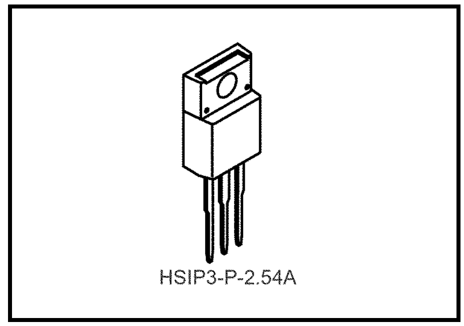
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

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

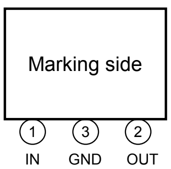


Weight: 1.7 g (typ.)

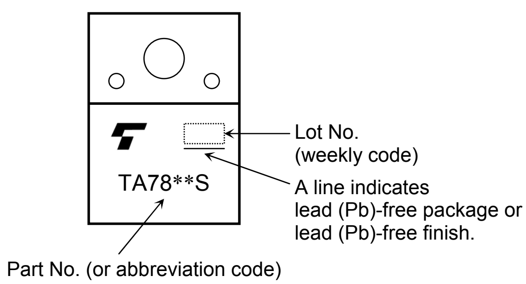
Features

- 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)

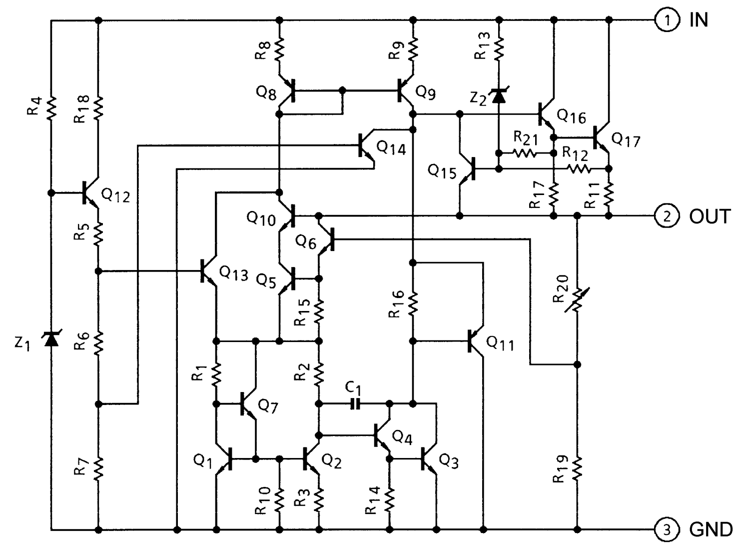
Pin Assignment



Marking



Equivalent Circuit



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		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}	−30~85	°C
Storage temperature		T_{stg}	−55~150	°C
Junction temperature		T_j	150	°C
Thermal resistance		$R_{th\ (j\text{-}c)}$	6.25	°C/W
		$R_{th\ (j\text{-}a)}$	62.5	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

TA7805S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 10 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

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

TA78057S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 10.7 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		5.47	5.7	5.93	V
Line regulation	Reg·line	1	T_j = 25°C	7.7 V ≤ V_{IN} ≤ 25 V	—	4	110	mV
				8.7 V ≤ V_{IN} ≤ 12.7 V	—	2	55	
Load regulation	Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 1.4 A	—	15	110	mV
				250 mA ≤ I_{OUT} ≤ 750 mA	—	5	55	
Output voltage	V_{OUT}	1	T_j = 25°C	7.7 V ≤ V_{IN} ≤ 20.7 V 5.0 mA ≤ I_{OUT} ≤ 1.0 A	5.42	—	5.98	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	7.7 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 5 mA, T_j = 25°C		—	—	1.3	mA
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz I_{OUT} = 50 mA		—	55	—	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 8.8 V ≤ V_{IN} ≤ 18.8 V, I_{OUT} = 50 mA, T_j = 25°C		62	77	—	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		—	1.5	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA		—	−0.7	—	mV/°C

TA7806S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 11 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		5.75	6.0	6.25	V
Line regulation	Reg·line	1	T_j = 25°C	8.0 V ≤ V_{IN} ≤ 25 V	—	4	120	mV
				9 V ≤ V_{IN} ≤ 13 V	—	2	60	
Load regulation	Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 1.4 A	—	15	120	mV
				250 mA ≤ I_{OUT} ≤ 750 mA	—	5	60	
Output voltage	V_{OUT}	1	T_j = 25°C	8 V ≤ V_{IN} ≤ 21 V 5.0 mA ≤ I_{OUT} ≤ 1.0 A	5.7	—	6.3	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	8.0 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 5 mA, T_j = 25°C		—	—	1.3	mA
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz I_{OUT} = 50 mA		—	55	—	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 9 V ≤ V_{IN} ≤ 19 V I_{OUT} = 50 mA, T_j = 25°C		61	77	—	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		—	1.5	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA		—	−0.7	—	mV/°C

TA7807S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 12 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		6.72	7.0	7.28	V
Line regulation	Reg·line	1	T_j = 25°C	9 V ≤ V_{IN} ≤ 25 V	—	5	140	mV
				10 V ≤ V_{IN} ≤ 14 V	—	2	70	
Load regulation	Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 1.4 A	—	15	140	mV
				250 mA ≤ I_{OUT} ≤ 750 mA	—	5	70	
Output voltage	V_{OUT}	1	T_j = 25°C	9 V ≤ V_{IN} ≤ 22 V 5.0 mA ≤ I_{OUT} ≤ 1.0 A	6.65	—	7.35	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	9 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 5 mA, T_j = 25°C		—	—	1.3	mA
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz I_{OUT} = 50 mA		—	60	—	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 10 V ≤ V_{IN} ≤ 20 V I_{OUT} = 50 mA, T_j = 25°C		59	75	—	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		—	1.3	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA		—	−0.8	—	mV/°C

TA7808S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°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	Ta = 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 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°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	Ta = 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 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		9.6	10.0	10.4	V
Line regulation	Reg·line	1	T_j = 25°C	12.5 V ≤ V_{IN} ≤ 27 V	—	8	200	mV
				14 V ≤ V_{IN} ≤ 20 V	—	2.5	100	
Load regulation	Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 1.4 A	—	12	200	mV
				250 mA ≤ I_{OUT} ≤ 750 mA	—	4	100	
Output voltage	V_{OUT}	1	T_j = 25°C	12.5 V ≤ V_{IN} ≤ 25 V 5.0 mA ≤ I_{OUT} ≤ 1.0 A	9.5	—	10.5	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	12.5 V ≤ V_{IN} ≤ 27 V, I_{OUT} = 5 mA, T_j = 25°C		—	—	1.0	mA
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz I_{OUT} = 50 mA		—	80	—	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 13.5 V ≤ V_{IN} ≤ 23.5 V I_{OUT} = 50 mA, T_j = 25°C		55	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		—	0.9	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA		—	−1.3	—	mV/°C

TA7812S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 19 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		11.5	12.0	12.5	V
Line regulation	Reg·line	1	T_j = 25°C	14.5 V ≤ V_{IN} ≤ 30 V	—	10	240	mV
				16 V ≤ V_{IN} ≤ 22 V	—	3	120	
Load regulation	Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 1.4 A	—	12	240	mV
				250 mA ≤ I_{OUT} ≤ 750 mA	—	4	120	
Output voltage	V_{OUT}	1	T_j = 25°C	14.5 V ≤ V_{IN} ≤ 27 V 5.0 mA ≤ I_{OUT} ≤ 1.0 A	11.4	—	12.6	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	14.5 V ≤ V_{IN} ≤ 30 V, I_{OUT} = 5 mA, T_j = 25°C		—	—	1.0	mA
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz I_{OUT} = 50 mA		—	90	—	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, 15 V ≤ V_{IN} ≤ 25 V I_{OUT} = 50 mA, T_j = 25°C		55	71	—	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		—	0.7	—	A
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA		—	−1.6	—	mV/°C

TA7815S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 23 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

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

TA7818S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 27 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

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

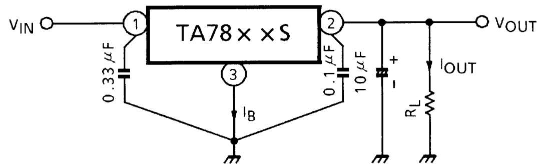
TA7820S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 29 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

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

TA7824S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 33 V, I_{OUT} = 500 mA, 0°C ≤ T_j ≤ 125°C)

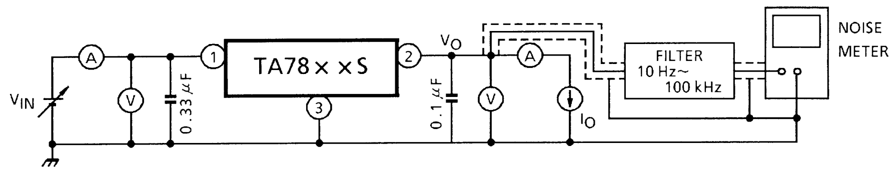
Characteristics	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C, I_{OUT} = 100 mA		23.0	24.0	25.0	V
Line regulation	Reg·line	1	T_j = 25°C	27 V ≤ V_{IN} ≤ 38 V	—	18	480	mV
			T_j = 25°C	30 V ≤ V_{IN} ≤ 36 V	—	6	240	mV
Load regulation	Reg·load	1	T_j = 25°C	5 mA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

Test Circuit 1/Standard Application Circuit



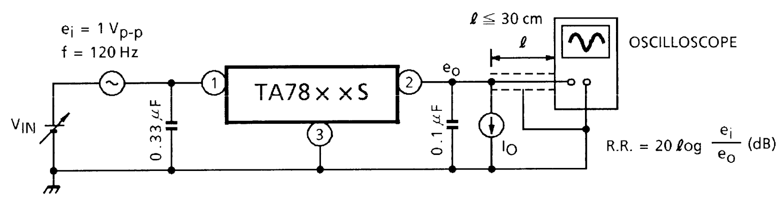
Test Circuit 2

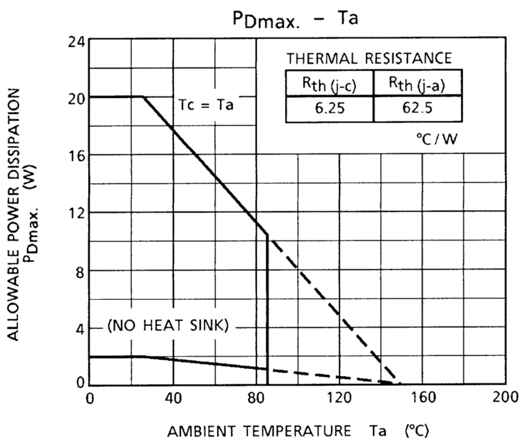
VNO

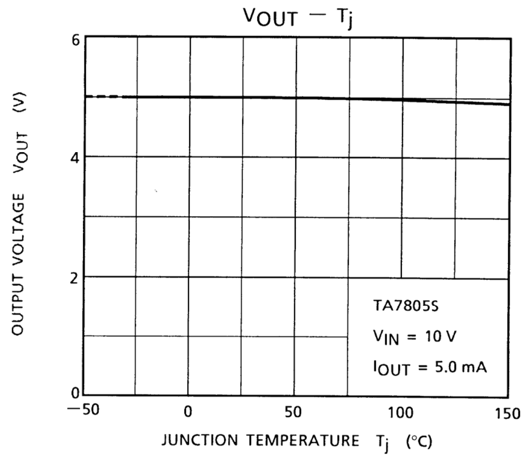


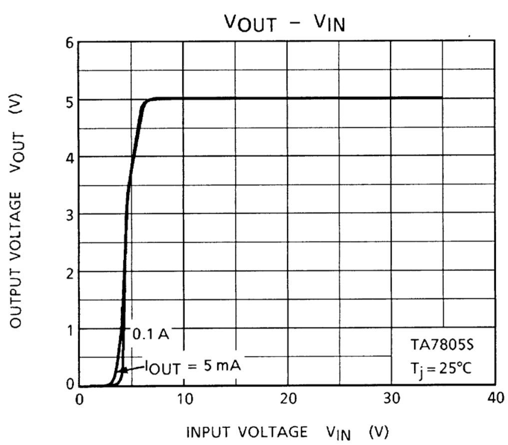
Test Circuit 3

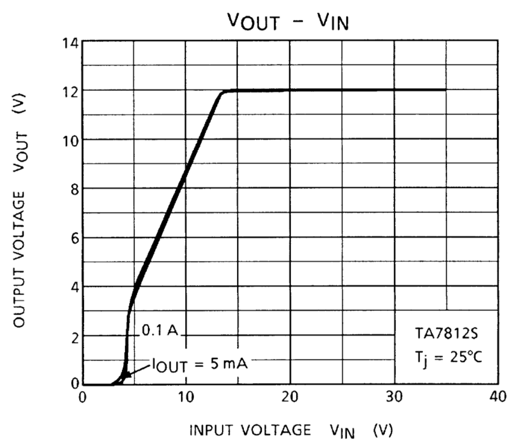
R.R.

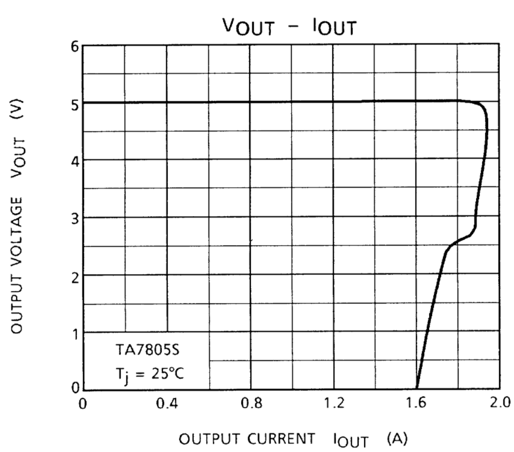


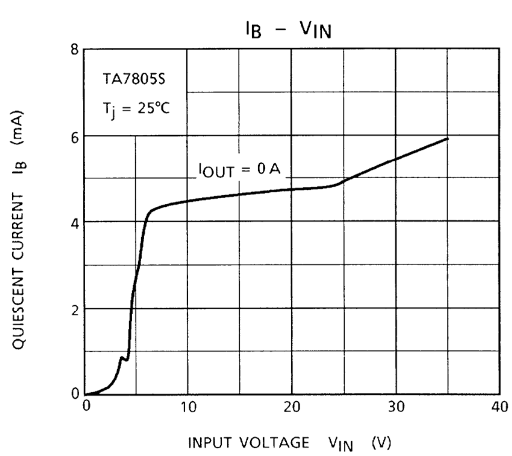

PDmax. – Ta
THERMAL RESISTANCE
Rth (j-c)
Rth (j-a)
6.25
62.5
°C / W
Tc = Ta
(NO HEAT SINK)
ALLOWABLE POWER DISSIPATION PDmax. (W)
AMBIENT TEMPERATURE Ta (°C)
0
4
8
12
16
20
24
0
40
80
120
160
200

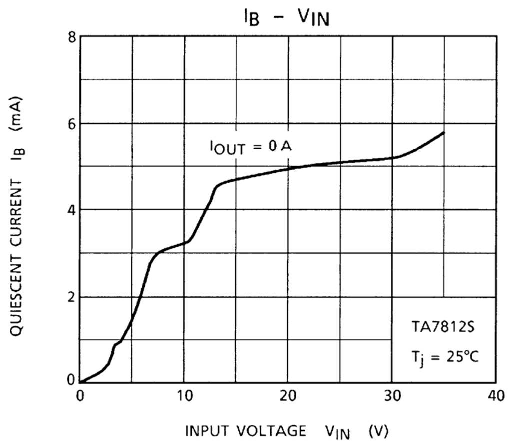

VOUT – Tj
TA7805S
VIN = 10 V
IOUT = 5.0 mA
OUTPUT VOLTAGE VOUT (V)
JUNCTION TEMPERATURE Tj (°C)
0
2
4
6
−50
0
50
100
150

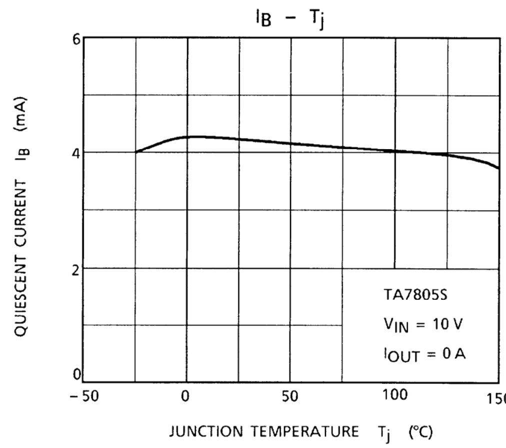

VOUT – VIN
0.1 A
IOUT = 5 mA
TA7805S
Tj = 25°C
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)
0
1
2
3
4
5
6
0
10
20
30
40

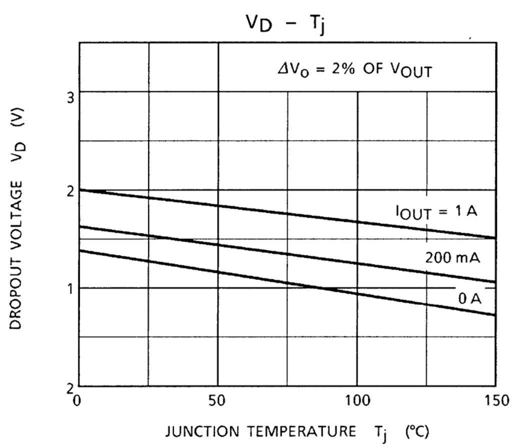

VOUT – VIN
0.1 A
IOUT = 5 mA
TA7812S
Tj = 25°C
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)
0
2
4
6
8
10
12
14
0
10
20
30
40

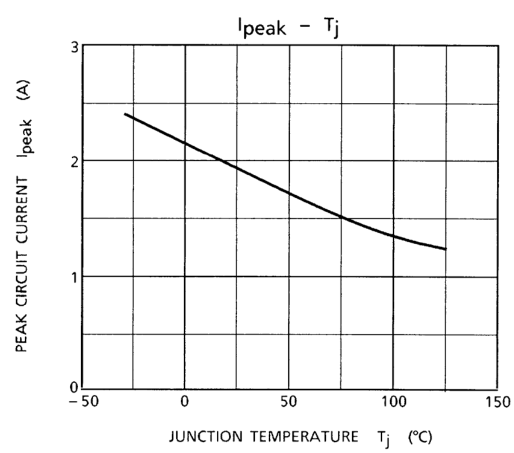

VOUT – IOUT
TA7805S
Tj = 25°C
OUTPUT VOLTAGE VOUT (V)
OUTPUT CURRENT IOUT (A)
0
1
2
3
4
5
6
0
0.4
0.8
1.2
1.6
2.0

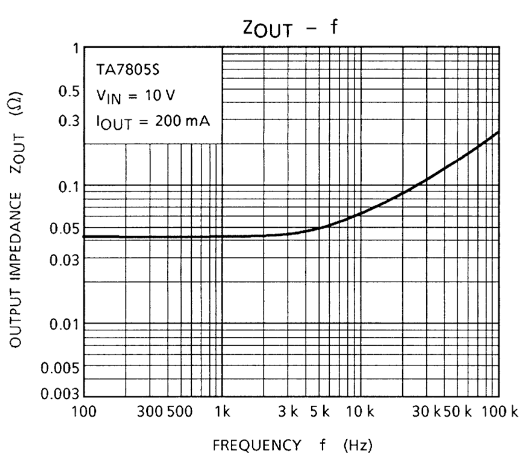

IB – VIN
TA7805S
Tj = 25°C
IOUT = 0 A
QUIESCENT CURRENT IB (mA)
INPUT VOLTAGE VIN (V)
0
2
4
6
8
0
10
20
30
40

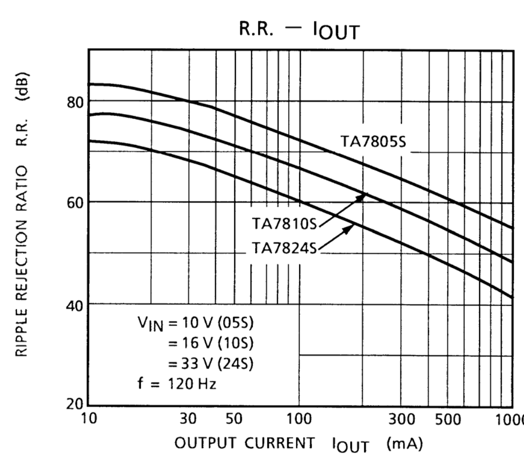

IB – VIN
QUIESCENT CURRENT IB (mA)
IOUT = 0 A
TA7812S
Tj = 25°C
INPUT VOLTAGE VIN (V)
0
2
4
6
8
10
20
30
40

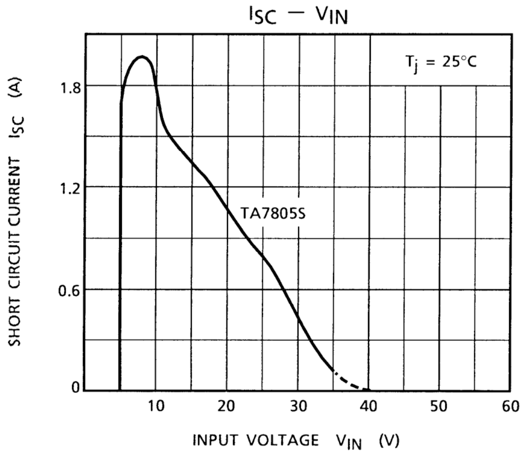

IB – Tj
QUIESCENT CURRENT IB (mA)
TA7805S
VIN = 10 V
IOUT = 0 A
JUNCTION TEMPERATURE Tj (°C)
0
2
4
6
– 50
50
100
150


VD – Tj
ΔVO = 2% OF VOUT
DROPOUT VOLTAGE VD (V)
IOUT = 1 A
200 mA
0 A
JUNCTION TEMPERATURE Tj (°C)
1
2
3
0
50
100
150


Ipeak – Tj
PEAK CIRCUIT CURRENT Ipeak (A)
JUNCTION TEMPERATURE Tj (°C)
0
1
2
3
– 50
50
100
150


ZOUT – f
OUTPUT IMPEDANCE ZOUT (Ω)
TA7805S
VIN = 10 V
IOUT = 200 mA
1
0.5
0.3
0.1
0.05
0.03
0.01
0.005
0.003
100
300 500
1k
3 k 5 k
10 k
30 k 50 k
100 k
FREQUENCY f (Hz)

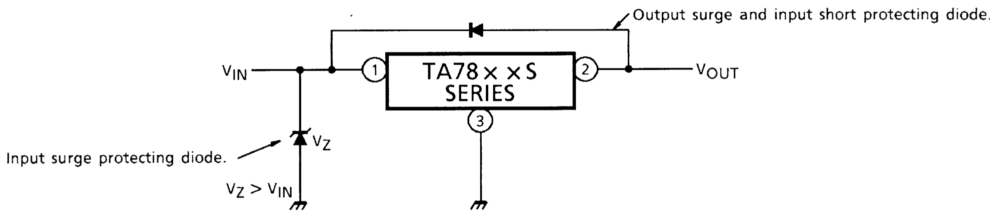

R.R. — IOUT
RIPPLE REJECTION RATIO R.R. (dB)
TA7805S
TA7810S
TA7824S
VIN = 10 V (05S)
= 16 V (10S)
= 33 V (24S)
f = 120 Hz
20
40
60
80
10
30
50
100
300
500
1000
OUTPUT CURRENT IOUT (mA)


I_{SC} – V_{IN}
T_j = 25°C
TA7805S
SHORT CIRCUIT CURRENT I_{SC} (A)
1.8
1.2
0.6
0
10
20
30
40
50
60
INPUT VOLTAGE V_{IN} (V)

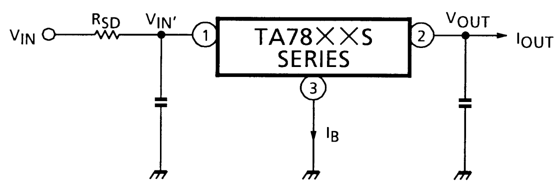
Precautions on Application

(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 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

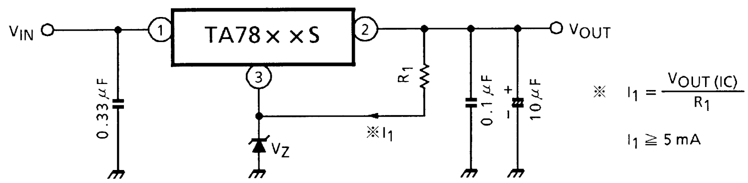
When installing the IC on a heat sink or the like, tighten the IC with a torque of less than the rated value. Tightening in excess of the rated value may cause internal elements of the IC to be adversely affected. Therefore, great care should be given to the installation procedure.

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

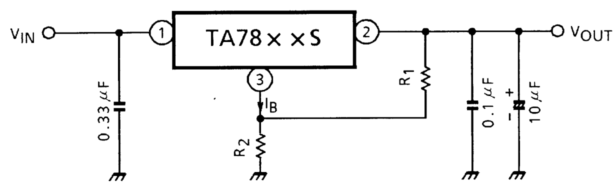
(1) Voltage boost regulator

(a) Voltage boost by use of zener diode



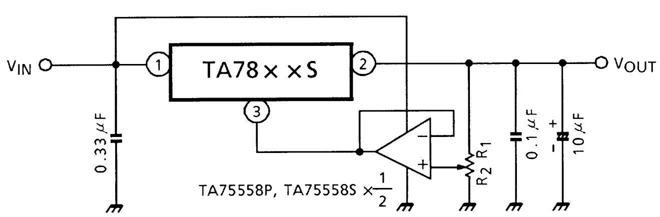
$V_{OUT} = V_{OUT\,(IC)} + V_Z$

(b) Voltage boost by use of resistor



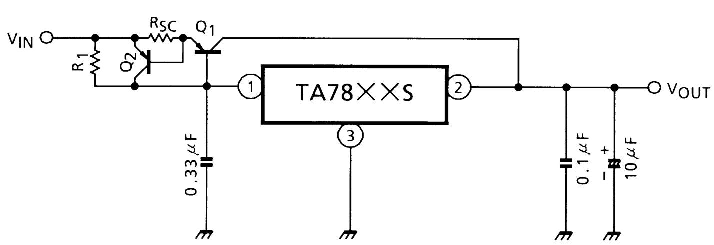
$V_{OUT} = V_{OUT\,(IC)} \left(1 + \frac{R_2}{R_1}\right) + R_2 \cdot I_B$

(c) Adjustable output regulator



$V_{OUT} = V_{OUT\,(IC)} \left(1 + \frac{R_2}{R_1}\right)$

(2) Current boost regulator



Heat sink is needed for Q_1.

$R_1 \le \frac{V_{BE1}}{I_{B\ MAX}}$

where,

V_{BE1} : V_{BE} of external transistor Q_1.

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

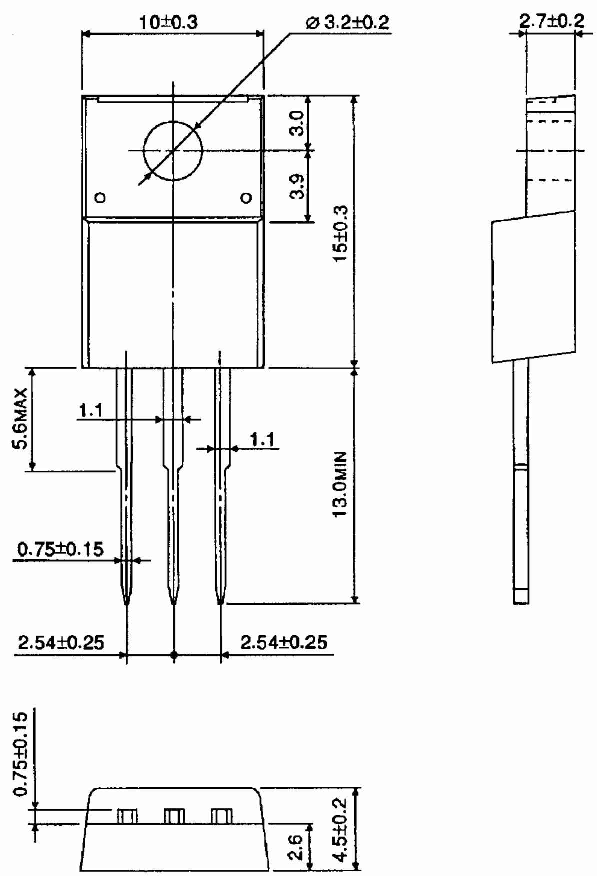
$R_{SC} = \frac{V_{BE2}}{I_{SC}}$

where,

I_{SC} : Short-circuit current.

Package Dimensions

HSIP3-P-2.54A Unit: mm



Weight: 1.7 g (typ.)

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20070701-EN

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