

UTC 78LXX LINEAR INTEGRATED CIRCUIT

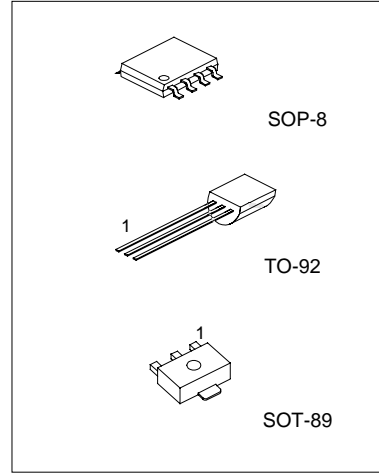
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR

DESCRIPTION

The UTC 78LXX family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 100mA.

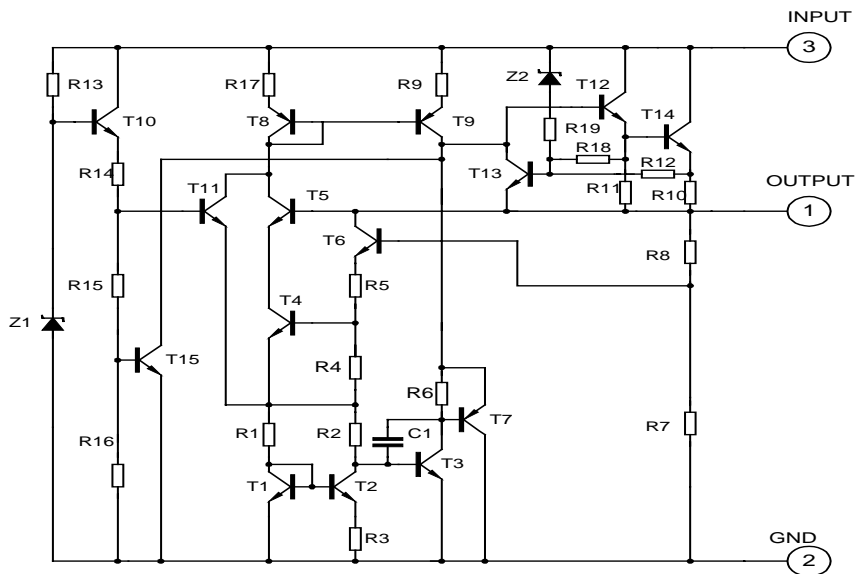
FEATURES

- *Output current up to 100mA
- *Fixed output voltage of 5V, 6V, 8V, 9V, 12V, 15V, 18V and 24V available
- *Thermal overload shutdown protection
- *Short circuit current limiting



SOP-8 1:Output 2,3,6,7:GND 8:Input
4,5:N.C.
TO-92 1:Output 2:GND; 3:Input
SOT-89 1:Output 2:GND; 3:Input

TEST CIRCUIT



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ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input voltage (for $V_o=5\sim 9V$) (for $V_o=12\sim 24V$)	V_i		30	V
	V_i		35	V
Output Current	I_o		100	mA
Power Dissipation	PD	SOP-8	300	mW
		TO-92	625	
		SOT-89	350	
Operating Junction Temperature Range	T_{OPR}	-20	+150	°C
Storage Temperature Range	T_{STG}	-55	+150	°C

UTC78L05 ELECTRICAL CHARACTERISTICS

($V_i=10V$, $I_o=40mA$, $0^\circ C < T_j < 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$	4.80	5.0	5.20	V
		$7V \leq V_i \leq 20V, I_o=1mA\sim 40mA$	4.75		5.25	V
		$7V \leq V_i \leq V_{MAX}, I_o=1mA\sim 70mA$	4.75		5.25	V (note 2)
Load Regulation	V_o	$T_j=25^\circ C, I_o=1mA\sim 100mA$		11	60	mV
		$T_j=25^\circ C, I_o=1mA\sim 40mA$		5.0	30	mV
Line regulation	V_o	$7V \leq V_i \leq 20V, T_j=25^\circ C$		8	150	mV
		$8V \leq V_i \leq 20V, T_j=25^\circ C$		6	100	mV
Quiescent Current	ΔI_q	$V_{IN}=10V, I_o=0mA, T_j=25^\circ C$		2.0	5.5	mA
Quiescent Current Change	ΔI_q	$8V \leq V_i \leq 20V$			1.5	mA
	ΔI_q	$1mA \leq I_o \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		40		μV
Temperature coefficient of V_o	V_o/T	$I_o=5mA$		-0.65		$mV/^\circ C$
Ripple Rejection	RR	$8V \leq V_i \leq 20V, f=120Hz, T_j=25^\circ C$	41	80		dB
Dropout Voltage	V_d	$T_j=25^\circ C$		1.7		V

UTC78L06 ELECTRICAL CHARACTERISTICS

($V_i=12V$, $I_o=40mA$, $0^\circ C < T_j < 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$	5.76	6.0	6.24	V
		$8.5V \leq V_i \leq 20V, I_o=1mA\sim 40mA$	5.70		6.30	V
		$8.5V \leq V_i \leq V_{MAX}, I_o=1mA\sim 70mA$	5.70		6.30	V (note 2)
Load Regulation	V_o	$T_j=25^\circ C, I_o=1mA\sim 100mA$		12.8	80	mV
		$T_j=25^\circ C, I_o=1mA\sim 70mA$		5.8	40	mV
Line regulation	V_o	$8.5V \leq V_i \leq 20V, T_j=25^\circ C$		64	175	mV
		$9V \leq V_i \leq 20V, T_j=25^\circ C$		54	125	mV
Quiescent Current	ΔI_q	$V_{IN}=12V, I_o=0mA, T_j=25^\circ C$		3.9	6.0	mA
Quiescent Current Change	ΔI_q	$9V \leq V_i \leq 20V$			1.5	mA
	ΔI_q	$1mA \leq I_o \leq 40mA$			0.1	mA

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Noise Voltage	V _N	10Hz<=f<=100kHz		49		uV
Temperature coefficient of V _o	V _o /T	I _o =5mA		0.75		mV/°C
Ripple Rejection	RR	10V<=V _I <=20V, f=120Hz, T _j =25°C	40	46		dB
Dropout Voltage	V _d	T _j =25°C		1.7		V

UTC78L08 ELECTRICAL CHARACTERISTICS

(V_I=14V, I_o=40mA, 0°C<T_j<125°C, C₁=0.33uF, C_o=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _o	T _j =25°C	7.68	8.0	8.32	V
		10.5V<=V _I <=23V, I _o =1mA-40mA	7.60		8.40	V
		10.5V<=V _I <=V _{MAX} , I _o =1mA-70mA	7.60		8.40	V (note 2)
Load Regulation	V _o	T _j =25°C, I _o =1mA-100mA		15	80	mV
		T _j =25°C, I _o =1mA-70mA		8.0	40	mV
Line regulation	V _o	10.5V<=V _I <=23V, T _j =25°C		10	175	mV
		11V<=V _I <=23V, T _j =25°C		8	125	mV
Quiescent Current	ΔI _q	V _{IN} =14V, I _o =0mA, T _j =25°C		2.0	5.5	mA
Quiescent Current Change	ΔI _q	11V<=V _I <=23V			1.5	mA
		1mA<=V _I <=40mA			0.1	mA
Output Noise Voltage	V _N	10Hz<=f<=100kHz		49		uV
Temperature coefficient of V _o	ΔV _o /ΔT	I _o =5mA		0.75		mV/°C
Ripple Rejection	RR	11V<=V _I <=23V, f=120Hz, T _j =25°C	39	70		dB
Dropout Voltage	V _d	T _j =25°C		1.7		V

UTC78L09 ELECTRICAL CHARACTERISTICS

(V_I=15V, I_o=40mA, 0°C<T_j<125°C, C₁=0.33uF, C_o=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _o	T _j =25°C	8.64	9.0	9.36	V
		11.5V<=V _I <=24V, I _o =1mA-40mA	8.55		9.45	V
		11.5V<=V _I <=V _{MAX} , I _o =1mA-70mA	8.55		9.45	V (note 2)
Load Regulation	V _o	T _j =25°C, I _o =1mA-100mA		20	90	mV
		T _j =25°C, I _o =1mA-40mA		10	45	mV
Line regulation	V _o	11.5V<=V _I <=24V, T _j =25°C		90	200	mV
		13V<=V _I <=24V, T _j =25°C		100	150	mV
Quiescent Current	ΔI _q	V _{IN} =15V, I _o =0mA, T _j =25°C		2.0	6.0	mA
Quiescent Current Change	ΔI _q	13V<=V _I <=24V			1.5	mA
		1mA<=V _I <=40mA			0.1	mA
Output Noise Voltage	V _N	10Hz<=f<=100kHz		49		uV
Temperature coefficient of V _o	ΔV _o /ΔT	I _o =5mA		0.75		mV/°C
Ripple Rejection	RR	12V<=V _I <=23V, f=120Hz, T _j =25°C	38	44		dB
Dropout Voltage	V _d	T _j =25°C		1.7		V

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UTC78L12 ELECTRICAL CHARACTERISTICS

($V_I=19V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_1=0.33\mu F, C_O=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	T _J =25°C	11.52	12.0	12.48	V
		14.5V ≤ V _I ≤ 27V, I _O =1mA-40mA	11.40		12.60	V
		14.5V ≤ V _I ≤ V _{MAX} , I _O =1mA-70mA	11.40		12.60	V (note 2)
Load Regulation	Vo	T _J =25°C, I _O =1mA-100mA		25	150	mV
		T _J =25°C, I _O =1mA-40mA		12	75	mV
Line regulation	Vo	14.5V ≤ V _I ≤ 27V, T _J =25°C		25	300	mV
		16V ≤ V _I ≤ 27V, T _J =25°C		20	250	mV
Quiescent Current	ΔI _q	V _{IN} =19V, I _O =0mA, T _J =25°C		2.0	6.0	mA
Quiescent Current Change	ΔI _q	16V ≤ V _I ≤ 27V			1.5	mA
	ΔI _q	1mA ≤ V _I ≤ 40mA			0.1	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		80		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _O =5mA		-1.0		mV/°C
Ripple Rejection	RR	15V ≤ V _I ≤ 25V, f=120Hz, T _J =25°C	37	65		dB
Dropout Voltage	V _d	T _J =25°C		1.7		V

UTC78L15 ELECTRICAL CHARACTERISTICS

($V_I=23V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_1=0.33\mu F, C_O=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	T _J =25°C	14.40	15.0	15.60	V
		17.5V ≤ V _I ≤ 30V, I _O =1mA-40mA	14.25		15.75	V
		17.5V ≤ V _I ≤ V _{MAX} , I _O =1mA-70mA	14.25		15.75	V (note 2)
Load Regulation	Vo	T _J =25°C, I _O =1mA-100mA		20	150	mV
		T _J =25°C, I _O =1mA-70mA		25	150	mV
Line regulation	Vo	17.5V ≤ V _I ≤ 30V, T _J =25°C		25	150	mV
		20V ≤ V _I ≤ 30V, T _J =25°C		15	75	mV
Quiescent Current	ΔI _q	V _{IN} =23V, I _O =0mA, T _J =25°C		2.2	6.5	mA
Quiescent Current Change	ΔI _q	20V ≤ V _I ≤ 30V			1.5	mA
	ΔI _q	1mA ≤ V _I ≤ 40mA			0.1	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _O =5mA		-1.3		mV/°C
Ripple Rejection	RR	18.5V ≤ V _I ≤ 28.5V, f=120Hz, T _J =25°C	34	63		dB
Dropout Voltage	V _d	T _J =25°C		1.7		V

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UTC78L18 ELECTRICAL CHARACTERISTICS

($V_I=27V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_1=0.33\mu F, C_O=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	T _J =25°C	17.28	18.0	18.72	V
		21V ≤ V _I ≤ 33V, I _O =1mA-40mA	17.10		18.90	V
		21V ≤ V _I ≤ V _{MAX} , I _O =1mA-70mA	17.10		18.90	V (note 2)
Load Regulation	Vo	T _J =25°C, I _O =1mA-100mA		30	170	mV
		T _J =25°C, I _O =1mA-40mA		15	85	mV
Line regulation	Vo	21V ≤ V _I ≤ 33V, T _J =25°C		145	300	mV
		22V ≤ V _I ≤ 33V, T _J =25°C		135	250	mV
Quiescent Current	ΔI _q	V _{IN} =27V, I _O =0mA, T _J =25°C		2.0	6.0	mA
Quiescent Current Change	ΔI _q	21V ≤ V _I ≤ 33V			1.5	mA
	ΔI _q	1mA ≤ V _I ≤ 40mA			0.1	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _O =5mA		-1.8		mV/°C
Ripple Rejection	RR	23V ≤ V _I ≤ 33V, f=120Hz, T _J =25°C	34	48		dB
Dropout Voltage	V _d	T _J =25°C		1.7		V

UTC78L24 ELECTRICAL CHARACTERISTICS

($V_I=33V, I_O=40mA, 0^\circ C < T_J < 125^\circ C, C_1=0.33\mu F, C_O=0.1\mu F$, unless otherwise specified)(Note 1)

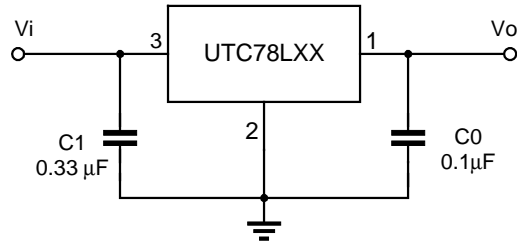
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	T _J =25°C	23.04	24.0	24.96	V
		27V ≤ V _I ≤ 38V, I _O =1mA-40mA	22.8		25.2	V
		27V ≤ V _I ≤ V _{MAX} , I _O =1mA-70mA	22.8		25.2	V (note 2)
Load Regulation	Vo	T _J =25°C, I _O =1mA-100mA		40	200	mV
		T _J =25°C, I _O =1mA-40mA		20	100	mV
Line regulation	Vo	27V ≤ V _I ≤ 38V, T _J =25°C		160	300	mV
		28V ≤ V _I ≤ 38V, T _J =25°C		150	250	mV
Quiescent Current	ΔI _q	V _{IN} =33V, I _O =0mA, T _J =25°C		2.2	6.0	mA
Quiescent Current Change	ΔI _q	27V ≤ V _I ≤ 38V			1.5	mA
	ΔI _q	1mA ≤ V _I ≤ 40mA			0.1	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		200		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _O =5mA		-2.0		mV/°C
Ripple Rejection	RR	27V ≤ V _I ≤ 38V, f=120Hz, T _J =25°C	34	45		dB
Dropout Voltage	V _d	T _J =25°C		1.7		V

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

Note 2: Power dissipation < 0.5W

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APPLICATION CIRCUIT



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.

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TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 Ambient temperature vs. Power dissipation

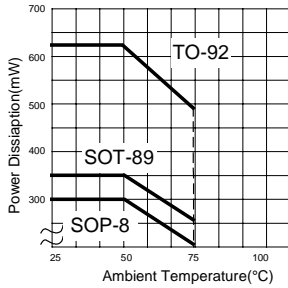


Fig.2 UTC78L05 Output Voltage vs. Ambient temperature

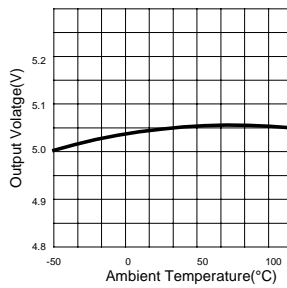


Fig.3 UTC78L12 Output Voltage vs. Ambient temperature

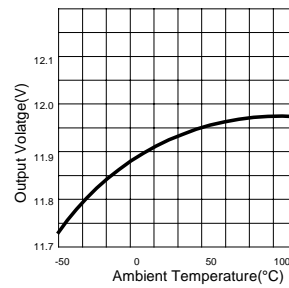


Fig.4 Output Characteristics (I_p=0mA, T_j=25°C)

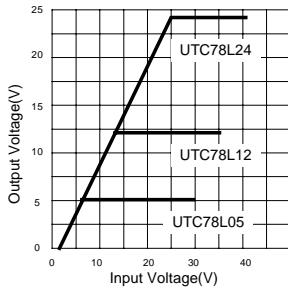


Fig.5 UTC78L05 Dropout Characteristics (T_j=25°C)

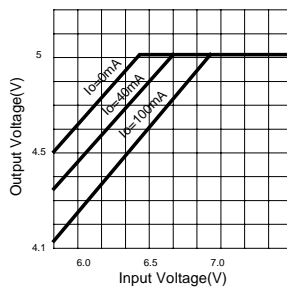


Fig.6 Short Circuit output current (T_j=25°C)

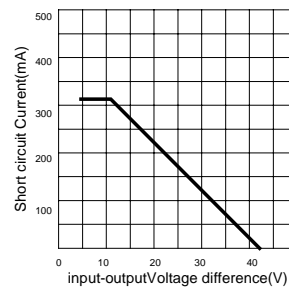


Fig.7 UTC78L12/24 quiescent current vs output current (T_j=25°C)

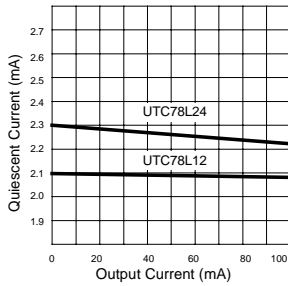


Fig.8 UTC78L05 Quiescent Current vs. Input Voltage (I_o=0mA, T_j=25°C)

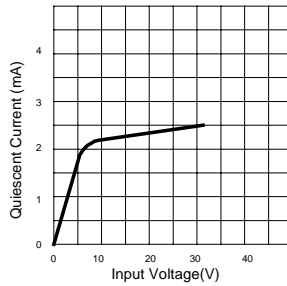
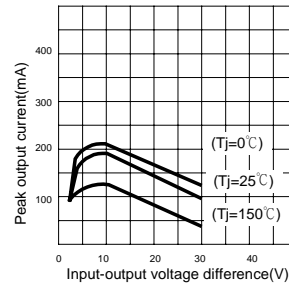


Fig.9 Peak output current vs Dropout voltage difference



UTC78LXX LINEAR INTEGRATED CIRCUIT

Fig.10 Dropout Voltage

