

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

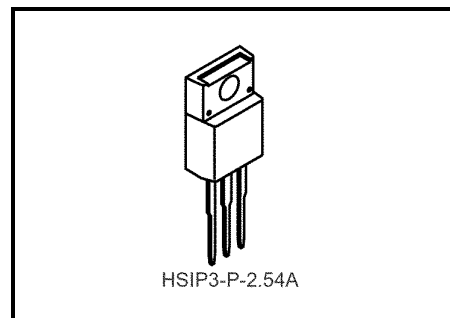
**TA7805S, TA78057S, TA7806S, TA7807S, TA7808S, TA7809S,
TA7810S, TA7812S, TA7815S, TA7818S, TA7820S, TA7824S**

Three Terminal Positive Voltage Regulators

5 V, 5.7 V, 6 V, 7 V, 8 V, 9 V, 10 V, 12 V, 15 V, 18 V, 20 V, 24 V

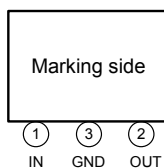
Features

- Suitable for CMOS, TTL, the power supply of other digital ICs
- Internal thermal overload protection
- Internal short circuit current limiting
- Maximum output current of 1 A
- Metal fin (tab) is fully covered with mold resin.
(T0-220 NIS package)

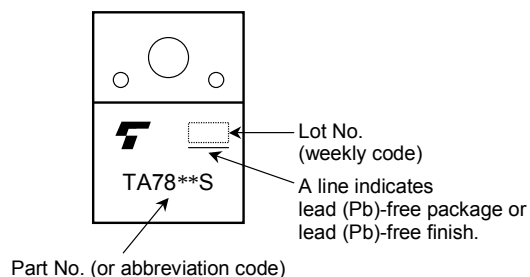


Weight: 1.7 g (typ.)

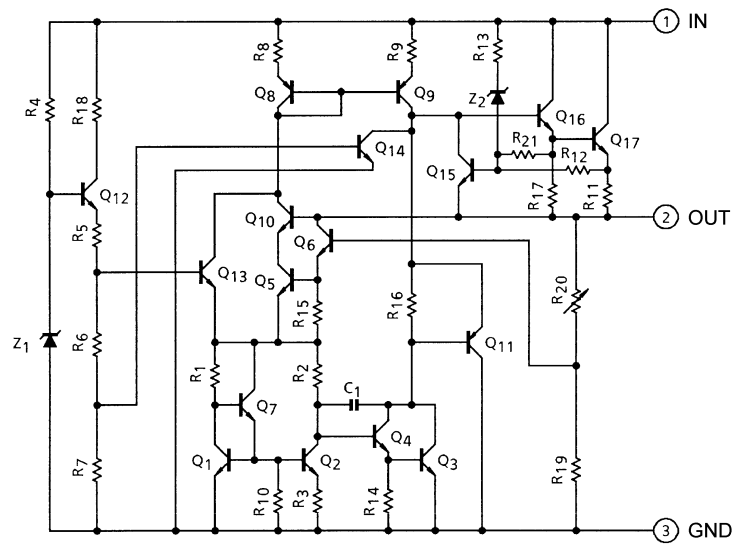
Pin Assignment



Marking



Equivalent Circuit



Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Input voltage	TA7805S	V _{IN}	35	V
	TA78057S			
	TA7806S			
	TA7807S			
	TA7808S			
	TA7809S			
	TA7810S			
	TA7812S			
	TA7815S		40	
	TA7818S			
	TA7820S			
	TA7824S			
Power dissipation	(Ta = 25°C)	P _D	2	W
	(Tc = 25°C)		20	
Operating temperature		T _{opr}	-30~85	°C
Storage temperature		T _{stg}	-55~150	°C
Junction temperature		T _j	150	°C
Thermal resistance		R _{th (j-c)}	6.25	°C/W
		R _{th (j-a)}	62.5	

TA7805S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 10\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	4.8	5.0	5.2	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $7.0\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	3	100	mV
			$8.0\text{ V} \leq V_{IN} \leq 12\text{ V}$	—	1	50	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	15	100	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	5	50	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $7.0\text{ V} \leq V_{IN} \leq 20\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	4.75	—	5.25	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.2	8.0	mA
Quiescent current change	ΔI_B	1	$7.0\text{ V} \leq V_{IN} \leq 25\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	50	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $8.0\text{ V} \leq V_{IN} \leq 18\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	62	78	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	1.6	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.6	—	$\text{mV}/^\circ\text{C}$

TA78057S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 10.7\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	5.47	5.7	5.93	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $7.7\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	4	110	mV
			$8.7\text{ V} \leq V_{IN} \leq 12.7\text{ V}$	—	2	55	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	15	110	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	5	55	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $7.7\text{ V} \leq V_{IN} \leq 20.7\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	5.42	—	5.98	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.3	8.0	mA
Quiescent current change	ΔI_B	1	$7.7\text{ V} \leq V_{IN} \leq 25\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	55	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $8.8\text{ V} \leq V_{IN} \leq 18.8\text{ V}$, $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	62	77	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	1.5	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.7	—	$\text{mV}/^\circ\text{C}$

TA7806S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 11\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	5.75	6.0	6.25	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $8.0\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	4	120	mV
			$9\text{ V} \leq V_{IN} \leq 13\text{ V}$	—	2	60	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	15	120	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	5	60	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $8\text{ V} \leq V_{IN} \leq 21\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	5.7	—	6.3	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.3	8.0	mA
Quiescent current change	ΔI_B	1	$8.0\text{ V} \leq V_{IN} \leq 25\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	55	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $9\text{ V} \leq V_{IN} \leq 19\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	61	77	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	1.5	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.7	—	$\text{mV}/^\circ\text{C}$

TA7807S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 12\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	6.72	7.0	7.28	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $9\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	5	140	mV
			$10\text{ V} \leq V_{IN} \leq 14\text{ V}$	—	2	70	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	15	140	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	5	70	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $9\text{ V} \leq V_{IN} \leq 22\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	6.65	—	7.35	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.3	8.0	mA
Quiescent current change	ΔI_B	1	$9\text{ V} \leq V_{IN} \leq 25\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.3	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	60	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $10\text{ V} \leq V_{IN} \leq 20\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	59	75	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	1.3	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.8	—	$\text{mV}/^\circ\text{C}$

TA7808S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 14\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V _{OUT}	1	T _j = 25°C, I _{OUT} = 100 mA		7.7	8.0	8.3	V
Line regulation	Reg-line	1	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 25 V	—	6	160	mV
				11 V ≤ V _{IN} ≤ 17 V	—	2	80	
Load regulation	Reg-load	1	T _j = 25°C	5 mA ≤ I _{OUT} ≤ 1.4 A	—	12	160	mV
				250 mA ≤ I _{OUT} ≤ 750 mA	—	4	80	
Output voltage	V _{OUT}	1	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 23 V 5.0 mA ≤ I _{OUT} ≤ 1.0 A	7.6	—	8.4	V
Quiescent current	I _B	1	T _j = 25°C, I _{OUT} = 5 mA		—	4.3	8.0	mA
Quiescent current change	ΔI _B	1	10.5 V ≤ V _{IN} ≤ 25 V, I _{OUT} = 5 mA, T _j = 25°C		—	—	1.0	mA
Output noise voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz I _{OUT} = 50 mA		—	70	—	μV _{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 11.5 V ≤ V _{IN} ≤ 21.5 V I _{OUT} = 50 mA, T _j = 25°C		58	74	—	dB
Dropout voltage	V _D	1	I _{OUT} = 1.0 A, T _j = 25°C		—	2.0	—	V
Short circuit current limit	I _{SC}	1	T _j = 25°C		—	1.1	—	A
Average temperature coefficient of output voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−1.0	—	mV/°C

TA7809S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 15\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V _{OUT}	1	T _j = 25°C, I _{OUT} = 100 mA		8.64	9.0	9.36	V
Line regulation	Reg-line	1	T _j = 25°C	11.5 V ≤ V _{IN} ≤ 26 V	—	7	180	mV
				13 V ≤ V _{IN} ≤ 19 V	—	2.5	90	
Load regulation	Reg-load	1	T _j = 25°C	5 mA ≤ I _{OUT} ≤ 1.4 A	—	12	180	mV
				250 mA ≤ I _{OUT} ≤ 750 mA	—	4	90	
Output voltage	V _{OUT}	1	T _j = 25°C	11.5 V ≤ V _{IN} ≤ 24 V 5.0 mA ≤ I _{OUT} ≤ 1.0 A	8.55	—	9.45	V
Quiescent current	I _B	1	T _j = 25°C, I _{OUT} = 5 mA		—	4.3	8.0	mA
Quiescent current change	ΔI _B	1	11.5 V ≤ V _{IN} ≤ 26 V, I _{OUT} = 5 mA, T _j = 25°C		—	—	1.0	mA
Output noise voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz I _{OUT} = 50 mA		—	75	—	μV _{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 12.5 V ≤ V _{IN} ≤ 22.5 V I _{OUT} = 50 mA, T _j = 25°C		56	72	—	dB
Dropout voltage	V _D	1	I _{OUT} = 1.0 A, T _j = 25°C		—	2.0	—	V
Short circuit current limit	I _{SC}	1	T _j = 25°C		—	1.0	—	A
Average temperature coefficient of output voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−1.1	—	mV/°C

TA7810S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	9.6	10.0	10.4	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $12.5\text{ V} \leq V_{IN} \leq 27\text{ V}$	—	8	200	mV
			$14\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	2.5	100	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	200	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	100	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $12.5\text{ V} \leq V_{IN} \leq 25\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	9.5	—	10.5	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.3	8.0	mA
Quiescent current change	ΔI_B	1	$12.5\text{ V} \leq V_{IN} \leq 27\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	80	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $13.5\text{ V} \leq V_{IN} \leq 23.5\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	55	72	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.9	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.3	—	$\text{mV}/^\circ\text{C}$

TA7812S
Electrical Characteristics

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

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	11.5	12.0	12.5	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $14.5\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	10	240	mV
			$16\text{ V} \leq V_{IN} \leq 22\text{ V}$	—	3	120	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	240	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	120	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	11.4	—	12.6	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.3	8.0	mA
Quiescent current change	ΔI_B	1	$14.5\text{ V} \leq V_{IN} \leq 30\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	90	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $15\text{ V} \leq V_{IN} \leq 25\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	55	71	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.7	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.6	—	$\text{mV}/^\circ\text{C}$

TA7815S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 23\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	14.4	15.0	15.6	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	11	300	mV
			$20\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	3	150	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	300	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	150	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	14.25	—	15.75	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.4	8.0	mA
Quiescent current change	ΔI_B	1	$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	110	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $18.5\text{ V} \leq V_{IN} \leq 28.5\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	54	70	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.5	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-2.0	—	$\text{mV}/^\circ\text{C}$

TA7818S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 27\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	17.3	18.0	18.7	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $21\text{ V} \leq V_{IN} \leq 33\text{ V}$	—	13	360	mV
			$24\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	4	180	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	360	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	180	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $21\text{ V} \leq V_{IN} \leq 33\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	17.1	—	18.9	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.5	8.0	mA
Quiescent current change	ΔI_B	1	$21\text{ V} \leq V_{IN} \leq 33\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	125	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $22\text{ V} \leq V_{IN} \leq 32\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	52	68	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.4	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-2.5	—	$\text{mV}/^\circ\text{C}$

TA7820S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 29\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

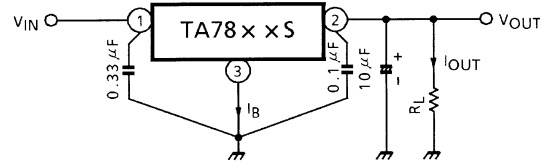
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	19.2	20.0	20.8	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $23\text{ V} \leq V_{IN} \leq 35\text{ V}$	—	15	400	mV
			$26\text{ V} \leq V_{IN} \leq 32\text{ V}$	—	5	200	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	400	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	200	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $23\text{ V} \leq V_{IN} \leq 35\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	19.0	—	21.0	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.6	8.0	mA
Quiescent current change	ΔI_B	1	$23\text{ V} \leq V_{IN} \leq 35\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	135	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $24\text{ V} \leq V_{IN} \leq 34\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	50	66	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.4	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-3.0	—	$\text{mV}/^\circ\text{C}$

TA7824S
Electrical Characteristics

 (Unless otherwise specified, $V_{IN} = 33\text{ V}$, $I_{OUT} = 500\text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

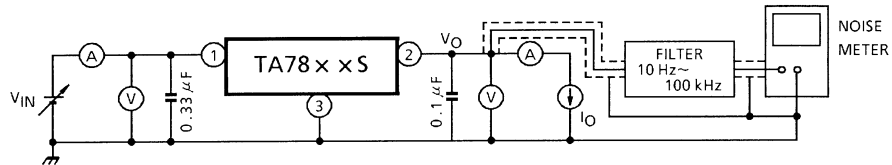
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	23.0	24.0	25.0	V
Line regulation	Reg.line	1	$T_j = 25^\circ\text{C}$ $27\text{ V} \leq V_{IN} \leq 38\text{ V}$	—	18	480	mV
			$30\text{ V} \leq V_{IN} \leq 36\text{ V}$	—	6	240	
Load regulation	Reg.load	1	$T_j = 25^\circ\text{C}$ $5\text{ mA} \leq I_{OUT} \leq 1.4\text{ A}$	—	12	480	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$	—	4	240	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$ $27\text{ V} \leq V_{IN} \leq 38\text{ V}$ $5.0\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$	22.8	—	25.2	V
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 5\text{ mA}$	—	4.6	8.0	mA
Quiescent current change	ΔI_B	1	$27\text{ V} \leq V_{IN} \leq 38\text{ V}$, $I_{OUT} = 5\text{ mA}$, $T_j = 25^\circ\text{C}$	—	—	1.0	mA
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$ $I_{OUT} = 50\text{ mA}$	—	150	—	μV_{rms}
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $28\text{ V} \leq V_{IN} \leq 38\text{ V}$ $I_{OUT} = 50\text{ mA}$, $T_j = 25^\circ\text{C}$	50	66	—	dB
Dropout voltage	V_D	1	$I_{OUT} = 1.0\text{ A}$, $T_j = 25^\circ\text{C}$	—	2.0	—	V
Short circuit current limit	I_{SC}	1	$T_j = 25^\circ\text{C}$	—	0.3	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-3.5	—	$\text{mV}/^\circ\text{C}$

Test Circuit 1/Standard Application Circuit



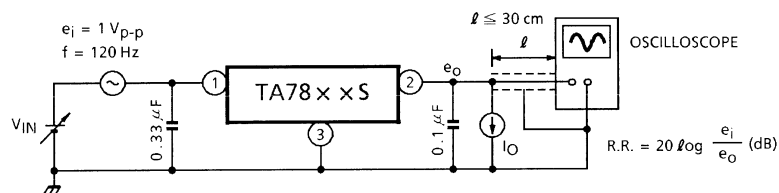
Test Circuit 2

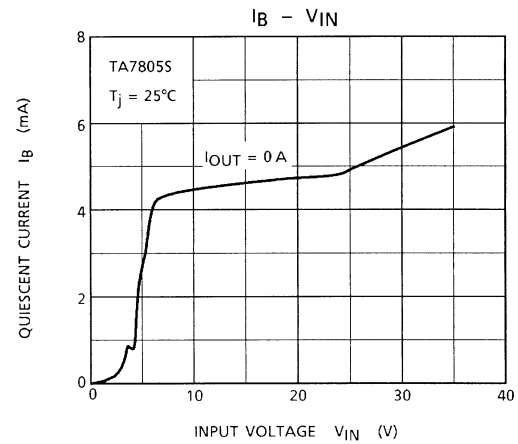
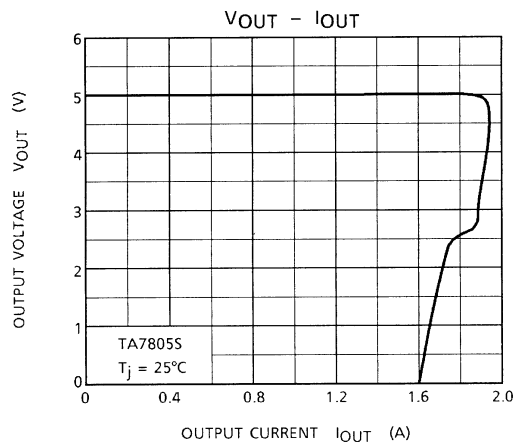
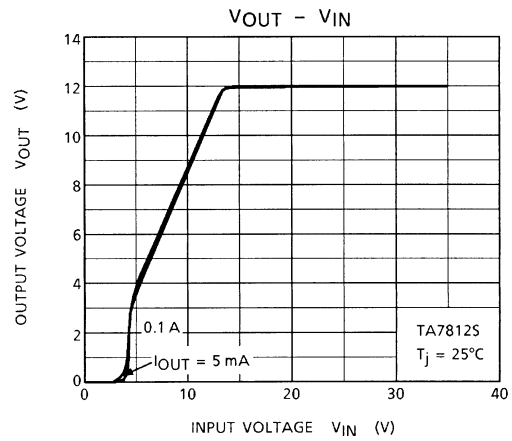
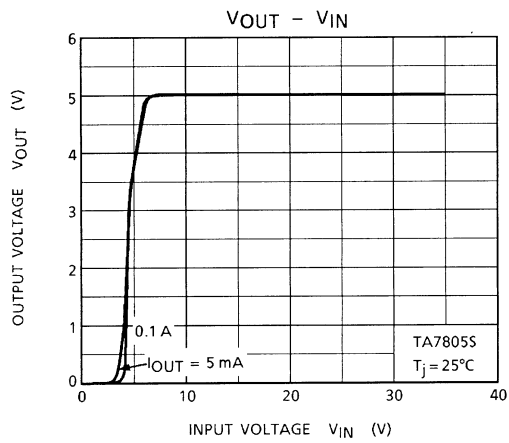
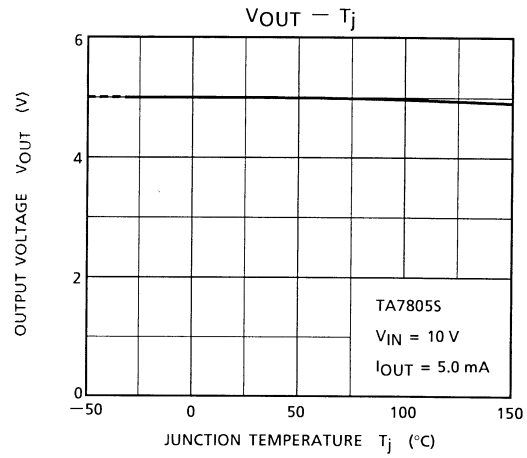
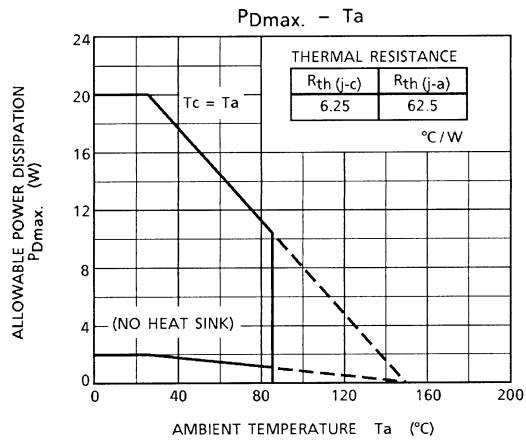
V_{NO}

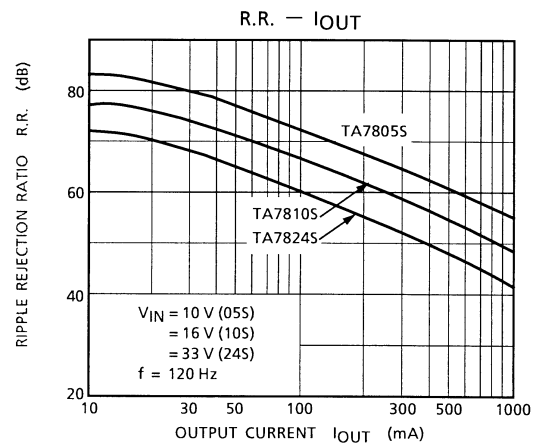
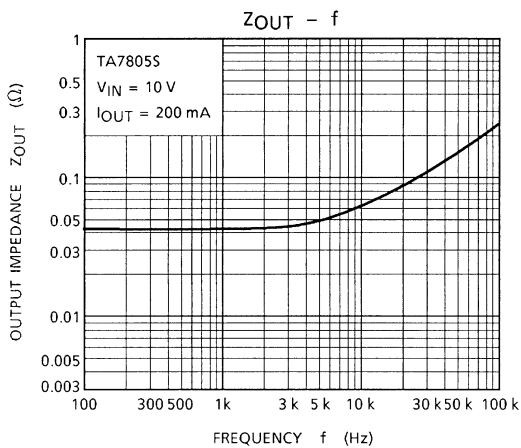
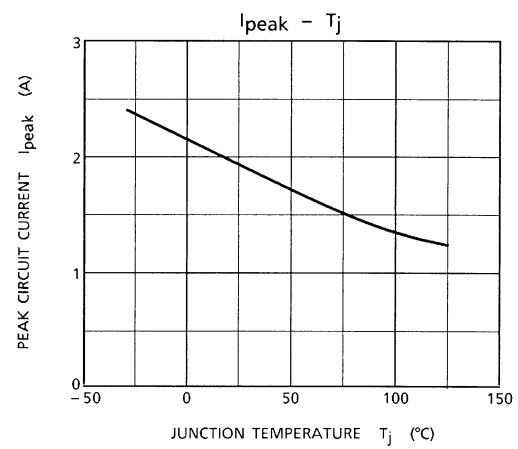
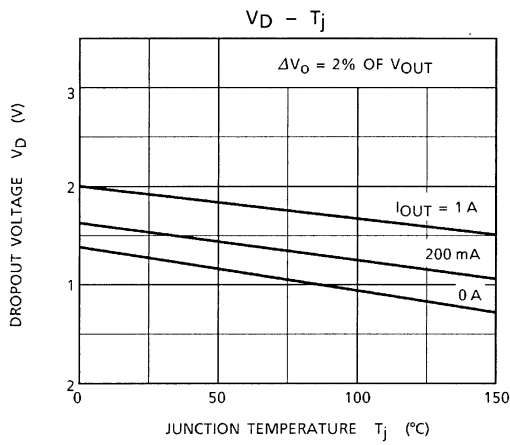
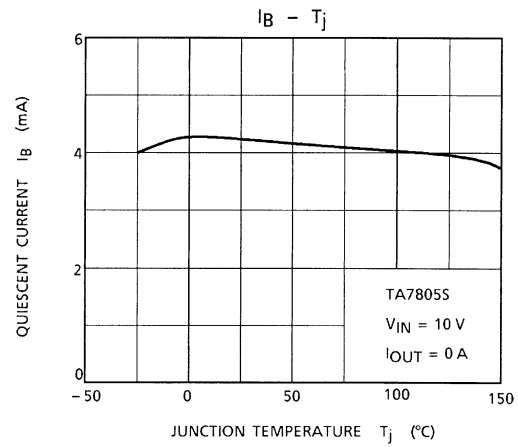
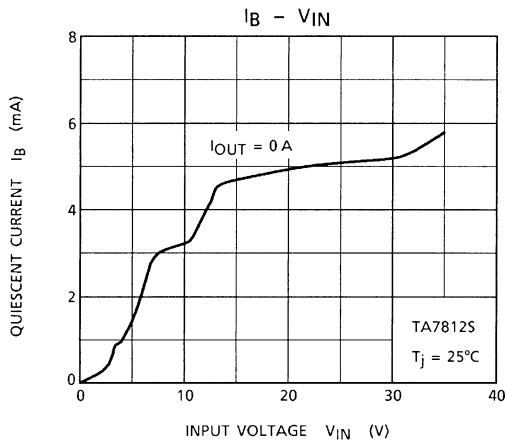


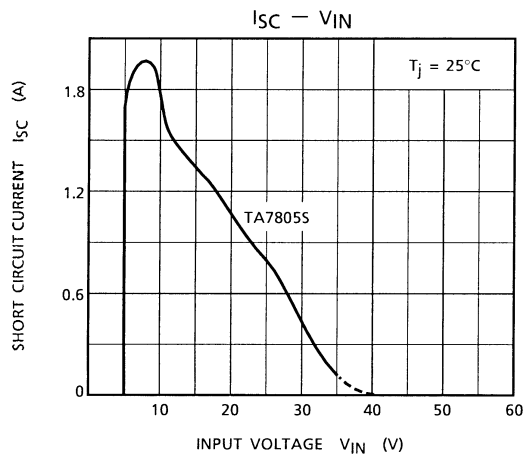
Test Circuit 3

R.R.



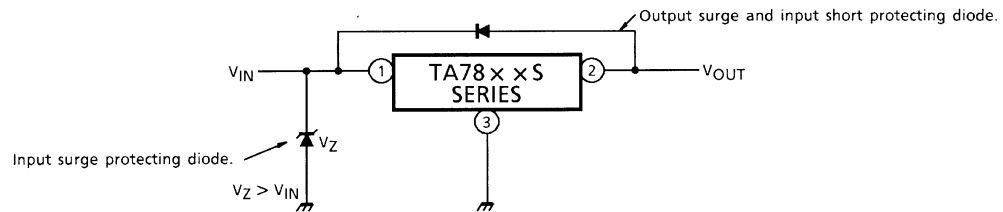




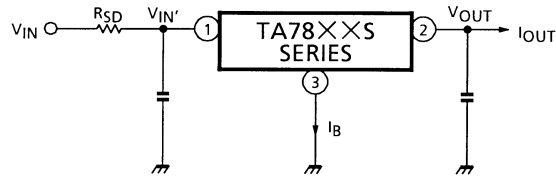


Precautions on Application

- (1) In regard to GND, be careful not to apply a negative voltage to the input/output terminal. Further, special care is necessary in the case of a voltage boost application.
- (2) If a surge voltage exceeding the maximum rating is applied to the input terminal or if a voltage in excess of the input terminal voltage is applied to the output terminal, the circuit may be destroyed. Particular care is necessary in the case of the latter.
Circuit destruction may also occur if the input terminal shorts to GND in a state of normal operation, causing the output terminal voltage to exceed the input voltage (GND potential) and the electrical charge of the chemical capacitor connected to the output terminal to flow into the input side.
Where these risks exist, take steps such as connecting zener and general silicon diodes to the circuit, as shown in the figure below.



- (3) When the input voltage is too high, the power dissipation of the three-terminal regulator, which is a series regulator, increases, causing the junction temperature to rise. In such a case, it is recommended to reduce the power dissipation, and hence the junction temperature, by inserting a power-limiting resistor R_{SD} in the input terminal.



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

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

Reducing $V_{IN'}$ below the lowest voltage necessary for the IC will cause ripple, deterioration in output regulation and, in certain circumstances, parasitic oscillation.

To determine the resistance value of R_{SD} , design with a margin, referring to the following equation.

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

- (4) Be sure to connect a capacitor near the input terminal and output terminal between both terminals and GND. The capacitances should be determined experimentally because they depend on PCB patterns. In particular, adequate investigation should be made to ensure there is no problem even in high or low temperatures

(5) Installation of IC for power supply

To obtain high reliability on the heat sink design of a regulator IC, it is generally required to derate more than 20% of maximum junction temperature ($T_{j \text{ max}}$).

Further, full consideration should be given to the installation of a heat sink in the IC.

(a) Heat sink design

The thermal resistance of the 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	0.6 N·m	Not provided	0.4~0.6 (1.0~1.5)

The figures given in parentheses denote the values for when there is no grease.

The regulator IC package serves as GND, therefore of the value for when there is “no mica” should be used.

(b) Silicone grease

In the design of a circuit not exceeding the maximum rating, grease should be used if possible. If it is necessary to reduce the contact thermal resistance for the sake of circuit design, the following methods are recommended.

If using grease, use YG6260 (TOSHIBA SILICON CORPORATION).

(c) Torque

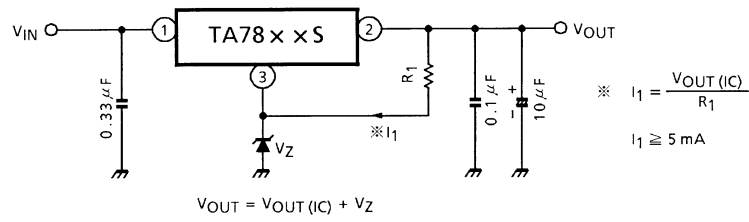
When installing the IC on a heat sink or the like, tighten the IC with a torque of less than the rated value. Tightening in excess of the rated value may cause internal elements of the IC to be adversely affected. Therefore, great care should be given to the installation procedure.

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

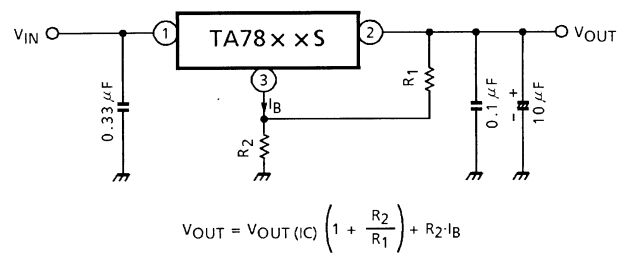
Application Circuits

(1) Voltage boost regulator

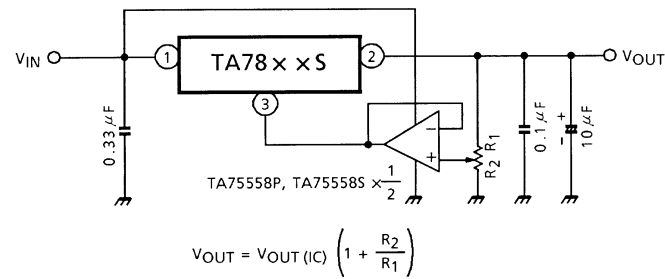
(a) Voltage boost by use of zener diode



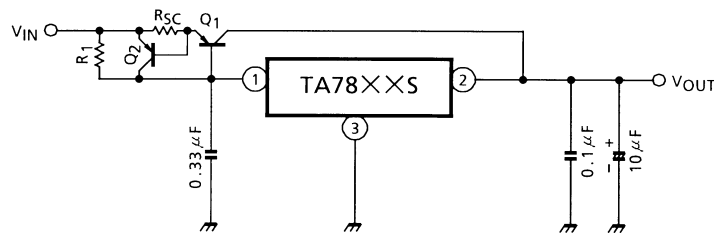
(b) Voltage boost by use of resistor



(c) Adjustable output regulator



(2) Current boost regulator



Heat sink is needed for Q₁.

$$R_1 \geq \frac{V_{BE1}}{I_{B \text{ MAX}}}$$

where,

V_{BE1} : V_{BE} of external transistor Q₁.

$I_{B \text{ MAX}}$: Quiescent current of IC.

$$R_{SC} = \frac{V_{BE2}}{I_{SC}}$$

where,

I_{SC} : Short-circuit current.

HSIP3-P-2.54A

Technical drawing of a 3D printer nozzle assembly. The drawing includes a top view, a side view, and a detail view of the nozzle tip.

Top View Dimensions:

- Overall width: 10 ± 0.3
- Overall height: 15 ± 0.3
- Distance from top edge to center of nozzle: 3.0
- Distance from center of nozzle to bottom edge: 3.9
- Nozzle diameter: $\varnothing 3.2 \pm 0.2$

Side View Dimensions:

- Overall height: 13.0 MIN
- Distance from top edge to nozzle tip: 5.6 MAX
- Distance from center of nozzle to nozzle tip: 1.1
- Distance from nozzle tip to bottom edge: 1.1

Detail View Dimensions (Nozzle Tip):

- Overall width: 2.54 ± 0.25
- Distance from center to nozzle tip: 0.75 ± 0.15
- Distance from nozzle tip to bottom edge: 2.6
- Overall height: 4.5 ± 0.2

Weight: 1.7 g (typ.)

RESTRICTIONS ON PRODUCT USE

030619EBA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.