

# CLH1110R1-R

## Multi-phase power inductor



### Product features

- High current multi-phase inductor
- 50 nH per phase coupled inductor
- Ferrite core material
- Patents pending
- 11.5 mm wide x 10.0 mm high footprint surface mount package with 23 mm, 30.8 mm, 38.3 mm and 45.8 mm lengths
- Moisture Sensitivity Level (MSL): 1
- Termination finish matte tin over nickel

### Applications

- For exclusive use with Maxim® VPR-Devices

### Environmental compliance and general specifications

- Storage temperature range (Component): -40 °C to +125 °C
- Operating temperature range: -40 °C to +125 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



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**Product specifications**

Part number <sup>6</sup>	Inductor phases	OCL <sup>1</sup> (nH) typical	OCL <sup>1</sup> (nH) minimum	FLL <sup>2</sup> (nH) minimum	I <sub>sat</sub> <sup>1</sup> (A)	SCL <sup>4</sup> (nH) ±20%	I <sub>sat</sub> <sup>2</sup> (A)	DCR (mΩ) maximum @ +20 °C
CLH1110R1-3-R050-R	3	300	240	200	25	50	140	0.23
CLH1110R1-4-R050-R	4	300	240	200	25	50	140	0.23
CLH1110R1-5-R050-R	5	300	240	200	25	50	140	0.23
CLH1110R1-6-R050-R	6	300	240	200	25	50	140	0.23

1. Open circuit inductance (OCL) test parameters: 1 MHz, 0.1 Vrms, 0.0 Adc, +105 °C
2. Full load inductance (FLL) test parameters: 1 MHz, 0.1 Vrms, I<sub>sat</sub><sup>1</sup>, +105 °C
3. I<sub>sat</sub><sup>1</sup>: Peak current at which OCL drops approximately 20% at +105 °C
4. Short Circuit Inductance (SCL) test parameters: 1 MHz, 0.1 Vrms, 0.0 Adc, +105 °C ±20%  
CLH1110R1-3-R050-R short (1 & 4), (3 & 6) measure (2 & 5), and divide by 3.  
CLH1110R1-4-R050-R short (1 & 4), (3 & 6), (5 & 8), measure (2 & 7), and divide by 4.  
CLH1110R1-5-R050-R, short (1 & 4), (3 & 6), (5 & 8), (7 & 10), measure (2 & 9), and divide by 5.  
CLH1110R1-6-R050-R, short (1 & 4), (3 & 6), (5 & 8), (7 & 10), (9 & 12), measure (2 & 11), and divide by 6
5. I<sub>sat</sub><sup>2</sup>: Peak current at which SCL drops approximately 20% at +105 °C

6. Part number definition: CLH1110R1-x-50-R

CLH1110R1 = Product code and size

x = Number of phases

50 = Inductance value per phase in nH

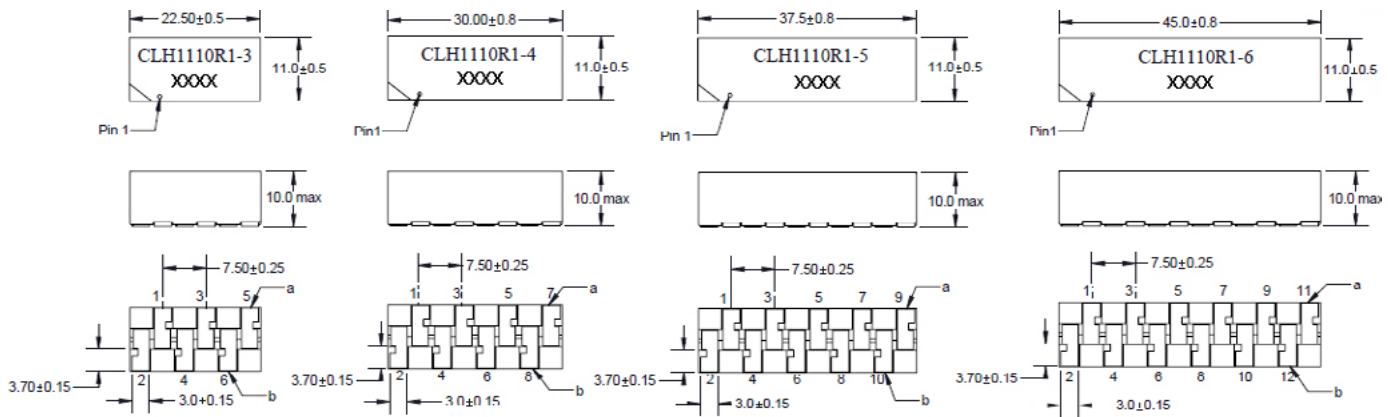
-R suffix = RoHS compliant

Note: The rated current and rated inductance per phase is determined by Maxim's testing and circuit design.

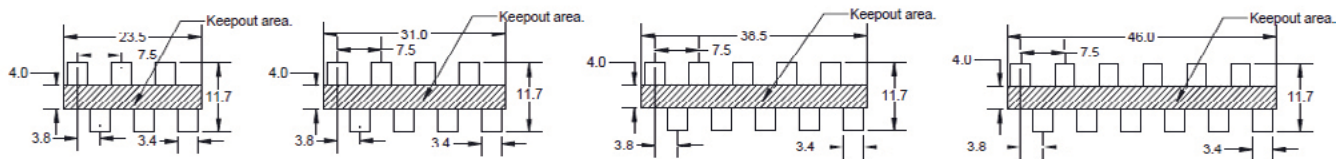
Additional information can be provided by contacting Maxim.

Note: This device is licensed for use only when incorporated within a voltage regulator employing power regulating devices manufactured by Maxim Integrated Devices, Inc. No license is granted expressly or by implication to use this device with power regulating devices manufactured by any company other than Maxim

**Dimensions (mm)**



**Recommended pad layout**



Part marking: CLH1110R1-x(x = number of phases), xxxx = lot code

Tolerances are ±0.15 millimeters unless stated otherwise

All soldering surfaces to be coplanar within 0.1 millimeters

Pad layout tolerances are ±0.1 millimeters unless stated otherwise

DCR measured from point "a" to point "b"

Traces or vias underneath the inductor is not recommended

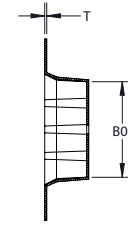
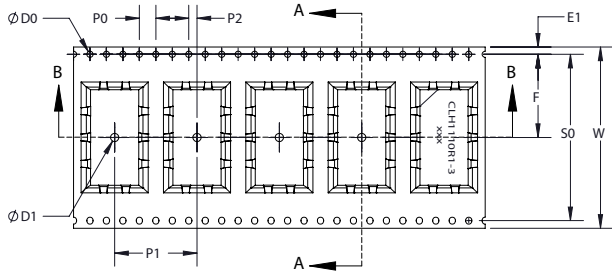
**CLH1110R1-R**  
**Multi-phase power inductor**

Technical Data 11001  
 Effective January 2020

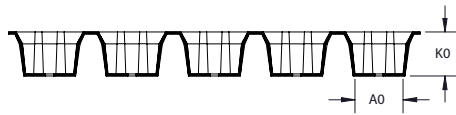
**Packaging information (mm)**

Supplied in tape and reel packaging on a 13" diameter reel  
 Drawing not to scale

CLH1110R1-3-R050-R  
 300 parts per reel



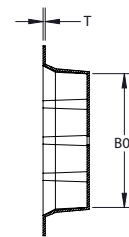
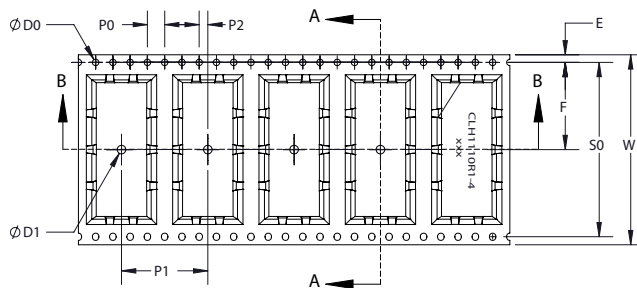
SECTION A-A



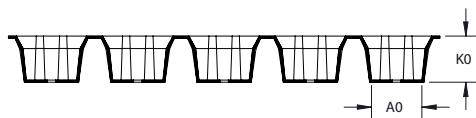
SECTION B-B

TABLE A	
Item	Dimensions
$W \pm 0.30$	44.00
$F \pm 0.15$	20.20
$E1 \pm 0.10$	1.75
$S0 \pm 0.10$	40.40
$P0 \pm 0.10$	4.00
$P1 \pm 0.10$	20.00
$P2 \pm 0.15$	2.00
$D0 + 0.10 / -0$	1.50
$D1$ Min	2.00
$A0 \pm 0.10$	11.70
$B0 \pm 0.10$	23.20
$K0 \pm 0.10$	10.20
$T \pm 0.05$	0.50

CLH1110R1-4-R050-R  
 300 parts per reel



SECTION A-A



SECTION B-B

TABLE A	
Item	Dimensions
$W \pm 0.30$	44.00
$F \pm 0.15$	20.20
$E1 \pm 0.10$	1.75
$S0 \pm 0.10$	40.40
$P0 \pm 0.10$	4.00
$P1 \pm 0.10$	20.00
$P2 \pm 0.15$	2.00
$D0 + 0.10 / -0$	1.50
$D1$ Min	2.00
$A0 \pm 0.10$	11.70
$B0 \pm 0.10$	31.00
$K0 \pm 0.10$	10.20
$T \pm 0.05$	0.50

**Packaging information (mm)**

Supplied in tape and reel packaging on a 13" diameter reel  
Drawing not to scale

CLH1110R1-5-R050-R  
200 parts per reel

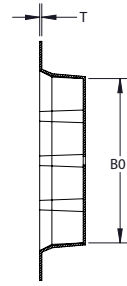
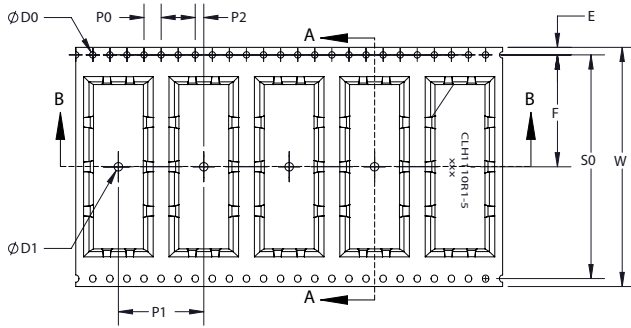
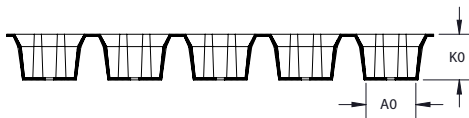


TABLE A	
Item	Dimensions
W±0.30	56.00
F±0.15	26.20
E1±0.10	1.75
S0±0.10	52.40
P0±0.10	4.00
P1±0.10	20.00
P2±0.15	2.00
D0+0.10/-0	1.50
D1 Min	2.00
A0±0.10	11.70
B0±0.10	38.50
K0±0.10	10.20
T±0.05	0.50



SECTION B-B

CLH1110R1-6-R050-R  
100 parts per reel

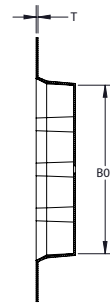
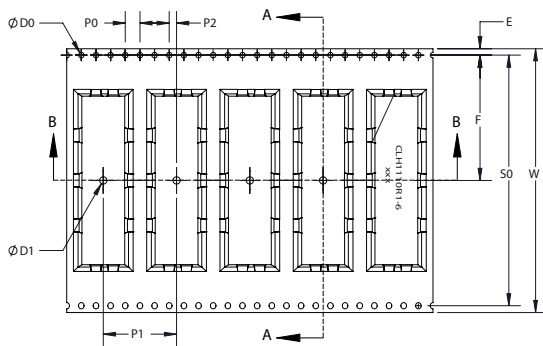
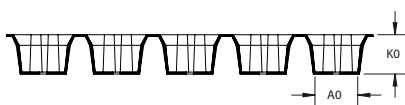
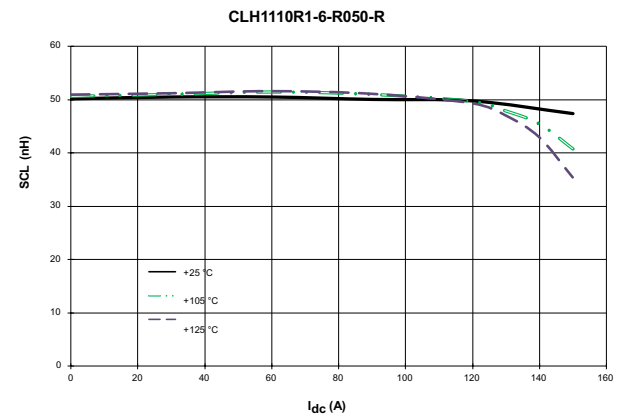
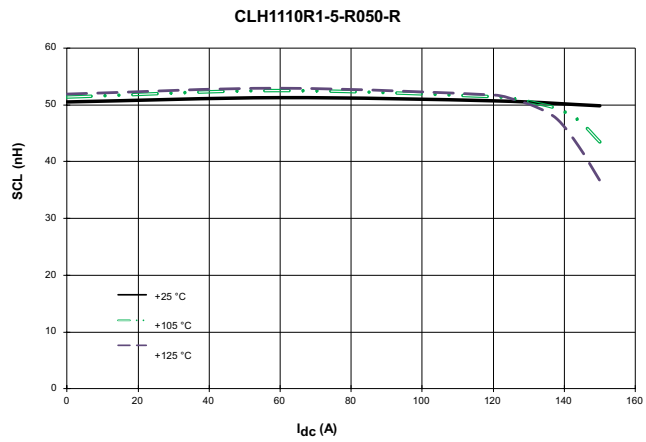
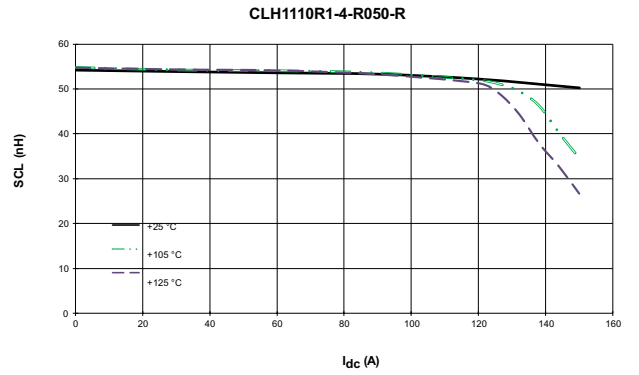
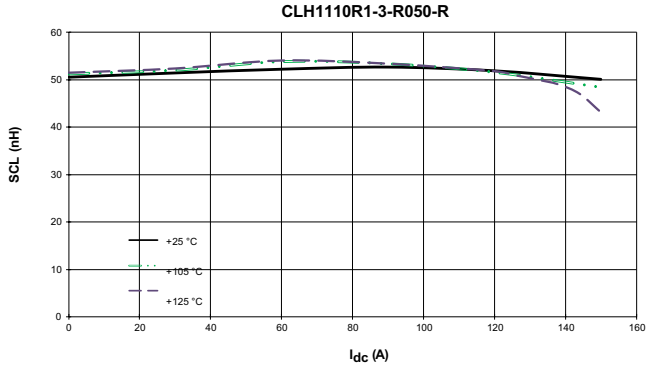


TABLE A	
Item	Dimensions
W±0.30	72.00
F±0.3	34.20
E1±0.10	1.75
S0±0.10	68.40
P0±0.10	4.00
P1±0.10	20.00
P2±0.2	2.00
D0+0.10/-0	1.50
D1 Min	2.00
A0±0.10	11.70
B0±0.10	46.00
K0±0.10	10.20
T±0.05	0.50



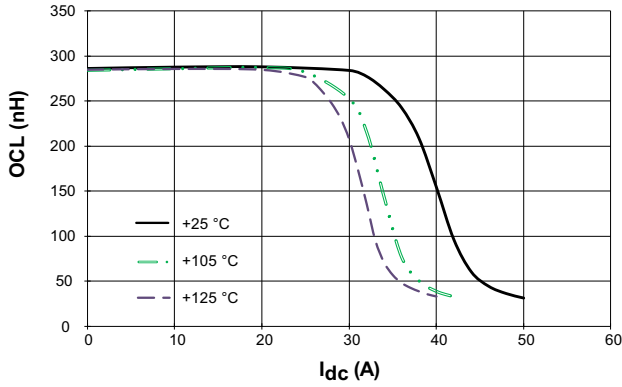
SECTION B-B

Inductance characteristics- SCL vs. current

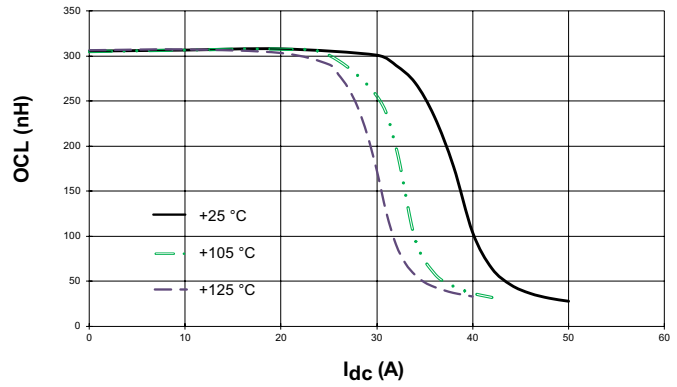


Inductance characteristics- OCL vs. current

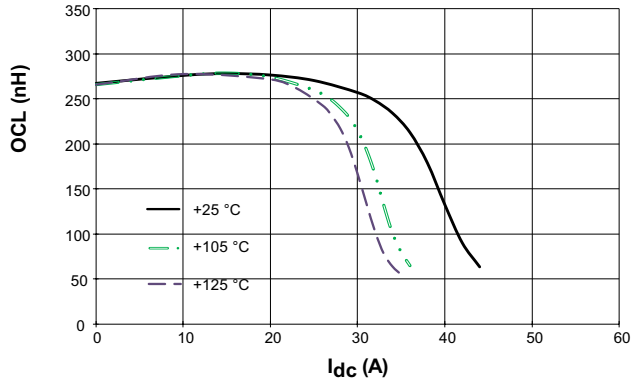
CLH1110R1-3-R050-R  
(1-2)



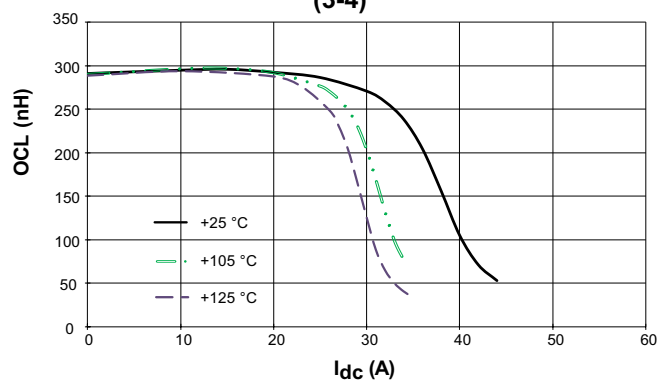
CLH1110R1-3-R050-R  
(3-4)



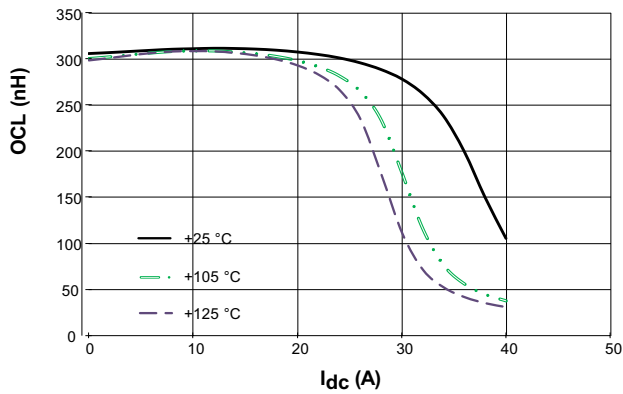
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(1-2)



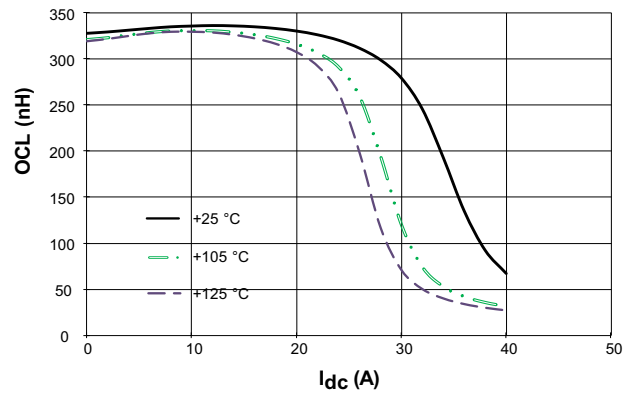
CLH1110R1-4-R050-R  
(3-4)



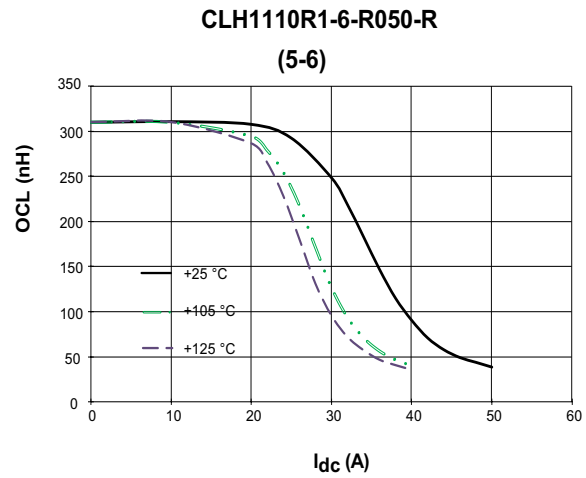
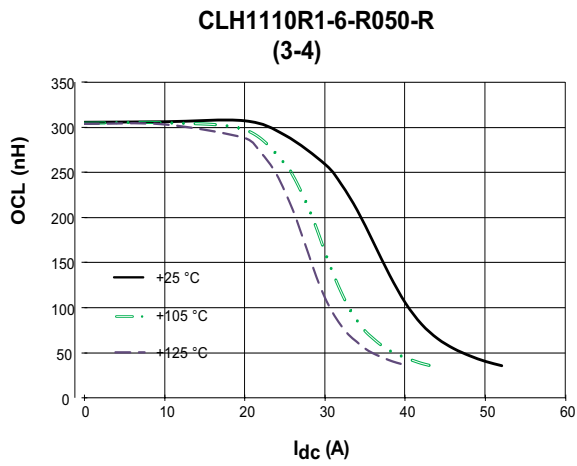
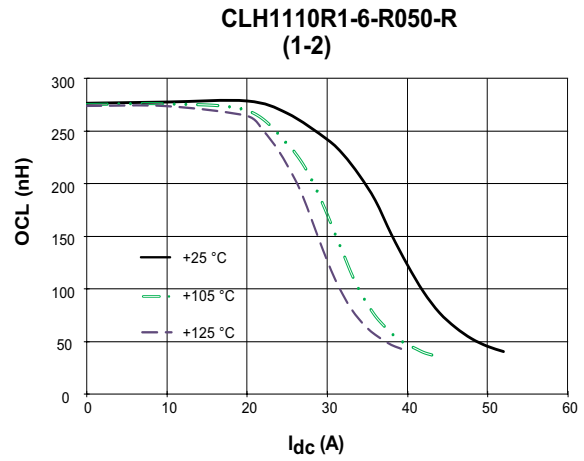
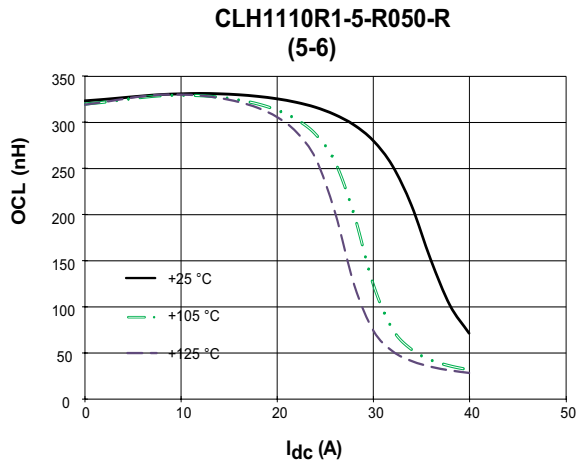
CLH1110R1-5-R050-R  
(1-2)



CLH1110R1-5-R050-R  
(3-4)

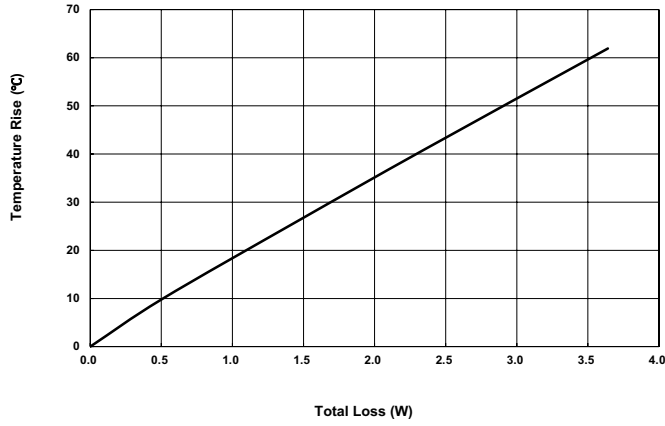


Inductance characteristics- OCL vs. current

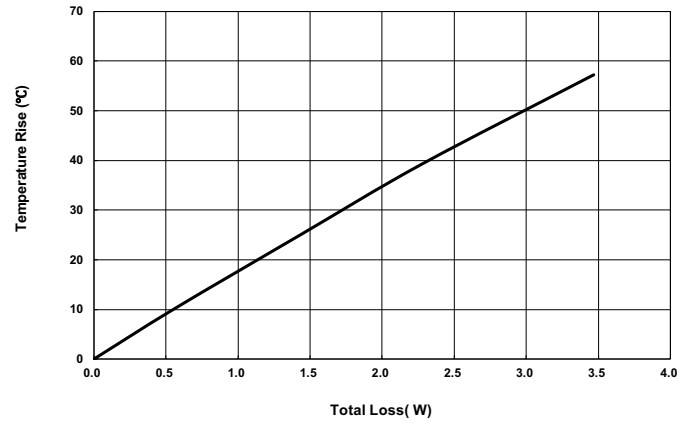


Temperature rise vs total loss

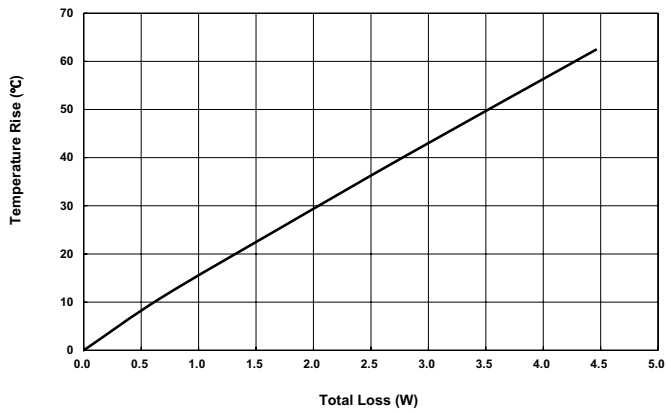
CLH1110R1-3-R050-R



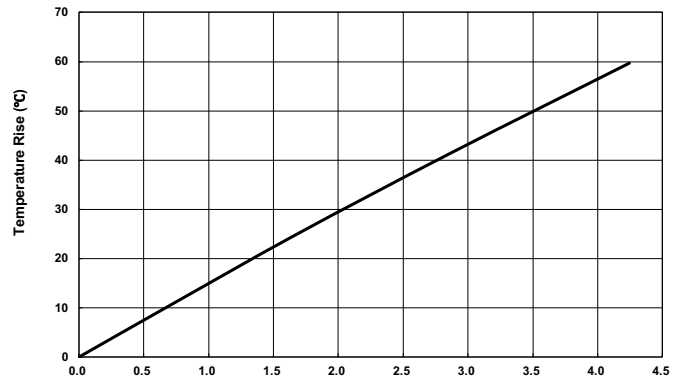
CLH1110R1-4-R050-R



CLH1110R1-5-R050-R



CLH1110R1-6-R050-R





Solder reflow profile

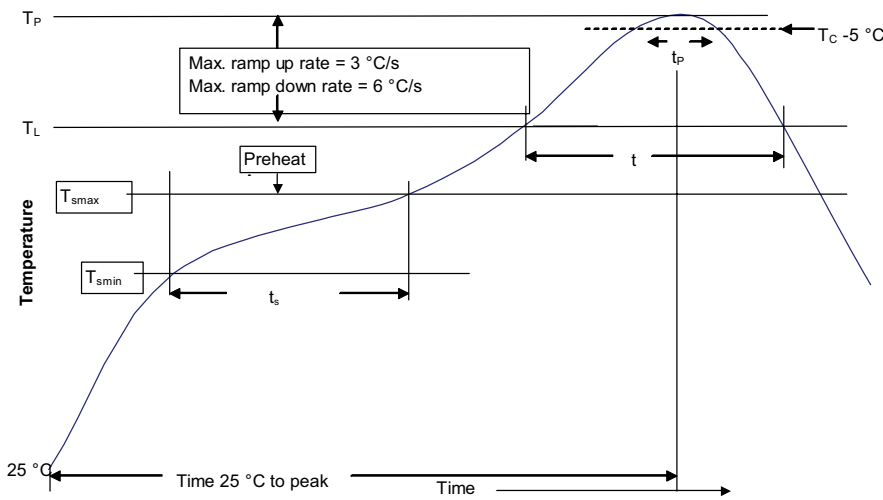


Table 1 - Standard SnPb solder ( $T_C$ )

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> >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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