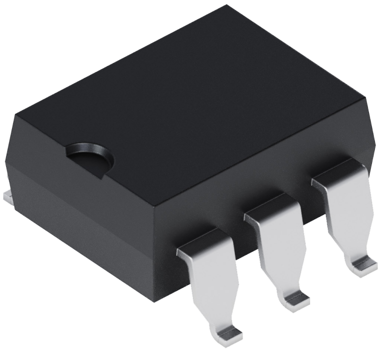
PLA140

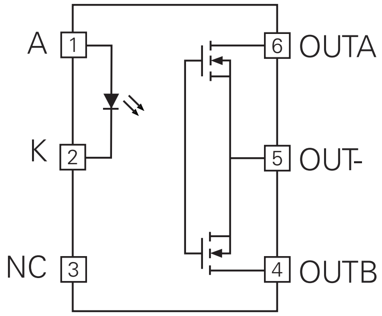
400V, 250 mA 1-Form-A SSR

Key Attributes

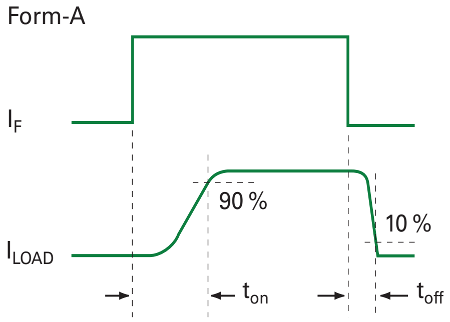
Characteristic	Rating	Unit
Blocking Voltage	400	V_P
Load Current	250	mA_{RMS}/mA_{DC}
On-resistance (max.)	8	Ω
LED Current to Operate	5	mA



Pin Configuration



Switching Characteristics of Normally Open/Closed Device



Description

The PLA140 is a single-pole normally open (1-Form-A) Solid State Relay that uses optically coupled MOSFET technology to provide $3750V_{RMS}$ of input-to-output isolation.

MOSFET output switches, which use Littelfuse Integrated Circuits' patented OptoMOS architecture, are controlled by a highly efficient infrared LED.

The PLA140's combination of low on-resistance and high load current handling makes it suitable for a variety of industrial applications.

Because Solid State Relays like the PLA140 have no moving parts, they offer faster, bounce-free switching in a more compact surface mount or though hole package than traditional electromechanical relays.

Features

- Low On-Resistance, High Current Handling
- Low Drive Power Requirements
- $3750V_{RMS}$ Input/Output Isolation
- Greater Reliability than Electromechanical Relays
- VDE Compatible
- FCC Compatible
- Small 6-Pin Package
- No EMI/RFI Generation
- Surface Mount Tape and Reel Version Available

Applications

- Telecommunications
  - Telecomm Switching
  - Hook Switch
- Instrumentation
- Multiplexers
- Data Acquisition
- Electronic Switching
- I/O Subsystems
- Meters (Watt-Hour, Water, Gas)
- Medical Equipment—Patient/Equipment Isolation
- Security
- Industrial Controls
- Automotive

Approvals

- UL 1577 Recognized Component: File E76270
- CSA Certified Component: Certificate # 1175739
- TUV EN 62368-1: Certificate # B 082667 0008

Ordering Information

Part Number	Description
PLA140	6-PIN DIP (50/Tube)
PLA140S	6-Pin Surface Mount (50/Tube)
PLA140STR	6-Pin Surface Mount (1,000/Reel)

Specifications

Absolute Maximum Ratings

Parameter	Ratings	Units
Blocking Voltage	400	V_P
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10 ms)	1	A
Input Power Dissipation [1]	150	mW
Total Power Dissipation [2]	800	
Isolation Voltage, Input to Output	3750	V_{RMS}
Operational Temperature, Ambient	−40 to +85	°C
Storage Temperature	−40 to +125	

[1] *Derate linearly 1.33 mW/°C*

[2] *Derate output power 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	Value			Units
			Minimum	Typical	Maximum	
Output Characteristics						
Blocking voltage	$I_L = 1\mu A$	V_{DRM}	400	—	—	V_P
Load current:						
Continuous, AC/DC Configuration	$I_F = 5$ mA	I_L	—	—	250	mA_{RMS}/mA_{DC}
Continuous, DC Configuration			—	—	350	mA_{DC}
Peak	$I_F = 5$ mA, $t = 10$ ms	I_{LPK}	—	—	±500	mA_P
On-resistance [1]						
AC/DC Configuration	$I_F = 5$ mA, $I_L = 250$ mA	R_{ON}	—	5.5	8	Ω
DC Configuration	$I_F = 5$ mA, $I_L = 350$ mA		—	1.5	3	
Off-state leakage current	$V_L = 400 V_P$	I_{LEAK}	—	—	1	µA
Switching speeds:						
Turn-on	$I_F = 5$ mA, $V_L = 10$ V	t_{on}	—	0.4	3	ms
Turn-off		t_{off}	—	0.19	1	
Output capacitance	$I_F = 0$ mA, $V_L = 50$ V, $f = 1$ MHz	C_{OUT}	—	18	—	pF
Input Characteristics						
Input control current to activate	$I_L = 250$ mA	I_F	—	0.46	5	mA
Input control current to deactivate	—	I_F	0.1	—	—	
Input voltage drop to deactivate	—	V_F	0.8	—	—	V
Input voltage drop	$I_F = 5$ mA	V_F	0.9	1.36	1.5	
Reverse input current	$V_R = 5$ V	I_R	—	—	10	µA
Common Characteristics						
Capacitance, input to output	$V_{IO} = 0$ V, $f = 1$ MHz	C_{IO}	—	3	—	pF

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

Load Configuration Methods

The diagrams below show load connection methods based on selected application circuit option.

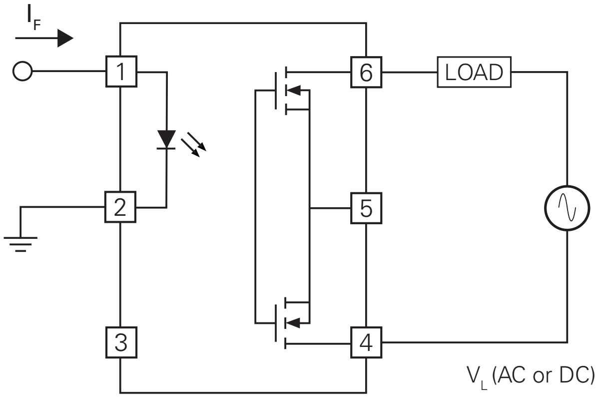


Figure 1. AC/DC, Bidirectional Load Configuration

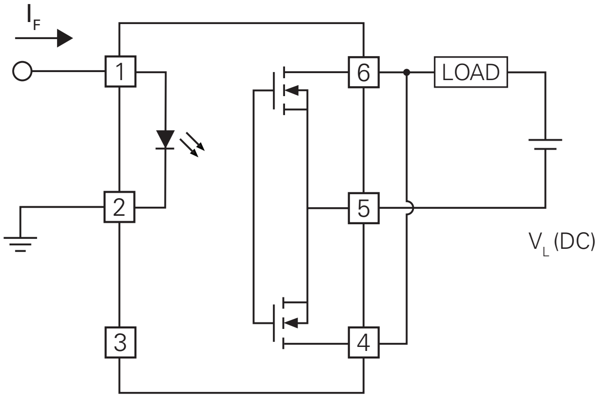
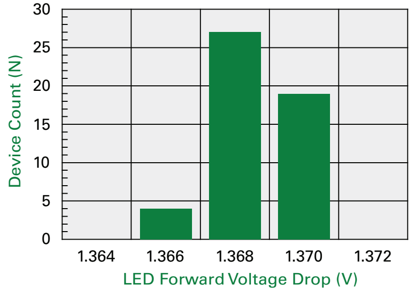
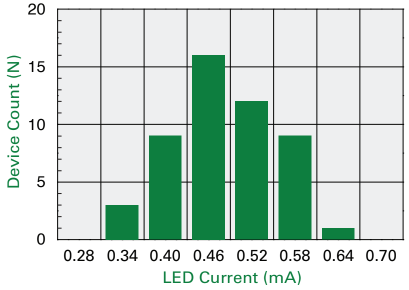
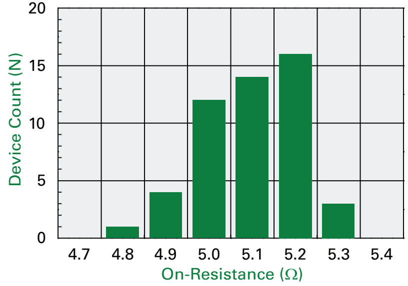


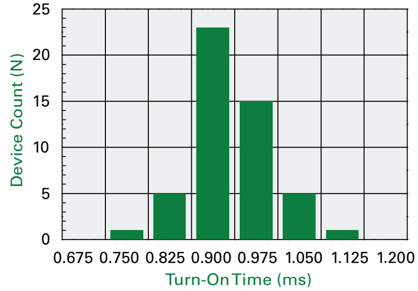
Figure 2. DC, Unidirectional Load Configuration

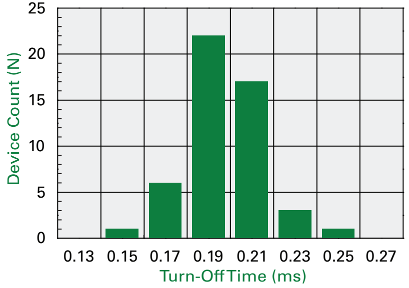
Characteristic Curves

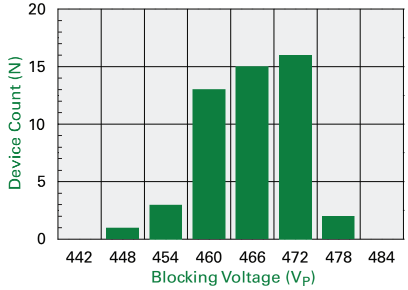

Typical LED Forward Voltage Drop ($N=50$, $I_F=5$ mA)

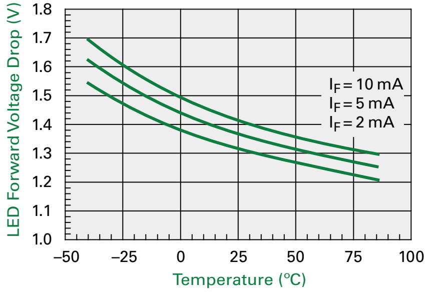

Typical I_F for Switch Operation ($I_L=250$ mA)

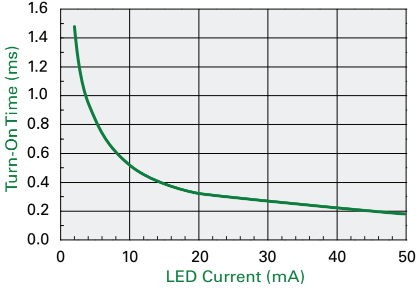

Typical On-Resistance Distribution ($N=50$, $I_F=5$ mA, $I_L=250$ mA)

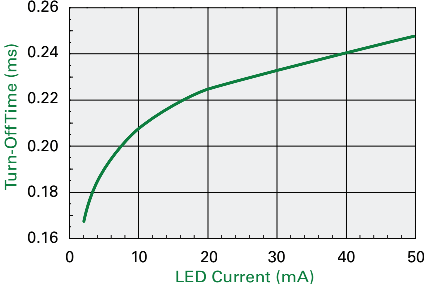

Typical Turn-On Time ($N=50$, $I_F=5$ mA, $I_L=100$ mA)

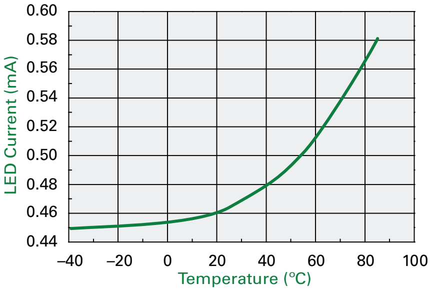

Typical Turn-Off Time ($N=50$, $I_F=5$ mA, $I_L=100$ mA)

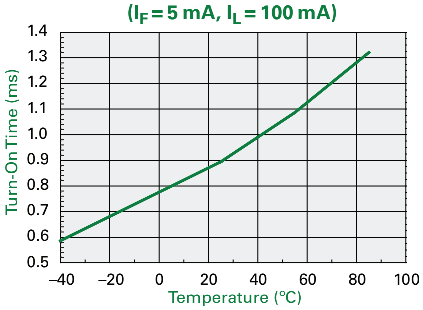

Typical Blocking Voltage Distribution ($N=50$, $I_F=0$ mA)

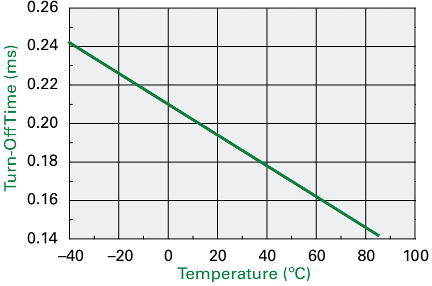

Typical LED Forward Voltage Drop vs. Temperature


Typical Turn-On Time vs. LED Forward Current ($I_L=100$ mA)


Typical Turn-Off Time vs. LED Forward Current ($I_L=100$ mA)


Typical I_F for Switch Operation vs. Temperature ($I_L=100$ mA)

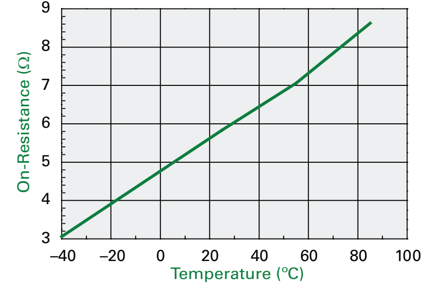

Typical Turn-On Time vs. Temperature ($I_F=5$ mA, $I_L=100$ mA)


Typical Turn-Off Time vs. Temperature ($I_F=5$ mA, $I_L=100$ mA)

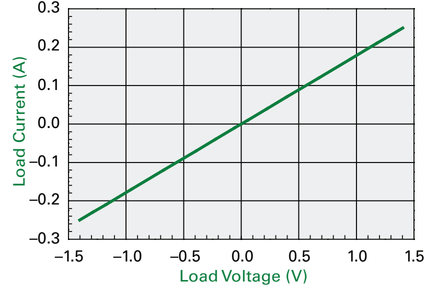
*Unless otherwise noted, data presented in these graphs is typical of device operation at $T_A = 25$°C.

Characteristic Curves

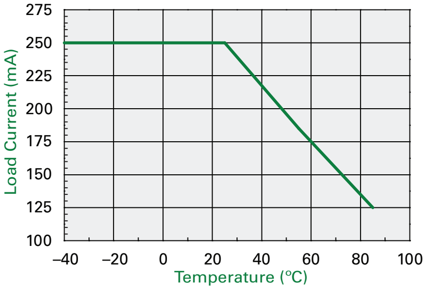
Typical On-Resistance vs. Temperature
AC/DC Configuration
($I_F = 5$ mA, $I_L = 100$ mA)



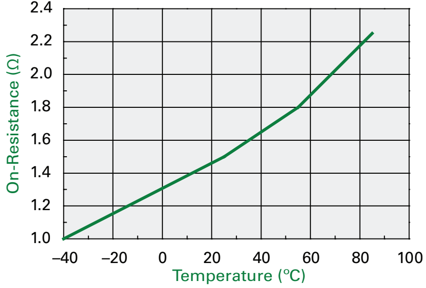
Typical Load Current vs. Load Voltage
AC/DC Configuration
($I_F = 5$ mA)



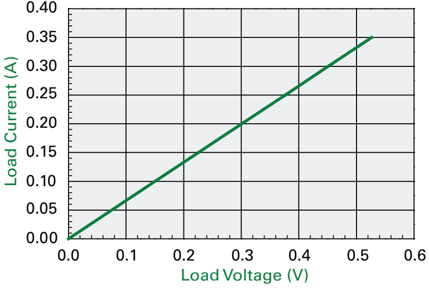
Maximum Load Current
vs. Temperature - AC/DC Configuration
($I_F = 5$ mA)



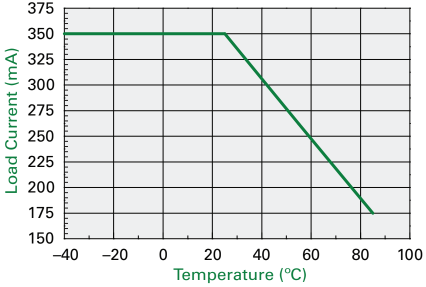
Typical On-Resistance vs. Temperature
DC-Only Configuration
($I_F = 5$ mA, $I_L = 100$ mA)



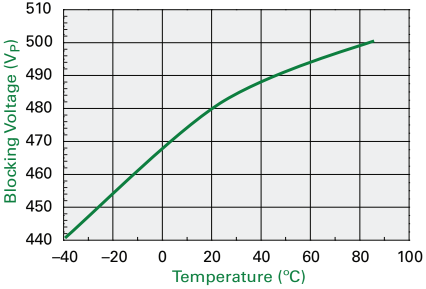
Typical Load Current vs. Load Voltage
DC-Only Configuration
($I_F = 5$ mA)



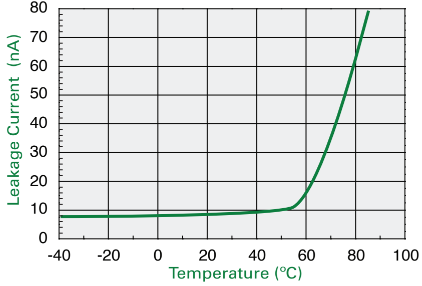
Maximum Load Current
vs. Temperature - DC-Only Configuration
($I_F = 5$ mA)



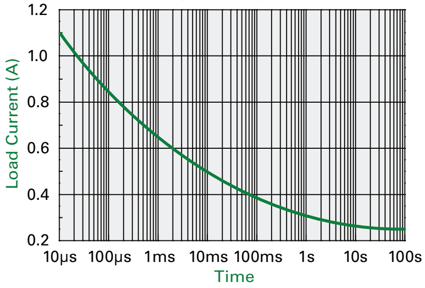
Typical Blocking Voltage
vs. Temperature



Typical Leakage vs. Temperature
Measured Across Pins 4&6
($V_L = 400$ V)



Energy Rating Curve



*Unless otherwise noted, data presented in these graphs is typical of device operation at $T_A = 25$°C.

Manufacturing Information

Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingression. Littelfuse 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
PLA140S	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 **IPC/JEDEC J-STD-020** Classification Temperature (T_C) and the maximum dwell time (T_C – 5°C). The Classification Temperature sets the Maximum Body Temperature allowed for these devices during reflow soldering processes.

Device	Classification Temperature (T_C)	Dwell Time (T_P)	Max Reflow Cycles
PLA140S	250°C	30 seconds	3

For through-hole devices, the maximum pin temperature and maximum dwell time through all solder waves is provided in the table below. Dwell time is the interval beginning when the pins are initially immersed into the solder wave until they exit the solder wave. For multiple waves, the dwell time is from entering the first wave until exiting the last wave. During this time, pin temperatures must not exceed the maximum temperature given in the table below. Body temperature of the device must not exceed the limit shown in the table below at any time during the soldering process.

Device	Maximum Pin Temperature	Maximum Body Temperature	Maximum Dwell Time	Wave Cycles
PLA140	260°C	250°C	10 seconds*	1

**Total cumulative duration of all waves.*

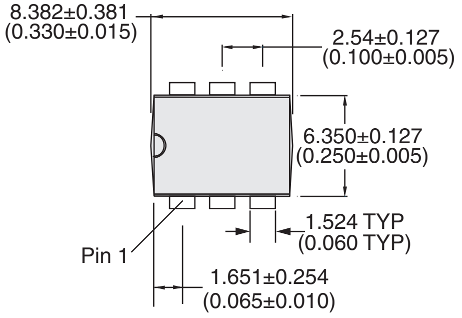
Board Wash

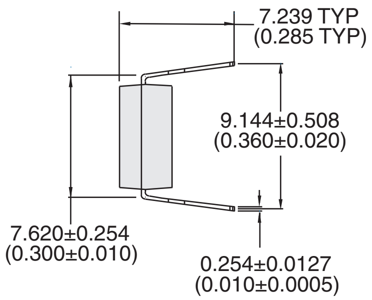
Littelfuse recommends the use of no-clean flux formulations. Board washing to reduce, or remove flux residue following the solder reflow process is acceptable, provided proper precautions are taken to prevent damage to the device. These precautions include, but are not limited to: Using a low pressure 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 halide flux or solvents.

Pb RoHS e3

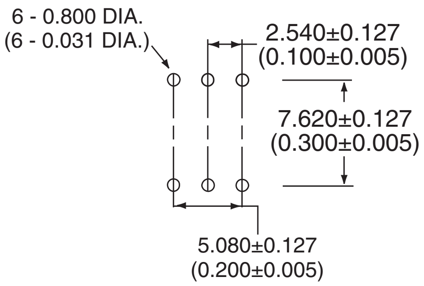
Mechanical Dimensions

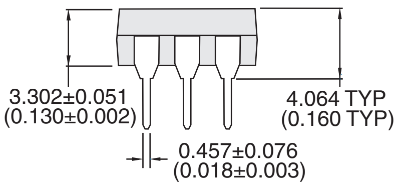
LCA110





PCB Hole Pattern

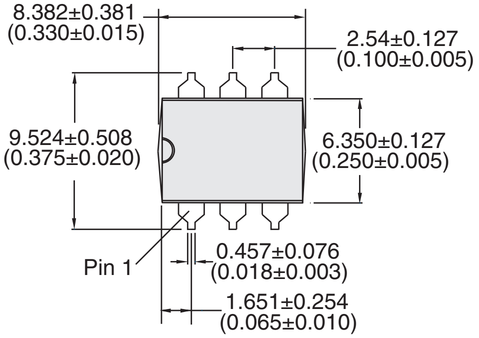


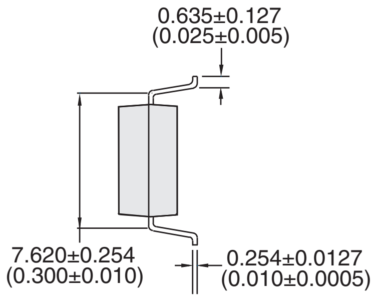


Controlling dimension: inches

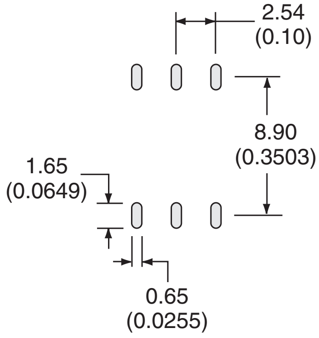
Dimensions
mm
(inches)

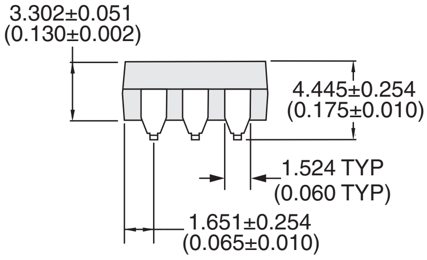
LCA110





PCB Land Pattern

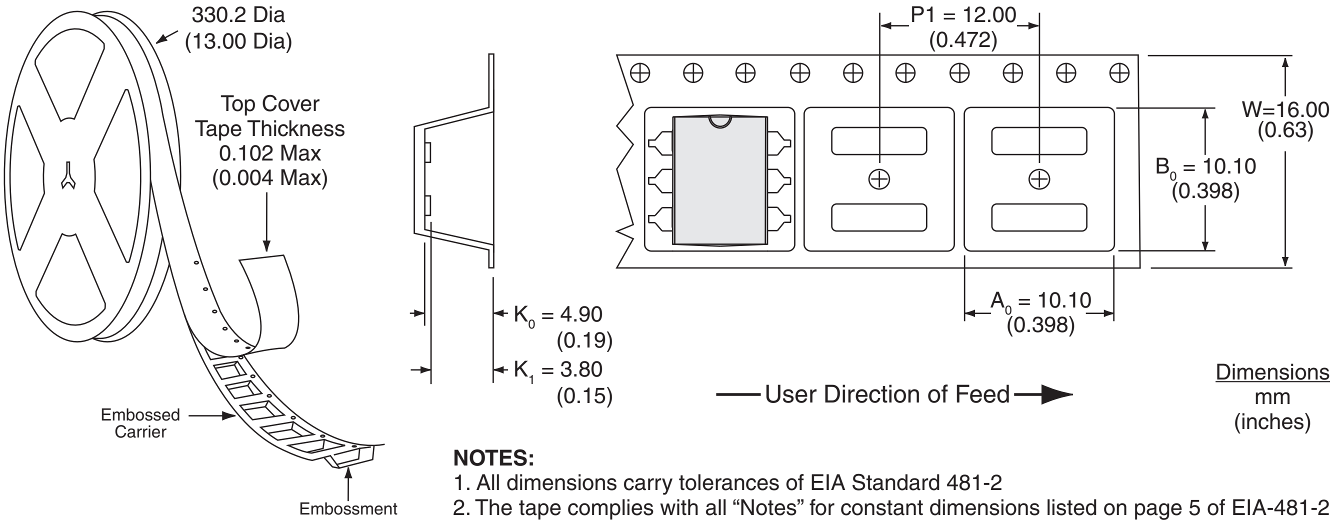




Controlling dimension: inches

Dimensions
mm
(inches)

LCA110 Tape and Reel Packaging



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