SIOV metal oxide varistors

Equation overview

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Equation overview

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1	$I = K V^{\alpha}$ $\quad \alpha > 1$ 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	$\lvert TC \rvert < 0.5 \cdot 10^{-3}/K = 0.05\%/K = 1\%/\Delta 20K$	
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	$W^* = ½ L i^{*2}$ [J] L [H] i^* [A]	
18	$W_{max} = v_{max}\, i_{max}\, t_{r\,max}$	

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19	$P^* = \frac{W^*}{T^*} = \frac{v^* \cdot i^* \cdot t^*_r}{T^*}$ [W]	W^* [J] i^* [A] T^* [s] t^*_r [s] v^* [V]	
20	$T_{min} = \frac{W^*}{P_{max}}$ [s]	W^* [J] P_{max} [W]	
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	$\lambda[fit] = \frac{10^9}{ML[h]}$		