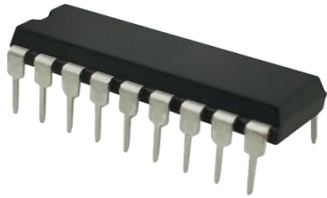


Description

The ULN2803A contain eight Darlington transistors with common emitters and integral suppression diodes for inductive loads. Each Darlington features current rating of 500 mA and can withstand at least 50 V in the OFF state. Outputs may be paralleled for higher current capability.

Four versions are available to simplify interfacing to standard logic families: the ULN2803A has a 2.7 k Ω input resistor for 5 V TTL and CMOS.

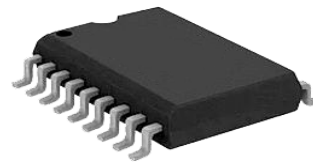
It is supplied in an 18-lead plastic DIP with a copper lead form and feature the convenient input-opposite-output pinout to simplify board layout.



DIP-18

Features

- Eight Darlington transistors with common emitters
- 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



SOP-18

Table 1. Device summary

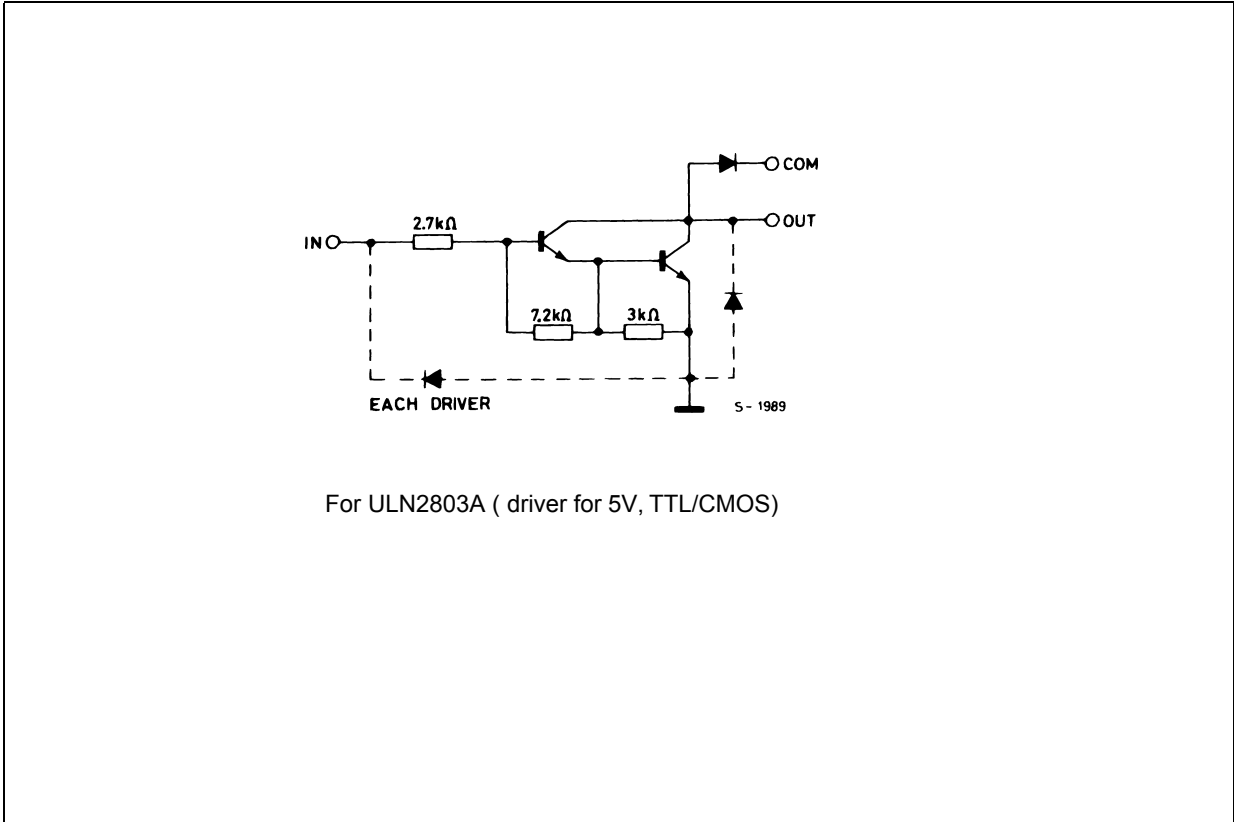
| Order codes | Package |
|-------------|---------|
| ULN2803APG | DIP-18 |
| ULN2803AFW | SOP-18 |

Contents

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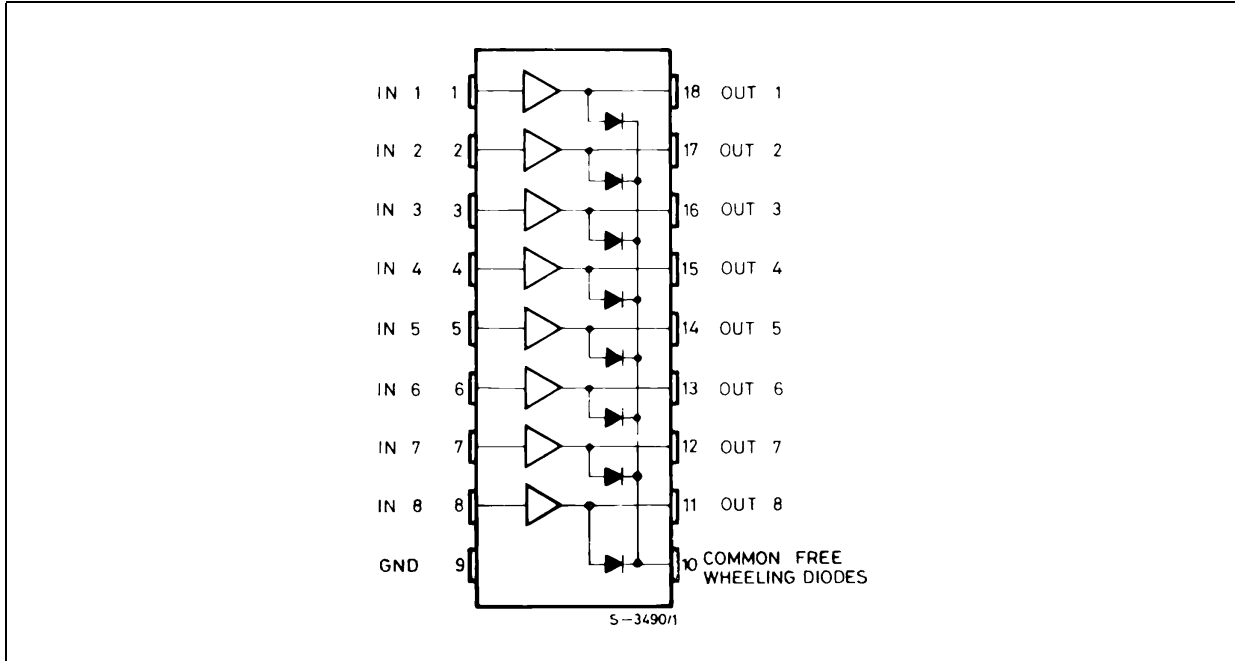
1 Diagram

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 ULN2803A) | 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 | - 20 to 85 | °C |
| T_{STG} | Storage temperature range | - 55 to 150 | °C |
| T_J | Junction temperature | -20 to 150 | °C |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|-------------------------------------|-------|------|
| R_{thJA} | Thermal resistance junction-ambient | 55 | °C/W |

4 Electrical characteristics

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

Table 4. Electrical characteristics

| Symbol | Parameter | Test condition | Min. | Typ. | Max. | Unit |
|---------------|---|---|------|------|-----------------|---------------|
| I_{CEX} | Output leakage current | $V_{CE} = 50\text{V}$ | | | | μA |
| | | $T_A = 70\text{ }^\circ\text{C}$, $V_{CE} = 50\text{ V}$ (Figure 3) | | | 50 | |
| | | $I_C = 100\text{ mA}$, $I_B = 250\text{ }\mu\text{A}$ | | 0.9 | 1.1 | |
| | | $I_C = 200\text{ mA}$, $I_B = 350\text{ }\mu\text{A}$ | | 1.1 | 1.3 | |
| $V_{CE(SAT)}$ | Collector-emitter saturation voltage (Figure 4) | $I_C = 350\text{ mA}$, $I_B = 500\text{ }\mu\text{A}$ | | 1.3 | 1.6 | V |
| | | for ULN2803A, $V_I = 3.85\text{ V}$ | | 0.93 | 1.35 | |
| | | $T_A = 70\text{ }^\circ\text{C}$, $I_C = 500\text{ }\mu\text{A}$ | | 1 | 1.45 | |
| $I_{I(ON)}$ | Input current (Figure 5) | for ULN2803A $I_C = 200\text{ mA}$ $I_C = 250\text{ mA}$ $I_C = 300\text{ mA}$ | | | 2.4 2.7 3 | mA |
| | | | 1000 | | | |
| | | $0.5 V_I$ to $0.5V_O$ $0.5 V_I$ to $0.5V_O$ | | 0.25 | 1 | |
| | | | | | 50 | |
| $I_{I(OFF)}$ | Input current (Figure 6) | $V_R = 50\text{ V}$ | | | 100 | μA |
| $V_{I(ON)}$ | Input voltage (Figure 7) | $T_A = 70\text{ }^\circ\text{C}$, $V_R = 50\text{ V}$ | | 1.7 | 2 | V |
| h_{FE} | DC Forward current gain (Figure 4) | $I_F = 350\text{ mA}$ | | | | |
| C_I | Input capacitance | | | | | pF |
| t_{PLH} | Turn-on delay time | | | | | μs |
| t_{PHL} | Turn-off delay time | | | | | μs |
| I_R | Clamp diode leakage current (Figure 8) | | | | | μA |
| | | | | | | |
| V_F | Clamp diode forward voltage (Figure 9) | | | | | V |

5 Test circuits

Figure 3. Output leakage current

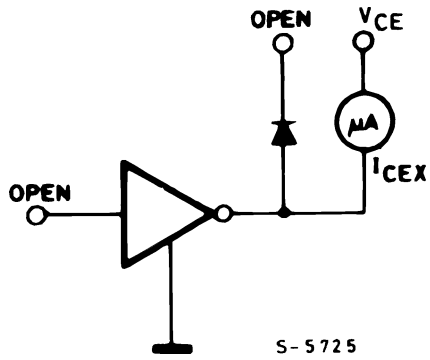


Figure 4. Collector-emitter saturation voltage

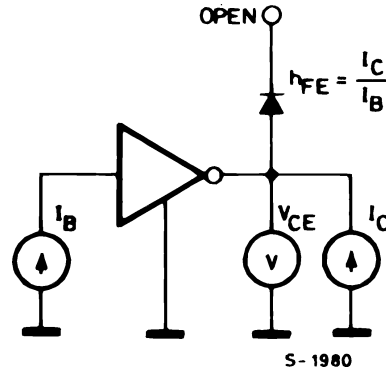


Figure 5. Input current (ON)

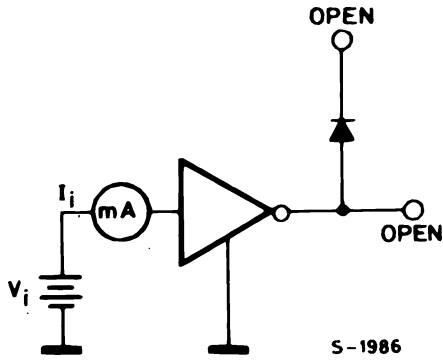


Figure 6. Input current (OFF)

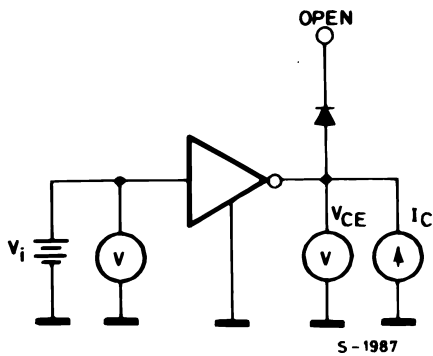
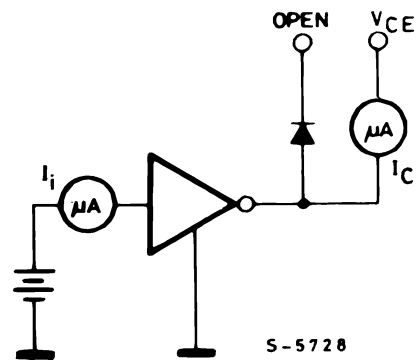


Figure 8. Clamp diode leakage current

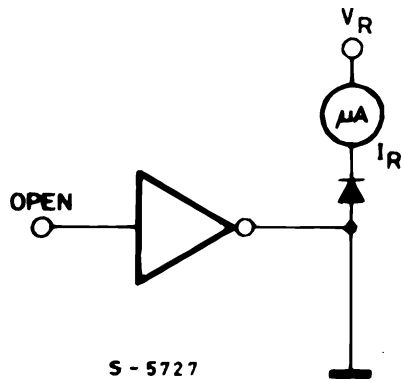
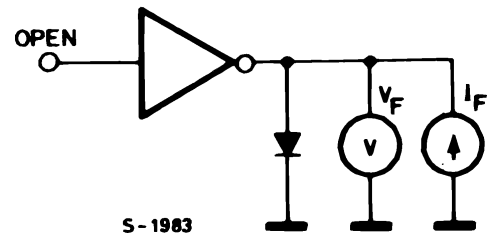


Figure 9. Clamp diode forward voltage



6 Typical performance characteristics

Figure 10. Collector current as a function of saturation voltage

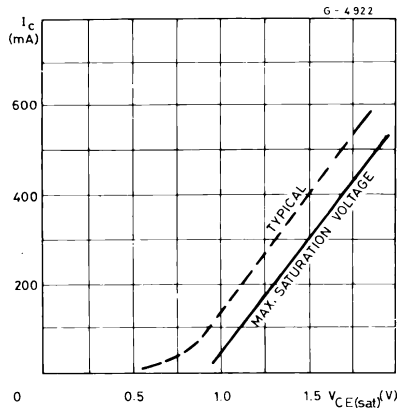


Figure 11. Collector current as a function of input current

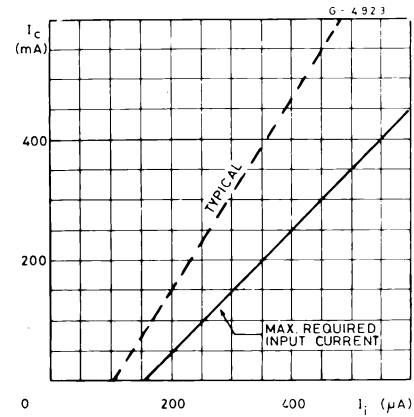


Figure 12. Allowable average power dissipation as a function of T_A

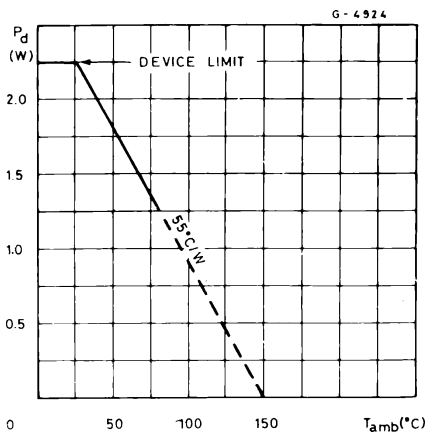


Figure 13. Peak collector current as a function of duty cycle

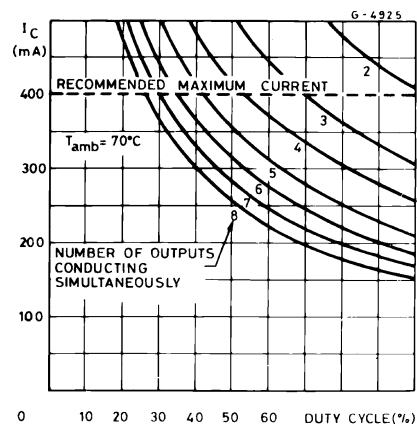
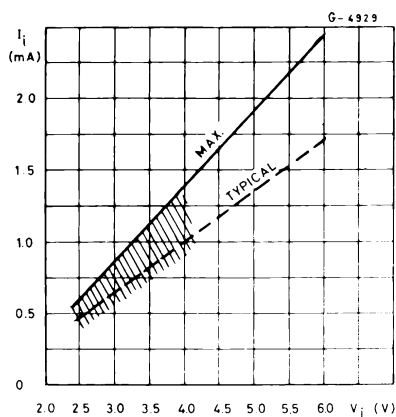


Figure 14. Input current as a function of input voltage (for ULN2803A)



7 Package mechanical data

Table 5. DIP-18 mechanical data

| Dim. | mm. | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| a1 | 0.254 | | |
| B | 1.39 | | 1.65 |
| b | | 0.46 | |
| b1 | | 0.25 | |
| D | | | 23.24 |
| E | | 8.5 | |
| e | | 2.54 | |
| e3 | | 20.32 | |
| F | | | 7.1 |
| I | | | 3.93 |
| L | | 3.3 | |
| Z | | 1.27 | 1.59 |

Figure 15. DIP-18 package dimensions

