

Low Voltage CMOS Driver Circuit

Description

The e5130 contains 4 independent driver outputs with an ON resistance of typ. 25 Ω (15 Ω) for the P-channel output transistors and typ. 20 Ω (13 Ω) 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.

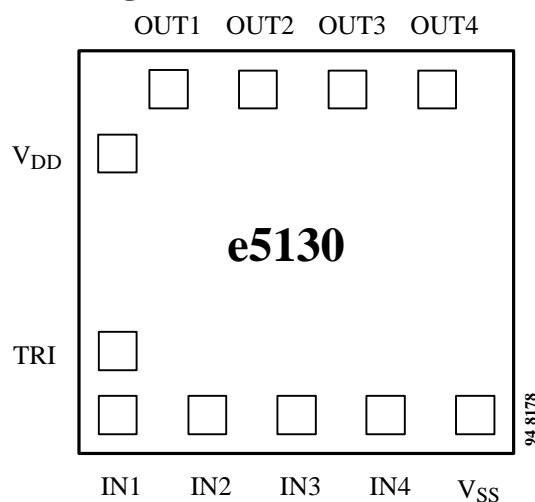
Features

- 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 _{DD} | Positive supply voltage |
| V _{SS} | 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 μ

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, $R_{L12} = R_{L34} = \infty$, 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, $R_{L12} = R_{L34} = 200$ Ω | I_{OUT} | ± 4.3 | ± 4.75 | | mA |
| Output current | $V_{DD} = 1.5$ V, $R_{L12} = R_{L34} = 200$ Ω | I_{OUT} | ± 5.7 | ± 6.20 | | mA |
| Output current | $V_{DD} = 3.0$ V, $R_{L12} = R_{L34} = 200$ Ω | I_{OUT} | ± 12 | ± 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, 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, 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 |

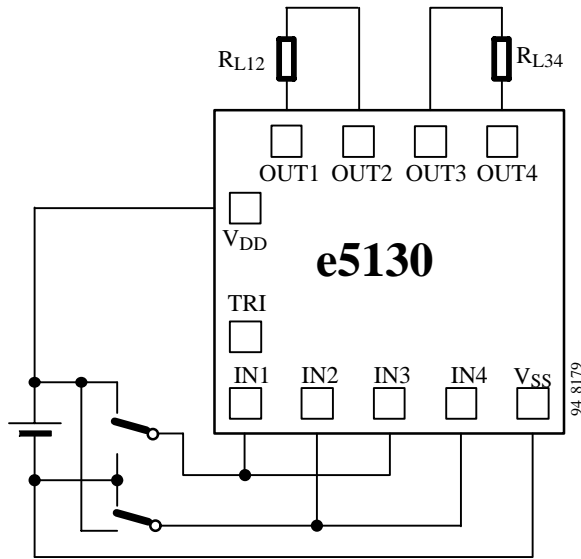


Figure 1. Test circuit

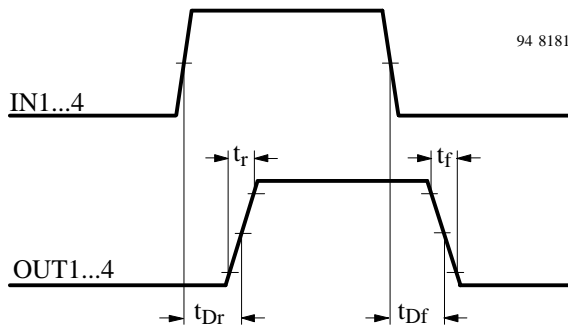


Figure 2.

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

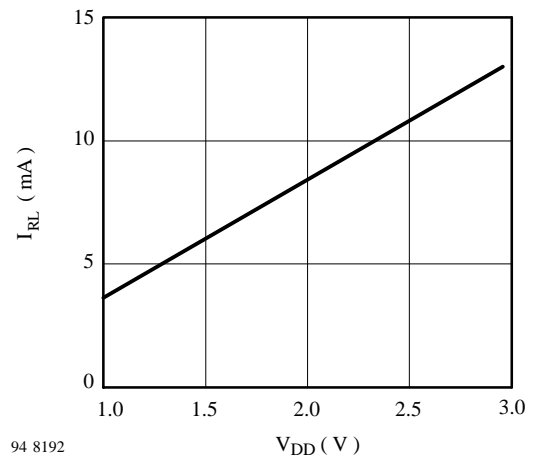


Figure 3. Typical current into 200 Ω load resistor, condition as per figure 1

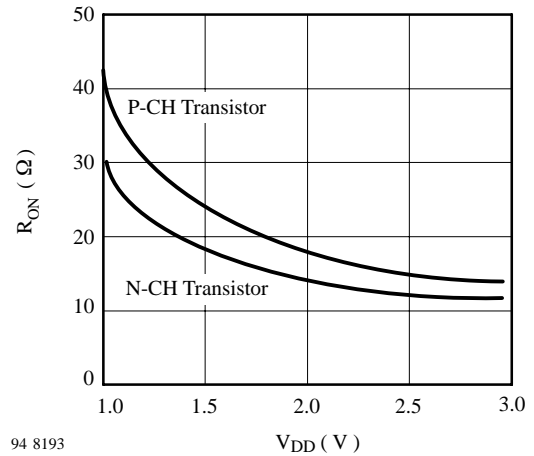


Figure 4. Typical output on-resistance vs. supply voltage at $V_{DS} = 0.2$ V

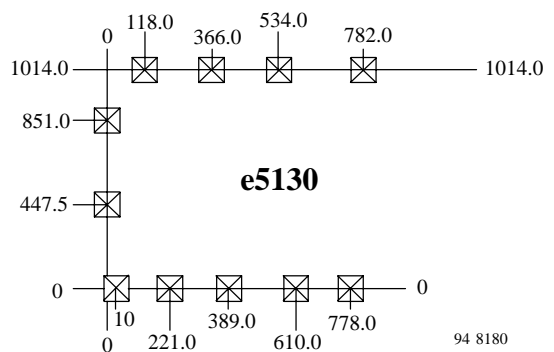
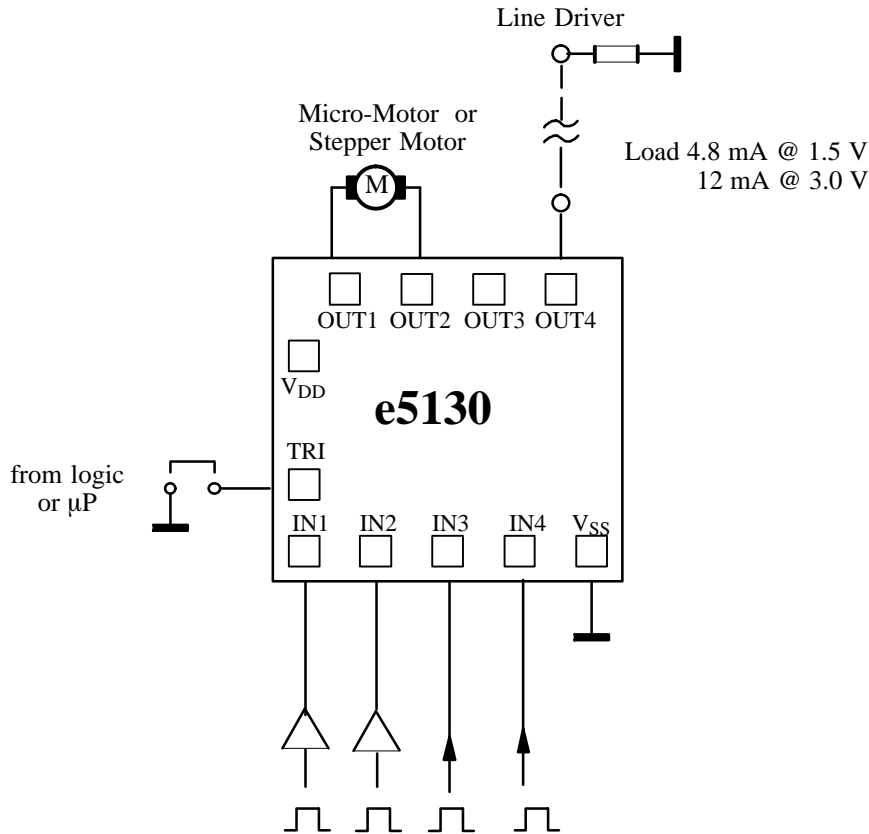


Figure 5. Pad coordinates

Application Circuit



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

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Atmel Wireless & Microcontrollers products for any unintended or unauthorized application, the buyer shall indemnify Atmel Wireless & Microcontrollers against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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

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