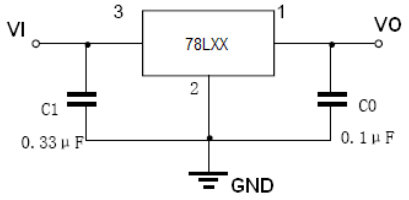
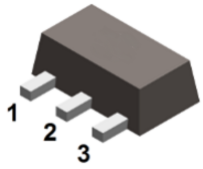
78LXX

Three-Terminal Low Current Positive Voltage Regulators

FEATURES

- Wide range of available,fixed output voltage.
- Low cost.
- Internal short-circuit current limiting.
- Internal thermal overload protection.
- No extermal components required.
- Complementary negative regulators offered (79LXX series).





SOT-89

APPLICATIONS

- Three-terminal positive voltage regulator.

ORDERING INFORMATION

Type No.	Marking	Package Code
. 78LXX	78LXX	SOT-89

MAXIMUM RATING operating temperature range applies unless otherwise specified

Symbol	Parameter	Value	Units
V_I	Input voltage(78L33-78L09) (78L10-78L15) (78L18-78L24)	30 35 40	V
I_{CM}	Maximum output current	100	mA
$R_{\theta JA}$	Thermal Resistance Junction-to-Air	250	°C/W
P_D	Power dissipation (T_A = 25°C)	500	mW
T_{OPR}	Operating Temperature Range	-40 ~ +125	°C
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature Range	-65 ~ +150	°C

ELECTRICAL CHARACTERISTICS

(V_{IN}=8.3V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μF,unless otherwise specified)

Parameter	Symbol	Test conditions	78L33			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 5.8V≤V_i≤20V,I_O=1mA-40mA V_i=8.3V,I_O=1mA-70mA	3.168 3.135 3.135	3.3 - -	3.432 3.465 3.465	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	-	60 30	mV
Line regulation	Reg_{line}	5.8V≤V_i≤20V, T_j=25℃ 6.3V≤V_i≤20V, T_j=25℃	-	-	150 100	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	-	6.0 5.5	mA
Quiescent Current Change	ΔI_Q	6.3V≤V_i≤20V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	10Hz ≤f≤100KHz	-	40	-	μV
Ripple rejection	RR	I_O=40mA,6.3V≤V_i≤16.3V f=120Hz,T_j=25℃	41	49	-	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=8.3V,I_O=40mA	-	2.5	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=10V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μF,unless otherwise specified)

Parameter	Symbol	Test conditions	78L05			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 7V≤V_i≤20V,I_O=1mA-40mA V_i=10V,I_O=1mA-70mA	4.8 4.75 4.75	5.0 - -	5.2 5.25 5.25	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	11 5	60 30	mV
Line regulation	Reg_{line}	7V≤V_i≤20V, T_j=25℃ 8V≤V_i≤20V, T_j=25℃	-	55 45	150 100	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	- -	3.8 -	6.0 5.5	mA
Quiescent Current Change	ΔI_Q	8V≤V_i≤20V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	10Hz ≤f≤100KHz	-	40	-	μV
Ripple rejection	RR	I_O=40mA,8V≤V_i≤18V,f=120Hz,T_j=25℃	41	49	-	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=10V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=12V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μF,unless otherwise specified)

Parameter	Symbol	Test conditions	78L06			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=8.5V-20V,I_O=1mA-40mA V_i=8.5V,I_O=1mA-70mA	5.75 5.7 5.7	6.0 - -	6.25 6.3 6.3	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-70mA	-	12.8 5.8	80 40	mV
Line regulation	Reg_{line}	8.5V≤V_i≤20V, T_j=25℃ 9V≤V_i≤20V, T_j=25℃	-	64 54	175 125	mV
Quiescent Current	I_Q	T_j=125℃, V_{IN}=12V,I_O=40mA T_j=25℃, V_{IN}=12V,I_O=40mA	- -	- 3.9	5.5 6.0	mA
Quiescent Current Change	ΔI_Q	9V≤V_i≤20V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	10Hz ≤f≤100KHz	-	40	-	μV
Ripple rejection	RR	I_O=40mA,10V≤V_i≤20V,f=120Hz,T_j=25℃	40	46	-	dB
Dropout voltage	V_D	T_j=25℃, V_{IN}=12V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=14V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1Mf,unless otherwise specified)

Parameter	Symbol	Test conditions	78L08			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 10.5V≤V_i≤23V,I_O=1mA-40mA V_i=14V,I_O=1mA-70mA	7.7 7.6 7.6	8.0 - -	8.3 8.4 8.4	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	15 8.0	80 40	mV
Line regulation	Reg_{line}	10.5V≤V_i≤23V, T_j=25℃ 11V≤V_i≤23V, T_j=25℃	-	20 12	175 125	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	3 -	6.0 5.5	mA
Quiescent Current Change	ΔI_Q	11V≤V_i≤23V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	T_A=25℃,10Hz≤f≤100KHz	-	60	-	μV
Ripple rejection	RR	I_O=40mA,12V≤V_i≤23V,f=120Hz,T_j=25℃	37	57	-	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=14V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=15V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1uF,unless otherwise specified)

Parameter	Symbol	Test conditions	78L09			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=11.5V-24V,I_O=1mA-40mA V_i=15V,I_O=1mA-70mA	8.6 8.5 8.5	9.0 - -	9.4 9.5 9.5	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	15 8.0	90 40	mV
Line regulation	Reg_{line}	11.5V≤V_i≤24V, T_j=25℃ 12V≤V_i≤24V, T_j=25℃	-	10 8	175 125	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	3.0 -	6.0 5.5	mA
Quiescent Current Change	ΔI_Q	11V≤V_i≤23V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	T_A=25℃,10Hz≤f≤100KHz	-	60	-	μV
Ripple rejection	RR	I_O=40mA,13V≤V_i≤24V,f=120Hz,T_j=25℃	37	57	-	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=15V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=16V,I_O=40mA,C_{IN}=0.33μF,C_O=0.1μf, T_j = 0 to 125℃ ,unless otherwise specified)

Parameter	Symbol	Test conditions	78L10			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_J=25℃	9.6	10	10.4	V
Load regulation(Note1)	$\triangle Reg_{load}$	I_O = 1 to 100mA, T_j = 25℃	-	17	90	mV
		I_O = 1 to 40mA, T_j = 25℃	-	9	45	mV
Line regulation(Note1)	$\triangle Reg_{line}$	V_i = 12.5 to 25V, T_j = 25℃	-	100	210	mV
		V_i = 13 to 25V, T_j = 25℃	-	90	160	mV
Quiescent Current	I_Q	T_j = 25℃	-	2.0	3.0	mA
Quiescent Current Change	ΔI_Q	V_i = 13 to 25V, T_j = 25℃	-	-	1.0	mA
Output Noise Voltage	V_N	10Hz≤f≤100KHz	-	70	-	μV
Ripple Rejection	RR	V_i= 13to23V, I_O= 40mA, f = 120Hz	42	52	-	dB
Dropout Voltage	V_D	T_J=25℃ V_{IN}=16V,I_O=40mA	-	1.7	-	V
Dropout voltage	V_I-V_O	I_O = 5mA, T_j = 0 to 125℃	-	0.9	-	mV/℃

ELECTRICAL CHARACTERISTICS

(V_{IN}=19V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μf,unless otherwise specified)

Parameter	Symbol	Test conditions	78L12			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=14.5V-27V, I_O=1mA-40mA V_i=19V, I_O=1mA-70mA	11.5 11.4 11.4	12 - -	12.5 12.6 12.6	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	20 10	100 50	mV
Line regulation	Reg_{line}	14.5V≤V_i≤27V, T_j=25℃ 16V≤V_i≤27V, T_j=25℃	-	120 100	250 200	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	4.2 -	6.5 6.0	mA
Quiescent Current Change	ΔI_Q	16V≤V_i≤27V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100KHz,T_A=25℃	-	80	-	μV
Ripple rejection	RR	I_O=40mA,15V≤V_i≤25V,f=120Hz, T_j=25℃	37	42	--	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=19V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=23V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μf,unless otherwise specified)

Parameter	Symbol	Test conditions	78L15			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=17.5V-30V,I_O=1mA-40mA V_i=23V,I_O=1mA-70mA	14.4 14.25 14.25	15 - -	15.6 15.75 15.75	V
Load regulation	△ Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	25 12	150 75	mV
Line regulation	△ Reg_{line}	17.5V≤V_i≤30V, T_j=25℃ 20V≤V_i≤30V, T_j=25℃	-	130 110	300 250	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	4.4 -	6.5 6.0	mA
Quiescent Current Change	ΔI_Q	20V≤V_i≤30V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	10Hz≤f≤100KHz,T_A=25℃	-	90	-	μV
Ripple rejection	RR	I_O=40mA,18.5V≤V_i≤28.5V, f=120Hz, T_J=25℃	34	39	-	dB
Dropout voltage	V_I-V_O	T_J=25℃, V_{IN}=23V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=27V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μf,unless otherwise specified)

Parameter	Symbol	Test conditions	78L18			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=20.7V-33V, I_O=1mA-40mA V_i=27V, I_O=1mA-70mA	17.3 17.1 17.1	18 - -	18.7 18.9 18.9	V
Load regulation	Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	30 15	170 85	mV
Line regulation	Reg_{line}	20.7V≤V_i≤33V, T_j=25℃ 21V≤V_i≤33V, T_j=25℃	-	45 35	325 275	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	3.1 -	6.5 6.0	mA
Quiescent Current Change	ΔI_Q	21V≤V_i≤33V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100KHz,T_A=25℃	-	150	-	μV
Ripple rejection	RR	I_O=40mA,23V≤V_i≤33V,f=120Hz, T_j=25℃	33	48	-	dB
Dropout voltage	V_I-V_O	T_j=25℃, V_{IN}=27V,I_O=40mA	-	1.7	-	V

ELECTRICAL CHARACTERISTICS

(V_{IN}=33V,I_O=40mA,0℃<T_j<125℃,C_I=0.33μF,C_O=0.1μf,unless otherwise specified)

Parameter	Symbol	Test conditions	78L24			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_i=27V-38V,I_O=1mA-40mA V_i=27V-33V,I_O=1mA-70mA	23 22.8 22.8	24 - -	25 25.2 25.2	V
Load regulation	△ Reg_{load}	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA	-	40 20	200 100	mV
Line regulation	△ Reg_{line}	28V≤V_i≤80V, T_j=25℃ 27V≤V_i≤38V, T_j=25℃	-	50 60	300 350	mV
Quiescent Current	I_Q	T_j=25℃ T_j=125℃	-	3.1 -	6.5 6.0	mA
Quiescent Current Change	ΔI_Q	28V≤V_i≤38V 1mA≤I_O≤40mA	-	-	1.5 0.1	mA
Output noise voltage	V_N	10Hz≤f≤100KHz,T_A=25℃	-	200	-	μV
Ripple rejection	RR	I_O=40mA,29V≤V_i≤35V, f=120Hz, T_J=25℃	31	45	-	dB
Dropout voltage	V_I-V_O	T_J=25℃, V_{IN}=33V,I_O=40mA	-	1.7	-	V

TYPICAL CHARACTERISTICS @ Ta=25℃ unless otherwise specified

Figure 1. Dropout Characteristics

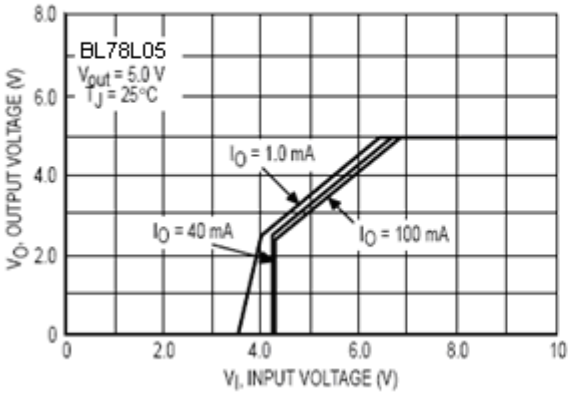


Figure 2. Dropout Voltage versus Junction Temperature

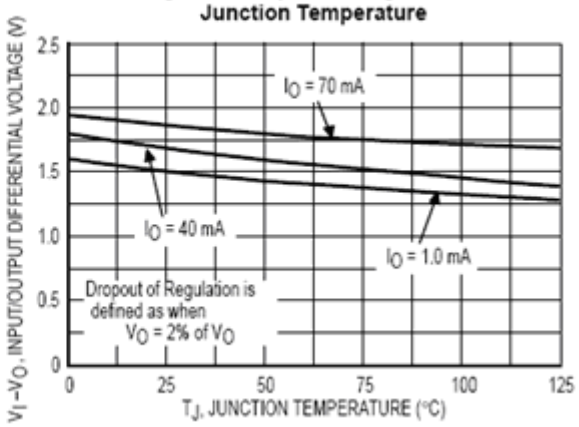


Figure 3. Input Bias Current versus Ambient Temperature

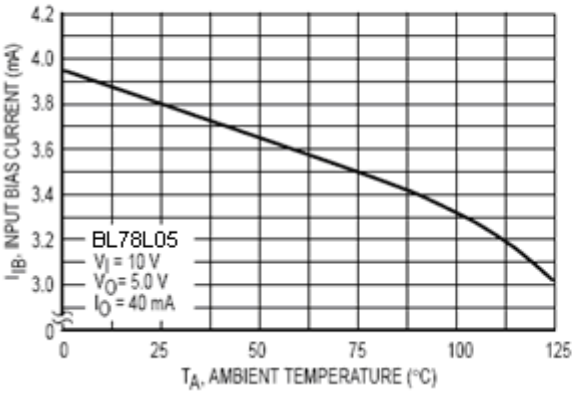


Figure 4. Input Bias Current versus Input Voltage

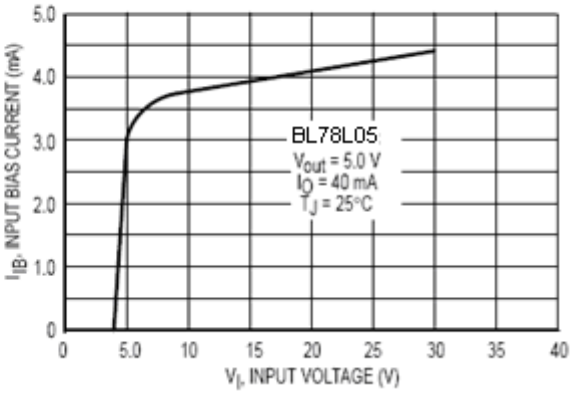
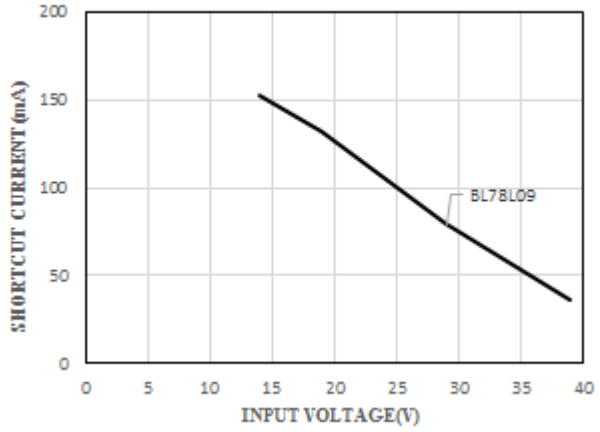


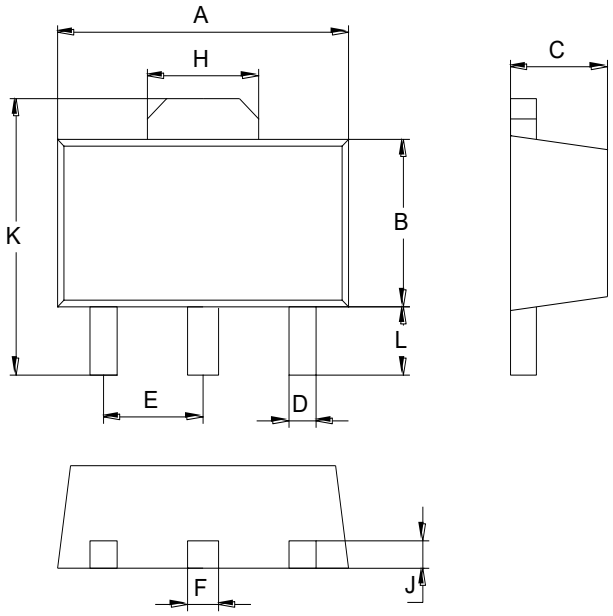
Figure 5.Shortcut Current vs. Input Voltage



78LXX

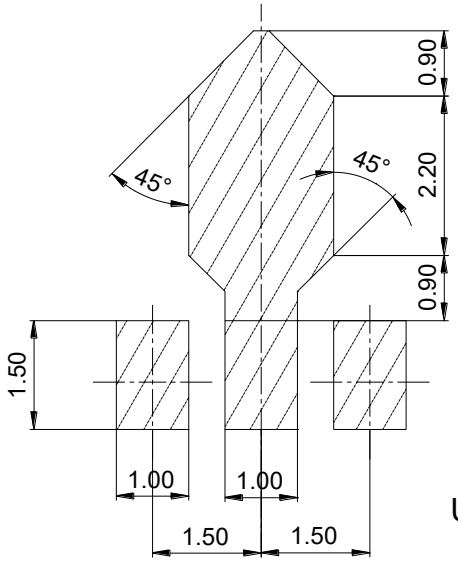
Three-Terminal Low Current Positive Voltage Regulators

PACKAGE OUTLINE



SOT-89		
Dim	Min	Max
A	4.30	4.70
B	2.25	2.65
C	1.30	1.70
D	0.30	0.50
E	1.40	1.60
F	0.38	0.58
H	1.60	1.80
J	0.30	0.50
L	0.90	1.10
K	3.95	4.35
All Dimensions in mm		

SOLDERING FOOTPRINT



Unit: mm

PACKAGE INFORMATION

Device	Package	Shipping
78LXX	SOT-89	1000 pcs / Tape & Reel