DATA SHEET

DCS 0402; DCT 0603;
DCU 0805; DCA 1206
Thick film flat chip resistors

Product specification
Supersedes data of 13th May 2002
File under BCcomponents, BC08

2002 Sep 24

BC COMPONENTS

FEATURES

- State of the art thick film technology
- Improved termination design
- Standard TC: ±100 and ±200 ppm/K
- Tight tolerance available: ±1%

Case sizes

Imperial:	0402	0603	0805	1206
Metric:	RR 1005M	RR 1608M	RR 2012M	RR 3216M

APPLICATIONS

- All general purpose applications
- Office automation equipment
- Consumer electronics.

DESCRIPTION

DCS 0402, DCT 0603, DCU 0805 and DCA 1206 thick film 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 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 60286-3**.

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 in accordance with **IEC 60115-1** and **IEC 60115-8**.

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

QUICK REFERENCE DATA

DESCRIPTION	DCS 0402	DCT 0603	DCU 0805	DCA 1206
Metric size	RR 1005M	RR 1608M	RR 2012M	RR 3216M
Resistance range	1 Ω to 3,3 MΩ	1 Ω to 22 MΩ	1 Ω to 22 MΩ	1 Ω to 22 MΩ
Resistance tolerance	±5%; ±1%			
Temperature coefficient	–300/+500 ppm/K; ±300 ppm/K; ±200 ppm/K	–300/+500 ppm/K; ±200 ppm/K; ±100 ppm/K		
Operation mode	standard	standard	standard	standard
Climatic category (LCT/UCT/days)	55/125/56	55/125/56	55/125/56	55/125/56
Rated dissipation, P_{70}	0,063 W	0,1 W	0,125 W	0,25 W
Operating voltage, U_{max} AC/DC	50 V	50 V	150 V	200 V
Film temperature	125 °C	125 °C	125 °C	125 °C
Max. resistance change at P_{70} for resistance range, $\Delta R/R$ max., after:	10 Ω to 1 MΩ	10 Ω to 1 MΩ	10 Ω to 1 MΩ	10 Ω to 1 MΩ
1 000 h	≤ 3%	≤ 1,5%	≤ 1,5%	≤ 1,5%
8 000 h	≤ 6%	≤ 3%	≤ 3%	≤ 3%
Specified lifetime	8000 h	8000 h	8000 h	8000 h
Permissible voltage against ambient:				
1 minute	75 V	150 V	150 V	200 V
continuous	75 V	75 V	75 V	75 V

Table 1 Temperature coefficient and resistance range

DESCRIPTION		RESISTANCE VALUE(1)			
T.C.	**TOLERANCE**	**DCS 0402**	**DCT 0603**	**DCU 0805**	**DCA 1206**
±400 ppm/K	±5%	–	11 MΩ to 22 MΩ	11 MΩ to 22 MΩ	11 MΩ to 22 MΩ
±300 ppm/K	±5%	1 kΩ to 3,3 MΩ	–	–	–
	±1%	1 kΩ to 1 MΩ	–	–	–
–300/+500 ppm/K	±5%	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω
	±1%	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω	1 Ω to 9,76 Ω
±200 ppm/K	±5%	10 Ω to 976 Ω	10 Ω to 10 MΩ	10 Ω to 10 MΩ	10 Ω to 10 MΩ
	±1%	10 Ω to 976 Ω	–	–	–
±100 ppm/K	±1%	–	10 Ω to 1 MΩ	10 Ω to 1 MΩ	10 Ω to 1 MΩ
Jumper	–	≤ 50 mΩ; I_{max} = 0,8 A	≤ 50 mΩ; I_{max} = 0,8 A	≤ 50 mΩ; I_{max} = 1,1 A	≤ 50 mΩ; I_{max} = 1,6 A

Note

1. Resistance value to be selected from E24 series for 5% tolerance and from E24/E96 series for 1% tolerance .

ORDERING INFORMATION

Components may be ordered by using either a simple clear text ordering code, see "Type description and ordering code" or BCcomponents' unique 12NC.

Numeric Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging; see Table 2.
- The remaining 4 digits indicate the resistance value:
  - The first 3 digits indicate the resistance value.
  - The last digit indicates the resistance decade in accordance with Table 3.

Table 2 12NC ordering code indicating resistor type and packaging

DESCRIPTION		ORDERING CODE 2312		
		CARDBOARD TAPE ON REEL		
TYPE	TOL.	PA 5000 units	E0 10000 units	PW 20000 units
DCS 0402	±5%	–	364 1....	–
	±1%	–	364 3....	–
	jumper	–	364 90001	–
DCT 0603	±5%	304 1....	–	309 1....
	±1%	304 7....	–	309 7....
	jumper	304 90001	–	309 90001
DCU 0805	±5%	324 1....	–	329 1....
	±1%	324 7....	–	329 7....
	jumper	324 90001	–	329 90001
DCA 1206	±5%	344 1....	–	349 1....
	±1%	344 7....	–	349 7....
	jumper	344 90001	–	349 90001

Table 3 Last digit of 12NC indicating resistance decade

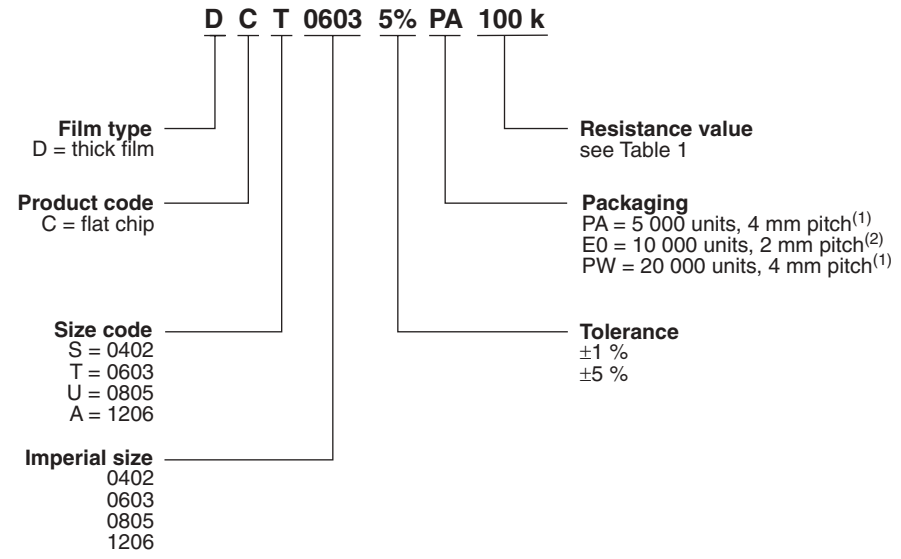
RESISTANCE DECADE	LAST DIGIT
1 to 9,99 Ω	8
10 to 99,9 Ω	9
100 to 999 Ω	1
1 kΩ to 9,99 kΩ	2
10 kΩ to 99,9 kΩ	3
100 kΩ to 999 kΩ	4
1 MΩ to 9,99 MΩ	5
10 MΩ to 99,9 MΩ	6

ORDERING EXAMPLE

The ordering code of a DCT 0603 resistor, value 100 kΩ with ±1% tolerance, supplied in cardboard tape of 20000 units per reel is: 2312 309 71004.

Type description and ordering code

- We recommend that the clear text ordering code is used to minimize the possibility of errors in order handling.



(1) PA and PW only for DCT 0603; DCU 0805 and DCA 1206.
(2) E0 only for DCS 0402.

FUNCTIONAL DESCRIPTION

Derating

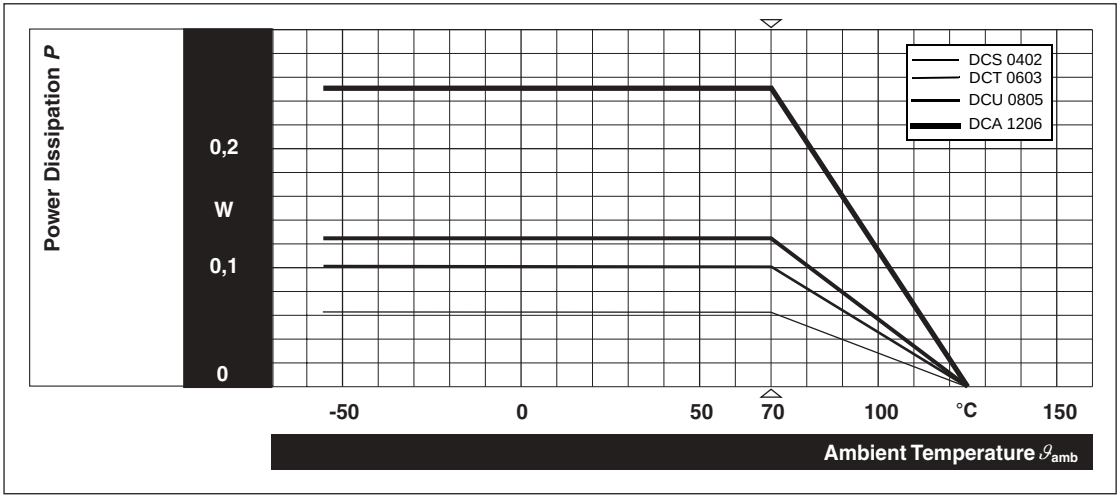


Fig.1 Derating, standard operation.

Current noise

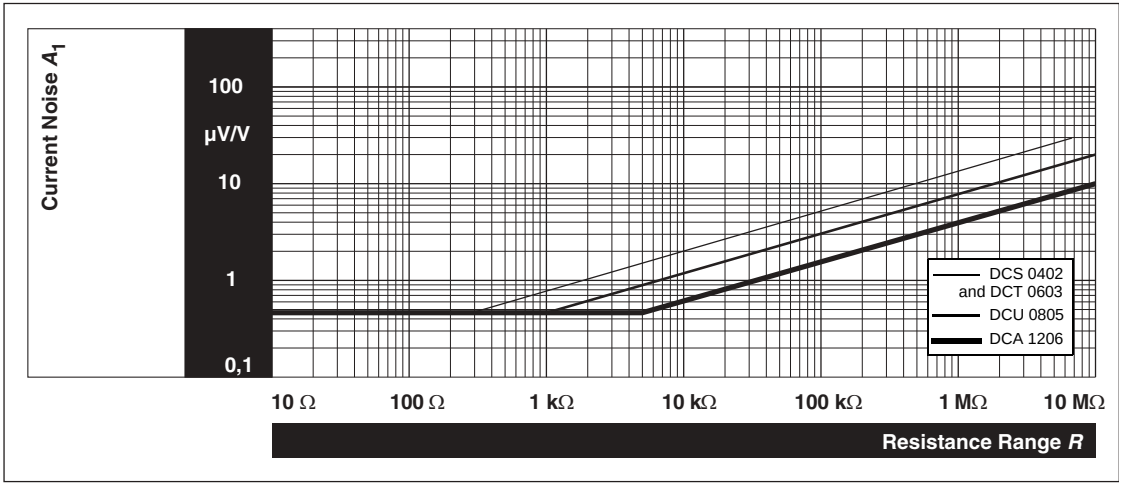
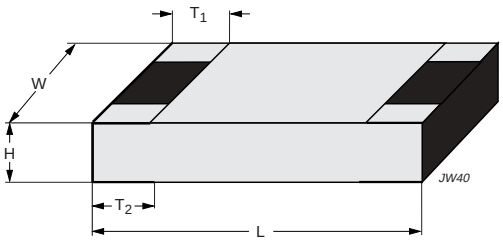


Fig.2 Current noise A_1 in accordance with IEC 60195.

MECHANICAL DATA

Outlines



For dimensions see Table 4.

Fig.3 Outlines.

Table 4 Chip resistor types, mass and relevant physical dimensions; see Fig.3

TYPE	H (mm)	L (mm)	W (mm)	T_1 (mm)	T_2 (mm)	MASS (mg)
DCS 0402	0,35 ±0,05	1,0 ±0,05	0,5 ±0,05	0,2 +0,15/–0,1	0,25 ±0,1	0,75
DCT 0603	0,45 ±0,1	1,6 ±0,1	0,85 ±0,1	0,3 ±0,2	0,3 ±0,2	2,08
DCU 0805	0,55 ±0,1	2,0 ±0,15	1,25 ±0,15	0,4 ±0,2	0,4 ±0,2	4,8
DCA 1206	0,55 ±0,1	3,15 ±0,15	1,6 ±0,15	0,5 ±0,25	0,5 ±0,25	8,9

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the following specifications:

IEC 60115-1, Generic specification (includes tests)

IEC 60115-1, Sectional specification (includes schedule for qualification approval)

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60068 and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45% to 75%

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar).

For testing the components are mounted on a test board in accordance withIEC 60115-1, 4.31 unless otherwise specified.

In Table 5 the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2; a short description of the test procedure is also given.

Table 5 Test procedures and requirements

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)	
			stability for product types:		
			DCS 0402	–	–
			DCT 0603	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
			DCU 0805	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
			DCA 1206	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
4.5	–	resistance		±1%; ±5%	
4.8.4.2	–	temperature coefficient	at 20 / LCT / 20 °C and 20 / UCT / 20 °C	-300/+500 ppm/K; ±300 ppm/K; ±200 ppm/K; ±100 ppm/K	
4.25.1	–	endurance at 70 °C	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1,5 h on; 0,5 h off 70 °C; 1000 h	±(1,5% + 0,1 Ω)	±(3% + 0,1 Ω)
4.25.3	–	endurance at upper category temperature	125 °C; 1000 h	±(1,5% + 0,1 Ω)	±(3% + 0,1 Ω)
4.24	3 (Ca)	damp heat, steady state	40 ±2 °C; 56 days; 93 +2/–3% RH	±(1,5% + 0,1 Ω)	±(3% + 0,1 Ω)

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)	
			stability for product types:		
			DCS 0402	–	–
			DCT 0603	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
			DCU 0805	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
			DCA 1206	10 Ω to 1 MΩ	<10 Ω; >1 MΩ
4.23		climatic sequence:			
4.23.2	2 (Ba)	dry heat	125 °C; 16 h		
4.23.3	30 (Db)	damp heat, cyclic	55 °C; 24 h; 90 to 100 % RH; 1 cycle		
4.23.4	1 (Aa)	cold	–55 °C; 2 h		
4.23.5	13 (M)	low air pressure	8,5 kPa; 2 h; 15 to 35 °C		
4.23.6	30 (Db)	damp heat, cyclic	55 °C; 5 days; 95 to 100 % RH; 5 cycles	±(1,5% + 0,1 Ω) no visible damage	±(3% + 0,1 Ω) no visible damage
4.13	–	short time overload	room temperature; $U = 2{,}5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max}$; 5 s	±(2% + 0,1 Ω) no visible damage	±(2% + 0,1 Ω) no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	±(1% + 0,05 Ω) no visible damage	±(1% + 0,05 Ω) no visible damage
4.29	45 (XA)	component solvent resistance	isopropyl alcohol +23 °C; toothbrush method	marking legible; no visible damage	
4.18.2	58 (Td)	resistance to soldering heat	unmounted components; 260 ±5 °C; 10 ±1 s	±(0,5% + 0,05 Ω) no visible damage	±(0,5% + 0,05 Ω) no visible damage
4.17.2	58 (Td)	solderability	+215 °C; 3 s solder bath method	good tinning (≥ 95% covered); no visible damage	
4.32	21 (Ue_3)	shear (adhesion)	5 N; 10 s	no visible damage	
4.7	–	voltage proof	U_{rms} = 100 V; 60 s	no flashover or breakdown	

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