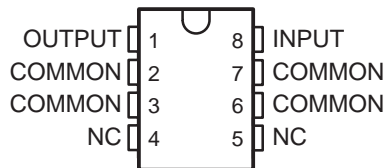


TL750L, TL751L SERIES TL751L05M, TL751L12M, TL750LxxY LOW-DROPOUT VOLTAGE REGULATORS

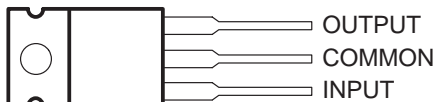
SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

- Very Low Dropout Voltage, Less Than 0.6 V at 150 mA
- Very Low Quiescent Current
- TTL- and CMOS-Compatible Enable on TL751L Series, TL751L05M, and TL751L12M
- 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, TL75L05M, and TL75L12M)

TL750L ... D PACKAGE
(TOP VIEW)



TL750L ... KC PACKAGE
(TOP VIEW)



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

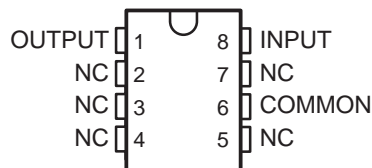
TO-220AB

TL750L ... LP PACKAGE
(TOP VIEW)

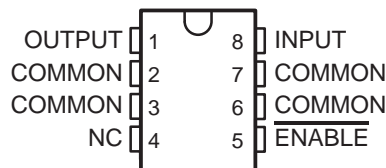


TO-226AA

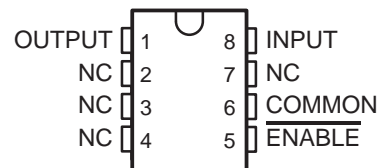
TL750L ... P PACKAGE
(TOP VIEW)



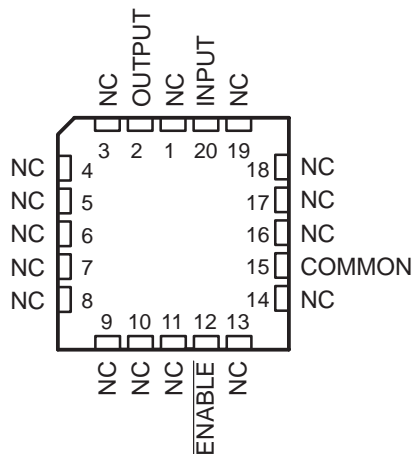
TL751L ... D PACKAGE
(TOP VIEW)



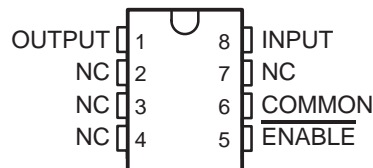
TL751L ... P PACKAGE
(TOP VIEW)



TL751L05M, TL751L12M ... FK PACKAGE
(TOP VIEW)



TL751L05M, TL751L12M ... JG PACKAGE
(TOP VIEW)



NC – No internal connection

DEVICE COMPONENT COUNT	
Transistors	20
JFET	2
Diodes	5
Resistors	16



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
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TL750L, TL751L SERIES

TL751L05M, TL751L12M, TL750LxxY

LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

description

The TL750L and TL751L series and the TL751L05M and TL751L12M 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. Both the series and the TL751L05M and TL751L12M are 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 series of fixed-output voltage regulators offers 5-V, 8-V, 10-V, and 12-V options. They are available in TO-226AA (formerly TO-92) (LP) packages, TO-220AB (KC) packages, 8-pin small-outline plastic packages (D), and 8-pin plastic dual-in-line packages (P).

The TL751L series of fixed-output voltage regulators offers 5-V, 8-V, 10-V, and 12-V options, with the addition of an enable input. The enable input, when taken high, places the regulator output in a high-impedance state. This gives the designer complete control over power up, power down, or emergency shutdown. This series is offered in the D and P packages.

The TL751L05M and TL751L12M fixed-output voltage regulators also offer 5-V and 12-V options, with an enable input. The enable input, when taken high, places the regulator output in a high-impedance state. This gives the designer complete control over power up, power down, or emergency shutdown. The TL751LxM are offered in the FK and JG packages.

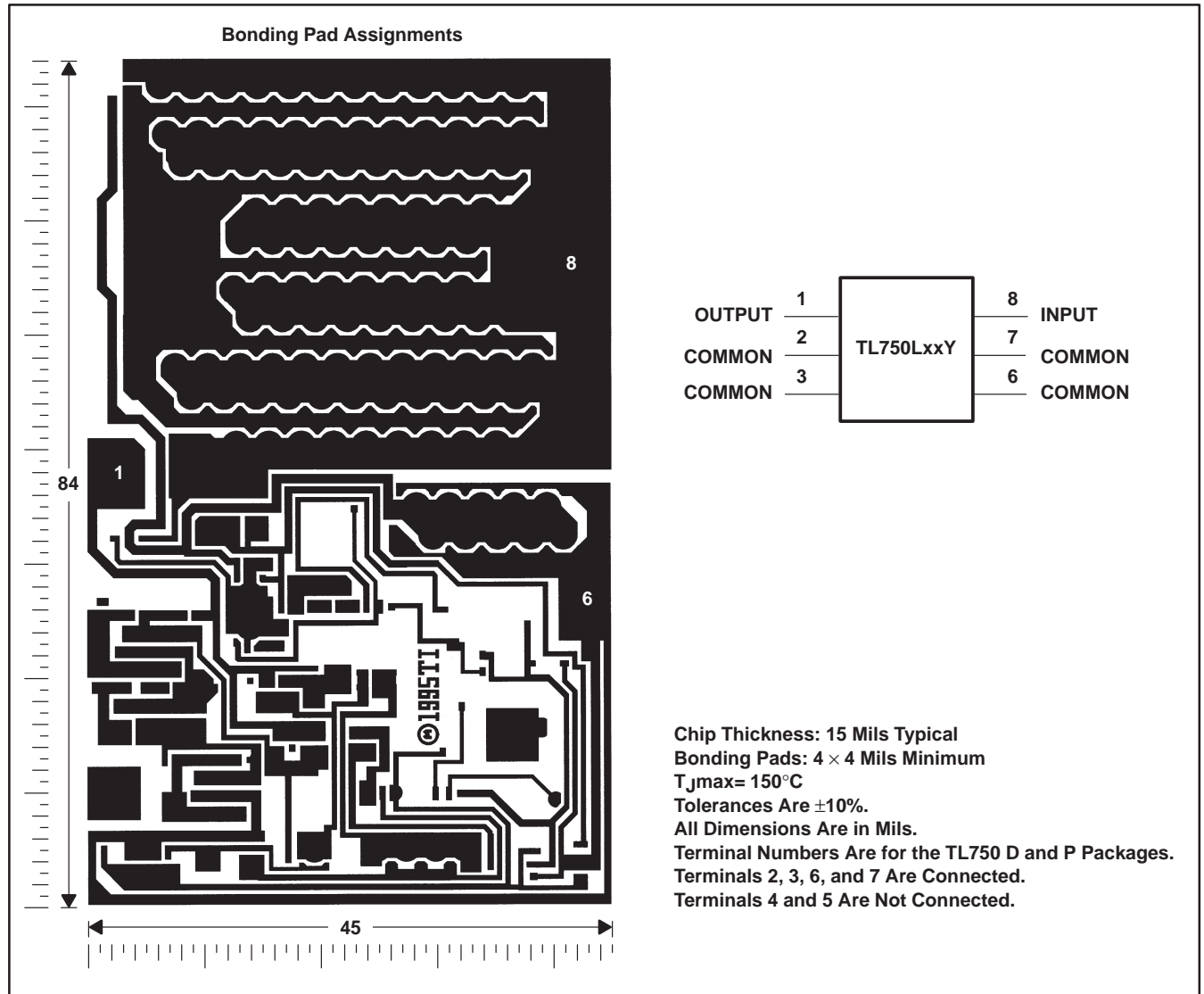
AVAILABLE OPTIONS

T _A	V _o typ AT 25°C	PACKAGED DEVICES						
		SMALL OUTLINE (D)	CERAMIC CHIP CARRIER (FK)	CERAMIC DIP (JG)	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	—	—	TL750L05QKC	TL750L05QLP	TL750L05QP TL751L05QP	—
	8 V	TL750L08QD TL751L08QD	—	—	TL750L08QKC	TL750L08QLP	TL750L08QP TL751L08QP	—
	10 V	TL750L10QD TL751L10QD	—	—	TL750L10QKC	TL750L10QLP	TL750L10QP TL751L10QP	—
	12 V	TL750L12QD TL751L12QD	—	—	TL750L12QKC	TL750L12QLP	TL750L12QP TL751L12QP	—
–55°C to 125°C	5 V	—	TL751L05MFK	TL751L05MJG	—	—	—	—
	12 V	—	TL751L12MFK	TL751L12MJG	—	—	—	—



TL750LxxY chip information

These chips, when properly assembled, display characteristics similar to the TL750LxxC. Thermal compression or ultrasonic bonding can be used on the doped-aluminum bonding pads. These chips can be mounted with conductive epoxy or a gold-silicon preform.



TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

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

	TL750L	TL751L TL751L_M	UNIT
Continuous input voltage	26	26	V
Transient input voltage, $T_A = 25^\circ\text{C}$ (see Note 1)	60	60	V
Continuous reverse input voltage	-15	-15	V
Transient reverse input voltage: $t \leq 100$ ms	-50	-50	V
Continuous total power dissipation	See dissipation-rating table		
Operating virtual junction temperature range, T_J	-40 to 150	-40 to 150	$^\circ\text{C}$
Storage temperature range, T_{stg}	-65 to 150	-65 to 150	$^\circ\text{C}$
Lead temperature 1,6 mm (1/16 inch) for 10 seconds	260	260	$^\circ\text{C}$

† 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.

NOTE 1: The transient input voltage rating applies to the waveform shown in Figure 1.

DISSIPATION-RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING (mW)	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$ (mW/ $^\circ\text{C}$)	$T_A = 70^\circ\text{C}$ POWER RATING (mW)	$T_A = 85^\circ\text{C}$ POWER RATING (mW)
D	825	6.6	528	429
FK	1375	11	880	715
JG	1050	8.4	672	546
KC	2000	15.2	1316	1088
LP	775	6.2	496	403
P	1000	8	640	520

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

		MIN	MAX	UNITS
Input voltage, V_I	TL75_L05 and TL751L05M	6	26	V
	TL75_L08	9	26	
	TL75_L10	11	26	
	TL75_L12 and TL751L12M	13	26	
High-level $\overline{\text{ENABLE}}$ input voltage, V_{IH}	TL751L and TL751L_M	2	15	V
Low-level $\overline{\text{ENABLE}}$ input voltage, V_{IL}^\ddagger	$T_A = 25^\circ\text{C}$	-0.3	0.8	V
	$T_A = \text{full range}$	-0.15	0.8	
Output current range, I_O	TL75_L and TL751L_M	0	150	mA
Operating virtual junction temperature, T_J	TL75_L_C	0	125	$^\circ\text{C}$
	TL75_L_Q	-40	125	
	TL751L_M	-55	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.



TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS
 SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

electrical characteristics, $V_I = 14\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted) (see Note 2)

PARAMETER	TEST CONDITIONST	TL750L05 TL751L05 TL751L05M			UNIT
		MIN	TYP	MAX	
Output voltage	$T_J = 25^\circ\text{C}$	4.80	5	5.2	V
	$T_J = T_{J\text{min}}$ to 125°C	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°C		1	2	
	$\overline{\text{ENABLE}} > 2\text{ V}$			0.5	

*On products compliant to MIL-PRF-38535, this parameter is not production tested.

† 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.

NOTE 2: 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.

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

PARAMETER	TEST CONDITIONST	TL750L08 TL751L08			UNIT
		MIN	TYP	MAX	
Output voltage	$T_J = 25^\circ\text{C}$	7.68	8	8.32	V
	$T_J = T_{J\text{min}}$ 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 , $I_O = 10\text{ mA}$, $T_J = T_{J\text{min}}$ to 125°C		1	2	
	$\overline{\text{ENABLE}} > 2\text{ V}$			0.5	

*On products compliant to MIL-PRF-38535, this parameter is not production tested.

† 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
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

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

PARAMETER	TEST CONDITIONST†	TL750L10 TL751L10			UNIT
		MIN	TYP	MAX	
Output voltage	$T_J = 25^\circ\text{C}$	9.6	10	10.4	V
	$T_J = T_{Jmin}$ 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 , $I_O = 10\text{ mA}$, $T_J = T_{Jmin}$ to 125°C		1	2	
	$\text{ENABLE} > 2\text{ V}$			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†	TL750L12 TL751L12 TL751L12M			UNIT
		MIN	TYP	MAX	
Output voltage	$T_J = 25^\circ\text{C}$	11.52	12	12.48	V
	$T_J = T_{Jmin}$ 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 , $I_O = 10\text{ mA}$, $T_J = T_{Jmin}$ to 125°C		1	2	
	$\text{ENABLE} > 2\text{ V}$			0.5	

*On products compliant to MIL-PRF-38535, this parameter is not production tested.

† 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
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS
 SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

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

PARAMETER	TEST CONDITION†	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		μV
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		

† 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 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		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 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		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.

TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

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		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.



TYPICAL CHARACTERISTICS

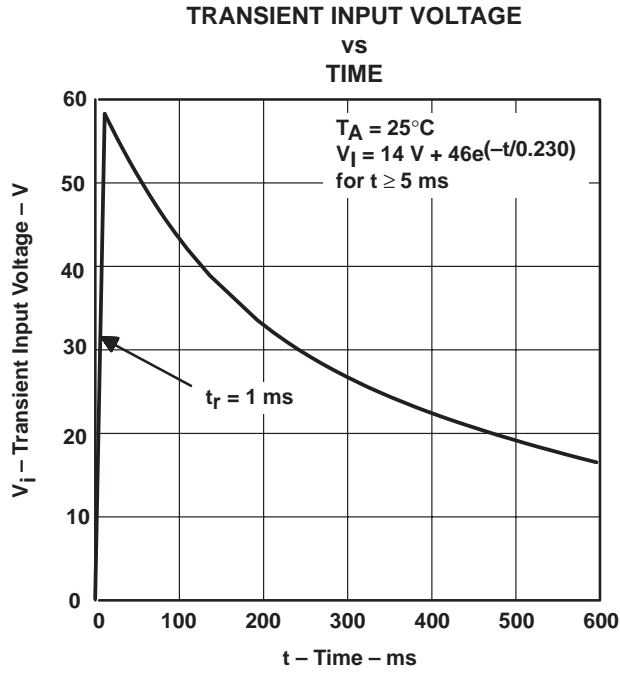


Figure 1

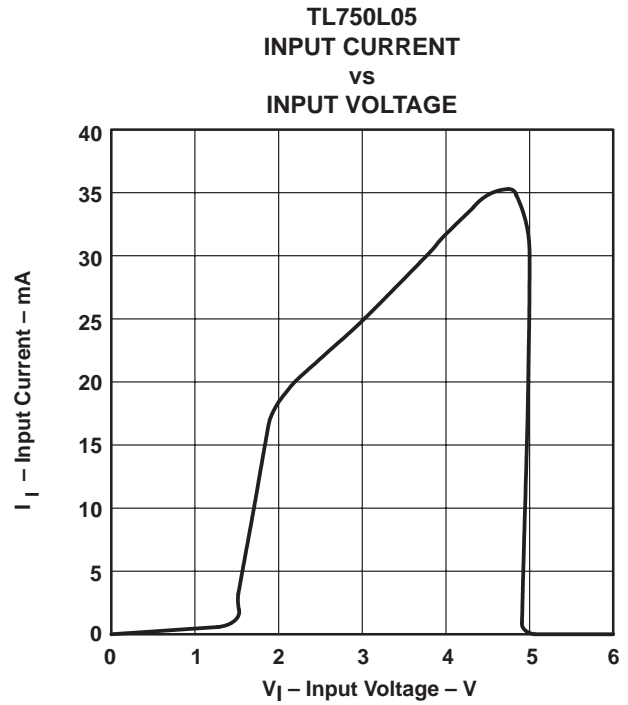


Figure 2

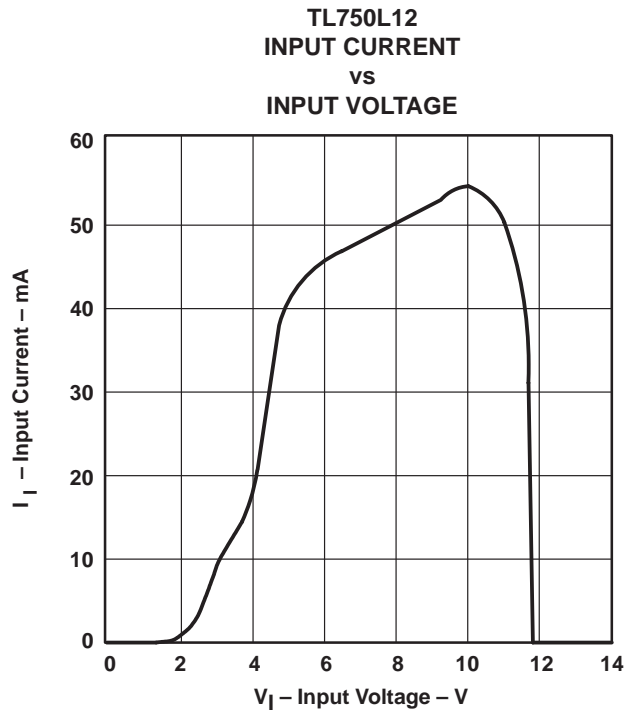


Figure 3

TYPICAL CHARACTERISTICS

TL750L05
EQUIVALENT SERIES RESISTANCE
vs
LOAD CURRENT

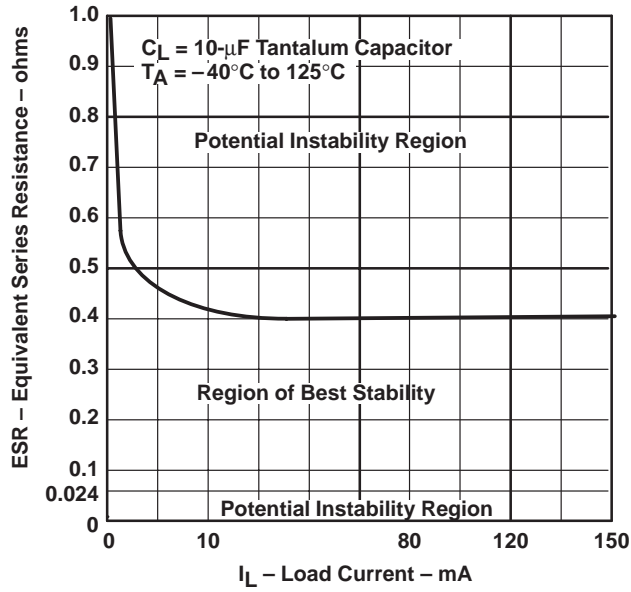


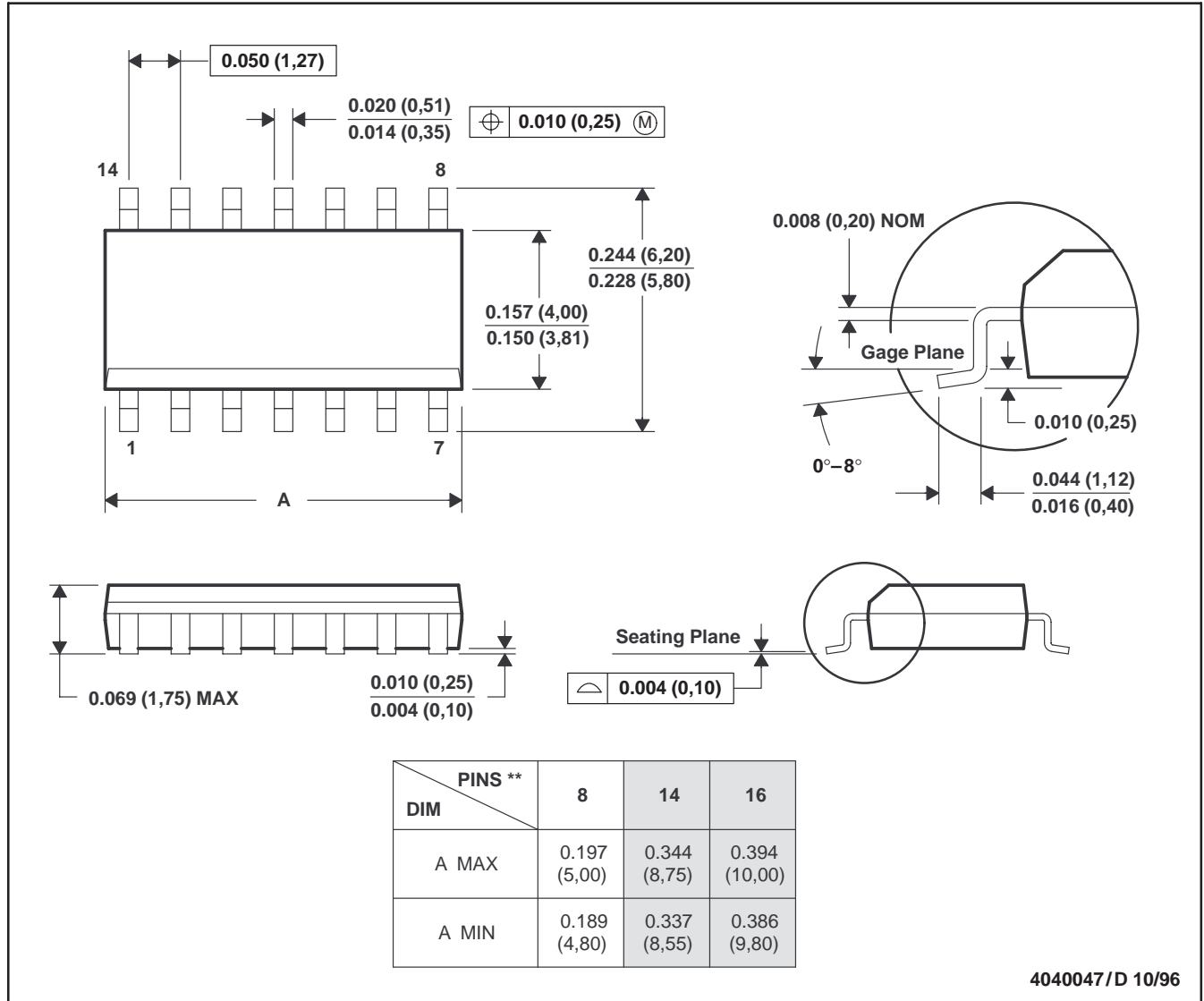
Figure 4

MECHANICAL DATA

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
 D. Falls within JEDEC MS-012

TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

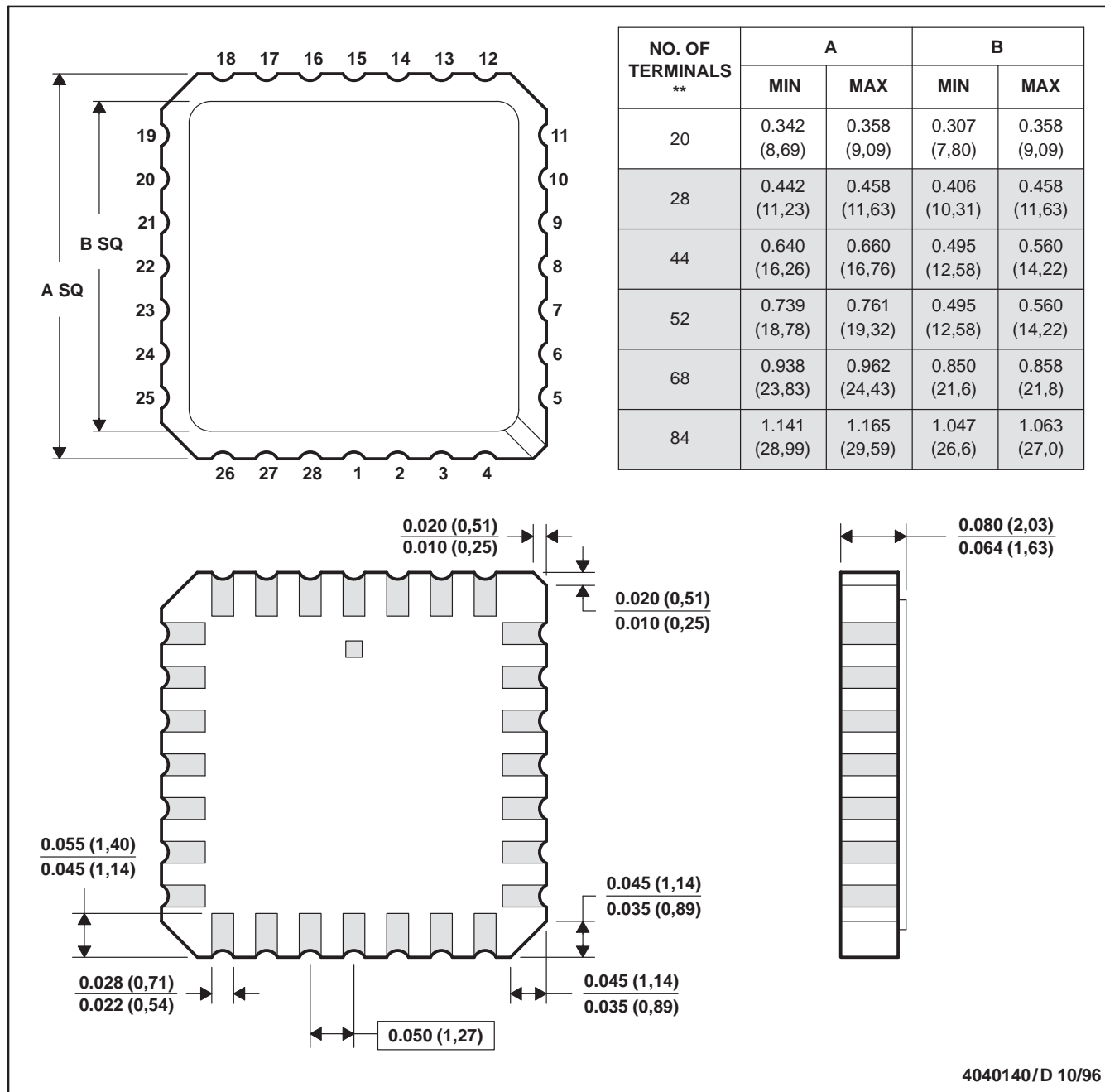
SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

MECHANICAL DATA

FK (S-CQCC-N)**

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



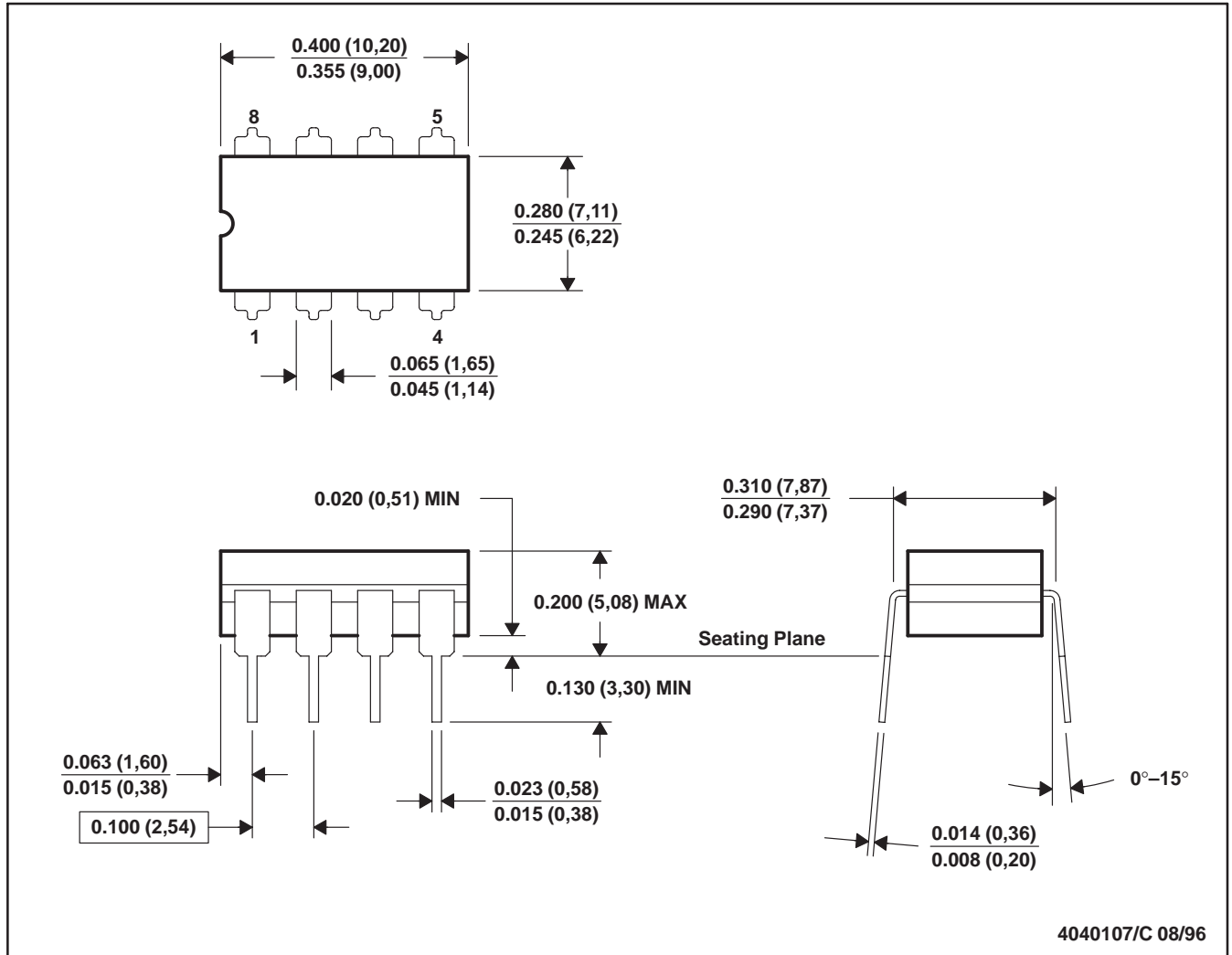
- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a metal lid.
 D. The terminals are gold plated.
 E. Falls within JEDEC MS-004



MECHANICAL DATA

JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE PACKAGE



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 E. Falls within MIL-STD-1835 GDIP1-T8

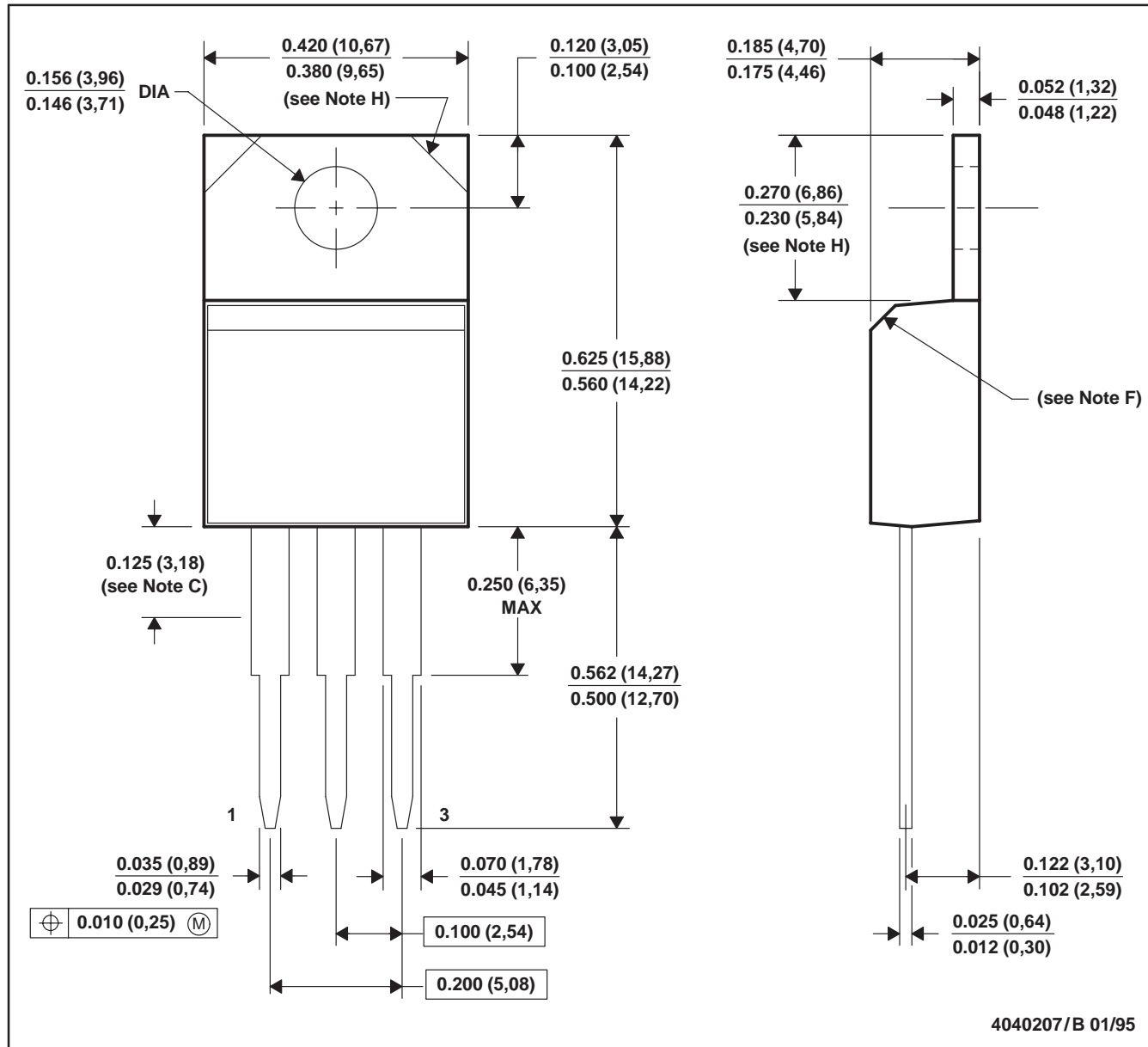
TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

MECHANICAL DATA

KC (R-PSFM-T3)

PLASTIC FLANGE-MOUNT PACKAGE



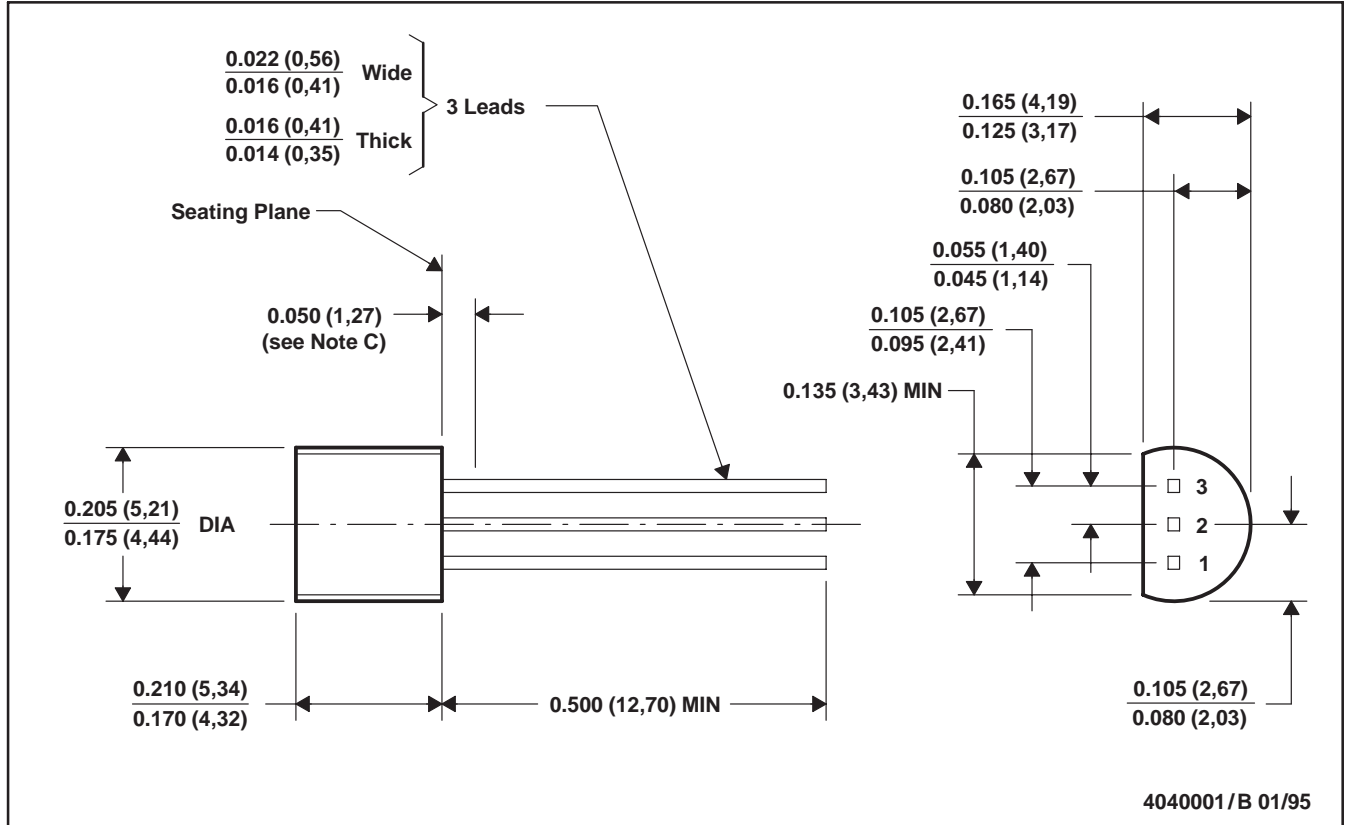
- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Lead dimensions are not controlled within this area.
 D. All lead dimensions apply before solder dip.
 E. The center lead is in electrical contact with the mounting tab.
 F. The chamfer is optional.
 G. Falls within JEDEC TO-220AB
 H. Tab contour optional within these dimensions



MECHANICAL DATA

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Lead dimensions are not controlled within this area.
 D. Falls within JEDEC TO-226AA (TO-226AA replaces TO-92)

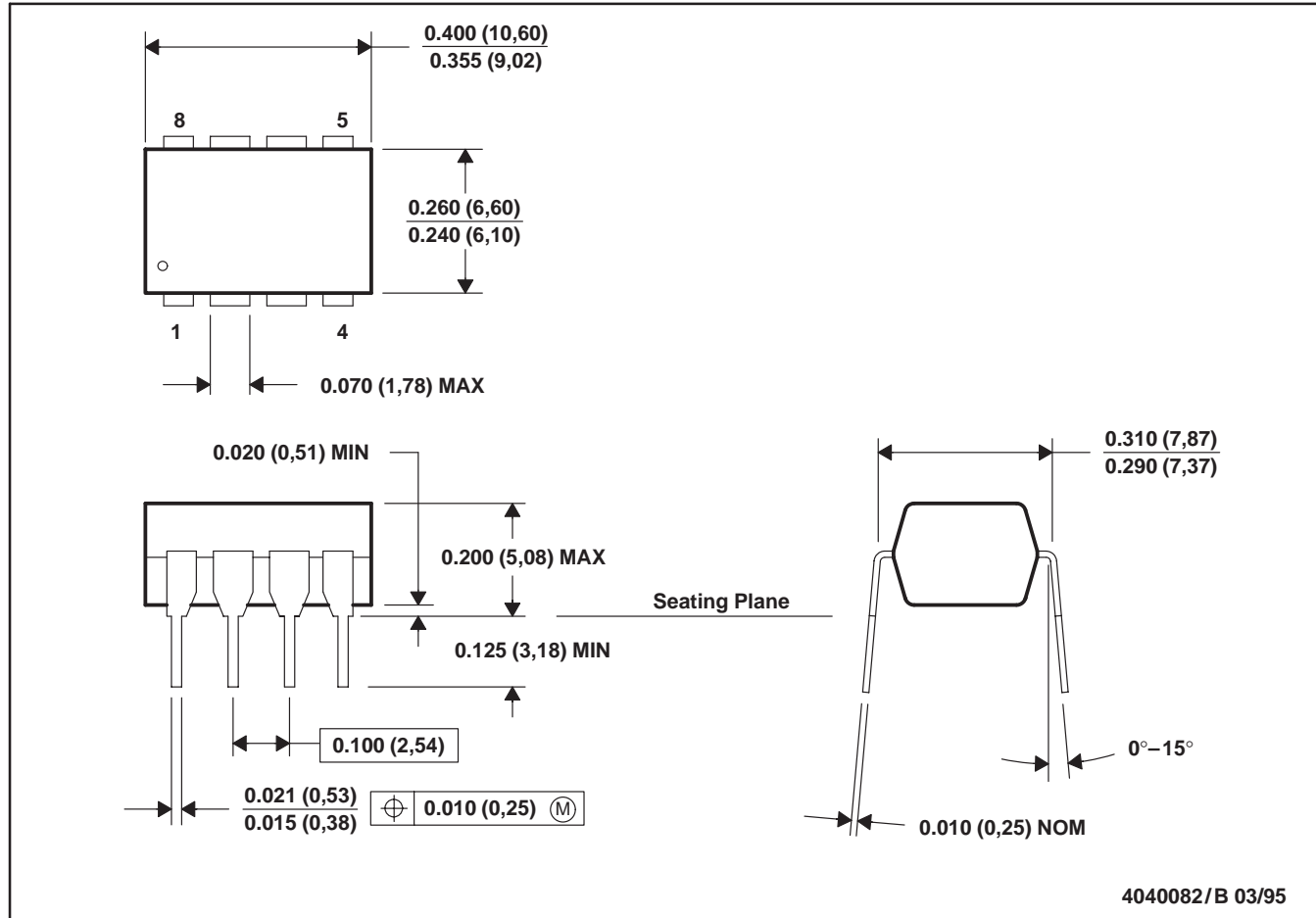
TL750L, TL751L SERIES
TL751L05M, TL751L12M, TL750LxxY
LOW-DROPOUT VOLTAGE REGULATORS

SLVS017G – SEPTEMBER 1987 – REVISED MARCH 1998

MECHANICAL DATA

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-001

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