NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC337

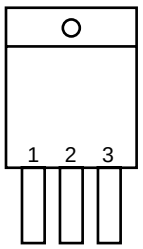
3-TERMINAL NEGATIVE ADJUSTABLE REGULATOR

The μPC337 is an adjustable 3-terminal negative voltage regulator, which has 1.5 A capable for the output current. The output voltage can be set any value between –1.3 V and –30 V by two external resistors.

FEATURES

- Output current excess of 1.5 A
- On-chip some protection circuit (over current protection, SOA protection and thermal shut down).

★ PIN CONFIGURATION (Marking Side)

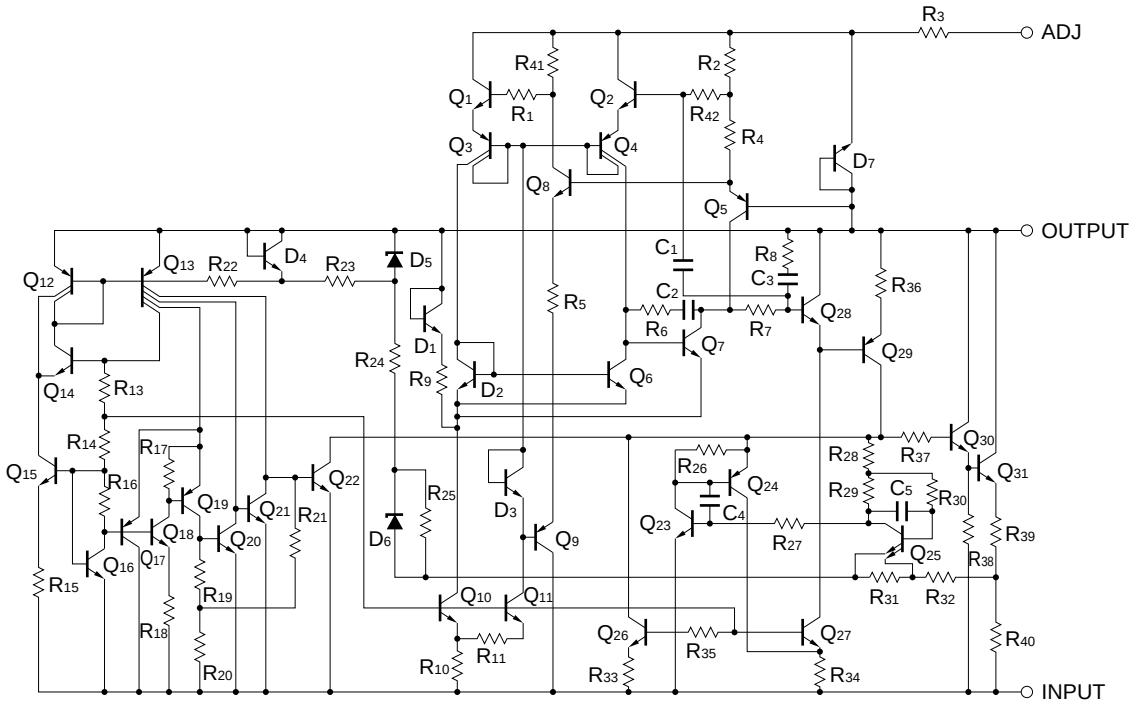


1 : ADJ
2 : INPUT
3 : OUTPUT

★ ORDERING INFORMATION

Part Number	Package
μPC337HF	3-pin plastic SIP (MP-45G) (isolated TO-220)

EQUIVALENT CIRCUIT



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The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified.)

	Parameter	Symbol	Rating	Unit
	Input-Output Voltage Differential	$V_{IN} - V_O$	–40	V
★	Total Power Dissipation	P_T	15[Note]	V
	Operating Ambient Temperature	T_A	–20 to +85	°C
	Operating Junction Temperature	T_J	–20 to +150	°C
	Storage Temperature	T_{stg}	–65 to +150	°C
★	Thermal Resistance (junction to case)	$R_{th(J-C)}$	7	°C/W
★	Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	65	°C/W

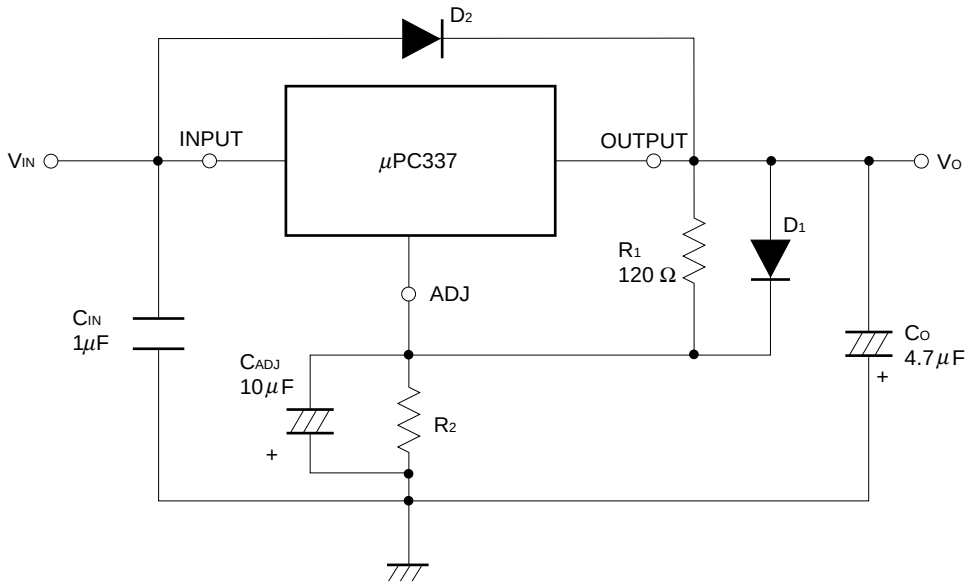
Note Internally limited.
When operating junction temperature rise up to 150 °C (≤200 °C), the internal circuit shutdown output voltage.

★ **Caution Exposure to Absolute Maximum Ratings for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The parameters apply independently. The device should be operated within the limits specified under DC and AC Characteristics.**

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input-Output Voltage Differential	$V_{IN} - V_O$	–3	–5	–38.7	V
Input Voltage	V_{IN}	–4.3		–40	V
Output Voltage	V_O	–1.3		–30	V
Output Current	I_O	0.01		1.5	A
Operating Junction Temperature	T_J	–20		+125	°C

★ TYPICAL CONNECTION



Remark R_1, R_2 : Resistor to set the output voltage.

$$V_O = (1 + \frac{R_2}{R_1}) \cdot V_{REF} + I_{ADJ} \cdot R_2 \fallingdotseq (1 + \frac{R_2}{R_1}) \cdot V_{REF}$$

V_O (V)	R_2 (Ω : TYP.)
–1.25	0
–2.5	120
–5.0	360
–12	1032
–24	2184
–30	2760

C_{IN} : Need to stop the oscillation for the long input wiring length.

C_O : Need to stop the oscillation for the long output wiring length.
Improve the transient stability of the output voltage when the lord current is suddently changed.

C_{ADJ} : Improve the ripple rejection and the oscillate rejection.

D_1 : Protect against C_{ADJ} from output short.

D_2 : Need for $V_{IN} > V_O$.

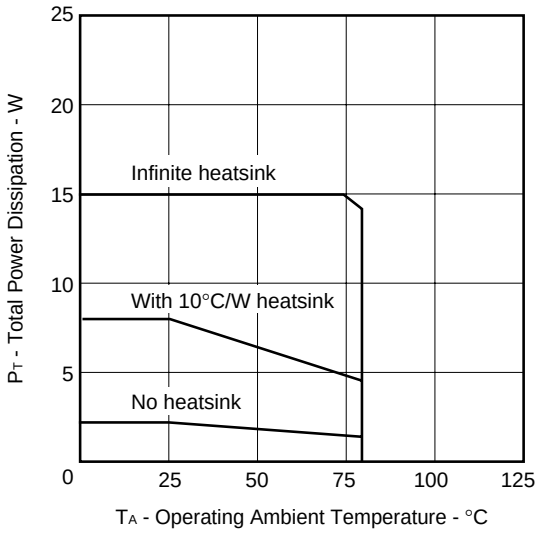
ELECTRICAL CHARACTERISTICS (V_{IN} – V_O = –5 V, I_O = 0.5 A, 0 °C ≤ T_J ≤ +125 °C, unless otherwise specified.)

	Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit
	Line Regulation	REG_{IN}	T_J = 25 °C, 3 V ≤ | V_{IN} – V_O | ≤ 40 V[Note]			0.005	0.04	%/V
			0 °C ≤ T_J ≤ 125 °C, 3 V ≤ | V_{IN} – V_O | ≤ 40 V[Note]			0.01	0.07	%/V
	Load Regulation	REG_L	T_J = 25 °C,	| V_O | ≤ 5 V		30	50	mV
			10 mA ≤ I_O ≤ 1.5 A[Note]	| V_O | ≥ 5 V		0.6	1.0	%
			0 °C ≤ T_J ≤ 125 °C,	| V_O | ≤ 5 V		45	70	mV
			10 mA ≤ I_O ≤ 1.5 A[Note]	| V_O | ≥ 5 V		0.9	1.5	%
	Thermal Regulation	REG_{TH}	T_J = 25 °C, | V_{IN} – V_O | = 40 V, V_O = –10 V, 0 A ≤ I_O ≤ 0.25 A, t = 10 ms			0.005	0.04	%/W
	ADJ pin Output Current	I_{ADJ}				60	100	μA
★	I_{ADJ} Change	ΔI_{ADJ}	T_J = 25 °C, 3 V ≤ | V_{IN} – V_O | ≤ 40 V, 10 mA ≤ I_O ≤ 1.5 A, P_T ≤ 15 W			2	5	μA
★	Reference Voltage	V_{REF}	3 V ≤ | V_{IN} – V_O | ≤ 40 V, 10 mA ≤ I_O ≤ 1.5 A, P_T ≤ 15 W		–1.20	–1.25	–1.30	V
	Temperature Stability of V_{REF}	$\Delta V_{REF}/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA			–0.6		%
	Minimum Load Current	$I_{OMIN.}$	| V_{IN} – V_O | = 40 V			2.1	10	mA
	Peak Output Current	I_{Opeak}	3 V ≤ | V_{IN} – V_O | ≤ 15 V		1.5	2.3	2.9	A
			T_J = 25 °C, | V_{IN} – V_O | = 40 V		0.15	0.8		A
	Output Noise Voltage (RMS)	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 10 kHz			0.002		%
	Ripple Rejection	R • R	T_J = 25 °C, ΔV_{IN} = 1 $V_{r.m.s}$	C_{ADJ} = 0		60		dB
			f = 120 Hz, V_O = –10 V	C_{ADJ} = 10 μF	66	75		dB

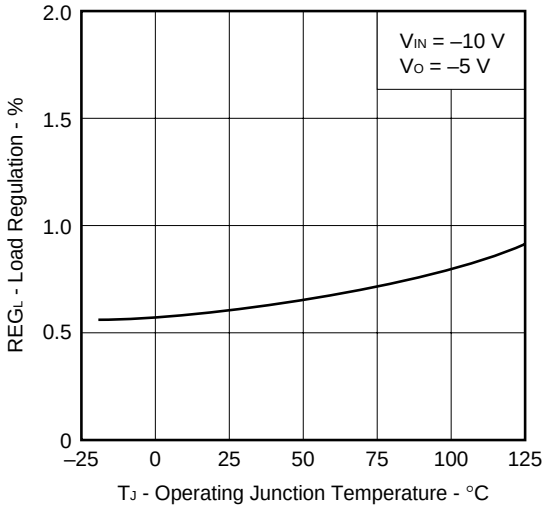
Note Measured at constant junction temperature, using pulse testing with a low duty cycle. PW = 10 ms, Duty Cycle ≤ 2 %

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified.)

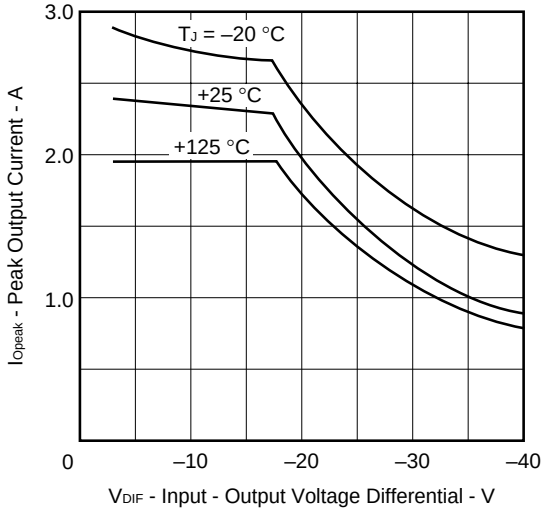
★ P_T vs T_A



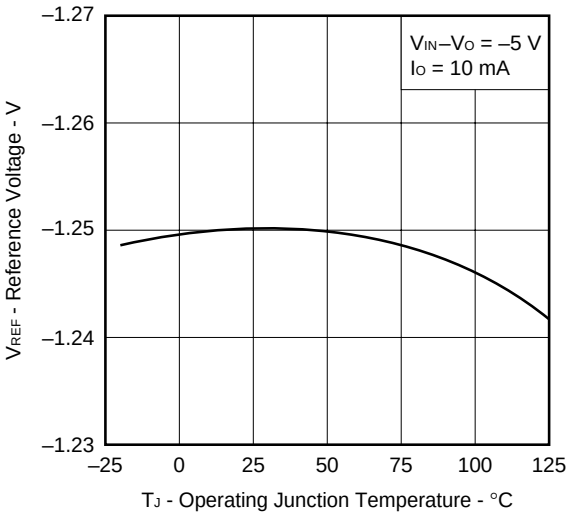
REG_L vs T_J



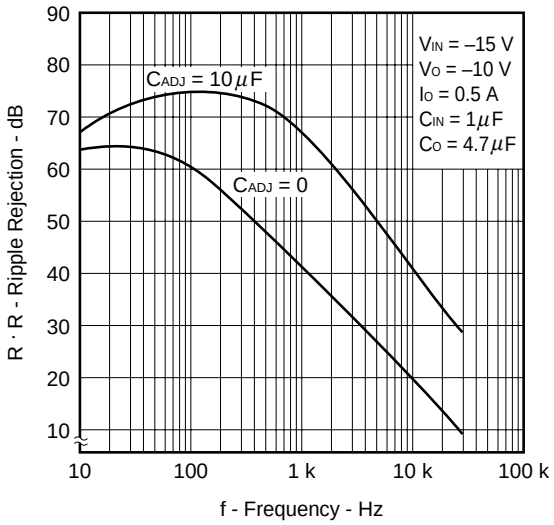
I_{Opeak} vs V_{DIF}



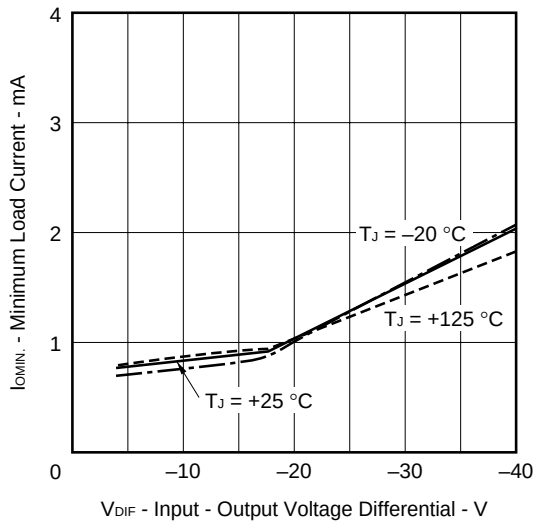
V_{REF} vs T_J



R · R vs V_O

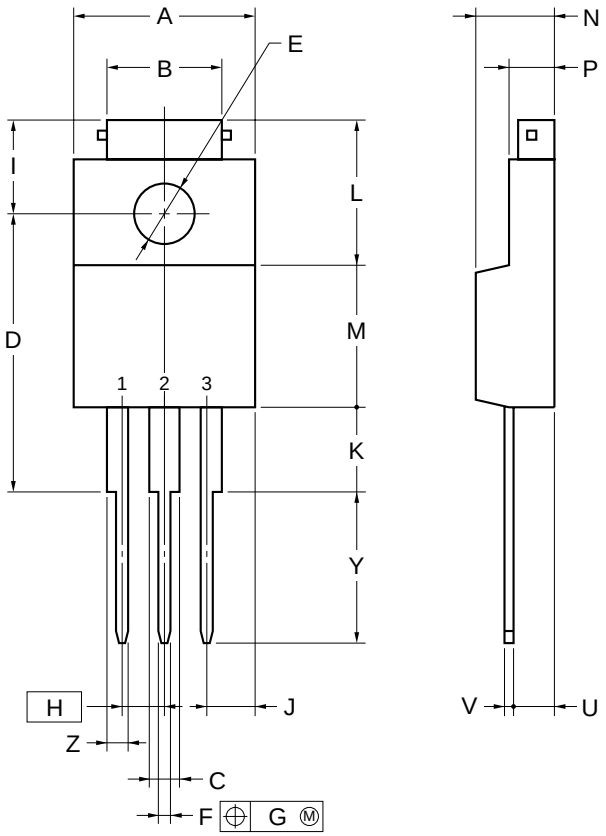


$I_{OMIN.}$ vs V_{DIF}



★ **PACKAGE DRAWING**

3PIN PLASTIC SIP (MP-45G)



NOTE

Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	10.0±0.2
B	7.0±0.2
C	1.50±0.2
D	17.0±0.3
E	φ3.3±0.2
F	0.75±0.10
G	0.25
H	2.54 (T.P.)
I	5.0±0.3
J	2.46±0.2
K	5.0±0.2
L	8.5±0.2
M	8.5±0.2
N	4.5±0.2
P	2.8±0.2
U	2.4±0.5
V	0.65±0.10
Y	8.9±0.7
Z	1.30±0.2

P3HF-254B-4

★ RECOMMENDED SOLDERING CONDITIONS

When soldering these products, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document **"SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E)**.

Type of Through-hole Devices

μPC337HF: 3-pin plastic SIP (MP-45G)

Process	Conditions
Wave soldering (only to leads)	Solder temperature: 260 °C or below, Flow time: 10 seconds or less.
Partial heating method	Pin temperature: 300 °C or below, Heat time: 3 seconds or less (per each lead).

Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.

★ REFERENCE DOCUMENTS

QUALITY GRADES ON NEC SEMICONDUCTOR DEVICES	C11531E
SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL	C10535E
NEC IC PACKAGE MANUAL (CD-ROM)	C13388E
GUIDE TO QUALITY ASSURANCE FOR SEMICONDUCTOR DEVICES	MEI-1202
SEMICONDUCTORS SELECTION GUIDE	X10679E
NEC SEMICONDUCTOR DEVICE RELIABILITY/QUALITY CONTROL SYSTEM –THREE TERMINAL REGULATOR	IEI-1212

[MEMO]