



## LINEAR INTEGRATED CIRCUIT 3-TERMINAL 1.5A POSITIVE VOLTAGE REGULATOR

### Description

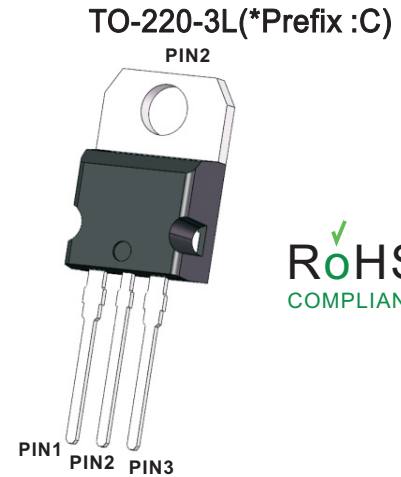
The 78XXC family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1.5A.

### Features

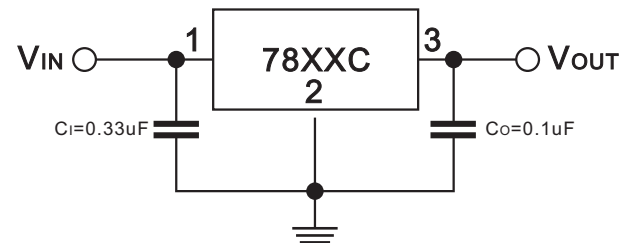
- Output current up to 1.5A
- Fixed output voltage of 5V, 6V, 8V, 9V, 12V, 15V available
- Thermal overload shutdown protection
- Output transistor SOA protection

### Mechanical data

- Case: TO-220-3L
- Approx. Weight: 2.04g (0.072oz)
- RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".



### APPLICATION CIRCUIT



### ■ ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

PARAMETER		SYMBOLS	RATINGS	UNIT
Drain-Source Voltage	$V_{OUT}=5\sim 15V$	$V_{IN}$	35	V
Output Current		$I_{OUT}$	1.5	A
Power Dissipation		$P_D$	Internally Limited	W
Junction Temperature		$T_J$	+150	°C
Operating Temperature		$T_{OPR}$	-40 ~ +125	°C
Storage Temperature		$T_{STG}$	-55 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL DATA

PARAMETER	SYMBOLS	RATINGS	UNIT
Junction to Ambient	$R_{thJA}$	65	°C/W
Junction to Case	$R_{thJC}$	5	°C/W



■ELECTRICAL CHARACTERISTICS ( $I_{OUT}=1.5A$ ,  $T_J=0^{\circ}C\sim 125^{\circ}C$ ,  $C_I=0.33\mu F$ ,  $C_O=0.1\mu F$ , unless otherwise specified)  
(Note 1)

For 78W05C ( $V_{IN}=10V$ )

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$T_J=25^{\circ}C$ , $I_{OUT}=5mA \sim 1.5A$	4.8	5.0	5.2	V
		$V_{IN}=7.5V \sim 20V$ , $I_{OUT}=5mA \sim 1.5A, P_D \leq 15W$	4.75		5.25	V
Dropout Voltage	$V_D$	$T_J=25^{\circ}C$		2.0		V
Load Regulation	$\Delta V_{OUT}$	$T_J=25^{\circ}C$ , $I_{OUT}=5mA \sim 1.5A$			50	mV
		$T_J=25^{\circ}C$ , $I_{OUT}=0.25A \sim 0.75A$			25	mV
Line regulation	$\Delta V_{OUT}$	$V_{IN}=7V \sim 25V$ , $T_J=25^{\circ}C$			50	mV
		$V_{IN}=7.5V \sim 20V$ , $T_J=25^{\circ}C$ , $I_{OUT}=1.5A$			50	mV
Quiescent Current	$I_Q$	$T_J=25^{\circ}C$ , $I_{OUT} \leq 1.5A$			8.0	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=7.5V \sim 20V$			1.0	mA
		$I_{OUT}=5mA \sim 1.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		40		$\mu V$
Ripple Rejection	RR	$V_{IN}=8V \sim 18V, f=120Hz$ , $T_J=25^{\circ}C$	59	80		dB
Peak Output Current	$I_{PEAK}$	$T_J=25^{\circ}C$		1.8		A

For 78W06C ( $V_{IN}=11V$ )

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$T_J=25^{\circ}C$ , $I_{OUT}=5mA \sim 1.5A$	5.76	6.0	6.24	V
		$V_{IN}=8.5V \sim 21V$ , $I_{OUT}=5mA \sim 1.5A, P_D \leq 15W$	5.70		6.30	V
Dropout Voltage	$V_D$	$T_J=25^{\circ}C$		2.0		V
Load Regulation	$\Delta V_{OUT}$	$T_J=25^{\circ}C$ , $I_{OUT}=5mA \sim 1.5A$			60	mV
		$T_J=25^{\circ}C$ , $I_{OUT}=0.25A \sim 0.75A$			30	mV
Line regulation	$\Delta V_{OUT}$	$V_{IN}=8V \sim 25V$ , $T_J=25^{\circ}C$			60	mV
		$V_{IN}=8.5V \sim 21V$ , $T_J=25^{\circ}C$ , $I_{OUT}=1.5A$			60	mV
Quiescent Current	$I_Q$	$T_J=25^{\circ}C$ , $I_{OUT} \leq 1.5A$			8.0	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=8.5V \sim 21V$			1.0	mA
		$I_{OUT}=5mA \sim 1.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		45		$\mu V$
Ripple Rejection	RR	$V_{IN}=9V \sim 19V, f=120Hz$ , $T_J=25^{\circ}C$	56	75		dB
Peak Output Current	$I_{PEAK}$	$T_J=25^{\circ}C$		1.8		A



For 78W08C (VIN=14V)

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A	7.68	8.0	8.32	V
		V <sub>IN</sub> =10.5V ~ 23V, I <sub>OUT</sub> =5mA ~ 1.5A, P <sub>D</sub> ≤15W	7.60		8.40	V
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> =25°C		2.0		V
Load Regulation	ΔV <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A			80	mV
		T <sub>J</sub> =25°C, I <sub>OUT</sub> =0.25A ~ 0.75A			40	mV
Line regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =10.5V ~ 25V, T <sub>J</sub> =25°C			80	mV
		V <sub>IN</sub> =10.5V ~ 23V, T <sub>J</sub> =25°C, I <sub>OUT</sub> =1.5A			80	mV
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> ≤1.5A			8.0	mA
Quiescent Current Change	ΔI <sub>Q</sub>	V <sub>IN</sub> =10.5V ~ 23V			1.0	mA
		I <sub>OUT</sub> =5mA ~ 1.5A			0.5	mA
Output Noise Voltage	e <sub>N</sub>	10Hz ≤ f ≤ 100kHz		58		uV
Ripple Rejection	RR	V <sub>IN</sub> =11.5V ~ 21.5V, f=120Hz, T <sub>J</sub> =25°C	53	72		dB
Peak Output Current	I <sub>PEAK</sub>	T <sub>J</sub> =25°C		1.8		A

For 78W09C (VIN=15V)

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A	8.64	9.0	9.36	V
		V <sub>IN</sub> =11.5V ~ 24V, I <sub>OUT</sub> =5mA ~ 1.5A, P <sub>D</sub> ≤15W	8.55		9.45	V
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> =25°C		2.0		V
Load Regulation	ΔV <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A			90	mV
		T <sub>J</sub> =25°C, I <sub>OUT</sub> =0.25A ~ 0.75A			45	mV
Line regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =11.5V ~ 25V, T <sub>J</sub> =25°C			90	mV
		V <sub>IN</sub> =11.5V ~ 24V, T <sub>J</sub> =25°C, I <sub>OUT</sub> =1.5A			90	mV
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> ≤1.5A			8.0	mA
Quiescent Current Change	ΔI <sub>Q</sub>	V <sub>IN</sub> =11.5V ~ 24V			1.0	mA
		I <sub>OUT</sub> =5mA ~ 1.5A			0.5	mA
Output Noise Voltage	e <sub>N</sub>	10Hz ≤ f ≤ 100kHz		58		uV
Ripple Rejection	RR	V <sub>IN</sub> =12.5V ~ 22.5V, f=120Hz, T <sub>J</sub> =25°C	53	72		dB
Peak Output Current	I <sub>PEAK</sub>	T <sub>J</sub> =25°C		1.8		A



For 78W12C (VIN=19V)

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A	11.52	12	12.48	V
		V <sub>IN</sub> =14.5V ~ 27V, I <sub>OUT</sub> =5mA ~ 1.5A, P <sub>D</sub> ≤15W	11.4		12.6	V
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> =25°C		2.0		V
Load Regulation	ΔV <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A			120	mV
		T <sub>J</sub> =25°C, I <sub>OUT</sub> =0.25A ~ 0.75A			60	mV
Line regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =14.5V ~ 30V, T <sub>J</sub> =25°C			120	mV
		V <sub>IN</sub> =14.5V ~ 27V, T <sub>J</sub> =25°C, I <sub>OUT</sub> =1.5A			120	mV
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> ≤1.5A			8.0	mA
Quiescent Current Change	ΔI <sub>Q</sub>	V <sub>IN</sub> =14.6V ~ 30V			1.0	mA
		I <sub>OUT</sub> =5mA ~ 1.5A			0.5	mA
Output Noise Voltage	e <sub>N</sub>	10Hz ≤ f ≤ 100kHz		75		μV
Ripple Rejection	RR	V <sub>IN</sub> =15V ~ 25V, f=120Hz, T <sub>J</sub> =25°C	52	72		dB
Peak Output Current	I <sub>PEAK</sub>	T <sub>J</sub> =25°C		1.8		A

For 78W15C (VIN=23V)

PARAMETER	SYMBOLS	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A	14.4	15.0	15.6	V
		V <sub>IN</sub> =17.5V ~ 30V, I <sub>OUT</sub> =5mA ~ 1.5A, P <sub>D</sub> ≤15W	14.25		15.75	V
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> =25°C		2.0		V
Load Regulation	ΔV <sub>OUT</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> =5mA ~ 1.5A			150	mV
		T <sub>J</sub> =25°C, I <sub>OUT</sub> =0.25A ~ 0.75A			75	mV
Line regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =18.5V ~ 30V, T <sub>J</sub> =25°C			150	mV
		V <sub>IN</sub> =17.7V ~ 30V, T <sub>J</sub> =25°C, I <sub>OUT</sub> =1.5A			150	mV
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> =25°C, I <sub>OUT</sub> ≤1.5A			8.0	mA
Quiescent Current Change	ΔI <sub>Q</sub>	V <sub>IN</sub> =17.5V ~ 30V			1.0	mA
		I <sub>OUT</sub> =5mA ~ 1.5A			0.5	mA
Output Noise Voltage	e <sub>N</sub>	10Hz ≤ f ≤ 100kHz		90		μV
Ripple Rejection	RR	V <sub>IN</sub> =18.5V ~ 28.5V, f=120Hz, T <sub>J</sub> =25°C	51	70		dB
Peak Output Current	I <sub>PEAK</sub>	T <sub>J</sub> =25°C		1.8		A

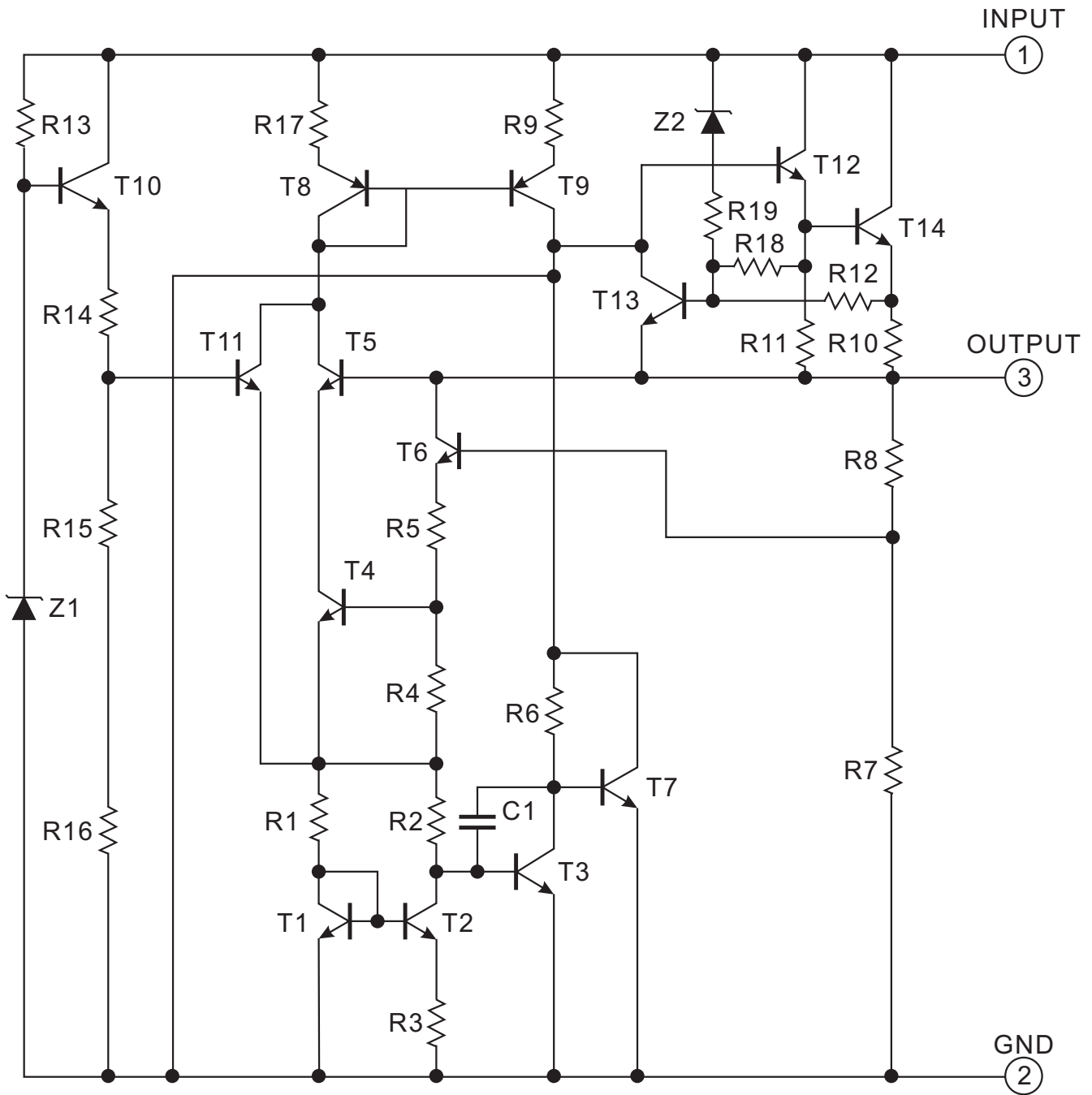
Notes:

1. The Maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represents pulse test conditions with junction temperatures specified at the initiation of test.

2. Power dissipation<0.5W



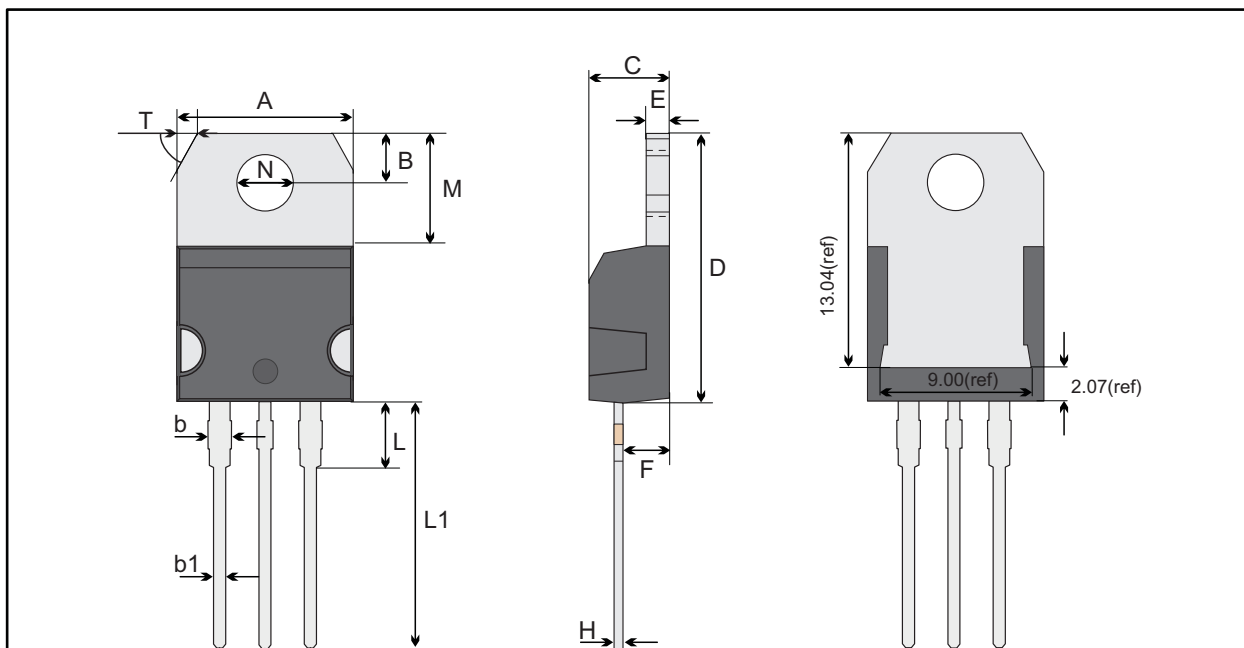
■ Test Circuits





Package Outline  
Through Hole Package ; 3 leads

TO-220-3L



TO-220-3L mechanical data

UNIT		A	B	b	b1	C	D	E	F	G	H	L	L1	M	N	T
mm	max	10.28	2.84	1.67	0.9	4.65	15.54	1.37	2.79	2.64	0.6	3.88	13.13	6.39	3.82 typ.	1.19 58° ref.
	typ	10.18	2.74	1.47	0.8	4.45	15.34	1.27	2.59	2.54	0.5	3.68	12.93	6.19		
	min	10.08	2.64	1.27	0.7	4.25	15.14	1.17	2.39	2.44	0.4	3.48	12.73	5.99		
mil	max	405	112	66	35	183	612	54	110	104	24	153	517	252	150 typ.	47 58° ref.
	typ	401	108	58	31	175	604	50	102	100	20	145	509	244		
	min	397	104	50	28	167	596	46	94	92	16	137	501	236		

Marking

Type number	Marking code
78WXXC	78WXXC



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