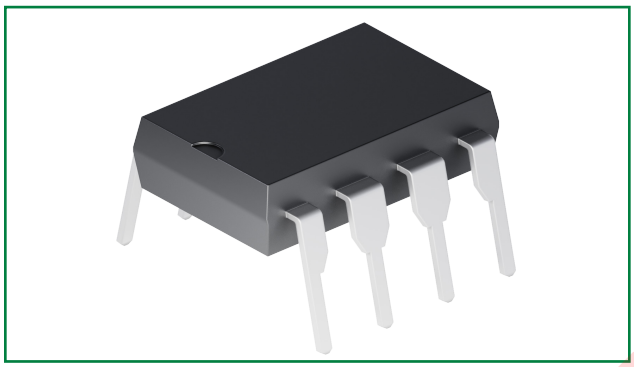
LBA110L

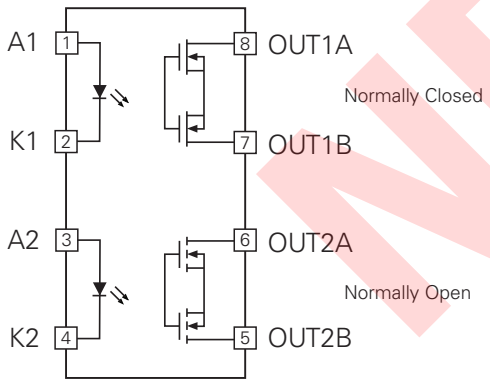
350V, 120 mA Dual Single-Pole Relays:
1-Form-A (NO) Current Limiting & 1-Form-B (NC)

Key Attributes

Characteristic	Rating	Unit
Blocking Voltage	350	V_P
Load Current	±120	mA_{RMS}/mA_{DC}
On-resistance (max.)	35	Ω
LED Current to Operate	5	mA



Pin Configuration



Description

LBA110L is a combination device comprising one normally open (1-Form-A) and one normally closed (1-Form-B) solid state relays. Both relays are independent, 350V, 120 mA, 35 Ω devices designed to provide an ideal solution where a complementary relay pair (1-Form-A / 1-Form-B) is required.

The normally open (1-Form-A) relay is configured as a current-limiting device.

Features

- 3750V_{RMS} Input/Output Isolation
- Normally Open Relay is a Current-Limiting Device
- Low Drive Power Requirements
- Greater Reliability than Electromechanical Relays
- No EMI/RFI Generation

Applications

- Telecommunications
- Instrumentation
- Multiplexers
- Data Acquisition
- Electronic Switching
- I/O Subsystems
- Utility Meters (gas, oil, electric and water)
- Medical Equipment—Patient/Equipment Isolation
- Security
- Industrial Controls

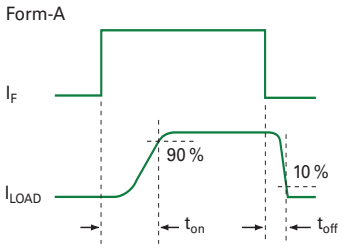
Approvals

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

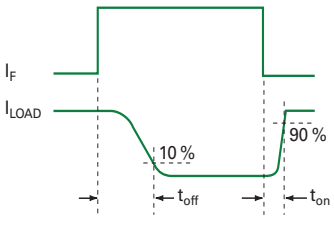
Ordering Information

Part Number	Description
LBA110L	8-Pin DIP (50/Tube)
LBA110PL	8-Pin SOIC (Flatpack) (50/Tube)
LBA110PLTR	8-Pin SOIC (Flatpack) (1000/Reel)
LBA110LS	8-Pin Surface Mount (50/Tube)
LBA110LSTR	8-Pin Surface Mount (1000/Reel)

Switching Characteristics of Normally Open Device



Switching Characteristics of Normally Closed Device



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Specifications

Absolute Maximum Ratings

Parameter	Ratings	Units
Blocking Voltage	350	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 µA	V_{DRM}	350	—	—	V_P
Load current: AC/DC						
Continuous [1]	—	I_L	—	—	±120	mA_{RMS}/mA_{DC}
Peak (1-Form-B)	t = 10 ms	I_{LPK}	—	—	±350	mA_P
Load current limiting (1-Form-A)	—	I_{CL}	±130	±170	±210	mA
On-resistance [2]	I_L = 120 mA	R_{ON}	—	23	35	Ω
Off-state leakage current	V_L = 350 V_P	I_{LEAK}	—	—	1	µA
Switching speeds:						
Turn-on	I_F = 5 mA, V_L = 10 V	t_{on}	—	—	3	ms
Turn-off		t_{off}	—	—	3	
Output Capacitance	V = 50V, f = 1 MHz	C_{OUT}	—	25	—	pF
Input Characteristics						
Input control current to activate	I_L = 120 mA	I_F	—	—	5	mA
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 = 5V	I_R	—	—	10	µA
Common Characteristics						
Capacitance, input to output	V_{IO} = 0 V, f = 1 MHz	C_{IO}	—	3	—	pF

[1] *NOTE: If both poles operate simultaneously, then load current must be derated so as not to exceed the package power dissipation value.*

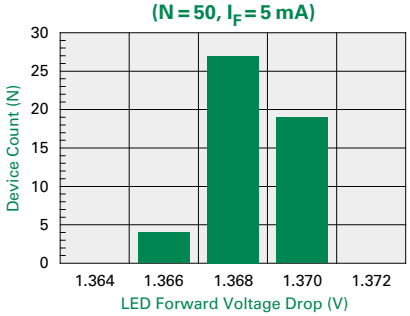
[2] *Measurement taken with one (1) second of on-time.*

NFND

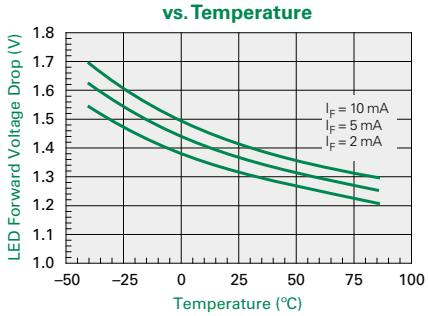
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Form-A/Form-B PERFORMANCE DATA*

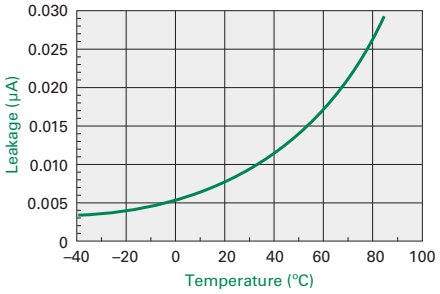
Typical LED Forward Voltage Drop (N = 50, I_F = 5 mA)



Typical LED Forward Voltage Drop vs. Temperature

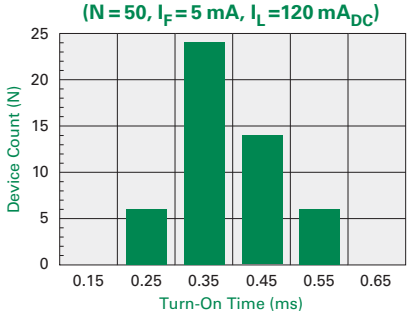


Typical Leakage vs. Temperature Measured Across Pins 5&6 or 7&8

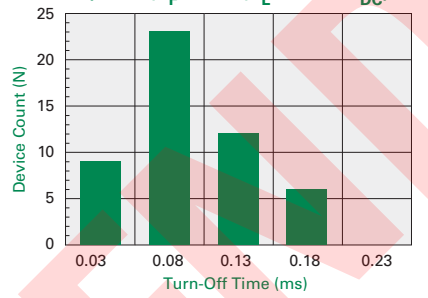


Form-A PERFORMANCE DATA*

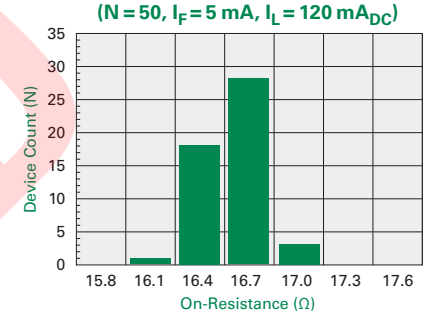
Form-A Typical Turn-On Time (N = 50, I_F = 5 mA, I_L = 120 mA_{DC})



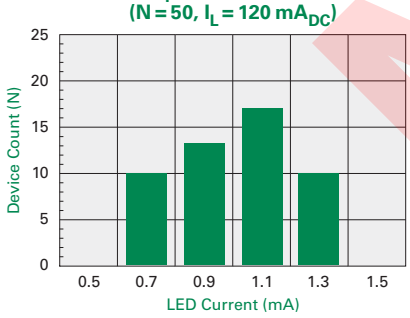
Form-A Typical Turn-Off Time (N = 50, I_F = 5 mA, I_L = 120 mA_{DC})



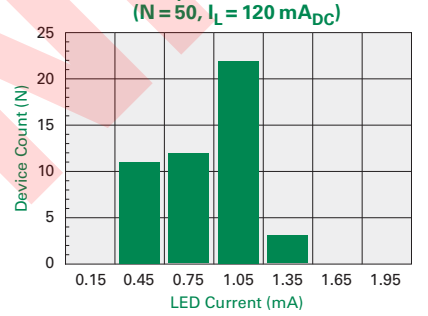
Form-A Typical On-Resistance Distribution (N = 50, I_F = 5 mA, I_L = 120 mA_{DC})



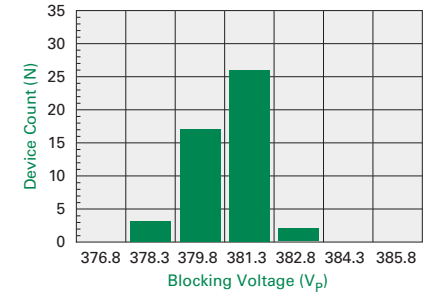
Form-A Typical I_F for Switch Operation (N = 50, I_L = 120 mA_{DC})



Form-A Typical I_F for Switch Dropout (N = 50, I_L = 120 mA_{DC})



Form-A Typical Blocking Voltage Distribution (N = 50)



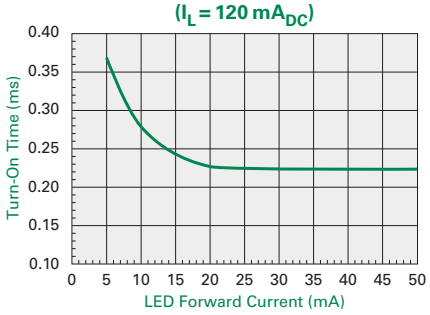
NFND

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

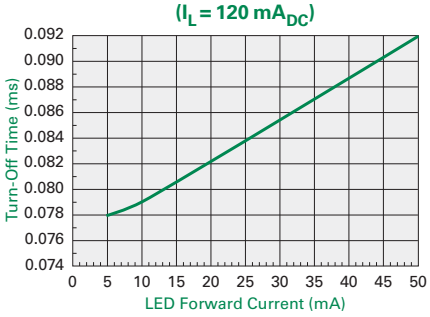
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Form-A PERFORMANCE DATA*

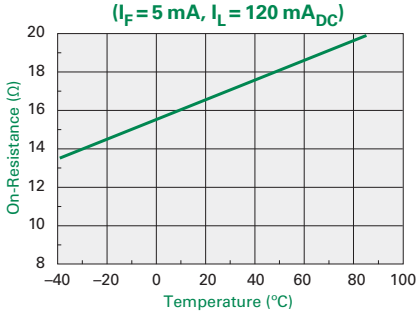
FormA
Typical Turn-On Time
vs. LED Forward Current
(I_L = 120 mA_{DC})



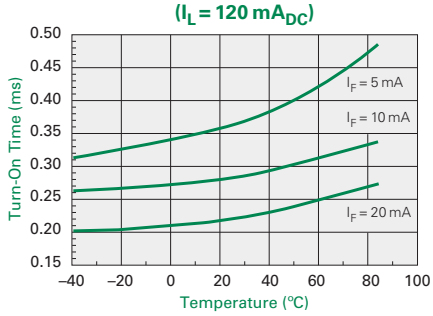
Form-A
Typical Turn-Off Time
vs. LED Forward Current
(I_L = 120 mA_{DC})



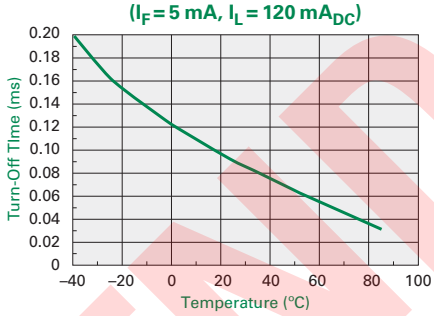
Form-A
Typical On-Resistance vs. Temperature
(I_F = 5 mA, I_L = 120 mA_{DC})



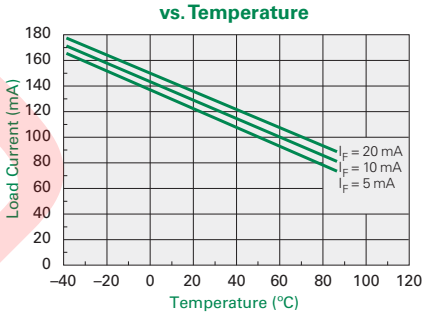
Form-A
Typical Turn-On Time
vs. Temperature
(I_L = 120 mA_{DC})



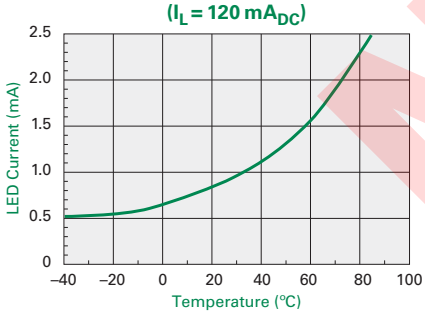
Form-A
Typical Turn-Off Time
vs. Temperature
(I_F = 5 mA, I_L = 120 mA_{DC})



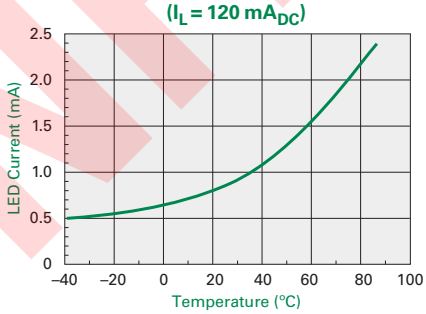
Form A
Maximum Load Current
vs. Temperature



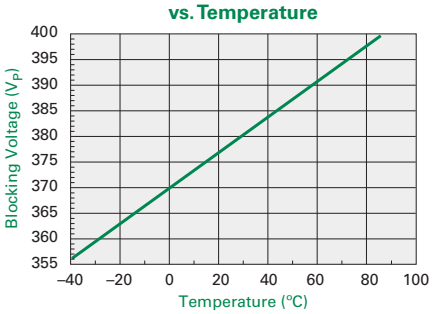
Form-A
Typical I_F for Switch Operation
vs. Temperature
(I_L = 120 mA_{DC})



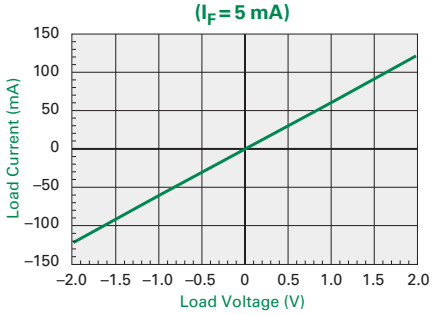
Form-A
Typical I_F for Switch Dropout
vs. Temperature
(I_L = 120 mA_{DC})



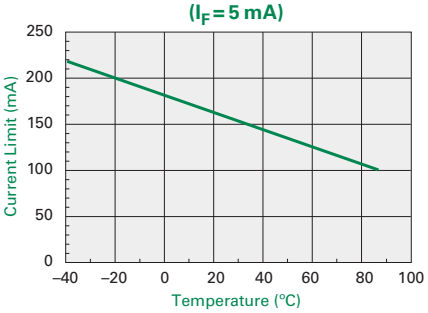
Form-A
Typical Blocking Voltage
vs. Temperature



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



Form-A
Typical Current Limiting Characteristics
vs. Temperature
(I_F = 5 mA)

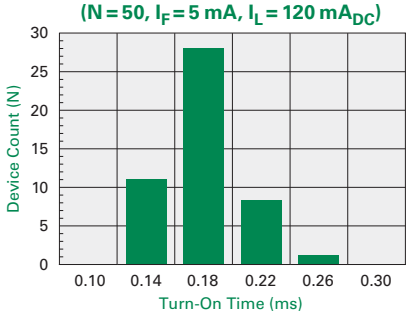


*Unless otherwise noted, data presented in these graphs is typical of device operation at T_A = 25°C.

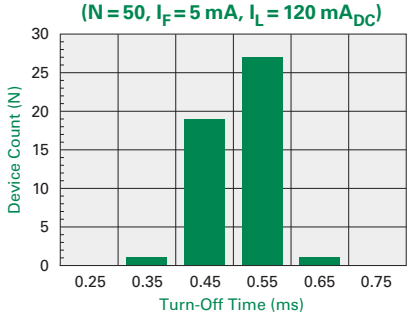
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Form-B PERFORMANCE DATA*

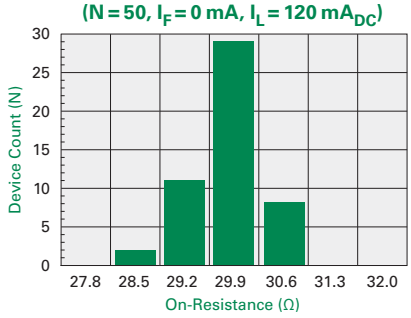
Form-B
Typical Turn-On Time
($N = 50$, $I_F = 5$ mA, $I_L = 120$ mA_{DC})



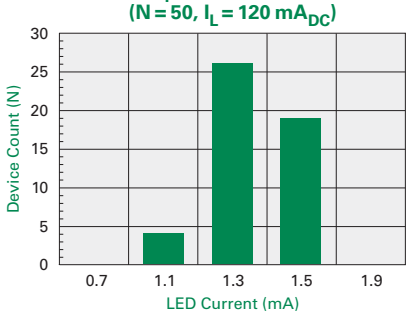
Form-B
Typical Turn-Off Time
($N = 50$, $I_F = 5$ mA, $I_L = 120$ mA_{DC})



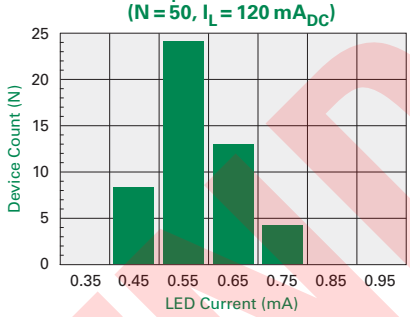
Form-B
Typical On-Resistance Distribution
($N = 50$, $I_F = 0$ mA, $I_L = 120$ mA_{DC})



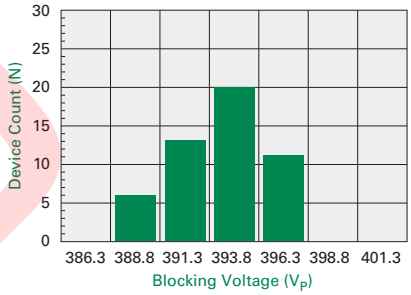
Form-B
Typical I_F for Switch Operation
($N = 50$, $I_L = 120$ mA_{DC})



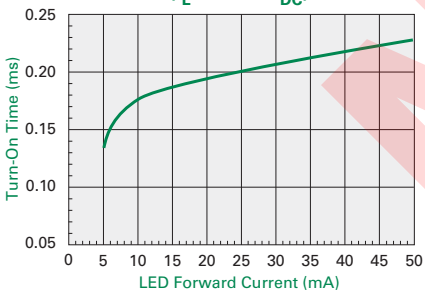
Form-B
Typical I_F for Switch Dropout
($N = 50$, $I_L = 120$ mA_{DC})



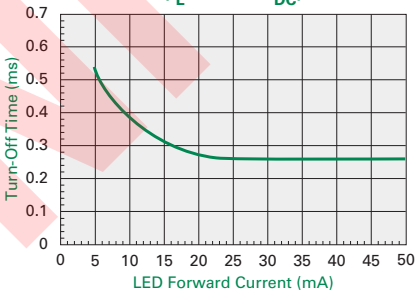
Form-B
Typical Blocking Voltage Distribution
($N = 50$)



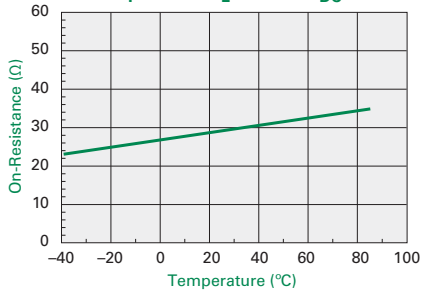
Form-B
Typical Turn-On Time
vs. LED Forward Current
($I_L = 120$ mA_{DC})



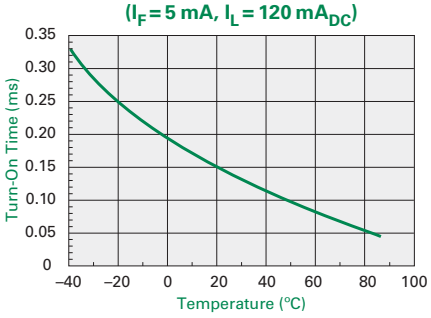
Form-B
Typical Turn-Off Time
vs. LED Forward Current
($I_L = 120$ mA_{DC})



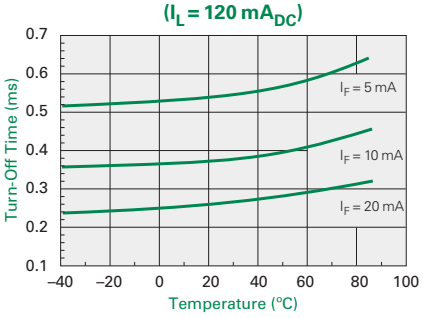
Form-B
Typical On-Resistance vs. Temperature
($I_F = 0$ mA, $I_L = 120$ mA_{DC})



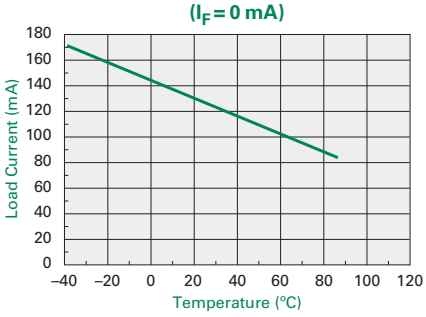
FormB
Typical Turn-On Time
vs. Temperature
($I_F = 5$ mA, $I_L = 120$ mA_{DC})



Form-B
Typical Turn-Off Time
vs. Temperature
($I_L = 120$ mA_{DC})



Form-B
Maximum Load Current vs. Temperature
($I_F = 0$ mA)

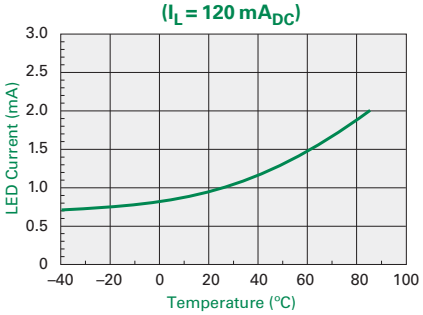


*Unless otherwise noted, data presented in these graphs is typical of device operation at T_A = 25°C.

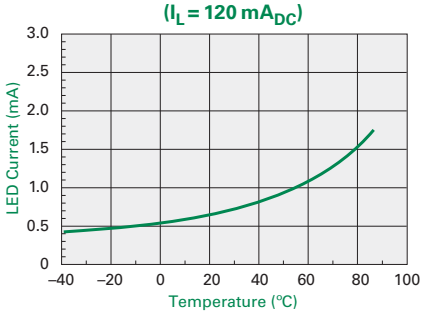
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Form-B PERFORMANCE DATA*

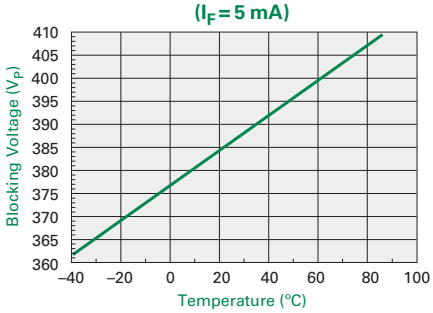
Form-B
Typical I_F for Switch Operation vs. Temperature (I_L = 120 mA_{DC})



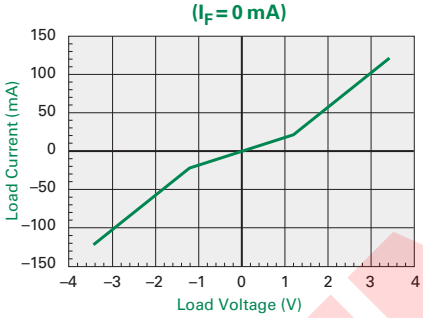
Form-B
Typical I_F for Switch Dropout vs. Temperature (I_L = 120 mA_{DC})



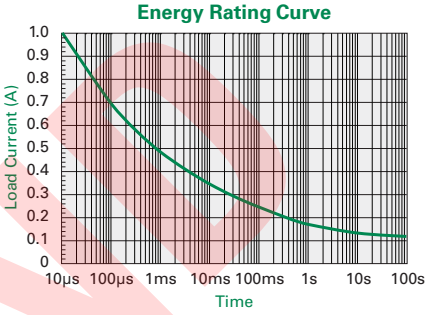
Form-B
Typical Blocking Voltage vs. Temperature (I_F = 5 mA)



Form-B
Typical Load Current vs. Load Voltage (I_F = 0 mA)



Form-B
Energy Rating Curve



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

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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
LBA110LS	MSL 1
LBA110PL	MSL 3

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
LBA110LS	250 °C	30 seconds	3
LBA110PL	245 °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
LBA110L	260 °C	250 °C	10 seconds*	1

**Total cumulative duration of all waves.*

Board Wash

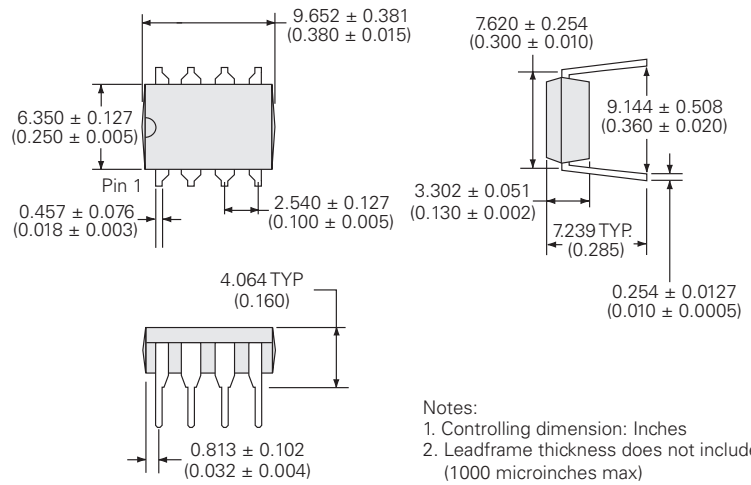
Littelfuse recommends the use of no-clean flux formulations. Board washing to reduce, or remove flux residue following the solder reflow process is acceptable, provided proper precautions are taken to prevent damage to the device. These precautions include, but are not limited to: Using a low pressure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

LIFEND

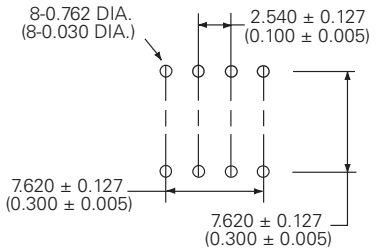
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Mechanical Dimensions

LBA110L



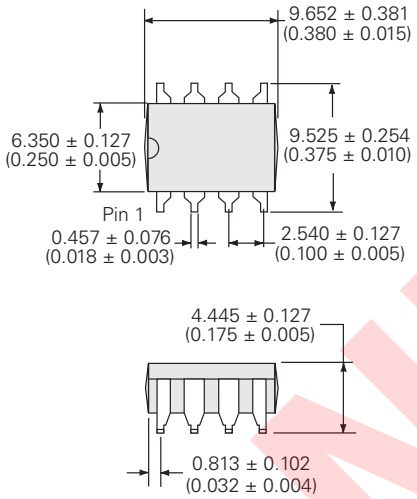
PCB Hole Pattern

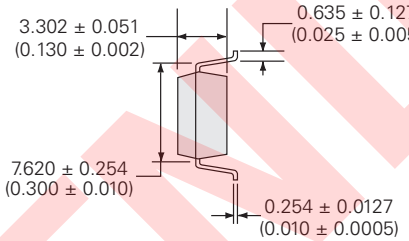


Notes:
1. Controlling dimension: Inches
2. Leadframe thickness does not include solder plating (1000 microinches max)

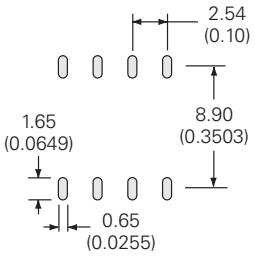
Dimensions
mm
(inches)

LBA110LS





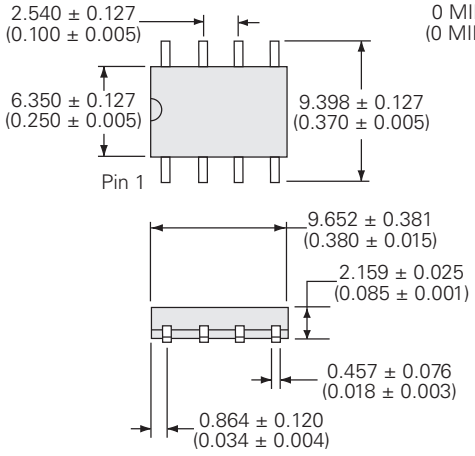
PCB Land Pattern

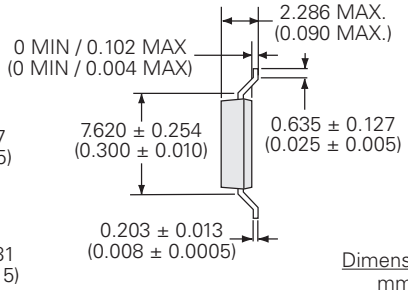


Notes:
1. Controlling dimension: Inches
2. Coplanarity = 0.004" (0.102 mm) max
3. Leadframe thickness does not include solder plating (1000 microinches max)

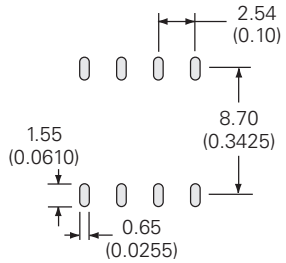
Dimensions
mm
(inches)

LBA110PL





PCB Land Pattern



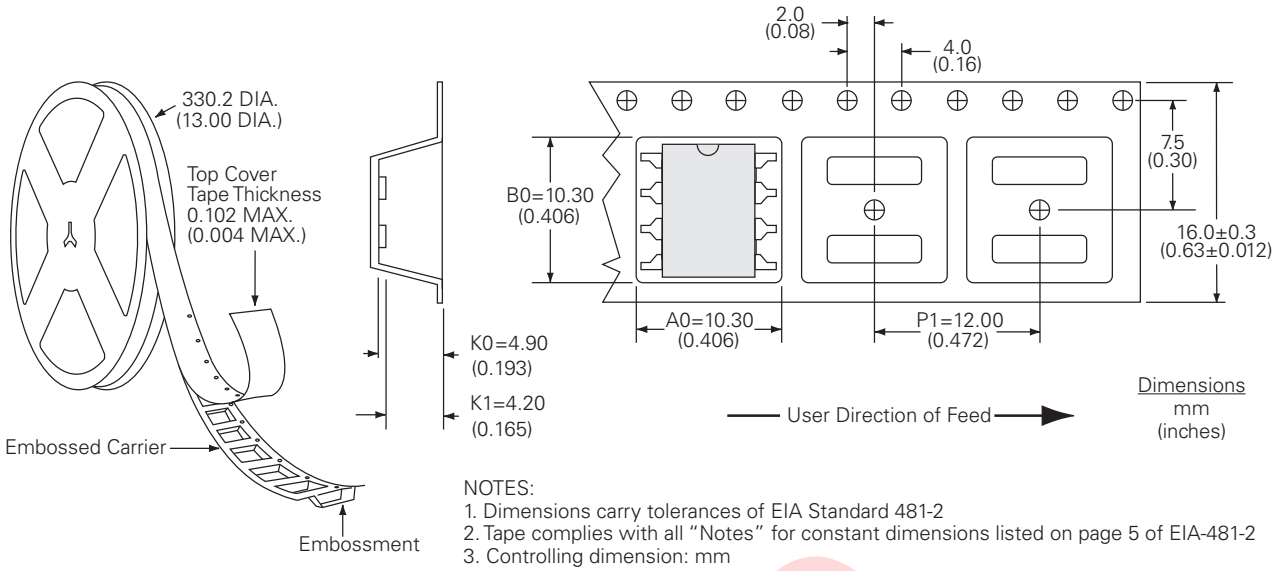
Dimensions
mm
(inches)

Notes:
1. Controlling dimension: Inches
2. Coplanarity = 0.004" (0.102 mm) max
3. Leadframe thickness does not include solder plating (1000µinches max)
4. Sum of package height, standoff, and coplanarity shall not exceed 0.090" (2.286 mm)

NFND

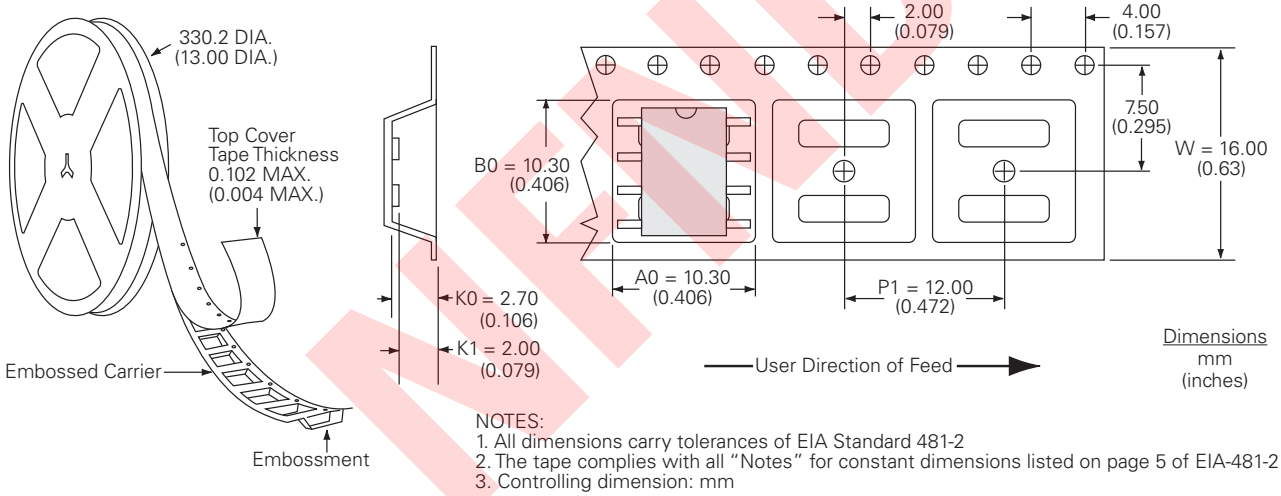
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LBA110LSTR Tape and Reel



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
3. Controlling dimension: mm

LBA110PLTR Tape and 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
3. Controlling dimension: mm

NEND

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