

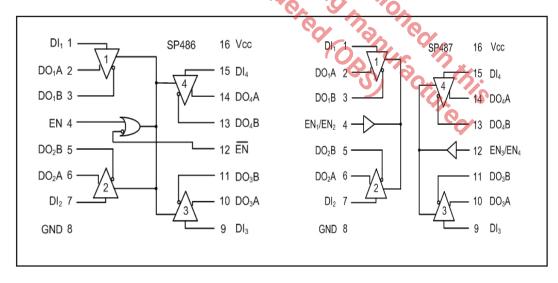
Quad RS-485/RS-422 Line Drivers

- RS-485 or RS-422 Applications
- Quad Differential Line Drivers
- Tri-state Output Control
- 40ns Typical Driver Propagation Delays
- 5ns Skew
- -7V to +12V Common Mode Output Range
- 100µA Supply Current
- Single +5V Supply Operation
- Pin Compatible with SN75172, SN75174, LTC486 and LTC487

DESCRIPTION

The **SP486** and **SP487** are low-power quad differential line drivers meeting RS-485 and RS-422 standards. The SP486 features a common driver enable control; the SP487 provides independent driver enable controls for each pair of drivers. Both feature tri-state outputs and a wide common-mode output range. SP486 and SP487 are available in a 16-pin SOIC package.

SP487 is available, SP486 is obsolete



ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

V _{cc}	+7V
Input Voltages	
Logic	0.5V to (Vcc + 0.5V)
Drivers	0.5V to (Vcc + 0.5V)
Driver Output Voltage	+/-14V
Input Currents	
Logic	+/-25mA
Driver	+/-25mA
Storage Temperature	65°C to +150°C
Power Dissipation	
Plastic DIP.	375mW
(derate 7mW/°C above	+70°C)
Small Outline	
(derate 7mW/°C above	+70°C)
'	

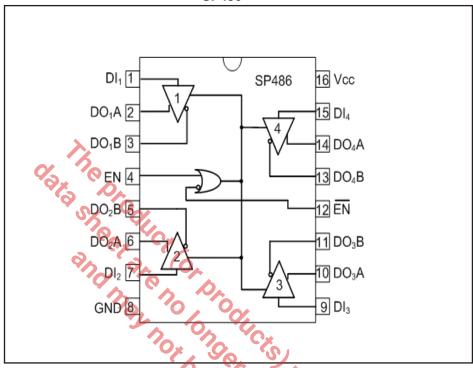
ELECTRICAL CHARACTERISTICS

V _{CC} = +5.0V +/-5%; typicals at 25°C; T _{MIN} ≤ T _{MAX} unless otherwise noted.					
PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
DC CHARACTERISTICS O					
DIGITAL INPUTS	0,	0,	00		DI, EN, EN, EN,/EN, EN,/EN,
Voltage V _{IL}	7	0,	0.8	Volts	
Voltage V _{IH}	2.0	$O_{\mathcal{X}}$	Ó	Volts	
Input Current		6	+/-2	μA	$V_{IN} = 0V \text{ to } V_{CC}$
DRIVER OUTPUTS		6	Q		
Differential Voltage			5	Volts	l₀ = 0; unloaded
Differential Voltage	2		P	Volts	$R_L = 50\Omega$ (RS-422); Figure 1
Differential Voltage	1.5	2	5	Volts	R = 27Ω (RS-485); Figure 1
Change in Output Magnitude for Complementary Output state			0.2	Volts	R_L = 27Ω or 50Ω; Figure 1
Common Mode Output Voltage		2.3	3	Volts	$R_L = 27\Omega$ or 50Ω ; Figure 1
Change in Common Mode Output Magnitude for Complementary Output state			0.2	Volts	$R_L = 27\Omega$ or 50Ω ; Figure 1
Driver Short Circuit Current V _{OH}			+/-250	mA	-7V ≤ V _o ≤ +10V
Driver Short Circuit Current V _{OL}			+/-250	mA	-7V ≤ V ₀ ≤ +10V
High Impedance Output Current		+/-2	+/-200	μA	V _o = -7V to +10V
POWER REQUIREMENTS					
Supply Voltage	4.75		5.25	Volts	
Supply Current		0.5	10	μA	No load, output enabled
Supply Current		0.1	10	μA	No load, output disabled

 $V_{\rm CC}$ = +5.0V +/-5%; typicals at 25°C; $T_{\rm MIN} \le T_{\rm AMB} \le T_{\rm MAX}$ unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
ENVIRONMENTAL AND MECHA	NICAL				
Operating Temperature, _C	0		+70	°C	
Operating Temperature, _E	-40		+85	°C	
Storage Temperature	-65		+150	°C	
PackageT		16-pin	SOIC		
AC CHARACTERISTICS					
Maximum Data Rate	10			Mbps	
Propagation Delay, t _{PLR}	20	40	60	ns	R_{DIFF} = 54 ohms, C_{L1} = C_{L2} = 100pF; Figure 2
Propagation Delay, t _{PHL}	20	40	60	ns	R_{DIFF} = 54 ohms, C_{L1} = C_{L2} = 100pF; Figure 2
Differential Driver Skew	0%	5	15	ns	R_{DIFF} = 54 ohms, C_{L1} = C_{L2} = 100pF; Figure 2
Driver Rise Time (t _R)	40"	20		ns	10% to 90%
Driver Fall Time (t _F)		20		ns	90% to 10%
Driver Enable to output High	9/0	60	110	ns	C _L = 100pF, Figures 3 and 5 (S2 closed)
Driver Enable to output Low	31, 70	60	115	ns	C _L = 100pF, Figures 3 and 5 (S1 closed)
Driver Disable from output High	20	60	130	ns	C _L = 15pF, Figures 3 and 5 (S2 closed)
Driver Disable from output Low	•	60	130	ns	C _∟ = 15pF, Figures 3 and 5 (S1 closed)
			dered	no mo	C _L = 15pF, Figures 3 and 5 (S2 closed) C _L = 15pF, Figures 3 and 5 (S1 closed)

SP486



Pin Function SP486

Pin 1 - DI₁ - Driver 1 Input - If driver 1 output is enabled, a logic 0 on DI₁ forces driver output DO₁A low and DO₁B high. A logic 1 on DI₁ with driver 1 output enabled forces driver DO₁A high and DO₁B low.

Pin 2 - DO₁A - Driver 1 output A.

Pin 3 - DO, B - Driver 1 output B.

Pin 4 - EN - Driver Output Enable; Please refer to SP486 truth table (1).

Pin 5 - DO₂B - Driver 2 output B.

Pin 6 - DO₂A - Driver 2 output A.

Pin 7 - $\mathrm{DI_2}$ - Driver 2 Input - If driver 2 output is enabled, a logic 0 on $\mathrm{DI_2}$ forces driver output $\mathrm{DO_2A}$ low and $\mathrm{DO_2B}$ high. A logic 1 on $\mathrm{DI_2}$ with driver 2 output enabled forces driver $\mathrm{DO_2A}$ high and $\mathrm{DO_2B}$ low.

Pin 8 - GND - Ground.

Pin 9 - DI₃ - Driver 3 Input - If driver 3 output is enabled, a logic 0 on DI, forces driver output DO₃A low and DO₃B high. A logic 1 on DI₃ with driver 3 output enabled forces driver DO₃A high and DO₃B low.

Pin 10 - DO₃A - Driver 3 output A.

Pin 11 - DO₂B - Driver 3 output B

Pin 12 - EN - Driver Output Disable, Please refer to SP486 truth table (1).

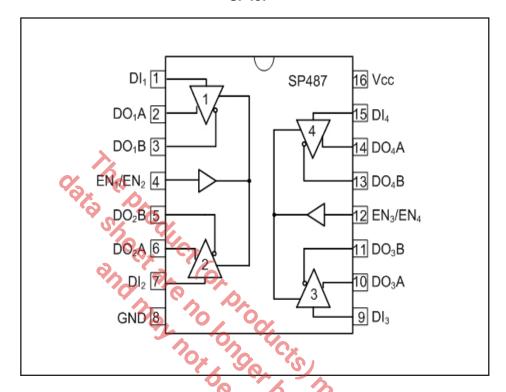
Pin 13 - DO₄B - Driver 4 output B.

Pin 14 - DO, A - Driver 4 output A.

Pin 15 - DI $_4$ - Driver 4 Input - If driver 4 output is enabled, a logic 0 on DI $_4$ forces driver output DO $_4$ A low and DO $_4$ B high. A logic 1 on DI $_4$ with driver 4 output enabled forces driver DO $_4$ A high and DO $_4$ B low.

Pin 16 - Supply Voltage - $+4.75V \le Vcc \le +5.25V$.

SP487



Pin Function SP487

Pin 1 - DI₁ - Driver 1 Input - If driver 1 output is enabled, a logic 0 on DI₁ forces driver output DO₁A low and DO₁B high. A logic 1 on DI₁ with driver 1 output enabled forces driver DO₁A high and DO₁B low.

Pin 2 - DO, A - Driver 1 output A.

Pin 3 - DO₁B - Driver 1 output B.

Pin 4 - EN₁/EN₂ - Driver 1 and 2 Output Enable; Please refer to SP487 truth table (2).

Pin 5 - DO₂B - Driver 2 output B.

Pin 6 - DO₂A - Driver 2 output A.

Pin 7 - DI₂ - Driver 2 Input - If driver 2 output is enabled, a logic 0 on DI₂ forces driver output DO₂A low and DO₂B high. A logic 1 on DI₂ with driver 2 output enabled forces driver DO₂A high and DO₂B low.

Pin 8 - GND - Ground.

Pin 9 - DI₃ - Driver 3 Input - If driver 3 output is enabled, a logic 0 on DI₄ forces driver output DO₃A low and DO₃B high. A logic 1 on DI₃ with driver 3 output enabled forces driver DO₃A high and DO₃B low.

Pin 10 - DO A Driver 3 output A

Pin 11 - DO₃B - Driver 3 output B.

Pin 12 - EN₃/EN₄ - Driver 3 and 4 Output Enable; Please refer to SP487 truth table (2)..

Pin 13 - DO₄B - Driver 4 output B.

Pin 14 - DO, A - Driver 4 output A.

Pin 15 - DI₄ - Driver 4 Input - If driver 4 output is enabled, a logic 0 on DI₄ forces driver output DO₄A low and DO₄B high. A logic 1 on DI₄ with driver 4 output enabled forces driver DO₄A high and DO₄B low.

Pin 16 - Supply Voltage - $+4.75V \le Vcc \le +5.25V$.

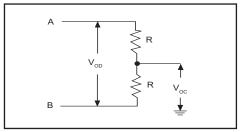


Figure 1. Driver DC Test Load

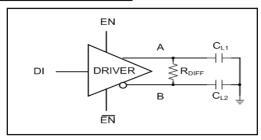


Figure 2. Driver Timing Test

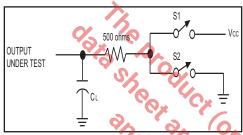


Figure 3. Driver Timing Test Load

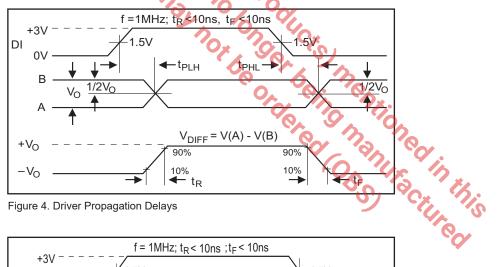


Figure 4. Driver Propagation Delays

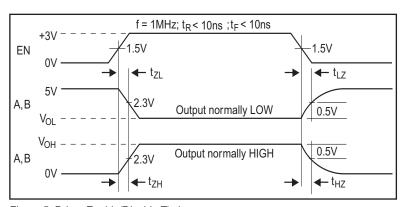


Figure 5. Driver Enable/Disable Timing

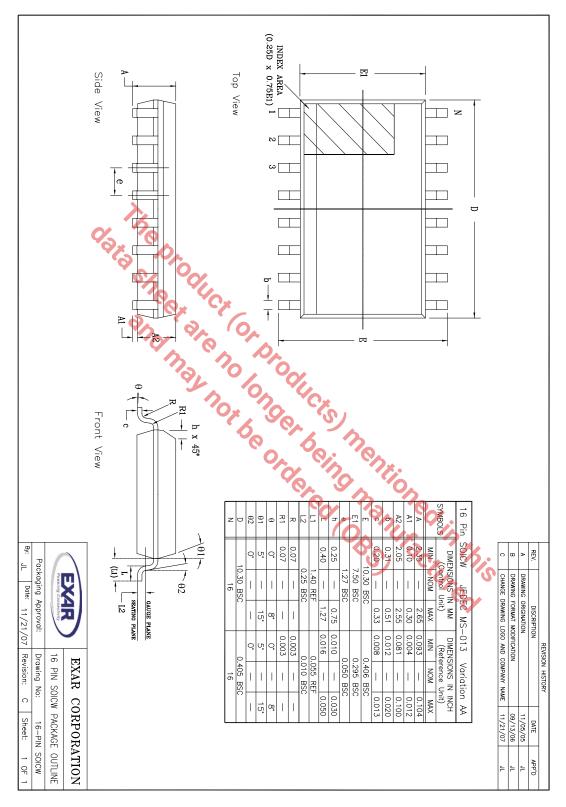
The SP486 and SP487 are low power quad differential line drivers meeting RS-485 and RS-422 standards. The SP486 features active high and active low common driver enable controls; the SP487 provides independent, active high driver enable controls for each pair of drivers. The driver outputs are short-circuit limited to 200mA. Data rates up to 10Mbps are supported. The SP486 and SP487 are available in a 16-pin SOIC package.

INPUT	EN	ABLES	OUT	PUTS			
DI	EN	EN	OUTA	OUTB			
Н	Н	X	Ø ^H .	G.			
L	Н	X	10	Н			
Н	Х	L	Н	L	ò		
L	Х	L	Q,F	Н	9/		
Х	L	Н	Hi-Z	Hi-Z	Cx		
Table 1.	SP486 Truth	Table		000	role in	enz.	
INPUT	ENA	BLES	OUT	PUTS	10	2 0	5
DI	EN ₁ /EN ₂	or EN ₃ /EN ₄	OUTA	OUTB	0	6	601
Н		Н	Н	L	(6)	10	~ 1/2
		Н	L	Н		9 7	\$ 1/ X
L		11	-				
X		L	Hi-Z	Hi-Z		5	ned in this

Table 1. SP486 Truth Table

INPUT	ENABLES	OUT	PUTS
DI	EN ₁ /EN ₂ or EN ₃ /EN ₄	OUTA	OUTB
Н	Н	Н	L
L	Н	L	Н
Х	L	Hi-Z	Hi-Z

Table 2. SP487 Truth Table



ORDERING INFORMATION(1), (3)

PART NUMBER	TEMPERATURE RANGE	PACKAGE	PACKAGING METHOD	LEAD-FREE(2)
SP487CT-L	0°C to 70°C	16-pin WSOIC	Tube	Yes
SP487CT-L/TR	0°C to 70°C	16-pin WSOIC	Tape and Reel	Yes

NOTES:

- 1. Refer to www.maxlinear.com/SP487 for most up to date Ordering Information.
- 2. Visit www.maxlinear.com for additional information on Environmental Rating.
- 3. SP486 is obsolete.

REVISION HISTORY

		1121101011111010111
DATE	REVISION	DESCRIPTION
June 2005	9x 0	Legacy Sipex Datasheet
June 2011	0.0.0	Update ordering information per PDN 110510-01 and convert to Exar Format
January 2020	1.0.1	Update to MaxLinear logo. Update ordering information.
	and	MaxLinear, Inc. 5966 La Place Court, Suite 100 Carlsbad, CA 92008 760.692.0711 p. 760.444.8598 f. www.maxlinear.com for informational use only, is subject to change without notice, and should not be construed as a commitment es no responsibility or liability for any errors or inaccuracies that may appear in the informational content
MAXI	LINE	5966 La Place Court, Suite 100 Carlsbad, CA 92008 760.692.0711 p. 760.444.8598 f. www.maxlinear.com
by MaxLinear, Inc. MaxL contained in this guide. part of this document ma	inear, Inc. assum Complying with al ay be reproduced	for informational use only, is subject to change without notice, and should not be construed as a commitment es no responsibility or liability for any errors or inaccuracies that may appear in the informational content I applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no into, stored in, or introduced into a retrieval system, or transmitted in any form or by any means (electronic, therwise), or for any purpose, without the express written permission of MaxLinear, Inc.
sonably be expected to such applications unless	cause failure of th MaxLinear, Inc. r	use of any of its products in life support applications where the failure or malfunction of the product can rea- e life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized; (b) tial liability of MaxLinear, Inc. is adequately protected under the circumstances.
document. Except as ex	pressly provided i	applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this n any written license agreement from MaxLinear, Inc., the furnishing of this document does not give you any yrights, or other intellectual property.



MaxLinear, the MaxLinear logo, and any MaxLinear trademarks, MxL, Full-Spectrum Capture, FSC, G.now, AirPHY and the MaxLinear logo are all on the products sold, are all trademarks of MaxLinear, Inc. or one of MaxLinear's subsidiaries in the U.S.A. and other countries. All rights reserved. Other company trademarks and product names appearing herein are the property of their respective owners.

© 2005 - 2020 MaxLinear, Inc. All rights reserved.