

# CS1107

## Single Relay Driver IC

This ASIC provides up to 350 mA of drive current for driving a relay. On-chip diagnostic features include open and short circuit detection in the on state, duty cycle current limit control, and thermal shutdown. Faults are reported on the Fault lead. Fault is an active-low output. An on-chip zener provides protection from flyback pulses from the relay. Internal pull-down circuitry is provided to ensure the output pin turns off when the Control pin is floating.

### Features

- Fault Detection
  - Open Circuit
  - Short Circuit
  - Overtemperature
- On-Chip Flyback Protection
- Low Standby Current
- Internally Fused Leads in SO-8 Package

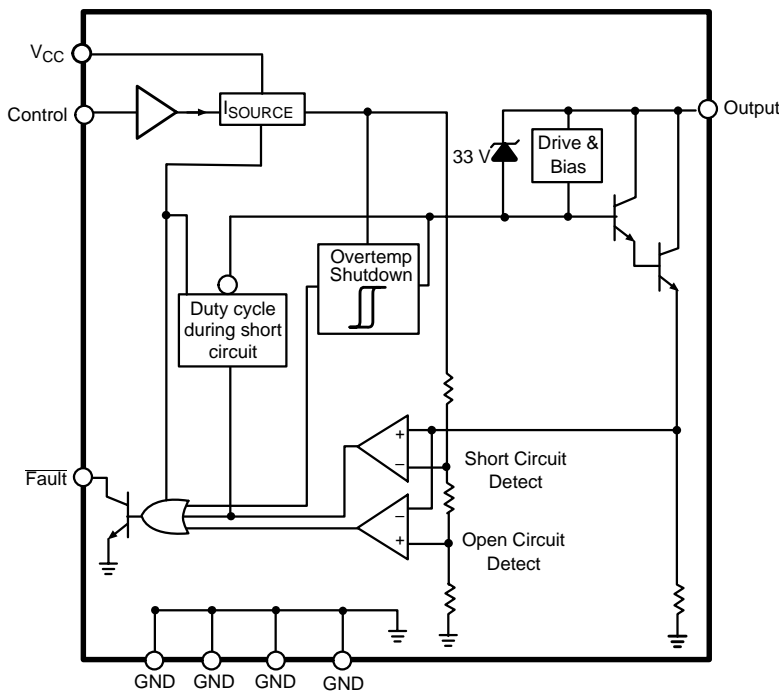


Figure 1. Block Diagram



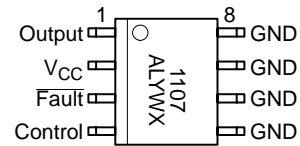
ON Semiconductor™

<http://onsemi.com>



SO-8  
DF SUFFIX  
CASE 751

### PIN CONNECTIONS AND MARKING DIAGRAM



A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week

### ORDERING INFORMATION

| Device      | Package | Shipping         |
|-------------|---------|------------------|
| CS1107EDF8  | SO-8    | 95 Units/Rail    |
| CS1107EDFR8 | SO-8    | 2500 Tape & Reel |

# CS1107

## ABSOLUTE MAXIMUM RATINGS\*

| Rating  | Value                               | Unit     |
|---|-------------------------------------|----------|
| Storage Temperature                                       | -65 to +150                         | °C       |
| $V_{CC}$ , $\overline{\text{Fault}}$ , Control            | -0.5 to 6.0                         | V        |
| ESD Capability (Human Body Model)                         | 2.0                                 | kV       |
| Peak Transient Voltage (output off mode, output pin only) | (26 V Load Dump @ 14 V $V_{BAT}$ )  | 40       |
| Lead Temperature Soldering:                               | Reflow: (SMD styles only) (Note 1.) | 230 peak |

1. 60 second maximum above 183°C.

\*The maximum package power dissipation must be observed.

**ELECTRICAL CHARACTERISTICS** ( $4.75 \leq V_{CC} \leq 5.25$  V,  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ ,  $-40^{\circ}\text{C} \leq T_J \leq 150^{\circ}\text{C}$ ; unless otherwise specified.)

| Characteristic                         | Test Conditions  | Min | Typ  | Max  | Unit          |
|--|--|-----|------|------|---------------|
| <b>Supply Requirements</b>             |  |     |      |      |               |
| $V_{CC}$ Quiescent Current             | Output ON  | –   | 3.0  | 6.0  | mA            |
| $V_{CC}$ Quiescent Current             | Output OFF   | –   | 70   | 250  | $\mu\text{A}$ |
| <b>Output</b>                          |  |     |      |      |               |
| Leakage Current                        | $V_{BAT} = 14$ V   | –   | 0    | 100  | $\mu\text{A}$ |
| Saturation Voltage                     | $I_{\text{OUTPUT}} = 350$ mA<br>$I_{\text{OUTPUT}} = 180$ mA | –   | 1.1  | 1.5  | V             |
|  |  | –   | 0.9  | 1.3  | V             |
| $V_{\text{CLAMP}}$                     | $V_{CC} < 4.5$ V, $I_{\text{OUTPUT}} = 180$ mA               | 29  | 33   | 36   | V             |
| <b>Current Sense</b>                   |  |     |      |      |               |
| Short Circuit Current                  | –  | 350 | 500  | 650  | mA            |
| Open Circuit Current                   | Output in the ON state                                       | 20  | 40   | 60   | mA            |
| <b>Control–Input</b>                   |  |     |      |      |               |
| Input Voltage                          | Logic = High<br>Logic = Low                                  | 2.0 | –    | –    | V             |
|  |  | –   | –    | 0.8  | V             |
| Input Current                          | Control = $V_{CC}$   | –   | 40   | 80   | $\mu\text{A}$ |
| <b>Fault Output – (Open Collector)</b> |  |     |      |      |               |
| Output Low Voltage                     | $I_{\text{FAULT}} = 250$ $\mu\text{A}$ (sink)                | –   | 0.24 | 0.40 | V             |
| <b>Overtemperature Shutdown</b>        |  |     |      |      |               |
| $T_J$ Output Disable Threshold         | (Guaranteed by Design)                                       | 150 | 180  | –    | °C            |
| $T_J$ Hysteresis                       | (Guaranteed by Design)                                       | 5.0 | –    | –    | °C            |

## PACKAGE PIN DESCRIPTION

| PACKAGE PIN #    | PIN SYMBOL                | FUNCTION   |
|------------------|---------------------------|--|
| 8 Lead SO Narrow |                           |  |
| 1                | Output                    | Open collector output.   |
| 2                | $V_{CC}$                  | 5.0 V regulated supply input.  |
| 3                | $\overline{\text{Fault}}$ | Open collector diagnostic output low during open load, short circuit and overtemperature conditions. |
| 4                | Control                   | TTL compatible input. A high on this pin turns the output on.  |
| 5, 6, 7, 8       | Ground                    | Signal ground.   |

# CS1107

## CIRCUIT DESCRIPTION

The CS1107 relay driver IC provides up to 350 mA of drive current in a low-side configuration. The Output driver pin is controlled through the TTL compatible Control input pin. A high condition on the Control pin turns the output pin on.

The  $\overline{\text{Fault}}$  pin reports short circuit, open circuit, and overtemperature conditions on the IC. If a fault is present, the open collector output  $\overline{\text{Fault}}$  pin will be low. Typical numbers for faults are: exceeding 500 mA of drive current will report a short circuit. Less than 40 mA (typical) will report an open circuit. A temperature fault will be reported when the die temperature exceeds 180°C (typical). Faults

are only reported when the Control pin is high, due to the low quiescent current when the Control pin is low and the output device is turned off.

Overcurrent protection is provided by duty cycle control. When the Output current exceeds the current limit threshold, the output enters duty cycle mode to reduce power dissipation of the IC to a safe level. The higher the threshold is exceeded the lower the duty cycle becomes.

A 33 V on-chip zener diode on the Output pin protects the device from flyback pulses when a relay is turned off. The saturation voltage of this pin will not exceed 1.5 V at 350 mA.

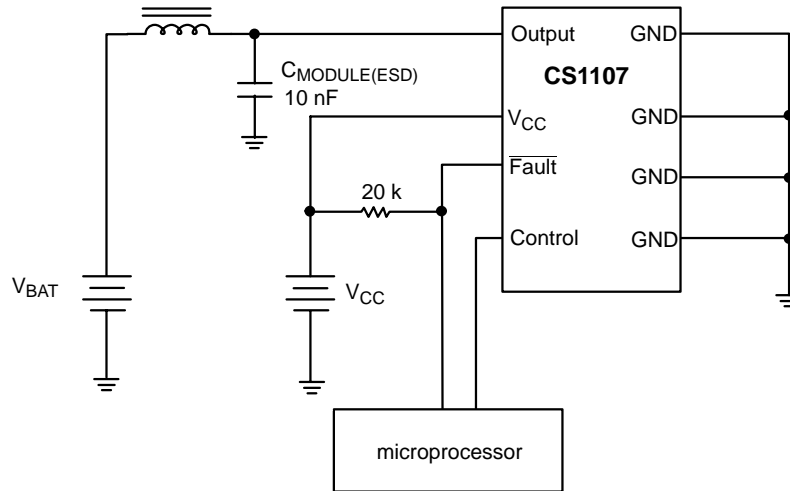
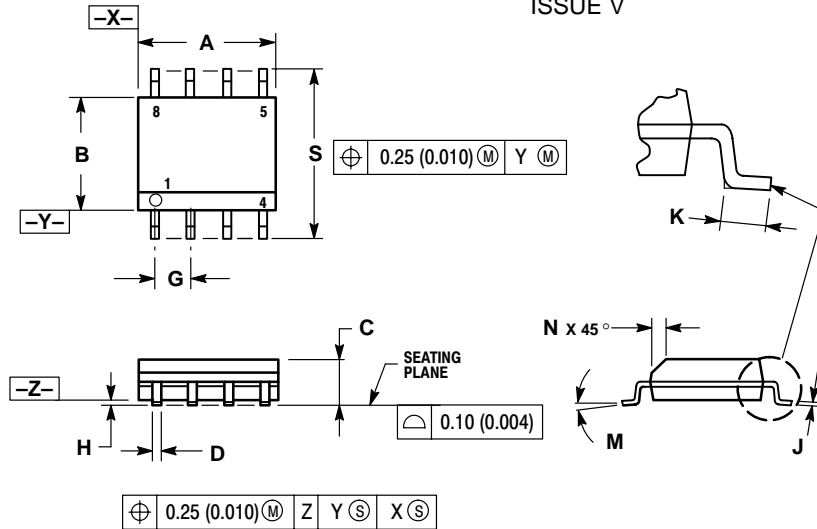


Figure 2. Applications Diagram

# CS1107

## PACKAGE DIMENSIONS

SO-8  
DF SUFFIX  
CASE 751-07  
ISSUE V



| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

### PACKAGE THERMAL DATA

| Parameter        |         | SO-8 | Unit |
|------------------|---------|------|------|
| R <sub>θJC</sub> | Typical | 25   | °C/W |
| R <sub>θJA</sub> | Typical | 110  | °C/W |

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

### PUBLICATION ORDERING INFORMATION

#### NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: ONlit@hibbertco.com  
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

#### N. American Technical Support: 800-282-9855 Toll Free USA/Canada

#### EUROPE: LDC for ON Semiconductor – European Support

German Phone: (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)  
Email: ONlit-german@hibbertco.com  
French Phone: (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)  
Email: ONlit-french@hibbertco.com  
English Phone: (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)  
Email: ONlit@hibbertco.com

#### EUROPEAN TOLL-FREE ACCESS\*: 00-800-4422-3781

\*Available from Germany, France, Italy, UK, Ireland

#### CENTRAL/SOUTH AMERICA:

Spanish Phone: 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)  
Email: ONlit-spanish@hibbertco.com

#### ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)  
Toll Free from Hong Kong & Singapore:  
001-800-4422-3781  
Email: ONlit-asia@hibbertco.com

#### JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031  
Phone: 81-3-5740-2745  
Email: r14525@onsemi.com

#### ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.