High-Voltage High-Current Darlington Transistor Arrays

General Description

The ET2003HV 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.

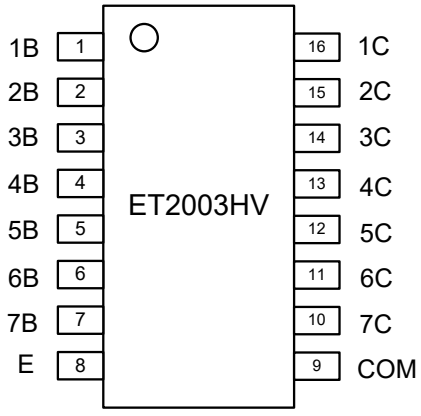
The ET2003HV is offered SOP16 package.

Features

- 500mA Rated Collector Current(single output)
- High-Voltage Outputs: 50V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay-Driver Applications
- Part No. and Package

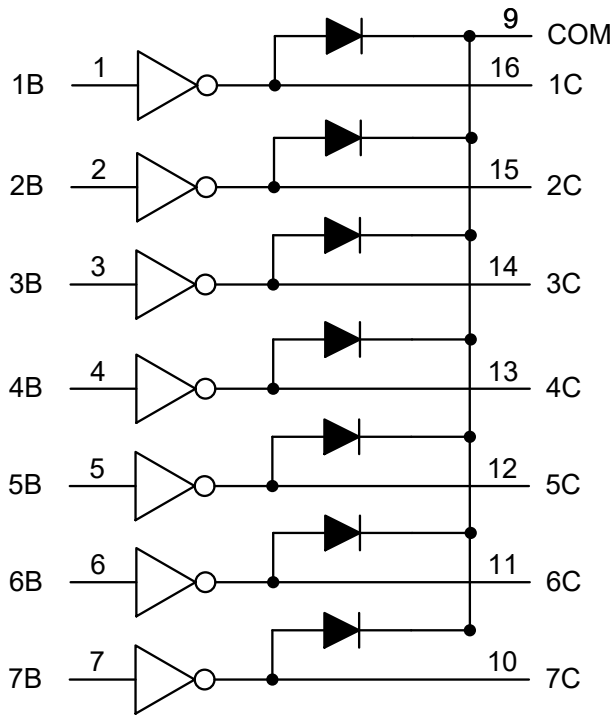
Part No.	Package	Packing Option	MSL
ET2003HV	SOP16 (10.0mm × 6.0mm)	Tape and Reel, 4K/Reel	3

Pin Configuration



Top View

Connection Diagram

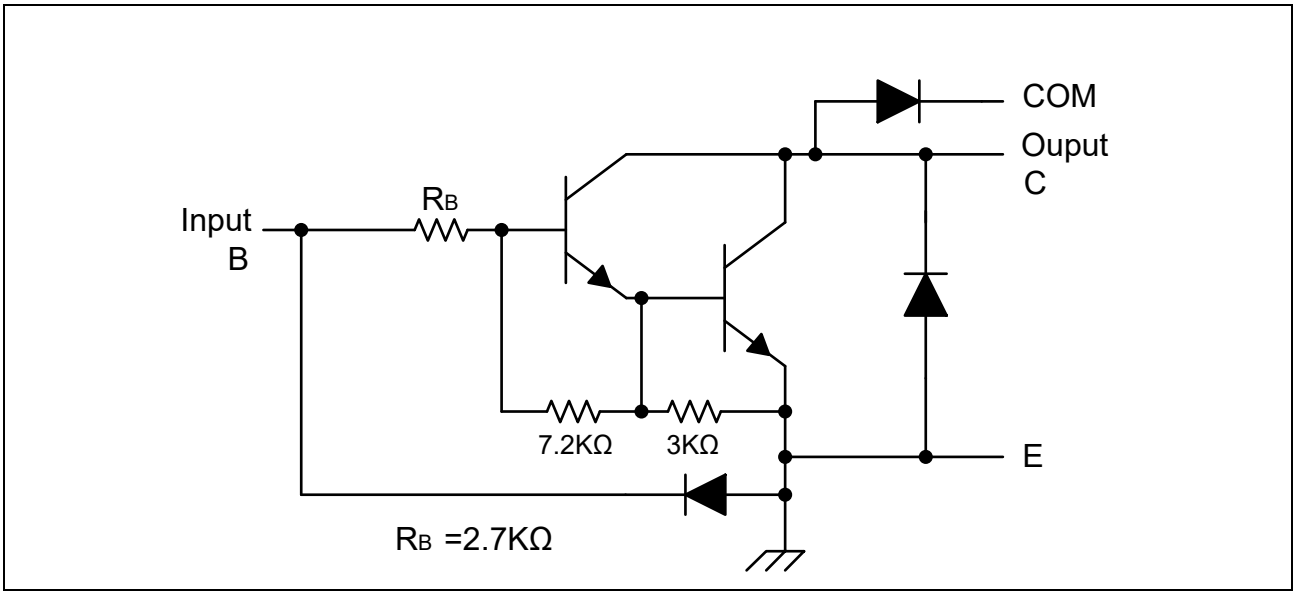


LOGIC DIAGRAM

Pin Function

Pin Name	Pin No.	Description
1B	1	Input pair1
2B	2	Input pair1
3B	3	Input pair1
4B	4	Input pair1
5B	5	Input pair1
6B	6	Input pair1
7B	7	Input pair1
E	8	Common Emitter (ground)
COM	9	Common Clamp Diodes
7C	10	Output pair7
6C	11	Output pair6
5C	12	Output pair5
4C	13	Output pair4
3C	14	Output pair3
2C	15	Output pair2
1C	16	Output pair1

Functional Block Diagram



Note1: All resistor values shown are nominal.

Note2: 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(3)

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

Symbol	Parameters	Min	Max	Unit
V_{CC}	Collector to emitter voltage	-0.5	50	V
V_R	Clamp diode reverse voltage	-0.5	50	V
V_I	Input voltage	-0.5	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	-40	105	° C
θ_{JA}	Thermal Resistance Junction-to-Ambient(4)	--	90	° C/W
θ_{JC}	Thermal Resistance Junction-to-Case(5)	--	55	
T_J	Operating virtual junction temperature	-40	+150	° C
T_{STG}	Storage temperature range	-65	+150	° C
ESD	Human Body Mode	2	--	kV

Note3: 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.

Note4: Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $PD = (T_J(max)–T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.

Note5: Maximum power dissipation is a function of $T_J(max)$, θ_{JC}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is PD = $(T_J(max)–T_A)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.

Recommended Operating Conditions

Symbol	Parameters	Min	Max	Unit
V_{CC}	Collector to Emitter voltage	--	50	V
T_A	Operating Ambient Temperature	-40	+105	°C

Electrical Characteristics

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

Symbol	Parameter	Test Figure	Test Conditions		Min	Typ	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	--	--	3.0	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	Figure 5	I_I = 250μA,	I_C = 100mA	--	0.9	1.1	V
			I_I = 350μA,	I_C = 200mA	--	1.0	1.3	V
			I_I = 500μA,	I_C = 350mA	--	1.2	1.6	V
I_{CEX}	Collector Cutoff Current	Figure 1	V_{CE} = 50V,	I_I = 0	--	--	50	uA
		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 = 500μA		50	65	--	uA
I_I	Input Current	Figure 4	V_I = 3.85V		--	0.93	1.35	mA
			V_I = 5V		--	1.5	1.85	
			V_I = 12V		--	4.2	4.55	
I_R	Clamp Reverse Current	Figure 7	V_R = 50V		--	--	50	uA
				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 Conditions	Min	Typ	Max	Unit
t_{PLH}	Propagation Delay Time, Low to High Level Output	See Figure 9		0.25	1	us
t_{PHL}	Propagation Delay Time, High to Low Level Output	See Figure 9		0.25	1	us
V_{OH}	High Level Output Voltage after Switching	V_S = 50V, I_O = 50mA, See Figure 9	V_S-20			mV

Parameter Measurement Information

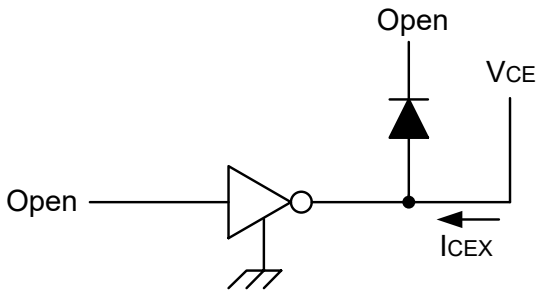


Figure 1. I_{CEX} Test Circuit

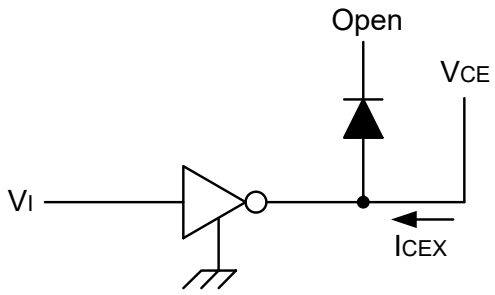


Figure 2. I_{CEX} Test Circuit

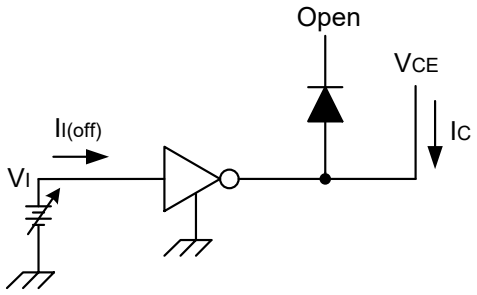


Figure 3. $I_{I(off)}$ Test Circuit

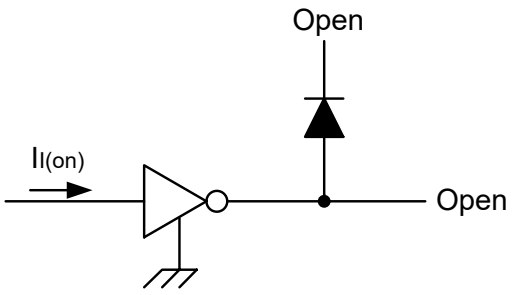


Figure 4. I_I Test Circuit

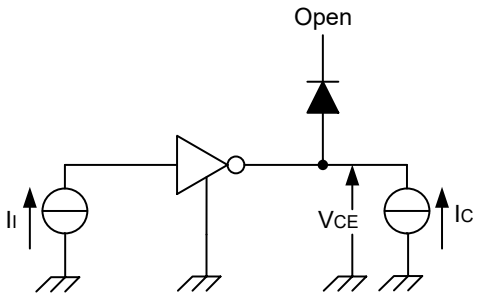


Figure 5. $V_{CE(sat)}$ Test Circuit

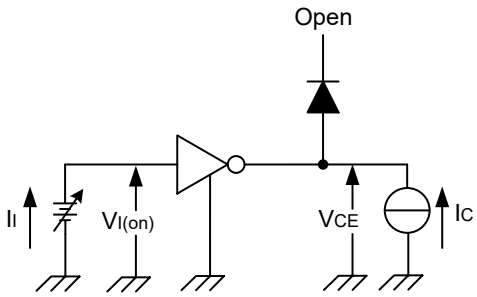


Figure 6. $V_{I(on)}$ Test Circuit

Parameter Measurement Information (Continued)

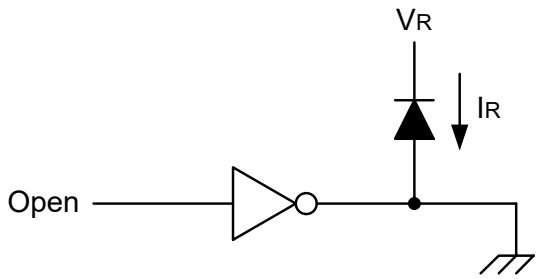


Figure 7. I_{CEX} Test Circuit

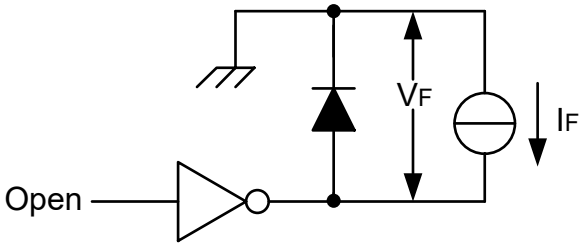
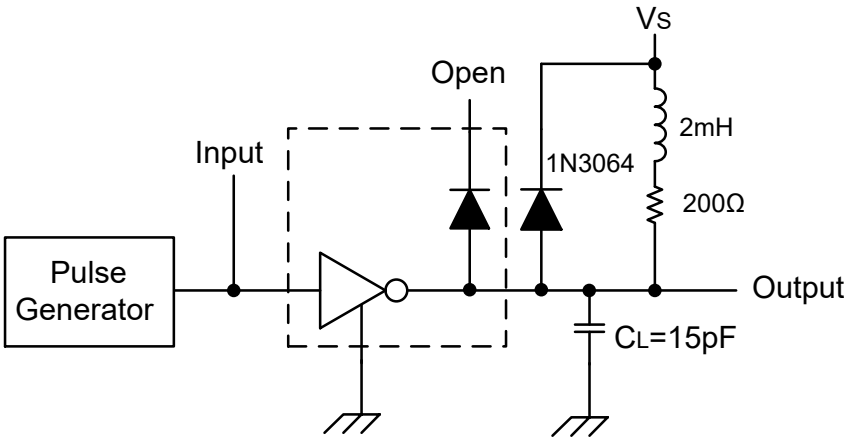
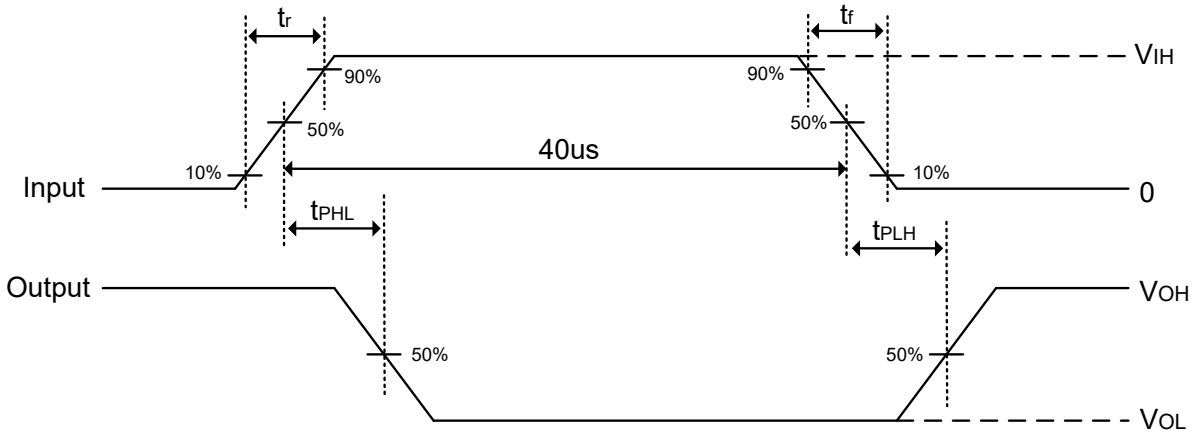


Figure 8. V_F Test Circuit



t_{ON}, t_{OFF}, Test Circuit [(6)(7)]



Voltage Waveform[(8)]

Figure 9. Latch-Up Test Circuit and Voltage Waveform

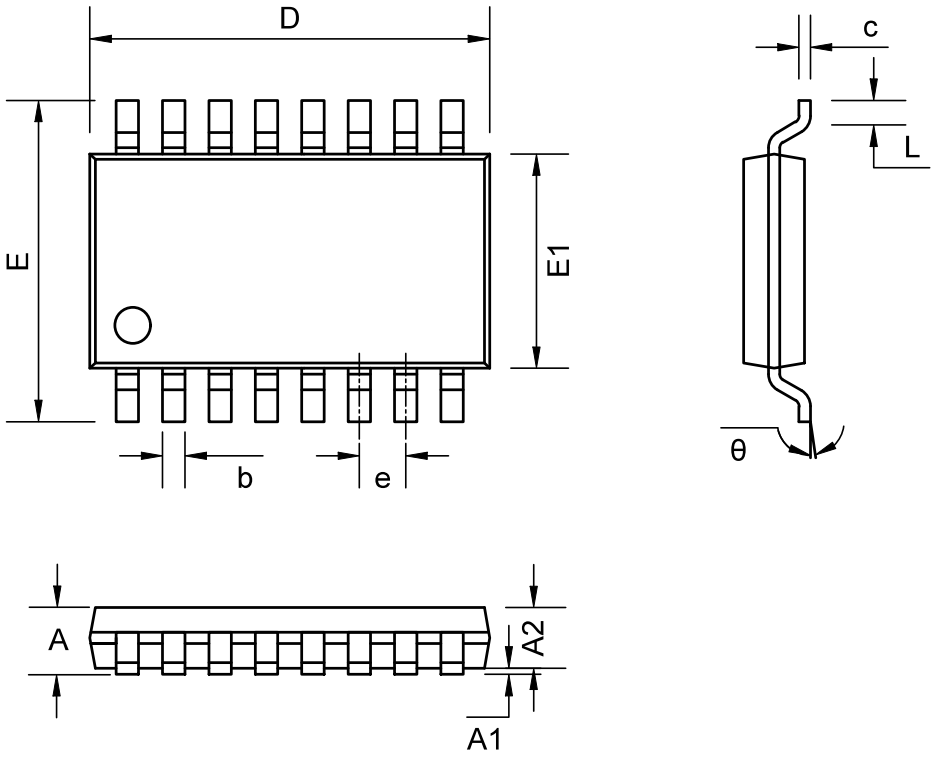
Note6: The pulse generator has the following characteristics: Pulse Width=12.5Hz, output impedance 50Ω, tr≤5ns, tr≤10ns.

Note7: C_L includes prove and jig capacitance.

Note8: V_{IH}=3V.

Package Dimension

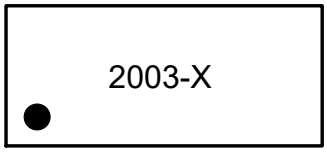
SOP16



Dimensions Table (Units:mm)

Symbol	Min	Non	Max
A	1.45	1.65	1.85
A1	0.10	0.20	0.30
A2	1.35	1.45	1.55
b	0.33	0.41	0.51
c	0.17	0.20	0.25
D	9.80	10.00	10.20
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.4	--	1.27
θ	0°	--	8°

Marking

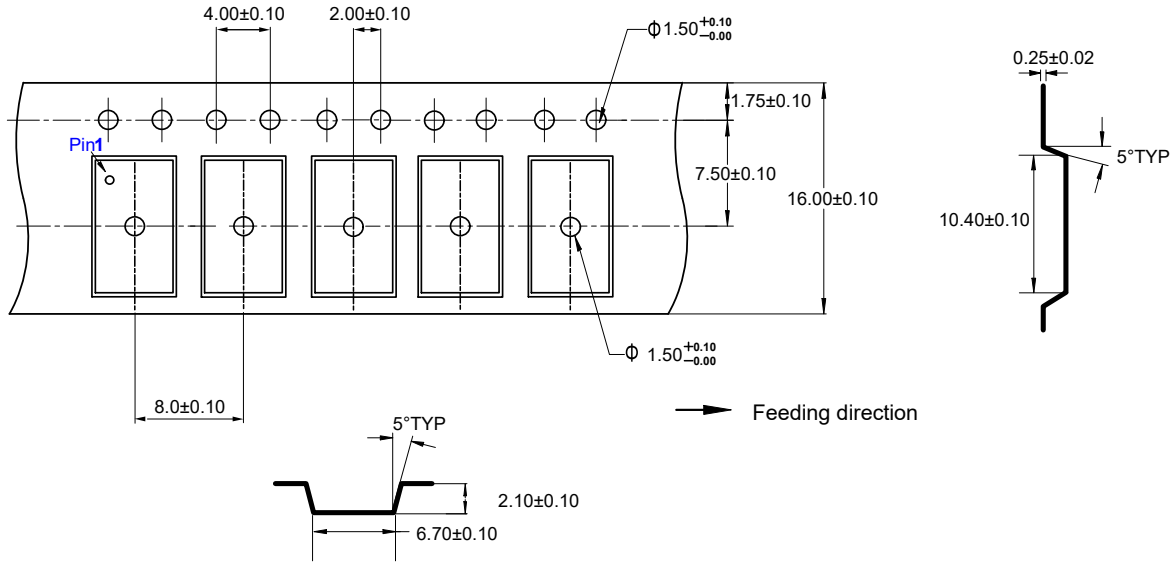


Pin1

2003 =Part Number.

X = Tracking Number.

Tape Information



Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-03-19	Preliminary Version	Liuj	Liuj	Liujy
1.0	2025-08-15	Initial Version	Caojc	Wuhs	Liujy
1.1	2026-05-06	Update AMR	Caojc	Wuhs	Liujy
1.2	2026-09-17	Add Packing Option and Tape Information and Marking	Caojc	Wuhs	Liujy