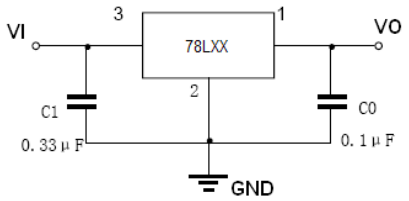
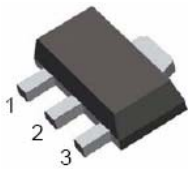
Three-Terminal Low Current Positive Voltage Regulators
BL78LXX

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 (BL79LXX series).

Lead-free





SOT-89

APPLICATIONS

- Three-terminal positive voltage regulator.

ORDERING INFORMATION

Type No.	Marking	Package Code
BL78LXX	78LXX	SOT-89

MAXIMUM RATING operating temperature range applies unless otherwise specified

Symbol	**Parameter**	**Value**	**Units**
V_I	Input voltage(3.3V-9V) (10V-15V) (18V-24V)	30 35 40	V
I_{CM}	Maximum output current	100	mA
$R_{th\ j\text{-}c}$	Thermal Resistance, Junction to Case	250	℃/W
P_D	Power dissipation	500	mW
T_{OPR}	Operating junction temperature	0 to +125	℃
T_j, T_{stg}	Storage temperature range	-40 to +150	℃

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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	BL78L33			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 5.8V≤V_i≤20V,I_O=1mA-40mA V_1=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
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃			6.0 5.5	mA
Input Bias Current Change	△I_{IB}	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℃		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	BL78L05			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 7V≤V_i≤20V,I_O=1mA-40mA V_1=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
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃		3.8	6.0 5.5	mA
Input Bias Current Change	△I_{IB}	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℃		1.7		V

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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	BL78L06			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ V_1=8.5V-20V,I_O=1mA-40mA V_1=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
Input Bias Current	I_{IB}	T_j=25℃, V_{IN}=12V,I_O=40mA T_j=125℃, V_{IN}=12V,I_O=40mA		 3.9	5.5 6.0	mA
Input Bias Current Change	$\triangle I_{IB}$	9V≤V_i≤20V 1mA≤I_O≤40mA			1.5 0.1	mA
Output noise voltage	V_N	10Hz ≤f≤100KHz		40		μV/V_O
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℃		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	BL78L08			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_j=25℃ 10.5V≤V_i≤23V,I_O=1mA-40mA V_1=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
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃		3	6.0 5.5	mA
Input Bias Current Change	$\triangle I_{IB}$	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=120H z,T_j=25℃	37	57		dB
Dropout voltage	V_I-V_O	T_j=25℃		1.7		V

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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	BL78L09			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℃		20 12	175 125	mV
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃		3.0	6.0 5.5	mA
Input Bias Current Change	△I_{IB}	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℃		1.7		V

Three-Terminal Low Current Positive Voltage Regulators
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ELECTRICAL CHARACTERISTICS

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

Parameter	Symbol	Test conditions	BL78L10			UNIT
			MIN	TYP	MAX	
Output voltage	V_O	T_J=25℃	9.6	10	10.4	V
Load regulation(Note1)	△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)	△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
Input Bias Current	I_{IB}	T_j = 25℃	-	2.0	3.0	mA
Input Bias Current Change	△I_{IB}	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℃	-	1.7	-	V
Dropout voltage	V_I-V_O	I_O = 5mA, T_j = 0 to 125℃	-	0.9	-	mV/℃

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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	BL78L12			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
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃		4.2	6.5 6.0	mA
Input Bias Current Change	$\triangle I_{IB}$	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℃		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	BL78L15			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	$\triangle Reg_{load}$	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA		25 12	150 75	mV
Line regulation	$\triangle Reg_{line}$	17.5V≤V_i≤30V, T_j=25℃ 20V≤V_i≤30V, T_j=25℃		130 110	300 250	mV
Intput Bias Current	I_{IB}	T_j=25℃ T_j=125℃		4.4	6.5 6.0	mA
Intput Bias Current Change	$\triangle I_{IB}$	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℃		1.7		V

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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	BL78L18			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
Input Bias Current	I_{IB}	T_j=25℃ T_j=125℃		3.1	6.5 6.0	mA
Input Bias Current Change	$\triangle I_{IB}$	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℃		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	BL78L24			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	$\triangle Reg_{load}$	T_j=25℃, I_O=1mA-100mA T_j=25℃, I_O=1mA-40mA		40 20	200 100	mV
Line regulation	$\triangle Reg_{line}$	28V≤V_i≤80V, T_j=25℃ 27V≤V_i≤38V, T_j=25℃		50 60	300 350	mV
Intput Bias Current	I_{IB}	T_j=25℃ T_j=125℃		3.1	6.5 6.0	mA
Intput Bias Current Change	$\triangle I_{IB}$	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℃		1.7		V

Three-Terminal Low Current Positive Voltage Regulators
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TYPICAL CHARACTERISTICS @ Ta=25℃ unless otherwise specified

Figure 1. Dropout Characteristics

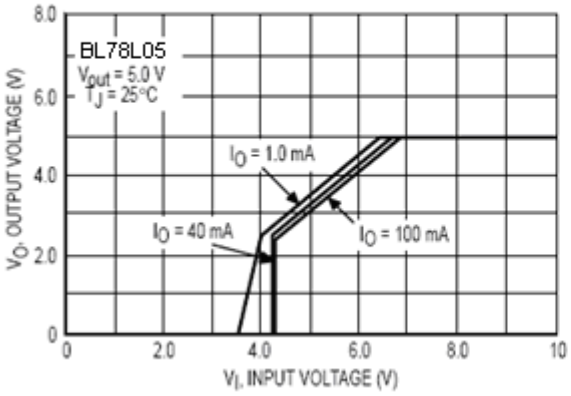


Figure 2. Dropout Voltage versus Junction Temperature

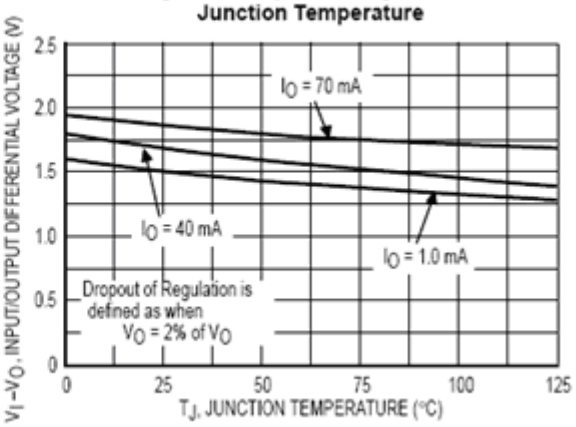


Figure 3. Input Bias Current versus Ambient Temperature

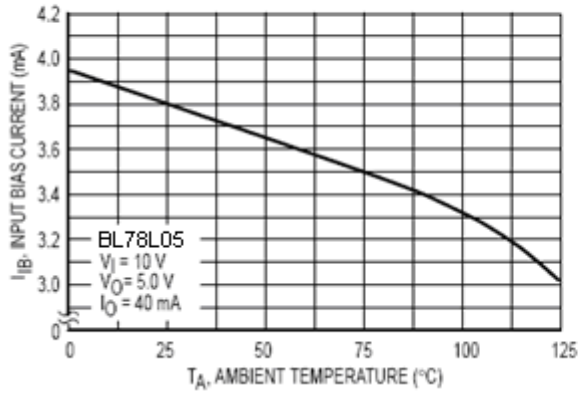
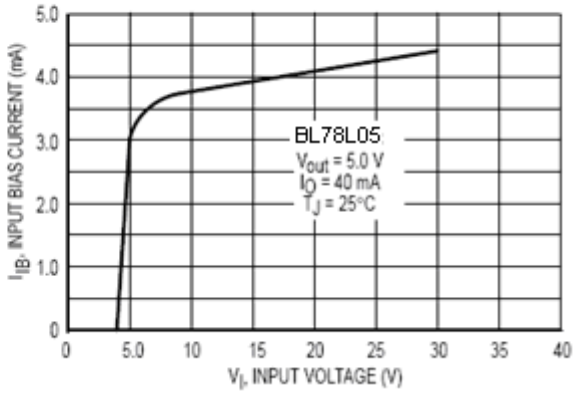


Figure 4. Input Bias Current versus Input Voltage



Three-Terminal Low Current Positive Voltage Regulators
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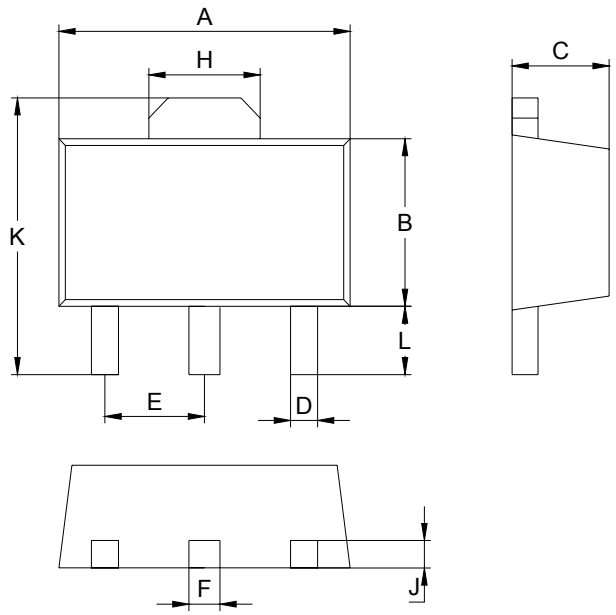
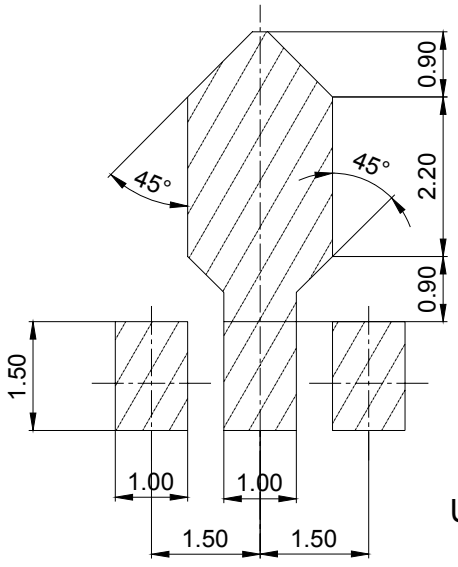
PACKAGE OUTLINE

Plastic surface mounted package SOT-89



SOT-89		
Dim	Min	Max
A	4.30	4.70
B	2.25	2.65
C	1.50 Typical	
D	0.40 Typical	
E	1.40	1.60
F	0.48 Typical	
H	1.60	1.80
J	0.40 Typical	
L	0.90	1.10
K	3.95	4.35
All Dimensions in mm		

SOLDERING FOOTPRINT



Unit:mm

PACKAGE INFORMATION

Device	Package	Shipping
BL78LXX	SOT-89	1000/Tape&Reel