

# Vacuum fluorescent display driver

# NE/SA594

## DESCRIPTION

The NE/SA594 is a display driver interface for vacuum fluorescent displays. The device is comprised of 8 drivers and a bias network, and is capable of driving the digits and/or segments of most vacuum fluorescent displays.

The inputs are designed to be compatible with TTL, DTL, NMOS, PMOS or CMOS output circuitry.

There is an active pull-down circuit on each output so that display ghosting is minimized and no external components are required for most fluorescent display applications.

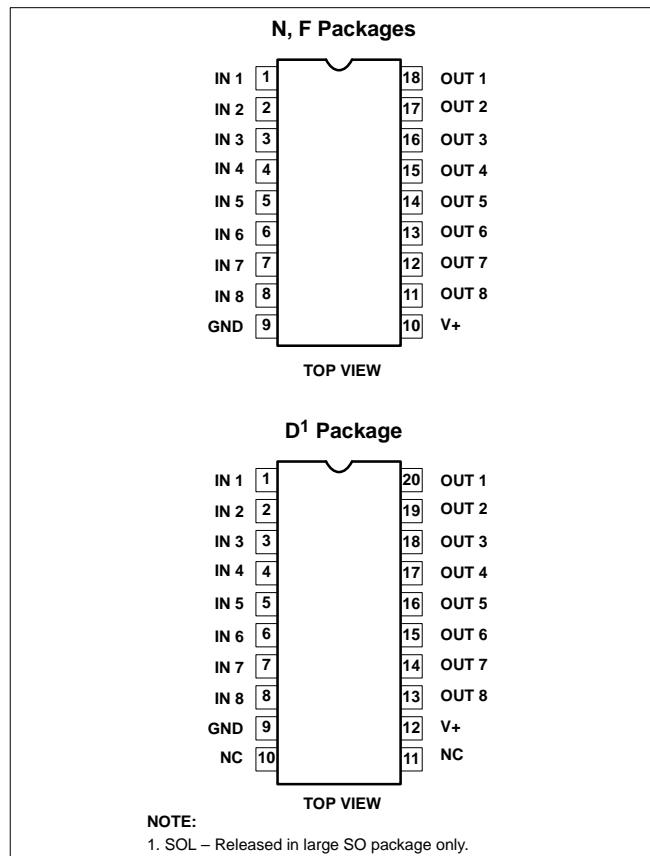
## FEATURES

- Digit and/or segment drivers
- Active output pull-down circuitry
- High output breakdown voltage
- Low supply voltage
- Input compatible with all logic outputs

## APPLICATIONS

- Digital clocks
- Dashboard displays
- Panel displays

## PIN CONFIGURATIONS



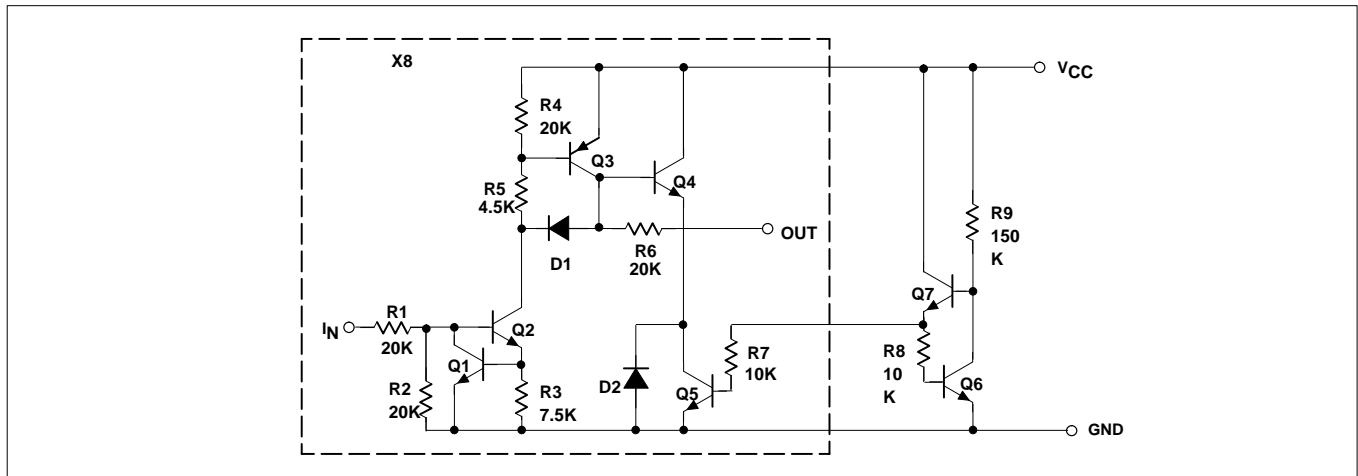
## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
18-Pin Plastic DIP	0 to +70°C	NE594N	0407A
18-Pin Ceramic DIP	0 to +70°C	NE594F	0583A
20-Pin Plastic SO	0 to +70°C	NE594D	0408B
18-Pin Plastic DIP	-40°C to +85°C	SA594N	0407A
18-Pin Ceramic DIP	-40°C to +85°C	SA594F	0583A
20-Pin Plastic SO	-40°C to +85°C	SA594D	0408B

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## EQUIVALENT SCHEMATIC



## ABSOLUTE MAXIMUM RATINGS (at 25°C, unless otherwise noted)

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Supply voltage	45	V
V <sub>OUT</sub>	Output voltage	V <sub>CC</sub>	
V <sub>IN</sub>	Input voltage	-0.3, +20	V
I <sub>OUT</sub>	Output current		
	Each output	50	mA
	All outputs	200	mA
P <sub>D</sub>	Maximum power dissipation, T <sub>A</sub> =25°C (still-air) <sup>1</sup>		
	F package	1500	mW
	N package	1690	mW
	D package	1390	mW
T <sub>A</sub>	Operating ambient temperature range		
	NE594	0 to 70	°C
	SA594	-40 to +85	°C
T <sub>STG</sub>	Storage temperature range	+65 to +150	°C
T <sub>J</sub>	Maximum junction temperature	-150	°C
T <sub>SOLD</sub>	Lead soldering temperature (10sec max)	300	°C

### NOTES:

1. Derate above 25°C, at the following rates:

F package at 12.0mW/°C

N package at 13.5mW/°C

D package at 11.1mW/°C

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**DC ELECTRICAL CHARACTERISTICS** $V_{CC}=+4.75$  to  $+40V$ ,  $T_A=0$  to  $70^{\circ}C$  (NE),  $T_A=-40$  to  $+85^{\circ}C$  (SA), unless otherwise stated.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
$V_{CC}$	Supply voltage range		4.75	35	40	V
$I_{CCH}$	Supply current (all outputs high)	$V_{CC}=40V$ , $V_{IN}=3.5V$		3	6	mA
$I_{CCL}$	Supply current (all outputs low)	$V_{CC}=40V$ , $V_{IN}=0.4V$		0.4	1	mA
$V_{IN}$	Input voltage range		0		15	V
$V_{IH}$	Input voltage to ensure logic '1'		2.6			V
$V_{IL}$	Input voltage to ensure logic '0'				0.8	V
$I_{IH}$	Input current to ensure logic '1'		100			$\mu A$
$I_{IL}$	Input current to ensure logic '0'				10	$\mu A$
$I_{IN}$	Input current	$V_{IN}=2.6V$ $V_{IN}=5.0V$ $V_{IN}=15.0V$		60 180 .68	130 330 1.3	$\mu A$ $\mu A$ mA
$V_{OH}$	Output high voltage	$V_{IN}=3.5V$ $I_{OUT}=-25mA$  $V_{OUT}$ with respect to $V_{CC}$	$T_A=25^{\circ}C$	$V_{CC}-1.5$	$V_{CC}-1.1$	V
			Over temp.	$V_{CC}-2$	$V_{CC}-1.3$	V
$V_{OH}$	Output high, no load voltage	$V_{IN}=3.5V$ , $I_{OUT}=0$ , $T_A=25^{\circ}C$ , $V_{OUT}$ with respect to $V_{CC}$	$V_{CC}-1$	$V_{CC}-0.8$		V
$V_{OFF}$	Output 'OFF' voltage level	$V_{IN}=0.8V$ , $I_{OUT}=0$		10	200	mV
$I_{OH}$	Available output current	$V_{CC}=35V$ , $V_{IN}=3.5V$ , $V_{OUT}=30V$ , $T_A=25^{\circ}C$	-35			mA
$I_{OUT}$	Output pull-down current	$V_{CC}=V_{OUT}=35V$ , Inputs open	100	200	400	$\mu A$
$I_{CEX}$	Output leakage current	$T_A=25^{\circ}C$ , $V_{IN}=0.4V$ $V_{CC}=40V$ , $V_{OUT}=0V$		-1 -1		$\mu A$

**AC ELECTRICAL CHARACTERISTICS** $V_{CC}=35V$ ,  $T_A=25^{\circ}C$ 

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
$t_{PLH}$	Propagation delay—low-to-high output transition	50% $V_{IN}$ to 50% $V_{OUT}$		1	5	$\mu s$
$t_{PHL}$	Propagation delay—high-to-low output transition	50% $V_{IN}$ to 50% $V_{OUT}$		3	10	$\mu s$
$t_R$	Output rise time	10% $V_{OUT}$ to 90% $V_{OUT}$		0.5	3	$\mu s$
$t_F$	Output fall time	90% $V_{OUT}$ to 10% $V_{OUT}$		1.5	5	$\mu s$

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## SWITCHING TIMES OF DRIVERS

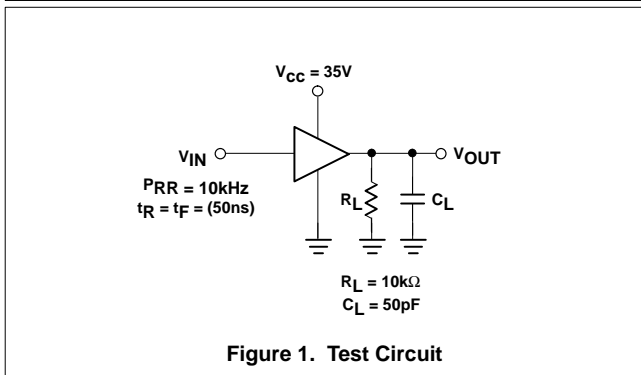
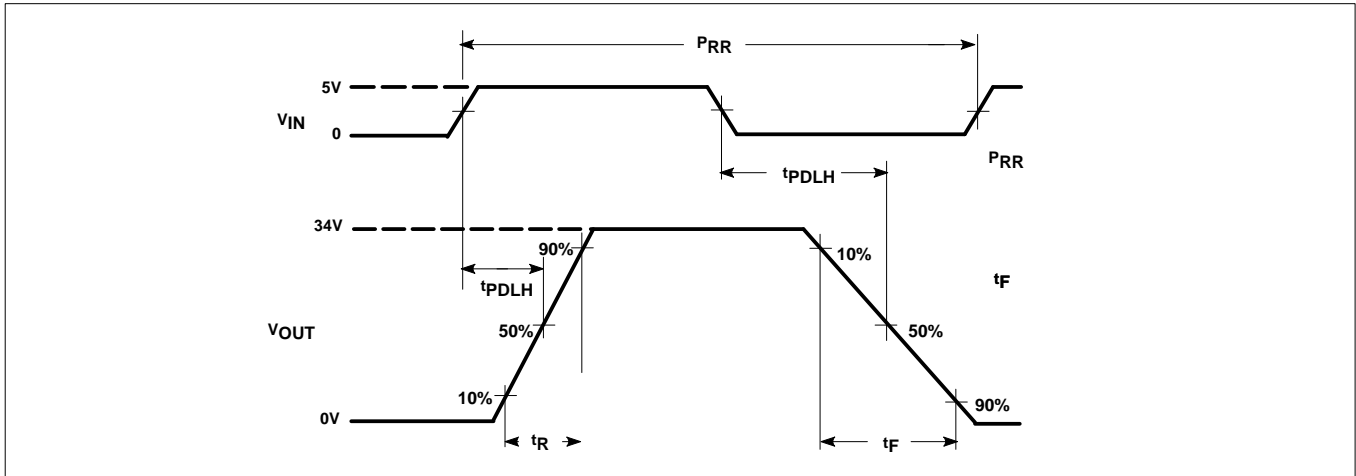
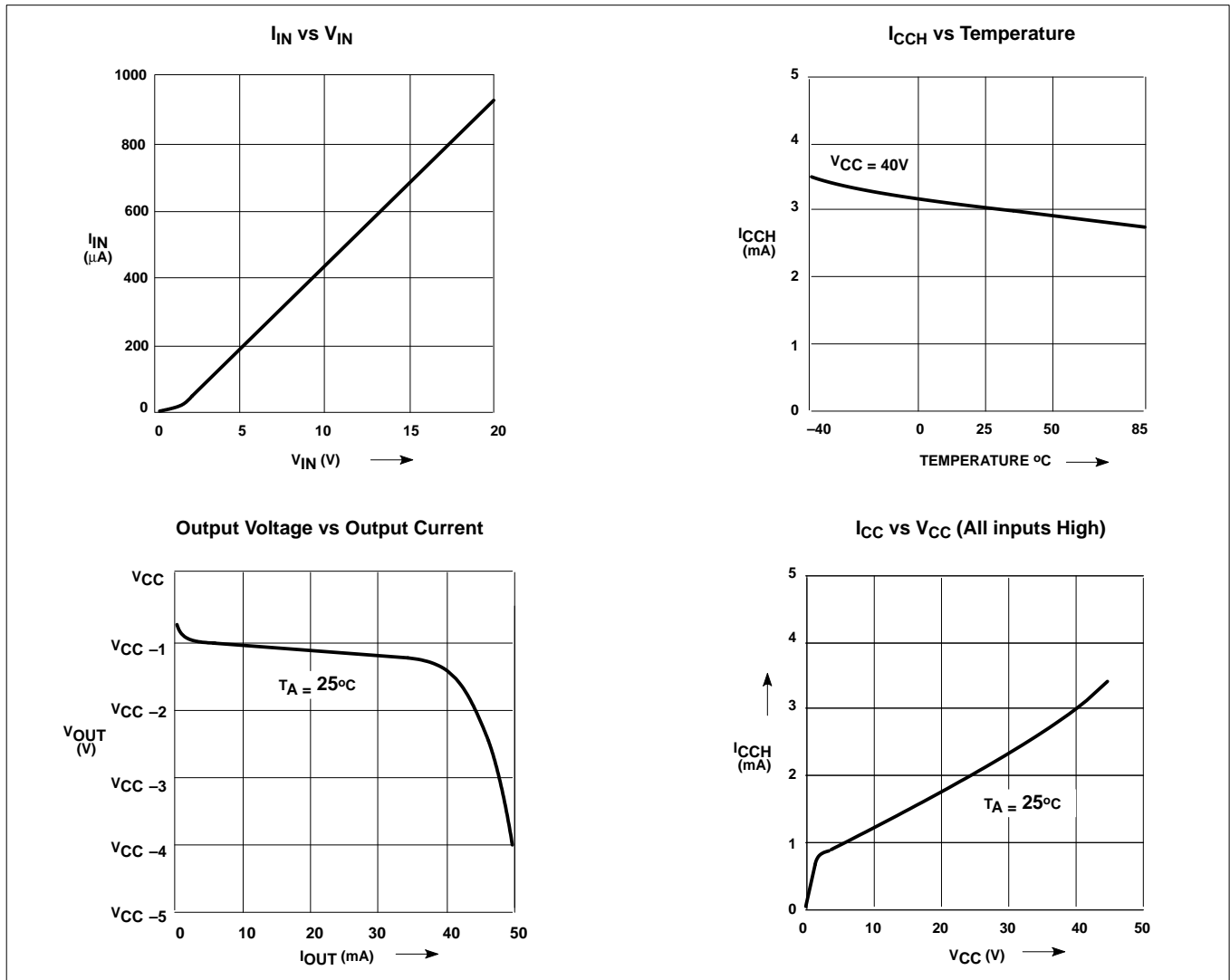


Figure 1. Test Circuit

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## TYPICAL PERFORMANCE CHARACTERISTICS



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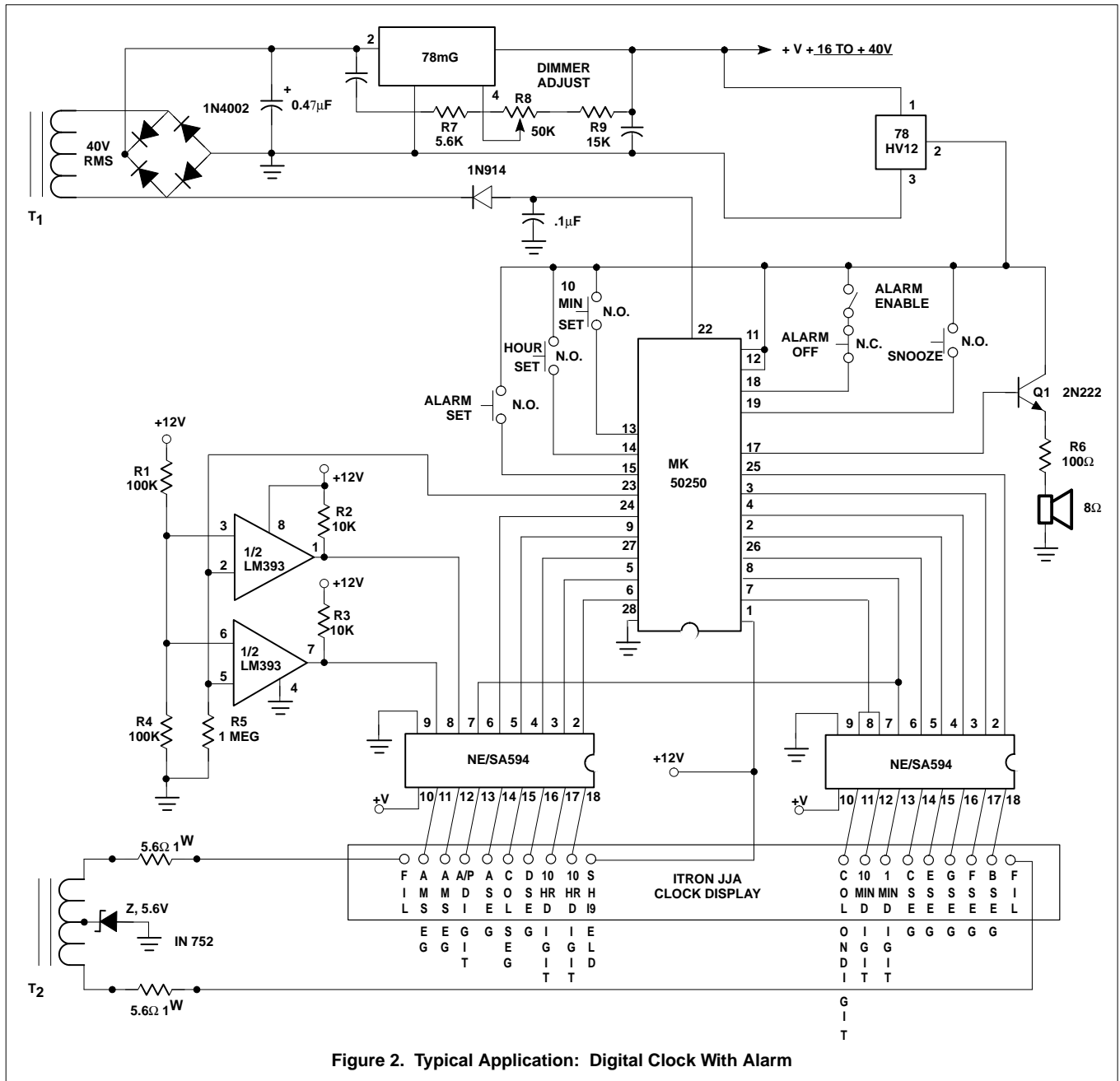


Figure 2. Typical Application: Digital Clock With Alarm