

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

Target MCU				Break Function			Trace Function	Memory reference change while executing program	Performance measurement	Trigger	Hot plug-in
Family	Series/Core	Group	Connection system	Hardware Break	Software Break	Special Break	Internal trace				
RA	RA6	RA6E2	SWD	6 points for an execution address. 4 points for a data access	2048 points for ROM/RAM area		Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info)	Not supported, the time b/w Go and Stop is measurable.	Not supported	Not supported	
		Others than RA6xx	JTAG or SWD								
	RA4E2	SWD									
	RA4M1 RA4W1	JTAG or SWD									
	Others than RA4xx	JTAG or SWD									
RA2	RA2xx	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	RED1				Obtains the information of up to 4K branches *5 (both branch-source and branch-destination info)					
RH850	RH850/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin	12 points being shared by an execution address and data access	2000 points for ROM/RAM area	Forcible break by selecting "Stop" on emulator debugger	Between 2K and 4K of branch information can be acquired when this is the only target or Between 1K and 2K 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.	supported		Supported	
		RH850/E1x	RH850/E1M-S2								LPD4-pin
	RH850/C1x	RH850/C1H RH850/C1M	LPD4-pin or LPD1-pin								
	RH850/D1x	RH850/D1L RH850/D1M	LPD4-pin or LPD1-pin								
	RH850/P1x	RH850/P1M-E	LPD4-pin								
		RH850/P1H-C RH850/P1M-C RH850/P1L-C	LPD4-pin								
	RH850/E2x	RH850/E2M RH850/E2H RH850/E2UH	LPD4-pin or JTAG								
RH850/U2x	RH850/U2A RH850/U2B	JTAG									
RL78	RL78/G2x	RL78/G22 RL78/G23 RL78/G24		2 points being shared by an execution address and data access	2000 points	Forcible break by selecting "Stop" on emulator debugger	Obtains the information of up to 256 branches (only branch-source info)	Supported	Not supported, the time b/w Go and Stop is measurable.	IN2ch OUT2ch	
		RL78/D1x	RL78/D1A	1 point being shared by an execution address and data access			Not supported				
	RL78/F1x	RL78/F12 RL78/F13 RL78/F14 RL78/F15 RL78/F16		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.				
		RL78/F2x	RL78/F23 RL78/F24				Not supported				
	RL78/G1x	RL78/G10 RL78/G1M RL78/G1N		2 points for an execution address			Not supported				
		RL78/G14 (ROM: 96KByte and more)	RL78/G1F RL78/G1H	2 points for an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				
		RL78/G11 RL78/G12 RL78/G13	RL78/G14 (ROM: 64KByte and less)	1 point being shared by an execution address and data access			Not supported				
		RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G13B RL78/G13C	RL78/G14 (ROM: 64KByte and less)	2 points for an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				
		RL78/G18 RL78/G19	RL78/G14 (ROM: 64KByte and less)	1 point being shared by an execution address and data access			Not supported				
		RL78/G17 RL78/G18 RL78/G19	RL78/G14 (ROM: 64KByte and less)	2 points for an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				
		RL78/G14 (ROM: 64KByte and less)	RL78/G14 (ROM: 64KByte and less)	1 point being shared by an execution address and data access			Not supported				
	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		2 points being shared by an execution address and data access			Obtains the information of up to 256 branches (only branch-source info)				
	RL78/FGIC	RL78/H1D		1 point being shared by an execution address and data access			Not supported				
	RX	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.				256 points at the max
RX64x RX65x RX66x RX67x RX68x			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		Others than RX64x RX65x RX66x RX67x RX68x	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.	Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation						
		RX200 RX140 Other than RX26T	Single-wire Serial	4 points for an execution address + 2 points for a data access * Sequential breaks are specifiable.	Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation *1						
RX100 Other than RX140		Single-wire Serial	4 points for an execution address + 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					

* 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			Connection system	Break Function			Trace Function	Memory reference & change while executing program	Performance measurement	Hot plug-in				
Family	Series/Core	Group		Hardware Break	Software Break	Special Break	Internal trace							
RA	RA6	RA6xx	SWD	6 points for an execution address, 2 points for a data access	2048 points for ROM/RAM area		Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info.)	Not supported; the time b/w Go and Stop is measurable.	Not supported					
	RA4	RA4M1 RA4W1					Obtained information of branches is stored in a dedicated buffer 1KB. (both branch-source and branch-destination info.)							
			Others than RA4xx	Obtained information of branches is stored in a dedicated buffer 2KB. (both branch-source and branch-destination info.)										
	RA2	RA2xx	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	RL78/G2x	RL78/G22 RL78/G23 RL78/G24	Single-wire Serial	2 points being shared by an execution address and data access	2000 points	Forcible break by selecting "Stop" on emulator debugger	Obtains the information of up to 256 branches (only branch-source info.)	Supported	Not supported; the time b/w Go and Stop is measurable.					
	RL78/D1x	RL78/D1A		1 point being shared by an execution address and data access			Not supported							
	RL78/F1x	RL78/F12		RL78/F13 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 limited to 64 branches on some MCUs.				
				RL78/F2x	RL78/F23 RL78/F24		2 points for an execution address			Not supported				
				RL78/G1x	RL78/G10 RL78/G1M RL78/G1N RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H RL78/G1I RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P		2 points for an execution address			Not supported	Obtains the information of up to 256 branches (only branch-source info.)			
	RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H RL78/G1I RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less) RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P	2 points being shared by an execution address and data access					Not supported			Obtains the information of up to 256 branches (only branch-source info.)				
	RL78/G14 (ROM: 64KByte and less) RL78/G15 RL78/G16 RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P	1 point being shared by an execution address and data access					Not supported			Not supported				
	RL78/I1x	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.)				
	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		2 points being shared by an execution address and data access	Obtains the information of up to 256 branches (only branch-source info.)									
				RL78/H1D	1 point being shared by an execution address and data access		Not supported							
		RL78/FGIC									Not supported			
	RX	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.			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)	Supported *3 *4 *5	Not supported
		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)		
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.		Obtains the information of up to 256 branches or the information of up to 256 cycles on data-access operation									
			4 points for an execution address + 2 points for a data access * Sequential breaks are specifiable.		Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation *1									
RX200 RX140 Other than RX26T			Single-wire Serial	4 points for an execution address + 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									

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	Memory reference & change while executing program	Performance measurement	Hot plug-in
Family	Series/Core	Group		Hardware Break	Software Break	Special Break	Internal trace			
RH850	RH850/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin	12 points being shared by an execution address and data access	2000 points for ROM/RAM area		Between 2K and 4K of branch information can be acquired when this is the only target or Between 1K and 2K 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.		supported	Supported #5
	RH850/E1x	RH850/E1M-S2	LPD4-pin							
	RH850/C1x	RH850/C1H RH850/C1M	LPD4-pin or LPD1-pin							
	RH850/D1x	RH850/D1L RH850/D1M	LPD4-pin or LPD1-pin							
	RH850/P1x	RH850/P1M	LPD4-pin							
RH850/P1M-E RH850/P1H-C RH850/P1M-C RH850/P1L-C		LPD4-pin								
RL78	RL78/D1x	RL78/D1A	Single-wire Serial	1 point being shared by an execution address and data access	2000 points	Forcible break by selecting "Stop" on emulator debugger	Not supported	Supported	Not supported: the time b/w Go and Stop is measurable.	Not supported
	RL78/F1x	RL78/F12		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.			Supported #5
		RL78/F13 RL78/F14 RL78/F15 RL78/F1E		2 points for an execution address	Not supported		Not supported			
	RL78/G1x	RL78/G10 RL78/G1M RL78/G1N RL78/G14 (ROM; 96KByte and more)		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/G1F RL78/G1H RL78/G11 RL78/G12 RL78/G13 RL78/G14 (ROM; 64KByte and less)		1 point being shared by an execution address and data access	Not supported					
		RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P		2000 points						
		RL78/I1A		2 points being shared by an execution address and data access						
	RL78/I1x	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)			Not supported
	RL78/L1x	RL78/L12 RL78/L13		1 point being shared by an execution address and data access	Obtains the information of up to 256 branches (only branch-source info)					
		RL78/L1A RL78/L1C		2 points being shared by an execution address and data access						
RL78/H1x	RL78/H1D	1 point being shared by an execution address and data access	Not supported							
RL78/FGIC										
RX	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.	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)	Supported #7	Supported #5 #6	
	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.						
		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.						
	RX200 RX140 Other than RX26T		Single-wire Serial	4 points for an execution address						
RX100 Other than RX140		Single-wire Serial	2 points for a data access * Sequential breaks are specifiable.	Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation #3	Not supported: the time b/w Go and Stop is measurable.	Not supported				
V850 #1 #2	V850E1 V850ES V850E2		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		Not supported: the time b/w Go and Stop is measurable.	Supported #5	
	V850E2M V850E2S	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 After-execution: Not supported Access: 4 points	8 points for ROM area 2000 points for RAM area						

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.
*7. 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/e1>

■ E1 Debugging Function – Continued–

Target MCU			Connection system	Break Function			Trace Function	Memory reference & change while executing program	Performance measurement	Hot plug-in
Family	Series/Core	Group		Hardware Break	Software Break	Special Break	Internal trace			
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			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	R8C/L35C, R8C/L36C, R8C/L38C and R8C/L3AC Groups R8C/L35M, R8C/L36M, R8C/L38M and R8C/L3AM Groups R8C/LA6A and R8C/LA8A Groups R8C/LA3A and R8C/LA5A Groups R8C/LAPS Group		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
	R8C/5x									
	R8C/3xT-A									
	R8C/32C, R8C/33C, R8C/34C, R8C/35C, R8C/36C, R8C/38C, R8C/3GC and R8C/3JC Groups R8C/32M, R8C/33M, R8C/34M, R8C/35M, R8C/36M, R8C/38M, R8C/3GM and R8C/3JM Groups R8C/33T, R8C/3JT and R8C/3NT Groups R8C/34W, R8C/36W and R8C/38W Groups R8C/34X, R8C/36X and R8C/38X Groups R8C/34Y, R8C/36Y and R8C/38Y Groups R8C/34Z, R8C/36Z and R8C/38Z Groups R8C/32G, R8C/32H, R8C/33G, R8C/33H, R8C/34P and R8C/34R Groups R8C/34K, R8C/34U, R8C/3MK and R8C/3MU Groups R8C/3MQ Group									

- 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			Connection system	Break Function			Trace Function		Memory reference & exchange while executing program	Performance measurement	Real-time RAM monitor	CO coverage	Hot plug-in											
Family	Series/Core	Group		Hardware Break	Software Break	Special Break	Internal trace	External Trace																
RH850	RH850/F1x	RH850/F1H RH850/F1M RH850/F1L RH850/F1K RH850/F1KM RH850/F1KH	LPD4-pin or LPD1-pin	12 points being shared by an execution address and data access	2000 points for ROM/RAM area		Between 2K and 4K of branch info can be acquired when this is the only target	Not supported	Supported				Supported											
		RH850/E1x	RH850/E1M-S2				LPD4-pin																	
	RH850/C1x	RH850/C1H RH850/C1M	LPD4-pin or LPD1-pin																					
	RH850/D1x	RH850/D1L RH850/D1M RH850/P1M	LPD4-pin or LPD1-pin																					
	RH850/P1x	RH850/P1M-E RH850/P1H-C RH850/P1M-C RH850/P1L-C	LPD4-pin																					
RL78	RL78/D1x	RL78/D1A RL78/F12		1 point being shared by an execution address and data access	2000 points	2000 points	Not supported	Not supported	Not supported: the time b/w Go and Stop is measurable.	Not supported	Not supported	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			Obtains the information of up to 128 branches (only branch-source info); the obtainable info is limited to 64 branches on some MCUs.																	
		RL78/G1x	RL78/G10 RL78/G1M RL78/G1N RL78/G14 (ROM: 96KByte and more) RL78/G1F RL78/G1H RL78/G1I RL78/G12 RL78/G13 RL78/G14 (ROM: 64KByte and less)	Single-wire Serial			2 points for an execution address							Not supported	Not supported	Obtains the information of up to 256 branches (only branch-source info)								
	RL78/G1A RL78/G1C RL78/G1D RL78/G1E RL78/G1G RL78/G13A RL78/G1P			1 point being shared by an execution address and data access			Not supported							Not supported	Not supported									
	RL78/11A RL78/11B RL78/11C RL78/11D RL78/11E			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 RL78/L1C				1 point being shared by an execution address and data access							Not supported	Not supported	Obtains the information of up to 256 branches (only branch-source info)								
	RL78/H1x		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)										
		RL78/FGIC		1 point being shared by an execution address and data access			Not supported							Not supported	Not 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.							256 points at the max	Forcible break by selecting "Stop" on emulator debugger	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	Not supported: the time b/w Go and Stop is measurable.	Not supported	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)						Supported (Data- and Last-access attributes [Read/Write/Non-accessed])	
		RX800	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
				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 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/Non-accessed])	
			Others than RX64x RX65x RX66x RX67x RX26T	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 supported
		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/Non-accessed])	Not supported																	
RX200 RX140 Other than RX26T		Single-wire Serial	4 points for an execution address + 2 points for a data access * Sequential breaks are specifiable.	Obtains the information of up to 64 branches or the information of up to 64 cycles on data-access operation ^{5,3}	Not supported	Not supported	Not supported	Not supported																
RX100 Other than RX140		Single-wire Serial	4 points for an execution address + 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	Not supported: the time b/w Go and Stop is measurable.	Not supported	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 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

■ E2O Debugging Function – Continued –

Target MCU			Connection system	Break Function			Trace Function		Memory reference & change while executing program	Performance measurement	Real-time RAM monitor	CO coverage	Hot plug-in
Family	Series/Core	Group		Hardware Break	Software Break	Special Break	Internal trace	External Trace					
V850 *1 *2	V850E1 V850ES V850E2		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	Not supported	Supported	Not supported: the time b/w Go and Stop is measurable.	Not supported	Not supported	Not supported	
	V850E2M V850E2S	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 After-execution: Not supported Access: 4 points 2000 points for RAM area									
78K0R		Single-wire Serial or double-wire Serial (clock and data)	1 point being shared by an execution address and data access	2000 points									
78K0		double-wire Serial (clock and data)	1 point for a before-execution break (only when software breaks are not used) + 1 point for an access break										
R8C	R8C/L35C, R8C/L36C, R8C/L38C and R8C/L3AC Groups R8C/L35M, R8C/L36M, R8C/L38M and R8C/L3AM Groups R8C/LA6A and R8C/LA8A Groups R8C/LA3A and R8C/LA5A Groups R8C/LAPS Group	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	Not supported	Supported	Not supported: the time b/w Go and Stop is measurable.	Not supported	Not supported	Not supported	
	R8C/5x												
	R8C/3xT-A												
	R8C/32C, R8C/33C, R8C/34C, R8C/35C, R8C/36C, R8C/38C, R8C/3GC and R8C/3JC Groups R8C/32M, R8C/33M, R8C/34M, R8C/35M, R8C/36M, R8C/38M, R8C/3GM and R8C/3JM Groups R8C/33T, R8C/3JT and R8C/3NT Groups R8C/34W, R8C/36W and R8C/38W Groups R8C/34X, R8C/36X and R8C/38X Groups R8C/34Y, R8C/36Y and R8C/38Y Groups R8C/34Z, R8C/36Z and R8C/38Z Groups R8C/32G, R8C/32H, R8C/33G, R8C/33H, R8C/34P and R8C/34R Groups R8C/34K, R8C/34J, R8C/3MK and R8C/3MU Groups R8C/3MQ Group												

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 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/e2o>

■ MINICUBE2 Debugging Function

Target MCU			Break Function			RAM Monitor	DMM (Rewriting memories during RUN)	Time Measurement (from the start of execution to break)
Family	Series/ Core	Group	Hardware Break	Software Break	Forcible break			
V850	V850E1 V850ES V850E2		2 points *1 (Shared by an execution and access)	ROM area: 4 points RAM area: 2000 points	Supported *2	Supported	Supported	Measurement resolution: 100 μs Max. measurement time: Approx. 100 hours
	V850E2M V850E2S		Before-execution break : 4 points Access break : 4 points * Sequential breaks are specifiable.	ROM area: 8 points RAM area: 2000 points	Supported			
78K0R			1 point (Shared by an execution and access)	2000 points	Supported	Pseudo-Real RAM Monitor (RRM) : Supported	Supported	Measurement resolution: 100 μs 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 μs 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 μs Max. measurement time: Approx. 100 hours

Notes:

*1. The following MCUs have not been supported yet: V850ES/KE2, V850ES/KF2, V850ES/KG2, μPD70F3733, 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.

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/cs+>> "Functions Supported by CS+"(PDF)

■E10A-USB (HS0005KCU01H/HS0005KCU02H) Debugging Function

Target MCU			Break Function		Performance Measurement Function	Invalid External extension Mode of Embedded ROM	Trace Function						
Family	Series/ Core	Group	Hardware Break	Software Break			Internal Trace	AUD Trace					
SuperH	SH-4A (Except for Multi-core MCUs)		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.	255 points	Supported	No Mode	8 branches ③	Up to 64K events *1 (Up to 32K of branch information can be acquired when branch trace is the only target) ③					
	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) ③					
		SH7750R				No Mode	-						
	SH-3	SH7721 SH7720 SH7712 SH7710 SH7705	Address/Data/R/W/Execution-count condition break : 1 point + Address/R/W condition break : 1 point * Sequential breaks are specifiable.		Supported	No Mode	8 branches	Up to 64K branches *1 (Only branch-destination information) ③					
		SH7727 SH7709S SH7706				No Mode		Up to 26214 branches *1					
	SH-2A (Except for Multi-core MCUs)	SH7206	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	No Mode	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) ③					
		SH72AY SH72AW SH72A0 SH72A2											
		SH7211 SH7216 (SH7216, SH7214) SH7231 SH7237 SH7239 SH7243 SH7285 SH7286											
		SH7670 SH726A SH726B SH7269 SH7268 SH7267 SH7266 SH7264 SH7262 SH7203 SH7263											
		SH7201 SH7261											
		SH7256R SH7254R											
		SH7253											
		SH-2				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 * Sequential breaks are specifiable.	Supported	Supported	4 branches	-
						SH7137					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 information can be acquired when branch trace is the only target) ③
	H8SX	H8SX/1700	H8SX/1720S H8SX/1720		Address break : 3 points + Address/Data/Satisfaction-count condition break : 1 point * Sequential breaks are specifiable.	Supported	- *3	8 branches	-				
		H8SX/1600											
		H8SX/1500											
	H8S	H8S/2400	H8S/2472 H8S/2463 H8S/2462 H8S/2456R H8S/2456 H8S/2454 H8S/2426R H8S/2426 H8S/2424		Address break : 6 points + Address/Data condition break : 2 points	-	Supported	4 branch sources	-				
			H8S/2427R H8S/2427 H8S/2425					4 branch sources or Bus trace : 1024 cycles					
			H8S/2378 H8S/2378R H8S/2368		Address/Data condition break : 2 points			8 branch sources					
H8S/2319 *4 H8S/2339 *5 H8S/2329 *6				4 branch sources or Bus trace : 512 cycles									
H8S/2200		H8S/2218 H8S/2215 *7 H8S/2212	Address/Data condition break : 2 points		Supported		4 branch sources						

Notes:
 ① 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.
 ④ 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.

③ Acquirable trace information:
 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 Emulator

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

Target MCU			Break Function		Performance Measurement Function	Invalid External extension Mode of Embedded ROM	Trace Function	
Family	Series/ Core	Group	Hardware Break	Software Break			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:
 Not usable with HS0005KCU01H.
 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.
 Only H8S/2339EF is supported.

*6. Only H8S/2329EF is supported.
 Only H8S/2215R and H8S/2215T are supported.
 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 Measurement Function	Invalid External extension Mode of Embedded ROM	Trace Function	
Family	Series/ Core	Group	Hardware Break	Software Break			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.	255 points	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.) ©
		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				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. Not 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 Measurement Function	Invalid External extension Mode of Embedded ROM	Trace Function	
Family	Series/ Core	Group	Hardware Break	Software Break			Internal Trace	AUD Trace
SuperH	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.) ©
	SH-2A (Multi-core MCU)	SH7205 SH7265					1024 cycles (When acquiring trace info by core in MCU, 512 cycles respectively.)	

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

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

* 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/e8a>