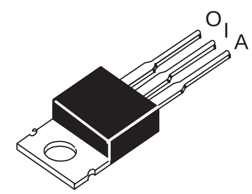
- **Output Voltage Range Adjustable From –1.2 V to –37 V**
- **Output Current Capability of 1.5 A Max**
- **Input Regulation Typically 0.01% Per Input-Voltage Change**
- **Output Regulation Typically 0.3%**
- **Peak Output Current Constant Over Temperature Range of Regulator**
- **Ripple Rejection Typically 77 dB**
- **Direct Replacement for National Semiconductor LM237 and LM337**

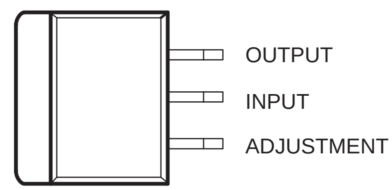
KC PACKAGE
(TOP VIEW)

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

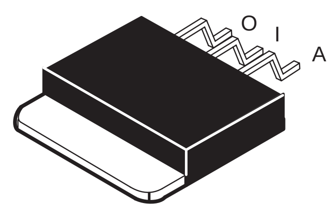
TO-220AB



KTE PACKAGE
(TOP VIEW)



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



description

The LM237 and LM337 are adjustable 3-terminal negative-voltage regulators capable of supplying in excess of –1.5 A over an output voltage range of –1.2 V to –37 V. They are exceptionally easy to use, requiring only two external resistors to set the output voltage and one output capacitor for frequency compensation. The current design has been optimized for excellent regulation and low thermal transients. In addition, the LM237 and LM337 feature internal current limiting, thermal shutdown, and safe-area compensation, making them virtually immune to blowout by overloads.

The LM237 and LM337 serve a wide variety of applications including local on-card regulation, programmable output voltage regulation, and precision current regulation.

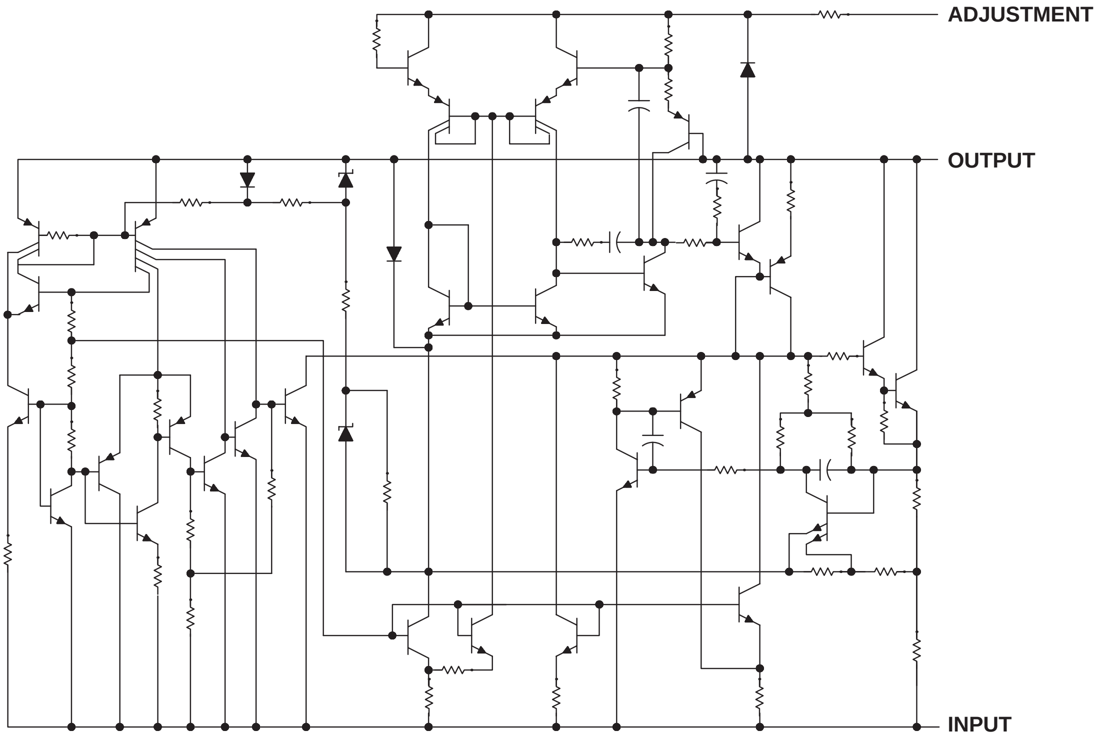
AVAILABLE OPTIONS

T_J	PACKAGED DEVICES		CHIP FORM (Y)
	HEAT-SINK MOUNTED (KC)	PLASTIC FLANGE MOUNTED (KTE)†	
–25°C to 150°C	LM237KC	LM237KTE	—
0°C to 125°C	LM337KC	LM337KTE	LM337Y

† The KTE package is also avaiable 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.

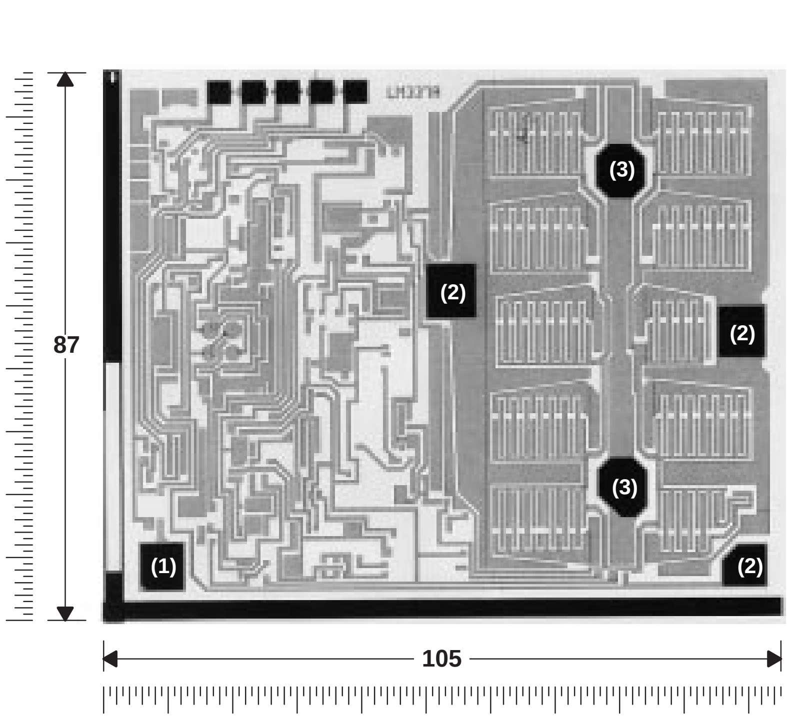
schematic diagram

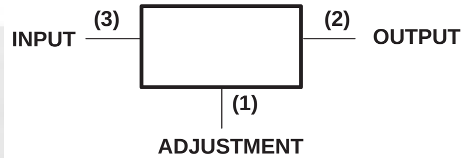


LM337Y chip information

This chip, when properly assembled, displays characteristics similar to the LM337C. Thermal compression or ultrasonic bonding can be used on the doped aluminum bonding pads. This chip can be mounted with solder, conductive epoxy or a gold-silicon preform. Solder mount is recommended for optimum thermal performance.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS: 15 MILS TYPICAL

BONDING PADS: 4 × 4 MILS MINIMUM

$T_J$max = 150°C

TOLERANCES ARE ±10%

ALL DIMENSIONS ARE IN MILS

NOTE A: All number-2 bonding pads and both number-3 bonding pads must be bonded out to the corresponding terminals.

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

Input-to-output differential voltage, $V_I - V_O$ . . . . –40 V
Continuous total power dissipation at (or below): T_A = 25°C (see Note 1) . . . See Dissipation Rating Tables
T_C = 90°C (see Note 1) . . . See Dissipation Rating Tables
Operating free-air, T_A, case, T_C, or virtual junction, T_J, temperature range: LM237 . . . . –25°C to 150°C
LM337 . . . . 0°C to 125°C
Storage temperature range, T_{stg} . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . 260°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: For operation above 25°C operating free-air or 90°C case temperature, refer to Figure 1 and Figure 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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 105°C POWER RATING	T_A = 125°C POWER RATING
KC	2000 mW	16.0 mW/°C	1280 mW	720 mW	400 mW
KTE	1900 mW	15.2 mW/°C	1216 mW	684 mW	380 mW

DISSIPATION RATING TABLE — CASE TEMPERATURE

PACKAGE	$T_C \le 90°C$ POWER RATING	DERATING FACTOR ABOVE T_C = 90°C	T_C = 125°C POWER RATING
KC	15000 mW	250.0 mW/°C	6250 mW
KTE	14300 mW	238.0 mW/°C	5970 mW

FREE-AIR TEMPERATURE DISSIPATION DERATING CURVE

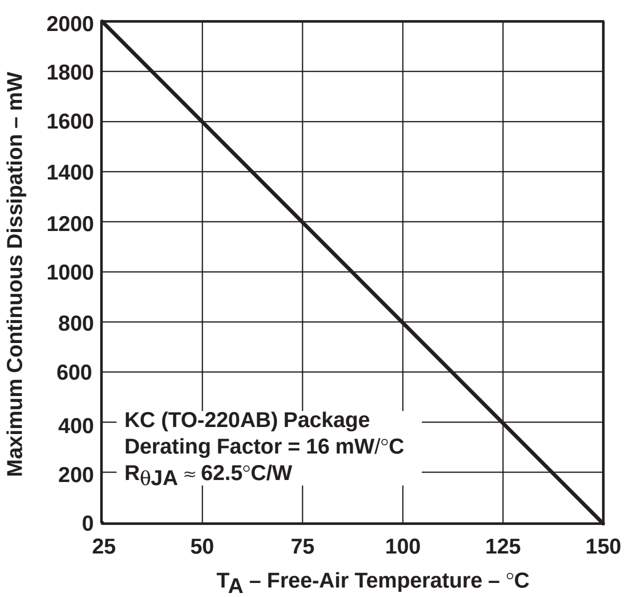


Figure 1

CASE TEMPERATURE DISSIPATION DERATING CURVE

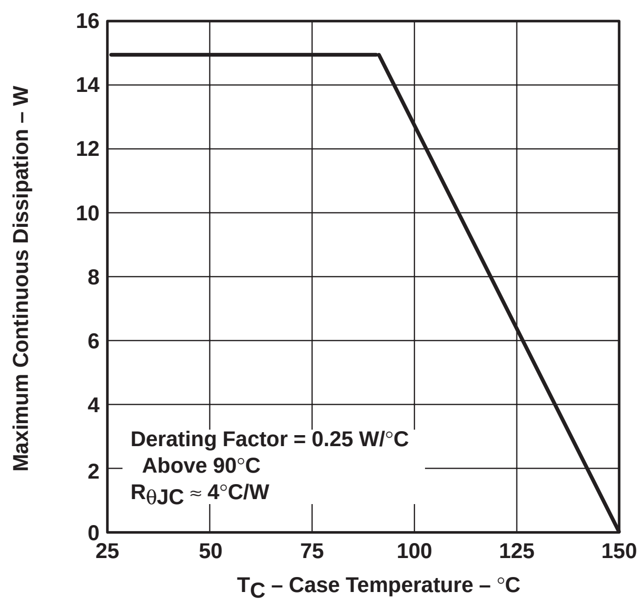


Figure 2

recommended operating conditions

			LM237		LM337		UNIT
			MIN	MAX	MIN	MAX	
Output current, I_O	$\lvert V_I - V_O \rvert \le 40$ V,	$P \le 15$ W	10	1500	10	1500	mA
	$\lvert V_I - V_O \rvert \le 10$ V,	$P \le 15$ W	6	1500	6	1500	mA
Operating virtual junction temperature, T_J			–25	150	0	125	°C

electrical characteristics over recommended ranges of operating virtual junction temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		LM237			LM337			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Input regulation‡	$V_I - V_O = -3$ V to -40 V	$T_J = 25°C$		0.01	0.02		0.01	0.04	%/V
		T_J = MIN to MAX		0.02	0.05		0.02	0.07	%/V
Ripple rejection	$V_O = -10$ V,	f = 120 Hz		60			60		dB
	$V_O = -10$ V, $C_{ADJ} = 10\ \mu F$	f = 120 Hz,	66	77		66	77		dB
Output regulation	I_O = 10 mA to 1.5 A, $T_J = 25°C$	$\lvert V_O \rvert \le 5$ V			25			50	mV
		$\lvert V_O \rvert \ge 5$ V		0.3%	0.5%		0.3%	1%	
	I_O = 10 mA to 1.5 A	$\lvert V_O \rvert \le 5$ V			50			70	mV
		$\lvert V_O \rvert \ge 5$ V			1%			1.5%	
Output voltage change with temperature	T_J = MIN to MAX			0.6%			0.6%		
Output voltage long-term drift (see Note 2)	After 1000 h at T_J = MAX and $V_I - V_O = -40$ V			0.3%	1%		0.3%	1%	
Output noise voltage	f = 10 Hz to 10 kHz,	$T_J = 25°C$		0.003%			0.003%		
Minimum output current to maintain regulation	$\lvert V_I - V_O \rvert \le 40$ V			2.5	5		2.5	10	mA
	$\lvert V_I - V_O \rvert \le 10$ V			1.2	3		1.5	6	mA
Peak output current	$\lvert V_I - V_O \rvert \le 15$ V		1.5	2.2		1.5	2.2		A
	$\lvert V_I - V_O \rvert \le 40$ V,	$T_J = 25°C$	0.24	0.4		0.15	0.4		A
Adjustment-terminal current				65	100		65	100	µA
Change in adjustment-terminal current	$V_I - V_O = -2.5$ V to -40 V, I_O = 10 mA to MAX	$T_J = 25°C$,		2	5		2	5	µA
Reference voltage (output to ADJ)	$V_I - V_O = -3$ V to -40 V, I_O = 10 mA to 1.5 A, $P \le$ rated dissipation	$T_J = 25°C$	–1.225	–1.25	–1.275	–1.213	–1.25	–1.287	V
		T_J = MIN to MAX	–1.2	–1.25	–1.3	–1.2	–1.25	–1.3	V
Thermal regulation	Initial $T_J = 25°C$,	10-ms pulse		0.002	0.02		0.003	0.04	%/W

† Unless otherwise noted, these specifications apply for the following test conditions $\lvert V_I - V_O \rvert = 5$ V and $I_O = 0.5$ A. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions. All characteristics are measured with a 0.1-µF capacitor across the input and a 1-µF capacitor across the output. 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.

‡ Input regulation is expressed here as the percentage change in output voltage per 1-V change at the input.

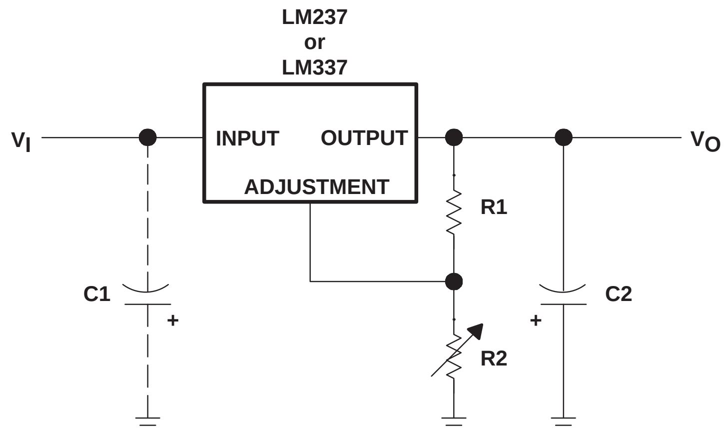
NOTE 2: Since long-term drift cannot be measured on the individual devices prior to shipment, this specification is not intended to be a warranty. It is an engineering estimate of the average drift to be expected from lot to lot.

electrical characteristics, T_J = 25°C

PARAMETER	TEST CONDITIONS†		MIN	TYP	MAX	UNIT
Input regulation‡	$V_I - V_O$ = –3 V to –40 V			0.01	0.04	%/V
Ripple rejection	V_O = –10 V, f = 120 Hz			60		dB
	V_O = –10 V, C_{ADJ} = 10 µF, f = 120 Hz		66	77		
Output regulation	I_O = 10 mA to 1.5 A	$\|V_O\| \le 5$ V			50	mV
		$\|V_O\| \ge 5$ V		0.3%	1%	
Output noise voltage	f = 10 Hz to 10 kHz			0.003%		
Minimum output current to maintain regulation	$\|V_I - V_O\| \le 40$ V			2.5	10	mA
	$\|V_I - V_O\| \le 10$ V			1.5	6	
Peak output current	$\|V_I - V_O\| \le 15$ V		1.5	2.2		A
	$\|V_I - V_O\| \le 40$ V		0.15	0.4		
Adjustment-terminal current				65	100	µA
Change in adjustment-terminal current	$V_I - V_O$ = – 2.5 V to –40 V, I_O = 10 mA to MAX			2	5	µA
Reference voltage (output to ADJ)	$V_I - V_O$ = – 3 V to –40 V, I_O = 10 mA to 1.5 A, P ≤ rated dissipation		–1.213	–1.25	–1.287	V

† Unless otherwise noted, these specifications apply for the following test conditions $|V_I - V_O|$ = 5 V and I_O = 0.5 A. All characteristics are measured with a 0.1-µF capacitor across the input and a 1-µF capacitor across the output. 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.
‡ Input regulation is expressed here as the percentage change in output voltage per 1-V change at the input.

APPLICATION INFORMATION

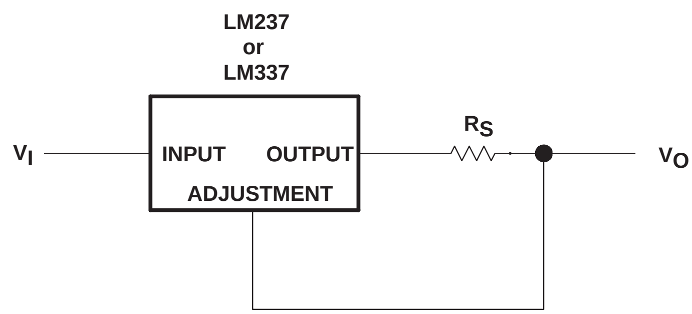


R1 is typically 120 Ω.

$$R2 = R1\left(\frac{-V_O}{-1.25} - 1\right)$$ where V_O is the output in volts.

C1 is a 1-µF solid tantalum capacitor required only if the regulator is more than 10 cm (4 in) from the power supply filter capacitor.
C2 is a 1-µF solid tantalum or 10-µF aluminum electrolytic capacitor required for stability.

Figure 3. Adjustable Negative-Voltage Regulator

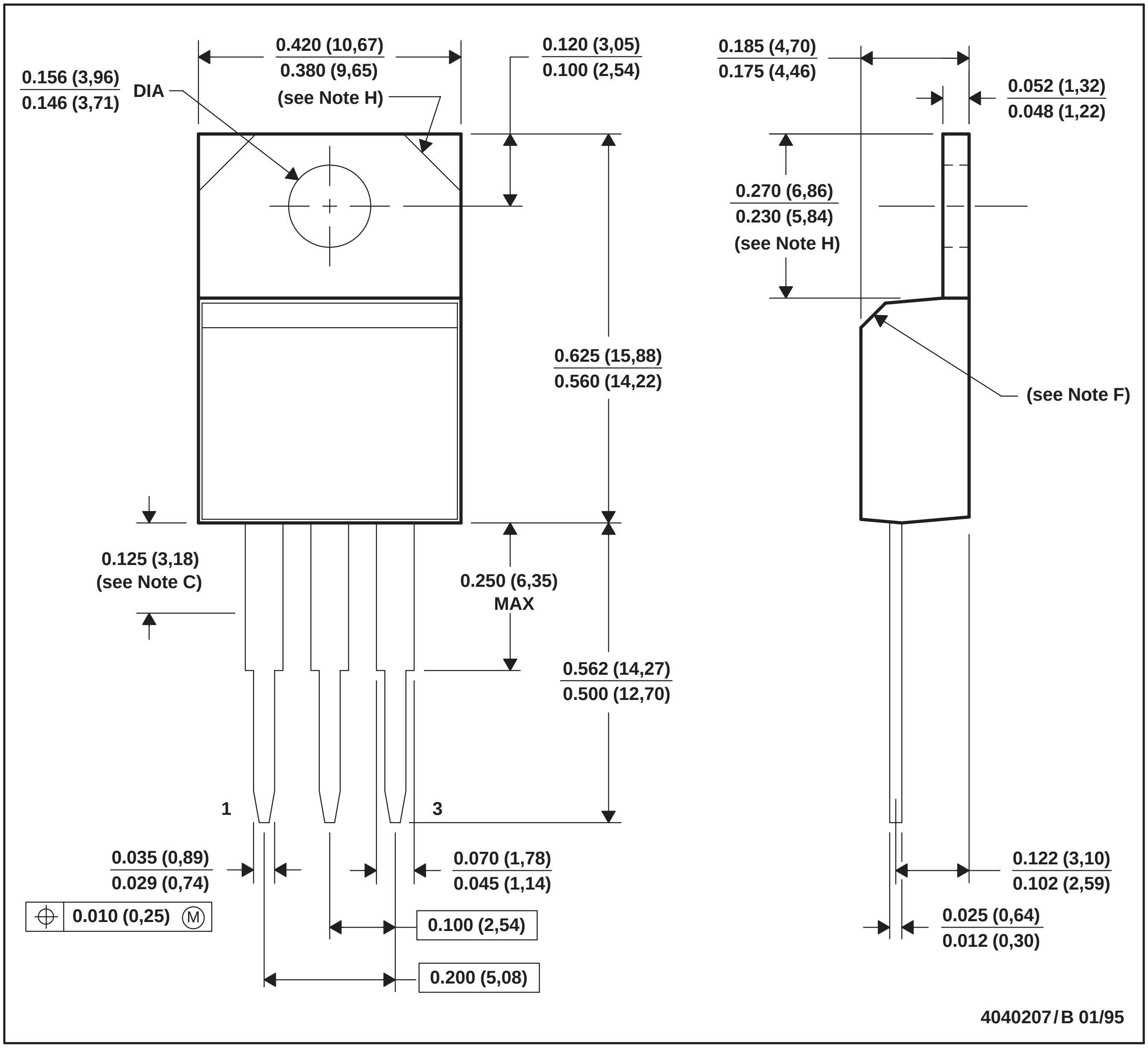


$$R_S = \frac{1.25\ \text{V}}{I_{LIMIT}}$$

Figure 4. Current-Limiting Circuit

MECHANICAL INFORMATION

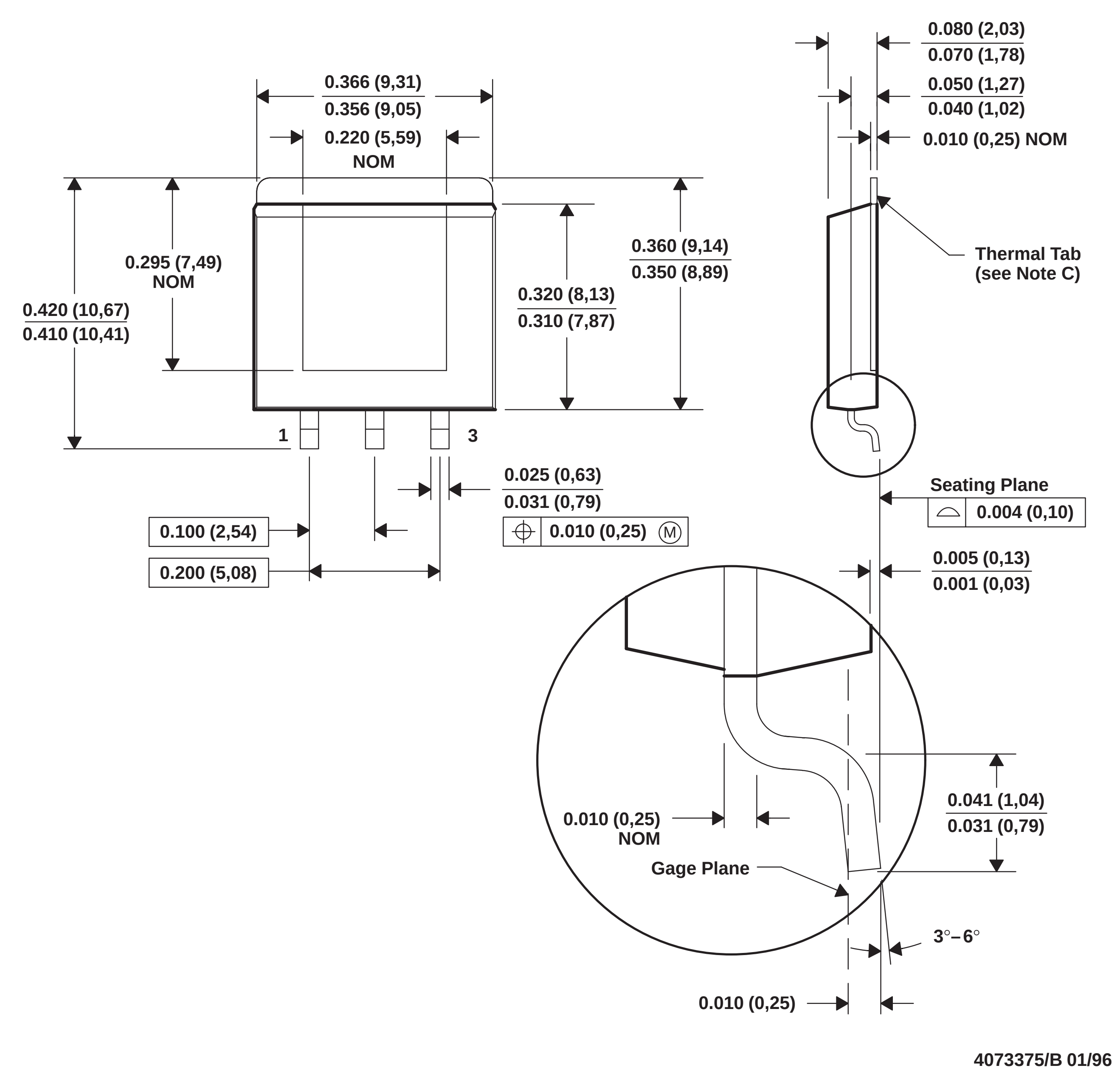
KC (R-PSFM-T3) **PLASTIC FLANGE-MOUNT PACKAGE**



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 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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