National Semiconductor

# DS3245 Quad MOS Clock Driver

## General Description

The DS3245 is a quad bipolar-to-MOS clock driver with TTL compatible inputs. It is designed to provide high output current and voltage capabilities necessary for optimum driving of high capacitance N-channel MOS memory systems.

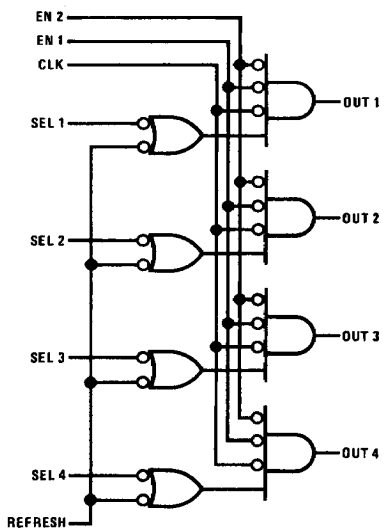
Only 2 supplies, 5 $V_{DC}$ and 12 $V_{DC}$, are required without compromising the usual high $V_{OH}$ specification obtained by circuits using a third supply.

The device features 2 common enable inputs, a refresh input, and a clock control input for simplified system designs. The circuit was designed for driving highly capacitive loads at high speeds and uses Schottky-clamped transistors. PNP transistors are used on all inputs, thereby minimizing input loading.

## Features

- TTL compatible inputs
- Operates from 2 standard supplies: 5 $V_{DC}$, 12 $V_{DC}$
- Internal bootstrap circuit eliminates need for external PNP's
- PNP inputs minimize loading
- High voltage/current outputs
- Input and output clamping diodes
- Control logic optimized for use with MOS memory systems
- Pin and function equivalent to Intel 3245

## Logic and Connection Diagrams

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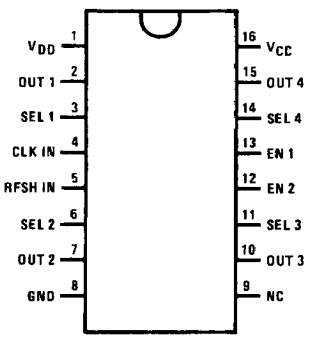
**Dual-In-Line Package**

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**Top View**

**Order Number DS3245J or DS3245N**
**See NS Package Number J16A or N16A**

## Absolute Maximum Ratings

**If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.**

| | |
|---|---|
| Temperature Under Bias | −10°C to +85°C |
| Storage Temperature | −65°C to +150°C |
| Supply Voltage, $V_{CC}$ | −0.5V to +7V |
| Supply Voltage, $V_{DD}$ | −0.5V to +14V |
| All Input Voltages | −1.0V to $V_{DD}$ |
| Outputs for Clock Driver | −1.0V to $V_{DD}$ + 1V |
| Maximum Power Dissipation* at 25°C | |
| Cavity Package | 1509 mW |
| Molded Package | 1476 mW |

*Derate cavity package 10.1 mW/°C above 25°C; derate molded package 11.8 mW/°C above 25°C.

## Operating Conditions

| | Min | Max | Units |
|---|---|---|---|
| Supply Voltage, $V_{CC}$ | 4.75 | 5.25 | V |
| Supply Voltage, $V_{DD}$ | 11.4 | 12.6 | V |
| Operating Temperature $9T_A$ | 0 | 75 | °C |

## Electrical Characteristics (Notes 2 and 3)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $I_{FD}$ | Select Input Load Current | $V_F$ = 0.45V | | | −0.25 | mA |
| $I_{FE}$ | Enable Input Load Current | $V_F$ = 0.45V | | | −1.0 | mA |
| $I_{RD}$ | Select Input Leakage Current | $V_R$ = 5V | | | 10 | μA |
| $I_{RE}$ | Enable Input Leakage Current | $V_R$ = 5V | | | 40 | μA |
| $V_{OL}$ | Output Low Voltage | $I_{OL}$ = 5 mA, $V_{IH}$ = 2V | | | 0.45 | V |
| | | $I_{OL}$ = −5 mA | −1.0 | | | V |
| $V_{OH}$ | Output High Voltage | $I_{OH}$ = −1 mA, $V_{IL}$ = 0.8V | $V_{DD}$ − 0.50 | | | V |
| | | $I_{OH}$ = 5 mA | | | $V_{DD}$ + 1.0 | V |
| $V_{IL}$ | Input Low Voltage, All Inputs | | | | 0.8 | V |
| $V_{IH}$ | Input High Voltage, All Inputs | | 2 | | | V |
| $V_{CLAMP}$ | Input Clamp Voltage | $V_{CC}$ = Min, $I_{IN}$ = −12 mA | | −1.0 | −1.5 | V |

## Power Supply Current Drain

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $I_{CC}$ | Current from $V_{CC}$ Output in High State | $V_{CC}$ = 5.25V, $V_{DD}$ = 12.6V | | 26 | 34 | mA |
| $I_{DD}$ | Current from $V_{DD}$ Output in High State | $V_{CC}$ = 5.25V, $V_{DD}$ = 12.6V | | 23 | 30 | mA |
| $I_{CC}$ | Current from $V_{CC}$ Output in Low State | $V_{CC}$ = 5.25V, $V_{DD}$ = 12.6V | | 29 | 39 | mA |
| $I_{DD}$ | Current from $V_{DD}$ Output in Low State | $V_{CC}$ = 5.25V, $V_{DD}$ = 12.6V | | 13 | 19 | mA |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Unless otherwise specified min/max limits apply across the 0°C to +°C range. All typical values are for $T_A$ = 25°C and $V_{CC}$ = 5V and $V_{DD}$ = 12V.

**Note 3:** All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

## Switching Characteristics $T_A = 0°C$ to $+75°C$, $V_{CC} = 5V \pm 5\%$, $V_{DD} = 12V \pm 5\%$

| Symbol | Parameter | Conditions | Min(1) | Typ(2,4) | Max(3) | Units |
|---|---|---|---|---|---|---|
| $t_{-+}$ | Input to Output Delay | $R_{SERIES} = 0$ | 5 | 11 | | ns |
| $t_{DR}$ | Delay Plus Rise Time | $R_{SERIES} = 0$ | | 20 | 32 | ns |
| $t_{+-}$ | Input to Output Delay | $R_{SERIES} = 0$ | 3 | 7 | | ns |
| $t_{DF}$ | Delay Plus Fall Time | $R_{SERIES} = 0$ | | 18 | 32 | ns |
| $t_T$ | Output Transition Time | $R_{SERIES} = 20\Omega$ | 10 | 17 | 25 | ns |
| $t_{DR}$ | Delay Plus Rise Time | $R_{SERIES} = 20\Omega$ | | 27 | 38 | ns |
| $t_{DF}$ | Delay Plus Fall Time | $R_{SERIES} = 20\Omega$ | | 25 | 38 | ns |

## Capacitance $T_A = 25°C$(5)

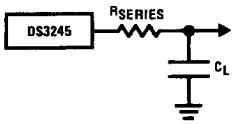
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance, $\overline{I_1}$, $\overline{I_2}$, $\overline{I_3}$, $\overline{I_4}$ | | | 5 | 8 | pF |
| $C_{IN}$ | Input Capacitance, $\overline{R}$, $\overline{C}$, $\overline{E1}$, $\overline{E2}$ | | | 8 | 12 | pF |

**Note 1:** $C_L = 150$ pF
**Note 2:** $C_L = 200$ pF
**Note 3:** $C_L = 250$ pF
} These values represent a range of total stray plus clock capacitance for nine 4k RAMs.

**Note 4:** Typical values are measured at 25°C.

**Note 5:** This parameter is periodically sampled and is not 100% tested. Condition of measurement is f = 1 MHz, $V_{BIAS} = 2V$, $V_{CC} = 0V$, and $T_A = 25°C$.

## AC Test Circuit and Switching Time Waveforms




Input pulse amplitudes: 3V
Input pulse rise and fall times:
5 ns between 1V and 2V
Measurements points: see waveforms

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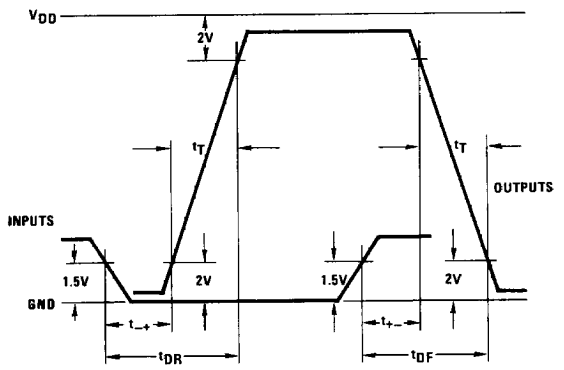


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