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high reliability
discrete semiconductor up-screening guide

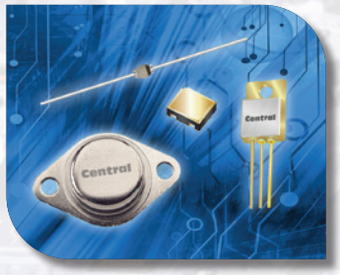
Central™ Semiconductor Corp.

www.centralsemi.com

Release: R5 0221

A heritage of outstanding quality

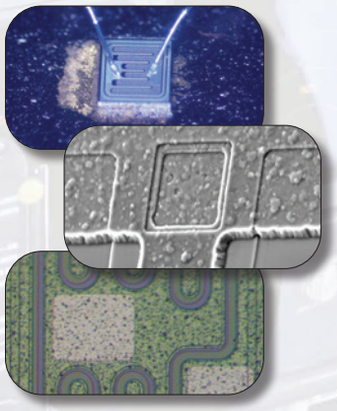
Since 1974, Central Semiconductor has manufactured innovative discrete semiconductors for OEM products worldwide. Devices are available in surface mount, through-hole and bare die. Epoxy molded, glass passivated, and hermetically sealed packages are available for a broad range of device types. Central maintains ISO 9001:2015 certification.



Devices include:

- Small signal transistors
- Bipolar power transistors
- MOSFETs/JFETs
- EOS protection devices (TVS)
- Diodes/Rectifiers
- Thyristors
- Multi Discrete Modules (MDM™)

Central Semiconductor has the capability to screen COTS devices to a variety of standards.



Quality by design

Central's designs provide superior performance and reliability with only superior materials used in the construction of its devices. Central's devices meet or exceed commercial performance standards and outperform industry expectations.

In a world where imperfection is all too often accepted, Central constantly monitors its manufacturing processes and business practices to achieve perfect quality products and outstanding service. Continuous improvement opportunities are regularly identified and implemented from within the organization.

High reliability up-screening

Central offers in-house up-screening solutions to ensure the highest quality devices for the most demanding high reliability applications. To best suit the constantly changing requirements of designers, up-screening and complete design solutions are available for both bare die and packaged devices.

Bare die solutions

Central has the capability to perform MIL-PRF-38534 and MIL-PRF-19500 equivalent up-screening, and maintains an extensive wafer inventory in its Long Island, NY facility.

MIL-PRF-38534

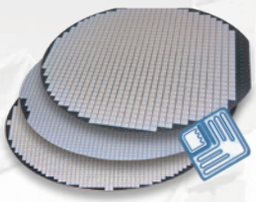
- Class H and K equivalents

MIL-PRF-19500

- Class HC and KC equivalents

Customer-specific up-screening

- Customer SCDs are reviewed and all requirements confirmed



Packaged device solutions

Central Semiconductor has standard up-screening solutions which meet the majority of customer requests.

J-lite
(JL)

COTS devices up-screened to a streamlined high reliability test flow

JX-lite
(JXL)

Lite version of JANTX with a streamlined test flow

EX
(EX)

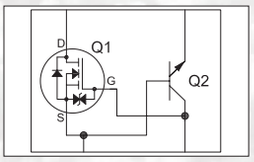
JANTX MIL-PRF-19500 equivalent

spacellite™
(SL)

Specialized testing at a lower cost, ideal for low Earth orbit (LEO) applications

Custom solutions

Your vision is our mission. When standard is not enough, Central excels at listening to customers' challenges and designing custom solutions that other manufacturers have no interest in pursuing. **Just ask.**



Options include:

- Electrical parameter screening
- Custom wafer diffusion and metallization
- Standard/customer-specific testing and up-screening

Super Industrial™ enhanced solutions include:

- Customer-specific high reliability testing
- Custom interconnect
- Custom packaging

Testing capabilities

All tests performed to MIL-STD-750 or MIL-STD-883 (bare die) test methods. Central provides dependable management of work flow with accurate device identification throughout the process.

Thermal stream testing

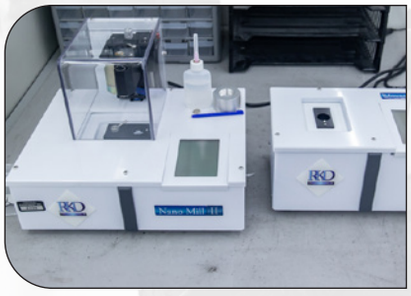
Temperature cycle testing

Particle Impact Noise Detection (PIND)

Burn-in testing

High temperature & humidity testing

Fine leak testing



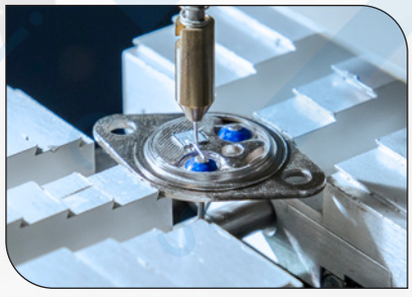
Gasket fabrication
for package decapsulation

X-Ray analysis

Digital microscope analysis

Scanning Electron Microscopy (SEM)

Highly-accelerated stress testing (HAST)



Wire pull & die shear testing

Part number nomenclature

The following is a guide to Central's up-screened and custom device part numbers.

Bare die devices - (example: CP127-H2N6300-CM)

Bipolar transistor die, up-screened to MIL-PRF-38534 Class H equivalent, 2N6300 device, packaged in chip tray.

CP127 - H - 2N6300 - CM

CENTRAL PROCESS NUMBER
5 - 7 ALPHA/NUMERIC
(BARE DIE ONLY)

CPxxx	=	Transistor/MOSFET
CPZxx	=	Zener Diode
CPDxx	=	Diode
CPQxx	=	TRIAC
CPSxx	=	SCR
CPCxx	=	Silicon Carbide

DEVICE TYPE NUMBER
(10 ALPHA/NUMERIC MAX)

UP-SCREENING LEVEL CODE

H	=	MIL-PRF-38534 Class H equivalent
K	=	MIL-PRF-38534 Class K equivalent
HC	=	MIL-PRF-19500 JANHC equivalent
KC	=	MIL-PRF-19500 JANKC equivalent
CEN	=	Customer-specific up-screening

PACKING METHOD
(BARE DIE ONLY)

CM = Singulated bare die,100% electrically tested, 100% visually inspected, reject die removed, tray (waffle) package.

All devices are in "CM" form.

Packaged devices - (example: JXL2N2222A)

JX-lite certified version of a Central Semiconductor 2N2222A transistor.

JXL 2N2222A

DEVICE TYPE NUMBER
(10 ALPHA/NUMERIC MAX)

UP-SCREENING LEVEL CODE

EX	=	MIL-PRF-19500 JANTX equivalent packaged device
JL	=	J-lite test flow
JXL	=	JX-lite test flow
SL	=	Spacellite™
CEN	=	Customer-specific up-screening

Other examples:

CP318V-H2N5682-CM	=	Standard MIL-PRF-38534 Class H equivalent up-screened bare die in chip tray.
EX2N5682	=	Standard MIL-PRF-19500 JANTX equivalent up-screened assembled product.
CEN1234	=	Custom device up-screened to MIL-PRF-19500 equivalent or customer-defined test specifications. (1234 represents a custom item)

Test Flow: Class H equivalent die

MIL-PRF-38534 Class H Equivalent Up-Screening		
Screening Requirements		
Test	Quantity (Accept Number of Failures)	Specification and Test Method
Subgroup 1: Electrical Test	100%	
Subgroup 2: Visual Inspection	100%	MIL-STD-750: 2069, 2070, 2072, 2073
Subgroup 3A: Internal/Die Visual Inspection	10 (0)	MIL-STD-750: 2069, 2070, 2072, 2073
Subgroup 3B: Sample Assembly	10 (0)	
Subgroup 4: Electrical Test as per Data-sheet: DC Test @ 25°C / DC Test @ 125°C / DC Test @-55°C/ (DC1-DC3)	10 (0)	
Subgroup 5 Wire Pull	10 Wires (0) or 20 Wires (1)	MIL-STD-883: 2011 Cond. D

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Test Flow: Class K equivalent die

MIL-PRF-38534 Class K Equivalent Up-screening		
Screening Requirements		
Test	Quantity (Accept Number of Failures)	Specification and Test Method
Subgroup 1: Electrical Test	100%	
Subgroup 2: Visual Inspection	100%	MIL-STD-883: 2010
		MIL-STD-750: 2069, 2070, 2072, 2073
Subgroup 3A: Internal/Die Visual Inspection	10 (0)	MIL-STD-883: 2010
		MIL-STD-750: 2069, 2070, 2072, 2073
Subgroup 3B: Sample Assembly	10	
Subgroup 4A: Electrical Test as per Data-sheet: DC Test @25°C (DC1)	10 devices per wafer (0)	
Subgroup 4B: Temperature Cycling	10 devices per wafer (0)	MIL-STD-883:1010-C 10 Cycles Minimum
Subgroup 4C: Mechanical Shock or Constant Acceleration	10 devices per wafer (0)	MIL-STD-750: 2002 or 2001 B, Y1 direction or 3000 g's Y1 Direction
Subgroup 4D: Electrical Test as per Data-sheet: DC Test @ 25°C / DC Test @ 125°C /DC Test @-55°C/ (DC2-DC4)	10 devices per wafer (0)	
Subgroup 4E: HTRB	10 devices per wafer (0)	MIL-STD-883: 1015-A 240 Hours, TA Minimum 125°C
Subgroup 4F: Electrical Test as per Data-sheet: DC Test @ 25°C / DC Test @ 125°C / DC Test @-55°C/ (DC5-DC7)	10 devices per wafer (0)	
Subgroup 4G: Steady State Life	10 devices per wafer (0)	MIL-STD-883: 1005-B 1000 Hours, TC Minimum 125°C
Subgroup 4H: Electrical Test as per Data-sheet: DC Test @ 25°C / DC Test @ 125°C / DC Test @-55°C/ (DC8-DC10)	10 devices per wafer (0)	
Subgroup 5: Wire Pull	10 Wires (0) or 20 Wires (1)	MIL-STD-883: 2011-D
Subgroup 6: SEM	Per Mil Standard	MIL-STD-750: 2077

Test Flow: Class HC equivalent die

MIL-PRF-19500 JANHC Equivalent Up-Screening		
Screening Requirements		
Test	Quantity (Accept Number of Failures)	MIL-STD-750
Subgroup 1: Electrical Test (DC1)	100%	
Subgroup 2: Visual Inspection	100%	2069, 2070, 2072, 2073
Subgroup 3A: Internal/Die Visual Inspection	10 (0)	2069, 2070, 2072, 2073
Subgroup 3B: Sample Assembly	10	
Subgroup 4A: Temperature Cycling	10 (0)	1051-C
Subgroup 4B: Electrical Test as per Data-sheet: DC Test @ 25°C / DC Test @ -55°C / DC Test @150°C/ AC Test @ 25°C (DC2-DC4), (AC1)	10 (0)	As per Electrical Datasheet
Subgroup 4C: HTRB	10 (0)	1039-A, 1042-B, 1038-A
Subgroup 4D: Electrical Test (DC5)	10 (0)	As per Electrical Datasheet
Subgroup 4E: Burn-In/SSOP	10 (0)	1039-B, 1042-A, 1038-B
Subgroup 4F: Electrical Test as per Data-sheet: DC Test @ 25°C (DC6)	10 (0)	As per Electrical Datasheet
Subgroup 5A: Wire Pull	10 Wires (0) or 20 Wires (1)	2037
Subgroup 5B: Die Shear	5(0) or 10 (1)	2017

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Test Flow: Class KC equivalent die

MIL-PRF-19500 JANKC Equivalent Up-Screening		
Screening Requirements		
Test	Quantity (Accept Number of Failures)	MIL-STD-750
Subgroup 1: Electrical Test	100%	
Subgroup 2: Visual Inspection	100%	TM: 2069, 2070, 2072, 2073
Subgroup 3A: Internal/Die Visual Inspection	22 devices per wafer (0)	TM: 2069, 2070, 2072, 2073
Subgroup 3B: Sample Assembly	22 devices per wafer (0)	
Subgroup 4A: Temperature Cycling	22 devices per wafer (0)	TM: 1051-C
Subgroup 4B: Mechanical Shock or Constant Acceleration	22 devices per wafer (0)	TM: 2016 or 2006
		Y1 Axis Direction
Subgroup 4C: Electrical Test: DC Test @ 25°C / DC Test @ TA MIN / DC Test @ TA MAX/ AC Test @ 25°C (DC2-DC4) (AC1) AC Test are performed when applicable	22 devices per wafer (0)	As per Electrical Datasheet
Subgroup 4D: HTRB	22 devices per wafer (0)	TM:1038-A, 1039-A, 1042-B
Subgroup 4E: Electrical Test (DC5)	22 devices per wafer (0)	As per Electrical Datasheet
Subgroup 4F: Burn-In	22 devices per wafer (0)	TM:1038-B, 1039-B, 1040-A,1042-A
Subgroup 4G: Electrical Test: DC Test @ 25°C (DC6)	22 devices per wafer (0)	As per Electrical Datasheet
Subgroup 4H: Steady State Life	22 devices per wafer (0)	TM:1038-A or B, 1039-B, 1040-A, 1042-A
Subgroup 4I: Electrical Test: DC Test @ 25°C / DC Test @ TA MIN / DC Test @ TA MAX / AC Test @ 25°C (DC7-DC9)	22 devices per wafer (0)	As per Electrical Datasheet
Subgroup 5A: Wire Pull	10 Wires (0) or 20 Wires (1)	TM:2037
Subgroup 5B: Die Shear	5(0) or 10 (1)	TM:2017
Subgroup 6: SEM	Per Mil Standard	TM:2077
Subgroup 7A: RHA Total Dose	As per customer requirement	TM: 1019
Subgroup 7B: Neutron Irradiation	As per customer requirement	TM: 1017

Test Flow: J-lite and JX-lite

J-lite and JX-lite Certification				
Test	Sample Size	Standard	J-lite (JL)	JX-lite (JXL)
Serialization			Read and Record	Read and Record
Number 1: Electrical Test	100%		25°C (DC1) Per Device Datasheet	25°C, -55°C, 125°C (DC1, DC2, DC3) Per Device Datasheet
Number 2: Temperature Cycling	100%	MIL-STD-750:	10 Cycles	20 Cycles
		TM 1051 Condition B	(-55°C to +125°C)	(-55°C to +125°C)
Number 3: Electrical Test	100%		25°C (DC2) Per Device Datasheet	25°C (DC4) Per Device Datasheet
Number 4: PIND	100%	MIL-STD-750:	-	Applicable
Hermetic Devices Only		2052 Condition A		
Number 5: HTRB	100%	MIL-STD 750:	48 Hours for Diodes. 48 Hours for NPN Transistors. 24 Hours for PNP Transistors. 48 Hours for MOSFETs.	96 Hours for Diodes. 96 Hours for NPN Transistors. 48 Hours for PNP Transistors. 96 Hours for MOSFETs.
		1038-A, 1039-A,		
		1040-A, 1042-B		
Number 6A: Electrical Test	100%		25°C	25°C
			(DC3)	(DC5)
			Per Device Datasheet	Per Device Datasheet
Number 6B: Delta Shift Calculations	100%		-	Per Specified Parameters on Device Datasheet
Number 6C: PDA Evaluation	100%		-	20% Allowable per Min/Max Limits of Device Datasheet
Number 7: Gross Leak	100%	MIL-STD 750	Performed	Performed
Hermetic Devices Only		1071		
Number 8: Final Electrical Test	100%		25°C (DC4) Per Device Datasheet	25°C, -55°C, 125°C (DC6, DC7, DC8) Per Device Datasheet

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Test Flow: J-lite and JX-lite

J-lite and JX-lite Qualification			
Process	**Test Method & Conditions**	**Failures/Sample Size**	
		J-lite (JL)	**JX-lite (JXL)**
MIL-PRF 19500 Group A		-	-
Subgroup 1: Visual and Mechanical Examination	MIL-STD 750: 2071	0/45	0/45
Subgroup 2: DC Testing @ 25°C	As Per Datasheet	0/116	0/116
Subgroup 3: DC Testing at High and Low Specified Temperatures		0/116	0/116
Subgroup 4: AC Testing @ 25°C		0/116	0/116
Subgroup 5: Safe Operation Area (Transistors Only)		0/45	0/45
Subgroup 6: Surge Current (Diodes/Rectifiers Only)		0/22	0/22
Subgroup 7: Selected Static and Dynamic Tests		0/22	0/22

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Note:

1. Devices supplied will be to the test flow illustrated above. Any changes to the flow must be agreed upon in writing by the customer and Central Semiconductor Corp.
2. Above are the standard Certification and Qualification test flows for all devices starting with JL (for J-lite) and JXL (for JX-lite) devices.

Example:

JL2N2222A = J-lite certified version of a Central Semiconductor 2N2222A
JXL2N2222A = JX-lite certified version of a Central Semiconductor 2N2222A

Test Flow: EX (JANTX equivalent)

EX Certification		
Certification		**100% Testing**
MIL-PRF-19500P Appendix E **Table E-IV - Screening Requirements**		
Test	Sample Size	MIL-STD-750 Method
1a) Die visual For Glass Diodes 1b) Internal visual		
2) High Temperature Life Nonoperating Life	Optional	1032
3a) Temperature Cycling	100%	1051
3b) Surge (as specified)		
3c) Thermal Impedance (as specified)	100%	
4) Constant Acceleration		
5) PIND		
6) Instability Shock Test		
7) Hermetic Seal F&G		
8) Serialization	100%	
9) Interim Electrical Parameters	100%	
10) HTRB 24 Hours	100%	1039 Condition A
11) Interim Electrical Parameters As Specified For Device Type	100%	
12) Burn-in 160 Hours	100%	1039 Condition B
13) Final Electrical Parameters As Specified For Device Type	100%	
14) Hermetic Seal F&G	100%	1071
15) Radiography		
16) External Visual Examination		
17) Case Isolation		

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Test Flow: EX (JANTX equivalent)

EX Qualification	
Qualification SubGroups A, B, C, E	
Group A	**Group B**
Subgroup 1 Visual & Inspection MIL-STD-750 Method 2071	**Subgroup 1** Solderability Resistance To Solvents Salt Atmosphere
Subgroup 2 DC (Static) test @ +25C	**Subgroup 2** Thermal Shock Glass Diodes Only Temperature Cycling 25 Cyc (20 @ Screening, totaling 45) Surge Current Hermetic Seal Electrical Measurements Per Group A SubG 2
Subgroup 3 DC (Static) test @ -65C and +150C	
Subgroup 4 Dynamic test @ +25C	
Subgroup 5 Safe Operating Area Test	**Subgroup 3** Steady State Operation Life Biased, 340 Hours Electrical Measurements Per Group A SubG 2 Hermetic Seal Method 1071 Bond Strength Condition D 11 Wires
Subgroup 6 Surge Current	**Subgroup 4** Decap - Internal Visual; Examination
	Subgroup 5 Thermal Resistance Not Applicable - Case Mount Device
Subgroup 7 Select Static & Dynamic Tests	**Subgroup 6** High Temperature Life, Non-Operating 340 Hours Electrical Measurements Per Group A SubG 2

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Test Flow: EX (JANTX equivalent)

Group C	Group E
Subgroup 1 Physical Dimensions	**Subgroup 1** Temperature Cycling Hermetic Seal Electrical Measurements Per Group A SubGroup 2
Subgroup 2 Thermal Shock (Glass Diodes Only) Temperature Cycling Terminal Strength Hermetic Seal Moisture Resistance Electrical Measurements (Per Group A Sub-Group 2)	**Subgroup 2** SS Operation Life Biased, 1000 Hrs
Subgroup 3 Shock Test Vibration, Variable Frequency Constant Acceleration Electrical Measurements (Per Group A Sub-Group 2)	**Subgroup 3** **Subgroup 4** Thermal Impedance Curves **Subgroup 5** Barometric Pressure
Subgroup 4 Salt Atmosphere **Subgroup 5** Thermal Resistance	**Subgroup 6** ESD
Subgroup 6 SS Operation Life Electrical Measurements (Per Group A Sub-Group 2) Hermetic Seal Bond Strength	**Subgroup 7** Resistance To Solder Heat Hermetic Seal Electrical Measurements (Per Group A SubGroup 2)
Subgroup 7 I G A	**Subgroup 8** Reverse Stability Method 1033 Condition B **Subgroup 9** Resistance To Glass Cracking

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spacellite™ solutions

what is spacellite™

Spacellite discrete semiconductors are devices designed to meet the reliability and functionality specifications for today's modern satellite applications.

why spacellite™

- Reduced cost without compromising quality or reliability
- Meets Space 2.0 methodology and directives
- Ideal for low Earth orbit (LEO) applications for the latest satellite technologies
- Equivalent to MIL-PRF-19500 and MIL-PRF-38534 devices

spacellite™ benefits

- Optional gold wire bonds
- "State of the art" advanced device technology
- Both plastic and hermetic packages available

plastic TO-220 package

hermetic TO-3 package

When standard commercial devices do not meet your requirements, Central Semiconductor's spacellite™ devices are the perfect solution.

View Central's spacellite™ brochure for additional information.

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