APPLICATION FOR ESCC QUALIFICATION APPROVAL

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Component Title: **Radiation Tolerant Single Port Gigabit Ethernet Copper PHY (VSC8541RT)**

Appl. No. 392

Executive Member: CNES Date: 12/05/2025

1 Components (including series and families) submitted for Qualification Approval

ESCC COMPONENT. NO.	VARIANTS	RANGE OF COMPONENTS	BASED ON	TEST VEHICLE / S	COMPONENT SIMILAR
9405/020	01	Radiation Tolerant Single Port Gigabit Ethernet Copper PHY	VSC8541RT – Manufactured on a 65nm, eight-metal-layers CMOS technology in TSMC, Taiwan, Packaged in a hermetic CQFP68 and assembled in Microchip Thailand.	VSC8541RT CQFP68	NA

2 Component Manufacturer
MICROCHIP TECHNOLOGY NANTES

3 Location of Manufacturing Plant
LA CHANTRERIE – ROUTE DE GACHET
BP70602
44306 NANTES CEDEX

4 ESCC Specification used for Qualification
Generic: ESCC9000
Issue 11
Detail/s: 9405/020
Issue 2

5 Qualification Report Reference and date:
QP_VSC8541RT_revD
Date: 01/09/2024

6 **PID** used for manufacturing Qualification Lot
Ref No: PID0043
Issue: 0
Date: 21/03/2025

7 **PID** changes since start of qualification
None ☒
Minor* ☐
Major* ☐
(* Details not published, provided in confidential annex 2.)

8 Current **PID** Verified by CNES
Name of Executive Representative
Ref No: VSC8541RT PID 0043
Issue 0
Date 21/03/2025

9 Current Manufacturing facilities surveyed by:
CNES (D. Dangla) ESA (S. Hernandez) 16/10/2024
(Name of Executive Responsible) (Date)

Report Reference
DTN QE EC-2024.0014739 - CR-ESCC QML survey MCHP-16102024.pdf
Satisfactory: Yes ☒ No ☐ Explain

10 Quality and Reliability Data
Evaluation testing performed Yes ☒ No ☐
Report Ref. No.: Date:
Equivalent Data: Single Phase Qualification applies
Certification:

Failure analysis, DPA, NCCS available Yes ☒ No ☐
(supply data)
Ref Nos. and purpose:
Construction analysis reports done by MCHP/SERMA: 20-2502-100_approved 2020-08-09.pdf (August 9th, 2020)

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The undersigned hereby certifies on behalf of the ESCC Executive, that the above information is correct; that the appropriate documentation has been evaluated; that full compliance to all ESCC requirements is evidence except as stated in box 13; that the reports and data are available at the ESCC Executive and therefore applies for ESCC qualification status to be given to the component(s) listed herein.

Date: 12/05/2025

Fontaine Lya Signature numérique de Fontaine Lya Date : 2025.05.12 15:07:07 +02'00'

L. FONTAINE

(Signature of the Executive Coordinator)

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Continuation of Boxes above: (Only non-confidential comments)

Qualification Package VSC8541RT - QP_VSC8541RT_revD.pdf

VSC8541RT ESCC QPL - submission 2025-02 rev1.pptx
RAD-VSC8541RT_rev4.pdf

Construction analysis reports done by MCHP/SERMA:
20-2502-100_approved 2020-08-09.pdf (August 9th, 2020)

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Non compliance to ESCC requirements:

No.:	Specification	Paragraph	Non compliance

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Additional tasks required to achieve full compliance for ESCC qualification or rationale for acceptability of noncompliance:

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Executive Manager Disposition

Application Approval: Yes ☒ No ☐

Action / Remarks:

Date:

Ali Zadeh

Digitally signed by Ali Zadeh
Date: 2025.06.02 10:35:09 +02'00'

A.Zadeh: Head of the Avionics and EEE Division

ANNEX 1: LIST OF TESTS DONE TO SUPPORT QUALIFICATION 16

Tests conducted in compliance with:

- ESCC 9000 generic specification; Chart F4 (for ESCC/QPL parts);
- Or PID-TFD Click here to enter text. (for ESCC/QML parts)

Tests vehicle identification/description:

VSC8541RT CQFP-68	The VSC8541RT device is a radiation tolerant single port Gigabit Ethernet copper PHY targeting space-constrained 10/100/1000BASE-T applications. It withstands the harsh aerospace environment with enhanced radiation performances, extreme temperatures, vacuum and high reliability. It features integrated, line-side termination to conserve board space, lower EMI, and improve system performance. Additionally, integrated RGMII timing compensation eliminates the need for on-board delay lines. The device supports the industry's widest range of LVCMOS levels for a parallel MAC interface including: 1.5 V, 1.8 V, 2.5 V, and 3.3 V, as well as 1.2 V, 1.5 V, 1.8 V, 2.5 V, and 3.3 V support on the MDIO/MDC interface. The VSC8541RT die, in its hermetic CQFP68 version, is bonded with Au wire of 25.4µm diameter, with pad metallization in Al. The minimum separation between 2 Au wires is one wire diameter (25.4µm) instead of 2 diameters (TM2010A). Static Burn-in does not apply. No seal test has been performed after Life-Test.

Detail Specification reference: 9405/020 issue 2

Qualification results – Environmental/Mechanical subgroup

The VSC8541RT is part of the package family "Flat-Substrate CQFP Au bonding".
Environmental/Mechanical subgroup, required by ESCC every 2-years, is done every 52-weeks per package family (*)

(*) VSC8541RT package family
Only 1 product in the family, meaning 52-weeks instead of 26-weeks.
As soon as qualified, the VSC8574RT will be introduced in this family, with a monitoring back to 26-weeks.
Flat-substrate CQFP Au bonding
- Wires: AlSi 25µm
- Die attach: JM7000
- Al203 body
- Seam-welded lid
- flat leads
  - min lead pitch: 0.635 mm
  - min lead width: 0.2 mm

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Chart F4	Test	Tick when done	Conditions	Assembly lot datecode	Tested Qty per lot	No. of Rejects	Comments if not performed. Comments on Rejection
Environmental/Mechanical Subgroup	Thermal Shock	☒	MIL-STD-883. Test Method 1011B	PPMG7A28BQ DC 2424	15	0	15 shocks Specific for Gold wire bonding: Initial qualification lots passed thermal shock tests with success up to 100 shocks
	Temperature Cycling	☒	MIL-STD-883. Test Method 1010C		(15)	0	100 cycles Specific for Gold wire bonding: Initial qualification lots passed temperature cycling tests with success up to 500 cycles
	Moisture Resistance	☒	MIL-STD-883, Test Method 1004		(15)	0	adding 3 parts preconditionned with TM2004B1
	Intermediate and End-Point Electrical Measurements	☒	3 Temperature Electrical Test		(15)	0	Device specification
	Seal (Fine and Gross Leak)	☒	MIL-STD-883, Test Method 1014		(15)	0	
	Visual Inspection	☒	MIL-STD-883, Test Method 2009		(15)	0	
	Mechanical Shock	☒	MIL-STD-883, Test Method 2002B	PCC06A28FD DC 2441	15	0	5 pulses Specific for Gold wire bonding: Initial qualification lots passed mechanical shock tests with success up to 50 pulses
	Vibration	☒	MIL-STD-883, Test Method 2007A		(15)	0	12 sweeps Specific for Gold wire bonding: Initial qualification lots passed vibration tests with success up to 120 sweeps
	Constant Acceleration	☒	MIL-STD-883, Test Method 2001E		(15)	0	Y1
	Intermediate and End-Point Electrical Measurements	☒	3 Temperature Electrical Test		(15)	0	Device specification
	Seal (Fine and Gross Leak)	☒	MIL-STD-883, Test Method 1014		(15)	0	
	Visual Inspection	☒	MIL-STD-883, Test Method 2009		(15)	0	

Endurance subgroup

Note:

Life test is done on each wafer lot. One wafer lot has been qualified.

The lot#1 has been submitted to extended life test, up to 4000 hours/125°C/Vccmax.

No seal test has been performed after life test.

Chart F4	Test	Tick when done	Conditions	Diffusion Lot Assembly lot Date code	Tested Qty per lot	No. of Rejects	Comments if not performed. Comments on Rejection
Endurance Subgroup	Operating Life-Test	☒	MIL-STD-883, Test Method 1005	PPMG74.00 19Q3	45	0	4000 hrs/Vccmax/125°C
	Intermediate and End-Point Electrical Measurements	☒	Intermediate and End-Point Electrical Measurements in the Detail Specification		(45)	0	

Assembly/Packaging capability is verified on each assembly lot.

- Solderability test, required by ESCC, is done on each assembly lot

- Terminal strength test, required by ESCC every 2-years, is done every 52-weeks per package family (*)

Chart F4	Test	Tick when done	Conditions	Date Code Diffusion Lot	Tested Qty per lot	No. of Rejects	Comments if not performed. Comments on Rejection
Assembly Capability Subgroup	Marking Permanency	☒	MIL-STD-883, Test Method 2015	PPMG7A2AJK DC2307	3#	0	
	Bond Pull / Ball Shear tests	☒	MIL-STD-883, Test Method 2011 JESD22-B116		4#	0	100% / 50% wires
	Bond Pull / Ball Shear tests After Bake 300°C / 1h	☒	MIL-STD-883, Test Method 2011 JESD22-B116	PPMG7A2AKA DC2314	4#	0	100% / 50% wires Specific for Gold wire bonding as preconized by MIL-PRF-38534 for hybrids
	Substrate attach strength	☒	MIL-STD-883, Test Method 2027	PPMG7A2CRC DC2320	3#	0	
	Internal Visual Inspection	☒	MIL-STD-883 Test Method 2010A	PPMG7A2637 DC2342	2#	0	
	Solderability test	☒	MIL-STD-883 Test Method 2003		3#	0	22 leads
	Terminal strength test	☒	MIL-STD-883 Test Method 2004 B2	PPMG7A28BQ DC 2424 PCC06A28FD DC 2441	3#		45 leads

Chart F4	Test	Tick when done	Conditions	Date Code Diffusion Lot	Tested Qty	No. of Rejects	Comments if not performed. Comments on Rejection
Additional Tests	HBM ESD	☒	ANSI/ESDA/JEDEC JS-001	1606AAZPA	3#	0	Ok up to 2000V Class 2
	CDM ESD	☒	ANSI/ESDA/JEDEC JS-002	PPMG74.4	3#	0	Ok up to 500V Class C2a
	Electrical latch-up	☒	JESD78	1606AAZPA	6#	0	Current injection 100mA, Overvoltage 1.5*Vccmax Class II : 125°C
	Pre seal Bond Pull / Ball Shear tests	☒	MIL-STD-883, Test Method 2011 JESD22-B116	PPMG7A2AKA PPMG7A2CRC PPMG7A2637 PPMG7A265J PPMG7A266S PPMG7A28BG	2# 2# 2# 2# 2# 2#	0 0 0 0 0 0	80% / 80% wires Specific for Gold wire bonding: Specificities of Assembly flow: Bonding controls before encapsulation Pre-bake before lid sealing limited to 150°C/4 hrs No stabilization bake (150°C/24 hrs)
	Pre seal Bond Pull / Ball Shear tests After Bake 300°C / 1h	☒	MIL-STD-883, Test Method 2011 JESD22-B116	PPMG7A2AKA PPMG7A2CRC PPMG7A2637 PPMG7A265J PPMG7A266S PPMG7A28BG	2# 2# 2# 2# 2# 2#	0 0 0 0 0 0	
	Operating Life-Test 1000hrs/125°C	☒	MIL-STD-883, Test Method 1005	PPMG7A282R DC2025	24#	0	Specific for Gold wire bonding: For Bonding evaluation after Life test
	Operating Life-Test 2000hrs/125°C	☒	MIL-STD-883, Test Method 1005		18#	0	
	Intermediate and End-Point Electrical Measurements	☒	Intermediate and End-Point Electrical Measurements in the Detail Specification		24# 18#	0 0	
	Operating Life-Test 1500hrs/125°C	☒	MIL-STD-883, Test Method 1005	PPMG7A284M DC2034	24#	0	
	Operating Life-Test 2000hrs/125°C	☒	MIL-STD-883, Test Method 1005		24#	0	
	Intermediate and End-Point Electrical Measurements	☒	Intermediate and End-Point Electrical Measurements in the Detail Specification		24# 24#	0 0	
	Operating Life-Test 1000hrs/125°C	☒	MIL-STD-883, Test Method 1005	PPMG7FBTAA DC2035	24#	0	
	Operating Life-Test 2000hrs/125°C	☒	MIL-STD-883, Test Method 1005		18#	0	
	Intermediate and End-Point Electrical Measurements	☒	Intermediate and End-Point Electrical Measurements in the Detail Specification		24# 18#	0 0	
	Bond Pull / Ball Shear tests After Life-Test 1000hrs/125°C* And 2000hrs/125°C	☒	MIL-STD-883, Test Method 2011 JESD22-B116	PPMG7A282R DC2025 PPMG7A284M DC2034 PPMG7FBTAA DC2035	5# 5# 5#	0 0 0	Specific for Gold wire bonding: 100% / 50% wires (*): after 1500 hours for the lot PPMG7A284M DC2034
	TID	☒	ESCC22900	PPMG74.00	27#	0	Ok 100 krad(Si) (22 ON and 5 OFF parts)

	SEL	☒	JESD57, ESCC25100	PPMG74.00	3# 3#	0 0	SEL LET threshold > 78 MeV.cm²/mg. Note: For SEU/SEFI, refer to “RAD-VSC8541RT_rev4.pdf” rad test report

NOTES ON THE COMPLETION OF THE APPLICATION FORM FOR ESCC QUALIFICATION APPROVAL

ENTRIES

Form Heading	shall indicate:— the title of the component as given in its detail specification or the name of the series or family; — the entering date; — the serial number and the suffix of the form.
Box 1	shall provide details given in table; in particular there shall be listed - the variants or range of variants; the range of components by using the ESCC code for values tolerances, etc.; the designation given in detail specification as 'based on'; ---under Test Vehicle enter either a cross or the specific characteristic capable to identify the component tested; — under component similar enter a cross.
Box 2 and 3	Manufacturer's name and location of plant where the components were manufactured and tested.
Box 4	Generic and detail specifications used during qualification program.
Box 5	Reference to test report(s) submitted in support of application.
Box 6	Enter details to identify the PID that was applicable at the time the qualification lot was manufactured.
Box 7	If the PID was evolved after qualification lot manufacture, adequate details of such evolution shall be provided together with reasons for changes. Major changes shall be clearly marked.
Box 8	The box serves to identify the current PID and the Executive Representative that has verified it together with the date of this occurrence.
Box 9	This box can be completed only after a physical visit to the plant to confirm that the practices, procedures, materials, etc. used in manufacturing the components are as described in the PID. This survey shall be carried out in accordance with the requirements of ESCC Basic Specification No. 20200 and its findings shall be recorded.
Box 10	Details entered shall be sufficient to evidence that an evaluation program according to ESCC Basic Specification No. 22600 has been performed and that the results thereof are summarized in the survey and test reports. If the evaluation program has not been carried out according to established ESCC documents, the applicant Executive Representative shall provide alternative data and declare its assessed degree of satisfactory compliance with the ESCC basic requirements. Reference shall be made to the reports on Destructive Physical Analysis (DPA), Failure Analysis and Non conformance (NCCS) issued during the Evaluation and/or Qualification Phase.
Box 11	Enter the name of the Executive Coordinator and the signature.
Box 12	To be used when there is a need to expand any of the boxes from 1 through 10. Identify box affected and reference the Box 12 in the relevant Box. Box 12 can be broken into 12a, 12b, etc. if several Boxes have to be expanded.
Box 13	Fill table as requested.
Box 14	Fill in any additional tasks required to achieve full compliance.
Box 15	All Executive recommendations on the application itself, special conditions or restrictions, modifications of the QPL or ESCC QML entry, letters to the manufacturer, etc. shall be entered clearly in Box 15, signed by the ESA Representative.
Box 16	Fill in Table as requested.
Box 17	Confidential details of PID changes shall be provided.
Box 18	State noncompliance with reference to specification(s) and paragraph(s). To simplify reference in Box 18 each nonconformance shall be sequentially numbered. If relevant state 'None'
Box 19	Any additional action deemed necessary by the Executive Representative to bring the submitted data to a standard likely to be accepted by the ESCC Executive should be listed herein or the reason(s) to accept the nonconformance.
Box 20	Additional Comments