LM109 Series
Positive 5 Volt Regulators

REFERENCE TABLE

Code	Stock No.
LM109H	**29368C**
LM109K	**29369A**
LM209H	**29371B**
LM209K	**29372X**
LM309H	**19680H**
LM309K	**19681F**

GENERAL DESCRIPTION

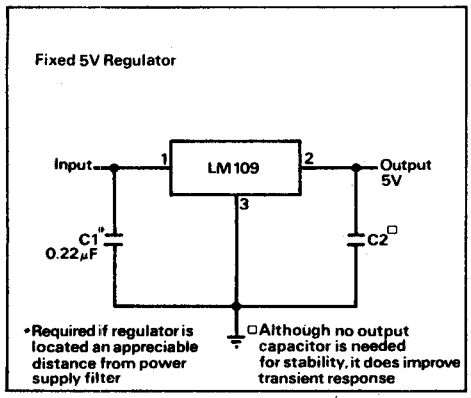
These are complete 5V monolithic regulators. They are designed for local regulation on digital logic cards, eliminating the distribution problems associated with single-point regulation. This device is easy to use, minimizes the number of external components, and is available in two common transistor packages. In the solid-kovar TO-5 header, it can deliver as output current in excess of 200mA, if adequate heat sinking is provided. With the TO-3 power package, the available output current is greater than 1A.

These regulators are essentially blow-out proof. Current limiting is included to limit the peak output current to a safe value. In addition, thermal shutdown is provided to keep the IC from overheating. If internal dissipation is too great, the regulator switches on and off with a duty cycle that prevents excessive heating.

Considerable effort was expended to make these devices easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response somewhat. Input bypassing is needed, however, if the regulator is located very far from the filter capacitor of the power supply. Stability is also achieved by methods that provide very good rejection of load or line transients as are usually seen with TTL logic.

Although designed primarily as fixed-voltage regulators the outputs can be set to voltages above 5V. It is also possible to use the circuits as the control element in precision regulators, taking advantage of the good current-handling capability and the thermal overload protection.

TYPICAL APPLICATION



FEATURES

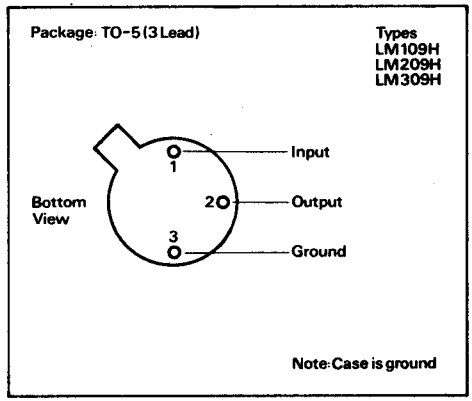
Specified to be complete, worst case, with TTL and DTL.

Output current in excess of 1A.

Internal thermal overload protection.

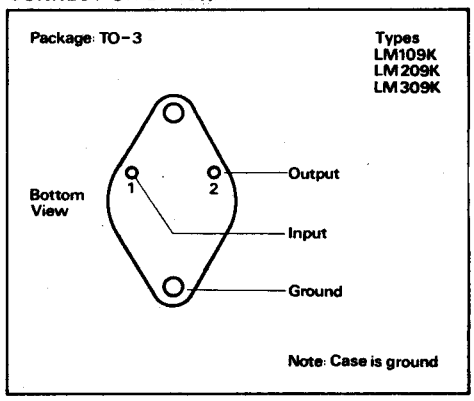
No external components required.

CONNECTION DIAGRAM



See outline drawing No. 67 for dimensions.

CONNECTION DIAGRAM



See outline drawing No. 94 for dimensions.

ABSOLUTE MAXIMUM RATINGS

Input voltage	35V
Power dissipation	Internally limited
Operating junction temperature range (LM109, LM209)	−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

ELECTRICAL CHARACTERISTICS (Note 1)

Parameter	Conditions	LM109, 209			LM309			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	$T_j = 25°C$	4.7	5.05	5.3	4.8	5.05	5.2	V
Line Regulation	$T_j = 25°C$ $7V \leq V_{IN} \leq 25V$		4	50		4.0	50	mV
Load Regulation	$T_j = 25°C$							
LM109H, 209H, 309H	$5mA \leq I_{OUT} \leq 0.5A$		20	50		20	50	mV
LM109K, 209K, 309K	$5mA \leq I_{OUT} \leq 1.5A$		50	100		50	100	mV
Output Voltage	$7V \leq V_{IN} \leq 25V$ $5mA \leq I_{OUT} \leq I_{max}$ $P < P_{max}$	4.6		5.4	4.75		5.25	V
Quiescent Current	$7V \leq V_{IN} \leq 25V$		5.2	10		5.2	10	mA
Quiescent Current Change	$7V \leq V_{IN} \leq 25V$			0.5			0.5	mA
	$5\,mA \leq I_{OUT} \leq I_{max}$			0.8			0.8	mA
Output Noise Voltage	$T_A = 25°C$ $10\,Hz \leq f \leq 100\,kHz$		40			40		μV
Long Term Stability				10			20	mV
Thermal Resistance Junction to Case (Note 2)								
LM109H, 209H, 309H			15			15		°C/W
LM109K, 209K, 309K			3			3.0		°C/W

Note 1: Unless otherwise specified, these specifications apply for the Operating Junction Temperature Ranges shown above, $V_{IN} = 10V$ and $I_{OUT} = 0.1A$ for the TO-5 package or $I_{OUT} = 0.5A$ for the TO-3 package. For the TO-5 package, $I_{max} = 0.2A$ and $P_{max} = 2.0W$. For the TO-3 package, $I_{max} = 1.0A$ and $P_{max} = 20W$.

Note 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.