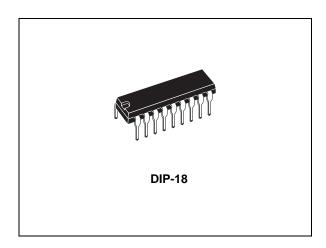


# ULQ2801, ULQ2802, ULQ2803, ULQ2804

### Eight Darlington arrays

Datasheet - production data



#### **Features**

- · Eight Darlingtons per package
- Extended temperature range: -40 to 105 °C
- Output current to 500 mA
- Output voltage to 50 V
- Integral suppression diodes
- Versions for all popular logic families
- Output can be paralleled
- Inputs pinned opposite outputs to simplify board layout

#### **Description**

The ULQ2801A-ULQ2804A each contain eight Darlington transistors with common emitters and integral suppression diodes for inductive loads. Each Darlington features a peak load current rating of 600 mA (500 mA continuous) and can withstand at least 50 V in the off state. Outputs may be paralleled for higher current capability.

Five versions are available to simplify interfacing to standard logic families: the ULQ2801A is designed for general purpose applications with a current limit resistor; the ULQ2802A has a 10.5 k $\Omega$  input resistor and zener for 14-25 V PMOS; the ULQ2803A has a 2.7 k $\Omega$  input resistor for 5 V TTL and CMOS; the ULQ2804A has a 10.5 k $\Omega$  input resistor for 6-15 V CMOS.

All types are supplied in a 18-lead plastic DIP with a copper lead from and feature the convenient input-opposite-output pinout to simplify board layout.

Table 1. Device summary

Order codes	Package	
ULQ2801A		
ULQ2802A	002A DIP-18	
ULQ2803A	DIF-10	
ULQ2804A		

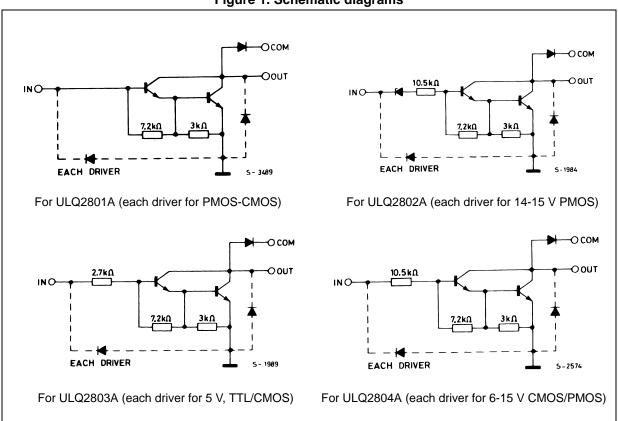
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### 1 Diagrams

Figure 1. Schematic diagrams



# 2 Pin configuration

18 OUT 1 IN 1 IN 2 OUT 2 IN 3 16 OUT 3 15 OUT 4 IN 4 IN 5 OUT 5 13 OUT 6 IN 6 IN 7 OUT 7 IN 8 OUT 8 10 COMMON FREE WHEELING DIODES GND 5-3490/1

Figure 2. Pin connections (top view)

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## 3 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit		
V <sub>O</sub>	Output voltage	50	V		
VI	Input voltage (for ULQ2802A - ULQ2803A - ULQ2804A)	30	V		
I <sub>C</sub>	Continuous collector current	Continuous collector current 500			
I <sub>B</sub>	Continuous base current	25	mA		
D	Power dissipation (one Darlington pair)	1	W		
P <sub>TOT</sub>	Power dissipation (total package)	2.25	۷V		
T <sub>A</sub>	Operating ambient temperature range - 40 to 85				
T <sub>STG</sub>	Storage temperature range - 55 to 150				

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thJA}$	Thermal resistance junction-ambient, Max.	55	°C/W

#### **Electrical characteristics** 4

 $T_A$  = 25 °C unless otherwise specified. **Table 4. Electrical characteristics** 

Symbol	Parameter Test condition		Min.	Тур.	Max.	Unit		
	Output leakage current	V <sub>CE</sub> = 50 V, ( <i>Figure 7</i> )			50	_		
I <sub>CEX</sub>		T <sub>A</sub> = 105°C, V <sub>CE</sub> = 50 V ( <i>Figure 7</i> )			100			
		$T_A$ = 105°C for ULQ2802A, $V_{CE}$ = 50 V, $V_I$ = 6 V ( <i>Figure 8</i> )			500	μΑ		
		$T_A$ = 105°C for ULQ2804A, $V_{CE}$ = 50 V, $V_I$ = 1 V ( <i>Figure 8</i> )			500			
		$I_C = 100 \text{ mA}, I_B = 250 \mu\text{A}$		0.9	1.1			
$V_{CE(SAT)}$	Collector-emitter saturation voltage ( <i>Figure 9</i> )	$I_C$ = 200 mA, $I_B$ = 350 $\mu$ A		1.1	1.3	V		
	remage (rigare e)	I <sub>C</sub> = 350 mA, I <sub>B</sub> = 500 μA		1.3	1.6			
		for ULQ2802A, V <sub>I</sub> = 17 V		0.82	1.25			
	lanut aumant (Figure C)	for ULQ2803A, V <sub>I</sub> = 3.85V		0.93	1.35	1		
I <sub>I(ON)</sub>	Input current (Figure 6)	for ULQ2804A, V <sub>I</sub> = 5 V		0.35	0.5	mA		
		V <sub>I</sub> = 12 V		1	1.45			
I <sub>I(OFF)</sub>	Input current (Figure 7)	T <sub>A</sub> = 105°C, I <sub>C</sub> = 500 μA	50	65		μΑ		
V <sub>I(ON)</sub>	Input voltage (Figure 8)	$V_{CE} = 2 \text{ V, for ULQ2802A}$ $I_{C} = 300 \text{ mA}$ for ULQ2803A $I_{C} = 200 \text{ mA}$ $I_{C} = 250 \text{ mA}$ $I_{C} = 300 \text{ mA}$ for ULQ2804A $I_{C} = 125 \text{ mA}$ $I_{C} = 125 \text{ mA}$ $I_{C} = 200 \text{ mA}$ $I_{C} = 350 \text{ mA}$			13 2.4 2.7 3 5 6 7 8	V		
h <sub>FE</sub>	DC forward current gain (Figure 5)	for ULQ2801A, V <sub>CE</sub> = 2 V, I <sub>C</sub> = 350 mA	1000					
C <sub>I</sub>	Input capacitance			15	25 <sup>(1)</sup>	pF		
t <sub>PLH</sub>	Turn-on delay time	0.5 V <sub>I</sub> to 0.5V <sub>O</sub>		0.25	1 (1)	μs		
t <sub>PHL</sub>	Turn-off delay time	0.5 V <sub>I</sub> to 0.5V <sub>O</sub>		0.25	1 <sup>(1)</sup>	μs		
	Clamp diode leakage current	V <sub>R</sub> = 50 V			50	^		
I <sub>R</sub>	(Figure 9)	T <sub>A</sub> = 105°C, V <sub>R</sub> = 50 V			100	μA		
V <sub>F</sub>	Clamp diode forward voltage (Figure 10)	I <sub>F</sub> = 350 mA		1.7	2	V		

<sup>1.</sup> Guaranteed by design.

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#### 5 Test circuits

Figure 3. Output leakage current

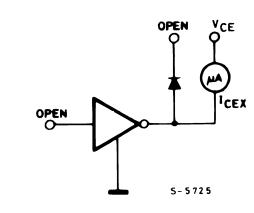


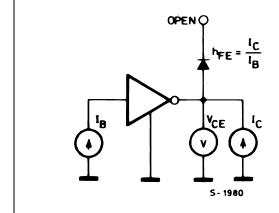
Figure 4. Output leakage current

OPEN
VCE

ICEX

5 -5 726

Figure 5. Collector-emitter saturation voltage



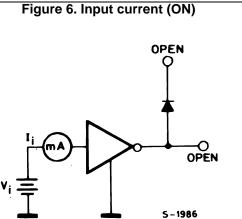
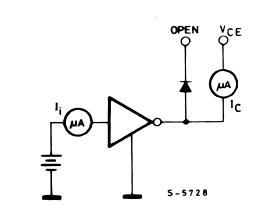
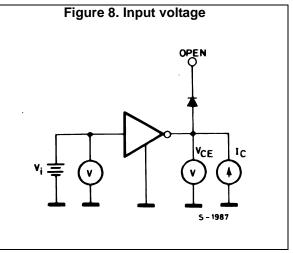


Figure 7. Input current (OFF)





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Figure 9. Clamp diode leakage current S - 5727

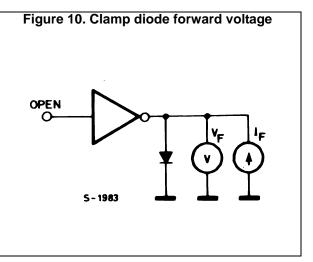
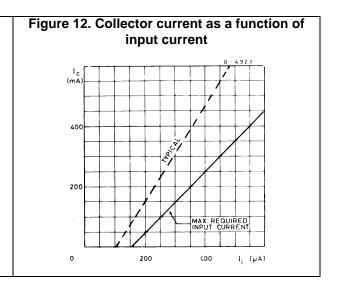
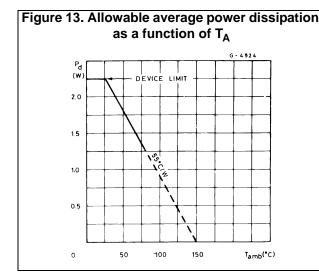
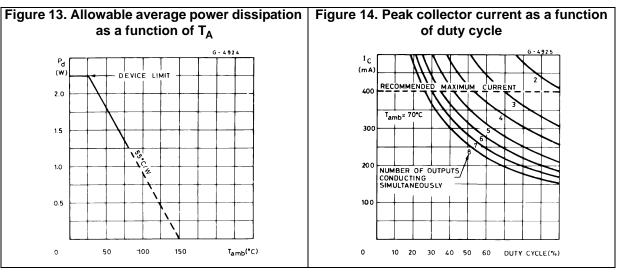


Figure 11. Collector current as a function of saturation voltage G - 4922 I<sub>c</sub> (mA) 600 400 200 1.0 1.5 V<sub>CE(sat)</sub>(V)







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Figure 15. Peak collector current as a function of duty

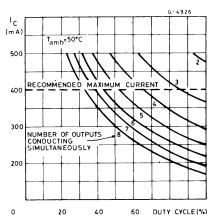


Figure 16. Input current as a function of input voltage (for ULQ2802A)

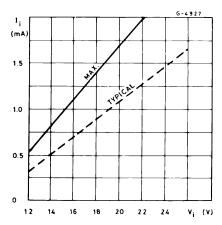


Figure 17. Input current as a function of input voltage (for ULQ2804A)

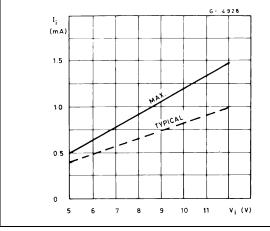
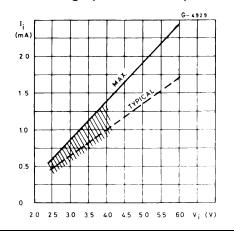


Figure 18. Input current as a function of input voltage (for ULQ2803A)



### 6 Package mechanical data

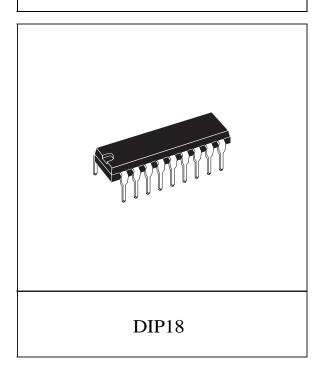
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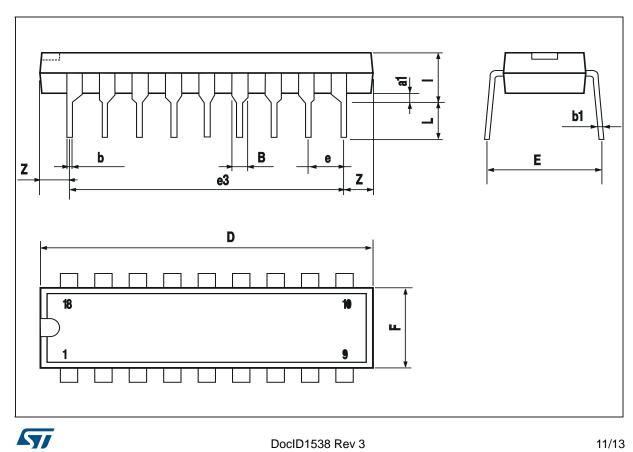
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DIM.	mm			inch		
DIVI.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
В	1.39		1.65	0.055		0.065
b		0.46			0.018	
b1		0.25			0.010	
D			23.24			0.915
Е		8.5			0.335	
e		2.54			0.100	
e3		20.32			0.800	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z		1.27	1.59		0.050	0.063

#### **OUTLINE AND** MECHANICAL DATA





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# 7 Revision history

**Table 5. Document revision history** 

Date	Revision	Changes	
19-Sep-2003	1	First issue.	
25-Jun-2008	2	Added: Table 1 on page 1.	
27-Jun-2018	3	Updated: I <sub>I(ON)</sub> test condition in <i>Table 4: Electrical characteristics</i> .	



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