



VISHAY INTERTECHNOLOGY, INC.

THE VISHAY PASSIVES GALLERY

Vishay Solutions Inside



A **WORLD OF**
SOLUTIONS™

www.vishay.com

PRODUCT LIST

Semiconductors

- MOSFETs
- ICs
- Rectifiers
- Small-Signal Diodes
- Protection Diodes
- Thyristors / SCRs
- Power Modules
- Optoelectronics

Passive Components

- Resistors
- Magnetics
- Capacitors

MARKET AND TECHNOLOGY LEADER

Semiconductors

- Low-Voltage Power MOSFETs
- Power Rectifiers
- Infrared Components
- TVS Avalanche Breakdown Diodes

Passive Components

- Thin Film SMD Resistors
- Power Inductors and Custom Magnetics
- Wirewound and Other Power Resistors
- Wet and Conformal-Coated Tantalum Capacitors
- Capacitors for Power Electronics
- Leaded Film Resistors

**Our Parts And
Your Vision
*meet here***

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The Art of Capacitors

RFCS

**High-Frequency
(Up to 20 GHz)**



50 V
0.1 pF to 27 pF
S-parameters available

NC

**Wire Bondable,
Thin Film**



200 V
0.5 pF to 1000 pF
0.020" x 0.020" to 0.060" x 0.060"

A...R and K...R

**High Operating
Temperature of
+160 °C**



50 V_{DC} to 200 V_{DC}
100 pF to 1 µF
Automotive Grade
COG, X7R

K...H

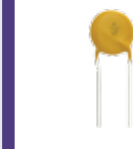
**High Operating
Temperature of
+175 °C**



50 V_{DC} to 200 V_{DC}
100 pF to 1 µF
Automotive Grade
COG, X0U

VY1 – COMPACT SIZE

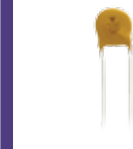
**X1 / Y1 Safety
Capacitor**



760 V_{AC} (X1) / 500 V_{AC} (Y1)
470 pF to 4.7 nF
10 kV pulse tested
85/85/1000 h

VY2

**X1 / Y2 Safety
Capacitor**



440 V_{AC} (X1) / 300 V_{AC} (Y2)
10 pF to 10 nF
Halogen-free

AY2

**X1 / Y2 Safety
Capacitor for
Automotive**



440 V_{AC} (X1) / 300 V_{AC} (Y2)
10 pF to 4.7 nF
Automotive Grade

440L

**X1 / Y1 Safety
Capacitor**



760 V_{AC} (X1) / 500 V_{AC} (Y1)
10 pF to 20 nF
Unique in the market:
10 nF and 20 nF Y1

615R

**High Dielectric
Strength**



10 kV_{DC} to 20 kV_{DC}
100 pF to 3.3 nF
Up to 20 kV rated voltage

HIK

**High Dielectric
Strength**



15 kV_{DC}
100 pF to 1.5 nF
Compact size

715C

**Extreme Dielectric
Strength**



10 kV_{DC} to 50 kV_{DC}
140 pF to 8 nF
Screw terminal mounting

RF POWER PLATES

High Power Levels



2 kV_{DC} to 30 kV_{DC}
5.6 pF to 27 nF
Maximum current up to 125 A_{RMS}

WATER COOLED

**Extremely High
Power Levels**



10 kV_{DC} to 27 kV_{DC}
100 pF to 10 nF
Maximum current up to 350 A_{RMS}

VOLTAGE MULTIPLIERS

**Fully Assembled
Solution**



Up to 19 kV_{DC} per disc
125 pF to 2.2 nF per disc
Highly customizable

CS201, TCN, MCN

**Offered with X7R
or COG (NP0)
Capacitors**



50 V
33 pF to 0.1 µF
Custom schematics available

HIGH-FREQUENCY

0402, 0603, 0805



0.1 pF to 1500 pF
Tolerance as tight as ± 0.05 pF
Operating temperature up to 200 °C
Ultra-high Q

QUAD HIGH-FREQUENCY

0505, 1111, 2525, 3838



200 V to 7200 V
0.1 pF to 5100 pF
Ultra-high Q
0505 and 1111 operating
temperature up to 200 °C

MILITARY GRADE MLCCS

**CDR (MIL-PRF-55681)
DSCC**



CDR: 50 V, 100 V
DSCC: 0402, 0603, 0805, 1206
High-frequency DSCC

SPACE GRADE MLCCS

MIL-PRF-123



From 0805 to 2225
100% acoustic scanned
100% hot IR (125 °C)

NON-MAG. MLCCS

**Screened for Non-
Magnetic Properties**



10 V to 3000 V
1.0 pF to 6.8 µF
0402 to 3640
Reflow and conductive epoxy
assembly

SURFACE-MOUNT SAFETY

X1 / Y2 and X2



250 V_{DC}
10 pF to 12 nF
IEC 60384-14

AUTOMOTIVE GRADE MLCCS

AEC-Q200 Qualified



RoHS Compliant: VJ...31X
Green: GA...34G
0402 to 1812, 1 pF to 1 µF
Matte tin, polymer, and AgPd

COMMERCIAL MLCCS

**Polymer Termination
Option**



10 V to 1000 V
1.0 pF to 6.8 µF
0402 to 3640

HVARC GUARD®

**Protects Against
Surface Arc-Over**



250 V to 2500 V
10 pF to 270 nF
0805 to 2225

LEGEND

Thin Film

Solid and Polymer
Tantalum

Aluminum

Ceramic Single-Layer

Wet Tantalum

Heavy-Current
Power Film (ESTA)

Ceramic Multilayer

Film

Energy Storage

HIGH-VOLTAGE MLCCS

Polymer Termination Option



200 V to 5000 V
10 pF to 1.8 μ F
Open mode design
Parts for reflow and conductive epoxy assembly

SOURCE ENERGY

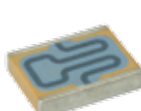
High Pulse Discharge Current



1000 V to 1500 V
4.7 nF to 560 nF
1812 to 4044

CDC

Low Electrostrictive Ceramic



1000 V to 1500 V
33 nF to 560 nF
Integrated 500 MO resistor

BASIC COMMODITY

C0G (NP0), X5R, X7R, Y5V



6.3 V to 100 V
0.5 pF to 100 μ F
0402 to 1210

0201 and ARRAYS

C0G (NP0), X5R, and X7R Dielectrics



6.3 V to 50 V and 16 V, 50 V
0.5 pF to 220 nF and
10 pF to 100 nF
4 capacitors in 0612 size

TM3 – MEDICAL

High-Reliability, Weibull Grading Options



4 V_{DC} to 20 V_{DC}
1 μ F to 220 μ F
Certified to medical standard
ISO 13485

TR3 – LOW ESR

100 % Surge Current Tested



4 V_{DC} to 63 V_{DC}
0.47 μ F to 1000 μ F
Seven case codes

TP3 – AUTOMOTIVE

AEC-Q200 Qualified



4 V_{DC} to 50 V_{DC}
0.10 μ F to 470 μ F
Low ESR and 100 % surge current tested

TH5 – HI-TMP®

Application Voltage: 21 V / 24 V at +200 °C



21 V_{DC} , 24 V_{DC}
4.7 μ F, 10 μ F
500 h continuous operation

TL3 – VERY LOW DCL

DC Leakage at 0.005 CV



4 V to 50 V
0.1 μ F to 470 μ F
Improved reliability: 0.50 %, 1000 h, 85 °C, rated voltage

T83 – HI-REL COTS

High-Reliability



4 V_{DC} to 63 V_{DC}
0.1 μ F to 470 μ F
Weibull grading and surge current test options

TM8

Hi-Rel: Medical and Military Qualified Tantalum Capacitor



2 V_{DC} to 40 V_{DC}
0.68 μ F to 47 μ F
Military and medical qualification

TP8

Automotive: Compact AEC-Q200 Qualified Tantalum Capacitors



6 V_{DC} to 40 V_{DC}
1.0 μ F to 100 μ F
Small sizes include 0603 footprint

597D

Industrial Grade: Robust Designs with Ultra-Low ESR



4 V_{DC} to 75 V_{DC}
10 μ F to 1500 μ F
Designed for industrial and military use

T54

Military: High Reliability Polymer Capacitors



16 V_{DC} to 75 V_{DC}
10 μ F to 470 μ F
High reliability

T55

General Purpose: Industrial Grade Polymer Capacitors



2.5 V to 10 V
3.3 μ F to 330 μ F
Molded body with lead frame terminations

T58

MicroTan: Compact Polymer Capacitors



4 V_{DC} to 25 V_{DC}
10 μ F to 330 μ F
Small size

T59

High Energy: Maximum Capacitance and Voltage Polymer Capacitors



16 V_{DC} to 75 V_{DC}
10 μ F to 470 μ F
High capacitance, high voltage

HE5 / EP1

High-Energy Wet Tantalum Capacitor



25 V_{DC} to 125 V_{DC}
1100 μ F to 72 000 μ F
Highest CV design

T16 and T18

Enhanced Performance Wet Tantalum



25 V_{DC} to 125 V_{DC}
10 μ F to 1800 μ F
High shock and vibration capable

ST and STE

Extended Capacitance Wet Tantalum



10 V_{DC} to 125 V_{DC}
10 μ F to 10 000 μ F
DLA drawings 93026 and 10004

134D and 135D

+200 °C Tantalum Case Wet Tantalum



6 V_{DC} to 125 V_{DC}
1.7 μ F to 2200 μ F

T22

SMD Wet Tantalum Capacitor with Metal Case and Hermetic Sealing



50 V_{DC} to 125 V_{DC}
10 μ F to 68 μ F

T25

SMD Solid Tantalum Capacitor with Metal Case and Hermetic Sealing



16 V_{DC} to 50 V_{DC}
22 μ F to 330 μ F



The Art of Capacitors

MKP1848C

High-Density DC-Link Capacitor



500 V_{dc} to 1200 V_{dc}
1 μ F to 500 μ F
Economic pack; more μ F for mm³

MKP1848S

**Slim DC-Link:
Low Building Height**



500 V_{dc} to 1000 V_{dc}
2 μ F to 100 μ F
Building heights of 12 mm, 15 mm,
18 mm, 24 mm

MKP1848

**High-Performance
DC-Link**



450 V_{dc} to 1200 V_{dc}
1 μ F to 400 μ F
AEC-Q200 qualified DC-Link

MKP386M

**Snubber for Direct
IGBT Mount**



700 V_{dc} to 2500 V_{dc}
0.047 μ F to 10 μ F
Multiple terminal configurations

MKP1847

**AC Filter with
Segmented Film**



230 V_{ac} to 440 V_{ac}
1 μ F to 70 μ F
Safe AC filtering for UPS systems

MKP385

**Pulse and High-
Frequency Capacitor**



160 V_{dc} to 2500 V_{dc}
0.00047 μ F to 82 μ F
High RMS current capabilities

MKP1839HQ

**Axial AC and Pulse
Capacitor**



630 V_{ac} to 1600 V_{ac}
0.1 μ F to 3.3 μ F
High-current and high-frequency

F339X1 330

**RFI Across the Line
X1**



330 V_{ac}
0.001 μ F to 2.2 μ F
Designed to withstand pulse loads

F339X1 480

**RFI Across the Line
X1**



480 V_{ac}
0.001 μ F to 1.0 μ F
Designed for high stability

F1772

**RFI Across the Line
X2**



310 V_{ac}
0.01 μ F to 2.2 μ F
Designed for series impedance

F1772S

**RFI Across the Line
X2**



310 V_{ac}
10 nF to 2.2 μ F
Series impedance: 85 °C, 85 % RH

F1773

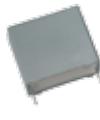
**RFI Across the Line
X2 Axial**



253 V_{ac}
0.01 μ F to 2.2 μ F
Low building height applications

MKP339X2

**RFI Across the Line
X2 AEC-Q200**



310 V_{ac}
0.001 μ F to 4.7 μ F
Automotive Grade X2 safety

MKP338 6 Y2

**RFI Across the Line
Y2 AEC-Q200**



300 V_{ac}
0.001 μ F to 0.47 μ F
Automotive Grade Y2 safety

MKT1820

**AEC-Q200 DC Filter
Automotive**



63 V_{dc} to 1000 V_{dc}
0.0001 μ F to 560 μ F
Operating temperature to 125 °C

MKT37X

**General Purpose
DC Capacitor**



50 V_{dc} to 630 V_{dc}
0.00068 μ F to 15 μ F
AEC-Q200 qualified

MKT1813

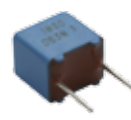
**General Purpose
Axial Capacitor**



63 V_{dc} to 1000 V_{dc}
0.00047 μ F to 22 μ F
Low building height applications

KP1830

**Precision Film,
Foil Capacitor**



63 V_{dc} to 630 V_{dc}
100 pF to 22 nF
High pulse capabilities

MKP1839

**Precision Axial
Capacitor**



160 V_{ac} to 630 V_{ac}
47 pF up to 22 μ F
Low building height applications

142 RHS

**Useful Life Up to
2500 h at 105 °C**



10 V to 450 V
1 μ F to 22 000 μ F
High CV product

146 RTI / 246 RTI-V

**Useful Life Up to
6000 h at 125 °C**



16 V to 63 V
68 μ F to 6800 μ F
Low Z, AEC-Q200 qualified
Vibration improved up to 50 g

160 RLA

**Useful life up to
2000 h at 150 °C**



16 V to 50 V
33 μ F to 3300 μ F
Low Z, AEC-Q200 qualified

152 RMH

**Useful Life Up to
4000 h at 105 °C**



200 V to 450 V
1.5 μ F to 220 μ F
High-voltage, AEC-Q200 qualified

150 CRZ / 250 CRZ-V

**Useful Life Up to
10 000 h at 105 °C**



6.3 V to 100 V
4.7 μ F to 10 000 μ F
Very low Z, AEC-Q200 qualified
Vibration improved up to 30 g

LEGEND

Thin Film

Solid and Polymer
Tantalum

Aluminum

Ceramic Single-Layer

Wet Tantalum

Heavy-Current
Power Film (ESTA)

Ceramic Multilayer

Film

Energy Storage

146 CTI / 246 CTI-V

Useful Life Up to
6000 h at 125 °C



16 V to 100 V
10 μ F to 4700 μ F
Low Z, AEC-Q200 qualified
Vibration improved up to 30 g

160 CLA / 260 CLA-V

Useful Life Up to
2000 h at 150 °C



16 V to 80 V
47 μ F to 3300 μ F
Low Z, AEC-Q200 qualified
Vibration improved up to 30 g

138 AML

Useful Life Up to
10 000 h at 105 °C



6.3 V to 100 V
2.2 μ F to 15 000 μ F
High CV product

118 AHT

Useful Life Up to
8000 h at 125 °C



6.3 V to 200 V
4.7 μ F to 10 000 μ F
High CV product

120 ATC

Useful Life Up to
8000 h at 125 °C



16 V to 100 V
47 μ F to 6800 μ F
High ripple current, low Z

096 PLL-4TSI

4-Terminal Snap-In



350 V to 500 V
390 μ F to 2700 μ F
Useful life \geq 5000 h at 85 °C

157 PUM-SI

Useful Life of 5000 h
at 85 °C



200 V to 500 V
47 μ F to 2200 μ F
Custom designs available on request

159 PUL-SI

Useful Life Up to
5000 h at 105 °C



200 V to 500 V
56 μ F to 1800 μ F
Low ESR, high ripple current
capability

101 / 102 PHR-ST

Useful Life Up to
15 000 h at 85 °C



25 V to 450 V
220 μ F to 1 F
Custom designs available on request

104 PHL-ST

Useful Life Up to
5000 h at 105 °C



200 V to 450 V
150 μ F to 33 000 μ F
Ultra-high reliability

196 HVC ENYCAP™

Energy Storage
Capacitor



1.4 V to 9.6 V
4.0 F to 90.0 F
High capacity and energy density

220 EDLC ENYCAP™

Energy Storage
Capacitor



2.7 V
15 F to 40 F
High capacity and energy density

LVAC PhMKP TUBULAR

Dry or Oil-Filled; IP00,
IP20; Low Height,
Slim Diameter



Up to 1000 V_{AC RMS}
Up to 37 kvar and 3 x 219 μ F (star)
LT > 150 000 h

LVAC PhMKP TRI

50 kvar in Low-
Height Dry Design



Up to 1000 V_{AC RMS}
Up to 56 kvar and 3 x 334 μ F (star)
LT > 130 000 h, indoor / outdoor

LVAC PhMKP RECT

Dry or Oil-Filled



Up to 1000 V_{AC RMS}
Up to 450 kvar and 3 x 1700 μ F (star)
LT > 150 000 h

HVAC

One-Phase,
One-Bushing



1 kV to 24 kV
50 kvar to 800 kvar

HVAC

One-Phase,
Two-Bushing



1 kV to 24 kV
50 kvar to 800 kvar

HVAC

Three-Phase,
Three-Bushing



1 kV to 7.2 kV
50 kvar to 800 kvar

PEC - DCMKP

Metallized PP, SH,
Dry



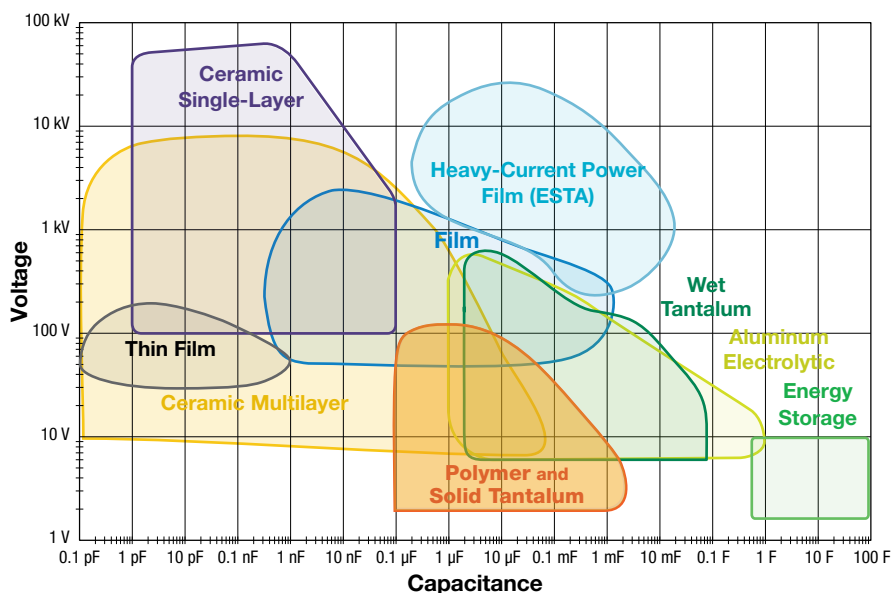
750 V_{DC} to 10 kV_{DC}
50 μ F to 20 mF

PEC - HDMKP

Metallized PP, SH,
Dry



900 V_{DC} to 2.7 kV_{DC}
40 μ F to 2.235 mF

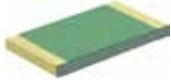




The Art of Resistors

0.031 W to 0.2 W

PVHT



39 Ω to 2.5 M Ω
Operating temperature range: -55 °C;
+250 °C (storage up to 270 °C)
Temperature coefficient down to
5 ppm/°C typical

0.04 W to 0.075 W

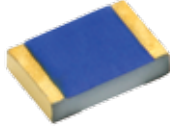
CZA, CZB



Impedance 50 Ω to 600 Ω
Attenuation 1 dB to 20 dB
Thick film fixed chip attenuator

0.0125 W to 0.1 W

CHP HT



0.1 Ω to 100 M Ω
5 % to 1 %
High temperature 245 °C

0.015 W to 0.2 W

M83401



10 Ω to 1 M Ω
Down to 0.1 %, (ratio tol. 0.5 %)
Military networks (SIP, DIP, Flatpack)

0.0189 W to 0.2 W

PHT



10 Ω to 7.5 M Ω
High temperature 230 °C
Case sizes 0402 to 2010

0.03 W to 0.2 W

PRA



10 Ω to 2 M Ω
0.1 % abs. / 0.01 % ratio to 0.05 %
2 to 8 resistors

0.125 W to 0.2 W

CRCA, CRCC,
CS206, TRC, MRCN



10 Ω to 1 M Ω
5 % to 1 %
R/C networks, chips and arrays

0.05 W to 0.25 W

PTF, PSF



15 Ω to 1 M Ω
1 % to 0.01 %
High precision / high stability

0.05 W to 0.25 W

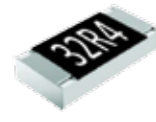
MDP, TxxL, SOMC,
SOGC



10 Ω to 2.2 M Ω
5 % to 1 %
Dual-in-line thick film networks

0.063 W to 0.25 W

RCG e3



1 Ω to 10 M Ω
Down to \pm 0.5 %
Fully green
Case sizes 0402 to 1206

0.1 W to 0.25 W

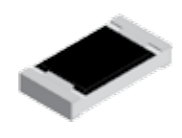
TNPU e3



100 Ω to 511 k Ω
Down to \pm 0.02 %
Low TCR down to \pm 5 ppm/K

0.125 W to 0.25 W

RCV e3



100 k Ω to 10 M Ω
Down to \pm 1 %
High operating voltage (500 V)
Case sizes 0805 to 1206

Up to 0.25 W

UM (UMA, UMB)



22 Ω to 390 k Ω
Down to 0.02 %
Down to 5 ppm

Up to 0.33 W

TNPV e3



121 k Ω to 3.01 M Ω
Case sizes 1206, 1210
High operating voltage up to 1000 V

0.05 W to 0.4 W

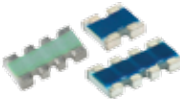
MSP, CSC, TxxS



10 Ω to 2.2 M Ω
5 % to 1 %
Single-in-line thin film networks

0.1 W to 0.4 W

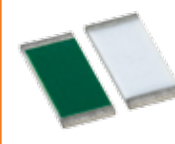
ACAS (ACAS 0612,
ACAS 0606 AT,
ACAS 0612 AT)



47 Ω to 221 k Ω
Down to \pm 0.05 %
TCR down to \pm 5 ppm/K

0.15 W to 0.4 W

PLT



250 Ω to 775 k Ω
0.1 % to 0.01 %
Low TCR down to 5 ppm/°C

0.25 W to 0.4 W

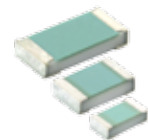
SFM, CTR, CL



1 Ω to 2 M Ω
0.1 % (ratio tol. 0.1 %)
25 ppm, wire bondable

Up to 0.4 W

MC (MCS, MCT,
MCU, MCA)



1 Ω to 10 M Ω
Down to 10 ppm/K
Case sizes 0402 to 1206

P_{ss} up to 0.4 W

MC AT (MCS AT,
MCT AT, MCU AT,
MCA AT)



1 Ω to 1 M Ω
Down to \pm 0.1 %
AEC-Q200 qualified

0.125 W to 0.5 W

UX (UXB, UXE), MPR



10 Ω to 1 M Ω
0.25 % to 0.05 %
Exceptional TCR \pm 2 ppm

0.2 W to 0.5 W

RCS



Case sizes 0402 to 1206
1 Ω to 10 M Ω
Anti surge high power

0.33 W to 0.5 W

NFR25



0.22 Ω to 15 k Ω
5 %
Fusible, non-flammable

Up to 0.5 W

TNPW e3



4.7 Ω to 3.01 M Ω
Down to \pm 0.1 %
Excellent overall stability

SERIES MAX. POWER RATINGS

- \leq 0.5 W
- $>$ 0.5 W up to 1 W
- $>$ 1 W up to 10 W
- $>$ than 10 W

STANDARD RESISTANCE VALUES

E192 (0.1, 0.25, 0.5) %
E96 1 %
E24 (2, 5) %
E12 10 %

E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96
10.0	10.0	11.5	11.5	13.3	13.3	15.4	15.4	17.8	17.8	20.5	20.5	23.7	23.7	27.4	27.4	31.2	31.2
10.1	10.1	11.7	11.7	13.5	13.5	15.6	15.6	18.0	18.0	20.8	20.8	24.0	24.0	27.7	27.7	31.5	31.5
10.2	10.2	11.8	11.8	13.7	13.7	15.8	15.8	18.2	18.2	21.0	21.0	24.3	24.3	28.0	28.0	31.8	31.8
10.4	10.4	12.0	12.0	13.9	13.9	16.0	16.0	18.4	18.4	21.3	21.3	24.6	24.6	28.4	28.4	32.1	32.1
10.5	10.5	12.1	12.1	14.0	14.0	16.2	16.2	18.7	18.7	21.5	21.5	24.9	24.9	28.7	28.7	32.4	32.4
10.6	10.6	12.3	12.3	14.2	14.2	16.4	16.4	18.9	18.9	21.8	21.8	25.2	25.2	29.1	29.1	32.7	32.7
10.7	10.7	12.4	12.4	14.3	14.3	16.5	16.5	19.1	19.1	22.1	22.1	25.5	25.5	29.4	29.4	33.0	33.0
10.9	10.9	12.6	12.6	14.5	14.5	16.7	16.7	19.3	19.3	22.3	22.3	25.8	25.8	29.8	29.8	33.3	33.3
11.0	11.0	12.7	12.7	14.7	14.7	16.9	16.9	19.6	19.6	22.6	22.6	26.1	26.1	30.1	30.1	33.6	33.6
11.1	11.1	12.9	12.9	14.9	14.9	17.2	17.2	19.8	19.8	22.9	22.9	26.4	26.4	30.5	30.5	33.9	33.9
11.3	11.3	13.0	13.0	15.0	15.0	17.4	17.4	20.0	20.0	23.2	23.2	26.7	26.7	30.9	30.9	34.2	34.2
11.4	11.4	13.2	13.2	15.2	15.2	17.6	17.6	20.3	20.3	23.4	23.4	27.1	27.1	31.2	31.2	34.5	34.5

<p>Up to 0.5 W</p> <p>TNPW Lead (Pb)-Bearing</p> <p>10 Ω to 3.01 MΩ Down to 10 ppm/K Excellent overall stability</p>	<p>Up to 1 W</p> <p>CRCW-IF e3, RCA-IF e3</p> <p>1 Ω to 100 kΩ High pulse performance (CRCW-IF and RCA-IF) and sulfur resistant (RCA-IF) Case sizes 0402 to 2512</p>	<p>Up to 1 W</p> <p>SMM</p> <p>0.16 Ω to 10 MΩ; OMM for 0 Ω Down to 0.1 % High pulse load capability</p>	<p>0.035 W to 1 W</p> <p>M55342, D55342, M32159</p> <p>0 Ω (jumper) to 22 MΩ 10 % to 0.1 % Military (M, P, R, S, U, V, T level)</p>	<p>0.04 W to 1 W</p> <p>RCWP, RC, RCHR</p> <p>1 Ω to 3 GΩ 25 % to 1 % Thick film chip resistors</p>	<p>P₇₀ 0.05 W to 1 W</p> <p>RMKHT</p> <p>10 Ω to 6 MΩ Die resistor or die network High temperature 230 °C</p>
<p>0.063 W to 1 W</p> <p>RCA e3</p> <p>1 Ω to 10 MΩ, and 0 0.5 %, 1 %, and 5 % AEC-Q200 (sulfur resistant) Case sizes 0402 to 2512</p>	<p>0.063 W to 1 W</p> <p>D AP, CRCW-AP</p> <p>3.6 Ω to 1 MΩ, and 0 5 %, 1 % For conductive gluing Case sizes 0402 to 2512</p>	<p>0.07 W to 1 W</p> <p>MBx (MBA, MBB, MBE), MRS</p> <p>0.22 Ω to 22 MΩ 5 % to 0.1 % AEC-Q200 options</p>	<p>0.25 W to 1 W</p> <p>PLTT, HTRN</p> <p>250 Ω to 3 MΩ 0.1 % to 0.02 % High temperature 215 °C</p>	<p>0.25 W to 1 W</p> <p>VR (VR25, VR37, VR68)</p> <p>10 Ω to 68 MΩ 5 % to 1 % High pulse load, U_{max} 10 kV</p>	<p>0.25 W to 1 W</p> <p>CRHV, CDHV, CRMV, CDMV</p> <p>150 Ω to 50 GΩ 20 % to 1 % Hi/med. voltage resistors / dividers</p>
<p>Up to 1 W</p> <p>CRCW-P e3</p> <p>1 Ω to 10 MΩ down to 0.25 % TCR down to 50 ppm/K Semi-precision Case sizes 0402 to 2512</p>	<p>Up to 1 W</p> <p>MM HV (MMA HV, MMB HV)</p> <p>340 kΩ to 10 MΩ Case sizes 0204, 0207 High operating voltage > 500 V</p>	<p>Up to 1 W</p> <p>MM (MMA, MMB, MMU)</p> <p>0.1 Ω to 15 MΩ, and 0 Down to 0.1 % High pulse load capability</p>	<p>Up to 1 W</p> <p>CM (CMA, CMB)</p> <p>2.2 Ω to 1.5 MΩ 5 %, 1 % Up to 10 kV/3 kW pulse capability</p>	<p>1 W</p> <p>WSLS</p> <p>10 mΩ to 100 mΩ 5 % to 0.5 % Power Metal Strip® high stability</p>	<p>P₈₅ up to 1 W</p> <p>MCW AT (MCW 0406 AT, MCW 0612 AT)</p> <p>1 Ω to 100 kΩ Down to \pm 0.1 % Robust against thermal cycles</p>
<p>0.2 W to 1.5 W</p> <p>CRCW-HP e3</p> <p>1 Ω to 1 MΩ, and 0 Pulse proof high power Case sizes 0402 to 2512</p>	<p>0.25 W to 2.0 W</p> <p>RCL, RCA-LS</p> <p>Case sizes 0406 to 1225 1 Ω to 1 MΩ Long side termination (RCL and RCA-LS) and sulfur resistant (RCA-LS)</p>	<p>0.05 W to 2 W</p> <p>CMF, RN, RL, CCF02, CCF50, CCF60</p> <p>0.1 Ω to 50 MΩ 5 % to 0.1 % Axial-leaded metal film resistors</p>	<p>0.05 W to 2 W</p> <p>RNC, RNR, RNN, RLR</p> <p>1 Ω to 10 MΩ 2 % to 0.1 % Military (M, P, R, and S level)</p>	<p>0.063 W to 2 W</p> <p>RCWE, RCWL</p> <p>10 mΩ to 976 mΩ 5 % to 0.5 % Low value thick film Case sizes 0402 to 2512</p>	<p>0.6 W to 3 W</p> <p>PR (PR01, PR02, PR03) PR01 & PR02 are AEC-Q200 qualified</p> <p>0.22 Ω to 1 MΩ 5 % to 1 % AEC-Q200 qualified</p>

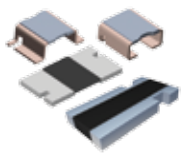
E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E24	E12	E24	E12
31.6	31.6	36.5	36.5	42.2	42.2	48.7	48.7	56.2	64.9	75.0	86.6	10	10	33	33		
32.0		37.0		42.7		49.3		56.9	65.7	75.9	87.6	11		36			
32.4	32.4	37.4	37.4	43.2	43.2	49.9	49.9	57.6	66.5	76.8	88.7	12	12	39	39		
32.8		37.9		43.7		50.5		58.3	67.3	77.7	89.8	13		43			
33.2	33.2	38.3	38.3	44.2	44.2	51.1	51.1	59.0	68.1	78.7	90.9	15	15	47	47		
33.6		38.8		44.8		51.7		59.7	69.0	79.6	92.0	16		51			
34.0	34.0	39.2	39.2	45.3	45.3	52.3	52.3	60.4	69.8	80.6	93.1	18	18	56	56		
34.4		39.7		45.9		53.0		61.2	70.6	81.6	94.2	20		62			
34.8	34.8	40.2	40.2	46.4	46.4	53.6	53.6	61.9	71.5	82.5	95.3	22	22	68	68		
35.2		40.7		47.0		54.2		62.6	72.3	83.5	96.5	24		75			
35.7	35.7	41.2	41.2	47.5	47.5	54.9	54.9	63.4	73.2	84.5	97.6	27	27	82	82		
36.1		41.7		48.1		55.6		64.2	74.1	85.6	98.8	30		91			



The Art of Resistors

1 W to 3 W

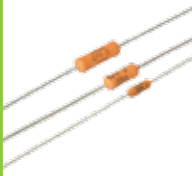
WSK, WSL3637,
WSL2726, WSL4026



0.3 mΩ to 200 mΩ
5 % to 0.1 %
4-terminal, kelvin connection

1 W to 3 W

CPF



0.1 Ω to 150 kΩ
5 % to 0.1 %
Industrial power metal film resistors

3 W

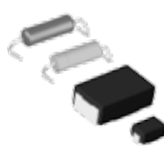
WSMS



50 μΩ to 100 μΩ
5 %
Meter shunt

0.5 W to 3.75 W

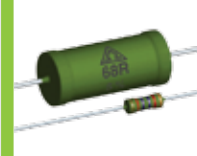
WSC, WSN,
WSF, WSZ



0.1 Ω to 100 kΩ
10 % to 0.1 %
Wirewound / film SMD

P₇₀ 1 W to 4 W

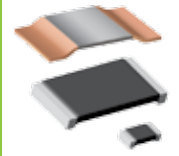
WK, WR
WK2 & WR4 are AEC-Q200 qualified



0.22 Ω to 1 MΩ
Down to 1 %
High power dissipation

0.1 W to 5 W

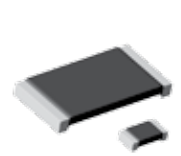
WSL, WSL...18



2 mΩ to 500 mΩ
5 % to 0.1 %
Power Metal Strip®

1 W to 5 W

WSLT



0.3 mΩ to 500 mΩ
5 % to 0.1 %
Power Metal Strip® high temp.

2 W to 5 W

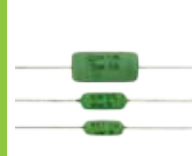
WSR



1 mΩ to 1 Ω
5 % to 0.5 %
Power Metal Strip® molded

P₄₀ 3 W to 5 W

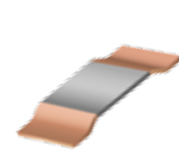
AC, CS
(AC01-CS, AC03-CS, AC05-CS)



4.7 Ω to 100 Ω
5 %
Fusible wirewound

Up to 6 W

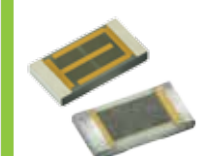
WSLF2512



0.3 mΩ to 3 mΩ
5 % to 1 %
Power Metal Strip® high-power

Up to 6 W

PCAN, PHP



100 ppm/°C to 25 ppm/°C
5 % to 1 %
Precision high power, thin film

7 W

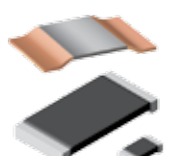
WSHM



1 mΩ to 100 mΩ
10 % to 0.05 %
Power Metal Strip® high power

0.4 W to 10 W

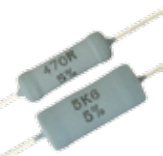
WSLP



0.3 mΩ to 500 mΩ
5 % to 0.1 %
Power Metal Strip® higher power

P₄₀ 1 W to 10 W

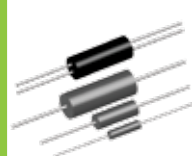
Z300-C



0.1 Ω to 27 kΩ
10 %, 5 %
High surge (≤ 12 kV)

1 W to 10 W

LVR, SPU



1 mΩ to 800 mΩ
10 % to 0.1 %
Low value axial leaded, molded

1 W to 10 W

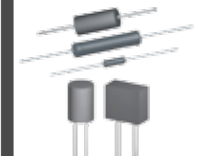
AC, AC-AT, PAC, Z300,
Z300-C00
AC-AT is AEC-Q200 qualified



0.1 Ω to 27 kΩ
10 % to 1 %
Non-flammable coating

0.06 W to 12 W

MR, MRA



0.01 Ω to 6 MΩ
10 % to 0.005 %
Non-magnetic / non-inductive

0.4 W to 13 W

CW, G, GN, RS, NS



0.1 Ω to 273 kΩ
10 % to 0.05 %
Leaded wirewound

1 W to 13 W

SR, SPU, SPR



0.5 mΩ to 50 mΩ
5 % to 0.01 %
Through-hole shunts

1 W to 13 W

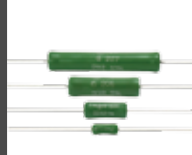
CW...HE, CW...HS



0.1 Ω to 167 kΩ
High continuous energy ≤ 106.5 J
Surge immunity ≤ 12 kV
Wirewound high energy/surge

4 W to 17 W

G200



0.1 Ω to 120 kΩ
10 % to 2 %
Enhanced humidity protection

0.25 W to 20 W

RNX, ROX, FHV,
TR, MVW, HWV, TD



100 Ω to 3 TΩ
20 % to 0.5 %
High voltage through hole resistors

2 W to 20 W

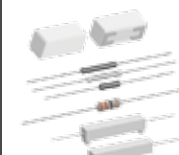
CPCx, CPW, CPWN



0.01 Ω to 150 kΩ
10 % to 0.5 %
Fireproof ceramic body

1 W to 25 W

CA, CP, CPR, CPSM



0.1 Ω to 50 kΩ
10 % to 5 %
Fiberglass core wirewound









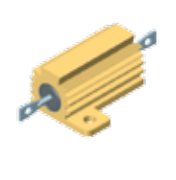









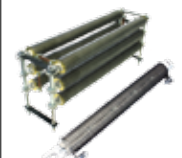


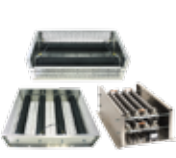


SERIES MAX. POWER RATINGS

- ≤ 0.5 W
- > 0.5 W up to 1 W
- > 1 W up to 10 W
- > than 10 W

STANDARD RESISTANCE VALUES

E192 (0.1, 0.25, 0.5) %
E96 1 %
E24 (2, 5) %
E12 10 %

E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96
10.0	10.0	11.5	11.5	13.3	13.3	15.4	15.4	17.8	17.8	20.5	20.5	23.7	23.7	27.4	27.4	31.2	31.2	35.5	35.5
10.1	10.1	11.7	11.7	13.5	13.5	15.6	15.6	18.0	18.0	20.8	20.8	24.0	24.0	27.7	27.7	31.5	31.5	35.8	35.8
10.2	10.2	11.8	11.8	13.7	13.7	15.8	15.8	18.2	18.2	21.0	21.0	24.3	24.3	28.0	28.0	31.8	31.8	36.0	36.0
10.4	10.4	12.0	12.0	14.0	14.0	16.0	16.0	18.4	18.4	21.3	21.3	24.6	24.6	28.4	28.4	32.1	32.1	36.3	36.3
10.5	10.5	12.1	12.1	14.2	14.2	16.2	16.2	18.7	18.7	21.5	21.5	24.9	24.9	28.7	28.7	32.4	32.4	36.6	36.6
10.6	10.6	12.3	12.3	14.3	14.3	16.4	16.4	18.9	18.9	21.8	21.8	25.2	25.2	29.0	29.0	32.7	32.7	36.9	36.9
10.7	10.7	12.4	12.4	14.5	14.5	16.5	16.5	19.1	19.1	22.1	22.1	25.5	25.5	29.4	29.4	33.0	33.0	37.2	37.2
10.9	10.9	12.6	12.6	14.7	14.7	16.7	16.7	19.3	19.3	22.3	22.3	25.8	25.8	29.8	29.8	33.3	33.3	37.5	37.5
11.0	11.0	12.7	12.7	14.9	14.9	16.9	16.9	19.6	19.6	22.6	22.6	26.1	26.1	30.1	30.1	33.6	33.6	37.8	37.8
11.1	11.1	12.9	12.9	15.0	15.0	17.2	17.2	19.8	19.8	22.9	22.9	26.4	26.4	30.4	30.4	33.9	33.9	38.1	38.1
11.3	11.3	13.0	13.0	15.2	15.2	17.4	17.4	20.0	20.0	23.2	23.2	26.7	26.7	30.7	30.7	34.2	34.2	38.4	38.4
11.4	11.4	13.2	13.2			17.6	17.6	20.3	20.3	23.4	23.4	27.1	27.1	31.0	31.0				

Up to 22 W RCP  10 Ω to 2 k Ω High power thick film chip, AlN substrate Case sizes 0505 to 2512	20 W to 35 W D2T0, DT025  0.01 Ω to 700 k Ω 10 % to 1 % TO-263 (D ² PAK) and TO-252 (DPAK)	36 W WSBS, WSBM  50 $\mu\Omega$ to 1000 $\mu\Omega$ 5 % to 1 % Battery shunt	20 W to 50 W RTO 20, RTO 50  0.01 Ω to 550 k Ω 10 % to 1 % TO-220 package	20 W, 30 W, and 100 W LTO  0.015 Ω to 1 M Ω 10 % to 1 % TO-220, TO-247	1 W to 120 W RWR, RER, RW, RE, RLV  0.01 Ω to 71.5 k Ω 1 % to 0.1 % Military qualified wirewound
30 W to 125 W SPR2213, SPR2214, MCRL, PC Quick Connect  0.2 Ω to 76 k Ω 10 % to 5 % Wirewound, heat sink mount	5 W to 225 W FST, FVT, AST, AVT, FSOT  0.1 Ω to 651 k Ω 10 % to 1 % Tubular wirewound	7.5 W to 250 W RH, NH  0.01 Ω to 273 k Ω 5 % to 0.05 % Chassis mount	6 W to 500 W ZBS, ZWS, ZWK  0.1 Ω to 620 k Ω 10 % to 2 % Ferrules, lugs, corrugated ribbon	50 W to 500 W VACR  2.7 Ω to 1.8 k Ω 10 % High overload capacity	400 W to 750 W RCEC  1 Ω to 1 M Ω 10 % to 5 % Partial discharge free, thick film
750 W RCMC  0.27 Ω to 18 Ω Thick film metal on ceramic High pulse load capability	270 W to 900 W C....T  0.33 Ω to 100 k Ω Very high dissipation Very high energy capability	7 W to 1000 W GBS, GWS, GWK, RW  0.1 Ω to 330 k Ω 10 % to 2 % Ferrules, lugs, corrugated ribbon	300 W to 1100 W LPS  0.3 Ω to 1.3 k Ω 10 % to 1 % Heatsink mounting	50 W to 1500 W FSE, FVE, ASE, AVE  0.1 Ω to 151 Ω 10 % to 1 % Tubular wirewound	0.14 MJ to 3.46 MJ ULDCR  1 m Ω to several ohms 15 % to 5 % High pulse energy (several kA)
400 W to 1600 W EDGF, EDGU, EDGS, HEXF  0.053 Ω to 91.7 Ω 10 % to 5 % Wirewound	5 W to 2000 W RBEF, RBEA, RBSF, RBSA, RDEF, RDEA  0.01 Ω to 227 k Ω 10 % to 1 % Tubular wirewound	Up to 2500 W WCR  4.7 Ω to 56 k Ω Non-inductive option Water cooled	300 W to 20 000 W CSQB, CSFR, CSPR  0.01 Ω to 227 k Ω 10 % to 1 % Wirewound assembly	1000 W to 100 000 W GRE1, GRE2, GRE4, GRES, NGR  0.01 Ω to 100 Ω 10 % to 5 % Stainless steel grid resistors	Up to 4 500 000 W Braking Resistor  Special design for harsh working conditions Railway, mining

E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E192	E96	E24	E12	E24	E12
31.6	31.6	36.5	36.5	42.2	42.2	48.7	48.7	56.2	64.9	75.0	86.6	10	10	33	33		
32.0		37.0		42.7		49.3		56.9	65.7	75.9	87.6	11		36			
32.4	32.4	37.4	37.4	43.2	43.2	49.9	49.9	57.6	66.5	76.8	88.7	12	12	39	39		
32.8		37.9		43.7		50.5		58.3	67.3	77.7	89.8	13		43			
33.2	33.2	38.3	38.3	44.2	44.2	51.1	51.1	59.0	68.1	78.7	90.9	15	15	47	47		
33.6		38.8		44.8		51.7		59.7	69.0	79.6	92.0	16		51			
34.0	34.0	39.2	39.2	45.3	45.3	52.3	52.3	60.4	69.8	80.6	93.1	18	18	56	56		
34.4		39.7		45.9		53.0		61.2	70.6	81.6	94.2	20		62			
34.8	34.8	40.2	40.2	46.4	46.4	53.6	53.6	61.9	71.5	82.5	95.3	22	22	68	68		
35.2		40.7		47.0		54.2		62.6	72.3	83.5	96.5	24		75			
35.7	35.7	41.2	41.2	47.5	47.5	54.9	54.9	63.4	73.2	84.5	97.6	27	27	82	82		
36.1		41.7		48.1		55.6		64.2	74.1	85.6	98.8	30		91			



The Art of Inductors

POWER INDUCTORS

IHLP-01 Series



Case sizes 1616 through 6767
Best saturation
Lowest core loss

POWER INDUCTORS

IHLP-A1 Series



Cases sizes 1616 through 6767
Automotive version of the -01 series

POWER INDUCTORS

IHLP-11 Series



Case sizes 1212 through 6767
Medium permeability series
Low DCR

POWER INDUCTORS

IHLP-1A Series



Case sizes 1616 through 8787
Automotive version of the -11 series

POWER INDUCTORS

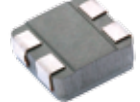
IHLE



Integrated E-Field shield eliminates
the need for separate shielding
Up to 20 dB E-Field reduction at 1cm

POWER INDUCTORS

IHCL



Coupled inductor manufactured with
IHLP technology
Designed for SEPIC circuits

POWER INDUCTORS

IHLP-51 Series



Case sizes 1616 through 8787
High temperature series

POWER INDUCTORS

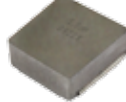
IHLP-5A Series



Case sizes 1616 through 8787
Automotive version of the -51 series

POWER INDUCTORS

IHLP-81 Series



Case sizes 1616 through 8787
180 °C operating temperature range

POWER INDUCTORS

IHLP-8A Series



Case sizes 1616 through 8787
Automotive version of the -81 series

POWER INDUCTORS

IHLD



Optimal design realizes high quality
sound and low distortion
Low coupling for minimal
cross-talk between inductors

POWER INDUCTORS

IHSM



4 case sizes available
High inductance values up to 18 mH

POWER INDUCTORS

IHTH-0750 / 1125



Through-hole inductor manufactured
with IHLP technology
Automotive Grade

POWER INDUCTORS

IHXL



Shielded construction
High temperature, up to 155 °C
Automotive Grade

POWER INDUCTORS

IFSC



Shielded ferrite
Small sizes

POWER INDUCTORS

IHHP



Magnetic alloy power choke coil
Miniature 0806 and 1008 sizes
Magnetic shielding

POWER INDUCTORS

IFLR Series



4 case sizes available
High current, over 50 A
High frequency VRM10.0 applications

POWER INDUCTORS

IFL Series



Ferrite core with polyurethane
enameled copper wire
Inductance up to 100 µH
3 case sizes available

POWER INDUCTORS

IFLS Series



Shielded ferrite core with
polyurethane enameled copper wire
Inductance up to 100 µH
3 case sizes available

POWER INDUCTORS

IDC/IDCS/IDCP



Drum core inductors available in
multiple sizes
Shielded and unshielded

POWER INDUCTORS

TJ3-HT / TJ5-HT



Toroid
High temperature, up to 200 °C
Vertical or horizontal options

COMMON MODE

ICM-2824 / 3528 / 4743



Common mode choke
Used for DC power lines

COMMON MODE

ICM-0805 / 1206



Common mode choke
Used for filtering

TRANSFORMERS

Custom – Automotive



High current transformers and
inductors
Focus on EV and HEV high voltage
inverters
Unique, thick copper conductors for
up to 7.5 KW

LEGEND

- Power Inductors
- Common Mode
- High Frequency
- Multilayer
- Wireless Charging
- Transformers
- Axial Leaded
- Filter Inductors
- Planar Transformers

TRANSFORMERS

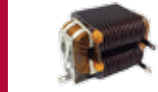
Custom – Aerospace / Military



Cockpit controls and backlight display
Mobile communications systems
Missile launch and guidance systems

TRANSFORMERS

Custom – Industrial



Switch mode power transformers, input / output inductors, filter inductors
Focus on complex designs for rugged environments
Winding construction includes: edgewound coils, planar coils, bob bobb-wound coils, and toroidal coils

TRANSFORMERS

Custom – Medical



Charging transformers
Telemetry coils
Custom inductors for implant market

TRANSFORMERS

LPT Series



Toroidal designs available in three different core materials

TRANSFORMERS

LPE Series



E-core transformers in gapped and ungapped configurations

HIGH FREQUENCY

IMC



Surface-mount molded inductor
0402 to 2220 case sizes

HIGH FREQUENCY

IMC-01



Surface-mount wirewound inductors
High SRF values
High Q values

HIGH FREQUENCY

IFCB



Thin film chip inductor
Tight tolerances
Stable inductance over high frequencies

HIGH FREQUENCY

ILC



Multilayer ceramic inductor
High reliability

HIGH FREQUENCY

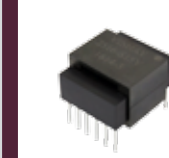
ISC



Surface-mount molded shielded inductors
1210 and 1812 case sizes

PLANAR TRANSFORMER

TPL



Higher power density levels versus traditional planar designs
Easily customized to meet design specific requirements
Full bridge / half bridge converter applications from 150 W to 300 W

MULTILAYER

ILSB



0603 / 0805 / 1206 case sizes
High reliability
Magnetically self shielded

MULTILAYER

ILBB



Ferrite bead series
0402 to 1812 cases sizes
Magnetically self shielded

MULTILAYER

ILHB



High current ferrite bead series
0603 to 1812 case sizes
Magnetically self shielded

MULTILAYER

ILAS



Chip array ferrite bead
Combines four single 0603 chips into one package
Minimal cross talk between adjacent circuits

FILTER INDUCTORS

IHV



High current filter inductor
Radial leaded
Designed for switching power supplies

FILTER INDUCTORS

IHD / IHA



Printed circuit mounting (axial leads)
Protected by polyolefin tubing
Pre-tinned leads

FILTER INDUCTORS

IH



High current filter inductor
Radial leaded
Pre-tinned leads

FILTER INDUCTORS

IHB



High current filter inductor
Radial leaded
6 sizes available, wide range of inductance values

AXIAL LEADED

IRF



Epoxy conformal coated, axial inductors
Ferrite core
Uniform roll coated

WIRELESS CHARGING

IWTX-47R0BE



Transmit coil
6.3 μ H and 24 μ H values available
Custom options available

WIRELESS CHARGING

IWTX-4646BE



Transmit coil
24 μ H
Custom options available

WIRELESS CHARGING

IWAS-4832



Receive coil
Available in 5 W, 7 W, and 10 W options
Custom options available

WIRELESS CHARGING

IWAS-3827



Receive coil
10.7 μ H for 5 W and 10 W applications
Custom options available



The Art of Thermistors

NTC - SMD

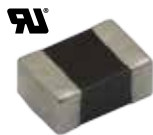
NTCS....E3...SMT



Monolithic with Ni and Sn
Enhanced stability
-40 °C to +125 °C
One R_{25} -value per case
0402, 0603, and 0805

NTC - SMD

NTCS....E3....T



Monolithic with Ni and Sn
Glass protected
-40 °C to +150 °C
Tolerance on R_{25} down to 1 %
Full range in 0402, 0603, and 0805
AEC-Q200 qualified

NTC - SMD

NTCC200E4...,
NTCC300E4...



Flat chip metallized (Ag or Au)
Suitable for wire bonding
-55 °C to +175 °C
Resistant to thermal shocks
and to leaching
AEC-Q200 qualified

NTC - SMD

NTCSMELFE3...



SOD-80 glass encapsulated
Diameter down to 1.7 mm
Response time down to 0.9 s
For corrosive atmospheres and
harsh environments

NTC - SMD

NTHS...



Wide resistance range
Monolithic with Ni and Sn
Design flexibility for temperature
sensing and compensation
0402, 0603, 0805, and 1206

NTC - LEADED

NTCLE100E3...



Wide resistance range
Color band coded
High conductivity copper wires

NTC - LEADED

NTCLE400...



Special long lead sensors
Accuracy over wide temperature
range
High stability and excellent
price / performance ratio

NTC - LEADED

NTCLE413...,
NTCLE428...



Mini PVC insulated leads
Battery sensor
Accurate down to ± 0.3 °C
Small body of max. 3 mm for
easy installation

NTC - LEADED

NTCLG100E2...



SOD-27 glass encapsulated
Temperature up to 200 °C
Diameter down to 1.8 mm
Response time down to 0.9 s
For corrosive atmospheres and
harsh environments

NTC - LEADED

T, M, C



Small size
Wide resistance range
Available in different curves
Tolerance on R_{25} down to 1 %
Precision down to ± 0.2 °C

NTC - ASSEMBLIES

NTCLP100...



Special long lead sensors
Accuracy over wide temperature
range
High stability and excellent
price / performance ratio

NTC - ASSEMBLIES

NTCLP450E3...



Pipe type with fast time response
and high stability
High resistance to humidity
Accurate over wide temperature
range

NTC - ASSEMBLIES

NTCALUG91A...



Robust surface sensor
-40 °C to +150 °C
Easy mounting M4
Rugged construction
PTFE insulated cable
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCASCWE3...



Screw threaded sensors
Easy mounting M4
Rugged construction
For surface temperature
applications

NTC - ASSEMBLIES

NTCACAP..



Refrigerator sensors
Enabling class A+++
Very good water, moisture, and
ice resistance
Thermal cycle resistant

NTC - ASSEMBLIES

NTCASRFE3C90406



Ice cube sensor
FDA-grade housing
Enabling class A+++
Very good water, moisture, and
ice resistance
Thermal cycle resistant

NTC - ASSEMBLIES

NTCAFLEX05...



Flex foil sensor for narrow
space applications
Response time down to 2 s
Insulated and humidity resistant
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCAIMME3...



Stainless steel immersion sensor
Fast response time
Reduced thermal gradient
For permanent contact
with liquids

PTC - LEADED

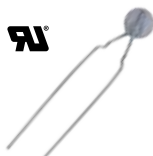
PTCSL03...



Over-temperature protection
Fast response time
Tolerance of ± 5 °C
Excellent long term behavior

PTC - LEADED

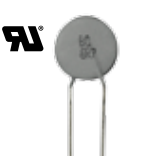
PTCCL...D/E..



For overload protection
30 V to 60 V
Small trip-hold ratio of 1.5
High maximum overload current

PTC - LEADED

PTCCL...F..



For overload protection
145 V
Small trip-hold ratio of 1.5
High maximum overload current

PTC - LEADED

PTGCL...H/S/T/V..



For overload protection
265 V to 600 V
Small trip-hold ratio of 1.5
High maximum overload current

PTC - LEADED

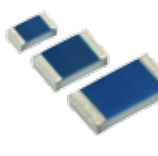
PTGEL...



Inrush current limiting
440 V_{RMS} to 560 V_{RMS} (800 V_{DC})
High energy absorption 150 J
to 270 J

RTD - SMD

PTS....0... (PTS)



Platinum thin film chip
Size 0603, 0805, and 1206
Lead (Pb)-free
Short reaction times
High accuracy and stability

LEGEND

Negative Temperature Coefficient (NTC):

- NTC - SMD (Surface-Mount Device)
- NTC - Leaded (Through-Hole)
- NTC - Assemblies

Positive Temperature Coefficient (PTC):

- PTC - SMD (Surface-Mount Device)
- PTC - Assemblies
- PTC - Leaded (Through-Hole)

Thin Film - Resistance Temperature Detectors (RTD):

- RTD - SMD (Surface-Mount Device)
- RTD - Leaded (Through-Hole)

Voltage Dependent Resistors:

- Varistors - SMD (Surface-Mount Device)
- Varistors - Leaded (Through-Hole)

NTC - LEADED

NTCLE201E3C90028



Long and flexible leads for special mounting
Fast response time of less than 0.5 s
Small head diameter

NTC - LEADED

NTCLE203E3...



High accuracy
Tolerance down to 1 %
Stability over a long lifetime
Low heat conductivity
Thin nickel wires

NTC - LEADED

NTCLE203E3...SB0



2-point accurate sensor
Tolerance down to 0.5 K
-55 °C to +150 °C
Stable, thermal shock-withstanding
AEC-Q200 qualified

NTC - LEADED

NTCLE301E4C90059



Long and flexible leads
Small diameter
Accuracy of ± 0.4 °C at 0 °C
Designed for cold temperature applications

NTC - LEADED

NTCLE305E4...SB



Miniature epoxy-ETFE insulated leads
Fast reacting and accurate
Exceptional withstanding to thermal shocks
AEC-Q200 qualified

NTC - LEADED

NTCLE213E3...



Advanced mini sensor
-55 °C to +150 °C
Thermal shock resistant
Fast response time
High sensitivity
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG01T



Robust surface sensor
150 °C long term stability
Easy mounting M3 with 2.7 kV_{ac} insulation voltage
ETFE insulated 600 V_{ac} rated
AWG26 cable
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG01A...



Robust surface sensor
-40 °C to +150 °C
Easy mounting M3 and M3.5
Rugged construction
PTFE insulated cable
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG02A...



Low thermal gradient surface sensor
Tolerance on R_{25} down to 1 %
PEEK AWG30 nickel wires
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG03A...



Miniature surface sensor
Fast response time
Low thermal mass
Stud screw mounted M2
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG39A...



Miniature surface sensor
Fast response time
Low thermal mass
Stud screw mounted M3
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCALUG54A...



Robust surface sensor
-40 °C to +150 °C
Easy mounting M5
Rugged construction
PTFE insulated cable
AEC-Q200 qualified

NTC - ASSEMBLIES

NTCASRFE4C90132



Surface temperature sensor with triangular shape housing
Fast response time
Mounted in a gauge or with a spring
Extreme low thermal gradient

PTC - SMD

PTCTZ...R...TT



Overload protection
30 V_{RMS} to 300 V_{RMS} operating
Fast response time to overload
Low heat transfer

PTC - ASSEMBLIES

PTCSGM3T...

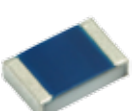


Over-temperature protection
Wide range of well defined protection temperatures
Excellent long term behavior

The Varistor Gallery

RTD - SMD

PTS...M... (PTS AT)



Platinum thin film chip
High accuracy and stability
Extended temperature range of -50 °C to +175 °C
Short reaction times
High thermal cycling capability
AEC-Q200 qualified

RTD - SMD

TFPT...



Nickel thin film chip
Wide resistance range
Size 0603, 0805, and 1206
Tolerance on R_{25} down to 0.5 %
-55 °C to +150 °C
High stability

RTD - LEADED

TFPTL...



Thin film linear thermistors
Tolerance on R_{25} down to 1 %
-55 °C to +150 °C
High stability

SMD

MLV...



Multilayer surge suppressor
Inherent bidirectional clamping
4 V_{CL} to 95 V_{RMS}
Excellent energy / volume ratio
Sizes 0402 up to 2220

LEADED

VDRS...



Standard surge
14 V_{RMS} to 680 V_{RMS}
 I_{surge} up to 6500 A (8/20 μ s)
Lead (Pb)-free and halogen-free

LEADED

VDRH...

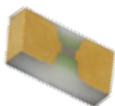


High surge
11 V_{RMS} to 680 V_{RMS}
 I_{surge} up to 10 kA (8/20 μ s)
Lead (Pb)-free and halogen-free

The Art of Specialty Passives

IGNITERS

EPIC



Very fast ignition down to 50 μ s
Surface-mount design for standard assembly process
Active area according to customer specifications
Case size 0603 (SMD version only)

IGNITERS

MEPIC



Firing energy down to 1.5 mJ
Surface-mount design for standard assembly process
Active area according to customer specifications
Case size 0805 (SMD version only)

POTENTIOMETERS

P11L



2 million cycles
Cermet element
12.5 mm square single turn panel control
4, 6, and 6.35 mm shaft diameters
and 29 terminal styles
Multiple assemblies - up to four modules

POTENTIOMETERS

P16



Version for military, professional and industrial applications
(cermet): 1 W at 40 °C
Compact (integrated)
Fully sealed and panel sealed

POTENTIOMETERS

PRV6



2 fully sealed high power rating
up to 1.5 W at 70 °C
Military performance

POTENTIOMETERS

RT



CCTU 05-03B (PA1)
Vitreous - RT style

POTENTIOMETERS

PP22SA



Very robust version
(vibrations, shocks)
High durability (25 M cycles)
Conductive plastic technology
Aeronautic, military, industrial applications

POTENTIOMETERS

RP12



Conductive plastic potentiometer technology
Infinite resolution
Anodized light alloy housing
Stainless steel floating shaft

POTENTIOMETERS

534



Bushing and servo mount designs available
Special resistance tolerances to 1 %
Rear shaft extensions and support bearing
Metric shaft available

POTENTIOMETERS

502



Bushing mount and servo mount designs are available
Large ohmic value range:
15 Ω to 100 k Ω
Dual gang configuration
Improved linearity available

POTENTIOMETERS

KIT LMF



Measurement range 25 mm to 1000 mm
High accuracy ± 1 % down to ± 0.025 %
Good repeatability
Simple and flexible mounting

POTENTIOMETERS

ROT



Size 08 to 30
Linearity ± 1 % down to ± 0.015 %
Excellent repeatability
Long life

POTENTIOMETERS

34THE



All electrical angles available up to: 3600°
Accurate linearity down to ± 0.5 %
Very long life: 50 M cycles for servo, 10 M cycles for bushing
Non contacting technology:
Hall effect; true power-on sensor

POTENTIOMETERS

981HE



Accurate linearity down to ± 0.5 %
Easy mounting principle
Non contacting technology:
Hall effect
Model dedicated to all applications in harsh environments

POTENTIOMETERS

P11S



12.5 mm square single turn panel control
Five shaft diameters and 29 terminal styles
Multiple assemblies - up to seven modules
Tests according to CECC 41000 or IEC 60393-1

POTENTIOMETERS

P16S



Version for military, professional, and industrial applications
(cermet): 1 W at 40 °C
Compact (integrated)
Detent and electric cut off at beginning of travel
Fully sealed and panel sealed

POTENTIOMETERS

P30L



2 million cycles
High power rating 3 W at 70 °C

POTENTIOMETERS

DIALS 21



Round vernier scale
1 13/16" diameter
15 turn

POTENTIOMETERS

REC 115L



Measurements range 25 mm to 1000 mm
High accuracy ± 1 % down to ± 0.025 %

POTENTIOMETERS

20 LHE



Linear non contacting 0 mm to 10 mm stroke
Accurate linearity down to -1 %
Long life: greater than 10 M cycles

POTENTIOMETERS

351HE



Non contacting
10 M cycles
Up to 360° angle

SENSOR

REC38L



12.5 mm to 150 mm
Miniature 9.52 mm diameter

POTENTIOMETERS

Multi-Turn Potentiometer



From 10 turns to 200 turns
Linearity 2 %
Big flexibility to adjust the number of turns to the request

POTENTIOMETERS

Ultra Flat Potentiometer



Linearity 1.5 %
Technology membrane (waterproof)
Aeronautic, industrial, or outdoor versions available

LEGEND

- Igniters
- Potentiometers and Trimmers
- Fuses
- Fuse Resistors
- Noise Suppressors
- Antennas
- Thermistors
- Varistors
- Temperature Sensors
- Tubular Heating
- Hybrids and Substrates
- Magnetics

TRIMMERS

T93



3/8" square multi-turn
Industrial grade
0.5 W at 70 °C

TRIMMERS

TS63



1/4" square multi-turn
0.25 W at 70 °C
Industrial grade

TRIMMERS

TS53



5 mm square single turn
0.25 W at 70 °C

FUSES

HCTF - High Current Thermal Fuse



(235 ± 15) °C
160 °C
24 V
≤ 55 A

FUSES

HCTF CP - High Current Thermal Fuse Clamp



(235 ± 15) °C
160 °C
24 V
≤ 50 A

FUSES

MFU - Thin Film Chip Fuses



0.5 A to 6.3 A
32 V to 63 V
UL recognition; VDE IEC 60127-4
ISO / TS 16949

FUSE RESISTORS

RS Style Wirewound Fuse Resistor



0.12 Ω to 500 Ω; 10 %, 5 %
Typical fusing times 4 ms to 70 ms
Fusing currents of 0.5 A to 20 A
Functions as both resistor and series fuse

FUSE RESISTORS

AC..CS Fusible Wirewound Safety Resistor



3 W to 5 W
UL1412
4 kV to 6 kV
Without flame and explosion

NOISE SUPPRESSORS

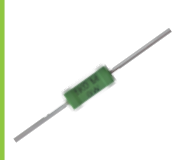
NSR, NSR HP



1 kΩ to 15 kΩ; 20 %, 10 %
9 μH to 78 μH
Customer end caps and electrodes available
Wirewound noise suppressor resistor

NOISE SUPPRESSORS

AC03



RFI / EMI suppression in automotive engine ignition system
Wirewound technology on ceramic core
High-voltage pulse handling
Wide range of resistance and inductance to suit application

ANTENNAS

UHF Antennas



868 MHz, 915 MHz
15 mm x 10 mm x 1.2 mm /
35 mm x 5 mm x 1.2 mm
433 MHz, 868 MHz, 915 MHz >
-2dBi

ANTENNAS

High-Frequency Antennas



1.575 GHz to 5 GHz
10x3x0.8; 3.2x1.6x0.6; 3.2x1.6x1.2;
5.2x2x1.1; 19x3x3.8;
1.575 GHz, 2.4 GHz, 5 GHz >
3.2 dBi

THERMISTORS

NTCLE203



High accuracy
Low tolerances ±1 %, ±0.5 %
Thin nickel wires

THERMISTORS

NTCLE203...SB0



2 point 0.5 °C accurate sensor
-55 °C to +150 °C operating temperature
Automotive use

THERMISTORS

NTCLE305



Miniature epoxy-ETFE insulated leads
Fast response time
Automotive use

THERMISTORS

NTCS...SMT



Enhanced stability < 0.2 % typical
Glass sealed

THERMISTORS

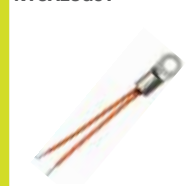
NTCLE413-428



Miniature PVC insulated leads
Battery sensor

THERMISTORS

NTCALUG01



Robust surface sensor
-40 °C to +150 °C operating temperature
Automotive use
UL-recognized

THERMISTORS

NTCALUG02



Low thermal gradient surface sensor
Low tolerances ±1 %, ±0.5 %
PEEK AWG30 nickel wires

THERMISTORS

NTCALUG03



Miniature surface sensor
M2/M3 stud screw mounted
Low thermal mass and fast response time

THERMISTORS

NTCAIMME3



Stainless steel miniature immersion sensor
-25 °C to +105 °C operating temperature

THERMISTORS

NTCSMELF



D035-glass encapsulated
-40 °C to +150 °C operating temperature

THERMISTORS

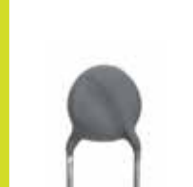
PTCSL03



One point over-temperature sensors
Accuracy ± 5 °C






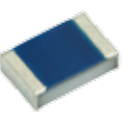
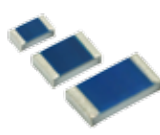

















THERMISTORS

PTCCL















Voltage range 30 V to 600 V
Small trip-hold ratio
UL-recognized

The Art of Specialty Passives

THERMISTORS NTCS  Case size 0402, 0603, 0805 -40 °C to 150 °C operating temperature Automotive use UL-recognized	THERMISTORS NTHS  Case size 0402, 0603, 0805, 1206 Wide resistance range	THERMISTORS NTCLE100  Standard classic Color band coded Wide resistance range	VARIATORS MLV  Case sizes 0402 through 2220 Up to 95 V _{ac} operation	VARIATORS VDRS, VDRH  Standard and high surge capabilities 5 mm through 20 mm nominal disc diameter High surge capability 6.5 kA, 10 kA Extended operating temperature	THIN FILM SENSORS - RTD PTS AT  Automotive use High thermal cycling capability -55 °C to +175 °C operating temperature High accuracy and stability < 0.1 %
THIN FILM SENSORS - RTD PTS  Case size 0603, 0805, 1206 Glass sealed High accuracy and stability < 0.04 % Lead (Pb)-free	THIN FILM SENSORS - RTD TFPT  Case size 0603, 0805, 1206 Wide resistance range 100 Ω to 10 kΩ High stability < 0.15 %	TUBULAR HEATING Stainless Steel Heating Elements  Power range from 250 W up to 100 kW Dielectric withstand up to 4 kV Single elements or complete heaters Application: heating, braking	HYBRIDS & SUBSTRATES MTLP  50 Ω micro-strip configuration Two rows of tuning pads Available in custom lengths	HYBRIDS & SUBSTRATES PSS, SPF  Custom substrates with conductor and resistor patterns Wide variety of substrate materials and metallizations	HYBRIDS & SUBSTRATES SDWP Side Wall Patterning  Conductor patterning on 4 surfaces Wirebondable or solderable metallizations
HYBRIDS & SUBSTRATES INT  Substrates with laser machining Filled vias, plated through holes or non-metallized holes	RF INDUCTORS Wirewound Inductors  Case sizes from 0805 to 2220 Open construction and molded versions High Q, high SRF	RF INDUCTORS High-Frequency Inductors  Thin film, ceramic, and laser spiral technology Multiple case sizes High Q, high SRF	RF INDUCTORS RFLW  High frequency wire bondable spiral inductor 3 nH to 150 nH Low parasitic capacitance, high SRF S-parameter files available for download	CHOKES Multilayer Ferrite Inductors  0603, 0805, 1206 case sizes High reliability Magnetically self shielded	FERRITE BEADS Ferrite Beads  Normal and high current bead series 0402 to 1812 case sizes Magnetically self shielded
WIRELESS CHARGING IWTX  WPC compatible transmitting coil A10 type Tx coil High permeability shielding for wireless charging	WIRELESS CHARGING IWAS  Receiving coils / shields feature up to 10 W for Rx applications Optimized for 5 V and 7 V charging circuitry	SURFACE-MOUNT TRANSFORMERS LPE Series  E-Core transformers in gapped and ungapped configurations	SURFACE-MOUNT TRANSFORMERS LPT Series  Toroidal designs available in three different core materials	CUSTOM - INDUSTRIAL Vishay Custom Magnetics  Switch mode power transformers, input / output inductors, filter inductors Focus on complex designs for rugged environments Winding construction includes: edgewound coils, planar coils, bobbin-wound coils, and toroidal coils	CUSTOM - AUTOMOTIVE Vishay Custom Magnetics  High current transformers and inductors Focus on EV and HEV high voltage inverters Unique, thick copper conductors for up to 7.5 kW

LEGEND

- | | | | | | |
|--|---|---|---|--|---|
|  Igniters |  Potentiometers and Trimmers |  Fuses |  Fuse Resistors |  Noise Suppressors |  Antennas |
|  Thermistors |  Varistors |  Temperature Sensors |  Tubular Heating |  Hybrids and Substrates |  Magnetics |

CUSTOM - AEROSPACE / MILITARY

Vishay Custom Magnetics



Cockpit controls and backlight display
Mobile communications systems
Missile launch and guidance systems

CUSTOM - MEDICAL

Vishay Custom Magnetics



Charging transformers
Telemetry coils
Custom inductors for implant market

FREQUENCY CONTROL

Crystals



Industry-standard sizes
Surface-mount and through-hole

FREQUENCY CONTROL

Oscillators



Industry-standard oscillators

POWER PLANAR TRANSFORMERS

TPL-2516



Higher power density levels versus traditional planar designs
Easily customized to meet design specific requirements
Full bridge/half bridge converter applications from 150 W to 300 W

POWER PLANAR TRANSFORMERS

PLA 51



Medium power up to 3 kW
Low-profile design
High typical efficiency of 99 %
Excellent thermal characteristics

POWER PLANAR TRANSFORMERS

PLA 32



Low power up to 500 W
Compact and versatile
Very low profile and weight
For high power density DC/DC converter applications

POWER INDUCTORS

IHHP



Magnetic alloy power choke coil
Miniature size 0806 and 1008 sizes
Magnetic shielding

POWER INDUCTORS

IHLD



Optimal design realizes high quality sound and low distortion
Low coupling for minimal cross-talk between inductors

POWER INDUCTORS

IHLE



Integrated E-Field shield eliminates the need for separate shielding
Up to 20 dB E-Field reduction at 1 cm

POWER INDUCTORS

IHLP-01 Series



Case sizes 1616 through 6767
Best saturation
Lowest core loss

POWER INDUCTORS

IHLP-A1 Series



Cases sizes 1616 through 6767
Automotive version of the -01 series

POWER INDUCTORS

IHLP-11 Series



Case sizes 1212 through 6767
Medium perm series
Low DCR

POWER INDUCTORS

IHLP-1A Series



Case sizes 1616 through 8787
Automotive version of the -11 series

POWER INDUCTORS

IHLP-51 Series



Case sizes 1616 through 8787
High-temperature series

POWER INDUCTORS

IHLP-5A Series



Case sizes 1616 through 8787
Automotive version of the -51 series

POWER INDUCTORS

IHCL



Coupled inductor manufactured with IHLP technology
Designed for SEPIC circuits

POWER INDUCTORS

IFSC



Shielded ferrite
Small sizes

POWER INDUCTORS

IDC, IDCS, IDCP



Drum core inductors available in multiple sizes
Shielded and unshielded

POWER INDUCTORS

IHSM



4 case sizes available
High inductance values up to 18 mH

POWER INDUCTORS

ICM-0805, ICM-1206



Common mode choke
Used for filtering

POWER INDUCTORS

ICM-2824, ICM-4743



Common mode choke
Used for DC power lines

POWER INDUCTORS

IHTH-0750, IHTH-1125



Through-hole inductor manufactured with IHLP® technology
Automotive Grade

POWER INDUCTORS

TJ3-HT, TJ5-HT



Toroid
High temperature, up to 200 °C
Vertical or horizontal options



Semiconductors

- MOSFETs
- ICs
- Rectifiers
- Small-Signal Diodes
- Protection Diodes
- Thyristors / SCRs
- IGBTs
- Power Modules
- Optoelectronics

Passive Components

- Resistors
- Magnetics
- Capacitors

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