

Contents

1 General7

1.1 Scope7

1.2 Normative references7

2 Technical data9

2.1 Units and symbols9

2.2 Terms and definitions9

2.3 Preferred values13

2.4 Marking13

2.5 Coding13

2.6 Packaging13

2.7 Storage14

2.8 Transportation14

3 Quality assessment procedures14

4 Test and measurement procedures14

4.1 General14

4.2 Standard atmospheric conditions14

4.3 Drying15

4.4 Visual examination and checking of dimensions15

4.5 Resistance16

4.6 Insulation resistance17

4.7 Voltage proof20

4.8 Variation of resistance with temperature20

4.9 Reactance22

4.10 Non-linearity23

4.11 Voltage coefficient23

4.12 Current Noise24

4.13 Short time overload24

4.14 Temperature rise24

4.15 Robustness of the resistor body25

4.16 Robustness of terminations26

4.17 Solderability27

4.18 Resistance to soldering heat28

4.19 Rapid change of temperature28

4.20 Bump29

4.21 Shock29

4.22 Vibration30

4.23 Climatic sequence30

4.24 Damp heat, steady state32

4.25 Endurance33

4.26 Accidental overload test41

4.27	Single-pulse high-voltage overload test	43
4.28	Periodic-pulse high-voltage overload test	46
4.29	Component solvent resistance	48
4.30	Solvent resistance of marking	49
4.31	Mounting of surface mount resistors	49
4.32	Shear test	50
4.33	Substrate bending test	50
4.34	Corrosion	51
4.35	Flammability	51
4.36	Operation at low temperature	51
4.37	Damp heat, steady state, accelerated	52
4.38	Electrostatic discharge	52
4.39	Periodic-pulse overload test	53
4.40	Whisker growth test	54
4.41	Hydrogen sulphide test	54
Annex B (normative) Rules for the preparation of detail specifications for resistors and capacitors for electronic equipment for use within the IECQ system		55
Annex C (informative) Example of test equipment for the periodic-pulse high-voltage overload test		56
Annex F (informative) Letter symbols and abbreviations		58
Annex G (informative) Index table for test and measurement procedures		60
Annex Q (normative) Quality assessment procedures		62
Annex ZA (informative) Example of a certified test record		70
Annex ZR (normative) Failure rate level evaluation, determination and qualification		72
Annex ZX (informative) Cross reference		79
Figures		
Figure 1 – Insulation resistance and voltage proof test jig for rectangular surface mount resistors		18
Figure 2 – Insulation resistance and voltage proof test jig for cylindrical surface mount resistors		19
Figure 3 – Test circuit		22
Figure 4 – Oscilloscope trace		23
Figure 5 – Testing of resistor body robustness		26
Figure 6 – Derating curve with specification of a suitable test dissipation		36
Figure 7 – Derating curve without specification of a suitable test dissipation		37
Figure 8 – Derating curve for UCT = MET		40
Figure 9 – Derating curve for UCT < MET		40
Figure 10 – Gauze cylinder fixture		42
Figure 11 – Pulse generator 1,2/50		44
Figure 12 – Pulse generator 10/700		44
Figure C.1 – Block diagram of test equipment		56
Figure C.2 – Tolerances on the pulse shape		57

Tables

Table 1 – Referee conditions.....15

Table 2 – Measuring voltages16

Table 3 – Calculation of resistance value (R) and change in resistance (ΔR)21

Table 4 – Calculation of temperature differences (ΔT)21

Table 5 – Tensile force for wire terminations.....26

Table 6 – Torque27

Table 7 – Number of cycles31

Table 8 – Severities45

Table 9 – List of preferred severities47

Table 10 – Periodic-pulse overload test condition.....53

Table ZR.1 – Component hours and permitted number of non-conformances for the qualification and extension of the qualification of a failure rate level (60 % statistic confidence level)73

Table ZR.2 – Component hours, permitted number of non-conformances and periodicity for the maintenance of the qualification of a failure rate level (10 % statistic confidence level)75

Table ZR.3 – Environmental factor π_E 78

Table ZR.4 – Quality factor π_Q 78