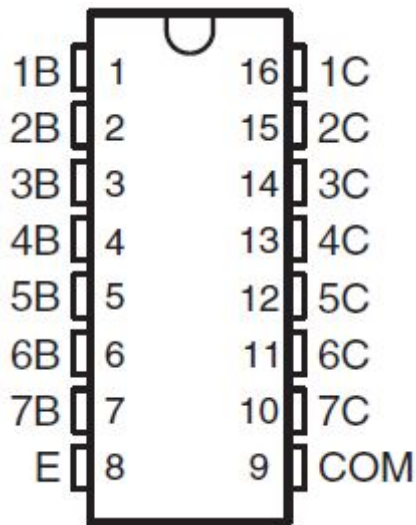
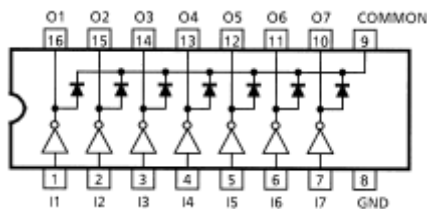


ULN2003A

The **ULN2003A** is an array of seven NPN Darlington transistors capable of 500 mA, 50 V output. It features common-cathode flyback diodes for switching inductive loads. It can come in PDIP, SOIC, SOP or TSSOP packaging.^{[1][2]} In the same family are ULN2002A, ULN2004A, as well as ULQ2003A and ULQ2004A, designed for different logic input levels.



ULN2003A pinout



ULN2003A pinout and functional diagram

The ULN2003A is also similar to the ULN2001A (4 inputs) and the ULN2801A, ULN2802A, ULN2803A, ULN2804A and ULN2805A, only differing in logic input

levels (TTL, CMOS, PMOS) and number of in/outputs (4/7/8).^[3]

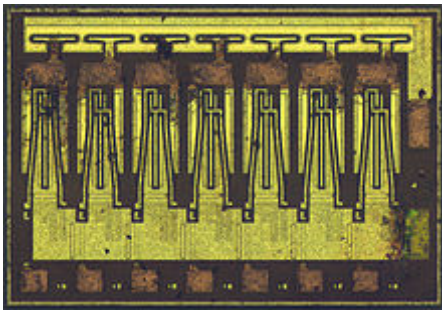
Darlington Transistor

A Darlington transistor (also known as Darlington pair) achieves very high current amplification by connecting two bipolar transistors in direct DC coupling so the current amplified by the first transistor is amplified further by the second one. The resultant current gain is the product of those of the two component transistors:

$$\beta_{\text{total}} \approx \beta_1 \cdot \beta_2$$

The seven Darlington pairs in ULN2003 can operate independently except the common cathode diodes that connect to their respective collectors.

Features



Chip die for ULN2003.

The ULN2003 is known for its high-current, high-voltage capacity. The drivers can be paralleled for even higher current output. Even further, stacking one

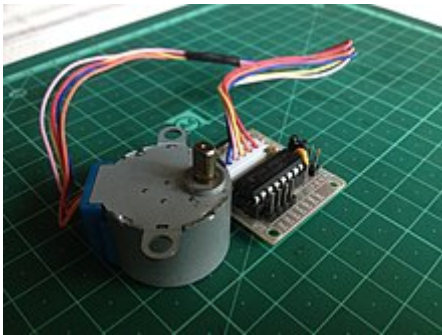
chip on top of another, both electrically and physically, has been done. Generally it can also be used for interfacing with a stepper motor, where the motor requires high ratings which cannot be provided by other interfacing devices.

Main specifications:

- 500 mA rated collector current (single output)
- 50 V output (there is a version that supports 100 V output)
- Includes output flyback diodes
- Inputs compatible with TTL and 5-V CMOS logic

Applications

Typical usage of the ULN2003A is in driver circuits for relays, lamp and LED displays, stepper motors, logic buffers and line drivers.



A ULN2003 installed in a breakout board to be used as a unipolar stepper motor driver with a 28BYJ stepper motor on the left.

References

Wikimedia Commons has media related to **ULN2003**.

1. *Texas, Instruments. "ULN2003A Datasheet" (PDF).*
2. *TOSHIBA, CORPORATION. "ULN2003 Datasheet" .*
3. *Texas, Instruments. "ULN2803A data sheet" (PDF).*

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