

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

## TA78DS05BP, TA78DS06BP, TA78DS08BP, TA78DS09BP, TA78DS10BP, TA78DS12BP, TA78DS15BP, TA78DS05CP

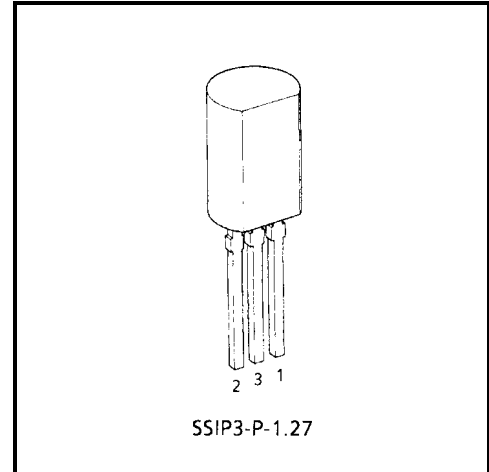
5 V, 6 V, 8 V, 9 V, 10 V, 12 V, 15 V

Low Dropout Voltage Regulator

The TA78DS××BP series consists of positive fixed output voltage regulator IC capable of sourcing current up to 30 mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery powered equipment. This series includes current limiting, thermal shutdown, over voltage protection, input fault protection and excessive transient protection circuits internally.

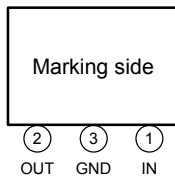
### Features

- Low standby current of 600  $\mu$ A typical.
- Maximum output current up to 30 mA.
- Low dropout voltage of less than 0.3 V.
- Multi-protection:  
Reverse connection of power supply, 60V load dump, thermal shut down and current limiting.
- Available in the plastic TO-92 MOD package.

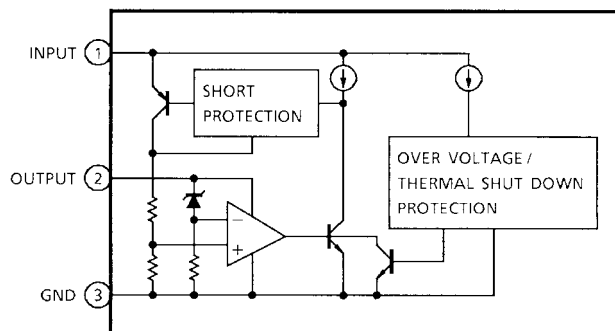


Weight: 0.36 g (Typ.)

### Pin Assignment



### Block Diagram



## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Operating input voltage	V <sub>IN</sub>	29	V
Input voltage of surge	V <sub>IN</sub>	60	V
Power dissipation	(Ta = 25°C) P <sub>D</sub>	800	mW
Operating temperature	T <sub>opr</sub>	-40~85	°C
Storage temperature	T <sub>stg</sub>	-55~150	°C
Junction temperature	T <sub>j</sub>	150	°C
Thermal resistance	R <sub>th(j-a)</sub>	156	°C/W
Soldering temperature-time	T <sub>sol</sub>	260 (10 s)	°C

## TA78DS05BP

### Electrical Characteristics

(Unless otherwise specified, V<sub>IN</sub> = 14 V, I<sub>OUT</sub> = 5 mA, C<sub>IN</sub> = 0.1 μF, C<sub>OUT</sub> = 3.3 μF, T<sub>j</sub> = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V <sub>OUT</sub>	—	5.35 V ≤ V <sub>IN</sub> ≤ 26 V	4.75	5.0	5.25	V
			5.35 V ≤ V <sub>IN</sub> ≤ 26 V, -40°C ≤ Ta ≤ 85°C	4.5	5.0	5.5	
Line regulation	Reg-line	—	9.0 V ≤ V <sub>IN</sub> ≤ 16 V	—	1	10	mV
			6.0 V ≤ V <sub>IN</sub> ≤ 26 V	—	4	30	
Load regulation	Reg-load	—	5.0 mA ≤ I <sub>OUT</sub> ≤ 30 mA	—	1	50	mV
Quiescent current	I <sub>B</sub>	—	I <sub>OUT</sub> = 0 mA	—	0.6	1	mA
			6 V ≤ V <sub>IN</sub> ≤ 26 V, I <sub>OUT</sub> = 5 mA	—	0.7	1	
Dropout voltage	V <sub>D</sub>	—	I <sub>OUT</sub> = 5 mA	—	0.1	0.2	V
			I <sub>OUT</sub> = 10 mA	—	0.2	0.3	
Max operating voltage	V <sub>IN</sub>	—	—	29	33	—	V

## TA78DS05CP

### Electrical Characteristics

(Unless otherwise specified, V<sub>IN</sub> = 14 V, I<sub>OUT</sub> = 5 mA, C<sub>IN</sub> = 0.1 μF, C<sub>OUT</sub> = 3.3 μF, T<sub>j</sub> = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V <sub>OUT</sub>	—	5.35 V ≤ V <sub>IN</sub> ≤ 26 V	4.8	5.0	5.2	V
			5.35 V ≤ V <sub>IN</sub> ≤ 26 V, -40°C ≤ Ta ≤ 85°C	4.75	5.0	5.25	
Line regulation	Reg-line	—	9.0 V ≤ V <sub>IN</sub> ≤ 16 V	—	1	10	mV
			6.0 V ≤ V <sub>IN</sub> ≤ 26 V	—	4	30	
Load regulation	Reg-load	—	5.0 mA ≤ I <sub>OUT</sub> ≤ 30 mA	—	1	50	mV
Quiescent current	I <sub>B</sub>	—	I <sub>OUT</sub> = 0 mA	—	0.6	1	mA
			6 V ≤ V <sub>IN</sub> ≤ 26 V, I <sub>OUT</sub> = 5 mA	—	0.7	1	
Dropout voltage	V <sub>D</sub>	—	I <sub>OUT</sub> = 5 mA	—	0.1	0.2	V
			I <sub>OUT</sub> = 10 mA	—	0.2	0.3	
Max operating voltage	V <sub>IN</sub>	—	—	29	33	—	V

## TA78DS06BP

### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$6.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	5.7	6.0	6.3	V
			$6.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	5.4	6.0	6.6	
Line regulation	Reg-line	—	$10\text{ V} \leq V_{IN} \leq 17\text{ V}$	—	1	20	mV
			$7.0\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	4	40	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	1	60	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	0.6	1.1	mA
			$7\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	0.7	1.1	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V

## TA78DS08BP

### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$8.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	7.6	8.0	8.4	V
			$8.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	7.2	8.0	8.8	
Line regulation	Reg-line	—	$12\text{ V} \leq V_{IN} \leq 19\text{ V}$	—	2	30	mV
			$9.0\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	5	60	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	4	80	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	0.7	1.2	mA
			$9\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	0.8	1.2	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V

## TA78DS09BP

### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$9.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	8.55	9.0	9.45	V
			$9.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	8.1	9.0	9.9	
Line regulation	Reg-line	—	$13\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	2	35	mV
			$10\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	5	70	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	4	90	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	0.7	1.3	mA
			$10\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	0.8	1.3	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V

## TA78DS10BP

### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$10.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	9.5	10.0	10.5	V
			$10.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	9.0	10.0	11.0	
Line regulation	Reg-line	—	$14\text{ V} \leq V_{IN} \leq 21\text{ V}$	—	3	40	mV
			$11\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	7	80	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	6	100	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	0.7	1.4	mA
			$11\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	0.8	1.4	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V

## TA78DS12BP

### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 18\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

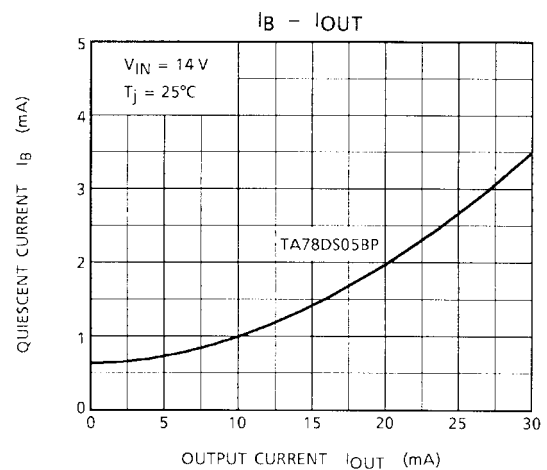
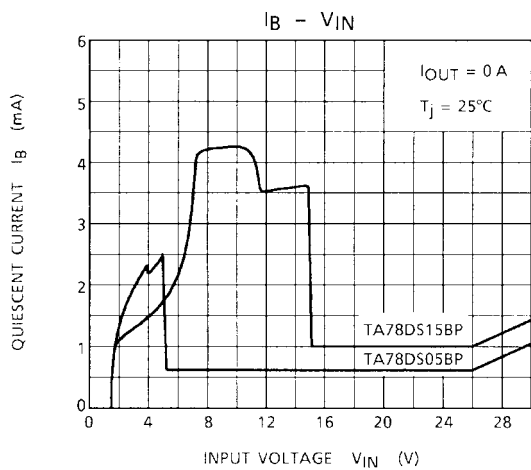
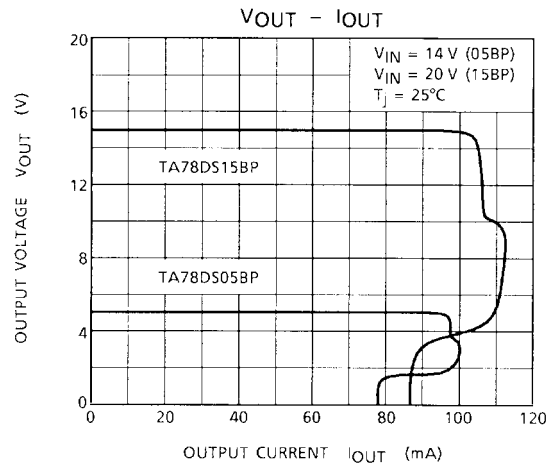
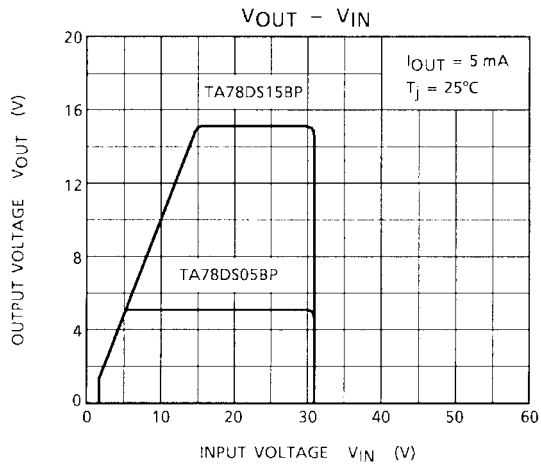
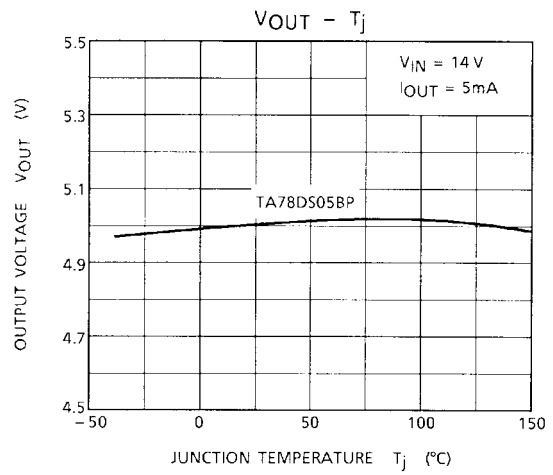
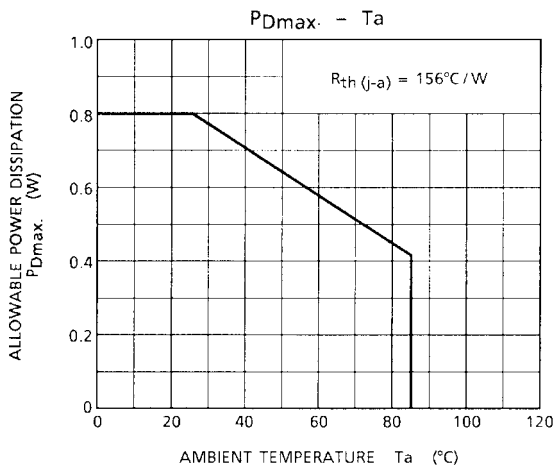
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$12.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	11.4	12.0	12.6	V
			$12.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	10.8	12.0	13.2	
Line regulation	Reg-line	—	$16\text{ V} \leq V_{IN} \leq 23\text{ V}$	—	4	50	mV
			$13\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	8	100	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	2	120	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	0.8	1.5	mA
			$13\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	1.0	1.5	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V

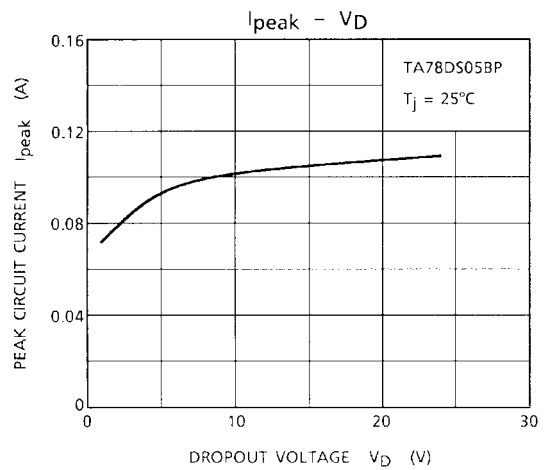
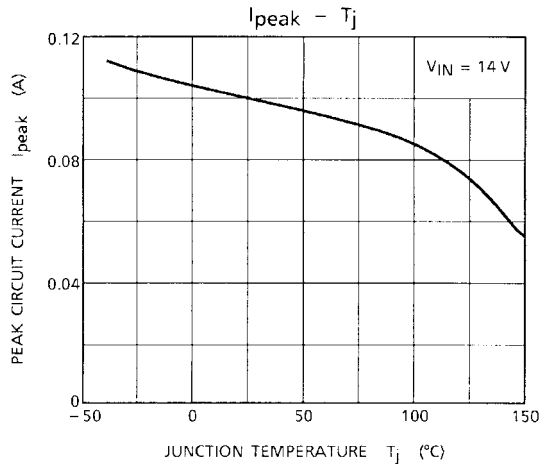
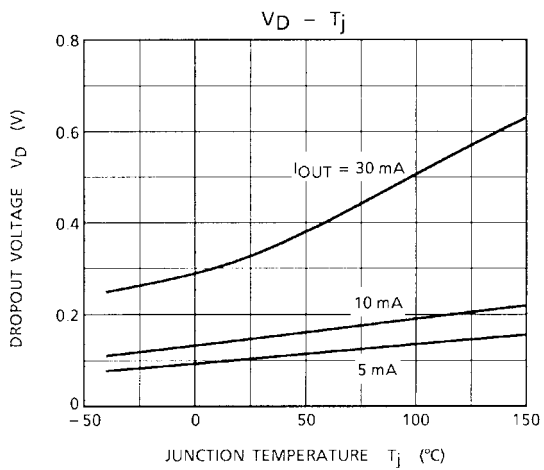
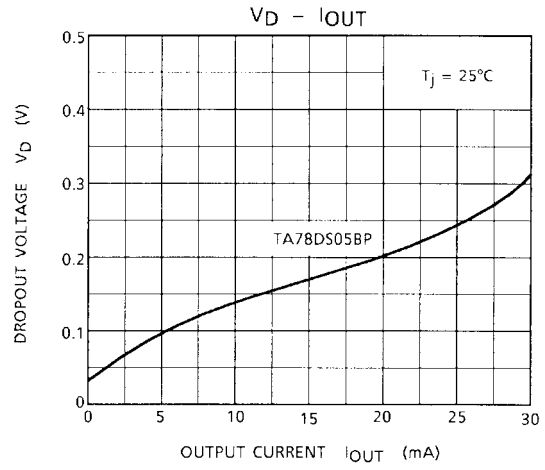
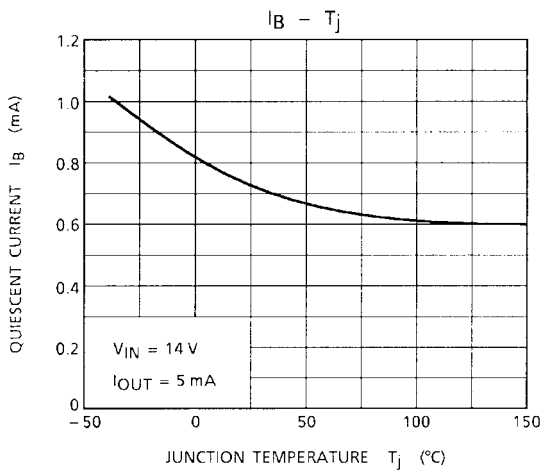
## TA78DS15BP

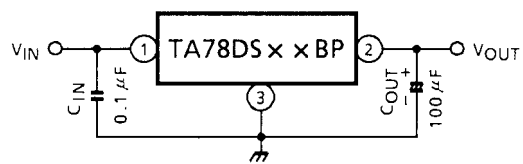
### Electrical Characteristics

(Unless otherwise specified,  $V_{IN} = 20\text{ V}$ ,  $I_{OUT} = 5\text{ mA}$ ,  $C_{IN} = 0.1\text{ }\mu\text{F}$ ,  $C_{OUT} = 3.3\text{ }\mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	—	$15.35\text{ V} \leq V_{IN} \leq 26\text{ V}$	14.25	15.0	15.75	V
			$15.35\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	13.5	15.0	16.5	
Line regulation	Reg-line	—	$19\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	5	60	mV
			$16\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	8	130	
Load regulation	Reg-load	—	$5.0\text{ mA} \leq I_{OUT} \leq 30\text{ mA}$	—	1	150	mV
Quiescent current	$I_B$	—	$I_{OUT} = 0\text{ mA}$	—	1.0	1.6	mA
			$16\text{ V} \leq V_{IN} \leq 26\text{ V}$ , $I_{OUT} = 5\text{ mA}$	—	1.2	1.6	
Dropout voltage	$V_D$	—	$I_{OUT} = 5\text{ mA}$	—	0.1	0.2	V
			$I_{OUT} = 10\text{ mA}$	—	0.2	0.3	
Max operating voltage	$V_{IN}$	—	—	29	33	—	V





**Application Circuit**

Capacitor  $C_{IN}/C_{OUT}$  must be guaranteed to operate of the temperature range that the regulator should be operated correctly, 100  $\mu\text{F}$  is a suitable value to suppress the oscillation phenomenon at the output terminal.

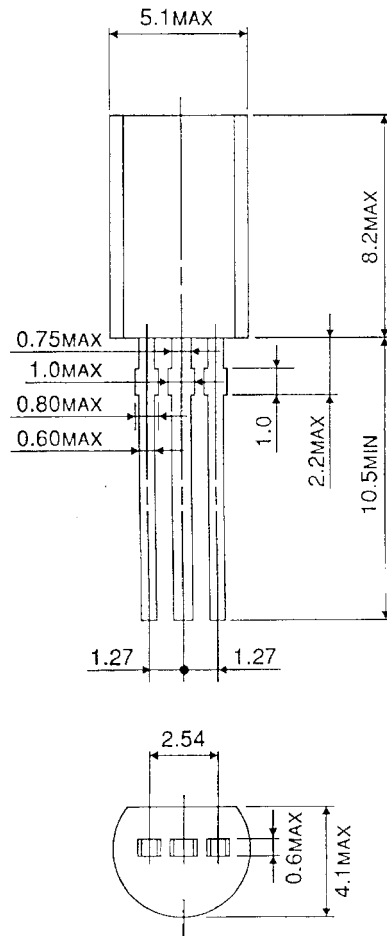
The equivalent series resistance (ESR) of  $C_{OUT}$  must be less than 1  $\Omega$  in operating temperature range.



## Package Dimensions

SSIP3-P-1.27

Unit : mm



Weight : 0.36 g (Typ.)

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000707EBA

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