



Product Parameters and Specifications
Model: Legatia L3SE Super Wide-Bandwidth Midrange

Thank you for your interest in Hybrid Audio Technologies' Stage IV super wide-bandwidth, point source Legatia Special Edition drivers, and specifically, the Legatia L3 Special Edition (SE) midrange. The Legatia L3SE is the culmination of an inordinate amount of time and resources spent testing and refining this product to the exacting specifications of Hybrid Audio Technologies and our long heritage of quality speakers. We are certain that this product will provide class-leading performance that simply cannot be beat by competing brands if installed properly.



The Legatia L3SE - A Brief History

The Legatia L3SE's topology has been based off of the massively successful Stage III Legatia L3 transducer, which was first launched in April 2006 to an enthusiastic reception of car audio competitors, enthusiasts, and car audiophiles. In the years since its inception, the L3 midrange has been included in more International Auto Sound Challenge Association (IASCA[®]) national- and world-championship vehicles than any other midrange in this period of time. When it came time to develop the SE series, the first product earmarked for production was the Legatia L6 SE midrange/midbass. In Spring 2009, the first prototypes were developed by company founder and lead designer Scott Buwalda, and the concept of an SE series was born. The Legatia L3SE was the second SE driver in the series, which also includes the Legatia L4SE super wide-bandwidth midrange, Legatia L6SE midbass/midrange, and the L8SE midrange/midbass, together with tweeter offerings from the emerging Stage V product line Legatia Pro Series.

By early 2010, a beta prototype pair of Legatia L3SE's had been refined after hundreds of hours of testing and development; these highly-evolved drivers were sent to Team Hybrids members Jorge Juaristi, Jim Becker, and Hajji Grape for final testing and evaluation; all three multiple IASCA and USACi champions. After countless hours testing the speakers under various circumstances, both as a dedicated midrange and as a "full range" point source driver (for midrange and treble duties without the use of a tweeter), the trio of testers gave their final approval. Production refinements were late Spring and Summer of 2010, to incorporate features inclusive and proprietary to the SE line, and final production commenced late Fall 2010. The Legatia L3SE was launched in December 2010 and is the reference 3.7-inch driver in Hybrid Audio's Stage IV product category known collectively as the Legatia Special Edition Series.

Legatia L3SE Attributes

The Legatia L3SE is a 93mm (3.7-inch) "small format" wide-bandwidth midrange driver to compliment three-way system designs, or in two-way designs where the L3SE is earmarked as the full-range speaker (for midrange and treble duties without the use of a tweeter). The following are the L3SE's design attributes:



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Basket

The basket of the L3SE is a shared design with the Stage III Legatia L3 for easy upgrade potential. If you already own the L3, the L3SE will drop right into place with only a negligible amount of mounting depth difference (one millimeter). The basket is a high-quality cast aluminum design, and contains a 93mm flange providing for the mounting of the driver via four screw holes (the use of 3mm cap head screws is ideal). The overall dimensions of the driver are very amenable for use in the car audio environment, and in locations typical of the standard “3-inch” driver, boasting a depth of just 44mm (1.73-inch). The basket features large openings behind the cone to eliminate chuffing and other aerodynamic-based noises and spider venting for improved thermal power handling, as well as provides adequate communication to the back of the cone for acoustic suspension.

Motor

The motor of the L3SE is paramount to the performance of the driver, providing for a flat and wide BL curve (as a learning note, BL is the equivalent of torque in a car; a car with a flat and constant torque curve provides much better acceleration and performance than a car with a peaky, non-constant torque curve). The BL curve is very flat and extended, yielding 6mm of two-way linear excursion, resulting in the L3SE being able to accurately track the input signal. Reduced distortion and greater dynamics are the immediate sonic benefits.

The motor of the L3SE is a cup-style multi-magnet neodymium (N48H grade) design, with the magnetic circuit fully enclosed within the voice coil. The result is the total profile of the motor being as small as possible, enhancing acoustic performance, and aiding in mounting via small size and low weight. The final enhancement to the motor is a machined aluminum, rose-tinted copper-plated motor radiator, which significantly increases thermal power dissipation and thermal power handling.



Shorting Rings

The L3SE uses the CuAl inductance ring system, consisting of optimally sized and placed rings of copper (Cu) and aluminum (Al) to create a total inductance profile that is extremely low over stroke, frequency, and power. Inductance is the biggest limiter of high frequency extension and modulation of inductance with stroke, frequency and power, and is the primary source of intermodulation distortion (IMD). The Legatia L3SE design ensures optimization of the total inductance profile.

Voice Coil

The voice coil diameter of the L3SE is 25.5mm (1-inch), which is the proper balance between size and moving mass in super high-end mobile audio midranges. The voice coil diameter serves several



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key functions: elevated power handling, dissipation of heat (thereby lowering power compression), and maximizing the size of the neodymium multi-magnet inside the motor for enhanced motor compliance. The voice coil is high-purity aluminum, which is superior to copper for heat dissipation, as well as significantly reduced moving mass. The result is an extremely light weight winding with good power handling and low inductance.

Suspension

The inverted surround is butyl rubber which is highly consistent, and does not suffer the variance of natural rubbers. This rubber surround terminates mechanical vibrations well, having a low stiffness for positive damping of resonances. The spider material was chosen for optimal performance; the spider is a 90/10 cotton/Nomex blend with single-dip low viscosity phenolic. This material provides the stiffness desired without being overly brittle or stiff, where vibrations in the spider are well damped and do not translate into the former or the cone.

Cone

Like other Legatia midrange designs, you will find no composite or metal cone materials used on the L3SE, as our approach to point-sourcing is to allow the Special Edition midrange driver to effectively play into upper treble frequencies. The Legatia L3SE is a cone-type driver consisting of a proprietary hybrid paper diaphragm with extremely low moving mass. Paper is widely acknowledged as the best-damping material, as provides the near optimum balance of strength and weight. The cone has been treated with a water resistant element at the rear to accommodate door mounting, or other areas prone to *occasional* contact with liquid. The cone design offers a wide dispersion pattern to make for flexible installation and speaker location. The Legatia L3SE has an outstanding extended frequency response; the usable frequency range of this driver exceeds seven complete octaves of usable bandwidth on-axis (resonance to 18,000 Hz). Even off-axis, the L3SE faithfully recreates six full octaves of information, for the ultimate “small-format” midrange.

Phase Plug

The L3SE comes equipped with a phase plug pole piece extension at the center of the cone; the phase plug is aluminum and provides some of the total inductance reduction benefits. The phase plug is plated in rose-tinted copper, which by design does not negatively reduce eddy current, and adds thermal dissipation potential, not to mention class-leading cosmetics. The phase plug extends well down inside the pole vent, and acts as a very large and efficient heatsink for any heat that radiates into the pole.

The highest frequencies of audio emanate from the area around the center of the cone and the lower frequencies are produced by the area of the cone that is farther from the center. The phase plug pole piece extension improves the L3SE’s performance and clarity by deflecting delicate midrange and treble tones forward of the driver, while minimizing distortion and improving bandwidth.

Tinsel Leads

The tinsel leads for the L3SE are terminated on one side of the voice coil, with a second, unused set of tinsel leads exiting the opposite side of the termination. Having two sets of tinsel leads reduces the rocking of the system under high stroke; the spider is mechanically balanced. Additionally the



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tinsel leads are bonded directly to the former and brought out to the terminals, which keeps tinsel lead slap to a minimum and does not compromise the structural integrity of the cone.

Terminals

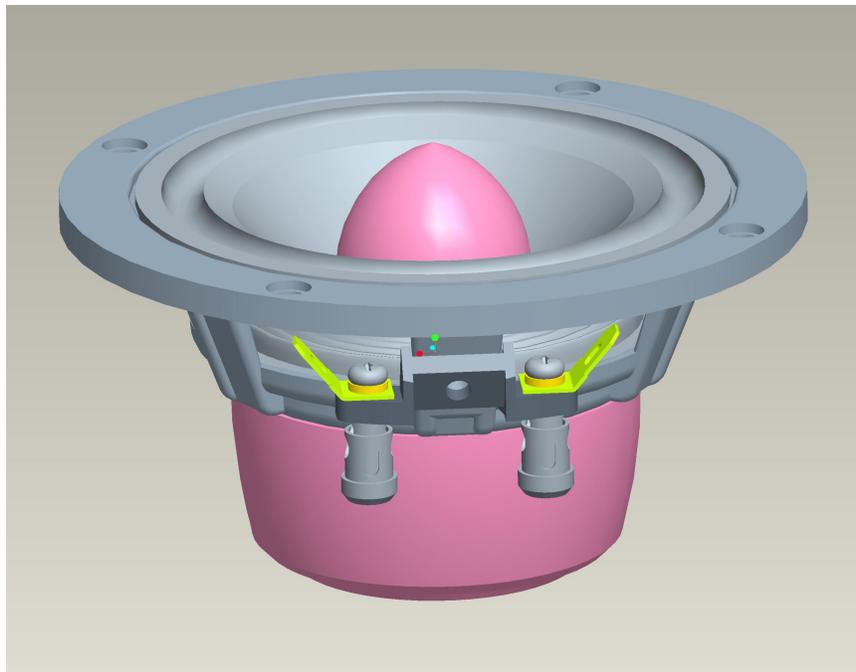
The Legatia L3SE comes equipped with heavy-duty spring loaded brass core terminals that are nickel plated to optimize contact, and give the end user flexibility in tinned wire or binding post terminations. The terminals are designed to accept up to 14 gauge wiring.

Summary

The Legatia L3SE is the ideal multi-purpose super high-end speaker driver. Mechanical and electrical parameters are amenable to a variety of different installations and speaker locations. This driver is intended to be used in an infinite baffle configuration; a simple, solid baffle, solidly attached to the car's chassis with available airspace at the rear of the baffle is all that is required for optimum operation. The size of the L3SE allows it to be mounted in typical "3-inch" midrange locations within a vehicle, as long as there is adequate airspace behind the driver to allow it to maintain proper damping and acoustic suspension.

At home in virtually any arrangement, the L3SE is Hybrid Audio Stage IV super high-end small-format midrange offering, boasting exceptional performance and a design philosophy that goes hand in hand with true high-fidelity playback.

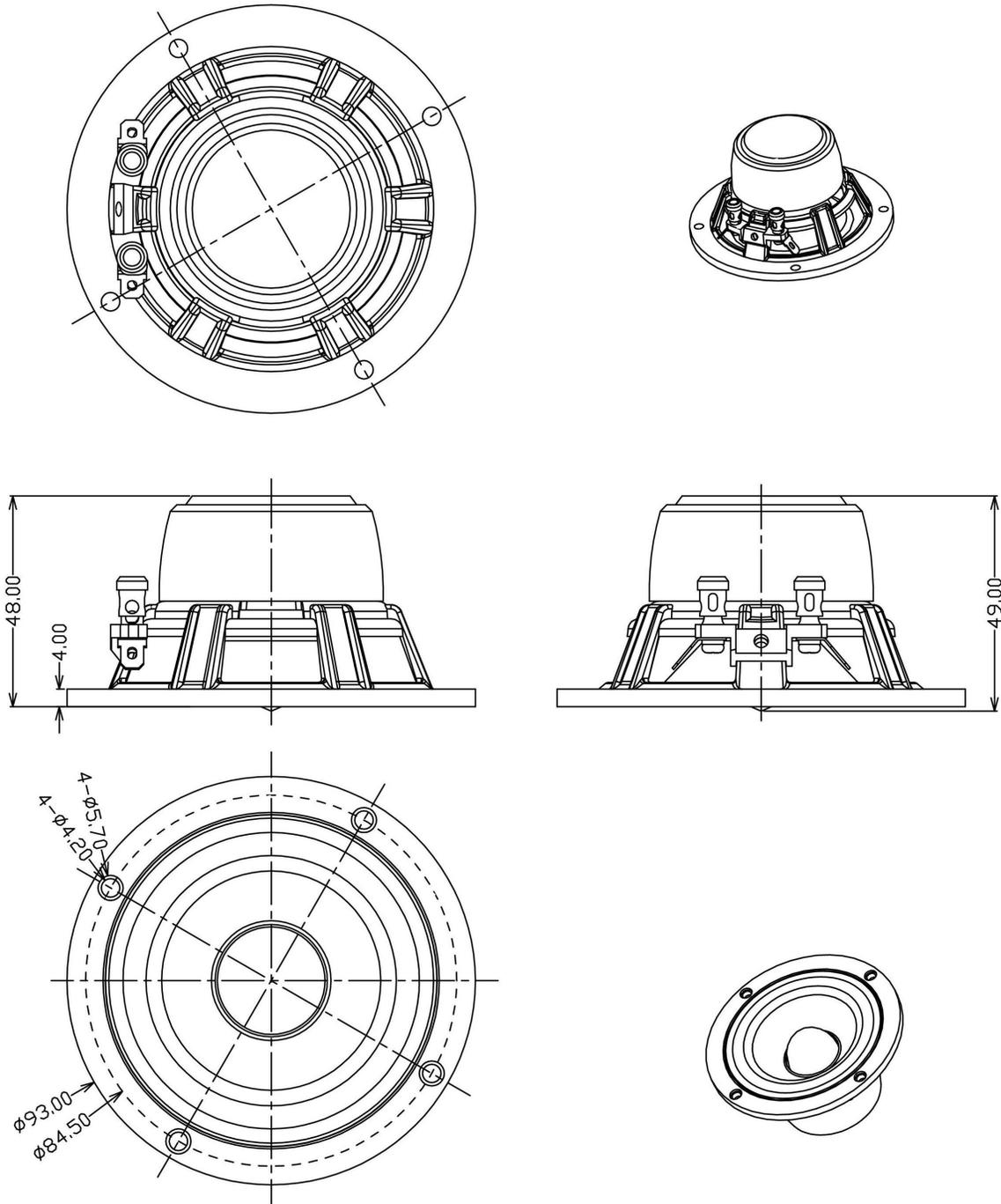
Legatia L3SE midrange - three-dimensional design drawing





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Legatia L3SE midrange - dimensioned mechanical drawing



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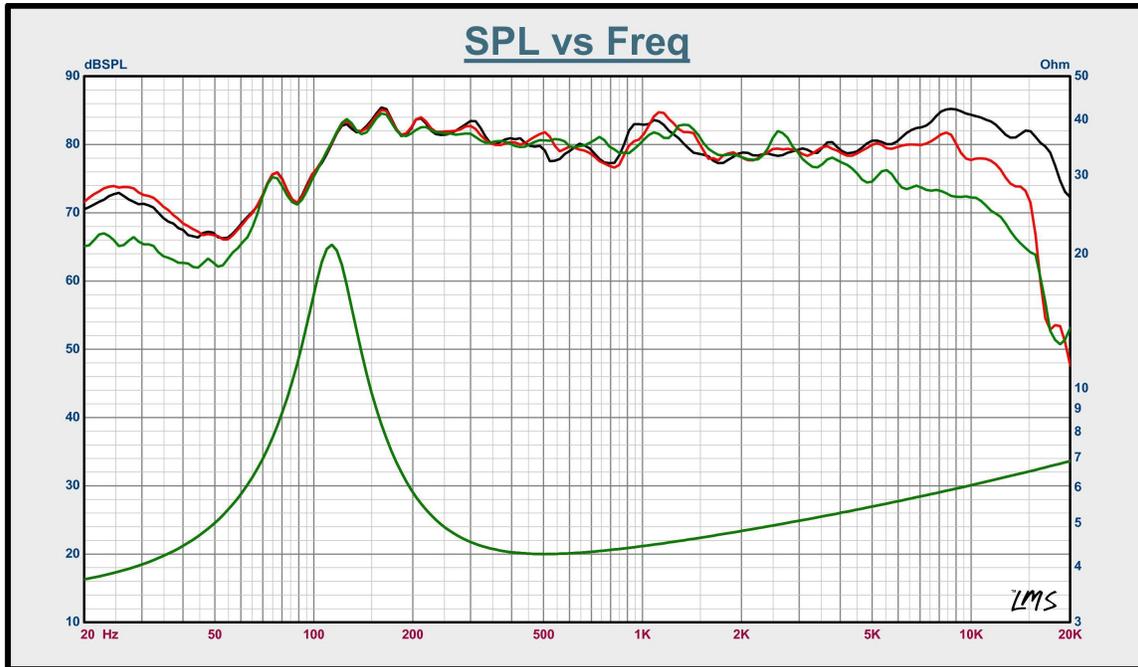
Legatia L3SE Thiele-Small Parameters

Overall Diameter	$\phi 93$ mm (3.7-inch)
Mounting Depth	44 mm
Bolt Circle Diameter	$\phi 85$ mm
Mounting Hole	$\phi 74$ mm
Recommended <i>Minimum</i> Crossover Frequency	160 Hz at 24 dB/octave highpass
P_{nom} Rated Power Input (No Crossover)	30 watts (AES Standard)
P_{max} Rated Power Input (No Crossover)	60 watts (AES Standard)
P_{max} (With Recommended Minimum Crossover)	125 watts
Frequency Range	113 Hz - 18,000 Hz, +/- 3 dB
Sensitivity	86 dB at 1 watt/1meter
Mms	2.466 g
Cms	798 $\mu\text{m}/\text{N}$
BL	2.933 T*m
Voice Coil Diameter	25.5 mm (1-inch)
Impedance	4 Ω
DC Resistance	3.2 Ω
Fs	113 Hz (free air)
Qms	3.602
Qes	0.654
Qts	0.553
Xmax	3 mm (one way)
Vas	1.1 L
Le	7.9 μH
Sd	3117 mm^2



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Legatia™ L3SE Impedance and SPL Verses Frequency Plot
note, curve is not corrected



Black = 0-degrees, on-axis
Red = 30-degrees off-axis
Green = 60-degrees off-axis