

Specification No.	Rev. Symbol	Page	Distribution No.
LP20-D-0002		0 / 7	

## DRAFT Specification

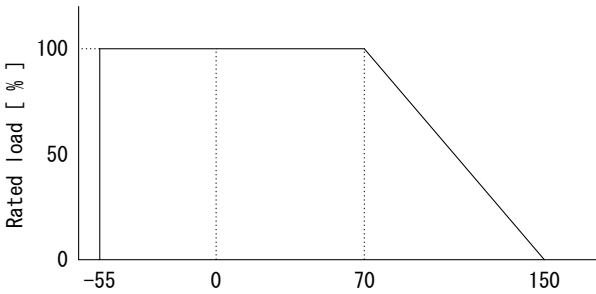
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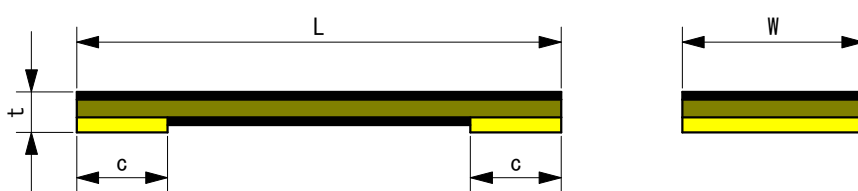
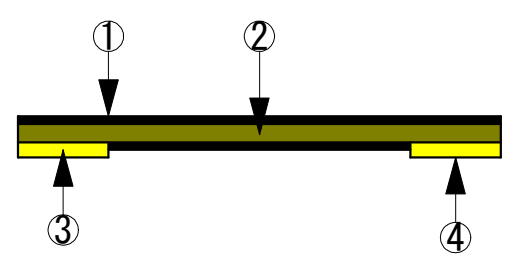
M o d e l                                      LP20                                

HOKURIKU ELECTRIC INDUSTRY CO., LTD.

COMPONENTS DIVISION • FILM RESISTOR FACTORY

Established Date	Revised Date	Applied Date
To be kept at   Engineering Section	Approved by	
	Checked by	
	Drawn up by	

Products Specification; LP20 type		No. LP20-D-0002														
Items	Contents															
1. Application	This specification covers Current Detecting Metal Plate Chip Resistors; LP20 type.															
2. Model No. designation	<p>Model No. is designated as follows.</p> <p>Ex. <u>LP20</u> <u>R003</u> <u>F</u> <u>E</u></p> <p>Model Nominal Tolerance Taping type resistance (Paper taping)</p> <p>Tolerance: Resistance tolerance is denoted by 1 alphabet capital letter. ( F → Resistance tolerance ±1.0 %)</p>															
3. Ratings	Ratings are shown Table-1.															
1) Ratings	<p style="text-align: center;">Table-1. Ratings</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Item</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>Nominal resistance</td> <td>0.001 Ω to 0.003 Ω</td> </tr> <tr> <td>Resistance tolerance</td> <td>Class F(±1.0 %)</td> </tr> <tr> <td>Temperature coefficient</td> <td>±100 ppm/°C</td> </tr> <tr> <td>Rated ambient temperature</td> <td>70 °C</td> </tr> <tr> <td>Operating temperature range</td> <td>-55 °C to 150 °C</td> </tr> <tr> <td>Rated wattage</td> <td>0.5 W</td> </tr> </tbody> </table> <p>※Rated wattage is the maximum continuous power applicable at ambient temperature from -55 °C to 70 °C.</p>		Item	Contents	Nominal resistance	0.001 Ω to 0.003 Ω	Resistance tolerance	Class F(±1.0 %)	Temperature coefficient	±100 ppm/°C	Rated ambient temperature	70 °C	Operating temperature range	-55 °C to 150 °C	Rated wattage	0.5 W
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2) Rated wattage	<p>In case of ambient temperature above 70 °C, power rating shall be in accordance with Fig 1. Derating curve.</p> <div style="text-align: center;">  <p>A line graph with 'Rated load [%]' on the y-axis (0, 50, 100) and 'Ambient temperature [°C]' on the x-axis (-55, 0, 70, 150). The curve is a horizontal line at 100% from -55°C to 70°C, and then a straight line sloping down to 0% at 150°C. Vertical dashed lines are drawn at 0°C and 70°C.</p> <p style="text-align: center;">Fig 1. Derating curve</p> </div>															
3) Rated voltage	<p>Rated voltage is the D.C. or rms A.C. maximum voltage at ambient temperature from -55 °C to 70 °C. Rated voltage shall be determined from following formula.</p> $E = \sqrt{P \times R}$ <p style="text-align: right;">E : Rated voltage[ V ] P : Rated wattage[ W ] R : Nominal resistance[ Ω ]</p>															
4) Nominal resistance	Nominal resistance is in the range of 0.001 Ω to 0.003 Ω															

Products Specification; LP20 type		No. LP20-D-0002																
Items	Contents																	
4. Marking	The product does not have the marking.																	
5. Weight, Dimensions and constructions,																		
1) Weight	The product weight changes with resistance; 0.004 g (typical)																	
2) Dimensions	The product dimensions are as follows.																	
																		
	UNIT : [ mm ]																	
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Model</th> <th>Nominal resistance</th> <th>L</th> <th>W</th> <th>t</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>LP20</td> <td>0.001Ω to 0.003Ω</td> <td>2±0.2</td> <td>1.25±0.2</td> <td>0.3±0.1</td> <td>0.60±0.20</td> </tr> </tbody> </table>			Model	Nominal resistance	L	W	t	c	LP20	0.001Ω to 0.003Ω	2±0.2	1.25±0.2	0.3±0.1	0.60±0.20			
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LP20	0.001Ω to 0.003Ω	2±0.2	1.25±0.2	0.3±0.1	0.60±0.20													
3) Constructions (Material)	The product constructions are as follows.																	
																		
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Products Specification; LP20 type		No. LP20-D-0002		
Items	Contents			
6. Characteristics and Test method	Characteristics and test method are shown Table 2.			
	Table 2. Characteristics and Test method			
	No.	Items	Characteristics	Test method
	1	Resistance	Tolerance class F; within $\pm 1.0\%$	Measurement current; 1 A measured at 25 °C
	2	Temperature coefficient of resistance	within $\pm 100$ ppm/°C	standard temperature; 25 °C measured temperature; 150 °C
	3	Short-time overload	Resistance change; within $\pm 0.5\%$	Be applied electric power equal to 3 times rated power in 5 s. JIS C 5201-1 4.13
	4	Insulation resistance	Over $10^9 \Omega$	Be measured at terminals and center of resistor by d.c.100 V $\pm 15$ V in 1 min. JIS C 5201-1 4.6
	5	Dielectric withstanding voltage	Without breakdown	Be applied at terminals and center of resistor on a.c. 100V, 1min. JIS C 5201-1 4.7
	6	Resistance to soldering heat	Resistance change; within $\pm 0.5\%$ No remarkable outward damage	Place it on the copper sheet (t=0.2 mm) heated by solder Copper sheet temperature; 260 °C $\pm 5$ °C Duration; 5 s $\pm 0.5$ s
	7	Solder-ability	Over 95 % coverage	Be immersed terminal in solder (Sn3Ag0.5Cu) Temperature of solder; 245 °C $\pm 5$ °C Duration of immersion; 3 s $\pm 0.5$ s JIS C 5201-1 4.17
	8	Vibration	Resistance change; within $\pm 0.5\%$ No remarkable outward damage	Vibration frequency range; 10 Hz to 55 Hz Peak to peak amplitude; 1.5 mm Rate of sweeping; 1 min. XYZ 3 - direction each 2 h JIS C 5201-1 4.22
	9	Resistance to solvent	No remarkable outward damage	Solvent; Isopropyl alcohol Temperature; 20 to 25 °C Duration of immersion; 60 s $\pm 5$ s
	10	High temp. exposure	Resistance change; within $\pm 2.0\%$	Temperature; 150 °C $\pm 2$ °C Bias load; 0 % power. Duration; 1 000 h JIS C 5201-1 4.23.2
	11	Change of temperature	Resistance change; within $\pm 0.5\%$ No remarkable outward damage	-55 °C $\pm 3$ °C(30 min.)/normal temp. (2 to 3 min.) /150 °C $\pm 2$ °C (30 min.)/normal temp.(2 to 3 min.) Number of cycles; 5 cycles
	12	Moisture resistance	Resistance change; within $\pm 1.0\%$	Test condition is MIL-STD-202, method 106, 0 % power 7a and 7b not required, 1cycle=24 h, 10 cycles
13	Bias humidity	Resistance change; within $\pm 1.0\%$	Temperature; 85 °C $\pm 2$ °C. Relative humidity; 85 %. 10 %-bias load; on time 90 min./off time 30 min. Duration; 1 000 h	
14	Endurance (Rated load)	Resistance change; within $\pm 2.0\%$	Temperature;70 °C $\pm 3$ °C. Rated wattage; 90 min ON, 30 min OFF. Duration; 1 000 h.	

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Items	Contents	
7. Taping		
1) Taping dimensions	<p>Taping dimensions are as follows.</p> <p style="text-align: right;">UNIT : [ mm ]</p>	
2) Reel dimensions	<p>Reel dimensions are as follows.</p> <p style="text-align: right;">UNIT : [ mm ]</p> <p style="text-align: center;">Axis details</p>	
3) Taping quantity	<p>Taping quantity is 5 000 pcs. / reel.</p>	
4) Label	<p>The label mentioning contents are as follows.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 10px; margin-right: 20px;"> <p style="text-align: center;">① ABC123</p> <p style="text-align: center;">② 5000 PCS</p> <p style="text-align: center;">③ LP20 R003 F E</p> <p style="text-align: center;">④ 3mΩ</p> <p style="text-align: center;">⑤ HDK 1702-1234</p> <p style="text-align: center;">⑥</p> </div> <div> <p>① Your part number</p> <p>② Quantity</p> <p>③ Our part number</p> <p>④ Resistance value</p> <p>⑤ Manufacturer mark</p> <p>⑥ Shipment year and month, lot No.</p> </div> </div>	

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Items	Contents		
8. Packaging	A reel is packaged in the following box.		
	Number of reel	D(mm)	Dimension of packaging box(mm)
	1	15	
	2	27	
	3	40	
4	48		

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9. Notice for application		
1) Circumstance	Please avoid the corrosive circumstances like the Ammonium, Sulfur, and Halo genic gases. These kinds of gases erode the solder plating of electrodes to trouble soldering, and cause open circuit.	
2) Soldering iron operation (inclusive of repair)	Soldering iron tip shall be slowly applied so as not to float the chip. Tip temperature shall be below 310 °C , time be within 3 s. each. Iron tip application to the same point shall be 2 times. For more than 2 times, please change the chip to fresh one.	
3) Reflow soldering	As shown below, pre-heat shall be 140 to 180 °C, 60 to 120 s, and reflow peak temperature be 255+/-5 °C, 5 s. maximum, the number of times within 2 times.	
	<p>Temperature [ °C ]</p> <p>Time [ s ]</p> <p>Peak temp. : 255+/-5 °C</p> <p>140 °C~180 °C 60 s~120 s</p> <p>30 s~60 s</p>	
4) Positioning	The products shall be so laid out as to minimize the impact that they may receive from the bend or deflection of the board when it is divided. The products shall not be installed in places close to the dividing line or prone to strains. Low-resistance resistors shall be used with care because the resistance of the wiring may be a few percent of that of the resistor.	
5) Coating treatment	Resin burying, coating, and similar operations may change the resistance greatly depending on the material used. The material shall therefore be checked before use.	
6) Thermal effect design	Please confirm thermal effects in using conditions because resistor is heat-up part.	

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Items	Contents	
10. Others		
1) Storing condition	It is guaranteed that the product will retain normal solder-ability for one year in the standard state as per JIS C 5201-1, clause 4.2 (at temperatures between 15 and 35 °C and relative humidity between 25 and 75 %). It is not desirable that the Resistor are stored are at dusty, harmful gas, for example hydrogen chloride and sulfate gas etc.	
2) Power derating	Even if have use it in a derating curve, in consideration of self-fever, ambient temperature of a resistor, heat influence from the other parts. We ask for enough load deratings in case of use in a stable state for a long term.	
3) Shock to the Resistor	When the resistors are shocked, there is danger that the resistor breaks. So in use of surface mounter, please adjust it for no damaging to the resistor. Please avoid dropping in a high, too.	
4) RoHS directive	This resistor is a product satisfying a RoHS.	
5) For environmental protection	We don't use Class I ODC and PBBOs, PBBs in a products and the process.	
6) Off the subject of the restriction of export(COCOM)	This product is off the subject of the restriction of export (COCOM) like the strategic material etc.	
7) Cautions for Resistors	<p>• This specification shows the quality and performance as a resistor simple. Before adoption, please evaluate and check your product in which the resistor was mounted.</p> <p>• This products are designed and manufactured for general standard use in general electro-nic equipment (AV equipment, household electric appliances, office equipment, information and communication equipment, etc.). When there is a danger that a human life and other serious damage will occur by the fault of this products at transportation equipment (such as train, automobile, vessel, etc.), traffic signal, medical equipment, aerospace equipment, electric heating appliances, burning appliances, gas apparatus, rotation equipment, disaster prevention, and crime prevention equipment, please design fail-safe systems and ensure safety, such as the following.</p> <ul style="list-style-type: none"> <li>* Systems with protective circuits and a protective equipment.</li> <li>* Systems with redundant circuits and others to do not cause danger by failure.</li> </ul>	
8) Solder mask and solder volume	<p>This product is small and lightweight, so a product may float on solder in case of much solder.</p> <p>When a product floats on solder, a resistance becomes higher than nominal resistance value.</p> <p>The thickness of solder mask is recommended about 0.1 mm.</p>	