

SIOV metal oxide varistors

Equation overview

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Equation overview

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1	$I = K V^\alpha$ $\alpha > 1$ I Current through varistor V Voltage across varistor K Ceramic constant (depending on varistor type) α Nonlinearity exponent (measure of nonlinearity of curve)	
2	$R = \frac{V}{I} = \frac{V}{K V^\alpha} = \frac{1}{K} V^{1-\alpha}$	
3	$\log I = \log K + \alpha \log V$	
4	$\log R = \log \left(\frac{1}{K} \right) + (1-\alpha) \log V$	
5	$\alpha = \frac{\log I_2 - \log I_1}{\log V_2 - \log V_1}$	
6	$W = \int_{t_0}^{t_1} v(t) i(t) dt$	
7	$ TC < 0.5 \cdot 10^{-3}/K = 0.05\%/K = 1\%/ \Delta 20K$	
8	$V_{SIOV} = \left(\frac{Z_{SIOV}}{Z_{source} + Z_{SIOV}} \right) V$	
9	$i^* \leq i_{max}$	
10	$W^* \leq W_{max}$	
11	$P^* \leq P_{max}$	
12	$i^* = \frac{V_s - V_{SIOV}}{Z_{source}}$	
13	$\tau \approx \frac{L}{R_{Cu} + R_{SIOV}} [s]$ L [H] Inductance R_{Cu} [Ω] Coil resistance R_{SIOV} [Ω] SIOV resistance at operating current	
14	$t_r^* = \frac{\int i^* dt}{\hat{i}^*}$	
15	$\frac{t_{37\%}}{t_{50\%}} = \frac{I_n 0.37}{I_n 0.50} = \frac{-0.994}{-0.693} = 1.43 = \frac{\tau}{T_r}$	
16	$W^* = \hat{v}^* \hat{i}^* t_r^*$ $[J]$ $\hat{v}^*$ [V] $\hat{i}^*$ [A] t_r^* [s]	
17	$W^* = \frac{1}{2} L i^{*2}$ $[J]$ L [H] i^* [A]	
18	$W_{max} = v_{max} i_{max} t_{rmax}$	

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19	$P^* = \frac{W^*}{T^*} = \frac{v^* \cdot i^* \cdot t_r^*}{T^*} [W]$	$W^* [J]$ $T^* [s]$ $v^* [V]$ $i^* [A]$ $t_r^* [s]$ $P^* [W]$	
20	$T_{min} = \frac{W^*}{P_{max}} [s]$	$W^* [J]$ $P_{max} [W]$ $T_{min} [s]$	
21	$\log V = b1 + b2 \cdot \log (I) + b3 \cdot e^{-\log (I)} + b4 \cdot e^{\log (I)}$	$I > 0$	
22	$AVR = \frac{v^*}{v_{max}}$		
23	$i_L = A + k\sqrt{t}$		
24	$\lambda_{[fit]} = \frac{10^9}{ML[h]}$		