TOSHIBA

Industrial Lithium-ion Battery SCiB™

SIP series

New Battery Solution for
Automated Guided Vehicle etc.

Let the SCiB™ “SIP series” solve all the inconveniences caused by lead-acid batteries

	Before	After
1	It takes 8 to 10 hours to charge a battery. Two sets of battery for charging and discharging have to be prepared for continuous operation.	1-hour quick charging improves the operation rate! 20-minute charging is even possible!* With 1 hour lunch break, one set of battery is just enough for 24/7 operation. * Depending on battery charger （20 minutes quick charging can be realized.）
2	Battery needs to be replaced every one to three years... Frequent replacement increases the maintenance cost...	10 years long life reduces the total cost! 10 years long life contributes to total cost reduction. Moreover, this is a maintenance-free battery!
3	Replacement of large and heavy battery is quite taxing… Space for charging battery is also a waste.	Compact and light battery can be replaced easily and smoothly. Battery weights reduced to one-quarter of lead acid battery for same operation time.
4	The place for charging battery is limited due to safety reasons. Unmanned charging could result in serious incident by possible hydrogen gas generation.	This battery has no risk of fuming or ignition. This battery does not produce hydrogen gas. Users can charge the battery anytime and anywhere!

Lead acid battery

SIP series

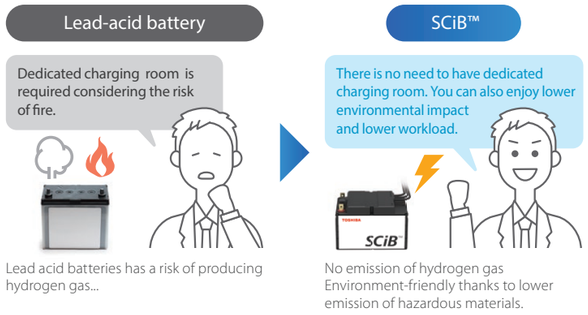
Lead-acid batteries can be replaced easily with “SIP series” which has unique features.

Note: The values do not guarantee the product performance.

The reasons why “SCiB™” is chosen rather than lead-acid batteries or other lithium-ion batteries

Safety

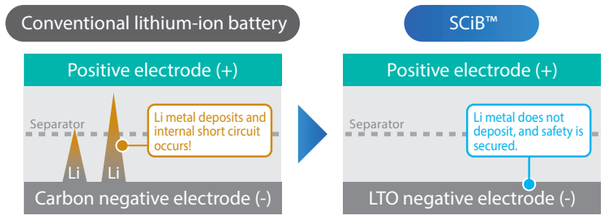
No emission of hydrogen gas
No need to have dedicated charging room



Lead acid batteries has a risk of producing hydrogen gas...

No emission of hydrogen gas
Environment-friendly thanks to lower emission of hazardous materials.

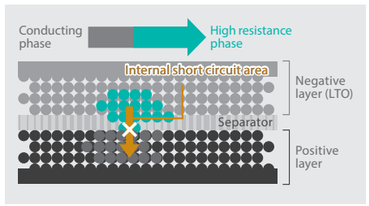
Highly safe LTO
There is **no risk** of lithium deposition

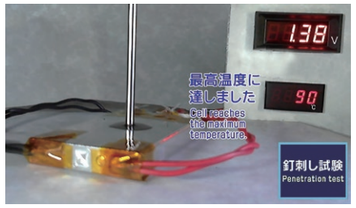


In case of conventional lithium-ion batteries, there is a risk of lithium metal deposition, which could break separator and cause internal short circuit when it is used for long period of time, under very cold temperature or with high charging current. There is no risk of lithium metal deposition in case of SCiB™.

Resistance of an internally-short-circuited area increases to reduce the short-circuit current.

Even in case of internal short circuit, there is lower risk of smoke or ignition on SCiB™ because it reduces short circuit current due to increase of resistance around internal short circuit area.





Compliance with safety standards

Organization	23Ah cell	SIP series
Intertek	• UL1642 • UL62133 • CAN/CSA-E62133	• UL62133 • CAN/CSA-E62133
JET	• JIS C 8715-2	–

Protection function

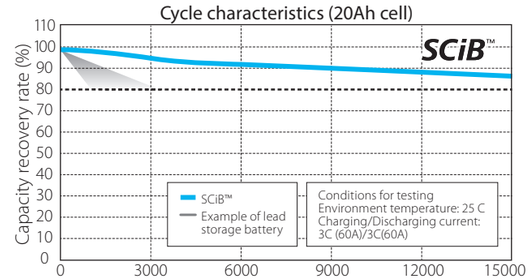
The SIP series is equipped with BMU* which monitors voltage, current, temperature and others to protect the battery from abnormalities

* BMU: Battery Management Unit

Long life

Continuous
15,000 cycles or more

According to Toshiba’s actual measurement, less than 20 % of capacity degradation occurs even after more than 15,000 cycles of 60A charging and discharging.



Cycle life of SIP Series depend on the operating conditions

Quick charging/discharging current

Charging completes within **1 hour**

One eighth of a lead-acid battery $\frac{1}{8}$

It takes 8 hours to charge a lead acid battery. On the other hand, SCiB™ reduces charging time significantly. With customized charger, 20 minutes charging becomes available.

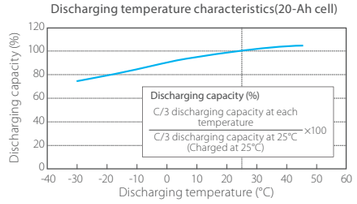
The SIP series also can be used for **starting current** of a motor, etc

For starting a motor, the maximum current could be three times as large as the rated current. However, the SIP series can apply to a large current , up to 125A - 200 seconds*.

* A single unit of SIP24-23, SIP48-23: 125A - 200 seconds/Two units of SIP24-23 in parallel: 150A - 200 seconds

Resistance to low temperature

SCiB™ outputs **70%** or higher capacity even when the surrounding temperature is at **-30°C**

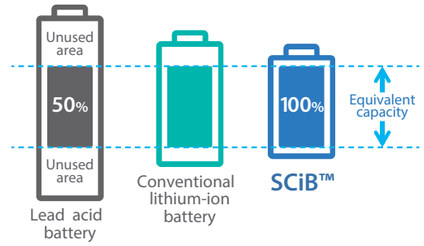


SCiB™ exhibits low degradation even when it is charged and discharged at -30°C

* Discharging capacity reaches 100% at 25°C

Using 100% of discharging depth(DOD)*

100% of DOD* is available

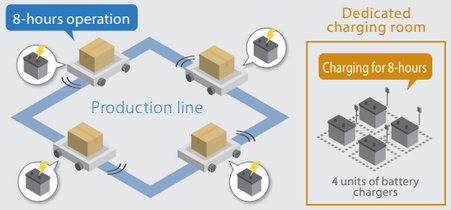
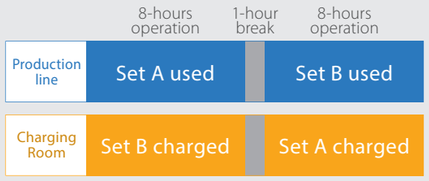
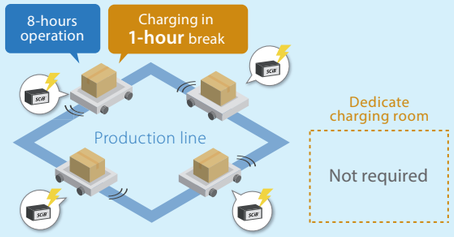
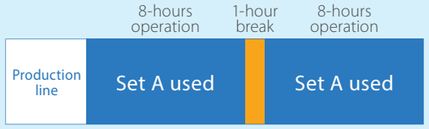
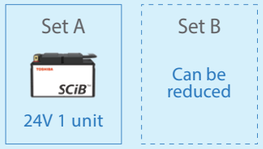
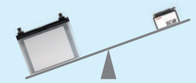
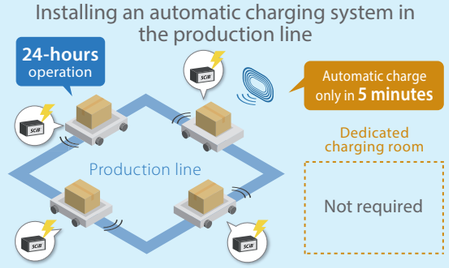
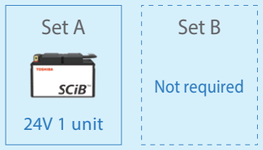


A lead-acid battery is ordinary used at approx. 50% of DOD in order to prevent degradation. However, SCiB™ is available at 100% of DOD.

* DOD: Depth of Discharge

Case Study : Automated Guided Vehicle (AGV) powered by SCiB™

In case of two 8-hours shifts operation

	Production Line Layout	Operational Image	Quantity	Weight	Workload for Charging	Life
Lead-acid battery 	There needs to be dedicated charging room separated from production line. 	Swapping set A and set B between shifts 	Set A / Set B  AGV power (24V) 2 series connection of 12V lead-acid battery → 4 batteries are required in total.	Per Set  **38** kg in total	Since Lead-acid batteries are large and heavy, charging and replacing is hard work..... 	1 to 3 years
SCiB™ 	Installing quick battery chargers in the production line 	SCiB™ can be charged on board (the AGV) during 1-hour break.  Charging during 1-hour break	Two batteries can be reduced to one if charging is done during 1-hour break. 	Equivalent capacity Lead-acid batteries 50Ah ≒ SCiB™ 22Ah AGV power (24V) Lead-acid batteries 24V = SCiB™ 24V Weight Lead-acid batteries 38kg > SCiB™ 8kg **About a quarter of the weight** of a lead-acid battery for same operation time 	Battery replacement is not required if batteries are charged on board during a break. Even if you remove batteries for charging, SIP series can be lifted easily thanks to small size and lightweight. 	**10 years**
SCiB™ + Automatic charging system 	Installing an automatic charging system in the production line 	24-hours continuous operation can be realized by charging on short stops 	One battery operation is available. 		Unmanned charging is possible! 	

4 advantages to adopt SCiB™

Safety and environment

No emission of hydrogen gas
Environment-friendly thanks to lower emission of hazardous materials

There is no need to have dedicated charging room. You can also enjoy lower environmental impact and lower workload.

Higher operational efficiency

Operational rate of AGVs improves by rapid charging

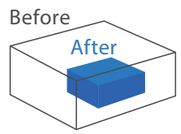
Downtime of AGVs: **8**h (Lead-acid battery) ▶ **1**h (SCiB™) ▶ **5**min x shot stops (SCiB™ + Automatic charging system)

Downtime for charging can be drastically reduced, which can also lead to the reduction of AGVs to be owned.

Reducing the workload

The smaller size reduces the workload when replacing the battery

Since lead-acid batteries are large and heavy, charging and replacing is hard work. However, the weight of SCiB™ is a quarter (8 kg) of a lead battery.

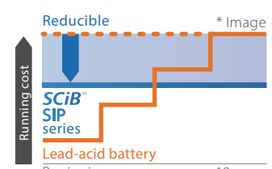


Reduction of TCO*

* TCO : Total cost of ownership

Total cost is lower because of long life

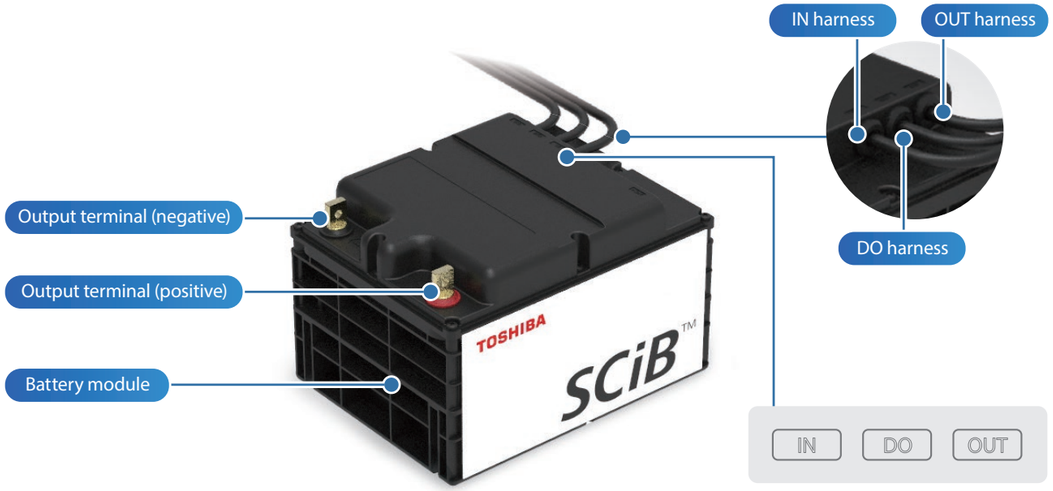
Although lead-acid battery is cheaper if only considering the initial cost, you can enjoy lower total cost of ownership by SIP series in the long run.



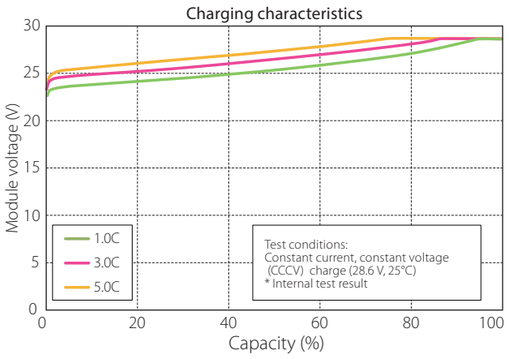
Note: The values described on this page are the reference values based on the simulation performed by Toshiba under the conditions assuming the AGV application.The values do not guarantee the product performance.

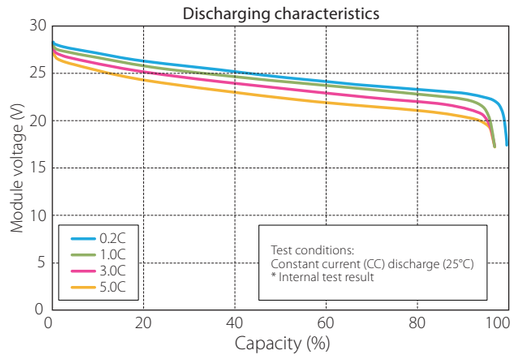
Product outline and characteristics

Product outline



Charging/discharging characteristics(SIP24-23)



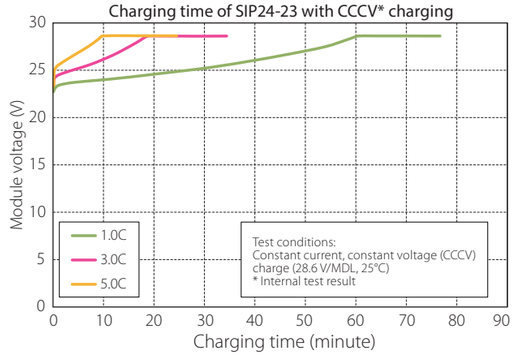


Charging method and charging time

CCCV* charging, which is the normal method for lithium-ion batteries, is recommended for charging of the SIP series.

For SIP24-23 : CV = 28.6 V
For SIP48-23 : CV = 57.2 V

* CCCV: Constant Current Constant Voltage



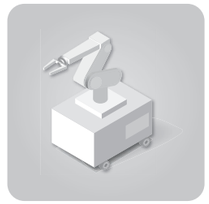
Note: The graphs and data above do not guarantee the product performance.
These are the reference data obtained under a certain condition.

Various applications and voice of customers

Applications suitable for SCiB™ SIP series

- Rapid charging
- Continuous and frequent operation
- Reliability • Safety
- Cold temperature
- Frequency regulation
- Power regeneration


Automated Guided Vehicle (AGV)


AGV with robot arm


Service robot


Aerial work platforms

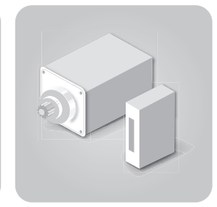

Traction vehicle


Electrified monorail system


Wind turbine


PV power system


U P S


Motor drive

Voice of customers

Automated guided vehicle manufacturer A

We proposed the quick charge with automatic charging systems to an automobile manufacturer and our proposal was adopted.

Leasing company B

Cost-effectiveness of a long-life (15,000 times) and maintenance-free battery was a determining factor.

Electronic device manufacturer C

We couldn't find a battery appropriate to the inductive(wireless) charging, and we were at a loss. However, we finally encountered the SIP series.

Automobile manufacturer D

It was a harsh task to remove and install heavy lead-acid battery. However, SIP series made our work much easier.

You can easily replace lead-acid batteries with SIP series

SCiB™ SIP series equips BMU (battery management unit) which monitors cell voltage, current and temperature, detects errors, and protects by itself.
You can easily handle and use as replacement of lead-acid batteries.

SIP24-23(24V)/SIP48-23(48V)

Lithium-ion battery appropriate for frequent and repeated charging and discharging

Up to 125A (200 seconds) charge and discharge are available.

SIP series is appropriate for the motor drive or AGVs, which repeat frequent charging and discharging.

Easy replacement from lead-acid batteries

SIP series is smaller and lighter than lead-acid batteries. They also can be handled more easily than other lithium-ion batteries. Therefore, you can replace your battery with the SIP series without difficulty.

Features

Safety	Built-in BMU*1 protects the battery from errors.
Rapid charging	Thanks to shorter charging time, you can adopt automatic charging system.
External interface	Warning, error message, and SOC*2 status are output by CAN communication.
Weight reduction	The weight of SIP series is about a quarter*3 of lead-acid battery (approx. 8kg)

*1 BMU: Battery Management Unit
*2 SOC: State of Charge
*3 Values based on the simulation uniquely performed by TOSHIBA under a certain condition

Product specifications

Product name	SIP24-23(24V)		SIP48-23(48V)
Model	FP01101MCB01A	FP01101MCB01A×2unit	FP01101MCB02A×2unit
Module configuration	Single configuration	2 in parallel	2 in series
Module configuration image	 556Wh	 1112Wh	 1112Wh
Nominal voltage	DC25.3V		DC50.6V
Voltage range	DC16.5 to 29.7V		DC33.0 to 59.4V
Rated capacity	556Wh(22Ah)	1112Wh(44Ah)	1112Wh(22Ah)
Maximum allowable current	125A(200 seconds)	150A(200 seconds)	125A(200 seconds)
Charging method	CCCV constant current/constant voltage(V=28.6V)		CCCV constant current/constant voltage(V=57.2V)
Dimensions	W247×D188×H165mm	Using two batteries (W247 x D188 x H165mm)	
Weight	Approx. 8kg	Approx. 16kg	Approx. 16kg
Ambient temperature for use	-30 to 45°C		
Ambient temperature for storage	-30 to 55°C (35°C or less is recommended)		
Humidity for use/storage	85%RH or less (without dew condensation)		
Dust-/Water-proof	IP53 or equivalent		
Protection function	over charge protection, over discharge protection, over current protection, high temperature protection, and low temperature protection		

Confirm the module configuration above when placing an order. SIP series is available only for the module configuration described above.

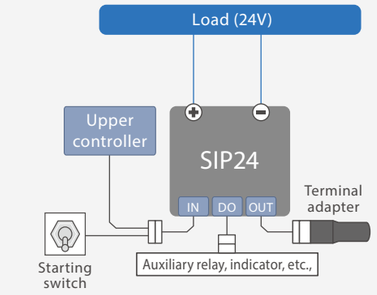
External interface specifications

Shape	Connector	Specifications	Remarks
Main circuit terminal	–	Bolt/Nut (M6)	To be prepared by customer
IN harness (250±30mm)	Manufacturer : JST (8-pin) SIP side: 08R-JWPF-VSLE-D System side: 08T-JWPF-VSLE-D*1	Upstream transmission, digital input 1ch: CAN communication (CAN2.0B, 250 kbps) 3-point: Starting signal, CAN address assignment, module number recognition	If the CAN communication is not used, connect the terminal adapter 2.  Terminal adapter 2 (FMW-GAA0064 (Option)) (This is not required for the SIP24 single configuration.)
DO harness (250±30mm)	Manufacturer : JST (6-pin) SIP side: 06R-JWPF-VSLE-D System side: 06T-JWPF-VSLE-D*1	Digital output (FET output: Up to 30 V, 20mA), power source 2-point: SOC output (The remaining SOC appears in four steps (2 bits). 3-point: Warning output*3 (low voltage, overvoltage, high temperature) 1-point: DC 5V power source (up to 25 mA)	You can connect auxiliary relay or indicators. If you use the external power source other than the DC 5V internal power source, No.5 pin of the IN harness is the GND. 
OUT harness (250±30mm)	Manufacturer : JST (8-pin) SIP side: 08T-JWPF-VSLE-D System side: Terminal adapter (supplied with the product)*2	Output to the slave module 1ch: CAN communication (CAN2.0B, 250 kbps) 3-point: Starting signal, CAN address assignment, module number recognition	Connect the terminal adapter to the module for single use or slave module for two series or parallel use.  Terminal adapter (FMW-GAA0059 (Option))

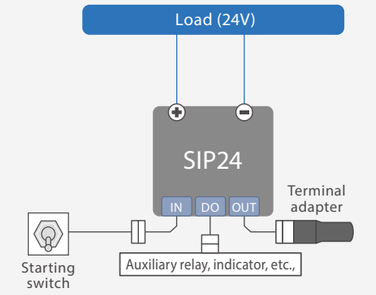
*1 Connectors on the device side shall be prepared by customer.
*2 For two series or parallel use, connect the OUT harness on the master module to IN harness on the slave module, then connect the terminal adapter to OUT harness on the slave module.
*3 We recommend customer to equip the circuit on system side to shut down the current when detecting DO waring output

System configuration

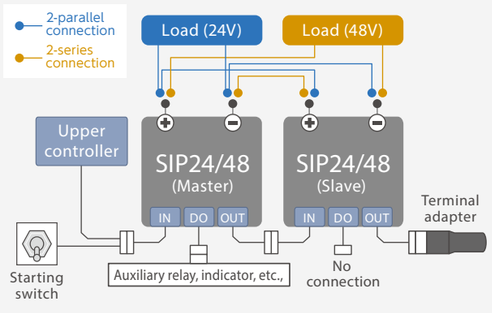
Single configuration (With CAN communication)



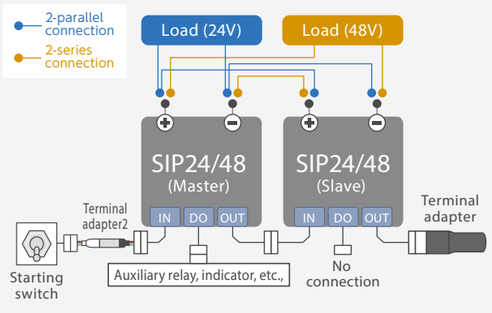
Single configuration (Without CAN communication)



2-parallel/2-series configuration (With CAN communication)



2-parallel/2-series configuration (Without CAN communication)



* When you use CAN communication, prepare the terminating resistor on the upper controller side.

From Inquiry to Delivery

Inquiry → Meeting → Quotation and proposal → Order → Delivery

The SIP series is available in the wider application range including automated guided vehicles (AGV), carrying robot, traction vehicle, electrified monorail system, power source solutions and others. If you have any problems with lead acid batteries, please feel free to contact us.

Manufacturing and R&D center: Toshiba Kashiwazaki Operations

Kashiwazaki Operations consistently undertakes the development, manufacturing, and quality control of SCiB™. It has a flexible production system that allows it to respond to demand changes. This environment-friendly factory also flexibly controls the clean and dry areas, and minimizes energy consumption required for sustainability. Moreover, the factory is equipped with a production quality system that meets TS16949, enabling it to supply high-quality and stable products.

⚠ Safety precautions

- Do not use this product for facilities in which there is a risk to human life or a disruption to public functionality if the product fails or malfunctions (nuclear power generator controls, aerospace applications, traffic equipment, life support equipment, safety equipment, and others).
- This product is produced under strict quality controls, however it may malfunction depending on the operating environment and conditions. Please consider countermeasure design (redundancies, failsafe measures, etc.) if using this product in facilities in which failure of the product would be expected to cause a great loss or accident.
- The operating environment must be within the range of specifications noted in the catalog and instruction manuals. Using the product outside the specified range may cause injury a fire or some other accident.
- Be sure to carefully read the instruction manuals before using this product so that you can use it correctly.
- Toshiba is not responsible for any losses related to malfunctions or abnormalities in equipment or devices connected to the product when the product fails or malfunctions, including losses from other secondary repercussions.
- The technical information in this document is for the purpose of explaining the typical operations and applications of the product, but not for granting any license or guarantee in regard to intellectual property rights, or any other rights, belonging to third parties or Toshiba.
- The product described in this document cannot be used in conjunction with products that are prohibited from production or sale by any rules, regulations, or laws in Japan or overseas.
- When exporting this product separately or combined with your equipment, please be sure to satisfy the objective conditions and inform conditions listed in the export control policies, so called Catch All restrictions, which are set by the Ministry of Economy, Trade and Industry of Japan, and Take appropriate export procedures .

TOSHIBA

TOSHIBA INFRASTRUCTURE SYSTEMS & SOLUTIONS CORPORATION

Industrial Systems Division
Battery Systems Overseas Sales Department
72-34, Horikawa-cho, Saiwai-ku, Kawasaki 212-8585, Japan
Tel +81-44-331-1574

<Agent>

SBT(E)-007a 18-02

- The characteristic graphs and data do not guarantee the product performance. These are the reference data obtained under a certain condition.
- The description in this catalog may change without prior notice.
- The product names, etc. described in this catalog may be used as the trademarks of each company.

- The product color may be different from the actual machine according to printing.
- The design, specifications, components, and others may change without prior notice.
- The package design presented is for catalog purpose, so the design of the actual battery will be different.

Go to the movie:

Go to the introduction pages:

Contact us:

For detailed information of this product, please visit our Website.

SCiB SIP Search http://scib.tdoc.toshiba.co.jp/en/product/sip/index.htm

The description in this catalog is as of February 2018.