



(43) International Publication Date
06 September 2024 (06.09.2024)

(51) International Patent Classification:
G06F 11/07 (2006.01) G06F 11/16 (2006.01)

(21) International Application Number:
PCT/US2024/014392

(22) International Filing Date:
05 February 2024 (05.02.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
18/176,902 01 March 2023 (01.03.2023) US

(71) Applicant: **QUALCOMM INCORPORATED** [US/US];
ATTN: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(72) Inventors: **ANEJA, Amit**; 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **GULATI, Rahul**;

5775 Morehouse Drive, San Diego, California 92121-1714 (US). **HARIHARAN, Sriram**; 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(74) Agent: **TEMPEL, Michael J.** et al.; SMITH TEMPEL BLAHA LLC, 1600 Parkwood Circle, Suite 620, Atlanta, Georgia 30339 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,

(54) Title: AUTOMOTIVE FAULT DETECTION SYSTEMS AND METHODS

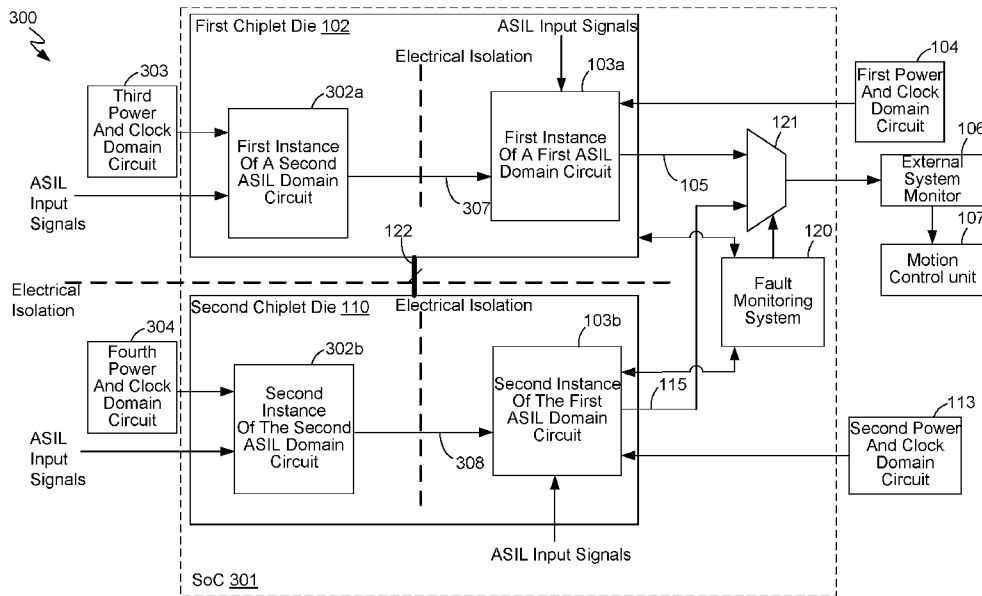


FIG. 3

(57) Abstract: Fail-safe and Fail-operational behavior can be achieved by providing two fully-redundant execution channels comprising at least first and second chiplet dies on a single SoC that are in communication with one another via a D2D interface. At least first and second instances of a first automotive safety integrity level (ASIL) domain circuit disposed on the at least first and second chiplet dies, respectively, perform at least a first ASIL domain process on one or more automotive sensor output signals to produce first and second output signals, respectively. A fault monitoring system monitors at least the first chiplet die for faults and assigns a first value to a selector signal if it detects a fault in the first chiplet die. A selector circuit outputs the second output signal from the system if the selector signal has the first value.



TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

- (84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:

24 October 2024 (24.10.2024)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2024/014392

A. CLASSIFICATION OF SUBJECT MATTER INV. G06F11/07 G06F11/16 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) G06F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2020/039530 A1 (SMOLYANSKY LEONID [IL] ET AL) 6 February 2020 (2020-02-06)	1-4,7, 18,19, 29,30
Y	abstract; figures 4-6,8 paragraphs [0004], [0007], [0076] -	2,8-13, 20-25
A	[0104], [0128] - [0152] -----	5,6
Y	US 2018/370540 A1 (YOUSUF MOHAMMED ABDULLA [US] ET AL) 27 December 2018 (2018-12-27) abstract; figures 5, 7a paragraphs [0003], [0027] - [0051], [0108], [0120] - [0123], [0163] - [0176], [0188] - [0190], [0201] -----	2
Y	EP 3 869 338 A1 (VEONEER SWEDEN AB [SE]) 25 August 2021 (2021-08-25) abstract paragraphs [0052], [0062] - [0073] -----	8-11, 20-23
- / - -		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search <p style="text-align: center;">12 September 2024</p>	Date of mailing of the international search report <p style="text-align: center;">27/09/2024</p>	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center;">Leuridan, Koen</p>	

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2024/014392

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2022/268270 A1 (CONTINENTAL AUTONOMOUS MOBILITY GERMANY GMBH [DE]) 29 December 2022 (2022-12-29) abstract page 9, line 12 - line 25 -----	1-11, 17-23, 29,30
Y	US 2020/026598 A1 (BOSCHI GABRIELE [IT] ET AL) 23 January 2020 (2020-01-23)	12,13, 24,25
A	abstract; figure 1 paragraphs [0037] - [0045] -----	14-16, 26-28
A	US 2014/351658 A1 (D AMBROSIO JOSEPH G [US]) 27 November 2014 (2014-11-27) the whole document -----	12-16, 24-28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2024/014392

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 2, 3, 5-11, 18, 20-23 (completely); 1, 4, 17, 19, 29, 30 (partially)

An automotive fault detection and recovery system having a specific arrangement to improve functional safety.

2. claims: 12-16, 24-28 (completely); 1, 4, 17, 19, 29, 30 (partially)

An automotive fault detection and recovery system having improved error detection capabilities

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2024/014392

Patent document cited in search report	A1	Publication date	Patent family member(s)	Publication date
US 2020039530	A1	06-02-2020	CN 110799404 A	14-02-2020
			EP 3612425 A1	26-02-2020
			EP 4186769 A1	31-05-2023
			JP 2020517028 A	11-06-2020
			KR 20200002925 A	08-01-2020
			US 2020039530 A1	06-02-2020
			US 2023202493 A1	29-06-2023
			WO 2018193449 A1	25-10-2018

US 2018370540	A1	27-12-2018	US 2018370540 A1	27-12-2018
			US 2022080992 A1	17-03-2022
			WO 2018237121 A1	27-12-2018

EP 3869338	A1	25-08-2021	NONE	

WO 2022268270	A1	29-12-2022	CN 117425881 A	19-01-2024
			DE 102021206379 A1	22-12-2022
			EP 4359933 A1	01-05-2024
			US 2024270263 A1	15-08-2024
			WO 2022268270 A1	29-12-2022

US 2020026598	A1	23-01-2020	DE 102020121003 A1	01-04-2021
			US 2020026598 A1	23-01-2020

US 2014351658	A1	27-11-2014	CN 104182303 A	03-12-2014
			DE 102013113296 A1	27-11-2014
			US 2014351658 A1	27-11-2014
