

Metal Composite Type Power Choke Coils

AEC-Q200 Compliant For Use In Harsh Environments

- Vibration Resistance of 10G ~ 30G (5Hz – 2kHz)
- Maximum Operating Temperature of 150°C
- Up to 40% Smaller 25% Lighter
- Thermal Shock -40 ~ +150°C
- Metal Composite Core with Magnetic Shielding
- Soft Saturation



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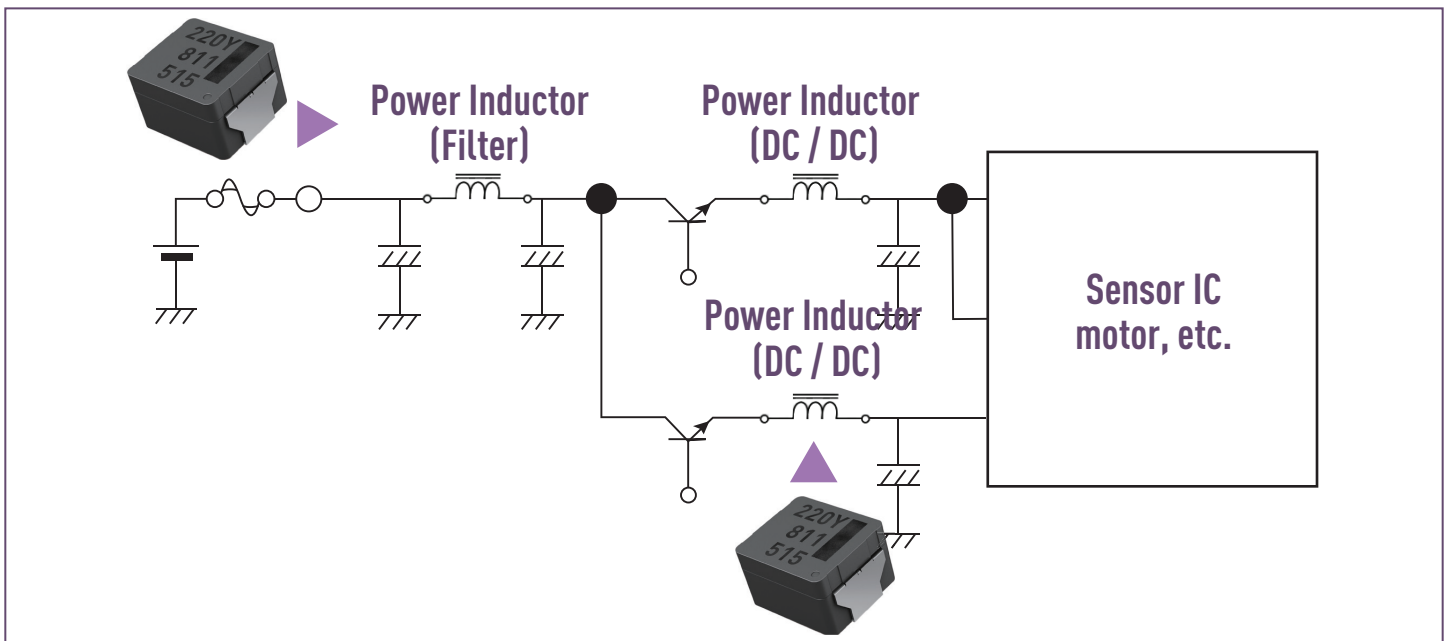
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Overview

Introduction

Panasonic's ETQ-PM Series Metal Composite Type Power Choke Coils are suited for filter, step-down and step-up circuits for DC/DC converters. They are AEC-Q200 Compliant offering reliability when exposed to high temperatures along with a high tolerance to vibration.

DC / DC Converter Application Example

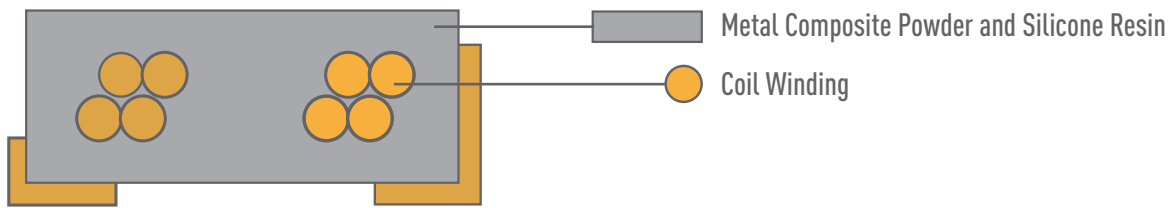


Applications

- Noise Filter For Drive Circuits
- DC/DC Converter
- Voltage Regulator
- Buck/Boost Converters
- Server
- Router
- CPU Drive
- Notebook, Tablet
- Power Supply Module
- LED Driver
- HEV/EV
- Engine ECU
- ADAS
- Power Train

Features And Benefits

High Current, High Heat Resistance and Excellent Thermal Stability

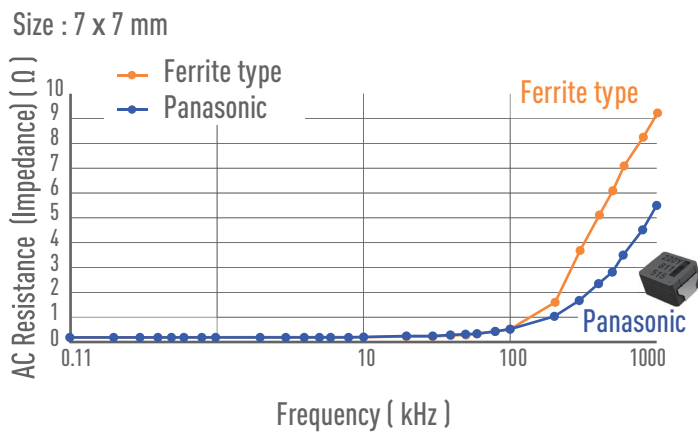


Cross-section view of an ETQ-PM Power Choke Coil.

- The ETQ-PM Power Inductor consists of metal powder, silicone 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 150°C is achievable.

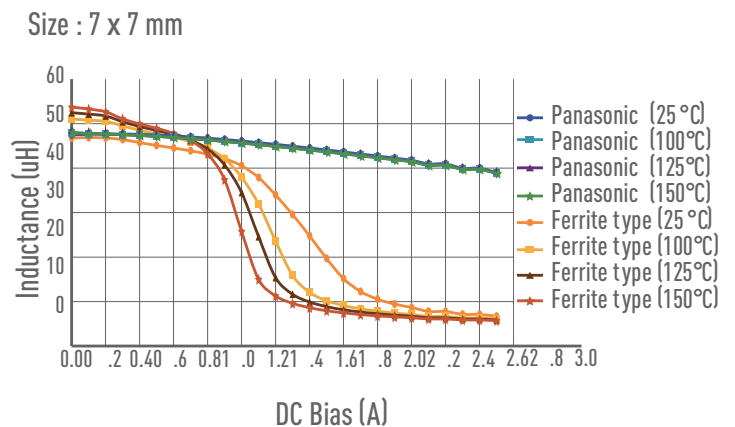
For higher maximum operating temperature in high volume applications, contact us.

Frequency Characteristics of AC Resistance



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

Effect of DC Bias Current on Inductance



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

Comparison of Panasonic vs. Ferrite Type (At The Same Inductance (Current) Capability)

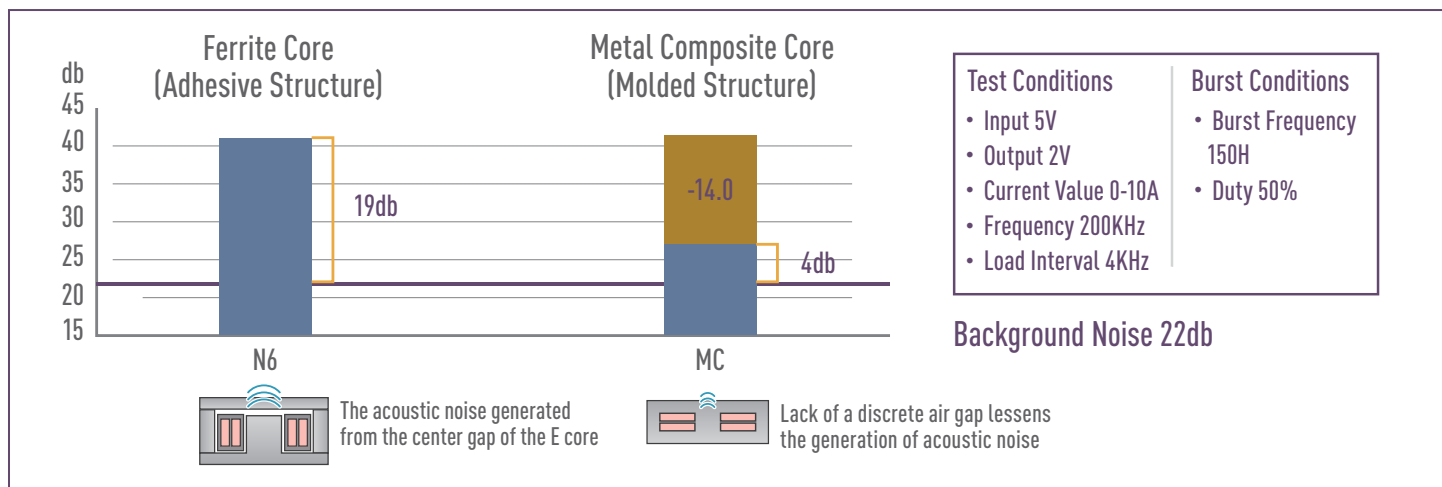
Manufacturer	Panasonic Metal Composite	Ferrite (Alternative Product)
Series	M0645	Ferrite Type
Size (mm)	6.5 × 6.0	7.4 × 6.9
Height (mm)	4.5 max	4.7 max
Volume (mm) ³	187	240
Core Material	Metal Composite	Ferrite
L1 (uH) at 100kHz	47.0 (0.8A)	47.0 (0.7A)
ISAT (A) at 125°C , L-10%	1.3	0.7
DCR (mΩ)	210	158
Performance Index Per Volume	100%	60%
Max Operating Temperature	150°C	125°C

Achieved 22% downsizing

Temperature condition 125°C

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.



Low Leakage Flux

The integrated molded structure of the Metal Composite Type with its distributed gap has low leakage flux from the core resulting in noise and interference reduction, facilitating high density layouts.

AEC-Q200 Compliant For Use In Harsh Environments

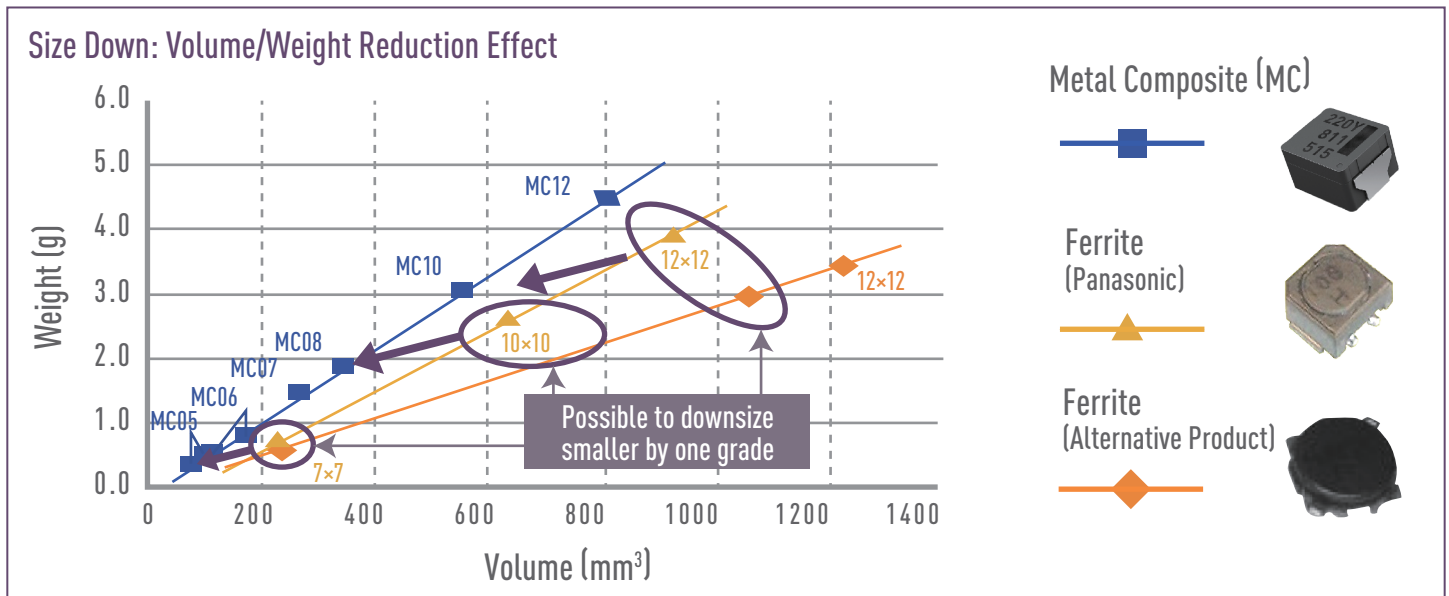
Through the previously mentioned improvements, the ETQ-PM Series product provides 150°C temperature and excellent vibration resistance characteristics.

Reliability Results for AEC-Q200 Compliance

Item	Condition	Time	Remark
Thermal Shock	-40 ~ +150°C (Each for 10 minutes)	2000cycles	<ul style="list-style-type: none"> Inductance is ±10% from initial value DCR is ±10% from initial value Insulation resistance is above 10KΩ Nothing abnormal on appearance and structures No open wire or mechanical damage
Vibration Resistance	10G ~ 30G (5Hz - 2kHz)	XYZ (Each for 2 hours)	
Heat Resistance	150°C	2000 hours	
High Temperature Lifetime	150°C (Rated current applied)		
Anti-Humidity	85°C, 85%RH	2000 hours	
Anti-Humidity Lifetime Test	85°C, 85%RH (Rated current applied)		
Low Temperature Test	-40°C	2000 hours	

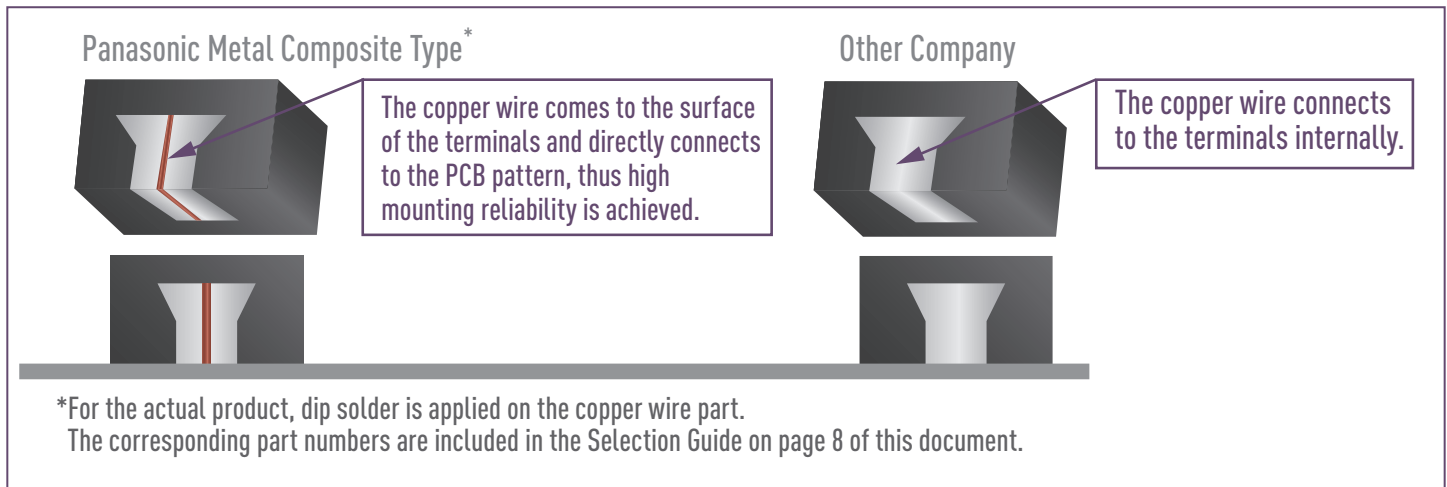
Facilitates Smaller And Lighter Designs

Panasonic Metal Composite Core Types facilitate smaller designs compared with Ferrite Type Choke Coils. Around 20-40% down in size and 5-25% down in weight.



Unique Terminal Structure

The copper wire of the internal coil is brought out directly to the terminal mounting part to ensure the reliability of mounting to the PCB. Other products make the connection inside the Metal Composite, thus it is hard to verify the connection condition and long-term reliability issues may occur with environmental stresses.



Excellent Withstanding Voltage Characteristics

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

Rated Voltage Table

Size mm \ Inductance μ H	0.68	1	1.5	2.2	3.3	4.7	6.8	10	15	22	33	47	68	100	
12.6×12.8×8.0mm	50V														
10.9×10.0×6.0mm	70V			70V											
10.9×10.0×5.0mm	70V			70V											
10.7×10.0×5.4mm			70V									65V	45V		
8.5×8.0×5.4mm		60V									65V	45V			
7.5×7.0×5.4mm			50V										25V		
6.5×6.0×4.5mm				40V	35V						25V				
6.5×6.0×3.0mm	40V			35V											
5.5×5.0×4.0mm						40V	35V								
5.5×5.0×3.0mm				40V	35V										

Comparison

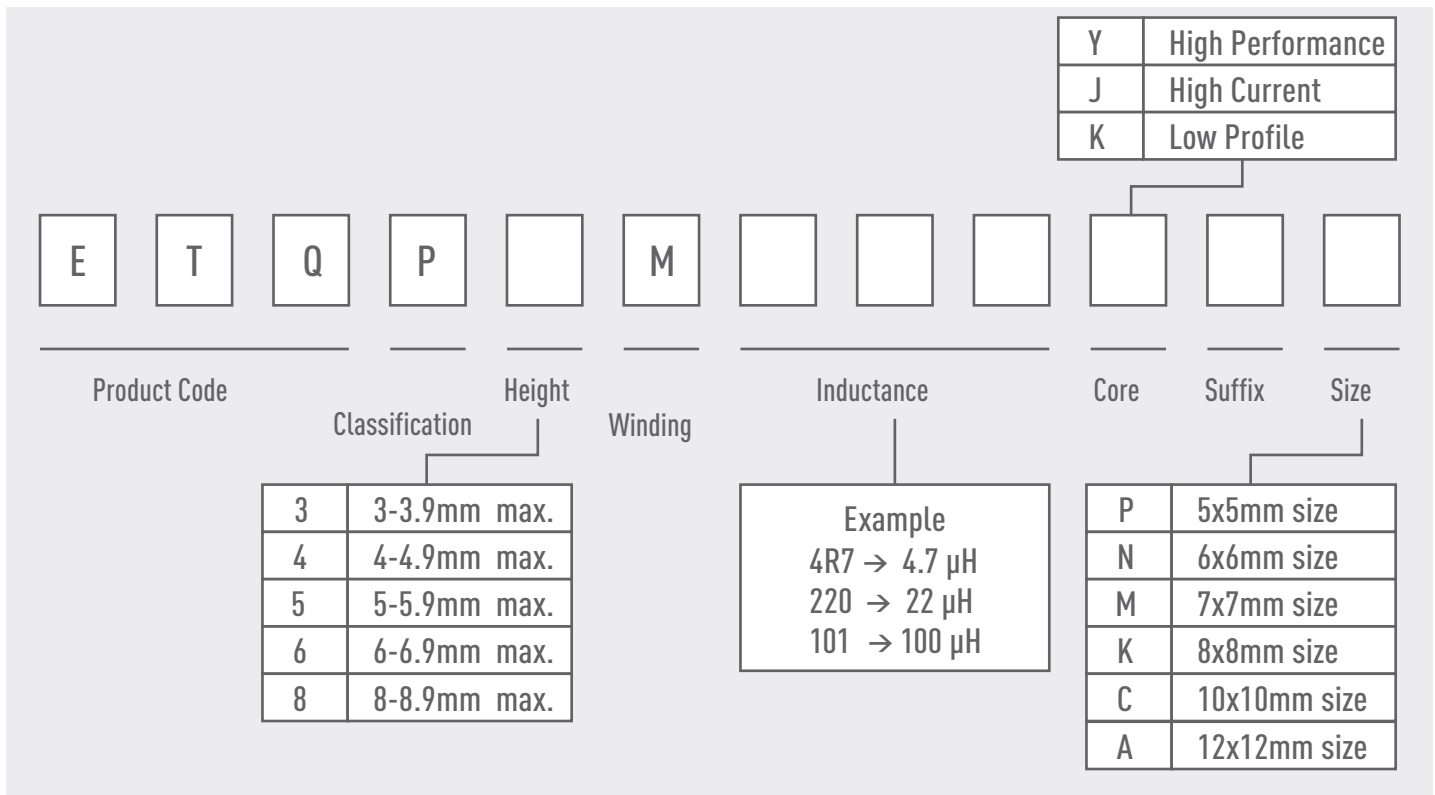
Panasonic's ETQ-PM Series Vs. Alternative Products

With unique metal magnetic material technology, the ETQ-PM Series displays low loss and downsizing compared with alternative products.

Panasonic Vs. Alternative Products						
Manufacturer	Panasonic		Alternative Products	Panasonic		Alternative Products
Power Inductor	8 × 8.5 × 5.4 ETQ-P5M220YFK	10 × 10.7 × 5.4 ETQ-P5M220YFC	10 × 10.7 × 4.0 22uH	8 × 8.5 × 5.4 ETQ-P5M470YFK	10 × 10.7 × 5.4 ETQ-P5M470YFC	10 × 10.7 × 4.0 47uH
Frequency	400kHz	400kHz	400kHz	400kHz	400kHz	400kHz
DCR 20°C	63mΩ	45mΩ	70mΩ	125mΩ	96mΩ	165mΩ
ACR	1190mΩ	861mΩ	1254mΩ	2416mΩ	2171mΩ	2805mΩ
Rated Current	4.33A	4.33A	4.33A	2.47A	2.47A	2.47A
I _{ac} (Ripple)	1.11A	1.11A	1.11A	0.52A	0.52A	0.52A
I _{dc} RMS	4.42A	4.42A	4.42A	2.51A	2.51A	2.51A
I _{ac} RMS	0.64A	0.64A	0.64A	0.30A	0.30A	0.30A
DC Loss	1.65W	1.18W	1.83W	1.06W	0.81W	1.39W
AC Loss	0.46W	0.34W	0.52W	0.22W	0.20W	0.25W
Total Loss	2.11W	1.51W	2.35W	1.27W	1.01W	1.65W
ΔT (Top)	78.1K	49.9K	80.9K	47.1K	33.2K	56.8K
ΔT (Terminal)	58.0K	35.5K	58.6K	35.0K	23.6K	41.1K

Explanation of Part Numbers

Panasonic's ETQ-PM Series Part Number Breakdown



Selection Guide

Panasonic's ETQ-PM Series Selection Guide

Panasonic's ETQ-PM High Performance Series Selection Guide

Type	5x5 ETQ-P*MxxxYFP		6x6 ETQ-P*MxxxYFN		7x7 ETQ-P5MxxxYFM		8x8 ETQ-P*MxxxY*K		10x10 ETQ-P*MxxxY*C		10x10 (Low DCR) ETQ-P*MxxxYLC	
(Size) WxLxT Height=t	5.5x5.0mm t=3.0mm (<4.7μH) t=4.0mm (≥4.7μH)		6.5x6.0mm t=3.0mm (<6.8μH) t=4.5mm (≥6.8μH)		7.5x7.0mm t=5.4mm (<95μH) t=5.0mm (≥95μH)		8.5x8.0 ETQ-P*MxxxY*K		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 (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)
100					1.4(*1)	348	1.7	302	1.6(*2)	208		
68									3.0(*7)	136		
47			1.8	210	2.3(*3)	156	2.9(*3)	125	3.5	99		
33					2.6	120			4.2	68.5		
22	1.9	163	2.3	126	3.0	92.0	4.1	63.0	5.2(*5)	45.0		
15							4.7	48.2				
10			3.5	54.2	4.7	37.6	5.7	33.4	7.1	23.8		
6.8			4.1	39.3	5.5	26.7						
4.7	4.0	36.0			6.3	20.4			10.9	10.2	11.8	8.7
3.3	4.0	32.3							13.1	7.1	14.2(*6)	6.0
2.2	4.8	22.6					11.9(*4)	7.6	15.1(*4)	5.3	16.3(*4)	4.55
1.5									17.9	3.8	19.6	3.2
1.0			8.8	7.9							23.0	2.3
0.68			9.8	6.3							26.3	1.75
0.33												

Note: Current value (Rated Current) is the typical value when overall temperature rise is 40k

(*1) 95μH (*2) 97μH (*3) 48μH (*4) 2.5μH (*5) 21.5μH (*6) 3.2μH (*7) 66μH

Selection Guide

Panasonic's ETQ-PM Series Selection Guide

Panasonic's ETQ-PM Low Profile Series // High Current Series Selection Guide

Type	5x5 ETQP*MxxxKVP		6x6 ETQP*MxxxKVN		8x8 ETQP*MxxxKVK		10x10 ETQP*MxxxKVC		12x12 ETQP*MxxxJFA	
(Size) WxLxT Height=t	5.5x5.0mm t=3.0mm		6.5x6.0mm t=3.0mm		8.5x8.0 t=4.0mm		10.7x10.0mm t=4.0mm		12.6x13.2mm t=8.0mm	
LO (μH)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)	Rated Current (A)	DCR (mOhm)
47							2.8	132.0		
33			1.7	207	2.6	118	3.4	84.6		
22			2.2	128	3.3	76.3	4.1	60.0		
15			2.5	99.2	3.8	55	5.2	37.0		
10	2.4	96	2.9	71.0	4.4	41.6	6.3	25.4		
6.8	2.9	65.7	3.6	45.6	5.9	23.5	7.4	18.5		
4.7	3.4	45.6	4.6	29.0	7.1	16.1	9.2	11.8	16.8	4.9
3.3	4.4	27.3	5.0	24.1	7.6	14	10.3	9.4	19.6(*1)	3.6
2.2	5.2	20.0	6.5	14.5	9.8	8.5	12.1	6.8	23.0	2.6
1.5	6.7	12.0	7.4	11.0	12.8	4.9	14.3	4.0	27.7	1.8
1.0	7.5	9.6	9.9	6.2	14.8	3.7	19.6	2.6	31.8	1.36
0.68	8.4	7.6	10.8	5.2	16.7	2.9			35.4	1.1
0.33									44.4	0.7

*please contact Panasonic for availability

Note: Current value (Rated Current) is the typical value when overall temperature rise is 40k
(*1) 2.5μH



To learn more about the
ETQ-PM Series visit the link below:
<http://bit.ly/2eN5e27>

Panasonic Industrial Devices Sales Company of America
Two Riverfront Plaza, 7th Floor, Newark, NJ 07102

1-800-344-2112 | na.industrial.panasonic.com | industrial@us.panasonic.com