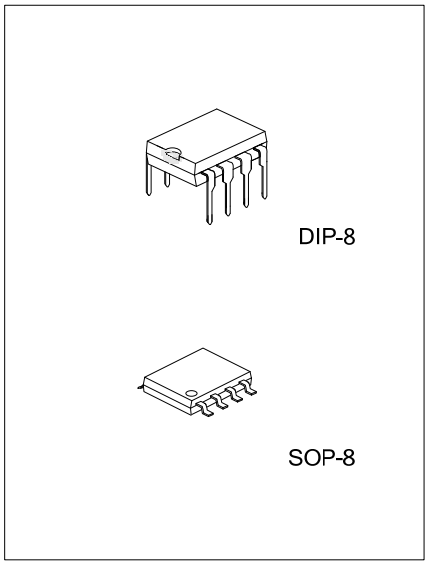
# ULN2001LC

**LINEAR INTEGRATED CIRCUIT**

## 3CH DARLINGTON SINK DRIVER




## ■ DESCRIPTION

The UTC **ULN2001LC** is high-voltage, high-current darlington transistor arrays. Each consists of three NPN darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single darlington pair is 100mA. All units feature integral clamp diodes for switching inductive loads.

Applications include relay, hammer, lamp and display (LED) drivers.

The UTC **ULN2001LC** has a 2.7kΩ series base resistor for each darlington pair for operation directly with TTL or 5V CMOS devices.

## ■ FEATURES

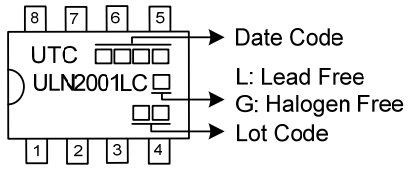
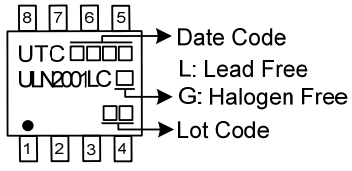
* Output Current (Single Output): 100mA max
* High Sustaining Voltage Output: 50V min
* Inputs Compatible with Various Types of Logic
* Output Clamp Diodes
* Relay-Driver Applications

## ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| ULN2001LCL-D08-T | ULN2001LCG-D08-T | DIP-8 | Tube |
| ULN2001LCL-S08-R | ULN2001LCG-S08-R | SOP-8 | Tape Reel |

| | |
|---|---|
| ULN2001LCG-D08-T<br>(1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) T: Tube, R: Tape Reel<br>(2) D08: DIP-8, S08: SOP-8<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

## ■ MARKING

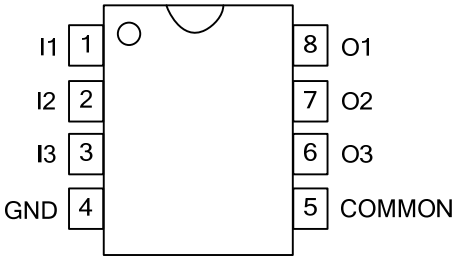
| DIP-8 | SOP-8 |
|---|---|
|  |  |






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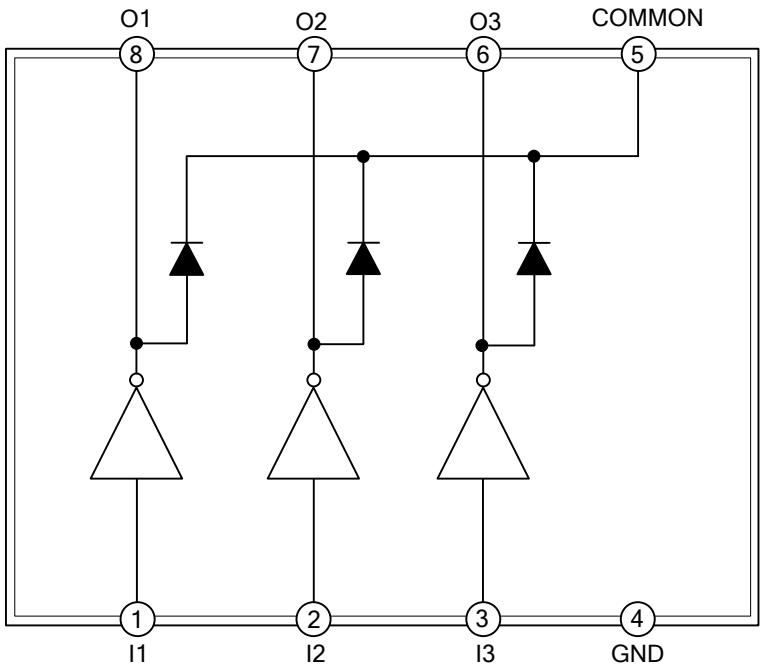
## ■ PIN CONFIGURATION




## ■ PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | I1 | 1 Channel Input Pin |
| 2 | I2 | 2 Channel Input Pin |
| 3 | I3 | 3 Channel Input Pin |
| 4 | GND | Ground |
| 5 | COMMON | Clamp Diode |
| 6 | O3 | 3 Channel Output Pin |
| 7 | O2 | 2 Channel Output Pin |
| 8 | O1 | 1 Channel Output Pin |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING ($T_A$=25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Collector-Emitter Voltage | | $V_{CE}$ | 50 | V |
| Clamp Diode Reverse Voltage | | $V_{COM}$ | 50 | V |
| Input Voltage | | $V_I$ | 30 | V |
| Peak Collector Current | | $I_{CP}$ | 100 | mA |
| Output Clamp Current | | $I_{OK}$ | 100 | mA |
| Power Dissipation | DIP-8 | $P_D$ | 0.750 | W |
| | SOP-8 | | 0.625 | W |
| Junction Temperature | | $T_J$ | +125 | °C |
| Storage Temperature | | $T_{STG}$ | -65 ~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ RECOMMENDED OPERATING CONDITIONS ($T_A$=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Output Sustaining Voltage | $V_{CE(SUS)}$ | | 0 | | 50 | V |
| Output Current | $I_{OUT}$ | $T_A$=+85°C | | | 100 | mA/ch |
| Input Voltage | $V_{IN}$ | | 0 | | 12 | V |
| Input Voltage (Output On) | $V_{IN\ (ON)}$ | $I_{OUT}$=100mA | 2.8 | | 12 | V |
| Input Voltage (Output Off) | $V_{IN\ (OFF)}$ | | 0 | | 0.7 | V |
| Clamp Diode Reverse Voltage | $V_R$ | | | | 50 | V |
| Clamp Diode Forward Current | $I_F$ | | | | 70 | mA |

## ■ THERMAL DATA

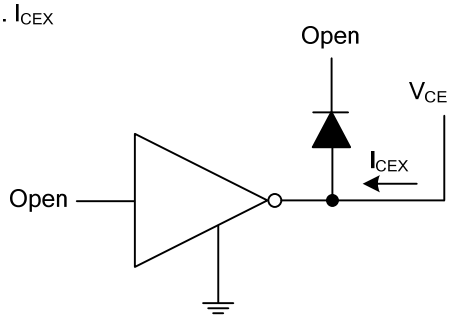
| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | DIP-8 | $\theta_{JA}$ | 133 | °C/W |
| | SOP-8 | | 160 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS ($T_A$=25°C, unless otherwise specified)

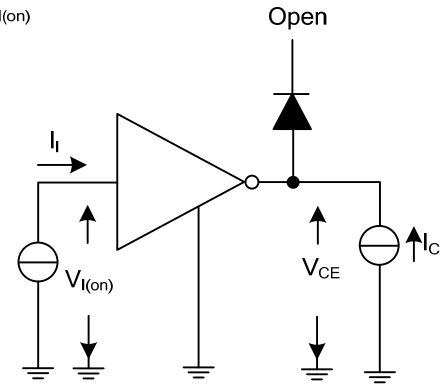
| PARAMETER | SYMBOL | TEST CIRCUIT | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Input Voltage (Output On) | $V_{I(ON)}$ | 2 | $V_{CE}$=1.5V | $I_C$=20mA | | 1.9 | 2.3 | V |
| | | | | $I_C$=50mA | | 2.0 | 2.4 | V |
| | | | | $I_C$=80mA | | 2.0 | 2.4 | V |
| | | | | $I_C$=100mA | | 2.1 | 2.5 | V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | 3 | $V_I$=2.4V ($I_I$>250μA) | $I_C$=20mA | | 0.83 | | V |
| | | | | $I_C$=50mA | | 0.92 | | V |
| | | | | $I_C$=80mA | | 0.99 | | V |
| | | | | $I_C$=100mA | | 1.10 | | V |
| Input Current | $I_I$ | 2 | $I_C$=60mA | $V_I$=12V | | 6.3 | | mA |
| | | | | $V_I$=6V | | 2.8 | | mA |
| | | | | $V_I$=4.5V | | 1.97 | | mA |
| | | | | $V_I$=2.4V | | 0.83 | | mA |
| Clamp Diode Forward Voltage | $V_F$ | 5 | $I_F$=70mA | | | 1.1 | 1.4 | V |
| Output Leakage Current | $I_{CEX}$ | 1 | $V_{CE}$=50V, $I_I$=0 | | | | 50 | μA |
| Collector-Emitter Voltage | $V_{CE}$ | 1 | $V_{CE}$=50V, $I_I$=0 | | 50 | | | V |
| Clamp Diode Reverse Voltage | $V_R$ | 4 | $V_R$=50V | | 50 | | | V |
| Clamp Diode Reverse Current | $I_R$ | 4 | $V_R$=50V | | | | 50 | μA |
| Propagation Delay Time, Low- to High | $t_{PLH}$ | 6 | $V_L$=12V, $R_L$=120Ω | | | 0.15 | 1 | μs |
| Propagation Delay Time, High - to Low | $t_{PHL}$ | 6 | $V_L$=12V, $R_L$=120Ω | | | 0.15 | 1 | μs |

## ■ TEST CIRCUIT

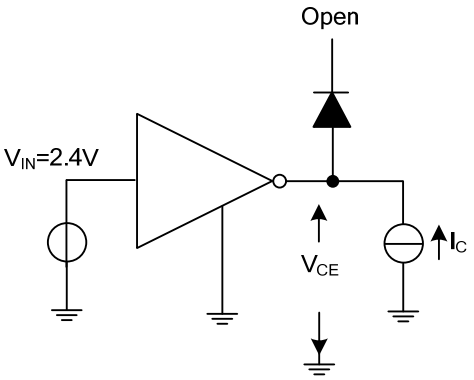
1. $I_{CEX}$



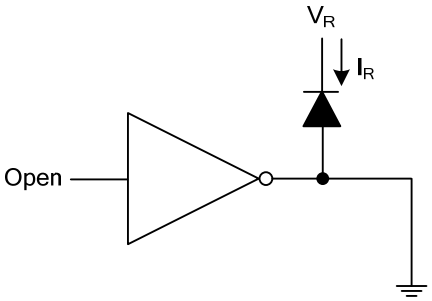

2. $I_I$ & $V_{I(on)}$



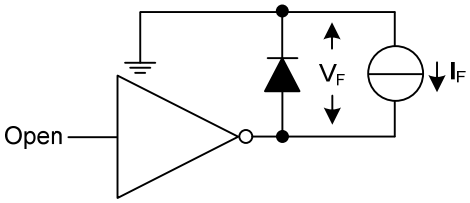

3. $V_{CE(sat)}$




4. $I_R$

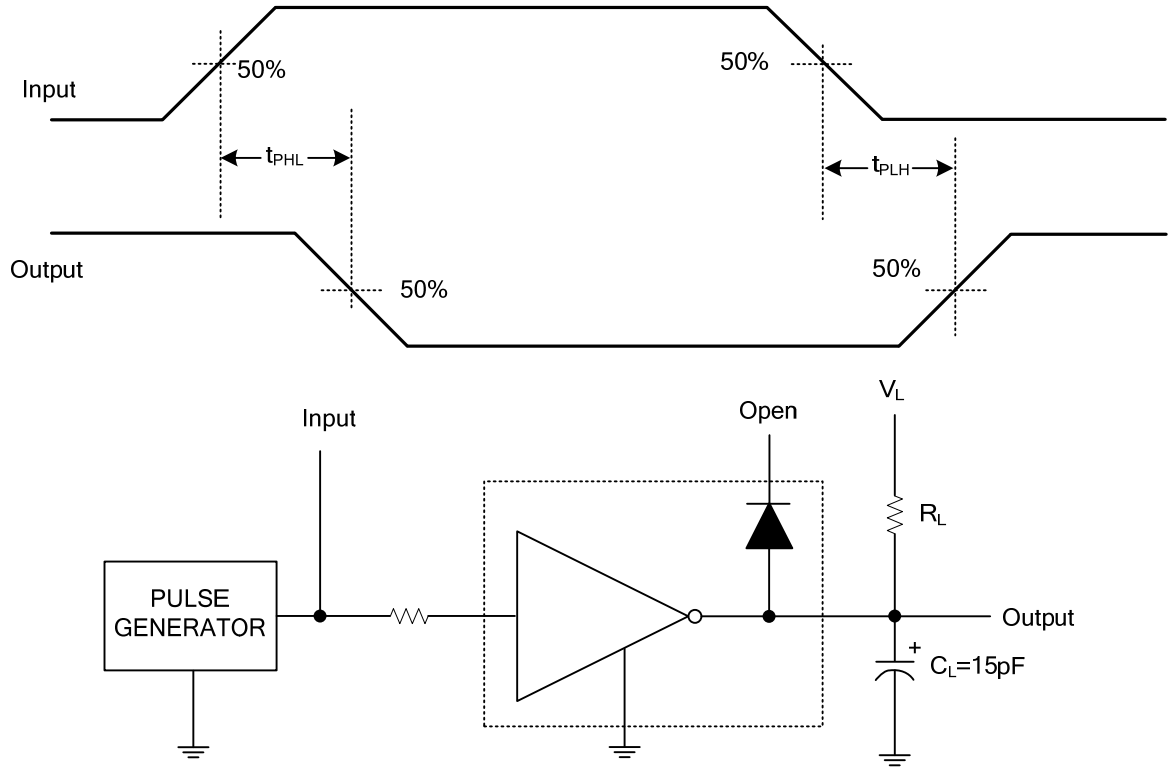



5. $V_F$

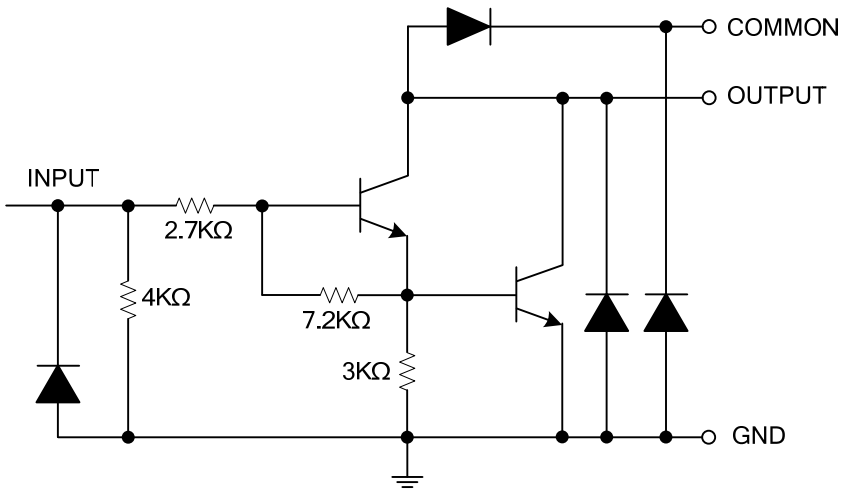


## ■ TEST CIRCUIT (Cont.)

6. Propagation Delay-Time Waveforms




## ■ TYPICAL APPLICATION CIRCUIT




UTC ULN2001 Drive Circuit

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