Low Voltage CMOS Driver Circuit

Description

The e5130 contains 4 independent driver outputs with an ON resistance of typ. 25 Ω (15 Ω) tor 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.

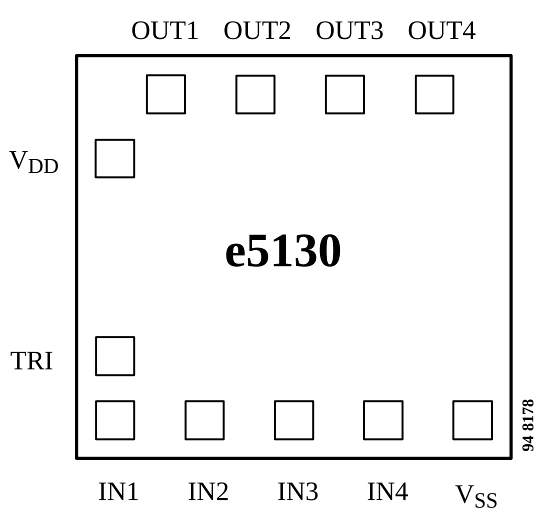
Features

- 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

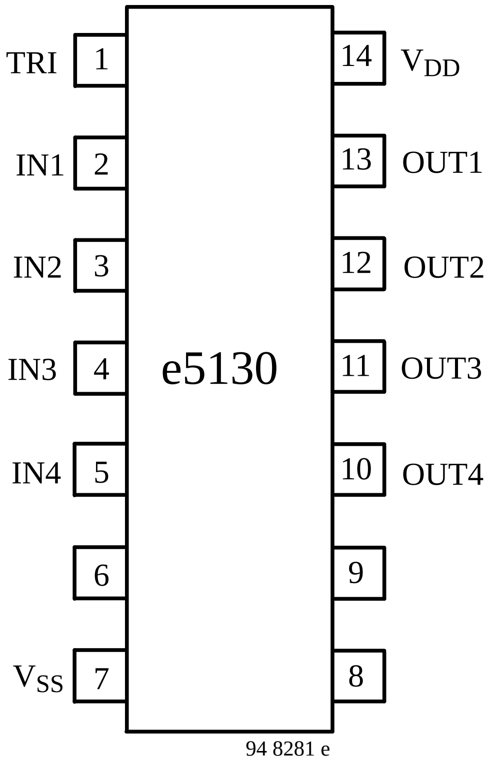
Pad configuration



Chipsize: x= 1.08 mm, y = 1.42 mm, padwindow 90 x 90 µ

Name	Description
V_{DD}	Positive supply voltage
V_{SS}	Negative supply voltage
IN1 ... IN4	Digital inputs
TRI	Tristate input
OUT1 ... OUT4	Drive outputs

Pinning



Pin Description

Pin	Symbol	Function
1	TRI	Tristate input
2	IN1	Input 1
3	IN2	Input 2
4	IN3	Input 3
5	IN4	Input 4
6	–	
7	V_{SS}	Negative supply voltage
8	–	
9	–	
10	OUT4	Output 4
11	OUT3	Output 3
12	OUT2	Output 2
13	OUT1	Output 1
14	V_{DD}	Positive supply voltage

Absolute Maximum Ratings

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
Power dissipation (DIL package)		125	mW
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

Absolute maximum ratings define parameter limits which, it exceeded, may permanently change or damage the device.

All inputs and outputs on EUR0SIL electronic GmbH 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.

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

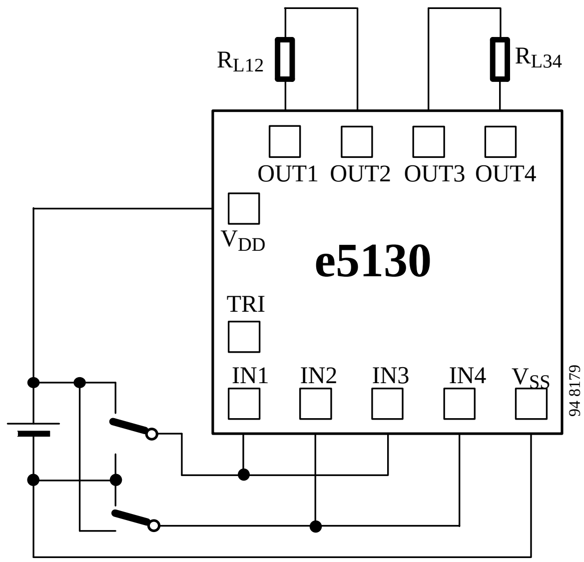


Figure 1 Test circuit.

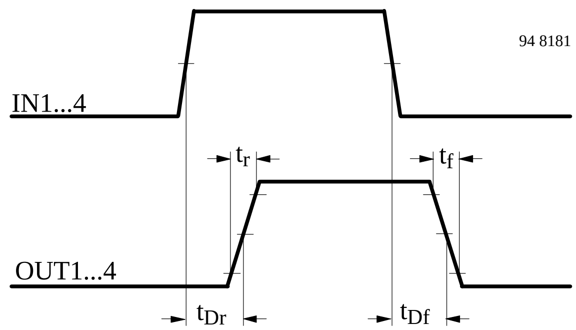


Figure 2

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

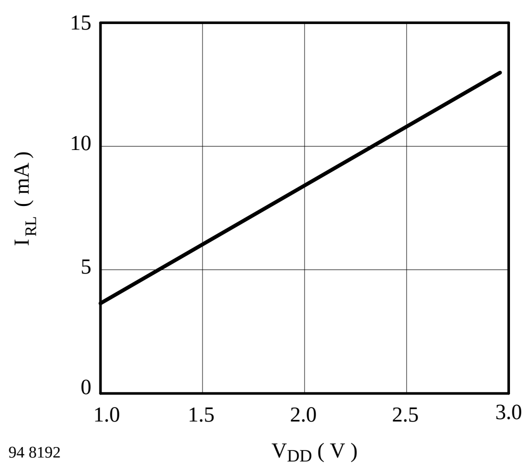


Figure 3 Typical current into 200 Ω load resistor, condition as per figure 1

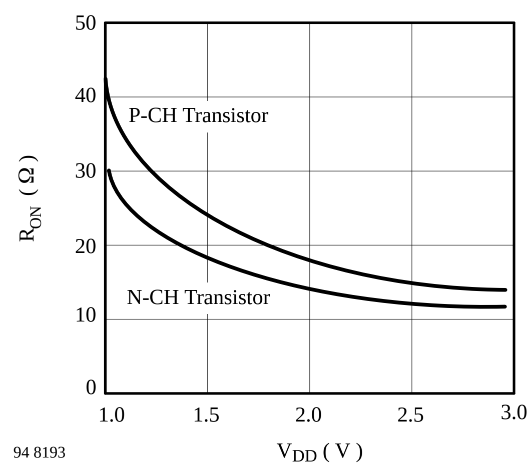


Figure 4 Typical output on-resistance vs. supply voltage at V_{DS} = 0.2 V

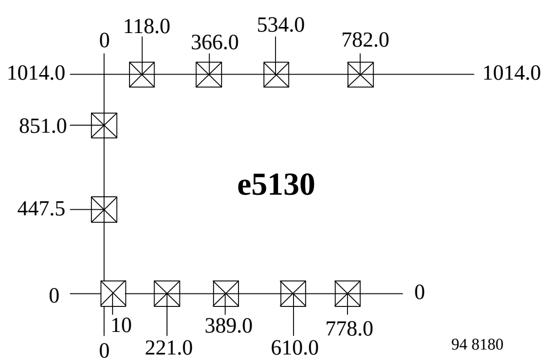
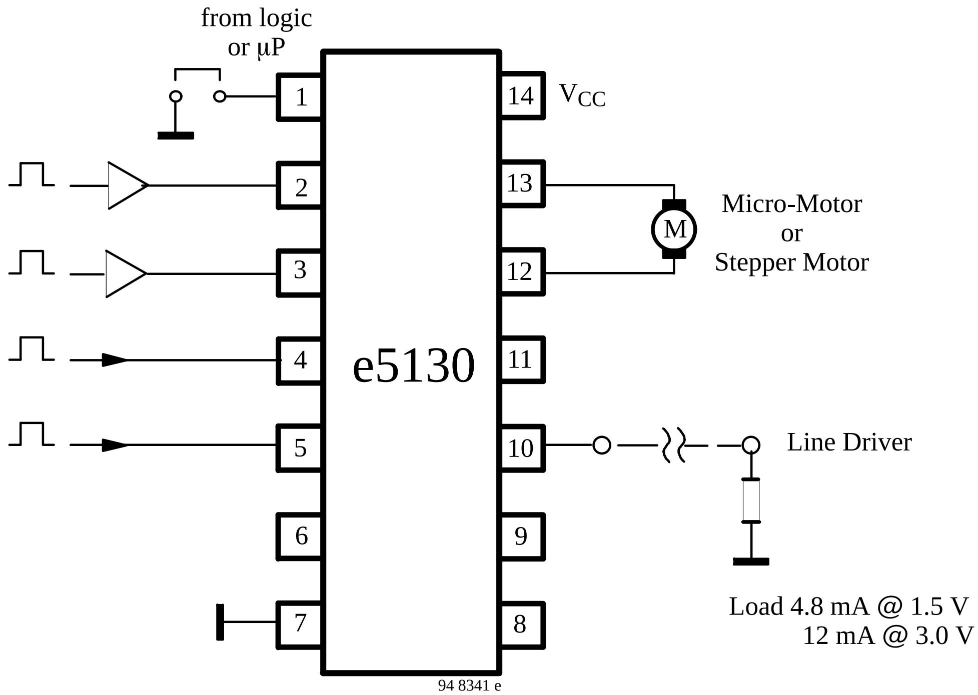


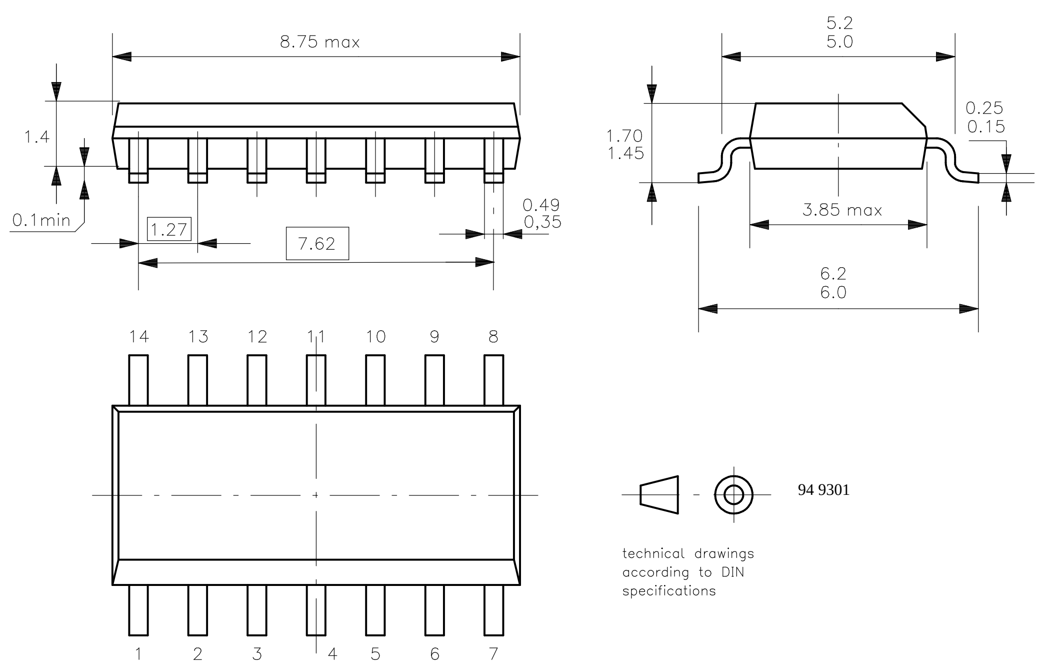
Figure 5 Pad coordinates

Application Circuit



Dimensions in mm

Package: SO 14



OZONE DEPLETING SUBSTANCES POLICY STATEMENT

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements and

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

Of particular concern is the control or elimination of releases into the atmosphere of those substances which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) will soon severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of any ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA and

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with and do not contain ozone depleting substances.

TEMIC TELEFUNKEN microelectronic GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax Number: 49 (0)7131 67 2423