February 10, 1998

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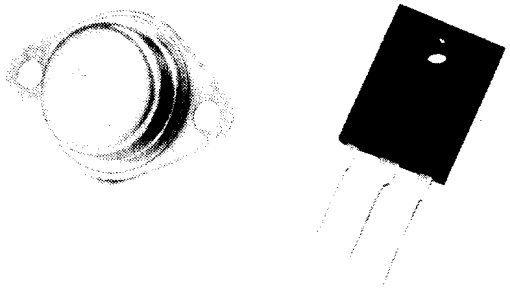


FEATURES

- Adjustable output down to 1.2V
- Line regulation typically 0.005%/V
- Load regulation typically 0.1%
- Current limit constant with temperature
- Standard 3-terminal TO-3 and TO-247 packages

DESCRIPTION

The LM 338 and LM 338P voltage regulators are monolithic integrated circuits designed for use in applications requiring a well regulated positive output voltage. Outstanding features include full power usage up to 5.0 amperes of load current, internal current limiting, thermal shutdown, and safe area protection on the die, providing protection of the series pass Darlington, under most operating conditions. Hermetically sealed TO-3 packages are available for high reliability and low thermal resistance. A cost effective TO-247 plastic SIP package is offered for assembly ease while maintaining high reliability and low thermal resistance.

The LM 338 and LM 338P three terminal adjustable regulators are available with an output range from +1.2 to +32 Volts. The output voltage is easily set by two external resistors. Since the regulator is "floating", higher output voltages can be obtained as long as the maximum input-output voltage differential is not exceeded.

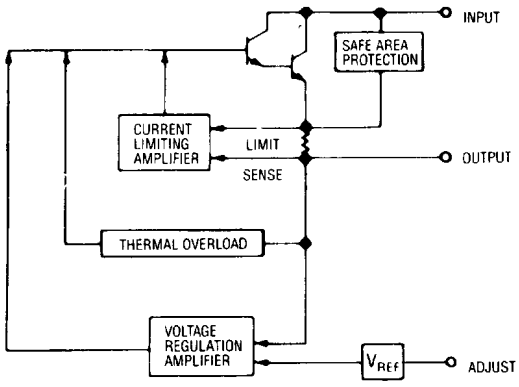
ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MINIMUM	MAXIMUM	UNITS
Input-Output Voltage Differential	$V_{IN} - V_{OUT}$		35	Volts
Power Dissipation	P_D		Internally Limited	
Thermal Resistance Junction to Case	θ_{JC}		1.0	°C/Watt
Operating Junction Temperature Range LM 338 LM 338P	T_J	 0	 125	°C
Storage Temperature Range	T_{STG}	-65	150	°C
Lead Temperature (Soldering, 60 Seconds Time Limit) LM 338 LM 338P	T_{LEAD}		 300 260	°C

DEVICE SELECTION GUIDE

DEVICE	PACKAGE
LM 338	TO-3
LM 338P	TO-247

BLOCK DIAGRAM



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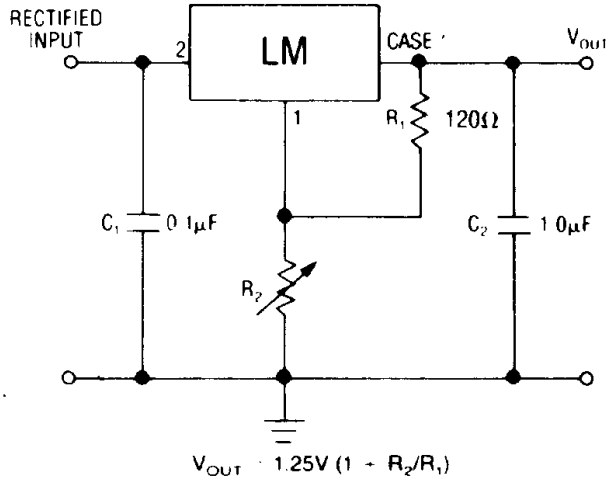
ELECTRICAL CHARACTERISTICS[6]

Parameter	Test Conditions[1]			Test Limits			Units
	V_{IN}-V_{OUT}	I_O	T_J[6]	Min	Typ	Max	
Line Regulation[2]	3V to 35V	10mA	25°C		0.005	0.03	%/V
					0.02	0.06	
Load Regulation[2] $V_O \leq 5V$	5V	10mA to 5A	25°C		5	25	mV
					0.1	0.5	%
					20	50	mV
					0.3	1.0	%
Thermal Regulation[3]	5V	2.5A	25°C		0.002	0.02	%/W
Adjust Pin Current	5V	2.5A			45	100	µA
Adjust Pin Current Change	3V to 35V	10mA to 5A			0.2	5	µA
Reference Voltage	3V to 35V	10mA to 5A		1.19	1.24	1.29	V
Temperature Stability	5V	2.5A			1		%
Minimum Load Current	35V				3.5	10.0	mA
Current Limit 0.5 ms pk	≤10V			5	8		A
				7	12		
	30V		25°C		1		
RMS Output Noise[4]	5V	2.5A	25°C		0.003		% V_O
Ripple Rejection Ratio[5] V_O = 10V, C_{ADJ} = 10µF	5V	2.5A		60	60		dB
					75		

(1) Although power dissipation is internally limited, these specifications are applicable for power dissipations of 50 Watts.
(2) Low duty cycle pulse testing with Kelvin connections required. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.
(3) 20ms pulse
(4) BW – 10Hz to 10kHz
(5) 120Hz input ripple
(6) Unless otherwise specified, the following T_J conditions apply:
LM 338 – 0 TO 125 C
LM 338P – 0 TO 125 C

TYPICAL APPLICATION
ADJUSTABLE VOLTAGE REGULATOR[1,2]



$V_{OUT} = 1.25V\ (1 + R_2/R_1)$

[1] C_1 needed if device is far from filter capacitors.
[2] C_2 optional - improves transient response.

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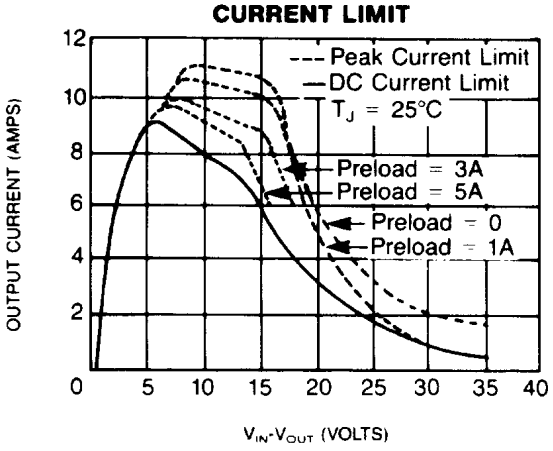
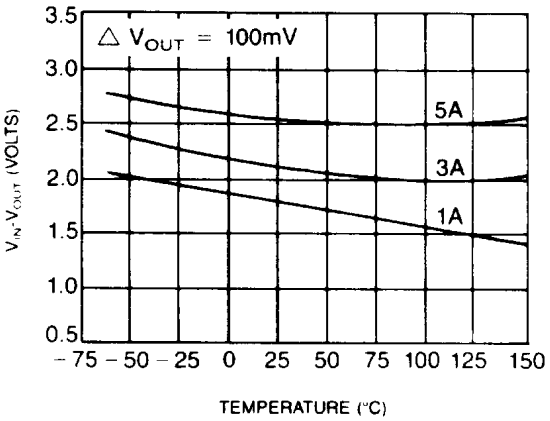
OPERATIONAL DATA

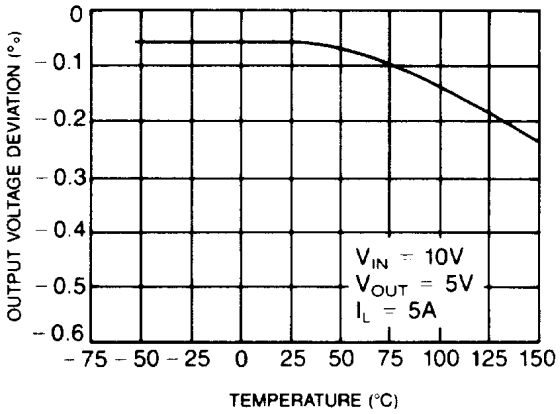
CURRENT LIMIT



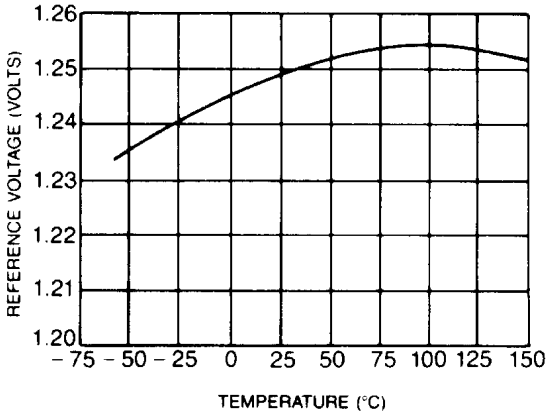
DROPOUT VOLTAGE



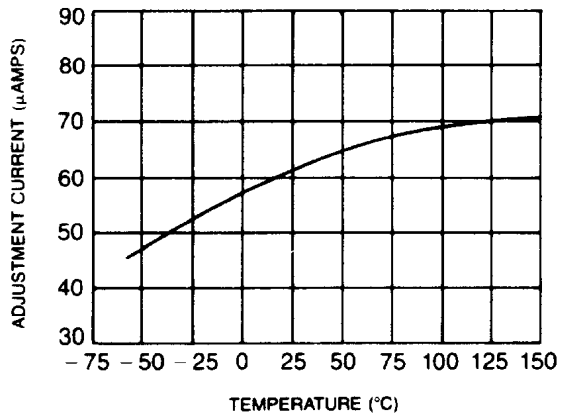
LOAD REGULATION



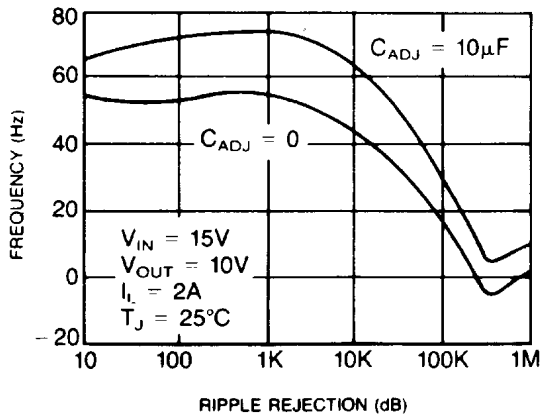
TEMPERATURE STABILITY



ADJUSTMENT CURRENT



RIPPLE REJECTION



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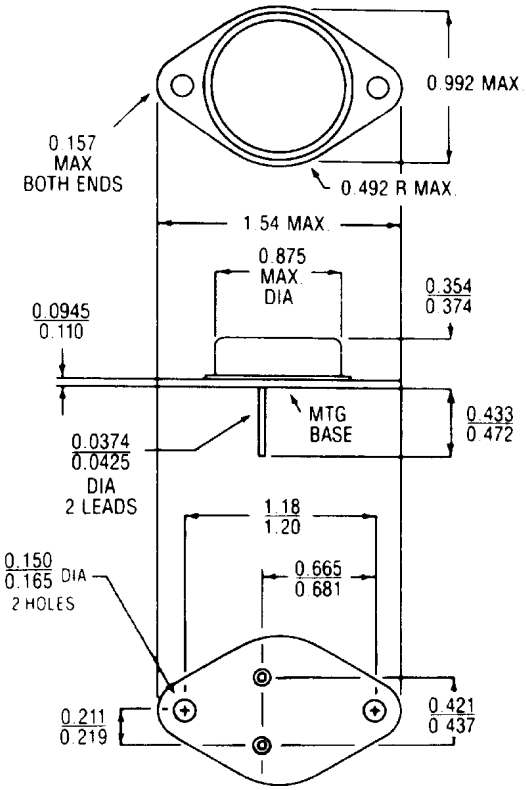
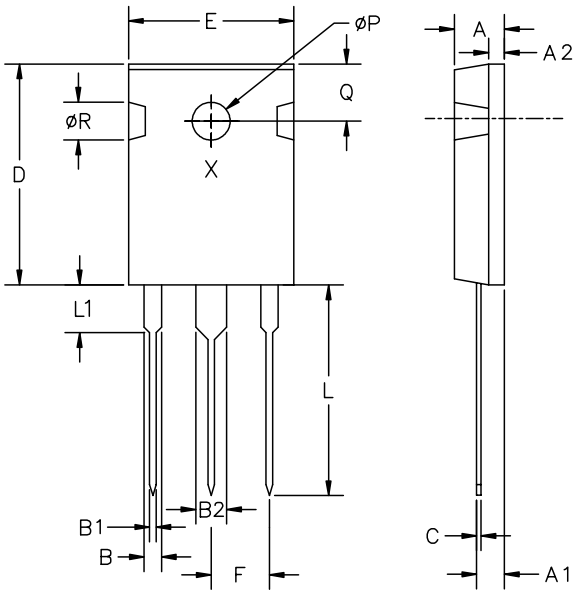
DEVICE OUTLINE

TO-3

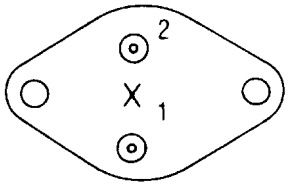


TO-247



DIM	DIMENSIONS INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	.185	.209	4.70	5.30	
A1	.087	.102	2.20	2.59	
A2	.059	.098	1.50	2.50	
B	.040	.055	1.02	1.40	
B1	.065	.084	1.65	2.13	
B2	.113	.123	2.87	3.13	
C	.016	.031	.40	.79	
D	.819	.845	20.8	21.5	
E	.610	.640	15.5	16.3	
F	.215	–	5.46	–	BSC
L	.780	.800	19.8	20.3	
L1	–	.177	–	4.50	
øP	.140	.144	3.56	3.66	
Q	.212	.244	5.38	6.20	
øR	.140	.216	4.32	5.49	

Bottom View



LM 338

1 – Adjust
2 – Input
Case is Output

LM 338P

1 — Adjust
2 — Output
3 — Input
Tab Is Output

NOTE: Case temperature measured at point X.
All dimensions are in inches.