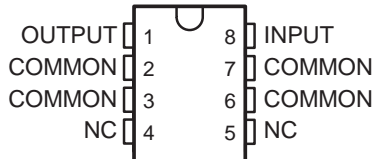


TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

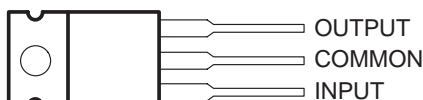
SLVS017I – SEPTEMBER 1987 – REVISED JULY 1999

- 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- μ A Disable (TL751L Series)

TL750L . . . D PACKAGE
(TOP VIEW)



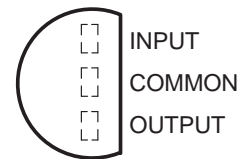
TL750L . . . KC PACKAGE
(TOP VIEW)



The common terminal is in electrical contact with the mounting base.

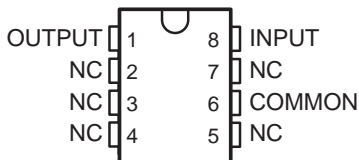
TO-220AB

TL750L . . . LP PACKAGE
(TOP VIEW)

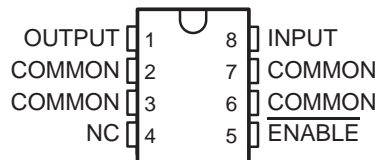


TO-226AA

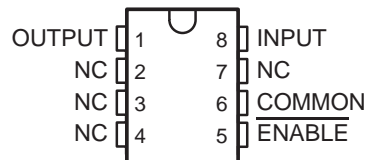
TL750L . . . P PACKAGE
(TOP VIEW)



TL751L . . . D PACKAGE
(TOP VIEW)



TL751L . . . P PACKAGE
(TOP VIEW)



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 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.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1999, Texas Instruments Incorporated

TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

SLVS017I – SEPTEMBER 1987 – REVISED JULY 1999

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 _J	V _O 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 _A = 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 _{JA} (see Notes 2 and 3)	D package	97
	KC package	22
	LP package	156
	P package	127
Virtual junction temperature range, T _J	-40 to 150	°C
Lead temperature 1,6 mm (1/16 inch) for 10 seconds	260	°C
Storage temperature range, T _{stg}	-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_J(max), θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_J(max) - T_A)/θ_{JA}. Operating at the absolute maximum T_J of 150°C can impact reliability.
 3. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.



TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

SLVS017I – SEPTEMBER 1987 – REVISED JULY 1999

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	$T_A = 25^\circ\text{C}$		-0.3	0.8	V
	$T_A = \text{full range}^\ddagger$		-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	

† 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.

‡ Full range is 0°C to 125°C for the TL75xLxxC devices, and -40°C to 125°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 §	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 V		5	10	mV
	$V_I = 6\text{ V}$ to 26 V		6	30	
Ripple rejection	$V_I = 8\text{ V}$ to 18 V , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to 150 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 kHz		500		μV
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 6\text{ V}$ to 26 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	

§ 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°C for the TL75xLxxC devices, and -40°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

SLVS0171 – SEPTEMBER 1987 – REVISED JULY 1999

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°C	7.6		8.4	
Input regulation voltage	$V_I = 10\text{ V}$ to 17 V		10	20	mV
	$V_I = 9\text{ V}$ to 26 V		25	50	
Ripple rejection	$V_I = 11\text{ V}$ to 21 V , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to 150 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 kHz		500		μV
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 9\text{ V}$ to 26 V , $I_O = 10\text{ mA}$, $T_J = 0^\circ\text{C}$ to 125°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°C	9.5		10.5	
Input regulation voltage	$V_I = 12\text{ V}$ to 19 V		10	25	mV
	$V_I = 11\text{ V}$ to 26 V		30	60	
Ripple rejection	$V_I = 12\text{ V}$ to 22 V , $f = 120\text{ Hz}$	60	65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to 150 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 kHz		700		μV
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 11\text{ V}$ to 26 V , $I_O = 10\text{ mA}$, $T_J = 0^\circ\text{C}$ to 125°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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

SLVS0171 – SEPTEMBER 1987 – REVISED JULY 1999

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

PARAMETER	TEST CONDITIONST	TL750L12 TL751L12			UNIT
		MIN	TYP	MAX	
Output voltage		11.52	12	12.48	V
	$T_J = 0^\circ\text{C}$ to 125°C	11.4		12.6	
Input regulation voltage	$V_I = 14\text{ V}$ to 19 V		15	30	mV
	$V_I = 13\text{ V}$ to 26 V		20	40	
Ripple rejection	$V_I = 13\text{ V}$ to 23 V , $f = 120\text{ Hz}$	50	55		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to 150 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 kHz		700		μV
Input bias current	$I_O = 150\text{ mA}$		10	12	mA
	$V_I = 13\text{ V}$ to 26 V , $I_O = 10\text{ mA}$, $T_J = 0^\circ\text{C}$ to 125°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 CONDITIONST	TL750L05Y			UNIT
		MIN	TYP	MAX	
Output voltage			5		V
Input regulation voltage	$V_I = 9\text{ V}$ to 16 V		5		mV
	$V_I = 6\text{ V}$ to 26 V		6		
Ripple rejection	$V_I = 8\text{ V}$ to 18 V , $f = 120\text{ Hz}$		65		dB
Output regulation voltage	$I_O = 5\text{ mA}$ to 150 mA		20		mV
Output noise voltage	$f = 10\text{ Hz}$ to 100 kHz		500		μV
Input bias current	$I_O = 150\text{ mA}$		10		mA
	$V_I = 6\text{ V}$ to 26 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 $0.1\text{-}\mu\text{F}$ 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

SLVS017I – SEPTEMBER 1987 – REVISED JULY 1999

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

PARAMETER	TEST CONDITIONS†	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		μV
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- μF capacitor across the input and a 10- μF capacitor, with equivalent series resistance of less than 0.4 Ω , 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†	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		μV
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- μF capacitor across the input and a 10- μF capacitor, with equivalent series resistance of less than 0.4 Ω , 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†	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		μV
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- μF capacitor across the input and a 10- μF capacitor, with equivalent series resistance of less than 0.4 Ω , across the output.



TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

SLVS0171 – SEPTEMBER 1987 – REVISED JULY 1999

TYPICAL CHARACTERISTICS

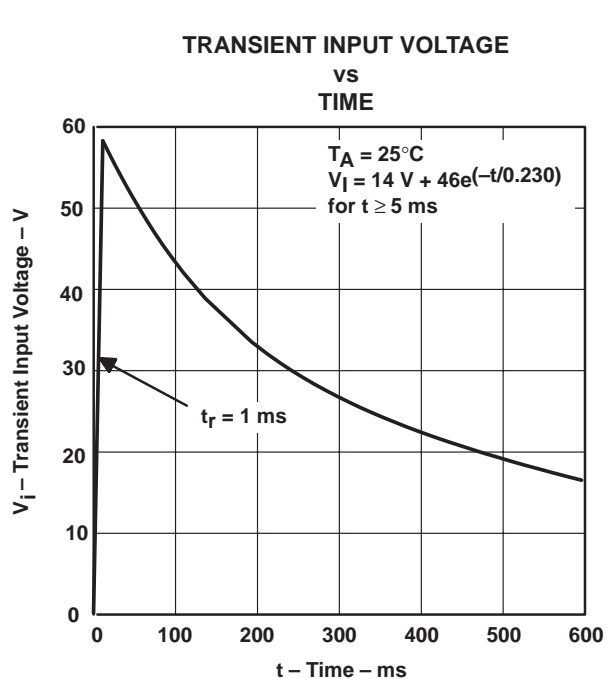


Figure 1

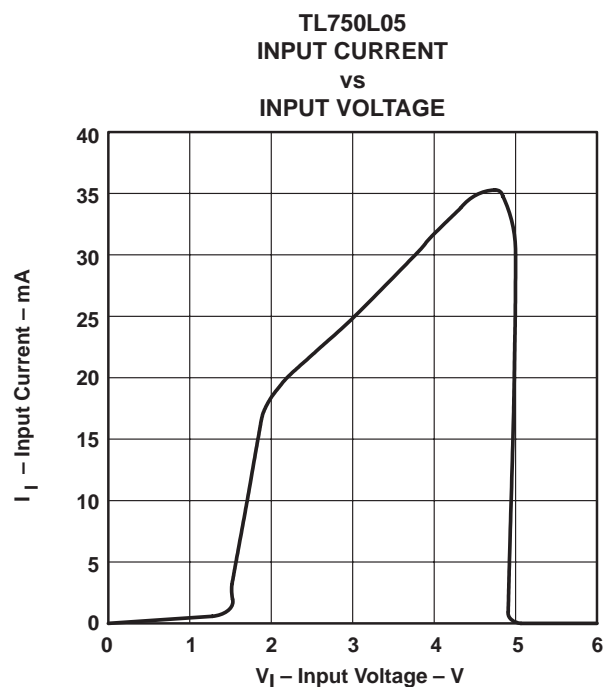


Figure 2

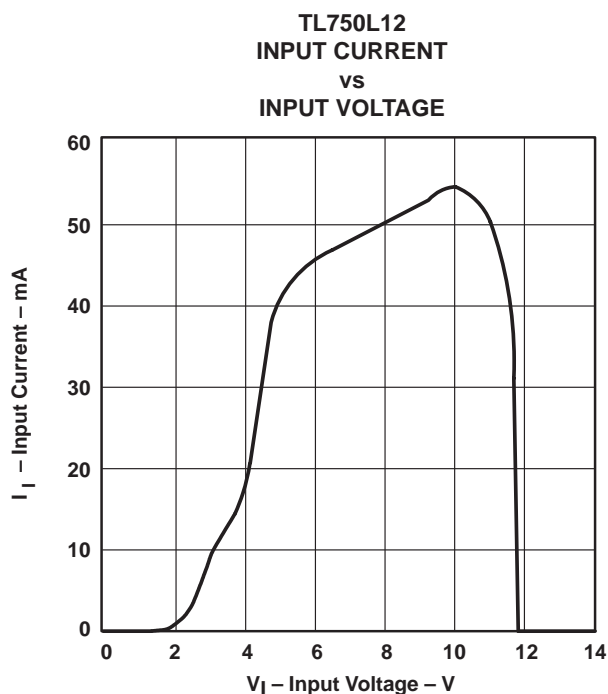


Figure 3



TL750L, TL751L SERIES LOW-DROPOUT VOLTAGE REGULATORS

SLVS017I – SEPTEMBER 1987 – REVISED JULY 1999

TYPICAL CHARACTERISTICS

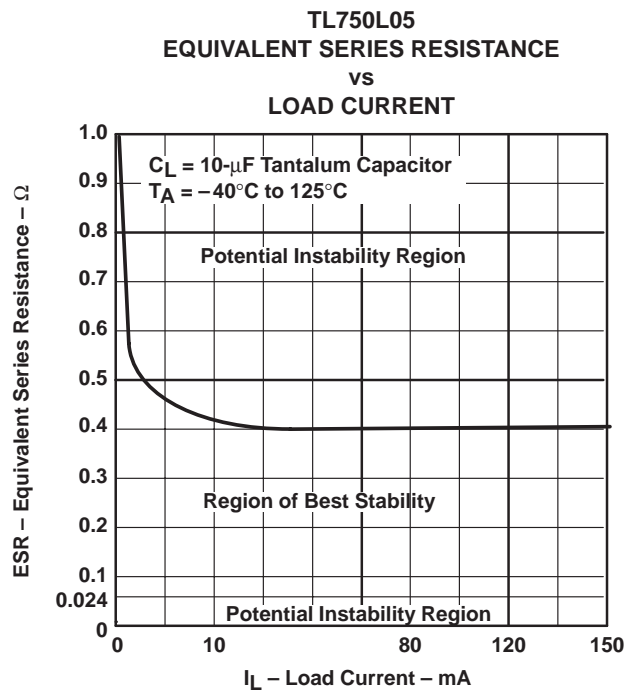


Figure 4

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.