



GF2140

LINEAR INTEGRATED CIRCUIT

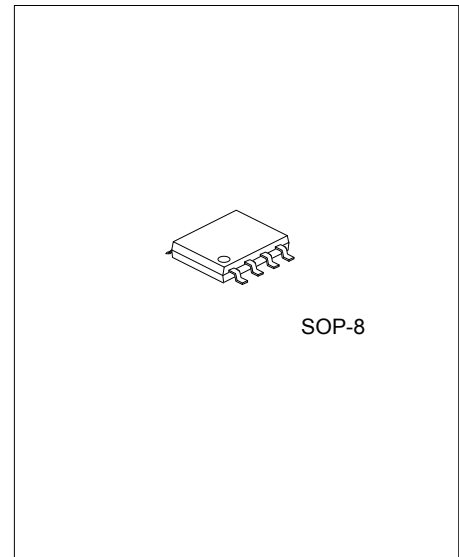
LOW POWER TWO-WIRE GROUND FAULT INTERRUPTER

DESCRIPTION

As a low power controller for AC output appliance leakage current interrupters, the UTC **GF2140** can detect hazardous current paths to ground, and trigger SCR to protect.

FEATURES

- * Directly powered from the AC line
- * Build-in bridge rectifier
- * Interface to SCR
- * Adjustable trip current and time delay
- * Minimum external components
- * For two-wire system
- * Be used in 110V or 220V system

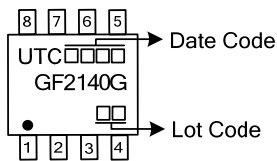


ORDERING INFORMATION

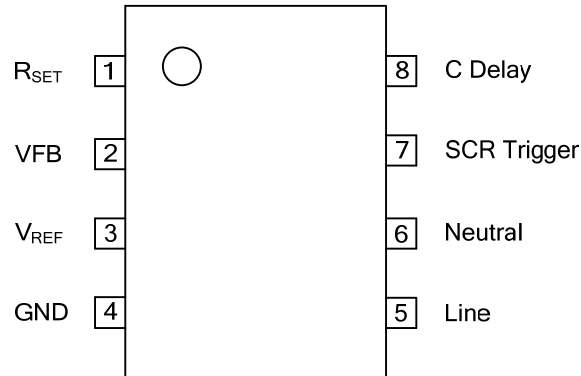
Ordering Number	Package	Packing
GF2140G-S08-R	SOP-8	Tape Reel

<p>GF2140G-S08-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free
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MARKING



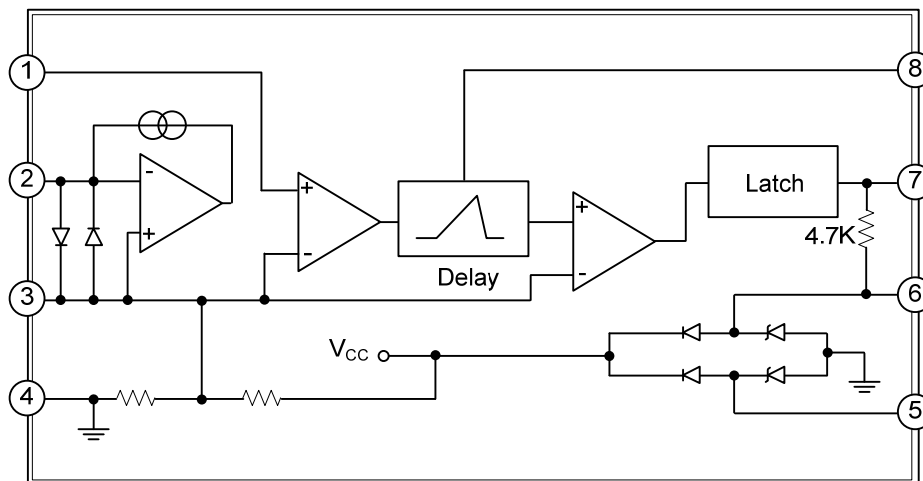
PIN CONNECTIONS



PIN DESCRIPTION

PIN	PIN NAME	I/O	PIN FUNCTION
1	R _{SET}	O	Output of Leakage current first
2	V _{FB}	I	Input of leakage current
3	V _{REF}	I	Reference voltage
4	GND		Ground
5	Line	I	Line input
6	Neutral	I	Neutral input
7	SCR Trigger		SCR Trigger
8	C Delay	O	The Delay time

BLOCK DIAGRAM



■ ELECTRICAL CHARACTERISTICS ($I_{LINE}=1.2mA$, $T_A=25^{\circ}C$, $R_{SET}=290k\Omega$)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Shunt Regulator (PIN 5-4)						
Regulator Voltage	V_{REG}	$I_{2-3}=11\mu A$	6.1	6.5	7.5	V
		$I_{LINE}=700\mu A$, $I_{2-3}=9\mu A$	6.1	6.5	7.5	
Sense Amplifier (PIN 2-3)						
Offset Voltage	$V_{I(OFF)}$	Design Value	-3.0	0	+3.0	mV
Input Bias Current	$I_{I(BIAS)}$	Design Value		15	30	nA
Gain Bandwidth	f_T	Design Value		3.44		MHz
SCR Trigger (PIN 7-6)						
Output Voltage	V_{OUT}	$I_{2-3}=9\mu A$	0	0.1	10	mV
		$I_{2-3}=11\mu A$	1.4	2.0	2.6	V
Output Current	I_{OUT}	$V_{7-6}=0V$, $I_{2-3}=11\mu A$	300	420	600	μA
Output Resistance	Z_O	$V_{5-6}=open$, $I_{2-3}=0$	4.0	4.7	5.4	K Ω
Reference Voltage (PIN 3-4)						
Reference Voltage	V_{REF}	$I_{LINE}=700\mu A$	2.6	2.9	3.4	V
Delay Time (PIN 8-4)						
Delay Current	I_D	$I_{2-3}=11\mu A$	23	30	43	μA
Delay Time	t_D	$C_{8-4}=20nF$		2.0		ms

■ FUNCTIONAL DESCRIPTION

(Refer to Block Diagram and Figure 1)

The shunt regulator generated by a 6.5V zener diode is built into the internal bridge rectifier. It is divided to create an internal reference voltage of 2.9V connected to pin 3. The secondary of the sense transformer is AC coupled to the inverting input of the sense amplifier at pin 2; the non-inverting input is referenced to pin 3. A current feedback loop around the sense amplifier ensures a virtual ground will be presented to the secondary of the sense transformer. In this manner it acts as a current transformer instead of a voltage transformer. In this mode, the transformer's characteristics are very predictable and circuit adjustments are not necessary in production.

The AC coupled transformer secondary current then flows through the sense amplifier's feedback loop, creating a full wave rectified version of the secondary fault current. This current passes through R_{SET} at pin 1, generating a voltage equal to R_{SET} times the peak fault current divided by the sense transformer turns ratio. This voltage is compared with the reference voltage at pin 3.

If the voltage at pin 1 is greater than pin 3, a comparator will charge C2 through a 29uA current source at pin 8. If the voltage at pin 1 exceeds pin 3 for longer than the delay time, a 400uA current will pulse between pins 7 and 6 which will trigger the gate of the SCR.

If the voltage at pin 1 exceeds pin 3 for less than the delay time, the SCR will not trigger.

The fault current at which the controller triggers the SCR is dependent on the value of R_{SET} and the time delay determined by C2.

UL 943 requires the circuit interrupter trip when the ground fault exceeds 6mA and not trip when the fault current is less than 4mA.

Supply Current Requirements

The UTC **GF2140** has a built-in diode bridge rectifier that provides power to the chip independent of the polarity of the AC line. This eliminates the external rectifier required for previous GFCI controllers.

R_{LINE} limits the shunt regulator current to 2mA. The recommended value is 47K to 91K for 110V systems and 91K to 150K for 220V systems. The recommended maximum peak line current through R_{LINE} is 7mA.

DO NOT connect a filter capacitor between pins 5 and 6 in an attempt to filter the supply voltage at the UTC **GF2140**. Proper operation of the UTC **GF2140** requires the internal supply voltage to be unfiltered.

SCR Driver

The SCR must have a high dV/dt rating to ensure that line noise (generated by electrically noisy appliances) does not falsely trigger the SCR. Also, the SCR must have a gate drive requirement less than 200uA. C3 is a noise filter that prevents high frequency line pulses from triggering the SCR.

The relay solenoid used should have a 3 ms or less response time to meet the UL 943 timing requirement.

■ TYPICAL APPLICATION CIRCUIT

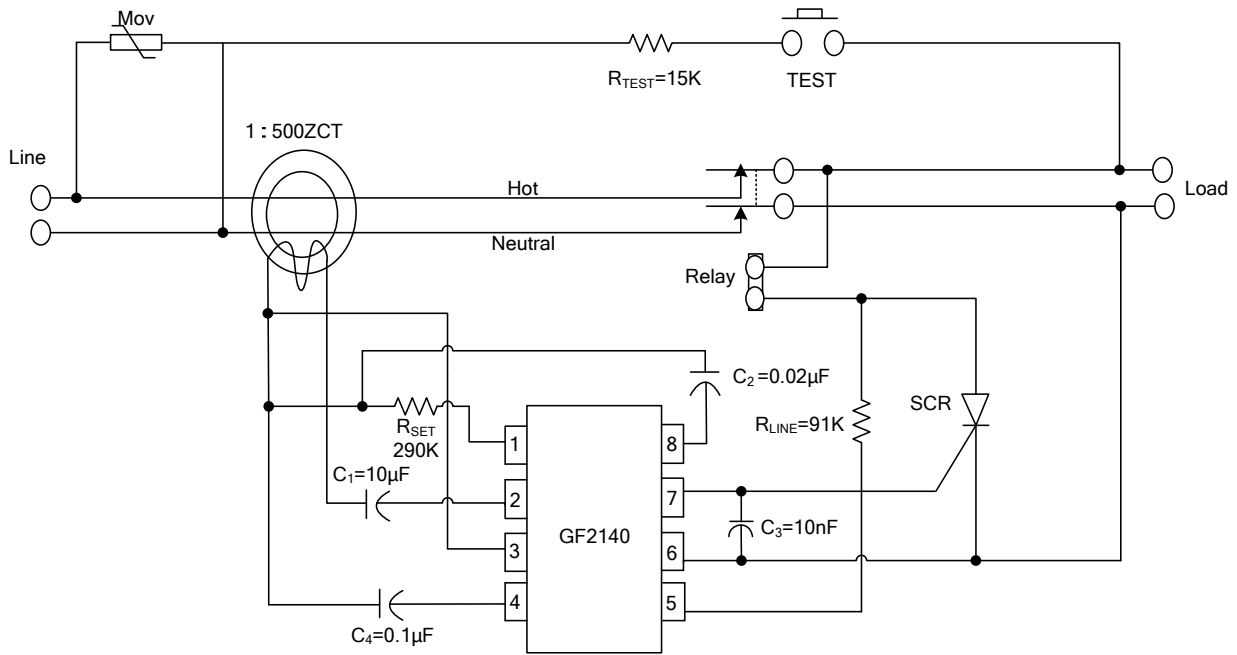


Figure 1. Appliance Leakage Detector Circuit Application

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