

ULN2803AP, ULN2803AFW, ULN2804AP, ULN2804AFW

8CH DARLINGTON SINK DRIVER

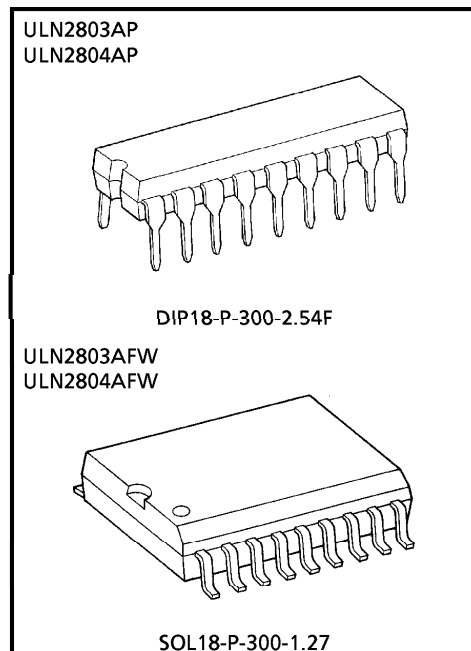
The ULN2803AP / AFW Series are high-voltage, high-current darlington drivers comprised of eight NPN darlington pairs.

All units feature integral clamp diodes for switching inductive loads.

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

FEATURES

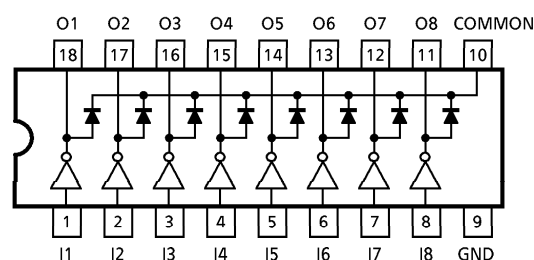
- Output current (single output)
500mA (Max.) (ULN2803AP / AFW series)
- High sustaining voltage output
50V (Min.) (ULN2803AP / AFW series)
- Output clamp diodes
- Inputs compatible with various types of logic.
- Package type-AP : DIP-18pin
- Package type-AFW : SOL-18pin



Weight
DIP18-P-300-2.54F : 1.478g (Typ.)
SOL18-P-300-1.27 : 0.48g (Typ.)

TYPE	INPUT BASE RESISTOR	DESIGNATION
ULN2803AP / AFW	2.7k Ω	TTL, 5V CMOS
ULN2804AP / AFW	10.5k Ω	6~15V PMOS, CMOS

PIN CONNECTION (TOP VIEW)

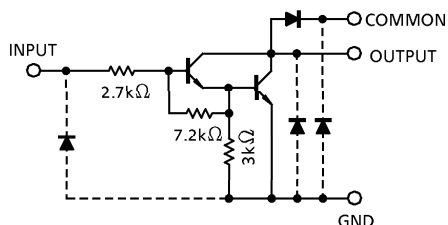


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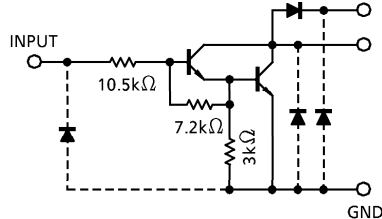
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SCHEMATICS (EACH DRIVER)

ULN2803AP / AFW



ULN2804AP / AFW



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

MAXIMUM RATINGS (Ta = 25°C)

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
Clamp Diode Forward Current		I_F	500	mA
Power Dissipation	AP	P_D	1.47	W
	AFW		0.92 / 1.31 (Note)	
Operating Temperature		T_{opr}	- 40~85	°C
Storage Temperature		T_{stg}	- 55~150	°C

(Note) On Glass Epoxy PCB (75 × 114 × 1.6mm Cu 20%)

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

CHARACTERISTIC		SYMBOL	TEST 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	
	AFW		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)	ULN2803AP / AFW	V _{IN (ON)}		3.5	—	30	V
	ULN2804AP / AFW			8	—	30	
Clamp Diode Reverse Voltage		V _R		—	—	50	V
Clamp Diode Forward Current		I _F		—	—	400	mA
Power Dissipation	AP	P _D	T _a = 85°C	—	—	0.76	W
	AFW		T _a = 85°C (Note)	—	—	0.48	

(Note) On Glass Epoxy PCB (75×114×1.6mm Cu 20%)

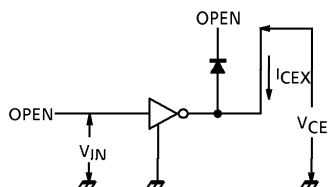
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Leakage Current <div>ULN2804AP / AFW</div>		I _{CEX}	1	V _{CE} = 50V	T _a = 25°C	—	—	50	μA
				V _{CE} = 50V	T _a = 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	ULN2803AP / AFW	I _{IN (ON)}	2	V _{IN} = 3.85V		—	0.93	1.35	mA
	ULN2804AP / AFW			V _{IN} = 5V		—	0.35	0.5	
	ULN2804AP / AFW			V _{IN} = 12V		—	1.0	1.45	
			I _{IN (OFF)}	4	I _{OUT} = 500μA, T _a = 85°C		50	65	—
Input Voltage (Output On)	ULN2803AP / AFW	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	
	ULN2804AP / AFW			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	T _a = 25°C (Note)		—	—	50	μA
				T _a = 85°C (Note)		—	—	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}		R _L = 125Ω, V _{OUT} = 50V		—	0.2	—	

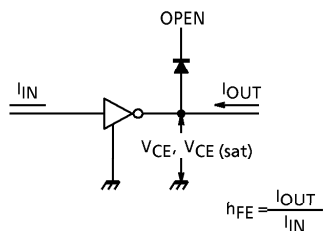
(Note) $V_R = V_R \text{ MAX.}$

TEST CIRCUIT

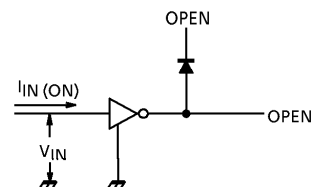
1. I_{CEX}



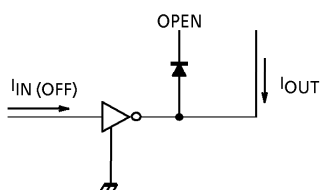
2. $V_{CE(sat)}$, h_{FE}



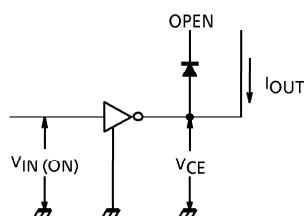
3. $I_{IN(ON)}$



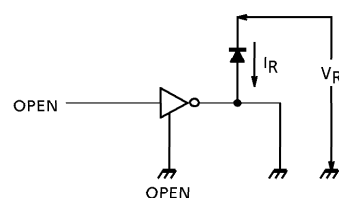
4. $I_{IN(OFF)}$



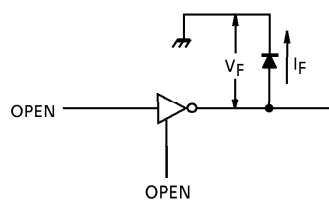
5. $V_{IN(ON)}$

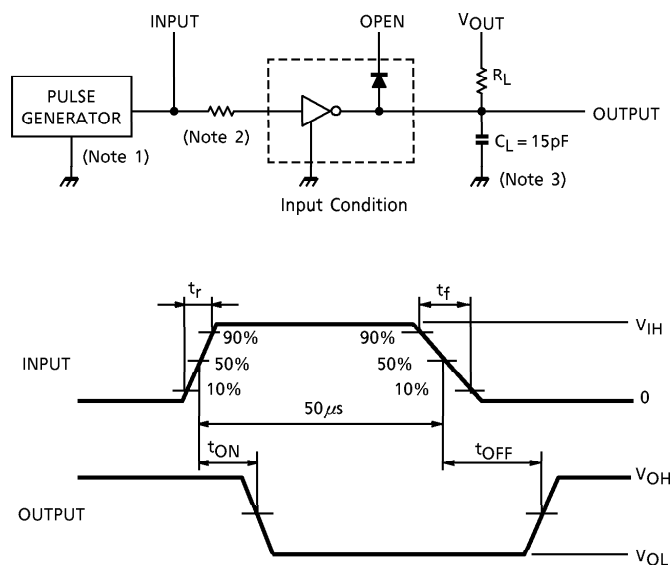


6. I_R



7. V_F



8. t_{ON} , t_{OFF} 

(Note 1) Pulse Width $50\mu s$, Duty Cycle 10%
Output Impedance 50Ω , $t_r \leq 5ns$, $t_f \leq 10ns$

(Note 2) See below.

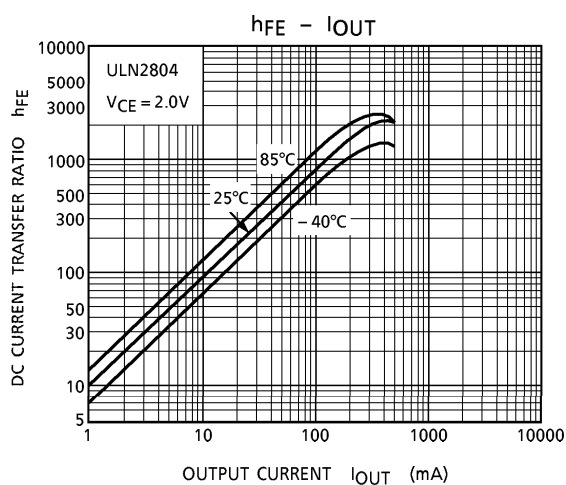
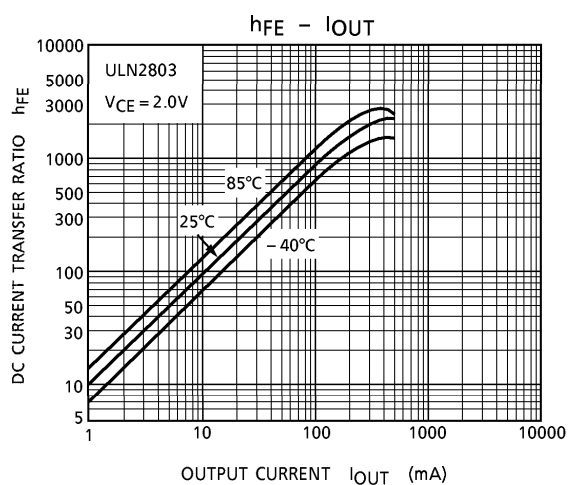
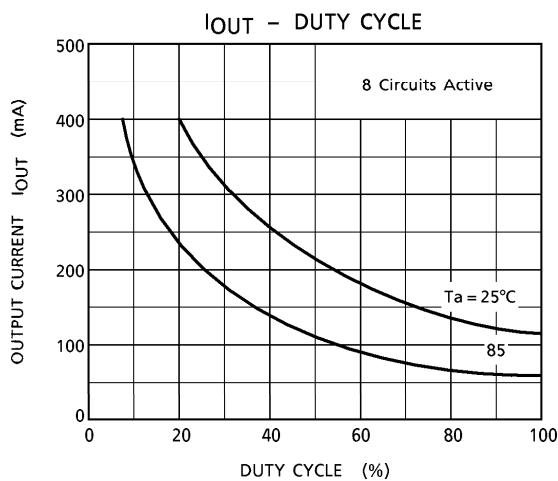
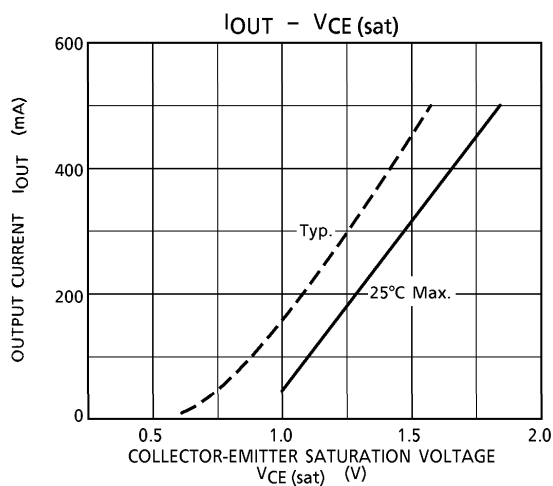
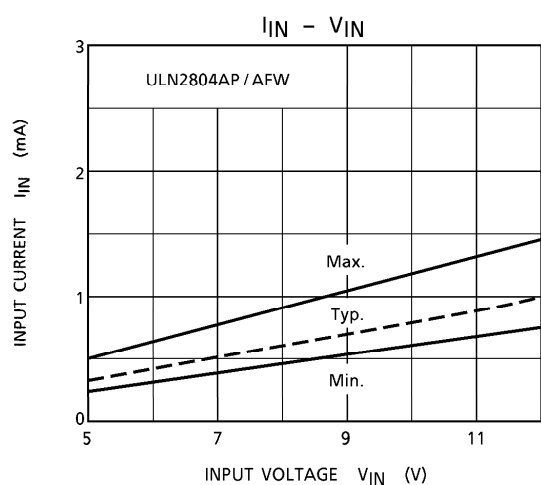
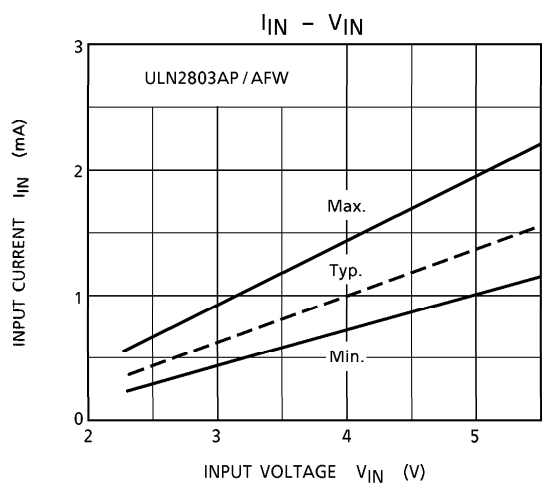
INPUT CONDITION

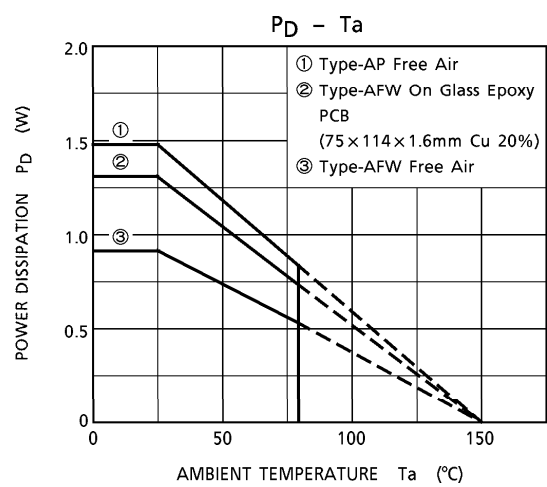
TYPE NUMBER	R1	V_{IH}
ULN2803AP / AFW	0Ω	3V
ULN2804AP / AFW	0Ω	8V

(Note 3) C_L includes probe and jig capacitance

PRECAUTIONS for USING

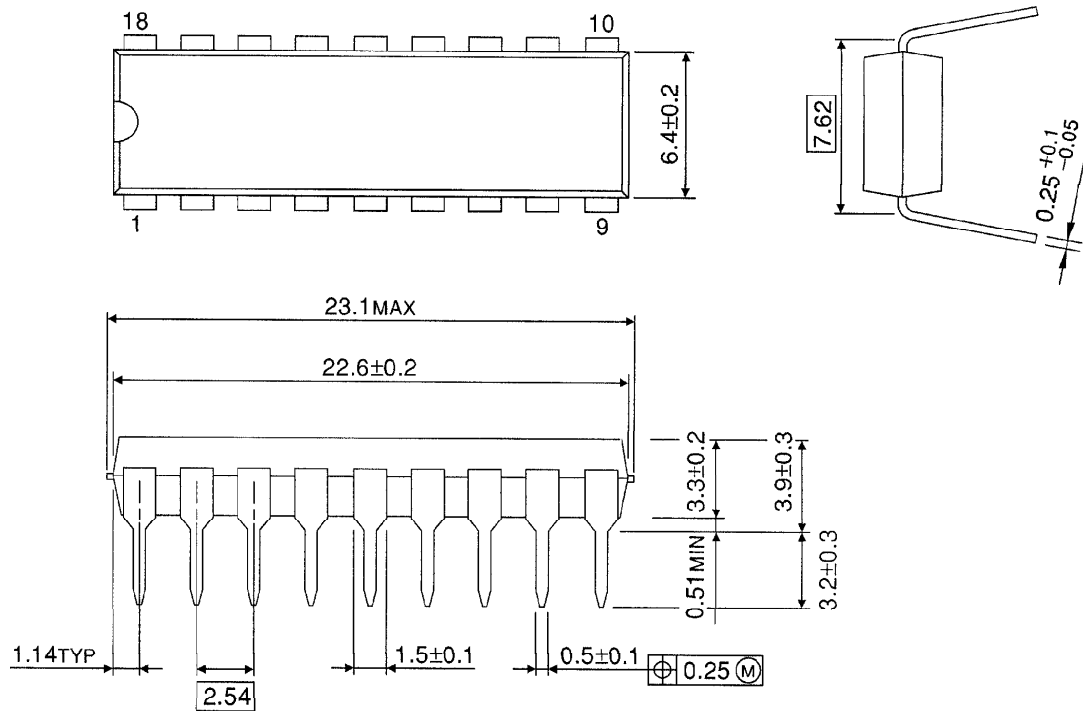
Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.





OUTLINE DRAWING
DIP18-P-300-2.54F

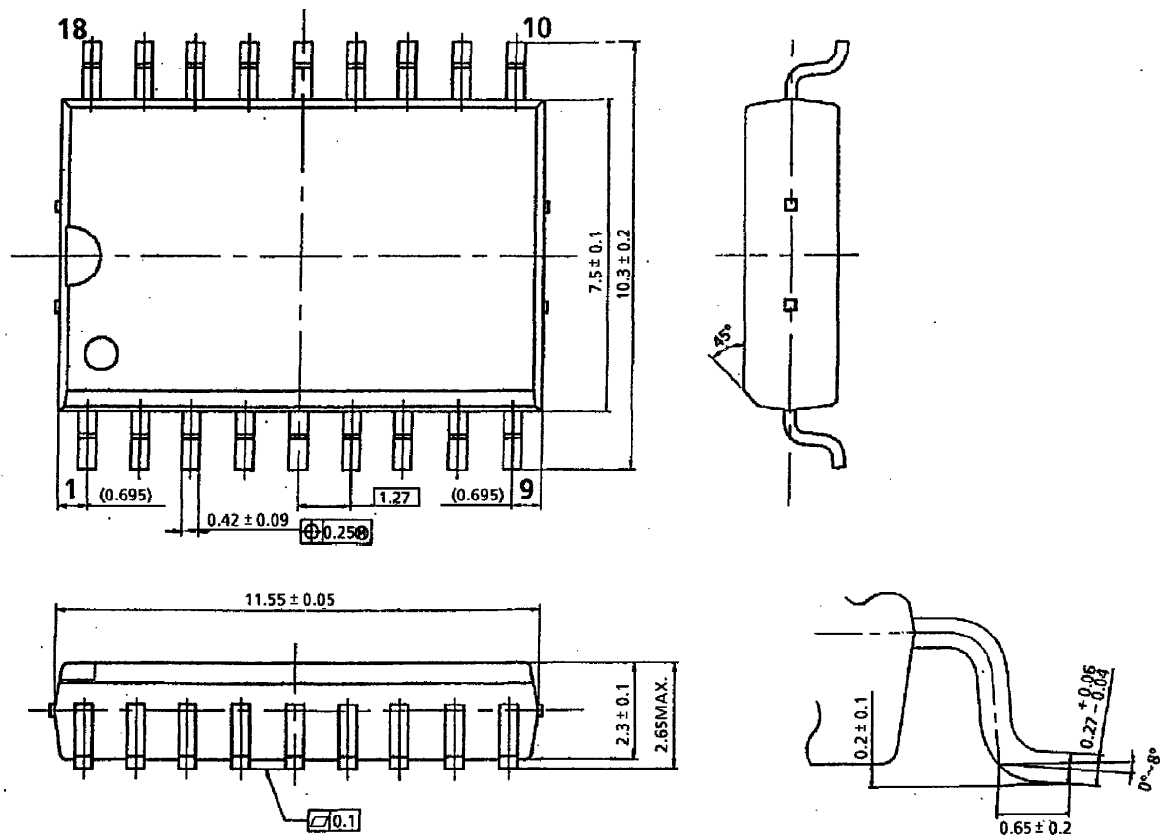
Unit : mm



Weight : 1.478g (Typ.)

OUTLINE DRAWING
SOL18-P-300-1.27

Unit : mm



Weight : 0.48g (Typ.)