

## Introduction



Murata has been developing and manufacturing a range of Modular, Scalable, High Density, Titanium products including AC-DC power supplies and DC-DC converters for various applications for more than 35 years. Recently, we have focused our efforts on power distribution sub-systems used in the emerging Data Center market. Our latest product offerings include shelf systems compliant with Open Compute V1 and V2 Power Shelf Specifications. While typical OCP Power Shelves only support 3-phase AC input, our Power Shelves support Single Phase AC, 3-Phase AC and HVDC (200-400Vdc) inputs, allowing you to achieve a leading edge, power efficient Data Center with either an AC or DC input power architecture.

## Key Components

- ❖ 12V and 54Vout, 21" 10U Power Shelf
- ❖ 19"/21" 2RU Power Shelf
- ❖ 54V, 3.6kW Titanium Efficiency Power Supply
- ❖ 12V, 3kW - 3.2kW Titanium Efficiency Power Supplies
- ❖ ATS (Automated Transfer Switch) Modules
- ❖ RMU (Remote Management Unit)
- ❖ Battery Backup Solution

## Murata's key power shelf features:

- ❖ Up to 15kW/16kW N+1 output power @ 12Vout
- ❖ Up to 18kW N+1 output power @ 54Vout\*
- ❖ 12.3V or 54V main output
- ❖ 12.2V AUX output
- ❖ PSU conversion efficiency higher than 96% at 50% of load (80 PLUS Titanium class)
- ❖ Available input configurations – Single phase AC, 3-Phase AC; HVDC

\* Planned future product. Contact Murata for the latest details



## Open Compute and Data Center Power Solutions

The OCP power distribution topology for centralized power supply systems is an excellent solution with which you can enjoy benefits such as redundancy and expandability. Our OCP compliant power shelves offer leading edge performance and provide a total power solution that can be scaled according to your needs today, while offering flexibility to support what you may need tomorrow.

### 10U Power Shelves

#### 12V

The MWOCES-21X Series of 21" 10U power shelves accommodate up to six 3kW/3.2kW power supply units (PSUs). Each shelf provides up to 15kW/16kW total output power, configured for N+1 redundancy.

The 3.2kW PSU includes a self-contained ATS and achieves efficiency >96% at 50% load, one of the highest available on the market.

#### 54V

The MWOCES-XXX-B\* Series of 19" or 21" 10U power shelves accommodate up to six 3.6kW PSUs. Each shelf provides up to 18kW total output power, configured for N+1 redundancy. The PSU achieves efficiency >96% at 50% load, one of the highest available on the market.

#### Power Shelf Features

- 80 PLUS® Titanium efficiency PSU
- Up to 6 PSUs per shelf
- High reliability, redundant design
- OCP V1 and V2 open rack compliant
- 2 AC inputs to shelf for flexible shelf configurations (N+1, N+N)
- 2 AC outlets for additional input power to ICT equipment in the rack
- External communication interface RMU through SNMP
- Hot swappable

\* Planned future product. Contact Murata for the latest details



### 2RU Power Shelf

The MWOCES-19x Series of 19" (convertible to 21") 2RU power shelves accommodate up to six 3kW PSUs and two ATS modules. Each shelf provides up to 15kW total output power, configured for N+1 redundancy.

#### Power Shelf Features

- Provides up to 15kW (N+1) in 2RU height
- 80 PLUS® Titanium efficiency PSU (3kW)
- Up to 6 PSUs per shelf
- High reliability, redundant design
- OCP V1 and V2 rack compliant
- ATS unit equipped to support high reliable AC redundancy
- 6 AC outlets for additional input power to ICT equipment in the rack
- External communication interface RMU through SNMP
- Hot swappable



## Power Supplies

### 54V, 3.6kW Power Supply

The MWOC68-3600-D-RM<sup>※</sup> is an 80 PLUS Titanium efficient (96% efficiency @ 50% load) 3,600 watt front end power module with a 54.5Vdc main output and a 12Vdc standby. The power supply is 68mm and 6 can fit into a 19" shelf. With an accessory kit the shelf will fit into a 21" rack.

#### Power Supply Features

- 3,600W maximum output power
- 54.5Vdc main output and a 12Vdc standby output
- 44.3W/inch<sup>3</sup> power density
- N+1 or N+N redundant
- 1U height 490mm x 68.0mm x 40mm (19.29"x2.68"x1.57")
- Input & output reporting with PMBus interface, active current sharing on 54V



### 12V, 3kW – 3.2kW Power Supplies

The MWOC74-3000-RM series power supplies are 80 PLUS Titanium efficient (96% at 50% of load) up to 3,200 Watts, power factor corrected front end power modules with 12.3Vdc main output and 12.2Vdc (2.5A) standby. The power modules have active current sharing and up to six (6) modules may be operated in an OCP shelf delivering up to 15kW, N+1 rack level power for use in the OCP Open Rack.

#### Power Supply Features

- 3,030W output power – MWOC74-3000-A-RM
- 3,200W output power with ATS – MWOC74A3200-A-RM
- 12.3V main output & 12.2V standby output
- 1U height 73.5 x 550 x 40mm (2.89" x 21.65" x 1.57")
- 30.4W/cubic inch power density
- N+1 redundancy capable
- Hot pluggable
- Active current sharing on 12V main output, ORing FET isolation



The MWOC74A3200-A-RM with ATS<sup>※</sup> offers the same features as above and includes an automatic transfer switch within the power supply.

It allows 2 inputs into the power supply and switches from one to another, if one fails.

Series	Output Power	Input Voltage	Output Voltage	Standby Voltage
MWOC74-3000-A-RM	3,030W Titanium	90 - 300Vac or 192 - 400Vdc	12.3Vdc	12.2Vdc
MWOC74A3200-A-RM with ATS	3,200W Titanium	180 - 305Vac	12.3Vdc	12.2Vdc

<sup>※</sup> Planned future product. Contact Murata for the latest details

## Remote Management Unit (RMU)

The MWOC-RMU is a Remote Management Unit for the MWOCES series OCP compliant power shelves. The MWOC-RMU can monitor and control the internal PSU(s) and/or peripheral equipment installed in the MWOCES-21x and MWOCES-19x via the PMBus™, and can communicate with the host system via Ethernet by SNMP. The MWOC-RMU provides efficient communication and reporting for datacenter applications.

### RMU Features

- Communicates internally via PMBus™
- Communicates externally via SNMP
- LED status indicators
- Two (2) RJ45 connectors
- Hot pluggable



## Battery Backup Solution\*

Murata offers 21" OCP and EIA 19" rack mountable battery backup solutions to support high reliability architectures. We utilize Murata's best in class Lithium Ion battery cell technology for our BBU (Battery Backup Unit). With a compact form factor, each BBU is capable of supplying 4kW for up to two minutes. The 21" OCP Battery Backup Shelf (BBS) has 4 slots for BBUs and can supply up to 16kW for two minutes in the event of an AC power loss. The BCU (Battery Control Unit) in the shelf communicates with each BBU and the power shelf to implement intelligent power system control via our Remote Management Unit (RMU). Murata's Battery Backup Solution is lighter and smaller than traditional Lead Acid batteries, improving your business in terms of maintenance, OPEX and total cost of ownership.

### BBU Features

- 4kW maximum output power
- 12V input and output voltage
- 120 seconds hold up time
- Adjustable charging power
- Active current sharing on 12V output
- ORing FET isolation
- Hot swap available
- Overvoltage, overcurrent, over temperature protection and reporting



### Battery Shelf Features

- Fits into the 21" OCP Open Rack Standard
- Up to 16kW total power per shelf (4 BBUs)
- Battery Shelf (600×537×87 mm)
- Four battery slots; each BBU provides 12Vdc, 4kW (max.)
- One battery control unit for management of BBUs
- Communicates with Murata Power Shelf (MWOC series)
- Three battery shelves can be connected in parallel



\* Planned future product. Contact Murata for the latest details



## Configuration Examples

### 19inch power shelf (2U)



#### Features

- Input redundancy can be achieved by ATS
- Total output power: 3kW to 15kW (N+1)
- Fits within the 21 inch rack using installation kit

### Configuration Example and required quantity

Assumption: Three-Phase Delta input; installed in ORV2 single power zone rack:

Related products	Description	Example ① 15kW With ATS	Example ② 15kW Without ATS
MWOCES-192-A	Power shelf (Delta input)	1	1
MWOC74-3000-A-RM	PSU	6	6
MWOC74-B	PSU-Blanking panel		
MWOC-ATS-1	ATS(Delta input)	2	
MWOC-ATS-3	ATS-Bypass(Delta input)		1
MWOC-ATS-B	ATS-Blanking panel		1
MWOC-RMU-2	Remote management unit	1	1
MWOC-KIT-6	Installation KIT(V2 SPZ)	1	1
MWOC-PCA-4-3-1	AC Power cable	2	2
TOTAL HEIGHT		2U	2U

### 19inch power shelf (2U) + Battery Backup



#### Features

- Hold-up time: 4kW @ 2 minutes ~ 6kW @ 2 minutes
- Up to three BBU shelves can be connected in parallel for maximum of 16kW @ 6 minutes hold-up time (12 BBUs)
- It is possible to construct robust system using ATS and BBU

### Configuration Example and required quantity

Assumption: Three-Phase Delta input; installed in ORV2 single power zone rack:

Related products	Description	Example ① 15kW with ATS 16kW@2min Backup	Example ② 15kW with ATS 16kW@4min Backup
MWOCES-192-A	Power shelf (Delta input)	1	1
MWOC74-3000-A-RM	PSU	6	6
MWOC74-B	PSU-Blanking panel		
MWOC-ATS-1	ATS(Delta input)	2	2
MWOC-ATS-3	ATS-Bypass(Delta input)		
MWOC-ATS-B	ATS-Blanking panel		
MWOC-RMU-2	Remote management unit	1	1
MWOC-KIT-6	Installation KIT(V2 SPZ)	1	1
MWOC-PCA-4-3-1	AC Power cable	2	2
MWBBES-212-A	BBU shelf	1	2
MWBBU118-4000-A-B	BBU	4	8
MWBBU118-B	BBU-Blanking panel		
MWBB-BCU-1	Battery control unit	1	1
MWBB-BCU-B	BCU-Blanking panel		
MWBB-KIT-2	Installation KIT	1	1
MWBB-KIT-3	Installation KIT(expand)		1
TOTAL HEIGHT		4U	6U

(Continued)

## Configuration Examples

### 19inch power shelf (1U)



#### Features

- Supports both single phase Vac and HVDC input
- 19 inch width fits within the EIA,ESA standard rack
- Total output power: 3kW to 12kW (N+1)
- Best configuration if installing in the 19 inch rack without ATS and < 12kW output power

### Configuration Example and required quantity

Assumption: Single-Phase input; installed in 19 inch rack:

Related products	Description	Example ① 9kW	Example ② 12kW
MWDCES-191-C	Power shelf(single input)	1	1
MWOC74-3000-A-RM	PSU	4	5
MWOC74-B	PSU-Blanking panel	1	
MWOC-RMU-2	Remote management unit	1	1
MWOC-KIT-12	Installation KIT	1	1
MWOC-PCA-7-3-4	AC Power cable	1	1
TOTAL HEIGHT		1U	1U

### 19inch power shelf (1U) + Battery Backup



#### Features

- Optimal solution for 19 inch power system with battery backup system
- Hold-up time is 4kW @ 2 minutes~12kW @ 2 minutes
- Up to three BBU shelves can be connected in parallel. And it can achieve 12kw @ 6 minutes hold-up time by 9 BBUs

### Configuration Example and required quantity

Assumption: Single-Phase input; installed in 19 inch rack:

Related products	Description	Example ① 12kW 12kW@2min Backup	Example ② 12kW 12kW@4min Backup
MWDCES-191-C	Power shelf(single input)	1	1
MWOC74-3000-A-RM	PSU	5	5
MWOC74-B	PSU-Blanking panel		
MWOC-RMU-2	Remote management unit	1	1
MWDC-KIT-12	Installation KIT	1	1
MWOC-PCA-7-3-4	AC Power cable	1	1
MWBBES-192-A	BBU shelf	1	3
MWBBU118-4000-A-B	BBU	3	6
MWBBU118-B	BBU-Blanking panel		
MWBB-BCU-1	Battery control unit	1	1
MWBB-BCU-B	Blanking panel		1
MWBB-KIT-6	Installation KIT	1	1
MWBB-KIT-7	Installation KIT(extend)		1
TOTAL HEIGHT		3U	5U

(Continued)

## Configuration Examples

### 21inch power shelf (10U)



#### Features

- It can be installed into both single power zone and dual power zone rack
- MWOCES-211-B and -F can install to the Rack directly without installation kit
- Total output power: 3kW to 15kW (N+1)
- Lack of ATS function results in low profile 10U height while capable of same output power as the MWOCES-192

### Configuration Example and required quantity

Assumption: Three-Phase Wye input; installed in ORV2 single power zone rack:

Related products	Description	Example ① 12kW	Example ② 15kW
MWOCES-211-G	Power shelf(Wye input)	1	1
MWOC74-3000-A-RM	PSU	5	6
MWOC74-B	PSU-Blanking panel	1	
MWOC-RMU-2	Remote management unit	1	1
MWOC-KIT-9	Blanking panel (SPZ)	1	1
MWOC-PCA-5-3-6	AC Power cable	1	1
TOTAL HEIGHT		10U	10U

### 21inch power shelf (10U)+ Battery Backup



#### Features

- It can be installed to the both single power zone and dual power zone
- Lack of ATS function results in low profile 10U height while capable of same output power as the MWOCES-192
- Hold-up time is 4kW @ 2 minutes ~ 16kW @ 2 minutes
- Up to three BBU shelves can be connected in parallel. And it can achieve 16kW @ 6 minutes hold-up time by 12 BBUs

### Configuration Example and required quantity

Assumption: Three-Phase Wye input; installed in ORV2 single power zone rack:

Related products	Description	Example ① 15kW 16kW@2min Backup	Example ② 15kW 16kW@4min Backup
MWOCES-211-G	Power shelf(Wye input)	1	1
MWOC74-3000-A-RM	PSU	6	6
MWOC74-B	PSU-Blanking panel		
MWOC-RMU-2	Remote management unit	1	1
MWOC-KIT-9	Installation KIT(SPZ)		
MWOC-KIT-23	Installation KIT	1	1
MWOC-PCA-5-3-6	AC Power cable	1	1
MWBBS-212-A	BBU shelf	1	2
MWBBSU118-4000-A-B	BBU	4	8
MWBBSU118-B	BBU-Blanking panel		
MWBBS-BCU-1	Battery control unit	1	1
MWBBS-BCU-B	BCU-Blanking panel		
MWBBS-KIT-5	Installation KIT	1	1
MWBBS-KIT-3	Installation KIT(expand)		1
TOTAL HEIGHT		30U	50U

## PRODUCT MAP (POWER SYSTEM)

Category	Order P/N	Open Rack		Rack	Installation KIT	Height	BBU connection	Input Configuration			Output		Applicable PSU		
		V1	V2	19"				3 Phase	Single Phase	HVDC	V [V]	Power [KW]	PSU(12.3V)	PSU(54.5V)	ATS-PSU
21" Empty Shelf	MWOCES-211-A*	✓	✓		Necessary	10U	No	✓ Delta			12.3	15 (N+1)	✓		
	MWOCES-211-B	✓	✓		NOT necessary	10U	No	✓ Wye	✓		12.3	15 (N+1)	✓		
	MWOCES-211-E*		✓		NOT necessary	10U	No	✓ Delta			12.3	15 (N+1)	✓		
	MWOCES-211-F		✓		NOT necessary	10U	No	✓ Wye	✓		12.3	15 (N+1)	✓		
	MWOCES-211-G	✓	✓		Necessary	10U	Yes	✓ Wye	✓		12.3	15 (N+1)	✓		
	MWOCES-211-H*	✓	✓		Necessary	10U	Yes			✓	12.3	15 (N+1)	✓		
19" Empty Shelf	MWOCES-211-F-A*		✓		Necessary	10U	Yes	✓ Wye	✓		12.3	16 (N+1)			✓
	MWDCES-191-C			✓	Necessary	1RU	Yes	✓ Wye	✓		12.3	12 (N+1)	✓		
	MWDCES-191-D			✓	Necessary	1RU	Yes			✓	12.3	12 (N+1)	✓		
	MWOCES-192-A	✓	✓	✓	Necessary	2RU	Yes	✓ Delta			12.3	15 (N+1)	✓		
	MWOCES-192-G*	✓	✓	✓	Necessary	2RU	Yes	✓ Wye	✓		12.3	15 (N+1)	✓		
	MWOCES-191-G-B*			✓	Necessary	1RU	Yes	✓ Wye	✓		54.5	18 (N+1)		✓	

Category	Order P/N	Output		Height	AC Input Voltage [Vac]		DC Input Voltage [Vdc]	
		V[V]	Power[KW]		min	max	min	max
PSU	MWOC74-3000-A-RM	12.3	3	1RU	90	300	192	400
	MWOC68-3600-D-RM*	54.5	3.6	1RU	180	305	192	400
ATS-PSU	MWOC74A3200-A-RM*	12.3	3.2	1RU	180	305		

Category	Order P/N	Product Description	Applicable Shelf		
			MWOCES 211	MWOCES 192	MWDCES 191
RMU	MWOC-RMU-2	Remote Management Unit	✓	✓	✓
ATS	MWOC-ATS-1*	Automatic Transfer Switch for 3 phase Delta AC input configuration.		✓	
	MWOC-ATS-2*	Automatic Transfer Switch for 3 phase Wye AC input configuration.		✓	
	MWOC-ATS-3	Bypass Unit in case of not using ATS-1		✓	
	MWOC-ATS-4*	Bypass Unit in case of not using ATS-2		✓	
Blanking Panels	MWOC-ATS-B	Blanking panel for MWOC-ATS series.		✓	
	MWOC74-B	Blanking panel for MWOC74 series.	✓	✓	✓

Category	Order P/N	Cable length [m]	Plug				Input Configuration		Applicable Shelf		
			Plug Qty	NEMA L6 30	IEC 60309	CS8365	3 Phase	Single Phase	MWOCES 211	MWOCES 192	MWDCES 191
AC Power Cable	MWOC-PCA-7-3-4	3	3		✓ 30A			✓			✓
	MWOC-PCA-7-3-5	3	3	✓ 30A				✓			✓
	MWOC-PCA-7-3-6	3	1		✓ 32A			✓			✓
	MWOC-PCA-7-3-7	3	2	✓ 30A				✓			✓
	MWOC-PCA-4-3-1	3	1			✓ 50A	✓ Delta			✓	
	MWOC-PCA-3-3-2	3	1	✓ 30A				✓	✓		
	MWOC-PCA-3-3-6	3	1		✓ 30A			✓	✓		
	MWOC-PCA-3-4-7A	4	2	✓ 30A					✓		
	MWOC-PCA-3-4-7B	4	2	✓ 30A					✓		
	MWOC-PCA-5-3-6	3	1		✓ 32A		✓ Wye		✓	✓	

Category	Order P/N	Product Description	Open Rack		Rack	Applicable Shelf			
			V1	V2	19"	MWOCES 211-B	MWOCES 211-G	MWOCES 192-A	MWDCES 191
Installation KIT	MWOC-KIT-6	Side Angle adjuster(2pc), Link Bus Bar (1pair) Tray(1pc)		✓ SPZ				✓	
	MWOC-KIT-7	Side Angle adjuster(2pc), Link Bus Bar (1pair) Tray(1pc)		✓ DPZ				✓	
	MWOC-KIT-8	Link Bus bar(1 pair) Tray(1pc)		✓ SPZ			✓		
	MWOC-KIT-9	Link Bus bar(1 pair) Tray(1pc)		✓ DPZ			✓		
	MWOC-KIT-20	Side Angle adjuster(2pc), Link 3 Bus Bar (1pair) Tray(1pc)	✓ DPZ					✓	
	MWOC-KIT-23	Tray (1pc)					✓		
	MWDC-KIT-12	Side Rail (4pc)			✓				✓

※ Planned future product. Contact Murata for the latest details



## PRODUCT MAP (BATTERY BACKUP)

Category	Order P/N	Open Rack		Rack	Installation KIT	Height	Charge		Discharge	
		V1	V2	19"			V [V]	Power [kW]	V [V]	Power [kW]
21" Empty Shelf	MWBBES-212-A*		✓		Necessary	2U	12.3	3.74	12.3	16
19" Empty Shelf	MWBBES-192-A*			✓	Necessary	2U	12.3	3.74	12.3	12

Category	Order P/N	Charge		Discharge		Height
		V [V]	Power [kW]	V [V]	Power [kW]	
BBU	MWBBU118-4000-A-B*	12.3	0.935	12.3	4	2U

Category	Order P/N	Product Description	Applicable Shelf (BBU)	
			MWBBES 192-A	MWBBES 212-A
BCU	MWBB-BCU-1*	Battery Control Unit for MWBBU series	✓	✓
Blanking Panels	MWBBU118-B*	Blanking panel for MWBBU118-4000-A-B	✓	✓
	MWBB-BCU-B*	Blanking panel for MWBB-BCU-1	✓	✓

Category	Order P/N	Product Description	Applicable Shelf (BBU)		Applicable Shelf (power)		
			MWBBES 192-A	MWBBES 212-A	MWOCES 211-G	MWOCES 192-A	MWDCES 191
Installation KIT	MWBB-KIT-2*	Main link busbar(MWOCES-192xMWBBES-212), Side Rail(SPZ_OCP Rack(Rittal)) , Communication Cable		✓		✓	
	MWBB-KIT-3*	Sub link bus bar 2mm thickness (MWBBES-212/192), Extension communication cable	✓	✓	✓	✓	
	MWBB-KIT-4*	Main link busbar(MWOCES-192xMWBBES-192), Side Rail(EIA19", ESA), Communication Cable	✓			✓	
	MWBB-KIT-5*	Main link busbar(MWOCES-211-G x MWBBES-212), Communication Cable, (SPZ_OCP rack(Rittal))		✓	✓		
	MWBB-KIT-6*	Main link busbar(MWDCES-191xMWBBES-192), Side Rail(EIA19", ESA), Communication Cable	✓				✓
	MWBB-KIT-7*	Sub link bus bar 4mm thickness (MWBBES-212/192), Extension communication cable	✓	✓		✓	✓
	MWBB-KIT-8*	Main link busbar(MWOCES-211-G x MWBBES-212), Communication Cable, (DPZ_OCP rack(FB))		✓	✓		

\* Planned future product. Contact Murata for the latest details

## AC POWER CABLE COFIGURATION

Order Number	Applicable shelf	Input	cable length(m)	Maximum current(A)	Plug		
					Quantity	Standard	Configuration
MWOC-PCA-7-3-4	MWDCES-191-C	single phase	3	30	3	CEE Plug IEC60309	
MWOC-PCA-7-3-5	MWDCES-191-C	single phase	3	30	3	NEMA L6-30	
MWOC-PCA-7-3-6	MWDCES-191-C	3-phase (Wye)	3	32	1	CEE Plug IEC60309	
MWOC-PCA-4-3-1	MWOCES-192-A	3-phase (Delta)	3	50	1	CS8365C (Hubble)	
MWOC-PCA-3-3-2	MWOCES-211-B,-F,-G	single phase	3	30	1	NEMA L6-30	
MWOC-PCA-3-3-6	MWOCES-211-B,-F,-G	single phase	3	30	1	CEE Plug IEC60309	
MWOC-PCA-3-4-7A	MWOCES-211-B,-F,-G	single phase	4	30	2	NEMA L6-30	
MWOC-PCA-3-4-7B	MWOCES-211-B,-F,-G	single phase	4	30	2	NEMA L6-30	
MWOC-PCA-5-3-6	MWOCES-211-B,-F,-G MWOCES-192-G	3-phase (Wye)	3	32	1	CEE Plug IEC60309	

## Global locations

For details please visit [www.murata.com](http://www.murata.com)



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### Note

#### 1. Export Control

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No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

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For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- ① Aircraft equipment
- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention /crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3. Product specifications in this catalog are as of May 2020. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. Please read rating and CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.

5. This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

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Murata Manufacturing Co., Ltd.

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