SOLID STATE OPTRONICS

M291

1 Form A
50V / 100mΩ
MOSFET Output Solid State Relay

Description

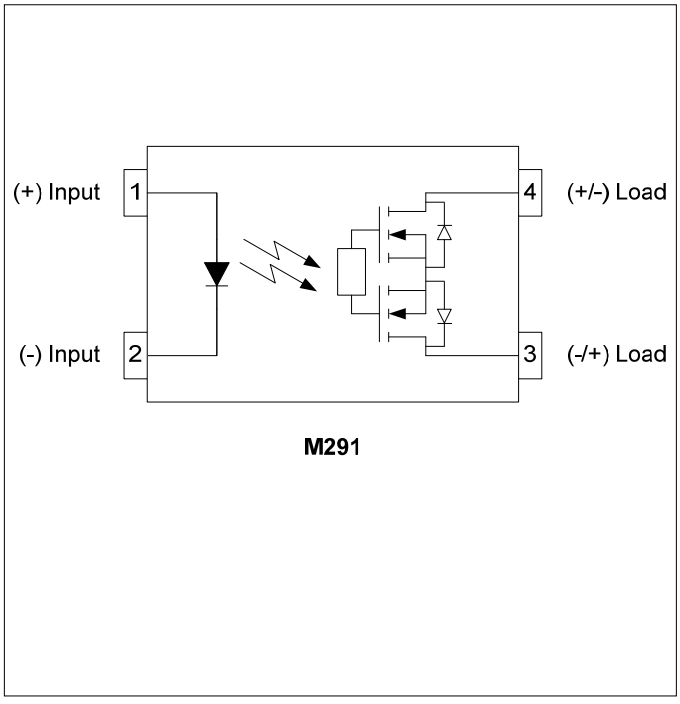
The M291 is a bi-directional, single-pole, single-throw, normally open multipurpose solid-state relay in a miniature 4-pin small outline package. It is designed to be a cost-effective replacement of reed relays in low voltage applications. The M291 has an extremely low on resistance of 70mΩ (TYP) and a very high continuous load current rating of up to 2A. The combination of low on-resistance, small package outline and high load current capabilities make the M291 a unique, unparalleled solid state relay.

The M291 comes standard in a 4 pin SOP package.

Applications

- Reed Relay Replacement
- Security Systems
- Meter Reading Equipment
- Data Acquisition
- Battery Monitoring
- Multiplexers

Schematic Diagram



M291

Features

- Low On Resistance (70mΩ TYP)
- High Continuous Load Current (2A MAX)
- High Input-to-Output Isolation (1500V MIN)
- Ultra Miniature 4SOP Package
- 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.....50mA
Transient Input Current.....500mA
Reverse Input Control Voltage 5V
Input Power Dissipation.....40mW
Total Power Dissipation 400mW
Solder Temperature – Wave (10sec).....260°C
Solder Temperature – IR Reflow (10sec).....260°C

Ordering Information

Part Number	Description
M291	4 pin SOP, (100/Tube)
M291-TR	4 pin SOP, Tape and Reel (2000/Reel)

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

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M291/TR
Rev 1.00 (03/06/2013)
001559

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
Input Reverse Current	I_R	-	-	10	µA	V_R = 5V
Turn-On Current	I_F	-	1	5	mA	V_O = 20V, I_O = 100mA (within 5mS)
Output Specifications						
Blocking Voltage	V_B	50	-	-	V	I_O=1µA
Continuous Load Current	I_O	-	-	2	A	I_F=5mA
On Resistance	R_{ON}	-	70	100	mΩ	I_F=5mA, I_O=2A
Leakage Current	I_{Oleak}	-	0.05	1	µA	I_F=0mA, V_O=50V
Output Capacitance	C_{OUT}	-	20	-	pF	V_O=25V, f=1.0MHz
Offset Voltage	V_{OFFSET}	-	-	0.2	mV	I_F=10mA
Coupled Specifications						
Turn-On Time	T_{ON}	-	1	5	mS	I_F=5mA, V_O=10V, I_O=2A
Turn-Off Time	T_{OFF}	-	0.05	0.5	mS	I_F=0mA, V_O=10V, I_O=2A
Coupled Capacitance	$C_{COUPLED}$	-	2	-	pF	
Contact Transient Ratio	-	2,000	7,000	0	V/µS	dV = 50V
Isolation Specifications						
Isolation Voltage	V_{ISO}	1500	-	-	V_{RMS}	RH ≤ 50%, t=1min
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	V_{I-O} = 500V_{DC}

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M291 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

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

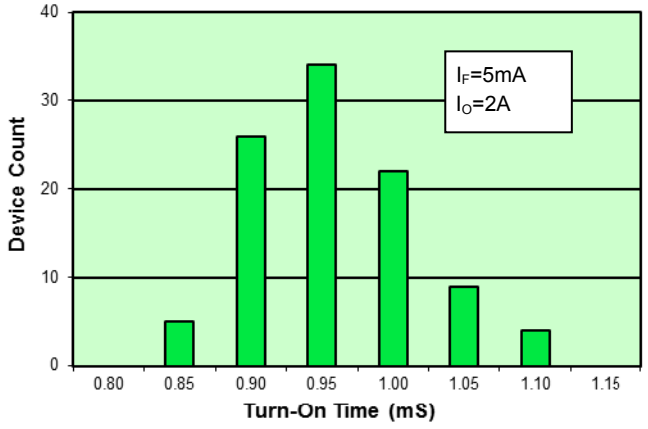


Figure 2: *Typical Turn-Off Time Distribution*
(N = 100, T_a = 25ºC)

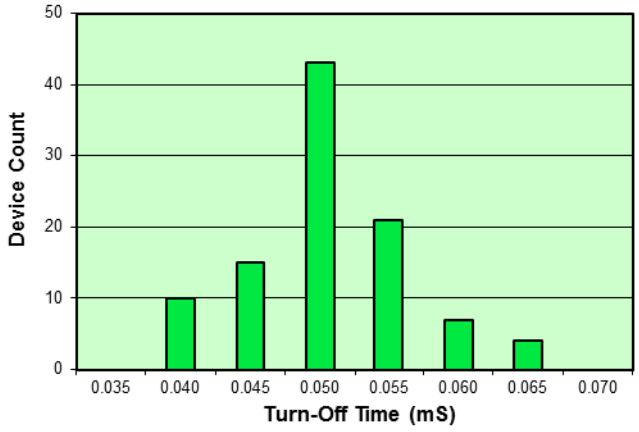


Figure 3: *Typical On-Resistance Distribution*
(N = 100, T_a = 25ºC)

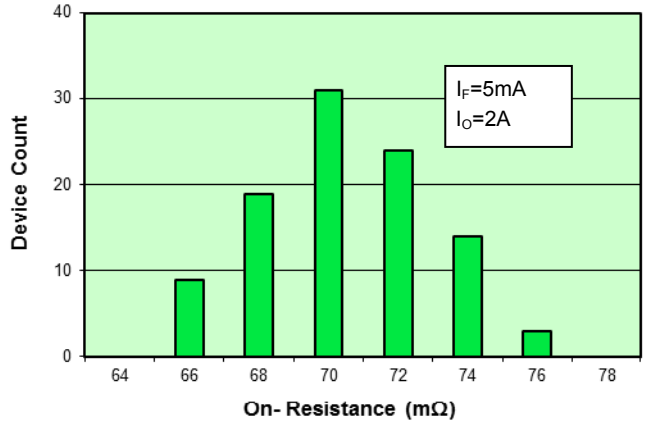


Figure 4: *Typical Output Leakage Current Distribution* (N = 100, T_a = 25ºC)

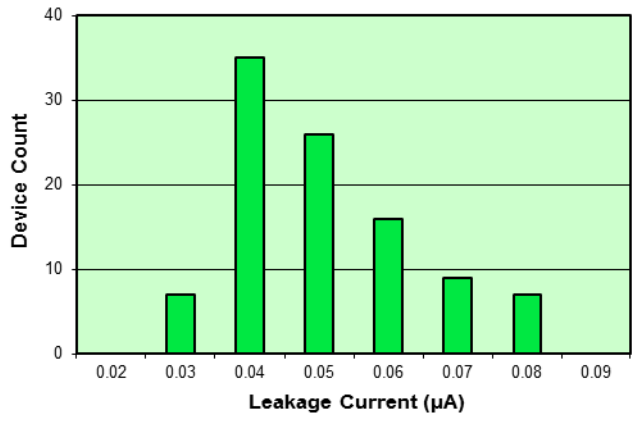


Figure 5: *Typical Blocking Voltage Distribution*
(N = 100, Ta = 25ºC)

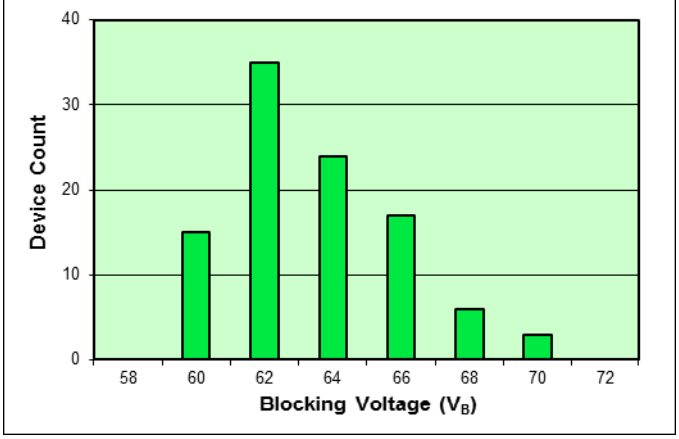
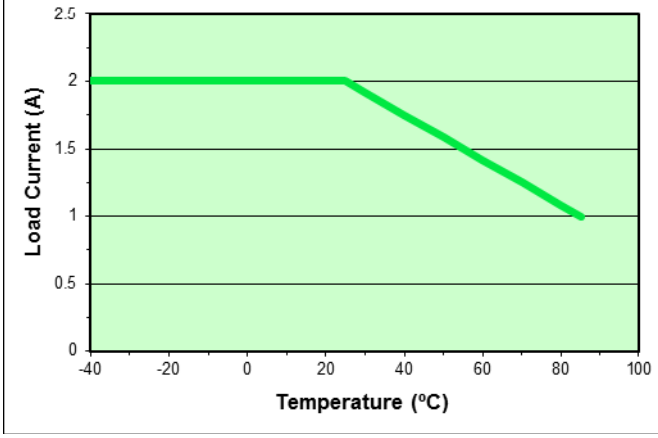


Figure 6: *Maximum Load Current vs. Temperature*

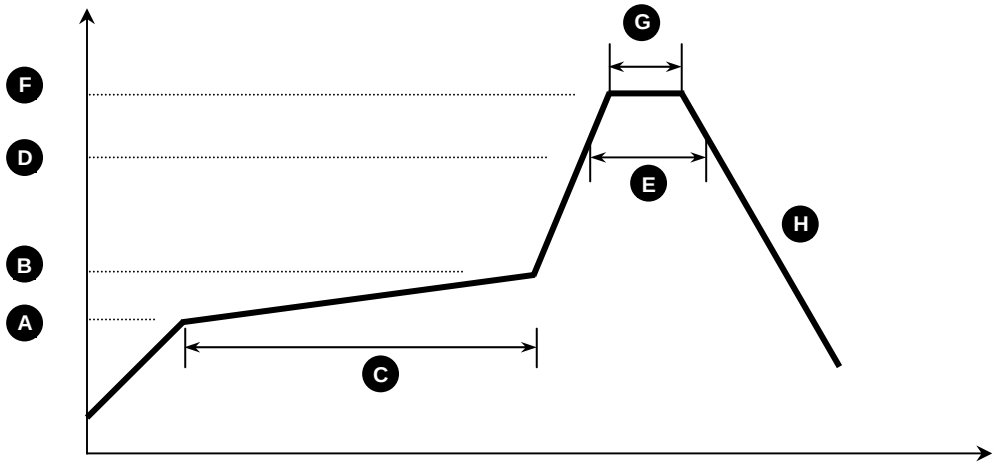


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M291 Solder Reflow Temperature Profile Recommendations

(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:



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:*

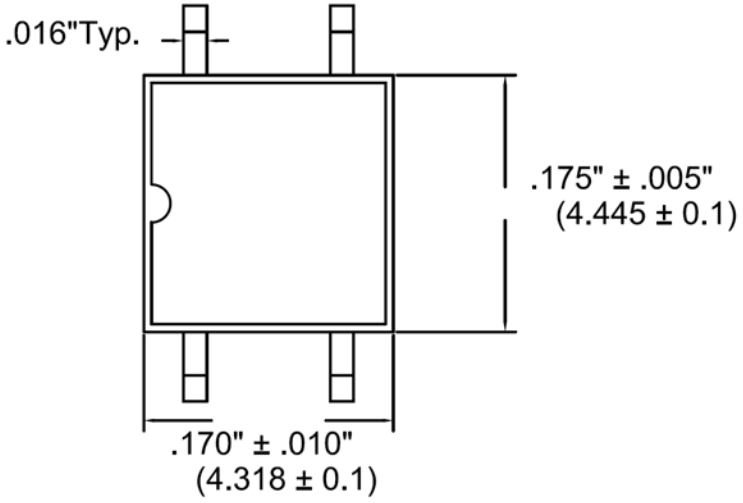
Maximum Temperature:	350ºC (at tip of soldering iron)
Maximum Time:	3s
Single Occurrence	

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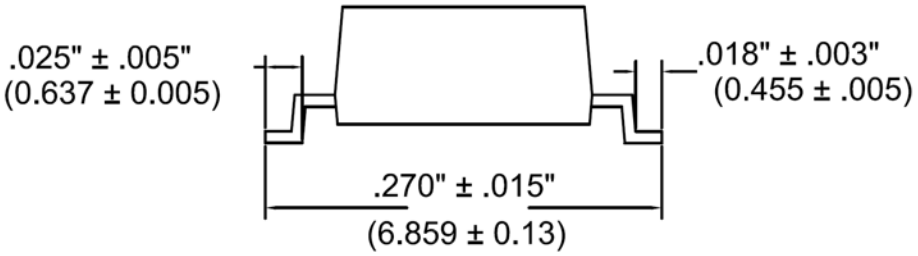
M291 Package Dimensions

4 PIN SOP Package

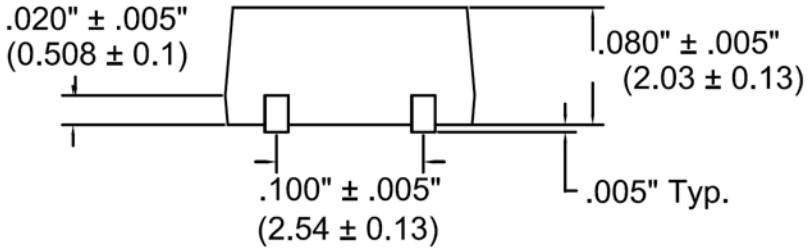
Note: *All dimensions in inches with millimeters [mm] in parenthesis ()*



TOP VIEW



END VIEW



SIDE VIEW

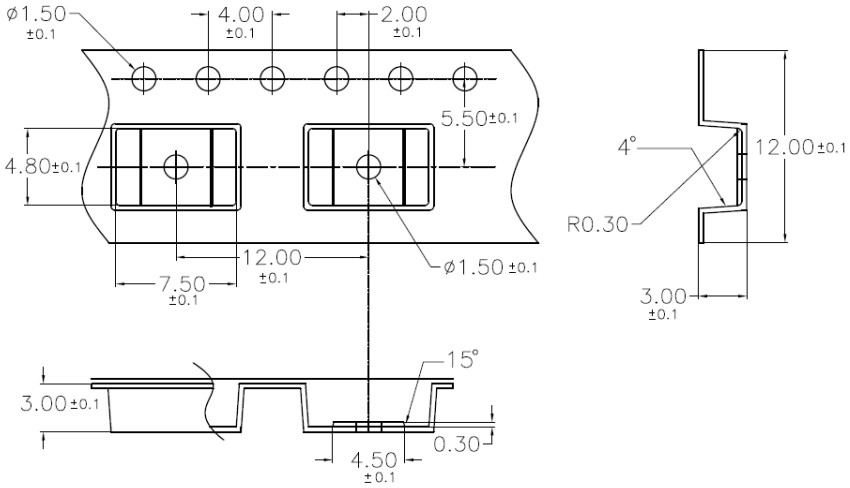
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M291 Packaging Specifications

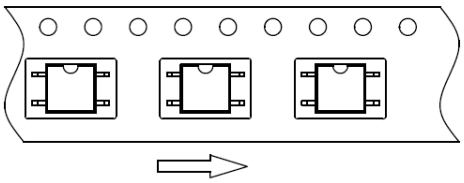
Tape & Reel Specifications (T&R)

Note: *All dimensions in millimeters [mm]*

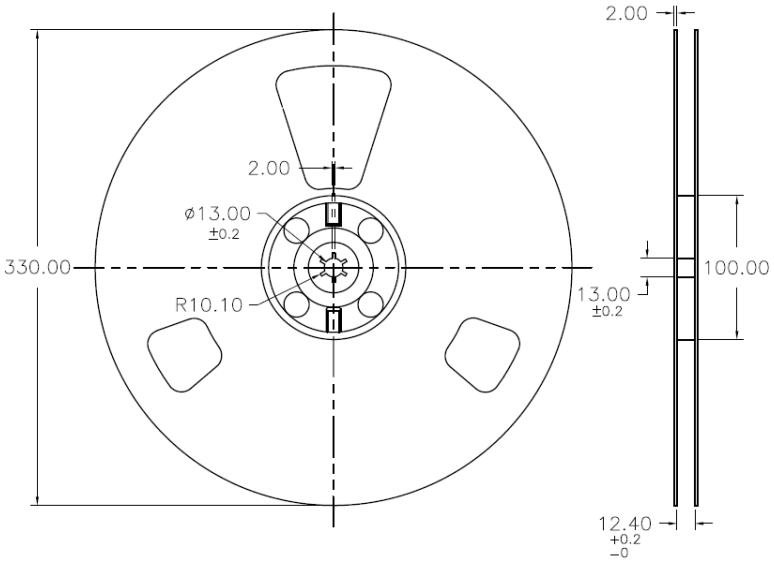
Outline and Dimension (Tape)



Parts Orientation and Tape Direction

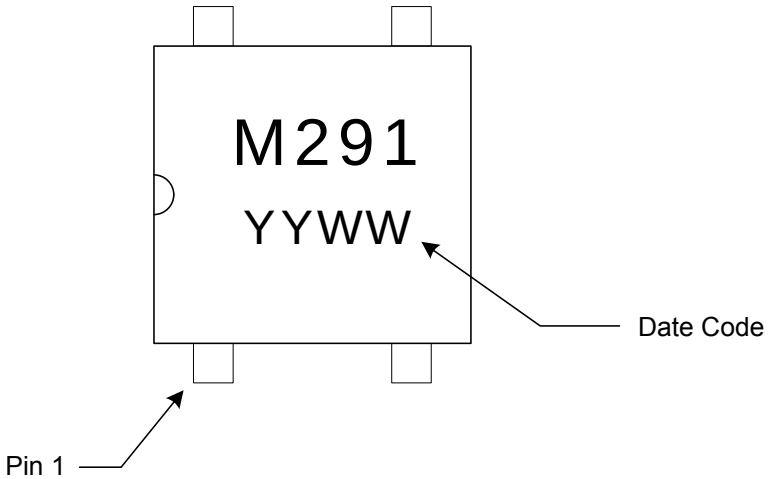


Outline and Dimensions (Reel)



Packaging: 2,000 pcs / reel

M291 Package Marking



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