Ферриты и аксессуары

RM 7, RM 7 LP
Core and accessories

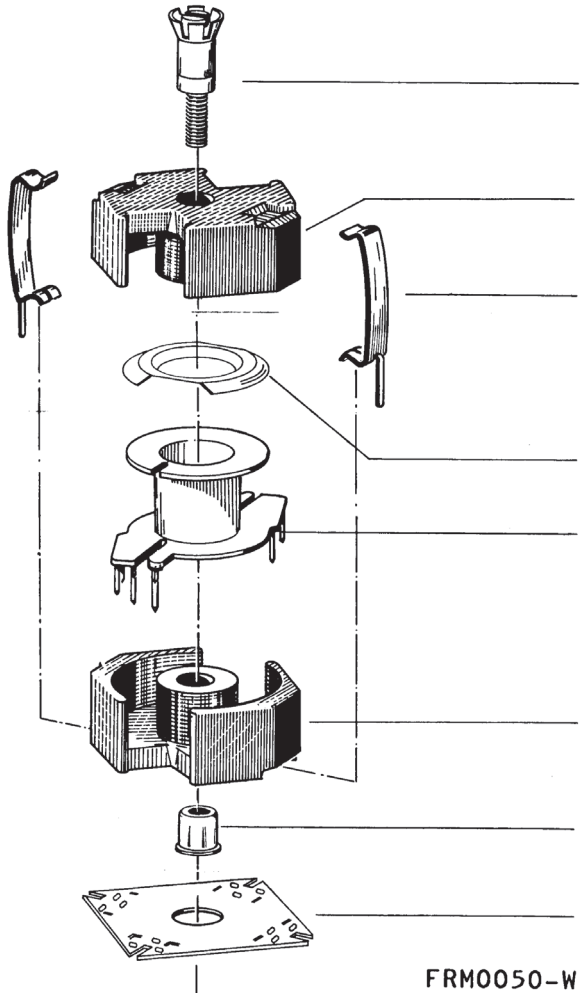
Series/Type: **B65819, B65820, B65659**

Date: May 2017

EPCOS AG is a TDK Group Company.

RM 7

Сердечник и аксессуары



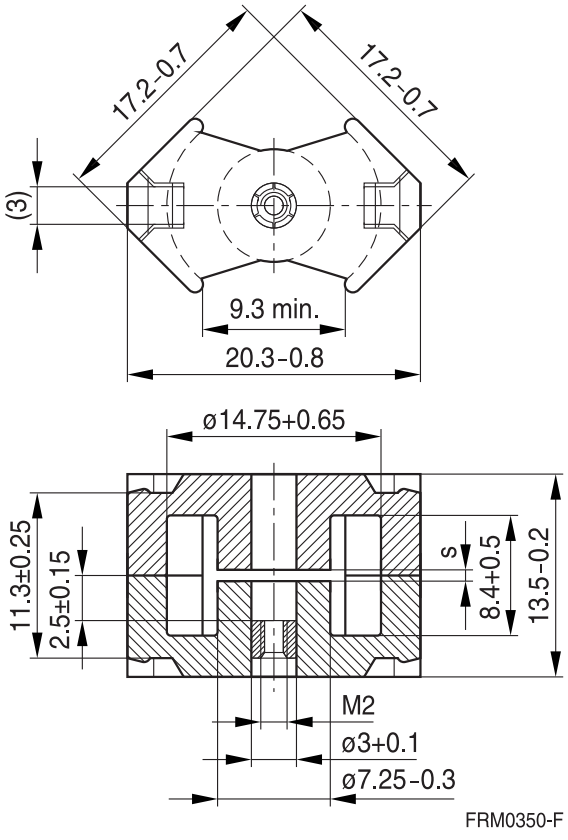
Individual parts	Part no.	Page
Adjusting screw	B65659	7
Core	B65819	3
Clamps	B65820	6
Insulating washer 1	B65820	6
Coil former	B65820	5
Core	B65819	3
Threaded sleeve (glued-in)		
Insulating washer 2	B65820	6

Пример комплекта для сборки

Также доступны:

<u>RM 7 low profile:</u>		
Core	B65819P	7

- To IEC 62317-4
- Сердечник без центрального отверстия для применения в трансформаторах
- Delivery mode: sets



Магнитные характеристики (в комплекте)

	с отверстием	без отверстия	
$\Sigma l/A$	0.75	0.7	mm^{-1}
l_e	29.8	30.4	mm
A_e	40	43	mm^2
A_{min}	—	39	mm^2
V_e	1190	1310	mm^3

Приблизительно. вес (в комплекте)

m	6.5	7.2	g

Зазор (A_L значения / примеры воздушных зазоров)

Material	A_L value nH	s approx. mm	μ_e	Ordering code[1)] -A with center hole -N with threaded sleeve -J without center hole
N41	160 ±5% 250 ±5%	0.30 0.18	90 141	B65819J0160J041 B65819J0250J041
N48	250 ±3% 315 ±3%	0.16 0.12	148 187	B65819+0250A048 B65819+0315A048

1) Замените + на кодовую букву “A “или” H " для требуемой версии.

RM 7

Core **B65819**

Без зазора

Material	A_L value nH	μ_e	P_V W/set	Ordering code -J without center hole
N30	5000 +30/–20%	2810		B65819J0000R030
T38	10000 +40/–30%	5630		B65819J0000Y038
N49	1900 +30/–20%	1070	< 0.22 (50 mT, 500 kHz, 100 °C)	B65819J0000R049
N87	2700 +30/–20%	1520	< 0.77 (200 mT, 100 kHz, 100 °C)	B65819J0000R087
N97	2700 +30/–20%	1520	< 0.58 (200 mT, 100 kHz, 100 °C)	B65819J0000R097
N95	3300 +30/–20%	1860	< 0.65 (200 mT, 100 kHz, 100 °C)	B65819J0000R095

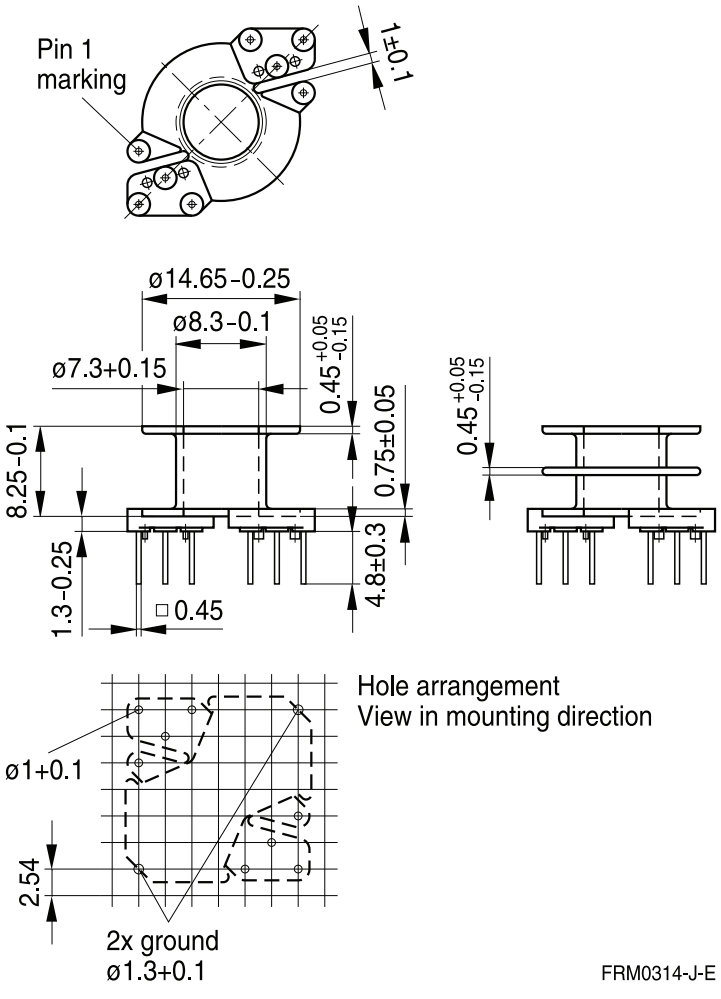
Другие значения AL/воздушные зазоры и материалы, доступные по запросу — см. Примечания по обработке на стр. 9.

Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 60085: F ≙max. рабочая температура 155 °C), цветовой код черный
Sumikon PM 9630® [E41429 (M)], SUMITOMO BAKELITE CO LTD
Solderability: to IEC 60068-2-20, испытания ТП, способ 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 60068-2-20, test Tb, method 1B: 350 °C, 3.5 s
Обмотка: см. раздел Примечания по обработке, 2.1

Штырьки: Квадратные булавки
Соответствующие зажимные и изоляционные шайбы см. на стр. 6.

Разделы	A_N mm²	l_N mm	A_R value μΩ	Pins	Ordering code
1	22.4	36.0	55.4	8	B65820W1008D001
2	21.9	36.0	56.5	8	B65820W1008D002



Зажим

- С клеммой заземления, изготовленной из пружинной стали (луженой) толщиной 0,4 мм
- Solderability to IEC 60068-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Изолирующая шайба 1 между сердечником и формирователем катушки

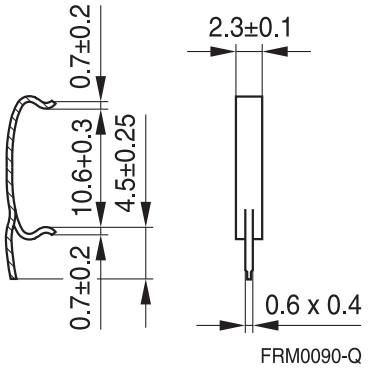
- Для компенсации допуска и для изоляции
- Made of polyarylate film (UL 94 V-0, insulation class to IEC 60085: E ≙ 120 °C), 0.08 mm thick Aryphan F685, [E167358 (M)], natural color, LOFO HIGH TECH FILM GMBH

Изолирующая шайба 2 для двухслойных печатных плат

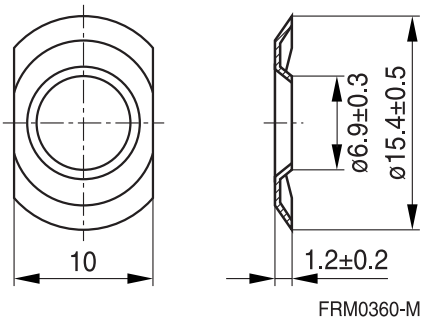
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 60085: E ≙ 120 °C), 0.3 mm thick Makrofol FR7-2 [E168120 (M)], COVESTRO AG

	Ordering code
Зажим (код заказа на штуку, требуется 2)	B65820B2001X000
Изолирующая шайба 1 (упаковка катушки, PU = 1 катушка)	B65820A5000X000
Изолирующая шайба 2 (насыпная)	B65820D2005X000

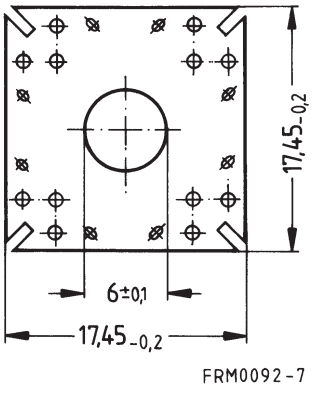
Зажим



Изолирующая шайба 1



Изолирующая шайба 2

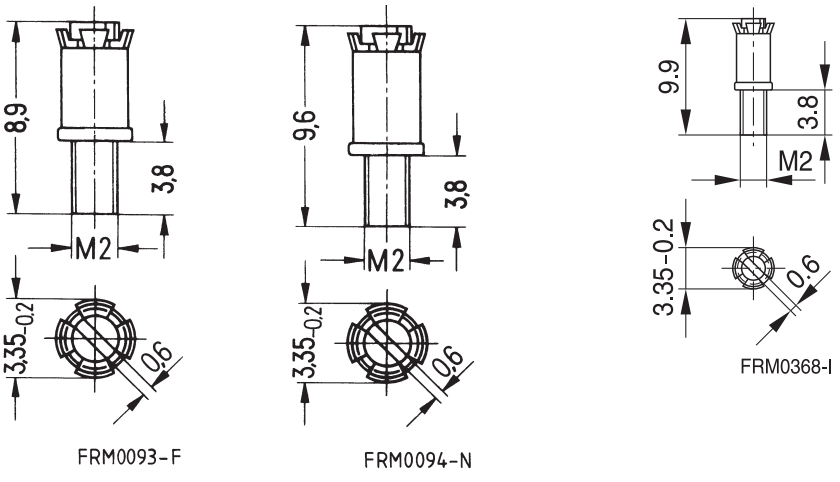


Регулировочный винт

- Трубный сердечник с резьбой и основной тормоз из GFR политерефталат Pocan B3235® [E245249 (M)], LANXESS AG

Figure	Tube core ∅ × length (mm)	Material	Color code	Ordering code
a	2.62 × 3.6	N22	red	B65659F0001X023
b	2.75 × 4.4	N22	black	B65659F0003X023
c	2.82 × 4.4	N22	yellow	B65659F0004X023

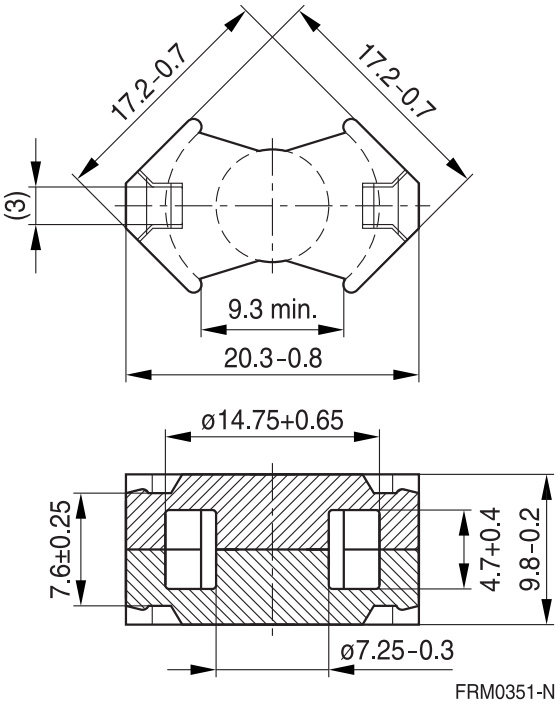
a b c



RM 7 »Low Profile«

Core B65819P

- To IEC 62317-4
- Для компактных трансформаторов
- Без центрального отверстия
- Режим доставки: наборы



Магнитные характеристики (за комплект)

$\Sigma l/A$ = 0.52 mm^{-1}
l_e = 23.5 mm
A_e = 45.3 mm^2
A_{min} = 39.6 mm^2
V_e = 1060 mm^3

Прибл. вес 5,7 г / комплект

Без зазора

Material	A_L value nH	μ_e	P_V W/set	Ordering code
T38	11500 +40/–30%	4750		B65819P0000Y038
N49	2400 +30/–20%	990	< 0.21 (50 mT, 500 kHz, 100 °C)	B65819P0000R049
N92	2600 +30/–20%	1070	< 0.63 (200 mT, 100 kHz, 100 °C)	B65819P0000R092
N87	3300 +30/–20%	1360	< 0.57 (200 mT, 100 kHz, 100 °C)	B65819P0000R087

Другие значения AL/воздушные зазоры и материалы доступны по запросу - см. Комментарии к обработке на стр. 9.

Механическое напряжение и монтаж

Ферритовые сердечники должны соответствовать механическим требованиям во время сборки и для растущего числа применений. Поскольку ферриты являются керамическими материалами, необходимо знать об особом поведении при механической нагрузке.

As valid for any ceramic material, ferrite cores are brittle and sensitive to any shock, fast temperature changing or tensile load. Especially high cooling rates under ultrasonic cleaning and high static or cyclic loads can cause cracks or failure of the ferrite cores.

Подробную информацию см. в книге данных, глава "Общие - Определения, 8.1".

Влияние комбинации ядер на величину AL

Напряжения в сердечнике влияют не только на механические, но и на магнитные свойства. Очевидно, что начальная проницаемость зависит от состояния напряжения сердцевины. Чем выше напряжения в сердцевине, тем ниже значение начальной проницаемости. Таким образом, среда для встраивания должна обладать максимально возможной эластичностью.

Подробную информацию см. в книге данных, глава "Общие - Определения, 8.1".

Нагрев

Ферриты могут нагреваться во время работы при более высоких плотностях потока и более высоких частотах.

NiZn-материалы

Магнитные свойства NiZn-материалы могут необратимо изменяться в высоких магнитных полях.

Ферритовые Аксессуары

EPCOS ферритовые аксессуары были разработаны и оценены только в сочетании с ферритовыми сердечниками EPCOS. EPCOS explicitly points out that EPCOS ferrite accessories or EPCOS ferrite cores may not be compatible with those of other manufacturers. Any such combination requires prior te-sting by the customer and will be at the customer‘s own risk.

EPCOS assumes no warranty or reliability for the combination of EPCOS ferrite accessories with cores and other accessories from any other manufacturer.

Обработка замечаний

The start of the winding process should be soft. Else the flanges may be destroyed.

- Too strong winding forces may blast the flanges or squeeze the tube that the cores can not be mounted any more.
- Too long soldering time at high temperature (>300 °C) may effect coplanarity or pin arrangement.
- Not following the processing notes for soldering of the J-leg terminals may cause solderability problems at the transformer because of pollution with Sn oxyde of the tin bath or burned insulation of the wire. For detailed information see chapter *“Processing notes”*, section 2.2.
- The dimensions of the hole arrangement have fixed values and should be understood as a recommendation for drilling the printed circuit board. For dimensioning the pins, the group of holes can only be seen under certain conditions, as they fit into the given hole arrangement. To avoid problems when mounting the transformer, the manufacturing tolerances for positioning the customers’ drilling process must be considered by increasing the hole diameter.

Отображение кодов заказа для продуктов EPCOS

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications and the website of EPCOS, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.epcos.com/orderingcodes.

Ferrites and accessories

Symbols and terms

Symbol	Meaning	Unit
A	Поперечное сечение катушки	mm^2
A_e	Эффективное магнитное поперечное сечение	mm^2
A_L	Коэффициент индуктивности; $A_L = L/N^2$	nH
A_{L1}	Minimum inductance at defined high saturation ($\triangleq \mu_a$)	nH
A_{min}	Минимальное сечение сердечника	mm^2
A_N	Сечение обмотки	mm^2
A_R	Коэффициент сопротивления; $A_R = R_{Cu}/N^2$	$\mu\Omega = 10^{-6}\ \Omega$
B	RMS value of magnetic flux density	Vs/m^2, mT
ΔB	Flux density deviation	Vs/m^2, mT
$\hat{B}$	Peak value of magnetic flux density	Vs/m^2, mT
$\Delta\hat{B}$	Peak value of flux density deviation	Vs/m^2, mT
B_{DC}	DC magnetic flux density	Vs/m^2, mT
B_R	Remanent flux density	Vs/m^2, mT
B_S	Saturation magnetization	Vs/m^2, mT
C_0	Winding capacitance	F = As/V
CDF	Core distortion factor	$mm^{-4.5}$
DF	Relative disaccommodation coefficient $DF = d/\mu_i$	
d	Disaccommodation coefficient	
E_a	Activation energy	J
f	Frequency	s^{-1}, Hz
f_{cutoff}	Cut-off frequency	s^{-1}, Hz
f_{max}	Upper frequency limit	s^{-1}, Hz
f_{min}	Lower frequency limit	s^{-1}, Hz
f_r	Resonance frequency	s^{-1}, Hz
f_{Cu}	Copper filling factor	
g	Air gap	mm
H	RMS value of magnetic field strength	A/m
$\hat{H}$	Peak value of magnetic field strength	A/m
H_{DC}	DC field strength	A/m
H_c	Coercive field strength	A/m
h	Hysteresis coefficient of material	10^{-6} cm/A
$h/\mu_i{}^2$	Relative hysteresis coefficient	10^{-6} cm/A
I	RMS value of current	A
I_{DC}	Direct current	A
$\hat{I}$	Peak value of current	A
J	Polarization	Vs/m^2
k	Boltzmann constant	J/K
k_3	Third harmonic distortion	
k_{3c}	Circuit third harmonic distortion	
L	Inductance	H = Vs/A

Symbols and terms

Symbol	Meaning	Unit
$\Delta L/L$	Relative inductance change	H
L_0	Inductance of coil without core	H
L_H	Main inductance	H
L_p	Parallel inductance	H
L_{rev}	Reversible inductance	H
L_s	Series inductance	H
l_e	Effective magnetic path length	mm
l_N	Average length of turn	mm
N	Number of turns	
P_{Cu}	Copper (winding) losses	W
P_{trans}	Transferrable power	W
P_V	Relative core losses	mW/g
PF	Performance factor	
Q	Quality factor ($Q = \omega L/R_s = 1/\tan \delta_L$)	
R	Resistance	Ω
R_{Cu}	Copper (winding) resistance (f = 0)	Ω
R_h	Hysteresis loss resistance of a core	Ω
ΔR_h	R_h change	Ω
R_i	Internal resistance	Ω
R_p	Parallel loss resistance of a core	Ω
R_s	Series loss resistance of a core	Ω
R_{th}	Thermal resistance	K/W
R_V	Effective loss resistance of a core	Ω
s	Total air gap	mm
T	Temperature	°C
ΔT	Temperature difference	K
T_C	Curie temperature	°C
t	Time	s
t_v	Pulse duty factor	
$\tan \delta$	Loss factor	
$\tan \delta_L$	Loss factor of coil	
$\tan \delta_r$	(Residual) loss factor at $H \rightarrow 0$	
$\tan \delta_e$	Relative loss factor	
$\tan \delta_h$	Hysteresis loss factor	
$\tan \delta/\mu_i$	Relative loss factor of material at $H \rightarrow 0$	
U	RMS value of voltage	V
$\hat{U}$	Peak value of voltage	V
V_e	Effective magnetic volume	mm^3
Z	Complex impedance	Ω
Z_n	Normalized impedance $\lvert Z\rvert_n = \lvert Z\rvert / N^2 \times \varepsilon\ (l_e/A_e)$	Ω/mm

Symbols and terms

Symbol	Meaning	Unit
α	Temperature coefficient (TK)	1/K
α_F	Relative temperature coefficient of material	1/K
α_e	Temperature coefficient of effective permeability	1/K
ε_r	Relative permittivity	
Φ	Magnetic flux	Vs
η	Efficiency of a transformer	
η_B	Hysteresis material constant	mT^{-1}
η_i	Hysteresis core constant	$A^{-1}H^{-1/2}$
λ_s	Magnetostriction at saturation magnetization	
μ	Relative complex permeability	
μ_0	Magnetic field constant	Vs/Am
μ_a	Relative amplitude permeability	
μ_{app}	Relative apparent permeability	
μ_e	Relative effective permeability	
μ_i	Relative initial permeability	
μ_p'	Relative real (inductive) component of $\overline{\mu}$ (for parallel components)	
μ_p''	Relative imaginary (loss) component of $\overline{\mu}$ (for parallel components)	
μ_r	Relative permeability	
μ_{rev}	Relative reversible permeability	
μ_s'	Relative real (inductive) component of $\overline{\mu}$ (for series components)	
μ_s''	Relative imaginary (loss) component of $\overline{\mu}$ (for series components)	
μ_{tot}	Relative total permeability derived from the static magnetization curve	
ρ	Resistivity	Ωm^{-1}
$\Sigma l/A$	Magnetic form factor	mm^{-1}
τ_{Cu}	DC time constant $\tau_{Cu} = L/R_{Cu} = A_L/A_R$	s
ω	Angular frequency; $\omega = 2\ \Pi f$	s^{-1}

All dimensions are given in mm.

SMD Surface-mount device

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.

2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.

3. **The warnings, cautions and product-specific notes must be observed**.

4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.

5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

   We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

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