Remaining Battery Power Display
Monolithic IC MM1305

Outline

This IC detects battery voltage and displays the power remaining in the battery. Portable equipment is becoming more and more popular, and one standard function of this type of equipment is remaining battery power display. This IC has four threshold voltages built in. Since their respective detection circuits share the reference voltage on one chip, the detection voltage for each lags in the same direction. Thus, there is much smaller error as compared to the reciprocal error resulting from combining single circuits.
Also, the stepped display of remaining battery power as in nickel cadmium, nickel hydrogen and lithium ion batteries is enabled through super high precision voltage detection of ±1%.

Features

1. A separate line-up of detection voltages for alkaline magnesium and nickel cadmium and nickel hydrogen batteries.
   Alkaline magnesium : 1.350V /1.285V /1.200V /1.100V
   Nickel cadmium, nickel hydrogen : 1.275V /1.245V /1.205V /1.100V
2. Super high precision detection voltage : ±1% typ.
3. Low current consumption : Waiting : 1.5µA
   Detection : 12µA
4. Ripple absorption pin
   Enables continuous ripple absorption and suppresses detection errors.
5. Built-in hysteresis voltage

Package

VSOP-8A (MM1305XW, MM1305AW, MM1305BW)

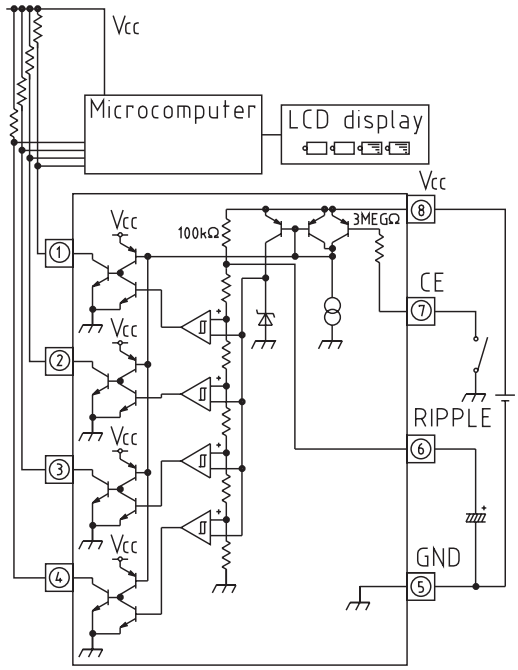
Absolute Maximum Ratings

Item	Specification	Unit
Storage temperature	–40~+125	°C
Operating temperature	–20~+70	°C
Input voltage	5	V
Output pin voltage	5	V
Allowable loss	300	mW

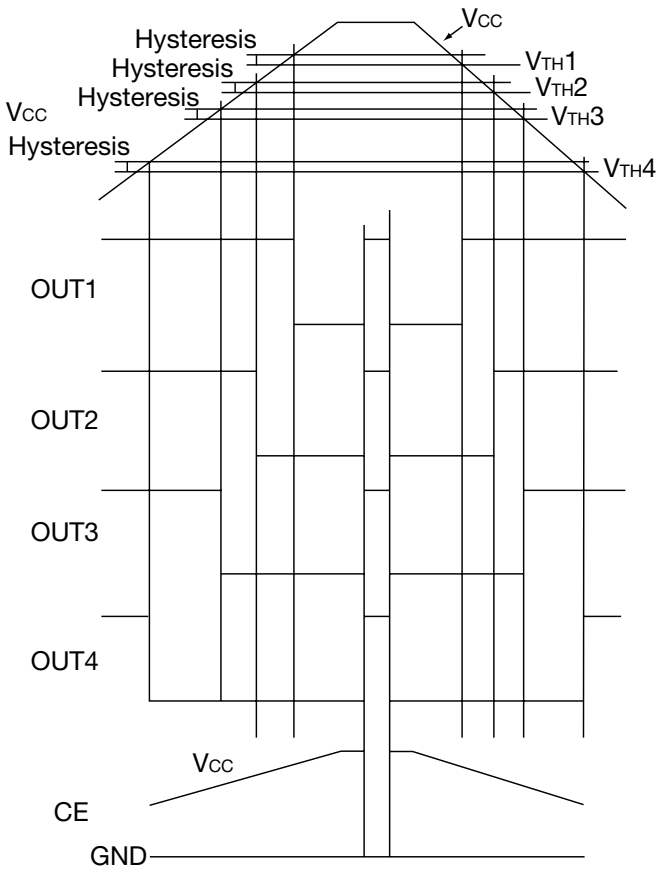
Electrical Characteristics (Unless otherwise specified Ta=25°C, V_{CC}=1.5V)

Item		Measurement Conditions		Min.	Typ.	Max.	Unit
Current consumption					12.0	8.0	µA
Current consumption during waiting		V_{CC}=1.3V, CE pin=L			1.5	2.5	µA
Detection voltage	1	Rank A	V_{CC}=H→L	1.330	1.350	1.370	V
	2			1.270	1.285	1.300	
	3			1.185	1.200	1.215	
	4			1.089	1.100	1.111	
	1	Rank X	V_{CC}=H→L	1.262	1.275	1.288	V
	2			1.232	1.245	1.258	
	3			1.193	1.205	1.217	
	4			1.089	1.100	1.111	
Detection voltage Difference	1	Rank A	∠$V_{TH}1=V_{TH}1-V_{TH}4$	230	250	270	mV
	2		∠$V_{TH}2=V_{TH}2-V_{TH}4$	160	185	200	
	3		∠$V_{TH}3=V_{TH}3-V_{TH}4$	85	100	115	
	1	Rank X	∠$V_{TH}1=V_{TH}1-V_{TH}2$	20	30	40	mV
	2		∠$V_{TH}2=V_{TH}2-V_{TH}3$	30	40	50	
	3		∠$V_{TH}3=V_{TH}2-V_{TH}4$	135	145	155	
Detection voltage temperature factor					±200		ppm/°C
Hysteresis voltage				10	20	35	mV
Output sink current		V_{CC}=1.3V, Output saturation voltage=0.3V		40			µA
Output saturation voltage	1	I_{SINK}=30µA			150	250	mV
	2				150	250	
	3				150	250	
	4				150	250	
Output leak voltage	1	V_{CC}=1.0V, Output saturation voltage=1.5V				1	µA
	2					1	
	3					1	
	4					1	
Power supply voltage operating limit					0.70	0.75	V
CEpin	Input H voltage	CE pin=0V		V_{CC}-0.3	V_{CC}	V_{CC}-0.3	V
	L voltage			100	300	500	nA
	L voltage			-0.3	0	-0.3	V
Ripple absorption resistance		measure resistance between pins 8pin-6pin		70	100	130	kΩ

Block Diagram, Example of Application Circuit



Timing Chart



Output

Vcc	VTH1 TH2 TH3 TH4				
OUT 1	L	H	H	H	H
OUT 2	L	L	H	H	H
OUT 3	L	L	L	H	H
OUT 4	L	L	L	L	H

CE pin

H	Operation
L	Waiting

Note : Please connect the CE pin to Vcc when not using.