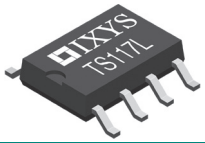
IXYS
INTEGRATED CIRCUITS DIVISION



TS117L
Multifunction Telecom Switch

Parameter	Rating	Units
Blocking Voltage	350	V_P
Load Current	120	mA_{rms} / mA_{DC}
On-Resistance (max)	35	Ω

Features
- Current-Limiting Relay
- 3750V_{rms} Input/Output Isolation
- Low Drive Power Requirements (TTL/CMOS Compatible)
- FCC Compatible
- VDE Compatible
- No EMI/RFI Generation
- Small 8-Pin Package
- Surface Mount and 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)
- Security
- Industrial Controls

Description
The TS117L integrated circuit device combines a current-limiting, 350V, normally open (1-Form-A) relay and an optocoupler in a single package. The relay uses optically coupled MOSFET technology to provide 3750V_{rms} of input to output isolation.

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

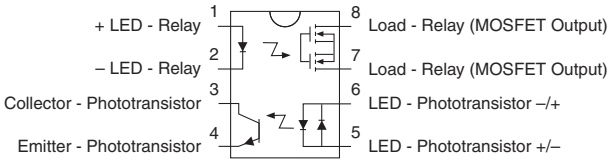
The TS117L enables telecom circuit designers to combine two discrete functions in a single component that uses less space than traditional discrete component solutions.

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

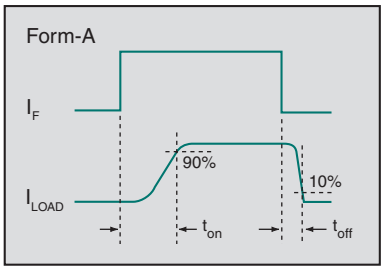
Ordering Information

Part #	Description
TS117L	8-Pin DIP (50/Tube)
TS117LS	8-Pin Surface Mount (50/Tube)
TS117LSTR	8-Pin Surface Mount (1000/Reel)

Pin Configuration



Switching Characteristics of Normally Open Devices



Absolute Maximum Ratings

Parameter	Ratings	Units
Blocking Voltage	350	V_P
Input Power Dissipation [1]	150	mW
Input Control Current, Relay	50	mA
Peak (10ms)	1	A
Reverse Input Voltage	5	V
Input Control Current, Detector	100	mA
Total Power Dissipation [2]	800	mW
Isolation Voltage, Input to Output	3750	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. Absolute Maximum Ratings are at T_A=25°C.

Unless otherwise specified, device characteristics are at T_A=25°C.

Typical values are characteristic of the device at T_A=25°C and are the result of engineering evaluations. They are provided for informational purposes only and are not part of the manufacturing testing requirements.

Electrical Characteristics: Relay Section

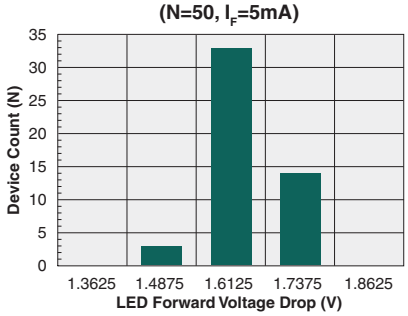
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics						
Load Current, Continuous	-	I_L	-	-	120	mA_{rms} / mA_{DC}
Load Current Limit	-	I_{CL}	130	170	210	mA
On-Resistance	I_L=120mA	R_{ON}	-	30	35	Ω
Off-State Leakage Current	V_L=350V	I_{LEAK}	-	-	1	µA
Switching Speeds						
Turn-On	I_F=5mA, V_L=10V	t_{on}	-	-	3	ms
Turn-Off		t_{off}	-	-	3	ms
Output Capacitance	V_L=50V, f=1MHz	C_{OUT}	-	25	-	pF
Input Characteristics						
Input Control Current to Activate	I_L=120mA	I_F	-	-	2	mA
Input Control Current to Deactivate	-	I_F	0.4	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						
Input to Output Capacitance	-	$C_{I/O}$	-	3	-	pF

Electrical Characteristics: Detector Section

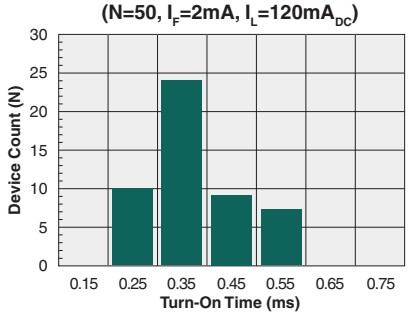
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics						
Phototransistor Blocking Voltage	I_C=10µA	BV_{CEO}	20	50	-	V
Phototransistor Dark Current	V_{CE}=5V, I_F=0mA	I_{CEO}	-	50	500	nA
Saturation Voltage	I_C=2mA, I_F=16mA	V_{SAT}	-	0.3	0.5	V
Current Transfer Ratio	I_F=6mA, V_{CE}=0.5V	CTR	33	100	-	%
Input Characteristics						
Input Control Current	I_C=2mA, V_{CE}=0.5V	I_F	-	2	6	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Input Current (Detector Must be Off)	I_C=1µA, V_{CE}=5V	I_F	5	25	-	µA
Isolation, Input to Output	-	$V_{I/O}$	3750	-	-	V_{rms}

RELAY PERFORMANCE DATA*

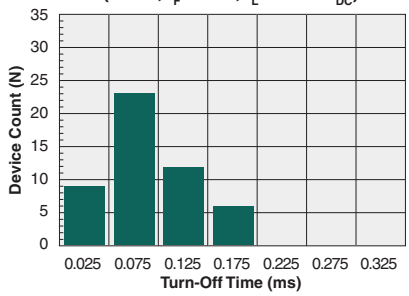
Typical LED Forward Voltage Drop (N=50, I_F=5mA)



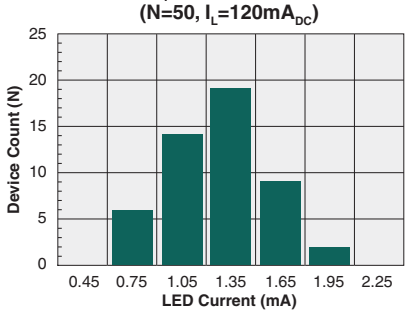
Typical Turn-On Time (N=50, I_F=2mA, I_L=120mA$_{DC}$)



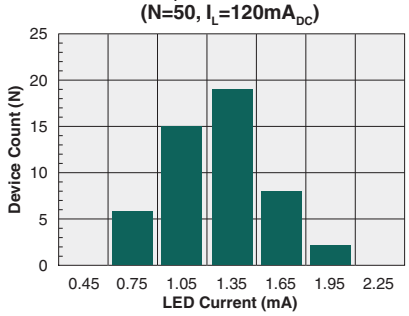
Typical Turn-Off Time (N=50, I_F=2mA, I_L=120mA$_{DC}$)



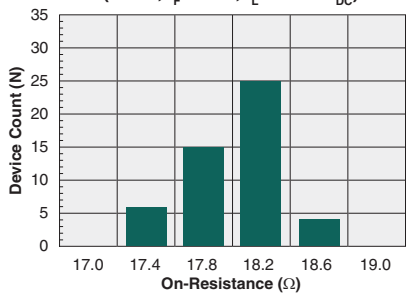
Typical I_F for Switch Operation (N=50, I_L=120mA$_{DC}$)



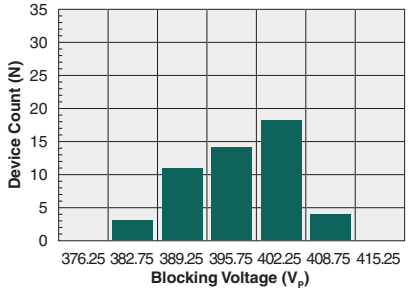
Typical I_F for Switch Dropout (N=50, I_L=120mA$_{DC}$)



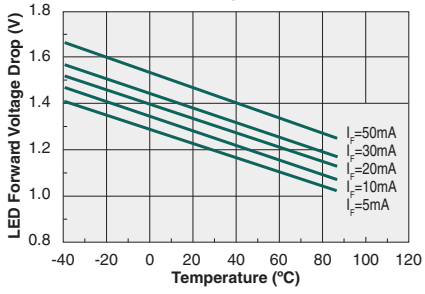
Typical On-Resistance Distribution (N=50, I_F=2mA, I_L=120mA$_{DC}$)



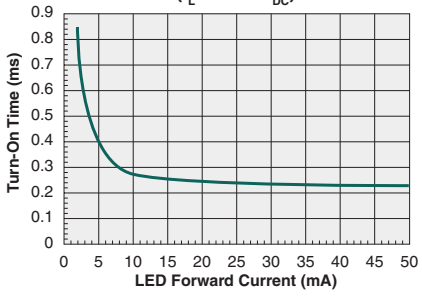
Typical Blocking Voltage Distribution (N=50)



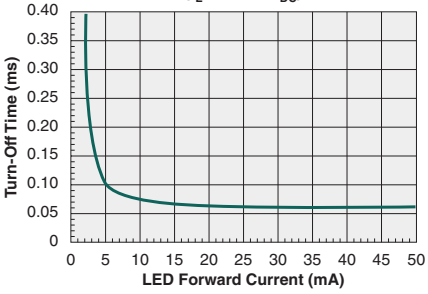
Typical LED Forward Voltage Drop vs. Temperature



Typical Turn-On Time vs. LED Forward Current (I_L=120mA$_{DC}$)



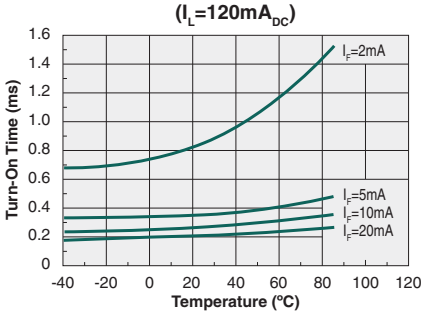
Typical Turn-Off Time vs. LED Forward Current (I_L=120mA$_{DC}$)



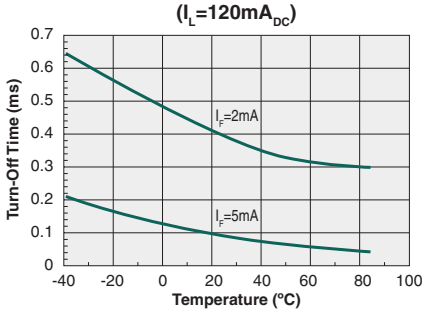
*Unless otherwise noted, data presented in these graphs is typical of device operation at T_A = 25°C.

RELAY PERFORMANCE DATA*

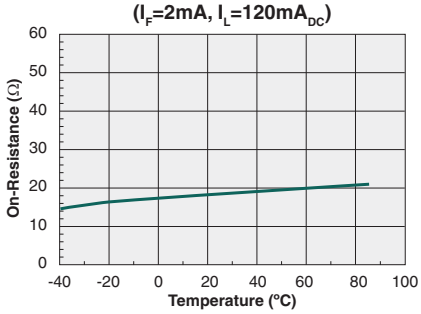
Typical Turn-On Time vs. Temperature (I_L=120mA$_{DC}$)



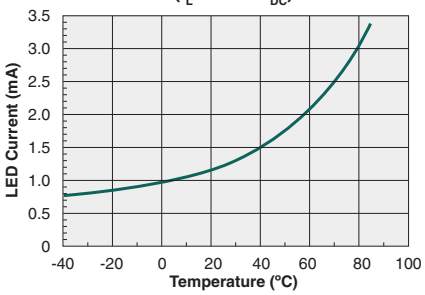
Typical Turn-Off Time vs. Temperature (I_L=120mA$_{DC}$)



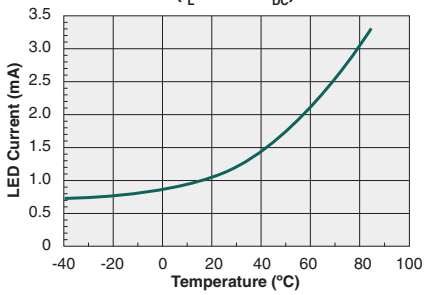
Typical On-Resistance vs. Temperature (I_F=2mA, I_L=120mA$_{DC}$)



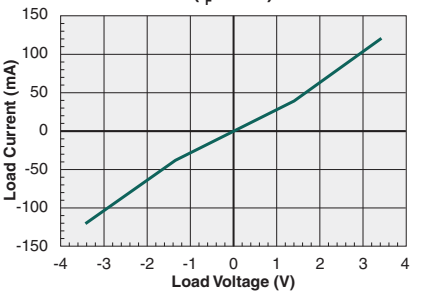
Typical I_F for Switch Operation vs. Temperature (I_L=120mA$_{DC}$)



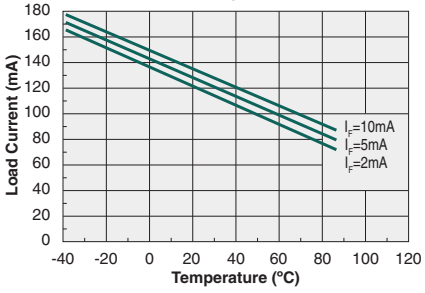
Typical I_F for Switch Dropout vs. Temperature (I_L=120mA$_{DC}$)



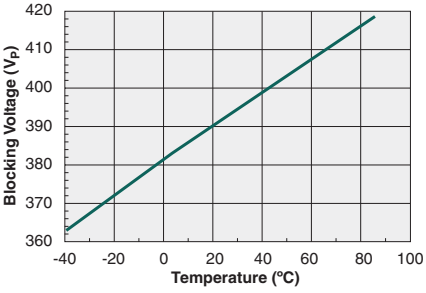
Typical Load Current vs. Load Voltage (I_F=2mA)



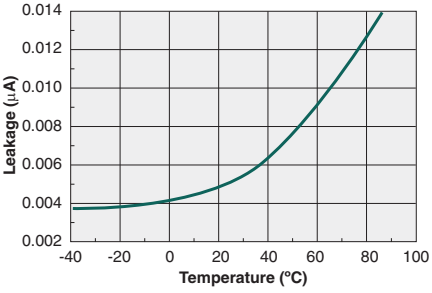
Maximum Load Current vs. Temperature



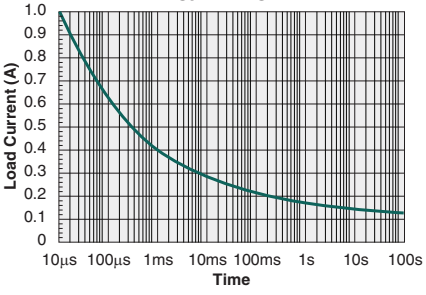
Typical Blocking Voltage vs. Temperature



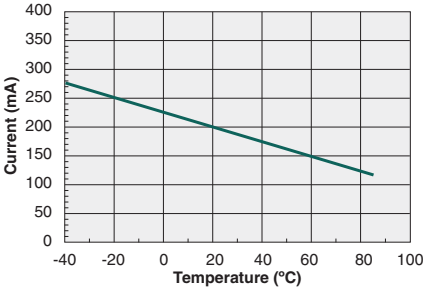
Typical Leakage vs. Temperature Measured across Pins 7&8



Energy Rating Curve



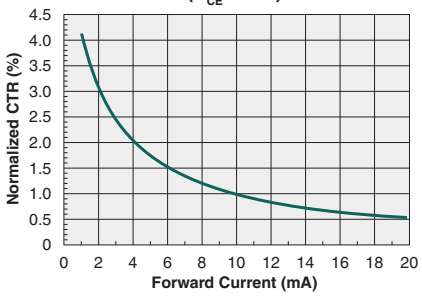
Typical Current Limiting vs. Temperature



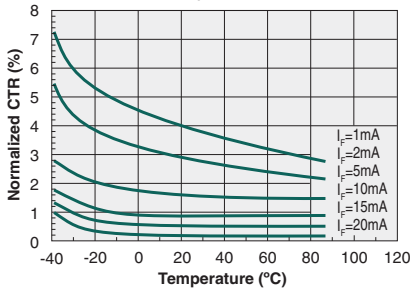
*Unless otherwise noted, data presented in these graphs is typical of device operation at T_A = 25°C.

DETECTOR PERFORMANCE DATA*

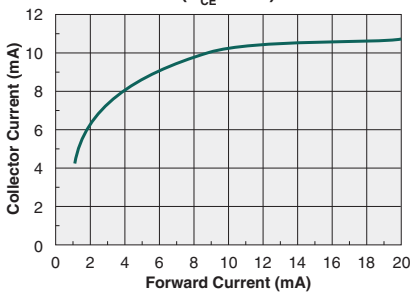
Typical Normalized CTR vs. Forward Current (V_{CE}=0.5V)



Typical Normalized CTR vs. Temperature (V_{CE}=0.5V)



Typical Collector Current vs. Forward Current (V_{CE}=0.5V)



*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
TS117LS	MSL 1

ESD Sensitivity

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

Soldering Profiles

Provided in the table below is the **IPC/JEDEC J-STD-020** Classification Temperature (T_C) and the maximum total dwell time (t_P) in all reflow processes that the body temperature of these surface mount devices may be (T_C - 5)°C or greater. The device's body temperature must not exceed the Classification Temperature at any time during reflow soldering processes.

Device	Classification Temperature (T_c)	Dwell Time (t_P)	Max Reflow Cycles
TS117LS	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
TS117L	260°C	250°C	10 seconds*	1

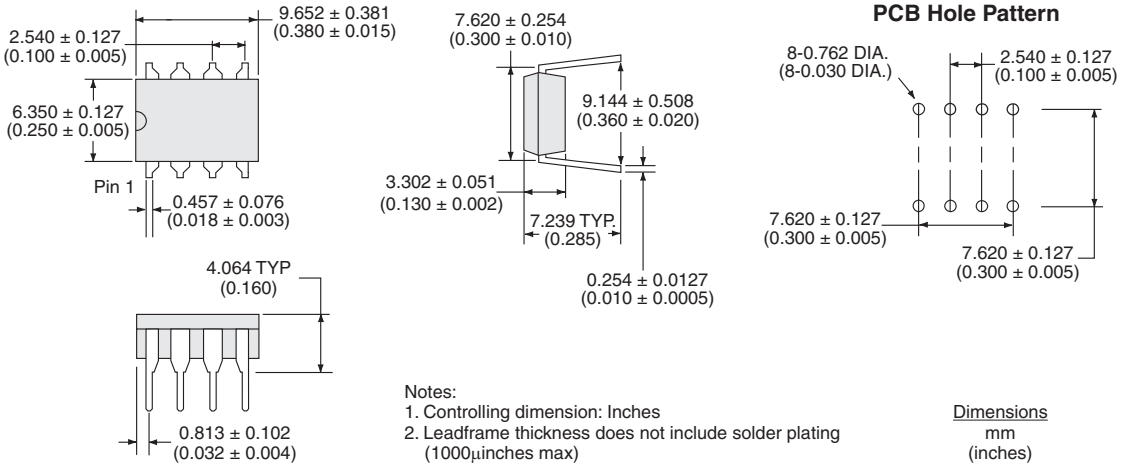
*Total cumulative duration of all waves.

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.

Mechanical Dimensions

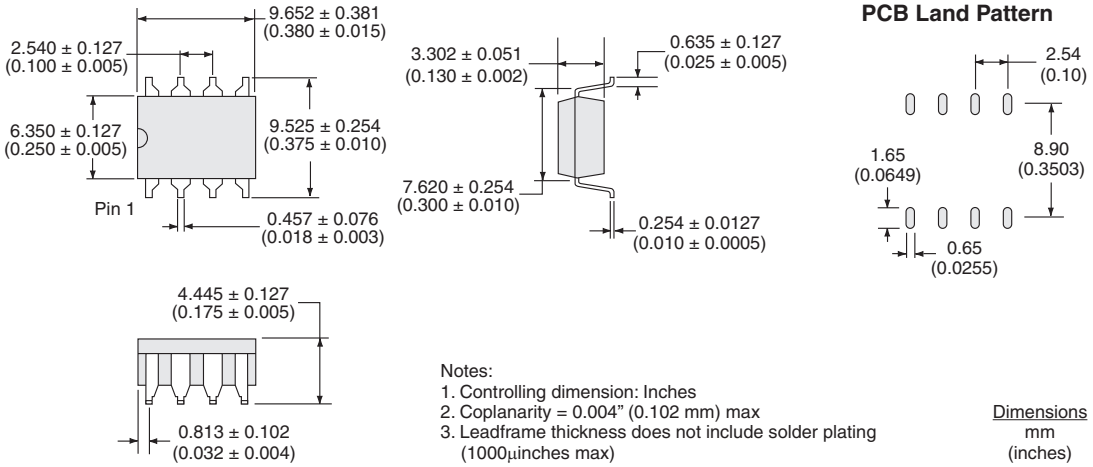
TS117L



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

Dimensions
mm
(inches)

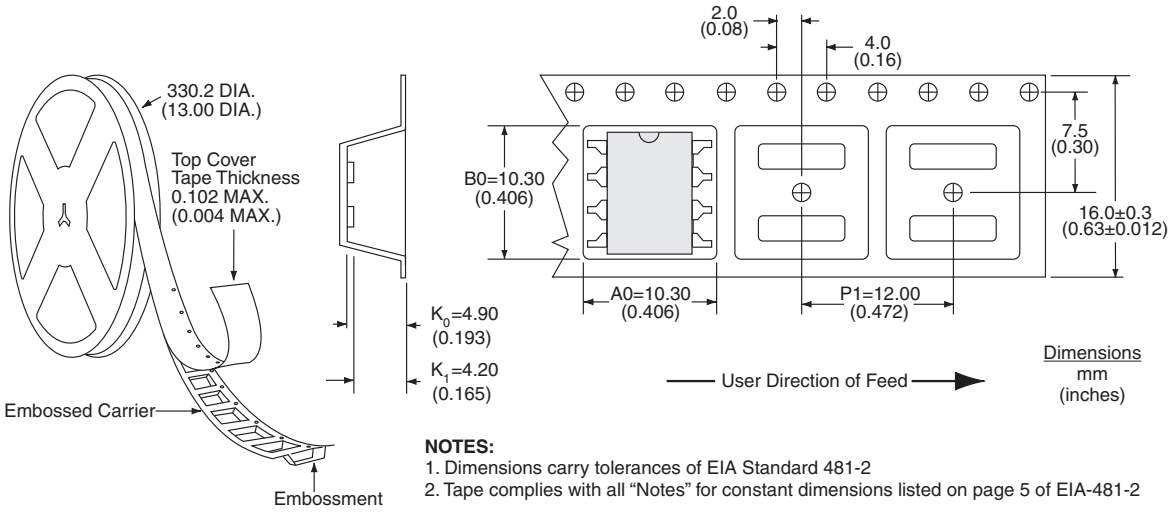
TS117LS



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

Dimensions
mm
(inches)

TS117LSTR 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: http://www.littelfuse.com

IXYS
A Littelfuse Technology

Specification: DS-TS117L-R07

5/4/2023