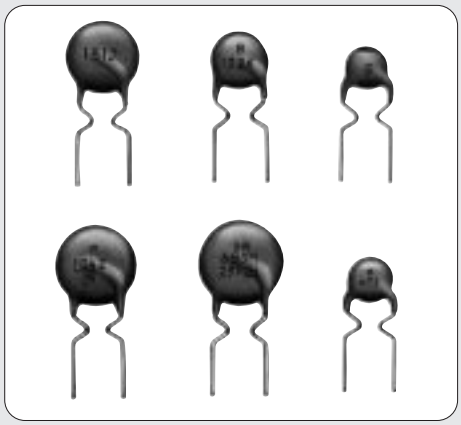
CERAMIC CAPACITORS 12V/16V/25V/50V/500V

DD100・DD10・DD300・DD400 Series

CERAMIC CAPACITORS



muRata Innovator in Electronics

Murata
Manufacturing Co., Ltd.

Cat.No.C83E-3

■CONTENT

■GENERAL DESCRIPTION OF CERAMIC CAPACITORS

Ceramic capacitors are produced by sandwiching a ceramic-dielectric layer of titanium oxide (TiO_2) or barium titanate ($BaTiO_3$) between two electrodes. Special features include high reliability, compact size, large capacitance, excellent high-frequency characteristics, and simple mass production. Furthermore, their low cost enables wide application in electronic circuits designed for by-pass, coupling, and resonant functions.

Ceramic capacitors are divided into two distinctive types according to structure ——— monolithic and disc type.

The latter type is available in a larger variety, with rated voltages of 50V, 250V, 500V, 1kV, 2kV, 3.15kV and 6.3kV, besides AC voltage. Murata has meanwhile developed its original BC capacitors ——— semiconductive ceramic capacitors which are much more compact in size and much larger in capacitance than conventional ceramic capacitors. BC capacitors are available in rated voltages of 12V, 16V, 25V and 50V.

■MURATA'S DISC TYPE CERAMIC CAPACITORS

DESCRIPTION	SERIES	TYPE 1	TYPE 2	TYPE 3	RATED VOLTAGE	CAPACITANCE RANGE (pF)
CERAMIC CAPACITORS	DD100 DD10	O	O	—	50V 500V	1 — 47000
BC CAPACITORS	DD300 DD400	—	—	O	12V 16V 25V 50V	1000 — 470000
HIGH-VOLTAGE CERAMIC CAPACITORS	GENERAL HR	O	O	O	250V 500V 1kV 2kV 3.15kV 6.3kV	10 — 10000
SAFETY STANDARD RECOGNIZED CERAMIC CAPACITORS	KH KX AC250V	—	O	—	AC250V	100 — 10000

■MURATA'S CERAMIC CAPACITORS

1. TABLE OF CAPACITANCE RANGE

Series	DC Rated Voltage (V)	Temp. Char.	Type	Nominal Capacitance Range (pF)	Page
DD100	50	CΔ	1	1–270	5–8
		SL		1–1000	
		B	2	100–10000	
		F		2200–47000	
DD10	500	CΔ	1	1–270	9–12
		SL		1–560	
		B	2	100–10000	
		E		1000–10000	
DD300 (Surface layer)	50	F	3	22000–100000	13–15
	25	F		22000–100000	
	16	F		220000	
	12	F		100000–470000	
DD400 (Boundary layer)	25	SR	3	1000–100000	
	16	SR		10000–100000	

Nominal Capacitance Range (pF): 1 50 100 200 500 1000 2000 5000 10000 20000 50000 100000 200000 500000

2. PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DD104 | −63 | B | 101 | K | 50

❶ ❷ ❸ ❹ ❺ ❻

❶ Type

Series	Code
DD100 DD300 DD400	DDXXX DD plus the first digit denotes the series; the next two digits denote nominal body diameter. (Example) DD1 06 Nominal Body Dia. 6mm DD100 Series
DD10	DDXX The two digits denote the nominal body diameter. (Example) DD 07 Nominal Body Dia. 7.5mm

❷ Lead Configuration

Code	Configuration
-63 -64	Inside Crimp
-959 -989 -999	Crimp Taping

❸ Temperature Characteristics

Code	Cap. Change or Temp. Coeff.	Temperature Range (℃)
CK	0±250 (ppm/℃)	−25 to +85
CJ	0±120 (ppm/℃)	
CH	0± 60 (ppm/℃)	
SL	+350 to −1000 (ppm/℃)	+20 to +85
B	Within ±10%	−25 to +85
E	Within $^{+20}_{-55}$%	
F	Within $^{+30}_{-80}$%	
SR	Within ±15%	

❹ Nominal Capacitance

The first two digits denote significant figures; the last digit denotes the multiplier of 10 in pF.

(Example)

$472=47\times10^{2}=4700pF$

	Photo	Special Feature and Application Fields
		High reliability and low cost due to simple structure. Low residual inductance permits application at high frequency. The temperature-compensating type, in particular, is much more stable than conventional capacitors against temperature variations. The temperature-compensating type is applied mainly in oscillation, tuning, and coupling circuits; the high dielectric-constant type in decoupling and by-pass capacitors.
		Widely used in electronic circuits for TV and power sources.
		BC capacitors have been designed to be more compact in size than the conventional ceramic capacitors and are available at a lower cost. The series is divided into two types by structure surface-layer and boundary-layer. The surface-layer series can be used in the same way as the high dielectric-constant type of ceramic capacitors. The boundary-layer series can replace polyester-film capacitors because of similar characteristics.

❺ Capacitance Tolerance

Code	Tolerance
C	±0.25pF
D	±0.5pF
J	± 5%
K	± 10%
M	± 20%
P	$^{+100}_{-0}$%
Z	$^{+80}_{-20}$%

❻ Rated Voltage

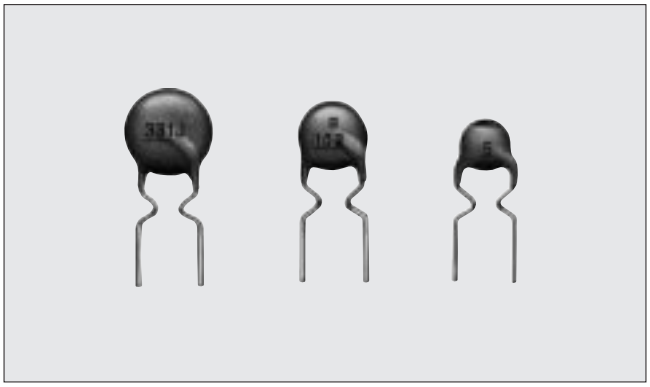
Code	DC Rated Voltage
12	12V
16	16V
25	25V
50	50V
500	500V

CERAMIC CAPACITORS

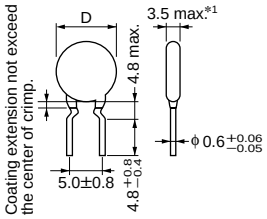
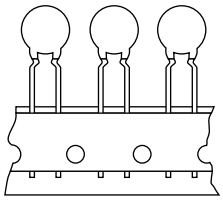
50V Ceramic Capacitors **DD100** Series

■FEATURES

1. High reliability and low cost.
2. Little residual inductance. Can be used in the high frequencies.
3. Temperature compensating type with high Q and stable against temperature changes.
4. 50V-capacitors are designed to be suitable for 63V-applications.



■DIMENSIONS

Packaging form	Bulk	Taping*2
Configuration	Inside Crimp	Inside Crimp
Lead code	-63	-989, -999, -959
Dimensions (in mm)		

Lead spacing F : 5.0
Pitch of component P : 12.7
Pitch of sprocket hole P0 : 12.7

*1 4.0 max. in the case of temperature compensating type of 22pF and under, and high dielectric constant type of 470pF and under.
*2 Please see page 16 on other taping specification.

■MARKING

Type / Temp. Char. / Item	Temperature Compensating Type		High Dielectric Constant Type	
	CK, CJ, CH	SL	B	F
DD104—DD106	12	12	B 102	472
DD107 & DD108	121J	331J	B 332K	223Z M 67
DD109—DD112	271J M 67	561J M 67	B 682K M 67	473Z M 67
Temperature Characteristics	Identified by color (Black).	Omitted.	Identified by code.	Omitted.
Nominal Capacitance	Under 100pF : Actual value. 100pF and over : Identified by 3-figure code.			
Capacitance Tolerance	Identified by code. Omitted for Nom. Dia. φ6mm and under except F103Z.			
Rated Voltage	Identified by horizontal line under capacitance.			
Manufacturer's Identification	Identified by M . Omitted for Nom. Dia. φ8mm and under except F223Z.			
Manufactured Date	Abbreviation. Omitted for Nom. Dia. φ8mm and under except F223Z.			

■STANDARD LIST

Temperature Compensating Type	DD100 Series

CK Characteristics (0±250ppm/℃)
CJ Characteristics (0±120ppm/℃)
CH Characteristics (0± 60ppm/℃)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
1	4	±0.25pF	50	DD104 □ CK 010 C 50	–63	–989
1.5				DD104 □ CK 1R5 C 50		
2				DD104 □ CK 020 C 50		
3				DD104 □ CJ 030 C 50		
4				DD104 □ CH 040 C 50		
5				DD104 □ CH 050 C 50		
6		±0.5pF		DD104 □ CH 060 D 50		
7				DD104 □ CH 070 D 50		
8				DD104 □ CH 080 D 50		
9				DD104 □ CH 090 D 50		
10				DD104 □ CH 100 D 50		
12		±5%		DD104 □ CH 120 J 50		
15				DD104 □ CH 150 J 50		
18				DD104 □ CH 180 J 50		
22				DD104 □ CH 220 J 50		
27				DD104 □ CH 270 J 50		
33				DD104 □ CH 330 J 50		
39				DD104 □ CH 390 J 50		
47				DD104 □ CH 470 J 50		
56	5			DD105 □ CH 560 J 50		
68	6			DD106 □ CH 680 J 50		–999
82				DD106 □ CH 820 J 50		
100	7.5			DD107 □ CH 101 J 50		–959
120				DD107 □ CH 121 J 50		
150	8			DD108 □ CH 151 J 50		
180	9.5			DD109 □ CH 181 J 50		
220				DD109 □ CH 221 J 50		
270	10.5			DD110 □ CH 271 J 50		

Temperature Compensating Type | DD100 Series

SL Characteristics (+350 to −1000ppm/℃)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code: Bulk Inside Crimp 	Lead Code: Taping Crimp 
1	4	±0.25pF	50	DD104 □ SL 010 C 50	–63	–989
1.5				DD104 □ SL 1R5 C 50		
2				DD104 □ SL 020 C 50		
3				DD104 □ SL 030 C 50		
4				DD104 □ SL 040 C 50		
5				DD104 □ SL 050 C 50		
6		±0.5pF		DD104 □ SL 060 D 50		
7				DD104 □ SL 070 D 50		
8				DD104 □ SL 080 D 50		
9				DD104 □ SL 090 D 50		
10				DD104 □ SL 100 D 50		
12		±5%		DD104 □ SL 120 J 50		
15				DD104 □ SL 150 J 50		
18				DD104 □ SL 180 J 50		
22				DD104 □ SL 220 J 50		
27				DD104 □ SL 270 J 50		
33				DD104 □ SL 330 J 50		
39				DD104 □ SL 390 J 50		
47				DD104 □ SL 470 J 50		
56				DD104 □ SL 560 J 50		
68				DD104 □ SL 680 J 50		
82				DD104 □ SL 820 J 50		
100				DD104 □ SL 101 J 50		
120				DD104 □ SL 121 J 50		
150	5			DD105 □ SL 151 J 50		
180	6			DD106 □ SL 181 J 50		–999
220				DD106 □ SL 221 J 50		
270	7.5			DD107 □ SL 271 J 50		–959
330				DD107 □ SL 331 J 50		
390				DD107 □ SL 391 J 50		
470	8			DD108 □ SL 471 J 50		
560	9.5			DD109 □ SL 561 J 50		
680	10.5			DD110 □ SL 681 J 50		
820				DD110 □ SL 821 J 50		
1000	12.5			DD112 □ SL 102 J 50		—

High Dielectric Constant Type | DD100 Series

B Characteristics (±10%)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
100	4	±10	50	DD104 □ B 101 K 50	–63	–989
120				DD104 □ B 121 K 50		
150				DD104 □ B 151 K 50		
180				DD104 □ B 181 K 50		
220				DD104 □ B 221 K 50		
270				DD104 □ B 271 K 50		
330				DD104 □ B 331 K 50		
390				DD104 □ B 391 K 50		
470				DD104 □ B 471 K 50		
560				DD104 □ B 561 K 50		
680				DD104 □ B 681 K 50		
820				DD104 □ B 821 K 50		
1000				DD104 □ B 102 K 50		
1200				DD104 □ B 122 K 50		
1500				DD104 □ B 152 K 50		
1800	5			DD105 □ B 182 K 50		
2200	6			DD106 □ B 222 K 50		–999
2700				DD106 □ B 272 K 50		
3300	7.5			DD107 □ B 332 K 50		–959
3900				DD107 □ B 392 K 50		
4700				DD107 □ B 472 K 50		
5600	8			DD108 □ B 562 K 50		
6800	9.5			DD109 □ B 682 K 50		
8200	10.5			DD110 □ B 822 K 50		
10000	11			DD111 □ B 103 K 50		

F Characteristics ($^{+30}_{-80}$%)

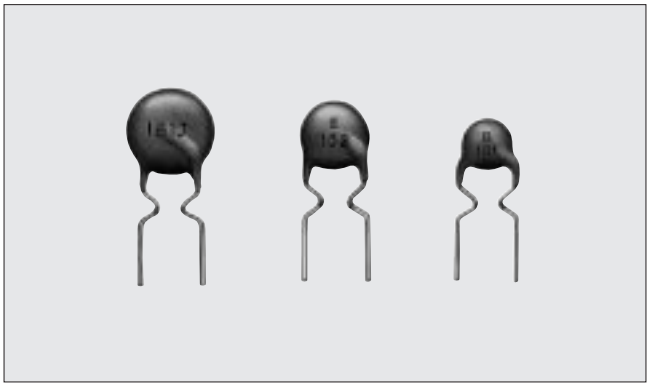
Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
2200	4	$^{+80}_{-20}$	50	DD104 □ F 222 Z 50	–63	–989
4700				DD104 □ F 472 Z 50		
6800	5			DD105 □ F 682 Z 50		
10000	6			DD106 □ F 103 Z 50		–999
22000	8			DD108 □ F 223 Z 50		–959
47000	10.5			DD110 □ F 473 Z 50		

CERAMIC CAPACITORS

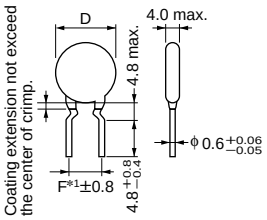
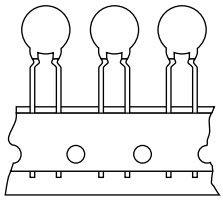
500V Ceramic Capacitors **DD10** Series

■FEATURES

1. High reliability and low cost.
2. Little residual inductance. Can be used in the high frequencies.
3. Temperature compensating type with high Q and stable against temperature changes.



■DIMENSIONS

Packaging form	Bulk	Taping*2
Configuration	Inside Crimp	Inside Crimp
Lead code	-63, -64	-989, -999, -959
Dimensions (in mm)		

Lead spacing F : 5.0
Pitch of component P : 12.7
Pitch of sprocket hole P_0 : 12.7

*1 F : 5.0 (Lead code : -63) or F : 10.0 (Lead code : -64)
*2 Please see page 16 on other taping specification.

■MARKING

Type / Temp. Char. / Item	Temperature Compensating Type		High Dielectric Constant Type	
	CK, CJ, CH	SL	B	E
DD05 & DD06	10	10	B 101	E 102
DD07 & DD08	33J	181J	B 122K	E 222P
DD09—DD18	221J M 67	561J M 67	B 103K M 67	E 103P M 67
Temperature Characteristics	Identified by color (Black).	Omitted.	Identified by code.	Identified by code.
Nominal Capacitance	Under 100pF : Actual value. 100pF and over : Identified by 3-figure code.			
Capacitance Tolerance	Identified by code. Omitted for Nom. Dia. φ6mm and under.			
Rated Voltage	Omitted.			
Manufacturer's Identification	Identified by M. Omitted for Nom. Dia. φ8mm and under.			
Manufactured Date	Abbreviation. Omitted for Nom. Dia. φ8mm and under.			

■STANDARD LIST

Temperature Compensating Type	DD10 Series

CK Characteristics (0±250ppm/℃)
CJ Characteristics (0±120ppm/℃)
CH Characteristics (0± 60ppm/℃)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
1	5	±0.25pF	500	DD05 □ CK 010 C 500	–63	–989
1.5				DD05 □ CK 1R5 C 500		
2				DD05 □ CK 020 C 500		
3				DD05 □ CJ 030 C 500		
4				DD05 □ CH 040 C 500		
5				DD05 □ CH 050 C 500		
6		±0.5pF		DD05 □ CH 060 D 500		
7				DD05 □ CH 070 D 500		
8				DD05 □ CH 080 D 500		
9				DD05 □ CH 090 D 500		
10				DD05 □ CH 100 D 500		
12		±5%		DD05 □ CH 120 J 500		
15				DD05 □ CH 150 J 500		
18				DD05 □ CH 180 J 500		
22				DD05 □ CH 220 J 500		
27	6			DD06 □ CH 270 J 500		–999
33	7.5			DD07 □ CH 330 J 500		–959
39				DD07 □ CH 390 J 500		
47				DD07 □ CH 470 J 500		
56	8			DD08 □ CH 560 J 500		
68	9.5			DD09 □ CH 680 J 500		
82				DD09 □ CH 820 J 500		
100	10.5			DD10 □ CH 101 J 500		
120				DD10 □ CH 121 J 500		
150	11			DD11 □ CH 151 J 500		
180	12.5			DD12 □ CH 181 J 500		——
220	14.5			DD14 □ CH 221 J 500	–64	
270				DD14 □ CH 271 J 500		

Temperature Compensating Type	DD10 Series

SL Characteristics (+350 to −1000ppm/℃)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
1	5	±0.25pF	500	DD05 □ SL 010 C 500	–63	–989
1.5				DD05 □ SL 1R5 C 500		
2				DD05 □ SL 020 C 500		
3				DD05 □ SL 030 C 500		
4				DD05 □ SL 040 C 500		
5				DD05 □ SL 050 C 500		
6		±0.5pF		DD05 □ SL 060 D 500		
7				DD05 □ SL 070 D 500		
8				DD05 □ SL 080 D 500		
9				DD05 □ SL 090 D 500		
10				DD05 □ SL 100 D 500		
12		±5%		DD05 □ SL 120 J 500		
15				DD05 □ SL 150 J 500		
18				DD05 □ SL 180 J 500		
22				DD05 □ SL 220 J 500		
27				DD05 □ SL 270 J 500		
33				DD05 □ SL 330 J 500		
39				DD05 □ SL 390 J 500		
47				DD05 □ SL 470 J 500		
56				DD05 □ SL 560 J 500		
68				DD05 □ SL 680 J 500		
82	6			DD06 □ SL 820 J 500		–999
100				DD06 □ SL 101 J 500		
120	7.5			DD07 □ SL 121 J 500		–959
150				DD07 □ SL 151 J 500		
180	8			DD08 □ SL 181 J 500		
220	9.5			DD09 □ SL 221 J 500		
270				DD09 □ SL 271 J 500		
330	10.5			DD10 □ SL 331 J 500		
390				DD10 □ SL 391 J 500		
470	11			DD11 □ SL 471 J 500		
560	12.5			DD12 □ SL 561 J 500		—

High Dielectric Constant Type	DD10 Series

B Characteristics (±10%)

Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
100	5	±10	500	DD05 □ B 101 K 500	–63	–989
120				DD05 □ B 121 K 500		
150				DD05 □ B 151 K 500		
180				DD05 □ B 181 K 500		
220				DD05 □ B 221 K 500		
270				DD05 □ B 271 K 500		
330				DD05 □ B 331 K 500		
390				DD05 □ B 391 K 500		
470				DD05 □ B 471 K 500		
560				DD05 □ B 561 K 500		
680	6			DD06 □ B 681 K 500		–999
820				DD06 □ B 821 K 500		
1000	7.5			DD07 □ B 102 K 500		–959
1200				DD07 □ B 122 K 500		
1500	8			DD08 □ B 152 K 500		
1800				DD08 □ B 182 K 500		
2200	9.5			DD09 □ B 222 K 500		
2700	10.5			DD10 □ B 272 K 500		
3300	11			DD11 □ B 332 K 500		
3900				DD11 □ B 392 K 500		
4700	12.5			DD12 □ B 472 K 500		—
5600	14.5			DD14 □ B 562 K 500	–64	
6800				DD14 □ B 682 K 500		
8200	16.5			DD16 □ B 822 K 500		
10000	18.5			DD18 □ B 103 K 500		

E Characteristics ($^{+20}_{-55}$%)

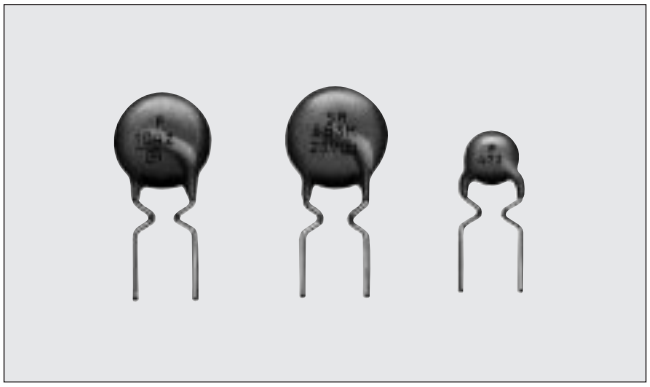
Nominal Capacitance (pF)	Body Dia. D (mm max.)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code	
					Bulk	Taping
					Inside Crimp 	Crimp 
1000	6	$^{+100}_{-0}$	500	DD06 □ E 102 P 500	–63	–999
1500	7.5			DD07 □ E 152 P 500		–959
2200	8			DD08 □ E 222 P 500		
3300	9.5			DD09 □ E 332 P 500		
4700	10.5			DD10 □ E 472 P 500		
6800	12.5			DD12 □ E 682 P 500		—
10000	14.5			DD14 □ E 103 P 500	–64	

BC CAPACITORS

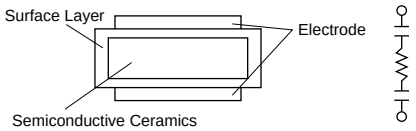
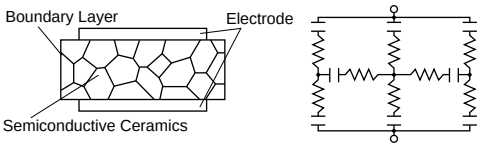
12/16/25/50V BC Capacitors DD300/DD400 Series

■FEATURES

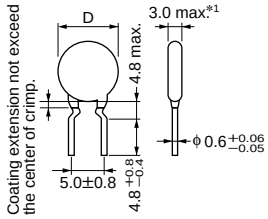
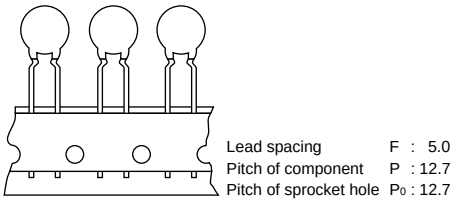
Murata has devoted constant effort to developing semiconductive ceramics technology. We design capacitors in much more compact sizes than conventional ceramic capacitors, having reduced the diameter by 50% and the effective thickness by 90%. Capacitance values available are 0.001 to 0.47µF, perfect for meeting the need for high density assemblies.
There are two kinds of BC capacitors, both designated by their inside construction ——— DD300 series (Surface layer type) and DD400 series (Boundary layer type).



■COMPARATIVE LIST OF EACH SERIES

Series / Item	DD300 Series (Surface Layer)	DD400 Series (Boundary Layer)
Inside Construction and Equivalent Circuit		

■DIMENSIONS

Packaging form	Bulk	Taping*2
Configuration	Inside Crimp	Inside Crimp
Lead code	-63	-989, -999, -959
Dimensions (in mm)		

*1 3.5mm max. in case of DD312
*2 Please see page 16 on other taping specification.

■MARKING

Series	DD300 Series		DD400 Series	
Temp. Char. / Rated Voltage / Type	F		Temp. Char.	SR
	12V 16V 25V	50V	Rated Voltage / Type	16V 25V
DD304 DD305			DD404 DD405	
DD306			DD406 DD407	
DD308			DD408	
DD310 DD312		——	DD410	
Temperature Characteristics	Identified by code.		Identified by code.	
Nominal Capacitance	Identified by 3-figure code.		Identified by 3-figure code.	
Capacitance Tolerance	Identified by code. Omitted for Nom. Dia. ϕ5mm and under.		Identified by code.	
Rated Voltage	12/16/25V	Identified by code. Omitted for Nom. Dia. ϕ5mm and under.	Identified by code. Omitted for Nom. Dia. ϕ5mm and under.	
	50V	Indentified by horizontal line (—) under capacitance.		
Manufacturer's Identification	Identified by M . Omitted for Nom. Dia. ϕ6.3mm and under.		Identified by M . Omitted for Nom. Dia. ϕ7mm and under.	
Manufactured Date	Abbreviation. Omitted for Nom. Dia. ϕ8mm and under.		Abbreviation. Omitted for Nom. Dia. ϕ8mm and under.	

● Marking of color : color of red

■STANDARD LIST

DD300 Series

F Characteristics ($^{+30}_{-80}$%)

Nominal Capacitance (pF)	Body Dia. D (mm)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code: Bulk Inside Crimp	Lead Code: Taping Crimp
100000	5±1	+80 −20	12	DD305 □ F 104 Z 12	–63	–999
220000	8±1			DD308 □ F 224 Z 12		–959
330000	10±1			DD310 □ F 334 Z 12		
470000	12.5±1.3			DD312 □ F 474 Z 12		——
220000	10±1		16	DD310 □ F 224 Z 16		–959
22000	4±1		25	DD304 □ F 223 Z 25		–989
33000				DD304 □ F 333 Z 25		
47000				DD304 □ F 473 Z 25		
100000	6.3±1			DD306 □ F 104 Z 25		–959
22000	4±1		50	DD304 □ F 223 Z 50		–989
33000	5±1			DD305 □ F 333 Z 50		–999
47000	6.3±1			DD306 □ F 473 Z 50		–959
100000	8±1			DD308 □ F 104 Z 50		

DD400 Series

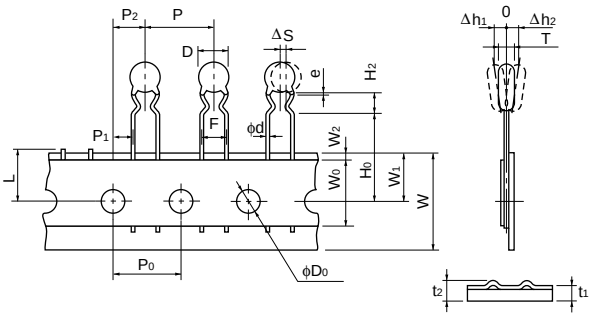
SR Characteristics (±15%)

Nominal Capacitance (pF)	Body Dia. D (mm)	Capacitance Tolerance (%)	DC Rated Voltage (V)	Part Number (□ : means optional lead code shown on the right.)	Lead Code: Bulk Inside Crimp 	Lead Code: Taping Crimp 
10000	4±1	±20	16	DD404 □ SR 103 M 16	–63	–989
12000				DD404 □ SR 123 M 16		
15000				DD404 □ SR 153 M 16		
18000				DD404 □ SR 183 M 16		
22000				DD404 □ SR 223 M 16		
27000	5±1			DD405 □ SR 273 M 16		–999
33000				DD405 □ SR 333 M 16		
39000				DD405 □ SR 393 M 16		
47000				DD405 □ SR 473 M 16		
56000	6.3±1			DD406 □ SR 563 M 16		–959
68000				DD406 □ SR 683 M 16		
82000	7±1			DD407 □ SR 823 M 16		
100000				DD407 □ SR 104 M 16		
1000	4±1		25	DD404 □ SR 102 M 25		–989
1200				DD404 □ SR 122 M 25		
1500				DD404 □ SR 152 M 25		
1800				DD404 □ SR 182 M 25		
2200				DD404 □ SR 222 M 25		
2700				DD404 □ SR 272 M 25		
3300				DD404 □ SR 332 M 25		
3900				DD404 □ SR 392 M 25		
4700				DD404 □ SR 472 M 25		
5600				DD404 □ SR 562 M 25		
6800				DD404 □ SR 682 M 25		
8200				DD404 □ SR 822 M 25		
10000				DD404 □ SR 103 M 25		
12000				DD404 □ SR 123 M 25		
15000				DD404 □ SR 153 M 25		
18000	5±1			DD405 □ SR 183 M 25		–999
22000				DD405 □ SR 223 M 25		
27000	6.3±1			DD406 □ SR 273 M 25		–959
33000				DD406 □ SR 333 M 25		
39000	7±1			DD407 □ SR 393 M 25		
47000				DD407 □ SR 473 M 25		
56000	8±1			DD408 □ SR 563 M 25		
68000				DD408 □ SR 683 M 25		
82000	10±1			DD410 □ SR 823 M 25		
100000				DD410 □ SR 104 M 25		

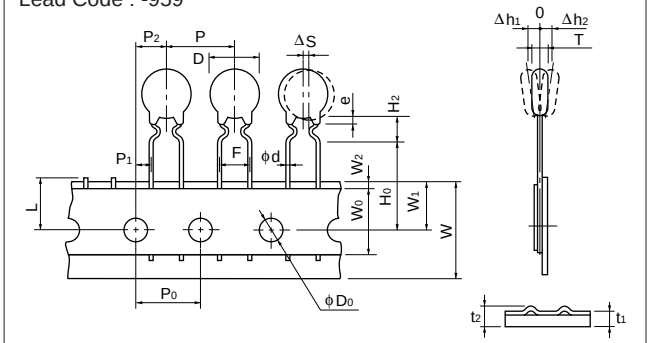
● Capacitance tolerance K (±10%) is also available.

4. TAPING SPECIFICATIONS

Lead Code : -989, -999



Lead Code : -959



Item	Code	Dimensions (mm)
Pitch of component	P	12.7
Pitch of sprocket hole	P_0	12.7±0.3
Lead spacing	F	$5.0^{+0.8}_{-0.2}$
Length from hole center to component center	P_2	6.35±1.3
Length from hole center to lead	P_1	3.85±0.7
Body diameter	D	See the individual product specification
Deviation along tape, left or right	ΔS	0±1.0
Carrier tape width	W	18.0±0.5
Position of sprocket hole	W_1	9.0±0.5
Lead distance between reference and bottom planes	H_2	6.0 max. (−989)
		5.0 max. (−999)
		4.8 max. (−959)
	H_0	16.0±0.5

Item	Code	Dimensions (mm)
Diameter of sprocket hole	ϕD_0	4.0±0.1
Lead diameter	ϕd	$0.6^{+0.06}_{-0.05}$
Total tape thickness	t_1	0.6±0.3
Total thickness, tape and lead wire	t_2	1.5 max.
Body thickness	T	See the individual product specification
Deviation across tape	$\Delta h_1, \Delta h_2$	1.0 max.
Portion to cut in case of defect	L	$11.0^{+0}_{-1.0}$
Hold down tape width	W_0	9.5 min.
Hold down tape position	W_2	1.5±1.5
Coating extension on lead	e	Up to the center of crimp

5. PACKAGING STYLES

Bulk	Taping
Polyethylene Bag 	Flat Pack 

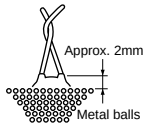
■MINIMUM QUANTITY* (Order in Sets Only)
[Bulk] 1,000 (pcs.) [Taping] 2,000 (pcs.)

■MINIMUM ORDER QUANTITY
10,000 (pcs.)

* "Minimum Quantity" means the numbers of units of each delivery or order. The quantity should be an integral multiple of the "minimum quantity".
(Please note that the actual delivery quantity in a package may change sometimes.)

6. SPECIFICATION AND TEST METHOD

6-1. TEMPERATURE COMPENSATING TYPE DD100/DD10 SERIES

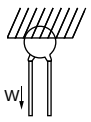
Item			Specification	Testing Method
1	Operating Temperature Range		−25 to +85℃	———
2	Capacitance		Within Specified tolerance.	The capacitance shall be measured at 20℃ with 1±0.2MHz and AC5V (r.m.s.) max..
3	Q		C ≧ 30pF : Q ≧ 1000 C < 30pF : Q ≧ 400+20C*1	Same condition as capacitance.
4	Insulation Resistance (I. R.)		10000MΩ min.	The insulation resistance shall be measured with DC10±1V (DC500±50V for DD10 Series) within 60±5 s of charging.
5	Dielectric Strength	Between lead wires	No failure.	The capacitor shall not be damage when DC voltage of 300% of the rated voltage are applied between the lead wires for 1 to 5 s. (Charge/discharge current≦50mA)
		Body Insulation	No failure.	The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, short-circuited, is kept approximately 2mm off the balls as shown in the figure, and DC voltage of 250% of the rated voltage is applied for 1 to 5 s between capacitor lead wires and small metals. (Charge/discharge current≦50mA) 
6	Temperature Characteristic	Temperature Coefficient	Within specified tolerance. (See Table A)	The capacitance measurement shall be made at each step specified in table. Capacitance change from the value of step 3 shall not exceed the limit specified.
		Capacitance Drift	Within ±0.2% or ±0.05pF whichever is greater.	
7	Vibration Resistance	Appearance	No marked defect.	The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range. 1.5mm in total amplitude, and about 1 min in the rate of vibration change from 10Hz to 55Hz and back to 10Hz is applied for a total of 6 h ; 2 h each in 3 mutually perpendicular directions.
		Capacitance	Within specified tolerance.	
		Q	C ≧ 30pF : Q ≧ 1000 C < 30pF : Q ≧ 400+20C*1	
8	Soldering Effect	Appearance	No marked defect.	The lead wire shall be immersed into the melted solder of 350±10℃ (Nominal body diameter ϕ5mm and under 270±5℃) up to about 1.5 to 2mm from the main body for 3.5±0.5 s. (Nominal body diameter ϕ5mm and under 5±0.5 s.) Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
		Capacitance Change	Within ±2.5% or ±0.25pF whichever is greater.	
		Dielectric Strength (Between lead wires)	Pass the item No. 5.	
9	Humidity (Under steady state)	Appearance	No marked defect.	Set the capacitor for 500$^{+24}_{0}$ h at 40±2℃ in 90 to 95% relative humidity. Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
		Capacitance Change	Within ±5% or ±0.5pF whichever is greater.	
		Q	C ≧ 30pF : Q ≧ 350 10 ≦ C < 30pF: Q ≧ 275+$\frac{5}{2}$C*1 C < 10pF : Q ≧ 200+10C*1	
		I. R.	1000MΩ min.	
		Dielectric Strength (Between lead wires)	Pass the item No. 5.	

Step	1	2	3	4	5
CΔ	20±2℃	−25±3℃	20±2℃	85±2℃	20±2℃
SL	—	—	20±2℃	85±2℃	20±2℃

*1 "C" expresses nominal capacitance value (pF).
*2 "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

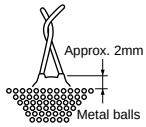
Table A

Char.	Temp. Coeff. (ppm/℃) between +20℃ and +85℃	Cap. Change (%) between +20℃ and −25℃		Char.	Temp. Coeff. (ppm/℃) between +20℃ and +85℃	Cap. Change (%) between +20℃ and −25℃	
		max.	min.			max.	min.
CK	0±250	1.54	−1.13	CH	0±60	0.49	−0.27
CJ	0±120	0.82	−0.54	SL	+350 to −1000	—	—

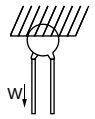
<table>
<tr><th colspan="3">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">10</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply the rated voltage for 500^{+24}_{0} h at 40±2℃ in 90 to 95% relative humidity.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
(Charge/discharge current≦50mA)</td></tr>
<tr><td>Capacitance Change</td><td>Within ±7.5% or ±0.75pF whichever is greater.</td></tr>
<tr><td>Q</td><td>C ≧ 30pF : Q ≧ 200
C ＜ 30pF : Q ≧ 100+$\frac{10}{3}$C*1</td></tr>
<tr><td>I. R.</td><td>500MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">11</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply a DC voltage of 200% of the rated voltage for 1000^{+48}_{0} h at 85±2℃.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
(Charge/discharge current≦50mA)</td></tr>
<tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF whichever is greater.</td></tr>
<tr><td>Q</td><td>C ≧ 30pF : Q ≧ 350
10≦C＜30pF: Q≧275+$\frac{5}{2}$C*1
C ＜ 10pF : Q ≧ 200+10C*1</td></tr>
<tr><td>I. R.</td><td>2000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Temperature and immersion cycling</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 5 cycles of temperature variation according to Table 1, then the capacitor shall be immersed into two baths, the one a clean water bath at temperature 65^{+5}_{0}℃ and the other a saturated salt water bath at temperature 0±3℃ for 15 min.
This immersion cycle shall be repeated 2 times, then the capacitor shall be washed in running water, wiped or dried with air draught.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
(Table 1)<table><tr><th>Step</th><th>Temperature (℃)</th><th>Time</th></tr><tr><td>1</td><td>-25^{+0}_{-3}</td><td>30 min</td></tr><tr><td>2</td><td>room temp.</td><td>3 min</td></tr><tr><td>3</td><td>85^{+3}_{0}</td><td>30 min</td></tr><tr><td>4</td><td>room temp.</td><td>3 min</td></tr></table></td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF whichever is greater.</td></tr>
<tr><td>Q</td><td>C ≧ 30pF : Q ≧ 350
10≦C＜30pF: Q≧275+$\frac{5}{2}$C*1
C ＜ 10pF : Q ≧ 200+10C*1</td></tr>
<tr><td>I. R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Strength of Lead</td><td>Pull</td><td rowspan="2">Lead wire shall not cut off.
Capacitor shall not be broken.</td><td>As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s.
  </td></tr>
<tr><td>Bending</td><td>Each lead wire shall be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.</td></tr>
<tr><td>14</td><td colspan="2">Solderability of Leads</td><td>Lead wire shall be soldered with uniformly coated on the axial direction over $\frac{3}{4}$ of the circumferential direction.</td><td>The lead wire of a capacitor shall be dipped into a methanol solution of 25wt% rosin and then into molten solder of 235±5℃ for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2 mm from the root of lead wires.</td></tr>
</table>

*1 "C" expresses nominal capacitance value (pF).
*2 "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

6-2. HIGH DIELECTRIC CONSTANT TYPE DD100/DD10 SERIES

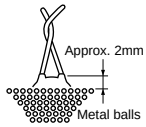
<table>
<tr><th colspan="3">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>−25 to +85℃</td><td>———</td></tr>
<tr><td>2</td><td colspan="2">Capacitance</td><td>Within Specified tolerance.</td><td>The capacitance shall be measured at 20℃ with 1±0.2kHz and AC5V (r.m.s.) max..</td></tr>
<tr><td>3</td><td colspan="2">Dissipation Factor (D. F.)</td><td>B/E : D. F. ≦ 2.5%
F : D. F. ≦ 5.0%</td><td>Same condition as capacitance.</td></tr>
<tr><td>4</td><td colspan="2">Insulation Resistance (I. R.)</td><td>C*1 ≦ 0.02μF : 10000MΩ min.
C*1 > 0.02μF : 7500MΩ min.</td><td>The insulation resistance shall be measured with DC10±1V (DC500±50V for DD10 Series) within 60±5 s of charging.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Dielectric Strength</td><td>Between lead wires</td><td>No failure.</td><td>The capacitor shall not be damage when DC voltage of 250% of the rated voltage are applied between the lead wires for 1 to 5 s.
(Charge/discharge current ≦ 50mA)</td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, short-circuited, is kept approximately 2mm off the balls as shown in the figure, and DC voltage of 250% of the rated voltage is applied for 1 to 5 s between capacitor lead wires and small metals.
(Charge/discharge current≦50mA)
  </td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Temperature Characteristic</td><td>No DC voltage</td><td>B : Within ±10%
E : Within $^{+20}_{-55}$%
F : Within $^{+30}_{-80}$%</td><td rowspan="2">The capacitance measurement shall be made at each step specified in table and at a sufficient number of intermediate temperatures between step 2 and 7.
Capacitance change from the value of step 3 shall not exceed the limit specified.
<table><tr><td>Step</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Temp.</td><td>20±2℃</td><td>−25±3℃</td><td>20±2℃</td><td>85±2℃</td></tr><tr><td>DC Voltage applied</td><td>None</td><td>None</td><td>None</td><td>None</td></tr></table><table><tr><td>Step</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Temp.</td><td>85±2℃</td><td>20±2℃</td><td>−25±3℃</td><td>20±2℃</td></tr><tr><td>DC Voltage applied</td><td>Rated</td><td>Rated</td><td>Rated</td><td>Rated</td></tr></table>Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before measurements.</td></tr>
<tr><td>With DC voltage</td><td>B : Within $^{+10}_{-20}$%
E : Within $^{+20}_{-80}$%
F : Within $^{+30}_{-95}$%</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range. 1.5 mm in total amplitude, and about 1 min in the rate of vibration change from 10Hz to 55Hz and back to 10Hz is applied for a total of 6 h ; 2 h each in 3 mutually perpendicular directions.</td></tr>
<tr><td>Capacitance</td><td>Within specified tolerance.</td></tr>
<tr><td>D. F.</td><td>Satisfies initial requirement.</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Soldering Effect</td><td>Appearance</td><td>No marked defect.</td><td rowspan="4">The lead wire shall be immersed into the melted solder of 350±10℃ (Nominal body diameter ϕ5mm and under 270±5℃) up to about 1.5 to 2mm from the main body for 3.5±0.5 s. (Nominal body diameter ϕ5mm and under 5±0.5 s.)
Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before initial measurements.
Post-treatment : Capacitor shall be stored for 24±2 h at *2room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B : Within ± 5%
E : Within ±15%
F : Within ±20%</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="5">9</td><td rowspan="5">Humidity (Under steady state)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Set the capacitor for 500$^{+24}_{0}$ h at 40±2℃ in 90 to 95% relative humidity.
Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before initial measurements.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B : Within ±10%
E : Within ±20%
F : Within ±30%</td></tr>
<tr><td>D. F.</td><td>B/E : D. F. ≦ 5.0%
F : D. F. ≦ 7.5%</td></tr>
<tr><td>I. R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
</table>

*1 "C" expresses nominal capacitance value.
*2 "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

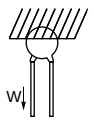
<table>
<tr><th colspan="3">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">10</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply the rated voltage for 500$^{+24}_{0}$ h at 40±2℃ in 90 to 95% relative humidity.
Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before initial measurements.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *2room condition.
(Charge/discharge current≦50mA)</td></tr>
<tr><td>Capacitance Change</td><td>B : Within ±10%
E : Within ±20%
F : Within ±30%</td></tr>
<tr><td>D. F.</td><td>B/E : D. F. ≦ 5.0%
F : D. F. ≦ 7.5%</td></tr>
<tr><td>I. R.</td><td>500MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">11</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply a DC voltage of 200% of the rated voltage for 1000$^{+48}_{0}$ h at 85±2℃.
Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before initial measurements.
Post-treatment : Capacitor shall be stored for 24±2 h at *2room condition.
(Charge/discharge current≦50mA)</td></tr>
<tr><td>Capacitance Change</td><td>B : Within ±10%
E : Within ±20%
F : Within ±30%</td></tr>
<tr><td>D. F.</td><td>B/E : D. F. ≦ 4.0%
F : D. F. ≦ 7.5%</td></tr>
<tr><td>I. R.</td><td>2000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Temperature and immersion cycling</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 5 cycles of temperature variation according to Table 1, then the capacitor shall be immersed into two baths, the one a clean water bath at temperature 65$^{+5}_{0}$℃ and the other a saturated salt water bath at temperature 0±3℃ for 15 min.
This immersion cycle shall be repeated 2 times, then the capacitor shall be washed in running water, wiped or dried with air draught.
Pre-treatment : Capacitor shall be stored at 85±2℃ for 1 h, then placed at *2room condition for 24±2 h before initial measurements.
Post-treatment : Capacitor shall be stored for 24±2 h at *2room condition.
(Table 1)<table><tr><th>Step</th><th>Temperature (℃)</th><th>Time</th></tr><tr><td>1</td><td>−25$^{+0}_{-3}$</td><td>30 min</td></tr><tr><td>2</td><td>room temp.</td><td>3 min</td></tr><tr><td>3</td><td>85$^{+3}_{0}$</td><td>30 min</td></tr><tr><td>4</td><td>room temp.</td><td>3 min</td></tr></table></td></tr>
<tr><td>Capacitance Change</td><td>B : Within ±10%
E : Within ±20%
F : Within ±30%</td></tr>
<tr><td>D. F.</td><td>B/E : D. F. ≦ 5.0%
F : D. F. ≦ 7.5%</td></tr>
<tr><td>I. R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Strength of Lead</td><td>Pull</td><td rowspan="2">Lead wire shall not cut off.
Capacitor shall not be broken.</td><td>As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s.
  </td></tr>
<tr><td>Bending</td><td>Each lead wire shall be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.</td></tr>
<tr><td>14</td><td colspan="2">Solderability of Leads</td><td>Lead wire shall be soldered with uniformly coated on the axial direction over $\frac{3}{4}$ of the circumferential direction.</td><td>The lead wire of a capacitor shall be dipped into a methanol solution of 25wt% rosin and then into molten solder of 235±5℃ for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2 mm from the root of lead wires.</td></tr>
</table>

*2 "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

6-3. SEMICONDUCTIVE DIELECTRIC TYPE DD300/DD400 SERIES

<table>
<tr><th colspan="3">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>−25 to +85℃</td><td>———</td></tr>
<tr><td>2</td><td colspan="2">Capacitance</td><td>Within Specified tolerance.</td><td>The capacitance shall be measured at 20℃ with 1±0.2kHz and AC0.1V (r.m.s.) max.. (SR : AC1.0V (r.m.s.) max..)</td></tr>
<tr><td>3</td><td colspan="2">Dissipation Factor (D. F.)</td><td>F : D. F. ≦ 5.0% SR : D. F. ≦ 2.5% (16V)
D. F. ≦ 1.0% (25V)</td><td>Same condition as capacitance.</td></tr>
<tr><td>4</td><td colspan="2">Insulation Resistance (I. R.)</td><td>F : 5MΩ • μF min.
SR : 100MΩ min. (16V)
1000MΩ or 20MΩ • μF min. whichever is smaller. (25V)</td><td>The insulation resistance shall be measured with DC10±1V within 60±5 s of charging.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Dielectric Strength</td><td>Between lead wires</td><td>No failure.</td><td>The capacitor shall not be damage when DC voltage of 250% of the rated voltage are applied between the lead wires for 1 to 5 s.(Charge/discharge current≦10mA)</td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, short-circuited, is kept approximately 2mm off the balls as shown in the figure, and DC voltage of 250% of the rated voltage is applied for 1 to 5 s between capacitor lead wires and small metals. (Charge/discharge current≦10mA)
  </td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Temperature Characteristic</td><td>No DC voltage</td><td>F : Within $^{+30}_{-80}$%
SR : Within ±15%</td><td rowspan="2">The capacitance measurement shall be made at each step specified in table and at a sufficient number of intermediate temperatures between step 2 and 7.
Capacitance change from the value of step 3 shall not exceed the limit specified.
<table><tr><td>Step</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Temp.</td><td>20±2℃</td><td>−25±3℃</td><td>20±2℃</td><td>85±2℃</td></tr><tr><td>DC Voltage applied</td><td>None</td><td>None</td><td>None</td><td>None</td></tr></table><table><tr><td>Step</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Temp.</td><td>85±2℃</td><td>20±2℃</td><td>−25±3℃</td><td>20±2℃</td></tr><tr><td>DC Voltage applied</td><td>$\frac{1}{2}$ Rated</td><td>$\frac{1}{2}$ Rated</td><td>$\frac{1}{2}$ Rated</td><td>$\frac{1}{2}$ Rated</td></tr></table>Pre-treatment : Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements.</td></tr>
<tr><td>With DC voltage</td><td>F : Within $^{+30}_{-95}$%
SR : Within $^{+15}_{-30}$%</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range. 1.5mm in total amplitude, and about 1 min in the rate of vibration change from 10Hz to 55Hz and back to 10Hz is applied for a total of 6 h ; 2 h each in 3 mutually perpendicular directions.</td></tr>
<tr><td>Capacitance</td><td>Within specified tolerance.</td></tr>
<tr><td>D. F.</td><td>Satisfies initial requirement.</td></tr>
<tr><td rowspan="6">8</td><td rowspan="6">Soldering Effect</td><td>Appearance</td><td>No marked defect.</td><td rowspan="6">The lead wire shall be immersed into the melted solder of 350±10℃ (Nominal body diameter ϕ4mm 270±5℃) up to about 1.5 to 2mm from the main body for 3.5±0.5 s. (Nominal body diameter ϕ4mm 5±0.5 s.)
Pre-treatment : Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements of capacitance and D. F.
Post-treatment : Capacitor shall be stored for 24±2 h at *room condition.
Measurement Order :
I. R. • Dielectric Strength→Pre-treatment →Capacitance • D. F.→Soldering Effect test→Post-treatment→ Capacitance • D. F. • I. R. • Dielectric Strength</td></tr>
<tr><td>Capacitance Change</td><td>F : Within ±20%
SR : Within ± 5%</td></tr>
<tr><td>D. F.</td><td>Satisfies initial requirement.</td></tr>
<tr><td>I. R.</td><td>Satisfies initial requirement.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">9</td><td rowspan="5">Humidity (Under steady state)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Set the capacitor for 500$^{+24}_{0}$ h at 40±2℃ in 90 to 95% relative humidity.
Pre-treatment : Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements of capacitance and D. F.
Post-treatment : Capacitor shall be stored for 1 to 2 h at *room condition.
Measurement Order:
I. R. • Dielectric Strength→Pre-treatment →Capacitance • D. F.→Humidity test →Post-treatment→Capacitance • D. F. • I. R. • Dielectric Strength</td></tr>
<tr><td>Capacitance Change</td><td>F : Within ±20%
SR : Within ±10%</td></tr>
<tr><td>D. F.</td><td>F : D. F. ≦ 7.5% SR : D. F. ≦ 4.0% (16V)
D. F. ≦ 1.5% (25V)</td></tr>
<tr><td>I. R.</td><td>F : Satisfies initial requirement.
SR : $\frac{1}{2}$ of initial requirement or over.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
</table>

* "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

<table>
<tr><th colspan="3">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">10</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply the rated voltage for 500^{+24}_{0} h at 40±2℃ in 90 to 95% relative humidity.
Pre-treatment and Post-treatment :
Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements of capacitance and D. F.
Measurement Order :
I. R. • Dielectric Strength→Pre-treatment →Capacitance • D. F.→Humidity Loading test →I. R. • Dielectric Strength* →Post-treatment→Capacitance • D. F.
(Charge/discharge current≦10mA)</td></tr>
<tr><td>Capacitance Change</td><td>F : Within ±20%
SR : Within ±10%</td></tr>
<tr><td>D. F.</td><td>F : D. F. ≦ 7.5% SR : D. F. ≦ 4.0% (16V)
D. F. ≦ 1.5% (25V)</td></tr>
<tr><td>I. R.</td><td>F : Satisfies initial requirement.
SR : $\frac{1}{2}$ of initial requirement or over.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">11</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply a DC voltage of 150% of the rated voltage for 1000^{+48}_{0} h at 85±2℃.
Pre-treatment and Post-treatment:
Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements of capacitance and D. F.
Measurement Order:
I. R. • Dielectric Strength→Pre-treatment →Capacitance • D. F.→Life test →I. R. • Dielectric Strength* →Post-treatment →Capacitance • D. F.
(Charge/discharge current≦10mA)</td></tr>
<tr><td>Capacitance Change</td><td>F : Within ±20%
SR : Within ±10%</td></tr>
<tr><td>D. F.</td><td>F : D. F. ≦ 7.5% SR : D. F. ≦ 4.0% (16V)
D. F. ≦ 1.5% (25V)</td></tr>
<tr><td>I. R.</td><td>F : Satisfies initial requirement.
SR : $\frac{1}{2}$ of initial requirement or over.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Temperature and immersion cycling</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 5 cycles of temperature variation according to Table 1, then the capacitor shall be immersed into two baths, the one a clean water bath at temperature 65^{+5}_{0}℃ and the other a saturated salt water bath at temperature 0±3℃ for 15 min.
This immersion cycle shall be repeated 2 times, then the capacitor shall be washed in running water, wiped or dried with air draught.
Pre-treatment : Capacitor shall be stored at 125±3℃ for 1 h, then placed at *room condition for 24±2 h before measurements of capacitance and D. F.
Post-treatment : Capacitor shall be stored for 24±2 h at *room condition.
Measurement Order:
I. R. • Dielectric Strength→Pre-treatment →Capacitance • D. F.→Temperature and Immersion cycling test →Post-treatment →Capacitance • D. F. • I.R. • Dielectric Strength
(Table 1)
<table><tr><th>Step</th><th>Temperature (℃)</th><th>Time</th></tr><tr><td>1</td><td>-25^{+0}_{-3}</td><td>30 min</td></tr><tr><td>2</td><td>room temp.</td><td>3 min</td></tr><tr><td>3</td><td>85^{+3}_{0}</td><td>30 min</td></tr><tr><td>4</td><td>room temp.</td><td>3 min</td></tr></table></td></tr>
<tr><td>Capacitance Change</td><td>F : Within ±20%
SR : Within ±10%</td></tr>
<tr><td>D. F.</td><td>F : D. F. ≦ 7.5% SR : D. F. ≦ 4.0% (16V)
D. F. ≦ 1.5% (25V)</td></tr>
<tr><td>I. R.</td><td>F : Satisfies initial requirement.
SR : $\frac{1}{2}$ of initial requirement or over.</td></tr>
<tr><td>Dielectric Strength (Between lead wires)</td><td>Pass the item No. 5.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Strength of Lead</td><td>Pull</td><td rowspan="2">Lead wire shall not cut off.
Capacitor shall not be broken.</td><td>As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s.
  </td></tr>
<tr><td>Bending</td><td>Each lead wire shall be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.</td></tr>
<tr><td>14</td><td colspan="2">Solderability of Leads</td><td>Lead wire shall be soldered with uniformly coated on the axial direction over $\frac{3}{4}$ of the circumferential direction.</td><td>The lead wire of a capacitor shall be dipped into a methanol solution of 25wt% rosin and then into molten solder of 235±5℃ for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2 mm from the root of lead wires.</td></tr>
</table>

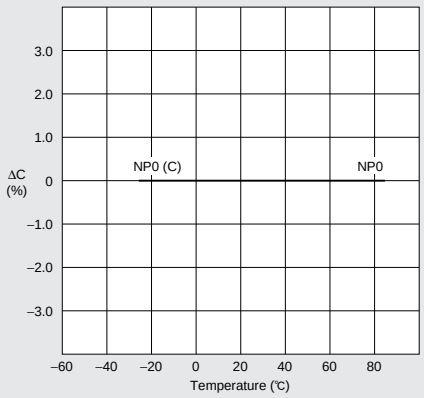
* "room condition" temperature : 15 to 35℃ relative humidity : 45 to 75% atmospheric pressure : 86 to 106kPa

- The measurement of I. R. and Dielectric Strength will be held in 1 to 2 h after Humidity Loading test and in 24±2 h after Life test.

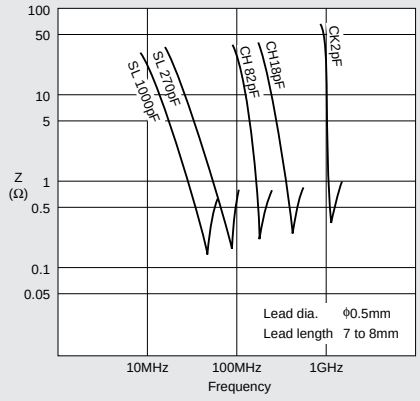
7. TYPICAL CHARACTERISTICS DATA

7.1 DD100/DD10 SERIES

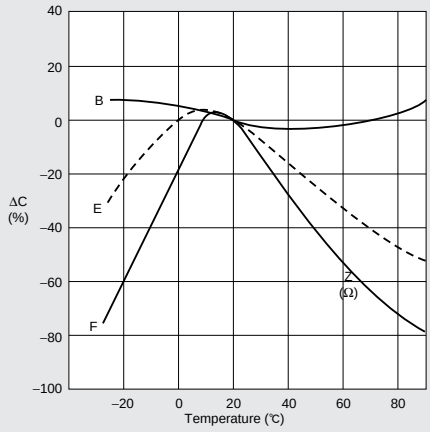
● Capacitance—Temp. Char.



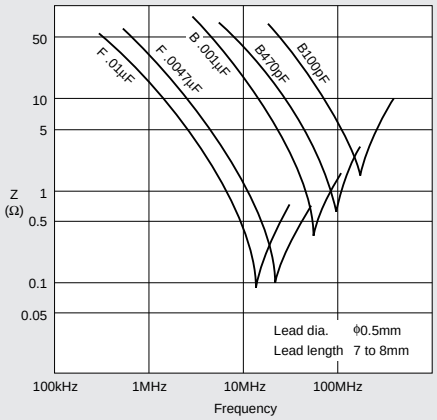
● Impedance (Z)—Freq. Char.



● Capacitance—Temp. Char.

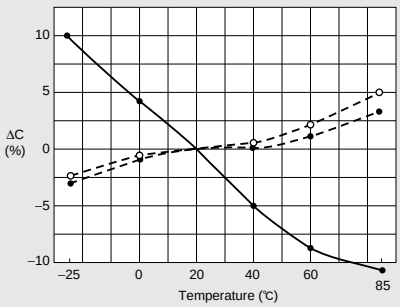


● Impedance (Z)—Freq. Char.



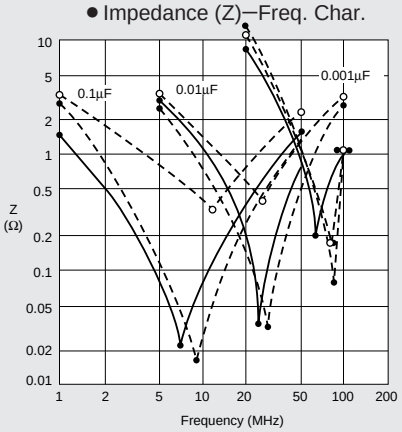
7.2 DD300/DD400 SERIES

● Capacitance—Temp. Char.

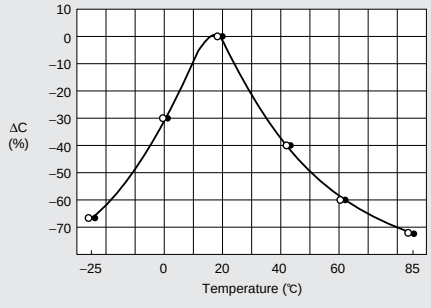


BC Capacitor DD400 Series SR Char. 25V.
Polyester Film Capacitor Ceneral Type.
Polyester Film Capacitor Noninductive Type.

● Impedance (Z)—Freq. Char.

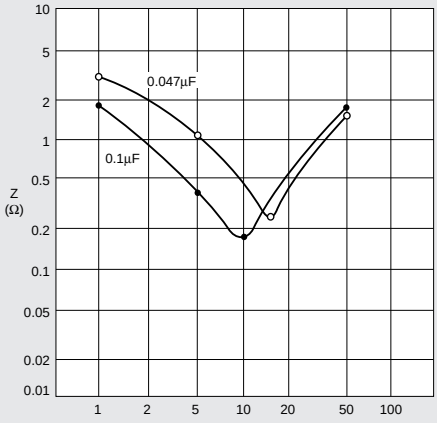


● Capacitance—Temp. Char.



BC Capacitor DD300 Series F Char. 25V.
BC Capacitor DD300 Series F Char. 50V.

● Impedance (Z)—Freq. Char.



■ ⚠CAUTION

1. Operating voltage
   When DC-rated capacitors are to be used in AC or ripple current signal circuits, be sure to maintain the Vp-p value of the applied voltage signal or the Vo-p which contains DC bias within the rated voltage range.
2. Operating temperature and self-generated heat
   Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself.
   When the capacitor is used in a high-frequency circuit, pulse signal circuit or the like, it may have the self-generated heat due to dielectric-loss. Applied voltage should be the load such as self-generated heat is within 20℃ on the condition of atmosphere temperature 25℃. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.
3. Operating and storage environment
   The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment.
   Store the capacitors where the temperature and relative humidity do not exceed 5 to 40℃ and 20 to 70%. Use capacitors within 6 months.
4. Vibration and impact
   Do not expose a capacitor or its leads to excessive shock or vibration during use.
5 Soldering
   When soldering this product to a PC board, do not exceed the solder heat resistance specification of the capacitor.
   Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

Failure to follow the above cautions may result, worst case, in a short circuit and fuming when the product is used.

■NOTICE

1. Cleaning (Ultrasonic cleaning)
   To perform ultrasonic cleaning, observe the following conditions.
   Rinse bath capacity : Output of 20 watts per liter or less.
   Rinsing time : 5 minutes max..
   Do not vibrate the PCB/PWB directly.
   Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

■ISO9000 CERTIFICATIONS

Manufacturing plants of these products in this catalog have obtained the ISO9000 quality system certificate.

Plant	Certified Date	Organization	Registration No.	Applied standard
Izumo Murata Manufacturing Co., Ltd.	Jul. 25. '97	Under Writers Laboratories Inc.	A5587	ISO9001
Murata Electronics (Thailand), Ltd.	Mar. 17. '98	Under Writers Laboratories Inc.	A6279	ISO9001

⚠Note:

1. Export Control
   〈For customers outside Japan〉
   Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.
   〈For customers in Japan〉
   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 our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than 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 in the above
3. Product specifications in this catalog are as of April 2000. 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 your ordering. If there are any questions, please contact our sales representatives or product engineers.
4. The parts numbers and specifications listed in this catalog are for information only. You are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.
5. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or third party's intellectual property rights and other related rights in consideration of your using our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
6. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.

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