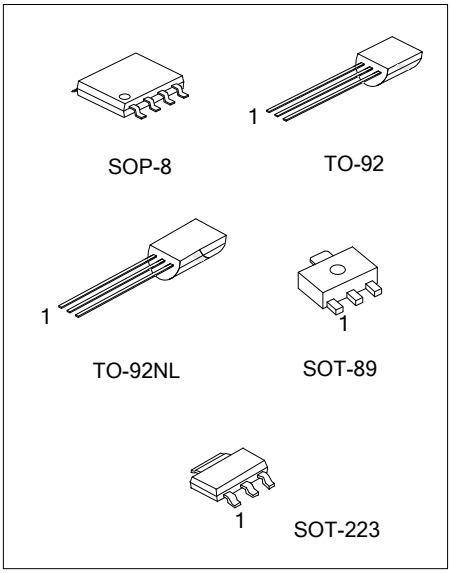
3-TERMINAL 0.2A POSITIVE VOLTAGE REGULATOR



■ DESCRIPTION

The UTC **78LXXM** family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 200mA.

■ FEATURES

*Output Current up to 200mA
*Fixed Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V Available
*Thermal Overload Shutdown Protection
*Short Circuit Current Limiting

■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
-	78LXXMG-AA3-R	SOT-223	O	G	I	-	-	-	-	-	Tape Reel
-	78LXXMG-AB3-R	SOT-89	O	G	I	-	-	-	-	-	Tape Reel
78LXXML-T92-B	78LXXMG-T92-B	TO-92	O	G	I	-	-	-	-	-	Tape Box
78LXXML-T92-K	78LXXMG-T92-K	TO-92	O	G	I	-	-	-	-	-	Bulk
78LXXML-T9N-B	78LXXMG-T9N-B	TO-92NL	O	G	I	-	-	-	-	-	Tape Box
78LXXML-T9N-K	78LXXMG-T9N-K	TO-92NL	O	G	I	-	-	-	-	-	Bulk
-	78LXXMG-S08-R	SOP-8	O	G	G	NC	NC	G	G	I	Tape Reel

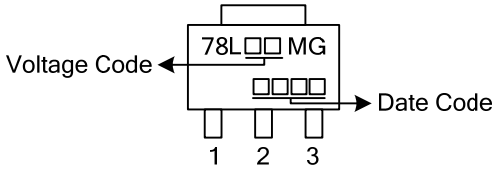
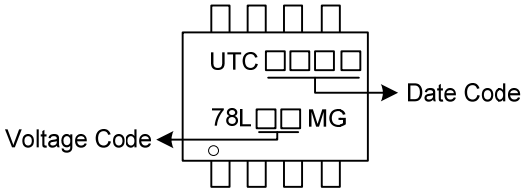
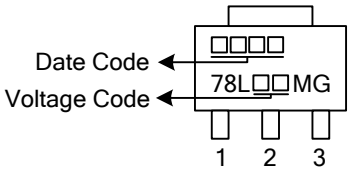
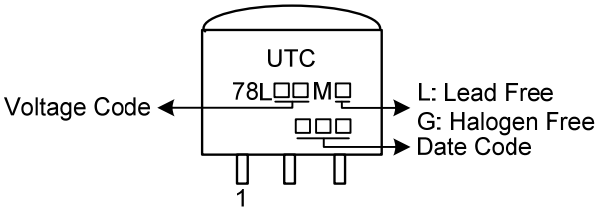
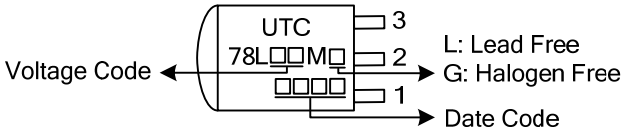
Note: 1. XX: Output Voltage, refer to Marking Information
2. Pin Assignment: O: Output G: GND I: Input

78LXXMG-AA3-R
(1)Packing Type
(2)Package Type
(3)Green Package
(4)Output Voltage Code

(1) B: Tape Box, K: Bulk, R: Tape Reel
(2) AA3: SOT-223, AB3: SOT-89, S08: SOP-8, T92: TO-92, T9N: TO-92NL
(3) G: Halogen Free and Lead Free, L: Lead Free
(4) xx: refer to Marking Information

Copyright © 2014 Unisonic Technologies Co., Ltd

■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	05:5.0V 06:6.0V 08:8.0V 09:9.0V 10:10V 12:12V 15:15V 18:18V 24:24V	
SOP-8		
SOT-89		
TO-92		
TO-92NL		

■ ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified.)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage	V_{OUT}=5~9V	V_{IN}	30	V
	V_{OUT}=12~24V		35	V
Output Current		I_{OUT}	200	mA
Power Dissipation	SOP-8	P_D	500	mW
	TO-92		625	
	TO-92L		800	
	TO-92NL		800	
	SOT-89		500	
	SOT-223		750	
Ambient Operating Temperature		T_{OPR}	-40~+85	°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.

■ ELECTRICAL CHARACTERISTICS

(0°C <T_J<125°C, C1=0.33uF, C_O=0.1uF, unless otherwise specified) (Note 1)

For UTC78L05M (V_{IN}=10V, I_{OUT}=40mA)

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-200mA	4.75		5.25	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		40		μV
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 UTC78L06M (V_{IN}=12V, I_{OUT}=40mA)

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	5.7		6.3	V
		8.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA - 200mA	5.7		6.3	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		49		μV
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 UTC78L08M (V_{IN}=14V, I_{OUT}=40mA)

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 - 200mA	7.60		8.40	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		49		μV
Temperature Coefficient of V_{OUT}	$\Delta V_O/\Delta T$	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 UTC78L09M (V_{IN}=15V, I_{OUT}=40mA)

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 - 200mA	8.55		9.45	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		49		μV
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 UTC78L10M (V_{IN}=16V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	9.6	10.0	10.4	V
		12.5V≦V_{IN}≦23V,I_{OUT}=1mA ~ 40mA	9.5		10.5	V
		12.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA - 200mA	9.5		10.5	V (Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C,I_{OUT}=1mA ~ 100mA		20	94	mV
		T_J=25°C,I_{OUT}=1mA ~ 70mA		10	47	mV
Line Regulation	ΔV_{OUT}	12.5V≦V_{IN}≦23V, T_J=25°C		100	220	mV
		14V≦V_{IN}≦23V, T_J=25°C		200	170	mV
Quiescent Current	I_Q			4.2	6.5	mA
Quiescent Current Change	ΔI_Q	12.5V≦V_{IN}≦23V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	e_N	10Hz≦f≦100kHz		74		μV
Temperature Coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		0.95		mV/°C
Ripple Rejection	RR	15V≦V_{IN}≦23V, f=120Hz,T_J=25°C	38	43		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC78L10M (V_{IN}=16V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	9.6	10.0	10.4	V
		12.5V≦V_{IN}≦23V,I_{OUT}=1mA ~ 40mA	9.5		10.5	V
		12.5V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA - 200mA	9.5		10.5	V (Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C,I_{OUT}=1mA ~ 100mA		20	94	mV
		T_J=25°C,I_{OUT}=1mA ~ 70mA		10	47	mV
Line Regulation	ΔV_{OUT}	12.5V≦V_{IN}≦23V, T_J=25°C		100	220	mV
		14V≦V_{IN}≦23V, T_J=25°C		200	170	mV
Quiescent Current	I_Q			4.2	6.5	mA
Quiescent Current Change	ΔI_Q	12.5V≦V_{IN}≦23V			1.5	mA
		1mA≦V_{IN}≦40mA			0.1	mA
Output Noise Voltage	e_N	10Hz≦f≦100kHz		74		μV
Temperature Coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		0.95		mV/°C
Ripple Rejection	RR	15V≦V_{IN}≦23V, f=120Hz,T_J=25°C	38	43		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L12M (V_{IN}=19V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	11.52	12	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 - 200mA	11.40		12.60	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		80		μV
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

For UTC78L15M (V_{IN}=23V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	14.40	15	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 - 200mA	14.25		15.75	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		90		μV
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

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC78L18M (V_{IN}=27V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	17.28	18	18.72	V
		21V≦V_{IN}≦33V,I_{OUT}=1mA ~ 40mA	17.10		18.90	V
		21V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA - 200mA	17.10		18.90	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		150		μV
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

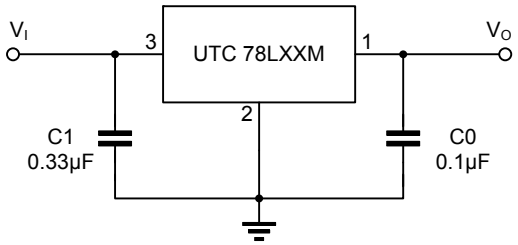
For UTC78L24M (V_{IN}=33V, I_{OUT}=40mA)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	23.04	24	24.96	V
		27V≦V_{IN}≦38V,I_{OUT}=1mA ~ 40mA	22.80		25.20	V
		27V≦V_{IN}≦V_{MAX}, I_{OUT}=1mA - 200mA	22.80		25.20	V (Note 2)
Load Regulation	ΔV_{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	ΔV_{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	I_Q			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	e_N	10Hz≦f≦100kHz		200		μV
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 are 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.

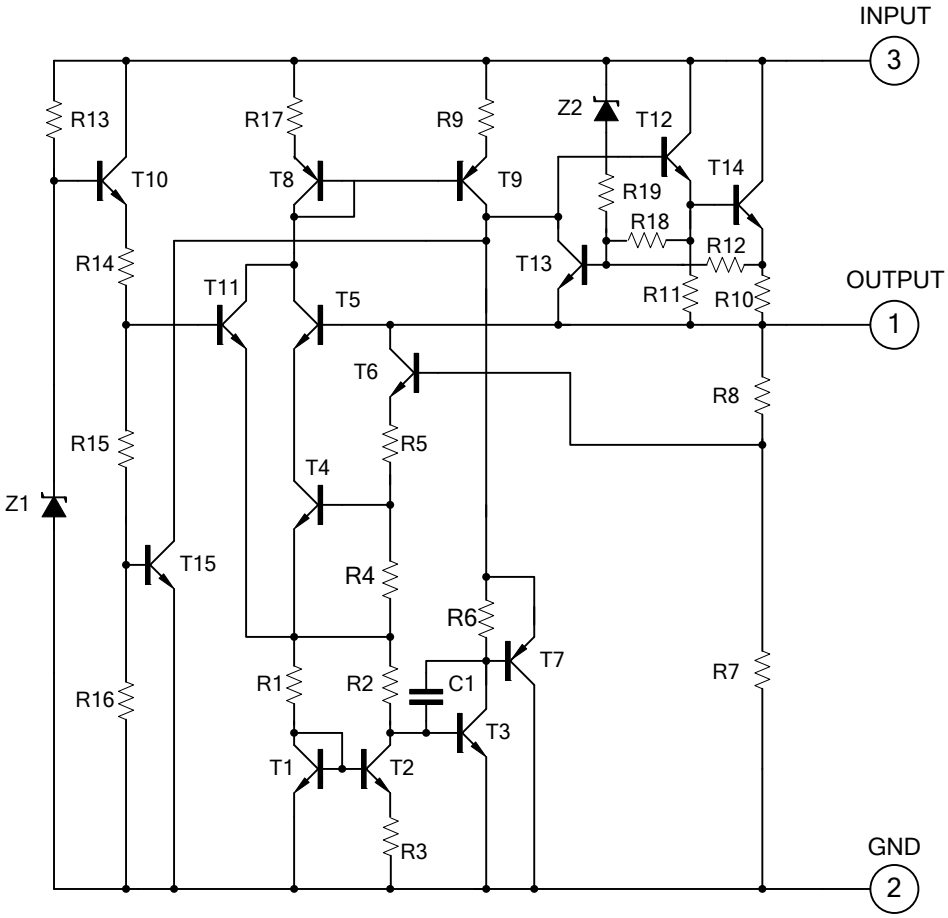
2. Power dissipation<0.5W

■ APPLICATION CIRCUIT



Notes 1: To specify an output voltage, substitute voltage value for "XXM".
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

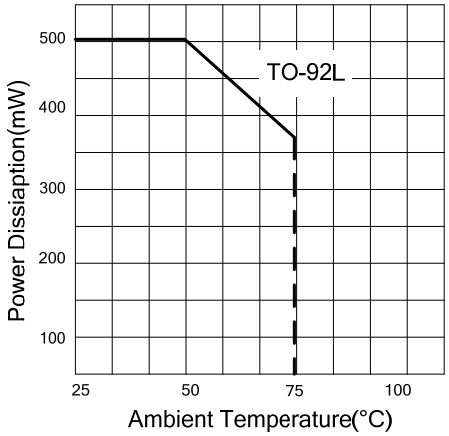


Fig.2 UTC78L05M Output Voltage vs.Ambient Temperature

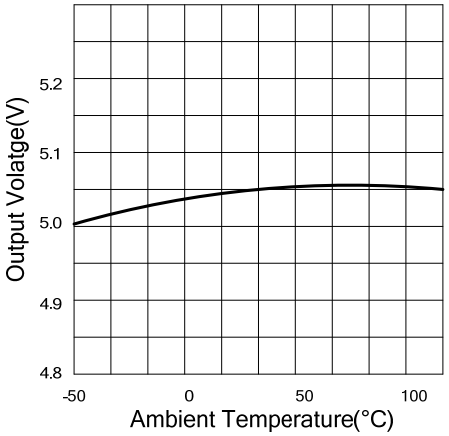


Fig.3 UTC78L12M Power Dissipation vs. Ambient Temperature

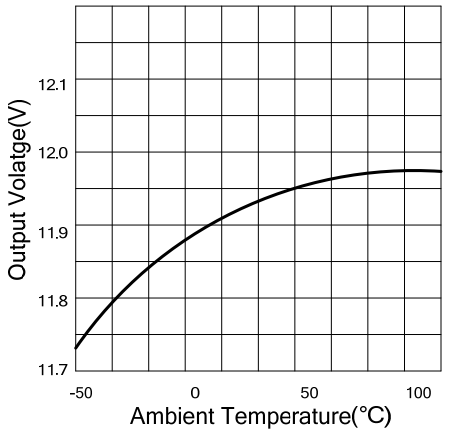


Fig.4 Output Characteristics (I_{OUT}=0mA,T_J=25℃)

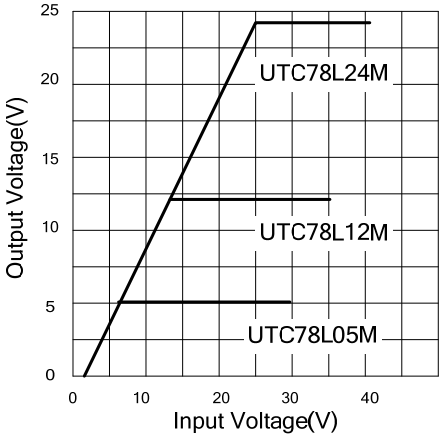


Fig.5 UTC78L05M Dropout Characteristics (T_J=25°C)

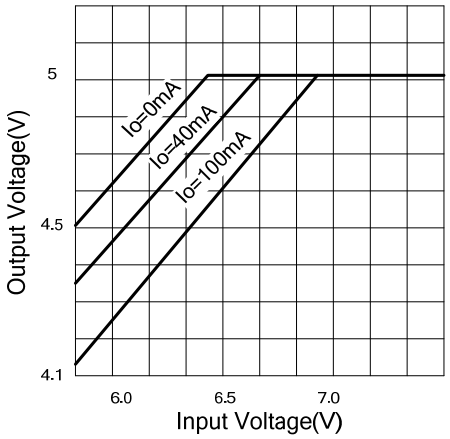
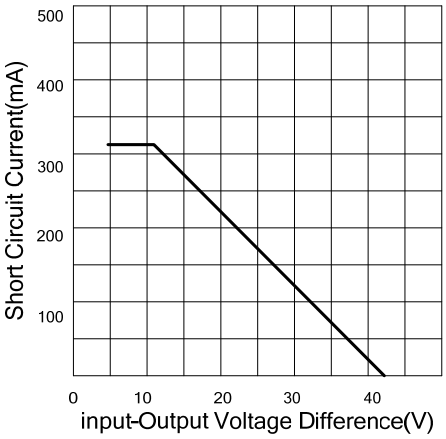


Fig.6 Short Circuit Output Current (T_J=25°C)



■ TYPICAL CHARACTERISTICS(Cont.)

Fig.7 UTC78L12/24M Quiescent Current vs Output Current (T_J=25°C)

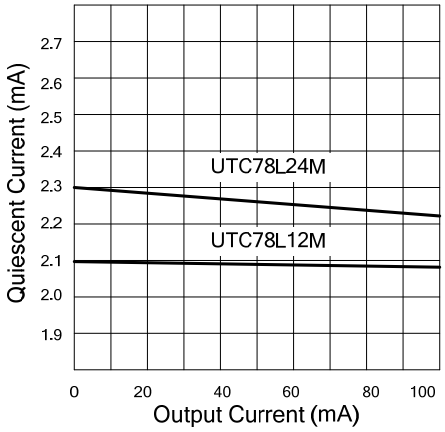


Fig.8 UTC78L05M Quiescent Current vs. Input Voltage (I_{OUT}=0mA,T_J=25°C)

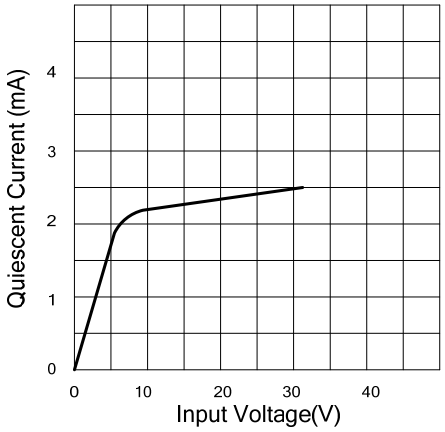
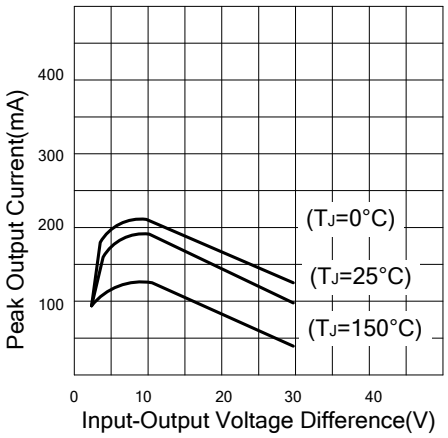


Fig.9 Peak Output Current vs Dropout Voltage Difference



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.