INTEGRATED CIRCUITS DIVISION

ITC117PL
Integrated Telecom Circuits

Parameter	Rating	Units
Relay Blocking Voltage	350	V
Relay Load Current	120	mA_{rms} / mA_{DC}
Relay On-Resistance (max)	20	Ω
Bridge Rectifier Reverse Voltage	100	V
Darlington Collector Current	120	mA
Darlington Current Gain	10,000	-

Features

- Current Limiting
- 3750V_{rms} Input/Output Isolation
- 2mW Hook Switch Drive Power (Logic Compatible)
- Full-Wave Bridge Rectifier
- Darlington Transistor for Electronic Inductor “Dry” Circuits
- Full-Wave Current Detector for Ring Signal or Loop Current Detect
- JEDEC Standard Lead Configuration
- Board Space and Cost Savings
- Small 16-Pin SOIC Package (PCMCIA Compatible)

Applications

- Data/Fax Modem
- Voice Mail Systems
- Telephone Sets
- Computer Telephony Integration
- Set Top Box Modems

Description

The Integrated Telecom Circuit combines a single-pole, normally open (1-Form-A) solid state relay, a bridge rectifier, a Darlington transistor, and an optocoupler into one 16-pin SOIC package, consolidating designs and reducing component count in telecom applications. The ITC117PL's relay features the added benefit of current limiting, and the optocoupler provides for full-wave detection of ring signals.

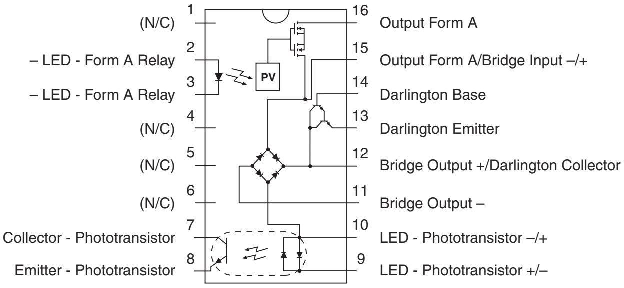
Approvals

- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1305490
- EN62368-1 Certified Component:
  TUV Certificate: B 082667 0008 Rev 00

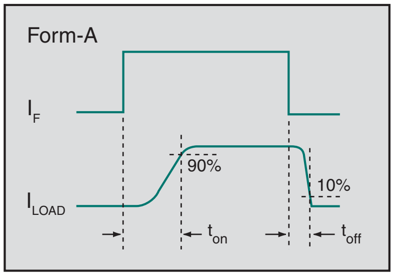
Ordering Information

Part #	Description
ITC117PL	16-Pin SOIC (50/Tube)
ITC117PLTR	16-Pin SOIC (1000/Reel)

Pin Configuration



Switching Characteristics of Normally Open Devices



Absolute Maximum Ratings @ 25°C

Parameter	Ratings	Units
Input Control Current, Relay	50	mA
Input Control Current, Detector	100	mA
Total Package Dissipation [1]	1	W
Isolation Voltage, Input to Output	3750	V_{rms}
Operational Temperature	-40 to +85	°C
Storage Temperature	-40 to +125	°C

[1] Derate linearly 8.33 mW / °C

Total Power Dissipation (PD):

$P_D=P_{HOOKSWITCH}+P_{BRIDGE}+P_{DARLINGTON}+P_{LED}$

$P_D=(R_{DS}(on))(I^2_L)+2(V_F)(I_L)+(V_{CE})(I_L)+(V_{LED})(I_F)$

WHERE:

$R_{DS}(on)$ = Maximum relay on-resistance
I_L = Maximum loop current
V_F = Maximum diode forward voltage
V_{CE} = Maximum voltage collector to emitter
V_{LED} = Maximum LED forward voltage
I_F = Maximum LED current

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: Relay Section

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Output Characteristics						
Blocking Voltage (Peak)	-	V_L	-	-	350	V_P
Load Current, Continuous	-	I_L	-	-	120	mA_{rms} / mA_{DC}
On-Resistance	I_L=120mA	R_{ON}	-	-	20	Ω
Off-State Leakage Current	V_L=350V_P, T_J=25°C	I_{LEAK}	-	-	1	µA
Switching Speeds						
Turn-On	I_F=5mA, V_L=10V	t_{on}	-	-	5	ms
Turn-Off		t_{off}	-	-	3	ms
Output Capacitance	V_L=50V, f=1MHz	C_{OUT}	-	25	-	pF
Current Limit	I_F=5mA	I_{CL}	190	235	280	mA
Input Characteristics						
Input Control Current to Activate	I_L=120mA	I_F	-	-	5	mA
Input Voltage Drop	I_F=5mA	V_F	0.9	1.2	1.4	V
Reverse Input Voltage	-	V_R	-	-	5	V
Reverse Input Current	V_R=5V	I_R	-	-	10	µA

Electrical Characteristics @25ºC: 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	400	-	%
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

Electrical Characteristics @25ºC (Unless Otherwise Noted): Bridge Rectifier Section

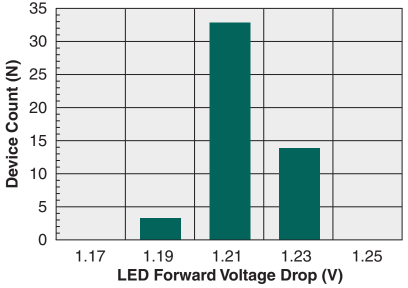
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Reverse Voltage	-	V_{RD}	-	-	100	V
Forward Voltage Drop	I_{FD}=120mA	V_{FD}	-	-	1.5	V
Reverse Leakage Current	T_J=25ºC, V_R=100V	I_{RD}	-	-	10	µA
	T_J=85ºC		-	50	-	
Forward Current Continuous	-	I_{FD}	-	-	140	mA
Peak	t=10ms		-	-	500	

Electrical Characteristics @25ºC: Darlington Transistor Section

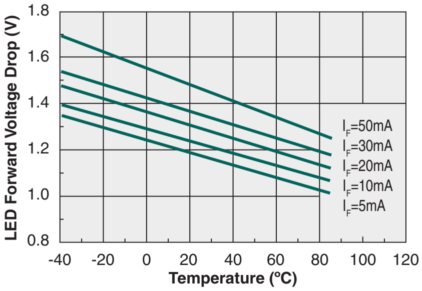
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Collector-Emitter Voltage	I_C=10mA$_{DC}$, I_B=0mA	V_{CEO}	40	-	-	V
Collector Current, Continuous	V_C=3.5V	I_C	-	-	120	mA
Power Dissipation	-	P_D	-	-	500	mW
Off-State Collector-Emitter Leakage Current	V_{CE}=10V, I_B=0mA	I_{CEX}	-	-	1	µA
DC Current Gain	V_{CE}=10V$_{DC}$, I_C=120mA	h_{FE}	10,000	-	-	-
Saturation Voltage	I_C=120mA	$V_{CE(sat)}$	-	-	1.5	V
Total Harmonic Distortion	I_C=40mA, f_O=300Hz @ -10dBm	-	-	-	-80	dB

DEVICE PERFORMANCE DATA*

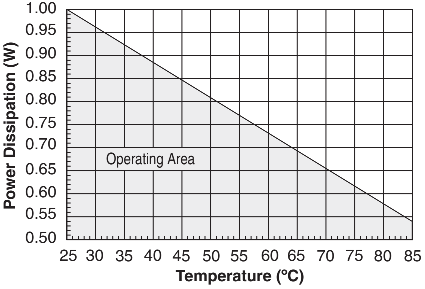
Typical LED Forward Voltage Drop
(N=50, I_F=5mA, T_A=25°C)



Typical LED Forward Voltage Drop
vs. Temperature

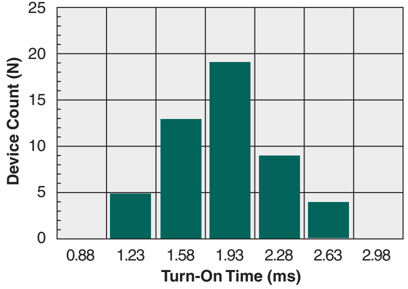


Package Power Derating

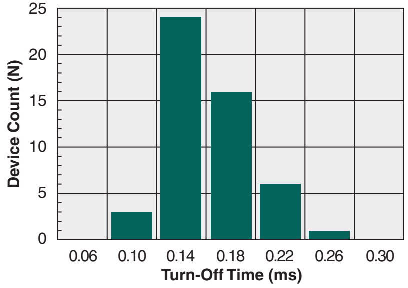


RELAY PERFORMANCE DATA*

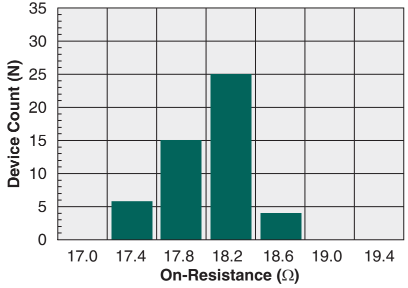
Typical Turn-On Time
(N=50, I_F=2mA, I_L=120mA$_{DC}$, T_A=25°C)



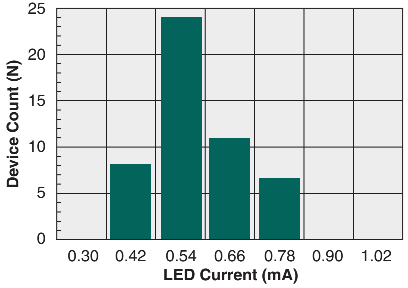
Typical Turn-Off Time
(N=50, I_F=2mA, I_L=120mA$_{DC}$, T_A=25°C)



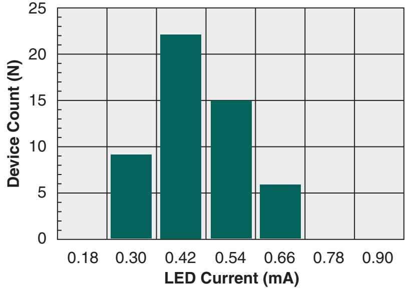
Typical On-Resistance Distribution
(N=50, I_F=2mA, I_L=120mA$_{DC}$, T_A=25°C)



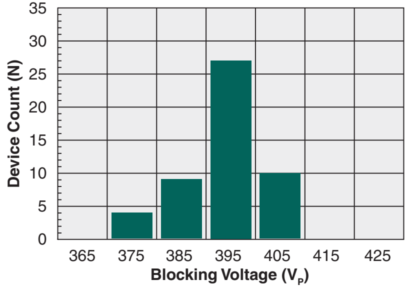
Typical I_F for Switch Operation
(N=50, I_L=120mA$_{DC}$, T_A=25°C)



Typical I_F for Switch Dropout
(N=50, I_L=120mA$_{DC}$, T_A=25°C)

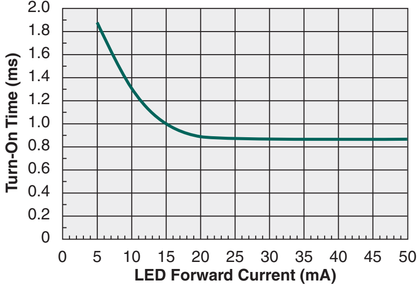


Typical Blocking Voltage Distribution
(N=50, T_A=25°C)

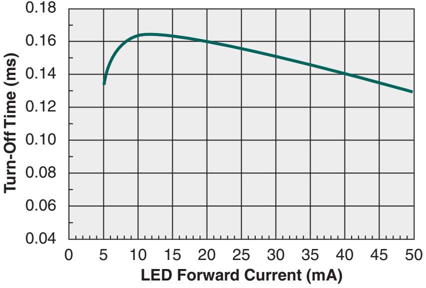


* Unless otherwise noted, data presented in these graphs is typical of device operation at 25°C.

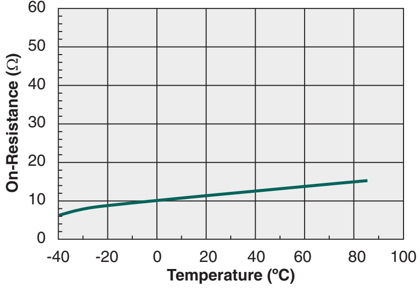
RELAY PERFORMANCE DATA (cont)*



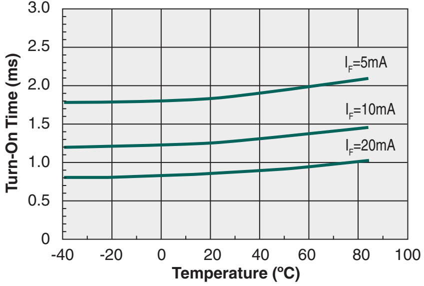
Typical Turn-On Time vs. LED Forward Current (I_L=120mA$_{DC}$)



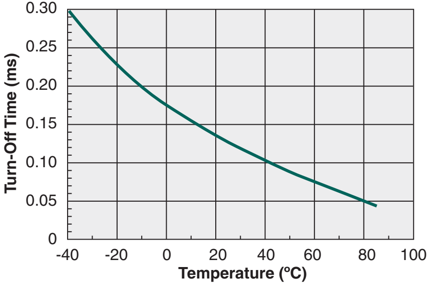
Typical Turn-Off Time vs. LED Forward Current (I_L=120mA$_{DC}$)



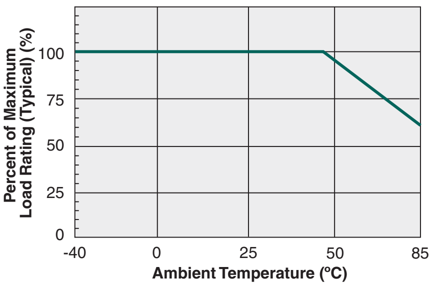
Typical On-Resistance vs. Temperature (I_F=5mA, I_L=120mA$_{DC}$)



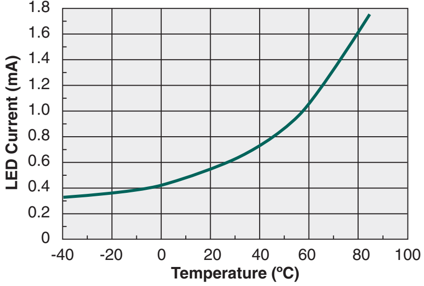
Typical Turn-On Time vs. Temperature (I_L=120mA$_{DC}$)



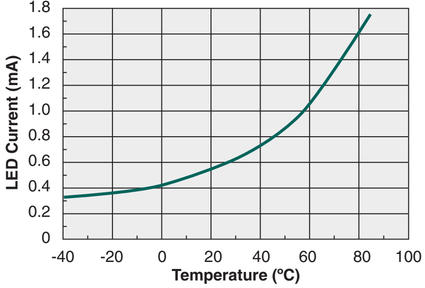
Typical Turn-Off Time vs. Temperature (I_F=5mA, I_L=120mA)



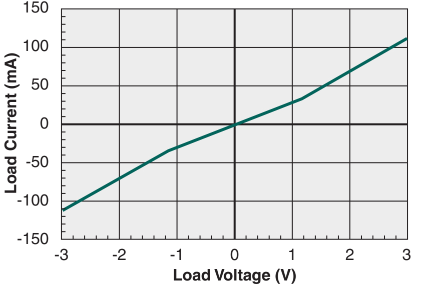
Load Current vs. Ambient Temperature (I_F=5mA)



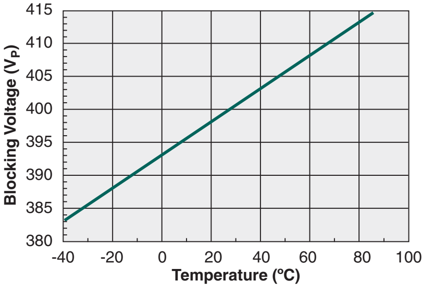
Typical I_F for Switch Operation vs. Temperature (I_L=120mA$_{DC}$)



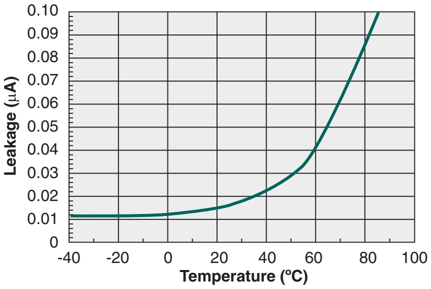
Typical I_F for Switch Dropout vs. Temperature (I_L=120mA$_{DC}$)



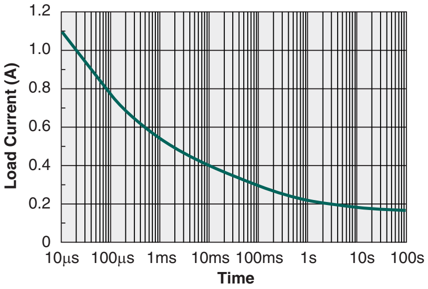
Typical Load Current vs. Load Voltage (I_F=2mA, T_A=25ºC)



Typical Blocking Voltage vs. Temperature



Typical Leakage vs. Temperature Measured across Pins 15&16

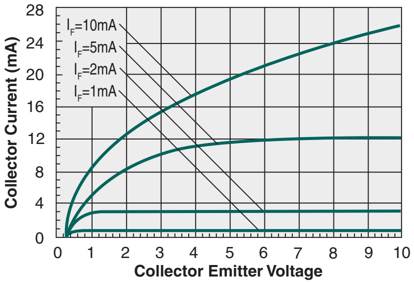


Energy Rating Curve

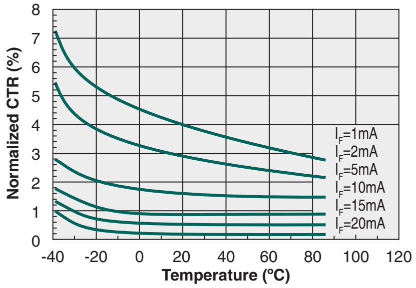
* Unless otherwise noted, data presented in these graphs is typical of device operation at 25ºC.

PHOTOTRANSISTOR PERFORMANCE DATA*

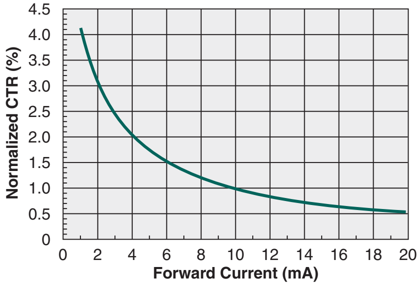
Typical Transfer Characteristics of Single Transistor Detector



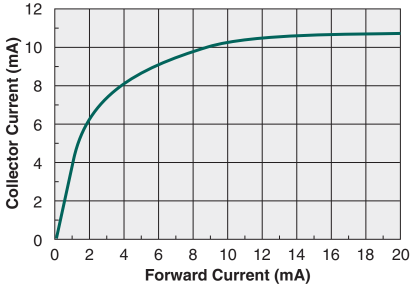
Single Transistor Typical Normalized CTR vs. Temperature (V_{CE}=0.5V)



Single Transistor Typical Normalized CTR vs. I_F (V_{CE}=0.5V)

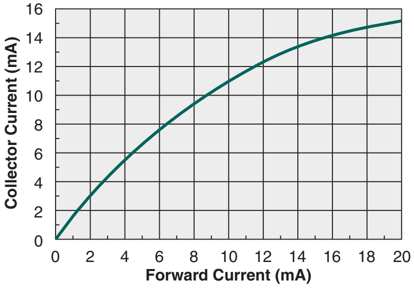


Single Transistor Typical I_C vs. I_F (V_{CE}=0.5V)

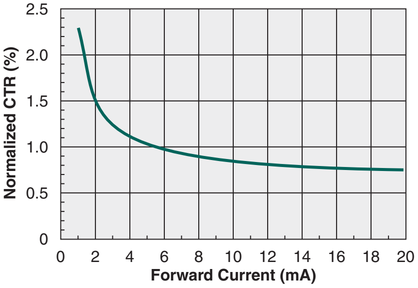


DARLINGTON PERFORMANCE DATA*

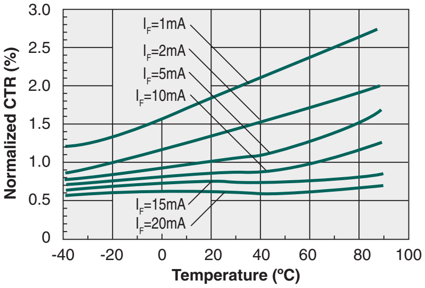
Darlington Transistor Typical I_C vs. I_F (V_{CE}=0.5V)



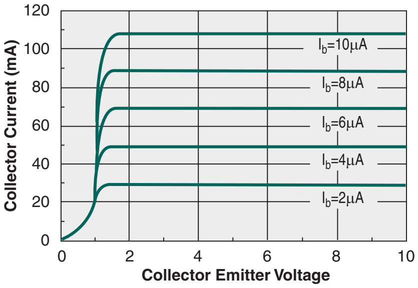
Darlington Transistor Typical Normalized CTR vs. I_F (V_{CE}=0.8V)



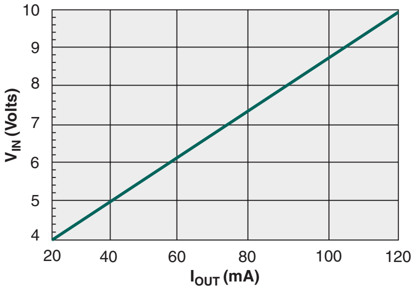
Darlington Transistor Typical Normalized CTR vs. Temperature (V_{CE}=0.8V)



Typical Transfer Characteristics of Darlington Transistor



V-I Characteristics for Test Circuit



* Unless otherwise noted, data presented in these graphs is typical of device operation at 25ºC.

Manufacturing Information

Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingression. IXYS Integrated Circuits 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
ITC117PL	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 the body temperature of these surface mount devices may be (T_C - 5)°C or greater. 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
ITC117PL	245°C	30 seconds	3

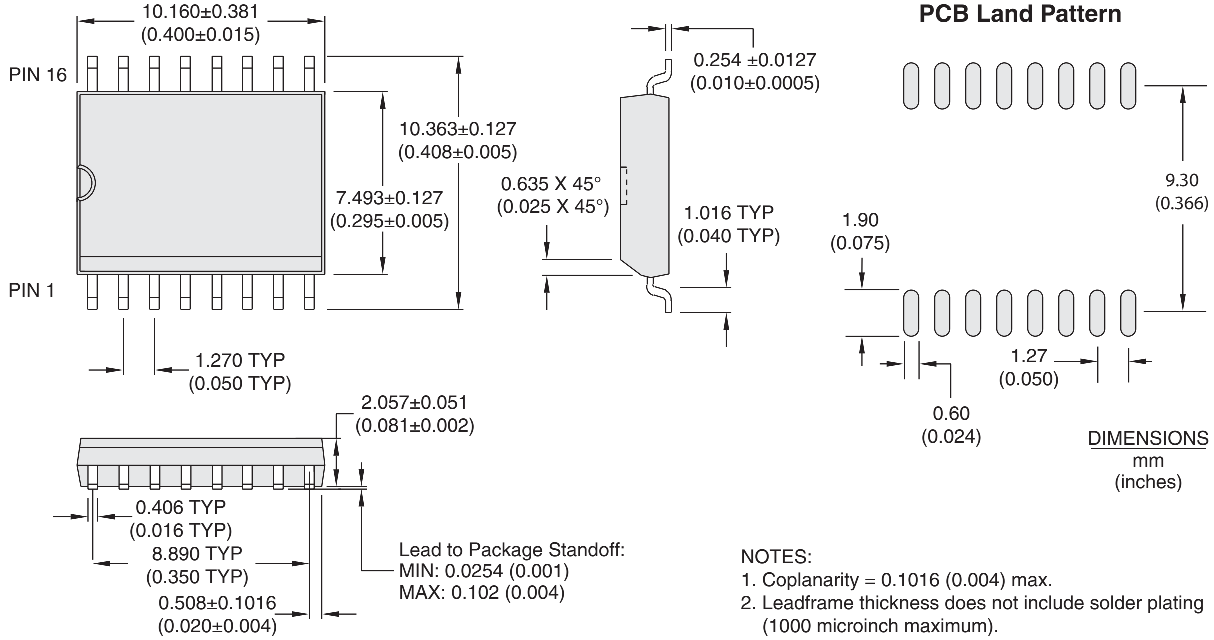
Board Wash

IXYS Integrated Circuits 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

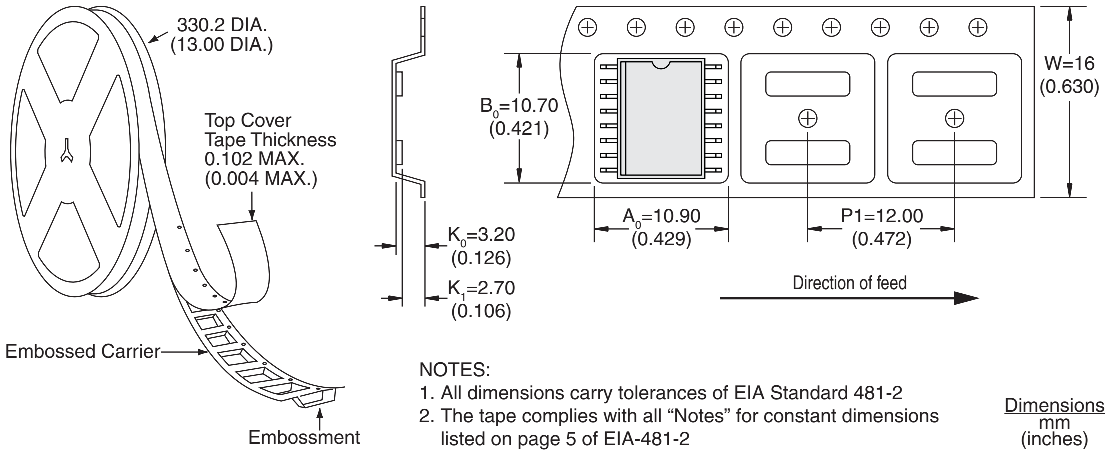
MECHANICAL DIMENSIONS

ITC117PL



NOTES:
1. Coplanarity = 0.1016 (0.004) max.
2. Leadframe thickness does not include solder plating (1000 microinch maximum).

ITC117PLTR 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: https://www.ixysic.com

Specification: DS-ITC117PL_R05

11/17/2020