EPCOS Application Guide

Automotive

Electronic Components for Powertrain Applications

www.epcos.com

EPCOS Components for Powertrain Applications

Powertrain applications place above-average demands on electronic components. A wide range of operating temperatures, high shock resistance and vibrational strength, high reliability and long-term stability are required. Lifetimes of significantly longer than ten years are a must – even under harsh operating conditions.

Building on our long-standing experience in developing and improving components for automotive electronics, we meet these high demands with a wide portfolio of products. Customer benefit from our EPCOS aluminum electrolytic capacitors, for example, which feature a vibrational strength of up to 60 *g*. Moreover, most EPCOS product families feature components that are designed for continuous temperatures of up to 150 °C.

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

EPCOS Components for Powertrain Applications

Contents

EPCOS Components for Powertrain Applications

Special Features

Aluminum Electrolytic Capacitors

- High reliability
- High ripple current capability
- Operating temperature up to +150 °C
- Low ESR
- High vibration resistance up to 60 *g*
- Compact design
- Capacitors with AEC-Q200 qualification available

Ceramic Transient Voltage Suppressors (CTVS) – MLVs

- Reliable ESD protection up to 30 kV for high-speed data buses
- Reliable pulse protection in automotive supply lines acc. ISO 7637-2
- Operating temperature up to +150 °C
- Available for lead-free soldering or hybrid mounting
- Highly rugged on extreme thermal cycles and repetitive pulses
- Qualified acc. to AEC-Q200

Film Capacitors (medium power)

- Long-term stability
- High pulse strength
- High peak and RMS current handling capability
- High contact reliability
- Low fire hazard due to liquid-free technology
- Standard and customized designs
- SMD version for reflow soldering
- Qualified acc. to AEC-Q200

Inductors

- Wide temperature range from –55 °C to +150 °C
- Miniaturized versions
- High mechanical strength
- Suitable for lead-free soldering profiles acc. to JEDEC J-STD 020D
- Qualified acc. to AEC-Q200

NTC Thermistors

- High measuring accuracy and long-term stability
- Short response time
- Temperature measurement up to +260 °C
- Heat resistant and highly stable
- Rugged design
- Compact dimensions
- Overmolded package
- Cable-bound or integrated connector versions
- Humidity resistant
- Customer-specific designs

EPCOS Components for Powertrain Applications

Special Features

NTC Thermistors – SMD

- High measuring accuracy and long-term stability
- Temperature measurement up to +150 °C
- Available for lead-free soldering or hybrid mounting
- Qualified acc. to AEC-Q200

Piezo Components

for diesel and gasoline injection systems

- Short response time and outstanding precision
- Customer-specific designs

Pressure Sensors

- Piezo-resistive dies and transmitters
- Small dimensions
- Long-term stability
- High media resistance
- High accuracy

PTC Thermistors

- Self-regulating heating elements
- Self-protecting, no overheating
- No overtemperature sensing required

Transformers

- Material class –40 °C to +155 °C
- High power density
- Advanced thermal behaviour
- Platform designs qualified acc. to AEC-Q200

Varistors

Leaded disk varistors

- Automotive grade ratings (load-dump, jump-start)
- Stable protection level
- Minimum leakage current
- Qualified acc. to AEC-Q200

EPCOS Components for Powertrain Applications

Overview

	Air flow sensors	Battery control units	ECU: Diesel engine control units	ECU: Gasoline engine control units	Injection systems	Electronic motor drives (fuel pump, fan, water pump, compressor)	Fan control units	Fuel pumps, diesel filters	NOx reduction	Pressure measurement (diesel particle filter, exhaust gases, fuel supply)	Starter generators	StartStopp systems	Temperature measurement (ambient, engine, oil, fuel tank, exhaust gases)	Transmission control units	Water pumps
Aluminum electrolytic capacitors															
Axial-lead			●	●		●	●	●			●	●		●	●
Large-size			●	●											
Single-ended			●	●		●	●	●				●		●	●
Ceramic transient voltage suppressors (CTVS) – MLVs															
Automotive series		●	●	●	●	●	●	●		●	●	●	●	●	●
Controlled-capacitance series			●	●										●	
High-speed series		●	●	●						●	●	●		●	●
Film capacitors (medium power)															
MKT			●	●		●	●				●	●			●
Inductors															
CAN-/ FlexRay bus chokes		●	●	●			●	●		●	●	●		●	●
E core chokes			●	●								●		●	
Power inductors		●	●	●	●						●	●		●	
SIMID 0603 ... 2220		●	●	●		●	●	●		●	●	●		●	●
NTC thermistors															
Glass-encapsulated NTCs	●	●				●		●	●		●	●	●		●
Leaded NTCs	●	●	●	●		●	●	●	●		●	●	●		●
SMD NTCs		●	●	●	●	●	●	●	●		●	●	●	●	●
Temperature probes		●											●		
Piezo components															
Multilayer actuators					●										
Pressure sensors															
Pressure die C32, 1.65 × 1.65 mm	●		●	●				●		●					
Pressure die C33, 1 × 1 mm	●		●	●						●					
Pressure die C38, 1.65 × 1.65 mm	●		●	●						●				●	
PTC thermistors															
Heating elements								●	●						
Transformers															
EHR series		●	●	●											
ERU series			●	●		●								●	
Varistors															
S07 … S20 AUTO (D1)			●	●		●								●	

Please read *Important notes* on page 13.

EPCOS Components for Powertrain Applications

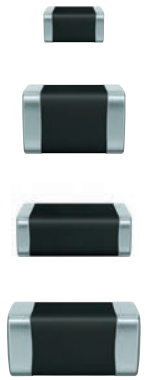
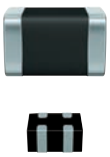
Characteristics

Series		Technical data	Features	Ordering code/ type
Aluminum electrolytic capacitors				
Axial-lead and soldering star	  	Low voltage: V_R: 25 … 100 V DC C_R: 100 … 10000 µF High voltage: V_R: 140 … 250 V DC C_R: 47 … 620 µF	Low voltage: Useful life up to +125 °C, 10000 h +150 °C, 2000 h High voltage: Useful life up to +125 °C, 2500 h Vibration resistance up to 60 *g* High ripple current density e.g. 29.5 A at +125 °C Low ESR values Different mechanical construction available Soldering star for horizontal and vertical mounting Whisker mitigation solutions available Shelf life up to 15 years for low voltage (≤ 100 V)	B41689/B41789 B41690/B41790 B41691/B41791 B41692/B41792 B41693/B41793 B41696/B41796 B43693/B43793
Large-size	 	V_R: 25 … 63 V DC C_R: 900 … 27000 µF	High vibration resistance up to 40 *g* High capacitance level 1.2 mm copper leads for soldering and welding Shelf life up to 15 years	B41605 B41607
Single-ended	   	Low voltage: V_R: 10 … 100 V DC C_R: 47 … 10000 µF High voltage: V_R: 160 … 250 V DC C_R: 33 … 270 µF	Low voltage: Useful life up to +125 °C, 10000 h High voltage: Useful life up to +125 °C, 4000 h Different lead configurations available, e.g. J leads, crimped leads, bent 90° leads Whisker mitigation solutions available	B41866 B41888 B41895 B41896 B41898 B43896

Please read *Important notes* on page 13.

EPCOS Components for Powertrain Applications

Characteristics

Series		Technical data	Features	Ordering code/ type
Ceramic transient voltage suppressors (CTVS) - MLVs				SMD
Automotive series		Temperature range up to +150 °C V_R: 16 … 56 V DC C_R: 10 pF … 10 µF V_{RMS}: 14 … 40 V AC W_{LD}: 1 … 25 J Case sizes: 0603, 0805, 1206, 1210, 1812, 2220	Protection against transient voltages in battery lines (e.g. ISO 7637-2) ESD protection up to 30 kV	B72500E… B72510E… B72520E… B72530E… B72540E… B72580V…
Controlled-capacitance series		V_R: 22 … 31 V DC C_R: 3 … 1200 pF V_{RMS}: 17 … 25 V AC Case sizes: 0508, 0603, 0805, 1206	Application-specific capacitance tolerances for combined ESD protection and EMI filtering	B72590E… B72500E… B72510E… B72812Q…
High-speed series		V_R: 16 … 32 V DC C_R: 3 … 15 pF V_{RMS}: 5 … 30 V AC Case sizes: 0402, 0508, 0603	Low capacitance value to avoid signal distortion at high-speed data rates	B72500T… B72590T… B72812Q…
Film capacitors (medium power)				
MKT		V_R: 63 … 630 V DC C_R: 1 nF … 220 µF	Good pulse handling capability Low ESR Flexible terminal solutions: – multi pin – flat terminals	B32520 … B32529
MKT and MKN SMD		V_R: 63 … 1000 V DC C_R: 1 nF … 20 µF	Temperature resistance up to +170 °C High connection reliability due to flat terminals Suitable for reflow soldering according to JEDEC J-STD 0202D	Upon request

EPCOS Components for Powertrain Applications

Characteristics

Series		Technical data		Features	Ordering code/ type
Inductors					SMD
CAN-/ FlexRay bus chokes	  	L_R: I_R:	5 µH … 4.7 mH up to 1.2 A	Miniaturized types ACT45B, B82789 in size 1812 Bifilar and sector winding Temperatures up to +150 °C For reflow soldering and gluing	ACT45B (B82787…) B82789C0… B82789S0… B82793C0… B82793S0…
E core chokes		L_R : I_{peak} :	0.5 … 35 µH 9 … 50 A	Compact design High ripple currents Low losses	B82559…
Power inductors	 	L_R: I_R: Case sizes:	0.82 … 1000 µH up to 11 A 6 × 6 … 12 × 12 mm	Shielded and unshielded versions Low DC resistance Temperatures up to +150 °C Qualified acc. to AEC-Q200	B82462A… B82462G… B82464A… B82464G… B82464P… B82472P… B82473M… B82475M… B82476B… B82477P…
SIMID 0603-C		L_R: I_R: Case size:	1 … 220 nH 110 … 1800 mA 0603	Copper plated ceramic core Laser cut winding Epoxy coated	B82496C…
SIMID 0805-F		L_R: I_R: Case size:	2.7 … 820 nH 180 … 1000 mA 0805	Cubic coil with ceramic core Epoxy molded flat top for vacuum pickup Winding ends welded to the terminals	B82498F…
SIMID 1210-H		L_R: I_R: Case size:	0.1 … 680 µH 61 … 2050 mA 1210	Ferrite drum core Laser welded winding Flame retardant molding	B82422H…
SIMID 1812-T/C		L_R: I_R: Case size:	1 … 1000 µH 55 … 1300 mA 1812	Ferrite drum core Laser welded winding Flame retardant molding	B82432C… B82432T…
SIMID 2220		L_R: I_R: Case size:	1 µH … 10 mH 25 … 3510 mA 2220	Ferrite drum core Laser welded winding Flame retardant molding	B82442…

Please read *Important notes* on page 13.

EPCOS Components for Powertrain Applications

Characteristics

Series		Technical data	Features	Ordering code/ type
NTC sensors				
Glass-encapsulated NTCs G1541 G1551 G1561		Temperature range: –55 … +260 °C (G1541: +250 °C) Rated resistance at +25 °C: 2 … 100 kΩ Resistance tolerance: ±1% … ±3% Insulation resistance: > 100 MΩ 500 V DC (1 s)	High-temperature resistant Insulated wires with high insulation voltage Non-standard wire configurations	B57541G1… B57551G1… B57561G1…
Leaded NTCs M891		Temperature range: –40 … +125 °C Rated resistance at +25 °C: 1 … 470 kΩ Resistance tolerance: ±5%, ±10%	Robust design Cost-effective Wide resistance range Lead spacing 2.5 mm Taped versions for automated processing	B57891M…
S86* S87* S88* S964 S971 S981 K1150 K220	 	Temperature range: –55 … +155 °C Rated resistance at +25 °C: 2 … 100 kΩ Resistance tolerance: ±1% … ±5%	Nonstandard lead configurations Taped versions for automatic processing Lead spacing 2.5 and 5.0 mm (S87*, S88*) UL approval (S86*) Leadless types (K1150, K220)	B5786*S… B5787*S… B5788*S… B579**S… B57150K1… B57220K…
SMD NTCs SMD		Temperature range: –40 … +150 °C Rated resistance at +25 °C: 4.7 … 100 kΩ Case sizes: 0402, 0603, 0805 Resistance tolerance: ±1%, ±3%, ±5% B-tolerance: ±1%, ±3%	Qualified acc. to AEC-Q200 Operating temperatures up to +150 °C	B572**V5… B573**V5… B574**V5…
Temperature probes Surface temperature sensor for battery temperature		Temperature range: –40 … +125 °C	Robust design Easy mounting Short response time	Upon request
Ambient temperature sensor		Temperature range: –40 … +85 °C IP6K6, IPX9K for 30 s	Water immersion test: 2000 h/ +80 °C Thermal cycling: 480 cycles with applied voltage 120000 cycles on/off Thermal shock: 200 cycles in air transition time < 30 s	Upon request

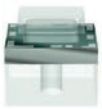
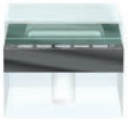
Please read *Important notes* on page 13.

EPCOS Components for Powertrain Applications

Characteristics

Series		Features	Ordering code/ type
Piezo components for diesel and gasoline injection systems			
Actuators		Customer-specific actuator designs in silver/palladium as well as copper multilayer technology available. Design range of typical parameters: Length: 5 … 80 mm Cross section: 2 × 2 … 12 × 12 mm² Voltage: 50 … 250 V Elongation: 5 … 200 µm Blocking force: 100 … 10000 N Temperature: –40 … +180 °C Life time: up to 10^{10} cycles Various contacting and packaging solutions available.	Upon request

Characteristics

Series		Technical data	Features	Ordering code/ type
Pressure sensors				
Pressure die C32		Rated pressure: 0.4 … 25 bar (40 bar for front side application) Pressure measurement: gauge, absolute and back side absolute Size: 1.65 × 1.65 mm	High signal stability Outstanding long-term stability Measurement media: non-aggressive gases and fluids Gold bond pads available	Absolute back side (barometric): B58600H8400A… Absolute front side (barometric): B58600H8000A… Gauge back side: B58601H8000A…
Pressure die C33		Rated pressure: 1.2 … 7 bar Pressure measurement: absolut front side (barometric) Size: 1 × 1 mm	Miniaturized size Small height High signal stability	B58600I0000A001
Pressure die C38		Rated pressure range: 10 … 25 bar Pressure measurement: gauge or absolute measurement Size: 1.65 × 1.65 mm	High burst pressure Single side bond pads for direct die to ASIC wire bonding High signal stability Outstanding long-term stability Measurement media non-aggressive gases and fluids Gold bond pads available	Absolute: B58600E38**B650 Gauge: B58601E38**B650
Pressure transmitter for fuel supply and leakage control		Pressure: 0.3 …10 bar Accuracy: ±1.5% Operating temp.: –40 … +125 °C Analog ratiometric output or digital signal (SENT)	High accuracy Long-term stability SENT signal with temperature sensing function High media resistance against all fuel mixtures	Upon request
Pressure transmitter for diesel/ gasoline particle filter (DPF/GPF)		Pressure: 0.2 … 10 bar Accuracy: ±1.5% Operating temp.: –40 … +140 °C, short-term up to +150 °C Analog ratiometric output or digital signal (SENT)	Differential pressure sensor High media resistance against aggressive media, e.g. exhaust gas, exhaust gas condensates High accuracy, perfectly suited for gasoline particle filters (GPF)	Upon request

Please read *Important notes* on page 13.

EPCOS Components for Powertrain Applications

Characteristics

Series		Technical data	Features	Ordering code/ type
PTC thermistors				
Heating elements		Max. operating voltage: 30 V DC Reference temperature: +80 … +120 °C	Silver metallization For clamp contacting Other voltage ratings, reference temperatures and geometries upon request	B59060A0…
		Max. operating voltage: 20 V DC Reference temperature: +80 … +120 °C	Silver metallization For clamp contacting Other voltage ratings, reference temperatures and geometries upon request	B59041R0…
Transformers				
EHR 16 LP EHR 16 EHR 18		Power: 20 … 50 W	Switching frequencies up to 700 kHz Saturation currents up to 30 A Leakage inductance typical 50 nH Flyback or buck boost	B78342 B78343 B78344
Varistors				
S07… AUTO (D1)		V_{DC}: 16 V V_{RMS}: 14 V C_{typ}: 2.3 nF I_{max} 8/20 µs: 250 A	High energy absorption, particulary in case of load dump Jump start strength Operation temperature up to +125 °C (D1)	B72207S1…
S10… AUTO (D1)		V_{DC}: 16 … 20 V V_{RMS}: 14 … 17 V C_{typ}: up to 5.2 nF I_{max} 8/20 µs: 500 A		B72210S1…
S14… AUTO (D1)		V_{DC}: 16 … 34 V V_{RMS}: 14 … 30 V C_{typ}: up to 10 nF I_{max} 8/20 µs: 1000 A		B72214S1…
S20… AUTO (D1)		V_{DC}: 16 … 34 V V_{RMS}: 14 … 30 V C_{typ}: up to 19 nF I_{max} 8/20 µs: 2000 A		B72220S1…

Please read *Important notes* on page 13.

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.

   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.

5. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.

6. The trade names EPCOS, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.

Get in Contact

Europe

Austria
TDK Austria GesmbH
T +43 1 25 63 630 56 39
F +43 1 25 63 630 56 44
sales.austria@eu.tdk.com

Bulgaria, Greece, Macedonia
TDK Austria GesmbH
T +43 1 25 63 630 56 30
F +43 1 25 63 630 56 44
sales.csee@eu.tdk.com

Czech Republic
TDK Czech s.r.o.
T +420 2 33 03 22 81
F +420 2 33 03 22 89
sales.czech@eu.tdk.com

Finland, Estonia
TDK Nordic OY
T +358 10 34 90 108
sales.nordic@eu.tdk.com

France, Belgium, Luxembourg, Malta
TDK Electronics France SAS
T +33 1 49 46 67 89
F +33 1 49 46 67 67
sales.france@eu.tdk.com

Germany, Liechtenstein, Netherlands, Switzerland
TDK Europe GmbH
T (D) 0180 500 33 48
(0.14 Euro/min.)
(NL) +31 70 33 10 611
(CH) +49 89 54020 2691
F +49 89 54020 2913
sales.germany@eu.tdk.com

Hungary
TDK Electronics Hungary Ltd.
T +36 1 436 07 20
F +36 1 436 07 21
sales.hungary@eu.tdk.com

Italy
TDK Italy S.r.l
T +39 02 50 99 54 25
F +39 02 50 99 54 55
sales.italy@eu.tdk.com

Poland, Latvia, Lithuania
TDK Polska Sp. z o.o.
T +48 22 24 60 409
F +48 22 24 60 400
sales.poland@eu.tdk.com

Portugal
TDK Electronics Spain S.L.U.
T +34 93 480 42 92
+34 93 480 42 68
F +34 93 480 42 31
sales.iberia@eu.tdk.com

Romania
TDK Austria GesmbH
T +43 1 25 63 630 56 30
F +43 1 25 63 630 56 44
sales.romania@eu.tdk.com

Russia, Belarus, Kazakhstan, Moldavia, Ukraine
TDK CIS LLC
T +7 495 663 21 00
+7 495 663 21 22
sales.cis@eu.tdk.com

Slovakia
TDK Austria GesmbH
T +43 1 25 63 630 56 30
F +43 1 25 63 630 56 44
sales.slovakia@eu.tdk.com

Bosnia and Herzegovina, Croatia, Montenegro, Serbia, Slovenia
TDK Austria GesmbH
T +43 1 25 63 630 56 30
F +43 1 25 63 630 56 44
sales.slovenia@eu.tdk.com

Spain
TDK Electronics Spain S.L.U.
T +34 93 480 42 92
+34 93 480 43 33
F +34 91 514 70 14
sales.iberia@eu.tdk.com

Sweden, Iceland, Denmark, Norway
TDK Nordic AB
T +46 8 4 77 27 00
F +46 8 4 77 27 01
sales.nordic@eu.tdk.com

Turkey
TDK Europe GmbH
T +90 216 5 69 81 01
F +90 216 4 64 07 56
sales.turkey@eu.tdk.com

United Kingdom, Ireland
TDK UK Limited
T +44 13 44 38 15 10
F +44 13 44 38 15 12
sales.uk@eu.tdk.com

Asia

Afghanistan, Iran, Iraq, Jordan, Lebanon, Pakistan, Syria
TDK Europe GmbH
T +90 216 5 69 81 01
F +90 216 4 64 07 56
sales.turkey@eu.tdk.com

China
EPCOS (Shanghai) Ltd.
T +86 21 22 19 15 00
F +86 21 22 19 15 99
sales.cn@epcos.com

Hong Kong
EPCOS Limited
T +852 36 69 82 00
F +852 36 69 82 56
sales.cn@epcos.com

India, Bahrain, Bangladesh, Kuwait, Nepal, Oman, Qatar, Saudi Arabia, Sri Lanka, United Arab Emirates
EPCOS India Private Ltd.
T +91 80 40 39 06 00
F +91 80 40 39 06 03
sales.in@epcos.com

Israel
TDK Sales Representative
T +972 73 2676 317
sales.israel@eu.tdk.com

Japan
TDK Corporation
T +81 3 68 52 73 00
inquiry@jp.tdk.com

Korea
EPCOS Korea LLC
T +82 2 21 56 68 18
F +82 2 21 56 68 98
sales.kr@epcos.com

Malaysia
EPCOS RDC SDN. BHD.
T +60 6 79 98 168
F +60 6 79 98 162
sales.asean@epcos.com

Philippines
c/o TDK Electronics Philippines Corporation
T +63 49 541 31 41 66 30
+63 49 541 31 41 66 31
F +63 49 541 31 40
sales.asean@epcos.com

Singapore, Indonesia, Thailand, Vietnam
EPCOS COMPONENTS PTE. LTD.
T +65 65 97 06 28
F +65 65 97 06 07
sales.asean@epcos.com

Taiwan
EPCOS Taiwan Co. Ltd.
T +886 2 26 55 76 76
F +886 2 27 82 03 89
sales.tw@epcos.com

Americas

USA, Canada, Mexico
EPCOS Inc.
T +1 732 9 06 43 00
F +1 732 9 06 43 95
sales.usa@epcos.com

South America
EPCOS do Brasil Ltda.
T +55 11 32 89 95 99 Ext. 6851
F +55 11 32 89 99 40
sales.br@epcos.com

Australia

Australia, New Zealand
TDK Sales Representative
T +61 3 95 66 72 17
F +61 3 95 66 72 99
sales.au@epcos.com

Africa

Egypt
TDK Europe GmbH
T +90 216 5 69 81 01
F +90 216 4 64 07 56
sales.turkey@eu.tdk.com

Morocco, Tunisia
TDK Electronics France SAS
T +33 1 49 46 67 89
F +33 1 49 46 67 67
sales.france@eu.tdk.com

South Africa
TDK Sales Representative
T +27 11 458 90 00 32
F +27 11 458 90 34
sales.southernafrica@epcos.com

02/17

The addresses of our worldwide distributors and regional sales offices are available at www.epcos.com/sales

Edition 2017 · Ordering No. EPC:65070-7600 · Printed in Germany · AG 02172.