SGS-THOMSON MICROELECTRONICS

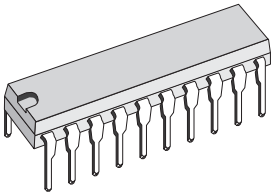
M5482

LED DISPLAY DRIVER

- 2 DIGIT LED DRIVER (15 segments)
- CURRENT GENERATOR OUTPUTS (no resistor required)
- CONTINUOUS BRIGHTNESS CONTROL
- SERIAL DATA INPUT
- WIDE SUPPLY VOLTAGE OPERATION
- TTL COMPATIBILITY

Application Examples

- MICROPROCESSOR DISPLAYS
- INDUSTRIAL CONTROL INDICATOR
- RELAY DRIVER
- INSTRUMENTATION READOUTS



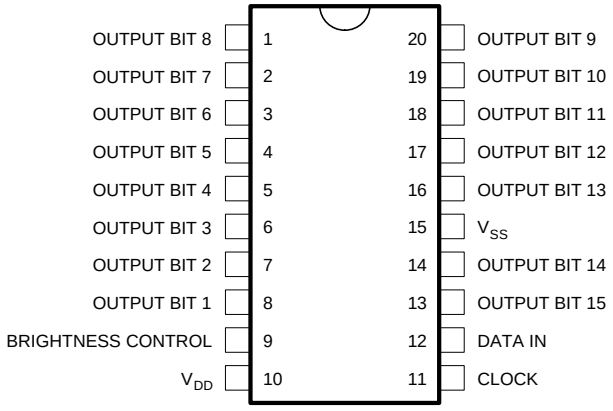
DIP20
(Plastic Package)

ORDER CODE : M5482B7

DESCRIPTION

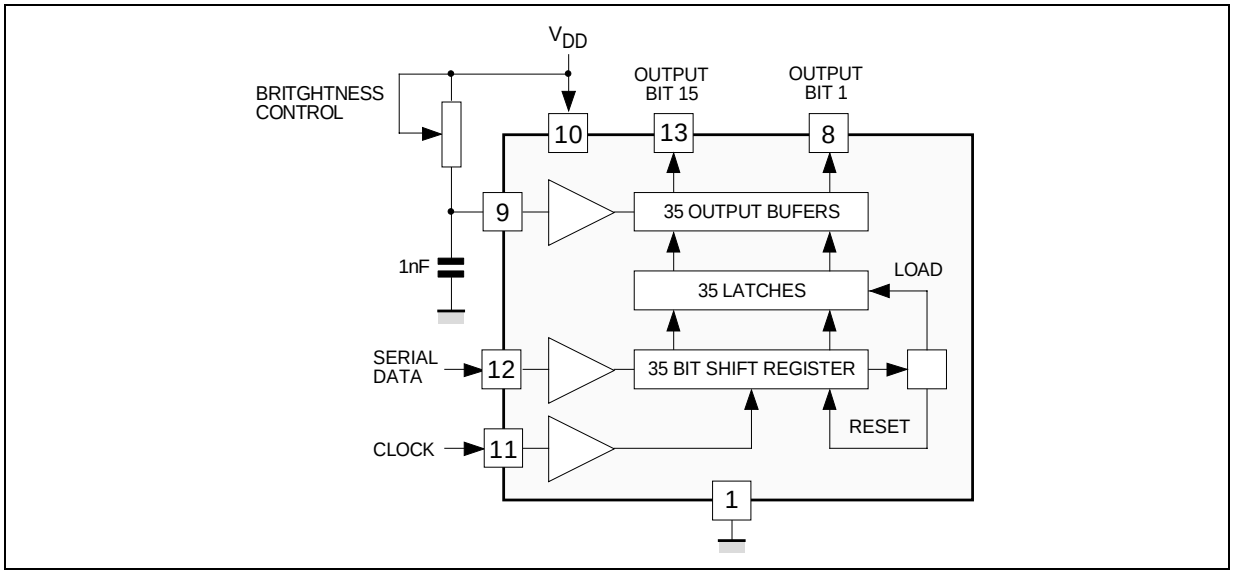
The M5482 is a monolithic MOS integrated circuit produced with an N-channel silicon gate technology. It utilizes the M5451 die packaged in a 20-pin plastic package copper frame, making it ideal for a 2-digit display. A single pin controls the LED display brightness by setting a reference current through a variable resistor connected either to V_{DD} or to a separate supply of 13.2V maximum.

PIN CONNECTIONS



5482-01.EPS

BLOCK DIAGRAM



5482-02.EPS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	– 0.3 to 15	V
V_I	Input Voltage	– 0.3 to 15	V
$V_{O\ (off)}$	Off State Output Voltage	15	V
I_O	Output Sink Current	40	mA
P_{tot}	Total Package Power Dissipation at 25 °C at 85 °C	1.5 800	W mW
T_j	Junction Temperature	150	°C
T_{oper}	Operating Temperature Range	– 25, + 85	°C
T_{stg}	Storage Temperature Range	– 65, + 150	°C

5482-01.TBL

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

STATIC ELECTRICAL CHARACTERISTICS

(T_{amb} within operating range, V_{DD} = 4.75V to 13.2V, V_{SS} = 0V,unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		4.75		13.2	V
I_{DD}	Supply Current	V_{DD} = 13.2 V			7	mA
V_I	Input Voltages Logical "0" Level Logical "1" Level	 ± 10 µA Input Bias 4.75 ≤ V_{DD} ≤ 5.25 V_{DD} > 5.25	 – 0.3 2.2 V_{DD} – 2		 0.8 V_{DD} V_{DD}	 V V V
I_B	Brightness Input Current (note 2)		0		0.75	mA
V_B	Brightness Input Voltage (pin 9)	Input Current = 750 µA T_{amb} = 25°C	3		4.3	V
$V_{O(off)}$	Off State Output Voltage				13.2	V
I_O	Output Sink Current (note 3) Segment OFF Segment ON	 V_O = 3 V V_O = 1 V (note 4) Brightness In. = 0 µA Brightness In. = 100 µA Brightness In. = 750 µA	 0 2 12	 2.7 15	 10 10 4 25	 µA µA mA mA
f_{clock}	Input Clock Frequency		0		0.5	MHz
I_O	Output Matching (note 1)				± 20	%

5482-02.TBL

Notes : 1. Output matching is calculated as the percent variation from I_{MAX} + I_{MIN}/2.
2. With a fixed resistor on the brightness input some variation in brightness will occur from one device to another.
3. Absolute maximum for each output should be limited to 40 mA.
4. The V_O voltage should be regulated by the user.

FUNCTIONAL DESCRIPTION

The M5482 uses the M5451 die which is packaged to operate 2-digit alphanumeric displays with minimal interface with the display and the data source. Serial data transfer from the data source to the display driver is accomplished with 2 signals, serial data and clock. Using a format of a leading "1" followed by the 35 data bits allows data transfer without an additional load signal.

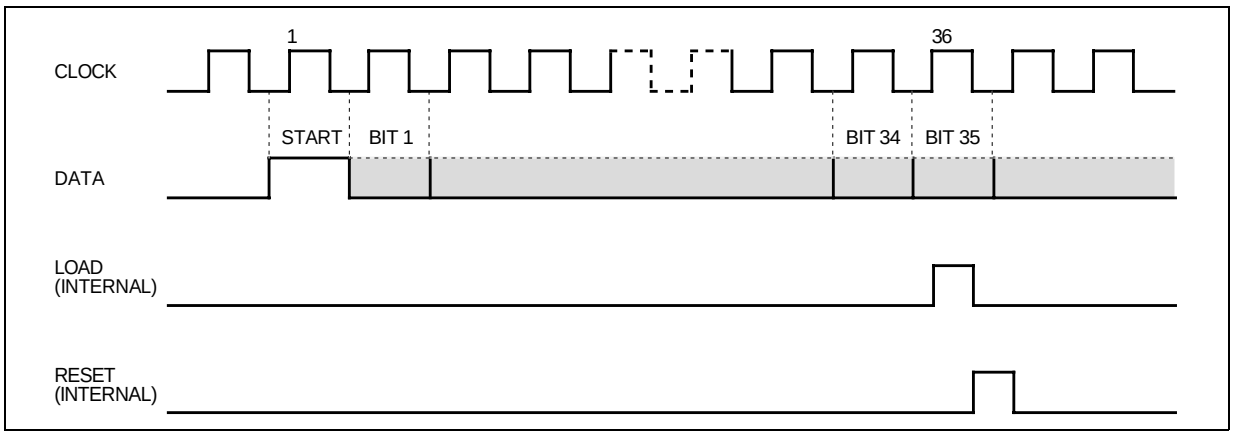
The 35 data bits are latched after the 36th bit is complete, thus providing non-multiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time. Display brightness is determined by control of the output current for LED displays. A 1nF capacitor should be connected to brightness control, Pin 9, to prevent possible oscillations.

A block diagram is shown in Figure 1. The output current is typically 20 times greater than the current into Pin 9, which is set by an external variable resistor.

There is an internal limiting resistor of 400Ω nominal value.

Figure 2 shows the input data format. A start bit of logical "1" precedes the 35 bits of data. At the 36th clock a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches.

Figure 2 : Input Data Format



5482-03.EPS

At the low state of the clock a RESET signal is generated which clears all the shift registers for the next set of data. The shift registers are static master slave configurations. There is no clear for the master portion of the first shift register, thus allowing continuous operation.

There must be a complete set of 36 clocks or the shift registers will not clear.

When power is first applied to the chip an internal power ON reset signal is generated which resets all registers and all latches. The START bit and the first clock return the chip to its normal operation.

Figure 3 shows the timing relationships between Data and Clock.

A maximum clock frequency of 0.5 MHz is assumed.

Figure 4 shows the Output Data Format for the M5482. Because it uses only 15 of the possible 35 outputs, 20 of the bits are "Don't Cares".

For applications where a lesser number of outputs are used it is possible to either increase the current per output or operate the part at higher than 1V V_{OUT}.

The following equation can be used for calculations.

$T_j \equiv [(V_{OUT})(I_{LED})(\text{no.of segments}) + V_{DD} \cdot 7\ mA](80\ °C/W) + T_{amb}$

where :

T_j = junction temperature (150 °C max)

V_{OUT} = the voltage at the LED driver outputs

I_{LED} = the LED current

80 °C/W = thermal coefficient of the package

T_{amb} = ambient temperature

Figure 3

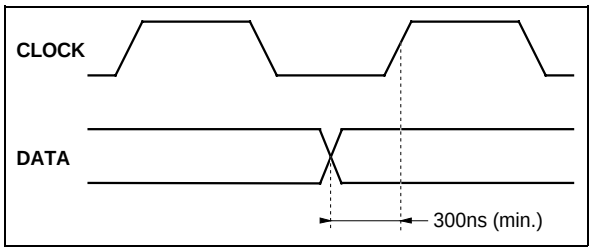


Figure 4 : Serial Data Bus / Outputs Correspondance

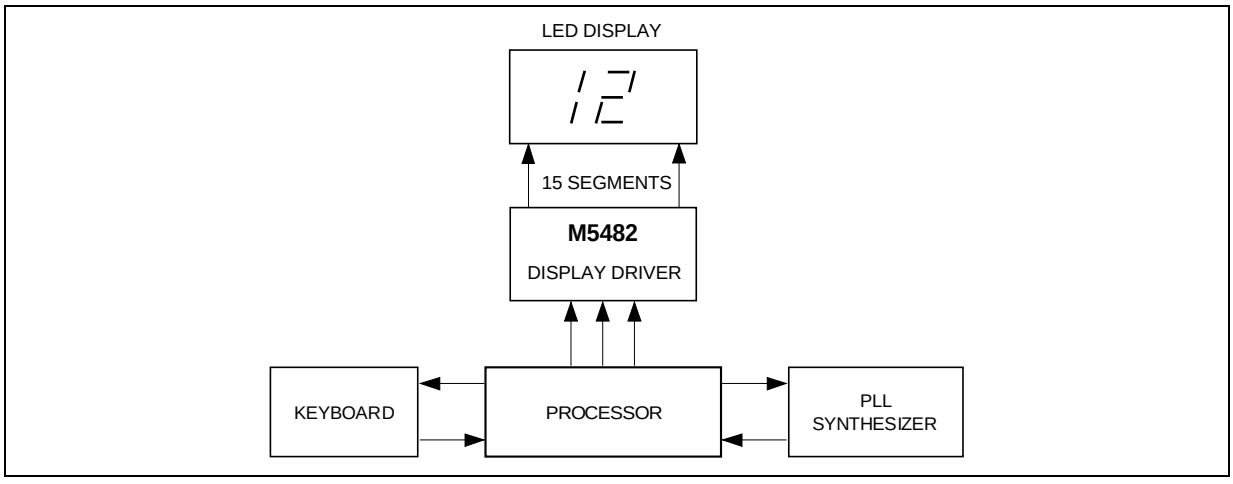
5451	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	START
5482	15	X	X	X	X	14	13	X	X	X	X	12	11	10	9	X	X	X	START

5451	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1		START
5482	X	8	7	6	5	X	X	X	X	4	3	2	1	X	X	X	X		START

5482-03.TBL

TYPICAL APPLICATION

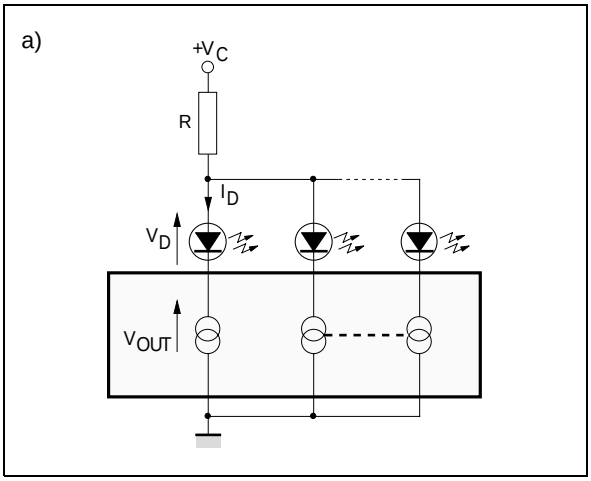
BASIC electronically tuned TV system.



POWER DISSIPATION OF THE IC

The power dissipation of the IC can be limited using different configurations.

a)



5482-06.EPS

In this application R must be chosen taking into account the worst operating conditions.

R is determined by the maximum number of segments activated.

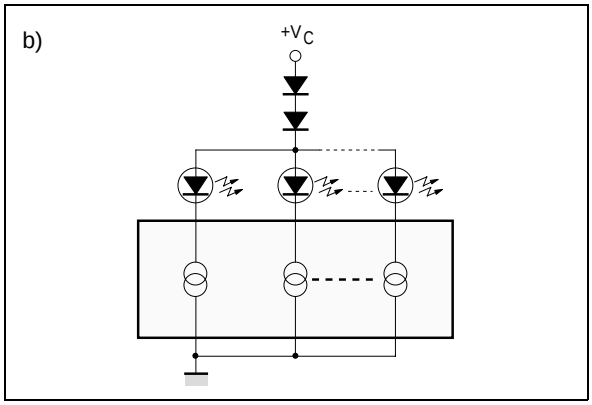
$$R = \frac{V_C - V_{D\,MAX} - V_{O\,MIN}}{N_{MAX} \cdot I_D}$$

The worst case condition for the device is when roughly half of the maximum number of segments are activated.

It must be checked that the total power dissipation does not exceed the absolute maximum ratings of the device.

In critical cases more resistors can be used in conjunction with groups of segments. In this case the current variation in the single resistor is reduced and P_{tot} limited.

b)

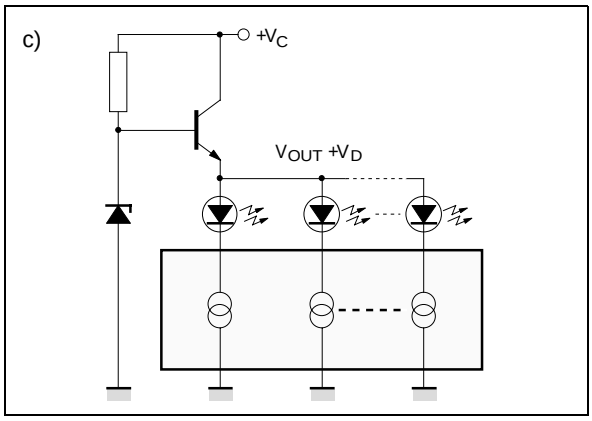


5482-07.EPS

In this configuration the drop on the serial connected diodes is quite stable if the diodes are properly chosen.

The total power dissipation of the IC is, in first approximation, depending only on the number of segments activated.

c)

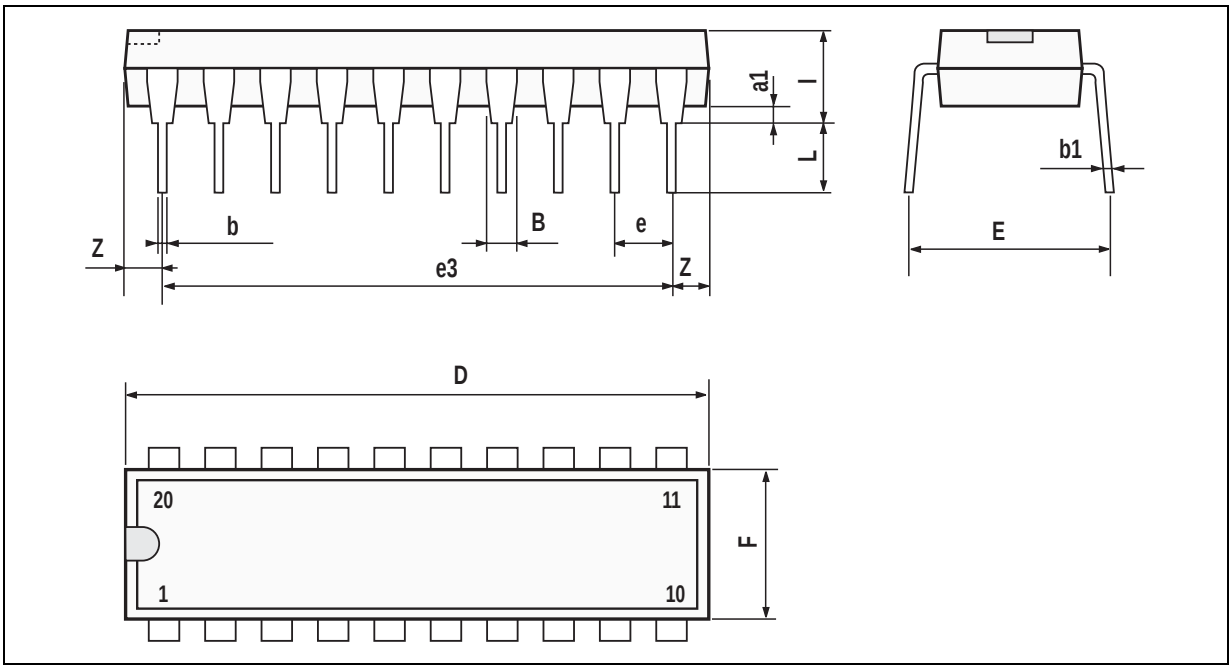


5482-08.EPS

In this configuration $V_{OUT} + V_D$ is constant. The total power dissipation of the IC depends only on the number of segments activated.

PACKAGE MECHANICAL DATA

20 PINS - PLASTIC DIP



PM-DIP20.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
i			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053

DIP20.TBL

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