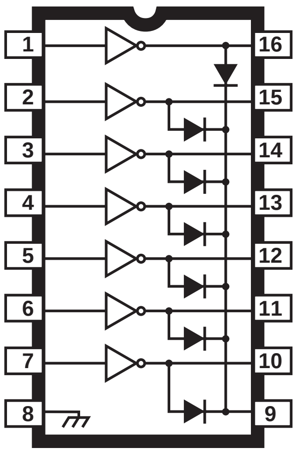
7003

Data Sheet
29304.10

HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAY



Dwg. No. A-9594

ABSOLUTE MAXIMUM RATINGS at T_A = +25°C

Output Voltage, V_{CEX} . . . . **135 V**

Output Sustaining Voltage,

$V_{CE(sus)}$ . . . . **90 V**

Output Current, I_C . . . . **300 mA**

Input Current, I_{IN} . . . . **25 mA**

Package Power Dissipation,

P_D . . . . **See Graph**

Operating Temperature Range,

T_A . . . . **-20°C to +85°C**

Storage Temperature Range,

T_S . . . . **-55°C to +150°C**

Output current may be limited by duty cycle, number of drivers operating, ambient temperature, and heat sinking. Under any set of conditions, do not exceed the specified maximum current rating or a junction temperature of 150°C.

Integrating seven high-voltage, high-current npn Darlingtons into a monolithic power array, the ULN7003A is designed for interfacing between TTL or CMOS logic and a variety of peripheral loads. The seven open-collector Darlington outputs are specified for 135 V minimum breakdown and 90 V minimum sustaining. Included are integral power diodes for switching inductive loads. Typical applications include relays, lamps, print heads and hammers, solenoids, and level shifting to power discretes.

The ULN7003A includes input current-limiting resistors compatible with the drive capabilities of TTL and (most) CMOS operating at a nominal logic supply of 5 V. Operation with 12 V CMOS may require additional input current limiting.

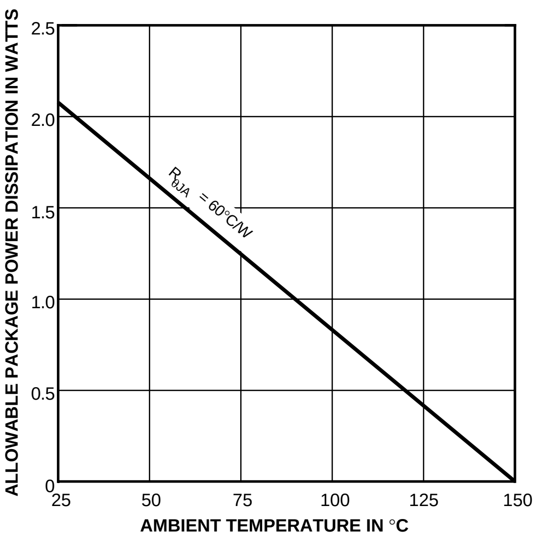
The high sustaining voltage rating of this power array makes it ideal for inductive load applications where Zener diode flyback techniques are used. The increased flyback voltage provides a much faster inductive load turn-OFF current decay that is especially useful with dc stepper motors, solenoids, and print heads.

The ULN7003A is pinned with outputs opposite inputs to facilitate ease of circuit board layout. It is supplied in a 16-pin plastic dual in-line package with a copper lead frame to maximize device power dissipation capabilities.

FEATURES

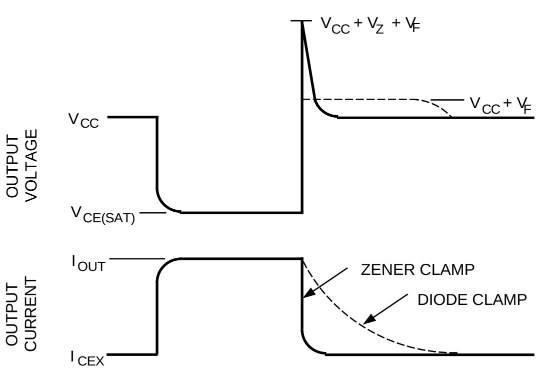
- 150 V Minimum Output Breakdown
- 90 V Minimum Sustaining Voltage
- 300 mA Output Current
- Internal High-Current Clamp Diodes
- Logic-Compatible Inputs

Always order by complete part number: **ULN7003A** .



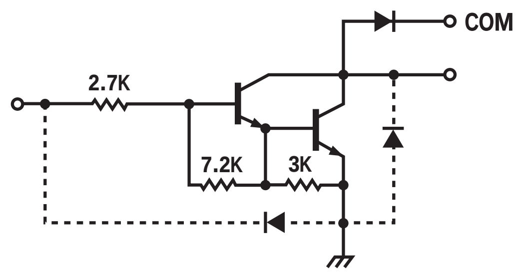
Dwg. No. GP-016

A Zener diode can be used to increase the flyback voltage. This gives a much faster inductive load turn-OFF current decay. The maximum Zener voltage plus the load supply voltage plus the internal diode forward voltage must not exceed the device's rated sustaining voltage.



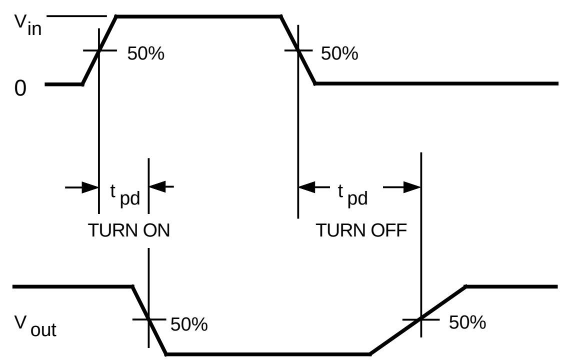
Dwg. No. WP-001

PARTIAL SCHEMATIC
(ONE OF SEVEN DRIVERS)



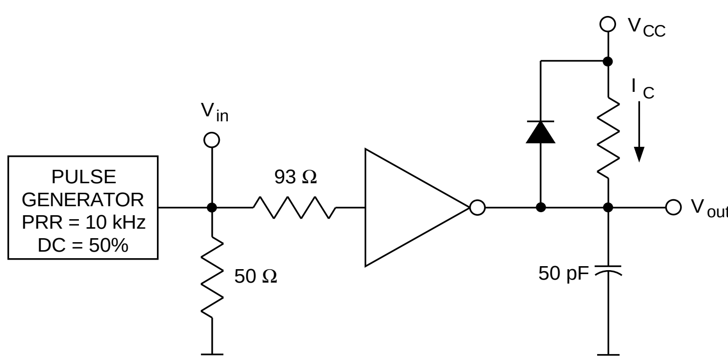
Dwg. No. A-9651

SWITCHING DELAY TEST CIRCUIT



V_{in} = 3.5 V for ULN7003A

Dwg. No. WP-010



Dwg. No. EP-020

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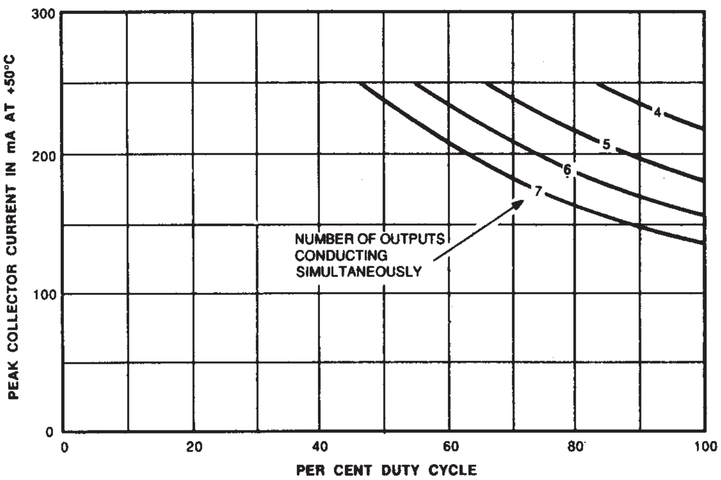
ELECTRICAL CHARACTERISTICS at T_A = +25°C (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Output Leakage Current	I_{CEX}	V_{CE} = 135 V	—	—	50	µA
		V_{CE} = 135 V, T_A = +70°C	—	—	100	µA
Output Sustaining Voltage	$V_{CE(sus)}$	I_C = 250 mA, L = 2 mH	90	—	—	V
Output Saturation Voltage	$V_{CE(SAT)}$	I_C = 100 mA, I_{IN} = 250 µA	—	1.1	1.3	V
		I_C = 250 mA, I_{IN} = 350 µA	—	1.3	1.6	V
Input Current	$I_{IN(ON)}$	V_{IN} = 3.85 V	—	0.93	1.35	mA
	$I_{IN(OFF)}$	I_C = 500 µA, T_A = +70°C	50	65	—	µA
Input Voltage	$V_{IN(ON)}$	V_{CE} = 2.0 V, I_C = 200 mA	—	—	2.4	V
		V_{CE} = 2.0 V, I_C = 250 mA	—	—	2.7	V
Input Capacitance	C_{IN}		—	15	25	pF
Switching Delay	t_{pd}	Turn On, I_C = 250 mA	—	0.05	1.0	µs
		Turn Off, I_C = 250 mA	—	0.5	1.0	µs
Clamp Diode Leakage Current	I_R	V_R = 150 V	—	—	50	µA
		V_R = 150 V, T_A = +70°C	—	—	100	µA
Clamp Diode Forward Voltage	V_F	I_F = 250 mA	—	1.7	2.0	V

Typical Data is for design information only.

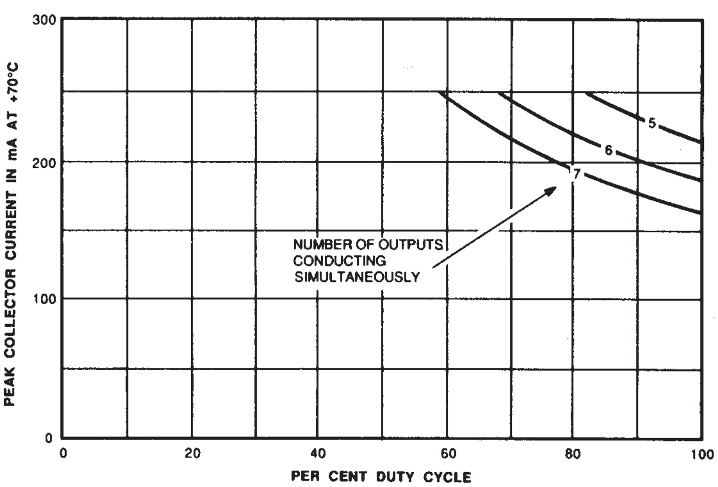
ALLOWABLE PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE

at T_A = +50°C



Dwg. No. GP-015

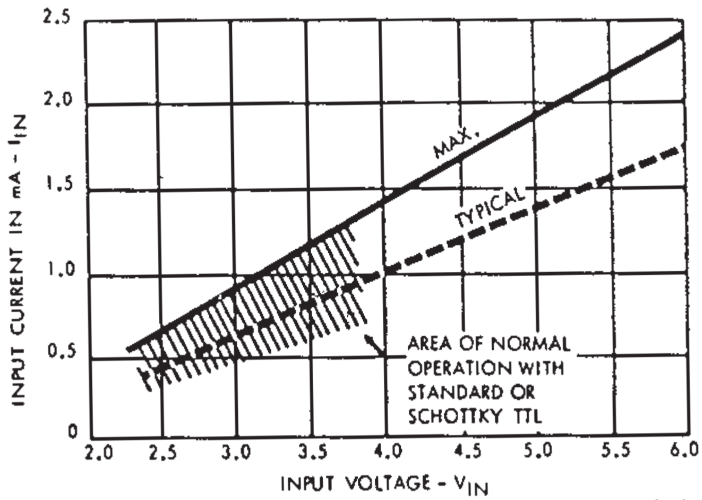
at T_A = +70°C



Dwg. No. GP-015-1

INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE

at T_A = +25°C



Dwg. No. A-9756B

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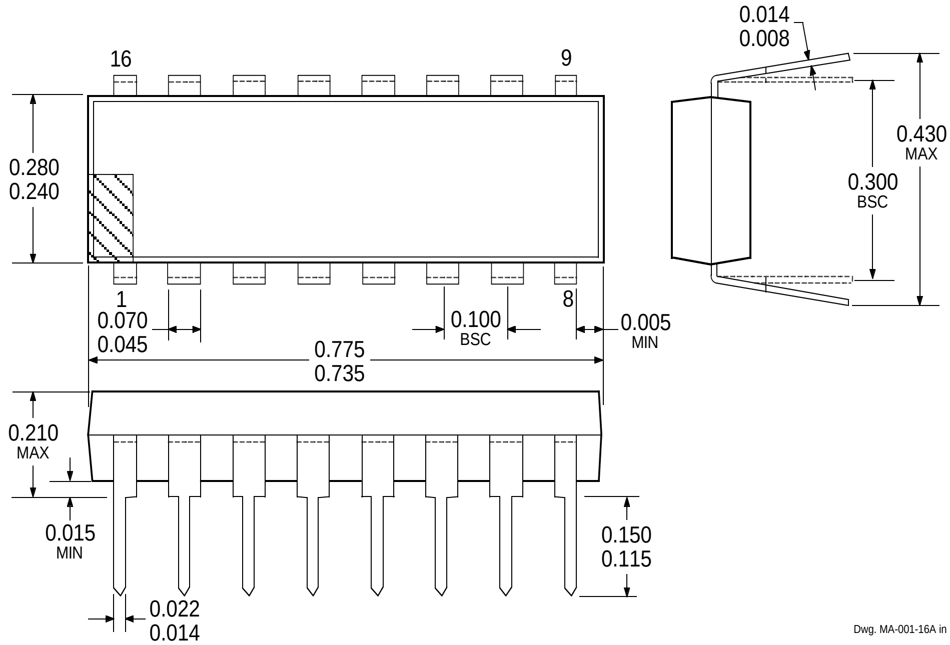
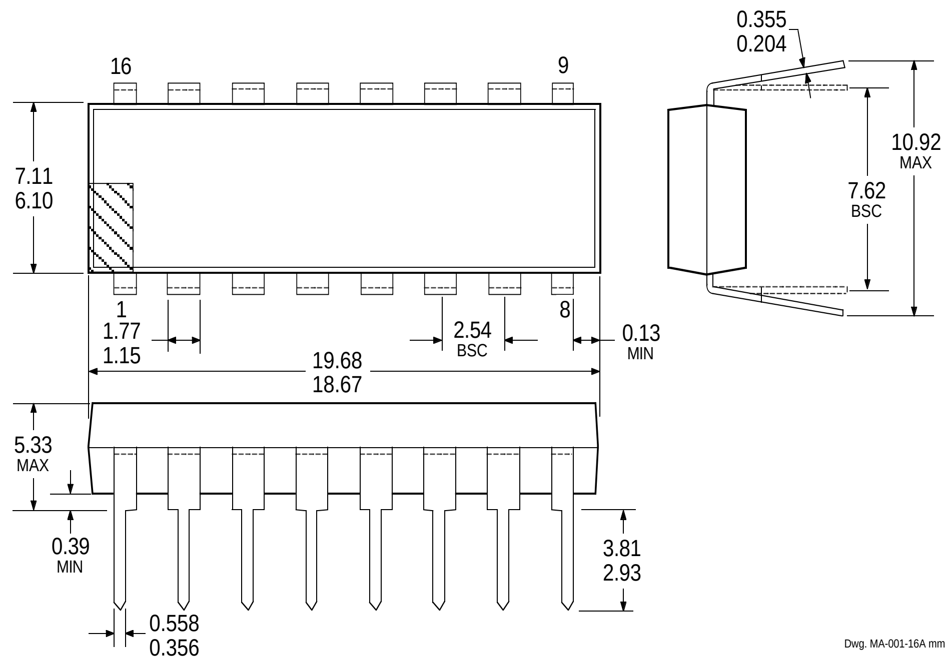
Dimensions in Inches



Dimensions in Millimeters
(Based on 1" = 25.4 mm)



NOTES:
1. Lead thickness is measured at seating plane or below.
2. Lead spacing tolerance is non-cumulative.
3. Exact body and lead configuration at vendor's option within limits shown.

HIGH-VOLTAGE (≥60 V) PERIPHERAL POWER AND DISPLAY DRIVERS

IN ORDER OF 1) OUTPUT VOLTAGE, 1) OUTPUT CURRENT, 3) NUMBER OF DRIVERS

Output Ratings*			Features					
V	mA	#	Serial Input	Latched Drivers	Diode Clamp	Saturated Outputs	Internal Protection	Part Number †
60	-25	8	–	X	–	–	–	5815
	-25	10	X	X	Active Pull-Down	–	–	5810-F
	-25	12	X	X	–	–	–	5811
	-25	20	X	X	Active Pull-Down	–	–	5812-F
	-25	32	X	X	Active Pull-Down	–	–	5818-F
	300	2	Hall Sensor/Driver		–	X	–	5275 ‡
	600	4	–	–	–	X	X	2547
	600	4	–	–	X	X	X	2549
	600	4	–	–	X	X	X	2559
	700	4	–	–	X	X	X	2543
	4000	4	–	–	X	–	–	2944
80	-350	8	–	–	X	–	–	2983 and 2984
	350	8	–	X	X	X	–	5842
	-350	8	X	X	X	–	–	5890
	1500	4	–	–	–	X	–	2065 and 2069
	4000	4	–	–	X	–	–	2879
-80	-350	8	–	–	X	–	–	2588-1
85	-25	8	–	–	–	–	–	6118
150	250	7	–	–	X	–	–	7003

* Current is maximum test condition; voltage is absolute maximum allowable.
Negative current is defined as coming out of (sourcing) the output.

† Complete part number includes additional characters to indicate operating temperature range and package style.

‡ Hall-Effect sensor.

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