Bonded Gasket Shielding Effectiveness Rivals Molded and Die Cut Parts

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Specialty Silicone Products (SSP) is sharing independent test results that show how bonded frame gaskets can have a shielding effectiveness that rivals that of molded or die cut parts. DLS Electronic Systems, Inc., a full-service testing laboratory in Wheeling, Illinois, tested a bonded frame gasket made of SSP2368-65DB at its ANAB-accredited facility on September 17, 2024.

SSP manufactures SSP2368-65DB material and fabricates parts from this MIL-DTL-83528, Type B elastomer. As a vertically integrated supplier, SSP has an R&D laboratory, materials manufacturing operations, and a machine shop where we make our own tooling. SSP molds EMI gaskets, but we also offer bonded gaskets that are flash cut and use a special joining process.

Shielding Effectiveness Test Results

The test results for SSP's bonded gasket appear below. They're also available from the product page for SSP2368-65DB material, where you'll find additional test results. The frame-style gasket that DLS Electronic Systems tested resembles a picture frame and has a large open area in the middle. Frame gaskets are usually rectangular since they protect a box-like housing or enclosure.

Type: B SSP2368-65DB				**Batch: 24-0082-GF**		
Frequency MHz	**OPEN Amplitude (dBuV)**	**SOLID PLATE Amplitude (dBuV)**	**Gasket Amplitude (dBuV)**	**Signal Generator Setting (dBm)**	**Shielding Effectiveness (dB)**	**Dynamic Range (dB)**
20	105	-25	-11	-13	116	-130
40	110	-25	-20	-28	130	-135
60	110	-25	-19	-26	129	-135
80	110	-25	-19	-53	129	-135
100	110	-25	-21	-71	131	-135
200	115	-25	-17	-3	132	-140
400	115	-25	-25	-2	140	-140
600	115	-25	-1	7	116	-140
800	110	-25	-6	-10	116	-135
1000	115	-20	-17	-58	132	-135
2000	115	-20	-16	-41	131	-135
4000	115	-20	-12	-42	127	-135
6000	115	-20	-14	-38	129	-135
8000	115	-20	-14	-42	129	-135
10000	115	-20	-13	-38	128	-135

The other sections in this white paper describe SSP2368-65DB and how it meets MIL-DTL-83528, Type B requirements for EMI shielding at a continuous-use temperature range. This EMI/RFI shielding silicone also meets ASTM E595 requirements for low levels of outgassing and MIL-DTL-83528 requirements for EMP survivability. The white paper also describes SSP's gasket bonding process.

SSP2368-65DB

SSP2368-65DB is a 65-durometer (Shore A) silicone that contains silver-plated aluminum particles. It meets MIL-DTL-83528 Type B requirements and is part of the M83528 Qualified Products List (QPL) from the Defense Logistics Agency (DLA) within the U.S. Department of Defense (DoD). Other SSP materials are also part of the M83528 QPL.

The DB in SSP2368-65DB indicates that this material is dark blue in color. It's also available in tan, as the image on the left shows. Products in either color can be used instead of CHO-SEAL® 1285 from Parker Chomerics. SSP 2368-DB is available in low minimum order quantities (MOQs) with short lead times and comes in compression-molded sheets, continuous rolls, extrusions, and ready-to-mold compounds

Among its advantages, SSP2368-65DB has low levels of outgassing, the unwanted release of trapped gases that occurs when a material is exposed to heat or low-pressure environments. Pacific Testing Laboratories of Valencia, California has tested samples of SSP2368-65DB and determined that they pass the ASTM E595 Outgas Test, which is based on a NASA standard. Download the test report.

TEST REPORT

In Account With	Date	
SPECIALTY SILICONE PRODUCTS CORPORATE TECHNOLOGY PARK 3 McCrea Hill Road Ballston Spa, NY 12020 Attn: Marty Migliori	December 10, 2018	Page 1 of 3 Pages
	W.O. Number 64315	Specification ASTM E 595
	P.O. No. 0027493	Received 11-29-18

IDENTIFICATION: Five (5) sample materials were submitted for Outgas Testing in accordance with ASTM E 595. The test samples were identified as follows:

1) SSP2529 JM20 2/177C
2) SSP2486-70DB
3) SSP2368-65DB
4) SSP2476-65
5) R+D 18-1109-3

SPECIFICATION : ASTM E 595.

REFERENCE : Purchase Order Number 0027493.

TESTING : Outgas Testing.

SUMMARY : The test results, reported herein, are submitted for customer evaluation.

Respectfully submitted,
PACIFIC TESTING LABORATORIES, INC.

Casie Giblin
Materials Engineer

Reviewed by,

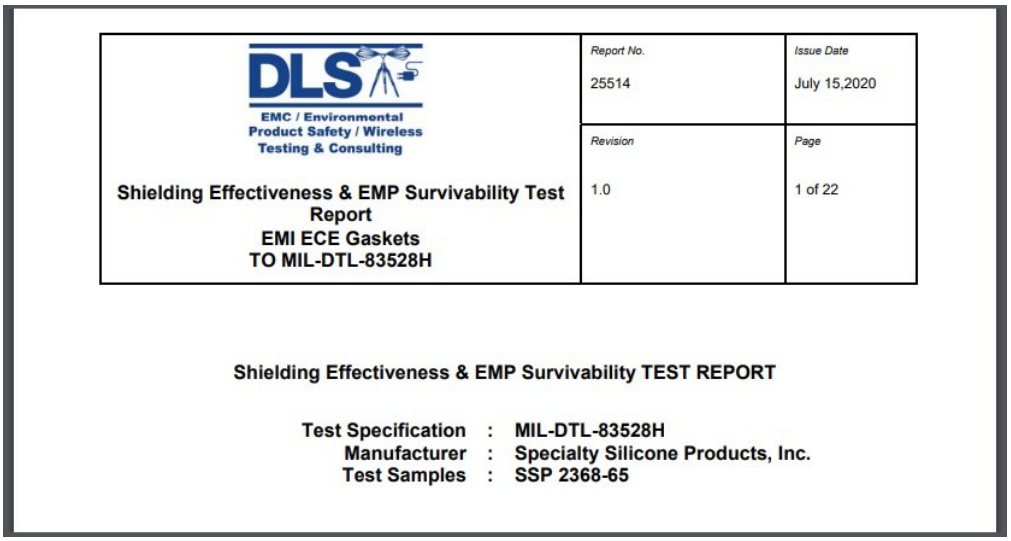
Hans Shin
Laboratory Director

MIL-DTL-83528 Type B

As a MIL-DTL-83528 Type B elastomer, SSP2368-65 is capable of 100 dB of plane wave shielding effectiveness at 10 GHz. Plane wave shielding effectiveness (SE) is expressed in decibels (dB) and quantifies the reduction of electromagnetic field (EMF) strength as an EMF field passes through a shielding material.

Plane wave SE has two key components: incident plane wave and attenuation mechanisms. An incident plane wave is a uniform electromagnetic wave propagating in a single direction with constant amplitude and phase across any plane perpendicular to the direction of propagation. Attenuation mechanisms include reflection loss, absorption loss, and multiple reflection loss.

As the MIL-DTL-83528 specification states, Type B materials need a continuous use temperature range of -55°C to 125°C. SSP2368-65 has a thermal stability range of -60°C to 200°C. Its tensile strength, a measure of the maximum stress that a material can withstand while being stretched or pulled before breaking, is 240 psi. Download the technical data sheet for more materials properties.



DLS
EMC / Environmental
Product Safety / Wireless
Testing & Consulting

Report No.	Issue Date
25514	July 15,2020
Revision	Page
1.0	1 of 22

Shielding Effectiveness & EMP Survivability Test Report
EMI ECE Gaskets
TO MIL-DTL-83528H

Shielding Effectiveness & EMP Survivability TEST REPORT

Test Specification : MIL-DTL-83528H
Manufacturer : Specialty Silicone Products, Inc.
Test Samples : SSP 2368-65

EMP Survivability Testing

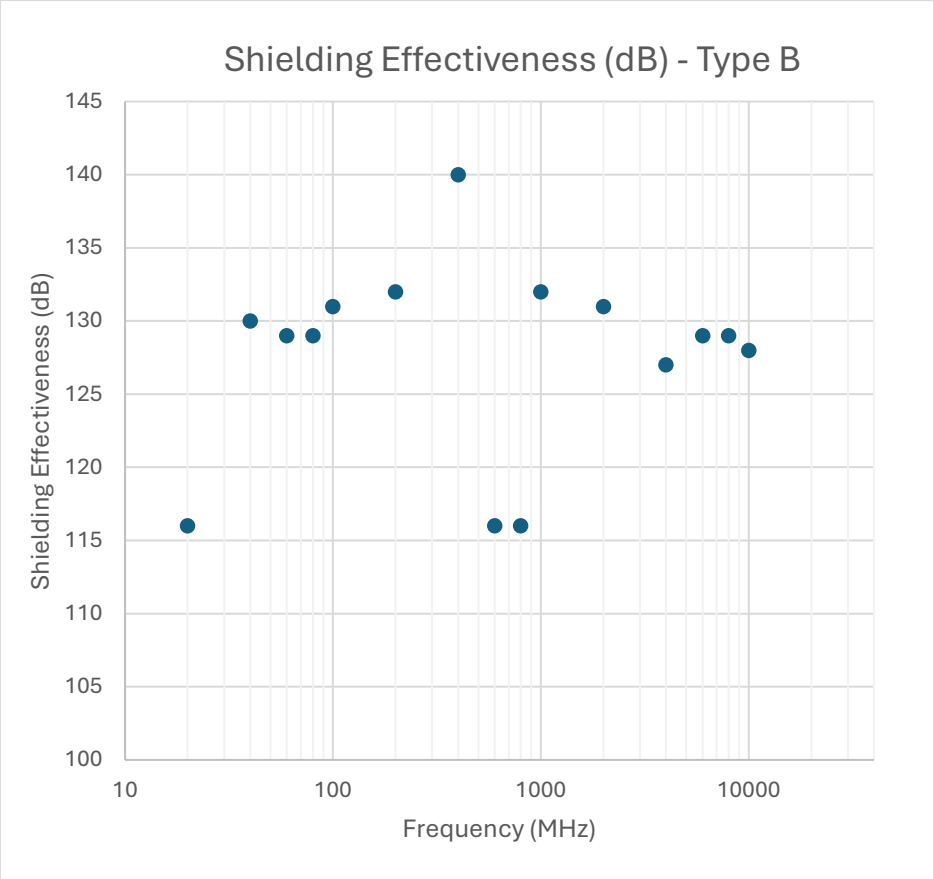
In addition to plane wave shielding effectiveness, DLS Electronic Systems has tested samples of SSP 2368-65 for EMP survivability. In the context of MIL-DTL-83528, EMP survivability refers to the ability of an EMI elastomer to maintain its electrical conductivity and shielding effectiveness even when exposed to a high-energy electromagnetic pulse (EPM), such as from a high-altitude nuclear blast.

On July 15, 2020, DLS Electronic Systems performed EMP tests by placing a sample of SSP2368-65 between two halves of a test sample that was designed according to MIL-DT-83528. A 1MHz 900Ap-p pulse was generated into the fixture and verified with an oscilloscope. Download the shielding effectiveness report to see how samples of SSP2368-65 passed EMP survivability testing.

Testing Bonded Frame Gaskets

In the September 2024 test, DLS Electronic Systems determined how well a bonded frame gasket made of SSP 2368-DB blocked electromagnetic waves across a range of frequencies from 20 MHz to 10000 MHz. A signal generator was used to produce controlled, repeatable electromagnetic signals across this range. A solid plate was used as a reference standard.

As the test data show, shielding effectiveness ranged from a low of 116 dB at 20, 600, and 800 MHz to a high of 140 dB at 40 MHz. Across all frequencies, shielding effectiveness averaged approximately 128 MHz. All the test values exceed the MIL-DTL-83528 Type B's requirement for a silver-plated, aluminum-filled silicone capable of 100 dB of plane wave shielding effectiveness at 10 GHz.



SSP's Gasket Bonding Method

Specialty Silicone Products (SSP) bonded the frame gasket by applying heat and pressure to an electrically conductive silicone adhesive with a durometer like that of SSP 2368-DB. This hot splicing method is more reliable than other joining methods and enables our skilled technicians to control quality throughout the process. Here, it's useful to compare other gasket bonding methods.

Some manufacturers bond EMI frame gaskets with a non-conductive room-temperature vulcanizing (RTV) silicone adhesive that lacks an EMI filler. This makes it possible for radio waves to penetrate the

joint and create EMI in the end-product. Manufacturers who use this type of adhesive also risk EMI leakage, which can interfere with nearby circuits.

Other manufacturers use non-silicone glues such as acrylics. These adhesives dry to a much harder durometer than the EMI silicone and leave “hard spots” in the corners that are susceptible to cracking. In part, that’s because acrylics can’t match the temperature range of the EMI silicone material. If the bonds are subjected to very high or very low temperatures, the joints can break.

Choose EMI Gaskets from SSP

SSP can bond EMI frame gaskets in low volumes or whenever a machined metal mold is cost-prohibitive. At higher volumes, molded frame gaskets are cost-effective since the material in the middle of a cut gasket usually gets discarded. For projects with cut gaskets in multiple sizes, however, parts nesting can reduce this waste and optimize material yields.

SSP cuts and molds EMI gaskets from the materials that we make. For low-volume production, our flash cutter is ideal because it uses standard knives instead of custom dies that require paying for special tooling. Like molding, die cutting is generally a better choice at higher volumes because the cost of a tool can be spread across many parts.

As this white paper has shown, bonded frame gaskets can have a shielding effectiveness that rivals that of molded or die cut parts. Whether you need EMI gaskets in high or low volumes, and in standard or custom sizes, SSP is ready to deliver. Contact us to discuss your application.

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