

Renesas MPUs & MCUs

V850 MCU Selection Guide



High-Performance

Applications	Device			Memory				Clock		I/O	Bus	Timer						Serial Interface										OCD	Peripheral Functions				Other									
	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	16-bit timer	8-bit timer	Other timers	Watch timer	Watchdog timer	PWM output	UART	UART supporting LIN	UART, CSI	UART supporting LIN, CSI	UART, I ² C	UART supporting LIN, I ² C	UART supporting LIN, CSI, I ² C	CSI	CSI, I ² C	CSI with a bus master/transmission reception function	I ² C	IEBUS	CAN	CAN, IEBus	UART supporting LIN, I ² C, CAN	On-chip debugging	LCD (segments × commons)	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size (mm))	In-circuit emulator Emulation board
All Flash	V850ES	V850ES/HE3	μPD70F3747	128	Flash	√	8	32	8 M, 240 k	√	51	-/-	7	-	-	1	1	16 bits × 8 (6 phases, 16 bits × 1)	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	√	-	-	10	-	POC, LVI, CLM, DMA	3.7 to 5.5	64-LQFP (10 × 10)	E1 QB-V850MINIL (MINICUBE) QB-V850ESFX3 (IECUBE)
		V850ES/HF3	μPD70F3750	256	Flash	√	16	32	8 M, 240 k	√	67	-/-	7	-	-	1	1	16 bits × 8 (6 phases, 16 bits × 1)	-	2	-	-	-	-	2	-	-	1	-	-	-	-	√	-	-	12	-	POC, LVI, CLM, DMA	3.7 to 5.5	80-LQFP (12 × 12)		
		V850ES/HG3	μPD70F3752	256	Flash	√	16	32	8 M, 240 k	√	84	-/-	8	-	-	1	1	16 bits × 11 (6 phases, 16 bits × 1)	-	3	-	-	-	-	2	-	-	1	-	-	-	-	√	-	-	16	-	POC, LVI, CLM, DMA	3.7 to 5.5	100-LQFP (14 × 14)		
		V850ES/HJ3	μPD70F3755	256	Flash	√	16	32	8 M, 240 k	√	128	16/16	9	-	-	1	1	16 bits × 14 (6 phases, 16 bits × 1)	-	3	-	-	-	-	3	-	-	1	-	-	-	-	√	-	-	24	-	POC, LVI, CLM, DMA	3.7 to 5.5	144-LQFP (20 × 20)		
μPD70F3757	512	32	4 ^{bits}	2 ^{bits}			1 ^{bit}												1	-																						

Note Six UART channels are provided in the μPD70F3757.

Remark POC: Power-on clear circuit
LVI: Low-voltage detector
CLM: Clock monitor

Applications	Device			Memory				Clock			I/O		Bus			Timer							Serial Interface											OC		Peripheral Functions				Other								
	CPU core	Commercial name	Product name	ROM size [Kb]	ROM type	Single voltage flash	RAM size [Kb]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32, 768 kHz)	I/O ports	External bus (data/address)	16-bit timer	8-bit timer	Other timers	Watch timer	Watchdog timer	PWM output	UART	UART supporting LIN	UART, CSI	UART supporting LIN, CSI	UART, I ² C	UART supporting LIN, I ² C	UART supporting UN, CSI, I ² C	CSI	CSI, I ² C	CSI with automatic transmission retransmission function	I ² C	IEBus	CAN	CAN, IEBus	UART supporting LIN, I ² C, CAN	On-chip debugging	OC (segments x commons)	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board						
All Flash	V850ES	V850ES/JE3-E	μPD70F3826 *	64	Flash	√	32 ^{note1}	50	220 k	√	26	-/-	11	-	Real-time counter	-	1	16 bits × 6	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	√	-	-	10	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	64-LQFP (10 × 10) 64-WQFN (9 × 9)	E1 QB-V850MINIL (MINICUBE) QB-V850ESJX3E (IECUBE)						
			μPD70F3827 *	128		48 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
			μPD70F3828 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-				
			μPD70F3829 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-				
		V850ES/JF3-E	μPD70F3830 *	64	Flash	√	32 ^{note1}	50	220 k	√	42	-/-	11	-	-	Real-time counter	-	1	16 bits × 7 (6 phases, 16 bits × 1)	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-	-	√	-	-	10	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller		2.85 to 3.6	80-LQFP (12 × 12)				
			μPD70F3831 *	128		48 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-				
			μPD70F3832 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-		
			μPD70F3833 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-		
		V850ES/JG3-E	μPD70F3834 *	64	Flash	√	32 ^{note1}	50	220 k	√	62	-/-	11	-	-	Real-time counter	-	1	16 bits × 8 (6 phases, 16 bits × 1)	-	-	-	1	-	1	2	2	-	-	-	-	-	-	-	-	√	-	-	10	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller		2.85 to 3.6	100-LQFP (14 × 14) 121-FBGA (8 × 8) ^{note3}				
			μPD70F3835 *	128		48 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-		
			μPD70F3836 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-
			μPD70F3837 *	256		64 ^{note1}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	
	V850ES/JH3-E	μPD70F3778	256	Flash	√	76 ^{note1}	50	220 k	√	84	16/22	13	-	-	Real-time counter	-	1	16 bits × 12 (6 phases, 16 bits × 1)	-	-	2	2	-	1	3	1	-	-	-	-	-	-	-	√	-	-	10	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	128-LQFP (14 × 20)							
		μPD70F3779	384		124 ^{note2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
		μPD70F3780	512		124 ^{note2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		μPD70F3781	384		124 ^{note2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		μPD70F3782	512		124 ^{note2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	V850ES/JJ3-E	μPD70F3783	512	Flash	√	76 ^{note1}	50	220 k	√	100	16/24	13	-	-	Real-time counter	-	1	16 bits × 13 (6 phases, 16 bits × 1)	-	-	2	4	-	1	3	1	-	-	1	-	-	-	-	√	-	-	12	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	144-LQFP (20 × 20)							
		μPD70F3784	512	Flash	√	76 ^{note1}	50	220 k	√	100	16/24	13	-	-	Real-time counter	-	1	16 bits × 13 (6 phases, 16 bits × 1)	-	-	2	4	-	1	3	1	-	-	1	-	-	-	-	√	-	-	12	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	144-LQFP (20 × 20)							
		μPD70F3785	512	Flash	√	76 ^{note1}	50	220 k	√	100	16/24	13	-	-	Real-time counter	-	1	16 bits × 13 (6 phases, 16 bits × 1)	-	-	2	4	-	1	3	1	-	-	1	-	-	-	-	√	-	-	12	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	144-LQFP (20 × 20)							
	μPD70F3786	512	Flash	√	76 ^{note1}	50	220 k	√	100	16/24	13	-	-	Real-time counter	-	1	16 bits × 13 (6 phases, 16 bits × 1)	-	-	2	4	-	1	3	1	-	-	1	-	-	-	-	√	-	-	12	-	LVI, CLM, DMA, CRC, USB 2.0 function, Ethernet controller	2.85 to 3.6	144-LQFP (20 × 20)								

- Notes
1. Contains a 16 KB area for data use only.
 2. Contains a 64 KB area for data use only.
 3. μPD70F3837 only.

* Under development

Remark LVI: Low-voltage detector
CLM: Clock monitor

Applications	Device			Memory				Clock			I/O ports	Bus	Timer							Serial Interface						OCD	Peripheral Functions			Other			
	CPU core	Commercial name	Product name	ROM size [Kb]	ROM type	Single voltage flash	RAM size [Kb]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)			External bus (data/address)	32-bit timer	16-bit timer	16-bit encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	IEBus	CAN		On-chip debugging	12-bit A/D converter	10-bit A/D converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board
All Flash	V850EZM	V850E2/MN4	μ PD70F3510	1024	Flash	√	64	200	-	-	188	32/26	4 ch × 1 unit	16 ch × 4 units	2	1	1	6	4	6	4	6	-	-	√	12 ^{bits}	12 ^{bits}	DMA, USB 2.0 host/function, H-bus shared memory: 64 KB; H-bus memory side cache: 16 KB; DMA dedicated to secondary memory controller, inverter timer support, boundary scan	1.1 to 1.3 (internal) 3.0 to 3.6 (external) 3.0 to 3.6 or 4.5 to 5.5 (analog system)	304-FBGA (19 × 19)	QB-V850MINIL (MINICUBE)		
			μ PD70F3512																														
			μ PD70F3514			64 × 2											2	2															
			μ PD70F3515	2048																													
		V850E2/ML4	μ PD70F4021 *	768		64						120		4 ch × 1 unit	16 ch × 2 units		1	1	2	2	2	2	2	-	1	√	12 ^{bits}	12 ^{bits}	DMA, USB 2.0 host/function, H-bus shared memory: 64 KB; Ethernet controller, inverter timer support, boundary scan	1.1 to 1.3 (internal) 3.0 to 3.6 (external) 3.0 to 3.6 or 4.5 to 5.5 (analog system)	216-LQFP (24 × 24)	QB-V850MINIL (MINICUBE)	
			μ PD70F4022 *	1024		64																											

Notes 1. Only when 5 V analog power supply is used.
2. Only when 3.3 V analog power supply is used.

* Under development

Applications		Device		Memory			Clock			I/O	Bus	Timer						Serial Interface										OC	Peripheral Functions				Other													
	CPU core	Commercial name	Product name	ROM size [Kb]	ROM type	Single voltage flash	RAM size [Kb]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	16-bit timer	8-bit timer	Other timers	Watch timer	Watchdog timer	PWM output	UART	UART supporting LIN	UART, CSI	UART supporting LIN, CSI	UART, I ² C	UART supporting LIN, I ² C	UART supporting LIN, CSI, I ² C	CSI	CSI, I ² C	CSI with automatic transmission/reception feature	I ² C	IEBus	CAN	CAN, IEBus	UART supporting LIN, I ² C, CAN	On-chip debugging	OC	LCD [segments x commons]	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board			
Inverter Control	V850E1	V850E/IA3	μPD703183	128	Mask	-	6	64	-	-	50	-/-	8	-	-	-	1	16 bits × 5 (6 phases, 16 bits × 1)	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	12	DMA, ROMC, operational amplifier × 5, comparator	2.3 to 2.7 4.0 to 5.5	80-QFP (14 × 14)	E1 QB-V850EIA4 (IECUBE)				
			μPD70F3184	256	Flash	√	12																																							
		V850E/IA4	μPD703185	128	Mask	-	6	64	-	-	64	-/-	9	-	-	-	-	1	16 bits × 5 (6 phases, 16 bits × 2)	1	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	DMA, ROMC, operational amplifier × 6, comparator	2.3 to 2.7 4.0 to 5.5	100-LQFP (14 × 14) 100-QFP (14 × 20)	E1 QB-V850MINIL (MINICUBE) QB-V850EIA4 (IECUBE)
	μPD703186		256			12																																								
	μPD70F3186			Flash	√																																									
	V850ES	V850ES/IK1	μPD703327	64	Mask	-	4	32	-	-	39	-/-	7	-	-	-	1	16 bits × 6 (6 phases, 16 bits × 1)	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	POC, LVI, ROMC	3.5 to 5.5	64-LQFP (14 × 14)
μPD703329			128			6																																								
μPD70F3329				Flash	√																																									

Remark POC: Power-on clear circuit
LVI: Low-voltage detector
ROMC: ROM correction

Applications	Device			Memory			Clock			I/O	Bus	Timer					Serial Interface					OC ²	Peripheral Functions			Other					
	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	IEBus	CAN	On-chip debugging	12-bit A/D converter	10-bit A/D converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board
Car Electronics Car Multimedia (All Flash)	V850E2M	V850E2/SG4-H	μPD70F4013 *	1024 ^{bits}	Flash	√	96	160	8 M, 240 k	√	58	16/20	4 ch × 1 unit	16 ch × 1 unit	-	1	2	4	-	2	2	4	1	1	√	-	8	DMA, real-time clock, multiplexed SRAM interface (8/16 bits), IISA interface: 4 ch; PCM interface: 1 ch; MLB: 1 ch; POC (available in M1 products, not available in M2 products), CLM, data CRC, LVI, HBUS-RAM: 32 KB; Data flash: 32 KB; backup RAM: 32 KB; instruction cache: 8 KB/2-way associative (4 KB/way)	1.1 to 1.3 (supplied internally) 3.0 to 3.6 (supplied from I/O)	100-LQFP (14 × 14)	E1 QB-V850MINIL (MINICUBE) QB-V850E2 (IECUBE2)
			μPD70F4014 *	1536 ^{bits}			128																								
	V850E2/SJ4-H	V850E2/SJ4-H	μPD70F4015 *	1024 ^{bits}	Flash	√	96	160	8 M, 240 k	√	100	16/24	4 ch × 1 unit	16 ch × 1 unit	-	1	2	5	-	2	3	4	1	2	√	-	16	DMA, real-time clock, SDRAM interface, multiplexed/separate SRAM interface (8/16 bits), IISA interface: 4 ch; PCM interface: 2 ch; MLB: 1 ch; POC (available in M1 products, not available in M2 products), CLM, data CRC, LVI, KR, HBUS-RAM: 32 KB; Data flash: 32 KB; backup RAM: 32 KB; instruction cache: 8 KB/2-way associative (4 KB/way)	1.1 to 1.3 (supplied internally) 3.0 to 3.6 (supplied from I/O)	144-LQFP (20 × 20)	
			μPD70F4016 *	1536 ^{bits}			128																								
	V850E2/SK4-H	V850E2/SK4-H	μPD70F4017	1536 ^{bits}	Flash	√	128	160	8 M, 240 k	√	127	32/24	4 ch × 1 unit	16 ch × 2 units	2	1	2	5	-	2	3	4	1	2	√	-	16	DMA, real-time clock, SDRAM interface, multiplexed/separate SRAM interface (8/16/32 bits), IISA interface: 6 ch; PCM interface: 2 ch; MLB: 1 ch; POC (available in M1 products, not available in M2 products), CLM, data CRC, LVI, KR, HBUS-RAM: 32 KB; Data flash: 32 KB; backup RAM: 32 KB; instruction cache: 8 KB/2-way associative (4 KB/way) Ethernet controller	1.1 to 1.3 (supplied internally) 3.0 to 3.6 (supplied from I/O)	176-LQFP (24 × 24)	
			μPD70F4018	2048 ^{bits}			192																								

Note This is the size of the code flash.

* Under development

Remark POC: Power-on clear circuit
LVI: Low-voltage detector
CLM: Clock monitor

Applications		Device		Memory				Clock			I/O		Bus			Timer						Serial Interface										OCD	Peripheral Functions				Other																				
		CPU core	Commercial name	Product name	ROM size [Kb]	ROM type	Single voltage flash	RAM size [Kb]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subdock (32.768 kHz)	I/O ports	External bus (data/address)	16-bit timer	8-bit timer	Other timers	Watch timer	Watchdog timer	PWM output	UART	UART supporting LIN	UART, CSI	UART supporting LIN, CSI	UART, I ² C	UART supporting LIN, I ² C	UART supporting LIN, CSI, I ² C	CSI	CSI, I ² C	CSI with "subpacket transmission" reception function	I ² C	IEBus	CAN	CAN, IEBus	UART supporting LIN, I ² C, CAN	On-chip debugging	LCD [segments x commons]	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board														
Car Electronics	V850ES	V850ES/SG3	μPD70F3335	256	Flash	√	24	32	220 k	√	84	16/22	8	-	-	1	1	16 bits × 9	-	-	-	1	-	2	-	3	1	-	-	-	-	1	-	√	-	-	-	12	2	LVI, CLM, DMA, ROMC, CRC	2.85 to 3.6	100-LQFP (14 × 14)	E1 QB-V850MINIL (MINICUBE) QB-V850ESSX2 (IECUBE)														
			μPD70F3336	384			32																																																		
			μPD70F3350	512			40																																																		
			μPD70F3351	640			48																																																		
			μPD70F3352	768			60																																																		
			μPD70F3353	1024																																																					
		V850ES/SJ3	μPD70F3354	384	Flash	√	32	32	220 k	√	128	16/24	11	-	-	-	1	1	16 bits × 12	-	1	-	1	-	2	-	4	1	-	-	-	-	1	-	√	-	-	-	16	2	LVI, CLM, DMA, ROMC, CRC	2.85 to 3.6	144-LQFP (20 × 20)														
			μPD70F3355	512			40																																																		
			μPD70F3356	640			48																																																		
			μPD70F3357	768			60																																																		
			μPD70F3358	1024																																																					
			μPD70F3364	384			32																																																		
	V850E1	V850E/SJ3-H	μPD70F3932B	512	Flash	√	60	48	220 k	√	128	16/24	13	-	Real-time counter	1	1	16 bits × 12	2	1	-	1	-	2	-	3	1	-	1	-	-	1	-	√	-	-	-	16	2	LVI, CLM, DMA, ROMC, CRC	2.85 to 3.6	144-LQFP (20 × 20)	E1 QB-V850MINIL (MINICUBE) QB-V850ESX3H (IECUBE)														
			μPD70F3933B	768			76																																																		
			μPD70F3935B	1024																																																					
			μPD70F3936B	1280																																																					
			μPD70F3938B	1536																																																					
			μPD70F3939B	1824																																																					
		V850E/SK3-H	μPD70F3475A	1280			92																																																		
			μPD70F3476A	1536																																																					
			μPD70F3478A	1824																																																					
			μPD70F3479A	2112																																																					
			μPD70F3926A	1024	Flash	√	76	48	220 k	√	156	16/24	13	-	Real-time counter	1	1	16 bits × 12	2	1	-	2	-	2	-	3	1	1	2	1	1	1	-	√	-	-	-	16	2	LVI, CLM, DMA, ROMC, CRC	2.85 to 3.6	176-LQFP (24 × 24)															
			μPD70F3927A	1280			92																																																		

Remark LVI: Low-voltage detector
CLM: Clock monitor
ROMC: ROM correction

Applications		Device		Memory			Clock		I/O	Bus	Timer				Serial Interface					OCD	Peripheral Functions		Other														
	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	IEBus	CAN	On-chip debugging	12-bit A/D converter	10-bit A/D converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board						
Car Electronics	Body Control (All Flash)	V850E2M	V850E2/FG4	μPD70F3548 *	512	Flash	√	48	80	8 M, 240 k	-	66	-	4 ch × 2 units	16 ch × 2 units	1	1	1	5	-	2	1	1	-	2	√	20	-	Data flash: 32 KB Backup RAM: 4 KB/8 KB Instruction cache: 8 KB/2-way associative (4 KB/way) DMA, motor control, POC, voltage comparator, CLM, RNG, data CRC, boundary scan	3.0 to 5.5	100-LQFP (14 × 14)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)					
				μPD70F3549 *	768			64																													
				μPD70F3550 *	1024			80																													
				μPD70F4000 ^{Note *}	512			48																													
				μPD70F4001 ^{Note *}	768			64																													
				μPD70F4002 ^{Note *}	1024			80																													
			V850E2/FJ4	μPD70F3551 *	512	Flash	√	48	80	8 M, 240 k	√	103	-	4 ch × 2 units	16 ch × 6 units	1	1	1	2	6	-	2	2	1	-	3	√	24	-	Data flash: 32 KB/64 KB Backup RAM: 4 KB/8 KB/16 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU (μPD70F3554, 70F4006 only) DMA, motor control, POC, PMC, DLY, voltage comparator, CLM, RNG, data CRC, boundary scan	3.0 to 5.5	144-HLQFP (20 × 20)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)				
				μPD70F3552 *	768			64																													
				μPD70F3553 *	1024			80																													
				μPD70F3554 *	1536			112																													
				μPD70F4003 ^{Note *}	512			48																													
				μPD70F4004 ^{Note *}	768			64																													
		V850E2/FK4	μPD70F3555 *	768	Flash	√	64	80	8 M, 240 k	√	128	16/22	4 ch × 2 units	16 ch × 7 units	1	1	1	2	8	-	2	3	1	-	4	√	40	-	Data flash: 32 KB/64 KB Backup RAM: 8 KB/16 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU (μPD70F3557, 70F3558, 70F4009, 70F4010 only) MEMC, DMA, motor control, PMC, DLY, POC, voltage comparator, CLM, RNG, data CRC, boundary scan	3.0 to 5.5	176-HLQFP (24 × 24)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)					
			μPD70F3556 *	1024			80																														
			μPD70F3557 *	1536			112																														
			μPD70F3558 *	2048			144																														
			μPD70F4007 ^{Note *}	768			64																														
			μPD70F4008 ^{Note *}	1024			80																														
		V850E2/FL4	μPD70F3559 *	1536	Flash	√	112	80	8 M, 240 k	√	158	16/22	4 ch × 2 units	16 ch × 8 units	1	1	1	2	12	-	2	3	1	-	4	√	48	-	Data flash: 64 KB Backup RAM: 16 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU, MEMC, DMA, motor control, PMC, DLY, POC, voltage comparator, CLM, RNG, data CRC, boundary scan	3.0 to 5.5	208-QFP (28 × 28), 256-BGA (21 × 21)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)					
			μPD70F3560 *	2048			144																														
			μPD70F4011 ^{Note *}	1536			112																														
			μPD70F4012 ^{Note *}	2048			144																														

Note Contains a FlexRay controller.

* Under development

Remark POC: Power-on clear circuit; CLM: Clock monitor; FLX: FlexRay controller; MEMC: External memory interface; PMC: PWM diagnostic module; DLY: PWM delay unit; RNG: Random number generator

Applications		Device		Memory			Clock			I/O	Bus	Timer				Serial Interface					OC ^D	Peripheral Functions			Other									
	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	IEBus	CAN	On-chip debugging	12-bit/A/D converter	10-bit/A/D converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board			
Car Electronics	V850E2S	V850E2/FE4-L	μPD70F3570 *	256	Flash	√	24	48	8 M, 240 k	-	45	-	4 ch × 1 unit	16 ch × 1 unit	-	1	2	2	-	2	-	1	-	1	√	-	12	Data flash: 32 KB Backup RAM: 4 KB DMA, POC, CLM, boundary scan	3.0 to 5.5	64-LQFP (10 × 10)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)			
			μPD70F3571 *	384		28																												
			μPD70F3572 *	512		32																												
		V850E2/FF4-L	μPD70F3573 *	256	Flash	√	24	48	8 M, 240 k	-	61	-	-	4 ch × 1 unit	16 ch × 1 unit	-	1	2	2	-	2	-	1	-	1	√	-	14	Data flash: 32 KB Backup RAM: 4 KB DMA, POC, CLM, boundary scan	3.0 to 5.5	80-LQFP (12 × 12)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)		
			μPD70F3574 *	384		28																												
			μPD70F3575 *	512		32																												
		V850E2/FG4-L	μPD70F3576 *	256	Flash	√	24	48	8 M, 240 k	-	76	-	-	4 ch × 1 unit	16 ch × 1 unit	-	1	2	3	-	3	-	1	-	2	√	-	20	Data flash: 32 KB Backup RAM: 4 KB/8 KB DMA, POC, CLM, boundary scan	3.0 to 5.5	100-LQFP (14 × 14)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)		
			μPD70F3577 *	384		28																												
			μPD70F3578 *	512		32																												
			μPD70F3579 *	768		48	64																											
			μPD70F3580 *	1024		64																												
		V850E2/FJ4-L	μPD70F3582 *	384	Flash	√	28	48	8 M, 240 k	-	116	-	-	4 ch × 1 unit	16 ch × 2 units	-	1	2	3	-	3	-	1	-	2	√	-	24	Data flash: 32 KB Backup RAM: 4 KB/8 KB DMA, POC, CLM, boundary scan	3.0 to 5.5	144-LQFP (20 × 20)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)		
			μPD70F3583 *	512		32																												
			μPD70F3584 *	768		48	64																											
			μPD70F3585 *	1024		64																												

Remark POC: Power-on clear circuit
CLM: Clock monitor

* Under development

Applications		Device		Memory			Clock		I/O	Bus	Timer				Serial Interface						OC ¹	Peripheral Functions		Other								
Applications	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subclock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	IEBus	CAN	On-chip debugging	12-bit A/D converter	10-bit A/D converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board	
Car Electronics	Body Control, Advanced Function (All Flash)	V850E2M	V850E2/FK4-H	μPD70F3561 *	2048	Flash	√	144	160	8 M, 240 k	√	131	16/22	4 ch × 2 units	16 ch × 7 units	√	1	2	12	-	2	3	1	-	4	√	40	-	Data flash: 64 KB Backup RAM: 16 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU, MEMC, DMA, DCAN, motor control, ETH, PMC, DLY, POC, voltage comparator, CLM, RNG, data CRC, boundary scan, FLX	3.0 to 5.5	176-HLQFP (24 × 24)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)
			V850E2/FL4-H	μPD70F3564 *	2048	Flash	√	144	160	8 M, 240 k	√	161	16/22	4 ch × 2 units	16 ch × 8 units	√	1	2	12	-	3	3	1	-	5	√	48	-	Data flash: 64 KB Backup RAM: 16 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU, MEMC, DMA, DCAN, motor control, ETH, PMC, DLY, POC, voltage comparator, CLM, RNG, data CRC, boundary scan, FLX	3.0 to 5.5	208-QFP (28 × 28), 272-BGA (21 × 21)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)
	Body Control, Motor Control (All Flash)	V850E2/FF4-M	μPD70F3543 *	μPD70F3543 *	256	Flash	√	32	80	8 M, 240 k	-	49	-	4 ch × 1 unit	16 ch × 2 units	1	1	2	3	-	2	-	1	-	1	√	12	-	Data flash: 32 KB Backup RAM: 4 KB Instruction cache: 8 KB/2-way associative (4 KB/way) FPU, DMA, motor control, POC, voltage comparator, CLM, RNG, data CRC, boundary scan	3.0 to 5.5	80-LQFP (12 × 12)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)
				μPD70F3544 *	384			40																								
μPD70F3545 *				512	48																											
Body Control (All Flash)	V850E2/FK4-G	μPD70F3592 *	1024	Flash	√	128	80	8 M, 240 k	√	136	-	4 ch × 2 units	16 ch × 2 units	-	1	2	5	-	2	1	1	-	6	√	24+12	-	Data flash: 32 KB Backup RAM: 8 KB Instruction cache: 8 KB/2-way associative (4 KB/way) DMA, POC, voltage comparator, CLM, RNG, data CRC, boundary scan, FLX	3.0 to 5.5	176-HLQFP (24 × 24)	E1 QB-V850E2 (IECUBE2) QB-MINI2 (MINICUBE2)		

Remark POC: Power-on clear circuit; CLM: Clock monitor; FLX: FLEXRay controller; MEMC: External memory interface; DCAN: Diagnostic CAN; PMC: PWM diagnostic module; ETH: Ethernet controller; DLY: PWM delay unit; RNG: Random number generator

* Under development

Applications		Device		Memory			Clock		I/O	Bus	Timer			Serial Interface					OCD	Peripheral Functions			Other												
Applications	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subdock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit timer encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	FS	CAN	FlexRay	On-chip debugging	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board		
Car Electronics Instrument Cluster Control	V850E2	V850E2/DJ4	μ PD70F3522	256	Flash	√	24	80	8 M/ 240 k	√	105	-/-	4 ch × 3 units	16 ch × 5 units	-	1	2	2	-	3	-	2	-	3	-	√	16	-	-	Data flash: 32 KB Backup RAM: 16 KB Real-time clock FPU, instruction cache, DMA LCD bus interface, POC, CLM, boundary scan LCD [segments x commons] 69 × 6	2.7 to 5.5	144-LQFP (20 x 20)	E1 QB-V850E2 (IECUBE)		
			μ PD70F3523	512		48																													
			μ PD70F3524	1024		96																													
			μ PD70F3525	2048		192	120																											1	1
			μ PD70F3526	3072		256																													

Remark FPU: Floating-point unit
POC: Power-on clear circuit
LVI: Low-voltage detector

Applications		Device			Memory			Clock			I/O		Bus		Timer					Serial Interface					OCD			Peripheral Functions			Other						
		CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subdock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit timer encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	I ² S	CAN	FlexRay	On-chip debugging	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions			Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board	
Car Electronics	Instrument cluster Control	V850E2	V850E2/DK4-H	μ PD70F3529	2048	Flash	√	96	80	8 M, 240 k	√	127	-	4 ch × 1 unit	16 ch × 3 units	-	1	2	2	-	2	-	2	1	3	-	√	12	-	-	Data flash: 32 KB Backup RAM: 8 KB/16 KB Video RAM: 592 K/8 MB FPU, instruction cache, DMA LCD bus interface, 2D graphics functions, POC, CLM, boundary scan HFSI: 1 ch to 2 ch	2.7 to 5.5	176-HLQFP (24 x 24)	E1 QB-V850E2 (IECUBE)			
			V850E2/DN4-H	μ PD70F3532	3072		256	160	165		32/24	4 ch × 3 units	16 ch × 5 units				4	3											16				1.1 to 1.3 (internal)		352-PBGA (23 x 23)		
			V850E2/DP4-H	μ PD70F3535	3072		256				-																									2.7 to 5.5 and 3.0 to 3.6 (external)	408-PBGA (27 x 27)
				μ PD70F3536																																	
				μ PD70F3537																																	

Remark FPU: Floating-point unit
POC: Power-on clear circuit
LVI: Low-voltage detector

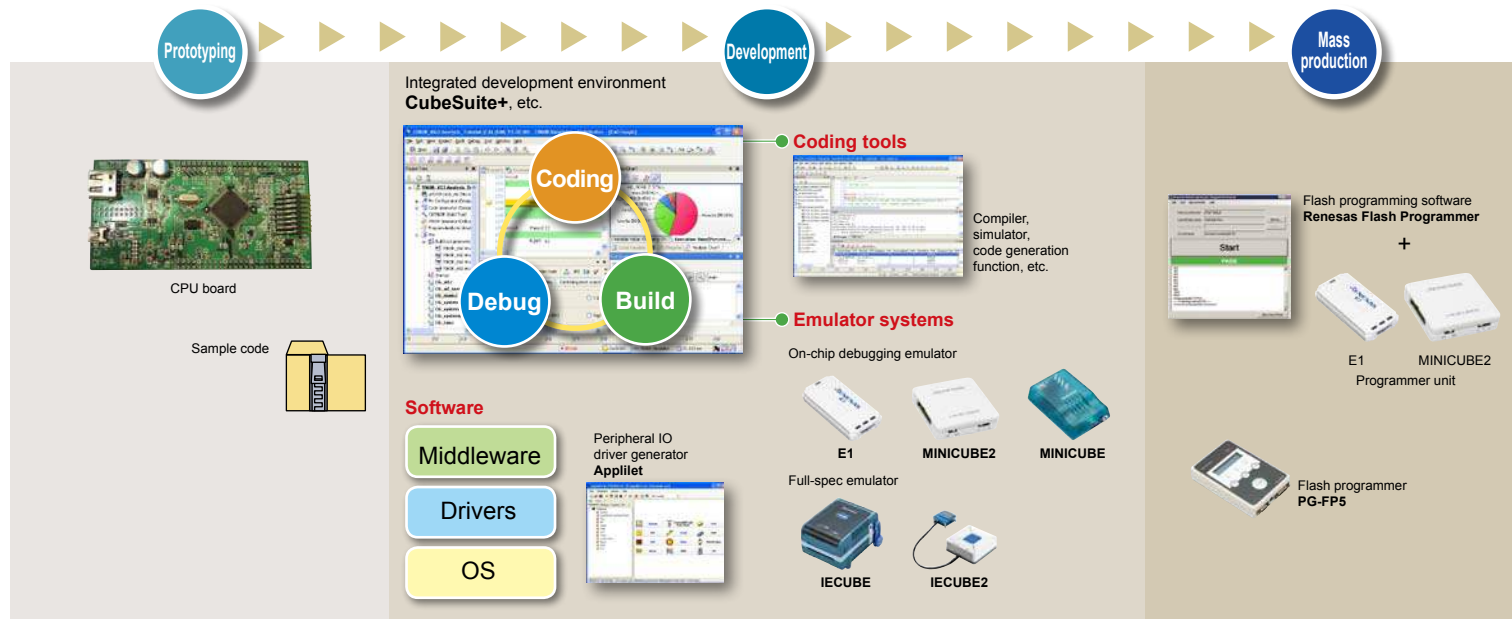
Applications		Device		Memory			Clock		I/O	Bus	Timer				Serial Interface						OCD	Peripheral Functions			Other								
		CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]			Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subdock (32.768 kHz)	External bus (data/address)	24-bit timer	16-bit timer	16-bit timer encoder timer	OS timer	Watchdog timer	UART supporting LIN		UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	FS	CAN	FlexRay	On-chip debugging	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions
Car Electronics	Body Control	V850E1	V850E/PG2	μ PD70F3413	240	Flash	√	12	64	-	-	49	-/-	1 + 5 units	2 units	6 units	-	-	3	-	2	-	-	1	-	-	22	-	-	Tuning RAM: 2 KB DMA, motor control, LVI, NBD	4.0 to 5.5 (external) 1.35 to 1.65 (internal)	100-QFP (14 x 14)	E1 QB-V850E2 (ECUBE) QB-MINI2 (MINICUBE2)
				μ PD70F3414	496		32	2																									

Remark NBD: Non-break debug
LVI: Low-voltage detector

Applications		Device	Memory				Clock		I/O	Bus	Timer				Serial Interface						OCD	Peripheral Functions			Other								
Applications	CPU core	Commercial name	Product name	ROM size [KB]	ROM type	Single voltage flash	RAM size [KB]	Maximum operating frequency [MHz]	On-chip oscillator [Hz]	Subdock (32.768 kHz)	I/O ports	External bus (data/address)	32-bit timer	16-bit timer	16-bit timer encoder timer	OS timer	Watchdog timer	UART supporting LIN	UART supporting FIFO	CSI	CSI supporting FIFO	I ² C	FS	CAN	FlexRay	On-chip debugging	12-bit A/D converter	10-bit A/D converter	8-bit D/A converter	Other functions	Power supply voltage [V]	Package (size [mm])	In-circuit emulator Emulation board
Car Electronics Body Control	V850E2	V850E2/PJ4	μ PD70F3506*	512	Flash	√	40	80	-	-	73	-/-	4 ch × 2 units	16 ch × 2 units	2 units	2	1	3	-	3	2	-	-	2	1	√	22	-	-	Data flash: 32 KB FPU, motor control, data CRC, POF, LVI, CLM, DMA	3.0 to 3.6 (external) 1.1 to 1.3 (internal)	144-HLQFP (20 x 20)	E1 QB-V850MINIL (MINICUBE)
			μ PD70F3507*				80	160																							4.5 to 5.5 (external) 1.1 to 1.3 (internal)		
			μ PD70F3508*	1024	80	160	3.0 to 3.6 (external) 1.1 to 1.3 (internal)																										
			μ PD70F3509*		80	160	4.5 to 5.5 (external) 1.1 to 1.3 (internal)																										
	V850E2/PG4-L	μ PD70F4154*	384	Flash	√	24	80	-	-	46	-/-	4 ch × 1 unit	16 ch × 1 unit	1 unit	2	1	2	-	2	-	-	-	2	-	√	18	-	-	Data flash: 16 KB motor control, data CRC, POF, LVI, CLM, DMA	3.0 to 5.5	100-LQFP (14 x 14)	E1 QB-V850MINIL (MINICUBE)	
																														μ PD70F4155*			3.0 to 5.5

Remark FPU: Floating-point unit
POF: Power-on flag
LVI: Low-voltage detector
CLM: Clock monitor

* Under development



* A free evaluation version is also available for the coding tools and flash programming software (Renesas Flash Programmer).

V850 Development Tool Lineup

MCU	Real-time OS	Software Tools	Emulators		Programming Tools
			On-chip debugging emulator	Full-spec emulator	Programmer ⁵
V850	Ri850V4 ¹ Ri850MP (V850E2M Dual Core)	Integrated Development Environment CubeSuite+ for V850 (includes integrated development environment ² , compiler, simulator, and emulator debugger)	E1 ⁴ MINICUBE2 MINICUBE (JTAG emulator for V850)	IECUBE IECUBE2	PG-FP5 ⁶ E1 ^{4,7} MINICUBE2 ^{7,8}
		Software Package for V850 [SP850] (includes integrated development environment ² , compiler, simulator, and emulator debugger)			

Notes:

- Some MCUs support the RX850V4 real-time OS instead.
- The integrated development environment is CubeSuite+.
- The integrated development environment is the project manager PM+.
- The E20 emulator may be used as well, but the supported debugging functions are equivalent to those of the E1.
- This is a programmer for flash MCUs from Renesas. For details about which programmers can be used with each MCU and the programmer specifications, see the Renesas website (<http://www.renesas.com/programmer>).
- Used together with a programming GUI (provided free of charge).
- Used together with the programming software Renesas Flash Programmer (a free evaluation version is available).
- Used together with the programming software QB-Programmer (provided free of charge).

* CubeSuite+ is not generally promoted to the U.S. and European customers. Customers in the U.S. and Europe who are interested in CubeSuite+ are requested to contact our regional marketing departments for details.

* For details about which emulators can be used with each MCU and emulator specifications, see the Renesas website (http://www.renesas.com/emulation_debugging). The emulator that can be used might differ depending on the MCU part number.

CPU Board

This CPU board is used to evaluate the operation of a V850 MCU by using the on-chip debugging emulator E1 or MINICUBE2 (each sold separately). By using this board, you can evaluate a series of development processes from program development to actual operation.

All MCU pins are assigned to peripheral board connectors, letting you create evaluation circuits using a commercially available universal board.



QB-V850ESJG3L-TB



QB-V850ESJG3U-TB

Target Device		Product Name	Emulator (sold separately)
Core	Group		
V850E2	V850E2/MN4	QB-V850E2MN4DUAL-TB *	E1
	V850E2/ML4	QB-V850E2ML4-TB	E1
V850E	V850E/IF3	QB-V850EIG3-TB *	E1 or MINICUBE2
	V850E/IG3		
V850ES	V850E/1H4-H	QB-V850E1H4H-TB *	E1 or MINICUBE2
	V850ES/1HE2	QB-V850ES1HG2-TB *	E1 or MINICUBE2
	V850ES/1HF2		
	V850ES/1HG2		
	V850ES/1HJ2		
	V850ES/1HE3	QB-V850ES1HG3-TB *	E1 or MINICUBE2
	V850ES/1HF3		
	V850ES/1HG3		
	V850ES/1HJ3		
	V850ES/1IE2	QB-V850ES1IE2-TB *	E1 or MINICUBE2
	V850ES/1JG2	QB-V850ES1JG2-TB *	E1 or MINICUBE2
	V850ES/1JJ2		
	V850ES/1JF3-L	QB-V850ES1JG3L-TB *	E1 or MINICUBE2
	V850ES/1JG3-L		
	V850ES/1JC3-L	QB-V850ES1JG3LUSB-TB *	E1 or MINICUBE2
	V850ES/1JE3-L		
	V850ES/1JF3-L		
	V850ES/1JG3-L		
	V850ES/1JG3-U	QB-V850ES1JG3U-TB *	E1 or MINICUBE2
	V850ES/1JH3-U		
V850ES/1JE3-E	QB-V850ES1JJ3E-TB *	E1 or MINICUBE2	
V850ES/1JF3-E			
V850ES/1JG3-E			
V850ES/1JH3-E			
V850ES/1JJ3-E			
V850ES/1JG3	QB-V850ES1JJ3-TB *	E1 or MINICUBE2	
V850ES/1JJ3			
V850ES/1KE2	QB-V850ES1KG2-TB *	E1 or MINICUBE2	
V850ES/1KF2			
V850ES/1KG2			
V850ES/1KJ2			



QB-F14T16-01

* A 14-/16-pin conversion adapter QB-F14T16-01 (sold separately) is required when connecting an E1 emulator to a CPU board that has a connector for the MINICUBE2 emulator.

Extensive Renesas Development Ecosystem

A wide variety of products for the V850 family, such as compilers and programmers, are available from partner tool vendors. These products enable the V850 family to be used in an even broader range of applications.

■ IDE/Compilers/Code generators

- Accurate Technologies
- CATS CO.,LTD.
- CriticalBlue
- dSPACE GmbH
- Gaio Technology Co., Ltd.
- Green Hills Software
- IAR Systems
- MathWorks
- Red Hat, Inc.
- Ubiquitous Corporation
- Vector Informatik GmbH

■ Co-verification

- Accurate Technologies
- ETAS GmbH
- Gaio Technology Co., Ltd.
- IAR Systems
- Synopsys
- Vector Informatik GmbH
- Yokogawa Digital Computer Corporation

■ OS

- EB (Elektrobit)
- ETAS GmbH
- Green Hills Software
- SEGGER Microcontroller
- Vector Informatik GmbH

■ Middleware/Drivers/Software IP

- Aplix Corporation
- E-Globaledge Corporation
- eSOL Co., Ltd.
- Kyoto Software Research, Inc.
- Mentor Graphics Corporation
- Ubiquitous Corporation
- Vector Informatik GmbH

■ Emulators and related emulation tools

- Accurate Technologies
- Computex Co., Ltd.
- ETAS GmbH
- Green Hills Software
- iSYSTEM AG
- Kyoto Microcomputer Co., Ltd.
- Lauterbach
- Tokyo Eletech Corporation
- Yokogawa Digital Computer Corporation

■ Starter kits/Evaluation boards/Platforms

- Sophia Systems Co., Ltd.
- Vector Informatik GmbH
- Yokogawa Digital Computer Corporation

■ Programmers

- Flash Support Group, Inc.
- Hokuto Denshi Co.,Ltd.
- Tokyo Eletech Corporation
- Vector Informatik GmbH
- WaveTechnology Co., Ltd.
- Yokogawa Digital Computer Corporation



The Alliance Partner Program provides online tools to increase the synergy between our Customers, 3rd Party Partners, and Renesas.

<http://www.renesas.com/partners>

Renesas MPUs & MCUs V850 MCU Selection Guide

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Renesas Electronics Corporation

Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohle-machi, Chiyoda-ku, Tokyo 100-0004, Japan

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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhichunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7888

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852-2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886-2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141