National Semiconductor

Display Controllers/Drivers

DS8885 MOS to High Voltage Cathode Buffer

General Description

The DS8885 interfaces MOS calculator or counter-latch-decoder-driver circuits directly to 7-segment, high-voltage, gas-filled displays. The six inputs A, B, D, E, F, G are decoded to drive the 7-segment of the tube.

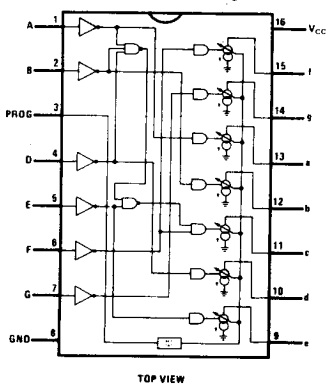
Each output constitutes a switchable, adjustable current source which provides constant current to the tube segment, even with high tube anode supply tolerance or fluctuation. These current sources have a voltage compliance from 3V to at least 80V. Each current source is ratioed to the b-output current as required for even illumination of all segments. Output currents may be varied over the 0.2 to 1.5 mA range for driving various tube types or multiplex operation. The output current is adjusted by connecting a program resistor (R_P) from V_{CC} to the program input.

Features

- Current source outputs
- Adjustable output currents 0.2 to 1.5 mA
- High output breakdown voltage 80V min
- Suitable for multiplex operation
- Low fan-in and low power
- Blanking via program input
- Also drives overrange, polarity, decimal point cathodes

Connection Diagram

Dual-In-Line Package



Order Number DS8885J or DS8885N
See NS Package J16A or N16A

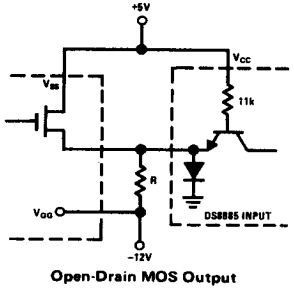
Truth Tables

A	B	D	E	F	G	DISPLAY
1	1	1	1	1	0	0
0	1	0	0	0	0	1
1	1	1	1	0	1	2
1	1	1	0	0	1	3
0	1	0	0	1	1	4
1	0	1	0	1	1	5
1	0	1	1	1	1	6
1	1	0	0	0	0	7
1	1	1	1	1	1	8
1	1	1	0	1	1	9
0	0	1	1	1	1	b
1	1	0	0	1	1	c
1	1	0	1	1	1	d
0	1	0	1	1	1	h
0	1	1	1	1	0	U
0	0	0	0	0	1	-
0	0	0	0	0	0	

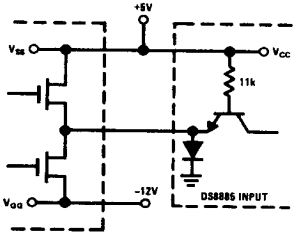
INPUT*	OUTPUT*
0	1 (OFF)
1	0 (ON)

*Positive Logic

Typical Applications



Open-Drain MOS Output



Push-Pull MOS Output

Absolute Maximum Ratings (Note 1)

V_{CC}	7V
Input Voltage	6V
Segment Output Voltage	80V
Power Dissipation	600 mW
Transient Segment Output Current (Note 4)	50 mA
Storage Temperature Range	−65°C to +150°C
Maximum Power Dissipation* at 25°C	
Cavity Package	1509 mW
Molded Package	1476 mW
Lead Temperature (Soldering, 10 seconds)	300°C

*Derate cavity package 10.06 mW/°C above 25°C; derate molded package 11.81 mW/°C above 25°C.

Operating Conditions

	MIN	MAX	UNITS
Supply Voltage (V_{CC})	4.75	5.25	V
Temperature (T_A)	0	+70	°C

Electrical Characteristics (Notes 2 and 3)

PARAMETER		CONDITIONS			MIN	TYP	MAX	UNITS
V_{IH}	Logical "1" Input Voltage	V_{CC} = Min			2.0			V
V_{IL}	Logical "0" Input Voltage	V_{CC} = Min					0.8	V
I_{IH}	Logical "1" Input Current	V_{CC} = Max	V_{IN} = 2.4V			2	15	μA
			V_{IN} = 5.5V			4	400	μA
I_{IL}	Logical "0" Input Current	V_{CC} = Max, V_{IN} = 0.4V				−300	−600	μA
I_{CC}	Power Supply Current	V_{CC} = Max, All Inputs = 0V, R_P = 2.2k				22	31	mA
V_I	Input Diode Clamp Voltage	V_{CC} = 5V, I_{IN} = −12 mA, T_A = 25°C				−0.9	−1.5	V
SEGMENT OUTPUTS								
I_O	"ON" Current Ratio	All Outputs = 50V, I_{OUT} b = Ref.	Outputs a, f, and g		0.84	0.93	1.02	
			Output c		1.12	1.25	1.38	
			Output d		0.90	1.00	1.10	
			Output e		0.99	1.10	1.21	
$I_{b\ ON}$	Output b "ON" Current	V_{CC} = 5V, V_{OUT} b = 50V, T_A = 25°C		R_P = 18.1k	0.15	0.20	0.25	mA
				R_P = 7.03k	0.45	0.50	0.55	mA
				R_P = 3.40k	0.90	1.00	1.10	mA
				R_P = 2.20k	1.35	1.50	1.65	mA
V_{SAT}	Output Saturation Voltage	V_{CC} = Min, I_{OUT} b = 2 mA, R_P = 1k ±5%, (Note 5)				0.8	2.5	V
I_{CEX}	Output Leakage Current	V_{OUT} = 75V, V_{IN} = 0.8V, R_P = 1k				0.003	3	μA
V_{BR}	Output Breakdown Voltage	I_{OUT} = 250μA, V_{IN} = 0.8V			80	110		V
t_{pd}	Propagation Delay of Input to Segment Output	V_{CC} = 5V, T_A = 25°C				0.4	10	μs

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the 0°C to +70°C range for the DS8885. All typical values are for T_A = 25°C and V_{CC} = 5V.

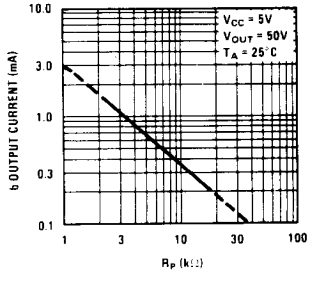
Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

Note 4: In all applications transient segment output current must be limited to 50 mA. This may be accomplished in dc applications by connecting a 2.2k resistor from the anode-supply filter capacitor to the display anode, or by current limiting the anode drive in multiplex applications.

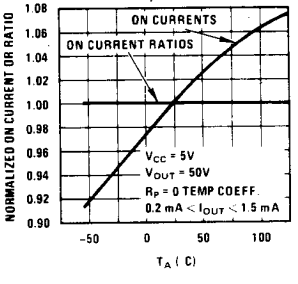
Note 5: For saturation mode the segment output currents are externally limited and ratioed.

Typical Performance Characteristics

Output Current Programming



On Currents vs Temperature



Output Characteristic