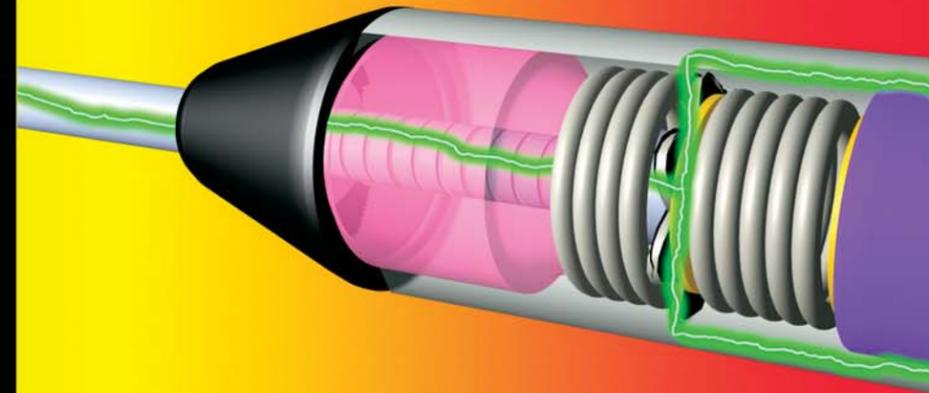


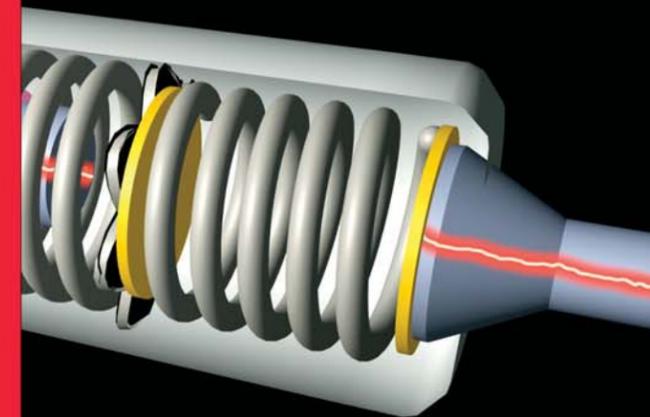


Thermal Cut-Offs

Produced by Hosho



**Fail-Safe,
High-Reliability
Thermal Protection**



World-wide Headquarters:

*The Hosho Corporation
Yushi Kogyo Kaikan
13-11, 3 Chome, Nihonbashi
Chuo-Ku, Tokyo 103-0027
Japan*

*Exclusive Hosho Sales Agents
and Distributors in the
Americas:*

*Thermshield LLC
PO Box 1641
Laconia, NH 03247 USA
Ph: 603-524-3714
Fax: 603-524-6602
Web: www.thermshield.com*

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0709/OEMM/10M

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Fail-Safe, High Reliability Thermal Protection

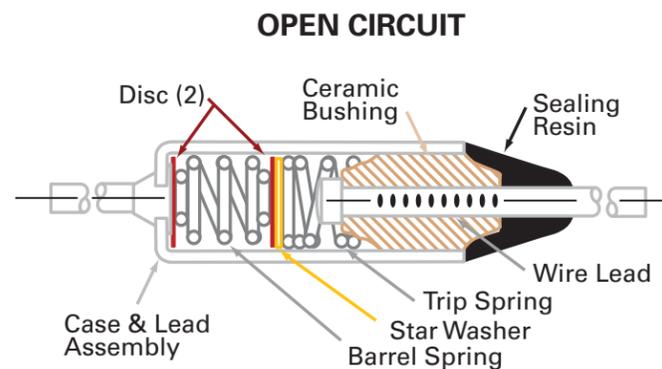
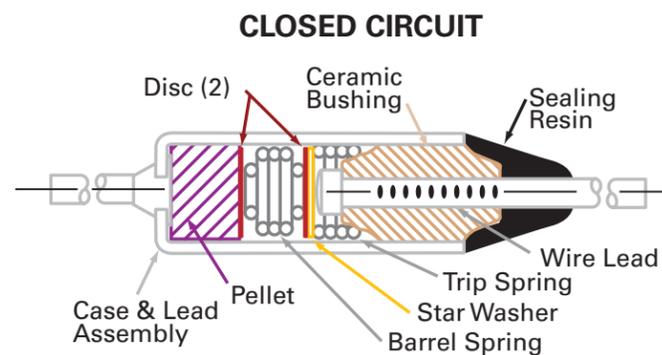


Figure 1. Thermal Cut-Offs (a) Closed Circuit; (b) Open Circuit

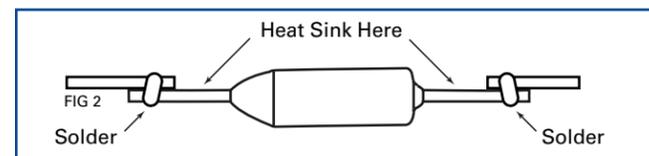


Figure 2. Soldering Technique

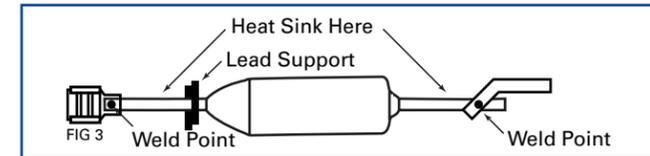


Figure 3. Welding Technique

Thermal Cut-Off Technology

Thermal Cut-Offs (TCOs) interrupt an electrical circuit when the ambient temperature of the environment in which they are used exceeds a narrow threshold or setpoint. The setpoint of a TCO can be precisely set to a well-defined temperature range, and will not increase when exposed to elevated temperatures. This is sharp contrast to eutectic-metallic technologies whose setpoint increases as the active elements oxidize due to exposure to elevated temperatures.

When the operating or environmental temperature exceeds the thermal rating of the TCO, a non-conductive, organic pellet changes phase, which allows spring-activated contacts to permanently open the circuit. TCOs are therefore a responsive, reliable, inexpensive, but one-shot device for catastrophic thermal protection.

Application Information

Elmwood TCOs are available in a variety of standard and custom configurations. All provide reliable, one-shot thermal protection. TCO performance can be affected by both the installation method and location; thorough testing of each is necessary for any application, both AC and DC.

Location

It is important to determine the proper location for a TCO to provide ample protection without tripping prematurely. Techniques to be considered include the use of infrared thermography, or a sufficient number of thermocouples to identify the highest temperature areas within the product to be protected.

Setpoint Temperature

A thermal cut-off should be selected with a rating above the maximum temperature that will be encountered during normal operation, including any short-term temperature overshoots. The life expectancy of the TCO will be determined by

the temperatures to which the TCO is exposed during normal operation. If the thermal setpoint rating is too close to the normal operating temperature environment, including overshoot temperatures after opening other safeguards such as thermostats, etc., the likelihood of a nuisance trip increases.

Any life curves for a TCO being considered should be used only as a guide; rather, actual life testing using functional TCOs for the particular application should be used to make a determination of the proper device to be used and its placement. Trade-offs must be made between response and overall life expectancy of the TCO based on the application within a product and its specific requirements. The variation in exposure temperatures from unit to unit should also be considered.

Temperature Limits

The life expectancy of a TCO is determined by normal operating temperatures and expected temperature overshoots. If the thermal cutoff rating is too close to normal operating temperatures, nuisance trips can result. TCOs of any rating (setpoint) should not be subjected to continuous normal operating temperatures higher than 200 °C. In addition, temperature overshoots should be minimized after the TCO opens to avoid dielectric breakdown and re-conduction of the TCO.

Soldering

The leads of the TCO should be heat-sinked during soldering (refer to Figure 2). Excessive heat conducted into the TCO can shorten its life. In addition, excessive lead temperatures can damage the epoxy seal and potentially causing the TCO to fail to open. Additional heat sinking is especially critical for TCOs with low temperature ratings (setpoints).

Welding

For similar reasons, the leads of the TCO should also be heat-sinked during welding (refer to Figure 3). To avoid damaging or welding internal parts, precautions should be taken so none

of the welding current is conducted through the TCO. Welding currents of hundreds of Amps can easily weld the internal TCO components together, resulting in it failing to open. In addition, the TCO leads should be supported during the welding operation to prevent breaking the epoxy seal.

Lead Forming

Special care must be taken when forming TCO leads so that the case will not be distorted or the epoxy seal cracked or broken. The TCO leads should be supported at each end near the TCO body. A minimum of 0.125" (3 mm) should be maintained between the epoxy seal and the bend in the lead.

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Thermal Cut Off Primary Selection/ID		
Part Number	Operating Temp., °C	Color Band
D070	68-72	Black
D076	73-77	Red
D081	80-84	Black
D088	86-90	Clear
D090	87-93	Blue
D098	96-100	Yellow
D103	100-104	Brown
D108	105-109	Green
D115	113-117	Violet
D118	115-121	Clear
D125	124-128	Blue
D139	135-141	Brown
D142	138-144	Yellow
D165	163-169	Orange
D181	180-184	Violet
D213	212-216	Black
D226	222-228	Red
D230	224-230	Green
D242	234-240	Green
D213C	212-216	Black
D242C	234-240	Green

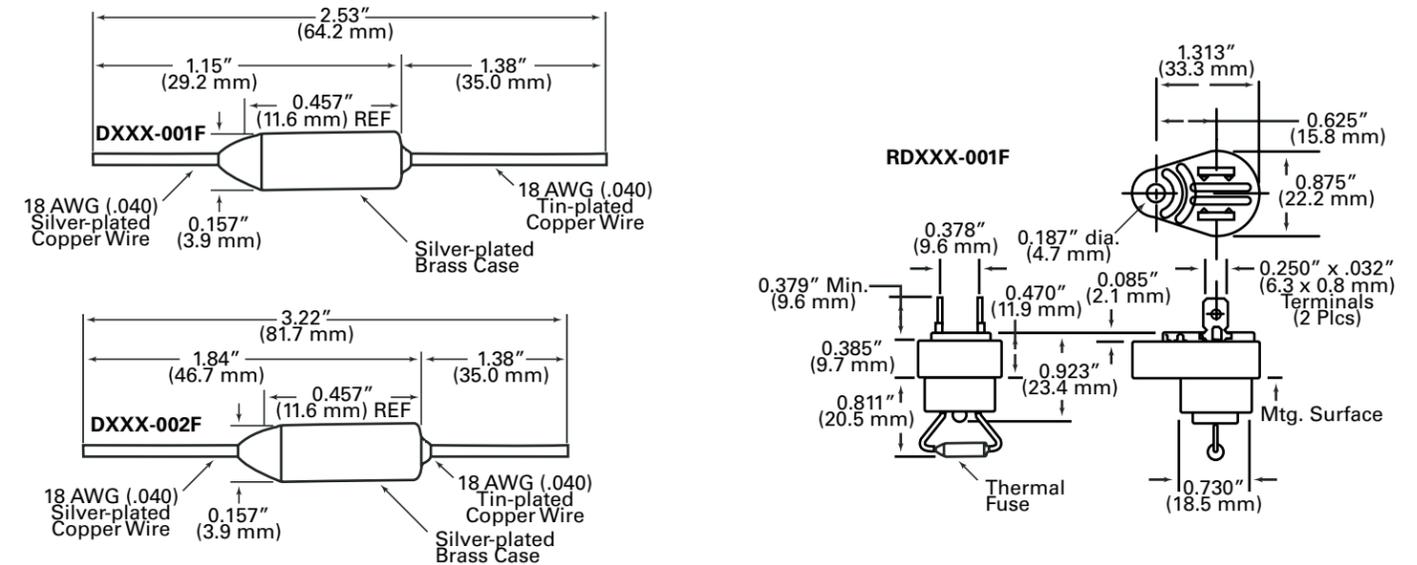
Thermal Cut-Off Approval Ratings (All Devices are RoHS-Compliant)							
Part No.	Functioning Temp. (T _F) and Tolerance			Holding Temp. (T _H) °C	Max. Temp. Limits (T _M) °C	Safety Approval	
	°C	°F	°C				
D070	72	162	+0/-4	65	115	UL, CSA, VDE, NEMKO, SEMKO	
D076	77	171	+0/-4	67	150		
D081	84	183	+0/-4	76	115		
D088	90	194	+0/-4	81	150		
D090	93	199	+0/-6	85	315		
D098	100	212	+0/-4	93	130		
D103	104	219	+0/-4	98	315		
D108	109	228	+0/-4	103	315		
D115	117	243	+0/-4	110	130		UL, CSA
D118	121	250	+0/-6	113	315		UL, CSA, VDE, NEMKO, SEMKO
D125	128	262	+0/-4	119	180		
D139	141	286	+0/-6	134	170		
D142	144	291	+0/-6	-	180		
D165	169	336	+0/-6	162	270(120V) 210(250V)		
D181	184	363	+0/-4	174	210		
D213	216	421	+0/-4	210	375		
D226	228	442	+0/-6	212	260(120V) 230(250V)		
D230	230	446	+0/-6	212	375		
D242	240	464	+0/-6	215	375		
D213C	216	421	+0/-4	212	375	UL, CSA, VDE, NEMKO, SEMKO	
D242C	240	464	+0/-6	215	375		

DXXX Electrical Rating					
	Voltage (AC)	Resistive Current		Inductive Current	
	(V _r)	(I _r)	(I _b)	(I _r)	(I _b)
UL, CSA	120 V/250 V (120 V for only D139)	16.7 A	25 A	0.84 A	5 LRA
All types except for D139, D226, D230					
VDE, SEMKO, NEMKO	120 V/250 V (120 V for only D139)	16.7 A (12 A for D213 only)	25 A	0.84 A	5 LRA
All types except for D139, D226, D230					
D213C, D242C Electrical Rating					
UL, CSA, VDE, SEMKO, NEMKO	120 V/250 V	10 A	15 A	-	-

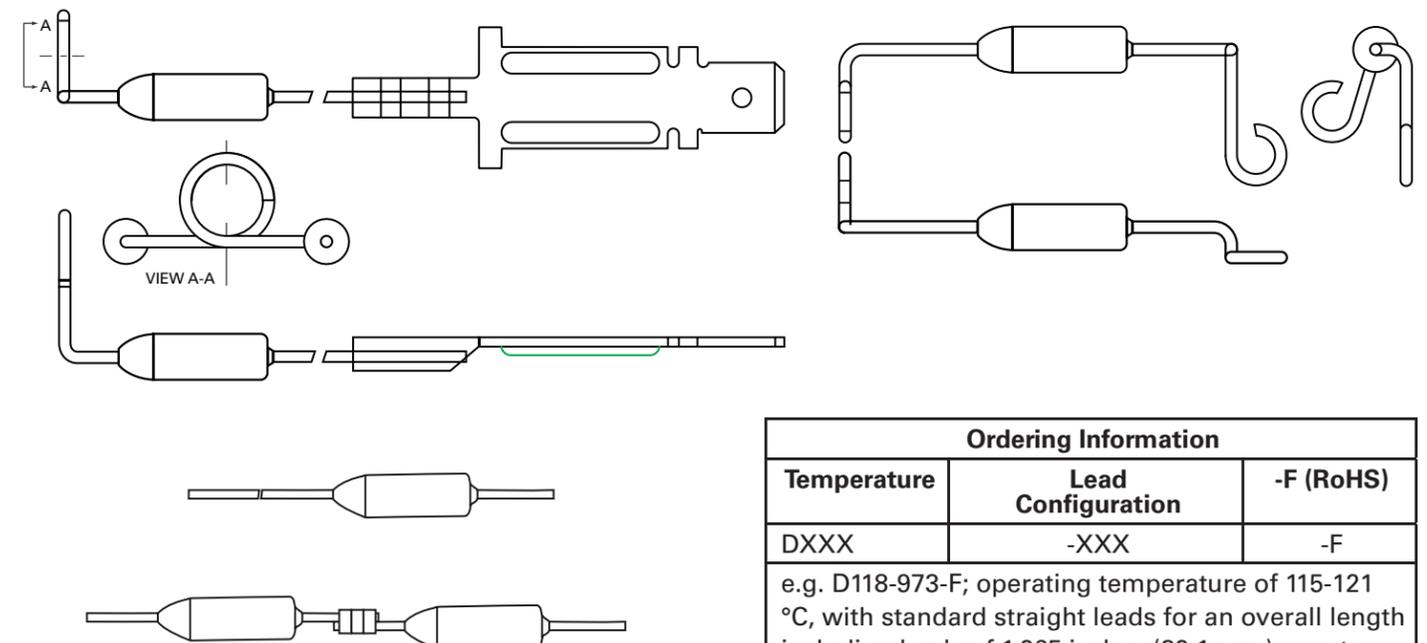
Worldwide Electrical Approvals

- UL - United States
- CSA - Canada
- VDE - Germany
- SEMKO - Sweden
- NEMKO - Norway
- CCC - China
- JET - Japan

Standard Configurations



Secondary Operations: Cut Leads To Custom Lengths - Custom Lead Bending and Terminations



Ordering Information		
Temperature	Lead Configuration	-F (RoHS)
DXXX	-XXX	-F
e.g. D118-973-F; operating temperature of 115-121 °C, with standard straight leads for an overall length including leads of 1.265 inches (32.1 mm), meets RoHS requirements; for -xxx lead configuration, please contact Thermshield LLC.		

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Typical Applications

Small Appliances

- Drip Coffeemakers
- Microwave Ovens
- Rice Cookers
- Hair Dryers



Office Automation

- Copiers
- Laser Printers
- Fax Machines
- Duplicators



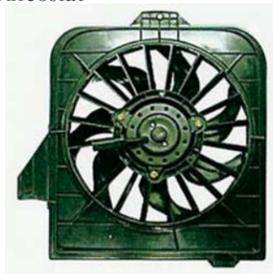
Power Management

- Battery Packs
- Cellphones
- Cordless Tools
- Camcorders
- Power Strips
- Surge Suppressors
- UPS



Automotive

- Dimmer Switch Rheostat
- Cigarette Lighter
- Radiator Fan



HVAC

- Air Conditioners
- Dehumidifiers
- Duct Heaters
- Exhaust Fans



Industrial

- Fractional HP Motors
- Ceiling Fans
- Plating Baths
- Film Developing



QUOTE REQUEST FORM

Thermshield, LLC
The Hosho Corp.
Tel. 888-524-3714
Fax 603-524-6602
e-mail info@thermshield.com

Customer Information

Full Company Name _____
 Requestor's Name _____
 Telephone# _____
 Address _____

Application Information

End Product _____
 End User Name (For Distributors) _____
 Amount of Voltage and Amperage to be Applied to TCO
 Voltage _____ Amperage _____ AC _____ or DC _____
 Resistive _____ or Inductive _____
 Secondary Operation (Assembly, bending, connector, etc. attach drawing or sketch) _____

Project Information

TCO Part Number _____
 Environmental Temp. _____
 How TCO will be mounted _____
 Required Safety Approvals UL _____ VDE _____ JET _____ Other _____
 EAU _____ Start Date of Project _____ Samples Required _____

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