REVISION HISTORY				
REV.	**DESCRIPTION**	**ER NUMBER**	**DATE**	**APPROVAL**
1.0	INITIAL RELEASE.	ER-47911	05/04/18	A.LETSO

TECHNICAL BULLETIN FOR M87784 KEYBOARD

CUSTOMER

APPROVALS	DATE
Drawn P.HUTCHINS	04/30/18
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.XX ± .010		
.XXX ± .005		

TITLE: TECHNICAL BULLETIN FOR M87784 KEYBOARD

SIZE	CAGE CODE	DWG NO	REV
A	12522	TB-224	1.0

SCALE	WT	SHEET
NONE		SHEET 1 OF 15

1.0 Purpose

The purpose of this technical bulletin is to provide details of modifications proposed to the M87784 Keyboard to; 1) improved reliability of trackball function, and 2) improve keyboard performance as a component of the Boeing KC46A Military Data Network (MDN).

2.0 Customer

Boeing Defense

3.0 Background

During Boeing functional testing of the M87784 keyboard two performance issues were discovered. First, the trackball experienced a failure during the Boeing Functional Test 842-714621. The second failure mode was the keyboard would shut down during connectivity testing within the KC46 communication network.

Through collaborative efforts, Boeing and Staco Systems engineered and tested successful corrective action, which is detailed in the following bulletin and instructions to correct all field installed products.

This report presents the evaluation results, recommended product enhancements and corrective actions required by the M87784 keyboard when used with the Boeing KC46A MDN. Specifically, it details changes to the trackball unit to pass Boeing's functional testing and changes to the Firmware to conform to the KST's current limit requirement.

4.0 Enhancements

4.1 Trackball:

- Boeing evaluation revealed the silicone rubber O-ring seal was folding under the trackball when short/sharp strikes were made to the trackball (Figure 1). This condition also allowed for the rollerball subcomponent to disengage from the unit.

Figure 1 Silicon Rubber Seal Folding as a result of use of short/sharp strikes.

- The hardness (durometer scale) of the silicon rubber O-ring seal component of the M87784 Trackball Assembly (P/N 137500-003, Figure 2) may contribute to this condition.

Figure 2 Trackball Assembly 137500-003

- The silicon rubber O-ring seal, located in the trackball retaining ring (with a polyurethane coating), was evaluated with a new O-ring seal with a higher durometer scale. Test results indicated acceptable results with no instances of mechanical or electrical failure.
- As an additional preventive measure, a thread lock adhesive (Loctite 422, Appendix A) was applied to the O-ring seal (Figure 3) to prevent loosening of the O-ring during use and potential creation of FOD (Foreign Object Debris) issues on-board the aircraft.

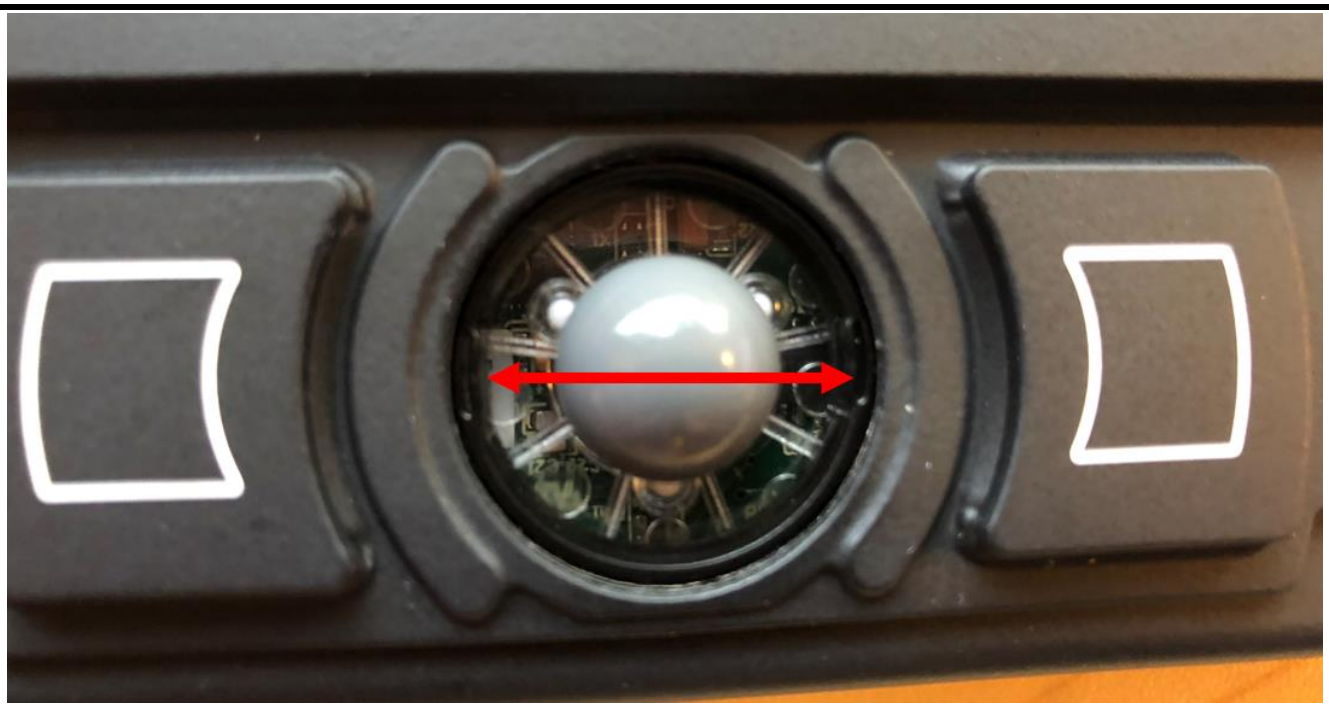


Figure 3 Location of Loctite 422 application

4.1 Current Management:

- During Boeing's evaluation, the keyboard exhibited a "shutdown" failure mode. The failure mode was only exhibited while the keyboard was within the Boeing communication network. "Shutdown" mode was attributed to the keyboard possibly exceeding inrush current limitations or exceeding steady state current ratings at initialization. It was also noted that in certain instances, Boeing, could adjust the initialization lighting output to prevent the "shutdown" occurrence. Table 1 indicates initial readings of steady state inrush current readings (peak) that were above the 525 mA steady state current specification and possibly causing the shutdown to occur.

Table 1: Scope Measurements supplied by Boeing

	Model/Serial Number	STACO M87784/Proto1	STACO M87784/0042	STACO M87784/0045	STACO M87780/0010	STACO M87780/0005
	Inrush at Lighting Level 0	2.72 Amp/20 µS	3.23 Amp/20 µS	3.17 Amp/20 µS	2.71 Amp/20 µS	2.62 Amp/20 µS
	Inrush at Lighting Level 1	2.60 Amp/20 µS	3.24 Amp/20 µS	3.12 Amp/20 µS	2.77 Amp/20 µS	2.86 Amp/20 µS
(A)	Inrush at Lighting Level 2	2.58 Amp/20 µS	3.20 Amp/20 µS	3.14 Amp/20 µS	2.62 Amp/20 µS	2.86 Amp/20 µS
(B)	Inrush at Lighting Level 3	2.59 Amp/20 µS	3.14 Amp/20 µS	2.97 Amp/20 µS	2.58 Amp/20 µS	2.86 Amp/20 µS
	Inrush at Lighting Level 4	2.73 Amp/20 µS	3.20 Amp/20 µS	3.24 Amp/20 µS	2.83 Amp/20 µS	2.81 Amp/20 µS
	Inrush at Lighting Level 5	2.75 Amp/20 µS	3.13 Amp/20 µS	3.02 Amp/20 µS	2.73 Amp/20 µS	2.79 Amp/20 µS
(C)	Steady State RMS at Lightting Level 0	78.3 mA	78.9 mA	78.8 mA	61.9 mA	62.3 mA
(D)	Steady State Inrush Peak at Lighting Level 0	N/A	N/A	N/A	N/A	N/A
(E)	Steady State Inrush Timing at Lighting Level 0	N/A	N/A	N/A	N/A	N/A
(F)	Steady State Inrush Period at Lightting Level 0	N/A	N/A	N/A	N/A	N/A
(C)	Steady State RMS at Lightting Level 1	115 mA	159 mA	112 mA	92 mA	96 mA
(D)	Steady State Inrush Peak at Lighting Level 1	320 mA	396 mA	230 mA	152 mA	154 mA
(E)	Steady State Inrush Timing at Lighting Level 1	800 µS	800 µS	800 µS	800 µS	800 µS
(F)	Steady State Inrush Period at Lightting Level 1	1.87 mS	1.87 mS	2.06 mS	1.87 mS	1.87 mS
(C)	Steady State RMS at Lightting Level 2	210 mA	293 mA	274 mA	154 mA	156 mA
(D)	Steady State Inrush Peak at Lighting Level 2	410 mA	742 mA	564 mA	352 mA	344 mA
(E)	Steady State Inrush Timing at Lighting Level 2	1100 µS	30 µS	90 µS	600 µS	600 µS
(F)	Steady State Inrush Period at Lightting Level 2	1.87 mS	1.87 mS	1.87 mS	1.87 mS	1.87 mS
(C)	Steady State RMS at Lightting Level 3	284 mA	350 mA	329 mA	243 mA	244 mA
(D)	Steady State Inrush Peak at Lighting Level 3	688 mA	784 mA	606 mA	622 mA	590 mA
(E)	Steady State Inrush Timing at Lighting Level 3	30 µS	30 µS	100 µS	80 µS	80 µS
(F)	Steady State Inrush Period at Lightting Level 3	1.87 mS	1.87 mS	1.87 mS	1.87 mS	1.87 mS
(C)	Steady State RMS at Lightting Level 4	308 mA	407 mA	380 mA	265 mA	260 mA
(D)	Steady State Inrush Peak at Lighting Level 4	704 mA	804 mA	704 mA	652 mA	620 mA
(E)	Steady State Inrush Timing at Lighting Level 4	30 µS	60 µS	90 µS	70 µS	70 µS
(F)	Steady State Inrush Period at Lightting Level 4	1.87 mS	1.87 mS	1.87 mS	1.87 mS	1.87 mS
(C)	Steady State RMS at Lightting Level 5	384 mA	445 mA	421 mA	323 mA	321 mA
(D)	Steady State Inrush Peak at Lighting Level 5	776 mA	700 mA	670 mA	880 mA	840 mA
(E)	Steady State Inrush Timing at Lighting Level 5	80 µS	30 µS	50 µS	80 µS	80 µS
(F)	Steady State Inrush Period at Lightting Level 5	1.87 mS	1.87 mS	1.87 mS	1.87 mS	1.87 mS

- After several iterations, it was agreed the following:
  - Staco would eliminate level 5 brightness to reduce steady state current draw.
  - Staco would improve PWM pulsation to lower current peaks associated with each square wave pulse designed for LED dimming.
- The current limiting fuse used in the M87784 series keyboards has a value of 750mA and may contribute to the in-rush current measurements recorded during the Boeing evaluation. For evaluation, a hardware change to the M87784 Keyboard (SN0023) modified the current limiting fuse's value to 500mA (MFR: Littelfuse P/N 1206L050YR, Appendix B) from 750mA. Implementation of the lower value fuse had an overall effect of inrush current as seen in Table 2.

Table 2 Scope Measurements Supplied by Boeing

	Model/Serial Number	STACO M87784/0023
(A) (B)	Inrush at Lighting Level 0	
	Inrush at Lighting Level 1	
	Inrush at Lighting Level 2	
	Inrush at Lighting Level 3	
	Inrush at Lighting Level 4	
	Inrush at Lighting Level 5	
(C)	Steady State RMS at Lightting Level 0	77.4 mA
(D)	Steady State Inrush Peak at Lighting Level 0	
(E)	Steady State Inrush Timing at Lighting Level 0	
(F)	Steady State Inrush Period at Lightting Level 0	
(C)	Steady State RMS at Lightting Level 1	124 mA
(D)	Steady State Inrush Peak at Lighting Level 1	462 mA
(E)	Steady State Inrush Timing at Lighting Level 1	
(F)	Steady State Inrush Period at Lightting Level 1	5.45 ms
(C)	Steady State RMS at Lightting Level 2	251 mA
(D)	Steady State Inrush Peak at Lighting Level 2	546 mA
(E)	Steady State Inrush Timing at Lighting Level 2	
(F)	Steady State Inrush Period at Lightting Level 2	5.45 ms
(C)	Steady State RMS at Lightting Level 3	293 mA
(D)	Steady State Inrush Peak at Lighting Level 3	546 mA
(E)	Steady State Inrush Timing at Lighting Level 3	
(F)	Steady State Inrush Period at Lightting Level 3	5.45 ms
(C)	Steady State RMS at Lightting Level 4	358 mA
(D)	Steady State Inrush Peak at Lighting Level 4	542 mA
(E)	Steady State Inrush Timing at Lighting Level 4	
(F)	Steady State Inrush Period at Lightting Level 4	5.45 ms
(C)	Steady State RMS at Lightting Level 5	
(D)	Steady State Inrush Peak at Lighting Level 5	
(E)	Steady State Inrush Timing at Lighting Level 5	
(F)	Steady State Inrush Period at Lightting Level 5	

- The lighting levels used in the M87784 series keyboards allowed for 5 levels of active lighting controlled by Firmware Number: M877-20160803. Upon modification of the pulsation of the PWM firmware, it was noticeable that lighting level 5 was less controllable through firmware adjustments. Upon further discussion, it was determined that for expediency, Boeing would allow elimination of the 5th lighting level, which was performed through firmware update (Firmware Number : M877-20180410).
- The results of the keyboard performance after modification were accepted by Boeing to work within the KC46 communication network.

5.0 M8774 Keyboard Corrective Action and Resolution Instructions

All Boeing keyboards in their possession of revision level 1.0 or 1.1 (Serial #'s specified in table 3), will require rework of the trackball O-ring seal, retaining ring, current limit fuse and firmware update to revision M877-20180410. The rework will be issued under and Return Material Authorization (RMA) from Staco Systems.

All future production for M87784 keyboards from Staco will have incorporated the aforementioned improvements per revision 1.2.

Table 3: Serial #'s that require rework

SERIAL NUMBERS	
00001	00043
00002	00044
00003	00045
00004	00046
00005	00047
00006	00048
00007	00049
00008	00050
00009	00051
00010	00052
00011	00053
00012	00055
00013	00056
00014	00057
00015	00058
00016	00059
00017	00061
00018	00062
00019	00063
00020	00064
00021	00065
00024	00066
00025	00067
00026	00068
00027	00069
00028	00070
00029	00071
00030	00072
00031	00073
00032	00074
00033	00075
00034	00076
00035	00077
00036	00078
00037	00079
00038	00080
00039	00123
00040	00124
00041	00125
00042	00126

LOCTITE

Technical Data Sheet

LOCTITE® 422™

January 2010

PRODUCT DESCRIPTION

LOCTITE® 422™ provides the following product characteristics:

Technology	Cyanoacrylate
Chemical Type	Ethyl cyanoacrylate
Appearance (uncured)	Clear liquid[LMS]
Components	One part - requires no mixing
Viscosity	High
Cure	Humidity
Application	Bonding
Key Substrates	Plastics, Rubbers and Metals

LOCTITE® 422™ is a general purpose cyanoacrylate instant adhesive.

Mil-A-46050C

LOCTITE® 422™ is tested to the lot requirements of Military Specification Mil-A-46050C. **Note:** This is a regional approval. Please contact your local Technical Service Center for more information and clarification.

Commercial Item Description A-A-3097:

LOCTITE® 422™ has been qualified to Commercial Item Description A-A-3097. **Note:** This is a regional approval. Please contact your local Technical Service Center for more information and clarification.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.05
Viscosity, Cone & Plate, mPa·s (cP):	
PHYSICA MK22 @ 100 s-1	1,700 to 3,000[LMS]
Viscosity, Brookfield - LVF, 25 °C, mPa·s (cP):	
Spindle 2, speed 6 rpm,	2,000 to 2,500
Vapour Pressure, hPa	<1
Flash Point - See SDS	

TYPICAL CURING PERFORMANCE

Under normal conditions, the atmospheric moisture initiates the curing process. Although full functional strength is developed in a relatively short time, curing continues for at least 24 hours before full chemical/solvent resistance is developed.

Cure Speed vs. Substrate

The rate of cure will depend on the substrate used. The table below shows the fixture time achieved on different materials at 22 °C / 50 % relative humidity. This is defined as the time to develop a shear strength of 0.1 N/mm² .

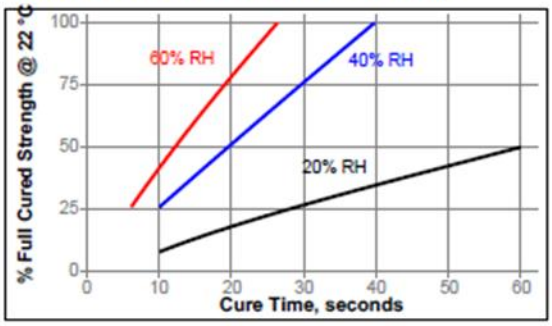
Fixture Time, seconds:	
Mild Steel (degreased)	20 to 50
Aluminum (degreased)	10 to 30
Zinc dichromate	40 to 100
Neoprene	<5
Rubber, nitrile	<5
ABS	15 to 40
PVC	20 to 50
Polycarbonate	30 to 70
Phenolic	10 to 40

Cure Speed vs. Bond Gap

The rate of cure will depend on the bondline gap. Thin bond lines result in high cure speeds, increasing the bond gap will decrease the rate of cure.

Cure Speed vs. Humidity

The rate of cure will depend on the ambient relative humidity. The following graph shows the tensile strength developed with time on Buna N rubber at different levels of humidity.



Cure Speed vs. Activator

Where cure speed is unacceptably long due to large gaps, applying activator to the surface will improve cure speed. However, this can reduce ultimate strength of the bond and therefore testing is recommended to confirm effect.

Henkel

TYPICAL PROPERTIES OF CURED MATERIAL

After 24 hours @ 22 °C

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}	100×10^{-6}
Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)	0.1
Softening Point, DIN EN 1427, °C	165

Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:

0.1 kHz	2 to 3.3 / <0.02
1 kHz	2 to 3.5 / <0.02
10 kHz	2 to 3.5 / <0.02
Volume Resistivity, IEC 60093, Ω·cm	2×10^{15} to 10×10^{15}
Surface Resistivity, IEC 60093, Ω	10×10^{15} to 80×10^{15}
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	25

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

After 24 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm²	18 to 26
	(psi)	(2,610 to 3,770)
Aluminum (grit blasted)	N/mm²	12 to 19
	(psi)	(1,740 to 2,755)
Zinc dichromate	N/mm²	6 to 13
	(psi)	(870 to 1,885)
ABS	N/mm²	6 to 20
	(psi)	(870 to 2,900)
PVC	N/mm²	6 to 20
	(psi)	(870 to 2,900)
Polycarbonate	N/mm²	5 to 20
	(psi)	(725 to 2,900)
Phenolic	N/mm²	5 to 15
	(psi)	(725 to 2,175)
Neoprene	N/mm²	5 to 15
	(psi)	(725 to 2,175)
Nitrile	N/mm²	5 to 15
	(psi)	(725 to 2,175)

Tensile Strength, ISO 6922:

Steel	N/mm²	12 to 25
	(psi)	(1,740 to 3,625)
Buna-N	N/mm²	5 to 15
	(psi)	(725 to 2,175)

"T" Peel Strength, ISO 11339:

Steel (degreased)	N/mm	<0.5
	(lb/in)	(<2.8)

After 10 seconds @ 22 °C

Tensile Strength, ISO 6922:

Buna-N	N/mm²	≥6.0[LMS]
	(psi)	(≥870)

TYPICAL ENVIRONMENTAL RESISTANCE

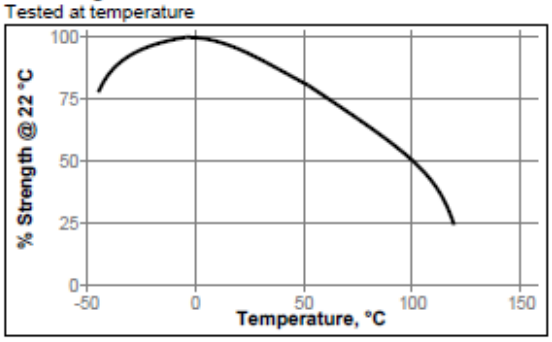
Cured for 1 week @ 22 °C

Lap Shear Strength, ISO 4587:

Mild Steel (grit blasted)

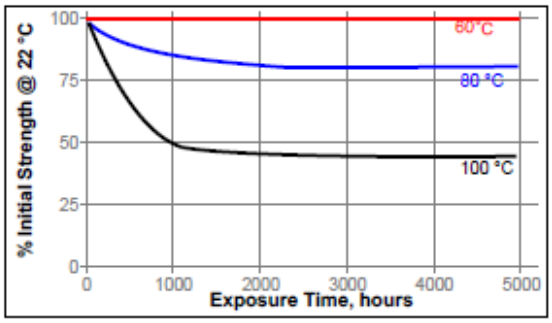
Hot Strength

Tested at temperature



Heat Aging

Aged at temperature indicated and tested @ 22 °C



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

		% of initial strength		
Environment	°C	100 h	500 h	1000 h
Motor oil (MIL-L-46152)	40	100	100	95
Gasoline	22	100	100	100
Isopropanol	22	100	100	100
Ethanol	22	100	100	100
Freon TA	22	100	100	100
1,1,1 Trichloroethane	22	100	100	100
Heat/humidity 95% RH	40	80	75	65
Heat/humidity 95% RH on polycarbonate	40	100	100	100

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Safety Data Sheet (SDS).

Directions for use:

1. For best performance bond surfaces should be clean and free from grease.
2. This product performs best in thin bond gaps (0.05 mm).
3. Excess adhesive can be dissolved with Loctite cleanup solvents, nitromethane or acetone.

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SIZE	CAGE CODE	DWG NO	REV
A	12522	TB-224	1.0

		SCALE	WT	SHEET
SEE SHEET 1	DO NOT SCALE DRAWING	NONE		SHEET 9 OF 15

Loctite Material Specification[LMS]
LMS dated December 02, 2002. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage
Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.
Optimal Storage: 2 °C to 8 °C. Storage below 2 °C or greater than 8 °C can adversely affect product properties.
Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions
(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
µm / 25.4 = mil
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

Note:
The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. Henkel is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product.
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Appendix B: Littelfuse P/N 1206L050YR Specification Sheet

POLY-FUSE® Resettable PTCs

Surface Mount > 1206L Series

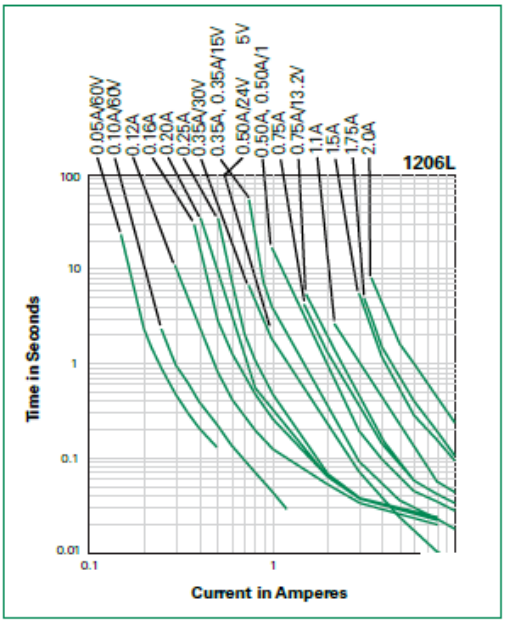
Littelfuse
Expertise Applied | Answers Delivered

Temperature Rerating

	Ambient Operation Temperature								
	-40°C	-20°C	0°C	20°C	40°C	50°C	60°C	70°C	85°C
Part Number	Hold Current (A)								
1206L005/60	0.076	0.068	0.060	0.050	0.043	0.038	0.033	0.028	0.023
1206L010/60	0.15	0.14	0.12	0.10	0.084	0.075	0.065	0.055	0.042
1206L012	0.18	0.16	0.14	0.125	0.10	0.09	0.08	0.07	0.05
1206L016	0.22	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.08
1206L020	0.28	0.25	0.23	0.20	0.17	0.15	0.14	0.12	0.09
1206L025	0.37	0.33	0.29	0.25	0.22	0.20	0.17	0.15	0.12
1206L035	0.50	0.45	0.40	0.35	0.30	0.27	0.24	0.21	0.15
1206L035/16	0.50	0.45	0.40	0.35	0.30	0.27	0.24	0.21	0.15
1206L035/30	0.51	0.46	0.41	0.35	0.30	0.27	0.25	0.21	0.18
1206L050	0.71	0.64	0.57	0.50	0.42	0.39	0.35	0.31	0.25
1206L050/15	0.71	0.64	0.57	0.50	0.42	0.39	0.35	0.31	0.25
1206L050/24	0.76	0.68	0.60	0.50	0.43	0.38	0.33	0.29	0.24
1206L075/13.2	1.14	1.04	0.88	0.75	0.65	0.59	0.54	0.49	0.41
1206L075/16	1.01	0.94	0.86	0.75	0.65	0.60	0.54	0.46	0.37
1206L075TH	1.14	1.01	0.88	0.75	0.65	0.59	0.54	0.49	0.41
1206L110TH	1.64	1.46	1.30	1.10	0.92	0.83	0.80	0.65	0.52
1206L150TH	2.20	1.99	1.77	1.50	1.34	1.23	1.10	1.01	0.84
1206L175	2.50	2.25	2.00	1.75	1.55	1.45	1.35	1.25	1.10
1206L200	2.60	2.44	2.35	2.00	1.78	1.67	1.50	1.45	1.10

Notes: The temperature rerating data is only for reference, please contact Littelfuse technical support for detail temperature rerating information.

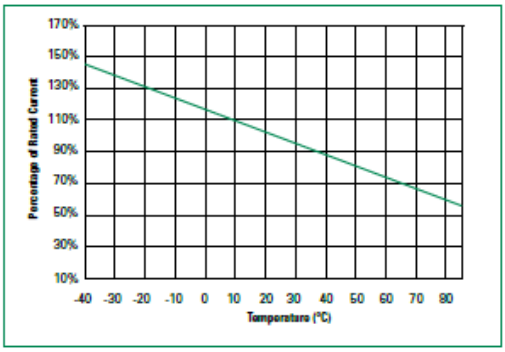
Average Time Current Curves



The average time current curves and Temperature Rerating curve performance is affected by a number or variables, and these curves provided as guidance only. Customer must verify the performance in their application.

Revised: 03/22/17

Temperature Rerating Curve



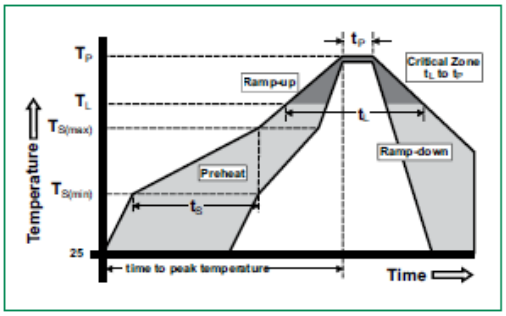
Additional Information

Datasheet | Resources | Samples

Use or disclosure of data contained on this sheet is subject to restrictions of the title page of this document.		SIZE A	CAGE CODE 12522	DWG NO TB-224	REV 1.0
SEE SHEET 1	DO NOT SCALE DRAWING	SCALE NONE	WT	SHEET SHEET 11 OF 15	

Soldering Parameters

Profile Feature		Pb-Free Assembly
Average Ramp-Up Rate ($T_{S(max)}$ to T_P)		3°C/second max
Pre Heat:	Temperature Min ($T_{s(min)}$)	150°C
	Temperature Max ($T_{s(max)}$)	200°C
	Time (Min to Max) (t_s)	60 – 180 secs
Time Maintained Above:	Temperature (T_L)	217°C
	Temperature (t_L)	60 – 150 seconds
Peak / Classification Temperature (T_p)		260$^{+0/5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_p)		8 minutes Max.



- All temperature refer to topside of the package, measured on the package body surface
- If reflow temperature exceeds the recommended profile, devices may not meet the performance requirements
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N_2 environment for lead
- Recommended maximum paste thickness is 0.25mm (0.010inch)
- Devices can be cleaned using standard industry methods and solvents
- Devices can be reworked using the standard industry practices

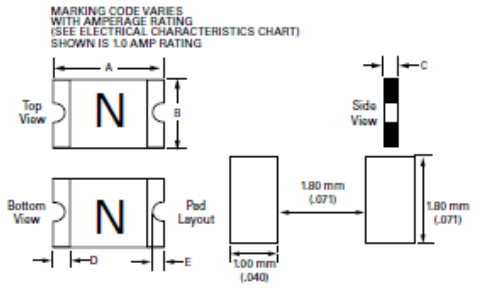
Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material: Matte Tin (Sn))
Lead Solderability	Meets EIA Specification RS186-9E, ANSI/J-STD-002 Category 3.

Environmental Specifications

Operating/Storage Temperature	-40°C to +85°C
Maximum Device Surface Temperature in Tripped State	125°C
Passive Aging	+85°C, 1000 hours -/+5% typical resistance change
Humidity Aging	+85°C, 85%, R.H., 1000 hours -/+5% typical resistance change
Thermal Shock	MIL-STD-202, Method 107 +85°C/-40°C 20 times -30% typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883, Method 2007, Condition A No change
Moisture Sensivity Level	Level 1, J-STD-020

Dimensions



Part Number	A				B				C				D				E			
	Inches		mm		Inches		mm		Inches		mm		Inches		mm		Inches		mm	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1206L005/60									0.03	0.05	0.65	1.25								
1206L010/60									0.03	0.05	0.65	1.25								
1206L012									0.03	0.06	0.65	1.45								
1206L016									0.03	0.06	0.65	1.45								
1206L020									0.02	0.04	0.50	1.00								
1206L025									0.02	0.04	0.5	1.00								
1206L035									0.02	0.03	0.45	0.75								
1206L035/16									0.02	0.03	0.45	0.75								
1206L035/30									0.02	0.04	0.50	1.00								
1206L050									0.02	0.03	0.45	0.75								
1206L050/15	0.12	0.13	3.00	3.40	0.06	0.07	1.50	1.80	0.02	0.03	0.45	0.75	0.01	0.03	0.25	0.75	0.002	0.018	0.05	0.45
1206L050/24									0.03	0.05	0.75	1.25								
1206L075/13.2									0.03	0.05	0.75	1.25								
1206L075/16									0.03	0.05	0.75	1.25								
1206L075TH									0.02	0.03	0.40	0.75								
1206L110TH									0.01	0.02	0.30	0.60								
1206L150TH									0.02	0.04	0.50	1.00								
1206L175									0.03	0.08	0.80	1.80								
1206L200									0.03	0.07	0.80	1.60								

WARNING

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration
- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage (L di/dt) above the rated voltage of the PPTC device.

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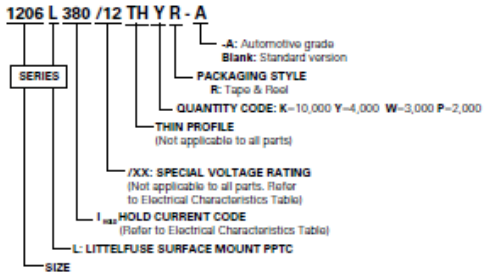
Part Ordering Number System



Packaging Options

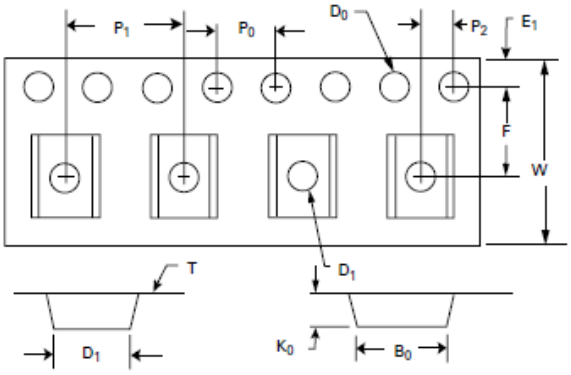
Part Number	Ordering Number	Halogen Free	I_{hold} (A)	I_{hold} Code	Packaging Option	Quantity	Quantity/Pack Code
1206L005/60	1206L005/60WR	Yes	0.05	050	Tape and Reel	3000	WR
1206L010/60	1206L010/60WR	Yes	0.10	100	Tape and Reel	3000	WR
1206L012	1206L012WR	Yes	0.125	012	Tape and Reel	3000	WR
1206L016	1206L016WR	Yes	0.16	016	Tape and Reel	3000	WR
1206L020	1206L020YR	Yes	0.20	020	Tape and Reel	4000	YR
1206L025	1206L025YR	Yes	0.25	025	Tape and Reel	4000	YR
1206L035	1206L035YR	Yes	0.35	035	Tape and Reel	4000	YR
1206L035/16	1206L035/16YR	Yes	0.35	035	Tape and Reel	4000	YR
1206L035/30	1206L035/30WR	Yes	0.35	350	Tape and Reel	3000	WR
1206L050	1206L050YR	Yes	0.50	050	Tape and Reel	4000	YR
1206L050/15	1206L050/15YR	Yes	0.50	050	Tape and Reel	4000	YR
1206L050/24	1206L050/24WR	Yes	0.50	500	Tape and Reel	3000	WR
1206L075/13.2	1206L075/13.2WR	Yes	0.75	075	Tape and Reel	3000	WR
1206L075/16	1206L075/16WR	Yes	0.08	75	Tape and Reel	3,000	WR
1206L075TH	1206L075THYR	Yes	0.75	075	Tape and Reel	4000	YR
1206L110TH	1206L110THYR	Yes	1.10	110	Tape and Reel	4000	YR
1206L150TH	1206L150THWR	Yes	1.50	150	Tape and Reel	3000	WR
1206L175	1206L175PR	Yes	1.75	175	Tape and Reel	2000	PR
1206L200	1206L200PR	Yes	2.00	200	Tape and Reel	2000	PR

Tape and Reel Specifications

TAPE SPECIFICATIONS: EIA-481-1 (mm)			
	Packaging Code "YR": 1206L020, 1206L025, 1206L035, 1206L035/16, 1206L050, 1206L050/15, 1206L075TH, 1206L110TH	Packaging Code "WR": 1206L005/60, 1206L010/60, 1206L012, 1206L016, 1206L035/30, 1206L050/15, 1206L050/24, 1206L075/13.6, 1206L150TH	Packaging Code "PR": 1206L175, 1206L200
W	8.20+0.10/-0.30	8.15+0.15/-0.30	8.20+0.10/-0.30
F	3.50+/-0.05	3.50+/-0.05	3.50+/-0.05
E_1	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10
D_0	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05
D_1	1.00+/-0.10	1.00+/-0.10	1.00+/-0.10
P_0	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10
P_1	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10
P_2	2.00+/-0.05	2.00+/-0.05	2.00+/-0.05
A_0	1.95+/-0.10	1.95+/-0.10	1.95+/-0.10
B_0	3.65+/-0.10	3.65+/-0.10	3.65+/-0.10
T	0.25+/-0.10	0.25+/-0.10	0.25+/-0.10
K_0	0.87+/-0.10	1.30+/-0.10	1.70+/-0.10
Leader min.	390	390	390
Trailer min.	160	160	160

REEL DIMENSIONS: EIA-481-1 (mm)	
C	Ø178+/-1.0
D	Ø60.2+/-0.5
H	11.0+/-0.5
W	9.0+/-1.5

Tape Specifications



Reel Specifications