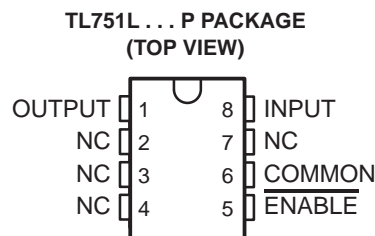
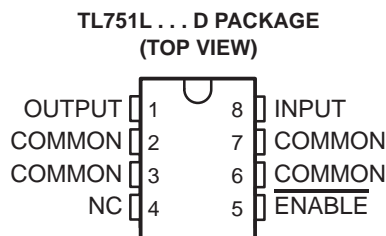
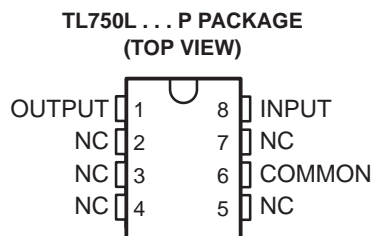
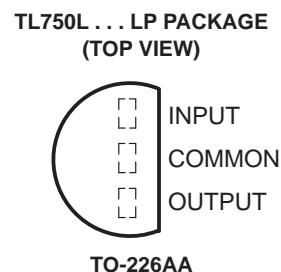
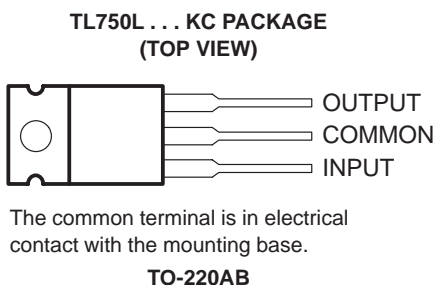
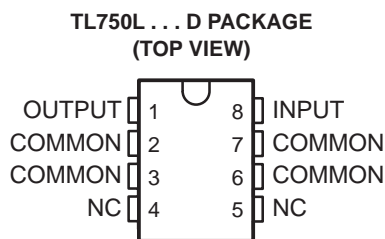


# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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- Very Low Dropout Voltage, Less Than 0.6 V at 150 mA
- Very Low Quiescent Current
- TTL- and CMOS-Compatible Enable on TL751L Series
- 60-V Load-Dump Protection
- Reverse Transient Protection Down to -50 V
- Internal Thermal-Overload Protection
- Overvoltage Protection
- Internal Overcurrent-Limiting Circuitry
- Less Than 500- $\mu$ A Disable (TL751L Series)



NC – No internal connection

DEVICE COMPONENT COUNT	
Transistors	20
JFETs	2
Diodes	5
Resistors	16

## description

The TL750L and TL751L series are low-dropout positive-voltage regulators specifically designed for battery-powered systems. These devices incorporate overvoltage and current-limiting protection circuitry, along with internal reverse-battery protection circuitry to protect the devices and the regulated system. The series is fully protected against 60-V load-dump and reverse-battery conditions. Extremely low quiescent current during full-load conditions makes these devices ideal for standby power systems.

The TL750L and TL751L series of fixed-output voltage regulators offers 5-V, 8-V, 10-V, and 12-V options. The TL751L series has the addition of an enable (ENABLE) input. When  $\overline{\text{ENABLE}}$  is high, the regulator output is placed in the high-impedance state. This gives the designer complete control over power up, power down, or emergency shutdown.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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## description (continued)

The TL750LxxC and the TL751LxxC series are characterized for operation over the virtual junction temperature range of 0°C to 125°C. The TL750L05Q and TL751L05Q are characterized for operation over the virtual junction temperature range of –40°C to 125°C.

### AVAILABLE OPTIONS

T <sub>J</sub>	V <sub>O</sub> TYP AT 25°C	PACKAGED DEVICES				
		SMALL OUTLINE (D)	HEAT-SINK MOUNTED (KC)	PLASTIC CYLINDRICAL (LP)	PLASTIC DIP (P)	CHIP FORM (Y)
0°C to 125°C	5 V	TL750L05CD TL751L05CD	TL750L05CKC	TL750L05CLP	TL750L05CP TL751L05CP	TL750L05Y
	8 V	TL750L08CD TL751L08CD	TL750L08CKC	TL750L08CLP	TL750L08CP TL751L08CP	TL750L08Y
	10 V	TL750L10CD TL751L10CD	TL750L10CKC	TL750L10CLP	TL750L10CP TL751L10CP	TL750L10Y
	12 V	TL750L12CD TL751L12CD	TL750L12CKC	TL750L12CLP	TL750L12CP TL751L12CP	TL750L12Y
–40°C to 125°C	5 V	TL750L05QD TL751L05QD	–	–	–	–

The D, KTE, and LP packages are available taped and reeled. The KTP is only available taped and reeled. Add R suffix to device type (e.g., TL750L05CDR). Chip forms are tested at 25°C.

## absolute maximum ratings over operating junction temperature range (unless otherwise noted)†

	TL750Lxx TL751Lxx	UNIT
Continuous input voltage	26	V
Transient input voltage, T <sub>A</sub> = 25°C (see Note 1)	60	V
Continuous reverse input voltage	–15	V
Transient reverse input voltage: t ≤ 100 ms	–50	V
Package thermal impedance, θ <sub>JA</sub> (see Notes 2 and 3)	D package	97
	KC package	22
	LP package	156
	P package	127
Virtual junction temperature range, T <sub>J</sub>	–40 to 150	°C
Lead temperature 1,6 mm (1/16 inch) for 10 seconds	260	°C
Storage temperature range, T <sub>stg</sub>	–65 to 150	°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. The transient input voltage rating applies to the waveform shown in Figure 1.
  2. Maximum power dissipation is a function of T<sub>J(max)</sub>, θ<sub>JA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J(max)</sub> – T<sub>A</sub>)/θ<sub>JA</sub>. Operating at the absolute maximum T<sub>J</sub> of 150°C can impact reliability.
  3. The package thermal impedance is calculated in accordance with JEDEC 51, except for through-hole packages, which use a trace length of zero.



# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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**recommended operating conditions over recommended operating junction temperature range (unless otherwise noted)**

			MIN	MAX	UNITS
Input voltage, $V_I$	TL75xL05		6	26	V
	TL75xL08		9	26	
	TL75xL10		11	26	
	TL75xL12		13	26	
High-level $\overline{\text{ENABLE}}$ input voltage, $V_{IH}$		TL751Lxx	2	15	V
Low-level $\overline{\text{ENABLE}}$ input voltage, $V_{IL}^\dagger$	$T_A = 25^\circ\text{C}$	TL751Lxx	-0.3	0.8	V
	$T_A = \text{full range}^\ddagger$	TL751Lxx	-0.15	0.8	
Output current range, $I_O$		TL75xLxx	0	150	mA
Operating virtual junction temperature, $T_J$	TL75xLxxC		0	125	$^\circ\text{C}$
	TL75xL05Q		-40	125	

$^\dagger$  The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for  $\overline{\text{ENABLE}}$  voltage levels and temperature only.

$^\ddagger$  Full range is  $0^\circ\text{C}$  to  $125^\circ\text{C}$  for the TL75xLxxC devices, and  $-40^\circ\text{C}$  to  $125^\circ\text{C}$  for the TL75L05Q devices.

**electrical characteristics,  $V_I = 14\text{ V}$ ,  $I_O = 10\text{ mA}$ ,  $T_J = 25^\circ\text{C}$  (unless otherwise noted) (see Note 4)**

PARAMETER	TEST CONDITIONS $^\S$	TL750L05 TL751L05			UNIT
		MIN	TYP	MAX	
Output voltage		4.80	5	5.2	V
	$T_J = T_J(\text{min})$ to $125^\circ\text{C}^\parallel$	4.75		5.25	
Input regulation voltage	$V_I = 9\text{ V}$ to $16\text{ V}$		5	10	mV
	$V_I = 6\text{ V}$ to $26\text{ V}$		6	30	
Ripple rejection	$V_I = 8\text{ V}$ to $18\text{ V}$ , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to $150\text{ mA}$		20	50	mV
Dropout voltage	$I_O = 10\text{ mA}$			0.2	V
	$I_O = 150\text{ mA}$			0.6	
Output noise voltage	$f = 10\text{ Hz}$ to $100\text{ kHz}$		500		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 6\text{ V}$ to $26\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = T_J(\text{min})$ to $125^\circ\text{C}^\parallel$		1	2	
	$\overline{\text{ENABLE}} > 2\text{ V}$			0.5	

$^\S$  Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a  $0.1\text{-}\mu\text{F}$  capacitor across the input and a  $10\text{-}\mu\text{F}$  capacitor, with equivalent series resistance of less than  $0.4\ \Omega$ , across the output.

$^\parallel$   $T_J(\text{min})$  is  $0^\circ\text{C}$  for the TL75xLxxC devices, and  $-40^\circ\text{C}$  for the TL75xLxxQ devices.

NOTE 4: For TL750L05Q/TL751L05Q, all characteristics are measured with a  $0.1\text{-}\mu\text{F}$  tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 4.

# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	TL750L08 TL751L08			UNIT
		MIN	TYP	MAX	
Output voltage		7.68	8	8.32	V
	$T_J = 0^\circ\text{C}$ to $125^\circ\text{C}$	7.6		8.4	
Input regulation voltage	$V_I = 10\text{ V}$ to $17\text{ V}$		10	20	mV
	$V_I = 9\text{ V}$ to $26\text{ V}$		25	50	
Ripple rejection	$V_I = 11\text{ V}$ to $21\text{ V}$ , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to $150\text{ mA}$		40	80	mV
Dropout voltage	$I_O = 10\text{ mA}$			0.2	V
	$I_O = 150\text{ mA}$			0.6	
Output noise voltage	$f = 10\text{ Hz}$ to $100\text{ kHz}$		500		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 9\text{ V}$ to $26\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 0^\circ\text{C}$ to $125^\circ\text{C}$		1	2	
	$\overline{\text{ENABLE}} > 2\text{ V}$			0.5	

† Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a  $0.1\text{-}\mu\text{F}$  capacitor across the input and a  $10\text{-}\mu\text{F}$  capacitor, with equivalent series resistance of less than  $0.4\ \Omega$ , across the output.

## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	TL750L10 TL751L10			UNIT
		MIN	TYP	MAX	
Output voltage		9.6	10	10.4	V
	$T_J = 0^\circ\text{C}$ to $125^\circ\text{C}$	9.5		10.5	
Input regulation voltage	$V_I = 12\text{ V}$ to $19\text{ V}$		10	25	mV
	$V_I = 11\text{ V}$ to $26\text{ V}$		30	60	
Ripple rejection	$V_I = 12\text{ V}$ to $22\text{ V}$ , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to $150\text{ mA}$		50	100	mV
Dropout voltage	$I_O = 10\text{ mA}$			0.2	V
	$I_O = 150\text{ mA}$			0.6	
Output noise voltage	$f = 10\text{ Hz}$ to $100\text{ kHz}$		700		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 11\text{ V}$ to $26\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 0^\circ\text{C}$ to $125^\circ\text{C}$		1	2	
	$\overline{\text{ENABLE}} > 2\text{ V}$			0.5	

† Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a  $0.1\text{-}\mu\text{F}$  capacitor across the input and a  $10\text{-}\mu\text{F}$  capacitor, with equivalent series resistance of less than  $0.4\ \Omega$ , across the output.



# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION <sup>†</sup>	TL750L12 TL751L12			UNIT
		MIN	TYP	MAX	
Output voltage		11.52	12	12.48	V
	$T_J = 0^\circ\text{C to } 125^\circ\text{C}$	11.4		12.6	
Input regulation voltage	$V_I = 14\text{ V to } 19\text{ V}$		15	30	mV
	$V_I = 13\text{ V to } 26\text{ V}$		20	40	
Ripple rejection	$V_I = 13\text{ V to } 23\text{ V}$ , $f = 120\text{ Hz}$	50	55		dB
Output regulation voltage	$I_O = 5\text{ mA to } 150\text{ mA}$		50	120	mV
Dropout voltage	$I_O = 10\text{ mA}$			0.2	V
	$I_O = 150\text{ mA}$			0.6	
Output noise voltage	$f = 10\text{ Hz to } 100\text{ kHz}$		700		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 13\text{ V to } 26\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 0^\circ\text{C to } 125^\circ\text{C}$		1	2	
	$\text{ENABLE} > 2\text{ V}$			0.5	

<sup>†</sup> Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 10- $\mu\text{F}$  capacitor, with equivalent series resistance of less than 0.4  $\Omega$ , across the output.

## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION <sup>†</sup>	TL750L05Y			UNIT
		MIN	TYP	MAX	
Output voltage			5		V
Input regulation voltage	$V_I = 9\text{ V to } 16\text{ V}$		5		mV
	$V_I = 6\text{ V to } 26\text{ V}$		6		
Ripple rejection	$V_I = 8\text{ V to } 18\text{ V}$ , $f = 120\text{ Hz}$		65		dB
Output regulation voltage	$I_O = 5\text{ mA to } 150\text{ mA}$		20		mV
Output noise voltage	$f = 10\text{ Hz to } 100\text{ kHz}$		500		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10		mA
	$V_I = 6\text{ V to } 26\text{ V}$ , $I_O = 10\text{ mA}$		1		

<sup>†</sup> Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 10- $\mu\text{F}$  capacitor, with equivalent series resistance of less than 0.4  $\Omega$ , across the output.

# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION†	TL750L08Y			UNIT
		MIN	TYP	MAX	
Output voltage			8		V
Input regulation voltage	$V_I = 10\text{ V to }17\text{ V}$		10		mV
	$V_I = 9\text{ V to }26\text{ V}$		25		
Ripple rejection	$V_I = 11\text{ V to }21\text{ V}$ , $f = 120\text{ Hz}$		65		dB
Output regulation voltage	$I_O = 5\text{ mA to }150\text{ mA}$		40		mV
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		500		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10		mA
	$V_I = 9\text{ V to }26\text{ V}$ , $I_O = 10\text{ mA}$		1		

† Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 10- $\mu\text{F}$  capacitor, with equivalent series resistance of less than 0.4  $\Omega$ , across the output.

## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION†	TL750L10Y			UNIT
		MIN	TYP	MAX	
Output voltage			10		V
Input regulation voltage	$V_I = 12\text{ V to }19\text{ V}$		10		mV
	$V_I = 11\text{ V to }26\text{ V}$		30		
Ripple rejection	$V_I = 12\text{ V to }22\text{ V}$ , $f = 120\text{ Hz}$		65		dB
Output regulation voltage	$I_O = 5\text{ mA to }150\text{ mA}$		50		mV
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		700		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10		mA
	$V_I = 11\text{ V to }26\text{ V}$ , $I_O = 10\text{ mA}$		1		

† Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 10- $\mu\text{F}$  capacitor, with equivalent series resistance of less than 0.4  $\Omega$ , across the output.

## electrical characteristics, $V_I = 14\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION†	TL750L12Y			UNIT
		MIN	TYP	MAX	
Output voltage			12		V
Input regulation voltage	$V_I = 14\text{ V to }19\text{ V}$		15		mV
	$V_I = 13\text{ V to }26\text{ V}$		20		
Ripple rejection	$V_I = 13\text{ V to }23\text{ V}$ , $f = 120\text{ Hz}$		55		dB
Output regulation voltage	$I_O = 5\text{ mA to }150\text{ mA}$		50		mV
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		700		$\mu\text{V}$
Input bias current	$I_O = 150\text{ mA}$		10		mA
	$V_I = 13\text{ V to }26\text{ V}$ , $I_O = 10\text{ mA}$		1		

† Pulse-testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 10- $\mu\text{F}$  capacitor, with equivalent series resistance of less than 0.4  $\Omega$ , across the output.



TYPICAL CHARACTERISTICS

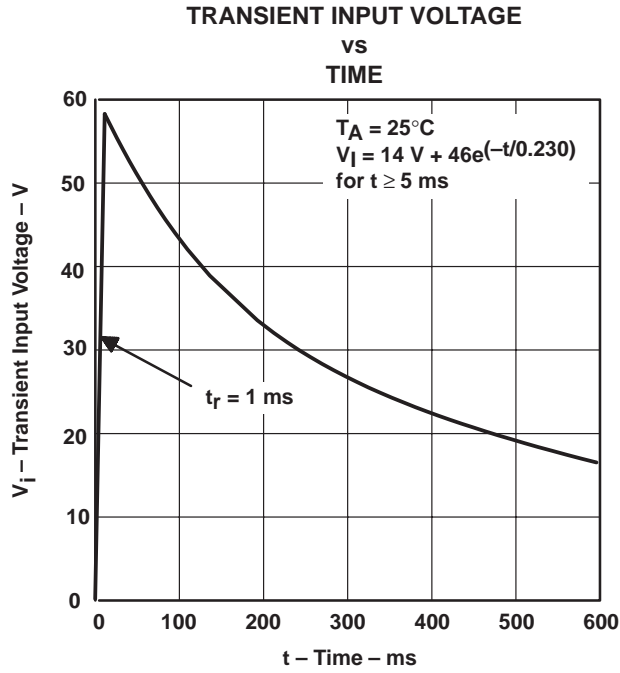


Figure 1

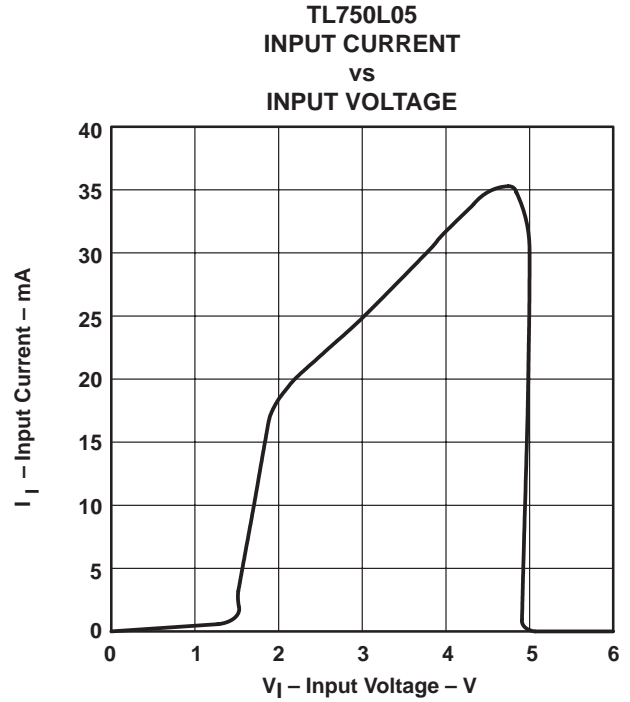


Figure 2

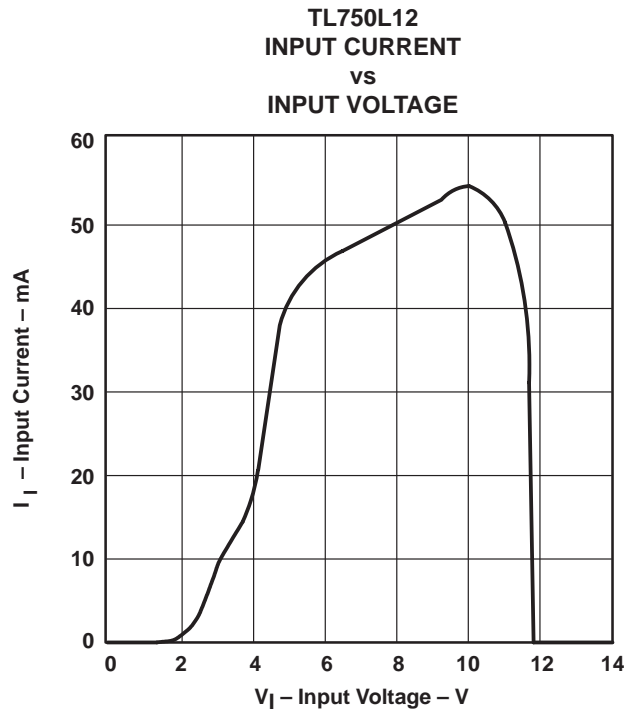


Figure 3

# TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

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## TYPICAL CHARACTERISTICS

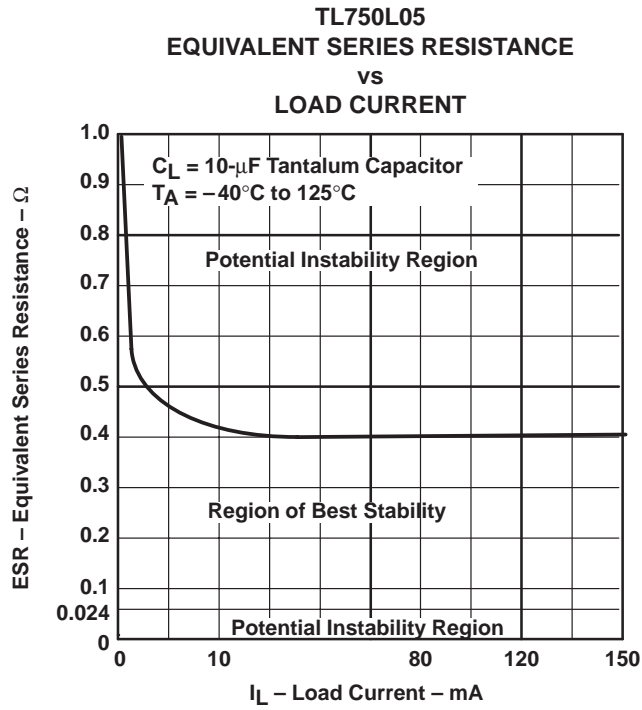


Figure 4



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