

# M51848/M5E555A

SINGLE TIMER

## DESCRIPTION

The M51848/M5E555A monolithic timing circuits are highly stable controllers capable of producing accurate time delays, or oscillation. Additional terminals are provided for triggering or resetting. In the time delay mode, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, both the free running frequency and the duty cycle are accurately controlled by two external resistors and capacitor. In this operation, the maximum frequency is 100kHz. The circuit will trigger and reset on falling waveforms. The reset voltage is about 1.4V and is compatible with TTL level. The output structure can source or sink up to 200mA or drive TTL circuits.

## FEATURES

- Timing from microseconds through minutes
- Operates in both astable and monostable modes
- Adjustable duty cycle
- High current output can source or sink 200mA
- Maximum frequency is 100kHz
- Reset voltage is about 1.4V for TTL level
- Built in power on reset
- Interchangeable with the signetics NE555 in pin configuration and characteristics

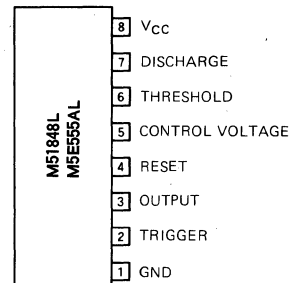
## APPLICATIONS

- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Missing pulse detector
- Precision timing
- Pulse generation

## RECOMMENDED OPERATING CONDITIONS

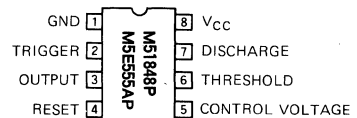
Supply voltage..... 4~17V  
 Rated supply voltage..... 6V, 12V

### PIN CONFIGURATION (TOP VIEW)

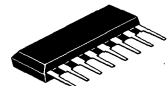
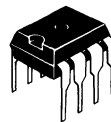


Outline 8P5

### PIN CONFIGURATION (TOP VIEW)



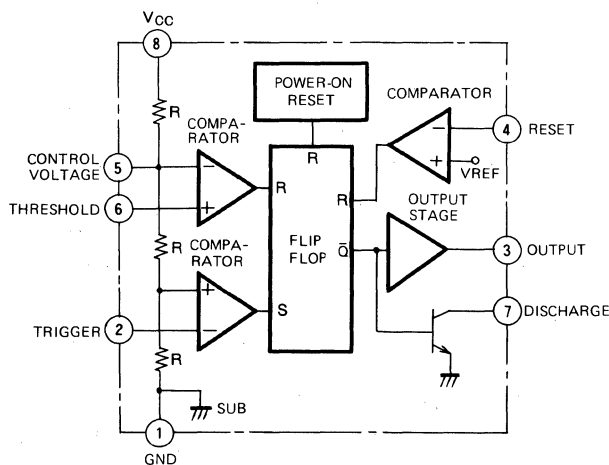
Outline 8P4



8-pin plastic DIL package

8-pin plastic SIL package

## BLOCK DIAGRAM



**MITSUBISHI LINEAR ICs**  
**M51848/M5E555A**

**SINGLE TIMER**

**ABSOLUTE MAXIMUM RATINGS** ( $T_a=25^{\circ}\text{C}$ , unless noted)

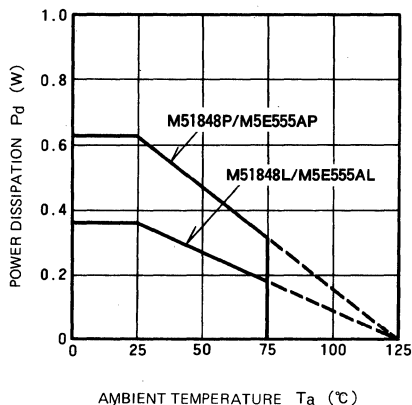
Symbol	Parameter	Conditions	Limits	Unit
$V_{CC}$	Supply voltage		18	V
$I_o$	Output current		200	mA
$P_d$	Power dissipation		360(SIL)	mW
			625(DIL)	mW
$T_{opr}$	Operating ambient temperature		$-20\sim+75$	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature		$-40\sim+125$	$^{\circ}\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_a=25^{\circ}\text{C}$ , unless otherwise noted)

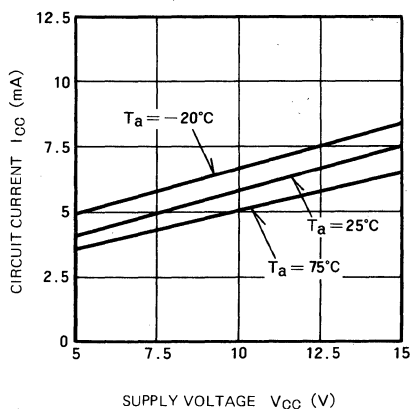
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{CC}$	Supply voltage		4		17	V
$I_{CC}$	Circuit current	$V_{CC}=5\text{V}$ , No load		3	5.5	mA
		$V_{CC}=15\text{V}$ , No load		7	10	mA
$V_{CNT}$	Control voltage	$V_{CC}=5\text{V}$	2.6	3.3	4	V
		$V_{CC}=15\text{V}$	9	10	11	V
$V_{TH}$	Threshold voltage			$\frac{2}{3}V_{CC}$		V
$I_{TH}$	Threshold current			0.05	0.3	$\mu\text{A}$
$V_T$	Trigger voltage			$\frac{1}{3}V_{CC}$		V
$I_T$	Trigger current			0.1	0.5	$\mu\text{A}$
$V_R$	Reset voltage		1.0	1.4	2.0	V
$I_R$	Reset current			0.05	0.2	$\mu\text{A}$
$V_{OL}$	Low output voltage	$V_{CC}=5\text{V}$ , $I_{sink}=5\text{mA}$		0.05	0.2	V
		$V_{CC}=15\text{V}$ , $I_{sink}=10\text{mA}$		0.05	0.2	V
		$V_{CC}=15\text{V}$ , $I_{sink}=50\text{mA}$		0.2	0.5	V
		$V_{CC}=15\text{V}$ , $I_{sink}=100\text{mA}$		0.5	2.0	V
$V_{OH}$	High output voltage	$V_{CC}=5\text{V}$ , $I_{source}=100\text{mA}$	2.8	3.3		V
		$V_{CC}=15\text{V}$ , $I_{source}=100\text{mA}$	12.8	13.3		V
$f_{max}$	Maximum frequency	$R_a=R_b=2\text{k}\Omega$ , $C_a=200\text{pF}$	100			kHz

**TYPICAL CHARACTERISTICS**

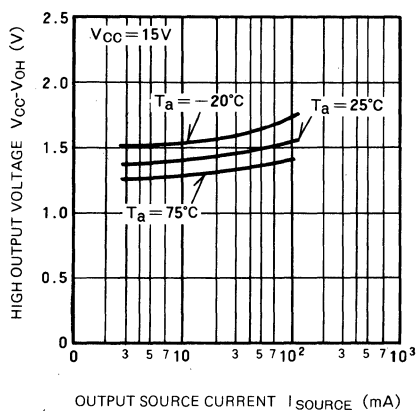
**THERMAL DERATING  
 (MAXIMUM RATING)**



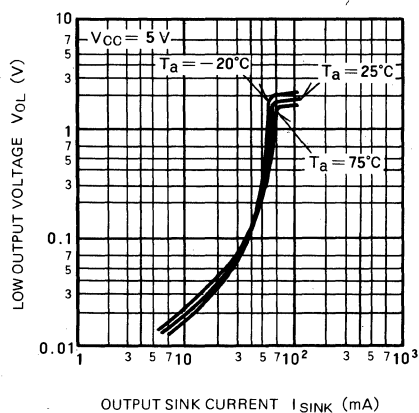
**SUPPLY VOLTAGE VS  
 CIRCUIT CURRENT**



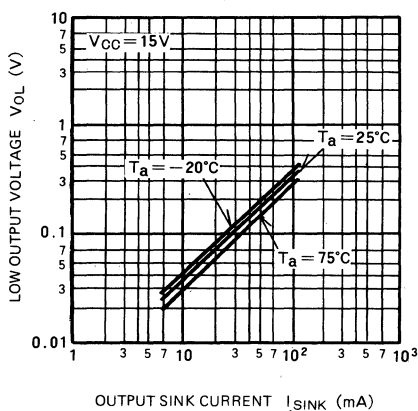
**HIGH OUTPUT VOLTAGE VS  
 OUTPUT SOURCE CURRENT**



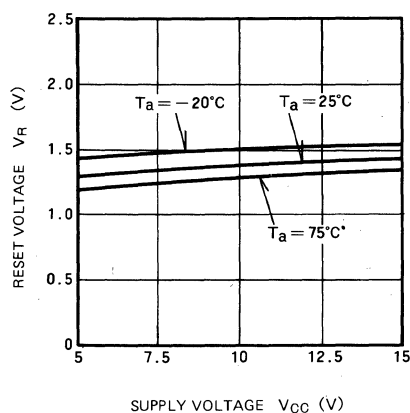
**LOW OUTPUT VOLTAGE VS  
 OUTPUT SINK CURRENT**

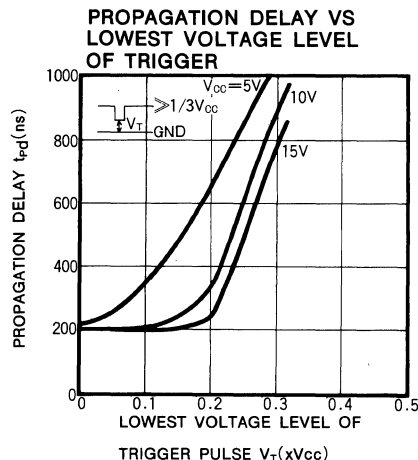
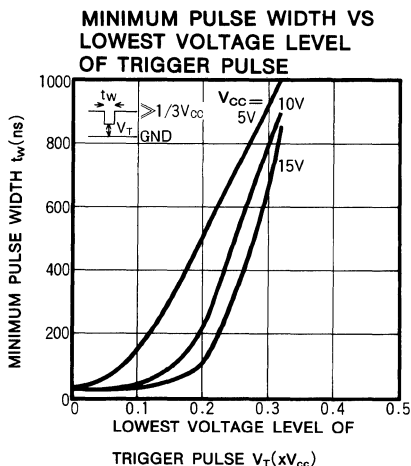


**LOW OUTPUT VOLTAGE VS  
 OUTPUT SINK CURRENT**



**SUPPLY VOLTAGE VS  
 RESET VOLTAGE**





**APPLICATIONS**

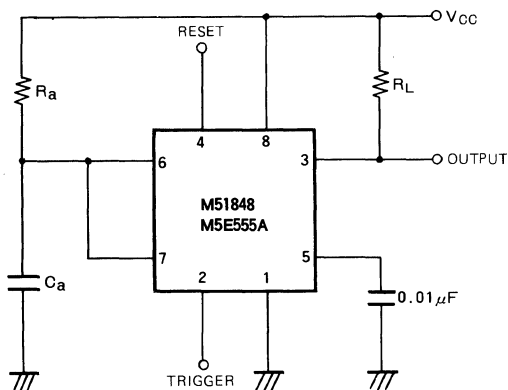
**Monostable operation**

In this mode operation, timer functions an one-shot. The external capacitor is initially held discharged by a transistor internal to the timer. Applying a negative trigger pulse to Pin ② sets the flip-flop, driving the output high and releasing the short-circuit across the external capacitor. The voltage across the capacitor increases with the time constant  $\tau = R_a \cdot C_a$  to  $2/3 V_{CC}$ , where the comparator resets the flip-flop and discharges the external capacitor. The output is now in the low state. The circuit triggering

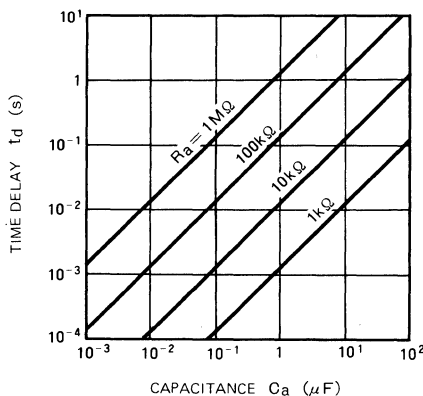
takes place when the negative going trigger pulse reaches  $1/3 V_{CC}$  and the circuit stays in the output high state until the set time elapses. The time the output remains in the high state is  $1.1 R_a \cdot C_a$  and can be determined by the graph. A negative pulse applied to Pin ④ during the timing cycle over again beginning on the positive going edge of the reset pulse. If reset function is not used, Pin ④ should be connected to  $V_{CC}$  to avoid false resetting. The delay time is given by:

$$t_d = 1.1 R_a \cdot C_a$$

**Monostable multivibrator**



**TIME DELAY VS  $R_a, C_a$**



**Astable operation**

With the circuit connected as shown and it will trigger itself and free run as a multivibrator. The external capacitor charges through  $R_a$  and  $R_b$  and discharges through  $R_b$  only.

Through the duty cycle is set by the ratio of these two resistors, and the capacitor charges and discharges between  $1/3 V_{CC}$  and  $2/3 V_{CC}$ .

Charge and discharge times, and therefore frequency, are independent of supply voltage. The free running fre-

quency versus  $R_a, R_b$  and  $C_a$  is shown in the graph. The charge time (output high) is given by:

$$t_1 = 0.693 (R_a + R_b) \cdot C_a$$

and discharge time (output low) by:

$$t_2 = 0.693 R_b \cdot C_a$$

Through the free running frequency is given by:

$$f = 1/(t_1 + t_2) \\ = 1.44 / \{(R_a + 2R_b) \cdot C_a\}$$

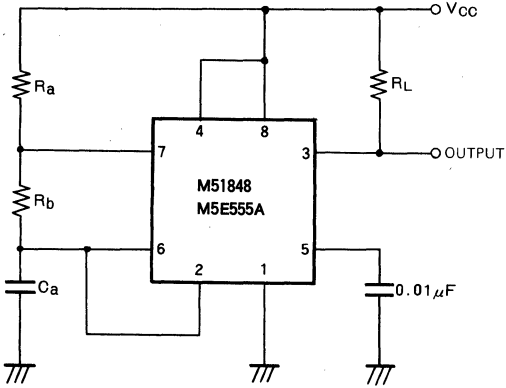
and the duty cycle by:

$$D = R_b / (R_a + 2R_b)$$

# M51848/M5E555A

## SINGLE TIMER

### Astable multivibrator



### FREE RUNNING FREQUENCY VS $R_a$ , $R_b$ and $C_a$

