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NE5532.pdf	22-Dec-99 00:13	273K	
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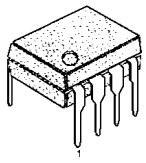
NE555M.pdf	22-Dec-99 00:13	82K	
NE555N.pdf	22-Dec-99 00:13	82K	

NE5532 DUAL OPERATIONAL AMPLIFIER

DUAL OPERATIONAL AMPLIFIERS

The NE5532 is a internally compensated dual low noise op AMP. The high small signal and power bandwidths provides superior performance in high quality AMP, all control circuits, and telephone applications.

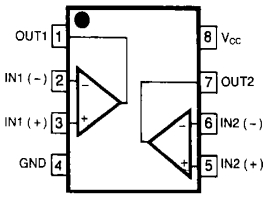
8 DIP



FEATURE

- Internal frequency compensation
- Slew Rate: 8V/μs
- Input noise voltage: 8nV/$\sqrt{Hz}$ (fo = 30Hz)
- Full power bandwidth: 140KHz

BLOCK DIAGRAM



ORDERING INFORMATION

Device	Package	Operating Temperature
NE5532	8 DIP	0 ~ + 70 °C

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Characteristics	Symbol	NE5532	Unit
Power Supply Voltage	V_{CC}	±22	V
Differential Input Voltage	V_{IO}	13	V
Input Voltage	V_I	Supply Voltage	V
Power Dissipation	P_D	1000	mW
Operating Temperature Range	T_{OPR}	0 ~ + 70	°C

ELECTRICAL CHARACTERISTICS (V_{CC}= -5V, V_{EE}= - 15V, T_A = 25 °C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Offset Voltage	V_{IO}			0.5	4.0	mV
Input Offset Current	I_{IO}			10	150	nA
Input Bias Current	I_{BIAS}			200	800	nA
Supply Current	I_{CC}			6.0	16	mA
Input Voltage Range	$V_{I(R)}$		±12	±13		V
Common Mode Rejection Range	CMRR	T_A = 25 °C	70	100		dB
Power Supply Rejection Ratio	PSRR	T_A = 25 °C	80	100		dB
Output Voltage Swing	$V_{O(P.P)}$	R_L≥600Ω	±12	±13		V
Input Resistance	R_I	T_A = 25 °C	30	300		KΩ
Short Circuit Current	I_{SC}			38		mA
Overshoot	O_S	R_L =600Ω, C_L =100pF		10	20	%
Gain	G_V	f = 10KHz	2	2.2		V/mV
Gain Bandwidth Product	GBW	C_L =100pF, R_L = 600Ω	8	10		MHz
Slew Rate	SR	R_L =1K, C_L =100pF,R_L =600Ω	6	8.0		V/us
Input Noise Voltage	V_{NI}	f_O = 30Hz f_O = 1KHz		8.0 5.0		nV/$\sqrt{Hz}$

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Rev. B

TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 Open Loop Frequency Response

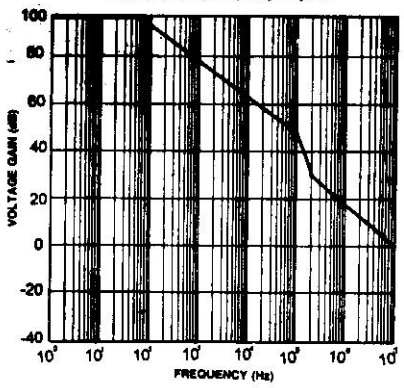


Fig. 2 Large Signal Frequency Response

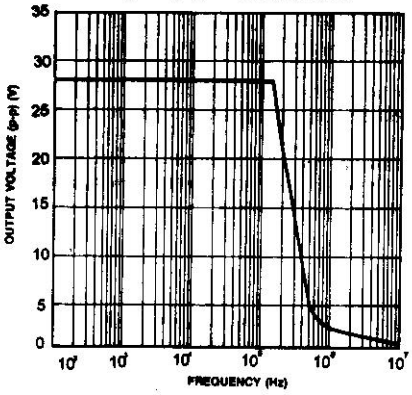


Fig. 3 Supply Current

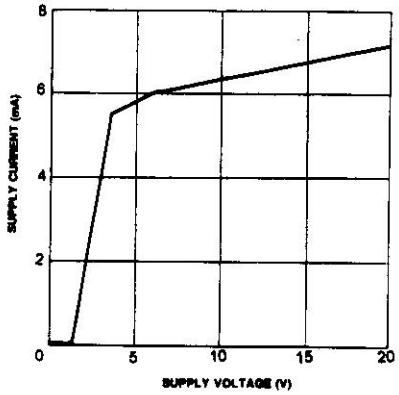


Fig. 4 Input Bias Current

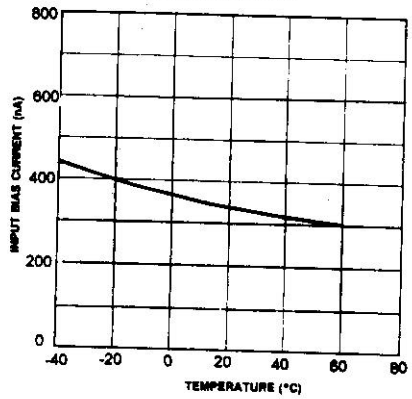


Fig. 5 Output Circuit Current

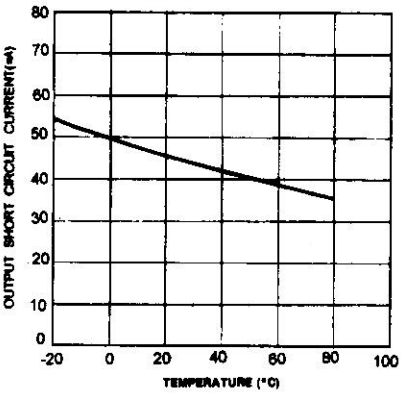
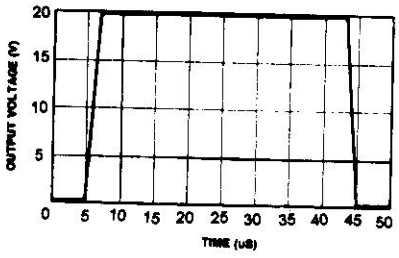


Fig. 6 Slew Rate



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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.

PRODUCT STATUS DEFINITIONS

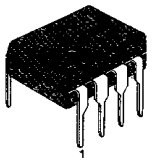
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

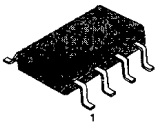
SINGLE TIMER

The NE555/I is a highly stable controller capable of producing accurate timing pulses. With monostable operation, the time delay is controlled by one external and one capacitor. With astable operation, the frequency and duty cycle are accurately controlled with two external resistors and one capacitor.

8 DIP



8 SOP



FEATURES

- High Current Drive Capability (= 200mA)
- Adjustable Duty Cycle
- Temperature Stability of 0.005%/°C
- Timing From μSec To Hours
- Turn Off Time Less Than 2μSec

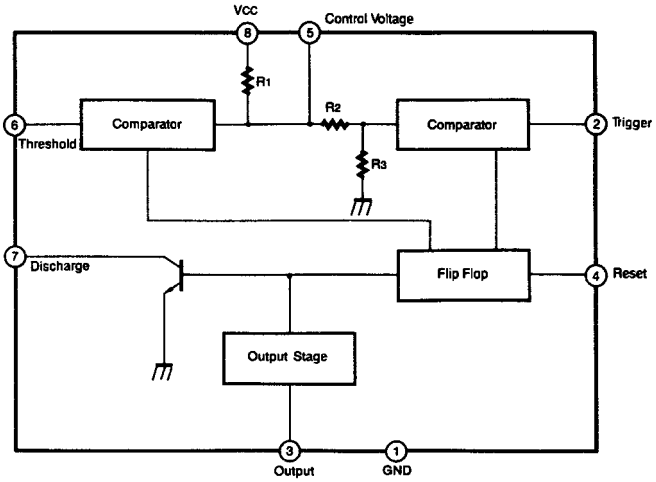
APPLICATIONS

- Precision Timing
- Pulse Generation
- Time Delay Generation
- Sequential Timing

ORDERING INFORMATION

Device	Package	Operating Temperature
NE555N	8 DIP	0 ~ +70°C
NE555M	8 SOP	
NE555IN	8 DIP	-40 ~ +85°C
NE555IM	8 SOP	

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Lead Temperature (soldering 10sec)	T_{LEAD}	300	°C
Power Dissipation	P_D	600	mW
Operating Temperature Range NE555C NE555CI	T_{OPR}	0 ~ + 70 - 40 ~ + 85	°C °C
Storage Temperature Range	T_{STG}	- 65 ~ + 150	°C

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, V_{CC} = 5 ~ 15V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{CC}		4.5		16	V
Supply Current	I_{CC}	V_{CC} = 5V, R_L = ∞		3	6	mA
∗[1](low stable)		V_{CC} = 15V, R_L = ∞		7.5	15	mA
∗Timing Error (Monostable) [2]Initial Accuracy Drift with Temperature Drift with Supply Voltage	 ACCUR Δt/ΔT $\Delta t/\Delta V_{CC}$	 R_A = 1KΩ to 100KΩ C = 0.1μF		 1.0 50 0.1	 3.0 0.5	 % ppm/°C %/V
∗Timing Error (astable) [2]Intial Accuracy Drift with Temperature Drift with Supply Voltage	 ACCUR Δt/ΔT $\Delta t/\Delta V_{CC}$	 R_A = 1KΩ to 100KΩ C = 0.1μF		 2.25 150 0.3		 % ppm/°C %/V
Control Voltage	V_C	V_{CC} = 15V	9.0	10.0	11.0	V
		V_{CC} = 5V	2.6	3.33	4.0	V
Threshold Voltage	V_{TH}	V_{CC} = 15 V		10.0		V
		V_{CC} = 5V		3.33		V
∗[3]Threshold Current	I_{TH}			0.1	0.25	μA
Trigger Voltage	V_{TR}	V_{CC} = 5V	1.1	1.67	2.2	V
Trigger Voltage	V_{TR}	V_{CC} = 15V	4.5	5	5.6	V
Trigger Current	I_{TR}	V_{TR} = 0V		0.01	2.0	μA
Reset Voltage	V_{RST}		0.4	0.7	1.0	V
Reset Current	I_{RST}			0.1	0.4	mA

ELECTRICAL CHARACTERISTICS

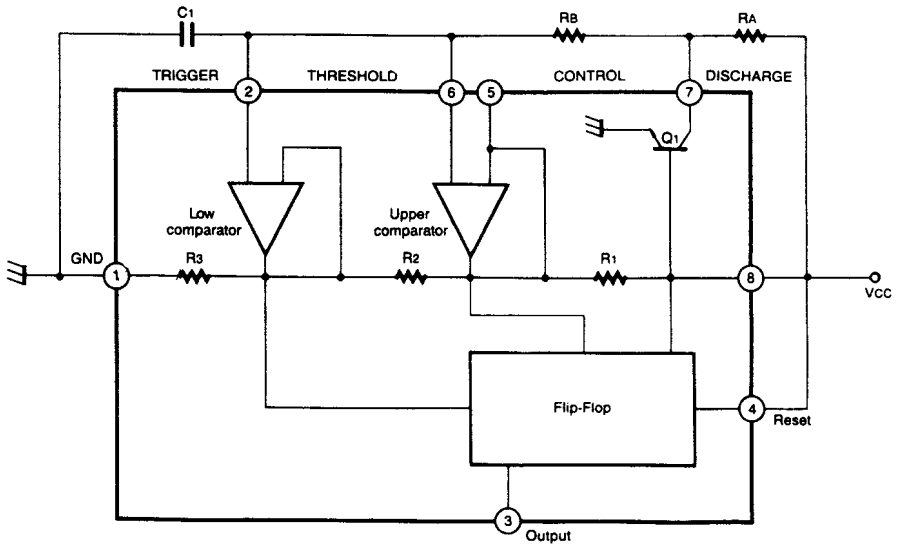
(T_A = 25°C, V_{CC} = 5 ~ 15V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Low Output Voltage	V_{OL}	V_{CC} = 15V I_{SINK} = 10mA I_{SINK} = 50mA		0.06 0.3	0.25 0.75	V V
		V_{CC} = 5V I_{SINK} = 5mA		0.05	0.35	V
High Output Voltage	V_{OH}	V_{CC} = 15V I_{SOURCE} = 200mA I_{SOURCE} = 100mA	 12.75	12.5 13.3		V V
		V_{CC} = 5V I_{SOURCE} = 100mA	2.75	3.3		V
Rise Time of Output	t_R			100		ns
Fall Time of Output	t_F			100		ns
Discharge Leakage Current	I_{LKG}			20	100	nA

Notes:

1. Supply current when output is high is typically 1mA less at V_{CC} = 5V
2. Tested at V_{CC} = 5.0V and V_{CC} = 15V
3. This will determine maximum value of $R_A + R_B$ for 15V operation, the max. total R = 20MΩ, and for 5V operation the max. total R = 6.7MΩ

APPLICATION CIRCUIT



APPLICATION NOTE

The application circuit shows astable mode.
Pin 6 (threshold) is tied to Pin 2 (trigger) and Pin 4 (reset) is tied to V_{CC} (Pin 8).
The external capacitor C_1 of Pin 6 and Pin 2 charges through R_A, R_B and discharges through R_B only.
In the internal circuit of the NE555 one input of the upper comparator is the 2/3 V_{CC} ($*R_1 = R_2 = R_3$, another input if it
If it is connected Pin 6.
As soon as charging C_1 is higher than 2/3 Vcc, discharge transistor Q_1 turns on and C_1 discharges to collector of transistor Q_1.
Therefore, the flip-flop circuit is reset and output is low.
One input of lower comparator is the 1/3 V_{CC}, discharge transistor Q_1 turn off and C_1 charges through R_A and R_B.
Therefore, the flip-flop circuit is set and output is high.
So to say, when C_1 charges through R_A and R_1 output is high and when C_1 discharges through R_B output is low.
The charge time (output is high) T_1 is 0.693 (R_A+R_B) C_1 and the discharge time (output is low) T_2 is 0.693 (R_B C_1).

$$(I_n \frac{V_{CC}\text{-}1/3V_{CC}}{V_{CC}\text{-}2/3V_{CC}} 0.693)$$

Thus the total period time T is given by
$T = T_1 + T_2 = 0.693 (R_A + 2R_B) C_1$.
Then the frequency of astable mode is given by

$$f = = \frac{1}{T} \quad \frac{1.44}{(R_A + 2R_B)C_1}$$

The duty cycle is given by

$$D.C = \frac{T_2}{T} \quad \frac{R_B}{R_A + 2R_B}$$

If you make use of the NE556 you can make two astable modes.

Astable Operation

The NE555 can free run as a mulitivibrator by triggering itself; refer to Fig.2. The output can swing from V_{DD} to GND and have 50 duty cycle square wave. Less than 1% frequency deviation can be observed, over a voltage range of 2 to 5V. f-1/1.4RC

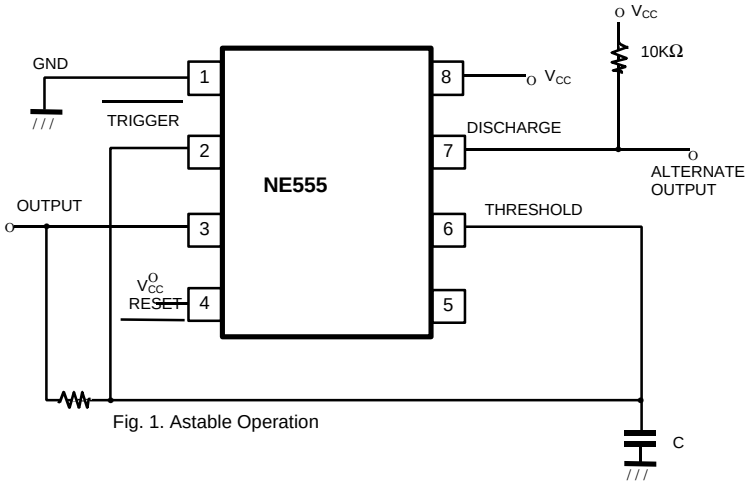


Fig. 1. Astable Operation

Monostable Operation

The NE555 can be used as a one-short, i.e. monostable multivibrator. Initially, because the inside discharge transistor is on state, external timing capacitor is held to GND potential. Upon application of a negative TRIGGER pulse pin 2, the intern discharge transistor is off state and the voltage across the capacitor increases with time constant $T = R_A C$ and OUTPUT goes to high state. When the voltage across the capacitor equals $2/3V_{CC}$ the inner comparator is reset by THRESHOLD input and the discharge transistor goes to on state, which in turn discharges the capacitor rapidly and drives the OUTPUT to its low state.

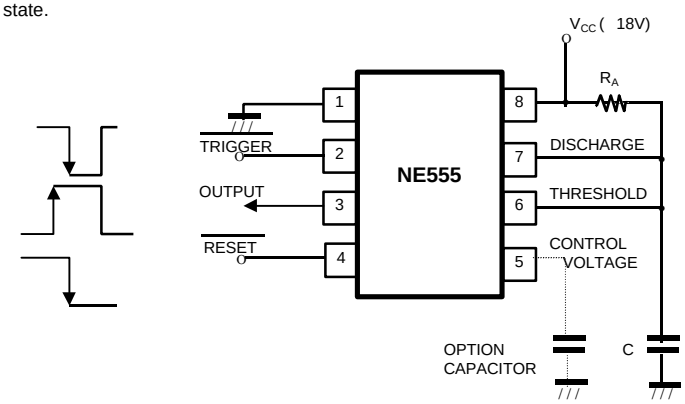


Fig. 2. Monostable Operation

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