

# DATA SHEET

## **NE/SA556** Dual timer

Product data  
Replaces NE/SA/SE556/NE556-1 of 1994 Aug 31  
IC11

2001 Aug 03

## Dual timer

## NE/SA556

## DESCRIPTION

Both the NE556 and SA556 Dual Monolithic timing circuits are highly stable controllers capable of producing accurate time delays or oscillation. The 556 is a dual 555. Timing is provided by an external resistor and capacitor for each timing function. The two timers operate independently of each other, sharing only  $V_{CC}$  and ground. The circuits may be triggered and reset on falling waveforms. The output structures may sink or source 200 mA.

## FEATURES

- Timing from microseconds to hours
- Replaces two 555 timers
- Operates in both astable and monostable modes
- High output current
- Adjustable duty cycle
- TTL compatible
- Temperature stability of 0.005%/°C

## APPLICATIONS

- Precision timing
- Sequential timing
- Pulse shaping
- Pulse generator
- Missing pulse detector
- Tone burst generator
- Pulse width modulation
- Time delay generator
- Frequency division
- Touch-Tone® encoder
- Industrial controls
- Pulse position modulation
- Appliance timing
- Traffic light control

## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Plastic Small Outline (SO) Package	0 to +70°C	NE556D	SOT108-1
14-Pin Plastic Dual In-Line Package (DIP)	0 to +70°C	NE556N	SOT27-1
14-Pin Plastic Dual In-Line Package (DIP)	-40°C to +85°C	SA556N	SOT27-1

## PIN CONFIGURATION

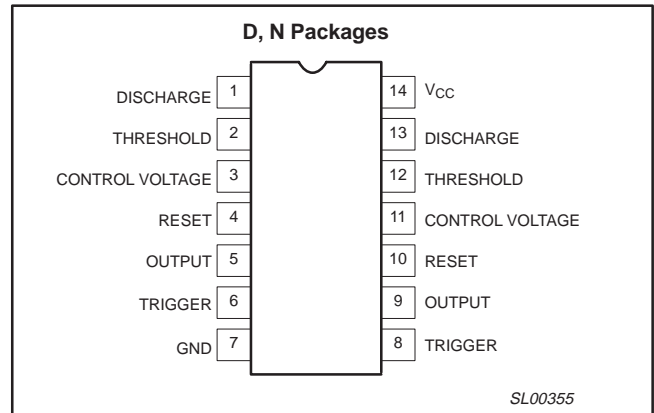


Figure 1. Pin Configuration

® Touch-Tone is a registered trademark of AT&T.

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## BLOCK DIAGRAM

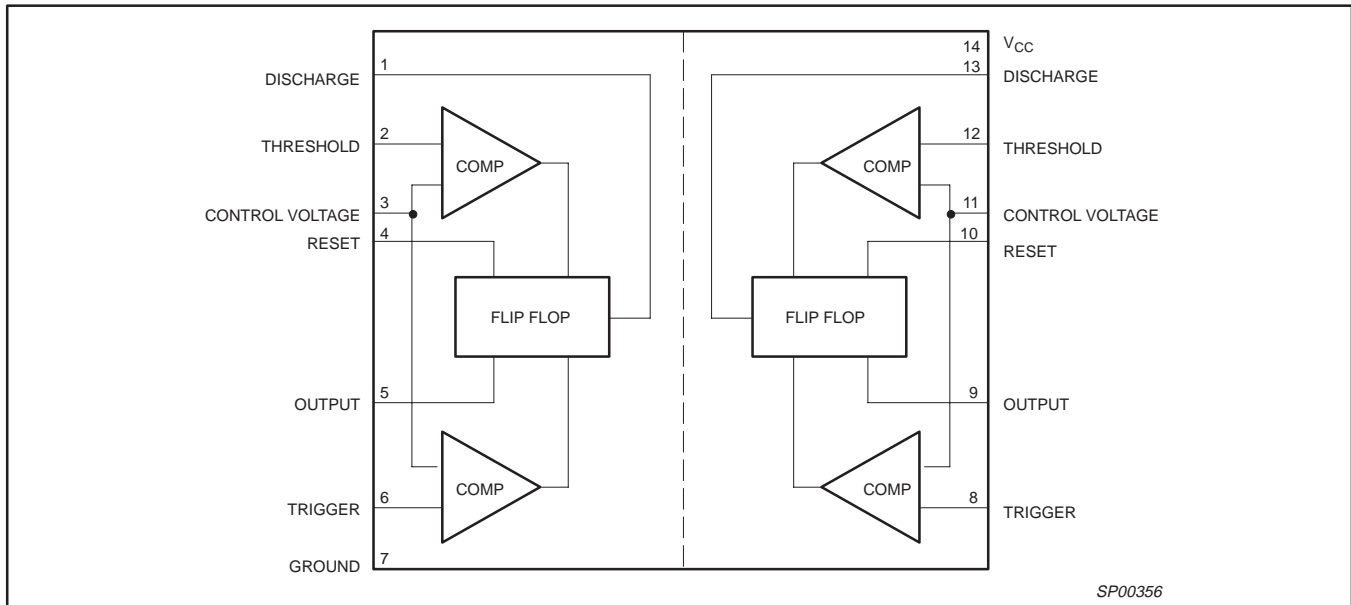


Figure 2. Block Diagram

## EQUIVALENT SCHEMATIC (Shown for one circuit only)

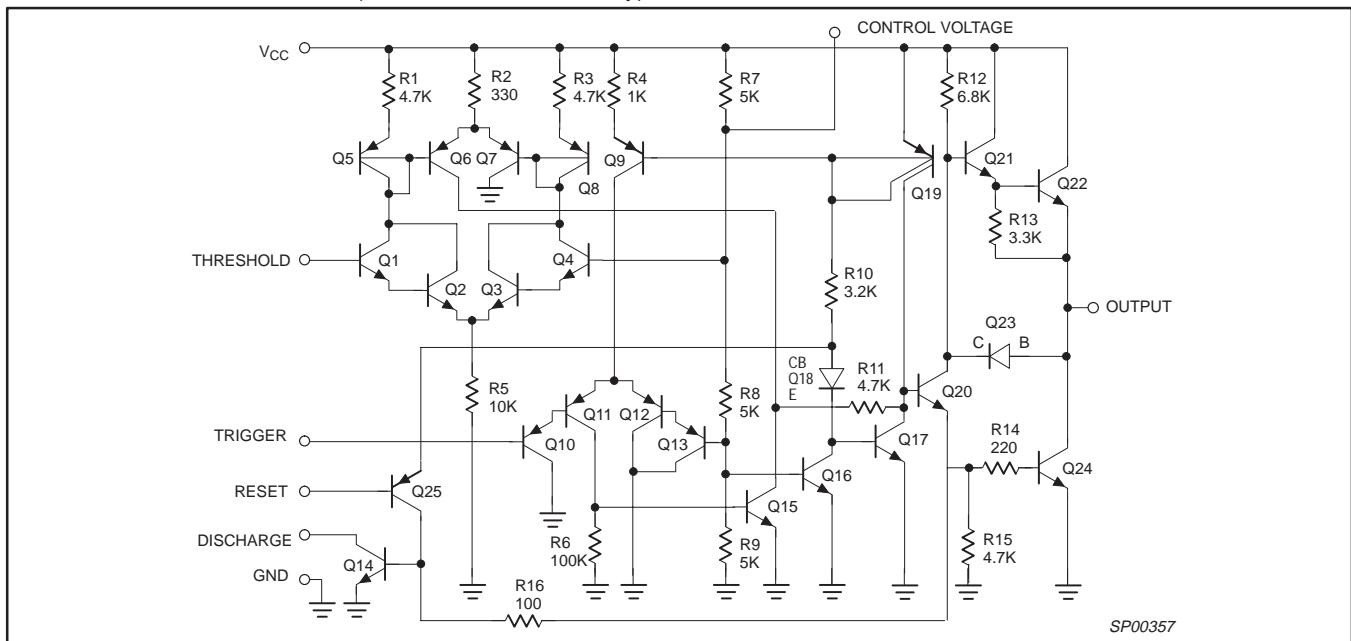


Figure 3. Equivalent Schematic

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**ABSOLUTE MAXIMUM RATINGS**

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Supply voltage	+16	V
P <sub>D</sub>	Maximum allowable power dissipation <sup>1</sup>	800	mW
T <sub>amb</sub>	Operating temperature range	0 to +70	°C
	NE556	-40 to +85	°C
	SA556		
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C
T <sub>SOLD</sub>	Lead soldering temperature (10 sec max)	+230	°C

**NOTE:**

- The junction temperature must be kept below 125 °C for the D package and below 150 °C for the N package. At ambient temperatures above 25 °C, where this limit would be exceeded, the Maximum Allowable Power Dissipation must be derated by the following:

D package 115 °C/W

N package 80 °C/W

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**ELECTRICAL CHARACTERISTICS**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = +5\text{ V}$  to  $+15\text{ V}$ , unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	Min	Typ	Max	UNIT
$V_{CC}$	Supply voltage		4.5		16	V
$I_{CC}$	Supply current (low state) <sup>1</sup>	$V_{CC} = 5\text{ V}$ , $R_L = \infty$ $V_{CC} = 15\text{ V}$ , $R_L = \infty$		6 20	12 30	mA mA
$t_M$ $\Delta t_M/\Delta T$ $\Delta t_M/\Delta V_S$	Timing error (monostable) Initial accuracy <sup>2</sup> Drift with temperature Drift with supply voltage	$R_A = 2\text{ k}\Omega$ to $100\text{ k}\Omega$ $C = 0.1\text{ }\mu\text{F}$ $T = 1.1\text{ RC}$		0.75 50 0.1	3.0 150 0.5	% ppm/ $^{\circ}\text{C}$ %/V
$t_A$ $\Delta t_A/\Delta T$ $\Delta t_A/\Delta V_S$	Timing error (astable) Initial accuracy <sup>2</sup> Drift with temperature Drift with supply voltage	$R_A, R_B = 1\text{ k}\Omega$ to $100\text{ k}\Omega$ $C = 0.1\text{ }\mu\text{F}$ $V_{CC} = 15\text{ V}$		5 400 0.3	13 500 1	% ppm/ $^{\circ}\text{C}$ %/V
$V_C$	Control voltage level	$V_{CC} = 15\text{ V}$ $V_{CC} = 5\text{ V}$	9.0 2.6	10.0 3.33	11.0 4.0	V
$V_{TH}$	Threshold voltage	$V_{CC} = 15\text{ V}$ $V_{CC} = 5\text{ V}$	8.8 2.4	10.0 3.33	11.2 4.2	V V
$I_{TH}$	Threshold current <sup>3</sup>	$V_{CC} = 15\text{ V}$ , $V_{TH} = 10.5\text{ V}$		30	250	nA
$V_{TRIG}$	Trigger voltage	$V_{CC} = 15\text{ V}$ $V_{CC} = 5\text{ V}$	4.5 1.1	5.0 1.67	5.6 2.2	V V
$I_{TRIG}$	Trigger current	$V_{TRIG} = 0\text{ V}$		0.5	2.0	$\mu\text{A}$
$V_{RESET}$	Reset voltage <sup>5</sup>		0.4	0.7	1.0	V
	Reset current	$V_{RESET} = 0.4\text{ V}$	0.4	0.1	0.6	mA
$I_{RESET}$	Reset current	$V_{RESET} = 0\text{ V}$		0.4	1.5	mA
$V_{OL}$	Output voltage (low)	$V_{CC} = 15\text{ V}$ $I_{SINK} = 10\text{ mA}$ $I_{SINK} = 50\text{ mA}$ $I_{SINK} = 100\text{ mA}$ $I_{SINK} = 200\text{ mA}$		0.1 0.4 2.0 2.5	0.25 0.75 3.2	V
		$V_{CC} = 5\text{ V}$ $I_{SINK} = 8\text{ mA}$ $I_{SINK} = 5\text{ mA}$		0.25 0.15	0.3 0.25	V
$V_{OH}$	Output voltage (high)	$V_{CC} = 15\text{ V}$ $I_{SOURCE} = 200\text{ mA}$ $I_{SOURCE} = 100\text{ mA}$	12.75	12.5 13.3		V
		$V_{CC} = 5\text{ V}$ $I_{SOURCE} = 100\text{ mA}$	2.75	3.3		
$t_R$	Rise time of output			100	300	ns
$t_F$	Fall time of output			100	300	ns
	Discharge leakage current			20	100	nA
	Matching characteristics <sup>4</sup> Initial accuracy <sup>2</sup> Drift with temperature Drift with supply voltage			1.0 $\pm 10$ 0.2	2.0 0.5	% ppm/ $^{\circ}\text{C}$ %/V

**NOTES:**

- Supply current when output is high is typically 1.0 mA less.
- Tested at  $V_{CC} = 5\text{ V}$  and  $V_{CC} = 15\text{ V}$ .
- This will determine maximum value of  $R_A + R_B$ . For 15 V operation, the max total  $R = 10\text{ M}\Omega$ , and for 5 V operation, the maximum total  $R = 3.4\text{ M}\Omega$ .
- Matching characteristics refer to the difference between performance characteristics for each timer section in the monostable mode.
- Specified with trigger input high. In order to guarantee reset the voltage at reset pin must be less than or equal to 0.4 V. To disable reset function, the voltage at reset pin has to be greater than 1 V.
- Time measured from a positive-going input pulse from 0 to 0.4  $V_{CC}$  into the threshold to the drop from high to low of the output. Trigger is tied to threshold.

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### TYPICAL APPLICATIONS

One feature of the dual timer is that by utilizing both halves it is possible to obtain sequential timing. By connecting the output of the first half to the input of the second half via a 0.001  $\mu\text{F}$  coupling capacitor sequential timing may be obtained. Delay  $t_1$  is determined by the first half and  $t_2$  by the second half delay.

The first half of the timer is started by momentarily connecting Pin 6 to ground. When it is timed out (determined by  $1.1R_1C_1$ ) the second half begins. Its duration is determined by  $1.1R_2C_2$ .

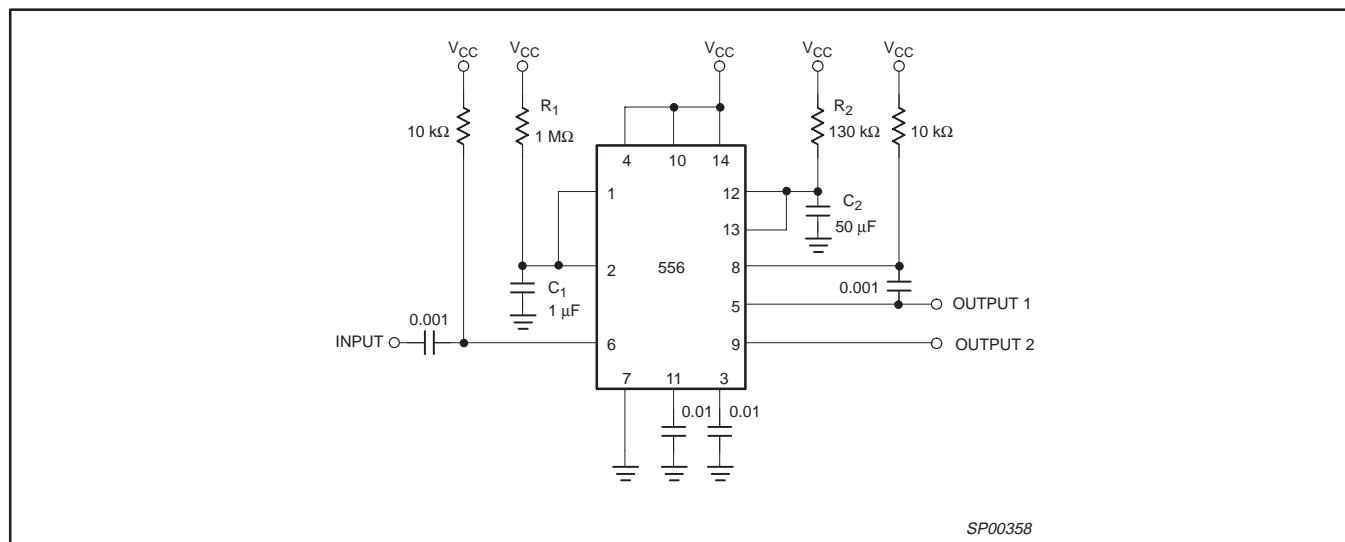


Figure 4. Sequential Timer

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TYPICAL PERFORMANCE CHARACTERISTICS

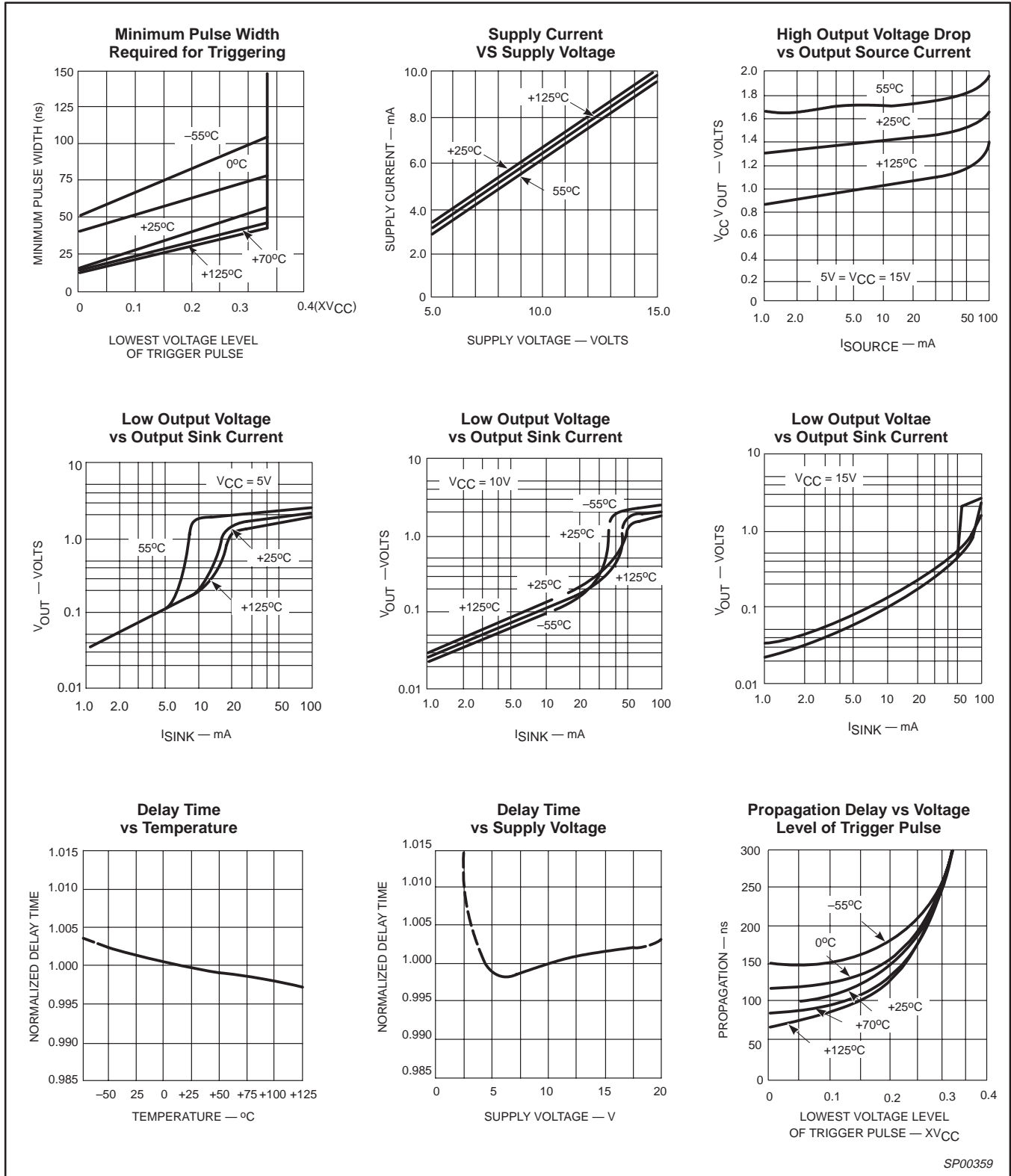


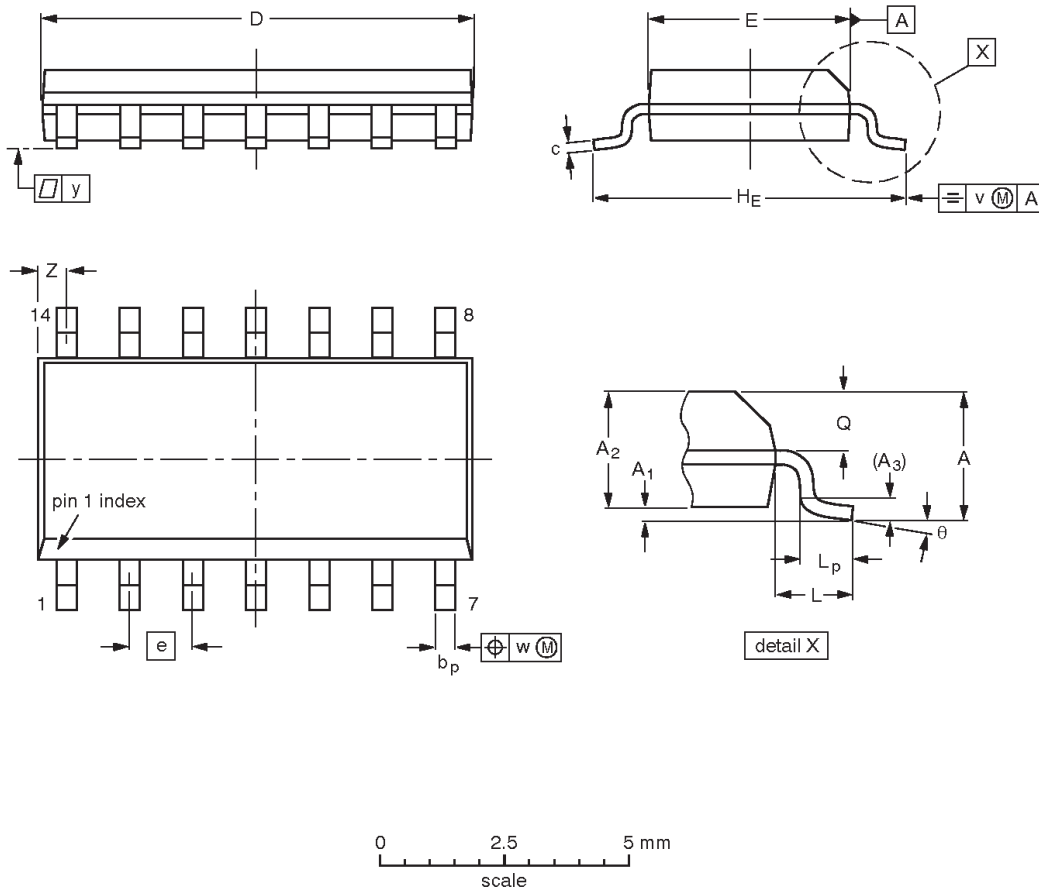
Figure 5. Typical Performance Characteristics

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SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



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

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	$\theta$
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**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			
SOT108-1	076E06	MS-012				97-05-22 99-12-27

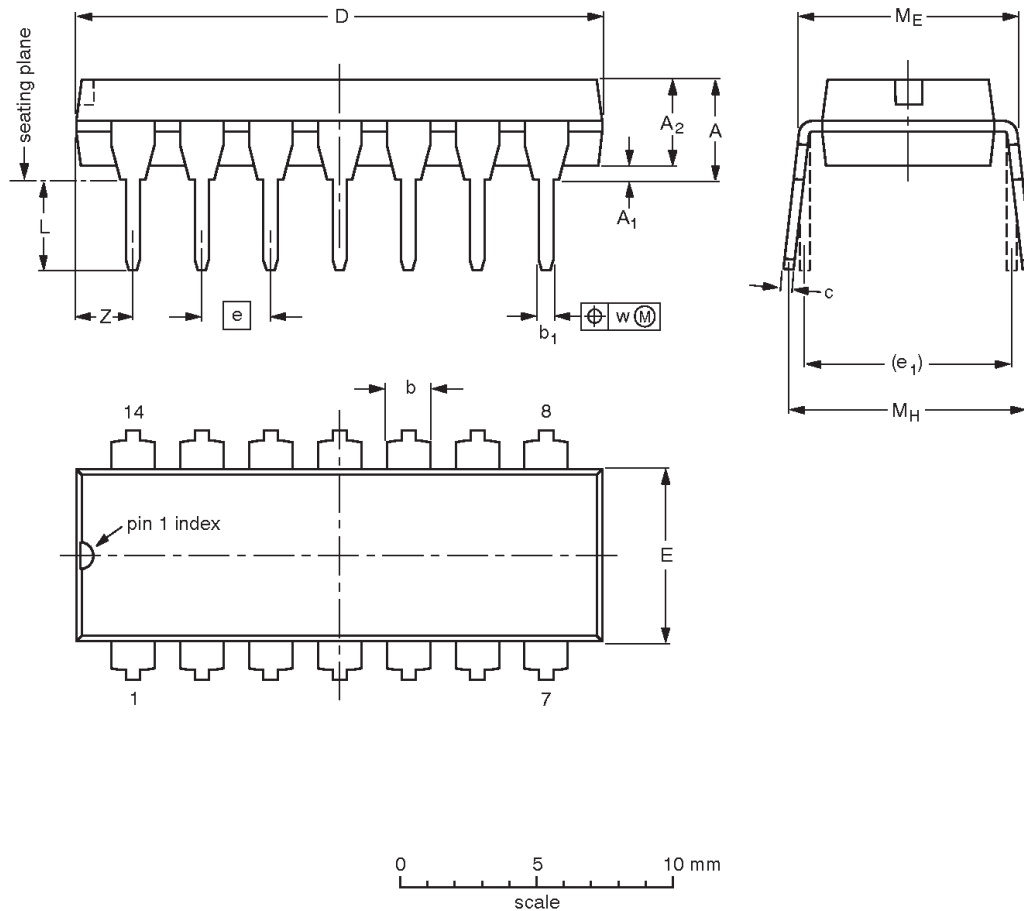


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DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



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

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001	SC-501-14			95-03-11 99-12-27

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Date of release: 10-01

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