Shanghai Fudan Microelectronics Group Company Limited

复旦微电子

# *VG54123L/P EARTH LEAKAGE CURRENT DETECTOR*

**Specification**

**Mar. 2012**

# Product Overview

## Description

VG54123L/P is a semiconductor integrated circuit with amplifier for a high-speed earth leakage circuit breaker. VG54123L/P is completely compatible with the M54123L.

## Features

- **Wide temperature range (-20℃ ~ +80℃）**
- **Good temperature characteristics of sensitivity current**
- **High input sensitivity ($V_T$ = 6.1mV Typ.)**
- **Low external component count**
- **High noise and surge-proof**
- **Low power demission ($P_d$ = 5mW Typ.)**
- **May be used both as 110V and 220V**
- **SIP8 (VG54123L), DIP8 (VG54123D), SOP8 (VG54123P)**

## Function

The VG54123 circuit for the amplifying parts of earth leakage circuit breaker consists of differential amplifier, latch circuit and voltage regulator. It is connected to the secondary side of the zero current transformers (ZCT) which detects leakage current in the both input of the differential amplifier. Signals amplified by differential amplifier are integrated by an external capacitor, and connects to the input terminal of latch circuit with output suitable for the characteristics of high-speed earth leakage circuit breaker. Latch circuit keeps low in the output till the input voltage reaches the fixed level, and output becomes high when the leakage current more than fixed flows. It drives a thyristor connected to the output terminal of latch circuit.

## Pin Function

| Pin | Symbol | Pin Function |
|---|---|---|
| 1 | $V_R$ | Reference voltage |
| 2 | IN | Input |
| 3 | GND | Ground |
| 4 | OD | Differential amplifier output |
| 5 | SC | Latch input |
| 6 | NR | Terminal and noise absorption |
| 7 | OS | Output |
| 8 | $V_S$ | Supply voltage |

# Characteristics

## Absolute Maximum Ratings

（Ta= -20℃ ~ +80℃, unless otherwise noted）

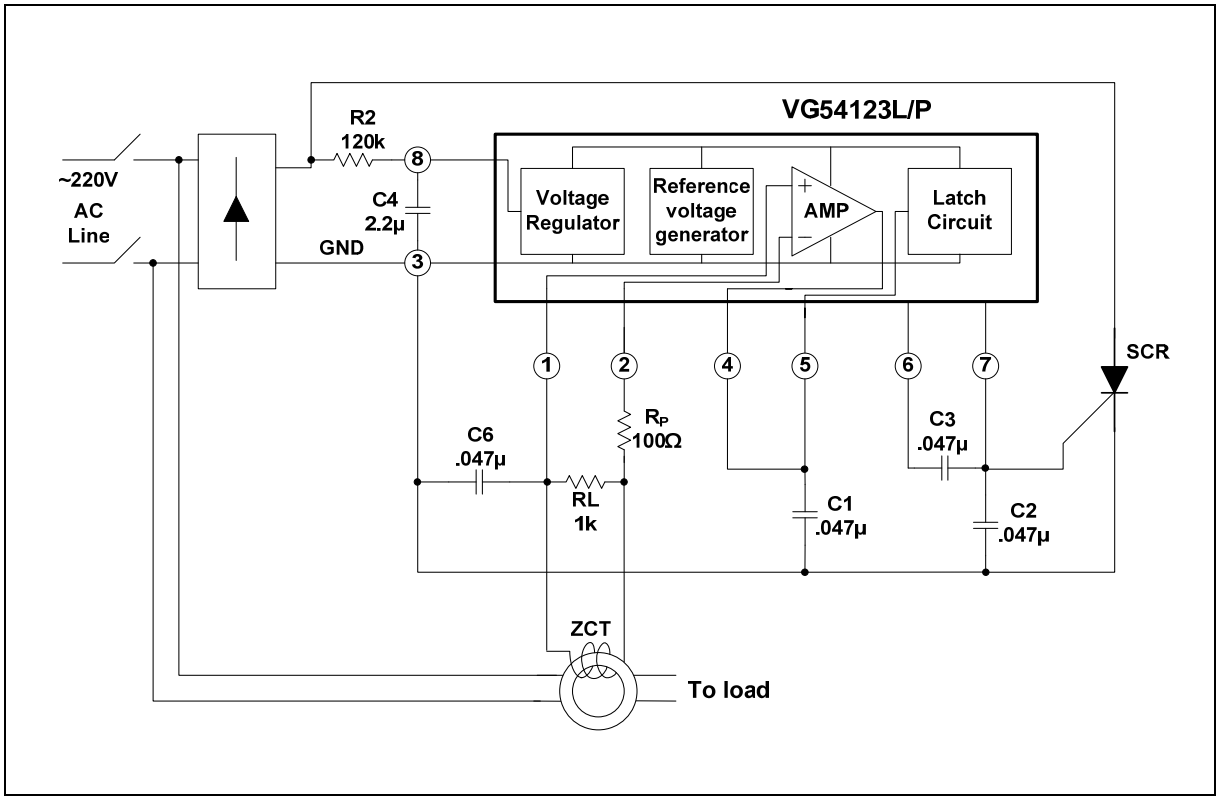
| Symbol | Parameter | Conditions | Rating | Unit |
|---|---|---|---|---|
| $I_S$ | Supply current | - | 8 | mA |
| $I_{VR}$ | VR pin current | $V_R$-IN | 250 | mA |
| | | $V_R$-GND | 30 | |
| | | IN-$V_R$ | -250 | |
| $I_{IN}$ | IN terminal current | IN-$V_R$ | 250 | mA |
| | | IN-GND | 30 | |
| | | $V_R$-IN | -250 | |
| $I_{SC}$ | SC terminal current | - | 5 | mA |
| $P_d$ | Power dissipation | - | 200 | mW |
| $T_{opr}$ | Operating temperature | - | -20 ~ +80 | ℃ |
| $T_{stg}$ | Storage temperature | - | -55 ~ +125 | ℃ |

## Electrical Characteristics

（Ta= -20℃ ~ +80℃, unless otherwise noted）

| Symbol | Parameter | Test conditions | Temperature (℃) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{S1}$ | Supply current | $V_S$=12V, $V_R$ -$V_i$=30mV | 25 | | 400 | 580 | μA |
| $V_T$ | Trip voltage | $V_S$=12V, $V_R$ -$V_i$ | -20~+80 | 4 | 6.1 | 9 | mVrms |
| $I_{TD1}$ | Timed current1 | $V_S$=12V, $V_R$ -$V_i$=30mV $V_{OD}$=1.2V | 25 | -30 | | -12 | μA |
| $I_{TD2}$ | Timed current2 | $V_S$=12V, short circuit between $V_R$ and $V_i$, $V_{OD}$=0.8V | 25 | 17 | | 37 | μA |
| $I_O$ | Output current | $V_{SC}$=1.4V $I_{S1}$=530μA | 25 | -100 | | | μA |
| | | $V_{OS}$=0.8V $I_{S1}$=480μA | 80 | -75 | | | |
| $V_{SC}$ "ON" | Sc "ON" voltage | $V_S$=12V | 25 | 0.7 | | 1.4 | V |
| $I_{SC}$ "ON" | Sc input current | $V_S$=12V | 25 | | | 5 | μA |
| $I_{OSL}$ | Output low-level current | $V_S$=12V, $V_{OSL}$=0.2V | -20~+80 | 200 | | | μA |
| $V_{IC}$ | Input clamp voltage | $V_S$=12V, $I_{IC}$=20mA | -20~+80 | 4.3 | | 6.7 | V |
| $V_S$ "OFF" | Latch circuit is off-state supply voltage | | 25 | 0.5 | | | V |
| $T_{ON}$ | Operating time | $V_S$=12V, $V_R$ -$V_i$=0.3V | 25 | 3 | | 4 | ms |

# Application Circuit



# Revision History

| Version | Publication date | Pages | Paragraph or Illustration | Revise Description |
|---|---|---|---|---|
| 1.0 | Mar. 1999 | 2 | | Initial Release. |
| 2.0 | Oct. 2007 | 7 | | Updated format. |
| 2.1 | May. 2008 | 7 | Sales and service | Updated the address of HK office. |
| 2.2 | Mar. 2012 | 7 | Electrical Characteristics | Corrected the Max and Min of $I_{TD1}$ in the Electrical Characteristics |

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