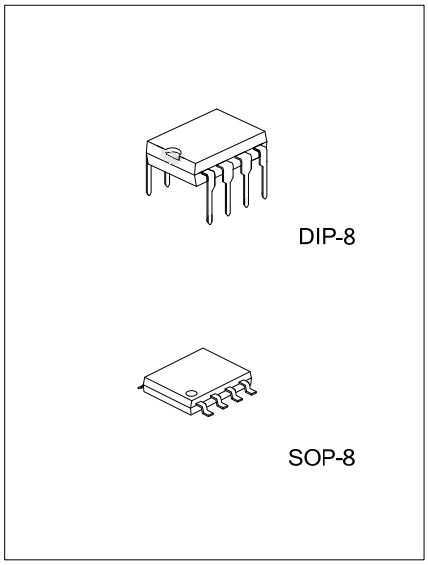
ULN2001LC

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

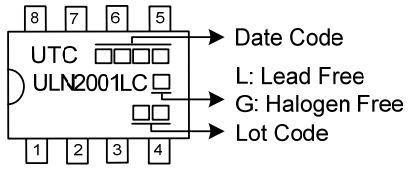
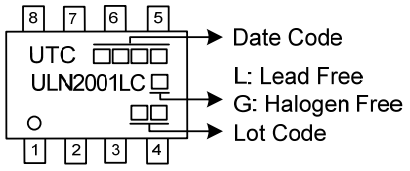
ULN2001LCG-D08-T

(1)Packing Type — (1) T: Tube, R: Tape Reel

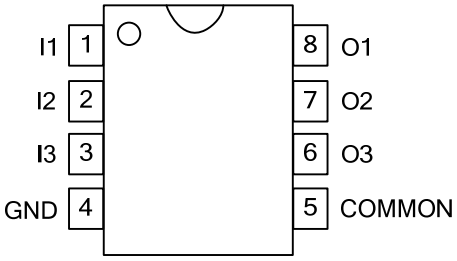
(2)Package Type — (2) D08: DIP-8, S08: SOP-8

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

DIP-8	SOP-8
	

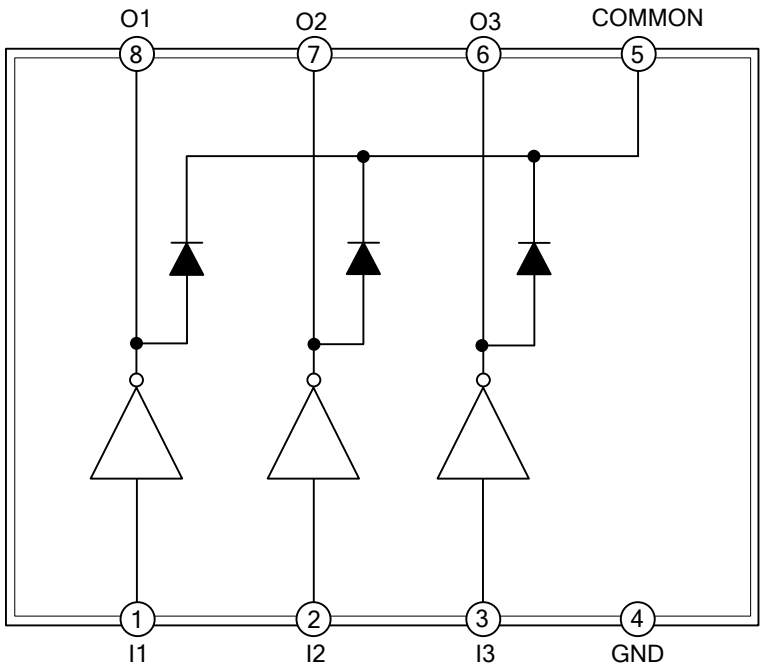
■ PIN CONFIGURATION



■ 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
Operating Temperature		T_{OPR}	-40 ~ +85	°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

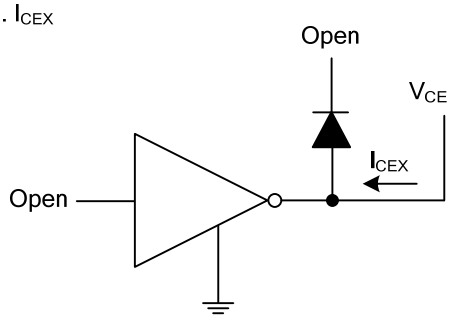
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	DIP-8	θ_{JA}	133	°C/W
	SOP-8		160	°C/W

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

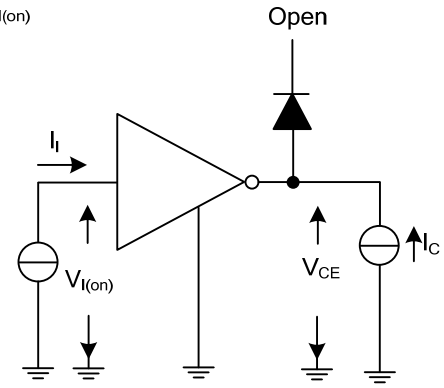
PARAMETER	SYMBOL	TEST CIRCUIT	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage (Output On)	$V_{I(ON)}$	2	V_{CE}=1.5V	I_C=20mA		1.9	2.3	V
				I_C=50mA		2.0	2.4	V
				I_C=80mA		2.0	2.4	V
				I_C=100mA		2.1	2.5	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	V_I=2.4V (I_I>250μA)	I_C=20mA		0.83		V
				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

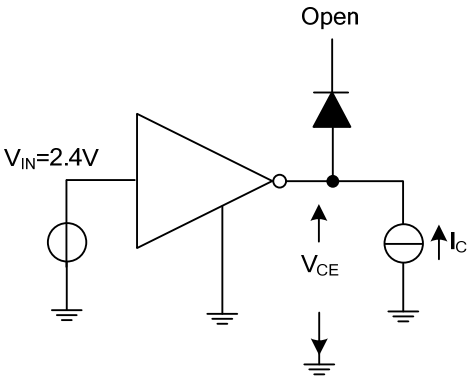
1. I_{CEX}



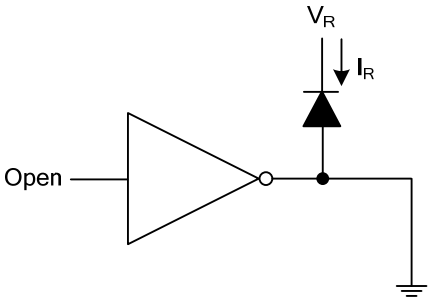
2. I_I & $V_{I(on)}$



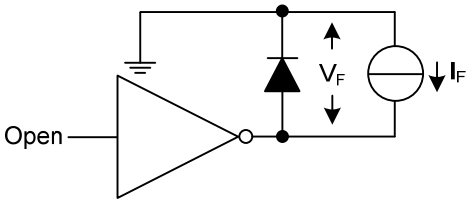
3. $V_{CE(sat)}$



4. I_R

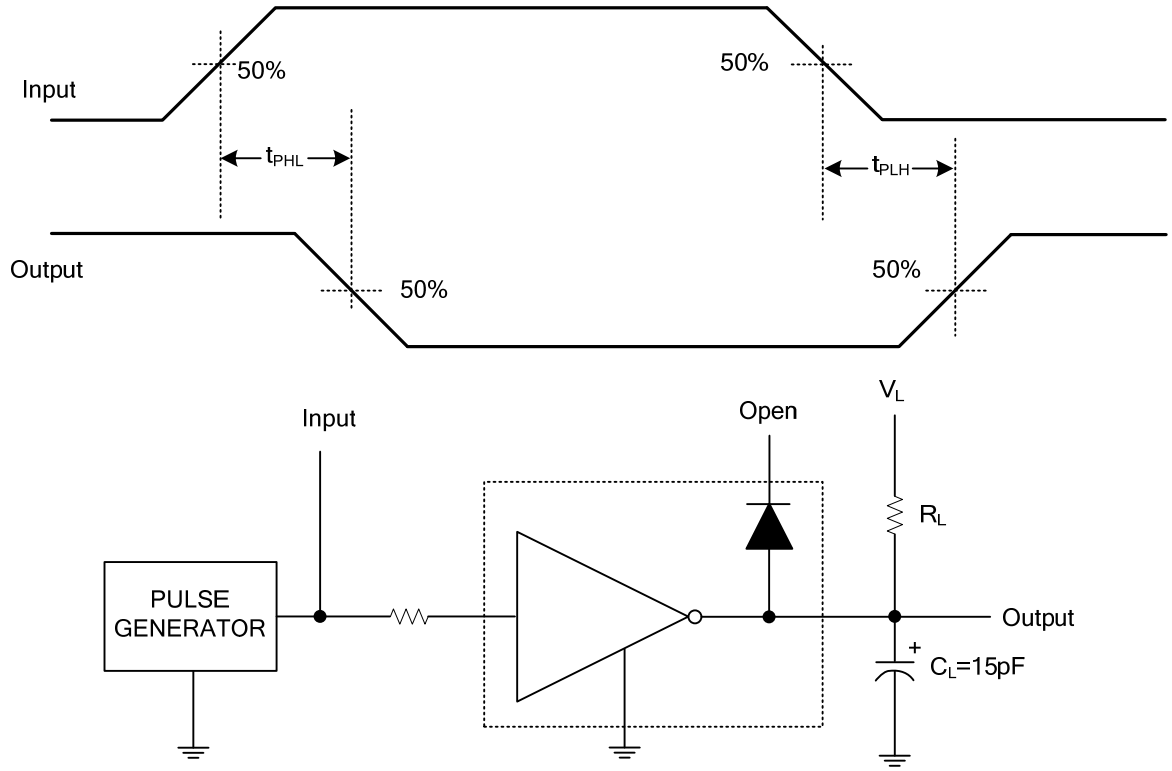


5. V_F

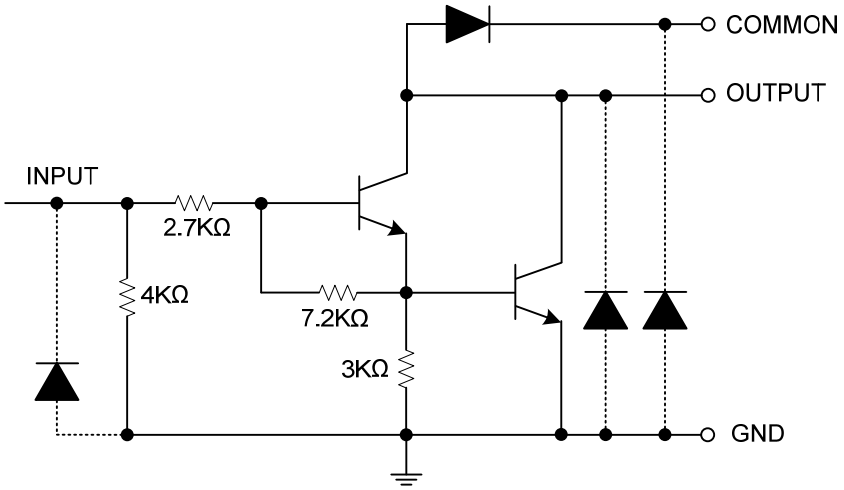


■ TEST CIRCUIT (Cont.)

6. Propagation Delay-Time Waveforms



■ TYPICAL APPLICATION CIRCUIT

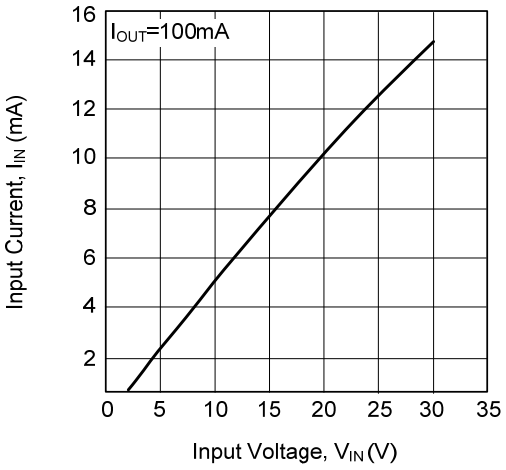


UTC ULN2001 Drive Circuit

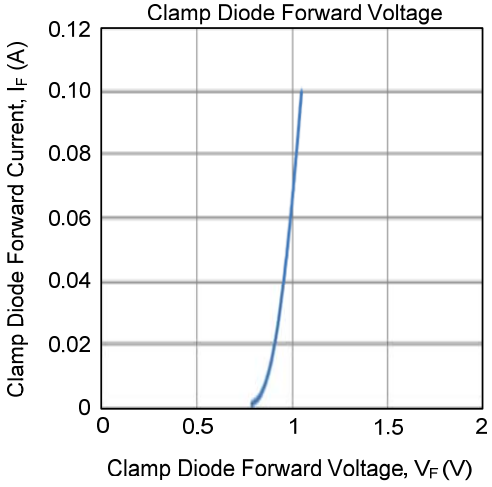
Note: The input and output parasitic diodes cannot be used as clamp diodes.

■ TYPICAL CHARACTERISTICS

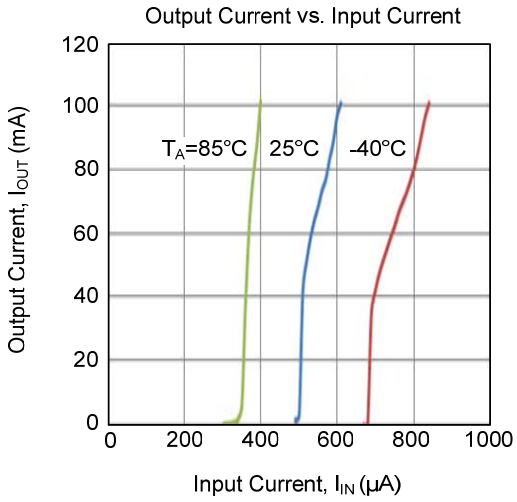
Input Current vs. Input Voltage



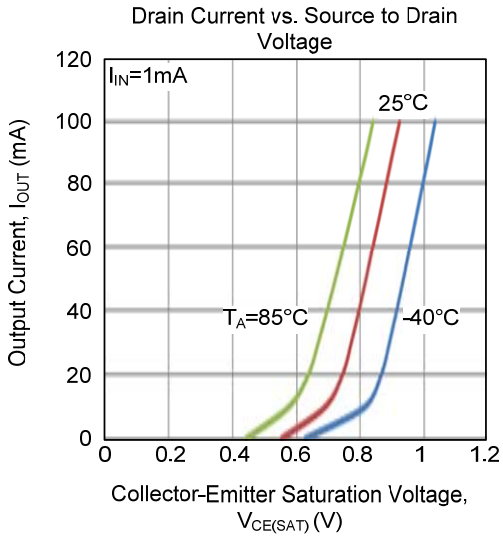
Clamp Diode Forward Current vs. Clamp Diode Forward Voltage



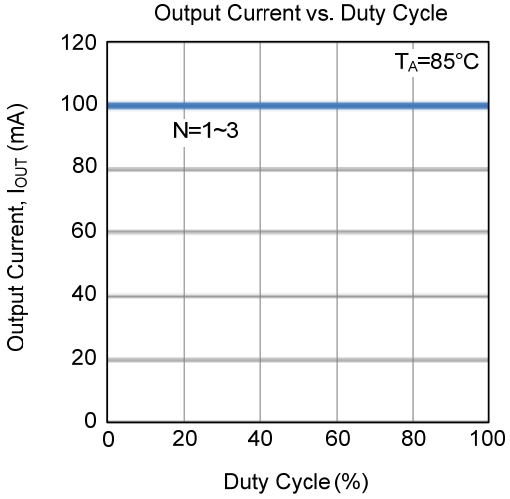
Output Current vs. Input Current



Drain Current vs. Source to Drain Voltage



Output Current vs. Duty Cycle



Power Dissipation vs. T_A