

Parameter	Rating	Units
Load Voltage	600	V <sub>P</sub>
Load Current	100	mA <sub>rms</sub> / mA <sub>DC</sub>
On-Resistance (max)	50	Ω

### Features

- 5000V<sub>rms</sub> Input/Output Isolation
- Low Drive Power Requirements
- High Reliability
- Arc-Free With No Snubbing Circuits
- No EMI/RFI Generation
- Small 8-Pin Package
- Flammability Rating UL 94 V-0
- Surface Mount Tape & Reel Version Available

### Applications

- Instrumentation
- Multiplexers
- Data Acquisition
- Electronic Switching
- I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment-Patient/Equipment Isolation
- Security
- Aerospace
- Industrial Controls

### Description

The PAA193 is a dual normally open (1-Form-A) solid state relay that uses optically coupled relay technology to provide an enhanced 5000V<sub>rms</sub> input to output isolation barrier. The efficient MOSFET switches use IXYS Integrated Circuits' patented OptoMOS architecture. Highly efficient infrared LEDs provide the optically coupled control.

Dual OptoMOS relays provide a more compact design solution than discrete single-pole relays in a variety of applications. The dual relays save board space by incorporating two relays in a single 8-pin package.

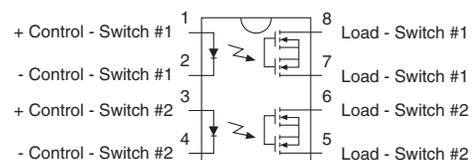
### Approvals

- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1175739
- EN/IEC 60950-1 Certified Component:  
Certificate available on our website

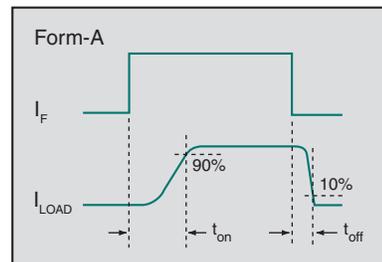
### Ordering Information

Part #	Description
PAA193	8-Lead DIP (50/tube)
PAA193S	8-Lead Surface Mount (50/tube)
PAA193STR	8-Lead Surface Mount (1000/Reel)

### Pin Configuration



### Switching Characteristics of Normally Open Devices



### Absolute Maximum Ratings @ 25°C

Parameter	Ratings	Units
Blocking Voltage	600	V <sub>p</sub>
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10ms)	1	A
Input Power Dissipation <sup>1</sup>	150	mW
Total Power Dissipation <sup>2</sup>	800	mW
Isolation Voltage, Input to Output	5000	V <sub>rms</sub>
Operational Temperature	-40 to +85	°C
Storage Temperature	-40 to +125	°C

<sup>1</sup> Derate linearly 1.33 mW / °C

<sup>2</sup> Derate linearly 6.67 mW / °C

*Absolute Maximum Ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at conditions beyond those indicated in the operational sections of this data sheet is not implied.*

*Typical values are characteristic of the device at +25°C, and are the result of engineering evaluations. They are provided for information purposes only, and are not part of the manufacturing testing requirements.*

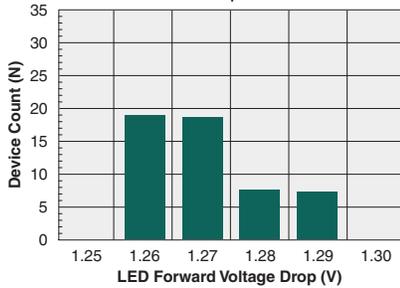
### Electrical Characteristics @ 25°C

Parameter	Conditions	Symbol	Min	Typ	Max	Units
<b>Output Characteristics</b>						
Load Current						
Continuous *	-	I <sub>L</sub>	-	-	100	mA <sub>rms</sub> / mA <sub>DC</sub>
Peak	t=10ms	I <sub>LPK</sub>	-	-	±350	mA <sub>p</sub>
On-Resistance	I <sub>L</sub> =100mA	R <sub>ON</sub>	-	-	50	Ω
Off-State Leakage Current	V <sub>L</sub> =600V <sub>p</sub>	I <sub>LEAK</sub>	-	-	10	μA
Switching Speeds						
Turn-On	I <sub>F</sub> =5mA, V <sub>L</sub> =10V	t <sub>on</sub>	-	-	5	ms
Turn-Off		t <sub>off</sub>	-	-	5	
Output Capacitance	I <sub>F</sub> =0mA, V <sub>L</sub> =50V, f=1MHz	C <sub>OUT</sub>	-	50	-	pF
<b>Input Characteristics</b>						
Input Control Current to Activate	I <sub>L</sub> =100mA	I <sub>F</sub>	-	-	5	mA
Input Voltage Drop	I <sub>F</sub> =5mA	V <sub>F</sub>	0.9	1.2	1.5	V
Reverse Input Current	V <sub>R</sub> =5V	I <sub>R</sub>	-	-	10	μA
<b>Common Characteristics</b>						
Capacitance, Input to Output	V <sub>IO</sub> =0V, f=1MHz	C <sub>IO</sub>	-	3	-	pF

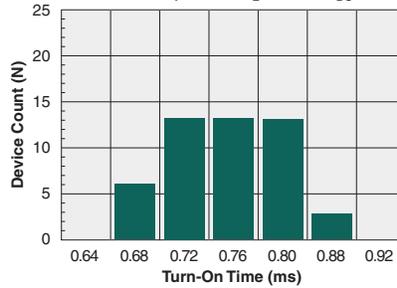
\*NOTE: If both poles operate simultaneously, then load current must be derated in order not to exceed the package power dissipation value.

PERFORMANCE DATA\*

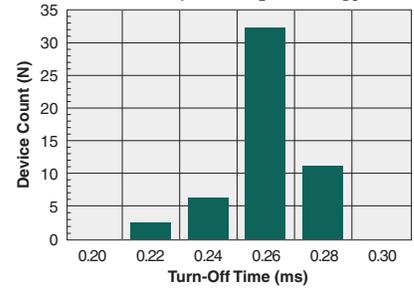
Typical LED Forward Voltage Drop  
(N=50, I<sub>F</sub>=5mA)



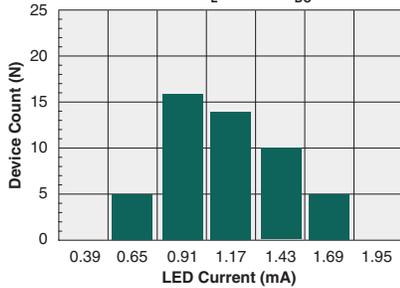
Typical Turn-On Time  
(N=50, I<sub>F</sub>=5mA, I<sub>L</sub>=120mA<sub>DC</sub>)



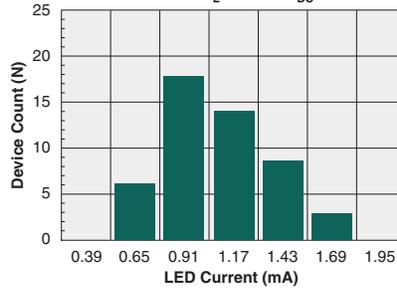
Typical Turn-Off Time  
(N=50, I<sub>F</sub>=5mA, I<sub>L</sub>=120mA<sub>DC</sub>)



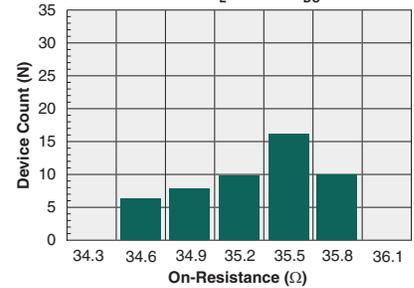
Typical I<sub>F</sub> for Switch Operation  
(N=50, I<sub>L</sub>=120mA<sub>DC</sub>)



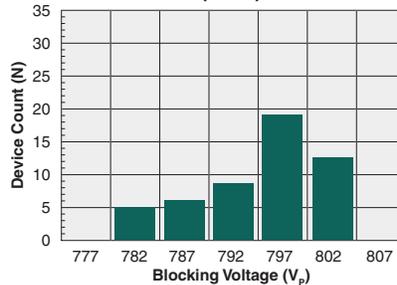
Typical I<sub>F</sub> for Switch Dropout  
(N=50, I<sub>L</sub>=120mA<sub>DC</sub>)



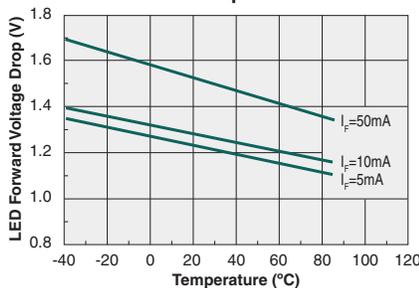
Typical On-Resistance Distribution  
(N=50, I<sub>L</sub>=120mA<sub>DC</sub>)



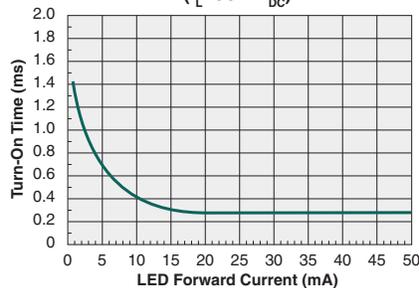
Typical Blocking Voltage Distribution  
(N=50)



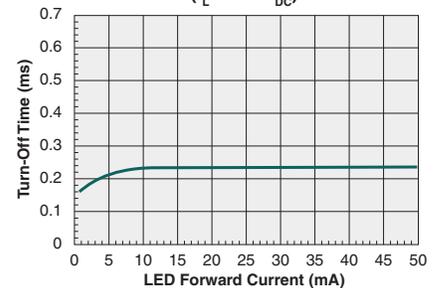
Typical LED Forward Voltage Drop vs. Temperature



Typical Turn-On Time vs. LED Forward Current  
(I<sub>L</sub>=50mA<sub>DC</sub>)



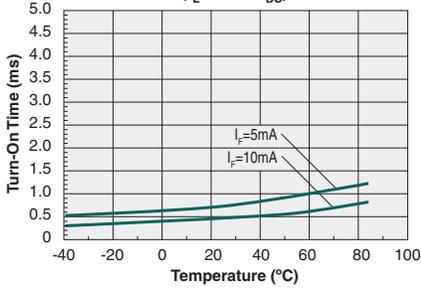
Typical Turn-Off Time vs. LED Forward Current  
(I<sub>L</sub>=50mA<sub>DC</sub>)



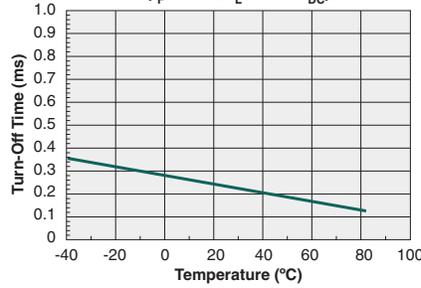
\*Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C. For guaranteed parameters not indicated in the written specifications, please contact our application department.

**PERFORMANCE DATA\***

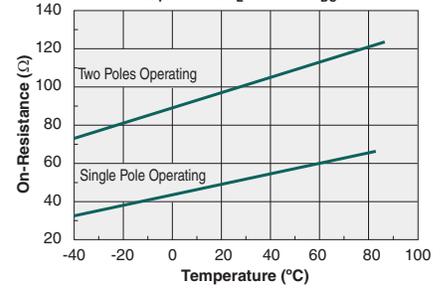
**Typical Turn-On Time vs. Temperature**  
( $I_L=50\text{mA}_{DC}$ )



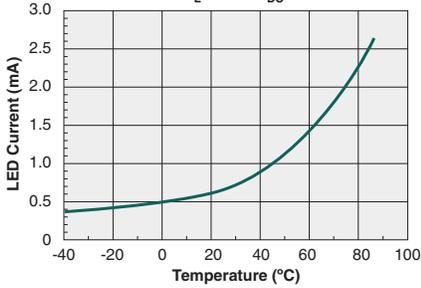
**Typical Turn-Off Time vs. Temperature**  
( $I_F=5\text{mA}$ ,  $I_L=50\text{mA}_{DC}$ )



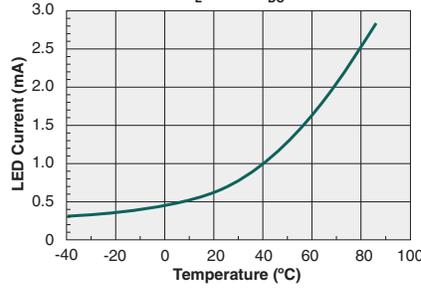
**Typical On-Resistance vs. Temperature**  
( $I_F=5\text{mA}$ ,  $I_L=100\text{mA}_{DC}$ )



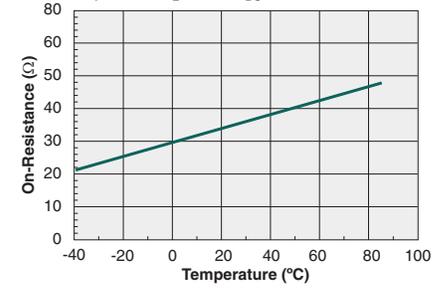
**Typical  $I_F$  for Switch Operation vs. Temperature**  
( $I_L=50\text{mA}_{DC}$ )



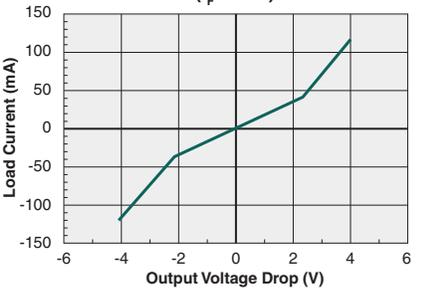
**Typical  $I_F$  for Switch Dropout vs. Temperature**  
( $I_L=50\text{mA}_{DC}$ )



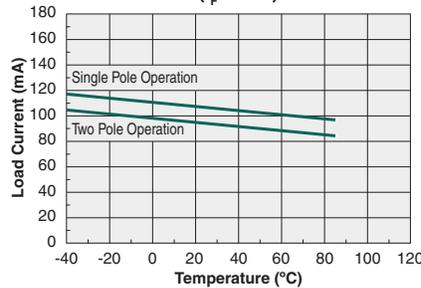
**Typical On-Resistance vs. Temperature**  
( $I_F=5\text{mA}$ ,  $I_L=50\text{mA}_{DC}$  Instantaneous)



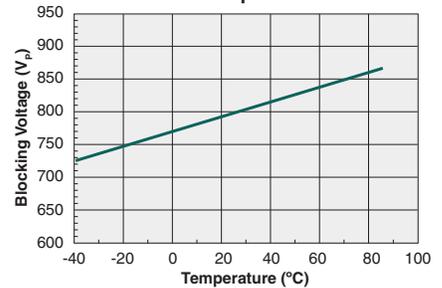
**Typical Load Current vs. Load Voltage**  
( $I_F=5\text{mA}$ )



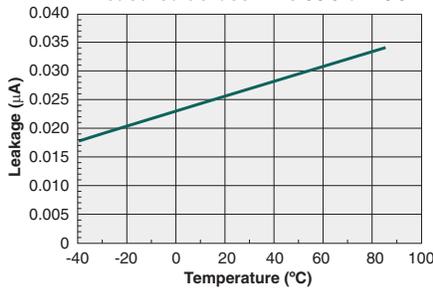
**Maximum Load Current vs. Temperature**  
( $I_F=5\text{mA}$ )



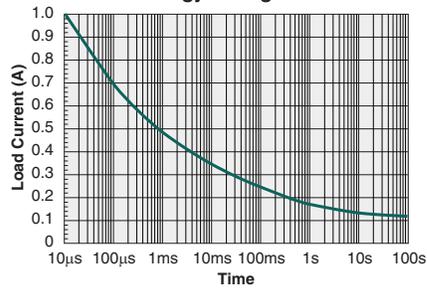
**Typical Blocking Voltage vs. Temperature**



**Typical Leakage vs. Temperature**  
Measured across Pins 5&6 or 7&8



**Energy Rating Curve**



\*Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C. For guaranteed parameters not indicated in the written specifications, please contact our application department.

## Manufacturing Information

### Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits classifies its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a Moisture Sensitivity Level (MSL) classification as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

Device	Moisture Sensitivity Level (MSL) Classification
PAA193 / PAA193S	MSL 1

### ESD Sensitivity



This product is **ESD Sensitive**, and should be handled according to the industry standard **JESD-625**.

### Soldering Profile

Provided in the table below is the Classification Temperature ( $T_C$ ) of this product and the maximum dwell time the body temperature of this device may be ( $T_C - 5$ )°C or greater. The classification temperature sets the Maximum Body Temperature allowed for this device during lead-free reflow processes. For through-hole devices, and any other processes, the guidelines of **J-STD-020** must be observed.

Device	Classification Temperature ( $T_C$ )	Dwell Time ( $t_p$ )	Max Reflow Cycles
PAA193	250°C	30 seconds	1
PAA193S	250°C	30 seconds	3

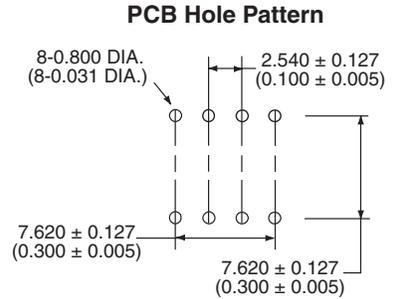
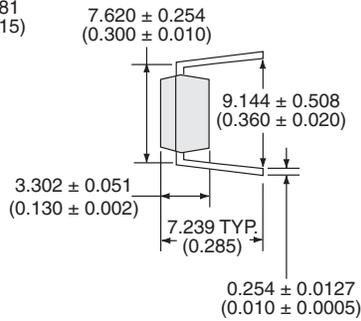
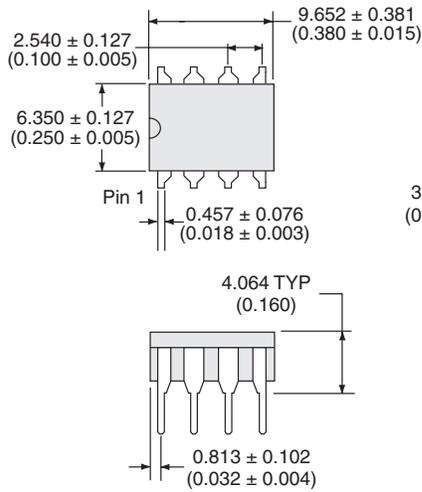
### Board Wash

IXYS Integrated Circuits recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include, but are not limited to: using a low pressure wash and providing a follow up bake cycle sufficient to remove any moisture trapped within the device due to the washing process. Due to the variability of the wash parameters used to clean the board, determination of the bake temperature and duration necessary to remove the moisture trapped within the package is the responsibility of the user (assembler). Cleaning or drying methods that employ ultrasonic energy may damage the device and should not be used. Additionally, the device must not be exposed to flux or solvents that are Chlorine- or Fluorine-based.



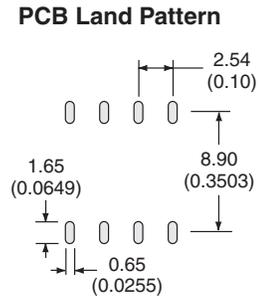
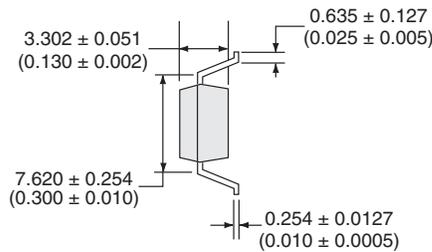
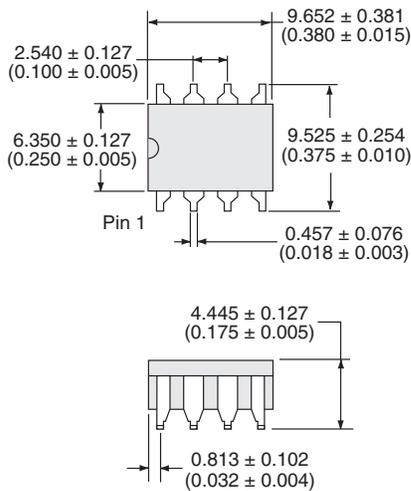
**Mechanical Dimensions**

**PAA193**



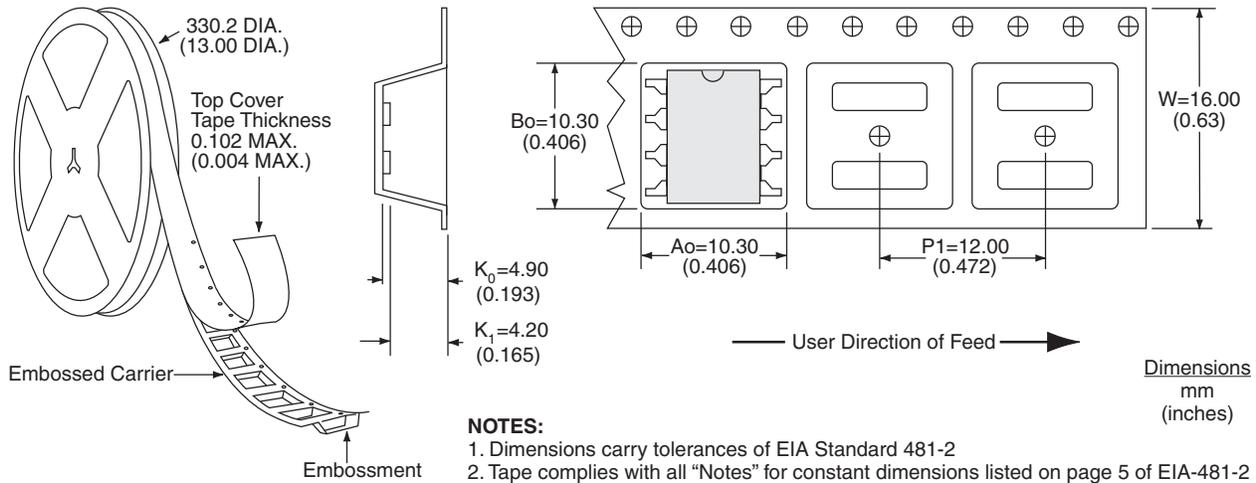
Dimensions  
mm  
(inches)

**PAA193S**



Dimensions  
mm  
(inches)

**PAA193STR Tape & Reel**



**For additional information please visit our website at: [www.ixysic.com](http://www.ixysic.com)**

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