Features

- 500-mA-Rated Collector Current(single output)
- High-Voltage Outputs:50V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay-Driver Applications

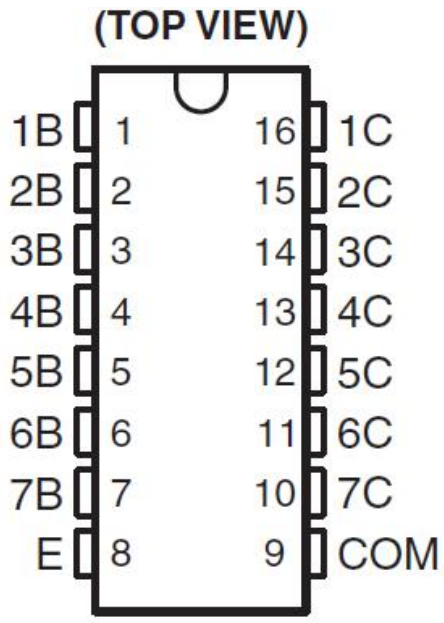
General Description

The 2003 is high-voltage high-current Darlington transistor arrays each containing seven open collector common emitter pairs. Each pair is rated at 500mA. Suppression diodes are included for inductive load driving, the inputs and outputs are pinned in opposition to simplify board layout.

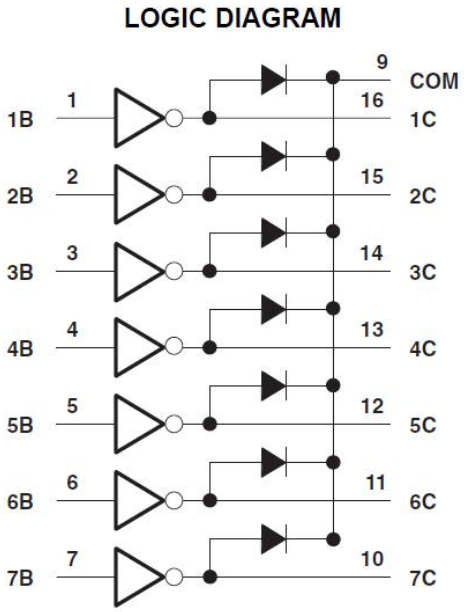
These devices are capable of driving a wide range of loads including solenoids, relays, DC motors, LED displays, filament lamps, thermal print-heads and high-power buffers.

The TX2003 is available in both a small outline 16-pin package (DIP16, SOP16 and SSOP16).

Pin Assignments



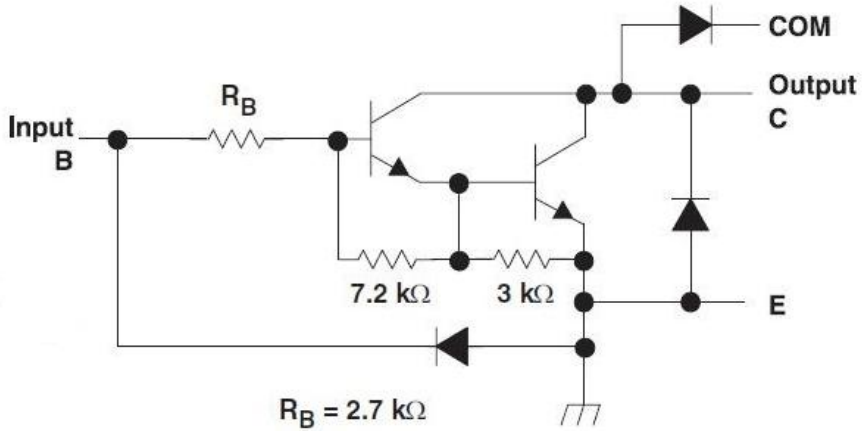
Connection Diagram



Pin Descriptions

Pin Number	Pin Name	Function
1	1B	Input pair1
2	2B	Input pair1
3	3B	Input pair1
4	4B	Input pair1
5	5B	Input pair1
6	6B	Input pair1
7	7B	Input pair1
8	E	Common Emitter (ground)
9	COM	Common Clamp Diodes
10	7C	Output pair7
11	6C	Output pair6
12	5C	Output pair5
13	4C	Output pair4
14	3C	Output pair3
15	2C	Output pair2
16	1C	Output pair1

Functional Block Diagram



Note: All resistor values shown are nominal.

The collentor-emitter diode is a parasitic structure and should not be used to conduct current.If the collector(s) go below ground an external Schoottky diode should be added to clamp negative undershoots.

Absolute Maximum Ratings (1)

At 25°C free-air temperature (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Collector to emitter voltage			50	V
V_R	Clamp diode reverse voltage(2)			50	V
V_I	Input voltage(2)			30	V
I_{CP}	Peak collector current	See typical characteristics		500	mA
I_{OK}	Output clamp current			500	mA
I_{TE}	Total emitter-terminal current			–2.5	A
T_A	Operating free-air temperature range	TX2003	–20	70	°C
θ_{JA}	Thermal Resistance Junction-to-Ambient(3)			63	°C/W
θ_{JC}	Thermal Resistance Junction-to-Case(4)			12	
T_J	Operating virtual junction temperature			150	°C
T_{STG}	Storage temperature range		–65	150	°C
ESD	Human Body Mode		--	3000	V

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.

(3) Maximum power dissipation is a function of TJ(max), θJA, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ(max) – TA)/θJA. Operating at the absolute maximum TJ of 150°C can affect reliability.

(4) Maximum power dissipation is a function of TJ(max), θJC, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ(max) – TA)/θJC. Operating at the absolute maximum TJ of 150°C can affect reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
VCC	Collector to Emitter voltage	-	50	V
TA	Operating Ambient Temperature	-40	+105	℃

Electrical Characteristics(TA=+25℃, unless otherwise specified)

Parameter		Test Figure	Test Conditions		TX2003A			Unit
					MIN	TYP	MAX	
$V_{I(on)}$	On-state input voltage	Figure 6	V_{CE} = 2 V	I_C = 200 mA	--	--	2.4	V
				I_C = 250 mA	--	--	2.7	
				I_C = 300 mA	--	--	3	
$V_{CE(sat)}$	Collector-emitter saturation voltage	Figure 5	I_I = 250 μA,	I_C = 100 mA	--	0.9	1.1	
			I_I = 350 μA,	I_C = 200 mA	--	1	1.3	V
			I_I = 500 μA,	I_C = 350 mA	--	1.2	1.6	
I_{CEX}	Collector cutoff current	Figure 1	V_{CE} = 50 V,	I_I = 0	--	--	50	μA
		Figure 2	V_{CE} = 50 V, T_A = +105°C	I_I = 0	--	--	100	
V_F	Clamp forward voltage	Figure 8	I_F = 350 mA		--	1.7	2	V
$I_{I(off)}$	Off-state input current	Figure 3	V_{CE} = 50 V, I_C = 500 μA		50	65	--	μA
I_I	Input current	Figure 4	V_I = 3.85 V		--	0.93	1.35	mA
			V_I = 5 V		--	--	--	
			V_I = 12 V		--	--	--	
I_R	Clamp reverse current	Figure 7	V_R = 50 V		--	--	50	μA
				T_A = 70°C	--	--	100	
C_i	Input capacitance		V_I = 0, f = 1 MHz		--	15	25	pF

Switching Characteristics (T_A = +25°C, unless otherwise specified)

Parameter		Test Conditions	TX2003			UNIT
			MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low- to high-level output	See Figure 9		0.25	1	μs
t_{PHL}	Propagation delay time, high- to low-level output	See Figure 9		0.25	1	μs
V_{OH}	High-level output voltage after switching	V_S = 50 V, I_O = 300 mA, See Figure 9	VS–20			mV

Parameter Measurement Information

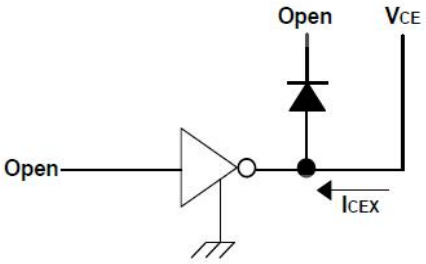


Fig.1 I_{CEX} Test Circuit

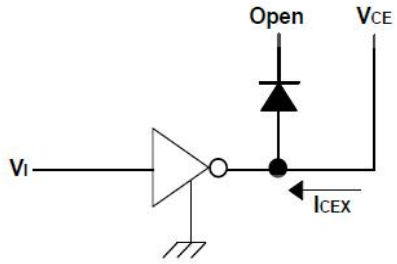


Fig.2 I_{CEX} Test Circuit

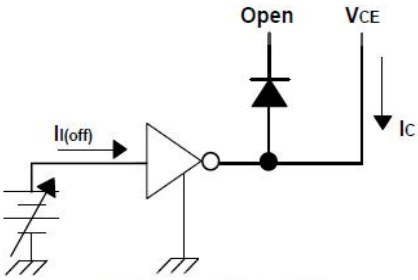


Fig.3 $I_{I(off)}$ Test Circuit

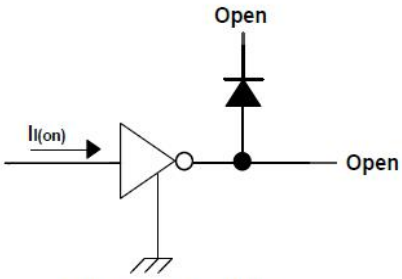


Fig.4 I_I Test Circuit

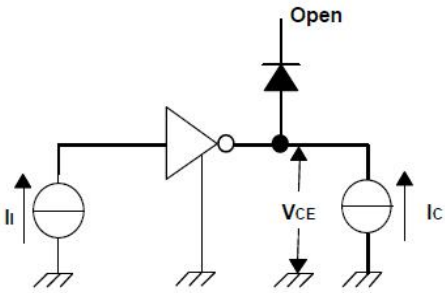


Fig. 5 h_{FE} , $V_{CE(sat)}$ Test Circuit

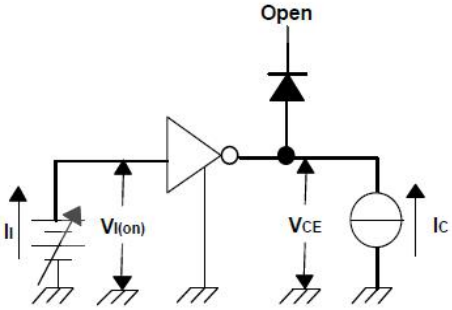


Fig. 6 $V_{I(on)}$ Test Circuit

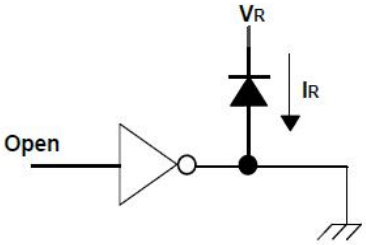


Fig. 7 I_R Test Circuit

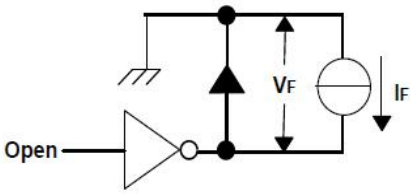
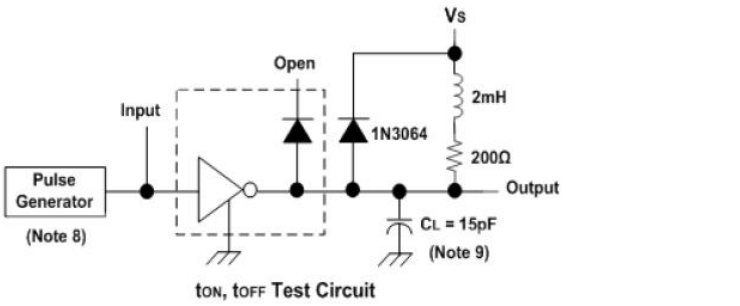
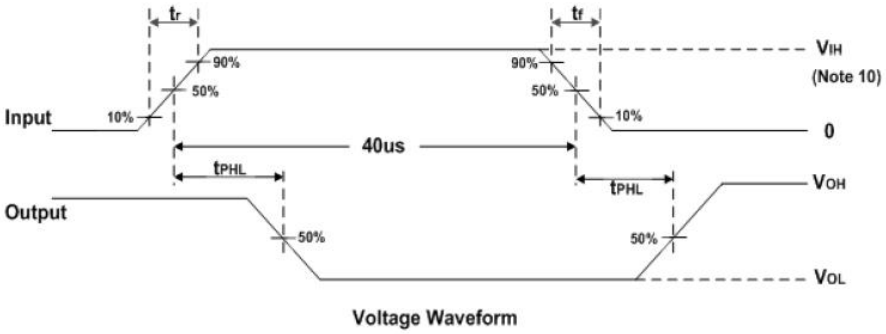


Fig. 8 V_F Test Circuit



tON, tOFF Test Circuit



Voltage Waveform

Fig. 9 Latch-Up Test Circuit and Voltage Waveform

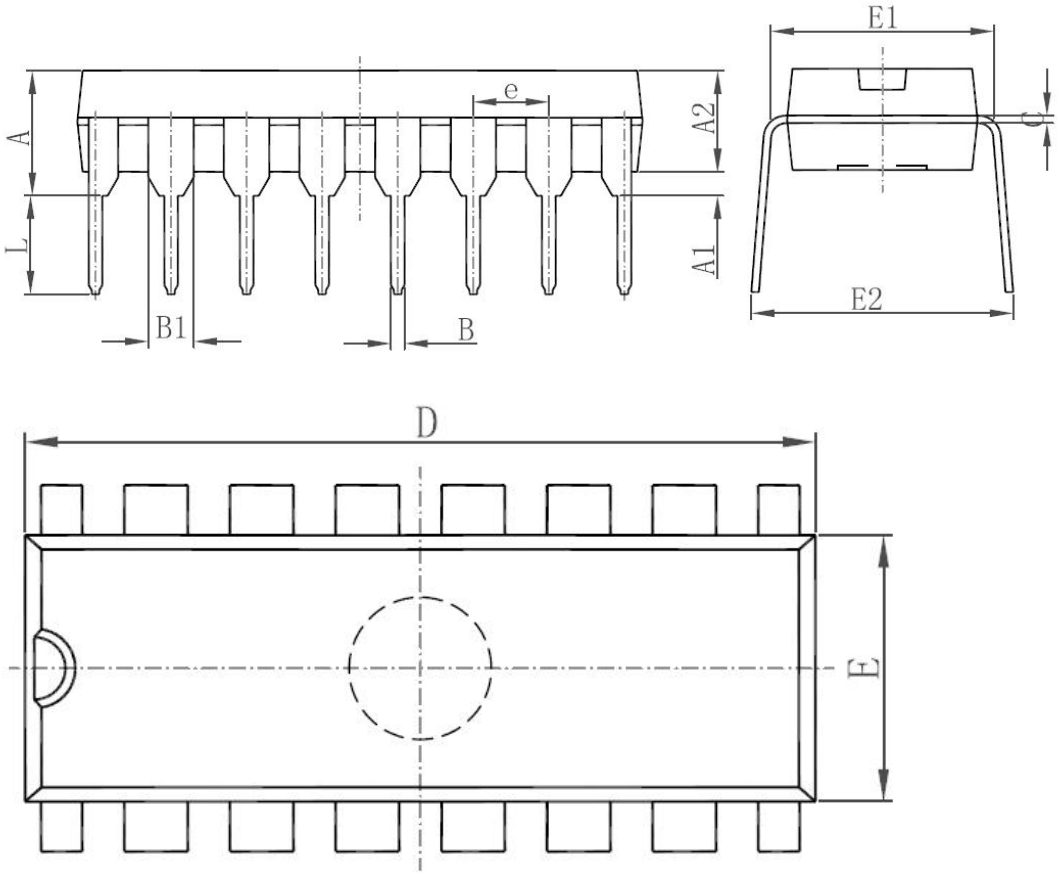
Notes: 8. The pulse generator has the following characteristics:

Pulse Width=12.5Hz, output impedance 50Ω, tr≤5ns, tr≤10ns.

9. C_L includes prove and jig capacitance.

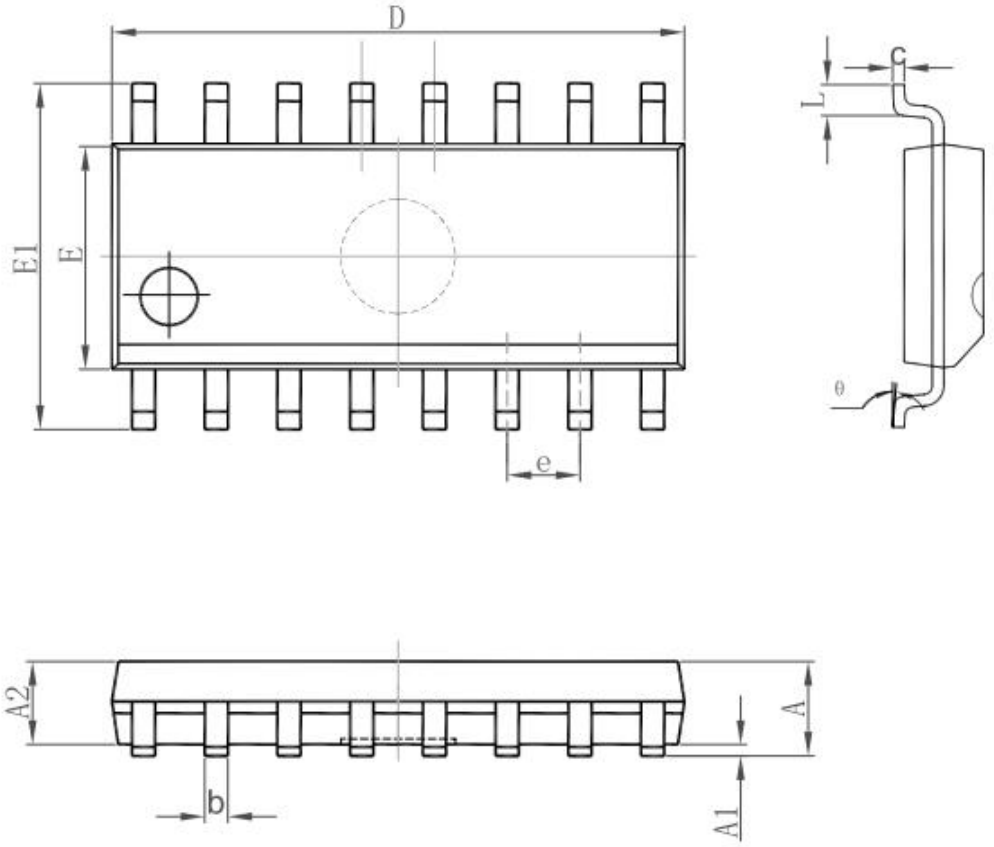
10. V_{IH}=3V

DIP16 Outline Dimensions



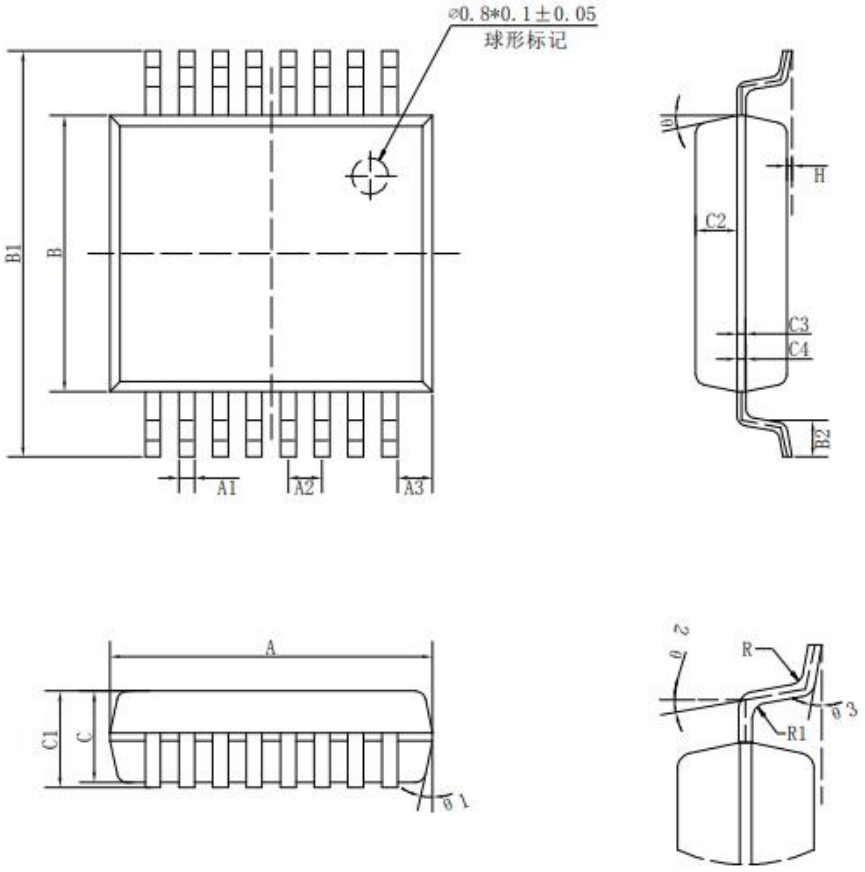
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

SOP16 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SSOP16 Outline Dimensions



尺寸 / 标注	最小(mm)	最大(mm)	尺寸 / 标注	最小(mm)	最大(mm)
A	6.15	6.25	C3	0.152	
A1	0.30TYP		C4	0.172	
A2	0.65TYP		H	0.05	0.15
A3	0.675TYP		θ	12° TYP4	
B	5.25	5.35	θ1	12° TYP4	
B1	7.65	7.95	θ2	10° TYP	
B2	0.60	0.80	θ3	0° ~ 8°	
C	1.70	1.80	R	0.20TYP	
C1	1.75	1.95	R1	0.15TYP	
C2	0.799				