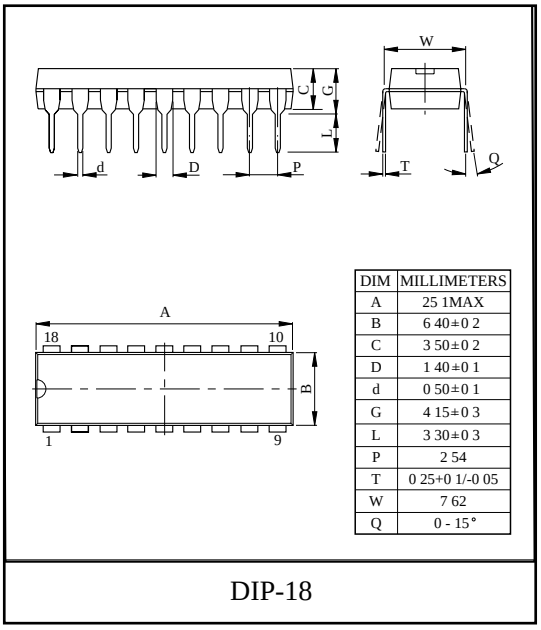
8 HIGH-VOLTAGE HIGH-CURRENT DARLINGTON
TRANSISTOR ARRAYS

The ULN2803/4 are high-voltage, high-current darlington drivers comprised of eight NPN darlington pairs.
All units feature integral clamp diodes for switching inductive loads.
Applications include relay, hammer, lamp and display(LED) drivers.



DIM	MILLIMETERS
A	25 1MAX
B	6 40±0 2
C	3 50±0 2
D	1 40±0 1
d	0 50±0 1
G	4 15±0 3
L	3 30±0 3
P	2 54
T	0 25+0 1/-0 05
W	7 62
Q	0 - 15°

DIP-18

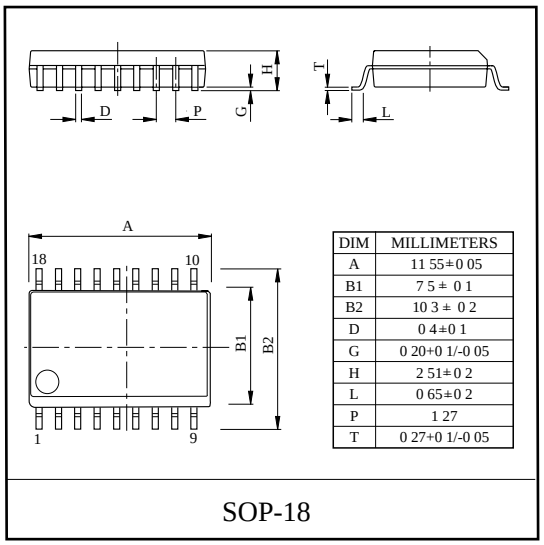
FEATURES

· Output Current (Single Output) : 500mA Max.
· High Sustaining Voltage Outputs : 50V Min.
· Output Clamp Diodes
· Inputs Compatible With Various Types of Logic.
· PKG Type, P : DIP-18
· PKG Type, F : SOP-18

TYPE	INPUT BASE RESISTOR	DESIGNATION
ULN2803	2.7kΩ	TTL, 5V C-MOS
ULN2804	10.5kΩ	6 ~ 15V P-MOS, C-MOS

MAXIMUM RATINGS (Ta=25℃, unless otherwise noted)

CHARACTERISTIC		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
	Forward Current	I_F	500	mA
Power Dissipation	AP	P_D	1.47	W
	AF		0.96	W
Operating Temperature		T_{opr}	-40 ~ 85	℃
Storage Temperature		T_{stg}	-55 ~ 150	℃

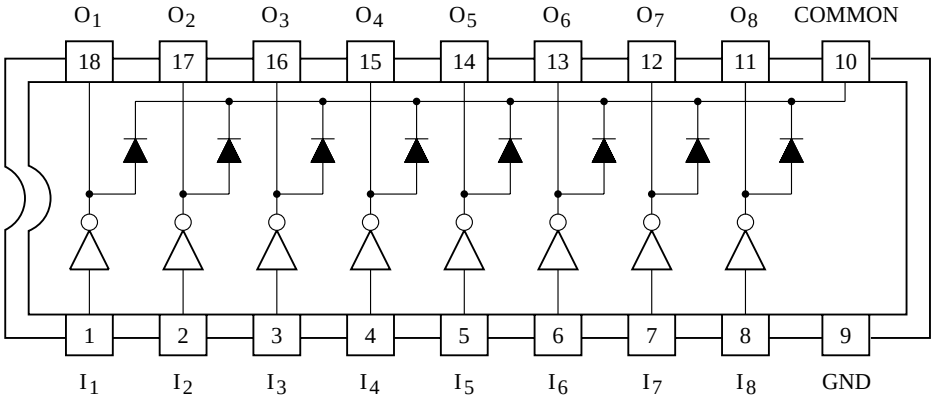


DIM	MILLIMETERS
A	11 55±0 05
B1	7 5 ± 0 1
B2	10 3 ± 0 2
D	0 4±0 1
G	0 20+0 1/-0 05
H	2 51±0 2
L	0 65±0 2
P	1 27
T	0 27+0 1/-0 05

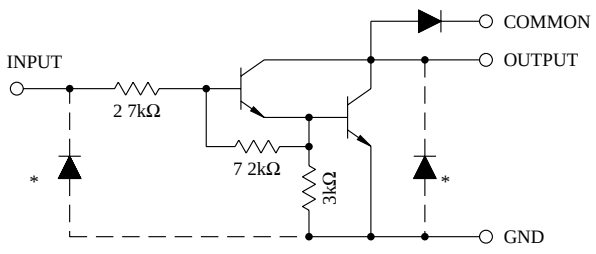
SOP-18

PIN CONNECTION (TOP VIEW)

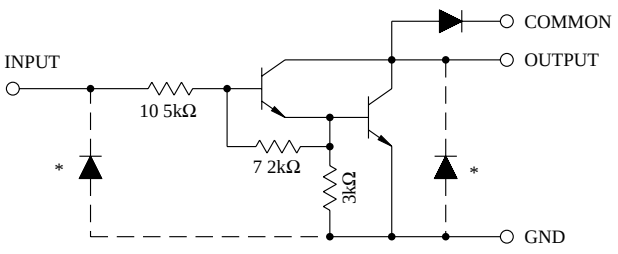
SOP-18



ULN2803



ULN2804



(* : Parasitic Diodes
NOTE. The input and output parasitic diodes cannot be used as clamp diodes.)

RECOMMENDED OPERATING CONDITIONS (Ta=-40 ~ 85℃)

CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Sustaining Voltage		$V_{CE(SUS)}$		0	-	50	V
Output Current	AP	I_{OUT}	T_{PW}=25ms, Duty=10%, 8 Circuits	0	-	347	mA/ch
			T_{PW}=25ms, Duty=50%, 8 Circuits	0	-	123	
	AF		T_{PW}=25ms, Duty=10%, 8 Circuits	0	-	268	
			T_{PW}=25ms, Duty=50%, 8 Circuits	0	-	90	
Input Voltage		V_{IN}		0	-	30	V
Input Voltage (Output ON)	ULN2803	$V_{IN(ON)}$		3.5	-	30	V
	ULN2804			8	-	30	
Clamp Diode Reverse Voltage		V_R		-	-	50	V
Clamp Diode Forward Current		I_F		-	-	400	mA
Power Dissipation	AP	P_D		-	-	0.52	W
	AF			-	-	0.35	

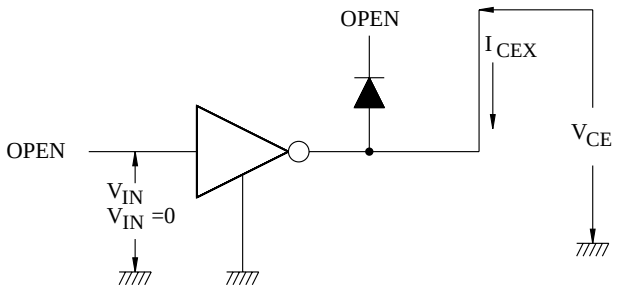
ELECTRICAL CHARACTERISTICS (Ta=25℃, unless otherwise noted)

CHARACTERISTICS		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Leak Current	ULN2803	I_{CEX}	1	V_{CE}=50V, Ta=25℃	-	-	50	μA
				V_{CE}=50V, Ta=85℃	-	-	100	
	ULN2804			V_{CE}=50V, V_{IN}=1V	-	-	500	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	2	I_{OUT}=350mA, I_{IN}=500μA	-	1.3	1.6	V
				I_{OUT}=200mA, I_{IN}=350μA	-	1.1	1.3	
				I_{OUT}=100mA, I_{IN}=250μA	-	0.9	1.1	
Input Current	ULN2803	$I_{IN(ON)}$	3	V_{IN}=3.85V	-	0.93	1.35	mA
	ULN2804			V_{IN}=5V	-	0.35	0.5	
				V_{IN}=12V	-	1.0	1.45	
		$I_{IN(OFF)}$	4	I_{OUT}=500μA, Ta=85℃	50	65	-	μA
Input Voltage (Output On)	ULN2803	$V_{IN(ON)}$	5	V_{CE}=2V, I_{OUT}=200mA	-	-	2.4	V
				V_{CE}=2V, I_{OUT}=250mA	-	-	2.7	
				V_{CE}=2V, I_{OUT}=300mA	-	-	3.0	
	ULN2804			V_{CE}=2V, I_{OUT}=125mA	-	-	5.0	
				V_{CE}=2V, I_{OUT}=200mA	-	-	6.0	
				V_{CE}=2V, I_{OUT}=275mA	-	-	7.0	
				V_{CE}=2V, I_{OUT}=350mA	-	-	8.0	
DC Current Transfer Ratio		h_{FE}	2	V_{CE}=2V, I_{OUT}=350mA	1000	-	-	
Clamp Diode Reverse Current		I_R	6	Ta=25℃ (*1)	-	-	50	μA
				Ta=85℃ (*1)	-	-	100	
Clamp Diode Forward Voltage		V_F	7	I_F=350mA	-	-	2.0	V
Input Capacitance		C_{IN}			-	-	15	pF
Turn-On Delay		t_{ON}	8	R_L=125Ω, V_{OUT}=50V	-	0.1	-	μs
Turn-Off Delay		t_{OFF}			-	0.21	-	

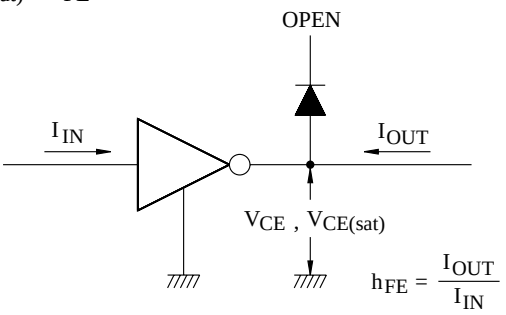
*1 VR=VR MAX

TEST CIRCUIT

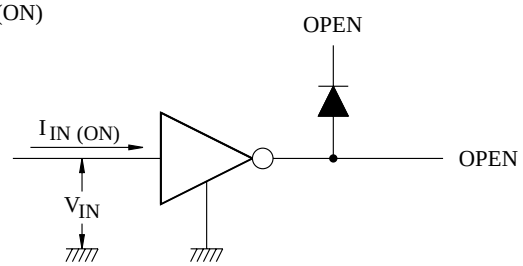
1. I_{CEX}



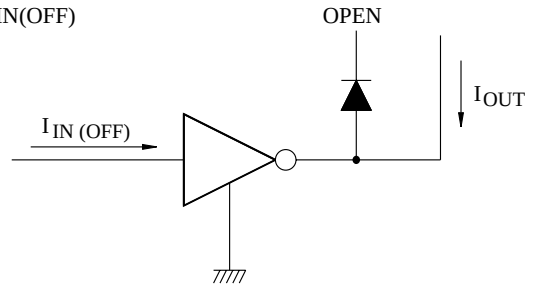
2. $V_{CE(sat)}$, h_{FE}



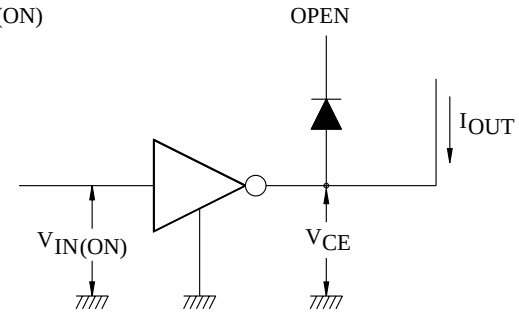
3. $I_{IN(ON)}$



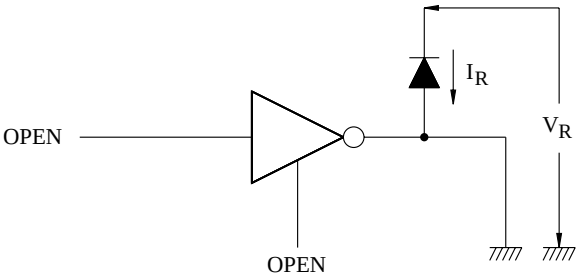
4. $I_{IN(OFF)}$



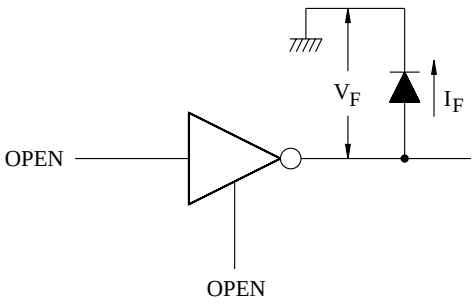
5. $V_{IN(ON)}$



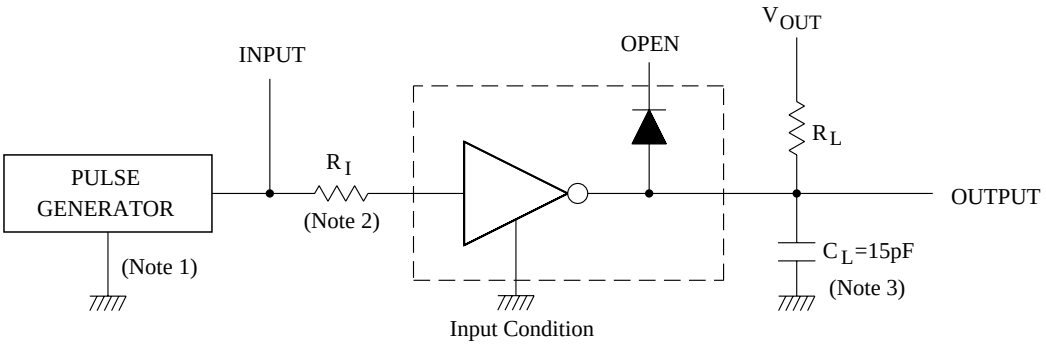
6. I_R

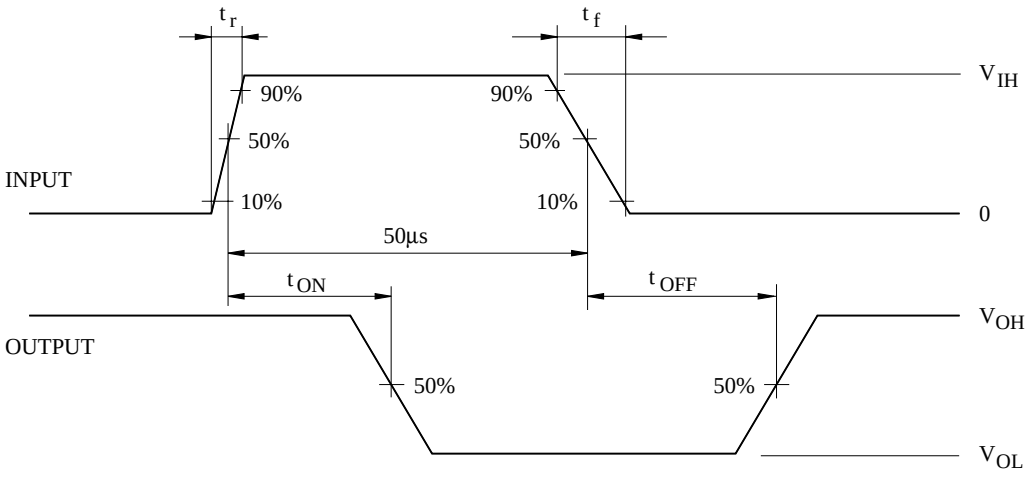


7. V_F



8. t_{ON} , t_{OFF}





Notes : 1. Pulse Width 50μs, Duty Cycle 10%
Output Impedance 50Ω , $t_r \leq$5ns, $t_f \leq$10ns

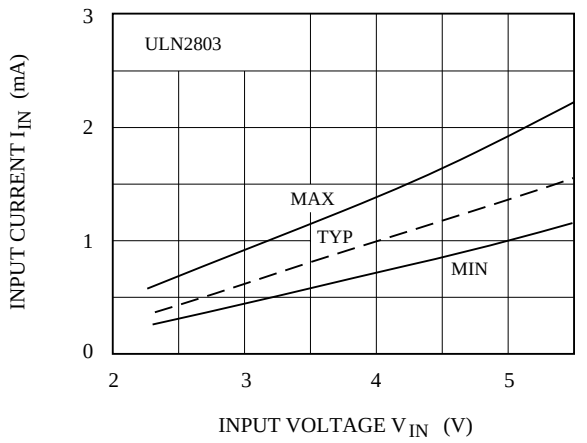
2. See below

Input Conditions

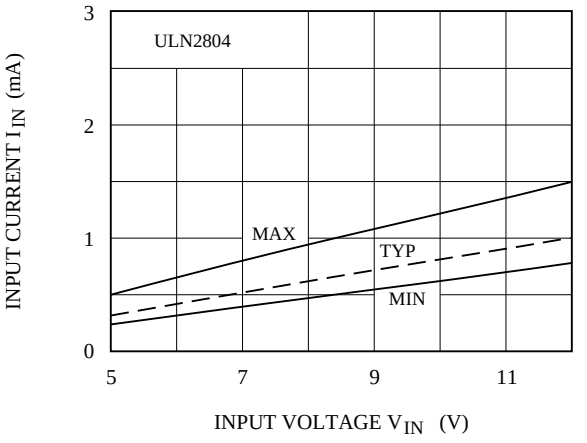
Type Number	R_I	V_{IH}
ULN2803	0	3V
ULN2804	0	8V

3. C_L includes probe and Jig capacitance.

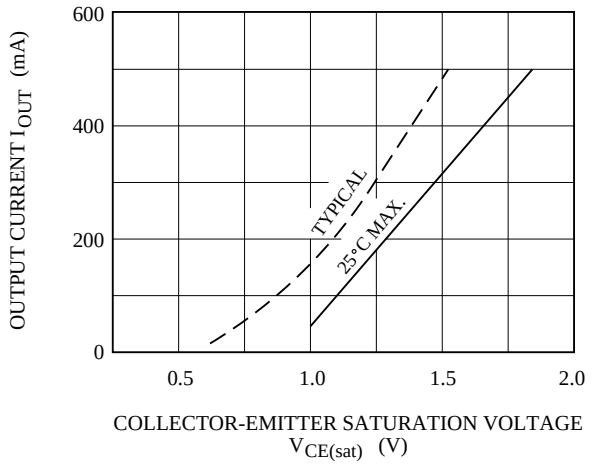
I_{IN} - V_{IN}



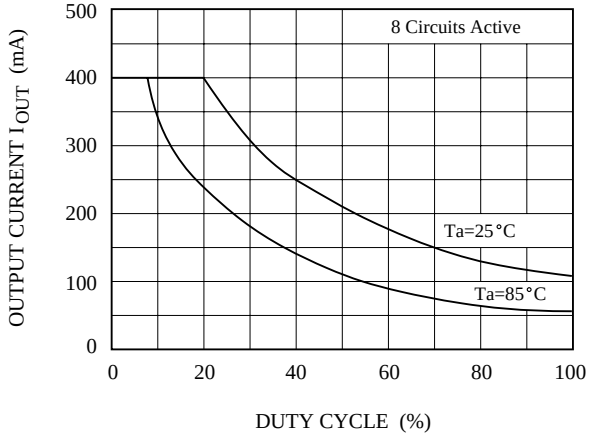
I_{IN} - V_{IN}



I_{OUT} - $V_{CE(sat)}$



I_{OUT} - DUTY CYCLE



P_D - Ta