VISHAY

www.vishay.com

EKE

Vishay Roederstein

Aluminum Capacitors
Radial Style

FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case
- Miniaturized, high CV-product per unit volume
- Low impedance
- Long lifetime
- Temperature range up to 105 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

APPLICATIONS

- General purpose, industrial, telecommunications, power supplies and audio-video
- Coupling, decoupling, timing, smoothing, filtering and buffering
- Portable and mobile units

QUICK REFERENCE DATA

DESCRIPTION	UNIT	VALUE		
Nominal case size (Ø D x L)	mm	5 x 11 to 18 x 40		
Rated capacitance range C_R	µF	0.22 to 15 000		
Capacitance tolerance	%	± 20		
Rated voltage range	V	6.3 to 450		
Category temperature range	°C	6.3 V to 350 V -40 to +105		400 V to 450 V -25 to +105
Load Life	h	5 x 11 to 6.3 x 11	8 x 11.5	10 x 12.5 to 18 x 40
$U_R \leq 100$ V		2000	3000	5000
$U_R > 100$ V		2000		
Based on sectional specification		IEC 60384-4 / EN 130300		
Climatic category IEC 60068		40 / 105 / 56		25 / 105 / 56

SELECTION CHART FOR C_R, U_R, AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

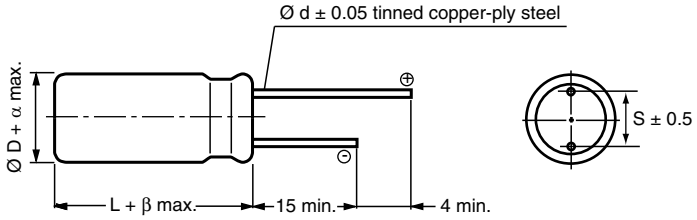
C_R (µF)	RATED VOLTAGE (V) (continuation see next page)							
	6.3	10	16	25	35	50	63	100
0.22	→	→	→	→	→	5 x 11	-	-
0.47	→	→	→	→	→	5 x 11	-	-
1.0	→	→	→	→	→	5 x 11	-	-
2.2	→	→	→	→	→	5 x 11	-	5 x 11
3.3	→	→	→	→	→	5 x 11	5 x 11	5 x 11
4.7	→	→	→	→	5 x 11	5 x 11	5 x 11	5 x 11
10	→	→	→	→	5 x 11	5 x 11	5 x 11	6.3 x 11
22	→	→	→	→	5 x 11	5 x 11	6.3 x 11	8 x 11.5
33	→	→	→	→	5 x 11	→	6.3 x 11	10 x 12.5
47	→	→	→	5 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 16
100	→	5 x 11	→	6.3 x 11	8 x 11.5	8 x 11.5	10 x 16	12.5 x 20
150	→	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 20	12.5 x 25
220	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	10 x 25	16 x 25
330	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	16 x 31.5
470	→	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	16 x 20	18 x 40
1000	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25	16 x 35.5	-
1500	→	10 x 20	12.5 x 20	16 x 20	16 x 25	16 x 31.5	-	-
2200	→	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	-	-
3300	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	-	-	-
4700	→	16 x 25	16 x 31.5	18 x 35.5	-	-	-	-
6800	16 x 25	16 x 31.5	18 x 35.5	-	-	-	-	-
10 000	16 x 31.5	18 x 35.5	-	-	-	-	-	-
15 000	18 x 35.5	-	-	-	-	-	-	-

For technical questions, contact: aluminumcaps1@vishay.com

SELECTION CHART FOR C_R, U_R, AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

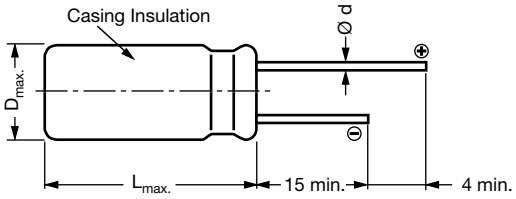
C_R (µF)	RATED VOLTAGE (V)				
	160	200	250	400	450
3.3	→	→	→	→	10 x 20
4.7	→	→	→	→	12.5 x 20
10	→	→	→	10 x 20	12.5 x 25
22	→	10 x 20	12.5 x 20	12.5 x 25	16 x 25
33	10 x 20	12.5 x 20	12.5 x 25	16 x 20	16 x 31.5
47	→	12.5 x 20	12.5 x 25	16 x 25	18 x 31.5
100	→	16 x 25	16 x 31.5	18 x 40	-
150	16 x 31.5	18 x 25	18 x 31.5	-	-
220	16 x 31.5	18 x 31.5	18 x 40	-	-
330	18 x 31.5	-	-	-	-

RADIAL STYLE: DIMENSIONS in millimeters

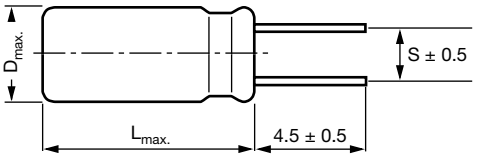


Ø D	5	6.3	8	10	12.5	16	18	22	25
S	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
Ø d	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0	1.0
β	1.5			2.0					
α	0.5							1.0	

DIMENSIONS in millimeters AND AVAILABLE FORMS



Ø D ≤ 18 long leads MALREKE00...



Ø D ≤ 18 shortened leads MALREKE05...
(S = 2 mm/2.5 mm/3.5 mm/5 mm/7.5 mm)

GENERAL NOTE

- For Minimum Package Quantity (MPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.
- For other packaging forms please refer to Vishay Roederstein General Information.

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
U_R	Rated voltage
C_R	Rated capacitance at 120 Hz
tan δ	Max. dissipation factor at 120 Hz
R_{ESR}	Calculated equivalent series resistance at 120 Hz
I_R	Rated ripple current (RMS)
Z	Max. impedance

Note

- Unless otherwise specified, all electrical values at T_a = 20 °C, P = 80 kPa to 120 kPa, RH = 45 % to 75 %.

ORDERING EXAMPLE

EKE 470 µF / 35 V, ± 20 %, size: 10 mm x 20 mm

Leads: long

Ordering code: MALREKE00DE347F00K

Leads: short

Ordering code: MALREKE05...

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (µF)	DIMENSIONS Ø D x L (mm)	tan δ 120 Hz	R_{ESR} 120 Hz / 20 °C (Ω)	Z 100 kHz / 20 °C (Ω)	I_R 100 kHz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
6.3	330	6.3 x 11	0.22	0.884	0.30	280	0.43	MALREKE00BA333B00K
	1000	10 x 12.5	0.22	0.292	0.10	660	1.90	MALREKE00DC410B00K
	3300	12.5 x 20	0.28	0.113	0.050	1400	4.50	MALREKE00FE433B00K
	6800	16 x 25	0.34	0.066	0.030	2100	6.60	MALREKE00JG468B00K
	10 000	16 x 31.5	0.40	0.053	0.025	2600	9.00	MALREKE00JS510B00K
	15 000	18 x 35.5	0.50	0.044	0.022	3000	11.5	MALREKE00KL515B00K
10	100	5 x 11	0.19	2.520	0.65	180	0.42	MALREKE00AA310C00K
	220	6.3 x 11	0.19	1.145	0.30	280	0.43	MALREKE00BA322C00K
	470	8 x 11.5	0.19	0.536	0.14	450	1.05	MALREKE00PB347C00K
	1000	10 x 16	0.19	0.252	0.080	850	2.40	MALREKE00DD410C00K
	1500	10 x 20	0.21	0.186	0.054	1100	3.00	MALREKE00DE415C00K
	2200	12.5 x 20	0.23	0.139	0.050	1400	4.50	MALREKE00FE422C00K
	3300	12.5 x 25	0.25	0.100	0.038	1700	4.70	MALREKE00FG433C00K
	4700	16 x 25	0.27	0.076	0.030	2100	6.60	MALREKE00JG447C00K
	6800	16 x 31.5	0.31	0.060	0.025	2600	9.00	MALREKE00JS468C00K
	10 000	18 x 35.5	0.37	0.049	0.022	3000	11.5	MALREKE00KL510C00K
16	150	6.3 x 11	0.16	1.415	0.30	280	0.43	MALREKE00BA315D00K
	330	8 x 11.5	0.16	0.643	0.14	450	1.05	MALREKE00PB333D00K
	470	10 x 12.5	0.16	0.452	0.10	660	1.90	MALREKE00DC347D00K
	1000	10 x 20	0.16	0.212	0.054	1100	3.00	MALREKE00DE410D00K
	1500	12.5 x 20	0.18	0.159	0.050	1400	4.50	MALREKE00FE415D00K
	2200	12.5 x 25	0.20	0.121	0.038	1700	4.70	MALREKE00FG422D00K
	3300	16 x 25	0.22	0.088	0.030	2100	6.60	MALREKE00JG433D00K
	4700	16 x 31.5	0.24	0.068	0.025	2600	9.00	MALREKE00JS447D00K
	6800	18 x 35.5	0.28	0.055	0.022	3000	11.5	MALREKE00KL468D00K
25	47	5 x 11	0.14	3.951	0.65	180	0.42	MALREKE00AA247E00K
	100	6.3 x 11	0.14	1.857	0.30	280	0.43	MALREKE00BA310E00K
	220	8 x 11.5	0.14	0.844	0.14	450	1.05	MALREKE00PB322E00K
	330	10 x 12.5	0.14	0.563	0.10	660	1.90	MALREKE00DC333E00K
	470	10 x 16	0.14	0.395	0.080	850	2.40	MALREKE00DD347E00K
	1000	12.5 x 20	0.14	0.186	0.050	1400	4.50	MALREKE00FE410E00K
	1500	16 x 20	0.16	0.141	0.030	2100	5.80	MALREKE00JE415E00K
	2200	16 x 25	0.18	0.109	0.030	2100	6.60	MALREKE00JG422E00K
	3300	16 x 31.5	0.20	0.080	0.025	2600	9.00	MALREKE00JS433E00K
	4700	18 x 35.5	0.22	0.062	0.022	3000	11.5	MALREKE00KL447E00K

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (µF)	DIMENSIONS Ø D x L (mm)	tan δ 120 Hz	R_{ESR} 120 Hz / 20 °C (Ω)	Z 100 kHz / 20 °C (Ω)	I_R 100 kHz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
35	4.7	5 x 11	0.12	33.86	0.70	180	0.42	MALREKE00AA147F00K
	10	5 x 11	0.12	15.92	0.70	180	0.42	MALREKE00AA210F00K
	22	5 x 11	0.12	7.235	0.70	180	0.42	MALREKE00AA222F00K
	33	5 x 11	0.12	4.823	0.65	180	0.42	MALREKE00AA233F00K
	47	6.3 x 11	0.12	3.386	0.30	280	0.43	MALREKE00BA247F00K
	100	8 x 11.5	0.12	1.592	0.14	450	1.05	MALREKE00PB310F00K
	150	8 x 11.5	0.12	1.061	0.14	450	1.05	MALREKE00PB315F00K
	220	10 x 12.5	0.12	0.723	0.10	660	1.90	MALREKE00DC322F00K
	330	10 x 16	0.12	0.482	0.080	850	2.40	MALREKE00DD333F00K
	470	10 x 20	0.12	0.339	0.054	1100	3.00	MALREKE00DE347F00K
	1000	12.5 x 25	0.12	0.159	0.038	1700	4.70	MALREKE00FG410F00K
	1500	16 x 25	0.14	0.124	0.030	2100	6.60	MALREKE00JG415F00K
	2200	16 x 31.5	0.16	0.096	0.025	2600	9.00	MALREKE00JS422F00K
	3300	18 x 35.5	0.18	0.072	0.022	3000	11.5	MALREKE00KL433F00K
50	0.22	5 x 11	0.10	602.9	8.00	18	0.42	MALREKE00AA022H00K
	0.47	5 x 11	0.10	282.2	5.00	25	0.42	MALREKE00AA047H00K
	1.0	5 x 11	0.10	132.6	3.50	40	0.42	MALREKE00AA110H00K
	2.2	5 x 11	0.10	60.29	3.00	55	0.42	MALREKE00AA122H00K
	3.3	5 x 11	0.10	40.19	2.60	65	0.42	MALREKE00AA133H00K
	4.7	5 x 11	0.10	28.22	2.30	90	0.42	MALREKE00AA147H00K
	10	5 x 11	0.10	13.26	1.40	120	0.42	MALREKE00AA210H00K
	22	5 x 11	0.10	6.029	1.20	150	0.42	MALREKE00AA222H00K
	47	6.3 x 11	0.10	2.822	0.43	250	0.43	MALREKE00BA247H00K
	100	8 x 11.5	0.10	1.326	0.24	340	1.05	MALREKE00PB310H00K
	150	10 x 12.5	0.10	0.884	0.17	490	1.90	MALREKE00DC315H00K
	220	10 x 16	0.10	0.603	0.12	650	2.40	MALREKE00DD322H00K
	330	10 x 20	0.10	0.402	0.10	810	3.00	MALREKE00DE333H00K
	470	12.5 x 20	0.10	0.282	0.085	1100	4.50	MALREKE00FE347H00K
	1000	16 x 25	0.10	0.133	0.043	1600	6.60	MALREKE00JG410H00K
	1500	16 x 31.5	0.12	0.106	0.038	2000	9.00	MALREKE00JS415H00K
	2200	18 x 35.5	0.14	0.084	0.034	2300	11.5	MALREKE00KL422H00K
63	3.3	5 x 11	0.09	36.17	2.00	64	0.42	MALREKE00AA133J00K
	4.7	5 x 11	0.09	25.40	2.00	76	0.42	MALREKE00AA147J00K
	10	5 x 11	0.09	11.94	2.00	111	0.42	MALREKE00AA210J00K
	22	6.3 x 11	0.09	5.426	0.60	190	0.43	MALREKE00BA222J00K
	33	6.3 x 11	0.09	3.617	0.60	233	0.43	MALREKE00BA233J00K
	47	8 x 11.5	0.09	2.540	0.50	328	1.05	MALREKE00PB247J00K
	100	10 x 16	0.09	1.194	0.12	456	2.40	MALREKE00DD310J00K
	150	10 x 20	0.09	0.796	0.10	610	3.00	MALREKE00DE315J00K
	220	10 x 25	0.09	0.543	0.090	809	3.20	MALREKE00DG322J00K
	330	12.5 x 20	0.09	0.362	0.085	1036	4.50	MALREKE00FE333J00K
	470	16 x 20	0.09	0.254	0.050	1411	5.80	MALREKE00JE347J00K
	1000	16 x 35.5	0.09	0.119	0.025	1967	10.0	MALREKE00JL410J00K

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (µF)	DIMENSIONS Ø D x L (mm)	tan δ 120 Hz	R_{ESR} 120 Hz / 20 °C (Ω)	Z 100 kHz / 20 °C (Ω)	I_R 100 kHz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
100	2.2	5 x 11	0.08	48.23	2.50	52	0.42	MALREKE00AA122L00K
	3.3	5 x 11	0.08	32.15	2.50	64	0.42	MALREKE00AA133L00K
	4.7	5 x 11	0.08	22.58	2.50	76	0.42	MALREKE00AA147L00K
	10	6.3 x 11	0.08	10.61	1.00	128	0.43	MALREKE00BA210L00K
	22	8 x 11.5	0.08	4.823	0.60	224	1.05	MALREKE00PB222L00K
	33	10 x 12.5	0.08	3.215	0.40	319	1.90	MALREKE00DC233L00K
	47	10 x 16	0.08	2.258	0.30	417	2.40	MALREKE00DD247L00K
	100	12.5 x 20	0.08	1.061	0.15	570	4.50	MALREKE00FE310L00K
	150	12.5 x 25	0.08	0.707	0.12	762	4.70	MALREKE00FG315L00K
	220	16 x 25	0.08	0.482	0.070	1250	6.60	MALREKE00JG322L00K
	330	16 x 31.5	0.08	0.322	0.050	1404	9.00	MALREKE00JS333L00K
	470	18 x 40	0.08	0.226	0.030	1980	15.0	MALREKE00KK347L00K
160	33	10 x 20	0.15	6.029	1.30	565	3.00	MALREKE00DE233M00K
	150	16 x 31.5	0.15	1.326	0.22	1300	9.00	MALREKE00JS315M00K
	220	16 x 31.5	0.15	0.904	0.22	1300	9.00	MALREKE00JS322M00K
	330	18 x 31.5	0.15	0.603	0.22	1700	11.0	MALREKE00KS333M00K
200	22	10 x 20	0.15	9.043	1.50	440	3.00	MALREKE00DE222S00K
	33	12.5 x 20	0.15	6.029	0.91	590	4.50	MALREKE00FE233S00K
	47	12.5 x 20	0.15	4.233	0.91	780	4.50	MALREKE00FE247S00K
	100	16 x 25	0.15	1.989	0.27	1280	6.60	MALREKE00JG310S00K
	150	18 x 25	0.15	1.326	0.27	1500	9.00	MALREKE00KG315S00K
	220	18 x 31.5	0.15	0.904	0.22	1700	11.0	MALREKE00KS322S00K
250	22	12.5 x 20	0.15	9.043	2.30	480	4.50	MALREKE00FE222N00K
	33	12.5 x 25	0.15	6.029	1.70	630	4.70	MALREKE00FG233N00K
	47	12.5 x 25	0.15	4.233	1.70	630	4.70	MALREKE00FG247N00K
	100	16 x 31.5	0.15	1.989	0.63	1400	9.00	MALREKE00JS310N00K
	150	18 x 31.5	0.15	1.326	0.42	1450	11.0	MALREKE00KS315N00K
	220	18 x 40	0.15	0.904	0.35	1485	15.0	MALREKE00KK322N00K
400	10	10 x 20	0.20	26.53	2.90	180	3.00	MALREKE00DE210X00K
	22	12.5 x 25	0.20	12.06	1.30	300	4.70	MALREKE00FG222X00K
	33	16 x 20	0.20	8.038	0.91	600	5.80	MALREKE00JE233X00K
	47	16 x 25	0.20	5.644	0.73	700	6.60	MALREKE00JG247X00K
	100	18 x 40	0.20	2.653	0.34	1250	15.0	MALREKE00KK310X00K
450	3.3	10 x 20	0.20	80.38	6.50	150	3.00	MALREKE00DE133P00K
	4.7	12.5 x 20	0.20	56.44	3.60	200	4.50	MALREKE00FE147P00K
	10	12.5 x 25	0.20	26.53	2.50	315	4.70	MALREKE00FG210P00K
	22	16 x 25	0.20	12.06	1.70	570	6.60	MALREKE00JG222P00K
	33	16 x 31.5	0.20	8.038	1.10	620	9.00	MALREKE00JS233P00K
	47	18 x 31.5	0.20	5.644	0.93	900	11.0	MALREKE00KS247P00K

LOW TEMPERATURE BEHAVIOR (at 120 Hz)

IMPEDANCE RATIO Z (T2) / Z (T1)	RATED VOLTAGE (V)					
T2 / T1	6.3	10	16	25 ~ 100	160 ~ 250	350 ~ 450
-25 °C / +20 °C	4	3	2	2	3	8
-40 °C / +20 °C	8	6	4	3	4	-

ADDITIONAL ELECTRICAL DATA

PARAMETER	CONDITIONS	VALUE		
Current				
Leakage current (test conditions: U_R, 20 °C)	After 1 min at U_R	$I_{L1} \leq 0.03 \times C_R \times U_R$	or 4 µA	for $U_R \leq 100$ V (whichever is greater)
	After 2 min at U_R	$I_{L2} \leq 0.01 \times C_R \times U_R$	or 3 µA	for $U_R \leq 100$ V (whichever is greater)
	After 5 min at U_R	$I_{L5} \leq 0.02 \times C_R \times U_R$	+ 15 µA	for $U_R > 100$ V
Resistance				
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max.}$ and C_R	$ESR = \tan \delta / 2 \pi f C_R$		

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY

FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R \leq 100$ V		
	$C_R \leq 47$ µF	$C_R = 68$ µF to 680 µF	$C_R \geq 1000$ µF
50	0.34	0.47	0.65
120	0.45	0.59	0.77
300	0.61	0.74	0.85
1000	0.70	0.79	0.88
10 000	0.91	0.88	0.88
100 000	1.00	1.00	1.00

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY

FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R > 100$ V	
	$C_R = 0.47$ µF to 220 µF	$C_R \geq 330$ µF
50	0.44	0.69
120	0.56	0.77
300	0.69	0.87
1000	0.78	0.87
10 000	0.89	0.88
100 000	1.00	1.00

TEST PROCEDURES AND REQUIREMENTS

TEST	PROCEDURE (quick reference)	REQUIREMENTS
Load life	T_{amb} = 105 °C U_R and I_R applied After specified hours	ΔC/C: ± 25 % of initial value $I_L \leq$ spec. limit $\tan \delta \leq 2 \times$ spec. limit
Shelf life	T_{amb} = 105 °C No voltage applied After 1000 h After test: U_R to be applied for 30 min 24 h to 48 h before measurement	ΔC/C: ± 25 % of initial value $I_L \leq$ spec. limit $\tan \delta \leq 2 \times$ spec. limit

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.

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.