SOLID STATE OPTRONICS

STR8083

Random Phase
800V / 1.2A
AC Solid State Relay

Description

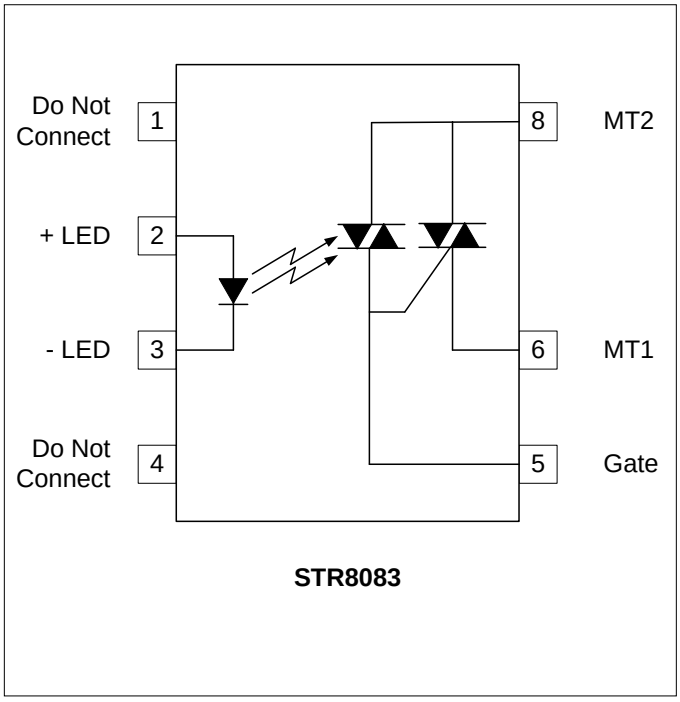
The STR8083 is a bi-directional, single-pole, single-throw, normally open multipurpose relay. The device consists of an IR LED optically coupled to a random phase switching AC output structure. It has a high blocking voltage (800V) and can handle continuous load currents of up to $1.2A_{RMS}$. The STR8083 assures no false triggering under adverse conditions.

The STR8083 comes standard in a compact 8 pin DIP package. The package construction makes it ideal for high-density board applications.

Applications

- Valve Control
- Meter Reading Systems
- Heating Elements
- Home Appliances
- Solenoid / Motor Control
- Dimmer Control

Schematic Diagram



STR8083

Features

- High Blocking Voltage (800V)
- $1.2A_{RMS}$ Continuous Load Current
- Random Phase Switching
- Low Control Current (<10mA)
- High Isolation Voltage (up to $5kV_{RMS}$)
- Long Life / High Reliability
- RoHS / Pb-Free / REACH Compliant

Agency Approvals

- UL
- C-UL

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.....50mA
Transient Input Current.....500mA
Reverse Input Control Voltage 5V
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
STR8083	8 pin DIP, (50/Tube)
STR8083-H	$5kV_{RMS}$ Viso, 8 pin DIP, (50/Tube)
STR8083-S	8 pin SMD, (50/Tube)
STR8083-HS	$5kV_{RMS}$, 8 pin SMD, (50/Tube)
STR8083-STR	8 pin SMD, Tape and Reel (1000/Reel)
STR8083-HSTR	$5kV_{RMS}$, 8 pin SMD, Tape and Reel (1000/Reel)

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

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STR8083 H/S/TR
Rev 2.20 (09/26/2014)
002170

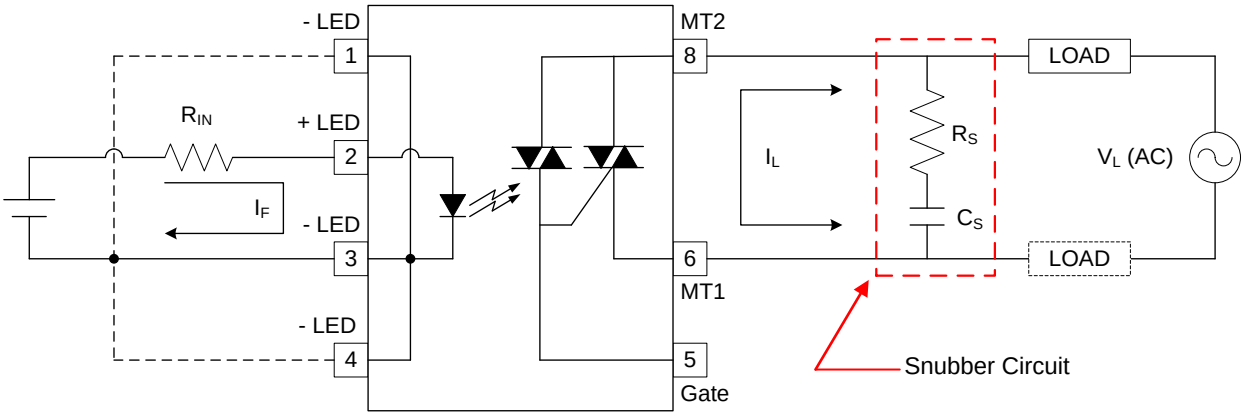
Electrical Characteristics, T_A = 25°C (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.4	1.8	V	I_F = 10mA
LED Reverse Voltage	BV_R	5	-	-	V	I_R = 10µA
Trigger Current [1]	I_{FT}	-	-	10	mA	Resistive Load
Output Specifications						
Peak Off-State Voltage	V_{DRM}	800	-	-	V	I_{DRM}=10µA
Continuous Load Current	$I_{T(RMS)}$	-	-	1.2	A	I_{FT}=10mA
Peak On-State Voltage	V_{TM}	-	1.0	2.5	V	I_{FT}=10mA, I_T=1000mA
Leakage Current	I_{DRM}	-	10	100	µA	I_{FT}=0mA, V_{DRM}=800V
Holding Current	I_H	-	5	25	mA	I_{FT}=10mA
Critical Rate of Rise (dV//dt)	dV_D/dt	-	-	400	V/µS	V_{DM}=67% 800V
Isolation Specifications						
Isolation Voltage	V_{ISO}	3750	-	-	V_{RMS}	RH ≤ 50%, t=1min
(-H Option)		5000	-	-		
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	V_{I-O} = 500V_{DC}

Notes:

1) I_{FT} = 20mA recommended for inductive loads

STR8083 Connection (Wiring) Diagram



Refer to the above figure as an example of a typical wiring diagram for the STR8083.

INPUT

The input LED is connected to a drive circuit, consisting of a power source and a limiting resistor (R_{IN}). Assuming 5V as the supply, calculating a value for R_{IN} can be determined by following:

R_{IN} = (5V – 1.5V) / 0.010A
= 3.5V / 0.010A
≈ **350 Ω**

In the above calculation, an LED drop of 1.5V and desired I_F of 10mA are used. Referencing the "Input Specifications" on page 2, the typical drop across the LED is 1.4V and the maximum drop is 1.8V. For a more precise resistor value across all expected temperature option, the "V_{IN} vs. Temperature" curve (Figure 05 on page 4) can be referenced.

OUPUT

The output terminals (MT1 & MT2) are connected to an AC load, with maximum peak voltage (V_L) of 800V and maximum continuous current (I_L) of 1.2 amps. The load must be derated according to temperature, and a derating curve can be found in Figure 04 on page 4. Typical loads may include resistive or inductive loads.

Examples of resistive loads include:

- Light Dimming Controls (home / office / industrial lighting)
- Heating Element Controls (rice cookers / deep fryers)

Examples of inductive loads include:

- Motor Controls (air conditioning blowers / fan control)
- Valve Controls (washing machine water flow pumps, gasoline pumps)

In general, the STR8083 can be used in many industrial and home appliance applications where high voltages (up to 800V peak) and loads of up to 1.2A are being switched.

SNUBBER CIRUIT

A snubber circuit (outlined in above diagram) may be added when high levels of noise and / or surge are expected from the load. These are often found in highly inductive loads and can lead to an "inductive kick" which may potentially damage components in the circuit. The snubber circuit consists of a resistor (R_S) and a capacitor (C_S) which together help dissipate charge buildup across the load. Values for R_S and C_S are dependent upon the load and SSO engineering support can help determine appropriate values if needed.

STR8083 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 1: *Typical Trigger Current Distribution*
(Resistive Load, N = 100, T_a = 25ºC)

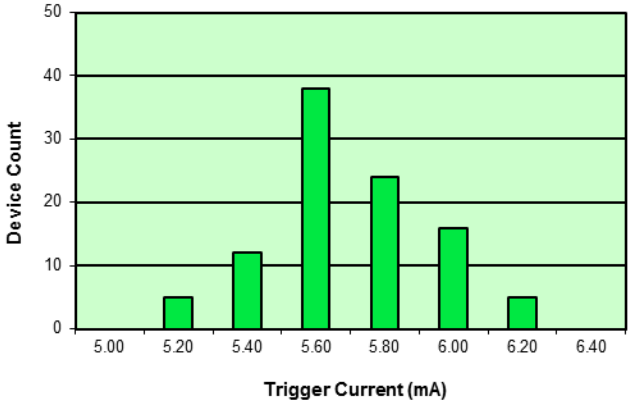


Figure 2: *Typical Peak Off-State Voltage Distribution*
(N = 100, Ta = 25ºC)

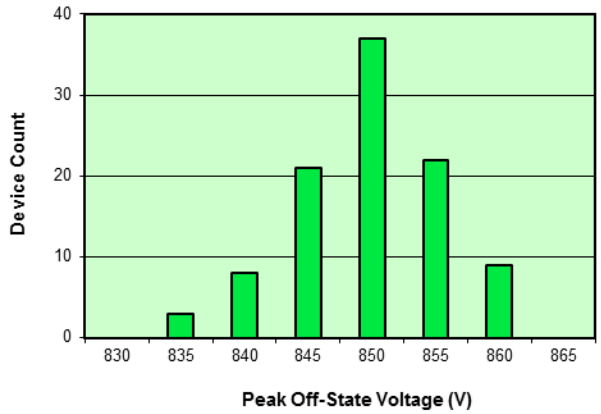


Figure 3: *On-State Voltage vs. Temperature*

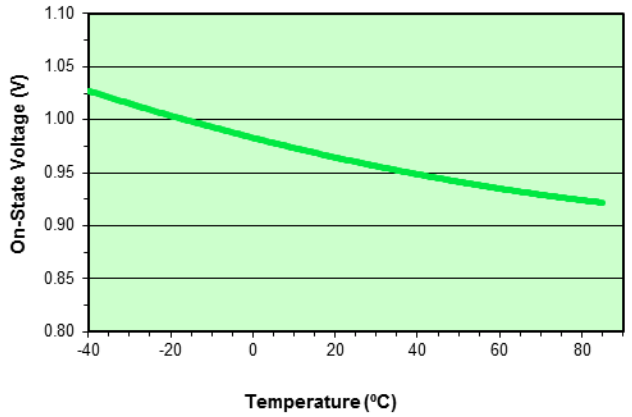


Figure 4: *Maximum Load Current vs. Temperature*

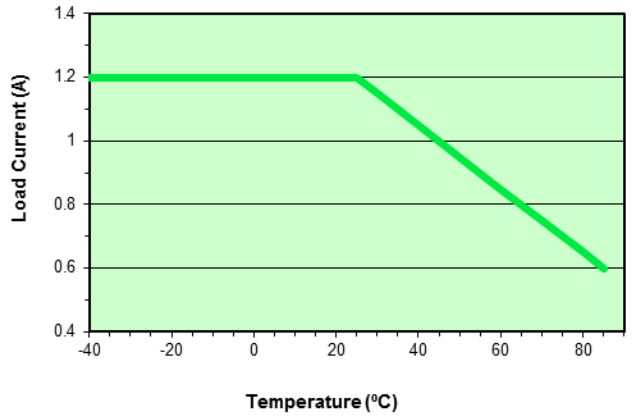
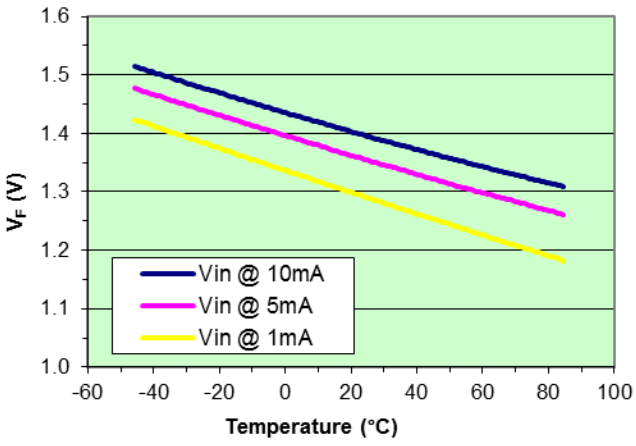


Figure 5: *Typical LED Voltage vs Temperature*



STR8083 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:

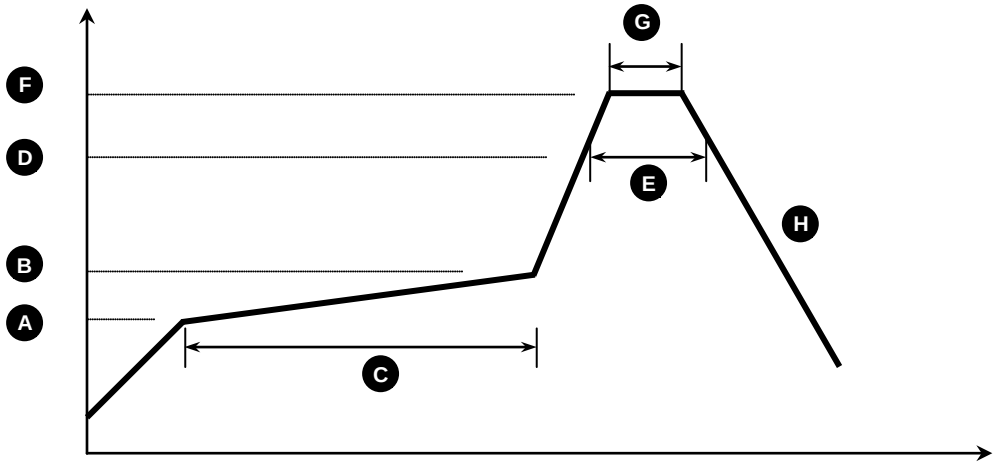


Figure 1

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	

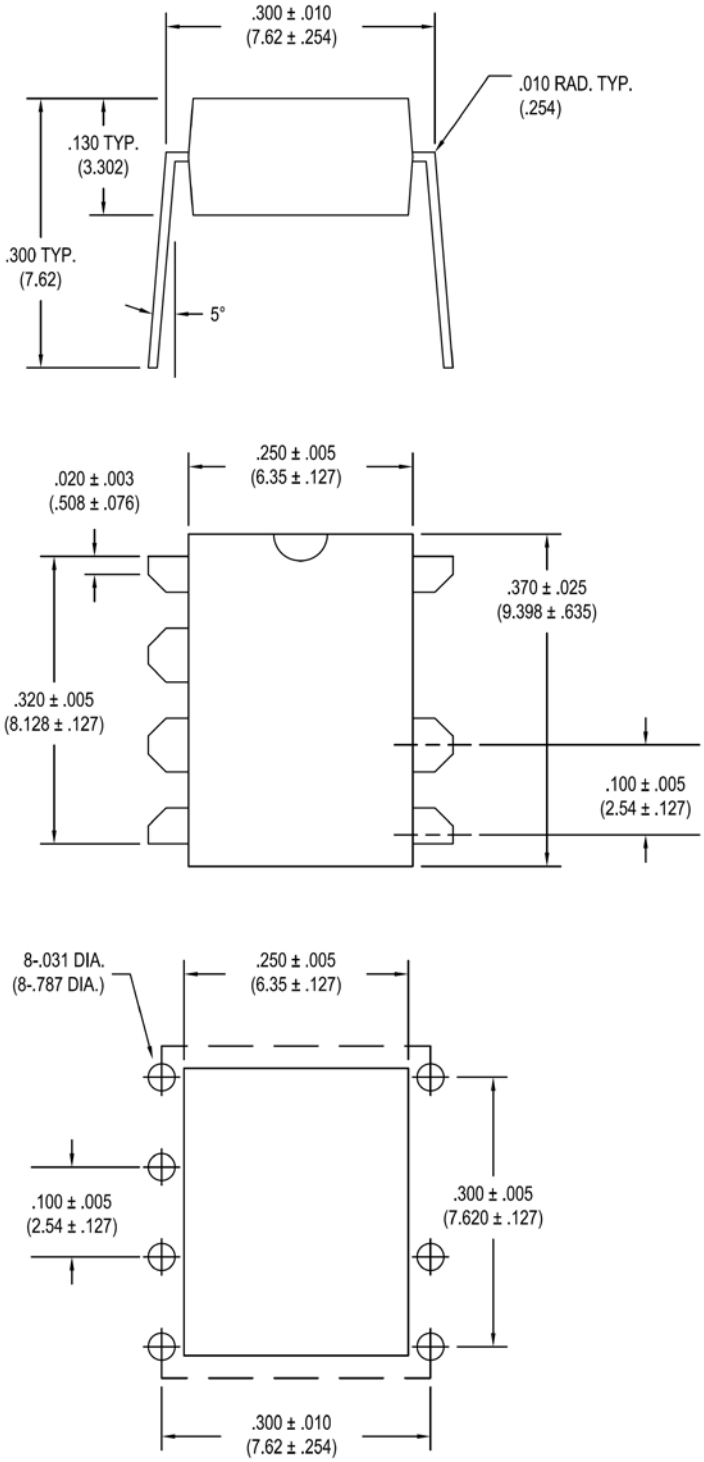
(3) *Hand Solder:*

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

STR8083 Package Dimensions

8 PIN DIP Package

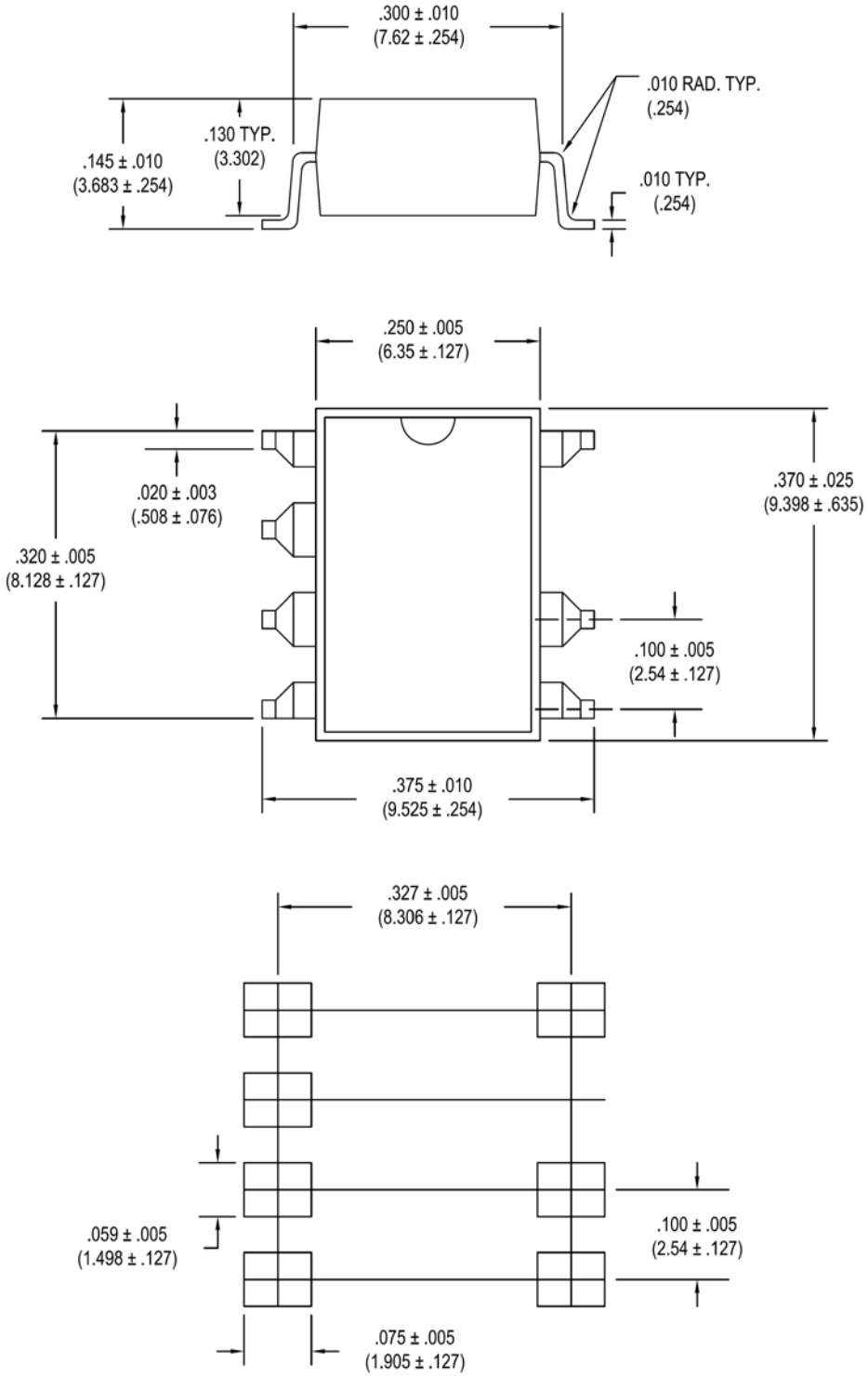
Note: *All dimensions in inches ["] with millimeters in parenthesis ()*



STR8083 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

Note: *All dimensions in inches ["] with millimeters in parenthesis ()*

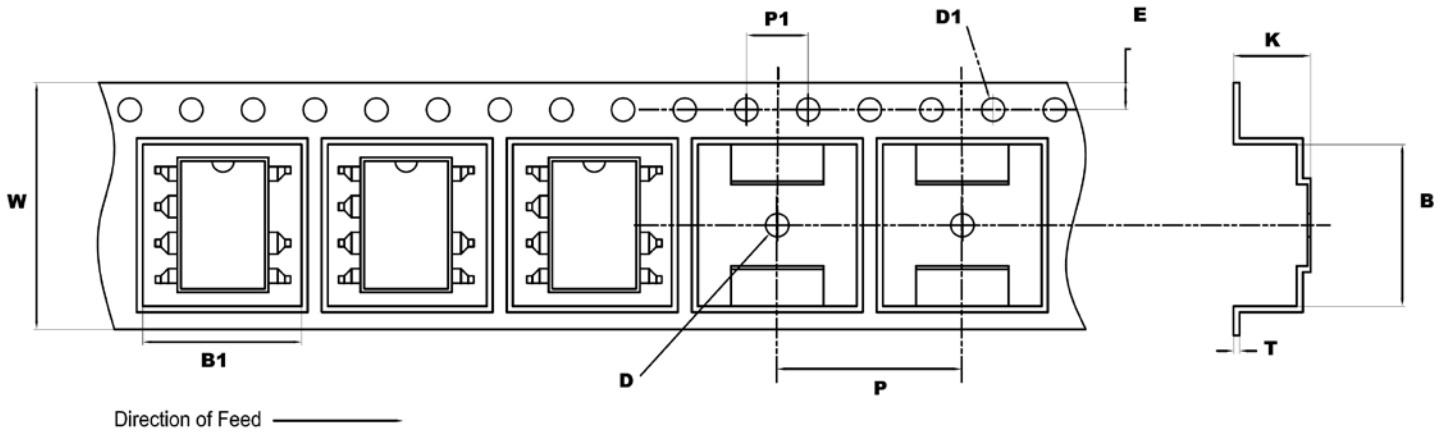


STR8083 Package Dimensions

8 PIN SMD Tape & Reel (-STR)

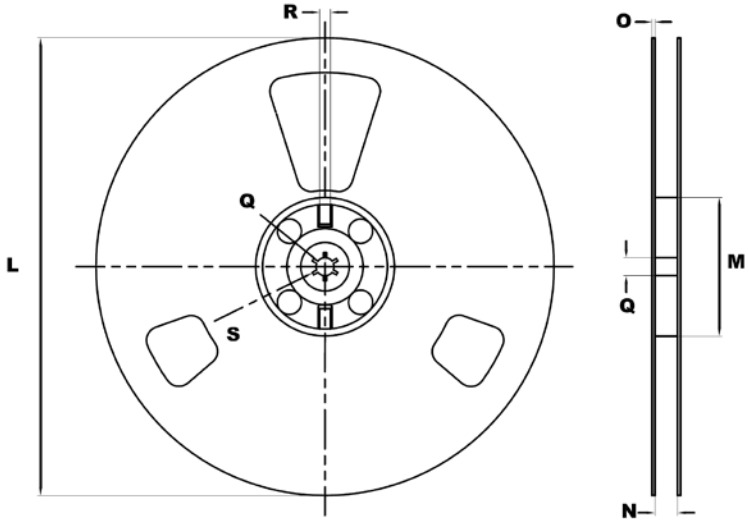
Note: *All dimensions in millimeters*

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

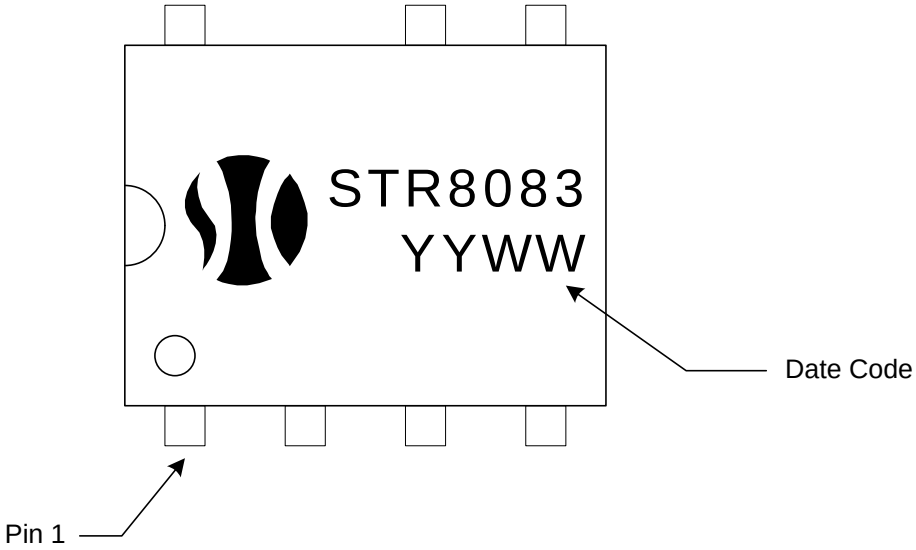
Outline and Dimensions (Reel)



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

STR8083 Package Marking



STR8083 Package Weights

Device	Single Unit	Full Tube (50pcs)	Full Pouch (10 tubes)	Full Reel (1000pcs)
STR8083-(H)	0.54	42	420	-
STR8083-(H)S	0.53	44	440	-
STR8083-(H)STR	0.53	-	-	950

Note: *All weights above are in GRAMS, and include packaging materials where applicable*