Separate Sheet

Product Specifications of the RH850/D1x Series of MCUs

RH850 D1M Key Features:

			176-pin R7F701404 R7F701424 R7F701405 R7F701425	272-pin R7F701406 R7F701426 R7F701407 R7F701427	376-pin R7F701408 R7F701428 R7F701410 R7F701430	484-pin R7F701411 R7F701431 R7F701412 R7F701432
CPU	**CPU System**		RH850G3M			
	CPU Frequency		160 MHz		240 MHz	
	Memory Protection Unit (MPU)		Supported			
	Floating Point Unit (FPU)		Supported			
	Memory caches	**Instruction cache**	8 KB / 4-way associative			
		Non-CPU system memories	16 KB / 4-way associative		32 KB / 4-way associative	
Memory	**Code Flash**		3.75 MB (R7F701404, R7F701424) 5 MB (R7F701405, R7F701425)	3.75 MB (R7F701406, R7F701426) 5 MB (R7F701407, R7F701427)	3.75 MB (R7F701408, R7F701428) 5 MB (R7F701410, R7F701430)	3.75 MB (R7F701411, R7F701431) 5 MB (R7F701412, R7F701432)
	Data Flash		64 KB			
	Local RAM		512 KB			
	Retention RAM		16 KB			
	Video RAM with Video RAM wrapper		1.55 MB		2 x 1.55 MB	
External memory interfaces	**SDRAM Interface**	**Bus width**	-	32-bit	16-bit	32-bit
		Mode	-	SDR-SDRAM (SDRA)	DDR2-SDRAM Interface (SDRB)	
		Max. clock	-	80 MHz	240 MHz	
	Serial Flash Memory Interface	**Bus width**	8-bit			
		Mode	SDR, DDR			
		Max. clock	SDR : 120 MHz, DDR : 80 MHz			

DMA		16 channels			
Operating clock	**Main Oscillator**	8 to 16 MHz			
	Low Speed Internal Oscillator	Typ. 240 kHz			
	High Speed Internal Oscillator	Typ. 8 MHz			
	Sub Oscillator	Typ. 32.768 kHz			
	Spread-spectrum PLL0	480 MHz			
	PLL1	Fixed to 480 MHz			
	PLL2	-		Max. 480 MHz	
I/O port		126	126	159	199
A/D converter		16 channels, 12 bit resolution		20 channels, 12 bit resolution	
Timer	**16-bit Timer Array Unit B (TAUB)**	3 units (16 channels / unit)			
	32-bit Timer Array Unit J (TAUJ)	1 unit (4 channels / unit)			
	Timer for Operating System (OSTM)	2 units (32-bit resolution, 1 channel / unit)			
	32-bit Always-On-Area Timer (AWOT)	1 unit (1 channel / unit)			
	Real Time Clock (RTCA)	Supported			
	Window Watchdog Timer A (WDTA)	2 units			
	PWM Generators with Diagnostic	1 unit (12-bit resolution, 24 PWM generators, 12 with diagnostic capability)			
Communication interface	**Clocked Serial Interface G (CSIG)**	4 channels			
	Queued Clocked Serial Interface H (CSIH)	2 channels			
	CAN Interface (RS-CAN)	3 channels (total 192 message buffers)			
	CAN Interface (RSCANFD)	3 channels (total 192 message buffers) : Only available for R7F701428, R7F701430, R7F701431, R7F701432			
	LIN / UART Interface (RLIN3)	4 channels			
	I^2C Interface (RIIC)	2 channels			
	Ethernet AVB MAC (ETNB)	1 channel (Media Access Controller for up to 100 Mbps, with Audio Video Bridging)			

Communication interface	**Media Local Bus (MLBB)**		-		1 channel (50 Mbps)
External interrupts	**Maskable**		11		
	Non-maskable (NMI)		1		
Audio	**Sound Generator (SG)**		5 units		
	PCM-PWM Converter (PCMP)		1 unit		
	I^2S Interface (SSIF)		2 units (1 channel / unit)		
Video and Graphics	**Video output (VO)**	**Channels**	1 channel (1024 x 1024 pixels, 30 MHz pixel clock, RGB888, 4 layers)	2 channels (1024 x 1024 pixels, 48 MHz pixel clock, RGB888, 4 layers)	
		Interface	LVTTL	LVTTL for both channels, single RSDS selectable for channel 0 or 1	
		Pre-distortion	Warping Engine (VOWE)	Warping Engine (VOWE) for video channel 0	
		RLE decoding	Supported	Supported for each video channel	
		Sprite layer	3 x 16 sprites for 3 output layers		
		Timing Controller(TCON)	7 programmable signals		
	Video input(VI)	**Channels**	1 channel	1 channel	2 channels
		Resolution	1024 x 1024 pixels		
		Pixel clock	30 MHz	60 MHz	
		Color formats	RGB666, ITU656	RGB888, ITU656	
		Interface	LVTTL		LVTTL for both channels, single MIPI CSI-2 for channel 0
	Graphics Processing Unit		2D Graphics Processing Unit (GPU2D), 80 MHz operation clock	2D Graphics Processing Unit (GPU2D), 240 MHz operation clock	
	JPEG Unit (JCUA)		Supported		
	Video output data control		Video Output Checker (VOCA)	Video Output Checker (VOCA)	

Video and Graphics	**Video output data control**		2 CRC checker (DISCOM)		2 CRC checker (DISCOM) for each video channel	
Other functions	**LCD Bus Interface (LCBI)**		18 bit output, max. 10 MHz	-		
	Clock Monitors (CLMA)		For Main oscillator, Low speed internal oscillator, High speed internal oscillator, PLL0, PLL1, Video Input pixel clocks			
	Data CRC (DCRA)		Supported			
	Power-On-Clear (POC)		Supported			
	Intelligent Stepper Motor Driver (ISM), incl. zero point detection for each channel		1 unit, 6 channels		1 unit, 4 channels	1 unit, 6 channels
	Error Correction Coding (ECC)		For Code Flash, Data Flash, Local RAM, Retention RAM, Video RAM, RS-CAN RAM, Caches tag / data RAMs			
	Intelligent Cryptographic Unit (ICU-S2)		Supported			
	On-Chip Debug (OCD)		Supported			
	Boundary Scan		Supported			
Voltage supply	**Internal logic**	**Always-On-Area**	3.3 V, 5 V via on-chip voltage regulator			
		Isolated-Area	3.3 V, 5 V via on-chip voltage regulator		1.25 V	
	I/O buffers	**GPIO**	3.3 V, 5 V			
		SDR-SDRAM	-	3.3 V	-	
		DDR2-SDRAM	-		1.8 V	
	A/D Converter supplies		Nominal 3.3 V, 5 V			
Package			HLQFP24 x 24 (0.5 mm)	BGA 21 x 21 (1.0 mm)	BGA 23 x 23 (1.0 mm)	BGA 27 x 27 (1.0 mm)

RH850/D1L Key Features:

			144-pin R7F701401 R7F701421	144-pin R7F701402 R7F701422	176-pin R7F701403 R7F701423
CPU	**CPU System**		RH850G3M		
	CPU Frequency		120 MHz		
	Memory Protection Unit (MPU)		Supported		
	Floating Point Unit (FPU)		Supported		
	Memory caches	**Instruction cache**	8 KB / 4-way associative		
		Non-CPU system memories	-	16 KB / 4-way associative	
Memory	**Code Flash**		2 MB	4 MB	
	Data Flash		64 KB		
	Local RAM		256 KB	512 KB	
	Retention RAM		16 KB		
	Video RAM with Video RAM wrapper		-	144 KB	
External memory interfaces	**Serial Flash Memory Interface**	**Bus width**	4-bit		8-bit
		Mode	SDR	SDR, DDR	
		Max. clock	40 MHz	SDR : 120 MHz, DDR : 80 MHz	
DMA			16 channels		
Operating clock	**Main Oscillator**		8 to 16 MHz		
	Low Speed Internal Oscillator		Typ. 240 kHz		
	High Speed Internal Oscillator		Typ. 8 MHz		
	Sub Oscillator		Typ. 32.768 kHz		
	Spread-spectrum PLL0		Max. 480 MHz		
	PLL1		Fixed to 480 MHz		
I/O port			103		126
A/D converter			16 channels, 12-bit resolution		
Timer	**16-bit Timer Array Unit B (TAUB)**		3 units (16 channels / unit)		
	32-bit Timer Array Unit J (TAUJ)		1 unit (4 channels / unit)		

Timer	**Timer for Operating System (OSTM)**		2 units (32-bit resolution, 1 channel / unit)		
	32-bit Always-On-Area Timer (AWOT)		1 unit (1 channel / unit)		
	Real Time Clock (RTCA)		Supported		
	Window Watchdog Timer A (WDTA)		2 units		
	PWM Generators with Diagnostic		1 unit (12-bit resolution, 24 PWM generators, 12 with diagnostic capability)		
Communication interface	**Clocked Serial Interface G (CSIG)**		4 channels		
	Queued Clocked Serial Interface H (CSIH)		2 channels		
	CAN Interface (RS-CAN)		3 channels (total 192 message buffers) : Only for R7F701401, R7F701402, R7F701403		
	CAN Interface (RSCANFD)		3 channels (total 192 message buffers) : Only for R7F701421, R7F701422, R7F701423		
	LIN/UART Interface (RLIN3)		4 channels		
	I^2C Interface (RIIC)		2 channels		
External Interrupt	**Maskable**		11		
	Non-maskable (NMI)		1		
Audio	**Sound Generator (SG)**		5 units		
	PCM-PWM Converter (PCMP)		1 unit		
	I^2S Interface (SSIF)		2 units (1 channel / unit)		
Video and Graphics	**Video output**	**Channels**	-	1 channel (480 x 320 pixels, 10 MHz pixel clock, RGB666, 4 layers)	
		Interface	-	LVTTL	
		RLE decoding	-	Supported	
		Sprite layer	-	3 x 16 sprites for 3 output layers	
		Timing Controller (TCON)	-	3 programmable signals	7 programmable signals
Other functions	**LCD Bus Interface (LCBI)**		18-bit output, max. 10 MHz		
	Clock Monitors (CLMA)		For Main oscillator, Low speed internal oscillator, High speed internal oscillator, PLL0, PLL1		

Other functions	**Data CRC (DCRA)**		Supported		
	Power-On-Clear (POC)		Supported		
	Intelligent Stepper Motor Driver (ISM), incl. zero point detection for each channel		1 unit, 6 channels		
	Error Collection Coding (ECC)		For Code Flash, Data Flash, Local RAM, Retention RAM, Video RAM, RS-CAN RAM, Caches tag/data RAMs		
	Intelligent Cryptographic Unit (ICU-S2)		Supported		
	On-Chip Debug (OCD)		Supported		
	Boundary Scan		Supported		
Voltage supply	**Internal logic**	**Always-On-Area**	3.3 V, 5 V via on-chip voltage regulator		
		Isolated-Area	3.3 V, 5 V via on-chip voltage regulator		
	I/O buffers	**GPIO**	3.3 V, 5 V		
	A/D Converter supplies		Nominal 3.3 V, 5 V		
Package			LQFP 20 x 20 (0.5 mm)	LQFP 20 x 20 (0.5 mm)	LQFP 24 x 24 (0.5 mm)

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