

## DCS / DCT / DCU / DCA Thick Film

- State of the Art Thick Film Technology
- Improved Termination Design
- Standard TC: 100 and 200 ppm/K
- Tight Tolerance available: 1 %
- Sizes    CECC:        0402    0603    0805    1206  
              EIA:         1005    1608    2012    3216

**DCS, DCT, DCU and DCA Thick Film Flat Chip Resistors are made for all general purpose applications. They are typically used in the production of office automation equipment and consumer electronics.**

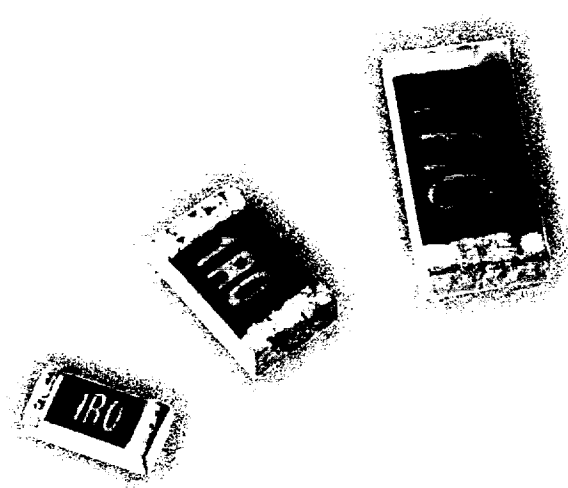
The production of the **DCS, DCT, DCU and DCA Thick Film Flat Chip Resistors** is performed in a mass volume production site. A thick film is screen printed on a high grade alumina ceramic substrate to form the resistive layer. Pre contacts are printed on both sides of the substrate. The resistors are laser trimmed to the target value. The resistor elements are covered by glass and a protective coating combined for superior electrical, mechanical and climatic protection. The prepared terminations receive an electroplating of PbSn solder on nickel plating. A three or four digit code designates the nominal resistance value.

The result of the determined production is verified by a final test performed on 100 % of the individual chip resistors. Only accepted products are laid directly into the paper tape according to **IEC 60 286-3**.

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions.

The resistors are tested according to **IEC 60 115** and **IEC 60 068**. They meet most of the requirements of **CECC 40 401-802** and **EN 140 400**.

This product family of thick film flat chip resistors is complemented by **Zero Ohm Jumpers**.



Temperature Coefficient and Resistance Range

	Tolerance	IEC Series	DCS 0402	DCT 0603	DCU 0805	DCA 1206
<b>TC 200</b>	5 %	E24	10 Ω - 1 MΩ	1 Ω - 6,8 MΩ	1 Ω - 10 MΩ	1 Ω - 10 MΩ
	1 %	E24 and E96	-	-	1 Ω - 9,76 Ω 1,02 MΩ - 10 MΩ	1 Ω - 9,76 Ω 1,02 MΩ - 10 MΩ
<b>TC 100</b>	1 %	E24 and E96	-	-	10 Ω - 1 MΩ	10 Ω - 1 MΩ
<b>Jumper</b>			≤ 50 mΩ $I_{\max} = 0,8 \text{ A}$	≤ 50 mΩ $I_{\max} = 0,8 \text{ A}$	≤ 50 mΩ $I_{\max} = 1,1 \text{ A}$	≤ 50 mΩ $I_{\max} = 1,6 \text{ A}$

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## Electrical Data

Style		DCS 0402	DCT 0603	DCU 0805	DCA 1206
Climatic Category		55 / 125 / 56	55 / 125 / 56	55 / 125 / 56	55 / 125 / 56
Operation Mode (see A4)		Standard	Standard	Standard	Standard
Film Temperature	°C	125	125	125	125
Specified Lifetime	h	8 000	8 000	8 000	8 000

The specification for standard operation mode ensures a maximum temperature of 110 °C at the solder joint on test boards according to CECC 00 802

Thermal Resistance $R_{th}$	K/W	880	880	440	220
Rated Dissipation $P_{70}$	W	0,063	0,063	0,125	0,25

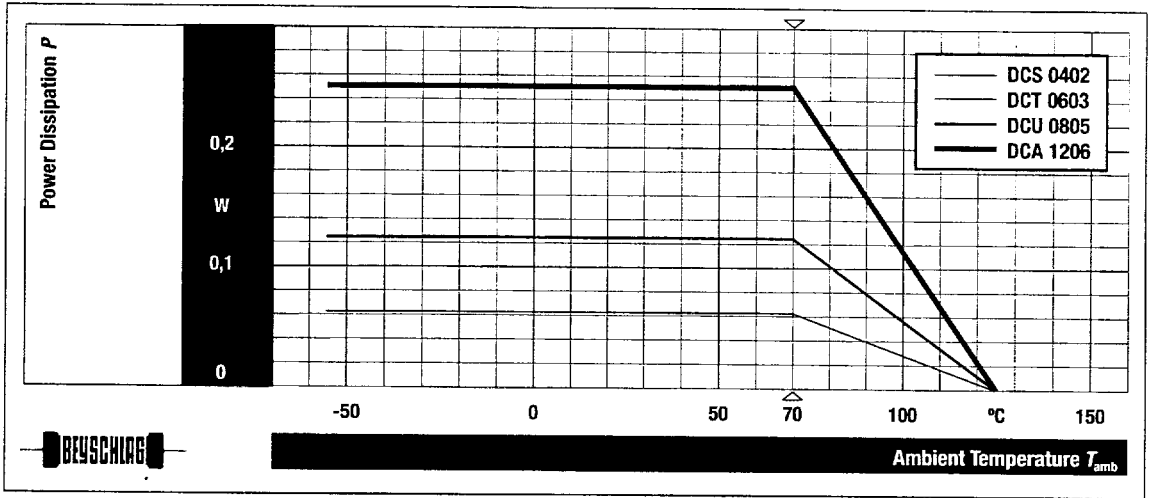
Voltage Pulse Load Capability					
Pulse Voltage, $U_{max}$	V	up to 100	up to 150	up to 300	up to 400
Single Pulse IEC 1,2 / 50	V	–	–	–	–
Energy Pulse Load Capability					
Single Pulse, $P_{max}$	W	up to 3	up to 4	up to 6	up to 10
Continuous Pulses, $P_{max}$	W	up to 0,7	up to 1	up to 1,3	up to 2
Current Noise, $A_1$	$\mu V/V$	down to 0,5	down to 0,5	down to 0,5	down to 0,5
Attenuation 3rd Harmonic, $A_3$	dB	–	up to 70	up to 80	up to 100

Max. Resistance Change at $P_{70}$ for Resistance Range		10 $\Omega$ - 1 M $\Omega$	10 $\Omega$ - 1 M $\Omega$	10 $\Omega$ - 1 M $\Omega$	10 $\Omega$ - 1 M $\Omega$
$\Delta R/R$ after ...					
... 1 000 h	%	$\leq 3$	$\leq 1,5$	$\leq 1,5$	$\leq 1,5$
... 8 000 h	%	$\leq 6$	$\leq 3$	$\leq 3$	$\leq 3$

Operating Voltage, $U_{max}$ AC / DC	V	50	50	150	200
Permissible Voltage against Ambient ...					
... 1 minute	V	75	150	150	200
... continuous	V	75	75	75	75
Isolation Resistance	$\Omega$	$10^9$	$10^9$	$10^9$	$10^9$



Derating • Standard Operation



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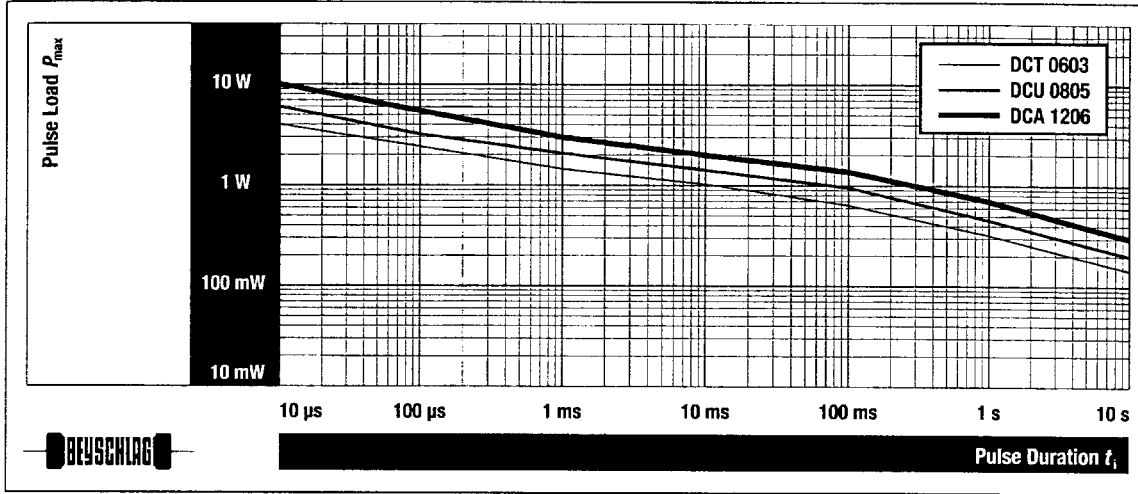
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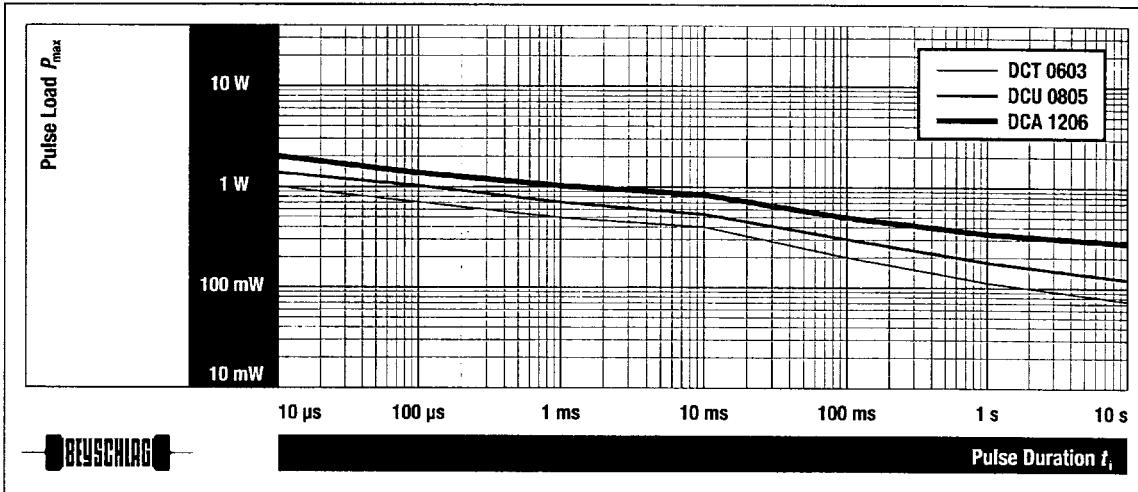
## Single Pulse

Maximum Pulse Load (single pulse; see A2)



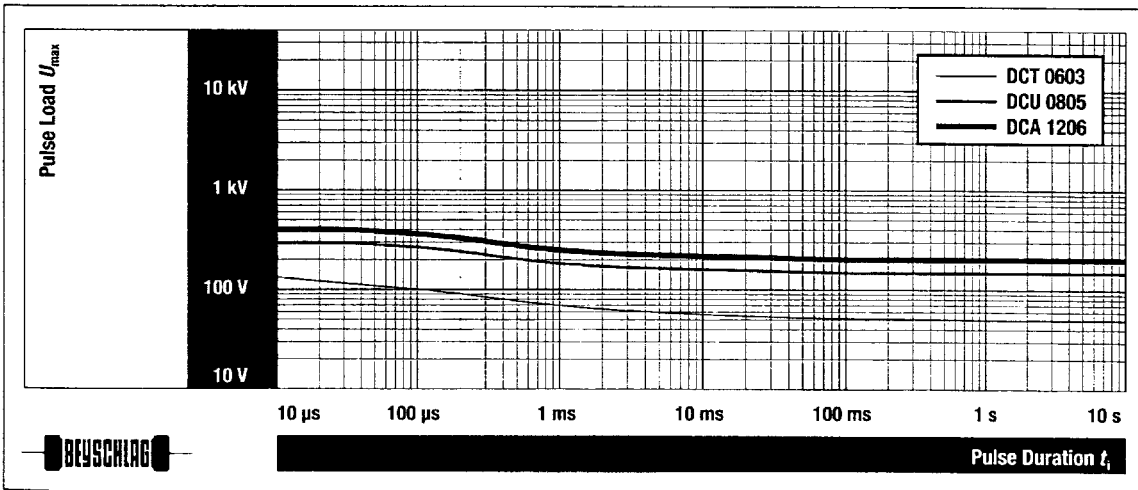
## Continuous Pulses

Maximum Pulse Load (continuous pulses; see A2)



## Pulse Load Voltage

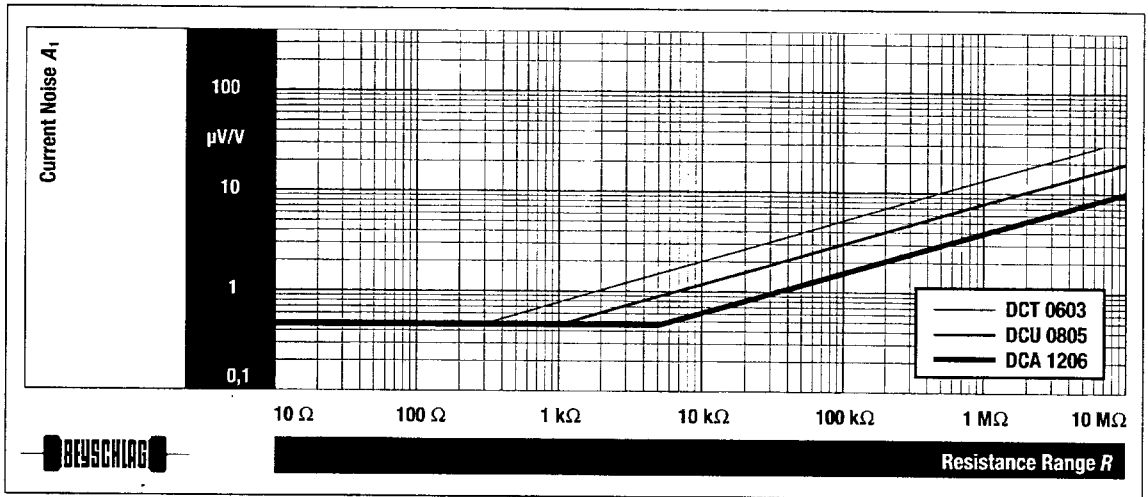
Maximum Pulse Voltage (single and continuous pulses; see A2)





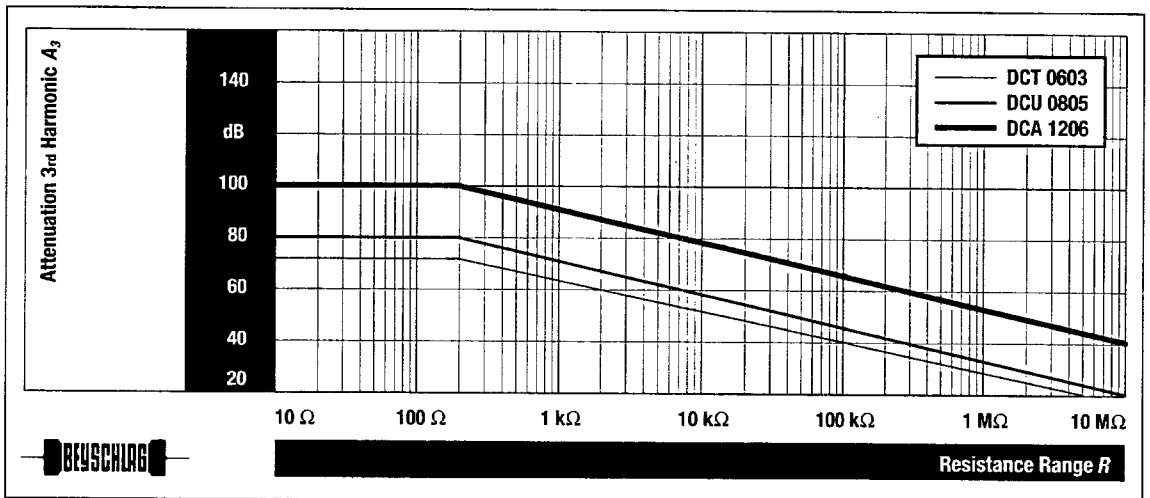
## Current Noise

Current Noise  $A_1$ , IEC 60 195



## Nonlinearity

Nonlinearity  $A_3$ , IEC 60 440



## Performance Characteristics

BEYSCHLAG Flat Chip Resistor Products fulfill the requirements of the following specifications:

- EN 140 000      Generic specifications: Fixed Resistors
- EN 140 400      Sectional specifications: Fixed low power non-wirewound Resistors

## Tests

	IEC 60 115-1 Clause	IEC 60 068-2 (Method)	Test Condition	Permissible Change $\Delta R$		
				DCS 0402	DCT 0603	DCU 0805
				-	-	$\leq 1 M\Omega$
				$\leq 1 M\Omega$	$> 1 M\Omega$	-
				$\leq 1 M\Omega$	$> 1 M\Omega$	-
				$\leq 1 M\Omega$	$> 1 M\Omega$	-
Short-Time Overload *)	4.13		2,5 x rated voltage / 2 x $U_{max}$ for 2 s	$\pm (1\%R+0,05\Omega)$	$\pm (1\%R+0,05\Omega)$	$\pm (2\%R+0,1\Omega)$
Resistance to Soldering Heat	4.18.2	20 (Tb)	+ 260 °C / 10 s	$\pm (0,5\%R+0,05\Omega)$	$\pm (0,5\%R+0,05\Omega)$	$\pm (1\%R+0,1\Omega)$
Rapid Change of Temperature *)	4.19	14 (Na)	5 cycles between - 55 °C / + 125 °C	$\pm (0,5\%R+0,05\Omega)$	$\pm (0,5\%R+0,05\Omega)$	$\pm (2\%R+0,1\Omega)$
Endurance at ...	4.25.1		Rated voltage / $U_{max}$ 1,5 h on / 0,5 h off			
... +70 °C / 1 000 h				$\pm (1,5\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$
Climatic Sequence *)	4.23	30 (D)	Dry heat – damp heat (1 cycle) – cold – low air pressure – damp heat (5 cycles)	$\pm (1,5\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$	$\pm (1\%R+0,1\Omega)$
Damp Heat, Steady State 56 Days *)	4.24	3 (Ca)	+ 40 °C / 93 % R.H.	$\pm (1,5\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$
Endurance at UCT / 1 000 h	4.25.3	27 (Ba)				
UCT = + 125 °C				$\pm (1,5\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$	$\pm (3\%R+0,1\Omega)$

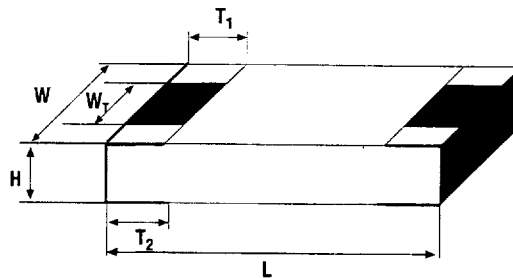
### Requirements

Terminal Adhesion (shear test)			CECC 00 802 / B.2 5 N / 10 s	No visible damage
Voltage Proof (dielectric withstanding voltage)	4.7		$V_{rms} = 100 V / 60 s$	No flashover or breakdown
Solderability	4.17.2	20 (Ta)	+ 215 °C / 3 s	Dipped area shall be covered with a smooth and bright solder coating of at least 95 %
Resistance against Solvents *)		45 (xA)	Alcohols, ester, hydrous solution, + 23 °C, tooth brush method	No mechanical damage Marking must be legible

\*) Resistors mounted on a test board according to CECC 00 802

## Product Dimensions • Thin Film Chip Resistors

Style	MCS 0402	MCT 0603	MCU 0805	—
		OCT 0603	OCU 0805	
		NCT 0603	NCU 0805	
		TCT 0603	TCU 0805	
CECC - Size	RR 0402	RR 0603	RR 0805	—
EIA - Size	1005	1608	2012	—
H	mm	min 0,27 / max 0,37	min 0,4 / max 0,55	min 0,4 / max 0,55
L	mm	min 0,95 / max 1,05	min 1,5 / max 1,6	min 1,9 / max 2,1
W	mm	min 0,45 / max 0,55	min 0,75 / max 0,95	min 1,1 / max 1,4
W <sub>T</sub>	mm	min 75 % of W	min 75 % of W	min 75 % of W
T <sub>1</sub>	mm	min 0,1 / max 0,3	min 0,2 / max 0,45	min 0,2 / max 0,5
T <sub>2</sub>	mm	min 0,15 / max 0,3	min 0,2 / max 0,45	min 0,2 / max 0,5
Weight	mg	0,8	1,5	3,2



## Product Dimensions • Thick Film Chip Resistors

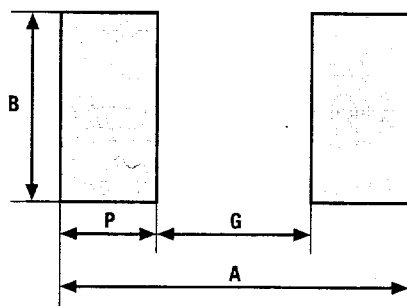
Style	DCS 0402	DCT 0603	DCU 0805	DCA 1206
CECC - Size	RR 0402	RR 0603	RR 0805	RR 1206
EIA - Size	1005	1608	2012	3216
H	mm	min 0,3 / max 0,4	min 0,35 / max 0,55	min 0,45 / max 0,55
L	mm	min 0,95 / max 1,05	min 1,5 / max 1,7	min 3,0 / max 3,3
W	mm	min 0,45 / max 0,55	min 0,75 / max 0,95	min 1,1 / max 1,4
W <sub>T</sub>	mm	—	min 0,75 / max 0,95	min 1,1 / max 1,4
T <sub>1</sub>	mm	min 0,1 / max 0,35	min 0,1 / max 0,5	min 0,2 / max 0,6
T <sub>2</sub>	mm	min 0,15 / max 0,35	min 0,1 / max 0,5	min 0,2 / max 0,6
Weight	mg	0,52	2,5	5,5



## PCB Layout Recommendations • Reflow Soldering

CECC - Size		0402	0603	0805	1206
EIA - Size		1005	1608	2012	3216
B	mm	0,65	1,0	1,5	1,9
P	mm	0,4	0,5	0,7	1,0
G	mm	0,4	1,0	1,2	1,8
A	mm	1,2	2,0	2,6	3,8

The used soldering process determines the optimum pad size.  
The pad size has an influence on the achievable power dissipation.  
Alternative recommendations and comprehensive information are given in the American standard IPC-SM-782:  
Surface Mount Design and Land Pattern Standard.



## PCB Layout Recommendations • Wave Soldering

CECC - Size		0402	0603	0805	1206
EIA - Size		1005	1608	2012	3216
B	mm	-	1,2	1,6	2,0
P	mm	-	0,6	0,9	1,2
G	mm	-	1,0	1,2	1,8
A	mm	-	2,2	3,0	4,2

The used soldering process determines the optimum pad size.  
The pad size has an influence on the achievable power dissipation.  
Alternative recommendations and comprehensive information are given in the American standard IPC-SM-782:  
Surface Mount Design and Land Pattern Standard.

## Resistance Coding

Style

MCS 0402

MCT 0603

MCU 0805

OCT 0603

OCU 0805

NCT 0603

NCU 0805

DCS 0402

DCT 0603

DCU 0805

DCA 1206

Marking of Resistance Values

Coding

-	-	E24: 3 digits	E24: 3 digits
-	-	E96: 4 digits	E96: 4 digits

According to IEC 60 062

## Packaging Information for MFC Series

Style

MCS 0402

MCT 0603

MCU 0805

-

OCT 0603

OCU 0805

NCT 0603

NCU 0805

TCT 0603

TCU 0805

Paper Tape	P1*	pcs.
	* precision only	
Paper Tape	P5	pcs.
Paper Tape	E0	pcs.
Bulk Case	M	pcs.

-	1 000	1 000	-
-	5 000	5 000	-
10 000	-	-	-
-	to be announced	to be announced	-

## Packaging Information for DFC Series

Style

DCS 0402

DCT 0603

DCU 0805

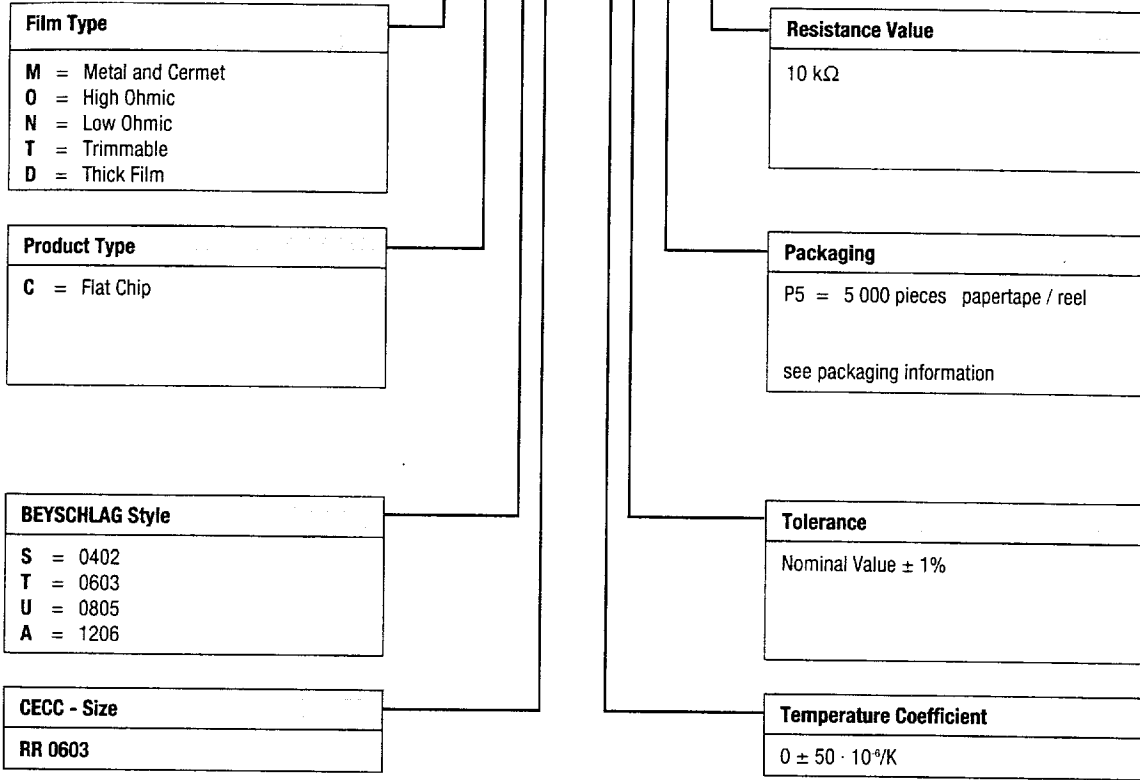
DCA 1206

Paper Tape	PW	pcs.
Paper Tape	PA	pcs.
Paper Tape	E0	pcs.

-	20 000	20 000	20 000
-	5 000	5 000	5 000
10 000	-	-	-

**Order Code Example**

**M C T 0603 - 50 1% P5 10 k**



Jumpers are ordered by the resistance value 0 Ω, e.g. **MCT 0603 P5 0R0**.  
A temperature coefficient 100 is marked -00, higher T.C. values are not specified.

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Reel for MFC Series

Style		MCS 0402	MCT 0603	MCU 0805			
			OCT 0603	OCU 0805			
			NCT 0603	NCU 0805			
			TCT 0603	TCU 0805			
		E0	P1	P5	P1	P5	
A	mm	180	180		180		
E	mm	2,5 ± 0,5				-	
D	mm	22,5 ± 2,0				-	
W <sub>1</sub>	mm	8,4 <sup>+1,5</sup> <sub>0</sub>				-	
C	mm	13,0 <sup>+0,5</sup> <sub>-0,25</sub>				-	
N	mm	62				-	
W <sub>2</sub>	mm	max 14,4				-	

According to IEC 60 286-3

Reel for DFC Series

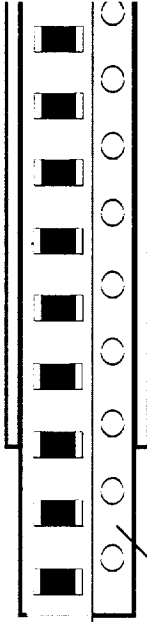
Style		DCS 0402	DCT 0603		DCU 0805		DCA 1206	
		E0	PA	PW	PA	PW	PA	PW
A	mm	180	180	330	180	330	180	330
E	mm	2,5 ± 0,5	2,5 ± 0,5	-	2,5 ± 0,5	-	2,5 ± 0,5	-
D	mm	22,5 ± 2,0	22,5 ± 2,0	20,5	22,5 ± 2,0	20,5	22,5 ± 2,0	20,5
W <sub>1</sub>	mm	8,4 <sup>+1,5</sup> <sub>0</sub>						
C	mm	13,0 <sup>+0,5</sup> <sub>-0,25</sub>	13,0 <sup>+0,5</sup> <sub>-0,25</sub>	12,75 <sup>+1,5</sup> <sub>0</sub>	13,0 <sup>+0,5</sup> <sub>-0,25</sub>	12,75 <sup>+0,15</sup> <sub>0</sub>	13,0 <sup>+0,5</sup> <sub>-0,25</sub>	12,75 <sup>+0,15</sup> <sub>0</sub>
N	mm	62						
W <sub>2</sub>	mm	max 14,4						

According to IEC 60 286-3

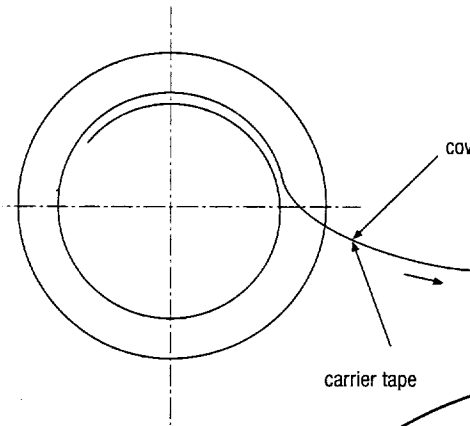
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Reel



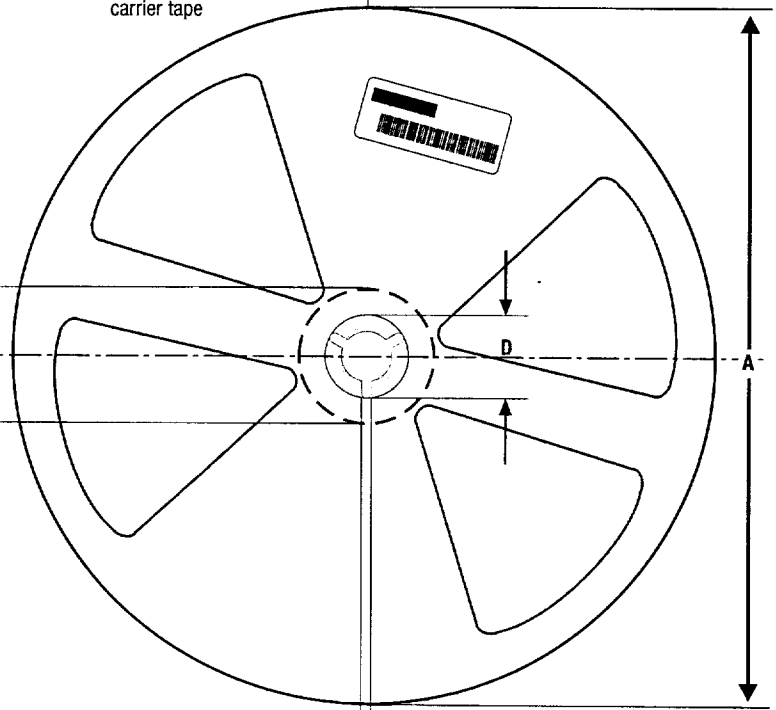
carrier tape



covering tape

carrier tape

direction of unreeling



W<sub>1</sub>

N

C

W<sub>2</sub>

D

A

E

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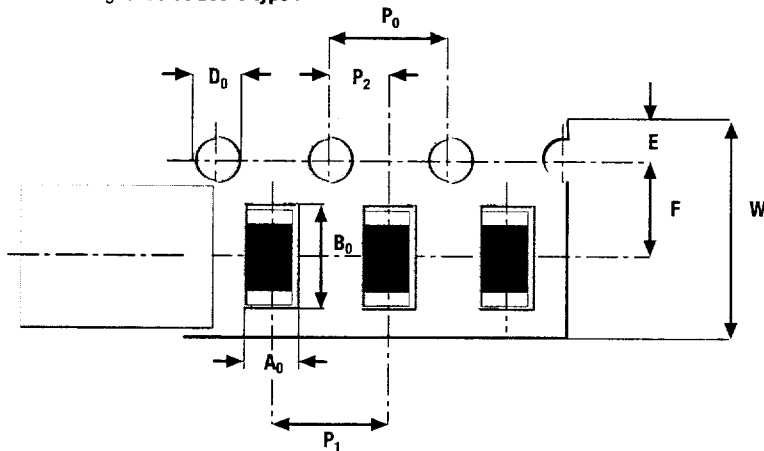
Distribution Network

### Cardboard Tape

Style	MCS 0402	MCT 0603	MCU 0805	DCS 0402	DCT 0603	DCU 0805	DCA 1206
		OCT 0603	OCU 0805				
		NCT 0603	NCU 0805				
		TCT 0603	TCU 0805				

A <sub>0</sub>	mm	0,7	1,1	1,6	0,7	1,0 <sup>+0,2</sup> <sub>0</sub>	1,5 <sup>+0,2</sup> <sub>0</sub>	1,85 <sup>+0,2</sup> <sub>0</sub>
B <sub>0</sub>	mm	1,2	1,9	2,38	1,2	1,8 <sup>+0,2</sup> <sub>0</sub>	2,25 <sup>+0,2</sup> <sub>0</sub>	3,45 <sup>+0,2</sup> <sub>0</sub>
E	mm	1,75 ± 0,1						
F	mm	3,5 ± 0,05						
D <sub>0</sub>	mm	1,5 <sup>+0,1</sup> <sub>0</sub>						
P <sub>0</sub>	mm	4,0 ± 0,1						
P <sub>1</sub>	mm	2,0	4,0 ± 0,1		2,0	4,0 ± 0,1		
P <sub>2</sub>	mm	2,0 ± 0,05						
W	mm	8,0 ± 0,3						

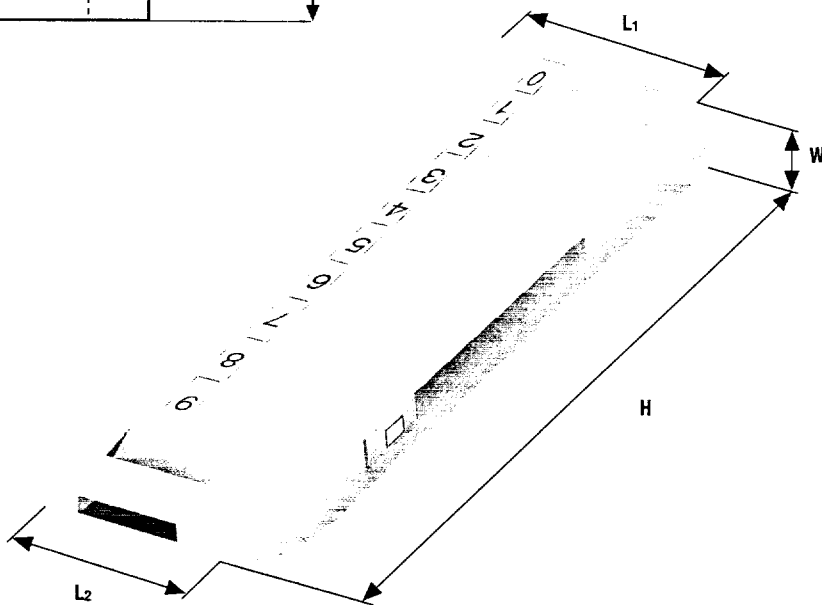
According to IEC 60 286-3 type I



### Bulk Case

		<b>MFC Series</b>
L <sub>1</sub>	mm	36
H	mm	110
W	mm	12
L <sub>2</sub>	mm	31,5

According to IEC 60 286-6



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