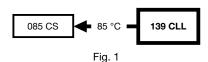


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Aluminum Electrolytic Capacitors SMD (Chip) Long Life





QUICK REFERENCE DATA						
DESCRIPTION	VALUE					
Nominal case sizes (L x W x H in mm)	14.3 x 6.2 x 6.9 and 14.3 x 7.6 x 8.2					
Rated capacitance range, C _R	1.0 μF to 220 μF					
Tolerance on C _R	± 20 %					
Rated voltage range, U _R	6.3 V to 100 V					
Category temperature range	-55 °C to +105 °C					
Endurance test at 105 °C	1000 h					
Useful life at 105 °C	2000 h					
Useful life at 40 °C; 1.3 x I _R applied	200 000 h					
Shelf life at 0 V, 105 °C	500 h					
Resistance to soldering heat test	Immersion in solder: 10 s at 260 °C or 40 s at 215 °C					
Based on sectional specification	IEC 60384-18 / CECC 32300					
Climatic category IEC 60068	55 / 105 / 56					

FEATURES

- Useful life: 2000 h at 105 °C
- Flexible terminals, reflow and wave solderable
- Compact, rectangular shape
- Charge and discharge proof, no peak current limitation
- Polarized aluminum electrolytic capacitors, non-solid electrolyte, self healing
- Extended voltage and capacitance range
- SMD-version, fully molded, insulated
- · Supplied in blister tape on reel
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

APPLICATIONS

- SMD technology
- · Industrial and professional applications
- Telecommunications, automotive, EDP general industrial
- Coupling, decoupling, smoothing, filtering, buffering, timing

MARKING

- Rated capacitance (in μF)
- Rated voltage (in V)
- Date code in accordance with IEC 60062
- Name of manufacturer
- "-" sign indicating the cathode. The anode is identified by bevelled edges
- Series number (139)

SELE	SELECTION CHART FOR C _R , U _R , AND RELEVANT NOMINAL CASE SIZES (L x W x H in mm)								
CR	U _R (V)								
(μ F)	6.3	10	16	25	40	50	63	100	
1.0	-	-	-	-	-	-	-	14.3 x 6.2 x 6.9	
2.2	-	-	-	-	-	-	14.3 x 6.2 x 6.9	14.3 x 6.2 x 6.9	
3.3	-	-	-	-	-	-	14.3 x 6.2 x 6.9	14.3 x 7.6 x 8.2	
4.7	-	-	-	-	-	-	14.3 x 6.2 x 6.9	14.3 x 7.6 x 8.2	
10	-	-	-	14.3 x 6.2 x 6.9	-	14.3 x 6.2 x 6.9	14.3 x 7.6 x 8.2	-	
15	-	-	-	-	14.3 x 6.2 x 6.9	14.3 x 7.6 x 8.2	-	-	
22	-	-	-	14.3 x 6.2 x 6.9	-	14.3 x 7.6 x 8.2	-	-	
33	-	-	-	-	14.3 x 7.6 x 8.2	-	-	-	

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SELE	SELECTION CHART FOR C_R , U_R , and relevant nominal case sizes (L \times W \times H in mm)										
C _R		U _R (V)									
(μ F)	6.3	10	16	25	40	50	63	100			
47	-	-	14.3 x 6.2 x 6.9	14.3 x 7.6 x 8.2	-	-	-	-			
68	-	14.3 x 6.2 x 6.9	-	-	-	-	-	-			
100	14.3 x 6.2 x 6.9	-	14.3 x 7.6 x 8.2	-	-	-	-	-			
150	-	14.3 x 7.6 x 8.2	-	-	-	-	-	-			
220	14.3 x 7.6 x 8.2	-	-	-	-	-	-	-			

DIMENSIONS in millimeters

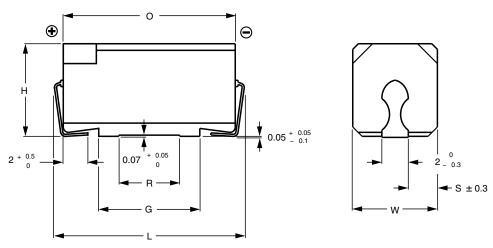


Fig. 2 - Dimensional outline

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES										
NOMINAL CASE SIZE L x W x H	CASE CODE	L _{max} .	W _{max} .	H _{max} .	O _{max} .	s	G _{max} .	R _{min.}	MASS (g)	PACKAGING QUANTITIES PER REEL
14.3 x 6.2 x 6.9	2	14.5	6.3	7.05	13.0	2.15	7.5	4.7	≈ 0.95	700
14.3 x 7.6 x 8.2	3	14.5	7.7	8.35	13.0	2.85	7.5	4.7	≈ 1.3	700

Note

• For detailed tape dimensions please see www.vishay.com/doc?28359



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Table 2

RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters (placement accuracy ± 0.25 mm)														
NOMINAL CASE SIZE		FOR REFLOW SOLDERING FOR WAVE SOLDERING												
LxWxH	Α	В	С	D	E	F	G	Α	В	С	D	E	F	G
14.3 x 6.2 x 6.9	15.8	8.8	3.5	2.8	8.0	16.2	7.7	18.6	10.0	4.3	5.0	8.8	20.5	11.5
14.3 x 7.6 x 8.2	15.8	8.8	3.5	2.8	8.0	16.2	9.1	18.6	10.0	4.3	6.0	8.8	21.5	13.0

MOUNTING

The capacitors are designed for automatic placement on to printed-circuit boards or hybrid circuits.

Optimum dimensions of soldering pads depend amongst others on soldering method, mounting accuracy, print lay-out and / or adjacent components.

For recommended soldering pad dimensions, refer to Fig. 3 and Table 2.

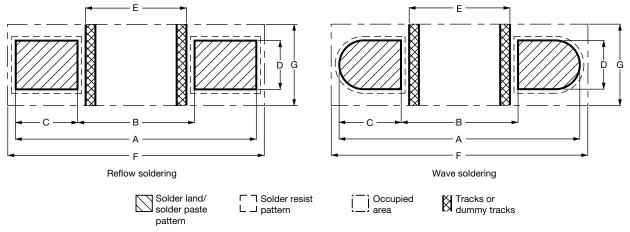


Fig. 3 - Recommended pad dimensions for reflow and wave soldering

SOLDERING

Soldering conditions are defined by the curve, temperature versus time, where the temperature is that measured on the soldering pad during processing.

For maximum conditions of different soldering methods see Fig. 4, 5, and 6.

Any temperature versus time curve which does not exceed the specified maximum curves may be applied.

AS A GENERAL PRINCIPLE, TEMPERATURE AND DURATION SHALL BE THE **MINIMUM** NECESSARY REQUIRED TO ENSURE GOOD SOLDERING CONNECTIONS. HOWEVER, THE SPECIFIED MAXIMUM CURVES SHOULD NEVER BE EXCEEDED.

Table 3

CURING CONDITIONS FOR SMD-GLUE						
MAX. T _{amb} (°C)	MAX. EXPOSURE TIME (min)					
125	30					
140	10					
150	5					
160	2					
160	2					



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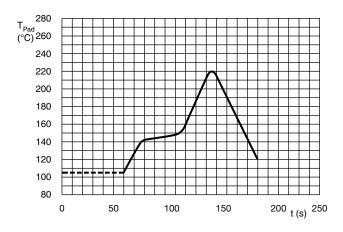


Fig. 4 - Maximum temperature load during infrared reflow soldering

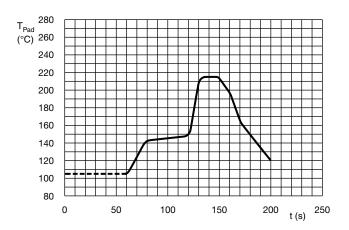


Fig. 5 - Maximum temperature load during vapor phase reflow soldering

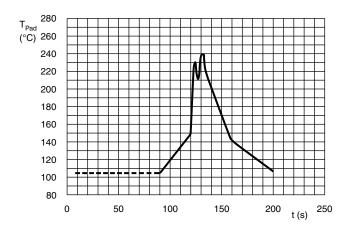


Fig. 6 - Maximum temperature load during (double-) wave soldering

ELECTRICAL DATA							
SYMBOL	DESCRIPTION						
C _R	Rated capacitance at 100 Hz, tolerance ± 20 %						
I _R	Rated RMS ripple current at 100 Hz,105 °C						
I _{L5}	Max. leakage current after 5 min at U _R						
$tan \delta$	Max. dissipation factor at 100 Hz						
Z	Max. impedance at 10 kHz						

Note

 Unless otherwise specified, all electrical values in Table 4 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

ORDERING EXAMPLE

Electrolytic capacitor 139 series

100 μF / 16 V; \pm 20 %

Nominal case size: 14.3 mm x 7.6 mm x 8.2 mm

Taped on reel

Ordering code: MAL213965101E3 Former 12NC: 2222 139 65101





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Table 4

ELEC	ELECTRICAL DATA AND ORDERING INFORMATION								
U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE L x W x H (mm)	I _R 100 Hz 105 °C (mA)	Ι _{L5} 5 min (μΑ)	tan δ 100 Hz	Ζ 10 kHz (Ω)	ORDERING CODE MAL2139		
6.3	100	14.3 x 6.2 x 6.9	79	4.3	0.24	3.0	63101E3		
0.3	220	14.3 x 7.6 x 8.2	120	5.8	0.24	1.4	63221E3		
10	68	14.3 x 6.2 x 6.9	71	4.4	0.20	2.9	64689E3		
10	150	14.3 x 7.6 x 8.2	110	6.0	0.20	1.3	64151E3		
16	47	14.3 x 6.2 x 6.9	66	4.5	0.16	3.4	65479E3		
16	100	14.3 x 7.6 x 8.2	100	6.2	0.16	1.6	65101E3		
	10	14.3 x 6.2 x 6.9	40	3.5	0.09	12	66109E3		
25	22	14.3 x 6.2 x 6.9	48	4.1	0.14	5.5	66229E3		
	47	14.3 x 7.6 x 8.2	79	5.4	0.14	2.6	66479E3		
40	15	14.3 x 6.2 x 6.9	45	4.2	0.11	6	67159E3		
40	33	14.3 x 7.6 x 8.2	75	5.6	0.11	2.7	67339E3		
	10	14.3 x 6.2 x 6.9	40	4.0	0.09	7	61109E3		
50	15	14.3 x 7.6 x 8.2	56	4.5	0.09	4.7	61159E3		
	22	14.3 x 7.6 x 8.2	67	5.2	0.09	3.2	61229E3		
	2.2	14.3 x 6.2 x 6.9	19	3.3	0.09	25	68228E3		
63	3.3	14.3 x 6.2 x 6.9	23	3.4	0.09	21	68338E3		
03	4.7	14.3 x 6.2 x 6.9	28	3.6	0.09	17	68478E3		
	10	14.3 x 7.6 x 8.2	48	4.3	0.08	8	68109E3		
	1.0	14.3 x 6.2 x 6.9	12	3.2	0.09	55	69108E3		
100	2.2	14.3 x 6.2 x 6.9	19	3.4	0.09	29	69228E3		
100	3.3	14.3 x 7.6 x 8.2	27	3.7	0.08	17	69338E3		
	4.7	14.3 x 7.6 x 8.2	33	3.9	0.08	11	69478E3		

ADDITIONAL ELECTRICAL DATA								
PARAMETER	CONDITIONS	VALUE						
Voltage								
Surge voltage for short periods		U _s ≤ 1.15 x U _R						
Reverse voltage		U _{rev} ≤ 1 V						
Current	Current							
Leakage current	After 1 min at U _R	$I_{L1} \le 0.02 C_R \times U_R + 3 \mu A$						
Leakage current	After 5 min at U _R	$I_{L5} \le 0.002 \ C_R \ x \ U_R + 3 \ \mu A$						
Inductance								
Equivalent series inductance (ESL)	Nominal case size 14.3 mm x 6.2 mm x 6.9 mm	Typ. 18 nH						
Equivalent series inductance (ESE)	Nominal case size 14.3 mm x 7.6 mm x 8.2 mm	Typ. 28 nH						
Resistance								
Equivalent series resistance (ESR)	Calculated from tan $\delta_{\text{max.}}$ and C_{R} (see Table 4)	ESR = $\tan \delta/2 \pi fC_R$						



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CAPACITANCE

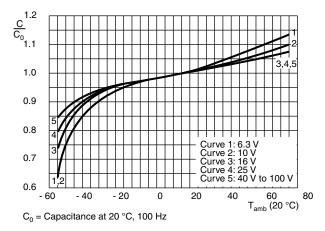


Fig. 7 - Typical multiplier of capacitance as a function of ambient temperature

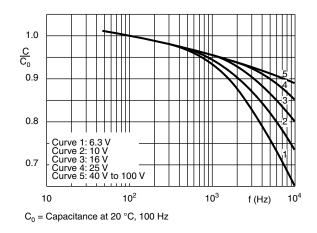


Fig. 8 - Typical multiplier of capacitance as a function of frequency

RIPPLE CURRENT AND USEFUL LIFE

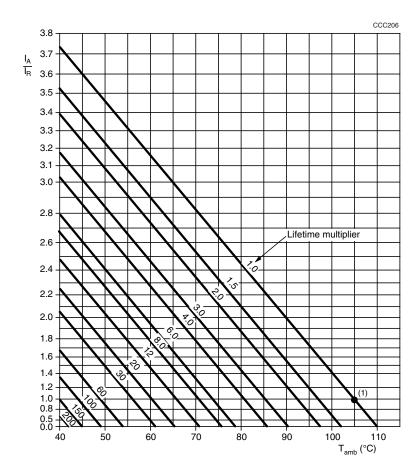


Fig. 9 - Multiplier of useful life as a function of ambient temperature and ripple current load

 I_A = Actual ripple current at 100 Hz I_B = Actual ripple current at 100 Hz, 105 °C

 $^{^{(1)}}$ Useful life at 105 °C and $I_{\rm B}$ applied: 2000 h





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MULTIPLIER OF RIPPLE CURRENT (IR) AS A FUNCTION OF FREQUENCY								
FREQUENCY	I _R MULTIPLIER							
(Hz)	U _R = 6.3 V TO 16 V	U _R = 25 V TO 50 V	U _R = 63 V TO 100 V					
50	0.95	0.90	0.85					
100	1.00	1.00	1.00					
300	1.07	1.12	1.20					
1000	1.12	1.20	1.30					
3000	1.15	1.25	1.35					
≥ 10 000	1.20	1.30	1.40					

Table 5

TEST PROCE	TEST PROCEDURES AND REQUIREMENTS						
7	TEST	PROCEDURE	DECUMPANTO				
NAME OF TEST	REFERENCE	(quick reference)	REQUIREMENTS				
Mounting	IEC 60384-18, subclause 4.3	Shall be performed prior to tests mentioned below; reflow or (double-) wave soldering; for maximum temperature load refer to chapter "Mounting"	Δ C/C: \pm 5 % tan δ \leq spec. limit I_{L5} \leq spec. limit				
Endurance	IEC 60384-18 / CECC 32300, subclause 4.15	T _{amb} = 105 °C; U _R applied; 1000 h	$\begin{array}{l} U_R \leq 6.3 \text{ V } \Delta C/C\text{:} +15 \text{ \% /} -30 \text{ \%} \\ U_R \geq 10 \text{ V } \Delta C/C\text{:} \pm 15 \text{ \%} \\ \tan \delta \leq 1.3 \text{ x spec. limit} \\ Z \leq 2 \text{ x spec. limit} \\ I_{L5} \leq \text{spec. limit} \end{array}$				
Useful life	CECC 30301, subclause 1.8.1	T _{amb} = 105 °C; U _R and I _R applied; 2000 h	$\begin{array}{l} U_R \leq 6.3 \text{ V } \Delta \text{C/C:} + 45 \text{ \% / -50 \%} \\ U_R \geq 10 \text{ V } \Delta \text{C/C:} \pm 45 \text{ \%} \\ \text{tan } \delta \leq 3 \text{ x spec. limit} \\ Z \leq 3 \text{ x spec. limit} \\ I_{L5} \leq \text{spec. limit} \\ \text{no short or open circuit} \\ \text{total failure percentage:} \leq 1 \text{ \%} \end{array}$				
Shelf life (storage at high temperature)	IEC 60384-18 / CECC 32300, subclause 4.17	T_{amb} = 105 °C; no voltage applied; 500 h after test: U _R to be applied for 30 min, 24 h to 48 h before measurement	For requirements see "Endurance test" above				

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.



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