



HN7101

Earth Leakage Current Detector

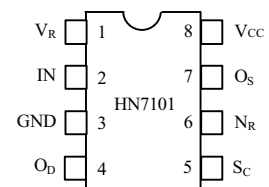
Description

The HN7101 is designed for use in earth leakage circuit interrupters for operation directly of the AC Line in breakers.

It contains pre regulator, main regulator, after regulator, differential amplifier, level comparator, latch circuit. The input in the differential amplifier is connect to the secondary node of zero current transformer. The level comparator generates high level when earth leakage current is greater than some level.

This IC is pin-pin replacement of M54123, GL7101. For replacing M54123, only R_L required to be about 640Ω .

Pin Configuration (Top View)



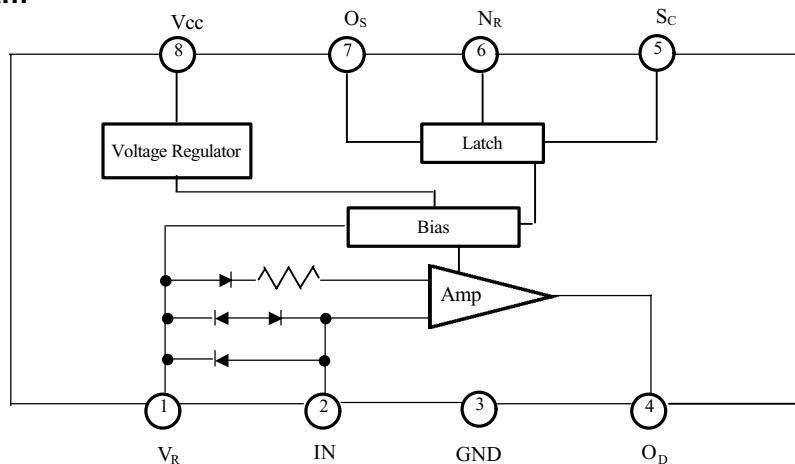
Feature

- Low Power Consumption (PD=5mW) 100V/200V
- 100V/200V Common Built-in Voltage Regulator
- High Gain Differential Amplifier
- High Input Sensitivity
- Minimum External Parts
- Large Surge Margin
- Wide Operating Temperature Range ($T_A = -30$ to 85°C)
- High Noise Immunity

Absolute Maximum Ratings ($T_A=25^\circ\text{c}$)

- Supply Voltage 20V
- Supply Current 8mA
- Power Dissipation 200mW
- Operating Temperature - 30 to 85°C
- Storage Temperature - 55 to 125°C

Block Diagram



Ordering Information

Part No.	Temp. Range	Package
HN7101ET	-30 – +85 $^\circ\text{C}$	SIP8
HN7101EM	-30 – +85 $^\circ\text{C}$	SOP8
HN7101EP	-30 – +85 $^\circ\text{C}$	DIP8

Recommended Operating Condition : Ta = -30°C to 80°C

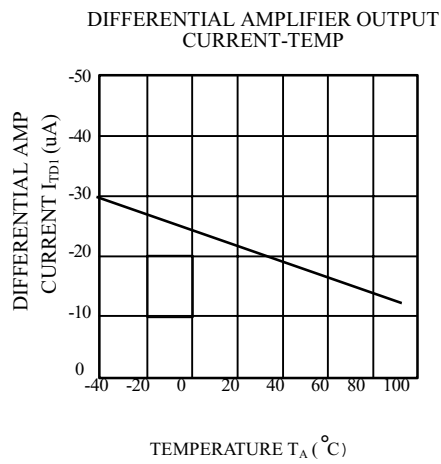
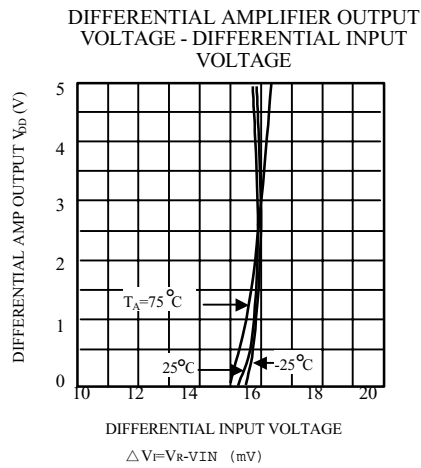
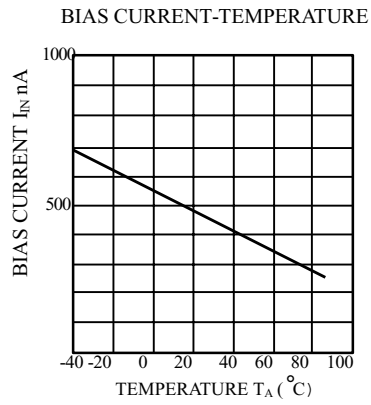
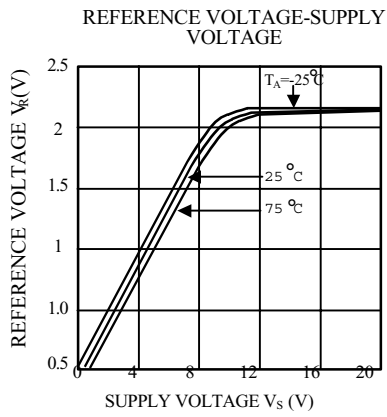
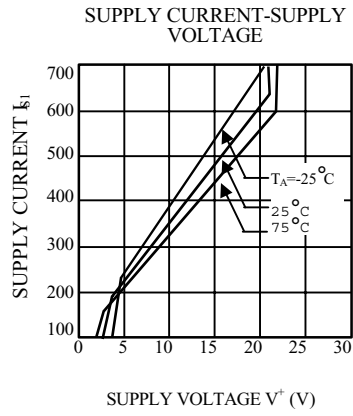
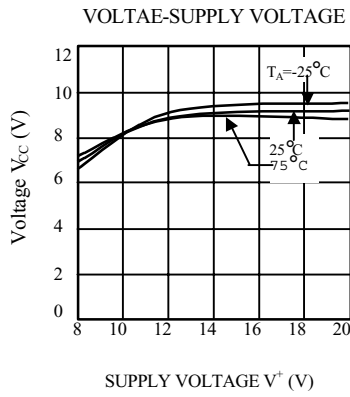
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V ⁺	12			V
V _S -GND Capacitor	C _{VS}	1			μF
O _S -GND Capacitor	C _{OS}			1	μF

Electrical Characteristics

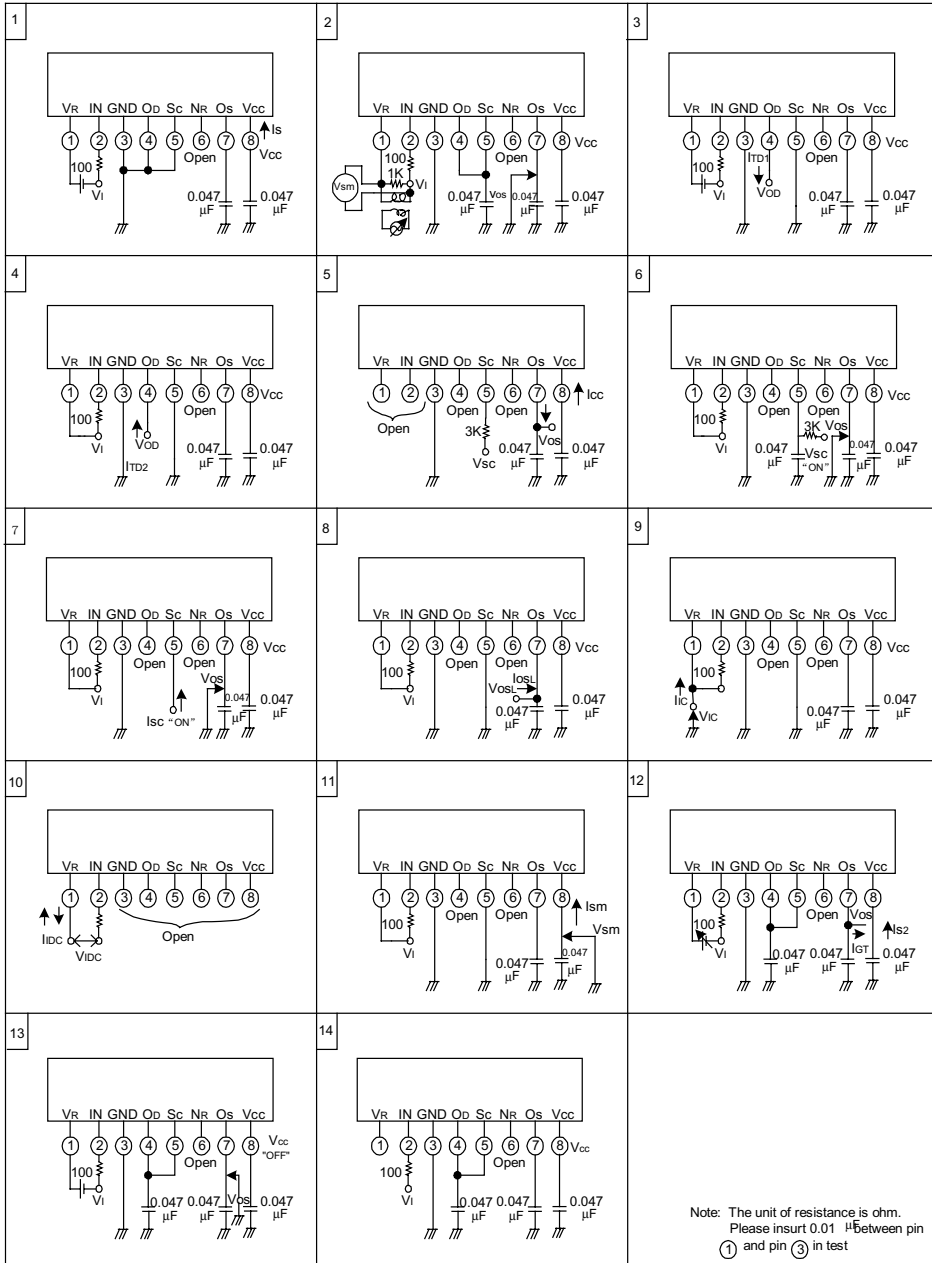
PARAMETER	SYMBOL	CONDITIONS	TEMP (°C)	MIN.	TYP.	MAX.	UNIT	TEST CIRCUIT
Supply Current 1	I _{S1}	V ⁺ =12V, V _R -V _I =30mV	-30	-	-	580	μA	1
			25	-	400	530		
			85	-	-	480		
* Trip Voltage	V _T	V ⁺ =16V, V _R -V _I =X	-30 85	9	13.5	18	mV(rms)	2
Differential Amplifier Output Current 1	I _{TD1}	V ⁺ =16V, V _R -V _I =30mV V _{OD} =1.2V	25	-12	-	-30	μA	3
Differential Amplifier Output Current 2	I _{TD2}	V ⁺ =6V, V _R -V _I =short V _{OD} =0.8V	25	17	-	37	μA	4
Output Current	I _O	V _{SC} =1.4V V _{OS} =0.8V	IsI=580 μA	-30	-200	-	μA	5
			IsI=530 μA	25	-100	-		
			IsI=480 μA	85	-75	-		
Sc On Voltage	V _{SC ON}	V ⁺ =16V	25	0.7	-	1.4	V	6
Sc Input Current	I _{SC ON}	V ⁺ =12V	25	-	-	5	μA	7
Output "L" Current	I _{OSL}	V ⁺ =12V, V _{OSL} =0.2V	-30	200	-	-	μA	8
			85					
Input Clamp Voltage	V _{IC}	V ⁺ =12V, V _{IC} =20mA	-30	4.3	-	6.7	V	9
			85					
Differential Input Clamp Voltage	V _{IDC}	I _{IDC} =100mV	-30	0.4	-	2	V	10
			85					
Max. Current voltage	V _{SM}	I _{SM} =7mA	25	20	-	28	V	11
Supply Current 2	I _{S2}	V _{OS} =0.5V, V _R -V _I =X	-30	-	-	900	μA	12
			85					
Latch Circuit Off Supply Voltage	V _{+OFF}		25	0.5	-		V	13
Response Time	T _{ON}	V ⁺ =16V, V _R -V _I =0.3V	25	1	-	4	ms	14

* A: 9 ~ 12.55 B: 11.5 ~ 15.5 C: 14.5 ~ 18

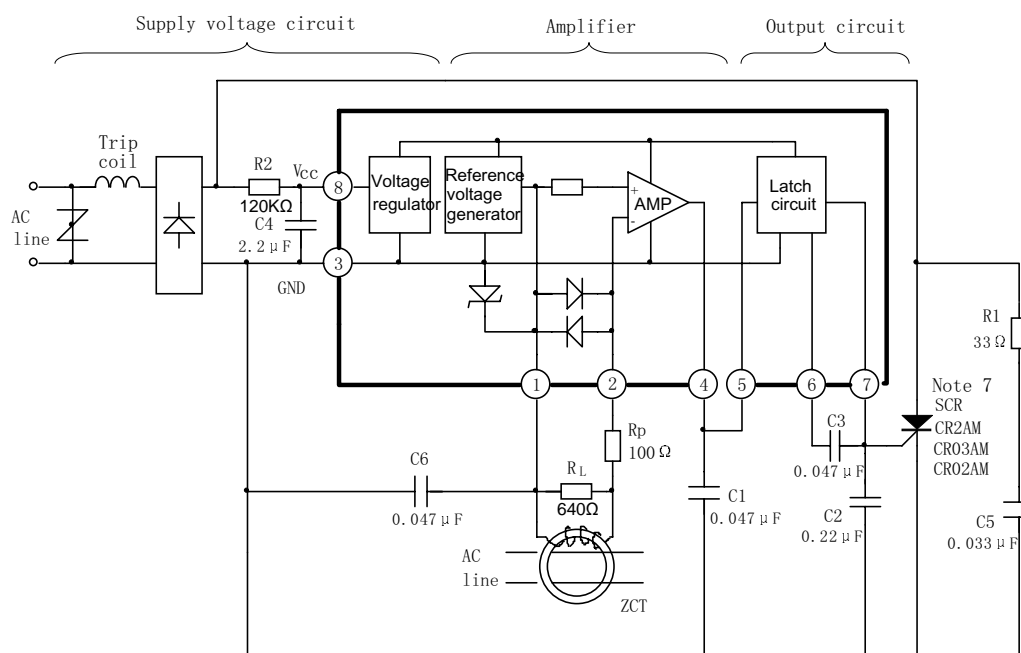
Typical Performance Curves



Test Circuit



Typical Application



Note 7: Gate current must be selected.
Please select voltage resistance by AC supply voltage.

Supply voltage circuit is connected as a previous diagram. Please decide constants R1, R2, C4, and C5 of a filter in order to keep at least 12V in Vcc, when normal, supply current flows.

In this case, please connect C4 (more than 1 μF) and C2 (less than 1 μF). ZCT and load resistance RL of ZCT are connected between input pin 1 and 2. In this case protective resistance (Rp=100 Ω) must be inserted. Sensitivity current is regulated by RL, RL could be about 640Ω for checking, and output of amplifier shows in pin 4. External capacitor C1 between pin 4 and GND is used for noise removal.

When large current is grounded in the primary side (AC line) of ZCT, the wave form in the secondary side of ZCT is distorted and some signals does not appear in the output of amplifier. So please connect a varistor or a diode (2 pcs) to ZCT in parallel.

Latch circuit is used to inspect the output level of amplifier and to supply gate current on the external SCR. When input pin becomes more than 1.1V (Typ.), latch circuit operate and supply gate current in the gate of SCR connected to the output pin 7. Pin 6 can be used in the open state, but please connect capacitor (about 0.047 μF) between pin 6 and pin 7.

Capacitor C6 between pin 1 and GND is used to remove noise and is about 0.047 μF.