

DATA SHEET

74AVCM162835

18-bit registered driver with 15 Ω
termination resistors (3-State)

Product specification

1999 Sep 14

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74AVCM162835

FEATURES

- Wide supply voltage range of 1.2 V to 3.6 V
- Complies with JEDEC standard no. 8-1A/5/7.
- CMOS low power consumption
- Input/output tolerant up to 3.6 V
- Low inductance multiple V_{CC} and GND pins for minimum noise and ground bounce

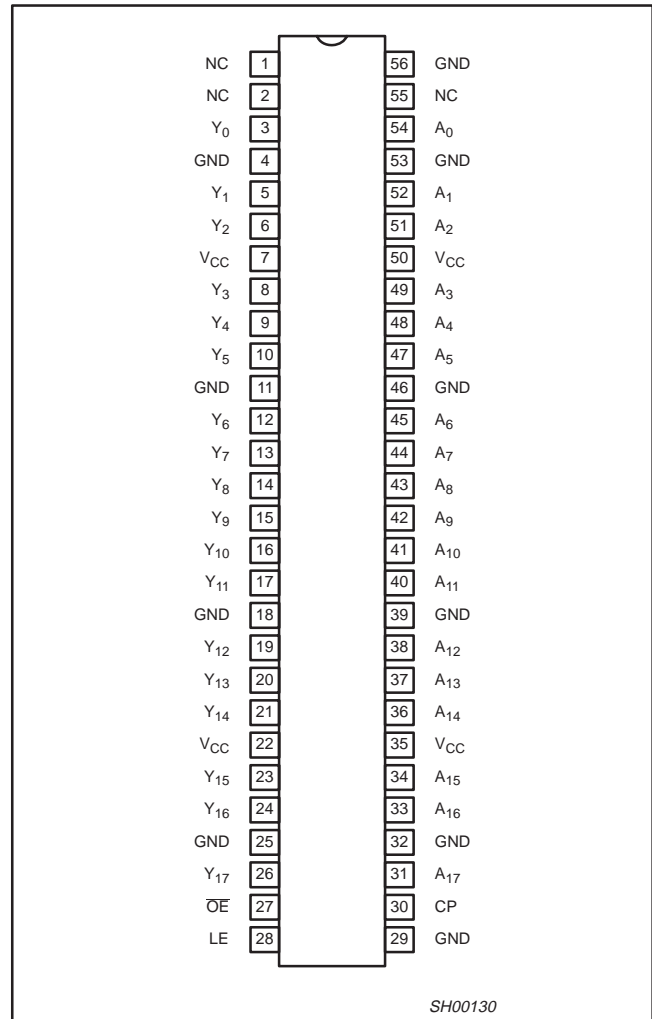
DESCRIPTION

The 74AVCM162835 is a 18-bit universal bus driver. Data flow is controlled by output enable (\overline{OE}), latch enable (LE) and clock inputs (CP).

This product is designed to have an extremely fast propagation delay and a minimum amount of power consumption.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor (Live Insertion).

PIN CONFIGURATION



QUICK REFERENCE DATA

GND = 0 V; $T_{amb} = 25^{\circ}\text{C}$; $t_r = t_f \leq 2.0$ ns; $C_L = 30$ pF.

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | UNIT | |
|-------------------|--|--|------------------------------------|---------|----|
| t_{PHL}/t_{PLH} | Propagation delay An to Yn | $V_{CC} = 1.8$ V $V_{CC} = 2.5$ V $V_{CC} = 3.3$ V | 2.6 2.0 1.7 | ns | |
| t_{PHL}/t_{PLH} | Propagation delay LE to Yn; CP to Yn | $V_{CC} = 1.8$ V $V_{CC} = 2.5$ V $V_{CC} = 3.3$ V | 2.8 2.2 1.8 | ns | |
| C_I | Input capacitance | | 5.0 | pF | |
| C_{PD} | Power dissipation capacitance per buffer | $V_I = \text{GND to } V_{CC}^1$ | Outputs enabled Output disabled | 25 6 | pF |

NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where: } f_i = \text{input frequency in MHz; } C_L = \text{output load capacitance in pF; } f_o = \text{output frequency in MHz; } V_{CC} = \text{supply voltage in V; } \sum (C_L \times V_{CC}^2 \times f_o) = \text{sum of outputs.}$$

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | ORDER CODE | DRAWING NUMBER |
|--|--|------------------|----------------|
| 56-Pin Plastic Thin Shrink Small Outline (TSSOP) Type II | -40°C to $+85^{\circ}\text{C}$ | 74AVCM162835 DGG | SOT364-1 |

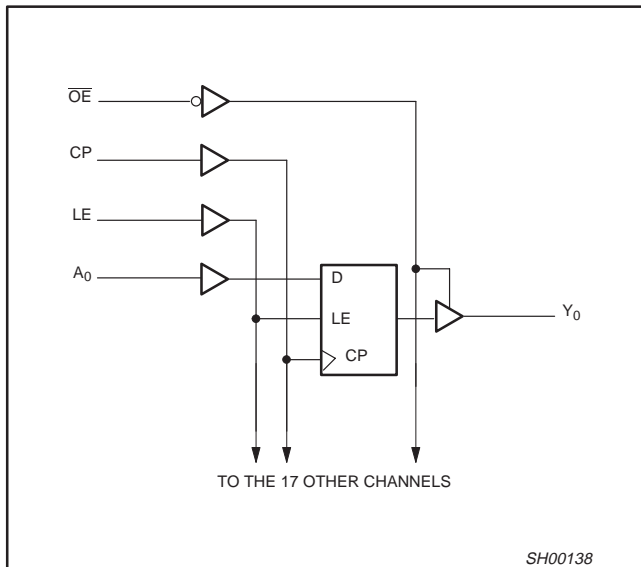
18-bit registered driver with 15 Ω termination resistors (3-State)

74AVCM162835

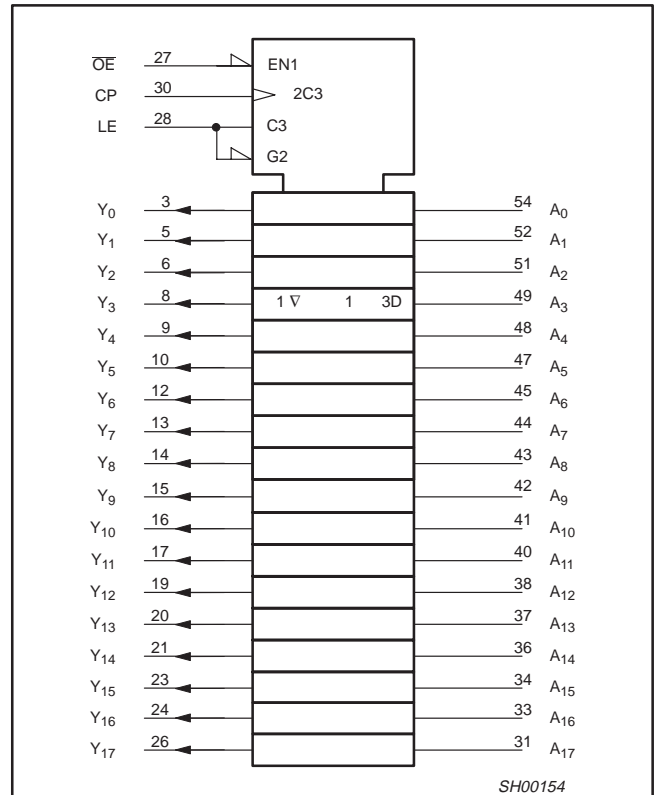
PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|--|-----------------------------------|----------------------------------|
| 1, 2, 55 | NC | No connection |
| 3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 26 | Y ₀ to Y ₁₇ | Data outputs |
| 4, 11, 18, 25, 32, 39, 46, 53, 56 | GND | Ground (0V) |
| 7, 22, 35, 50 | V _{CC} | Positive supply voltage |
| 27 | \overline{OE} | Output enable input (active LOW) |
| 28 | LE | Latch enable input (active HIGH) |
| 30 | CP | Clock input |
| 54, 52, 51, 49, 48, 47, 45, 44, 43, 42, 41, 40, 38, 37, 36, 34, 33, 31 | A ₀ to A ₁₇ | Data inputs |

LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

| INPUTS | | | | OUTPUTS |
|-----------------|----|----|---|-----------------------------|
| \overline{OE} | LE | CP | A | |
| H | X | X | X | Z |
| L | H | X | L | L |
| L | H | X | H | H |
| L | L | ↑ | L | L |
| L | L | ↑ | H | H |
| L | L | H | X | Y ₀ ¹ |
| L | L | L | X | Y ₀ ² |

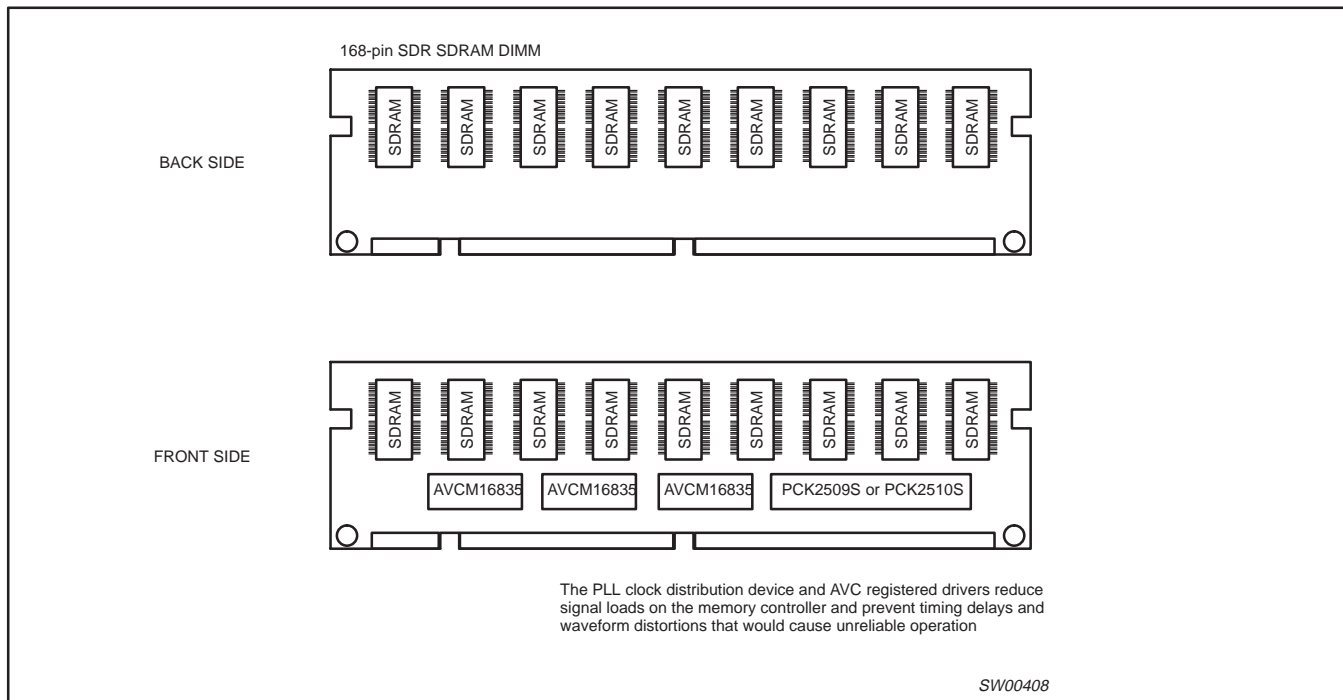
- H = HIGH voltage level
- L = LOW voltage level
- X = Don't care
- Z = High impedance "off" state
- ↑ = LOW-to-HIGH level transition

NOTES:

1. Output level before the indicated steady-state input conditions were established, provided that CP is high before LE goes low.
2. Output level before the indicated steady-state input conditions were established.

18-bit registered driver with 15 Ω termination resistors (3-State)

74AVCM162835



RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | CONDITIONS | MIN | MAX | UNIT |
|---------------------------------|---|--|--------------------|--------------------|------|
| V _{CC} | DC supply voltage (according to JEDEC Low Voltage Standards) | | 1.65 2.3 3.0 | 1.95 2.7 3.6 | V |
| | DC supply voltage (for low voltage applications) | | 1.2 | 3.6 | |
| V _I | DC Input voltage range | | 0 | 3.6 | V |
| V _O | DC output voltage range; output 3-State | | 0 | 3.6 | V |
| | DC output voltage range; output HIGH or LOW state | | 0 | V _{CC} | |
| T _{amb} | Operating free-air temperature range | | -40 | +85 | °C |
| t _r , t _f | Input rise and fall times | V _{CC} = 1.65 to 2.3V V _{CC} = 2.3 to 3.0V V _{CC} = 3.0 to 3.6V | 0 0 0 | 30 20 10 | ns/V |

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74AVCM162835

ABSOLUTE MAXIMUM RATINGS

In accordance with the Absolute Maximum Rating System (IEC 134)

Voltages are referenced to GND (ground = 0 V)

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-------------------|--|---|------------------------|--------------------|
| V_{CC} | DC supply voltage | | -0.5 to +4.6 | V |
| I_{IK} | DC input diode current | $V_I < 0$ | -50 | mA |
| V_I | DC input voltage | For all inputs ¹ | -0.5 to 4.6 | V |
| I_{OK} | DC output diode current | $V_O > V_{CC}$ or $V_O < 0$ | ± 50 | mA |
| V_O | DC output voltage; output 3-State | Note 1 | -0.5 to 4.6 | V |
| V_O | DC output voltage; output HIGH or LOW state | Note 1 | -0.5 to $V_{CC} + 0.5$ | V |
| I_O | DC output source or sink current | $V_O = 0$ to V_{CC} | ± 50 | mA |
| I_{GND}, I_{CC} | DC V_{CC} or GND current | | ± 100 | mA |
| T_{stg} | Storage temperature range | | -65 to +150 | $^{\circ}\text{C}$ |
| P_{TOT} | Power dissipation per package -plastic thin-medium-shrink (TSSOP) | For temperature range: -40 to +125 $^{\circ}\text{C}$ above +55 $^{\circ}\text{C}$ derate linearly with 8 mW/K | 600 | mW |

NOTE:

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltage are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT |
|-------------------|----------------------------------|---|---|------------------|--------------|---------------|
| | | | Temp = -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$ | | | |
| | | | MIN | TYP ¹ | MAX | |
| V_{IH} | HIGH level Input voltage | $V_{CC} = 1.2\text{ V}$ | V_{CC} | - | - | V |
| | | $V_{CC} = 1.65\text{ to }1.95\text{ V}$ | $0.65V_{CC}$ | 0.9 | - | |
| | | $V_{CC} = 2.3\text{ to }2.7\text{ V}$ | 1.7 | 1.2 | - | |
| | | $V_{CC} = 3.0\text{ to }3.6\text{ V}$ | 2.0 | 1.5 | - | |
| V_{IL} | LOW level Input voltage | $V_{CC} = 1.2\text{ V}$ | - | - | GND | V |
| | | $V_{CC} = 1.65\text{ to }1.95\text{ V}$ | - | 0.9 | $0.35V_{CC}$ | |
| | | $V_{CC} = 2.3\text{ to }2.7\text{ V}$ | - | 1.2 | 0.7 | |
| | | $V_{CC} = 3.0\text{ to }3.6\text{ V}$ | - | 1.5 | 0.8 | |
| V_{OH} | HIGH level output voltage | $V_{CC} = 1.65\text{ to }3.6\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = -100\ \mu\text{A}$ | $V_{CC} - 0.20$ | V_{CC} | - | V |
| | | $V_{CC} = 1.65\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = -4\text{ mA}$ | $V_{CC} - 0.45$ | $V_{CC} - 0.10$ | - | |
| | | $V_{CC} = 2.3\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = -8\text{ mA}$ | $V_{CC} - 0.55$ | $V_{CC} - 0.28$ | - | |
| | | $V_{CC} = 3.0\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = -12\text{ mA}$ | $V_{CC} - 0.70$ | $V_{CC} - 0.32$ | - | |
| V_{OL} | LOW level output voltage | $V_{CC} = 1.65\text{ to }3.6\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = 100\ \mu\text{A}$ | - | GND | 0.20 | V |
| | | $V_{CC} = 1.65\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = 4\text{ mA}$ | - | 0.10 | 0.45 | |
| | | $V_{CC} = 2.3\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = 8\text{ mA}$ | - | 0.26 | 0.55 | |
| | | $V_{CC} = 3.0\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; I_O = 12\text{ mA}$ | - | 0.36 | 0.70 | |
| I_I | Input leakage current | $V_{CC} = 1.65\text{ to }3.6\text{ V}; V_I = V_{CC}\text{ or GND}$ | - | 0.1 | 2.5 | μA |
| I_{OFF} | 3-State output OFF-state current | $V_{CC} = 0\text{ V}; V_I\text{ or }V_O = 3.6\text{ V}$ | - | 0.1 | ± 10 | μA |
| I_{IHZ}/I_{ILZ} | 3-State output OFF-state current | $V_{CC} = 1.65\text{ to }3.6\text{ V}; V_I = V_{CC}\text{ or GND}$ | - | 0.1 | 12.5 | μA |
| I_{OZ} | 3-State output OFF-state current | $V_{CC} = 1.65\text{ to }2.7\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; V_O = V_{CC}\text{ or GND}$ | - | 0.1 | 5 | μA |
| | | $V_{CC} = 3.0\text{ to }3.6\text{ V}; V_I = V_{IH}\text{ or }V_{IL}; V_O = V_{CC}\text{ or GND}$ | - | 0.1 | 10 | |
| I_{CC} | Quiescent supply current | $V_{CC} = 1.65\text{ to }2.7\text{ V}; V_I = V_{CC}\text{ or GND}; I_O = 0$ | - | 0.1 | 20 | μA |
| | | $V_{CC} = 3.0\text{ to }3.6\text{ V}; V_I = V_{CC}\text{ or GND}; I_O = 0$ | - | 0.2 | 40 | |

NOTES:

1. All typical values are at $T_{amb} = 25^{\circ}\text{C}$.

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74AVCM162835

AC CHARACTERISTICS

GND = 0 V; $t_r = t_f \leq 2.0$ ns; $C_L = 30$ pF

| SYMBOL | PARAMETER | WAVE-FORM | LIMITS | | | | | | | | | | UNIT | |
|-------------------|---|-----------|--------------------------|------------------|-----|--------------------------|------------------|-----|---------------------------|------------------|-----|------------------|------|-----|
| | | | $V_{CC} = 3.3 \pm 0.3$ V | | | $V_{CC} = 2.5 \pm 0.2$ V | | | $V_{CC} = 1.8 \pm 0.15$ V | | | $V_{CC} = 1.2$ V | | |
| | | | MIN | TYP ¹ | MAX | MIN | TYP ¹ | MAX | MIN | TYP ¹ | MAX | MIN | | TYP |
| t_{PHL}/t_{PLH} | Propagation delay An to Yn | 1, 7 | 0.7 | 1.7 | 2.5 | 0.8 | 2.0 | 3.1 | 1.0 | 2.6 | 4.5 | – | 5.2 | ns |
| | Propagation delay LE to Yn | 2, 7 | 0.7 | 1.8 | 2.7 | 0.8 | 2.2 | 3.3 | 1.0 | 2.8 | 5.0 | – | 5.6 | |
| | Propagation delay CP to Yn | 3, 7 | 0.7 | 1.7 | 2.5 | 0.8 | 2.0 | 3.0 | 1.0 | 2.6 | 4.5 | – | 5.2 | |
| t_{PZH}/t_{PZL} | 3-State output enable time \overline{OE} to Yn | 6, 7 | 1.0 | 2.3 | 4.5 | 1.0 | 2.5 | 4.5 | 1.5 | 3.0 | 6.5 | – | 5.5 | ns |
| t_{PHZ}/t_{PLZ} | 3-State output disable time \overline{OE} to Yn | 6, 7 | 1.0 | 2.3 | 3.5 | 1.0 | 2.2 | 4.0 | 1.5 | 3.5 | 6.5 | – | 6.9 | ns |
| t_w | CP pulse width HIGH or LOW | 3, 7 | 1.0 | – | – | 1.2 | – | – | 2.0 | – | – | – | – | ns |
| | LE pulse width HIGH | 2, 7 | 1.0 | – | – | 1.2 | – | – | 2.0 | – | – | – | – | |
| t_{SU} | Set-up time An to CP | 5, 7 | 0.7 | – | – | 0.7 | – | – | 0.7 | – | – | 1.0 | – | ns |
| | Set-up time An to LE HIGH | 4, 7 | 0.5 | – | – | 0.5 | – | – | 0.5 | – | – | 0.2 | – | |
| | Set-up time An to LE LOW | 4, 7 | 0.5 | – | – | 0.5 | – | – | 0.6 | – | – | 2.0 | – | |
| t_h | Hold time An to CP | 5, 7 | 0.9 | – | – | 0.9 | – | – | 1.0 | – | – | 1.5 | – | ns |
| | Hold time An to LE HIGH | 4, 7 | 1.6 | – | – | 1.7 | – | – | 2.0 | – | – | 3.2 | – | |
| | Hold time An to LE LOW | 4, 7 | 1.4 | – | – | 1.5 | – | – | 1.7 | – | – | 2.8 | – | |
| F_{max} | Maximum clock pulse frequency | 3, 7 | 500 | – | – | 400 | – | – | 250 | – | – | – | – | MHz |

NOTES:

1. All typical values are measured at $T_{amb} = 25^\circ\text{C}$ and at $V_{CC} = 1.8$ V, 2.5 V, 3.3 V.

18-bit registered driver with 15 Ω termination resistors (3-State)

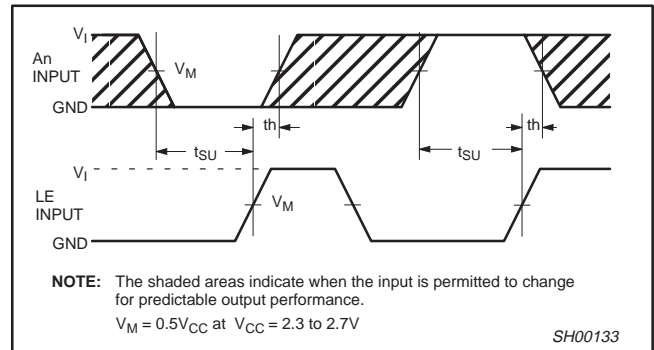
74AVCM162835

AC WAVEFORMS FOR $V_{CC} = 3.0\text{ V TO } 3.6\text{ V RANGE}$

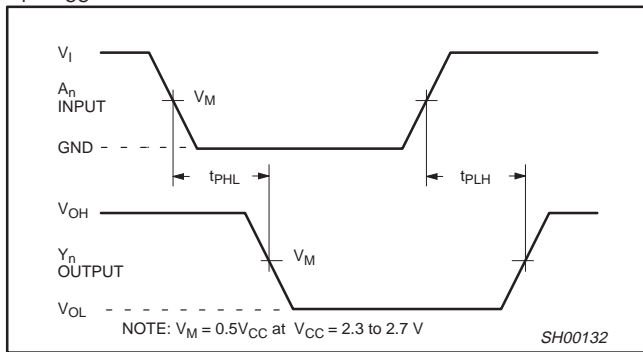
$V_M = 0.5 V_{CC}$
 $V_X = V_{OL} + 0.300\text{ V}$
 $V_Y = V_{OH} - 0.300\text{ V}$
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
 $V_I = V_{CC}$

AC WAVEFORMS FOR $V_{CC} = 2.3\text{ V TO } 2.7\text{ V AND } V_{CC} < 2.3\text{ V RANGE}$

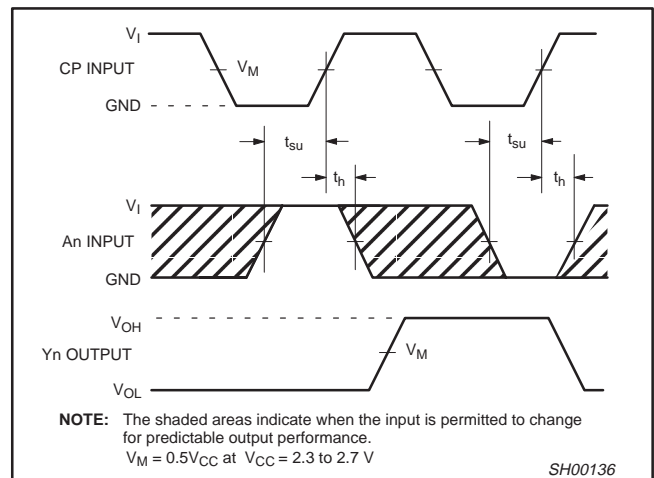
$V_M = 0.5 V_{CC}$
 $V_X = V_{OL} + 0.15\text{ V}$
 $V_Y = V_{OH} - 0.15\text{ V}$
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
 $V_I = V_{CC}$



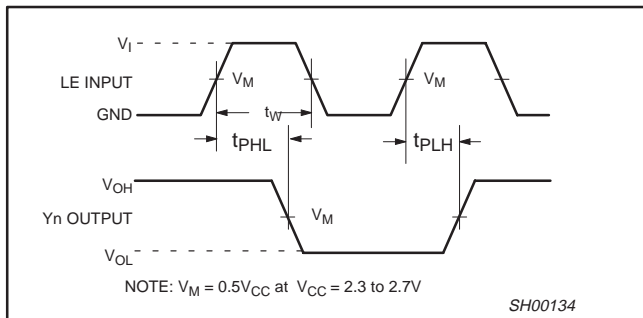
Waveform 4. Data set-up and hold times for the An input to the LE input



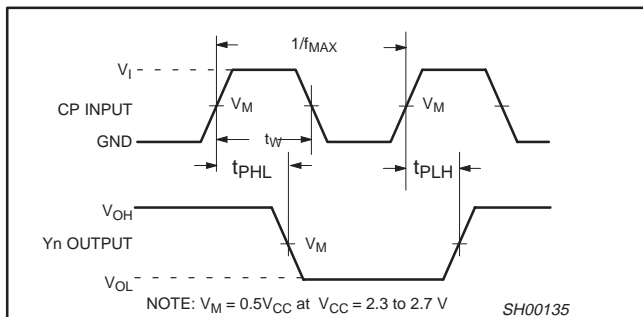
Waveform 1. Input (An) to output (Yn) propagation delay



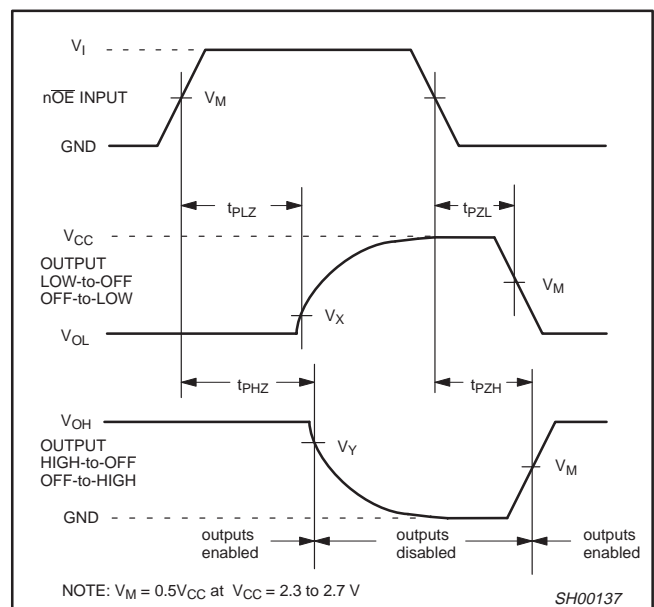
Waveform 5. Data set-up and hold times for the An input to the clock CP input



Waveform 2. Latch enable input (LE) pulse width, the latch enable input to output (Yn) propagation delays.



Waveform 3. The clock (CP) to Yn propagation delays, the clock pulse width and the maximum clock frequency.

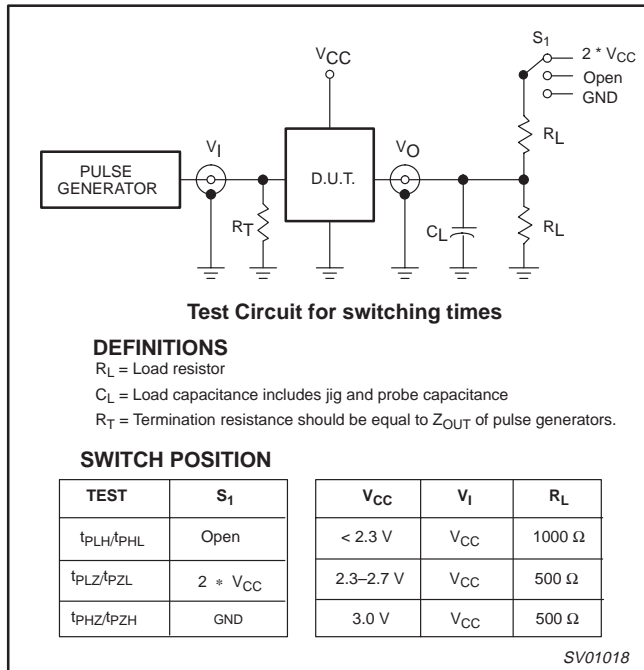


Waveform 6. 3-State enable and disable times

18-bit registered driver with 15 Ω termination resistors (3-State)

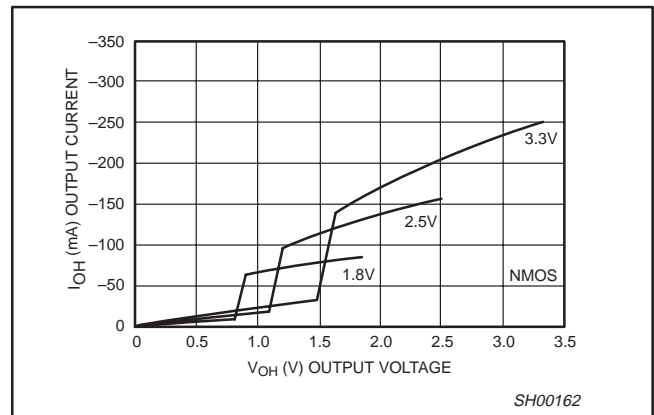
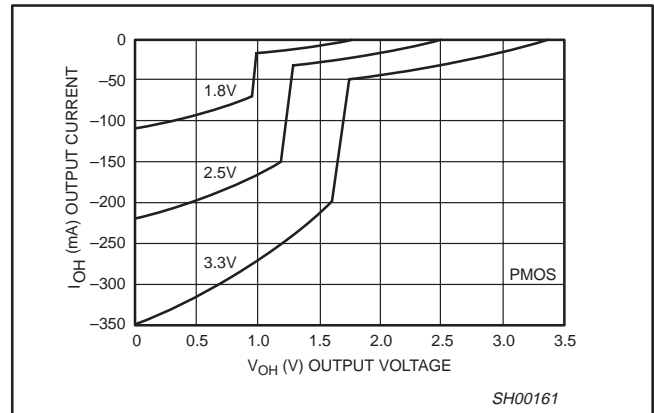
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TEST CIRCUIT



Waveform 7. Load circuitry for switching times

GRAPHS

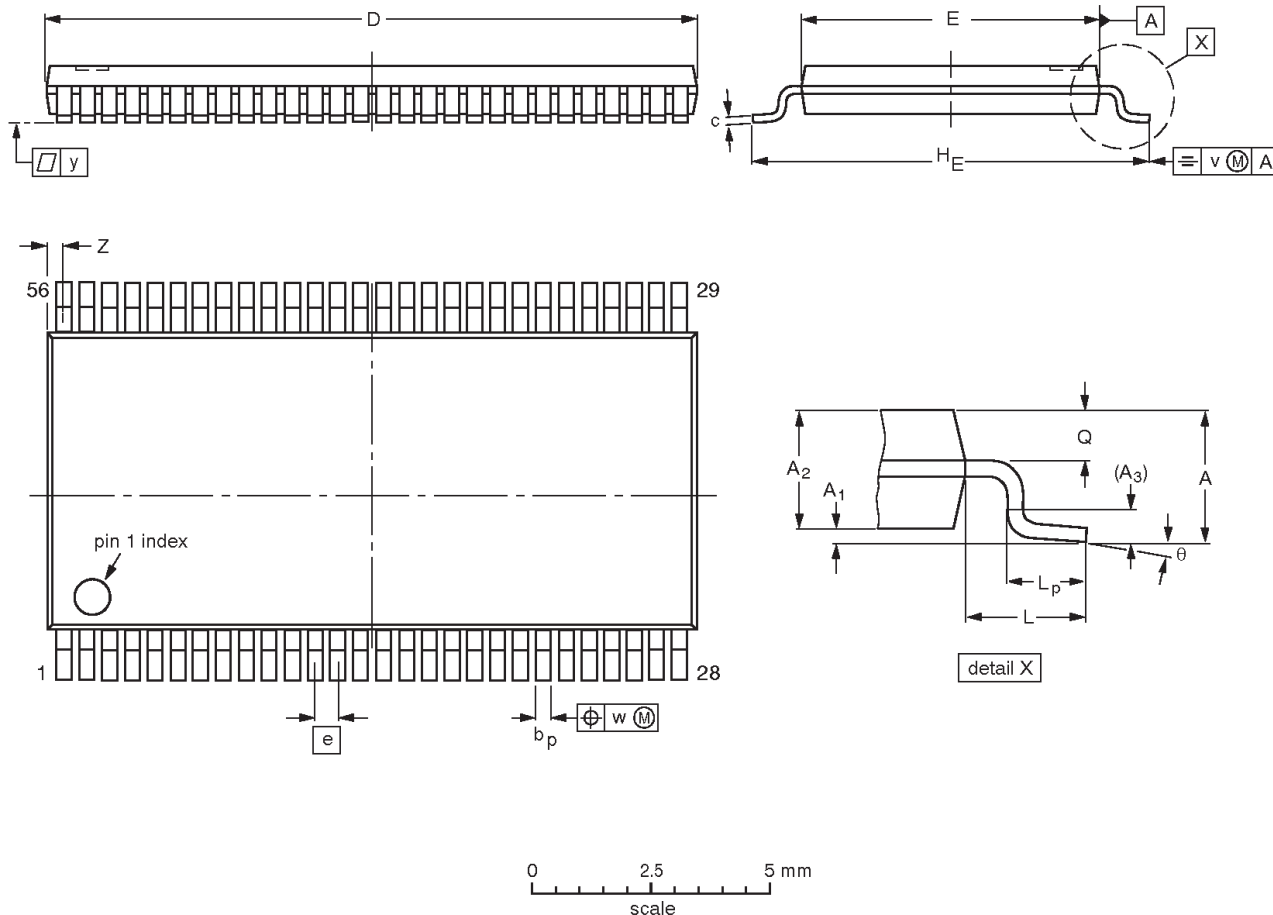


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74AVCM162835

TSSOP56: plastic thin shrink small outline package; 56 leads; body width 6.1mm

SOT364-1



DIMENSIONS (mm are the original dimensions).

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|-----|----------------|-----|----------------|--------------|------|------|-----|------------|----------|
| mm | 1.2 | 0.15 0.05 | 1.05 0.85 | 0.25 | 0.28 0.17 | 0.2 0.1 | 14.1 13.9 | 6.2 6.0 | 0.5 | 8.3 7.9 | 1.0 | 0.8 0.4 | 0.50 0.35 | 0.25 | 0.08 | 0.1 | 0.5 0.1 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT364-1 | | MO-153EE | | | | 93-02-03 95-02-10 |

18-bit registered driver with 15 Ω termination resistors (3-State)

74AVCM162835

Data sheet status

| Data sheet status | Product status | Definition [1] |
|---------------------------|----------------|--|
| Objective specification | Development | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice. |
| Preliminary specification | Qualification | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification | Production | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |

[1] Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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