SOLID STATE OPTRONICS

SMA4120

1 Form A
600V / 6Ω
MOSFET Output Solid State Relay

Description

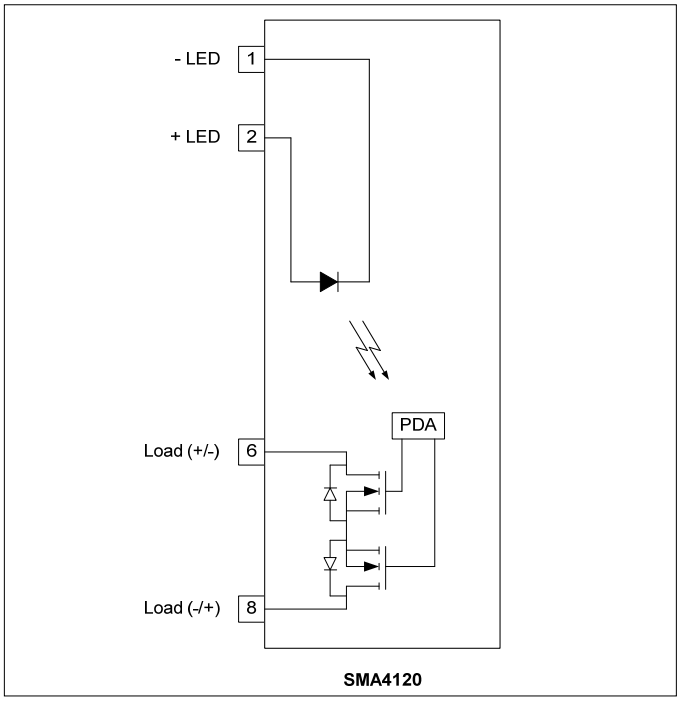
The SMA4120 is a single-pole, single-throw, normally open multipurpose solid state relay. The circuit is composed of an infra-red LED on the input side optically coupled to a Photo Diode Array which drives back-to-back high voltage enhancement type DMOS transistors on the output. The SMA4120 has a high blocking voltage (600V) and is rated for a continuous load current of 0.5A. The combination of high blocking voltage, high load current, and small form factor make the SMA4120 ideal for electromechanical and reed relay replacement.

The SMA4120 comes standard in a 4 pin SIP package.

Applications

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

Schematic Diagram



SMA4120

Features

- High Blocking Voltage (600V MIN)
- High Load Current (0.5A MAX Continuous)
- Low Input Control Current (3mA TYP)
- Low On Resistance (4Ω TYP)
- High Input-to-Output Isolation (4kV)
- 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
SMA4120	4 pin SIP, (25/Tube)

NOTE: Suffixes listed above are not included in marking on device for part number identification

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 = 6V
Turn-On Current	I_F	-	3	5	mA	I_O = 0.5A
Turn-Off Current	I_{FOFF}	-	1	-	mA	I_O = 0.5A
Output Specifications						
Blocking Voltage	V_B	600	-	-	V	I_F = 0mA, I_O = 1µA
Continuous Load Current	I_O	-	-	0.5	A	I_F = 5mA
On Resistance	R_{ON}	-	4	6	Ω	I_F = 5mA, I_O = 0.5A
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}	-	3	5	mS	I_F = 5mA, I_O = 0.5A, V_O = 10V
Turn-Off Time	T_{OFF}	-	0.5	2	mS	I_F = 0mA, I_O = 0.5A, V_O = 10V
Coupled Capacitance	$C_{COUPLED}$	-	2	-	pF	
Contact Transient Ratio	-	2,000	7,000	0	V/µS	dV = 50V
Isolation Specifications						
Isolation Voltage	V_{ISO}	4000	-	-	V_{RMS}	RH ≤ 50%, t=1min
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	V_{I-O} = 500V_{DC}

SMA4120 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

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

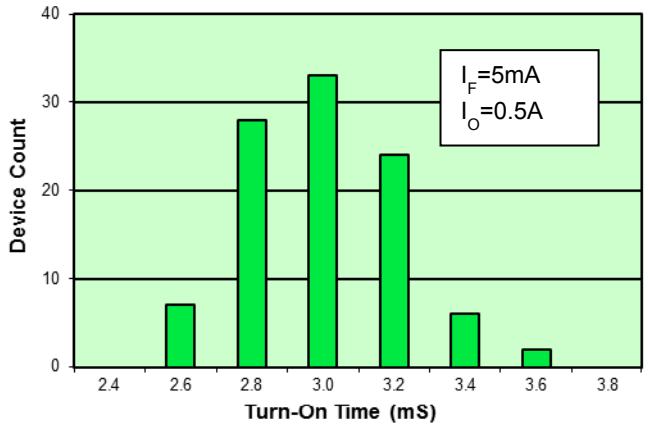


Figure 2: *Typical Turn-Off Time Distribution* (N = 100, T_a = 25ºC)

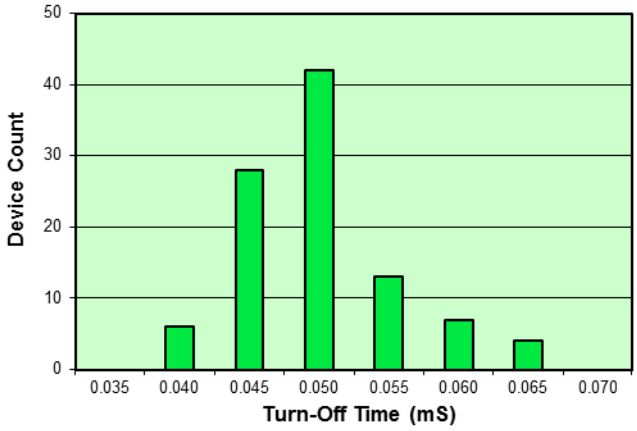


Figure 3: *Typical On-Resistance Distribution* (N = 100, T_a = 25ºC)

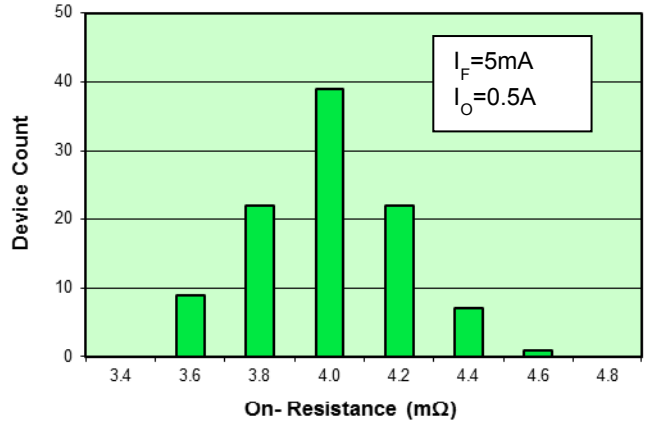


Figure 4: *Typical Output Leakage Current Distribution* (N = 100, T_a = 25ºC)

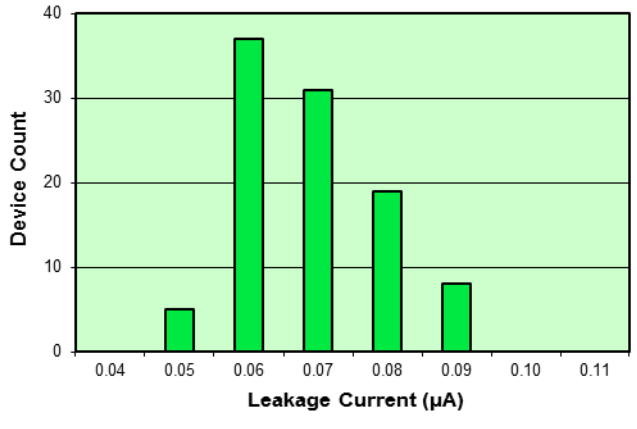


Figure 5: *Typical Blocking Voltage Distribution* (N = 100, Ta = 25ºC)

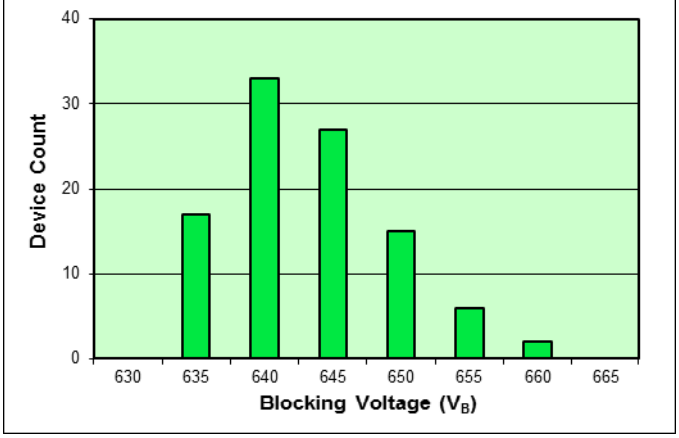
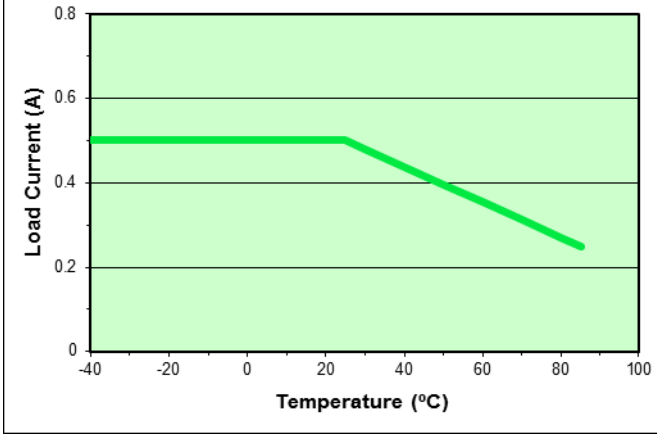


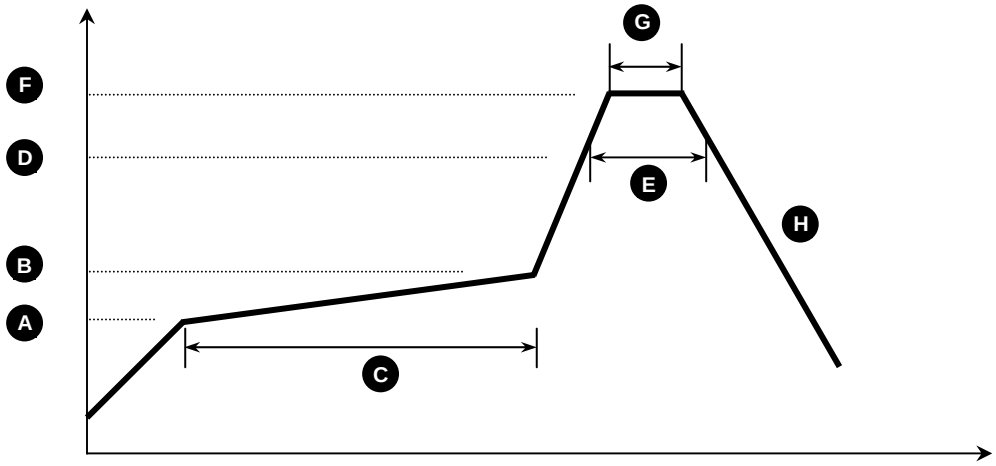
Figure 6: *Maximum Load Current vs. Temperature*



SMA4120 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	

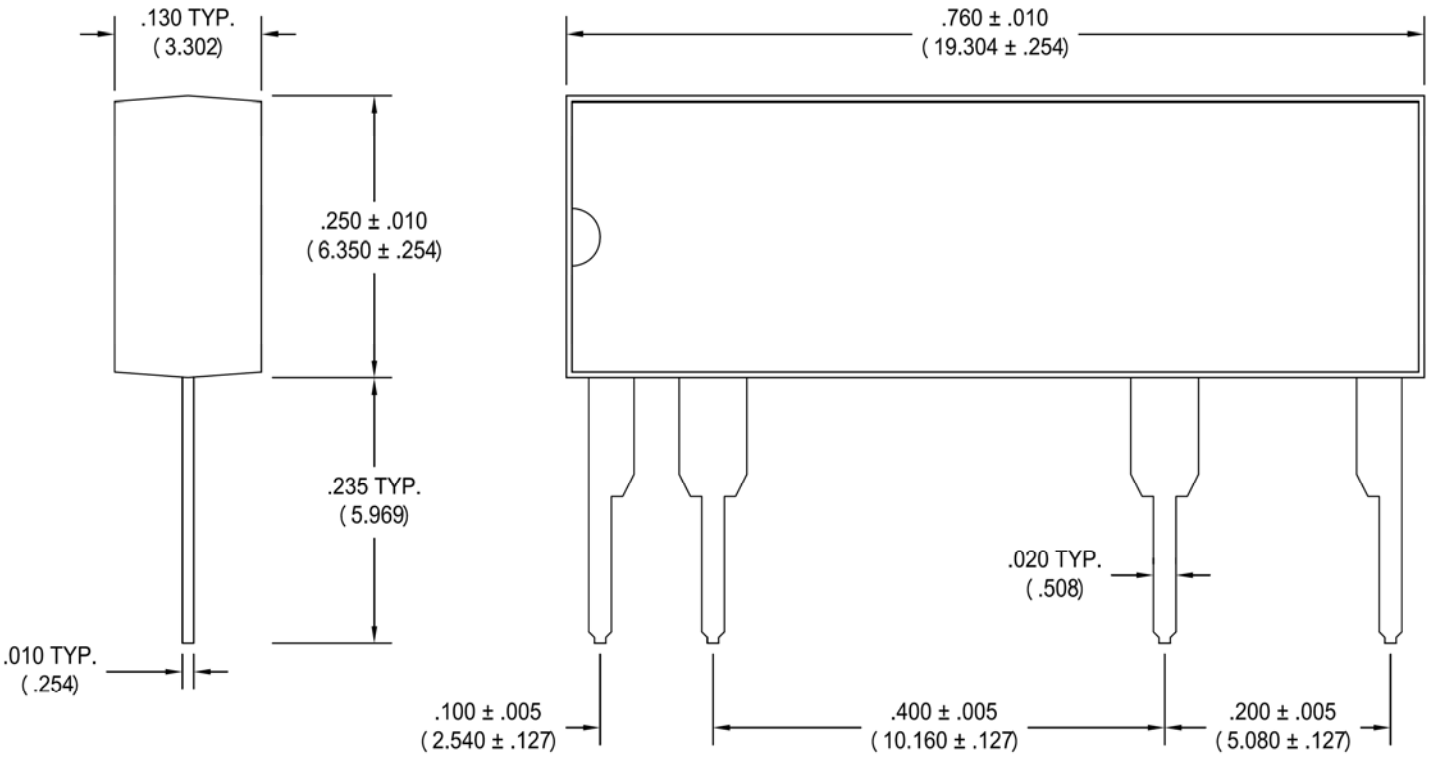
(3) *Hand Solder:*

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

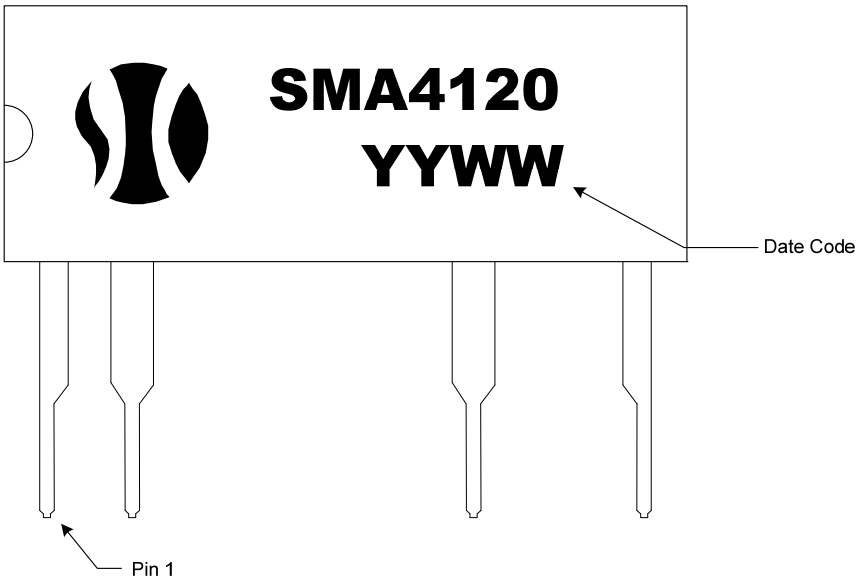
SMA4120 Package Dimensions

4 PIN SIP Package

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



SMA4120 Package Marking



SMA4120 Package Weights

Device	Single Unit	Full Tube (25pcs)	Full Pouch (10 tubes)
SMA4120	0.88	35	370

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

DISCLAIMER

Solid State Optronics (SSO) makes no warranties or representations with regards to the completeness and accuracy of this document. SSO reserves the right to make changes to product description, specifications at any time without further notices.
SSO shall not assume any liability arising out of the application or use of any product or circuit described herein. Neither circuit patent licenses nor indemnity are expressed or implied.
Except as specified in SSO's Standard Terms & Conditions, SSO disclaims liability for consequential or other damage, and we make no other warranty, expressed or implied, including merchantability and fitness for particular use.

LIFE SUPPORT POLICY

SSO does not authorize use of its devices in life support applications wherein failure or malfunction of a device may lead to personal injury or death. Users of SSO devices in life support applications assume all risks of such use and agree to indemnify SSO against any and all damages resulting from such use. Life support devices are defined as devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when used properly in accordance with instructions for use can be reasonably expected to result in significant injury to the user, or (d) a critical component of a life support device or system whose failure can be reasonably expected to cause failure of the life support device or system, or to affect its safety or effectiveness.