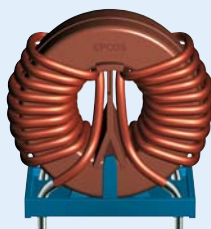


EPCOS Application Guide 2012

Industrial Electronics

Electronic Components for Green Power Generation



Welcome to the World of Electronic Components, Modules and Systems



EPCOS is a leading manufacturer of electronic components, modules and systems. Our broad portfolio includes capacitors, inductors and ferrites, EMC filters, sensors and sensor systems, nonlinear resistors, and arresters, as well as SAW and BAW components and RF modules. As an innovative technology-driven company, EPCOS focuses technologically demanding growth markets in the areas of information and communications technology, automotive, industrial, and consumer electronics. We offer our customers both standard components as well as application-specific solutions.

EPCOS has design, manufacturing and marketing facilities in Europe, Asia and the Americas. We are continuously strengthening our global research and development network by expanding R&D activities at our production locations, primarily in Eastern Europe, China and India. With our global presence we are able to provide our customers with local development and manufacturing know-how and support in the early phases of their projects.

EPCOS is continually improving its processes and thus the quality of its products and services. The Group is ISO/TS 16949 certified and remains committed to constantly reviewing and systematically improving its quality management system.

EPCOS Components for Green Power Generation



In the demanding market for green energy EPCOS is more than just a provider of components. Based on many years of experience in industrial electronics we offer a broad portfolio of reliable solutions. Aluminum electrolytic capacitors for example, offer high ripple current capabilities and useful lifetimes for inverters in solar power generation. Alternatively, the PCC[®] (power capacitor chip) can also be designed into such applications. This compact power capacitor features extremely low ESR and ESL values and can be mounted directly onto the IGBT module. Transformers and power inductors also play a key role in inverters. Our capacitors and inductors are used in the DC link circuits of frequency converters because of their high quality and reliability.

Power quality is essential in all systems for the generation of renewable energy. The broad spectrum of components and systems for power factor correction, for example, helps to significantly improve the efficiency of wind power plants. PTC thermistors protect the systems from overcurrent and overtemperature. Thanks to our broad spectrum of EMC filters and customer-specific solutions, we offer reliable protection against electromagnetic interference (EMI) as well.

As power grids become ever more intelligent, our proven SAW filters will play a key role in the required advanced metering infrastructures (AMI).

EPCOS Components for Green Power Generation

Special Features



AC Capacitors

- MKP technology with metallized polypropylene film
- Highest safety class according to IEC 60252-1 2001-02
- Self-healing
- High insulation resistance
- Low dissipation factor
- Flame-retardant materials to IEC 60335-1
- Dry type
- Maintenance-free
- Standard products available

Aluminum Electrolytic Capacitors

- High ripple current capability
- Operating temperature up to +125 °C
- Very low ESR and ESL
- Long useful life (> 20 years)
- Optimized thermal concept
- Special design for base cooling
- Self-extinguishing electrolyte upon request
- Compact can size

CeraDiodes

- Bidirectional ESD protection acc. to IEC 61000-4-2, level 4
- Operating temperature up to +85 °C without temperature derating
- Short response time < 0.5 ns
- Replacement of semiconductor diodes

Ceramic Transient Voltage Suppressors – CTVS

- Multilayer varistors (MLVs) with case sizes 0402 to 2220
- SMD disk varistors for surge current protection
- Protection against wide overvoltage range
- Bidirectional components
- No temperature derating up to +85 °C/+125 °C (depending on type)
- High temperature types for operation at +150 °C available

EMC Filters and Chokes

Power line filters

- Wide current range up to 2500 A
- Rated voltage up to 760 V AC and 2000 V DC
- Different terminals (tab connectors, litz wires, threaded studs, terminal blocks, pins, IEC connectors, bus bars)
- UL / CSA / ENEC approvals

EPCOS Components for Green Power Generation



High voltage common-mode chokes

- High DC voltage capability
- High current handling capability
- Suppression of asymmetrical interferences coupled in on lines. The high-frequency portions of the symmetrical data signal are decreased so far that EMC problems can be significantly reduced
- Customized designs

High current common-mode chokes (power line)

- Wide current range up to 62 A
- High current-handling capability
- One- and three-phase design available
- Suppression of asymmetrical interferences coupled in on lines. The high-frequency portions of the symmetrical data signal are decreased so far that EMC problems can be significantly reduced
- Customized designs

Standard common-mode chokes

- Suppression of asymmetrical interference coupled in on lines. The high-frequency portions of the symmetrical data signal are decreased so far that EMC problems can be significantly reduced
- Wide range of different core shapes and sizes available, with specific properties
- High current-handling capability
- High temperature stability
- Standard and customized designs

Ferrites

- Wide range of ferrite materials, core shapes and accessories
- Customized shapes

Film Capacitors (Medium Power)

- Long-term stability and reliability
- High peak and RMS current capability
- Overvoltage capability (self-healing)
- DC and AC voltage operation
- Very low ESR/ESL
- UL94V-0 epoxy and plastic resin sealing for boxed types

Inductors

SIMID, power inductors

- High current-handling capability
- Wide temperature range from $-55\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$
- Energy storage in DC/DC converters
- Suppression of electromagnetic interferences
- Suitable for lead-free soldering profiles acc. to JEDEC J-STD 020D

High current chokes

- Suppression of electromagnetic interferences
- Energy storage in DC/DC converters
- High current-handling capability
- High temperature stability

Storage chokes

- Output-filtering for switch-mode power supply circuits and low power inverters
- Designed to customer's requirements

EPCOS Components for Green Power Generation

Special Features



NTC Thermistors

- Long-term stability
- High measuring accuracy
- Short response time
- Heat resistant and highly stable
- Compact dimensions
- Rugged design
- Customer-specific solutions upon request
- NTC thermistors as inrush current limiters

Power Capacitors (PEC)

- High peak current capability
- Overpressure disconnect
- Self-healing
- Maintenance free
- Customized configurations
- Standard products available
- MKP AC capacitors for input and output filtering
- MKP DC capacitors for DC link and pitch control
- MKV capacitors for snubbing and AC filtering
- PCC LP for DC link
- MKK HP for high performance filtering
- MKK DC for DC link

Power Capacitors (PFC) & Key Components

- Capacitors with long service life, high inrush current withstandability, suitable for tough ambient conditions and high ambient temperatures (especially MKV)
- Broad range of key components for PFC in all kind of industrial applications
- Key components for conventional, dynamic, tuned and detuned PFC allow customized solutions

Pressure Sensors

- Piezoresistive silicon technology
- High measurement accuracy
- Various packaging forms
- Absolute, differential and gauge pressure measurement

PTC Thermistors

- For overcurrent protection, limit temperature protection and heating
- Exponential rise of resistance after specified reference temperature by several decades
- Very high mechanical strength
- Customer-specific solutions upon request

SAW Components

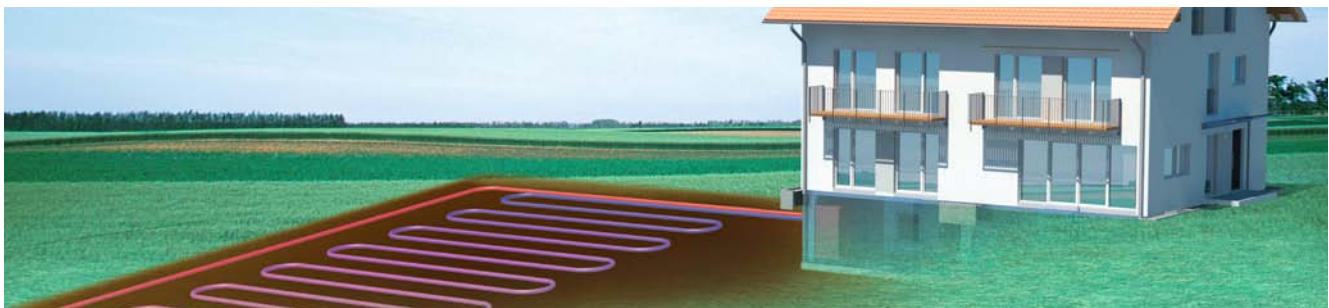
LT filter

- Wideband filters (bandwidth: 1 to 30 MHz)

Quartz filter

- Narrowband filters (bandwidth: 0.1 to 0.6 MHz)

EPCOS Components for Green Power Generation



Surge Arresters

H3, L1

- AC mains 230/400 V AC
- N-PE protection
- EN 61643-11 class I
- Suitable for direct strikes

V1

- AC mains 230/400 V AC
- N-PE protection
- EN 61643-11 class I & II

EF

- AC mains 230/400 V AC
- EN 61643-11 class III
- Device protection
- High ignition voltage

A7

- AC mains 230/400 V AC
- EN 61643-11 class III
- Device protection
- High ignition voltage

A8

- ITU.T-K.12
- Protection of telecom and signalling lines
- 2-electrode

T8

- Protection of telecom and signalling lines
- ITU.T-K.12
- 3-electrode

T83...F

- Protection of telecom and signalling lines
- ITU.T-K.12
- 3-electrode
- With fail-safe

Transformers

Magnetics for LAN applications

- 10/100 Base-T
- 1000 Base-T
- Power over Ethernet

Flyback transformers

- Power supply for control circuits and micro inverters
- Wide range of different core shapes and core-materials available
- Customized designs

Gate drive transformers

- IGBT gate drive
- Wide range of different core shapes and core-materials available
- Customized designs

Power transformers

- Isolating PV to power grid
- Wide range of different core shapes and core materials available
- Customized designs

Current sense transformers

- Standard designs in SMD
- Three different sizes available
- Very low losses and high reliability, ruggedness and simple implementation
- Customized designs possible

Varistors

- Leaded varistors with 5 to 25 mm disk
- Strap varistors
- Block varistors
- ThermoFuse varistors (ETFV)

EPCOS Components for Green Power Generation

Portfolio overview														
	Wind energy													
	Drive technology		Over-voltage protection		Power generation, conversation & transformation						Power quality solutions			
	Electric drives (pitch control, nacelle adjust)	Drive control	Lightning protection	Overvoltage protection for electronic devices	Generator	Gearbox	DC filtering	DC link	Snubbing	Output filtering	Outdoor cabinet heating	Electronic power meter	Ground fault circuit interruptor	Power factor correction facilities
AC capacitors														
MotorCap P0														
MotorCap P2														
Super MotorCap P2														
Aluminum electrolytic capacitors														
Screw terminals	●						●							
4-pin snap-in terminals & solder pins	●													
Snap-in	●													
CeraDiodes														
Standard series											●			
High-speed series											●			
Ceramic transient voltage suppressors – CTVS														
Multilayer varistors (MLV)			●	●							●			
SMD disk varistors (CU)	●		●	●					●		●	●		
EMC filters and chokes														
2-line filters							●							
3-line filters									●					
4-line filters									●					
Output filters									●					
Reactors/ chokes						●			●				●	
High voltage common-mode chokes							●		●					
High current/ Standard common-mode chokes		●							●				●	

EPCOS Components for Green Power Generation

Portfolio overview														
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	Drive technology		Over-voltage protection		Power generation, conversation & transformation						Power quality solutions			
	Electric drives (pitch control, nacelle adjust)	Drive control	Lightning protection	Overvoltage protection for electronic devices	Generator	Gearbox	DC filtering	DC link	Snubbering	Output filtering	Outdoor cabinet heating	Electronic power meter	Ground fault circuit interruptor	Power factor correction facilities
Ferrites														
E, EFD, ETD cores	●	●												
ELP, ER, EQ cores	●	●										●		
PQ cores	●	●												
U, PM cores									●					
Ring cores	●	●										●		
Film capacitors (medium power)														
MKP, MKT for DC link	●						●	●						
MKP snubber	●							●						
MKP AC for output filtering	●								●					
MKP for general purpose	●							●						
MKT AC heavy duty												●		
X2, X1	●		●											
Y2, Y1	●		●											
Inductors														
SIMID 0603 ... 2220														
Power inductors, High current chokes												●		
Storage chokes														
NTC thermistors														
SMD NTC			●			●						●		
S86*, S87*, S88*, S964, S971, S981	●		●		●	●					●	●		●
G1541, G1551, G1561	●		●		●	●					●	●		●
M703*, M1703*	●		●		●	●					●	●		●
K45*	●		●		●	●								●
T120*														
K301*														
Inrush current limiters	●	●												

EPCOS Components for Green Power Generation

Portfolio overview													
	Wind energy												
	Drive technology		Over-voltage protection		Power generation, conversation & transformation						Power quality solutions		
	Electric drives (pitch control, nacelle adjust)	Drive control	Lightning protection	Overvoltage protection for electronic devices	Generator	Gearbox	DC filtering	DC link	Snubbing	Output filtering	Outdoor cabinet heating	Electronic power meter	Ground fault circuit interruptor
Power capacitors (PEC)													
MKP AC, MKP AC HP	●								●				
MKP DC, MKP DC LSI	●						●	●					
MKV	●							●	●				
PCC LP	●						●	●					
MKK HP	●								●				
MKK DC	●						●	●					
Power capacitors (PFC) & key components													
PhaseCap	●								●				●
PhiCap	●								●				●
MKV	●								●				●
PFC key components	●								●				●
Pressure sensors													
ASB 1200						●							
PTC thermistors													
Limit temperature sensors, sizes 0402, 0603, 0805	●	●			●	●						●	
Motor protection sensors					●								
Overcurrent protection, sizes 0603 and 1210		●										●	
Overcurrent protection, sizes 3225 and 4032		●											
Overcurrent protection, SMD disks		●										●	
Overcurrent protection, leaded disks		●										●	
Overcurrent protection for telecom lines												●	
Heating elements										●			
Inrush current limiters, leaded disks	●							●					
Inrush current limiters, phenolic resin plastic case	●							●					






EPCOS Components for Green Power Generation

Portfolio overview

	Wind energy													
	Drive technology		Over-voltage protection		Power generation, conversion & transformation						Power quality solutions			
	Electric drives (pitch control, nacelle adjust)	Drive control	Lightning protection	Overvoltage protection for electronic devices	Generator	Gearbox	DC filtering	DC link	Snubbing	Output filtering	Outdoor cabinet heating	Electronic power meter	Ground fault circuit interruptor	Power factor correction facilities
SAW components														
European ISM bands, f _c : 869 MHz, 433.92 MHz														
NAFTA ISM bands, f _c : 915 MHz, 315 MHz														
Custom SAW filters for licensed bands														
Surge arresters														
2-electrode arresters H3, L1			●	●										
2-electrode arresters V1			●	●										
2-electrode arresters EF, A7			●	●							●			
2-electrode arresters A8				●										
3-electrode arresters T8				●										
Transformers														
Magnetics modules for LAN applications														
Flyback transformers											●			
Gate drive transformers														
Power transformers														
Current sense transformers														
Varistors														
Leaded round disks, S05 ... S25	●	●	●	●							●	●		
Leaded square disks, Q14, Q20	●	●	●	●							●	●		
Strap varistors, LS40 ... LS42			●											
Strap varistors, LS40 ... QE7			●											
Block varistors, B32 ... B80			●		●			●						
ThermoFuse varistors, ETFV14 ... 25			●								●	●		





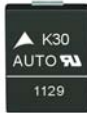
EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
AC capacitors			
MotorCap P0	 <p> C_R: 1 ... 60 μF V_{RMS}: 400 ... 480 V AC T_{op}: -25 ... +85 °C Terminals: - fast-on - flexible wires - twin core cable </p>	Safety Class P0 acc. to IEC 60252-1 Life expect. 10000 h/Class B Compact size VDE approved IEC 60252-1 / IEC 60335-1 Plastic can	B32323 B32328 B32329
MotorCap P2 Compact	 <p> C_R: 2 ... 20 μF V_R: 400/450 V AC T_{op}: -25 ... +85 °C Terminals: - fast-on - flexible wires - twin core cable </p>	Safety Class P2 acc. to IEC 60252-1 Life expect. 30000 h/Class A Flexible mounting options VDE approved IEC 60252-1 / IEC 60335-1 Plastic can	B32352 B32355 B32356
Super MotorCap	 <p> C_R: 1 ... 60 μF V_R: 250 ... 450 V AC T_{op}: -25 ... +85 °C Terminals: - fast-on - twin core cable </p>	Safety Class P2 acc. to IEC 60252-1 Life expect. 30000 h/Class A Compact size VDE approved IEC 60252-1 / IEC 60335-1 Aluminum can	B32330 B32332 B32333
Aluminum electrolytic capacitors			
Screw terminals	 <p> Low voltage V_R: 16 ... 100 V DC C_R: 1500 ... 680000 μF Useful life up to +125 °C, 5000 h +105 °C, 20000 h +85 °C, 12000 h High voltage V_R: 200 ... 550 V DC C_R: 560 ... 33000 μF Useful life up to +105 °C, 8000 h +85 °C, 15000 h </p>	High ripple current capability Long useful life (> 20 years) Compact can size Special design for base cooling Self-extinguishing electrolyte upon request	B41550/B41570 B41554 B41456/B41458 B41560/B41580 B43455/B43457 B43456/B43458 B43564/B43584 B43740/B43760 B43750/B43770
4-pin snap-in terminals & solder pins	 <p> High voltage V_R: 350 ... 500 V DC C_R: 390 ... 2700 μF Useful life up to +105 °C, 3000 h +85 °C, 12000 h </p>	High ripple current capability Long useful life (> 20 years) Compact can size	B43510/B43520 B43511/B43521 B43515/B43525







EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
Aluminum electrolytic capacitors			
Snap-in	 <p>Low voltage V_R: 10 ... 100 V DC C_R: 820 ... 68000 μF Useful life up to +105 °C, 5000 h +85 °C, 2000 h</p> <p>High voltage V_R: 160 ... 500 V DC C_R: 47 ... 3300 μF Useful life up to +105 °C, 5000 h +85 °C, 10000 h</p>	High ripple current capability Long useful life (> 20 years) Compact can size	B41231 B41252 B41505/B43505 B43305 B43501 B43504 B43508 B43540 B43543 B43601
CeraDiodes <u>SMD</u>			
Standard	 <p>C_{typ}: 33 ... 470 pF</p> <p>Case sizes single components: 0402 (SOT-723), 0603 (SOD-523), 1003 (SOD-323)</p> <p>Case sizes array components: 0508, 0612</p>	Use of parasitic capacitance for EMI suppression and high-frequency filtering (replacement of additional MLCC)	B725**D****A*60 B725**D****A*62
High-speed	 <p>C_{typ}: 0.6 ... 10 pF</p> <p>Case sizes single components: 0402 (SOT-723), 0603 (SOD-523), 1003 (SOD-323)</p> <p>Case sizes array components: 0508, 0612, 0506 (SOT-666), 1012 (SOT-23 6L)</p>	Ultra low capacitance down to 0.6 pF for ESD protection of high-speed data lines such as USB, Ethernet, video <p>Specific arrays for ESD protection of USB and Ethernet</p>	B725**D****H*60 B725**D****H*62
Ceramic transient voltage suppressors – CTVS <u>SMD</u>			
Multilayer varistors (MLV)	 <p>Operating voltage V_{RMS}: up to 60 V</p> <p>Surge current capability (8/20 μs): up to 1200 A</p> <p>Operating temperature: up to +150 °C</p>	Case sizes 0402 ... 2220 Bidirectional multilayer protection components with very short response time < 0.5 ns <p>Protection against ESD, surge, burst, switching inductive load, temporary overvoltage (depending on type)</p>	B725**T ... B725**V ...
SMD disk varistors (CU)	 <p>Operating voltage V_{RMS}: up to 300 V</p> <p>Surge current capability (8/20 μs): up to 1200 A</p> <p>Operating temperature: up to +85 °C</p>	Case sizes 3225 ... 4032 Encapsulated disk varistors (5 and 7 mm) for SMD mounting <p>For surge current protection Bidirectionality UL and CSA approved</p>	B726*0M****K ...





EPCOS Components for Green Power Generation



Characteristics				
Series	Technical data	Features	Ordering code / Type	
EMC filters				
2-line filters	 	V_R : 250 ... 520 V AC V_R : 250 ... 5000 V DC I_R : 0.5 ... 1000 A	Suppression of differential and common-mode disturbances Modular SIFI filter system with various cases and insertion loss performances 1 or 2 stage filters Ambient temperature up to +100 °C Filters for frequency converters	B84110 B84111F ... B84112G ... B84113H ... B84142A****R ... B84142A****S ... B84142C****S ...
				3-line filters
4-line filters	  	V_R : 440 ... 530 V AC I_R : 6 ... 600 A	For 3-phase applications with unsymmetrical load, space saving design B84108: chassis filters B84131: for power supplies B84144A****R120 with terminal blocks B84144B****S120 with busbars, standard performance B84144B****S121 with busbars, extended performance	B84108 B84131 B84144
Output filters Sine-wave EMC output filters (SineFormer)		V_R : 440 ... 760 V AC I_R : 6 ... 1500 A Clock frequency: 2.5 ... 16 kHz	dv/dt filters Sine-wave output filters Low-cost sine-wave output filters Sine-wave EMC output filters (SineFormer) 520 V AC (R127 series) 760 V AC (R290 series)	B84143U****R000 B84143U****S000 B84143V****R027 B84143V****R127 B84143V****R227 B84143V****R290












EPCOS Components for Green Power Generation



Characteristics					
Series		Technical data		Features	Ordering code / Type
EMC filters					
Reactors/ chokes		V _R : I _R :	520 ... 760 V AC 6 ... 1500 A	Line reactors dv/dt chokes DC chokes	B86301U****R000 B86301U****S000 B86304L****R000 B86304L****S000
High voltage common- mode chokes		V _R : L _R :	400 ... 1000 V DC 1 ... 5 mH	Special mechanical design for improved electrical strength and long creepage distances Approx. 0.3 ... 1% stray inductance for symmetrical interference suppression High current chokes on baseplate, winding wire serves as solder terminal	B82726S6 ... B82727S6 ... Upon request
High current common- mode chokes (power line)		V _R : L _R :	250 ... 300 V AC / 440 ... 500 V AC 0.5 ... 5 mH	Approx. 0.3 ... 1% stray inductance for symmetrical interference suppression Higher current chokes on baseplate Winding wire serves as solder terminal	B82725S ... B82726S ... B82746S ... B82747S ... Upon request
Standard common- mode chokes		I _R : L _R :	0.25 ... 16 A 0.2 ... 100 mH	High resonance frequency owing to special winding technique Approx. 1... 2 % stray inductance for symmetrical interference suppression Ring-and D-Core-Design: optimized impedance due to closed core Framecore (FC)-Design: High stray inductance, excellent differential mode suppression, low height	B82720 ... B82725 B82730 ... B82734








EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Ferrites				
E cores EFD cores ETD cores		Material: N87, N97 A _L : 69 ... 14000 nH	Wide range of core shapes, sizes and accessories Cost optimized	E5 ... E80
				EFD15 ... EFD30
				ETD29 ... ETD59
ELP cores ER cores EQ cores		Material: N49, N87, N92, N95, N97 A _L : 160 ... 5000 nH	Flat mounting height Planar solution Board integrated	ELP14 ... ELP64
				ER9.5 ... ER32 EQ13 ... EQ30
PQ cores		Material: N49, N87, N92, N95, N97 A _L : 1900 ... 7600 nH	Compact design Ferrite cores for power transformers and chokes	PQ16 ... PQ35
U, PM cores		Material: N27, N87, N97 A _L : 250 ... 16000 nH	Large volume cores	U93 ... U141
				PM50 ... PM114
Ring cores for chokes		Material: N30, T35, T37, T38, T46 A _L : 700 ... 21300 nH	Epoxy coated	R10 ... R87
Film capacitors				
MKP DC link		V _R : 450 ... 1300 V DC C _R : 1.5 ... 110 µF	High-density series, compact Operating temperature up to +105 °C Useful life 100000 h at 1.0 · V _R , +70 °C High vibration resistance due to 4-pin terminals 2 and 4-pin versions Lead spacing 27.5 ... 52.5 mm	B32774 ... B32778
		V _R : 450 ... 1050 V DC C _R : 0.47 ... 60 µF	High power: higher RMS current capability than B3277x Operating temperature up to +105 °C Useful life 100000 h at 1.0 · V _R , +70 °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 Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Film capacitors				
MKT DC link		V _R : 63 ... 400 V DC C _R : 1 nF ... 220 µF	Low voltage DC-link applications Operating temperature up to +125 °C Useful life 200000 h at 1.0 · V _R , +70 °C Lead spacing 5 ... 37.5 mm	B32520 ... B32529
MKP snubber	 	V _R : 850 ... 2000 V DC C _R : 0.047 ... 3.3 µF	Operating temperature up to +110 °C Service life 200000 h at 1.0 · V _R , +85 °C Seven different terminal versions High dv/dt and current/frequency capability	B32656S
MKP AC filtering		V _{RMS} : 250 ... 400 V AC C _R : 0.82 ... 75 µF	Operating temperature up to +105 °C Output AC filtering Optimized AC voltage performance with small dimensions High ripple current/frequency capability Lead spacing 27.5 ... 52.5 mm	B32794 ... B32798
MKP general purpose	 	V _R : 250 ... 2000 V DC C _R : 1 nF ... 8.2 µF	For snubber, resonant or switching Operating temperature up to +105 °C Lead spacing 10 ... 37.5 mm Possibility of AC and/or DC operation High dv/dt and RMS current capability Lead spacing 10 ... 37.5 mm	B32651 ... B32656 B32671L ... B32672L
MKT AC heavy duty		V _{RMS} : 305 V AC C _R : 47 nF ... 10 µF	+85 °C/85% RH/1000 h/240 V AC X2 safety class per UL/IEC (C ≤ 2.2 µF) High stability on capacitance	B32931 ... B32936

EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Film capacitors				
X2		V _{RMS} : 305 V AC C _R : 10 nF ... 45 µF	X2 (2500 V) class for interference suppression and EMC Approved acc. to international standards Lead spacing 10 ... 52.5 mm	B32921 ... B32928
X1		V _{RMS} : 330 V AC C _R : 10 nF ... 6.8 µF	X1 (4000 V) 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 µF	Y2 (5000 V) class for interference suppression and EMC Approved acc. to international standards Line to ground connection Lead spacing 10 ... 37.5 mm	B32021 ... B32026
Y1		V _{RMS} : 250 V AC C _R : 1 nF ... 22 nF	Y1 (8000 V) class for interference suppression and EMC Approved acc. to international standards Line to ground connection Lead spacing 15 ... 22.5 mm	B81123
Inductors				
SIMID 0603 ... 2220 SMD		L _R : 1 nH ... 10 mH I _R : up to 3.5 A	Laser-welded, molded High current handling capability SIMID 0603-C: Laser-cut technology Narrow tolerances High resonant frequency Temperature -55 ... +125 °C SIMID 0805 ... 2220: Laser welded, molded Temperature up to +150 °C	B82496C ...
				B82498F ... B82422 B82432 B82442
Power inductors SMD		L _R : 0.39 ... 1000 µH I _R : up to 11 A	Shielded and unshielded versions High current capability Low DC resistance	B8246 ...
				B8247 ...
High current chokes, helically wound SMD		L _R : 0.44 ... 10 µH I _{sat} : up to 71 A	Highly rated current Very low DC resistance Very low profile and smallest possible footprint Suitable for pick and place processes	B82559






EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
Inductors			
Storage chokes	 <p>I_R: 0.5 ... 8 A Frequency: up to 48 kHz</p>	Specific inductance over current behaviour	B826 ... B78 ... Upon request
NTC thermistors			
SMD NTC	 <p>Case size: 0402 ... 1206 B values: 3450 ... 4480 K R values: 100 Ω ... 680 kΩ</p>		B572**V2 ... B573**V2 ... B574**V2 ... B576**C5 ...
S86* S87* S88* S964 S971 S981	 <p>Temperature range: -55 ... +155 °C Rated resistance at +25 °C: 2 ... 100 kΩ Resistance tolerance: ± 1 ... ± 5%</p>	Taped versions for automatic processing UL approval (S88*) Lead spacing 2.5 and 5.0 mm (S87*, S88*) Customer-specific lead geometrics available	B5786*S ... B5787*S ... B5788*S ... B57964S ... B57971S ... B57981S ...
G1541 G1551 G1561	 <p>Temperature range: -55 ... +260 °C (G1541: +250 °C) Rated resistance at +25 °C: 2 ... 100 kΩ Resistance tolerance: ± 1 ... ± 3% Insulation resistance: > 100 MΩ Insulation voltage: 500 V DC (1 s)</p>	High temperature resistance Insulated wires with high insulation voltage Customer-specific lead geometrics available	B57541G1 ... B57551G1 ... B57561G1 ...
M703	 <p>Temperature range: -55 ... +125 °C Rated resistance at +25 °C: 5 ... 30 kΩ Resistance tolerance: ± 2%</p>	Easy mounting Good thermal coupling through metal-tag UL approval (E69802)	B57703M0103G040 B57703M0303G040 B57703M0502G040








EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
NTC thermistors			SMD
M1703	 <p>Temperature range: -20 ... +300 °C</p> <p>Rated resistance at +25 °C: 10 ... 100 kΩ</p> <p>Resistance tolerance: ±2 ... ±3%</p>	<p>High-temperature resistant</p> <p>Easy mounting</p> <p>Good thermal coupling through metal-tag</p>	<p>B57703M1103A001</p> <p>B57703M1104A001</p>
K45	 <p>Temperature range: -55 ... +125 °C</p> <p>Rated resistance at +25 °C: 1 ... 150 kΩ</p> <p>Resistance tolerance: ±10%</p>	<p>Electrically isolated aluminum case</p> <p>Tinned copper leads</p> <p>Good thermal coupling through screw-type case (thread M3)</p> <p>Cost-effective</p>	<p>B57045K0102K000</p> <p>B57045K0222K000</p> <p>B57045K0472K000</p> <p>B57045K0682K000</p>
T120	 <p>Temperature range: +5 ... +110 °C</p> <p>Rated resistance at +25 °C: 10 kΩ</p> <p>Rated resistance at +60 °C: 2.5 ... 3.0 kΩ</p> <p>Resistance tolerance: ±3%</p>	<p>Pipe mounted clip-on sensor to measure fluid temperature</p> <p>Short response time due to glass-encapsulated NTC thermistor</p> <p>NTC (τ_a, surface < 3 s)</p> <p>Fast and easy mounting</p> <p>For pipes with diameter 13.5, 15, 18, 19 and 22 mm</p> <p>2.8 x 0.5 or 4.8 x 0.8 mm plug terminals</p>	<p>B58100A0439A000</p> <p>B58100A0506A000</p> <p>B58100A0507A000</p> <p>B58100A0527A000</p> <p>B58100A0531A000</p> <p>B58100A0628A000</p> <p>B58100A0629A000</p>
K301	 <p>Temperature range: -30 ... +110 °C</p> <p>Rated resistance at +25 °C: 10 kΩ</p> <p>Resistance tolerance: ±2%</p>	<p>Temperature measurement in heating water</p> <p>NTC in brass housing</p> <p>Short response time in water (τ_a, water approx. 5 s)</p> <p>Sealing with O-ring</p> <p>Fast and easy mounting (G1/8" thread)</p> <p>Tab connector and mini-module connector variants</p>	<p>B57301K0103A001</p> <p>B57301K0103A003</p>
Inrush current limiters	 <p>Rated resistance at +25 °C: 1 ... 80 kΩ</p> <p>I_{max}: up to 20 A</p> <p>V_{RMS}: 265 V</p>	<p>Limiting of inrush current</p> <p>Taped versions for automatic processing</p> <p>UL approval (E69802)</p> <p>High accuracy and easy mounting</p> <p>Lead spacing 5 and 7.5 mm</p>	B57***S***M ...
S153			
S235			
S236			
S237			
S238			
S364			
S464			





EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Power capacitors (PEC)				
MKP AC MKP AC HP		C_R : 3 ... 600 μ F V_{RMS} : 220 ... 600 V AC T_{op} : -40 ... +70 °C Five different terminal types Aluminum can IEC1071, UL E106388 approved	High peak current capability Customized configurations Overpressure disconnecter Self-healing	B32360 B32361 B32362 B32363 B32364 B25360
MKP DC MKP DC LSI	 	C_R : 30 ... 1500 μ F V_R : 880 ... 1980 V DC T_{op} : -55 ... +60 °C Six different terminal types Aluminum can / plastic case IEC1071 approved	High peak current capability Customized configurations Self-healing Low self-inductance	B25620 B25621 B25622 B25623 B25624 B25625 B25631
MKV		C_R : 0.1 ... 220 μ F V_R : 500 ... 2100 V AC T_{op} : -25 ... +85 °C Five different terminal types Aluminum can IEC1071 approved	High peak current capability High dielectric strength Overpressure disconnecter Self-healing	B25834 B25856
PCC LP		C_R : 300 ... 3800 μ F V_R : 450 ... 1500 V DC T_{op} : -25 ... +85 °C IEC1071 approved	Compact size Self-healing High volume fill factor Customer specific designs	B25655J ... B25655M ...
MKK HP		C_R : from 3 · 50 μ F up to 1000 V AC T_{op} : -40 ... +70 °C Delta or Star connected Aluminum or Stainless steel Rectangular case IEC1071 approved	Compact size Low ESR Self-healing Supports high THD Customer specific design	B25610
MKK DC		C_R : up to 15000 μ F V_R : up to 1500 V DC T_{op} : -25 ... +70 °C Open capacitors Rectangular case IEC1071 approved	Compact size Low ESL Self-healing Customer specific design	B25640 B25650 B25750






EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
Power capacitors (PFC)			
PhaseCap Premium	 <p>Q_R: 5 ... 33 kvar V_R: 230 ... 800 V AC f_R: 50/60 Hz</p> <p>MKK-technology Extruded aluminum can with stud Concentric winding Optimized capacitor safety terminal Ceramic discharge resistor premounted up to 690 V; external discharge module for 765 and 800 V</p>	<p>High pulse current withstandability up to 300 · I_R</p> <p>Triple safety system: self healing, overpressure disconnecter, dry technology</p> <p>Mean life expectancy up to 180000 h at temp. class -40/C</p> <p>cUL file E238746 up to 690 V GOST</p>	B25667C ...
PhaseCap Compact	 <p>Q_R: 5 ... 33 kvar V_R: 230 ... 1000 V AC f_R: 50/60 Hz</p> <p>MKK-technology Extruded aluminum can with stud Concentric winding Optimized capacitor safety terminal Ceramic discharge resistor pre-mounted up to 690 V; external discharge module for > 690 V</p>	<p>High pulse current withstandability up to 400 · I_R</p> <p>Dual safety system: self healing, overpressure disconnecter</p> <p>Mean life expectancy up to 200000 h at temp. class -40/C</p>	B25673A ... B25673S ...
PhaseCap HD	 <p>Q_R: 40 ... 60 kvar V_R: 400 ... 525 V AC f_R: 50/60 Hz</p> <p>MKK-technology Extruded aluminum can with stud Stacked winding SIGUT™ safety terminal Pre-mounted discharge module</p>	<p>High pulse current withstandability up to 300 · I_R</p> <p>Triple safety system: self healing, overpressure disconnecter, dry type</p> <p>Mean life expectancy up to 180000 h at temp. class -40/C GOST</p>	B25669
PhiCap	 <p>Q_R: 0.5 ... 30 kvar V_R: 230 ... 525 V AC f_R: 50/60 Hz</p> <p>MKP-technology Extruded aluminum can with stud Stacked winding Optimized capacitor safety terminal for B32344-series; fast-on terminals for B32340- and B32343-series Ceramic discharge resistor premounted for B32344 series; included in the delivery for other series</p>	<p>High pulse current withstandability up to 200 · I_R</p> <p>Dual safety system: self healing, overpressure disconnecter</p> <p>Mean life expectancy up to 135000 h at temp. class -40/C</p> <p>cUL file E106388 CSA file C22.2 No. 190 MC236094 (diameter up to 85 mm) GOST</p>	B32340 B32343 B32344







EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
Power capacitors (PFC)			
MKV	 <p> Q_R: 4.2 ... 30 kvar V_R: 400 ... 800 V AC f_R: 50/60 Hz MKV-technology Extruded aluminum can with stud Stacked winding SIGUT™-terminal Discharge module pre-mounted </p>	High pulse current withstandability up to $500 \cdot I_R$ Dual safety system: self healing, overpressure disconnecter Mean life expectancy up to 300000 h at temp. class -40/D For ambient temperatures up to +70 °C GOST	B25836
PFC key components			
PF controller BR6000-series V5.0	 <p> Supply voltage: 110 ... 230 V AC Measurement voltage range: 30 ... 525 V AC (L-N) or (L-L) f_R: 50/60 Hz Output stages: 6 and 12 steps Interface for BR6000-R12/S485 20 control series preset and control editor for free programming </p>	Intelligent control behaviour 10 languages available for plain language menu Version BR6000-T for dynamic PFC Version BR6000-T6R6 for mixed compensation	B44066R6 ...
Capacitor contactors	 <p> Q_R: 12.5 ... 100 kvar V_R: 400 ... 690 V f_R: 50/60 Hz cUL file 224924 CCC up to 75 kvar for J110/J230 series AC6b utilization category for J110/J230 series </p>	Series J110/J230 for PFC systems without reactors; coil voltage 230 resp. 110 V Series N110/N230 for PFC systems with reactors only; coil voltage 230 resp. 110 V	B44066S****J110/N110 B44066S****J230/N230
Thyristor modules TSM-series	 <p> Q_R: 10 ... 200 kvar V_R: 3 x 400 V TSM-LC-series 3 x 690 V TSM-HV series f_R: 50/60 Hz Fast electronically controlled self-observing thyristor-switches for dynamic PFC Switching of capacitors within 5 ms </p>	Easy installation Display of various system parameters For usage with dynamic PF-controller BR6000-T series	B44066T****E402 B44066T****E690
Harmonic filter reactors	 <p> Q_R: 10 ... 100 kvar V_R: 400 and 440 V (other voltages on request) f_R: 50 and 60 Hz Detuning factor: 5.67%, 7% and 14% High harmonic loading capability Temperature protection by microswitch (NC) Low noise emission </p>	Easy installation Ambient temperature +40 °C High linearity to avoid choke tilt	B44066D****I ... B44066D****M ... B44066D ...

EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Pressure sensors				
ASB1200		Rated pressure : 0.2 ... 1.2 bar, absolute Voltage output: 0 ... 1 V or ratiometric to VCC Measured media: Air, non-aggressive gases (gas humidity 0 ... 100% r.h., short term dewing admissible). Dimensions: 4 x 4 x 2.5 mm	Compact packaged sensor SMT ceramic package for PCB mounting Piezoresistive MEMS technology Gel protected Halogen-free	B58620A0010A001 B58620A0010A002
PTC thermistors				
Limit temperature sensor, chip <u>SMD</u>		Sensing temperature: +70 ... +130 °C in steps of 10 °C +75 ... +145 °C in steps of 10 °C Rated resistance: 470 Ω Case sizes: 0402, 0603, 0805	Superior series Lead free tinned terminations Suitable for wave and reflow soldering	B59421A0**5A062 B59641A0**5A062 B59721A0**0A062
Temperature sensors for motor protection, Single and triple sensors		Sensing temperature: +60 ... +180 °C in steps of 10 °C Standard lead length: 520 mm Customized sensors upon request	Thermistor pellets with insulating encapsulation in series connection (triple sensor) Silver-plated and PTFE-insulated AWG 26 litz wires Characteristics for sensing temperatures $T_{sense} = +90\text{ °C}$ up to $+160\text{ °C}$ conform with DIN 44081 / DIN 44082 Color coding of litz wires to DIN 44081 / DIN 44082 UL approval to UL 1434	B59100M1**0A070 B59300M1**0A070
Overcurrent protection, chip <u>SMD</u>		Rated current: 12 ... 90 mA Operating voltage: 30 ... 400 V DC Rated resistance: 27 ... 1500 Ω Case sizes: 0603, 1210	Lead-free tinned termination Short response time	B59606A0110A062 B59607A0120A062 B59622A0090A062 B59623A0090A062 B59707A0120A062 B59807A0090A062 B59907A0120A062
Overcurrent protection, chip <u>SMD</u>		Rated current: 85 ... 310 mA Operating voltage: 24 ... 63 V DC Rated resistance: 16 ... 55 Ω Case sizes: 3225, 4032	Molded epoxy encapsulation, lead-free tinned solder terminals Suitable for wave and reflow soldering	B59101P1**0A062 B59201P1**0A062 B59301P1**0A062 B59115P1**0A062 B59215P1**0A062 B59315P1**0A062
Overcurrent protection, SMD disks <u>SMD</u>		Rated current: 90 ... 190 mA Operating voltage: 230 V AC Rated resistance: 10 ... 50 Ω 8 mm PTC disk suitable for surface mount placement	UL approval to UL 1434	B59085G1120A161 B59080G1120B262 B59084G1120A161

EPCOS Components for Green Power Generation



Characteristics			
Series	Technical data	Features	Ordering code / Type
PTC thermistors			
Overcurrent protection, leaded	 Rated current: 8 ... 2100 mA Operating voltage: 12 ... 1000 V DC Various rated resistance versions available	Broad product range UL approval	B59585B1150A070 B599**C0**0A070 B598**C0**0A070 B597**B01**A070
Overcurrent protection for telecom lines SMD	 Rated current: 70 ... 180 mA Rated resistance: 5 ... 75 Ω	Two matched PTCs in one SMD housing Housing material acc. to UL94-V0 Compliant with ITU-T standards	B595**T1120A062 B595**T1120A262 B597**T1120A062 B598**T1120A062 B59805T1080A062
Heating elements	 Surface temperature: +105 ... +235 °C Max. operating voltage: 20 ... 265 V DC, other voltage ratings upon request	Silver metallization Different voltage ratings, reference temperatures and geometries upon request	B59041R0**0A010 B59053A0**0A010 B59060A0**0A010 B59102R0**0A010
Inrush current limiters, leaded disks	 Max. DC-link voltage: 360 ... 800 V DC Rated resistance: 25 ... 500 Ω Operating cycles: 50000	Inrush current limiters are not damaged when directly connected to V_{max} even without additional current limitation	B59750B0120A070 B59751B0120A070 B59752B0120A070 B59753B0120A070 B59754B0120A070 B59755B0150A070 B59412C1130B070 B59451C1130B070
Inrush current limiters, phenolic resin plastic case	 Max. DC-link voltage: 360 ... 800 V DC Rated resistance: 22 ... 100 Ω Operating cycles: 100000	Inrush current limiters are not damaged when directly connected to V_{max} even without additional current limitation	B59105J0130A020 B59107J0130A020 B59109J0130A020
SAW components			
LT filters	 Center frequency: 315.00 MHz Usable bandwidth: 1.0 MHz Center frequency: 315.00 MHz Usable bandwidth: 0.6 MHz Center frequency: 433.92 MHz Usable bandwidth: 1.6 MHz Center frequency: 433.92 MHz Usable bandwidth: 1.7 MHz Center frequency: 869.00 MHz Usable bandwidth: 2.0 MHz Center frequency: 869.00 MHz Usable bandwidth: 2.0 MHz Center frequency: 915.00 MHz Usable bandwidth: 26.0 MHz Center frequency: 915.00 MHz Usable bandwidth: 26.0 MHz Center frequency: 915.00 MHz Usable bandwidth: 10.0 MHz Center frequency: 2.4 GHz Usable bandwidth: 97.0 MHz Center frequency: 915.00 MHz Usable bandwidth: 26.0 MHz	Chip: lithium tantalate substrate Input / output: 50 Ω Low insertion attenuation Qualified to AEC-Q200 Temperature range: -40 ... +125 °C (1000 temp. cycles) 85% rel. humidity tested (1000 h)	B39321B3722U410 B39321B3711U410 B39431B3721U410 B39431B3710U410 B39871B3716U410 B39871B3725U410 B39921B3588U410 B39921B3728U410 B39921B3726U410 B39252B4041U410 B39921B4301F210






EPCOS Components for Green Power Generation



Characteristics				
Series	Technical data	Features	Ordering code / Type	
SAW components				
Quarz filters		Center frequency: 315.00 MHz Usable bandwidth: 0.360 MHz	Chip: quartz substrate Input / output: 50 Ω w/ matching Excellent selectivity Qualified to AEC-Q200 -40 ... +125 °C (1000 temp. cycles) 85% rel. humidity tested (1000 h)	B39321B3741H110
		Center frequency: 315.00 MHz Usable bandwidth: 0.100 MHz		B39431B3792Z810
		Center frequency: 433.92 MHz Usable bandwidth: 0.360 MHz		B39431B3740H110
		Center frequency: 433.92 MHz Usable bandwidth: 0.340 MHz		B39431B3743H110
		Center frequency: 868.30 MHz Usable bandwidth: 0.300 MHz		B39871B3734H110
		Center frequency: 869.30 MHz Usable bandwidth: 0.600 MHz		B39871B3744H110
Surge arresters				
H3		Operating voltage V_{RMS} : 255 V Protection level at 1.2/50 μs, 6 kV: < 1500 V I_N 8/20 μs: 100 kA I_{imp} 10/350 μs: 100 kA	High insulation resistance Temporary overvoltage withstand	B88069X6821 ...
L1		Operating voltage V_{RMS} : 255 V Protection level at 1.2/50 μs, 6 kV: < 1500 V I_N 8/20 μs: 50 kA I_{imp} 10/350 μs: 50 kA	High insulation resistance Temporary overvoltage withstand	B88069X5731 ... B88069X6551 ...
V1	 	Operating voltage V_{RMS} : 255 V Protection level at 1.2/50 μs, 6 kV: < 1500 V I_N 8/20 μs: 40 kA class I: I_{imp} 10/350 μs: 12 kA class II: I_{max} 8/20 μs: 65 kA	High insulation resistance Temporary overvoltage withstand	B88069X4390 ... B88069X4400 ... B88069X6940 ...

EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Surge arresters				
EF		DC breakdown voltage: 270 V, 470 V, 600 V, 800 V, 1500 V, 2500 V Max. discharge current 8/20 μ s: 10 kA	High discharge current High isolation resistance High follow current High voltage types available Small size	B88069X2641 ...
				B88069X4131 ...
				B88069X4301 ...
				B88069X5080 ...
				B88069X5690 ...
				B88069X6461 ...
A7		DC breakdown voltage: 800 V, 1000 V, 1400 V Maximum discharge current 8/20 μ s: 10 kA	Short response time High isolation resistance Application in series with MOV High discharge current High voltage types available Compact size	B88069X2140 ...
				B88069X2180 ...
				B88069X3820 ...
A8		DC breakdown voltage: 90 V, 230 V, 350 V Maximum discharge current 8/20 μ s: 20 kA	Short response time High isolation resistance High discharge current SMD and leaded version	B88069X1380 ...
				B88069X1620 ...
				B88069X1630 ...
				B88069X2250 ...
				B88069X2380 ...
T8		DC breakdown voltage: 90 V, 230 V, 350 V Maximum discharge current 8/20 μ s: 10 kA	Short response time High isolation resistance High discharge current	B88069X3651 ...
				B88069X8300 ...
				B88069X8690 ...
				B88069X8910 ...
T8, fail-safe		DC breakdown voltage: 90 V, 230 V, 350 V Maximum discharge current 8/20 μ s: 10 kA	Short response time High isolation resistance High discharge current	B88069X8080 ...
				B88069X8680 ...
				B88069X8720 ...
				B88069X8750 ...








EPCOS Components for Green Power Generation



Characteristics				
Series		Technical data	Features	Ordering code / Type
Transformers				
Magnetics modules for LAN applications <u>SMD</u>		Single, dual and quad port solutions Standard temperature range 0 ... +70 °C Extended temperature range: -40 ... +85 °C	Fully compliant with IPC / JEDEC J-STD-020D / EEE 802.3 Optimized for all major transceiver ICs Industry standard footprint	B78476A****A003
Flyback transformers		> 8 mm creepage and clearance distance available	High dielectric strength Low cost Low stray inductance	B78 ... Upon request
Gate drive transformers		> 8 mm creepage and clearance distance available 600 ... 1000 V separation	High dielectric strength SMD reflow solderable	B78 ... Upon request
Power transformers		up to 5000 W	Low stray inductance High power capability	B78 ... Upon request
Current sense transformers <u>SMD</u>	 	Sensed current 7 ... 40 A Turn ratio 1:20 ... 1:200	Very low DC resistance Different turn ratios Very small package	B82801

EPCOS Components for Green Power Generation



Characteristics					
Series		Technical data		Features	Ordering code / Type
Varistors					
S05		I_{max} 8/20 μ s:	up to 800 A	High surge current ratings	B72205S ...
S07		I_{max} 8/20 μ s:	up to 1750 A	High energy ratings (2 ms) up to 440 J	B72207S ...
S10		I_{max} 8/20 μ s:	up to 3.5 kA	For high energy absorption	B72210S ...
S14		I_{max} 8/20 μ s:	up to 6 kA		B72214S ...
S20		I_{max} 8/20 μ s:	up to 12 kA		B72220S ...
		Operating voltage V_{RMS} :	11 ... 1100 V		
S25		I_{max} 8/20 μ s:	20 kA	High surge current up to 20 kA	B72225S ...
		Operating voltage V_{RMS} :	130 ... 750 V	High energy ratings (2 ms, 185 up to 1025 J)	
Q14		I_{max} 8/20 μ s:	8 A	Maximum load capacity at minimum component	B72214Q ...
Q20		I_{max} 8/20 μ s:	15 kA		Height miniaturization
		Operating voltage V_{RMS} :	130 ... 320 V		
LS40		I_{max} 8/20 μ s:	40 kA	High surge current ratings	B72240L ...
LS41		I_{max} 8/20 μ s:	50 kA	High energy ratings (2 ms) up to 1200 J	B72241L ...
LS42		I_{max} 8/20 μ s:	65 kA		B72242L ...
		Operating voltage V_{RMS} :	130 ... 750 V		
LS40 ... QE7		I_{imp} 10/350 μ s:	6.5 kA	IEC 61643-11 class I	B72240L7 ...
		I_{max} 8/20 μ s:	40.0 kA	High surge current ratings at 10/350 μ s	
		Operating voltage V_{RMS} :	130 ... 460 V	High energy ratings (2 ms) up to 960 J	
B32		I_{max} 8/20 μ s:	25 kA	Disk shaped varistor element potted in plastic housing	B72232B ...
B40		I_{max} 8/20 μ s:	40 kA		B72240B ...
B60		I_{max} 8/20 μ s:	70 kA	Housing and potting flame retardant to UL94 V-0	B72260B ...
B80		I_{max} 8/20 μ s:	100 kA	Screw terminals	B72280B ...
		Operating voltage V_{RMS} :	75 ... 1100 V		
ETFV14		I_{max} 8/20 μ s:	6 kA	ThermoFuse (varistor and fuse in one housing)	B72214T ...
ETFV20		I_{max} 8/20 μ s:	10 kA	Space saving	B72220T ...
ETFV25		I_{max} 8/20 μ s:	20 kA	Monitoring option with third lead UL 1449 approved	B72225T ...
		Operating voltage V_{RMS} :	130 ... 1000 V		
		Operating voltage V_{DC} :	170 ... 1465 V		

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