

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

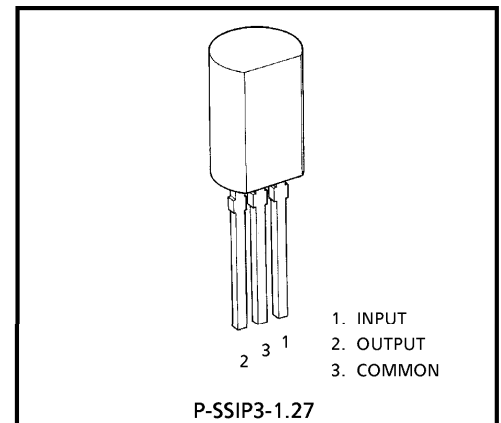
TA78L005AP, TA78L006AP, TA78L007AP, TA78L075AP, TA78L008AP
TA78L009AP, TA78L010AP, TA78L012AP, TA78L132AP
TA78L015AP, TA78L018AP, TA78L020AP, TA78L024AP

THREE TERMINAL POSITIVE REGULATORS

5 V, 6 V, 7 V, 7.5 V, 8 V, 9 V, 10 V, 12 V, 13.2 V, 15 V, 18 V, 20 V, 24 V

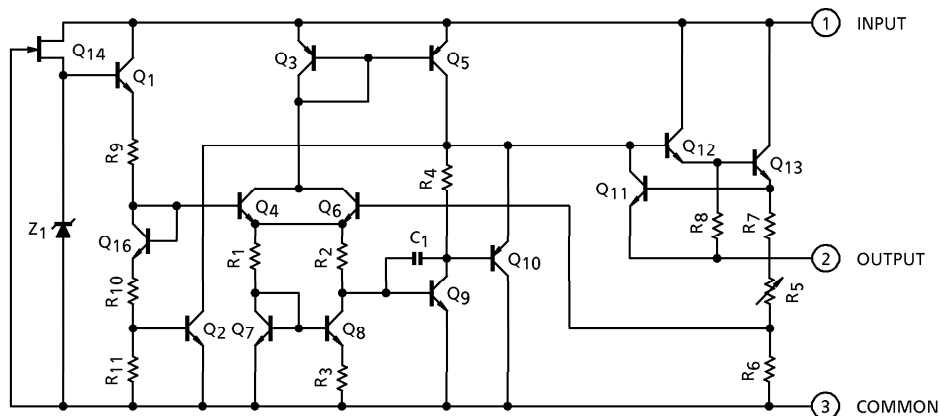
FEATURES

- Suitable for TTL, C²MOS Power Supply
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- Maximum Output Current of 150 mA ($T_j = 25^\circ\text{C}$)
- Available in the Plastic TO-92MOD Package



Weight : 0.36 g (Typ.)

EQUIVALENT CIRCUIT



980910EBA1

- 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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- The information contained herein is subject to change without notice.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	TA78L005AP	V _{IN}	35	V
	TA78L006AP			
	TA78L007AP			
	TA78L075AP			
	TA78L008AP			
	TA78L009AP			
	TA78L010AP			
	TA78L012AP			
	TA78L132AP			
	TA78L015AP		40	
	TA78L018AP			
	TA78L020AP			
	TA78L024AP			
Power Dissipation	(Ta = 25°C)	P _D	800	mW
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-a)}	156	°C / W

TA78L005AP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 10\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		4.8	5.0	5.2	V
Line Regulation	Reg·line	1	T _j = 25°C	7.0 V ≤ V _{IN} ≤ 20 V	—	55	150	mV
				8.0 V ≤ V _{IN} ≤ 20 V	—	45	100	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	11	60	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	5.0	30	
Output Voltage	V _{OUT}	1	T _j = 25°C	7.0 V ≤ V _{IN} ≤ 20 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	4.75	—	5.25	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	4.75	—	5.25	
Quiescent Current	I _B	1	T _j = 25°C		—	3.1	6.0	mA
			T _j = 125°C		—	—	5.5	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	8.0 V ≤ V _{IN} ≤ 20 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	40	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	12	—	mV / kh
Ripple Rejection	R.R.	3	f = 120Hz, 8.0 V ≤ V _{IN} ≤ 18 V, T _j = 25°C		41	49	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−0.6	—	mV / °C

TA78L006AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 11\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		5.76	6.0	6.24	V
Line Regulation	Reg·line	1	T _j = 25°C	8.1 V ≤ V _{IN} ≤ 21 V	—	50	150	mV
				9.0 V ≤ V _{IN} ≤ 21 V	—	45	110	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	12	70	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	5.5	35	
Output Voltage	V _{OUT}	1	T _j = 25°C	8.1 V ≤ V _{IN} ≤ 21 V	5.7	—	6.3	V
				1.0 mA ≤ I _{OUT} ≤ 40 mA				
				1.0 mA ≤ I _{OUT} ≤ 70 mA				
Quiescent Current	I _B	1	T _j = 25°C	—	3.1	6.0	mA	
			T _j = 125°C	—	—	5.5		
Quiescent Current Change	ΔI _B	1	T _j = 25°C	9.0 V ≤ V _{IN} ≤ 20 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	40	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	14	—	mV /kh
Ripple Rejection	R.R.	3	f = 120 Hz, 9.0 V ≤ V _{IN} ≤ 19 V, T _j = 25°C		39	47	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	−0.7	—	mV / °C

TA78L007AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 12\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		6.72	7.0	7.28	V
Line Regulation	Reg·line	1	T _j = 25°C	9.2 V ≤ V _{IN} ≤ 22 V	—	50	160	mV
				10 V ≤ V _{IN} ≤ 22 V	—	45	115	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	13	75	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	6.0	40	
Output Voltage	V _{OUT}	1	T _j = 25°C	9.2 V ≤ V _{IN} ≤ 22 V	6.65	—	7.35	V
				1.0 mA ≤ I _{OUT} ≤ 40 mA				
				1.0 mA ≤ I _{OUT} ≤ 70 mA				
Quiescent Current	I _B	1	T _j = 25°C		—	3.1	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	10 V ≤ V _{IN} ≤ 22 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	50	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	17	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 10 V ≤ V _{IN} ≤ 20 V, T _j = 25°C		37	46	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−0.75	—	mV / °C

TA78L075AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 13\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		7.21	7.5	7.79	V
Line Regulation	Reg·line	1	T _j = 25°C	9.8 V ≤ V _{IN} ≤ 23 V	—	40	170	mV
				10.5 V ≤ V _{IN} ≤ 23 V	—	40	120	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	14	80	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	6.5	40	
Output Voltage	V _{OUT}	1	T _j = 25°C	9.8 V ≤ V _{IN} ≤ 23 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	7.125	—	7.875	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	7.125	—	7.875	
Quiescent Current	I _B	1	T _j = 25°C		—	3.1	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 23 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	60	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	19	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 11 V ≤ V _{IN} ≤ 21 V, T _j = 25°C		37	45	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−0.75	—	mV / °C

TA78L008AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 14\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		7.7	8.0	8.3	V
Line Regulation	Reg·line	1	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 23 V	—	20	175	mV
				11 V ≤ V _{IN} ≤ 23 V	—	12	125	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	15	80	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	7.0	40	
Output Voltage	V _{OUT}	1	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 23 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	7.6	—	8.4	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	7.6	—	8.4	
Quiescent Current	I _B	1	T _j = 25°C		—	3.1	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	11 V ≤ V _{IN} ≤ 23 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	60	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	20	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 12 V ≤ V _{IN} ≤ 23 V, T _j = 25°C		37	45	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−0.8	—	mV / °C

TA78L009AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 15\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	8.64	9.0	9.36	V
Line Regulation	Reg·line	1	$T_j = 25^\circ\text{C}$	$11.4\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	80	mV
				$12\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	20	
Load Regulation	Reg·load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	17	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	8.0	
Output Voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$11.4\text{ V} \leq V_{IN} \leq 24\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	8.55	—	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	8.55	—	
Quiescent Current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.2	6.5	mA
			$T_j = 125^\circ\text{C}$	—	—	6.0	
Quiescent Current Change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$12\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	—	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	
Output Noise Voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	65	—	μV_{rms}
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	21	—	mV/kh
Ripple Rejection	R.R.	3	$f = 120\text{ Hz}$, $12\text{ V} \leq V_{IN} \leq 24\text{ V}$, $T_j = 25^\circ\text{C}$	36	44	—	dB
Dropout Voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 150\text{ mA}$	—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.85	—	mV/ $^\circ\text{C}$

TA78L010AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		9.6	10	10.4	V
Line Regulation	Reg·line	1	T _j = 25°C	12.5 V ≤ V _{IN} ≤ 25 V	—	80	230	mV
				13 V ≤ V _{IN} ≤ 25 V	—	30	170	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	18	90	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	8.5	45	
Output Voltage	V _{OUT}	1	T _j = 25°C	12.5 V ≤ V _{IN} ≤ 25 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	9.5	—	10.5	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	9.5	—	10.5	
Quiescent Current	I _B	1	T _j = 25°C		—	3.2	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	13 V ≤ V _{IN} ≤ 25 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	70	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	22	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 13 V ≤ V _{IN} ≤ 24 V, T _j = 25°C		36	43	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	−0.9	—	mV / °C

TA78L012AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 19\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		11.5	12	12.5	V
Line Regulation	Reg·line	1	T _j = 25°C	14.5 V ≤ V _{IN} ≤ 27 V	—	120	250	mV
				16 V ≤ V _{IN} ≤ 27 V	—	100	200	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	20	100	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	10	50	
Output Voltage	V _{OUT}	1	T _j = 25°C	14.5 V ≤ V _{IN} ≤ 27 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	11.4	—	12.6	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	11.4	—	12.6	
Quiescent Current	I _B	1	T _j = 25°C		—	3.2	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	16 V ≤ V _{IN} ≤ 27 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	80	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	24	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 15 V ≤ V _{IN} ≤ 25 V, T _j = 25°C		36	41	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	– 1.0	—	mV / °C

TA78L132AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 21\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		12.67	13.2	13.73	V
Line Regulation	Reg·line	1	T _j = 25°C	16 V ≤ V _{IN} ≤ 28 V	—	125	270	mV
				17 V ≤ V _{IN} ≤ 28 V	—	105	225	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	22	120	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	11	60	
Output Voltage	V _{OUT}	1	T _j = 25°C	16 V ≤ V _{IN} ≤ 28 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	12.54	—	13.86	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	12.54	—	13.86	
Quiescent Current	I _B	1	T _j = 25°C		—	3.2	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	17 V ≤ V _{IN} ≤ 28 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	90	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	28	—	mV /kh
Ripple Rejection	R.R.	3	f = 120 Hz, 17 V ≤ V _{IN} ≤ 27 V, T _j = 25°C		34	41	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	− 1.2	—	mV / °C

TA78L015AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 23\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		14.4	15	15.6	V
Line Regulation	Reg·line	1	T _j = 25°C	17.5 V ≤ V _{IN} ≤ 30 V	—	130	300	mV
				20 V ≤ V _{IN} ≤ 30 V	—	110	250	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	25	150	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	12	75	
Output Voltage	V _{OUT}	1	T _j = 25°C	17.5 V ≤ V _{IN} ≤ 30 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	14.25	—	15.75	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	14.25	—	15.75	
Quiescent Current	I _B	1	T _j = 25°C		—	3.3	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	20 V ≤ V _{IN} ≤ 30 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	90	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	30	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 18.5 V ≤ V _{IN} ≤ 28.5 V, T _j = 25°C		34	40	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	– 1.3	—	mV / °C

TA78L018AP

ELECTRICAL CHARACTERISTICS

 (Unless otherwise specified, $V_{IN} = 27\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		17.3	18	18.7	V
Line Regulation	Reg·line	1	T _j = 25°C	21.4 V ≤ V _{IN} ≤ 33 V	—	32	325	mV
				22 V ≤ V _{IN} ≤ 33 V	—	27	275	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	30	170	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	15	75	
Output Voltage	V _{OUT}	1	T _j = 25°C	21.4 V ≤ V _{IN} ≤ 33 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	17.1	—	18.9	V
				1.0 mA ≤ I _{OUT} ≤ 70 mA	17.1	—	18.9	
Quiescent Current	I _B	1	T _j = 25°C		—	3.3	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	22 V ≤ V _{IN} ≤ 33 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	150	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	45	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 23 V ≤ V _{IN} ≤ 33 V, T _j = 25°C		32	38	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	– 1.5	—	mV / °C

TA78L020AP

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 29\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

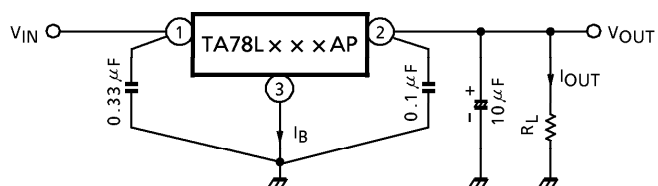
CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		19.2	20	20.8	V
Line Regulation	Reg·line	1	T _j = 25°C	23.5 V ≤ V _{IN} ≤ 35 V	—	33	330	mV
				24 V ≤ V _{IN} ≤ 35 V	—	28	285	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	33	180	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	17	90	
Output Voltage	V _{OUT}	1	T _j = 25°C	23.5 V ≤ V _{IN} ≤ 35 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	19.0	—	21.0	V
				1.0 mA ≤ I _{OUT} ≤ 70mA	19.0	—	21.0	
Quiescent Current	I _B	1	T _j = 25°C		—	3.3	6.5	mA
			T _j = 125°C		—	—	6.0	
Quiescent Current Change	ΔI _B	1	T _j = 25°C	24 V ≤ V _{IN} ≤ 35 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	170	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	49	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 25 V ≤ V _{IN} ≤ 35 V, T _j = 25°C		31	37	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	– 1.7	—	mV / °C

TA78L024AP

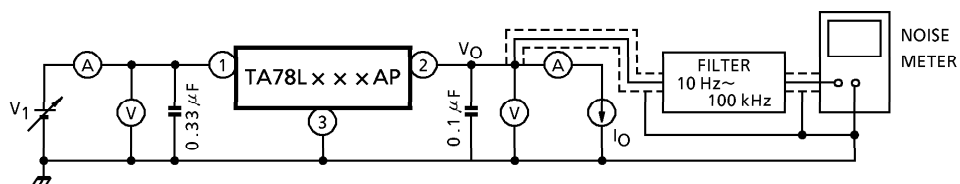
ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 33\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		23	24	25	V
Line Regulation	Reg·line	1	T _j = 25°C	27.5 V ≤ V _{IN} ≤ 38 V	—	35	350	mV
				28 V ≤ V _{IN} ≤ 38 V	—	30	300	
Load Regulation	Reg·load	1	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 100 mA	—	40	200	mV
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	20	100	
Output Voltage	V _{OUT}	1	T _j = 25°C	27.5 V ≤ V _{IN} ≤ 38 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	22.8	—	25.2	V
				1.0 mA ≤ I _{OUT} ≤ 70mA	22.8	—	25.2	
Quiescent Current	I _B	1	T _j = 25°C	—	3.5	6.5	mA	
			T _j = 125°C	—	—	6.0		
Quiescent Current Change	ΔI _B	1	T _j = 25°C	28 V ≤ V _{IN} ≤ 38 V	—	—	1.5	mA
				1.0 mA ≤ I _{OUT} ≤ 40 mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	200	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	56	—	mV / kh
Ripple Rejection	R.R.	3	f = 120 Hz, 29 V ≤ V _{IN} ≤ 39 V, T _j = 25°C		31	35	—	dB
Dropout Voltage	V _D	1	T _j = 25°C, I _{OUT} = 150 mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5 mA		—	− 2.0	—	mV / °C

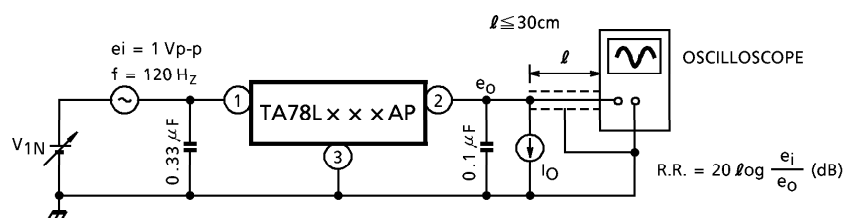
TEST CIRCUIT 1 / STANDARD APPLICATION

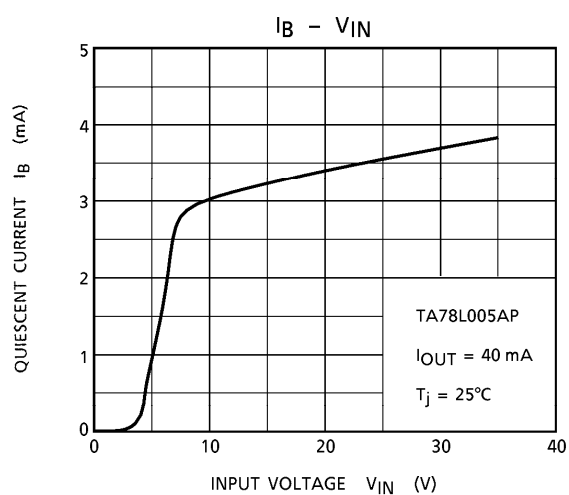
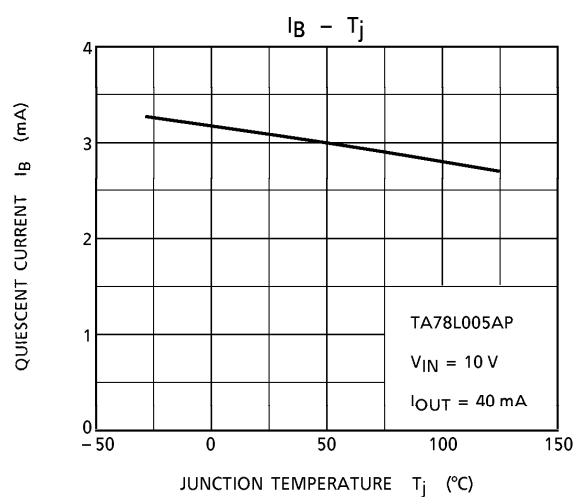
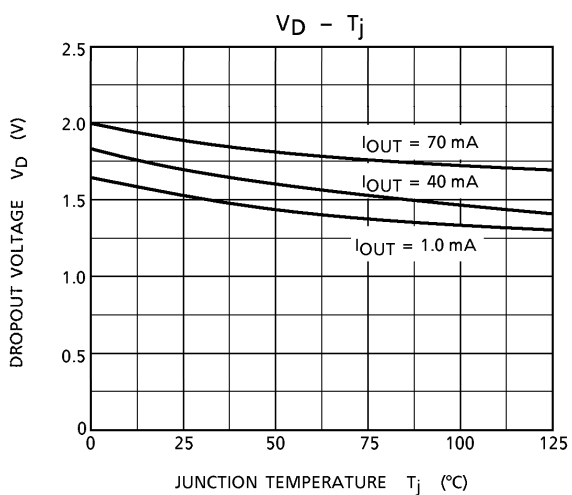
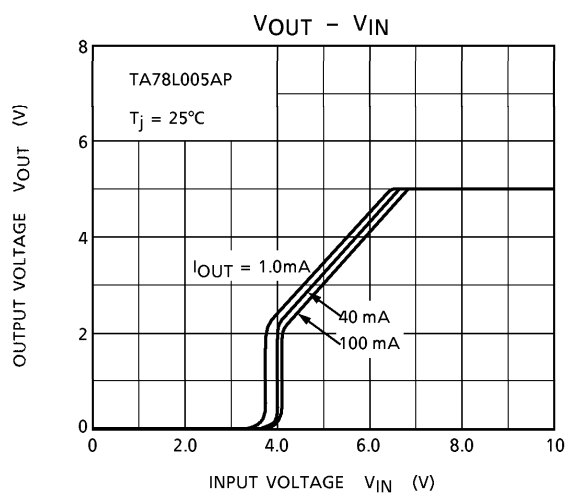
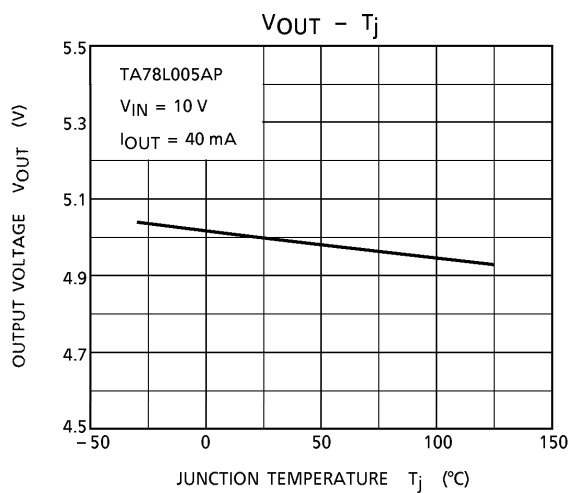
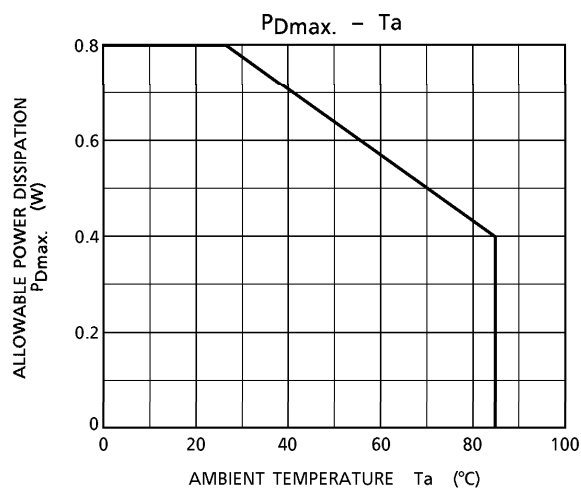


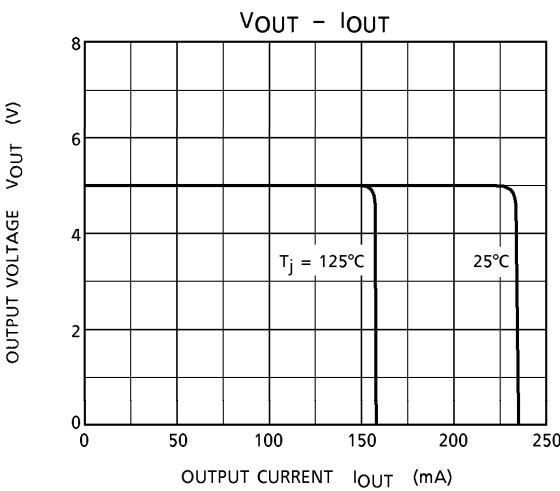
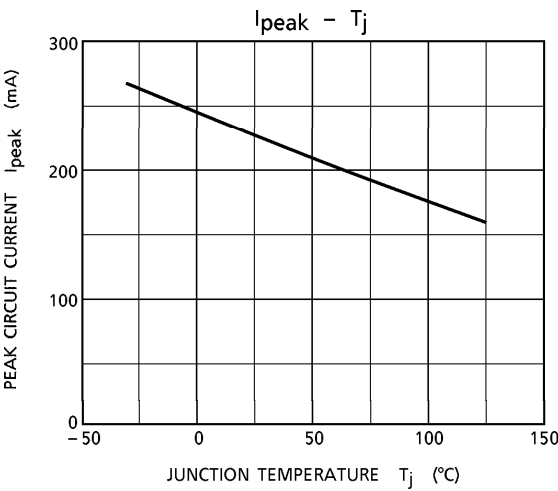
TEST CIRCUIT 2 V_{NO}



TEST CIRCUIT 3 R.R.





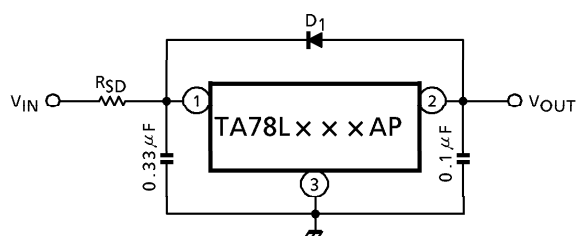


Precautions for Use

If high voltage in excess of output voltage (TYP. value) of IC is applied to its output terminal, IC may be destroyed. In this case, connect a Zener diode between the output terminal and GND to prevent application of excessive voltage. In particular, in such a current boosting circuit as shown in Application Circuit Example (2), if input voltage is suddenly applied by stages and furthermore, load is light, excessive voltage may be applied transiently to the output terminal of IC. In such a case as this, it may become necessary to increase capacity of output capacitor as appropriate, use a smaller R_1 (a resistor for bypassing IC bias current) or gradually rise input voltage in addition to use of a Zener diode as mentioned above.

APPLICATION CIRCUIT

(1) STANDARD APPLICATION



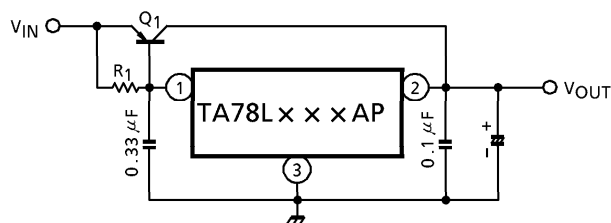
D_1 : IC protective diode

When surge voltage is applied to IC output terminal or $V_{IN} < V_{OUT}$ at the time of power ON/OFF, always connect the high speed swithing diode D_1 .

R_{SD} : Power limiting resistor

If V_{IN} is too high, always connect R_{SD} in order to reduce power consumption of IC.

(2) A. CURRENT BOOST VOLTAGE REGULATOR

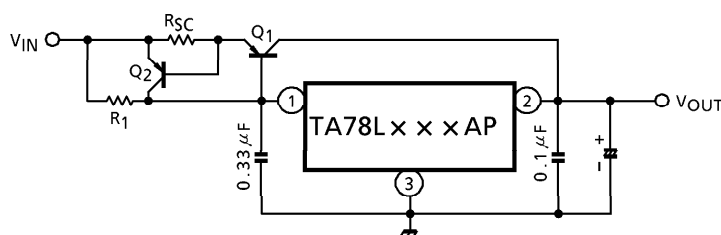


Use a required rediation plate for Q_1 .

$$R_1 \leq \frac{V_{BE1}}{I_B \text{ MAX}}$$

where, V_{BE1} : V_{BE} of external transistor Q_1 .
 $I_B \text{ MAX}$: Max. bias current of IC.

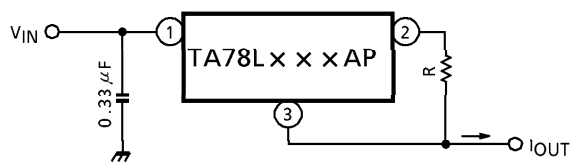
B. SHORT-CIRCUIT PROTECTION



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

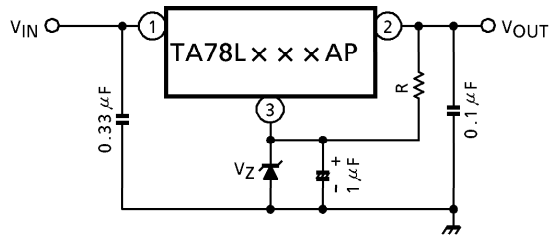
where, I_{SC} : Short-Circuit current

(3) CURRENT REGULATOR

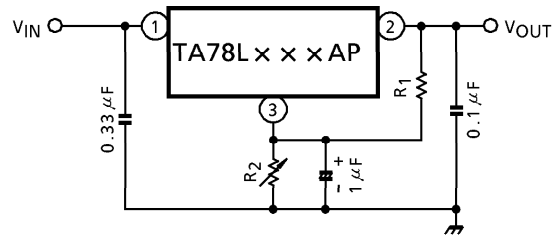


$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

(4) VOLTAGE BOOST REGULATOR

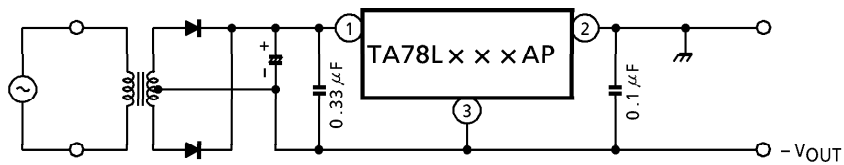


$V_{OUT} = V_Z + V_{OUT}(\text{of IC})$
A little of current in resistor R is needed.

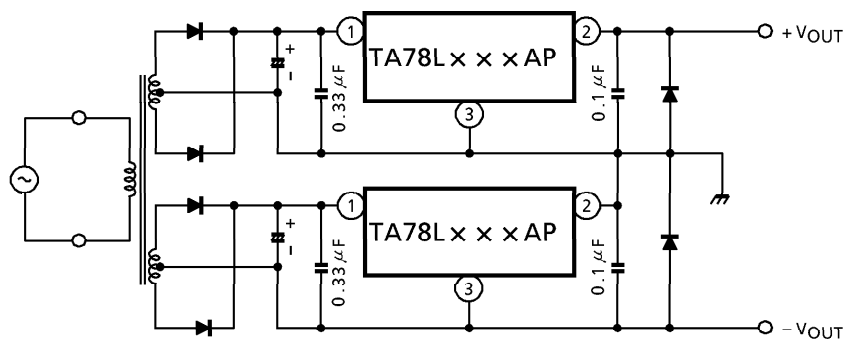


$$V_{OUT} = R_2 (I_B + \frac{V_{OUT}(\text{of IC})}{R_1}) + V_{OUT}(\text{of IC})$$

(5) NEGATIVE REGULATOR

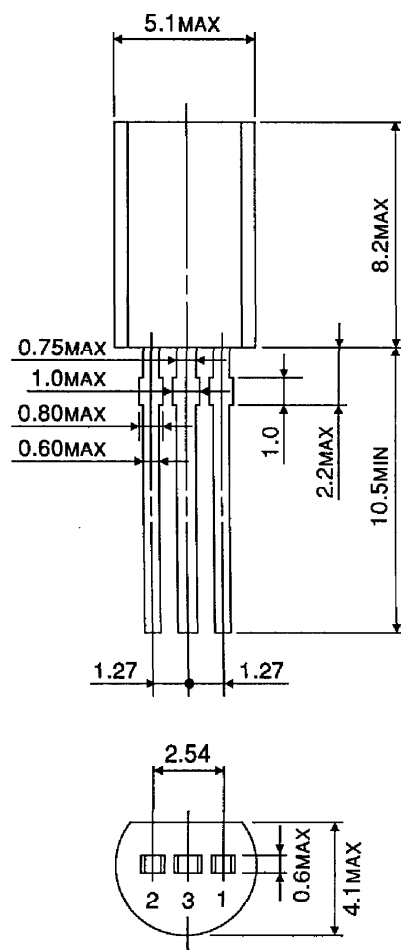


(6) POSITIVE AND NEGATIVE REGULATOR



PACKAGE DIMENSIONS
P-SSIP3-1.27

Unit : mm



Weight : 0.36g (Typ.)