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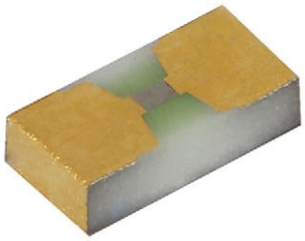
Electro-Pyrotechnic Initiator Thin Film Chip Resistor



LINKS TO ADDITIONAL RESOURCES

3D Models

The electro-pyrotechnic initiator thin film chips (EPIC) are resistors dedicated to pyrotechnic applications. The EPIC resistors are based on Ta_2N thin film technology deposited on specifically prepared ceramic substrate for optimized dissipation purpose. The standard case geometry (SMD) enables the implementation of assembly process commonly used in the electronic component industry (pick and place, reflow soldering on flat PCB used as header) providing high productivity. The principle of EPIC is to 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 the mining industry, as the bridge wire (BW) technology, the EPIC is commonly used in electronic detonators (digital blasting) for very precise rock fragmentation. The EPIC resistors are designed for any pyrotechnic application requiring very fast and reproducible ignition.

FEATURES

Pb-free Available

RoHS* Available

- Surface Mount Design for standard assembly process
- SMD version only
- Active area designed upon performances
- Case size 0603
- Firing energy down to 50 µJ
- Firing time down to 50 µs
- Ohmic value: 2 Ω to 10 Ω ± 15 % (typical) (1)
- Joule effect, 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 behavior
- Compatibility with pyrotechnic element has to be tested in real environment

Notes

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

(1) For ohmic value < 3 Ω the tolerance will be discussed with Vishay Sfernice

TECHNOLOGY

The EPIC active area (heating zone) will be impregnated by the user with a primary pyrotechnic material (usually wet primer followed by drying) in such way to ensure an intimate contact for an optimum heat transfer of thermal energy. The geometry of the active area of the EPIC, and both the primer chemistry and its impregnation method, will determine the global performances. Note that the active area of EPIC shall not be put in direct contact with explosive powder as grain size will not ensure intimate contact and will induce non reproducible and non reliable performances.

The two main characteristics of a EPIC resistor are their “All Fire” (AF) and “No Fire” (NF) performances:

- “All Fire” (AF) represents the command pulse where the major amount of the dissipated energy will be transferred to the primer to generate the ignition. Customer will have to provide Vishay Sfernice with “All Fire” conditions, usually with capacitance discharge parameters or with minimum current or voltage and corresponding short pulse duration.
- “No Fire” (NF) represents the immunity of the resistor with primer to the environmental electro-magnetic pollution and electric continuity test, where the major amount of the dissipated energy will be transferred to the substrate to ensure no ignition. Customer will have to provide Vishay Sfernice with “No Fire” conditions, usually maximum current or voltage and corresponding longest duration. In case of applicable capacitance discharge test the parameters shall also be provided.

ASSEMBLY PRECAUTIONS

In order to obtain reproducible ignition performances it is important that the assembly process fulfills the following criteria:

- Do not use iron soldering method to mount the EPIC on its header because uncontrolled amount of solder could impact the heat transfer (potential misfire or ignition delay).
- Take specific precautions, such as no air bubble during preparation and application of primer, in order to ensure the intimate contact of pyrotechnic primer and EPIC active area (potential misfire).
- Take specific handling precaution in order not to damage EPIC active area (ex: pickup head design for pick and place or specific fixing tools in the entire assembly process).
- The EPIC reliability is only guaranteed for one single reflow profile.
- In case of necessity to dismantle an EPIC, another EPIC must be used (no rework is allowed)
- Pay specific attention to the cleaning process after reflow soldering in order not to damage the active area and to keep it clean from various pollutions

STANDARD ELECTRICAL SPECIFICATIONS			
MODEL	SIZE / CASE DESIGNATION (1)	RESISTANCE RANGE Ω	RESISTANCE TOLERANCE %
EPIC (SMD)	0603	2 to 10	15 to 30

Note

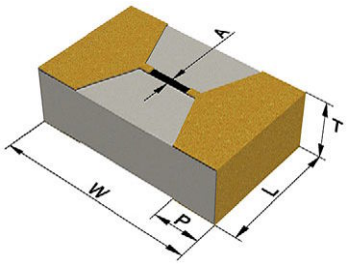
(1) Detailed dimensions are specified in Dimensions and Tolerances table

RANGE OF IGNITION PERFORMANCES					
MODEL	"NO FIRE" CURRENT A	"NO FIRE" DURATION s	"ALL FIRE" CURRENT A	IGNITION TIME ms	"ALL FIRE" ENERGY µJ
EPIC	0.3 to 0.8	2 to 5	Down to 0.8	Down to 0.05	Down to 50

Note

- Ignition performances are dependent on both pyrotechnic primer chemistry and active area geometry

DIMENSIONS AND TOLERANCES in millimeters (inches)



MODEL	SIZE / CASE DESIGNATION	WIDTH W	LENGTH L	THICKNESS T	INSULATION DISTANCE I	BACK SIDE PADS P	ACTIVE AREA WIDTH TOLERANCE A
EPIC (SMD)	0603	1.52 ± 0.15 (0.080 ± 0.006)	0.76 ± 0.13 (0.030 ± 0.005)	0.40 ± 0.13 (0.016 ± 0.005)	-	0.38 ± 0.13 (0.015 ± 0.005)	± 0.007 (± 0.0003)

CONSTRUCTION

- Substrate: ceramic (alumina)
- Resistive element: Ta_2N
- Terminations: SMD wraparound
- Electro-plated gold or hot dipped tin-silver on nickel

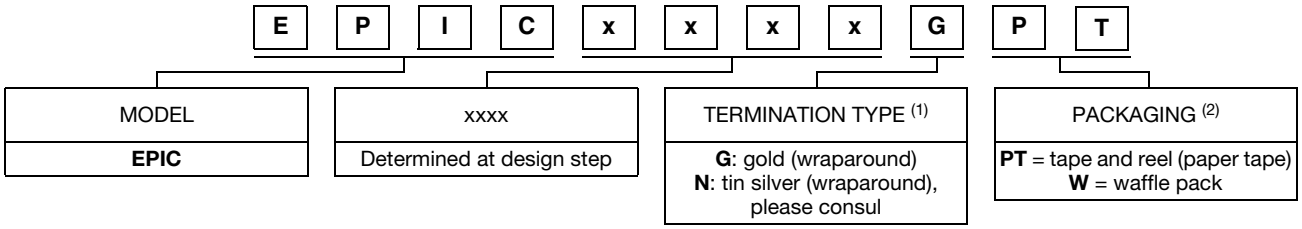
HOW TO GET THE RIGHT EPIC

Each EPIC will have to be adapted to customer pyrotechnic primer chemistry (energetic material). To reach the right EPIC design it is necessary to work by "iterations". Upon receipt of the EPIC Design Guide duly filled, an initial sampling lot is given to customer (along with a EPIC reference) so he can provide "No Firing" / "All Firing" performances obtained after first testing. After the analysis of these first test results a new set of samples will be proposed (eventually tooling charges will be necessary) in order to get closer to the customer requirements. It may be several iterations until the right design is found. It may also happen that all requirements cannot be fulfilled simultaneously and then a compromise will be necessary between EPIC design and customer pyrotechnic primer chemistry or ignition parameters.

When the iterations are finished, which means that the design is validated with total or partial requirements fulfilled, Vishay Sfernice will design a final set of photomasks for serial production.

ORDERING PROCEDURE

Global Part Numbering: EPICxxxxGT



Notes

- EPIC being a semi-custom product, please fill EPIC / MEPIC Design Guide

(1) Gold termination finish valid for both reflow soldering and conductive gluing. Tin Silver termination finish only valid for reflow soldering

(2) Customer assembly process requirement:
- Waffle pack for manual placing on PCB
- Tape and reel for automatic pick and place

Massive Electro-Pyrotechnic Initiator
AEC-Q200 Qualified Resistor Chip

DESIGN SUPPORT TOOLS

click logo to get started

3D Models Available

MEPIA is the AEC-Q200 qualified declination of Vishay MEPIC product.
The principle of MEPIA is to convert electrical energy into heat in a precise electro-thermal profile. Automotive applications cover airbags and security belts activation.

FEATURES

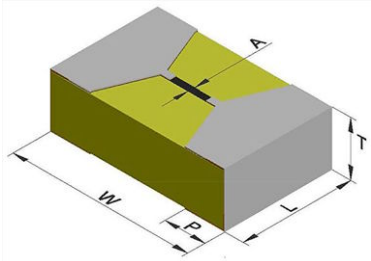
- **AEC-Q200 qualified**
- Surface mount design for standard assembly process
- SMD version only, with tin terminations
- Case size 0805
- Firing energy down to 0.5 mJ (1)
- Firing time down to 250 µs
- Ohmic value: 2 Ω
- Joule effect ignition
- Easy set up by design of firing levels
- Very predictable, reproducible and reliable behavior
- Compatibility with pyrotechnic element has to be tested in real environment

Pb-free RoHS COMPLIANT

Note

(1) Ignitor performances are dependent on both pyrotechnic primer chemistry and active areas geometry

DIMENSIONS AND TOLERANCES in millimeters (inches)



MODEL	SIZE / CASE DESIGNATION	WIDTH W	LENGTH L	THICKNESS T	BACK SIDE PADS P	ACTIVE AREA WIDTH TOLERANCE A
MEPIA (SMD)	0805	2.00 ± 0.15 (0.080 ± 0.006)	1.25 ± 0.10 (0.050 ± 0.004)	0.6 ± 0.1 (0.024 ± 0.004)	0.45 ± 0.2 (0.018 ± 0.006)	± 0.01 (± 0.0004)

Notes

- For the assembly on board, we recommend the lead (Pb)-free thermal profile as per J-STD-020C
- Do not use iron soldering method to mount a MEPIA because it may damage the component (deformation that may cause active area cracks)

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE / CASE DESIGNATION	RESISTANCE RANGE Ω	RESISTANCE TOLERANCE %
MEPIA (SMD)	0805	2	7.5 to 30

MECHANICAL SPECIFICATIONS

Mechanical protection	None
Resistive element	NiCr foil
Substrate	Epoxy based FRx
Terminations	Tin

PERFORMANCES				
TESTS	**SPEC.**	**CONDITIONS**	**SPEC. REQUIREMENTS**	**TYPICAL PERFORMANCES**
High temperature exposure	MIL-STD-202 Method 108	*T* = 125 °C / 1000 h	± 2 % ± 0.05 Ω	± 1.5 %
Temperature cycling	JESD22 Method JA-104	-55 °C / 125 °C 1000 cycles	± 5 % ± 0.05 Ω	± 1.5 %
Biased humidity	MIL-STD-202 Method 103	85 °C / 85 % RH 1000 h	± 2 % ± 0.05 Ω	± 1.2 %
Operational life	MIL-STD-202 Method 108	*T* = 125°C / 1000 h *P* = 51 mW (P based on no fire conditions)	± 2 % ± 0.05 Ω	± 1.6 %
Mechanical shock	MIL-STD-202 Method 213	100 *G*	± 2 % ± 0.05 Ω	± 0.2 %
Vibration	MIL-STD-202 Method 204	2000 Hz / 5G 10 cycles	± 2 % ± 0.05 Ω	± 0.2 %
Solderability	MIL-STD-202 Method 210 Cond. D	T = 245 °C / 3 s	No degradation of termination side	Visual inspection: conform to spec.
ESD	AEC-Q200-002	Air discharge *U* = 25 kV / 1 time	± 5 % ± 0.05 Ω	± 1.5 %
Reflow	According to IPC-610 / vers. E § 8.3.2.6 / Fig. 8.35	Sn96.6Ag3Cu0.5 soldering	25 % of the height of the termination	Visual inspection: conform to spec.
Electrical characterization	User spec.	-55°C / 125°C alumina board	± 200 ppm/°C	± 160 ppm/°C
Electrical characterization	User spec.	-55°C / 125°C FR4 board	± 200 ppm/°C	± 170 ppm/°C
Board flex	AEC-Q200-005	60 s / 2 mm	± 2 % ± 0.05 Ω	± 0.2 %
Shear test	AEC-Q200-006	0.5 N / 60 s	± 2 % ± 0.05 Ω	± 0.8 %

RANGE OF IGNITION PERFORMANCES					
MODEL	**"NO FIRE" CURRENT A**	**"NO FIRE" DURATION s**	**"ALL FIRE" CURRENT A**	**IGNITION TIME ms**	**"ALL FIRE" ENERGY µJ**
MEPIA (SMD)	0.5 to 1.2	2 to 10	Down to 1	Down to 0.25	Down to 500

TECHNOLOGY

The MEPIA active area (heating zone) will be impregnated by the user with a primary pyrotechnic material (usually wet primer followed by drying) in such way to ensure an intimate contact for an optimum heat transfer of thermal energy. Note that the active area of MEPIA shall not be put in direct contact with explosive powder as grain size will not ensure intimate contact and will induce non reproducible and non reliable performances.

The two main characteristics of a MEPIA resistor are their "All Fire" (AF) and "No Fire" (NF) performances:

- "All Fire" (AF) represents the command pulse (generally with capacitance discharge) where the major amount of the dissipated energy will be transferred to the primer to generate the ignition
- "No Fire" (NF) represents the immunity of the resistor with primer to the environmental electro-magnetic pollution and electric continuity test, where the major amount of the dissipated energy will be transferred to the substrate to ensure no ignition

ASSEMBLY PRECAUTIONS

In order to obtain reproducible ignition performances it is important that the assembly process fulfills the following criteria:

- Take specific precautions, such as no air bubble during preparation and application of primer, in order to ensure the intimate contact of pyrotechnic primer and MEPIA active area (potential misfire)
- Take specific handling precaution in order not to damage MEPIA active area (ex: pickup head design for pick and place or specific fixing tools in the entire assembly process)
- All along the assembly process, take specific care to extreme thermo-mechanic stress that could be applied to the MEPIA (such as stress induced during over molding) because the active area of MEPIA is subjected to crack (and generate unstable resistance value)
- The MEPIA reliability is only guaranteed for one single reflow profile
- In case of necessity to dismantle a MEPIA, another MEPIA must be used (no rework is allowed)
- Pay specific attention to the cleaning process after reflow soldering in order not to damage the active area and to keep it clean from various pollution

ORDERING PROCEDURE

Global Part Numbering: MEPIA0805-2R0ILT09

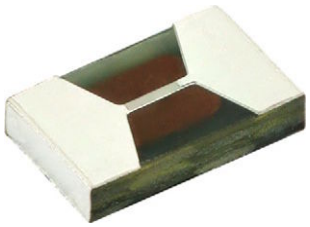
M	E	P	I	A	0	8	0	5	-	2	R	0	I	L	T	0	9

MODEL	SIZE	VALUE	TOLERANCE	ENERGY CLASS	PACKAGING	OPTION
MEPIA	**0805**	**2R0**	**I** = 7.5 % **K** = 10 % **L** = 20 % **M** = 30 %	**L** = low (typical all fire = 500 µJ) **H** = high (typical all fire = 1 mJ)	For more information see “Codification of packaging” table	Leave blank if no option

CODIFICATION OF PACKAGING

CODE 18	PACKAGING	REMARK (USUAL ASSEMBLY PROCESS)
T	Tape and reel (plastic tape)	Automatic pick-and-place
W	Waffle pack	Manual placing on PCB
B	Bag	Bowl feeding

Massive Electro-Pyrotechnic Initiator Chip Resistor



LINKS TO ADDITIONAL RESOURCES

3D Models

The Massive Electro-Pyrotechnic Initiator Chips (MEPIC) are resistors dedicated to pyrotechnic applications. The MEPIC resistors are the Surface Mount Device (SMD) variants from the established NiCr on FR type substrate technology from Vishay Sfernice. The standard case geometry (SMD) enables the implementation of assembly process commonly used in the electronic component industry (pick and place, reflow soldering on flat PCB used as header) providing high productivity. The principle of MEPIC is to convert electrical energy into heat in a precise electro-thermal profile for the purpose of initiating a series of pyrotechnic events in a controlled energetic reaction. In the mining industry this effect is commonly used for the ignition of electronic detonators (digital blasting). Other industries such as firework (e-match manufacturing) and demolition (various electric detonators) are also focused applications.

The MEPIC design has been developed specifically to offer an alternative to the Bridge Wire (BW) technology, insuring at least the same level of performances, while providing cost efficient assembly process and initiator design alternatives.

FEATURES

Pb-free Available

RoHS* Available

- Surface mount design for standard assembly process
- SMD version only
- Active area designed upon performances
- Case size 0805
- Firing energy down to 1.0 mJ (1)
- Firing time down to 250 µs
- Ohmic value: 2 Ω to 8 Ω ± 10 % (typical) (2)
- Joule effect ignition
- Easy set up by design of firing levels
- Very predictable, reproducible and reliable behavior
- Compatibility with pyrotechnic element has to be tested in real environment

Notes

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

(1) Ignitor performances are dependent on both pyrotechnic primer chemistry and active areas geometry

(2) For ohmic value < 3 Ω the tolerance will be discussed with Vishay Sfernice

TECHNOLOGY

The MEPIC active area (heating zone) will be impregnated by the user with a primary pyrotechnic material (usually wet primer followed by drying) in such way to ensure an intimate contact for an optimum heat transfer of thermal energy. The geometry of the active area of the MEPIC, and both the primer chemistry and its impregnation method, will determine the global performances. Note that the active area of MEPIC shall not be put in direct contact with explosive powder as grain size will not ensure intimate contact and will induce non reproducible and non reliable performances.

The two main characteristics of a MEPIC resistor are their “All Fire” (AF) and “No Fire” (NF) performances:

- “All Fire” (AF) represents the command pulse where the major amount of the dissipated energy will be transferred to the primer to generate the ignition. Customer will have to provide Vishay Sfernice with “All Fire” conditions, usually with capacitance discharge parameters or with Minimum Current or Voltage and corresponding short pulse duration.
- “No Fire” (NF) represents the immunity of the resistor with primer to the environmental electro-magnetic pollution and electric continuity test, where the major amount of the dissipated energy will be transferred to the substrate to ensure no ignition. Customer will have to provide Vishay Sfernice with “No Fire” conditions, usually maximum current or voltage and corresponding longest duration. In case of applicable capacitance discharge test the parameters shall also be provided.

ASSEMBLY PRECAUTIONS

In order to obtain reproducible ignition performances it is important that the assembly process fulfills the following criteria:

- Do not use iron soldering method to mount the MEPIC on its header because uncontrolled amount of solder could impact the heat transfer (potential misfire or ignition delay) and local over heating may damage the MEPIC (deformation that may cause active area cracks).
- Take specific precautions, such as no air bubble during preparation and application of primer, in order to ensure the intimate contact of pyrotechnic primer and MEPIC active area (potential misfire).
- Take specific handling precaution in order not to damage MEPIC active area (ex: pickup head design for pick and place or specific fixing tools in the entire assembly process.
- All along the assembly process, take specific care to extreme thermo-mechanic stress that could be applied to the MEPIC (such as stress induced during over molding) because the active area of MEPIC is subjected to crack (and generate unstable resistance value).
- The MEPIC reliability is only guaranteed for one single reflow profile.
- In case of necessity to dismantle a MEPIC, another MEPIC must be used (no rework is allowed).
- Pay specific attention to the cleaning process after reflow soldering in order not to damage the active area and to keep it clean from various pollutions.

STANDARD ELECTRICAL SPECIFICATIONS			
MODEL	SIZE / CASE DESIGNATION (1)	RESISTANCE RANGE Ω	RESISTANCE TOLERANCE %
MEPIC (SMD)	0805	2 to 8	10 to 30

Note

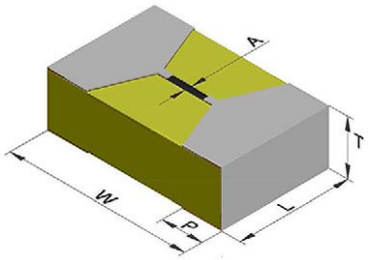
(1) Detailed dimensions are specified in Dimensions and Tolerances table

RANGE OF IGNITION PERFORMANCES					
MODEL	"NO FIRE" CURRENT A	"NO FIRE" DURATION s	"ALL FIRE" CURRENT A	IGNITION TIME ms	"ALL FIRE" ENERGY µJ
MEPIC (SMD)	0.5 to 1.2	2 to 10	Down to 1	Down to 0.25	Down to 1000

Note

- Ignition performances are dependent on both pyrotechnic primer chemistry and active area geometry

DIMENSIONS AND TOLERANCES in millimeters (inches)



MODEL	SIZE / CASE DESIGNATION	WIDTH W	LENGTH L	THICKNESS T	INSULATION DISTANCE I	BACK SIDE PADS P	ACTIVE AREA WIDTH TOLERANCE A
MEPIC (SMD)	0805	2.00 ± 0.15 (0.080 ± 0.006)	1.25 ± 0.10 (0.050 ± 0.004)	0.6 ± 0.1 (0.024 ± 0.004)	-	0.45 ± 0.15 (0.018 ± 0.006)	± 0.01 (± 0.0004)

CONSTRUCTION

- Substrate: epoxy based (FRx type)
- Resistive element: NiCr
- Terminations: SMD wraparound
- Tin plated copper or silver plated copper

HOW TO GET THE RIGHT MEPIC

Each MEPIC will have to be adapted to customer pyrotechnic primer chemistry (energetic material). To reach the right MEPIC design it is necessary to work by "iterations". Upon receipt of the MEPIC Design Guide duly filled, an initial sampling lot is given to customer (along with a MEPIC reference) so he can provide "No Firing" / "All Firing" performances obtained after first testing. After the analysis of these first test results a new set of samples will be proposed (eventually tooling charges will be necessary) in order to get closer to the customer requirements. It may be several iterations until the right design is found. It may also happen that all requirements cannot be fulfilled simultaneously and then a compromise will be necessary between MEPIC design and customer pyrotechnic primer chemistry or ignition parameters.

When the iterations are finished, which means that the design is validated with total or partial requirements fulfilled, Vishay Sfernice will design a final set of photomasks for serial production.

ORDERING PROCEDURE

Global Part Numbering: MEPICxxxxWTT

M	E	P	I	C	x	x	x	x	W	T	T

MODEL	xxxx	TERMINATION TYPE	TERMINATION MATERIAL (1)	PACKAGING (2)
MEPIC	Determined at design step	**W**: wraparound	**T** = tin **S** = silver, please consult	**T** = tape and reel (plastic tape) **W** = waffle pack **B** = bag

Notes

- MEPIC being a semi-custom product, please fill EPIC / MEPIC Design Guide

(1) Silver termination finish valid for both reflow soldering and conductive gluing. Tin termination finish only valid for reflow soldering

(2) Customer assembly process requirement:
- Waffle pack for manual placing on PCB
- Tape and reel for automatic pick and place
- Bag for bowl feeding

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