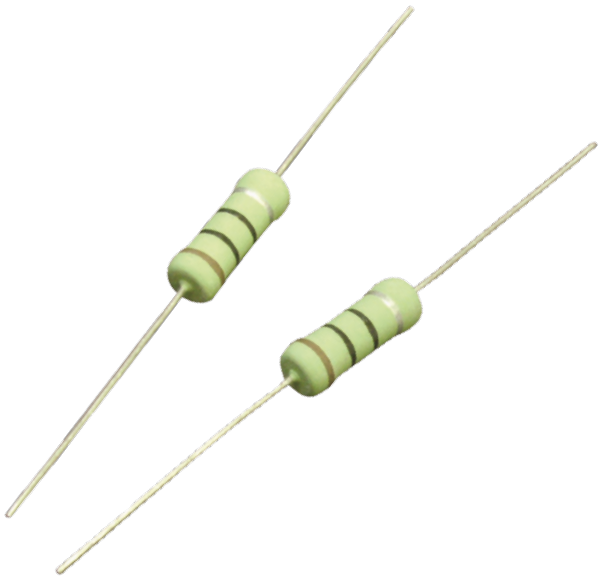
CERAMIC COMPOSITION RESISTORS

TYPE CCR SERIES

INTRODUCTION

TE Connectivity (TE)'s Ceramic Composition Resistors (CCR) series of resistors is constructed using solid ceramic composition, which is the traditional medium for absorbing high energy pulses, in cases of high inrush current. CCR resistors have evolved over many years to have excellent pulse withstand capabilities while remaining very stable. These improved characteristics have been achieved by prudent selection of materials with optimum physical properties and by advances in the manufacturing process.

The CCR series is ideal for circuitry associated performance in high voltage power supplies, R-C snubber circuits, and inrush limiters and is now tested to the AEC-Q200 standard.



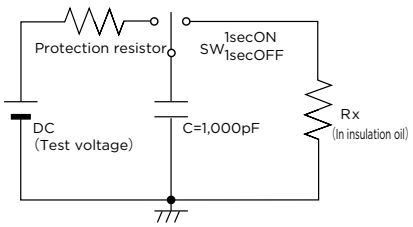
FEATURES

- Designed for pulse withstand
- Range of resistance tolerances
- Solid ceramic composition
- Low cost, high performance
- Three sizes available
- Wide range of resistance values
- Available on tape
- Coated flameproof material
- AEC-Q200 tested

ELECTRICAL CHARACTERISTICS

Characteristics	CCR1/2	CCR1	CCR2
Power at 70°C	0.5 Watt	1 Watt	2 Watt
Tolerance %	10% 20%	10% 20%	10% 20%
Resistance Range	4R7 – 100K	3R3 – 390K	3R3 – 390K
Maximum working voltage	200V	300V	400V
Maximum overload voltage	400V	600V	800V
Dielectric withstanding voltage	500V	500V	700V

PERFORMANCE

<table>
<tr><th rowspan="2">Test Items</th><th colspan="2">Performance Requirements</th><th rowspan="2">Test Method</th></tr>
<tr><th>Limit</th><th>Typical</th></tr>
<tr><td rowspan="4">Resistance</td><td rowspan="4">Within specified tolerance</td><td rowspan="4">-</td><td colspan="2">25°C</td></tr>
<tr><td>Resistance</td><td>Measuring voltage</td></tr>
<tr><td>3.3Ω ≤ R < 10Ω</td><td>0.3V</td></tr>
<tr><td>10Ω ≤ R < 100Ω</td><td>1.0V</td></tr>
<tr><td></td><td></td><td></td><td>100Ω ≤ R < 390kΩ</td><td>3.0V</td></tr>
<tr><td>T.C.R</td><td>-500~-1300:3.3Ω≤R<10Ω
-600~-1500:10Ω≤R<100Ω
-700~-1800:100Ω≤R<1kΩ
-900~-1900:1kΩ≤R<100kΩ
-900~2000:100kΩ≤R<200kΩ
-900~2200:200kΩ≤R<390kΩ</td><td>-</td><td colspan="2">+25°C/-40°C, +25°C/+75°C and +25°C/+125°C</td></tr>
<tr><td>Voltage coefficient (Apply for 1kΩ or over)</td><td>0~-0.20%/V</td><td>-</td><td colspan="2">Rated voltage and rated voltage X 10%</td></tr>
<tr><td>Overload (Short time)</td><td>ΔR± (2% + 0.05Ω)</td><td>ΔR± (0.4% + 0.05Ω)</td><td colspan="2">Rated voltage X 2.5 or Max. overload vol., whichever is lower, for 5s.</td></tr>
<tr><td>Resistance to pulse</td><td>Refer to table</td><td>-</td><td colspan="2">The resistor mounted on to the test circuit as below is applied with high voltage impulse 10000 cycles.
<table>
<tr><th>Type</th><th>Test Voltage</th><th>Performance Requirements ΔR± (% + 0.05Ω)</th></tr>
<tr><td rowspan="4">CCR1/2</td><td>10KV:4.7Ω≤R<10KΩ</td><td>5</td></tr>
<tr><td>10KV:10KΩ≤R<33KΩ</td><td>10</td></tr>
<tr><td>10KV:33KΩ≤R<100KΩ</td><td>25</td></tr>
<tr><td>4KV:10KΩ≤R<100KΩ</td><td>5</td></tr>
<tr><td rowspan="3">CCR1</td><td>14KV:3.3Ω≤R<30KΩ</td><td>5</td></tr>
<tr><td>14KV:30KΩ≤R<390KΩ</td><td>10</td></tr>
<tr><td>7KV:30KΩ≤R<390KΩ</td><td>5</td></tr>
<tr><td rowspan="3">CCR2</td><td>20KV:3.3Ω≤R<10KΩ</td><td>5</td></tr>
<tr><td>20KV:10KΩ≤R<390KΩ</td><td>10</td></tr>
<tr><td>11KV:10KΩ≤R<390KΩ</td><td>5</td></tr>
</table>


</td></tr>
</table>

CERAMIC COMPOSITION RESISTORS

CCR Series

Test Items	Performance Requirements		Test Method
	Limit	Typical	
Resistance to soldering heat	ΔR± (2% + 0.05Ω)	ΔR± (0.8% + 0.05Ω)	350°C±10°C, 3.5s±0.5s
Rapid change of temp.	ΔR± (2% + 0.05Ω)	ΔR± (0.4% + 0.05Ω)	-40°C (30min.) /+85°C 930min.) 5 cycles
Moisture resistance	ΔR± (5% + 0.05Ω)	ΔR± (0.6% + 0.05Ω)	40°C±2°C, 90%~95%RH, 1000h 1.5h ON/0.5h OFF cycles
Load life	ΔR± (5% + 0.05Ω)	ΔR± (0.4% + 0.05Ω)	70°C±2°C, 1000h 1.5h ON/0.5h OFF cycles
Resistance to solvent	No abnormality in appearance. Marking shall be easily legible	-	Dipping in IPA or Xylene for 3 min. and leaving for 10 min. after removing drops, then brushing 10 times.

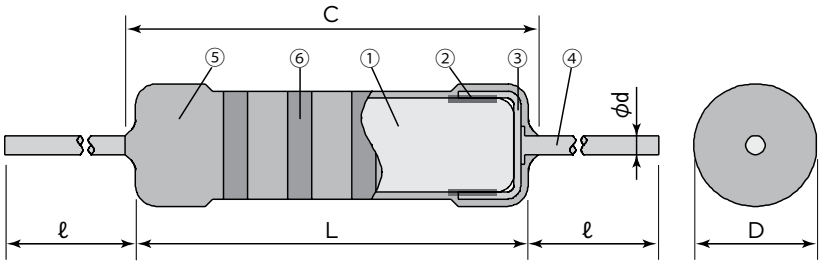
AEC-Q200 TESTING

Test Item	Reference Standard	Test Conditions
High Temperature Exposure	MIL-STD-202 Method 108	+125°C, 1000h, Unpowered
Temperature Cycling	JESD22 Method JA-104	-55°C⇔+125°C (each 30min), Transition time 1 min, 1000 cycles
Biased Humidity	MIL-STD-202 Method 103	+85°C, 85%RH, 10% of rated power, 1000h
High Temperature Operating Life	MIL-STD-202 Method 108	+125°C, Rated voltage (Temperature derating), 1000h
Physical Dimension	JESD22 Method JB-100	Vernier caliper
Terminal Strength	MIL-STD-202 Method 211	Pull (2.27kg), Bending (227g), Torsion (360°, 3 times)
Resistance To Solvents	MIL-STD-202 Method 215	IPA (1 min)⇔Brushing 10 times, 3 cycles
Mechanical Shock	MIL-STD-202 Method 213	100g's 6ms, Half sine wave 3.75m/ sec, 5 times each direction
Vibration	MIL-STD-202 Method 204	5 g's for 20 min, 12 cycles each of 3 orientations
Resistance To Solder Heat	MIL-STD-202 Method 210	+260±5°C, 10±1 sec
ESD	AEC-200-002 ISO/DIS 10605	2kΩ, 150pF, 25kV (DC)
Solderability	J-STD-002	+235°C, 2.5±0.5 sec
TCR	-	+25°C/-40°C, +25°C/+75°C and +25°C/+125°C
Flammability	UL-94	UL94 V-0
Flame Retardance	AEC-Q200-001	9~32V (DC)

CERAMIC COMPOSITION RESISTORS

CCR Series

DIMENSIONS

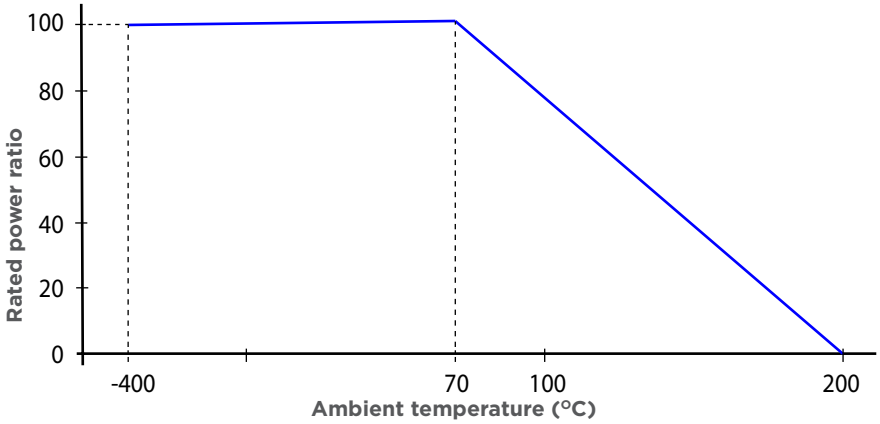


①	Resistive body	④	Lead wire
②	Inner electrode	⑤	Coating
③	Electrode cap	⑥	Marking

Type	Dimensions (mm)				
	L±1	C max.	D	Ød (nom.)	ℓ *
CCR1/2	9.0	11.1	3.5±0.5	0.7	30.0±3.0
CCR1	16.5	19.0	5.5±1	0.8	38.0±3.0
CCR2	19.0	22.5	7.0±1	0.8	38.0±3.0

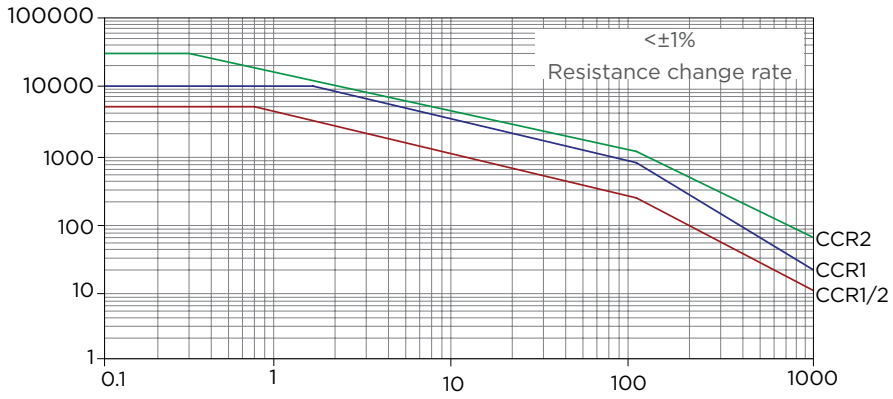
*ℓ Lead length changes depending on taping type.

DERATING CURVE

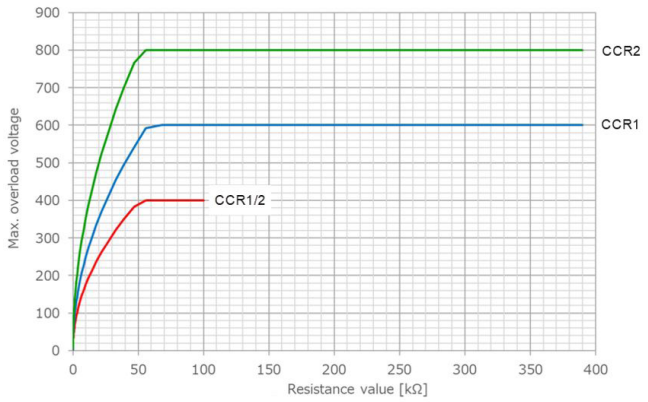


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

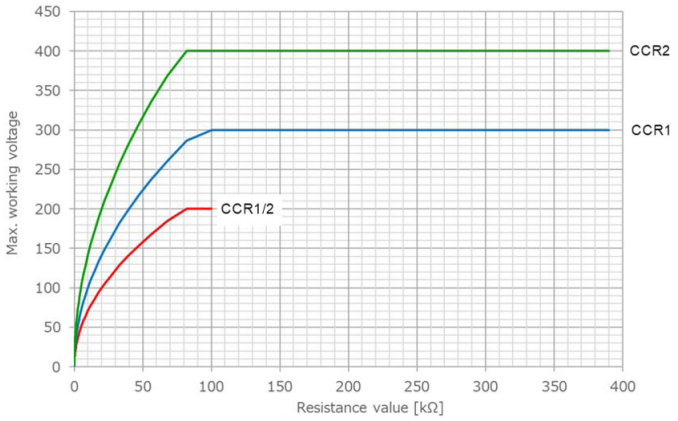
ONE PULSE LIMIT POWER CURVE



ONE PULSE LIMIT POWER CURVE

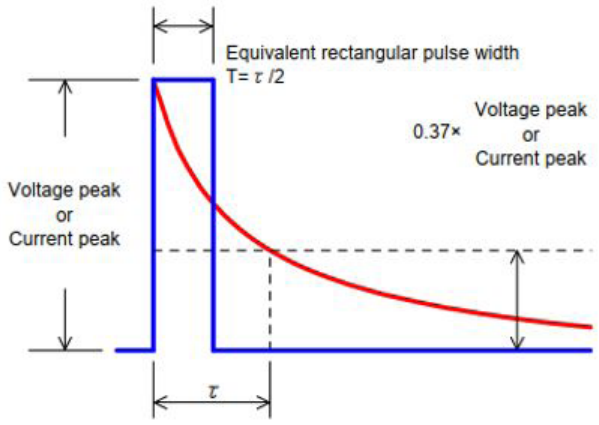


MAX. WORKING VOLTAGE CURVE

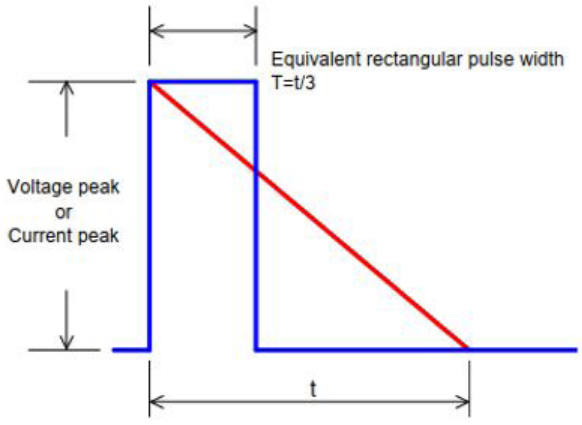


CONVERSION OF DISCHARGE WAVEFORM INTO RECTANGULAR WAVEFORM

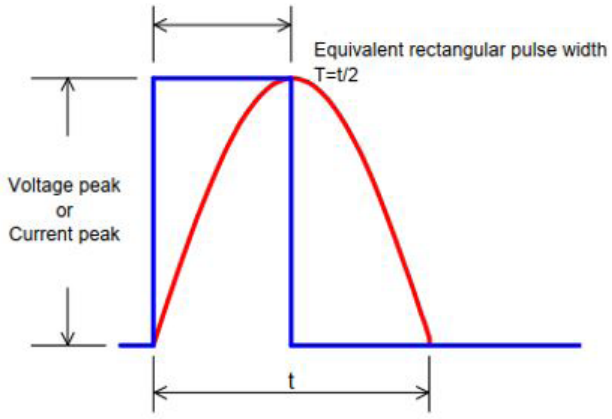
<Electric discharge wave with time constant " τ ">



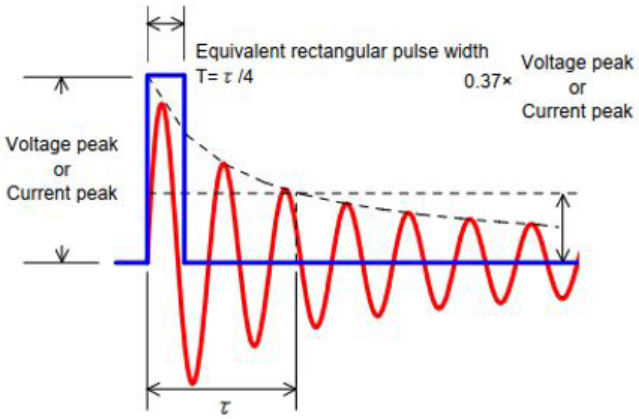
<Triangle wave having base "t">



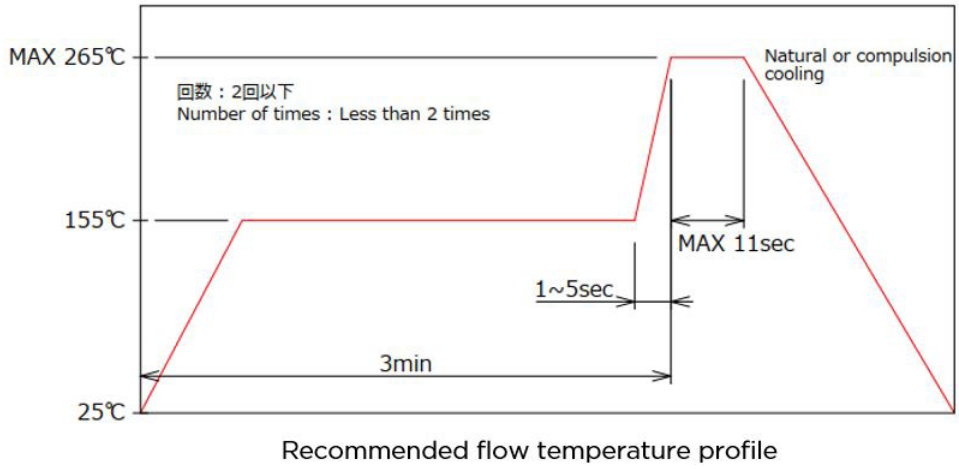
<Half-wave rectified wave>



<Damped oscillatory wave with damping time constant " τ ">



SOLDERING



Recommended flow temperature profile

Note:

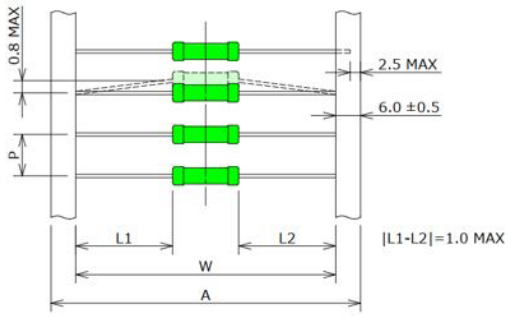
- If a profile other these conditions is used, please check resistance value before and after soldering.

MARKING

The resistors shall be marked with colour codes as per JIS C 5062.

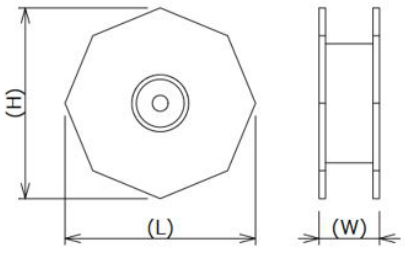
PACKAGING

Tape Dimensions (mm)



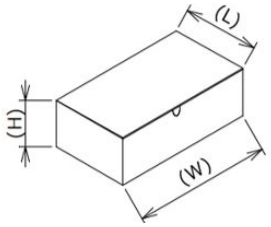
Type	Taping Type	W	P	A
CCR1/2	T52	52±1	5.08±0.38	65±1
CCR1	T631	63±1	10.16±0.80	-
CCR2	T631	63±1	10.16±0.80	-

Reel Dimensions (mm)



Type	Taping Type	L	W	H	Qty
CCR1/2	T52	340	75	340	2000
CCR1	T631	340	85	340	1000
CCR2	T631	340	85	340	500

Bulk Box Dimensions (mm)



Type	Quantity/Bag	Quantity/Box	L	W	H
CCR1/2	100	2000	150	275	45
CCR1	100	1000	150	275	60
CCR2	50	500	150	275	45

STORAGE

Avoid hot and humid conditions to store Pb-free components. Solderability of the components will degrade sooner than conventional ones with Sn-Pb terminals. Whiskers may develop in hot and humid conditions or a room with severe temperature changes. Storage in a room with temperature range of 5~40°C and humidity range of 35~70%RH within 3 years from shipping (taping package product within 2 years) is recommended for Pb-free terminal components. Dew condensation, poisonous gas (e.g., hydrogen sulfide, sulfur dioxide gas, hydrogen chloride), dust and direct sunlight should also be avoided because of degradation of solderability. Please check the condition of appearance, resistance value and solderability before use of these products after long term storage.

PRODUCT CODE STRUCTURE

Part Number

CCR	1	10R	K	B

Common Part

CCR	Ceramic Composition Resistors

Power Rating

_	0.5 Watt
1	1.0 Watt
2	2.0 Watt

Resistance Value

10R	10 ohm (10 ohms)
1K	1K ohms (1000 ohms)
100K	100K ohms (100000 ohms)

Packaging

B	Bulk
T	Taped

Tolerance

K	10%
M	20%

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