IXYS
INTEGRATED CIRCUITS DIVISION

# PLA193
## Single-Pole, Normally Open OptoMOS® Relay

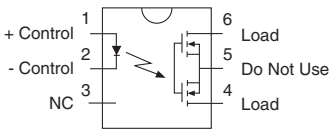
| Parameters | Ratings | Units |
|---|---|---|
| Blocking Voltage | 600 | $V_P$ |
| Load Current | 100 | $mA_{rms}$ / $mA_{DC}$ |
| On-Resistance (max) | 50 | Ω |
| LED Current to Operate | 5 | mA |

## Features
- PLA193E is 100% Tested for Partial Discharge: DIN EN 60747-5-5
- 5000$V_{rms}$ 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 6-Pin Package
- Machine Insertable, Wave Solderable

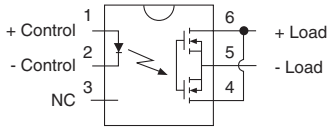
## Applications
- Instrumentation
  - Multiplexers
  - Data Acquisition
  - Electronic Switching
  - I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment—Patient/Equipment Isolation
- Security
- Aerospace
- Industrial Controls

## Pin Configuration

AC/DC Configuration




DC Only Configuration




## Description
IXYS Integrated Circuits Division's PLA193 is a single-pole, normally open (1-Form-A) solid state relay that provides 5000$V_{rms}$ of input to output isolation.

In addition to all the features and benefits of the PLA193, the PLA193E meets the partial discharge demands of DIN EN 60747-5-5 (Previously VDE 0884).

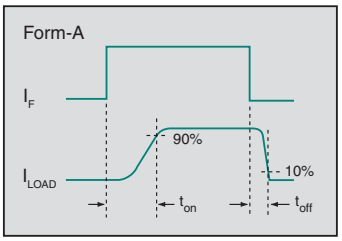
All versions of the PLA193 can be used to replace mechanical relays, while offering the superior reliability associated with semiconductor devices. Optically coupled outputs that use the patented OptoMOS architecture are controlled by a highly efficient GaAIAs infrared LED. Because they have no moving parts, they offer bounce-free switching in more compact surface mount or thru-hole packages.

## Approvals
- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1175739
- EN/IEC 60950-1 Certified Component: TUV Certificate B 12 11 82667 002
- DIN EN 60747-5-5 Certified ("E" Suffix Only) VDE Certificate 40036603

## Ordering Information

| Part # | Description |
|---|---|
| PLA193E | 6-Pin DIP (50/Tube) |
| PLA193ES | 6-Pin Surface Mount (50/Tube) |
| PLA193ESTR | 6-Pin Surface Mount (1000/Reel) |
| PLA193 | 6-Pin DIP (50/Tube) |
| PLA193S | 6-Pin Surface Mount (50/Tube) |
| PLA193STR | 6-Pin Surface Mount (1000/Reel) |

**Switching Characteristics of Normally Open Devices**




Pb RoHS e3



ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

## Absolute Maximum Ratings (@25ºC Unless Otherwise Noted)

| Parameter | Ratings | Units |
|---|---|---|
| Peak Blocking Voltage | 600 | $V_P$ |
| Reverse Input Voltage | 5 | V |
| Input Control Current | 50 | mA |
| Peak (10ms) | 1 | A |
| Input Power Dissipation [1] | 150 | mW |
| Total Package Dissipation [2] | 800 | mW |
| ESD Rating, Human Body Model | 8 | kV |
| Isolation Voltage, Input to Output (60 Seconds) | 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 Unless Otherwise Noted)

| Parameters | Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Output Characteristics** | | | | | | |
| Load Current, Continuous | | | | | | |
| AC/DC Configuration | - | $I_L$ | - | - | 100 | $mA_{rms}$ / $mA_{DC}$ |
| DC-Only Configuration | | | - | - | 190 | $mA_{DC}$ |
| Peak Load Current | t=10ms | $I_{LPK}$ | - | - | ±350 | $mA_P$ |
| On-Resistance [1] | | | | | | |
| AC/DC Configuration | $I_F$=5mA, $I_L$=100mA | $R_{ON}$ | - | 25 | 50 | Ω |
| DC-Only Configuration | $I_F$=5mA, $I_L$=190mA | | - | 10 | 18 | |
| Off-State Leakage Current | $I_F$=0V, $V_L$=600$V_P$ | $I_{LEAK}$ | - | - | 1 | µA |
| Switching Speeds | | | | | | |
| Turn-On | $I_F$=5mA, $V_L$=10V | $t_{on}$ | - | 0.6 | 5 | ms |
| Turn-Off | | $t_{off}$ | - | 0.3 | 5 | ms |
| Output Capacitance | $I_F$=0V, $V_L$=50V, f=1MHz | $C_{OUT}$ | - | 5 | - | pF |
| **Input Characteristics** | | | | | | |
| Input Control Current to Activate | $I_L$=100mA | $I_F$ | - | 0.45 | 5 | mA |
| Input Control Current to Deactivate | - | $I_F$ | 0.3 | 0.44 | - | 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** | | | | | | |
| Input to Output Capacitance | - | $C_{I/O}$ | - | 3 | - | pF |

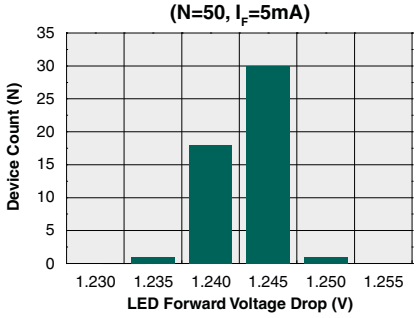
[1] Measurement taken within 1 second of on-time.

## PLA193E Safety and Insulation Ratings

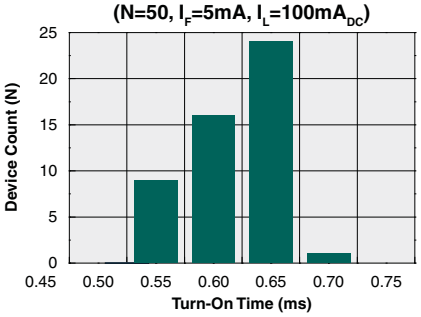
| Parameters | Conditions | Symbol | Min | Max | Units |
|---|---|---|---|---|---|
| Pollution Degree 2 according to DIN VDE 0109 | - | - | - | - | - |
| Highest Allowable Over-Voltage | Transient Voltage | $V_{IOTM}$ | 7071 | - | $V_P$ |
| Maximum Working Insulation Voltage | Recurring Voltage | $V_{IORM}$ | 1000 | - | $V_P$ |
| Partial Discharge Test Voltage | DIN EN 60747-5-5 Method B | $V_{PR}$ | - | 1875 | $V_P$ |
| Isolation Test Voltage | - | $V_{ISO}$ | - | 5000 | $V_{rms}$ |
| Creepage Distance | - | - | 7.6 | - | mm |
| Clearance Distance | - | - | 7.6 | - | mm |

## PERFORMANCE DATA (@25ºC Unless Otherwise Noted)*

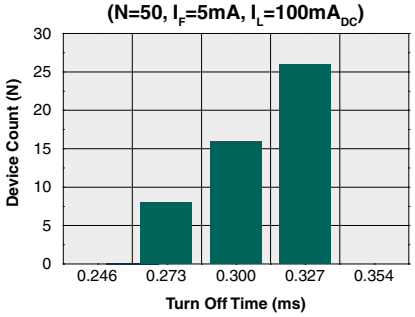
**Typical LED Forward Voltage Drop (N=50, $I_F$=5mA)**



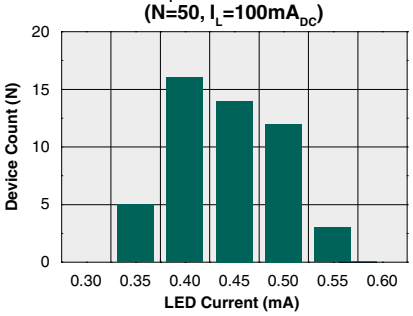

**Typical Turn-On Time (N=50, $I_F$=5mA, $I_L$=100mA$_{DC}$)**



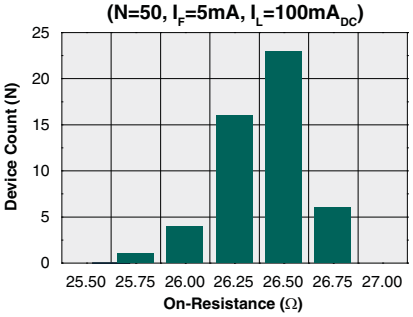

**Typical Turn-Off Time (N=50, $I_F$=5mA, $I_L$=100mA$_{DC}$)**



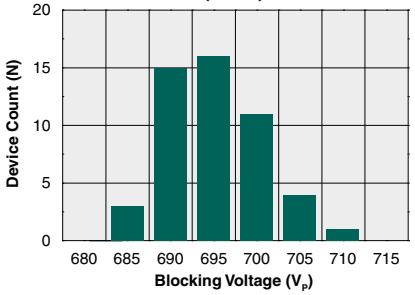

**Typical $I_F$ for Switch Operation (N=50, $I_L$=100mA$_{DC}$)**



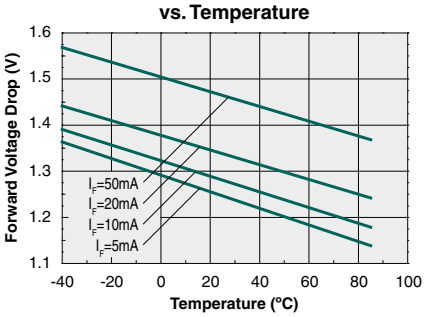

**Typical On-Resistance Distribution (N=50, $I_F$=5mA, $I_L$=100mA$_{DC}$)**



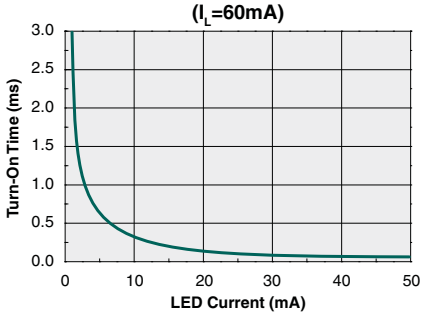

**Typical Blocking Voltage Distribution (N=50)**



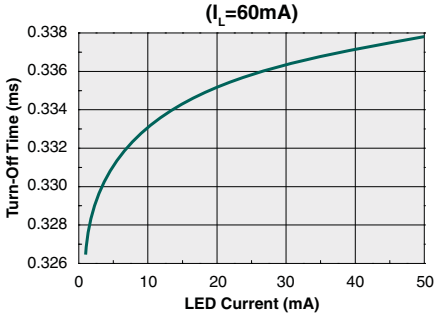

**Typical LED Forward Voltage Drop vs. Temperature**



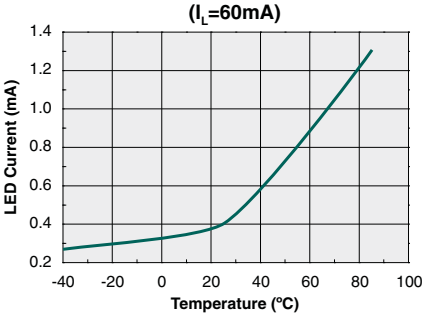

**Typical Turn-On Time vs. LED Forward Current ($I_L$=60mA)**



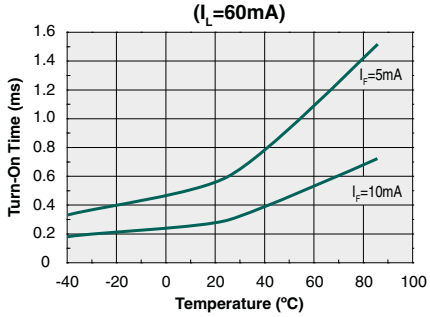

**Typical Turn-Off Time vs. LED Forward Current ($I_L$=60mA)**



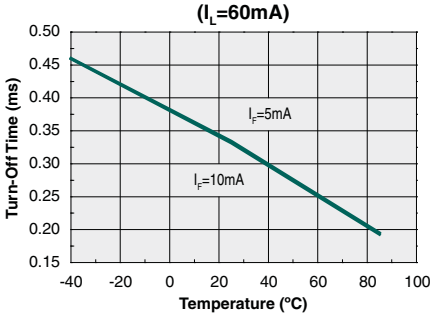

**Typical $I_F$ for Switch Operation vs. Temperature ($I_L$=60mA)**




**Typical Turn-On Time vs. Temperature ($I_L$=60mA)**



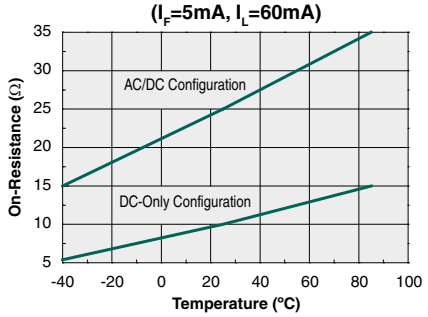

**Typical Turn-Off Time vs. Temperature ($I_L$=60mA)**



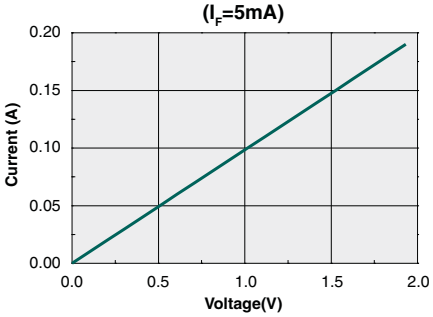

*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

## PERFORMANCE DATA (@25ºC Unless Otherwise Noted)*

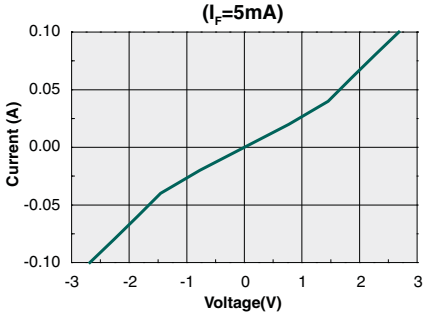
**Typical On-Resistance vs. Temperature ($I_F$=5mA, $I_L$=60mA)**



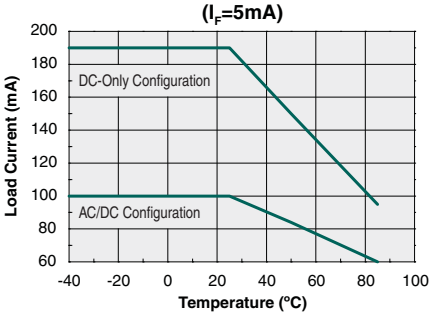

**Typical Load Current vs. Load Voltage DC-Only Configuration ($I_F$=5mA)**



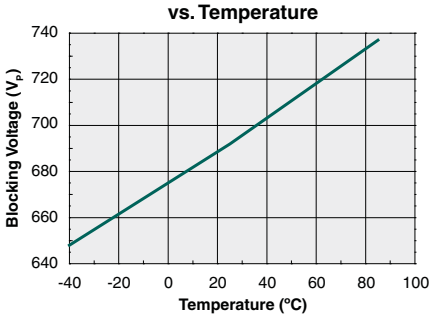

**Typical Load Current vs. Load Voltage AC/DC Configuration ($I_F$=5mA)**



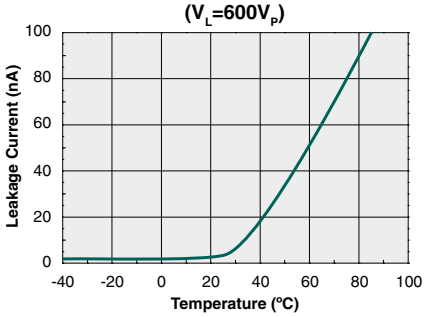

**Maximum Load Current vs. Temperature ($I_F$=5mA)**



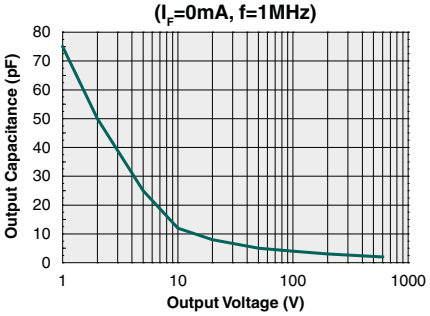

**Typical Blocking Voltage vs. Temperature**



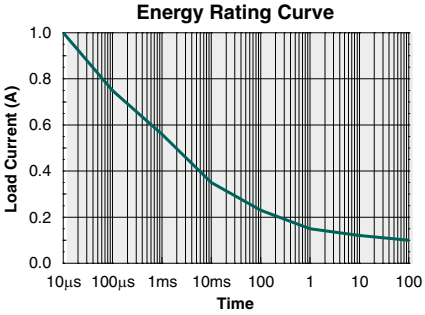

**Typical Leakage vs. Temperature Measured Across Pins 4&6 ($V_L$=600$V_P$)**




**Output Capacitance vs. Load Voltage ($I_F$=0mA, f=1MHz)**




**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 |
|---|---|
| All Versions | 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.

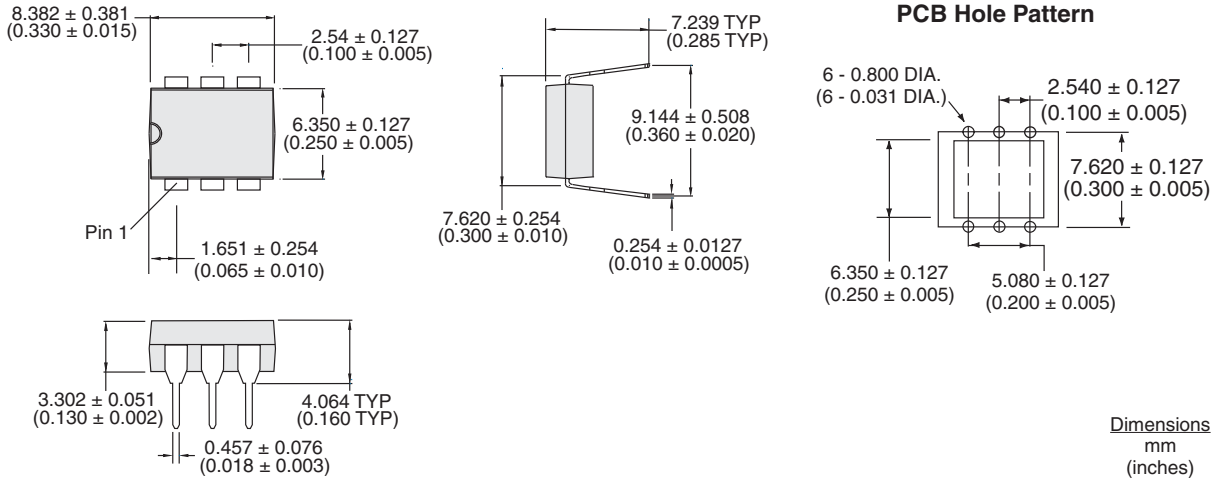
| Device | Maximum Temperature x Time |
|---|---|
| All Versions | 250°C for 30 seconds |

### Board Wash

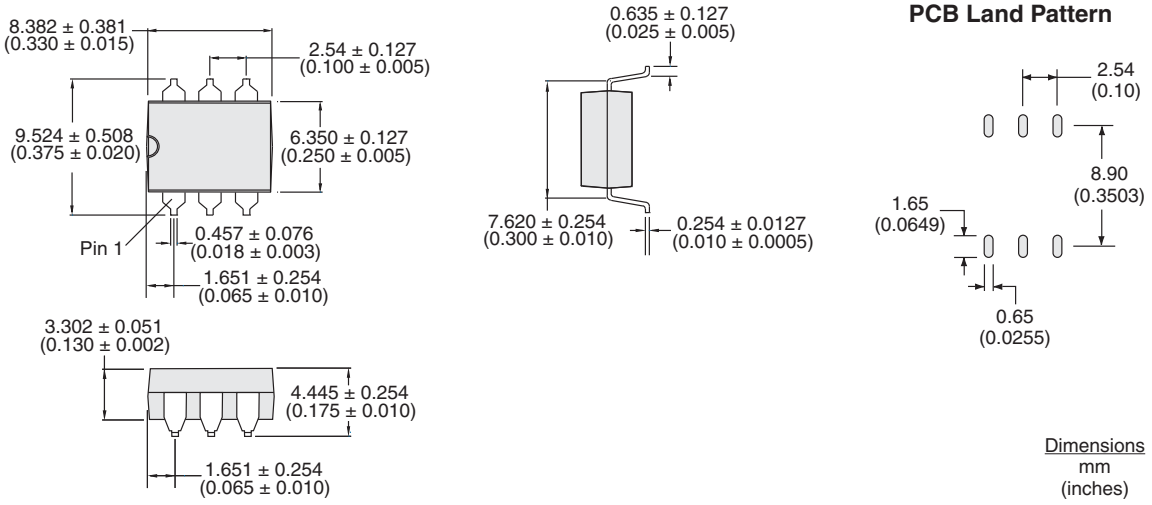
IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable. IXYS Integrated Circuits Division employs the use of silicone coating as an optical waveguide in the standard PLA193 (without the "E" suffix); the use of a short drying bake could be necessary if a wash is used after solder reflow processes. The E-suffix product, being of double-molded construction, does not have the same necessity for a drying bake. Chlorine- or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

# MECHANICAL DIMENSIONS

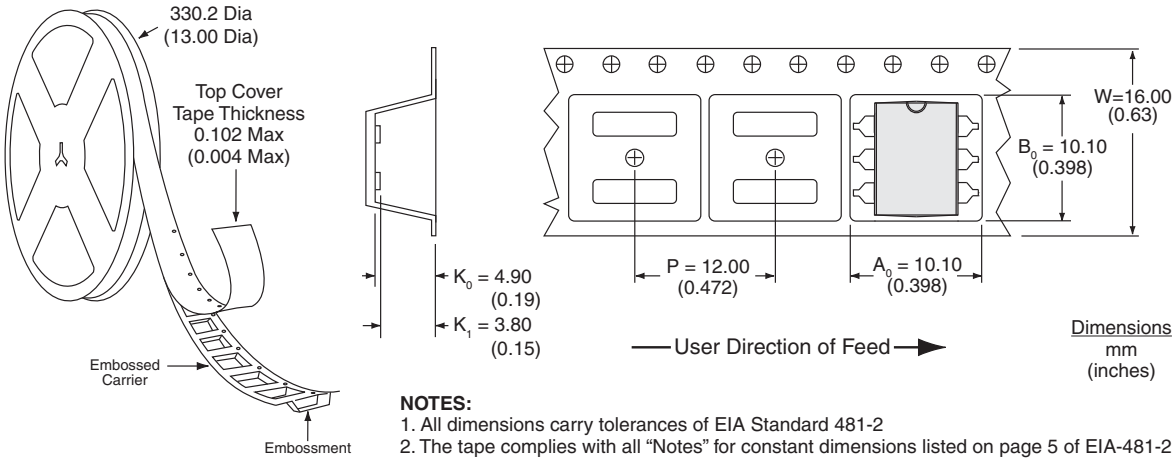
## PLA193 & PLA193E




## PLA193S & PLA193ES



## PLA193STR & PLA193ESTR Tape & Reel




**NOTES:**
1. All dimensions carry tolerances of EIA Standard 481-2
2. The 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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2/28/2013

# Mouser Electronics

Authorized Distributor

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