# Metal Composite Power Inductors MPGV

## Overview

The KEMET MPGV metal composite inductors are ideal for use in DC to DC switching power supplies for automotive applications. The metal composite core has high saturation capabilities maintaining functionality with high current transients and is characterized by temperature stable inductance. The durability has been further improved and allows for vibration resistance of up to 50 G.

## Applications

Automotive ECU applications, such as:

- LED headlights
- Meter cluster panels
- Head-up displays (HUD)
- Electric water pumps (EWP)
- Electric oil pumps (EOP)
- Electric power steering (EPS)

## Benefits

- Metal composite powder
- Shielded construction, SMD configuration
- 50 G vibration resistance
- Inductance range from 0.47 – 47.00 µH
- Operating temperature up to +155°C
- Low acoustic noise
- Low magnetic flux leakage
- AEC–Q200 qualified

## Part Number System

| MPGV | 1 | D1054 | L | 1R5 |
|---|---|---|---|---|
| Series | Version | Size Code | Inductor | Inductance Code µH |
| MPGV | 1 | D1054 = 10 x 10 x 5.4 mm | | The first two digits represent the inductance value. The third digit indicates the number of zeros to be added.<br>R = decimal point<br><br>Examples:<br>100 = 10.00 µH<br>R68 = 0.68 µH<br>1R5 = 1.50 µH |

## Performance Characteristics

| Item | Performance Characteristics |
|---|---|
| Operating Temperature | −55°C to +155°C (including self-temperature rise) |
| Rated Inductance Range | 0.47 – 47.00 µH at 100 kHz, 1 mA |
| Inductance Tolerance | ±20% |
| Rated DC Resistance Range | 1.9 – 135.2 mΩ maximum |
| Rated Current Range | 3.6 – 30.9 A |

## Table 1 – Ratings & Part Number Reference

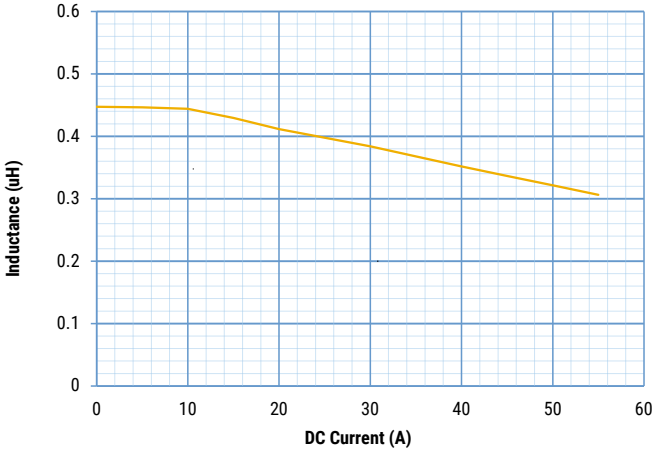
| Part Number | Inductance (µH) at 100 kHz, 1 mA | Inductance Tolerance | DC Resistance (mΩ) Typical | DC Resistance (mΩ) Maximum | Rated Current (A) | | | Self-Resonance Frequency (MHz) |
|---|---|---|---|---|---|---|---|---|
| | | | | | Irms[1] (Reference) | Isat[2] (Reference) | Isat[3] (Reference) | |
| MPGV1D1054LR47 | 0.47 | ±20% | 1.60 | 1.90 | 30.9 | 39.0 | 51.0 | 46.0 |
| MPGV1D1054LR68 | 0.68 | ±20% | 2.30 | 2.80 | 25.6 | 28.0 | 38.0 | 37.0 |
| MPGV1D1054L1R0 | 1.00 | ±20% | 2.80 | 3.20 | 23.2 | 24.0 | 34.0 | 32.0 |
| MPGV1D1054L1R5 | 1.50 | ±20% | 3.90 | 4.50 | 19.7 | 19.5 | 28.0 | 24.0 |
| MPGV1D1054L2R2 | 2.20 | ±20% | 5.50 | 6.30 | 16.6 | 19.0 | 26.5 | 21.0 |
| MPGV1D1054L3R3 | 3.30 | ±20% | 7.20 | 8.30 | 14.5 | 16.5 | 23.0 | 16.0 |
| MPGV1D1054L4R7 | 4.70 | ±20% | 11.80 | 13.60 | 11.3 | 13.0 | 18.5 | 14.0 |
| MPGV1D1054L6R8 | 6.80 | ±20% | 17.00 | 19.60 | 9.4 | 11.0 | 15.0 | 10.0 |
| MPGV1D1054L100 | 10.00 | ±20% | 26.00 | 29.90 | 7.6 | 8.5 | 12.5 | 9.5 |
| MPGV1D1054L150 | 15.00 | ±20% | 34.20 | 39.30 | 6.6 | 7.0 | 11.0 | 7.5 |
| MPGV1D1054L220 | 22.00 | ±20% | 44.60 | 51.30 | 5.8 | 5.5 | 8.5 | 6.5 |
| MPGV1D1054L330 | 33.00 | ±20% | 74.00 | 85.10 | 4.5 | 5.0 | 7.5 | 5.0 |
| MPGV1D1054L470 | 47.00 | ±20% | 117.60 | 135.20 | 3.6 | 4.0 | 6.0 | 4.0 |
| **Part Number** | **Inductance (µH) at 100 kHz, 1 mA** | **Inductance Tolerance** | **DC Resistance (mΩ) Typical** | **DC Resistance (mΩ) Maximum** | **Irms[1]** | **Isat[2]** | **Isat[3]** | **Self-Resonance Frequency (MHz)** |
| | | | | | **Rated Current (A)** | | | |

[1] *T = 40 K rise at rated current*
[2] *Inductance drop 20% at rated current*
[3] *Inductance drop 30% at rated current*

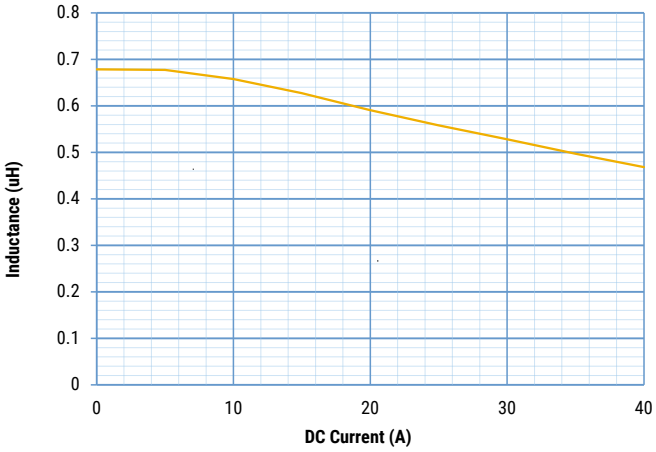
*All electrical characteristics data is referenced to 25°C.*

## DC-Superposed Characteristics

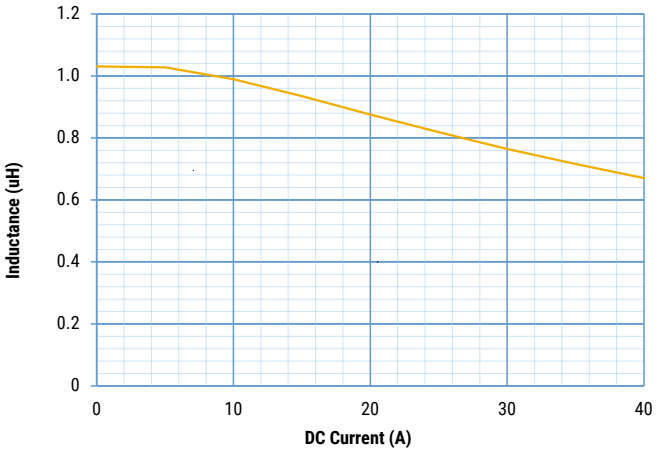
MPGV1D1054LR47




MPGV1D1054LR68




MPGV1D1054L1R0

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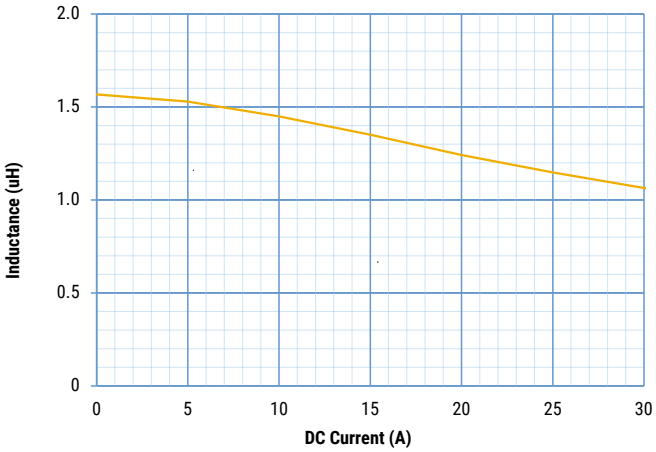
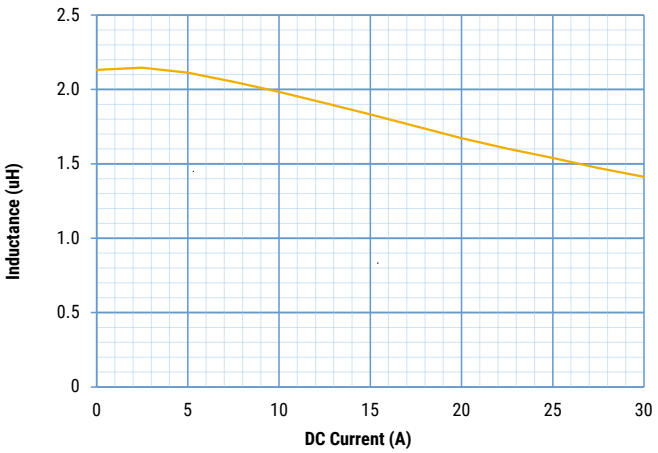



MPGV1D1054L2R2

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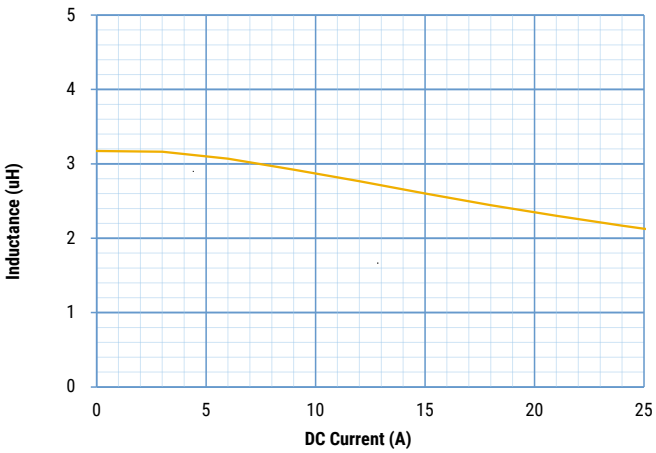
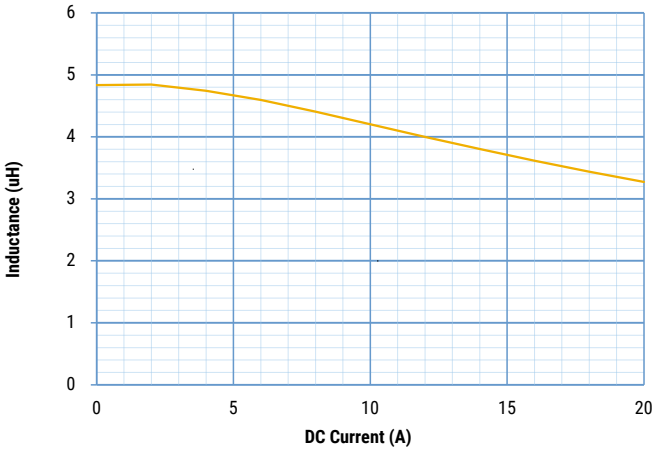


## DC-Superposed Characteristics cont.

MPGV1D1054L4R7

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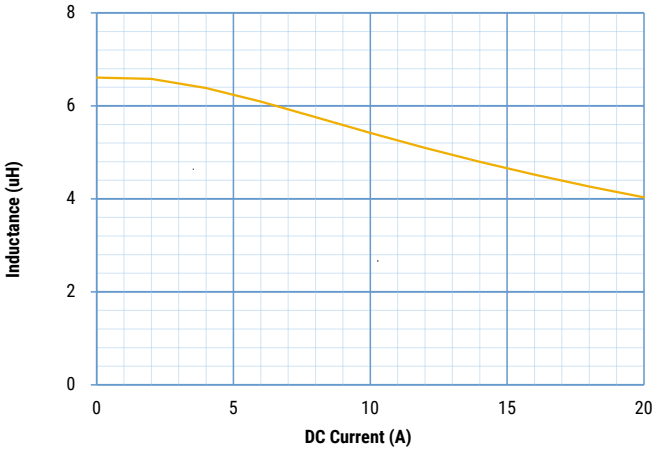


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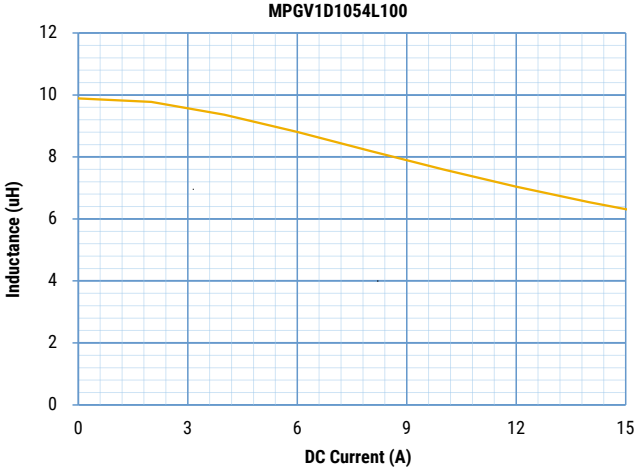


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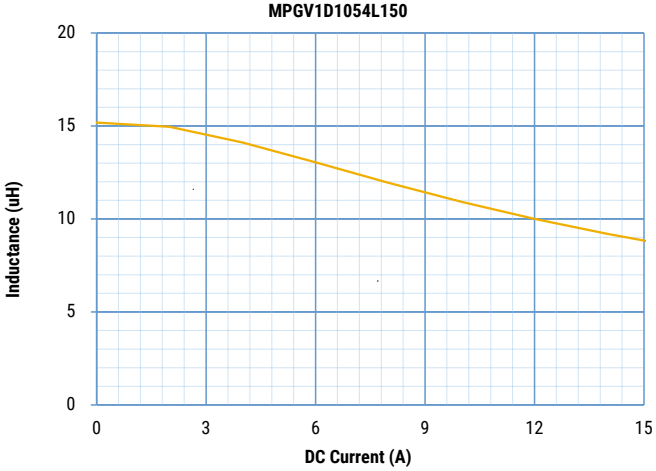


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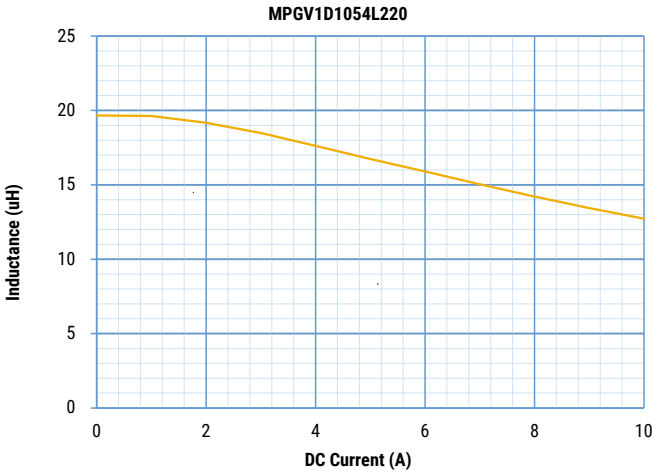


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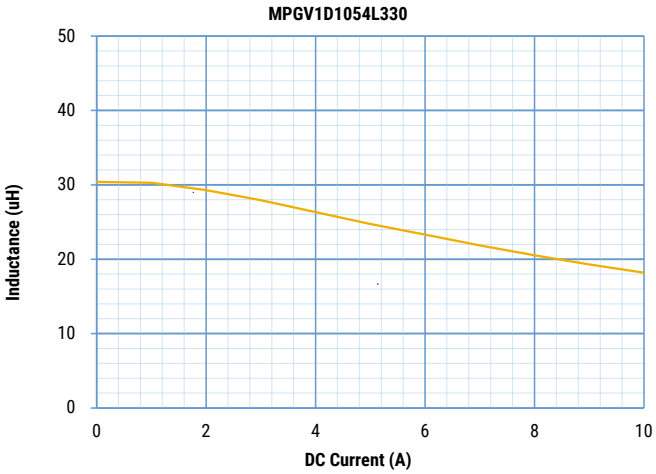
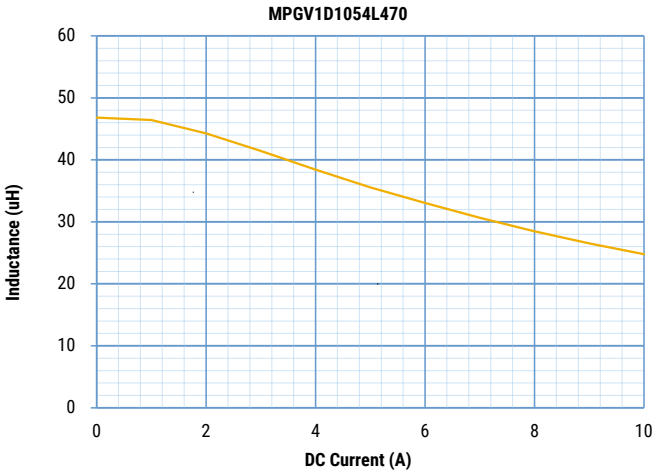
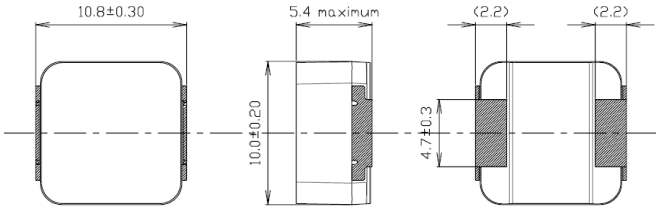
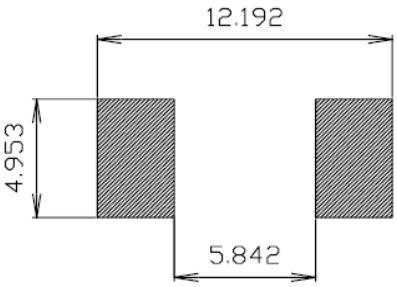


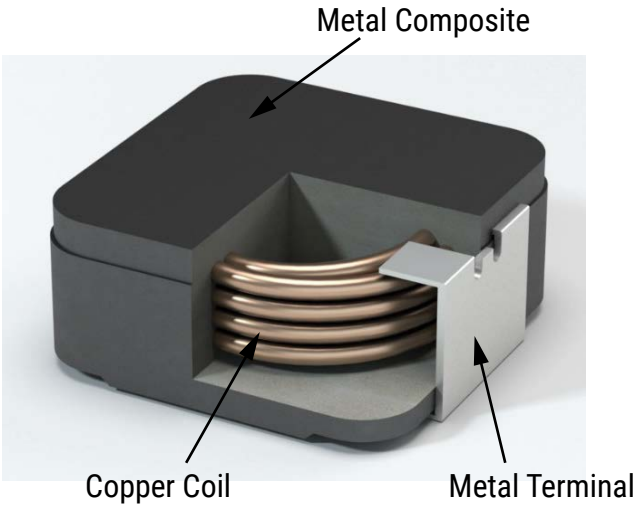
## DC-Superposed Characteristics cont.




## Dimensions

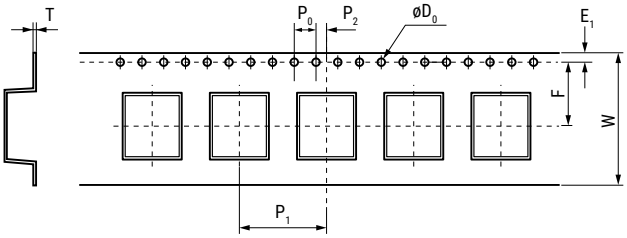
| Case Size | Dimensions (mm) | Land Pattern (mm) |
|---|---|---|
| MPGV1D1054 |  |  |

## Construction



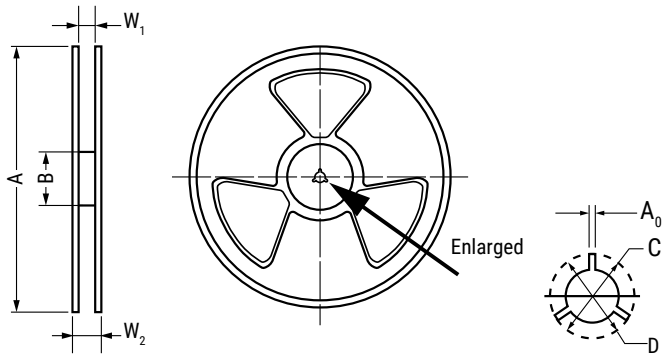

## Taping Specification

**Dimensions of Indented Square Hole Plastic Tape**




| Case Size | Reel Quantity | | Dimensions (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | W | F | $E_1$ | $P_1$ | $P_2$ | $P_0$ | $øD_0$ | T |
| MPGV1D1054 | 500 | Tolerance | ±0.3 | ±0.1 | ±0.1 | ±0.1 | ±0.1 | ±0.1 | ±0.05 | ±0.05 |
| | | Nominal | 24.0 | 11.5 | 1.75 | 16.0 | 2.0 | 4.0 | 1.55 | 0.4 |

## Reel Specifications

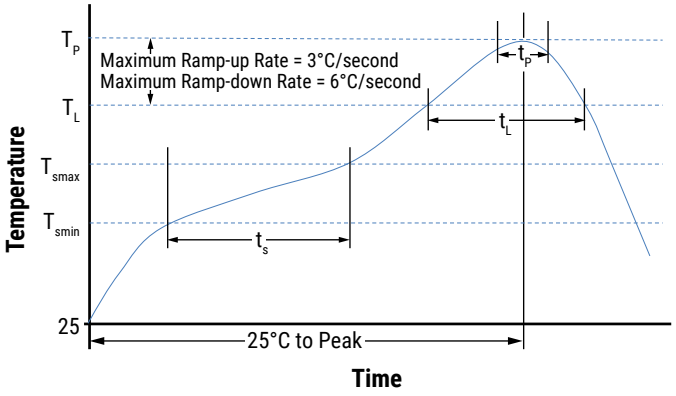



| Case Size | | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | $A_0$ | $W_1$ | $W_2$ |
| MPGV1D1054 | Tolerance | ±3.0 | ±2.0 | ±0.5 | ±0.8 | ±0.5 | | |
| | Nominal | ø330 | ø100 | ø13.0 | ø21.5 | 2.6 | 25.0 | 29.4 |

## Soldering Process

**Recommended Reflow Soldering Profile**
Reference ICP/JEDEC J-STD-020E

| Profile Feature | Pb-Free Assembly |
|---|---|
| **Preheat/Soak** | |
| Temperature Minimum ($T_{Smin}$) | 150°C |
| Temperature Maximum ($T_{Smax}$) | 200°C |
| Time ($t_s$) from $T_{smin}$ to $T_{smax}$ | 60 – 120 seconds |
| Ramp-Up Rate ($T_L$ to $T_P$) | 3°C/second maximum |
| Liquidous Temperature ($T_L$) | 217°C |
| Time Above Liquidous ($t_L$) | 60 – 150 seconds |
| Peak Temperature ($T_P$) | 245°C for MPGV1D1054 |
| Time within 5°C of Maximum Peak Temperature ($t_P$) | 30 seconds maximum |
| Ramp-Down Rate ($T_P$ to $T_L$) | 6°C/second maximum |
| Time 25°C to Peak Temperature | 8 minutes maximum |



## Environmental Compliance

All KEMET SMD Inductors are RoHS compliant.


## Handling Precautions

Inductors should be stored in normal working environments. While the inductors themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage.

KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 70% relative humidity. Atmospheres should be free of chlorine and sulfur bearing compounds. Temperature fluctuations should be minimized to avoid condensation on the parts.

For optimized solderability, inductors' stock should be used promptly, preferably within six months of receipt.

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