

# $\mu$ A7390

## GROUND FAULT DETECTOR

### FAIRCHILD LINEAR INTEGRATED CIRCUIT

**GENERAL DESCRIPTION** — The  $\mu$ A7390 is a monolithic ground fault detector circuit utilizing the Fairchild Planar\* Epitaxial Process. It is designed for use in class A Ground Fault Circuit Interrupters for operation directly off the ac line in either breakers or receptacles. The  $\mu$ A7390 contains an operational amplifier, a threshold detector, and a driver capable of providing high energy pulses for thyristor triggering.

- OPERATES DIRECTLY FROM AC LINE
- BUILT IN 24 V REGULATOR
- HIGH GAIN OPERATIONAL AMPLIFIER
- 50 mA OUTPUT CURRENT PULSE TO TRIGGER SCRs
- LOW EXTERNAL PART COUNT
- MINI-DIP PACKAGE
- HIGH NOISE IMMUNITY

#### ABSOLUTE MAXIMUM RATINGS

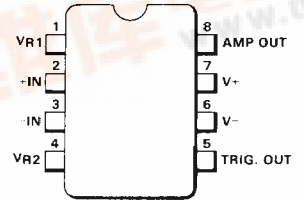
Supply Voltage Limited by Internal Zener (Note 1)  
 Supply Current (Note 2)  
 Power Dissipation (Note 3)  
 Storage Temperature Range  
 Operating Temperature  
 Pin Temperature soldering 10 s

40 mA  
 560 mW  
 -55°C to +125°C  
 -40°C to +85°C  
 260°C

#### NOTES:

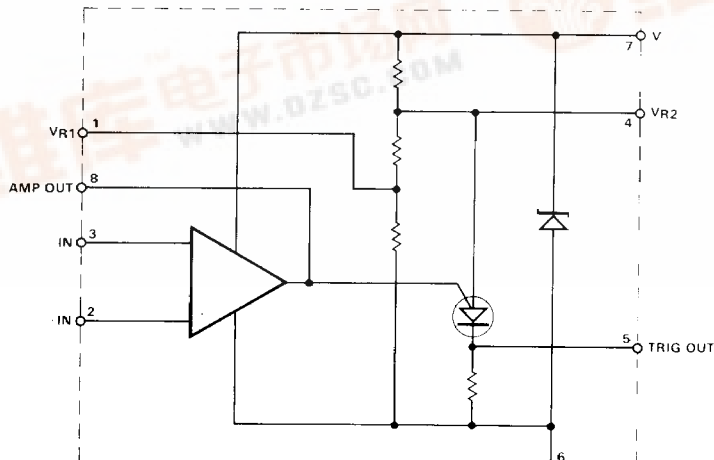
- 1 Device must always have a series resistor between the supply and pin 7, which limits current to 40 mA maximum
- 2 Single cycle 60 Hz surge current. Steady state current limited by Power Dissipation.
- 3 Power Dissipation applies to case temperature of 25°C derate at 5.6 mW/°C.

**CONNECTION DIAGRAM**  
**8-PIN MINI-DIP**  
 (TOP VIEW)  
 PACKAGE OUTLINE 9T  
 PACKAGE CODE T



**ORDER INFORMATION**  
 TYPE PART NO.  
 $\mu$ A7390  $\mu$ A7390TC

#### BLOCK DIAGRAM





## APPLICATIONS (Cont'd)

## FULL WAVE GFI FOR RECEPTACLE

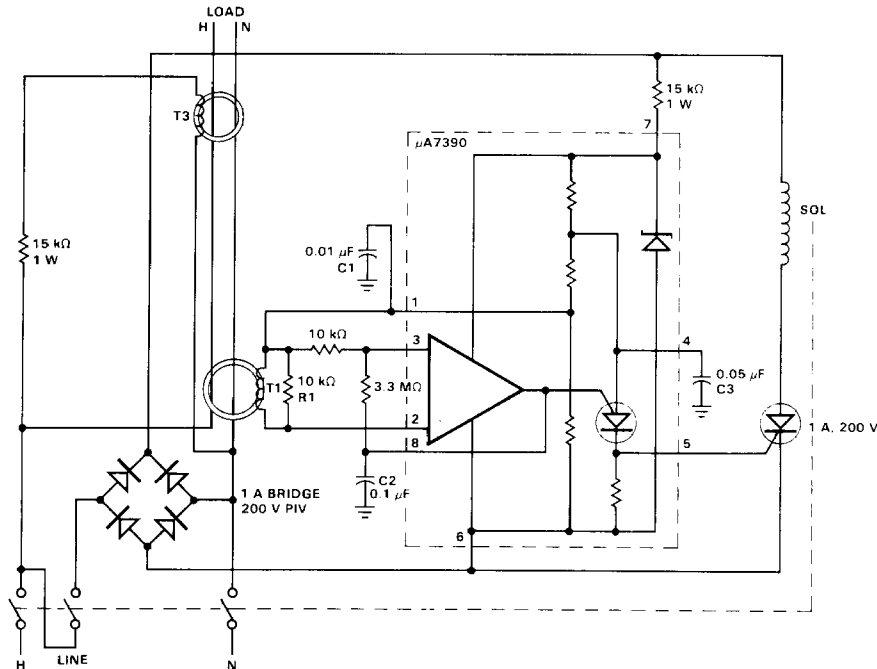


Fig. 2

Figure 1 shows the  $\mu$ A7390 connected in a typical Ground Fault Interrupter System. Power is applied to the V+ terminal of the  $\mu$ A7390 directly from the hot power line through a 15 k $\Omega$  resistor and the primary winding of transformer, T2. This limits the supply current into the  $\mu$ A7390 to a peak of 10 mA. The internal zener diode clamps the supply voltage to 23.5 V during the positive half-cycle and to more than minus 1 V during the negative half-cycle. The system therefore functions only on positive half-cycles of the line voltage.

Ground Fault currents (any currents in the hot line that are not returned in the neutral line) are detected by the differential current transformer, T1. The output voltage signal of T1 is amplified by the  $\mu$ A7390 operational amplifier and appears as a half-cycle sine wave signal referenced to VR2 at the output of the amplifier. The amplifier closed-loop gain is adjusted by modifying the external input and feedback resistors to compensate for transformer variations. When the peak signal amplitude equals VR2 + 0.6 V, the output trigger will fire and discharge the .1  $\mu$ F capacitor connected to amp-out and the 0.05  $\mu$ F capacitor connected to VR2 into the gate of the external SCR which energizes the trip coil which opens the circuit breaker. The .01  $\mu$ F capacitor and the 470  $\Omega$  resistor are for transient suppression.

The transformer, T2, induces a small voltage, on the order of 10-20 mV on the neutral line with respect to ground so that a short from neutral load to ground will cause a fault current to flow in the neutral line of sufficient magnitude to cause the breaker to open as required for Class A Ground Fault Interrupter operation.

Figure 2 shows a typical full wave ground fault interrupter system. The full wave bridge supplies power to the  $\mu$ A7390 during both the positive and negative half-cycles of the line voltage. This allows the hot and neutral lines to be interchanged. The use of a third breaker contact allows interchanging the line and load sides of the breaker system. These two features allow the use of this system in ground fault interrupter receptacle applications.