DS8881

DS8881 Vacuum Fluorescent Display Driver

Literature Number: SNOSBN3A

National Semiconductor

May 1988

DS8881 Vacuum Fluorescent Display Driver

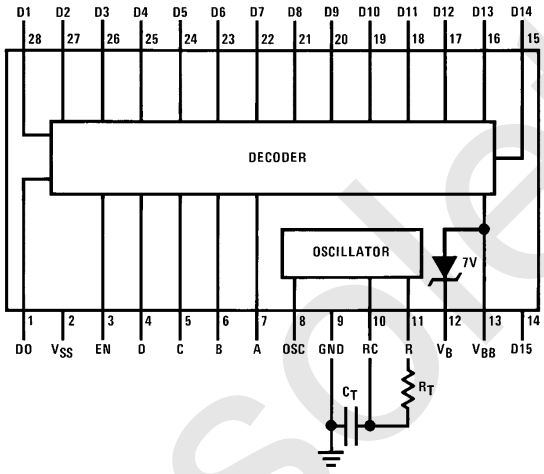
General Description

The DS8881 vacuum fluorescent display driver will drive 16-digit grids of a vacuum fluorescent display. The decode inputs select one of the sixteen outputs to be pulled high. The device contains an oscillator for supplying clock signals to the MOS circuit, the filament bias zener and 50 kΩ pull-down resistors for each grid. Outputs will source up to 7 mA. The DS8881 is designed for 9V operation. If the enable input is pulled low, all outputs are disabled.

Features

- Oscillator frequency accuracy and stability allows maximum system speed
- Interdigit blanking with the enable input provides ghost-free display operation
- 50 kΩ pull-down resistors for each grid
- 7V filament bias zener

Connection Diagram



TL/F/5846–1

Top View

Order Number DS8881N
See NS Package Number N28B

Truth Table All outputs now shown high are off (low)

Inputs					Digit Outputs														
E_N	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H	L	L	L	L	H															
H	L	L	L	H		H														
H	L	L	H	L			H													
H	L	L	H	H				H												
H	L	H	L	L					H											
H	L	H	L	H						H										
H	L	H	H	L							H									
H	L	H	H	H								H								
H	H	L	L	L									H							
H	H	L	L	H										H						
H	H	L	H	L											H					
H	H	L	H	H												H				
H	H	H	L	L													H			
H	H	H	L	H														H		
H	H	H	H	L															H	
H	H	H	H	H																H
L	X	X	X	X	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L

  RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ($V_{SS}-V_{BB}$)	38V
Input Current	10 mA
Output Current	−20 mA
Storage Temperature	−65°C to +150°C
Maximum Power Dissipation* at 25°C Molded Package	2168 mW
Lead Temperature (Soldering, 4 sec.)	260°C

*Derate molded package 17.35 mW/°C above 25°C.

Operating Conditions

	Min	Max	Units
Supply Voltage			
V_{SS}	5.0	9.5	V
V_{BB}	Gnd	−26	V
Temperature (T_A)	0	+70	°C

Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions				Min	Typ	Max	Units
V_{IH}	Logical "1" Input Voltage	V_{SS} = Max	Enable	I_{IN} = 260 μA				5.1	V
			A, B, C, D	I_{IN} = 1400 μA				1.5	V
I_{IH}	Logical "1" Input Current	V_{SS} = Max	Enable A, B, C, D					260	μA
V_{IL}	Logical "0" Input Voltage	V_{SS} = Max	Enable					1.0	V
			A, B, C, D					0.3	V
I_{IL}	Logical "0" Input Current	V_{SS} = Max	Enable	V_{IN} = 0V				−1.0	μA
			A, B, C, D	V_{IN} = $V_{IL(MAX)}$		25			μA
V_{OH}	Logical "1" Output Voltage	Digit Output, I_{OH} = −7 mA				V_{SS} − 2.5			V
I_{OH}	Logical "1" Output Current	V_{SS} = Max, Osc. Output, V_{RC} = 0.6V, V_{OH} = 10V						50	μA
I_{OS}	Output Short-Circuit Current	V_{SS} = Min, Pin R, V_{RC} = 0.6V, V_R = 0V				−150		−450	μA
R_{OUT}	Output Pull-Down Resistor	V_{SS} = Min, Digit Output				30	50	85	kΩ
V_{OL}	Logical "0" Output Voltage	V_{SS} = Min	Osc	V_{RC} = 1.6V	I_{OL} = 6 mA			0.5	V
			Pin R		I_{OL} = 60 μA			0.2	V
		V_{SS} = Max	Digit Output	V_{ENABLE} = 1V	I_{OL} = 10 μA			V_{BB} + 1.4	V
I_{SS}	Supply Current	V_{SS} = 9.5V, I_{OH} = 0		V_{ENABLE} = 5.1V			9.0	12.5	mA
				V_{ENABLE} = 1V			5.0	9.0	mA
I_{BB}	Supply Current	V_{SS} = 9.5V, I_B = 0, V_{BB} = −26V, I_{IN} = 300 μA (Note 4)		V_{ENABLE} = 1V			−0.8	−1.5	mA
				V_{ENABLE} = 5.1V			−3.0	−5.0	mA
V_B	Filament Bias Voltage	I_B = 10 mA				V_{BB} + 6.4	V_{BB} + 6.9	V_{BB} + 7.4	V

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. All typicals are given for T_A = 25°C.

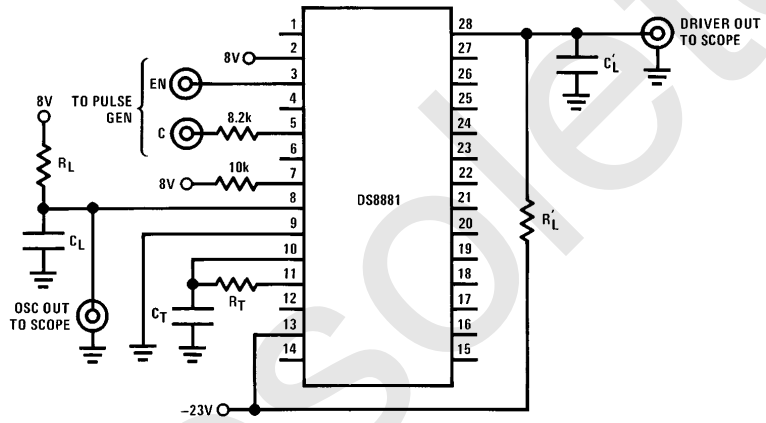
Note 3: All currents into device pins shown as positive, out of device pins as negative, and all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

Note 4: Approximately 50% of input current on pins 4, 5, 6, 7 is shunted to V_{BB}. If minimum I_{BB} is desired, then I_{IN} should be minimized by using resistors in series with the inputs.

Switching Characteristics $T_A = 25°C$ unless otherwise specified

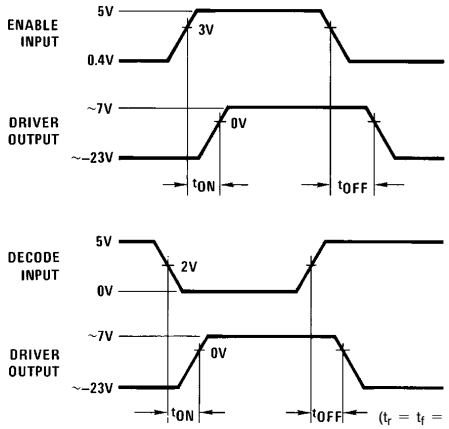
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd0}	Propagation Delay to a Logical "0" from Enable Input to Digit Output	$R_L = 4.7\ k\Omega$, $C_L = 50\ pF$, $V_{BB} = -23V$, $V_{SS} = 8V$			1	μs
t_{pd0}	Propagation Delay to a Logical "0" A, B, C, D to Digit Output				1	μs
t_{pd1}	Propagation Delay to a Logical "1" from Enable Input to Digit Output				300	ns
t_{pd1}	Propagation Delay to a Logical "1" from A, B, C, D to Digit Output				500	ns
t_{FALL}	Oscillator Output Transition Time from 1 to 0	$V_{SS} = 9.5V$, $R_L = 6k$ to V_{SS}, $C_L = 25\ pF$			50	ns
f_{OSC}	Oscillator Frequency	$7V < V_{SS} < 9.5V$, $R_T = 27\ k\Omega \pm 2\%$, $R_L = 1.3k$, $C_T = 100\ pF, \pm 5\%$, $C_L = 50\ pF$	320	360	400	kHz
dc	Oscillator Duty Cycle		46	56	66	%

AC Test Circuit



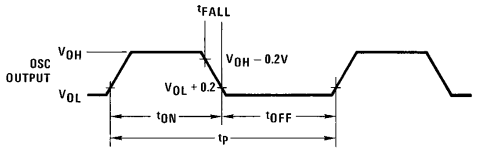
TL/F/5846–2

Switching Time Waveforms



($t_r = t_f = 10$ ns from 10% to 90% of input)

TL/F/5846–3

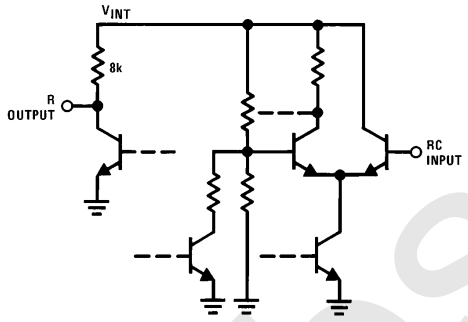


TL/F/5846–4

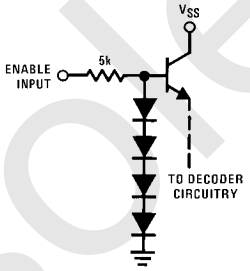
$$\text{Duty Cycle} = \frac{t_{ON}}{t_p}$$

$$\text{Frequency} = \frac{1}{t_p}$$

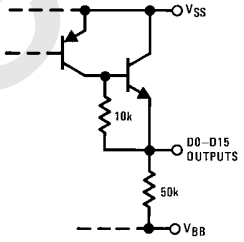
Input-Output Schematics



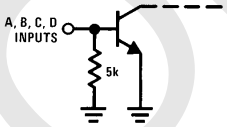
TL/F/5846–5



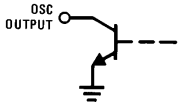
TL/F/5846–6



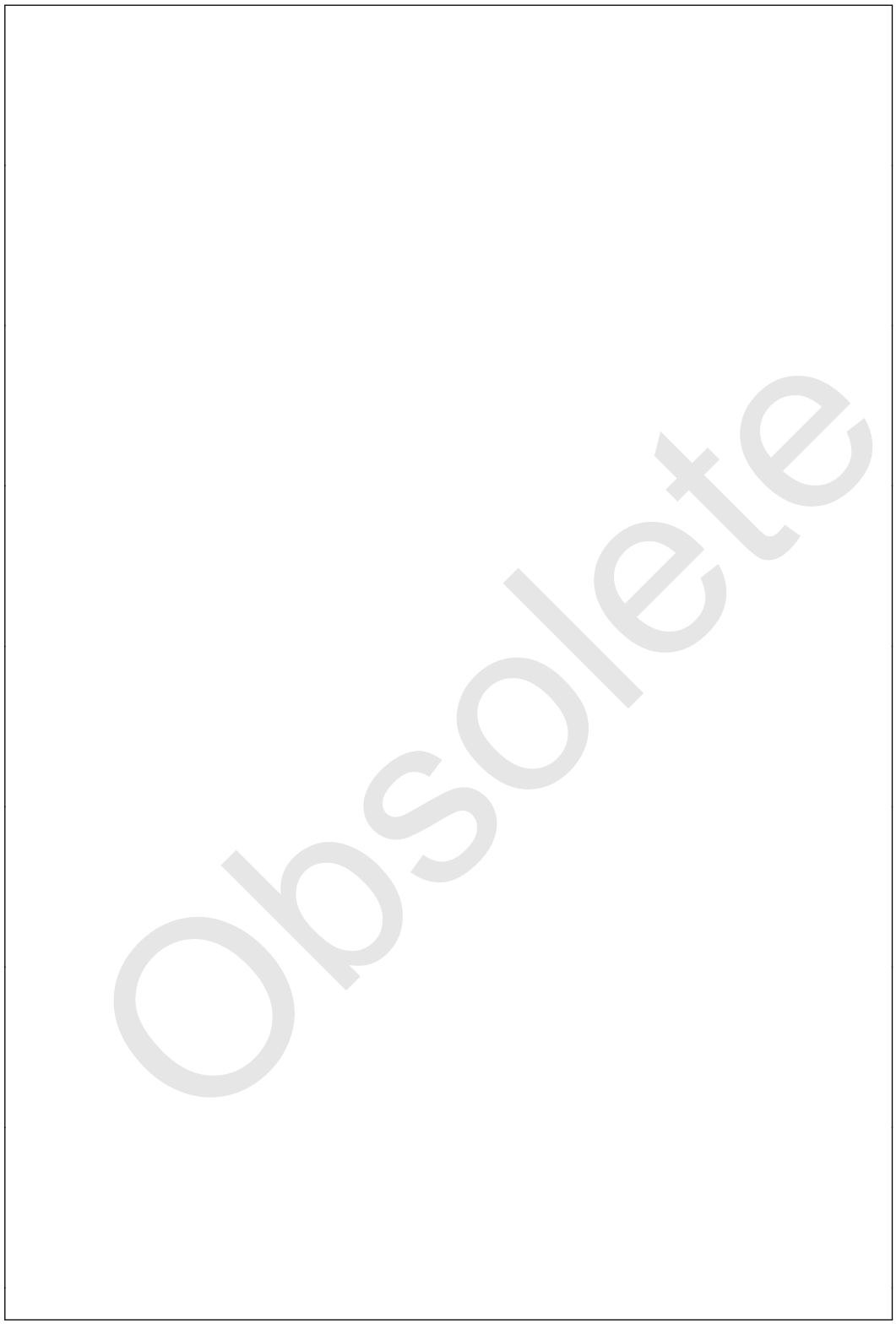
TL/F/5846–7



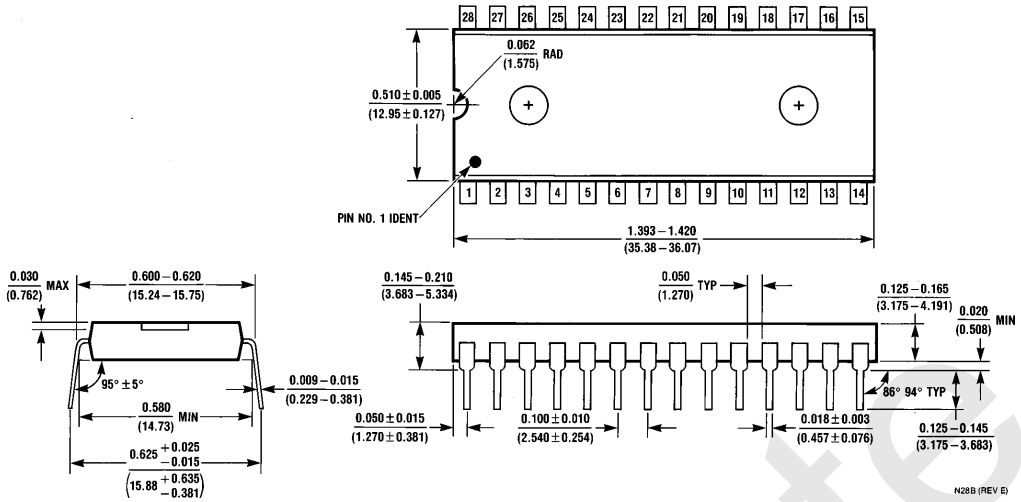
TL/F/5846–8



TL/F/5846–9


Obsolete

Physical Dimensions inches (millimeters)



Molded Dual-In-Line Package (N)
Order Number DS8881N
NS Package Number N28B

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265