

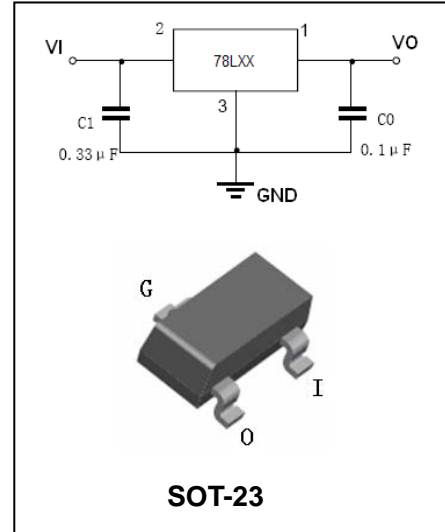
## Three-Terminal Low Current Positive Voltage Regulators

### 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).

HF



#### 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
$V_I$	Input voltage(78L33-78L09)	30	V
	(78L10-78L15)	35	
	(78L18-78L24)	40	
$I_{CM}$	Maximum output current	100	mA
$P_D$	Power dissipation	350	mW
$T_{OPR}$	Operating junction temperature	-40 to +125	°C
$T_{STG}$	Storage temperature range	-65 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	$V_O$	$T_j=25^{\circ}C$ $5.3V \leq V_i \leq 20V, I_O=1mA-40mA$ $V_i=8.3V, I_O=1mA-70mA$	3.168 3.135 3.135	3.3	3.432 3.465 3.465	V
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$ $T_j=25^{\circ}C, I_O=1mA-40mA$			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	$V_O$	$T_j=25^{\circ}C$ $7V \leq V_i \leq 20V, I_O=1mA-40mA$ $V_i=10V, I_O=1mA-70mA$	4.8 4.75 4.75	5.0	5.2 5.25 5.25	V
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$ $T_j=25^{\circ}C, I_O=1mA-40mA$		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	$V_O$	$T_j=25^{\circ}C$ $V_i=8.5V-20V, I_O=1mA-40mA$ $V_i=8.5V, I_O=1mA-70mA$	5.75 5.7 5.7	6.0	6.25 6.3 6.3	V
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$ $T_j=25^{\circ}C, I_O=1mA-70mA$		12.8 5.8	80 40	mV
Line regulation	$Reg_{line}$	$8.5V \leq V_i \leq 20V, T_j=25^{\circ}C$ $9V \leq V_i \leq 20V, T_j=25^{\circ}C$		64 54	175 125	mV
Input Bias Current	$I_{IB}$	$T_j=25^{\circ}C, V_{IN}=12V, I_O=40mA$ $T_j=125^{\circ}C, V_{IN}=12V, I_O=40mA$		3.9	5.5 6.0	mA
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		$\mu V$
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	$V_O$	$T_j=25^{\circ}C$ $10.5V \leq V_i \leq 23V, I_O=1mA-40mA$ $V_i=14V, I_O=1mA-70mA$	7.7 7.6 7.6	8.0	8.3 8.4 8.4	V
Load regulation	$Reg_{load}$	$T_j=25^{\circ}C, I_O=1mA-100mA$ $T_j=25^{\circ}C, I_O=1mA-40mA$		15 8.0	80 40	mV
Line regulation	$Reg_{line}$	$10.5V \leq V_i \leq 23V, T_j=25^{\circ}C$ $11V \leq V_i \leq 23V, T_j=25^{\circ}C$		20 12	175 125	mV
Input Bias Current	$I_{IB}$	$T_j=25^{\circ}C$ $T_j=125^{\circ}C$		3	6.0 5.5	mA
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	$\Delta I_{IB}$	$11V \leq V_i \leq 23V$			1.5	mA
		$1mA \leq I_O \leq 40mA$			0.1	
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	$\Delta I_{IB}$	$16V \leq V_i \leq 27V$			1.5	mA
		$1mA \leq I_O \leq 40mA$			0.1	
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

# Three-Terminal Low Current Positive Voltage Regulators

## BL78LXX

TYPICAL CHARACTERISTICS @  $T_a=25^\circ\text{C}$  unless otherwise specified

Figure 1. Dropout Characteristics

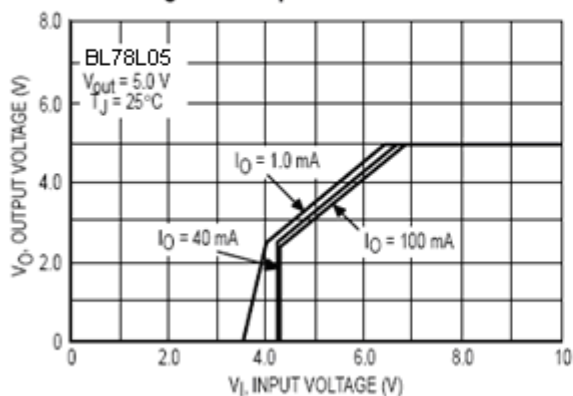


Figure 2. Dropout Voltage versus Junction Temperature

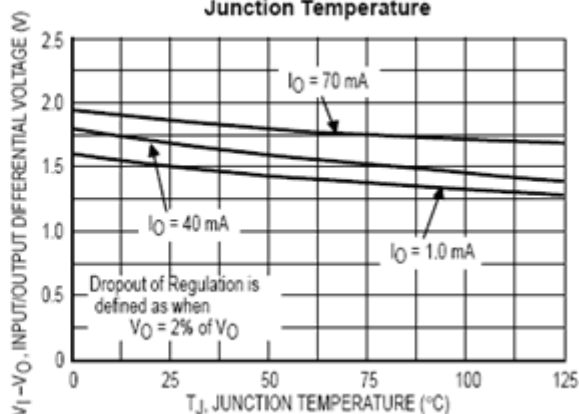


Figure 3. Input Bias Current versus Ambient Temperature

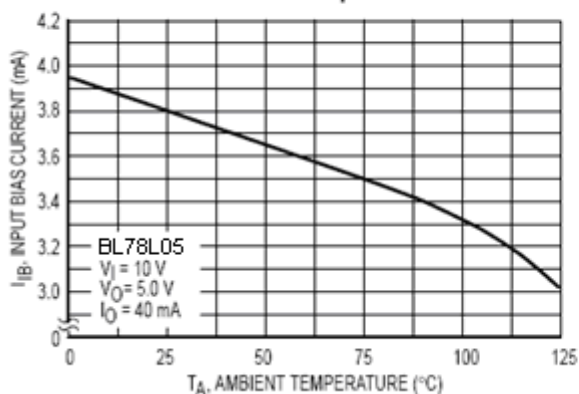


Figure 4. Input Bias Current versus Input Voltage

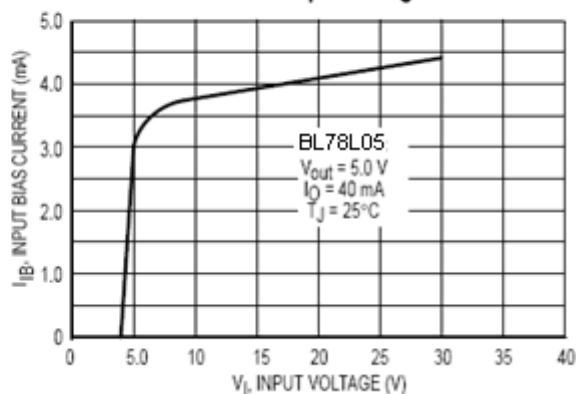


Figure 5. Maximum Average Power Dissipation versus Ambient Temperature – TO-92 Type Package

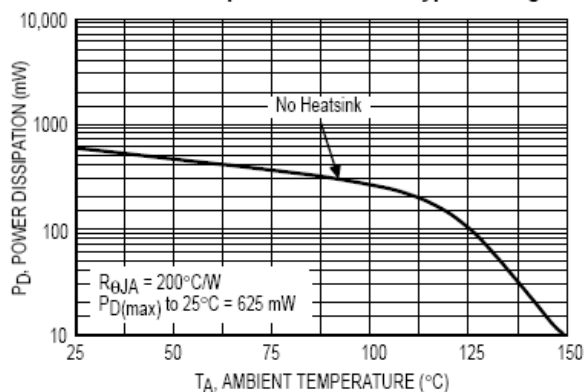
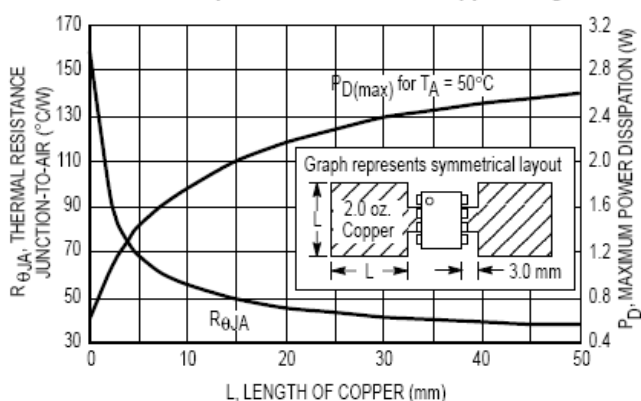


Figure 6. SOP-8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length



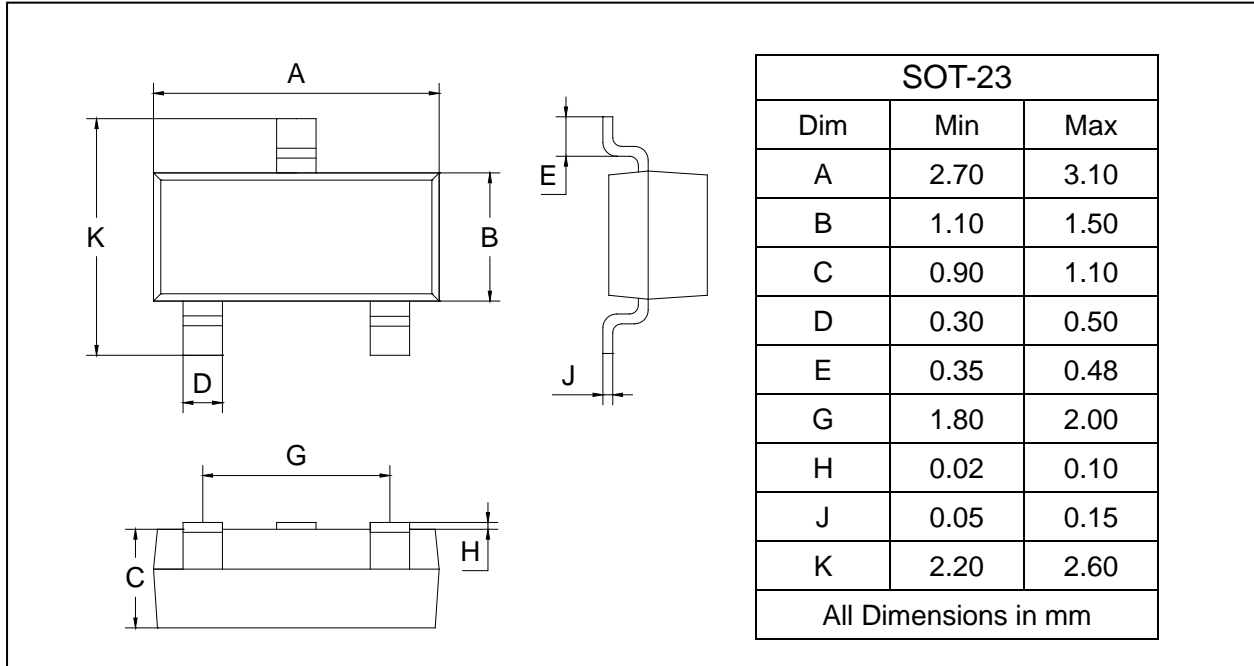
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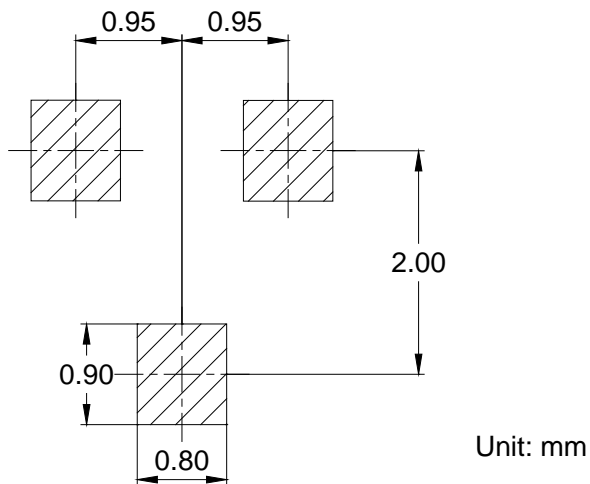
#### PACKAGE OUTLINE

Plastic surface mounted package

SOT-23



#### SOLDERING FOOTPRINT



#### PACKAGE INFORMATION

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