |
| | | Low | 4 | | |
| $t_{su}$ | Setup time, data before CLK↑ | High | 1.5 | | ns |
| | | Low | 2.5 | | |
| $t_h$ | Hold time, data after CLK↑ | High | 1 | | ns |
| | | Low | 1 | | |

## switching characteristics over recommended ranges of supply voltage and operating ambient temperature (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | MIN | TYP‡ | MAX | UNIT |
|---|---|---|---|---|---|---|
| $f_{max}$ | | | 180 | | | MHz |
| $t_{PLH}$ | CLK | Q | 0.8 | 2.2 | 4 | ns |
| $t_{PHL}$ | | | 0.8 | 2.1 | 3.8 | |
| $t_{PLH}$ | $\overline{OE}$ | Q | 0.5 | 1.4 | 3.2 | ns |
| $t_{PHL}$ | | | 0.5 | 1.7 | 3.3 | |
| $t_r$ | | Y | | 1.5 | | ns |
| $t_f$ | | Y | | 1.5 | | ns |

† 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, $V_{EE}$ = −5.2 V, $T_A$ = 25°C.

## PARAMETER MEASUREMENT INFORMATION




NOTES: A. For TTL inputs, input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r$ = 2.5 ns, $t_f$ = 2.5 ns.
B. For ECL inputs, input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r$ = 1.5 ns, $t_f$ = 1.5 ns.
C. Waveform 1 is for an output with internal conditions such that the output is high except when disabled by $\overline{OE}$.
D. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

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