Product Datasheet

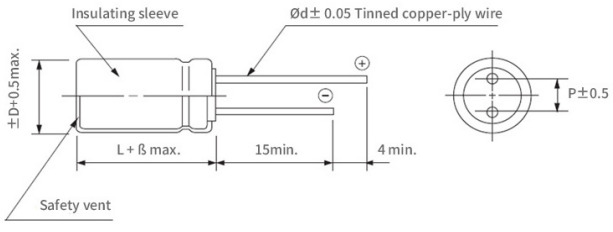
Small cell ultracapacitor – solderable type

- **3 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C08S-3R0-0003**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	3 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	45 mΩ (40 mΩ)
ESR, DC [2] (Typical Values)	70 mΩ (60 mΩ)
Leakage Current IL [4]	0.010 mA
Max Peak Current I_{Max} [5]	3.7 A
Usable Continuous Current I_S [6]	1.3A
Stored Energy E [7]	3.75 mWh
Energy Density E_d [8]	2.34 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	20.1 kW/kg
Thermal Resistance R_{Th} [10]	135 K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER	
Type	**C08S-3R0-0003**
Mass M	1.6 g
Terminals (wire leads)	Solderable [16]
Dimensions [17] Diameter D	8.0 mm
Length L + β max.	20.0 mm + 1.5
Lead distance P	3.5 mm
Lead diameter d	0.6 mm

DIMENSIONS	
Type	**C08S-3R0-0003**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

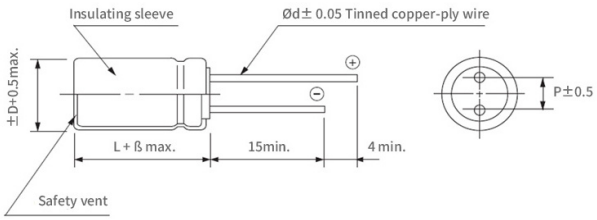
- **5 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C10S-3R0-0005**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	5 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	40 mΩ (27 mΩ)
ESR, DC [2] (Typical Values)	45 mΩ (39 mΩ)
Leakage Current IL [4]	0.015 mA
Max Peak Current I_{Max} [5]	6.1 A
Usable Continuous Current I_S [6]	1.6A
Stored Energy E [7]	6.25 mWh
Energy Density E_d [8]	2.72 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	21.7 kW/kg
Thermal Resistance R_{Th} [10]	76K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER		
Type		**C10S-3R0-0005**
Mass M		2.3 g
Terminals (wire leads)		Solderable [16]
Dimensions [17]	Diameter D	10.0 mm
	Length L + β max.	20.0 mm +2
	Lead distance P	5.0 mm
	Lead diameter d	0.6 mm

DIMENSIONS

Type **C10S-3R0-0005**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

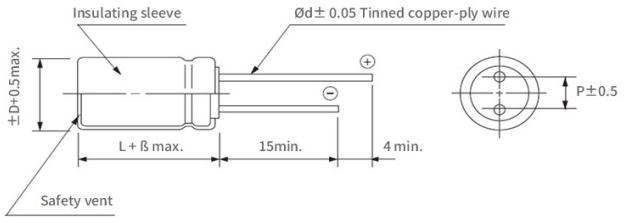
- **10 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C10S-3R0-0010**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	10 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	25 mΩ (16 mΩ)
ESR, DC [2] (Typical Values)	40 mΩ (30 mΩ)
Leakage Current IL [4]	0.030 mA
Max Peak Current I_{Max} [5]	10.7 A
Usable Continuous Current I_S [6]	2.5A
Stored Energy E [7]	12.5 mWh
Energy Density E_d [8]	3.57 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	16.1 kW/kg
Thermal Resistance R_{Th} [10]	39K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER		
Type		**C10S-3R0-0010**
Mass M		3.5 g
Terminals (wire leads)		Solderable [16]
Dimensions [17]	Diameter D	10.0 mm
	Length L + β max.	30.0 mm +2
	Lead distance P	5.0 mm
	Lead diameter d	0.6 mm

DIMENSIONS

Type **C10S-3R0-0010**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

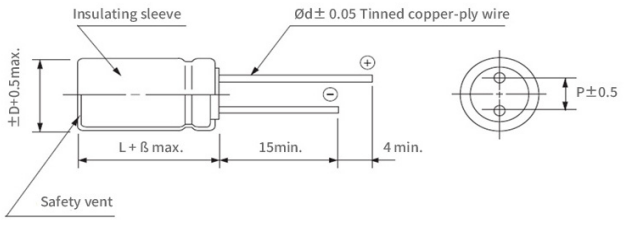
- **15 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C12S-3R0-0015**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	15 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	20 mΩ (16 mΩ)
ESR, DC [2] (Typical Values)	35 mΩ (28 mΩ)
Leakage Current IL [4]	0.050 mA
Max Peak Current I_{Max} [5]	14.75 A
Usable Continuous Current I_S [6]	2.9 A
Stored Energy E [7]	18.7 mWh
Energy Density E_d [8]	4.17 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	14.29 kW/kg
Thermal Resistance R_{Th} [10]	49K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER		
Type		**C12S-3R0-0015**
Mass M		4.5 g
Terminals (wire leads)		Solderable [16]
Dimensions [17]	Diameter D	12.5 mm
	Length L + β max.	25.0 mm +2
	Lead distance P	5.0 mm
	Lead diameter d	0.6 mm

DIMENSIONS

Type **C12S-3R0-0015**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

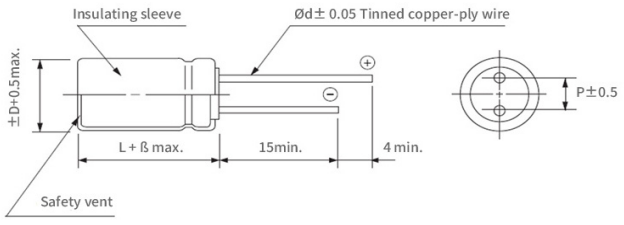
- **25 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C16S-3R0-0025**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	25 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	15 mΩ (12 mΩ)
ESR, DC [2] (Typical Values)	25 mΩ (18 mΩ)
Leakage Current IL [4]	0.070 mA
Max Peak Current I_{Max} [5]	23.1 A
Usable Continuous Current I_S [6]	3.4A
Stored Energy E [7]	31 mWh
Energy Density E_d [8]	4.17 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	12.0 kW/kg
Thermal Resistance R_{Th} [10]	34K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER		
Type		**C16S-3R0-0025**
Mass M		7.5 g
Terminals (wire leads)		Solderable [16]
Dimensions [17]	Diameter D	16.0 mm
	Length L + β max.	25.0 mm +2
	Lead distance P	7.5 mm
	Lead diameter d	0.8 mm

DIMENSIONS

Type **C16S-3R0-0025**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

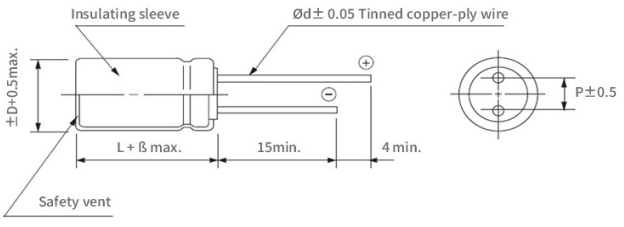
- **33 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C18S-3R0-0033**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	33 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	13 mΩ (11 mΩ)
ESR, DC [2] (Typical Values)	20 mΩ (18 mΩ)
Leakage Current IL [4]	0.10 mA
Max Peak Current I_{Max} [5]	29.82 A
Usable Continuous Current I_S [6]	5.4A
Stored Energy E [7]	41 mWh
Energy Density E_d [8]	4.08 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	11.14 kW/kg
Thermal Resistance R_{Th} [10]	26 K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER	
Type	**C18S-3R0-0033**
Mass M	10.1 g
Terminals (wire leads)	Solderable [16]
Dimensions [17] Diameter D	18.0 mm
Length L + β max.	32.0 mm +2
Lead distance P	7.5 mm
Lead diameter d	0.8 mm

DIMENSIONS

Type **C18S-3R0-0033**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

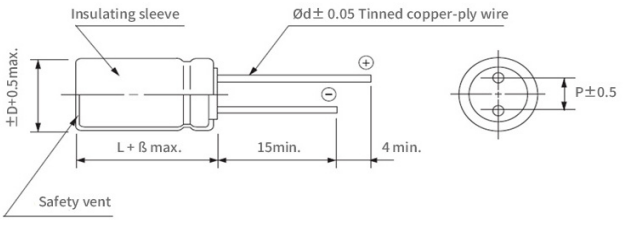
- **50 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C18S-3R0-0050**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	50 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	10 mΩ (8 mΩ)
ESR, DC [2] (Typical Values)	15 mΩ (12 mΩ)
Leakage Current IL [4]	0.15 mA
Max Peak Current I_{Max} [5]	42.9 A
Usable Continuous Current I_S [6]	5.5A
Stored Energy E [7]	62.5 mWh
Energy Density E_d [8]	4.63 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	11.1 kW/kg
Thermal Resistance R_{Th} [10]	22K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER		
Type		**C18S-3R0-0050**
Mass M		13.5 g
Terminals (wire leads)		Solderable [16]
Dimensions [17]	Diameter D	18.0 mm
	Length L + β max.	40.0 mm +2
	Lead distance P	7.5 mm
	Lead diameter d	0.8 mm

DIMENSIONS

Type **C18S-3R0-0050**



Basic characteristics and **Notes** of our small cells - **see page 9**

Product Datasheet

Small cell ultracapacitor – solderable type

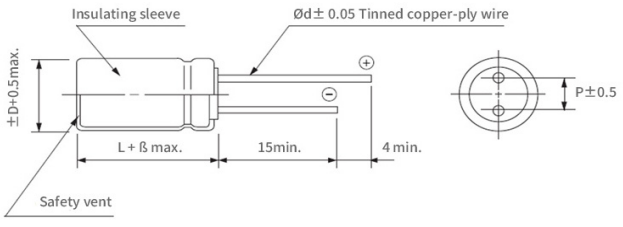
- **100 F** capacitance
- Rated voltage **3.0 VDC**
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size

PRODUCT SPECIFICATION	
Type	**C22S-3R0-0100**
Rated Voltage V_R @ -40 - +65°C	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V
Rated Capacitance C [2]	100 F
Capacitance Tolerance [3]	-10% / +20%
ESR, 1kHz [2] (Typical Values)	8 mΩ (7 mΩ)
ESR, DC [2] (Typical Values)	13 mΩ (12 mΩ)
Leakage Current IL [4]	0.3 mA
Max Peak Current I_{Max} [5]	65.2 A
Usable Continuous Current I_S [6]	10.7A
Stored Energy E [7]	125 mWh
Energy Density E_d [8]	5.95 Wh/kg
Matched Impedance Power Density P_{dMax} [9]	8.2 kW/kg
Thermal Resistance R_{Th} [10]	10K/W
DC Life at HT @ 65°C [11]	1000 hours
DC Life at HT @ 85°C [11]	1000 hours @ max. 2.5V

PHYSICAL PARAMETER	
Type	**C22S-3R0-0100**
Mass M	21.0 g
Terminals (wire leads)	Solderable [16]
Dimensions [17] Diameter D	22.0 mm
Length L + β max.	45.0 mm +3
Lead distance P	10.0 mm
Lead diameter d	1.0 mm

DIMENSIONS

Type **C22S-3R0-0100**



Basic characteristics and **Notes** of our small cells - **see page 9**

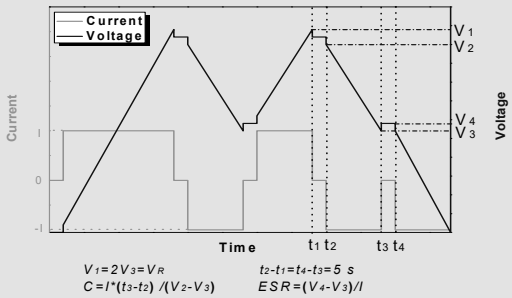
Product Datasheet

BASIC CHARACTERISTICS FOR ALL SMALL CELL TYPES

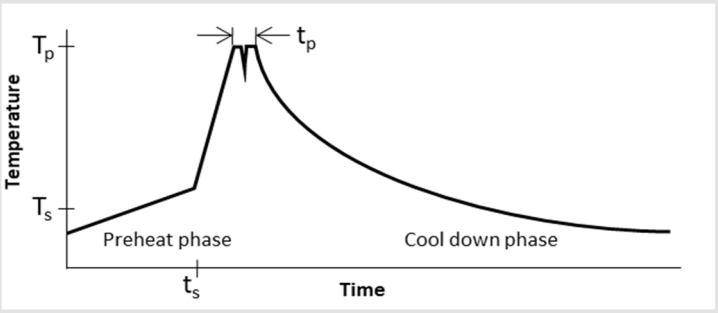
LIFETIME	DC Life at RT[12]	10 years
	Cycle Life[13]	500'000 cycles
	Shelf Life[14]	3 years
THERMAL	Operating Temperature	-40 ~ 65°C
	Temperature Characteristics at RT	Capacitance change within ±5% of value, ESR change within ±150% of value
SAFETY & ENVIRONMENTAL	Safety	RoHS, REACH and UL810
	Shock and vibration	MIL-STD-202, Method 213, Fig. 1, condition C; Method
	Warning	Do not overvoltage, do not reverse polarity

NOTES FOR ALL SMALL CELL TYPES

1. Surge voltage V_S: Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
2. Capacitance C: The test current is 0.075 A/F, if the calculated current is >100A, then apply 100A.



3. Capacitance tolerance: Typical tolerance is +5%~+10%.
4. Leakage current measurement procedure: 1) Charge the capacitor to the V_R with a constant current (0.075 A/F, if the calculated current is >100A, then apply 100A). 2) Hold the voltage at V_R for 72h. 3) The current to maintain V_R after 72 h is the leakage current.
5. Max current: $I_{Max} = 0.5C * V_R/(\Delta t + ESR * C)$, discharge from V_R to V_R /2 in 1 second.
6. Max constant working current: $I_{MCC} = \sqrt{\Delta T/(ESR * R_{Th})}$
7. Stored energy: $E = 0.5C * V^2/3600$
8. Energy density: $E_d = E/M$
9. Matched impedance power density: $P_{dMax} = (0.25V_R^2/ESR)/M$
10. Thermal resistance ($\Delta T = 15°C$): $R_{Th} = \Delta T/P$, where P = ESR * I²
11. DC life at high temperature HT: At 65°C hold the capacitor charged at rated voltage for 1000h or at 85°C at max. 2.5V for 1000h. The capacitance shall be >70% of the rated value, the ESR shall be <200% of the rated value.
12. DC life at RT: Hold the capacitor charged at rated voltage at room temperature RT, the capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.
13. Cycle life: Charge and discharged the capacitor in the range between V_R and V_R/2. 5 seconds waiting period between charge and discharge. The constant test current is 0.075 A/F (if the calculated current >100A, then apply 100A).
14. Storage temperature: Storage in discharge state, <35°C
15. Shelf life: Stored uncharged at RT, <50% RH
16. Wave solder profile



Profile feature	Standard SnPb	Pb free
Preheat/soak temperature T_s	100°C	100°C
Preheat/soak time t_s	60 s	60 s
Peak temperature T_p	220 – 260°C	250 – 260°C
Time to peak temperature t_p	10s max, 5s max/wave	10s max, 5s max/wave
Ramp-down rate	2-5 K/s	2-5 K/s
Time solder process (RT to RT)	4 min	4 min

Notes:

Standard markings:

+ Name of manufacturer, part number, serial number
+ Rated voltage and capacitance, negative and positive terminals, warning marking
+ Stored energy in watt-hours

Mounting recommendations:

+ Mounting without applying undue mechanical stress on the terminals
+ Provide adequate spacing in between cells to secure required insulation strength
+ Provide clearance around the safety vent and do not position anything above the safety vent that may be damaged in an event of vent rupture