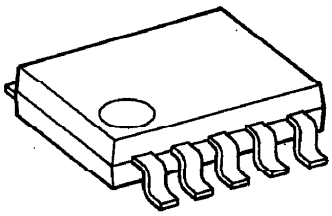
TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TB1010F

CR TIMER

FEATURES

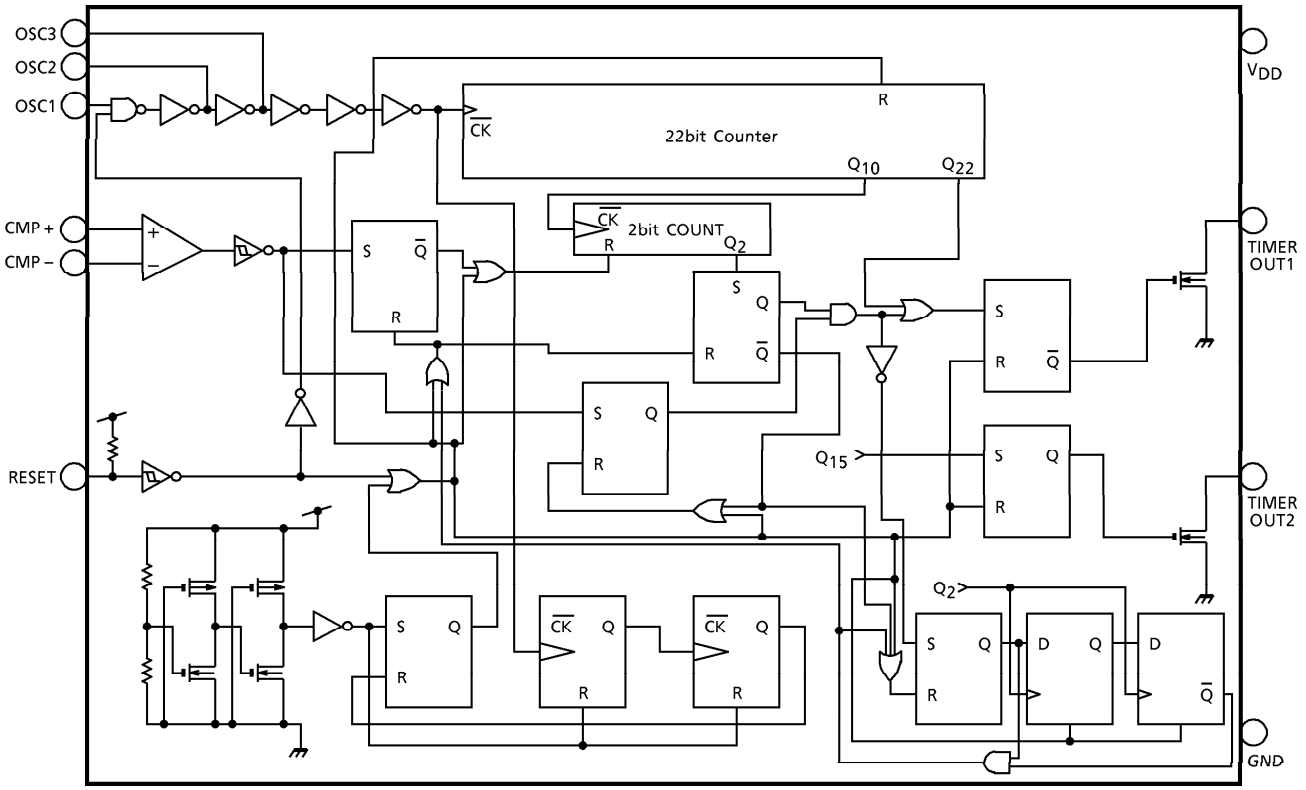
- MOS IC with 22-stage binary counter.
- Built-in initialize circuit.
- Built-in voltage detection comparator.
- Wide range timer setting.
- Low power dissipation current.
- Suitable for Ni-cd battery charger.



SSOP10-P-225-1.00

Weight : 0.1g (Typ.)

BLOCK DIAGRAM



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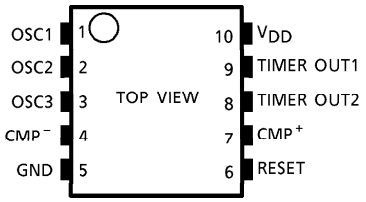
FUNCTION DESCRIPTION ON EACH TERMINAL

PIN No.	SYMBOL	FUNCTION
1	OSC1	Oscillation input terminal
2	OSC2	Oscillation input terminal
3	OSC3	Oscillation input terminal
4	CMP^-	Comparator minus (−) side input terminal "L" : Timer mode, "H" : Timer stop
5	GND	GND
6	RESET	Reset terminal (H→L : inside reset)
7	CMP^+	Comparator plus (+) side input terminal Comparator reference voltage setting terminal
8	TIMER OUT2	Timer output terminal 2 ($\overline{\text{TIMER OUT1}}$) (N-ch open drain sink max. 5mA)
9	TIMER OUT1	Timer output terminal 1 (N-ch open drain, sink max. 5mA)
10	V_{DD}	Power supply voltage

PIN CONNECTION



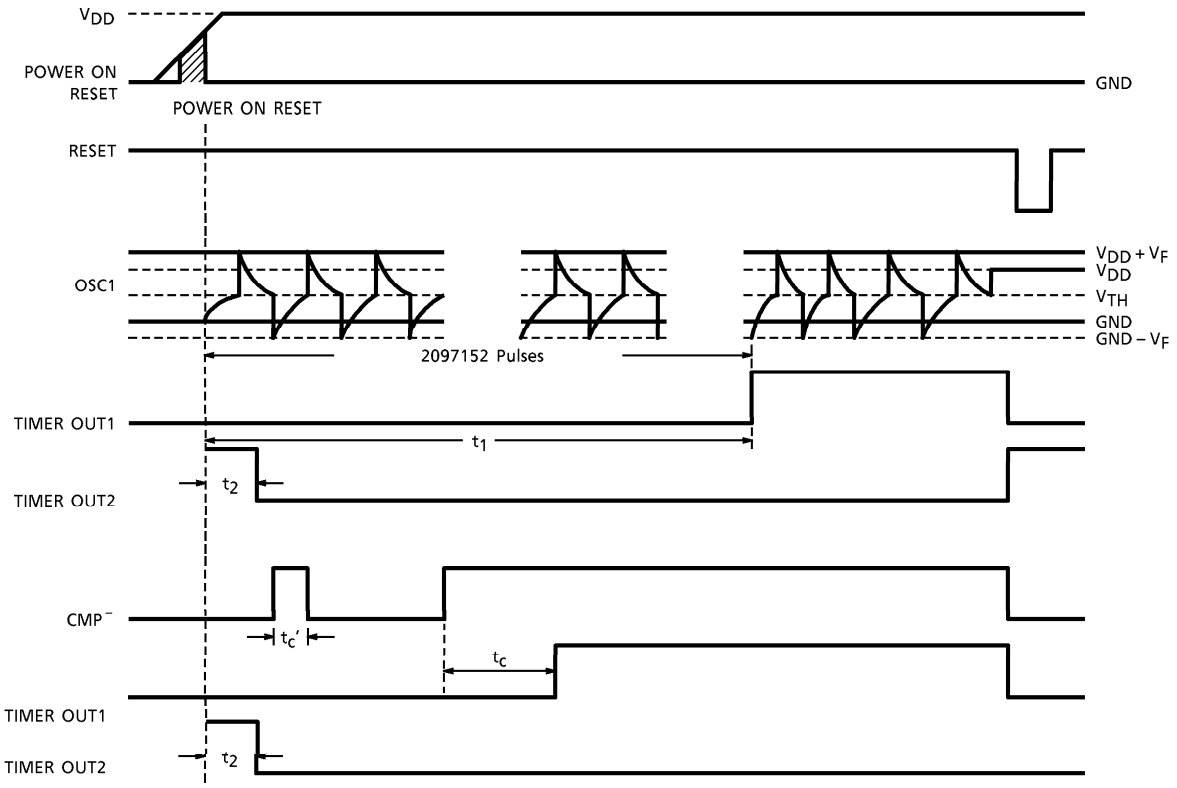
TRUTH TABLE

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	I_L	±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)		—		%
Power Dissipation Current	1	I_{QD}	—	CR OSC. stopping (at reset) V_{DD} = 6V	—	—	130	μA
	2	I_{DD}	—	CR OSC. operating (at 60s setting)	—	—	700	μA
Power on Reset Release Voltage		V_{thH}	—	V_{DD} rise time 40μs / V	1.4	2.5	3.5	V
		V_{thL}	—		1.4	2.5	3.5	V

DC CHARACTERISTICS

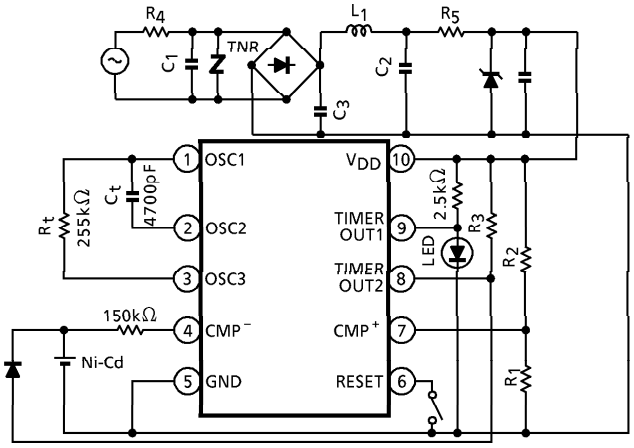
1. Oscillation Input							
OSC1 Leak Current	$I_{IH\ OSC}$	—	V_{IN} = 5.0V	− 1.0	—	1.0	μA
OSC1 Leak Current	$I_{IL\ OSC}$	—	V_{IN} = 0V	− 1.0	—	1.0	μA
2. CMP^+, CMP^- Terminal							
CMP Offset Voltage	V_{off}	—	V_{DD} = 5V	− 30	—	30	mV
Offset Supply Voltage Change	ΔV_{off}	—	V_{DD} = 4~6V	− 10	—	10	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 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

CHARACTERISTICS	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Timer Precision (TIMER OUT1)	ΔT_1	—	C = 4700pF, R = 254.9kΩ, V_{DD} = 5V (1H setting)	—	—	10	%
	ΔT_2	—	C = 1000pF, R = 17.2kΩ, V_{DD} = 5V (60s setting)	—	—	15	%
			C = 0.01μF, R = 966.7kΩ, V_{DD} = 5V (8H setting)		—		%
CMP Detecting Timer Precision	t_c	—	C = 4700pF, R = 254.9kΩ, V_{DD} = 5V (1H)	− 50	3.5s	50	%
Timer2 Precision (TIMER OUT2)	ΔT_3	—	C = 4700pF, R = 254.9kΩ, V_{DD} = 5V (1H setting)	− 10	28.12	10	%

APPLICATION CIRCUIT (Example)

1 hour setting



Timer setting time

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

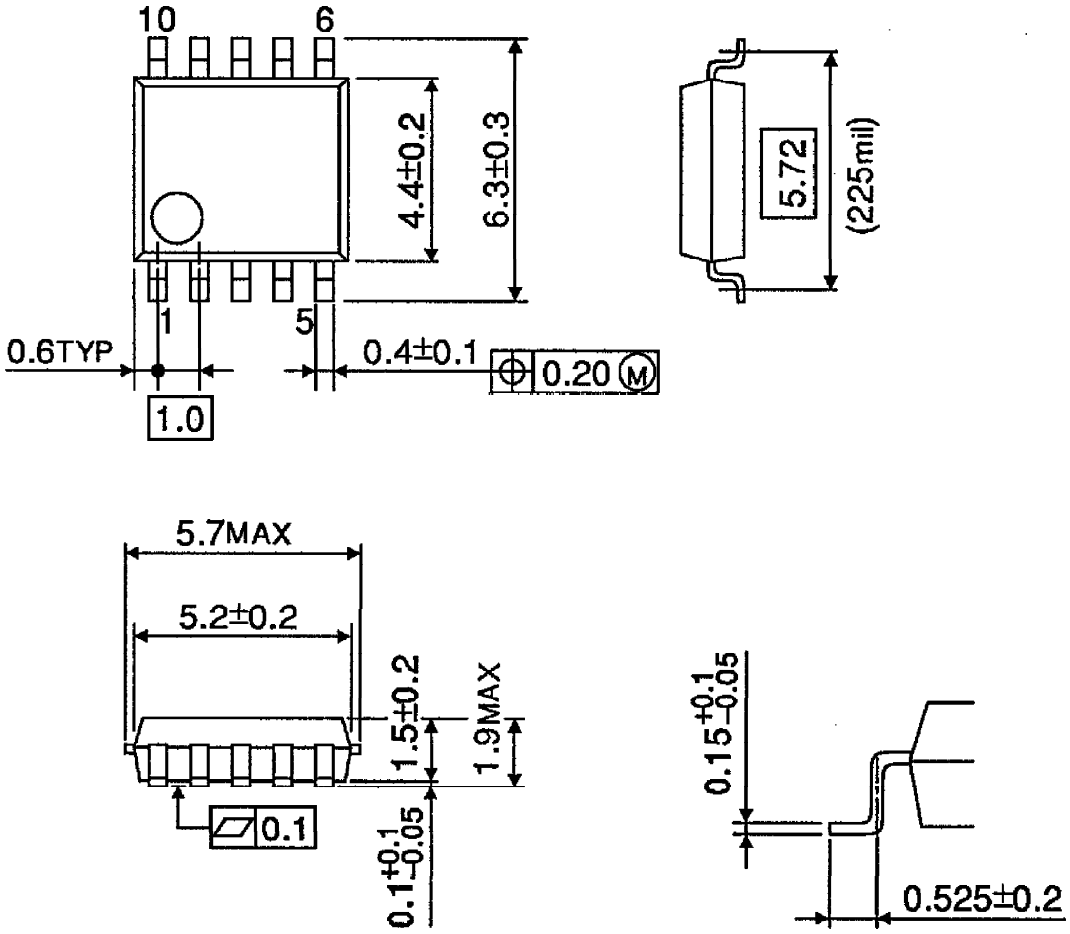
T : Timer setting time (s)
C_t (F) : Capacitor
R_t (Ω) : Resistance
V_{TH} = 1.95 (V) : Voltage of OSC. first stage circuit
V_f = 0.7 (V) : Voltage of input protection diode (1Pin)

(*) Recommendation of timer setting

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

OUTLINE DRAWING

SSOP10-P-225-1.00 Unit : mm



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