

# μA7900 SERIES NEGATIVE-VOLTAGE REGULATORS

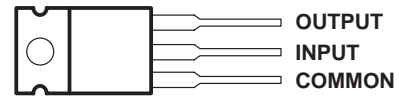
SLVS058A – JUNE 1976 – REVISED OCTOBER 1996

- 3-Terminal Regulators
- Output Current Up to 1.5 A
- No External Components
- Internal Thermal Overload Protection
- High-Power Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Essentially Equivalent to National LM320 Series

## description

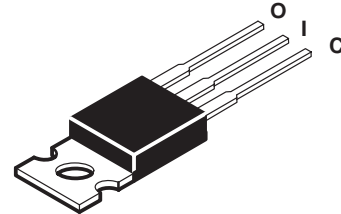
This series of fixed-negative-voltage monolithic integrated-circuit voltage regulators is designed to complement Series μA7800 in a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current limiting and thermal shutdown features of these regulators make them essentially immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents and also as the power pass element in precision regulators.

KC PACKAGE  
(TOP VIEW)

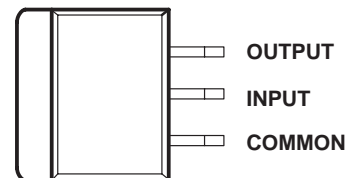


The input terminal is in electrical contact with the mounting base

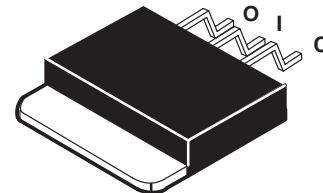
TO-220AB



KTE PACKAGE  
(TOP VIEW)



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



## AVAILABLE OPTIONS

T <sub>A</sub>	V <sub>O(nom)</sub> (V)	PACKAGED DEVICES		CHIP FORM (Y)
		HEAT-SINK MOUNTED (KC)	HEAT-SINK MOUNTED† (KTE)	
0°C to 125°C	-5	μA7905CKC	μA7905CKTE	μA7905Y
	-5.2	μA7952CKC	μA7952CKTE	μA7952Y
	-6	μA7906CKC	μA7906CKTE	μA7906Y
	-8	μA7908CKC	μA7908CKTE	μA7908Y
	-12	μA7912CKC	μA7912CKTE	μA7912Y
	-15	μA7915CKC	μA7915CKTE	μA7915Y
	-18	μA7918CKC	μA7918CKTE	μA7918Y
	-24	μA7924CKC	μA7924CKTE	μA7924Y

† The KTE package is also available taped and reeled.



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**

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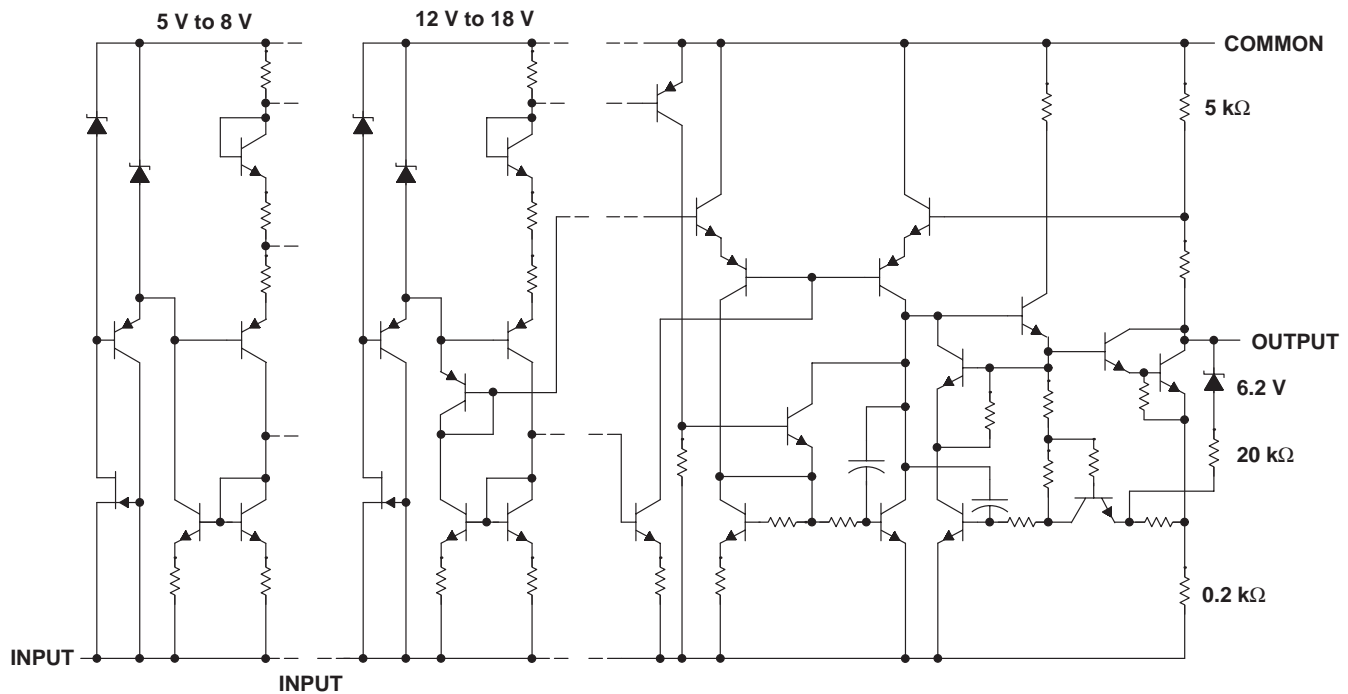
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## schematic



All component values are nominal.

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

Input voltage, $V_I$ : $\mu A7924C$ .....	-40 V
All others .....	-35 V
Continuous total power dissipation at (or below): $T_A = 25^\circ C$ (see Note 1) ...	See Dissipation Rating Tables
$T_C = 90^\circ C$ (see Note 1) ...	See Dissipation Rating Tables
Operating free-air, $T_A$ , case, $T_C$ , or virtual junction, $T_J$ , temperature range .....	0 to $150^\circ C$
Storage temperature range, $T_{stg}$ .....	-65 to $150^\circ C$
Lead temperature 3.2 mm (1/8 inch) from case for 10 seconds .....	$260^\circ C$

NOTE 1: For operation above  $25^\circ C$  free-air or  $90^\circ C$  case temperature, refer to Figures 1 and 2. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

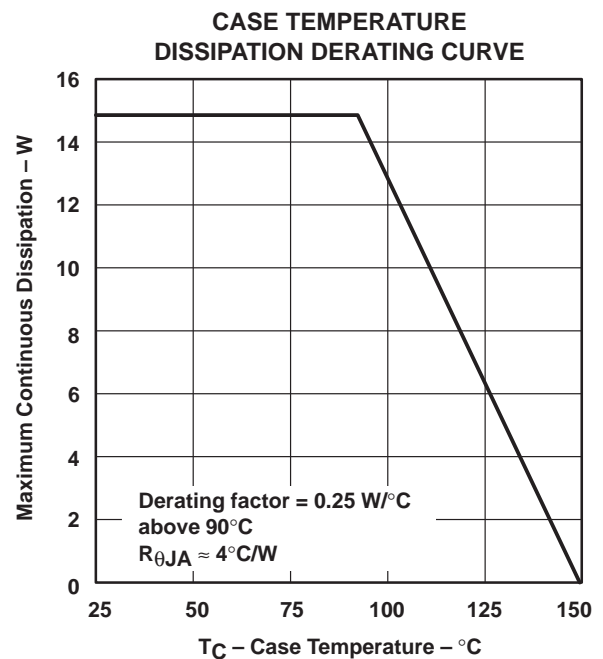
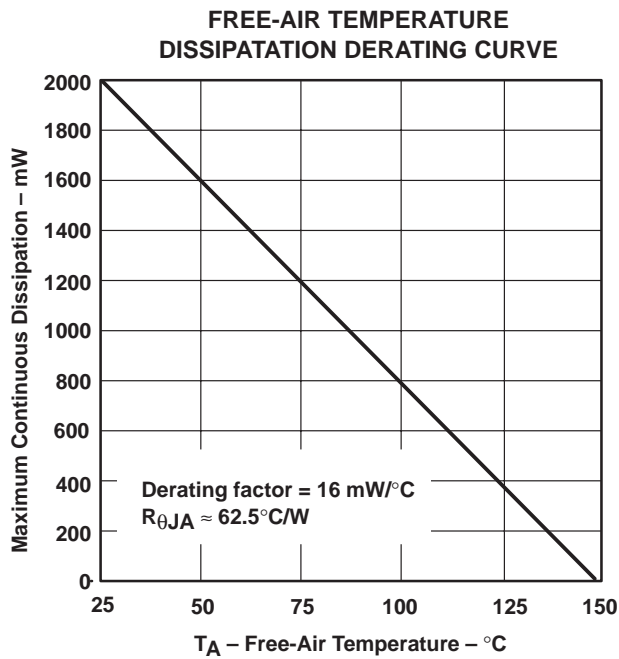
DISSIPATION RATING TABLE — FREE-AIR TEMPERATURE

PACKAGE	$T_A \leq 25^\circ C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ C$	$T_A = 70^\circ C$ POWER RATING	$T_A = 105^\circ C$ POWER RATING	$T_A = 125^\circ C$ POWER RATING
KC	2000 mW	16.0 mW/ $^\circ C$	1280 mW	720 mW	400 mW
KTE	1900 mW	15.2 mW/ $^\circ C$	1216 mW	684 mW	380 mW

DISSIPATION RATING TABLE — CASE TEMPERATURE

PACKAGE	$T_C \leq 90^\circ C$ POWER RATING	DERATING FACTOR ABOVE $T_C = 90^\circ C$	$T_A = 125^\circ C$ POWER RATING
KC	15000 mW	250.0 mW/ $^\circ C$	6250 mW
KTE	14300 mW	238.0 mW/ $^\circ C$	5970 mW





**recommended operating conditions**

		MIN	MAX	UNIT
Input voltage, $V_I$	μA7905C	-7	-25	V
	μA7952C	-7.2	-25	
	μA7906C	-8	-25	
	μA7908C	-10.5	-25	
	μA7912C	-14.5	-30	
	μA7915C	-17.5	-30	
	μA7918C	-21	-33	
	μA7924C	-27	-28	
Output current, $I_O$			1.5	A
Operating virtual junction temperature, $T_J$		0	125	°C

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**electrical characteristics at specified virtual junction temperature,  $V_I = -10$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7905C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-4.8	-5	-5.2	V
	$I_O = 5$ mA to 1 A, $P \leq 15$ W $V_I = -7$ V to -20 V,	0°C to 125°C	-4.75		-5.25	
Input regulation	$V_I = -7$ V to -25 V			12.5	50	mV
	$V_I = -8$ V to -12 V			4	15	
Ripple rejection	$V_I = -8$ V to -18 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			15	100	mV
	$I_O = 250$ mA to 750 mA			5	50	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C	-0.4			mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		125		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -7$ V to -25 V			0.15	0.5	mA
	$I_O = 5$ mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

**electrical characteristics at specified virtual junction temperature,  $V_I = -10$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7952C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-5	-5.2	-5.4	V
	$I_O = 5$ mA to 1 A, $P \leq 15$ W $V_I = -7.2$ V to -20 V,	0°C to 125°C	-4.95		-5.45	
Input regulation	$V_I = -7.2$ V to -25 V			12.5	100	mV
	$V_I = -8.2$ V to -12 V			4	50	
Ripple rejection	$V_I = -8.2$ V to -18 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			15	100	mV
	$I_O = 250$ mA to 750 mA			5	50	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C	-0.4			mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		125		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -7.2$ V to -25 V			0.15	1.3	mA
	$I_O = 5$ mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

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**electrical characteristics at specified virtual junction temperature,  $V_I = -11$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7906C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-5.75	-6	-6.25	V
	$I_O = 5$ mA to 1 A, $V_I = -8$ V to -21 V, $P \leq 15$ W	0°C to 125°C	-5.7		-6.3	
Input regulation	$V_I = -8$ V to -25 V			12.5	120	mV
	$V_I = -9$ V to -13 V			4	60	
Ripple rejection	$V_I = -9$ V to -19 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			15	120	mV
	$I_O = 250$ mA to 750 mA			5	60	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C		-0.4		mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		150		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -8$ V to -25 V			0.15	1.3	mA
	$I_O = 5$ mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

**electrical characteristics at specified virtual junction temperature,  $V_I = -14$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7908C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-7.7	-8	-8.3	V
	$I_O = 5$ mA to 1 A, $V_I = -10.5$ V to -23 V, $P \leq 15$ W	0°C to 125°C	-7.6		-8.4	
Input regulation	$V_I = -10.5$ V to -25 V			12.5	160	mV
	$V_I = -11$ V to -17 V			4	80	
Ripple rejection	$V_I = -11.5$ V to -21.5 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			15	160	mV
	$I_O = 250$ mA to 750 mA			5	80	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C		-0.6		mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		200		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -10.5$ V to -25 V			0.15	1	mA
	$I_O = 5$ mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.



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electrical characteristics at specified virtual junction temperature,  $V_I = -19\text{ V}$ ,  $I_O = 500\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7912C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-11.5	-12	-12.5	V
	$I_O = 5\text{ mA to }1\text{ A}$ , $V_I = -14.5\text{ V to }-27\text{ V}$ , $P \leq 15\text{ W}$	0°C to 125°C	-11.4		-12.6	
Input regulation	$V_I = -14.5\text{ V to }-30\text{ V}$			5	80	mV
	$V_I = -16\text{ V to }-22\text{ V}$			3	30	
Ripple rejection	$V_I = -15\text{ V to }-25\text{ V}$ , $f = 120\text{ Hz}$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5\text{ mA to }1.5\text{ A}$			15	200	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			5	75	
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C		-0.8		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		300		μV
Dropout voltage	$I_O = 1\text{ A}$	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -14.5\text{ V to }-30\text{ V}$			0.04	0.5	mA
	$I_O = 5\text{ mA to }1\text{ A}$			0.06	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

electrical characteristics at specified virtual junction temperature,  $V_I = -23\text{ V}$ ,  $I_O = 500\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7915C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-14.4	-15	-15.6	V
	$I_O = 5\text{ mA to }1\text{ A}$ , $V_I = -17.5\text{ V to }-30\text{ V}$ , $P \leq 15\text{ W}$	0°C to 125°C	-14.25		-15.75	
Input regulation	$V_I = -17.5\text{ V to }-30\text{ V}$			5	100	mV
	$V_I = -20\text{ V to }-26\text{ V}$			3	50	
Ripple rejection	$V_I = -18.5\text{ V to }-28.5\text{ V}$ , $f = 120\text{ Hz}$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5\text{ mA to }1.5\text{ A}$			20	300	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			8	150	
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		375		μV
Dropout voltage	$I_O = 1\text{ A}$	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -17.5\text{ V to }-30\text{ V}$			0.04	0.5	mA
	$I_O = 5\text{ mA to }1\text{ A}$			0.06	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

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**electrical characteristics at specified virtual junction temperature,  $V_I = -27$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7918C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-17.3	-18	-18.7	V
	$I_O = 5$ mA to 1 A, $V_I = -21$ V to -33 V, $P \leq 15$ W	0°C to 125°C	-17.1		-18.9	
Input regulation	$V_I = -21$ V to -33 V			5	360	mV
	$V_I = -24$ V to -30 V			3	180	
Ripple rejection	$V_I = -22$ V to -32 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			30	360	mV
	$I_O = 250$ mA to 750 mA			10	180	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C		-1		mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		450		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -21$ V to -33 V			0.04	1	mA
	$I_O = 5$ mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

**electrical characteristics at specified virtual junction temperature,  $V_I = -33$  V,  $I_O = 500$  mA (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA7924C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	-23	-24	-25	V
	$I_O = 5$ mA to 1 A, $V_I = -27$ V to -38 V, $P \leq 15$ W	0°C to 125°C	-22.8		-25.2	
Input regulation	$V_I = -27$ V to -38 V			5	480	mV
	$V_I = -30$ V to -36 V			3	240	
Ripple rejection	$V_I = -28$ V to -38 V, $f = 120$ Hz	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5$ mA to 1.5 A			85	480	mV
	$I_O = 250$ mA to 750 mA			25	240	
Temperature coefficient of output voltage	$I_O = 5$ mA	0°C to 125°C		-1		mV/°C
Output noise voltage	$f = 10$ Hz to 100 kHz	25°C		600		μV
Dropout voltage	$I_O = 1$ A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -27$ V to -38 V			0.04	1	mA
	$I_O = 5$ mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† 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 2-μF capacitor across the input and a 1-μF capacitor across the output.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

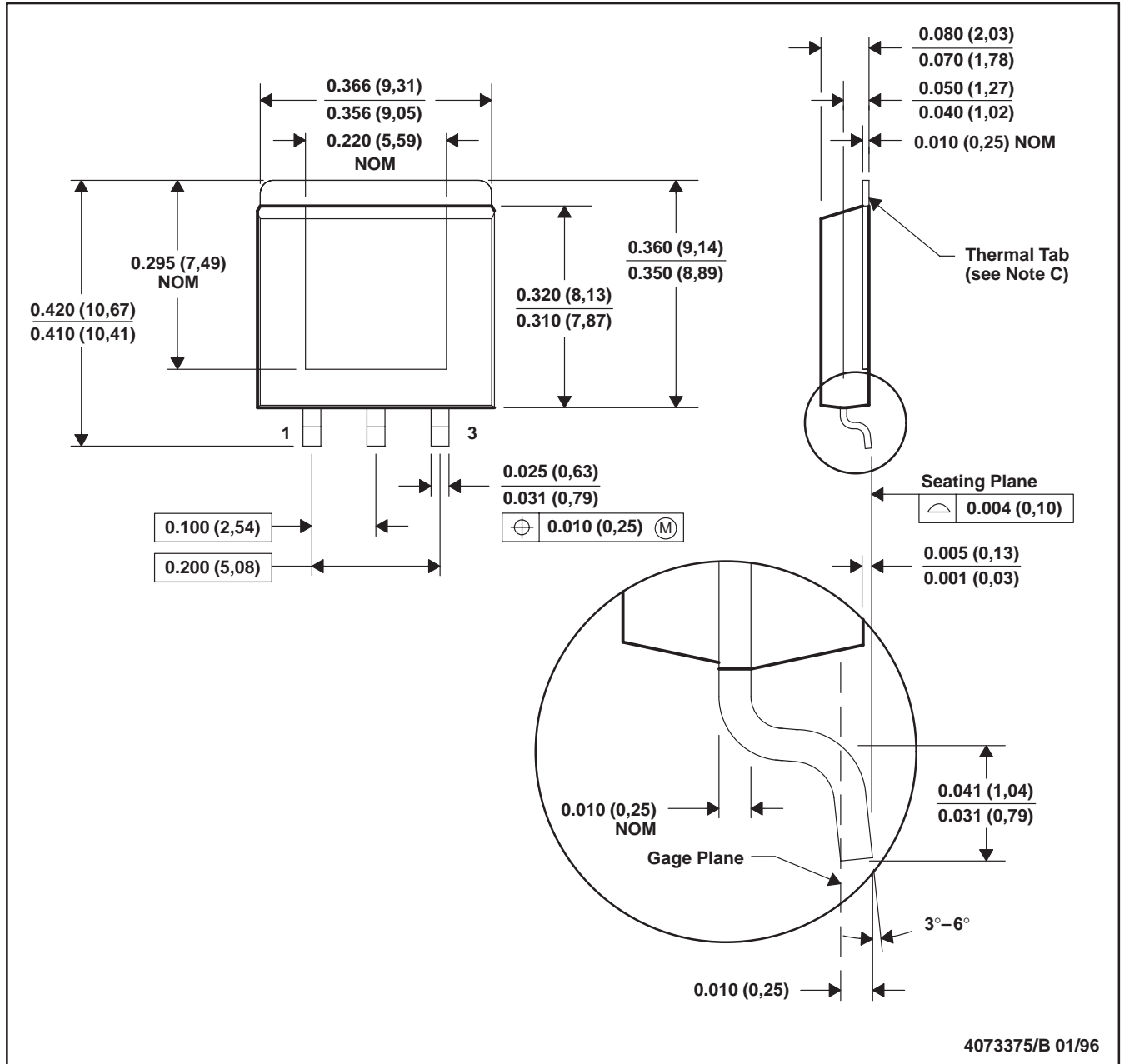




MECHANICAL INFORMATION

KTE (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. The center lead is in electrical contact with the thermal tab.

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