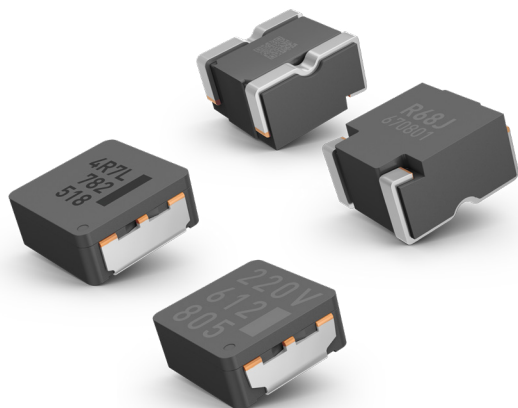


Metal Composite Power Inductors

AEC-Q200 Compliant
for Automotive & Industrial
Use in Harsh Environments

- Vibration Resistance up to 50G (5Hz - 2kHz)
- Miniaturization up to 50% compared to ferrite products with the same performances
- Fully magnetic shielded structure



IN Your Future



IN Your Innovation



Power Inductor Automotive Application

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Features and Benefits

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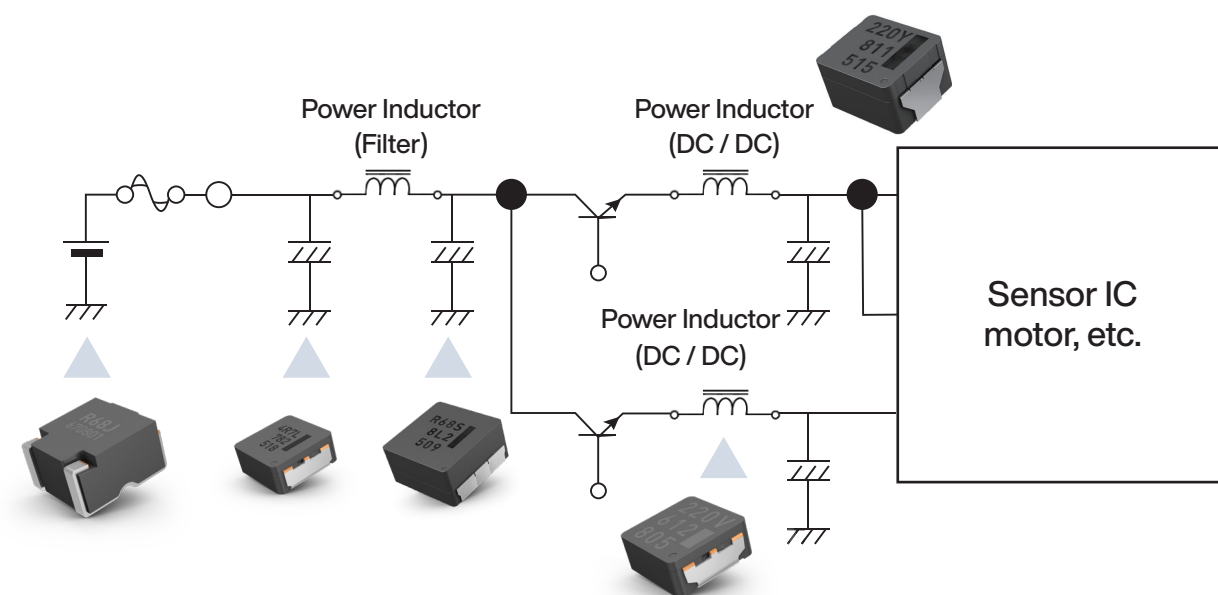
Selection Guide

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DC / DC Converter Application Example



Applications



Circuit Function

- Noise Filter For Drive Circuits
- DC/DC Converter
- Voltage Regulator
- Buck/Boost Converters



Automotive

- HEV/EV
- Engine ECU
- ADAS
- Powertrain
- Lighting
- Autonomous Driving



Industrial

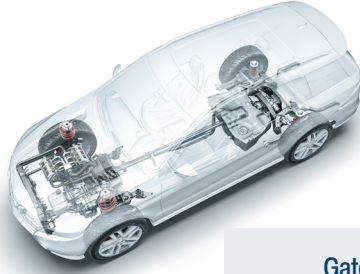
- Automation
- Server
- LED Driver
- Power Supply Module

Main Series

This image displays four electronic components arranged in a row. From left to right: a small black resistor with white markings, a larger black resistor with white markings, a small black capacitor with white markings, and a larger black capacitor with white markings. Each component is shown from a perspective view, highlighting its physical form and labeling.

Series	PCC-MC High Performance	PCC-LP Low Profile	PCC-LE LE type	PCC-1280/-1510 Large Current	High Vibration Series
Temperature range	-40°C - +150°C	-55°C - +155°C	-40°C - +150°C	-40°C - +160°C	-40°C - +150°C
Inductance range	0.33 - 100μH	0.33 - 47μH	3.3 - 47μH	0.33 - 4.7μH	0.68 - 44μH
Rated current	1.9 - 39.7A	2.1 - 23.9A	2.9 - 9.2A	20.2 - 83A	4.1 - 32.3A
Package size (mm)	□5.5x5.0x3.0 - □0.9x10.0x6.0	□5.5x5.0x3.0 - □10.7x10.0x4.0	□6.4x6.0x4.8 □7.4x7.0x4.8	□13.2x12.6x8.0 □15.6x17.2x10.5	□9.5x8.0x5.4 □10.9x10.0x5.0-6.0
Benefit	▪ High performance ▪ Robust & high stability ▪ High saturation ▪ Low AC-power loss	▪ Low profile design ▪ Max 3.0 & 4.0mm height. ▪ Low DCR ▪ Pin layout compatible with IHLP series.	▪ Lower DCR ▪ Pin to pin compatible with Ferrite type	▪ High current ▪ Lower DCR ▪ 30G Vibration ▪ ½ package size	▪ 50G Vibration ▪ High Performance ▪ Low AC-power loss

Automotive Application Examples

Engine ECU	Autonomous Driving	E-Power Steering	Transmission ECU	Battery Management System
E-Compressors	Navigation System			Battery ECU
Panel/HUD	On-board Charger			Camera
Radar	ADAS			Lidar
Fan Motor Driver	Domain Controller			Monitor
LED Headlamp	Electrical Pump	48V/EV Inverter	Zone Controller	Door Motor Controller

Main Characteristics

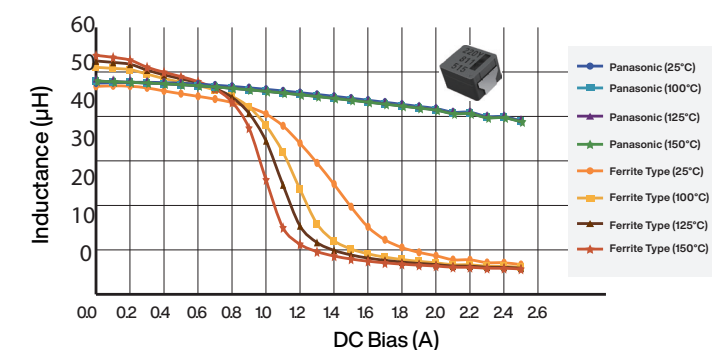
The diagram shows a cross-section of a rectangular block. The block is composed of a grey material, labeled 'Metal Composite Powder and High Temperature Resistance Resin'. Inside the block, there are two clusters of four orange circles, labeled 'Coil Winding'. The block is supported by a yellow base.

Cross-section view of an ETQPM Power Choke Coil.

- The ETQP Power Inductor consists of metal powder, Binding & Coating resin and coil winding. The magnetic material, which is created from Fe-based powder, enables high current, high heat resistance and excellent thermal stability.
- Excellent magnetic saturation characteristics (i.e. Ferrite core = 0.4T vs. Metal Composite Type=above 1.5T) make it difficult to magnetically saturate, resulting in good inductance vs. current performance without substantial drop off.
- By using a high temperature capable resin material, an operating temperature up to 180°C is achievable for several hours.

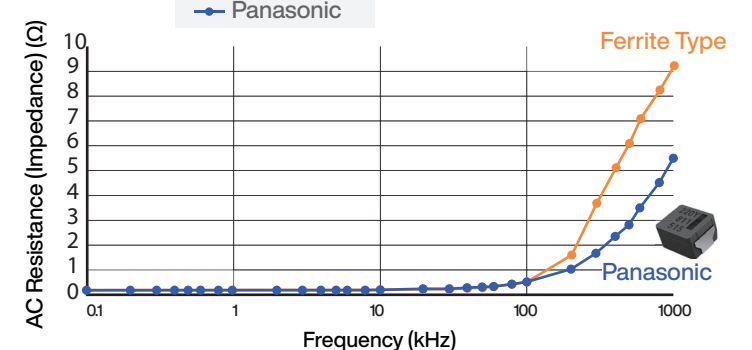
With metal composite power inductors you can save up to 50% space with respect a ferrite type inductor with the same performances.

Size: 7x7mm



The metal composite molded structure has a distributed gap rather than a discrete gap resulting in low AC resistance (impedance) at higher frequencies.

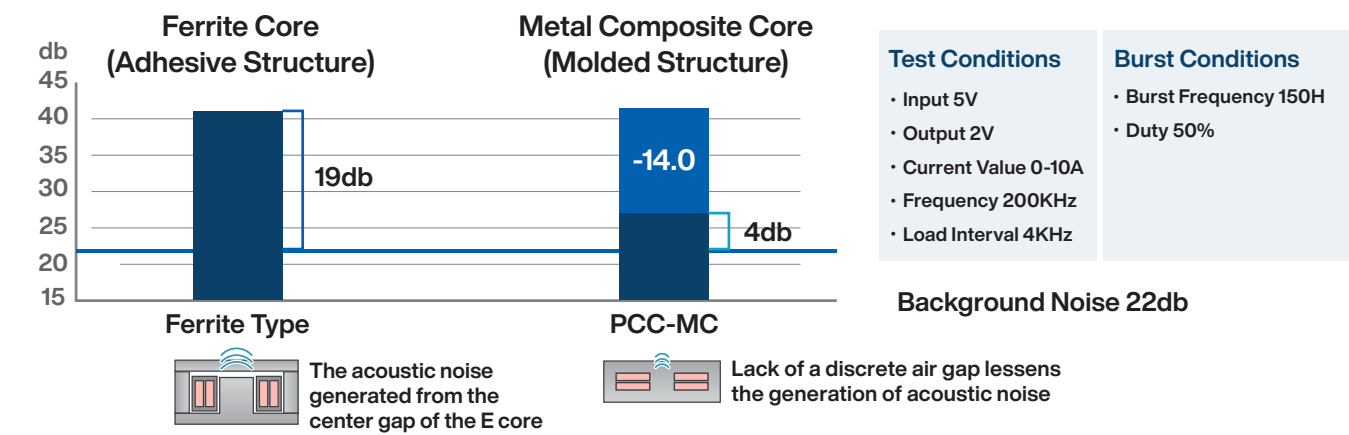
Size: 7x7mm



The ETQP Inductor allows for large currents. The inductance levels do not drop significantly as the current increases regardless of the temperature.

Acoustic Noise Reduction

Troublesome acoustic noise at audible frequencies is reduced by having a distributed gap structure where the resin replaces the air gap. This enables a large reduction of acoustic noise compared to Ferrite Types.



Withstanding Voltage Characteristics

ETQP Series Metal Composite Type achieves excellent withstanding voltage characteristics that can be used in various applications.

Maximum Operation Voltage Target

PCC Series	Size (mm)	Withstanding Voltage													
		0.68μH	1.0μH	1.5μH	2.2μH	3.3μH	4.7μH	6.8uH	10μH	15μH	22μH	33μH	47μH	68μH	100μH
Large Current	13.2x12.6x8.0	50V													
High Performance	10.9x10.0x6.0			70V											
High Performance	10.9x10.0x5.0	70V													
High Performance	10.7x10.0x5.4			70V											65V
Low Profile	10.7x10.0x4.0	65V												60V	
High Performance	8.5x8.0x5.4				70V				65V						
Low Profile	8.5x8.0x4.0	65V													
High Performance	7.5x7.0x5.4				65V				60V						
High Performance	6.5x6.0x4.5				60V				55V						
High Performance	6.5x6.0x3.0	60V													
Low Profile	6.4x6.0x3.0	60V						55V							
High Performance	5.5x5.0x4.0						55V								
High Performance	5.5x5.0x3.0				55V										
Low Profile	5.5x5.0x3.0	55V						50V							

Robust Design for High Vibration Proof and Large Current

High Vibration Design Features

Standard Design

Monolithic Molded structure

Full mold with Core & Coil

Special terminal design with gap clearance

Hard coated wire

10G to 30G

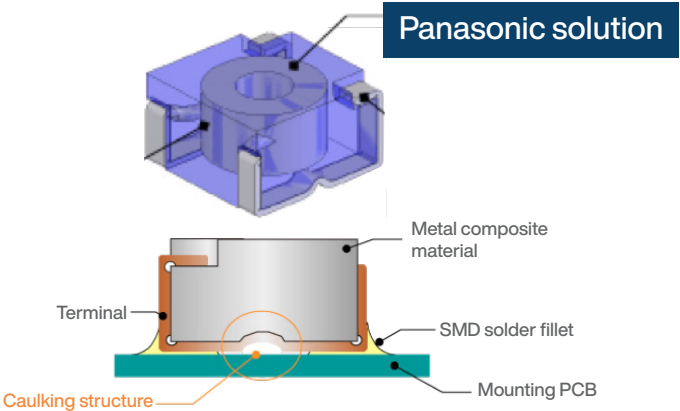
High Vibration Design

Lower position Terminal design
Lower center of gravity, less movement

PCC 10x10mm <50G
5-2,000Hz 108/axis

30G to 50G

Large Current Series Features

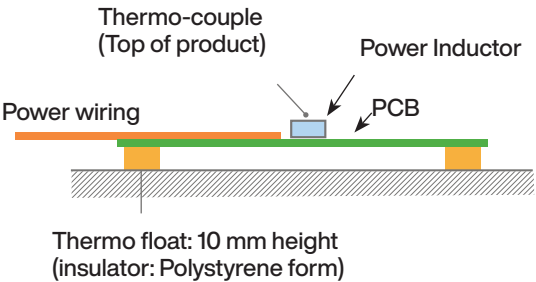


- ETQP8M__JFA & ETQPAM__JFW series**
- Large current in compact size as 12x12mm & 15x15mm SMD
 - Designed for harsh environments up to 30G vibration proof
 - High saturation current up to 100A

Technical Information

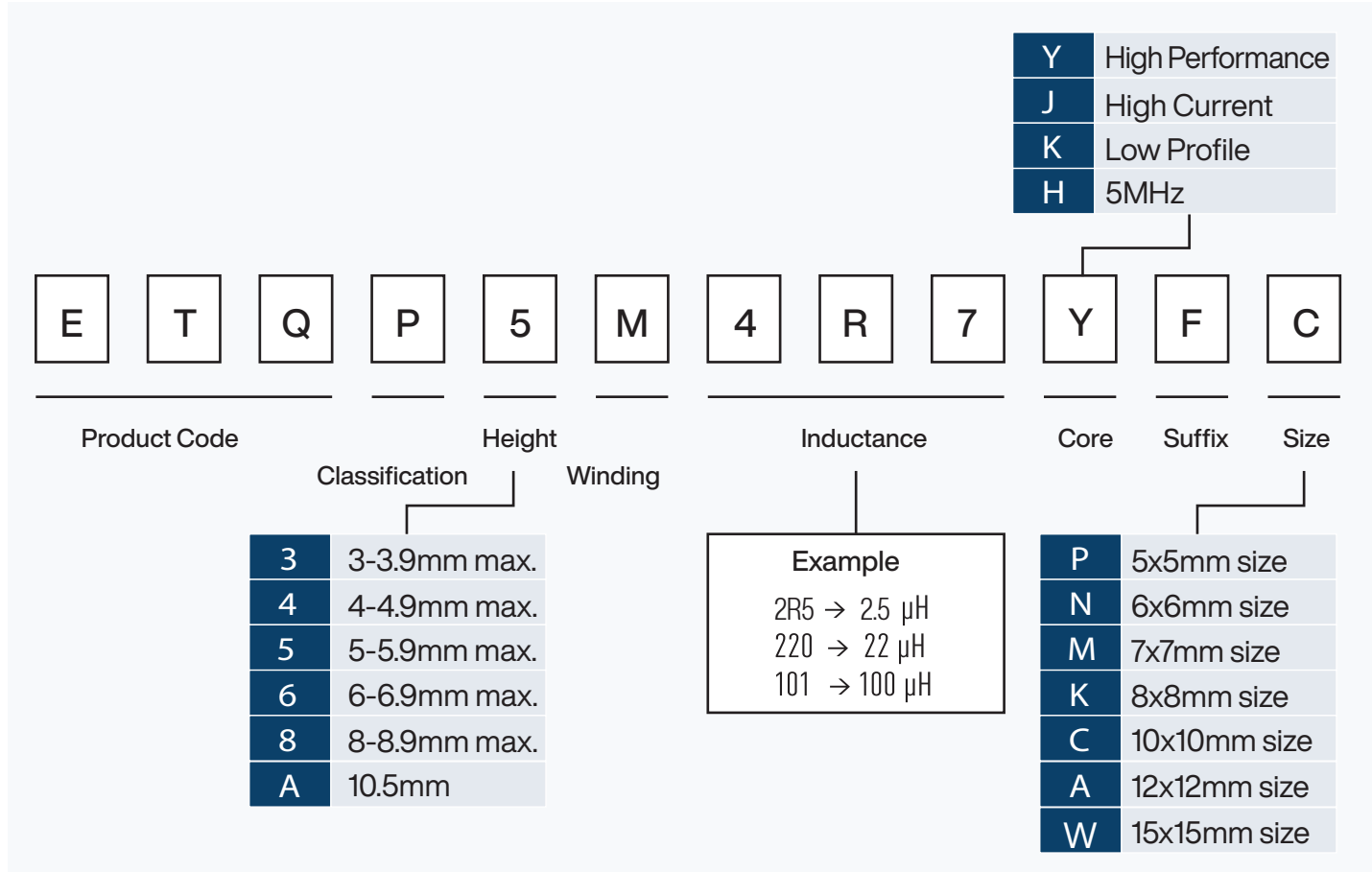
Design Information

Temperature Measurement Conditions by Panasonic



- PCB specification:**
- 1) 1.6mm, FR4 / 4layers or Multi-layer PCB
 - 2) PCB with high heat dissipation performance
 - PCB size: 110 × 80 × T1.6 mm
 - Land pattern; Using Panasonic recommendation pattern by series (shown in WEB catalog)

Explanation of Part Numbers



Selection Guide

Panasonic ETQP Series Selection Guide

High Performance Series												
Type	5x5 ETQP*M__YFP		6x6 ETQP*M__YFN		7x7 ETQP5M__YFM		8x8 ETQP5M__Y*K		10x10 ETQP5M__Y*C		10x10 (Low DCR) ETQP*M__YLC	
(Size) WxLxT Height=t	5.5x5.0mm t=3.0mm (<4.7μH) t=4.0mm (≥4.7μH)		6.5x6.0mm t=3.0mm (<2.2μH) t=4.5mm (≥2.2μH)		7.5x7.0mm t=5.4mm (<95μH) t=5.0mm (≥95μH))		8.5x8.0mm t=5.4mm (<95μH) t=5.0mm (≥95μH)		10.7x10.0mm t=5.4mm (<95μH) t=5.0mm (≥95μH)		10.9x10.0mm t=5.0mm (<1.5μH) t=6.0mm (≥1.5μH)	
LO (μH)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)
100					1.9 (*1)	348	2.1	302	2.7(*5)	208		
68					2.3	251			3.6 (*7)	136		
47			2.2	210	2.9 (*3)	156	3.4 (*3)	125	4.2	99		
33			2.5	172	3.3	120			5.0	68.5		
22	2.3	163	2.9	126	3.7	92.0	4.8	63.0	6.2	45.0		
15							5.5	48.2	7.0	35.6	7.9 (*8)	28.0
10			4.5	54.2	5.7	37.6	6.7	33.4	8.5	23.8		
6.8			5.2	39.3	6.9	26.7						
4.7	4.8	36.0			8.0	20.4			13.1	10.2	14.1	8.7
3.3	5.0	31.3	8.2	16.1	10.4	11.9	12.5	9.5	15.7	7.1	17.0	6.0
2.2	5.8	22.6	10.2	10.4			14.0 (*4)	7.6	18.1(*4)	5.3	19.6(*9)	4.55
1.5									21.4	3.8	23.3	3.2
1.0			10.7	7.9							27.5	2.3
0.68			12.0	6.3							31.5	1.75
0.33											39.7	1.1

*Other part numbers available upon request

Note: Current value (Rated Current) is the typical value when overall temperature rise is 40K up with multi-layer PWB (high-heat dissipation)
(*1) 95μH (*2) 97μH (*3) 48μH (*4) 2.5μH (*5) 97.0μH (*6) 3.2μH (*7) 66μH (*8) 14.0μH (*9) 2.5μH

Selection Guide

Panasonic ETQP Series Selection Guide

Low Profile Series // LE Series

Part Number	M0530M-LP		M0630M-LP		M0648M-LE		M0748M-LE		M0840M-LP		M1040M-LP	
Type	5x5 ETQP3M__KVP		6x6 ETQP3M__KVN		8x8 ETQP4M__KVK		10x10 ETQP4M__KVC		6x6 ETQP4M__KFN		7x7 ETQP4M__KFM	
(Size) WxLxT Height=t	5.5x5.0mm t=3.0mm		6.4x6.0mm t=3.0mm		8.5x8.0mm t=4.0mm		10.7x10.0mm t=4.0mm		6.4x6.0mm t=4.8mm		7.4x7.0mm t=4.8mm	
L0 (μH)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)
47							3.4	132.0			2.9	148.6
33			2.1	206	3.1	118	4.2	84.6				
22			2.7	128	3.8	78.4	5.0	60.0			3.9	84.1
15			3.0	99.2	4.5	55	6.3	37.0	4.2	63.8		
10	2.9	96	3.6	71.0	5.2	41.6	7.6	25.4	5.2	40.4	6.0	36.0
6.8	3.5	65.7	4.5	45.6	6.9	23.5	8.9	18.5	5.9	32.1		
4.7	4.1	45.6	5.6	29.0	8.3	16.1	11.2	12.3	7.3	20.7	8.8	16.8
3.3	5.4	27.3	6.1	24.1	8.9	14.1	12.6	9.4	9.2	13.1		
2.2	6.3	20.0	7.9	14.5	11.4	8.5	14.8	6.8				
1.5	8.1	12.0	9.1	11.0	15.1	4.9	17.4	4.9				
1.0	9.0	9.6	12.1	6.2	17.3	3.7	23.9	2.6				
0.68	10.2	7.6	13.2	5.2	19.5	2.92						
0.47	11.6	5.8										
0.33	12.7	4.85										

*please contact Panasonic for availability

Note: Current value (Rated Current) is the typical value when overall temperature rise is 40K up with multi-layer PWB (high-heat dissipation)

Panasonic ETQP Series Selection Guide

High Frequency Series // High Vibration Resistance Series // Large Current Series

Type	5x5 ETQP3M__HFP		6x6 ETQP3M__HFN		8x8 ETQP5M__YSK		10x10 ETQP5M__YSC		12x12 ETQP*M__JFA		15x15 ETQPAM__JFW	
(Size) WxLxT Height=t	5.5x5.0mm t=3.0mm		6.5x6.0mm t=3.0mm		8.5x8.0mm t=5.4mm		10.9x10.0mm t=5.0mm		13.2x12.8mm t=8.0mm		15.6x17.2mm t=10.0mm	
L0 (μH)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)	Rated Current (A)	DCR (mΩ)
47							4.1 (*5)	102				
33												
22			2.5	144			6.2 (*4)	45.5				
15												
10			3.7	68								
6.8												
4.7									20.2	4.9		
3.3									23.6	3.6		
2.2	6.3	19.5			14.1 (*1)	7.4	19.7 (*2)	4.48	27.7 (*1)	2.6		
1.5							29.8 (*3)	19.8	33.3	1.8		
1.0									38.3	1.36		
0.68							32.3	1.66	42.6	1.1	65	0.70
0.47												
0.33									53.5	0.7	83	0.42

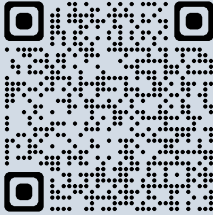
*please contact Panasonic for availability

Note: Current value (Rated Current) is the typical value when overall temperature rise is 40K up with multi-layer PWB (high-heat dissipation)

(*1) 2.45μH (*2) 2.5μH (*3) 1.9μH (*4) 20.0μH (*5) 44.0μH

Panasonic ETQP Design & Sales Support

Panasonic offers many tools to help with your circuit designs. Follow the links below for a device library for circuit simulators, CAD data and further information.

Scan and find all the information about Panasonic Power Inductors	Simulation Data Libraries	Industrial & Automotive use LC filter simulator	Power Inductor Loss Simulator
	Equivalent circuit models and S-parameter data can be downloaded for each individual item number.	The Industrial & Automotive use LC filter simulator enables the simulation of attenuation amounts when configuring a filter using Panasonic power inductor and aluminum electrolytic capacitor suitable for industrial & automotive use.	The Power Inductor loss simulator for automotive application enables the simulation of losses and temperature rises according to the current for Panasonic power inductors designed for automotive use.
	 Start Selection	 Start Simulation	 Start Simulation

CAD Data	Characteristic Viewer	Local Technical Support
Find inductor CAD data for download (3D STEP, 3D PDF)	Characteristic Viewer is the tool which represent various characteristics of a selected part by means of a graph of the frequency axis and temperature axis, etc.	Our Business Development Team as well as our respective Product Managers are available for technical on-site support. Or if you have any further inquiries, you can contact them at Inductor@eu.panasonic.com
 Start Selection	 Start Simulation	

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