April 27, 2005

LORD
THERMOSET
Advanced Electronic Materials

TC-228

HIGH TEMPERATURE RESISTANT, ALCOHOL CLEANABLE, THERMALLY CONDUCTIVE GREASE

Description:

Lord TC-228 is a non-reactive, non-silicone, thermally conductive grease with a non-flowable consistency. It is rated for use in applications where the continuous operating temperature is ≤ 200°C and can withstand intermittent exposure up to 300°C. TC-228 is designed for use in applications where a silicon-free thermal interface material is required and where the device may later need to be easily removed from the heat sink. It can be used with a variety of emerging and standard devices including microprocessors, DSPs, graphic accelerators, etc. packaged in flip-chip, PPGA, BGA. MicroBGA and other package types. TC-228 exhibits low bleed and has a successful history of use in demanding environments, including microprocessor flip-chip applications.

Other typical device applications include multi-chip modules, power transistors, diodes, and silicon-controlled rectifiers. In these situations, a small amount of the thermally conductive grease is applied to either the substrate or the device. The thixotropic character of the TC-228 grease will usually hold the device in place until it is mechanically attached.

Lord TC-228 is easily removed with isopropyl alcohol or acetone. This prevents having to use a solvent that may be toxic or contain CFCs that carry a federal tax burden. TC-228 does not contain a silicone carrier or abrasive fillers.

Key Features and Benefits:

+ Superior Thermal Performance – 0.9 W/m°C
+ Rated for 200°C Continuous Operation
+ Silicone-Free
+ Thin Bondlines ≤ 1 mil
+ Easy to Apply by Dispensing or Printing
+ Reworkable/Easy to Remove
+ Alcohol Cleanable
+ Good 85/85 and other Reliability Performance
+ Low Bleed
+ High Volume Resistivity

Typical Properties:

Viscosity (cps)	350,000
Specific Gravity	2.36
Evaporation (%) (24 Hours @ 150°C)	.5 Max.
Bleed (24 hours @ 150°C)	Nil
Thermal Conductivity W/mK (ASTM F-433)	1.1
Color	Blue
Maximum Continuous Service Temperature (°C)	200
Shelf Life @ 25°C (months)	6
@ -15°C (months)	12
Weight Loss (%)	
after 24 hours @ 150°C	0.5 max.
after 1 hour @ 300°C	1.7
Dielectric Constant @ 25°C	
10 kHz	2.85
100 kHz	2.80
1MHz	2.75
(ASTM D 150)	
Dissipation Factor @ 25°C	
10 kHz	0.0202
100 kHz	0.0101
1MHz	0.0123
(ASTM D 150)	

Shelf Life:

TC-228 has a shelf life of six months at 25°C in unopened containers. Slight settling of the filler may occur during long-term storage at room temperature. If storage time will exceed the room temperature shelf life of 6 months, we recommend storing the material at -15°C to avoid settling.

Clean-Up:

It is recommended that customers use disposable containers and utensils whenever possible to simplify clean-up. However, when disposable materials are impractical, TC-228 can be removed by cleaning equipment with solvents such as isopropyl alcohol or acetone. Observe appropriate precautions when using flammable solvents. Solvent-cleaned utensils should be thoroughly dried. Any remaining solvent can contaminate TC-228 during the next application or use.

Handling Precautions:

The labels on containers of Lord materials contain current information on the hazards associated with each particular product. Most resins and hardeners are skin and eye irritants, and some may actually be corrosive to the skin and eyes. Other problems, such as skin sensitization or serious health hazards may exist. Further information on each product is contained in the Material Safety Data Sheet, which will be sent upon request.

DS3740

Shipping and Unpacking Procedure:

This material is packed and shipped in Johnny Blue Ice at approximately 5°C to protect it from thermal excursions during shipment. The substantially engineered system of an insulated container and packing material is designed to protect the material for up to 6 days in transit (international) and up to 48 hours in transit (domestic). It is critical that the shipping container is not opened in transit and that the shipment be expedited during transit to its final destination. **DO NOT ALLOW THE SHIPMENT TO BE LEFT ON LOADING DOCKS, IN CUSTOMS WAREHOUSES, OR ON FREIGHT TRUCKS FOR LONG TIME PERIODS.**

Maintaining temperature at or below 5°C, but not less than 0°C, upon receipt is critical to maintain the functionality and performance of the material. Failure to maintain temperature at 0°C to 5°C, unless otherwise stated on the technical data sheet, will void any warranties and may adversely affect performance.

Upon receipt, the syringes must be transferred from the shipping container to a suitable storage environment.

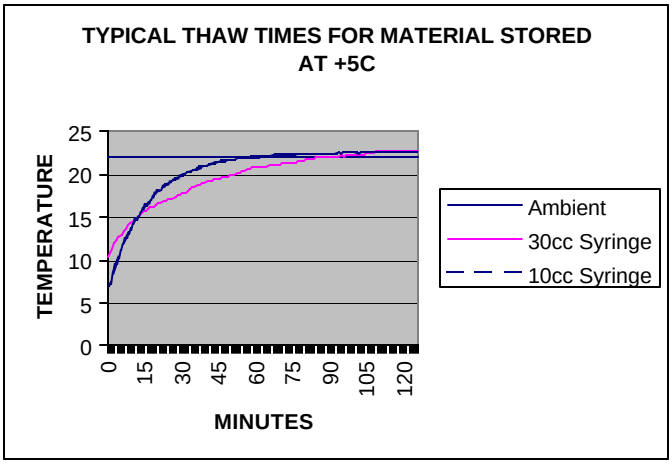
NOTE: Please refer to the technical data sheet for alternative storage condition recommendations.

Storage and Thaw Procedure:

ALL SYRINGES MUST BE STORED AS RECOMMENDED (TYPICALLY 0°C TO 5°C) IN AN UPRIGHT (VERTICAL) POSITION WITH THE SYRINGE TIP FACING DOWN. DO NOT LAY SYRINGES ON THEIR SIDES (HORIZONTALLY) UNDER ANY CIRCUMSTANCES.

Prior to application, the material must be allowed to thaw naturally to room temperature (ideally 20-25°C) by placing the syringes in a vertical position with dispense tip facing downward in an ambient environment. This is a critical step for obtaining optimum dispensing performance.

Under no circumstance should artificial heat sources be used to increase thaw speed. Do not place the syringes in warm water or near any heat source including ovens, hot plates, hot air guns, etc. Thaw time varies by package style and size and is typically 45 to 75 minutes based on ambient temperature. Please refer to the chart below.



Do not use the syringes before contents reach ambient temperature. Wipe all excess moisture from the syringes prior to use. A small amount of air in the tip-cap area is normal. Carefully remove the tip cover and manually extrude a small amount of material displacing any air that may be in the tip – cap interface. Mount the syringe onto the dispense equipment that has been thoroughly cleaned and purge material through the system until an unbroken flow of material is extruded. The system is now ready to begin dispensing.

Once thawed to room temperature, the syringes must be consumed within the allotted working life specified then discarded. Under no circumstances should the material be refrozen for reuse or consumed after the working life has expired.

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