

Wet Tantalum Hybrid Capacitors, High Energy, Ultra High Capacitance, -55 °C to +125 °C Operation



FEATURES

- High energy, very high capacitance design
- All tantalum, hermetically-sealed case
- Utilizes Vishay-proven SuperTan® technology
- 2 termination options: SMD and SMD / radial combination
- Approved to DLA land and maritime drawing 26001

PERFORMANCE CHARACTERISTICS

Operating Temperature:

-55 °C to +85 °C (to +125 °C with voltage derating)

Capacitance Tolerance:

at 120 Hz, +25 °C ± 20 % standard
± 10 % available as special

DC Leakage Current (DCL Max.):

at +25 °C: leakage current shall not exceed the values listed in the Standard Ratings table.

Life Test:

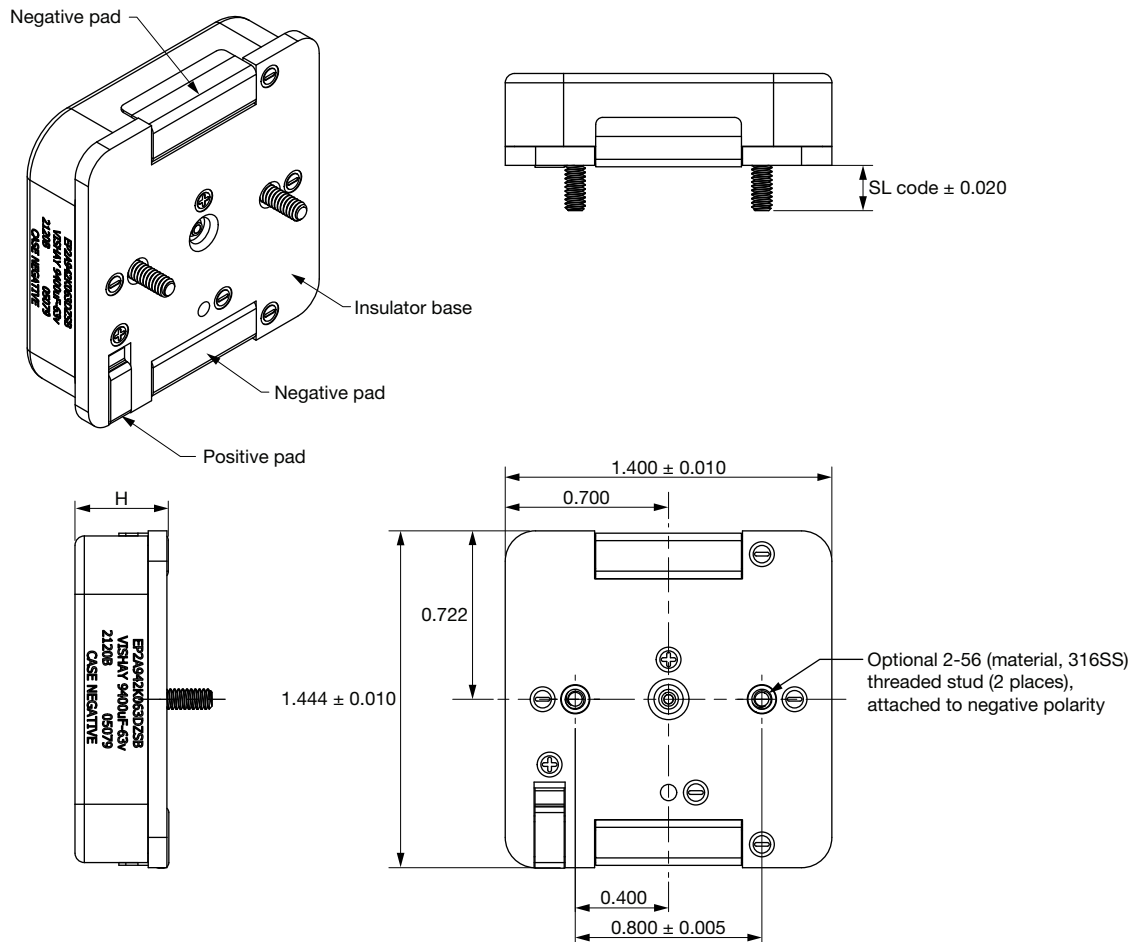
capacitors are capable of withstanding a 2000 h life test at a temperature of +85 °C at the applicable rated DC working voltage.

ORDERING INFORMATION				
26001 DLA DRAWING NUMBER	-01 DASH NUMBER See Standard Ratings table	K CAPACITANCE TOLERANCE K = ± 10 % ⁽¹⁾ M = ± 20 %	LETTER O / N TO Z OPTIONAL CENTER LEAD LENGTH O = SMD no leads Z = standard See TL table in Dimensions	Blank / G TO L OPTIONAL STUD MOUNT Blank = no stud See SL table in Dimensions

Note

⁽¹⁾ Contact marketing for availability

DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	DRAWING NUMBER 26001
---	--------------------------------

**DIMENSIONS in inches [millimeters]
BASE - SMD TERMINATION WITH AND WITHOUT STUDS**


CASE SIZE	H
A	0.402 ± 0.015 [10.21 ± 0.38]
B	0.540 ± 0.015 [13.72 ± 0.38]
C	0.690 ± 0.015 [17.53 ± 0.38]
D	0.845 ± 0.015 [21.46 ± 0.38]

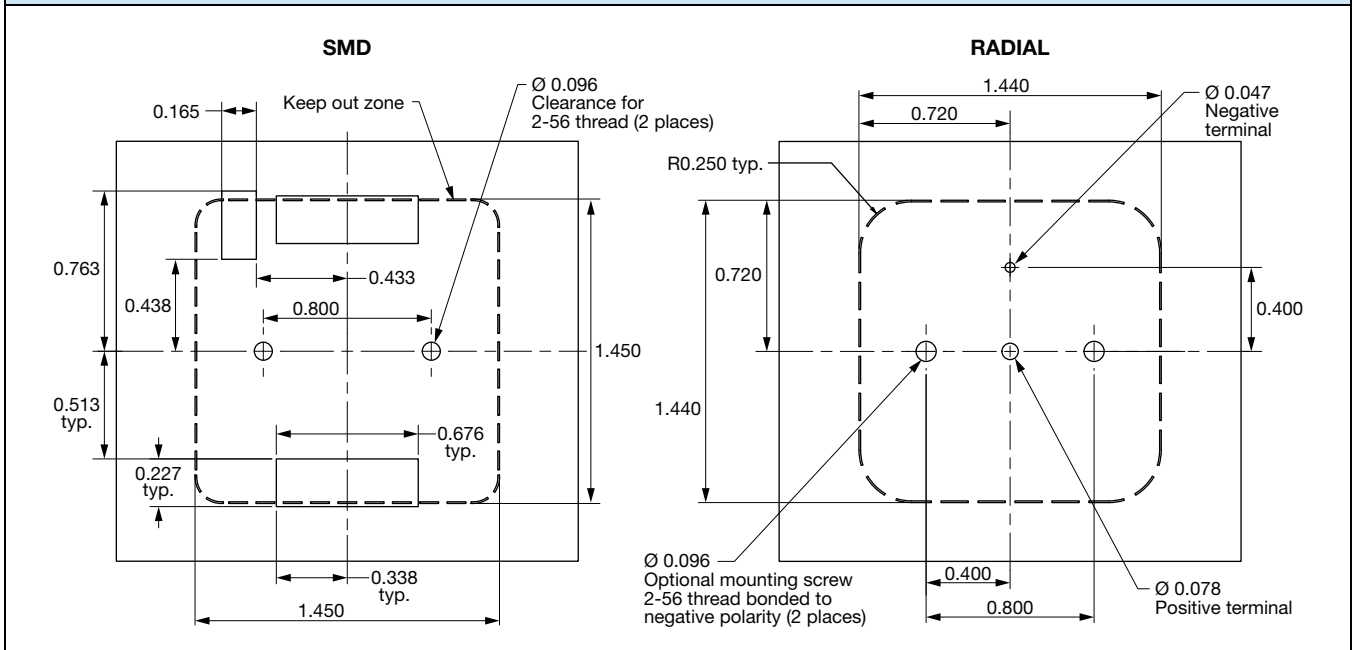
POSITIVE TERMINAL LENGTH CODE [TL]	LENGTH
O	No termination

MOUNTING STUDS LENGTH CODE [SL]	LENGTH
None	Blank
G	0.21 [5.33]
H	0.27 [6.86]
I	0.40 [10.16]
J	0.15 [3.81]
K	0.18 [4.57]
L	0.35 [8.89]

Notes

- SMD terminations are tin / lead
- EP2 base pad layout is in full compliance to EP1 base. Base weight is ~ 8 g
- Stainless steel hex nuts, 2-56 thread size, are provided with studs

PAD LAYOUT WITH MINIMUM PTH DIAMETERS FOR SMD AND RADIAL TERMINATIONS





STANDARD RATINGS						
CAPACITANCE (μF)	CASE CODE	PART NUMBER	MAX. ESR AT +25 °C, 1 kHz (Ω)	MAX. DCL AT +25 °C (μA)	MAX. DCL AT +85 °C (mA)	WEIGHT (g)
25 V_{DC} AT +85 °C; 15 V_{DC} AT +125 °C, SURGE VOLTAGE = 27.5 V_{DC}						
24 000	A ⁽¹⁾	26001-01	0.030	150	n/a	-
30 000	A ⁽¹⁾	26001-02	0.035	200	2.0	60
48 000	B ⁽¹⁾	26001-03	0.020	250	2.0	80
72 000	C ⁽¹⁾	26001-04	0.015	350	2.5	108
96 000	D ⁽¹⁾	26001-05	0.012	450	3.0	134
35 V_{DC} AT +85 °C; 21 V_{DC} AT +125 °C, SURGE VOLTAGE = 38.5 V_{DC}						
22 000	A ⁽¹⁾	26001-06	0.040	150	1.5	55
32 000	B ⁽¹⁾	26001-07	0.020	250	2.0	80
36 000	B ⁽¹⁾	26001-08	0.022	250	2.0	80
40 000	B ⁽¹⁾	26001-09	0.022	250	2.0	86
47 000	C ⁽¹⁾	26001-10	0.015	350	2.5	110
48 000	C ⁽¹⁾	26001-11	0.015	350	2.5	108
58 000	C	26001-12	0.017	350	3.0	125
70 000	D ⁽¹⁾	26001-13	0.012	450	3.5	134
50 V_{DC} AT +85 °C; 30 V_{DC} AT +125 °C, SURGE VOLTAGE = 55 V_{DC}						
11 000	A ⁽¹⁾	26001-14	0.050	150	n/a	-
12 000	A ⁽¹⁾	26001-15	0.055	100	1.0	60
13 000	A ⁽¹⁾	26001-16	0.060	100	1.0	65
17 000	B	26001-17	0.025	200	1.5	80
22 000	B ⁽¹⁾	26001-18	0.025	250	1.5	80
24 000	B ⁽¹⁾	26001-19	0.027	250	1.5	86
23 000	C	26001-20	0.017	200	2.5	109
33 000	C ⁽¹⁾	26001-21	0.017	350	2.0	108
34 000	C	26001-22	0.018	350	2.5	122
37 000	C	26001-23	0.020	350	2.5	122
44 000	D	26001-24	0.015	450	2.5	160
48 000	D ⁽¹⁾	26001-25	0.015	450	3.5	165
60 V_{DC} AT +85 °C; 38 V_{DC} AT +125 °C, SURGE VOLTAGE = 66 V_{DC}						
6300	A ⁽¹⁾	26001-26	0.050	100	1.0	60
12 600	B	26001-27	0.025	150	1.5	89
19 000	C	26001-28	0.017	250	2.5	115
25 000	D ⁽¹⁾	26001-29	0.015	450	3.0	145
63 V_{DC} AT +85 °C; 38 V_{DC} AT +125 °C, SURGE VOLTAGE = 69 V_{DC}						
6000	A	26001-30	0.050	100	1.0	60
9400	B	26001-31	0.025	150	1.5	86
11 000	B	26001-32	0.025	150	1.5	90
12 000	B	26001-33	0.025	150	1.5	90
13 000	B ⁽¹⁾	26001-34	0.025	150	1.5	92
14 000	C	26001-35	0.017	200	2.0	115
18 000	C	26001-36	0.020	250	2.5	120
24 000	D ⁽¹⁾	26001-37	0.018	450	3.0	160

Notes

- Everything possible is done to ensure the part meets the ESR requirements, but with the base, expect the ESR to be 1 m Ω to 2 m Ω higher. Slightly higher ESRs are acceptable.
- (1) Preliminary rating, specification subject to change. Contact marketing for availability



STANDARD RATINGS							
CAPACITANCE (μF)	CASE CODE	PART NUMBER	MAX. ESR AT +25 °C, 1 kHz (Ω)	MAX. DCL AT +25 °C (μA)	MAX. DCL AT +85 °C (mA)	WEIGHT (g)	
80 V_{DC} AT +85 °C; 48 V_{DC} AT +125 °C, SURGE VOLTAGE = 88 V_{DC}							
3000	A ⁽¹⁾	26001-38	0.055	100	n/a	-	-
4000	A	26001-39	0.055	100	1.0	60	60
6000	B	26001-40	0.027	150	1.5	86	86
7000	B ⁽¹⁾	26001-41	0.030	150	1.5	90	90
8000	B ⁽¹⁾	26001-42	0.030	200	2.0	90	90
9000	B ⁽¹⁾	26001-43	0.030	200	2.0	92	92
9000	C	26001-44	0.018	200	2.0	115	115
12 000	C ⁽¹⁾	26001-45	0.020	250	2.5	120	120
14 000	C ⁽¹⁾	26001-46	0.020	250	2.5	125	125
16 000	D ⁽¹⁾	26001-47	0.015	450	3.0	145	145
100 V_{DC} AT +85 °C; 60 V_{DC} AT +125 °C, SURGE VOLTAGE = 110 V_{DC}							
2200	A ⁽¹⁾	26001-48	0.065	100	n/a	-	-
3000	A	26001-49	0.065	125	1.3	65	65
4200	B ⁽¹⁾	26001-50	0.030	100	1.5	86	86
4400	B	26001-51	0.030	150	1.5	86	86
5800	B ⁽¹⁾	26001-52	0.035	150	1.5	90	90
6600	C ⁽¹⁾	26001-53	0.020	200	2.0	115	115
7900	C ⁽¹⁾	26001-54	0.025	250	2.5	125	125
9000	C ⁽¹⁾	26001-55	0.025	250	2.5	130	130
10 500	D ⁽¹⁾	26001-56	0.020	450	3.0	160	160
110 V_{DC} AT +85 °C; 66 V_{DC} AT +125 °C, SURGE VOLTAGE = 121 V_{DC}							
2000	A ⁽¹⁾	26001-57	0.085	100	n/a	60	60
2200	A ⁽¹⁾	26001-58	0.085	100	1.0	60	60
4000	B	26001-59	0.040	150	1.5	95	95
6000	C	26001-60	0.027	200	2.0	128	128
8000	D ⁽¹⁾	26001-61	0.020	450	3.0	150	150
125 V_{DC} AT +85 °C; 75 V_{DC} AT +125 °C, SURGE VOLTAGE = 137.5 V_{DC}							
1500	A ⁽¹⁾	26001-62	0.100	100	1.0	60	60
1900	A	26001-63	0.100	100	1.0	60	60
2000	A	26001-64	0.100	100	1.0	63	63
2700	B	26001-65	0.045	150	1.5	90	90
3000	B	26001-66	0.045	150	1.5	90	90
3600	B	26001-67	0.050	150	1.5	95	95
3800	B ⁽¹⁾	26001-68	0.050	150	1.5	95	95
3600	C ⁽¹⁾	26001-69	0.025	250	2.5	105	105
4500	C ⁽¹⁾	26001-70	0.025	250	2.5	120	120
5300	C ⁽¹⁾	26001-71	0.035	250	2.5	135	135
5600	C	26001-72	0.035	250	2.5	135	135
7000	D ⁽¹⁾	26001-73	0.025	450	3.0	150	150

Notes

- Everything possible is done to ensure the part meets the ESR requirements, but with the base, expect the ESR to be 1 m Ω to 2 m Ω higher. Slightly higher ESRs are acceptable.
- (1) Preliminary rating, specification subject to change. Contact marketing for availability

CHECK DLA 26001 DRAWING FOR CURRENT DLA-APPROVED RATINGS



PERFORMANCE CHARACTERISTICS OF HIGH ENERGY CAPACITORS

ELECTRICAL PERFORMANCE CHARACTERISTICS	
ITEM	PERFORMANCE CHARACTERISTICS
Operating temperature range	-55 °C to +85 °C (to +125 °C with voltage derating)
Capacitor tolerance	± 20 % at 120 Hz
ESR	Limits per Standard Ratings table
DC leakage current (DCL max.)	At 25 °C the leakage current shall not exceed values listed in the Standard Rating table
Reverse voltage	No continuous reverse voltage permitted
Surge voltage	The test shall be at 1000 cycles at surge voltage (110 % of rated) at 85 °C. A cycle consists of a 30 s charge and a 330 s discharge through 1000 Ω resistor.
Life test	2000 h at +85 °C (at rated voltage)

ENVIRONMENTAL CHARACTERISTICS		
ITEM	TEST AND CONDITIONS	COMMENTS
Seal	MIL-STD-202, method 112 C/IIIa	The capacitor shall be hermetically sealed such that the case does not leak electrolyte or vent any gas when exposed to a vacuum.
Moisture resistance	MIL-STD-202, method 106	6 V polarity
Barometric pressure (reduced) / altitude	MIL-STD-202, method 105 C, test condition D	100 000 feet test

MECHANICAL PERFORMANCE CHARACTERISTICS		
ITEM	TEST METHOD	CONDITION
Thermal shock	MIL-STD-202, method 107 G	Test condition A
Shock	MIL-STD-202, method 213 B	Test condition G 11 ms, 50 g
Vibration - high frequency	MIL-STD-202, method 204 D	Test condition D 12 sweeps/axis, 20 g peak
Vibration - random	MIL-STD-202, method 214	Test condition II, letter E 1.5 h/axis, 19.64 g
Resistance to solder heat	MIL-STD-202, method 210 F	The capacitor must withstand solder dipping of the terminals at 260 °C for 10 s. The capacitor must not be visibly damaged, and the electrical characteristics must not be affected.
Solderability	MIL-STD-202, method 208	ANSI/J-STD-002, test A
Terminal strength	MIL-STD-202, method 211 A	The capacitor terminals must withstand a 5 pound pull test for 5 s to 10 s. The capacitor must not be visibly damaged, and the electrical characteristics must not be affected.
Resistance to solvents	MIL-STD-202, method 215 J	The capacitor shall be permanently and legibly marked on the circumference of the case. The markings shall be resistant to solvents.
Fungus resistance		The capacitor materials shall not support fungus growth and shall not be a nutrient to fungus.
Weight (mass)		See "Standard Ratings" table



High Energy Mounting FAQs

Capacitors mounted using leads only are not recommended for applications experiencing mechanical shock or vibration. Mounting studs can be provided and/or staking compounds should be used in high vibration environments. With the large mass of this type of component, secure mounting to the printed circuit board (PCB) is crucial, and combining methods is often preferred.

- **Mounting studs:** provide the strongest hold, especially in vibration environments. Vishay offers 2-56 316SS studs as standard options.
- **Epoxy staking:** even with studs, we recommend epoxy staking the capacitor to the PCB for maximum vibration resistance. In some cases, potting the cavity between the PCB and the capacitor body might be necessary. For the most demanding shock/vibration applications, full potting may be required.

RECOMMENDATIONS

- When using the stud option, tighten the nuts on the studs only $\frac{1}{2}$ to $\frac{3}{4}$ turn beyond the initial point of contact, equivalent to 24 to 28 in-oz torque maximum. Maximum pre-load tension is about 15 pounds. Lock washers are not recommended. Use an adhesive locknut conforming to MIL-S-22473E, grade A - red.
- Handle the capacitor with care to avoid damaging the positive terminal Glass-to-Metal Seal (GTMS), which is a critical component for sealing and electrical performance. The tube should not be trimmed or bent; different tube lengths are available to meet your dimensional needs. Any force (lateral, axial, or torque) applied to the tube could cause damage, so it is important to minimize any mechanical shock to this area.

SOLDERING RECOMMENDATIONS

Do NOT run EP2 parts through a reflow oven. It will damage the capacitor.

WE RECOMMEND SECURING THE COMPONENT TO THE BOARD WITH STAKING COMPOUND AND / OR THE STUDS PRIOR TO SOLDERING.

- The capacitor rim is designed to directly mate with the PCB. “No-clean” flux is recommended for soldering. Post solder cleaning is not required for electrical or mechanical performance when “no-clean” flux is used and properly processed.
- Follow standard ANSI J-STD 001 through-hole soldering methods.

LEAD TRIMMING

- If negative lead trimming is necessary, handle the leads with care.
- Cutting the positive terminal is strictly prohibited as it may result in “OPEN” failure mode.
- Leads are available from 0.1" to 0.313" (measured from the capacitor rim).

ADDITIONAL NOTES

- Consider these guidelines as recommendations for optimal performance and component longevity.
- Specific application requirements may necessitate adjustments to these guidelines.



Hand Soldering EP2 Procedure

Due to the relatively large size, high thermal mass, and hermetically sealed construction of the EP2 capacitor, the traditional method of surface mounting using a reflow furnace is strongly discouraged when applied to EP2 units. The solder pad area required for EP2 capacitors is significantly larger than for other surface-mount components and therefore requires a proportionally larger amount of solder and longer heating times. In addition, the large thermal mass of the capacitor further increases the total heat exposure during assembly.

Heating the large solder pad area using a reflow furnace or other uncontrolled heating methods causes the entire printed circuit board and the EP2 capacitor body to be exposed to excessive heat for an extended duration. Such excessive or prolonged thermal exposure may result in mechanical deformation of the capacitor case, bulging, internal seal degradation, and in severe cases electrolyte leakage. These failure modes may occur immediately or present as latent reliability issues during field operation.

By comparison, manual (hand) soldering with a controlled soldering iron is the recommended assembly method for EP2 capacitors, as it allows localized heating, reduced dwell time, and significantly lower risk of thermal overstress. Manual soldering shall be performed only in accordance with the procedure defined below. Deviation from this procedure, excessive heating, or repeated soldering cycles may compromise capacitor integrity, performance, and long term reliability.

Mandatory Hand Soldering Procedure

1. Mount the EP2 capacitor to the printed circuit board and if there are studs on the part, use nuts to secure it prior to soldering. Mechanical fixation is preferred before any thermal process is applied.
2. Attach a 1/8" soldering iron tip. Use of larger tips or alternative heating tools is not recommended.
3. Set the soldering iron temperature to approximately 730 °F (388 °C). Excessive temperature or prolonged dwell time shall be avoided.
4. Wet the joints at the solder pads with an appropriate flux to promote rapid solder wetting and minimize heat exposure.
5. Solder by hand, feeding solder wire directly into the joint. Multiple heating cycles on the same terminal shall be avoided.
6. If needed for inspection, cosmetic reasons, or to remove visible flux residues, clean finished solder joints with an appropriate flux remover. When "no-clean" flux is used, cleaning is optional.
7. Inspect solder joints in accordance with the acceptability requirements of IPC A 610, section 5.



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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. 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.