



## 78TXX

## LINEAR INTEGRATED CIRCUIT

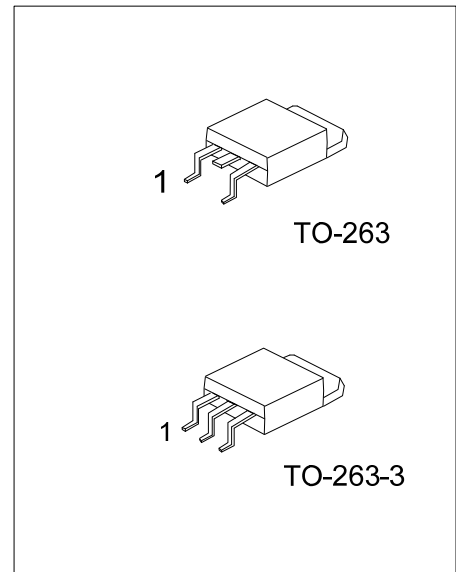
### 3-TERMINALS 0.5A POSITIVE VOLTAGE REGULATOR

#### DESCRIPTION

The UTC **78TXX** family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 0.5 A.

#### FEATURE

- \* Output current up to 0.5 A
- \* Fixed output voltage of 4.7V, 5V, 6V, 8V, 9V, 12V, 15V, 18V and 24V available
- \* Thermal overload shutdown protection
- \* Short circuit current limiting
- \* Output transistor SOA protection



\*Pb-free plating product number:78TXXL

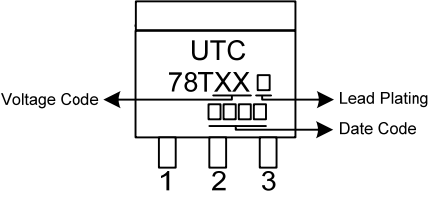
#### ORDERING INFORMATION

Ordering Number		Pin Assignment			Package	Packing
Normal	Lead Free Plating	1	2	3		
78Txx-TQ2-R	78TxxL-TQ2-R	I	G	O	TO-263	Tape Reel
78Txx-TQ2-T	78TxxL-TQ2-T	I	G	O	TO-263	Tube
78Txx-TQ3-R	78TxxL-TQ3-R	I	G	O	TO-263-3	Tape Reel
78Txx-TQ3-T	78TxxL-TQ3-T	I	G	O	TO-263-3	Tube

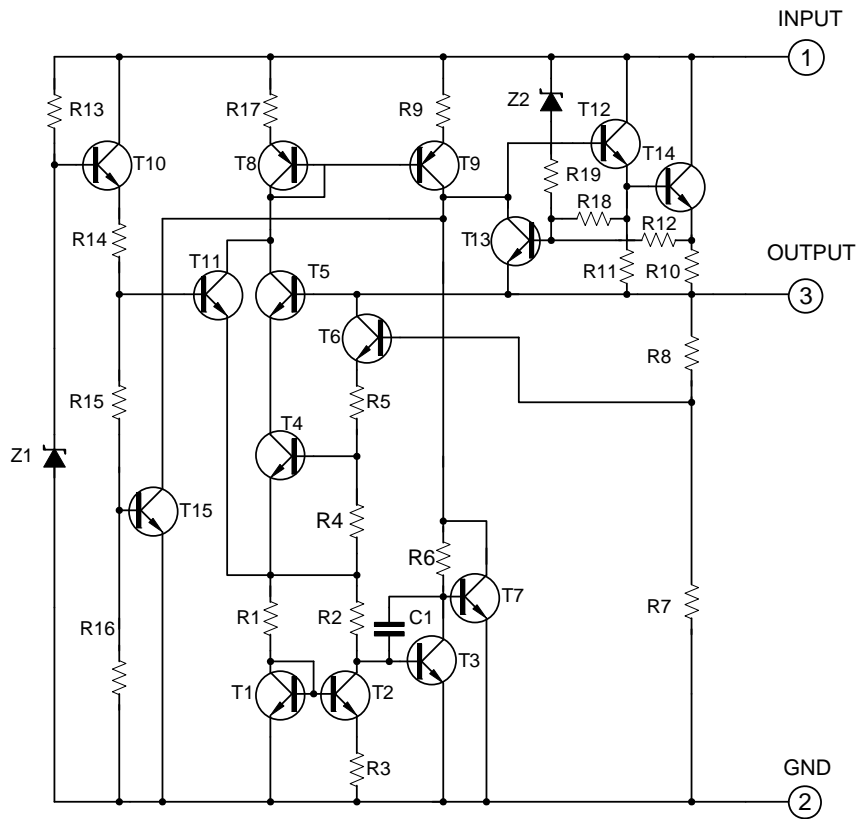
Note: 1. xx: output voltage, refer to Marking Information  
 2. Pin Code: I: Input G: GND O: Output

<p>78TxxL-TQ2-R</p>	<p>(1)Packing Type          (2)Package Type          (3)Lead Plating          (4)Output Voltage Code</p>	<p>(1) R: Tape Reel, T: Tube          (2) TQ2: TO-263, TQ3: TO-263-3          (3) L: Lead Free Plating, Blank: Pb/Sn          (4) xx: refer to Marking Information</p>
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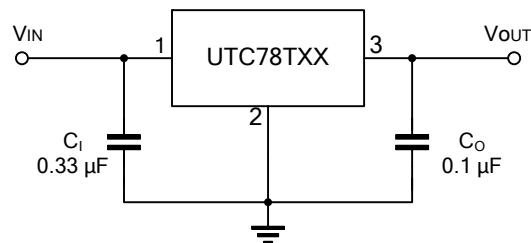
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
TO-263 TO-263-3	47 : 4.7V 05 : 5V 06 : 6V 08 : 8V 09 : 9V 12 : 12V 15 : 15V 18 : 18V 24 : 24V	

■ BLOCK DIAGRAM



■ TYPICAL APPLICATION CIRCUIT



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

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

PARAMETER	SYMBOL	RATINGS	UNIT	
Input Voltage	$V_{IN}$	$V_{OUT}=4.7\sim 18V$	35	V
		$V_{OUT}=20\sim 24V$	40	V
Output Current	$I_{OUT}$	0.5	A	
Power Dissipation	$P_D$	Internally Limited	W	
Operating Junction Temperature	$T_J$	0~+125	°C	
Storage Temperature	$T_{STG}$	-65 ~ +150	°C	

Note:1. Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.

2. 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 are showed as electrical characteristics table represents pulse test conditions with junction temperatures specified at the initiation of test.

■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ C, C_I=0.33\mu F, C_O=0.1\mu F, P_D\leq 7W$ , unless otherwise specified)

**For 78T47** ( $V_{IN}=9.7V, I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	4.512	4.7	4.888	V
		$V_{IN}=7.2\sim 19.7V, I_{OUT}=5mA\sim 0.5A$	4.465		4.935	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			47	mV
		$I_{OUT}=5mA\sim 200mA$			24	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=7.2\sim 19.7V$			47	mV
		$V_{IN}=7.2\sim 19.7V, I_{OUT}=0.5A$			47	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=7.2\sim 19.7V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		40		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.6		mV/°C
Ripple Rejection	RR	$V_{IN}=7.7\sim 17.7V, f=120Hz$	62	80		dB
Peak Output Current	$I_{PEAK}$			1.8		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

**For 78T05** ( $V_{IN}=10V, I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	4.8	5	5.2	V
		$V_{IN}=7.5\sim 20V, I_{OUT}=5mA\sim 0.5A$	4.75		5.25	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			100	mV
		$I_{OUT}=5mA\sim 200mA$			50	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=7V\sim 25V$			100	mV
		$V_{IN}=7.5\sim 20V, I_{OUT}=0.5A$			50	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{UT}=7.5\sim 20V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		40		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.6		mV/°C
Ripple Rejection	RR	$V_{IN}=8\sim 18V, f=120Hz$	62	80		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78T06 ( $V_{IN}=11V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	5.76	6	6.24	V
		$V_{IN}=8.5\sim 21V, I_{OUT}=5mA\sim 0.5A$	5.7		6.3	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			60	mV
		$I_{OUT}=5mA\sim 200mA$			30	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=8\sim 25V$			60	mV
		$V_{IN}=8.5\sim 21V, I_{OUT}=0.5A$			60	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=8.5\sim 21V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		45		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.7		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=9\sim 19V, f=120Hz$	59	75		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

For 78T08 ( $V_{IN}=14V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	7.68	8	8.32	V
		$V_{IN}=10.5\sim 23V, I_{OUT}=5mA\sim 0.5A$	7.6		8.4	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			80	mV
		$I_{OUT}=5mA\sim 200mA$			40	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=10.5\sim 25V$			80	mV
		$V_{IN}=10.5\sim 23V, I_{OUT}=0.5A$			80	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=10.5\sim 23V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		58		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.9		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=11.5\sim 21.5V, f=120Hz$	56	72		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

For 78T09 ( $V_{IN}=15V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	8.64	9	9.36	V
		$V_{IN}=11.5\sim 24V, I_{OUT}=5mA\sim 0.5A$	8.55		9.45	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			90	mV
		$I_{OUT}=5mA\sim 200mA$			45	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=11.5\sim 25V$			90	mV
		$V_{IN}=11.5\sim 24V, I_{OUT}=0.5A$			90	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=11.5\sim 24V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		58		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.1		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=12.5\sim 22.5V, f=120Hz$	56	72		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78T12 ( $V_{IN}=19V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	11.52	12	12.48	V
		$V_{IN}=14.5\sim 27V, I_{OUT}=5mA\sim 0.5A$	11.4		12.6	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			120	mV
		$I_{OUT}=5mA\sim 200mA$			60	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=14.5\sim 30V$			120	mV
		$V_{IN}=14.6\sim 27V, I_{OUT}=0.5A$			120	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=14.5\sim 30V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		75		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.5		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=15\sim 25V, f=120Hz$	55	72		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

For 78T15 ( $V_{IN}=23V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	14.4	15	15.6	V
		$V_{IN}=17.5\sim 30V, I_{OUT}=5mA\sim 0.5A$	14.25		15.75	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			150	mV
		$I_{OUT}=5mA\sim 200mA$			75	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=18.5\sim 30V$			150	mV
		$V_{IN}=17.5\sim 30V, I_{OUT}=0.5A$			150	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=17.5\sim 30V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		90		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.8		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=18.5\sim 28.5V, f=120Hz$	54	70		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

For 78T18 ( $V_{IN}=27V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	17.28	18	18.72	V
		$V_{IN}=21\sim 33V, I_{OUT}=5mA\sim 0.5A$	17.1		18.9	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			180	mV
		$I_{OUT}=5mA\sim 200mA$			90	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=21\sim 33V$			180	mV
		$V_{IN}=21\sim 33V, I_{OUT}=0.5A$			180	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=21.5\sim 33V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		110		$\mu V$
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.2		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=22\sim 32V, f=120Hz$	53	69		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78T24 ( $V_{IN}=33V$ ,  $I_{OUT}=0.5A$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$	23.04	24	24.96	V
		$V_{IN}=27\sim 38V$ , $I_{OUT}=5mA\sim 0.5A$	22.8		25.2	V
Load Regulation	$\Delta V_{OUT}$	$I_{OUT}=5mA\sim 0.5A$			240	mV
		$I_{OUT}=5mA\sim 200mA$			120	mV
Line Regulation	$\Delta V_{OUT}$	$V_{IN}=27\sim 38V$			240	mV
		$V_{IN}=27\sim 38V$ , $I_{OUT}=0.5A$			240	mV
Quiescent Current	$I_Q$	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	$\Delta I_Q$	$V_{IN}=28\sim 38V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz \leq f \leq 100kHz$		170		uV
Temperature coefficient of $V_{OUT}$	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.8		mV/°C
Ripple Rejection	RR	$V_{IN}=28\sim 38V$ , $f=120Hz$	50	66		dB
Peak Output Current	$I_{PEAK}$			1.2		A
Short-Circuit Current	$I_{SC}$	$V_{IN}=35V$		250		mA
Dropout Voltage	$V_D$			2		V

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