

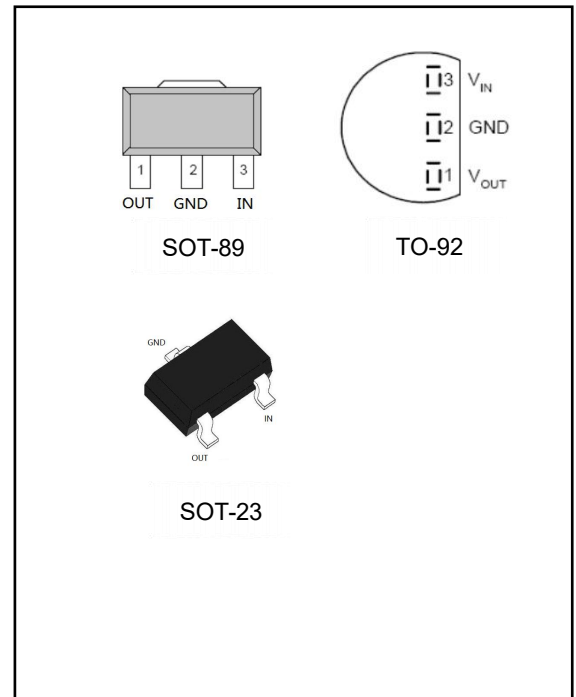
POSITIVE VOLTAGE REGULATORS

1 Description

The 78LXX series of three-terminal positive regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heat-sink is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators. The 78LXX series used as Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two

2 Features

- OUTPUT CURRENT UP TO 100 mA
- OUTPUT VOLTAGES OF 5; 6; 8; 9 ; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- NO EXTERNAL COMPONENTS ARE REQUIRED
- AVAILABLE IN EITHER $\pm 5\%$ (AC) OR $\pm 10\%$ (C) SELECTION

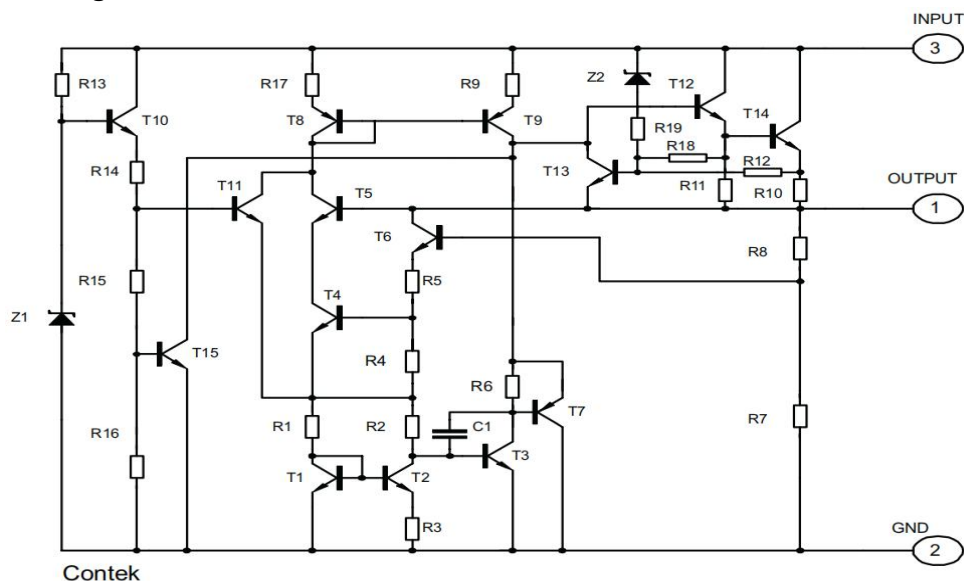


3 Electrical Characteristics

3.1 Absolute Maximum Ratings (T_c=25°C, unless otherwise noted)

Characteristic		Symbol	Value	Unit
Input Voltage	VO = 5 to 9 V	V _I	30	V
	VO = 12 to 18V		35	
	VO = 24V		40	
Operating Temperature Range		T _{OPR}	0 ~ +125	°C
Storage Temperature Range		T _{STG}	-55 ~ +150	°C
Output Current		I _o	Internally Limited	
Continuous total dissipation	TO-92	P _D	0.5	W
	SOT-89		0.35	
	SOT-23		0.35	

3.2 Block Diagram



3.3 Electrical Characteristics

78L05:(refer to the test circuits , $0 < T_j < 125^{\circ}\text{C}$, $I_o = 40\text{mA}$, $V_i = 10\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions		78L05			Unit
				Min	Typ	Max	
Output Voltage	V_o^*	$V_i=10V, I_o=40mA, T_j=25^{\circ}C$		4.80	5.0	5.20	V
Output Voltage	V_o	$V_i=7.5V\sim 20V, \quad 1.0mA\sim 40mA$	$T_j=25^{\circ}C$	4.75	5.0	5.25	V
		$1.0mA\sim 70mA, P_o<0.5W$		4.75	5.0	5.25	
Line Regulation	$\triangle V_o$	$T_j=25^{\circ}C, I_o=40mA$	$V_i=7V\leq V_i\leq 20V$	-	32	150	mV
			$V_i=8V\leq V_i\leq 20V$	-	26	100	
Load Regulation	$\triangle V_o$	$T_j=25^{\circ}C, V_i=10V$	$I_o=1mA\sim 100mA$	-	15	60	mV
			$I_o=1mA\sim 40mA$	-	8.0	30	
Quiescent Current	I_q	$V_i=10V, I_o=40mA, T_j=25^{\circ}C$		-	2.0	6.0	mA
Quiescent Current Change	$\triangle I_q$	$T_j=25^{\circ}C, V_i=10V, I_o=1mA\sim 40mA$	$T_j=25^{\circ}C$	-	-	1.5	mA
		$T_j=25^{\circ}C, I_o=40mA, V_i=8V\leq V_i\leq 20V$		-	-	0.8	
Output Voltage Drift	$\triangle V_o/\triangle T$	$I_o=5mA, T_j=25^{\circ}C$		-	-0.65	-	mV/ $^{\circ}C$
Output Noise Voltage	V_N	$f=10Hz\sim 100KHz, T_a=25^{\circ}C$		-	40	-	μV
Supply Voltage Rejection	RR	$f=120Hz, V_i=8V\sim 20V$	$T_j=25^{\circ}C$	41	80	-	dB
Dropout Voltage	V_D	$T_j=25^{\circ}C$		-	1.7	-	V

*** V_o : $\pm 1\%$ 、 $\pm 2\%$ 、 $\pm 3\%$ 、 $\pm 4\%$**

78L06:(refer to the test circuits , $0 < T_j < 125^{\circ}\text{C}$, $I_o = 40\text{mA}$, $V_i = 12\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions		78L06			Unit
				Min	Typ	Max	
Output Voltage	V_O^*	$V_I=12V, I_O=40mA, T_J=25^{\circ}C$		5.76	6.0	6.24	V
Output Voltage	V_O	$V_I=8.5V\sim 20V, 1.0mA\sim 40mA$	$T_J=25^{\circ}C$	5.7	6.0	6.3	V
		$1.0mA\sim 70mA, P_O<0.5W$		5.7	6.0	6.3	
Line Regulation	$\triangle V_O$	$T_J=25^{\circ}C, I_O=40mA$	$V_I=8.5V\leq V_I\leq 20V$	-	64	150	mV
			$V_I=9V\leq V_I\leq 20V$	-	54	120	
Load Regulation	$\triangle V_O$	$T_J=25^{\circ}C, V_I=12V$	$I_O=1mA\sim 100mA$	-	12.8	80	mV
			$I_O=1mA\sim 40mA$	-	5.8	40	
Quiescent Current	I_Q	$V_I=12V, I_O=40mA, T_J=25^{\circ}C$		-	3.8	6.0	mA
Quiescent Current Change	$\triangle I_Q$	$T_J=25^{\circ}C, V_I=12V, I_O=1mA\sim 40mA$	$T_J=25^{\circ}C$	-	-	1.5	mA
		$T_J=25^{\circ}C, I_O=40mA, V_I=9V\leq V_I\leq 20V$		-	-	0.8	
Output Voltage Drift	$\triangle V_O/\triangle T$	$I_O=5mA, T_J=25^{\circ}C$		-	0.75	-	mV/ $^{\circ}C$
Output Noise Voltage	V_N	$f=10Hz\sim 100KHz, T_a=25^{\circ}C$		-	49	-	μV
Supply Voltage Rejection	RR	$f=120Hz, V_I=10V\sim 20V$	$T_a=25^{\circ}C$	40	46	-	dB
Dropout Voltage	V_D	$T_J=25^{\circ}C$		-	1.7	-	V

*** V_o : $\pm 1\%$ 、 $\pm 2\%$ 、 $\pm 3\%$ 、 $\pm 4\%$**

78L08:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=14V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	78L08			Unit
			Min	Typ	Max	
Output Voltage	V _o *	V _i =14V,I _o =40mA,T _j =25°C	7.7	8.0	8.3	V
Output Voltage	V _o	V _i =10.5V~23V, 1.0mA~40mA	7.6	8.0	8.4	V
		1.0mA~70mA,P _o <0.5W	7.6	8.0	8.4	
Line Regulation	ΔV _o	T _j =25°C,I _o =40mA	V _i =10.5V≤V _i ≤23V		175	mV
			V _i =11V≤V _i ≤23V		120	
Load Regulation	ΔV _o	T _j =25°C,V _i =14V	I _o =1mA~100mA		80	mV
			I _o =1mA~40mA		30	
Quiescent Current	I _q	V _i =14V,I _o =40mA,T _j =25°C	-	2.0	6.0	mA
Quiescent Current Change	ΔI _q	T _j =25°C,V _i =14V,I _o =1mA~40mA	-	-	0.5	mA
		T _j =25°C,I _o =40mA,V _i =11V≤V _i ≤23V	-	-	0.8	
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _j =25°C	-	0.75	-	mV/°C
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C	-	49	-	μV
Supply Voltage Rejection	RR	f=120Hz, V _i =11V~23V	39	70	-	dB
Dropout Voltage	V _D	T _j =25°C	-	1.7	-	V

***V_o: ±1%、±2%、±3%、±4%**

78L09:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=15V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions	78L09			Unit
			Min	Typ	Max	
Output Voltage	V _o *	V _i =15V,I _o =40mA,T _j =25°C	8.64	9.0	9.36	V
Output Voltage	V _o	V _i =11.5V~24V, 1.0mA~40mA	8.55	9.0	9.45	V
		1.0mA~70mA,P _o <0.5W	8.55	9.0	9.45	
Line Regulation	ΔV _o	T _j =25°C,I _o =40mA	V _i =11.5V≤V _i ≤24V		200	mV
			V _i =13V≤V _i ≤24V		150	
Load Regulation	ΔV _o	T _j =25°C,V _i =15V	I _o =1mA~100mA		90	mV
			I _o =1mA~40mA		45	
Quiescent Current	I _q	V _i =15V,I _o =40mA,T _j =25°C	-	2.0	6.0	mA
Quiescent Current Change	ΔI _q	T _j =25°C,V _i =15V,I _o =1mA~40mA	-	-	0.5	mA
		T _j =25°C,I _o =40mA,V _i =13V≤V _i ≤24V	-	-	0.8	
Output Voltage Drift	ΔV _o /ΔT	I _o =5mA,T _j =25°C	-	0.75	-	mV/°C
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25°C	-	49	-	μV
Supply Voltage Rejection	RR	f=120Hz, V _i =12V~23V	38	44	-	dB
Dropout Voltage	V _D	T _j =25°C	-	1.7	-	V

***V_o: ±1%、±2%、±3%、±4%**

78L12:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=19V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions		78L12			Unit
				Min	Typ	Max	
Output Voltage	V _O [*]	V _I =19V,I _o =40mA,T _J =25℃		11.5	12	12.5	V
Output Voltage	V _O	V _I =14.5V~27V, 1.0mA~40mA	T _J =25℃	11.4	12	12.6	V
		1.0mA~70mA,P _O <0.5W		11.4	12	12.6	
Line Regulation	ΔV _O	T _J =25℃,I _o =40mA	V _I =14.5V≤V _i ≤27V	-	25	200	mV
			V _I =16V≤V _i ≤27V	-	20	180	
Load Regulation	ΔV _O	T _J =25℃,V _I =19V	I _o =1mA~100mA	-	25	120	mV
			I _o =1mA~40mA	-	12	75	
Quiescent Current	I _Q	V _I =19V,I _o =40mA,T _J =25℃		-	2.0	6.0	mA
Quiescent Current Change	ΔI _Q	T _J =25℃,V _I =19V,I _o =1mA~40mA	T _J =25℃	-	-	1.5	mA
		T _J =25℃,I _o =40mA,V _I =16V≤V _i ≤27V		-	-	0.8	
Output Voltage Drift	ΔV _O /ΔT	I _o =5mA,T _J =25℃		-	-1.0	-	mV/℃
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25℃		-	80	-	μV
Supply Voltage Rejection	RR	f=120Hz, V _I =15V~25V	T _a =25℃	37	65	-	dB
Dropout Voltage	V _D	T _J =25℃		-	1.7	-	V

***V_O: ±1%、±2%、±3%、±4%**

78L15:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=23V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions		78L15			Unit
				Min	Typ	Max	
Output Voltage	V _O [*]	V _I =23V,I _O =40mA,T _J =25℃		14.4	15	15.6	V
Output Voltage	V _O	V _I =17.5V~30V, 1.0mA~40mA	T _J =25℃	14.25	15	15.75	V
		1.0mA~70mA,P _O <0.5W		14.25	15	15.75	
Line Regulation	ΔV _O	T _J =25℃,I _O =40mA	V _I =17.5V≤V _I ≤30V	-	30	150	mV
			V _I =20V≤V _I ≤30V	-	15	75	
Load Regulation	ΔV _O	T _J =25℃,V _I =23V	I _O =1mA~100mA	-	25	150	mV
			I _O =1mA~40mA	-	20	120	
Quiescent Current	I _Q	V _I =23V,I _O =40mA,T _J =25℃		-	2.2	6.0	mA
Quiescent Current Change	ΔI _Q	T _J =25℃,V _I =23V,I _O =1mA~40mA	T _J =25℃	-	-	1.5	mA
		T _J =25℃,I _O =40mA,V _I =20V≤V _I ≤30V		-	-	0.8	
Output Voltage Drift	ΔV _O /ΔT	I _O =5mA,T _J =25℃		-	-1.3	-	mV/℃
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25℃		-	90	-	μV
Supply Voltage Rejection	RR	f=120Hz, V _I =18V~28V	T _a =25℃	34	63	-	dB
Dropout Voltage	V _D	T _J =25℃		-	1.7	-	V

***V_O: ±1%、±2%、±3%、±4%**

78L18:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=27V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions		78L18			Unit
				Min	Typ	Max	
Output Voltage	V _O [*]	V _I =27V,I _o =40mA,T _J =25℃		17.3	18	18.7	V
Output Voltage	V _O	V _I =21V~33V, 1.0mA~40mA	T _J =25℃	17.1	18	18.9	V
		1.0mA~70mA,P _O <0.5W		17.1	18	18.9	
Line Regulation	△V _O	T _J =25℃,I _o =40mA	V _I =21V≤V _i ≤33V	-	140	250	mV
			V _I =22V≤V _i ≤33V	-	120	220	
Load Regulation	△V _O	T _J =25℃,V _I =27V	I _o =1mA~100mA	-	30	160	mV
			I _o =1mA~40mA	-	15	80	
Quiescent Current	I _Q	V _I =27V,I _o =40mA,T _J =25℃		-	2.0	6.0	mA
Quiescent Current Change	△I _Q	T _J =25℃,V _I =27V,I _o =1mA~40mA	T _J =25℃	-	-	1.5	mA
		T _J =25℃,I _o =40mA,V _I =21V≤V _i ≤33V		-	-	0.8	
Output Voltage Drift	△V _O /△T	I _o =5mA,T _J =25℃		-	-1.8	-	mV/℃
Output Noise Voltage	V _N	f=10Hz~100KHz, T _a =25℃		-	150	-	μV
Supply Voltage Rejection	RR	f=120Hz, V _I =23V~33V	T _a =25℃	34	48	-	dB
Dropout Voltage	V _D	T _J =25℃		-	1.7	-	V

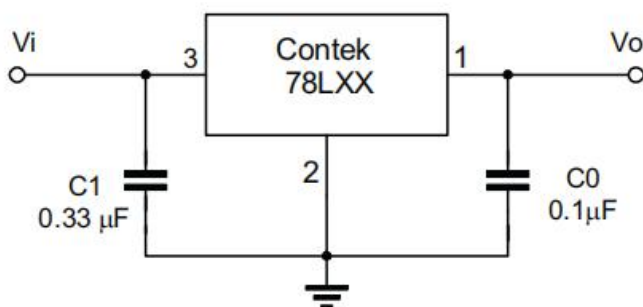
***V_O: ±1%、±2%、±3%、±4%**

78L24:(refer to the test circuits ,0<T_j<125°C,I_o=40mA,V_i=33V,C_i=0.33μF, Co=0.1μF,unless otherwise specified)

Parameter	Symbol	Test Conditions		78L24			Unit
				Min	Typ	Max	
Output Voltage	V_O^*	$V_I=33V, I_O=40mA, T_J=25^{\circ}C$		23	24	25	V
Output Voltage	V_O	$V_I=27V\sim 38V, 1.0mA\sim 40mA$	$T_J=25^{\circ}C$	22.8	24	25.2	V
		$1.0mA\sim 70mA, P_O<0.5W$		22.8	24	25.2	
Line Regulation	ΔV_O	$T_J=25^{\circ}C, I_O=40mA$	$V_I=27V\leq V_I\leq 38V$	-	160	300	mV
			$V_I=28V\leq V_I\leq 38V$	-	150	250	
Load Regulation	ΔV_O	$T_J=25^{\circ}C, V_I=33V$	$I_O=1mA\sim 100mA$	-	40	200	mV
			$I_O=1mA\sim 40mA$	-	20	100	
Quiescent Current	I_Q	$V_I=33V, I_O=40mA, T_J=25^{\circ}C$		-	2.2	6.0	mA
Quiescent Current Change	ΔI_Q	$T_J=25^{\circ}C, V_I=33V, I_O=1mA\sim 40mA$	$T_J=25^{\circ}C$	-	-	1.5	mA
		$T_J=25^{\circ}C, I_O=40mA, V_I=27V\leq V_I\leq 38V$		-	-	0.8	
Output Voltage Drift	$\Delta V_O/\Delta T$	$I_O=5mA, T_J=25^{\circ}C$		-	-2.0	-	mV/ $^{\circ}C$
Output Noise Voltage	V_N	$f=10Hz\sim 100KHz, T_a=25^{\circ}C$		-	200	-	μV
Supply Voltage Rejection	RR	$f=120Hz, V_I=27V\sim 38V$	$T_a=25^{\circ}C$	34	45	-	dB
Dropout Voltage	V_D	$T_J=25^{\circ}C$		-	1.7	-	V

***V_O: ±1%、±2%、±3%、±4%**

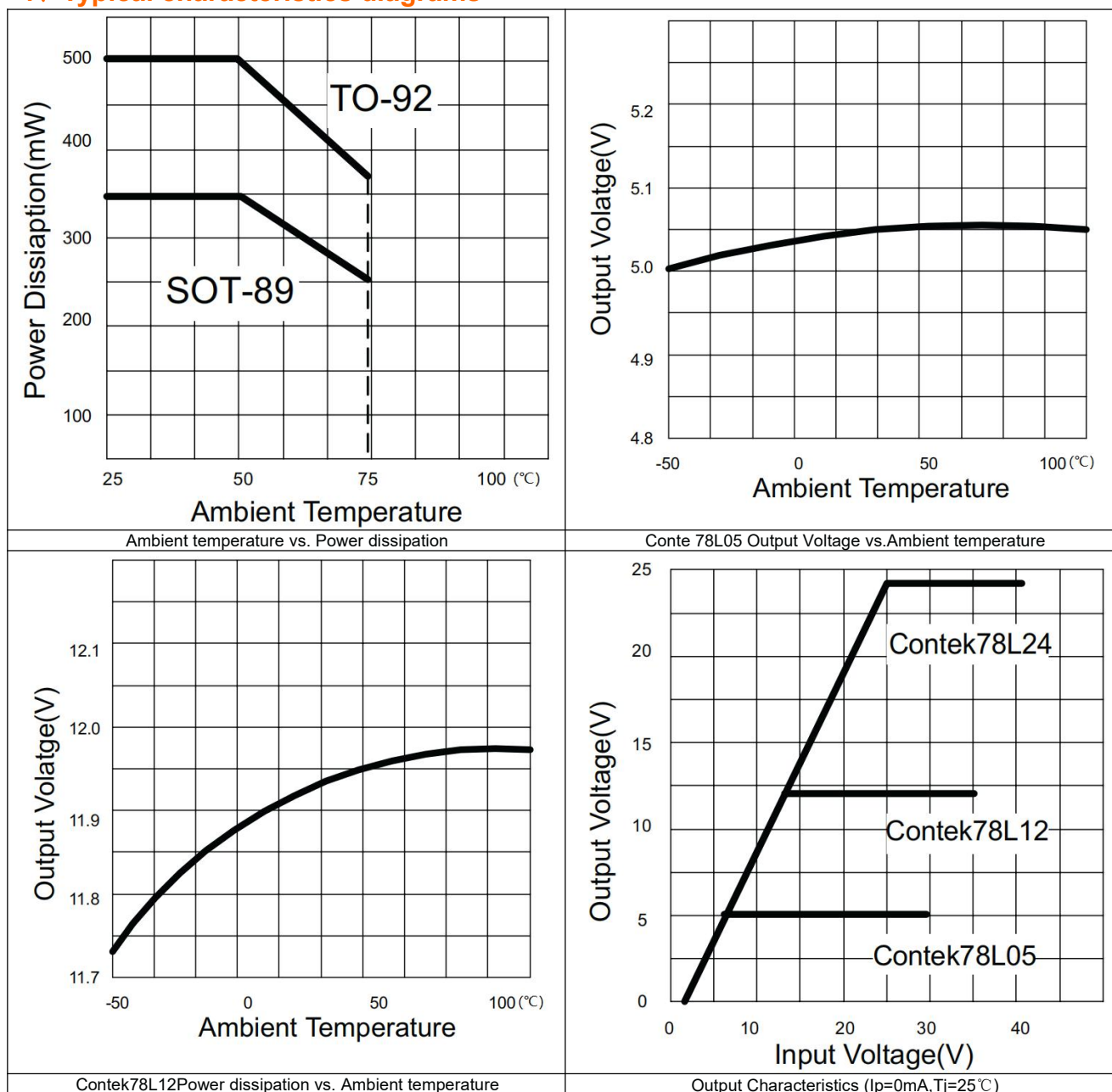
TYPICAL APPLICATION

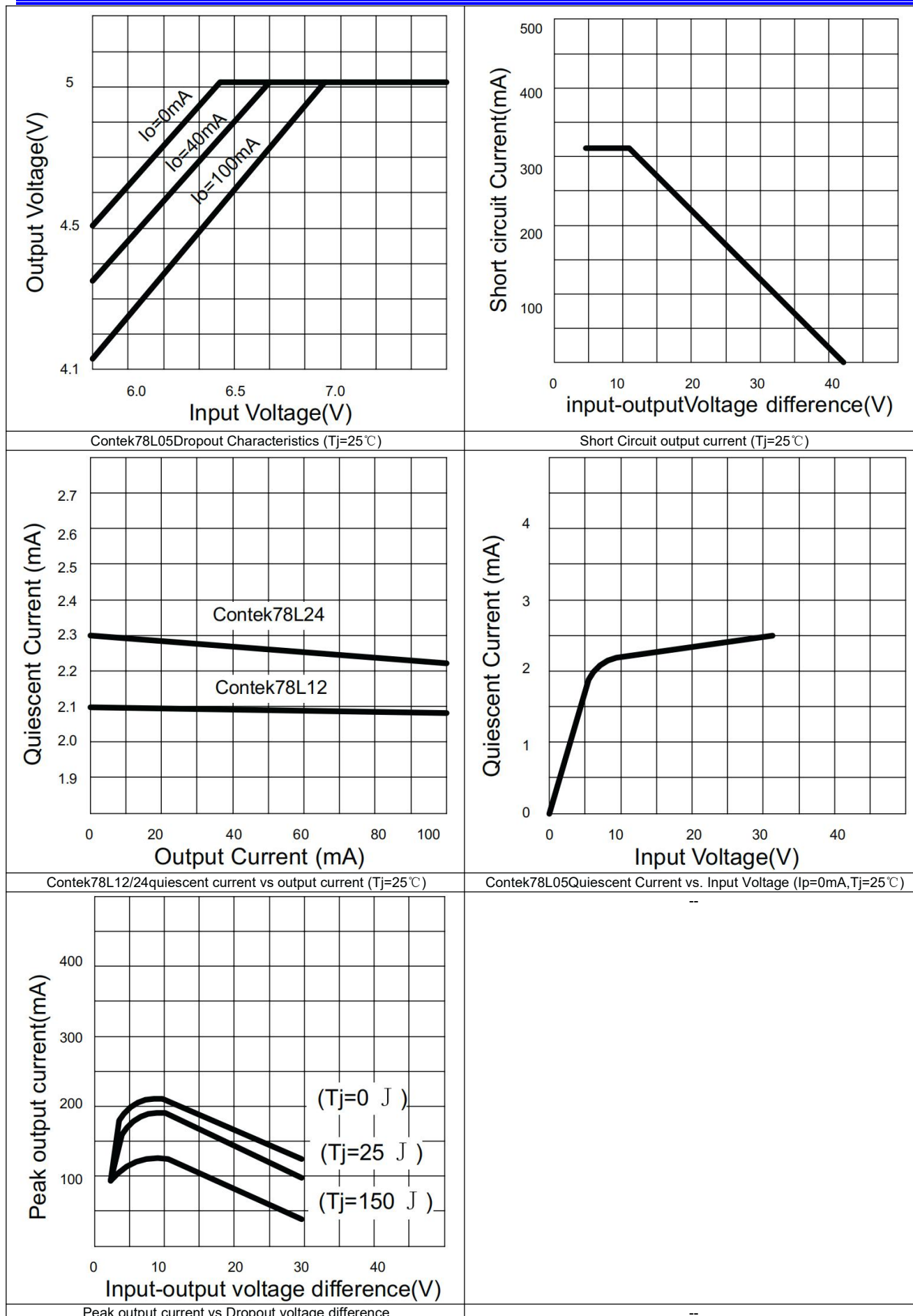


Note 1: To specify an output voltage, substitute voltage value for "XX".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

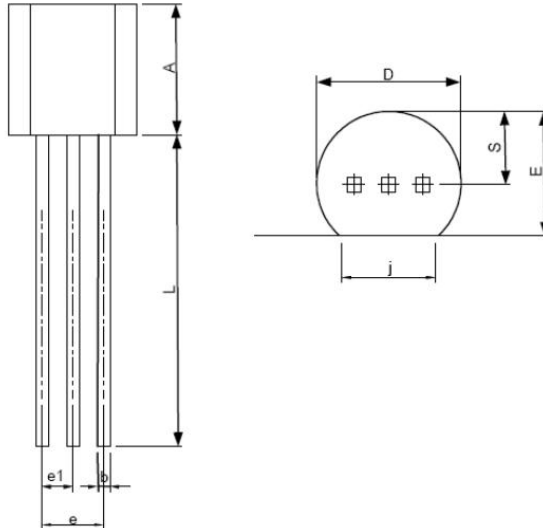
4. Typical characteristics diagrams





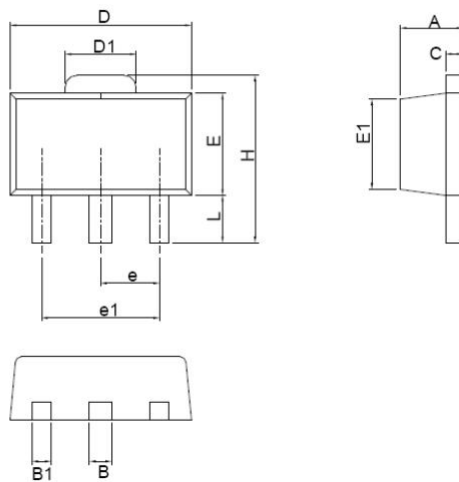
7、Dimensions

TO-92



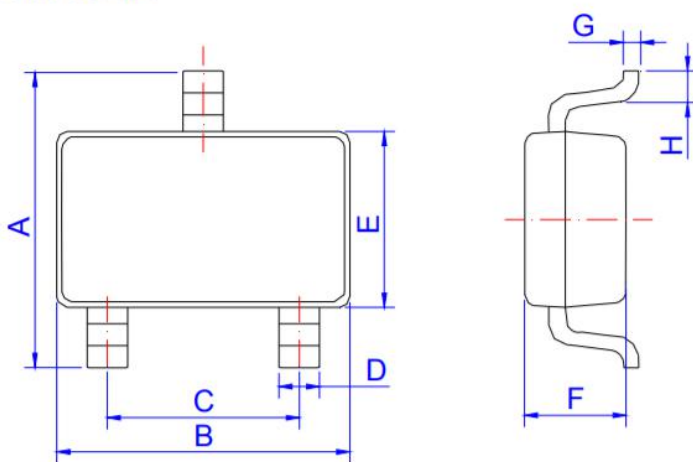
SYMBOL	TO-92			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.32	5.33	0.170	0.210
B	0.41	0.53	0.016	0.021
D	4.45	5.20	0.175	0.205
E	3.18	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
j	3.43	4.00	0.135	0.157
L	12.70	15.00	0.500	0.591
S	2.03	2.66	0.080	0.105

SOT-89



SYMBOL	SOT-89			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.40	1.60	0.055	0.063
B	0.44	0.56	0.017	0.022
B1	0.36	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.62	1.83	0.064	0.072
E	2.29	2.60	0.090	0.102
E1	2.13	2.29	0.084	0.090
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
H	3.94	4.25	0.155	0.167
L	0.89	1.20	0.035	0.047

SOT-23-3L



Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
A	2.30	2.40	2.50
B	2.80	2.90	3.00
C	1.80	1.90	2.00
D	0.30	0.35	0.50
E	1.20	1.30	1.40
F	0.87	0.97	1.07
G	0.05	0.15	0.25
H	0.25	0.40	0.55

8、Attentions

- Jiangsu Donghai Semiconductor Technology Co., Ltd. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of WXDH products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

9、Appendix

Revision history:

Date	REV.	Description	Page
2017.09.18	1.0	Original	