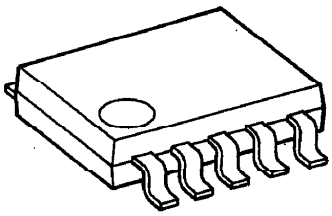
TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TB1012F

CR TIMER

FEATURES

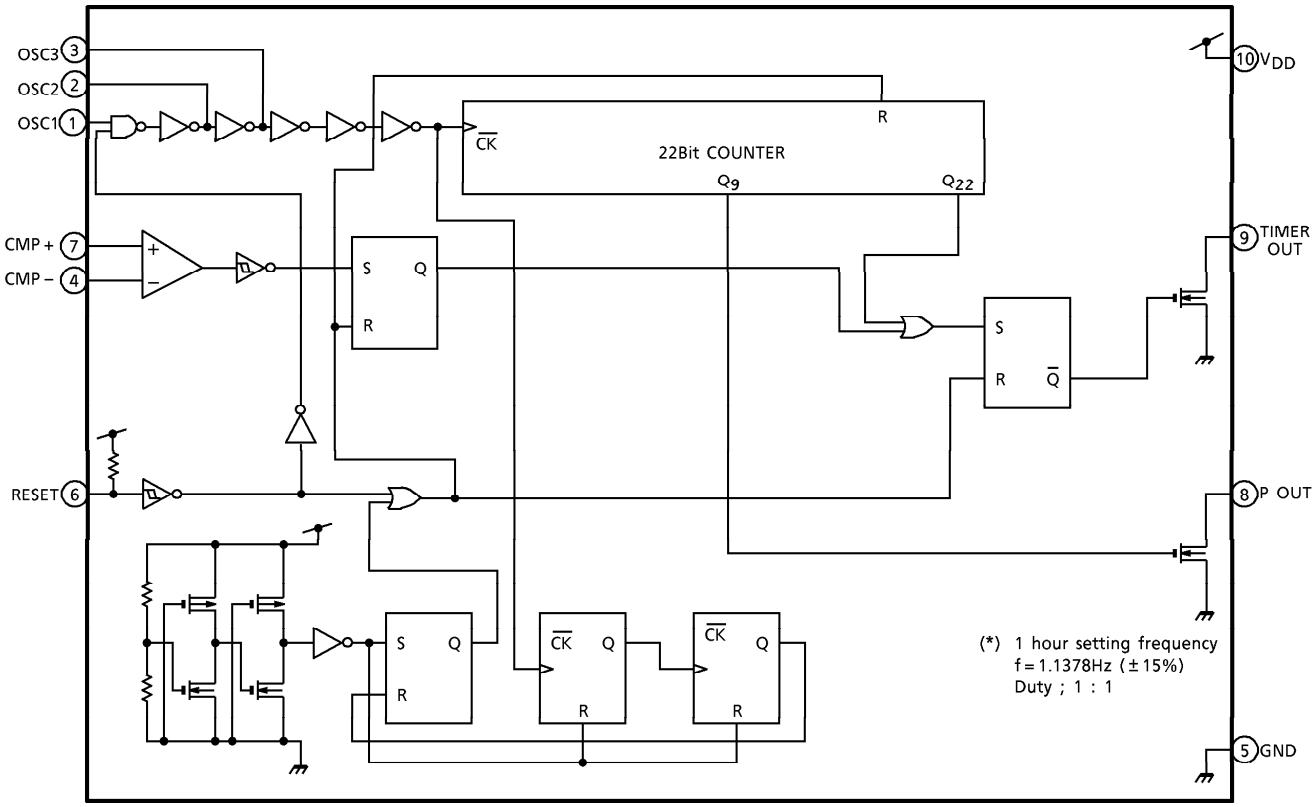
- MOS IC with 22-stage binary counter.
- Built-in initialize circuit.
- Built-in voltage detection comparator.
- Wide range timer setting.
- Low power dissipation current.
- Suitable for Ni-cd battery charger.



SSOP10-P-225-1.00

Weight : 0.1g (Typ.)

BLOCK DIAGRAM

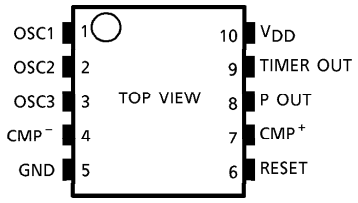


961001EBA2

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	P Out	Pulse output terminal (N-ch open drain, sink max. 5mA)
9	TIMER OUT1	Timer output terminal (N-ch open drain, sink max. 5mA)
10	V_{DD}	System power supply

PIN CONNECTION



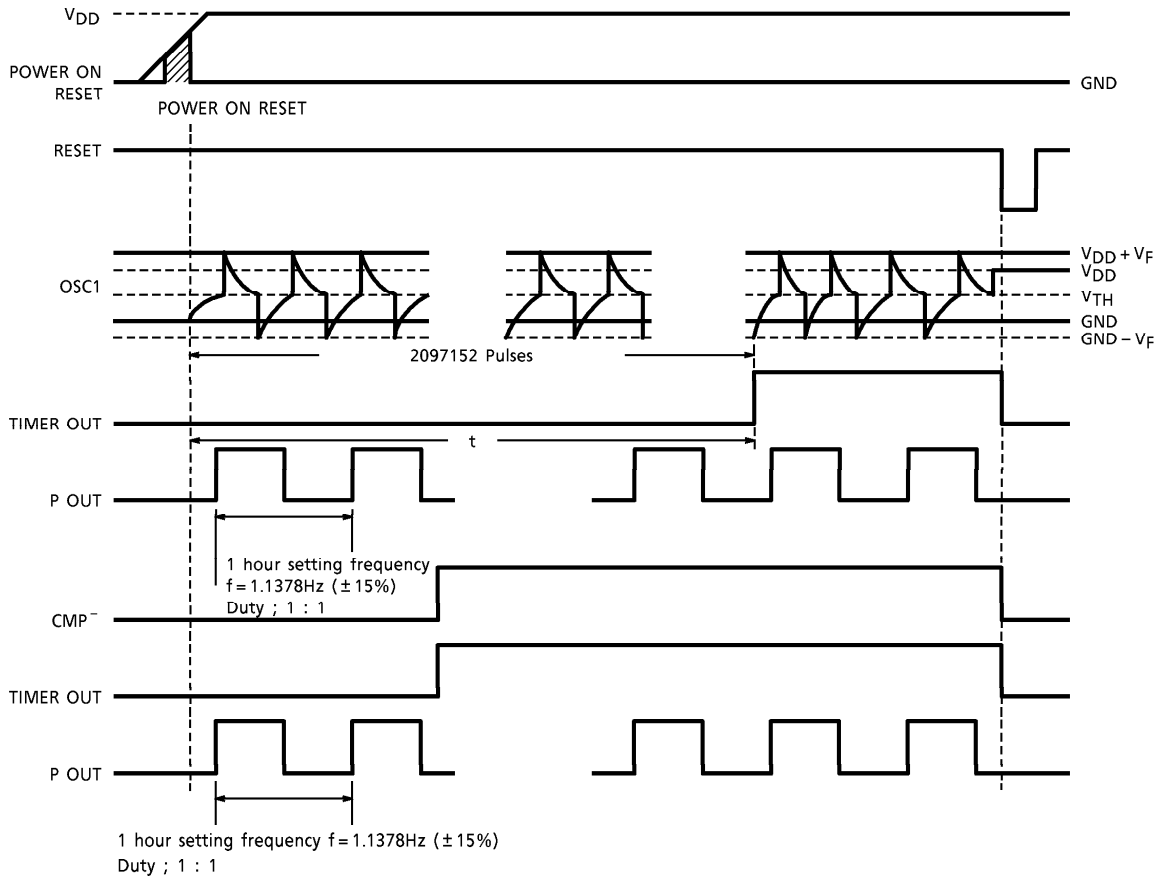
TRUTH TABLE

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



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} = 4~6V (f = 582.5Hz)	−15	—	15	%
		Δf_{osc2}	—	60s C = 1000pF, R = 17.2kΩ, V_{DD} = 4~6V (f = 34.9kHz)	−20	—	20	%
				8H C = 0.01μF, R = 996.7kΩ, V_{DD} = 4~6V (f = 72.8Hz)		—		%
Power Dissipation Current	1	I_{QD}	—	CR OSC. stopping (at reset) V_{DD} = 6V	—	—	130	μA
	2	I_{DD}	—	CR OSC. operating	—	—	700	μA

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	μA
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 Out, P OUT Terminal							
Sink Current	I_{TS}	—	V_{OL} = 0.3V	—	—	5	mA
Offleak Current	$I_{TLH1,\ 2}$	—	V_{IN} = 0~5.0V	−1.0	—	1.0	μA

FUNCTION CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Timer Precision	ΔT_1	—	C = 4700pF, R = 254.9kΩ, V_{DD} = 4~6V (1H)	−15	—	15	%
	ΔT_2	—	C = 1000pF, R = 17.2kΩ, V_{DD} = 4~6V (60s)	−20	—	20	
			C = 0.01μF, R = 966.7kΩ, V_{DD} = 4~6V (8H)		—		
Pulse Precision	Δf	—	C = 4700pF, R = 254.9kΩ, V_{DD} = 4~6V (1H)	0.967	1.1378	1.308	%
	Pt			—	1 : 1	—	—

Timer setting time

$$T = 2^{21} \cdot C_t \cdot R_t \cdot \ell n \left\{ \frac{V_{DD}^2 - V_f^2}{V_{TH}\,(V_{DD} - V_{TH})} \right\}$$

T : Timer setting time (s)

C_t (F)

R_t (Ω)

V_{TH} = 1.95 (V) : Voltage of oscillator first stage circuit

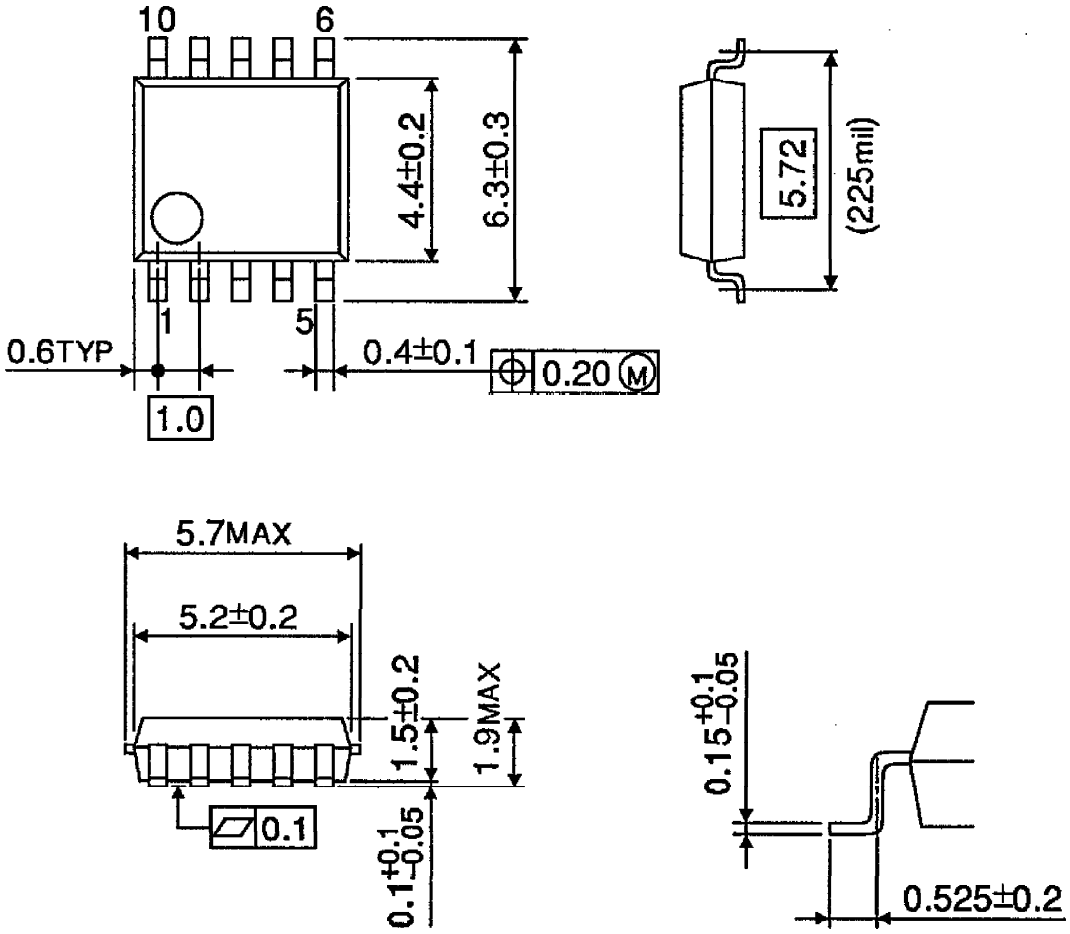
V_f = 0.7 (V) : Voltage of input protection diode (1Pin)

(*) Recommendation of timer setting

TIMER SET UP	R_t	C_t
About 60s	17.2kΩ	1000pF
About 1Hour	254.9kΩ	4700pF
About 8Hour	966.7kΩ	0.01μF

OUTLINE DRAWING

SSOP10-P-225-1.00 Unit : mm



Weight : 0.1g (Typ.)