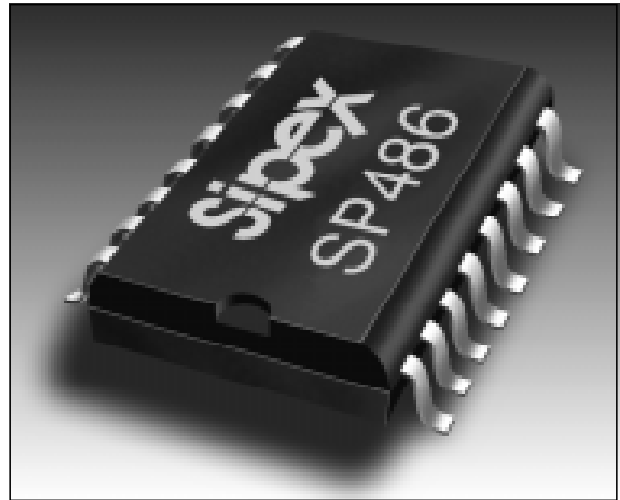


Quad RS-485/RS-422 Line Drivers

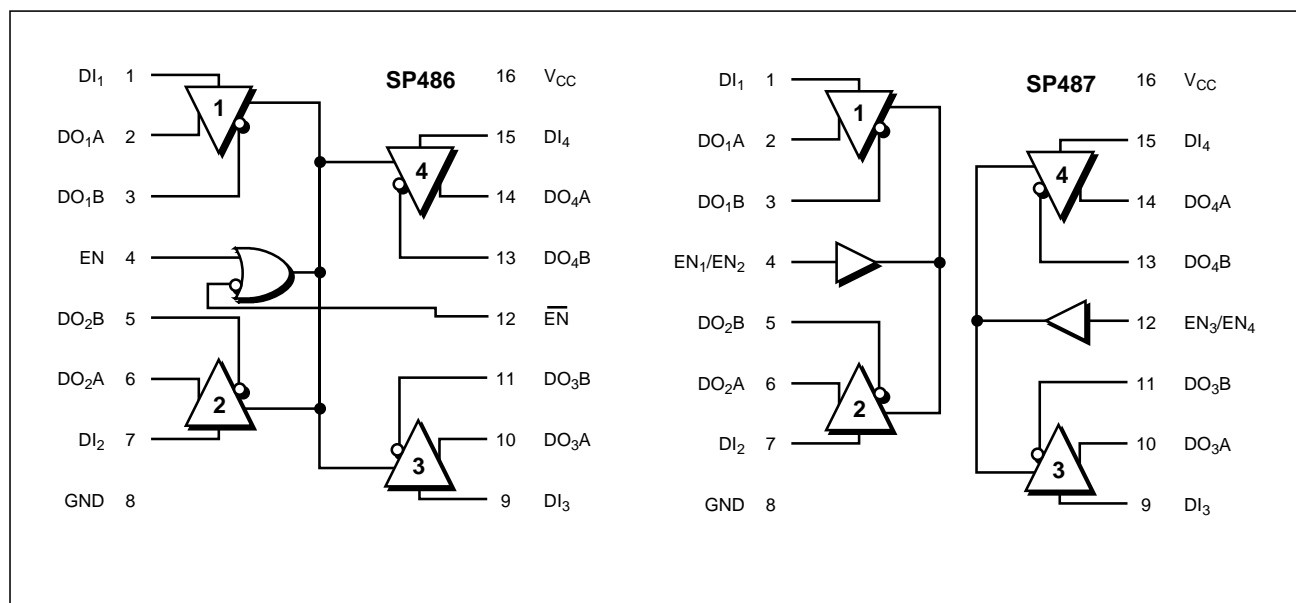
- RS-485 or RS-422 Applications
- Quad Differential Line Drivers
- Tri-state Output Control
- 40ns Typical Driver Propagation Delays
- 5ns Skew
- -7V to +12V Common Mode Output Range
- 100µA Supply Current
- Single +5V Supply Operation
- Pin Compatible with SN75172, SN75174, LTC486, and LTC487



Now available in Lead Free

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 wide common-mode input range. Both are available in 16-pin plastic DIP and SOIC packages.



ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these 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.

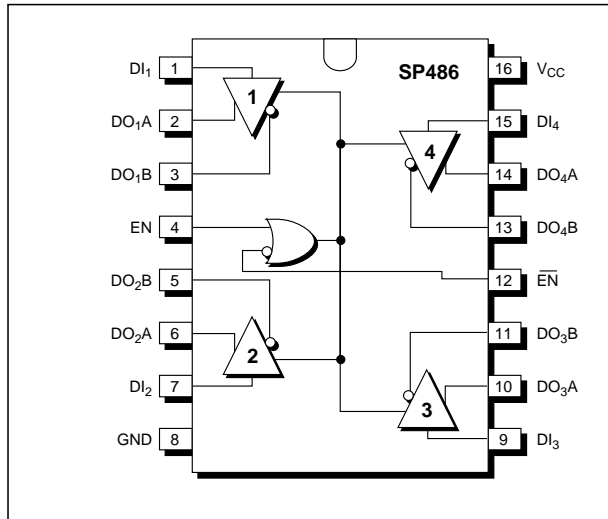
| | |
|--|------------------------------|
| V_{CC} | +7V |
| Input Voltages | |
| Logic | -0.5V to ($V_{CC} + 0.5V$) |
| Drivers | -0.5V to ($V_{CC} + 0.5V$) |
| Driver Output Voltage | $\pm 14V$ |
| Input Currents | |
| Logic | $\pm 25mA$ |
| Driver | $\pm 25mA$ |
| Storage Temperature | -65°C to +150°C |
| Power Dissipation | |
| Plastic DIP | 375mW |
| (derate 7mW/°C above +70°C) | |
| Small Outline | 375mW |
| (derate 7mW/°C above +70°C) | |
| Lead Temperature (soldering, 10 sec) | 300°C |

SPECIFICATIONS

$V_{CC} = 5V \pm 5\%$; typicals at 25°C; $T_{MIN} \leq T_A \leq T_{MAX}$ unless otherwise noted.

| PARAMETER | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|--------------------|---------|-----------|---------|---|
| DC CHARACTERISTICS | | | | | |
| Digital Inputs | | | | | DI, EN, \overline{EN} , EN ₁ /EN ₂ , EN ₃ /EN ₄ |
| Voltage | | | 0.8 | Volts | |
| V_{IL} | 2.0 | | | Volts | |
| V_{IH} | | | | Volts | |
| Input Current | | | ± 2 | μA | $V_{IN} = 0V$ to V_{CC} |
| DRIVER OUTPUTS | | | | | |
| Differential Voltage | | | 5 | Volts | $I_O = 0$; unloaded |
| | 2 | | | Volts | $R_L = 50\Omega$ (RS-422) |
| | 1.5 | 2 | 5 | Volts | $R_L = 27\Omega$ (RS-485); Fig. 1 |
| Change in Output Magnitude for Complementary Output State | | | 0.2 | Volts | $R_L = 27\Omega$ or 50Ω ; Fig. 1 |
| Common Mode Output Voltage | | 2.3 | 3 | Volts | $R_L = 27\Omega$ or 50Ω ; Fig. 1 |
| Change in Common Mode Output Magnitude for Complementary Output State | | | 0.2 | Volts | $R_L = 27\Omega$ or 50Ω ; Fig. 1 |
| | | | | Volts | $R_L = 50\Omega$ (RS-422) |
| | | | | Volts | $R_L = 27\Omega$ (RS-485) |
| Maximum Data Rate | 10 | | | Mbps | |
| Short-circuit Current | | | ± 250 | mA | $-7V \leq V_O \leq +10V$ |
| V_{OH} | | | ± 250 | mA | $-7V \leq V_O \leq +10V$ |
| V_{OL} | | | ± 200 | μA | $V_O = -7V$ to $+10V$ |
| High Impedance Output Current | | ± 2 | | | |
| POWER REQUIREMENTS | | | | | |
| Supply Voltage | 4.75 | 5.00 | 5.25 | Volts | |
| Supply Current | | 0.5 | 10 | μA | No load, output enabled |
| | | 0.5 | 10 | μA | No load, output disabled |
| ENVIRONMENTAL AND MECHANICAL | | | | | |
| Operating Temperature | | | | | |
| -C | 0 | | +70 | °C | |
| -E | -40 | | +85 | °C | |
| Storage Temperature | -65 | | +150 | °C | |
| Package | | | | | |
| -S | 16-pin Plastic DIP | | | | |
| -T | 16-pin SOIC | | | | |

PINOUT — SP486



SP486 PINOUT

Pin 1 — DI_1 — Driver 1 Input — If Driver 1 output is enabled, logic 0 on DI_1 forces driver output DO_1A low and DO_1B high. A logic 1 on DI_1 with Driver 1 output enabled forces driver DO_1A high and DO_1B low.

Pin 2 — DO_1A — Driver 1 output A.

Pin 3 — DO_1B — Driver 1 output B.

Pin 4 — EN — Driver Output Enable. Please refer to SP486 Truth Table (1).

Pin 5 — DO_2B — Driver 2 output B.

Pin 6 — DO_2A — Driver 2 output A.

Pin 7 — DI_2 — Driver 2 Input — If Driver 2 output is enabled, logic 0 on DI_2 forces driver output DO_2A low and DO_2B high. A logic 1 on DI_2 with Driver 2 output enabled forces driver DO_2A high and DO_2B low.

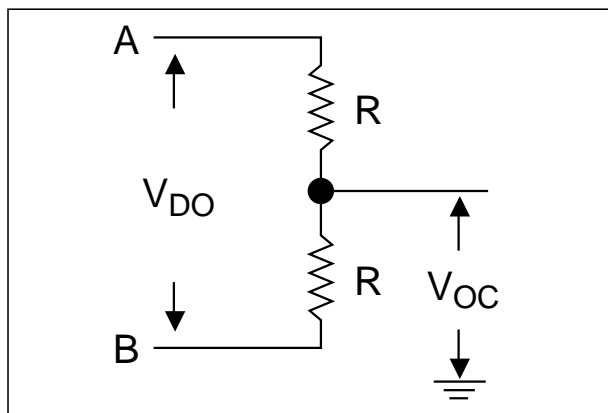


Figure 1. Driver DC Test Load

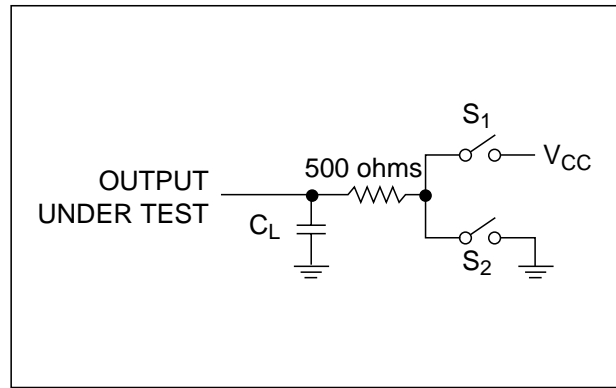


Figure 3. Driver Timing Test Load

Pin 8 — GND — Digital Ground.

Pin 9 — DI_3 — Driver 3 Input — If Driver 3 output is enabled, logic 0 on DI_3 forces driver output DO_3A low and DO_3B high. A logic 1 on DI_3 with Driver 3 output enabled forces driver DO_3A high and DO_3B low.

Pin 10 — DO_3A — Driver 3 output A.

Pin 11 — DO_3B — Driver 3 output B.

Pin 12 — \overline{EN} — Driver Output Disable. Please refer to SP486 Truth Table (1).

Pin 13 — DO_4B — Driver 4 output B.

Pin 14 — DO_4A — Driver 4 output A.

Pin 15 — DI_4 — Driver 4 Input — If Driver 4 output is enabled, logic 0 on DI_4 forces driver output DO_4A low and DO_4B high. A logic 1 on DI_4 with Driver 3 output enabled forces driver DO_4A high and DO_4B low.

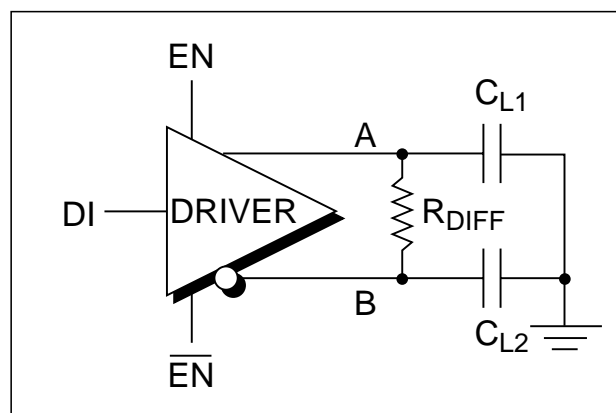
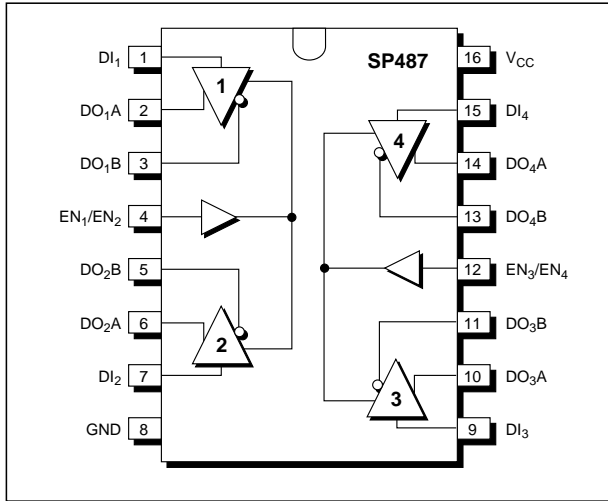


Figure 2. Driver Timing Test

PINOUT — SP487



Pin 16 — Supply Voltage V_{CC} — $4.75V \leq V_{CC} \leq 5.25V$.

SP487 PINOUT

Pin 1 — DI_1 — Driver 1 Input — If Driver 1 output is enabled, logic 0 on DI_1 forces driver output DO_1A low and DO_1B high. A logic 1 on DI_1 with Driver 1 output enabled forces driver DO_1A high and DO_1B low.

Pin 2 — DO_1A — Driver 1 output A.

Pin 3 — DO_1B — Driver 1 output B.

Pin 4 — EN_1/EN_2 — Driver 1 and 2 Output Enable. Please refer to SP487 Truth Table (2).

Pin 5 — DO_2B — Driver 2 output B.

Pin 6 — DO_2A — Driver 2 output A.

Pin 7 — DI_2 — Driver 2 Input — If Driver 2 output is enabled, logic 0 on DI_2 forces driver output DO_2A low and DO_2B high. A logic 1 on DI_2 with Driver 2 output enabled forces driver DO_2A high and DO_2B low.

Pin 8 — GND — Digital Ground.

Pin 9 — DI_3 — Driver 3 Input — If Driver 3 output is enabled, logic 0 on DI_3 forces driver output DO_3A low and DO_3B high. A logic 1 on DI_3 with Driver 3 output enabled forces driver DO_3A high and DO_3B low.

Pin 10 — DO_3A — Driver 3 output A.

| INPUT | ENABLES | | OUTPUTS | |
|-------|---------|-----------------|---------|------|
| DI | EN | \overline{EN} | OUTA | OUTB |
| H | H | X | H | L |
| L | H | X | L | H |
| H | X | L | H | L |
| L | X | L | L | H |
| X | L | H | Hi-Z | Hi-Z |

Table 1. SP486 Truth Table

Pin 11 — DO_3B — Driver 3 output B.

Pin 12 — EN_3/EN_4 — Driver 3 and 4 Output Enable. Please refer to SP487 Truth Table (2).

Pin 13 — DO_4B — Driver 4 output B.

Pin 14 — DO_4A — Driver 4 output A.

Pin 15 — DI_4 — Driver 4 Input — If Driver 4 output is enabled, logic 0 on DI_4 forces driver output DO_4A low and DO_4B high. A logic 1 on DI_4 with Driver 3 output enabled forces driver DO_4A high and DO_4B low.

Pin 16 — Supply Voltage V_{CC} — $4.75V \leq V_{CC} \leq 5.25V$.

FEATURES...

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. Both are available in 16-pin plastic DIP and SOIC packages.

| INPUT | ENABLES | OUTPUTS | |
|-------|--------------------|---------|------|
| DI | EN1/EN2 or EN3/EN4 | OUTA | OUTB |
| H | H | H | L |
| L | H | L | H |
| X | L | Hi-Z | Hi-Z |

Table 2. SP487 Truth Table

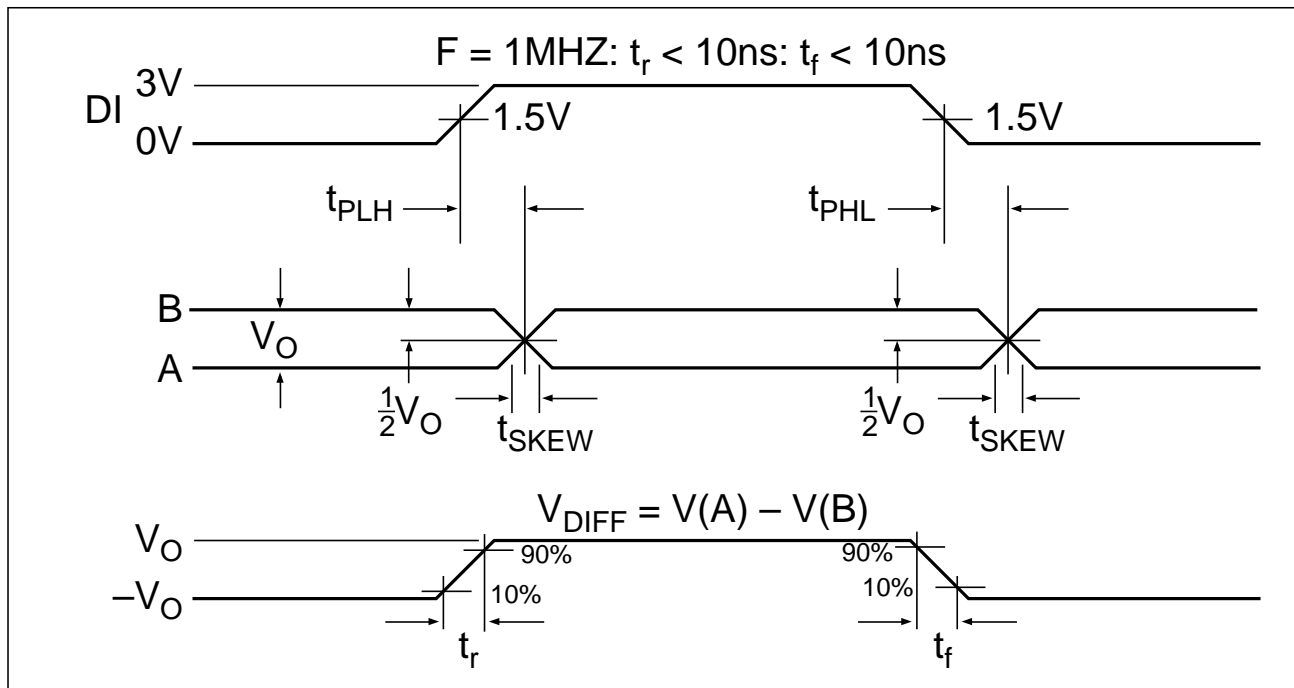


Figure 4. Driver Propagation Delays

AC PARAMETERS

$V_{CC} = 5V \pm 5\%$; typicals at $25^{\circ}C$; $0^{\circ}C \leq T_A \leq +70^{\circ}C$ unless otherwise noted.

| PARAMETER | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|--|------|------|------|------|--|
| PROPAGATION DELAY | | | | | |
| Driver Input to Output | | | | | $R_{DIFF} = 54 \text{ Ohms}$, $C_{L1} = C_{L2} = 100\text{pF}$; Figure 2 |
| Low to High (t_{PLH}) | 20 | 40 | 60 | ns | |
| High to Low (t_{PHL}) | 20 | 40 | 60 | ns | |
| Driver Output to Output (t_{SKEW}) | | 5 | 15 | ns | |
| Driver Rise Time (t_r) | | | | | 10% to 90% |
| SP486 | | 20 | | ns | |
| SP487 | | 20 | | ns | |
| Driver Fall Time (t_f) | | | | | 90% to 10% |
| SP486 | | 20 | | ns | |
| SP487 | | 20 | | ns | |
| DRIVER ENABLE | | | | | |
| To Output High | | 60 | 110 | ns | $C_L = 100\text{pF}$; Figures 3 and 5 (S_2 closed) |
| To Output Low | | 60 | 115 | ns | $C_L = 100\text{pF}$; Figures 3 and 5 (S_1 closed) |
| DRIVER DISABLE | | | | | |
| From Output Low | | 60 | 130 | ns | $C_L = 15\text{pF}$; Figures 3 and 5 (S_1 closed) |
| From Output High | | 60 | 130 | ns | $C_L = 15\text{pF}$; Figures 3 and 5 (S_2 closed) |

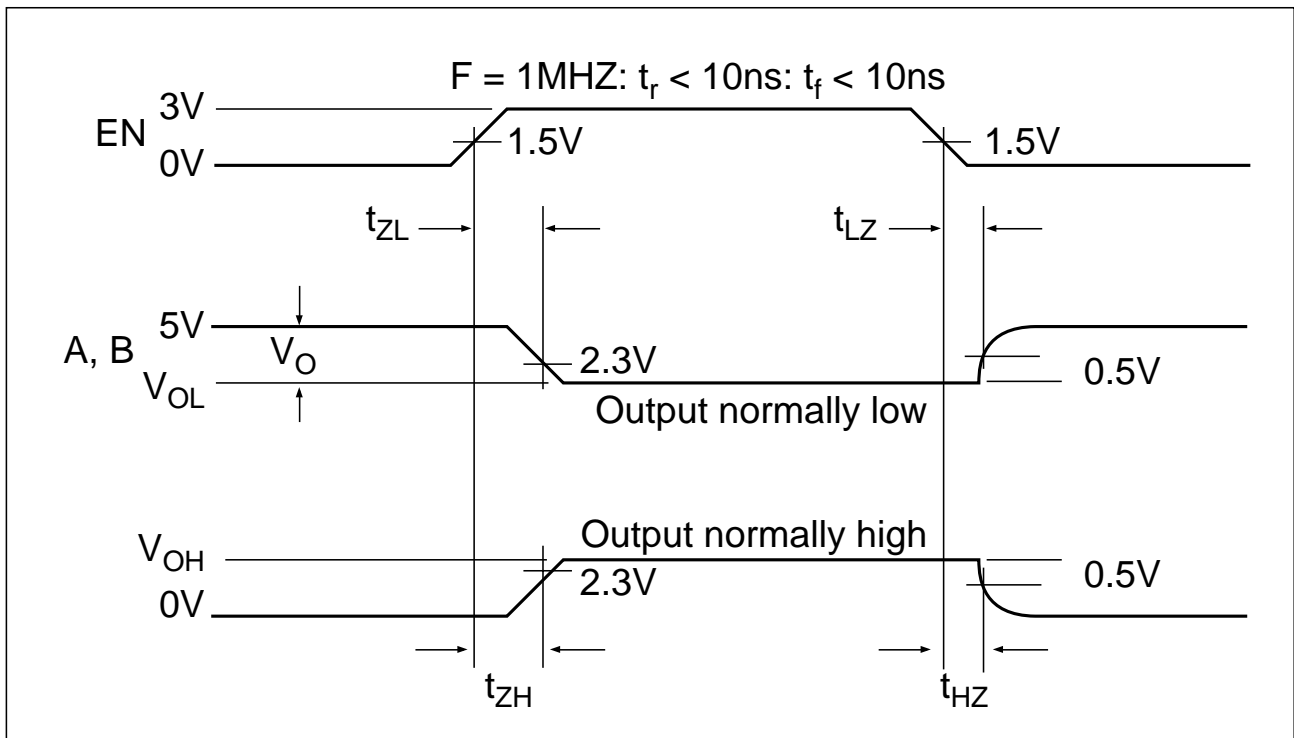


Figure 5. Driver Enable/Disable Timing

ORDERING INFORMATION

Quad RS485 Drivers:

| Model | Enable/Disable | Temperature Range | Package |
|---------|------------------------------------|-------------------|--------------------|
| SP486CS | Common; active Low and Active High | 0°C to +70°C | 16-pin Plastic DIP |
| SP486CT | Common; active Low and Active High | 0°C to +70°C | 16-pin SOIC |
| SP486ES | Common; active Low and Active High | -40°C to +85°C | 16-pin Plastic DIP |
| SP486ET | Common; active Low and Active High | -40°C to +85°C | 16-pin SOIC |
| SP487CS | One per driver pair; active High | 0°C to +70°C | 16-pin Plastic DIP |
| SP487CT | One per driver pair; active High | 0°C to +70°C | 16-pin SOIC |
| SP487ES | One per driver pair; active High | -40°C to +85°C | 16-pin Plastic DIP |
| SP487ET | One per driver pair; active High | -40°C to +85°C | 16-pin SOIC |

Now available in Lead Free. To order add "-L" to the part number.
Example: SP488A = normal, SP488A-L = Lead free



SIGNAL PROCESSING EXCELLENCE

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