



# TS190L Multifunction Telecom Switch

Parameter	Rating	Units
Blocking Voltage	400	V <sub>P</sub>
Load Current	150	mA <sub>rms</sub> / mA <sub>DC</sub>
On-Resistance (max)	25	Ω

#### **Features**

- Current Limiting
- 3750V<sub>rms</sub> Input/Output Isolation
- Low Drive Power Requirements (TTL/CMOS Compatible)
- FCC Compatible
- VDE Compatible
- No EMI/RFI Generation
- No Moving Parts
- High Reliability
- · Arc-Free With No Snubbing Circuits
- Small 8-Pin Package
- · Machine Insertable, Wave Solderable
- Surface Mount 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)
- Medical Equipment-Patient/Equipment Isolation
- Security
- Aerospace
- Industrial Controls

#### **Description**

The TS190L integrated circuit device combines a current limited, 400V, normally open (1-Form-A) relay with an optocoupler in a single package. The relay, with enhanced peak load current handling capability, uses optically coupled MOSFET technology to provide 3750V<sub>rms</sub> of input to output isolation.

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

Telecom circuit designers, using the TS190L, can now take advantage of two discrete functions in a single component that uses less space than traditional discrete component solutions.

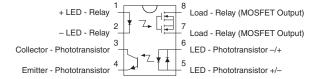
#### **Approvals**

- UL Recognized Component: File E76270
- CSA Certified Component: Certificate 1175739
- EN/IEC 60950 Certified Component: TUV Certificate: B 10 05 49410 006

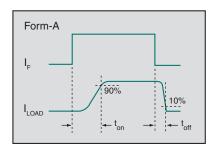
#### **Ordering Information**

	Part #	Description		
1	TS190PL	8-Pin Flatpack (50/Tube)		
4	TS190PLTR	8-Pin Flatpack (1000/Reel)		

#### **Pin Configuration**



# **Switching Characteristics** of Normally Open Devices











**TS190L** 

## Absolute Maximum Ratings @ 25°C

Parameter	Ratings	Units
Relay Blocking Voltage	400	$V_P$
Reverse Input Voltage	5	V
Relay Input Power Dissipation <sup>1</sup>	150	mW
Relay Input Control Current	50	mA
Peak (10ms)	1	Α
Detector Input Control Current	100	mA
Peak (10ms)	1	Α
Total Power Dissipation <sup>2</sup>	800	mW
Isolation Voltage, Input to Output	3750	V <sub>rms</sub>
Operational Temperature	-40 to +85	°C
Storage Temperature	-40 to +125	°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 @25°C: Relay Section

Parameter	Conditions	Symbol	Min	Тур	Max	Units
Output Characteristics						
Load Current, Continuous	-	IL	-	7	150	mA <sub>rms</sub> / mA <sub>DC</sub>
Load Current Limiting	-	I <sub>CL</sub>	190	235	280	mA
On-Resistance	I <sub>L</sub> =150mA	R <sub>ON</sub>	-	18	25	Ω
Off-State Leakage Current	V <sub>L</sub> =400V	I <sub>LEAK</sub>	-	-	1	μА
Switching Speeds						
Turn-On	$I_E=5\text{mA}, V_I=10\text{V}$	t <sub>on</sub>	-	-	1	ms
Turn-Off	$V_{\rm F}=5000$ A, $V_{\rm L}=100$	t <sub>off</sub>	-	-	0.25	ms
Output Capacitance	$V_L=50V$ , $f=1MHz$	C <sub>OUT</sub>	-	25	-	pF
Input Characteristics				•		
Input Control Current to Activate	I <sub>L</sub> =150mA	I <sub>F</sub>	-	-	5	mA
Input Control Current to Deactivate		I <sub>F</sub>	0.4	0.7	-	mA
Input Voltage Drop	I <sub>F</sub> =5mA	V <sub>F</sub>	0.9	1.2	1.4	V
Reverse Input Current	V <sub>R</sub> =5V	I <sub>R</sub>	-	-	10	μА
Common Characteristics					•	•
Input to Output Capacitance	-	C <sub>I/O</sub>	-	3	-	pF

# Electrical Characteristics @25°C: Detector Section

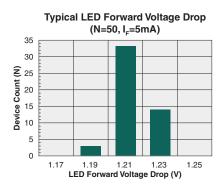
Parameter	Conditions	Symbol	Min	Тур	Max	Units	
Output Characteristics	'					'	
Phototransistor Blocking Voltage	I <sub>C</sub> =10μA	BV <sub>CEO</sub>	20	50	-	V	
Phototransistor Dark Current	V <sub>CE</sub> =5V, I <sub>F</sub> =0mA	I <sub>CEO</sub>	-	50	500	nA	
Saturation Voltage	I <sub>C</sub> =2mA, I <sub>F</sub> =16mA	V <sub>CEsat</sub>	-	0.3	0.5	V	
Current Transfer Ratio	I <sub>F</sub> =6mA, V <sub>CE</sub> =0.5V	CTR	33	100	-	%	
Input Characteristics	·						
Input Control Current	$I_C=2mA, V_{CE}=0.5V$	I <sub>F</sub>	-	2	6	mA	
Input Voltage Drop	I <sub>F</sub> =5mA	V <sub>F</sub>	0.9	1.2	1.4	V	
Input Current (Detector must be off)	$I_{C}=1 \mu A, V_{CE}=5 V$	I <sub>F</sub>	5	25	-	μΑ	
Isolation, Input to Output	-	V <sub>I/O</sub>	3750	-	-	V <sub>rms</sub>	
Common Characteristics	•					•	
Input to Output Capacitance	-	C <sub>I/O</sub>	-	3	-	pF	

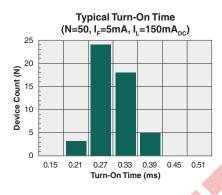
<sup>&</sup>lt;sup>1</sup> Derate linearly 1.33 mW / °C

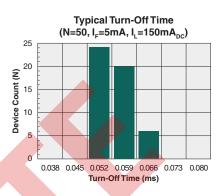
<sup>&</sup>lt;sup>2</sup> Derate linearly 6.67 mW / °C

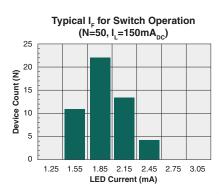


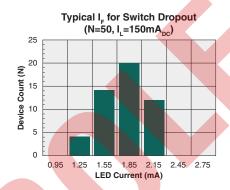
# RELAY PERFORMANCE DATA @25°C (Unless Otherwise Noted)\*

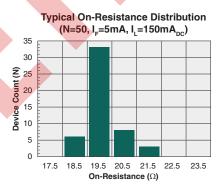


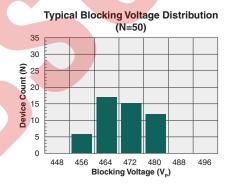


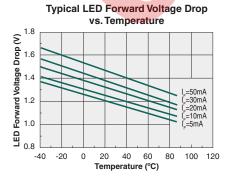


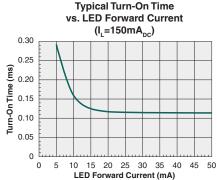


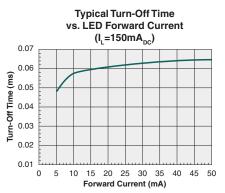








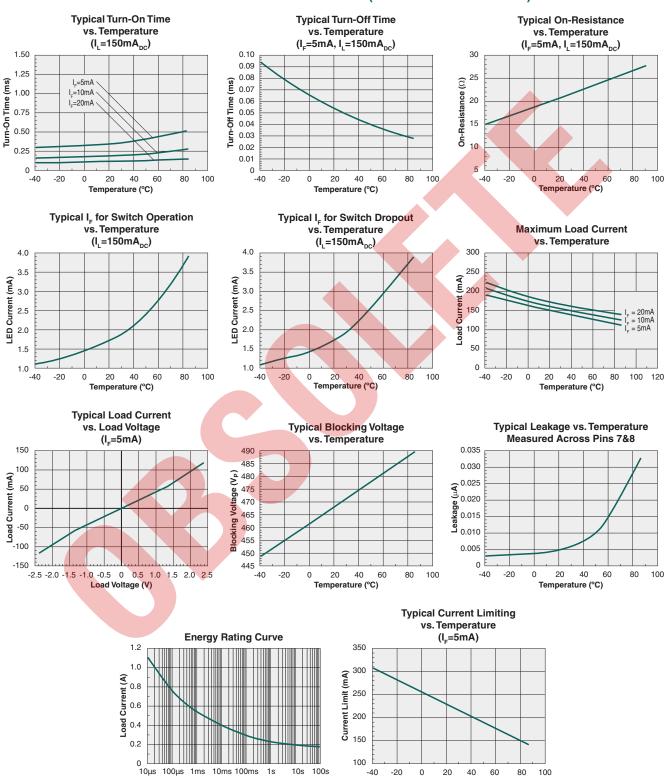




<sup>\*</sup>The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.



#### RELAY PERFORMANCE DATA @25°C (Unless Otherwise Noted)\*



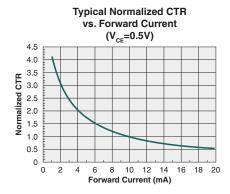
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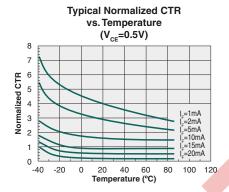
Temperature (°C)

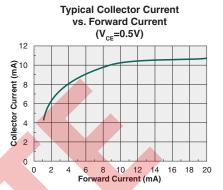


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# DETECTOR PERFORMANCE DATA @25°C (Unless Otherwise Noted)\*









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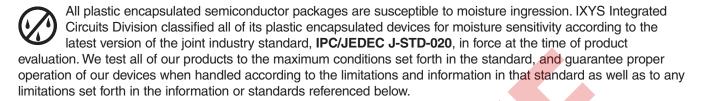
<sup>\*</sup> The Performance data shown in the graphs above is typical of device performance. For guaranteed parameters not indicated in the written specifications, please contact our application department.



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#### **Manufacturing Information**

# **Moisture Sensitivity**



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			
TS190PL	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
TS190PL	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.



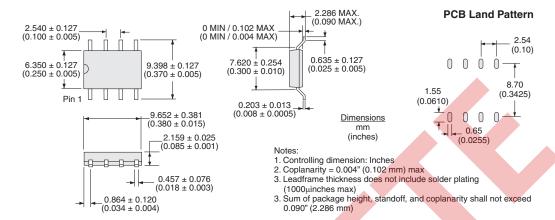




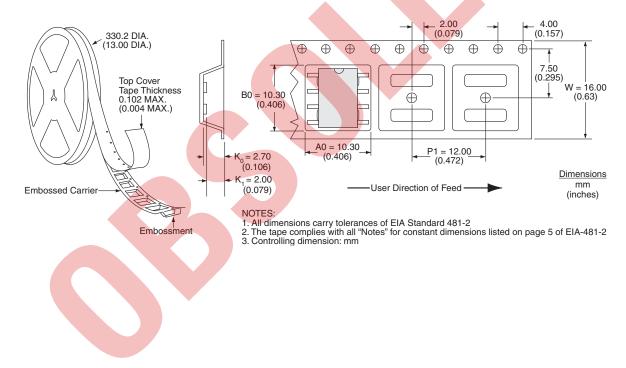


#### **Mechanical Dimensions**

#### **TS190PL**



### TS190PLTR Tape & Reel



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

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