Leaded Varistors

Advanced-MP Compact Series

Series/Type:	**SIOV- S14K***E2K55**
Ordering code:	**B72214P2**1K10***
Date:	2019-06-03
Version:	b

Applications

Overvoltage protection

Features

- Wide operating voltage range 130 ... 460 V_{RMS}
- All types duty cycle @6KV/3KA=>10 pulses, according to IEC 62368-1;G.8.2 and IEC 60950-1; Annex Q, IEC 61051-2
- All types In @ 3KA =>15 pulses according to UL 1449, 4th edition surge current generator (8/20 µs), type 5 listed
- Combination wave pulse 6KV/3KA according to IEC 61000-4-5

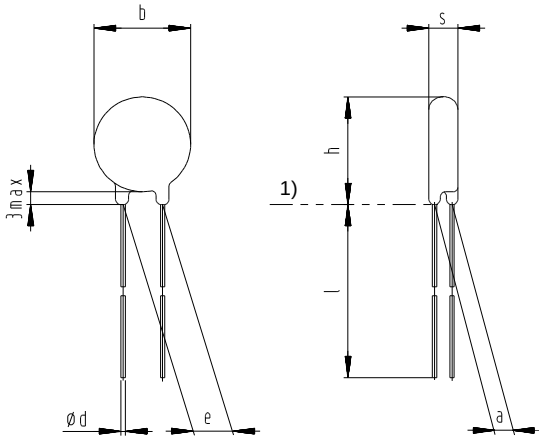
SIOV nomenclature

S	=	Disk type
14	=	Rated disk diameter
K	=	Tolerance of V_V at 1mA : ±10%
***	=	Max. AC operating voltage
E2…K55	=	Advanced-MP Compact Series

General technical data

Climatic category	to IEC 60068-1	40/105/56
Operating temperature	to IEC 61051	-40…+105 °C
Storage temperature		-40…+125 °C
Electric strength	to IEC 61051	≥2.5 kV_{RMS}
Insulation resistance	to IEC 61051	≥100 MΩ

Dimensional drawings in mm



b_{max}	=	see table 1
h_{max}	=	see table 1
s_{max}	=	see table 1
e	=	7.5 ±1.0
a_{typ}	=	see table 1
l_{min}	=	25.0
∅d	=	0.8 ±0.05

1) Seating plane in accordance with IEC 60717

Table 1

Ordering code	Type SIOV-	b_{max} [mm]	h_{max} [mm]	s_{max} [mm]	a_{typ} [mm]
B72214P2131K102	S14K130E2K55	13.0	17.0	4.7	2.0
B72214P2141K102	S14K140E2K55	13.0	17.0	4.8	2.1
B72214P2151K102	S14K150E2K55	13.0	17.0	4.9	2.2
B72214P2171K102	S14K175E2K55	13.0	17.0	5.1	2.4
B72214P2211K102	S14K210E2K55	13.0	17.0	5.4	2.7
B72214P2231K103	S14K230E2K55	13.0	17.0	5.6	2.9
B72214P2251K103	S14K250E2K55	13.5	17.0	5.7	3.0
B72214P2271K104	S14K275E2K55	13.5	17.0	5.9	3.2
B72214P2301K103	S14K300E2K55	13.5	17.0	6.1	3.5
B72214P2321K102	S14K320E2K55	13.5	17.0	6.3	3.7
B72214P2351K103	S14K350E2K55	13.5	17.0	6.7	4.1
B72214P2381K102	S14K385E2K55	14.0	18.0	7.7	4.4
B72214P2421K104	S14K420E2K55	14.0	18.0	8.2	4.7
B72214P2461K102	S14K460E2K55	14.0	18.0	8.5	5.1

Electrical data

Maximum ratings (105 °C)

Table 2

Ordering code	Type SIOV-S14K	V_{RMS} [V]	V_{DC} [V]	i_{max} (8/20 µs) 1 time [A]*	i_{max} (8/20 µs) 2 time [A]*	W_{max} (2 ms) 1 time [J]	P_{max} [W]
B72214P2131K102	130E2K55	130	170	6000	5000	60	0.6
B72214P2141K102	140E2K55	140	180	6000	5000	65	0.6
B72214P2151K102	150E2K55	150	200	6000	5000	70	0.6
B72214P2171K102	175E2K55	175	225	6000	5000	80	0.6
B72214P2211K102	210E2K55	210	270	6000	4500	95	0.6
B72214P2231K103	230E2K55	230	300	6000	4500	105	0.6
B72214P2251K103	250E2K55	250	320	6000	4500	115	0.6
B72214P2271K104	275E2K55	275	350	6000	4500	130	0.6
B72214P2301K103	300E2K55	300	385	6000	4500	140	0.6
B72214P2321K102	320E2K55	320	420	6000	4500	150	0.6
B72214P2351K103	350E2K55	350	460	6000	4500	165	0.6
B72214P2381K102	385E2K55	385	505	6000	4500	180	0.6
B72214P2421K104	420E2K55	420	560	6000	4500	190	0.6
B72214P2461K102	460E2K55	460	615	6000	4500	200	0.6

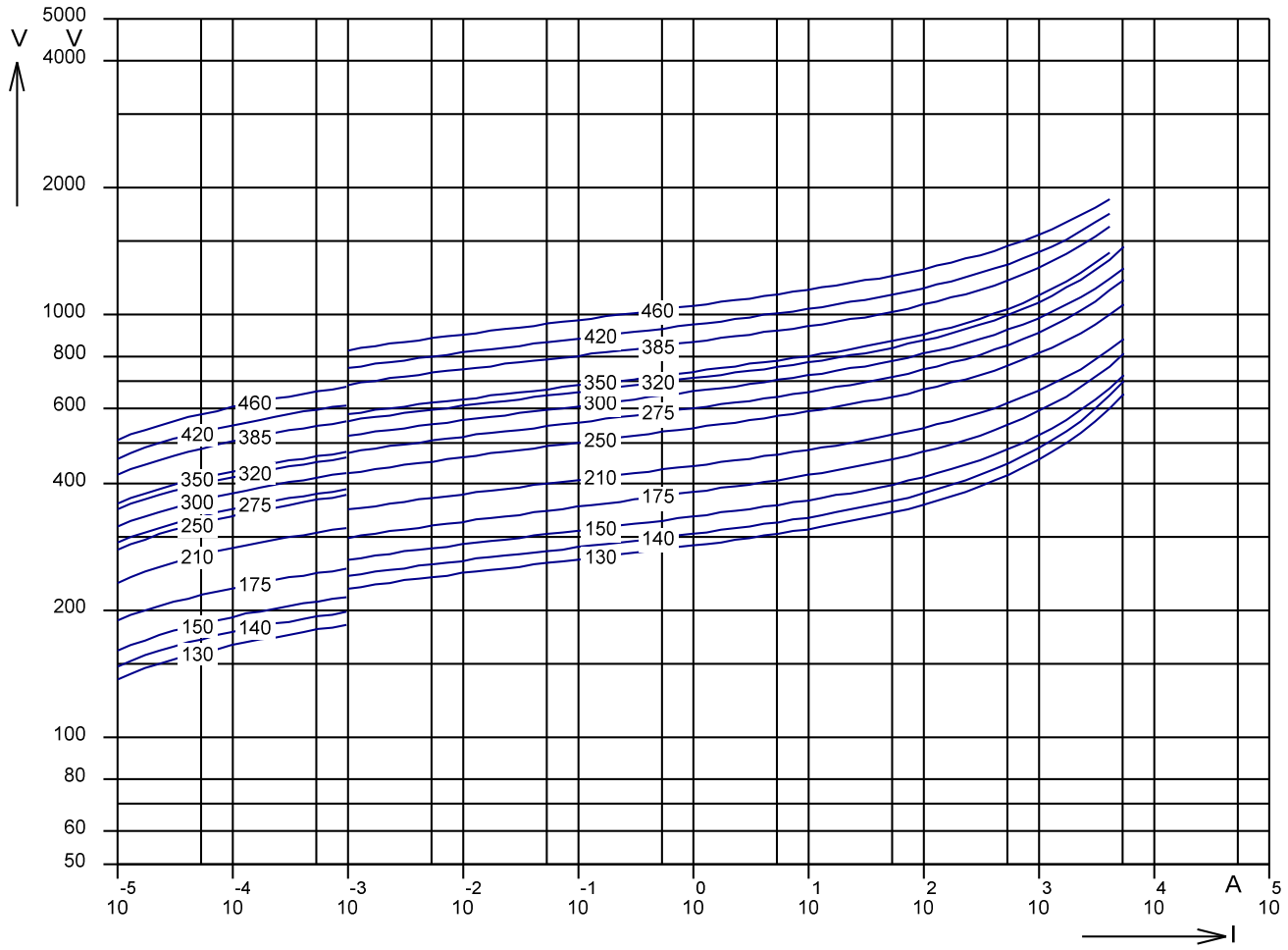
Characteristics (25 °C)

Table 2

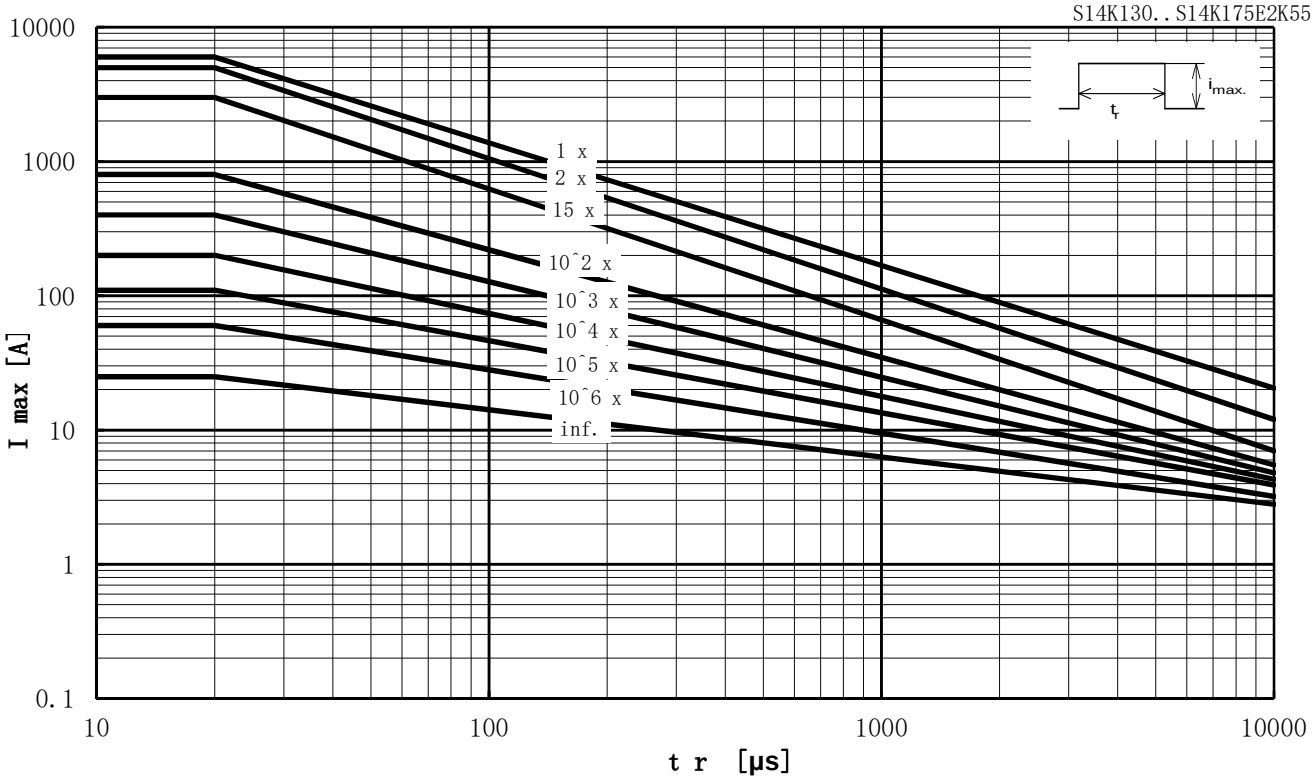
Ordering code	Type SIOV-S14K	V_v (1 mA) [V]	ΔV_v (1 mA) [%]	Max clamping voltage Vc [V]	Ic [A]	C_{typ} (1 kHz) [pF]
B72214P2131K102	130E2K55	205	±10	340	50	790
B72214P2141K102	140E2K55	220	±10	360	50	720
B72214P2151K102	150E2K55	240	±10	395	50	645
B72214P2171K102	175E2K55	270	±10	455	50	575
B72214P2211K102	210E2K55	330	±10	545	50	495
B72214P2231K103	230E2K55	360	±10	595	50	450
B72214P2251K103	250E2K55	390	±10	650	50	420
B72214P2271K104	275E2K55	430	±10	710	50	380
B72214P2301K103	300E2K55	470	±10	775	50	350
B72214P2321K102	320E2K55	510	±10	840	50	320
B72214P2351K103	350E2K55	560	±10	910	50	295
B72214P2381K102	385E2K55	620	±10	1025	50	280
B72214P2421K104	420E2K55	680	±10	1120	50	255
B72214P2461K102	460E2K55	750	±10	1240	50	230

V/I Characteristic

S14K...E2K55



Derating


S14K130..S14K175E2K55
10000
1000
100
10
1
0.1
I max [A]
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t r [µs]
1 x
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10^4 x
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10^6 x
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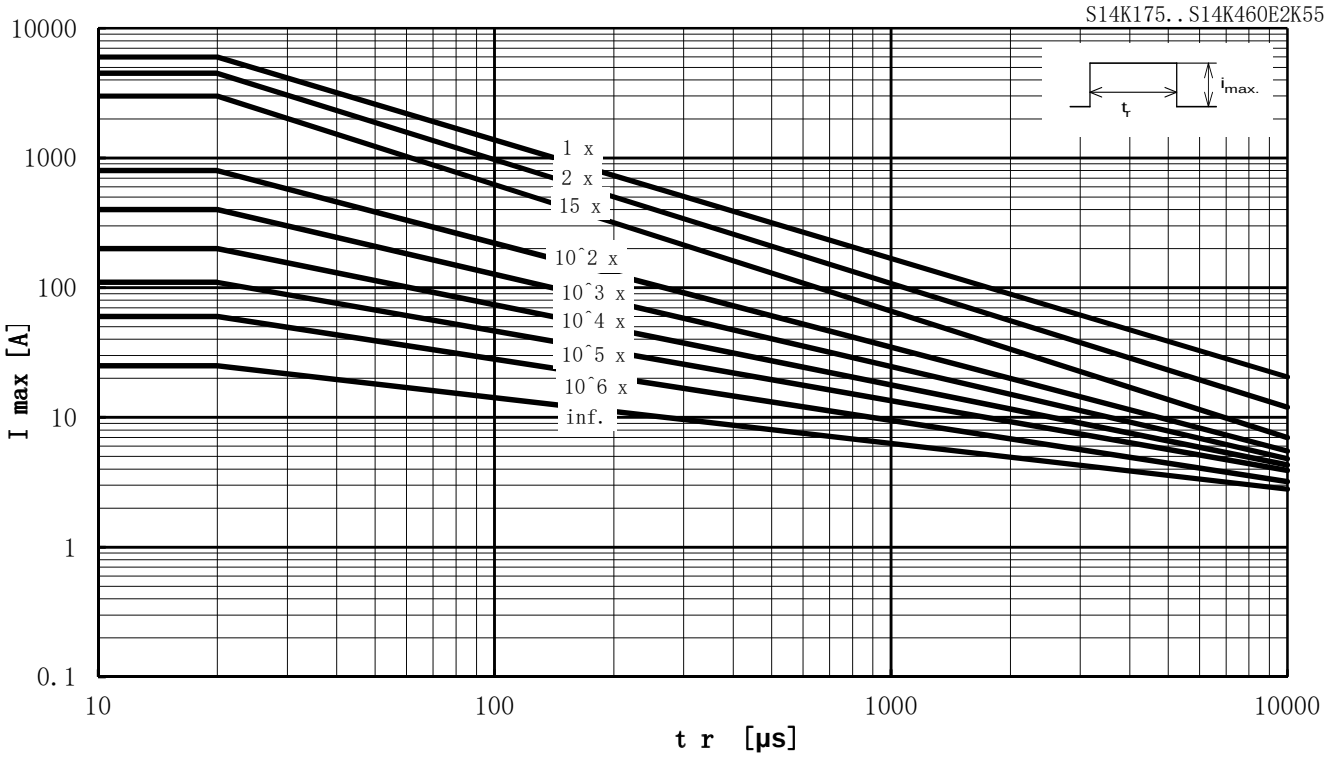
S14K175..S14K460E2K55
10000
1000
100
10
1
0.1
I max [A]
10
100
1000
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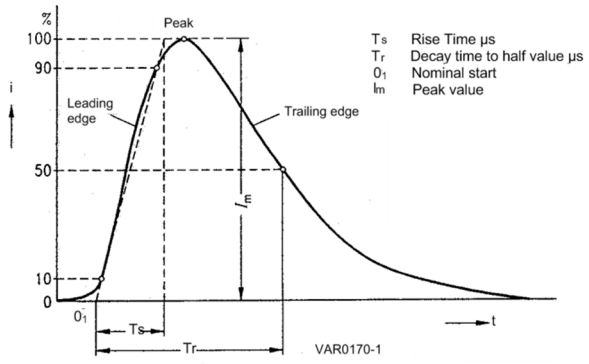
t r [µs]
1 x
2 x
15 x
10^2 x
10^3 x
10^4 x
10^5 x
10^6 x
inf.
imax.
tr

Reliability Data Electrical

Characteristics	Test Methods/Description	Specifications
Varistor Voltage	The voltage between two terminals with the specified measuring current applied is called Vv (1 mADC @ 0.2 … 2 s).	To meet the specified value.
Clamping Voltage	The maximum voltage between two terminals with the specified standard impulse current (8/20µs) illustrated below applied. 	To meet the specified value.
Surge current derating, 8/20 µs	10 surge currents (8/20 µs), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 µs	|ΔV /V (1 mA)| ≤10% (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	10 surge currents (2ms), unipolar, interval 120s, amplitude corresponding to derating curve for 10 impulses at 2 ms	|ΔV /V (1 mA)| ≤10% (measured in direction of surge current) No visible damage

Reliability Data Mechanical

Characteristics	Test Methods/Description	Specifications
Tensile strength	IEC 60068-2-21, test Ua1 After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage. Force for wire diameter: 0.6 mm = 10 N 0.8 mm = 10 N 1.0 mm = 20 N	|ΔV /V (1 mA)| ≤5% No break of solder joint, no wire break
Vibration	IEC 60068-2-6, test Fc, method B4 Frequency range: 10 .... 55 Hz Amplitude: 0.75 mm or 98 m/s² Duration: 6 h (3 x 2 h) Pulse: sine wave After repeatedly applying a single harmonic vibration according to the table above, the change of Vv shall be measured and the part shall be visually examined.	|ΔV /V (1 mA)| ≤5% No visible damage
Solderability	IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: 245°C, 3 s: After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 245 °C for 3 s, the terminals shall be visually examined.	The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.

Characteristics	Test Methods/Description	Specifications
Resistance to soldering heat	IEC 60068-2-20, test Tb, method 1A, 260 °C, 10 s: Each lead shall be dipped into a solder bath having a temperature of 260 ±5 °C to a point 2.0 to 2.5 mm from the body of the unit, be held there for 10 ±1 s and then be stored at room temperature and normal humidity for 1 to 2 hours. The change of Vv shall be measured and the part shall be visually examined.	|ΔV /V (1 mA)| ≤5% No visible damage
Bump	IEC 60068-2-29, test Eb Pulse duration: 6 ms Max. acceleration: 400m/s2 Number of bumps: 4000 Pulse: half sine	|ΔV /V (1 mA)| ≤5% No visible damage
Fire hazard	IEC 60695-11-5 (needle flame test) Severity: vertical 10 s	5 s max.
Electric strength	IEC 61051-1, test 4.9.2 Metal balls method, 2500 VRMS, 60 s The varistor is placed in a container holding 1.6 ±0.2 mm diameter metal balls such that only the terminations of the varistor are protruding. The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls.	No breakdown

Reliability Data Environmental

Characteristics	Test Methods/Description	Specifications
Endurance at upper category temperature	1000 h at UCT After having continuously applied the maximum allowable voltage at UCT ±2 °C for 1000 h, the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured.	|ΔV /V (1 mA)| ≤10%
Damp heat, steady state	IEC 60068-2-78, test Ca The specimen shall be subjected to 40 ±2 °C, 90 to 95 % r.H. for 56 days without load / with 10% of the maximum continuous DC operating voltage VDC. Then stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured. Thereafter, insulation resistance Rins shall be measured at V = 500 V (insulated varistors only).	|ΔV /V (1 mA)| ≤10% R_{ins} ≥100 MΩ
Climatic sequence	The specimen shall be subjected to: a) IEC 60068-2-2, test Ba, dry heat at UCT, 16 h b) IEC 60068-2-30, test Db, damp heat, 1st cycle: 55 °C, 93% r.H., 24 h c) IEC 60068-2-1, test Aa, cold, LCT, 2 h d) IEC 60068-2-30, test Db, damp heat, additional 5 cycles: 55 °C/25 °C, 93% r.H., 24 h/cycle. Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured. Thereafter, insulation resistance Rins shall be measured at V = 500 V.	|ΔV /V (1 mA)| ≤10% R_{ins} ≥100 MΩ
Rapid change of temperature	IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles	|ΔV /V (1 mA)| ≤5% No visible damage

Note:

UCT = Upper category temperature

LCT = Lower category temperature

R_{ins} = Insulation resistance

Cautions and warnings

General

1. TDK Electronics metal oxide varistors (SIOVs) are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data books unless otherwise agreed with TDK Electronics during the design-in-phase.

2. Ensure suitability of SIOVs through reliability testing during the design-in phase. The SIOVs should be evaluated taking into consideration worst-case conditions.

3. For applications of SIOVs in line-to ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

Storage

1. Store SIOVs only in original packaging. Do not open the package prior to processing.

2. Recommended storage conditions in original packaging:

Storage temperature:	-25 °C … +45 °C
Relative humidity:	<75% annual average, <95% on maximum 30 days a year.
Dew precipitation:	Is to be avoided.

3. Avoid contamination of an SIOV's during storage, handling and processing.

4. Avoid storage of SIOVs in harmful environments that can affect the function during long-term operation (examples given under operation precautions).

5. The SIOV type series should be soldered after shipment from TDK Electronics within the time specified.

SIOV-S, -Q, -LS, -B, -SNF	24 months
ETFV/ T series, -CU	12 months.

Handling

1. SIOVs must not be dropped.

2. Components must not be touched with bare hands. Gloves are recommended.

3. Avoid contamination of the surface of SIOV electrodes during handling, be careful of the sharp edge of SIOV electrodes.

Soldering (where applicable)

1. Use rosin-type flux or non-activated flux.

2. Insufficient preheating may cause ceramic cracks.

3. Rapid cooling by dipping in solvent is not recommended.

4. Complete removal of flux is recommended.

5. Temperatures of all preheat stages and the solder bath must be strictly controlled especially for T series (T14 and T20).

Mounting

1. Potting, sealing or adhesive compounds can produce chemical reactions in the SIOV ceramic that will degrade the component's electrical characteristics.

2. Overloading SIOVs may result in ruptured packages and expulsion of hot materials. For this reason the SIOVs should be physically shielded from adjacent components.

Operation

1. Use SIOVs only within the specified temperature operating range

2. Use SIOVs only within the specified voltage and current ranges.

3. Environmental conditions must not harm the SIOVs. Use SIOVs only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions, Avoid contact with any liquids and solvents.

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