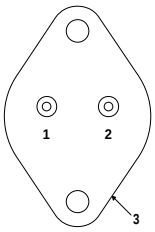
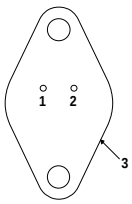
IP137 SERIES LM137 SERIES
IP137A SERIES LM137A SERIES
IP337 SERIES
IP337A SERIES



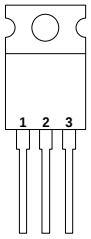
Pin 1 – ADJ.
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO–3



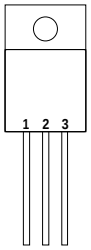
Pin 1 – ADJ.
Pin 2 – V_{OUT}
Case – V_{IN}

R Package – TO–66



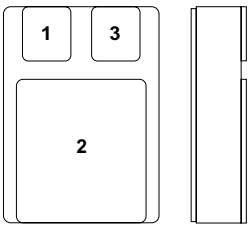
Pin 1 – ADJ.
Pin 2 – V_{IN}
Pin 3 – V_{OUT}
Case – V_{IN}

T Package – TO–220



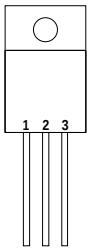
Pin 1 – ADJ.
Pin 2 – V_{IN}
Pin 3 – V_{OUT}
Case – V_{IN}

G Package – TO–257



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

SG Package – SMD1
CERAMIC SURFACE MOUNT



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

IG Package – TO–257 (Isolated)

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°C unless otherwise stated)

$V_{I–O}$	Input - Output Differential Voltage	– Standard	40V
		– HV Series	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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IP137 SERIES LM137 SERIES
IP137A SERIES LM137A SERIES
IP337 SERIES
IP337A SERIES

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} $V_{IN} - V_{OUT}$ = 3V to V_{MAX} $P \le P_{MAX}$ T_J = -55 to 150°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}			0.005	0.010		0.010	0.020	%/V
			T_J = -55 to 150°C		0.010	0.030		0.020	0.050	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation [1]	I_{OUT} = 10mA to I_{MAX}	$V_{OUT} \le 5V$		5	25		15	25	mV
			$V_{OUT} \ge 5V$		0.1	0.5		0.3	0.5	%
		I_{OUT} = 10mA to I_{MAX} T_J = -55 to 150°C	$V_{OUT} \le 5V$		10	50		20	50	mV
			$V_{OUT} \ge 5V$		0.2	1		0.3	1	%
	Thermal Regulation	t_p = 10ms	T_A = 25°C		0.002	0.020		0.002	0.02	%/W
	Ripple Rejection	V_{OUT} = -10V f = 120Hz	C_{ADJ} = 0	60	66			60		dB
			C_{ADJ} = 10µF T_J = -55 to 150°C	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	$V_{IN} - V_{OUT} \le 40V$		2.5	5		2.5	5	mA
			$V_{IN} - V_{OUT} \le 10V$		1.2	3		1.2	3	
I_{CL}	Current Limit	T_J = -55 to 150°C	$V_{IN} - V_{OUT} \le 15V$	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		%
$R_{\theta JC}$	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	

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 SMD1 package, 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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IP137A SERIES LM137A SERIES
IP337 SERIES
IP337A SERIES

Parameter		Test Conditions		IP337AHV Min.	IP337AHV Typ.	IP337AHV Max.	IP337HV LM337HV Min.	IP337HV LM337HV Typ.	IP337HV LM337HV Max.	Units
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} $P \le P_{MAX}$ 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}			0.005	0.010		0.010	0.040	%/V
			T_J = 0 to 125°C		0.010	0.030		0.020	0.070	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation [1]	I_{OUT} = 10mA to I_{MAX}	$V_{OUT} \le 5V$		5	25		15	50	mV
			$V_{OUT} \ge 5V$		0.1	0.5		0.3	1	%
		I_{OUT} = 10mA to I_{MAX} T_J = 0 to 125°C	$V_{OUT} \le 5V$		10	50		20	70	mV
			$V_{OUT} \ge 5V$		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	µA
			$V_{IN} - V_{OUT}$ = 3V to 50V **(HV SERIES)**		2.0	6		3	6	µA
I_{MIN}	Minimum Load Current	T_J = 0 to 125°C	$V_{IN} - V_{OUT} \le 40V$		2.5	5		2.5	10	mA
			$V_{IN} - V_{OUT} \le 10V$		1.2	3		1	6	mA
I_{CL}	Current Limit	T_J = 0 to 125°C	$V_{IN} - V_{OUT} \le 15V$	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		A
			$V_{IN} - V_{OUT}$ = 50V **(HV SERIES)**	0.2	0.4	0.8	0.1	0.4	0.8	A
$\frac{\Delta V_{OUT}}{\Delta TEMP}$	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		%
$R_{\theta JC}$	Thermal Resistance Junction to Case	K Package			2.3	3		2.3	3	°C/W
		T Package			4	5		4		°C/W

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 SMD1 package, 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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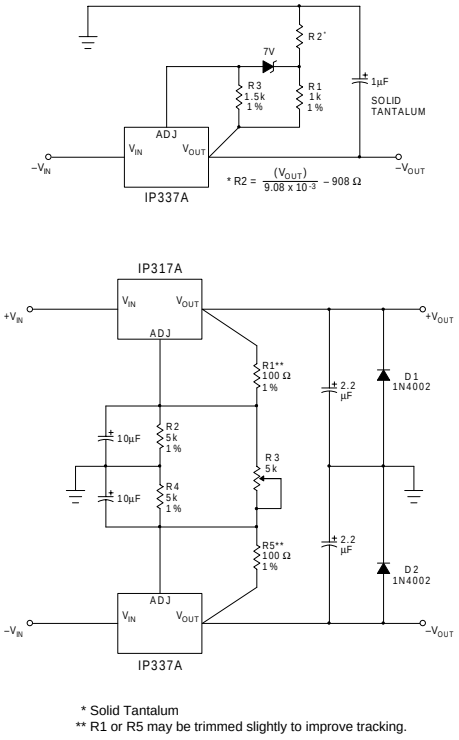
APPLICATIONS INFORMATION

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.



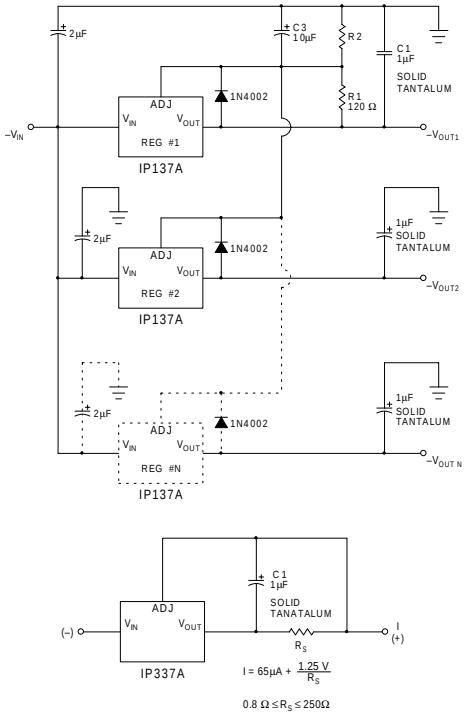
* Solid Tantalum
** R1 or R5 may be trimmed slightly to improve tracking.

Dual Tracking Supply

Multiple Tracking Regulators

In the application shown below, regulator #2 to “N” will track regulator #1 to within ±24mV initially, and to ±60mV 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_{OUT} / 1.25V compared to a standard regulator, so regulator #1 should be the one which has the lowest load current.



Current Regulator

Order Information

Part Number	K–Pack (TO–3)	R–Pack (TO–66)	IG–Pack G–Pack (TO–257)	T–Pack (TO–220)	SG–Pack SMD1	Temp. Range
LM137	✔	✔	✔		✔	-55 to +150°C
LM137HV	✔	✔	✔		✔	”
LM137A	✔	✔	✔		✔	”
LM137AHV	✔	✔	✔		✔	”
IP137	✔	✔	✔		✔	-55 to +150°C
IP137HV	✔	✔	✔		✔	”
IP137A	✔	✔	✔		✔	”
IP137AHV	✔	✔	✔		✔	”
LM337	✔			✔		0 to 125°C
LM337HV	✔			✔		0 to 125°C
IP337	✔			✔		0 to 125°C
IP337HV	✔			✔		”
IP337A	✔			✔		0 to 125°C
IP337AHV	✔			✔		”

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