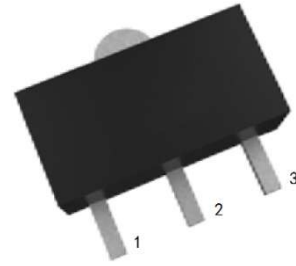


## 3-Terminal Positive Voltage Regulator

### FEATURES

- Maximum Output Current  $I_o$ : 0.15 A
- Output Voltage  $V_o$ : 5V/6V/8V/9V/10V/12V/15V/18V/20V/24V
- Continuous Total Dissipation  
Pd: 0.5 W ( $T_a = 25^\circ\text{C}$ )



1: OUT 2: GND 3: IN  
SOT-89 PLASTIC PACKAGE

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Parameter		Symbol	Rating	Unit
Input Voltage	78L05~78L15	$V_i$	35	V
	78L18~78L24		40	
Output Current	78L05~78L24	$I_o$	150	mA
Power Dissipation		$P_{tot}$	500 <sup>1)</sup>	mW
Operating Temperature		$T_{opr}$	- 40 to + 85	$^\circ\text{C}$
Junction Temperature Range		$T_j$	- 40 to +125	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	- 55 to +150	$^\circ\text{C}$

1) Device is installed in the heat dissipation good environment

### 78L05 Electrical Characteristics ( $T_a = 25^\circ\text{C}$ ) (Unless otherwise specified, $V_i = 10\text{ V}$ , $I_o = 40\text{ mA}$ , $C_i = 0.33\ \mu\text{F}$ , $C_o = 0.1\ \mu\text{F}$ )

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	$V_o$	$T_j = 25^\circ\text{C}$	4.75	5	5.25	V
		$7\text{ V} \leq V_i \leq 20\text{ V}$ , $1\text{ mA} \leq I_o \leq 40\text{ mA}$	4.65	5	5.35	V
Voltage Regulation	$S_v$	$7\text{ V} \leq V_i \leq 20\text{ V}$ , $T_j = 25^\circ\text{C}$	--	--	150	mV
		$8\text{ V} \leq V_i \leq 20\text{ V}$ , $T_j = 25^\circ\text{C}$	--	--	100	
Current Regulation	$S_i$	$1\text{ mA} \leq I_o \leq 100\text{ mA}$ , $T_j = 25^\circ\text{C}$	--	--	60	mV
Quiescent Current	$I_Q$	$T_j = 25^\circ\text{C}$	--	--	6	mA
Quiescent Current Change	$\Delta I_Q$	$8\text{ V} \leq V_i \leq 20\text{ V}$	--	--	1.5	mA
		$1\text{ mA} \leq I_o \leq 40\text{ mA}$	--	--	0.1	
Ripple Rejection	$S_{rip}$	$f = 120\text{ Hz}$ , $8\text{ V} \leq V_i \leq 18\text{ V}$ , $T_j = 25^\circ\text{C}$	--	49	--	dB
Dropout Voltage	$V_{Drop}$	$T_j = 25^\circ\text{C}$	--	1.7	--	V

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**78L06 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified, V<sub>I</sub> = 10 V, I<sub>O</sub> = 40 mA, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1 μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	5.70	6	6.30	V
		8.1 V ≤ V <sub>I</sub> ≤ 21 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	5.58	6	6.42	V
Voltage Regulation	S <sub>v</sub>	8.1 V ≤ V <sub>I</sub> ≤ 21 V, T <sub>j</sub> = 25°C	--	--	150	mV
		9 V ≤ V <sub>I</sub> ≤ 21 V, T <sub>j</sub> = 25°C	--	--	110	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	70	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6	mA
Quiescent Current Change	ΔI <sub>Q</sub>	9 V ≤ V <sub>I</sub> ≤ 21 V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 9 V ≤ V <sub>I</sub> ≤ 19 V, T <sub>j</sub> = 25°C	--	47	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

**78L08 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified, 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 14V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	7.60	8	8.40	V
		10.5 V ≤ V <sub>I</sub> ≤ 23 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	7.44	8	8.56	V
Voltage Regulation	S <sub>v</sub>	10.5 V ≤ V <sub>I</sub> ≤ 23 V, T <sub>j</sub> = 25°C	--	--	175	mV
		11 V ≤ V <sub>I</sub> ≤ 23 V, T <sub>j</sub> = 25°C	--	--	125	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	80	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	11 V ≤ V <sub>I</sub> ≤ 23 V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 12 V ≤ V <sub>I</sub> ≤ 23 V, T <sub>j</sub> = 25°C	--	45	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V



## 78L09 Electrical Characteristics (T<sub>a</sub> = 25°C) (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 15V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	8.55	9	9.45	V
		11.4 V ≤ V <sub>I</sub> ≤ 24 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	8.37	9	9.63	V
Voltage Regulation	S <sub>v</sub>	11.4 V ≤ V <sub>I</sub> ≤ 24 V, T <sub>j</sub> = 25°C	--	--	200	mV
		12 V ≤ V <sub>I</sub> ≤ 24 V, T <sub>j</sub> = 25°C	--	--	160	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	90	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	12 V ≤ V <sub>I</sub> ≤ 24 V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 12 V ≤ V <sub>I</sub> ≤ 24 V, T <sub>j</sub> = 25°C	--	44	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

## 78L10 Electrical Characteristics (T<sub>a</sub> = 25°C) (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 16V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	9.50	10	10.50	V
		12.5 V ≤ V <sub>I</sub> ≤ 25 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	9.30	10	10.70	V
Voltage Regulation	S <sub>v</sub>	12.5 V ≤ V <sub>I</sub> ≤ 25 V, T <sub>j</sub> = 25°C	--	--	230	mV
		13 V ≤ V <sub>I</sub> ≤ 25 V, T <sub>j</sub> = 25°C	--	--	170	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	90	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	13 V ≤ V <sub>I</sub> ≤ 25	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 13 V ≤ V <sub>I</sub> ≤ 24 V, T <sub>j</sub> = 25°C	--	43	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

## 78L12 Electrical Characteristics (T<sub>a</sub> = 25°C) (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 19V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	11.40	12	12.60	V
		14.5 V ≤ V <sub>I</sub> ≤ 27 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	11.16	12	12.84	V
Voltage Regulation	S <sub>v</sub>	14.5 V ≤ V <sub>I</sub> ≤ 27 V, T <sub>j</sub> = 25°C	--	--	250	mV
		16 V ≤ V <sub>I</sub> ≤ 27 V, T <sub>j</sub> = 25°C	--	--	200	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	100	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	16 V ≤ V <sub>I</sub> ≤ 27 V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 15 V ≤ V <sub>I</sub> ≤ 25V, T <sub>j</sub> = 25°C	--	43	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

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**78L15 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 23V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	14.25	15	15.75	V
		17.5 V ≤ V <sub>I</sub> ≤ 30V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	13.95	15	16.05	V
Voltage Regulation	S <sub>v</sub>	17.5 V ≤ V <sub>I</sub> ≤ 30V, T <sub>j</sub> = 25°C	--	--	200	mV
		20 V ≤ V <sub>I</sub> ≤ 30V, T <sub>j</sub> = 25°C	--	--	250	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	150	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	20 V ≤ V <sub>I</sub> ≤ 30 V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 18.5 V ≤ V <sub>I</sub> ≤ 28.5V, T <sub>j</sub> = 25°C	--	40	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

**78L18 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 27V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	17.10	18	18.90	V
		21.4 V ≤ V <sub>I</sub> ≤ 33V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	16.74	18	19.26	V
Voltage Regulation	S <sub>v</sub>	21.4 V ≤ V <sub>I</sub> ≤ 33V, T <sub>j</sub> = 25°C	--	--	325	mV
		22 V ≤ V <sub>I</sub> ≤ 33V, T <sub>j</sub> = 25°C	--	--	275	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	170	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	22 V ≤ V <sub>I</sub> ≤ 33V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 23 V ≤ V <sub>I</sub> ≤ 33V, T <sub>j</sub> = 25°C	--	38	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

**78L20 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 29V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>j</sub> = 25°C	19.0	20	21.0	V
		23.5 V ≤ V <sub>I</sub> ≤ 35V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	18.60	20	21.40	V
Voltage Regulation	S <sub>v</sub>	23.5 V ≤ V <sub>I</sub> ≤ 35V, T <sub>j</sub> = 25°C	--	--	330	mV
		24V ≤ V <sub>I</sub> ≤ 35V, T <sub>j</sub> = 25°C	--	--	285	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>j</sub> = 25°C	--	--	180	mV
Quiescent Current	I <sub>Q</sub>	T <sub>j</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	24V ≤ V <sub>I</sub> ≤ 35V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 25V ≤ V <sub>I</sub> ≤ 35V, T <sub>j</sub> = 25°C	--	37	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>j</sub> = 25°C	--	1.7	--	V

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**78L24 Electrical Characteristics (T<sub>a</sub> = 25°C)** (Unless otherwise specified: 0 ≤ T<sub>J</sub> ≤ +125°C, V<sub>I</sub> = 33V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	22.80	24	25.20	V
		27.5 V ≤ V <sub>I</sub> ≤ 38V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	22.32	24	25.68	V
Voltage Regulation	S <sub>V</sub>	27.5 V ≤ V <sub>I</sub> ≤ 38V, T <sub>J</sub> = 25°C	--	--	350	mV
		28V ≤ V <sub>I</sub> ≤ 38V, T <sub>J</sub> = 25°C	--	--	300	
Current Regulation	S <sub>I</sub>	1 mA ≤ I <sub>O</sub> ≤ 100 mA, T <sub>J</sub> = 25°C	--	--	200	mV
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C	--	--	6.5	mA
Quiescent Current Change	ΔI <sub>Q</sub>	28V ≤ V <sub>I</sub> ≤ 38V	--	--	1.5	mA
		1 mA ≤ I <sub>O</sub> ≤ 40 mA	--	--	0.1	
Ripple Rejection	S <sub>rip</sub>	f = 120 Hz, 29V ≤ V <sub>I</sub> ≤ 39V, T <sub>J</sub> = 25°C	--	35	--	dB
Dropout Voltage	V <sub>Drop</sub>	T <sub>J</sub> = 25°C	--	1.7	--	V

**Electrical characteristic curve**

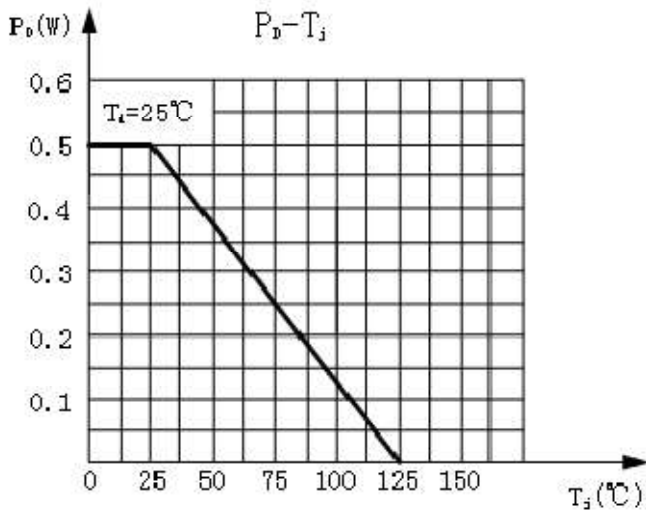


Figure 1: dissipation power relationship with the temperature curve

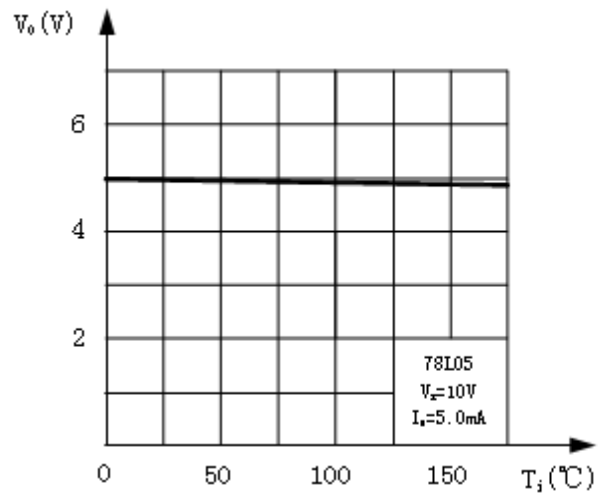
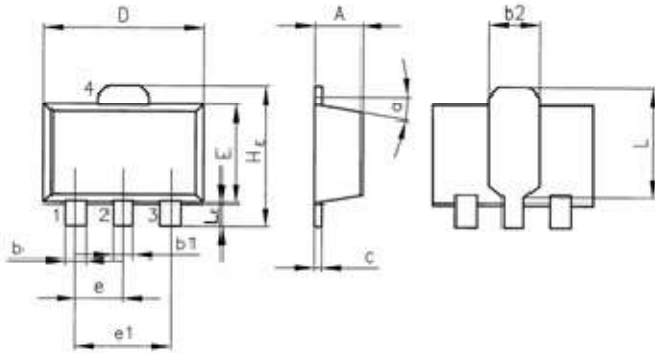


Figure 2 output voltage and junction temperature curve



## Outline Dimension

Unit: mm



SOT-89			
Symbol	min	typ	max
A	1.4	---	1.6
b	0.35	---	0.55
b1	0.4	---	0.65
b2	---	1.6	---
c	0.35	---	0.45
D	4.4	---	4.6
E	2.35	---	2.55
e	---	1.5	---
e1	---	3	---
HE	---	4.15	---
L	---	2.7	---
LE	---	1.0	---
a	---	5°	---

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