

### 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 kΩ input resistor and zener for 14-25 V PMOS; the ULQ2803A has a 2.7 kΩ input resistor for 5 V TTL and CMOS; the ULQ2804A has a 10.5 kΩ 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**

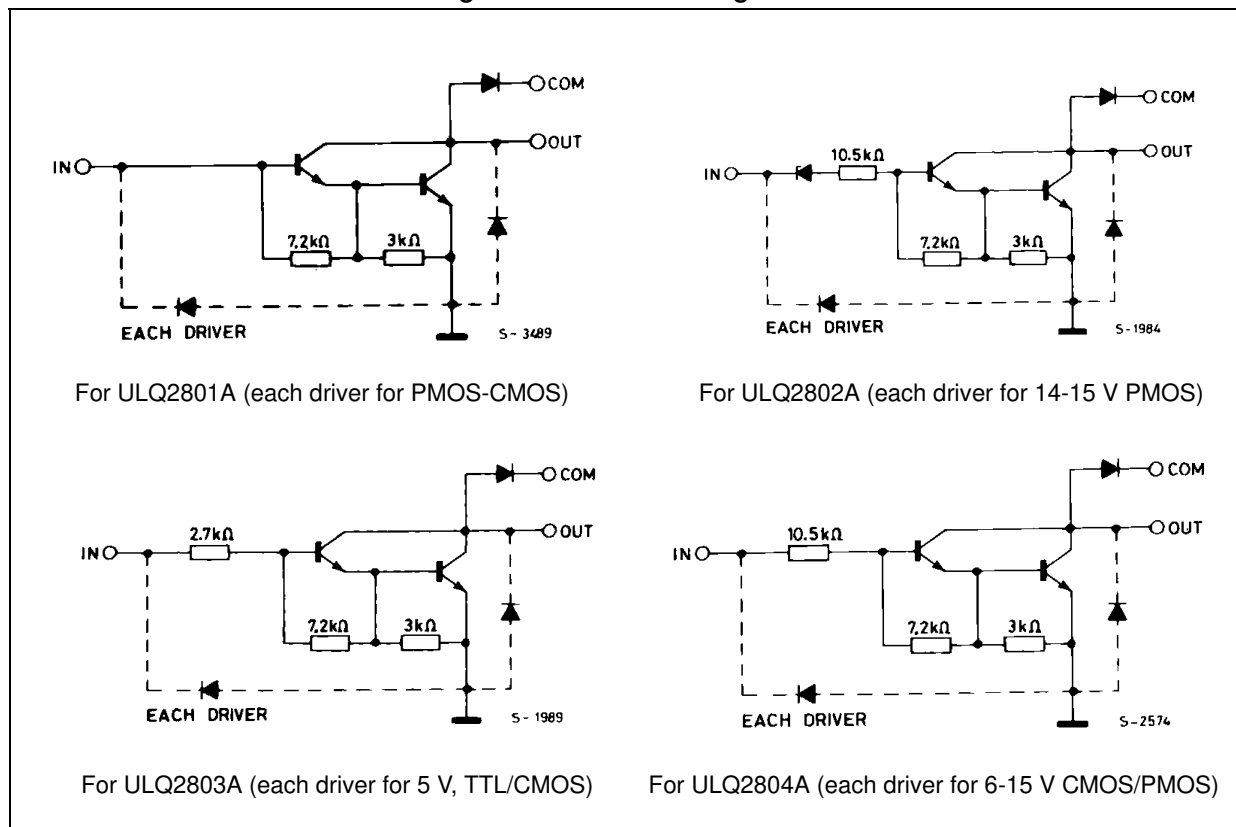
Order codes	Package
ULQ2801A	DIP-18
ULQ2802A	
ULQ2803A	
ULQ2804A	

# Contents

1	<b>Diagrams</b> .....	3
2	<b>Pin configuration</b> .....	4
3	<b>Maximum ratings</b> .....	5
4	<b>Electrical characteristics</b> .....	6
5	<b>Test circuits</b> .....	7
6	<b>Package mechanical data</b> .....	10
7	<b>Revision history</b> .....	12

# 1 Diagrams

Figure 1. Schematic diagrams



For ULQ2801A (each driver for PMOS-CMOS)

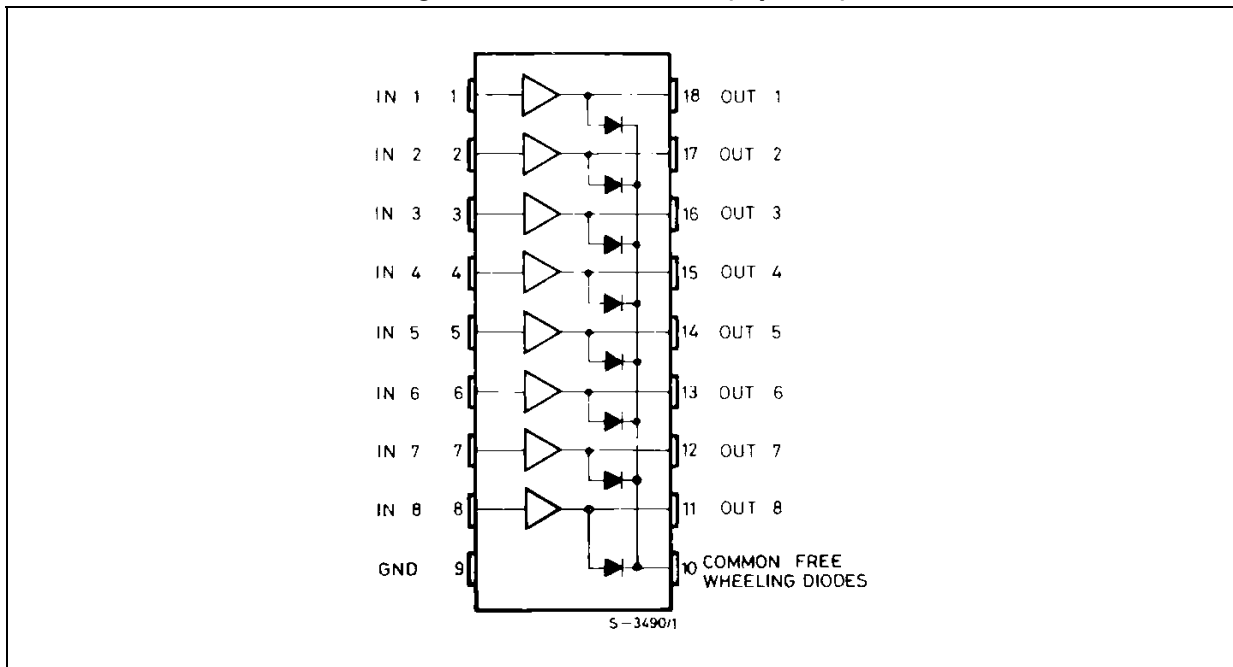
For ULQ2802A (each driver for 14-15 V PMOS)

For ULQ2803A (each driver for 5 V, TTL/CMOS)

For ULQ2804A (each driver for 6-15 V CMOS/PMOS)

## 2 Pin configuration

Figure 2. Pin connections (top view)



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_O$	Output voltage	50	V
$V_I$	Input voltage (for ULQ2802A - ULQ2803A - ULQ2804A)	30	V
$I_C$	Continuous collector current	500	mA
$I_B$	Continuous base current	25	mA
$P_{TOT}$	Power dissipation (one Darlington pair)	1	W
	Power dissipation (total package)	2.25	
$T_A$	Operating ambient temperature range	- 40 to 85	°C
$T_{STG}$	Storage temperature range	- 55 to 150	°C

**Table 3. Thermal data**

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

## 4 Electrical characteristics

$T_A = 25\text{ °C}$  unless otherwise specified.

**Table 4. Electrical characteristics**

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$I_{CEX}$	Output leakage current	$V_{CE} = 50\text{ V}$ , (Figure 7)			50	$\mu\text{A}$
		$T_A = 105\text{ °C}$ , $V_{CE} = 50\text{ V}$ (Figure 7)			100	
		$T_A = 105\text{ °C}$ for ULQ2802A, $V_{CE} = 50\text{ V}$ , $V_I = 6\text{ V}$ (Figure 8)			500	
		$T_A = 105\text{ °C}$ for ULQ2804A, $V_{CE} = 50\text{ V}$ , $V_I = 1\text{ V}$ (Figure 8)			500	
$V_{CE(SAT)}$	Collector-emitter saturation voltage (Figure 9)	$I_C = 100\text{ mA}$ , $I_B = 250\text{ }\mu\text{A}$		0.9	1.1	V
		$I_C = 200\text{ mA}$ , $I_B = 350\text{ }\mu\text{A}$		1.1	1.3	
		$I_C = 350\text{ mA}$ , $I_B = 500\text{ }\mu\text{A}$		1.3	1.6	
$I_{I(ON)}$	Input current (Figure 6)	for ULQ2802A, $V_I = 17\text{ V}$		0.82	1.25	mA
		for ULQ2803A, $V_I = 3.85\text{ V}$		0.93	1.35	
		for ULQ2804A, $V_I = 5\text{ V}$		0.35	0.5	
		$V_I = 12\text{ V}$		1	1.45	
$I_{I(OFF)}$	Input current (Figure 7)	$T_A = 105\text{ °C}$ , $I_C = 500\text{ }\mu\text{A}$	50	65		$\mu\text{A}$
$V_{I(ON)}$	Input voltage (Figure 8)	$V_{CE} = 2\text{ V}$ , for ULQ2802A			13	V
		$I_C = 300\text{ mA}$				
		for ULQ2803A				
		$I_C = 200\text{ mA}$			2.4	
		$I_C = 250\text{ mA}$			2.7	
		$I_C = 300\text{ mA}$			3	
		for ULQ2804A				
		$I_C = 125\text{ mA}$			5	
$I_C = 200\text{ mA}$			6			
$I_C = 275\text{ mA}$			7			
$I_C = 350\text{ mA}$			8			
$h_{FE}$	DC forward current gain (Figure 5)	for ULQ2801A, $V_{CE} = 2\text{ V}$ , $I_C = 350\text{ mA}$	1000			
$C_I$	Input capacitance			15	25 <sup>(1)</sup>	pF
$t_{PLH}$	Turn-on delay time	$0.5\text{ }V_I$ to $0.5V_O$		0.25	1 <sup>(1)</sup>	$\mu\text{s}$
$t_{PHL}$	Turn-off delay time	$0.5\text{ }V_I$ to $0.5V_O$		0.25	1 <sup>(1)</sup>	$\mu\text{s}$
$I_R$	Clamp diode leakage current (Figure 9)	$V_R = 50\text{ V}$			50	$\mu\text{A}$
		$T_A = 105\text{ °C}$ , $V_R = 50\text{ V}$			100	
$V_F$	Clamp diode forward voltage (Figure 10)	$I_F = 350\text{ mA}$		1.7	2	V

1. Guaranteed by design.

## 5 Test circuits

Figure 3. Output leakage current

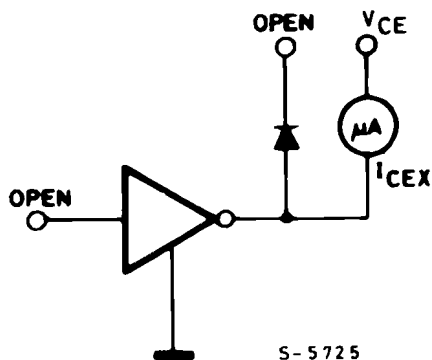


Figure 4. Output leakage current

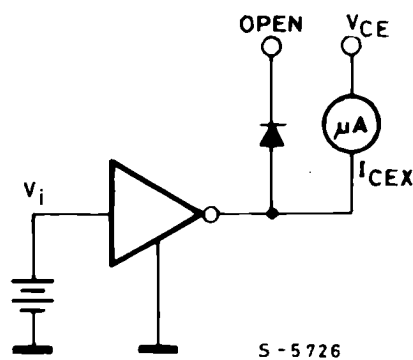


Figure 5. Collector-emitter saturation voltage

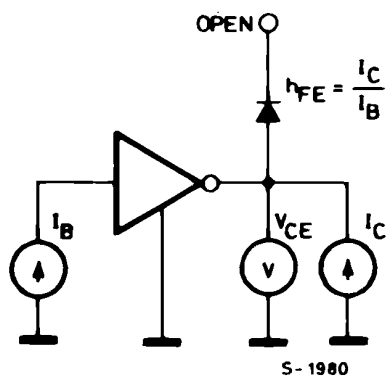


Figure 6. Input current (ON)

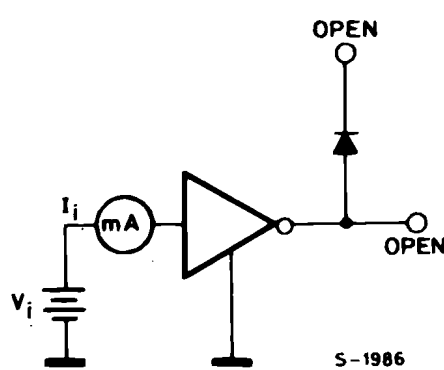


Figure 7. Input current (OFF)

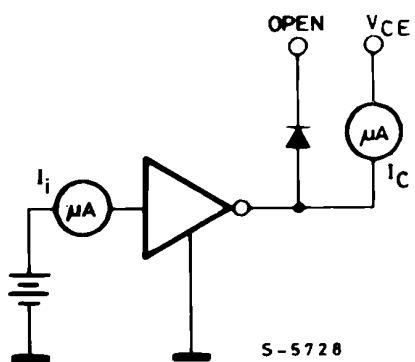
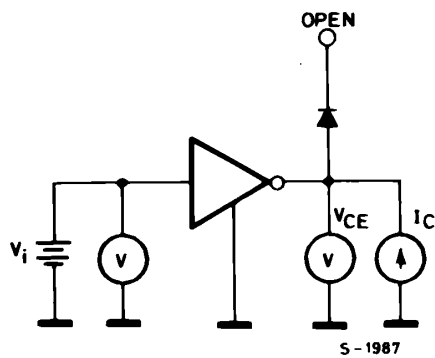
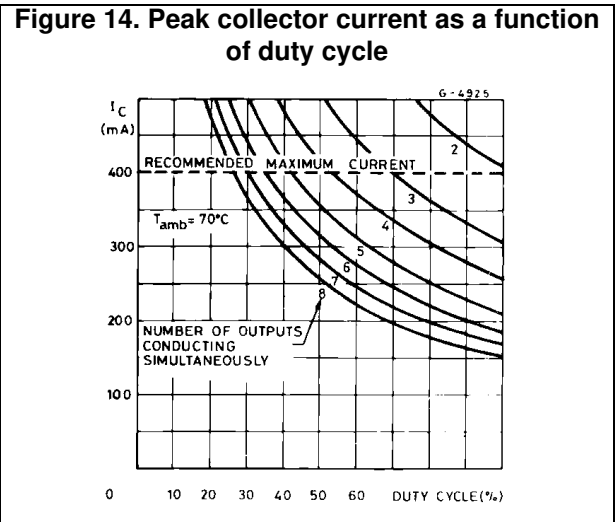
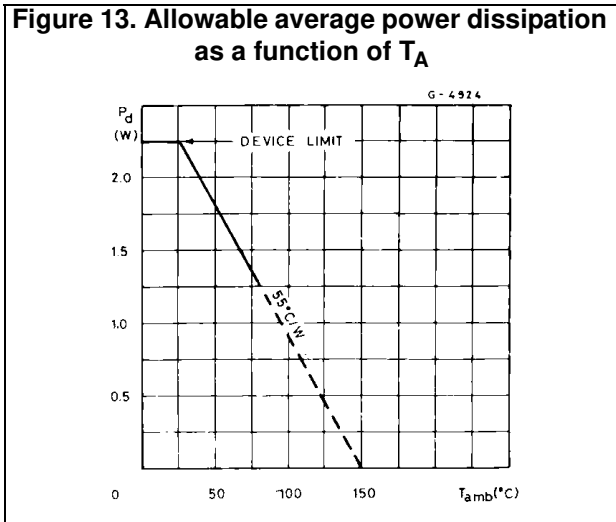
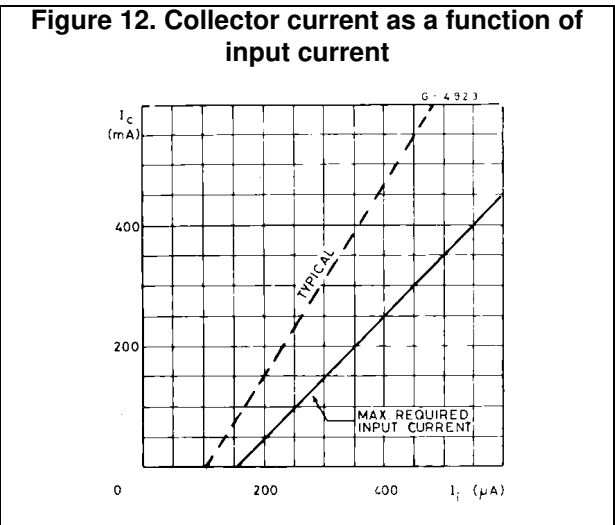
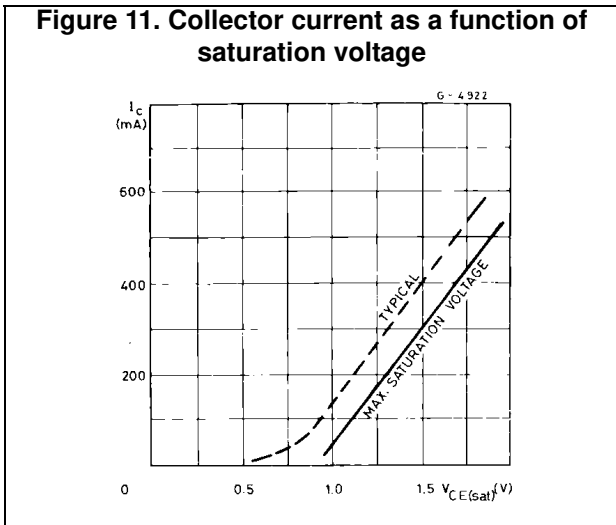
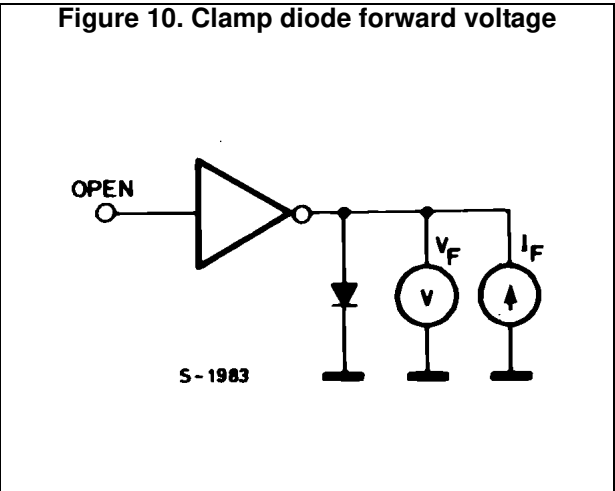
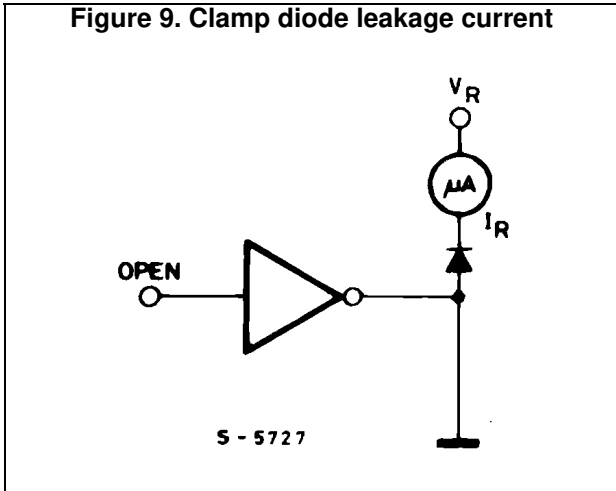


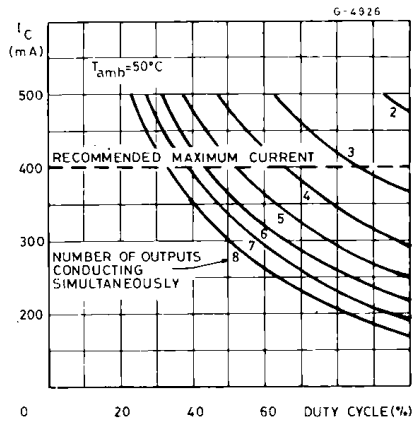
Figure 8. Input voltage



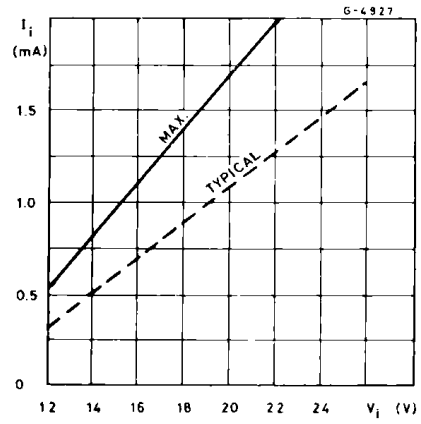




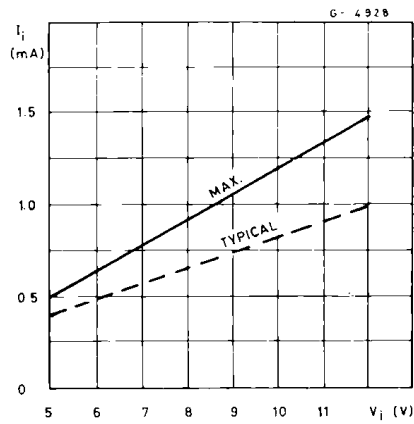
**Figure 15. Peak collector current as a function of duty**



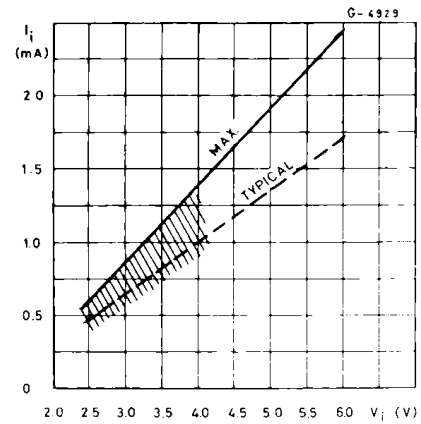
**Figure 16. Input current as a function of input voltage (for ULQ2802A)**



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



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

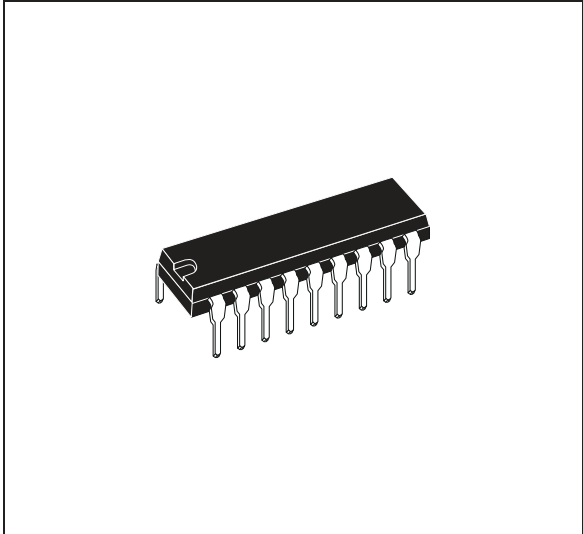


## 6 Package mechanical data

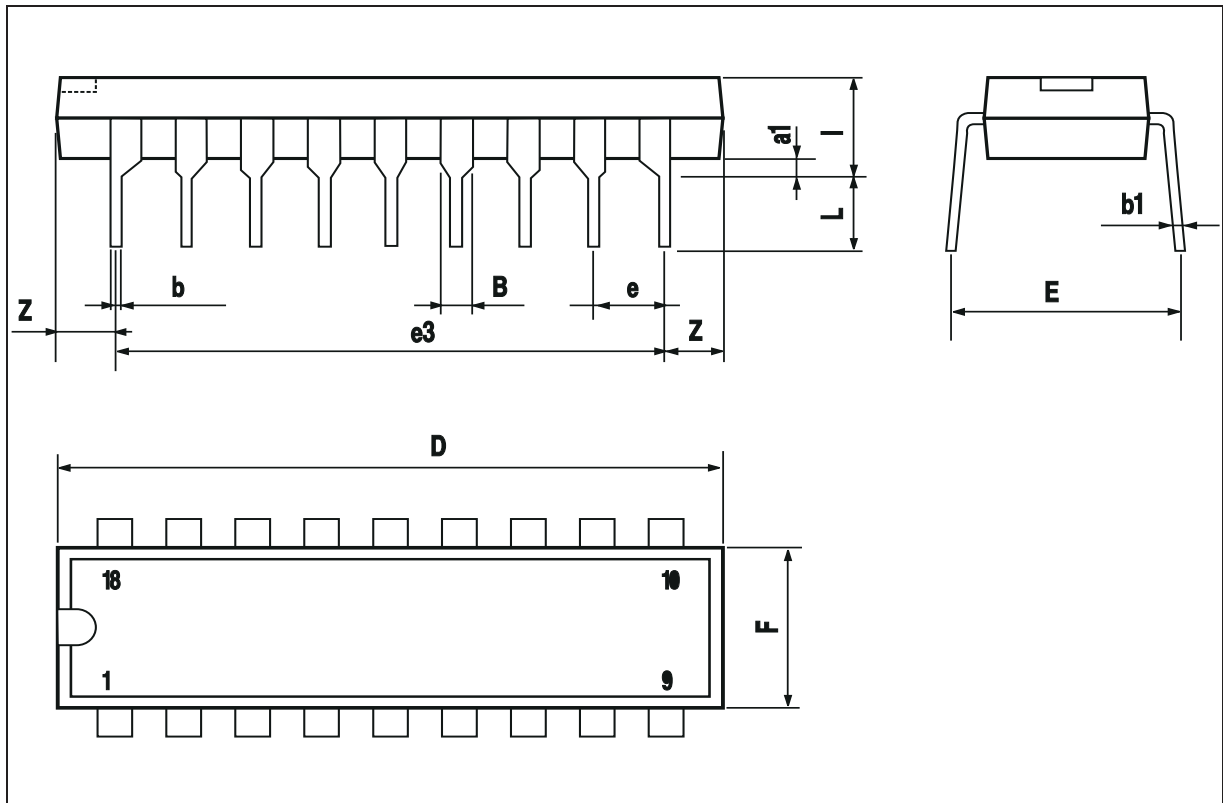
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.46			0.018	
b1		0.25			0.010	
D			23.24			0.915
E		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



DIP18



## 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: $I_{I(ON)}$ test condition in <a href="#">Table 4: Electrical characteristics</a> .

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved