

RS-485 Interface Circuit

PRODUCT DESCRIPTION

The MS3485/MS3485M/MS3485D is a RS-485 transceiver. The bus pins are robust to electrostatic discharge (ESD) events, with high levels of protection to Human-Body Model (HBM, $\pm 20\text{kV}$), Air-Gap Discharge, and Contact Discharge specifications, the Data Rate can transmit up to 10Mbps. The driver differential outputs and the receiver differential inputs are connected internally to form a bus port suitable for half-duplex communication.

FEATURES

- Bus-Pin Protection:
 - $\pm 20\text{ kV}$ HBM Protection
 - $\pm 12\text{ kV}$ IEC61000-4-2 Contact Discharge
 - $+4\text{ kV}$ IEC61000-4-4 Fast Transient Burst
- Up to 256 Nodes on a Bus
- Data Rate: 300 bps to 10Mbps(@5V)
- Power Supply Range: 2.5V-6.0V
- Three State Output
- Power Range: 4.5V-6.0V

APPLICATIONS

- E-Metering Networks
- Industrial Automation
- HVAC Systems
- Process Control
- Motion Control
- RS-485 Interface

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS3485	SOP8	MS3485
MS3485M	MSOP8	MS3485M
MS3485D	DIP8	MS3485D



SOP8

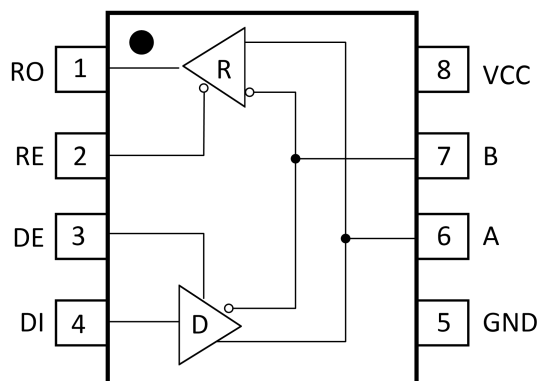


MSOP8



DIP8

PIN CONFIGURATIONS



PIN DESCRIPTION

Pin	Name	Type	Description
1	RO	O	Receive Data Output
2	RE	I	Receiver Enable, Active Low
3	DE	I	Driver Enable, Active High
4	DI	I	Driver Data Input
5	GND	I	Ground
6	A	I/O	Driver Output or Receiver Input (Complementary to B)
7	B	I/O	Driver Output or Receiver Input (Complementary to A)
8	VCC	POWER	Supply

ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

Parameter	Symbol	Ratings	Unit
Supply voltage	VCC	-0.5~+7	V
Input voltage at control pin	VDE, VRE	-0.5~+7	V
Driver Input Voltage	VDI	-0.5~+7	V
Driver Output Voltage	VA, VB	-0.5~+7	V
Receiver Input Voltage	VA, VB	-7~+12	V
Receiver Output Voltage	VRO	-0.5~+7	V
Continuous Power Dissipation(at 70°C)	PC	470(SOP8)	mW
		725(DIP8)	
Storage temperature	TSTORE	-60~+150	°C
Lead Temperature(10s)	TSOLDERING	+260	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	+2.5		+6	V
Input Voltage on DI, DE, RE	VDE, VRE	-0.5		VCC	V
Bus Voltage	VA, VB	-7		+12	V
Operating Temperature Range	TWORK	-40		+120	°C

ELECTRICAL CHARACTERISTICS(VCC=5V)

DC Electrical Characteristics

VCC=5.0V, TA = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Driver Differential Output Voltage	VOD	No load	4	4.5		V
		RL=50Ω	2	2.5		
Change in Magnitude of Driver Differential Output	ΔVOD	RL=50Ω			0.2	V
driver Common-mode Output Voltage	VOC	RL=50Ω			3	V
Change in Magnitude of Driver Common-mode Output	ΔVOC	RL=50Ω			0.2	V
Input High Voltage	VIH	DE,RE,DI	2			V
Input Low Voltage	VIL	DE,RE,DI			0.8	V
Logic Input Current	IIN,LOGIC	DE,RE,DI			±2	uA
input Current(A, B)	IIN,BUS	DE=0V, VIN=5V		40	90	uA
		VCC=5V VIN=0V		60	100	
Receiver Differential Threshold Voltage	VTH	-7V≤VCM≤12V	-0.1		0.1	V
Receiver Input Hysteresis	ΔVTH	VCM=0V		25		mV
Receiver Output High Voltage	VOH	IOUT=-1.5mA, VID=200mV	4.2	4.8		V
Receiver Output Low Voltage	VOL	IOUT=-1.5mA, VID=200mV		0.1	0.2	V
Three-State Output Current at Receiver	IOSR	VCC=5V, 0V≤VOUT≤VCC			±1	uA
Receiver Input Resistance	RIN	-7V≤VCM≤12V		100		kΩ
Supply Current	ICC	No load, RE=DE=DI=0V or VCC		0.48	0.9	mA
Driver Short-Circuit Current	IOSD	VOUT = -7V	25			mA
		VOUT = 12V	25			
Receiver Short-Circuit Current	IOSR	0V≤VRO≤VCC	7			mA
ESD Protection(A,B)	VESD	Human Body Model		±20		kV

Switching Characteristics

VCC=5.0V, TA = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Driver Input to Output	tPLH	RDIFF=50Ω, CLA=CLB=100pF	10	35	70	ns
	tPHL		10	50	90	
Driver Input to Output	tPDS	RDIFF=50Ω, CLA=CLB=100pF		30		ns
Driver Rise Time	tTTR	RDIFF=50Ω, CLA=CLB=100pF		40	70	ns
Driver Fall Time	tTTF	RDIFF=50Ω, CLA=CLB=100pF		40	70	ns
Driver Enable to Output High	tPZH	CL=100pF		30	70	ns
Driver Enable to Output Low	tPZL	CL=100pF		30	70	ns
Driver Disable Time from Low	tPHZ	CL=100pF		90	110	ns
Driver Disable Time from High	tPLZ	CL=100pF		100	120	ns
Receiver Input to Output	tPLH	CL=15pF	20	60	200	ns
	tPHL		20	40	200	
Differential Receiver Skew	tPDS	CL=15pF, tPLH - tPHL		20		ns
Receiver Enable to Output High	tPZH	CL=15pF		50	80	ns
Receiver Enable to Output Low	tPZL	CL=15pF		60	90	ns
Receiver Disable Time from High	tPHZ	CL=15pF		50	80	ns
Receiver Disable Time from Low	tPLZ	CL=15pF		60	90	ns
Maximum Data Rate	fMAX				10	Mbps

ELECTRICAL CHARACTERISTICS(VCC=3.3V)

DC Electrical Characteristics

VCC=3.3V, TA = 25°C, unless otherwise noted.

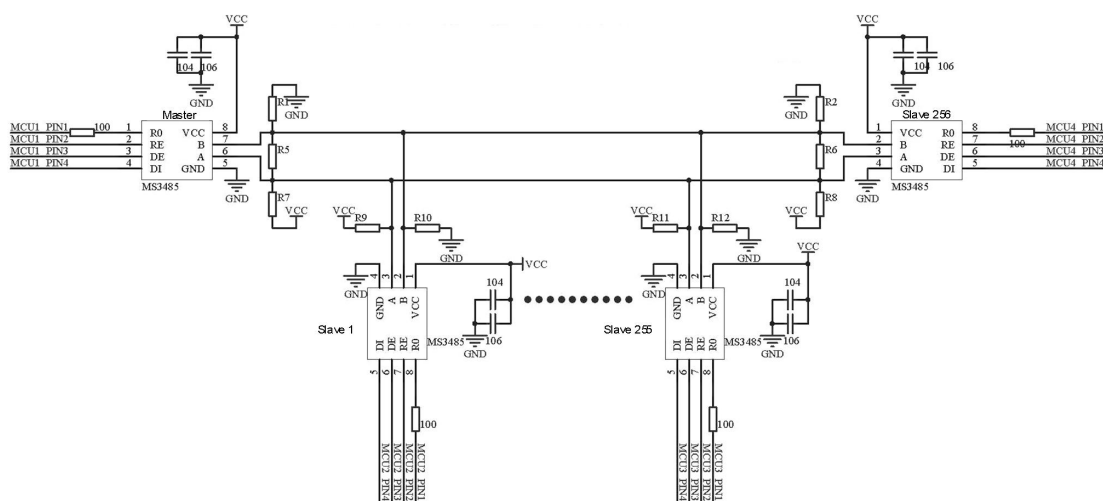
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Driver Differential Output Voltage	VOD	No load	2.5	2.8		V
		RL=50Ω		1.35		
Change in Magnitude of Driver Differential Output	ΔVOD	RL=50Ω			0.2	V
Driver Common-mode Output Voltage	VOC	RL=50Ω		1.65	3	V
Change in Magnitude of Driver Common-mode Output	ΔVOC	RL=50Ω			0.2	V
Input High Voltage	VIH	DE, RE, DI	2			V
Input Low Voltage	VIL	DE, RE, DI			0.8	V
logic input current	IIN,LOGIC	DE, RE, DI			±2	uA
input Current(A, B)	IIN,BUS	DE=0V, VIN=3.3V		40	90	uA
		VCC=3.3V VIN=0V		60	100	
Receiver Differential Threshold Voltage	VTH	-7V≤VCM≤12V	-0.2		0.2	V
Receiver Input Hysteresis	ΔVTH	VCM=0V		25		mV
Receiver Output High Voltage	VOH	IOUT=-1.5mA, VID=200mV	VCC-0.4			V
Receiver Output Low Voltage	VOL	IOUT=-1.5mA, VID=200mV			0.4	V
Three-StateOutput Current at Receiver	IOSR	VCC=5V, 0V≤VOUT≤VCC			±1	uA
Receiver Input Resistance	RIN	-7V≤VCM≤12V		100		kΩ
Supply Current	ICC	No load, RE=DE=DI=0V or VCC		0.2		mA
Driver Short-Circuit Current,	IOSD	VOUT = -7V		133		mA
		VOUT = 12V		80		
Receiver Short-Circuit Current	IOSR	0V≤VRO≤VCC		98		mA
ESD Protection(A,B)	VESD	Human Body Model		±20		kV

Switching Characteristics

VCC=3.3V, TA = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Driver Input to Output	tPLH	RL=27Ω, CLA=CLB=15pF	7	22	35	ns
	tPHL		7	22	35	
Driver Input to Output	tPDS	RL=27Ω, CLA=CLB=15pF			8	ns
Driver Enable to Output High	tPZH	RL=110Ω, CLA=CLB=15pF		45	90	ns
Driver Enable to Output Low	tPZL	RL=110Ω, CLA=CLB=15pF		45	90	ns
Driver Disable Time from Low	tPHZ	RL=110Ω, CLA=CLB=15pF		40	80	ns
Driver Disable Time from High	tPLZ	RL=110Ω, CLA=CLB=15pF		40	80	ns
Receiver Input to Output	tPLH	CL=15pF	25	65	90	ns
	tPHL		25	75	120	
Differential Receiver Skew	tPDS	CL=15pF, tPLH –tPHL			10	ns
Receiver Enable to Output High	tPZH	CL=15pF		25	50	ns
Receiver Enable to Output Low	tPZL	CL=15pF		25	50	ns
Receiver Disable Time from High	tPHZ	CL=15pF		25	45	ns
Receiver Disable Time from Low	tPLZ	CL=15pF		25	45	ns
Maximum Data Rate	fMAX	VCC=3.3V			6	Mbps

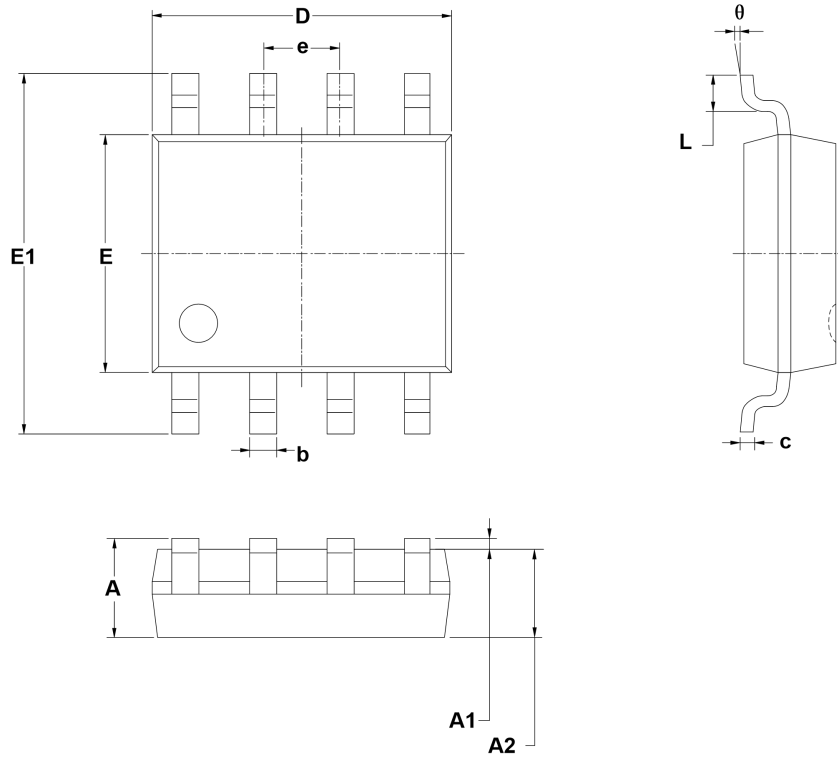
APPLICATIONS INFORMATION



1. R1 resistance value ranges from (slave number+1)k to (slave number+1)×10k.
2. R2 resistance value ranges from 100 to 1k. R2 is only needed to connect on the MS3485 farthest to both ends, in order to reduce signal reflex, instead of connecting R2 on AB line of all masters.
3. When many slaves are connected, adopt daisy chain rather than topology.
4. It is recommended to use twisted pair, and the farthest distance doesn't exceed 1.5km.

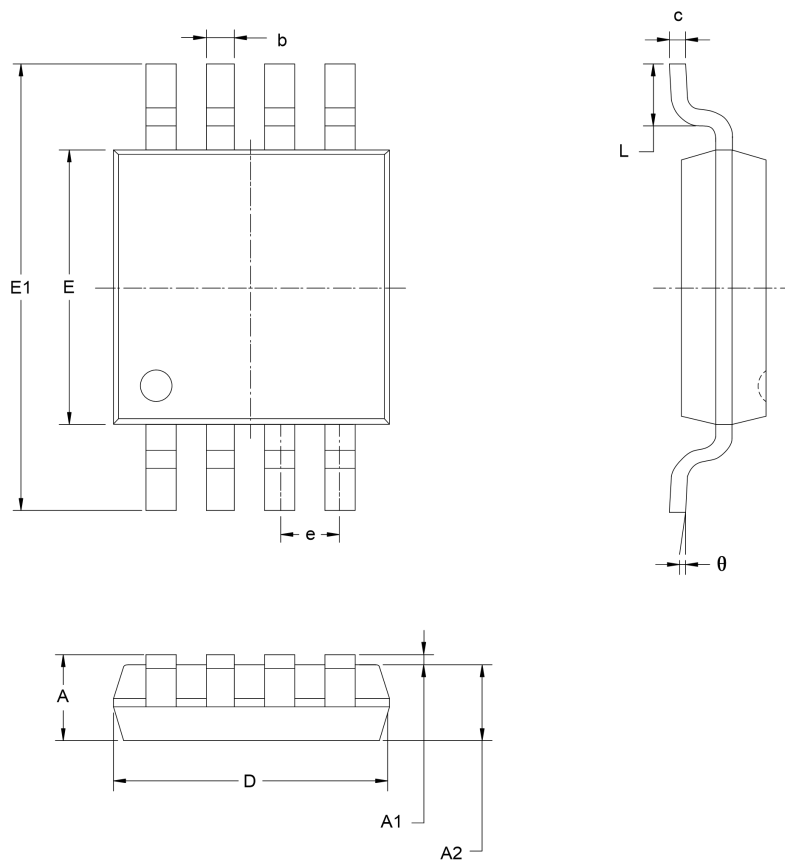
PACKAGE OUTLINE DIMENSIONS

SOP8



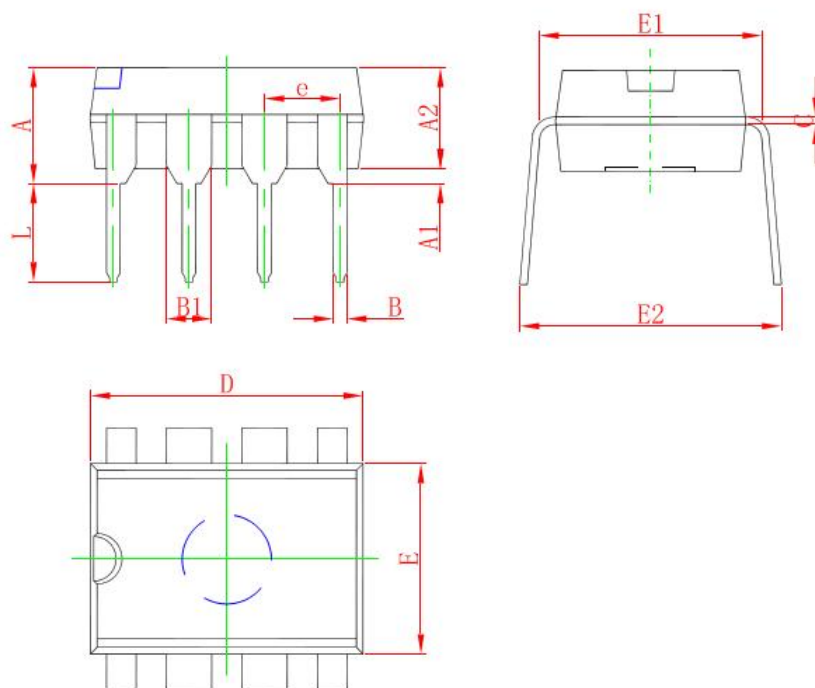
Symbol	Dimensions In Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

MSOP8



Symbol	Dimensions In Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650BSC		0.026BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

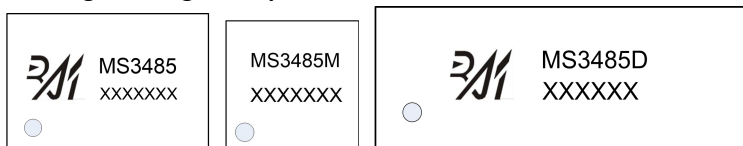
DIP8



Symbol	Dimensions In Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

MARKING and PACKAGING SPECIFICATIONS

1. Marking Drawing Description



Product Name : MS3485, MS3485M, MS3485D

Product Code : XXXXXX, XXXXXX

2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

3. Packaging Specifications

Device	Package	Piece/Reel	Reel/Box	Piece /Box	Box/Carton	Piece/Carton
MS3485	SOP8	2500	1	2500	8	20000
MS3485M	MSOP8	3000	1	3000	8	24000

Device	Package	Piece/Tube	Tube/Box	Piece /Box	Box/Carton	Piece/Carton
MS3485D	DIP8	50	40	2000	10	20000

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**MOS CIRCUIT OPERATION PRECAUTIONS**

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.



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