

**52149/52174**

79HG REPLACEMENT

**NEGATIVE ADJUSTABLE 5-AMP  
VOLTAGE REGULATOR**

**Mii**

HYBRID MICROELECTRONICS  
PRODUCTS DIVISION

**Features:**

- Replacement for 79HG
- 5.0A Output Current
- Internal Current And Thermal Overload Protection
- Internal Short Circuit Current Limit
- Low Drop-Out Voltage (Typically -2.2 V @ 5.0 A)
- 50W Power Dissipation
- Electrically Isolated Case
- Steel TO-3 Case

**Applications:**

- Designed for use in general purpose applications where adjustability is advantageous.
- Military and Hi Rel Industrial applications where hermeticity is required.

**ORDER INFORMATION**

52149	Standard
52174	MIL-STD-883 Screened

**DESCRIPTION**

The 52149/52174, which is a replacement for the 79HG, is an adjustable 4-terminal voltage regulator capable of supplying in excess of 5 A over a -24 V to -2.55 V output range. This Hybrid Voltage Regulator has been designed with all the inherent characteristics of the monolithic 4-terminal regulator; i.e., full thermal overload and short circuit protection. It is packaged in a hermetically sealed 4-pin, TO-3 package providing 50W power dissipation. The regulator consists of a monolithic chip driving a discrete series-pass element and short circuit detection transistors.

**ABSOLUTE MAXIMUM RATINGS**

Input Voltage.....	-35 V
Internal Power Dissipation @T <sub>c</sub> = 25°C.....	50W
Maximum Input-to-Output Voltage Differential.....	35 V
Operating Junction Temperature .....	150°C
Storage Temperature Range.....	-55°C to +150°C
Pin Temperature (Soldering, 60 seconds).....	300°C
Commercial Temperature Range 52149 .....	0°C to +125°C
Military Temperature Range 52174.....	-55°C to +125°C

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## NEGATIVE ADJUSTABLE 5-AMP, VOLTAGE REGULATOR

## ELECTRICAL CHARACTERISTICS

$T_J = 25^\circ\text{C}$ ,  $V_{IN} = -10\text{V}$  and  $I_{OUT} = -2.0\text{A}$  unless otherwise specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage Range		-7.0		-35	V
Nominal Output Voltage Range	$V_{IN} = V_{OUT} - 5\text{V}$	2.55		24	V
Output Voltage Tolerance	$40\text{V} \leq V_{IN} \leq -7\text{V}$			4	% ( $V_{OUT}$ )
Line Regulation	$40\text{V} \leq V_{IN} \leq -7\text{V}$		0.4	1.0	% ( $V_{OUT}$ )
Load Regulation	$V_{IN} = V_{OUT} - 10\text{V}$ $-10\text{mA} \leq I_{OUT} \leq -5.0\text{A}$		0.7	1.0	% ( $V_{OUT}$ )
Control Pin Current				3.0	$\mu\text{A}$
Quiescent Current	$V_{IN} = -10\text{V}$			7.0	$\text{mA}$
Ripple Rejection	$-18\text{V} \leq V_{IN} \leq -8.5\text{V}$ $V_{OUT} = -5\text{V}$ , $f = 120\text{ Hz}$		50		$\text{dB}$
Output Noise Voltage	$V_{OUT} = -5\text{V}$ , $10\text{ Hz} \leq f \leq 100\text{kHz}$		200		$\mu\text{V}$
Dropout Voltage	$I_{OUT} = -5\text{A} @ -0.95 V_{OUT}$		-2.2		V
Short-Circuit Current Limit	$V_{IN} = -15\text{V}$		8	12	A
Control Pin voltage (Reference)	$V_{IN} = -10\text{V}$	-2.65		-2.45	V

## DESIGN CONSIDERATIONS

This device has thermal overload protection from excessive power and internal short circuit protection, which limits the circuit's maximum current. Thus, the device is protected from overload abnormalities. Although the internal power dissipation is limited, the junction temperature must be kept below the maximum specified temperature ( $150^\circ\text{C}$ ). It is recommended, by the manufacturer, that the maximum junction temperature be kept as low as possible for increased reliability. To calculate the maximum junction temperature or heat sink required, the following thermal resistance values should be used.

Package	$\theta_{JC}$	
	Typical	Max
TO-3	1.8	2.5

Where:  $T_J$  = Junction Temperature  
 $T_A$  = Ambient Temperature  
 $P_D$  = Power Dissipation  $\theta_{CS}$  = Case-to-heat sink thermal resistance  
 $\theta_{JC}$  = Junction-to-case thermal resistance

$$P_{D(\text{MAX})} = \frac{T_{J(\text{MAX})} - T_A}{\theta_{JC} + \theta_{CA}} \quad \theta_{CA} = \theta_{CS} + \theta_{SA}$$

$$\text{Solving for } T_J = T_A + P_D (\theta_{JC} + \theta_{CA})$$

$\theta_{CA}$  = Case-to-ambient thermal resistance

$\theta_{SA}$  = Heat sink-to-ambient thermal resistance

The device is designed to operate without external compensation components. However, the amount of external filtering of these voltage regulators depends upon the circuit layout. If in a specific application the regulator is more than four inches from the filter capacitor, a  $2\mu\text{F}$  solid tantalum capacitor should be used at the input. A  $1\mu\text{F}$  capacitor should be used at the output to reduce transients created by fast switching loads, as seen in the basic test circuit. These filter capacitors must be located as close to the regulator as possible.

**Caution:** Permanent damage can result from forcing the output voltage higher than the input voltage. A protection diode from output to input should be used if this condition exists.

## VOLTAGE OUTPUT

The device has an adjustable output voltage from  $-2.55$  to  $-24\text{V}$  which can be programmed by the external resistor network (potentiometer or two fixed resistors) using the relationship:

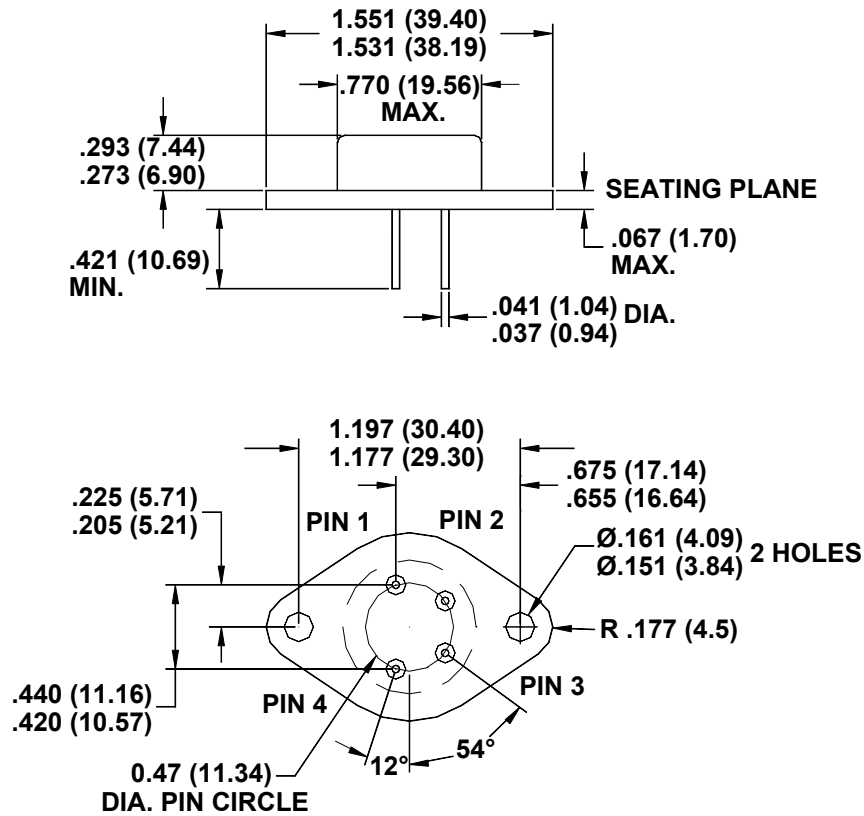
$$V_{OUT} = V_{CONTROL} \frac{R1 + R2}{R2}$$

Example: If  $R1 = 0\Omega$  and  $R2 = 5\text{k}\Omega$ , Then  
 $V_{OUT} = -2.55\text{ V}$  nominal,  
 or, if  $R1 = 12.8\text{ k}\Omega$  and  $R2 = 2.1\text{ k}\Omega$  then  
 $V_{OUT} = -18\text{V}$ .

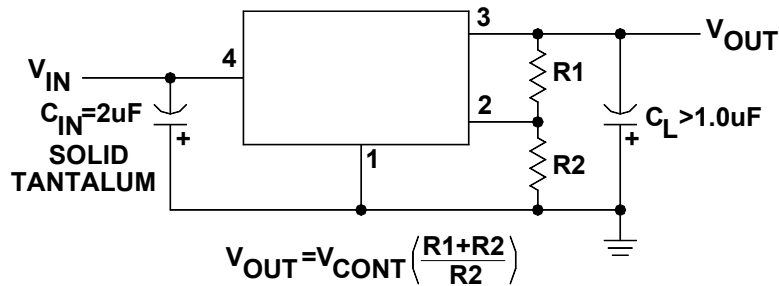
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**Mechanical Configuration**



**Basic Test Circuit Adjustable Output Voltage**



**Note:** All Dimension in notes and Millimeters (parenthesis)

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