

LINEAR INTEGRATED CIRCUITS

DESCRIPTION

The LM109 and LM309 are complete 5 volt regulators fabricated on a single silicon chip. These regulators are designed for local "on card" regulation to eliminate many of the noise and ground loop problems associated with single-point regulation. They employ internal current limiting, thermal shutdown, and safe-area compensation which makes the circuitry essentially blow-out proof. If adequate heat sinking is provided, the devices can deliver output currents in excess of 200mA from the TO-5 package, and 1A from the TO-3 package. In addition to their use as fixed 5 volt regulators, these devices may be used with external components to obtain adjustable output levels. They may also be used as the power pass element in precision regulators.

FEATURES

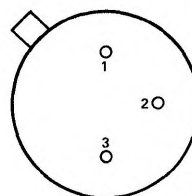
- OUTPUT CURRENTS IN EXCESS OF 1 amp
- INTERNAL THERMAL OVERLOAD PROTECTION
- INTERNAL CURRENT LIMITING
- NO EXTERNAL COMPONENTS REQUIRED

ABSOLUTE MAXIMUM RATINGS

Input Voltage	35V
Power Dissipation	Internally Limited
Operating Junction Temperature Range	
LM109	-55°C to 150°C
LM309	0°C to 125°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

PIN CONFIGURATIONS

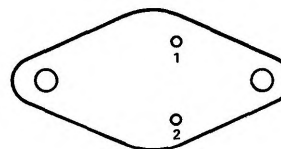
H PACKAGE (Top View)



1. Input
2. Output
3. Ground

ORDER PART NOS. LM109H/LM309H

K PACKAGE

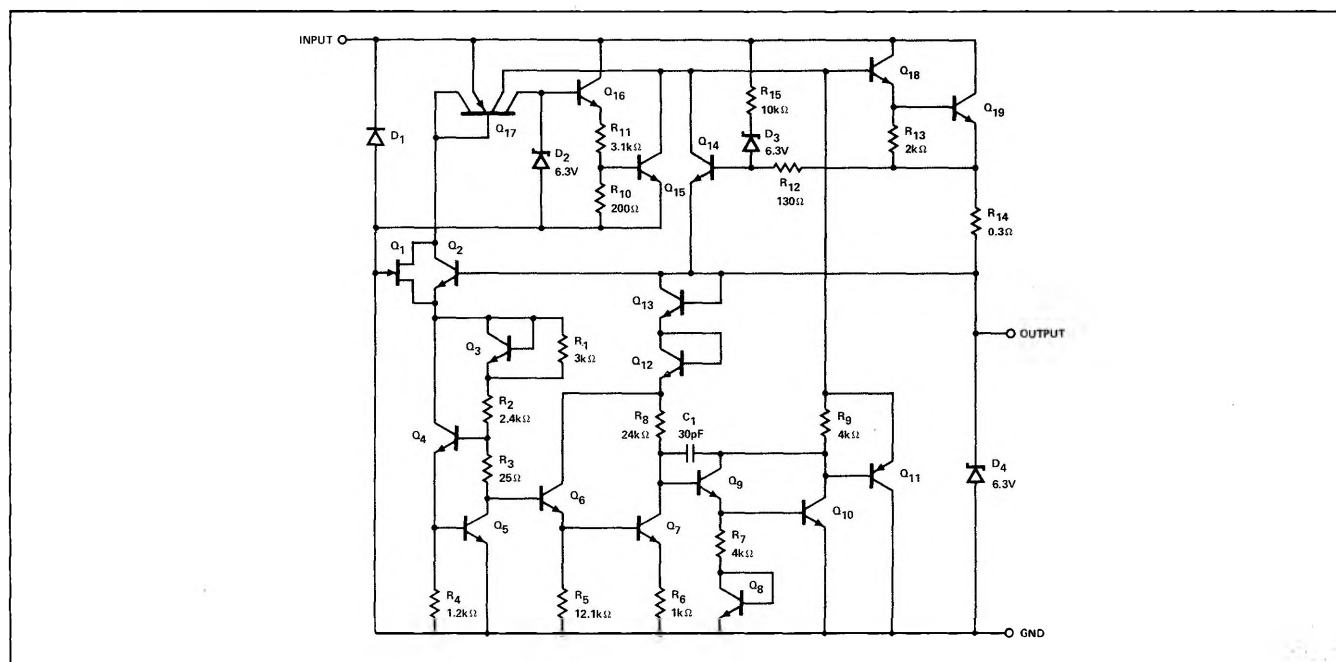


1. Input
2. Output

Case is connected to ground.

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EQUIVALENT CIRCUIT



ELECTRICAL CHARACTERISTICS (Note 1)

PARAMETER	CONDITIONS	LM109			LM309			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Output Voltage	$T_j = 25^{\circ}\text{C}$	4.7	5.05	5.3	4.8	5.05	5.2	V
Line Regulation	$T_j = 25^{\circ}\text{C}$ $7\text{V} \leq V_{\text{IN}} \leq 25\text{V}$		4	50		4	50	mV
Load Regulation	$T_j = 25^{\circ}\text{C}$ $5\text{mA} \leq I_{\text{OUT}} \leq 0.5\text{A}$		20	50		20	50	mV
	$5\text{mA} \leq I_{\text{OUT}} \leq 1.5\text{A}$		50	100		50	100	mV
Output Voltage	$7\text{V} \leq V_{\text{IN}} \leq 25\text{V}$ $5\text{mA} \leq I_{\text{OUT}} \leq I_{\text{max}}$ $P < P_{\text{max}}$	4.6		5.4	4.75		5.25	V
Quiescent Current	$7\text{V} \leq V_{\text{IN}} \leq 25\text{V}$		5.2	10		5.2	10	mA
Quiescent Current Change	$7\text{V} \leq V_{\text{IN}} \leq 25\text{V}$ $5\text{mA} \leq I_{\text{OUT}} \leq I_{\text{max}}$			0.5			0.5	mA
				0.8			0.8	mA
Output Noise Voltage	$T_A = 25^{\circ}\text{C}$ $10\text{Hz} \leq f \leq 100\text{ kHz}$		40			40		μV
Long Term Stability				10			20	mV
Thermal Resistance								
Junction to Case (Note 2)								$^{\circ}\text{C/W}$
TO-5			15			15		$^{\circ}\text{C/W}$
TO-3			3			3		$^{\circ}\text{C/W}$

NOTES:

1. Unless otherwise specified, these specifications apply for $-55^{\circ}\text{C} \leq T_j \leq 150^{\circ}\text{C}$ for the 5109 or $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ for the 5309, $V_{\text{IN}} = 10\text{V}$ and $I_{\text{OUT}} = 0.1\text{A}$ for the TO-5 package or $I_{\text{OUT}} = 0.5\text{A}$ for the TO-3 package. For the TO-5 package, $I_{\text{max}} = 0.2\text{A}$ and $P_{\text{max}} = 2.0\text{W}$. For the TO-3 package, $I_{\text{max}} = 1.0\text{A}$ and $P_{\text{max}} = 20\text{W}$.
2. Without a heat sink, the thermal resistance of the TO-5 package is about 150°C/W , while that of the TO-3 package is approximately 35°C/W . With a heat sink, the effective thermal resistance can only approach the values specified, depending on the efficiency of the sink.

TYPICAL APPLICATIONS

FIXED 5V REGULATOR

NOTES: *Required if regulator is located an appreciable distance from power supply filter.
†Although no output capacitor is needed for stability, it does improve transient response.

PRECISION VOLTAGE REGULATOR

NOTES: *Regulation better than 0.01% load, line and temperature, can be obtained.
†Determines zener current. May be adjusted to minimize thermal drift.
‡Solid tantalum.

ADJUSTABLE OUTPUT REGULATOR

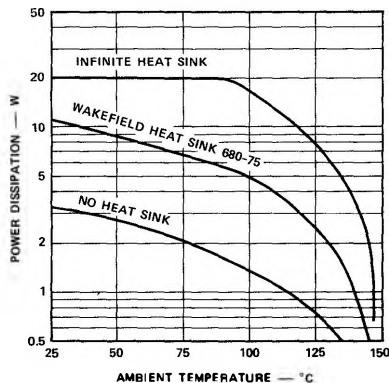
NOTES: *Determines output current.

CURRENT REGULATOR

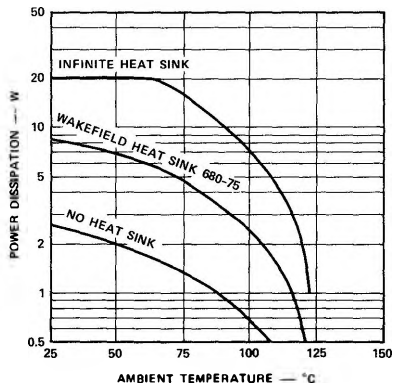
NOTES: *Determines output current.

TYPICAL CHARACTERISTIC CURVES

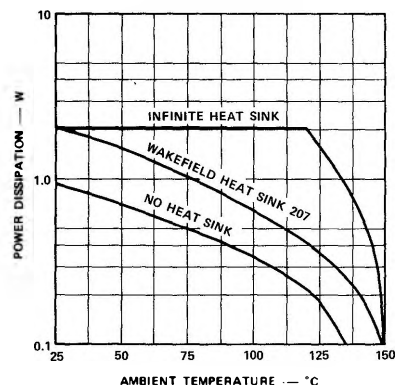
MAXIMUM AVERAGE
POWER DISSIPATION
LM109 (TO-3)



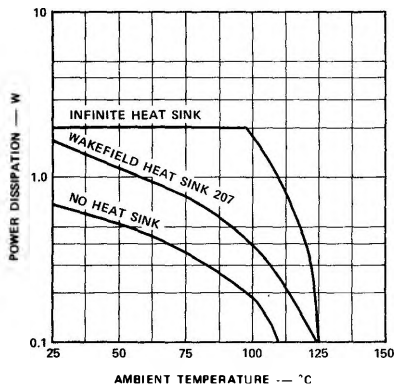
MAXIMUM AVERAGE
POWER DISSIPATION
LM309 (TO-3)



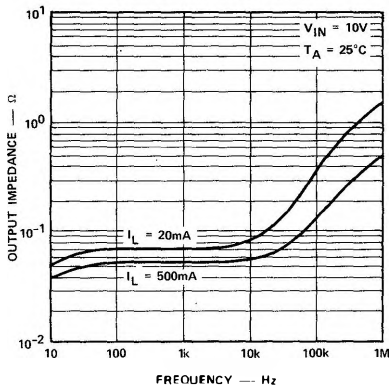
MAXIMUM AVERAGE
POWER DISSIPATION
LM109 (TO-5)



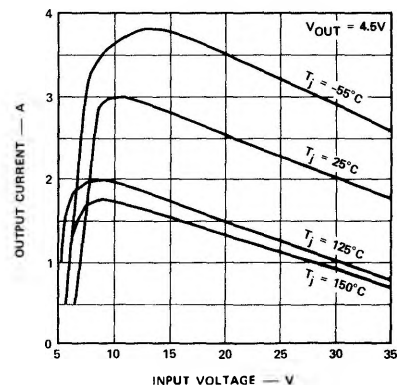
MAXIMUM AVERAGE
POWER DISSIPATION
LM309 (TO-5)



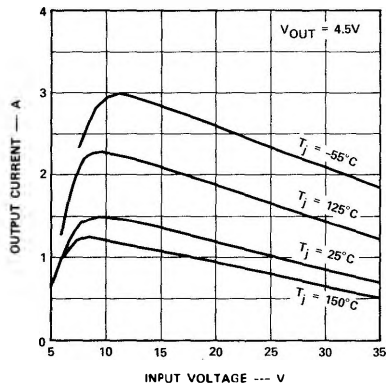
OUTPUT IMPEDANCE



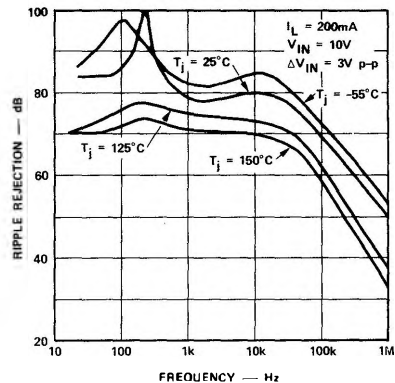
PEAK OUTPUT CURRENT
K PACKAGE (TO-3)



PEAK OUTPUT CURRENT
H PACKAGE (TO-5)



RIPPLE REJECTION



TYPICAL CHARACTERISTIC CURVES (Cont'd.)

