
vivaTech

SUPER CAPACITOR



vivaTech

CONTENTS

**Environmental
Technology
Company**

- 01. Company Information**
- 02. Supercapacitor Technology**
- 03. Field Applications**
- 04. VET Technology**
- 05. VPC Technology**
- 06. Mission and Vision**

01

Company Information

Overview

History

Business Area

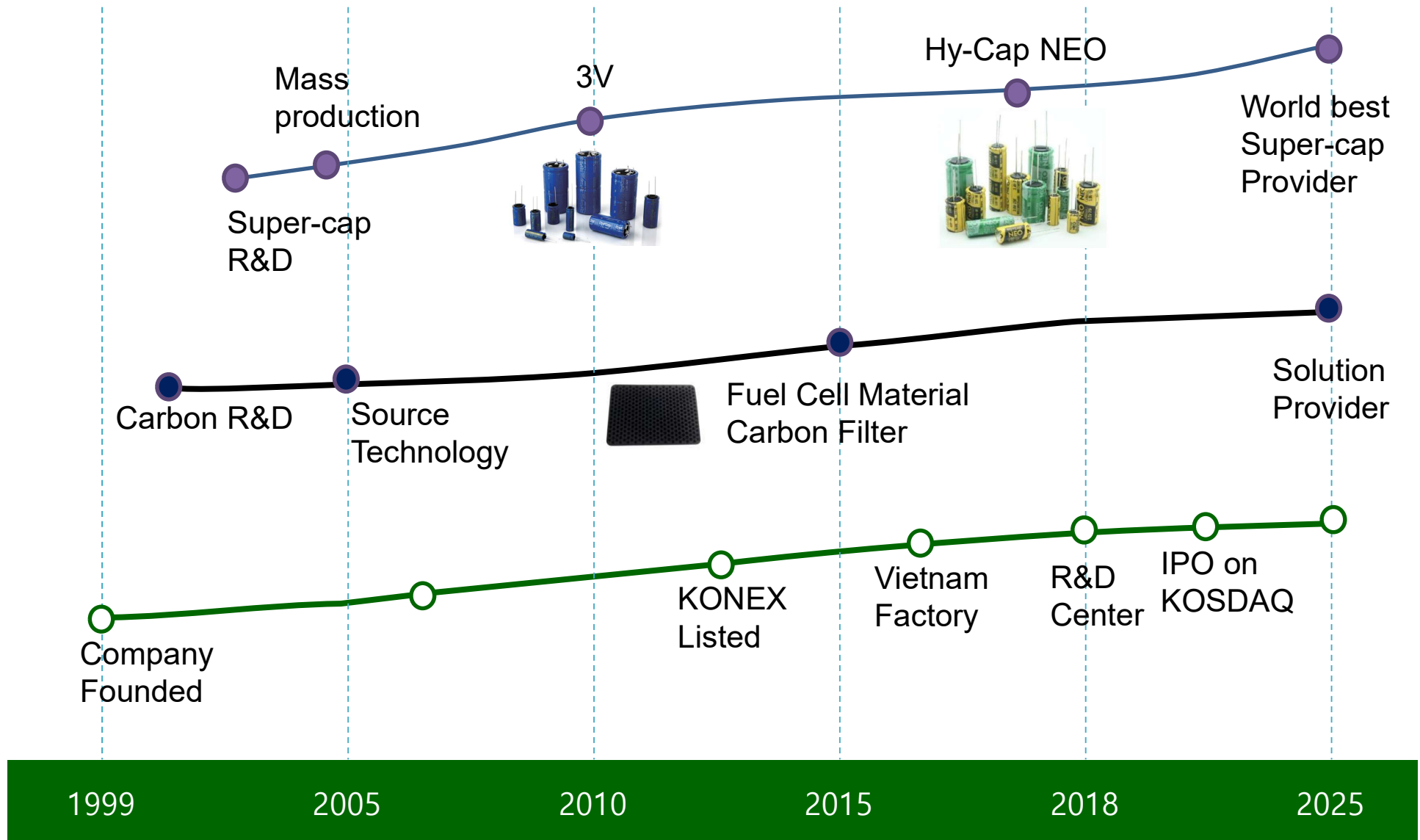
Facilities

Worldwide Network

Product Line-Up

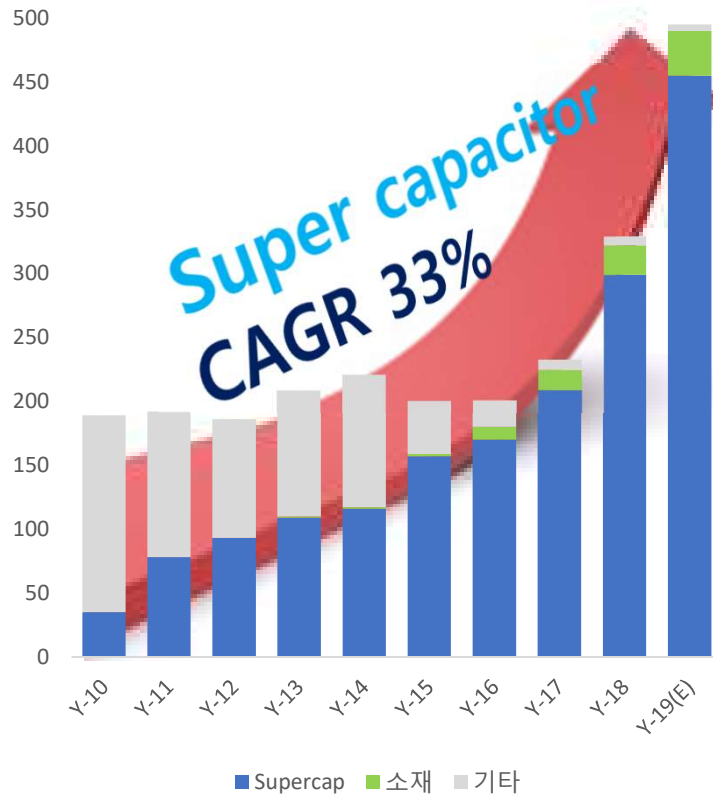
Patents & Certification

Strong Point of Vinatech Supercapacitor



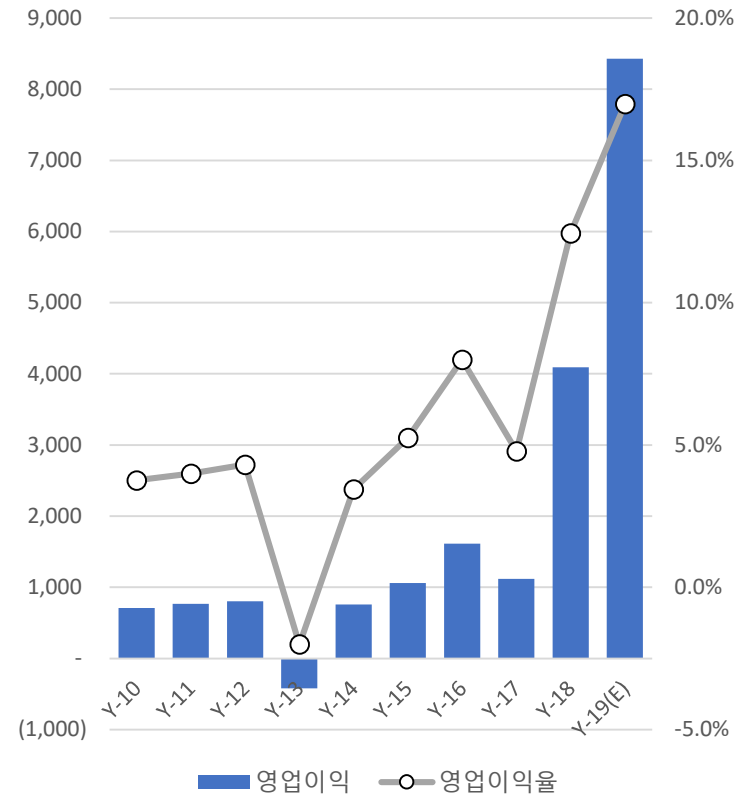
Sales Revenue

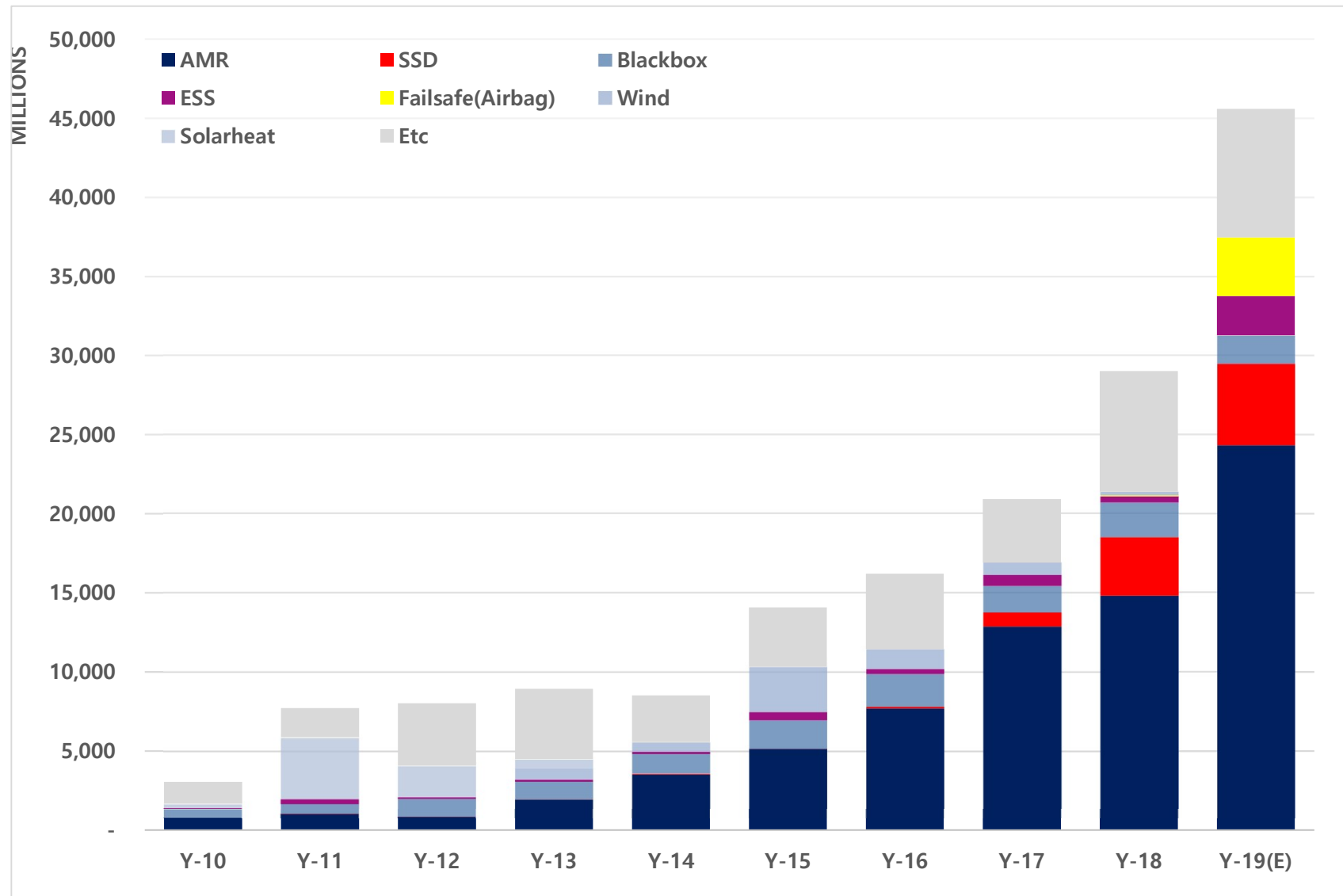
(Unit: 100M KRW)



Operational Profit

(Unit: 1M KRW, %)







Distribution & Supercapacitor Biz.



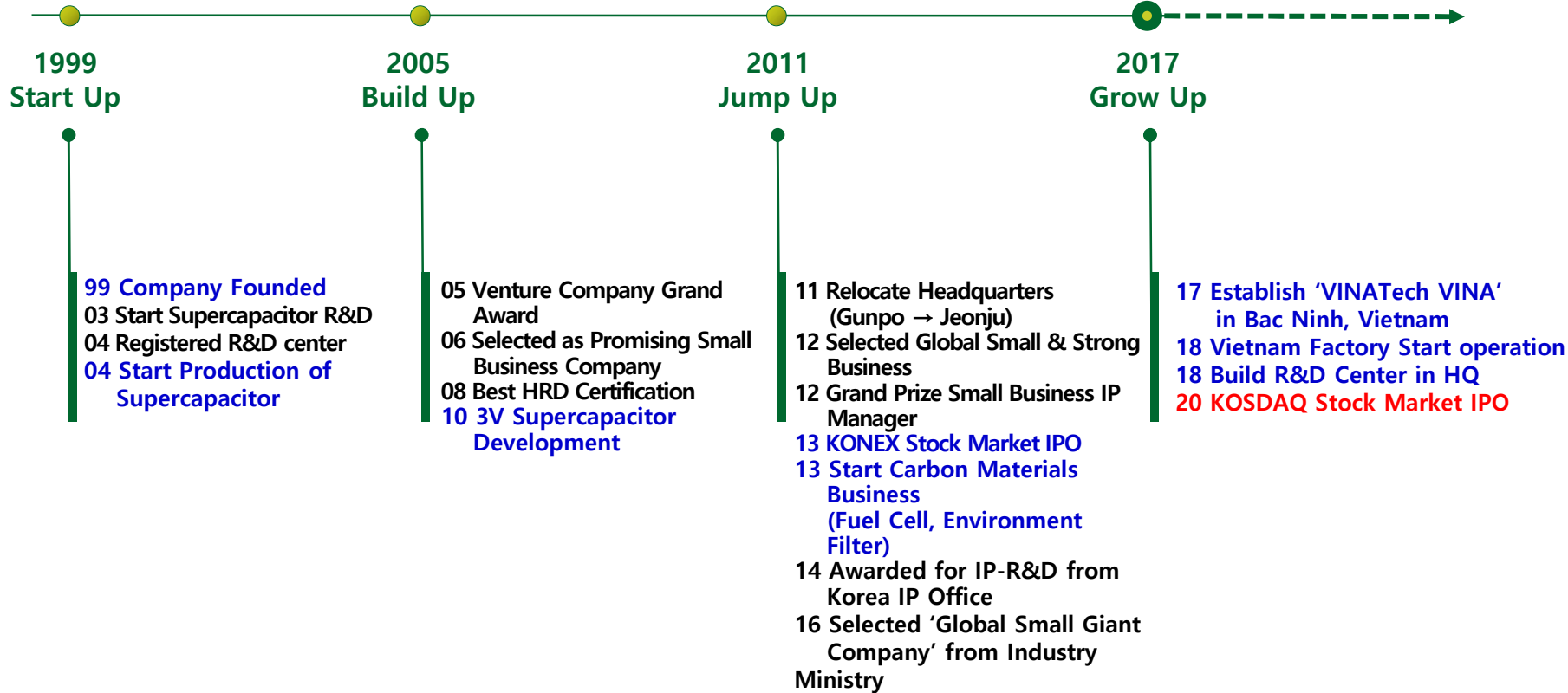
R&D · Manufacturing Technology Improvement



Energy Storage Device Expert Company



Energy Storage Device Leading Company



Since 2003

EDLC, Hybrid-Cap
Hy-Cap NEO
2.3V/2.7V/3V EDLC, P-EDLC
Cell & Module



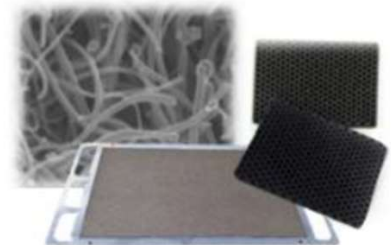
Energy Storage Device



Carbon Applied Components

Since 2002

Fuel Cell : Supporter, Catalyst
MEA(Membrane Electrode Assembly)
Carbon Filter : Deodorizer, Air Filter Fence



Since 1999

IT Electronic Device Design Support
Passive/Active Components

Global Sourcing & Sales

● Production Capacity :
Jeonju, Korea: 8.0M / month

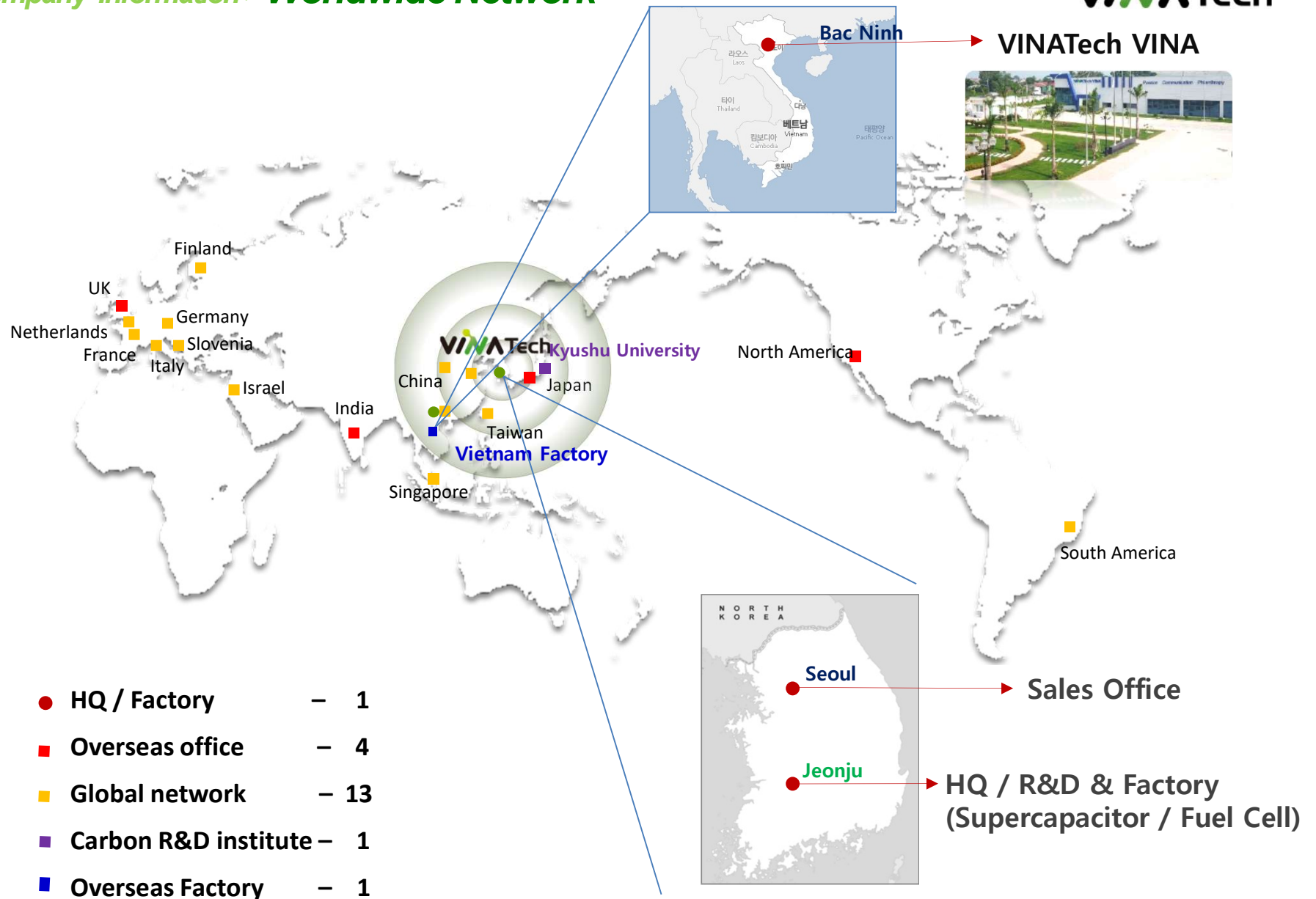
Small Size (1F ~ 15F)	6,000K / month
Medium Size (20F ~ 50F)	1,800K / month
Large Size (100F ~ 500F)	200k / month

Bac Ninh, Vietnam: 7.0M / month

Small Size (1F ~ 15F)	5,900K / month
Medium Size (20F ~ 50F)	1,000K / month
Large Size (100F ~ 500F)	100k / month



Company Information > Worldwide Network



Features

EDLC
Electric Double
Layer Capacitor



High Power Type
2.7V, 3.0V

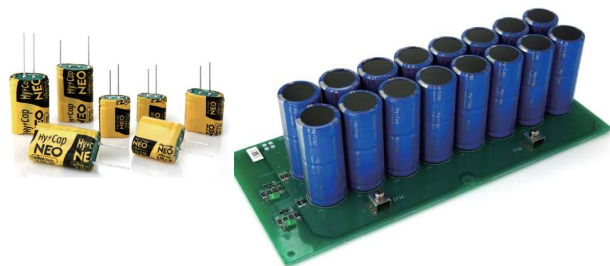
- Higher Power Density (low ESR)
- Over 500,000 cycle life (semi-permanent)
- Short-term Peak Power assist applications
- Rated 2.5V & 2.7V & 3.0V : -40°C ~ 85°C

LIC
Lithium-Ion
Capacitor

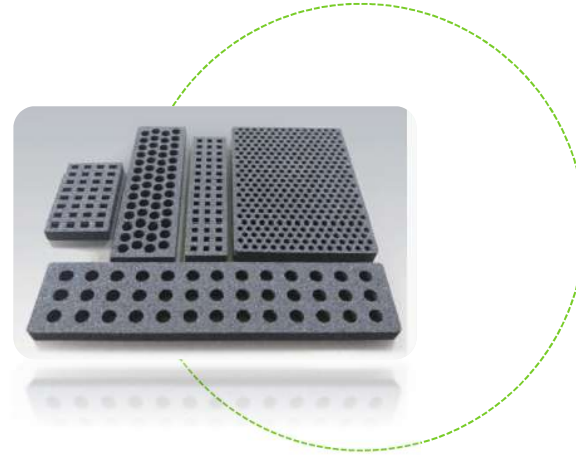
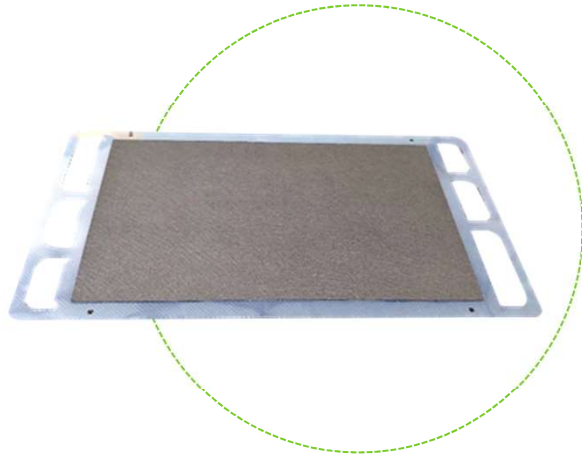


High Energy Type
3.8V

- Higher Energy Density (2 times of EDLC)
- Over 100,000 cycle life
- Low Self Discharge, Low Leakage Current
& long-term backup applications
- Rated 3.8V : -30°C ~ 85°C



High voltage & High reliability modules



Fuel Cell Materials

- **Supporter**
 - CNF (Carbon Nano Fiber) – High Durability
 - Application: "H" Company Fuel Cell Car
- **Catalyst**
 - High Durability, High Capacitance
- **MEA (Membrane Electrode Assembly)**
 - PEMFC : Residential FC, Transportation (Proton Exchange Membrane)
 - DMFC : Portable FC, Defense (Direct Methanol)

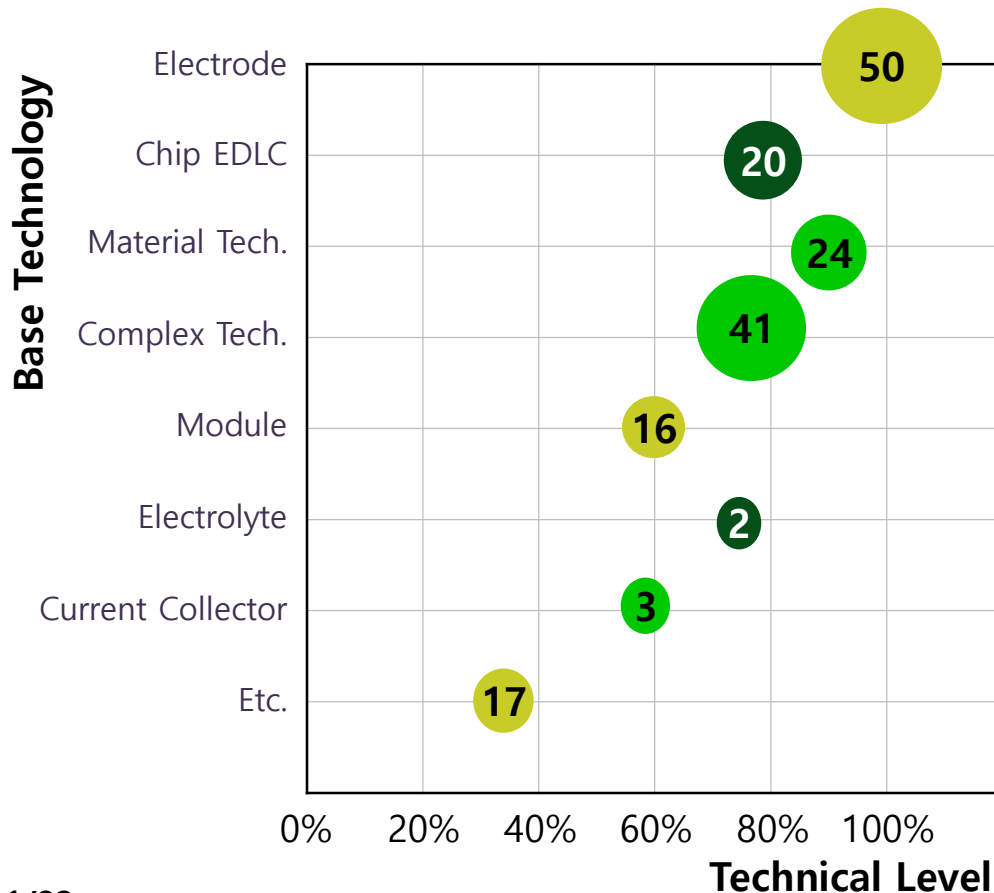
Deodorizing Filter

- **Carbon Filter**
 - Refrigerator Deodorizing Filter
 - Water Filter
- **Carbon Fiber**
 - Filter for Motor Way
 - Car Passenger Room Air Purification Filter
 - Indoor Air Purification Filter

● Intellectual Properties

Korea: 155 Applied (128 Registered)
International: 18 Applied (9 Registered)

- 3V EDLC: Electrode & electrolyte
- 3V P-EDLC: Anode electrode
- High current cell & terminal structure



● Certifications

IATF 16949:2016



ISO-14001

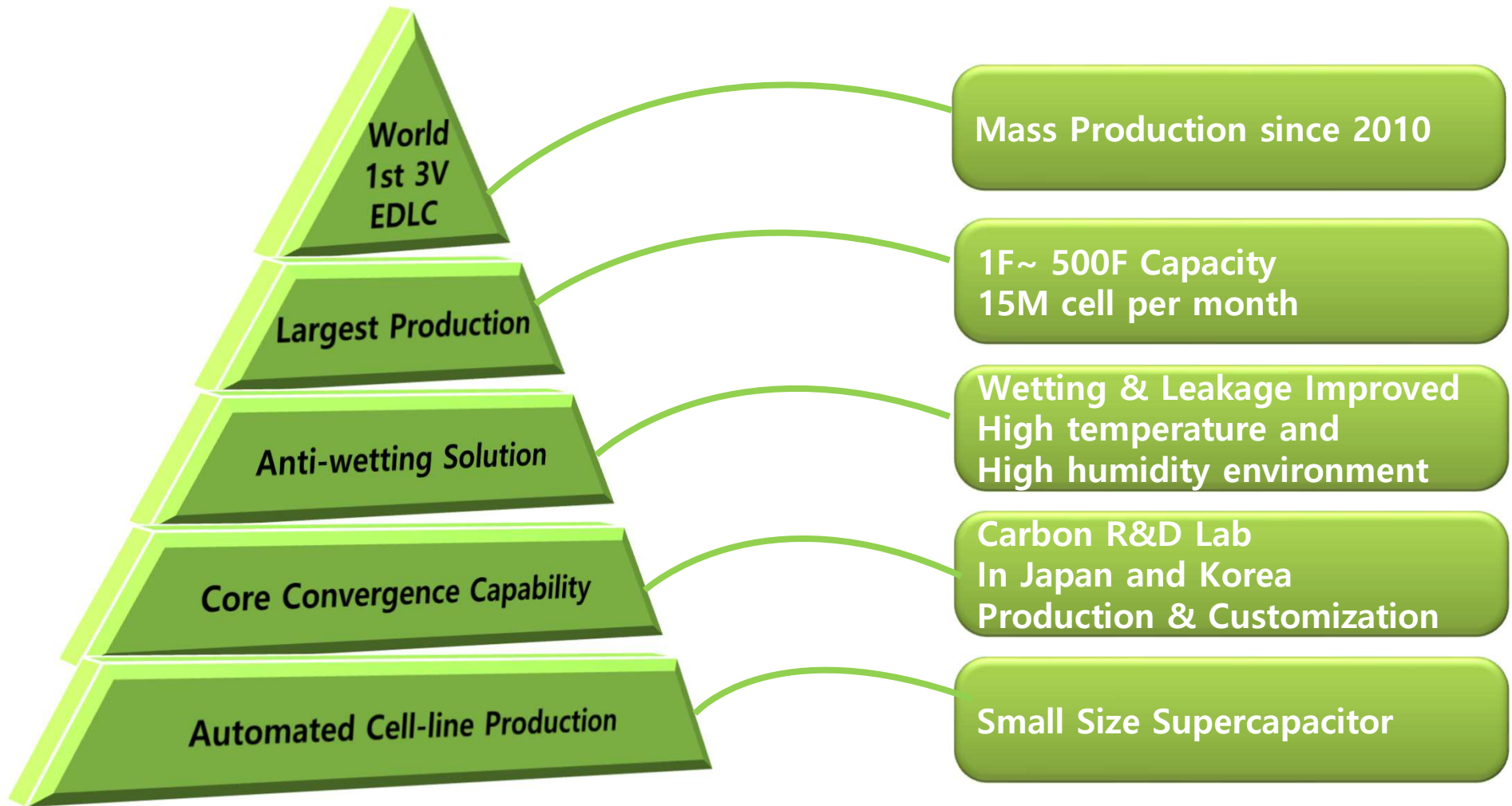


UL



Trade Mark

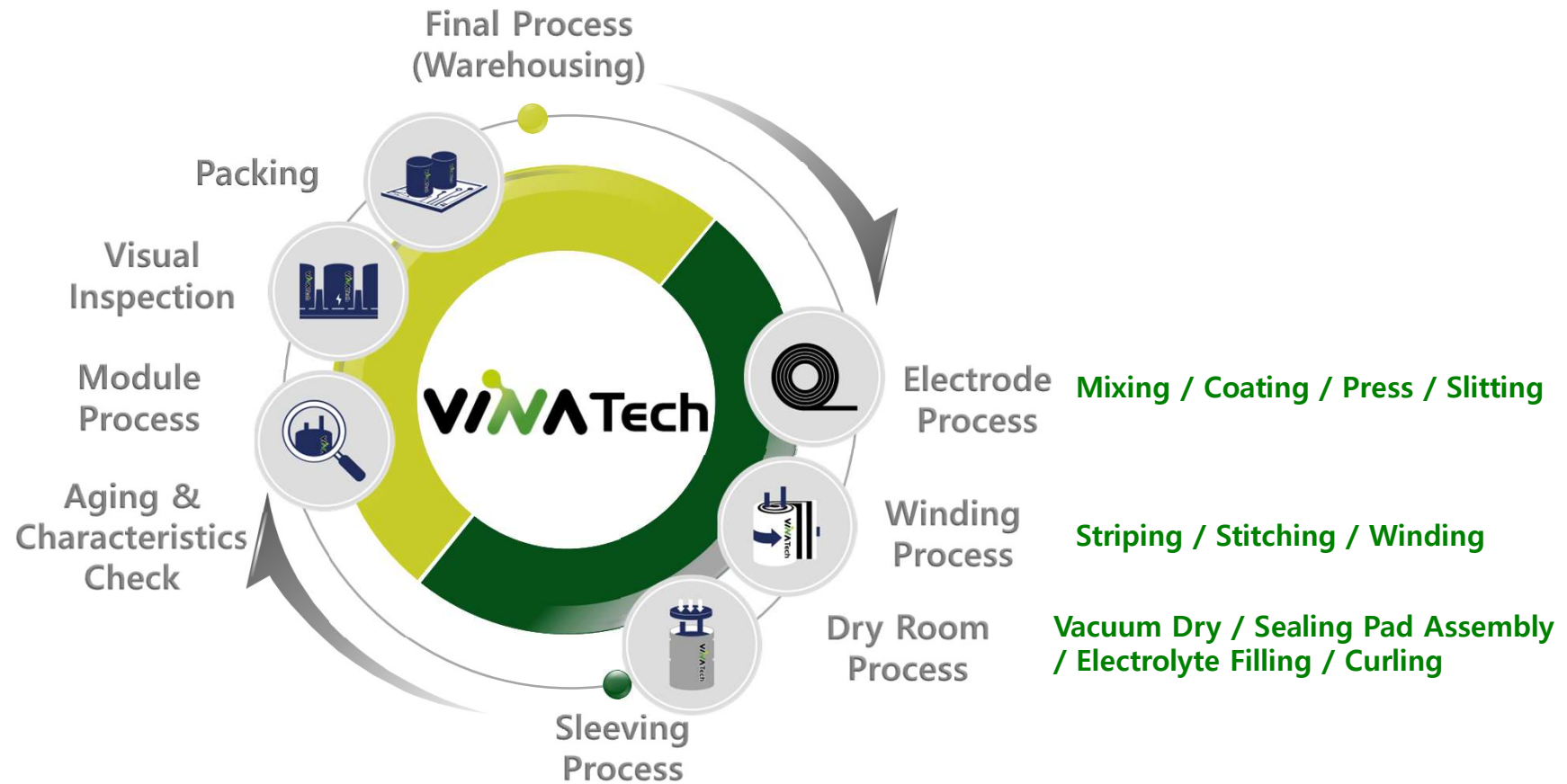




02

Supercapacitor Technology

Production Process



Dry Process

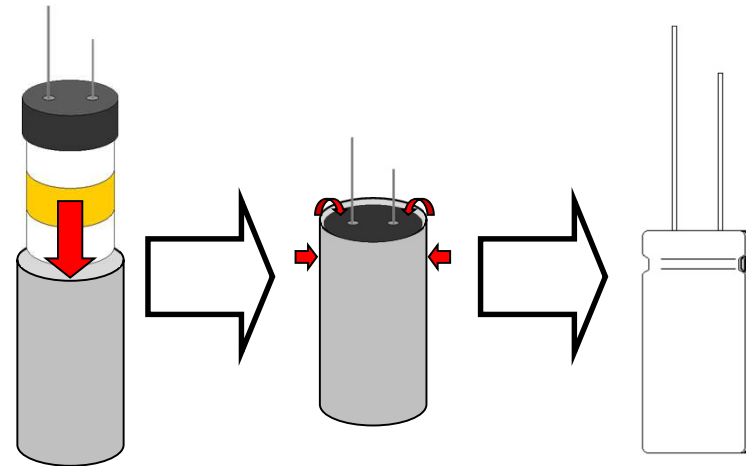
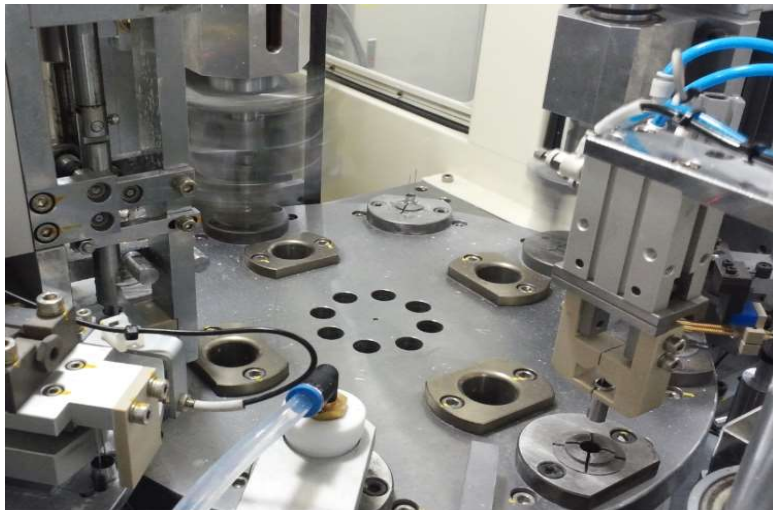


High Temperature Vacuum Dry Oven

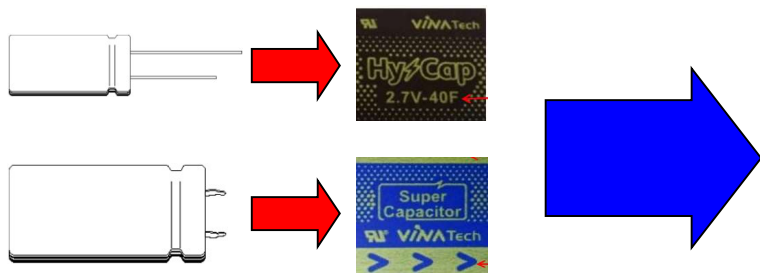
Electrolyte Filling Process



Al Can Assembly Process



Sleeving Process



Aging & Sorting 6hours burn in and 24 hours at 65c



03

Field Applications

Applications

Metering/ Data logging
SMART Metering

Electricity, Water & Gas Long life RTC and last gasp
GPRS & PLC concentrators Last Gasp & RTC back up

SMART Homes/ Buildings
Water Management
Emergency Lighting
Solar Studs in roads

Energy storage, Thermostats control, actuators.
Supporting Batteries with pulse management
Reduces requirement to replace Batteries
Longer life than Batteries

LED Lights

Consumer products for back up (Vacuum control)





Applications

SSD/ DRAM back up

Graceful shut down, PCs & Photocopiers

Engine Cranking for Generators

Replaces Batteries

PSU /SMPSU

Supporting Peak demands

Energy Storage Systems

Peak demand from battery

Fuel Cell systems

Peak power back up

SMART Grid

Feeder Terminal Unit / Monitoring

Tram system

Storing braking energy

Elevators

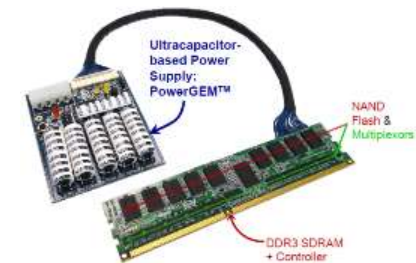
Regenerative braking energy storage

EPOS

Last gasp and Back up

Ethernet Controllers

Actuator controls



Automotive Applications

Tracking of Assets and Vehicles
Navigation systems
Container Trackers
Black box recorders/ DVR
ement
Braking system
Steering wheel
Hybrid Electric Vehicle
Idle stop start
Regenerative braking system and Pulse demands , gear shift growing applicatio
HUD Head up displays



Pulse support last gasp & Fail safe
Last gasp & Pulse support
Pulse management & last gasp
Immediate response, no battery replac

Back up power
Peak power assist
Power assist
Battery saving



04

New VET Series
(1st true 2.7V 85°C 85%)

Competitor Analysis
Technical Data

1-1. Competitor Analysis (1030, 10F)



Content	Competitor Product						VINATech	Remark
	C사	P사	E사	A사	K사	M사	VINATech VET 2R7 106 QG	
Rated Voltage (V _R)	2.5V	2.5V	2.5V	2.5V	2.7V	2.7V	2.7V	
Operating Temperature	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	Pass Low & High temperature characteristic test
Operating Humidity	-	-	-	-	-	-	85%RH	Acquisition of 85%RH condition reliability
Capacitance	10F	7.5F	10F	10F	10F	9F	10F	Company P: 7.5F (Using PC Electrolyte)
AC ESR 1kHz (mΩ)	26	30	55	50	55	25	32	
DC ESR (mΩ)	-	-	150	75	110	-	48	
Endurance Cap. & ESR (After 1000hr)	≤ 30% of initial value	≤ 40% of initial value	≤ 30% of initial value	≤ 30% of initial value	≤ 30% of initial value	≤ 20% of min. specification	≤ 30% of initial value	Company M = 9F is Standard
	≤ 2 times of specified value	≤ 4 times of specified value	≤ 3 times of specified value	≤ 2 times of specified value	≤ 4 times of specified value	≤ 2 times of specified value	≤ 3 times of specified value	
Leakage Current (mA, 72hr)	0.025	-	0.600(24hr)	0.03	-	0.025	0.030	

2-1. Spec. Sheet VET

High Temp . test Data_2.7V(0820 ~ 1325)

Rating

Capacitance	3.3F to 15F (0820 ~ 1325)
Maximum working voltage	2.7V
Capacitance tolerance	-10% to +30%(+20°C)
Operating Temperature & Humidity	-40 ~ +85°C, 85%RH

Specifications

Part Number	Rated Voltage (V)	Capacitance (F)	ESR(mΩ)		Max. Current (A)	Leakage Current (mA, 72hr)	Size (mm)
			AC(1kHz)	DC			D x L
VET 2R7 335 QG	2.7V	3.3	55	95	3	0.007	8 X 20
VET 2R7 505 QG	2.7V	5	40	60	5	0.020	8 X 30
VET 2R7 705 QG	2.7V	7	35	52	8.5	0.025	10 X 25
VET 2R7 106 QG	2.7V	10	32	48	9	0.030	10 X 30
VET 2R7 156 QG	2.7V	15	30	45	12	0.045	13 X 25

Performance

Parameter	Capacitance change(% of initial value)	ESR (% of initial Spec value)
Endurance (1000hr hours at High Temperature & High Humidity)	≤ 30% of initial value	≤ 3 times of specified value
Cycle Life Characteristics	Cycle	Over 500,000 at + 25°C
	ΔC	≤ 30% of initial value
	ESR	≤ 3 times of specified value
	Method	Cycle of Charge/discharge from V_R to $1/2V_R$
Shelf Life	2 Years, No Electrical Charge, Temperature below 70°C (ΔC : ≤ 10% of initial value / ΔESR : ≤ 50% of specified value)	

2-2. Spec. Sheet VET



High Temp . test Data_2.7V(1030,1325)

Test Condition

Test Condition	Temp.	Voltage	Time
	85°C±0.3°C 85%RH (ESPEC CORP.)	2.7V	1,000hr
Capacitance	(10mA/F) charging to 2.7V, 2.7V for 30min and (10mA/F) discharging to 0.1V F=I×(TI-T2)/(V1-V2), V1=2.16V , V2=1.08V (IEC-62391, Class 3)		
AC - ESR	mΩ @ 1kHz		

Summary Data

Test Result	Division	Cap. (F)		AC-ESR (mΩ)	
		VINA VET Series (VET1 1030)	VINA VET Series (VET1 1325)	VINA VET Series (VET1 1030)	VINA VET Series (VET1 1325)
	Initial characteristics	10.72(76)	15.88	Actual Value : 15.59	Actual Value : 14.19
	1000hrs	8.49(51)	11.77	Actual Value : 55.01	Actual Value : 59.22
	Rate(%)	-20.8(20.9)	-25.9	(Relative to Spec) +171.9	(Relative to Spec) +197.4

Spec : 10F

Spec : 15F

Spec : 32mΩ

Spec : 30mΩ

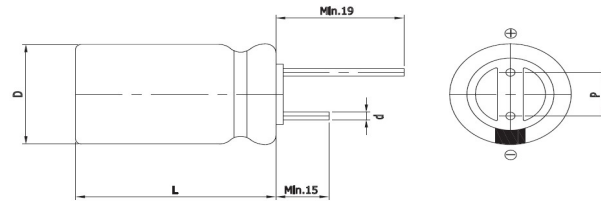
2.7V 3.3F (0820) New

Features

EDLC (Electric Double Layer Capacitor)

- High Power Density
- Over 500,000 cycle life (semi-permanent)
- Short-term Peak Power assist applications
- RoHS compliant
- Long-term reliability improved at high temperature and humidity

Drawing



D (Φ)	8.0
L (mm)	20.0
d (Φ)	0.6
P (mm)	3.5

Specification

Item	Characteristics	
Product series	EDLC	
Rated Voltage (V _R)	2.7V	
Operating Temperature	-40 ~ +85°C	
Capacitance Tolerance	-10 ~ +30%	
High Temperature & High Humidity Load Life	After 1,000 hours at V _R loaded under +85°C, 85%RH Humidity, capacitors meet the following criteria.	
	Capacitance Change	≤ 30% of initial value
	ESR	≤ 3 times of specified value
Cycle Life Characteristics	Cycle	Over 500,000
	ΔC	≤ 30% of initial value
	ESR	≤ 3 times of specified value
	Method	Cycle of Charge/discharge from V _R to 1/2V _R
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 10% of initial value / ΔESR : ≤ 50% of specified value)	

Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ)		Max. Current (A)	Leakage Current (mA, 72hr)	Size (mm)
			AC(1kHz)	DC			D x L
VET 2R7 335 QG	2.7	3.3	55	95	3	0.007	08 x 20

* **Max. Current** : 1 sec. discharge to 1/2V_R

* **Note**: The products are tested based on the test conditions and methods defined in AEC-Q200

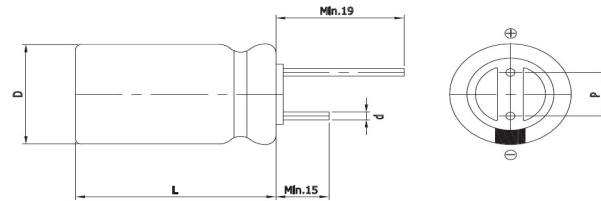
2.7V 5F (0830) New

Features

EDLC (Electric Double Layer Capacitor)

- High Power Density
- Over 500,000 cycle life (semi-permanent)
- Short-term Peak Power assist applications
- RoHS compliant
- Long-term reliability improved at high temperature and humidity

Drawing



D (Φ)	8.0
L (mm)	30.0
d (Φ)	0.6
P (mm)	3.5

Specification

Item	Characteristics	
Product series	EDLC	
Rated Voltage (V_R)	2.7V	
Operating Temperature	-40 ~ +85°C	
Capacitance Tolerance	-10 ~ +30%	
High Temperature & High Humidity Load Life	After 1,000 hours at V_R loaded under +85°C, 85%RH Humidity, capacitors meet the following criteria.	
	Capacitance Change	≤ 30% of initial value
	ESR	≤ 3 times of specified value
Cycle Life Characteristics	Cycle	Over 500,000
	ΔC	≤ 30% of initial value
	ESR	≤ 3 times of specified value
	Method	Cycle of Charge/discharge from V_R to $1/2V_R$
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 10% of initial value / ΔESR : ≤ 50% of specified value)	

Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ)		Max. Current (A)	Leakage Current (mA, 72hr)	Size (mm)
			AC(1kHz)	DC			D x L
VET 2R7 505 QG	2.7	5	40	60	5	0.020	08 x 30

* **Max. Current** : 1 sec. discharge to $1/2V_R$

* **Note**: The products are tested based on the test conditions and methods defined in AEC-Q200

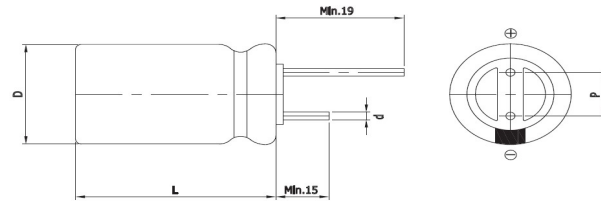
2.7V 10F (1030) New

Features

EDLC (Electric Double Layer Capacitor)

- High Power Density
- Over 500,000 cycle life (semi-permanent)
- Short-term Peak Power assist applications
- RoHS compliant
- Long-term reliability improved at high temperature and humidity

Drawing



D (Φ)	10.0
L (mm)	30.0
d (Φ)	0.6
P (mm)	5.0

Specification

Item	Characteristics	
Product series	EDLC	
Rated Voltage (V_R)	2.7V	
Operating Temperature	-40 ~ +85°C	
Capacitance Tolerance	-10 ~ +30%	
High Temperature & High Humidity Load Life	After 1,000 hours at V_R loaded under +85°C, 85%RH Humidity, capacitors meet the following criteria.	
	Capacitance Change	≤ 30% of initial value
	ESR	≤ 3 times of specified value
Cycle Life Characteristics	Cycle	Over 500,000
	ΔC	≤ 30% of initial value
	ESR	≤ 3 times of specified value
	Method	Cycle of Charge/discharge from V_R to $1/2V_R$
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 10% of initial value / ΔESR : ≤ 50% of specified value)	

Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ)		Max. Current (A)	Leakage Current (mA, 72hr)	Size (mm)
			AC(1kHz)	DC			D x L
VET 2R7 106 QG	2.7	10	32	48	9	0.030	10 x 30

* **Max. Current** : 1 sec. discharge to $1/2V_R$

* **Note**: The products are tested based on the test conditions and methods defined in AEC-Q200

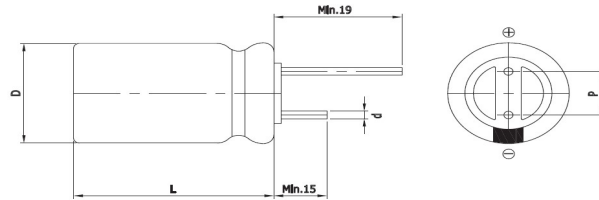
2.7V 15F (1325) New

Features

EDLC (Electric Double Layer Capacitor)

- High Power Density
- Over 500,000 cycle life (semi-permanent)
- Short-term Peak Power assist applications
- RoHS compliant
- Long-term reliability improved at high temperature and humidity

Drawing



D (Φ)	12.5
L (mm)	25.0
d (Φ)	0.6
P (mm)	5.0

Specification

Item	Characteristics	
Product series	EDLC	
Rated Voltage (V _R)	2.7V	
Operating Temperature	-40 ~ +85°C	
Capacitance Tolerance	-10 ~ +30%	
High Temperature & High Humidity Load Life	After 1,000 hours at V _R loaded under +85°C, 85%RH Humidity, capacitors meet the following criteria.	
	Capacitance Change	≤ 30% of initial value
	ESR	≤ 3 times of specified value
Cycle Life Characteristics	Cycle	Over 500,000
	ΔC	≤ 30% of initial value
	ESR	≤ 3 times of specified value
	Method	Cycle of Charge/discharge from V _R to 1/2V _R
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 10% of initial value / ΔESR : ≤ 50% of specified value)	

Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ)		Max. Current (A)	Leakage Current (mA, 72hr)	Size (mm)
			AC(1kHz)	DC			D x L
VET 2R7 156 QG	2.7	15	30	45	12	0.045	13 x 25

* **Max. Current** : 1 sec. discharge to 1/2V_R

* **Note**: The products are tested based on the test conditions and methods defined in AEC-Q200

05

New VPC (VINA Pulse Capacitor)

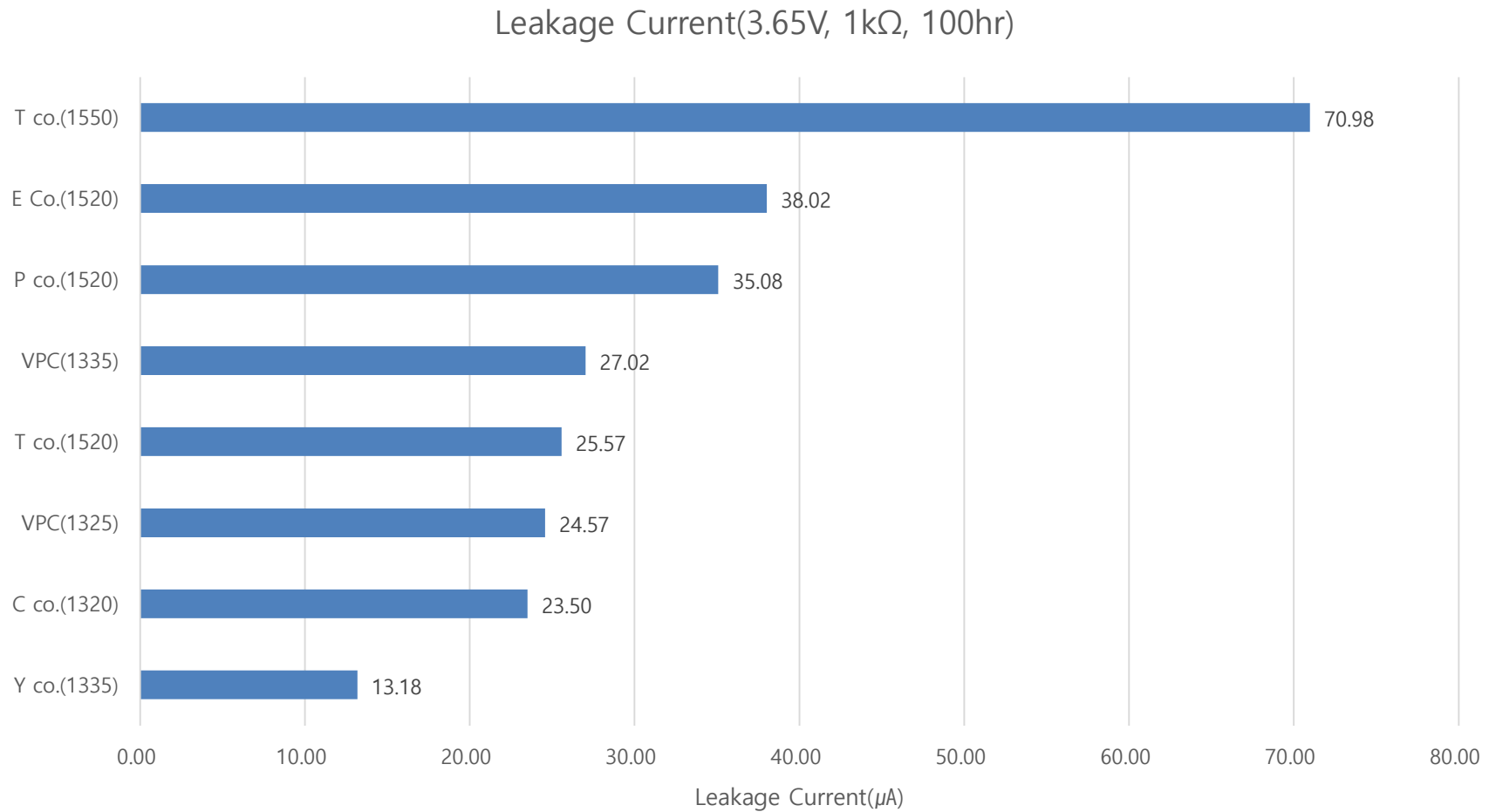
Introduction
Competitor Analysis
Technical Data
Strategy and Future Plan

1. VPC Introduction

	EDLC-WEC	LIC -VLC	Pulse Capacitor VEL	LIB
Anode Material	Activated Carbon	Activated Carbon	Activated Carbon + Li Active Material	Li Active Material
Cathode Material	Activated Carbon	Graphite/Hard Carbon +Li Metal	Graphite/ Hard Carbon	Graphite/ Hard Carbon
Electrolyte	Organic Solvent	Organic Solvent	Organic Solvent	Organic Solvent
Internal Resistance	Low	Medium	Medium	High
Operating Temperature (°C)	-40~85	-30~85	-20~70	-10~60
Rated Voltage (V)	2.3 to 3.0	3.8	3.8 to 4.0	4.1 to 4.3
Minimum Operating Voltage (V)	0	2.2	2.5	2.5
Capacitance / Volume	Not Good (1)	Not Good (2~3)	Good (5~10)	Very Good (~100)
Charge / Discharge Cycle	Very Good (100k ~)	Very Good (100k ~)	Good (20k ~)	Poor (~ 5K)
Self-Discharge	Poor	Good	Good	Good
Voltage Monitoring Required	Not Required	Mandatory	Mandatory	Mandatory
Production cost / Size	Very Good (1) *Based on Single Cell	Poor (~4)	Good (~2)	Poor (~5)

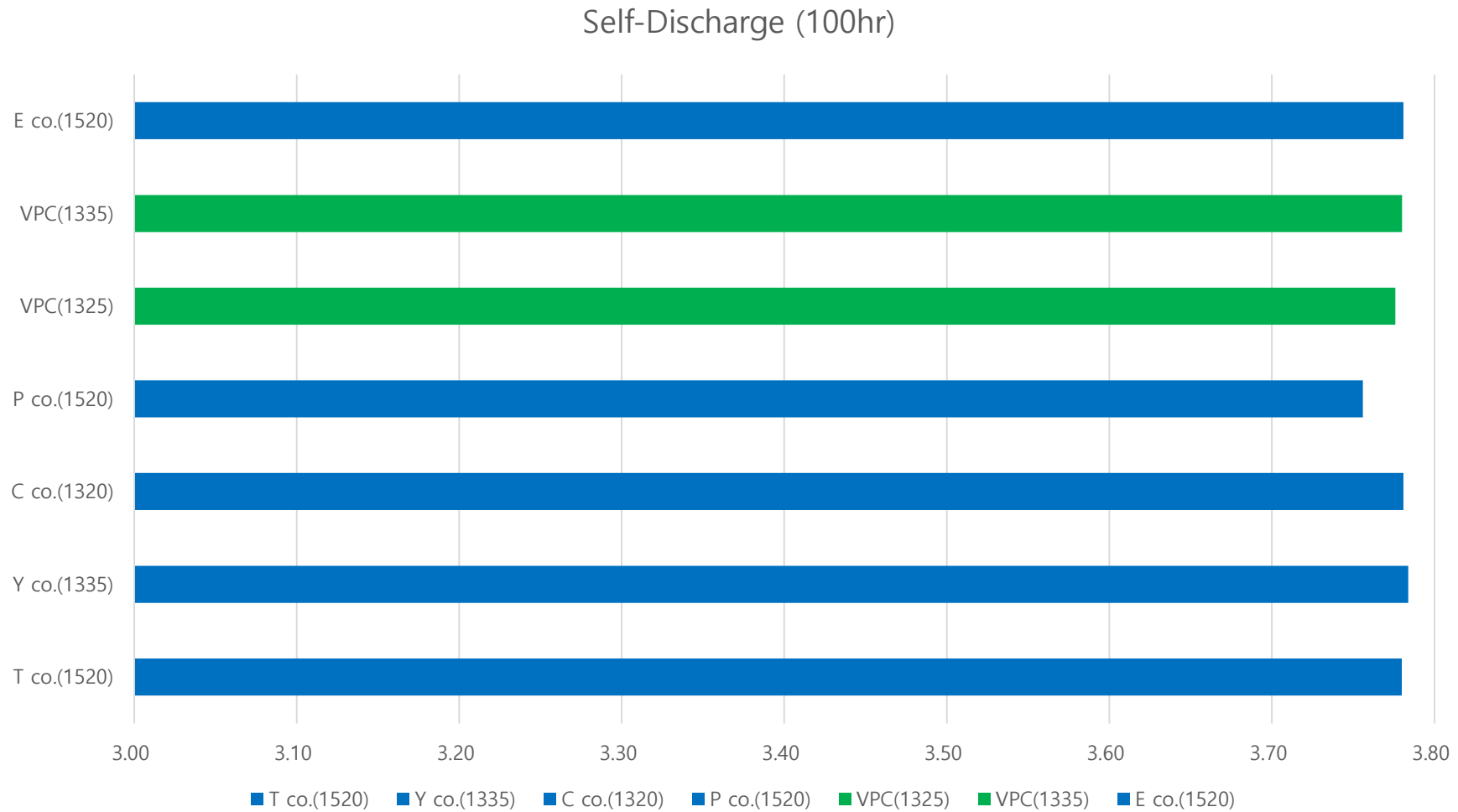
2-5. Leakage Current Test DATA

- Test Conditions : Room Temperature
- Measuring conditions : Charge 3.65V, 100hr, Charge Protection Resistance (1k Ω)



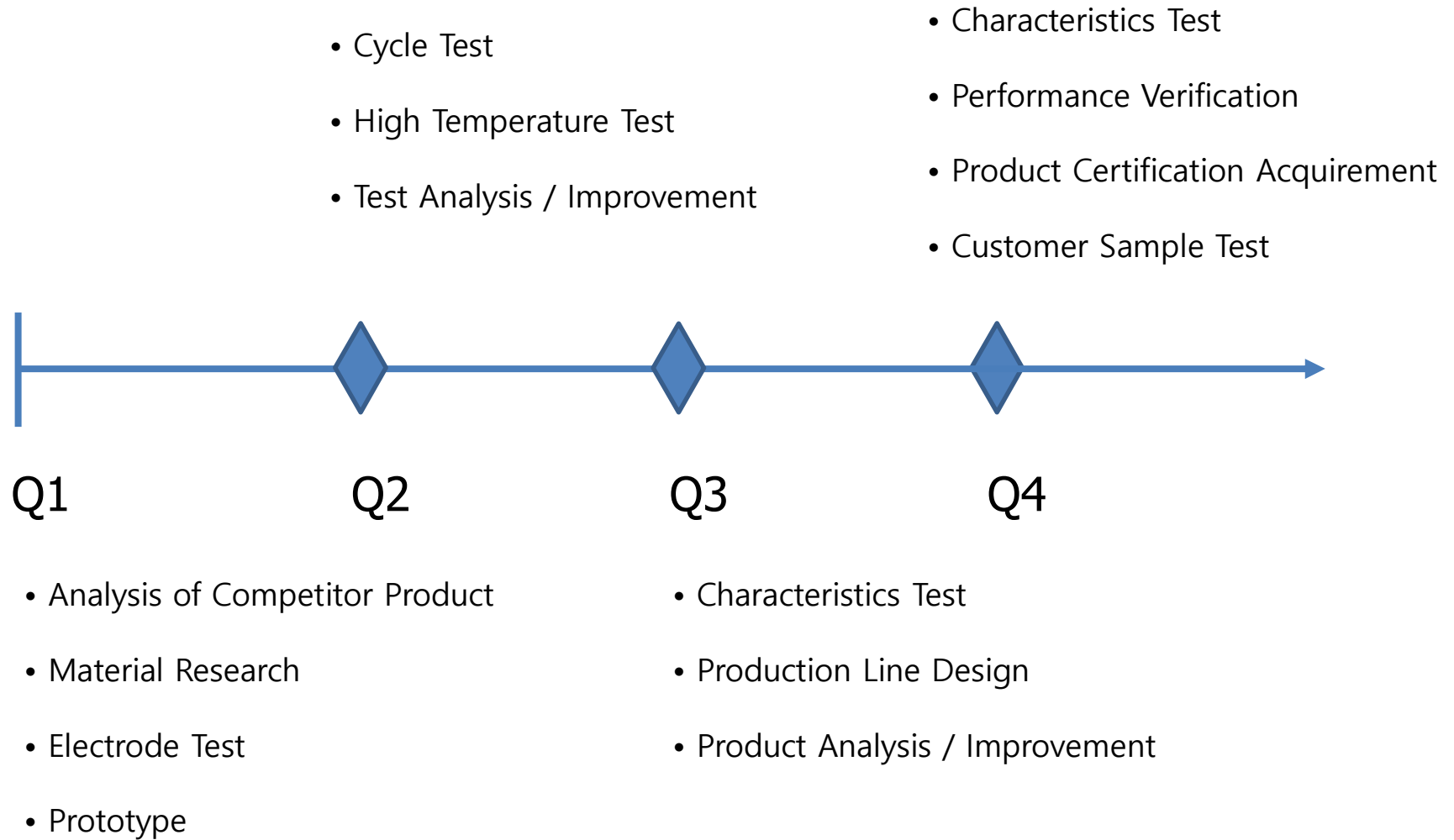
2-6. Self-Discharge Test DATA

- Test Conditions : Room Temperature
- Measuring conditions : Charge 3.8V, 3hr / Rest



- Self-Discharge levels of all company products are similar (China P is the Lowest)

3. R&D Road Map



3.8V 100F (1030)

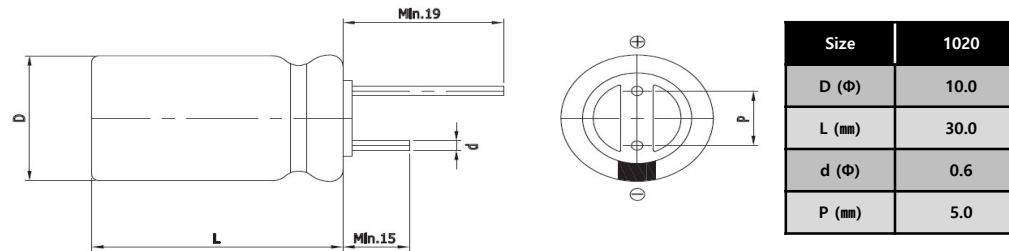
New

Features

VPC (Vina Pulse Capacitor)

- Low Self Discharge
- Wide Operating Temperature Range
- High Operating Voltage
- High Capacitance

Drawing



Specification

Item	Characteristics					
Product series	VPC					
Rated Voltage (V_R)	3.8V					
Operating Temperature	-25 ~ +70°C (-40 ~ +85°C#1)					
Capacitance Tolerance	-10 ~ +30%					
Temperature Characteristics	The specifications shall be met at category temperature range form -25°C to 70°C					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
High Temperature Loaded	After 1,000 hours at V_R loaded under +70°C(+85°C#2) capacitors meet the following criteria.					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 5% of initial value / ΔESR : ≤ 100% of specified value)					
Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ) AC(1kHz)	Max.Discharge Current (A)		Size (mm) D x L
VEL 3R8 107 G	3.8	100	90	Continuous	Pulse (1s)	10 x 30

* #1 in SOCI2 battery system

* #2 Charging voltage is 3.5V when above 85°C

3.8V 150F (1325)

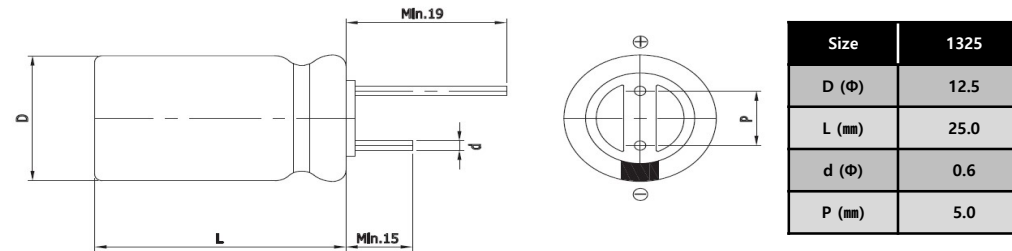
New

Features

VPC (Vina Pulse Capacitor)

- Low Self Discharge
- Wide Operating Temperature Range
- High Operating Voltage
- High Capacitance

Drawing



Specification

Item	Characteristics					
Product series	VPC					
Rated Voltage (V_R)	3.8V					
Operating Temperature	-25 ~ +70°C (-40 ~ +85°C#1)					
Capacitance Tolerance	-10 ~ +30%					
Temperature Characteristics	The specifications shall be met at category temperature range form -25°C to 70°C					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
High Temperature Loaded	After 1,000 hours at V_R loaded under +70°C(+85°C#2) capacitors meet the following criteria.					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 5% of initial value / ΔESR : ≤ 100% of specified value)					
Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ) AC(1kHz)	Max.Discharge Current (A) Continuous	Pulse (1s)	Size (mm) D x L
VEL 3R8 157 G	3.8	150	50	1.0	4.0	12.5 x 25

* #1 in SOCI2 battery system

* #2 Charging voltage is 3.5V when above 85°C

3.8V 250F (1335)

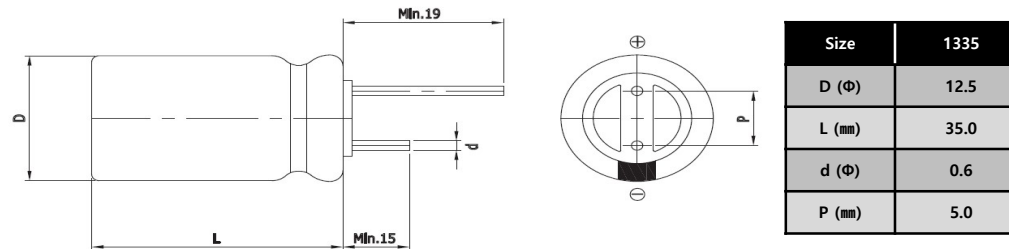
New

Features

VPC (Vina Pulse Capacitor)

- Low Self Discharge
- Wide Operating Temperature Range
- High Operating Voltage
- High Capacitance

Drawing



Specification

Item	Characteristics					
Product series	VPC					
Rated Voltage (V_R)	3.8V					
Operating Temperature	-25 ~ +70°C (-40 ~ +85°C#1)					
Capacitance Tolerance	-10 ~ +30%					
Temperature Characteristics	The specifications shall be met at category temperature range form -25°C to 70°C					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
High Temperature Loaded	After 1,000 hours at V_R loaded under +70°C(+85°C#2) capacitors meet the following criteria.					
	Capacitance Change	≤ 30% of initial value				
	ESR	≤ 2 times of specified value				
Shelf Life	2 Years No Electrical Charge, Temperature below 70°C (ΔC : ≤ 5% of initial value / ΔESR : ≤ 100% of specified value)					
Part Number	Rated Voltage (V)	Capacitance (F)	ESR (mΩ) AC(1kHz)	Max.Discharge Current (A) Continuous	Pulse (1s)	Size (mm) D x L
VEL 3R8 257 G	3.8	250	40	2.0	5.0	12.5 x 35

* #1 in SOCI2 battery system

* #2 Charging voltage is 3.5V when above 85°C

VINA Spirit

"Customers are the Reason behind our Business"

Mission

"We endeavour to fulfill the happiness of our customers, employees and shareholders as well as our society, by offering environmentally-friendly products"

Vision
2020

Energy Solution

World Best Super Capacitor Provider

Sales Revenue 70M US\$

Operating Income 17.5M US\$

Carbon Solution

Fuel Cell · Activated Carbon business

Sales Revenue 10M US\$

Operating Income 2M US\$

Thank You

