SOLID STATE OPTRONICS

M231

1 Form A
250V / 10Ω
MOSFET Output Solid State Relay

Description

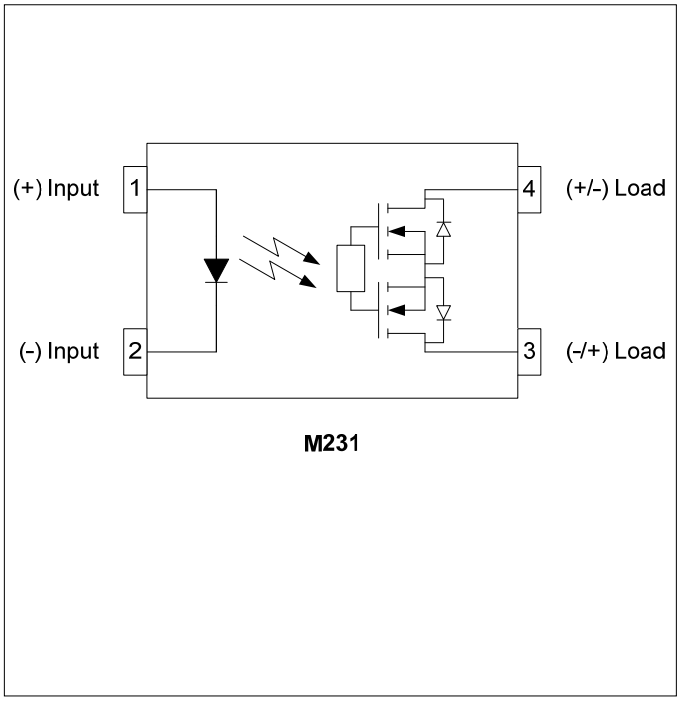
The M231 is a bi-directional, single-pole, single-throw, normally open multipurpose solid-state relay in a miniature 4-pin small outline package. With a high blocking voltage (250V) and low on-resistance, it is ideally suited to high voltage applications requiring higher load currents. The relay consists of an integrated circuit that drives two rugged source-to-source enhancement type DMOS transistors – optically coupled to a light emitting diode. The output MOS transistors are protected with free-wheeling diodes that can handle up to 1.5A of inrush current

The M231 comes standard in a 4 pin SOP package.

Applications

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

Schematic Diagram



M231

Features

- High Input-to-Output Isolation (1500V MIN)
- Low Input Control Current (2.5mA TYP)
- 150mA Maximum Continuous Load Current
- Low On Resistance (6Ω TYP)
- 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
M231	4 pin SOP, (100/Tube)
M231-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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M231 /TR
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Electrical Characteristics, T_A = 25°C (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.5	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	-	2.5	5	mA	V_O = 20V, I_O = 150mA (within 10mS)
Turn-Off Current	$I_{F(OFF)}$	-	0.5	-	mA	I_O = 140mA
Output Specifications						
Blocking Voltage	V_B	250	-	-	V	I_O=1µA
Continuous Load Current	I_O	-	-	150	mA	I_F=5mA
On Resistance	R_{ON}	-	6	10	Ω	I_F=5mA, I_O=150mA
Leakage Current	I_{Oleak}	-	0.2	1	µA	I_F=0mA, V_O=250V
Output Capacitance	C_{OUT}	-	20	-	pF	V_O=25V, f=1.0MHz
Offset Voltage	V_{OFFSET}	-	-	0.2	mV	I_F=5mA
Coupled Specifications						
Turn-On Time	T_{ON}	-	2	5	mS	I_F=5mA, I_O=140mA
Turn-Off Time	T_{OFF}	-	0.15	0.5	mS	I_F=0mA, I_O=140mA
Coupled Capacitance	$C_{COUPLED}$	-	3	-	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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M231 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 1: *Typical Blocking Voltage Distribution*
(N = 100, Ta = 25ºC)

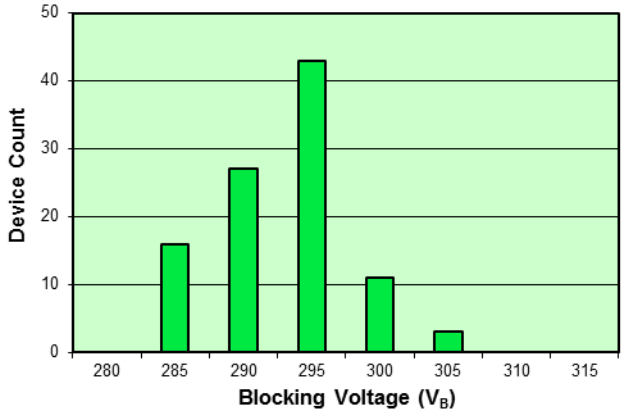
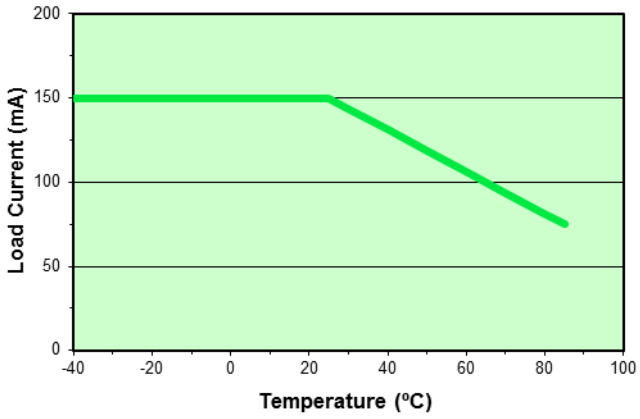


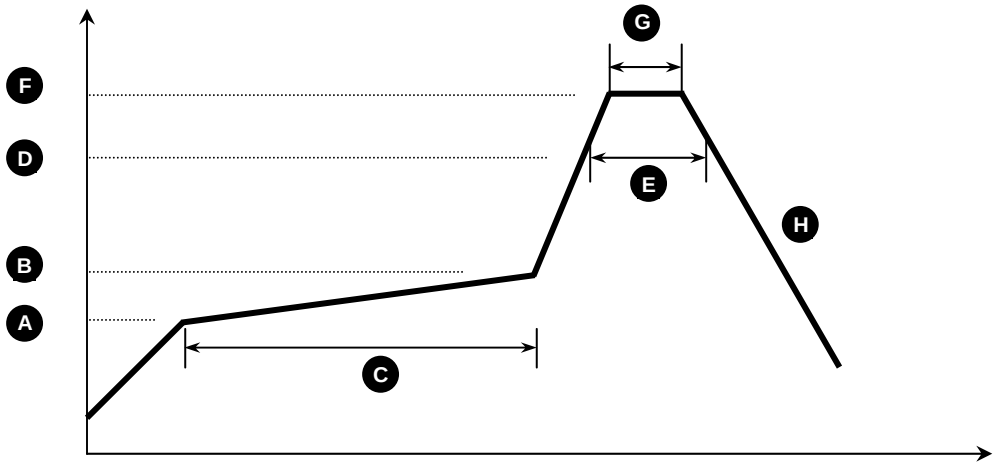
Figure 2: *Maximum Load Current vs. Temperature*



M231 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

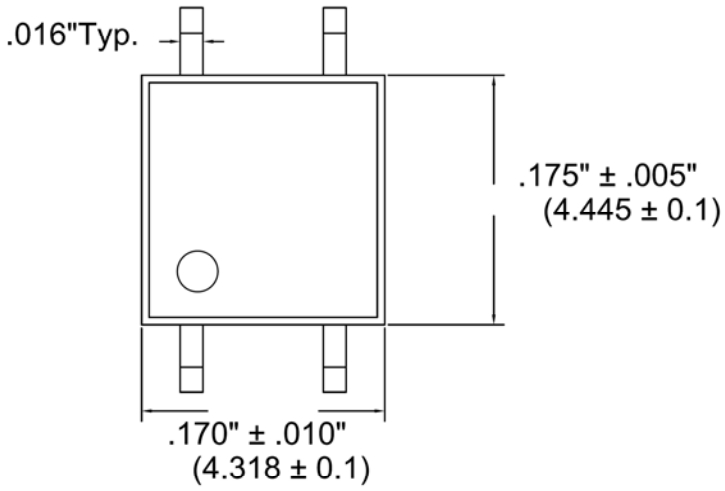
(3) *Hand Solder*:

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

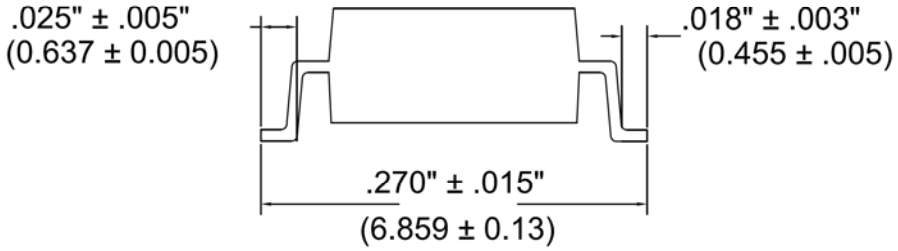
M231 Package Dimensions

4 PIN SOP Package

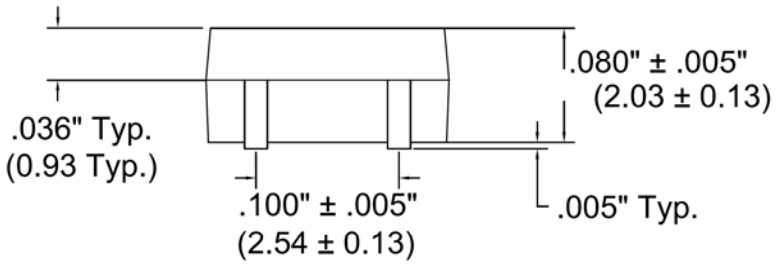
Note: *All dimensions in inches with millimeters [mm] in parenthesis ()*



TOP VIEW



END VIEW



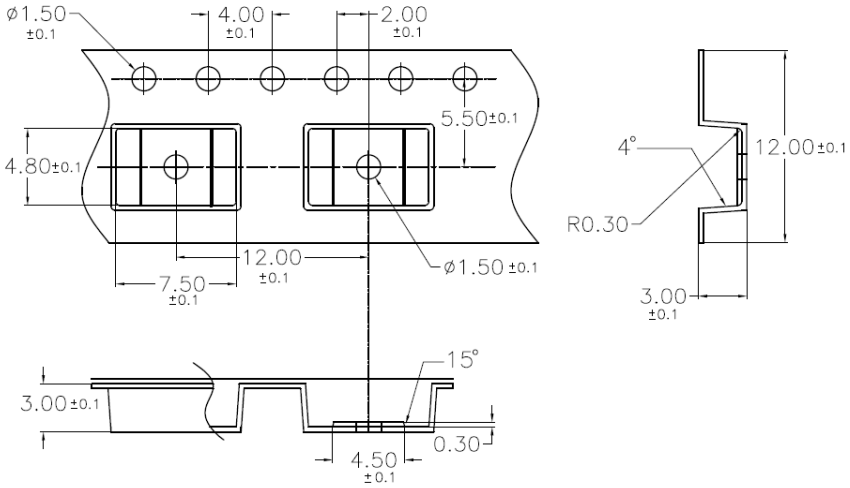
SIDE VIEW

M231 Packaging Specifications

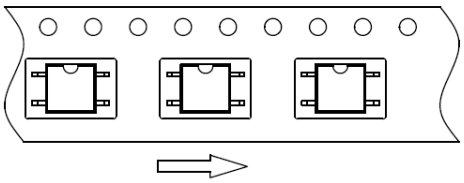
Tape & Reel Specifications (T&R)

Note: *All dimensions in millimeters [mm]*

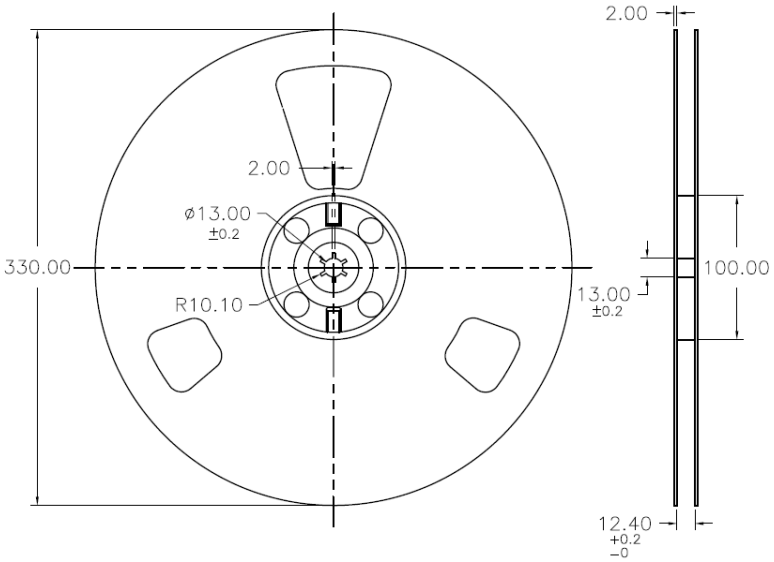
Outline and Dimension (Tape)



Parts Orientation and Tape Direction

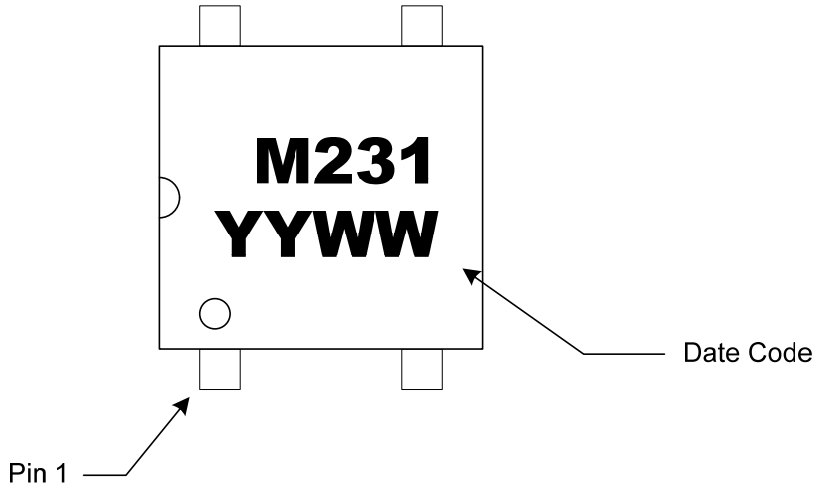


Outline and Dimensions (Reel)



Packaging: 2,000 pcs / reel

M231 Package Marking



M231 Package Weights

Device	Single Unit	Full Tube (100pcs)	Full Pouch (10 tubes)	Full Reel (2000pcs)
M231	0.10	23	240	-
M231-TR	0.10	-	-	500

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

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