MIL-PRF-38534 CERTIFIED FACILITY

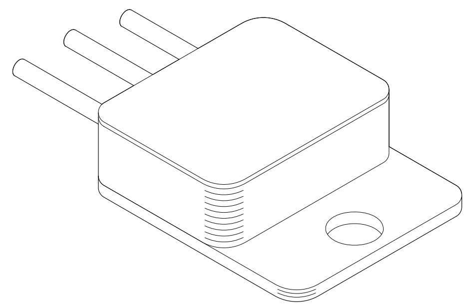
M.S.KENNEDY CORP.

FIXED OUTPUT 3A NEGATIVE VOLTAGE REGULATOR

5174 SERIES

4707 Dey Road Liverpool, N.Y. 13088 (315) 701-6751

FEATURES:

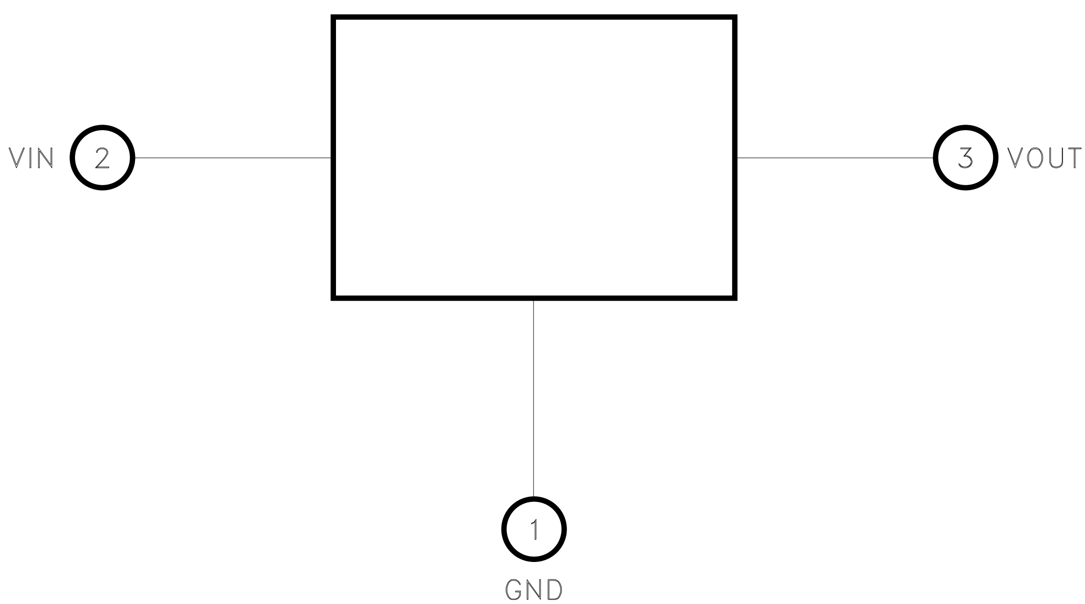


- Isolated Package
- Output Voltages; -5V, -12V and -15V
- On Board Thermal Overload Protection
- Short Circuit Current Limiting
- Replaces IR OM7608, 7609 & 7610
- Contact Factory for Alternate Output Voltages
- Contact MSK for MIL-PRF-38534 Qualification Status

DESCRIPTION:

The MSK 5174 voltage regulator is a negative fixed output regulator that with proper heatsinking, can provide high output current. Low dropout and impressive thermal characteristics help to improve efficiency and lower power dissipation. An accurate reference voltage allows for precise output voltage. Excellent line and load regulation characteristics ensure highly accurate performance. The MSK 5174 is packaged in a hermetic, space efficient, isolated 3 pin power package, allowing for direct bolt down heat sinking.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS

- High Efficiency, High Current Linear Regulators
- Constant Current Regulators
- System Power Supplies
- Switching Power Supply Post Regulators
- Battery Chargers

PIN-OUT INFORMATION

1 GND
2 VIN
3 VOUT

CASE = ISOLATED

ABSOLUTE MAXIMUM RATINGS ⑨

-VIN	Input Voltage (WRT VOUT) . . . . -35V	T_{ST}	Storage Temperature Range . . -65°C to +150°C
P_D	Power Dissipation . . . . . . Internally Limited	T_{LD}	Lead Temperature Range . . . . 300°C (10 Seconds)
I_{OUT}	Output Current . . . . -3A	T_C	Case Operating Temperature MSK 5174H . . . . -55°C to +125°C MSK 5174 . . . . -55°C to +125°C
T_J	Junction Temperature . . . . +150°C		

ELECTRICAL SPECIFICATIONS

Parameter	Test Conditions ③	Group A Subgroup	MSK 5174H Min.	MSK 5174H Typ.	MSK 5174H Max.	MSK 5174 Min.	MSK 5174 Typ.	MSK 5174 Max.	Units
Output Voltage Tolerance	I_{OUT}=10mA; VIN=VOUT+3V	1	-	0.1	1.0	-	0.1	2.0	%
		2,3	-	0.1	2.0	-	-	-	%
Dropout Voltage ②	I_{OUT}=1A; ΔVOUT=1%	-	-	1.8	-	-	1.8	-	V
Load Regulation	10mA≤I_{OUT}≤3A	1	-	0.2	1.0	-	0.2	2.0	%
		2,3	-	0.3	2.0	-	-	-	%
Line Regulation	I_{OUT}=10mA	1	-	0.1	0.5	-	0.1	0.6	%
	(VOUT+3V)≤VIN≤(VOUT+15V)	2,3	-	0.2	0.75	-	-	-	%
Current Limit ②	VIN=VOUT+8V	-	3	-4.3	-	3	-4.3	-	A
Ripple Rejection ②	I_{OUT}=3A; C_{OUT}=25μF; f=120Hz	-	-	66	-	-	66	-	dB
Thermal Resistance ②	JUNCTION TO CASE @ 125°C	-	-	TBD	TBD	-	TBD	TBD	°C/W

PART NUMBER	OUTPUT VOLTAGE ⑦
MSK5174-5.0	-5.0V
MSK5174-12	-12.0V
MSK5174-15	-15.0V

NOTES:

① Output is decoupled to ground using 2μF minimum, solid tantalum capacitor unless otherwise specified.
② Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
③ All output parameters are tested using a low duty cycle pulse to maintain T_J = T_C.
④ Industrial grade devices shall be tested to subgroup 1 unless otherwise specified.
⑤ Military grade devices ("H" suffix) shall be 100% tested to subgroups 1,2 and 3.
⑥ Subgroup 1 T_A=T_C=+25°C
2 T_A=T_C=+125°C
3 T_A=T_C=-55°C
⑦ Please consult the factory if alternate output voltages are required.
⑧ Input voltage (V_{IN}= V_{OUT} + a specified voltage) is implied to be more negative than V_{OUT}.
⑨ Continuous operation at or above absolute maximum ratings may adversely effect the device performance and/or life cycle.

BYPASS CAPACITORS

For most applications a 2uF minimum, solid tantalum capacitor should be attached as close to the regulator's output as possible. This will effectively lower the regulator's output impedance, increase transient response and eliminate any oscillations. Additional bypass capacitors can be used at the remote load locations to further improve regulation. These can be either of the tantalum or the electrolytic variety. A 4.7uF minimum tantalum capacitor should also be added to the regulator's input.

LOAD REGULATION

For best results the ground pin should be connected directly to the load as shown below, this effectively reduces the ground loop effect and eliminates excessive voltage drop in the sense leg. It is also important to keep the output connection between the regulator and the load as short as possible since this directly affects the load regulation. For example, if 20 gauge wire were used which has a resistance of about .008 ohms per foot, this would result in a drop of 8mV/ft at 1Amp of load current. It is also important to follow the capacitor selection guidelines to achieve best performance. Refer to Figure 1 for connection diagram.

MSK 5174 TYPICAL APPLICATION:

Negative Power Supply

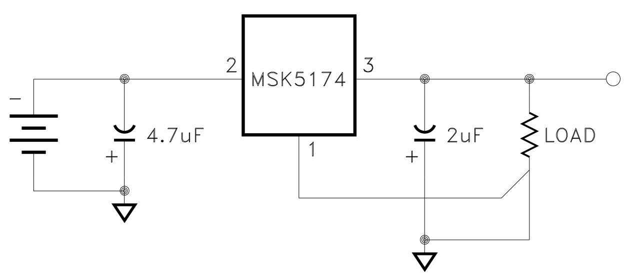


FIGURE 1

HEAT SINKING

To determine if a heat sink is required for your application and if so, what type, refer to the thermal model and governing equation below.

Governing Equation: $Tj = Pd \times (R_{\theta}jc + R_{\theta}cs + R_{\theta}sa) + Ta$

WHERE
- Tj = Junction Temperature
- Pd = Total Power Dissipation
- $R_{\theta}jc$ = Junction to Case Thermal Resistance
- $R_{\theta}cs$ = Case to Heat Sink Thermal Resistance
- $R_{\theta}sa$ = Heat Sink to Ambient Thermal Resistance
- Tc = Case Temperature
- Ta = Ambient Temperature
- Ts = Heat Sink Temperature

EXAMPLE:

This example demonstrates an analysis where the regulator is at one-half of its maximum rated power dissipation, which occurs when the output current is at 1.5 amps.

Conditions for MSK 5174:

VIN = -7.0V; Iout = -1.5A

1.) Assume 45° heat spreading model.
2.) Find regulator power dissipation:

Pd = (VIN - VOUT)(Iout)
Pd = (-7-(-5))(-1.5)
= 3.0W

3.) For conservative design, set Tj = +125°C Max.
4.) For this example, worst case Ta = +90°C.
5.) $R_{\theta}jc$ = TBD°C/W from the Electrical Specification Table.
6.) $R_{\theta}cs$ = 0.15°C/W for most thermal greases.
7.) Rearrange governing equation to solve for $R_{\theta}sa$:

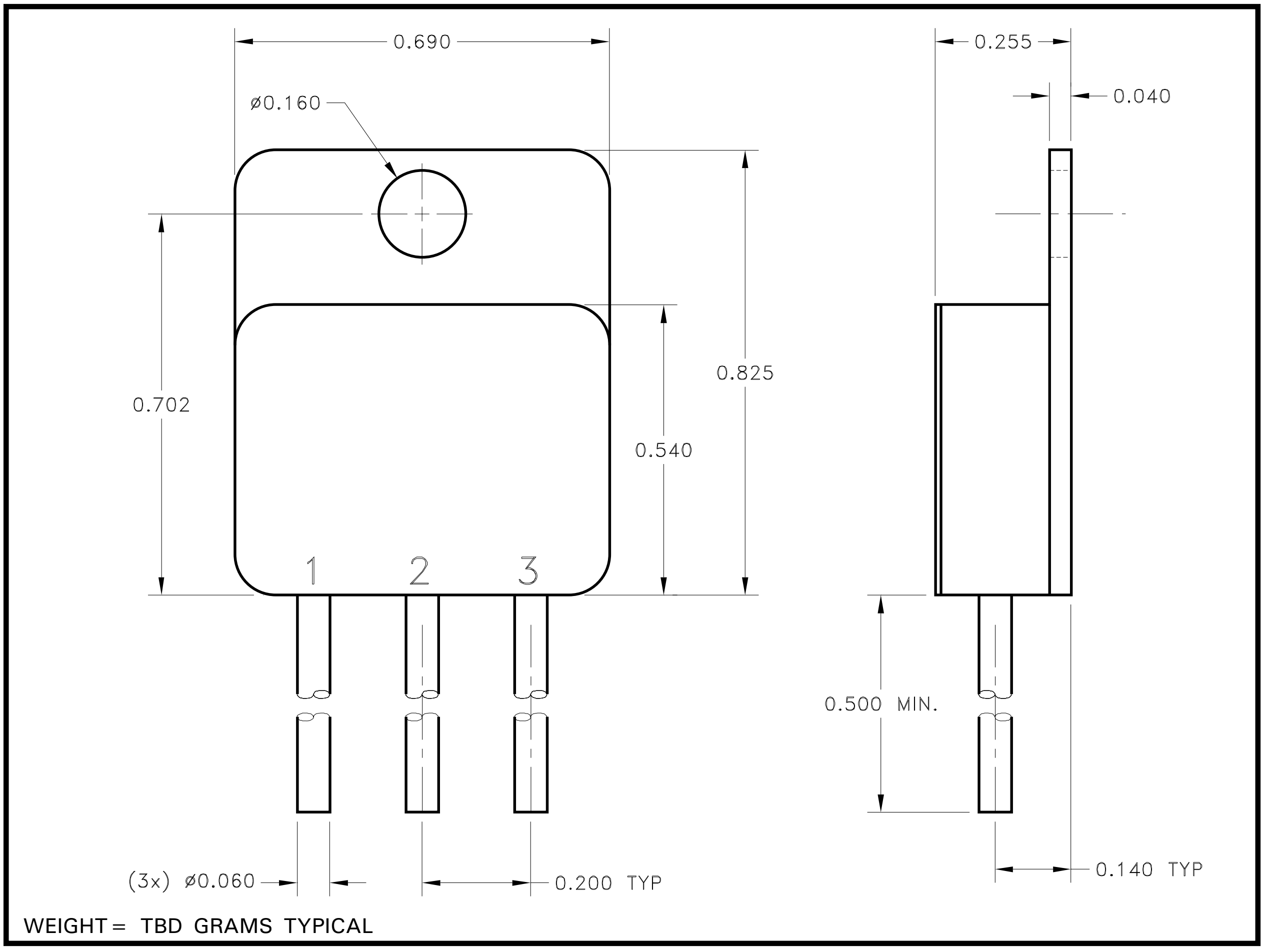
$R_{\theta}sa$ = ((Tj - Ta)/Pd) - ($R_{\theta}jc$) - ($R_{\theta}cs$)
= (125°C - 90°C)/3.0W - TBD°C/W - 0.15°C/W
= TBD°C/W

In this case the result is TBD°C/W. Therefore, a heat sink with a thermal resistance of no more than TBD°C/W must be used in this application to maintain the regulator junction temperature under 125°C.

TYPICAL PERFORMANCE CURVES

TBD

MECHANICAL SPECIFICATIONS



NOTE: ALL DIMENSIONS ARE ±0.010 INCHES UNLESS OTHERWISE LABELED.

ORDERING INFORMATION

MSK5174-5.0 H

SCREENING
BLANK = INDUSTRIAL; H = MIL-PR 38534 CLASSH

OUTPUT VOLTAGE
5.0 = -5.0V; 12 = -12.0V; 15 = -15.0V

GENERAL PART NUMBER

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