2nd EDITION

TELEDYNE | Teledyne e2v Semiconductors

Teledyne e2v Space Flows Comparison Chart

Overview and comparison chart of globally recognised and Teledyne e2v's own space flows, including military, industrial and commercial flows, to help our customers find the most suitable quality grade. Read more about our products by flashing the following QR Code:

WE DELIVER

Over 6,000 space grade ADC, DAC and Processor flight models and over 40,000 avionics flight models delivered.

ZERO FAULTS

Teledyne e2v devices have never failed in-orbit since delivering the first space grade flight parts over 25 years ago.

GLOBAL STANDARDS

Our Semiconductor manufacturing site has been awarded the highest quality certifications, including EN9100 and QML Q, V and Y.

CLASSIFICATIONS

MIL-PRF-38535 Class Q	US DLA for hermetically sealed parts for military applications (class level B).
MIL-PRF-38535 class V	US DLA for hermetically sealed parts for space applications (class level S).
MIL-PRF-38535 Class Y	US DLA standard for non hermetical parts for Space applications (class level S).
ESCC9000	European standard for hermetic and non hermetic parts for space applications (class level S).
PEM-INST-001	US NASA guidelines for Plastic Encapsulated Microcircuits (PEM) for space applications (Level 1 to 3).
ECSS-Q-ST-60-13	European standard for commercial electronic parts for space applications (Grade 1 to 3).
JESD47	JEDEC standard for commercial parts.
Grade C, V, F, M	Operating temperature range of parts from Commercial Grade to Military Grade.

KEY TERMS

C-SAM	Confocal – Scanning Acoustic Microscopy
PIND	Particle Impact Noise Detection
DPA	Destructive Physical Analysis
HTOL	High Temperature Operating Life
PDA	Percentage Defect Allowed
QCI	Quality Conformance Inspection
LVT	Lot Validation Testing
LAT	Lot Acceptance Test
SMD	Standard Microcircuit Drawing
EM	Engineering Model
EQM	Engineering Qualification Model
FM	Flight Model
-X1	Teledyne X1

Please refer to definition NE 60S 220869

FLOW CHARTS

		CERAMIC / HERMETIC				ORGANIC / NON-HERMETIC								
Main Process Flow Steps	Method / Condition	JESD47	EQM Manufactured Internally		QML-Q	QML-V		NB1		QML-Y	"-Nx" NASA level			"-Ex" ECSS Class			EQM Manufactured Internally		JESD47	Teledyne X1
		C, V, F, M	(wired)	(Flip Chip)	(wired)	(wired)	(Flip Chip)	(wired)	(Flip Chip)	(Flip Chip)	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	(wired)	(Flip Chip)	C, V, F, M	-X1
	Specification reference	INTERNAL PROCEDURE			MIL-PRF-38535			ESCC 9000		MIL-PRF-38535	EEE-INST-002 / PEM-INST-001			ECSS-Q-ST-60 / ECSS-Q-ST-60-13			INTERNAL PROCEDURE		INTERNAL PROCEDURE	INTERNAL PROCEDURE
Wafer Lot Acceptance	MIL-STD-883 TM5007 / QM Plan	if appl.	if appl.								Internal or Subcontractor procedure			Internal or Subcontractor procedure			if appl.		Internal or Subcontractor procedure	Internal or Subcontractor procedure
Die Sawing / Select	Internal procedure / MIL-STD-883 TM2010 / ESCC 20400	Cond B	Cond A		Cond B	Cond A		Cond A		Cond A							Cond A			
Die attach / cure	Internal or Subcontractor procedure																			
Internal Visual Inspection	MIL-STD-883 TM2010 / ESCC 20400									Cond A										
Customer Precap	MIL-STD-883 TM2010 / ESCC 20400									if appl.										
Flip Chip die attach / cure	Internal or Subcontractor procedure																			
Wire bonding	Internal or Subcontractor procedure																			
Underfill dispense / cure / C-SAM	Internal procedure / MIL-STD-883 TM 2030																			
SMD report / reflow	Internal procedure			if appl.			if appl.		if appl.	if appl.								if appl.		
Molding / Dam & Fill / Cure	Internal or Subcontractor procedure																			
Solder balls report / reflow	Internal or Subcontractor procedure			if appl.			if appl.		if appl.	if appl.								if appl.		
Internal Visual Inspection	MIL-STD-883 TM2010 / ESCC 20400																			
Customer Precap	MIL-STD-883 TM2010 / ESCC 20400									if appl.										
Heat sink attach	Internal Procedure								if appl.	if appl.										
Lid report / Sealing	Internal Procedure									if appl.										
Stabilization	MIL-STD-883 TM1008																			
PIND test	MIL-STD-883 TM2020 / A								if appl.	if appl.										
Constant acceleration	MIL-STD-883 TM2001 / E / Y1 orientation				if appl.	if appl.			if appl.											
Incoming inspection	Internal Procedure											if appl.			if appl.				if appl.	if appl.
Marking	Internal or Subcontractor procedure																			
Serialization Marking	Internal procedure																			
Temperature Cycling	MIL-STD-883 TM1010 Cond B / +125°C / -55°C									10cy organic		20cy			10cy					20cy
Temperature Cycling	MIL-STD-883 TM1010 Cond C / +150°C / -65°C				10cy	10cy			10cy	10cy ceramic										
Xray inspection	MIL-STD-883 TM 2012		if appl.									if appl.								sampl.
C-SAM	Internal procedure / 1 view per interface			if appl.			if appl.			if appl.		if appl.								sampl.
Pre-ambient electrical	Per Device Specification (25°C)																			
Extreme temp. Electrical	Per Device Specification																			
Dynamic Burn-In	MIL-STD-883, TM1015 cond. D (125°C)			160Hrs		160Hrs	240Hrs		240Hrs	240Hrs		240Hrs	160Hrs		240Hrs	160Hrs		160Hrs		
Intermediate-ambient Elect.	Per Device Specification / +25°C																			
Static Burn-in	MIL-STD-883 TM1015 cond. A or B or C (125°C)						144Hrs			144Hrs		120Hrs								
Post-Burn-In Electrical	Per Device Specification / +25°C																			
Extreme temp. Electrical	Per Device Specification																			
Drift calculation	Internal procedure / per Device Spec.																			
PDA	PDA (at all temp and after all Burn-in steps)			20%								5%	10%					20%		
PDA	PDA (amb temp post Dyn.)					5%	5% / 3% (functional)		5%	5% / 3% (functional)					5%					
Extreme temp. Electrical	Per Device Specification (-55°C / +125°C)																			
Termination report	Internal or Subcontractor procedure	if appl.	if appl.		if appl.	if appl.			if appl.	if appl.								if appl.	if appl.	
Fine & Gross leaks test	MIL-STD-883, TM1014 / A / C								if appl.											
Final Electrical	Per Device Specification / +25°C			if appl.														if appl.		
Extreme temp. Electrical	Per Device Specification						if appl.			if appl.										
Physical dimension control	Per Device Specification																			
External Visual inspection	MIL-STD-883 TM2009																			
Final source inspection	MIL-STD-883 TM2009 / A																			
Bake	J-STD-033 / 125°C								if appl.											
Packing	J-STD-033 / Internal procedure																			
Certificate of Compliance	MIL-PRF-38535																			

QUALITY REQUIREMENTS

Teledyne-e2v program benefits													
Applied Quality Management System		ISO9001 or EN9100	EN9100	EN9100	EN9100	EN9100	EN9100	EN9100	EN9100	EN9100	ISO9001 or EN9100	ISO9001 or EN9100
Single Fab, assembly and test sites												
Single wafer diffusion lot	Per delivery (on customer request)											
Single lot date code	Per delivery (on customer request)											
Change Notification Process	J-STD-046											
Product Discontinuance Notification Process	J-STD-048											
Lot traceability report	Main production steps											Limited
Electrical datalog	For delivered parts											
Initial qualification	Available for customer on request	based on JESD47	based on JESD47	MIL-PRF-38535	MIL-PRF-38535	ESCC 9000	MIL-PRF-38535	PEM-INST-001 or ECSS-Q-ST-60-13 or based on JESD47	PEM-INST-001 or ECSS-Q-ST-60-13 or based on JESD47	based on JESD47	based on JESD47	based on JESD47
Lot Verification Testing (ESCC9000)	LVT report delivered with parts											
LVT1 - Environmental	ESCC 9000 - Chart F4											
LVT1 - Mechanical	ESCC 9000 - Chart F4											
LVT2 - Endurance	ESCC 9000 - Chart F4											
LVT3 - Capability	ESCC 9000 - Chart F4											
Quality Conformance Insp. (MIL-PRF-38535)	QCI report delivered with parts											
Group A - Electrical test	MIL-PRF-38535 / delivered parts											
Group B – Assembly Capability	MIL-PRF-38535											
Group C - Steady-state life test	MIL-PRF-38535											
Group D - Thermal & Mechanical	MIL-PRF-38535											
Group E – RHA	MIL-PRF-38535			on request	on request		on request					
Wafer acceptance lot	QM plan											
Outgassing test	ASTM E595 or ECSS-Q-ST-70-02											
Preconditioning / CSAM	J-STD-020 / MIL-STD-883 TM 2030											
Qualification Lot (NASA)	Qualification report delivered with parts											
Radiation Verification Tests	TID and SEE - ESCC 22900 / MIL STD 883 1019 /ESCC 25100											
C-SAM	PEM-INST-001											
Preconditioning	Moisture soak / Reflow simulation							32 parts	17 parts			
Subgroup 1a - Life testing	MIL-STD-883 TM1005 / D / 125°C							1500H / 22 #	1000H / 22 #	500H / 10 #		
Subgroup 1b - Temp cycling	MIL-STD-883 TM 1010 / B + DPA							500cy / 22 #	200cy / 22 #	100cy / 10 #		
- DPA/FA	PEM-INST-001 and internal standards											
- CSAM T1	PEM-INST-001											
Subgroup 2 - Biased HAST	JESD22-A110 / 96 hours / +130°C / 85% RH							on 10 #				
- Unbiased HAST	JESD22-A118 / A / 96 hours / +130°C / 85% RH								on 10 #	on 7 #		
Lot Acceptance Test (ECSS-Q-ST-60-13	LAT report delivered with parts											
Construction analysis	ESCC 21400									on 5 #		
Outgassing test	ECSS-Q-ST-70-02											
Precond + Biased HAST or THB	JESD22-A110 96H / +130°C / 85%RH or JESD22-A101									on 10 #		
Precond / Temp.Cycling / C-SAM	MIL-STD-883 TM 1010 / B / 100cy / -55°C to 125°C									on 10 #		
HTOL	MIL-STD-883 TM 1005 / D / / 125°C / per diffusion lot									2000H / 15#	1000H / 15#	
Radiation Verification Tests	TID and SEE - ESCC 22900 / MIL STD 883 1019 /ESCC 25100											
Lot Trace Code validation	No evaluation report delivered with parts											
Radiation Evaluation	TID and SEE - ESCC 22900 / MIL STD 883 1019 /ESCC 25100											

"Copyright© 2023 Teledyne e2v Semiconductors SAS. All rights reserved. No part of this material may be copied, translated, or transmitted (in any medium) without the prior written permission of Teledyne e2v Semiconductors SAS."

Authors: Christelle BISSONNIER - Semiconductors Products Quality Engineer/ Carine NIKITINE - Semiconductors Products Quality Engineer/ Yoann BRUNEL - Semiconductors Products Quality and Reliability Technician/ Sébastien RENAUD - Semiconductors Products Quality Engineer and Point of Contact for the DLA.