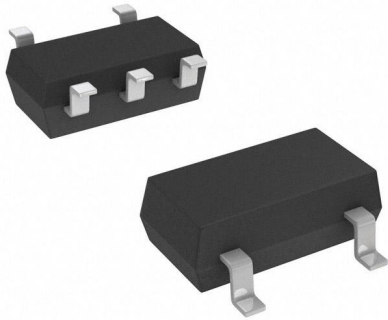


# PQ1T251M2ZP Datasheet

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DiGi Electronics Part Number	PQ1T251M2ZP-DG
Manufacturer	<a href="#">Sharp Microelectronics</a>
Manufacturer Product Number	PQ1T251M2ZP
Description	IC REG LINEAR 2.5V 150MA SOT23-5
Detailed Description	Switching Regulator IC Output

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## Purchase and inquiry

Manufacturer Product Number:

PQ1T251M2ZP

Series:

\*

Base Product Number:

PQ1T251

Manufacturer:

Sharp Microelectronics

Product Status:

Obsolete

## Environmental & Export classification

Moisture Sensitivity Level (MSL):

1 (Unlimited)

HTSUS:

8542.39.0001

ECCN:

EAR99

# PQ1Txx1M2ZP Series

## ■ Features

1. Compact surface mount package (2.9×1.6×1.1mm)
  2. Low power-loss  
(Dropout voltage:TYP. 0.10 V/MAX. 0.15V at  $I_o=60\text{mA}/V_o=3.0\text{V}$ )
  3. High ripple rejection (TYP. 70dB)
  4. Low current operation type  
(Dissipation current at no load:TYP. 35 $\mu\text{A}$ )
  5. Built-in ON/OFF control function  
(Dissipation current at OFF-state:MAX. 1 $\mu\text{A}$ )
  6. Low voltage operation type  
(Input voltage:MIN. 1.8V)
  7. Overcurrent protection functions
- \*It is available for every 0.1V(1.8V to 5.5V)

## ■ Applications

1. Cellular phones
2. Cordless phones
3. Personal information tools(PDA)
4. Cameras/Camcoders
5. PCMCIA cards for notebook PCs

## ■ Model Line-up

Output Voltage (TYP.)	Model No.	Output Voltage (TYP.)	Model No.
1.8V	PQ1T181M2ZP	3.3V	PQ1T331M2ZP
2.5V	PQ1T251M2ZP	3.5V	PQ1T351M2ZP
2.7V	PQ1T271M2ZP	3.6V	PQ1T361M2ZP
2.8V	PQ1T281M2ZP	3.8V	PQ1T381M2ZP
3.0V	PQ1T301M2ZP	4.0V	PQ1T401M2ZP
3.2V	PQ1T321M2ZP	5.0V	PQ1T501M2ZP

## ■ Absolute Maximum Ratings (T<sub>a</sub>=25°C)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V <sub>IN</sub>	9	V
*1 Output control voltage	V <sub>C</sub>	0 to V <sub>IN</sub>	V
Output current	I <sub>O</sub>	400	mA
*2 Power dissipation	P <sub>D</sub>	350	mW
Junction temperature	T <sub>j</sub>	125	°C
Operating temperature	T <sub>opr</sub>	-40 to +80	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C
Soldering temperature	T <sub>sol</sub>	260 (10s)	°C

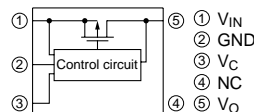
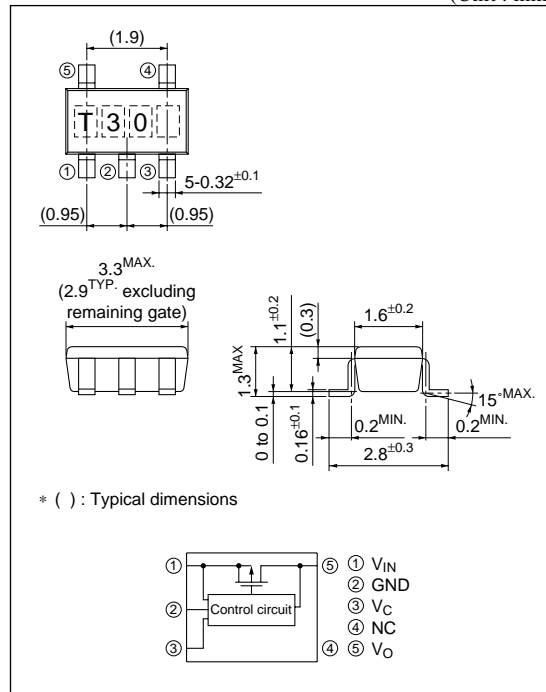
\*1 All are open except GND and applicable terminals

\*2 At mounting PCB

## Low Output Current, Compact Surface Mount Type Low Power-Loss Voltage Regulators

## ■ Outline Dimensions

(Unit : mm)



## ■ Electrical Characteristics

(Unless otherwise specified,  $V_{IN}=V_O(TYP)+1.0V$ ,  $I_O=30mA$ ,  $V_C=1.8V$ ,  $T_a=25^\circ C$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	$V_O$	–	Refer to the following table.1			V
<sup>*3</sup> Output peak current	$I_{op}$	–	310	370	–	mA
Recommended output current	–	–	–	–	150	mA
Load regulation	$R_{egL1}$	$I_O=5$ to 80mA	–	6	36	mV
	$R_{egL2}$	$I_O=5$ to 150mA	–	12	80	mV
	$R_{egL3}$	$I_O=5$ to 300mA	–	25	150	mV
Line regulation	$R_{egI}$	$V_{IN}=V_O(TYP)+1V$ to $V_O(TYP)+6V(MAX. 9.0V)$	–	0.02	0.15	%/V
Temperature coefficient of output voltage	$T_c V_O$	$I_O=10mA$ , $T_j=-25$ to $+75^\circ C$	–	$\pm 50$	–	ppm/ $^\circ C$
<sup>*4</sup> Ripple rejection	RR	Refer to Fig.2	–	70	–	dB
<sup>*4</sup> Output noise voltage	$V_{no (rms)}$	10Hz<f<100kHz, $I_O=30mA$	–	60	–	$\mu V$
Dropout voltage	$V_{I-o1}$	$I_O=60mA$ <sup>*5</sup>	Refer to the following table.2			V
	$V_{I-o2}$	$I_O=150mA$ <sup>*5</sup>	Refer to the following table.3			
	$V_{I-o3}$	$I_O=300mA$ <sup>*5</sup>	Refer to the following table.4			
<sup>*6</sup> ON-state voltage for control	$V_{C(ON)}$	–	1.8	–	–	V
ON-state current for control	$I_{C(ON)}$	$V_{IN}=V_C=9.0V$	–	2	4	$\mu A$
OFF-state voltage for control	$V_{C(OFF)}$	–	–	–	0.8	V
Quiescent current	$I_q$	$I_O=0mA$	–	35	65	$\mu A$
Output OFF-state consumption current	$I_{qs}$	$V_C=0.2V$	–	–	1	$\mu A$

<sup>\*3</sup> Output current shall be the value when output voltage lowers 0.3V from the voltage at  $I_O=30mA$   
 Temperature coefficient of Output peak current: Around 1.3mA/ $^\circ C$   
 (In case of low temperature, current work is lower.)

<sup>\*4</sup> Typical value of 3.0V output type

<sup>\*5</sup> Input voltage when output voltage falls 0.1V from that at  $V_{IN}=V_O(TYP)+1.0V$ .

<sup>\*6</sup> In case that the control terminal (Ⓢ pin) is non-connection, output voltage should be OFF state.

Table.1 Output Voltage Line-up

(  $V_{IN}=V_O(TYP)+1.0V$ ,  $I_O=30mA$ ,  $V_C=1.8V$ ,  $T_a=25^\circ C$ )

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_O$	1.770	1.8	1.830	V
PQ1T251M2ZP	$V_O$	2.462	2.5	2.538	V
PQ1T271M2ZP	$V_O$	2.659	2.7	2.741	V
PQ1T281M2ZP	$V_O$	2.758	2.8	2.842	V
PQ1T301M2ZP	$V_O$	2.955	3.0	3.045	V
PQ1T321M2ZP	$V_O$	3.152	3.2	3.248	V
PQ1T331M2ZP	$V_O$	3.250	3.3	3.350	V
PQ1T351M2ZP	$V_O$	3.447	3.5	3.553	V
PQ1T361M2ZP	$V_O$	3.546	3.6	3.654	V
PQ1T381M2ZP	$V_O$	3.743	3.8	3.857	V
PQ1T401M2ZP	$V_O$	3.940	4.0	4.060	V
PQ1T501M2ZP	$V_O$	4.925	5.0	5.075	V

Table.2 Dropout voltage Line-up( $I_O=60mA$ )(  $V_{IN}(*5)$ ,  $V_C=1.8V$ ,  $I_O=60mA$ ,  $T_a=25^\circ C$ )

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i-o1}$	–	0.17	0.35	V
PQ1T251M2ZP	$V_{i-o1}$	–	0.13	0.18	V
PQ1T271M2ZP	$V_{i-o1}$	–	0.12	0.17	V
PQ1T281M2ZP	$V_{i-o1}$	–	0.11	0.16	V
PQ1T301M2ZP	$V_{i-o1}$	–	0.10	0.15	V
PQ1T321M2ZP	$V_{i-o1}$	–	0.10	0.14	V
PQ1T331M2ZP	$V_{i-o1}$	–	0.10	0.14	V
PQ1T351M2ZP	$V_{i-o1}$	–	0.09	0.14	V
PQ1T361M2ZP	$V_{i-o1}$	–	0.09	0.13	V
PQ1T381M2ZP	$V_{i-o1}$	–	0.09	0.13	V
PQ1T401M2ZP	$V_{i-o1}$	–	0.08	0.12	V
PQ1T501M2ZP	$V_{i-o1}$	–	0.07	0.10	V

<sup>\*5</sup> Input voltage when output voltage falls 0.1V from that at  $V_{IN}=V_O(TYP)+1.0V$ .

Table.3 Dropout voltage Line-up( $I_o=150\text{mA}$ ) $(V_{IN}(*5), V_C=1.8\text{V}, I_o=150\text{mA}, T_a=25^\circ\text{C})$ 

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i-o2}$	—	0.40	0.68	V
PQ1T251M2ZP	$V_{i-o2}$	—	0.31	0.43	V
PQ1T271M2ZP	$V_{i-o2}$	—	0.28	0.40	V
PQ1T281M2ZP	$V_{i-o2}$	—	0.27	0.39	V
PQ1T301M2ZP	$V_{i-o2}$	—	0.25	0.37	V
PQ1T321M2ZP	$V_{i-o2}$	—	0.24	0.35	V
PQ1T331M2ZP	$V_{i-o2}$	—	0.24	0.35	V
PQ1T351M2ZP	$V_{i-o2}$	—	0.23	0.34	V
PQ1T361M2ZP	$V_{i-o2}$	—	0.22	0.33	V
PQ1T381M2ZP	$V_{i-o2}$	—	0.22	0.32	V
PQ1T401M2ZP	$V_{i-o2}$	—	0.21	0.31	V
PQ1T501M2ZP	$V_{i-o2}$	—	0.18	0.27	V

\*5 Input voltage when output voltage falls 0.1V from that at  $V_{in}=V_o(\text{TYP})+1.0\text{V}$ .Table.4 Dropout voltage Line-up( $I_o=300\text{mA}$ ) $(V_{IN}(*5), V_C=1.8\text{V}, I_o=300\text{mA}, T_a=25^\circ\text{C})$ 

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i-o3}$	—	0.64	0.85	V
PQ1T251M2ZP	$V_{i-o3}$	—	0.54	0.74	V
PQ1T271M2ZP	$V_{i-o3}$	—	0.52	0.72	V
PQ1T281M2ZP	$V_{i-o3}$	—	0.51	0.71	V
PQ1T301M2ZP	$V_{i-o3}$	—	0.50	0.70	V
PQ1T321M2ZP	$V_{i-o3}$	—	0.48	0.68	V
PQ1T331M2ZP	$V_{i-o3}$	—	0.47	0.67	V
PQ1T351M2ZP	$V_{i-o3}$	—	0.46	0.65	V
PQ1T361M2ZP	$V_{i-o3}$	—	0.45	0.64	V
PQ1T381M2ZP	$V_{i-o3}$	—	0.44	0.62	V
PQ1T401M2ZP	$V_{i-o3}$	—	0.43	0.60	V
PQ1T501M2ZP	$V_{i-o3}$	—	0.35	0.50	V

\*5 Input voltage when output voltage falls 0.1V from that at  $V_{in}=V_o(\text{TYP})+1.0\text{V}$ .

Fig.1 Standard Test Circuit

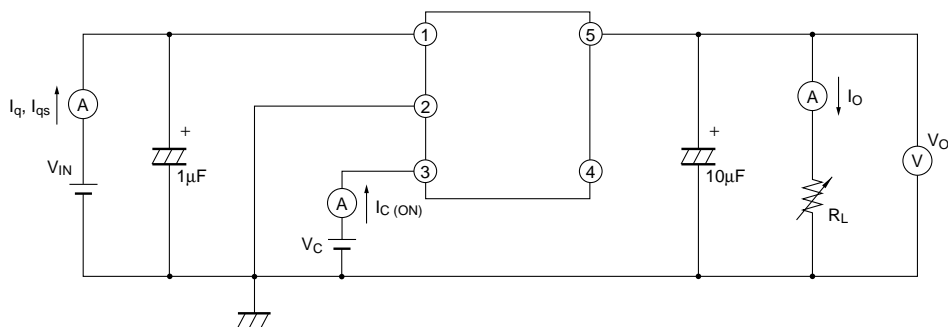
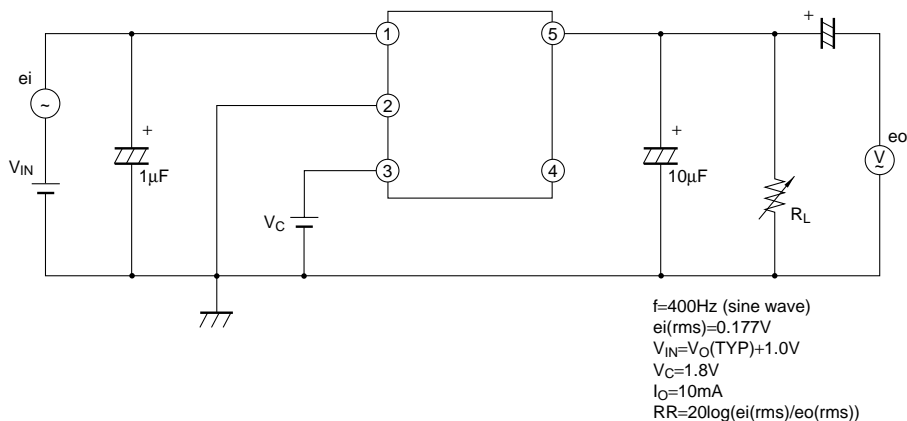
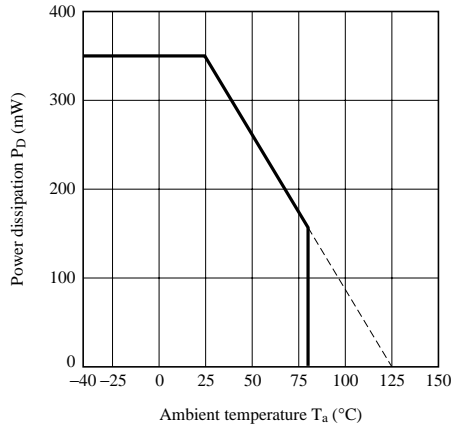


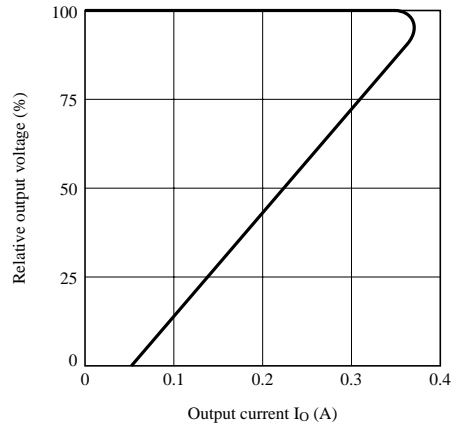
Fig.2 Test Circuit for Ripple Rejection



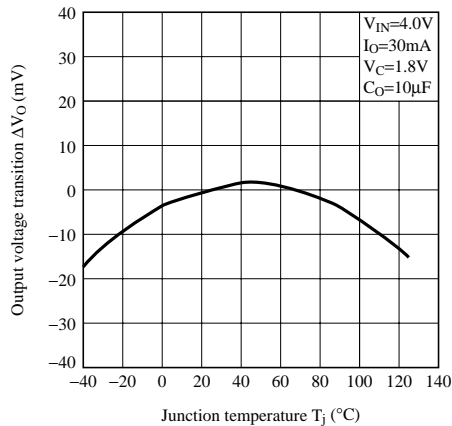
**Fig.3 Power Dissipation vs. Ambient Temperature**



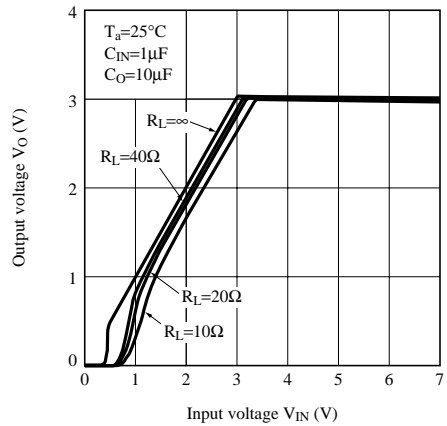
**Fig.4 Overcurrent Protection Characteristics (Typical Value)**



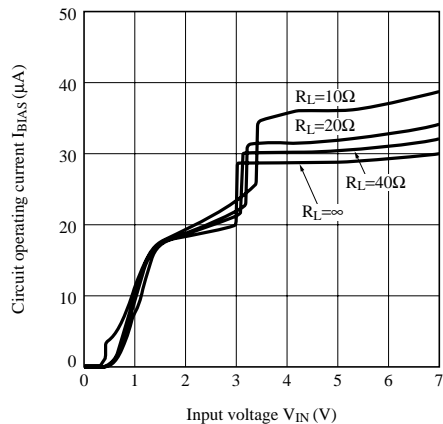
**Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)**



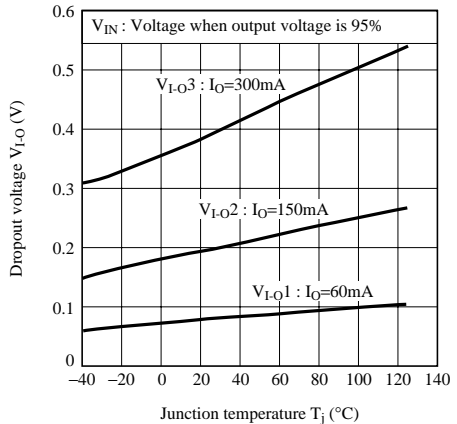
**Fig.6 Output Voltage vs. Input Voltage (PQ1T301M2ZP)(Typical Value)**



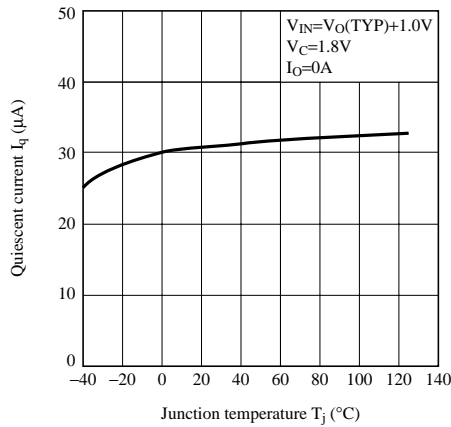
**Fig.7 Circuit Operating Current vs. Input Voltage (PQ1T301M2ZP)(Typical Value)**



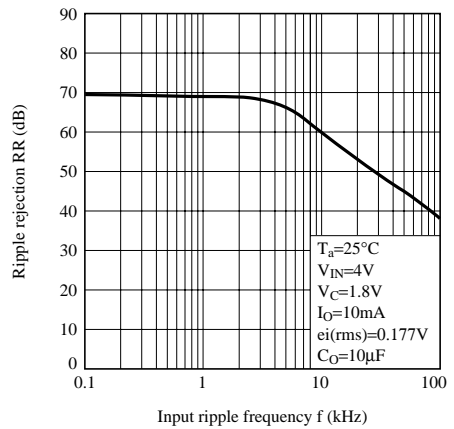
**Fig.8 Dropout Voltage vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)**



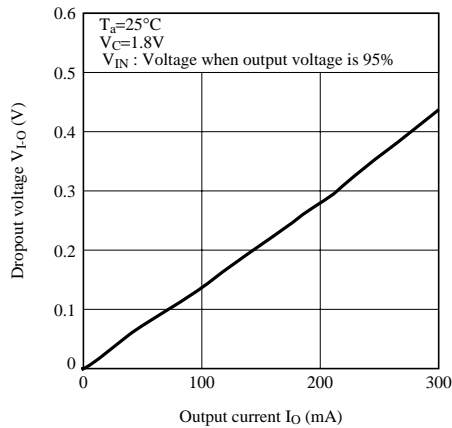
**Fig.9 Quiescent Current vs. Junction Temperature (Typical Value)**



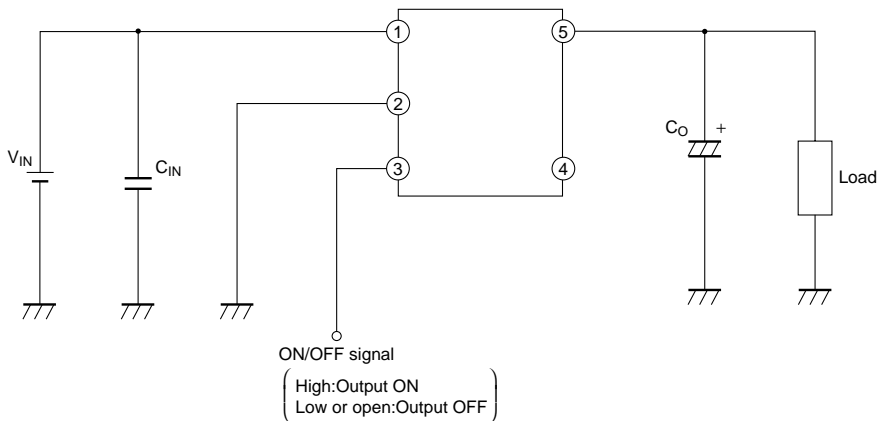
**Fig.10 Ripple Rejection vs. Input Frequency**



**Fig.11 Dropout Voltage vs. Output Current (PQ1T301M2ZP)**

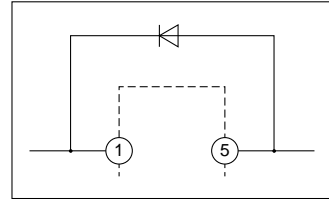


**Fig.12 Example of Application**



### 1. External connection

- (1) Please perform shortest wiring for connection between C<sub>O</sub> or C<sub>in</sub> and the individual terminal. There is case that oscillation occurs easily by kinds of capacity capacity and how to wire. Before you use this device, you should confirm output voltage in your actual using conditions.
- (2) The input terminal for ON/OFF output control is compatible with LS-TTL, and direct driving by TTL or C-MOS standard logic (RCA 4000 series) is also available.
- (3) If voltage is applied under the conditions that the device pin is connected divergently or reversely, the deterioration of characteristics or damage may occur. Never allow improper mounting.
- (4) If voltage exceeding the voltage of DC input terminal ① is applied to the output terminal ⑤, the element may be damaged. Especially when the DC input terminal ① is short-circuited to the GND in ordinary operating state, charges accumulated in the output capacitor C<sub>o</sub> flow to the input side, causing damage to the element. In this case, connect the ordinary silicon diode as shown in the figure.



### 2. Thermal protection design

Maximum power dissipation of devices is obtained by the following equation.

$$P_D = V_{IN} \times I_{IN} - V_O \times I_O$$

When ambient temperature T<sub>a</sub> and power dissipation P<sub>D</sub> (MAX.) during operation are determined, use a heat sink which allows the element to operate within the safety operation area specified by the derating curve. Insufficient radiation gives an unfavorable influence to the normal operation and reliability of the device.

These devices are without built-in overheat protection function.

### 3. ESD (Electro Static Discharge)

Be careful not to apply electro static discharge to the device since this device employs a CMOS IC and may be damaged by electro static discharge. Followings are some methods against excessive voltage caused by electro static discharge.

- (1) Human body must be grounded to discharge the static electricity from the body or cloth.
- (2) Anything that is in contact with the device such as workbench, inserter, or measuring instrument must be grounded.
- (3) Use a solder dip basin with a minimum leak current (isolation resistance 10MΩ or more) from the commercial power supply. Also the solder dip basin must be grounded.

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    - Test and measurement equipment
    - Industrial control
    - Audio visual equipment
    - Consumer electronics
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    - Gas leakage sensor breakers
    - Alarm equipment
    - Various safety devices, etc.
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    - Telecommunication equipment [trunk lines]
    - Nuclear power control equipment
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