INDEX

Emulator	Page
E2 emulator	On-chip Debuggers Performance Property - 1
E2 emulator Lite	On-chip Debuggers Performance Property - 2
E1	On-chip Debuggers Performance Property - 3, 4
E20	On-chip Debuggers Performance Property - 5, 6
MINICUBE2	On-chip Debuggers Performance Property - 7
E10A-USB	On-chip Debuggers Performance Property - 8, 9
E8a	On-chip Debuggers Performance Property - 10

■E2 emulator Debugging Function

Family	Target MC Series/Core	Group	Connection system	Break Function Hardware Break	Software Break	Special Break	Trace Function Internal trace	reference &change while executing	Performance measurement	Trigger	Hot plug [.] in																	
	RA8	RA8D1/M1	JTAG or	8 points for an execution address,			Obtained information of branches is stored in a dedicated buffer 8KB.	program																				
		RA6E2	SWD	8 points for a data access	-		(both branch-source and branch-destination info)	-																				
	RA6	Others than	JTAG				Obtained information of branches is stored in a																					
		RA6xx	or SWD				dedicated buffer 2KB. (both branch-source and branch-destination info)																					
RA		RA4E2	SWD	6 points for an execution address, 4 points for a data access				-	Not supported;		Supporte																	
	RA4	RA4M1 RA4W1	JTAG		2048 points for ROM/RAM area		Obtained information of branches is stored in a dedicated buffer 1KB. (both branch-source and branch-destination info)		the time b/w Go and Stop is measurable.	Not supported																		
		Others than RA4xx	or SWD				Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info)		measurable.																			
	RA2	RA2xx						-																				
	RA0	RA0xx	SWD	4 points for an execution address, 2 points for a data access			Obtains the information of up to 2K branches *5 (both branch-source and branch-destination info)																					
RE	RE0	RE01					Obtains the information of up to 4K branches *5 (both branch-source and branch-destination info)	-			Not supporte																	
		RH850/F1H RH850/F1M						-			supporte																	
	RH850/F1x	RH850/F1L RH850/F1K	LPD4-pin or LPD1-pin																									
	RH850/E1x	RH850/F1KM RH850/F1KH RH850/E1M-S2					Between 2K and 4K of branch information																					
	RH850/C1x	RH850/C1H RH850/C1M	LPD4-pin				can be acquired when this is the only target or Between 1K and 2K of cycle information																					
	RH850/D1x	RH850/D1L RH850/D1M	LPD4-pin or				on data-access operation can be acquired when this is the only target																					
RH850		RH850/P1M RH850/P1M-E	LPD1-pin	12 points	2000 points for		Trace function isn't supported in some MCU's.				C																	
КПОЈО	RH850/P1x	RH850/P1H-C RH850/P1M-C	LPD4-pin	being shared by an execution address and data access	ROM/RAM area				supported		Supporte																	
		RH850/P1L-C						-																				
	RH850/E2x	RH850/E2M RH850/E2H					Between 4K and 8K of branch information can be acquired when this is the only target																					
		RH850/E2UH	LPD4-pin or JTAG				or Between 2K and 4K of cycle information																					
	RH850/U2x	RH850/U2A RH850/U2B	JTAG				on data-access operation can be acquired when this is the only target Trace function isn't supported in some MCU's.																					
		RL78/G22		2 points			Obtains the information of up to 256 branches	-																				
	RL78/G2x RL78/D1x	RL78/G23 RL78/G24 RL78/D1A		being shared by an execution address and data access	-		(only branch-source info)	-			Not supporte																	
		RL78/F12 RL78/F13		being shared by an execution address and data access	2000 points		Not supported	-																				
	RL78/F1x	RL78/F14 RL78/F15 RL78/F1E		2 points being shared by an execution address and data access			Obtains the information of up to 128 branches (only branch-source info); the obtainable info is				Supporte																	
	RL78/F2x	RL78/F23 RL78/F24 RL78/G10					limited to 64 branches on some MCUs.	-																				
		RL78/G1M RL78/G1N RL78/G14 (ROM:			Not supported	-																						
		96KByte and more) RL78/G1F				-		-	-	-	-			-	-	-						Example 2 points being shared by an execution address and data access H		Obtains the information of up to 256 branches (only branch-source info)				
		RL78/G1H RL78/G11 RL78/G12				Forcible break by selecting "Stop"	op″	Supported	ed Not supported	IN:2ch																		
RL78	RL78/G1x	1x RL78/G13 RL78/G14 (ROM: 64KByte and	RL78/G13 RL78/G14 (ROM: 64KByte and	RL78/G13 RL78/G14 (ROM 64KByte and	RL78/G13 RL78/G14 (ROM: 64KByte and	Single-wire Serial			on emulator debugger			Not supported; the time b/w Go and Stop is	OUT:2ch															
		less) RL78/G15		1 point					measurable.																			
		RL78/G16 RL78/G1A RL78/G1C		being shared by an execution address and data access			Not supported				Not																	
		RL78/G1D RL78/G1E			2000 points						supporte																	
		RL78/G1G RL78/G13A RL78/I1A																										
	RL78/I1x	RL78/I1B RL78/I1C RL78/I1D		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)																					
		RL78/I1E RL78/L12		1 point	-		Not supported																					
	RL78/L1x	RL78/L13 RL78/L1A RL78/L1C		being shared by an execution address and data access 2 points	-		Obtains the information of up to 256 branches	-																				
	RL78/H1x	RL78/H1D 8/FGIC		being shared by an execution address and data access 1 point	-		(only branch-source info) Not supported	-																				
				being shared by an execution address and data access 8 points for an execution address			Obtains the information of up to 256 branches	-																				
	RX700	RX72x RX71x	JTAG or Single-wire Serial	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			or the information of up to 256 cycles on data-access operation																					
		RX64x		 * Sequential breaks are specifiable. 8 points for an execution address 	-		(DMAC or DTC bus is selectable as a bus master) Obtains the information of up to 256 branches	-																				
		RX65x RX66x RX67x	JTAG or Single-wire Serial	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			or the information of up to 256 cycles on data-access operation				Supporte *3																	
	RX600	RX26T Others than	JTAG	* Sequential breaks are specifiable.	-		(DMAC or DTC bus is selectable as a bus master)	-	Supported *4		-																	
RX		RX64x RX65x RX66x	or double-wire Serial	8 points for an execution address + 4 points for a data access	256 points at the max		Obtains the information of up to 256 branches or the information of up to 256 cycles																					
		RX67x RX26T	*2 (clock and data)	* Sequential breaks are specifiable.			on data-access operation																					
	R	X200 X140					Obtains the information of up to 64 branches or the information of up to 64 cycles																					
	Other t	han RX26T	Single-wire Serial	4 points for an execution address + 2 points for a data access			on data-access operation *1 Obtains the information of up to 32 branches	-	Not supported;		Not supporte																	
		X100 han RX140		* Sequential breaks are specifiable.			or the information of up to 32 cycles		the time b/w Go and Stop is																			
							on data-access operation <g4mh></g4mh>		measurable.																			
			<g4mh></g4mh>	<g4mh></g4mh>			Between 2K and 8K of branch information can be acquired when this is the only target or		<g4mh> Supported</g4mh>																			
	R−Car S4		LPD-4pin or JTAG	12 points for an execution address/a data access <cortex-a> 6 pints for an execution address</cortex-a>			Between 2K and 4K of cycle information on data-access operation can be acquired		<cortex-a,r></cortex-a,r>																			
			<cortex-a,r></cortex-a,r>	· Cortex−R> 6 pints for an execution address	2048 points for		when this is the only target <cortex-a,r></cortex-a,r>		Not supported; the time b/w Go and Stop is																			
R−Car			JTAG	2 pints for a data address	2048 points for ROM/RAM area		Obtained information of branches is stored in a dedicated buffer 32KB.		measurable.		Supporte																	
				<cortex-a></cortex-a>	-		(both branch-source and branch-destination info)	-		Not supported																		
	R−Car V4H	_	JTAG	6 pints for an execution address <cortex-r></cortex-r>			Obtained information of branches is stored in a dedicated buffer 32KB.		Not supported; the time b/w Go and Stop is																			
				6 pints for an execution address 2 pints for a data address			(both branch-source and branch-destination info)		and Stop is measurable.																			
				A	2000				Not supported;		NI -																	
RISC-V MCU	R9A02G021	R9A02G021	cJTAG	4 points being shared by an execution address and data access	2000 points for ROM/RAM area		Not supported		the time b/w Go and Stop is		Not supporte																	

Notes: *1. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained. *2. The debugging function and the connection system vary by the MCU you use. *3. Available only when the emulator is connected via JTAG interface. *4. 1 sections can be gauged with RX100. 2 sections can be gauged with RX600." *5. The internal RAM of the microcomputer is used as the trace buffer.

* The information provided only applies to MCUs where we have been able to confirm the specifications of the emulator. This includes MCUs and emulator software that are under development. For more information on support for these items as it becomes available, check our website at: https://www.renesas.com/e2

E2 emulator Lite Debugging Function

	Target MCU			Break Function			Trace Function	Memory reference &change	Performanc e	Hot plug-
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	while executing program	measureme nt	
	RA8	RA8D1/M1		8 points for an execution address, 8 points for a data access			Obtained information of branches is stored in a dedicated buffer 8KB. (both branch-source and branch-destination info)			
	RA6 RA4	RA6xx RA4M1	SWD	6 points for an execution address,			Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info) Obtained information of branches is stored in a dedicated buffer 1KB.			
RA		RA4W1 Others than RA4xx		2 points for a data access	2048 points for ROM/RAM area		(both branch-source and branch-destination info) Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info)	b	Not supported; the time b/w Go and Stop is measurable.	
	RA2 RA0	RA2xx RA0xx	SWD	4 points for an execution address, 2 points for a data access			Obtains the information of up to 2K branches *6 (both branch-source and branch-destination info)			
RE	RE0	RE01					Obtains the information of up to 4K branches *6 (both branch-source and branch-destination info)			
	RL78/G2x	RL78/G22 RL78/G23 RL78/G24		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)			Not supported
	RL78/D1x	RL78/D1A RL78/F12		1 point being shared by an execution address and data access	2000 points		Not supported			
	RL78/F1x RL78/F2x	RL78/F13 RL78/F14 RL78/F15 RL78/F15 RL78/F12 RL78/F23 RL78/F24		2 points being shared by an execution address and data access			Obtains the information of up to 128 branches (only branch-source info); the obtainable info is limited to 64 branches on some MCUs.			Supporte d *3
		RL78/G10 RL78/G1M RL78/G1N		2 points for an execution address	Not supported		Not supported			
		RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H		2 points being shared by an execution address and data access						
RL78	RL78/G1x	RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1C RL78/G1D RL78/G1G RL78/G13A	Single-wire Serial	1 point being shared by an execution address and data access	2000 points	Forcible break by selecting "Stop" on emulator		Supporte	Not supported; the time b/w Go and Stop is measurable.	
	RL78/I1x	RL78/I1A RL78/I1B RL78/I1C RL78/I1D		2 points being shared by an execution address and data access		debugger	Obtains the information of up to 256 branches (only branch-source info)	-		
	RL78/L1x	RL78/I1E RL78/L12 RL78/L13		1 point being shared by an execution address and data access			Not supported			
	RL78/H1x	RL78/L1A RL78/L1C RL78/H1D		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)			
		8/FGIC		1 point being shared by an execution address and data access			Not supported			
	RX700	RX72x RX71x	JTAG or Single-wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)			
	RX600	RX64x RX65x RX66x RX67x RX26T	JTAG or Single-wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)		Supported *5	Supporte d *3 *4
RX	RX600	Others than RX64x RX65x RX66x RX67x RX26T	JTAG or double-wire Serial *2 (clock and data)	8 points for an execution address + 4 points for a data access * Sequential breaks are specifiable.	256 points at the max		Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation			
	R	X200 X140 han RX26T		4 points for an execution address			Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation *1			
		X100 han RX140	Single−wire Serial	2 points for a data access * Sequential breaks are specifiable.			Obtains the information of up to 32 branches or the information of up to 32 cycles on data-access operation		Not supported; the time b/w Go and Stop is measurable.	Not supported
RISC-V MCU	R9A02G021	R9A02G021	cJTAG	4 points being shared by an execution address and data access	2000 points for ROM/RAM area		Not supported		Not supported; the time b/w Go and Stop is measurable.	

Notes:

*1. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained.

*2. The debugging function and the connection system vary by the MCU you use.

*3. Hot-plug Adapter for the E1 Emulator (optional) is required.

*4. Available only when the emulator is connected via JTAG interface.

*5. 1 sections can be gauged with RX100. 2 sections can be gauged with RX600.

*6. The internal RAM of the microcomputer is used as the trace buffer.

* The information provided only applies to MCUs where we have been able to confirm the specifications of the emulator. This includes MCUs and emulator software that are under development. For more information on support for these items as it becomes available, check our website at: https://www.renesas.com/e2lite

E1 Debugging Function

	Target MCU		Connection system	Break Function			Trace Function	&change	Performanc e	Hot plug-
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	while executing program	measureme nt	in
	RH850/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin							
	RH850/E1x	RH850/E1M-S2	LPD4-pin							
	RH850/C1x	RH850/C1H RH850/C1M					Between 2K and 4K of branch information can be acquired when this is the only target or		supported	
RH850	RH850/D1x	RH850/D1L RH850/D1M	LPD4-pin	12 points being shared by an execution address and data access	2000 points for ROM/RAM area		Between 1K and 2K of cycle information on data-access operation can be acquired when this is the only target			Supporte *5
		RH850/P1M	or LPD1-pin				Trace function isn't supported in some MCU's.			
	RH850/P1x	RH850/P1M-E RH850/P1H-C	LPD4-pin							
		RH850/P1M-C RH850/P1L-C								-
	RL78/D1x	RL78/D1A RL78/F12		1 point being shared by an execution address and data access			Not supported			Not support
	RL78/F1x	RL78/F13 RL78/F14 RL78/F15 RL78/F15 RL78/F1E		2 points being shared by an execution address and data access	2000 points		Obtains the information of up to 128 branches (only branch-source info); the obtainable info is limited to 64 branches on some MCUs.			Support *5
		RL78/G10 RL78/G1M RL78/G1N		2 points for an execution address	Not supported		Not supported			
		RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)	ł		
RL78	RL78/G1x	RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G1A RL78/G1C RL78/G1D RL78/G1D RL78/G1G RL78/G13A RL78/G1P	Single-wire Serial	1 point being shared by an execution address and data access	2000 points	Forcible break by	Not supported		Not supported; the time b/w Go and Stop is measurable.	
	RL78/I1x	RL78/I1A RL78/I1B RL78/I1C RL78/I1D RL78/I1E		2 points being shared by an execution address and data access	_	selecting "Stop" on emulator debugger	Obtains the information of up to 256 branches (only branch-source info)			
	RL78/L1x	RL78/L12 RL78/L13	-	1 point being shared by an execution address and data access			Not supported			
	RL78/H1x	RL78/L1A RL78/L1C RL78/H1D		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)			
	RL7	/8/FGIC		1 point being shared by an execution address and data access			Not supported			
	RX700	RX72x RX71x	JTAG or Single-wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)			
	RX600	RX64x RX65x RX66x RX67x RX26T	JTAG or Single-wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)		Supported *7	Support *5 *6
RX		Others than RX64x RX65x RX66x RX67x RX26T	JTAG or double−wire Serial *4 (clock and data)	8 points for an execution address + 4 points for a data access * Sequential breaks are specifiable.	256 points at the max		Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation			
	F	8X200 8X140 8han RX26T		4 points for an execution address			Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation *3			
		tX100 than RX140	Single-wire Serial	+ 2 points for a data access * Sequential breaks are specifiable.			Obtains the information of up to 32 branches or the information of up to 32 cycles on data-access operation		Not supported; the time b/w Go and Stop is measurable.	support
	V	850E1 850ES 850E2	JTAG, double−wire or 4−wire Serial (data × 2, clock and handshake)	2 points being shared by an execution address and data access * Sequential breaks are specifiable.	4 points for ROM area 2000 points for RAM area				Not supported;	
V850 *1 *2		50E2M 550E2S	Nexus or Single-wire Serial	[When using JTAG I/F][When using Serial I/F]Before-execution: 4 pointsBefore-execution: 4 pointsAfter-execution: 8 pointsAfter-execution: Not supported Access: 6 points* Sequential breaks are specifiable.	8 points for ROM area 2000 points for RAM area		Not supported		b/w Go and Stop is measurable.	

 $\ast 1.$ V850E2/ME3 and V850E/ME2 cannot be used with the E1 emulator. Use the MINICUBE for them.

*2. The number of break points varies by the integrated development environment you use.

*3. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained.

*4. The debugging function and the connection system vary by the MCU you use.

*5. Hot-plug Adapter for the E1 Emulator (optional) is required.

*6. Available only when the emulator is connected via JTAG interface.

*7. 1 sections can be gauged with RX100. 2 sections can be gauged with RX600.

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E1 Debugging Function – Continued-

	Target MCU			Break Function			Trace Function	Memory reference &change	Performanc e	Hot plug-
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	while executing program	measureme	
	78K0R		Single-wire Serial or double-wire Serial (clock and data)	1 point being shared by an execution address and data access	2000 points		Not supported			
	78K0R78K078K0R8C/L35C, R8C/L36C, R8C/L38C and R8C/L36C, R8C/L38M and R8C/L3AM Groups R8C/LA6A and R8C/L3AM Groups R8C/LA6A and R8C/LA8A Groups R8C/LA6A and R8C/LA8A Groups R8C/LA3A and R8C/LA5A Groups R8C/LA9S GroupR8C/LA6A and R8C/LA8A Groups R8C/LA9S GroupR8C/LA6A and R8C/LA8A Groups R8C/LA9S GroupR8C/LA6A and R8C/LA8A Groups R8C/LA9S GroupR8C/LA3A and R8C/LA8A Groups R8C/33C, R8C/33C, R8C/34C, R8C/33C, R8C/34C, R8C/33GC and R8C/3GC and R8C/3GC and R8C/3GG and 		double−wire Serial (clock and data)	1 point for a before-execution break (only when software breaks are not used) + 1 point for Access break	2000 points		Not supported			
R8C			Single-wire Serial	8 points for an address break + 2 points for a data condition break * Sequential breaks are specifiable.	256 points at the max	Forcible break by selecting "Stop" on emulator debugger	Obtains the information of 4 branches (sum of the branch-source and branch-destination PC) or the information of up to 8 cycles of specified data access	Supported	Not supported; the time b/w Go and Stop is measurable.	Not supported

Notes:

*1. V850E2/ME3 and V850E/ME2 cannot be used with the E1 emulator. Use the MINICUBE for them.

*2. The number of break points varies by the integrated development environment you use.

*3. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained.

*4. The debugging function and the connection system vary by the MCU you use.

*5. Hot-plug Adapter for the E1 Emulator (optional) is required.

*6. Available only when the emulator is connected via JTAG interface.

* The information provided only applies to MCUs where we have been able to confirm the specifications of the emulator. This includes MCUs and emulator software that are under development. For more information on support for these items as it becomes available, check our website at: https://www.renesas.com/e1

E20 Debugging Function

	Target MCU	J		Break Function			Trace F	Function		Performanc			
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	External Trace	&change while executing	e measureme nt	Real-time RAM monitor	C0 coverage	Hot plug- in
	RH850/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin			Dieak	Between 2K and 4K of branch info can be acquired		program				
RH850	RH850/E1x RH850/C1x	RH850/E1M-S2 RH850/C1H RH850/C1M RH850/D1L	LPD4-pin LPD4-pin	12 points being shared by an execution address and data access	2000 points for ROM/RAM area		when this is the only target or Between 1K and 2K of cycle info on data-access operation can be acquired when this is the only target	Not supported		Supported			Supporte
	RH850/D1x RH850/P1x	RH850/D1M RH850/P1M RH850/P1M-E RH850/P1H-C	or LPD1-pin LPD4-pin				Trace function isn't supported in some MCU's.						
	RL78/D1x	RH850/P1M-C RH850/P1L-C RL78/D1A		1 point being shared by			Not supported						Not
	RL78/F1x	RL78/F12 RL78/F13 RL78/F14 RL78/F15 RL78/F1E		an execution address and data access 2 points being shared by an execution address and data access	2000 points		Obtains the information of up to 128 branches (only branch-source info); the obtainable info is limited to 64 branches on some MCUs.					Not	Supported
		RL78/G10 RL78/G1M RL78/G1N		2 points for an execution address	Not supported		Not supported						
		RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				Not supported		
RL78	RL78/G1x	RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P	Single-wire Serial	1 point being shared by an execution address and data access	2000 points		Not supported	Not supported		Not supported; the time b/w Go and Stop is measurable			Not supported
	RL78/I1x	RL78/I1A RL78/I1B RL78/I1C RL78/I1D RL78/I1E		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)	n of					
	RL78/L1x	RL78/L12 RL78/L13		1 point being shared by an execution address and data access			Not supported						
	RL78/H1x	RL78/L1A RL78/L1C RL78/H1D		2 points being shared by an execution address and data access		Forcible break by selecting	Obtains the information of up to 256 branches (only branch-source info)						
	RL7	8/FGIC		1 point being shared by an execution address and data access		"Stop" on emulator debugger	Not supported		Supported				
RX	RX700	RX71x	JTAG only or Single-wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)	-			Not supported	Not supported	
			JTAG + External Trace	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)	Obtains the information of approx. 2M branches or the information of approx. 2M cycles on data access operation (DMAC or DTC bus is selectable as a bus master)	ches of iles eration ous is		Supported (Data- and Last-access attributes [Read/Write/N on-accessed])	Supported	
		RX64x RX65x RX66x RX67x RX26T	JTAG only or Single−wire Serial	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)	-			Not supported	Not supported	Supporte *5
	RX600	RX64x RX65x RX66x RX67x	JTAG + External Trace	8 points for an execution address + 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable.	256 points at the max		Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is selectable as a bus master)	Obtains the information of approx. 2M branches or the information of approx. 2M cycles on data access operation (DMAC or DTC bus is selectable as a bus master)		Supported *6	Supported (Data- and Last-access attributes [Read/Write/N on-accessed])	Supported	
	RX600 -	Others than RX64x RX65x	JTAG only or double-wire Serial *4 (clock and data)	8 points for an execution address + 4 points for a data access * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation	_			Not supported	Not	
		RX66x RX67x RX26T	JTAG or double–wire Serial *4 (clock and data)	8 points for an execution address + 4 points for a data access * Sequential breaks are specifiable.			Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation	Obtains the information of approx. 2M branches or the information of approx. 2M cycles on data access operation			Supported (Data- and Last-access attributes [Read/Write/N on-accessed])	supported	
	R Other th	X200 X140 han RX26T X100 han RX140	Single-wire Serial	4 points for an execution address + 2 points for a data access * Sequential breaks are specifiable.	a access		Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation*3 Obtains the information of up to 32 branches or the information of	Not supported		Not supported; the time b/w Go and	Not supported	Not supported	Not supporte

 $\ast 1.$ V850E2/ME3 and V850E/ME2 cannot be used with the E1 emulator. Use the MINICUBE for them.

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This includes MCUs and emulator software that are under development. For more information on support for these items as it becomes available, check our website at: https://www.renesas.com/e20

*2. The number of break points varies by the integrated development environment you use. *3. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained.

*4. The debugging function and connection system vary by the MCU you use.

*5. Available only when the emulator is connected via JTAG interface.

*6. 1 sections can be gauged with RX100. 2 sections can be gauged with RX600.

E20 Debugging Function - Continued-

	Target MCU				Break Functio	'n		Trace F	unction	Memory reference &change	Performanc e	Real-time	C0	Hot plug-		
Family	Series/Core	Group	Connection system	Hardwar	e Break	Software Break	Special Break	Internal trace	External Trace	while executing program	measureme	RAM monitor	coverage			
		0E1 0ES 0E2	JTAG, double−wire or 4−wire Serial (data × 2, clock and handshake)	2 po being sh an execution addres * Sequential breal	ared by ss and data access	4 points for ROM area 2000 points for RAM area										
V850 *1 *2		V850E2M V850E2S 78K0R		[When using JTAG I/F] Before-execution: 4 points After-execution: 8 points Access: 6 points * Sequential breat	Before-execution: 4 points After-execution: Not supported Access: 4 points	3 points for ROM area 2000 points for RAM area		Not supported						Supported		
	78K0R		Single-wire Serial or double-wire Serial (clock and data)	1 point bein an execution addres		2000 points										
	78K0		double-wire Serial (clock and data)	1 point for a before (only when software + 1 point for an	breaks are not used) -	2000 points										
R8C	R8C/L38C au Grc R8C/L35M, R8C/L38M au Grc R8C/LA6A a Grc R8C/LA3A a Grc R8C/LA3A a Grc R8C/LA3A R8C/LA3A R8C/32C, R8C, R8C/35C, R8C, R8C/35C, R8C, R8C/32M, R8C, R8C/32M, R8C, R8C/33M, R8C, R8C/34W, F R8C/34W, F R8C/34W, F R8C/34W, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, F R8C/34A, R8C, R8C/34A, R8C, R8C, R8C, R8C, R8C, R8C, R8C, R8C	/36C, R8C/38C, GC and C Groups /33M, R8C/34M, /36M, R8C/38M, GM and M Groups /8C/3JT and T Groups /8C/36W and N Groups /8C/36X and X Groups /8C/36Y and Y Groups /8C/36Z and Z Groups	Single-wire Serial	8 points for an 4 2 points for a data * Sequential break	- a condition break	256 points at the max	Forcible break by selecting "Stop" on emulator debugger	Obtains the information of 4 branches (sum of the branch-source and branch-destination PC) or the information of up to 8 cycles of specified data access	Not supported	Supported	b/ w Go and Stop is measurable.		Not supported	Not supported		

*1. V850E2/ME3 and V850E/ME2 cannot be used with the E1 emulator. Use the MINICUBE for them.

*2. The number of break points varies by the integrated development environment you use.

*3. For RX220 group, the information of 32 branches or the information of 32 cycles on data-access operation is obtained.

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*4. The debugging function and connection system vary by the MCU you use.

*5. Available only when the emulator is connected via JTAG interface.

■MINICUBE2 Debugging Function

	Target MCU		Break Fun	ction			DMM	Time Measurement				
Family	Series/ Core	Group	Hardware Break	Software Break	Forcible break	RAM Monitor	(Rewriting memories during RUN)	(from the start of execution to break)				
V850	V85	50E1 50ES 50E2	2 points *1 (Shared by an execution and access)	ROM area: 4 points RAM area: 2000 points	Supported *2	Supported	Supported	Measurement resolution: 100 μ s				
¥830		DE2M OE2S	Before−execution break : 4 points Access break : 4 points * Sequential breaks are specifiable.	ROM area: 8 points RAM area: 2000 points	Supported	Supported	Supported	Max. measurement time: Approx. 100 hours				
	78K0R	1 point 78KOR (Shared by an execution and access)		2000 points	Supported	Pseudo-Real RAM Monitor (RRM) : Supported	Supported	Measurement resolution: $100 \ \mu \ s$ Max. measurement time: Approx. 100 hours				
	78K0		Before-execution break : 1 point (Not supported when software breaks are used) Access break : 1 point	2000 points	Supported	Pseudo-Real RAM Monitor (RRM) : Supported	Supported	Measurement resolution: 100 μ s Max. measurement time: Approx. 100 hours				
Notos:	78K0S		78K0S		78K0S Not supported		Not supported	2000 points	Supported (Not supported while interrupts are inhibited)	Not supported	Not supported	Measurement resolution: 100 μ s Max. measurement time: Approx. 100 hours

Notes:

*1. The following MCUs have not been supported yet: V850ES/KE2, V850ES/KF2, V850ES/KG2, μ PD70F3733, and V850ES/IE2. *2. A forcible break is not possible in the following states.

- Interrupts are inhibited (DI).

- Interrupts from the serial interface used for communications between MINICUBE2 and the target device are masked.

- The device is on standby and triggering of release from standby by makeable interrupts is disabled.

 The main clock is stopped while the UART is being used as the communications interface between MINICUBE2 and the target device. * The information provided only applies to MCUs where we have been able to confirm the specifications of the emulator.

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https://www.renesas.com/cs+ > "Functions Supported by CS+"(PDF)

On-chip Debuggers Performance Property - page 7

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	Target MCU		Break Function		Deufeureeree		Trace	Function											
Family	Series/ Core	Group	Hardware Break	Software Break	Performance Measurement Function	Invalid External extension Mode of Embedded ROM	Internal Trace	AUD Trace											
	SH (Except for Mu		Address/Data/R/W/Execution-count condition break : 2 points + Address/R/W condition break : 4 points + Data/R/W condition break : 2 points + System bus condition break : 2 points * Sequential breaks are specifiable.		Supported	No Mode	8 branches ©	Up to 64K events *1 (Up to 32K of branch informat can be acquired when branch trace is the only targe ©											
	SH-4	SH7760 SH7751R	* Sequential breaks are specifiable. Address/Data/R/W : 2 points + Address/R/W condition break : 4 points * Sequential breaks are specifiable.		Supported	No Mode	8 branches	Up to 64K events *1 (Up to 32K of branch informatican be acquired when branch trace is the only targ											
		SH7750R				No Mode		-											
	SH-3	SH7721 SH7720 SH7712 SH7710 SH7705 SH7727	Address/Data/R/W/Execution-count condition break : 1 point + Address/R/W condition break : 1 point		Supported	No Mode	8 branches	Up to 64K branches ★1 (Only branch-destination information) ◎											
		SH7709S SH7706 SH7206	* Sequential breaks are specifiable.			No Mode		Up to 26214 branches *1											
		SH7200 SH72AY SH72AW SH72A0 SH72A2				No Mode	1000 cycles												
	SH-2A	SH7211 SH7216 (SH7216, SH7214) SH7231 SH7237 SH7239 SH7243 SH7285 SH7285 SH7286	Address break : 8 points + Address/Data/R/W/Execution-count condition break : 1 point		Supported	Supported	Select the target info from: Address/Data/Status/ Time stamp bus.	Up to 64K events *1 (Up to 32K of branch informa											
SuperH	(Except for Multi-core - MCUs)	SH7670 SH726A SH726B SH7269 SH7268 SH7267 SH7266 SH7264 SH7262 SH7203	condition break : 1 point + Address/Data/R/W condition break : 1 point * Sequential breaks are specifiable.			No Mode	256 cycles Select the target info from: Address/Data/Status/ Time stamp bus.	can be acquired when branch trace is the only targ ©											
		SH7263 SH7201 SH7261	266 264 262 203 263 201 261 56R			No Mode													
		SH7256R SH7254R		255 points		Supported	-												
		SH7253					200 points	_	No Mode		-								
	SH-2	SH7619 SH7618	+		-	No Mode	4 branches	-											
		SH-2				-						-	SH7145F SH7144F SH7047F	Address break : 4 points * Sequential breaks are specifiable.			-	-	Up to 64K events *2 (Up to 32K of branch informa can be acquired when branch trace is the only tar
			R5F71494A R5F71464A R5F70865A R5F70855A R5F70854A R5F70845A R5F70844A R5F70835A	Address break : 2 points + Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point		Supported	Supported	4 branches											
		R5F70834A SH7137	* Sequential breaks are specifiable.			Supported													
		SH7136 SH7125 SH7124			-	No Mode													
		R5E71494R R5E71491R R5E71464R R5E70865R R5E70855R R5E70845R R5E70835R	Address break : 8 points + Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point * Sequential breaks are specifiable.		Supported	Supported	1000 cycles Select the target info from: Address/Data/Status/ Time stamp bus.	Up to 64K events *1 (Up to 32K of branch informa can be acquired when branch trace is the only tar ©											
	H8SX/1700	H8SX/1720S H8SX/1720	Address break : 3 points +		Supported														
H8SX	H8SX H8SX	/1600	Address/Data/Satisfaction-count condition break : 1 point * Sequential breaks are specifiable.		-	- *3	8 branches	-											
		H8S/2472 H8S/2463 H8S/2462				-	4 branch sources												
	H8S/2400	H8S/2456R H8S/2456 H8S/2454 H8S/2426R H8S/2426 H8S/2426 H8S/2424	Address break : 6 points + Address/Data condition break : 2 points		_	Supported	4 branch sources or Bus trace : 1024 cycles	_											
H8S		H8S/2427R H8S/2427 H8S/2425					8 branch sources												
	H8S/2300	H8S/2378 H8S/2378R H8S/2368 H8S/2319 *4 H8S/2339 *5	Address/Data condition break : 2 points			- Supported	4 branch sources or Bus trace : 512 cycles 4 branch sources												
		H8S/2329 *6 H8S/2218		-															
	H8S/2200	H8S/2215 *7 H8S/2212	Address/Data condition break : 2 points		– © Acquirable trace	-	4 branch sources	-											

₭¶..⊠ot usable with HS0005KCU01H.

€2. The tusable with HS0005KCU01H. While using RAM monitor function with HS0005KCU02H, no trace information can be acquired.

☑. [Supported only by H8SX/1651.
☑. [Only H8S/2319EF is supported.

€3. Only H8S/2339EF is supported.

*6. Only H8S/2329EF is supported.

*7. Only H8S/2215R and H8S/2215T are supported.

Branch, Memory access within the specified range, and Software trace (Trace(x): variable x).

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E10A-USB(HS0005KCU01H/HS0005KCU02H) Debugging Function - Continued-

	Target MCU		Break Function		Performance		Trace Function		
Family	Series/ Core	Group	Hardware Break	Software Break	Measurement Function	Invalid External extension Mode of Embedded ROM	Internal Trace	AUD Trace	
H8S	H8S/2100	H8S/2168 H8S/2153 H8S/2164 H8S/2117 H8S/2117R H8S/2125 H8S/2116 H8S/2113 H8S/2112 H8S/2112R	Address break : 6 points + Address/Data condition break : 2 points	255 points	Not supported	No Mode	4 branch sources	Not supported	
		H8S/2189R H8S/2114R	Address break : 6 points + Address/Data condition break : 2 points				4 branch sources or Bus trace : 512 cycles		

Notes:

₺ Mot usable with HS0005KCU01H.

程.IDot usable with HS0005KCU01H. While using RAM monitor function with HS0005KCU02H, no trace information can be acquired.

*6. Only H8S/2329EF is supported.

₺ . @nly H8S/2215R and H8S/2215T are supported.

₭3.**[S**upported only by H8SX/1651.

≹4.**O**nly H8S/2319EF is supported. €3. Only H8S/2339EF is supported. \ast The information provided only applies to MCUs where we have been able to confirm the specifications of the emulator. This includes MCUs and emulator software that are under development. For more information on support

for these items as it becomes available, check our website at: https://www.renesas.com/e10a_usb

■E10A-USB(HS0005KCU01H/HS0005KCU02H + Debug MCU Board) Debugging Function

	Target MCU		Break Function		Performance		Trace	Function
Family	Series/ Core	Group	Hardware Break	Software Break	Measurement Function	Invalid External extension Mode of Embedded ROM	Internal Trace	AUD Trace
SuperH	SH-4A	SH7456 SH7455 SH7451 SH7450	Address/Data/R/W/Execution-count condition break : 2 points + Address/R/W condition break : 4 points + Data/R/W condition break : 2 points + System bus condition break : 2 points * Sequential breaks are specifiable.		Supported	No Mode	8 branches ©	Up to 64K events *1 (Up to 32K of branch information can be acquired when branch trace is the only target) ©
Guponn	SH-2	SH7125 SH7124	Address break : 8 points + Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point * Available to specify the sequential break	255 points	Supported	No Mode	1000 cycles Select the target one from Address/Data/Status/ Time stamp bus.	Up to 64K events *1 (Up to 32K of branch information can be acquired when branch trace is the only target.) ©
H8S	H8S/2400	H8S/2456R H8S/2456 H8S/2454 H8S/2426R H8S/2426 H8S/2424	Address break : 6 points + Address/Data condition break : 2 points		Not supported	Supported	4 branch sources or Bus trace : 1024 cycles	Not supported

Mote: *1. Dot usable with HS0005KCU01H.

© Acquirable trace information: Branch, Memory access within the specified range, and Software trace (Trace(x): variable x).

■E10A-USB(HS0005KCU14H) Debugging Function

		Target MCU		Break Function		Performance		Trace Function	
	Family	Series/ Core	Group	Hardware Break	Software Break	Measurement Function	Invalid External extension Mode of Embedded ROM	Internal Trace	AUD Trace
		SH-4A (Multi-core MCU)	SH7786	10 points (Using UBC module)	255 points (for each core in MCU)	Supported	No Mode	60 sets of branch sources and destinations	Up to 128K events (Up to 64K of branch information can be acquired when branch trace is the only target) ©
	SuperH	SH-2A (Multi-core MCU)	SH7205 SH7265					1024 cycles (When acquiring trace info by core in MCU, 512 cycles respectively.)	

O Acquirable trace acquisition information: Branch, Memory access, and General register. (Conditions are settable by each CPU.)

★ New product ★★ Under development \Rightarrow In planning

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E8a Debugging Function

Target MCU			Break Function			Trace Function	
Family	Series/ Core	es/ Core Group Hardware Break		Software Break	Special Break	Internal Trace	
	R8C/Lx		Address break : 8 points + Data condition break : 2 points * Sequential breaks are specifiable.			4 branches (sum of branch source PC and destination PC) or Up to 8 cycles of specified data access	
	R8C	∑/Mx	Address break : 4 points + Data condition break : 1 point			3 branches (sum of branch source PC and destination PC) or 6 branches (branch source PC) or Up to 8 cycles of specified data access	
R8C	R8C/3x	Other than R8C/3xD	Address break : 8 points + Data condition break : 2 points * Sequential breaks are specifiable.			4 branches (sum of branch source PC and destination PC) or Up to 8 cycles of specified data access	
		R8C/3xD	Address break : 4 points				
	R8C/2x Other than R8C/10-13		or Address break : 2 points + Data condition break : 1 point			The latest 4 branches (branch source PC)	
	R8C/1x	R8C/10-13	Address break : 2 points			_	
	R32C/100						
	M32C/80		Address break : 8 points			_	
	M16C/60	M16C/62P M16C/6Nx M16C/6S		255 points	Forcible break by selecting "Stop" on emulator debugger		
M16C		M16C/63 M16C/64A M16C/64C M16C/65 M16C/65C M16C/6C	Address break : 8 points			32 branches of order execution history (sum of branch source PC and destination PC) or Up to 64 cycles of specified data access 16 branches of order execution history	
		M16C/6S1 M16C/6B	Data condition break : 2 points * Sequential breaks are specifiable.			(sum of branch source PC and destination PC) or Up to 32 cycles of specified data access	
	M16C/50					32 branches of order execution history (sum of branch source PC and destination PC) or Up to 64 cycles of specified data access	
	M16C/Tiny		Address break : 6 points				
H8S	H8S/Tiny		Address break : 8 points + Address/Data condition break : 2 points			The latest 8 branch sources or The latest 4 branch sources + 4 branch destinations	
	H8/300H Tiny		Address/Data condition break : 1 point				
H8	H8/300H Super Low Power		Address break : 1 point + Address/Data condition break : 1 point			The latest 4 branch sources	
	H8/300L Super Low Power		Address/Data condition break : 1 point				
	740		Address break : 2 points			-	

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On-chip Debuggers Performance Property - page 10

 \bigstar New product $\bigstar \bigstar$ Under development \Rightarrow In planning

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