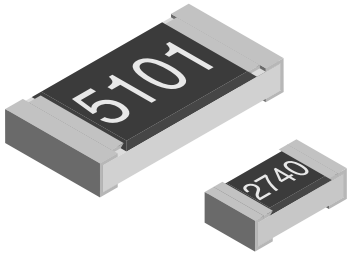
High Stability Thin Film Chip Resistor

≤ 0.05 % (1000 h rated power at 70 °C)



TNPW Precision Thin Film Flat Chip Resistors are the perfect choice for most fields of modern electronics where reliability and stability is of major concern. Typical applications include telecommunication, industrial, medical equipment, high-end computer and audio/video electronics.

FEATURES

- Metal film layer on high quality ceramic
- Protective top coat
- Tin/lead (Pb) solder contacts
- Excellent overall stability at different environmental conditions ≤ 0.05 % (1000 h rated power at + 70 °C)
- Low temperature coefficient and tight tolerances (± 0.1 %; ± 10 ppm/K)

APPLICATIONS

- Automotive
- Telecommunication
- Medical Equipment
- Industrial Equipment

STANDARD ELECTRICAL SPECIFICATIONS

	TNPW0402	TNPW0603	TNPW0805	TNPW1206	TNPW1210[1)]	TNPW2010	TNPW2512[1)]
Metric Size	RR 1005M	RR 1608M	RR 2012M	RR 3216M	RR 3225M	RR 5025M	RR 6332M
Resistance range	10 Ω to 100 kΩ	10 Ω to 332 kΩ	10 Ω to 1 MΩ	10 Ω to 2 MΩ	10 Ω to 3.01 MΩ	10 Ω to 4.99 MΩ	10 Ω to 8.87 MΩ
Resistance tolerance	± 1 %; ± 0.5 %; ± 0.1 %						
Temperature Coefficent	± 50 ppm/K; ± 25 ppm/K; ± 15 ppm/K; ± 10 ppm/K					± 50 ppm/K; ± 25 ppm/K	
Climatic category (LCT/UCT/days)	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56
Rated dissipation, P_{70} [2)]	0.063 W	0.1 W	0.125 W	0.25 W	0.33 W	0.4 W	0.5 W
Operating voltage, U_{max} AC/DC	50 V	75 V	150 V	200 V	200 V	300 V	300 V
Maximum permissible film temperature	155 °C	155 °C	155 °C	155 °C	155 °C	155 °C	155 °C
Thermal resistance[3)]	870 K/W	550 K/W	440 K/W	220 K/W	170 K/W	140 K/W	110 K/W
Insulation voltage:							
U_{ins} 1 min	75 V	100 V	200 V	300 V	300 V	300 V	300 V
continuous	75 V	75 V	75 V	75 V	75 V	75 V	75 V
Failure rate	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h
Weight/1000 pcs.	0.65 g	2 g	5.5 g	10 g	16 g	28 g	39 g

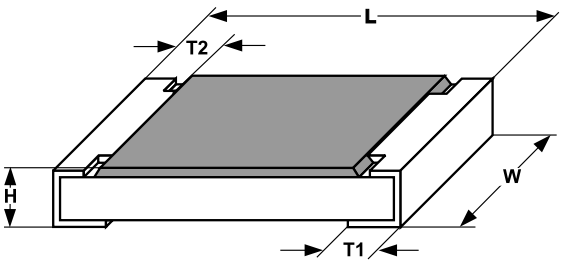
1) Size not specified in EN 140401-801

2) Rated voltage $\sqrt{P \times R}$. The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded

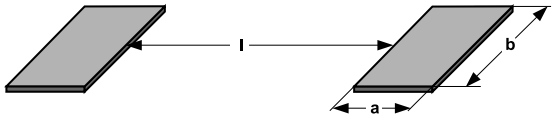
3) Measuring conditions in accordance with EN 140401-801

- TNPW 0402 without marking
- Extended values, tighter tolerances and temperature coefficient available on request

DIMENSIONS



SIZE		DIMENSIONS millimeters				
INCH	METRIC	L	W	H	T1	T2
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.10	
0603	1608	1.6 ± 0.10	0.85 ± 0.10	0.45 ± 0.10	0.3 ± 0.20	
0805	2012	2.0 ± 0.15	1.25 ± 0.15	0.45 ± 0.10	0.4 ± 0.20	
1206	3216	3.2 ± 0.15	1.6 ± 0.15	0.55 ± 0.10	0.5 ± 0.25	
1210	3225	3.2 ± 0.15	2.45 ± 0.15	0.60 ± 0.15	0.5 ± 0.25	
2010	5025	5.0 ± 0.15	2.5 ± 0.15	0.60 ± 0.15	0.6 ± 0.25	
2512	6332	6.3 ± 0.20	3.1 ± 0.15	0.60 ± 0.15	0.6 ± 0.25	



SOLDER PAD DIMENSIONS millimeters							
SIZE		REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	a	b	l	a	b	l
0402	1005	0.4	0.6	0.5	-	-	-
0603	1608	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	0.9	2.5	2.0	1.1	2.5	2.3
2010	5025	1.0	2.5	3.9	1.2	2.5	3.9
2512	6332	1.0	3.2	5.2	1.2	3.2	5.2

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE	TCR	TOLERANCE	RESISTANCE VALUE	E-SERIES
TNPW0402	± 50 ppm/K	± 1 %	10R - 100K	24 -96
		± 0.5 %	10R - 100K	24-192
		± 0.1 %	47R - 100K	
	± 25 ppm/K	± 1 %	10R - 100K	24 -96
		± 0.5 %	10R - 100K	24-192
		± 0.1 %	47R - 100K	
	± 15 ppm/K	± 0.1 %		
	± 10 ppm/K	± 0.1 %		
TNPW0603	± 50 ppm/K	± 1 %	10R - 332K	24 -96
		± 0.5 %	10R - 332K	24-192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R - 332K	24 -96
		± 0.5 %	10R - 332K	24-192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R - 332K	
	± 10 ppm/K	± 0.1 %		
TNPW0805	± 50 ppm/K	± 1 %	10R - 1M0	24 -96
		± 0.5 %	10R - 1M0	24-192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R - 1M0	24 -96
		± 0.5 %	10R - 1M0	24-192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R - 1M0	
	± 10 ppm/K	± 0.1 %		

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE	TCR	TOLERANCE	RESISTANCE VALUE	E-SERIES
TNPW1206	± 50 ppm/K	± 1 %	10R - 2M0	24 -96
		± 0.5 %	10R - 2M0	24-192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R - 2M0	24 -96
		± 0.5 %	10R - 2M0	24-192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R - 2M0	
	± 10 ppm/K	± 0.1 %		
TNPW1210	± 50 ppm/K	± 1 %	10R - 3M01	24 -96
		± 0.5 %	10R - 3M01	24-192
		± 0.1 %	47R - 2M13	
	± 25 ppm/K	± 1 %	10R - 3M01	24 -96
		± 0.5 %	10R - 3M01	24-192
		± 0.1 %	47R - 2M13	
	± 15 ppm/K	± 0.1 %		
	± 10 ppm/K	± 0.1 %		
TNPW2010	± 50 ppm/K	± 1 %	10R - 4M99	24 -96
		± 0.5 %	10R - 4M99	24-192
		± 0.1 %	47R - 1M0	
	± 25 ppm/K	± 1 %	10R - 4M99	24 -96
		± 0.5 %	10R - 4M99	24-192
		± 0.1 %	47R - 1M0	
TNPW2512	± 50 ppm/K	± 1 %	10R - 8M87	24 -96
		± 0.5 %	10R - 8M87	24-192
		± 0.1 %	47R - 1M0	
	± 25 ppm/K	± 1 %	10R - 8M87	24 -96
		± 0.5 %	10R - 8M87	24-192
		± 0.1 %	47R - 1M0	

PART NUMBER AND PRODUCT DESCRIPTION

Products can be ordered using either the Product Description or the Part Number.
For ordering TNPW with lead (Pb)-free contacts please refer to latest edition of data sheet TNPW e3.

Part Number: (TIN LEAD) TNPW12061K32DETA

T	N	P	W	1	2	0	6	1	K	3	2	D	E	T	A		

MODEL	VALUE	TOLERANCE	TCR	PACKING[1)]	SPECIAL
TNPW 0402 TNPW 0603 TNPW 0805 TNPW 1206 TNPW 1210 TNPW 2010 TNPW 2512	R = Decimal K = Thousand M = Million (4 digits)	B = ± 0.1 % D = ± 0.5 % F = ± 1.0 %	H = ± 50 ppm/K E = ± 25 ppm/K X = ± 15 ppm/K Y = ± 10 ppm/K	TA TC TD TF TG CN TY	up to 2 digits Blank = standard

Historical Part Number: TNPW-1206 1.32K 0.5 % T-9 RT1(will continue to be accepted)

TNPW-1206	1.32K	0.5 %	T-9	RT1
MODEL	RESISTANCE VALUE Ω	TOLERANCE	TCR	PACKING[1)]
TNPW-0402 TNPW-0603 TNPW-0805 TNPW-1206 TNPW-1210 TNPW-2010 TNPW-2512	Examples: 1K32 = 1320 Ω 99.68K = 99 680 Ω 360 = 360 Ω	± 0.1 % ± 0.5 % ± 1.0 %	T-2 = ± 50 ppm/K T-9 = ± 25 ppm/K T-10 = ± 15 ppm/K T-13 = ± 10 ppm/K	RT1 RT6 RT7 R02 R67 R52 R75

[1)] Please refer to PACKING table

High Stability Thin Film Chip Resistor
≤ 0.05 % (1000 h rated power at 70 °C)

PACKING							
MODEL	TAPE WIDTH [mm]	PITCH [mm]	REEL DIAMETER [mm/inch]	PIECES PER REEL	PACKING CODE for PRODUCT DESCRIPTION	PACKING CODE for PART NUMBER	TYPE OF CARRIER TAPE
TNPW 0402	8	2	180/7	10 000	RT7	TD	Paper
TNPW 0603 TNPW 0805 TNPW 1206 TNPW 1210	8	4	180/7	1000	R52[1]	CN[1]	Paper
TNPW 0603 TNPW 0805 TNPW 1206 TNPW 1210	8	4	180/7	5000	RT1	TA	Paper
TNPW 0603 TNPW 0805 TNPW 1206 TNPW 1210	8	4	330/13	20 000	RT6	TC	Paper
TNPW 2010	12	4	180/7	1000	R75	TY	Blister
				4000	R02	TF	Blister
TNPW 2512	12	4	180/7	1000	R75	TY	Blister
				2000	R67	TG	Blister

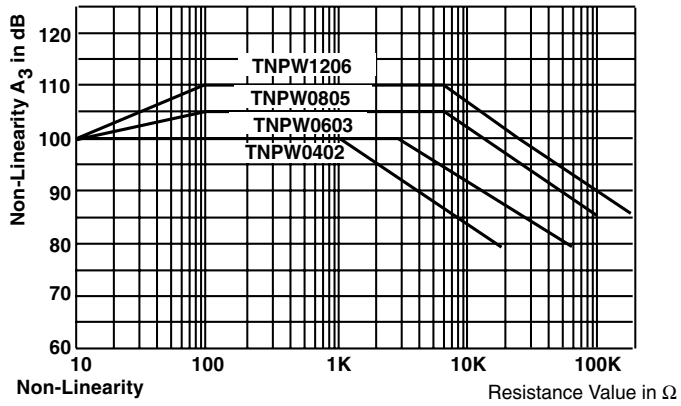
[1] R52/CN only for precision resistors with tolerance ± 0.1 % and temperature coefficient ≤ ± 25 ppm/k

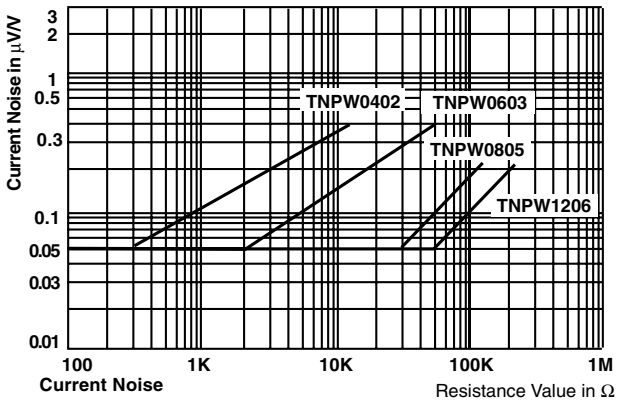
DESCRIPTION

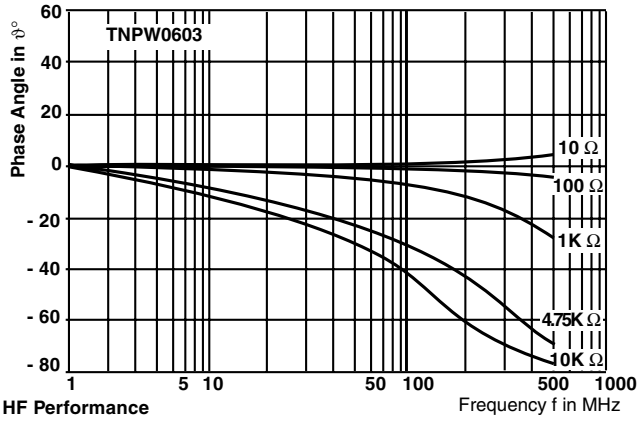
Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a super high grade ceramic substrate and conditioned to achieve the desired temperature coefficient. A special laser is used to achieve the target value by smoothly cutting a meander groove in the resistive layer without damaging the ceramics.

ASSEMBLY

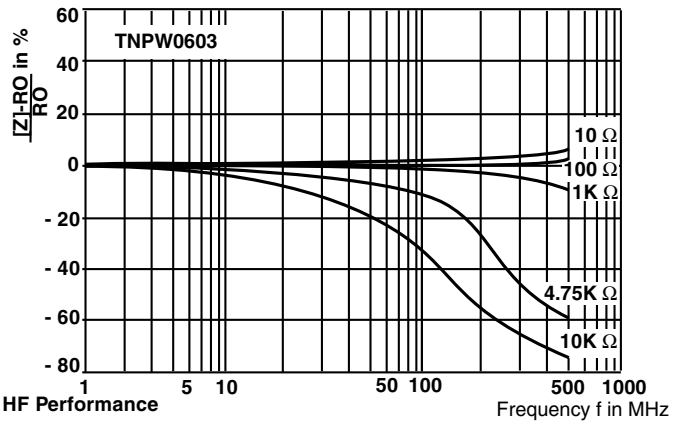
The resistors are suitable for processing on automatic SMD assembly systems.







HF Performance



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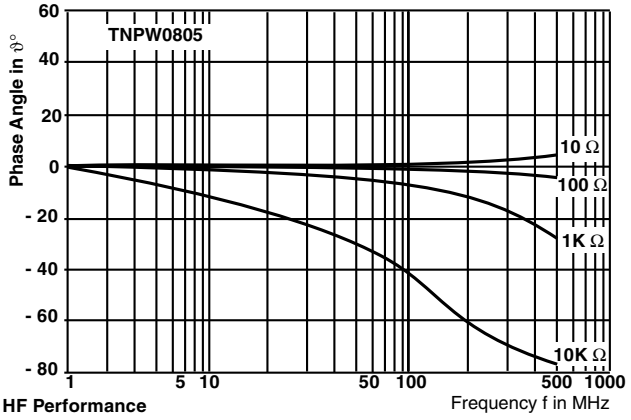

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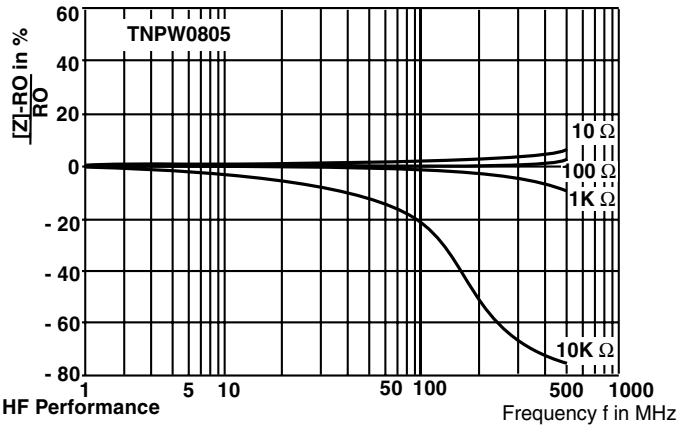

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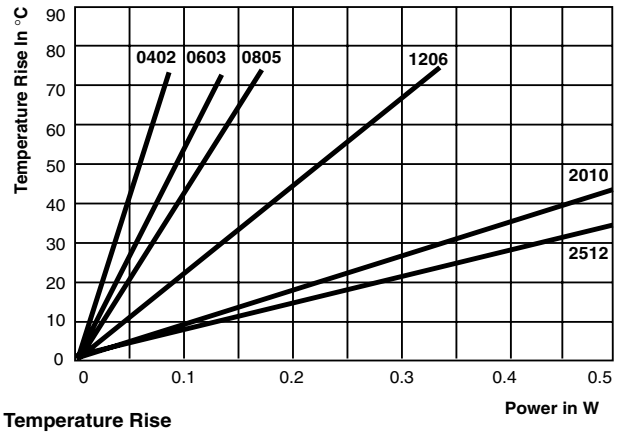
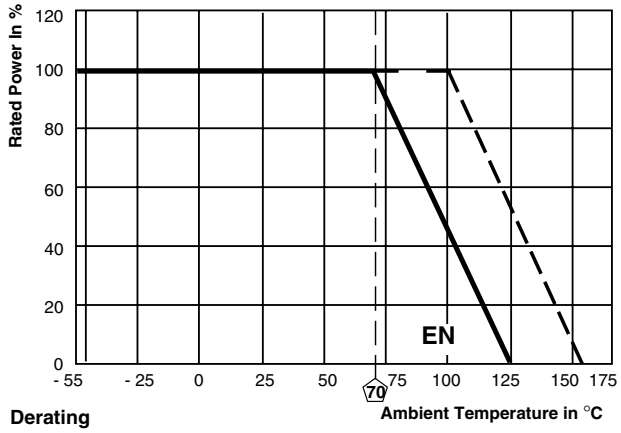
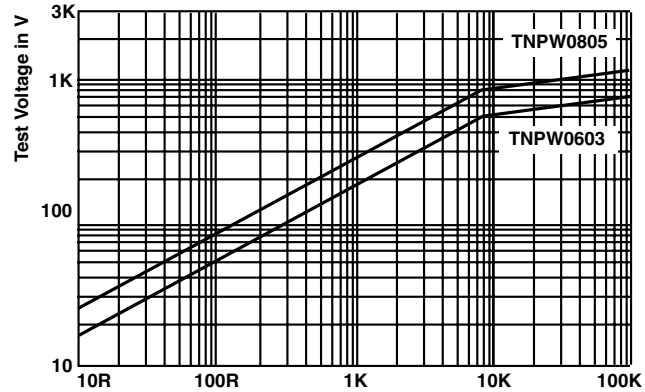


Temperature Rise

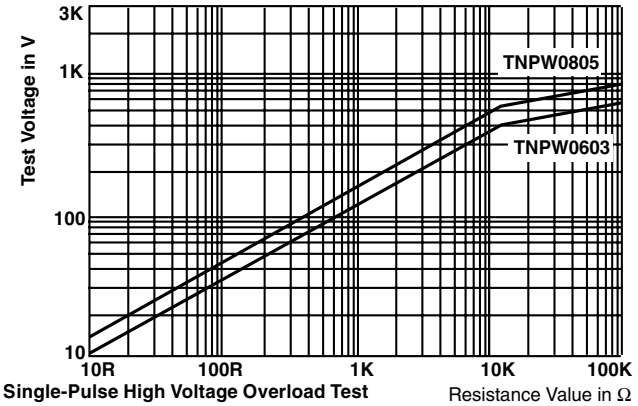


Derating

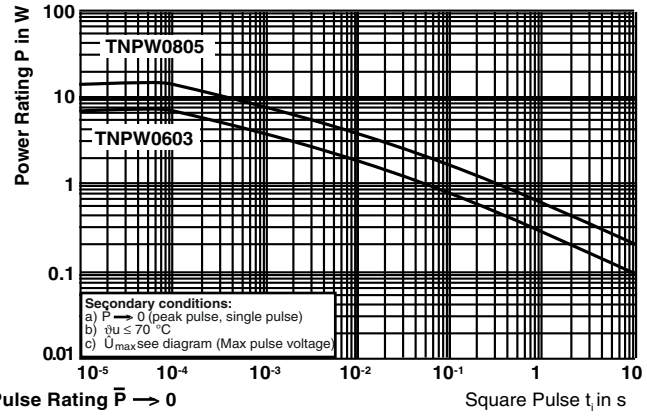
High Stability Thin Film Chip Resistor
≤ 0.05 % (1000 h rated power at 70 °C)



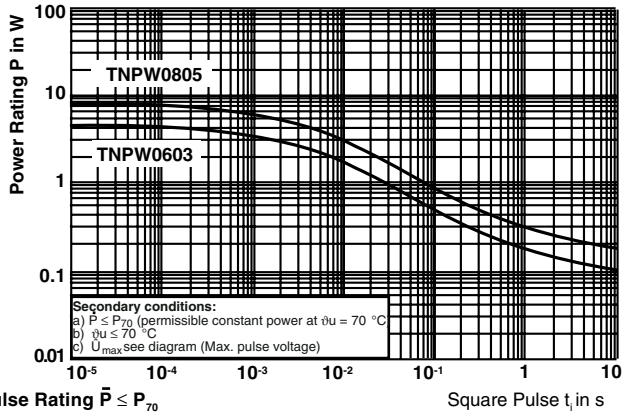
Single-Pulse High Voltage Overload Test
1.2/50 µs EN140000 4.27



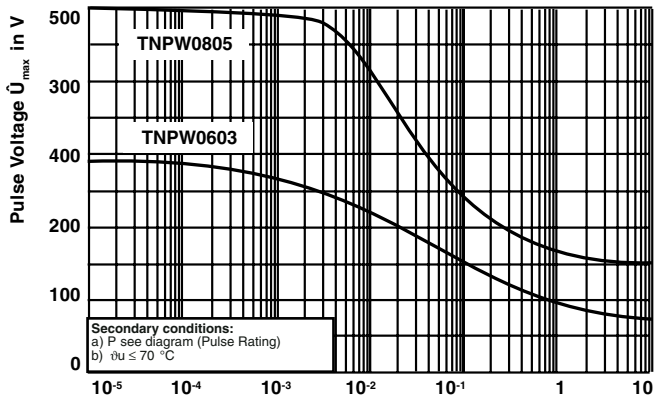
Single-Pulse High Voltage Overload Test
10/700 µs EN140000 4.27



Pulse Rating $\bar{P} \longrightarrow 0$



Pulse Rating $\bar{P} \leq P_{70}$



Maximum Pulse Voltage

TEST AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:
EN 60115-1, Generic specification (includes tests)
EN 140 400, Sectional specification (includes schedule for qualification approval)
EN 140 401-801, Detail specification (includes schedule for conformance inspection)

The following table contains only the most important tests. For the full test schedule refer to the documents listed above. 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).

The components are mounted for testing on boards in accordance with EN 60115-1, 4.31 unless otherwise specified. The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140 401-801. However, some additional tests and a number of improvements against those minimum requirements have been included.

TEST PROCEDURES AND REQUIREMENTS

TEST	CONDITIONS OF TEST	TEST RESULTS TNPW0402 TO TNPW2512 TOLERANCES		
		± 0.1 %; ± 0.25 %		
		< 100R	≥ 100R	± 0.5 %; ± 1.0 %
Endurance Test at 70 °C IEC 60115-1 4.25.1	1000 hours at 70 °C, 1.5 hours “ON”, 0.5 hours “OFF”	≤ ± 0.1 %	≤ ± 0.05 %	≤ ± 0.25 %
Endurance at UCT IEC 60115-1 4.25.3	1000 hours at 125 °C without load	≤ ± 0.1 %	≤ ± 0.05 %	≤ ± 0.5 %
Overload Test IEC 60115-1 4.13	Short time overload for 2 seconds 2.5 x rated voltage or ≤ 2 x limiting element voltage	≤ ± 0.05 %	≤ ± 0.02 %	≤ ± 0.1 %
Thermal Shock IEC 60115-1 4.19, IEC 60068-2-14	Rapid change between upper and lower category temperature	≤ ± 0.05 %	≤ ± 0.02 %	≤ ± 0.1 %
Damp Heat Steady State IEC 60115-1 4.24, IEC 60068-2-3	56 days at 40 °C and 93 % relative humidity	≤ ± 0.1 %	≤ ± 0.05 %	≤ ± 0.5 %
Resistance to Soldering Heat IEC 60115-1 4.18, IEC 60068-2-20	10 seconds at 260 °C solder bath temperature	≤ ± 0.05 %	≤ ± 0.02 %	≤ ± 0.1 %

APPLICABLE SPECIFICATIONS

- CECC40000/40400
- EN140400
- EIA 575
- EN 140401-801
- EN 60115-1
- IEC 60286-3

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