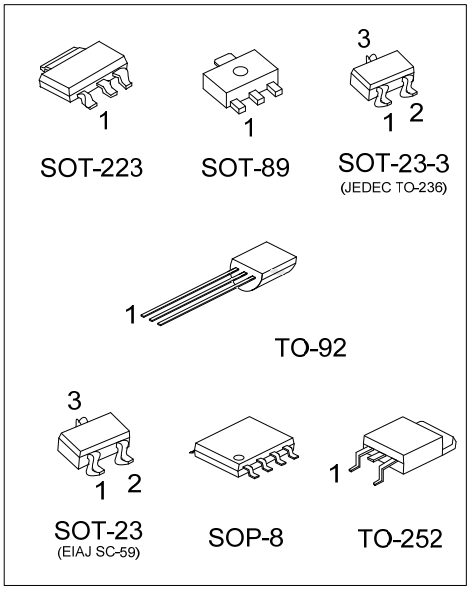
78LXXS

LINEAR INTEGRATED CIRCUIT

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR



■ DESCRIPTION

The UTC **78LXXS** 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, 10V, 12V and 15V available
* Thermal overload shutdown protection
* Short circuit current limiting

■ ORDERING INFORMATION

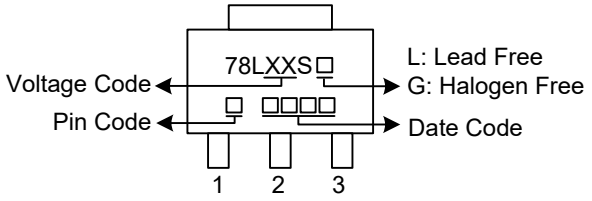
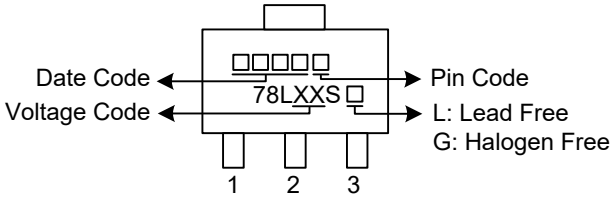
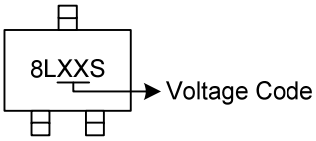
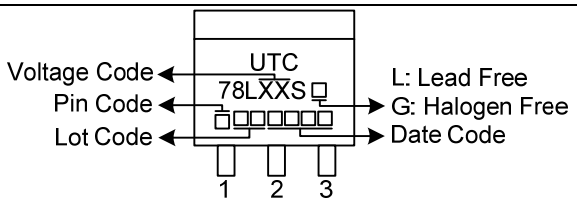
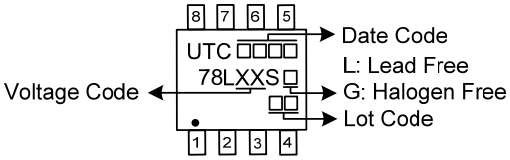
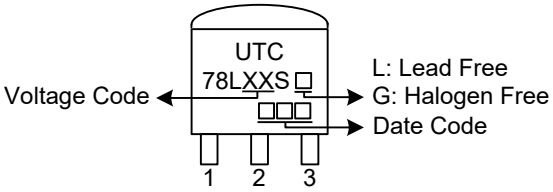
Ordering Number		Package	Pin Assignment	Packing
Lead Free	Halogen Free			
78LXXSL-AA3-x-R	78LXXSG-AA3-x-R	SOT-223	Pin Code: A: G O I; B: O G I; C: G I O; D: I G O	Tape Reel
78LXXSL-AB3-x-R	78LXXSG-AB3-x-R	SOT-89		
78LXXSL-TN3-x-R	78LXXSG-TN3-x-R	TO-252		
78LXXSL-AE2-x-R	78LXXSG-AE2-x-R	SOT-23-3	Pin Code: 2: O I G	Tape Reel
78LXXSL-AE3-x-R	78LXXSG-AE3-x-R	SOT-23		Tape Reel
78LXXSL-S08-R	78LXXSG-S08-R	SOP-8	OGGNNGGI	Tape Reel
78LXXSL-T92-B	78LXXSG-T92-B	TO-92	OGI	Tape Box
78LXXSL-T92-K	78LXXSG-T92-K	TO-92	OGI	Bulk

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

78LXXSG-AA3-x-R
(1)Packing Type
(2)Pin Assignment
(3)Package Type
(4)Green Package
(5)Output Voltage Code

(1) R: Tape Reel, B: Tape Box, K: Bulk
(2) refer to Pin Assignment
(3) AA3: SOT-223, AB3: SOT-89, AE2: SOT-23-3
AE3: SOT-23, TN3: TO-252, S08: SOP-8
T92: TO-92
(4) G: Halogen Free and Lead Free, L: Lead Free
(5) XX: refer to Marking Information

■ 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	
SOT-89		
SOT-23-3 SOT-23		
TO-252		
SOP-8		
TO-92		

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage	V_{OUT}=5~9V	V_{IN}	30	V
	V_{OUT}=10~18V		35	V
	V_{OUT}=24V		40	V
Output Current		I_{OUT}	100	mA
Power Dissipation	SOT-223	P_D	600	mW
	SOT-89		550	mW
	SOT-23-3 SOT-23		330	mW
	TO-252		890	mW
	SOP-8		660	mW
	TO-92		625	mW
Junction Temperature		T_J	+150	°C
Operating Temperature (Note 2)		T_{OPR}	-40 ~ +125	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 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. It is guarantee by design, not 100% be tested.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223	θ_{JA}	165	°C/W
	SOT-89		180	°C/W
	SOT-23-3 SOT-23		300	°C/W
	TO-252		112	°C/W
	SOP-8		150	°C/W
	TO-92		160	°C/W
Junction to Case	SOT-223	θ_{JC}	15	°C/W
	SOT-89		50	°C/W
	SOT-23-3 SOT-23		120	°C/W
	TO-252		12	°C/W
	SOP-8		20	°C/W
	TO-92		83	°C/W

■ ELECTRICAL CHARACTERISTICS

For UTC78L05S (V_{IN}=10V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	4.90	5.0	5.10	V
		7V≤V_{IN}≤20V, I_{OUT}=1mA-40mA	4.85		5.15	V
		7V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	4.85		5.15	V(Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C, I_{OUT}=1mA-100mA		15	60	mV
		T_J=25°C, I_{OUT}=1mA-40mA		8	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	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≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		40		μV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		1.0		mV/°C
Ripple Rejection	RR	8V≤V_{IN}≤20V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L06S (V_{IN}=12V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	5.88	6.0	6.12	V
		8.5V≤V_{IN}≤20V, I_{OUT}=1mA-40mA	5.82		6.18	V
		8.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	5.82		6.18	V(Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C, I_{OUT}=1mA-100mA		16	80	mV
		T_J=25°C, I_{OUT}=1mA-40mA		9	40	mV
Line regulation	ΔV_{OUT}	8.5V≤V_{IN}≤20V, T_J=25°C		10	175	mV
		9V≤V_{IN}≤20V, T_J=25°C		8	125	mV
Quiescent Current	I_Q	V_{IN}=12V,I_{OUT}=0mA, T_J=25°C		2.0	5.5	mA
Quiescent Current Change	ΔI_Q	9V≤V_{IN}≤20V			1.5	mA
		1mA≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		1.3		mV/°C
Ripple Rejection	RR	10V≤V_{IN}≤20V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L08S (V_{IN}=14V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	7.84	8.0	8.16	V
		10.5V≤V_{IN}≤23V, I_{OUT}=1mA-40mA	7.76		8.24	V
		10.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	7.76		8.24	V(Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C, I_{OUT}=1mA-100mA		18	80	mV
		T_J=25°C, I_{OUT}=1mA-40mA		10	40	mV
Line regulation	ΔV_{OUT}	10.5V≤V_{IN}≤23V, T_J=25°C		12	175	mV
		11V≤V_{IN}≤23V, T_J=25°C		10	125	mV
Quiescent Current	I_Q	V_{IN}=14V,I_{OUT}=0mA, T_J=25°C		2.0	5.5	mA
Quiescent Current Change	ΔI_Q	11V≤V_{IN}≤23V			1.5	mA
		1mA≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of V_o	$\Delta V_O/\Delta_T$	I_{OUT}=5mA		1.5		mV/°C
Ripple Rejection	RR	11V≤V_{IN}≤23V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

■ ELECTRICAL CHARACTERISTICS

For UTC78L09S (V_{IN}=15V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	8.82	9.0	9.18	V
		11.5V≤V_{IN}≤24V, I_{OUT}=1mA-40mA	8.73		9.27	V
		11.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	8.73		9.27	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	40	mV
Line regulation	ΔV_{OUT}	11.5V≤V_{IN}≤24V, T_J=25°C		15	200	mV
		13V≤V_{IN}≤24V, T_J=25°C		10	150	mV
Quiescent Current	I_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≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		70		μV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		1.6		mV/°C
Ripple Rejection	RR	12V≤V_{IN}≤24V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L10S (V_{IN}=16V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	9.8	10	10.2	V
		12.5V≤V_{IN}≤25V, I_{OUT}=1mA-40mA	9.7		10.3	V
		12.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	9.7		10.3	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}	12.5V≤V_{IN}≤25V, T_J=25°C		25	200	mV
		14V≤V_{IN}≤25V, T_J=25°C		20	170	mV
Quiescent Current	I_Q	V_{IN}=17V,I_{OUT}=0mA, T_J=25°C		2.0	6.0	mA
Quiescent Current Change	ΔI_Q	12.5V≤V_{IN}≤25V			1.5	mA
		1mA≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		74		μV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		1.7		mV/°C
Ripple Rejection	RR	15V≤V_{IN}≤25V,f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

For UTC78L12S (V_{IN}=19V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	11.76	12	12.24	V
		14.5V≤V_{IN}≤27V, I_{OUT}=1mA-40mA	11.64		12.36	V
		14.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	11.64		12.36	V(Note 2)
Load Regulation	ΔV_{OUT}	T_J=25°C, I_{OUT}=1mA-100mA		25	100	mV
		T_J=25°C, I_{OUT}=1mA-40mA		12	50	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	V_{IN}=19V, I_{OUT}=0mA, T_J=25°C		2.0	6.5	mA
Quiescent Current Change	ΔI_Q	16V≤V_{IN}≤27V			1.5	mA
		1mA≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		80		μV
Temperature coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		1.8		mV/°C
Ripple Rejection	RR	15V≤V_{IN}≤25V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

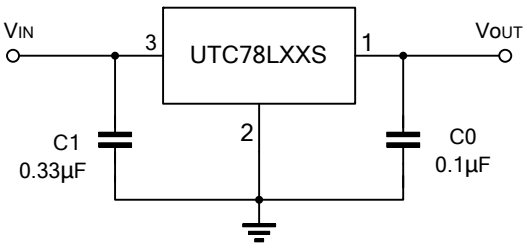
■ ELECTRICAL CHARACTERISTICS (Cont.)

For UTC78L15S (V_{IN}=23V, I_{OUT}=40mA, 0°C<T_J<150°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	T_J=25°C	14.70	15	15.30	V
		17.5V≤V_{IN}≤30V, I_{OUT}=1mA-40mA	14.55		15.45	V
		17.5V≤V_{IN}≤V_{MAX}, I_{OUT}=1mA-70mA	14.55		15.45	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		15	75	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	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≤I_{OUT}≤40mA			0.1	mA
Output Noise Voltage	eN	10Hz≤f≤100kHz		90		μV
Temperature Coefficient of V_{OUT}	$\Delta V_O/\Delta T$	I_{OUT}=5mA		2.0		mV/°C
Ripple Rejection	RR	18.5V≤V_{IN}≤28.5V, f=120Hz, T_J=25°C		50		dB
Dropout Voltage	V_D	T_J=25°C		1.7		V

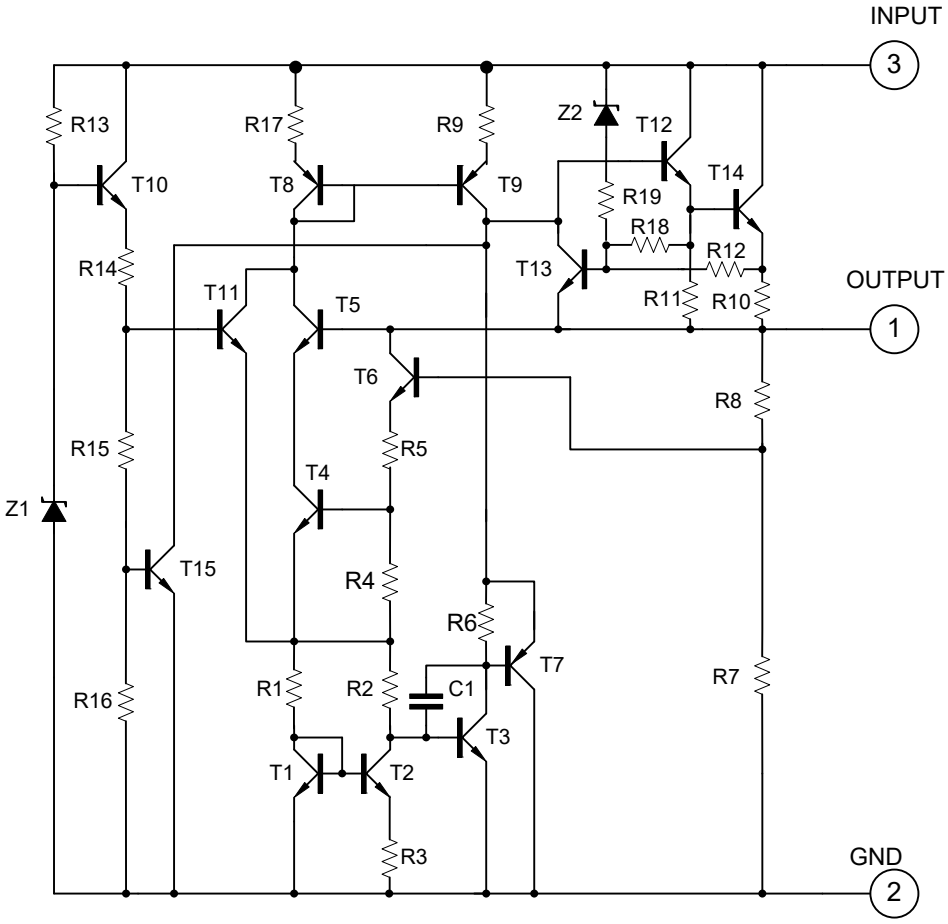
Notes: 1. The Maximum steady state usable output current is dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB.
2. Power dissipation < Absolute maximum ratings.

■ APPLICATION CIRCUIT



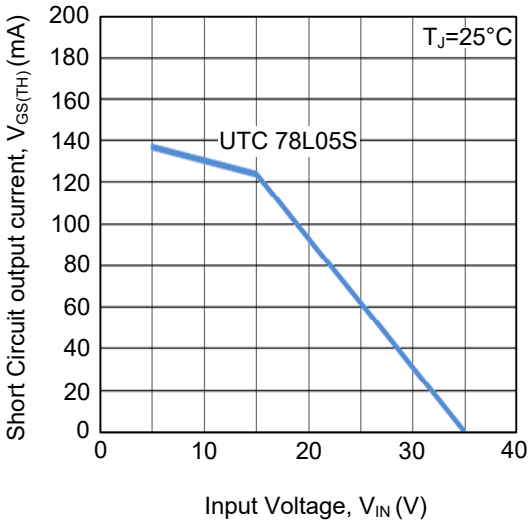
Notes: 1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

■ TEST CIRCUIT

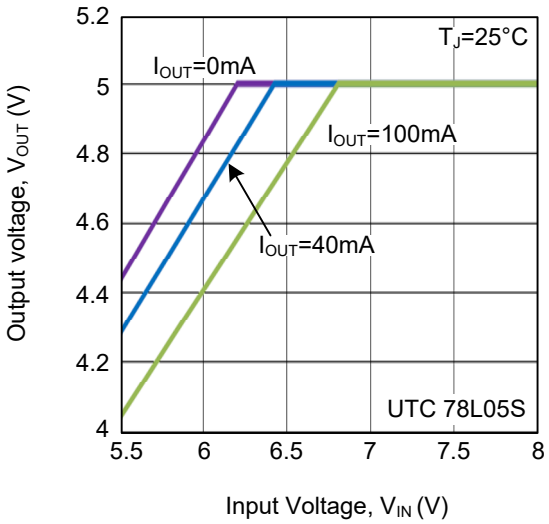


■ TYPICAL CHARACTERISTICS

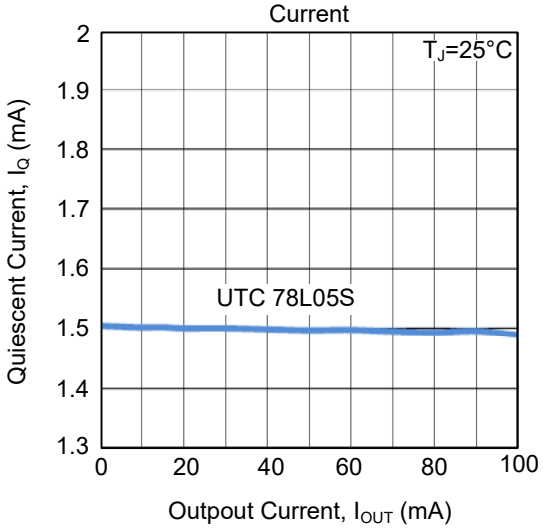
Short Circuit output current



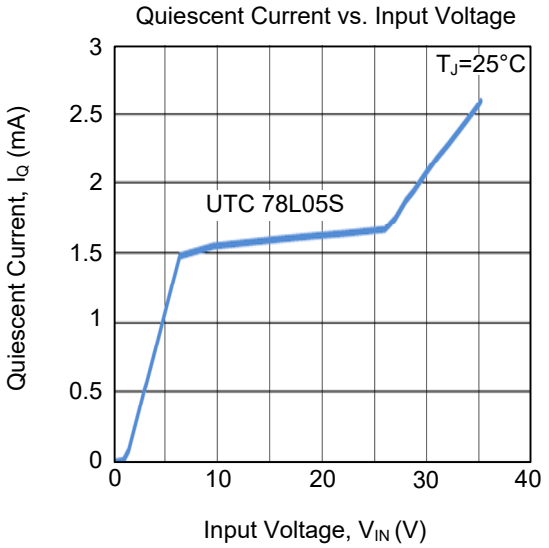
Dropout Characteristics



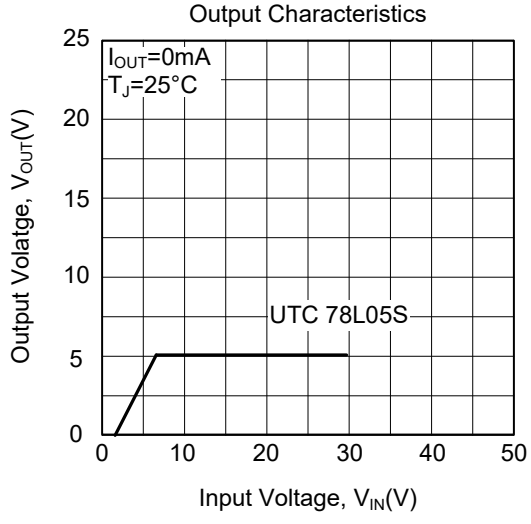
Quiescent Current vs. Output Current



Quiescent Current vs. Input Voltage



Output Characteristics



Power dissipation vs. ambient temperature