High Stability - High Temperature (230 °C) Thin Film Wraparound Chip Resistors, Sulfur Resistant

DESIGN SUPPORT TOOLS

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3D Models Available

INTRODUCTION

For applications such as down hole applications, the need for parts able to withstand very severe conditions (temperature as high as 215 °C powered or up to 230 °C un-powered) has leaded Vishay Sfernice to push out the limit of the thin film technology.

Designers might read the application note: Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (P, PRA etc…) (High Temperature Application) www.vishay.com/doc?53047 in conjunction with this datasheet to help them to properly design their PCBs and get the best performances of the PHT.

Vishay Sfernice R&D engineers will be willing to support any customer design considerations.

FEATURES

- Operating temperature range: -55 °C; +215 °C
- Storage temperature: -55 °C; +230 °C
- Gold terminations (< 1 µm thick)
- 5 sizes available (0402, 0603, 0805, 1206, 2010); other sizes upon request
- Temperature coefficient down to 15 ppm (-55 °C; +215 °C)
- Tolerance down to 0.05 %
- Load life stability: 0.35 % max. after 2000 h at 220 °C (ambient) at Pn
- Shelf life stability: 0.7 % typ. (1 % max.) after 15 000 h at 230 °C
- SMD wraparound
- TCR remains constant after long term storage at 230 °C (15 000 h)
- Sulfur resistant (per ASTM B809-95 humid vapor test)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE Ω	RATED POWER (1)(2) $P_{215\,°C}$ W	LIMITING ELEMENT VOLTAGE V	TOLERANCE (2) ± %	TEMPERATURE COEFFICIENT (3) ± ppm/°C
PHT0402	0402	10 to 130K	0.0189	50	0.05, 0.1, 0.5, 1	10, 15, 25, 30, 50, 55
PHT0603	0603	10 to 320K	0.0375	75	0.05, 0.1, 0.5, 1	10, 15, 25, 30, 50, 55
PHT0805	0805	10 to 720K	0.06	150	0.05, 0.1, 0.5, 1	10, 15, 25, 30, 50, 55
PHT1206	1206	10 to 2.7M	0.1	200	0.05, 0.1, 0.5, 1	10, 15, 25, 30, 50, 55
PHT2010	2010	10 to 7.5M	0.2 (4)	300	0.05, 0.1, 0.5, 1	10, 15, 25, 30, 50, 55

Notes

(1) For power handling improvement, please refer to application note 53047: "Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (High Temperature Applications)" www.vishay.com/doc?53047 and consult Vishay Sfernice

(2) See Table 2 on next page

(3) See Table 1 on next page

(4) It is possible to dissipate up to 0.3 W, but there will be an additional drift of 0.1 % after load life

CLIMATIC SPECIFICATIONS

Operating temperature range	-55 °C; +215 °C
Storage temperature range	-55 °C; +230 °C

PERFORMANCE VS. HUMID SULFUR VAPOR

Test conditions	50 °C ± 2 °C, 85 % ± 4 % RH, exposure time 500 h
Test results	Resistance drift < (0.05 % R + 0.05 Ω), no corrosion products observed

MECHANICAL SPECIFICATIONS

Substrate	Alumina
Resistive Element	Nichrome (NiCr)
Passivation	Silicon nitride (Si_3N_4)
Protection	Epoxy + silicone
Terminations	Gold (< 1 µm) over nickel barrier

Note

- For other terminations, please consult

For technical questions, contact: sferthinfilm@vishay.com
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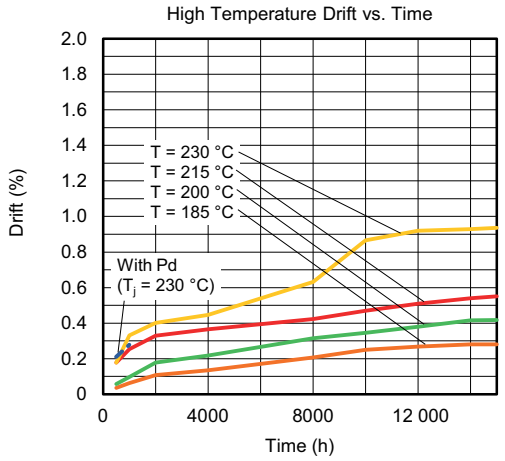
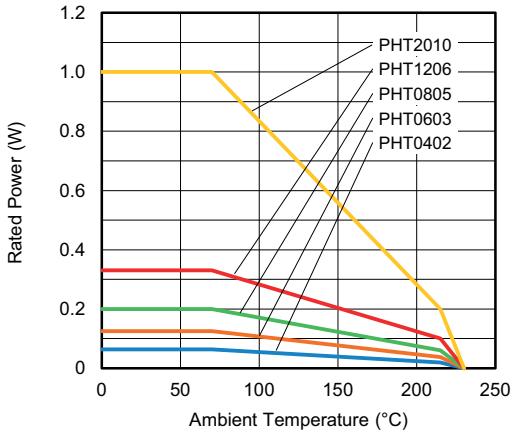
TABLE 1 - TEMPERATURE COEFFICIENT		
Y	10 ppm/°C	-55 °C; +155 °C
	15 ppm/°C	-55 °C; +215 °C
E	25 ppm/°C	-55 °C; +155 °C
	30 ppm/°C	-55 °C; +215 °C
H	50 ppm/°C	-55 °C; +155 °C
	55 ppm/°C	-55 °C; +215 °C

TABLE 2 - BEST TOLERANCE AND TCR VS. OHMIC VALUE			
SERIES	**RANGE (Ω)**	**TOL. (± %)**	**TCR CODE**
0402	10 to 50	0.1; 0.5; 1	Y; E; H
	> 50 to 90K	0.05; 0.1; 0.5; 1	Y; E; H
	> 90K to 130K	0.05; 0.1; 0.5; 1	E; H
0603	10 to 50	0.1; 0.5; 1	Y; E; H
	> 50 to 210K	0.05; 0.1; 0.5; 1	Y; E; H
	> 210K to 320K	0.05; 0.1; 0.5; 1	E; H
0805	10 to 50	0.1; 0.5; 1	Y; E; H
	> 50 to 480K	0.05; 0.1; 0.5; 1	Y; E; H
	> 480K to 720K	0.05; 0.1; 0.5; 1	E; H
1206	10 to 50	0.1; 0.5; 1	Y; E; H
	> 50 to < 1.8M	0.05; 0.1; 0.5; 1	Y; E; H
	> 1.8M to 2.7M	0.05; 0.1; 0.5; 1	E; H
2010	10 to 50	0.1; 0.5; 1	Y; E; H
	> 50 to 5M	0.05; 0.1; 0.5; 1	Y; E; H
	> 5M to 7.5M	0.05; 0.1; 0.5; 1	E; H

PHT STABILITY CURVE



POWER DERATING CURVE



Note

- Stability will be dependent on resistivity of resistor. Above curves are worst case.

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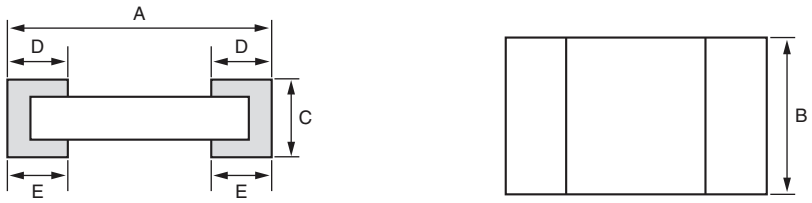
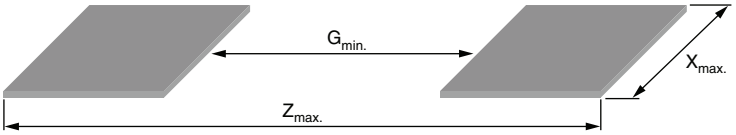
DIMENSIONS in millimeters (inches)



CASE SIZE	A	B	C	D/E	
	MAX. TOL. +0.152 (+0.006) MIN. TOL. -0.152 (-0.006)	MAX. TOL. +0.127 (+0.005) MIN. TOL. -0.127 (-0.005)			
	NOMINAL	NOMINAL		NOMINAL	TOLERANCE
0402	1.00 (0.039)	0.60 (0.024)	Termination N: 0.5 (0.02) ± 0.127 (0.005) Termination G: 0.4 (0.016) ± 0.051 (0.002)	0.25 (0.010)	0.1 (0.004)
0603	1.52 (0.060)	0.85 (0.033)		0.38 (0.015)	0.13 (0.005)
0805	1.91 (0.075)	1.27 (0.050)			
1206	3.06 (0.120)	1.60 (0.063)		0.40 (0.016)	
2010	5.08 (0.200)	2.54 (0.100)		0.48 (0.019)	

SUGGESTED LAND PATTERN (TO IPC-7351A)



CHIP SIZE	DIMENSIONS (in millimeter)		
	$Z_{max.}$	$G_{min.}$	$X_{max.}$
0402	1.55	0.15	0.73
0603	2.37	0.35	0.98
0805	2.76	0.74	1.40
1206	3.91	1.85	1.73
2010	5.93	3.71	2.67

Caution:
Performances obtained with following mounting conditions:
PCB: polyimide
Solder paste: PbSnAg (93.5/5/1.5)

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POPULAR OPTIONS

It is recommended to consult Vishay Sfernice for availability first.

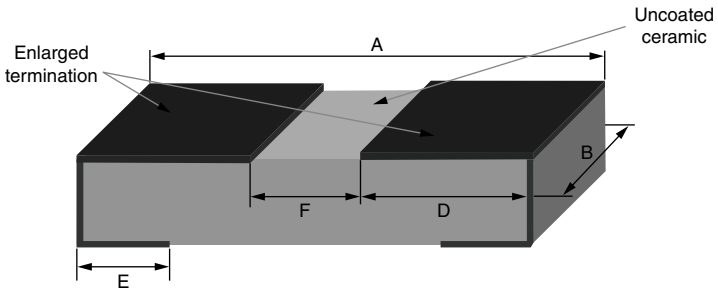
Option: Enlarged terminations:

For stringent and special power dissipation requirements, the thermal resistance between the resistive layer and the solder joint can be reduced using enlarged terminations chip resistors which are soldered on large and thick copper pads acting as heatsink (see application note: 53048 “Power Dissipation in High Precision Vishay Sfernice Chip Resistors and Arrays (P Thin Film, PRA Arrays, CHP Thick Film)” www.vishay.com/doc?53048.

Option to order: 0063 (applies to size 1206 / 2010).

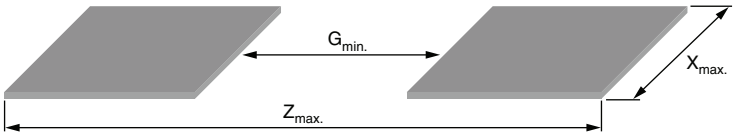
DIMENSIONS (Option 0063) in millimeters

Bottom view for mounting



CASE SIZE	A	B	E	D	F		
	MAX. TOL. +0.152 MIN. TOL. -0.152	MAX. TOL. +0.127 MIN. TOL. -0.127	MAX. TOL. +0.13 MIN. TOL. -0.13	MAX. TOL. +0.13 MIN. TOL. -0.13			
	NOMINAL	NOMINAL	NOMINAL	NOMINAL	NOMINAL	MIN.	MAX.
1206	3.06	1.60	0.40	1.215	0.63	0.50	0.76
2010	5.08	2.54	0.48	2.25			

SUGGESTED LAND PATTERN (Option 0063)



CHIP SIZE	DIMENSIONS (in millimeter)		
	$Z_{max.}$	$G_{min.}$	$X_{max.}$
1206	3.91	0.50	1.73
2010	5.93		2.67

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PACKAGING

ESD packaging available: waffle-pack and plastic tape and reel (low conductivity). Paper tape available upon request (for sizes 0402, 0603, 0805 and 1206).

SIZE	MOQ	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
		WAFFLE PACK 2" × 2"	TAPE AND REEL		
			MIN.	MAX.	
0402	100	100	100	5000	8 mm
0603					
0805				4000	
1206		140			
2010		60		1000	8 mm [1]

Note
[1] 12 mm on request

PACKAGING RULES

Waffle Pack
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered exceeds maximum quantity of a single waffle pack, the waffle packs are stacked up on the top of each other and closed by one single cover.
To get "not stacked up" waffle pack in case of ordered quantity > maximum number of pieces per package: Please consult Vishay Sfernice for specific ordering code.

Tape and Reel
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered is between the MOQ and the maximum reel capacity, only one reel is provided.
When several reels are needed for ordered quantity within MOQ and maximum reel capacity: please consult Vishay Sfernice for specific ordering code.

GLOBAL PART NUMBER INFORMATION

Global Part Numbering: PHT1206Y1001BGT063

P	H	T	1	2	0	6	Y	1	0	0	1	B	G	T	0	6	3

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION
PHT	**0402** **0603** **0805** **1206** **2010**	**Y** **E** **H**	The first three digits are significant figures and the last digit specifies the number of zeros to follow, R designates decimal point **10R0** = 10 Ω **3901** = 3900 Ω **1004** = 1 MΩ	**W** = 0.05 % **B** = 0.1 % **D** = 0.5 % **F** = 1 %	**G** = gold **N** = tin / silver [1]	For more information see codification of Packaging table	Leave blank if no option

Note
[1] For usage at temperatures up to 200 °C maximum N (tin/silver termination are available upon request)

CODIFICATION OF PACKAGING

CODE 18	PACKAGING
WAFFLE PACK	
W	100 min., 1 mult
WA	100 min., 100 mult (available only on size 1206)
PLASTIC TAPE (in standard for all sizes)	
T	100 min., 1 mult
TA	100 min., 100 mult
TB	250 min., 250 mult
TC	500 min., 500 mult
TD	1000 min., 1000 mult
TE	2500min., 2500 mult
TF	Full tape (quantity depending on size of chips)
PAPER TAPE (Available for 0402, 0603, 0805 and 1206. Please consult Vishay Sfernice for 2010 size.)	
PT	100 min., 1 mult
PA	100 min., 100 mult
PB	250 min., 250 mult
PC	500 min., 500 mult
PD (not available for size 0402)	1000 min., 1000 mult
PE (not available for size 0402)	2500min., 2500 mult
PF (not available for size 0402)	Full tape (quantity depending on size of chips)

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