

Metal Composite Type Power Choke Coils

AEC-Q200 Compliant For Use In Harsh Environments

ETQ-PM Series Inductor Product Guide

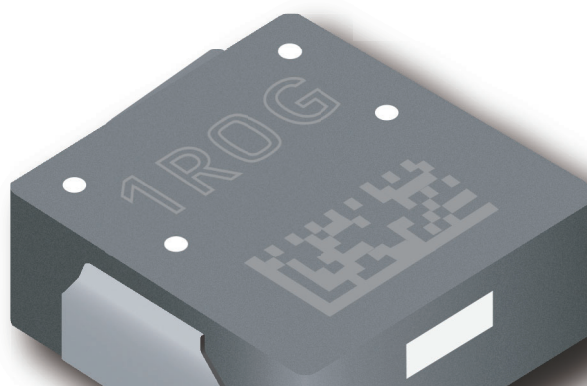
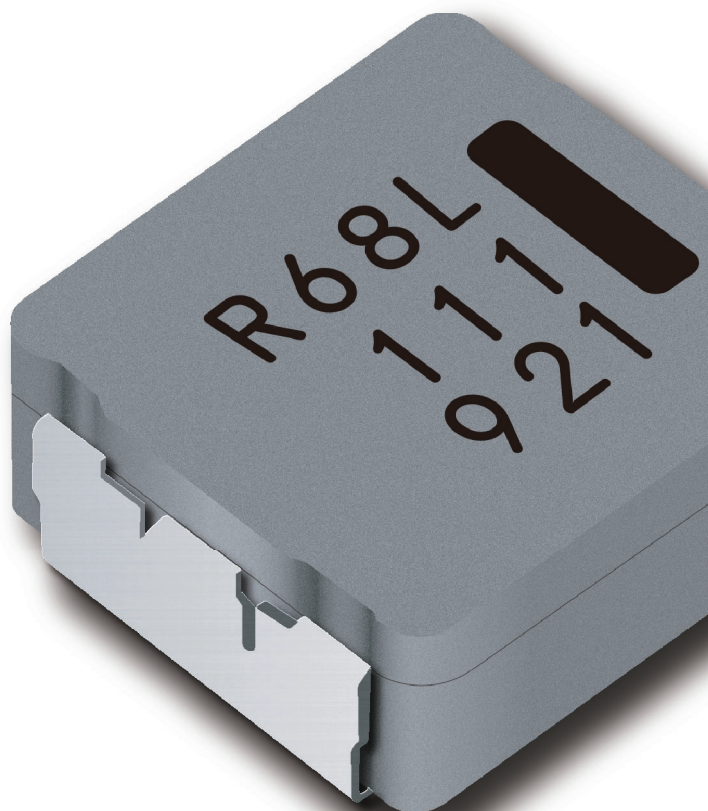
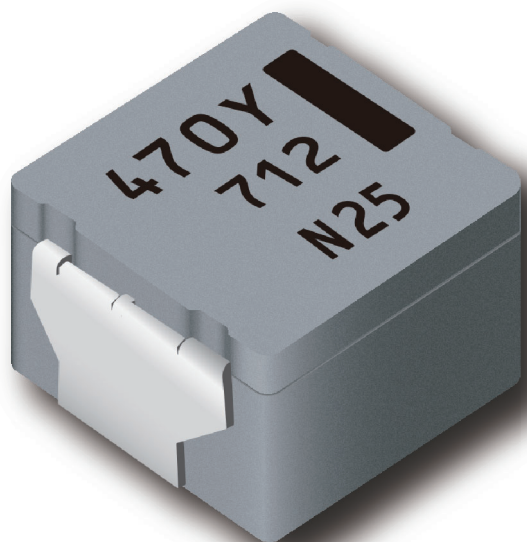








Table of contents

| | |
|---|----|
| 1. Overview | |
| 1-1. Product list & main applications | 1 |
| 1-2. Introduction | 2 |
| 2. Features and benefits | |
| 2-1. High current, High heat resistance and excellent thermal stability | 3 |
| 2-2. Acoustic noise reduction | 4 |
| 2-3. Low leakage flux | 4 |
| 2-4. AEC-Q200 compliant for use in harsh environments | 5 |
| 2-5. Facilitates smaller and lighter designs | 5 |
| 2-6. Unique terminal structure | 6 |
| 2-7. Excellent withstanding voltage characteristics | 6 |
| 3. Panasonic vs Other supplier | |
| 3-1. Panasonic's ETQ-PM series vs alternative products | 7 |
| 4. For specific requirements | |
| 4-1. Large current, Large size type (12x12mm) | 8 |
| 4-2. High vibration resistance series | 9 |
| 4-3. Low profile series | 10 |
| 5. Explanation of part numbers | |
| 5-1. Panasonic's ETQP series part number breakdown | 11 |
| 6. Line-up | |
| 6-1. Standard type | 12 |
| 6-2. LP type / LE type | 13 |
| 6-3. High power type / Vibration proof type | 14 |
| 7. Design support tool | |
| 7-1. Simulation data libraries | 15 |
| 7-2. Industrial & Automotive use LC filter simulator | 15 |
| 7-3. Power inductor loss simulator | 15 |

1-1. Product list & main applications

| Series | Standard | LP / LE | Anti-vibration | 4x4 mm | 12x12 mm | 15x15 mm |
|------------------------|---|---|---|---|---|---|
| Appearance |  |  |  |  |  |  |
| Status | MP | MP | MP (Partially) | 2021/Q4 to | MP | 2022/Q2 to |
| Size (mm) | 5x5 to 10x10 | 5x5 to 10x10 | 8x8 to 10x10 | 4x4 | 12x12 | 15x15 |
| L (μH) | 0.33 to 100 | 0.19 to 100 | 0.68 to 47 | 0.1 to 4.7 | 0.33 to 4.7 | 0.33 to 4.7 |
| I (A) | 1.4 to 33.2 | 1.6 to 32.5 | 2.9 to 26.3 | 2.3 to 10.0 | 16.8 to 44.4 | 27 to 73 |
| DCR (mΩ) | 3.8 to 348 | 0.9 to 206 | 1.75 to 125 | 5.8 to 106.7 | 0.7 to 4.9 | 0.4 to 3.0 |
| Vibration (G) | 10 to 30 | 4.4 to 30 | 30 to 50 | 10 | 30 | 30 |
| Power- train | Engine | ✓✓ | | | | |
| | Transmission | ✓✓ | ✓ | ✓✓ | | |
| | Pump | ✓✓ | ✓ | ✓✓ | ✓✓ | ✓✓ |
| | Cooling fan | ✓ | | | ✓✓ | ✓✓ |
| EV, HEV, PHV | BMS | | ✓✓ | ✓ | | |
| | Inverter | ✓ | ✓✓ | | | |
| | OBC | | ✓✓ | | | |
| | 48 V DC-DC | ✓ | | | ✓✓ | ✓✓ |
| Body, Chassis & Safety | Brake, ABS | ✓ | | ✓✓ | ✓ | ✓ |
| | Steering, EPS | ✓ | | | ✓✓ | ✓✓ |
| | BCM | ✓ | ✓✓ | | ✓ | |
| | Power window | ✓ | ✓✓ | | ✓ | |
| | Lighting | ✓ | ✓✓ | | | |
| AD / ADAS | DCU | ✓ | ✓ | | ✓✓ | ✓ |
| | Camera | ✓ | ✓ | | ✓✓ | ✓ |
| | Rader | ✓ | ✓ | | ✓✓ | |
| | Lidar | ✓ | ✓ | | ✓✓ | |
| | T-Box | ✓ | ✓ | | ✓✓ | |

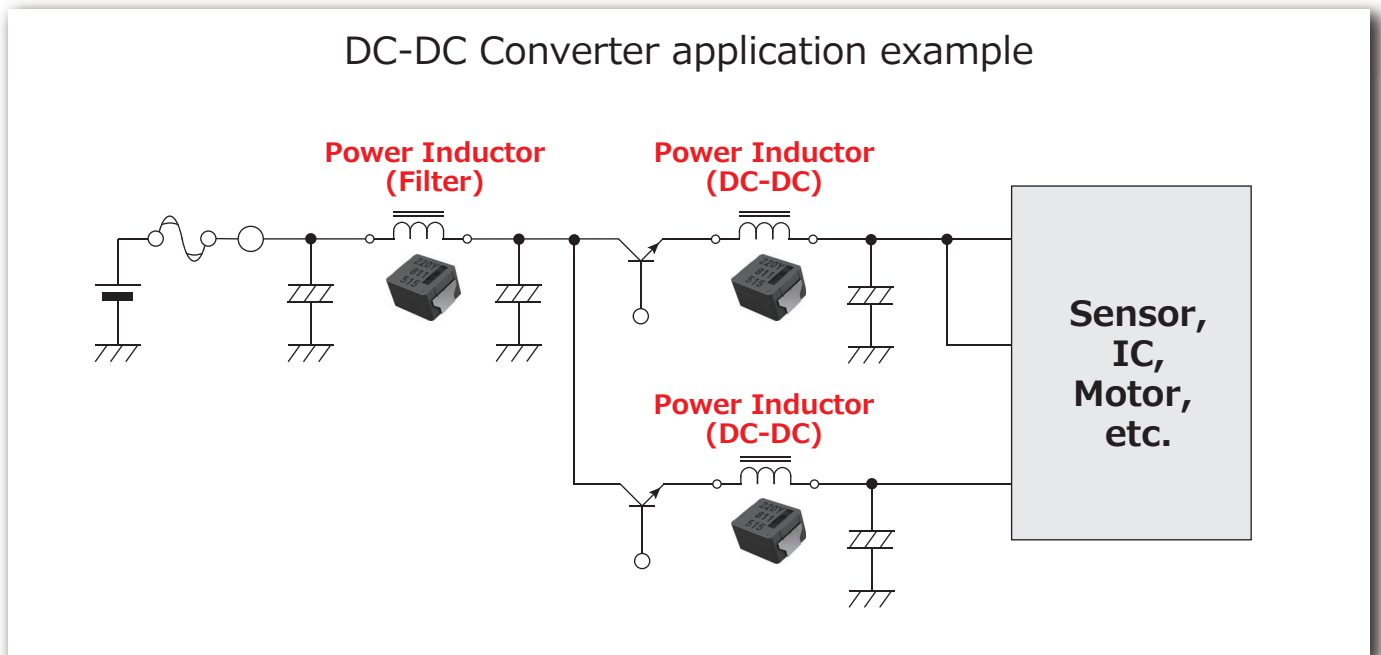
✓✓ : Especially recommended
 ✓ : Recommended



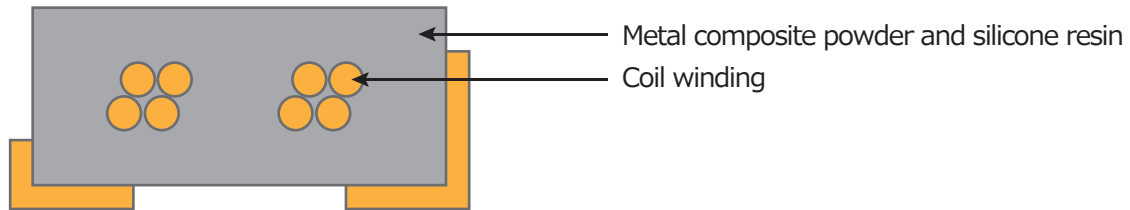
Please visit our website
for details !

1-2. Introduction

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

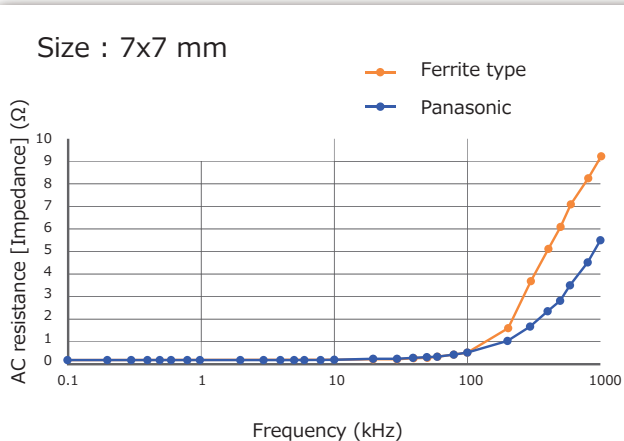


2-1. High current, High heat resistance and excellent thermal stability



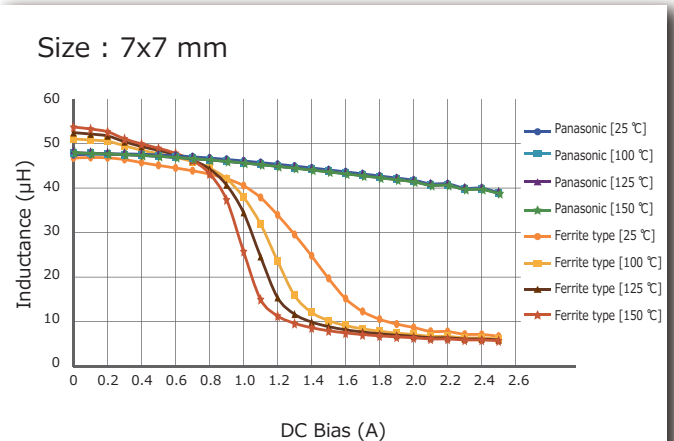
- The ETQ-PM Power Inductor consists of metal powder, silicone resin and coil winding. The magnetic material, which is created from Fe-based powder, enables high current, high heat resistance and excellent thermal stability.
- Excellent magnetic saturation characteristics (i.e. Ferrite core = 0.4T vs. 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.

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)

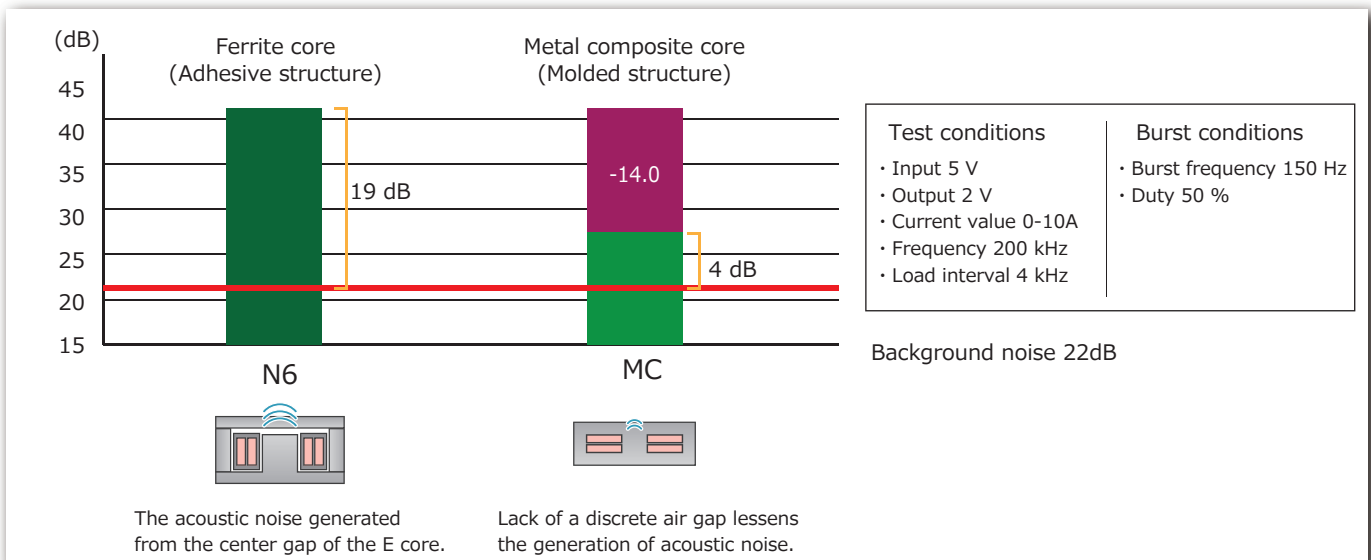
Temperature condition 125 °C

| Manufacturer | Panasonic metal composite | Ferrite (Alternative product) |
|------------------------------|---------------------------|-------------------------------|
| Series | M0645 | Ferrite type |
| Size (mm) | 6.5 x 6.0 | 7.4 x 6.9 |
| Height (mm max.) | 4.5 | 4.7 |
| Volume (mm ³) | 187 | 240 |
| Core material | Metal Composite | Ferrite |
| L1 (μH) at 100 kHz | 47.0 (0.8 A) | 47.0 (0.7 A) |
| 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

2-2. 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.



2-3. 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.

2-4. 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.

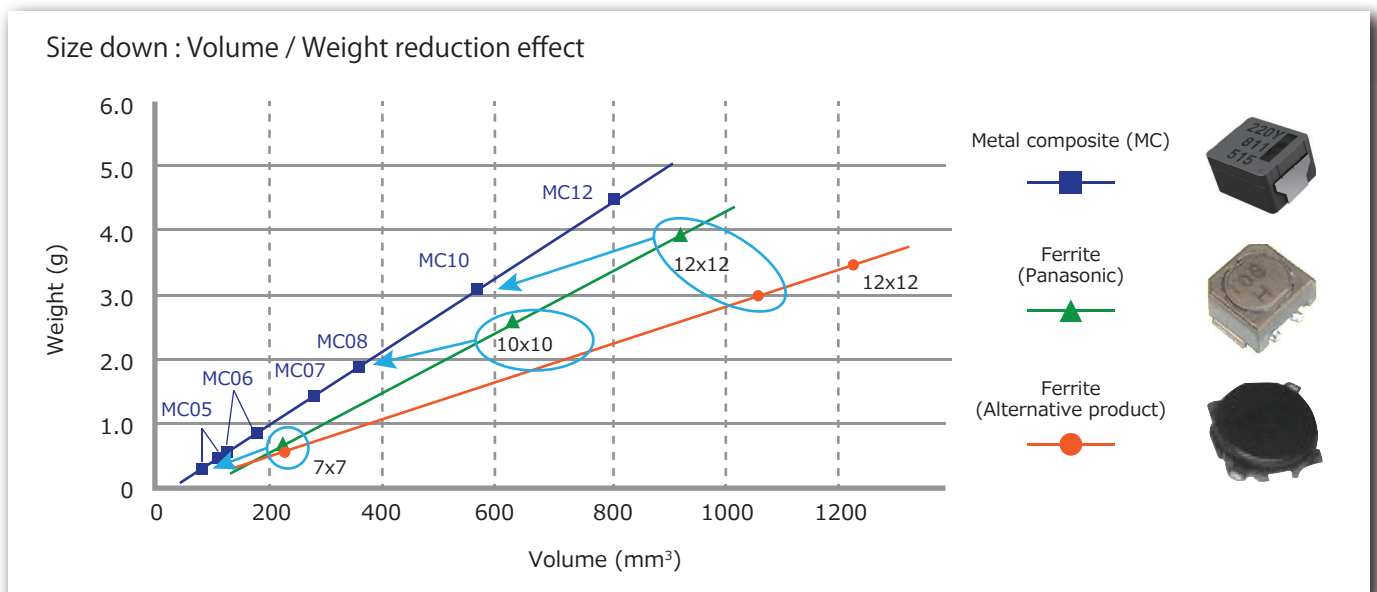
Reliability results for AEC-Q200 compliant

| Item | Condition | Time | Remark |
|-----------------------------|---|------------------------|--|
| Thermal shock | -40 to +150 °C (Each for 10 minutes) | 2000 cycles | <ul style="list-style-type: none"> Inductance is $\pm 10\%$ from initial value DCR is $\pm 10\%$ from initial value Insulation resistance is above 10KΩ Nothing abnormal on appearance and structures No open wire or mechanical damage |
| Vibration resistance | 10 G to 30 G (5 Hz - 2 kHz) | 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 | |

2-5. Facilitates smaller and lighter designs

Panasonic metal composite core types facilitate smaller designs compared with ferrite type choke coils.

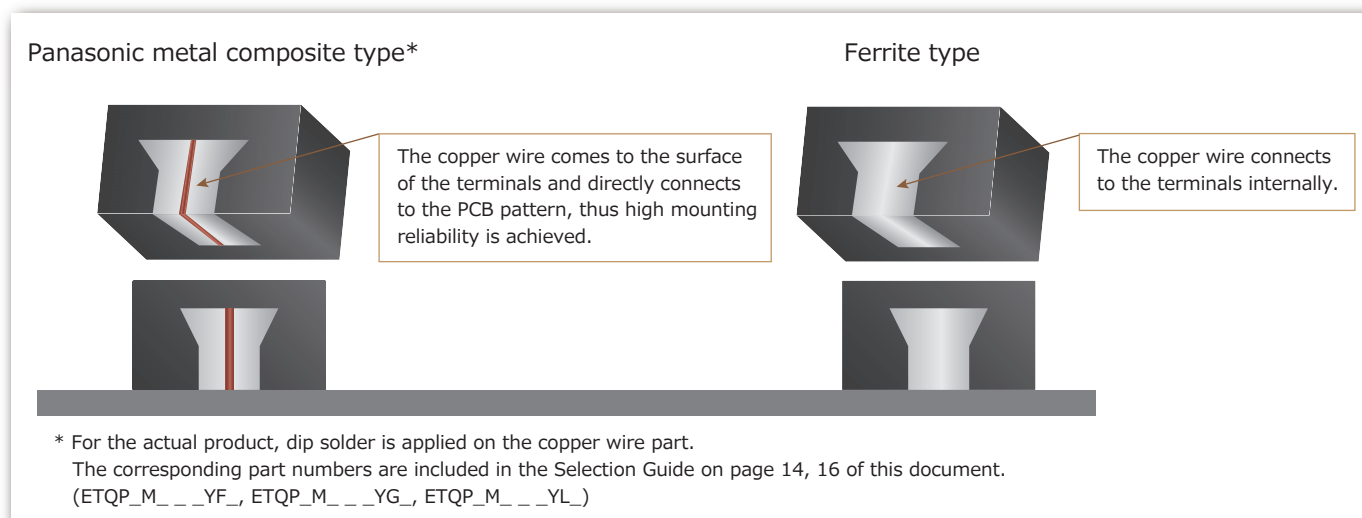
Around 20 - 40 % down in size and 5 - 25 % down in weight.



2-6. Unique terminal structure

[Standard type]

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.



2-7. Developing idea for high voltage proof

Insulation voltage target of Panasonic power choke coils

• High performance series (ETQP_M_ _ _Y_ _)

| | Size (mm) | Existing withstand voltage (V) | Revise specification | | | | | | | | | | | | | | |
|------------------|-----------|--------------------------------|----------------------|-----|------|---------|------|-----|-----|------|------|----|----|----|------|-----|--|
| | | | Inductance (μH) | | | | | | | | | | | | | | |
| | | | 0.68 | 1.0 | 1.5 | 2.2/2.5 | 3.3 | 4.7 | 6.8 | 10 | 15 | 22 | 33 | 47 | 68 | 100 | |
| M0530 M0540 | 5x5 | 20 | 55 V | | | | | | | | | | | | | | |
| M0630 M0645 | 6x6 | 25 | 60 V | | | | | | | 55 V | | | | | | | |
| M0750 M0754 | 7x7 | 35 | | | | | 65 V | | | | 60 V | | | | | | |
| M0850 M0854 | 8x8 | 35 | | | | 70 V | | | | 65 V | | | | | | | |
| M1050 M1054 | 10x10 | 35 | | | 70 V | | | | | | | | | | 65 V | | |
| M1050L M1054L | 10x10 | 35 | 70 V | | | | | | | | | | | | | | |

• Low profile series (ETQP_M_ _ _KV_ _)

| | Size (mm) | Existing withstand voltage (V) | Revise specification | | | | | | | | | | | | | |
|---------|-----------|--------------------------------|----------------------|-----|-----|---------|-----|-----|------|------|----|----|----|----|------|-----|
| | | | Inductance (μH) | | | | | | | | | | | | | |
| | | | 0.68 | 1.0 | 1.5 | 2.2/2.5 | 3.3 | 4.7 | 6.8 | 10 | 15 | 22 | 33 | 47 | 68 | 100 |
| M0530LP | 5x5 | 25 | 55 V | | | | | | | 50 V | | | | | | |
| M0630LP | 6x6 | 25 | 60 V | | | | | | 55 V | | | | | | | |
| M0840LP | 8x8 | 35 | 65 V | | | | | | | | | | | | | |
| M1040LP | 10x10 | 35 | 65 V | | | | | | | | | | | | 60 V | |

3-1. 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

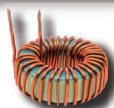
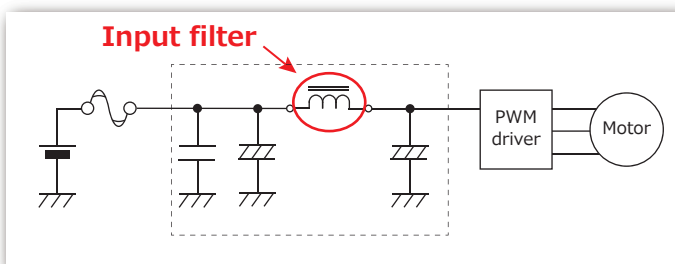
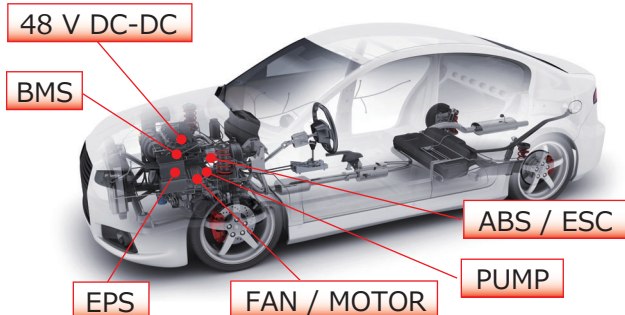
| Manufacturer | Panasonic | | Alternative products | Panasonic | | Alternative products |
|-----------------------------|----------------------------|------------------------------|---------------------------|----------------------------|------------------------------|---------------------------|
| | 8x8.5x5.4 ETQ-P5M220YFK | 10x10.7x5.4 ETQ-P5M220YFC | 10x10.7x4.0 22 μ H | 8x8.5x5.4 ETQ-P5M470YFK | 10x10.7x5.4 ETQ-P5M470YFC | 10x10.7x4.0 47 μ H |
| Size (mm) Power inductor | 8x8.5x5.4 ETQ-P5M220YFK | 10x10.7x5.4 ETQ-P5M220YFC | 10x10.7x4.0 22 μ H | 8x8.5x5.4 ETQ-P5M470YFK | 10x10.7x5.4 ETQ-P5M470YFC | 10x10.7x4.0 47 μ H |
| Frequency (kHz) | 400 | 400 | 400 | 400 | 400 | 400 |
| DCR 20 °C (m Ω) | 63 | 45 | 70 | 125 | 96 | 165 |
| ACR (m Ω) | 1190 | 861 | 1254 | 2416 | 2171 | 2805 |
| Rated current (A) | 4.33 | 4.33 | 4.33 | 2.47 | 2.47 | 2.47 |
| Iac [Ripple] (A) | 1.11 | 1.11 | 1.11 | 0.52 | 0.52 | 0.52 |
| Idc RMS (A) | 4.42 | 4.42 | 4.42 | 2.51 | 2.51 | 2.51 |
| Iac RMS (A) | 0.64 | 0.64 | 0.64 | 0.30 | 0.30 | 0.30 |
| DC loss (W) | 1.65 | 1.18 | 1.83 | 1.06 | 0.81 | 1.39 |
| AC loss (W) | 0.46 | 0.34 | 0.52 | 0.22 | 0.20 | 0.25 |
| Total loss | 2.11 | 1.51 | 2.35 | 1.27 | 1.01 | 1.65 |
| Δ T [Top] (K) | 78.1 | 49.9 | 80.9 | 47.1 | 33.2 | 56.8 |
| Δ T [Terminal] (K) | 58.0 | 35.5 | 58.6 | 35.0 | 23.6 | 41.1 |

4-1. Large current, large size type (12x12mm)

Features

Target applications

- Filters/DC-DC converters for below applications, etc.



THD → SMD

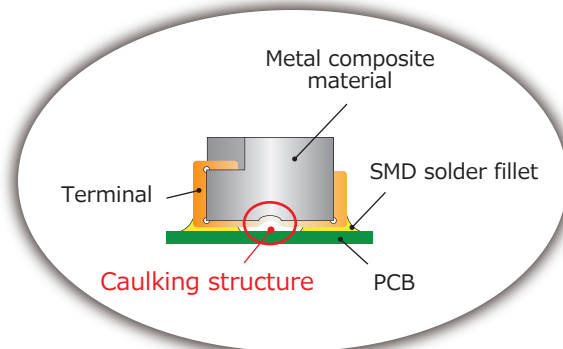


Reliability

- High vibration resistance by 4-point fixing 30 G / 5 Hz to 2000 Hz



- " Internal coil=Lead wire=terminal" achieves very high reliability electrode structure
- High heat resistance $\geq 160\text{ }^{\circ}\text{C}$



Line up and benchmark

| Other company | | |
|-------------------------------|----------|--------------------------------|
| Alternative products | | |
| Size : 17.2 x 17.2 x 7.0 (mm) | | |
| L0 (μH) | DCR (mΩ) | Rated current (A) ΔT: +40 K |
| 4.7 | 4.90 | 24 |
| 3.3 | 3.10 | 32.2 |
| 2.2 | 2.25 | 38.5 |
| 1.5 | - | - |
| 1.0 | 1.36 | 53.0 |
| 0.68 | - | - |
| 0.47 | 0.89 | 65.0 |
| 0.33 | - | - |



| Panasonic | | | |
|-------------------------------|----------|--------------------------------|-------------------------------------|
| PCC-M1280MF | | | |
| Size : 12.6 x 13.2 x 8.0 (mm) | | | |
| L0 (μH) | DCR (mΩ) | Rated current (A) ΔT: +40 K | Saturation current (A) ΔT: -30 % |
| 4.7 | 4.90 | 20.2 | 224.7 |
| 3.3 | 3.10 | 23.6 | 27.6 |
| 2.2 | 2.60 | 27.7 | 32.1 |
| 1.5 | 1.80 | 33.3 | 29.9 |
| 1.0 | 1.36 | 38.3 | 44.4 |
| 0.68 | 1.10 | 42.6 | 56.9 |
| - | - | - | - |
| 0.33 | .070 | 53.5 | 84.5 |

45% Less space

SOP 2022

In MP

4-2. High vibration resistance series

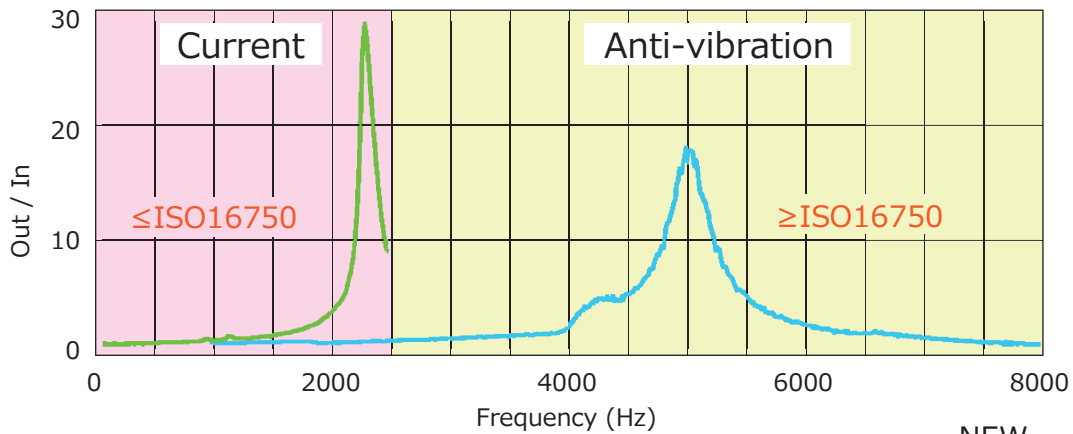
Features

Target applications

- Engine direct attachment, mechanical and electrical integration system applications

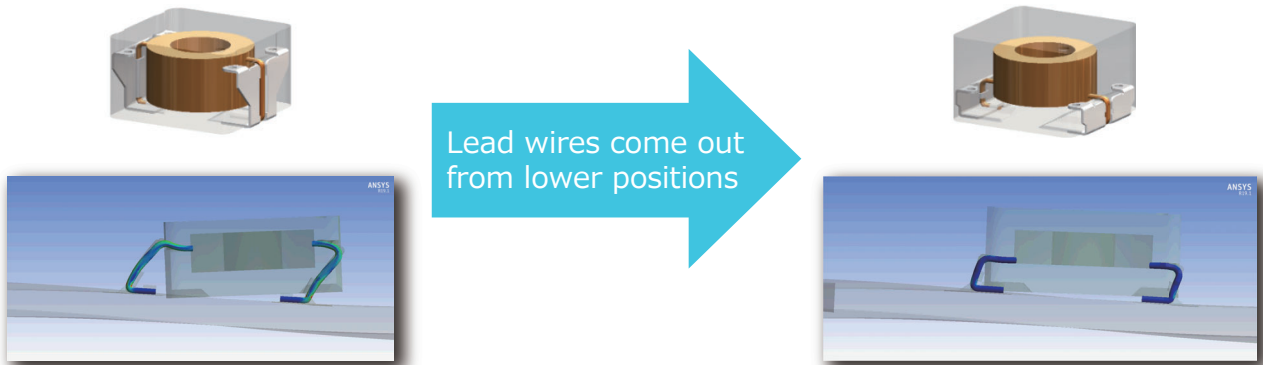
Reliability

- Vibration 30 to 50 G/10⁸ times/150 °C
Frequency ≤ 2000Hz, SRF ≥ 3000Hz



Current

NEW (Anti-vibration)



| 10.9 x 10.0 x H5-6 (mm) | | | 8.5 x 8.0 x H5-6 (mm) | | |
|-------------------------|----------|--------------------------------|-----------------------|----------|--------------------------------|
| L0 (μH) | DCR (mΩ) | Rated current (A) ΔT: +40 K | L0 (μH) | DCR (mΩ) | Rated current (A) ΔT: +40 K |
| 47 | 99.0 | 3.50 | 47 | 125 | 2.90 |
| 33 | 68.5 | 4.20 | 33 | 100 | 3.30 |
| 22 | 45.0 | 5.20 | 22 | 63.0 | 4.10 |
| 10 | 23.8 | 7.10 | 10 | 33.4 | 5.70 |
| 4.7 | 8.70 | 11.8 | 4.7 | 16.8 | 8.00 |
| 3.3 | 6.00 | 14.2 | 3.3 | 9.60 | 10.6 |
| 2.5 | 4.55 | 16.3 | 2.5 | 7.60 | 11.9 |
| 2.0 | 4.60 | 16.2 | - | - | - |
| 1.5 | 3.10 | 19.8 | - | - | - |
| 1.0 | 2.30 | 23.0 | - | - | - |
| 0.68 | 1.75 | 26.3 | - | - | - |



Proto-line sample available

In MP

* Sample LT: 1 to 2 months

4-3. Low profile series

| 5 x 5 size 5.5 x 5.0 x 3.0 (mm) | | | | |
|------------------------------------|--------------------------|------------------|-------------------------|------------------|
| L (μ H) | Panasonic ETQP3M__KVP | | Alternative products | |
| | DCR (m Ω) | Isat -20% (A) | DCR (m Ω) | Isat -20% (A) |
| 47 | - | - | - | - |
| 33 | - | - | - | - |
| 22 | - | - | - | - |
| 10 | 96.0 | 3.4 | 132 | 1.6 |
| 6.8 | 65.7 | 4.5 | 104 | 2.2 |
| 4.7 | 45.6 | 5.4 | 72.8 | 3.7 |
| 3.3 | 27.3 | 5.8 | 44.0 | 5.5 |
| 2.2 | 20 | 7.4 | 24.7 | 6.3 |
| 1.5 | 12 | 9.6 | 18.0 | 7.1 |
| 1.0 | 9.6 | 11.4 | 11.5 | 8.0 |
| 0.68 | 7.6 | 11.3 | 9.1 | 8.2 |

| 6 x 6 size 6.4 x 6.0 x 3.0 (mm) | | | | |
|------------------------------------|--------------------------|------------------|-------------------------|------------------|
| L (μ H) | Panasonic ETQP3M__KVN | | Alternative products | |
| | DCR (m Ω) | Isat -20% (A) | DCR (m Ω) | Isat -20% (A) |
| 47 | - | - | - | - |
| 33 | - | - | - | - |
| 22 | 128 | 2.8 | 163.0 | 2.2 |
| 10 | 99.2 | 3.5 | 118.0 | 2.8 |
| 6.8 | 71.0 | 4.2 | 71.9 | 2.9 |
| 4.7 | 45.6 | 5.5 | 53.8 | 4.4 |
| 3.3 | 29 | 7.2 | 35.9 | 5.6 |
| 2.2 | 24.1 | 7.3 | 26.5 | 8.3 |
| 1.5 | 14.5 | 8.9 | 17.1 | 10.8 |
| 1.0 | 6.2 | 10.7 | 7.9 | 13.0 |
| 0.68 | 5.2 | 11.8 | 5.38 | 17.0 |

| 8 x 8 size 8.5 x 8.0 x 4.0 (mm) | | | | |
|------------------------------------|--------------------------|------------------|-------------------------|------------------|
| L (μ H) | Panasonic ETQP4M__KVK | | Alternative products | |
| | DCR (m Ω) | Isat -20% (A) | DCR (m Ω) | Isat -20% (A) |
| 47 | - | - | - | - |
| 33 | 118 | 3.7 | 149 | 3.2 |
| 22 | 76.3 | 5.0 | 103 | 3.8 |
| 15 | 55 | 5.8 | 62.0 | 3.6 |
| 10 | 41.6 | 6.8 | 50.0 | 5.2 |
| 6.8 | 23.5 | 7.6 | - | - |
| 4.7 | 16.1 | 9.2 | 26.6 | 9.1 |
| 3.3 | 14 | 11.7 | 15.4 | 11.8 |
| 2.2 | 8.5 | 15.2 | 11.7 | 14.0 |
| 1.0 | 3.7 | 19.1 | 4.58 | 16.2 |
| 0.68 | 2.9 | 21.0 | 3.3 | 16.2 |

| 10 x 10 size 10.7 x 10.0 x 4.0 (mm) | | | | |
|--|--------------------------|------------------|-------------------------|------------------|
| L (μ H) | Panasonic ETQP4M__KVC | | Alternative products | |
| | DCR (m Ω) | Isat -20% (A) | DCR (m Ω) | Isat -20% (A) |
| 47 | 132 | 3.4 | 167 | 4.5 |
| 33 | 84.6 | 4.1 | 110 | 4.2 |
| 22 | 60.0 | 5.6 | 70.5 | 6.4 |
| 15 | 37.0 | 6.0 | 47.0 | 7.7 |
| 10 | 25.4 | 8.1 | 30.9 | 8.5 |
| 6.8 | 23.5 | 8.9 | 20.9 | 9.0 |
| 4.7 | 11.8 | 10.6 | 14.3 | 9.2 |
| 3.3 | 12.7 | 9.4 | 11.0 | 12.0 |
| 2.2 | 6.8 | 16.9 | 8.15 | 12.0 |
| 1.0 | 2.6 | 24.0 | 2.87 | 24.0 |
| 0.68 | - | - | - | - |

IDC1 : Direct current based on the L 20% drop from the initial value.

(without drop in L before/after this value because of using Metal composite core)

Operating temperature : up to 150 deg.C (including self-temperature rise)

5

Explanation of part numbers

5-1. Panasonic's ETQP series part number breakdown










Product code Classification Height Winding Inductance Core Suffix Size

| Code | Height (mm max.) | Code | Inductance (μH) | Code | Core type | Code | Size (mm) |
|------|------------------|----------|-----------------|------|------------------|------|-----------|
| 3 | 3.0 to 3.9 | 4R7 | 4.7 | Y | High performance | P | 5 x 5 |
| 4 | 4.0 to 4.9 | 220 | 22 | J | High current | N | 6 x 6 |
| 5 | 5.0 to 5.9 | 101 | 100 | K | Low profile | M | 7 x 7 |
| 6 | 6.0 to 6.9 | *Example | | H | 5 MHz | K | 8 x 8 |
| 8 | 8.0 to 8.9 | | | | | C | 10 x 10 |
| | | | | | | A | 12 x 12 |

6-3. High power type / Vibration proof type

Standard type (High-I saturation)

| 5 x 5 | | | | 6 x 6 | | | | | | | | | | | |
|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|
| M0530M | | M0540M | | M0630M | | M0645M | | | | | | | | | |
| ETQP3M__YFP | | ETQP4M__YFP | | ETQP3M__YFN | | ETQP4M__YFN | | | | | | | | | |
|  5.5 x 5.0 x H3.0 (mm) | | | |  5.5 x 5.0 x H4.0 (mm) | | | |  6.5 x 6.0 x H3.0 (mm) | | | |  6.5 x 6.0 x H4.5 (mm) | | | |
| L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | |
| | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 47.0 | 210.0 | 3.8 | 2.2 |
| | | | | | | | | | | | | 33.0 | 172.0 | 4.1 | 2.5 |
| | | | | 22.0 | 163.0 | 3.1 | 2.3 | | | | | 22.0 | 126.0 | 6.0 | 2.9 |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 10.0 | 54.2 | 8.3 | 4.5 |
| | | | | | | | | | | | | 6.8 | 39.3 | 10.0 | 5.2 |
| | | | | 4.7 | 36.0 | 7.7 | 4.8 | | | | | | | | |
| 3.3 | 31.3 | 8.6 | 5.0 | | | | | | | | | 3.3 | 16.1 | 13.1 | 8.2 |
| 2.2 | 22.6 | 10.9 | 5.8 | | | | | | | | | 2.2 | 10.4 | 14.4 | 10.2 |
| | | | | | | | | 1.0 | 7.9 | 20.0 | 8.8 | | | | |
| | | | | | | | | 0.68 | 6.3 | 24.0 | 9.8 | | | | |

| 7 x 7 | | | | 8 x 8 | | | | 10 x 10 | | | |
|--|----------------------|-------------------|-----------------|---|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|
| M0754M | | M0854M | | M1054M | | M1054M | | M1054M | | M1054M | |
| ETQP5M__YFM | | ETQP5M__YFK | | ETQP5M__YFC | | ETQP5M__YFC | | ETQP5M__YFC | | ETQP5M__YFC | |
|  7.5 x 7.0 x H5.4 (mm) | | | |  8.5x 8.0 x H5.4 (mm) | | | |  10.7 x 10.0 x H5.4 (mm) | | | |
| L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | |
| | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K |
| 100.0 | 348.0 | 3.1 | 1.9 | 100.0 | 302.0 | 3.0 | 2.1 | 97.0 | 208.0 | 3.0 | 2.7 |
| 68.0 | 251.0 | 3.9 | 2.3 | | | | | 68.0 | 136.0 | 5.2 | 3.6 |
| 47.0 | 156.0 | 4.1 | 2.9 | 48.0 | 125.0 | 5.4 | 3.4 | 47.0 | 99.0 | 6.8 | 4.2 |
| 33.0 | 120.0 | 4.8 | 3.3 | | | | | 33.0 | 68.5 | 7.6 | 5.0 |
| 22.0 | 92.0 | 5.8 | 3.7 | 22.0 | 63.0 | 6.9 | 4.8 | 22.0 | 45.0 | 8.8 | 6.2 |
| | | | | 15.0 | 48.2 | 7.7 | 5.5 | 15.0 | 35.6 | 11.2 | 7.0 |
| 10.0 | 37.6 | 10.6 | 5.7 | 10.0 | 33.4 | 13.0 | 6.7 | 10.0 | 23.8 | 12.0 | 8.5 |
| 6.8 | 26.7 | 12.0 | 6.9 | | | | | | | | |
| 4.7 | 20.4 | 13.1 | 8.0 | | | | | 4.7 | 10.2 | 20.0 | 13.1 |
| 3.3 | 11.9 | 14.4 | 10.4 | 3.3 | 9.5 | 17.9 | 12.5 | 3.3 | 7.1 | 23.4 | 14.7 |
| | | | | 2.5 | 7.6 | 20.1 | 14.0 | 3.3 | 7.1 | 22.7 | 15.7 |
| | | | | | | | | 2.5 | 5.3 | 27.2 | 18.1 |
| | | | | | | | | 1.5 | 3.8 | 35.1 | 21.4 |

Please visit our website
for standard type !







← H=5 to YG_

← H=5 to YGC



- ◆ Rated current is the current value at which temperature rise is 40K. Please use within Tc 150°C including self-temperature rise.
- ◆ The proven current value for making the overall temperature rise of 40k, when mounted on multi-layer board with high-heat dissipation.

6-2. LP type / LE type

LP type

| 5 x 5 | | | | 6 x 6 | | | | 8 x 8 | | | | 10 x 10 | | | |
|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|
| M0530M-LP | | | | M0630M-LP | | | | M0840M-LP | | | | M1040M-LP | | | |
| ETQP3M__KVP | | | | ETQP3M__KVN | | | | ETQP4M__KVK | | | | ETQP4M__KVC | | | |
|  5.5 x 5.0 x H3.0 (mm) | | | |  6.4 x 6.0 x H3.0 (mm) | | | |  8.5 x 8.0 x H4.0 (mm) | | | |  10.7 x 10.0 x H4.0 (mm) | | | |
| L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | |
| | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K |
| | | | | | | | | | | | | 47.0 | 132.0 | 4.7 | 3.4 |
| | | | | 33.0 | 206.0 | 3.0 | 2.1 | 33.0 | 118.0 | 4.7 | 3.1 | 33.0 | 84.6 | 5.6 | 4.2 |
| | | | | 22.0 | 128.0 | 4.3 | 2.7 | 22.0 | 78.4 | 6.0 | 3.8 | 22.0 | 60.0 | 7.4 | 5.0 |
| | | | | 15.0 | 99.2 | 5.1 | 3.0 | 15.0 | 55.0 | 7.6 | 4.5 | 15.0 | 37.0 | 9.2 | 6.3 |
| 10.0 | 96.0 | 4.2 | 2.4 | 10.0 | 71.0 | 5.8 | 3.6 | 10.0 | 41.6 | 9.1 | 5.2 | 10.0 | 25.4 | 10.8 | 7.6 |
| 6.8 | 65.7 | 6.1 | 2.9 | 6.8 | 45.6 | 8.1 | 4.5 | 6.8 | 23.5 | 11.0 | 6.9 | 6.8 | 18.5 | 12.1 | 8.9 |
| 4.7 | 45.6 | 6.7 | 3.4 | 4.7 | 29.0 | 9.8 | 5.6 | 4.7 | 16.1 | 15.1 | 8.3 | 4.7 | 12.3 | 13.9 | 11.2 |
| 3.3 | 27.3 | 8.0 | 4.4 | 3.3 | 24.1 | 11.5 | 6.1 | 3.3 | 14.1 | 17.4 | 8.9 | 3.3 | 9.4 | 17.1 | 12.6 |
| 2.2 | 20.0 | 10.1 | 5.2 | 2.2 | 14.5 | 12.8 | 7.9 | 2.2 | 8.5 | 20.4 | 11.4 | 2.2 | 6.8 | 21.0 | 14.8 |
| 1.5 | 12.0 | 12.0 | 6.7 | 1.5 | 11.0 | 14.2 | 9.1 | 1.5 | 4.9 | 22.5 | 15.1 | 1.5 | 4.9 | 25.0 | 17.4 |
| 1.0 | 9.6 | 14.1 | 7.5 | 1.0 | 6.2 | 16.0 | 12.1 | 1.0 | 3.7 | 24.4 | 17.3 | 1.0 | 2.6 | 34.6 | 23.9 |
| 0.68 | 7.6 | 15.9 | 8.43 | 0.68 | 5.2 | 20.2 | 13.2 | 0.68 | 2.92 | 29.0 | 19.5 | | | | |
| 0.33 | 4.85 | 21.8 | 10.5 | | | | | | | | | | | | |

LE type

| 6 x 6 | | | | 7 x 7 | | | |
|--|----------------------|-------------------|-----------------|--|----------------------|-------------------|-----------------|
| M0648M-LE | | | | M0748M-LE | | | |
| ETQP4M__KFN | | | | ETQP4M__KFM | | | |
|  6.5 x 6.0 x H4.8 (mm) | | | |  7.5 x 7.0 x H4.8 (mm) | | | |
| L0 (μ H) | DCR (m Ω) | Rated current (A) | | L0 (μ H) | DCR (m Ω) | Rated current (A) | |
| | | Δ L:-30% | Δ T:+40K | | | Δ L:-30% | Δ T:+40K |
| | | | | 47.0 | 148.6 | 3.7 | 2.9 |
| | | | | 22.0 | 84.1 | 4.6 | 3.9 |
| 15.0 | 63.8 | 6.7 | 4.2 | | | | |
| 10.0 | 40.4 | 8.1 | 5.2 | 10.0 | 36.0 | 9.6 | 6.0 |
| 4.7 | 20.7 | 9.3 | 7.3 | 4.7 | 16.8 | 10.7 | 8.8 |
| 3.3 | 13.1 | 12.0 | 9.2 | | | | |

Please visit our website
for LP type !






Please visit our website
for LE type !

- ◆ Rated current is the current value at which temperature rise is 40K. Please use within Tc 155°C including self-temperature rise.
- ◆ The proven current value for making the overall temperature rise of 40k, when mounted on multi-layer board with high-heat dissipation.



6-3. High power type / Vibration proof type

High power type

| 10 x 10 (Low-DCR)* ¹ | | | | | | | | 12 x 12* ² | | | |
|--|-------------|-------------------|---------|--|-------------|-------------------|---------|---|-------------|-------------------|----------------------|
| M1050ML | | | | M1060ML | | | | M1280MF | | | |
| ETQP5M_YLC | | | | ETQP6M_YLC | | | | ETQP8M_JFA | | | |
|  10.9 x 10.0 x H5.0 (mm) | | | |  10.9 x 10.0 x H6.0 (mm) | | | |  12.6 x 13.1/13.2 x H8.0 (mm) | | | |
| L0 (μH) | DCR (mΩ) | Rated current (A) | | L0 (μH) | DCR (mΩ) | Rated current (A) | | L0 (μH) | DCR (mΩ) | Rated current (A) | |
| | | ΔL:-30% | ΔT:+40K | | | ΔL:-30% | ΔT:+40K | | | ΔL:-30% | ΔT:+40K (4-layer) |
| | | | | 4.7 | 8.70 | 22.5 | 14.1 | 4.7 | 4.90 | 24.7 | 20.2 |
| | | | | 3.3 | 6.00 | 26.3 | 17.0 | 3.3 | 3.60 | 27.6 | 23.6 |
| | | | | 2.5 | 4.55 | 25.8 | 19.6 | 2.5 | 2.60 | 32.1 | 27.7 |
| | | | | 1.5 | 3.20 | 32.0 | 23.3 | 1.5 | 1.80 | 29.9 | 33.3 |
| 1.0 | 2.30 | 37.8 | 27.5 | | | | | 1.0 | 1.36 | 44.4 | 38.3 |
| 0.68 | 1.75 | 40.0 | 31.5 | | | | | 0.68 | 1.10 | 56.9 | 42.6 |
| 0.33 | 1.10 | 56.7 | 39.7 | | | | | 0.33 | 0.70 | 84.5 | 53.5 |

Please visit our website
for high power type !



| Vibration proof type* ¹ | | | | | | | |
|--|-------------|-------------------|---------|---|-------------|-------------------|---------|
| 8 x 8 | | | | 10 x 10 (Low-DCR) | | | |
| M0854MS | | | | M1050MS/M1060MS | | | |
| ETQP5M_YSK | | | | ETQP5M_YSC/ETQP6M_YSC | | | |
|  8.5 x 8.0 x H5.4 (mm) | | | |  10.9 x 10.0 x H5.0/H6.0 (mm) | | | |
| L0 (μH) | DCR (mΩ) | Rated current (A) | | L0 (μH) | DCR (mΩ) | Rated current (A) | |
| | | ΔL:-30% | ΔT:+40K | | | ΔL:-30% | ΔT:+40K |
| 2.45 | 7.4 | 19.3 | 14.1 | | | | |
| | | | | 1.9 | 4.45 | 30.0 | 16.5 |
| | | | | 0.68 | 1.66 | 40.0 | 32.3 |

Please visit our website
for vibration proof type !



*1: Rated current is the current value at which temperature rise is 40K. Please use within Tc 150°C including self-temperature rise.

*2: Rated current is the current value at which temperature rise is 40K. Please use within Tc 160°C including self-temperature rise.

◆The proven current value for making the overall temperature rise of 40k, when mounted on multi-layer board with high-heat dissipation.

7-1. Simulation data libraries

Equivalent circuit models, and S-parameter data can be downloaded for each individual item number.

Simulation Data Libraries

7-2. Industrial & Automotive use LC filter simulator

The Industrial & Automotive use LC filter simulator enables the simulation of attenuation amounts when configuring a filter using Panasonic's power inductor and aluminum electrolytic capacitor suitable for industrial & automotive use.

LC Filter Simulator

7-3. Power inductor loss simulator

The Power Inductor loss simulator for automotive application enables the simulation of losses and temperature rises according to the current for Panasonic's power inductors designed for automotive use.

Loss Simulator

Safety Precautions

When using our products, no matter what sort of equipment they might be used for, be sure to confirm the applications and environmental conditions with our specifications in advance.

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INDUSTRY

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