

100307

Low Power Quint Exclusive OR/NOR Gate

General Description

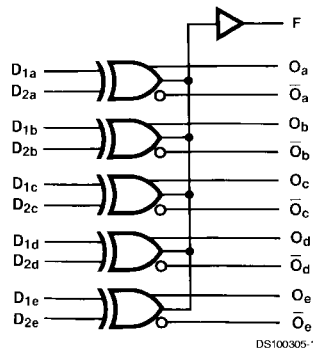
The 100307 is monolithic quint exclusive-OR/NOR gate. The Function output is the wire-OR of all five exclusive-OR outputs. All inputs have 50 kΩ pull-down resistors.

- 2000V ESD protection
- Pin/function compatible with 100107
- Voltage compensated operating range = -4.2V to -5.7V
- Available to industrial grade temperature range
- Available to Standard Microcircuit Drawing (SMD) 5962-9459001

Features

- Low Power Operation

Logic Symbol



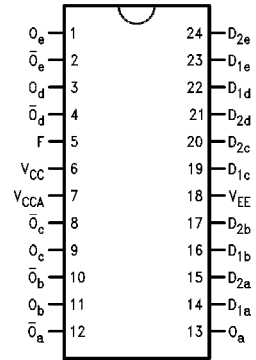
Logic Equation

$$F = (D_{1a} \oplus D_{2a}) + (D_{1b} \oplus D_{2b}) + (D_{1c} \oplus D_{2c}) + (D_{1d} \oplus D_{2d}) + (D_{1e} \oplus D_{2e})$$

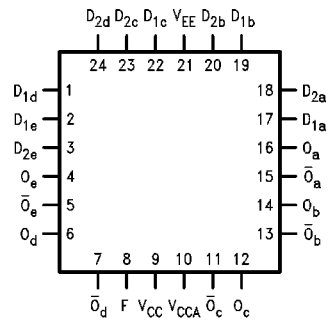
| Pin Names | Description |
|-----------------------|----------------------------|
| $D_{1a}-D_{2e}$ | Data Inputs |
| F | Function Output |
| O_a-O_e | Data Outputs |
| $\bar{O}_a-\bar{O}_e$ | Complementary Data Outputs |

Connection Diagrams

24-Pin DIP



24-Pin Quad Cerpak



Absolute Maximum Ratings (Note 1)

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

Above which the useful life may be impaired. (Note 1)

| | |
|--|-------------------|
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Maximum Junction Temperature (T_J) | |
| Ceramic | +175°C |
| Plastic | +150°C |
| V_{EE} Pin Potential to Ground Pin | -7.0V to +0.5V |
| Input Voltage (DC) | V_{EE} to +0.5V |
| Output Current (DC Output HIGH) | -50 mA |

ESD (Note 2)

≥2000V

Recommended Operating Conditions

| | |
|-----------------------------|-----------------|
| Case Temperature (T_C) | |
| Military | -55°C to +125°C |
| Supply Voltage (V_{EE}) | -5.7V to -4.2V |

Note 1: Absolute maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: ESD testing conforms to MIL-STD-883, Method 3015.

Military Version DC Electrical Characteristics

$V_{EE} = -4.2V$ to $-5.7V$, $V_{CC} = V_{CCA} = GND$, $T_C = -55°C$ to $+125°C$

| Symbol | Parameter | Min | Max | Units | T_C | Conditions | Notes | |
|-----------|---------------------------------------|-------|-------|-------|-----------------|--|---------------------------|---------|
| V_{OH} | Output HIGH Voltage | -1025 | -870 | mV | 0°C to +125°C | $V_{IN} = V_{IH} (Max)$ or $V_{IL} (Min)$ | Loading with 50Ω to -2.0V | 1, 2, 3 |
| | | -1085 | -870 | mV | -55°C | | | |
| V_{OL} | Output LOW Voltage | -1830 | -1620 | mV | 0°C to +125°C | $V_{IN} = V_{IH} (Min)$ or $V_{IL} (Max)$ | Loading with 50Ω to -2.0V | 1, 2, 3 |
| | | -1830 | -1555 | mV | -55°C | | | |
| V_{OHC} | Output HIGH Voltage | -1035 | | mV | 0°C to +125°C | $V_{IN} = V_{IH} (Min)$ or $V_{IL} (Max)$ | Loading with 50Ω to -2.0V | 1, 2, 3 |
| | | -1085 | | mV | -55°C | | | |
| V_{OLC} | Output LOW Voltage | | -1610 | mV | 0°C to +125°C | $V_{IN} = V_{IH} (Min)$ or $V_{IL} (Max)$ | Loading with 50Ω to -2.0V | 1, 2, 3 |
| | | | -1555 | mV | -55°C | | | |
| V_{IH} | Input HIGH Voltage | -1165 | -870 | mV | -55°C to +125°C | Guaranteed HIGH Signal for All Inputs | 1, 2, 3, 4 | |
| V_{IL} | Input LOW Voltage | -1830 | -1475 | mV | -55°C to +125°C | Guaranteed LOW Signal for All Inputs | 1, 2, 3, 4 | |
| I_{IL} | Input LOW Current | 0.50 | | μA | -55°C to +125°C | $V_{EE} = -4.2V$ $V_{IN} = V_{IL} (Min)$ | 1, 2, 3 | |
| I_{IH} | Input High Current $D_{2a}-D_{2e}$ | | 250 | μA | 0°C to +125°C | $V_{EE} = -5.7V$ $V_{IN} = V_{IH} (Max)$ | 1, 2, 3 | |
| | | | 350 | μA | -55°C | | | |
| | $D_{1a}-D_{1e}$ | | 350 | μA | -55°C | | | |
| | | | 500 | μA | -55°C | | | |
| I_{EE} | Power Supply Current | -75 | -25 | mA | -55°C to +125°C | Inputs Open | 1, 2, 3 | |

Note 3: F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals -55°C), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

Note 4: Screen tested 100% on each device at -55°C, +25°C, and +125°C, Subgroups 1, 2, 3, 7, and 8.

Note 5: Sample tested (Method 5005, Table I) on each manufactured lot at -55°C, +25°C, and +125°C, Subgroups A1, 2, 3, 7, and 8.

Note 6: Guaranteed by applying specified input condition and testing V_{OH}/V_{OL} .

AC Electrical Characteristics

$V_{EE} = -4.2V$ to $-5.7V$, $V_{CC} = V_{CCA} = GND$

| Symbol | Parameter | $T_C = -55^\circ C$ | | $T_C = +25^\circ C$ | | $T_C = +125^\circ C$ | | Units | Conditions | Notes |
|-----------|-----------------------------------|---------------------|------|---------------------|------|----------------------|------|-------|--------------|---------|
| | | Min | Max | Min | Max | Min | Max | | | |
| t_{PLH} | Propagation Delay | 0.30 | 2.10 | 0.40 | 1.90 | 0.40 | 2.40 | ns | Figures 1, 2 | 1, 2, 3 |
| t_{PHL} | $D_{2a}-D_{2e}$ to O_1, \bar{O} | | | | | | | | | |
| t_{PLH} | Propagation Delay | 0.30 | 1.90 | 0.40 | 1.80 | 0.40 | 2.20 | | | |
| t_{PHL} | $D_{1a}-D_{1e}$ to O, \bar{O} | | | | | | | | | |
| t_{PLH} | Propagation Delay | 0.80 | 2.90 | 0.90 | 2.80 | 0.90 | 3.40 | | | |
| t_{PHL} | Data to F | | | | | | | | | |
| t_{TLH} | Transition Time | 0.20 | 1.70 | 0.30 | 1.60 | 0.20 | 1.70 | ns | | 4 |
| t_{THL} | 20% to 80%, 80% to 20% | | | | | | | | | |

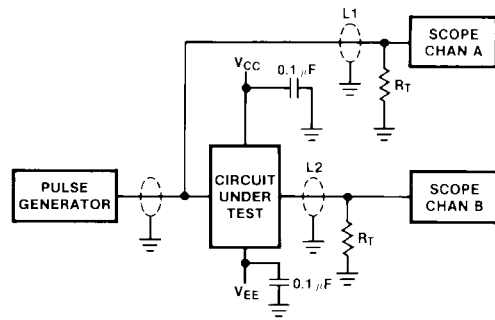
Note 7: F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals $-55^\circ C$), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

Note 8: Screen tested 100% on each device at $+25^\circ C$ temperature only, Subgroup A9.

Note 9: Sample tested (Method 5005, Table I) on each mfg. lot at $+25^\circ C$, Subgroup A9, and at $+125^\circ C$ and $-55^\circ C$ temperatures, Subgroups A10 and A11.

Note 10: Not tested at $+25^\circ C$, $+125^\circ C$, and $-55^\circ C$ temperature (design characterization data).

Test Circuitry



DS100305-5

Notes:

$V_{CC}, V_{CCA} = +2V$, $V_{EE} = -2.5V$

$L1$ and $L2 =$ equal length 50Ω impedance lines

$R_T = 50\Omega$ terminator internal to scope

Decoupling $0.1 \mu F$ from GND to V_{CC} and V_{EE}

All unused outputs are loaded with 50Ω to GND

$C_L =$ Fixture and stray capacitance $\leq 3 pF$

FIGURE 1. AC Test Circuit

Switching Waveforms

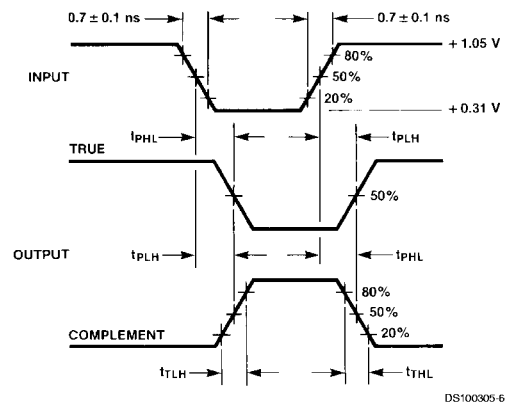


FIGURE 2. Propagation Delay and Transition Times

