

UNISONIC TECHNOLOGIES CO., LTD

ULN2004

LINEAR INTEGRATED CIRCUIT

7CH DARLINGTON SINK **DRIVER**

DESCRIPTION

The UTC ULN2004 are high-voltage, high-current darlington drivers comprised of seven NPN darlingto pairs.

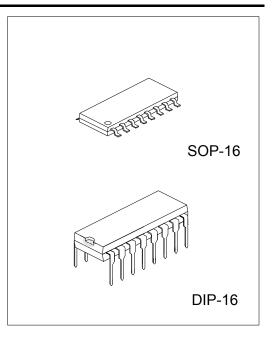
All units feature integral clamp diodes for switching inductive

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

FEATURES

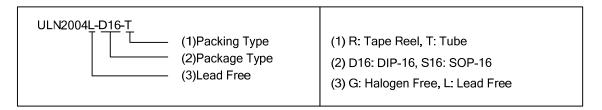
*Output current (single output): 500mA (MAX.) *High sustaining voltage output: 50V (MIN.)

*Output clamp diodes



ORDERING INFORMATION

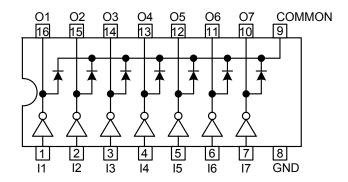
Ordering	Number	Dookaga	Dooking	
Lead Free	Halogen Free	Package	Packing	
ULN2004L-D16-T	ULN2004G-D16-T	DIP-16	Tube	
ULN2004L-S16-R	ULN2004G-S16-R	SOP-16	Tape Reel	
ULN2004L-S16-T	ULN2004G-S16-T	SOP-16	Tube	



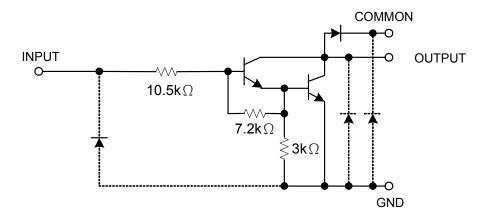
www.unisonic.com.tw 1 of 8 QW-R113-008.B

^{*}Inputs compatible with various types of logic

PIN CONNECTION



■ BLOCK DIAGRAM



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

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER		SYMBOL	RATING	UNIT
Output Sustaining Voltage		V _{OUT}	-0.5~50	V
Output Current		Гоит	500	mA / ch
Input Voltage		V_{IN}	-0.5~30	V
Clamp Diode Reverse Voltage		V_R	50	V
Clamp Diode Forward Current		I _F	500	mA
Dower Dissination	DIP-16	D	1.47	W
Power Dissipation	SOP-16	P _D	0.625	W
Junction Temperature		TJ	+125	$^{\circ}\!\mathbb{C}$
Operating Temperature	•	T _{OPR}	-40~+85	$^{\circ}\mathbb{C}$
Storage Temperature	•	T_{STG}	-40~+150	$^{\circ}\!\mathbb{C}$

Note 1. 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.

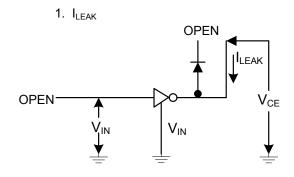
■ RECOMMENDED OPERATING CONDITIONS (Ta=-40~+85°C)

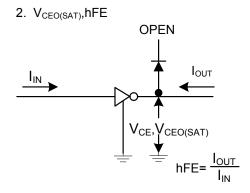
CHARACTERIST	TC .	SYMBOL	TEST CONDITIONS		TEST CONDITIONS MIN TY		TYP	MAX	UNIT
Output Sustaining Voltage	1	V _{OUT}			0		50	V	
Output Current	DIP-16	- I _{OUT}	$T_{pw} = 25ms$	Duty = 10%	0		370		
			7 Circuits	Duty = 50%	0		130	m ∆ /ob	
	SOP-16		Ta = 85℃	Duty = 10%	0		233	mA/ch	
			TJ = 120℃	Duty = 50%	0		70		
Input Voltage		V _{IN}			0		24	V	
Input Voltage (Output On)		V _{IN (ON)}	$I_{OUT} = 400 \text{mA}, h_{FE} = 800$		6.2		24	V	
Input Voltage (Output Off)		V _{IN (OFF)}			0		1.0	V	
Clamp Diode Reverse Voltage		V_R					50	V	
Clamp Diode Forward Current		I _F					350	mA	
Danier Diagination	DIP-16	В	Ta = 85°C			0.76	W		
Power Dissipation	SOP-16	P_D	Ta = 85°C			0.325	VV		

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

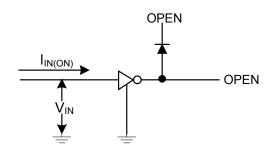
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Leakage Current	I _{LEAK}	1	V _{CE} = 50 V, Ta = 25°ℂ				50	uА
Output Leakage Outrent	ILEAK		V _{CE} = 50 V, Ta = 85°ℂ				100	μΛ
			I _{OUT} = 350 mA	, I _{IN} = 500 μA		1.3	1.6	
Collector-Emitter Saturation Voltage	$V_{\text{CEO(SAT)}}$	2	I _{OUT} = 200 mA	I_{OUT} = 200 mA, I_{IN} = 350 μ A		1.1	1.3	V
			$I_{OUT} = 100 \text{ mA}$, I _{IN} = 250 μA		0.9	1.1	
DC Current Transfer Ratio	h _{FE}	2	V _{CE} = 2 V, I _{OUT} = 350 mA		1000			
Input Current (Output On)	I _{IN (ON)}	3	V _{IN} = 9.5 V, I _{OUT} = 350 mA			8.0	1.2	mA
Input Current (Output Off)	I _{IN (OFF)}	4	I _{OUT} = 500 μA, Ta = 85°C		50	65		μΑ
Institute of Contract Co.	V _{IN(ON)}	5	V _{CE} = 2 V	I_{OUT} = 350 mA			4.7	\ \
Input Voltage (Output On)			$h_{FE} = 800$	I_{OUT} = 200 mA			4.4	V
Clamp Diada Bayaraa Current	I _R	6	V _R = 50 V, Ta	= 25°C			50	
Clamp Diode Reverse Current			V _R = 50 V, Ta	= 85°C			100	μA
Clamp Diode Forward Voltage	V_{F}	7	I _F = 350 mA				2.0	٧
Input Capacitance	C _{IN}					15		pF
Turn-On Delay	t _{ON}	8	V_{OUT} = 50 V, R_L = 125 Ω C_L = 15 pF			0.1		
Turn-Off Delay	t _{OFF}	8	$V_{OUT} = 50 \text{ V}, R_L = 125 \Omega$ $C_L = 15 \text{ pF}$			0.2		μs

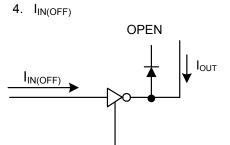
■ TEST CIRCUIT



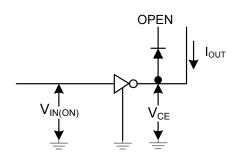




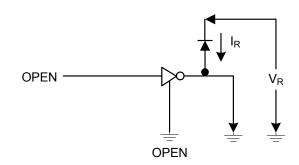




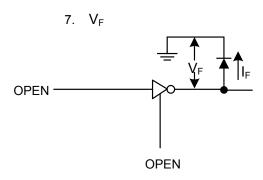
5. V_{IN(ON)}



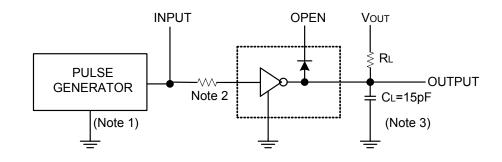


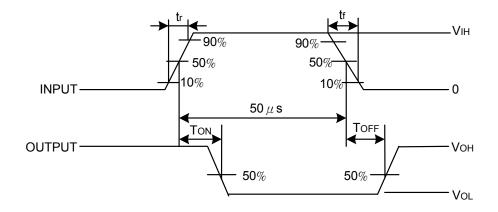


■ TEST CIRCUIT(cont.)



8. ton, toff





Note1: Pulse width 50 $\mu\,\mathrm{s}$,duty cycle 10%

Output impedance 50Ω , $tr \le 5ns$, $tf \le 10ns$

Note2: See below

INPUT CONDITION

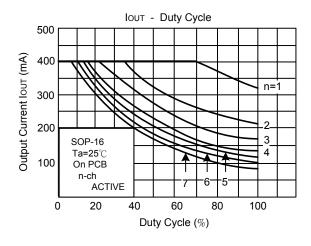
TYPE NUMBER	R1	V _{IH}
ULN2004	0	8V

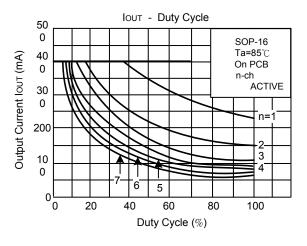
Note3: C∟ includes probe and jig capacitance

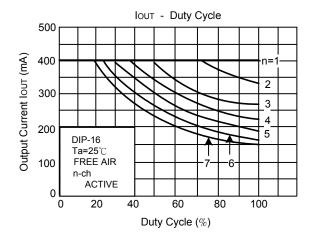
PRECAUTIONS FOR USING

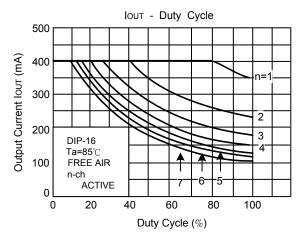
This IC does not include built-in protection circuits for excess current or overvoltage. If this IC is subjected to excess current or overvoltage, it may be destroyed. Hence, the utmost care must be taken when systems which incorporate this IC are designed. Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

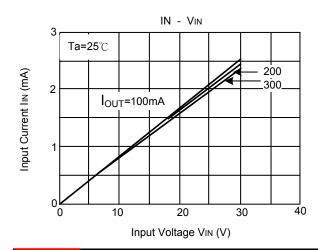
TYPICAL CHARACTERISTICS

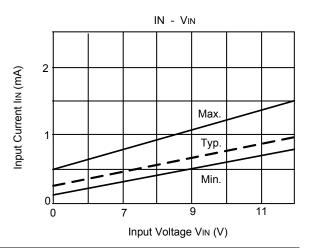




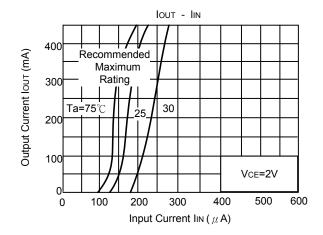


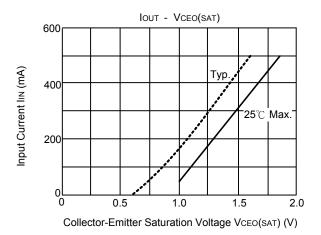


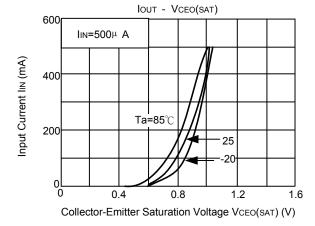


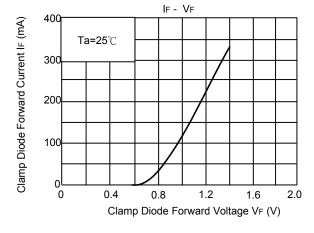


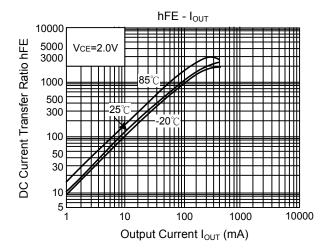
■ TYPICAL CHARACTERISTICS(cont.)



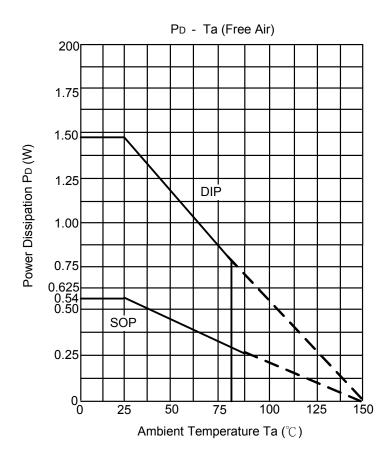








■ TYPICAL CHARACTERISTICS(cont.)



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. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.