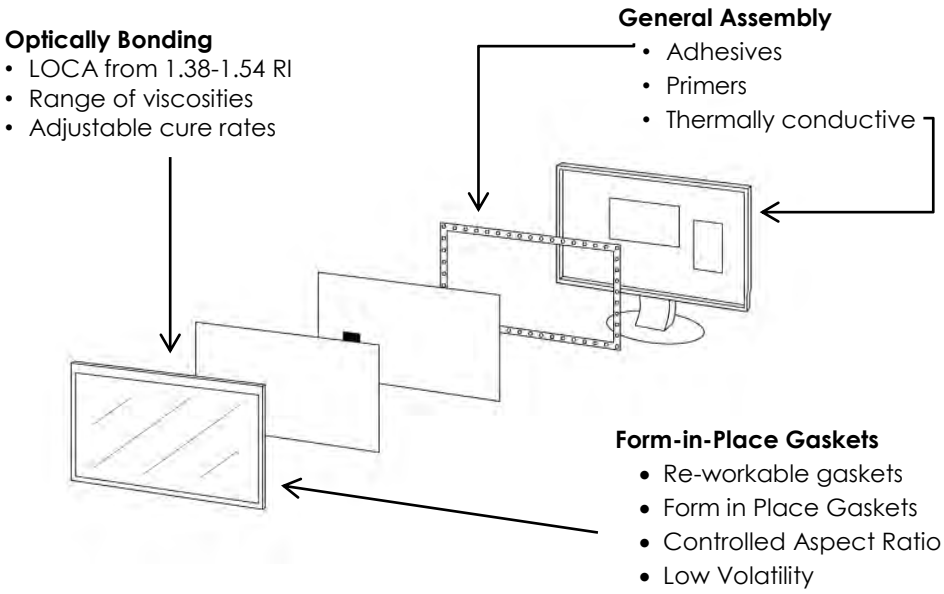
THE CHEMISTRY OF CARE

Full Solution for Display Assembly

Display designs are entering an exciting new era of creating new formats changing how we interact with the world. With this come challenges in designing the next generation of displays which are not only smaller and thinner but also process larger amounts of information. This can create more mechanical and thermal stress on the device reducing its overall operating life.



NuSil's High Purity Silicone Products for Displays

NuSil Technology began over 30 years ago by designing silicones for the extreme environments of space and medical devices, and is now a world leader in space grade and medical grade silicones. From our proprietary processes to our regulatory support, NuSil is there when failure is not an option.

NuSil's high purity solutions improve overall display performance with a large variety of liquid optically clear adhesives (LOCAs). These allow greater light output and viewing angle while also improving impact and thermal resistance. NuSil also offers a diverse line of low volatility adhesives, thermally conductive silicones and Form-In-Place gaskets for creating dams for LOCA. This enables device manufacturers from smart phones to stadium screens and everything in between to create next-generation displays that are sharper, brighter and more rugged.

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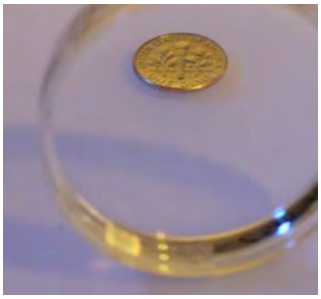
NuSil Products for Optical Bonding

NuSil's has solutions to improve overall display performance starting with a large variety of liquid optically clear adhesives (LOCAs) that allow greater light output and viewing angle, while also improving impact and thermal resistance.

Product	RI (n_D, 25°C)	Hardness	Mixed Viscosity (cPs)	Weight Loss (3hrs at 150°C)	Yellow Index (b*)
LS-3238	1.38	15 '00'	1,500	<1%	NA
GEL-8136	1.40	15 mm	450	<1%	< 1
GEL-8127	1.40	9 mm	575	<1%	< 1
LS-3441	1.40	0.4 mm	14,500	<1%	NA
LS1-3443	1.43	6 mm	650	<1%	< 1
LS-3443	1.43	5 mm	500	<1%	NA
LS1-3446	1.46	6 mm	1,200	0.1%	< 1
LS-3246	1.46	10 '00'	1,000	<1%	NA
GEL-8246	1.47	55 '00'	35,000	<1%	< 1
LS1-3252	1.52	25 '00'	360	NT	NA
LS3-3354	1.54	60 '00'	5,200	<1%	< 1

Data is not to be used for writing specifications. See Data Sheets for test parameter details.

Benefits of NuSil's Liquid Optically Clear Adhesives



- Completely transparent in visible range
- Thermally Stable – non yellowing
- RI values from 1.38 to 1.54 to index match cover glass
- RI values 1.40 – 1.43 recommend for harsh environments
- High purity – Low volatility
- Soft and flexible to reduce stress
- Reworkable
- Low viscosity reduces risk of bubbles
- Excellent for Direct Bonding applications

Benefits of optical bonding for increased operating life:

- Increases brightness and reduces washout when in environments of bright ambient light or outdoors
- Increased brightness reduces power consumption and operating temperature
- Low modulus gels absorb stress, reduces impact and improves ruggedness
- Protects from dust, dirt and moisture that can obstruct the image
- Excellent for many display applications including marine, automobile, aircraft, digital signage and flexible displays

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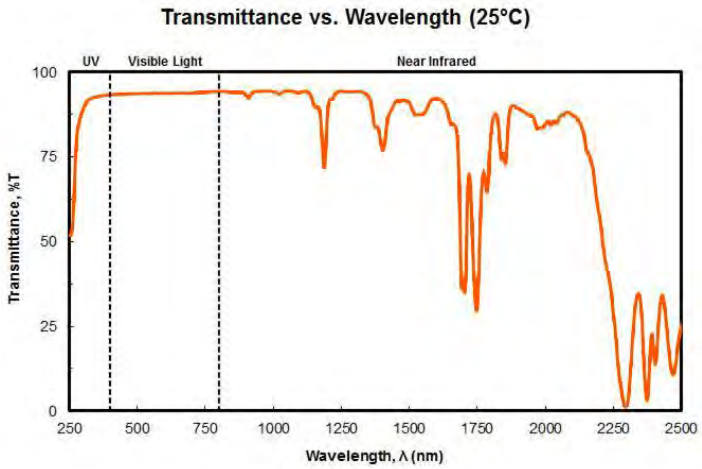

Form In-Place Gaskets

NuSil's Form-in-Place gaskets offer controlled aspect ratio for consistent gasket shape and are low volatility (% maximum volatile content at 275˚C) which greatly reduces contamination that produces fogging or lack of adhesion.

Product	Durometer (Type A)	*Work Time minutes	Compressibility @ 25°C (% Recovery)	Dielectric Strength (V/mil, kV/mm)	DC @ 100 Hz	VR Ohm-cm	CTE (-40°C – 250°C & Tg)	Applications
EPM1-2412	40	5	5	550/21.4	2.8	>1X10^{14}	270 ppm/°C -50 °C	Translucent Dam & Fill
EPM-2412	30	30	10	530/20.6	2.8	>1X10^{14}	310 ppm/°C – 50 °C	Translucent removable gasket
EPM-2412-2	30	NT	NT	NT	NT	NT	310 ppm/°C - 50 °C	Black removable gasket

Data is not to be used for writing specifications. See Data Sheets for test parameter details. * Pot life based on time to double in viscosity.

Benefits:

- Optimized for Aspect Ratio (~0.9)
- Cures within 24 hours at room temperature or rapidly with heat with minimal change in shape
- Bead aspect ratio is independent of gauge size or pressure
- EPM-2412 and EPM-2412-2 (black) allow rapid re-working if needed

Applications:

- Designed for automated mix and meter systems
- Devices where molded gaskets are currently used to decrease time bringing new designs to market

General Assembly

NuSil also offers a diverse line of materials for general assembly from low volatility adhesives to thermally conductive silicones. This enables device manufacturers from smart phones to stadium screens and everything in between to create next-generation displays that are sharper, brighter and more rugged.

Primers

NuSil technology has over 50 primers formulated to increase adhesion based on substrate, cure environment, chemical compatibility and the silicone cure chemistry.

Product	Adhesive Cure System	Recommend Substrates	Benefits
SP-120	Pt or Tin	PPA, PU, PC, PPSU, PEEK, PI, PET, epoxy, butyl rubber	Available in red (SP-121)
CF1-135	Pt	PU, PVC, PC, PSU, PPSU, PMMA, PEEK, PI, PET, epoxy	Available in red (CF1-136).
CF2-135	Pt	Same as above but needed for slight cure inhibition	Available with UV Tracer for backlight inspection(CF2-137)
CF6-135	Pt	Same as above but needed for persistent cure inhibition	Available in IPA (SP-126) and in red and IPA (CF6-136)
SP-142	Pt	PU, PVC, PC, PSU, PPSU, PEEK, PI, PET, epoxy, butyl rubber	Versatile

Adhesives

NuSil offers a large variety of silicone adhesives designed to accommodate several production processes and adhere to a variety of substrates without slumping. See our Optoelectronics & Electronics Product Guide for a larger selection of adhesives that are self-leveling or have other attributes needed for the your application.

Product	Cure Type	Appearance	Durometer (Type A)	Mixed Rheology	Work Time	*Lap Shear (psi/MPa)	Applications
R-2141	Pt	Translucent	40	80,000 cPs	1.5 hrs	350/2.4	General
R31-2186	Pt	Translucent	20	80,000 cPs	15 minutes	110/0.76	General
R32-2186	Pt	Translucent	15	80,000 cPs	15 hrs	150/1	General
R33-2186	Pt	Translucent	20	80,000 cPs	2 hrs	100/0.69	General
R34-2186	Pt	Translucent	50	9 g/min	18 hrs	NT	Excellent to PET
R1-2145	Pt	Dark Gray	45	290 g/min	1 hr	145/1	General
EPM-2840	Tin/Oxime	Translucent	35	30 g/min	25 minutes tack free	280/1.9	Recommended for PC

Data is not to be used for writing specifications. See Data Sheets for test parameter details. .*Aluminum

Benefits:

- NuSil's low temperature addition cure adhesives designed to cure at room temperature to accommodate heat sensitive processes and reduce power consumption during processing.
- NuSil also provides materials designed to have extended working time for dispensing with positive displacement dispensing equipment when Part A and B are pre-mixed.
- Applications:
- Gaskets for confining LOCA
- Attaching or encapsulating components

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Thermally Conductive

Thermal management is critical to device performance and NuSil Technology has a diverse line of thermally conductive silicones. Our EPM line is low volatility (1% maximum volatile content at 275˚C) and helps reduce of contamination in harsh environment.

Product	Cure Type	Appearance	Durometer (Type A)	Mixed Rheology	Work Time	Thermal Conductivity (W/mK)
R-2175	Pt	Black	50	~2,000 cPs	1 hr minimum	0.40
R-2165	Pt	Gray	60	~4,000 cPs	10 minutes minimum	0.60
R-2940	Pt	Gray	90	Paste	5 hrs	0.85
R-2930	Pt	White	80	Paste	3 hrs	1.5
EPM-2496	Pt	Gray	60	~4,000 cPs	25 minutes	0.50
EPM1-2493	Pt	White	65	60,000	4.9	1.0

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NuSil's low volatility thermally conductive silicone potting and adhesives:

- Process Benefits
  - Reduce risk of silicone contamination affecting adhesion of downstream process
  - Eliminates the need of costly "bake outs" in device
- Device Operation
  - Reduces risk of fogging within display that distorts image

NuSil for Optoelectronics

NuSil Technology, the global leader in medical and space-grade silicones, draws on over three decades of manufacturing expertise and innovation to develop products used in the most extreme environments – from deep inside the human body to the harsh conditions of outer space.

As a low-stress alternative for electronic packaging, NuSil silicones allow the designer to choose from a unique line of silicones for various levels of packaging. We have an extensive line of encapsulants, adhesives and greases to choose from. These include thermally and electrically conductive silicones for Thermal Interface Materials (TIM) or for EMI and RFI shielding applications.

NuSil has been a credible supplier to the optoelectronics industry for over a decade. Our silicones are ideal for the growing market of displays technologies and the constant need for materials of the highest purity. We can offer the widest range of refractive index-matching silicones in the industry because we are basic in phenyl.

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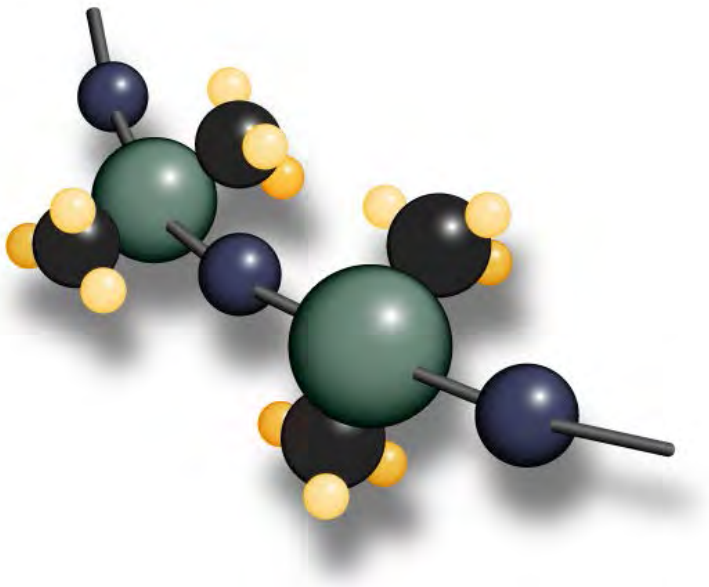

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