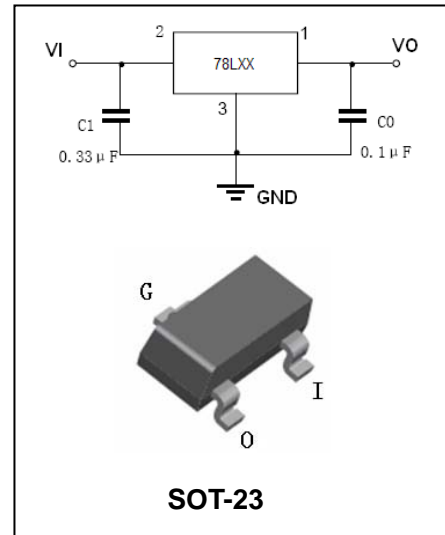


## Three-Terminal Low Current Positive Voltage Regulators

### BL78LXX

#### FEATURES

- Wide range of available, fixed output voltage.
- Low cost.
- Internal short-circuit current limiting.
- Internal thermal overload protection.
- No external components required.
- Complementary negative regulators offered (BL79LXX series).



#### APPLICATIONS

- Three-terminal positive voltage regulator.

#### ORDERING INFORMATION

Type No.	Marking	Package Code
BL78LXX	78LXX	SOT-23

#### MAXIMUM RATING @ Ta=25°C unless otherwise specified

Symbol	Parameter	Value	Units
V <sub>I</sub>	Input voltage(3.3V-9V) (12V-15V) (18V-24V)	30	V
		35	
		40	
I <sub>CM</sub>	Maximum output current	100	mA
P <sub>D</sub>	Power dissipation	350	mW
T <sub>OPR</sub>	Operating junction temperature	0 to +125	°C
T <sub>j</sub> , T <sub>stg</sub>	Storage temperature range	-40 to +150	°C

## Three-Terminal Low Current Positive Voltage Regulators BL78LXX

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=10V, I_O=40mA, 0^\circ C < T_j < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L33			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^\circ C$ $5.3V \leq V_i \leq 20V, I_O=1mA-40mA$ $V_1=8.3V, I_O=1mA-70mA$	3.168 3.135 3.135	3.3	3.432 3.465 3.465	V
Load regulation	$Reg_{load}$	$T_j=25^\circ C, I_O=1mA-100mA$ $T_j=25^\circ C, I_O=1mA-40mA$			60 30	mV
Line regulation	$Reg_{line}$	$5.3V \leq V_i \leq 20V, T_j=25^\circ C$ $6.3V \leq V_i \leq 20V, T_j=25^\circ C$			150 100	mV
Input Bias Current	$I_{IB}$	$T_j=25^\circ C$ $T_j=125^\circ C$			6.0 5.5	mA
Input Bias Current Change	$\Delta I_{IB}$	$6.3V \leq V_i \leq 20V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$10Hz \leq f \leq 100KHz$		40		$\mu V$
Ripple rejection	RR	$I_O=40mA, 6.3V \leq V_i \leq 16.3V$ $f=120Hz, T_j=25^\circ C$	41	49		dB
Dropout voltage	$V_I-V_O$	$T_j=25^\circ C$		1.7		V

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=10V, I_O=40mA, 0^\circ C < T_j < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L05			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^\circ C$ $7V \leq V_i \leq 20V, I_O=1mA-40mA$ $V_1=10V, I_O=1mA-70mA$	4.8 4.75 4.75	5.0	5.2 5.25 5.25	V
Load regulation	$Reg_{load}$	$T_j=25^\circ C, I_O=1mA-100mA$ $T_j=25^\circ C, I_O=1mA-40mA$		11 5	60 30	mV
Line regulation	$Reg_{line}$	$7V \leq V_i \leq 20V, T_j=25^\circ C$ $8V \leq V_i \leq 20V, T_j=25^\circ C$		55 45	150 100	mV
Input Bias Current	$I_{IB}$	$T_j=25^\circ C$ $T_j=125^\circ C$		3.8	6.0 5.5	mA
Input Bias Current Change	$\Delta I_{IB}$	$8V \leq V_i \leq 20V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$10Hz \leq f \leq 100KHz$		40		$\mu V$
Ripple rejection	RR	$I_O=40mA, 8V \leq V_i \leq 18V, f=120Hz$ $T_j=25^\circ C$	41	49		dB
Dropout voltage	$V_I-V_O$	$T_j=25^\circ C$		1.7		V

## Three-Terminal Low Current Positive Voltage Regulators BL78LXX

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=12V, I_O=40mA, 0^\circ C < T_j < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L06			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^\circ C$	5.75	6.0	6.25	V
		$V_1=8.5V-20V, I_O=1mA-40mA$	5.7		6.3	
		$V_1=8.5V, I_O=1mA-70mA$	5.7		6.3	
Load regulation	$Reg_{load}$	$T_j=25^\circ C, I_O=1mA-100mA$		12.8	80	mV
		$T_j=25^\circ C, I_O=1mA-70mA$		5.8	40	
Line regulation	$Reg_{line}$	$8.5V \leq V_i \leq 20V, T_j=25^\circ C$		64	175	mV
		$9V \leq V_i \leq 20V, T_j=25^\circ C$		54	125	
Input Bias Current	$I_{IB}$	$T_j=25^\circ C, V_{IN}=12V, I_O=40mA$			5.5	mA
		$T_j=125^\circ C, V_{IN}=12V, I_O=40mA$		3.9	6.0	
Input Bias Current Change	$\Delta I_{IB}$	$9V \leq V_i \leq 20V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$10Hz \leq f \leq 100KHz$		40		$\mu V/V_O$
Ripple rejection	RR	$I_O=40mA, 10V \leq V_i \leq 20V, f=120Hz,$ $T_j=25^\circ C$	40	46		dB
Dropout voltage	$V_D$	$T_j=25^\circ C$		1.7		V

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=14V, I_O=40mA, 0^\circ C < T_j < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L08			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^\circ C$	7.7	8.0	8.3	V
		$10.5V \leq V_i \leq 23V, I_O=1mA-40mA$	7.6		8.4	
		$V_1=14V, I_O=1mA-70mA$	7.6		8.4	
Load regulation	$Reg_{load}$	$T_j=25^\circ C, I_O=1mA-100mA$		15	80	mV
		$T_j=25^\circ C, I_O=1mA-40mA$		8.0	40	
Line regulation	$Reg_{line}$	$10.5V \leq V_i \leq 23V, T_j=25^\circ C$		20	175	mV
		$11V \leq V_i \leq 23V, T_j=25^\circ C$		12	125	
Input Bias Current	$I_{IB}$	$T_j=25^\circ C$		3	6.0	mA
		$T_j=125^\circ C$			5.5	
Input Bias Current Change	$\Delta I_{IB}$	$11V \leq V_i \leq 23V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$T_A=25^\circ C, 10Hz \leq f \leq 100KHz$		60		$\mu V$
Ripple rejection	RR	$I_O=40mA, 12V \leq V_i \leq 23V, f=120Hz,$ $T_j=25^\circ C$	37	57		dB
Dropout voltage	$V_I-V_O$	$T_j=25^\circ C$		1.7		V

## Three-Terminal Low Current Positive Voltage Regulators BL78LXX

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=15V, I_O=40mA, 0^{\circ}C < T_j < 125^{\circ}C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L09			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^{\circ}C$	8.6	9.0	9.4	V
		$V_I=11.5V-24V, I_O=1mA-40mA$	8.5		9.5	
		$V_I=15V, I_O=1mA-70mA$	8.5		9.5	
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$		15	90	mV
		$T_j=25^{\circ}C, I_O=1mA-40mA$		8.0	40	
Line regulation	$Reg_{line}$	$11.5V \leq V_I \leq 24V, T_j=25^{\circ}C$		20	175	mV
		$12V \leq V_I \leq 24V, T_j=25^{\circ}C$		12	125	
Input Bias Current	$I_{IB}$	$T_j=25^{\circ}C$		3.0	6.0	mA
		$T_j=125^{\circ}C$			5.5	
Input Bias Current Change	$\Delta I_{IB}$	$11V \leq V_I \leq 23V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$T_A=25^{\circ}C, 10Hz \leq f \leq 100KHz$		60		$\mu V$
Ripple rejection	RR	$I_O=40mA, 13V \leq V_I \leq 24V, f=120Hz$ $z, T_j=25^{\circ}C$	37	57		dB
Dropout voltage	$V_I-V_O$	$T_j=25^{\circ}C$		1.7		V

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=19V, I_O=40mA, 0^{\circ}C < T_j < 125^{\circ}C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L12			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_j=25^{\circ}C$	11.5	12	12.5	V
		$V_I=14.5V-27V, I_O=1mA-40mA$	11.4		12.6	
		$V_I=19V, I_O=1mA-70mA$	11.4		12.6	
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$		20	100	mV
		$T_j=25^{\circ}C, I_O=1mA-40mA$		10	50	
Line regulation	$Reg_{line}$	$14.5V \leq V_I \leq 27V, T_j=25^{\circ}C$		120	250	mV
		$16V \leq V_I \leq 27V, T_j=25^{\circ}C$		100	200	
Input Bias Current	$I_{IB}$	$T_j=25^{\circ}C$		4.2	6.5	mA
		$T_j=125^{\circ}C$			6.0	
Input Bias Current Change	$\Delta I_{IB}$	$16V \leq V_I \leq 27V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100KHz, T_A=25^{\circ}C$		80		$\mu V$
Ripple rejection	RR	$I_O=40mA, 15V \leq V_I \leq 25V, f=120Hz,$ $T_j=25^{\circ}C$	37	42		dB
Dropout voltage	$V_I-V_O$	$T_j=25^{\circ}C$		1.7		V

## Three-Terminal Low Current Positive Voltage Regulators BL78LXX

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=23V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L15			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_J=25^\circ C$ $V_i=17.5V-30V, I_O=1mA-40mA$ $V_i=23V, I_O=1mA-70mA$	14.4 14.25 14.25	15	15.6 15.75 15.75	V
Load regulation	$\Delta Reg_{load}$	$T_J=25^\circ C, I_O=1mA-100mA$ $T_J=25^\circ C, I_O=1mA-40mA$		25 12	150 75	mV
Line regulation	$\Delta Reg_{line}$	$17.5V \leq V_i \leq 30V, T_J=25^\circ C$ $20V \leq V_i \leq 30V, T_J=25^\circ C$		130 110	300 250	mV
Input Bias Current	$I_{IB}$	$T_J=25^\circ C$ $T_J=125^\circ C$		4.4	6.5 6.0	mA
Input Bias Current Change	$\Delta I_{IB}$	$20V \leq V_i \leq 30V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$10Hz \leq f \leq 100KHz, T_A=25^\circ C$		90		$\mu V$
Ripple rejection	RR	$I_O=40mA, 18.5V \leq V_i \leq 28.5V,$ $f=120Hz, T_J=25^\circ C$	34	39		dB
Dropout voltage	$V_I-V_O$	$T_J=25^\circ C$		1.7		V

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=27V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L18			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_J=25^\circ C$ $V_i=20.7V-33V, I_O=1mA-40mA$ $V_i=27V, I_O=1mA-70mA$	17.3 17.1 17.1	18	18.7 18.9 18.9	V
Load regulation	$Reg_{load}$	$T_J=25^\circ C, I_O=1mA-100mA$ $T_J=25^\circ C, I_O=1mA-40mA$		30 15	170 85	mV
Line regulation	$Reg_{line}$	$20.7V \leq V_i \leq 33V, T_J=25^\circ C$ $21V \leq V_i \leq 33V, T_J=25^\circ C$		45 35	325 275	mV
Input Bias Current	$I_{IB}$	$T_J=25^\circ C$ $T_J=125^\circ C$		3.1	6.5 6.0	mA
Input Bias Current Change	$\Delta I_{IB}$	$21V \leq V_i \leq 33V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100KHz, T_A=25^\circ C$		150		$\mu V$
Ripple rejection	RR	$I_O=40mA, 23V \leq V_i \leq 33V, f=120Hz,$ $T_J=25^\circ C$	33	48		dB
Dropout voltage	$V_I-V_O$	$T_J=25^\circ C$		1.7		V

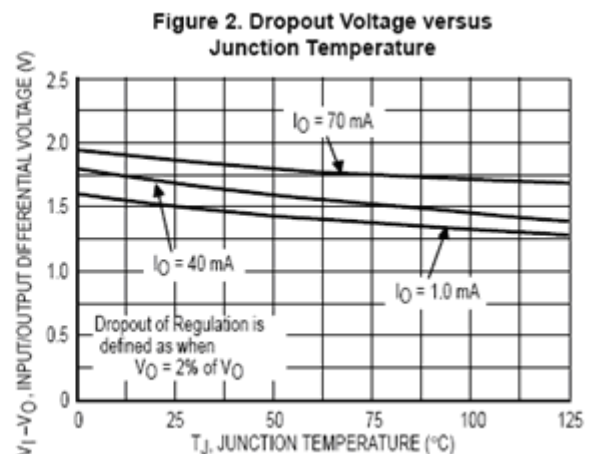
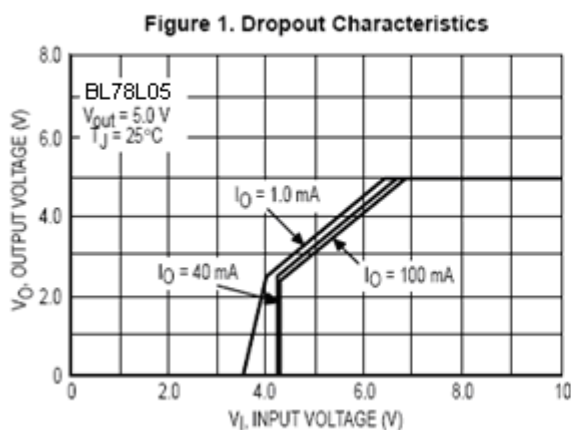
## Three-Terminal Low Current Positive Voltage Regulators BL78LXX

### ELECTRICAL CHARACTERISTICS

( $V_{IN}=33V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_I=0.33\mu F, C_O=0.1\mu f$ , unless otherwise specified)

Parameter	Symbol	Test conditions	BL78L24			UNIT
			MIN	TYP	MAX	
Output voltage	$V_O$	$T_J=25^\circ C$ $V_i=27V-38V, I_O=1mA-40mA$ $V_i=27V-33V, I_O=1mA-70mA$	23 22.8 22.8	24	25 25.2 25.2	V
Load regulation	$\Delta Reg_{load}$	$T_J=25^\circ C, I_O=1mA-100mA$ $T_J=25^\circ C, I_O=1mA-40mA$		40 20	200 100	mV
Line regulation	$\Delta Reg_{line}$	$27.5V \leq V_i \leq 38V, T_J=25^\circ C$ $28V \leq V_i \leq 38V, T_J=25^\circ C$		35 30	350 300	mV
Input Bias Current	$I_{IB}$	$T_J=25^\circ C$ $T_J=125^\circ C$		3.1	6.5 6.0	mA
Input Bias Current Change	$\Delta I_{IB}$	$28V \leq V_i \leq 38V$ $1mA \leq I_O \leq 40mA$			1.5 0.1	mA
Output noise voltage	$V_N$	$10Hz \leq f \leq 100KHz, T_A=25^\circ C$		200		$\mu V$
Ripple rejection	RR	$I_O=40mA, 29V \leq V_i \leq 35V,$ $f=120Hz, T_J=25^\circ C$	31	45		dB
Dropout voltage	$V_i - V_O$	$T_J=25^\circ C$		1.7		V

### TYPICAL CHARACTERISTICS @ $T_a=25^\circ C$ unless otherwise specified



# Three-Terminal Low Current Positive Voltage Regulators

## BL78LXX

Figure 3. Input Bias Current versus Ambient Temperature

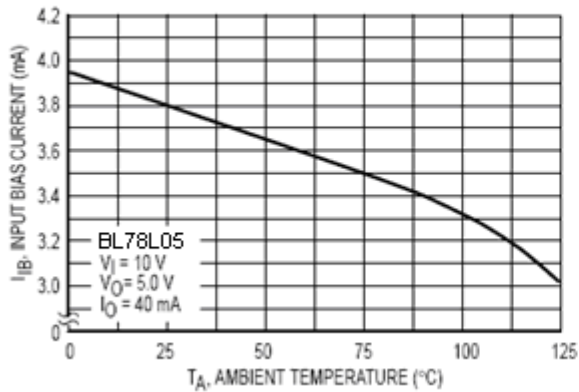


Figure 4. Input Bias Current versus Input Voltage

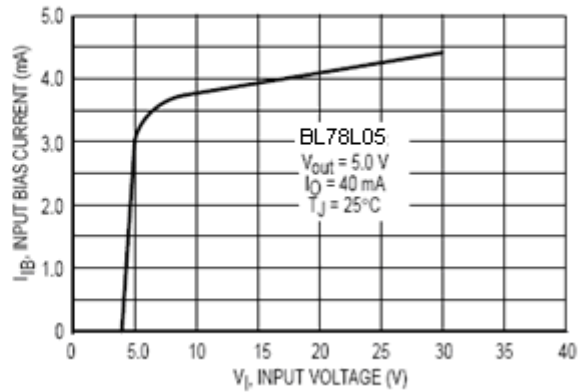


Figure 5. Maximum Average Power Dissipation versus Ambient Temperature – TO-92 Type Package

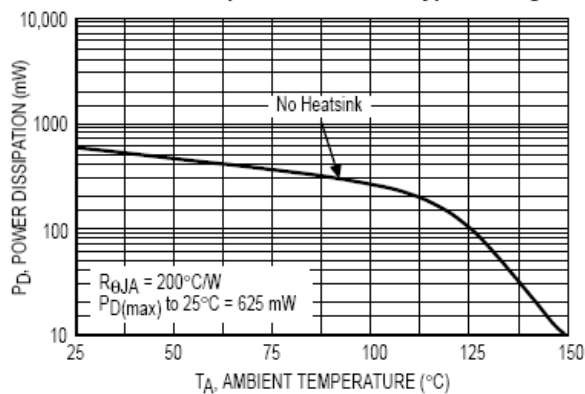
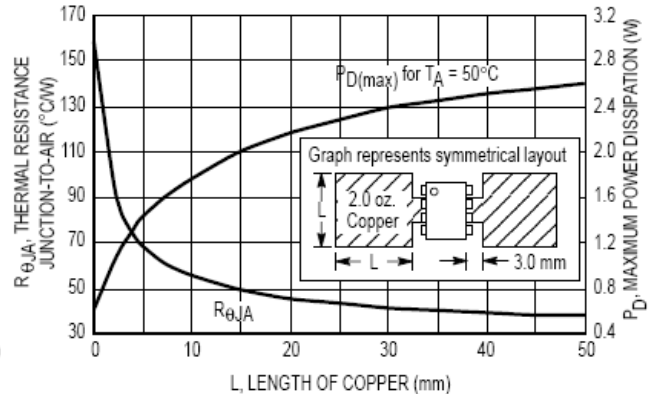


Figure 6. SOP-8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length



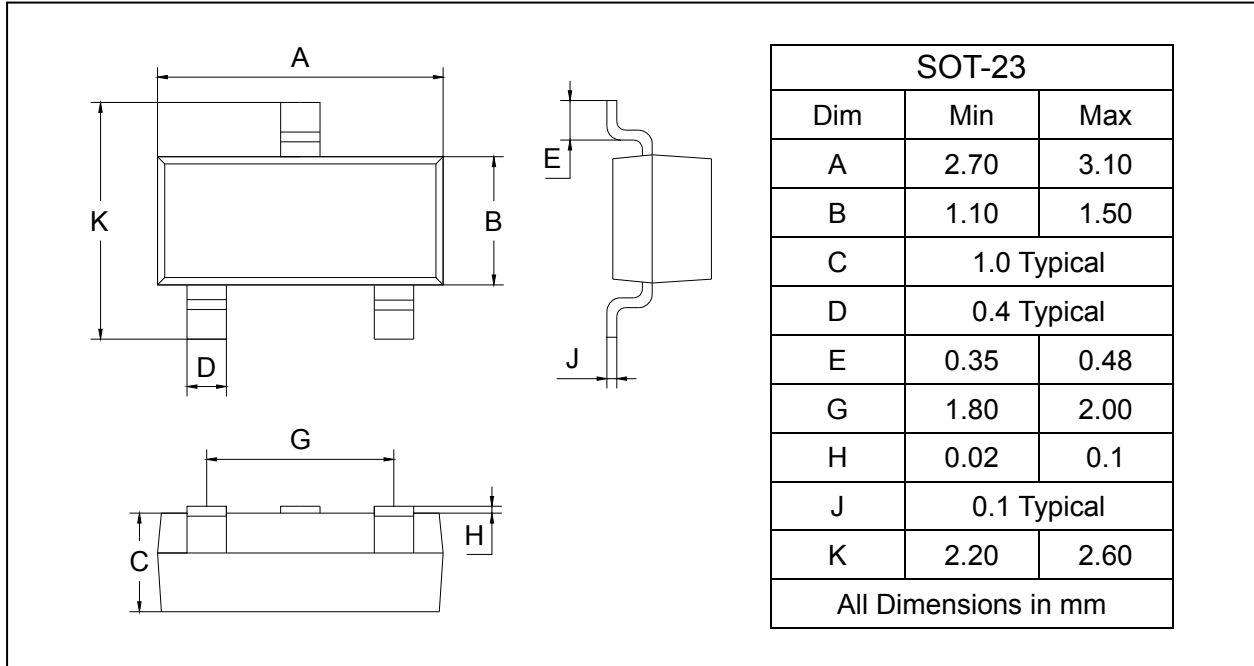
## Three-Terminal Low Current Positive Voltage Regulators

### BL78LXX

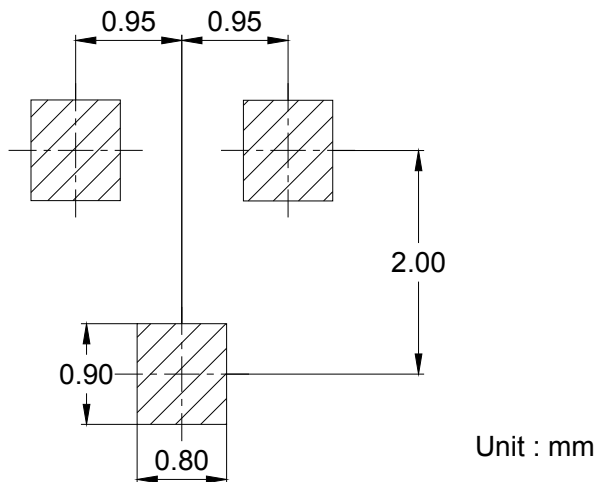
#### PACKAGE OUTLINE

Plastic surface mounted package

SOT-23



#### SOLDERING FOOTPRINT



#### PACKAGE INFORMATION

Device	Package	Shipping
BL78LXX	SOT-23	3000/Tape&Reel