

MITSUBISHI <LINEAR ICs>  
**M51849L,FP**

**COUNTER TIMER**

**DESCRIPTION**

The M51849 is a semiconductor integrated circuit designed for controller of long time delay, consisting of 11 stage divider by ILL. The time base period of oscillator is extended 1024 times, determining by the 11 stage divider by ILL, and the maximum output period is 10 hours.

**FEATURES**

- Timing from 100ms through 10 hr max
- High current output can sink (30mA peak)
- Built-in stabilization zener
- Built-in power on reset

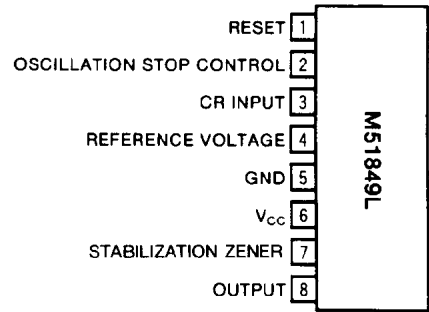
**APPLICATION**

Precision timing, time delay generation, Ultra-low-frequency oscillator

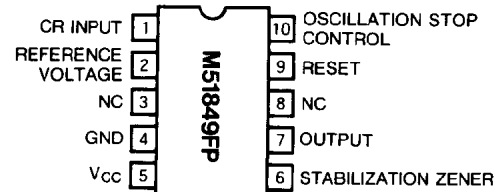
**RECOMMENDED OPERATING CONDITIONS**

Supply voltage .....  $5V \sim V_z$  ( $V_z = \text{pin } \textcircled{7}$  Zener voltage)  
 Rated supply voltage .....  $6V \pm 10\%$

**PIN CONFIGURATION (TOP VIEW)**



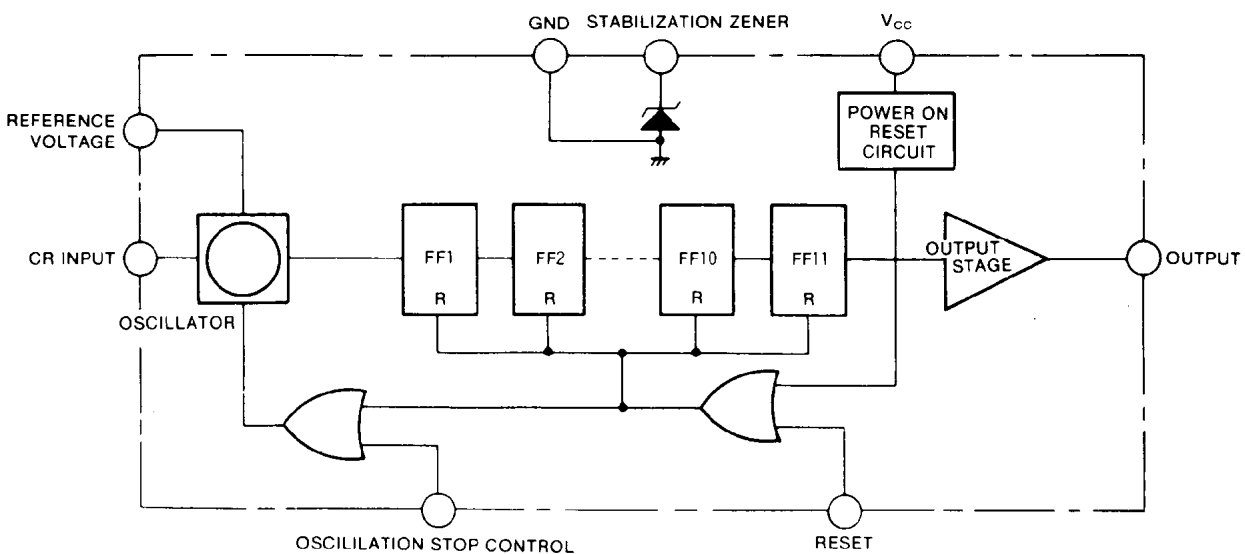
**Outline 8P5**



**Outline 10P2-C**

NC : NO CONNECTION

**BLOCK DIAGRAM**



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

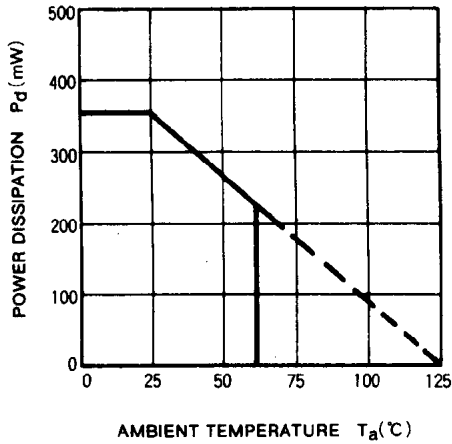
Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC}$	Supply voltage		7.0	V
$I_Z$	Zener current		20	mA
$I_O$	Output sink current		30	mA
$P_D$	Power dissipation		360 (L/FP)	mW
$K_{\theta}$	Thermal derating	$T_a \geq 25^{\circ}\text{C}$	3.6 (L/FP)	mW/ $^{\circ}\text{C}$
$T_{opr}$	Operating temperature		0~+60	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature		-40~+125	$^{\circ}\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_a=25^{\circ}\text{C}$ ,  $V_{CC}=6\text{V}$  unless otherwise noted)

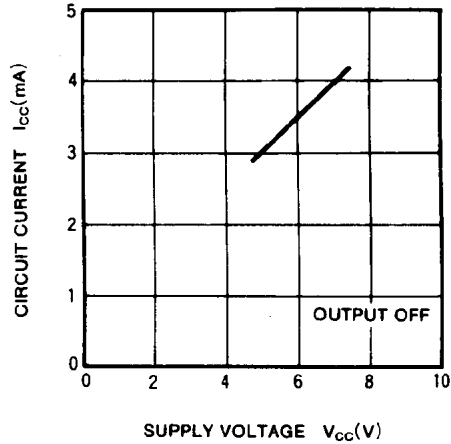
Symbol	Parameter	Test condition	Limits			Unit
			Min	Typ	Max	
$I_{CC}$	Circuit current	$V_{CC}=6.0\text{V}$		3.5	6.0	mA
$V_Z$	Zener voltage	$I_Z=1\text{mA}$	6.0	6.4	6.8	V
$V_R$	Reset voltage			1.5	1.8	V
$I_R$	Reset current			0.1		mA
$V_{OS}$	Oscillation stop voltage			1.6	1.9	V
$I_{OS}$	Oscillation stop input current			0.1		mA
$V_{OH}$	High output voltage	$I_{source}=10\text{mA}$	4.0	4.5		V
$V_{OL}$	Low output voltage	$I_{sink}=10\text{mA}$		0.2	0.6	V
—	Disposition possible time		100			ms
—	Timing accuracy			5.0		%
—	Temperature coefficient			500		ppm/ $^{\circ}\text{C}$
—	Supply voltage rejection ratio			0.1		%/V
—	rise time			150		ns

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

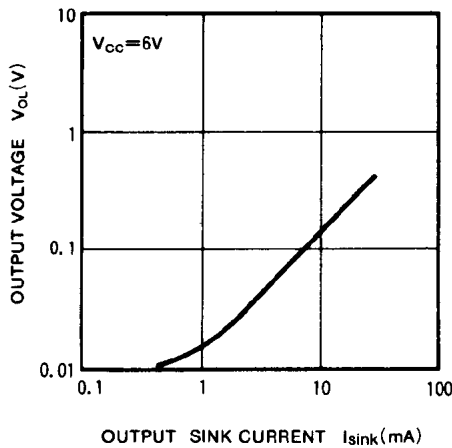
**THERMAL DERATING  
(MAXIMUM RATING)**



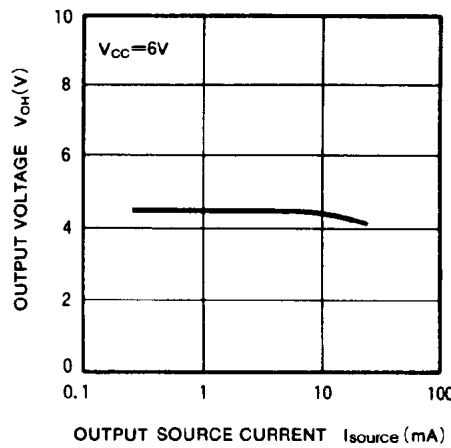
**CIRCUIT CURRENT VS.  
SUPPLY VOLTAGE**



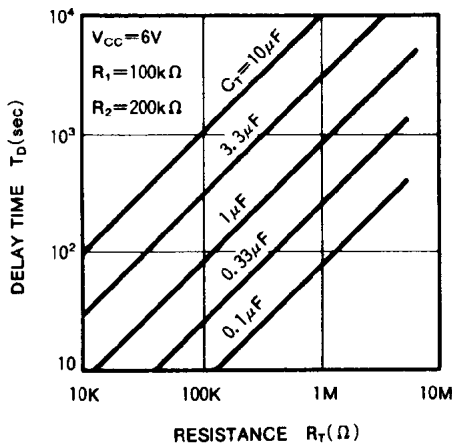
**OUTPUT VOLTAGE VS.  
OUTPUT SINK CURRENT**



**OUTPUT VOLTAGE VS.  
OUTPUT SOURCE CURRENT**



**RESISTANCE VS. DELAY TIME**



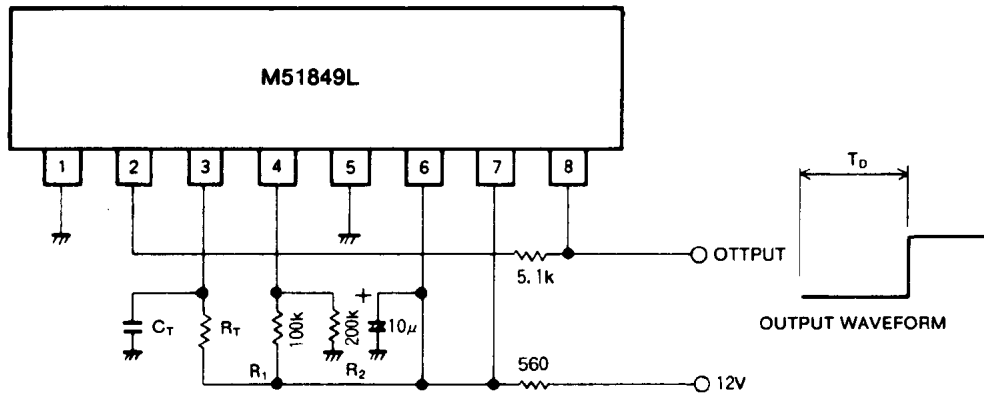
**PIN DESCRIPTION**

1. Reset pin <pin①(L), pin⑨(FP)>  
 This pin is used to stop counter operation. If the pin is in the high state, the counter is cleared and oscillation is stopped. Connect this pin to GND, if not used.
2. Oscillation stop control pin <pin②(L), pin⑩(FP)>  
 If the pin is in the high state, the oscillation stops. But the status of counter is not maintained, and therefore, if the pin is reset to the low state, timing operation is resumed. Connect the pin to GND, if not used.
3. CR input pin <pin③(L), pin①(FP)>  
 The capacitor  $C_T$  and resistor  $R_T$  are connected to this pin. The oscillation period is given in the following equation. The resistor  $R_T$  should be  $1k\Omega$  or above.
4. Reference voltage pin <pin④(L), pin②(FP)>  
 The highest voltage for the oscillation level is supplied at this pin. The voltage should be set at approximately 2/3

- $V_{CC}$  by a variable resistor or resistor division ( $R_1, R_2$ ). The capacitor  $C_T$  is corrected by minutely adjusting this voltage by a variable resistor. The voltage can be set between 0.4V to 0.8V. The oscillator may not function if the voltage is outside this range.
5. Stabilization zener pin <pin⑦(L), pin⑥(FP)>  
 A zener diode of approximately 6.4V is connected between this pin and pin⑤ (GND). Set the resistance so that the zener current is 5mA.
6. Output pin <pin⑧(L), pin⑦(FP)>  
 The output voltage changes from the low state to the high state when the oscillation period is 1024 times of  $T_0$ , and the voltage returns from the high state to the low state when the period is 2048 times for one cycle. The voltage can sink or source up to 10mA(typ.). Care must be taken in power supply variation in the integrated circuit when the output load current is large.

**APPLICATION EXAMPLE**

**Monostable operation**



The delay time in the above application example is given by :  
 $T_D \approx 800C_T \cdot R_T(\text{sec})$   
 The timing resistor  $R_T$  should be  $1k\Omega$  or above.

**Precautions for use**

1. CR input pin <pin③(L), pin①(FP)> must not be directly connected to  $V_{CC}$  to avoid destruction of the integrated circuit.
2. Timing accuracy should be fine-tune to use external resistor series with  $R_T$  when that need less than  $\pm 5\%$ .
3. This integrated operates at ultra-low supply voltage. Therefore it is very sensitive to external noise and is subject to misoperation. A capacitor must be connected near the  $V_{CC}$  pin <pin⑥(L), pin⑤(FP)> to avoid noise.