

TELEDYNE COUGAR

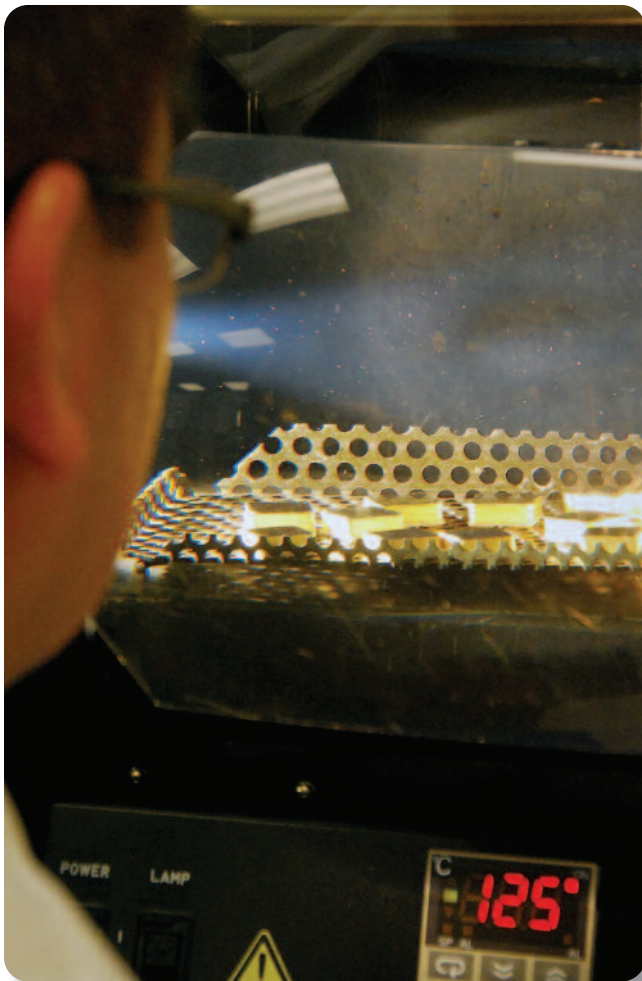
A Teledyne Technologies Company

DIE SERVICES AND VALUE ADD

Teledyne Cougar offers a complete portfolio of Value Add and High Reliability services, including die up-screening, sorting, testing, packaging, binning, marking, Lot Acceptance and reliability testing. Cougar's additional Value Add services include labeling, lead forming and tinning, tape-and-reel packaging, environmental screening, hybrid and SMA-assembly, and other services.

Cougar offers full chip-and-wire assembly of products ranging from single die (MMIC, FET, etc.) through complex hybrids, which Cougar can then submit to a combination of customer specified RF and DC testing and environmental screening. Cougar performs Lot Acceptance Testing on packaged devices or bare-die, including diodes, transistors, and MMICs, with test capabilities to 40 GHz.

Cougar's value-added capabilities simplify choice, increase product yields, reduce labor content, reduce scrap/rework and tuning, reduce field returns, and reduce lead-times. Cougar offers a complete range of services for commercial, military, and space requirements including MIL-PRF-38534, MIL-PRF-38535, MIL-PRF-19500, MIL-STD-883, and MIL-STD-750.



Die Services

Cougar's broad scope of die services assure quick, reliable and cost-effective inspecting, testing, sorting, and packaging of die. These help you maintain a consistent flow of die to your manufacturing environment in volumes and at the quality level appropriate to your needs. Cougar also provides qualified die through 100% visual inspection and Lot Acceptance testing for space and military level applications.

Die Assembly, Packaging, Sorting and Testing

- **Store Wafers (Dry Nitrogen Desiccators)**
- **DC probe of Discrete Die**
 - Capacitors, Diodes (chip and beam lead), Transistors, MMICs
- **Die Visual**
 - Commercial Level
 - Military Level and S-Class to MIL-PRF-19500, MIL-STD-750, MIL-STD-883, MIL-PRF-38534, MIL-PRF-38535
- **Die assembly (MMICs, transistors, diodes, FETs) into hermetic packages, including**
 - Full wire bonding
 - Visual inspection
 - Testing
- **Die Package in Waffle or Gel Pack**
 - Facilitate automated pick-and-place or manual transfer

Die Up-screening (Element Evaluation)

Element evaluation verifies procured materials can adequately meet the application's requirements. Cougar up-screens (element evaluation) on COT RF-semiconductor die in full conformance with Classes H and K of MIL-PRF-38534, and Class S of MIL-PRF-38535 (MIL-S-19500), meeting all requirements of military and space applications.

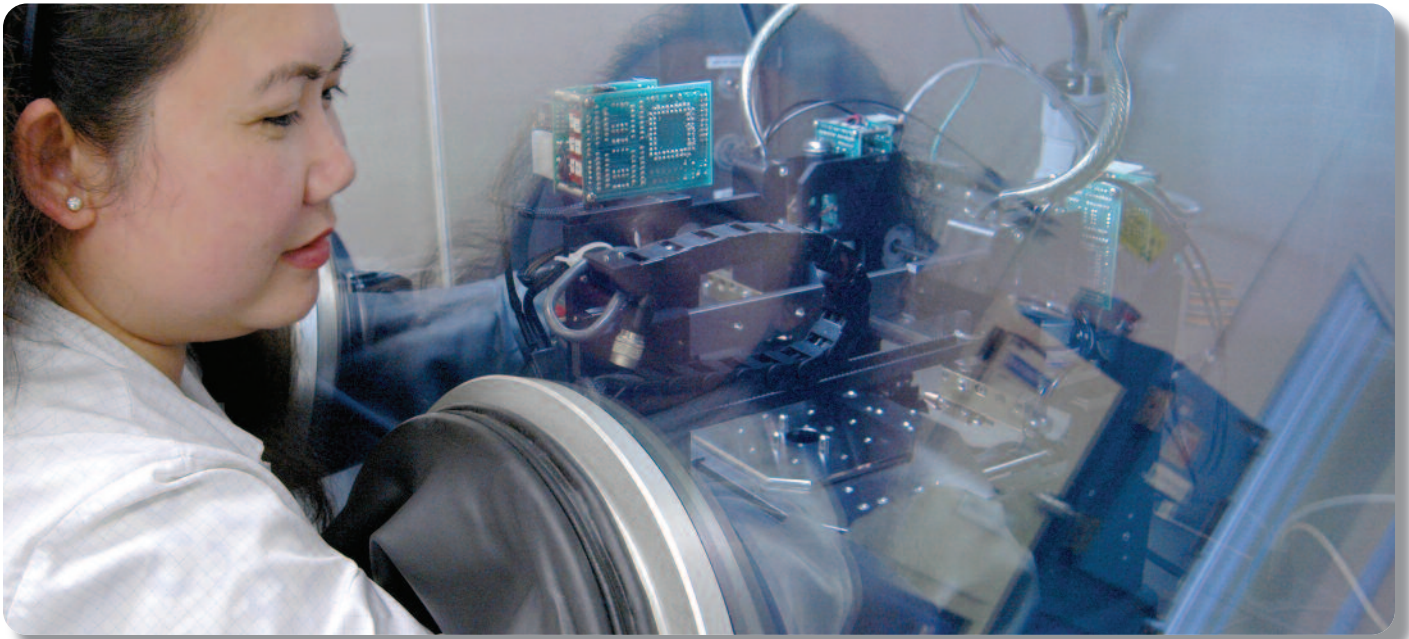
Additionally, Cougar supports custom screening flows for many element types, including screening of beam lead diodes, MMICs, bipolar and FETs, and more. In addition, Cougar also up-screens chip capacitors, packages, substrates, and other elements.

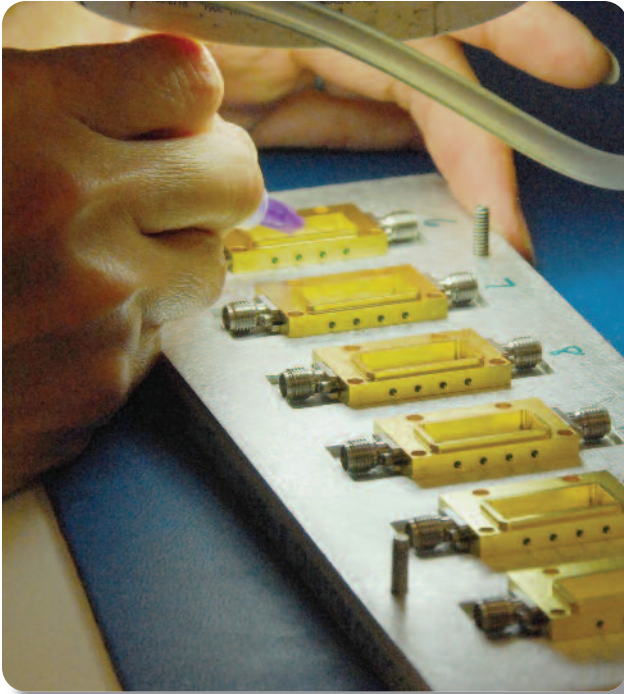
ELEMENT TYPE	CLASS H	CLASS K
Microcircuit and Semiconductor Die Evaluation	X	X
Passive Element Evaluation	X	X
Substrate Evaluation	X	X
Package Evaluation	X	X

Microcircuit and Semiconductor Die Evaluation

Cougar can 100% screen Microcircuit and Semiconductor Die per MIL-PRF-38534, Classes H and K. Cougar also supports other industry standard and custom screening and evaluation sequences, including diode screening from MIL-DLT-28837.

CLASS H	CLASS K
Element Electrical	Element Electrical
Element Visual	Element Visual
Internal Visual	Internal Visual
Final Electrical	Temperature Cycling
Wire Bond Evaluation	Constant Acceleration
Attribute Data / Certificate of Conformance	Interim Electrical Burn-in
	Post Burn-in Electrical
	Steady State Life
	Final Electrical
	Wire Bond Evaluation
	SEM Examination
	Attribute Data / Certificate of Conformance





Environmental Testing, Including QCI and Qualification Testing

Cougar is a full service MIL-STD-750 and MIL-STD-883 environmental test laboratory and program management organization. Cougar conducts individual environmental tests or full qualification/screening programs to standard military or customer proprietary specifications, including MIL-PRF-19500, MIL-PRF-38534, MIL-PRF38535 Groups A, B, C, D, and E testing. Cougar conducts environmental testing on a large variety of products, including:

- **Amplifiers (hermetic hybrids and SMA configurations)**
- **VCOs**
- **Filters (combine, cavity, ceramic, lumped element)**
- **Packaged transistors, diodes and MMICs**
- **Frequency Dividers (Pre Scalars)**
- **Frequency Mixers**
- **Custom Packaged Devices**
- **Voltage Controlled Attenuators, Detectors, Power Dividers**

100% or Sample Device Screening

Screening is a series of tests and inspections performed on each device in order to eliminate products which do not meet the performance requirements. Typically, each device in the manufacturing lot is subjected to and must pass all applicable screening tests and inspections in accordance with the applicable requirements. Typical screening sequences Cougar perform include:

- **Internal Visual (assemblies, assembled components)**
- **Stabilization Bake**
- **Temperature Cycle**
- **Constant Acceleration**
- **PIND (Particle Impact Noise Detection)**
- **HTRB (High Temperature Reverse Bias)**
- **Burn-In / Life Test**
- **Electrical Parameter Testing (DC and RF to 40 GHz)**
- **Seal (Fine/Gross)**
- **Radiographic**
- **External Visual**
- **Bond Pull/Die Shear**
- **Solderability**
- **Lead Integrity**
- **Resistance to solvents**
- **SEM (Scanning Electron Microscope)**



Electrical Test Capabilities

Cougar's full DC, RF and microwave test capabilities cover all element, hybrid, component, and integration testing requirements. Using fully documented and controlled test procedures, Cougar quickly provides go/no-go or complete RF test results from ambient to full military/space temperature extremes. Customers can specify the testing parameters, temperatures and data format. Cougar's testing results are quick, accurate, and reliable.

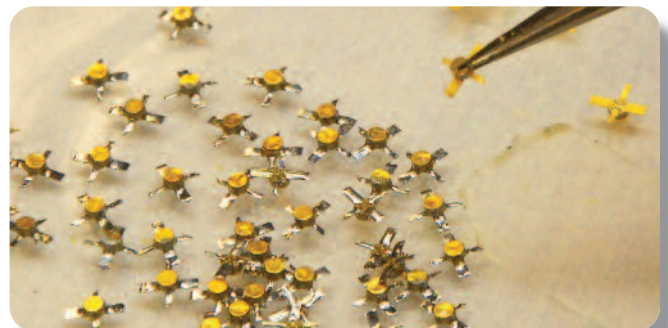
- **RF Power Test, Selection and Sort (80 MHz to 2800 MHz)**
 - CW to 200 Watts
 - Single, Multiple or Burst Pulse Formats
 - Example Test Parameters: Pout, Power Gain, PAE
 - Custom Test Capability: High Frequency, IP3, Load Pull, Mismatch VSWR
- **DC Test, MMIC and Transistors**
 - FET: IDSS, VP, GM, Breakdown Voltage, IGSS
 - MMIC: IDD
 - BiPolar: ICBO, IEBO, HFE, BVCEO, BVCBO, BVEBO
- **RF Test, MMIC and Transistors (100 kHz to 40 GHz)**
 - Small Signal Gain, P1dB, Psat, VSWR, Reverse Isolation
 - Noise Figure, IP3, Harmonic
 - Phase Noise
 - Phase and Amplitude Matching
 - Over Temperature
 - S-Parameter Testing



Standard Hybrid Assembly

Cougar's experienced and quality-focused production staff and extensive hybrid clean-room assembly facilities offers world-class manufacturing service for thin film, SMT, and subassembly production. Using fully characterized, qualified and documented assembly procedures, Cougar specializes in low volumes high-mix, through high volume single-mix requirements. Whether you need an assembly source for full assembly turnkey, or a single hybrid or board, Cougar's production capacity and highly trained production staff can reduce our costs and lead-time, and increase your overall quality and reliability.

- **Thin Film Hybrid Assembly**
 - Ultrasonic Cleaning
 - Desktop Substrate Reflow
 - Eutectic Die Attach
 - Plasma Clean
 - Automatic Ball and Wedge Bonding
 - Manual Wedge, Ball and Ribbon Bonding
 - Gap Welding
 - DC Tuning
 - Hermetic Sealing
 - Package Labeling/Marking
- **SMT Assembly**
 - Hakko Manual Soldering Stations
 - Ultrasonic Solvent Pre-Cleaning
 - J-STD-001 Capability
 - Expansion to Desktop 5 Zone Reflow System
 - Expansion to Mini Screen Printing System



Standard Hybrid Screening Flow

Cougar offers various streamlined hybrid screening sequences for customer-supplied hybrids intended for commercial, industrial, military, and space applications. Examples are shown at right. Cougar also supports customer specified screening sequences.

Documentation Related Services

Cougar offers complete documentation generation services, providing the following types of procedures and plans.

- **Acceptance Test Programs Procedures**
- **Qualification Test Procedures and Plans**
- **Lot Travelers and Operation Sheets**
- **Inspection Instructions and Plans**
- **Process Procedures**

HYBRID PRODUCTS TYPICAL SCREENING FLOW

Test or Inspection ¹	Method	Condition
Element Evaluation		
Nondestructive Bond Pull	2023	
In-Line Process Verification		
Internal Visual	2017	
Temperature Cycle	1010	C
Constant Acceleration	2001	A
PIND	2020	A
Pre Burn-in Electrical		
Burn-in ²	1015	B
Final Electrical		
Group A		
Seal (fine and gross)	1014	A1/C
In-line Process Verification		
Radiographic Examination	2012	
External Visual	2009	

¹ Methods, conditions and flow based on MIL-PRF-38534 and MIL-STD-883. Actual sequence and conditions specified by customer.

² RF power burn-in available.



Packaging

Cougar's MIL-PRF-38534 qualified sealing procedures assure highest quality, consistency, and hermeticity. Cougar's thoroughly controlled and continuously monitored sealing environment assures meeting the most stringent sealing requirements, including space and military levels.

- **Packaging**
 - SSC Seam Sealer
 - Polaris Welder
 - DAP Solder Sealer
 - Multiple Mechanical Configurations
 - TO-style Packages
 - Rectangular Packages
 - Pre-seal Nitrogen-environment Bake
 - Sample of 100% Fine and Gross Leak Test
 - Pre-seal PIND Clean
 - PIND Testing Available
 - Package Labeling Available