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# Introduction of INR18650-25R

SAMSUNG SDI

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**Energy Business Division**

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# Specification

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| Type | | Spec. | Typical INR18650-25R |
|---|---|---|---|
| Chemistry | | NCA | NCA |
| Dimension (mm) | Diameter | 18.33 ± 0.07 | 18.33 ± 0.07 |
| | Height | 64.85 ± 0.15 | 64.85 ± 0.15 |
| Weight (g) | | Max. 45.0 | 43.8 |
| Initial IR (mΩ AC 1kHz) | | ≤ 18 | 13.20 ± 2 |
| Initial IR (mΩ DC (10A-1A)) | | ≤ 30 | 22.15 ± 2 |
| Nominal Voltage (V) | | 3.6 | 3.64 |
| Charge Method (100mA cut-off) | | CC-CV (4.2±0.05V) | CC-CV (4.2±0.05V) |
| Charge Time | Standard (min), 0.5C | 180min | 134min |
| | Rapid (min), 4A | 60min | 55min |
| Charge Current | Standard current (A) | 1.25 | 1.25 |
| | Max. current (A) | 4.0 | 4.0 |
| Discharge | End voltage (V) | 2.5 | 2.5 |
| | Max. cont. current (A) | 20 | 20 |
| | Max. momentary pulse (A, <1sec) | 100 | 100 |
| Rated discharge Capacity | Standard (mAh) (0.2C) | 2,500 | 2.560 |
| | rated (mAh) (10A) | 2,450 | 2.539 |

# Capacity _ 0.2C vs. 10A

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## ▪ 0.2C capacity

| Cell | Capacity(Ah) | Energy(Wh) | Avg. volt(V) |
|---|---|---|---|
| 1 | 2.555 | 9.36 | 3.66 |
| 2 | 2.557 | 9.37 | 3.66 |
| 3 | 2.557 | 9.37 | 3.67 |
| 4 | 2.564 | 9.39 | 3.66 |
| 5 | 2.565 | 9.40 | 3.66 |
| **Avg.** | **2.560** | **9.38** | **3.66** |

## ▪ 10A capacity

| Cell | Capacity(Ah) | Energy(Wh) | Avg. volt(V) |
|---|---|---|---|
| 1 | 2.533 | 8.71 | 3.44 |
| 2 | 2.531 | 8.70 | 3.43 |
| 3 | 2.539 | 8.74 | 3.44 |
| 4 | 2.544 | 8.77 | 3.45 |
| 5 | 2.548 | 8.76 | 3.44 |
| **Avg.** | **2.539** | **8.74** | **3.44** |

# AC/DC Impedance

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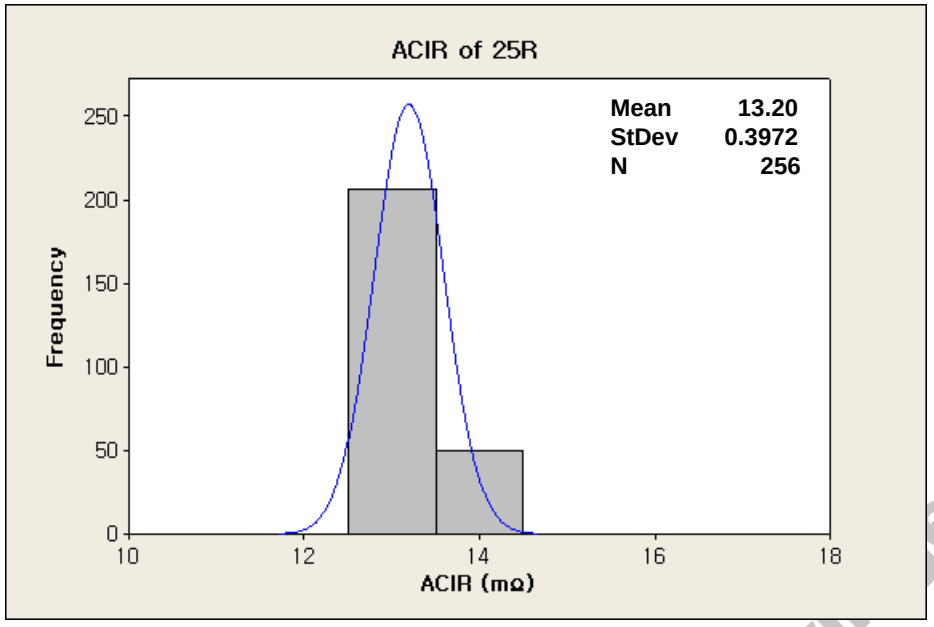
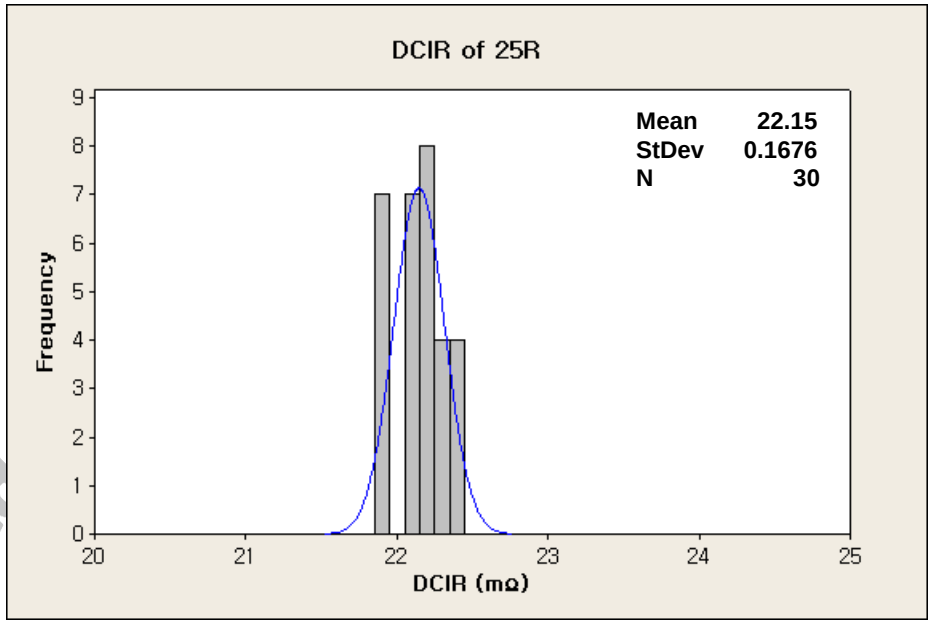
## ▪ AC-IR




| AC-IR |
| --- |
| 13.20 ± 2mΩ |

## ▪ DC-IR




| DC-IR |
| --- |
| 22.15 ± 2mΩ |

# Capacity & Temperature vs. discharge capacity

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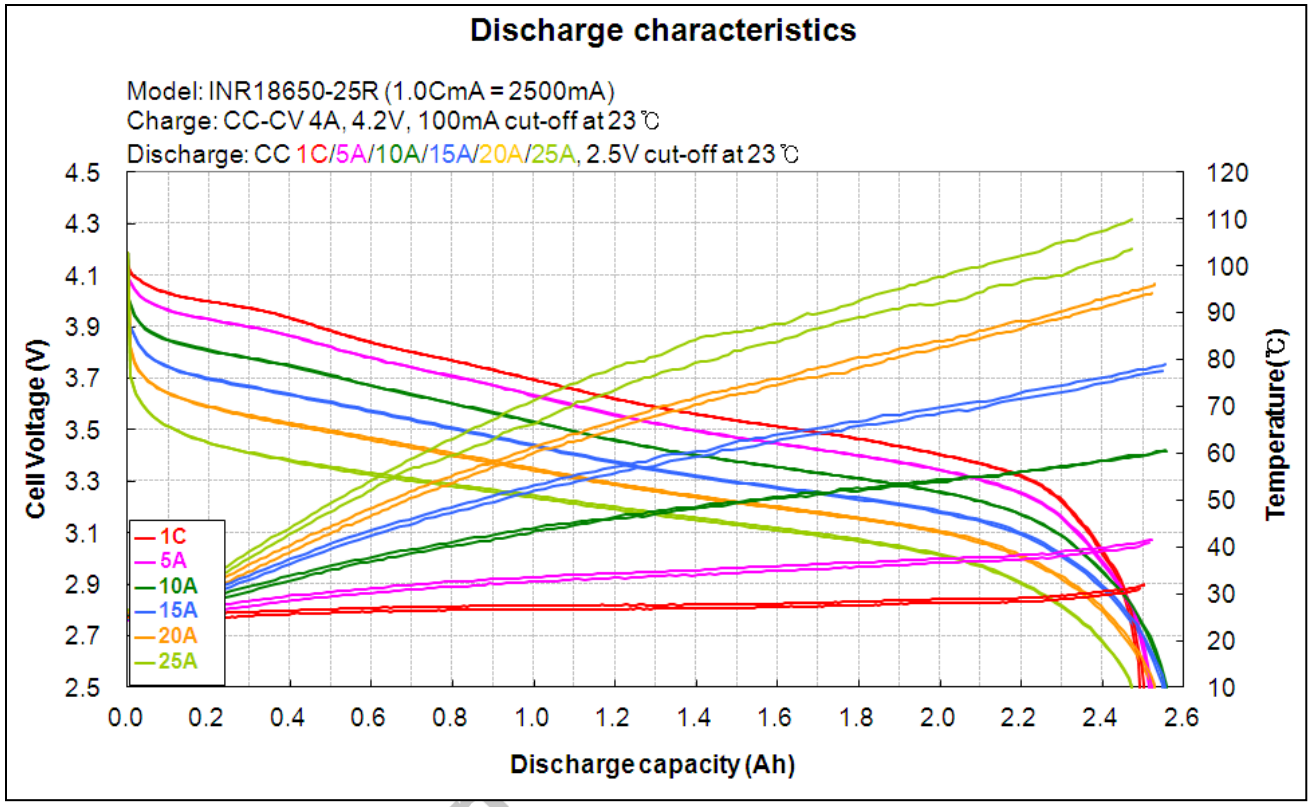


| Discharge current | | | | | | |
|---|---|---|---|---|---|---|
| | 1C | 5A | 10A | 15A | 20A | 25A |
| Capa.(Ah) | 2.496 | 2.518 | 2.556 | 2.550 | 2.525 | 2.472 |
| Temp.(℃) | 31.6 | 41.2 | 60.6 | 78.4 | 95.2 | 106.8 |
| Time(min.) | 59.9 | 30.2 | 15.3 | 10.2 | 7.6 | 5.9 |

# Energy & Avg. voltage at different current

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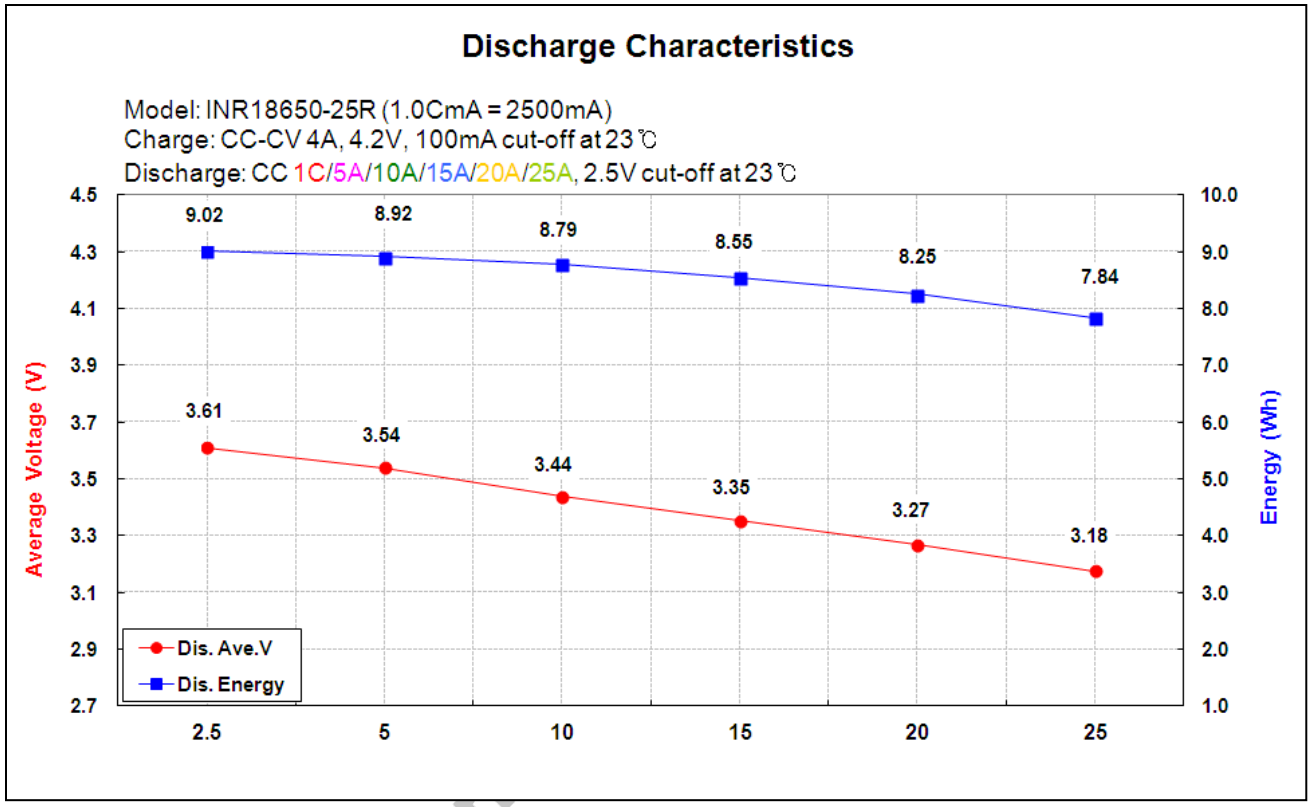


| Discharge current | | | | | | |
|---|---|---|---|---|---|---|
| | 1C | 5A | 10A | 15A | 20A | 25A |
| Energy(Wh) | 9.02 | 8.95 | 8.79 | 8.55 | 8.25 | 7.84 |
| Avg. voltage(V) | 3.61 | 3.54 | 3.44 | 3.35 | 3.27 | 3.18 |

# Cycle life _ 20A cycle

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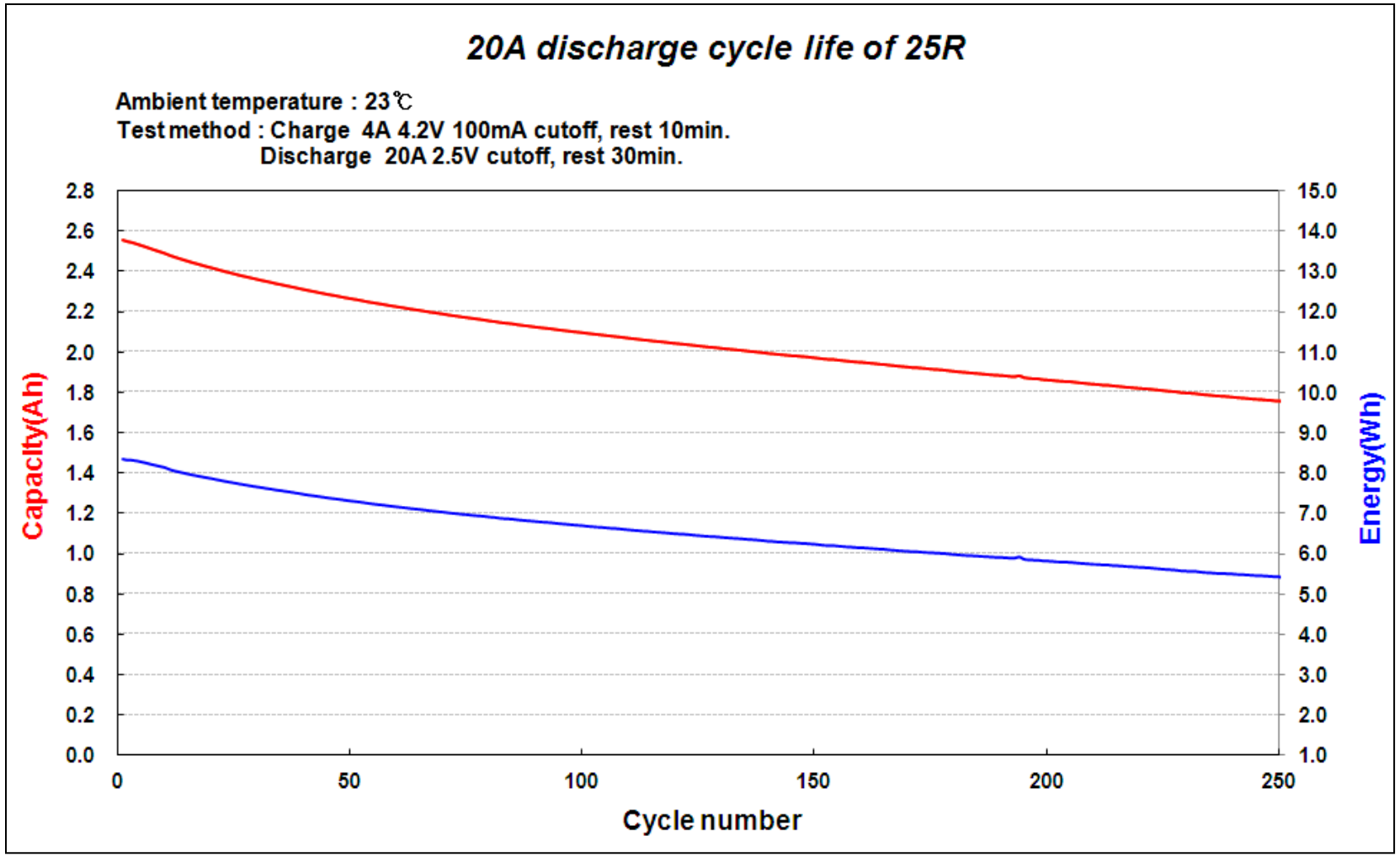

# Cycle life _ 30A cycle(70℃ T-cut)

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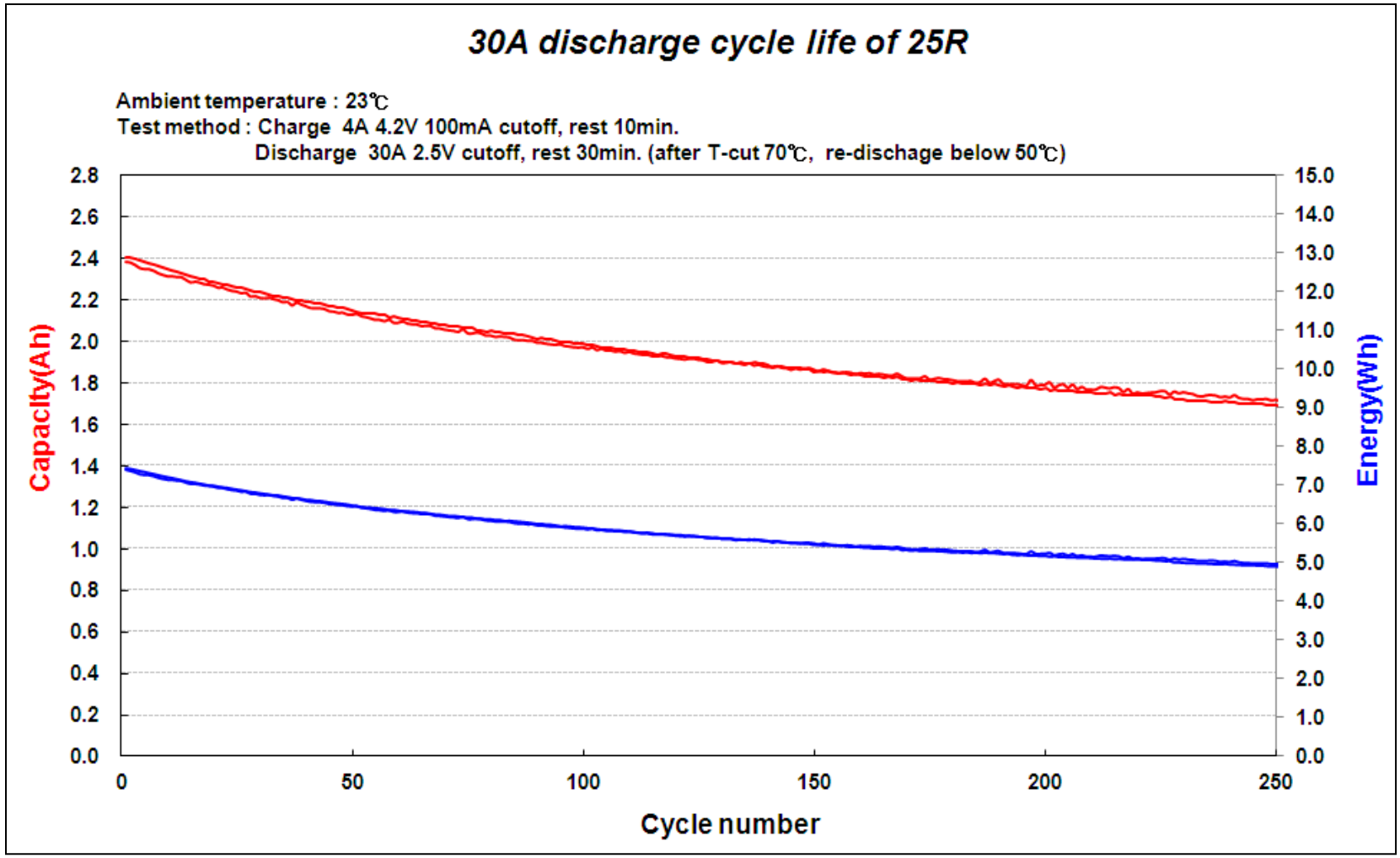

# High pulse cycle life

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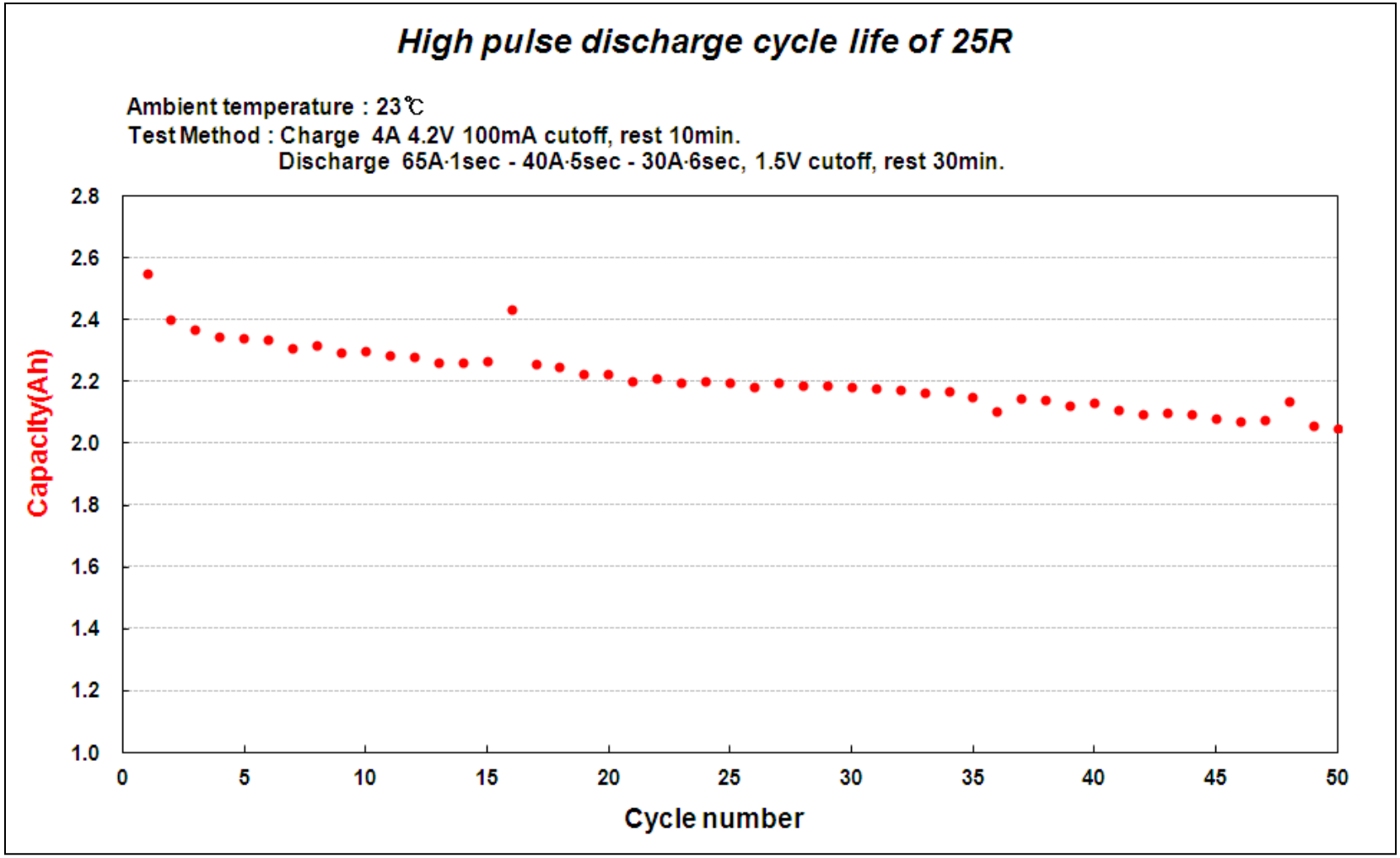

# High pulse cycle life 2

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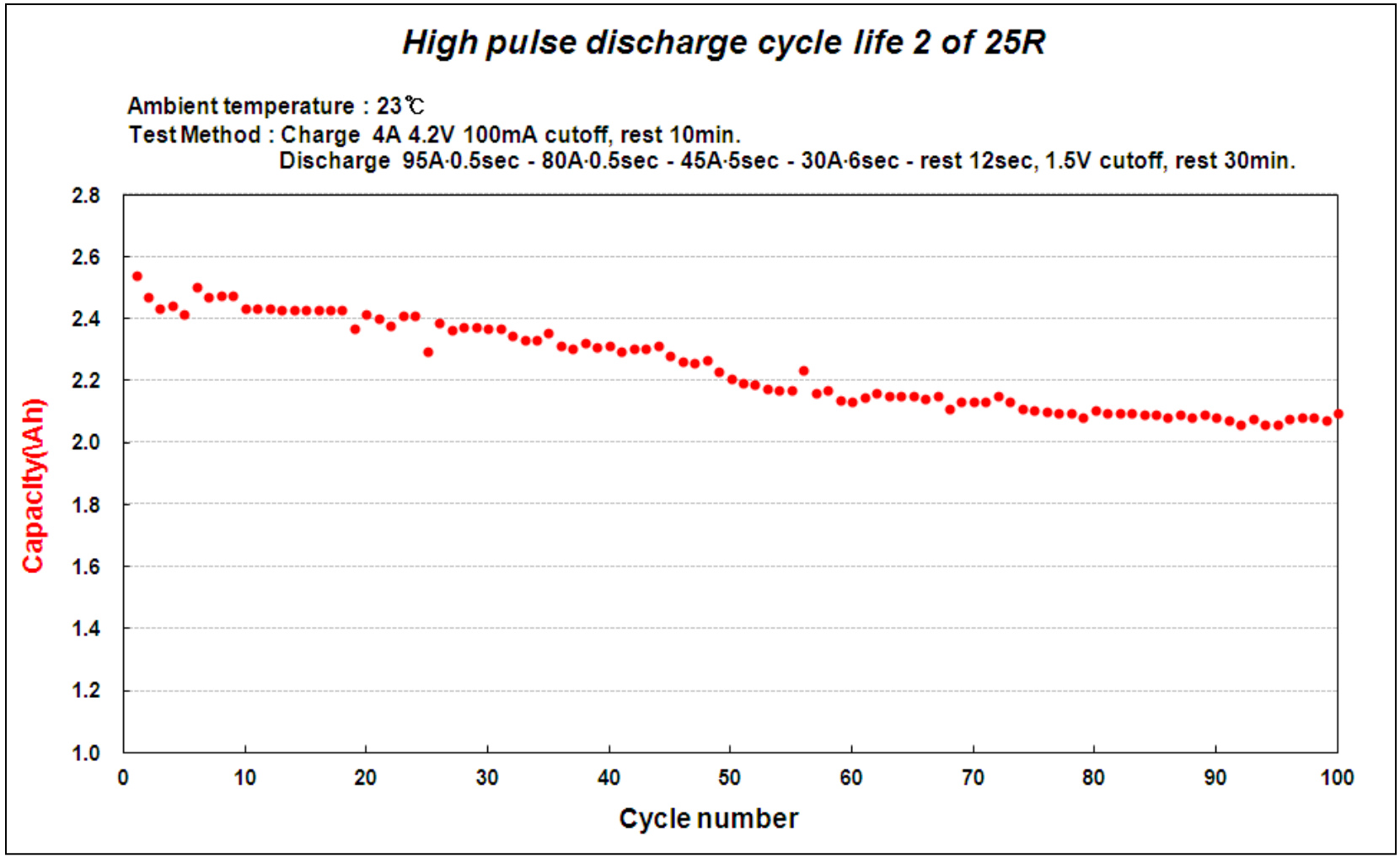

# Low temperature discharge (10A)

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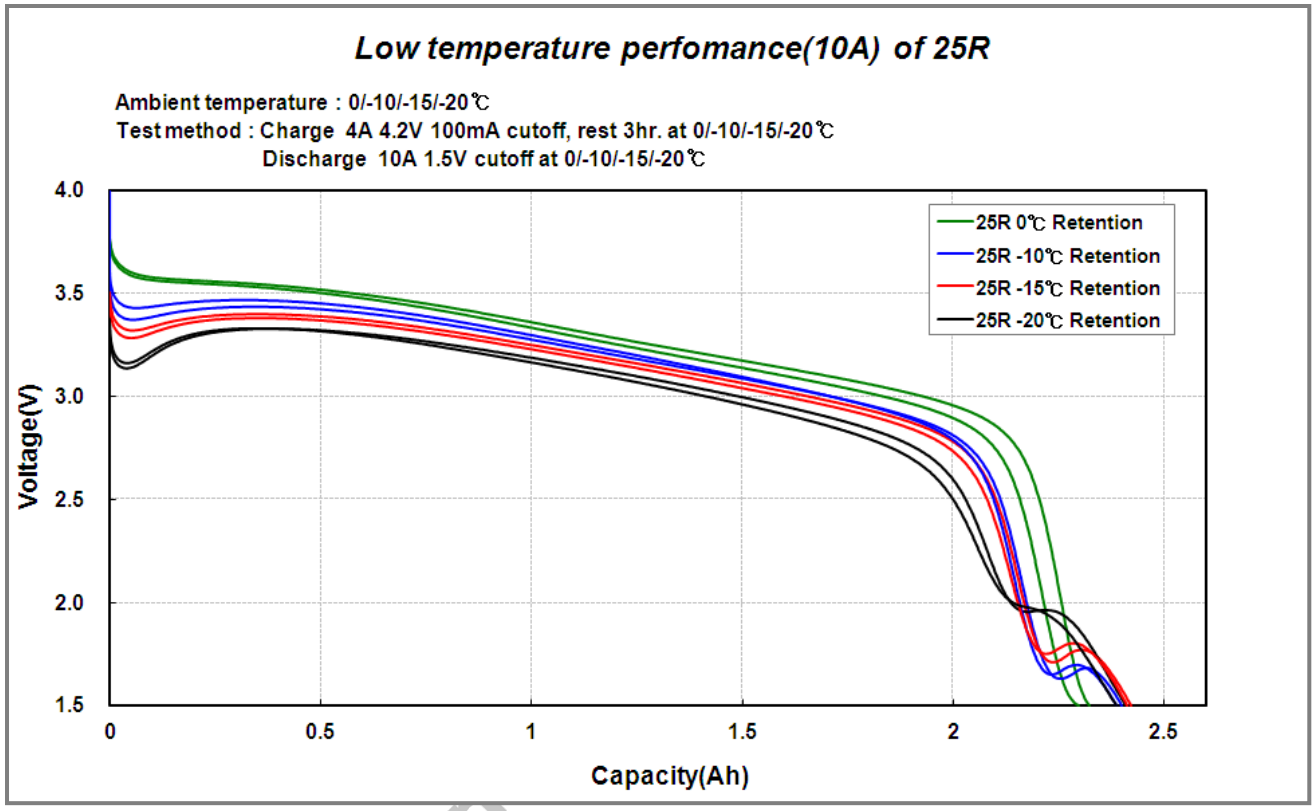


| | 0 ℃ | | -10 ℃ | | -15 ℃ | | -20 ℃ | |
|---|---|---|---|---|---|---|---|---|
| | Capacity(Ah) | Capa.(%) | Capacity(Ah) | Capa.(%) | Capacity(Ah) | Capa.(%) | Capacity(Ah) | Capa.(%) |
| 10A | 2.323 | 92.9 | 2.398 | 95.9 | 2.413 | 96.5 | 2.407 | 96.3 |
| | 2.298 | 91.9 | 2.385 | 95.4 | 2.421 | 96.8 | 2.386 | 95.4 |
| **Avg.** | **2.310** | **92.4** | **2.392** | **95.7** | **2.417** | **96.7** | **2.397** | **95.9** |

# Storage at 60℃

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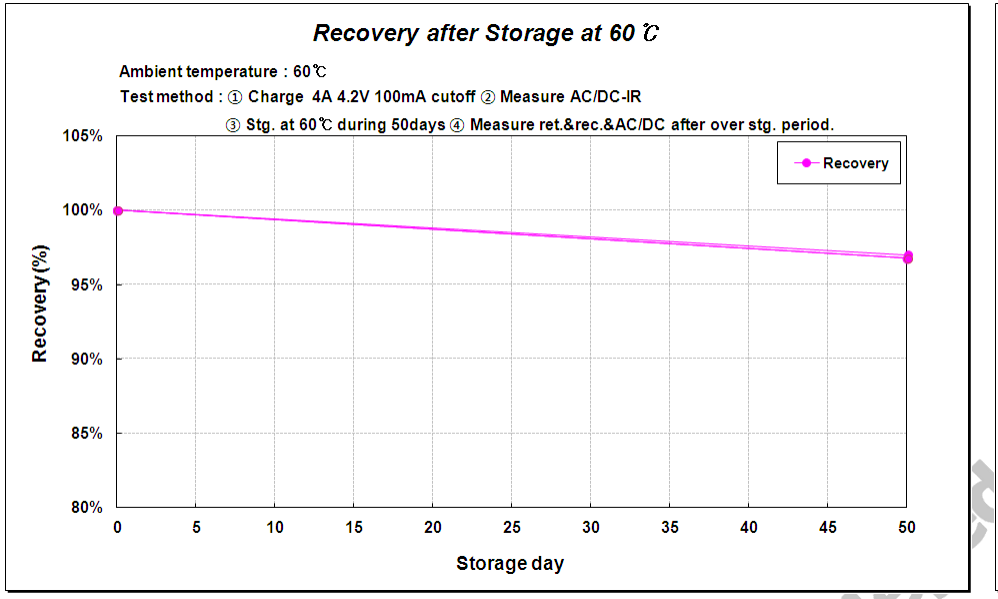
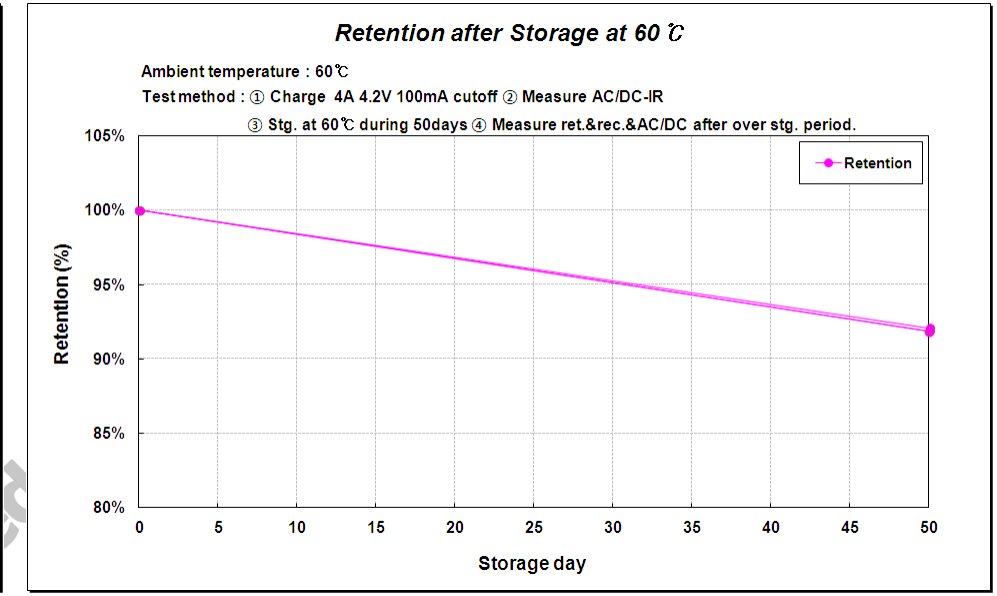
## ▪ Recovery




## ▪ Retention




**Storage at 60℃**

| storage day | initial | | | after storage | | | | Ratio(%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACIR | DCIR | Capacity | ACIR | DCIR | Retention | Recovery | ACIR | DCIR | Retention | Recovery |
| 50 | 13.2 | 20.2 | 2597 | 15.3 | 29.3 | 2122 | 2393 | 115.8 | 145.2 | 81.7 | 92.1 |

# Storage at 60℃

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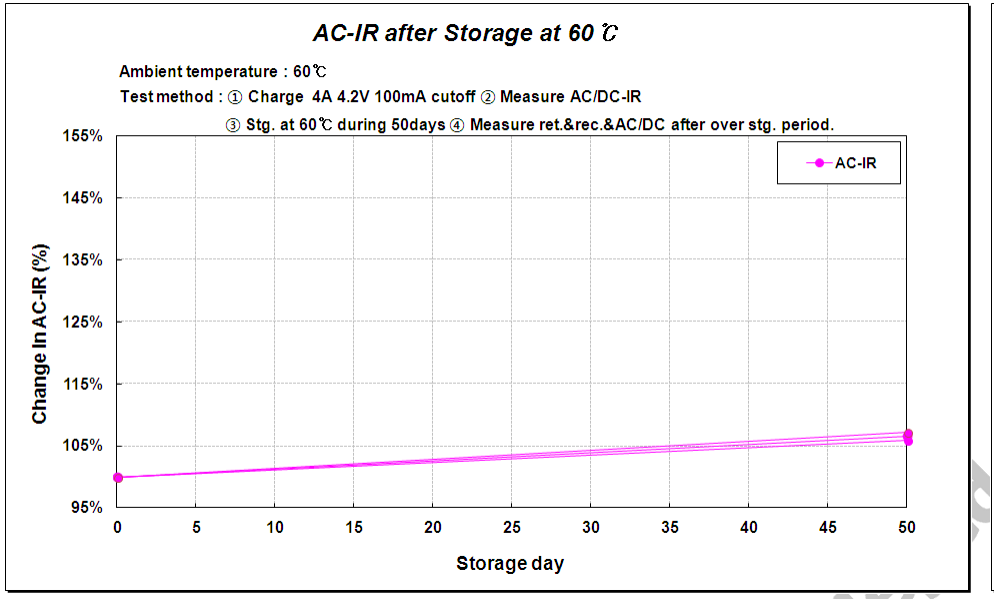
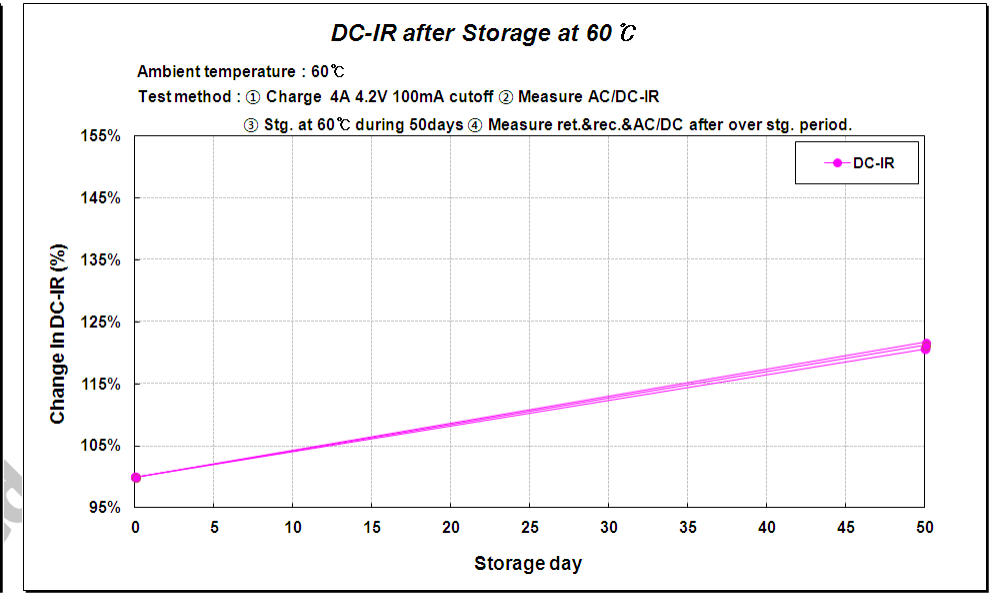
## ▪ AC-IR




## ▪ DC-IR




**Storage at 60℃**

| storage day | initial | | | after storage | | | | Ratio(%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACIR | DCIR | Capacity | ACIR | DCIR | Retention | Recovery | ACIR | DCIR | Retention | Recovery |
| 50 | 13.2 | 20.2 | 2597 | 15.3 | 29.3 | 2122 | 2393 | 115.8 | 145.2 | 81.7 | 92.1 |

# Safety test

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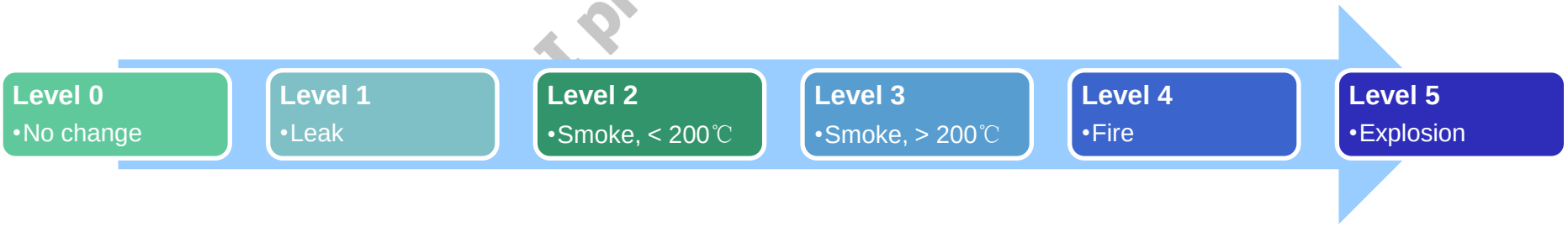
| Test item | | | Spec. | Results | | OK/NG | Remark |
|---|---|---|---|---|---|---|---|
| | | | | Results | Max. temp. | | |
| Electrical Abuse | Overcharge | 20A 20V(UL) | L1 | 3L1 | 115.6 | OK | |
| | Short circuit | 10mΩ at 23℃ | L1 | 3L1 | 55.0 | OK | |
| Mechanical Abuse | Impact | UL | L1 | 5L0 | 22.6 | OK | |
| | Crush | UL | L1 | 5L0 | 23.9 | OK | |
| Thermal Abuse | Hot oven | 140℃ | L1 | 3L1 | 144.0 | OK | |

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