

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

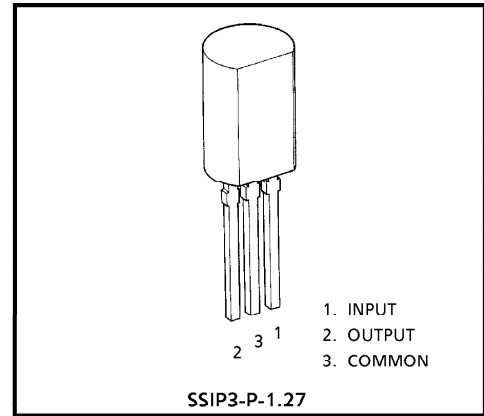
TA78L005AP, TA78L006AP, TA78L007AP, TA78L075AP  
 TA78L008AP, TA78L009AP, TA78L010AP, TA78L012AP  
 TA78L132AP, TA78L015AP, TA78L018AP, TA78L020AP, TA78L024AP

**THREE TERMINAL POSITIVE REGULATORS**

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

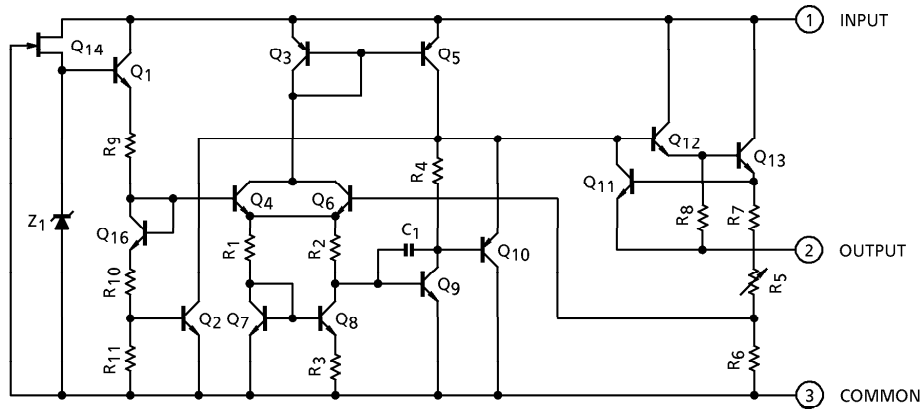
**FEATURES**

- Suitable for TTL, C<sup>2</sup>MOS Power Supply
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- Maximum Output Current of 150mA (T<sub>j</sub> = 25°C)
- Available in the Plastic TO-92MOD Package



Weight : 0.36g (Typ.)

**EQUIVALENT CIRCUIT**



961001EBA2

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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 <sub>IN</sub>	35	V
	TA78L006AP			
	TA78L007AP			
	TA78L075AP			
	TA78L008AP			
	TA78L009AP			
	TA78L010AP			
	TA78L012AP			
	TA78L132AP			
	TA78L015AP			
	TA78L018AP			
	TA78L020AP		40	
	TA78L024AP			
Power Dissipation	(Ta = 25°C)	P <sub>D</sub>	800	mW
Operating Temperature		T <sub>opr</sub>	- 30~75	°C
Storage Temperature		T <sub>stg</sub>	- 55~150	°C
Operating Junction Temperature		T <sub>j</sub>	- 30~150	°C
Thermal Resistance		R <sub>th(j-a)</sub>	156	°C/W

TA78L005AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	4.8	5.0	5.2	V	
Line Regulation	Reg.line	1	$T_j = 25^\circ C$	$7.0V \leq V_{IN} \leq 20V$	—	55	150	mV
				$8.0V \leq V_{IN} \leq 20V$	—	45	100	
Load Regulation	Reg.load	1	$T_j = 25^\circ C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	11	60	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	5.0	30	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	$7.0V \leq V_{IN} \leq 20V$ , $1.0mA \leq I_{OUT} \leq 40mA$	4.75	—	5.25	V
				$1.0mA \leq I_{OUT} \leq 70mA$	4.75	—	5.25	
Quiescent Current	$I_B$	1	$T_j = 25^\circ C$	—	3.1	6.0	mA	
			$T_j = 125^\circ C$	—	—	5.5		
Quiescent Current Change	$\Delta I_B$	1	$8.0V \leq V_{IN} \leq 20V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^\circ C$ , $10Hz \leq f \leq 100kHz$	—	40	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	12	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $8.0V \leq V_{IN} \leq 18V$ , $T_j = 25^\circ C$	41	49	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^\circ C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.6	—	mV / °C	

TA78L006AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	5.76	6.0	6.24	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$8.1V \leq V_{IN} \leq 21V$	—	50	150	mV
				$9.0V \leq V_{IN} \leq 21V$	—	45	110	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	12	70	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	5.5	35	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$8.1V \leq V_{IN} \leq 21V$	5.7	—	6.3	V
				$1.0mA \leq I_{OUT} \leq 40mA$	5.7	—	6.3	
				$1.0mA \leq I_{OUT} \leq 70mA$	5.7	—	6.3	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.1	6.0	mA	
			$T_j = 125^{\circ}C$	—	—	5.5		
Quiescent Current Change	$\Delta I_B$	1	$9.0V \leq V_{IN} \leq 20V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	40	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	14	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $9.0V \leq V_{IN} \leq 19V$ , $T_j = 25^{\circ}C$	39	47	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.7	—	mV / $^{\circ}C$	

TA78L007AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	6.72	7.0	7.28	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$9.2V \leq V_{IN} \leq 22V$	—	50	160	mV
				$10V \leq V_{IN} \leq 22V$	—	45	115	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	13	75	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	6.0	40	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$9.2V \leq V_{IN} \leq 22V$	6.65	—	7.35	V
				$1.0mA \leq I_{OUT} \leq 40mA$	6.65	—	7.35	
				$1.0mA \leq I_{OUT} \leq 70mA$	6.65	—	7.35	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.1	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$10V \leq V_{IN} \leq 22V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	50	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	17	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $10V \leq V_{IN} \leq 20V$ , $T_j = 25^{\circ}C$	37	46	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.75	—	mV / $^{\circ}C$	

TA78L075AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	7.21	7.5	7.79	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$9.8V \leq V_{IN} \leq 23V$	—	40	170	mV
				$10.5V \leq V_{IN} \leq 23V$	—	40	120	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	14	80	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	6.5	40	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$9.8V \leq V_{IN} \leq 23V,$ $1.0mA \leq I_{OUT} \leq 40mA$	7.125	—	7.875	V
				$1.0mA \leq I_{OUT} \leq 70mA$	7.125	—	7.875	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.1	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$10.5V \leq V_{IN} \leq 23V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C, 10Hz \leq f \leq 100kHz$	—	60	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	19	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz,$ $11V \leq V_{IN} \leq 21V, T_j = 25^{\circ}C$	37	45	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C, I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.75	—	mV / $^{\circ}C$	

TA78L008AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	7.7	8.0	8.3	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$10.5V \leq V_{IN} \leq 23V$	—	20	175	mV
				$11V \leq V_{IN} \leq 23V$	—	12	125	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	15	80	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	7.0	40	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$10.5V \leq V_{IN} \leq 23V$ , $1.0mA \leq I_{OUT} \leq 40mA$	7.6	—	8.4	V
				$1.0mA \leq I_{OUT} \leq 70mA$	7.6	—	8.4	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.1	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$11V \leq V_{IN} \leq 23V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	60	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	20	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $12V \leq V_{IN} \leq 23V$ , $T_j = 25^{\circ}C$	37	45	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.8	—	mV / $^{\circ}C$	

TA78L009AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	8.64	9.0	9.36	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$11.4V \leq V_{IN} \leq 24V$	—	80	200	mV
				$12V \leq V_{IN} \leq 24V$	—	20	160	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	17	90	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	8.0	45	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$11.4V \leq V_{IN} \leq 24V$	8.55	—	9.45	V
				$1.0mA \leq I_{OUT} \leq 40mA$	8.55	—	9.45	
				$1.0mA \leq I_{OUT} \leq 70mA$	8.55	—	9.45	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.2	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$12V \leq V_{IN} \leq 24V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	65	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	21	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $12V \leq V_{IN} \leq 24V$ , $T_j = 25^{\circ}C$	36	44	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.85	—	mV / $^{\circ}C$	



TA78L010AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	9.6	10	10.4	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$12.5V \leq V_{IN} \leq 25V$	—	80	230	mV
				$13V \leq V_{IN} \leq 25V$	—	30	170	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	18	90	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	8.5	45	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$12.5V \leq V_{IN} \leq 25V$ , $1.0mA \leq I_{OUT} \leq 40mA$	9.5	—	10.5	V
				$1.0mA \leq I_{OUT} \leq 70mA$	9.5	—	10.5	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.2	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$13V \leq V_{IN} \leq 25V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	70	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	22	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $13V \leq V_{IN} \leq 24V$ , $T_j = 25^{\circ}C$	36	43	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-0.9	—	mV / $^{\circ}C$	

TA78L012AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	11.5	12	12.5	V	
Line Regulation	Reg.line	1	$T_j = 25^\circ C$	$14.5V \leq V_{IN} \leq 27V$	—	120	250	mV
				$16V \leq V_{IN} \leq 27V$	—	100	200	
Load Regulation	Reg.load	1	$T_j = 25^\circ C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	20	100	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	10	50	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	$14.5V \leq V_{IN} \leq 27V$ , $1.0mA \leq I_{OUT} \leq 40mA$	11.4	—	12.6	V
				$1.0mA \leq I_{OUT} \leq 70mA$	11.4	—	12.6	
Quiescent Current	$I_B$	1	$T_j = 25^\circ C$	—	3.2	6.5	mA	
			$T_j = 125^\circ C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$16V \leq V_{IN} \leq 27V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^\circ C$ , $10Hz \leq f \leq 100kHz$	—	80	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	24	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $15V \leq V_{IN} \leq 25V$ , $T_j = 25^\circ C$	36	41	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^\circ C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-1.0	—	mV / °C	

TA78L132AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	12.67	13.2	13.73	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$16V \leq V_{IN} \leq 28V$	—	125	270	mV
				$17V \leq V_{IN} \leq 28V$	—	105	225	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	22	120	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	11	60	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$16V \leq V_{IN} \leq 28V,$ $1.0mA \leq I_{OUT} \leq 40mA$	12.54	—	13.86	V
				$1.0mA \leq I_{OUT} \leq 70mA$	12.54	—	13.86	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.2	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$17V \leq V_{IN} \leq 28V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C, 10Hz \leq f \leq 100kHz$	—	90	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	28	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz,$ $17V \leq V_{IN} \leq 27V, T_j = 25^{\circ}C$	34	41	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C, I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-1.2	—	mV / $^{\circ}C$	

TA78L015AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	14.4	15	15.6	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$17.5V \leq V_{IN} \leq 30V$	—	130	300	mV
				$20V \leq V_{IN} \leq 30V$	—	110	250	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	25	150	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	12	75	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$17.5V \leq V_{IN} \leq 30V$ , $1.0mA \leq I_{OUT} \leq 40mA$	14.25	—	15.75	V
				$1.0mA \leq I_{OUT} \leq 70mA$	14.25	—	15.75	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.3	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$20V \leq V_{IN} \leq 30V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	90	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	30	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $18.5V \leq V_{IN} \leq 28.5V$ , $T_j = 25^{\circ}C$	34	40	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-1.3	—	mV / $^{\circ}C$	

TA78L018AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	17.3	18	18.7	V	
Line Regulation	Reg.line	1	$T_j = 25^\circ C$	$21.4V \leq V_{IN} \leq 33V$	—	32	325	mV
				$22V \leq V_{IN} \leq 33V$	—	27	275	
Load Regulation	Reg.load	1	$T_j = 25^\circ C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	30	170	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	15	75	
Output Voltage	$V_{OUT}$	1	$T_j = 25^\circ C$	$21.4V \leq V_{IN} \leq 33V$ , $1.0mA \leq I_{OUT} \leq 40mA$	17.1	—	18.9	V
				$1.0mA \leq I_{OUT} \leq 70mA$	17.1	—	18.9	
Quiescent Current	$I_B$	1	$T_j = 25^\circ C$	—	3.3	6.5	mA	
			$T_j = 125^\circ C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$22V \leq V_{IN} \leq 33V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^\circ C$ , $10Hz \leq f \leq 100kHz$	—	150	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	45	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $23V \leq V_{IN} \leq 33V$ , $T_j = 25^\circ C$	32	38	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^\circ C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-1.5	—	mV / °C	

TA78L020AP

**ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	19.2	20	20.8	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$23.5V \leq V_{IN} \leq 35V$	—	33	330	mV
				$24V \leq V_{IN} \leq 35V$	—	28	285	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	33	180	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	17	90	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$23.5V \leq V_{IN} \leq 35V$ , $1.0mA \leq I_{OUT} \leq 40mA$	19.0	—	21.0	V
				$1.0mA \leq I_{OUT} \leq 70mA$	19.0	—	21.0	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.3	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$24V \leq V_{IN} \leq 35V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	170	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	49	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $25V \leq V_{IN} \leq 35V$ , $T_j = 25^{\circ}C$	31	37	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-1.7	—	mV / $^{\circ}C$	

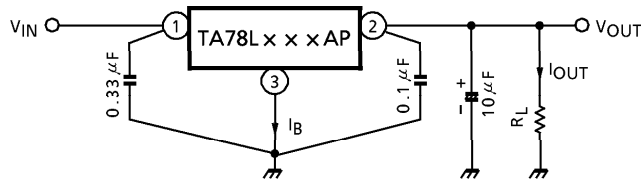
TA78L024AP

**ELECTRICAL CHARACTERISTICS**

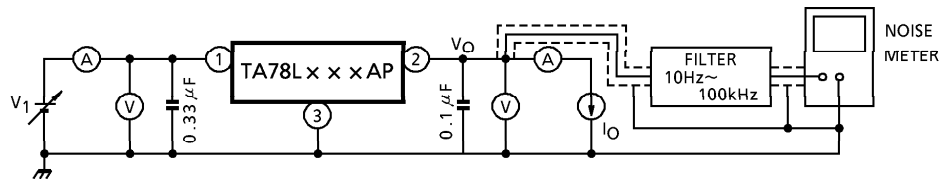
(Unless otherwise specified,  $V_{IN} = 33V$ ,  $I_{OUT} = 40mA$ ,  $C_{IN} = 0.33\mu F$ ,  $C_{OUT} = 0.1\mu F$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ )

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	23	24	25	V	
Line Regulation	Reg.line	1	$T_j = 25^{\circ}C$	$27.5V \leq V_{IN} \leq 38V$	—	35	350	mV
				$28V \leq V_{IN} \leq 38V$	—	30	300	
Load Regulation	Reg.load	1	$T_j = 25^{\circ}C$	$1.0mA \leq I_{OUT} \leq 100mA$	—	40	200	mV
				$1.0mA \leq I_{OUT} \leq 40mA$	—	20	100	
Output Voltage	$V_{OUT}$	1	$T_j = 25^{\circ}C$	$27.5V \leq V_{IN} \leq 38V$ , $1.0mA \leq I_{OUT} \leq 40mA$	22.8	—	25.2	V
				$1.0mA \leq I_{OUT} \leq 70mA$	22.8	—	25.2	
Quiescent Current	$I_B$	1	$T_j = 25^{\circ}C$	—	3.5	6.5	mA	
			$T_j = 125^{\circ}C$	—	—	6.0		
Quiescent Current Change	$\Delta I_B$	1	$28V \leq V_{IN} \leq 38V$	—	—	1.5	mA	
			$1.0mA \leq I_{OUT} \leq 40mA$	—	—	0.1		
Output Noise Voltage	$V_{NO}$	2	$T_a = 25^{\circ}C$ , $10Hz \leq f \leq 100kHz$	—	200	—	$\mu V_{rms}$	
Long Term Stability	$\Delta V_{OUT} / \Delta t$	1	—	—	56	—	mV / 1.0kh	
Ripple Rejection	R.R.	3	$f = 120Hz$ , $29V \leq V_{IN} \leq 39V$ , $T_j = 25^{\circ}C$	31	35	—	dB	
Dropout Voltage	$ V_{IN} - V_{OUT} $	1	$T_j = 25^{\circ}C$ , $I_{OUT} = 150mA$	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	$T_{CVO}$	1	$I_{OUT} = 5mA$	—	-2.0	—	mV / $^{\circ}C$	

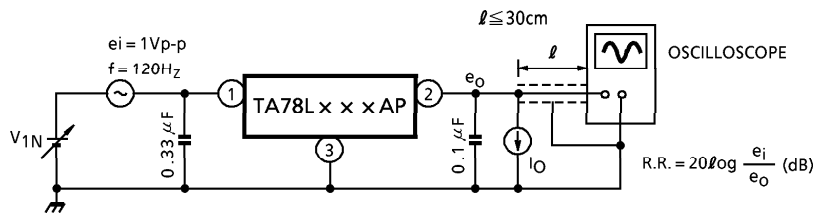
**TEST CIRCUIT 1 / STANDARD APPLICATION**



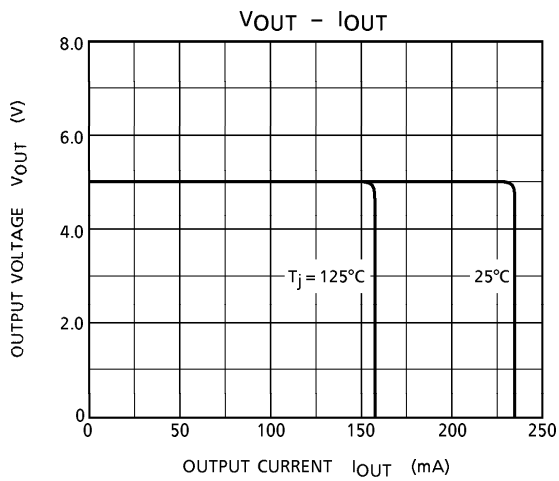
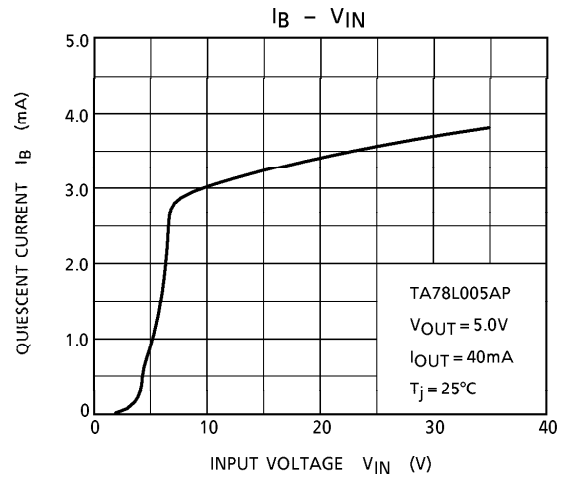
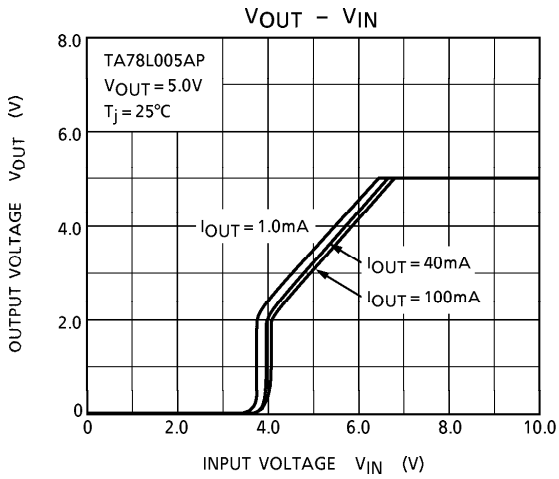
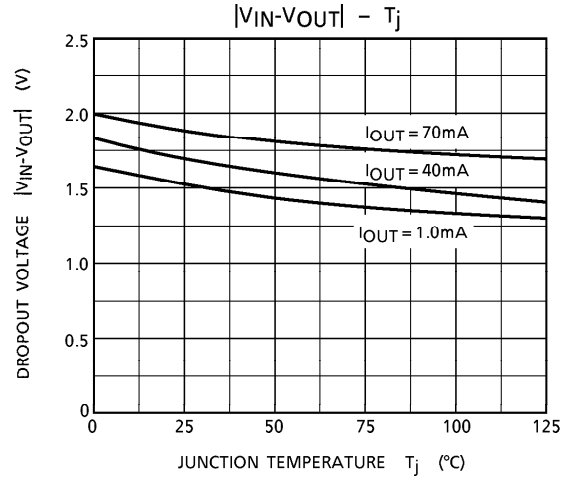
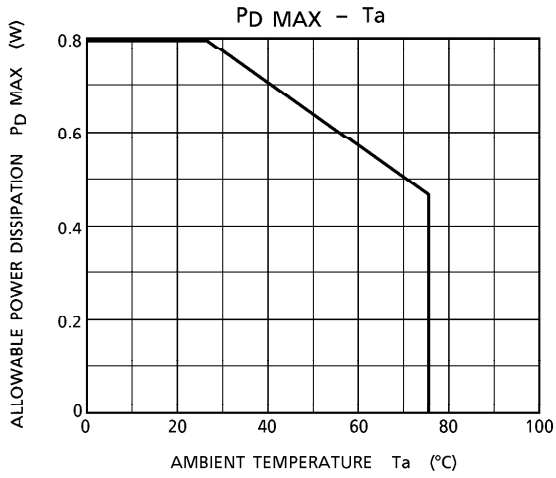
**TEST CIRCUIT 2  $V_{NO}$**



**TEST CIRCUIT 3 R.R.**





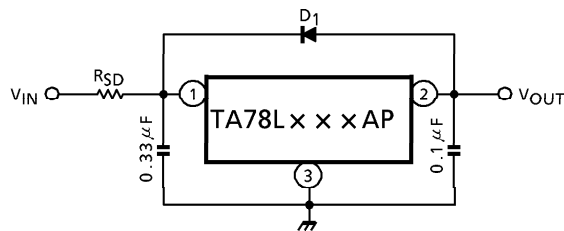


**Precautions for Use**

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.

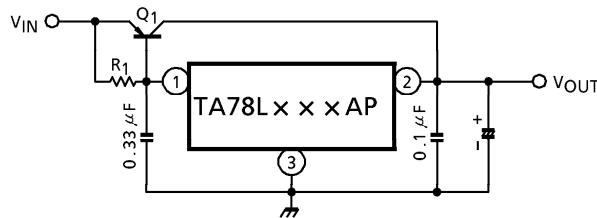
**APPLICATION CIRCUIT**

(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

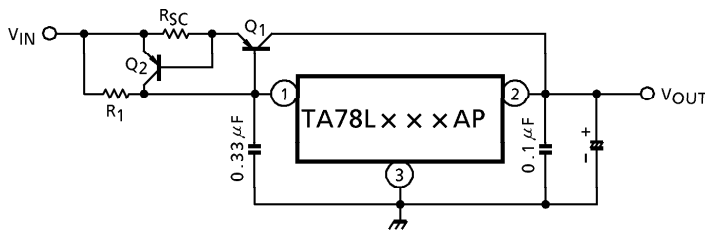


Use a required rediation plate for  $Q_1$ .

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

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

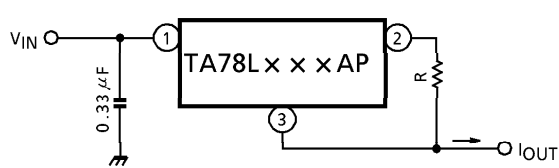
B. SHORT-CIRCUIT PROTECTION



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

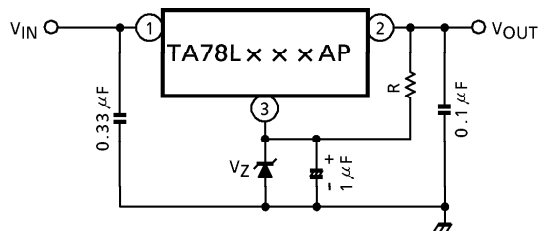
where,  $I_{SC}$  : Short-Circuit current

(3) CURRENT REGULATOR

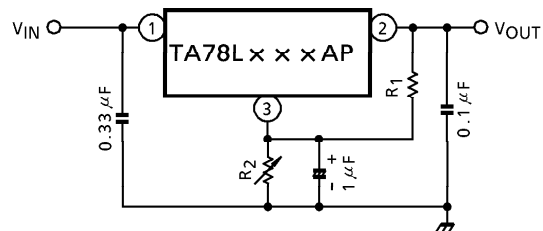


$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

(4) VOLTAGE BOOST REGULATOR

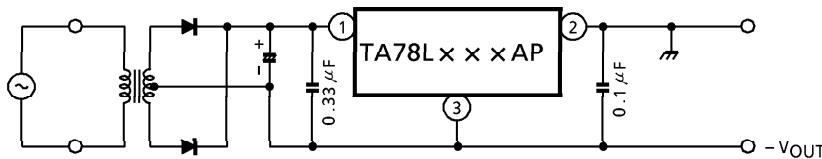


$V_{OUT} = V_Z + V_{OUT}(\text{of IC})$   
A little of current in resistor R is needed.

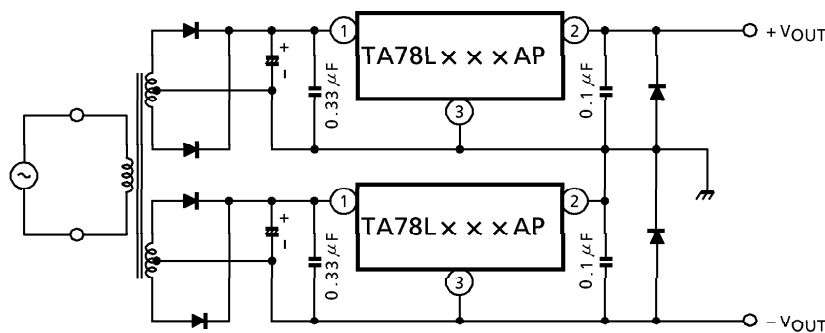


$$V_{OUT} = R_2 (I_B \cdot \frac{V_{OUT}(\text{of IC})}{R_1}) + V_{OUT}(\text{of IC})$$

(5) NEGATIVE REGULATOR

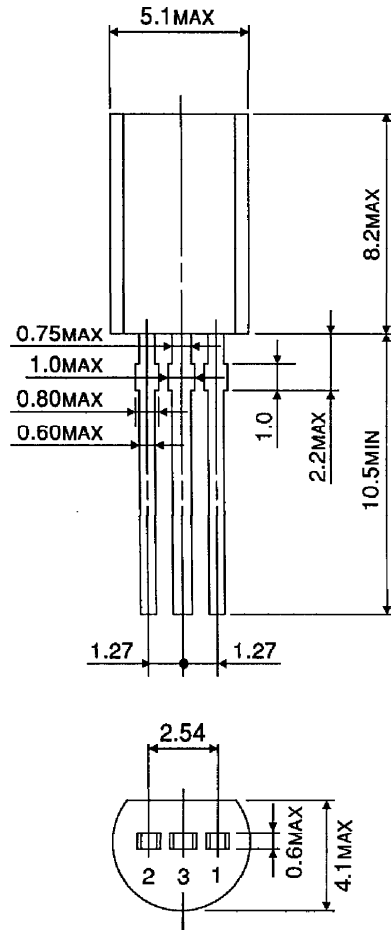


(6) POSITIVE AND NEGATIVE REGULATOR



**OUTLINE DRAWING**  
SSIP3-P-1.27

Unit : mm



Weight : 0.36g (Typ.)