

# DATASHEET

## 96V 93F MODULE



<b>PRODUCT CODE</b>	<b>CTM 00093C0 0096V0 NN00</b>
<b>DATASHEET VERSION</b>	<b>V2020-0 of 19/10/2020</b>

CapTop 96V 93F Module has low ESR & high Power Density, over 1,000,000 duty cycles, low maintenance needs, compact and fully closed splash proof design. Suitable for applications like automotive, railway transportation, heavy duty machinery and Energy storage system.

<b>SPECIFICATIONS</b>	
<b>Item</b>	<b>Characteristics</b>
Nominal capacitance	93 F
Capacitance tolerance	0% / +20%
Rated voltage	96 V
Surge voltage	100 V
ESR, DC	7,04 mΩ
Maximum continuous current (DT=15°C)	100 A
Maximum continuous current (DT=40°C)	160 A
Maximum peak current, 1 sec.	2000 A
Leakage current (25°C, after 72h)	10 mA
Operating temperature range	-40 °C to +65 °C
Storage temperature range	-40 °C to +70 °C
Power Terminals	M8/M10
Recommended Torque - Terminal	20/30 Nm
Vibration Specification	IEC 255-21-1
Shock Specification	IEC 255-21-1

Cell Voltage Monitoring	Midpoint Voltage
Temperature Monitoring	Pt100
Stored Energy	119 Wh
Temperature Performance (-40°C to 65°C)	$\Delta C \leq 5\%$ of initial measured value@ 25°C ESR $\leq 50\%$ of specified value
High Temp. Life (1,500 hours @ 65°C, Rated Voltage)	$\Delta C \leq 20\%$ of initial measured value ESR $\leq 200\%$ of specified value
Room Temp. Life (10 years @ 25°C, Rated Voltage)	$\Delta C \leq 20\%$ of initial measured value ESR $\leq 200\%$ of specified value
Cycle Life (1,000,000 cycles between VR and 1/2 VR )	$\Delta C \leq 20\%$ of initial measured value ESR $\leq 200\%$ of specified value
Shelf Life (25°C, uncharged)	4 years
Factory High-Pot Test	DC 2,500 V
Typical Thermal Resistance	0.12 °C/W
Typical Thermal Capacitance	21,000 J/°C

\*All values are provisional and may vary

DIFFERENCE PARAMETER LIST	
Environmental Protection	IP54
Weight	23,47 kg
Usable Power Density (Pd)	6,693 W/kg
Impedance Match Power Density (Pmax)	13,943 W/kg
Gravimetric Energy Density (Emax)	5,072 Wh/kg
Environment Humidity	$\leq 90\%RH$
Installation	M8 short screw

## NOTES

1. Surge voltage is non-repetitive. The duration must not exceed 1 second.
2. Maximum peak Current is non-repetitive. The duration must not exceed 1 second.
3. Formula of maximum peak Current:

$$I_{peak} = \frac{1 / 2CV}{C \times ESR_{DC} + 1}$$

C is rated capacity, V is rated voltage.

4. Formula of power and energy:

Usable Power Density:

$$P_d = \frac{0.12V^2}{ESR_{DC} \times mass}$$

Impedance Match Power Density:

$$P_{max} = \frac{V^2}{4ESR_{DC} \times mass}$$

Gravimetric Energy Density:

$$E_{max} = \frac{1 / 2CV^2}{3600 \times mass}$$

Stored Energy:

$$E = \frac{1 / 2CV^2}{3600}$$

## MEASURING METHOD

### 1) Charge and Discharge procedure (Figure 1)

- A) Charge the capacitor using constant current I to rated voltage  $V_0$
- B) Keep rated voltage 5 min
- C) Discharge the capacitor using constant current I to half rated voltage, record discharge time  $T_1$  during voltage change from  $V_1$  to  $V_2$
- D) Rest 2-5s, record voltage change  $\Delta V$
- E) Discharge it to a very low voltage around 0.01V
- F)  $V_1=85\% V_0$   $V_2=50\% V_0$

### 2) Capacitance

$$C = I \cdot T_1 / (V_1 - V_2)$$

C: Capacitance (F)

I: Constant Discharge Current (A)

$T_1$ : Discharge Time (S)

### 3) DC ESR

$$\text{DC ESR} = \Delta V / I$$

DC ESR: DC Equivalent Series Resistance ( $\Omega$ )

$\Delta V$ : Voltage Change (V)

I: Constant Discharge Current (A)

### 4) AC ESR

Measure AC ESR using LCR meter Frequency:

1KHz

Voltage: fully discharge

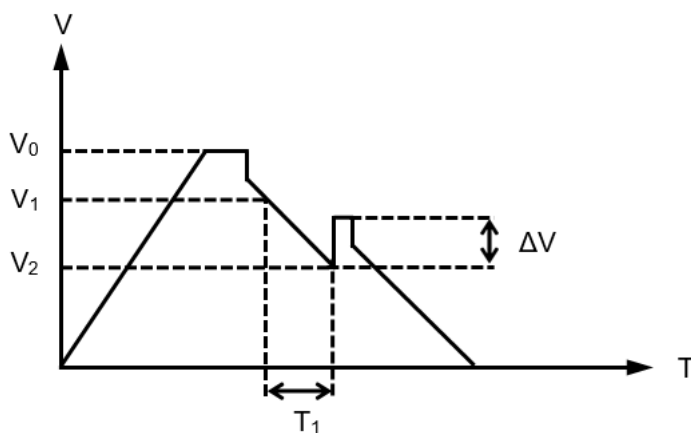


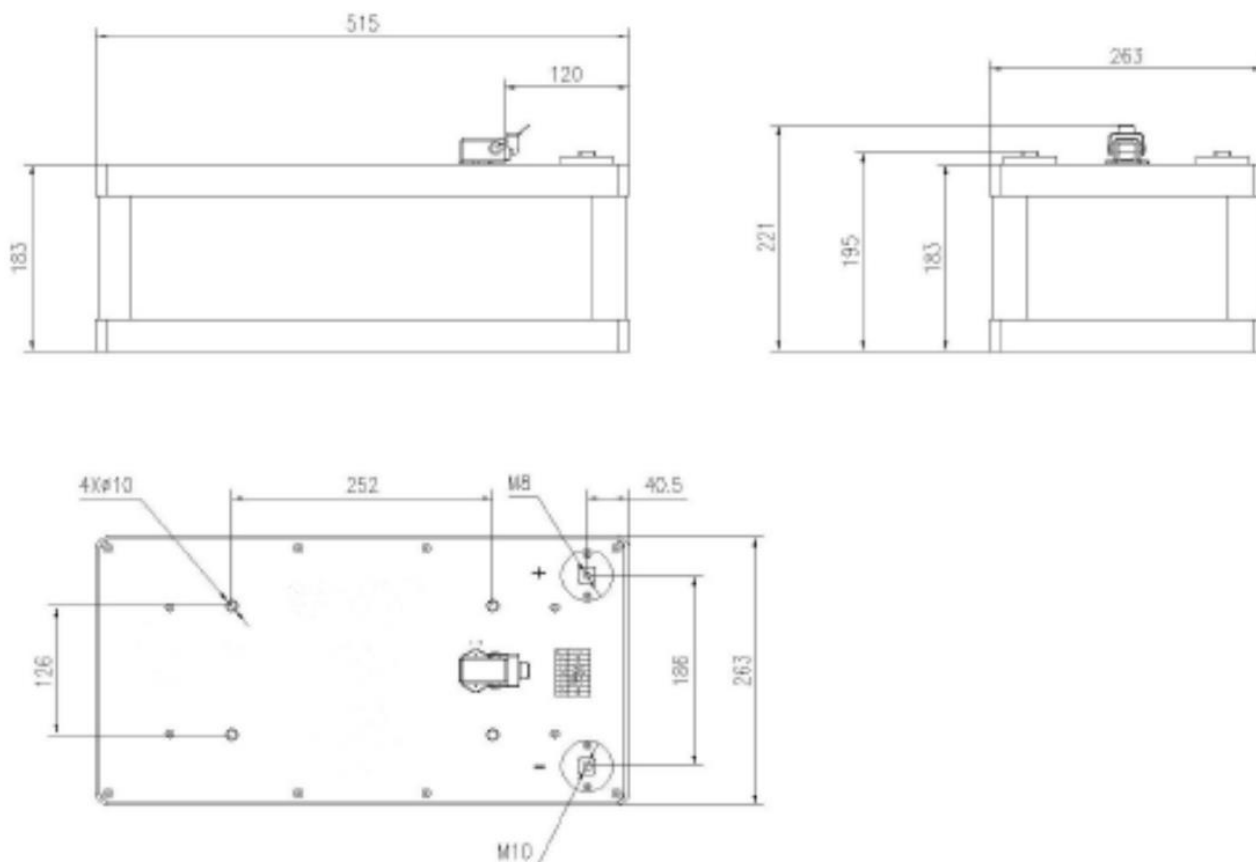
Figure 1

PIN DEFINITION		
Pin Number	Definition	Remark
1	NC	
2	NC	
3	Temperature signal	Pt100
4	Temperature signal	
5	Midpoint voltage (+)	
6	Negative voltage (-)	
7	NC	
8	NC	

## OPTIONAL ACCESSORIES

Fan and heat sink can be installed on the module, which can increase module cooling capacity. The fan needs external 24V power supply, and it's installed under the module with the sink.

## CONSTRUCTION & DIMENSIONS



D (Max.)	L/mm	
	L1	L2
515 mm	263 mm	221 mm

Product dimensions are for reference only unless otherwise identified.

Product dimensions and specifications may change without notice.

Product complies to the following certification requirements:



Version	Date	Revision History
V2020-0	19/10/2020	Original Version

## CAPTOP S.R.L

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