

Chip resistor for current detection (metal plate type)

High Power Low Ohmic Shunt Resistors GMR Series

• Overview

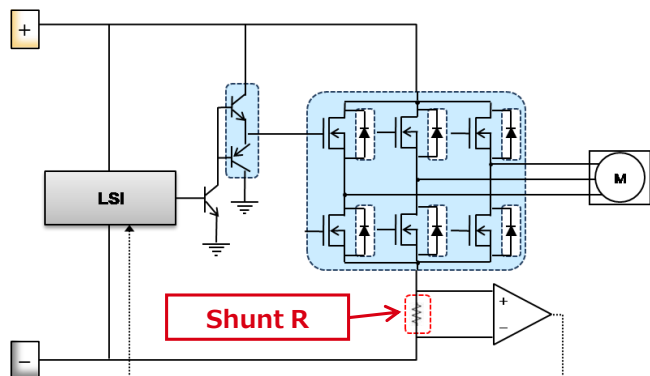
The GMR100 series of shunt resistors feature high dissipation and reliability. And high rated power in a compact form factor is achieved by optimizing the heat dissipation path.

• Features

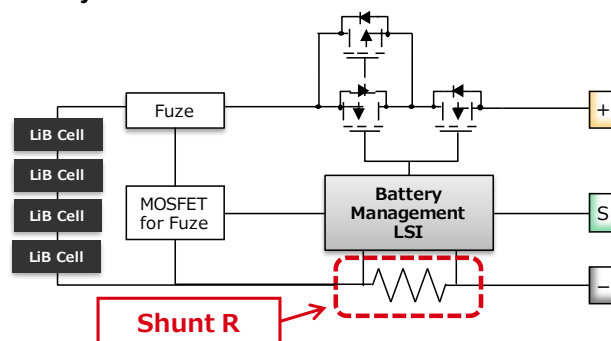
- 1) High power 3W
- 2) High heat dissipation
- 3) Excellent TCR characteristics
- 4) Broad resistance range: 5mΩ to 220mΩ

• Usage Examples

Motor Drive Circuit



Battery Protection Circuit



• Specifications

Part No.	Size mm (inch)	Rated Power (W)	Tolerance	Temperature Coefficient of Resistance (ppm/°C) *1	Resistance Range (mΩ)	Operating Temperature Range (°C)	Automotive Grade (AEC-Q200)
GMR100	6432 (2512)	3	F(±1%)	0 to +50	☆5	-55 to +170	Yes
				±20	10~220(E6) *2		

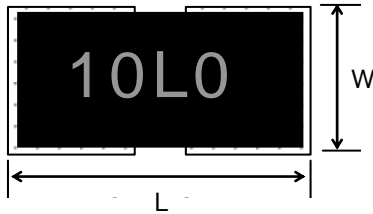
☆ Under development, *1: +20°C to +60°C, *2: Please inquire for resistance values outside the normal range.

●Dimensions

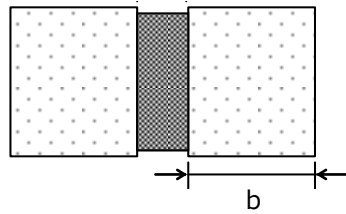
Unit : mm

Part No.	L	W	t	b
GMR100	6.40±0.25	3.20±0.25	0.40±0.15	2.75±0.25

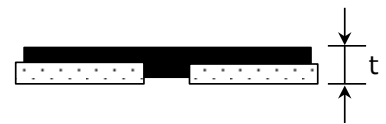
(Upper)



(Bottom)



(Side)



● Part Number Description

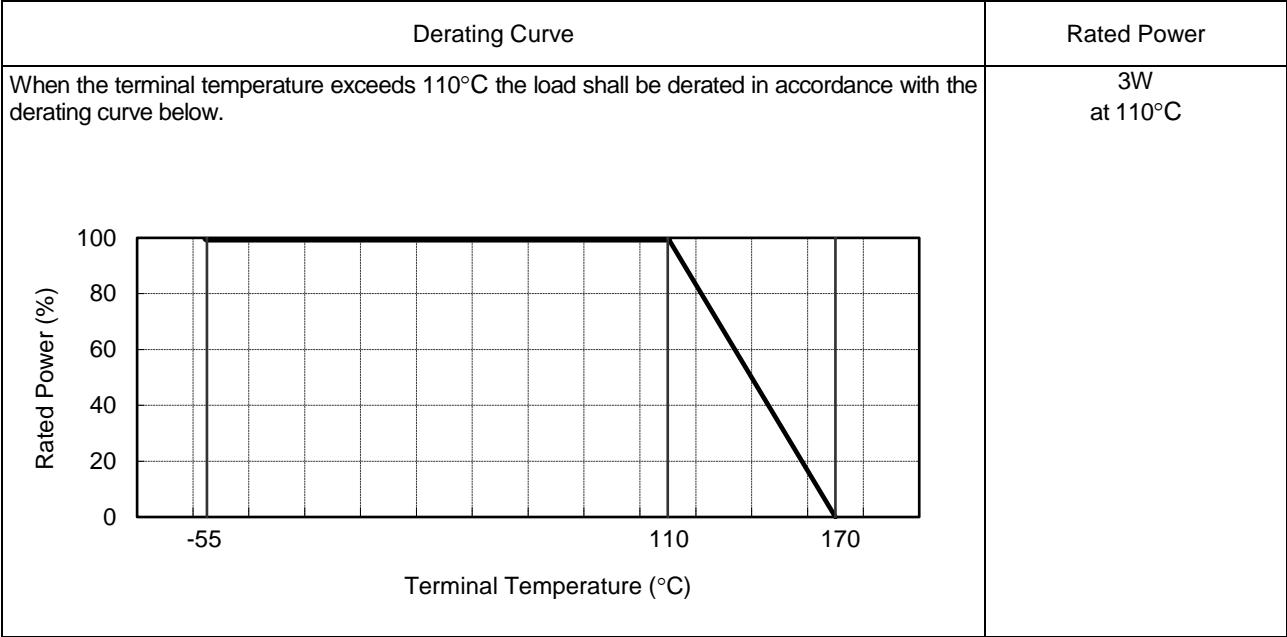
GMR100HTBAFA□□□(□)

Part No.

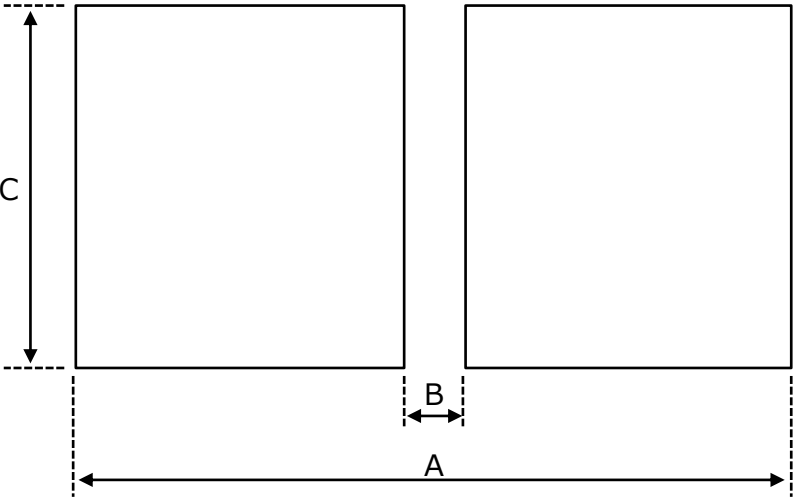
Packaging
CodeProduct
CodeCustom
CodeResistance
ToleranceSpecial
CodeNominal
Resistance Value
(IEC Code)

Resistance	Part No.	Packaging Code	Product Code	Custom Code	Resistance Tolerance	Special Code	Nominal Resistance Value (IEC Code)
10mΩ	GMR100	H	TB	-	F	A	10L0
15mΩ				-		E	R015
20mΩ				-		H	R020
22mΩ				-		I	R022
33mΩ				-		M	R033
39mΩ				-		O	R039
40mΩ				A		A	R040
47mΩ				-		Q	R047
56mΩ				-		S	R056
100mΩ			TC	-		A	R100
220mΩ				-		I	R220

● Derating Curve



● Land Pattern Example



Unit : mm

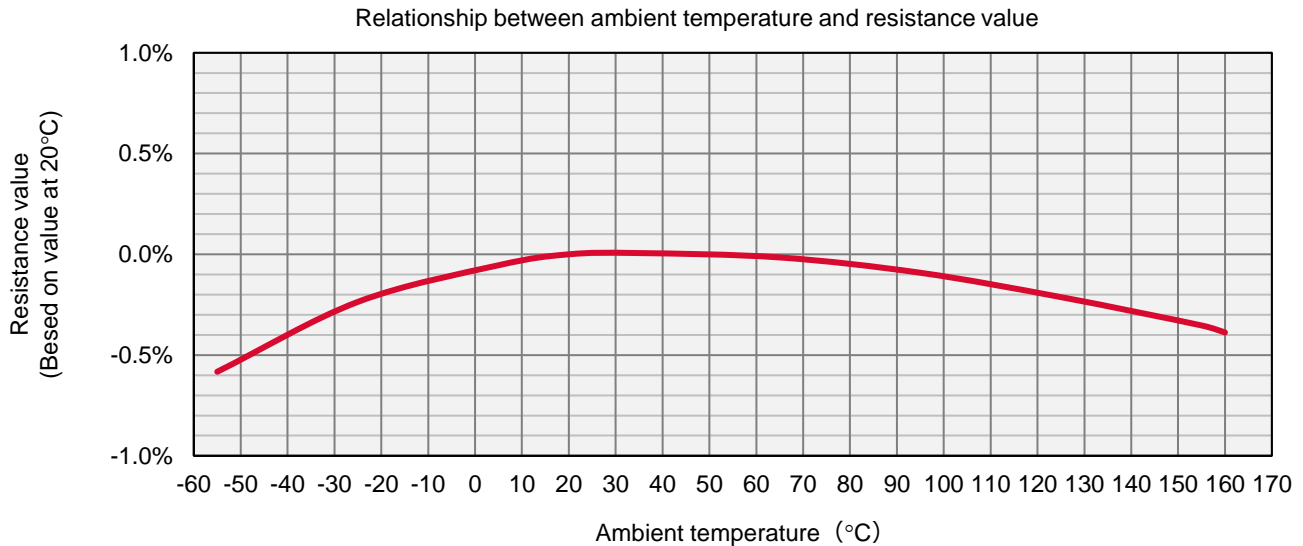
Part No.	A	B	C
GMR100	7.1	0.6	3.6

■Characteristic

Temperature Coefficient of Resistance

The resistive metal alloy used in the GMR series features low TCR (Temperature Coefficient of Resistance).

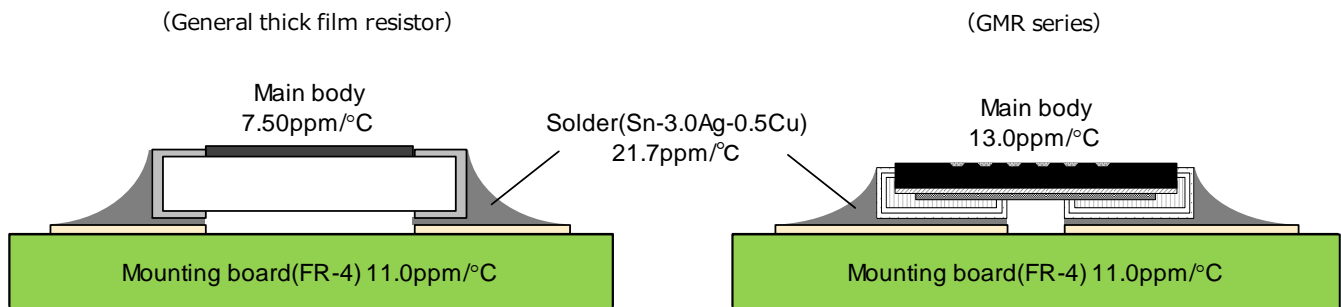
In particular, the resistance change between 20°C and 60°C is minimized. (The graph below is a representative example of a 100mΩ product)



Temperature Cycling

- The coefficient of thermal expansion (lateral direction) of the main body of the GMR series is closer to the mounting board (FR-4) than that of general-purpose chip resistors, making it less susceptible to solder cracks.

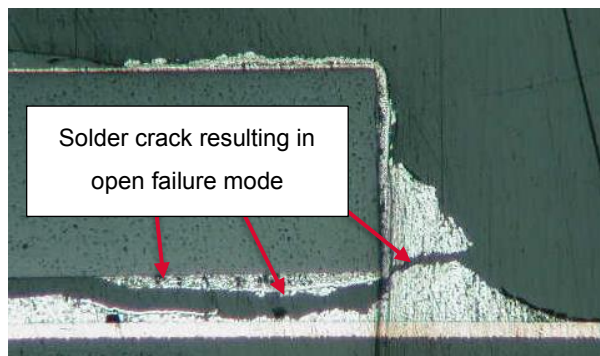
*For mounting boards other than FR-4, please use only after conducting thorough evaluation



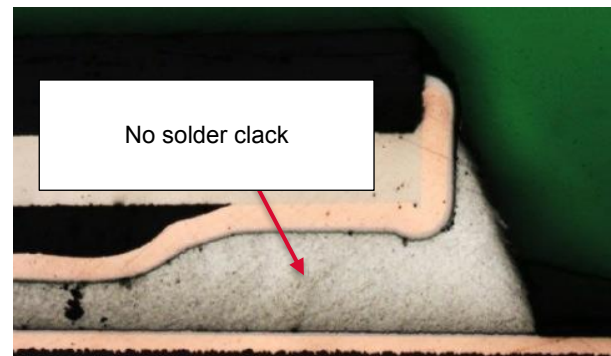
(Reference Data)

Temperature Cycling Test Conditions: -55°C ⇄ +155°C

1. MCR100 (6.4×3.2mm, Standard Type)



2. GMR100 (6.4×3.2mm)

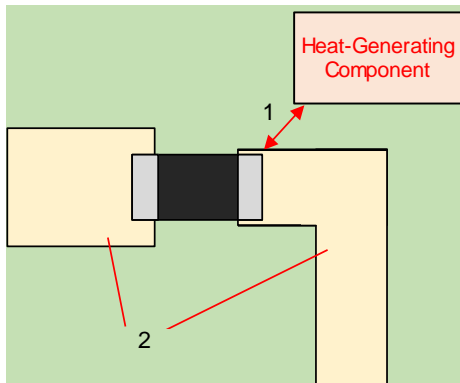


■ Precautions on the usage of shunt resistors

Thermal EMF (Electromotive Force)

A small voltage is generated when a temperature difference occurs between the left and right terminals of a metal plate shunt resistor.

This is caused by thermal EMF, and affects the accuracy of the detection voltage, so during circuit design it is necessary to consider the placement of heat generating parts and wiring layout in order to prevent temperature differences.



Case 1

The distance between the shunt resistor and heat generating component is close. As a result, the temperature of the right electrode is higher than that of the left, generating a small voltage via thermal EMF.

Case 2

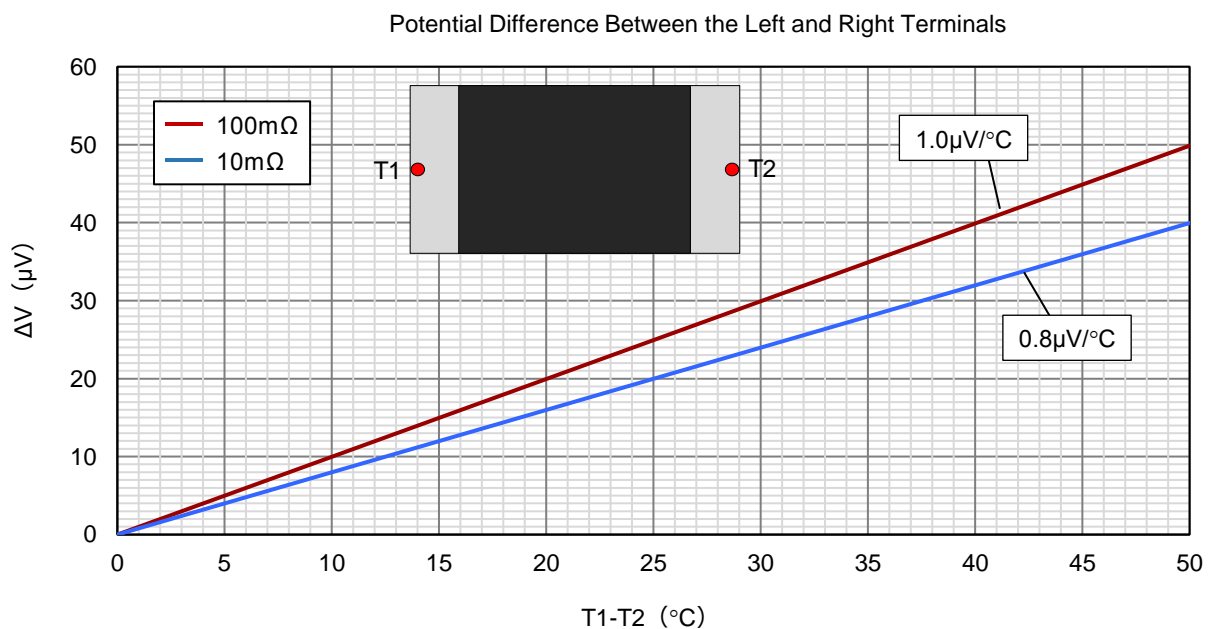
The width of wiring or wiring pattern is asymmetrical, causing a small voltage to be produced by thermal EMF due to the difference in heat generation between the right and left terminals.

Reference Data

The graph below shows the generated voltage due to thermal EMF of 10mΩ and 100mΩ GMR series resistors.

As you can see, the low thermal EMF of the GMR100 series results in a low generated potential that will not significantly affect the detection accuracy.

However, please note that this thermal EMF will vary depending on the product, so caution is required.



Resistance	Rated power (W)	Rated Current (A)	Conversion voltage (μV)	Thermal E.M.F (μV/°C)	Ex.)T1-T2=30°C、Impact on detection accuracy		
					Rated power 10% load	Rated power 50% load	Rated power 100% load
10mΩ	3	17.3	173,205.1	0.8	0.04%	0.02%	0.01%
100mΩ	3	5.5	547,722.6	1.0	0.02%	0.01%	0.01%

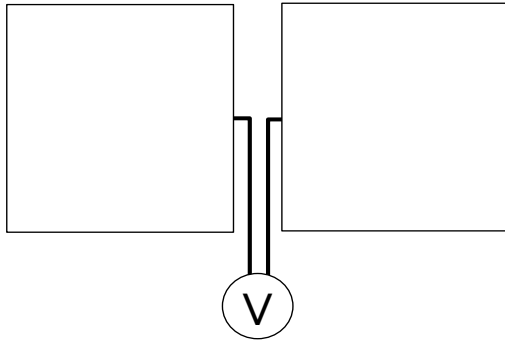
Relationship Between Voltage Detection Accuracy and Resistance Value

The actual resistance value of a shunt resistor when mounted on a board will vary depending on the land pattern, current path, and voltage detection position.

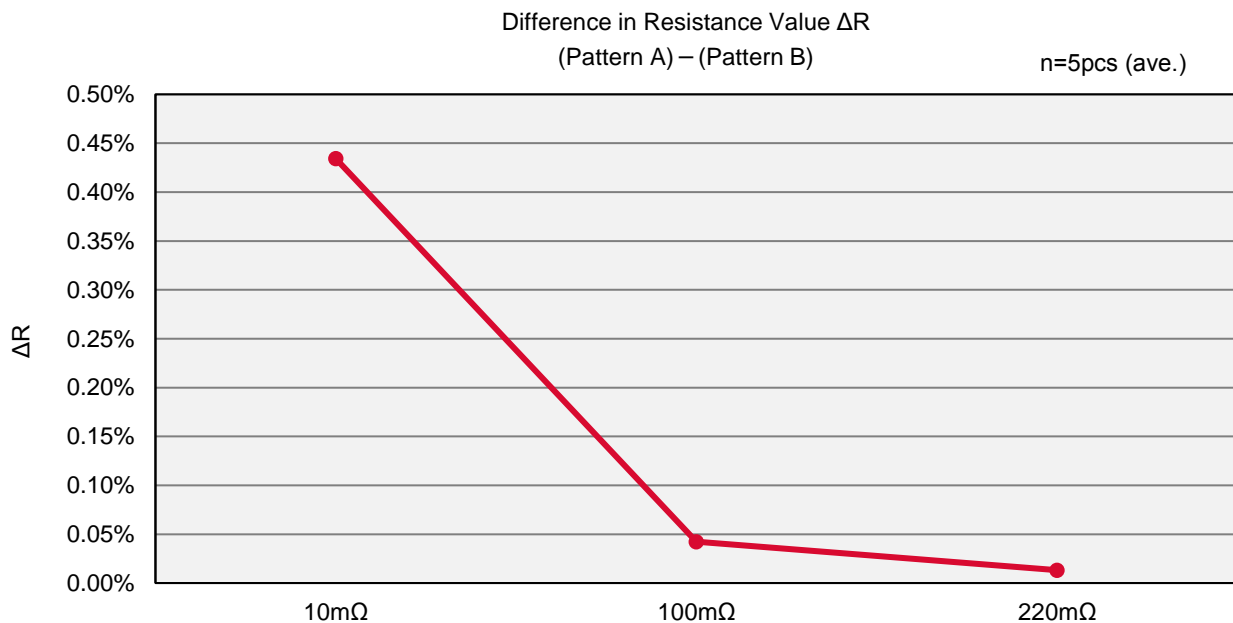
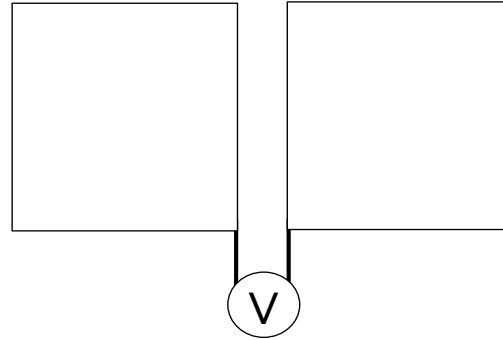
The graph below shows the resistance value when changing the voltage detection position using the same land pattern and current path.

As you can see, the voltage detection position has a greater impact at lower nominal resistances, so care must be taken.

<Pattern A>



<Pattern B>



Heat Generation at Load

High Current Circuits

In large current circuits, in addition to the joule heat generated in the resistor, heat generated in the wiring pattern and soldering cannot be ignored, and can lead to large heat generation in the total circuit.

Therefore, in high current circuits please use a wide, thick wiring pattern with sufficient heat dissipation design and be sure to verify the temperature rise beforehand.

Component Heat Generation

The resistor temperature may exceed the maximum operating temperature depending on the type of mounting board, wiring pattern, and heat generation/ambient temperatures of the surrounding components – regardless of the magnitude of load power – so please verify in advance and ensure operation under conditions that will not cause damage to the mounting board or peripheral parts.

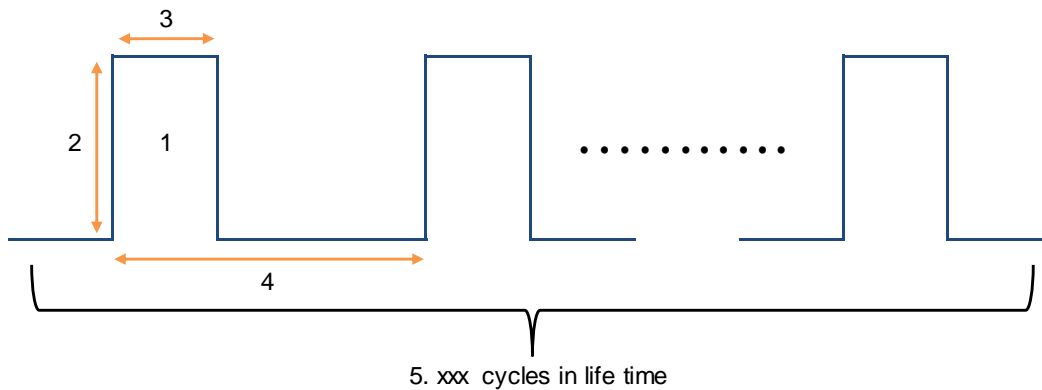
Make sure in advance you use it in the condition that it does not damage the mounting board and the surrounding components.

■ Technical Support Examples

Pulse Determination

Our guaranteed power is the rated power, but in the case where overload that exceeds the rated power is instantaneously applied for less than 1s by design, we request the following waveform conditions by the customer in order to determine if the overload value will be problematic.

1. Pulse waveform
2. Pulse peak power or current
3. Pulse width
4. Pulse period
5. Number of pulse repetitions

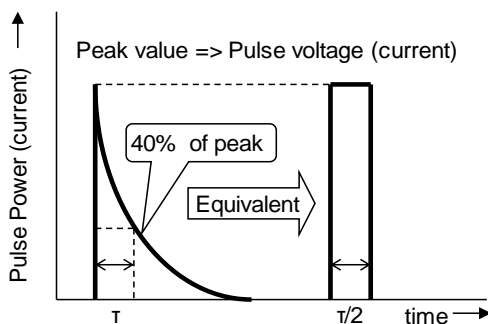


Pulse Waveform Conversion

Pulse determination is made at ROHM based on evaluation of pulse performance using rectangular waves.

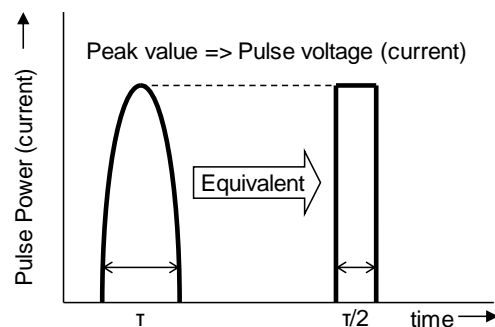
As a result, determination involves first converting the customer's waveform(s) into rectangular waves.

(1) Capacitor discharge waveform



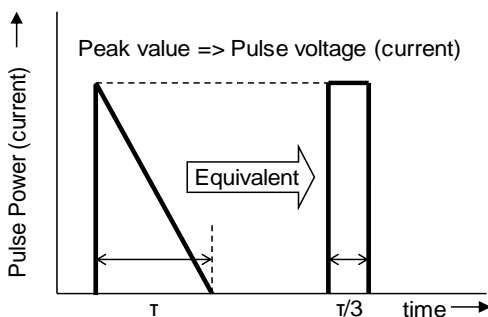
The pulse time (T) is determined to be the time it takes for the voltage (current) to drop to less than 40% of the peak value

(2) Sine waveform



When converting sine waves to rectangular waves, the pulse time will be $1/2$

(3) Triangular waveform



When converting triangular waves to rectangular waves, the pulse time will be $1/3$

Notes

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- 2) Before you use our Products, please contact our sales representative and verify the latest specifications :
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- 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
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- 7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.
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