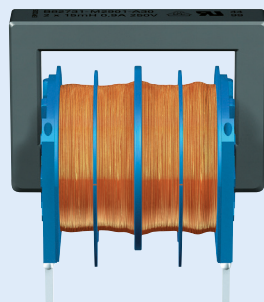


EPCOS Application Guide 2019

Home Appliances

Electronic Components for Consumer Electronics



EPCOS Components for Home Appliances



The electronics content in home appliances continues to grow, to enable both more powerful features and convenience of use, as well as to save energy. This requires highly reliable electronic components that feature unparalleled performance and extremely high precision. For example, the innovative PowerHap™ piezo actuator with haptic feedback and integrated sensor functionality offer unrivalled force, acceleration, and response time, and thus provide an unprecedented quality of haptic feedback and significantly enhance the sensory experience of human-machine interfaces. The M2020 series of temperature sensors for refrigerators and freezers is a typical example of our engineering excellence. Their special manufacturing process creates a hermetic seal that is essential for their very high long-term stability. Even when subjected to water immersion tests for over 4000 hours their resistance drift remains significantly below two percent.

On the following pages you will find further special features that distinguish our products and solutions for use in home appliances.

EPCOS Components for Home Appliances

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EPCOS Components for Home Appliances

Special Features



Aluminum Electrolytic Capacitors

- High ripple current capability
- Low ESR
- Optimized thermal concept
- Long useful life
- Ultra-compact design
- Different case sizes for each capacitance value

Ceramic Transient Voltage Suppressors

- SMD Multilayer varistors and CeraDiodes in EIA case sizes 0201 to 2220 for surge suppressing and ESD protection
- SMD disk varistors (CU) for surge current protection
- Bidirectional components
- No temperature derating up to +85 °C / +150 °C (depending on type)
- Protection against wide over-voltage range

EMC Filters

- Wide current range up to 2500 A
- Rated voltage up to 760 V AC and 1500 V DC
- Different terminals (tab connectors, litz wires, threaded studs, terminal blocks, pins, IEC connectors, bus bars)
- UL/CSA/ENEC approvals
- EPCOS also runs its own accredited EMC laboratory in Regensburg/Germany which can perform all relevant tests and issue the necessary documentation to obtain CE-conformity

Ferrites

- Wide range of core shapes, sizes, materials and accessories
- Ring cores in materials optimized for EMI chokes
- Epoxy-coated ring cores are standard

Film Capacitors

Leaded

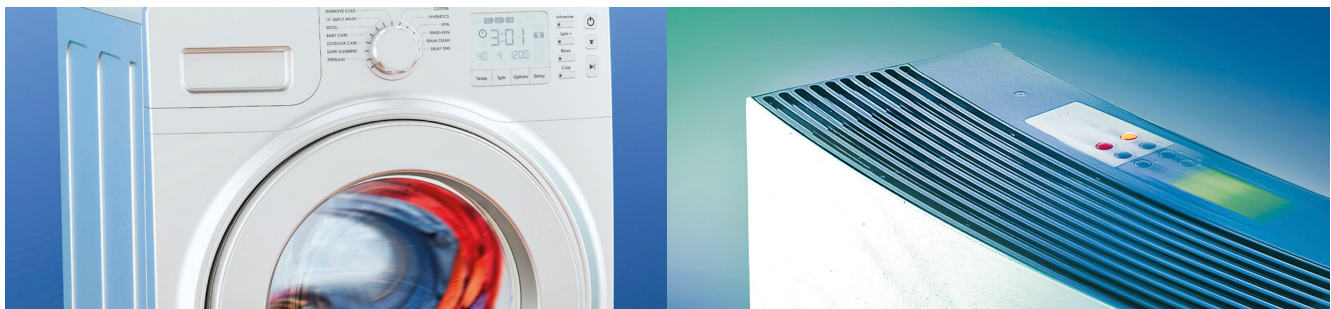
- High ripple current
- AC voltage capability
- Very good peak voltage/current capability
- Long-term reliability and stability
- Very low ESR and ESL
- Low profile types for applications with height restrictions
- Heavy Duty series with extreme long capacitance stability
- Customer-specific products upon request

Motor run

- Very low losses due to innovative film technology
- High insulation and vibration resistance
- Long-term reliability 30 000 h (class A) available
- 10000 A fault-current-proof versions
- Ultra-compact and economic design in aluminum and plastic can
- Various mounting options
- Very high safety level S2/S3 to IEC 60252-1
- Temperature up to +100 °C
- IEC 60335-1 compatible versions
- UL810-, VDE-, CQC- and TÜV-approved versions

EPCOS Components for Home Appliances

Special Features



Inductors

SIMID, power inductors

- High current handling capability
- Wide temperature range
-55 °C to +150 °C
- Suppression of electromagnetic interference
- Energy storage in DC/DC converters
- Suitable for lead-free soldering profiles acc. to JEDEC J-STD 020D

Leaded RF chokes

- High current handling capability
- Wide temperature range
-55 °C to +125 °C
- Suppression of electromagnetic interference
- Energy storage in DC/DC converters

Powerline chokes

Common-mode chokes

- High current handling capability
- Housing design up to 16 A
- High temperature stability up to +125 °C
- Suppression of asymmetrical interference coupled onto lines
- High frequency parts of the symmetrical data signal are significantly minimized
- Special constructions and materials for home appliance requirements

Piezo Actuator PowerHap

- Active haptic feedback
- Small and powerful actuator
- Can do force sensing
- Flexible design of haptic feedback

Surge Arresters

- Overvoltage protection
- High current capability
- Low capacitance

Switching Spark Gaps

- Very short breakdown time
- Low switching losses

Thermistors NTC

SMD and leaded thermistors

- High measuring accuracy and reliability
- Fast response time
- Compact dimensions
- Rugged design
- Automatic processing
- Customer-specific solutions upon request

Glass-encapsulated thermistors

- High-temperature measuring capability
- High reliability
- Fast response time
- Small dimensions
- Simplified processibility
- Customer-specific solutions upon request

Sensors

- Long-term stability
- High accuracy
- High insulation voltage
- Dedicated probes for every application
- Customer-specific solutions upon request

Inrush current limiters

- Long-term stability
- No derating of steady state current at 0 °C and +65 °C
- Usable in series connections up to 265 V RMS
- UL approved file no. E69802

Thermistors PTC

- For overcurrent protection, inrush current limiting, compressor starting, heating and liquid level sensors

Transformers

- High creepage distance (> 8 mm)
- Very good dielectric strength (3.75 kV)

Varistors

- Leaded disk varistors up to +105 °C
- SNF varistors up to +125 °C
- Intrinsically safe ThermoFuse varistors

EPCOS Components for Home Appliances

Overview												
	Control unit	Dishwasher	Dryer	Electric cooker	Freezer	Heating, ventilation, air conditioning	Ignition units for gas cooker	Induction cooker	Microwave oven	Portable household devices, e.g. water heaters, irons, percolators	Refrigerator	Washing machine
Aluminum electrolytic capacitors												
Snap-in		•	•		•	•					•	•
Ceramic transient voltage suppressors												
Multilayer varistors	•	•	•	•	•	•	•	•	•	•	•	•
CeraDiodes	•	•	•	•	•	•	•	•	•	•	•	•
EMC filters												
IEC inlet filters	•	•	•	•	•	•		•	•	•	•	•
2-line filters	•	•	•	•	•	•		•	•		•	•
3-line filters, 4-line filters						•		•				
Ferrites												
Ring cores		•	•		•			• ¹⁾			•	•
Film capacitors (medium power)												
X2, X2 humidity	•	•	•	•	•	•	•	•	•	•	•	•
X1	•	•	•	•	•	•	•	•	•	•	•	•
Y2, Y2 humidity	•	•	•	•	•	•	•	•	•	•	•	•
MKP PFC					•	•					•	•
MKP DC link						•		•				•
MKP general purpose	•					•		•	•			•
MKT, boxed	•						•					•
MKP AC filtering						•						•
MMKP/MFP								•	•			
MotorCap S0, plastic can		•	•									•
MotorCap S3, plastic compact		•	•		•	•					•	•
MotorCap S2, aluminum can		•	•		•	•					•	•
Dual MotorCap S2, aluminum can						•						
LCap, plastic can S0 or S3			•									•
DC link, round can						•						
Inductors												
SIMID 0603 ... 2220	•	•	•									•
Power inductors	•	•	•									•
Leaded RF chokes	•	•	•							•	•	•
Ring core chokes, double	•	•	•		•	•		•	•		•	•
E, FC, D, U core chokes	•	•	•		•	•		•	•		•	•
Piezo actuators												
PowerHap	•	•	•		•	•	•	•		•	•	•

¹⁾ Customized products upon request








EPCOS Components for Home Appliances

Overview												
	Control unit	Dishwasher	Dryer	Electric cooker	Freezer	Heating, ventilation, air conditioning	Ignition units for gas cooker	Induction cooker	Microwave oven	Portable household devices, e.g. water heaters, irons, percolators	Refrigerator	Washing machine
Surge arresters												
EHV						●						
Switching spark gaps												
CAS							●					
Thermistors NTC												
SMD V-type (chip)	●	●	●	●	●	●	●	●	●	●	●	●
M89*, S8* (leaded)	●											
G15* (glass-encapsulated)		●	●	●			●	●	●			
K276, Z276, Z278		● ¹⁾	● ¹⁾									● ¹⁾
K504		●	●									●
K514, K524			● ¹⁾				● ¹⁾					
Z606		● ¹⁾										
M1005, M20*0					● ¹⁾						● ¹⁾	
M703 (screw probe)	●											
M1703 (screw probe)				● ¹⁾					● ¹⁾			
K45	●											
K560, K1560								● ¹⁾	● ¹⁾			
M500 (air probe)	●					● ¹⁾						
K500 (evaporator probe)						● ¹⁾						
T120 (pipe-mounted probe)						● ¹⁾						
F120 (surface-mounted probe)						● ¹⁾						
Z81, K301 (immersion probe)						● ¹⁾						
Inrush current limiters	●	●	●		●	●		●	●	●	●	●
Thermistors PTC												
Overcurrent protection (chip)	●	●	●	●	●	●		●	●	●	●	●
Overcurrent protection (leaded)	●	●	●	●	●	●		●	●	●	●	●
Inrush current limiters	●	●	●		●	●		●	●		●	●
Motor start PTC					●	●					●	
Liquid point level sensor		●										●
Heater PTC						●				●		●
Transformers												
EF16 ... EF25	●	●	●	●	●	●	●	●	●		●	●
Varistors												
S05 ... S25	●	●	●	●	●	●		●	●	●	●	●
Q14, Q20	●	●	●	●	●	●		●	●		●	●
T14 ... T25, NT14 ... NT20	●	●	●	●	●	●		●	●		●	●

¹⁾ Customized products upon request







EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Aluminum electrolytic capacitors				
Snap-in	 	High voltage	Useful life up to +105 °C, 8000 h +85 °C, 8000 h 2-pin version with standard pin (6.3 mm) or short pin (4.5 mm), 3-pin version with short pin	B43509 B43541 B43544 B43545 B43547 B43624 B43630 B43634 B43640 B43641 B43642 B43643 B43644
		V_R : 200 ... 600 V DC C_R : 47 ... 3300 µF		
Ceramic transient voltage suppressors (CTVS)				
Multilayer varistors SMD	 	EIA case sizes single components: 0201 ... 2220 EIA case sizes array components: 0405 (2-fold), 0508, 0612 (4-fold)	Bidirectional multilayer protection components with very fast response time < 0.5 ns Protection against ESD, surge, burst, switching inductive load, temporary overvoltage (depending on type) High surge series for replacement of semiconductor diodes TVS SMA*, SMB*	B725**T... B727... B725**E...
		V_{max} : up to 150 V DC $I_{surge max}$: up to 6500 A $V_{clamp, max}$ (8/20 µs): up to 360 V C_{typ} : down to 0.6 pF T_{op} : -40 ... +85 °C, -55 ... +150 °C		
CeraDiodes SMD	  	EIA case sizes single components: 0201, SOD-723 (0402), SOD-523 (0603), SOD-323 (1003) EIA case sizes array components: 0508, 0612 (4-fold), SOT-666 (0506) SOT-23-6L (1012)	ESD protection components Replacement of semiconductor diodes TVS No temperature derating up to +85 °C Special arrays for USB protection	B725**D... B727**D...
		V_{max} : 5.6 ... 30 V DC C_{typ} : 0.6 ... 470 pF $V_{ESD, air}$: 15 kV (to IEC 61000-4-2) $V_{ESD, contact}$: 8 kV (to IEC 61000-4-2) T_{op} : -40 ... +85 °C		






EPCOS Components for Home Appliances



Characteristics					
Series		Technical data		Features	Ordering code/ type
EMC filters					
IEC inlet filters		V_R : I_R :	250 V AC / V DC 1 ... 20 A	EMC filters with integrated IEC connector Compact design Medical versions with very low leakage current	B8477... B84103...
2-line filters		V_R : I_R :	250 V AC / V DC 2 ... 36 A	Modular SIFI filter system with various cases and insertion losses Medical versions with very low leakage current Suppression of differential and common-mode interference	B84111F... B84112G... B84113H...
3-line filters, 4-line filters		V_R : I_R :	440 ... 760 V AC 8 ... 2500 A	3-line and 4-line filters with high insertion loss Optimized leakage current Compact design	B84143... B84144... B84243...
Ferrites					
Ring cores		Material: A_L :	N30, T35, T37, T38 700 ... 21300 nH	Epoxy-coated ring cores are standard	R9.53 ... R202
Film capacitors (medium power)					
X2		V_{RMS} : C_R :	305 V AC 10 nF ... 30 μ F	X2 class for interference suppression and EMC Approved acc. to international standards Across the line connection Lead spacing 10 ... 52.5 mm	B32921 ... B32928
X2 humidity		V_{RMS} : C_R :	305 V AC 0.1 ... 15 μ F	+85 °C/85% RH/1000 h/240 V AC +60 °C/95% RH/1000 h/240 V AC For severe ambient conditions Between the lines and series application X2 safety class per UL/IEC High stability on capacitance	B32922H/J ... B32926H/J







EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Film capacitors (medium power)				
X1		V_{RMS} : 330 V AC C_R : 10 nF ... 6.8 μ F V_{RMS} : 530 V AC C_R : 6.8 nF ... 5.6 μ F	X1 class for interference suppression and EMC Approved acc. to international standards Across the line connection Lead spacing 10 ... 37.5 mm	B32911 ... B32916
Y2		V_{RMS} : 300 V AC C_R : 1 nF ... 1 μ F	Y2 class for interference suppression and EMC Approved acc. to international standards Line to ground connection Lead spacing 10 ... 37.5 mm	B32021 ... B32026
Y2 humidity		V_{RMS} : 350 V AC C_R : 4.7 nF ... 1.2 μ F	Y2 class for interference suppression for severe ambient conditions and automotive Approved acc. to international standards, AEC-Q200D Line to ground connection Lead spacing 15 ... 37.5 mm	B32032 ... B32036
MKP PFC		V_R : 450 ... 630 V DC C_R : 0.068 ... 2.2 μ F	Operating temperature up to +125 °C Super miniaturized Designed for PFC stage	B32671P ... B32673P
		V_R : 220 ... 310 V AC C_R : 10 nF ... 20 μ F	Operating temperature up to +125 °C High current, PFC	B32671Z ... B32676Z
MKP DC link		V_R : 450 ... 1300 V DC C_R : 1.5 ... 480 μ F	High-density series, compact Operating temperature up to +105 °C Useful life 100000 h at $1.0 \cdot V_R$, +70 °C High vibration resistance due to 4-pin terminals 2, 4 and 12-pin versions Lead spacing 27.5 ... 52.5 mm	B32774 ... B32778
		V_R : 300 ... 875 V DC C_R : 0.47 ... 270 μ F	High power: higher RMS current capability than B3277x Operating temperature up to +105 °C Useful life 200000 h at $1.0 \cdot V_R$, +85 °C High vibration resistance due to 4-pin terminals 2 and 4-pin versions Lead spacing 27.5 ... 52.5 mm	B32674 ... B32678






EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Film capacitors (medium power)				
MKP DC link high density THB		V_R : 450 ... 1300 V DC C_R : 1.5 ... 120 μ F	High density, compact for severe ambient conditions Operating temperature up to +105 °C +60 °C/95% RH/VR/1000 h AEC-Q200	B32774H ... B32778H
MKP general purpose		V_R : 250 ... 2000 V DC C_R : 1 nF ... 40 μ F	For snubber, resonant or switching Operating temperature up to +110 °C Lead spacing 10 ... 52.5 mm Possibility of AC and/or DC operation High dv/dt and RMS current capability	B32652 ... B32658
MKT		V_R : 63 ... 630 V DC C_R : 1 nF ... 220 μ F	Low voltage DC link applications Operating temperature up to +125 °C Useful life 200000 hat $1.0 \cdot V_R$, +85 °C Lead spacing 5 ... 37.5 mm	B32520 ... B32529
MKP AC filtering		V_{RMS} : 250 ... 400 V AC C_R : 1.0 ... 70 μ F	Operating temperature up to +105 °C Output AC filtering Optimized AC voltage performance with small dimensions High ripple current/frequency capability +60 °C/95% RH/Vrac/1000 h	B32754 ... B32758
MMKP		V_R : 400 ... 2000 V DC C_R : 2.2 ... 560 nF	Operating temperature up to +110 °C Double sided metallized for snubbing, resonator or switching High dv/dt and I_{RMS}	B32641 ... B32643
MFP		V_{RMS} : 250 ... 750 V AC V_R : 400 ... 2500 V DC C_R : 0.47 nF ... 1.5 μ F	Operating temperature up to +110 °C Service life 200 000 h at V_R High dv/dt Lead spacing 15 ... 37.5 mm	B32682 ... B32686




EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Film capacitors (medium power)				
MotorCap S0, plastic		V_R : 250, 400, 480 V AC C_R : 1 ... 60 μ F Terminals: – Fast-on (single/double) – Insulated wire – Twin core cable Housing: plastic can	Safety class S0 to IEC 60252 Life expectancy – 250 V, 10000 h – 400 V, 10000 h – 480 V, 3000 h Max. temperature: +85 °C Mounting options: M8 bolt, fast fixation unit IEC 60335-1 compatible versions available	B32320/B32322
				B32321/B32323
				B32327
				B32328
MotorCap S3, plastic compact		V_R : 400/450 V AC C_R : 1.5 ... 20 μ F Terminals: – Fast-on (single/double) – Insulated wire – Twin core cable Housing: plastic can	Safety class S3 to IEC 60252 Life expectancy – 400 V, 30000 h – 450 V, 10000 h Max. temperature: up to +100 °C Mounting options: M8 bolt, fast fixation unit IEC 60335-1 compatible versions available	B32350/B32352
				B32355
				B32356
MotorCap S2, aluminum	  	V_R : 250, 450 V AC C_R : 1 ... 60 μ F Terminals: – Single fast-on – Double fast-on – Twin core cable Housing: aluminum can	Safety class S2 to IEC 60252 Life expectancy – up to 30000 h Max. temperature: +70 °C and +85 °C Mounting options: M8 bolt IEC 60335-1 compatible version available	B32330/B32332
				B32333
				B33331

EPCOS Components for Home Appliances



Characteristics			
Series	Technical data	Features	Ordering code/ type
Film capacitors (medium power)			
Dual MotorCap S2, aluminum	 <p> V_R: 250; 450 V AC C_R: 15 + 2 ... 60 + 10 μF Terminals: – Single fast-on – Double fast-on – Quadruple fast-on Housing: aluminum can </p>	Safety class S2 to IEC 60252 Life expectancy – up to 30000 h Max. temperature: +85 °C Mounting options: M8 bolt IEC 60335-1 compatible version available	B32335
			B33335
LCap S0 or S3, plastic	 <p> V_R: 440 V AC C_R: 4 ... 50 μF L_R: 5 ... 110 μH, built in Terminals: – Single fast-on Housing: plastic can </p>	Safety class S0 or S2 Life expectancy – 440 V, 10000 h IEC 60335-1 compatible version available	B32350
			B32320
DC link and RF filter in DC link	 <p> V_R: 350 V DC C_R: 65 μF R_S: 10 mΩ </p>	With thermal fuse	B32320I

EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Inductors				
SIMID 0603 SMD		L_R : 1.0 ... 220 nH I_R : up to 1.8 A EIA case size: 0603	Laser-cut technology Narrow L tolerances High resonant frequency Temperature -55 ... +150 °C	B82496C...
SIMID 0805-F SMD		L_R : 2.7 ... 820 nH I_R : 180 ... 1000 mA EIA case size: 0805	Cubic coil with ceramic core Epoxy molded flat top for vacuum pickup Winding ends welded to the terminals	B82498F...
SIMID 1210 SMD		L_R : 82 nH ... 680 μ H I_R : 61 ... 1150 mA EIA case size: 1210	Ferrite drum core Laser welded winding Flame retardant molding	B82422
SIMID 1812-T/C SMD		L_R : 1 ... 1000 μ H I_R : 55 ... 1300 mA EIA case size: 1812	Ferrite drum core Laser welded winding Flame retardant molding	B82432C... B82432T...
SIMID 2220 SMD		L_R : 1 μ H ... 10 mH I_R : 25 ... 3510 mA EIA case size: 2220	Ferrite drum core Laser welded winding Flame retardant molding	B82442
Power inductors SMD	 	L_R : 0.82 ... 1000 μ H I_R : up to 12.25 A	Shielded and unshielded versions Low-profile versions available High current handling capability Low DC resistance	B8246... B8247...
Leaded RF chokes		L_R : 0.1 μ H ... 100 mH I_R : up to 7.3 A	High current handling capability Low DC resistance Very good saturation characteristics Axial and radial leaded versions	B781... B8214...

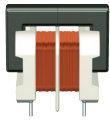




EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Inductors				
Ring core chokes, double		L_R : 0.19 ... 100 mH I_R : 0.25 ... 62 A	High resonance frequency due to special winding technique UL and ENEC (VDE) approvals for most types Approx. 1% stray inductance for symm. interference suppression	B8272...
				B82791G2...
				B82791H2...
Ring core chokes, double		L_R : 0.4 ... 47 mH I_R : 0.4 ... 10 A	High resonance frequency due to special winding technique Fully potted for local reduction of pollution degree CTI600 plastic materials approved to EN 60335-1, cl. 30 UL and ENEC (VDE) approvals Approx. 1% stray inductance for symm. interference suppression Sepcial designs for home appliances	B82721K2*U*
				B82724J2*U*
D core chokes		L_R : 3.3 ... 100 mH I_R : 0.35 ... 4.6 A	High resonance frequency due to 2-section winding High pulse strength Low whirring noise UL and ENEC (VDE) approvals Approx. 1% stray inductance for symm. interference suppression	B82731... B82732... B82734...
Framecore chokes (FC)		L_R : 10 ... 100 mH I_R : 0.45 ... 2.3 A	Closed magnetic circuit with frame construction 4-section winding High stray inductance, excellent differential mode suppression High pulse-handling capability UL and ENEC (VDE) approvals Optional: magnetic bypass to increase stray inductance	B82732F... B82733F...



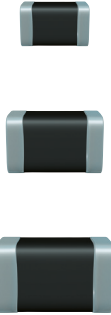

EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Inductors				
U core chokes		L_R : 0.33 ... 15 mH I_R : 0.4 ... 2.6 A	High resonance frequency due to 2-section winding Low whirring noise UL and ENEC (VDE) approvals UL 1446 class 155 (F) EIS Approx. 1.3% stray inductance for symm. interference suppression	B82730U...
E core chokes		L_R : 3.3 ... 100 mH I_R : 0.3 ... 1.8 A	High resonance frequency due to 2-section winding High pulse strength Low whirring noise UL and ENEC (VDE) approvals Approx. 2% stray inductance for symm. interference suppression	
Piezo actuators				
PowerHap™ 15G type		Acceleration 15G (100 g mass) Size: 26 × 26 mm Insertion height: 2.4 mm Operating voltage: 0 ... 120 V Displacement: 200 μm Operating temperature: -40 to +85 °C	Can be used as force sensor and actuator. Programmable haptic feedback Low power consumption Large displacement High force but at small dimensions Fast response Qualified based on AEC-Q200	B54101H1020A001
PowerHap™ 7G type		Acceleration 7G (100 g mass) Size: 12.7 × 12.7 mm Insertion height: 1.9 mm Operating voltage: 0 ... 120 V Displacement: 65 μm Operating temperature: -40 to +85 °C		B54102H1020A001
PowerHap™ 2.5G type		Acceleration 2.5G (100 g mass) Size: 9 × 9 mm Insertion height: 1.2 mm Operating voltage: 0 ... 60 V Displacement: 30 μm Operating temperature: -40 to +85 °C		B54103H2020A001

EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Surge arresters				
EHV		V_{sdclN^*} : 2500 V	Overvoltage protection for AC power supplies Low capacitance < 1 pF Negligible leakage current Discharge current: 1 operation 5 kA 8/20 μ s 300 operations 100 A 8/20 μ s	B88069X1893...
		V_{sdclN^*} : 2700 V		B88069X2423...
		V_{sdclN^*} : 3600 V		B88069X1683...
		V_{sdclN^*} : 5500 V		B88069X1793...
Switching spark gaps				
CAS		Breakdown voltage: 200 ... 255 V	Generate high voltage impulses in igniter circuits High operation temperature Very stable over life time SMD version available	B88069X0680...
		Switching operations: 4 000 000		B88069X0710...
				B88069X6321...
Thermistors NTC				
SMD		Temperature range: -55 ... +125 °C (+150 °C upon request) Rated resistance at +25 °C: 1 ... 470 k Ω Resistance tolerance: +0.5%; EIA case sizes: 0402 (B572...V2), 0603 (B573...V2), 0805 (B574...V2)	Multilayer SMD NTC with inner electrodes AgNiSn termination High accuracy in resistance and B value Very good resistance stability during soldering High aging stability Cost-effective Tape and reel packaging	B572**V2...
EIA 0402				B573**V2...
EIA 0603				B574**V2...
EIA 0805				
SMD				
M891		Temperature range: -55 ... +125 °C Rated resistance at +25 °C: 1 ... 470 k Ω Resistance tolerance: +5, +10 %	Lacquer-coated NTC thermistor Wide resistance range Taped versions for automatic processing Lead spacing 2.5 and 5 mm Non-standard wire configuration upon request Cost-effective	B57891M...
M895				B57895M...








EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors NTC				
S86 S87 S88 S964		Temperature range: $-55 \dots +155 \text{ }^\circ\text{C}$ Rated resistance at $+25 \text{ }^\circ\text{C}$: $2 \dots 100 \text{ k}\Omega$ Resistance tolerance: $+1 \dots +5\%$	Non-standard lead configurations Taped versions for automatic processing Lead spacing 2.5 and 5.0 mm (S87, S88) UL approval (S86) Lead-free as option	B5786*S... B5787*S... B5788*S...
G1540 G1550 G1560		Temperature range: $-55 \dots +300 \text{ }^\circ\text{C}$ (G1540: $+250 \text{ }^\circ\text{C}$) Rated resistance at $+25 \text{ }^\circ\text{C}$: $2 \dots 230 \text{ k}\Omega$ Resistance tolerance: $+2, +3\%$ Head diameter (max.): $0.9 \dots 2.5 \text{ mm}$	High-temperature resistant Short response time Small head diameters Non-standard wire configurations	B57540G... B57550G... B57560G...
G1541 G1551 G1561 G1565		Temperature range: $-55 \dots +260 \text{ }^\circ\text{C}$ (G1541: $+250 \text{ }^\circ\text{C}$) Rated resistance at $+25 \text{ }^\circ\text{C}$: $2 \dots 230 \text{ k}\Omega$ Resistance tolerance: $+2, +3\%$ Insulation resistance: $> 100 \text{ M}\Omega$ 500 V DC (1s)	High-temperature resistant Insulated wires with high insulation voltage Non-standard wire configurations	B57541G... B57551G... B57561G...
K276		Temperature range: $-10 \dots +100 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $4.8, 12 \text{ k}\Omega$ Resistance tolerance: $\geq 2\%$ Insulation voltage: 3750 V AC Thermal time constant τ_a water approx. 20 s	NTC thermistor potted in a compact stainless steel case Suitable for use in corrosive environments Cost-optimized ready to use solution UL approval (E69802) RAST 2.5 and 5 plug terminals available	B57276K...
Z276		Temperature range: $-10 \dots +100 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $4.8 \text{ k}\Omega$ Resistance tolerance: $\geq 2\%$ Insulation voltage: 3750 V AC Thermal time constant τ_a water approx. 10 s	VDE protection class II (K276, Z276) Variety of R/T characteristics and tolerances	B57276Z...
Z278		Temperature range: $-10 \dots +100 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $20 \text{ k}\Omega$ Resistance tolerance: $\geq 2\%$ Insulation voltage: 500 V AC Thermal time constant τ_a water approx. 4 s		B57278Z...





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Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors NTC				
K504		Temperature range: $-20 \dots +150 \text{ }^\circ\text{C}$ Insulation voltage: $> 1250 \text{ V AC}$	NTC thermistor potted into a medium-resistant stainless steel case Short thermal response time in water 1 to 4 s Wire heat proof up to $+200 \text{ }^\circ\text{C}$ Customized sensor design available	Upon request
K514		Temperature range: $-10 \dots +200 \text{ }^\circ\text{C}$ Insulation voltage: $> 1250 \text{ V AC}$ Thermal cooling time constant τ_a air approx. 25 s	NTC thermistor in molded plastic case with fast-on contacts Plastic material PA6.6-GF30 Peak operating temperature up to $+175 \text{ }^\circ\text{C}$ / 1000 hours Modular construction for different mounting situations	B57514K...
K524		Temperature range: $-10 \dots +300 \text{ }^\circ\text{C}$ Insulation voltage: $> 1250 \text{ V AC}$ Thermal cooling time constant τ_a air approx. 30 s	Variety of R/T characteristics and tolerances	B57524K...
Z606		Temperature range: $0 \dots +85 \text{ }^\circ\text{C}$ Insulation voltage: $> 3750 \text{ V AC}$	NTC thermistor potted into molded plastic case with connector outlet Fast and simply assembly due to RAST 2.5 connector Designed according to DIN EN 60730-1/VDE, protection class 2 Variety of R/T characteristics and tolerances	Upon request
M1005		Temperature range: $-30 \dots +80 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: 2.7, 5 k Ω Resistance tolerance: $\geq 2\%$ Insulation voltage: 1250 V AC Thermal time constant τ_a water approx. 15 s	NTC thermistor in molded plastic case with cable outlet Highly resistant to water/moisture Double insulated wires (with oval/round cable sheath) and single insulated twin wires UL approval (E69802)	B57005M1...
M2010		Temperature range: $-30 \dots +80 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: 2, 2.1 k Ω Resistance tolerance: $\geq 2\%$ Insulation voltage: 1250 V AC Thermal time constant τ_a water approx. 25 s	VDE protection class II (M2020) Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57010M2...
M2020		Temperature range: $-40 \dots +80 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: 2.7, 5, 10 k Ω Resistance tolerance: $\geq 2\%$ Insulation voltage: 3750 V AC Thermal time constant τ_a water approx. 35 s		B57020M2...



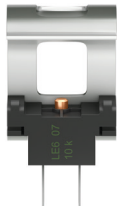

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Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors NTC				
M703		Temperature range: $-20 \dots +125 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: 5, 10 k Ω Insulation voltage: $> 1000 \text{ V AC}$	NTC thermistor encapsulated in metal-tag case Easy mounting Good thermal coupling through metal-tag PTFE-insulated leads of silver-plated nickel wire (AWG 30) UL approval (E69802) Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57703M...
M1703		Temperature range: $-10 \dots +280 \text{ }^\circ\text{C}$ Insulation voltage: $> 1250 \text{ V AC}$	NTC thermistor encapsulated in brass metal-tag case Easy mounting Good thermal coupling through brass metal-tag Teflon insulated wire AWG 26 coated with fiberglass sleeve Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57703M1...
K45		Temperature range: $-20 \dots +125 \text{ }^\circ\text{C}$ Insulation voltage: $> 2500 \text{ V AC}$	NTC thermistors potted into screw-in aluminum case Thermal response time in air approx. 75 s Good thermal coupling through screw-in case Tinned copper leads Fast and simple screw-in installation	B57045K...
K560 K1560		Temperature range: $-10 \dots +250 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: 49, 100 k Ω Insulation voltage: $> 1250 \text{ V AC}$ (K560) $> 3000 \text{ V AC}$ (K1560) Thermal time constant τ_a water approx. 2 s	NTC thermistor potted into aluminum or ceramic housing with cable outlet Flange housing for good thermal coupling to hot surface Virtually uninfluenced by electromagnetic energy High-temperature resistant Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57560K...


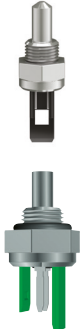


EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors NTC				
M500		Temperature range: $-30 \dots +100 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $10 \text{ k}\Omega$ Insulation voltage: 1250 V AC Thermal cooling time constant τ_a air approx. 20 s	NTC thermistor with epoxy encapsulation Air sensor for air-conditioning PVC-insulated twin wires with tinned ends ($T_{\text{max}} = +105 \text{ }^\circ\text{C}$, AWG 26) Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57500M...
K500		Temperature range: $-30 \dots +100 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $4.7, 10 \text{ k}\Omega$ Insulation voltage: 1500 V AC Thermal time constant τ_a water approx. 8 s	NTC thermistor potted in copper case Evaporator sensor for air-conditioning PVC-insulated twin wires with tinned ends ($T_{\text{max}} = +105 \text{ }^\circ\text{C}$, AWG 26) Variety of R/T characteristics and tolerances Alternative cable lengths and connectors upon request	B57500K0103A001
T120		Temperature range: $+5 \dots +110 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $10 \text{ k}\Omega, 1 \text{ M}\Omega$ Insulation voltage: 500 V AC Thermal time constant τ_a pipe $< 3 \text{ s}$	NTC thermistor potted in copper case Fast and easy mounting Pipe diameter: 13.5, 15, 18, 22 mm Water tightness according to EN 60529 (IP43) for 2 min Alternative fast-on plug terminals available Other R/T characteristics available upon request	B58100A0628A...
F120		Temperature range: $+5 \dots +110 \text{ }^\circ\text{C}$ Typ. rated resistance at $+25 \text{ }^\circ\text{C}$: $10 \text{ k}\Omega, 1 \text{ M}\Omega$ Insulation voltage: 500 V AC Thermal time constant τ_a pipe $< 3 \text{ s}$	NTC thermistor potted in copper case Fast and easy mounting Precise fixation screw attachment Water tightness according to EN 60529 (IP43) for 2 min Other R/T characteristics available upon request	B58100A0461A000

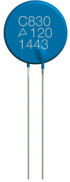





EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors NTC				
Z81		Temperature range: +5 ... +110 °C Insulation voltage: 500 V AC Thermal time constant τ_a water < 5 s	NTC thermistor molded in brass case Suitable for direct water contact Mechanically rugged design Fast-on plug terminals with RAST 5 connector Other R/T characteristics available upon request	B58100A0414A000
K301		Temperature range: -30 ... +110 °C Typ. rated resistance at +25 °C: 10 k Ω Insulation voltage: 2500 V AC Thermal time constant τ_a water < 5 s	NTC thermistor potted in nickel plated brass case Suitable for direct water contact Compact rugged design G1/8" thread according to ISO 228/1 Tab connector or minimodul connector Other R/T characteristics available upon request	B57301K0103A001 B57301K0103A003
Inrush current limiters		Rated resistance at +25 °C: 1 ... 120 Ω I_{max} : up to 20 A V_{RMS} : 265 V	Limiting of inrush current Taped versions for automatic processing UL approval (E69802) available High accuracy and easy mounting Lead spacing 5 and 7.5 mm	B57***S****M...
Thermistors PTC				
Overcurrent protection, chip		Rated resistance: 27 Ω V_{max} : 30 V	EIA case size 1210	B59606A0110A062
A606		Rated resistance: 55 Ω V_{max} : 30 V	Lead-free tinned termination	B59607A0120A062
A607		Rated resistance: 125 Ω V_{max} : 80 V	Short response time	B59707A0120A062
A707		Rated resistance: 400 Ω V_{max} : 265 V		B59807A0090A062
A807		Rated resistance: 1500 Ω V_{max} : 400 V		B59907A0120A062
A907				
SMD				





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Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors PTC				
Overcurrent protection, leaded		Various rated resistance versions available V_{max} : up to 1000 V	Broad product range UL approval VDE approval	B404, B406 B750 ... B774 C810 ... C890 C884 ... C886
Inrush current limiters		Rated resistance: 22, 33, 56, 100 Ω V_{max} : up to 800 V DC	For inrush current limiting in converter circuits Leaded and coated PTC thermistors as well as PTC thermistor disks mounted in thermoplast casing Self protecting in case of malfunction of inverter electronics	B59213J0130A020 B59215J0130A020 B59217J0130A020 B59219J0130A020
C1412 C1451 C75*		Rated resistance at +25 °C: 22 ... 500 Ω V_{max} : up to 800 V		B59412C1130B070 B59451C1130B070 B59750C0120A070 B59751C0120A070 B59755C0115A070
Motor start PTC		Rated resistance: 4.7... 47 Ω V_{max} : up to 400 V	Excellent long-term stability For clamp contacting Approval acc. to UL1434 Standard sizes	Upon request
Liquid point level sensor		Rated resistance: 40 ... 80 Ω V_{max} : 18 V DC	Hermetically sealed stainless steel case	B59050D1100B040 B59050D1120B040
Heater PTC A053		Rated resistance: 4200, 6000 Ω V_{max} : 230 V DC	For door lock in washing machines, thermal actuators, insecticide and perfume vaporizers Silver metallization Suitable for clamp contacting Self-regulating	B59053A0110A010 B59053A0130A010 B59053A0150A010 B59053A0180A010 B59053A0220A010






EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Thermistors PTC				
R102		Rated resistance: 700, 1000, 1300 Ω V _{max} : 230 V DC	For hair curlers, fan heaters, coffee machines, water boilers and glue guns Aluminum metallization Suitable for clamp contacting Self-regulating	B59102R0050A010 B59102R0070A010 B59102R0090A010 B59102R0110A010 B59102R0130A010 B59102R0150A010 B59102R0180A010 B59102R0220A010 B59102R0240A010 B59102R0270A010
Transformers				
EF16 ... EF25		Power: ca. 25 W	Types with > 8 mm creepage and clearance distance available	B78310 B78311 B78313
Varistors				
S05 S07 S10 S14 S20		I _{max} 8/20 μs: up to 800 A I _{max} 8/20 μs: up to 1750 A I _{max} 8/20 μs: up to 3.5 kA I _{max} 8/20 μs: up to 6 kA I _{max} 8/20 μs: up to 12 kA	Operating voltage V _{RMS} : 11 ... 1100 V High surge current ratings up to 12 kA High energy ratings (2 ms) up to 440 J For high energy absorption	B72205S... B72207S... B72210S... B72214S... B72220S...
S25		I _{max} 8/20 μs: 20 kA	Operating voltage V _{RMS} : 130 ... 750 V High surge current up to 20 kA High energy ratings (2 ms) up to 1025 J For high energy absorption	B72225S...

EPCOS Components for Home Appliances



Characteristics				
Series		Technical data	Features	Ordering code/ type
Varistors				
Q14		I_{max} 8/20 μ s: 8 kA	Operating voltage V_{RMS} : 11 ... 680 V Maximum load capacity at minimum component size Height miniaturization High surge current rating up to 15 kA	B72214Q...
Q20		I_{max} 8/20 μ s: 15 kA		B72220Q...
T14	   	I_{max} 8/20 μ s: 6 kA	Operating voltage V_{RMS} : 130 ... 1000 V Disk varistor and fuse in one housing Space saving Monitoring option with 3rd lead UL approval (1449)	B72214T...
T20		I_{max} 8/20 μ s: 10 kA		B72220T...
NT14				B72214R...
NT20				B72214W... B72220R... B72220W...

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