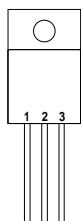


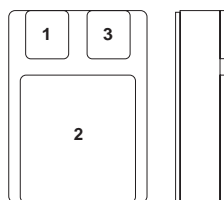
Pin 1 – ADJ.
 Pin 2 – V_{IN}
 Pin 3 – V_{OUT}
 Case – V_{IN}

G Package – (TO-257AA)



Pin 1 – ADJ.
 Pin 2 – V_{IN}
 Pin 3 – V_{OUT}

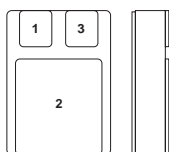
**IG Package – (TO-257AA)
 (Isolated)**



Pin 1 – ADJ.
 Pin 2 – V_{IN}
 Pin 3 – V_{OUT}

SMD1 (TO276AB)

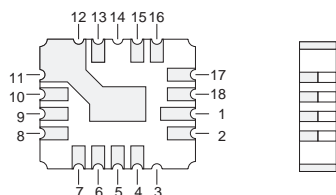
CERAMIC SURFACE MOUNT



Pin 1 – ADJ.
 Pin 2 – V_{IN}
 Pin 3 – V_{OUT}

SMD05 (TO-276AA)

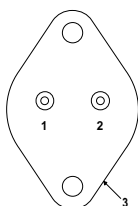
CERAMIC SURFACE MOUNT



Pins 4,5 – ADJ.
 Pins 6,7,8,9,10,11,12,13 – V_{OUT}
 Pins 15,16,17,18,1,2 – V_{IN}

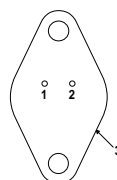
LCC4

CERAMIC SURFACE MOUNT



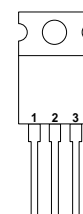
Pin 1 – ADJ.
 Pin 2 – V_{OUT}
 Case – V_{IN}

K Package – TO-3 (TO-204AA)



Pin 1 – ADJ.
 Pin 2 – V_{OUT}
 Case – V_{IN}

**R Package – TO-66
 (TO-213AA)**



Pin 1 – ADJ.
 Pin 2 – V_{IN}
 Pin 3 – V_{OUT}
 Case – V_{IN}

T Package – TO-220

1.5 AMP NEGATIVE ADJUSTABLE VOLTAGE REGULATOR

FEATURES

- **OUTPUT VOLTAGE RANGE OF:**
 1.25 TO 40V FOR STANDARD VERSION
 1.25 TO 50V FOR –HV VERSION
- **1% OUTPUT VOLTAGE TOLERANCE**
- **0.3% LOAD REGULATION**
- **0.01%/V LINE REGULATION**
- **COMPLETE SERIES OF PROTECTIONS:**
 - **CURRENT LIMITING**
 - **THERMAL SHUTDOWN**
 - **SOA CONTROL**

ABSOLUTE MAXIMUM RATINGS ($T_{case} = 25^{\circ}C$ unless otherwise stated)

V_{I-O}	Input - Output Differential Voltage	– Standard – HV Series	40V 50V
I_O	Output Current		Internally limited
P_D	Power Dissipation		Internally limited
T_j	Operating Junction Temperature Range		See Order Information Table
T_{stg}	Storage Temperature		-65 to 150°C

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Parameter	Test Conditions	IP137A , IP137AHV LM137A , LM137AHV			IP137 , IP137HV LM137 , LM137HV			Units	
		Min.	Typ.	Max.	Min.	Typ.	Max.		
V _{REF} Reference Voltage	I _{OUT} = 10mA	-1.238	-1.25	-1.262	-1.225	-1.25	-1.275	V	
	I _{OUT} = 10mA to I _{MAX} T _J = -55 to 150°C V _{IN} - V _{OUT} = 3V to V _{MAX} P ≤ P _{MAX}	-1.220	-1.25	-1.280	-1.200	-1.250	-1.300	V	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Line Regulation 1	V _{IN} - V _{OUT} = 3V to V _{MAX} T _J = -55 to 150°C	0.005	0.010		0.010	0.020	%V		
		0.010	0.030		0.020	0.050			
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	I _{OUT} = 10mA to I _{MAX} V _{OUT} ≤ 5V	5	25		15	25	mV		
		0.1	0.5		0.3	0.5	%		
	I _{OUT} = 10mA to I _{MAX} V _{OUT} ≤ 5V T _J = -55 to 150°C	10	50		20	50	mV		
		0.2	1		0.3	1	%		
Thermal Regulation	t _p = 10ms T _A = 25°C LCC4 Package	0.002	0.020		0.002	0.02	%W		
				0.040		0.040			
Ripple Rejection	V _{OUT} = -10V f = 120Hz C _{ADJ} = 0 C _{ADJ} = 10μF T _J = -55 to 150°C	60	66		60		dB		
		70	80		66	77	dB		
I _{ADJ} Adjust Pin Current	T _J = -55 to 150°C		65	100		65	100	μA	
ΔI _{ADJ} Adjust Pin Current Change	T _J = -55 to 150°C	I _{OUT} = 10mA to I _{MAX}	0.2	2		0.5	5	μA	
		V _{IN} - V _{OUT} = 3V to 40V	1.0	5		2	5		
		V _{IN} - V _{OUT} = 3V to 50V (HV SERIES)	2.0	6		3	6		
I _{MIN} Minimum Load Current	T _J = -55 to 150°C	V _{IN} - V _{OUT} ≤ 40V	2.5	5		2.5	5	mA	
		V _{IN} - V _{OUT} ≤ 10V	1.2	3		1.2	3		
I _{CL} Current Limit	T _J = -55 to 150°C	V _{IN} - V _{OUT} ≤ 15V	1.5	2.2	3.2	1.5	2.2	3.2	A
		V _{IN} - V _{OUT} = 40V	0.24	0.4	1	0.24	0.4		
		V _{IN} - V _{OUT} = 50V (HV SERIES)	0.2	0.4	0.8	0.2	0.4	0.8	
$\frac{\Delta V_{OUT}}{\Delta TEMP}$ Temperature Stability	T _J = -55 to 150°C		0.6	1.5		0.6		%	
$\frac{\Delta V_{OUT}}{\Delta TIME}$ Long Term Stability	T _A = +125°C t = 1000 Hrs		0.3	1		0.3	1	%	
e _n RMS Output Noise (% of V _{OUT})	f = 10 Hz to 10 kHz T _A = 25°C		0.003			0.003		%	
R _{θJC} Thermal Resistance Junction to Case	K Package		2.3	3		2.3	3	°C/W	
	R Package		5	7		5	7		
	G Package		3	5		3	5		
	LCC4 Package			13			13		

1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured at a point 1/8" from the bottom of the package for the TO-3 and TO-66 packages, at the junction of the wide and narrow portion of the output lead for the SMD packages, and 1/8" below the base of the package on the output pin of the TO-257 package.

2) Test Conditions unless otherwise stated: V_{IN} - V_{OUT} = 5V , I_{OUT} = 0.5A , P_{MAX} = 20W , I_{MAX} = 1.5A , V_{MAX} = 40V for standard series , 50V for HV series.

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Parameter	Test Conditions	IP337A IP337AHV			IP337, IP337HV LM337, LM337HV			Units	
		Min.	Typ.	Max.	Min.	Typ.	Max.		
V _{REF} Reference Voltage	I _{OUT} = 10mA	-1.238	-1.25	-1.262	-1.213	-1.25	-1.287	V	
	I _{OUT} = 10mA to I _{MAX} V _{IN} - V _{OUT} = 3V to V _{MAX} P ≤ P _{MAX} T _J = 0 to 125°C	-1.220	-1.25	-1.280	-1.200	-1.250	-1.300	V	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Line Regulation 1	V _{IN} - V _{OUT} = 3V to V _{MAX} T _J = 0 to 125°C		0.005	0.010		0.010	0.040	%V	
			0.010	0.030		0.020	0.070		
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	I _{OUT} = 10mA to I _{MAX}	V _{OUT} ≤ 5V		5	25		15	50	mV
		V _{OUT} ≥ 5V		0.1	0.5		0.3	1	%
	I _{OUT} = 10mA to I _{MAX} T _J = 0 to 125°C	V _{OUT} ≤ 5V		10	50		20	70	mV
		V _{OUT} ≥ 5V		0.2	1		0.3	1.5	%
Thermal Regulation	t _p = 10ms T _A = 25°C		0.002	0.020		0.003	0.04	%/W	
Ripple Rejection	V _{OUT} = 10V f = 120Hz	C _{ADJ} = 0	60	66		60		dB	
		C _{ADJ} = 10μF T _J = 0 to 125°C	70	80		66	77	dB	
I _{ADJ} Adjust Pin Current	T _J = 0 to 125°C		65	100		65	100	μA	
ΔI _{ADJ} Adjust Pin Current Change	T _J = 0 to 125°C	I _{OUT} = 10mA to I _{MAX}		0.2	2		0.5	5	μA
		V _{IN} - V _{OUT} = 3V to 40V		1.0	5		2	5	
		V _{IN} - V _{OUT} = 3V to 50V (HV SERIES)		2.0	6		3	6	
I _{MIN} Minimum Load Current	T _J = 0 to 125°C	V _{IN} - V _{OUT} ≤ 40V		2.5	5		2.5	10	mA
		V _{IN} - V _{OUT} ≤ 10V		1.2	3		1	6	
I _{CL} Current Limit	T _J = 0 to 125°C	V _{IN} - V _{OUT} ≤ 15V	1.5	2.2	3.5	1.5	2.2	3.5	A
		V _{IN} - V _{OUT} = 40V	0.24	0.4	1	0.15	0.4		
		V _{IN} - V _{OUT} = 50V (HV SERIES)	0.2	0.4	0.8	0.1	0.4	0.8	
$\frac{\Delta V_{OUT}}{\Delta TEMP}$ Temperature Stability	T _J = 0 to 125°C		0.6	1.5		0.6		%	
$\frac{\Delta V_{OUT}}{\Delta TIME}$ Long Term Stability	t = 1000 Hrs		0.3	1		0.3	1	%	
e _n RMS Output Noise (% of V _{OUT})	f = 10 Hz to 10 kHz T _A = 25°C		0.003			0.003		%	
R _{θJC} Thermal Resistance Junction to Case	K Package		2.3	3		2.3	3	°C/W	
	T Package		4	5		4			
	LCC4 Package			13			13		

1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured at a point 1/8" from the bottom of the package for the TO-3 and TO-66 packages, at the junction of the wide and narrow portion of the output lead for the SMD packages, and 1/8" below the base of the package on the output pin of the TO-257 package.

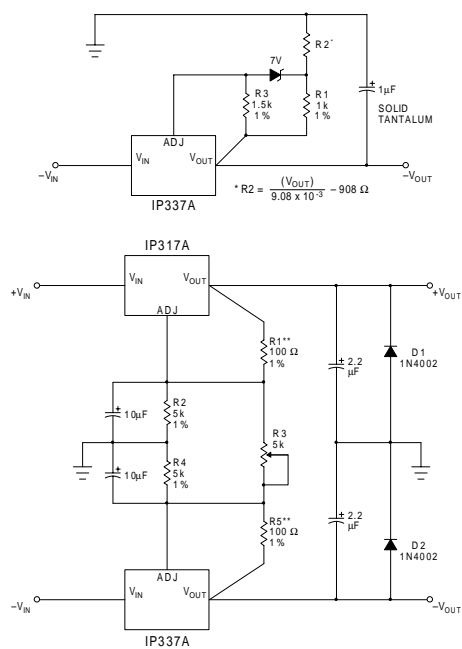
2) Test Conditions unless otherwise stated: V_{IN} - V_{OUT} = 5V, I_{OUT} = 0.5A, P_{MAX} = 20W, I_{MAX} = 1.5A
V_{MAX} = 40V for standard series, 50V for HV series.

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APPLICATIONS INFORMATION

High Stability Regulator

The output stability, load regulation, line regulation, thermal regulation, temperature drift, long term drift, and noise, can be improved by a factor of 6.6 over the standard regulator configuration. This assumes a zener has 20PPM/°C maximum drift and about 10 times lower noise than the regulator.



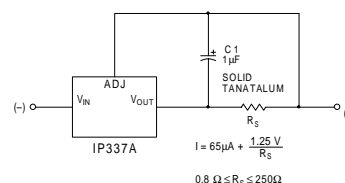
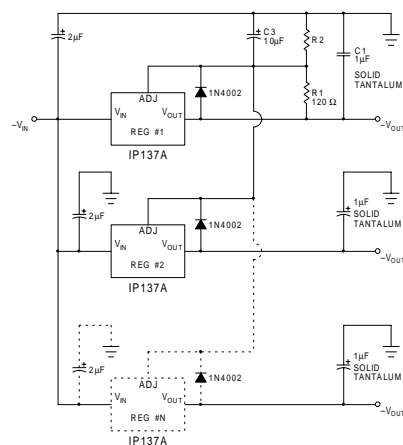
* Solid Tantalum
** R1 or R5 may be trimmed slightly to improve tracking.

Dual Tracking Supply

Multiple Tracking Regulators

In the application shown below, regulator #2 to "N" will track regulator #1 to within $\pm 24\text{mV}$ initially, and to $\pm 60\text{mV}$ over all load, line, and temperature conditions.

If any regulator output is shorted to ground, all other outputs will drop to -2V . Load regulation of regulators 2 to "N" will be improved by $V_{\text{OUT}} / 1.25\text{V}$ compared to a standard regulator, so regulator #1 should be the one which has the lowest load current.



Current Regulator

Order Information

Part Number	IG-Pack G-Pack (TO257)	SMD1	SMD05	LCC4	K-Pack (TO3)	R-Pack (TO66)	T-Pack (TO220)	Temp. Range
LM137	✓	✓	✓	✓	✓	✓		-55 to +150°C
LM137HV	✓	✓	✓	✓	✓	✓		"
LM137A	✓	✓	✓	✓	✓	✓		"
LM137AHV	✓	✓	✓	✓	✓	✓		"
IP137	✓	✓	✓	✓	✓	✓		"
IP137HV	✓	✓	✓	✓	✓	✓		"
IP137A	✓	✓	✓	✓	✓	✓		"
IP137AHV	✓	✓	✓	✓	✓	✓		"
LM337					✓		✓	0 to 125°C
LM337HV					✓		✓	"
IP337					✓		✓	"
IP337HV					✓		✓	"
IP337A					✓		✓	"
IP337AHV					✓		✓	"

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