DATA SHEET

NE594/SA594
Vacuum fluorescent display driver

Product data
Supersedes data of 1994 Aug 31
File under Integrated Circuits, IC11 Handbook

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Philips
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Vacuum fluorescent display driver NE594/SA594

DESCRIPTION

The NE594/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

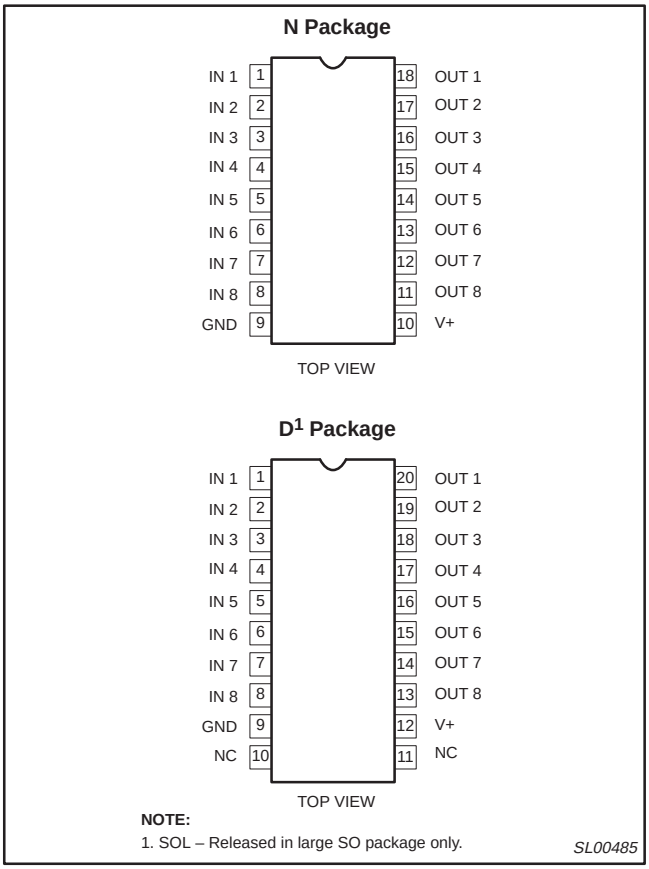


Figure 1. Pin Configurations

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
18-Pin Plastic DIP	0 °C to +70 °C	NE594N	SOT102-4
20-Pin Plastic SO	0 °C to +70 °C	NE594D	SOT163-1
18-Pin Plastic DIP	–40 °C to +85 °C	SA594N	SOT102-4
20-Pin Plastic SO	–40 °C to +85 °C	SA594D	SOT163-1

EQUIVALENT SCHEMATIC

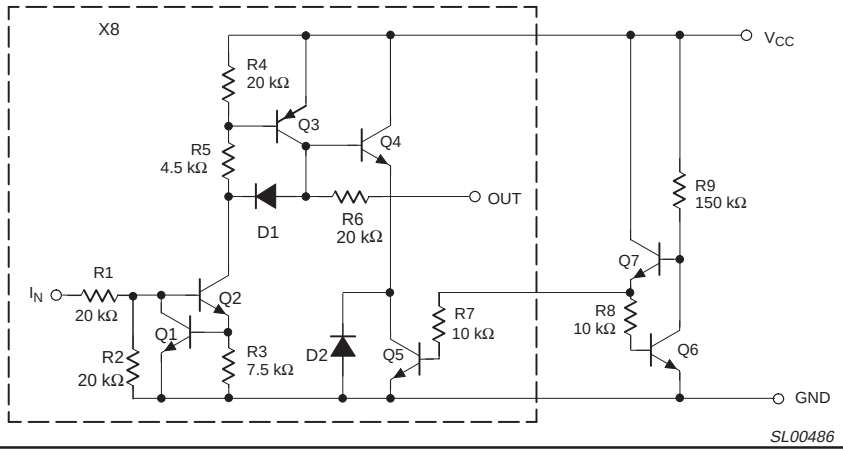


Figure 2. Equivalent Schematic

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

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	45	V
V_{OUT}	Output voltage	V_{CC}	
V_{IN}	Input voltage	–0.3, +20	V
I_{OUT}	Output current Each output All outputs	 50 200	 mA mA
P_D	Maximum power dissipation, T_{amb} = 25 °C (still-air)[1] N package D package	 1690 1390	 mW mW
T_{amb}	Operating ambient temperature range NE594 SA594	 0 to +70 –40 to +85	 °C °C
T_{stg}	Storage temperature range	+65 to +150	°C
T_j	Maximum junction temperature	–150	°C
T_{sld}	Lead soldering temperature (10 sec max)	230	°C

NOTE:
1. Derate above 25 °C, at the following rates:
   N package at 13.5 mW/°C
   D package at 11.1 mW/°C

DC ELECTRICAL CHARACTERISTICS

V_{CC}=+4.75 V to +40 V; T_{amb} = 0 °C to +70 °C (NE), T_{amb} = –40 °C to +85 °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} = 40 V; V_{IN} = 3.5 V			3	6	mA
I_{CCL}	Supply current (all outputs LOW)	V_{CC} = 40 V; V_{IN} = 0.4 V			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			µA
I_{IL}	Input current to ensure logic ‘0’					10	µA
I_{IN}	Input current	V_{IN} = 2.6 V			60	130	µA
		V_{IN} = 5.0 V			180	330	µA
		V_{IN} = 15.0 V			0.68	1.3	mA
V_{OH}	Output high voltage	V_{IN} = 3.5 V; I_{OUT} = –25 mA	T_{amb} = 25 °C	V_{CC} –1.5	V_{CC} –1.1		V
		V_{OUT} with respect to V_{CC}	Over temp.	V_{CC} –2	V_{CC} –1.3		V
V_{OH}	Output high, no load voltage	V_{IN} = 3.5 V; I_{OUT} = 0; T_{amb} = 25 °C; V_{OUT} with respect to V_{CC}		V_{CC} –1	V_{CC} –0.8		V
V_{OFF}	Output ‘OFF’ voltage level	V_{IN} = 0.8 V; I_{OUT} = 0			10	200	mV
I_{OH}	Available output current	V_{CC} = 35 V; V_{IN} = 3.5 V; V_{OUT} = 30 V; T_{amb} = 25 °C		–35			mA
I_{OUT}	Output pull-down current	V_{CC} = V_{OUT} = 35 V; inputs open		100	200	400	µA
I_{CEX}	Output leakage current	T_{amb} = 25 °C; V_{IN} = 0.4 V V_{CC} = 40 V; V_{OUT} = 0 V			–1 –1		µA

AC ELECTRICAL CHARACTERISTICS

V_{CC} = 35 V; T_{amb} = 25 °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	µs
t_{PHL}	Propagation delay high–to–low output transition	50% V_{IN} to 50% V_{OUT}		3	10	µs
t_R	Output rise time	10% V_{OUT} to 90% V_{OUT}		0.5	3	µs
t_F	Output fall time	90% V_{OUT} to 10% V_{OUT}		1.5	5	µs

SWITCHING TIMES OF DRIVERS

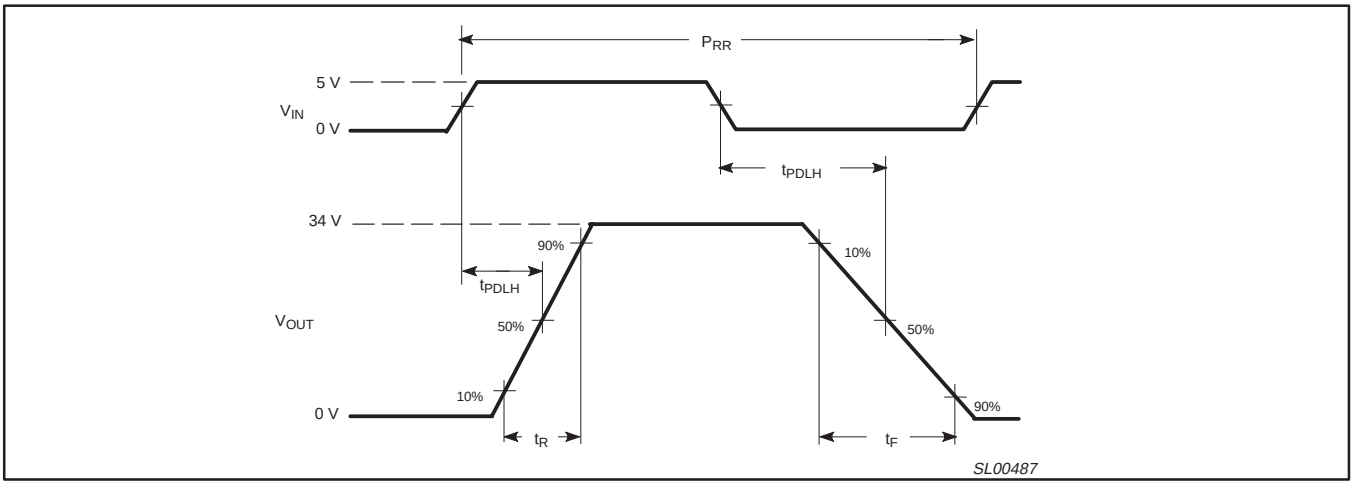


Figure 3. Switching Times of Drivers

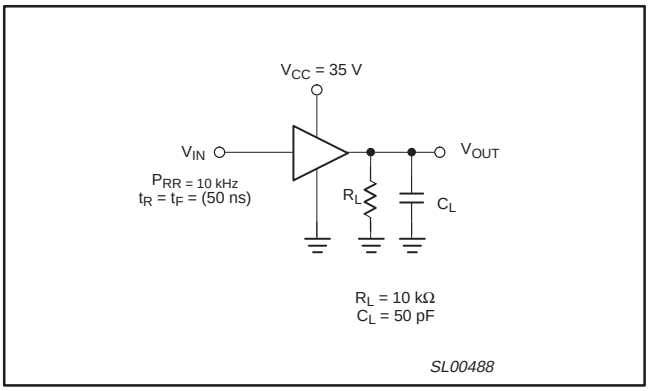


Figure 4. Test Circuit

TYPICAL PERFORMANCE CHARACTERISTICS

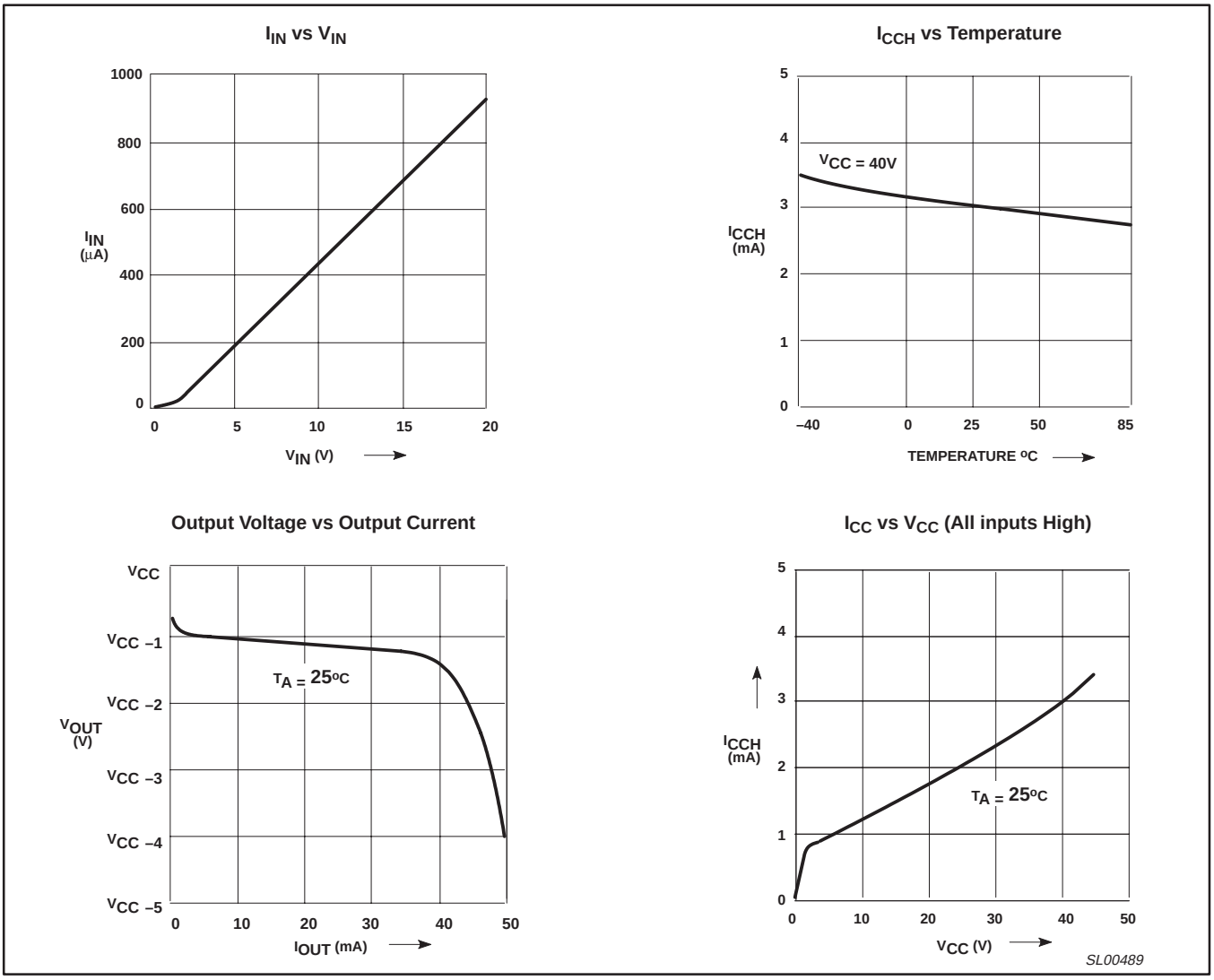


Figure 5. Typical Performance Characteristics

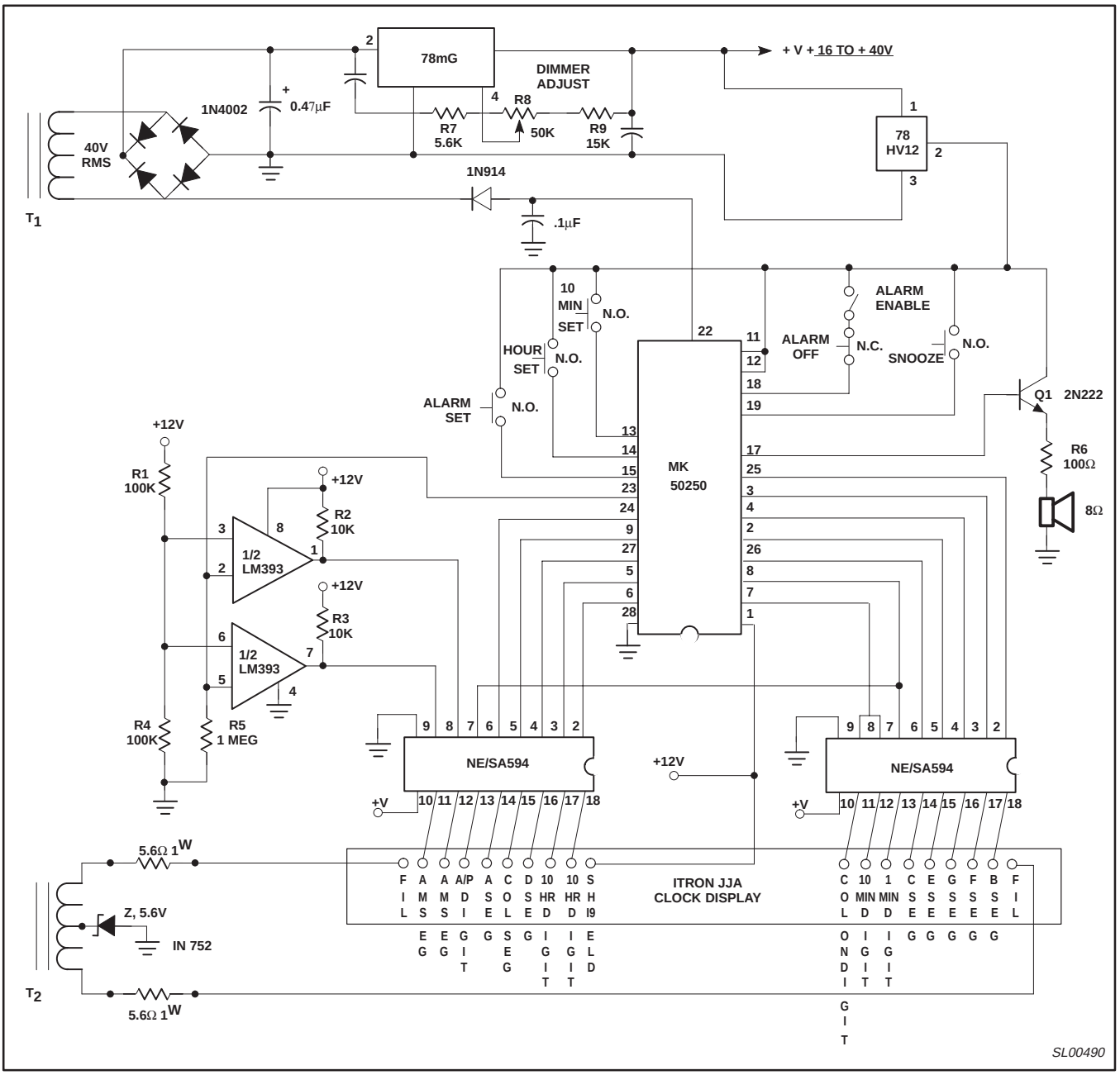
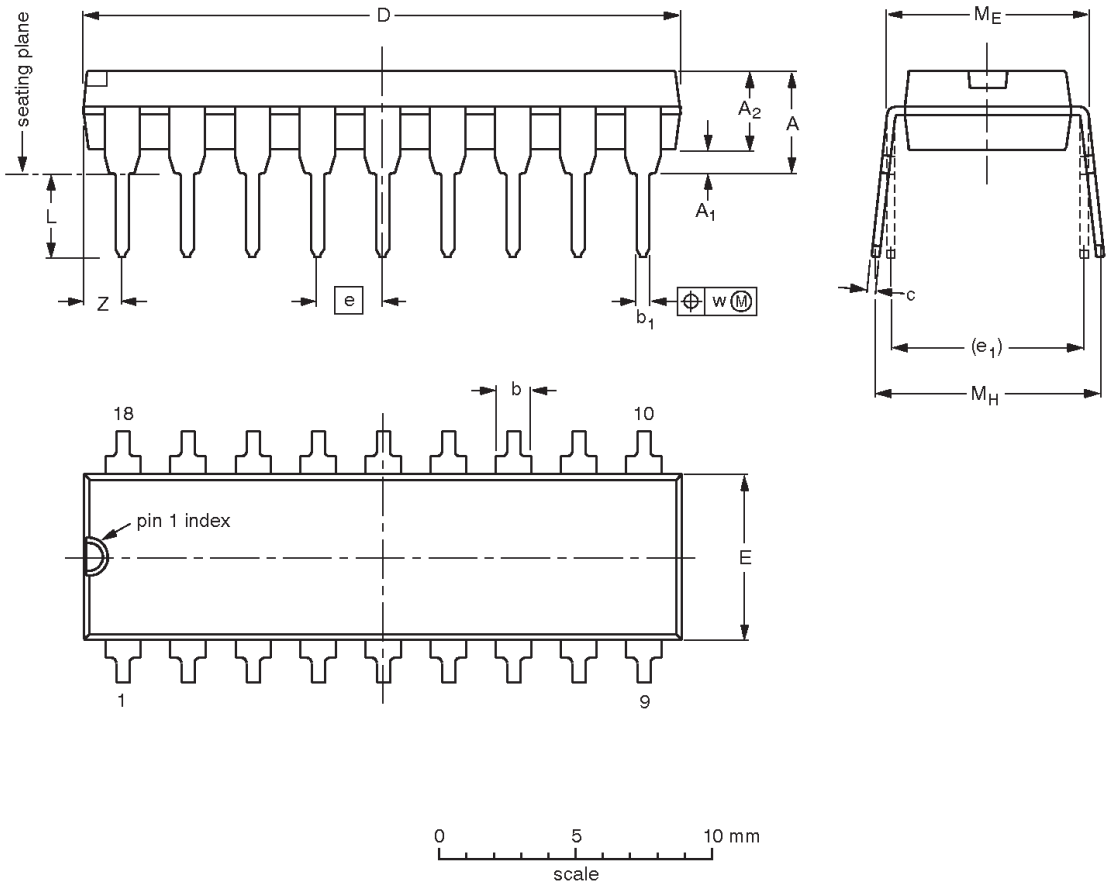


Figure 6. Typical Application: Digital Clock With Alarm

DIP18: plastic dual in-line package; 18 leads (300 mil); long body **SOT102-4**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

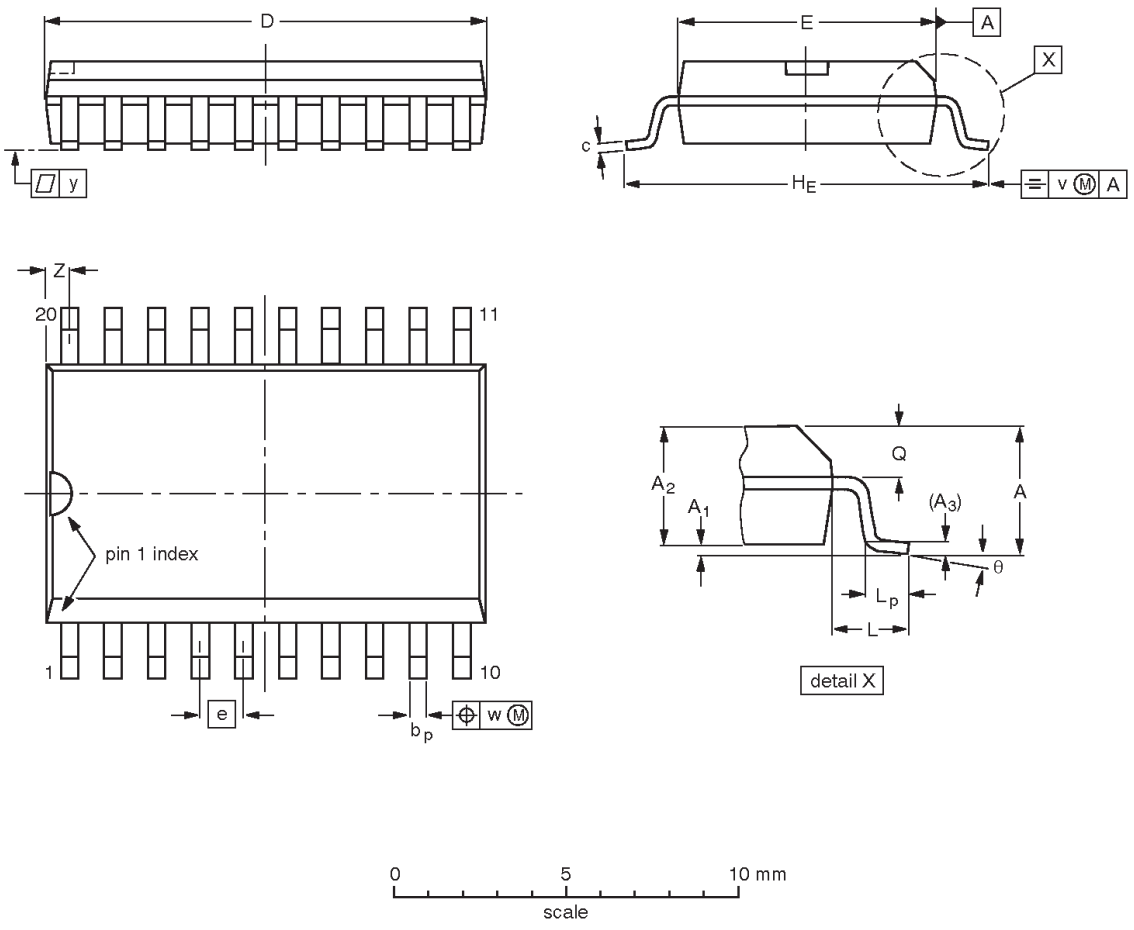
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.06	0.51	3.38	1.63 1.14	0.56 0.43	0.36 0.25	23.37 22.61	6.48 6.22	2.54	7.62	3.51 3.05	8.13 7.62	10.03 7.62	0.25	1.65
inches	0.160	0.020	0.140	0.064 0.045	0.022 0.017	0.014 0.010	0.920 0.890	0.255 0.245	0.100	0.300	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.065

Note

1. Plastic or metal protrusions of 0.01 inch maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT102-4		MS-001				~~99-07-08~~ 99-12-27

SO20: plastic small outline package; 20 leads; body width 7.5 mm **SOT163-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013				~~97-05-22~~ 99-12-27

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