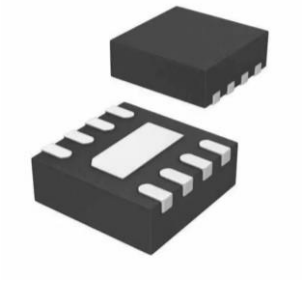
Polarized RS-485 Interface Circuit

PRODUCT DESCRIPTION

The MS3485/MS3485M/MS3485DN/MS3485D is a RS-485 transceiver with half-duplex operation and ±10kV ESD. Its transmission rate and receiving rate can be up to 10Mbps. The on-chip integrated transient protection is free from the influence of IEC61000 Electrostatic Discharge (ESD) and Electrical Fast Transient (EFT). The device is featured with wide common-mode voltage range, which is suitable for multiple-point applications over long cable.

SOP8

MSOP8



DFN8

DIP8

FEATURES

- Bus-Pin Protection:
  ±20kV HBM Protection
  ±12kV IEC61000-4-2 Contact Discharge
  +4kV IEC61000-4-4 Fast Transient Burst
- Up to 256 Nodes on Bus
- Data Rate: 300 bps to 10Mbps(@5V)
- Power Supply Range: 2.5V-6.0V
- Three-state Output
- Compatible with other 485 chips

APPLICATIONS

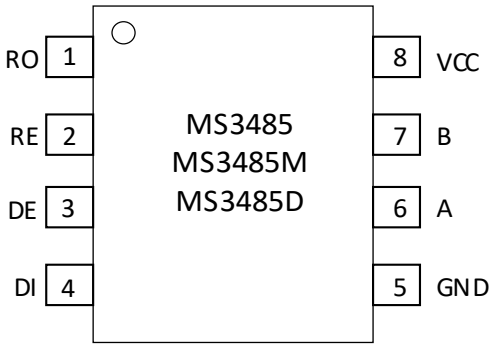
- Industrial Automation
- Electricity Meter
- Heating, Ventilation, Air Conditioning Systems (HVAC)
- DMX512 Networks
- Process Control
- Motion Control
- RS-485 Interface

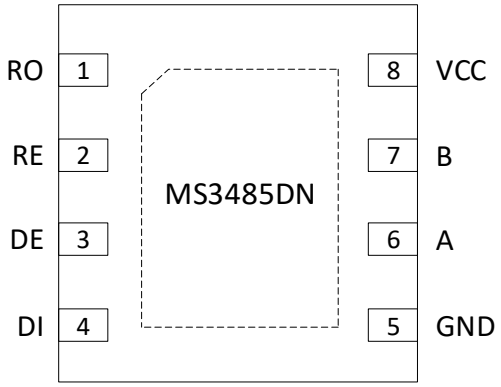
PRODUCT SPECIFICATION

Part Number	Package	Marking
MS3485	SOP8	MS3485
MS3485M	MSOP8	MS3485M
MS3485DN	DFN8	MS3485DN
*MS3485D	DIP8	MS3485D

*The package is not available temporarily. If necessary, please contact Hangzhou Ruimeng Sales Department Center.

PIN CONFIGURATIONS

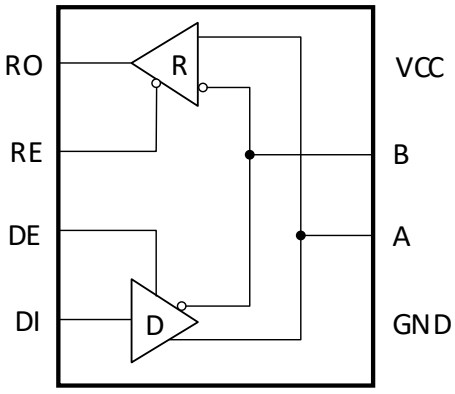




PIN DESCRIPTION

Pin	Name	Type	Description
1	RO	O	Receiver Output
2	RE	I	Receiver Enable, Active Low. When RE is high, receiver output is in Hi-Z state.
3	DE	I	Transmitter Enable, Active High. When DE is low, transmitter output is in Hi-Z state.
4	DI	I	Transmitter Input
5	GND	-	Ground
6	A	I/O	Bus Port A
7	B	I/O	Bus Port B
8	VCC	-	Supply

BLOCK DIAGRAM



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	V_{CC}	-0.5 ~ +7	V
Input Voltage on Control Pin	V_{DE}, V_{RE}	-0.5 ~ +7	V
Transmitter Input Voltage	V_{DI}	-0.5 ~ +7	V
Transmitter Output Voltage	$V_{A,OUT}$; $V_{B,OUT}$	-0.5 ~ +7	V
Receiver Input Voltage	$V_{A,IN}$; $V_{B,IN}$	-7 ~ +12	V
Receiver Output Voltage	V_{RO}	-0.5 ~ +7	V
Continuous Power Dissipation(at 70°C)	P_C	470 (SOP8) 725 (DIP8)	mW
Storage Temperature	T_{STG}	-65 ~ +150	°C
Soldering Temperature (10s)	$T_{SOLDERING}$	+260	°C
ESD (HBM) (A,B Pins)	V_{ESD}	±20	kV

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	+2.5		+6	V
Input Voltage on DI, DE, RE	V_{DE}, V_{RE}	-0.5		V_{CC}	V
Bus Voltage	V_A,V_B	-7		+12	V
Operating Temperature Range	T_A	-40		+125	°C

ELECTRICAL CHARACTERISTICS(VCC=5V)

DC Electrical Characteristics

V_{CC}=5.0V, T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Transmitter Differential Output Voltage	V_{OD}	No load		4	4.5		V
		R_L=100Ω			2.5		
Differential Output Voltage Magnitude Mismatch	ΔV_{OD}	R_L=100Ω			±0.1		V
Differential Output Common-mode Voltage	V_{OC}	R_L=100Ω			2.5		V
Change of Differential Output Common-mode Voltage	ΔV_{OC}	R_L=100Ω			±0.1		V
High-level Logic Input Voltage	V_{IH}	V_{DE}, V_{RE}, V_{DI}		2.5			V
Low-level Logic Input Voltage	V_{IL}	V_{DE}, V_{RE}, V_{DI}				0.7	V
Logic Input Current	$I_{IN,LOGIIC}$	V_{DE}, V_{RE}, V_{DI}				±2	μA
Bus Input Current	$I_{IN,BUS}$	V_{DE}=0V,	V_{IN}=5V		40		μA
		V_{CC}=5V	V_{IN}=0V		60		
Receiver Differential Threshold Voltage	V_{TH}	-7V≤V_{CM}≤12V		-0.2		0	V
Receiver Input Hysteresis	ΔV_{TH}	V_{CM}=0V			25		mV
Receiver High-level Output Voltage	V_{OH}	I_{OUT}=-1.5mA, V_{ID}=200mV		0			V
Receiver Low-level Output Voltage	V_{OL}	I_{OUT}=-1.5mA, V_{ID}=-200mV				0.4	V
Three-State(Hi-Z) Output Current at Receiver	I_{ZR}	V_{CC}=5V, 0V≤V_{OUT}≤V_{CC}			±1		μA
Receiver Input Resistance	R_{IN}	-7V≤V_{CM}≤12V			100		kΩ
Supply Current	I_{CC}	No load, V_{RE}=V_{DE}=V_{DI}=0V or V_{CC}			0.48	0.9	mA
Transmitter Output Short-Circuit Current	I_{OS}	V_{CC}=5V, A or B short to GND		50			mA
Receiver Output Short-Circuit Current	I_{OSR}	0V≤V_{RO}≤V_{CC}			±90		mA

Switching Characteristics

V_{CC}=5.0V, T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Transmitter Propagation Delay	t_{PLH}	R_{DIFF}=50Ω, C_{LA}=C_{LB}=100pF		35		ns
	t_{PHL}			50		
Transmitter Transmission Distortion	t_{PDS}	R_{DIF}=50Ω, C_{LA}=C_{LB}=100pF		15		ns
Transmitter Rising Time	t_{TTR}	R_{DIF}=50Ω, C_{LA}=C_{LB}=100pF		40		ns
Transmitter Falling Time	t_{TTF}	R_{DIF}=50Ω, C_{LA}=C_{LB}=100pF		40		ns
Transmitter Output Goes High After Enable Delay	t_{PZH}	C_L=100pF		30		ns
Transmitter Output Goes Low After Enable Delay	t_{PZL}	C_L=100pF		30		ns
Transmitter Output Goes High After Disable Delay	t_{PHZ}	C_L=100pF		90		ns
Transmitter Output Goes Low After Disable Delay	t_{PLZ}	C_L=100pF		100		ns
Receiver Propagation Delay	t_{PLH}	C_L=15pF		60		ns
	t_{PHL}			40		
Receiver Transmission Distortion	t_{PDS}	C_L=15pF, $\lvert t_{PLH} - t_{PHL} \rvert$		20		ns
Receiver Output Goes High After Enable Delay	t_{PZH}	C_L=15pF		50		ns
Receiver Output Goes Low After Enable Delay	t_{PZL}	C_L=15pF		60		ns
Receiver Output Goes High After Disable Delay	t_{PHZ}	C_L=15pF		50		ns
Receiver Output Goes Low After Disable Delay	t_{PLZ}	C_L=15pF		60		ns
Maximum Data Rate	f_{MAX}				10	Mbps

ELECTRICAL CHARACTERISTICS(VCC=3.3V)

DC Electrical Characteristics

V_{CC}=3.3V, T_A = 25°C, unless otherwise noted.

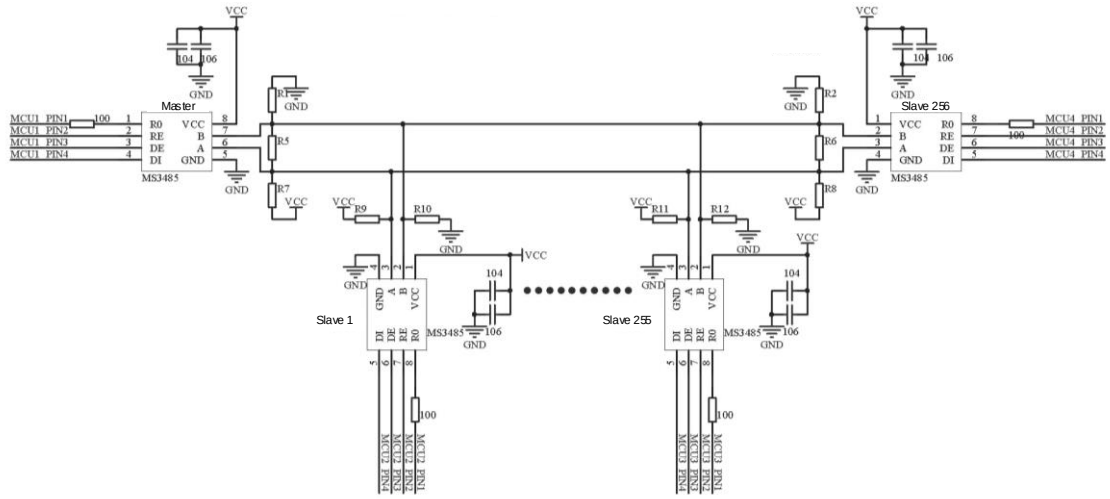
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Transmitter Differential Output Voltage	V_{OD}	No load	2.5	2.8		V
		R_L=100Ω		1.35		
Differential Output Voltage Magnitude Mismatch	ΔV_{OD}	R_L=100Ω		±0.1		V
Differential Output Common-mode Voltage	V_{OC}	R_L=100Ω		1.65		V
Change of Differential Output Common-mode Voltage	ΔV_{OC}	R_L=100Ω		±0.1		V
High-level Logic Input Voltage	V_{IH}	V_{DE}, V_{RE}, V_{DI}	2.0			V
Low-level Logic Input Voltage	V_{IL}	V_{DE}, V_{RE}, V_{DI}			0.7	V
Logic Input Current	$I_{IN,LOGIIC}$	V_{DE}, V_{RE}, V_{DI}			±2	μA
Input Current(A, B)	$I_{IN,BUS}$	V_{DE}=0V, V_{CC}=3.3V, V_{IN}=3.3V		40		μA
		V_{DE}=0V, V_{CC}=3.3V, V_{IN}=0V		60		
Receiver Differential Threshold Voltage	V_{TH}	-7V≤V_{CM}≤12V	-0.2		0	V
Receiver Input Hysteresis	ΔV_{TH}	V_{CM}=0V		25		mV
Receiver High-level Output Voltage	V_{OH}	I_{OUT}=-1.5mA, V_{ID}=200mV	V_{CC}-0.4			V
Receiver Low-level Output Voltage	V_{OL}	I_{OUT}=-1.5mA, V_{ID}=-200mV			0.4	V
Three-State(Hi-Z) Output Current at Receiver	I_{ZR}	V_{CC}=3.3V, 0V≤V_{OUT}≤V_{CC}		±1		μA
Receiver Input Resistance	R_{IN}	-7V≤V_{CM}≤12V		100		kΩ
Supply Current	I_{CC}	No load, V_{RE}=V_{DE}=V_{DI}=0V or V_{CC}		0.2		mA
Transmitter Output Short-Circuit Current	I_{OS}	V_{CC}=3.3V, A or B short to GND	50			mA
Receiver Output Short-Circuit Current	I_{OSR}	0V≤V_{RO}≤V_{CC}		±45		mA

Switching Characteristics

V_{CC}=3.3V, T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Transmitter Propagation Delay	t_{PLH}	R_L=27Ω, C_{LA}=C_{LB}=15pF		22		ns
	t_{PHL}			22		
Transmitter Transmission Distortion	t_{PDS}	R_L=27Ω, C_{LA}=C_{LB}=15pF		0		ns
Transmitter Output Goes High After Enable Delay	t_{PZH}	R_L=110Ω, C_{LA}=C_{LB}=15pF		45		ns
Transmitter Output Goes Low After Enable Delay	t_{PZL}	R_L=110Ω, C_{LA}=C_{LB}=15pF		45		ns
Transmitter Output Goes High After Disable Delay	t_{PHZ}	R_L=110Ω, C_{LA}=C_{LB}=15pF		40		ns
Transmitter Output Goes Low After Disable Delay	t_{PLZ}	R_L=110Ω, C_{LA}=C_{LB}=15pF		40		ns
Receiver Propagation Delay	t_{PLH}	C_L=15pF		65		ns
	t_{PHL}			75		
Receiver Transmission Distortion	t_{PDS}	C_L=15pF, $\lvert t_{PLH} - t_{PHL} \rvert$		10		ns
Receiver Output Goes High After Enable Delay	t_{PZH}	C_L=15pF		25		ns
Receiver Output Goes Low After Enable Delay	t_{PZL}	C_L=15pF		25		ns
Receiver Output Goes High After Disable Delay	t_{PHZ}	C_L=15pF		25		ns
Receiver Output Goes Low After Disable Delay	t_{PLZ}	C_L=15pF		25		ns
Maximum Data Rate	f_{MAX}	V_{CC}=3.3V			6	Mbps

APPLICATIONS INFORMATION



1. R1 value ranges from (slave number+1)×k to (slave number+1)×10k.

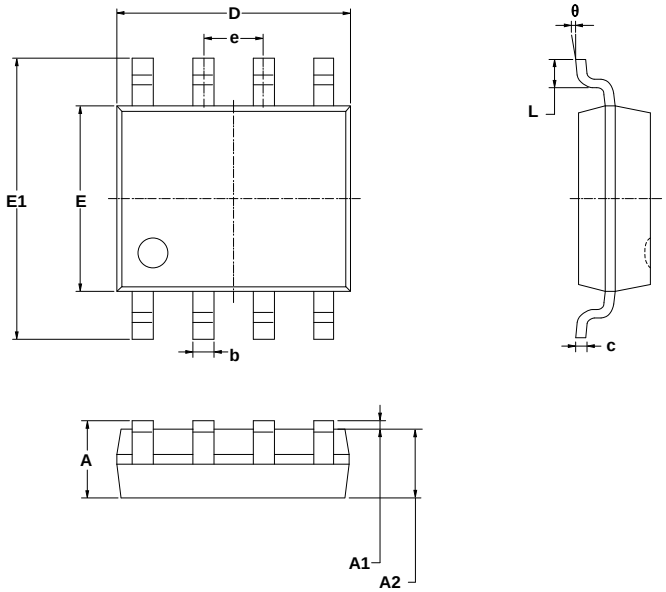
2. R5 value ranges from 100 to 1k. R5 needs to be connected on the MS3485 farthest to both ends, in order to reduce signal reflex, instead of connecting R5 on AB line of all masters.

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.

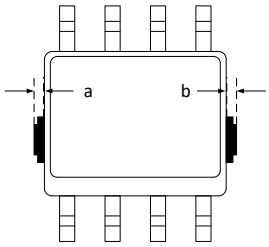
PACKAGE OUTLINE DIMENSIONS

SOP8

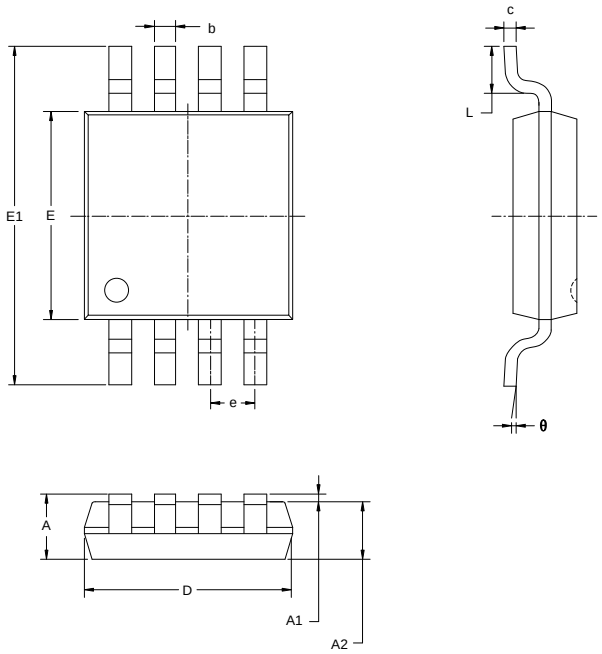


Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27(BSC)		0.050(BSC)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

Note: In addition to the package size, a, b are allowed to have the maximum size of 0.15mm for waste glue simultaneously.



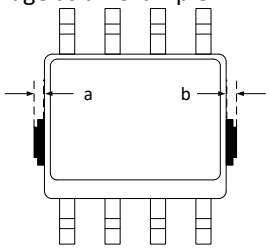
MSOP8



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	0º	6º	0º	6º

Note: In addition to the package size, a, b are allowed to have the maximum size of 0.15mm for waste glue simultaneously.

The diagram is as follows: taking SOP8 package as an example.



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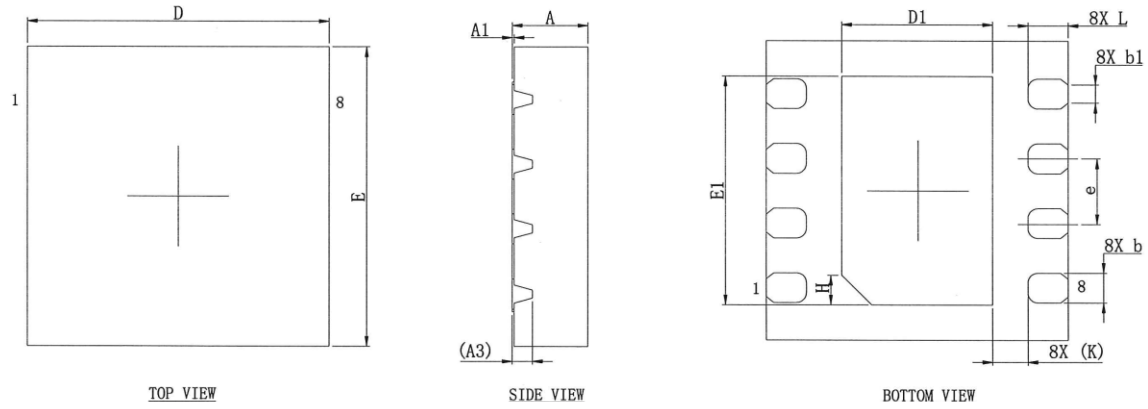
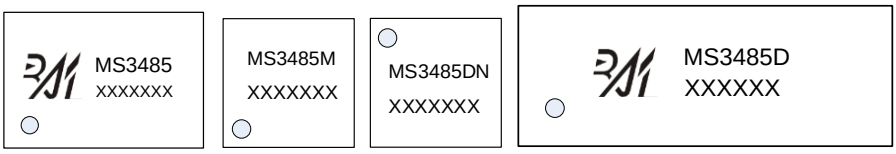


Symbol	Dimensions in Millimeters		
	Min	Typ	Max
A	0.7	0.75	0.8
A1	0	0.02	0.05
A3		0.203 REF	
b	0.25	0.3	0.35
b1		0.18 REF	
D	2.9	3.0	3.1
E	2.9	3.0	3.1
e		0.65 BSC	
D1	1.4	1.5	1.6
E1	2.2	2.3	2.4
L	0.3	0.4	0.5
K		0.35 REF	
H		0.3 REF	

MARKING and PACKAGING SPECIFICATION

1. **Marking Drawing Description**



Product Name : MS3485, MS3485M, MS3485DN, MS3485D

Product Code : XXXXXX, XXXXXXX

2. Marking Drawing Demand

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

3. Packaging Specification

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
MS3485DN	DFN8	3000	10	30000	4	120000

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

STATEMENT

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  Customer should get latest version information and verify the integrity before placing order.
- When using Ruimeng products to design and produce, purchaser has the responsibility to observe safety standard and adopt corresponding precautions, in order to avoid personal injury and property loss caused by potential failure risk.
- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

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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