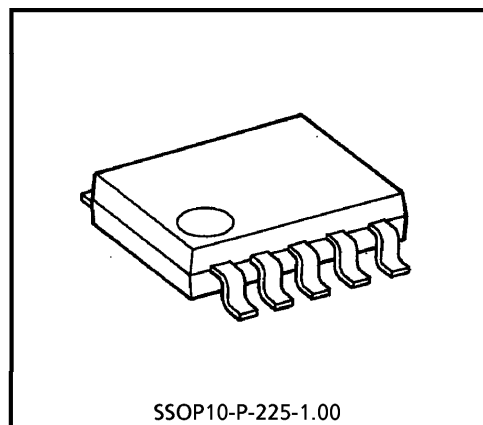


TB1022F

CR TIMER

FEATURES

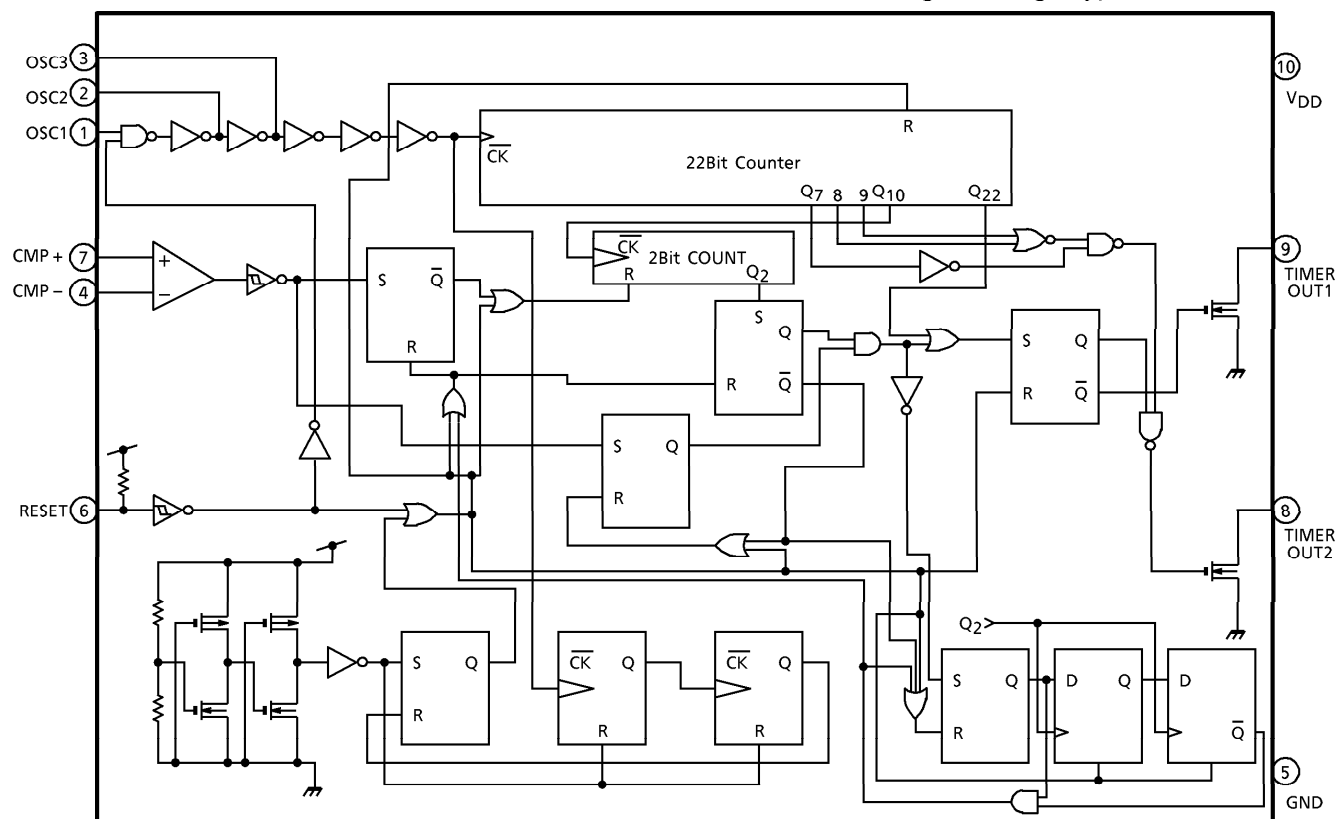
- MOS IC with 22-stage binary counter.
- Built-in initialize circuit.
- Built-in voltage detection comparator.
- Wide range timer setting.
- Low power dissipation current.
- Suitable for Ni-cd battery charger.



SSOP10-P-225-1.00

BLOCK DIAGRAM

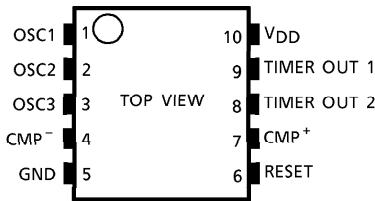
Weight : 0.1g (Typ.)



FUNCTION DESCRIPTION ON EACH TERMINAL

PIN No.	SYMBOL	FUNCTION
1	OSC1	Oscillation input terminal 1
2	OSC2	Oscillation input terminal 2
3	OSC3	Oscillation input terminal 3
4	CMP ⁻	Comparator minus (-) side input terminal "L" : Timer mode, "H" : Timer over voltage detection mode
5	GND	GND
6	RESET	Reset terminal (H→L : inside reset)
7	CMP ⁺	Comparator plus (+) side input terminal "H" : Timer mode, "L" : Timer over voltage detection mode
8	TIMER OUT2	Timer output terminal 2 (N-ch open drain, sink max. 5mA)
9	TIMER OUT1	Timer output terminal 1 (N-ch open drain, sink max. 5mA)
10	V _{DD}	System power supply

PIN CONNECTION

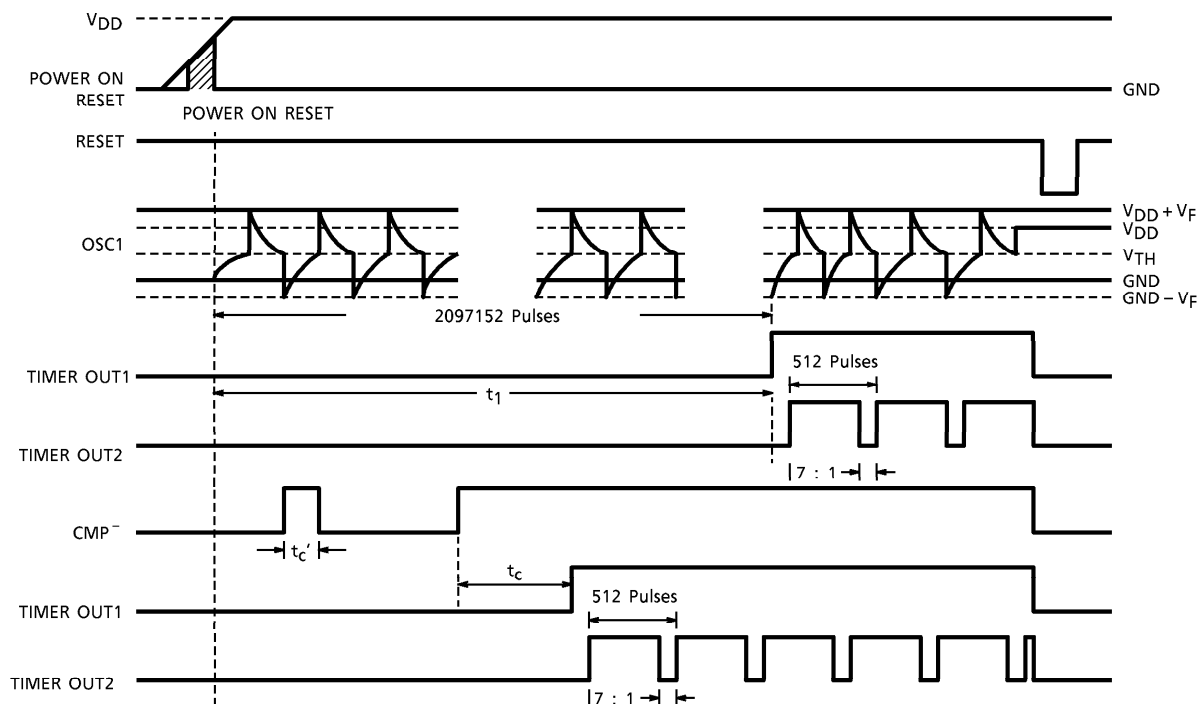


TRUTH TABLE

MODE	INPUT			OUTPUT
	RESET	CMP ⁺	CMP ⁻	
1	L	(*)	(*)	L
2	H	H	L	Timer Mode
3	H	L	H	Timer over voltage detecting Mode

(*) : H or L
Turning the power supply on, "Power on Reset" is operated and output level is "L".

TIMING CHART



(*) : $t_c' < t_c$ at CMP⁻ input "H" Level cancelled

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V _{DD}	- 0.3~7.0	V
Power Dissipation	P _D	250~300	mW
Operating Temperature	T _{opr}	- 20~75	°C
Storage Temperature	T _{stg}	- 55~125	°C
Electrostatic Discharge	ESD (*)	± 200	V
Latch Up Current	—	± 10	mA

(*) : C = 200pF, R = 0Ω, one time discharge

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = 25 ± 1.5°C, V_{DD} = 5.0V)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V _{opr}	—	—	4.0	5.0	6.0	V
Oscillation Frequency Characteristic	Δf _{osc1}	—	1H C = 4700pF, R = 254.9kΩ, V _{DD} = 5V (f = 582.5Hz)	—	—	10	%
	Δf _{osc2}	—	60s C = 1000pF, R = 17.2kΩ, V _{DD} = 5V (f = 34.9kHz)	—	—	15	
			8H C = 0.01μF, R = 996.7kΩ, V _{DD} = 5V (f = 72.8Hz)		—		

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Dissipation Current	1	I _{QD}	—	CR OSC. stopping (at reset) V _{DD} = 6V	—	—	130	μ A
	2	I _{DD}	—	CR OSC. operating (at 60s setting)	—	—	700	
Power on Reset Release Voltage		V _{thH}	—	V _{DD} rise time	1.4	2.5	3.5	V
		V _{thL}	—	40 μ s / V	1.4	2.5	3.5	

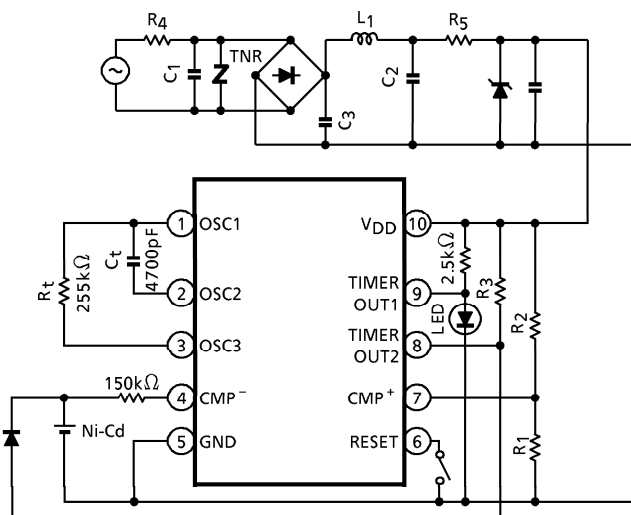
DC CHARACTERISTICS

1. Oscillation Input							
OSC1 Leak Current	I _{IH OSC}	—	V _{IN} = 5.0V	– 1.0	—	1.0	μA
OSC1 Leak Current	I _{IL OSC}	—	V _{IN} = 0V	– 1.0	—	1.0	μA
2. CMP Terminal							
CMP Offset Voltage	V _{Off}	—	V _{DD} = 5V	– 30	—	30	mV
Offset Supply Voltage Change	ΔV _{Off}	—	V _{DD} = 4~6V	– 10	—	10	mV
CMP ⁺ , CMP ⁻ Leak Current	I _{IH CMP⁺, -}	—	V _{IN} = 5.0V	– 1.0	—	1.0	μA
	I _{IL CMP⁺, -}		V _{IN} = 0V	– 1.0	—	1.0	
Input Dynamic Range	—	—	—	0	—	V _{DD} – 2.5	V
3. Reset Terminal							
Leak Current	I _{IHR}	—	V _{IN} = 5.0V	– 1.0	—	1.0	μA
Input Pull Up Resistance	R ₃	—	—	490	700	910	kΩ
4. Timer OUT1, 2 Terminal							
Timer Out1, 2 Sink Current	I _{TS}	—	V _{OL} = 0.3V	—	—	5	mA
Timer Out Offleak Current	I _{TLH1, 2}	—	V _{IN} = 0~5.0V	– 1.0	—	1.0	μA

FUNCTION CHARACTERISTICS

Timer 1 Precision (TIMER OUT1)	ΔT_1	—	C = 4700pF, R = 254.9k Ω , V _{DD} = 5V (1H)	—	—	10	%
	ΔT_2	—	C = 1000pF, R = 17.2k Ω , V _{DD} = 5V (60s)	—	—	15	
			C = 0.01 μ F, R = 966.7k Ω , V _{DD} = 5V (8H)		—		
CMP Detecting Timer Precision	t _c	—	C = 4700pF, R = 254.9k Ω , V _{DD} = 5V (1H) Typ. = 3.5s	– 50	—	50	%
Timer 2 Precision (TIMER OUT2)	Duty	—	C = 4700pF, R = 254.9k Ω , V _{DD} = 5V (1H)	0.85 : 7.15	1 : 7	1.15 : 6.85	—
	Frequency			0.967	1.137	1.308	Hz

1 hour setting


$$T = 2^{21} \cdot C_t \cdot R_t \cdot \ln \left\{ \frac{V_{DD}^2 - V_f^2}{V_{TH} (V_{DD} - V_{TH})} \right\}$$
 $C_t \text{ (F)}$ $R_t(\Omega)$

$V_{TH} = 1.95$ (V) : Voltage of OSC. first stage circuit

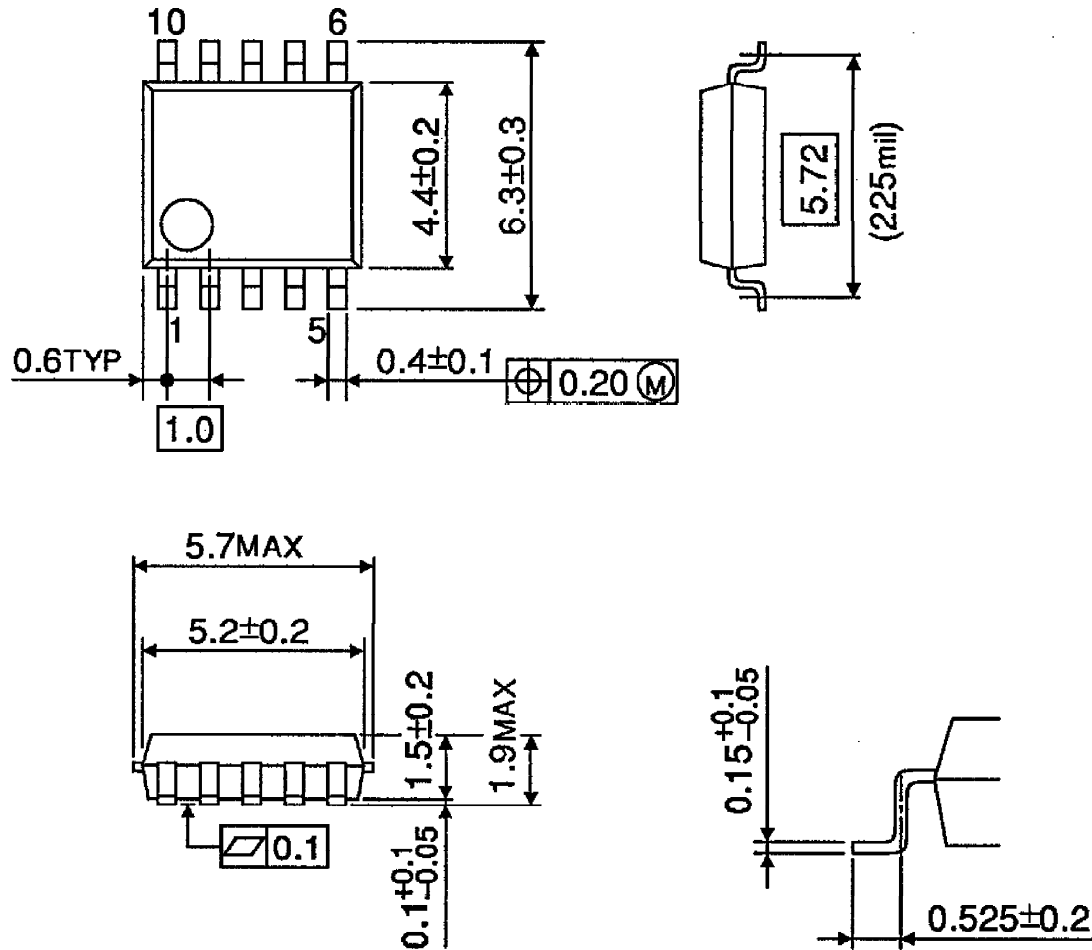
$V_f = 0.7$ (V) : Voltage of input protection diode (1Pin)

(*) Recommendation of timer setting

TIMER SET UP	R _t	C _t
About 60s	17.2.kΩ	1000pF
About 1Hour	254.9.kΩ	4700pF
About 8Hour	966.7.kΩ	0.01μF

PACKAGE DIMENSIONS
SSOP10-P-225-1.00

Unit : mm



Weight : 0.1g (Typ.)

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000707EBA

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