

## Low Voltage CMOS Driver Circuit

### Description

The e5130 contains 4 independent driver outputs with an ON resistance of typ. 25  $\Omega$  (15  $\Omega$ ) for the P-channel output transistors and typ. 20  $\Omega$  (13  $\Omega$ ) for the N-channel output transistors; at a supply voltage of 1.5 V (3 V). To obtain a fast transition of the outputs, even for slow rise/-fall time input signals, all digital inputs (IN1 ... IN4) have a schmitt-trigger characteristic; with a hysteresis of

typ. 50 mV. If a higher driving capability is needed, all inputs and outputs may be connected in parallel. In this case the rise/-fall time of the input signals IN1 ... IN4 must be less than 200 nsec. Due to the fast switching characteristic of the tristatable output drivers, the circuit is also suited as low voltage bus driver.

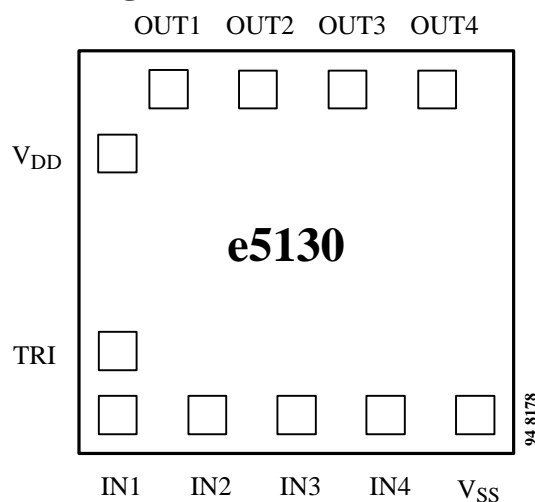
### Features

- 1.1 – 3.6 V operating voltage range
- 4 non-inverting, tristatable drivers for the following applications:
  - Motor driver for bipolar stepper motors in watch/clock applications
  - Driver for piezoelectric transducers (buzzer)
  - LED Driver
  - Line driver for medium speed applications

### Advantages

- High load current at low supply voltage
- Replaces several discrete transistors
- Tri-state operation possible
- Possible applications:
  - Motor driver
  - Radio controlled clock/watch
  - Line driver for mini-computer, laptop
  - LED driver
  - Relay driver

### Pad Configuration



| Name            | Description             |
|-----------------|-------------------------|
| V <sub>DD</sub> | Positive supply voltage |
| V <sub>SS</sub> | Negative supply voltage |
| IN1 ... IN4     | Digital inputs          |
| TRI             | Tristate input          |
| OUT1 ... OUT4   | Drive outputs           |

Chipsize: x = 1.08 mm, y = 1.42 mm,  
Padwindow: 90 x 90  $\mu$

### Ordering Information

| Extended Type Number | Package | Remarks      |
|----------------------|---------|--------------|
| e5130A-DIT           | Die     | Die in Trays |

## Absolute Maximum Ratings

Absolute maximum ratings define parameter limits which, if exceeded, may permanently change or damage the device. All inputs and outputs on circuits are highly protected against electrostatic discharges.

However, precautions to minimize build-up of electrostatic charges during handling are recommended.

The circuits are protected against supply voltage reversal for typically 5 minutes, if the current is limited to 120 mA.

| Parameters   | Symbol            | Value                            | Unit |
|--|-------------------|----------------------------------|------|
| Supply voltage   | $V_{DD} - V_{SS}$ | – 0.3 to + 5                     | V    |
| Input voltage range, all inputs                          | $V_I$             | $V_{SS} - 0.3$ to $V_{DD} + 0.3$ | V    |
| Operating ambient temperature range                      |                   | – 20 to + 70                     | °C   |
| Storage temperature range                                |                   | – 40 to + 125                    | °C   |
| Lead temperature during soldering at 2 mm distance, 10 s |                   | 260                              | °C   |

## Operating Characteristics

$V_{SS} = 0$  V,  $V_{DD} = + 1.5$  V,  $T_{amb} = + 25$  °C, unless otherwise specified.

All voltage levels are measured with reference to  $V_{SS}$ .

| Parameters                  | Test Conditions / Pin  | Symbol           | Min       | Typ        | Max  | Unit |
|-----------------------------|--|------------------|-----------|------------|------|------|
| Operating voltage           |  | $V_{DD}$         | 1.1       |            | 3.6  | V    |
| Operating temperature       |  | $T_{amb}$        | – 10      |            | 60   | °C   |
| Operating current (standby) | $V_{DD} = 3.6$ V, $R_{L12} = R_{L34} = \infty$ ,<br>IN1 to IN4 at $V_{DD}$ or $V_{SS}$ , TRI at $V_{SS}$ | $I_{DD}$         |           | 0.05       | 1    | µA   |
| Drive output OUT1 to OUT4   |  |                  |           |            |      |      |
| Output current              | $V_{DD} = 1.2$ V, $R_{L12} = R_{L34} = 200 \Omega$   | $I_{OUT}$        | $\pm 4.3$ | $\pm 4.75$ |      | mA   |
| Output current              | $V_{DD} = 1.5$ V, $R_{L12} = R_{L34} = 200 \Omega$   | $I_{OUT}$        | $\pm 5.7$ | $\pm 6.20$ |      | mA   |
| Output current              | $V_{DD} = 3.0$ V, $R_{L12} = R_{L34} = 200 \Omega$   | $I_{OUT}$        | $\pm 12$  | $\pm 13$   |      | mA   |
| Delay time                  | $V_{DD} = 3$ V, $C_L = 50$ pF  | $T_{Dr}, T_{Df}$ |           | 35         | 60   | ns   |
| Delay time                  | $V_{DD} = 1.5$ V, $C_L = 50$ pF,<br>see figure 2, note 1   | $T_{Dr}, T_{Df}$ |           | 80         | 150  | ns   |
| Rise/-fall time             | $V_{DD} = 3$ V, $C_L = 50$ pF  | $t_r, t_f$       |           | 8          | 15   | ns   |
| Rise/-fall time             | $V_{DD} = 1.5$ V, $C_L = 50$ pF,<br>see figure 2, note 2   | $t_r, t_f$       |           | 12         | 25   | ns   |
| Digital input IN1 to IN4    |  |                  |           |            |      |      |
| Input current               | $V_{IL} = 0$ V   | $I_{IL}$         |           |            | –100 | nA   |
| Input current               | $V_{IH} = V_{DD}$  | $I_{IH}$         |           |            | 100  | nA   |
| Threshold                   | V  | $V_{TH}$         |           | $V_{DD}/2$ |      | V    |
| Hysteresis                  | mV   | $V_{HYST}$       |           | 50         |      | mV   |
| Tristate input TRI          |  |                  |           |            |      |      |
| Input current TRI           | $V_{IH} = V_{DD}$  | $I_{IH}$         | 0.15      | 0.4        | 1.2  | µA   |

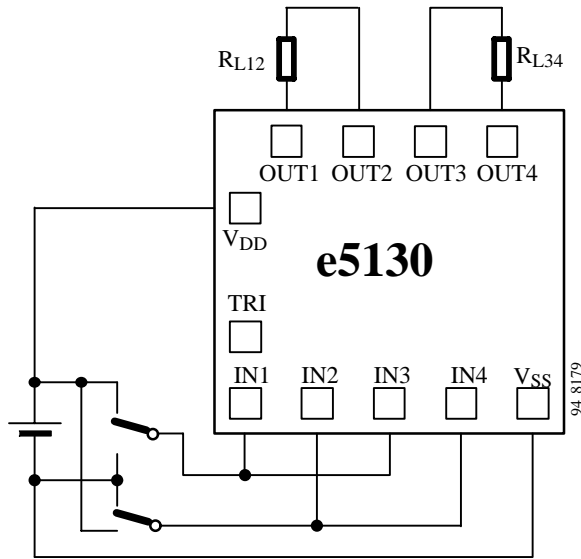


Figure 1. Test circuit

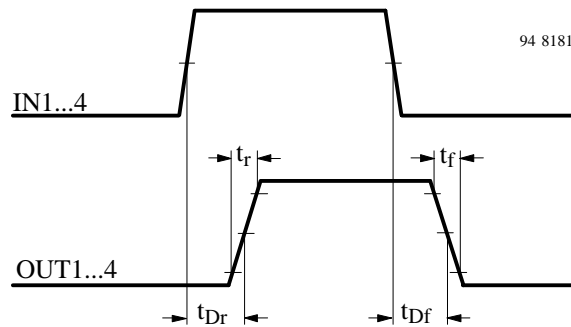


Figure 2.

Note 1:  $t_{Dr}$ ,  $t_{Df}$  is defined at 50% of supply voltage  
 Note 2:  $t_r$ ,  $t_f$  is defined from 10% to 90%, resp. 90% to 10% of supply voltage

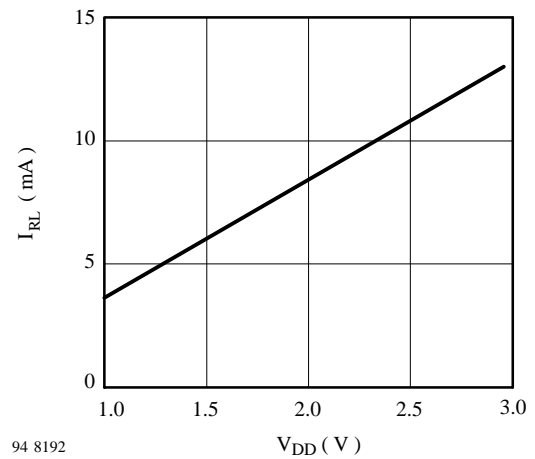


Figure 3. Typical current into 200  $\Omega$  load resistor, condition as per figure 1

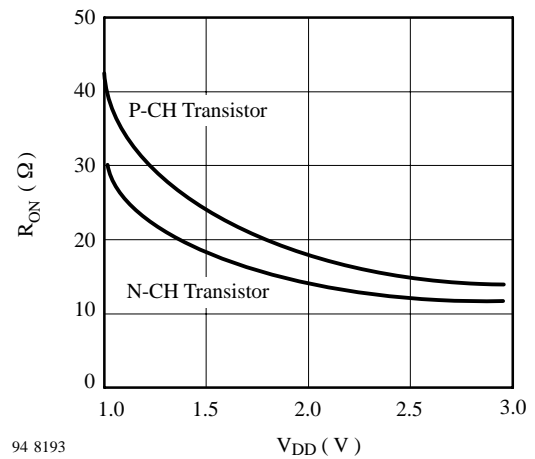


Figure 4. Typical output on-resistance vs. supply voltage at  $V_{DS} = 0.2$  V

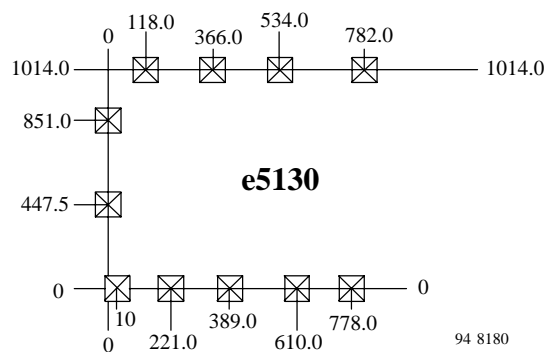
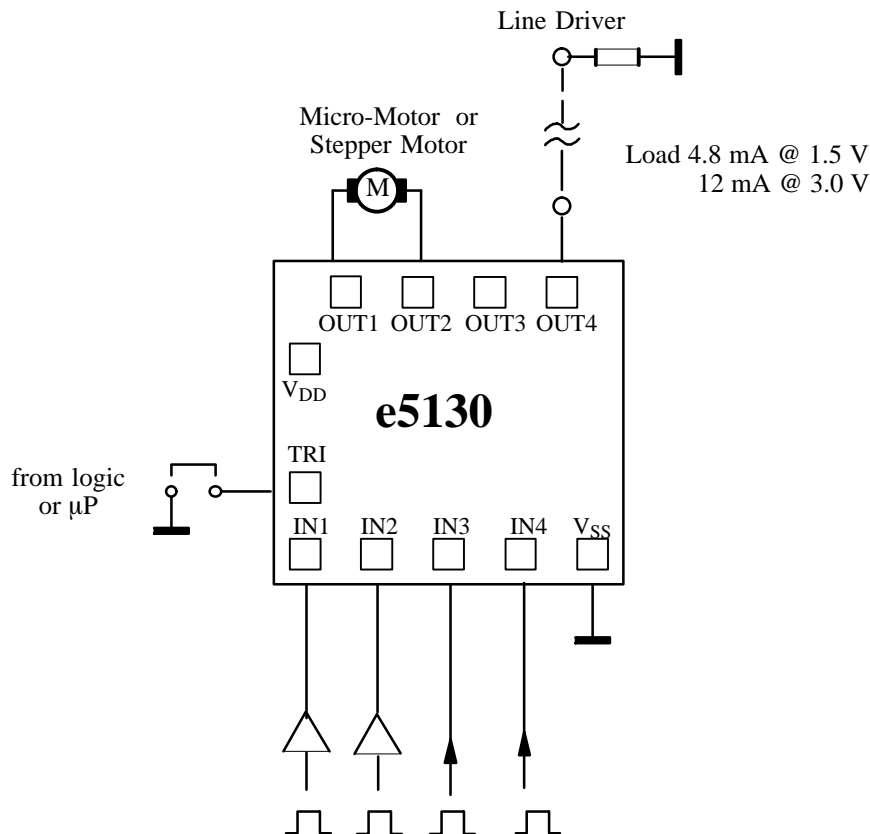


Figure 5. Pad coordinates

## Application Circuit



**We reserve the right to make changes to improve technical design and may do so without further notice.**

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**Data sheets can also be retrieved from the Internet: <http://www.atmel-wm.com>**

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