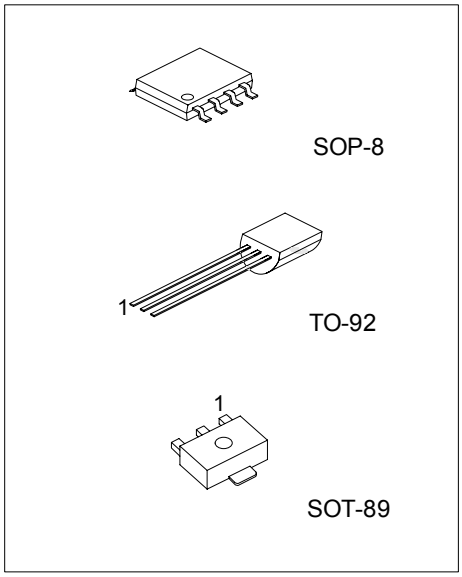
78LXX

LINEAR INTEGRATED CIRCUIT

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR



* Pb-free plating product number: 78LXXL

■ 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

■ ORDERING INFORMATION

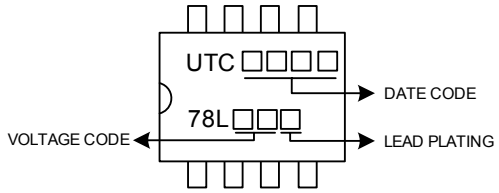
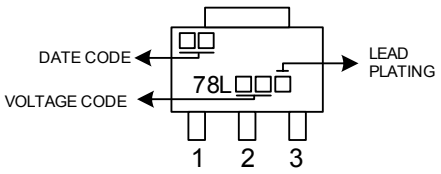
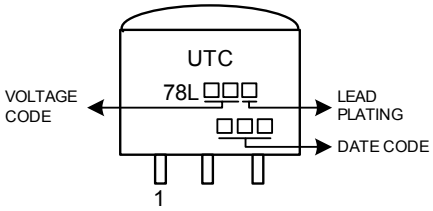
Order Number		Pin Assignment								Package	Packing
Normal	Lead Free Plating	1	2	3	4	5	6	7	8		
78Lxx-AB3-B-R	78LxxL-AB3-B-R	O	G	I	-	-	-	-	-	SOT-89	Tape Reel
78Lxx-S08-0-R	78LxxL-S08-0-R	O	G	G	N	N	G	G	I	SOP-8	Tape Reel
78Lxx-S08-0-T	78LxxL-S08-0-T	O	G	G	N	N	G	G	I	SOP-8	Tube
78Lxx-T92-B-B	78LxxL-T92-B-B	O	G	I	-	-	-	-	-	TO-92	Tape Box
78Lxx-T92-B-K	78LxxL-T92-B-K	O	G	I	-	-	-	-	-	TO-92	Bulk
78Lxx-T92-B-R	78LxxL-T92-B-R	O	G	I	-	-	-	-	-	TO-92	Tape Reel

Note: 1. xx: Output Voltage, refer to Marking Information.
2.O: Output G: GND I: Input N: No Connection

78LxxL-AB3-B-R

(1)Packing Type	(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube
(2)Pin Assignment	(2) refer to Pin Assignment
(3)Package Type	(3) AB3: SOT-89, S08: SOP-8, T92: TO-92
(4)Lead Plating	(4) L: Lead Free Plating, Blank: Pb/Sn
(5)Output Voltage Code	(5) xx: refer to Marking Information

■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOP-8	05:5.0V 06:6.0V 08:8.0V 09:9.0V 12:12V 15:15V 18:18V 24:24V	
SOT-89		
TO-92		

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Input voltage	V_{OUT}=5~9V	V_{IN}	30	V
	V_{OUT}=12~24V		35	
Output Current		I_{OUT}	100	mA
Power Dissipation	SOP-8	P_D	300	mW
	TO-92		625	
	SOT-89		350	
Junction Temperature		T_J	+125	°C
Operating Temperature		T_{OPR}	-20~+85	°C
Storage Temperature		T_{STG}	-40~+150	°C

Note 1. 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.
2. The device is guaranteed to meet performance specification within 0℃~+70℃ operating temperature range and assured by design from -20℃~+85℃

■ ELECTRICAL CHARACTERISTICS

For UTC78L05 (V_{IN}=10V, I_{OUT}=40mA, 0°C <T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	4.80	5.0	5.20	V
		7V≦V_{IN}≦20V,I_{OUT}=1mA-40mA	4.75		5.25	V
		7V≦V_{IN}≦V_{MAX},I_{OUT}=1mA-70mA	4.75		5.25	V (note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		11	60	mV
		T_J=25°C,I_{OUT}=1mA-40mA		5.0	30	mV
Line regulation	V_{OUT}	7V≦V_{IN}≦20V,T_J=25°C		8	150	mV
		8V≦V_{IN}≦20V,T_J=25°C		6	100	mV
Quiescent Current	ΔI_Q	V_{IN}=10V,I_{OUT}=0mA,T_J=25°C		2.0	5.5	mA
Quiescent Current Change	ΔI_Q	8V≦V_{IN}≦20V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		40		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		-0.65		mV/°C
Ripple Rejection	RR	8V≦V_{IN}≦20V,f=120Hz,T_J=25°C	41	80		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L06 (V_{IN}=12V, I_{OUT}=40mA, 0°C <T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	5.76	6.0	6.24	V
		8.5V≦V_{IN}≦20V,I_{OUT}=1mA-40mA	5.70		6.30	V
		8.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	5.70		6.30	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		12.8	80	mV
		T_J=25°C,I_{OUT}=1mA-70mA		5.8	40	mV
Line regulation	V_{OUT}	8.5V≦V_{IN}≦20V,T_J=25°C		64	175	mV
		9V≦V_{IN}≦20V,T_J=25°C		54	125	mV
Quiescent Current	ΔI_Q	V_{IN}=12V,I_{OUT}=0mA,T_J=25°C		3.9	6.0	mA
Quiescent Current Change	ΔI_Q	9V≦V_{IN}≦20V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		49		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		0.75		mV/°C
Ripple Rejection	RR	10V≦V_{IN}≦20V,f=120Hz, T_J=25°C	40	46		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

For UTC78L08 (V_{IN}=14V, I_{OUT}=40mA, 0°C<T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	7.68	8.0	8.32	V
		10.5V≦V_{IN}≦23V,I_{OUT}=1mA-40mA	7.60		8.40	V
		10.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	7.60		8.40	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		15	80	mV
		T_J=25°C,I_{OUT}=1mA-70mA		8.0	40	mV
Line regulation	V_{OUT}	10.5V≦V_{IN}≦23V,T_J=25°C		10	175	mV
		11V≦V_{IN}≦23V,T_J=25°C		8	125	mV
Quiescent Current	ΔI_Q	V_{IN}=14V,I_{OUT}=0mA,TJ=25°C		2.0	5.5	mA
Quiescent Current Change	ΔI_Q	11V≦V_{IN}≦23V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		49		uV
Temperature coefficient of V_o	$\Delta V_O/\Delta T$	I_{OUT}=5mA		0.75		mV/°C
Ripple Rejection	RR	11V≦V_{IN}≦23V,f=120Hz,T_J=25°C	39	70		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L09 (V_{IN}=15V, I_{OUT}=40mA, 0°C <T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	8.64	9.0	9.36	V
		11.5V≦V_{IN}≦24V,I_{OUT}=1mA-40mA	8.55		9.45	V
		11.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	8.55		9.45	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		20	90	mV
		T_J=25°C,I_{OUT}=1mA-40mA		10	45	mV
Line regulation	V_{OUT}	11.5V≦V_{IN}≦24V,T_J=25°C		90	200	mV
		13V≦V_{IN}≦24V,T_J=25°C		100	150	mV
Quiescent Current	ΔI_Q	V_{IN}=15V,I_{OUT}=0mA,T_J=25°C		2.0	6.0	mA
Quiescent Current Change	ΔI_Q	13V≦V_{IN}≦24V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≦f≦100kHz		49		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		0.75		mV/°C
Ripple Rejection	RR	12V≦V_{IN}≦23V,f=120Hz,T_J=25°C	38	44		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L12 (V_{IN}=19V, I_{OUT}=40mA, 0°C <T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	11.52	12.0	12.48	V
		14.5V≦V_{IN}≦27V,I_{OUT}=1mA-40mA	11.40		12.60	V
		14.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	11.40		12.60	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		25	150	mV
		T_J=25°C,I_{OUT}=1mA-40mA		12	75	mV
Line regulation	V_{OUT}	14.5V≦V_{IN}≦27V,T_J=25°C		25	300	mV
		16V≦V_{IN}≦=27V,T_J=25°C		20	250	mV
Quiescent Current	ΔI_Q	V_{IN}=19V,I_{OUT}=0mA,T_J=25°C		2.0	6.0	mA
Quiescent Current Change	ΔI_Q	16V≦V_{IN}≦27V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		80		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		-1.0		mV/°C
Ripple Rejection	RR	15V≦V_{IN}≦25V,f=120Hz,T_J=25°C	37	65		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

For UTC78L15 (V_{IN}=23V, I_{OUT}=40mA, 0°C <T_J<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	14.40	15.0	15.60	V
		17.5V≦V_{IN}≦30V,I_{OUT}=1mA-40mA	14.25		15.75	V
		17.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	14.25		15.75	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		20	150	mV
		T_j=25°C,I_{OUT}=1mA-70mA		25	150	mV
Line regulation	V_{OUT}	17.5V≦V_{IN}≦30V,T_J=25°C		25	150	mV
		20V≦V_{IN}≦30V,T_J=25°C		15	75	mV
Quiescent Current	ΔI_Q	V_{IN}=23V,I_{OUT}=0mA,T_J=25°C		2.2	6.5	mA
Quiescent Current Change	ΔI_Q	20V≦V_{IN}≦30V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		90		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		-1.3		mV/°C
Ripple Rejection	RR	18.5V≦V_{IN}≦28.5V,f=120Hz, T_J=25°C	34	63		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L18 (V_{IN}=27V,I_{OUT}=40mA,0°C<T_J<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	17.28	18.0	18.72	V
		21V≦V_{IN}≦33V,I_{OUT}=1mA-40mA	17.10		18.90	V
		21V≦V_{IN}≦V_{MAX},I_{OUT}=1mA-70mA	17.10		18.90	V(note 2)
Load Regulation	V_{OUT}	T_J=25°C,I_{OUT}=1mA-100mA		30	170	mV
		T_J=25°C,I_{OUT}=1mA-40mA		15	85	mV
Line regulation	V_{OUT}	21V≦V_{IN}≦33V,T_J=25°C		145	300	mV
		22V≦V_{IN}≦33V,T_J=25°C		135	250	mV
Quiescent Current	ΔI_Q	V_{IN}=27V,I_{OUT}=0mA,T_J=25°C		2.0	6.0	mA
Quiescent Current Change	ΔI_Q	21V≦V_{IN}≦33V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		150		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		-1.8		mV/°C
Ripple Rejection	RR	23V≦V_{IN}≦33V,f=120Hz,T_J=25°C	34	48		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

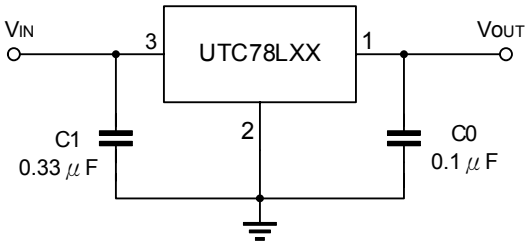
For UTC78L24 (V_{IN}=33V,I_{OUT}=40mA,0°C <T_J<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	23.04	24.0	24.96	V
		27V≦V_{IN}≦38V,I_{OUT}=1mA-40mA	22.8		25.2	V
		27V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA-70mA	22.8		25.2	V(note 2)
Load Regulation	$\triangle V_{OUT}$	T_J=25°C,I_{OUT}=1mA-100mA		40	200	mV
		T_J=25°C,I_{OUT}=1mA-40mA		20	100	mV
Line regulation	$\triangle V_{OUT}$	27V≦V_{IN}≦38V,T_J=25°C		160	300	mV
		28V≦V_{IN}≦38V,T_J=25°C		150	250	mV
Quiescent Current	ΔI_Q	V_{IN}=33V,I_{OUT}=0mA,T_J=25°C		2.2	6.0	mA
Quiescent Current Change	ΔI_Q	27V≦V_{IN}≦38V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	eN	10Hz≦f≦100kHz		200		uV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		-2.0		mV/°C
Ripple Rejection	RR	27V≦V_{IN}≦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.

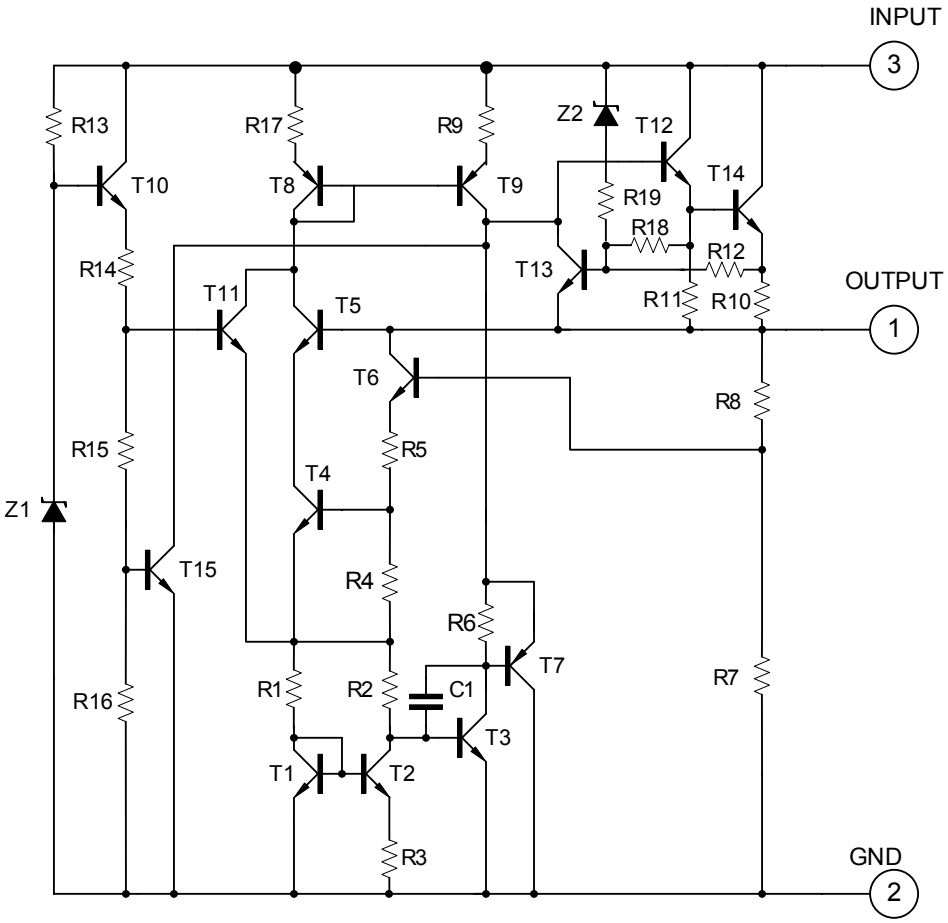
2.Power dissipation<0.5W

■ APPLICATION CIRCUIT



Note 1.To specify an output voltage, substitute voltage value for "XX".
2.Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

■ TEST CIRCUIT



■ TYPICAL CHARACTERISTICS

Fig.1 Ambient temperature vs. Power dissipation

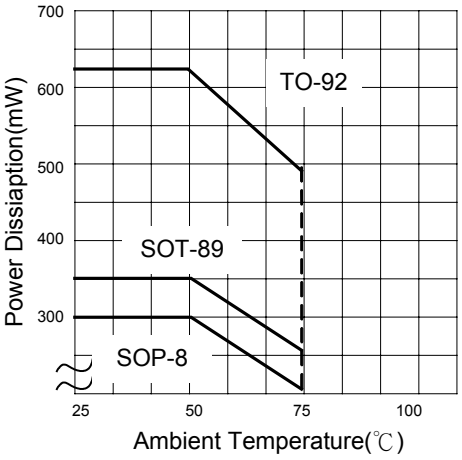


Fig.2 UTC78L05 Output Voltage vs.Ambient temperature

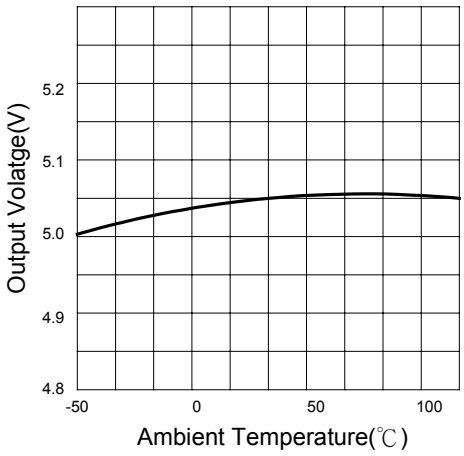


Fig.3 UTC78L12 Output Voltage vs. Ambient temperature

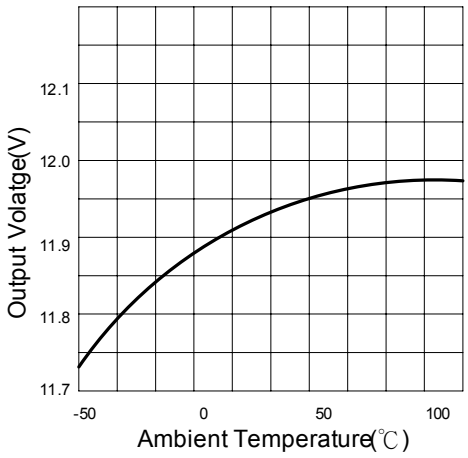


Fig.4 Output Characteristics (I_P=0mA,T_J=25℃)

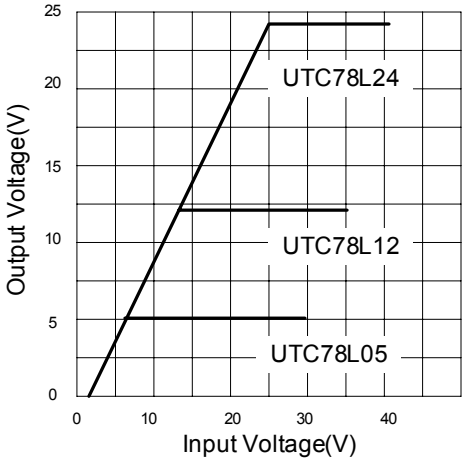


Fig.5 UTC78L05 Dropout Characteristics (T_J=25℃)

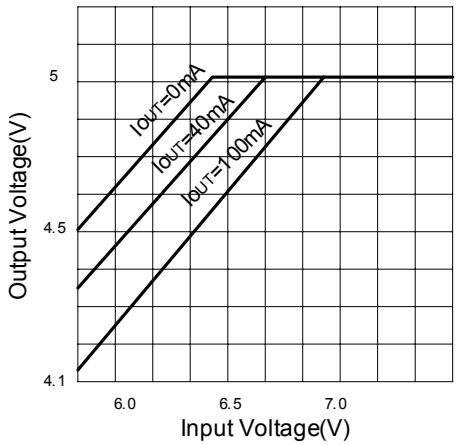
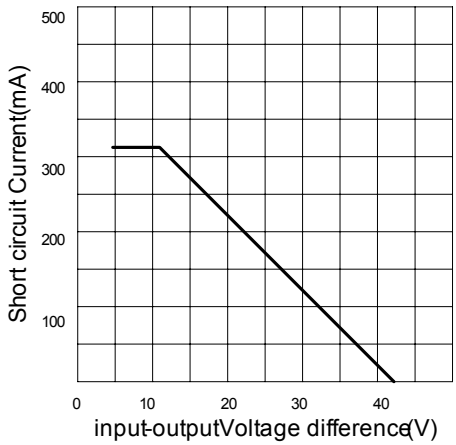


Fig.6 Short Circuit output current (T_J=25℃)



■ TYPICAL CHARACTERISTICS(Cont.)

Fig.7 UTC78L12/24 quiescent current vs output current (T_J=25℃)

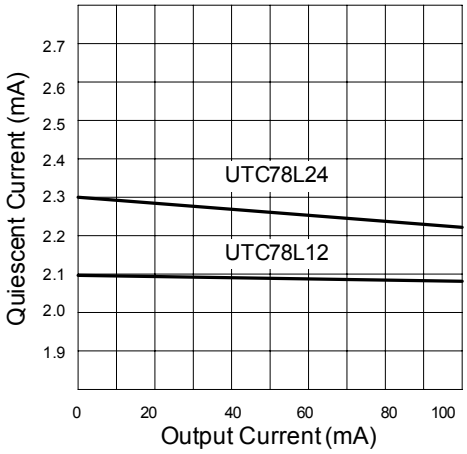


Fig.8 UTC78L05 Quiescent Current vs. Input Voltage (I_{OUT}=0mA,T_J=25℃)

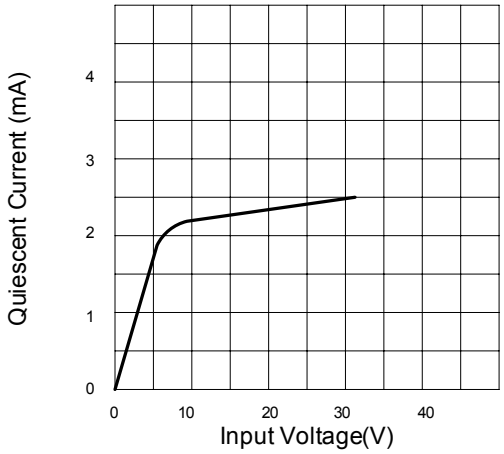


Fig.9 Peak Output Current vs Dropout Voltage Difference

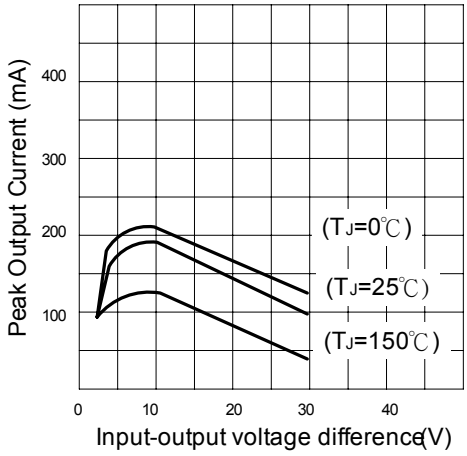


Fig.10 Dropout Voltage