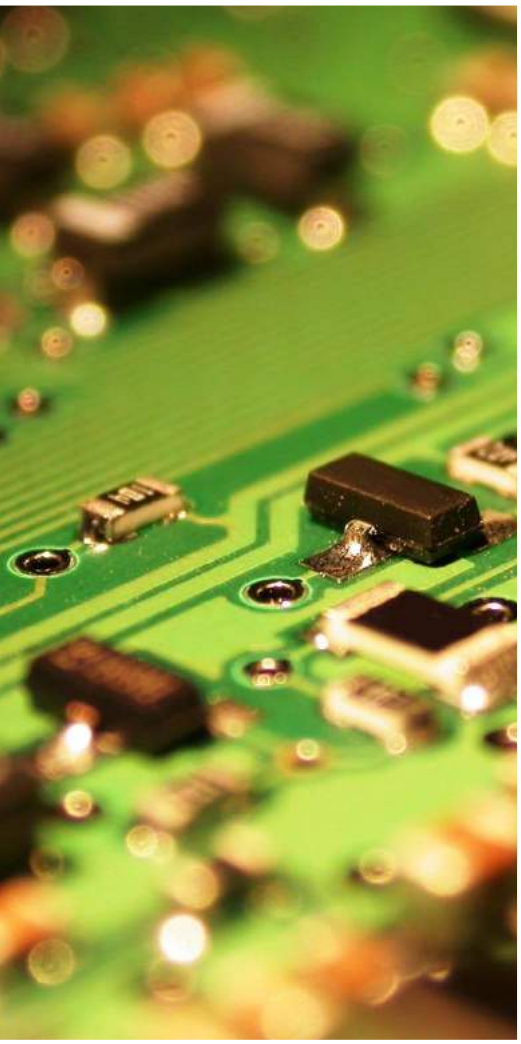
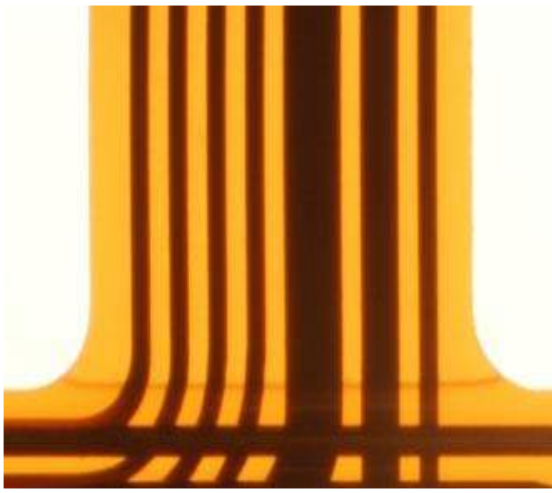
www.dymax.com





Smart Connected Device Assembly

UV Light-Curable Adhesives, Coatings, & Encapsulants for Assembly of Mobile Phones, Tablets, Portable Computers, Laptops, Readers, and Other Smart Connected Devices

DYMAX®

The Dymax Edge

Oligomers. Adhesives. Coatings. Equipment. And one priceless resource. That's the Dymax Edge.

At Dymax, we're committed to providing our customers with the solutions they need for their specific application challenges. Inherent in the Dymax Edge approach is the commitment to view a customer's challenge differently by listening, focusing, and using an entire toolbox of resources and expertise to deliver the most efficient solution. This expertise isn't limited to the formulation of chemistry or the calibration of a machine. Rather, it's defined by a depth and breadth of knowledge that allows us to devise innovative solutions based on an optimal balance of material, chemistry, and equipment. The Dymax Edge is more than the combined resources of product, technology, and service. It's the fundamental belief that you best serve a customer when you look at the need from their perspective, not yours.

DYMAX EDGE®

LISTEN. ENVISION. DELIVER.

Dymax Light-Curable Materials for Smart Connected Device Assembly

The smart connected device industry is rapidly evolving at a faster rate than ever before. Today's complex designs, innovative materials, and increased focus on the environment can present challenges to many manufacturers. Whatever demands or challenges you face, Dymax is here to work with you to design a more efficient process for a higher quality end product.

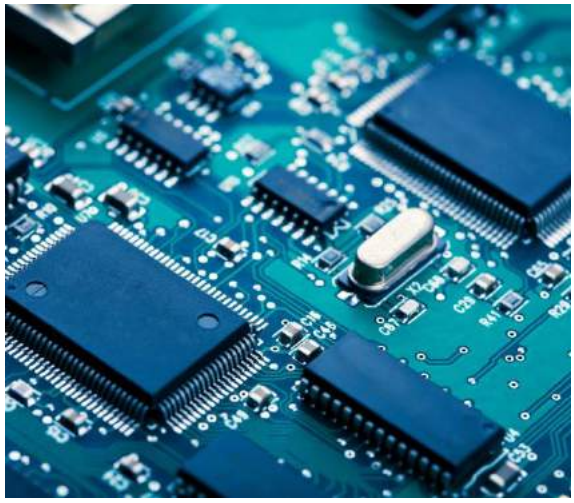
From conformal coatings to encapsulants to edgebond materials to adhesives for camera lens assembly, Dymax provides innovative, solvent-free, UV light-curing technology solutions. We offer many cost-reducing solutions that turn problems like shadowed areas, cure confirmation, and production throughput into non-issues.

IPC approved, MIL-I-46058C and UL listed self-extinguishing grades are available.

Dymax is dedicated to reducing environmental impact. Our products replace technologies that contain hazardous ingredients, produce waste, or require higher amounts of energy to process. We understand that safe, ecologically friendly products benefit our customers, the environment, and us. We have created materials with attributes that lower product costs, life-cycle costs, and ecological impact. Many of our materials for smart connected device assembly are certified as halogen free and meet or exceed standards set forth in IEC 61249-2-21.

Encapsulants for Printed Circuit Boards

Dymax light-curable materials cure in seconds upon exposure to UV and/or visible light to produce tough, flexible encapsulants for bare die, wire bonds, or integrated circuits (IC). The encapsulants' fast cure helps reduce processing and energy costs associated with alternative technologies. The materials are all one part, so no mixing is required and viscosity is consistent. In addition, Dual-Cure light/moisture cure encapsulants are available to address shadowed area concerns.



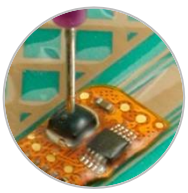
Dymax encapsulating materials have high ionic purity, and resistance to humidity and thermal shock, which effectively protect components. Our encapsulants contain no sharp, abrasive, mineral or glass fillers which may abrade fine wires. Their combination of low T_g and low modulus translates into low stress for bonded wires.

UV light-curing and UV/Moisture-cure resins are ideal for glob-top and chip-on-board applications. They may also be used on flex circuits (FPC) for encapsulating ICs, coating the circuit, or attaching it to glass or PCB. A wide range of viscosities from thin wicking to non-flowing gel are available.

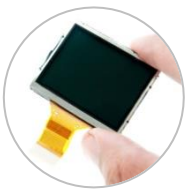
Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
9001-E-V3.1	UV/Visible light cure with secondary heat cure; high viscosity; excellent adhesion to PCB & components	4,500	D45	5.2 [750]	17 [2,500]	HF HALOGEN FREE
9008	UV/Visible light cure; flexible; excellent adhesion to polyimide	4,500	A85	6.2 [900]	–	HF HALOGEN FREE
9101	UV/Visible light cure with secondary moisture cure; flexible; moisture and thermal resistance	7,000	D30-D50	5.06 [735]	17.5 [2,550]	HF HALOGEN FREE
9102		17,000	D30-D50	4.8 [703]	18.4 [2,670]	HF HALOGEN FREE
9103		25,000	D30-D50	4.9 [718]	17.6 [2,560]	HF HALOGEN FREE

Glob Top Encapsulant

FPC to Glass Strain Relief



Encapsulants



FPC to LCD Module

Conformal Coatings

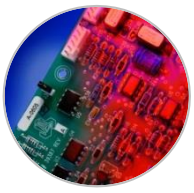
Dymax conformal coatings for printed circuit boards cure tack free in seconds upon exposure to UV/Visible light to help streamline manufacturing assembly processes. Apply, cure, and ship immediately and eliminate the time-consuming steps of traditional thermal-cure and room temperature-cure conformal coatings. Each conformal coating is one part (no mixing required) for easy dispensing and is electrically insulated so it can be applied over the entire PCB surface or in select areas to provide protection from service environments. Dymax conformal coatings are available for tin whisker mitigation, humid environments, and are also available with Dual-Cure technology. Dual-Cure products cure over time in shadowed areas with moisture, eliminating the need for a second process step and concerns of component life degradation due to temperature exposure.

Our solvent-free conformal coatings contain very low VOCs, eliminating the need for solvent handling, while enhancing worker safety and minimizing environmental impact.

Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
9481-E	UV/Visible light cure with secondary moisture cure for shadowed areas; solvent free; blue fluorescing	125	D75	–	150 [21,800]	HF HALOGEN FREE MIL-I-46058C IPC-CC-830B UL 94 V0 UL 746-E
9482	UV/Visible light cure with secondary moisture cure for shadowed areas; solvent free; blue fluorescing	1,100	D70	15.8 [2,300]	275 [40,000]	HF HALOGEN FREE
9-20351-UR	Ultra-Red™ fluorescing; flexible; high viscosity for thick selective coating; solvent free; isocyanate free	13,500	D60	13 [1,800]	19 [2,700]	HF HALOGEN FREE
9-20557	Flexible; medium-viscosity coating for thin coating applications; solvent free; isocyanate free; blue fluorescing	2,300	D60	10 [1,500]	89 [13,000]	HF HALOGEN FREE MIL-I-46058C IPC-CC-830-B UL 94 V1

Blue Fluorescing Grades Available

Easy Dispensing with Spray Equipment

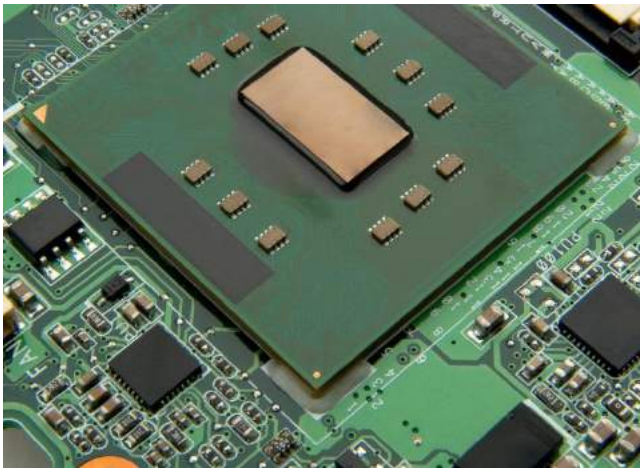


Ultra-Red™ Fluorescing for Easy Inspection

Black Conformal Coatings Available

Ruggedizing/Edgebond Materials for BGAs & VGAs

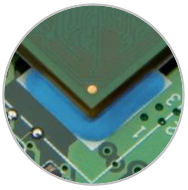
Dymax component ruggedizing and staking materials are engineered to hold critical components, such as Ball Grid Arrays (BGA) and Video Graphics Arrays (VGA), for secondary processes or long-term reliability. Should one ball-grid interconnect fail, an entire device could be compromised. UV light-curable ruggedizing materials help enhance the shock and vibration resistance of electronic assemblies.



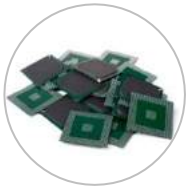
As an alternative to underfill or heat-cured epoxies, light-curable adhesives offer a range of benefits including:

- Fast, ambient dispense and cure in seconds
- Easy rework – adhesive leaves no residue on solder pads or between solder balls
- Reduced stress on interconnects during push, pull, shock, drop, and vibration
- Enhance PCB life span
- Eliminate leadless component (BGA/VGA) interconnect cracking due to CTE mismatch
- Post reflow application
- Simple visual inspection

Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
9309-SC	UV/Visible light cure; formulated with See-Cure technology; high viscosity; highly thixotropic material	42,500	D60	16 [2,300]	90 [13,000]	HF HALOGEN FREE
9422-SC	UV/Visible light cure; formulated with See-Cure technology; high viscosity; Reduces stress on board components; highly thixotropic material for minimal movement after dispense	38,000	D50	16 [2,300]	98 [14,000]	HF HALOGEN FREE

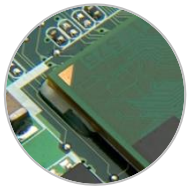


See-Cure Color Change Technology



IC Ruggedizing

Material Transitions to Clear Upon Full Cure



Excellent Underfill Alternative

Materials for Camera Module Assemblies

Dymax light-curable adhesives are ideal for use in the assembly of camera modules. Our adhesives cure in seconds, providing greater product yields in a much shorter assembly time. Dymax adhesives also have excellent adhesion to substrates typically used in the manufacturing of electronic device housings and camera modules and can withstand harsh conditions like moisture and shock, which smart connected devices are often exposed to.

Typical Camera Module Applications

1 - Bonding the camera lens

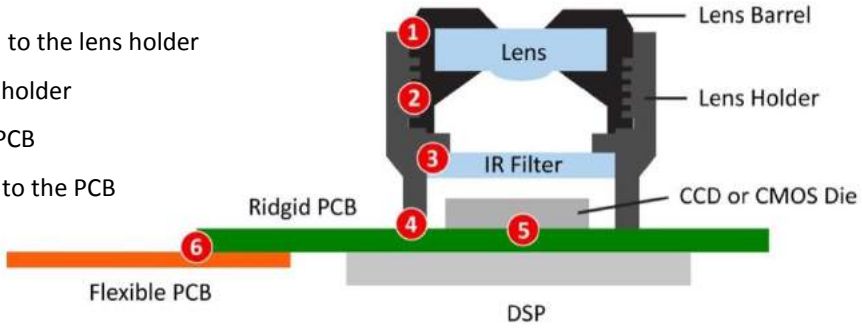
2 - Fixturing the camera lens barrel to the lens holder

3 - Bonding the IR filter to the lens holder

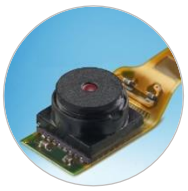
4 - Bonding the lens holder to the PCB

5 - Attaching the CCD or CMOS die to the PCB

6 - Reinforcing the FPC (6)



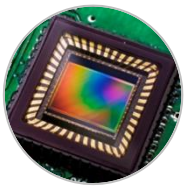
Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
3069-T	UV/Visible light cure; adhesion to various substrates including LCP and TPU materials; different viscosities available	6,000	D55	17 [2,400]	170 [25,000]	HF HALOGEN FREE
3094-T	UV/Visible light cure; adhesion to various substrates including PC and lens materials; different viscosities available; low shrinkage and stress	9,000	D62	14 [2,100]	240 [35,000]	HF HALOGEN FREE
3-20686	UV/Visible light cure; adhesion to various substrates including PC and lens materials; low outgassing	4,000	D85	48 [6,900]	760 [110,000]	HF HALOGEN FREE



Attachment of the FPC

Keys Bonded to TPU Backing

Camera Lens Bonding



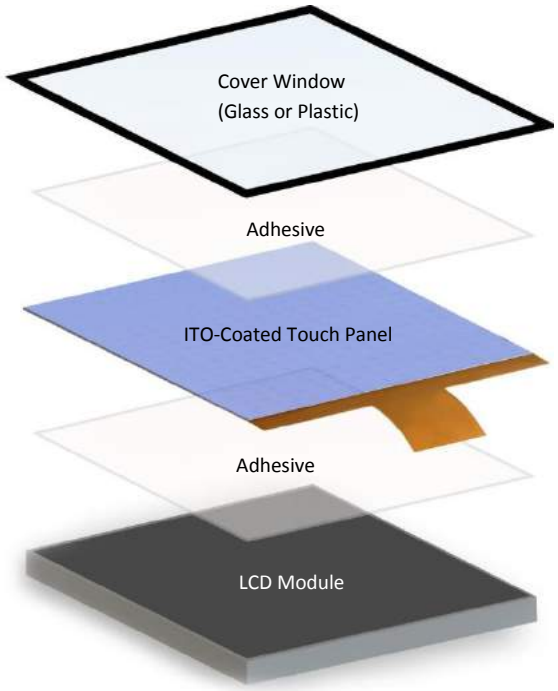
CCD Sensor Attachment

Materials for Display Lamination and Assembly

Dymax light-curable adhesives for display lamination and bonding are specifically formulated for applications where durable, crystal-clear, invisible bonds are required. Their fast, on-demand cure allows substrates to be repositioned precisely until parts are ready to be cured. One-part LCD adhesives are ideal for bonding flat panel displays, touch screens, LCD screens, liquid crystal displays, mobile phones, and many other electronic devices.

Benefits of Dymax display lamination adhesives include:

- Very low yellowing for increased light transmission, enhanced brightness, optical clarity, and better contrast ratios
- Excellent bond strength
- Superior re-workability for easy removal or repair
- Easy flow characteristics for flat panel lamination
- Excellent thermal shock resistance
- Low shrinkage minimizes visible distortion after cure



Typical Display Construction

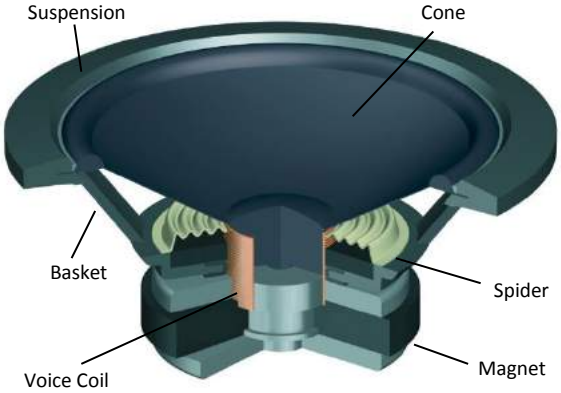
LCD adhesives also help reduce air entrapment and bubbles to create strong, ripple-free bonds that help increase panel strength. They also act as a barrier against stressing, significantly improving product reliability and minimizing warranty costs.

Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
9701	Excellent re-workability; very low yellowing; low shrinkage; good thermal shock resistance; bonds to a variety of surfaces	200	00-70	0.49 [71]	0.54 [79]	HF HALOGEN FREE
9702	Excellent re-workability; low shrinkage; very low yellowing; good thermal shock resistance; Bonds to a variety of surfaces	950	00-70	0.89 [129]	0.36 [52]	HF HALOGEN FREE
9703	High viscosity making it ideal for edge damming applications; low shrinkage; very low yellowing; good thermal shock resistance; excellent re-workability; bonds to a variety of surfaces	30,000	00-80	1.85 [268]	0.73 [106]	HF HALOGEN FREE

Materials for Micro Speaker Applications

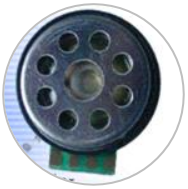
With consumers increasingly turning to their phones and other smart devices for music and multimedia applications, the necessity for high-quality micro speakers has drastically increased. UV light-curable adhesives are ideal for micro speaker applications because they provide a strong bond to plastics and metals while providing enough flexibility that sound properties are not compromised.

Dymax adhesives for speaker assembly cure in seconds for optimal performance in speaker applications and can be used in a number of applications including bonding speaker magnets, cones, speaker membranes, and voice coils.

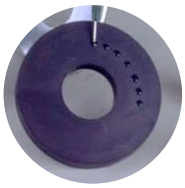


Typical Speaker Components

Product	Features	Viscosity, cP	Shore Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Industry Approvals
9-20763	UV/Visible light cure; black color; high adhesion to voice coil and membranes	13,000	D60	37 [5,300]	14 [21,000]	-
9671	UV/Visible light cure; bright red color; high adhesion to LCP, voice coil; thick viscosity for easy application	45,000	D55	15.8 [2,100]	193 [26,000]	HF HALOGEN FREE


Micro Speaker Assembly


Bright Red Color Available

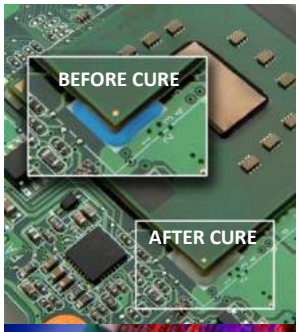

Speaker Magnet Bonding


Speakers in Mobile Phones & Accessories

Innovative Technologies

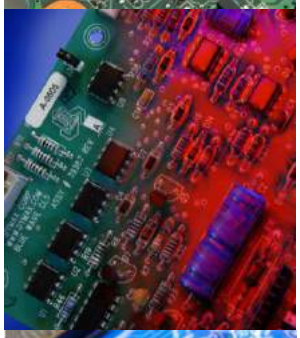
See-Cure Technology

Dymax light-curable adhesives with patented See-Cure technology have built-in cure validation that makes it easy for operators or simple automated inspection equipment to confirm cure without investing in additional specialized equipment. See-Cure technology is an indicator of cure that intentionally transitions the color of the adhesive after it has cured and builds a visible safety factor into the assembly process.



Ultra-Red™ Fluorescing Technology

Ultra-Red™ fluorescing technology, formulated into Dymax adhesives, enhances bond-line inspection processes and product authentication. The adhesives remain clear until exposed to low-intensity UV light at which point they fluoresce bright red. This is particularly effective while bonding plastics that naturally fluoresce blue, such as PVC and PET. Ultra-Red technology also produces a unique spectral signature that can be used by manufacturers for product authentication.



Dual-Cure Light/Moisture-Cure Technology

Dual-Cure coatings are formulated to ensure complete cure in applications where shadowed areas on high-density circuit boards are a concern. Previously, areas shadowed from light were managed by selective coating or a secondary heat-cure process. Dual-Cure coatings ensure shadowed areas cure over time with moisture, eliminating the need for that second process step or concerns of component life degradation due to temperature exposure.

LED Light-Curable Adhesives

Dymax offers specially formulated LED light-curable adhesives for use with Dymax LED UV/Visible light-curing systems. The adhesives range from fast to ultra-fast cure speeds in order to accommodate specific medical device, electronic, and industrial assembly needs.

Curing and Dispensing Equipment

Dymax offers a wide range of curing equipment including various spot lamps, flood lamps, and conveyor systems, as well as radiometers and other accessories**.** Since Dymax designs and manufactures its own lamp systems, the lamps are optimized to work with the adhesives to gain process efficiencies by targeting rapid surface curing, depth of cure, and speed of cure, all while delivering light in a rapid and economical way. CE marked equipment is available.

Light-Emitting Spot Lamps

Spot lamps provide a wide variety of methods to deliver light to a very precise location. They can be used manually by an operator or incorporated into a high-speed automated assembly line. Dymax offers multi-spectrum light-emitting lamps which use high-pressure mercury vapor bulbs, as well as light-emitting diode spot lamps, which use an array of surface-mounted LEDs instead of traditional metal halide or mercury bulbs.

Light-Emitting Flood Lamps

Static flood lamp systems are suited for area curing or for curing multiple assemblies. They use moderate- to high-intensity, multi-spectrum UV/Visible light for fast curing. Light-curing flood lamps can be easily integrated into existing manufacturing processes by mounting the lamps above high-speed assembly lines to achieve rapid cures. Shutter assemblies, mounting stands, and shields are available to create a custom curing system.

Light-Emitting Conveyors

Conveyor systems consist of a moving belt that passes through a curing tunnel with multi-spectrum lamps mounted from above or on each side for fast curing of parts. These conveyor systems are designed to offer consistent, fast, and safe curing. They can be outfitted with standard metal halide (longwave UV), mercury (shortwave UV), or visible bulbs. Consistent line speed, lamp height, and intensity provide a consistent light-curing process for high throughput.

Radiometers

Measurement of the lamp intensity and dosage is critical to the successful implementation of light-curing technology. Dymax radiometers allow operators to monitor and document a light-curing process.

Dispensing Systems

Our Application Engineering lab can assist manufacturers with integrating the appropriate manual and robotic dispensing systems into their production lines.

Photo courtesy of Asymtek

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