NE5501/5502/5503/5504-N

DESCRIPTION

These high-voltage, high-current Darlington transistor arrays are comprised of seven silicon NPN Darlington pairs on a common monolithic substrate. All units feature open collector outputs and integral suppression diodes for inductive loads. Peak inrush currents to 600mA are allowable, making them ideal for driving tungsten filament lamps also.

The Type NE5501 is a general-purpose array which may be used with DTL, TTL, PMOS, CMOS, etc. It is pinned with inputs opposite outputs to facilitate ease of circuit board layout and is priced to compete directly with discrete transistor alternatives.

The Type NE5502 was specifically designed for use with 14 to 25V PMOS devices. Each input has a Zener diode and resistor in series in order to limit the input current to a safe value.

The Type NE5503 has a series base resistor to each Darlington pair, and thus allows operation directly with TTL or CMOS operating at a supply voltage of 5V.

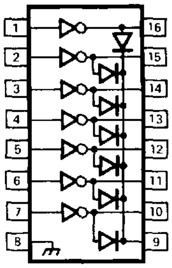
The Type NE5504 has an appropriate series input resistor to allow its operation directly from CMOS or PMOS outputs utilizing supply voltages of 6 to 15V. The required input current is below that of the Type NE5503 while the required input voltage is less than that required by the Type NE5502.

In all cases, the individual Darlington pair collector current rating is 500mA. However, outputs may be paralleled for higher load current capability. All devices are supplied in a 16-pin dual in-line plastic "N" package.

FEATURES

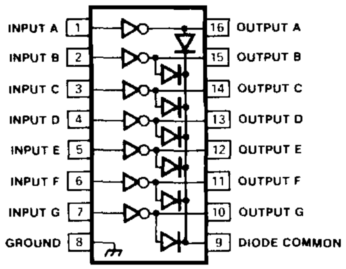
- **Output $V_{CEO} > 100V$**
- **Peak inrush current 600mA**
- **Protected internally against inductive loads**
- **Open collector topology**
- **Compatible with most logic technologies**

BLOCK DIAGRAM



PIN CONFIGURATION

N PACKAGE

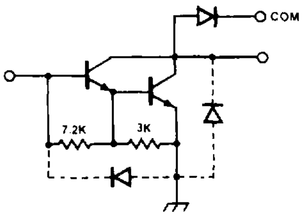


ORDER PART NO.

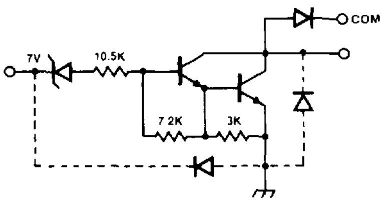
NE5501N
NE5502N
NE5503N
NE5504N

EQUIVALENT SCHEMATICS

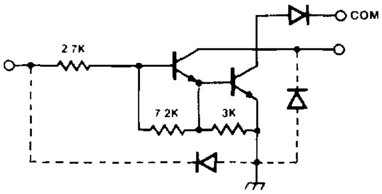
TYPE NE5501
(each driver)



TYPE NE5502
(each driver)



TYPE NE5503
(each driver)



TYPE NE5504
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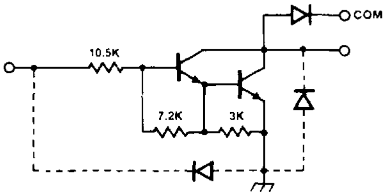


ABSOLUTE MAXIMUM RATINGS[1,2]

PARAMETER		RATING	UNIT
V_{CE}	Output breakdown voltage	100	V
V_{IN}	Input voltage (except 5501)	30	V
V_{EBO}	Emitter base voltage	6	V
I_C	Continuous collector current	500	mA
I_B	Continuous base current	25	mA
P_D	Power dissipation	1.3	W
T_A	Ambient temperature	0 to +85	°C
T_{sg}	Storage temperature	-65 to +150	°C

NOTES

1 $T_A = 25°C$

2 *Thermal resistivity, θjA, = 95°C/Watt.*

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$ unless otherwise specified.[1,2,3]

PARAMETER		TEST CONDITIONS	NE5501			NE5502			UNIT
			Min	Typ	Max	Min	Typ	Max	
I_{CEX}	Output leakage current	V_{CE} = 100V, T_A = 70°C, Test Fig. 1A		0.1	10		—		μA
		V_{CE} = 100V, T_A = 70°C, V_{IN} = 6V, Test Fig. 1B		—			0.1	10	μA
V_{CESAT}	Collecter emitter saturation voltage	I_C = 350mA, I_B = 500μA, Test Fig. 2		1.6	2.0		1.6	2.0	V
		I_C = 200mA, I_B = 350μA, Test Fig. 2		1.2	1.6		1.2	1.6	V
		I_C = 100mA, I_B = 250μA, Test Fig. 2		1.0	1.4		1.0	1.4	V
I_{IN}	Input current (ON)	V_{IN} = 17V, Test Fig. 3		—			0.9	1.45	mA
I_{IN}	Input current (OFF)	I_C = 500μA, T_A = 70°C, Test Fig. 4	50	65		50	65		μA
V_{IN}	Input voltage (ON)	V_{CE} = 2V, I_C = 300mA, Test Fig. 5		—				13	V
h_{FE}	Forward current gain	V_{CE} = 2V, I_C = 350mA, Test Fig. 2	1000				—		
I_R	Clamp diode leakage	V_R = 100V, Test Fig. 6			10			10	μA
V_F	Clamp diode forward voltage	I_F = 350mA, Test Fig. 7		1.6	2.0		1.6	2.0	V

DC ELECTRICAL CHARACTERISTICS (Cont'd) $T_A = 25°C$ unless otherwise specified.[1,2,3]

PARAMETER		TEST CONDITIONS	NE5503			NE5504			UNIT
			Min	Typ	Max	Min	Typ	Max	
I_{CEX}	Output leakage current	V_{CE} = 100V, T_A = 70°C, Test Fig. 1A		0.1	10		—		μA
		V_{CE} = 100V, T_A = 70°C, V_{IN} = 1V, Test Fig. 1B		—			0.1	10	μA
V_{CESAT}	Collecter emitter saturation voltage	I_C = 350mA, I_B = 500μA, Test Fig. 2		1.6	2.0		1.6	2.0	V
		I_C = 200mA, I_B = 350μA, Test Fig. 2		1.2	1.6		1.2	1.6	V
		I_C = 100mA, I_B = 250μA, Test Fig. 2		1.0	1.4		1.0	1.4	V
I_{IN}	Input current (ON)	V_{IN} = 3.85V, Test Fig. 3		1.05	1.65		—		mA
		V_{IN} = 5V, Test Fig. 3		—			0.4	0.65	mA
		V_{IN} = 12V, Test Fig. 3		—			1.1	1.7	mA
I_{IN}	Input current (OFF)	I_C = 500μA, T_A = 70°C, Test Fig. 4	50	65		50	65		μA
V_{IN}	Input voltage (ON)	V_{CE} = 2V, I_C = 200mA, Test Fig. 5			2.4		—		V
		V_{CE} = 2V, I_C = 250mA, Test Fig. 5			2.7		—		V
		V_{CE} = 2V, I_C = 300mA, Test Fig. 5			3.0		—		V
V_{IN}	Input voltage (ON)	V_{CE} = 2V, I_C = 125mA, Test Fig. 5						5.0	V
		V_{CE} = 2V, I_C = 200mA, Test Fig. 5						6.0	V
		V_{CE} = 2V, I_C = 275mA, Test Fig. 5						7.0	V
		V_{CE} = 2V, I_C = 350mA, Test Fig. 5						8.0	V
I_R	Clamp diode leakage	V_R = 100V, Test Fig. 6			10			10	μA
V_F	Clamp diode forward voltage	I_F = 350mA, Test Fig. 7		1.6	2.0		1.6	2.0	V

NOTES

1. All limits stated apply to the complete Darlington series except as specified for a single device type.
2. The $I_{IN(OFF)}$ current limit guarantees against partial turn-on of the output.
3. The $V_{IN(ON)}$ voltage limit guarantees a minimum output sink current per the specified test conditions.

AC ELECTRICAL CHARACTERISTICS $T_A = 25°C$ unless otherwise specified.

PARAMETER		TO	FROM	TEST CONDITIONS	NE5501			NE5502			UNIT
					Min	Typ	Max	Min	Typ	Max	
C_{IN}	Input capacitance					15	30		15	30	pF
T_{PLH}	Turn on delay	Input	Output	50% E_{IN} to 50% E_{OUT}		1	5		1	5	µs
T_{PHL}	Turn off delay	Input	Output	50% E_{IN} to 50% E_{OUT}		1	5		1	5	µs

AC ELECTRICAL CHARACTERISTICS (Cont'd) $T_A = 25°C$ unless otherwise specified.

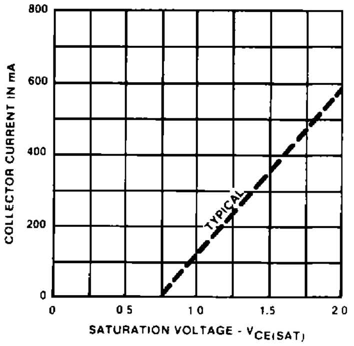
PARAMETER		TO	FROM	TEST CONDITIONS	NE5503			NE5504			UNIT
					Min	Typ	Max	Min	Typ	Max	
C_{IN}	Input capacitance					15	30		15	30	pF
T_{PLH}	Turn on delay	Input	Output	50% E_{IN} to 50% E_{OUT}		1	5		1	5	µs
T_{PHL}	Turn off delay	Input	Output	50% E_{IN} to 50% E_{OUT}		1	5		1	5	µs

NOTES

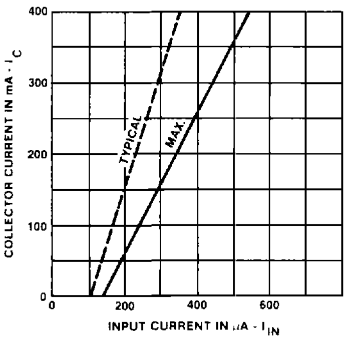
1. All limits stated apply to the complete Darlington series except as specified for a single device type.
2. The $I_{IN(OFF)}$ current limit guarantees against partial turn-on of the output
3. The $V_{IN(ON)}$ voltage limit guarantees a minimum output sink current per the specified test conditions.

TYPICAL PERFORMANCE CHARACTERISTICS

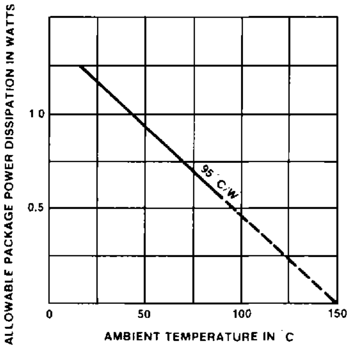
COLLECTOR CURRENT AS A FUNCTION OF SATURATION VOLTAGE



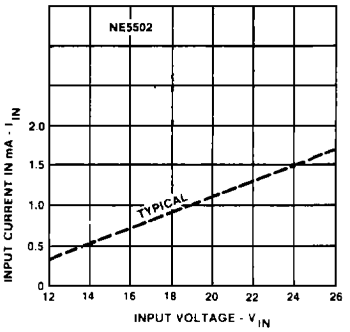
COLLECTOR CURRENT AS A FUNCTION OF INPUT CURRENT



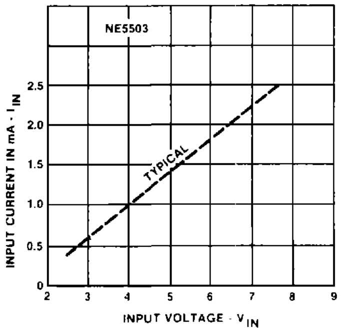
ALLOWABLE AVERAGE PACKAGE POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



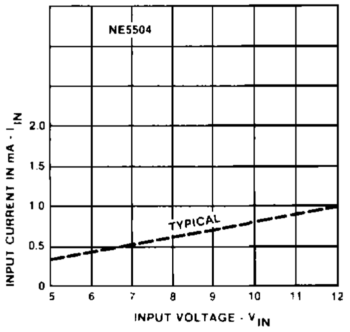
INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE FOR TYPE NE5502



INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE FOR TYPE NE5503



INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE FOR TYPE NE5504



TEST LOAD CIRCUITS

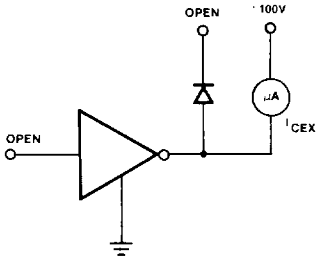


Figure 1A

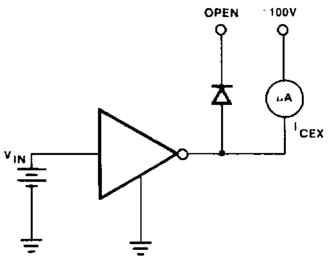


Figure 1B

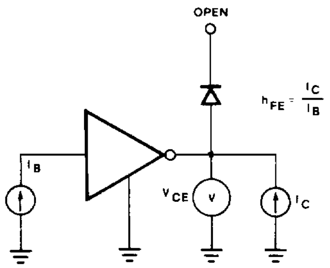


Figure 2

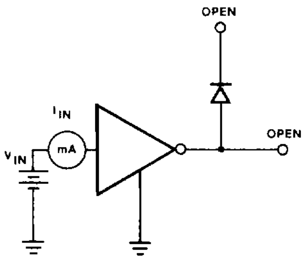


Figure 3

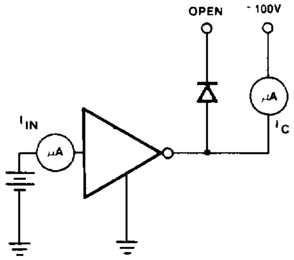


Figure 4

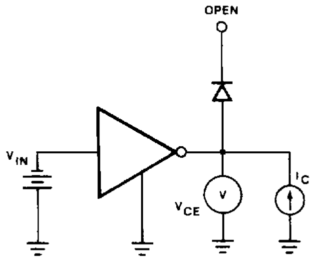


Figure 5

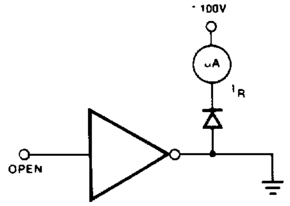


Figure 6

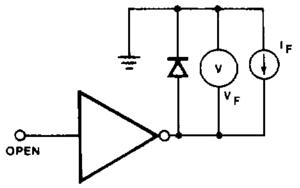
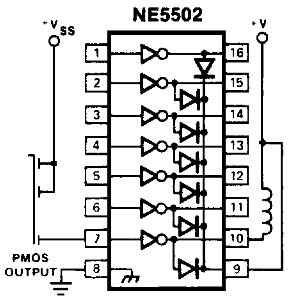


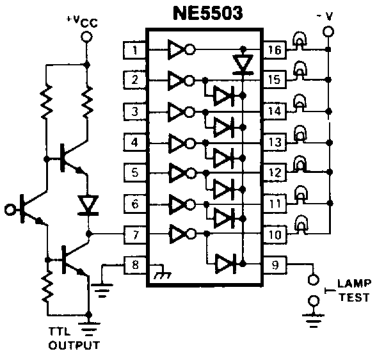
Figure 7

TYPICAL APPLICATIONS

PMOS TO LOAD



TTL TO LOAD



BUFFER FOR HIGHER CURRENT LOADS