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	Target MCI	U		Break Function			Trace Function	Memory reference			
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	&change while executing	Performance measurement	Trigger	Hot plug in
	RA8	DAOD1/M1	JTAG	8 points for an execution address,			Obtained information of branches is stored in a	program			
	KA8	RA8D1/M1	or SWD	8 points for a data access	-		dedicated buffer 8KB. (both branch-source and branch-destination info)				
	RA6	RA6E2 Others than	SWD 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			Obtained information of branches is stored in a		Not supported;		Supporte
	RA4	RA4M1 RA4W1	JTAG or		2048 points for ROM/RAM area		dedicated buffer 1KB. (both branch-source and branch-destination info)		the time b/w Go and Stop is measurable.	Not supported	
		Others than RA4xx	SWD				Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info)				
	RA2	RA2xx					Obtains the information of up to 2K branches *5				
	RA0	RA0xx	SWD	4 points for an execution address, 2 points for a data access			(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/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin								
		RH850/E1M-S2 RH850/C1H	LPD4-pin				Between 2K and 4K of branch information can be acquired when this is the only target or				
	RH850/C1x RH850/D1x	RH850/C1M RH850/D1L	LPD4-pin				Between 1K and 2K of cycle information on data-access operation can be acquired when this is the only target				
Dila		RH850/D1M RH850/P1M RH850/P1M-E	or LPD1-pin	12 points	2000 points for		when this is the only target Trace function isn't supported in some MCU's.				
RH850	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/E2x	RH850/P1L-C RH850/E2M RH850/E2H RH850/E2UH					Between 4K and 8K of branch information can be acquired when this is the only target				
	RH850/U2x	RH850/U2A RH850/U2B	LPD4-pin - or JTAG				or Between 2K and 4K of cycle information on data-access operation can be acquired when this is the only target Trace function isn't supported in some MCU's.				
	RL78/G2x	RL78/G22 RL78/G23		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				Not
	RL78/D1x	RL78/G24 RL78/D1A RL78/F12		1 point being shared by an execution address and data access			Not supported				supporte
	RL78/F1x	RL78/F13 RL78/F14 RL78/F15		2 points	2000 points		Obtains the information of up to 128 branches				
	RL78/F2x	RL78/F1E RL78/F23		being shared by an execution address and data access			(only branch-source info); the obtainable info is limited to 64 branches on some MCUs.				Supporte
		RL78/F24 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)				
RL78	RL78/G1x	RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less)	Single-wire Serial			Forcible break by selecting "Stop" on emulator debugger		Supported	Not supported; the time b/w Go and Stop is measurable.	IN:2ch OUT:2ch	
		RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D		1 point being shared by an execution address and data access	2000		Not supported				Not supported
		RL78/G1E RL78/G1G RL78/G13A RL78/I1A RL78/I1B			2000 points						
	RL78/I1x	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)				
	RL78/L1x	RL78/L12 RL78/L13 RL78/L1A		1 point being shared by an execution address and data access	_		Not supported Obtains the information of up to 256 branches				
	RL78/H1x	RL78/L1C RL78/H1D		2 points being shared by an execution address and data access			(only branch-source info)				
	RL78	B/FGIC		1 point being shared by an execution address and data access 8 points for an execution address			Not supported Obtains the information of up to 256 branches				
	RX700	RX72x RX71x RX64x	JTAG or Single-wire Serial	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master) * Sequential breaks are specifiable. 8 points for an execution address	_		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 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	Others than	JTAG	* Sequential breaks are specifiable.	256 int-		(DMAC or DTC bus is selectable as a bus master)		Supported *4		
RX		RX64x RX65x RX66x	or double-wire Serial *2	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	(clock and data)	* Sequential breaks are specifiable.			on data-access operation Obtains the information of up to 64 branches				
	R)	X200 X140 nan RX26T		4 points for an execution address			or the information of up to 64 cycles				
	R)	X100	Single-wire Serial	+ 2 points for a data access * Sequential breaks are specifiable.			on data-access operation *1 Obtains the information of up to 32 branches or		Not supported; the time b/w Go		Not supported
		nan RX140				-	the information of up to 32 cycles on data-access operation		and Stop is measurable.		
							<g4mh> Between 2K and 8K of branch information</g4mh>		(0.444)		
			<g4mh> LPD−4pin or</g4mh>	<g4mh> 12 points for an execution address/a data access ⟨Cortex−A⟩</g4mh>			can be acquired when this is the only target or Between 2K and 4K of cycle information		<g4mh> Supported</g4mh>		
	R-Car S4	-	JTAG <cortex=a.r></cortex=a.r>	6 pints for an execution address Cortex-R> 6 pints for an execution address			on data-access operation can be acquired when this is the only target		Cortex-A,R> Not supported; the time b/w Go		
R-Car			JTAG	2 pints for a data address	2048 points for ROM/RAM area		⟨Cortex-A,R⟩ Obtained information of branches is stored in a dedicated buffer 32KB.		and Stop is measurable.		Supporte
					_		(both branch-source and branch-destination info)			Not supported	
		-	JTAG	<cortex−a> 6 pints for an execution address <cortex−r></cortex−r></cortex−a>			Obtained information of branches is stored in a dedicated buffer 32KB.		Not supported; the time b/w Go		
	R-Car V4H				1	I	(both branch-source and branch-destination info)		and Stop is	I	1
	R-Car V4H			6 pints for an execution address 2 pints for a data address			(Both Branch Source and Branch destination into)		measurable.		
RISC-V	R-Car V4H R9A02G021	R9A02G021	cJTAG	•	2000 points for		Not supported		measurable. Not supported; the time b/w Go		Not

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.

Renesas general tools catalog

■E2 emulator Lite Debugging Function

	Target MCU		Connection system	Break Function			Trace Function	&change		Hot plug
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace	while executing program	measureme nt	e in
	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	RA6xx					Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info)			
	RA4	RA4M1 RA4W1	SWD	6 points for an execution address, 2 points for a data access			Obtained information of branches is stored in a dedicated buffer 1KB.		Not	
RA		Others than RA4xx		<u> </u>	2048 points for ROM/RAM area		(both branch-source and branch-destination info) Obtained information of branches is stored in a dedicated buffer 2KB.	_	supported; the time b/w Go and	
	RA2	RA2xx			NOW/NAW area		(both branch-source and branch-destination info)		Stop is measurable.	
	RA0	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		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)			Not
	RL78/D1x	RL78/G24 RL78/D1A		1 point	-			_		support
		RL78/F12		being shared by an execution address and data access	2000 points		Not supported			
	RL78/F1x	RL78/F13 RL78/F14 RL78/F15 RL78/F1E RL78/F23		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.			Suppor d *3
	RL78/F2x	RL78/F24 RL78/G10 RL78/G1M		2 points for an execution address	Not supported		Not supported			
		RL78/G1N 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)	•		
RL78	RL78/G1x	RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D RL78/G1G	Single-wire Serial	1 point being shared by an execution address and data access	2000 points	Forcible break by selecting "Stop"	Not supported	Supporte	Not supported; the time b/w Go and Stop is measurable.	d
	RL78/I1x	RL78/G13A RL78/I1A RL78/I1B				on emulator debugger		d		
	NE70/11X	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)			
	RL78/L1x	RL78/L12 RL78/L13 RL78/L1A		1 point being shared by an execution address and data access	_		Not supported			
	RL78/H1x	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 *5	Suppor d *3 *4
RX		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	Single-wire Serial	4 points for an execution address + 2 points for a data access			Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation *1			Not
		X100 han RX140	Sanglo Will Octiful	* 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.	d
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.	Not d support

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 Emulator

■E1 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	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	RH850/C1x	RH850/C1H RH850/C1M	Er 54 pill	12 points	2000 points for		Between 2K and 4K of branch information can be acquired when this is the only target or Between 1K and 2K of cycle information		supported	Supported
111000	RH850/D1x	RH850/D1L RH850/D1M	LPD4-pin or	being shared by an execution address and data access	ROM/RAM area		on data-access operation can be acquired when this is the only target		Supported	*5
		RH850/P1M	LPD1-pin				Trace function isn't supported in some MCU's.			
	RH850/P1x RH850/P1M-E RH850/P1H-C RH850/P1M-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 supported
	RL78/F1x	RL78/F13 RL78/F14 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.	-		Supported *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)			
RL78		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	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	o″			
	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)			
	RL	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	Supported *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	RX200 RX140 than 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			
		RX100 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.	Not supported
	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 :50E2S	Nexus or Single-wire Serial	[When using JTAG I/F] Before-execution: 4 points After-execution: 8 points Access: 6 points * Sequential breaks are specifiable. [When using Serial I/F] Before-execution: 4 points A points After-execution: Not supported Access: 4 points	8 points for ROM area 2000 points for RAM area		Not supported		the time b/w Go and Stop is measurable.	

* 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

^{*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.

■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	in
	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			
	78K0 R8C/L35C, R8C/L36C, R8C/L38C and R8C/L3AC Groups		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	re breaks are not used) + 2000 points		Not supported			
R8C	R8C/L38C R8C/L38M R8C/L38M G R8C/LA6A G R8C/LA3A G R8C/LA3A G R8C/LA3A R8C/LA3A R8C/32C, R8G R8C/35C, R8G R8C/35C, R8G R8C/35M, R8G R8C/32M, R8G R8C/33M, R8G R8C/33M, R8G R8C/33M, R8G R8C/34W, R8C/3 R8C/34W, R8C/3	and R8C/L3AC		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

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.

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becomes available, check our website at: https://www.renesas.com/e1

E20 Emulator

■E20 Debugging Function

Secretary Secr		Target MCU			Break Function			Trace F	Function	Memory reference &change	Performanc e	Real-time	C0	Hot plug-
1999 1999	Family	Series/Core	Group	Connection system	Hardware Break	Software Break		Internal trace	External Trace	while executing	measureme			in
Process Company Comp	RH850	RH850/E1x RH850/C1x RH850/D1x	RH850/F1M RH850/F1L RH850/F1KM RH850/F1KM RH850/F1KH RH850/E1M-S2 RH850/C1H RH850/C1M RH850/D1L RH850/D1M RH850/P1M	or LPD1–pin LPD4–pin LPD4–pin or LPD1–pin	being shared by			branch info can be acquired 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	program	Supported			Supported
1.00 1.00		DI 78/D1v	RH850/P1M-C RH850/P1L-C	LPD4 pin	1 point									
But			RL78/F12 RL78/F13 RL78/F14 RL78/F15		being shared by an execution address and data access 2 points being shared by	2000 points		Obtains the information of up to 128 branches (only branch-source info); the obtainable info is						Not supported Supported
Part			RL78/G1M		2 points for an execution address	Not supported								
R.2.72 In Part of the Company of the		RL78/6 RL78/6 (ROM: 96 and mo RL78/6 RL78/6 RL78/G1x RL78/			being shared by			up to 256 branches				Not supported		
R. 2010 R. 201	RL78	RL78/G1x	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	being shared by	2000 points		Not supported	Not supported		supported; the time b/w Go and Stop is			Not supported
RUND IN TAX DESCRIPTION AND ADDRESS OF THE RESOLUTION AND ADDRESS		RL78/I1x	RL78/I1B RL78/I1C RL78/I1D		being shared by an execution address and data access			up to 256 branches						
RX39/FGC RX39/F		RL78/L1x	RL78/L13 RL78/L1A		being shared by an execution address and data access 2 points		Foreible	Obtains the information of						
RXX TAO orly 2 points for an execution address 2 points for an execution address 3 points for an execution address 4 points for		RL78/H1x	RL78/L12 RL78/L13 RL78/L1A RL78/L1C RL78/H1D		an execution address and data access		break by selecting			Supported				
FX710 PX71x PX71x PX71x FXX1x FXX		RL78	8/FGIC		being shared by	break by selecting "Stop" on emulator								
B prints for an execution address (DMAQ or PTO bas basicerable as a bus (DMAQ or PTO basic special breaks are specifiable.) RX64x RX65x	RX	RX700		or	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			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		
RX60v				+	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			up to 256 branches or the information of up to 256 cycles on data-access operation (DMAC or DTC bus is	approx. 2M branches or the information of approx. 2M cycles on data access operation (DMAC or DTC bus is			(Data- and Last-access attributes [Read/Write/N		
RX600 RX612 RX652 RX663 RX672 RX600 RX6000 RX6000 RX6000 RX6000 RX6000 RX6000 RX6000 RX6000			RX65x RX66x RX67x	or	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			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	-			Not supported		Supported *5
Others than RX66x RX67x RX26T RX200 RX140 Other than RX26T Single-wire Serial * Others than RX60x RX100 RX100 RX100 Other sthan RX100 Other sthan RX60x RX60x RX67x RX26T Single-wire Serial * Other sthan RX60x RX100 Other sthan RX26T Single-wire Serial * Other sthan RX60x RX100 Other sthan RX26T Single-wire Serial * Other sthan RX60x RX100 Other sthan RX26T Single-wire Serial * Other sthan RX60x RX60x RX60x RX60x RX100 Other sthan RX26T Single-wire Serial * Other sthan RX26T Sequential breaks are specifiable. Other sthan RX26T Sequential breaks are specifi		RX600	RX65x RX66x	+	+ 4 points for a data access (DMAC or DTC bus is selectable as a bus master)			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)	approx. 2M branches or the information of approx. 2M cycles on data access operation (DMAC or DTC bus is			(Data- and Last-access attributes [Read/Write/N	Supported	
RX200 RX140 Other than RX26T RX100			RX64x	or double−wire Serial *4	+ 4 points for a data access			up to 256 branches or the information of up to 256 cycles	-			Not supported	Not	
RX200 RX140 Other than RX26T Single-wire Serial RX100 RX100 Single-wire Serial RX100 Single-wire Serial Single-wire Serial Single-wire Serial RX100 Single-wire Serial Single-w			RX65x RX66x RX67x RX26T or double-wire Serial *4 (clock and data) 8 points for an execution address + 4 points for a data access * Sequential breaks are specifiable.	up to 256 branches or the information of up to 256 cycles on data-access operation	approx. 2M branches or the information of approx. 2M cycles			(Data- and Last-access attributes [Read/Write/N						
Other than RX140 the information of up to 32 cycles on data-access operation the information of up to 32 cycles on data-access operation b/w Go and Stop is measurable.		RX140 Other than RX26T Single-wire Serial RX100 * Sequential by		+ 2 points for a data access			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 up to 32 cycles	Not supported		supported; the time b/w Go and Stop is	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.
- $\ensuremath{*4}.$ 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.

* 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/e20

E20 Emulator

■E20 Debugging Function - Continued-

	Target MCU	J			Break Functio	n		Trace F	unction	Memory reference &change	Performanc e	Real-time	C0	Hot plug-
Family	Series/Core	Group	Connection system	Hardwar	re Break	Software Break	Special Break	Internal trace	External Trace	while executing program	measureme	RAM monitor	coverage	
	V8	50E1 50ES 50E2	JTAG, double–wire or 4–wire Serial (data × 2, clock and handshake)	2 po being sh an execution addre * Sequential breal	nared by	4 points for ROM area 2000 points for RAM area								Not supported
V850 *1 *2		50E2M 50E2S	Nexus or Single-wire Serial	[When using JTAG I/F] Before-execution: 4 points After-execution: 8 points Access: 6 points * Sequential breal	Before-execution: 4 points After-execution: Not supported Access: 4 points	8 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 addre		2000 points								
	78K0		double-wire Serial (clock and data)	1 point for a beford (only when software + 1 point for an	+	2000 points								
R8C	R8C/L38C a Gr R8C/L35M R8C/L38M a Gr R8C/LA6A a Gr R8C/LA3A a Gr R8C/JA3A a Gr R8C/32C, R8C R8C/35C, R8C R8C/35C, R8C R8C/35M, R8C R8C/35M, R8C R8C/35M, R8C R8C/35M, R8C R8C/35M, R8C R8C/34W, F R8C/38 R8C/34W, F R8C/38 R8C/34Y, F R8C/38 R8C/34Z, F R8C/38 R8C/34Z, F R8C/38 R8C/34Z, F R8C/38 R8C/34K, R8C	C, R8C/L36C, and R8C/L3AC roups M, R8C/L36M, and R8C/L3AM roups and R8C/LA8A roups and R8C/LA5A roups APS Group C/5x C/3xT-A C/33C, R8C/34C, C/36C, R8C/38C, 38C, 38C, 38M, R8C/38M, R8C/38M, GM and JM Groups R8C/35M and JM Groups R8C/36W and JM Groups R8C/34W and JM Groups MQ Group	Single-wire Serial	8 points for an 4 2 points for a dat * Sequential breal		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	Not supported; the time b/w Go and Stop is measurable.	Not supported	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
- $\ensuremath{\star} 4.$ The debugging function and connection system vary by the MCU you use.
- *5. 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/e20

■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	Suggested	Commented	Measurement resolution: 100μ s		
	V630	V850E2M V850E2S		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		78K0R (Shar		1 point (Shared by an execution and access)		Supported	Pseudo-Real RAM Monitor (RRM) : Supported	Supported	Measurement resolution: 100 μ s Max. measurement time: Approx. 100 hours
				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		
		78K0S		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:

 ${\tt https://www.renesas.com/cs+>"Functions Supported by CS+"(PDF)}$

^{*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.

 $[\]overline{\ }$ 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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E10A-USB Emulator

■E10A-USB(HS0005KCU01H/HS0005KCU02H) Debugging Function

	Target MCU		Break Function		Performance	Involid Enternal	Trace	Function
Family	Series/ Core	Group	Hardware Break	Software Break	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 information can be acquired when branch trace is the only target)
	SH-4	SH7760 SH7751R	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 information can be acquired when branch trace is the only target)
		SH7750R SH7721 SH7720 SH7712	Address/Data/R/W/Execution-count			No Mode		Up to 64K branches *1
	SH-3	SH7710 SH7705 SH7727 SH7709S	condition break : 1 point + Address/R/W condition break : 1 point * Sequential breaks are specifiable.		Supported	No Mode	8 branches	(Only branch−destination information) ⊚ Up to 26214 branches *1
		SH7706 SH7206 SH72AY SH72AW	06 AY W AO			No Mode		
	SH-2A	SH72A0 SH72A2 SH7211 SH7216 (SH7216, SH7214) SH7231 SH7237 SH7239 SH7243 SH7285 SH7286	Address break : 8 points + Address/Data/R/W/Execution-count condition break : 1 point		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 information
SuperH	(Except for Multi-core MCUs)	SH7670 SH726A SH726B SH7269 SH7267 SH7266 SH7266 SH7264 SH7262 SH7203 SH7263	+ 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 target) ©
		SH7201 SH7261 SH7256R SH7254R SH7253		255 points	-	No Mode Supported No Mode	-	
		SH7619 SH7618	Address/Data/R/W/Execution-count condition break : 1 point + Address/R/W condition break : 1 point * Sequential breaks are specifiable.		_	No Mode	4 branches	-
		SH7145F SH7144F SH7047F	Address break : 4 points * Sequential breaks are specifiable.			-	-	Up to 64K events *2 (Up to 32K of branch information can be acquired when branch trace is the only target)
	SH-2	R5F71494A R5F71464A R5F70865A R5F70855A R5F70854A R5F70845A R5F70844A R5F70835A R5F70834A	Address break : 2 points + Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point		Supported	Supported Supported	4 branches	-
		SH7137 SH7136 SH7125 SH7124 R5E71494R	* Sequential breaks are specifiable. Address break : 8 points		-	No Mode		
		R5E71491R R5E71464R R5E70865R R5E70855R R5E70845R	+ Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point		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 information can be acquired when branch trace is the only target)
H8SX	H8SX/1700 H8SX		* Sequential breaks are specifiable. Address break : 3 points + Address/Data/Satisfaction-count condition break : 1 point		Supported	- *3	8 branches	-
H8S	H8SX H8S/2400	H8S/2472 H8S/2463 H8S/2462 H8S/2456R H8S/2456 H8S/2454 H8S/2426R H8S/2426 H8S/2427 H8S/2427	* Sequential breaks are specifiable. Address break : 6 points + Address/Data condition break : 2 points		-	- Supported	4 branch sources 4 branch sources or Bus trace : 1024 cycles 8 branch sources	_
	H8S/2425 H8S/2378 H8S/2378R H8S/2368 H8S/2319 *4 H8S/2339 *5	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/2200	H8S/2329 *6 H8S/2218 H8S/2215 *7	Address/Data condition break : 2 points	1	_	_	4 branch sources	_

^{₺ .} Not usable with HS0005KCU01H.

^{₹2.} Not usable 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.

^{₹5.} 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).

^{*} 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) Debugging Function - Continued-

		Target MCU		Break Function		Performance		Trace	Function
F	amily	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	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:

₺ . Not usable with HS0005KCU01H.

- ₹2. Not usable with HS0005KCU01H. While using RAM monitor function with HS0005KCU02H, no trace information can be acquired.
- €3. Supported only by H8SX/1651. €2. Only H8S/2319EF is supported.
- ₹3. Only H8S/2339EF is supported.

*6. Only H8S/2329EF is supported.

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

	Target MCU		Break Function		Performance	T 115 M .	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)
	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

Note:

*1.\(\text{Not usable with HS0005KCU01H.}\)

■E10A-USB(HS0005KCU14H) Debugging Function

	Target MCU		Break Function		Performance	Totalid Estamal automaian Mada	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					60 sets of branch sources and destinations	Up to 128K events	
SuperH	SH-2A SH7205 (Multi-core MCU) SH7265		10 points (Using UBC module)	255 points (for each core in MCU)	Supported	No Mode	1024 cycles (When acquiring trace info by core in MCU, 512 cycles respectively.)	(Up to 64K of branch information can be acquired when branch trace is the only target)	

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

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

■E8a Debugging Function

Target MCU			Break Function			Trace Function
Family	Series/ Core	Group	Hardware Break	Software Break	Special Break	Internal Trace
R8C	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/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
	D0/	R8C/3xD	Address break : 4 points			The latest 4 branches (branch source PC)
		Other than R8C/10-13	Address break : 2 points + Data condition break : 1 point			
		R8C/10-13	Address break : 2 points			-
M16C	R32C/100 M32C/80 M16C/62P M16C/6Nx M16C/6S		Address break : 8 points	255 points	Forcible break by selecting "Stop" on emulator debugger	-
	M16C/60	M16C/63 M16C/64A M16C/64C M16C/65 M16C/65C M16C/6C	Address break : 8 points + Data condition break : 2 points * Sequential breaks are specifiable.		emulator debugger	32 branches of order execution history (sum of branch source PC and destination PC) or Up to 64 cycles of specified data access
		M16C/6S1 M16C/6B				(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 +			The latest 8 branch sources or
Н8	Цо /200Ц Т:		Address/Data condition break : 2 points			The latest 4 branch sources + 4 branch destinations
	H8/300H Tiny H8/300H Super Low Power		Address/Data condition break : 1 point 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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