

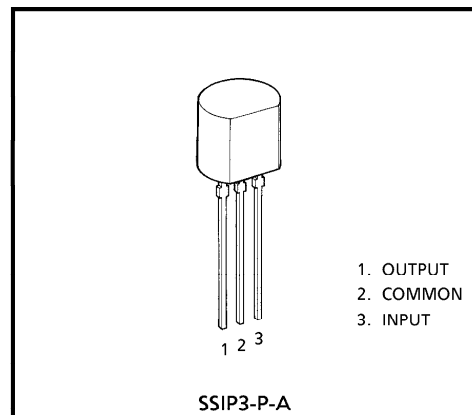
THREE TERMINAL POSITIVE VOLTAGE REGULATORS

5V, 7V, 8V, 9V, 10V, 12V, 15V

The TA78L $\times$ S series of fixed voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications.

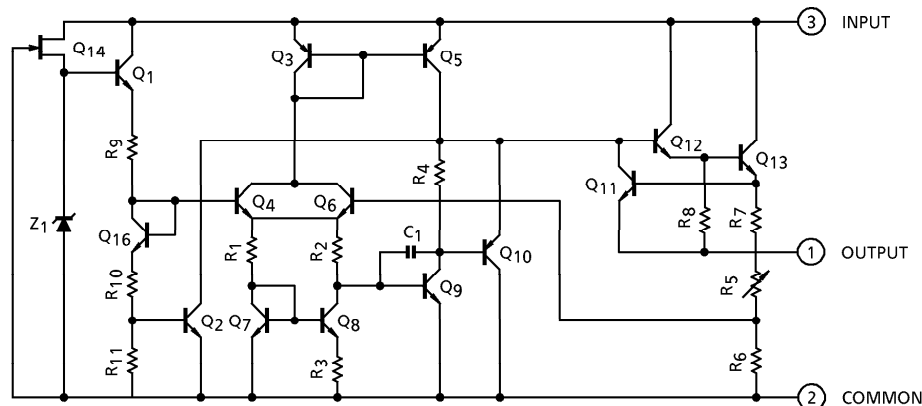
FEATURES

- Suitable for TTL, C²MOS Power Supply
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- Maximum Output Current of 100mA ($T_j = 25^\circ\text{C}$)
- TO-92 Package



Weight : 0.21g (Typ.)

EQUIVALENT CIRCUIT



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Input Voltage	V _{IN}	35	V
Power Dissipation (Ta = 25°C)	P _D	600	mW
Operating Temperature	T _{opr}	– 30~75	°C
Storage Temperature	T _{stg}	– 55~150	°C
Operating Junction Temperature	T _j	– 30~150	°C
Thermal Resistance	R _{th(j-a)}	208	°C/W

TA78L05S

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 10V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, 0°C ≤ T_j ≤ 125°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 7.0V ≤ V _{IN} ≤ 20V	—	55	150	mV
			8.0V ≤ V _{IN} ≤ 20V	—	45	100	
Load Regulation	Reg.load	1	T _j = 25°C 1.0mA ≤ I _{OUT} ≤ 100mA	—	11	60	mV
			1.0mA ≤ I _{OUT} ≤ 40mA	—	5.0	30	
Output Voltage	V _{OUT}	1	T _j = 25°C 7.0V ≤ V _{IN} ≤ 20V	4.75	—	5.25	V
			1.0mA ≤ I _{OUT} ≤ 40mA	4.75	—	5.25	
			1.0mA ≤ I _{OUT} ≤ 70mA	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	8.0V ≤ V _{IN} ≤ 20V	—	—	1.5	mA
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz	—	40	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	12	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 8.0V ≤ V _{IN} ≤ 18V	41	49	—	dB
Dropout Voltage	V _{IN} - V _{OUT}	1	T _j = 25°C	—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	– 0.6	—	mV / °C

TA78L07S

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°C		6.72	7.0	7.28	V
Line Regulation	Reg.line	1	T _j = 25°C	9.2V ≤ V _{IN} ≤ 22V	—	50	160	mV
				10V ≤ V _{IN} ≤ 22V	—	45	115	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	13	75	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	6.0	40	
Output Voltage	V _{OUT}	1	T _j = 25°C	9.2V ≤ V _{IN} ≤ 22V	6.65	—	7.35	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	10V ≤ V _{IN} ≤ 22V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	50	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	17	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 10V ≤ V _{IN} ≤ 20V		37	46	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 0.84	—	mV / °C

TA78L08S

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°C		7.7	8.0	8.3	V
Line Regulation	Reg.line	1	T _j = 25°C	10.5V ≤ V _{IN} ≤ 23V	—	20	175	mV
				11V ≤ V _{IN} ≤ 23V	—	12	125	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	15	80	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	7.0	40	
Output Voltage	V _{OUT}	1	T _j = 25°C	10.5V ≤ V _{IN} ≤ 23V	7.6	—	8.4	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	11V ≤ V _{IN} ≤ 23V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	60	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	20	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 12V ≤ V _{IN} ≤ 23V		37	45	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	−0.97	—	mV / °C

TA78L09S

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°C		8.64	9.0	9.36	V
Line Regulation	Reg.line	1	T _j = 25°C	11.4V ≤ V _{IN} ≤ 24V	—	80	200	mV
				12V ≤ V _{IN} ≤ 24V	—	20	160	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	17	90	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	8.0	45	
Output Voltage	V _{OUT}	1	T _j = 25°C	11.4V ≤ V _{IN} ≤ 24V	8.55	—	9.45	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA	8.55	—	9.45	
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	12V ≤ V _{IN} ≤ 24V		—	—	1.5	mA
			1.0mA ≤ I _{OUT} ≤ 40mA		—	—	0.1	
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	65	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	21	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 12V ≤ V _{IN} ≤ 24V		36	44	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.09	—	mV / °C

TA78L10S

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°C		9.6	10	10.4	V
Line Regulation	Reg.line	1	T _j = 25°C	12.5V ≤ V _{IN} ≤ 25V	—	80	230	mV
				13V ≤ V _{IN} ≤ 25V	—	30	170	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	18	90	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	8.5	45	
Output Voltage	V _{OUT}	1	T _j = 25°C	12.5V ≤ V _{IN} ≤ 25V	9.5	—	10.5	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	13V ≤ V _{IN} ≤ 25V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	70	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	22	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 13V ≤ V _{IN} ≤ 24V		36	43	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.21	—	mV / °C

TA78L12S

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°C		11.5	12	12.5	V
Line Regulation	Reg.line	1	T _j = 25°C	14.5V ≤ V _{IN} ≤ 27V	—	120	250	mV
				16V ≤ V _{IN} ≤ 27V	—	100	200	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	20	100	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	10	50	
Output Voltage	V _{OUT}	1	T _j = 25°C	14.5V ≤ V _{IN} ≤ 27V	11.4	—	12.6	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA	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	16V ≤ V _{IN} ≤ 27V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	80	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	24	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 15V ≤ V _{IN} ≤ 25V		36	41	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.45	—	mV / °C

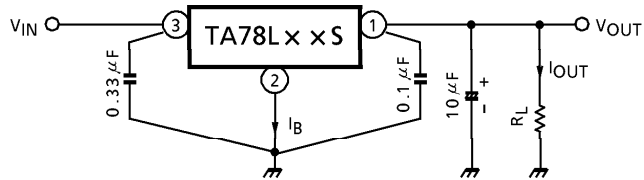
TA78L15S

ELECTRICAL CHARACTERISTICS

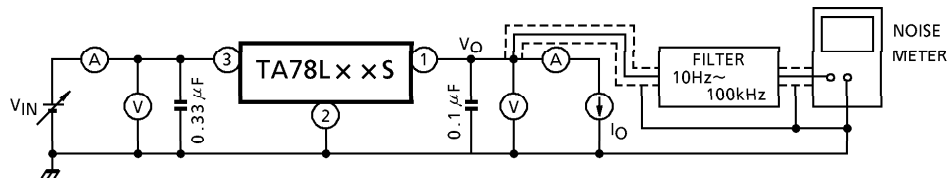
(Unless otherwise specified, $V_{IN} = 23V$, $I_{OUT} = 40mA$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $0^\circ C \leq T_j \leq 125^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	V _{OUT}	1	T _j = 25°C		14.4	15	15.6	V
Line Regulation	Reg.line	1	T _j = 25°C	17.5V ≤ V _{IN} ≤ 30V	—	130	300	mV
				20V ≤ V _{IN} ≤ 30V	—	110	250	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	25	150	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	12	75	
Output Voltage	V _{OUT}	1	T _j = 25°C	17.5V ≤ V _{IN} ≤ 30V	14.25	—	15.75	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	20V ≤ V _{IN} ≤ 30V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C, 10Hz ≤ f ≤ 100kHz		—	90	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	30	—	mV / 1.0kh
Ripple Rejection	R.R.	3	f = 120Hz, T _j = 25°C 18.5V ≤ V _{IN} ≤ 28.5V		34	40	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.82	—	mV / °C

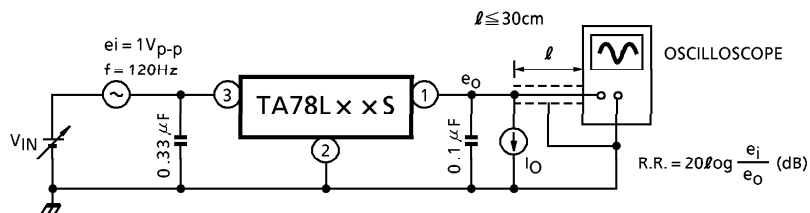
TEST CIRCUIT 1 / STANDARD APPLICATION



TEST CIRCUIT 2 V_{NO}



TEST CIRCUIT 3 R.R.

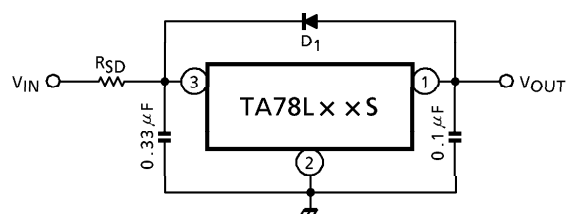


Precautions for Use

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



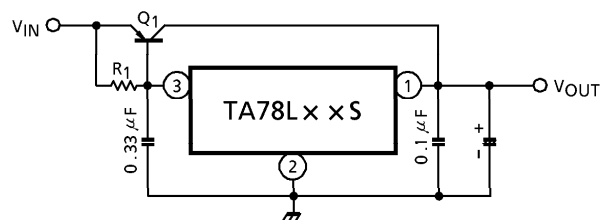
D_1 : IC protective diode

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 switching 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



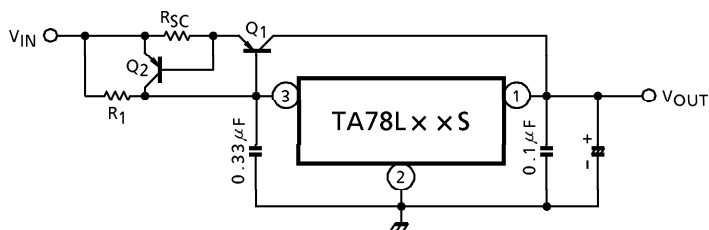
Use a required radiation plate for Q_1 .

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

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

$I_B \text{ MAX}$: Max. bias current of IC.

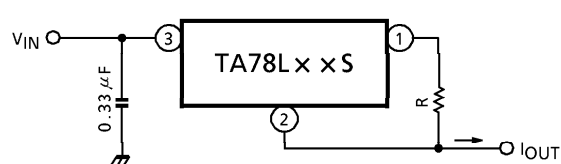
B. SHORT-CIRCUIT PROTECTION



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

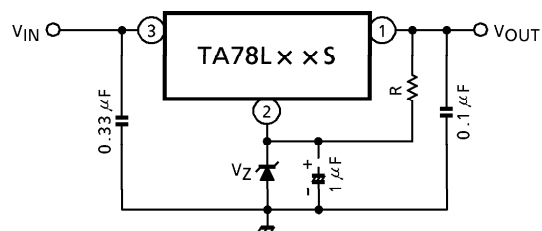
where, I_{SC} : Short-Circuit current

(3) CURRENT REGULATOR

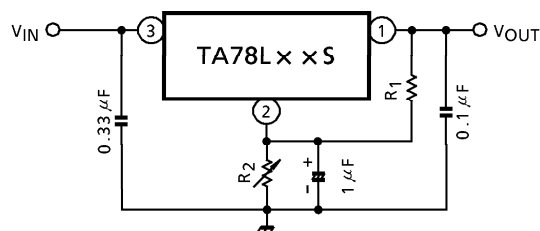


$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

(4) VOLTAGE BOOST REGULATOR

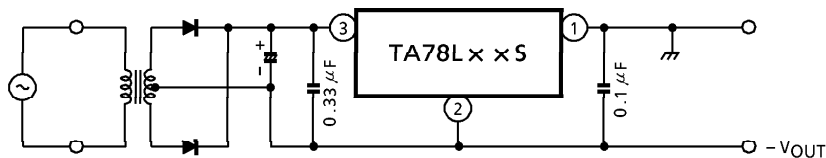


$V_{OUT} = V_Z + V_{OUT} \text{ (of IC)}$
Apply current of several mA to R.

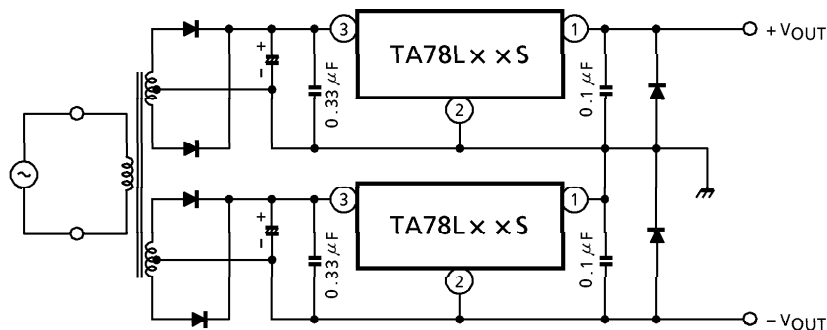


$$V_{OUT} = R_2 \left(I_B + \frac{V_{OUT} \text{ (of IC)}}{R_1} \right) + V_{OUT} \text{ (of IC)}$$

(5) NEGATIVE REGULATOR

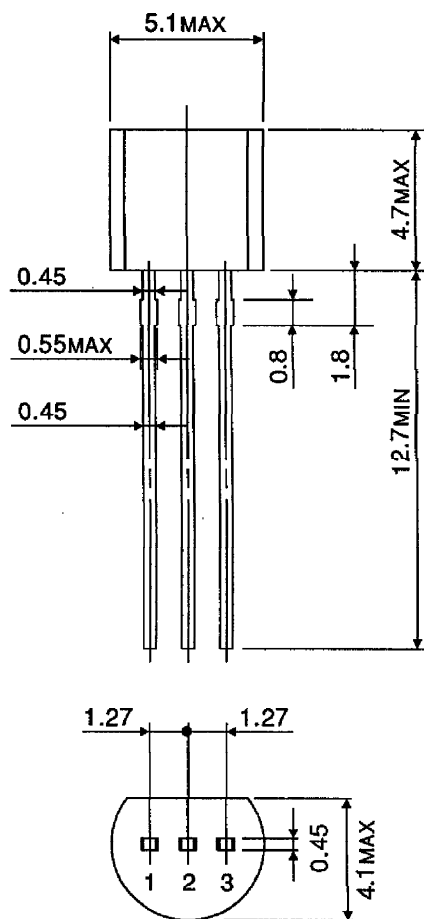


(6) POSITIVE AND NEGATIVE REGULATOR



OUTLINE DRAWING
SSIP3-P-A

Unit : mm



Weight : 0.21g (Typ.)