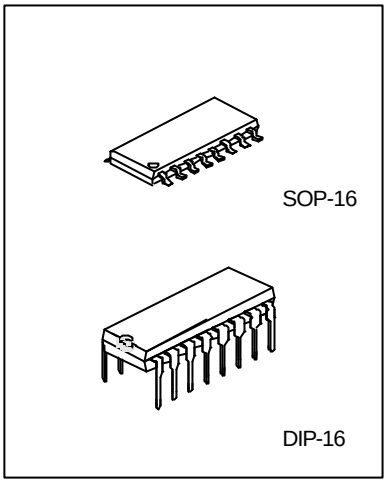
UTC ULN2003 LINEAR INTEGRATED CIRCUIT

SEVEN DARLINGTON ARRAYS



DESCRIPTION

The UTC ULN2003 is high-voltage,high-current darlighton drivers comprised of seven NPN darlington pairs.

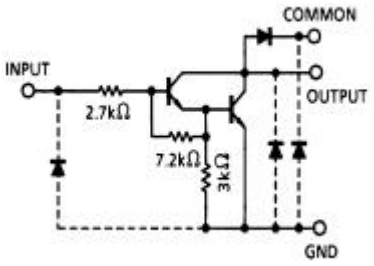
FEATURES

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

APPLICATIONS

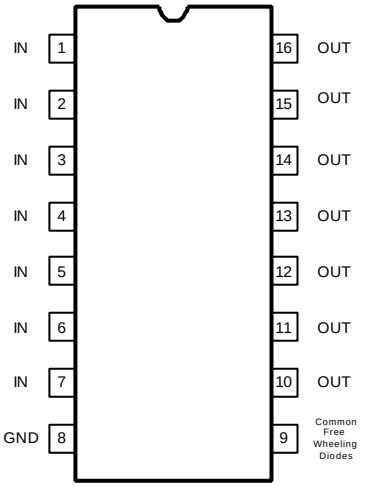
*Relay, hammer, lamp and display (LED) drivers.

SCHEMATICS (EACH DRIVER)



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

PIN CONFIGURATIONS



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Input Voltage	V_{IN}	-0.5~30	V
Output Sustaining Voltage	$V_{CE\ (SUS)}$	-0.5~50	V
Output Current	I_{OUT}	500	mA/ch
Clamp Diode Reverse Voltage	VR	50	V
Clamp Diode Forward Current	IF	500	mA
Power Dissipation	P_D	DIP: 1.47 SOP:0.54/0.625(Note)	W
Operating Ambient Temperature Range	T_{opr}	-40 to +85	°C
Storage Temperature Range	T_{Stg}	-55 to +150	°C

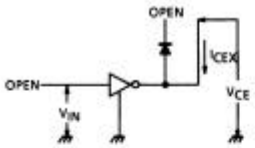
Note: On glass epoxy PCB (30x30x1.6mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Ta = 25 °C, Unless otherwise specified)

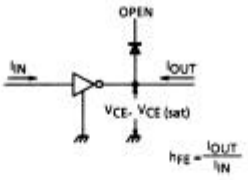
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	FIG
Output Leakage Current	I_{CEX}	V_{CE}=50V,T_A=25°C V_{CE}=50V,T_A=85°C			50 100	μA	1
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	I_{OUT}=350mA,I_{IN}=500μA I_{OUT}=200mA,I_{IN}=350μA I_{OUT}=100mA,I_{IN}=250μA		1.3 1.1 0.9	1.6 1.3 1.1	V	2
Input Current (output on)	$I_{IN(ON)}$	V_{IN} =2.4V,I_{OUT}=350mA		0.4	0.7	mA	3
Input Current (output off)	$I_{IN(OFF)}$	I_{OUT}=500μA,T_A=85°C	50	65		μA	4
Input Voltage (output on)	$V_{IN(ON)}$	V_{CE}=2.0V,hFE=800, I_{OUT}=350mA I_{OUT}=200mA			 2.6 2.0	V	5
Clamp Diode Reverse Current	IR	V_R=50V, T_A=25°C V_R=50V, T_A=85°C			50 100	μA	6
Clamp Diode Forward Voltage	VF	I_F=350mA			2.0	V	7
Input Capacitance	C_{IN}			15		pF	-
Turn-On Delay	t_{ON}	V_{OUT}=50V,R_L=125Ω,CL=15pF		0.1		μS	8
Turn-Off Delay	t_{OFF}	V_{OUT}=50V,R_L=125Ω,CL=15pF		0.2		μS	8

TEST CIRCUIT

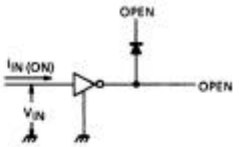
1. I_{CEX}



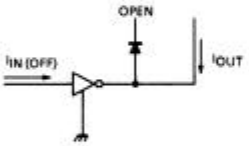
2. $V_{CE\ (sat)}$, h_{FE}



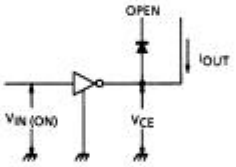
3. $I_{IN\ (ON)}$



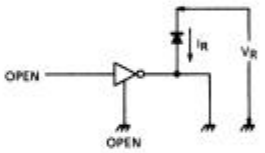
4. $I_{IN\ (OFF)}$



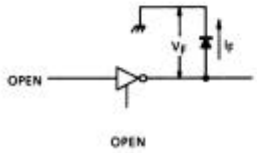
5. $V_{IN\ (ON)}$



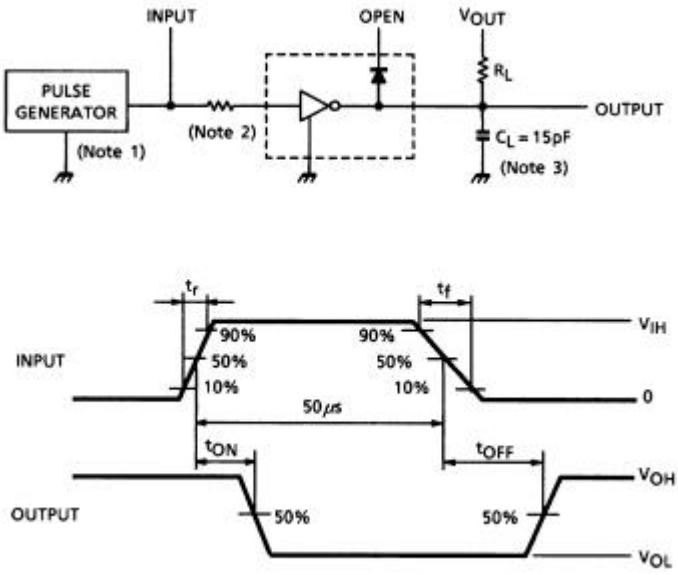
6. I_R



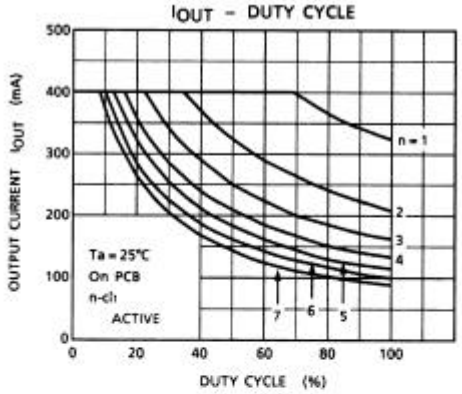
7. V_F

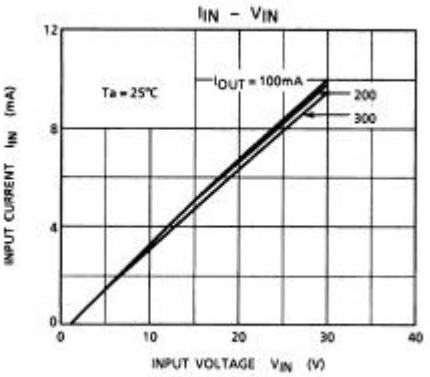


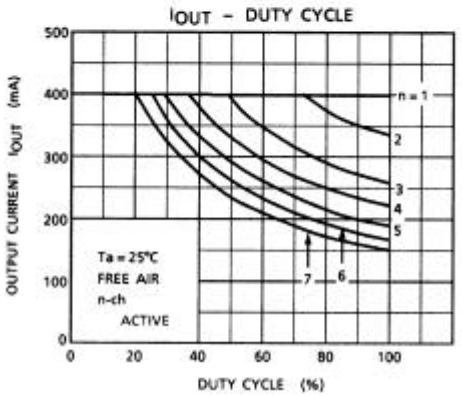
8. tON, tOFF

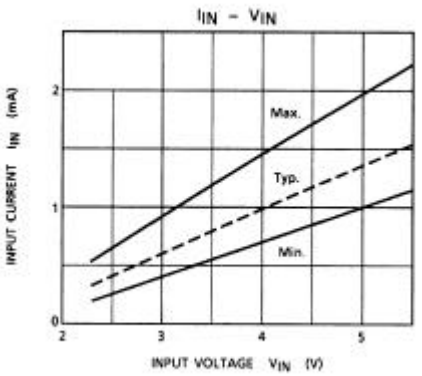


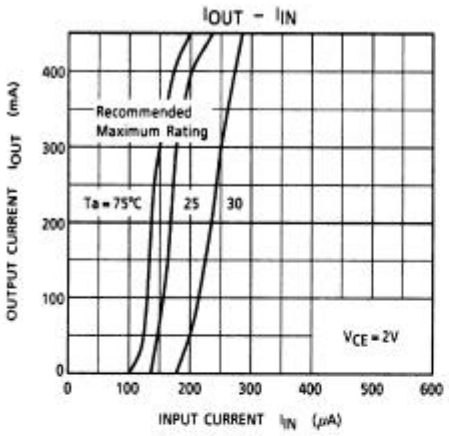
Note1: Pulse width 50μs, duty cycle 10%
Output impedance 50Ω, tr<=5ns, tf<=10ns
Note2: R_1: 0, V_{IH} : 3V
Note3: CL includes probe and jig capacitance.

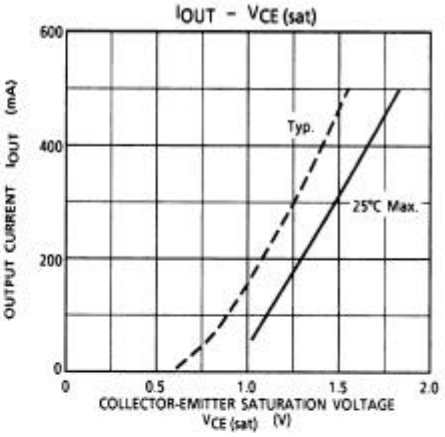

I_{OUT} - DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
Ta = 25°C
On PCB
n-ch
ACTIVE
n = 1
2
3
4
5
6
7

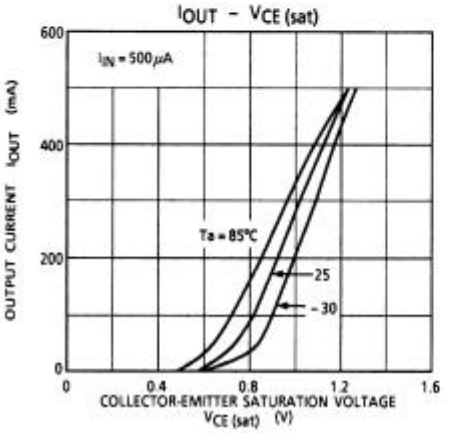

I_{IN} - V_{IN}
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
Ta = 25°C
I_{OUT} = 100mA
200
300

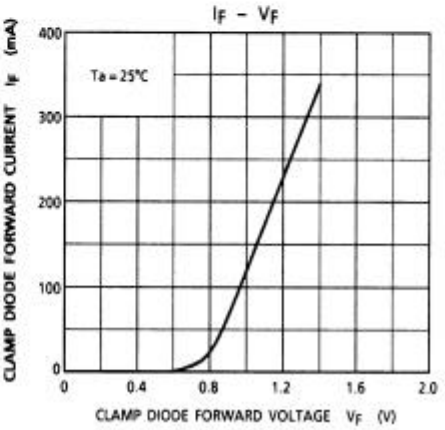

I_{OUT} - DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
Ta = 25°C
FREE AIR
n-ch
ACTIVE
n = 1
2
3
4
5
6
7

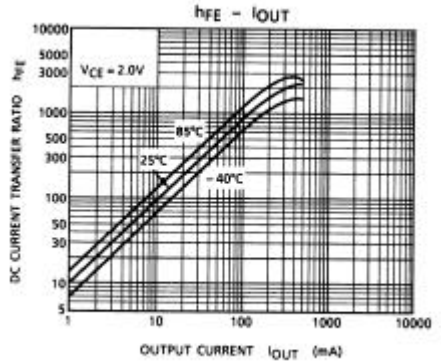

I_{IN} - V_{IN}
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
Max.
Typ.
Min.

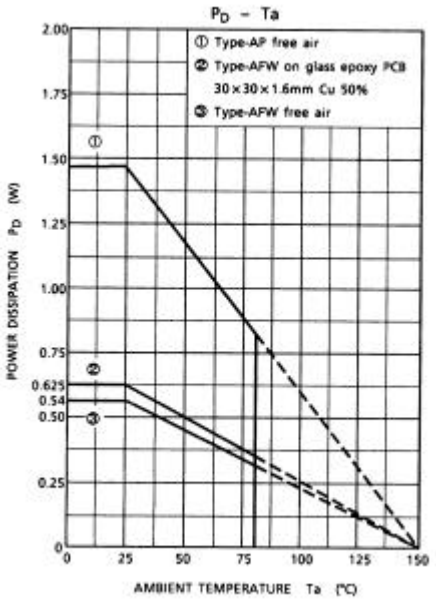

I_{OUT} - I_{IN}
OUTPUT CURRENT I_{OUT} (mA)
Recommended
Maximum Rating
Ta = 75°C
25
30
V_{CE} = 2V
INPUT CURRENT I_{IN} (μA)


I_{OUT} - $V_{CE(sat)}$
OUTPUT CURRENT I_{OUT} (mA)
Typ.
25°C Max.
COLLECTOR-EMITTER SATURATION VOLTAGE
$V_{CE(sat)}$ (V)


I_{OUT} - $V_{CE(sat)}$
I_{IN} = 500μA
OUTPUT CURRENT I_{OUT} (mA)
Ta = 85°C
25
30
COLLECTOR-EMITTER SATURATION VOLTAGE
$V_{CE(sat)}$ (V)


I_F - V_F
Ta = 25°C
CLAMP DIODE FORWARD CURRENT I_F (mA)
CLAMP DIODE FORWARD VOLTAGE V_F (V)


h_{FE} - I_{OUT}
V_{CE} = 2.0V
85°C
25°C
-40°C
DC CURRENT TRANSFER RATIO h_{FE}
OUTPUT CURRENT I_{OUT} (mA)
10000
5000
3000
1000
500
300
100
50
30
10
5
1
10
100
1000
10000


P_D - Ta
① Type-AP free air
② Type-AFW on glass epoxy PCB
30×30×1.6mm Cu 50%
③ Type-AFW free air
POWER DISSIPATION P_D (W)
AMBIENT TEMPERATURE Ta (°C)
2.00
1.75
1.50
1.25
1.00
0.75
0.625
0.54
0.50
0.25
0
25
50
75
100
125
150