



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-MAX490E

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

网址 www.sztdbdt.com Q

用芯智造 · 卓越品质

**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



Features

- Strong anti-noise capability;
- Integrated transient voltage suppression function;
- Data transmission rate can reach 2.5M in an electrical noise environment;
- 4.5V~5.5V power supply, full-duplex;
- Fail-Safe feature;
- 1/8 unit load, allowing a maximum of 256 devices to be connected to the bus;
- Short-circuit output protection for the driver;
- Open-uit fail-safe protection for the receiver;
- A, B port protection: HBM $\pm 15\text{KV}$;

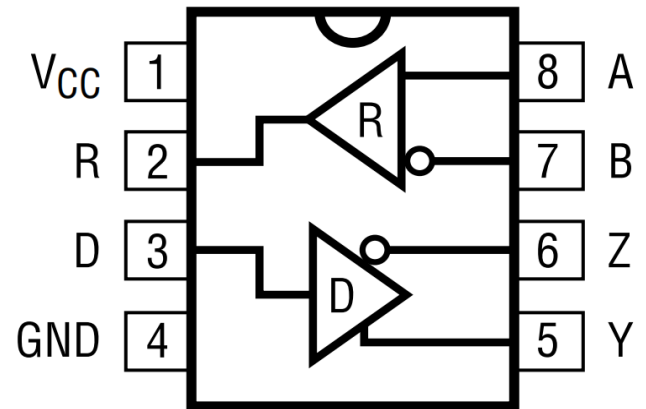


Figure 1. Pin Diagram

Description

The MAX490E is a low-power, RS-485/RS-422 transceiver for harsh environments. Each output and receiver input is protected against $\pm 15\text{kV}$ electrostatic discharge (ESD) with no latch-up. These parts contain one driver and one receiver. The MAX90E 's driver rise time is unconstrained, allowing them to transmit up to 2.5Mbps. These transceivers consume only 120μ of supply current with the drivers disabled and the line fully loaded. All parts operate from a single 5V supply. Short-circuit current is limited, and thermal shutdown circuit is protected, forcing the outputs into a high-impedance state to prevent excessive power dissipation. The receiver input has a fail-safe feature that guarantees the output to be logic if it is open. The MAX490E is designed for full-duplex communication.

Applications

- Low-Power RS-485/RS-422 Transceivers
- Level Translators Transceivers for EMI-Sensitive Applications
- Industrial-Control Local Area Networks



Pin description

Pin number	Pin name	Pin function
1	VCC	Power supply: $4.5V \leq VCC \leq 5.5V$
2	R	Receiver output.
3	D	Driver Input
4	GND	Landing
5	Y	Driver in-phase output terminal
6	Z	Driver inverting output
7	B	Receiver inverting input
8	A	Receiver in-phase input

AbsoluteRating

parameter	symbol	size	Unit
supply voltage	VCC	+7	V
Control port voltage	D	-0.3~VCC+0.3	V
bus-side input voltage	A、B	-8~13	V
Receiver output voltage	R	-0.3~VCC+0.3	V
operating temperature range		-40~85	
Storage operating temperature range		-60~150	
welding temperature range		300	
continuous power consumption	SOP8	400	mW
	DIP8	700	mW

Unless otherwise specified, VCC is 5V $\pm 10\%$, with temperature ranging from TMIN to TMAX. Typical operating conditions are VCC= +5V and 25°C

NOTE1: ΔVOD and ΔVOC represent the amplitude variations of VOD and VOC respectively, caused by state changes in the input signal DI.

The maximum limit parameters are values beyond which the device can be damaged in an irreversible manner. Operation of the device under these conditions is not intended to be and continuous operation at the maximum rated limits may affect device reliability. All voltages are referenced to ground.



FunctionTable

Send Function Table					
input	D	1	0	X	X
output	Y	H	L	Z	Z(shutdown)
	Z	L	H	Z	
Receive Function Table					
input	A-B	≥ -50mV	≤ -200mV	Open/short circuit	X
output	R	H	L	H	Z

Note:X:Any level;Z:High impedance.

Drive switch characteristics

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input to output propagation delay (low to high)	tDPLH	RDIF=54 Q,CL ₁ =CL ₂ =100pF(see Figure 3 and Figure 4)		12	35	ns
Input to output propagation delay(high to low)	tDPHL			12	35	ns
tDPLH-tDPHL	tsKEW1			7	10	ns
Rise time/fall time	tDR,tDF			10	25	ns

ESD Protect

Parameter	symbol	Test condition	Minimum	Typicalcase	Maximum	Unit
A、B、Y、Z		Human bodymodel		±15		KV
Other ports		Human bodymodel		±6		KV



DC Electrical Characteristics of the Receiver

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input current(A,B)	In2	VCC=0 or 5V			125	uA
		VCC=0 or 5V	-100			uA
Forward input threshold voltage	VIT+	$-7V \leq V_{cm} \leq 12V$			-50	mV
Reverse input threshold voltage	VIT-	$-7V \leq V_{cm} \leq 12V$	-200			mV
Input hysteresis voltage	Vhys	$-7V \leq V_{cm} \leq 12V$	10	30		mV
High level output voltage	VoH	IoUT = -4mA, VD = +200 mV	VCC-1.5			V
Low level output voltage	VoL	IoUT = +4mA, VID = -200 mV			0.4	V
Three state input leakage current	IozR	$0.4V < V_o < 2.4V$			±1	uA
Input resistance of receiver	RIn	$-7V \leq V_{cm} \leq 12V$	96			kS
Receiver short circuit current	IosR	$0V \leq V_o \leq VCC$	±7		±95	mA

Unless otherwise specified, VCC is 5V ±10%, with temperature ranging from TMIN to TMAX. Typical operating conditions are VCC= +5V and 25°C.

Receiver switch characteristic

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit	
Propagation delay from receiver input to	tRPLH	See Figure 5 and Figure 6 VD ≥ 2.0V; rising and falling edge time Vm ≤ 15ns	20	60	90	ns	
The propagation delay from receiver	tRPHL		20	60	90	ns	
tRPLH-tRPHL	tsKEW2			7	10	ns	



Supply Current

Parameter	symbol	Test condition	Minimum	Typicalcase	Maximum	Unit
Supply current	Icc	DI=0 or VCC		220	400	uA

Explanation

Resume

The 490E is a full-duplex high-speed RS-485/RS-422 transceiver with integrated driver and receiver,featuring fail-safe operation,overvoltage and overcurrent protection.It delivers error-free data transmission at speeds up to 2.5Mbps.

Failure Safety

When the receiver input is short-circuited or open-circuited,or when all drivers connected to the terminal matching transmission line are disabled(idle),the 490E ensures a logic high level at the receiver output.This is achieved by setting the receiver input thresholds to-10mV and-200mV respectively.If the differential receiver input voltage(A-B)is $\geq -10\text{mV}$,RO is a logic high level,if the voltage(A-B)is $\leq -200\text{mV}$,RO is a logic low level.Based on the receiver thresholds,a logic high level with a minimum noise tolerance of 50mV can be achieved.The-10mV to-200mV threshold voltage complies with the $\pm 200\text{mV}$ requirement of the EIA/TIA-485 standard.

256 Transceivers on the Bus

A standard RS485 receiver has an input impedance of $12\text{k}\Omega$ (1 unit load),while a standard driver can support up to 32 unit loads.The 490E transceiver's receiver features an 1/8 unit load input impedance($96\text{k}\Omega$),enabling up to 256 transceivers to be connected in parallel on the same communication bus.These devices can be configured individually or combined with other RS485 transceivers,provided the total load does not exceed 32 unit loads.

drive output protection

The overcurrent and overvoltage protection mechanism prevents excessive output current and power consumption caused by faults or bus conflicts,and provides rapid short-circuit protection across the entire common-mode voltage range(referencing typical operating characteristics).



TestCircuit

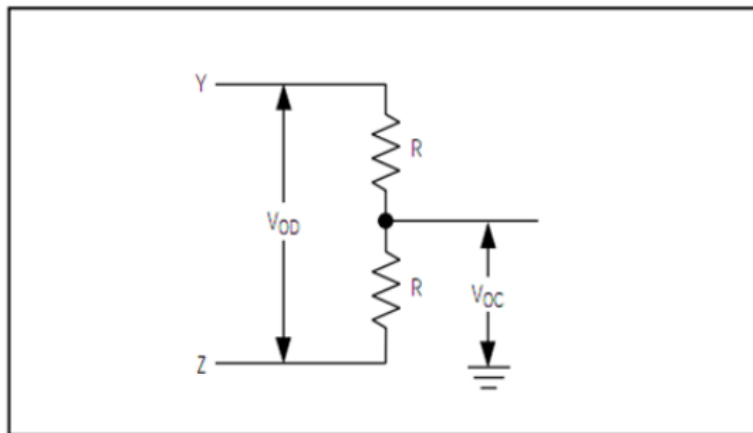


Figure 2 DC Test Load of the Driver

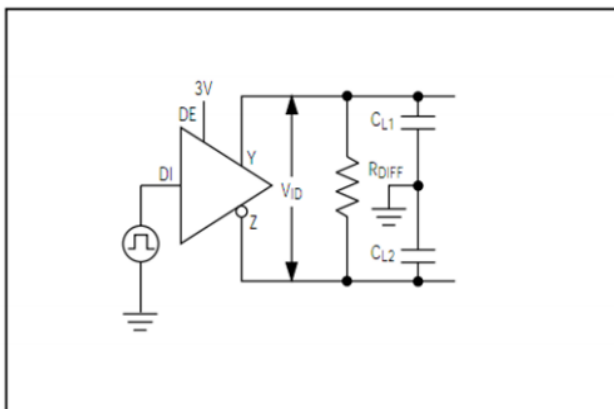


Figure 3. Driver Timing Test Circuit

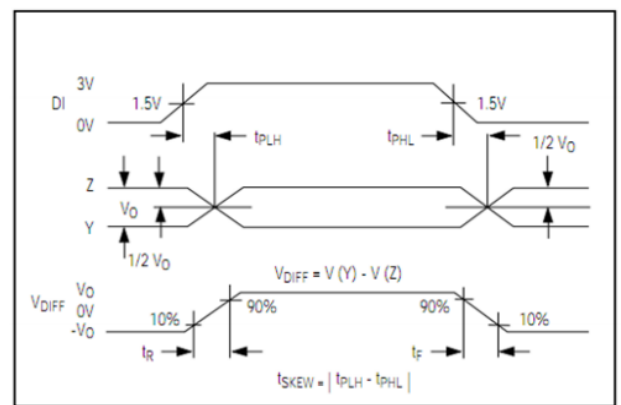


Figure 4 Propagation Delay of Driver

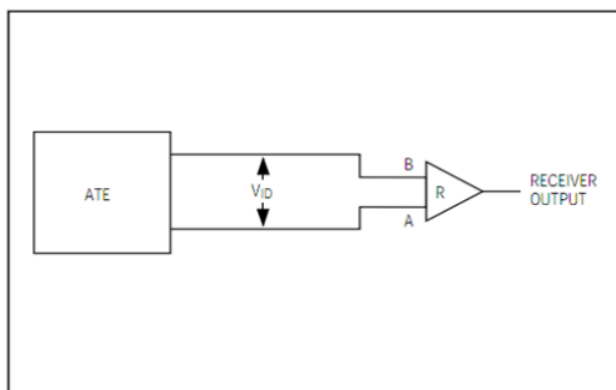


Figure 5 Receiver Propagation Delay Test Circuit

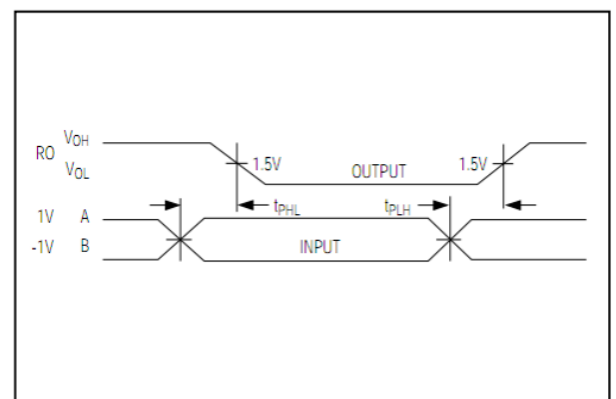


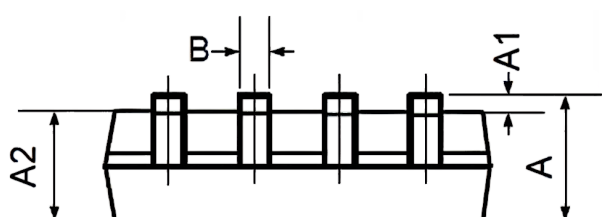
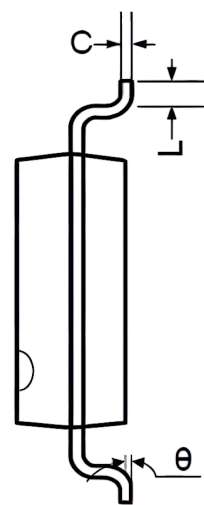
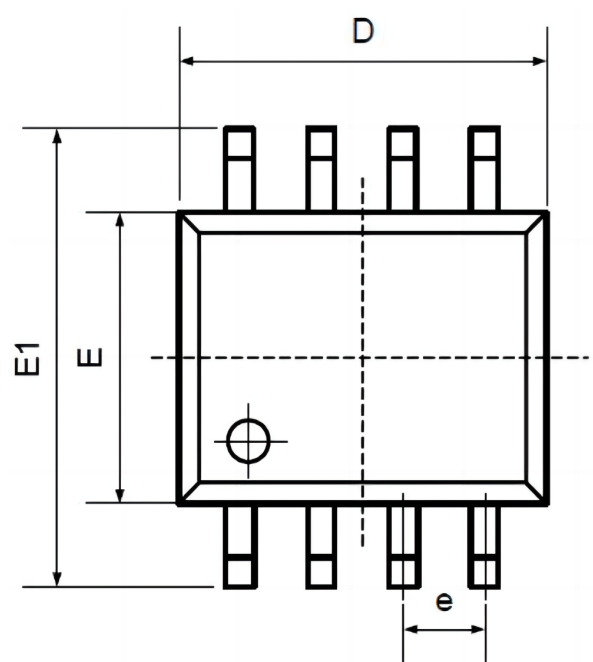
Figure 6 Receiver Propagation Delay Sequence



Order information

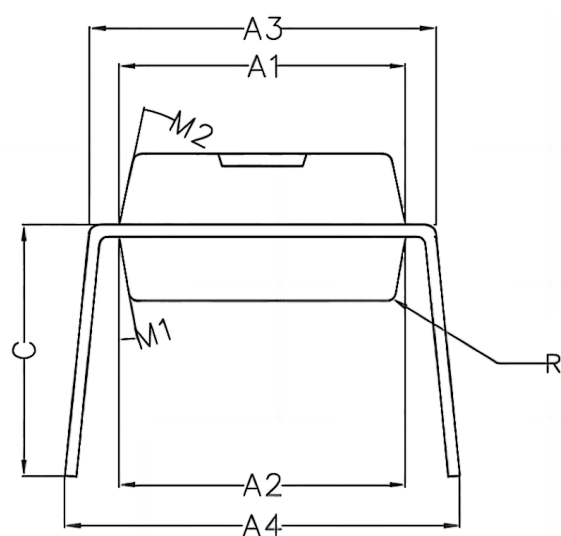
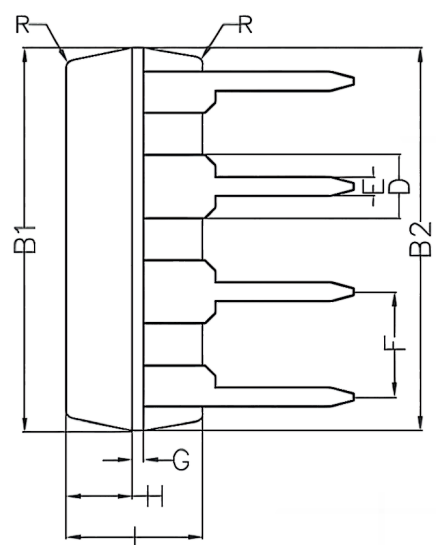
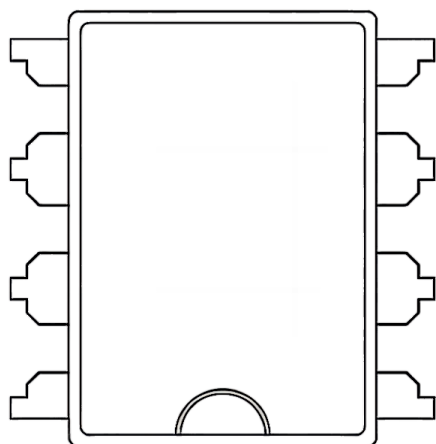
Order Number	Package	Package Quantity	Marking On The park	Temperature
MAX490ECPA-TUDI	DIP8	Tube,50,A box of 2000	MAX490ECPA	0°C to 70°C
MAX490ECSA-TUDI	SOP8	Tape,Reel,2500	MAX490ECSA	
MAX490EEPA-TUDI	DIP8	Tube,50,A box of 2000	MAX490EEPA	- 40°C to 85°C
MAX490EESA-TUDI	SOP8	Tape,Reel,2500	MAX490EESA	

Package SOP8



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	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Package DIP8



Symbol	Min	Non	Max
A1	6.28	6.33	6.38
A2	6.33	6.38	6.43
A3	7.52	7.62	7.72
A4	7.80	8.40	9.00
B1	9.15	9.20	9.25
B2	9.20	9.25	9.30
C		5.57	
D		1.52	
E	0.43	0.45	0.47
F		2.54	
G		0.25	
H	1.54	1.59	1.64
I	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°



Important statement:

- TUDI Semiconductor reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using TUDI Semiconductor products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- TUDI Semiconductor products have not been licensed for life support, military, and aerospace applications, and therefore TUDI Semiconductor is not responsible for any consequences arising from the use of this product in these areas.
- If any or all TUDI Semiconductor products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all TUDI Semiconductor products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- TUDI Semiconductor documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. TUDI Semiconductor assumes no responsibility or liability for altered documents.
- TUDI Semiconductor is committed to becoming the preferred semiconductor brand for customers, and TUDI Semiconductor will strive to provide customers with better performance and better quality products.