

| Parameter | Rating | Units |
|----------------------------------|--------|--|
| Relay Load Voltage | 350 | V |
| Relay Load Current | 120 | $\text{mA}_{\text{rms}} / \text{mA}_{\text{DC}}$ |
| Relay On-Resistance (max) | 15 | Ω |
| Bridge Rectifier Reverse Voltage | 100 | V |
| Darlington Collector Current | 120 | mA |
| Darlington Current Gain | 10,000 | - |

Features

- 3750V_{rms} Input/Output Isolation
- 2mW Hook Switch Drive Power (Logic Compatible)
- No Moving Parts
- FCC Compatible Part 68
- Full-Wave Bridge Rectifier
- Darlington Transistor for Electronic Inductor “Dry” Circuits
- Full Wave Current Detector for Ring Signal or Loop Current Detect
- JEDEC Standard Pin-Out
- 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

This 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 ITC117's optocoupler provides for full-wave detection of ringing signals.

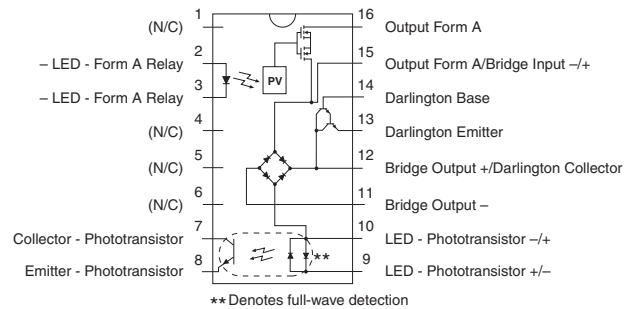
Approvals

- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1305490
- EN/IEC 60950-1 Certified Component:
TUV Certificate: B 12 11 82667 002

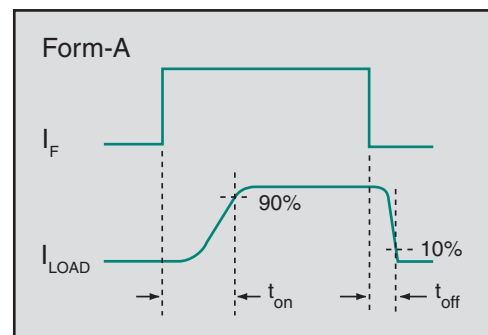
Ordering Information

| Part # | Description |
|-----------|-------------------------|
| ITC117P | 16-Pin SOIC (50/Tube) |
| ITC117PTR | 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):

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

$$P_D = (P_{\text{DS(on)}}) (I_F^2) + 2(V_F)(I_L) + (V_{\text{CE}})(I_L) + (V_{\text{LED}})(I_F)$$

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.

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} |
| Peak | t=10ms | I _{LPK} | - | - | 400 | mA _P |
| On-Resistance | I _L =120mA | R _{ON} | - | - | 15 | Ω |
| Off-State Leakage Current | V _L =350V, T _J =25°C | 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 | - | - | 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 @25°C: Detector Section

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|--------------------------------------|-------------------------|------------|-----|-----|-----|---------|
| Output Characteristics | | | | | | |
| Phototransistor Blocking Voltage | $I_C=10\mu A$ | 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) | $I_C=1\mu A, V_{CE}=5V$ | I_F | 5 | 25 | - | μA |

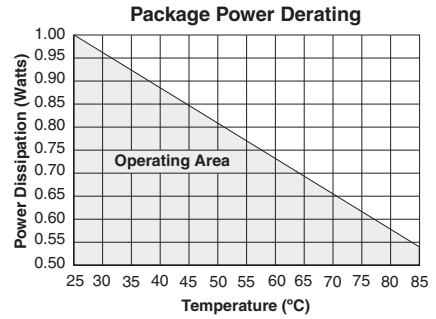
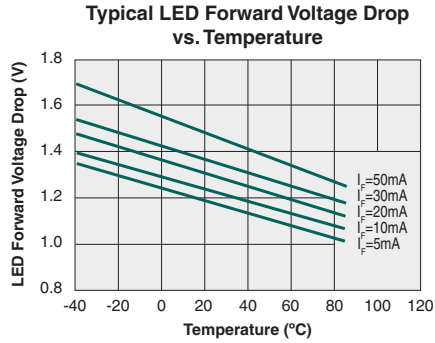
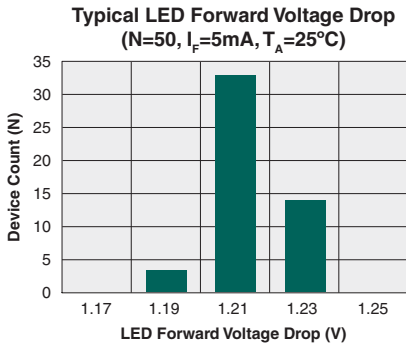
Electrical Characteristics @25°C (Unless Otherwise Noted): Bridge Rectifier Section

| 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 | $T_J=25^\circ C, V_R=100V$ | I_{RD} | - | - | 10 | μA |
| | $T_J=85^\circ C$ | | - | - | 50 | |
| Forward Current | - | I_{FD} | - | - | 140 | mA |
| | $t=10ms$ | | - | - | 500 | |

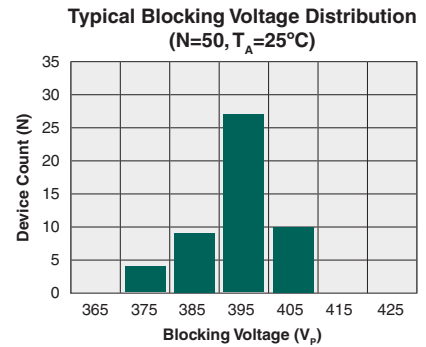
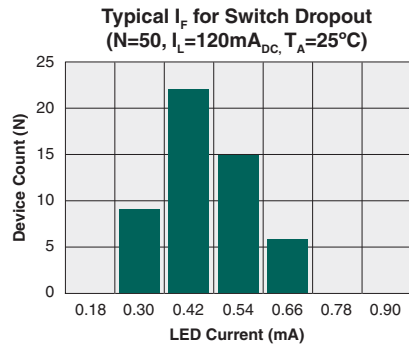
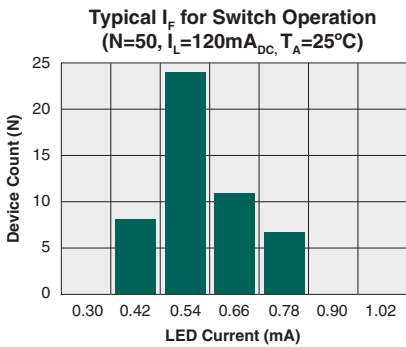
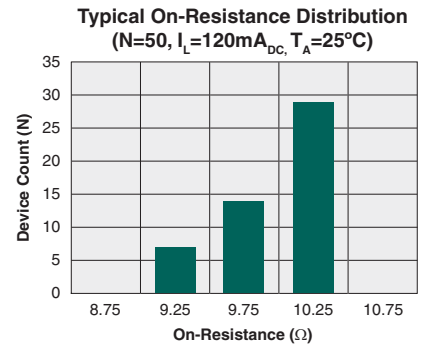
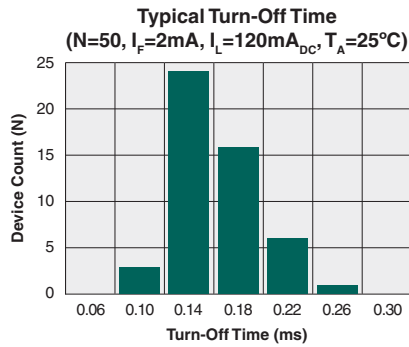
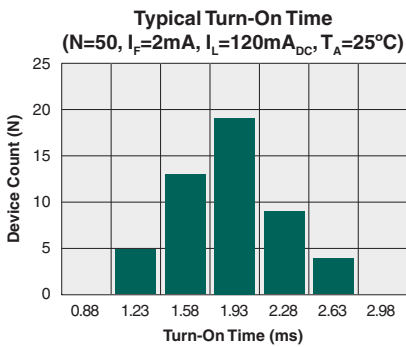
Electrical Characteristics @25°C: Darlington Transistor Section

| Parameter | Conditions | Symbol | Min | Typ | Max | Units |
|---|--------------------------------|---------------|--------|-----|-----|---------|
| Collector-Emitter Voltage | $I_C=10mA_{DC}, I_B=0mA$ | V_{CEO} | 40 | - | - | V |
| Collector Current, Continuous | $V_{CE}=3.5V$ | 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*



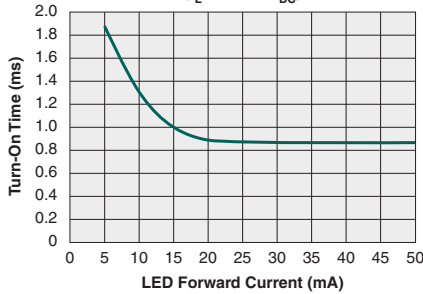
RELAY PERFORMANCE DATA*



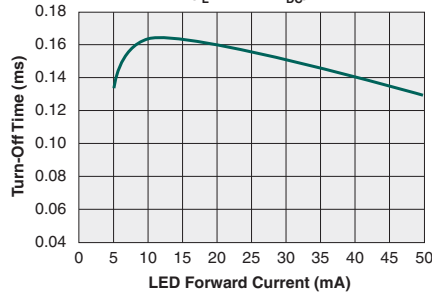
* The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

RELAY PERFORMANCE DATA (cont)*

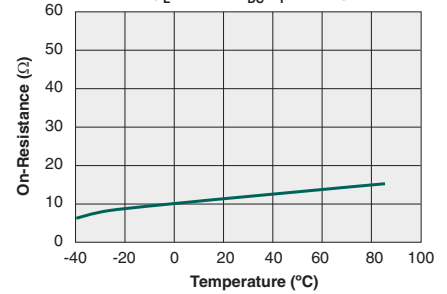
Typical Turn-On Time vs. LED Forward Current
($I_L=120\text{mA}_{DC}$)



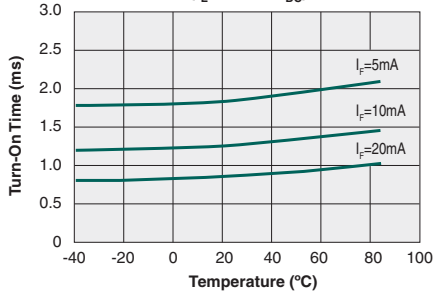
Typical Turn-Off Time vs. LED Forward Current
($I_L=120\text{mA}_{DC}$)



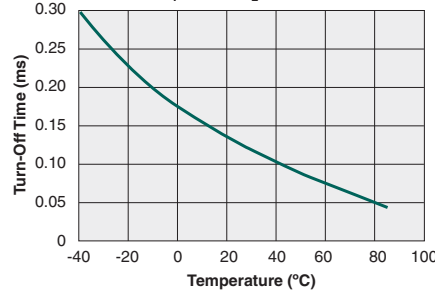
Typical On-Resistance vs. Temperature
($I_L=120\text{mA}_{DC}$, $I_F=5\text{mA}$)



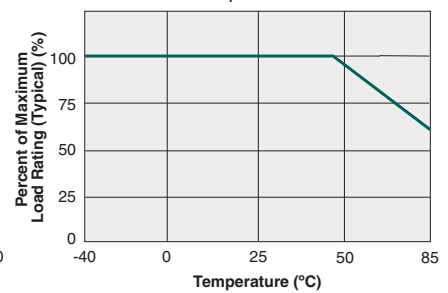
Typical Turn-On Time vs. Temperature
($I_L=120\text{mA}_{DC}$)



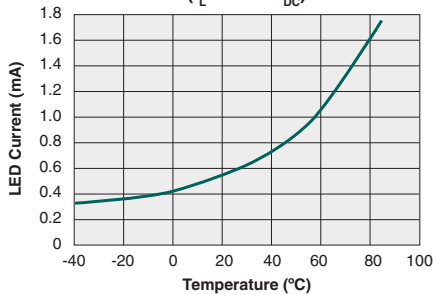
Typical Turn-Off Time vs. Temperature
($I_F=5\text{mA}$, $I_L=120\text{mA}$)



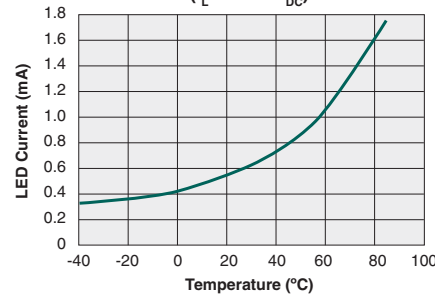
Load Current vs. Ambient Temperature
($I_F=5\text{mA}$)



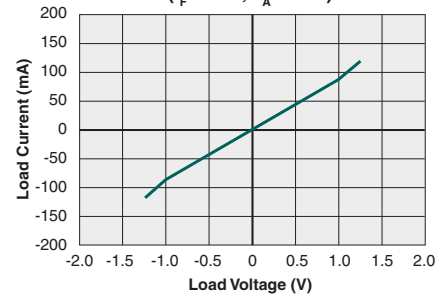
Typical I_F for Switch Operation vs. Temperature
($I_L=120\text{mA}_{DC}$)



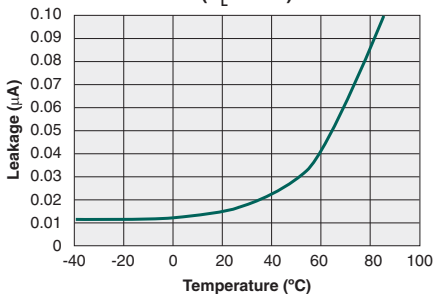
Typical I_F for Switch Dropout vs. Temperature
($I_L=120\text{mA}_{DC}$)



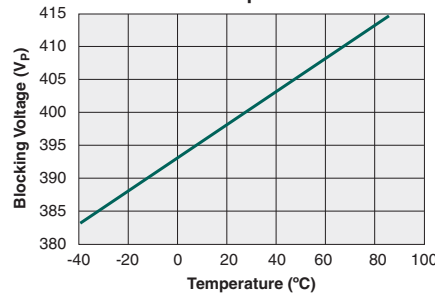
Typical Load Current vs. Load Voltage
($I_F=5\text{mA}$, $T_A=25^\circ\text{C}$)



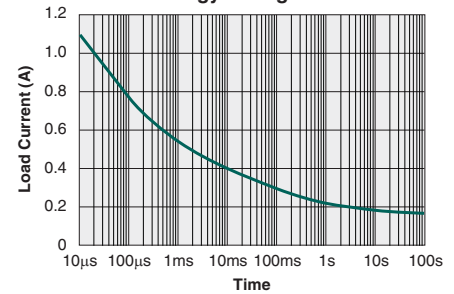
Typical Leakage vs. Temperature Measured across Pins 15&16
($V_L=350\text{V}$)



Typical Blocking Voltage vs. Temperature

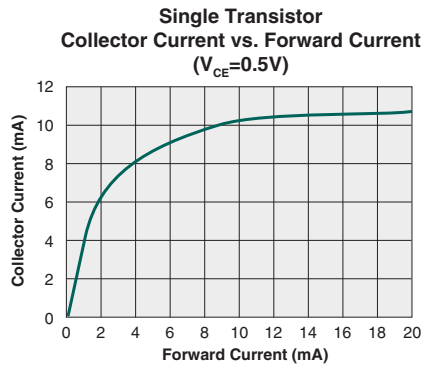
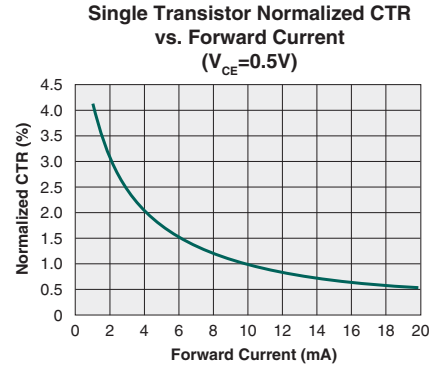
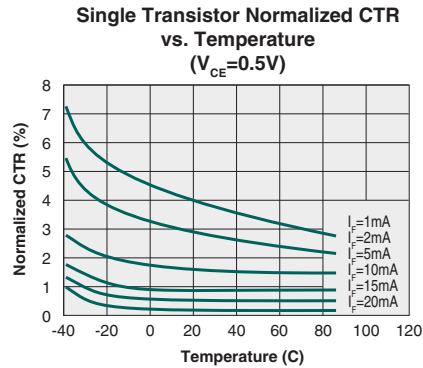
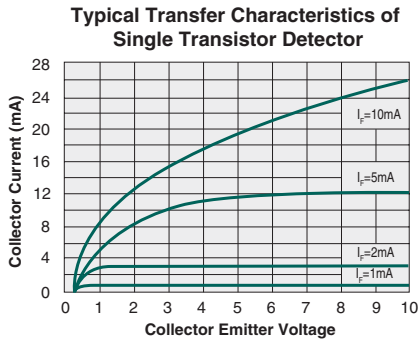


Energy Rating Curve

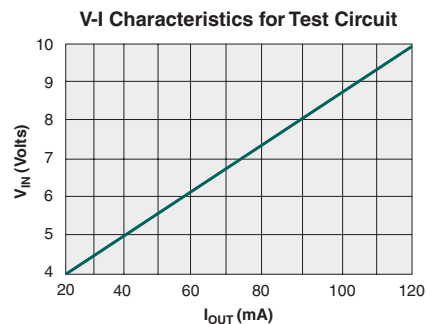
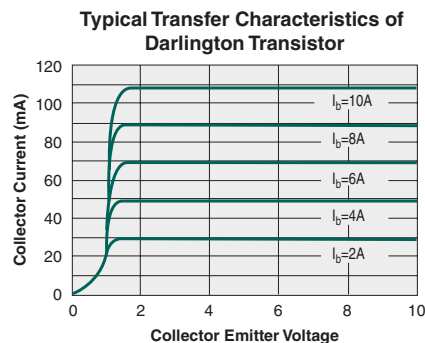
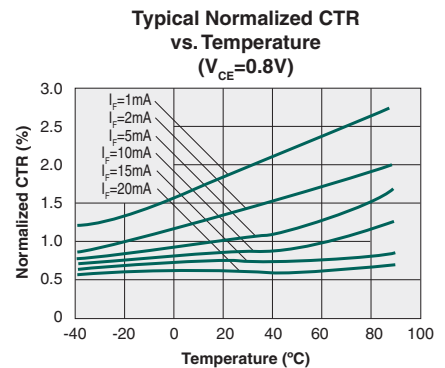
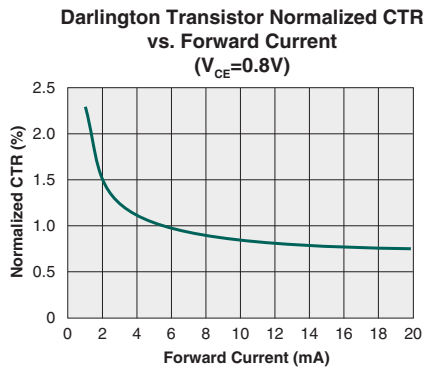
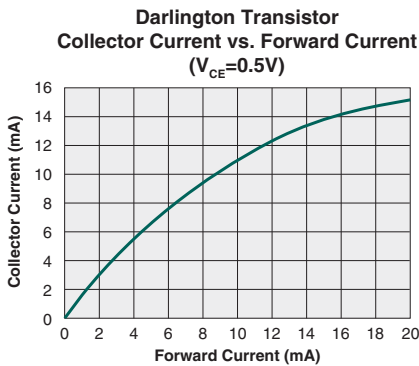


* The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PHOTOTRANSISTOR PERFORMANCE DATA*



DARLINGTON PERFORMANCE DATA*



* The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

Manufacturing Information

Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits Division classified all of 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) rating** 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) Rating |
|---------|---|
| ITC117P | MSL 1 |

ESD Sensitivity



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

Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

| Device | Maximum Temperature x Time |
|---------|----------------------------|
| ITC117P | 260°C for 30 seconds |

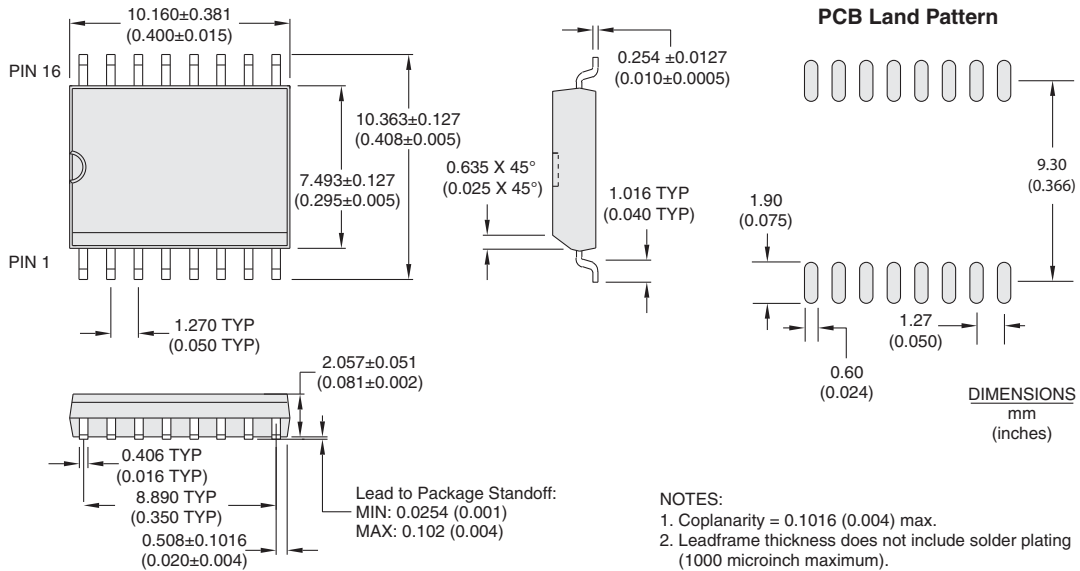
Board Wash

IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable. Since IXYS Integrated Circuits Division employs the use of silicone coating as an optical waveguide in many of its optically isolated products, the use of a short drying bake could be necessary if a wash is used after solder reflow processes. Chlorine- or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

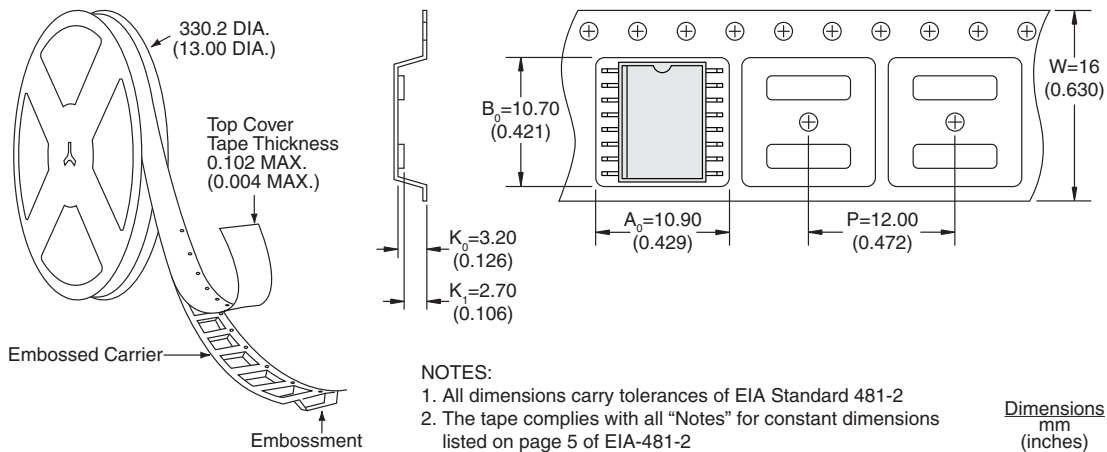


MECHANICAL DIMENSIONS

ITC117P



ITC117PTR Tape & Reel



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