



ULN2001

Preliminary

LINEAR INTEGRATED CIRCUIT

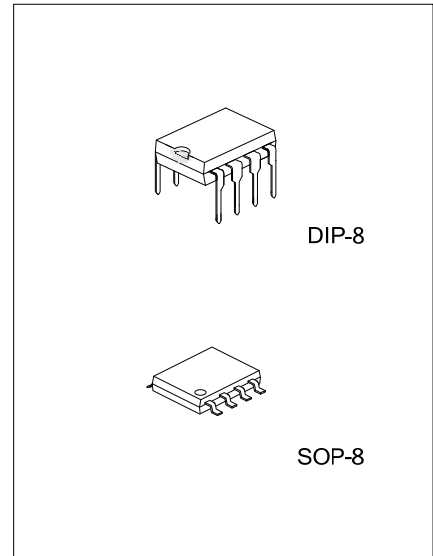
3CH DARLINGTON SINK DRIVER

DESCRIPTION

The UTC **ULN2001** 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 500mA. All units feature integral clamp diodes for switching inductive loads.

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

The UTC **ULN2001** 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): 500mA max
- * High Sustaining Voltage Output: 50V min
- * Inputs Compatible with Various Types of Logic
- * Output Clamp Diodes
- * Relay-Driver Applications

ORDERING INFORMATION

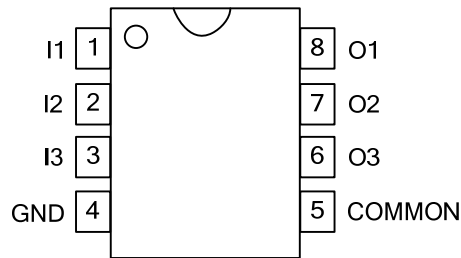
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULN2001L-D08-T	ULN2001G-D08-T	DIP-8	Tube
ULN2001L-S08-R	ULN2001G-S08-R	SOP-8	Tape Reel

<p>ULN2001G-D08-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) D08: DIP-8, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

DIP-8	SOP-8
<p>Date Code</p> <p>L: Lead Free</p> <p>G: Halogen Free</p> <p>Lot Code</p>	<p>Date Code</p> <p>L: Lead Free</p> <p>G: Halogen Free</p> <p>Lot Code</p>

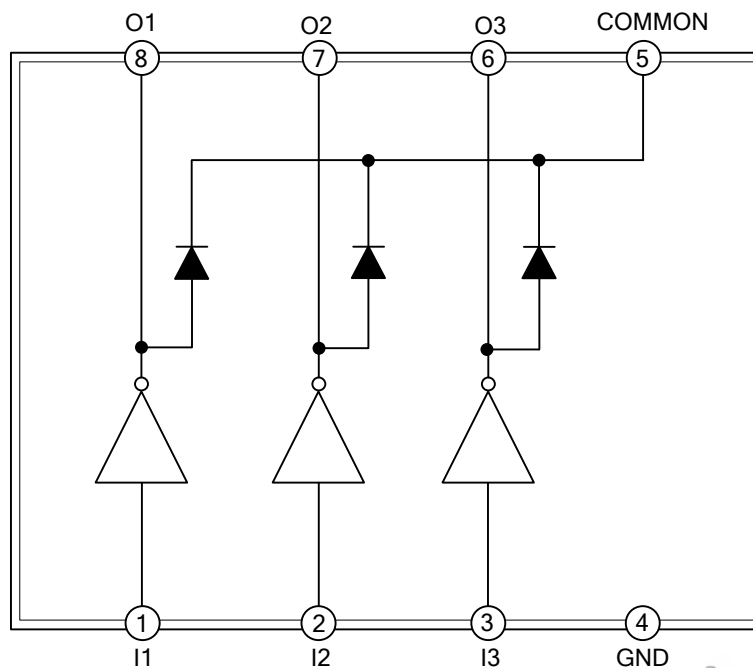
■ PIN CONFIGURATION



■ 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 ($T_A=25^{\circ}\text{C}$, 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
Input Voltage	V_{COMMON}	50	V
Peak Collector Current	I_{CP}	500	mA/ch
Output Clamp Current	I_F	500	mA
Power Dissipation	DIP-8	P_D	0.750
	SOP-8		0.625
Junction Temperature	T_J	+125	$^{\circ}\text{C}$
Operating Temperature	TOPR	-40 ~ +85	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	-65 ~ +150	$^{\circ}\text{C}$

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 ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Sustaining Voltage	$V_{CE(SUS)}$		0		50	V
Output Current	I_{OUT}	$T_A=+85^{\circ}\text{C}$			350	mA/ch
Input Voltage	V_{IN}		0		12	V
Input Voltage (Output On)	$V_{IN(ON)}$	$I_{OUT}=350\text{mA}$	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				350	mA

■ THERMAL DATA

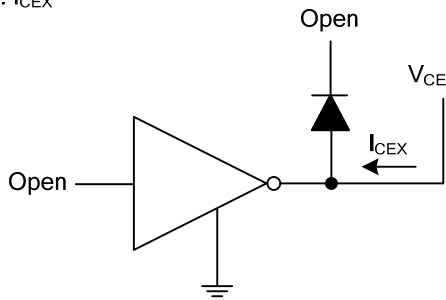
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	DIP-8	θ_{JA}	133
	SOP-8		160

■ ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

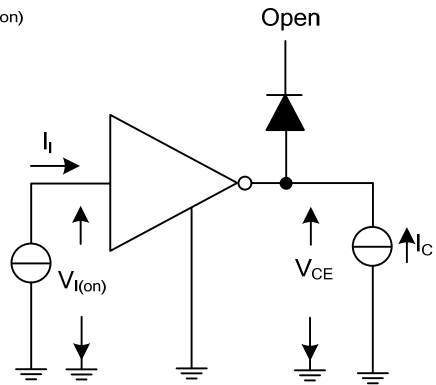
PARAMETER	SYMBOL	TEST CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage (Output On)	$I_{I(ON)}$	2	$V_{CE}=1.5\text{V}$	$I_C=100\text{mA}$	2.1	2.5	V
				$I_C=200\text{mA}$	2.2	2.6	V
				$I_C=350\text{mA}$	2.3	2.7	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	$V_I=2.4\text{V}$ ($I_I>250\mu\text{A}$)	$I_C=100\text{mA}$	1.1		V
				$I_C=200\text{mA}$	1.2		V
				$I_C=350\text{mA}$	1.3		V
Input Current	I_I	2	$I_O=350\text{mA}$	$V_I=12\text{V}$	6.5		mA
				$V_I=6\text{V}$	3.0		mA
				$V_I=4.5\text{V}$	2.1		mA
				$V_I=2.4\text{V}$	0.9		mA
Clamp Diode Forward Voltage	V_F	5	$I_F=350\text{mA}$			2.0	V
Output Leakage Current	I_{CEX}	1	$V_{CE}=50\text{V}, I_I=0$			50	μA
Clamp Diode Reverse Current	I_R	4	$V_R=50\text{V}$			50	μA
Propagation Delay Time, Low- to High	t_{PLH}	6	$V_L=12\text{V}, R_L=120\Omega$		0.15	1	μs
Propagation Delay Time, High - to Low	t_{PHL}	6	$V_L=12\text{V}, R_L=120\Omega$		0.15	1	μs

■ TEST CIRCUIT

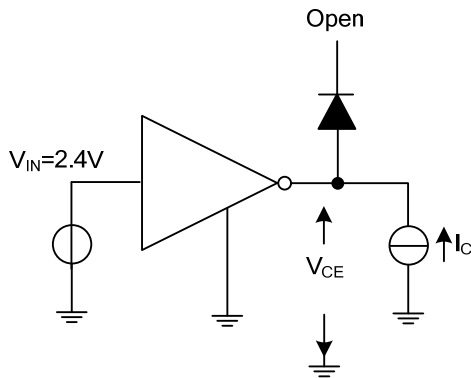
1. I_{CEX}



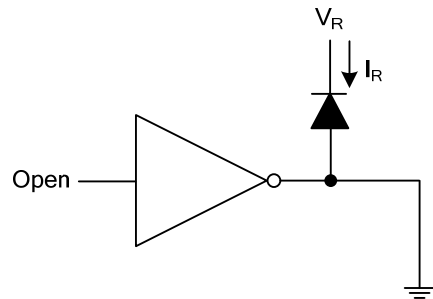
2. I_i & $V_{I(on)}$



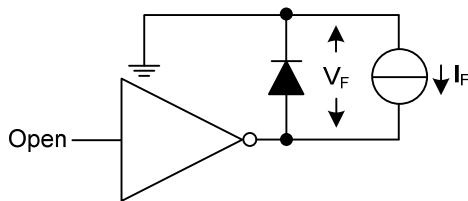
3. $V_{CE(sat)}$



4. I_R



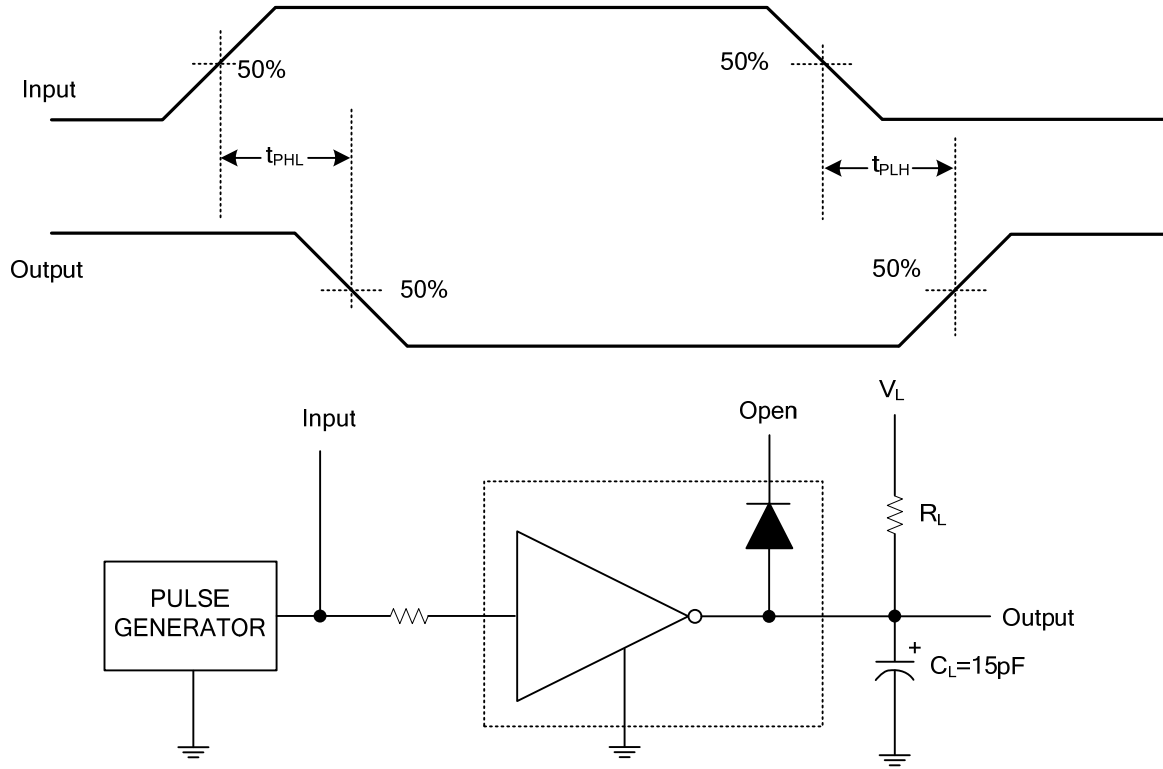
5. V_F



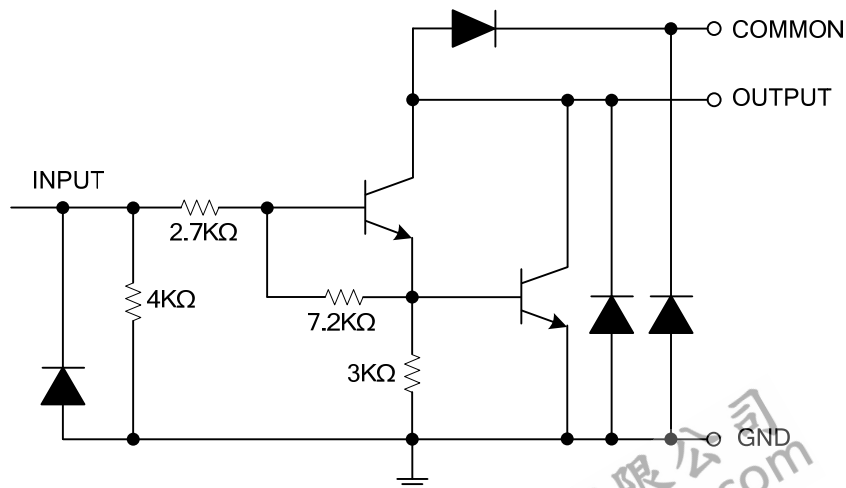
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■ TEST CIRCUIT (Cont.)

6. Propagation Delay-Time Waveforms



■ TYPICAL APPLICATION CIRCUIT



UTC ULN2001 Drive Circuit

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.