

MC74VHC1G135

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------------------|--|--|-----------------------|
| V _{CC} | DC Supply Voltage | - 0.5 to + 7.0 | V |
| V _{IN} | DC Input Voltage | - 0.5 to +7.0 | V |
| V _{OUT} | DC Output Voltage | - 0.5 to +7.0 | V |
| I _{IK} | Input Diode Current | -20 | mA |
| I _{OK} | Output Diode Current | V _{OUT} < GND; V _{OUT} > V _{CC} | +20 mA |
| I _{OUT} | DC Output Current, per Pin | + 25 | mA |
| I _{CC} | DC Supply Current, V _{CC} and GND | +50 | mA |
| P _D | Power dissipation in still air | SC-88A, TSOP-5 | 200 mW |
| θ _{JA} | Thermal resistance | SC-88A, TSOP-5 | 333 °C/W |
| T _L | Lead Temperature, 1 mm from Case for 10 s | 260 | °C |
| T _J | Junction Temperature Under Bias | + 150 | °C |
| T _{stg} | Storage temperature | -65 to +150 | °C |
| V _{ESD} | ESD Withstand Voltage | Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) | >2000 > 200 N/A |
| I _{LATCH-UP} | Latch-Up Performance | Above V _{CC} and Below GND at 125°C (Note 5) | ± 500 mA |

1. Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.
2. Tested to EIA/JESD22-A114-A
3. Tested to EIA/JESD22-A115-A
4. Tested to JESD22-C101-A
5. Tested to EIA/JESD78

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|---------------------------------|-----------------------------|--|----------|------|
| V _{CC} | DC Supply Voltage | 2.0 | 5.5 | V |
| V _{IN} | DC Input Voltage | 0.0 | 5.5 | V |
| V _{OUT} | DC Output Voltage | 0.0 | 7.0 | V |
| T _A | Operating Temperature Range | - 55 | + 125 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 3.3 ± 0.3 V V _{CC} = 5.0 ± 0.5 V | 0 100 | ns/V |
| | | | 20 | |

DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80 | 1,032,200 | 117.8 |
| 90 | 419,300 | 47.9 |
| 100 | 178,700 | 20.4 |
| 110 | 79,600 | 9.4 |
| 120 | 37,000 | 4.2 |
| 130 | 17,800 | 2.0 |
| 140 | 8,900 | 1.0 |

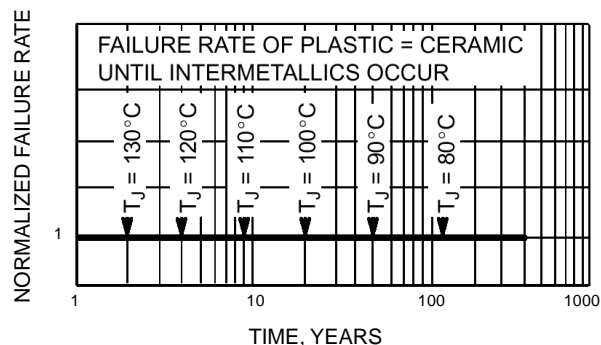


Figure 3. Failure Rate vs. Time Junction Temperature

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | V _{CC} (V) | T _A = 25°C | | | T _A ≤ 85°C | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---|--|------------------------|-----------------------|------|------|-----------------------|------|--------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| V _{T+} | Positive Threshold Voltage | | 3.0 | 1.50 | 1.88 | 2.25 | 1.50 | 2.25 | 1.50 | 2.25 | V |
| | | | 4.5 | 2.35 | 2.66 | 3.10 | 2.35 | 3.10 | 2.35 | 3.10 | |
| | | | 5.5 | 2.80 | 3.21 | 3.70 | 2.80 | 3.70 | 2.80 | 3.70 | |
| V _{T-} | Negative Threshold Voltage | | 3.0 | 0.65 | 1.03 | 1.40 | 0.65 | 1.40 | 0.65 | 1.40 | V |
| | | | 4.5 | 1.10 | 1.62 | 2.10 | 1.10 | 2.10 | 1.10 | 2.10 | |
| | | | 5.5 | 1.45 | 2.02 | 2.60 | 1.45 | 2.60 | 1.45 | 2.60 | |
| V _H | Hysteresis Voltage | | 3.0 | 0.30 | 0.85 | 1.60 | 0.30 | 1.60 | 0.30 | 1.60 | V |
| | | | 4.5 | 0.40 | 1.05 | 2.00 | 0.40 | 2.00 | 0.40 | 2.00 | |
| | | | 5.5 | 0.50 | 1.20 | 2.25 | 0.50 | 2.25 | 0.50 | 2.25 | |
| V _{OH} | Minimum High-Level Output Voltage I _{OH} = -50 μA | V _{IN} = V _{IH} or V _{IL} I _{OH} = -50 μA | 2.0 | 1.9 | 2.0 | | 1.9 | | 1.9 | | V |
| | | | 3.0 | 2.9 | 3.0 | | 2.9 | | 2.9 | | |
| | | 4.5 | 4.4 | 4.5 | | 4.4 | | 4.4 | | | |
| | | I _{OH} = -4 mA I _{OH} = -8 mA | 3.0 | 2.58 | | | 2.48 | | 2.34 | | V |
| 4.5 | 3.94 | | | 3.80 | | 3.66 | | | | | |
| V _{OL} | Maximum Low-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA | 2.0 | | 0.0 | 0.1 | | 0.1 | | 0.1 | V |
| | | | 3.0 | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | | 4.5 | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | I _{OL} = 4 mA I _{OL} = 8 mA | 3.0 | | | 0.36 | | 0.44 | | 0.52 | V |
| 4.5 | | | 0.36 | | 0.44 | | 0.52 | | | | |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = 5.5 V or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | | ±1.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 2.0 | | 20 | | 40 | μA |
| I _{OPD} | Maximum Off-state Leakage Current | V _{OUT} = 5.5 V | 0 | | | 0.25 | | 2.5 | | 5.0 | μA |

AC ELECTRICAL CHARACTERISTICS C_{load} = 50 pF, Input t_r / t_f = 3.0 ns

| Symbol | Parameter | Test Conditions | T _A = 25°C | | | T _A ≤ 85°C | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---|--|-----------------------|------|------|-----------------------|------|--------------------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PZL} | Maximum Output Enable Time, Input A or B to \bar{Y} | V _{CC} = 3.3 ± 0.3 V C _L = 15 pF R _L = R _I = 500 Ω C _L = 50 pF | | 7.6 | 11.9 | 1.0 | 14.0 | 1.0 | 16.1 | ns |
| | | | | 10.1 | 15.4 | 1.0 | 17.5 | 1.0 | 19.6 | |
| t _{PLZ} | Maximum Output Disable Time | V _{CC} = 5.0 ± 0.5 V C _L = 15 pF R _L = R _I = 500 Ω C _L = 50 pF | | 4.9 | 7.7 | 1.0 | 9.0 | 1.0 | 10.3 | ns |
| | | | | 6.4 | 9.7 | 1.0 | 11.0 | 1.0 | 12.3 | |
| t _{PLZ} | Maximum Output Disable Time | V _{CC} = 3.3 ± 0.3 V C _L = 50 pF R _L = R _I = 500 Ω | | 10.1 | 15.4 | | 17.5 | | 19.6 | ns |
| | | | | 6.4 | 9.7 | | 11.0 | | 12.3 | |
| C _{IN} | Maximum Input Capacitance | | | 5.0 | 10 | | 10 | | 10 | pF |

| | | | Typical @ 25°C, V _{CC} = 5.0 V | | | | |
|-----------------|--|--|---|--|--|--|----|
| C _{PD} | Power Dissipation Capacitance (Note 6) | | 16 | | | | pF |

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

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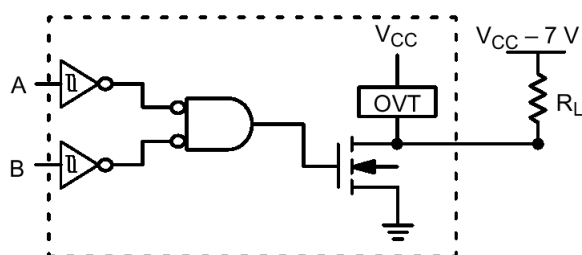


Figure 4. Output Voltage Mismatch Application

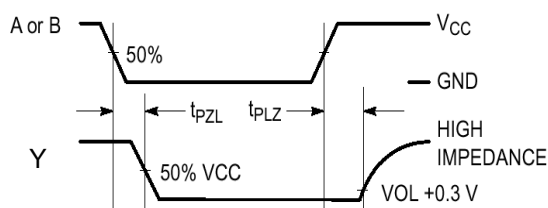
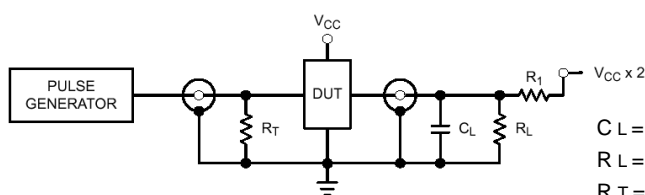


Figure 5. Switching Waveforms



C L = 50 pF equivalent (Includes jig and probe capacitance)
 R L = R 1 = 500 Ω or equivalent
 R T = Z OUT of pulse generator (typically 50 Ω)

Figure 6. Test Circuit

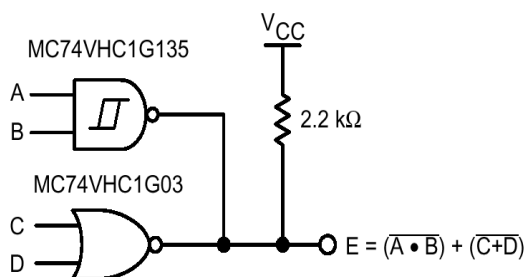


Figure 7. Complex Boolean Functions

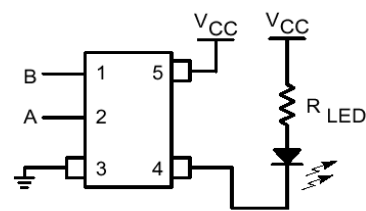


Figure 8. LED Driver

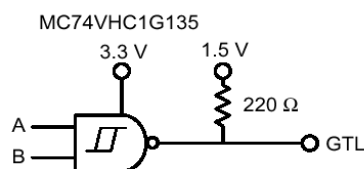


Figure 9. GTL Driver

DEVICE ORDERING INFORMATION

| Device Nomenclature | | | | | | | | |
|---------------------|-------------------------|-----------------------|------------|-----------------|----------------|----------------------|--------------------------------------|----------------------------|
| Device Order Number | Logic Circuit Indicator | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape and Reel Suffix | Package Type (Name/SOT#/Common Name) | Tape and Reel Size |
| MC74VHC1G135DFT1 | MC | 74 | VHC1G | 135 | DF | T1 | SC-70/SC-88A/SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G135DFT2 | MC | 74 | VHC1G | 135 | DF | T2 | SC-70/SC-88A/SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G135DFT4 | MC | 74 | VHC1G | 135 | DF | T4 | SC-70/SC-88A/SOT-353 | 330 mm (13 in) 10,000 Unit |
| MC74VHC1G135DTT1 | MC | 74 | VHC1G | 135 | DT | T1 | SOT-23/TSOPS/SC-59 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G135DTT3 | MC | 74 | VHC1G | 135 | DT | T3 | SOT-23/TSOPS/SC-59 | 330 mm (13 in) 10,000 Unit |