IXYS
INTEGRATED CIRCUITS DIVISION

PAA191
Dual Single-Pole, Normally Open OptoMOS® Relays

Parameter	Rating	Units
Load Voltage	400	V_P
Load Current	250	mA_{rms} / mA_{DC}
On-Resistance (max)	8	Ω

Features
- 5000V_{rms} Input/Output Isolation
- Low Drive Power Requirements (TTL/CMOS Compatible)
- No Moving Parts
- High Reliability
- Arc-Free With No Snubbing Circuits
- No EMI/RFI Generation
- Small 8-Pin Packages
- Machine Insertable, Wave Solderable
- Surface Mount Tape & Reel Version Available

Applications
- Telecommunications
  - Telecom Switching
  - Tip/Ring Circuits
  - Modem Switching (Laptop, Notebook, Pocket Size)
  - Hook Switch
  - Dial Pulsing
  - Ground Start
  - Ringing Injection
- Instrumentation
  - Multiplexers
  - Data Acquisition
  - Electronic Switching
  - I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment-Patient/Equipment Isolation
- Security
- Aerospace
- Industrial Controls

Description
PAA191 is a dual 400V, 250mA, 8Ω, normally open (1-Form-A) solid state relay that uses optically coupled MOSFET technology to provide 5000V_{rms} of input to output isolation.

Its optically coupled outputs, which use the patented OptoMOS architecture, are controlled by a highly efficient GaAIAs infrared LED.

This dual single-pole OptoMOS relay provides a more compact design solution than discrete single-pole relays in a variety of applications, and saves board space by incorporating both switches in a single 8-pin package.

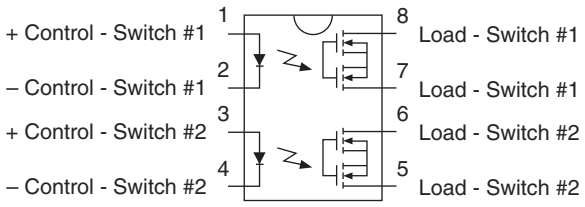
Approvals
- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1175739
- EN/IEC 60950-1 Certified Component: TUV Certificate B 09 07 49410 004

Ordering Information

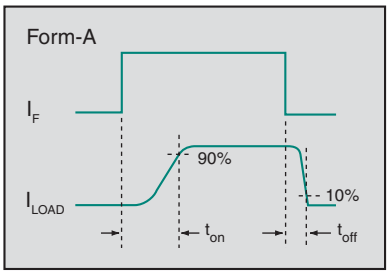
Part #	Description
PAA191	8-Lead DIP (50/tube)
PAA191S	8-Lead Surface Mount (50/tube)
PAA191STR	8-Lead Surface Mount (1000/Reel)

Pin Configuration

AC/DC Configuration



Switching Characteristics of Normally Open Devices



Absolute Maximum Ratings @ 25ºC

Parameter	Ratings	Units
Blocking Voltage	400	V_P
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10ms)	1	A
Input Power Dissipation [1]	150	mW
Total Power Dissipation [2]	800	mW
Isolation Voltage, Input to Output	5000	V_{rms}
Operational Temperature	-40 to +85	°C
Storage Temperature	-40 to +125	°C

[1] Derate linearly 1.33 mW / °C
[2] 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.

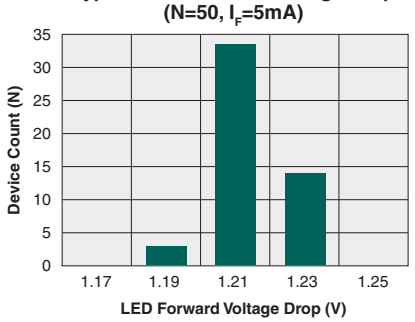
Electrical Characteristics @ 25ºC

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics						
Load Current *						
Continuous, AC/DC Configuration	-	I_L	-	-	250	mA_{rms} / mA_{DC}
Peak	10ms	I_{LPK}	-	-	±500	mA_P
On-Resistance, AC/DC Configuration	I_L=250mA	R_{ON}	-	6	8	Ω
Off-State Leakage Current	V_L=400V_P	I_{LEAK}	-	-	1	µA
Switching Speeds						
Turn-On	I_F=5mA, V_L=10V	t_{on}	-	-	3	ms
Turn-Off		t_{off}	-	-	1	
Output Capacitance	V_L=50V, f=1MHz	C_{OUT}	-	25	-	pF
Input Characteristics						
Input Control Current to Activate	I_L=250mA	I_F	-	-	5	mA
Input Control Current to Deactivate	-	I_F	0.2	0.7	-	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Reverse Input Current	V_R=5V	I_R	-	-	10	µA
Common Characteristics						
Capacitance, Input to Output	-	$C_{I/O}$	-	3	-	pF

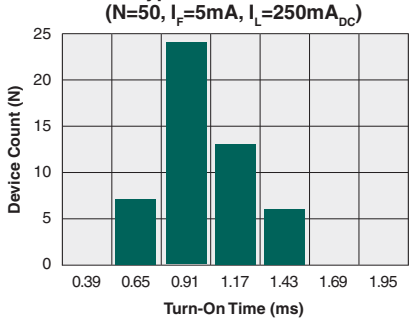
*NOTE: If both poles operate simultaneously, then load current must be derated in order not to exceed the package power dissipation value.

PERFORMANCE DATA @25ºC (Unless Otherwise Noted)*

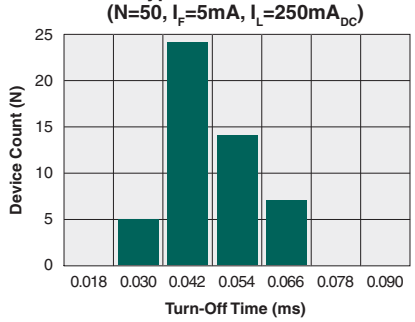
Typical LED Forward Voltage Drop (N=50, I_F=5mA)



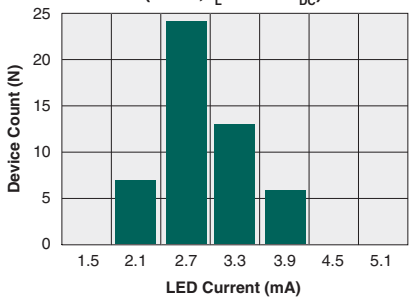
Typical Turn-On Time (N=50, I_F=5mA, I_L=250mA$_{DC}$)



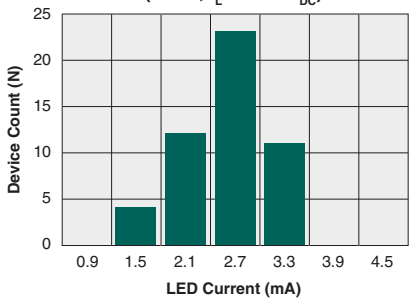
Typical Turn-Off Time (N=50, I_F=5mA, I_L=250mA$_{DC}$)



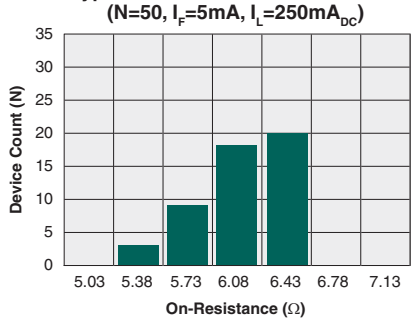
Typical I_F for Switch Operation (N=50, I_L=250mA$_{DC}$)



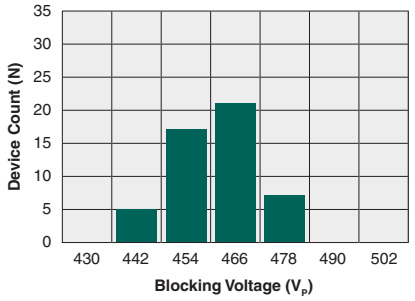
Typical I_F for Switch Dropout (N=50, I_L=250mA$_{DC}$)



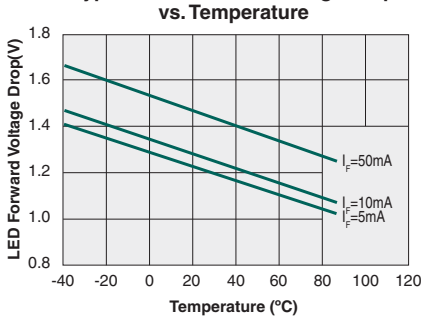
Typical On-Resistance Distribution (N=50, I_F=5mA, I_L=250mA$_{DC}$)



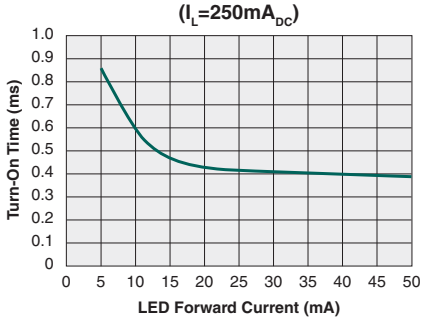
Typical Blocking Voltage Distribution (N=50)



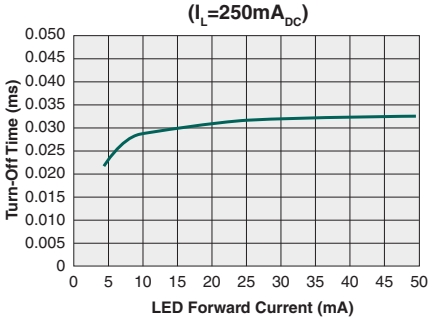
Typical LED Forward Voltage Drop vs. Temperature



Typical Turn-On Time vs. LED Forward Current (I_L=250mA$_{DC}$)



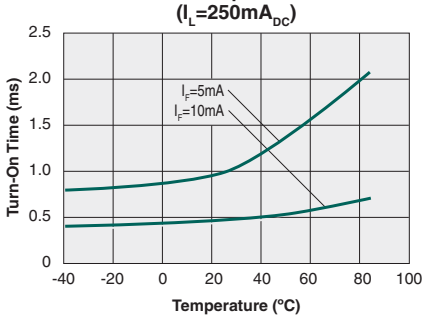
Typical Turn-Off Time vs. LED Forward Current (I_L=250mA$_{DC}$)



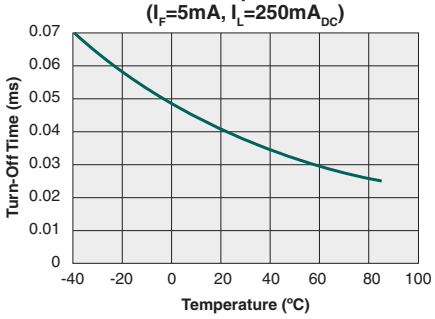
*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA @25ºC (Unless Otherwise Noted)*

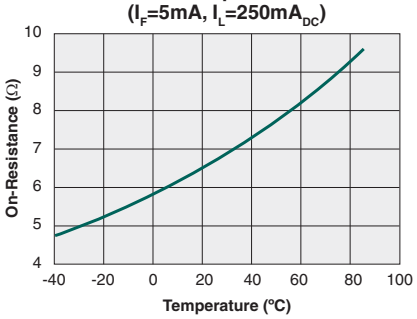
Typical Turn-On Time vs. Temperature (I_L=250mA$_{DC}$)



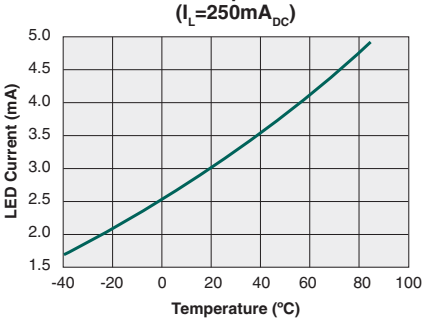
Typical Turn-Off Time vs. Temperature (I_F=5mA, I_L=250mA$_{DC}$)



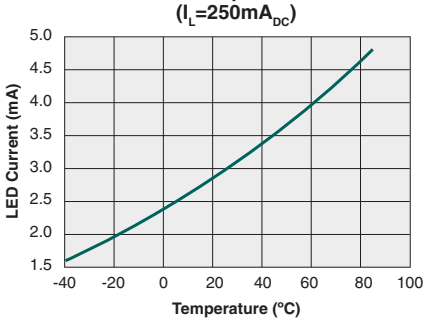
Typical On-Resistance vs. Temperature (I_F=5mA, I_L=250mA$_{DC}$)



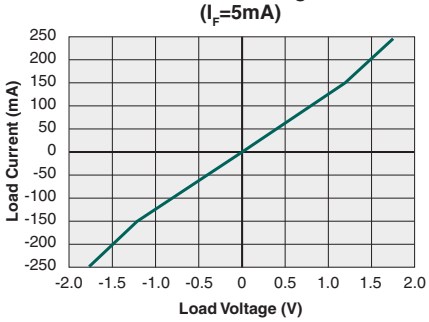
Typical I_F for Switch Operation vs. Temperature (I_L=250mA$_{DC}$)



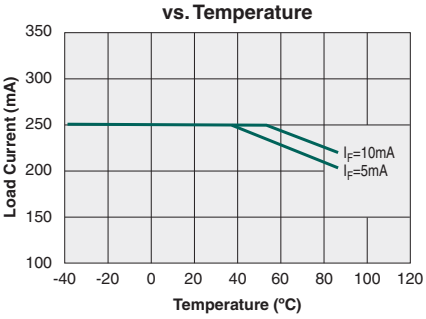
Typical I_F for Switch Dropout vs. Temperature (I_L=250mA$_{DC}$)



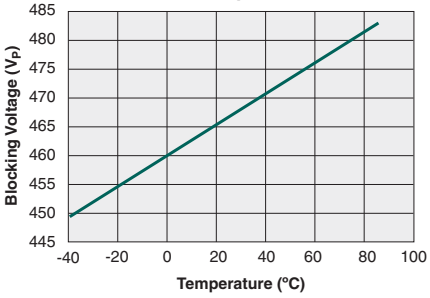
Typical Load Current vs. Load Voltage (I_F=5mA)



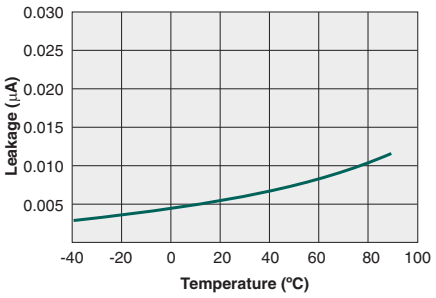
Maximum Load Current vs. Temperature



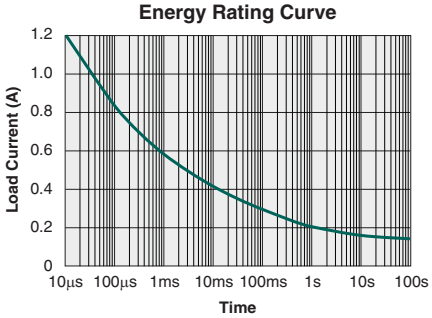
Typical Blocking Voltage vs. Temperature



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



Energy Rating Curve



*The Performance data shown in the graphs above is typical of device performance. 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 ingression. IXYS Integrated Circuits Division classified all of 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) rating** 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) Rating
PAA191 / PAA191S	MSL 1

ESD Sensitivity

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

Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

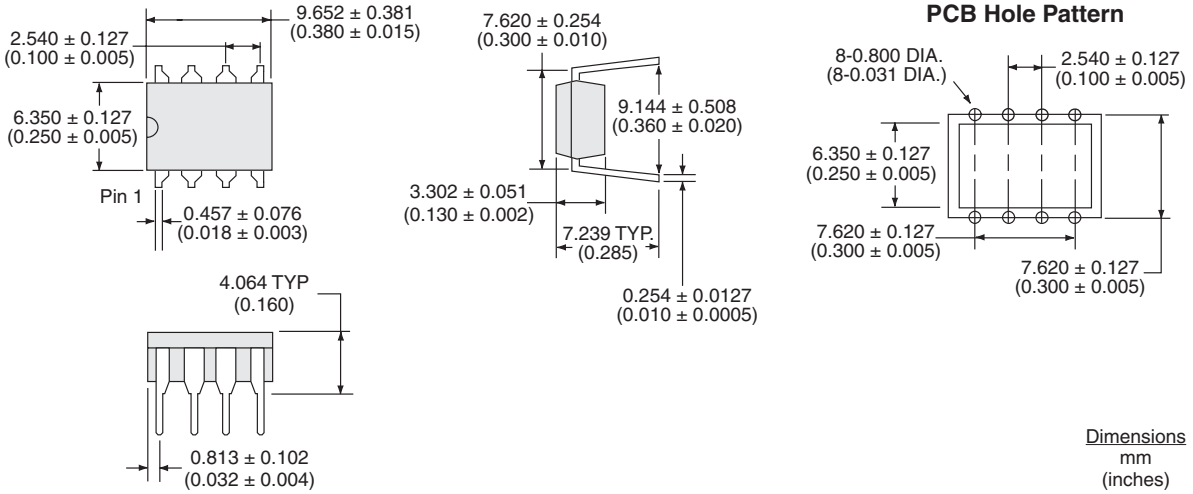
Device	Maximum Temperature x Time
PAA191 / PAA191S	250°C for 30 seconds

Board Wash

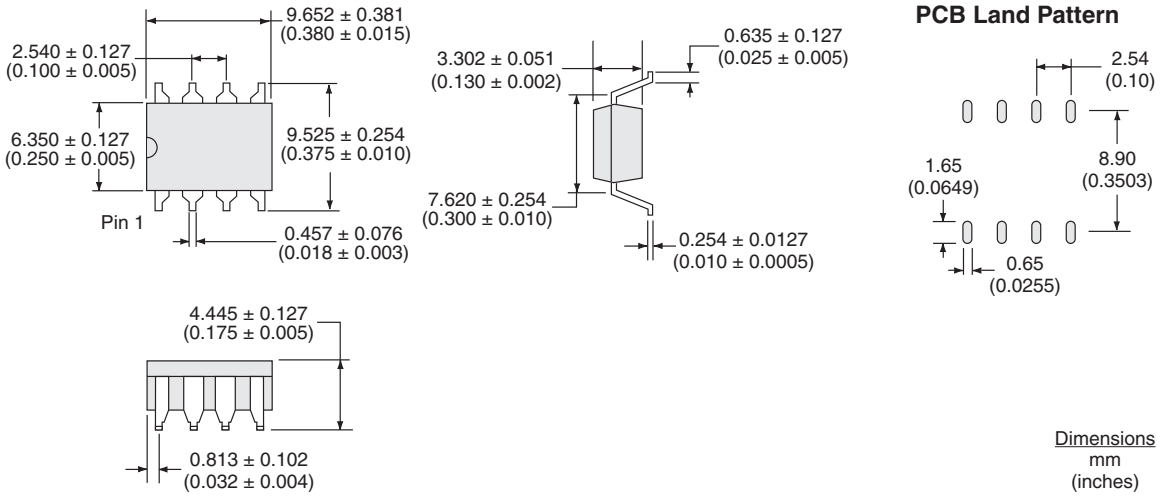
IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable. Since IXYS Integrated Circuits Division employs the use of silicone coating as an optical waveguide in many of its optically isolated products, the use of a short drying bake could be necessary if a wash is used after solder reflow processes. Chlorine- or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

Mechanical Dimensions

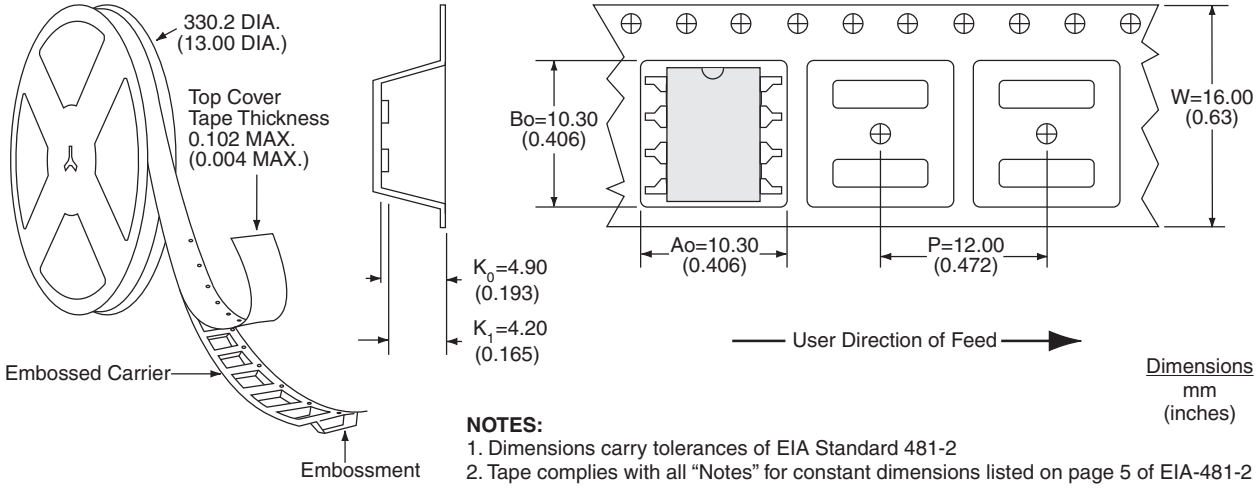
PAA191



PAA191S



PAA191STR Tape & Reel



NOTES:
1. Dimensions carry tolerances of EIA Standard 481-2
2. Tape complies with all "Notes" for constant dimensions listed on page 5 of EIA-481-2

For additional information please visit our website at: www.ixysic.com

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Specification: DS-PAA191-R04
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