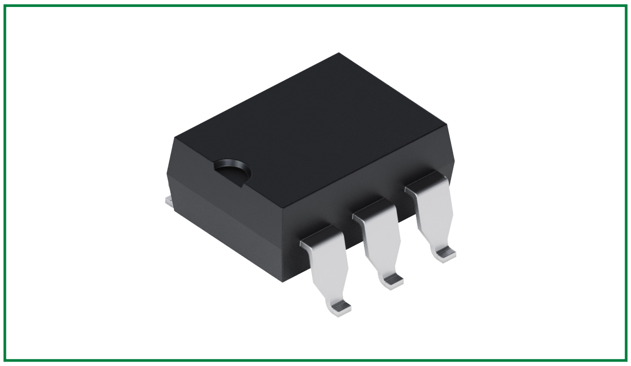
LCA120

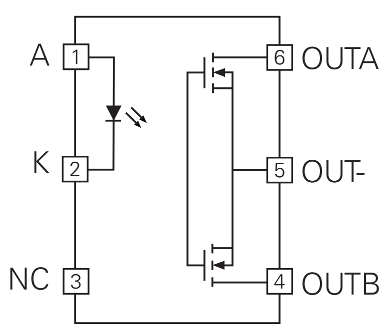
250V, 170 mA Single-Pole Normally Open Relay

Key Attributes

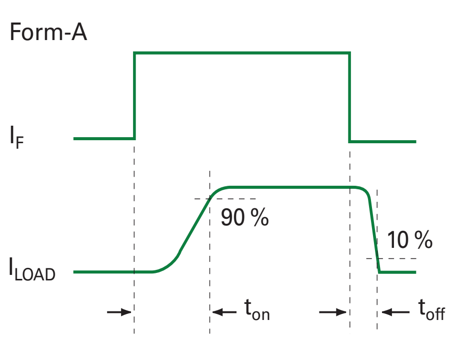
Characteristic	Rating	Unit
Blocking Voltage	250	V_P
Load Current	170	mA_{RMS}/mA_{DC}
On-resistance (max.)	20	Ω
LED Current to Operate	5	mA



Pin Configuration



Switching Characteristics of Normally Open Device



Description

The LCA120 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.

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

LCA120 can be used to replace mechanical relays, and offers the superior reliability associated with semiconductor devices. Because it has no moving parts, it can offer faster, bounce-free switching in a more compact surface mount or thru-hole package.

Features

- $3750V_{RMS}$ Input/Output Isolation
- Small 6-Pin Package
- Low Drive Power Requirements
- Greater Reliability than Electromechanical Relays
- No EMI/RFI Generation
- Small 6-Pin Package
- Flammability Rating UL 94 V-0

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
- Industrial Controls

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
LCA120	6-PIN DIP (50/Tube)
LCA120S	6-Pin Surface Mount (50/Tube)
LCA120STR	6-Pin Surface Mount (1,000/Reel)

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Specifications

Absolute Maximum Ratings

Parameter	Ratings	Units
Blocking Voltage	250	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	3750	V_{RMS}
Operational Temperature, Ambient	−40 to +85	°C
Storage Temperature	−40 to +125	°C

[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 Minimum	Value Typical	Value Maximum	Units
Output Characteristics						
Blocking voltage	$I_L = 1\mu A$	V_{DRM}	250	—	—	V_P
Load current:						
Continuous, AC/DC Configuration	—	I_L	—	—	170	mA_{RMS}/mA_{DC}
Continuous, DC Configuration	—	I_L	—	—	200	mA_{DC}
Peak	t = 10ms	I_{LPK}	—	—	350	mA
On-resistance [1]						
AC/DC Configuration	$I_L = 170mA$	R_{ON}	—	15	20	Ω
DC Configuration	$I_L = 200mA$	R_{ON}	—	5	6	Ω
Off-state leakage current	$V_L = 250V_P$	I_{LEAK}	—	—	1	µA
Switching speeds:						
Turn-on	$I_F = 5mA$, $V_L = 10V$	t_{on}	—	—	3	ms
Turn-off	$I_F = 5mA$, $V_L = 10V$	t_{off}	—	—	3	ms
Output capacitance	$I_F = 0mA$, $V_L = 50V$, f = 1MHz	C_{OUT}	—	50	—	pF
Input Characteristics						
Input control current to activate	$I_L = 170mA$	I_F	—	—	5	mA
Input control current to deactivate	—	I_F	0.1	0.7	—	mA
Input voltage drop to deactivate	—	V_F	0.8	—	—	V
Input voltage drop	$I_F = 5mA$	V_F	0.9	1.36	1.5	V
Reverse input current	$V_R = 5V$	I_R	—	—	10	µA
Common Characteristics						
Capacitance, input to output	$V_{IO} = 0V$, f = 1MHz	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.

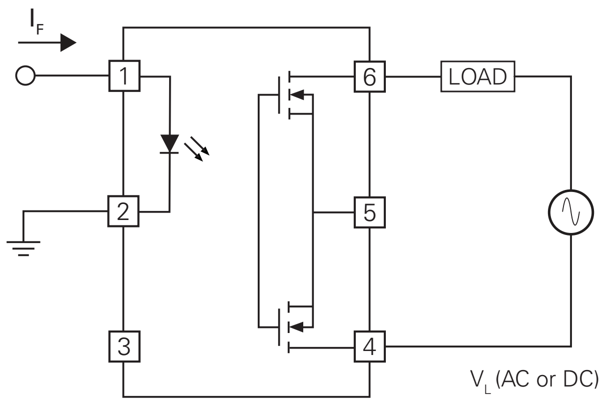

Figure 1. AC/DC, Bidirectional Load Configuration

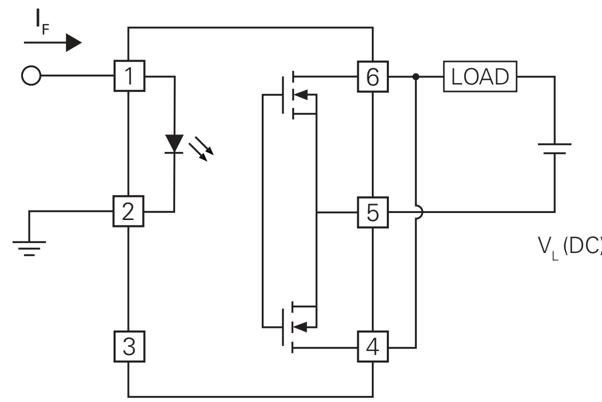

Figure 2. DC, Unidirectional Load Configuration

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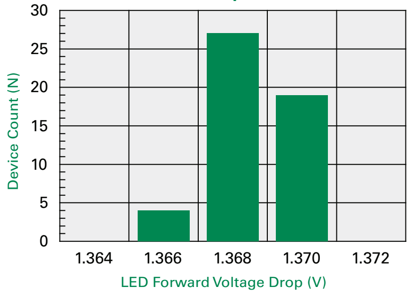
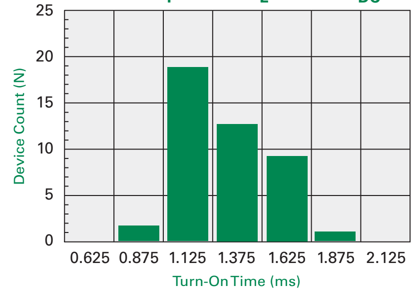
Characteristic Curves

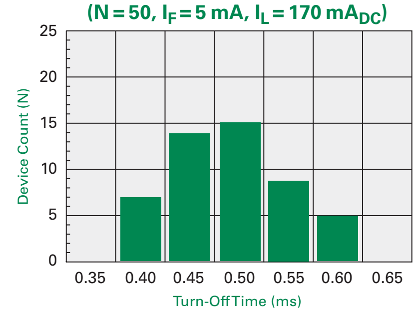
Typical LED Forward Voltage Drop
(N = 50, I_F = 5 mA)



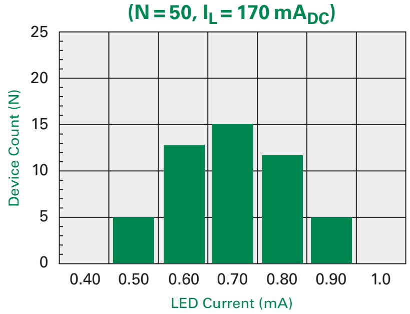
Typical Turn-On Time
(N = 50, I_F = 5 mA, I_L = 170 mA_{DC})



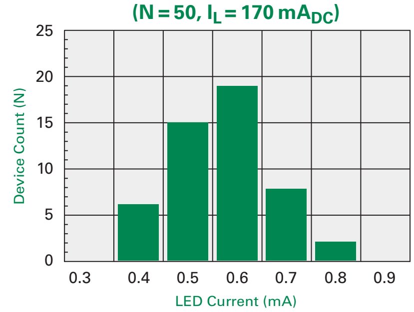
Typical Turn-Off Time
(N = 50, I_F = 5 mA, I_L = 170 mA_{DC})



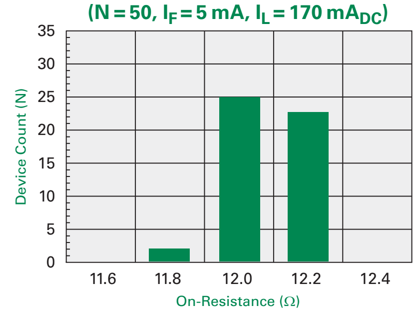
Typical I_F for Switch Operation
(N = 50, I_L = 170 mA_{DC})



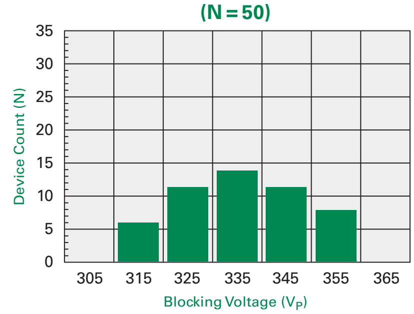
Typical I_F for Switch Dropout
(N = 50, I_L = 170 mA_{DC})



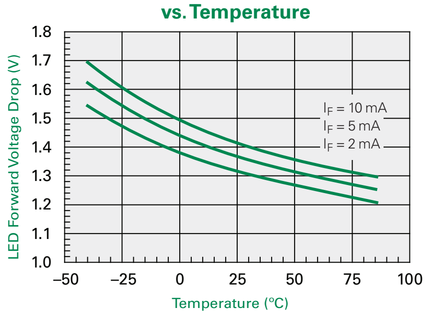
Typical On-Resistance Distribution
(N = 50, I_F = 5 mA, I_L = 170 mA_{DC})



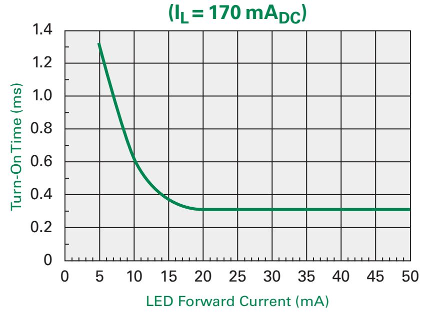
Typical Blocking Voltage Distribution
(N = 50)



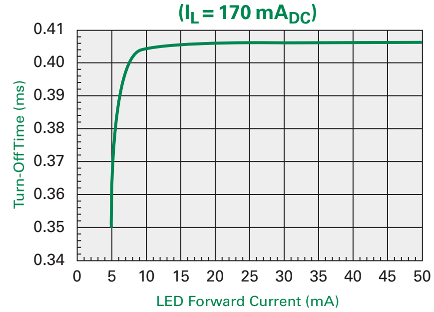
Typical LED Forward Voltage Drop
vs. Temperature



Typical Turn-On Time
vs.LED Forward Current
(I_L = 170 mA_{DC})



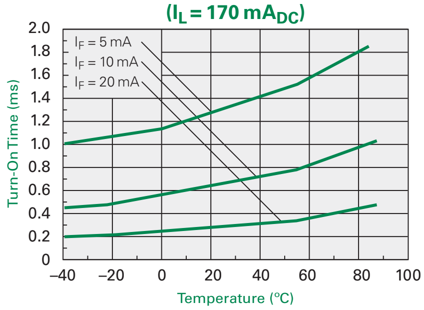
Typical Turn-Off Time
vs. LED Forward Current
(I_L = 170 mA_{DC})



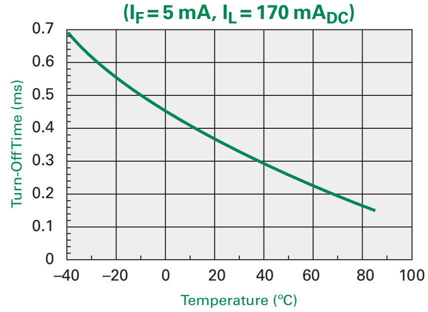
*Unless otherwise noted, data presented in these graphs is typical of device operation at T_A = 25°C.

Characteristic Curves

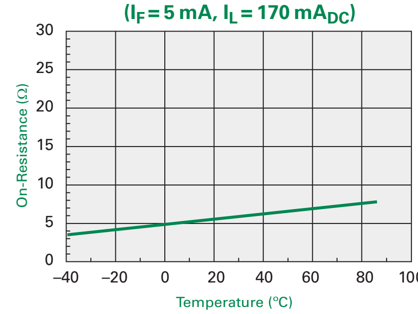
Typical Turn-On Time vs. Temperature (I_L = 170 mA_{DC})



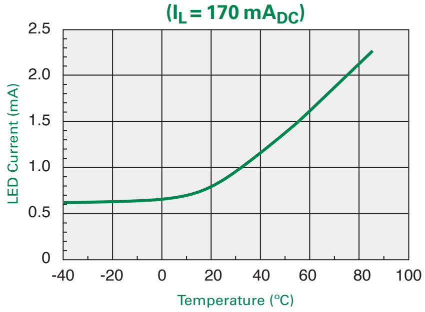
Typical Turn-Off Time vs. Temperature (I_F = 5 mA, I_L = 170 mA_{DC})



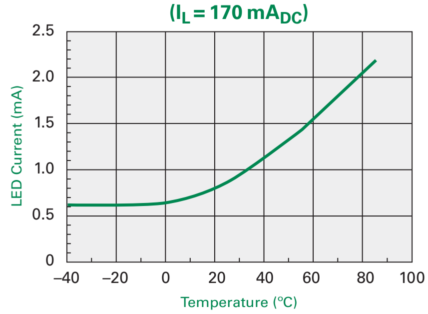
Typical On-Resistance vs. Temperature (I_F = 5 mA, I_L = 170 mA_{DC})



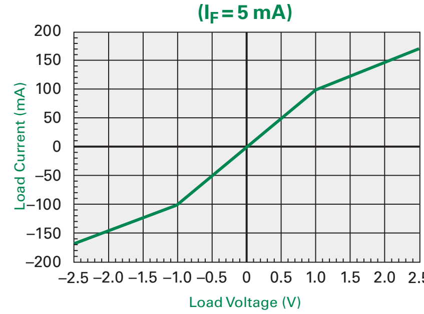
Typical I_F for Switch Operation vs. Temperature (I_L = 170 mA_{DC})



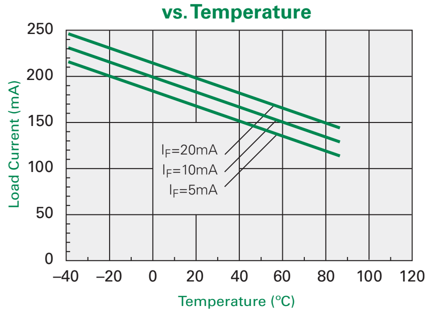
Typical I_F for Switch Dropout vs. Temperature (I_L = 170 mA_{DC})



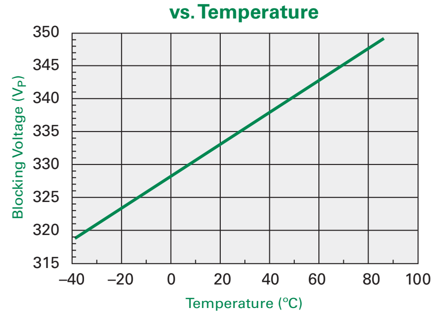
Typical Load Current vs. Load Voltage (I_F = 5 mA)



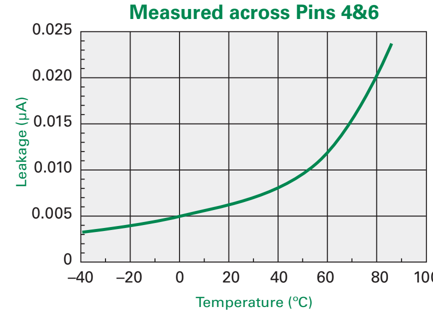
Maximum Load Current vs. Temperature



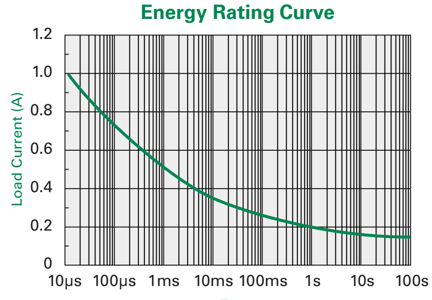
Typical Blocking Voltage vs. Temperature



Typical Leakage vs. Temperature Measured across Pins 4&6



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
LCA120S	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
LCA120S	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
LCA120S	260°C	250°C	10 seconds*	1

**Total cumulative duration of all waves.*

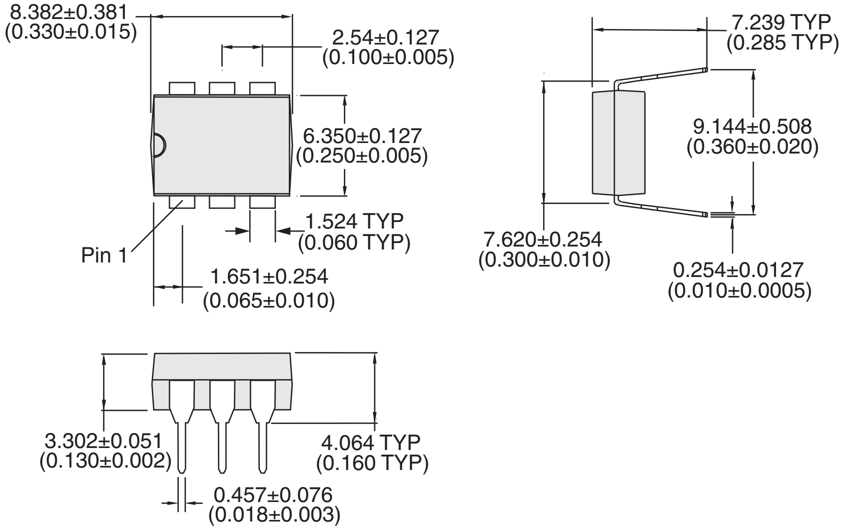
Board Wash

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.

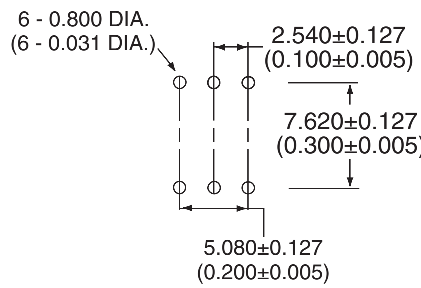
Pb RoHS e3

Mechanical Dimensions

LCA120



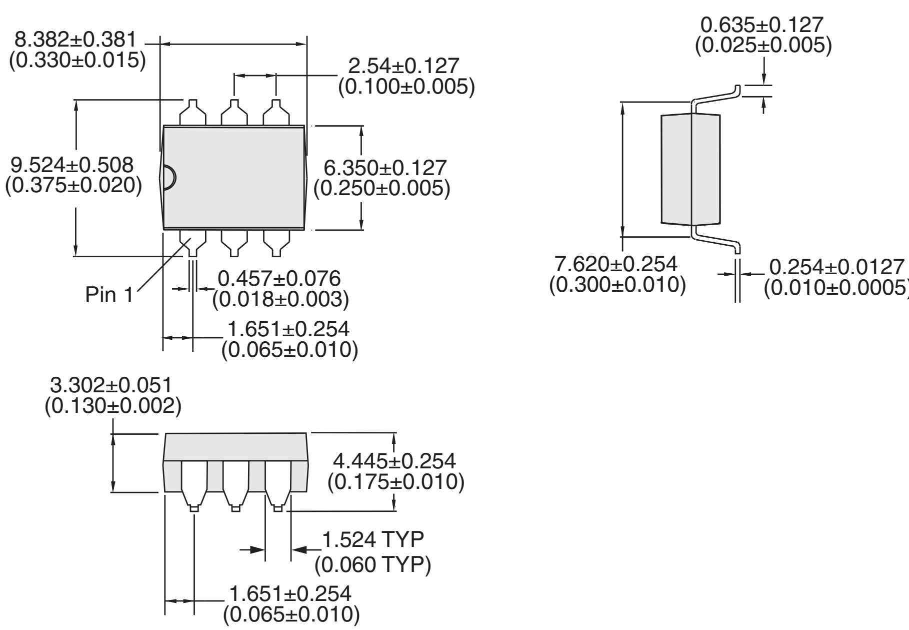
PCB Hole Pattern



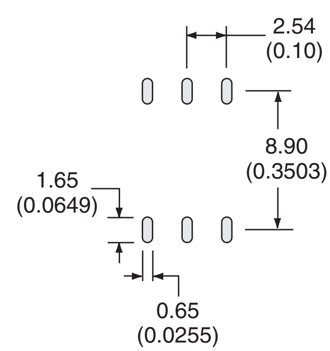
Controlling dimension: inches

Dimensions
mm
(inches)

LCA120S



PCB Land Pattern



Controlling dimension: inches

Dimensions
mm
(inches)

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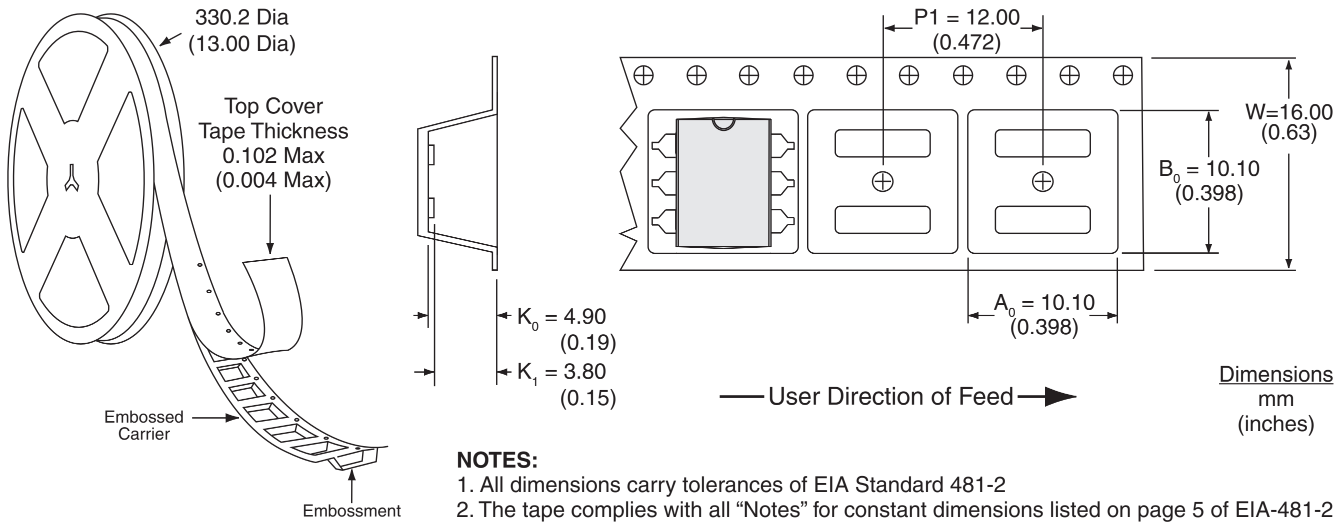
LCA120STR Tape and Reel Packaging



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

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