

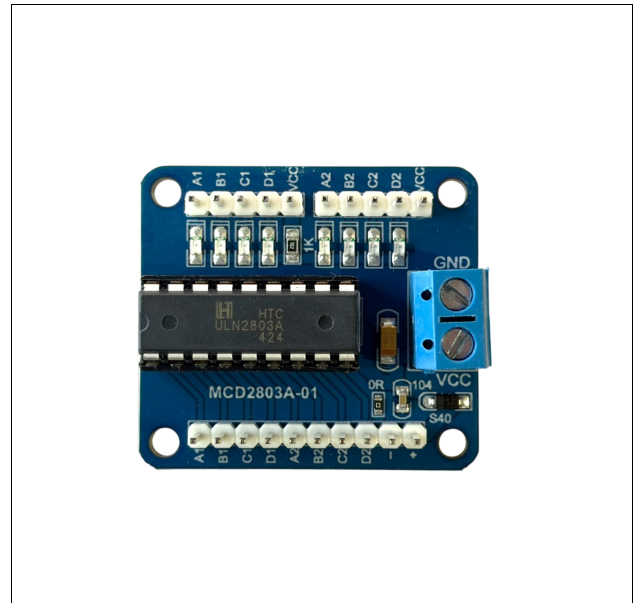
# ULN2803A Stepper Motor Driver Module

## FEATURES

- ULN2803A Stepper Motor Driver Module
- Recommended Input Voltage: DC 5.0V
- Output breakdown voltage: 50V
- Output current: 500mA

## APPLICATIONS

- Relay Drivers
- Stepper and DC Brushed Motor Drivers
- Lamp Drivers
- Line Drivers



## DESCRIPTION

The ULN2803A Module is monolithic high-voltage, high-current Darlington transistor arrays.

## ORDERING INFORMATION

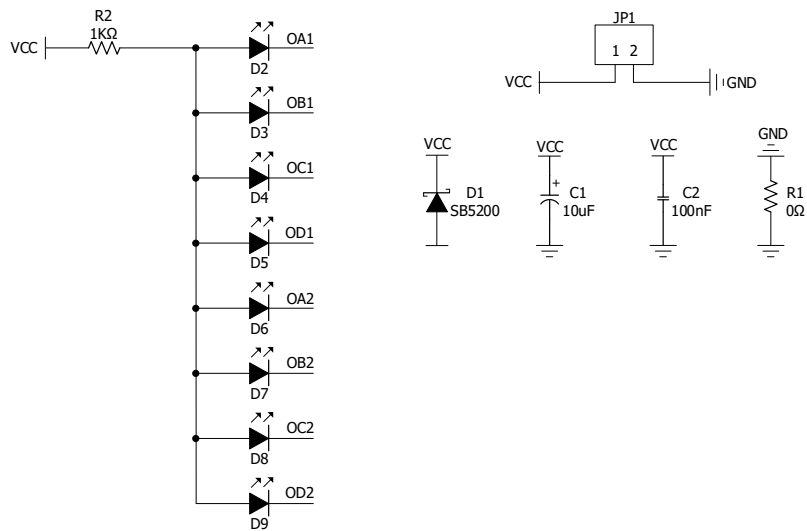
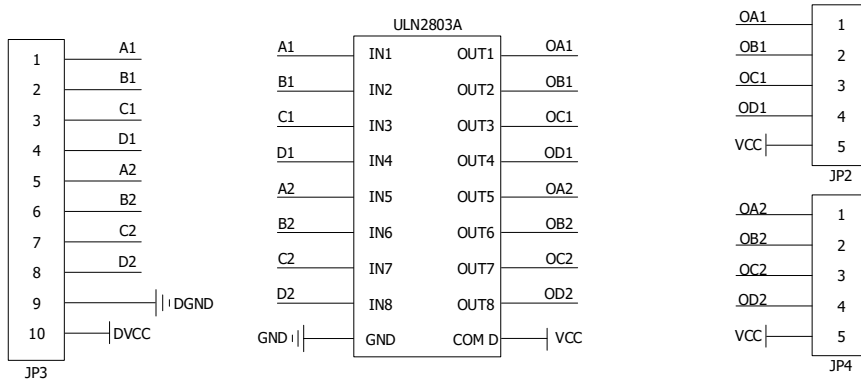
Part Number	MCD2803A-01
Device	ULN2803A Stepper Motor Driver Module
Package	Assembled Module (37mm X 33mm)

## APPLICATION GUIDE

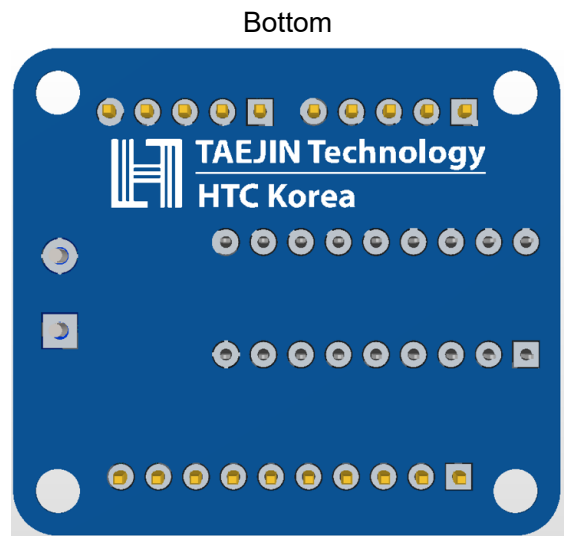
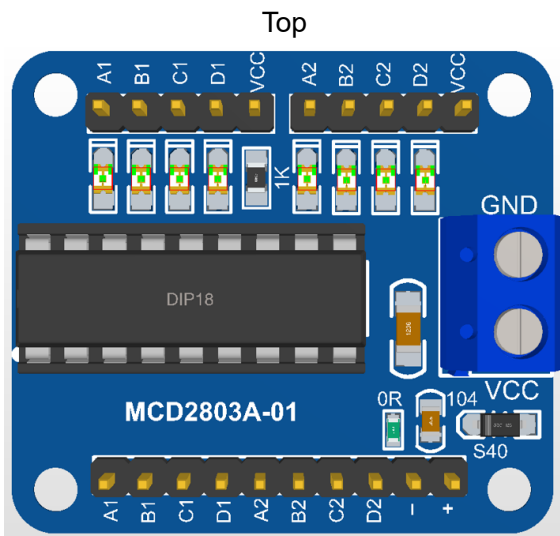
Each consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers

# ULN2803A Stepper Motor Driver Module

## SCHEMATICS



## LAYOUT

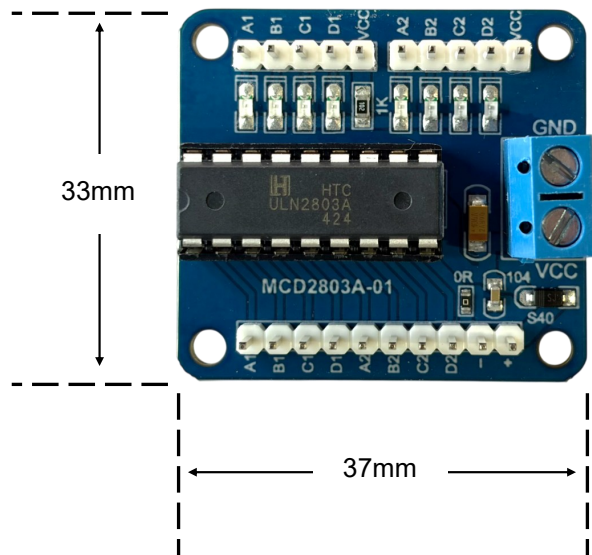


# ULN2803A Stepper Motor Driver Module

## PARTS LIST

Name	Description	P/N	Qty.	Distributor
PCB	Printed Circuit Board	FR4 Lead-Free PCB	1	TAEJIN
IC	ULN2803AN, DIP-18	ULN2803AN	1	TAEJIN
IC Socket	DIP-18 IC Socket	DIP-18 IC Socket	1	Generic
Connector	Wire to Board Connector	KF301	1	Generic
Pin Header	1*10 / 2.54mm pitch	Male Pin Header	1	Generic
Pin Header	1*5 / 2.54mm pitch	Male Pin Header	2	Generic
LED	LED for Indicator	LED, Green	8	Generic
Diode	Schottky Power Rectifier Diodes	B5817W	1	Generic
Resistor	0Ω Resistor	0Ω 5% Resistor, 1608(0603)	1	Generic
Resistor	1KΩ Resistor	1KΩ 5% Resistor, 1608(0603)	1	Generic
Capacitor	100nF / 16V Capacitor	100nF / 16V Capacitor 1608(0603)	1	Generic
Capacitor	10uF / 10V Capacitor	10uF / 10V Capacitor, 3216(1206)	1	Generic

## SIZE INFORMATION

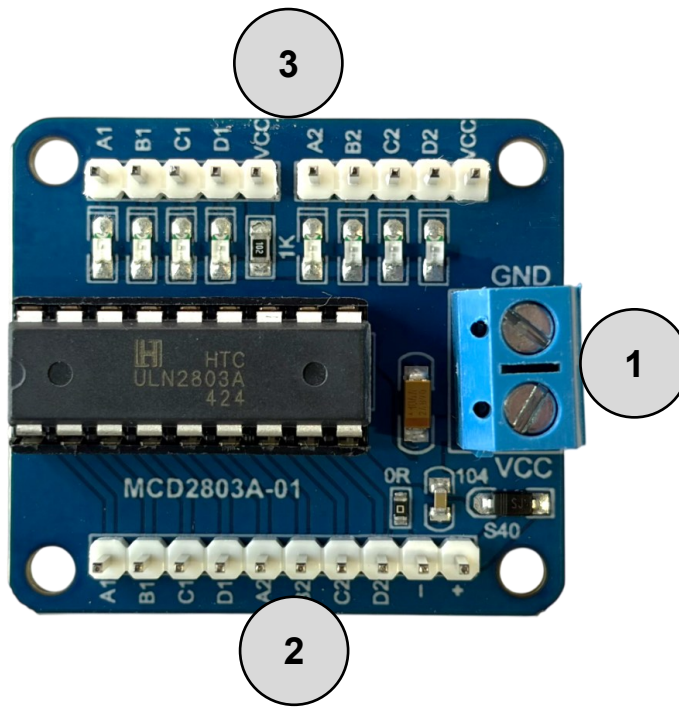


# ULN2803A Stepper Motor Driver Module

## PRODUCT IMAGE



## I/O PORT CONFIGURATION AND DESCRIPTION



Designator	Port Name	Port Description
1	VCC Connector	Input DC 5V
2	Driver Input Pin	Channel 1 through 8 Darlington base Input
3	Driver Output Pin	Channel 1 through 8 Darlington collector Output

# ULN2803A Stepper Motor Driver Module

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## REVISION NOTICE

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## FEATURES

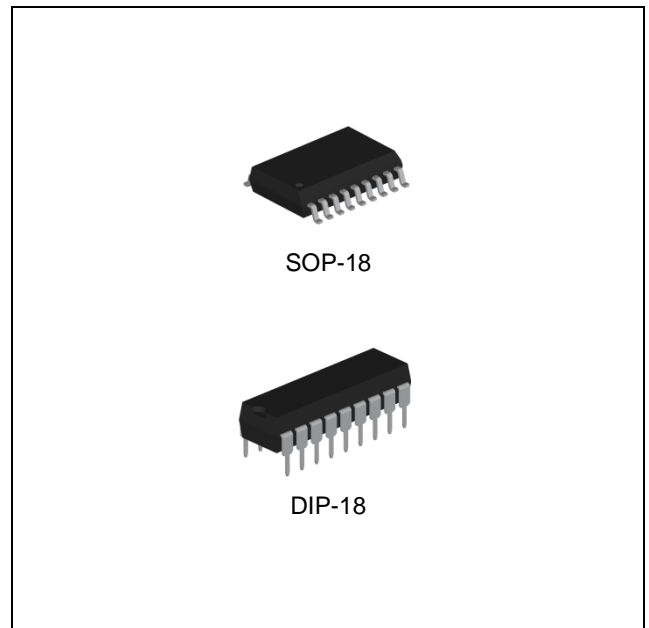
- 8 Darlington Arrays per Package
- 500 mA Rated Collector Current (Single Output)
- Output voltage 50V
- Output Clamp Diodes
- Input Compatible with Various Types of Logic
- Relay-Driver Applications
- Input pins placed opposite to output pins to simplify layout

## APPLICATION

- Relay Drivers
- Stepper and DC Brushed Motor Drivers
- Lamp Drivers
- Display Drivers
- Line Drivers
- Logic Buffers

## DESCRIPTION

The ULN2803A is monolithic high-voltage, high-current Darlington transistor arrays. Each consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers.



## ORDERING INFORMATION

Device	Package
ULN2803AD	SOP-18
ULN2803AN	DIP-18

## ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Output Voltage	$V_O$	-	50	V
Input Voltage <small>(Note 2)</small>	$V_I$	-	30	V
Peak Collector Current	$I_C$	-	500	mA
Output Clamp Current	$I_{OK}$	-	500	mA
Total Emitter-Terminal Current	$I_E$	-	2.5	A
Maximum Junction Temperature	$T_J$	-	150	°C

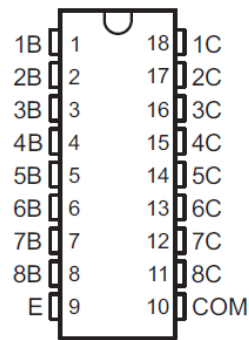
## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Output Voltage	$V_O$	-	50	V
Junction Temperature	$T_J$	-40	125	°C
Operating Free-Air Temperature Range	$T_A$	-40	85	°C

## ORDERING INFORMATION

Package	Order No.	Description	Package Marking	Status
SOP-18	ULN2803AD	8-Digit Darlington Current Driver	ULN2803A	Active
DIP-18	ULN2803AN	8-Digit Darlington Current Driver	ULN2803A	Active

## PIN CONFIGURATION

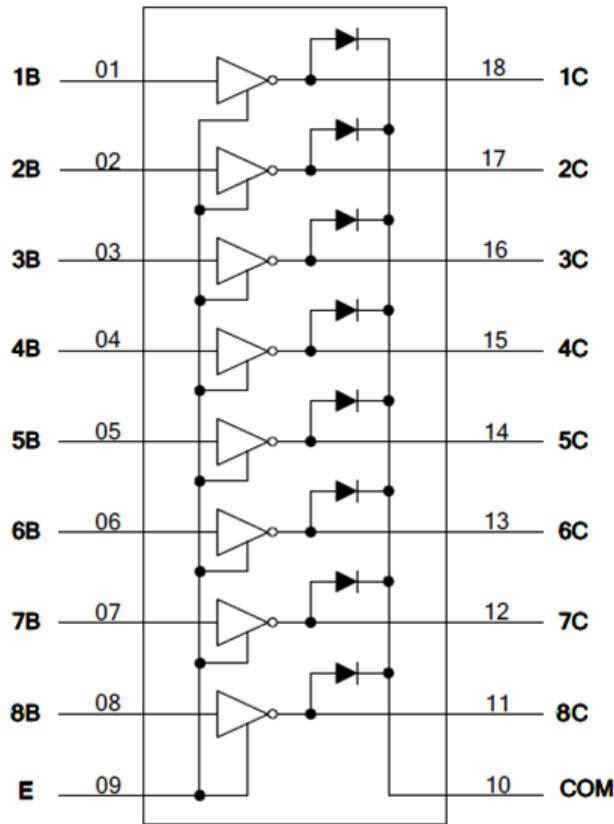


SOP-18 / DIP-18

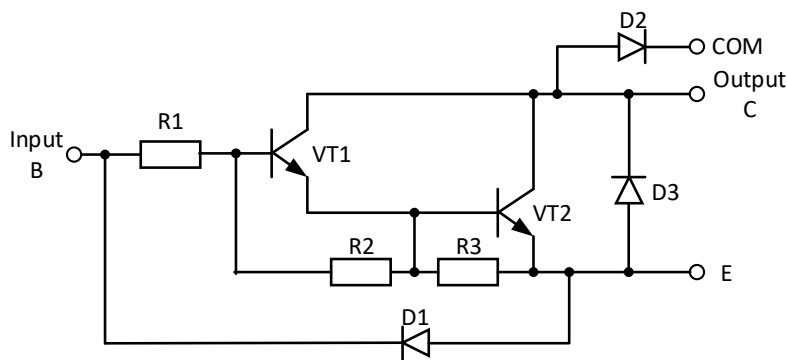
## PIN DESCRIPTION

Pin No.		Pin Name	Pin Function
SOP-18	DIP-18		
1	1	1B	Channel 1 through 8 Darlington Base Input
2	2	2B	
3	3	3B	
4	4	4B	
5	5	5B	
6	6	6B	
7	7	7B	
8	8	8B	
9	9	E	Common Emitter shared by All Channels
10	10	COM	Common Cathode Node for Flyback Diodes
11	11	8C	Channel 1 through 8 Darlington Collector Output
12	12	7C	
13	13	6C	
14	14	5C	
15	15	4C	
16	16	3C	
17	17	2C	
18	18	1C	

## PIN CONNECTION DIAGRAM



## BLOCK DIAGRAM



- R1 : Resistor  
2.7k $\Omega$
- R2 : Resistor  
7.2 k $\Omega$
- R3 : Resistor  
3.0 k $\Omega$

## ELECTRICAL CHARACTERISTICS (Note 3)

Limits in standard typeface are for  $T_J=25^\circ\text{C}$ , unless otherwise specified.

PARAMETER	SYMBOL	TEST FIGURE	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
ON-State Input Voltage	$V_{I(ON)}$	Fig. 1.	$V_{CE}=2\text{V}$	$I_C=200\text{mA}$	-	-	2.4	V
				$I_C=250\text{mA}$	-	-	2.7	
				$I_C=300\text{mA}$	-	-	3.0	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	Fig. 2.	$I_I=250\mu\text{A}, I_C=100\text{mA}$		-	0.9	1.1	V
			$I_I=350\mu\text{A}, I_C=200\text{mA}$		-	1.0	1.3	
			$I_I=500\mu\text{A}, I_C=350\text{mA}$		-	1.2	1.6	
Output Leakage Current	$I_{CEX}$	Fig. 3. Fig. 4.	$V_{CE}=50\text{V},$	$I_I=0\text{mA}$	-	-	50	$\mu\text{A}$
			$V_{CE}=50\text{V},$ $T_A=85^\circ\text{C}$	$I_I=0\text{mA}$	-	-	100	
				$V_I=1\text{V}$	-	-	500	
Clamp Forward Voltage	$V_F$	Fig. 5.	$I_F=350\text{mA}$		-	1.7	2	V
Off-State Input Current	$I_{I(OFF)}$	Fig. 6.	$V_{CE}=50\text{V}, I_C=500\mu\text{A}, T_A=85^\circ\text{C}$		50	65	-	$\mu\text{A}$
Input Current	$I_{I(ON)}$	Fig. 7.	$V_I=3.85\text{V}$		-	-	1.35	mA
Clamp Diode Leakage Current	$I_R$	Fig. 8.	$V_R=50\text{V}$		-	-	50	$\mu\text{A}$
			$V_R=50\text{V}, T_A=85^\circ\text{C}$		-	-	100	
Turn-On Propagation Delay Time	$t_{PLH}$	-	$V_{OUT}=50\text{V}, R_L=125\Omega, C_L=15\text{pF}$		-	0.1		$\mu\text{s}$
Turn-Off Propagation Delay Time	$t_{PHL}$	-	$V_{OUT}=50\text{V}, R_L=125\Omega, C_L=15\text{pF}$		-	0.2		

Note 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.

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

Note 3. The device is not guaranteed to function outside its operating ratings.

## PARAMETER MEASUREMENT INFORMATION

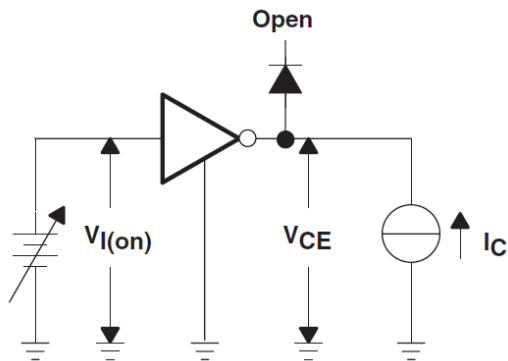


Fig. 1. ON-State Input Voltage Test Circuit

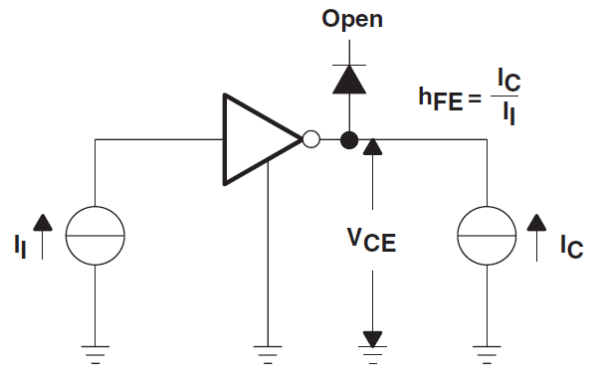


Fig. 2. Collector-Emitter Saturation Voltage Test Circuit

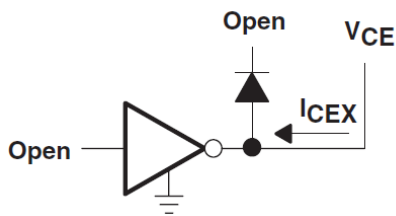


Fig. 3. Output Leakage Current Test Circuit

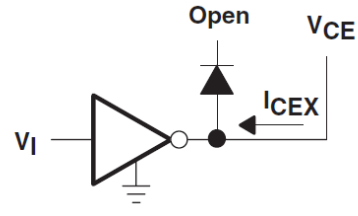


Fig. 4. Output Leakage Current Test Circuit

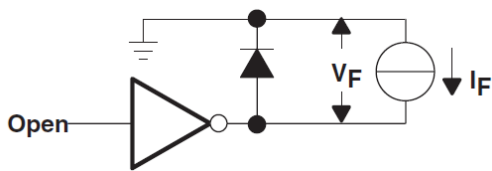


Fig. 5. Clamp Forward Voltage Test Circuit

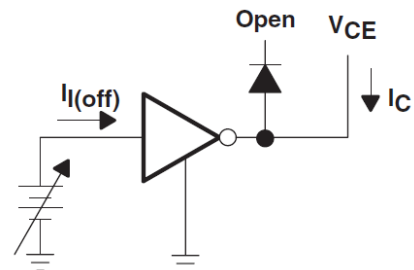


Fig. 6. Off-State Input Current Test Circuit

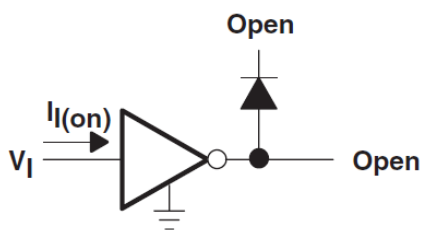


Fig. 7. Input Current Test Circuit

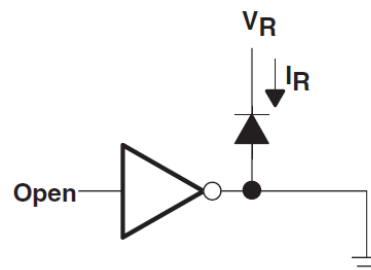


Fig. 8. Clamp Diode Leakage Current Test Circuit

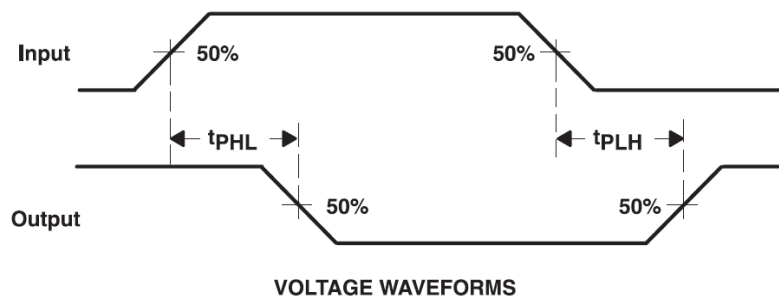


Fig. 9. Propagation Delay Time Waveform

## APPLICATION INFORMATION

T.B.D.

## TYPICAL OPERATING CHARACTERISTICS

T.B.D.

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