

## DS8884A High Voltage Cathode Decoder/Driver

### General Description

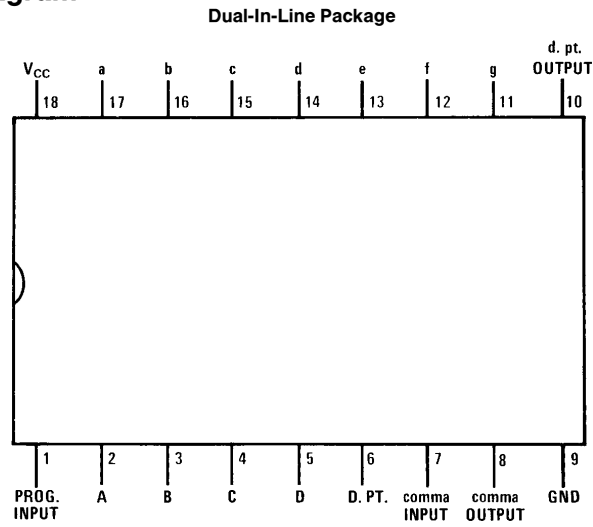
The DS8884A is designed to decode four lines of BCD input and drive seven-segment digits of gas-filled readout displays.

All outputs consist of switchable and programmable current sinks which provide constant current to the tube cathodes, even with high tube anode supply tolerance. Output currents may be varied over the 0.2 mA to 1.2 mA range for multiplex operation. The output current is adjusted by connecting an external program resistor ( $R_P$ ) from  $V_{CC}$  to the program input in accordance with the programming curve. Unused outputs must be tied to  $V_{CC}$ .

### Features

- Usable with AC or DC input coupling
- Current sink outputs
- High output breakdown voltage
- Low input load current
- Intended for multiplex operation
- Input pullups increase noise immunity
- Comma/d.pt. drive

### Connection Diagram



TL/F/5847-2

Order Number DS8884AN  
See NS Package Number N18A

DS8884A High Voltage Cathode Decoder/Driver

## Absolute Maximum Ratings (Note 1)

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

$V_{CC}$	7V
Input Voltage (Note 4)	$V_{CC}$
Segment Output Voltage	80V
Power Dissipation	600 mW
Transient Segment Output Current (Note 5)	50 mA

Storage Temperature Range	-65°C to +150°C	
Maximum Power Dissipation* at 25°C	Molded Package 1714 mW	
*Derate molded package 13.71 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)

Symbol	Parameter	Conditions	Min	Max	Units	
$V_{IH}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	2.0		V	
$V_{IL}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$		1.0	V	
$I_{IH}$	Logical "1" Input Current	$V_{CC} = 5.25V, V_{IN} = 2.4V$		15	$\mu A$	
$I_{IL}$	Logical "0" Input Current	$V_{CC} = 5.25V, V_{IN} = 0.4V$		-250	$\mu A$	
$I_{CC}$	Power Supply Current	$V_{CC} = 5.25V, R_P = 2.8k, \text{All Inputs} = 5V$		40	mA	
$V_{I+}$	Positive Input Clamp Voltage	$V_{CC} = 4.75V, I_{IN} = 1 \text{ mA}$	5.0		V	
$V_{I-}$	Negative Input Clamp Voltage	$V_{CC} = 5V, I_{IN} = -12 \text{ mA}, T_A = 25^\circ C$		-1.5	V	
$\Delta I_O$	SEGMENT OUTPUTS "ON" Current Ratio	All Outputs = 50V, $I_{OUT b} = \text{Ref.}, \text{All Outputs}$	0.9	1.1		
$I_{b ON}$	Output b "ON" Current	$V_{CC} = 5V, V_{OUT b} = 50V, T_A = 25^\circ C$	$R_P = 18.1k$	0.15	0.25	mA
			$R_P = 7.03k$	0.45	0.55	mA
			$R_P = 3.40k$	0.90	1.10	mA
			$R_P = 2.80k$	1.08	1.32	mA
$I_{CEX}$	Output Leakage Current	$V_{OUT} = 75V$		5	$\mu A$	
$V_{BR}$	Output Breakdown Voltage	$I_{OUT} = 250 \mu A$	80		V	
$t_{pd}$	Propagation Delay of Any Input to Segment Output	$V_{CC} = 5V, T_A = 25^\circ C$		10	$\mu s$	

**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.

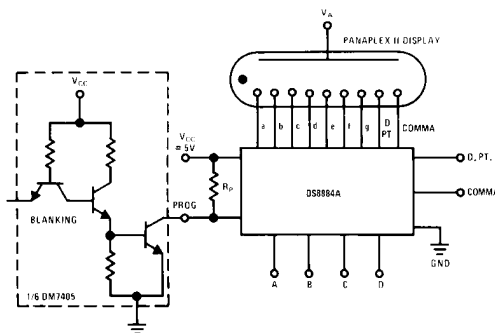
**Note 2:** Unless otherwise specified min/max limits apply across the 0°C to +70°C temperature range for the DS8884A. All typical values are for  $T_A = 25^\circ C$  and  $V_{CC} = 5V$ .

**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:** This limit can be higher for a current limiting voltage source.

**Note 5:** 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 driver in multiplex applications.

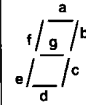
## Typical Application



TL/F/5847-4

## Truth Table

FUNCTION	D.P.T.	COMMA	D	C	B	A	a	b	c	d	e	f	g	DISPLAY
0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
1	1	1	0	0	0	1	1	0	0	1	1	1	1	1
2	1	1	0	0	1	0	0	1	0	0	1	0	0	0
3	1	1	0	0	1	1	0	0	0	0	1	1	0	0
4	1	1	0	1	0	0	1	0	0	1	1	0	0	0
5	1	1	0	1	0	1	0	1	0	0	1	0	0	0
6	1	1	0	1	1	0	0	1	0	0	0	0	0	0
7	1	1	0	1	1	1	0	0	0	1	1	1	1	1
8	1	1	1	0	0	0	0	0	0	0	0	0	0	0
9	1	1	1	0	0	1	0	0	0	0	1	0	0	0
10	1	1	1	0	1	0	1	1	0	0	0	1	1	1
11	1	1	1	0	1	1	1	1	0	0	0	1	0	0
12	1	1	1	1	0	0	0	0	1	1	1	0	0	0
13	1	1	1	1	0	1	0	1	1	0	0	0	0	0
14	1	1	1	1	1	0	1	1	1	1	1	1	1	0
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*D.P.T.	0	1	X	X	X	X	X	X	X	X	X	X	X	.
*Comma	0	0	X	X	X	X	X	X	X	X	X	X	X	,

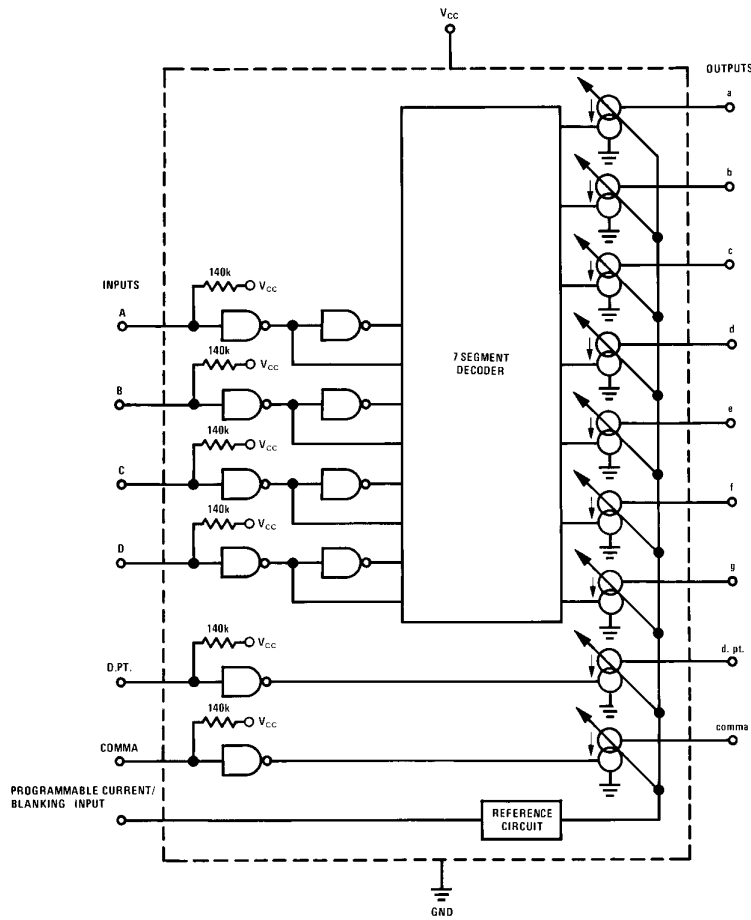


Decimal Point  
 Comma

TL/F/5847-3

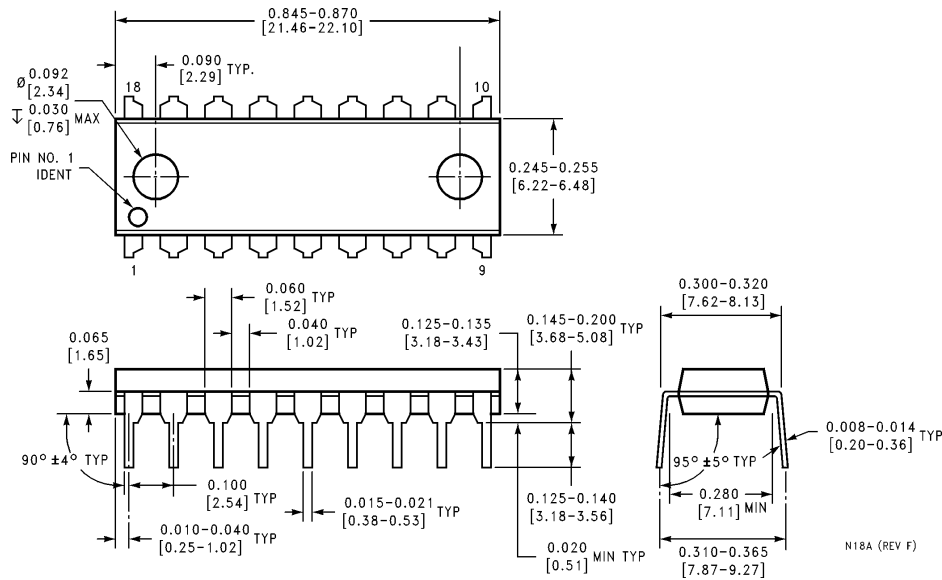
\*Decimal point and comma can be displayed with or without any numeral.

## Logic Diagram



TL/F/5847-1

**Physical Dimensions** inches (millimeters)



**Molded Dual-In-Line Package (N)**  
**Order Number DS8884AN**  
**NS Package Number N18A**

N18A (REV F)

**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.**  
 19th 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

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.