Solutions for Humanoid Robots

Humanoid robots employ an anthropomorphic chassis with articulated, multi-axis joints that provide extensive degrees of freedom and dynamic motion. Autonomous operation requires distributed electronics for actuation, sensing and power management to be tightly integrated into the robot's confined spaces, with a high-performance central processor providing coordination. This architecture creates significant interconnect challenges, requiring densely routed connections to support high-speed data, power distribution and control signals within an extremely limited footprint, while maintaining reliability under vibration, shock and thermal cycling inherent to human-centric environments.

Molex addresses these demands with compact, high-density interconnect solutions designed for mixed-signal versatility and mechanical durability. Board-to-board connectors enable tight PCB stacking within distributed processing modules, while flexible circuits and cable assemblies simplify routing through articulated structures. Wire-to-board connectors with positive-lock retention and vibration-resistant contacts ensure stable power delivery and signal integrity under constant movement, enabling reliable autonomous operation in advanced humanoid robot designs.

Humanoid Robot

Computing System

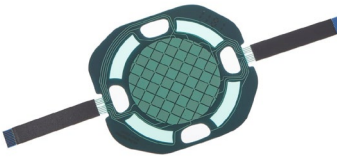
Power System

Perception System

Body Actuation

Dexterous Hands

MOLEX SOLUTIONS FOR HUMANOIDS

MiniCirc Connectors	HSAutoLink C Interconnect System	EXTreme Ten60 High-Power Connectors	Printed Electronics Touch Foils
			
Application Use			
Servo motor connections	LiDAR sensor interface to main PCBA	Hybrid power distribution for robot actuators	Finger tactile sensors
Product Benefits			
Compact circular design	High-speed differential connectivity	High-current power contacts	Ultra-thin flexible sensors
Secure mating and vibration resistance	Flexible I/O interface design	Power and signal integration	Responsive touch sensing

Humanoid Robot

Perception System

Board-to-board connectors (SlimStack)

FFC/FPC connectors

Circular connectors (M12, MiniCirc)

I/O connectors (HSAutoLink C, High-Speed FAKRA-Mini, USB)

Wire-to-board connectors (Micro-Lock Plus, Pico-Clasp, Rely-On)

Body Actuation

Cable assemblies (Signal/low-power cables)

Circular connectors (SPE, MiniCirc)

Wire-to-board connectors (Micro-Lock Plus, Pico-Lock)

Dexterous Hands

Board-to-board connectors (SlimStack)

FFC/FPC connectors

Wire-to-board connectors (Zero-Hachi, Pico-EZmate)

Printed Electronics (Flexible Hybrid Electronics)

Flexible Printed Circuits (FPCs)

Computing System

Board-to-board connectors (SlimStack, Mirror Mezz, ZN Stack)

Cable assemblies (Signal/low-power cables)

Circular connectors (Nano-Change M8, M12, MiniCirc)

I/O connectors (HSAutoLink C, High-Speed FAKRA-Mini)

Wire-to-board connectors (Micro-Fit, DuraClik, CLIK-Mate)

Power System

Board-to-board connectors (SlimStack, Flexi-Latch+)

FFC/FPC connectors

Premo-Flex Flat Flexible Cables (FFC/FPCs)

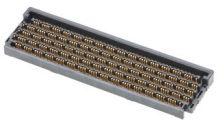
Cable assemblies (Signal/low-power cables)

High-Power connectors (EXTreme Ten60, EXTreme Guardian)

Wire-to-board connectors (Nano-Fit, Micro-Lock Plus, MX150 Mid-Voltage)

Micro-Lock Plus Connectors

High-Speed FAKRA-Mini Interconnect System



Mirror Mezz Connectors

M12 Connectors

SlimStack Floating FSB3 Connectors

References

Wire-to-Board Connectors

UL-approved

Signal options

Glow Wire offerings

Fit families

Board-to-Board Connectors

UL-approved

Micro product reference guide

I/O Connectors

Digital product board

USB Connectors

FFC/FPC Connectors

Digital product board

Core products

Easy-On Connectors

Premo-Flex FFCs

FPC solutions

Circular Connectors

Nano-Change M8 Connectors

M12 Connectors

M23 Connectors

Cables

Power and signal

Pre-crimped leads

Custom cable creator

SUBASSEMBLY BREAKDOWN

Computing System - Processes sensor data and coordinates motion, balance and interaction.

Power System - Delivers high-density power to support mobility and compute loads.

Perception System – Captures and processes visual and spatial data for recognition, navigation and awareness

Body Actuation – Enables joint movement for locomotion, balance and terrain adaptation

Dexterous Hands – Provide precise movements for grasping, manipulation and interaction

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