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■ E1 Debugging Function

Target MCU			Break Function			Trace Function	
Family	Series/ Core	Group	Hardware Break	Software Break	Special Break	Internal trace	
V850 *1 *2 *5	V850E1 V850ES		Execution address/Data access [shared] : 2 points * Can specify the sequential break	ROM area : 4 points RAM area : 2000 points	Forced break by selecting "Stop" on emulator debugger	Not Supported	
	V850E2M V850E2S		[When using JTAG I/F] Before execution : 4 points After execution : 8 points Access : 6 points * Can specify the sequential break	[When using Serial I/F] Before execution : 4 points After execution : - Access : 4 points		ROM area : 8 points RAM area : 2000 points	Not Supported
RX	RX600 *2 *3		Execution address : 8 points + Data access : 4 points * Can specify the sequential break	Max. 256 points		Max. 256 branches and/or cycles of Data access information	
	RX200 ★		Execution address : 4 points + Data access : 2 points * Can specify the sequential break			Max. 64 branches and/or cycles of Data access information	
RL78	RL78/G12 ★★ RL78/G13 RL78/G14 (ROM : less than 64KByte) RL78/F12 ★★ RL78/I1A ★★ RL78/L12 ★★ RL78/G1A ★★		Execution address/Data access [shared] : 1 point	2000 points		Not Supported	
	RL78/G14 (ROM : more than 96KByte)		Execution address/Data access [shared] : 2 points			Max. 256 branches (Only branch source information)	
R8C	R8C/Lx		Address break : 8 points + Data condition break : 2 points * Can specify the sequential break	Max. 256 points		4 branches (sum of branch source PC and destination PC) or Max. 8 cycles of specified Data access	
	R8C/5x ★★						
	R8C/3xT-A						
	R8C/3x *4						
78K0R			Execution address/Data access [shared] : 1 point	2000 points	Not Supported		
78K0			Break before execution : 1 point (Only when not using software break) + Access break : 1 point	2000 points	Not Supported		

Notes:
*1. V850E2/ME3 and V850E/ME2 cannot be used with E1 emulator. Use MINICUBE for them.
*2. Including MCUs of underdevelopment.
*3. Including emulator software of underdevelopment.

*4. Including MCUs not supported by E1/E20 emulator in the Series.
*5. The number of break points varies depending on the integrated development environment.

■ E20 Debugging Function

Target MCU			Break Function			Trace Function	
Family	Series/ Core	Group	Hardware Break	Software Break	Special Break	Internal trace	External Trace
V850 *1 *2 *5	V850E1 V850ES		Execution address/Data access [shared] : 2 points * Can specify the sequential break	ROM area : 4 points RAM area : 2000 points	Forced break by selecting "Stop" on emulator debugger	Not Supported	Not Supported
	V850E2M V850E2S		[When using JTAG I/F] Before execution : 4 points After execution : 8 points Access : 6 points * Can specify the sequential break	[When using Serial I/F] Before execution : 4 points After execution : - Access : 4 points		ROM area : 8 points RAM area : 2000 points	Not Supported
RX	RX600 *2 *3		Execution address : 8 points + Data access : 4 points * Can specify the sequential break	Max. 256 points		Max. 256 branches and/or cycles of Data access information	Approximately 2M branches and/or cycles of Data access information
	RX200 ★		Execution address : 4 points + Data access : 2 points * Can specify the sequential break			Max. 64 branches and/or cycles of Data access information	Not Supported
RL78	RL78/G12 ★★ RL78/G13 RL78/G14 (ROM : less than 64KByte) RL78/F12 ★★ RL78/I1A ★★ RL78/L12 ★★		Execution address/Data access [shared] : 1 point	2000 points		Not Supported	Not Supported
	RL78/G14 (ROM : more than 96KByte)		Execution address/Data access [shared] : 2 points			Max. 256 branches (Only branch source information)	
R8C	R8C/Lx		Address break : 8 points + Data condition break : 2 points * Can specify the sequential break	Max. 256 points		4 branches (sum of branch source PC and destination PC) or Max. 8 cycles of specified Data access	
	R8C/5x ★★						
	R8C/3xT-A						
	R8C/3x *4						
78K0R			Execution address/Data access [shared] : 1 point	2000 points	Not Supported	Not Supported	
78K0			Break before execution : 1 point (Only when not using software break) + Access break : 1 point	2000 points	Not Supported	Not Supported	

Notes:
*1. V850E2/ME3 and V850E/ME2 cannot be used with E1 emulator. Use MINICUBE for them.
*2. Including MCUs of underdevelopment.
*3. Including emulator software of underdevelopment.

*4. Including MCUs not supported by E1/E20 emulator in the Series.
*5. The number of break points varies depending on the integrated development environment.

■ 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	Forced Break			
V850	V850E1 V850ES		2 points *1 (Execution/ Access [shared])	ROM area: 4 points RAM area: 2000 points	Supported *2	Supported	Supported	Measurement resolution: 100 μs Max. measurement time: Approx. 100 hours
	V850E2M *3 V850E2S		Before execution break : 4 points Access break : 4 points * Can specify the sequential break	ROM area: 8 points RAM area: 2000 points	Supported			
78K0R *3			1 point (Execution/ Access [shared])	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 using software break) 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 interrupt disable)	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, μ PD70F3733, V850ES/IE2.

*2. Forced break is not supported under the conditions below.

- When interrupt is disable, (DI)
- When the interrupt of Serial I/F that is used for communications between MINICUBE2 and the target MCU is masked.
- When the standby mode is set while the standby release by maskable interrupt is prohibited.
- When the main clock is stopped while the communication I/F between MINICUBE2 and the target MCU is UART.

*3. Including MCUs of underdevelopment.

■ 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 *9 *10 (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 * Can specify the sequential break		255 points	Supported	No Mode	8 branches ◎ Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ◎									
	SH-4	SH7760 SH7751R	Address/Data/R/W : 2 points + Address/R/W condition break : 4 points * Can specify the sequential break			Supported	No Mode	8 branches Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ◎									
		SH7750R					No Mode	Not Supported									
	SH-3	SH7721 SH7720 SH7712 SH7710 SH7705	Address/Data/R/W/Execution-count condition break : 1 point + Address/R/W condition break : 1 point * Can specify the sequential break			Supported	No Mode	8 branches Max. 64K branches *1 (Only for branch destination information) ◎									
		SH7727 SH7709S SH7706					No Mode	Max. 26214 branches *1									
	SH-2A (Except for Multi-core MCUs)	SH7206	SH72AY ★★ SH72AW ★★ SH72A0 ★★ SH72A2 ★★	Address break : 8 points + Address/Data/R/W/Execution-count condition break : 1 point + Address/Data/R/W condition break : 1 point * Can specify the sequential break		Supported	No Mode	1000 cycles Select the target one from Address/Data/Status/Time stamp bus.	Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ◎								
										SH7211 SH7216 (SH7216, SH7214)	SH7231 SH7237 SH7239 SH7243 SH7285 SH7286						
		SH7670 SH726A ★★ SH726B ★★ SH7269 ★ SH7268 ★ SH7267 SH7266 SH7264 SH7262 SH7203 SH7263	SH7201 SH7261				No Mode	Select the target one from Address/Data/Status/Time stamp bus.									
										SH7256R ★★ SH7254R	No Mode	Not Supported					
		SH7253					Not Supported	No Mode					Not Supported				
		SH-2	SH7619 SH7618							Address/Data/R/W/Execution-count condition break : 1 point + Address/R/W condition break : 1 point * Can specify the sequential break		Not Supported		No Mode	4 branches	Not Supported	
							SH7145F SH7144F SH7047F			Address break : 4 points * Can specify the sequential break							
			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 * Can specify the sequential break			Supported	Supported		4 branches	Not Supported			
							SH7137 SH7136 SH7125 SH7124								Not Supported		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 * Can specify the sequential break			Supported	Supported		1000 cycles Select the target one from Address/Data/Status/Time stamp bus.	Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ◎			
		H8SX	H8SX/1700				H8SX/1720S *8 H8SX/1720	Address break : 3 points + Address/Data/Satisfaction-count condition break : 1 point * Can specify the sequential break		Supported	Not Supported *3	8 branches	Not Supported				
	H8SX/1600					Not Supported											
	H8SX/1500																
	H8S	H8S/2400	H8S/2472 H8S/2463 H8S/2482	Address break : 6 points + Address/Data condition break : 2 points		Not Supported	Supported	4 branch sources	Not Supported								
H8S/2456R H8S/2456 H8S/2454 H8S/2426R H8S/2426 H8S/2424			4 branch sources or Bus trace : 1024 cycles														
H8S/2427R H8S/2427 H8S/2425			8 branch sources														
H8S/2300		H8S/2378 H8S/2378R H8S/2368	Address/Data condition break : 2 points			Not Supported	Not Supported	4 branch sources or Bus trace : 512 cycles									
		H8S/2319 *4 H8S/2339 *5 H8S/2329 *6						Supported		4 branch sources							
H8S/2200		H8S/2218 H8S/2215 *7 H8S/2212	Address/Data condition break : 2 points			Not Supported	Not Supported	4 branch sources		Not Supported							

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.
*8. Emulator software is under development.
*9. Including emulator software of underdevelopment.
*10. Including MCUs of underdevelopment.
◎ Trace acquisition information:
Branch, Memory access within the specified range, and Software trace (Trace(x): variable x).

■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 *8 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:
 *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.
 *8. Emulator software is under development.
 *9. Including emulator software of underdevelopment.
 *10. Including MCUs of underdevelopment.

■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 * Can specify the sequential break	255 points	Supported	No Mode	8 branches ©	Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ©
	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				1000 cycles Select the target one from Address/Data/Status/Time stamp bus.	Max. 64K events *1 (When acquiring only branch trace information, 32K branches in max.) ©
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.
 © Trace acquisition 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	Max. 128K events (When acquiring only branch trace information, 64K in max.) ©
	SH-2A (Multi-core MCU)	SH7205 SH7265					1024 cycles (When acquiring trace info by core in MCU, 512 cycles each.)	

- © 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 * Can specify the sequential break	255 points	Forced break by selecting "Stop" on emulator debugger	4 branches (sum of branch source PC and destination PC) or Max. 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 Max. 6 cycles of specified Data access		
	R8C/3x	Other than R8C/3xD	Address break : 8 points + Data condition break : 2 points * Can specify the sequential break			4 branches (sum of branch source PC and destination PC) or Max. 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							
	R8C/1x	Other than R8C/10-13	Address break : 2 points			Not Supported		
R8C/10-13		Not Supported						
M16C	R32C/100		Address break : 8 points			255 points	Forced break by selecting "Stop" on emulator debugger	Not Supported
	M32C/80							Not Supported
	M16C/60	M16C/62P M16C/6Nx M16C/6S	Address break : 8 points + Data condition break : 2 points * Can specify the sequential break					32 branches of order execution history (sum of branch source PC and destination PC) or Max. 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 Max. 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 Max. 64 cycles of specified Data access			
		M16C/50		Not Supported				
M16C/Tiny		Address break : 6 points	The latest 8 branch sources or The latest 4 branch sources + 4 branch destinations					
H8S	H8S/Tiny *1		Address break : 8 points + Address/Data condition break : 2 points	255 points	Forced break by selecting "Stop" on emulator debugger			The latest 4 branch sources
H8	H8/300H Tiny		Address/Data condition break : 1 point					
	H8/300H Super Low Power *1		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			Not Supported		

Note:
*1. Including emulator software of underdevelopment.