

Remaining Battery Power Display Monolithic IC MM1251, MM1252, MM1253

Outline

This IC detects battery voltage and displays the power remaining in the battery. Display of the battery's remaining power is an indispensable function for portable equipment. The use of this IC makes this display easily achievable.

The usual method of display of remaining battery power, as in the MM1206, is three marks lighting up in sequence on an LED or other display. This IC, however, uses only one light to display the remaining battery power, resulting in lower cost.

Features

1. Adjustable flashing speed
2. Adjustable detection voltage supports all settings
3. Adjustable hysteresis voltage enables response to large ripple settings
4. High precision voltage detection (MM1253) enables support of sets using nickel cadmium and other batteries
5. The LED can be lit up by the voltage from one battery (type of special built-in step-up circuit : rank B)

Package

SOP-8D (MM1251AF, MM1251BF, MM1252AF, MM1252BF, MM1253AF)

Series Description

	Display Pattern		Detection Precision
	Normal	Low Power	
MM1251	Light Off	Flashing	±30mV
MM1252	Light On	Flashing	±30mV
MM1253	Light Off	Flashing	±9mV

Absolute Maximum Ratings (Ta=25°C)

Item	Rating	Unit
Storage temperature	-40~+125	°C
Operating temperature	-20~+70	°C
Input voltage	-0.3~+3	V
Output Terminal Applied Voltage	-0.3~+7	V
Allowable loss	300	mW

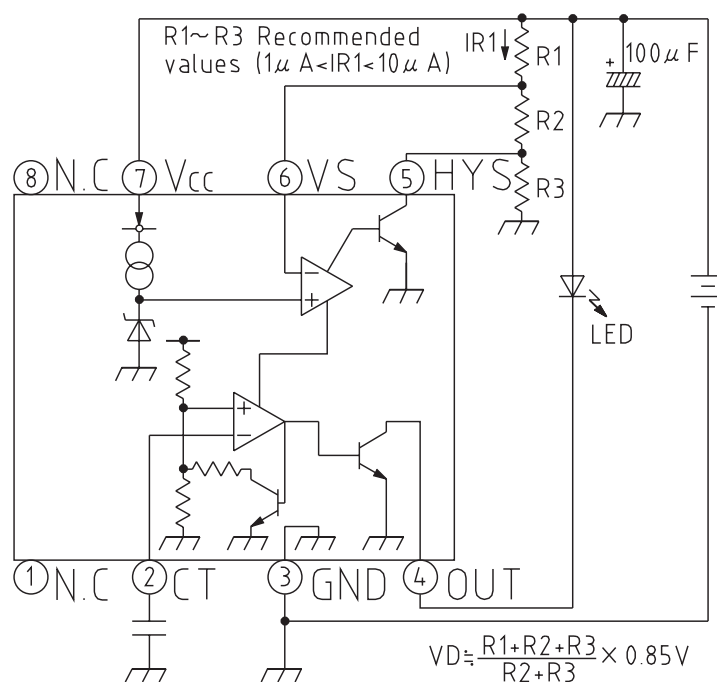
Electrical Characteristics

(Unless otherwise specified Ta=25°C, Vc=1.5V, Vs=0.8V)
(Applicable to all models when the model name is left blank.)

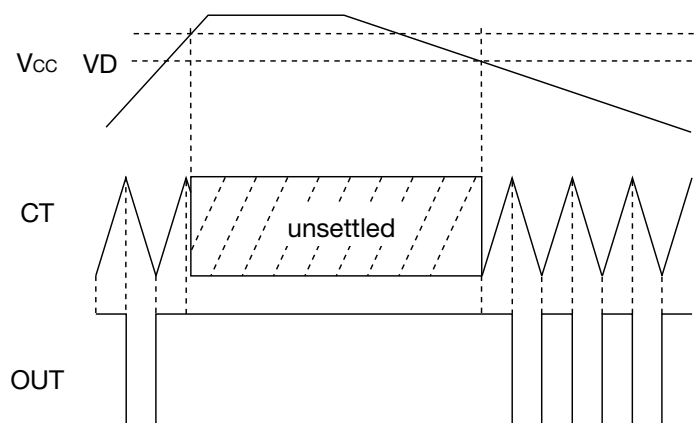
Item	Symbol	Measurement Conditions	Min.	Typ.	Max.	Unit
Current consumption 1	I _{CC1}	V _S =1.0V		25	40	μA
		V _{CT} =0.4V		0.15	0.25	mA
Current consumption 2	I _{CC2}	V _S =0.8V, V _{CT} =0.4V	MM1251A	0.15	0.25	mA
			MM1253A			
			MM1251B	25	40	μA
Detection voltage	V _D	V _S =1V→0.5V V _{HYS} ≤ 0.1V	MM1251	0.82	0.85	0.88
			MM1252			
			MM1253	0.841	0.85	0.859
Detection voltage temperature factor		ΔV/ΔT			±200	PPM/°C
HYS pin saturation voltage 1	V _{HYS1}	I _{HYS} =5μA		25	50	mV
HYS pin saturation voltage 2	V _{HYS2}	I _{HYS} =25μA		50	100	mV
C _T pin charge current	I _{CTS}	V _{CT} =0.1V		-60	-40	-20
C _T pin discharge current	I _{CTO}	V _{CT} =0.4V		20	40	60
C _T pin threshold value H	V _{CTH}	V _{CT} =0.1→0.4, V _O ≤ 0.1V		0.2	0.3	0.4
C _T pin threshold value L	V _{CTL}	V _{CT} =0.4→0.1, V _O ≥ 0.1V		0.1	0.2	0.3
Output sink current	I _{OUT}	V _{CR} =0.4V		5	10	
Output saturation voltage	I _{OUTL}	V _{CT} =0.4, I _{OUT} =1mA		100	150	
Output leak current	I _{LE}	V _S =1V, V _{OUT} =5V			1	
Operating limit voltage	V _{OPR}	V _S =0.8×V _{CC} V _{OUT} >0.4V	Rank A	0.65	0.75	
Step-up operation limit voltage	V _{OPL}	V _S =0.8×V _{CC} V _{CC} =0.1V→0.5V Voltage limit for maintaining LED flashing	Rank B	0.85	0.95	

MM1251A/MM1253A

Application Circuit

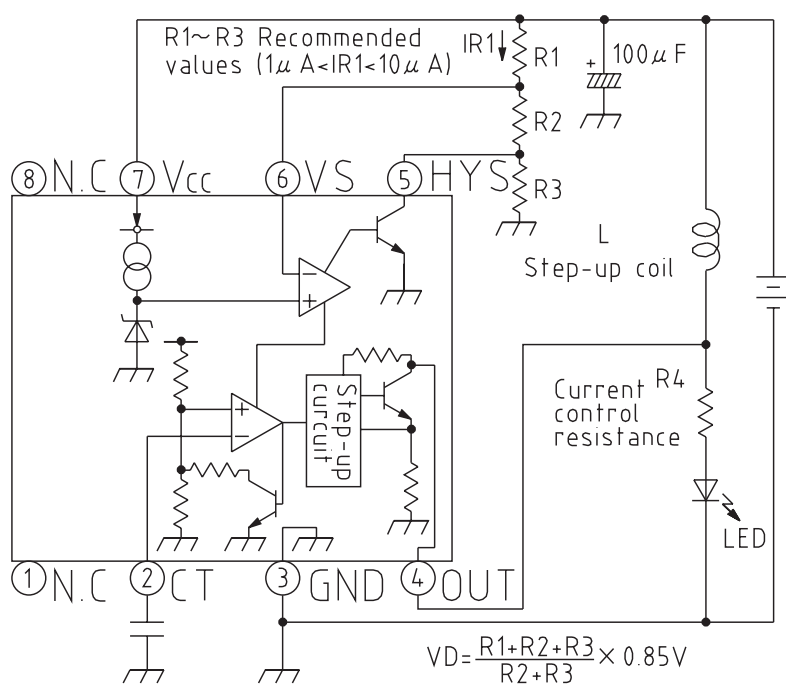


Timing Chart

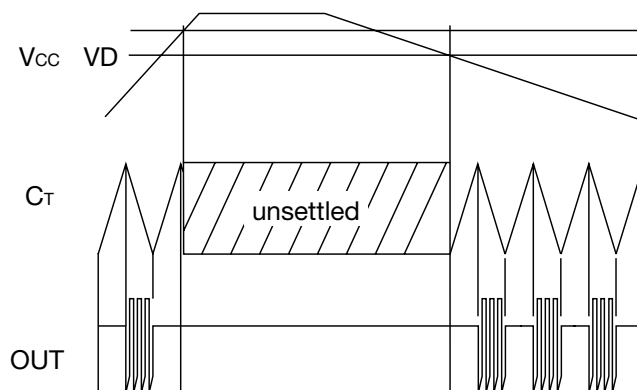


MM1251B

Application Circuit

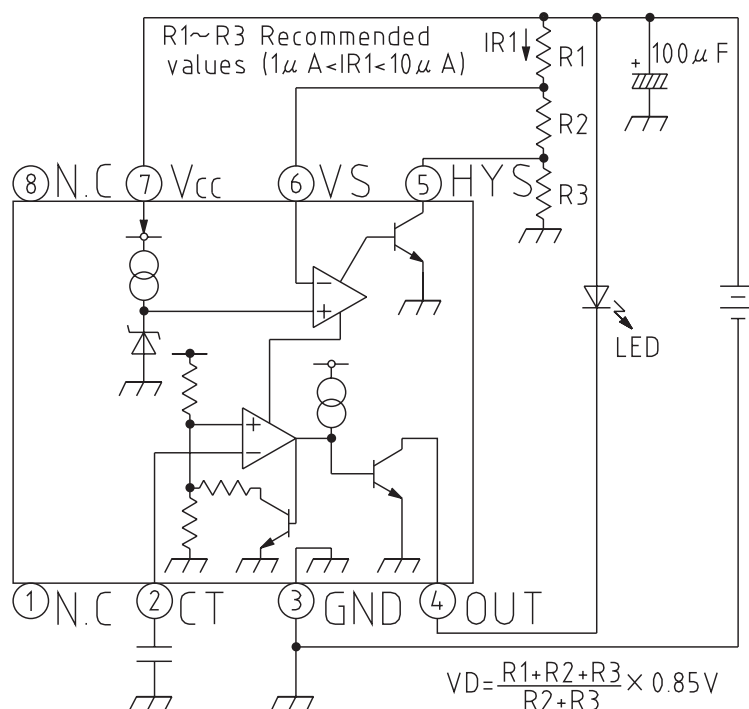


Timing Chart

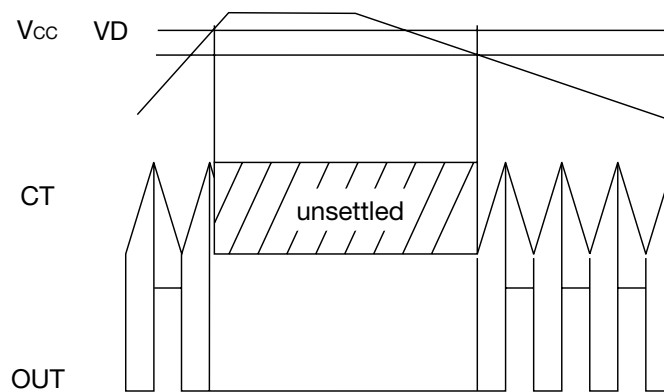


MM1252A

Application Circuit

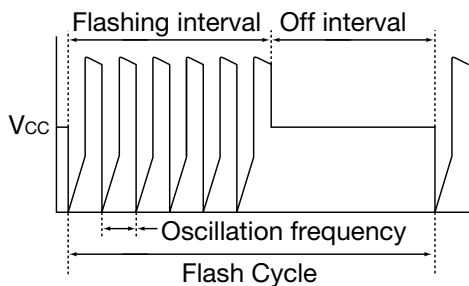


Timing Chart

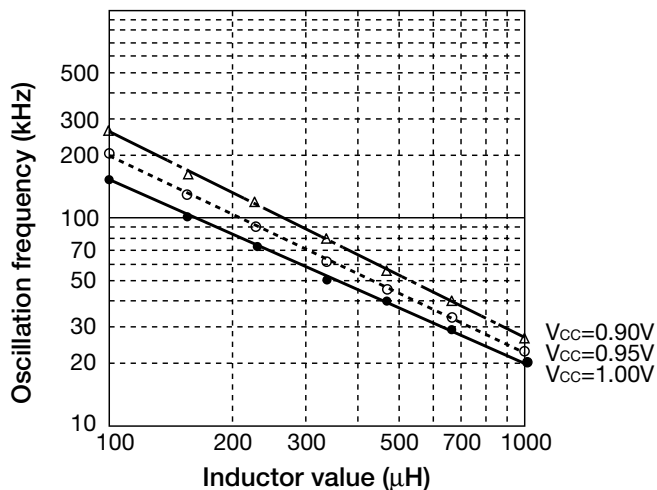


Step-up (Rank B) Type Inductor Values

This circuit allows step-up for LED lighting even when low only. The LED repeats On/Off at high frequency, but to the human eye it appears as if the LED is lit. Therefore, we do not recommend the use of this step-up circuit in other circuits.



Inductor Value-Oscillation Frequency Characteristics (reference data)



Note : The above data are reference values. Please set constants using a $\pm 50\%$ variance.