Electro-Pyrotechnic Initiator Chip Resistor

Electro-pyrotechnic initiator resistors, also known as bridge resistors, are resistive elements, which convert electrical energy into heat energy in a precise electro-thermal profile for the purpose of initiating a series of pyrotechnic events in a controlled energetic reaction. In automotive applications this effect is used to deploy automotive airbags and other safety devices. These same devices are also used in military applications for pilot ejection systems, explosive bolt disengagement of airbone missiles, chaff dispensers, artillery projectile activators, anti-tank mines, etc. Commercially, they are used in mining and de-constructions applications.

FEATURES

Pb-free Available

RoHS* COMPLIANT

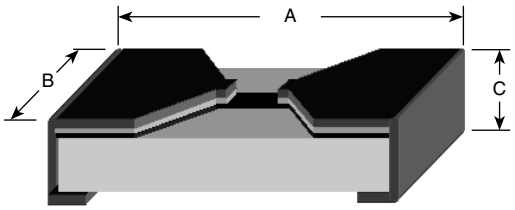
Vishay has developed a special thin film resistor chip specifically designed to provide pyrotechnic engineers with a lot of advantages

- Firing energy down to 50 µJ
- Firing time down to 50 µs
- Ohmic range: 2R to 10R
- Compatibility with various pyrotechnic composition even with no primer
- Joule effect ignition or flash ignition for very fast firing
- Easy set up by design of firing levels
- “No fire”/“all fire” ratio up to 70 %
- Very predictable, reproducible and reliable behaviour
- Size: 0603 preferred - other size available upon request

PRINCIPLE OF OPERATION

The two main parameters of an EPIC are “no fire” and “all fire” conditions.
“No fire” represents the immunity of the resistor to the environmental electro-magnetic pollution and electric continuity test: Therefore customer will have to provide Vishay/Sfernice with “no firing” conditions: Maximum current and longest duration when part should not ignite the explosive powder.
“All fire” represents the command pulse. Customer will have to provide Vishay/Sfernice with “all firing” conditions: Minimum current, duration necessary to ignite the explosive powder.

DIMENSIONS in millimeters (inches)



CASE SIZE	DIMENSION		
	A	B	C
	MAX. TOL. + 0.152 (0.006) MIN. TOL. - 0.152 (0.006)	MAX. TOL. + 0.127 (0.005) MIN. TOL. - 0.127 (0.005)	MAX. TOL. + 0.127 (0.005) MIN. TOL. - 0.127 (0.005)
0603	1.52 (0.060)	0.75 (0.030)	0.5 (0.020)

MECHANICAL SPECIFICATIONS

- Substrate: Special alumina based substrate
- Resistive element: Fine line patterned Tantalum nitride thin film layer
- Diffusion and conductive thin film layers
- Terminations: Wraparound over nickel barrier

TECHNOLOGY

This technology contributes to the stability of the heating element, the precise electro-thermal response profile and the ability to design a precise activation energy.
All these features are perfectly controlled on high production volumes.

* Pb containing terminations are not RoHS compliant, exemptions may apply

For technical questions, contact: sfer@vishay.com

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EXAMPLE OF APPLICATION

Chip: 0603
R: 2R ± 0R2
Energy: Around 1.5 mJ
Response time: 0.2 ms
Mounting Recommendations
EPIC can be mounted either on a PCB or on a squib. Please refer to Application Note (http://www.vishay.com//doc?53044) to see Vishay/Sfernice recommendations.

AIRBAGS INITIATORS

A prerequisite to valid reliability estimation of an electro-explosive device (EED) is a sensitivity test program carefully chosen and properly perform. The Bruceton Method (or up and down method) of sensitivity testing was developed specifically for ordinance testing. Here under is an example of Bruceton's test results.
2 customers: Customer A and customer B have equipped squibs of their own with 3 variants (Variant 1, 2 and 3) . Bruceton's test results of Vishay heating elements are shown in Table 1

HEATING ELEMENT	CUSTOMER A		CUSTOMER B	
	NF (in mA)	AF (in mA)	NF (in mA)	AF (in mA)
Variant 1	546	766	538	776
Variant 2	571	839	577	859
Variant 3	619	891	612	875

CONCLUSION

Bruceton test results are self explanatory. They show that the electro-thermal behavior of EPIC is predictable, precise and reproducible.
For more information please read the Application Note (http://www.vishay.com/doc?53044).

HOW TO GET THE RIGHT EPIC

Each EPIC will have to be adapted to customer pyrotechnic element. To reach the right product, Vishay/Sfernice works by "iteration". Upon receipt of the EPIC Design Guide (http://www.vishay.com/doc?53045) duly filled, an initial sampling lot is given to customer (along with an EPIC reference) so he can provide Vishay/Sfernice with "no firing"/"all firing" conditions.
Then Vishay/Sfernice will be able to provide a new set of samples (eventually tooling charges will be necessary). Ohmic value of samples will remain the same, but there will be a new compromise between the length, the width and the thickness of the filament so as to increase the sensitivity of the EPIC and adapt the firing conditions to the pyrotechnic element of the customer.
When the right parameters are reached Vishay/Sfernice will design a final set of mask (with the participation of the customer).

ORDERING PROCEDURE

New Global Part Numbering: EPICxxxxNT

E	P	I	C	x	x	x	x	N	T

MODEL	xxxx	TERMINATION (1)	PACKAGING
EPIC	Will be determined at time of design	**N:** Tin/silver **B:** Tin/lead **G:** Gold	**W** = Waffle pack **T** = Tape and reel

Notes

(1) Tin/lead: Please consult

- EPIC being a semi-custom product, please fill EPIC Design Guide (http://www.vishay.com/doc?53045) and send to sfer@vishay.com to get appropriate part number.
- Per Vishay policy all the components designed for automotive applications should be tested in accordance to AEC Q200 specification. As the EPIC is just part of an ignitor which is designed and qualified by each customer Vishay is not proceeding to any AEC Q200 test.

Disclaimer

All product specifications and data are subject to change without notice.

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