

SIOV metal oxide varistors

Equation overview

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Equation overview

Equation no.		Page					
1	$I = K V^{\alpha} \qquad \qquad \alpha > 1$ $I \qquad \text{Current through varistor}$ $V \qquad \text{Voltage across varistor}$ $K \qquad \text{Ceramic constant (depending on varistor type)}$ $\alpha \qquad \text{Nonlinearity exponent}$ $(\text{measure of nonlinearity of curve})$						
2	$R = \frac{V}{I} = \frac{V}{KV^{\alpha}} = \frac{1}{K}V^{1-\alpha}$						
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* ≤i _{max}						
10	$W^* \le W_{max}$						
11	$P^* \le P_{max}$						
12	$i^* = \frac{V_s - V_{SIOV}}{Z_{source}}$						
13	$\tau \approx \frac{L}{R_{Cu} + R_{SIOV}} \left[s \right] \hspace{1cm} \begin{array}{c} L & [H] & Inductance \\ R_{Cu} & [\Omega] & Coil \ resistance \\ R_{SIOV} & [\Omega] & SIOV \ resistance \ at \ operating \ current \end{array}$						
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	$W^* = \hat{v}^* \hat{i}^* t^*_r$ $\begin{bmatrix} \hat{v}^* & [V] \\ \hat{i}^* & [A] \\ t^*_r & [s] \end{bmatrix}$						
17	$W^* = \frac{1}{2} \operatorname{L} i^{*2} $ [J] $\operatorname{L} [H]$ [A]						
18	$W_{\text{max}} = v_{\text{max}} i_{\text{max}} t_{\text{r max}}$						



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Equation no.						Page
19	$P^* = \frac{W^*}{T^*} = \frac{v^* i^* t^*_r}{T^*} [W]$	W* T* v*	[J] [s] [V]	i* t* _r P*	[A] [s] [W]	
20	$T_{\min} = \frac{W^*}{P_{\max}}[s]$	W* P _{max}	[J]	T _{min}	[s]	
21	$\log V = b1 + b2 \cdot \log (I) + b3 \cdot e^{-\log (I)} + b4 \cdot e^{\log (I)}$			l > 0		
22	$AVR = \frac{V^*}{V_{max}}$					
23	$i_L = A + k\sqrt{t}$					
24	$\lambda[\text{fit}] = \frac{10^9}{\text{ML[h]}}$					