# SMA4123

1 Form A
60V / 200mΩ
MOSFET Output Solid State Relay



## Description

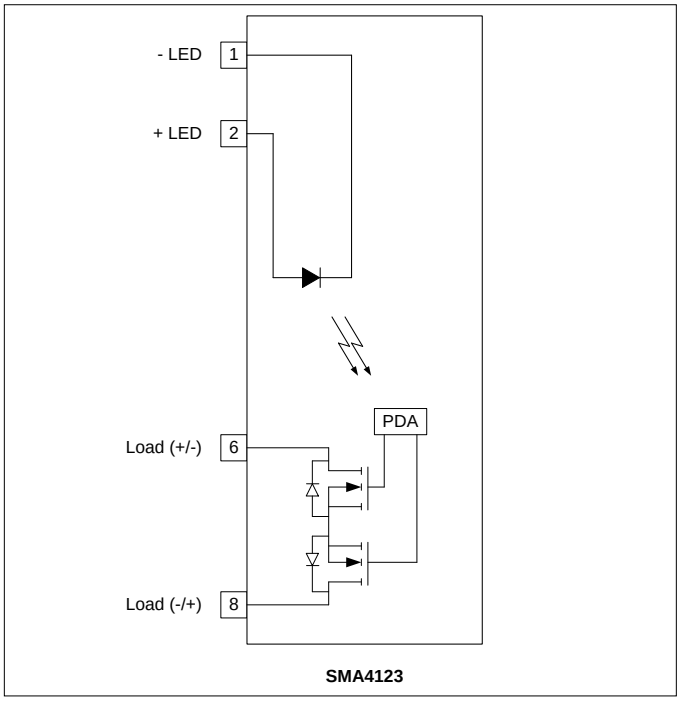
The SMA4123 is a single-pole, single-throw, normally open multipurpose solid state relay. The circuit is composed of an infra-red LED on the input side optically coupled to a Photo Diode Array which drives back-to-back low on resistance enhancement type DMOS transistors on the output. The SMA4123 has a low on resistance of 160mΩ (TYP) and a high continuous load current rating of up to 2.2 amps.

The SMA4123 comes standard in a 4 pin SIP package.

## Applications

- Reed Relay Replacement
- Mechanical Relay Replacement
- Medical Equipment
- Battery Monitoring
- Multiplexers
- Test Equipment

## Schematic Diagram




SMA4123

## Features

- High Load Current (2.2A MAX)
- Low Input Control Current (1.5mA TYP)
- Low On Resistance (160mΩ TYP)
- High Input-to-Output Isolation (5kV option)
- Long Life / High Reliability
- RoHS / Pb-Free / REACH Compliant

## Agency Approvals

| | |
|---|---|
| UL/C-UL: | File # E90096 |
| VDE: | File # 40035191 (EN 60747-5-2) |

## Absolute Maximum Ratings

The values indicated are absolute stress ratings. Functional operation of the device is not implied at these or any conditions in excess of those defined in electrical characteristics section of this document. Exposure to absolute Maximum Ratings may cause permanent damage to the device and may adversely affect reliability.

Storage Temperature .....-55 to +125°C
Operating Temperature .....-40 to +85°C
Continuous Input Current.....50mA
Transient Input Current.....500mA
Reverse Input Control Voltage .....5V
Input Power Dissipation.....40mW
Total Power Dissipation .....1.2W
Solder Temperature – Wave (10sec).....260°C
Solder Temperature – IR Reflow (10sec).....260°C

## Ordering Information

| Part Number | Description |
|---|---|
| SMA4123 | 4 pin SIP, (25/Tube) |
| SMA4123-H | $5kV_{RMS}$ $V_{ISO}$, 4 pin SIP, (25/Tube) |

**NOTE: (-H) suffix listed above may not be included in marking on device for part number identification**

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**Electrical Characteristics,** $T_A$ = 25°C (unless otherwise specified)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| **Input Specifications** | | | | | | |
| LED Forward Voltage | $V_F$ | - | 1.4 | 1.8 | V | $I_F$ = 10mA |
| LED Reverse Voltage | $BV_R$ | 5 | - | - | V | $I_R$ = 10µA |
| Input Reverse Current | $I_R$ | - | - | 10 | µA | $V_R$ = 5V |
| Turn-On Current | $I_F$ | - | 1.5 | 5 | mA | $I_O$ = 2.2A |
| Turn-Off Current | $I_{FOFF}$ | - | 0.5 | - | mA | $I_O$ = 2.2A |
| **Output Specifications** | | | | | | |
| Blocking Voltage | $V_B$ | 60 | - | - | V | $I_F$ = 0mA, $I_O$ = 1µA |
| Continuous Load Current | $I_O$ | - | - | 2.2 | A | $I_F$ = 5mA |
| On Resistance | $R_{ON}$ | - | 160 | 200 | mΩ | $I_F$ = 5mA, $I_O$ = 2.2A |
| Leakage Current | $I_{Oleak}$ | - | 0.1 | 1 | µA | $I_F$ = 0mA, $V_O$ = 600V |
| Output Capacitance | $C_{OUT}$ | - | 20 | - | pF | $V_O$=25V, f=1.0MHz |
| Offset Voltage | $V_{OFFSET}$ | - | - | 0.2 | mV | $I_F$ = 10mA |
| **Coupled Specifications** | | | | | | |
| Turn-On Time | $T_{ON}$ | - | 1 | 2 | mS | $I_F$ = 5mA, $I_O$ = 2.2A |
| Turn-Off Time | $T_{OFF}$ | - | 0.1 | 1 | mS | $I_F$ = 0mA, $I_O$ = 2.2A |
| Coupled Capacitance | $C_{COUPLED}$ | - | 2 | - | pF | |
| Contact Transient Ratio | - | 2,000 | 7,000 | 0 | V/µS | dV = 50V |
| **Isolation Specifications** | | | | | | |
| Isolation Voltage | $V_{ISO}$ | 3,750 | - | - | $V_{RMS}$ | RH ≤ 50%, t=1min |
| -H Option | | 5,000 | - | - | | |
| Input-Output Resistance | $R_{I-O}$ | - | $10^{12}$ | - | Ω | $V_{I-O}$ = 500$V_{DC}$ |

## SMA4123 Performance & Characteristics Plots, $T_A$ = 25°C (unless otherwise specified)

**Figure 1:** *Typical Turn-On Time Distribution*
(N = 100, $T_a$ = 25ºC)

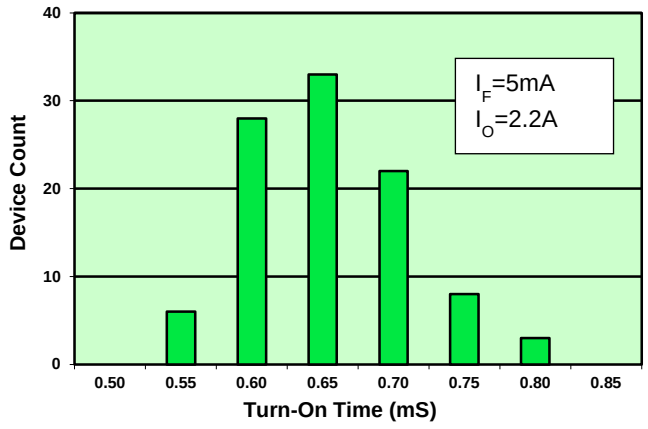



**Figure 2:** *Typical Turn-Off Time Distribution*
(N = 100, $T_a$ = 25ºC)

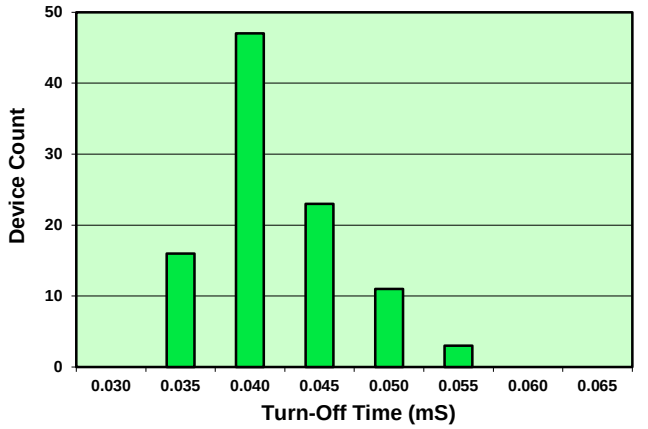



**Figure 3:** *Typical On-Resistance Distribution*
(N = 100, $T_a$ = 25ºC)

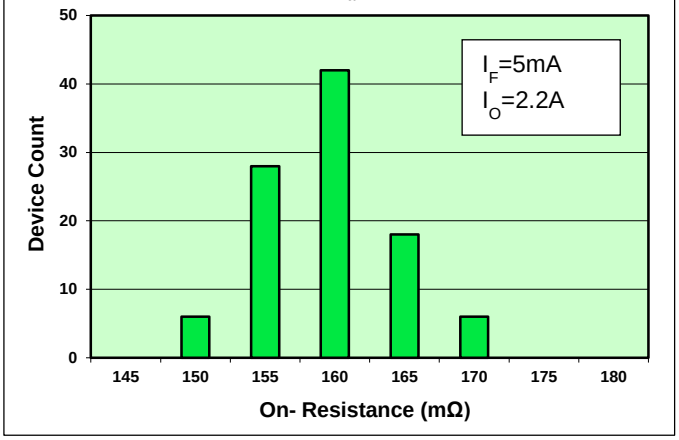



**Figure 4:** *Typical Output Leakage Current Distribution* (N = 100, $T_a$ = 25ºC)

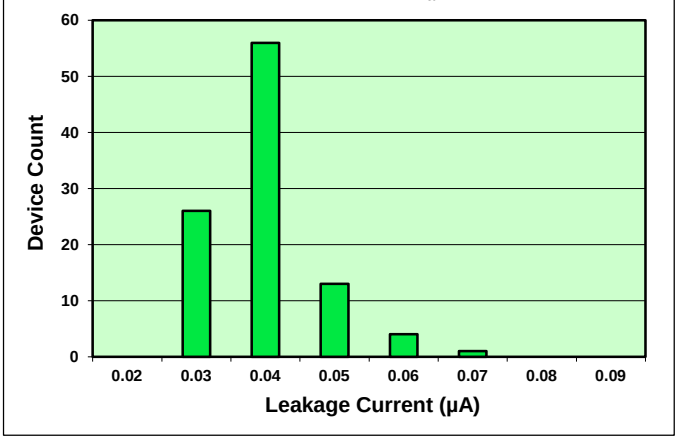



**Figure 5:** *Typical Blocking Voltage Distribution*
(N = 100, Ta = 25ºC)

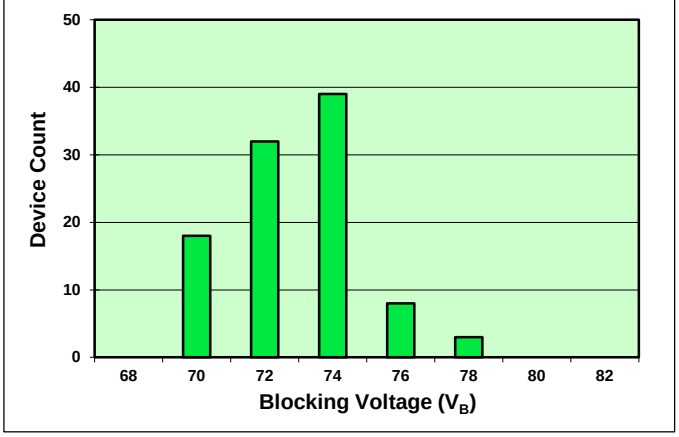
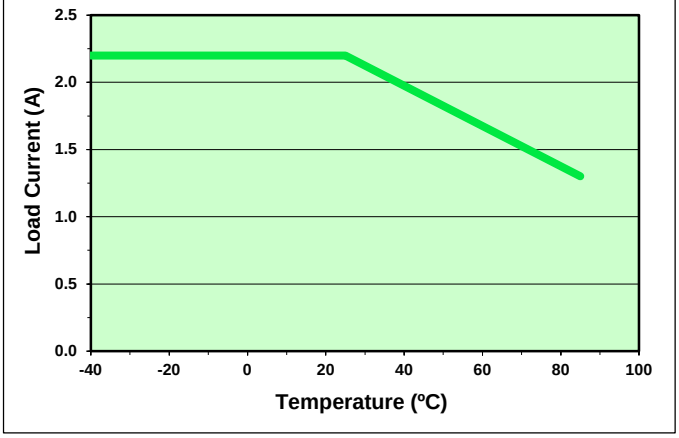



**Figure 6:** *Maximum Load Current vs. Temperature*

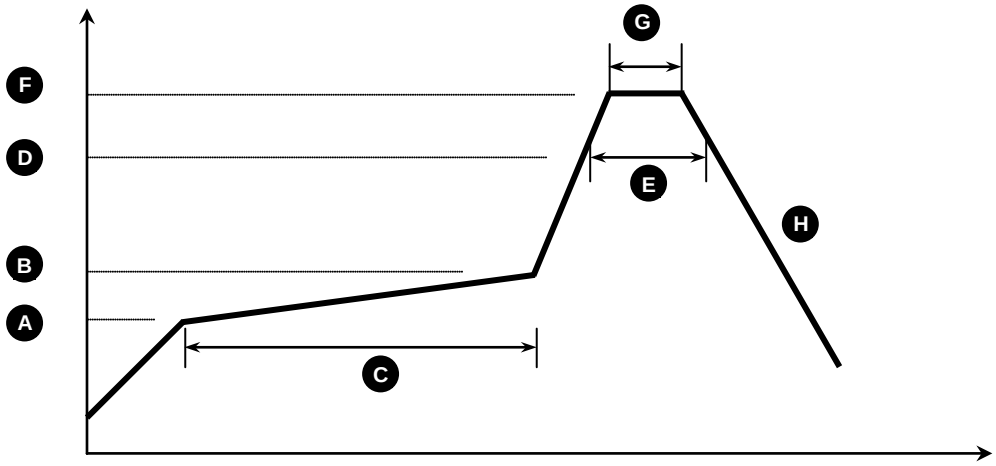



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## SMA4123 Solder Reflow Temperature Profile Recommendations

### (1) *Infrared Reflow:*

Refer to the following figure as an example of an optimal temperature profile for single occurrence infrared reflow. Soldering process should not exceed temperature or time limits expressed herein. Surface temperature of device package should not exceed 250ºC:




| Process Step | Description | Parameter |
|---|---|---|
| A | Preheat Start Temperature (ºC) | 150ºC |
| B | Preheat Finish Temperature (ºC) | 180ºC |
| C | Preheat Time (s) | 90 - 120s |
| D | Melting Temperature (ºC) | 230ºC |
| E | Time above Melting Temperature (s) | 30s |
| F | Peak Temperature, at Terminal (ºC) | 260ºC |
| G | Dwell Time at Peak Temperature (s) | 10s |
| H | Cool-down (ºC/s) | <6ºC/s |

### (2) *Wave Solder:*

| | |
|---|---|
| Maximum Temperature: | 260ºC (at terminal) |
| Maximum Time: | 10s |
| Pre-heating: | 100 - 150ºC (30 - 90s) |
| Single Occurrence | |

### (3) *Hand Solder:*

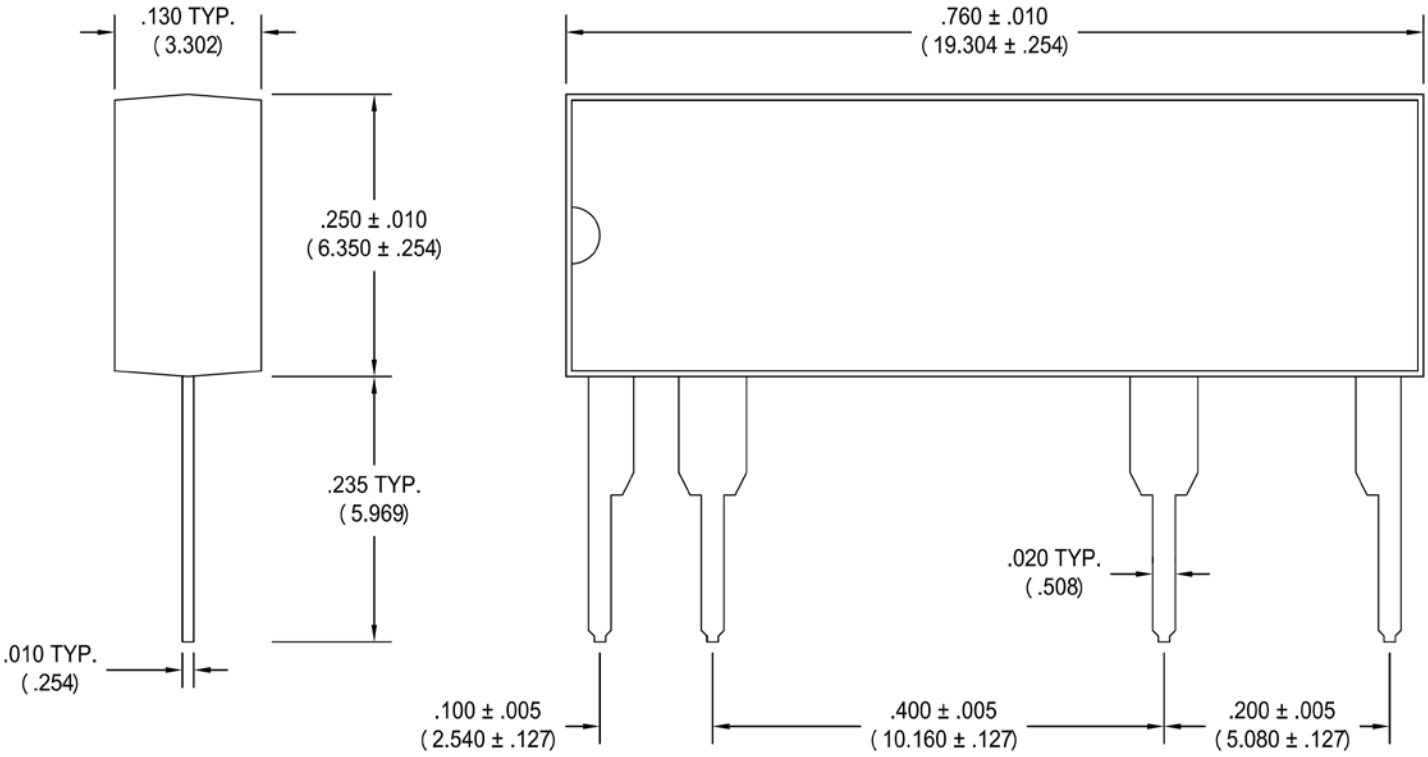
| | |
|---|---|
| Maximum Temperature: | 350ºC (at tip of soldering iron) |
| Maximum Time: | 3s |
| Single Occurrence | |

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## SMA4123 Package Dimensions

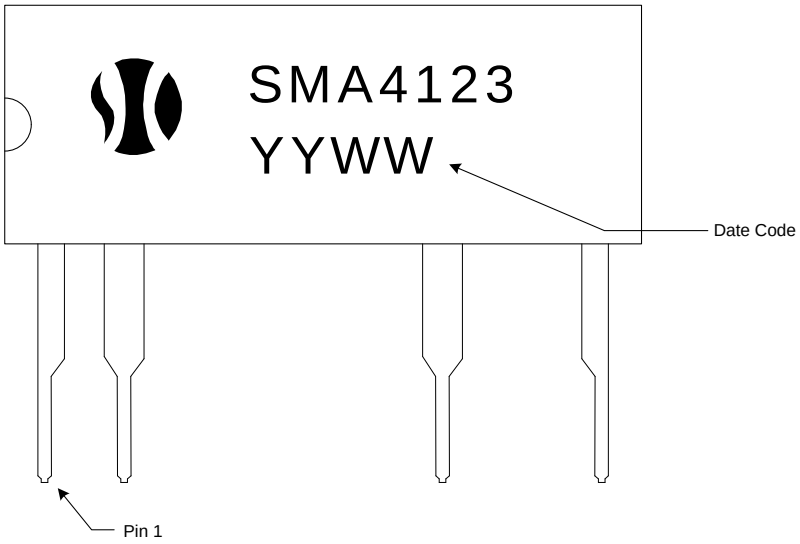
*4 PIN SIP Package*

***Note:*** *All dimensions in inches with millimeters [mm] in parenthesis ()*




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## SMA4123 Package Marking




## SMA4123 Package Weights

| Device | Single Unit | Full Tube (25pcs) | Full Pouch (10 tubes) |
|---|---|---|---|
| SMA4123 | 0.88 | 35 | 370 |

***Note:*** *All weights above are in GRAMS, and include packaging materials where applicable*

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