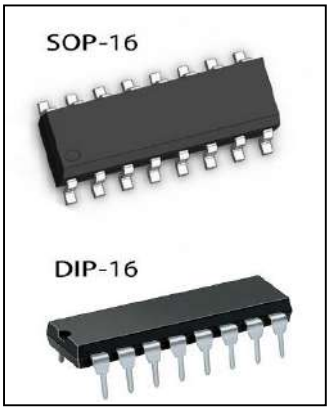
High-voltage High-current Darlington Transistor Arrays

CYN2003

General Description

CYN2003 is a single-chip integrated high voltage, high current Darlington tube array, The circuit contains seven independent Darlington tube drive single channel. The circuit is designed with continuous diode, which can be used to drive relay, stepping motor and other inductive loads. A single darlington collector can output 500mA current. Higher output current capacity can be achieved by connecting darlington tubes in parallel.



Features

- 500mA-Rated Collector Current(single output)
- Input Compatible TTL/CMOS logic signals
- High-Voltage Outputs:50V
- Relay-Driver Applications
- Package：SOP-16，DIP-16

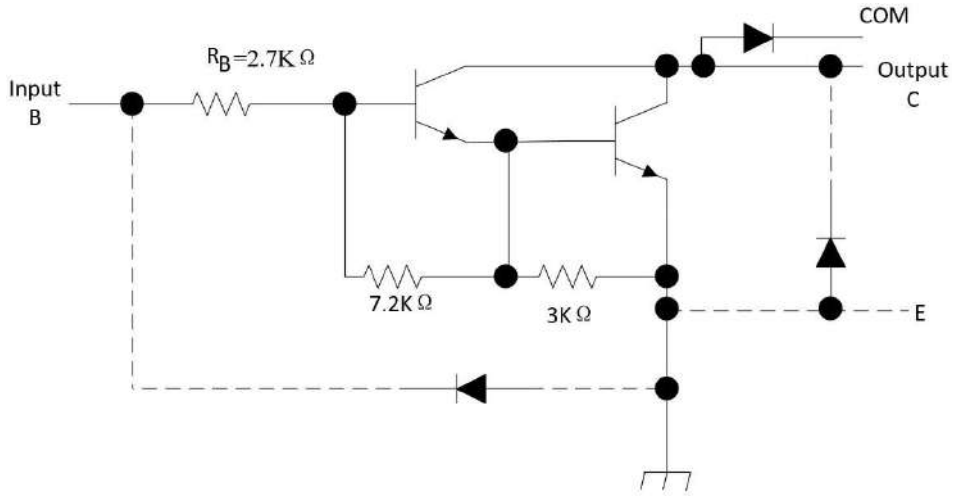
Applications

- Solenoids
- Relays
- DC motors
- LED displays
- Filament lamps
- Thermal-print heads
- High-power buffers

Order information

Product model	Package	Manner of packing	Minimum packing quantity
CYN2003-SOP16	SOP-16	reel	3500
CYN2003-DIP16	DIP-16	Tube	50

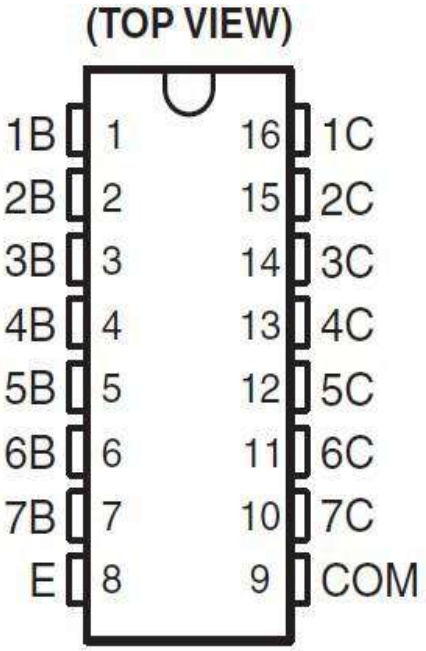
Functional Block Diagram



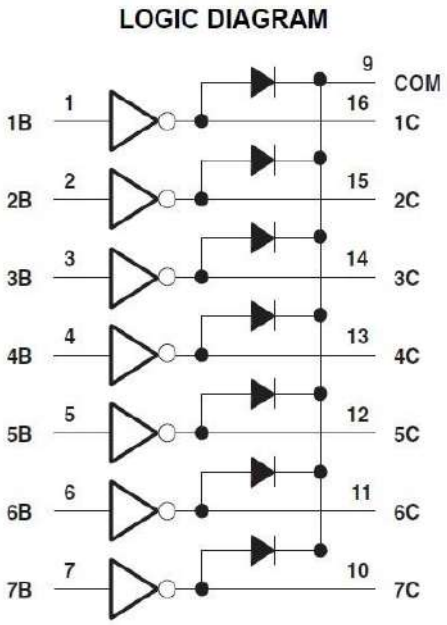
Note: All resistor values shown are nominal.

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.

Pin Assignments



Connection Diagram



Pin Descriptions

Pin Number	Pin Name	Function
1	1B	Input pair1
2	2B	Input pair2
3	3B	Input pair3
4	4B	Input pair4
5	5B	Input pair5
6	6B	Input pair6
7	7B	Input pair7
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

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		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	–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	–40	85	°C

(1) Exceeding the absolute maximum rating may cause permanent damage to the chip. These are only maximum ratings and prolonged use at absolute maximum ratings may affect the reliability of the chip.

(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.

Electrical Characteristics

(TA=+25℃, unless otherwise specified)

Symbol	Parameter	Test Figure	Test Conditions		CYN2003 MIN	CYN2003 TYP	CYN2003 MAX	Unit
$V_{I(on)}$	On-state input voltage	Figure 6	V_{CE}=2V	I_C=200mA	--	--	2.4	V
				I_C=250mA	--	--	2.7	
				I_C=300mA	--	--	3	
$V_{CE(sat)}$	Collector-emitter saturation voltage	Figure 5	I_I=250μA,	I_C=100mA	--	0.9	1.1	
			I_I=350μA,	I_C=200mA	--	1	1.3	V
			I_I=500μA,	I_C=350mA	--	1.2	1.6	
I_{CEX}	Collector cutoff current	Figure 1	V_{CE}=50V,	I_I=0	--	--	50	μA
		Figure 2	V_{CE}=50V, T_A=+105°C	I_I=0	--	--	100	
V_F	Clamp forward voltage	Figure 8	I_F=350mA		--	1.7	2	V
$I_{I(off)}$	Off-state input current	Figure 3	V_{CE}=50V, I_C=500 μA		50	65	--	μA
I_I	Input current	Figure 4	V_I=3.85V		--	0.93	1.35	mA
			V_I=5V		--	--	--	
			V_I=12V		--	--	--	
I_R	Clamp reverse current	Figure 7	V_R=50V		--	--	50	μA
				T_A=70°C	--	--	100	
C_i	Input capacitance		V_I=0, f =1MHz		--	15	25	pF

Switching Characteristics

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

Symbol	Parameter	Test pattern	Test Conditions	CYN2003 MIN	CYN2003 TYP	CYN2003 MAX	UNIT
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	See Figure 9	V_S = 50 V, I_O = 300 mA,	VS–20	--	--	mV

Parameter Measurement Information

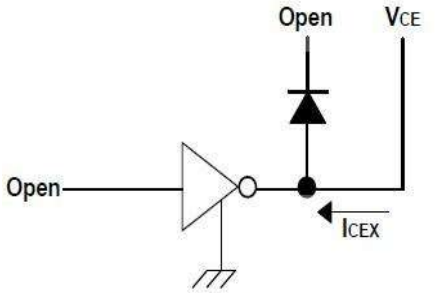


Fig.1 I_{CEX} Test Circuit

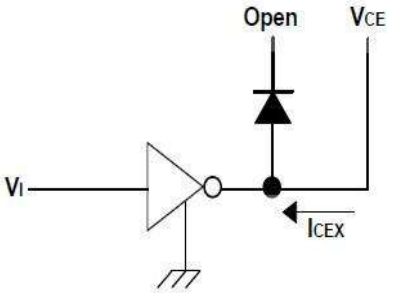


Fig.2 I_{CEX} Test Circuit

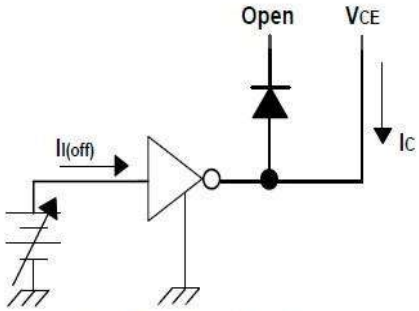


Fig.3 $I_{I(off)}$ Test Circuit

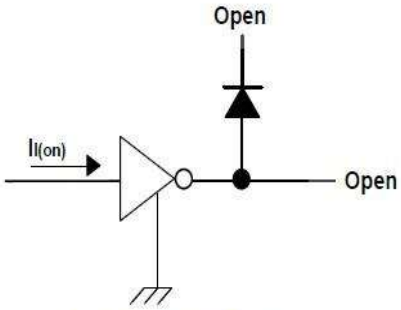


Fig.4 I_I Test Circuit

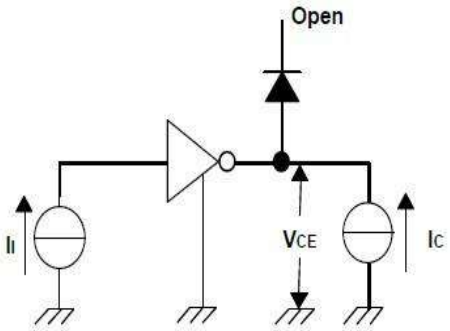


Fig. 5 h_{FE} , $V_{CE(sat)}$ Test Circuit

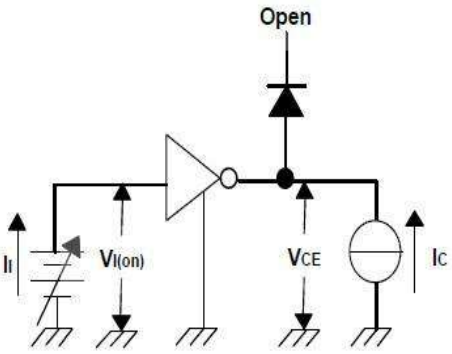


Fig. 6 $V_{I(on)}$ Test Circuit

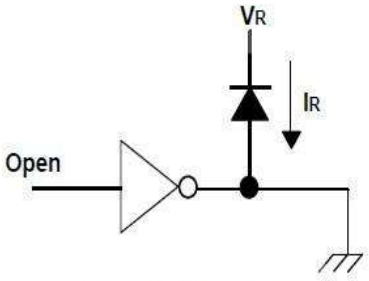


Fig. 7 I_R Test Circuit

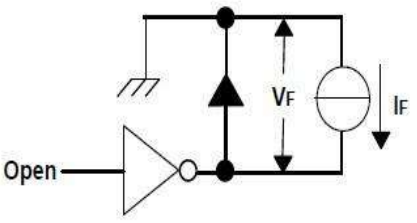
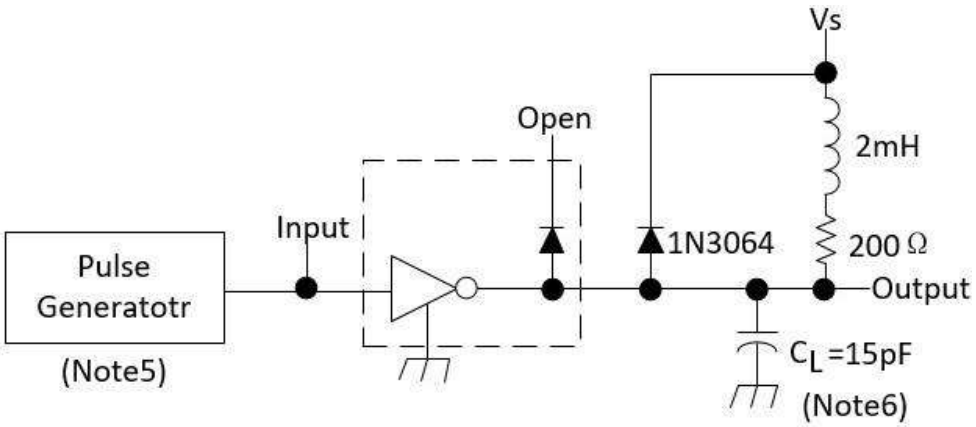


Fig. 8 V_F Test Circuit



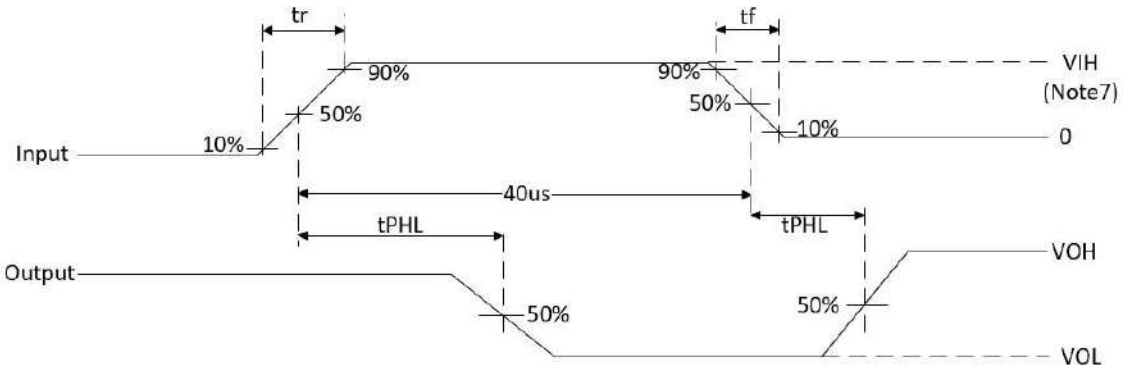
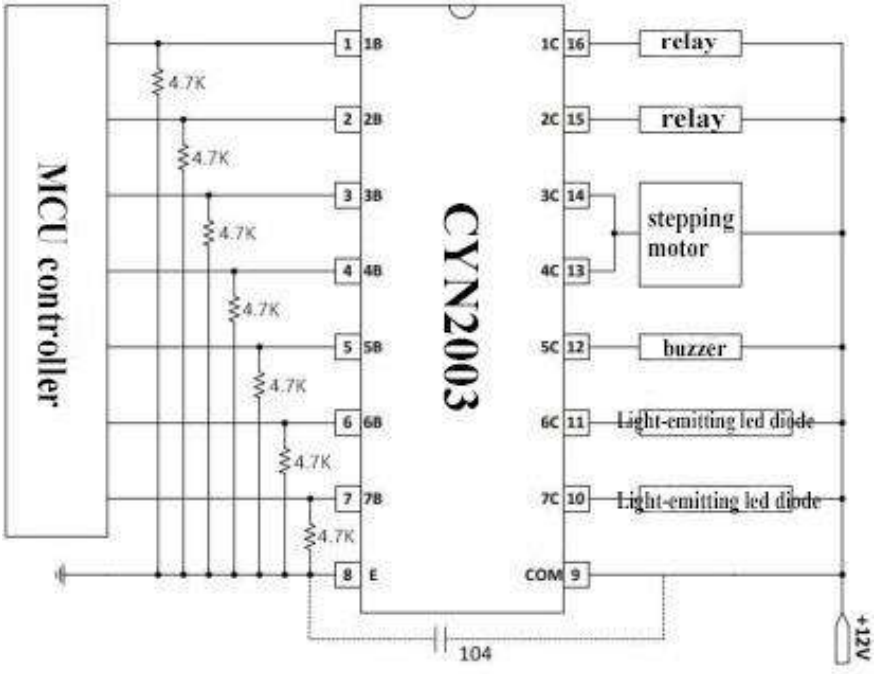


Fig.9 Transmission delay waveform diagram

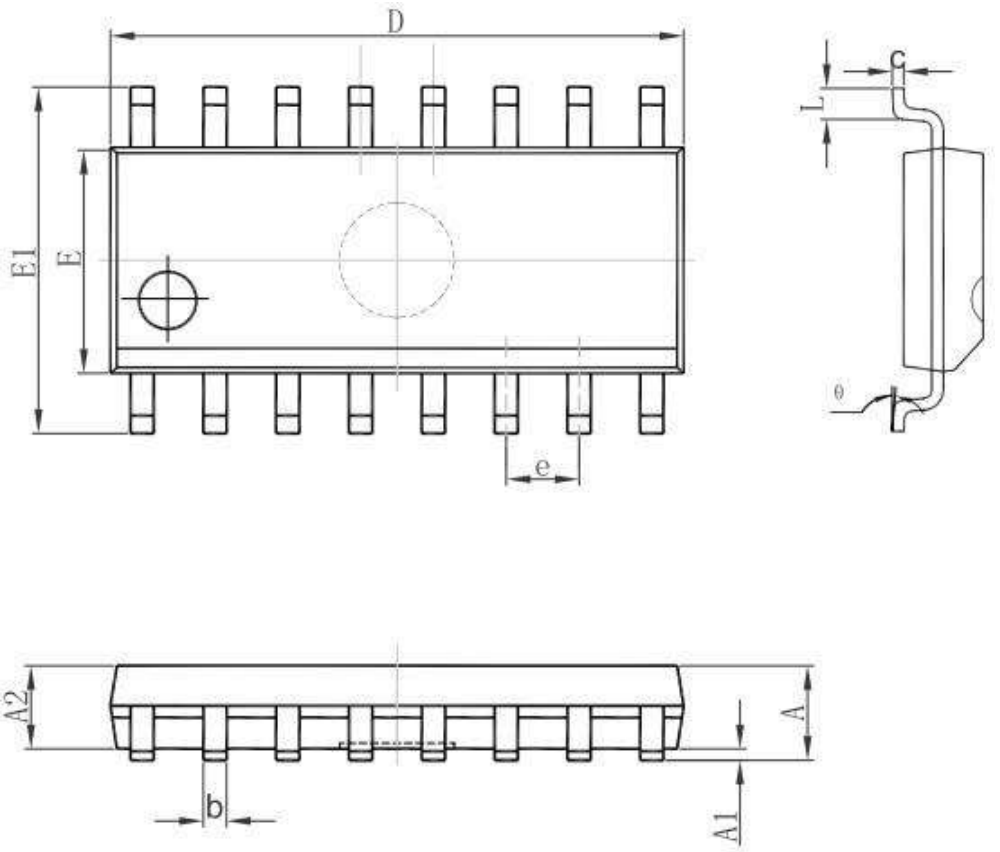
Notes: (5)The pulse generator has the following characteristics:
Pulse Width=12.5Hz, output impedance 50Ω, tr≤5ns, tr≤10ns.
(6) C_L includes prove and jig capacitance.
(7) V_{IH}=3V

Typical application



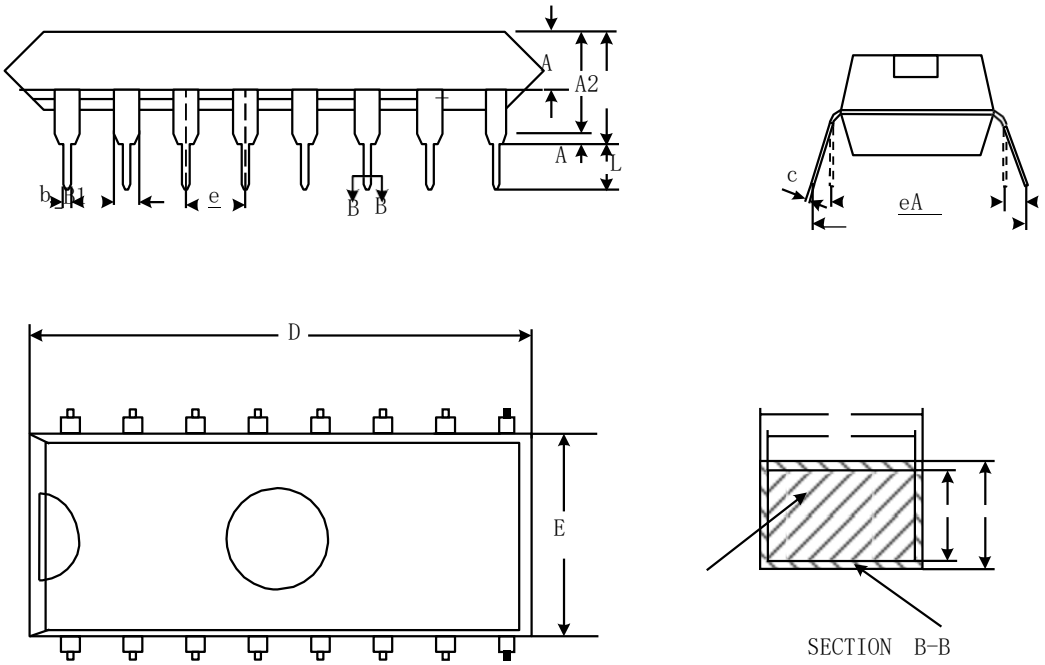
Considering that some applications use a single-chip machine with pull resistance,The output state of the single chip is unstable during power-up. At this time, the CYN2003 input stage will be affected by the single-chip pull-up resistance and turn on the load. In order to avoid load misoperation, it is recommended that customers with such application problems connect a 4.7K pull-down resistance at the input stage, as shown in the figure above.

Packaging Information（SOP-16）



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°

Packaging Information（DIP-16）



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	3.60	3.80	4.00
A1	0.51	_	_
A2	3.10	3.30	3.50
A3	1.42	1.52	1.62
b	0.44	_	0.53
b1	0.43	0.46	0.48
B1	1.52BSC		
c	0.25	_	0.31
c1	0.24	0.25	0.26
D	18.90	19.10	19.30
E1	6.15	6.35	6.55
e	2.54BSC		
eA	7.62BSC		
eB	7.62	_	9.50
eC	0	_	0.94
L	3.00	_	_

Special Version

The company reserves the right of final interpretation of this specification.

Version Change Description

Versions：V1.3 Writer：Si Yuan Wu Time：2021.9.7

Amendant record：

1.Re-typesetting the manual and checking some data