



DESCRIPTION

The MAX1487ESA are low-power transceivers for RS-485 and RS-422 communications in harsh environments. Each driver output and receiver input is protected against $\pm 15\text{kV}$ electro-static discharge (ESD) shocks, without latchup. These parts contain one driver and one receiver.

The MAX1487ESA feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, thus allowing error-free data transmission up to 2.5Mbps.

These transceivers draw as little as $120\mu\text{A}$ supply current when unloaded or when fully loaded with disabled drivers. All parts operate from a single +5V supply.

Drivers are short-circuit current limited, and are protected against excessive power dissipation by thermal shutdown circuitry that places their outputs into a high-impedance state.

The receiver input has a fail-safe feature that guarantees a logic-high output if the input is open circuit.

The MAX1487ESA feature quarter-unit-load receiver input impedance, allowing up to 128 transceivers on the bus. The MAX1487ESA is designed for half-duplex applications.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) 12V

Control Input Voltage -0.5V to ($V_{CC} + 0.5\text{V}$)

Driver Input Voltage (DI) -0.5V to ($V_{CC} + 0.5\text{V}$)

Driver Output Voltage (A, B) -8V to +12.5V

Receiver Input Voltage (A, B) -8V to +12.5V

Receiver Output Voltage (RO) -0.5V to ($V_{CC} + 0.5\text{V}$)

Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)

8-Pin SO (derate 5.88mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$)

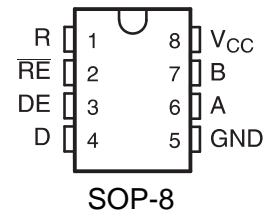
471mW

Operating Temperature Ranges 0°C to $+70^\circ\text{C}$

Storage Temperature Range -65°C to $+150^\circ\text{C}$

Lead Temperature (soldering, 10sec) $+300^\circ\text{C}$

PIN CONFIGURATION



FEATURES

- Provide low current shutdown mode
- Provide industry standard SOP-8 packaging
- Up to 256 transceivers are allowed to be mounted on the bus
- True fail safe receiver compatible with EIA/TIA-485
- The powerful swing rate control function helps achieve error free data transmission
- Provide enhanced ESD protection for RS-485/RS-422 A/B pins
- HBM human mode: $\pm 15\text{kV}$
IEC 61000-4-2: Contact discharge +12kV
Air discharge $\pm 15\text{kV}$

APPLICATIONS

- industrial control
- Electricity, water, and gas meters
- EMI sensitive transceivers
- Application security system
- lighting system
- Instrumentation



DC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V_{OD1}				5	V
Differential Driver Output (with load)	V_{OD2}	$R = 50\Omega$ (RS-422)	2			V
		$R = 27\Omega$ (RS-485)	1.5		5	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV_{OD}	$R = 27\Omega$ or 50Ω			0.2	V
Driver Common-Mode Output Voltage	V_{OC}	$R = 27\Omega$ or 50Ω			3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV_{OD}	$R = 27\Omega$ or 50Ω			0.2	V
Input High Voltage	V_{IH}	DE, DI, \overline{RE}	2.0			V
Input Low Voltage	V_{IL}	DE, DI, \overline{RE}			0.8	V
Input Current	I_{IN1}	DE, DI, RE			± 2	μA
Input Current (A, B)	I_{IN2}	DE = 0V; $V_{CC} = 0V$ or $5.25V$,	$V_{IN} = 12V$		1.0	mA
			$V_{IN} = -7V$		-0.8	
Receiver Differential Threshold Voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-0.2		0.2	V
Receiver Input Hysteresis	ΔV_{TH}	$V_{CM} = 0V$		70		mV
Receiver Output High Voltage	V_{OH}	$I_O = -4mA$, $V_{ID} = 200mV$	3.5			V
Receiver Output Low Voltage	V_{OL}	$I_O = 4mA$, $V_{ID} = -200mV$			0.4	V
Three-State (high impedance) Output Current at Receiver	I_{OZR}	$0.4V \leq V_O \leq 2.4V$			± 1	μA
Receiver Input Resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	48			k Ω

DC ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
No-Load Supply Current	I_{CC}	DE = V_{CC}		300	500	μA
		$\overline{RE} = 0V$ or V_{CC}		230	400	
		DE = 0V				
Driver Short-Circuit Current,						
	I_{OSD1}	$-7V \leq V_O \leq 12V$	35		250	mA
$V_O =$ High						
Driver Short-Circuit Current,						
	I_{OSD2}	$-7V \leq V_O \leq 12V$	35		250	mA
$V_O =$ Low						
Receiver Short-Circuit Current	I_{OSR}	$0V \leq V_O \leq V_{CC}$	7		95	mA



SWITCHING CHARACTERISTICS

(V_{CC} = 5V ±5%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t _{PLH}	R _{DIFF} = 54Ω	10	40	60	ns
	t _{PHL}	C _{L1} = C _{L2} = 100pF	10	40	60	
Driver Output Skew to Output	t _{SKEW}	R _{DIFF} = 54Ω, C _{L1} = C _{L2} = 100pF		5	10	ns
Driver Enable to Output High	t _{ZH}	C _L = 100pF, S2 closed		45	70	ns
Driver Enable to Output Low	t _{ZL}	C _L = 100pF, S1 closed		45	70	ns
Driver Disable Time from Low	t _{LZ}	C _L = 15pF, S1 closed		45	70	ns
Driver Disable Time from High	t _{HZ}	C _L = 15pF, S2 closed		45	70	ns
t _{PLH} - t _{PHL} Differential	t _{SKD}	R _{DIFF} = 54Ω		5		ns
Receiver Skew		C _{L1} = C _{L2} = 100pF				
Receiver Enable to Output Low	t _{ZL}	C _{RL} = 15pF, S1 closed		20	50	ns
Receiver Enable to Output High	t _{ZH}	C _{RL} = 15pF, S2 closed		20	50	ns
Receiver Disable Time from Low	t _{LZ}	C _{RL} = 15pF, S1 closed		20	50	ns
Receiver Disable Time from High	t _{HZ}	C _{RL} = 15pF, S2 closed		20	50	ns
Maximum Data Rate	f _{MAX}		2.5			Mbps

TABLE OF ST3485EBDR OPERATION

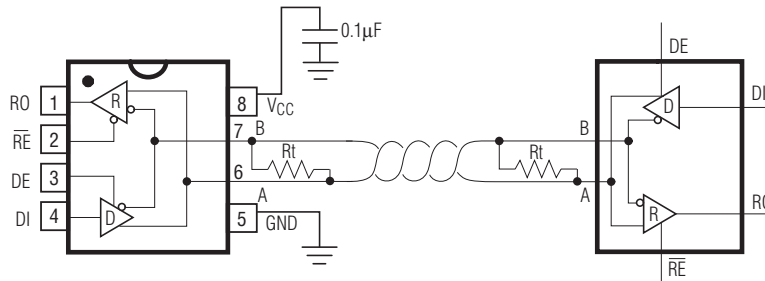
Transmission					Receipt			
Inputs			Outputs X		Inputs			Outputs
RE	DE	DI	A	B	RE	DE	A-B	RO
X	1	1	H	L	0	X	+0.2V	H
X	1	0	L	H	0	X	-0.2V	L
0	0	X	Z	Z	0	X	Inputs open	H
1	0	X	Z(shutdown)		1	X	X	Z

X-Any level

Z-High resistance



Typical Operating Circuit



Applications Information

The MAX1487ESA is low-power transceivers for RS-485 and RS-422 communications. The MAX1487ESA is intended for harsh environments where high-speed communication is important. The device eliminates the need for transient suppressor diodes and the associated high capacitance loading.

The MAX1487ESA can transmit and receive at data rates up to 2.5Mbps. The MAX1487ESA is half-duplex. In addition, driver-enable (DE) and receiver-enable (RE) pins are included on the MAX1487ESA. When disabled, the driver and receiver outputs are high impedance.

Applications Information

The transmitter outputs and receiver inputs of this product family is characterized for protection to $\pm 15\text{kV}$ using the Human Body Model.

128 Transceivers on the Bus

The $48\text{k}\Omega$, 1/4-unit-load receiver input impedance of the MAX1487ESA allows up to 128 transceivers on a bus, compared to the 1-unit load ($12\text{k}\Omega$ input impedance) of standard RS-485 drivers (32 transceivers maximum). Any combination of MAX1487ESA and other RS-485 transceivers with a total of 32 unit loads or less can be put on the bus.

It takes the drivers and receivers longer to become enabled from the low-power shutdown state ($t_{ZH}(\text{SHDN})$, $t_{ZL}(\text{SHDN})$) than from the operating mode (t_{ZH} , t_{ZL}). (The parts are in operating mode if the RE, DE inputs equal a logical 0, 1 or 1, 1 or 0, 0.)

Driver Output Protection

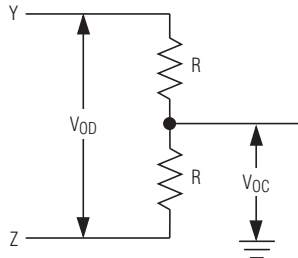
Excessive output current and power dissipation caused by faults or by bus contention are prevented by two mechanisms. A foldback current limit on the output stage provides immediate protection against short circuits over the whole common-mode voltage range (see Typical Operating Characteristics). In addition, a thermal shut-down circuit forces the driver outputs into a high-impedance state if the die temperature rises excessively.

Propagation Delay

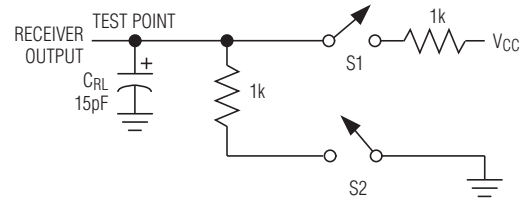
The difference in receiver delay times, $t_{PLH} - t_{PHL}$, is typically under 13ns for the MAX1487ESA. The driver skew times are typically 5ns (10ns max).



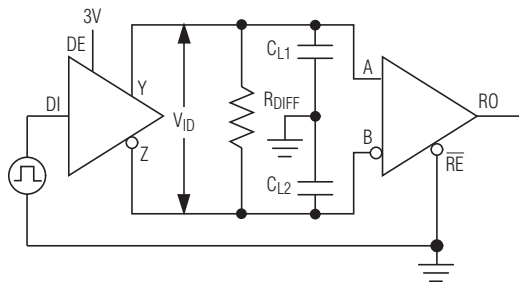
Driver DC Test Load



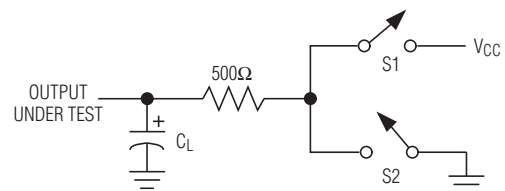
Receiver Timing Test Load



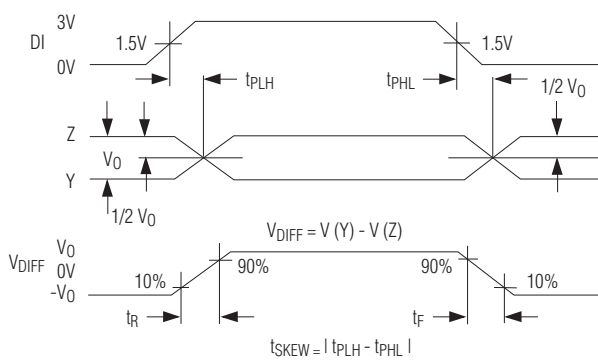
Driver/Receiver Timing Test Circuit



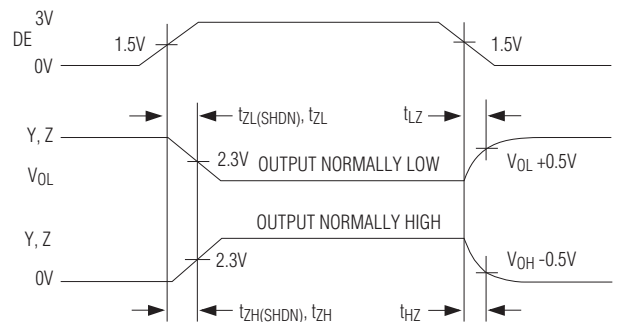
Driver Timing Test Load



Driver Propagation Delays

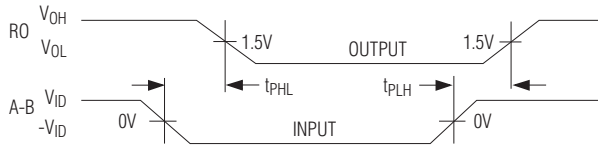


Driver Enable and Disable Times

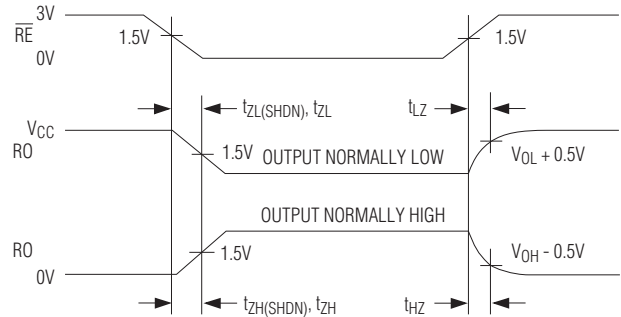




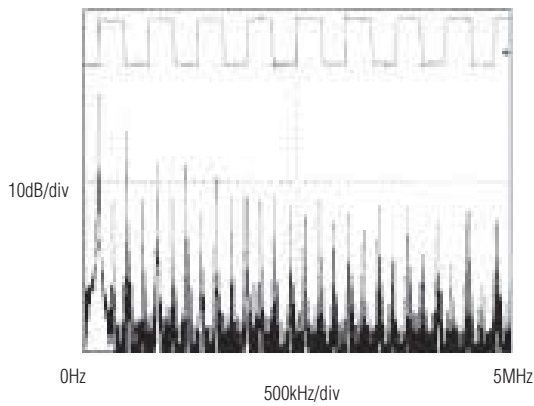
Receiver Propagation Delays



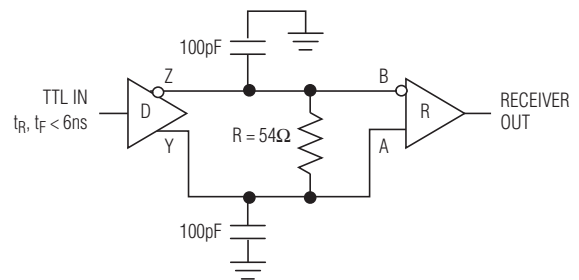
Receiver Enable and Disable Times



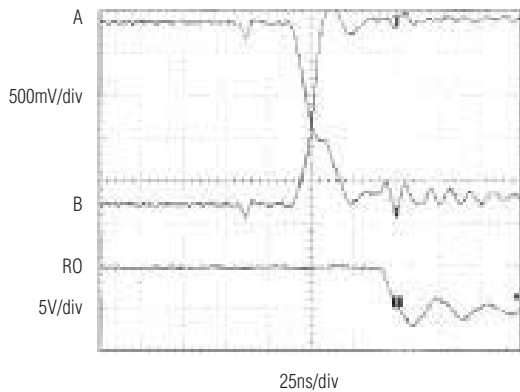
Driver Output Waveform and FFT Plot Transmitting a 150kHz Signal



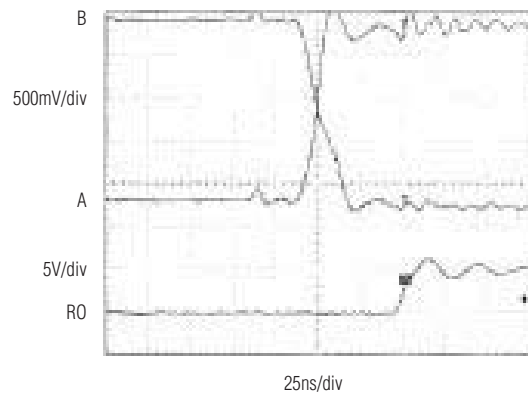
Receiver Propagation Delay Test Circuit



Receiver tPHL

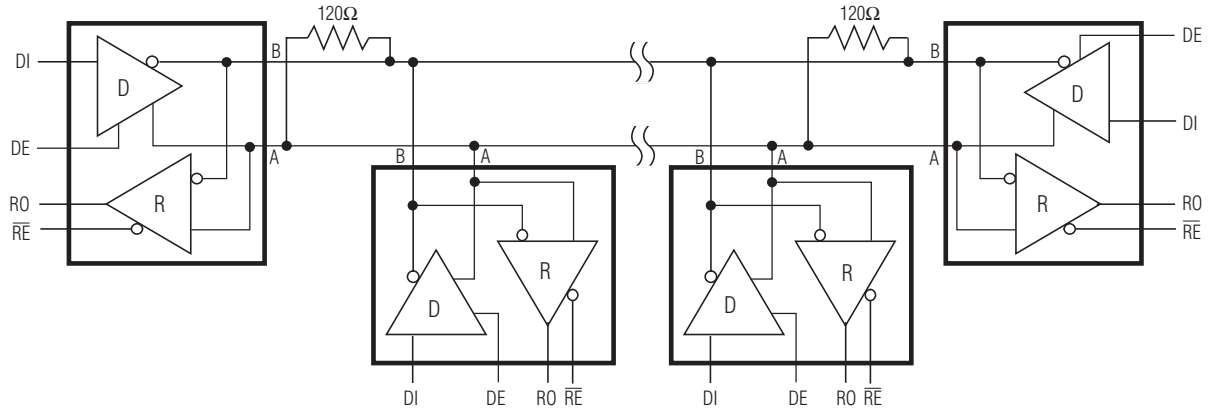


Receiver tPLH





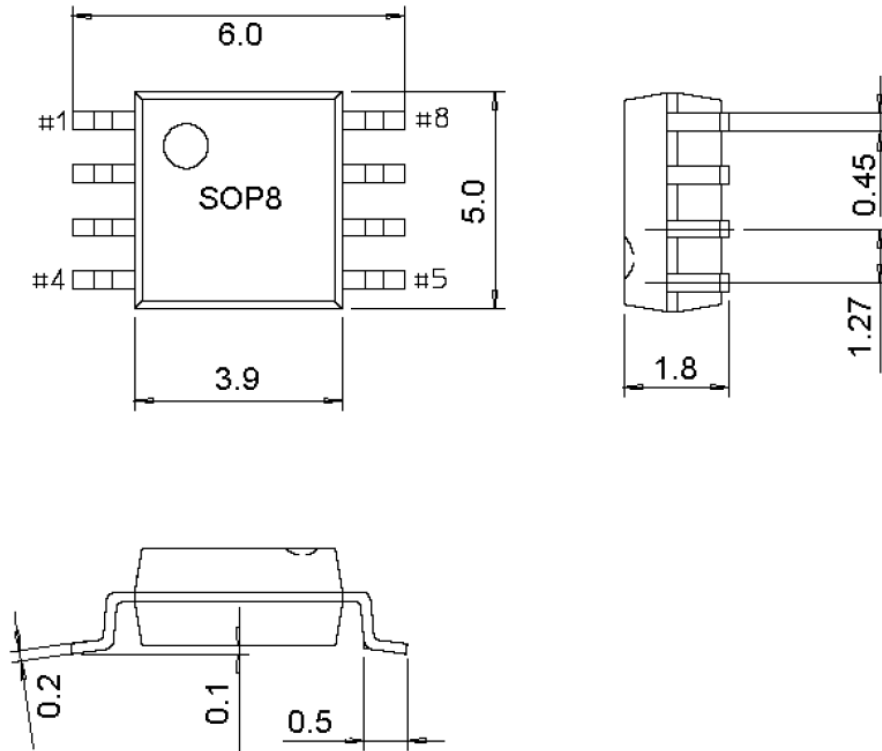
Typical Half-Duplex RS-485 Network





PACKAGE OUTLINE DIMENSIONS

SOP-8





Attention

- Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.
- HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.
- Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of HUA XUAN YANG ELECTRONICS CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [RS-422/RS-485 Interface IC](#) category:

Click to view products by [HXY MOS](#) manufacturer:

Other Similar products are found below :

[SP3494CN-L/TR](#) [ISL4486IBZ-T](#) [ISL4491EIB](#) [ISL4491EIBZ-T](#) [ISL81483IB](#) [ISL83086EIB](#) [ISL83088EIB](#) [ISL83488IB](#) [ISL8483EIB](#)
[ISL8487EIB](#) [ISL8489EIB](#) [ISL8491IP](#) [ADM489AN](#) [CA-IS3080WX](#) [CA-IS3086WX](#) [NSi83085E-DSWR](#) [SIT65HVD75ETK](#) [GM13487E](#)
[CS48520M](#) [CA-IF4820FD](#) [HSN65HVD12DR](#) [UM3088EESA](#) [ISOW1412BDFMR](#) [MAX485MJA/883B](#) [CA-IF4888HS](#) [CS485M](#)
[CLM3085ESA+](#) [CLM485ESA+](#) [CLM485EESA+](#) [CLM3085EESA+](#) [CS4585EO](#) [DW3085](#) [WS3471EEUA](#) [WS3079](#) [MS2583](#)
[H485EIMM/TR](#) [SP3485EN-HXY](#) [SP3483EN-HXY](#) [ST3485EBDR-HXY](#) [MAX1487ESA-HXY](#) [MAX3483ESA-HXY](#) [MAX487ESA-HXY](#)
[SP485EN-HXY](#) [SN75LBC184DR-HXY](#) [MAX485EESA-HXY](#) [SN65LBC184N-HXY](#) [SN75176N-HXY](#) [MAX3485EESA-HXY](#) [SP3485EN-](#)
[MS](#) [SIT3490EEPA](#)