

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.

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

Table 1. Device summary

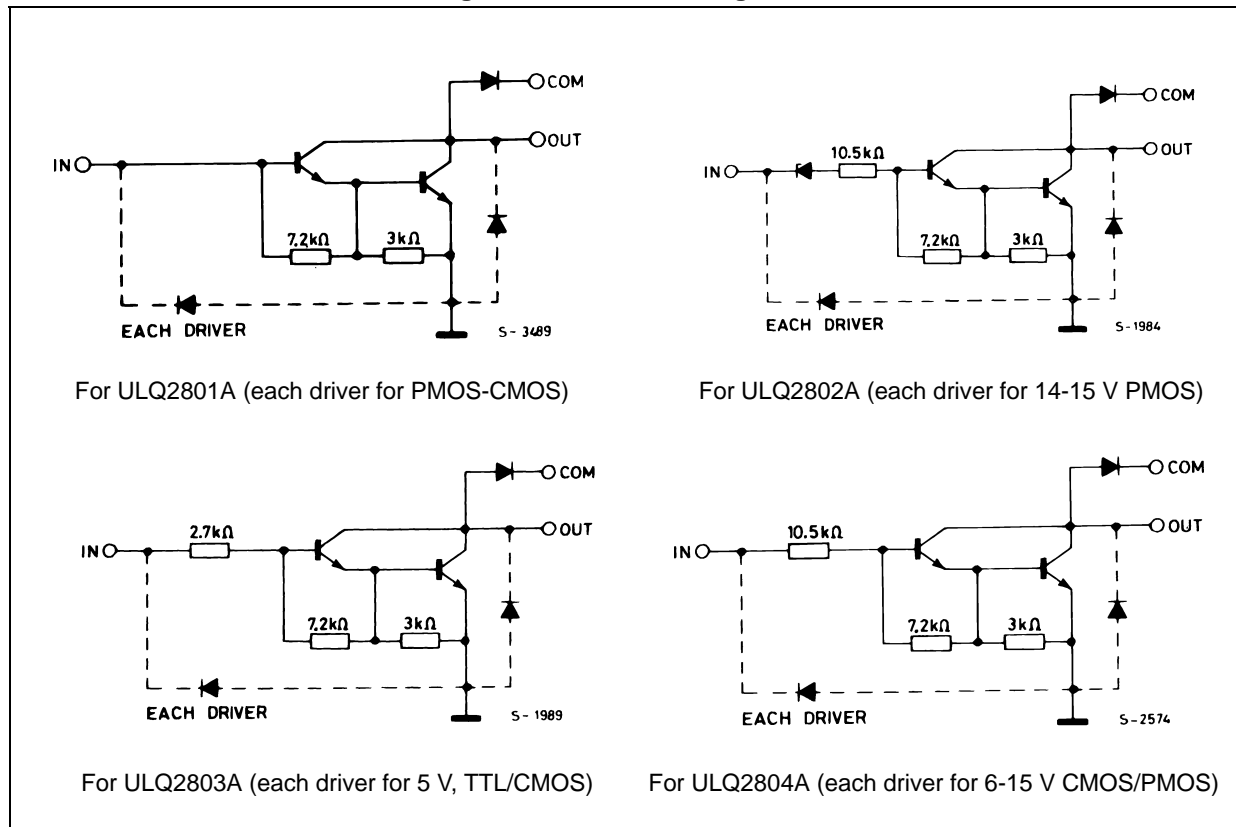
| Order codes | Package |
|-------------|---------|
| ULQ2801A | DIP-18 |
| ULQ2802A | |
| ULQ2803A | |
| ULQ2804A | |

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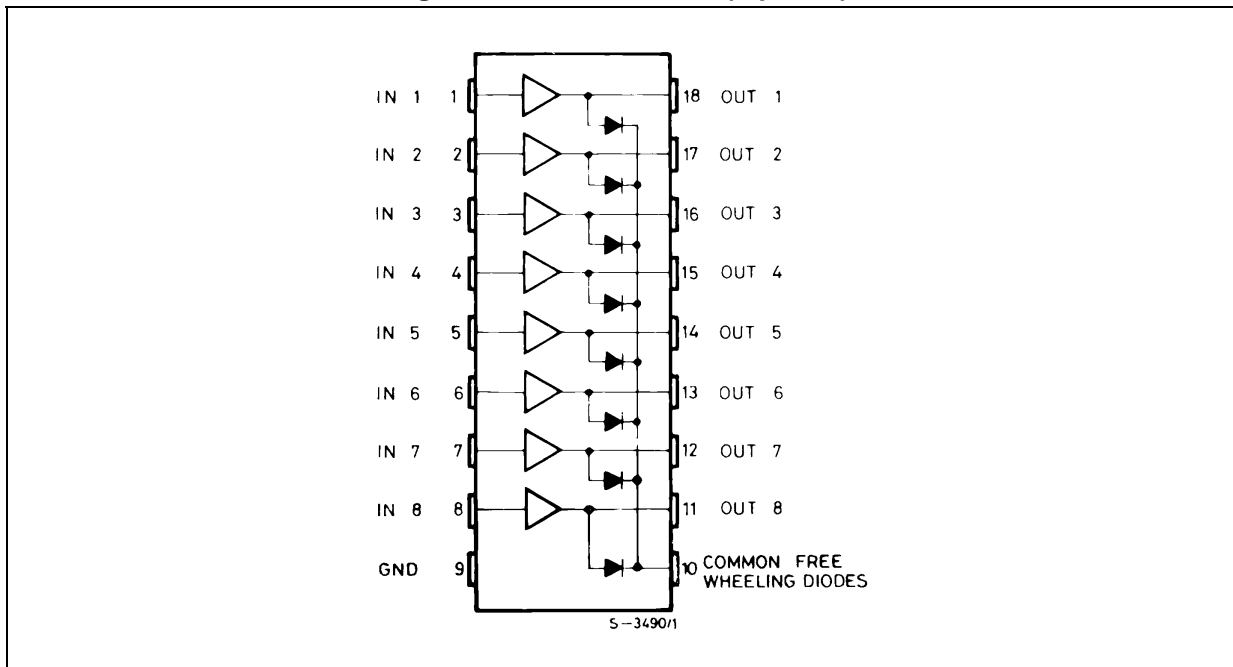
1 Diagrams

Figure 1. Schematic diagrams



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

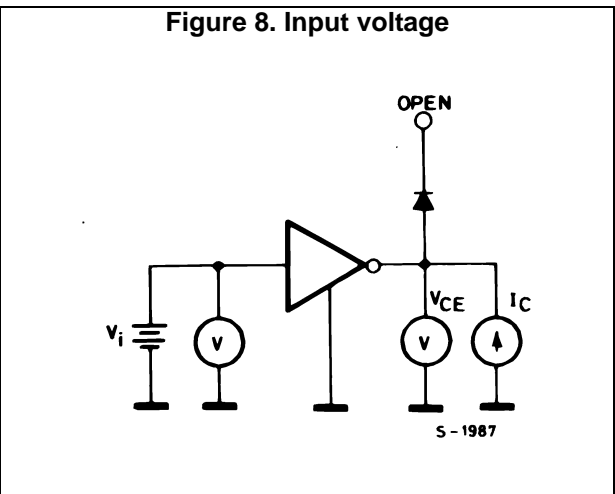
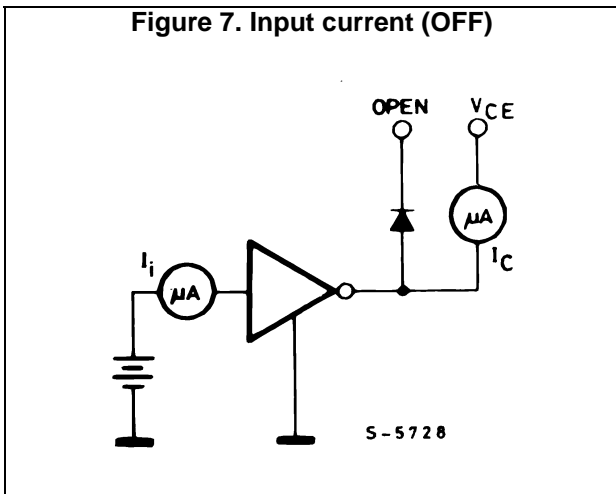
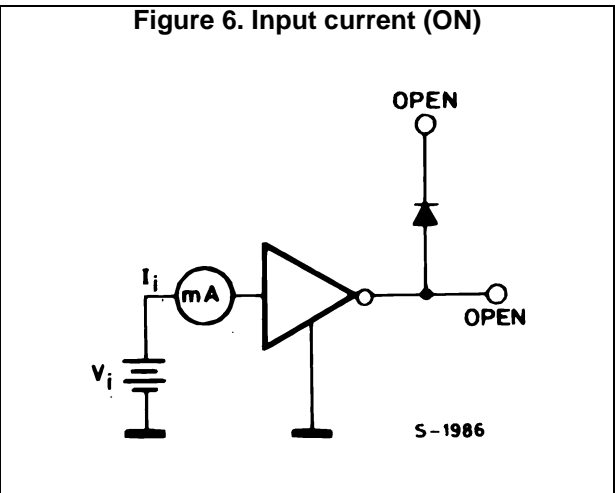
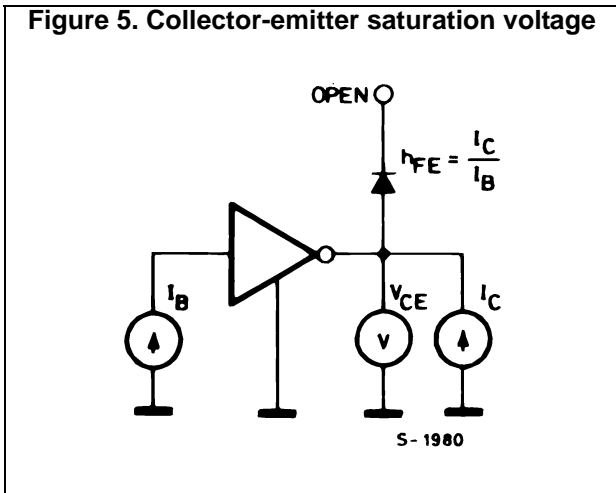
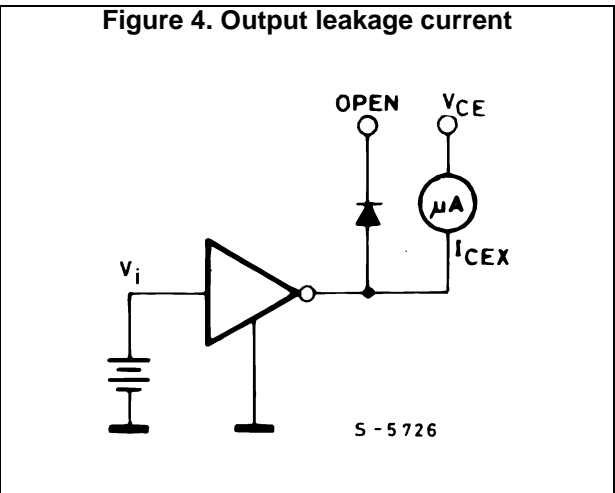
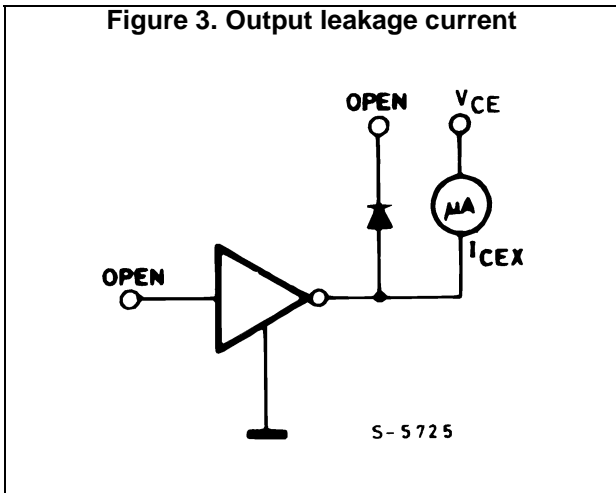
$T_A = 25\text{ °C}$ unless otherwise specified.

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 | μA |
| | | $T_A = 105\text{ °C}$, $V_{CE} = 50\text{ V}$ (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 | | μA |
| $V_{I(ON)}$ | 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 ⁽¹⁾ | pF |
| t_{PLH} | Turn-on delay time | 0.5 V_I to 0.5 V_O | | 0.25 | 1 ⁽¹⁾ | μs |
| t_{PHL} | Turn-off delay time | 0.5 V_I to 0.5 V_O | | 0.25 | 1 ⁽¹⁾ | μs |
| I_R | Clamp diode leakage current (Figure 9) | $V_R = 50\text{ V}$ | | | 50 | μA |
| | | $T_A = 105\text{ °C}$, $V_R = 50\text{ V}$ | | | 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



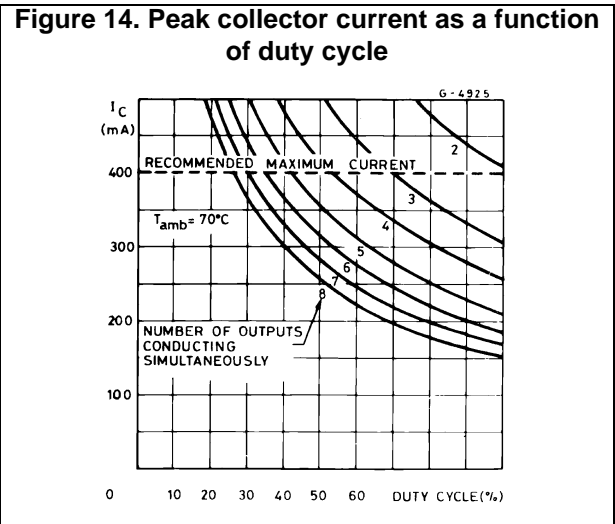
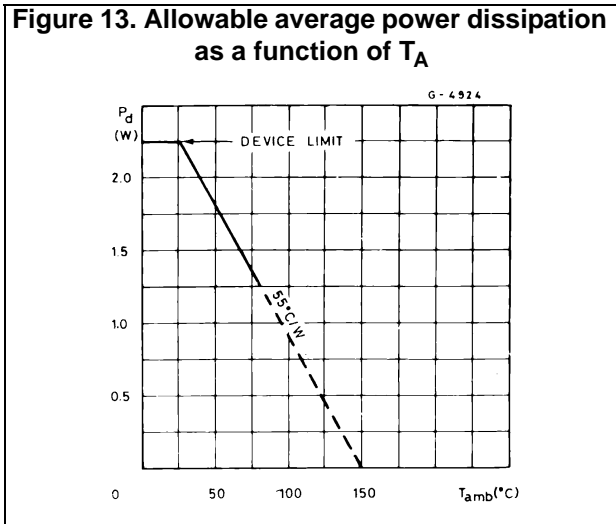
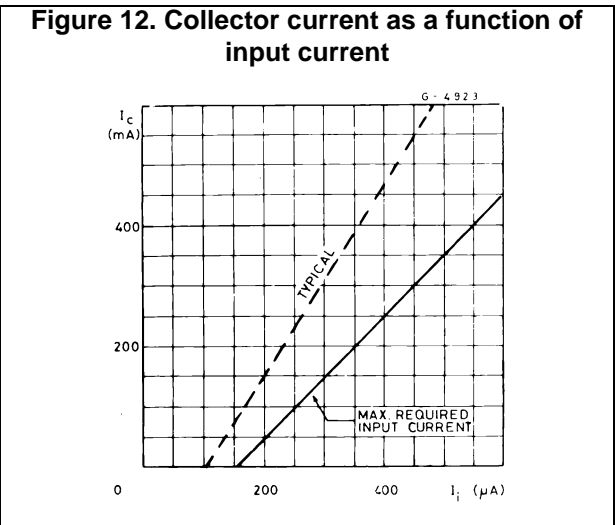
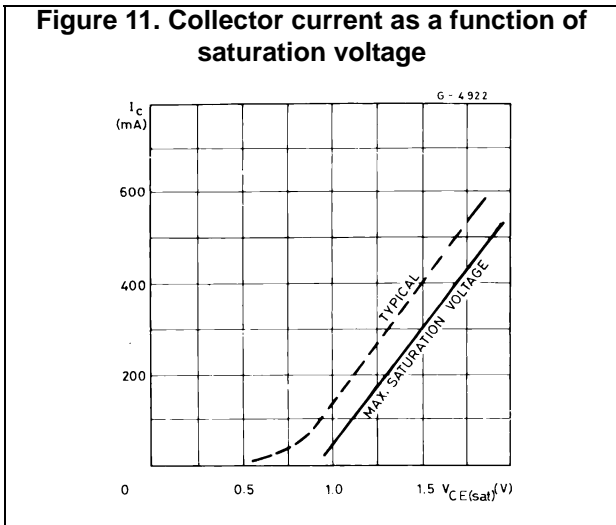
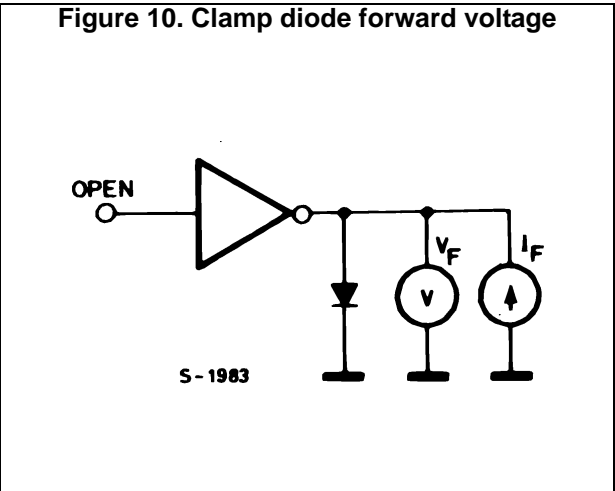
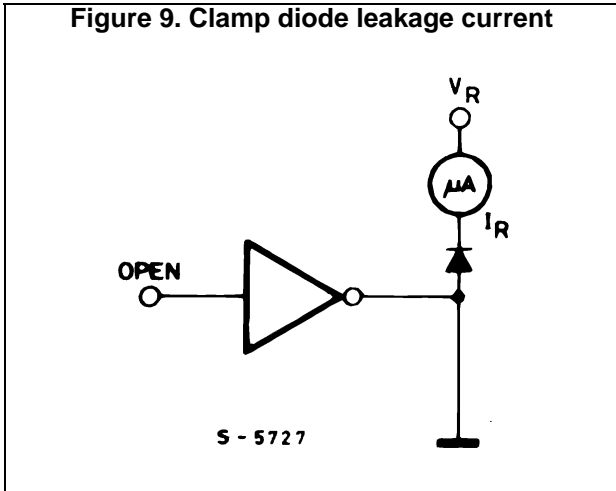


Figure 15. Peak collector current as a function of duty

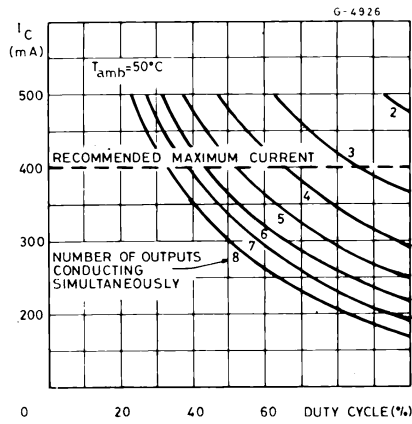


Figure 16. Input current as a function of input voltage (for ULQ2802A)

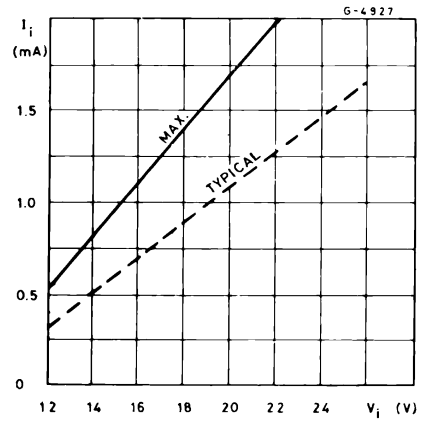


Figure 17. Input current as a function of input voltage (for ULQ2804A)

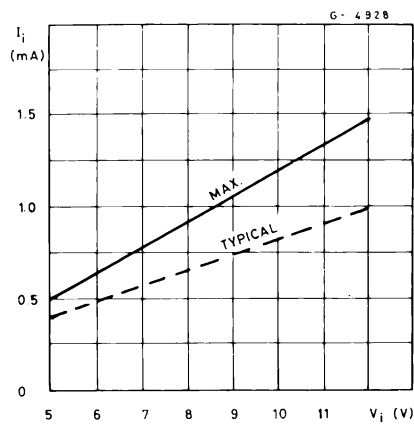
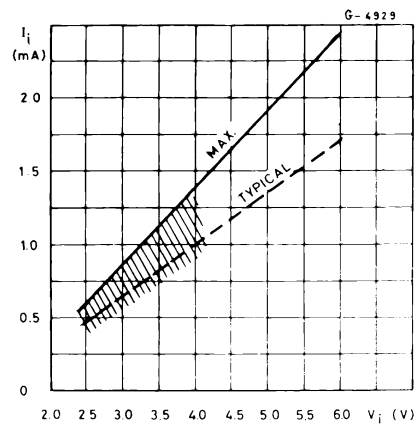


Figure 18. Input current as a function of input voltage (for ULQ2803A)

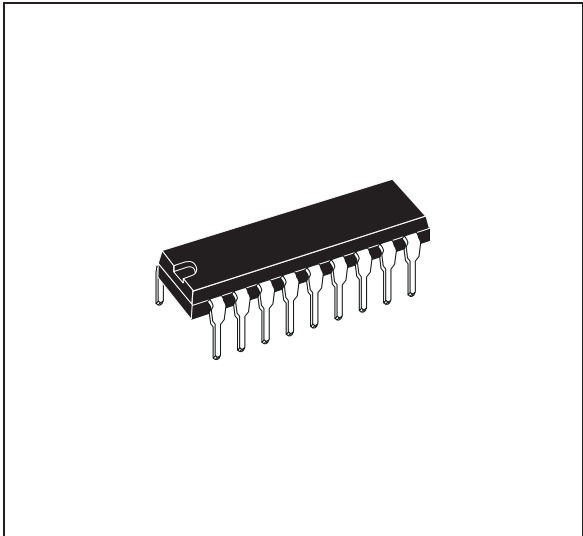


6 Package mechanical data

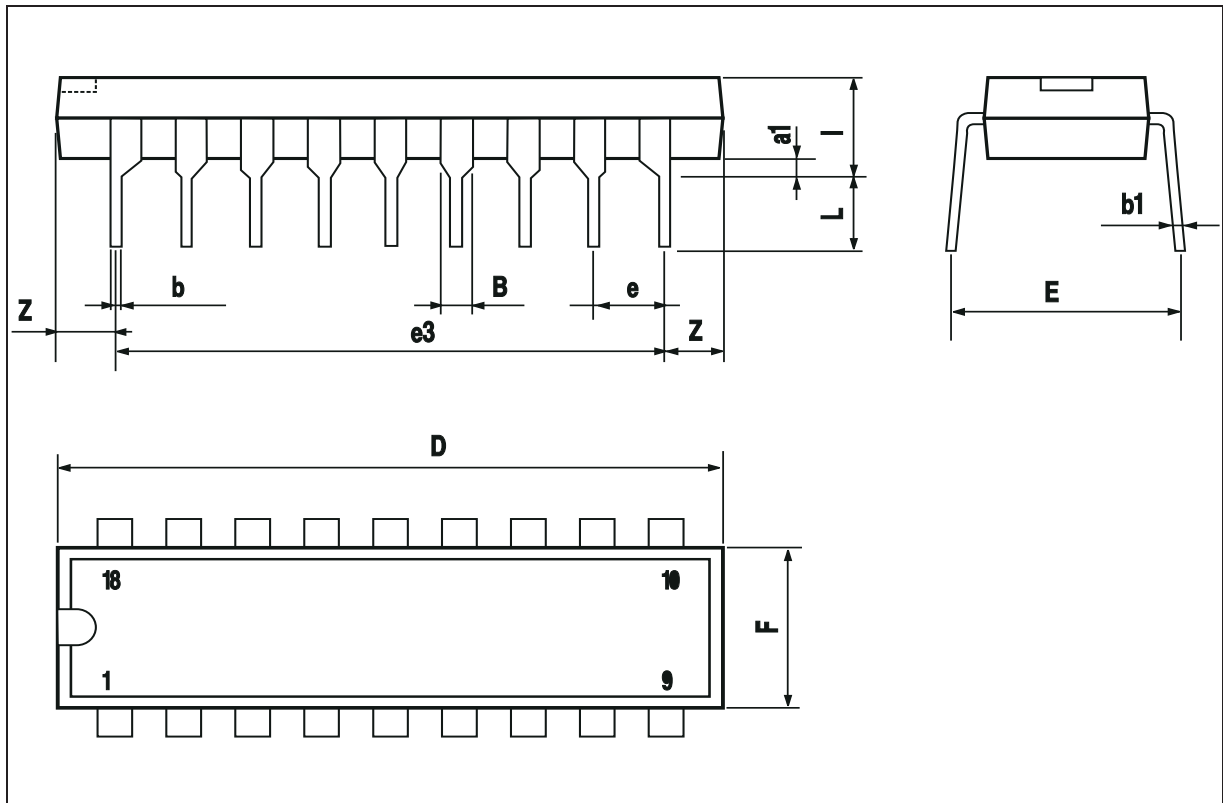
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| DIM. | mm | | | inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.254 | | | 0.010 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.46 | | | 0.018 | |
| b1 | | 0.25 | | | 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 Table 4: Electrical characteristics . |

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