

High-Voltage, High-Current Darlington Arrays

DESCRIPTION

The ULN2803/2804 series are high-voltage, high-current darlington arrays comprised of eight NPN darlington

pairs. All units feature integral clamp diodes for switching inductive loads.

FEATURES

- Output current.....500mA
- High Sustaining Voltage.....50V Min.
- Output Clamp Diode
- Inputs Compatible With Various Types of Logic

Type	Input Resistor	Designation
ULN2803	2.7K	TTL , 5V C - MOS
ULN2804	10.5K	6 ~ 15V P -MOS, C -MOS

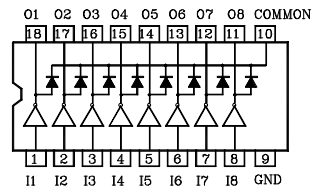
MAXIMUM RATING (Ta=25°C unless otherwise noted)

Characteristic	Symbol	Rating	Unit
Output Sustaining Voltage	$V_{CE(SUS)}$	50	V
Output Current	I_{OUT}	500	mA
Input Voltage	V_{IN*}	-0.5~+30	V
Input Current	I_{IN*}	25	mA
Clamp Diode	Reverse Voltage	V_R	50 V
	Forward Current	I_F	500 mA
GND Terminal Current	I_{GND}	3.2	A
Power Dissipation	P_D	1.47	W
Operating Temperature	T_{opr}	-40~85	°C
Storage Temperature	T_{stg}	-55~150	°C

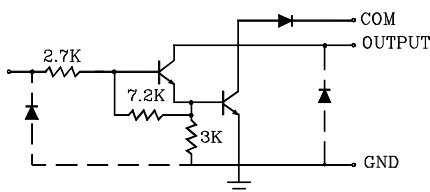
18 DIP



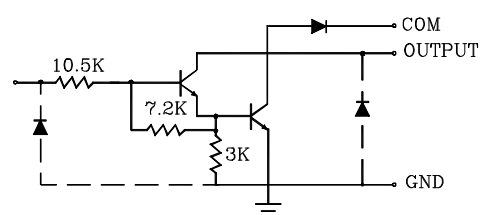
PIN CONNECTION (TOP VIEW)



ULN2803



ULN2804



High-Voltage, High-Current Darlington Arrays

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

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Sustaining Voltage	V _{CE(SUS)}		0	-	50	V
Output Current	I _{OUT}	T _{PW} =25mS,DF=8%, 8 Circuits	0	-	400	mA
		T _{PW} =25mS,DF=25% 8 Circuits	0	-	200	
Input Voltage	V _{IN}		0	-	30	V
Clamp Diode Reverse Voltage	V _R		-	-	50	V
Clamp Diode Forward Current	I _F		-	-	400	mA
Power Dissipation	P _D		-	-	0.52	W

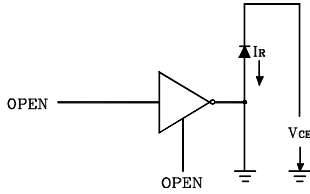
ELECTRICAL CHARACTERISTICS(Ta=25°C unless otherwise noted)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT	
Output leak Current	I _{CEX}	1	V _{CE} =50V, Ta=25°C	-	-	50	μF D	
			V _{CE} =50V, Ta=85°C	-	-	100		
			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)}	V _{IN} =3.85V	-	0.93	1.35	mA	
			V _{IN} =5V	-	0.35	0.5		
	ULN2804	I _{ON(OFF)}	V _{IN} =12V	-	1.0	1.45		
			I _{OUT} =500μA, Ta=85°C	50	65	-		μF D
Input Voltage	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 Transistor Ratio	h _{FE}	2	V _{CE} =2V, I _{OUT} =350mA	1000	-	-		
Clamp Diode Reverse Current	I _E	6	V _R =50V, Ta=25°C	-	-	50	μF D	
Clamp Diode Forward Voltage	V _F	7	V _R =50V, Ta=85°C	-	-	100	V	
			I _F =350mA			2.0		
Input Capacitance	C _{IN}			-	15	-	pF	
Turn-On Delay	t _{ON}	8	V _{OUT} =50V, R _L =163Ω	-	0.1	-	μS	
Turn-Off Delay	t _{OFF}			C _L =15 pF	-	0.2		-

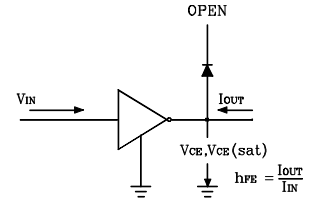
High-Voltage, High-Current Darlington Arrays

TEST CIRCUIT

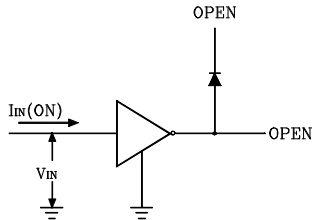
1. I_{CEX}



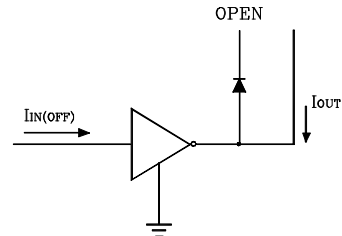
2. $V_{CE(sat)}$, h_{FE}



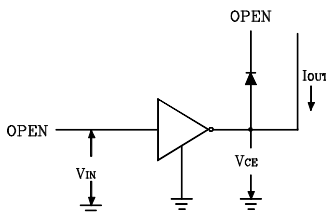
3. $I_{IN(ON)}$



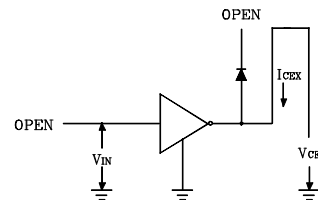
4. $I_{IN(OFF)}$



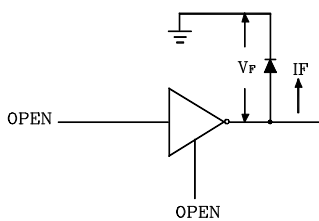
5. $V_{IN(ON)}$



6. I_R

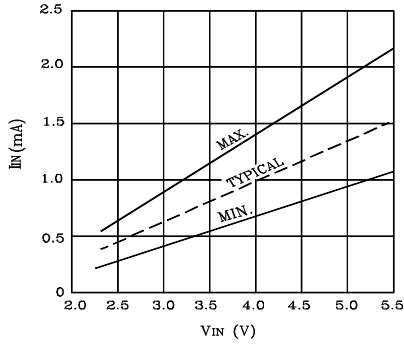


7. V_F

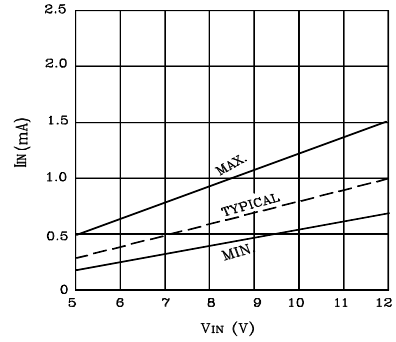


High-Voltage, High-Current Darlington Arrays

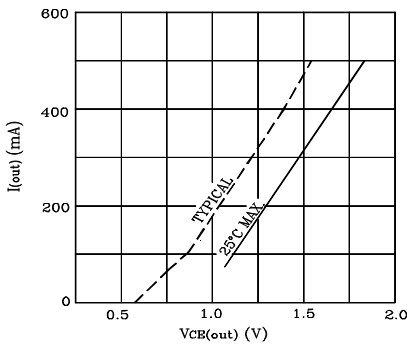
ULN2803 $I_{IN} - V_{IN}$



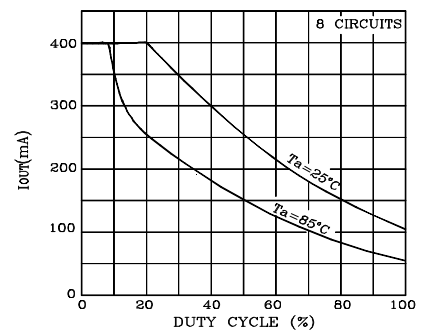
ULN2804 $I_{IN} - V_{IN}$



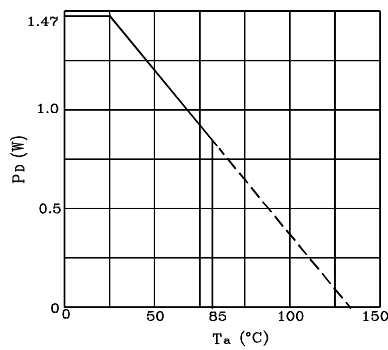
$P_D - T_a$



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

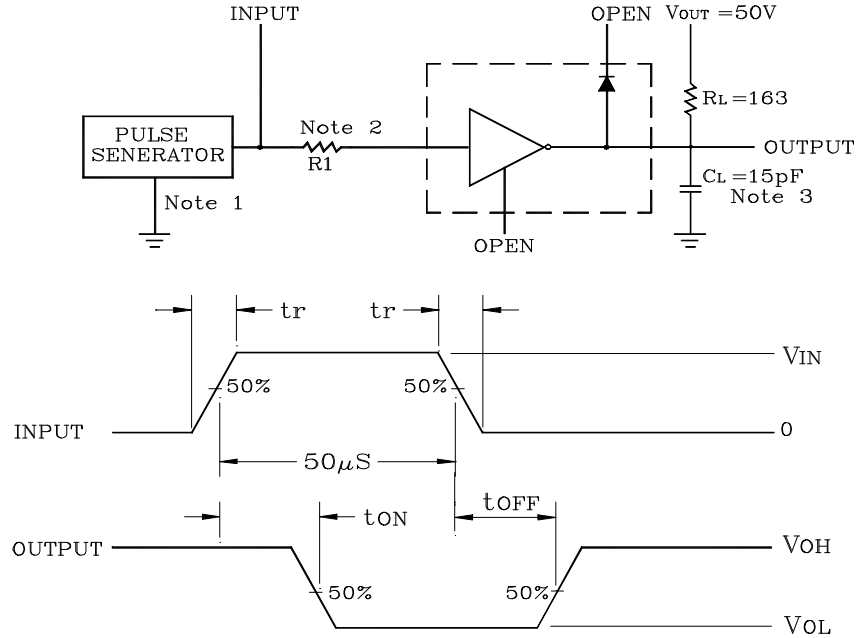


$I_{OUT} - DUTY CYCLE$



High-Voltage, High-Current Darlington Arrays

8. t_{ON} , t_{OFF}



Notes: 1. Pulse Width 50µs, Duty Cycle 10%

Output Impedance 50

t_r 5ns, t_f 10ns

2. See below

Input Conditions

TYPE NUMBER	R_I	V_{IH}
ULN2803	0	3V
ULN2804	0	8V

3. C_L includes prob and jig capacitance.