

UTC ULN2004 LINEAR INTEGRATED CIRCUIT

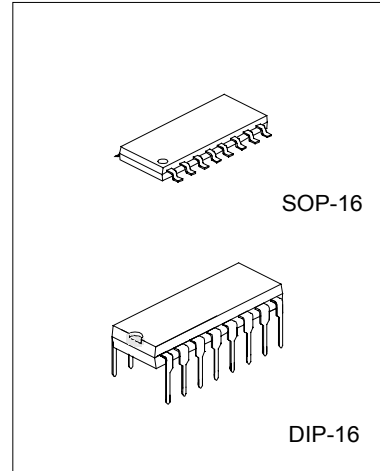
7CH DARLINGTON SINK DRIVER

DESCRIPTION

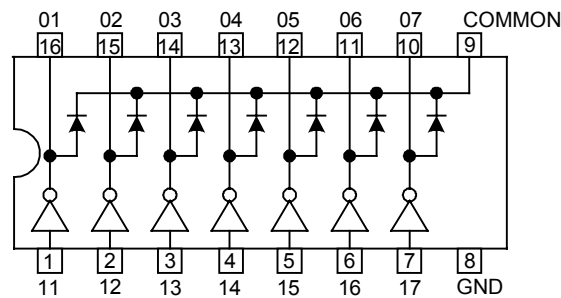
The UTC ULN2004 is high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs. All units feature integral clamp diodes for switching inductive loads. Applications include relay, hammer, lamp and display (LED) drivers.

FEATURES

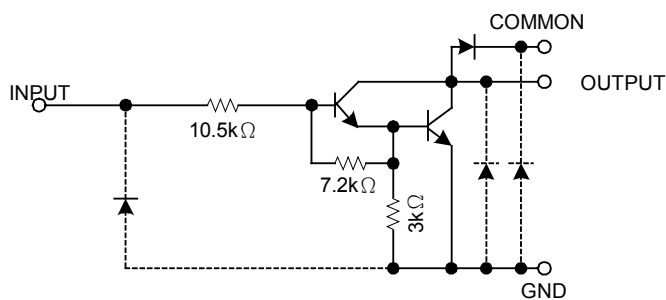
- *Output current (single output): 500 mA (MAX.)
- *High sustaining voltage output: 50 V (MIN.)
- *Output clamp diodes
- *Inputs compatible with various types of logic



PIN CONNECTION



SCHEMATICS (EACH DRIVER)



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

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ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Output Sustaining Voltage	V _{CE (SUS)}	-0.5~50	V
Output Current	I _{OUT}	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
Power Dissipation	P _D	1.47	W
		0.625	W
Operating Temperature	T _{opr}	-40~85	°C
Storage Temperature	T _{stg}	-55~150	°C

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Sustaining Voltage	V _{CE (SUS)}		0		50	V
Output Current	I _{OUT}	T _{pw} = 25 ms 7 Circuits T _a = 85°C T _j = 120°C	Duty = 10%	0	370	mA/ch
			Duty = 50%	0	130	
			Duty = 10%	0	233	
			Duty = 50%	0	70	
Input Voltage	V _{IN}		0		24	V
Input Voltage (Output On)	V _{IN (ON)}	I _{OUT} = 400 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
Power Dissipation	DIP-16	P _D	T _a = 85°C		0.76	W
	SOP-16				0.325	

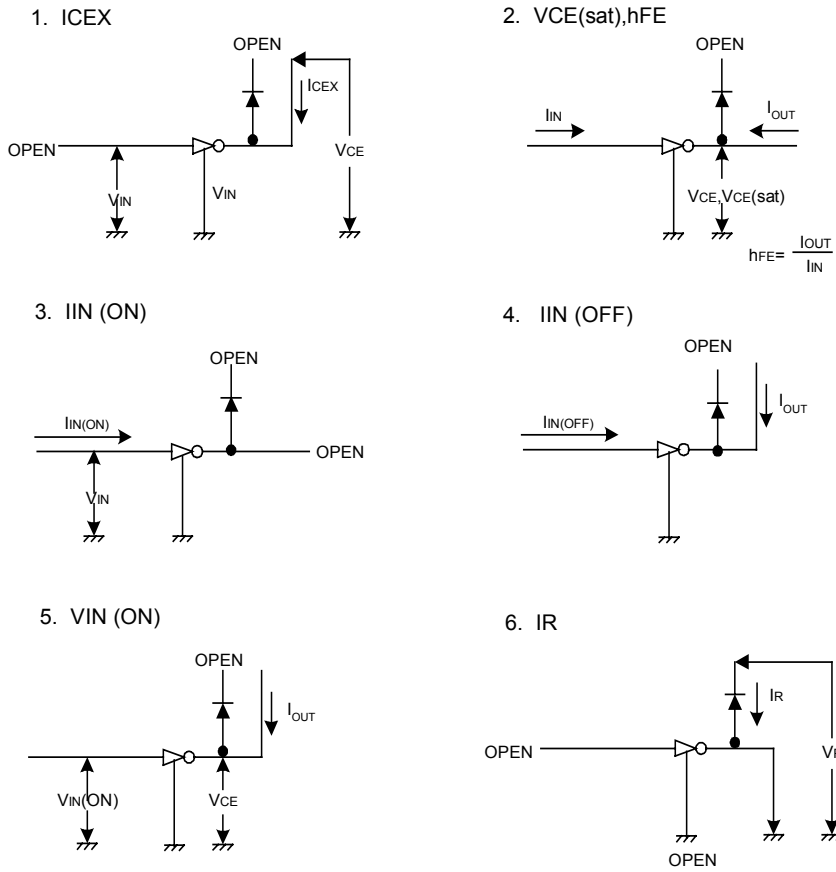
ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise noted)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Leakage Current	I _{CEX}	1	V _{CE} = 50 V, T _a = 25°C			50	μA
			V _{CE} = 50 V, T _a = 85°C			100	
CollectorEmitter Saturation Voltage	V _{CE (sat)}	2	I _{OUT} = 350 mA, I _{IN} = 500 μA		1.3	1.6	V
			I _{OUT} = 200 mA, I _{IN} = 350 μA		1.1	1.3	
			I _{OUT} = 100 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		0.8	1.2	mA
Input Current (Output Off)	I _{IN (OFF)}	4	I _{OUT} = 500 μA, T _a = 85°C	50	65		μA
Input Voltage (Output On)	V _{IN (ON)}	5	V _{CE} = 2 V h _{FE} = 800	I _{OUT} = 350 mA		4.7	V
				I _{OUT} = 200 mA		4.4	
Clamp Diode Reverse Current	I _R	6	V _R = 50 V, T _a = 25°C			50	μA
			V _R = 50 V, T _a = 85°C			100	
Clamp Diode Forward Voltage	V _F	7	I _F = 350 mA			2.0	V
Input Capacitance	C _{IN}				15		pF
Turn-On Delay	t _{ON}	8	V _{OUT} = 50 V, R _L = 125 CL = 15 pF		0.1		μs

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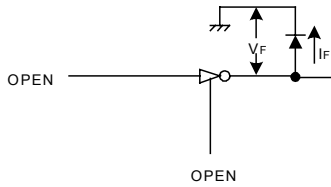
Turn-Off Delay	t_{OFF}	9	$V_{OUT} = 50\text{ V}$, $R_L = 125$ $C_L = 15\text{ pF}$	0.2		
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TEST CIRCUIT

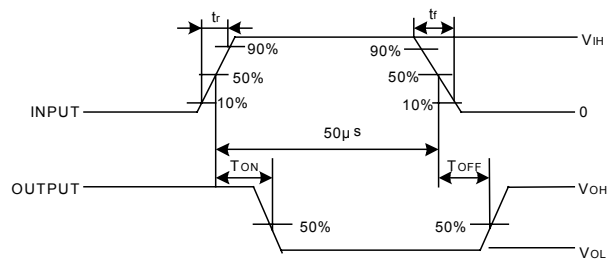
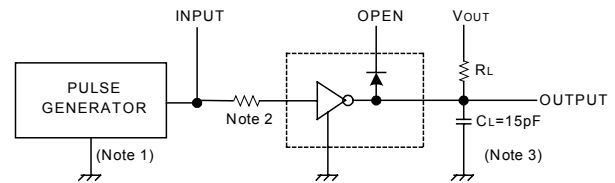


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7. V_F



8. t_{ON} , t_{OFF}

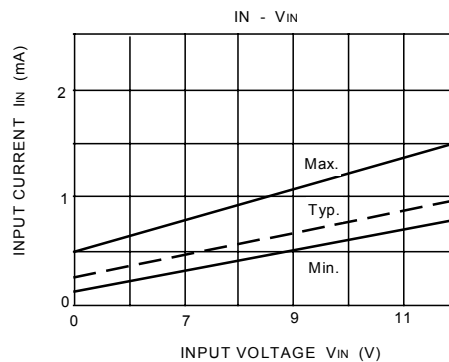
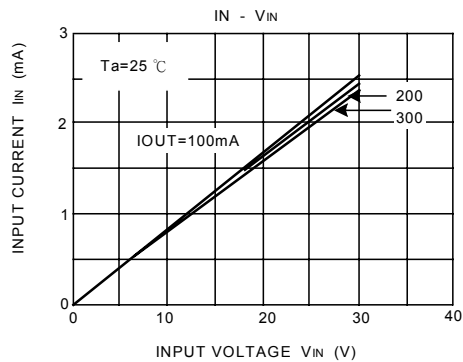
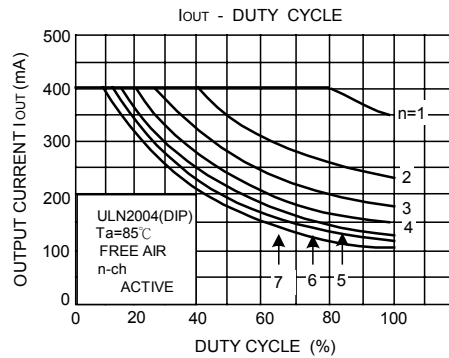
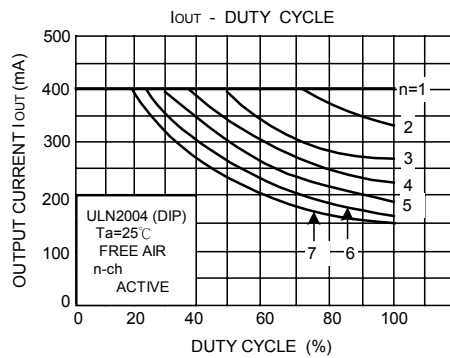
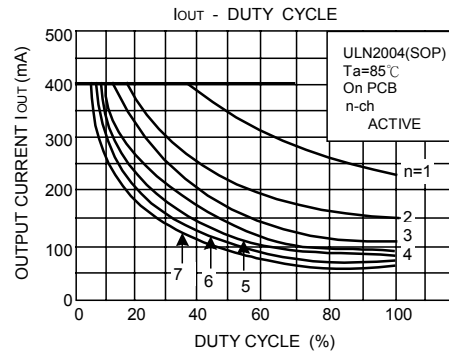
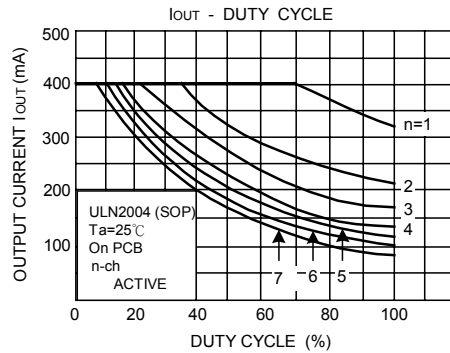


Note1: Pulse width $50\mu s$, duty cycle 10%
 Output impedance 50Ω , $t_r \leq 5ns$, $t_f \leq 10ns$
 Note2: $R1=0\Omega$, $V_{IH}=8V$
 Note3: C_L includes probe and jig capacitance.

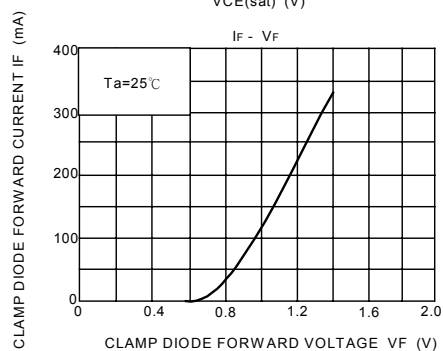
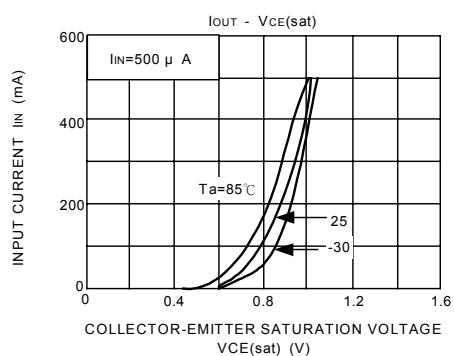
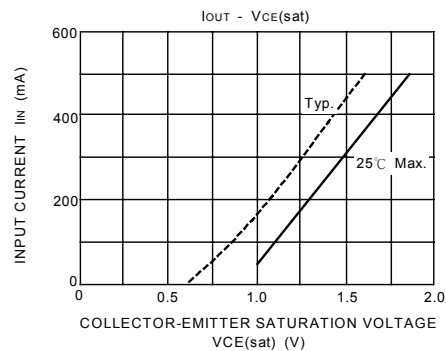
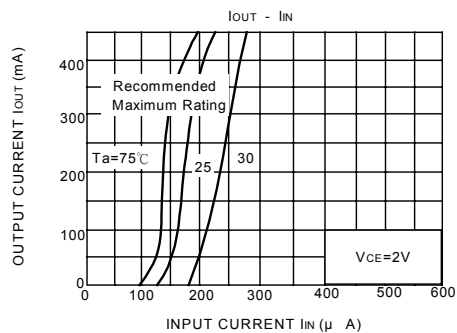
PRECAUTIONS FOR USING

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.

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