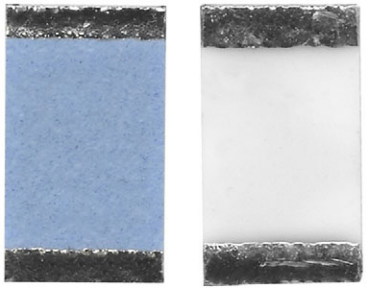
High Precision Wraparound - Wide Ohmic Value Range Thin Film Chip Resistors, Sulfur Resistant



FEATURES

- Load life stability 0.02 % typical at 8000 h at 70 °C under Pd (0.033 % maximum)
- Low temperature coefficient down to **5 ppm/°C** (-55 °C; +155 °C)
- Very low noise < -35 dB and voltage coefficient < 0.01 ppm/V
- Wide resistance range: 10 Ω to 86 MΩ depending on size
- Tolerances to **± 0.01 %**
- In lot tracking ≤ 5 ppm/°C
- Termination: thin film technology
- Short circuits (jumpers) r < 50 mR, I < 2 A, see PZR datasheet (www.vishay.com/doc?53053)
- 85/85 test
- Sulfur resistant (per ASTM B809-95 humid vapor test)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS* Available

HALOGEN FREE Available

GREEN (5-2008) Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

LINKS TO ADDITIONAL RESOURCES

3D Models

For low noise and precision applications, superior stability, low temperature coefficient of resistance, and low voltage coefficient, Vishay Sfernice's proven precision thin film wraparound resistors exceed requirements of MIL-PRF-55342G characteristics Y ± 10 ppm/°C (-55 °C; +155 °C) down to ± 5 ppm/°C (-55 °C; +155 °C).

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE (2) (Ω)	RATED POWER W Pn (1)	RATED POWER W Pd (1)	LIMITING ELEMENT VOLTAGE V	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C
P0402	0402	10 to 1M	0.063	0.040	50	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P0505	0505	10 to 4M	0.125	0.050	50	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P0603	0603	10 to 3.2M	0.125	0.100	75	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P0805 (3)	0805	10 to 8M	0.200	0.125	150	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P1005	1005	10 to 7.5M	0.250	0.125	75	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P1206	1206	10 to 22M	0.330	0.250	200	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P1505	1505	10 to 13.8M	0.350	0.175	200	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P2010	2010	10 to 62M	1 (4)	0.500	300	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100
P2512	2512	10 to 86M	2 (4)	1	300	0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1, 2, 5	5, 10, 25, 50, 100

Notes

(1) Pn = nominal power: Pd = derated power intended to improve stability

(2) **For ohmic range versus tolerance and TCR see detailed table on next page**

(3) Model P0805 having the same size than P0705 and the same performances, only codification of P0805 remains

(4) With special assembly care

CLIMATIC SPECIFICATIONS

Operating temperature range	-55 °C; +155 °C

Note

- For temperature up to 230 °C, see PHT datasheet (www.vishay.com/doc?53050)

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

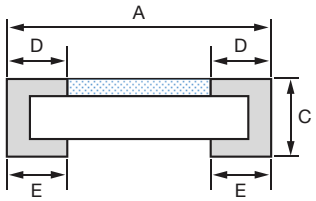
MECHANICAL SPECIFICATIONS

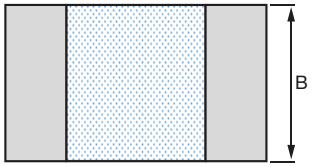
Substrate	Alumina
Technology	Thin film
Film	**Nickel chromium** with mineral passivation or **CrSi**
Protection	Epoxy + silicone
Terminations	**B type:** SnPb over nickel barrier for solder reflow **N type:** SnAg over nickel barrier **G type:** gold over nickel barrierfor other applications

For technical questions, contact: sferthinfilm@vishay.com

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DIMENSIONS in millimeters (inches)



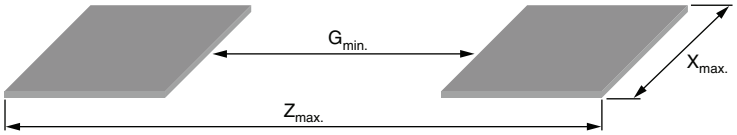


CASE SIZE	A	B	C	D		E	
	TOL. ± 0.150 (± 0.006)	TOL. ± 0.130 (± 0.005)	TOL. ± 0.130 (± 0.005)				
	NOMINAL	NOMINAL	NOMINAL	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
0402	1.000 (0.039)	0.600 (0.024)	0.500 (0.020)	0.100 (0.004)	0.350 (0.014)	0.150 (0.006)	0.350 (0.014)
0505	1.270 (0.005)	1.270 (0.050)		0.250 (0.010)	0.510 (0.020)	0.250 (0.010)	0.510 (0.020)
0603	1.520 (0.060)	0.850 (0.033)					
0805	1.910 (0.075)	1.270 (0.050)					
1005	2.540 (0.100)	1.270 (0.050)					
1206	3.060 (0.120)	1.600 (0.063)		0.270 (0.011)	0.530 (0.021)	0.270 (0.011)	0.530 (0.021)
1505	3.810 (0.150)	1.320 (0.052)		0.350 (0.014)	0.610 (0.024)	0.350 (0.014)	0.610 (0.024)
2010	5.080 (0.200)	2.540 (0.100)					
2512	6.300 (0.248)	3.300 (0.130)					

Note

- Model P0805 having the same size than P0705 and the same performances, only codification of P0805 remains

SUGGESTED LAND PATTERN (to IPC-7351A)



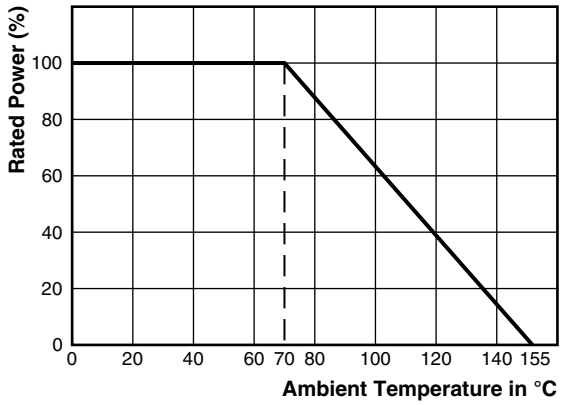
CHIP SIZE	**DIMENSIONS** in millimeters (inches)		
	$Z_{max.}$	$G_{min.}$	$X_{max.}$
0402	1.55 (0.061)	0.15 (0.006)	0.73 (0.029)
0505	1.82 (0.072)	0.10 (0.004)	1.40 (0.055)
0603	2.37 (0.093)	0.35 (0.014)	0.98 (0.039)
0805	2.76 (0.109)	0.74 (0.029)	1.40 (0.055)
1005	3.39 (0.133)	1.37 (0.054)	1.40 (0.055)
1206	3.91 (0.154)	1.85 (0.073)	1.73 (0.068)
1505	4.66 (0.183)	2.44 (0.096)	1.45 (0.057)
2010	5.93 (0.233)	3.71 (0.146)	2.67 (0.105)
2512	7.15 (0.281)	4.93 (0.194)	3.43 (0.135)

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TEMPERATURE COEFFICIENT		
TCR	CODE	FILM
± 5 ppm/°C	C (-55 °C; +155 °C)	NiCr
± 5 ppm/°C	Z (0 °C; +70 °C)	NiCr
± 10 ppm/°C	Y	NiCr
± 25 ppm/°C	E	NiCr
± 50 ppm/°C	H	NiCr or CrSi
± 100 ppm/°C	K	NiCr or CrSi

POWER DERATING CURVE



BEST TOLERANCE AND TCR VS. OHMIC VALUE			
STYLE	RANGE (Ω)	TOLERANCE (± %)	TCR CODE
0402	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 67K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 67K to 200K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 200K to 341K	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 341K to 1M	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
0505	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 187K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 187K to 260K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 260K to 400K	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 400K to 4M	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
0603	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 160K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 160K to 332K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 332K to 500K	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 500K to 3M2	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
0805	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 360K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 360K to 511K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 511K to 750K	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 750K to 8M	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K

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BEST TOLERANCE AND TCR VS. OHMIC VALUE			
STYLE	**RANGE (Ω)**	**TOLERANCE (± %)**	**TCR CODE**
1005	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 400K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 400K to 550K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 550K to 810K	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 810K to 7M5	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
1206	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 1M3	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 1M3 to 2M	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 2M to 3M5	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 3M5 to 22M	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
1505	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to 720K	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 720K to 1M	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 1M to 1M5	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 1M5 to 13M8	0.1; 0.25; 0.5; 1; 2; 5 (1)	H; K
2010	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to < 3M8	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 3M8 to 5M	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 5M to 7M5	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 7M5 to 25M	0.1; 0.25; 0.5; 1; 2; 5	H; K
	> 25M to 50M	0.25; 0.5; 1; 2; 5	H; K
	> 50M to 62M	0.5; 1; 2; 5	H; K
2512	10 to < 50	0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	50 to < 100	0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	100 to < 250	0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	250 to < 6M4	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	C; Z; Y; E; H; K
	> 6M4 to 8M6	0.01; 0.02; 0.05; 0.1; 0.25; 0.5; 1; 2; 5	Z; Y; E; H; K
	> 8M6 to 12M9	0.05; 0.1; 0.25; 0.5; 1; 2; 5	E; H; K
	> 12M9 to 25M	0.1; 0.25; 0.5; 1; 2; 5	H; K
	> 25M to 50M	0.25; 0.5; 1; 2; 5	H; K
	> 50M to 86M	0.5; 1; 2; 5	H; K

Note

(1) Tolerance 0.05 % on request

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POPULAR OPTIONS

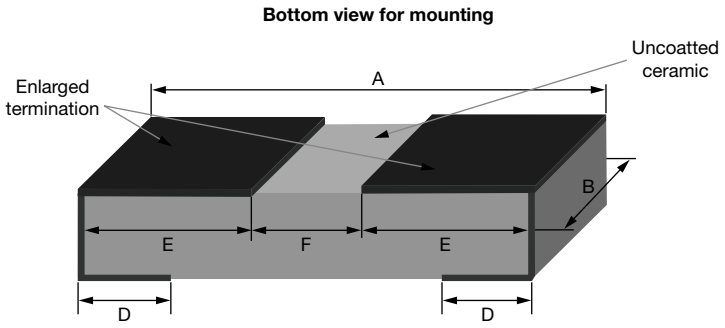
For any option it is recommended to consult Vishay Sfernice for availability first.

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.

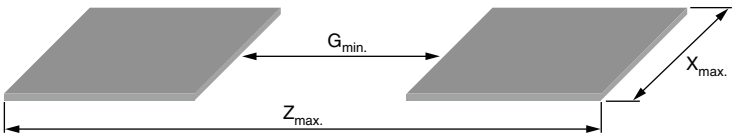
Option to order 0063: (applies to size 1206 / 1505 / 2010 / 2512).

DIMENSIONS (Option 0063) in millimeters



CASE SIZE	A	B	D	E	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
1505	3.81	1.32	0.48	1.59			
2010	5.08	2.54		2.215			
2512	6.30	3.30		2.835			

SUGGESTED LAND PATTERN (Option 0063)



CHIP SIZE	DIMENSIONS (IN MILLIMETER)		
	$Z_{max.}$	$G_{min.}$	$X_{max.}$
1206	3.91	0.50	1.73
1505	4.66		1.45
2010	5.93		2.67
2512	7.15		3.43

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Option: Marking

Option to order 0013:
Marking of ohmic value and tolerance:
Sizes: 0805 to 1005: 3 digits marking according to IEC 60062
Sizes: 1206 to 2512: 4 digits marking according to IEC 60062
Tolerance indicated according to IEC 60062.
Option to order 0014:
Marking of ohmic value:
Sizes: 0805 to 1005: 3 digits marking according to IEC 60062
Sizes: 1206 to 2512: 4 digits marking according to IEC 60062
No standard marking available for smaller sizes.
A price adder will apply to the unit price of the parts for options 0013 and 0014.

Option: Moisture Resistance Test 85/85

For moisture resistance test only.
Option to order 0058: for tolerance ≥ 0.02 %
Specific production process to withstand 85 °C/85 % at Pn/10

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	340	100	5000	8 mm
0505		100		4000	
0603				5000	
0805				4000	
1005		221			
1206		140			
1505		60			12 mm
2010				2000	
2512		50			

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

See Part Numbering information to get the quantity desired by tape.

PERFORMANCE

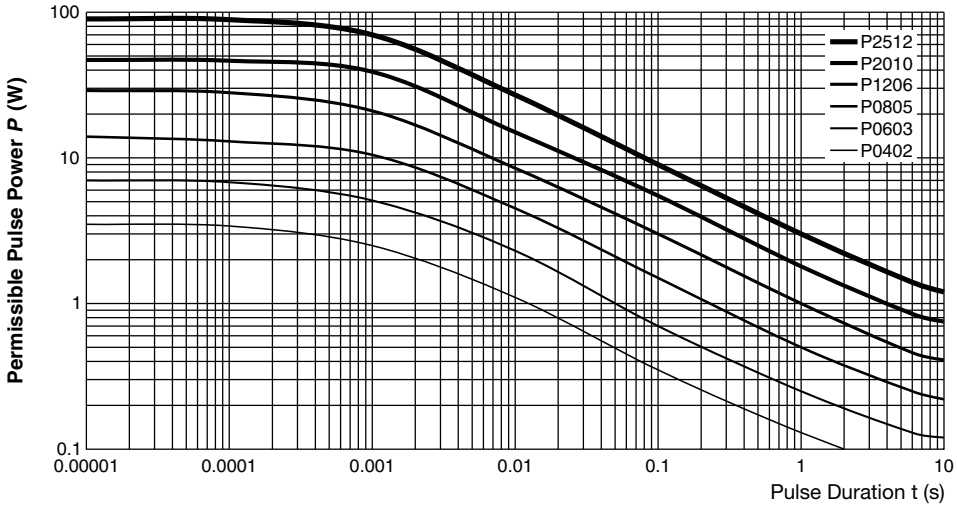
TESTS	CONDITIONS	MIL OR CECC REQUIREMENTS	TYPICAL PERFORMANCES
Thermal shock	MIL-PRF-55342G MIL-STD-202 F-Method 107 F	± 0.05 %	± 0.02 %
Short time overload	MIL-PRF-55342G PARA 3.10.4.7.5	± 0.05 %	± 0.01 %
Low temperature operation	MIL-PRF-55342G PARA 3.9 and 4.7.4	± 0.05 %	± 0.01 %
Resistance to solder heat	MIL-PRF-55342G PARA 3.12, 4.7.7, 4.7.1.2	± 0.05 %	± 0.03 %
Moisture resistance	MIL-PRF-55342G PARA 3.13 and 4.7.8 MIL-STD-202 F-Method 106 E	± 0.10 %	± 0.01 %
	CECC 56 days/40 °C/93 % RH	± 0.10 %	± 0.01 %
	AEC-Q200 (1) 85 °C/85 % RH/Pn/10, 1000 h	± 0.5 % + 0.05 Ω	Max. < 0.3 % + 0.05 Ω
High temperature	MIL-PRF-55342G PARA 3.11 and 4.7.6	± 0.05 %	± 0.05 %
Load life	MIL-PRF-55342G 8000 h Pn at 70 °C MIL-STD-202 F-Method 108 A	± 0.5 %	± 0.1 % (2)

Notes

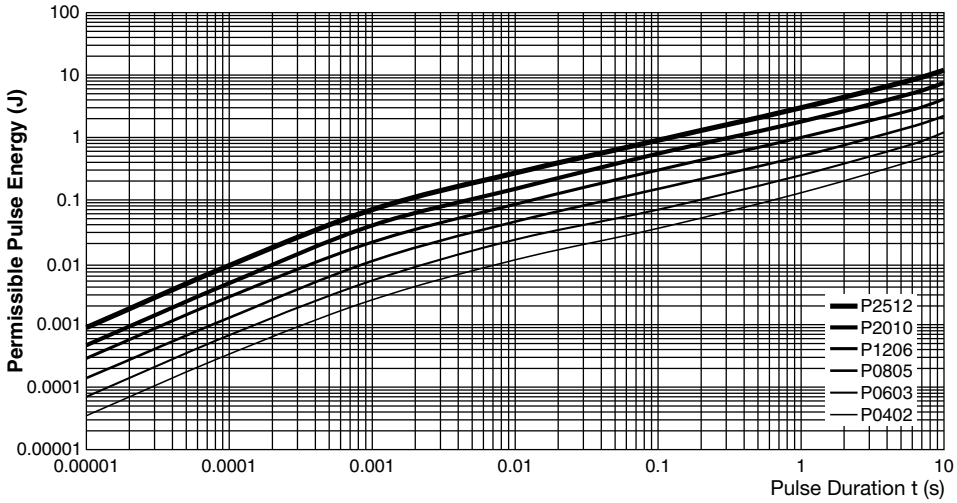
(1) Option to order 0058
(2) Typical drift ± 0.02 % at Pd

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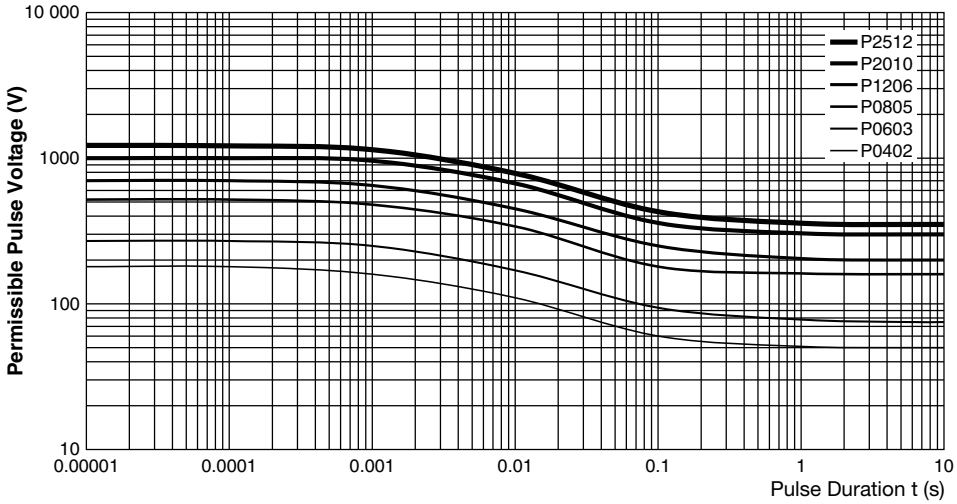
Maximum permissible pulse load P_i max. for single pulse (1)



Energy for single pulse (1)



Maximum permissible pulse voltage U_i max. for single pulse (1)

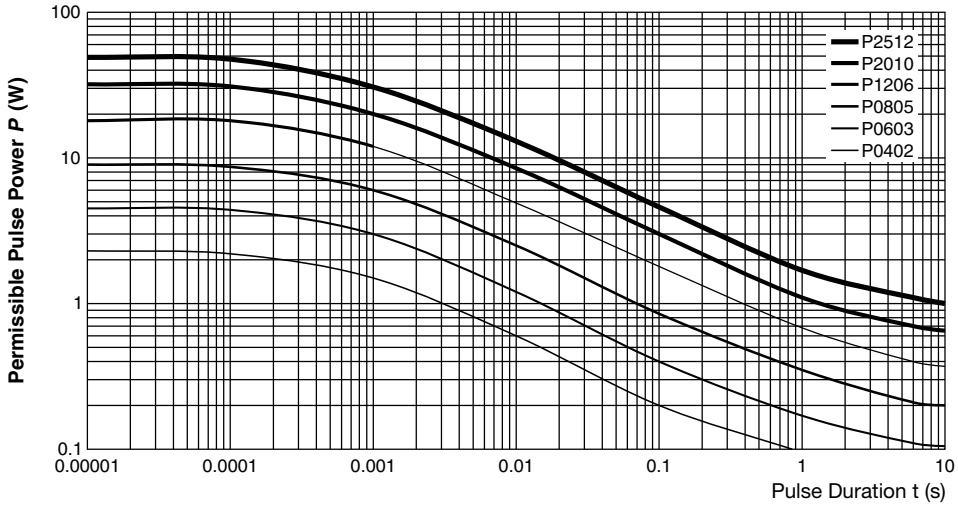


Note

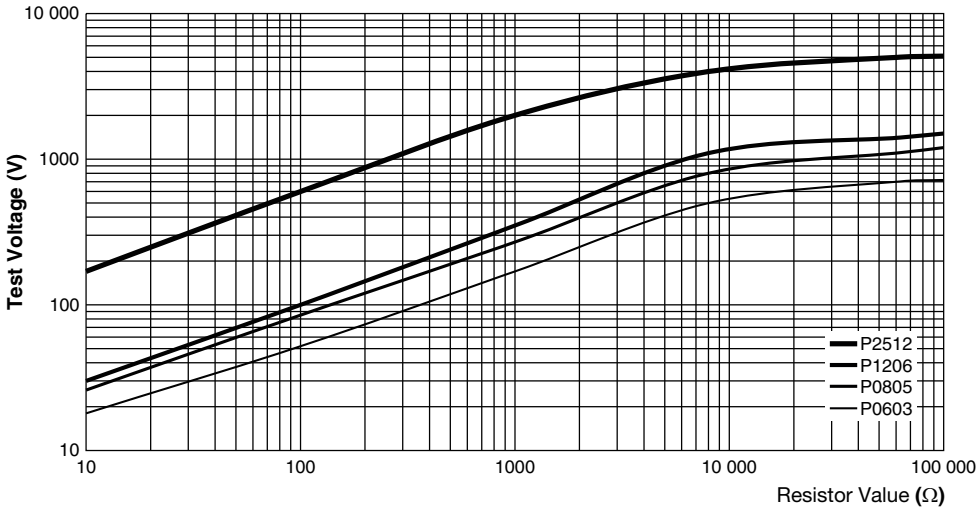
(1) One should apply the data mentioned on the 3 curves together to get the right performances

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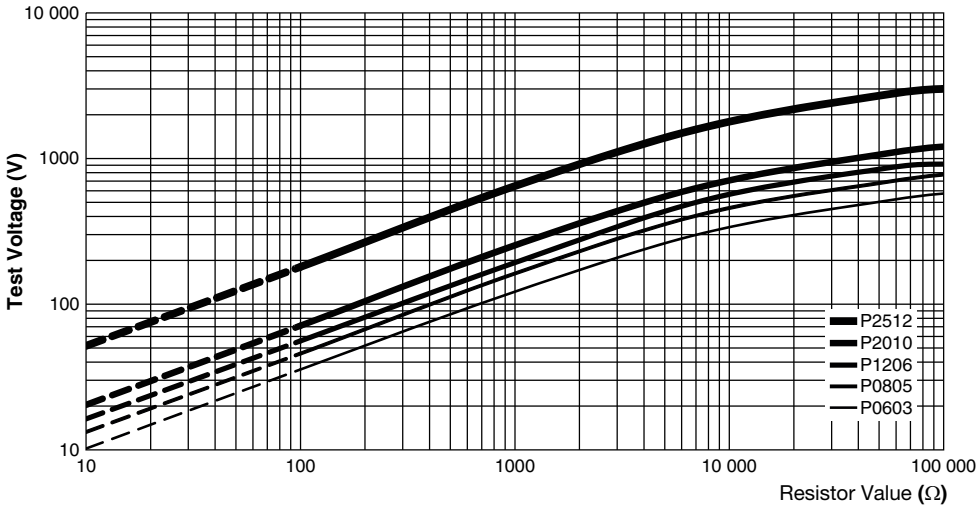
Maximum permissible pulse load P_l max.



1.2/50 µs lightning surge



10/700 µs lightning surge



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GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: P0505Y1003BBT0999

P	0	5	0	5	Y	1	0	0	3	B	B	T		9	9	9

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION
P	**0402** **0505** **0603** **0805** **1005** **1206** **1505** **2010** **2512**	**K** = ± 100 ppm/°C **H** = ± 50 ppm/°C **E** = ± 25 ppm/°C **Y** = ± 10 ppm/°C **Z** = ± 5 ppm (0 °C; +70 °C) **C** = ± 5 ppm (- 55 °C; + 155 °C)	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	**L** = ± 0.01 % **P** = ± 0.02 % **W** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**B**: SnPb over nickel barrier **N**: SnAg over nickel barrier **G**: gold over nickel barrier **B**: lead bearing version **N** and **G**: lead (Pb)-free/RoHS version	For more information see "Codification of packaging" table	From 1 to 3 digits, leave blank if no option

Historical Part Number Examples:

P1206Y1001LNT100 (tapes of 100 pieces)
P1206H7151FBT250 (tapes of 250 pieces)
P1206Y1503WNT1K032 (tapes of 1000 pieces and option 32)
P1206Y2372BG (waffle pack)

Historical part numbers are not recommended, but can still be used for ordering.

CODIFICATION OF PACKAGING

CODE 18	PACKAGING
WAFFLE PACK	
W	100 min., 1 mult.
WA	100 min., 100 mult. (available only in 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	2500 min., 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 other sizes)	
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)	2500 min., 2500 mult.
PF (not available for size 0402)	Full tape (quantity depending on size of chips)

Notes

- For CECC qualified, see RV datasheet (www.vishay.com/doc?60022)
- For ESCC qualified, see PHR datasheet (www.vishay.com/doc?53037) or PFRR datasheet (www.vishay.com/doc?53046)
- For high temperature (230 °C), see PHT datasheet (www.vishay.com/doc?53050)
- For very high temperature (270 °C), see PVHT datasheet (www.vishay.com/doc?53060)
- For strap (0 Ω), see PZR datasheet (www.vishay.com/doc?53053)

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