



Description

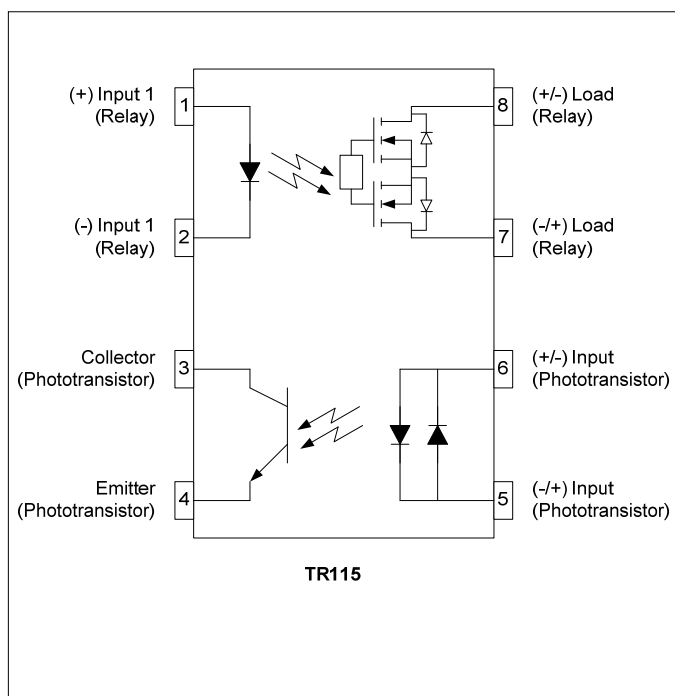
The TR115 is a dual function circuit designed specifically as a telecommunications switch. It consists of an optically isolated solid state relay and an optically isolated optocoupler combined in a compact 8pin DIP package. The relay portion is normally open, and composed of an LED on the input, optically 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



Features

- Function Integration (SSR + Optocoupler) in compact package
- 20 Ω 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 Voltage6V
Input Power Dissipation.....40mW
Output Power Dissipation800mW
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

Electrical Characteristics, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

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

TR115 Performance & Characteristics Plots, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

Figure 1: Relay (Form A)
Typical Turn-On Time Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

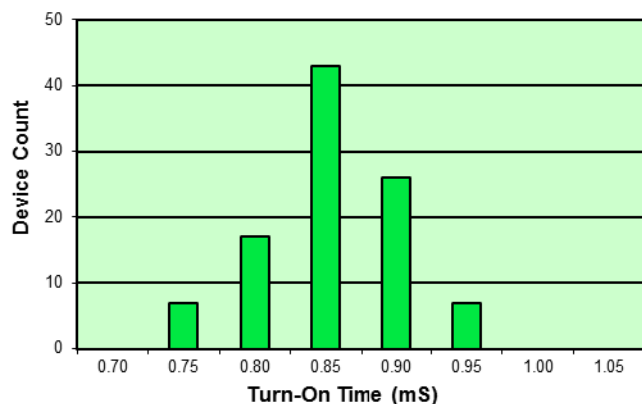


Figure 2: Relay (Form A)
Typical Turn-Off Time Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

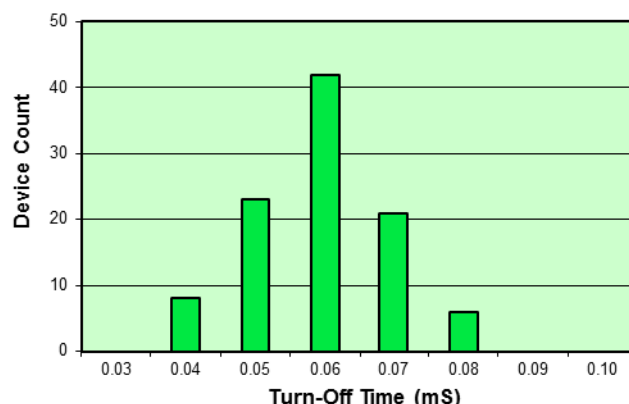


Figure 3: Relay (Form A)
Typical On-Resistance Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

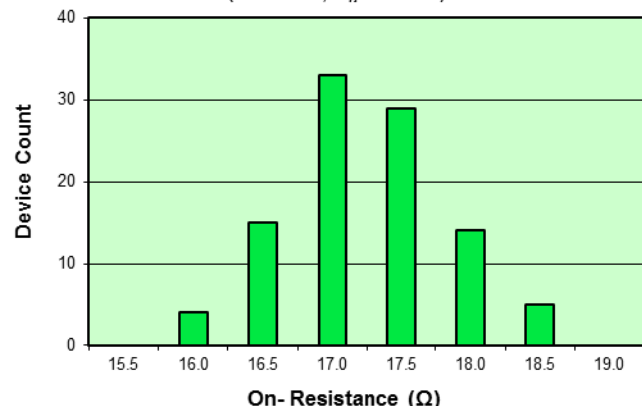


Figure 4: Relay (Form A)
Typical Output Leakage Current Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

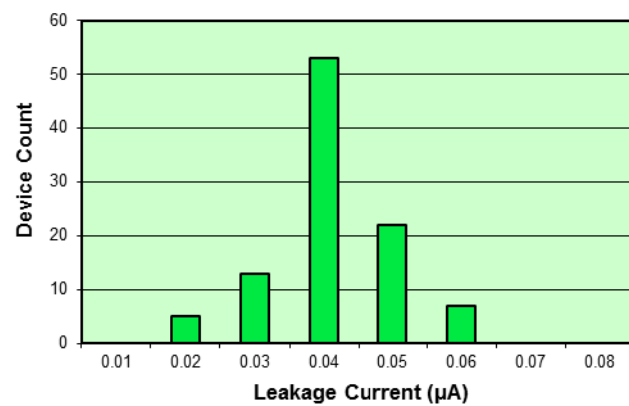


Figure 5: Relay (Form A)
Typical Blocking Voltage Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

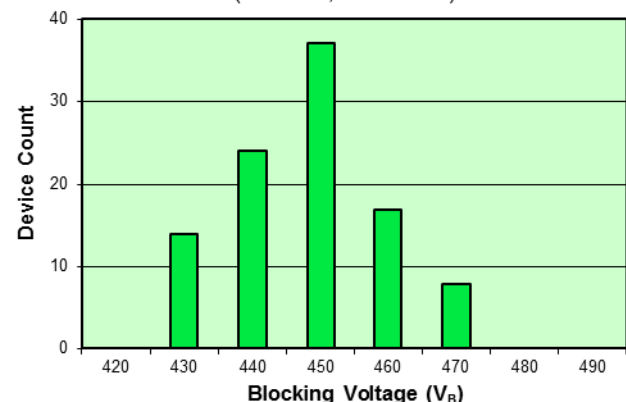
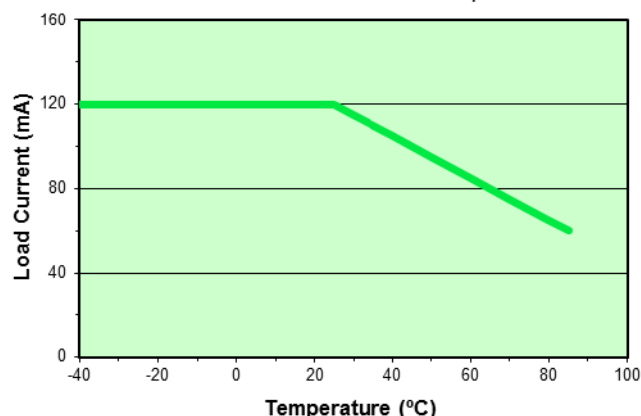


Figure 6: Relay (Form A)
Maximum Load Current vs. Temperature



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 250°C:

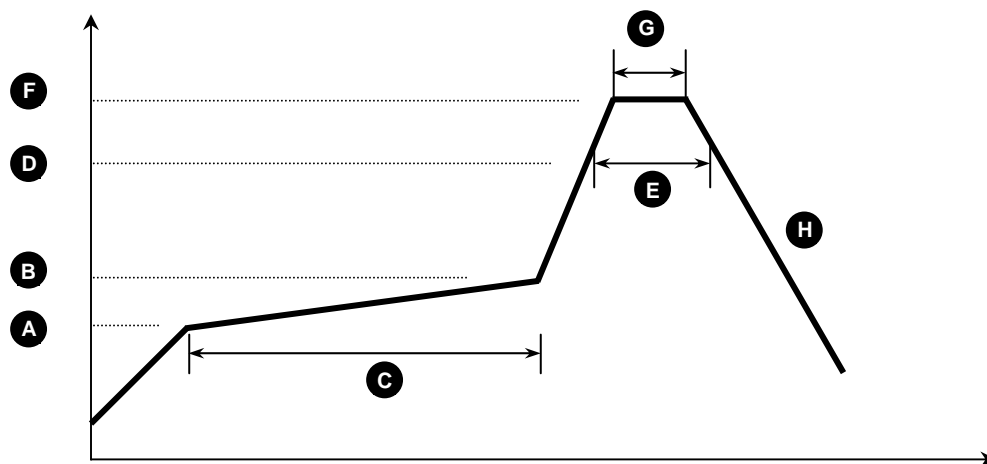


Figure 1

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

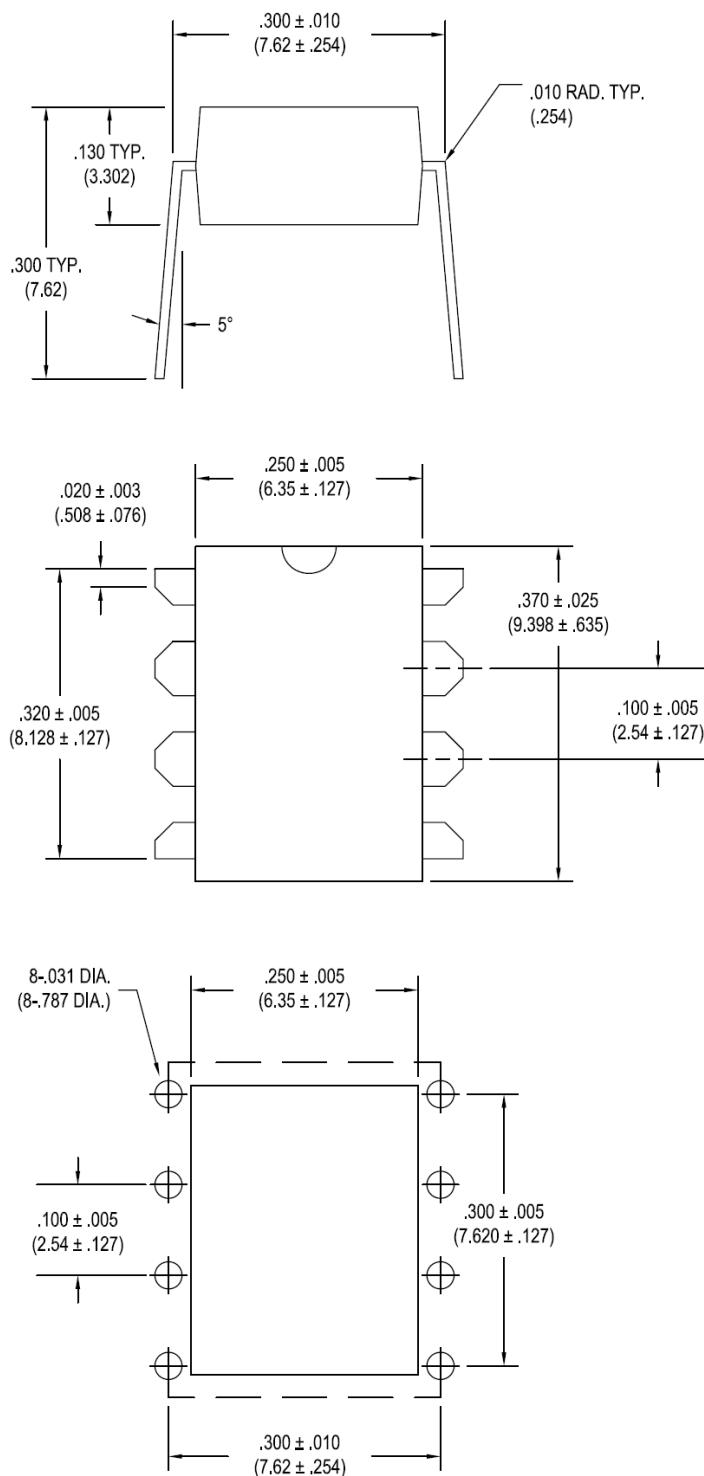
(2) Wave Solder:

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

(3) Hand Solder:

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

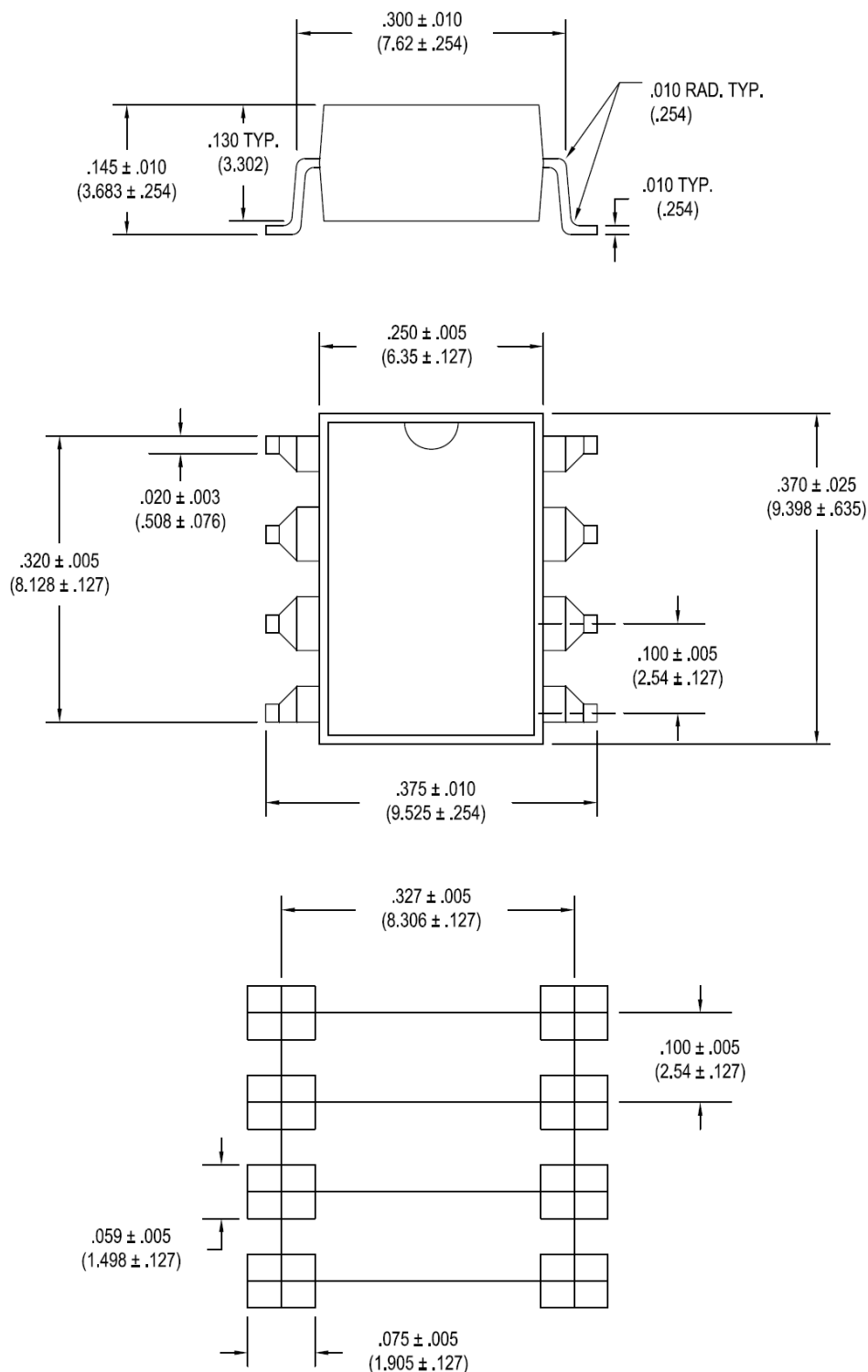
TR115 Package Dimensions
8 PIN DIP Package
Note: All dimensions in inches [""] with millimeters in parenthesis ()

Device Weight: 0.45g


TR115 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

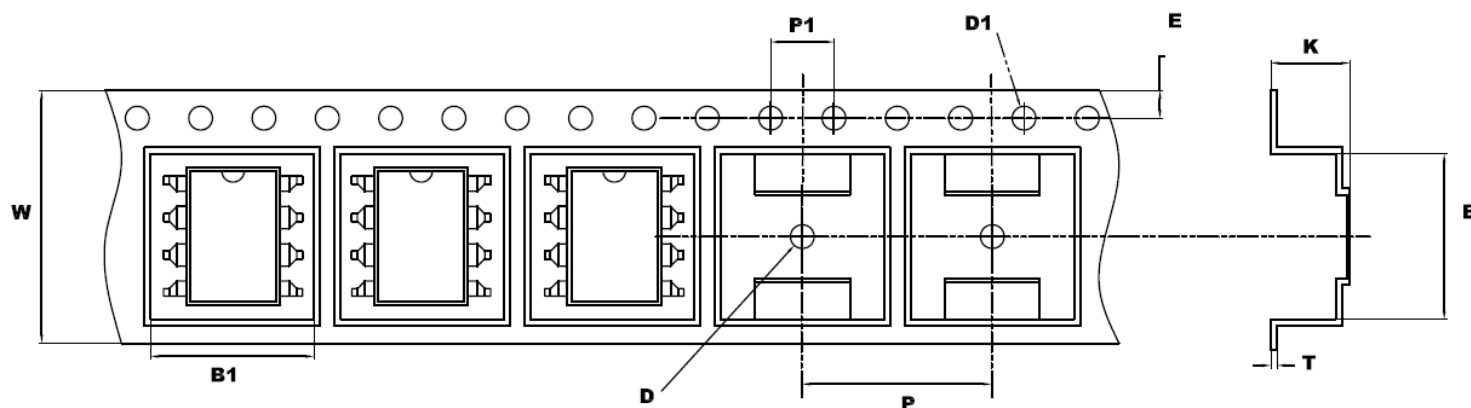
Note: All dimensions in inches [""] with millimeters in parenthesis ()
Device Weight: 0.45g



TR115 Package Dimensions

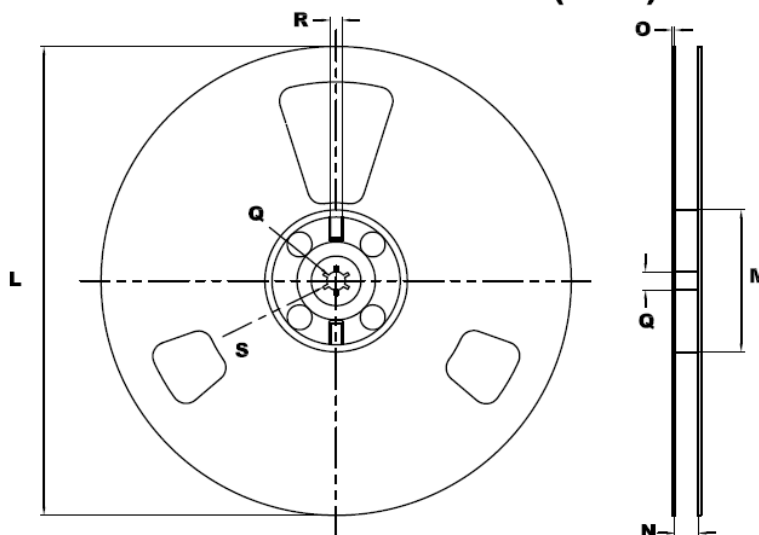
8 PIN SMD Tape & Reel (-STR)

Note: All dimensions in millimeters

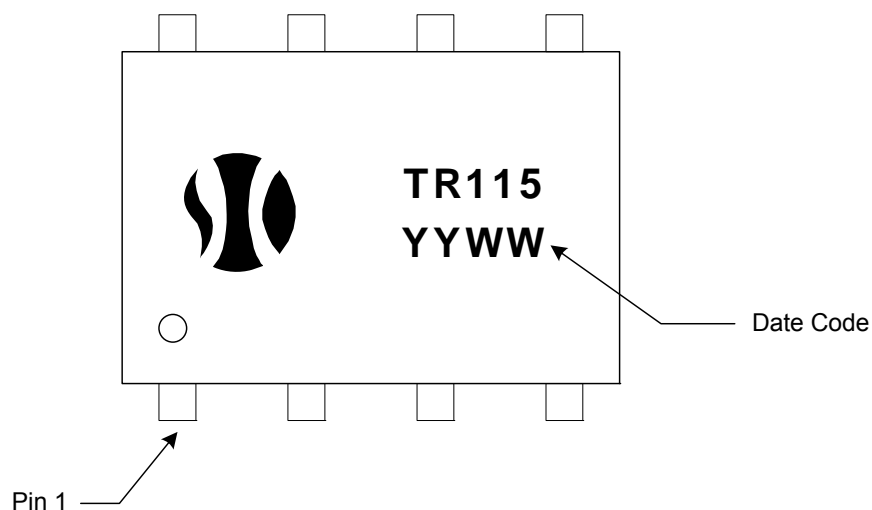
Outline and Dimension (Tape)


Direction of Feed

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**

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