



Description

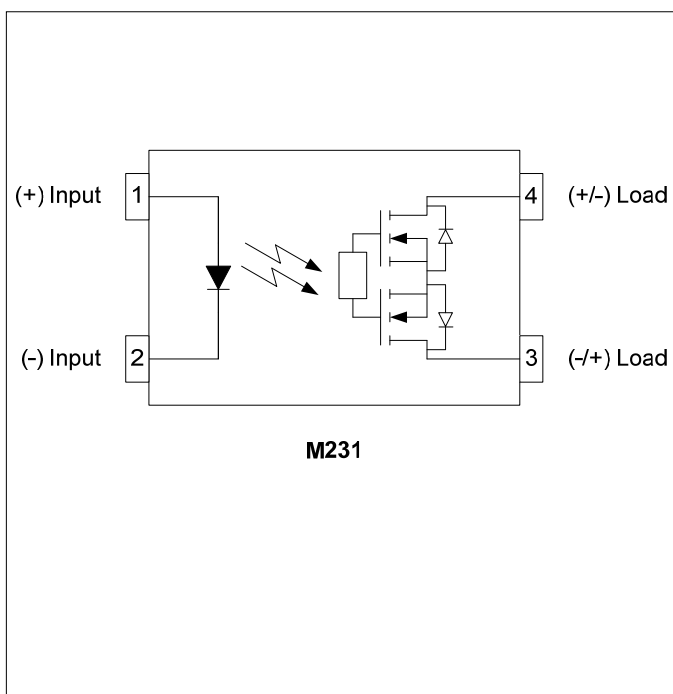
The M231 is a bi-directional, single-pole, single-throw, normally open multipurpose solid-state relay in a miniature 4-pin small outline package. With a high blocking voltage (250V) and low on-resistance, it is ideally suited to high voltage applications requiring higher load currents. The relay consists 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



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 Voltage5V
Input Power Dissipation.....40mW
Total Power Dissipation400mW
Solder Temperature – Wave (10sec).....260°C
Solder Temperature – IR Reflow (10sec).....260°C

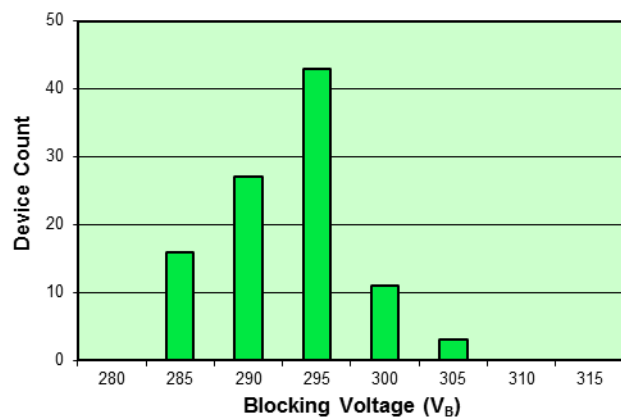
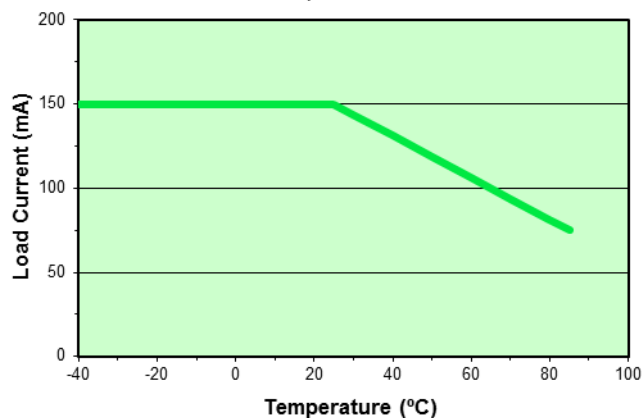
Ordering Information

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

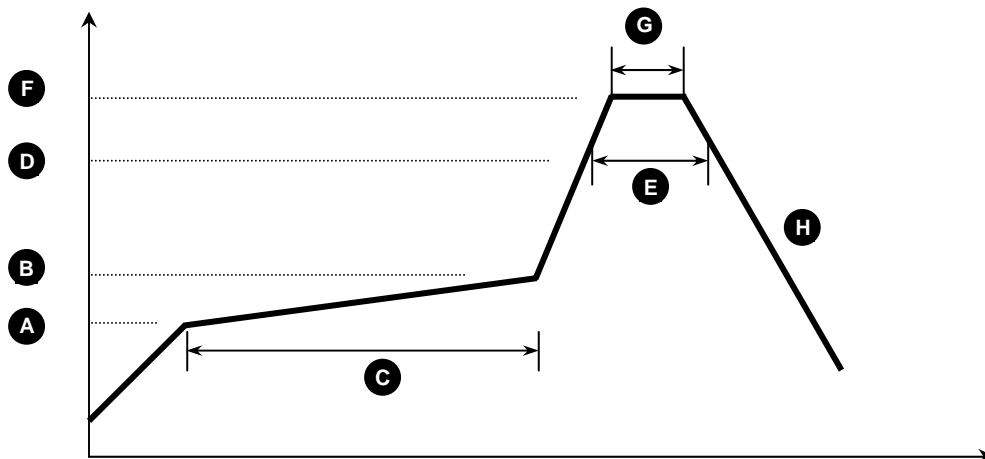
Electrical Characteristics, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.5	V	$I_F = 10\text{mA}$
LED Reverse Voltage	BV_R	5	-	-	V	$I_R = 10\mu\text{A}$
Input Reverse Current	I_R	-	-	10	μA	$V_R = 5\text{V}$
Turn-On Current	I_F	-	2.5	5	mA	$V_O = 20\text{V}$, $I_O = 150\text{mA}$ (within 10mS)
Turn-Off Current	$I_{F(\text{OFF})}$	-	0.5	-	mA	$I_O = 140\text{mA}$
Output Specifications						
Blocking Voltage	V_B	250	-	-	V	$I_O = 1\mu\text{A}$
Continuous Load Current	I_O	-	-	150	mA	$I_F = 5\text{mA}$
On Resistance	R_{ON}	-	6	10	Ω	$I_F = 5\text{mA}$, $I_O = 150\text{mA}$
Leakage Current	I_{leak}	-	0.2	1	μA	$I_F = 0\text{mA}$, $V_O = 250\text{V}$
Output Capacitance	C_{OUT}	-	20	-	pF	$V_O = 25\text{V}$, $f = 1.0\text{MHz}$
Offset Voltage	V_{OFFSET}	-	-	0.2	mV	$I_F = 5\text{mA}$
Coupled Specifications						
Turn-On Time	T_{ON}	-	2	5	mS	$I_F = 5\text{mA}$, $I_O = 140\text{mA}$
Turn-Off Time	T_{OFF}	-	0.15	0.5	mS	$I_F = 0\text{mA}$, $I_O = 140\text{mA}$
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}	1500	-	-	V_{RMS}	$\text{RH} \leq 50\%$, $t = 1\text{min}$
Input-Output Resistance	$R_{\text{I-O}}$	-	10^{12}	-	Ω	$V_{\text{I-O}} = 500V_{\text{DC}}$

M231 Performance & Characteristics Plots, $T_A = 25^\circ\text{C}$ (unless otherwise specified)
Figure 1: Typical Blocking Voltage Distribution
(N = 100, $T_A = 25^\circ\text{C}$)

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 250°C:



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:

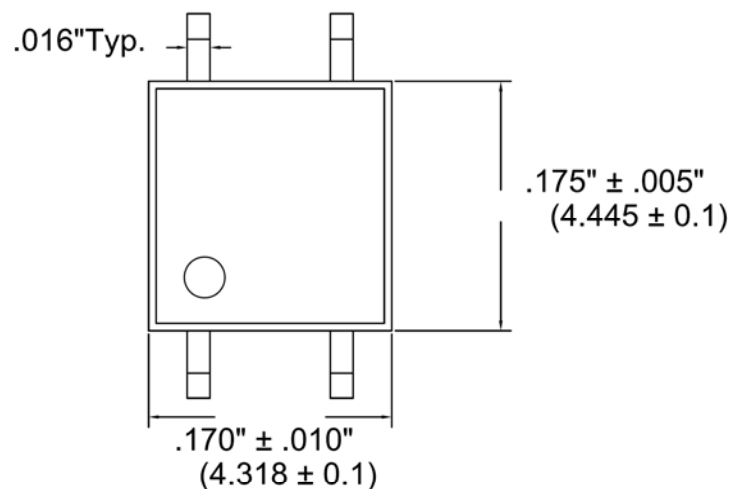
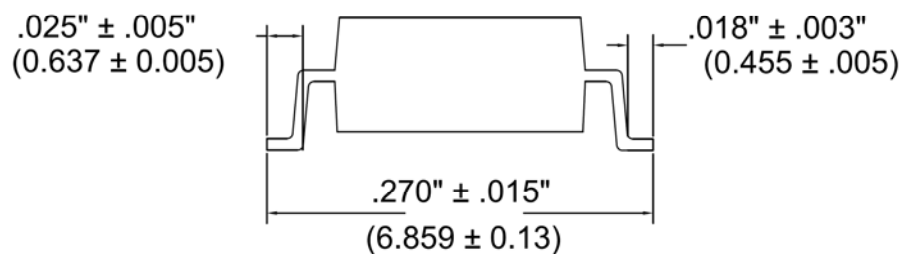
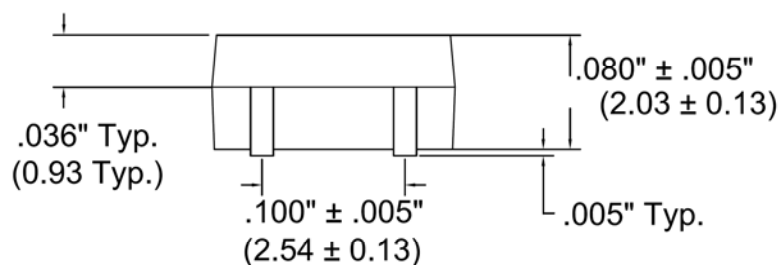
Maximum Temperature: 260°C (at terminal)
Maximum Time: 10s
Pre-heating: 100 - 150°C (30 - 90s)
Single Occurrence

(3) Hand Solder:

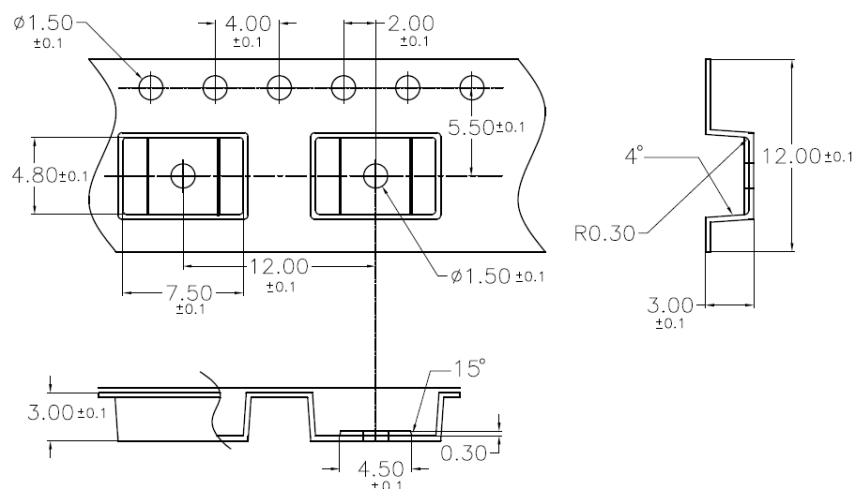
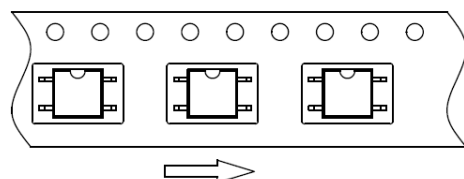
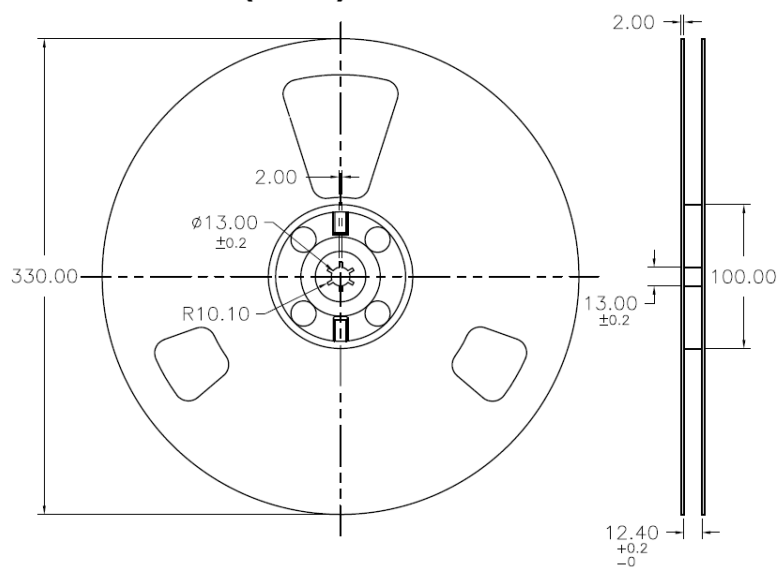
Maximum Temperature: 350°C (at tip of soldering iron)
Maximum Time: 3s
Single Occurrence

M231 Package Dimensions

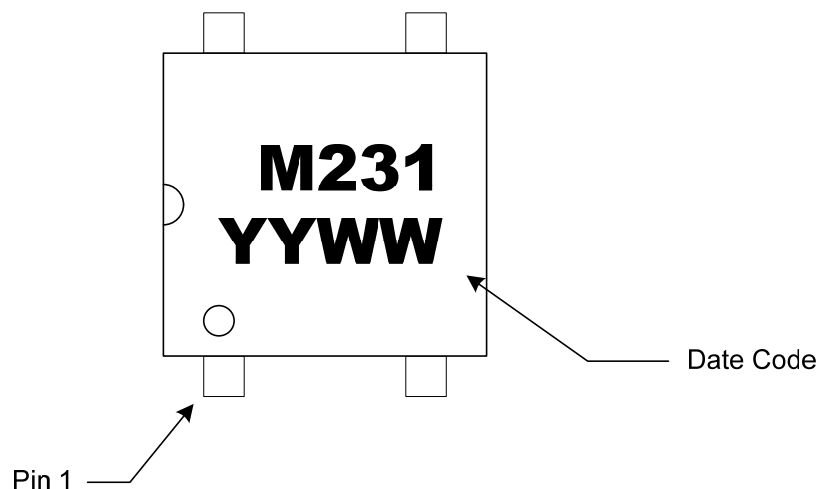
4 PIN SOP Package

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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