



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010656

Specification for Approval

Customer : 深圳市子錦年科技有限公司

Product Name: LEAD-FREE HIGH POWER THICK FILM CHIP RESISTORS

Part Name : HP SERIES $\pm 1\%$ 、 $\pm 5\%$

Part No. : HP****F****T*E

HP****J****T*E

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Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	1/13



Contents

Introduction	Page
1.0 Scope	4
2.0 Ratings & Dimension	4
3.0 Power Rating.....	5
4.0 Structure.....	5
5.0 Marking.....	6~7
6.0 Performance Specification	8~9
7.0 Explanation of Part No. System.....	10
8.0 Ordering Procedure	11
9.0 Packing	11~12
10.0 Precaution for storage/Transportation.....	13

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	2/13



File Name: HP SERIES ±1%、±5%		Date	2013.08.29	Edition No.	1
Amendment Record				Signature	
Edition	Prescription of amendment	Amend Page	Amend Date	Amended by	Checked by

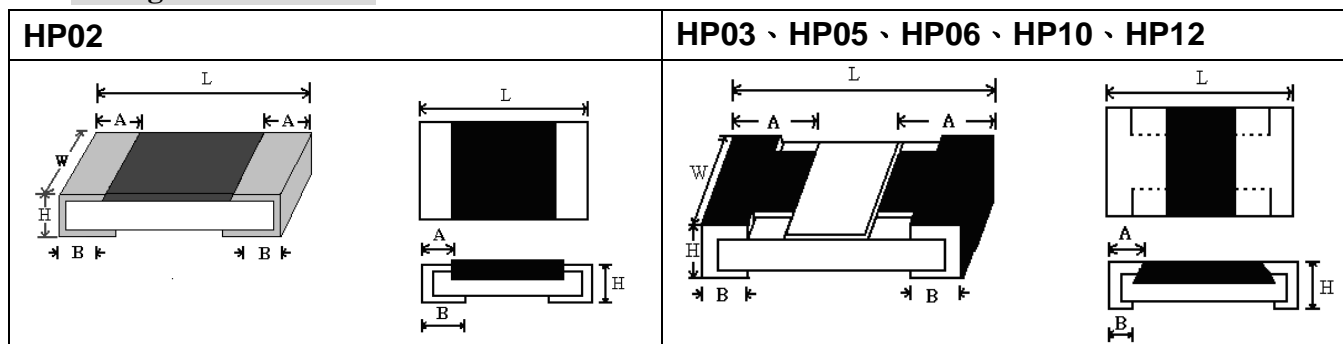
Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	3/13



1.0 Scope:

This sheet is the statement of the Lead-Free High Power Thick Film Chip Resistors specification that UNIOHM'S productions can meet.

2.0 Ratings & Dimension:



Dimension (mm)

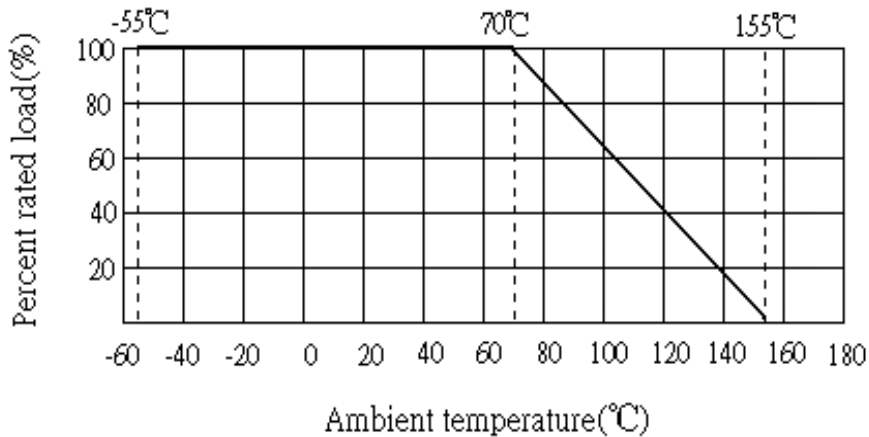
Type		HP02	HP03	HP05	HP06	HP10	HP12
Power Rating at 70°C		1/10W	1/5W	1/3W	1/2W	1W	1.5W
Dimension(mm)	L	1.00±0.10	1.60±0.10	2.00±0.15	3.10±0.15	5.00±0.10	6.35±0.10
	W	0.50 ^{+0.05} _{-0.05}	0.80±0.10	1.25 ^{+0.15} _{-0.10}	1.55 ^{+0.15} _{-0.10}	2.50±0.20	3.20±0.20
	H	0.35±0.05	0.45±0.10	0.55±0.10	0.55±0.10	0.55±0.10	0.55±0.10
	A	0.20±0.10	0.30±0.20	0.40±0.20	0.45±0.20	0.60±0.25	0.60±0.25
	B	0.25±0.10	0.30±0.20	0.40±0.20	0.45±0.20	0.50±0.20	1.80±0.25
Resistance range	±1%	1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω~10Ω
	±5%	1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω-10MΩ	0.1Ω~10Ω
Max Working Voltage		50V	50V	150V	200V	200V	200V
Max Overload Voltage		100V	100V	300V	400V	400V	400V
Dielectric Withstanding Voltage		100V	300V	500V	500V	500V	500V
Operating Temperature		-55 ~ +155°C					

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	4/13

3.0 Power Rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derate as shown in figure 1.

Figure 1



3.1 Voltage rating:

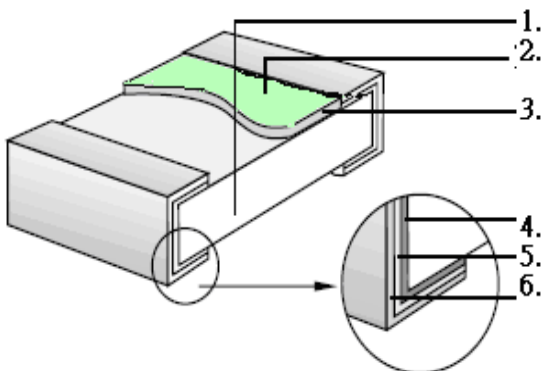
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P * R}$$

Where: RCWV= Rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (VOLT.)
P=Power Rating (WATT.)
R=Nominal Resistance (OHM)

In no case shall the rated dc or RMS ac continuous working voltage be greater than the applicable maximum value.

4.0 Structure:



- 1) High purity alumina substrate
- 2) Protective covering
- 3) Resistive element
- 4) Termination inner (Ni/Cr)
- 5) Termination (between) Ni Barrier
- 6) Termination (outer) Sn

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	5/13

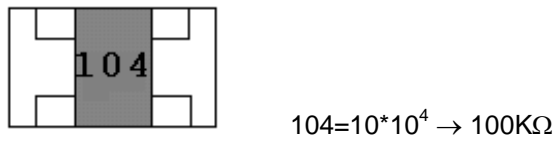


5.0 Marking:

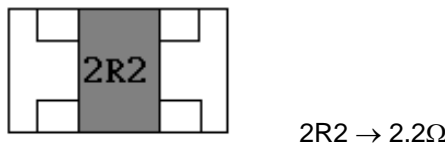
(1) For HP02 size. Due to the very small size of the resistor's body, there is no marking on the body.



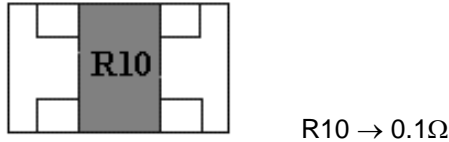
(2) ±5% Tolerance: the first two digits are significant figures of resistance and the third denotes number of zeros following.



(3) ±5% Tolerance: below 10Ω Show as following, read alphabet "R" as decimal point.



(4) ±1%, ±5% Tolerance: 1Ω show as following, read alphabet "R" as decimal point.



(5) ±1% Tolerance: 4 digits, first three digits are significant; fourth digit is number of zeros. Letter r is decimal point.



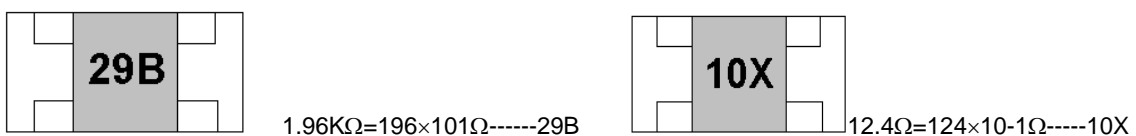
(6) Standard E-96 series values (±1% tolerance) of HP03 size. Due the small size of the resistor's body, 3 digits marking will be used to indicate the accurate resistance value by using the following multiplier & resistance code.

Multiplier code:

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

Coding formula

First two digits-----Resistance code; Third digit-----Multiplier code

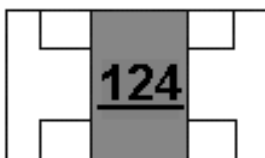


Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	6/13

STANDARD E-96 VALUES AND HP03 RESISTANCE CODE

Ω VALUE	CODE	Ω VALUE	CODE	Ω VALUE	CODE	Ω VALUE	CODE
100	01	178	25	316	49	562	73
102	02	182	26	324	50	576	74
105	03	187	27	332	51	590	75
107	04	191	28	340	52	604	76
110	05	196	29	348	53	619	77
113	06	200	30	357	54	634	78
115	07	205	31	365	55	649	79
118	08	210	32	374	56	665	80
121	09	215	33	383	57	681	81
124	10	221	34	392	58	698	82
127	11	226	35	402	59	715	83
130	12	232	36	412	60	732	84
133	13	237	37	422	61	750	85
137	14	243	38	432	62	768	86
140	15	249	39	442	63	787	87
143	16	255	40	453	64	806	88
147	17	261	41	464	65	825	89
150	18	267	42	475	66	845	90
154	19	274	43	487	67	866	91
158	20	280	44	499	68	887	92
162	21	287	45	511	69	909	93
165	22	294	46	523	70	931	94
169	23	301	47	536	71	953	95
174	24	309	48	549	72	976	96

(7) Standard E-24 and not belong to E-96 series values (in ±1% tolerance) of HP03 size. The marking is the same as 5% tolerance but marking as underline



$124 \rightarrow 12 * 10^4 = 120K\Omega$

6.0 Performance Specification:

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	7/13



ISO14001



ISO/TS16949



244546



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REG.-Nr.A759



CQC04001010656

Characteristic	Limits		Test Method (JIS-C-5201&JIS-C-5202)
Temperature Coefficient	HP02: $\leq 10\Omega$: $\pm 400\text{PPM}/^\circ\text{C}$ $10\Omega < R \leq 100\Omega$: $\pm 200\text{PPM}/^\circ\text{C}$ $> 100\Omega$: $\pm 100\text{PPM}/^\circ\text{C}$		4.8 Natural resistance changes per temp. Degree centigrade $R_2 - R_1$ $\frac{R_2 - R_1}{R_1(T_2 - T_1)} \times 10^6$ (PPM/ $^\circ\text{C}$) $R_1(T_2 - T_1)$ R_1 : resistance value at room temp. (T_1) R_2 : resistance value at room temp. $+100^\circ\text{C}$ (T_2) Test pattern: room temp. (T_1), room temp. $+100^\circ\text{C}$ (T_2)
	HP03 · HP05: $\leq 10\Omega$: $\pm 200\text{PPM}/^\circ\text{C}$ $> 10\Omega$: $\pm 100\text{PPM}/^\circ\text{C}$		
	HP06 · HP10: $0.1\Omega < R \leq 1\Omega$: $\pm 100\text{PPM}/^\circ\text{C}$ $1\Omega < R \leq 10\Omega$: $\pm 200\text{PPM}/^\circ\text{C}$ $10\Omega < R \leq 10\text{M}\Omega$: $\pm 100\text{PPM}/^\circ\text{C}$		
	HP12: $\pm 100\text{PPM}/^\circ\text{C}$		
Short-time overload	$\pm 5\%$	$\pm(2.0\% + 0.1\Omega)$ Max	4.13 Permanent resistance change after the application of 2.5 times RCWV for 5 seconds.
	$\pm 1\%$	$\pm(1.0\% + 0.1\Omega)$ Max	
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation breaks done.		4.7 Clamped in the trough of a 90°C metallic v-block and shall be tested at ac potential respectively specified in the type for 60-70 seconds
Terminal bending	$\pm(1.0\% + 0.05\Omega)$ Max		4.33 Twist of test board: $Y/x = 3/90$ mm for 60seconds
Soldering heat	Resistance change rate is $\pm(1.0\% + 0.05\Omega)$ Max		4.18 Dipping the resistor into a solder bath having a temperature of $260^\circ\text{C} \pm 5^\circ\text{C}$ and hold it for 10 ± 1 seconds

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	8/13



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010656

Solderability	95% coverage Min.		Wave solder: Test temperature of solder: 245°C±3°C dipping time in solder: 2-3 seconds.															
			Reflow: 															
Temperature cycling	±5%	±(1.0%+0.05 Ω)Max	4.19 Resistance change after continuous five cycles for duty cycle specified below: <table border="1"> <thead> <tr> <th>STEP</th> <th>TEMPERATURE</th> <th>TIME</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C±3°C</td> <td>30 MINS</td> </tr> <tr> <td>2</td> <td>ROOM TEMP.</td> <td>10 --- 15 MINS</td> </tr> <tr> <td>3</td> <td>+155°C±2°C</td> <td>30 MINS</td> </tr> <tr> <td>4</td> <td>ROOM TEMP.</td> <td>10 --- 15 MINS</td> </tr> </tbody> </table>	STEP	TEMPERATURE	TIME	1	-55°C±3°C	30 MINS	2	ROOM TEMP.	10 --- 15 MINS	3	+155°C±2°C	30 MINS	4	ROOM TEMP.	10 --- 15 MINS
	STEP	TEMPERATURE		TIME														
1	-55°C±3°C	30 MINS																
2	ROOM TEMP.	10 --- 15 MINS																
3	+155°C±2°C	30 MINS																
4	ROOM TEMP.	10 --- 15 MINS																
	±1%	±(0.5%+0.05 Ω)Max																
Humidity (steady state)	±5%	±(3.0%+0.1Ω) Max.	4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% relative humidity,															
	±1%	±(0.5%+0.1Ω) Max.																
Load life in humidity	±5%	±(3.0%+0.1Ω) Max.	7.9 Resistance change after 1,000 hours (1.5 hours "ON", 0.5 hour "OFF") at RCWV in a humidity chamber controlled at 40°C±2°C and 90 to 95% relative humidity.															
	±1%	±(1.0%+0.1Ω) Max.																
Load life	±5%	±(3.0%+0.1Ω) Max.	4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours "ON", 0.5 hour "OFF" at 70°C±2°C ambient.															
	±1%	±(1.0%+0.1Ω) Max.																

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	9/13



7.0 Explanation of Part No. System:

The standard Part No. includes 14 digits with the following explanation:

7.1 This is to indicate the High Power Thick Film Chip Resistors size.

Example: HP02、HP03、HP05、HP06、HP10、HP12

7.2 5th~6th digits:

7.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers,

The following codes are used; and please refer to the following chart for detail:

W=Normal Size; S=Small Size; U=Extra Small Size; “1” ~ “G” to denotes “1” ~ “16” as Hexadecimal:

1/16W~ 1W:

Wattage	1/2	1/3	1/4	1/5	1/6	3/4	1/8	1/10	1/16	1
Normal Size	W2	W3	W4	W5	W6	/	W8	WA	WG	1W
Small Size	S2	S3	S4	S5	S6	07	S8	SA	SG	1S

7.2.2 For power rating less than 1 watt, the 5th digit will be the letters “W” or “S” to represent the size required & the 6th digit will be a number or a letter code.

Example: W3=1/3W、S4=1/4W-S

7.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.

F=±1% G=±2% J=±5% K= ±10%

7.4 The 8th to 11th digits is to denote the Resistance Value.

7.4.1 For the standard resistance values of E-24 series, the 8th digit is “0”, the 9th & 10th digits are to denote the significant figures of the resistance and the 11th digit is the number of zeros following;

For the standard resistance values of E-96 series, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.

7.4.2 The following number s and the letter codes are to be used to indicate the number of zeros in the 11th digit:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

7.4.3 The 12th, 13th & 14th digits.

The 12th digit is to denote the Packaging Type with the following codes:

C=Bulk in (Chip Product) T=Tape/Reel

7.4.4 The 13th digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. The following letter code is to be used for some packing quantities:

1=1000pcs 2=2000pcs 3=3000pcs 4=4000pcs
5=5000pcs C=10000pcs D=20000pcs E=15000pcs

Chip Product:

BD=B/B-20000pcs TC=T/R-10000pcs

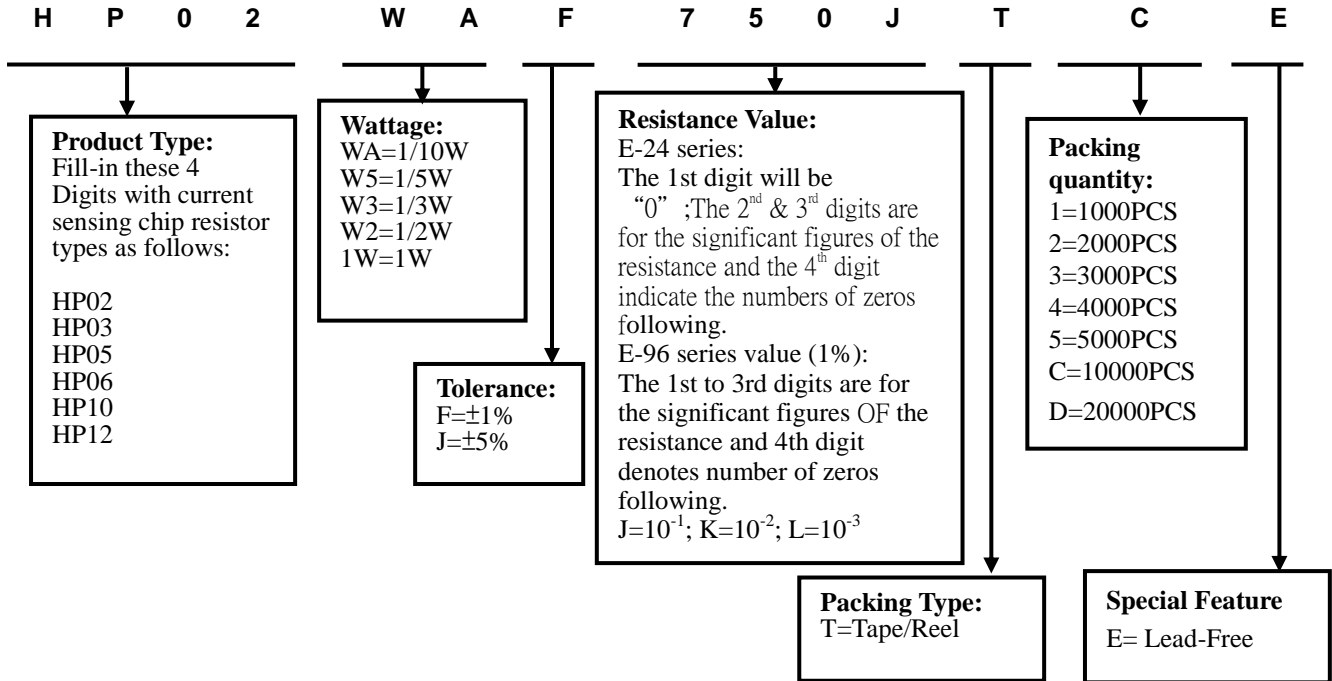
7.4.5 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

E=For “Environmental Protection, Lead Free type” .

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	10/13

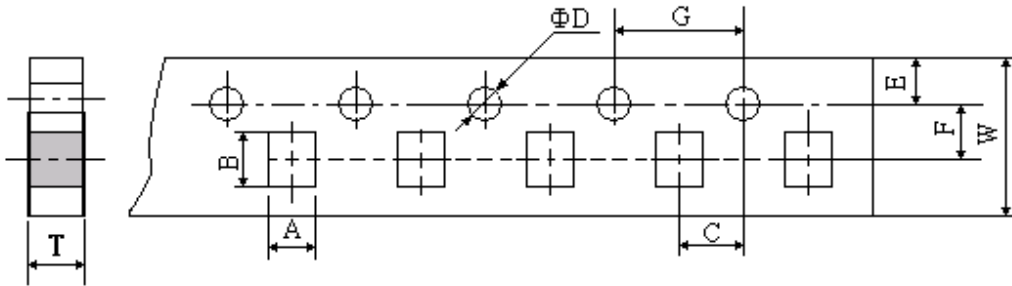


8.0 Ordering Procedure: (Example: HP02 1/10W ±1% 75Ω T/R-10000)



9.0 Packaging:

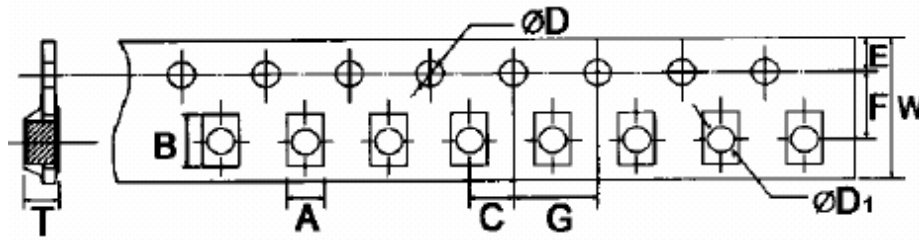
9.1 Tapping Dimension:



Unit: mm

TYPE	A ± 0.2	B ± 0.2	C ± 0.05	φD +0.1 -0	E ± 0.1	F ± 0.05	G ± 0.1	W ± 0.2	T ± 0.10
HP02	0.65	1.15	2.00	1.50	1.75	3.5	4.00	8.0	0.45
HP03	1.10	1.90	2.00	1.50	1.75	3.5	4.00	8.0	0.67
HP05	1.65	2.40	2.00	1.50	1.75	3.5	4.00	8.0	0.81
HP06	2.00	3.60	2.00	1.50	1.75	3.5	4.00	8.0	0.81
HP10	2.80	5.40	2.00	1.50	1.75	5.5	4.00	12.0	0.75

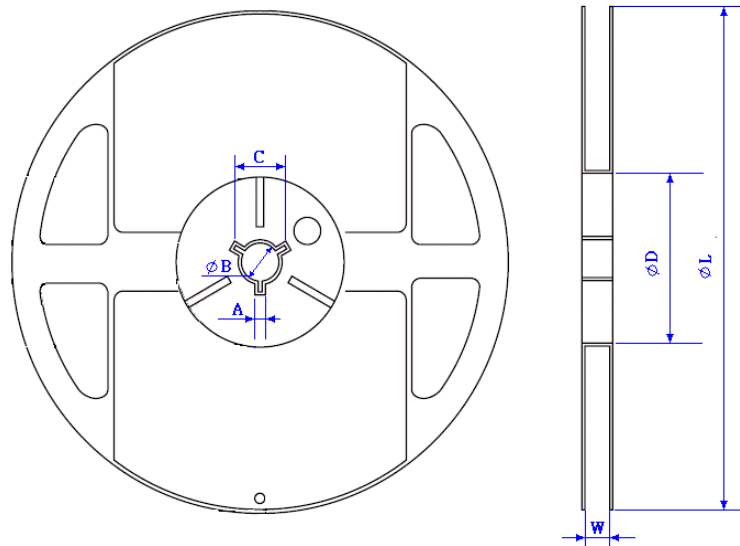
Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	11/13



Unit: mm

Type	A±0.2	B±0.2	C±0.05	+0.1 φD -0	+0.25 φD1 -0	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
HP12	3.5	6.7	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0

9.2 Dimension:



Unit: mm

Type	Taping	Size	A±0.5	B±0.5	C±0.5	ΦD±1	ΦL±2	W±1
HP02	Paper	10,000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
HP03	Paper	5,000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
HP05	Paper	5,000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
HP06	Paper	5,000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
HP10	Paper or Embossed	4,000pcs reel	2.0	13.0	21.0	60.0	178.0	13.8
HP12	Embossed	4,000pcs reel	2.0	13.0	21.0	60.0	178.0	13.8

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	12/13



10.0 Precaution for storage/Transportation:

101. UNIOHM recommend the storage condition temperature: 15°C~35°C, humidity :25%~75% (Put condition for individual product)
Even under UNIOHM recommended storage condition, solderability of products over 1 year old (Put condition for each product) many be degraded.
- 10.2. Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 10.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:
- Storage in high Electrostatic
 - Storage in direct sunshine、rain and snow or condensation
 - Where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S₃, NH₃, SO₂, NO₂.

Approved	Checked	Prepared	File NO.	Edition	Date	Page
Willam Zhao	Apple Liu	Wu Li	ZJN- 01 - 001	1	2013.08.29	13/13