TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT   SILICON MONOLITHIC
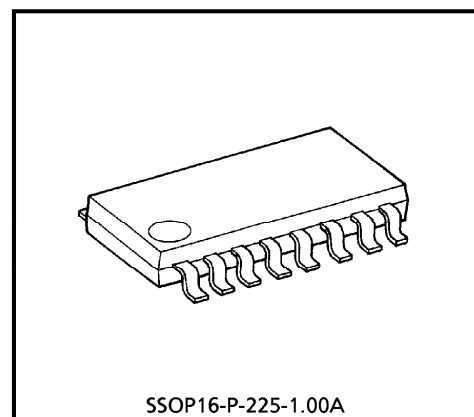
TA8045BF

5V VOLTAGE REGULATOR WITH WATCHDOG TIMER

This IC is designed especially for microcomputer system in automobiles and is capable of providing output voltage 5 ±0.15V without any adjustment.

This IC incorporates the system reset function, that is, low voltage reset and watchdog timer which can self-diagnose the microcomputer system so that program runaway can be prevented.
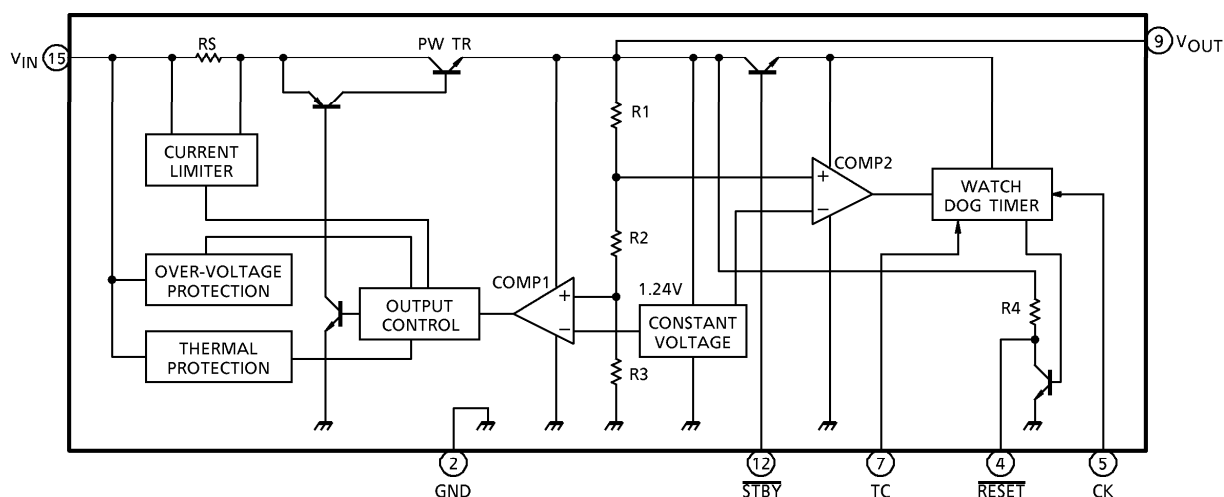
This IC also has an over-voltage protection, current limiter and thermal protection to protect the IC from destruction caused of overstress and load accident.

In addition, this IC has a low standby current function, so it can be connected directly to an automotive battery.

SSOP16-P-225-1.00A

Weight : 0.14g (Typ.)

- Operating DC Supply Voltage Range : 6~30V
- Transient Supply Voltage : 60V (Max.)
- Extremely low Quiescent Current in Standby Mode
    : 400μA (Max.)
- High Accurate Output Voltage : 5±0.15V (3%)
- Output Current Capability : 50mA (Max.)
- Dropout Voltage between VIN and Vout : 1V (Iout = 50mA)
- On-Chip System reset function
    : Watchdog Timer, power On Reset Timer, Low Voltage Reset.
- On-Chip Protective function
    : Current limiter (100mA Typ.), Over-Voltage Protection (28V Typ.), Thermal Protection (150°C Typ.).
- Wide Operating temperature : − 40~105°C (125°C)
- Compact Package : Plastic SSOP 16 Pin Package.

BLOCK DIAGRAM

961001EBA2

TOSHIBA

PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	N.C	Not connected.
2	GND	Grounded.
3	N.C	Not connected.
4	$\overline{RESET}$	Watchdog timer reset pin. – Generates a reset signal which is determined by the CR combination of the TC pin. – Intermittently generates reset pulses if no clock is supplied to the CK pin. The $\overline{RESET}$ signal is the output from the collector of an NPN transistor with a pull-up resistor.
5	CK	Clock input pin for the watchdog timer. If it is used for a Power-on reset timer only, it is pulled up to $\overline{RESET}$ pin.
6	N.C	Not connected.
7	TC	Pin for setting a time for the reset timer and watchdog timer. It connects to a resistor R_T which leads to V_{CC} and a capacitor C_T which is grounded.
8	N.C	Not connected.
9	V_{OUT}	Output pin for 5V constant-voltage power supply. It has a current capacity of up to 50mA (Max.). This pin is also a power supply pin for the reset timer.
10, 11	N.C	Not connected.
12	$\overline{ST}$	Standby mode setup pin. When the signal is low, the system is in standby mode in which the reset timer is off and the power current is limited to 0.4mA or less. When the signal is high, the system is in active mode in which the power supply and reset timer are active.
13, 14	N.C	Not connected.
15	V_{IN}	Power supply input pin.
16	N.C	Not connected.

TIMING CHART
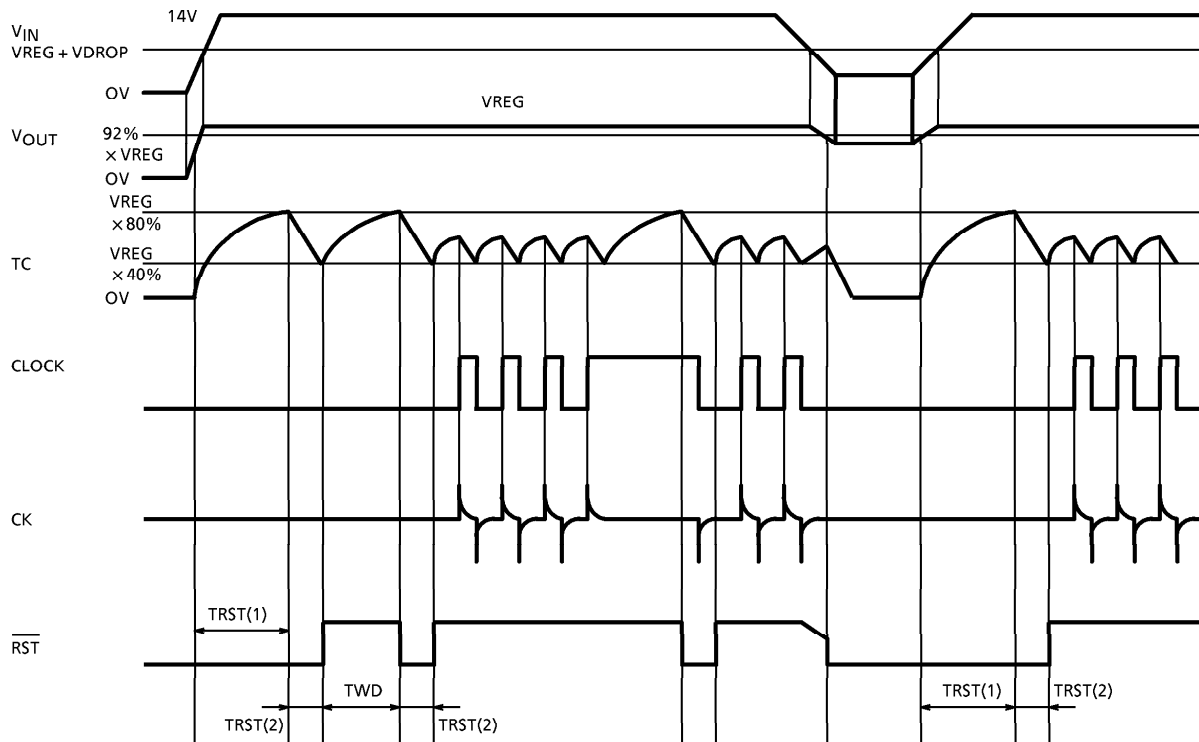
ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	PIN	RATING	UNIT
Supply Voltage	V_{IN}	V_{IN}	30 (DC)	V
			60 (<1s)	
Input Voltage	V_{IN}	CK	−5~5	V
		$\overline{RESET}$, $\overline{STBY}$, TC	−0.3~5	
Input Current	I_{IN}	CK, $\overline{STBY}$, TC	−5~5	mA
Output Current	I_{OUT}	V_{OUT}	50	mA
		$\overline{RESET}$	2	
Output Voltage	V_{OUT}	V_{OUT}, $\overline{RESET}$	16	V
Operation Temperature	T_{OPR}		−40~105	°C
Junction Temperature	T_j		−40~150	°C
Storage Temperature	T_{stg}		−40~150	°C
Lead Temperature Time	T_{sol}		260 (1s)	°C

THERMAL DATA

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Dissipation	PD	0.6	W
Thermal Resistance Junction-ambient	$R_{\theta}J\text{-}A$	200	°C / W
Thermal Shutdown Junction-Temperature	T_{JSD}	150	°C

AC CHARACTERISTICS

CHARACTERISTIC	SYMBOL	PIN	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Watchdog Timer	TWD	$\overline{RESET}$		$0.9 \times C_T \cdot R_T$	$1.1 \times C_T \cdot R_T$	$1.3 \times C_T \cdot R_T$	
	$T_{RST(1)}$			$1.3 \times C_T \cdot R_T$	$1.6 \times C_T \cdot R_T$	$1.9 \times C_T \cdot R_T$	
	$T_{RST(2)}$			$300 \times C_T$	$700 \times C_T$	$1500 \times C_T$	
Clock Pulse Width	TW	CK		3	—	—	μs
Transfer Delay Time	T_{DHL}	$\overline{RESET}$	C1 = 0μF $\overline{RESET}$ "High" to "Low"	—	3	10	μs

ELECTRICAL CHARACTERISTICS $\left(V_{IN} = 6 \sim 18V, Ta = -40 \sim 105°C, I_{LOAD} = 10mA \atop \text{unless otherwise specified} \right)$

CHARACTERISTIC	SYMBOL	PIN	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{REG}	V_{OUT}	$I_{LOAD} = 1 \sim 50mA$ $Ta = -40 \sim 85°C$	4.85	5	5.15	V
Line Regulation	V_{LINE}	V_{OUT}	$V_{IN} = 6 \sim 25V$	—	0.1	0.5	%
Load Regulation	V_{LOAD}	V_{OUT}	$Ta = 25°C,$ $I_{LOAD} = 1 \sim 50mA$	—	0.1	0.5	%
Temperature Coefficient	$\triangle V_{REG} / \triangle_{OUT}$	V_{OUT}	—	—	0.01	—	% / °C
Dropout Voltage	V_{DROP}	V_{OUT}	$I_{LOAD} = 50mA$ $Ta = 25°C$	—	0.85	1.0	V
Current Limiter Detection	I_{LIMIT}	V_{OUT}	$Ta = 25°C$	—	100	—	mA
Reset Detect Voltage	V_{TH}	V_{OUT}	—	$V_{REG} \times$ 89%	$V_{REG} \times$ 92%	$V_{REG} \times$ 95%	V
Output Voltage	V_{OL}	$\overline{RESET}$	$I_{OL} = 1mA$		0.3	0.5	V
Output Leakage Current	I_{LEAK}	$\overline{RESET}$	$V_{OUT} = 5V$	−5	0	5	μA
Input Current	I_{IN}	TC	$V_{IN} = 0 \sim 3.5V$	−3	0	3	μA
Threshold Voltage	V_{TH-H}	TC	$\overline{RESET}$ "High" to "Low"	—	$V_{REG} \times$ 80%	—	V
	V_{TH-L}		$\overline{RESET}$ "Low" to "High"	—	$V_{REG} \times$ 40%	—	
Input Current	I_{IN}	CK	$V_{IN} = 5V$	—	0.3	0.7	mA
Input Detect Voltage	V_{IH}	CK		2	—	—	V
	V_{IL}	$\overline{STBY}$		—	—	0.5	
Input Current	I_{IN}	$\overline{STBY}$	$V_{IN} = 5V$	—	40	80	μA
Standby Current	I_{ST}	V_{IN}	$\overline{STBY} = "L", V_{IN} = 14V$	—	0.18	0.4	mA
Current Consumption	I_{CC}	V_{IN}	$\overline{STBY} = "H", V_{IN} = 14V$	—	0.9	1.8	mA
Over-Voltage Detection	V_{SD}	V_{IN}		25	28	31	V

EXAMPLE OF APPLICATION CIRCUIT
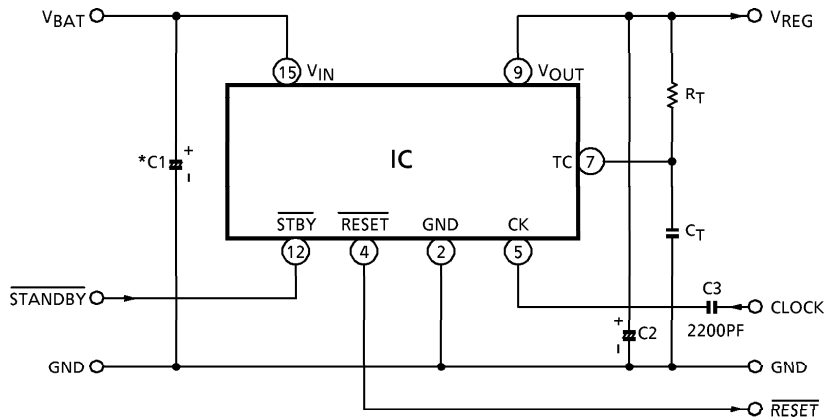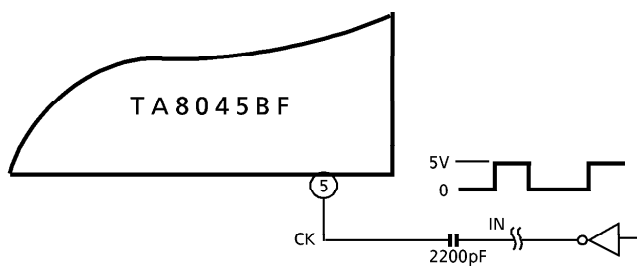

* Cautions for wiring
  1. C1 and C2 are for absorbing disturbance, noise, etc.
     Connect them as close to the IC as possible.
  2. Use capacitor C1 and C2 having less temperature coefficient (tantalum capacitor, etc).
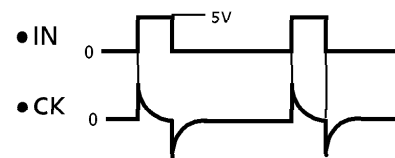
RECOMENDED CONDITIONS

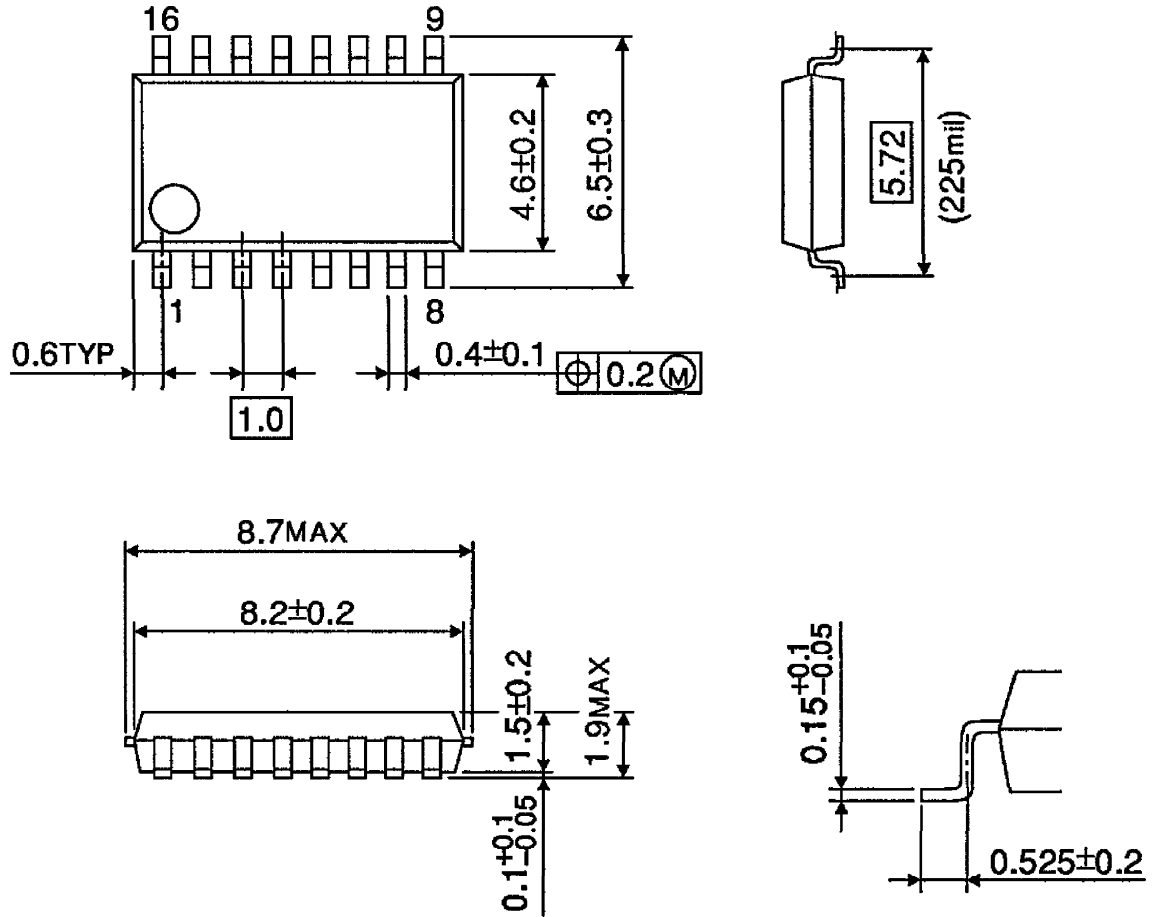| PART NAME	MIN.	MAX.	UNIT
C_T	0.01	100	μF
R_T	5	100	$k\Omega$

CK INPUT APPLICATION CIRCUIT

Capacitor Coupling

Timing Chart

The capacitor coupling allows reset pulses to be supplied intermittently from the $\overline{RESET}$ pin whether the input level (IN) is high or low.

OUTLINE DRAWING

SSOP16-P-225-1.00A

Unit : mm

Weight : 0.14g (Typ.)