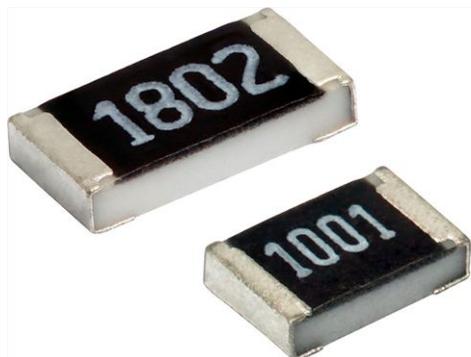


Lead (Pb)-Bearing Thick Film Chip Resistors with CECC Approval, Available with Established Reliability



FEATURES

- IECQ-CECC approved to EN 140401-802, version E, with established reliability, failure rate level E6
- IECQ-CECC approved to EN 140401-802, version A, without failure rate level
- SnPb termination plating on Ni barrier, minimum 10 % Pb
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

- Military
- Avionics
- Industrial

TECHNICAL SPECIFICATIONS		
DESCRIPTION	D12 EN802 ..	D25 EN802 ..
Imperial size	0805	1206
Metric size code (EN/CECC style)	RR2012M	RR3216M
Resistance range	1 Ω to 1 M Ω ; 0 Ω	
Resistance tolerance	$\pm 5\%$, $\pm 1\%$	
Temperature coefficient	± 200 ppm/K, ± 100 ppm/K, ± 50 ppm/K	
Rated dissipation, P_{70}	0.125 W	0.25 W
Operating voltage, U_{max} . AC _{RMS} or DC	150 V	200 V
Permissible film temperature, ϑ_F max.	125 °C	
Operating temperature range	-55 °C to 125 °C	
Max. resistance change at P_{70} for resistance, $ \Delta R/R $ max. after:	$\pm 1\%$ tolerance products: 10 Ω to 1 M Ω	
1000 h	$\leq 1\%$	
8000 h	$\leq 2\%$	
Insulation resistance	≥ 1 G Ω	
Permissible voltage against ambient (insulation):		
1 min; U_{ins}	200 V	300 V

Notes

- Specifications given for a product description ending “EN802 ..” apply likewise to both product versions, the “Version A”, whose description ends with “EN802 E0” and the “Version E”, whose description ends with “EN802 E6”.
- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

TECHNICAL SPECIFICATIONS for “Version A”		
DESCRIPTION	D12 EN802 E0	D25 EN802 E0
Nominal failure rate level	E0	
Quality factor, π_Q	3	
Failure rate, FIT _{observed}	$< 0.1 \times 10^{-9}/h$	

TECHNICAL SPECIFICATIONS for “Version E”		
DESCRIPTION	D12 EN802 E6	D25 EN802 E6
Assessed failure rate level	E6 = $10^{-6}/h$	
Quality factor, π_Q	0.3	
Failure rate, FIT _{observed}	$< 0.1 \times 10^{-9}/h$	

Note

- Failure rate level E6 ($10^{-6}/h$, $\pi_Q = 0.3$), equivalent to MIL level P, is superior to level E5 ($10^{-5}/h$, $\pi_Q = 1$) and thus can be used as a replacement.



TEMPERATURE COEFFICIENT AND RESISTANCE RANGE				
TYPE / SIZE	TCR	TOLERANCE	RESISTANCE	E-SERIES
D12 EN802 E0	± 200 ppm/K	± 5 %	1 Ω to 1 MΩ	E24
	± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	E24; E96
	± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	E24; E96
	Jumper ⁽²⁾ ; I _{max.} = 1.5 A	≤ 20 mΩ	0 Ω	-
D12 EN802 E6 ⁽¹⁾	± 200 ppm/K	± 5 %	1 Ω to 9.1 Ω	E24
	± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	E96
	± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	E96
	Jumper ⁽²⁾ ; I _{max.} = 1.5 A	≤ 20 mΩ	0 Ω	-
D25 EN802 E0	± 200 ppm/K	± 5 %	1 Ω to 1 MΩ	E24
	± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	E24; E96
	± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	E24; E96
	Jumper ⁽²⁾ ; I _{max.} = 2 A	≤ 20 mΩ	0 Ω	-
D25 EN802 E6 ⁽¹⁾	± 200 ppm/K	± 5 %	1 Ω to 9.1 Ω	E24
	± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	E96
	± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	E96
	Jumper ⁽²⁾ ; I _{max.} = 2 A	≤ 20 mΩ	0 Ω	-

Notes

- (1) Other TCR or tolerances, or combinations thereof, or resistance values from other E-series than given are not permitted in EN 140401-802 for version E products.
- (2) The temperature coefficient of resistance (TCR) is not specified for 0 Ω jumpers.

PACKAGING						
TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS
D12 EN802 E6	P1	1000	Paper tape acc. IEC 60286-3, Type 1a, on reel	8 mm	4 mm	Ø 180 mm / 7"
D12 EN802 ..	P5	5000				Ø 285 mm / 11 1/4"
	P0	10 000				Ø 180 mm / 7"
D25 EN802 E6	P1	1000				Ø 180 mm / 7"
D25 EN802 ..	P5	5000				Ø 285 mm / 11 1/4"
	P0	10 000				



PART NUMBER AND PRODUCT DESCRIPTION																	
Part Number: D1208050B5620FP5E6																	
Part Number for Zero Ohm Jumpers: D120805000000P5E6																	
D	1	2	0	8	0	5	0	B	5	6	2	0	F	P	5	E	6
D	1	2	0	8	0	5	0	0	0	0	0	0	0	P	5	E	6
TYPE / SIZE	VERSION	TCR	RESISTANCE	TOLERANCE	PACKAGING	SPECIAL											
D120805 D251206	0 = Neutral	C = ± 50 ppm/K B = ± 100 ppm/K A = ± 200 ppm/K 0 = jumper	3 digit value 1 digit multiplier MULTIPLIER 8 = *10 ⁻² 9 = *10 ⁻¹ 0 = *10 ⁰ 1 = *10 ¹ 2 = *10 ² 3 = *10 ³ 4 = *10 ⁴ 0000 = jumper	F = ± 1 % J = ± 5 % 0 = jumper	P1 P5 P0	EN 140401-802 E6 EN 140401-802 E0											
Product Description: D12 100 562R 1 % P5 EN802 E6																	
Product Description for Zero Ohm Jumpers: D12 0R0 P5 EN802 E6																	
D12	100	562R	1 %	P5	EN802	E6											
D12	-	0R0	-	P5	EN802	E6											
TYPE / SIZE	TCR	RESISTANCE	TOLERANCE	PACKAGING	SPECIFICATION	FAILURE RATE LEVEL											
D12 D25	± 50 ppm/K ± 100 ppm/K ± 200 ppm/K	10R = 10 Ω 562R = 562 Ω 10K = 10 kΩ 1M = 1 MΩ 0R0 = jumper	± 1 % ± 5 %	P1 P5 P0	EN 140401-802	E6 E0											

EN 140401-802 ORDERING INFORMATION	
Example of the ordering information for a resistor: D12 100 562R 1 % EN802 E6	
EN140401-802EZRR2012MS562RFE6	
The elements used in the component number have the following meaning:	
EN140401-802	EN detail specification number
EZ	Assessment level for the zero-defect approach
RR2012M	Style
S	Temperature coefficient, according to EN 60062 U = ± 200 ppm/K; S = ± 100 ppm/K; R = ± 50 ppm/K
562R	Resistance value, according to EN 60062, 4 characters
F	Tolerance on rated resistance, according to EN 60062 J = ± 5 %; F = ± 1 %
E6	Failure rate level according to EN 60115-1, table ZB.1 for "version A" the nominal failure rate level is E0
Please note that the EN 140401-802 ordering information is not specific to the nature of the termination plating.	

- Note**
- The ordering information according to EN 140401-802: 2007 shown above succeeds and replaces the ordering information according to earlier versions of the detail specification EN 140401-802 or its predecessor CECC 40401-802, for example:
 - CECC 40401-802 EZ RR2012M B 562R F E6
 - CECC 40401-802 S RR2012 B 562R F E6
 - with
 - EZ; S Assessment level, where EZ is successor to and superior replacement for S
 - RR2012M; RR2012 Style, with suffix M for "metric"
 - B Temperature coefficient, according to the detail specification
 - A = ± 200 ppm/K; B = ± 100 ppm/K; C = ± 50 ppm/K



DESCRIPTION

Production follows a set of instructions established for reproducibility. A thick film layer and a glass-over are deposited on a high grade ceramic substrate (Al_2O_3) with its prepared inner contacts. The target value is achieved by laser cutting an L shaped groove in the resistive layer. The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final SnPb on nickel plating, controlled for a minimum lead content of 10 %. A four-character code marking designates the resistance value in accordance with **IEC 60062** ⁽¹⁾.

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are placed into the paper tape according to **IEC 60286-3** ⁽¹⁾, **type 1a**.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1** ⁽¹⁾. Solderability is specified for 2 years after production.

The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings, potting compounds, and their processes, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein ⁽²⁾
- The Global Automotive Declarable Substance List (GADSL) ⁽³⁾
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) ⁽⁴⁾ for its supply chain

Except for the intentionally added lead (Pb) in the termination finish, the products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

APPROVALS

The resistors are approved within the **IECQ-CECC** Quality Assessment System for Electronic Components to the detail specification **EN 140401-802** which refers to **EN 60115-1**, **EN 60115-8** and the variety of environmental test procedures of the **IEC 60068** ⁽¹⁾ series.

Conformity is attested by the use of the **CECC** logo () as the Mark of Conformity on the package label.

The Vishay Draloric production facility is registered with the CAGE code SH903.

RELATED PRODUCTS

A parallel family of lead (Pb)-free thick film chip resistors with CECC approval, available with established reliability, is available, see datasheet:

- “CRCW... EN802 - Thick Film Chip Resistors with CECC Approval, available with Established Reliability”
(www.vishay.com/doc?28806)

A wider range of product sizes, TCR, tolerance and resistance values, plus the option of values from a different E series is available without approval to any EN specification (quality factor $\pi_Q = 10$). See the datasheets:

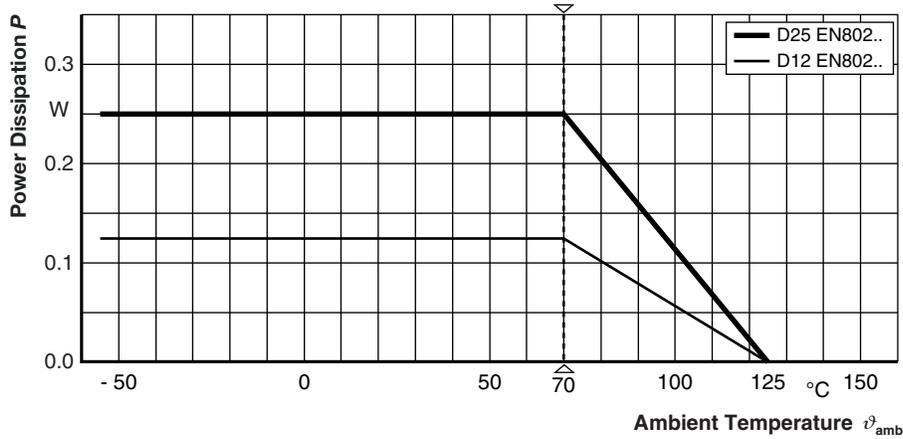
- “D/CRCW e3 - Standard Thick Film Chip Resistors”
(www.vishay.com/doc?20035)
- “D/CRCW - Lead (Pb)-Bearing Thick Film, Rectangular Chip Resistors”
(www.vishay.com/doc?20008)

Notes

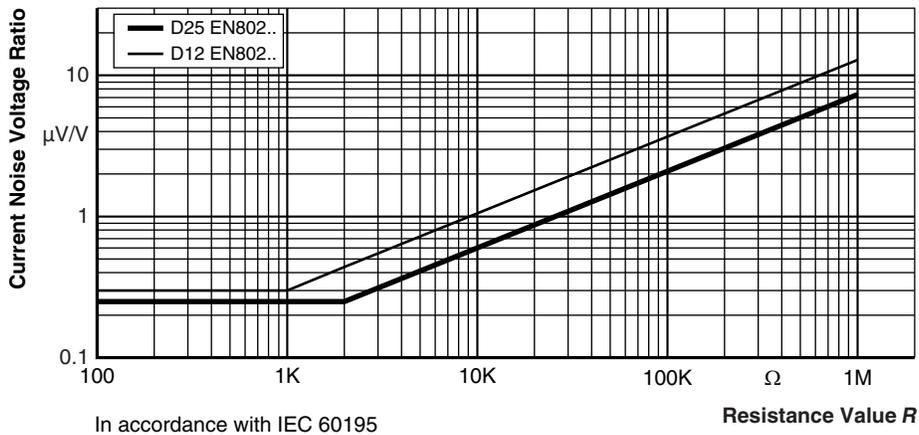
- ⁽¹⁾ The quoted IEC standards are also released as EN standards with the same number and identical contents.
- ⁽²⁾ The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>.
- ⁽³⁾ The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council, and available at www.gadsl.org.
- ⁽⁴⁾ The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>.



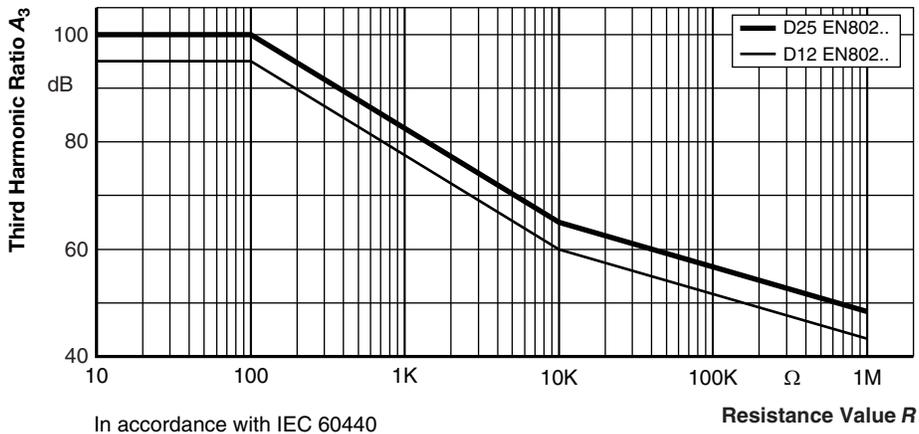
FUNCTIONAL PERFORMANCE



Derating



Current Noise Voltage Ratio



Non-Linearity - Third Harmonic Ratio A_3



TESTS AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:

- EN 60115-1, generic specification
- EN 60115-8 (successor of EN 140400), sectional specification
- EN 140401-802, detail specification
- IEC 60068-2-xx ⁽¹⁾, test methods

The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-802. The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/ECA-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1 ⁽¹⁾, 4.5, whereupon the following values are applied:

- Temperature: 15 °C to 35 °C
- Relative humidity: 25 % to 75 %
- Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on printed-circuit boards in accordance with EN 60115-8, 2.4.2, unless otherwise specified.

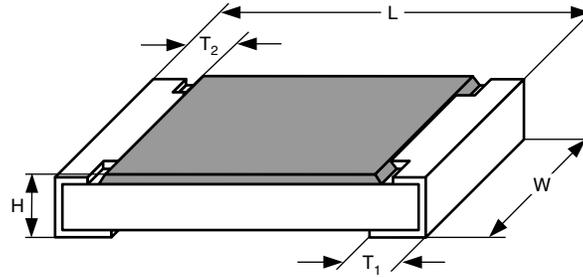
TEST PROCEDURES AND REQUIREMENTS						
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)		
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER	
				Stability for product types:		
			D12 EN802.. D25 EN802..	10 Ω to 1 M Ω	1.0 Ω to 1 M Ω	
4.5	-	Resistance	-	$\pm 1 \%$	$\pm 5 \%$	
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$; 60 s	No flashover or breakdown		
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70}} \times R \leq 2 \times U_{max.}$; duration according to style D12: 1 s; D25: 2 s	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$	
4.17	58 (Td)	Solderability	Solder bath method; Sn60Pb40; non-activated flux (235 \pm 5) °C; (2 \pm 0.2) s	Good tinning ($\geq 95 \%$ covered); no visible damage		
4.8	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C	± 50 ppm/K; ± 100 ppm/K	± 200 ppm/K	
4.32	21 (Ue ₃)	Shear (adhesion)	45 N	No visible damage		
4.33	21 (Ue ₁)	Substrate bending	Depth 2 mm, 3 times	No visible damage; no open circuit in bent position		
				$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$	
4.19	14 (Na)	Rapid change of temperature	30 min at - 55 °C 30 min at 125 °C	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$	
			5 cycles			$\pm (1 \% R + 0.05 \Omega)$
			1000 cycles			



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
				Stability for product types:	
			D12 EN802.. D25 EN802..	10 Ω to 1 M Ω	1.0 Ω to 1 M Ω
4.23		Climatic sequence:			
4.23.2	2 (Bb)	Dry heat	125 °C; 16 h		
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 1 cycle		
4.23.4	1 (Ab)	Cold	- 55 °C; 2 h	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.23.5	13 (M)	Low air pressure	1 kPa; (25 \pm 10) °C; 1 h		
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 5 cycles		
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1 min		
4.25.1	-	Endurance at 70 °C	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h	$\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$ $\pm (4 \% R + 0.1 \Omega)$
4.18	58 (Td)	Resistance to soldering heat	Solder bath method; (260 \pm 5) °C; (10 \pm 1) s	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
4.35	-	Flammability, needle flame test	IEC 60695-11-5 ⁽¹⁾ , 10 s	No burning after 30 s	
4.24	78 (Cab)	Damp heat, steady state	(40 \pm 2) °C (93 \pm 3) % RH; 56 days	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1 ⁽¹⁾ 3 pos. + 3 neg. discharges; Voltage acc. to style D12: 800 V; D25: 1000 V	$\pm (1 \% R + 0.05 \Omega)$	
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 °C; method 2	No visible damage	
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 °C; method 1, toothbrush	Marking legible, no visible damage	
4.22	6 (Fc)	Vibration, endurance by sweeping	$f = 10$ Hz to 2000 Hz; $x, y, z \leq 1.5$ mm; $A \leq 200$ m/s ² ; 10 sweeps per axis	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
4.39	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{max.}$; 0.1 s on; 2.5 s off; 1000 cycles	$\pm (1 \% R + 0.05 \Omega)$	
4.27	-	Single pulse high voltage overload; 10 μ s/700 μ s	$U = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; 10 pulses	$\pm (1 \% R + 0.05 \Omega)$	

Note

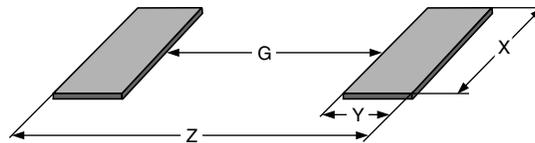
⁽¹⁾ The quoted IEC standards are also released as EN standards with the same number and identical contents.

DIMENSIONS


DIMENSIONS AND MASS						
TYPE / SIZE	L (mm)	W (mm)	H (mm)	T ₁ (mm)	T ₂ (mm)	MASS (mg)
D12 EN802..	2.00 ± 0.15	1.25 ± 0.15	0.5 ± 0.15	0.40 ± 0.20	0.40 ± 0.20	≤ 5.5
D25 EN802..	3.20 ± 0.15	1.60 ± 0.15	0.5 ± 0.15	0.50 ± 0.25	0.50 ± 0.25	≤ 10

Notes

- The resistors are marked using the four-character code system of IEC 60062 ⁽¹⁾ on their black protective coating.
- ⁽¹⁾ The quoted IEC standards are also released as EN standards with the same number and identical contents.



RECOMMENDED SOLDER PAD DIMENSIONS								
TYPE / SIZE	WAVE SOLDERING				REFLOW SOLDERING			
	G (mm)	Y (mm)	X (mm)	Z (mm)	G (mm)	Y (mm)	X (mm)	Z (mm)
D12 EN802..	0.65	1.40	1.50	3.45	0.65	1.10	1.40	2.85
D25 EN802..	1.50	1.60	1.90	4.70	1.50	1.25	1.75	4.00



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.