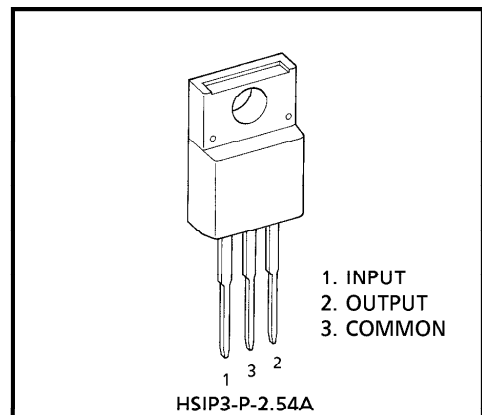


TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC
TA7805S, TA78057S, TA7806S, TA7807S, TA7808S, TA7809S
TA7810S, TA7812S, TA7815S, TA7818S, TA7820S, TA7824S

THREE TERMINAL POSITIVE VOLTAGE REGULATORS
5V, 5.7V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V

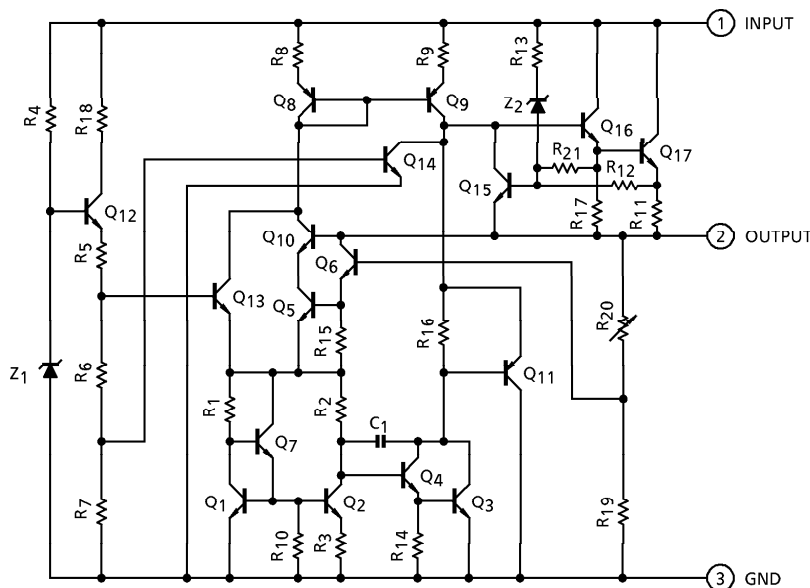
FEATURES

- Suitable for CMOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Metal Fin (Tab) is fully covered with Mold Resin.
(T0-220 NIS package)



Weight : 1.7g (Typ.)

EQUIVALENT CIRCUIT



961001EBA2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

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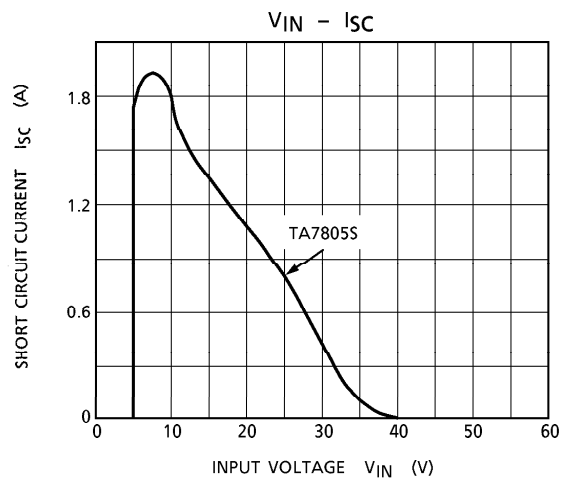
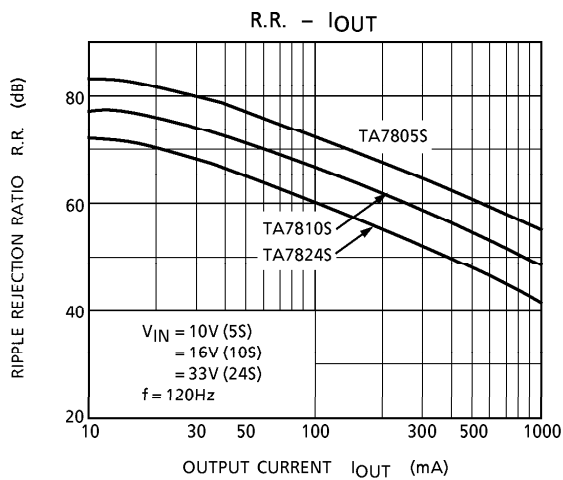
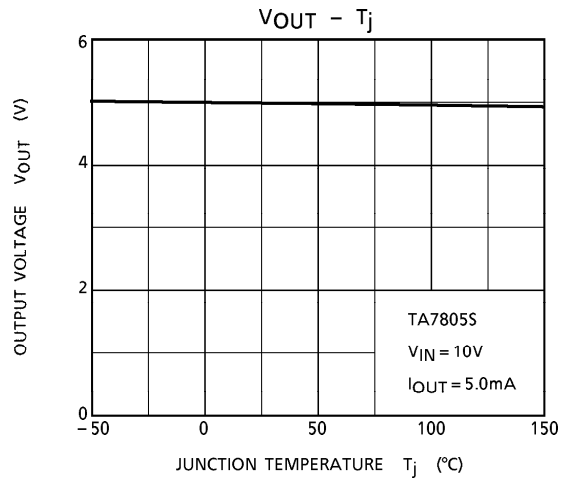
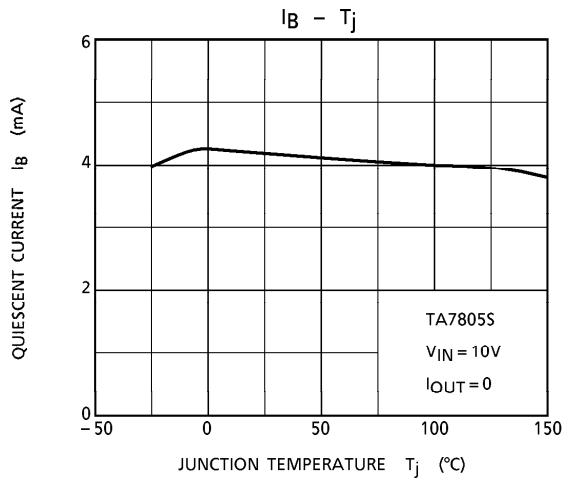
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	TA7805S	V _{IN}	35	V
	TA78057S			
	TA7806S			
	TA7807S			
	TA7808S			
	TA7809S			
	TA7810S			
	TA7812S			
	TA7815S			
	TA7818S		40	
	TA7820S			
	TA7824S			
Power Dissipation	(Ta = 25°C)	P _D	2	W
	(Tc = 25°C)		20	
Operating Temperature		T _{opr}	- 30~75	°C
Storage Temperature		T _{stg}	- 55~150	°C
Operating Junction Temperature		T _j	- 30~150	°C
Thermal Resistance	R _{th(j-c)}		6.25	°C / W
	R _{th(j-a)}		62.5	

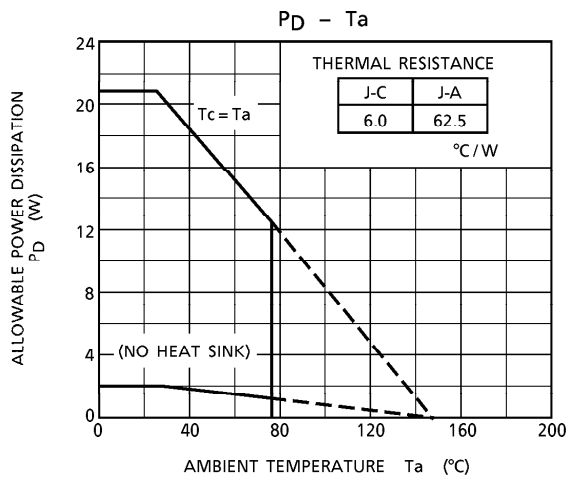
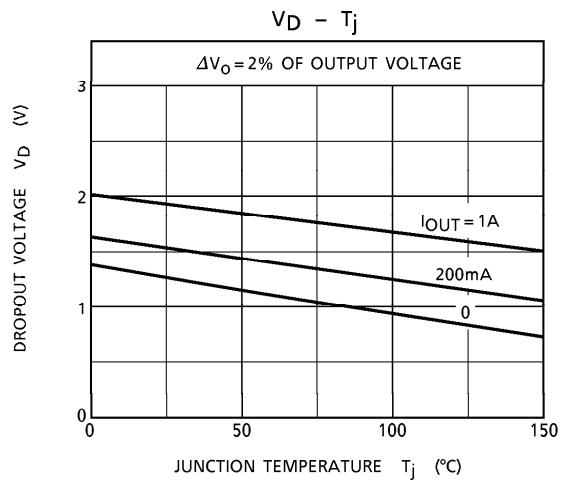
TA7812S

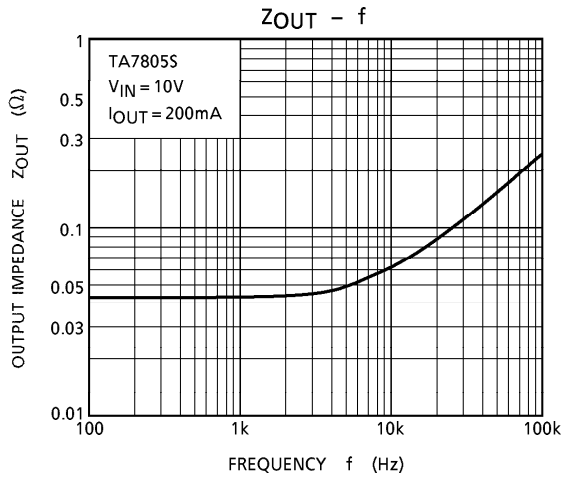
ELECTRICAL CHARACTERISTICS ($V_{IN} = 19V$, $I_{OUT} = 500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V_{OUT}	1	$T_j = 25^{\circ}C$, $I_{OUT} = 100mA$	11.5	12.0	12.5	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$14.5V \leq V_{IN} \leq 30V$	—	10	240	mV
				$16V \leq V_{IN} = 22V$	—	3	120	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$5mA \leq I_{OUT} \leq 1.4A$	—	12	240	mV
				$250mA \leq I_{OUT} \leq 750mA$	—	4	120	
Output Voltage	V_{OUT}	1	$T_j = 25^{\circ}C$ $14.5V \leq V_{IN} \leq 27V$ $5.0mA \leq I_{OUT} \leq 1.0A$, $P_D \leq 15W$	11.4	—	12.6	V	
Quiescent Current	I_B	1	$T_j = 25^{\circ}C$, $I_{OUT} = 5mA$	—	4.3	8.0	mA	
Quiescent Current Change	ΔI_B	1	$14.5V \leq V_{IN} \leq 30V$	—	—	1.0	mA	
Output Noise Voltage	V_{NO}	2	$T_a = 25^{\circ}C$, $10Hz \leq f \leq 100kHz$ $I_{OUT} = 50mA$	—	90	—	μV_{rms}	
Ripple Rejection	R.R.	3	$f = 120Hz$, $15V \leq V_{IN} \leq 25V$ $I_{OUT} = 50mA$, $T_j = 25^{\circ}C$	55	71	—	dB	
Dropout Voltage	V_D	1	$I_{OUT} = 1.0A$, $T_j = 25^{\circ}C$	—	2.0	—	V	
Short Circuit Current Limit	I_{SC}	1	$T_j = 25^{\circ}C$	—	0.7	—	A	
Average Temperature Coefficient of Output Voltage	T_{CVO}	1	$I_{OUT} = 5mA$	—	-1.6	—	mV/ $^{\circ}C$	



10





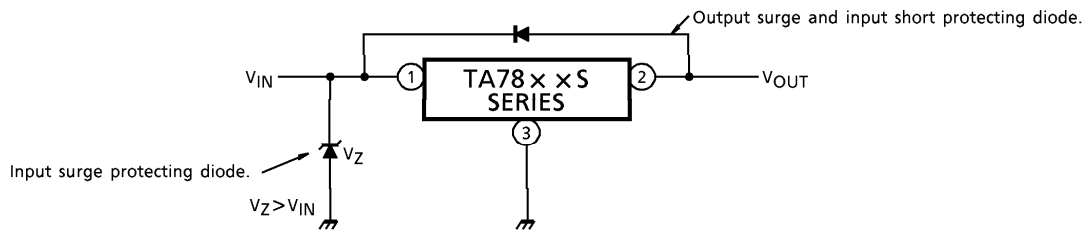
PRECAUTIONS ON APPLICATION

- (1) In regard to GND, be careful not to apply a negative voltage to the input/output terminal. Further, special care is necessary in case of a voltage boost application.
- (2) When a surge voltage exceeding maximum rating is applied to the input terminal or when a voltage in excess of the input terminal voltage is applied to the output terminal, the circuit may be destroyed.

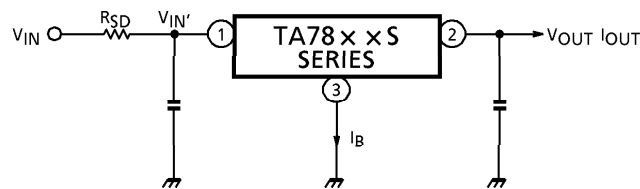
Specially, in the latter case, great care is necessary.

Further, if the input terminal shorts to GND in a state of normal operation, the output terminal voltage becomes higher than the input voltage (GND potential), and the electric charge of a chemical capacitor connected to the output terminal flows into the input side, which may cause the destruction of circuit.

In these cases, take such steps as a zener diode and a general silicon diode are connected to the circuit, as shown in the following figure.



- (3) When the input voltage is too high, the power dissipation of three terminal regulator increases because of series regulator, so that the junction temperature rises. In such a case, it is recommended to reduce the power dissipation by inserting the power limiting resistor \$R_{SD}\$ in the input terminal, and to reduce the junction temperature as a result.



The power dissipation \$P_D\$ of IC is expressed in the following equation.

$$P_D = (V_{IN}' - V_{OUT}) \cdot I_{OUT} + V_{IN}' \cdot I_B$$

If \$V_{IN}'\$ is reduced below the lowest voltage necessary for the IC, the parasitic oscillation will be caused according to circumstances.

In determining the resistance value of \$R_{SD}\$, design with margin should be made by making reference to the following equation.

$$R_{SD} < \frac{V_{IN} - V_{IN}'}{I_{OUT} + I_B}$$

- (4) Connect the input terminal and GND, and the output terminal and GND, by capacitor respectively. The capacitances should be determined experimentally because they depend on printed patterns. In particular, adequate investigation should be made so that there is no problem even at time of high or low temperature.
- (5) Installation of IC for power supply
 For obtaining high reliability on the heat sink design of the regulator IC, it is generally required to derate more than 20% of maximum junction temperature (T_j MAX.). Further, full consideration should be given to the installation of IC to the heat sink.

(a) Heat sink design

The thermal resistance of IC itself is required from the viewpoint of the design of elements, but the thermal resistance from the IC package to the open air varies with the contact thermal resistance.

TABLE 1 shows how much the value of the contact thermal resistance ($\theta_c + \theta_s$) is changed by insulating sheet (mica) and heat sink grease.

TABLE 1 Unit : °C/W

PACKAGE	MODEL No.	TORQUE	MICA	$\theta_c + \theta_s$
TO-220NIS	TA78××S	0.6N·m	Not Provided	0.4~0.6 (1.0~1.5)

The figures given in parentheses denote the values at time of no grease.

The package of regulator IC serves as GND, therefore, usually use the value at time of "no mica."

(b) Silicon grease

When a circuit not exceeding maximum rating is designed, it is to be desired that the grease should be used if possible. If it is required that the contact thermal resistance is reduced from the viewpoint of the circuit design, it is recommended that the following methods be adopted.

A : Use Thercon (NOTE)

B : Use YG6260 (TOSHIBA SILICON CORPORATION) , if grease is used.

(NOTE) Thercon is a registered trademark of Fuji High Polymer Kogyo K.K..

(c) Torque

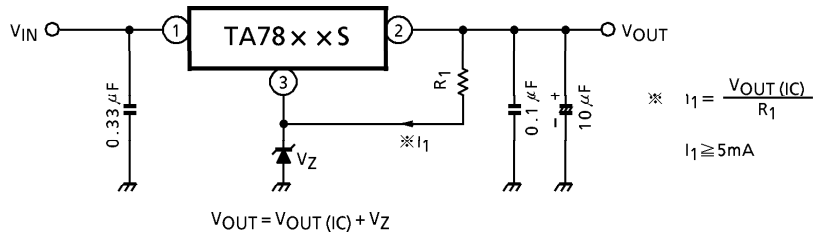
When installing IC on a heat sink or the like, tighten the IC with the torque of less than the rated value. If it is tightened with the torque in excess of the rated value, sometimes the internal elements of the IC are adversely affected. Therefore, great care should be given to the installing operation.

Further, if polycarbonate screws are used, the torque causes a change with the passage of time, which may lessen the effect of radiation.

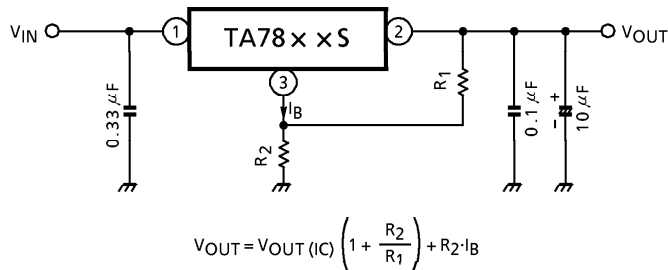
APPLICATION CIRCUITS

(1) VOLTAGE BOOST REGULATOR

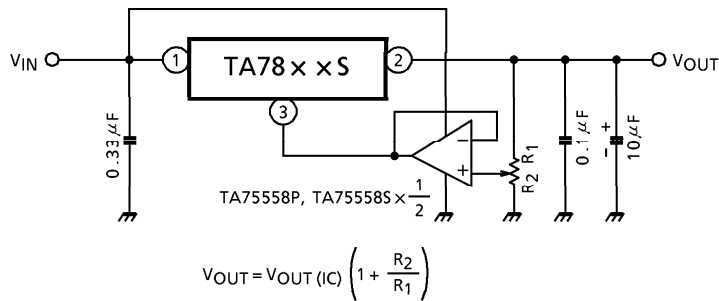
(a) Voltage boost by use of zener diode



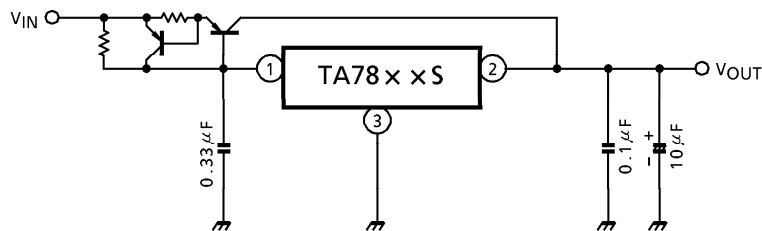
(b) Voltage boost by use of resistor



(c) Adjustable output regulator

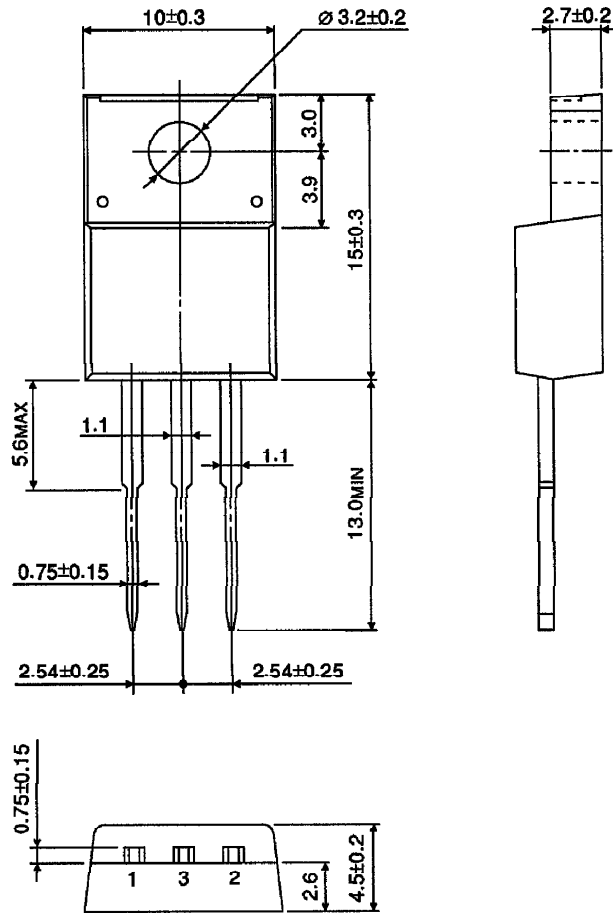


(2) CURRENT BOOST REGULATOR



OUTLINE DRAWING
HSIP3-P-2.54A

Unit : mm



Weight : 1.7g (Typ.)