

Tadiran INCHARGE™

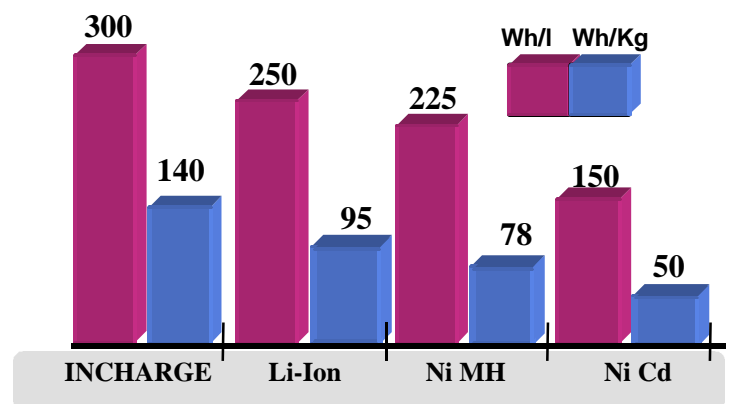
Rechargeable *Lithium Metal* Battery Size AA (R 15505)

Tadiran Introduces Today, the Innovative Rechargeable Lithium Metal Battery of the 21st Century

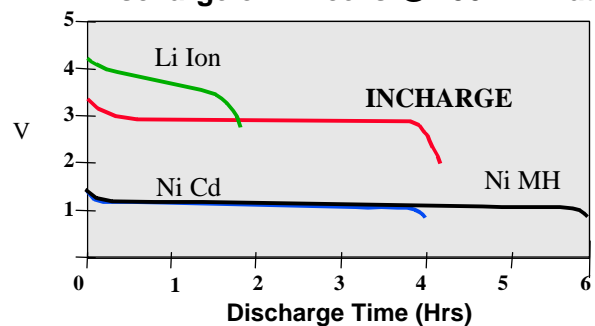
- The Most Energetic Rechargeable AA Cell in The Market ... Ever!**
- Higher energy density than, NiMH and Li-Ion cells.
- Enables volume and weight reduction in new designs.
- Enables extended operating time in standard battery housings.
- Enables parallel connection of cells .
- Inherently fail-safe, due to a patented cell chemistry
- Tadiran INCHARGE™ is the battery-of-choice for new designs of high-tech, compact, portable devices:**
 - Cellular and PCN phones.
 - Hand-Held computers and PDAs.
 - Hand held portable terminals.
 - Camcorders.
 - Note and sub-notebook computers.
- High discharge current**
 - Up to 10.0A pulses.
- Excellent capacity retention**
 - 85% after one year storage at RT.
- Wide operating temperature range**
 - From -30 Deg C to +85 Deg C.
- Flat discharge curve**
- Hermetically sealed construction**
 - Ensures leak-proof operation and storage.
- NO MEMORY EFFECT**
- Unrestricted transportation**
- Designed to be stored in its charged state**



Energy Densities of Rechargeable AA Cells



Discharge of AA cells @ 250 mA Rate



TADIRAN BATTERIES LTD.

P.O.Box 1 Kiryat Ekron 70500, Israel. Tel: 972-8-9444366. Fax: 972-8-9413062

. 87-03-991 Rev-A

Tadiran INCHARGE™

Rechargeable *Lithium Metal* Battery Size AA (R 15505)

Specification

Model_____TLR-7103
Chemical System_____Li/Li_xMnO₂
Dimensions_____15.0mm x 50.5mm
Weight_____17 gr
Nominal Capacity to 2 Volts_____800 mAh
Nominal Voltage_____3.0 V
End of Discharge Voltage_____2.0 V
Nominal Discharge Rate atRT_____250 mA
Maximum Pulse Current_____10.0 A
Nominal Charging Rate_____80 mA to 3.40 V
Maximum charge rate * _____250 mA to 3.45V
Typical Number of Cycles to 65% of Initial Capacity
 at Nominal Charging Rate and 100% DOD** _____300-350 Cycles
 at Nominal Charging Rate and 50% DOD** _____700 Cycles
Capacity Retention after 1 year storage at RT_____85 %
Operating Temperature Range_____ -30 Deg.C to +85 Deg.C
Recommended Storage Temperature_____0 Deg.C to 30 Deg.C

* Fast charge should be applied for not more than 10% of the cycling life

** DOD = Depth Of Discharge

Advanced information January 1999. Data subject to alteration without notice.

Any representations in this brochure concerning performance are for informational purposes only and are not warranties either expressed or implied, of future performance. Tadiran's standard limited warranty, stated in its sales contract or order confirmation form is the only warranty offered by Tadiran.

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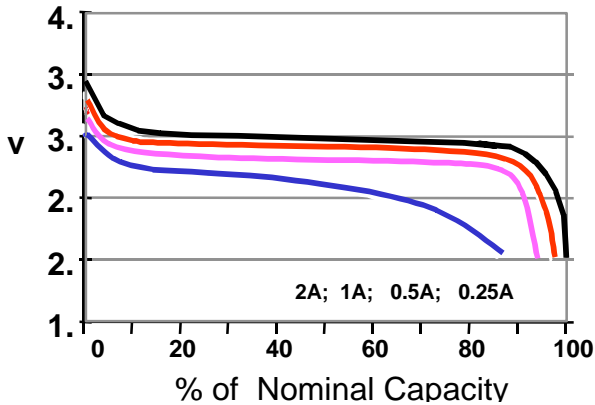
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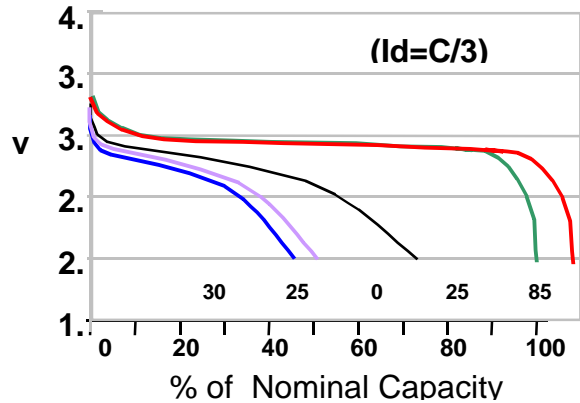
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Tadiran INCHARGE™ Cell Performance

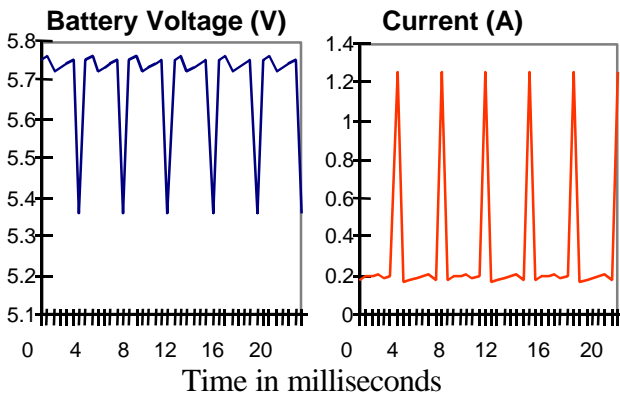
Discharge at Different Currents



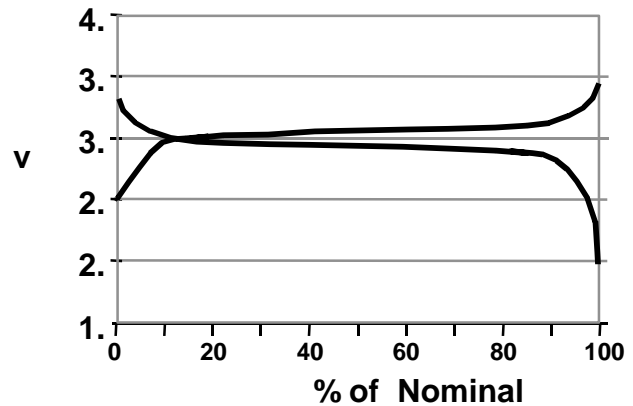
Discharge at Different Temperatures



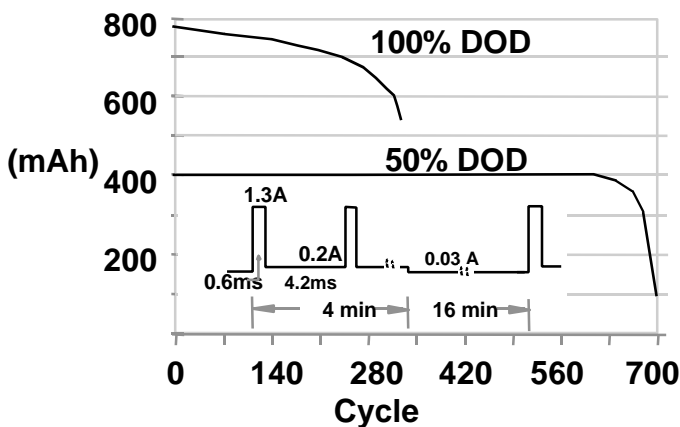
High pulses 6V/0.8 Ah battery pack



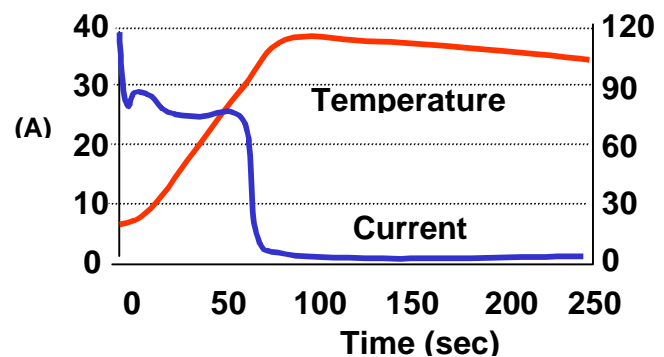
Charge-Discharge Curves



GSM Pulse Discharge Mode



Typical Short Circuit Behavior



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Battery Safety and Handling

Fail-Safe Design

The fail-safe patented design of **Tadiran INCHARGE™ Lithium Metal** cell, incorporates an innovative electrochemical system which prevents hazardous events during electrical abuse conditions such as external and internal short circuits, overheating, overcharge and over-discharge.

The fail-safe mechanism of the battery is combined with a built-in safety vent to provide ultimate protection.

Together, they deactivate the cell in case of electrical and mechanical abuses such as crush and nail penetration.

Safety Tests

The following abusive tests were conducted to prove the reliability of the fail-safe mechanism of the cells. They are, therefore, performed on cells which are not protected by external safety circuits such as fuses and/or diodes. These tests which are done by Tadiran in confined and protected facilities, are not applicable for the testing of battery packs.

Tadiran INCHARGE™ Lithium Metal cells withstand successfully the following abuse conditions:

- Short Circuit
- Overcharge up to 0.5 A to +10 volts
- Over discharge up to 0.5 A to -12 Volts

- High temperature exposure up to 130 Deg.C
- Crush to 30% of outer diameter
- Nail penetration

Cells Handling and Regulations

UL Component Recognition

The **Tadiran INCHARGE™ Lithium Metal** AA cell meets the safety requirements as specified in UL component recognition program (UL-1642) for lithium batteries.

Transportation

The **Tadiran INCHARGE™ Lithium Metal** AA cell is not restricted for transportation.

The cell is defined as solid cathode cell and contains less than 1 gram of lithium metal.

Disposal

The **Tadiran INCHARGE™ Lithium Metal** AA cell contains no heavy metals, such as Mercury or Cadmium. Like other used primary lithium batteries it should be disposed of in designated landfill areas.

Caution

Never attempt to dispose of lithium cells by fire or by incineration; or by compacting or mutilating them to destroy their physical integrity.

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Battery Circuit Design

Design Considerations

In order to obtain optimum capacity and maximum charge/discharge cycle life from the **Tadiran INCHARGE™** battery, both the battery pack and related power circuits must be carefully designed. These include:.

- **Battery Pack** - mechanical and electrical construction
- **Charger** - electrical and control circuits
- **Load Equipment** - power input circuits

The design considerations should be such as to prevent the activation of the cell's safety mechanism in regular operating conditions.

Battery-Pack Design Principles

The battery pack is completely different from nickel cadmium or other rechargeable battery packs and it must be ensured that it will only be charged by its specific charger. Charging the battery pack with conventional battery chargers will require a specific electrical circuit built into the battery pack.

The battery pack shall include a protective device:

- *PTC* - *Positive Thermal Coefficient* resistor, selected to provide the required over-current and short circuit protection, in series with the battery cells.

Charger Design Principles

- The cell/battery should receive its charging current from a constant current source
- The optimal charging rate for a string of cells is 80 mA
- The current of 250mA should not be exceeded in the fast charge mode for a string of single cells.
- The charger must be protected by a properly selected fuse.
- Depending on the application, the battery/charger system may be required to supply current to the equipment at the same time as the battery is being charged. In such instances a separate charging path should be provided for the battery.

Charging Scheme

Cells can be charged in series by a proper power supply, monitoring and balancing the voltage of each cell .

The charge should be stopped at 3.40 volt/cell.



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Battery Circuit Design

A special circuit, for balancing the cells voltage, shall be included in the charger or in the battery pack.

Variation of 3% in the end-charge voltage set point will cause a change of 4% in the charging time and respectively in the capacity.

- Due to the excellent charge retention of Tadiran INCHARGE™ lithium metal battery, trickle charging is not recommended.

Equipment Side Interface

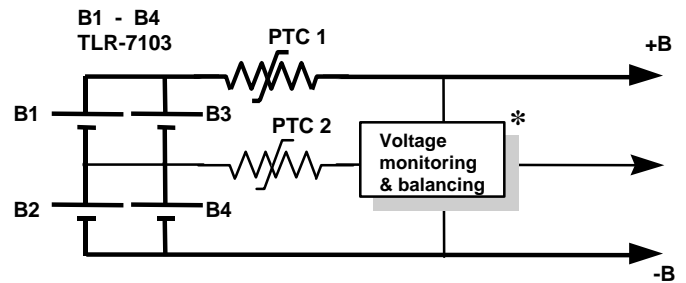
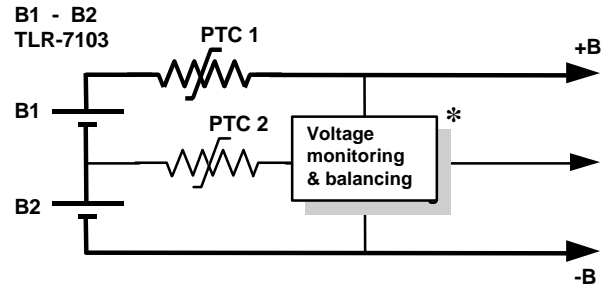
The voltage spread of the battery charge and discharge characteristics given in the **Cell Performance Curves** should be taken into consideration when designing the equipment electronics.

An *Undervoltage* protection is required to assure the battery proper performance when discharging. This protection should disconnect the battery load when the battery voltage reaches 2.0 - 2.2 V/cell.

Customer Technical Support

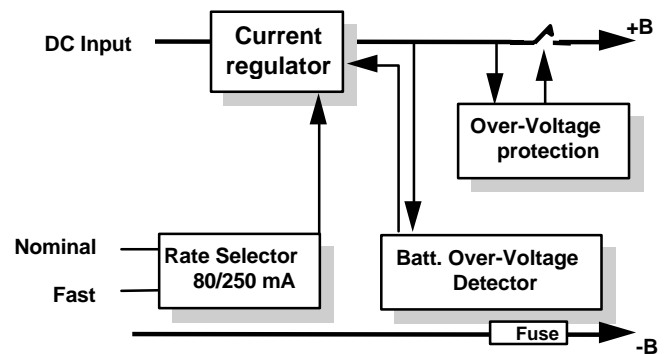
Tadiran's technical team is available to provide technical support to all customers in their **Tadiran INCHARGE™** Lithium Metal battery applications.

Typical 6 Volt Battery Configurations



* Can be placed either in the battery pack or in the charger.

Basic Charger Design



Equipment Side Interface

