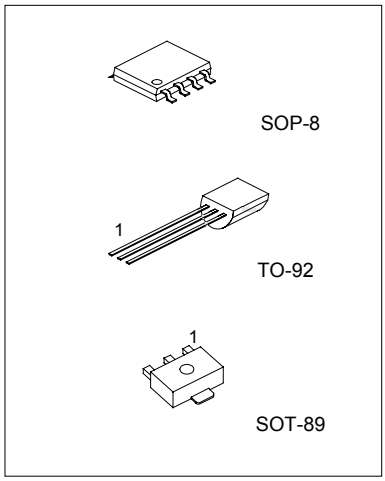
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR

DESCRIPTION

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

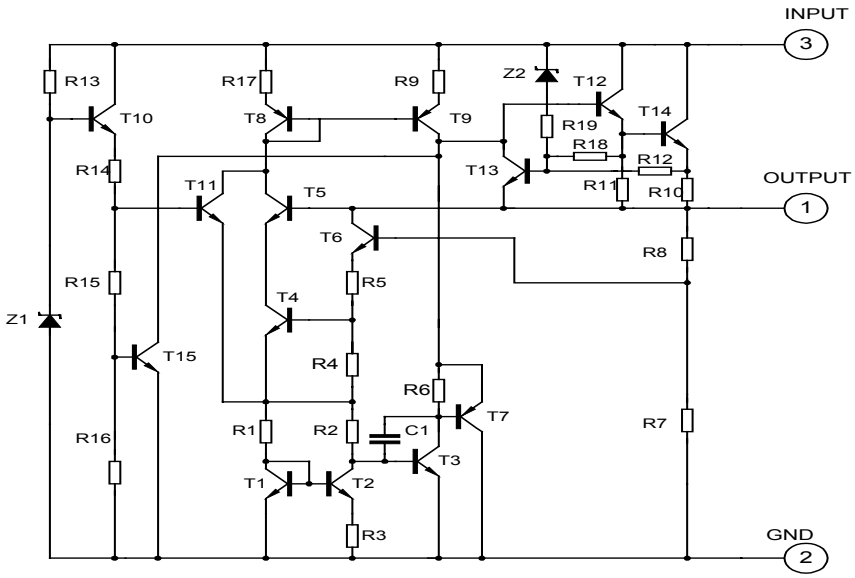
FEATURES

*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



ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input voltage (for Vo=5~9V)	V_I		30	V
(for Vo=12~24V)	V_I		35	V
Output Current	Io		100	mA
Power Dissipation				
SOP-8	PD		300	mW
TO-92			500	
SOT-89			350	
Operating Junction Temperature Range	T_{OPR}	-20	+150	°C
Storage Temperature Range	T_{STG}	-55	+150	°C

UTC78L05 ELECTRICAL CHARACTERISTICS

(VI=10V, Io=40mA, 0°C <Tj<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	Vo	Tj=25°C	4.80	5.0	5.20	V
		7V<=V_I<=20V,I_O=1mA-40mA	4.75		5.25	V
		7V<=V_I<=V_{MAX},I_O=1mA-70mA	4.75		5.25	V (note 2)
Load Regulation	Vo	Tj=25°C,I_O=1mA-100mA		11	60	mV
		Tj=25°C,I_O=1mA-40mA		5.0	30	mV
Line regulation	Vo	7V<=V_I<=20V,Tj=25°C		8	150	mV
		8V<=V_I<=20V,Tj=25°C		6	100	mV
Quiescent Current	ΔIq	V_{IN}=10V,I_O=0mA,Tj=25°C		2.0	5.5	mA
Quiescent Current Change	ΔIq	8V<=V_I<=20V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA
Output Noise Voltage	V_N	10Hz<=f<=100kHz		40		uV
Temperature coefficient of Vo	Vo/T	Io=5mA		-0.65		mV/°C
Ripple Rejection	RR	8V<=V_I<=20V,f=120Hz,Tj=25°C	41	80		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L06 ELECTRICAL CHARACTERISTICS

(VI=12V, Io=40mA, 0°C <Tj<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	Vo	Tj=25°C	5.76	6.0	6.24	V
		8.5V<=V_I<=20V,I_O=1mA-40mA	5.70		6.30	V
		8.5V<=V_I<=V_{MAX}, I_O=1mA-70mA	5.70		6.30	V (note 2)
Load Regulation	Vo	Tj=25°C,I_O=1mA-100mA		12.8	80	mV
		Tj=25°C,I_O=1mA-70mA		5.8	40	mV
Line regulation	Vo	8.5V<=V_I<=20V,Tj=25°C		64	175	mV
		9V<=V_I<=20V,Tj=25°C		54	125	mV
Quiescent Current	ΔIq	V_{IN}=12V,I_O=0mA,Tj=25°C		3.9	6.0	mA
Quiescent Current Change	ΔIq	9V<=V_I<=20V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Noise Voltage	V_N	10Hz<=f<=100kHz		49		uV
Temperature coefficient of Vo	Vo/T	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	10V<=V_I<=20V,f=120Hz, Tj=25°C	40	46		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L08 ELECTRICAL CHARACTERISTICS

(VI=14V,Io=40mA,0°C<Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_O	Tj=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	Vo	Tj=25°C,I_O=1mA-100mA		15	80	mV
		Tj=25°C,I_O=1mA-70mA		8.0	40	mV
Line regulation	Vo	10.5V<=V_I<=23V,Tj=25°C		10	175	mV
		11V<=V_I<=23V,Tj=25°C		8	125	mV
Quiescent Current	ΔIq	V_{IN}=14V,I_O=0mA,Tj=25°C		2.0	5.5	mA
Quiescent Current Change	ΔIq	11V<=V_I<=23V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA
Output Noise Voltage	V_N	10Hz<=f<=100kHz		49		uV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	11V<=V_I<=23V,f=120Hz,Tj=25°C	39	70		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L09 ELECTRICAL CHARACTERISTICS

(VI=15V,Io=40mA,0°C <Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_O	Tj=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	Vo	Tj=25°C,I_O=1mA-100mA		20	90	mV
		Tj=25°C,I_O=1mA-40mA		10	45	mV
Line regulation	Vo	11.5V<=V_I<=24V,Tj=25°C		90	200	mV
		13V<=V_I<=24V,Tj=25°C		100	150	mV
Quiescent Current	ΔIq	V_{IN}=15V,I_O=0mA,Tj=25°C		2.0	6.0	mA
Quiescent Current Change	ΔIq	13V<=V_I<=24V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA
Output Noise Voltage	V_N	10Hz<=f<=100kHz		49		UV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	12V<=V_I<=23V,f=120Hz,Tj=25°C	38	44		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L12 ELECTRICAL CHARACTERISTICS

(VI=19V,Io=40mA,0°C <Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	11.52	12.0	12.48	V
		14.5V<=VI<=27V,IO=1mA-40mA	11.40		12.60	V
		14.5V<=VI<=VMAX, IO=1mA-70mA	11.40		12.60	V (note 2)
Load Regulation	Vo	Tj=25°C,IO=1mA-100mA		25	150	mV
		Tj=25°C,IO=1mA-40mA		12	75	mV
Line regulation	Vo	14.5V<=VI<=27V,Tj=25°C		25	300	mV
		16V<=VI<=27V,Tj=25°C		20	250	mV
Quiescent Current	ΔIq	VIN=19V,IO=0mA,Tj=25°C		2.0	6.0	mA
Quiescent Current Change	ΔIq	16V<=VI<=27V			1.5	mA
	ΔIq	1mA<=VI<=40mA			0.1	mA
Output Noise Voltage	VN	10Hz<=f<=100kHz		80		uV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-1.0		mV/°C
Ripple Rejection	RR	15V<=VI<=25V,f=120Hz,Tj=25°C	37	65		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L15 ELECTRICAL CHARACTERISTICS

(VI=23V,Io=40mA,0°C <Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	14.40	15.0	15.60	V
		17.5V<=VI<=30V,IO=1mA-40mA	14.25		15.75	V
		17.5V<=VI<=VMAX, IO=1mA-70mA	14.25		15.75	V (note 2)
Load Regulation	Vo	Tj=25°C,IO=1mA-100mA		20	150	mV
		Tj=25°C,IO=1mA-70mA		25	150	mV
Line regulation	Vo	17.5V<=VI<=30V,Tj=25°C		25	150	mV
		20V<=VI<=30V,Tj=25°C		15	75	mV
Quiescent Current	ΔIq	VIN=23V,IO=0mA,Tj=25°C		2.2	6.5	mA
Quiescent Current Change	ΔIq	20V<=VI<=30V			1.5	mA
	ΔIq	1mA<=VI<=40mA			0.1	mA
Output Noise Voltage	VN	10Hz<=f<=100kHz		90		uV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-1.3		mV/°C
Ripple Rejection	RR	18.5V<=VI<=28.5V,f=120Hz, Tj=25°C	34	63		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L18 ELECTRICAL CHARACTERISTICS

(VI=27V,Io=40mA,0°C<Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_O	Tj=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	Tj=25°C,I_O=1mA-100mA		30	170	mV
		Tj=25°C,I_O=1mA-40mA		15	85	mV
Line regulation	Vo	21V<=V_I<=33V,Tj=25°C		145	300	mV
		22V<=V_I<=33V,Tj=25°C		135	250	mV
Quiescent Current	ΔIq	V_{IN}=27V,I_O=0mA,Tj=25°C		2.0	6.0	mA
Quiescent Current Change	ΔIq	21V<=V_I<=33V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA
Output Noise Voltage	V_N	10Hz<=f<=100kHz		150		uV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-1.8		mV/°C
Ripple Rejection	RR	23V<=V_I<=33V,f=120Hz,Tj=25°C	34	48		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

UTC78L24 ELECTRICAL CHARACTERISTICS

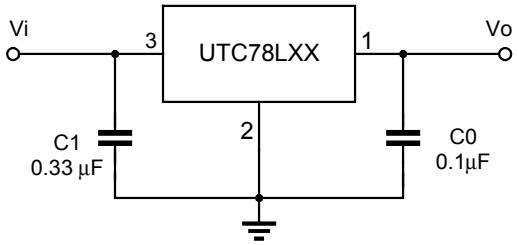
(VI=33V,Io=40mA,0°C <Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_O	Tj=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	Tj=25°C,I_O=1mA-100mA		40	200	mV
		Tj=25°C,I_O=1mA-40mA		20	100	mV
Line regulation	Vo	27V<=V_I<=38V,Tj=25°C		160	300	mV
		28V<=V_I<=38V,Tj=25°C		150	250	mV
Quiescent Current	ΔIq	V_{IN}=33V,I_O=0mA,Tj=25°C		2.2	6.0	mA
Quiescent Current Change	ΔIq	27V<=V_I<=38V			1.5	mA
	ΔIq	1mA<=V_I<=40mA			0.1	mA
Output Noise Voltage	V_N	10Hz<=f<=100kHz		200		uV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-2.0		mV/°C
Ripple Rejection	RR	27V<=V_I<=38V,f=120Hz,Tj=25°C	34	45		dB
Dropout Voltage	Vd	Tj=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

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.

TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 Ambient temperature vs. Power dissipation

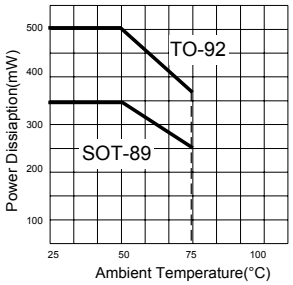


Fig.2 UTC78L05 Output Voltage vs.Ambient temperature

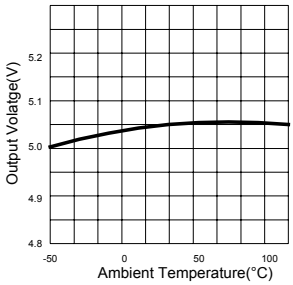


Fig.3 UTC78L12 Power dissipation vs. Ambient temperature

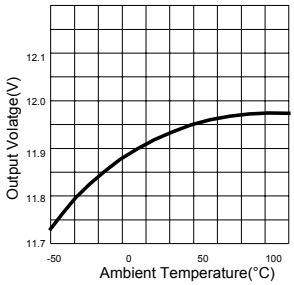


Fig.4 Output Characteristics (Ip=0mA,Tj=25°C)

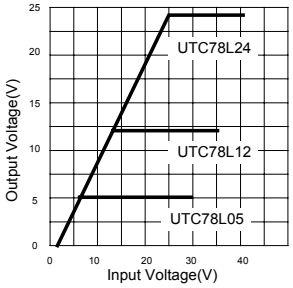


Fig.5 UTC78L05 Dropout Characteristics (Tj=25°C)

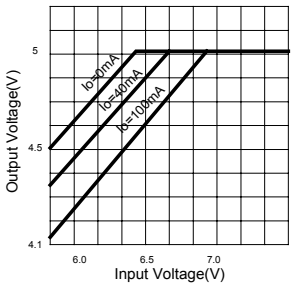


Fig.6 Short Circuit output current (Tj=25°C)

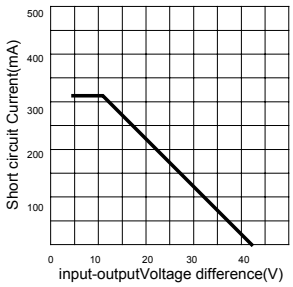


Fig.7 UTC78L12/24 quiescent current vs output current (Tj=25°C)

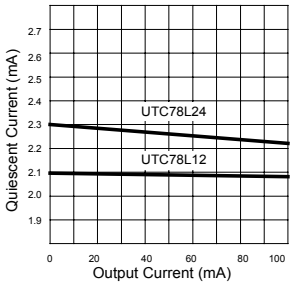


Fig.8 UTC78L05 Quiescent Current vs. Input Voltage (Io=0mA,Tj=25°C)

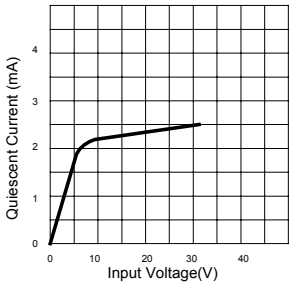


Fig.9 Peak output current vs Dropout voltage difference