

4825898 INTEGRATED POWER

82D 00310 D

INTEGRATED POWER

SEMICONDUCTORS, LTD.

5 Amp Positive Adjustable Regulators

T-58-11-23

Description

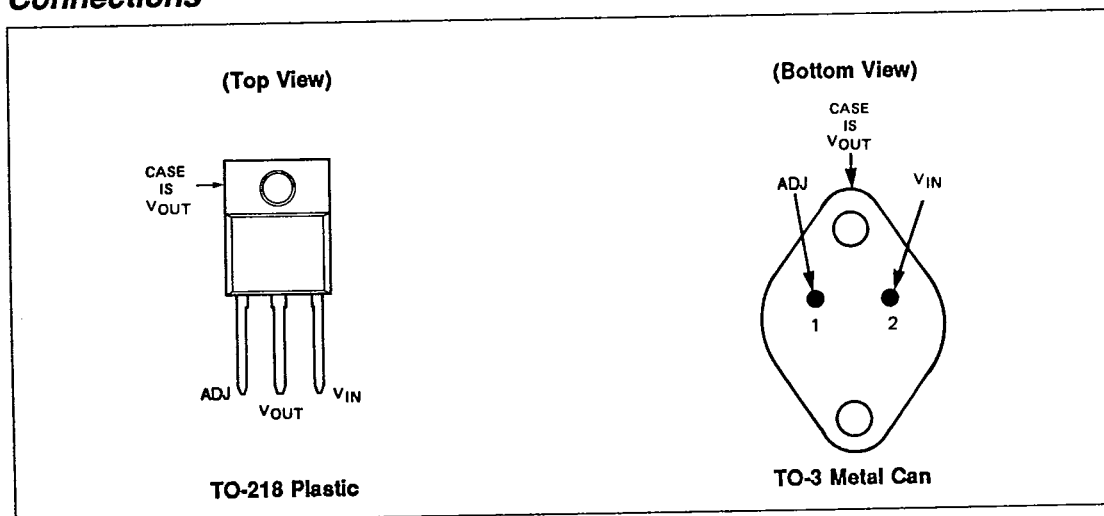
The IP138A series are 3-terminal positive adjustable voltage regulators capable of supplying in excess of 5A over a 1.25V to 35V output range. These regulators are exceptionally easy to use and require only two external resistors to set the output voltage. In addition to improved line and load regulation, a major feature of the "A" series is the initial output voltage tolerance, which is guaranteed to be less than 1%. Over full operating conditions, including load, line and power dissipation, the reference voltage is guaranteed not to vary more than 2%. These devices exhibit current limit, thermal overload protection, and improved power device safe operating area protection, making them essentially indestructible.

Features

- Available in low cost TO-218
- Guaranteed 1% output voltage tolerance
- Guaranteed 0.3% load regulation
- Guaranteed 0.01%/V line regulation
- Internal current limiting constant with temperature
- Internal thermal overload protection
- Improved output transistor safe operating area compensation
- Output adjustable between 1.25V and 35V
- 100% thermal limit burn-in

Section 5 - Voltage Regulators
IP138A, IP238A, IP338A
LM138, LM238, LM338

Connections



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Absolute Maximum Ratings

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Power Dissipation Internally Limited Storage Temperature Range -65°C to +150°C
 Input to Output Voltage Differential 35V Lead Temperature (Soldering, 10 sec.) 300°C

Operating Junction Temperature Range
 IP138A, LM138 -55°C to +150°C
 IP238A, LM238 -25°C to +150°C
 IP338A, LM338 0°C to +125°C

Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits. The electrical characteristics provide conditions for actual device operation.

Electrical Characteristics (Note1)

Parameter	Test Conditions	IP138A IP238A			LM138 LM238			Units
		Min	Typ	Max	Min	Typ	Max	
Reference Voltage, V_{REF}	$I_{OUT} = 10 \text{ mA}$	1.238	1.250	1.262				V
	$3V \leq (V_{IN} - V_{OUT}) \leq 35V$	1.225	1.250	1.270	1.19	1.24	1.29	V
	$10 \text{ mA} \leq I_{OUT} \leq 5A, P \leq 50W$							
Line Regulation, $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$3V \leq (V_{IN} - V_{OUT}) \leq 35V$		0.005	0.010		0.005	0.01	%/V
	(See Note 2)		0.020	0.04		0.020	0.04	%/V
Load Regulation, $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10 \text{ mA} \leq I_{OUT} \leq 5A$		5	15		5	15	mV
	(See Note 2)		0.1	0.3		0.1	0.3	%
	$V_O \leq 5V$		20	30		20	30	mV
	$V_O \geq 5V$		0.3	0.6		0.3	0.6	%
Thermal Regulation	20 msec Pulse		0.002	0.01		0.002	0.01	%/W
Ripple Rejection	$V_{OUT} = 10V, f = 120 \text{ Hz}$		60			60		dB
	$C_{ADJ} = 10\mu F$	60	75		60	75		dB
Adjust Pin Current, I_{ADJ}			45	100		45	100	μA
Adjust Pin Current Change, ΔI_{ADJ}	$10 \text{ mA} \leq I_{OUT} \leq 5A$		0.2	5		0.2	5	μA
	$3V \leq (V_{IN} - V_{OUT}) \leq 35V$							
Minimum Load Current, I_{MIN}	$(V_{IN} - V_{OUT}) = 35V$		3.5	5		3.5	5	mA
Current Limit, I_{SC}	$(V_{IN} - V_{OUT}) \leq 10V$		5	8		5	8	A
	DC		7	12		7	12	A
	0.5ms peak		1			1		A
	$(V_{IN} - V_{OUT}) = 30V$							
Temperature Stability, $\frac{\Delta V_{OUT}}{\Delta TEMP}$			1	2		1		%
Long Term Stability, $\frac{\Delta V_{OUT}}{\Delta TIME}$	$T_A = 125^\circ C, 1000 \text{ Hrs}$		0.3	1		0.3	1	%
RMS Output Noise (% of V_{OUT}), e_n	$10 \text{ Hz} \leq f \leq 10 \text{ kHz}$		0.001			0.001		%
Thermal Resistance Junction to Case, θ_{jc}	K Package			1			1	$^\circ C/W$

Section 5 - Voltage Regulators
 IP138A, IP238A, IP338A
 LM138, LM238, LM338

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Electrical Characteristics (Note 1)

Parameter	Test Conditions	IP338A			LM338			Units
		Min	Typ	Max	Min	Typ	Max	
Reference Voltage, V_{REF}	$I_{OUT} = 10 \text{ mA}$	1.238	1.250	1.262				V
	$3\text{V} \leq (V_{IN} - V_{OUT}) \leq 35\text{V}$	• 1.225	1.250	1.270	1.19	1.24	1.29	V
	$10\text{mA} \leq I_{OUT} \leq 5\text{A}$, $P \leq 50\text{W}$							
Line Regulation, $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$3\text{V} \leq (V_{IN} - V_{OUT}) \leq 35\text{V}$		0.005	0.01		0.005	0.03	%/V
	(See Note 2)	•	0.02	0.04		0.020	0.06	%/V
Load Regulation, $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10\text{mA} \leq I_{OUT} \leq 5\text{A}$		5	15		5	25	mV
	(See Note 2)							
	$V_O \geq 5\text{V}$		0.1	0.3		0.1	0.5	%
	$V_O \leq 5\text{V}$	•	20	30		20	50	mV
Thermal Regulation	$V_O \geq 5\text{V}$	•	0.3	0.6		0.3	1	%
	20 msec Pulse		0.002	0.02		0.002	0.02	%/W
Ripple Rejection	$V_{OUT} = 10\text{V}$, $C_{ADJ} = 0$	•	60			60		dB
	$f = 120 \text{ Hz}$, $C_{ADJ} = 10\mu\text{F}$	• 60	75		60	75		dB
Adjust Pin Current, I_{ADJ}		•	45	100		45	100	μA
Adjust Pin Current Change, ΔI_{ADJ}	$10\text{mA} \leq I_{OUT} \leq 5\text{A}$, $3\text{V} \leq (V_{IN} - V_{OUT}) \leq 35\text{V}$	•	0.2	5		0.2	5	μA
Minimum Load Current, I_{MIN}	$(V_{IN} - V_{OUT}) = 35\text{V}$	•	3.5	10		3.5	10	mA
Current Limit, I_{SC}	$(V_{IN} - V_{OUT}) \leq 10\text{V}$	•	5	8		5	8	A
	DC	•	6	12		6	12	A
	$(V_{IN} - V_{OUT}) = 30\text{V}$		1			1		A
Temperature Stability, $\frac{\Delta V_{OUT}}{\Delta T_{EMP}}$		•	1	2		1		%
Long Term Stability, $\frac{\Delta V_{OUT}}{\Delta T_{IME}}$	$T_A = 125^\circ\text{C}$, 1000 hrs		0.3	1		0.3	1	%
RMS Output Noise (% of V_{OUT}), e_n	$10\text{Hz} \leq f \leq 10\text{kHz}$		0.001			0.003		%
Thermal Resistance Junction to Case, θ_{JC}	K Package			1			1	$^\circ\text{C/W}$
	V Package			1			1	$^\circ\text{C/W}$

The • denotes the specifications which apply over the full operating temperature range, all others apply at $T_J = 25^\circ\text{C}$ unless otherwise specified.

Note 1. Unless otherwise specified, these specifications apply for $V_{IN} - V_{OUT} = 5\text{V}$, $I_{OUT} = 2.5\text{A}$. Although power dissipation is internally limited, these specifications apply for dissipations of 50W and $I_{MAX} = 5\text{A}$.

Note 2. 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 from the bottom of the package for the TO-3, and at the junction of the wide and narrow portion of the output lead for the TO-218.

Section 5 - Voltage Regulators
IP138A, IP238A, IP338A
LM138, LM238, LM338

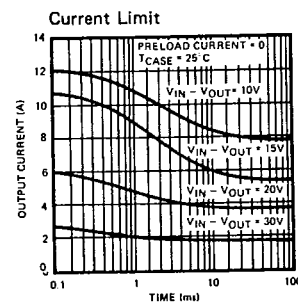
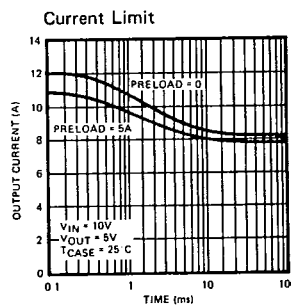
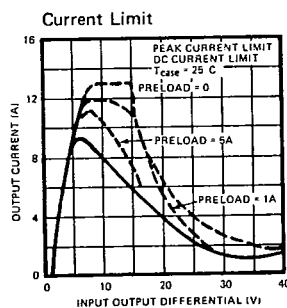
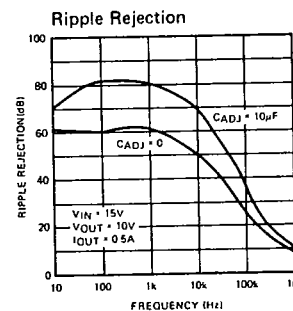
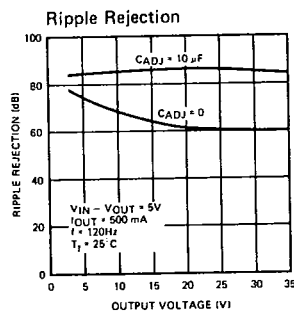
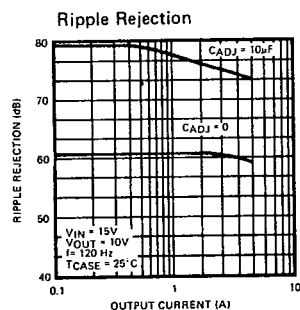
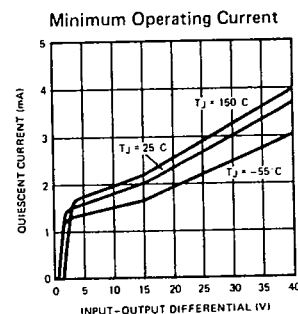
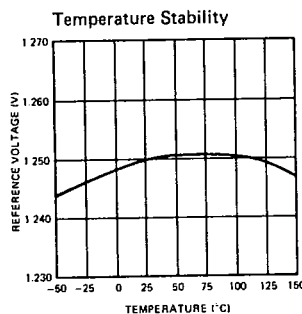
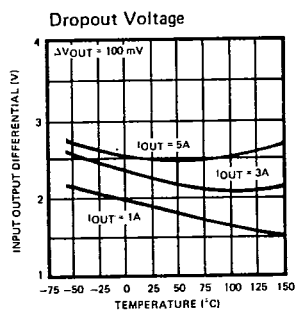
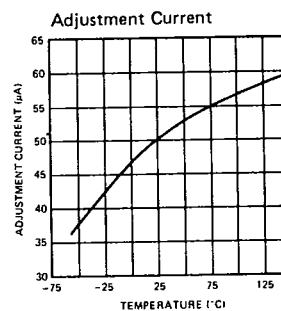
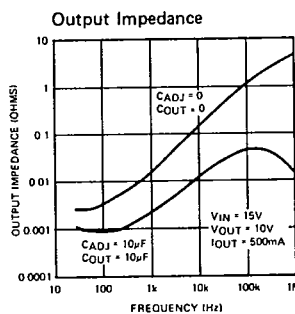
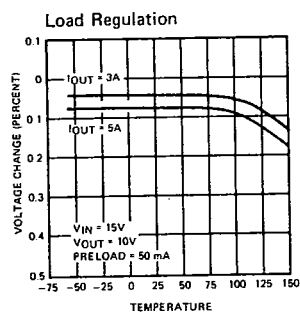


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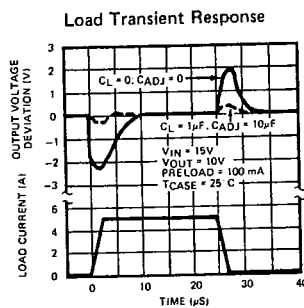
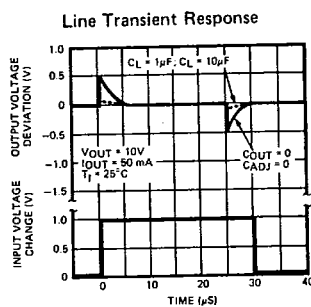
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Typical Performance Characteristics

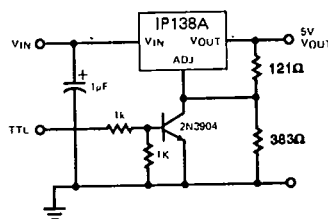
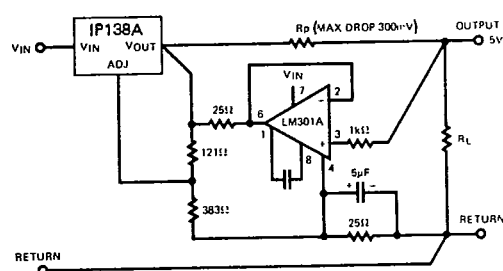


Section 5 - Voltage Regulators
IP138A, IP238A, IP338A
LM138, LM238, LM338

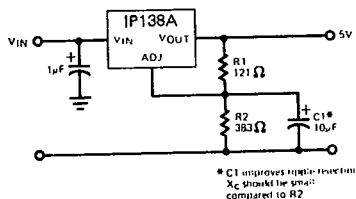
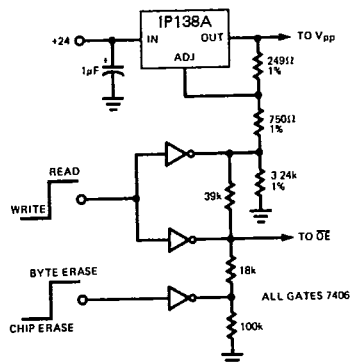
Typical Performance Characteristics (Cont.)



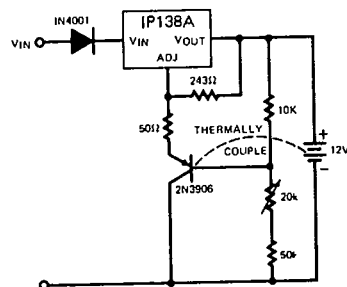
Typical Applications



Remote Sensing



Improving Ripple Rejection



Temperature Compensated Lead Acid Battery Charger

	DE	V _{pp}
READ	0V	5V
WRITE		
BYTE	5V	21V
CHIP ERASE	12V	21V

2816 EEPROM Supply Programmer for Read/Write Control

Section 5 - Voltage Regulators
 IP138A, IP238A, IP338A
 LM138, LM238, LM338

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Order Information

Part Number	Temperature Range	Package
IP138AK	-55°C to +150°C	TO-3
LM138K	-55°C to +150°C	TO-3
IP238AK	-25°C to +150°C	TO-3
LM238K	-25°C to +150°C	TO-3
IP338AK	0°C to +125°C	TO-3
LM338K	0°C to +125°C	TO-3
IP338AV	0°C to +125°C	TO-218
IP338V	0°C to +125°C	TO-218

Section 5 - Voltage Regulators
 IP138A, IP238A, IP338A
 LM138, LM238, LM338

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Integrated Power Semiconductors, Ltd.

2727 Walsh Avenue, Suite 201, Santa Clara, CA 95051 • Telephone: 408-727-2772 • Telex: 350073 (IPS SNTA) • FAX: 408-988-6185
 8 Quaker Drive, West Warwick, RI 02893 • Telephone: 401-821-4260 • Telex: 332948 (IPS RI) • FAX: 401-823-7260
 2081 Business Center Drive, Suite 140, Irvine, CA 92715 • Telephone: 714-752-0188 • FAX: 714-752-5019
 789 Turnpike Street, North Andover, MA 01845 • Telephone: 617-683-9042 • FAX: 617-975-0193