

HPAL1V1040

High current inductor



Product features

- High current carrying capacity
- Low core losses
- Magnetically shielded, low EMI
- Inductance range from 0.22 μ H to 47 μ H
- Current range from 2.8 A to 60 A
- 11.5 mm x 10.3 mm footprint surface mount package in a 4.0 mm height
- Iron powder core material
- Moisture Sensitivity Level (MSL) 1

Applications

- Voltage Regulator Module (VRM)
- Multi-phase regulators
- Point-of-load modules (PoL)
- Desktop and server VRMs and EVRDs
- Base station equipment
- Notebook and laptop regulators
- Battery power systems
- Graphics cards
- Data networking and storage systems

Environmental compliance and general specifications

- Storage temperature range (Component): -55 °C to +125 °C
- Operating temperature range: -55 °C to +125 °C (ambient plus self-temperature rise)



Product specifications

Part number ⁶	OCL ¹ (μH) ± 20%	FLL ² (μH) minimum	I _{rms} ³ (A)	I _{sat} ⁴ (A)	DCR (mΩ) typical @ +20 °C	DCR (mΩ) maximum @ +20 °C	SRF (MHz) typical	K-factor ⁵
HPAL1V1040-R22-R	0.22	0.124	35	60	0.8	1.0	112	616
HPAL1V1040-R30-R	0.30	0.168	35	45	0.9	1.1	96	499
HPAL1V1040-R36-R	0.36	0.202	30	45	1.02	1.2	90	428
HPAL1V1040-R47-R	0.47	0.264	30	40	1.35	1.7	83	698
HPAL1V1040-R56-R	0.56	0.314	25	33	1.7	1.8	63	457
HPAL1V1040-R68-R	0.68	0.381	23	30	2.06	2.4	63	381
HPAL1V1040-R80-R	0.8	0.448	23	29	2.2	2.7	50	427
HPAL1V1040-1R0-R	1.0	0.56	19	28	2.8	3.3	44	293
HPAL1V1040-1R5-R	1.5	0.84	16	24	4.0	4.2	38	296
HPAL1V1040-2R2-R	2.2	1.24	12	16.5	6.3	7.0	25	277
HPAL1V1040-3R3-R	3.3	1.85	11	16	9.8	11.8	20	208
HPAL1V1040-4R7-R	4.7	2.64	9.0	13	13	20	17	169
HPAL1V1040-6R8-R	6.8	3.81	8.5	12	20	25	14	208
HPAL1V1040-8R2-R	8.2	4.60	8.0	9.0	24	27	15	127
HPAL1V1040-100-R	10	5.60	7.8	8.5	27	30	12	134
HPAL1V1040-150-R	15	8.4	5.2	7.0	41	45	9.8	89
HPAL1V1040-220-R	22	12.3	4.3	5.5	60	66	6.8	129
HPAL1V1040-330-R	33	18.5	3.3	5.0	83	92	5.9	68
HPAL1V1040-470-R	47	26.3	2.8	3.5	134	145	4.7	73

1. Open circuit inductance (OCL) test parameters: 100 kHz, 1.0 V_{rms}, 0.0 Adc, +25 °C

2. Full load inductance (FLL) test parameters: 100 kHz, 1.0 V_{rms}, I_{sat}, +25 °C

3. I_{rms}: DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents.

PCB layout, trace thickness and width, air-flow, and proximity of other heat generating components will affect the temperature rise. It is recommended that the temperature of the part not exceed +125 °C under worst case operating conditions verified in the end application.

4. I_{sat}: Peak current for approximately 30% rolloff @ +25 °C

5. K-factor: Used to determine Bp-p for core loss (see graph). Bp-p = K * L * ΔI. Bp-p: (Gauss), K: (K-factor from table), L: (Inductance in μH), ΔI (Peak to peak ripple current in Amps)

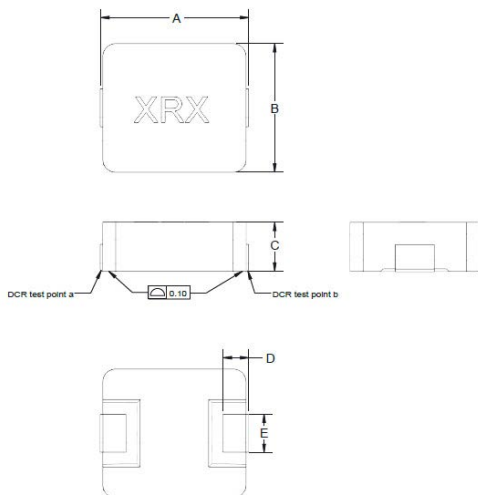
6. Part Number Definition: HPAL1V1040-xxx-R

HPAL1V1040 = Product code and size

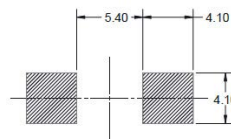
xxx=inductance value in all, "R" = decimal point, if no "R" is present, then third digit equals the number of zeros

-R suffix = RoHS compliant

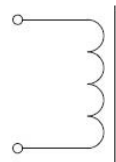
Dimensions (mm)



Recommended pad layout



Schematic



Part number	A	B	C	D	E
HPAL1V1040-xxx-R	11.5 max	10.0 ± 0.3	3.8 ± 0.2	2.0 ± 0.5	3.0 ± 0.5

Part marking: XRX=inductance value in uH, R=decimal point. If no R is present then last character equals number of zeros.

All soldering surfaces to be coplanar within 0.1 millimeters

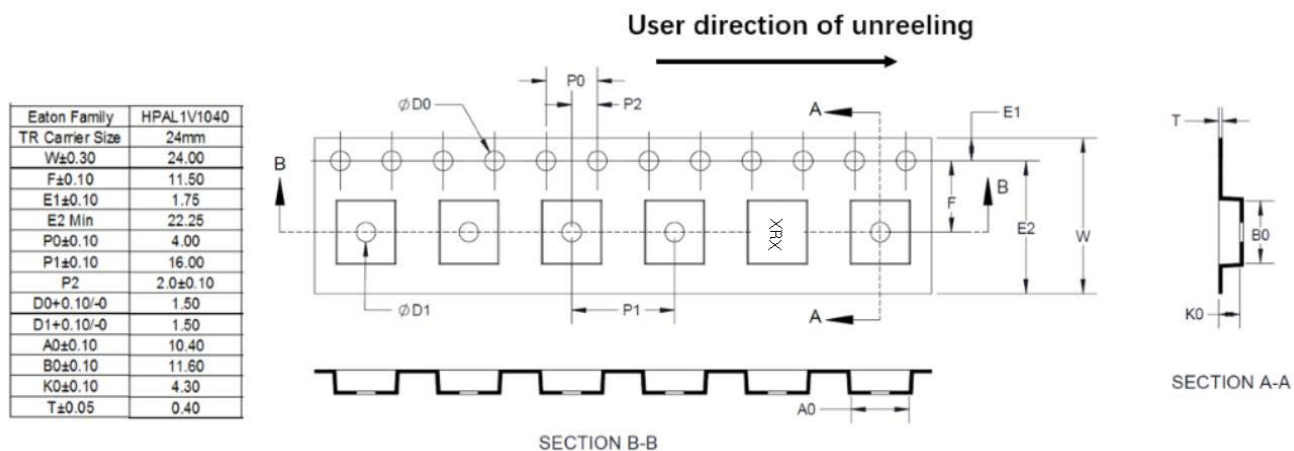
Tolerances are ±0.2 millimeters unless stated otherwise

Pad layout tolerance is ±0.1 millimeters unless stated otherwise

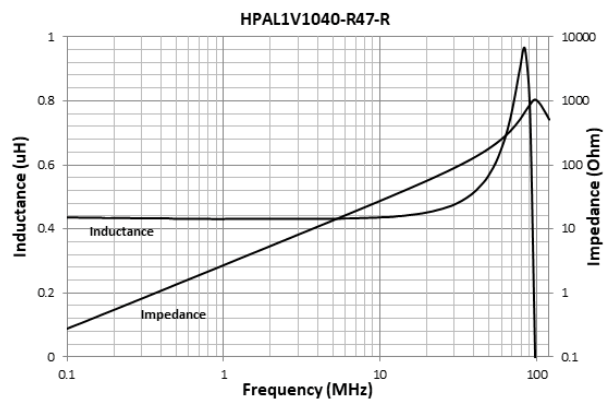
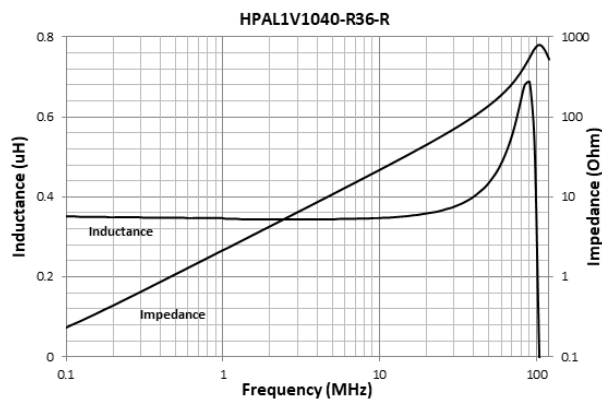
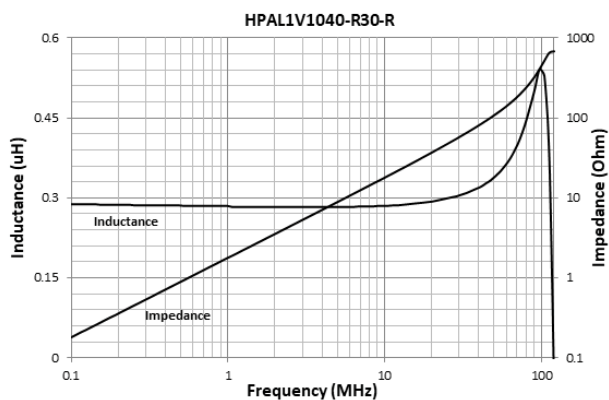
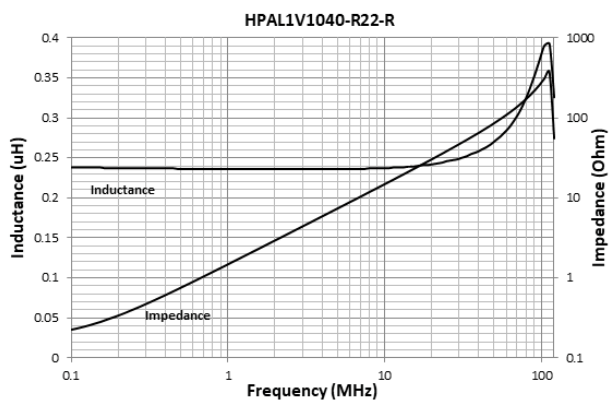
Traces or vias underneath the inductor is not recommended

Packaging information (mm)

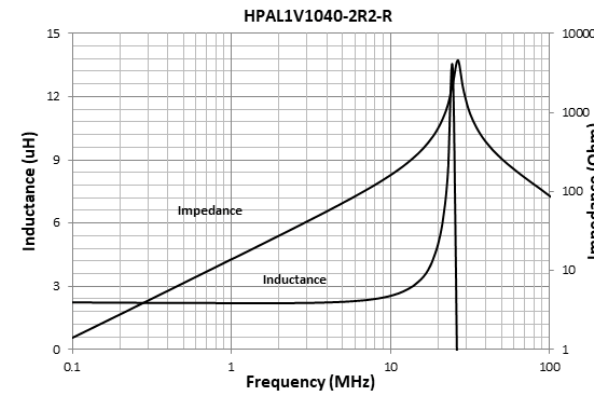
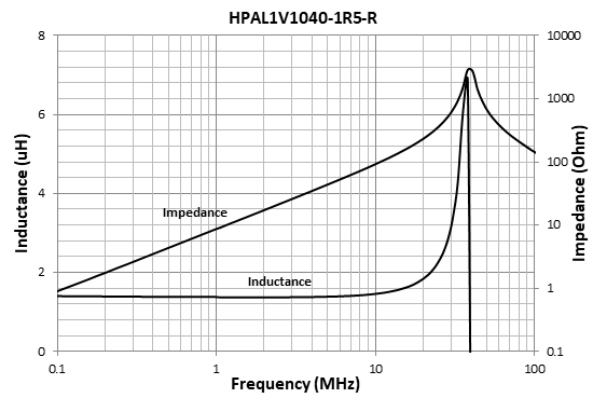
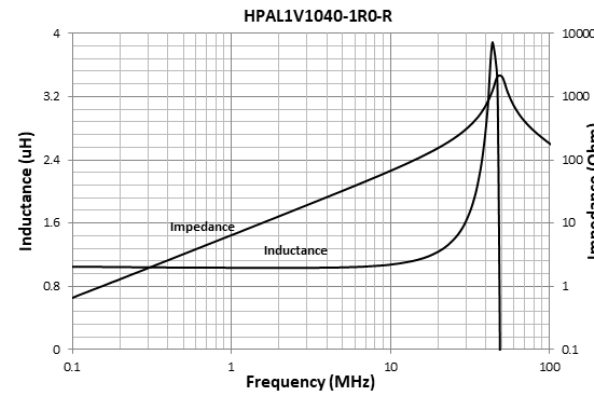
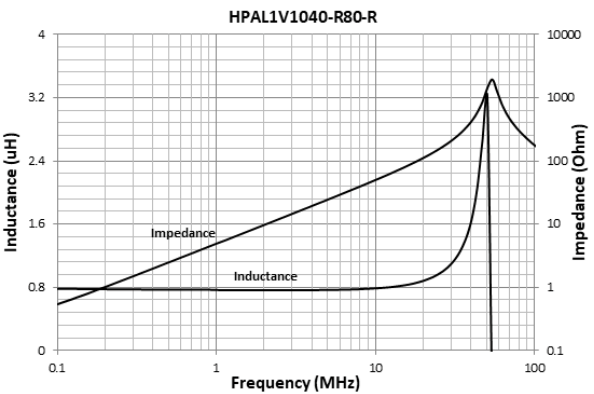
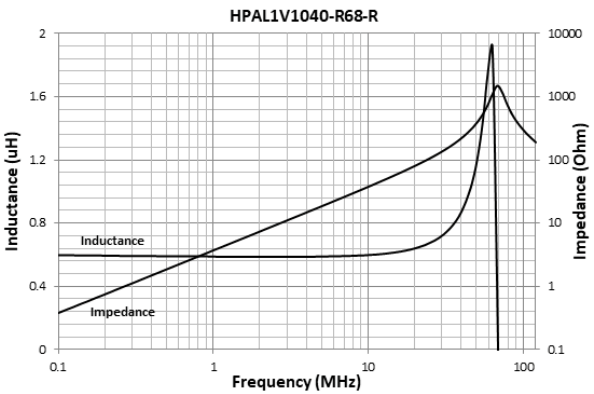
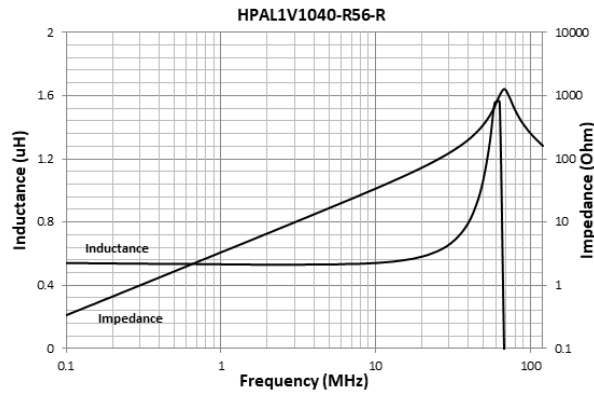
Supplied in tape and reel packaging, 500 parts per 13" diameter reel



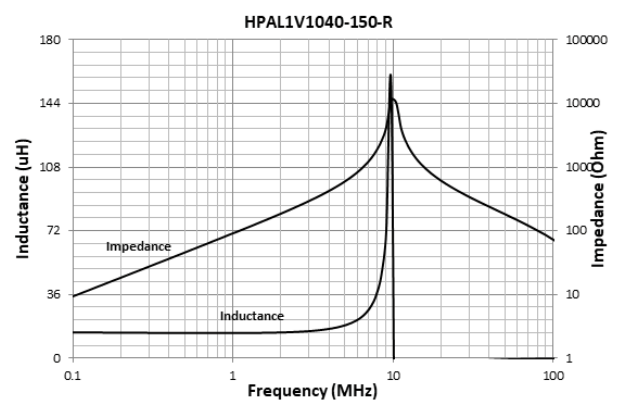
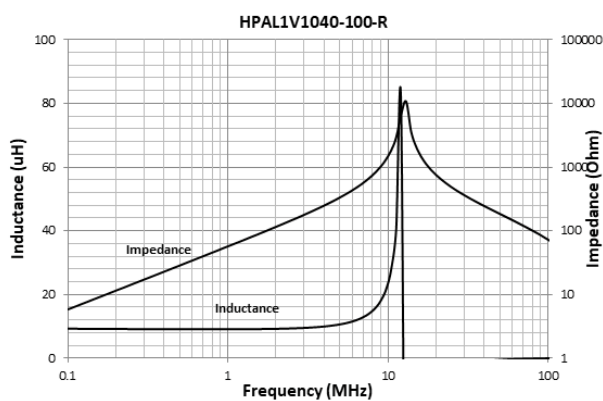
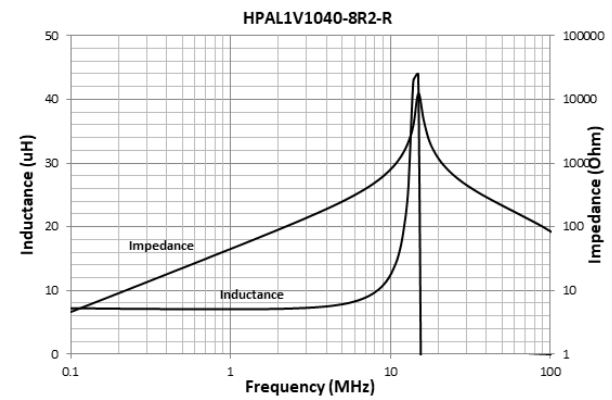
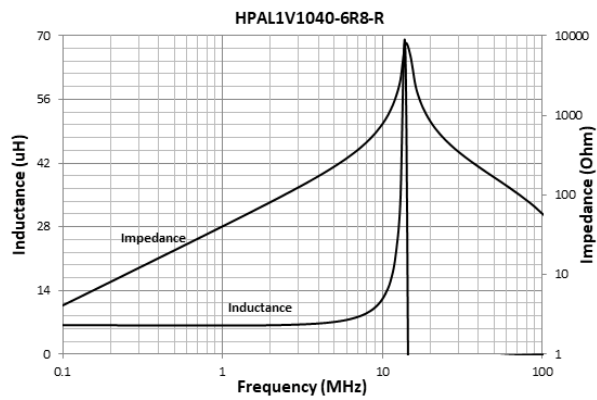
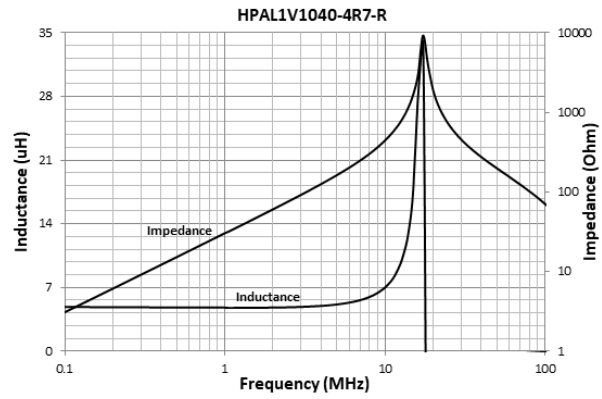
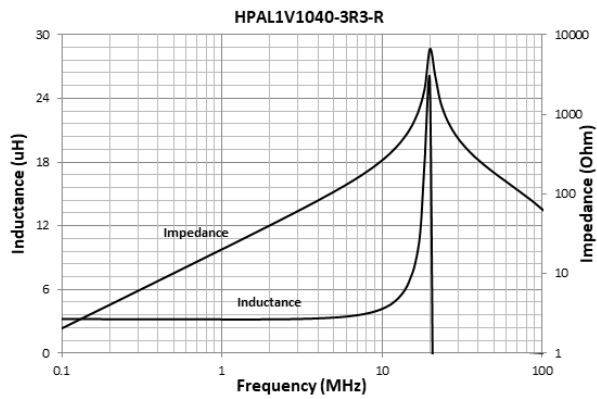
Inductance and impedance vs frequency



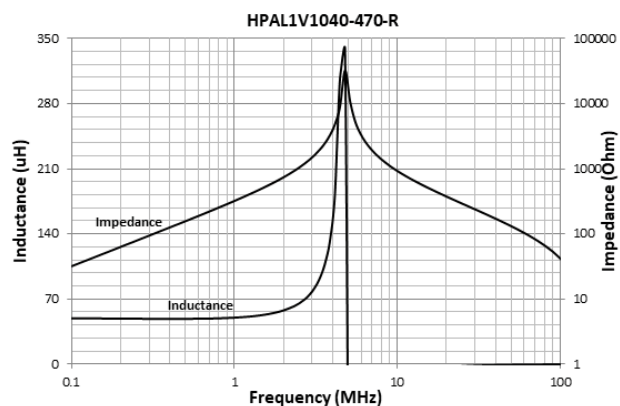
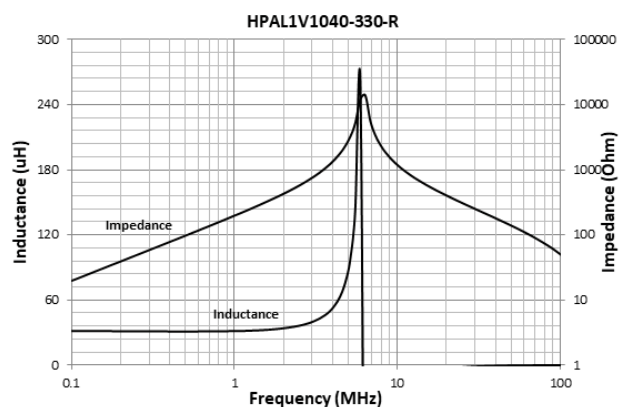
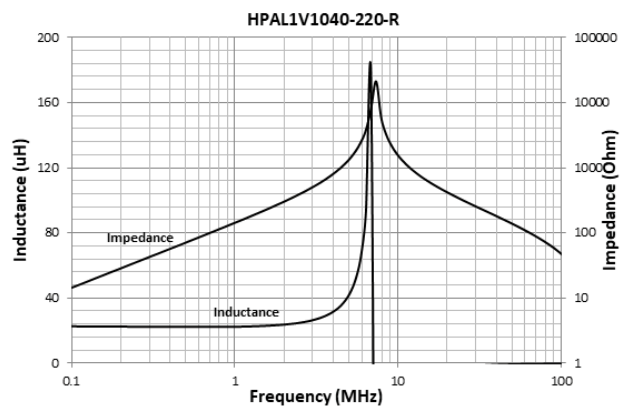
Inductance and impedance vs frequency



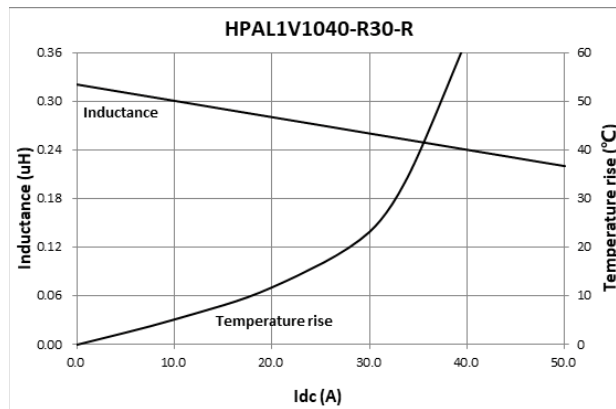
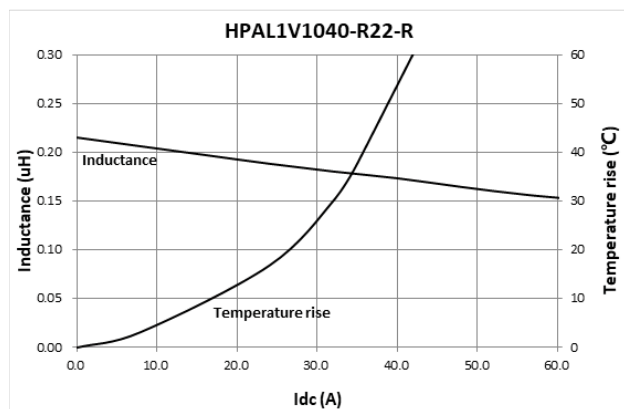
Inductance and impedance vs frequency



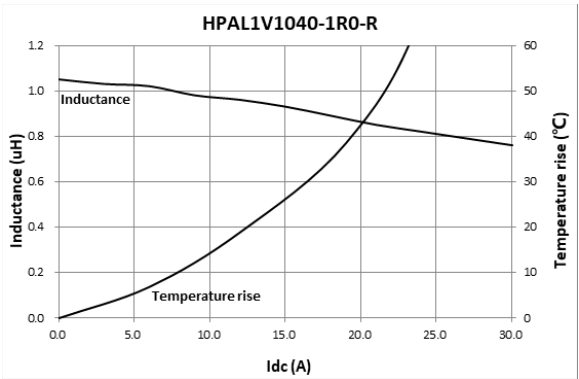
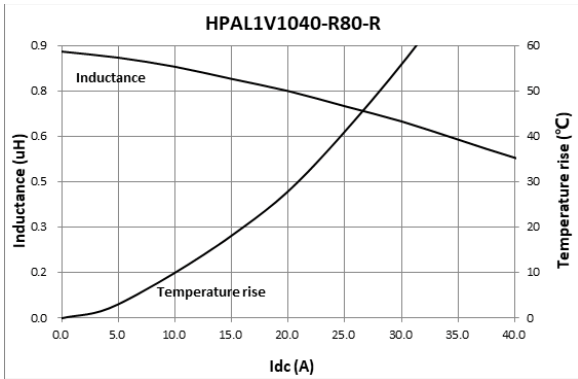
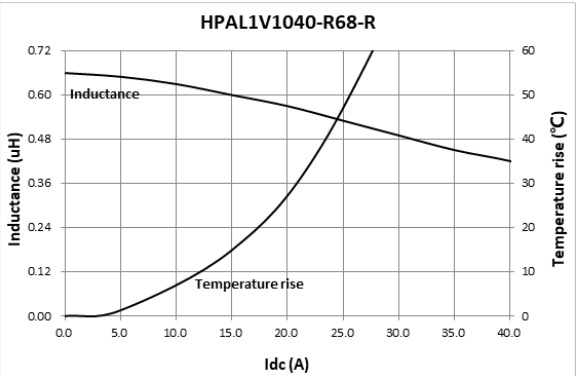
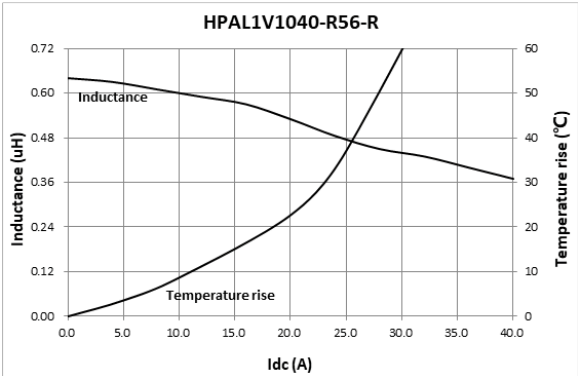
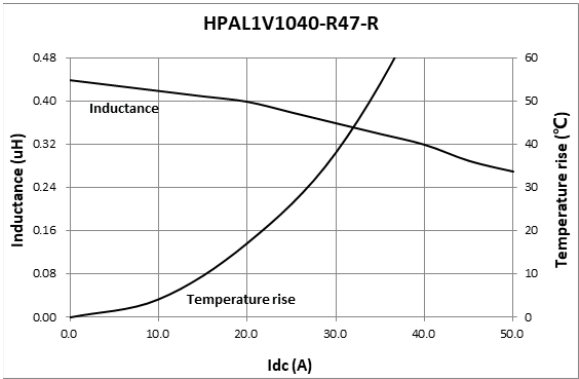
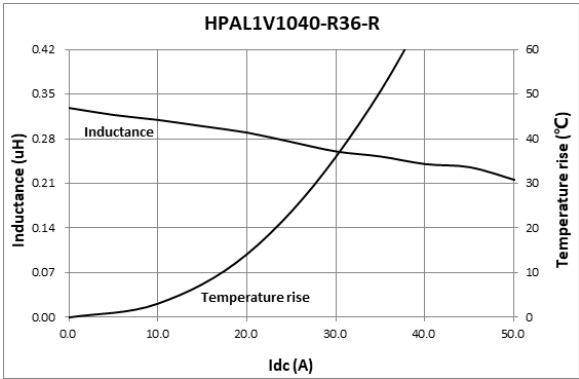
Inductance and impedance vs frequency



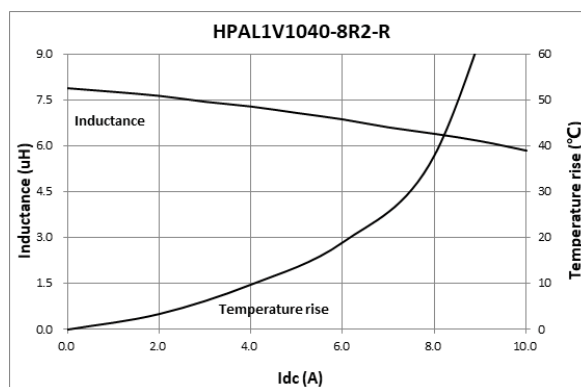
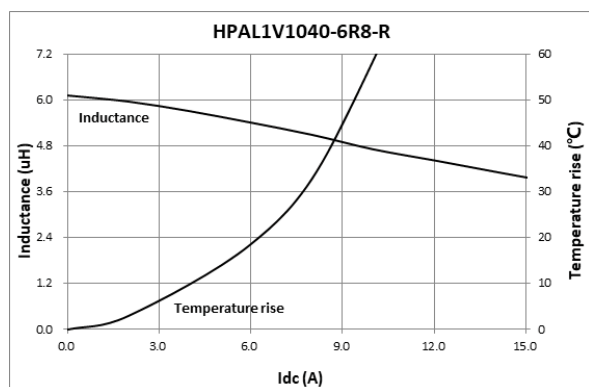
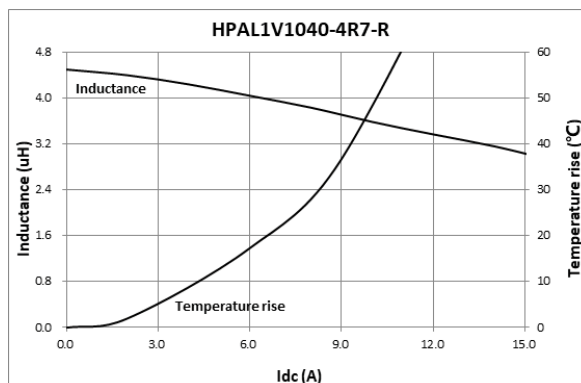
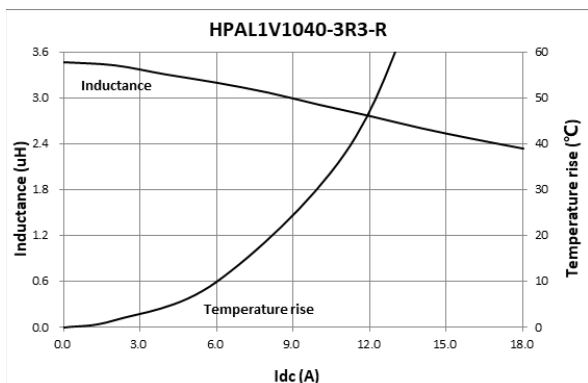
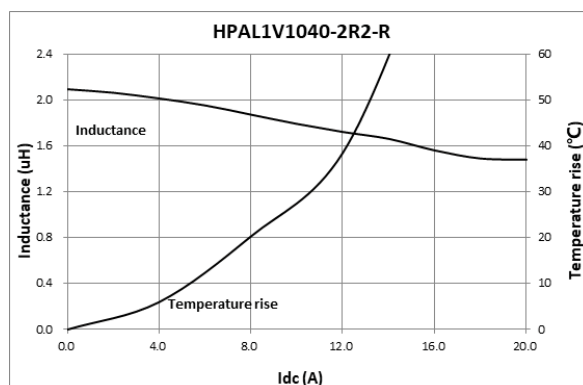
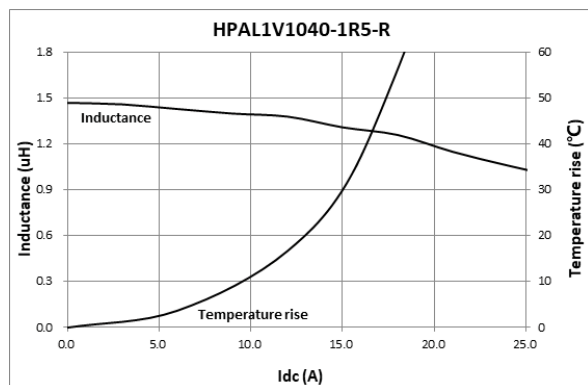
Inductance and temperature rise vs Idc



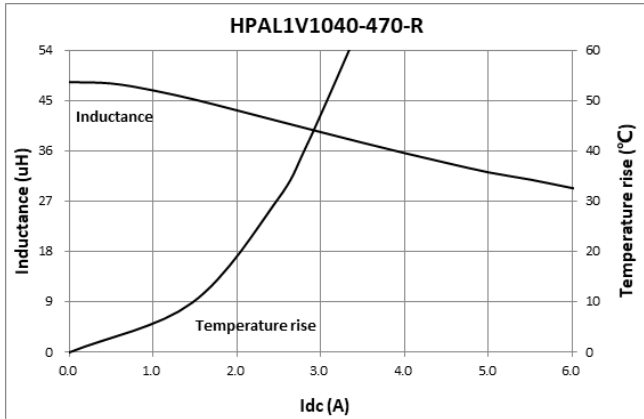
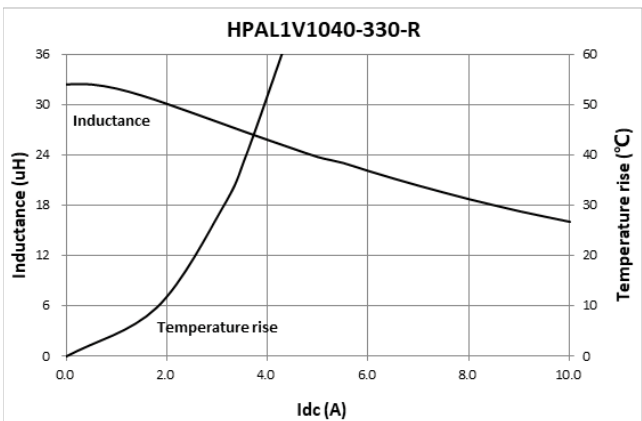
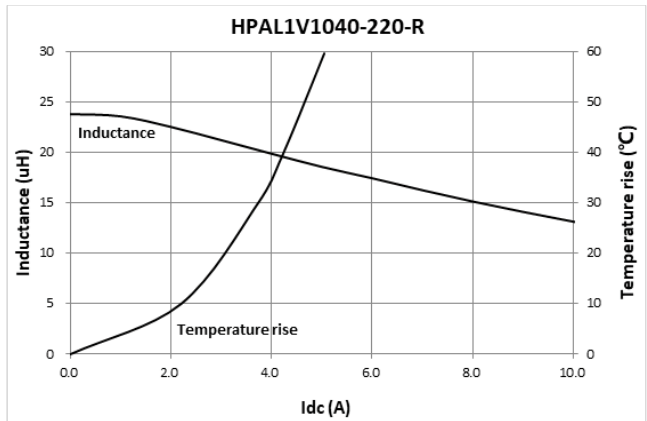
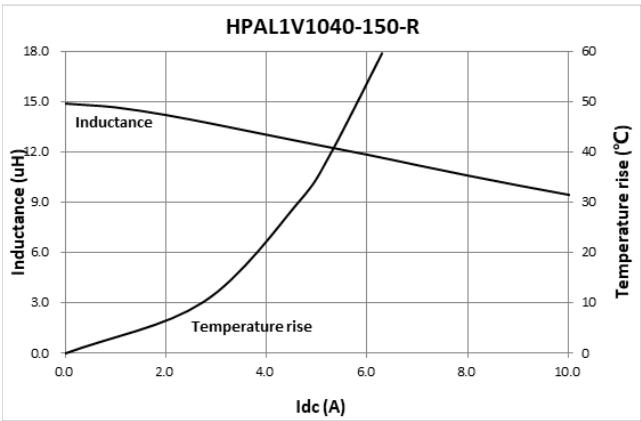
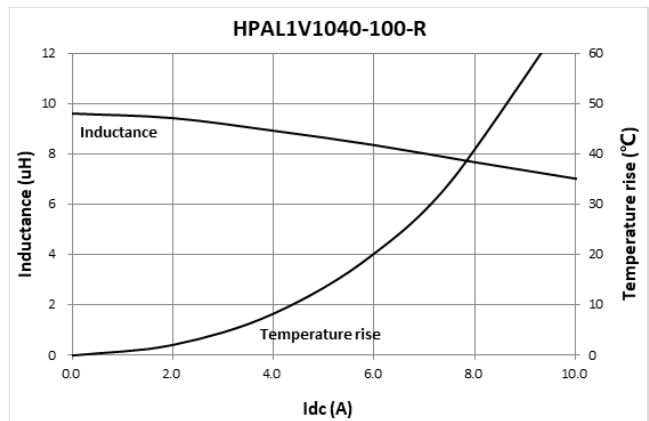
Inductance and impedance vs frequency



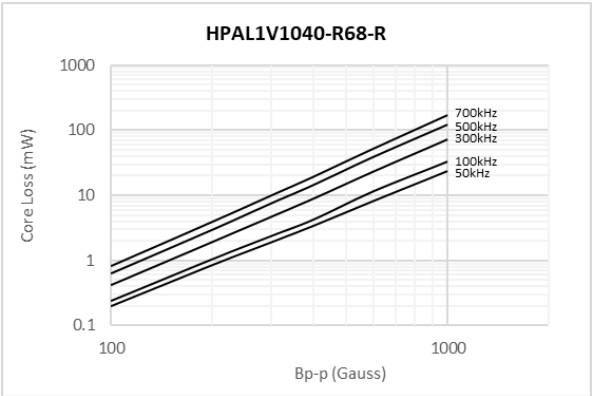
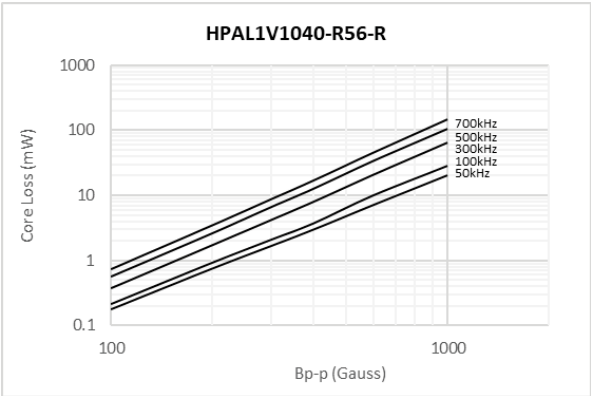
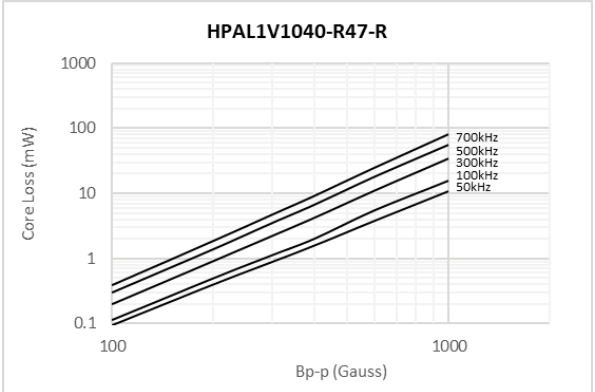
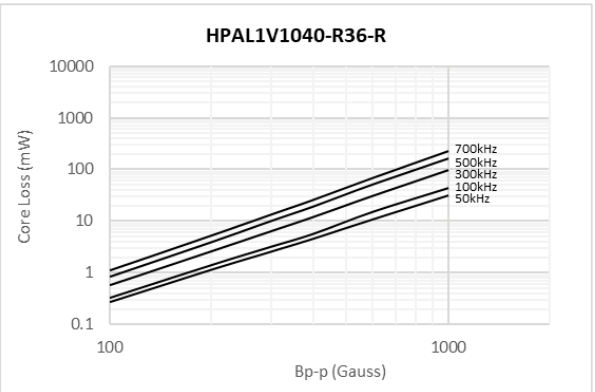
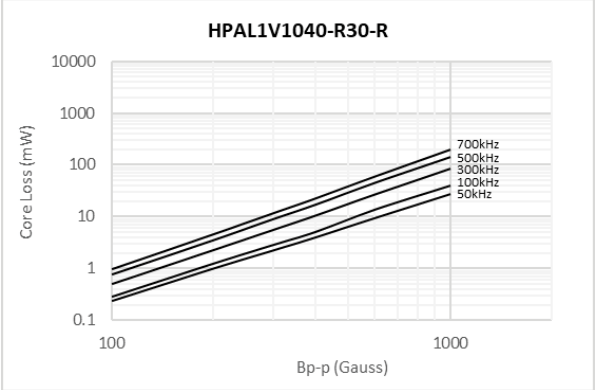
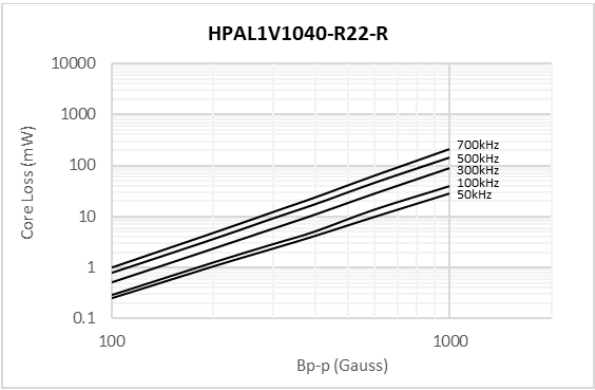
Inductance and impedance vs frequency



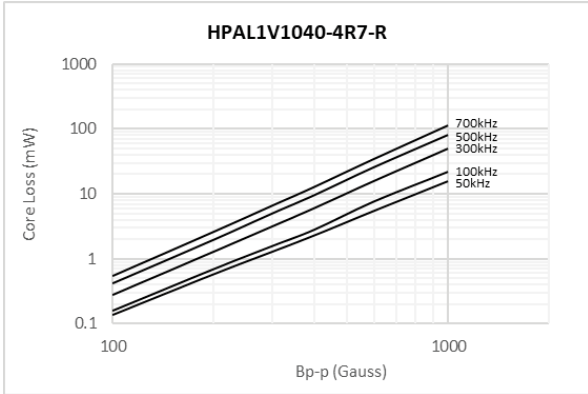
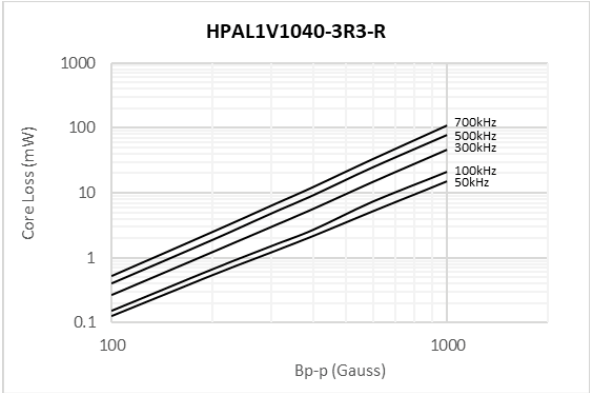
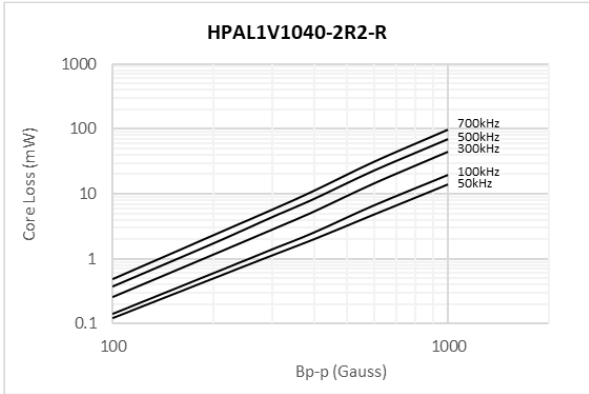
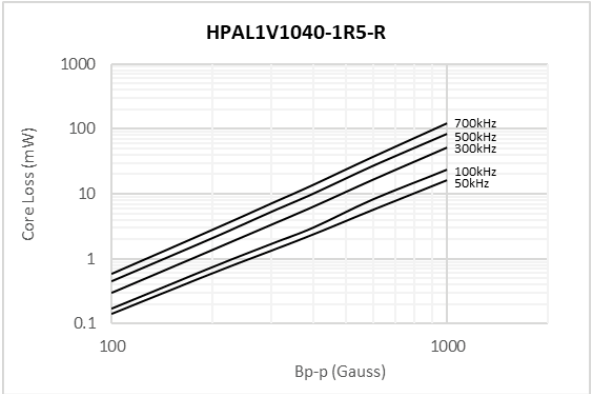
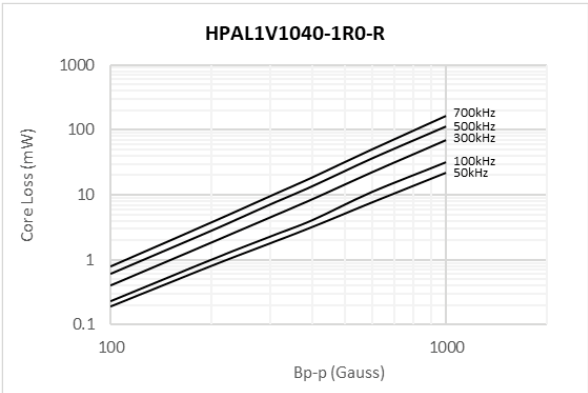
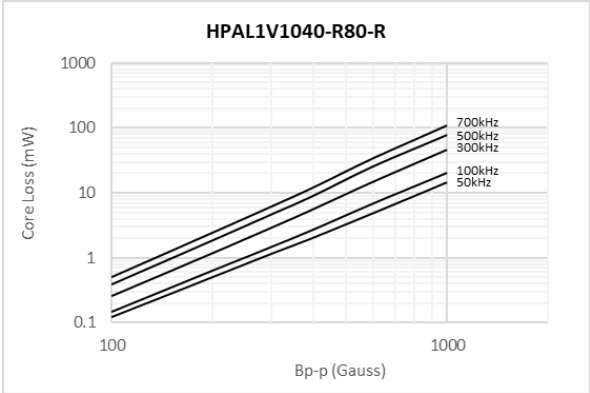
Inductance and impedance vs frequency



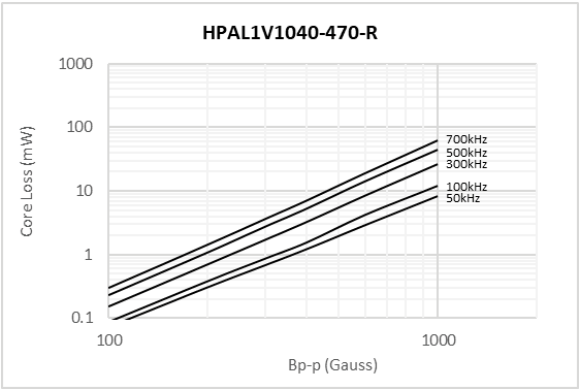
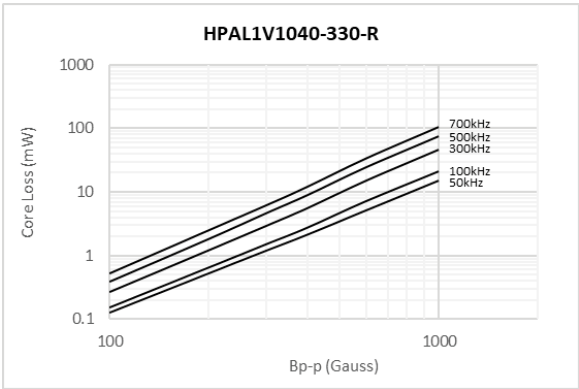
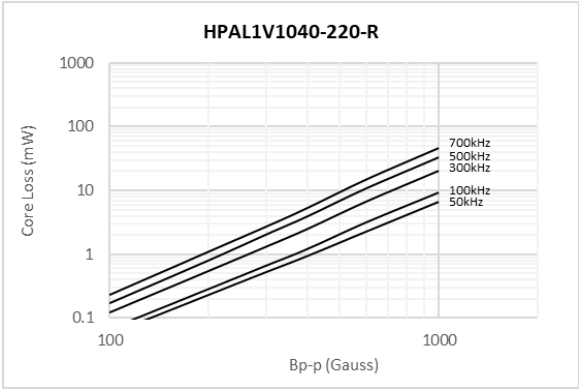
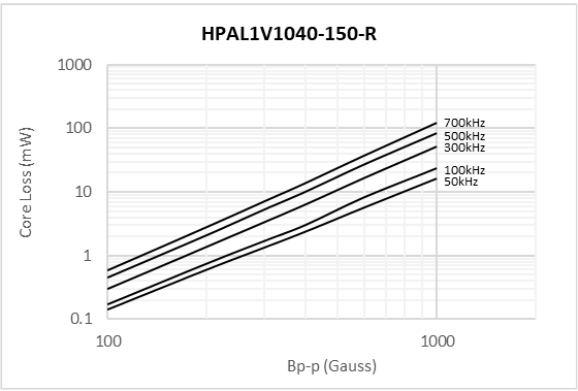
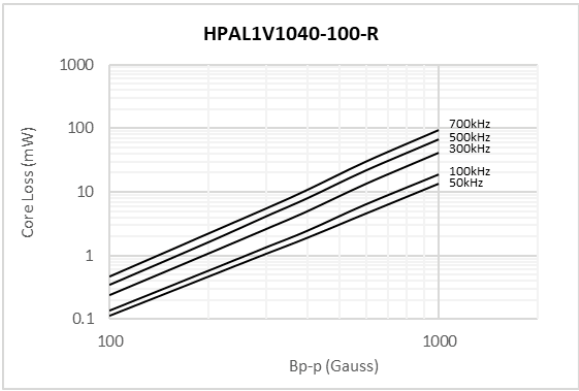
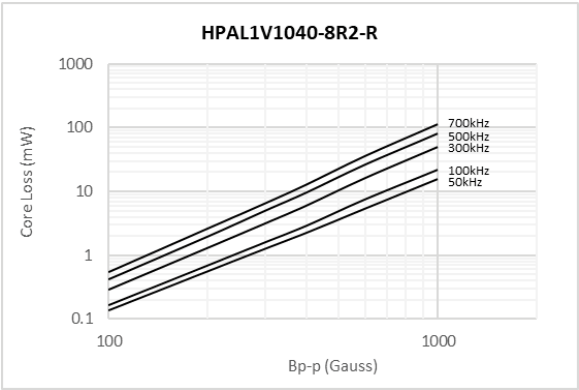
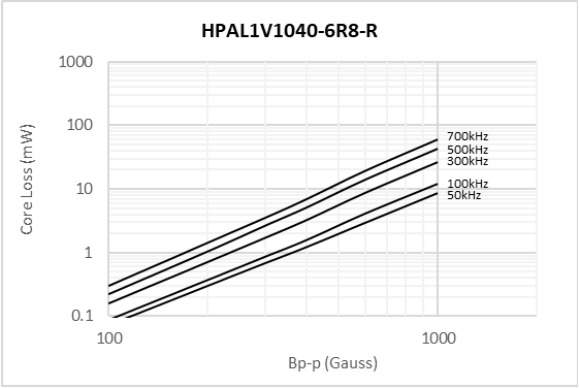
Core loss vs Bp-p



Core loss vs Bp-p



Core loss vs Bp-p



Solder reflow profile

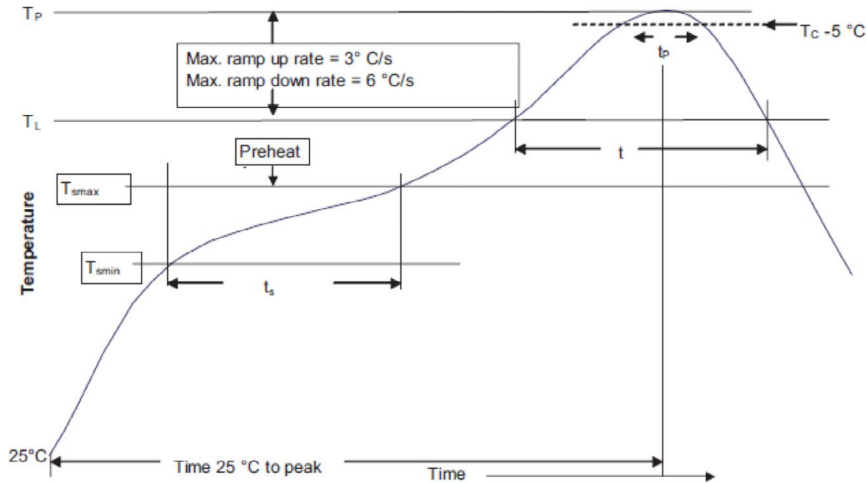


Table 1 - Standard SnPb solder (T_C)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm)	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2 - Lead (Pb) free solder (T_C)

Package thickness	Volume mm ³ <350	Volume mm ³ 350 - 2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Reference J-STD-020

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and soak		
• Temperature min. (T_{smin})	100 °C	150 °C
• Temperature max. (T_{smax})	150 °C	200 °C
• Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Ramp up rate T_L to T_P	3 °C/ second max.	3 °C/ second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time (t_L) maintained above T_L	60-150 seconds	60-150 seconds
Peak package body temperature (T_P)*	Table 1	Table 2
Time (t_P)* within 5 °C of the specified classification temperature (T_C)	20 seconds*	30 seconds*
Ramp-down rate (T_P to T_L)	6 °C/ second max.	6 °C/ second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

* Tolerance for peak profile temperature (T_P) is defined as a supplier minimum and a user maximum.

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Printed in USA
Publication No. 10984
February 2025

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