

## Ceramic Disc Capacitors Class 1 and 2, 1 kV<sub>DC</sub>, 2 kV<sub>DC</sub>, 3 kV<sub>DC</sub> and 6 kV<sub>DC</sub>, General Purpose



Capacitors with 5 mm (0.20"), 7.5 mm (0.30") and  
10 mm (0.40") lead spacing

QUICK REFERENCE DATA		
DESCRIPTION	CLASS 1 (SL0, S3N)	CLASS 2 (Y5P, X7R, Z5U, Y5V, X5F)
Voltage (V <sub>DC</sub> )	1000, 2000, 3000, 6000	
Min. Capacitance (pF)	10	100
Max. Capacitance (pF)	220	33 000
Mounting	Through hole	

### MARKING

Straight and kinked leaded versions are gold coloured  
Marking indicates capacitance value and tolerance in  
accordance with "EIA 198" and voltage:

### OPERATING TEMPERATURE RANGE

Class 1 SL0, S3N, - 55 °C to + 125 °C

Class 2, X7R - 55 °C to + 125 °C

Class 2, Y5P, Z5U, Y5V, - 30 °C to + 85 °C

Class 2, X5F - 55 °C to + 85 °C

### TEMPERATURE COEFFICIENTS

Class 1 SL0, S3N

Class 2 X7R, Y5P, Z5U, Y5V, X5F

### SECTIONAL SPECIFICATIONS

Class 1, IEC 60 384-8,

Class 2, IEC 60 384-9,

EIA 198

### CLIMATIC CATEGORY

Class 1, SL0, 55/125/21

Class 2, X7R, 55/125/21

Class 2, Y5P, Z5U, Y5V, 30/85/21

Class 2, X5F, 55/85/21

### FEATURES

- Low losses
- High stability
- High capacitance in small size
- Kinked (preferred) or straight leads
- Compliant to RoHS directive 2002/95/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- DC high voltage
- Pulse high voltage
- SMPS
- HV power supply
- HF ballast

### DESIGN

The capacitors consist of a ceramic disc both sides of which are silver-plated. Connection leads are made of tinned copper having a diameter of 0.6 mm or 0.8 mm up to 3 kV and 0.8 mm for 6 kV.

The capacitors may be supplied with kinked or straight leads with a lead spacing of 5 mm (0.20"), 7.5 mm (0.30") or 10 mm (0.40") and a lead length from 4 mm to 30 mm. The standard tolerance on capacitance is 5 % or 10 % for class 1 capacitors and ± 10 % or ± 20 % for class 2 capacitors. Encapsulation is made of gold-colored epoxy-resin, flammable resistant in accordance with "UL 94 V-0"

### CAPACITANCE RANGE

Class 1, at 1 MHz, 1.2 V<sub>RMS</sub> ; 10 pF to 220 pF

1 kHz, 1 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub> for capacitance values higher than 1000 pF

Class 2, at 1 kHz, 1 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub> ; 100 pF to 33 000 pF

### RATED DC VOLTAGE

1 kV; 2 kV; 3 kV; 6 kV

### DIELECTRIC STRENGTH

200 % of rated voltage

### INSULATION RESISTANCE AT 500 V<sub>DC</sub>

≥ 10 000 MΩ

### TOLERANCE ON CAPACITANCE

± 5 % ; ± 10 % ; ± 20 % ; + 80/- 20 %

Other tolerances available on request

### DISSIPATION FACTOR

Class 1, C ≤ 30 pF; ≤ 20 x (10/C + 0.7) x 10<sup>-4</sup> max.

Class 1, C > 30 pF; ≤ 0.2 %

Class 2, ≤ 3.0 %

ORDERING INFORMATION 1 kV <sub>DC</sub> , STRAIGHT								
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE			
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT			
<b>CLASS 1 SLO</b>								
10	± 5	6.5	5.0	4.0	S100J25SL0N6.J5.			
	± 10				S100K25SL0N6.J5.			
12	± 5				S120J25SL0N6.J5.			
	± 10				S120K25SL0N6.J5.			
15	± 5				S150J25SL0N6.J5.			
	± 10				S150K25SL0N6.J5.			
18	± 5				S180J25SL0N6.J5.			
	± 10				S180K25SL0N6.J5.			
22	± 5				S220J25SL0N6.J5.			
	± 10				S220K25SL0N6.J5.			
27	± 5				S270J25SL0N6.J5.			
	± 10				S270K25SL0N6.J5.			
33	± 5				S330J25SL0N6.J5.			
	± 10				S330K25SL0N6.J5.			
39	± 5				S390J25SL0N6.J5.			
	± 10				S390K25SL0N6.J5.			
47	± 5				S470J25SL0N6.J5.			
	± 10				S470K25SL0N6.J5.			
56	± 5	7.5	5.0	4.0	S560J29SL0N6.J5.			
	± 10				S560K29SL0N6.J5.			
68	± 5				S680J29SL0N6.J5.			
	± 10				S680K29SL0N6.J5.			
82	± 5				S820J29SL0N6.J5.			
	± 10				S820K29SL0N6.J5.			
100	± 5				S101J29SL0N6.J5.			
	± 10				S101K29SL0N6.J5.			
120	± 5				8.5	5.0	4.0	S121J33SL0N6.J5.
	± 10							S121K33SL0N6.J5.
150	± 10				10	5.0	4.0	S151K33SL0N6.J5.
220								S221K39SL0N6.J5.
<b>CLASS 2 X7R</b>								
100	± 10	6.5	5.0	4.0	S101K25X7RN6.J5.			
150					S151K25X7RN6.J5.			
220					S221K25X7RN6.J5.			
330					S331K25X7RN6.J5.			
470					S471K29X7RN6.J5.			
680					S681K29X7RN6.J5.			
1000		8.5	7.5	4.8	S102K33X7RN6.J5.			
1500		10			S152K39X7RN6.J5.			
2200		11			S222K43X7RN6.J5.			
3 300		12			S332K47X7RN6.J7.			
4 700		15			S472K59X7RN6.J7.			
<b>CLASS 2 Y5P</b>								
100	± 10	6.5	5.0	4.0	S101K25Y5PN6.J5.			
150					S151K25Y5PN6.J5.			
220					S221K25Y5PN6.J5.			
330					S331K25Y5PN6.J5.			
470					S471K25Y5PN6.J5.			
680					S681K29Y5PN6.J5.			
1000		7.5	7.5	4.8	S102K29Y5PN6.J5.			
1500		8.5			S152K33Y5PN6.J5.			



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Vishay BCcomponents

<b>ORDERING INFORMATION 1 kV<sub>DC</sub>, STRAIGHT</b>					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 2 Y5P</b>					
2200	± 10	10	5.0	4.0	S222K39Y5PN6.J5.
3300		11			S332K43Y5PN6.J5.
4700		13.5	7.5	4.8	S472K53Y5PN63J7.
6800		15			S682K59Y5PN63J7.
10 000		19			10
<b>CLASS 2 Z5U</b>					
1000	± 20	6.5	5.0	4.0	S102M25Z5UN6.J5.
1500					S152M29Z5UN6.J5.
2200					S222M29Z5UN6.J5.
3300					S332M33Z5UN6.J5.
4700		S472M39Z5UN6.J5.			
6800		11	S682M43Z5UN6.J5.		
10 000		12	7.5	4.8	S103M47Z5UN63J7.
15 000		15			S153M59Z5UN63J7.
22 000		19			10
<b>CLASS 2 Y5V</b>					
1000	+ 80/- 20	6.5	5.0	4.0	S102Z25Y5VN6.J5.
1500					S152Z25Y5VN6.J5.
2200					S222Z29Y5VN6.J5.
3300					S332Z29Y5VN6.J5.
4700		8.5	S472Z33Y5VN6.J5.		
6800		10	S682Z39Y5VN6.J5.		
10 000		11	S103Z43Y5VN6.J5.		
15 000		13.5	7.5	4.8	S153Z53Y5VN6.J7.
22 000		15			S223Z59Y5VN6.J7.
33 000		19			10

<b>ORDERING INFORMATION 1 kV<sub>DC</sub>, KINKED</b>					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(2)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 2 X5F</b>					
100	± 10	6.5	5.0	4.0	S101K25X5FN6.J5R
220					S221K25X5FN6.J5R
270					S271K25X5FN6.J5R
330					S331K25X5FN6.J5R
390					S391K25X5FN6.J5R
470					S471K25X5FN6.J5R
680					S681K29X5FN6.J5R
820		7.5	S821K29X5FN6.J5R		
1000		S102K29X5FN6.J5R			
2200		11	S222K43X5FN6.J5R		
3300		13.5	7.5	4.8	S332K53X5FN6.J7R
4700		16			S472K63X5FN63J7R

**Notes**

- <sup>(1)</sup> SH = seated height
- Maximum thickness 4.0 mm
- Lead style codes refer to inward kinked leads. Other styles available on request

ORDERING INFORMATION 2 kV <sub>DC</sub> , KINKED								
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE			
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT			
<b>CLASS 1 SLO</b>								
10	± 5	6.5	5.0	4.0	S100J25SLOP6.K5.			
	± 10				S100K25SLOP6.K5.			
12	± 5				S120J25SLOP6.K5.			
	± 10				S120K25SLOP6.K5.			
15	± 5				S150J25SLOP6.K5.			
	± 10				S150K25SLOP6.K5.			
18	± 5				S180J25SLOP6.K5.			
	± 10				S180K25SLOP6.K5.			
22	± 5				S220J25SLOP6.K5.			
	± 10				S220K25SLOP6.K5.			
27	± 5				S270J25SLOP6.K5.			
	± 10				S270K25SLOP6.K5.			
33	± 5	7.5			S330J29SLOP6.K5.			
	± 10				S330K29SLOP6.K5.			
39	± 5				S390J29SLOP6.K5.			
	± 10				S390K29SLOP6.K5.			
47	± 5				S470J29SLOP6.K5.			
	± 10				S470K29SLOP6.K5.			
56	± 5				S560J29SLOP6.K5.			
	± 10				S560K29SLOP6.K5.			
68	± 5				8.5	S680J33SLOP6.K5.		
	± 10					S680K33SLOP6.K5.		
82	± 5					S820J33SLOP6.K5.		
	± 10					S820K33SLOP6.K5.		
100	± 5	10	S101J39SLOP6.K5.					
	± 10		S101K39SLOP6.K5.					
120	± 5		S121J39SLOP6.K5.					
	± 10		S121K39SLOP6.K5.					
150	± 10		S151K43SLOP6.K5.					
<b>CLASS 2 X7R</b>								
100	± 10	6.5	5.0	4.0	S101K25X7RP6.K5.			
150					S151K25X7RP6.K5.			
220					S221K25X7RP6.K5.			
330					S331K25X7RP6.K5.			
470					S471K29X7RP6.K5.			
680					S681K33X7RP6.K5.			
1000		10			S102K39X7RP6.K5.			
1500		11			S152K43X7RP6.K5.			
2200		13.5			7.5	4.8	S222K53X7RP6.K7.	
3300		15			S332K59X7RP6.K7.			
<b>CLASS 2 Y5P</b>								
100		± 10			6.5	5.0	4.0	S101K25Y5PP6.K5.
150	S151K25Y5PP6.K5.							
220	S221K25Y5PP6.K5.							
330	S331K25Y5PP6.K5.							
470	S471K29Y5PP6.K5.							
680	S681K29Y5PP6.K5.							
1000	8.5		S102K33Y5PP6.K5.					
1500	10		S152K39Y5PP6.K5.					
2200	11		S222K43Y5PP6.K5.					
3300	13.5		7.5	4.8	S332K53Y5PP63K7.			
4700	17.5		S472K69Y5PP63K7.					



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<b>ORDERING INFORMATION 2 kV<sub>DC</sub>, KINKED</b>					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 2 Z5U</b>					
1000	± 20	7.5	5.0	4.0	S102M29Z5UP6.K5.
1500					S152M29Z5UP6.K5.
2200					S222M33Z5UP6.K5.
3300		11	7.5	4.8	S332M43Z5UP6.K5.
4700		12			S472M47Z5UP63K7.
6800		13.5			S682M53Z5UP63K7.
10 000		17.5			S103M69Z5UP63K7.
<b>CLASS 2 Y5V</b>					
1000	+ 80/- 20	7.5	5.0	4.0	S102Z29Y5VP6.K5.
1500					S152Z29Y5VP6.K5.
2200					S222Z33Y5VP6.K5.
3300		10.5	7.5	4.8	S322Z39Y5VP6.K5.
4700		11			S472Z43Y5VP6.K5.
6800		12			S682Z47Y5VP6.K7.
10 000		15			S103Z59Y5VP6.K7.
<b>CLASS 2 X5F</b>					
1 00	± 10	6.5	5.0	4.0	S101K25X5FP6.K5R
220					S221K25X5FP6.K5R
330					7.5
470		8	7.5	4.8	S471K31X5FP6.K5R
680		10			S681K39X5FP6.K5R
1000		11			S102K43X5FP6.K5R
2200		15			S222K59X5FP6.K7R
3300	16.5	S332K65X5FP63K7R			

**Notes**

<sup>(1)</sup> SH = seated height

- Maximum thickness 4.0 mm
- Lead style codes refer to inward kinked leads. Other styles available on request

<b>ORDERING INFORMATION CLASS 3 kV<sub>DC</sub>, KINKED</b>					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 1 SL</b>					
10	± 10	8.5	7.5	4.0	S100K33SL0R63K7.
15					S150K33SL0R63K7.
22					S220K33SL0R63K7.
33					S330K33SL0R63K7.
47					S470K33SL0R63K7.
68	10	S680K39SL0R63K7.			
<b>CLASS 2 X7R</b>					
100	± 10	8.5	7.5	4.0	S101K33X7RR63K7.
150					S151K33X7RR63K7.
220					S221K33X7RR63K7.
330					S331K33X7RR63K7.
470					S471K33X7RR63K7.
680		10	4.8	S681K39X7RR63K7.	
1000		11		S102K43X7RR63K7.	
1500	13.5	S152K53X7RR63K7.			
2200	17.5	S222K59X7RR83K7.			

ORDERING INFORMATION CLASS 3 kV <sub>DC</sub> , KINKED					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 2 Y5P</b>					
100	± 10	8.5	7.5	4.0	S101K33Y5PR63K7.
150					S151K33Y5PR63K7.
220					S221K33Y5PR63K7.
330					S331K33Y5PR63K7.
470					S471K33Y5PR63K7.
680					S681K39Y5PR63K7.
1000				4.8	S102K43Y5PR63K7.
1500					S152K47Y5PR63K7.
2200					S222K59Y5PR63K7.
3 300					S332K75Y5PR83K0.
<b>CLASS 2 Z5U</b>					
470	± 20	8.5	7.5	4.0	S471M33Z5UR63K7.
680					S681M33Z5UR63K7.
1000					S102M33Z5UR63K7.
1500					S152M39Z5UR63K7.
2200				S222M43Z5UR63K7.	
3300				4.8	S332M53Z5UR63K7.
4700					S472M69Z5UR83K7.
<b>CLASS 2 Y5V</b>					
1000	+ 80/- 20	8.5	7.5	4.0	S102Z33Y5VR63K7.
1500					S152Z33Y5VR63K7.
2200					S222Z39Y5VR63K7.
3300					S322Z43Y5VR63K7.
4700				4.8	S472Z47Y5VR63K7.
6800					S682Z59Y5VR63K7.

**Notes**

- <sup>(1)</sup> SH = seated height
- Maximum thickness 4.0 mm
- Lead style codes refer to inward kinked leads. Other styles available on request

ORDERING INFORMATION CLASS 6 kV <sub>DC</sub> , KINKED					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE
					13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 1 SL</b>					
10	± 20	10	10	3.0	S100M39SL0U83L0.
15					S150M43SL0U83L0.
22					S220M43SL0U83L0.
33					S330M53SL0U83L0.
<b>CLASS 1 S3N</b>					
47	± 20	11	10	3.0	S470M43S3NU83L0.
68		13.5			S680M53S3NU83L0.
100		15			S101M59S3NU83L0.
150		15			S151M59S3NU83L0.
<b>CLASS 2 Z5U</b>					
220	± 20	10	10	3.0	S221M39Z5UU83L0.
330		11			S331M43Z5UU83L0.
470		12			S471M47Z5UU83L0.

ORDERING INFORMATION CLASS 6 kV <sub>DC</sub> , KINKED					
C (pF)	TOL. (%)	D <sub>MAX.</sub> (mm)	LEAD SPACING (mm)	SH <sup>(1)</sup> (mm)	CLEAR TEXT CODE 13 <sup>TH</sup> DIGIT: T = REEL; U = AMMO; 3 = BULK 16 <sup>TH</sup> DIGIT: R = RoHS COMPLIANT
<b>CLASS 2 Z5U</b>					
680	± 20	13.5	10	3.0	S681M53Z5UU83L0.
1000		15			S102M59Z5UU83L0.
1500		17.5			S152M69Z5UU83L0.
2200		19			S222M75Z5UU83L0.

**Notes**

<sup>(1)</sup> SH = seated height

- Maximum thickness 4.0 mm
- Lead style codes refer to inward kinked leads. Other styles available on request

PACKAGING					
PACKAGING TYPE	SIZE CODE	LEAD SPACE (mm)	VOLTAGE (V <sub>DC</sub> )	SPQ	BOX DIMENSIONS L x W x H (mm)
Bulk (long lead L ≥ 25.4 mm)	20 to 47	all	all	1000	245 x 120 x 65
				1000	
	53 to 75			500	
	84 to 96			250	
Tape and reel	≤ 47	≤ 6.40	< 500	2500	370 x 370 x 60
			500 ≤ WV ≤ 2000	2000	
		≥ 7.5	3000	1000	
			all	1000	
Ammopack	≤ 47	≤ 6.40	< 500	2000	335 x 240 x 50
			500 ≤ WV < 2000	1500	335 x 290 x 50
		≥ 7.5	2000 and 3000	1500	360 x 330 x 55
			all	1500	

**Note**

- The capacitors are supplied in bulk packaging (cardboard boxes), in tape on reel or in ammopack



DIMENSIONS OF TAPE			
SYMBOL	PARAMETER	DIMENSIONS (mm)	
		NOMINAL	TOLERANCE
D	Body diameter	11.0 maximum	-
d	Lead diameter	0.6	± 0.05
P	Pitch between capacitors	12.7	± 1.0
P <sub>0</sub> <sup>(1)</sup>	Feed-hole pitch	12.7	± 0.3
ΔP	Plane deviation	1.0 maximum	-
P <sub>1</sub> <sup>(2)</sup>	Feed-hole center to lead center	3.85	± 0.7
P <sub>2</sub> <sup>(2)</sup>	Feed-hole center to component center	6.35	± 1.3
F	Lead spacing	5.0	0.6 - 0.4
Δh	Component alignment	0	± 1.0
W	Tape width	18.0	1.0 - 0.5
W <sub>0</sub>	Hold-down tape width	5.0 minimum	-
W <sub>1</sub>	Hole position	9.0	0.75 - 0.5
W <sub>2</sub>	Hold-down tape margin	3.0 maximum	-
H <sub>0</sub>	Height to seating plane	16.0	± 0.5
H <sub>1</sub>	Maximum component height	32.0	-
e	Lead end protrusion	1.0 maximum	-
L	Maximum length of snapped lead	11.0	-
D <sub>0</sub>	Feed-hole diameter	4.0	± 0.2
t	Total tape thickness	0.9 maximum	-
t <sub>1</sub>	Maximum thickness of tape and wires	1.5 maximum	-

**Notes**

(1) Cumulative pitch error:  $\pm \leq 1 \text{ mm}/20 \text{ pitches}$

(2) Obliquity maximum 3°

**REEL AND TAPE DATA** in millimeters







## Disclaimer

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Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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