SIEMENS

Static LED Display Driver with Blanking Capability

SDA 2131-2

Features

● Integrated load resistances, thus few external components are required
● Number of LEDs software-selectable
● Blanking capability through DC-controlled input
● Simple connection to a microcomputer

Type	Ordering Code	Package
SDA 2131-2	Q67000-A2044	P-DIP-22

The SDA 2131-2 includes a static display driver for 16 LEDs, each featuring 10 mA output current. The serial data interface enables a simple connection to the microcomputer.

Circuit Description

A serial interface consisting of data input D, enable input E, and clock input CLK, connects the IC to a microprocessor. The 16-bit information ("H" at input D corresponds to the current flow at outputs A1 to A16) is loaded into a 16-bit shift register via the serial data input, beginning with LSB. Data transfer is initiated by the HL slope of the clock pulse at CLK. The data transfer D can take place only during the H state of the enable input E. A buffer accepts the data from the shift register during the HL slope of the enable input. The buffer directly drives the outputs A1 to A16.

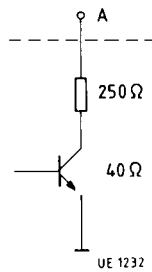The output is limited by an internal resistor of 290 Ω.

Through input C the outputs can be switched off ($V_{CB} = 0$ V).

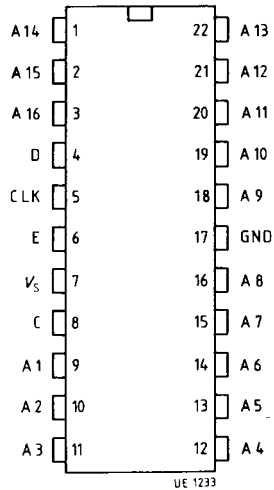The inputs D, E, and CLK, and the input C are TTL-compatible.

Block Diagram
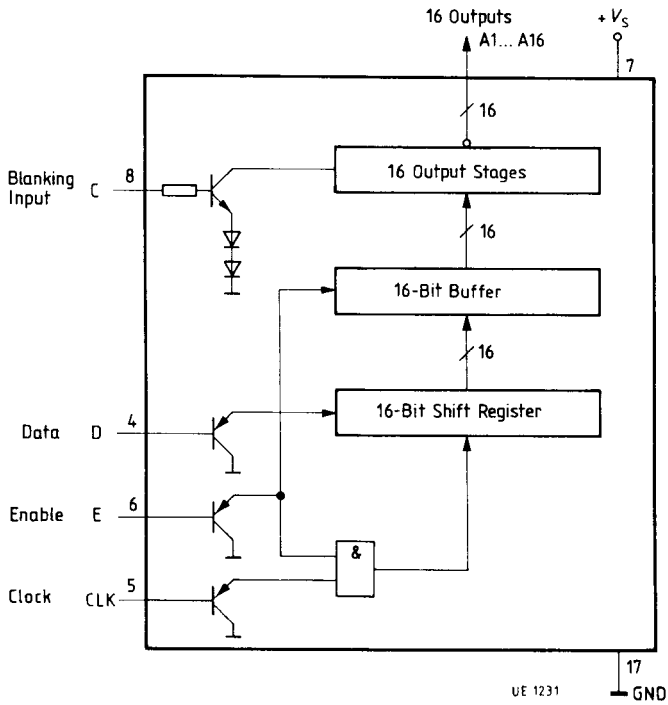
Internal Circuitry of an Output A:

Pin Configuration

(top view)

```
         ┌───┐
  A14 ┌ 1      22 ┐ A 13
  A 15 ┌ 2      21 ┐ A 12
  A 16 ┌ 3      20 ┐ A 11
    D ┌ 4       19 ┐ A 10
  CLK ┌ 5       18 ┐ A 9
    E ┌ 6       17 ┐ GND
   Vs ┌ 7       16 ┐ A 8
    C ┌ 8       15 ┐ A 7
  A 1 ┌ 9       14 ┐ A 6
  A 2 ┌ 10      13 ┐ A 5
  A 3 ┌ 11      12 ┐ A 4
         └────┘
         UE 1233
```

Pin Definitions and Functions

Pin No.	Symbol	Function
1	A14	Output 14 for LED cathode
2	A15	Output 15 for LED cathode
3	A16	Output 16 for LED cathode
4	D	Input for data
5	CLK	Input for clock
6	E	Input for enable
7	V_S	Supply voltage
8	C	Input for blanking
9	A1	Output 1 for LED cathode
10	A2	Output 2 for LED cathode
11	A3	Output 3 for LED cathode
12	A4	Output 4 for LED cathode
13	A5	Output 5 for LED cathode
14	A6	Output 6 for LED cathode
15	A7	Output 7 for LED cathode
16	A8	Output 8 for LED cathode
17	GND	Ground
18	A9	Output 9 for LED cathode
19	A10	Output 10 for LED cathode
20	A11	Output 11 for LED cathode
21	A12	Output 12 for LED cathode
22	A13	Output 13 for LED cathode

Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Supply voltage range	V_{S7}	– 0.3 to 7	V
Input voltage range	$V_{i\,4,5,6}$	– 0.3 to 7	V
Output voltage range (outputs blocked) (pins 1 to 3, 9 to 16, 18 to 22)	V_{qH}	– 0.3 to 7	V
Input voltage C range	V_{C8}	– 0.3 to V_S	V
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	– 40 to 125	°C
Thermal resistance (system-air)	$R_{th\,SA}$	65	K/W

The anode voltage of the LEDs and the number of simultaneously active outputs should be selected so that a total power dissipation of 800 mW in the IC is not exceeded.

Operating Range

Supply voltage	V_{S7}	4.5 to 5.5	V
Ambient temperature	T_A	0 to 70	°C

Characteristics

$V_S = 5$ V; $T_A = 25$ °C

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Supply current (all LEDs ON) $I_Q = 10$ mA	I_{S7}		10	15	mA
Quiescent current $I_Q = 0$; C = "L"	I_{S7}		2.5	3.5	mA
Switching voltage	$V_{S4,5,6}$	0.8	1.4	2.0	V
H - input current $V_H = 5.5$ V	$I_{H4,5,6}$			1	μA
L - input current $V_L = 0.4$ V	$-I_{L4,5,6}$			10	μA
Output current ($V_Q = 2.9$ V) pins 1 to 3, 9 to 16, 18 to 22	I_Q	8	10	12.5	mA
Output leakage current ($V_Q = V_S$) pins 1 to 3, 9 to 16, 18 to 22	I_{QI}			10	μA
Switching voltage C	V_{S8}	1.5	2.1	2.7	V
H - input current C $V_{H8} = 5$ V	I_{H8}		0.6	0.9	mA
L - input current C $V_{L8} = 0$ V	$-I_{L8}$			1	μA
H - input current C at switching voltage	I_{H8}			15	μA

Switching Times

			Symbol				Unit
CLK (pin 5)	H pulse width		t_{HCLK}	1			μs
	L pulse width		t_{LCLK}	2			μs
	Set-up time		t_{SCLK}	0			μs
	Hold time		t_{hCLK}	0			μs
D (pin 4)	Set-up time		t_{SD}	0.5			μs
	Hold time		t_{hD}	0.5			μs
E (pin 6)	H pulse width		t_{HE}	50			μs
	L pulse width		t_{LE}	0.5			μs
	Set-up time		t_{SE}	1.5			μs
	Hold time		t_{hE}	1			μs
A	Delay time		t_A	10			μs

Pulse Diagram

Enable of Data Input

Acceptance in Memory and Displays

E

LSB
L H H L L H H L L H L L L L H L

MSB

D

CLK

First Shifted Bit   UE 1234   Last Shifted Bit
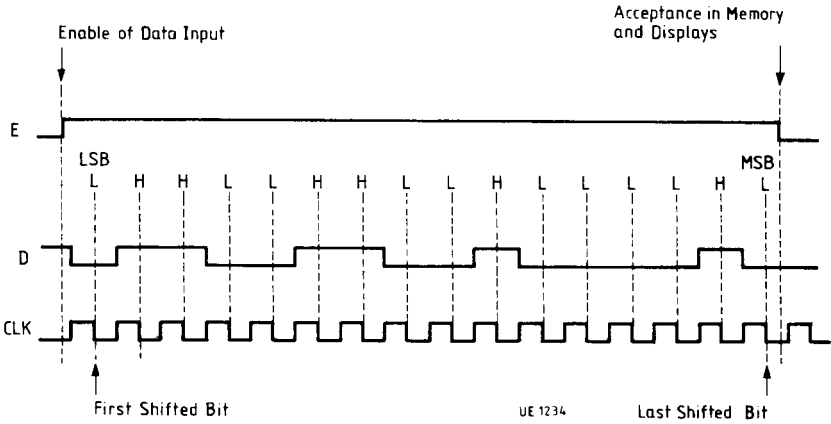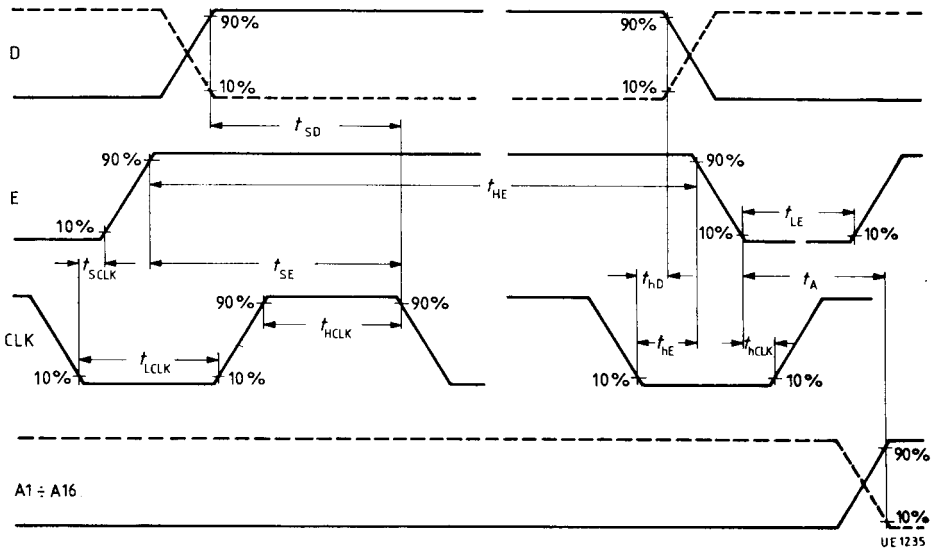
Memory contents after the falling edge of E
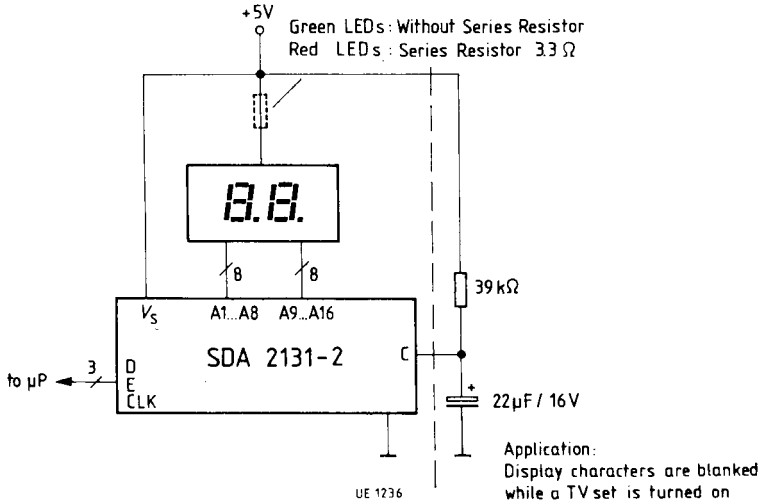
LSB   MSB

L H H L L H H L L H L L L L H L

The first information shifted to D with CLK is displayed at A1.

Pulse Diagram

D

t_{SD}

E

t_{HE}

t_{LE}

t_{SCLK} t_{SE}

t_{hD} t_A

CLK

t_{HCLK}

t_{LCLK}

t_{hE} t_{hCLK}

A1 ÷ A16

UE 1235

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Application Circuit 1

2-digit 7-segment display

+5V
Green LEDs: Without Series Resistor
Red LEDs : Series Resistor 3.3 Ω

V_S A1...A8 A9...A16

to µP — 3 / D E CLK

SDA 2131-2 C

39 kΩ

22 µF / 16 V

Application:
Display characters are blanked
while a TV set is turned on

UE 1236

Application Circuit 2

Point display (1 of 16 diodes illuminated)

+5V

16 LEDs

V_S A1   A16

to µP — 3 / D E CLK

SDA 2131-2

UE 1237

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