TS190L
Multifunction Telecom Switch

Parameters	Ratings	Units
Load Voltage	400	V_P
Load Current	150	mA
Max R_{ON}	25	Ω

Features
- Small 8-Pin Package
- Through-hole and surface mount packages available
- Low Drive Power Requirements (TTL/CMOS Compatible)
- No Moving Parts
- High Reliability
- Arc-Free With No Snubbing Circuits
- 3750V_{rms} Input/Output Isolation
- FCC Compatible
- VDE Compatible
- No EMI/RFI Generation
- Machine Insertable, Wave Solderable
- Tape & Reel available for surface mount packages.

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
- Aerospace
- Industrial Controls

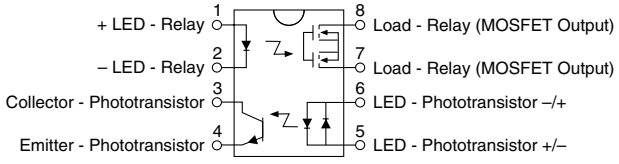
Description
TS190L is a 400V_P, 150mA, 25Ω, 1-Form-A current limiting relay with a bidirectional input, single transistor output optocoupler in a single package. The Solid State Relay (SSR) features enhanced peak load voltage capability with improved peak load current handling for specialized telecom applications.

Approvals
- UL Recognized: File Number E76270
- CSA Certified: File Number LR 43639-10
- Complies with:
  - EN 60950
  - IEZC 950
  - AS/NZ 3260
  - EN 41003

Ordering Information

Part #	Description
TS190L	8-Pin DIP (50/Tube)
TS190PL	8-Pin Flatpack (50/Tube)
TS190PLTR	8-Pin Flatpack (1000/Reel)
TS190LS	8-Pin Surface Mount (50/Tube)
TS190LSTR	8-Pin Surface Mount (1000/Reel)

Pin Configuration



Absolute Maximum Ratings

Parameter	Ratings	Units
Relay Portion		
Blocking Voltage	400	V_P
Reverse Input Voltage	5	V
Input Control Current	50	mA
Peak (10ms)	1	A
Input Power Dissipation [1]	150	mW
Detector Portion		
Blocking Voltage	20	V_P
Input Control Current	100	mA
Peak (10ms)	1	A
Common Ratings		
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

Electrical absolute maximum ratings are at 25°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.

Electrical Characteristics

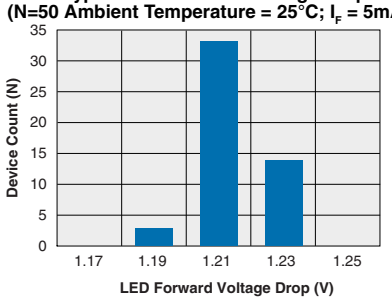
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Relay Portion (Pins 7, 8) Output Characteristics @ 25°C						
Load Current (Continuous)	-	I_L	-	-	150	mA
Load Current Limit	-	I_{CL}	190	235	280	mA
On-Resistance	I_L=150mA	R_{ON}	-	18	25	Ω
Off-State Leakage Current	V_L=400V	I_{LEAK}	-	-	1	µA
Switching Speeds Turn-On	I_F=5mA, V_L=10V	T_{ON}	-	-	1	ms
Turn-Off	I_F=5mA, V_L=10V	T_{OFF}	-	-	0.25	ms
Output Capacitance	50V; f=1MHz	C_{OUT}	-	25	-	pF
Relay Portion (Pins 1, 2) Input Characteristics @ 25°C						
Input Control Current	I_L=150mA	I_F	5	-	-	mA
Input Dropout Current	-	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
Relay Portion Common Characteristics, Input to Output						
Capacitance	-	$C_{I/O}$	-	3	-	pF

Electrical Characteristics (Continued)

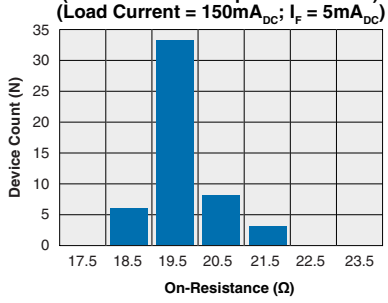
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Detector Portion (Pins 3,4) Output Characteristics @ 25°C						
Phototransistor Blocking Voltage	I_C=10µA	BV_{CEO}	20	50	-	V
Phototransistor Output Dark Current	V_{CE}=5V, I_F=0mA	I_{CEO}	-	50	500	nA
Saturation Voltage	I_C=2mA, I_F=16mA	V_{CEsat}	-	0.3	0.5	V
Current Transfer Ratio	I_F=6mA, V_{CE}=0.5V	CTR	33	100	-	%
Detector Portion (Pins 5,6) Input Characteristics @ 25°C						
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
Detector Portion Common Characteristics, Input to Output						
Capacitance	-	$C_{I/O}$	-	3	-	pF

PERFORMANCE DATA*

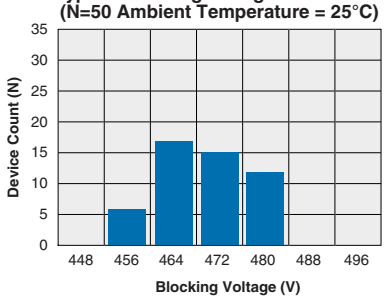
TS190L
Typical LED Forward Voltage Drop
(N=50 Ambient Temperature = 25°C; I_F = 5mA$_{DC}$)



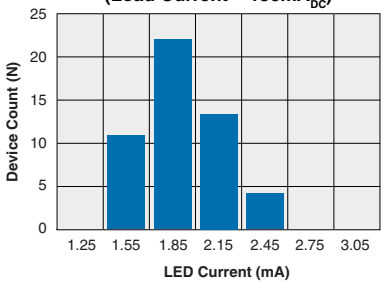
TS190L
Typical On-Resistance Distribution
(N=50 Ambient Temperature = 25°C)
(Load Current = 150mA$_{DC}$; I_F = 5mA$_{DC}$)



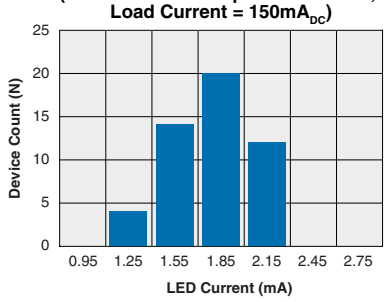
TS190L
Typical Blocking Voltage Distribution
(N=50 Ambient Temperature = 25°C)



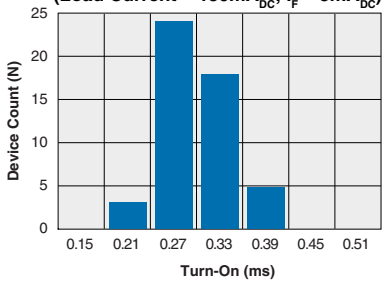
TS190L
Typical I_F for Switch Operation
(N=50 Ambient Temperature = 25°C)
(Load Current = 150mA$_{DC}$)



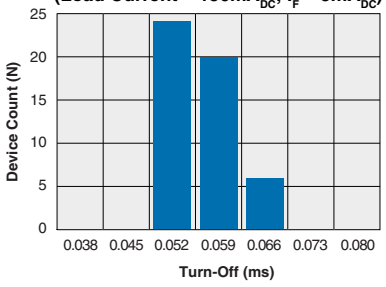
TS190L
Typical I_F for Switch Dropout
(N=50 Ambient Temperature = 25°C;
Load Current = 150mA$_{DC}$)



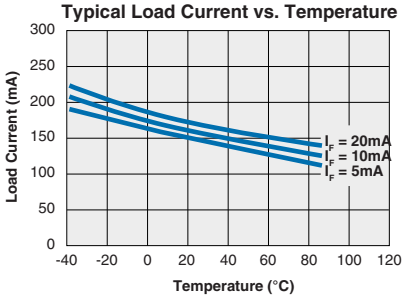
TS190L
Typical Turn-On Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 150mA$_{DC}$; I_F = 5mA$_{DC}$)



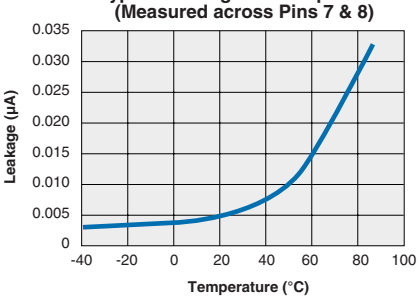
TS190L
Typical Turn-Off Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 150mA$_{DC}$; I_F = 5mA$_{DC}$)



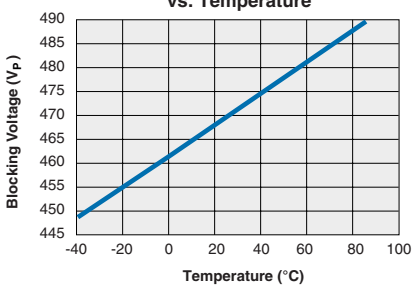
TS190L
Typical Load Current vs. Temperature



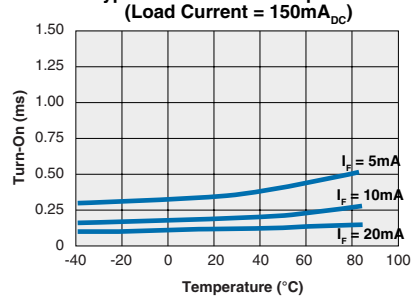
TS190L
Typical Leakage vs. Temperature
(Measured across Pins 7 & 8)



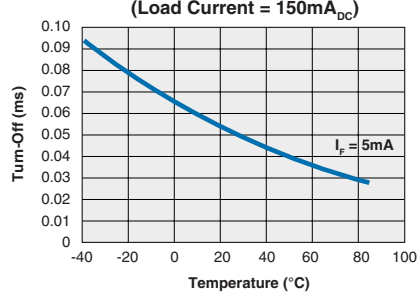
TS190L
Typical Blocking Voltage
vs. Temperature



TS190L
Typical Turn-On vs. Temperature
(Load Current = 150mA$_{DC}$)



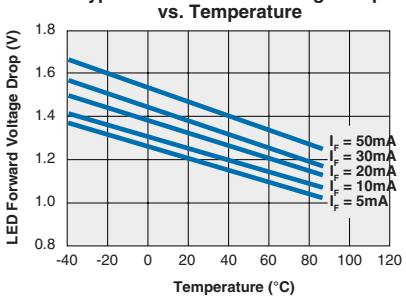
TS190L
Typical Turn-Off vs. Temperature
(Load Current = 150mA$_{DC}$)



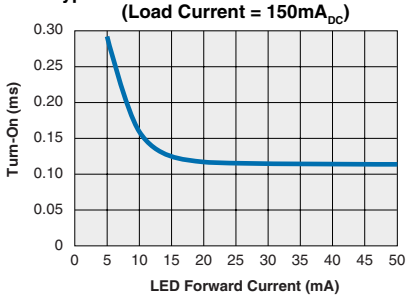
*The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.

PERFORMANCE DATA*

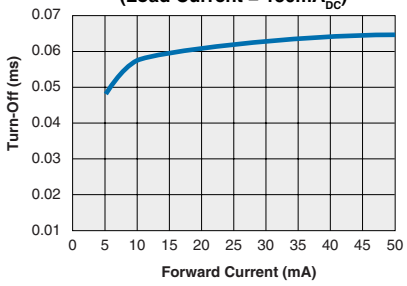
TS190L
Typical LED Forward Voltage Drop vs. Temperature



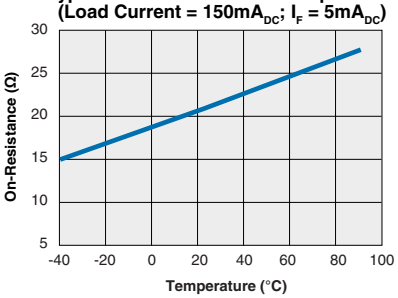
TS190L
Typical LED Forward Current vs. Turn-On (Load Current = 150mA$_{DC}$)



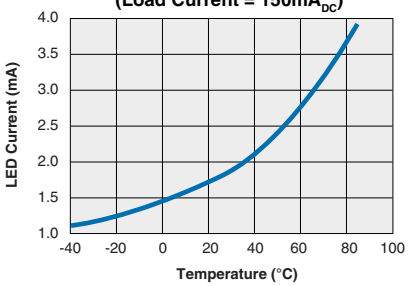
TS190L
Typical Turn-Off vs. LED Forward Current (Load Current = 150mA$_{DC}$)



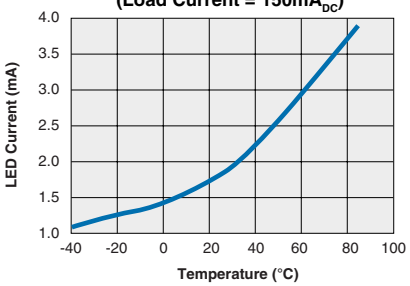
TS190L
Typical On-Resistance vs. Temperature (Load Current = 150mA$_{DC}$; I_F = 5mA$_{DC}$)



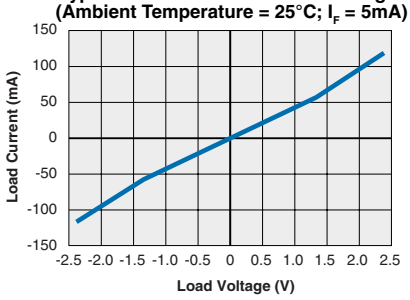
TS190L
Typical I_F for Switch Operation vs. Temperature (Load Current = 150mA$_{DC}$)



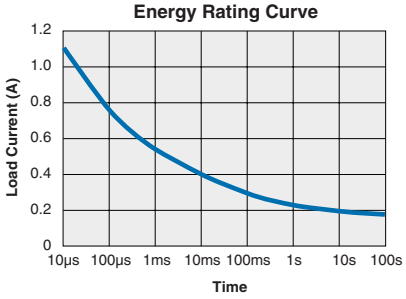
TS190L
Typical I_F for Switch Dropout vs. Temperature (Load Current = 150mA$_{DC}$)



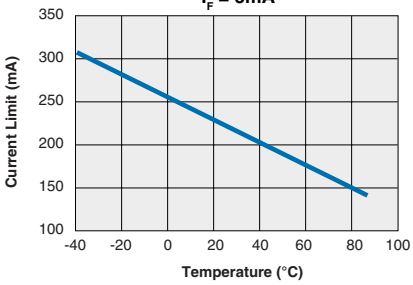
TS190L
Typical Load Current vs. Load Voltage (Ambient Temperature = 25°C; I_F = 5mA)



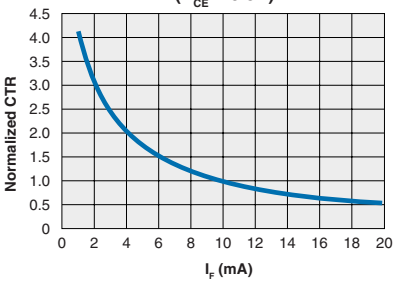
TS190L
Energy Rating Curve



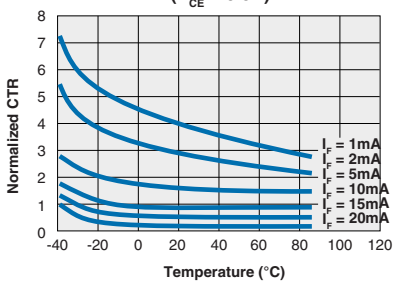
TS190L
Typical Current Limiting Characteristics vs. Temperature I_F = 5mA



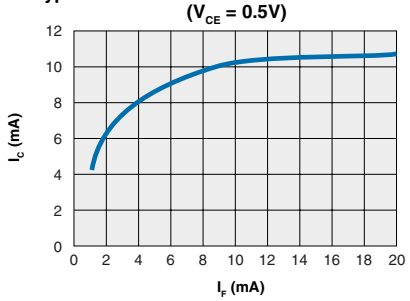
TS190L
Typical Normalized CTR vs. Forward Current (V_{CE} = 0.5V)



TS190L
Typical Normalized CTR vs. Temperature (V_{CE} = 0.5V)



TS190L
Typical Collector Current vs. Forward Current (V_{CE} = 0.5V)



*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.

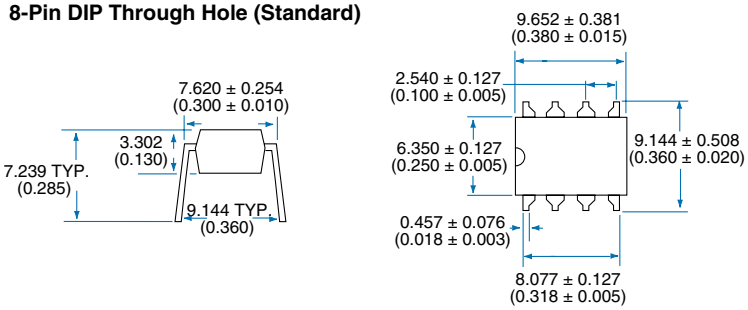
Manufacturing Information

Soldering
Recommended soldering processes are limited to 260ºC component body temperature for 10 seconds.

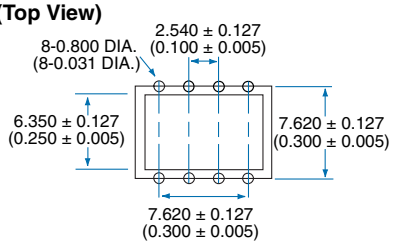
Washing
Clare does not recommend ultrasonic cleaning or the use of chlorinated solvents.

MECHANICAL DIMENSIONS

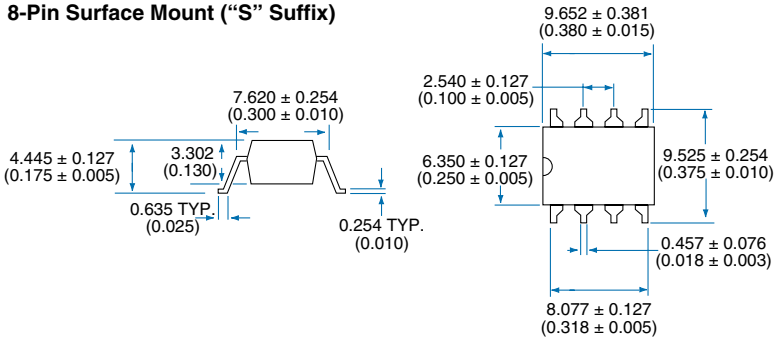
8-Pin DIP Through Hole (Standard)



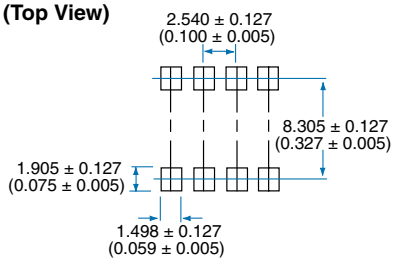
PC Board Pattern (Top View)



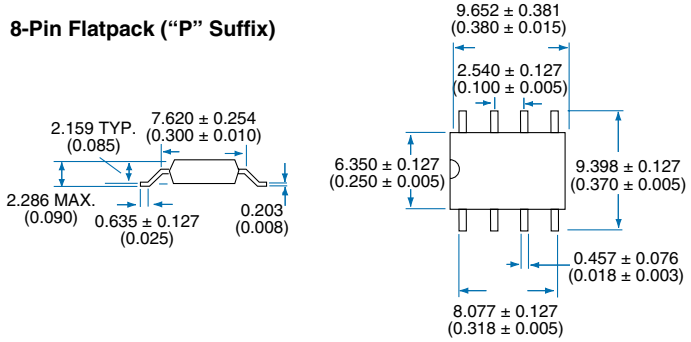
8-Pin Surface Mount ("S" Suffix)



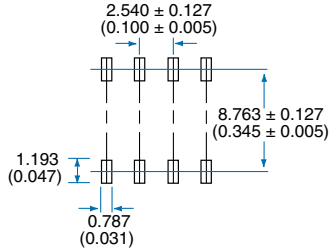
PC Board Pattern (Top View)



8-Pin Flatpack ("P" Suffix)



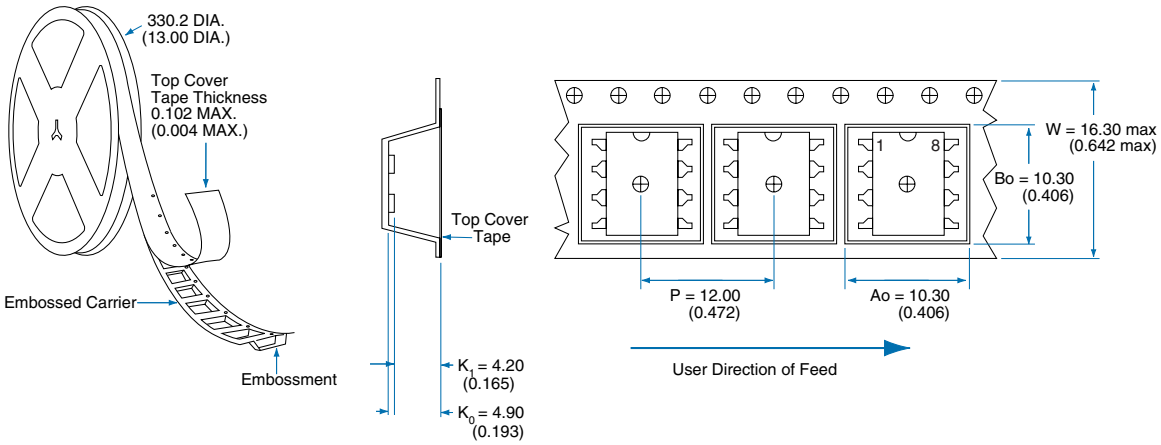
PC Board Pattern (Top View)



Dimensions:
mm
(inches)

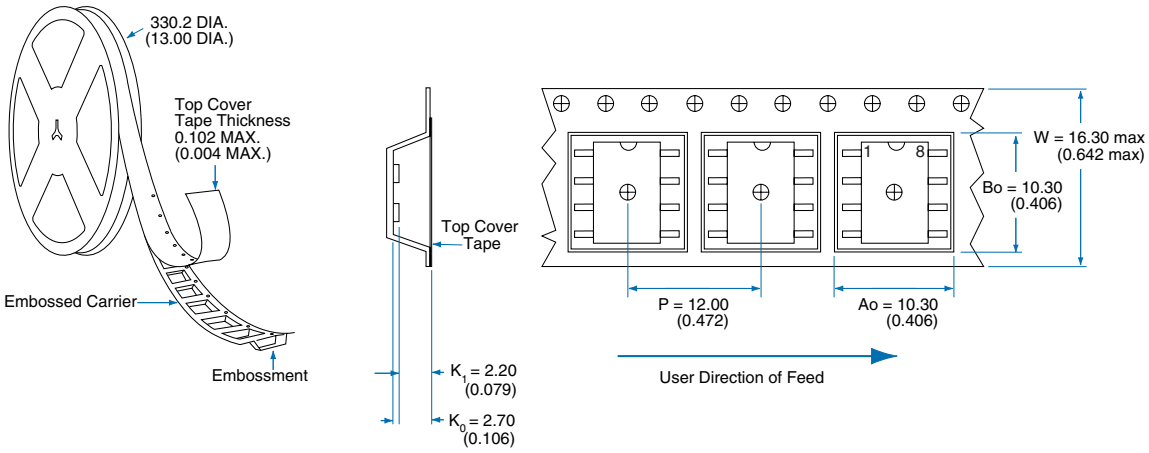
MECHANICAL DIMENSIONS

Tape and Reel Packaging for 8-Pin Surface Mount Package



NOTE: Tape dimensions not shown, comply with JEDEC Standard EIA-481-2

Tape and Reel Packaging for 8-Pin Flatpack Package



NOTE: Tape dimensions not shown, comply with JEDEC Standard EIA-481-2

Dimensions:
mm
(inches)

For additional information please visit our website at: www.clare.com

Specification: DS-TS190L-R05

11/18/05