SOLID STATE OPTRONICS



TR115

1 Form A / Optocoupler
400V / 20 Ω
Multifunction Telecommunications Switch

Description

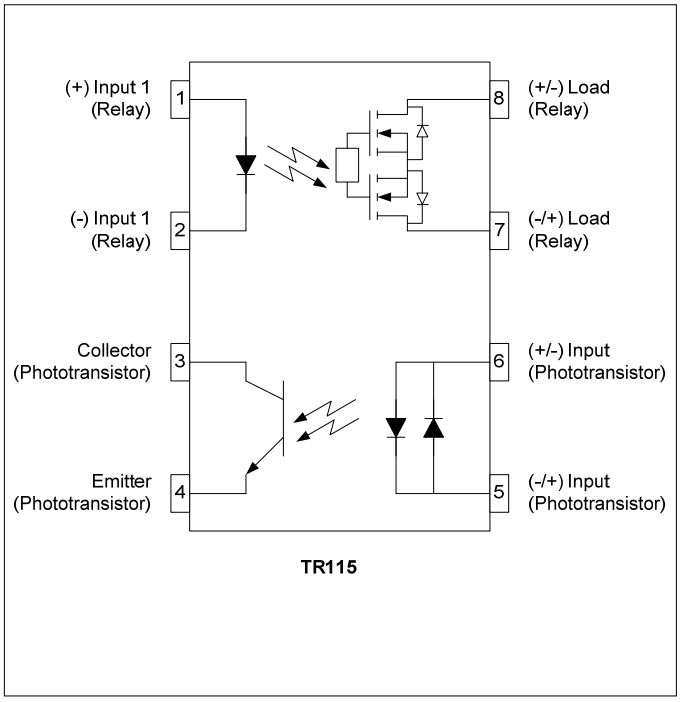
The TR115 is a dual function circuit designed specifically as a telecommunications switch. It consists of an optically isolated solid state relay and an optically isolated optocoupler combined in a compact 8pin DIP package. The relay portion is normally open, and composed of an LED on the input, optically coupled to a sensing circuit which drives two source-to-source DMOS transistors. The optocoupler portion of the device consists of two back-to-back LEDs that drive an output phototransistor

The TR115 comes standard in a miniature 8 pin DIP package making it ideal for high-density board applications.

Applications

- Telecom Switching
- Fax / Modem Modules
- Set-top Boxes
- DAA Arrangements
- Hookswitch
- Loop Current Detection
- Pulse Dialing

Schematic Diagram



TR115

Features

- Function Integration (SSR + Optocoupler) in compact package
- 20Ω MAX On Resistance (Relay Portion)
- 120mA MAX Continuous Load Current (Relay Portion)
- Low Input Control Current (2.5mA TYP, Relay Portion)
- High Input-Output Isolation
- Long Life / High Reliability
- RoHS / Pb-Free / REACH Compliant

Agency Approvals

UL/C-UL:	File # E201932
VDE:	File # 40035191 (EN 60747-5-2)

Absolute Maximum Ratings

The values indicated are absolute stress ratings. Functional operation of the device is not implied at these or any conditions in excess of those defined in electrical characteristics section of this document. Exposure to absolute Maximum Ratings may cause permanent damage to the device and may adversely affect reliability.

Storage Temperature	-55 to +125°C
Operating Temperature	-40 to +85°C
Continuous Input Current	40mA
Transient Input Current	400mA
Reverse Input Control Voltage	6V
Input Power Dissipation	40mW
Output Power Dissipation	800mW
Solder Temperature – Wave (10sec)	260°C
Solder Temperature – IR Reflow (10sec)	260°C

Ordering Information

Part Number	Description
TR115	8 pin DIP, (50/Tube)
TR115-H	3.75kV$_{RMS}$ Viso, 8 pin DIP, (50/Tube)
TR115-S	8 pin SMD, (50/Tube)
TR115-HS	3.75kV$_{RMS}$, 8 pin SMD, (50/Tube)
TR115-STR	8 pin SMD, Tape and Reel (1000/Reel)
TR115-HSTR	3.75kV$_{RMS}$, 8 pin SMD, Tape and Reel (1000/Reel)

NOTE: Suffixes listed above are not included in marking on device for part number identification

© 2013 Solid State Optronics • San José, CA

Electrical Characteristics, T_A = 25°C (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Relay Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.5	V	I_F = 10mA
LED Reverse Voltage	BV_R	6	-	-	V	I_R = 10µA
Turn-On Current	I_F	-	2.5	5	mA	I_O = 120mA
Turn-Off Current	I_{FOFF}	-	0.5	-	mA	I_O = 120mA
Relay Output Specifications						
Blocking Voltage	V_B	400	-	-	V	I_O=1µA
Continuous Load Current	I_O	-	-	120	mA	I_F=5mA
On Resistance	R_{ON}	-	17	20	Ω	I_F=5mA, I_O=120mA
Leakage Current	I_{Oleak}	-	0.2	1	µA	I_F=0mA, V_O=400V
Output Capacitance	C_{OUT}	-	10	-	pF	V_O=25V, f=1.0MHz
Offset Voltage	V_{OFFSET}	-	-	0.2	mV	I_F=5mA
Turn-On Time	T_{ON}	-	1	5	mS	I_F=5mA, I_O=120mA
Turn-Off Time	T_{OFF}	-	0.5	1	mS	I_F=0mA, I_O=120mA
Phototransistor Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.4	V	I_F = ±20mA
Terminal Capacitance	C_t	-	30	250	pF	V=0, f=1KHz
Reverse Current	I_R	-	-	10	µA	V_R=4V
Phototransistor Output Specifications						
Collector-Emitter Voltage	V_{CEO}	60	-	-	V	I_C=100µA
Emitter-Collector Voltage	V_{COE}	6	-	-	V	I_E=10µA
Collector Dark Current	I_{CEO}	-	-	500	nA	V_{CE}=20V, I_F=0mA
Floating Capacitance	C_f	-	0.6	1.0	pF	V=0, f=1MHz
Cut-Off Frequency	f_C	-	80	-	kHz	V_{CE}=5V, I_C=±2mA, R_L=100Ω, -3dB
Saturation Voltage	$V_{CE(sat)}$	-	0.1	0.5	V	I_F=±5mA, I_C=10mA
Current Transfer Ratio	CTR	30	-	800	%	I_F=±2mA, V_{CE}=5V
Coupled Specifications						
Coupled Capacitance	$C_{COUPLED}$	-	3	-	pF	
Contact Transient Ratio	-	2,000	7,000	0	V/µS	dV = 50V
Isolation Specifications						
Isolation Voltage	V_{ISO}	2,500	-	-	V_{RMS}	RH ≤ 50%, t=1min
-H Option	V_{ISO}	3,750	-	-	V_{RMS}	RH ≤ 50%, t=1min
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	V_{I-O} = 500V_{DC}

© 2013 Solid State Optronics • San José, CA

TR115 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 1: *Relay (Form A)*
Typical Turn-On Time Distribution
(N = 100, T_a = 25ºC)

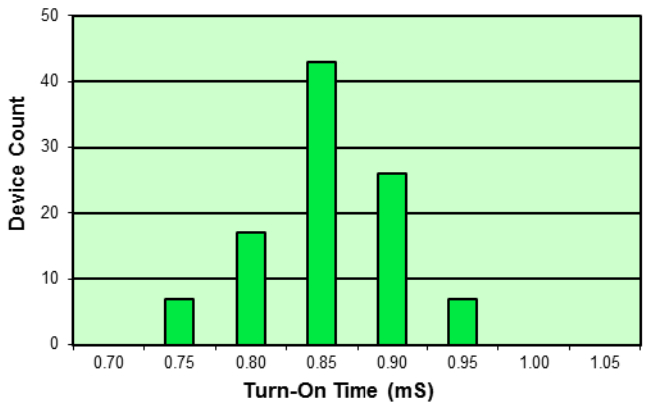


Figure 2: *Relay (Form A)*
Typical Turn-Off Time Distribution
(N = 100, T_a = 25ºC)

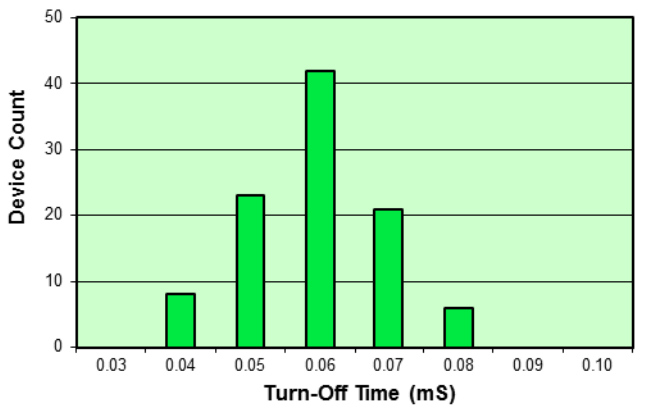


Figure 3: *Relay (Form A)*
Typical On-Resistance Distribution
(N = 100, T_a = 25ºC)

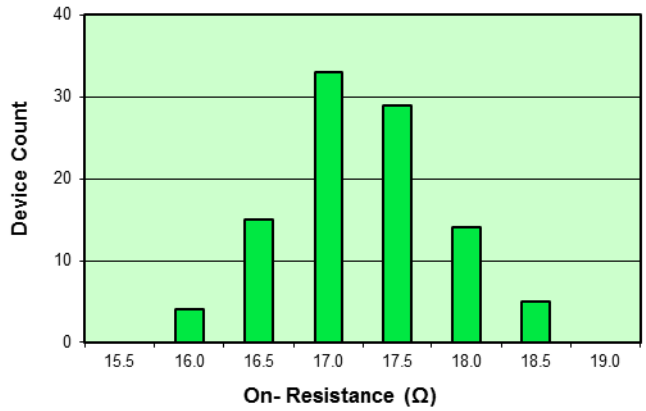


Figure 4: *Relay (Form A)*
Typical Output Leakage Current Distribution
(N = 100, T_a = 25ºC)

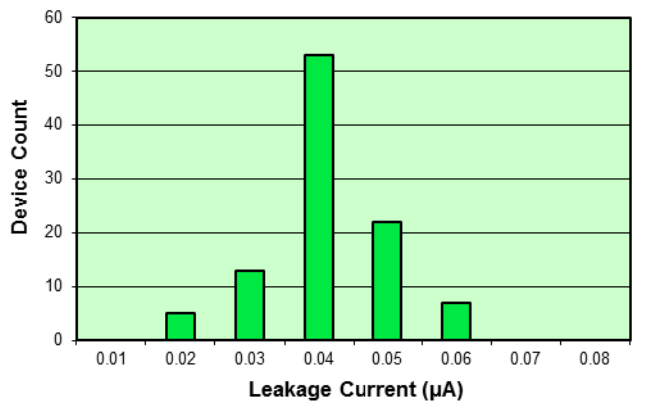


Figure 5: *Relay (Form A)*
Typical Blocking Voltage Distribution
(N = 100, Ta = 25ºC)

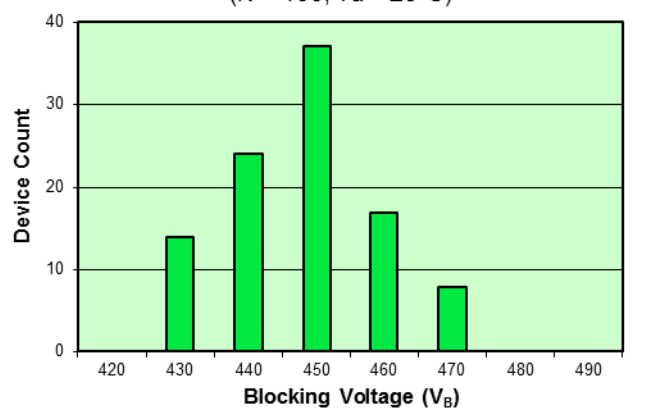
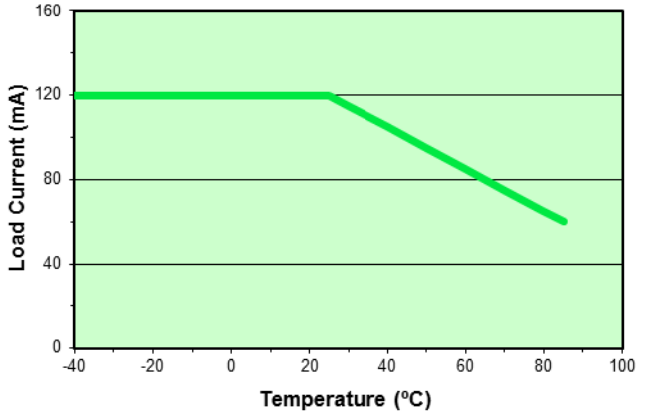


Figure 6: *Relay (Form A)*
Maximum Load Current vs. Temperature



© 2013 Solid State Optronics • San José, CA

TR115 Solder Temperature Profile Recommendations

(1) *Infrared Reflow:*

Refer to the following figure as an example of an optimal temperature profile for single occurrence infrared reflow. Soldering process should not exceed temperature or time limits expressed herein. Surface temperature of device package should not exceed 250ºC:

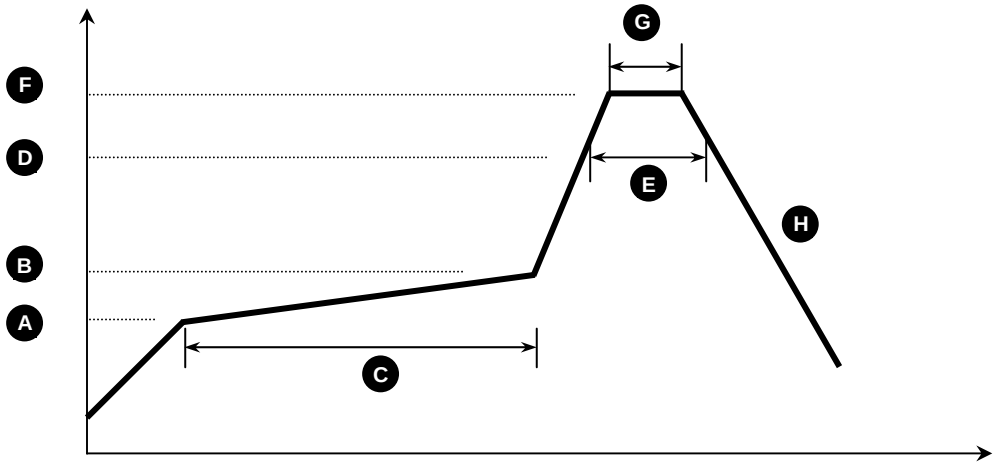


Figure 1

Process Step	Description	Parameter
A	Preheat Start Temperature (ºC)	150ºC
B	Preheat Finish Temperature (ºC)	180ºC
C	Preheat Time (s)	90 - 120s
D	Melting Temperature (ºC)	230ºC
E	Time above Melting Temperature (s)	30s
F	Peak Temperature, at Terminal (ºC)	260ºC
G	Dwell Time at Peak Temperature (s)	10s
H	Cool-down (ºC/s)	<6ºC/s

(2) *Wave Solder:*

Maximum Temperature:	260ºC (at terminal)
Maximum Time:	10s
Pre-heating:	100 - 150ºC (30 - 90s)
Single Occurrence	

(3) *Hand Solder:*

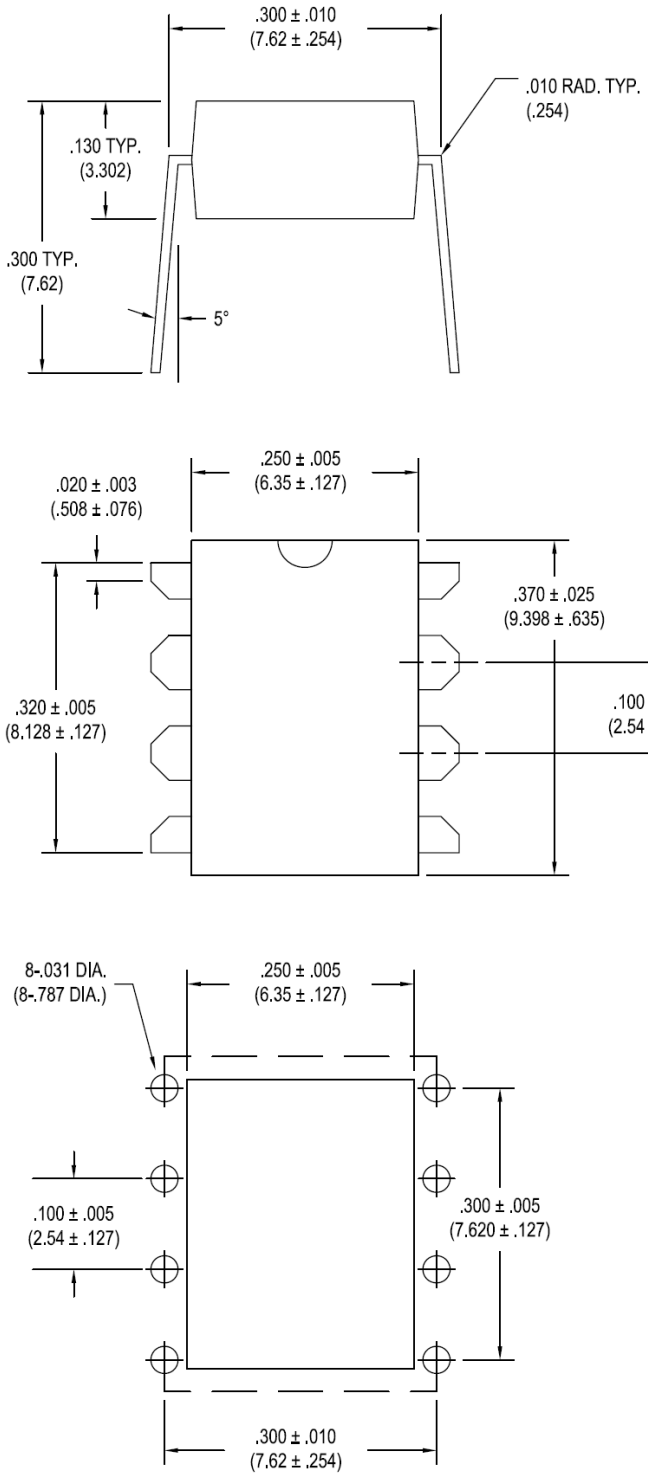
Maximum Temperature:	350ºC (at tip of soldering iron)
Maximum Time:	3s
Single Occurrence	

© 2013 Solid State Optronics • San José, CA

TR115 Package Dimensions

8 PIN DIP Package

Note: *All dimensions in inches ["] with millimeters in parenthesis ()*
Device Weight: 0.45g

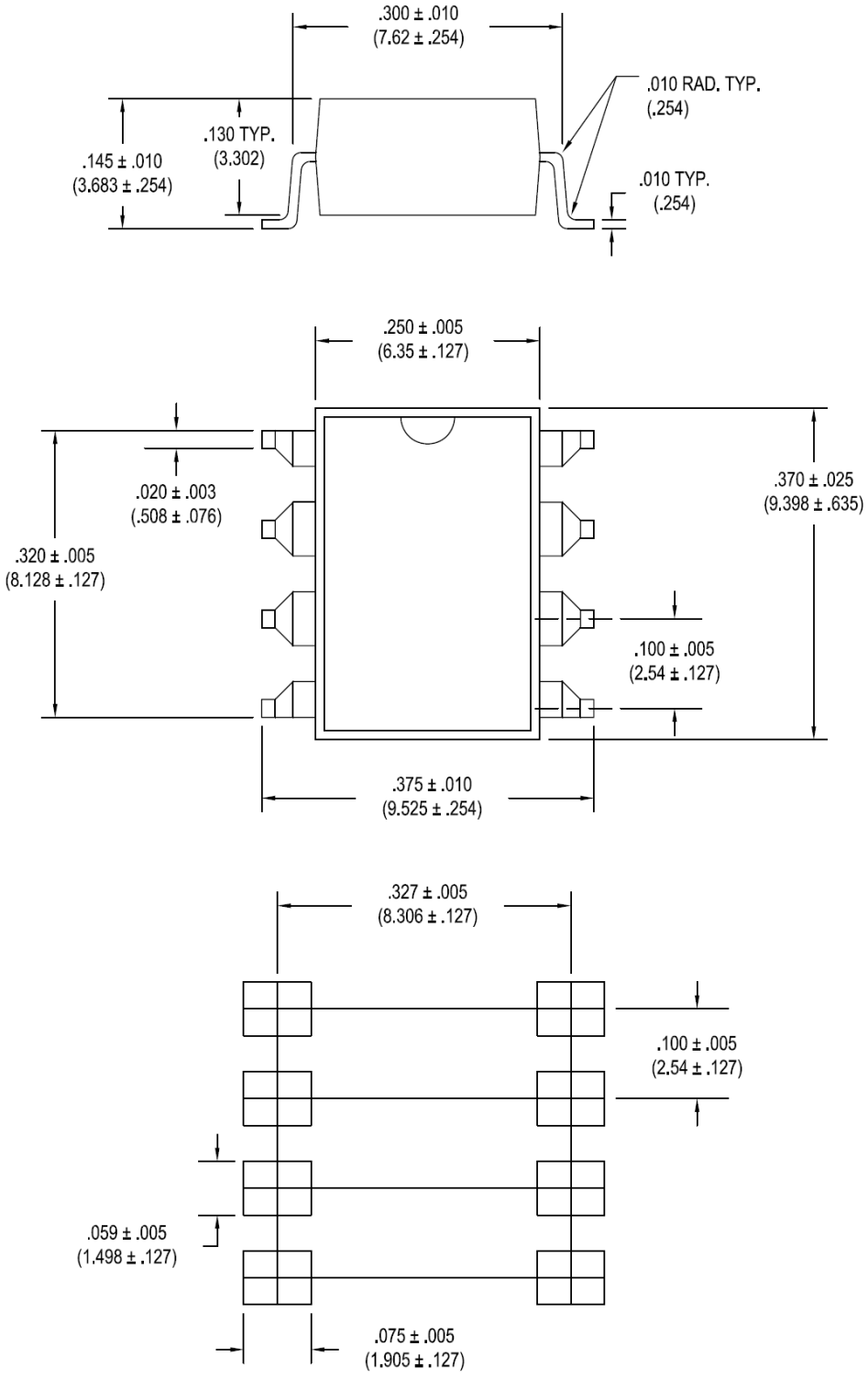


© 2013 Solid State Optronics • San José, CA

TR115 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

Note: *All dimensions in inches ["] with millimeters in parenthesis ()*
Device Weight: 0.45g

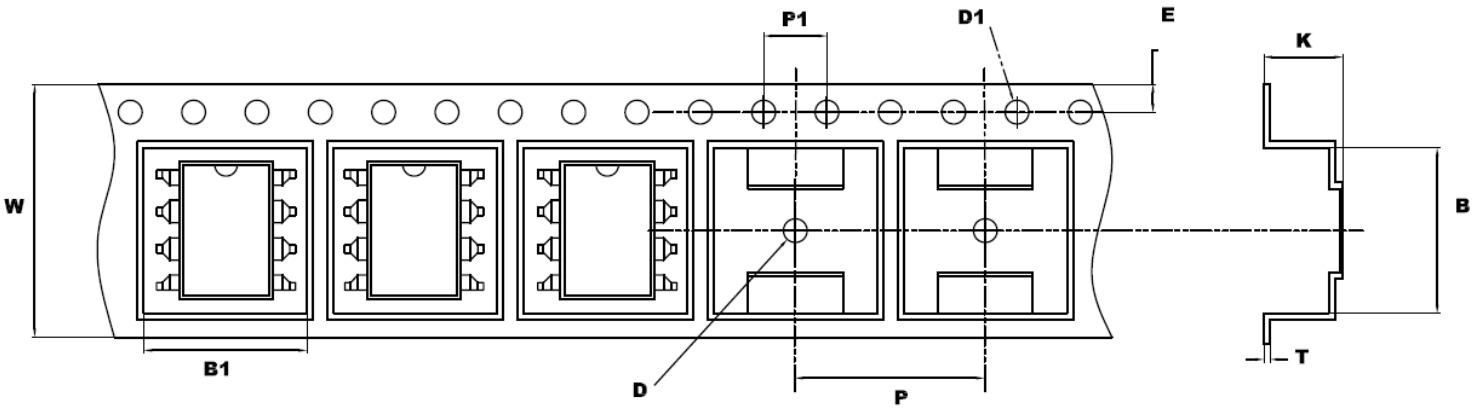


TR115 Package Dimensions

8 PIN SMD Tape & Reel (-STR)

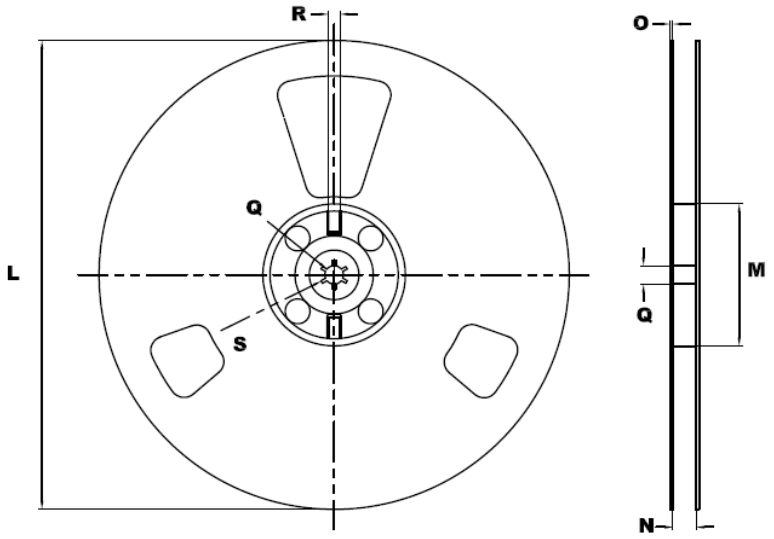
Note: *All dimensions in millimeters*

Outline and Dimension (Tape)



W	B	B1	P	P1	K	E	T	D	D1
16.00 ±0.1	10.50 ±0.1	10.30 ±0.1	12.00 ±0.1	4.00 ±0.1	5.00 ±0.1	1.75 ±0.1	0.40 ±0.1	1.50 ±0.1	1.50 ±0.1

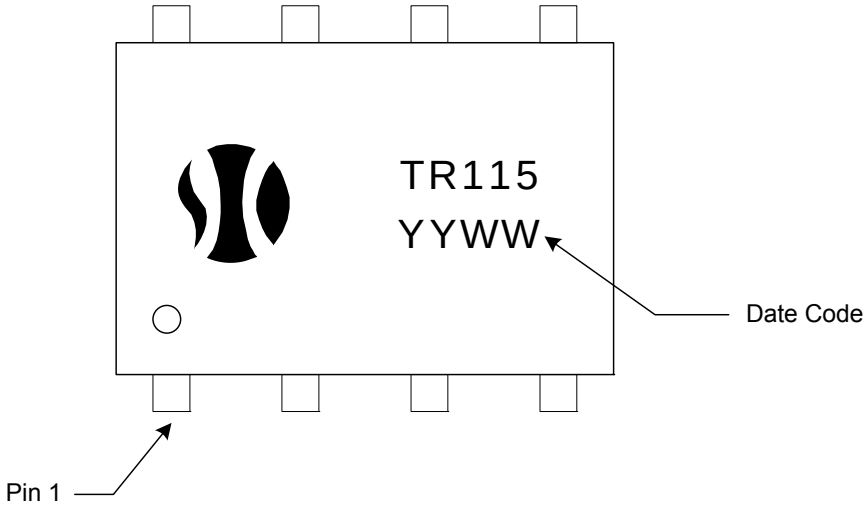
Outline and Dimensions (Reel)



Packaging: 1,000 pcs / reel

L	M	N	O	Q	R	S
330.00	100.00	16.40 +0.2	2.00 ±0.1	13.00 ±0.2	2.00	10.00

TR115 Package Marking



DISCLAIMER

Solid State Optronics (SSO) makes no warranties or representations with regards to the completeness and accuracy of this document. SSO reserves the right to make changes to product description, specifications at any time without further notices.
SSO shall not assume any liability arising out of the application or use of any product or circuit described herein. Neither circuit patent licenses nor indemnity are expressed or implied.
Except as specified in SSO's Standard Terms & Conditions, SSO disclaims liability for consequential or other damage, and we make no other warranty, expressed or implied, including merchantability and fitness for particular use.

LIFE SUPPORT POLICY

SSO does not authorize use of its devices in life support applications wherein failure or malfunction of a device may lead to personal injury or death. Users of SSO devices in life support applications assume all risks of such use and agree to indemnify SSO against any and all damages resulting from such use. Life support devices are defined as devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when used properly in accordance with instructions for use can be reasonably expected to result in significant injury to the user, or (d) a critical component of a life support device or system whose failure can be reasonably expected to cause failure of the life support device or system, or to affect its safety or effectiveness.