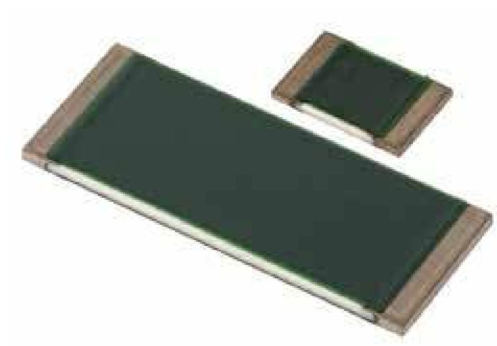
TFSS Series

Thick film Surface Mount
Surge-capable Non-inductive



FEATURES

- Excellent for medical surge protection applications
- Ideal to replace standard carbon composition resistors
- Custom dimensions, values, tolerances and characteristics available

The TFSS Series has been specifically developed to absorb large amounts of energy by efficient use of its compact mass. Ideal for medical surge protection applications, these thick film resistors offer non-inductive performance in a surface mount package.

Uses include power supply conversion, electron microscopes, X-ray systems, high-resolution CRT displays, defibrillators, and geophysical instrument related products.

SERIES SPECIFICATIONS

Type	Watts	KV	Energy (J)
TFSS A	0.50	3	6
TFSS B	0.50	3.5	9
TFSS C	0.75	4	11
TFSS D	1.00	7	33
TFSS E	1.50	7	44
TFSS F	2.00	11	55

CHARACTERISTICS

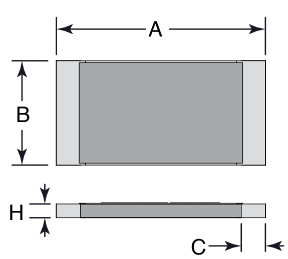
Resistive Element	Thick Film
Termination	Wraparound, 5 sides
Encapsulation	Overglaze
Resistance Value	100Ω up to 10KΩ
Tolerance	±1%, ±2%, ±5%, ±10%
Operating Temperature	-40°C to +155°C
Temperature Coefficient	±100 ppm/°C
TCR Temp Range	0°C to +85°C
Solderability	Mil-Std-202 >95%
Material	96% Alumina Substrate TF: PdAg Conductor, RuO2 Resistor, Glass coating

Notes

- Momentary overload capability is 5 times rated power for 1 second or 2 times rated power for 5 seconds. Always verify designs with pulse and surge conditions through thorough testing of the design at maximum operating temperature and maximum pulse loading (or some margin above maximum pulse loading).
- Damage to the resistor by excessive pulse loading is generally indicated by an increasing resistance of the resistor.
- Energy ratings are based on single pulses (at least 1 minute between pulses).
- For multiple pulse applications the energy pulse rating should be reduced and the average power should not exceed the nominal power rating of the selected model.
- See Single Pulse Energy section for more information

DIMENSIONS

mm



Type	Watts	A	B	C	H
TFSS A	0.50	9	5.5	1.25	0.7
TFSS B	0.50	11	5.5	1.25	0.7
TFSS C	0.75	13	5.5	1.25	0.7
TFSS D	1.00	21	8	1.65	0.9
TFSS E	1.50	21	10.5	1.65	0.9
TFSS F	2.00	26	10.5	1.65	0.9

(continued)

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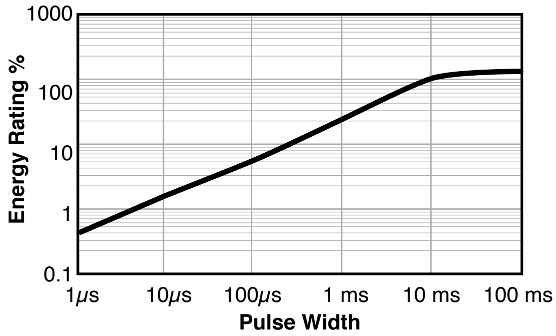
SINGLE PULSE ENERGY RATING

Maximum Individual Pulse Rating



Published energy rating is for 10ms pulse. For shorter pulses energy rating has to be derated according to Max. Individual Pulse Rating chart and Single Pulse Energy Rating in TFSS consideration.

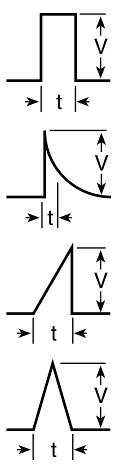
Although Ohmite's TFSS Series resistors have been specially designed and developed to absorb much more energy than standard resistors, pulses and transients require special consideration since they cause an instantaneous temperature rise in the resistor film. This application note can guide you through these considerations.

For applications with transients, pulses or surges the following must be considered:

1. Do not exceed the normal rated operating voltage of the device.
2. Using the figure at right, estimate the energy (E_a) and the pulse duration (t_a) for a single pulse in your application.
3. Calculate the energy ratio in percent (E_r) between the nominal energy rating of the model you have chosen (see table) and the single pulse energy in your application (E_a from step 2) using the formula:

$$E_r = \frac{E_a}{E_{nominal}} \times 100$$

4. Refer to the Pulse Chart. On this chart find the point where the energy ratio (E_r), found at step 3, and time (t_a) coincide. Qualify that this point falls below the maximum pulse energy curve. If the point is above the curve a bigger model should be chosen.



$$E = \frac{V^2t}{R}$$

$$E = \frac{1}{2}CV^2 \quad t = RC$$

$$E = \frac{V^2t}{3R}$$

$$E = \frac{V^2t}{3R}$$

E =	Energy	(joules)
t =	Time	(seconds)
V =	Voltage	(volts)
R =	Resistance	(ohms)
C =	Capacitance	(farads)

Example

A 1μF capacitor is charged to 3.5kV and model TFSSC, 1KΩ has been selected. Model TFSSC is rated for 4kV, so the peak voltage of 3.5kV is acceptable.

$$E_a = \frac{1}{2}CV^2 = 6.1J$$

$$t_a = R\,C = 1\text{ ms}$$

$$E_r = \frac{6.1J}{11J} \times 100 = 55\%$$

According to the pulse chart, an energy ratio of 55% for a pulse width of 1ms falls well above the energy curve. The limit is actually located around 25-30%. Model TFSSC cannot be used for this application.

A bigger model should be chosen, for example TFSSD. Model TFSSD, 1KΩ, can be used for this application because we have an energy ratio E_r of 18%, which is below the energy curve.

$$E_r = \frac{6.1J}{33J} \times 100 = 18\%$$

ORDERING INFORMATION

RoHS Compliant

T F S S A 1 0 K 0 J E

Series

Energy Rating
joules
A = 6 D = 33
B = 9 E = 44
C = 11 F = 55

Ohm Value
Example:
100R = 100Ω
2K40 = 2400Ω

Tolerance
F = 1%
G = 2%
J = 5%
K = 10%

rev 8/22-8

OHMITE®