

PRODUCT SCOUT AUTOMOTIVE

2022.04

AUTOMOTIVE MICROCONTROLLERS

EDITION APRIL 2022

Series	Nickname/ Group	Part number	Flash size	RAM [B]	Data flash	Core	FPU	I/O lines	CS/UART/LIN	CAN/CAN-FD	PC	External bus	Other interface	Timer channels [8/16/32-bit]	PWMs	Clock speed [MHz]	Internal oscillator	Subclock [32 kHz]	A/D converter/ D/A converter	Supply voltage (IDD) [V]	Pins	Packages	T _{max} [°C]	Other features		
F Series	RL78/ F12	RSF10968	8 K	0.5 K																						
		RSF1096A	16 K	1 K																						
		RSF1096B	24 K	1.5 K																						
		RSF1096C	32 K	2 K				16	2/3/1			1				4			-	4x 10-bit/-		20	PLSP0020JC-A			
		RSF1096D	48 K	3 K																						
		RSF1096E	64 K	4 K																						
		RSF109AA	16 K	1 K																						
		RSF109AB	24 K	1.5 K																						
		RSF109AC	32 K	2 K				26	4/4/1			4				7			-	8x 10-bit/-		30	PLSP0030JB-B			
		RSF109AD	48 K	3 K																						
		RSF109AE	64 K	4 K																						
		RSF109BA	16 K	1 K																						
		RSF109BB	24 K	1.5 K																						
		RSF109BC	32 K	2 K																						
		RSF109BD	48 K	3 K				28	4/4/1	0/-	4	-			-		7	32	1x 15 kHz 32 MHz	-	8x 10-bit/-	1.8...5.5	32	PWON0032KB-A	85, 125	DMA, LVI, POC
		RSF109BE	64 K	4 K																						
		RSF109GA	16 K	1 K																						
		RSF109GB	24 K	1.5 K																						
		RSF109GC	32 K	2 K				44	6/5/1		6						7			✓	10x 10-bit/-		48	PLOP0048KF-A		
		RSF109GD	48 K	3 K																						
		RSF109GE	64 K	4 K																						
		RSF109LA	16 K	1 K																						
		RSF109LB	24 K	1.5 K				58	7/6/1		7						7			✓	12x 10-bit/-		64	PLOP0064KF-A		
		RSF109LC	32 K	2 K																						
		RSF109LD	48 K	3 K																						
		RSF109LE	64 K	4 K																						
		RL78/ F13-LIN	RSF10A6A	16 K	1 K																					
			RSF10A6C	32 K	2 K																					
			RSF10A6D	48 K	3 K				16	2/2/1		2				-/17/-	9			-	4x 10-bit/-		20	PLSP0020JC-B		
			RSF10A6E	64 K	4 K																					
	RSF10AAA		16 K	1 K																						
	RSF10AAC		32 K	2 K				26	2/2/1		2				-/17/-	9			-	10x 10-bit/-		30	PLSP0030JB-A			
	RSF10AAD		48 K	3 K																						
	RSF10AAE		64 K	4 K																						
	RSF10ABA		16 K	1 K																						
	RSF10ABC		32 K	2 K				28	2/2/1		2				-/17/-	8			-	8x 10-bit/-		32	PVON0032KD-A			
	RSF10ABD		48 K	3 K																						
	RSF10ABE		64 K	4 K																						
	RSF10AGA		16 K	1 K																						
	RSF10AGC		32 K	2 K				44	2/2/1	0/-	2			-	-/17/-	9			✓	12x 10-bit/-	2.7...5.5	48	PVON0048KG-A, PLOP0048KF-A	105, 125, 150	DTC, LVI, MCT, POC	
	RSF10AGD		48 K	3 K																						
	RSF10AGE		64 K	4 K																						
	RSF10AGF		96 K	6 K				4/3/1		5					-/21/-	11				15x 10-bit/-						
	RSF10AGG		128 K	8 K																						
	RSF10ALC		32 K	2 K																						
	RSF10ALD		48 K	3 K				2/2/1		2					-/17/-	9			✓	12x 10-bit/-		64	PLOP0064KF-A			
	RSF10ALE		64 K	4 K																						
	RSF10ALF		96 K	6 K				4/3/1		5					-/21/-	11				19x 10-bit/-						
	RSF10ALG		128 K	8 K																						
	RSF10AME		64 K	4 K																						
	RSF10AMF		96 K	6 K				74	4/3/1		5				-/21/-	11			✓	20x 10-bit/-		80	PLOP0080KE-A			
	RSF10AMG		128 K	8 K																						
	RL78/ F13-CAN		RSF10BAC	32 K	2 K																					
			RSF10BAD	48 K	3 K				26	3/3/1		3														
			RSF10BAE	64 K	4 K																					
			RSF10BAF	96 K	6 K																					
		RSF10BAG	128 K	8 K																						
		RSF10BBC	32 K	2 K																						
		RSF10BBD	48 K	3 K				28	3/3/1		4															
		RSF10BBE	64 K	4 K																						
		RSF10BBF	96 K	6 K																						
		RSF10BBG	128 K	8 K																						
		RSF10BGC	32 K	2 K				44	4/3/1	1/-	5			-	-/21/-	11			✓	15x 10-bit/-	2.7...5.5	48	PVON0048KG-A, PLOP0048KF-A	105, 125, 150	DTC, LVI, MCT, POC	
		RSF10BGD	48 K	3 K																						
		RSF10BGE	64 K	4 K																						
		RSF10BGF	96 K	6 K																						
		RSF10BGG	128 K	8 K																						
		RSF10BLC	32 K	2 K				58	4/3/1		5				-/21/-	11			✓	19x 10-bit/-		64	PLOP0064KF-A			
		RSF10BLD	48 K	3 K																						
		RSF10BLE	64 K	4 K																						
		RSF10BLF	96 K	6 K																						
		RSF10BLG	128 K	8 K																						
		RSF10BME	64 K	4 K																						
		RSF10BMF	96 K	6 K				74	4/3/1		5				-/21/-	12			✓	20x 10-bit/-		80	PLOP0080KE-A			
		RSF10BMG	128 K	8 K																						
		RL78/ F14	RSF10BMD	48 K	4 K				26	3/3/1		3				-/21/-	11			-	12x 10-bit/ 1x 8-bit		30	PLSP0030JB-A		
			RS																							

IAR Embedded Workbench (RL78 & RH850)

- Integrated development environment for C/C++
- Package includes project manager, editor, compiler, assembler, linker, simulator and C-Spy debugger
- Supports ELF/DWARF debugging format
- Different license options: locked to PC, dongled (USB), floating
- Order code depends on target platform and license type
- For more information visit www.iar.com



Green Hills Multi (RH850)

- Integrated development environment for C/C++
- Package includes project manager, editor, compiler, assembler, linker, simulator and debugger
- Supports ELF/DWARF debugging format
- Different license options: locked to PC, dongled (USB), floating
- Order code depends on target platform and license type
- For more information visit www.ghs.com



AP4, AppliNet3, SmartConfigurator (RL78 & RH850)

- Peripheral driver code generator for RL78 & RH850 devices
- Based on graphical user interface settings the peripheral driver initialization and API function code will be generated
- Available for free at <http://www.renesas.com/ap4>
- SmartConfigurator: <https://www.renesas.com/software-tool/smart-configurator>



Wind River Diab Compiler (RH850)

- Integrated development environment for C
- Package includes project manager, editor, compiler, assembler, linker and simulator
- Supports ELF/DWARF debugging format
- Different license options: locked to PC, dongled (USB), floating
- For more information visit www.windriver.com



Renesas CS+ (RL78 & RH850)

- Integrated development environment for C Package includes project manager, editor, compiler, assembler, linker simulator and debugger
- Supports ELF/DWARF debugging format
- Different license Options: node locked, floating
- Different License Types: permanent
- For more information visit www.renesas.com/cs+



Renesas e² studio (RL78 & RH850)

- Integrated development environment based on Eclipse platform
- Support IAR compiler, GHS RH850 compiler and Renesas CC-RL compiler
- Supports ELF/DWARF debugging format
- For more information visit www.renesas.com/e2studio



Renesas Graphic Library (RGL)

- For RH850/D1x
- Driver stack for all graphic related macros
- Simple interface for graphics programming
- Production quality code
- Easy to integrate into no-OS and RTOS environment
- Example programs for the best possible out of the box experience
- Contact you Renesas Sales representative for more information



Autosar MCAL

- Standard Peripheral Abstraction Layer (SPAL) drivers, communication drivers and test drivers
- For AUTOSAR AR4X based MCAL for RH850
- Worldwide support infrastructure with interface for 1st and 2nd level support in Europe
- Cooperation with various BSW/OS vendors and integrators
- Flexible mass-production licenses
- Free-of-charge development licenses for up to 500 prototypes



Renesas is working closely with multiple partners in order to extend the software offer and support customer requirements. From OS vendors to system integration.

A complete list of SW solutions, and its contact can be found under:
<https://www.renesas.com/en/en/products/microcontrollers-microprocessors/rh850-automotive-mcus/software-tools>

E2 On-Chip Debugging Emulator (RL78 & RH850)

- On-Chip Debugging Emulator for all RL78 and RH850 devices
- Supports fast in-circuit flash programming (Download speed 2 times faster than E1)
- Supports various target interfaces
 - LPD (Low Pin Debug) for RH850
 - Single-pin for RL78
 - 3.3V ... 5V (max. 200mA)
- Supports hot plug-in function (including connector)
- Package includes USB interface cable and 14-pin target cable
- Order code: RTE0T0002KCE0000R



E2 Lite On-Chip Debugging Emulator

- E2 Lite On-Chip Debugging Emulator (RL78 only)
- On-Chip Debugging Emulator for all RL78 devices
- Supports single-pin target interface for RL78
- Support 3.3V (max. 200mA) power supply to target
- Package includes USB interface cable and 14-pin target cable
- Order code: RTE0T0002KCE0000R



IECUBE In-Circuit Emulator (RL78)

- For RL78 devices
- Package includes
 - IAR Embedded Workbench (size limited)
 - USB cable, power supply
- Order codes:
 - Y-QB-RL78F12-ZZZ-EE (RL78/F12)
 - Y-QB-RL78F14-ZZZ-EE (RL78/F13 & RL78/F14)
 - Y-QB-RL78F15-ZZZ-EE (RL78/F15)
 - Y-QB-RL78D1A-ZZZ-EE (RL78/D1A)
 - Y-QB-RL78D1A2-ZZZ-EE (RL78/D1A, 512 KB version)



Please visit <https://www.renesas.com/en/en/software-tool/iecube-r178-family> for socket references and additional tool information.

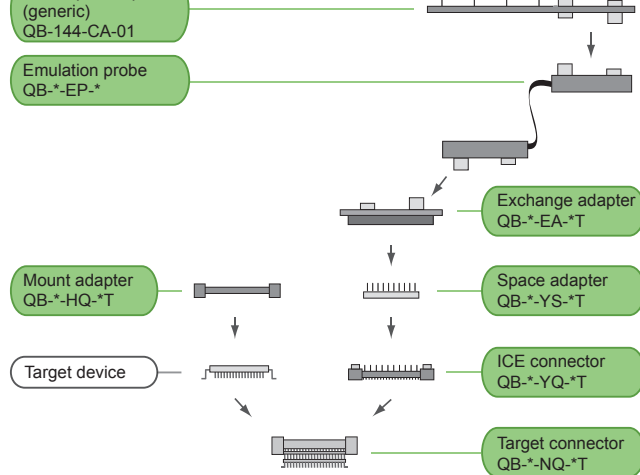
IE850 In-Circuit Emulator (RH850)

- For RH850/D1x devices
- Universal main unit, device dependent emulation probe
- Package includes
 - USB cable, power supply
- Order codes:
 - Y-QB-V850E2-EE (main unit)
 - RTE7701460EPA0000R (Emulation Probe for RH850/D1M2H, RH850/D1M2, RH850/D1M1A, RH850/D1M1-V2, RH850/D1L2H, RH850/D1L2, RH850/D1L1 and RH850/D1S1)



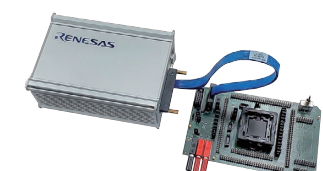
Please visit <https://www.renesas.com/en/en/software-tool/ie850> for socket references and additional tool information.

Socket System (RL78)



IE850A Emulator featuring AURORA Trace (RH850/E2M and RH850/U2A16)

- For RH850/E2M and RH850/U2A16 devices
- The IE850A emulator features 9 GB of memory for storing histories of program execution, enabling the saving and checking of histories of program execution over longer periods, and is equipped with a rich variety of debugging functions, such as events, tracing, and time measurement.
- Order codes:
 - Y-RTE0T0850AKCT00000J-EU (IE850A Emulator main unit)
 - Y-RH850-E2X-40NM-EMU-ADAPTER-REVZ (Emulation Adapter for RH850/E2M)
 - RTE7702200EAB0000J (Emulation Adapter for RH850/U2A16)



Please visit <http://www.renesas.com/en/en/products/software-tools/emulator/ie850a.html> for additional tool information.

iSYSTEM

- Universal emulator and debugger system:
 - On-chip debugging for RL78 and RH850
 - In-Circuit Emulation of RL78
 - On-Chip and Off-Chip Trace (Parallel and AURORA) for RH850
 - Support for common compiler platforms
 - Software API for 3rd party tools and test automation
- For more information visit www.isystem.com



Lauterbach

- Universal debugger system TRACE32™
 - On-chip debugging for RL78 and RH850
 - On-Chip and Off-Chip Trace (Parallel and AURORA) for RH850
 - Support for common compiler platforms
 - Software API for 3rd party tools and test automation
- For more information visit www.lauterbach.com



PLS

- Universal Debug Engine for debugging, trace and testing:
 - UAD2pro, UADnext, UAD3+ support for RH850
 - Support for common compiler platforms
 - Software API for 3rd party tools and test automation
- For more information visit www.pls-mc.com



Flash Programmer PG-FP6

- Supports RL78 and RH850 flash microcontrollers
- For development, prototyping and mass production
- Windows™ and terminal interface
- Host-controlled and stand-alone operation
- 256 MB internal memory for up to 8 program codes incl. setup data
- USB2.0 and RS-232 interface
- Order code: RTE0T0001FWREA000R



Renesas Flash Programming Software (RFP) for Microsoft Windows™

- Supports RL78 and RH850 flash microcontrollers
- For development and prototyping
- Works with
 - E2 On-Chip Debugging emulator and E2 Lite On-Chip Debugging emulator and direct RS-232/UART connection
- Graphical user interface
- Ability to save programming settings in workspace files
- Support for automated programming using scripts
- Available for free at <http://www.renesas.com/rfp>



E2 Lite On-Chip Debugging Emulator (RL78 only)



E2 On-Chip Debugging Emulator (RL78 & RH850)



RL78/F12 Starter Kit

- Equipped with
 - 48-pin RL78/F12 device (RSF109GE)
 - LIN interface
 - One switch, two LEDs
 - Breadboard area (2.54 mm pin pitch)
 - 20 MHz main clock resonator
 - 14-pin debugging and programming interface
- Package includes
 - KickStart Edition of IAR EWRL78 (16 KB)
 - E2-Lite On-Chip Debugging Emulator
 - Quick-start guide, user's manual and sample software
- Renesas CS+ evaluation license (60 days)
- Order code: Y-ASK-RL78F12-V2



RL78/F13 Starter Kit

- Equipped with
 - 80-pin device (RSF108MG)
 - CAN & LIN interface
 - One switch, two LEDs
 - Breadboard area (2.54 mm pin pitch)
 - 4 MHz main clock resonator
 - 14-pin debugging and programming interface
- Package includes
 - KickStart Edition of IAR EWRL78 (16 KB)
 - E2-Lite On-Chip Debugging Emulator
 - Quick-start guide, user's manual and sample software
- Renesas CS+ evaluation license (60 days)
- Order code: Y-ASK-RL78F13-V2



RL78/F14 Starter Kit

- Equipped with
 - 100-pin device (RSF10PPJ)
 - CAN & LIN interface
 - One switch, two LEDs
 - Breadboard area (2.54 mm pin pitch)
 - 4 MHz main clock resonator
 - 14-pin debugging and programming interface
- Package includes
 - KickStart Edition of IAR EWRL78 (16 KB)
 - E2-Lite On-Chip Debugging Emulator
 - Quick-start guide, user's manual and sample software
- Renesas CS+ evaluation license (60 days)
- Order code: Y-ASK-RL78F14-V2



RL78/F14 BLDC Starter Kit

- Equipped with
 - 80-pin device (RSF10PMJ)
 - LIN interface
 - One switch
 - 8 MHz main clock resonator
 - 14-pin debugging and programming interface
- Package includes
 - KickStart Edition of IAR EWRL78 (16 KB)
 - E1 On-Chip Debugging Emulator, BLDC motor
 - Quick-start guide, user's manual and sample software
- Order code: Y-BLDC-SK-RL78F14



RL78/F15 Starter Kit

- Equipped with
 - 144-pin RL78/F15 (RSF113TL) device
 - 14-pin debug and flash programming interface
 - CAN + LIN interface
 - 4 MHz main clock resonator
 - One switch, two LEDs
 - Universal breadboard area (2.54 mm pin pitch)
- Package includes
 - Target board: Y-QB-RS5113TL7B-V2
 - E2-Lite On-Chip Debugging Emulator
 - IAR EWRL78 KickStart Edition
 - Quick-Start Guide
- Renesas CS+ evaluation license (60 days)
- Order code: Y-ASK-RL78F15-V2



RH850/F1KM-S1 Starter Kit

- Equipped with
 - 100-pin RH850/F1KM-S1 device (R7F701684)
 - 2 CAN-FD, LIN, UART/RS232 interface
 - rotary switch with LEDs and push button
 - potentiometer for analogue measurements
 - pin headers for direct access to all microcontroller I/O pins
- 14-pin debugging and programming interface
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
- Order code: Y-ASK-RH850F1KM-S1-V3



RH850/F1K Starter Kit

- Equipped with
 - 176-pin RH850/F1K PREMIUM device (R7F701587)
 - 2 CAN-FD, LIN, UART/RS232 interface
 - rotary switch with LEDs and push button
 - potentiometer for analogue measurements
 - pin headers for direct access to all microcontroller I/O pins
- 14-pin debugging and programming interface
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
- Order code: Y-ASK-RH850F1K-V3



RH850/F1KM-S4 Starter Kit

- Equipped with
 - 176-pin RH850/F1KM-S4 device (R7F701649)
 - 2 CAN-FD, LIN, UART/RS232 interface
 - Ethernet, FlexRay, 2 CAN-FD, LIN, UART/RS232 interface
 - rotary switch with LEDs and push button
 - potentiometer for analogue measurements
 - pin headers for direct access to all microcontroller I/O pins
- 14-pin debugging and programming interface
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
- Order code: Y-ASK-RH850F1KM-S4-V3



RH850/F1KH-D8 Starter Kit

- Equipped with
 - 176-pin RH850/F1KH-D8 device (R7F701609)
 - Ethernet, FlexRay, 2 CAN-FD, LIN, UART/RS232 interface
 - rotary switch with LEDs and push button
 - potentiometer for analogue measurements
 - pin headers for direct access to all microcontroller I/O pins
- 14-pin debugging and programming interface
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
- Order code: Y-ASK-RH850F1KH-D8-V3



RH850/F1KM-S1 BLDC Starter Kit

- Equipped with
 - 100-pin RH850/F1KM-S1 device (R7F701684)
 - 2 CAN-FD, LIN, UART/RS232 interface
 - rotary switch with LEDs and push button
 - potentiometer for analogue measurements
 - pin headers for direct access to all microcontroller I/O pins
- 14-pin debugging and programming interface
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
 - IPS Sensor
- Order code: Y-ASK-RH850F1KM-S1-V2



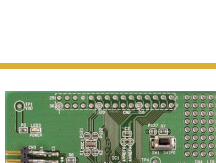
RH850/C1M-A2 Starter Kit

- Equipped with
 - 176-pin RH850/C1M-A2 device
 - 2 CAN-FD, 1 LIN/SENT, 1 USB/UART interface
 - rotary switch with LEDs and push button
 - Inputs for resolver signals for motor control
- Motor control Features
 - Access to R/D (resolver-to-digital converter)
 - Output for motor control signals
 - Inputs for resolver signals for motor control
- Package includes
 - GHS MULTI evaluation license (90 days)
 - IAR EWRH850 Kickstart license (128KB or 30 days)
 - Renesas CS+ evaluation license (60 days)
 - E1 On-Chip debugging Emulator
 - sample code software
- Order Code: Y-ASK-RH850C1M-A2



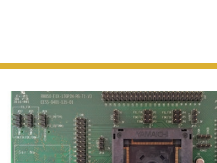
RL78/F1x Target Boards

- For RL78/F1x evaluation
- Equipped with
 - RL78/F12, RL78/F13, RL78/F14 or RL78/F15
 - 14-pin debugging and programming interface
 - CAN & LIN interface
 - 4 or 20 MHz main clock resonator
 - switch, 2 LEDs
 - breadboard area (2.54 mm pin pitch)
- Board dimensions: approx. 110 mm x 55 mm
- Order codes:
 - QB-RS5109GE-TB (RL78/F12)
 - QB-RS5108MG-TB (RL78/F13)
 - QB-RS5109PJ-TB (RL78/F14)
 - Y-QB-RS5113TL7B-V2 (RL78/F15)



RH850 Evaluation Platform – F1Kx Adapter Boards

- For RH850/F1K and F1Kx evaluation
- To be used in combination with the RH850 Evaluation Platform main boards or stand-alone operation
- Equipped with
 - Burn-in socket to adapt RH850/F1Kx devices
 - pin headers for direct access to all microcontroller I/O pins
 - 8 Signal LEDs
 - Reset circuit, Oscillator circuit
- 14-pin debug and flash programming connector
- Board dimensions: 160 mm x 100 mm
- Package includes CD with user's manual and schematic
- Order codes:
 - Y-RH850-F1X-048PIN-PB-T1-V1 (RH850/F1KM-S1, 48 pin)
 - Y-RH850-F1X-064PIN-PB-T1-V1 (RH850/F1KM-S1, 64-pin)
 - Y-RH850-F1X-080PIN-PB-T1-V1 (RH850/F1KM-S1, 80-pin)
 - Y-RH850-F1X-100PIN-PB-T1-V3 (RH850/F1K, F1KM-S1/S4, 100-pin)
 - Y-RH850-F1X-144PIN-PB-T1-V3 (RH850/F1K, F1KM-S4, 144-pin)
 - Y-RH850-F1X-176PIN-PB-T1-V4 (RH850/F1K, F1KM-S4, F1KH-D8 176-pin)
 - Y-RH850-F1X-233PIN-PB-T2-V1 (RH850/F1KM-S4, F1KH-D8, 233-pin)
 - Y-RH850-F1X-324PIN-PB-T1-V1 (RH850/F1KH-D8, 324-pin)



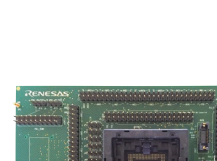
RH850 Evaluation Platform – P1M-E, P1x-C Adapter Boards

- For RH850/P1M-E and P1x-C evaluation
- To be used in combination with the RH850 Evaluation Platform main boards or stand-alone operation
- Equipped with
 - Burn-in socket to adapt RH850/P1M-E, P1x-C devices
 - pin headers for direct access to all microcontroller I/O pins
 - 8 Signal LEDs
 - Reset circuit, Oscillator circuit
- 14-pin debug and flash programming connector
- Board dimensions: 160 mm x 100 mm
- Package includes CD with user's manual and schematic
- Order codes:
 - Y-RH850-P1X-100PIN-PB-T1-V2 (RH850/P1M-E, 100-pin, 0.5 mm p. p.)
 - Y-RH850-P1X-144PIN-PB-T1-V2 (RH850/P1M-E, 144-pin, 0.4 mm p. p.)
 - Y-RH850-P1XC-080PIN-PB-T1-V1 (RH850/P1x-C, 80-pin, 0.4 mm p. p.)
 - Y-RH850-P1XC-100PIN-PB-T1-V1 (RH850/P1x-C, 100-pin, 0.4 mm p. p.)
 - Y-RH850-P1XC-144PIN-PB-T1-V1 (RH850/P1x-C, 144-pin, 0.4 mm p. p.)
 - Y-RH850-P1XC-156PIN-PB-T1-V1 (RH850/P1x-C, 156-pin)
 - Y-RH850-P1XC-292PIN-PB-T1-V2 (RH850/P1x-C, 292-pin)
 - Y-RH850-P1XC-404PIN-PB-T1-V2 (RH850/P1x-C Emulation Device supporting AURORA Trace)



RH850 Evaluation Platform - E2M Adapter Boards

- For RH850/E2M evaluation
- To be used in combination with the RH850 Evaluation Platform or stand-alone operation
- Equipped with
 - Burn-in socket to adapt RH850/E2M devices
 - pin headers for direct access to all microcontroller I/O pins
 - 8 Signal LEDs
 - Reset circuit, Oscillator circuit
- 14-pin debug and flash programming connector
- Board dimensions: 160 mm x 100 mm
- Package includes CD with user's manual and schematic
- Order codes:
 - Y-RH850-E2X-292PIN-PB-T1-V2 (RH850/E2x, 292-pin)
 - Y-RH850-E2X-373PIN-PB-T1-V1 (RH850/E2x, 373-pin)
 - Y-RH850-E2X-468PIN-PB-T1-V1 (RH850/E2x, 468-pin)



Series	Nickname/ Group	Part number	Core	FPU	Clock Speed [MHz]	GPU	GPU Clock Speed [MHz]	DDR-Interface	Flash Interface	Video Output	Video Input	External bus	High Speed Interface	CAN/CAN FD	Ethernet 100 MBit/1 GBit	USB	MLB	SPI	UART	I ² C	Pins	Packages	T _J max [°C]	Other features
R-Car Gen3e	R-Car H3e	R8A779M0	4x Cortex A57 4x Cortex A53 Cortex R7	✓	1700 1200 800	PowerVR - GX6650 D/AVE-HD	600	4x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS 2x HDMI	2x Digital 3x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 4x 2.0	3-pin MOST50	4	11	7	1384	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car H3e-2G	R8A779M1	4x Cortex A57 4x Cortex A53 Cortex R7	✓	2000 1200 800	PowerVR - GX6650 D/AVE-HD	600	4x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS 2x HDMI	2x Digital 3x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 4x 2.0	3-pin MOST50	4	11	7	1384	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car H3Ne	R8A779M8	4x Cortex A57 4x Cortex A53 Cortex R7	✓	1500 1200 800	PowerVR - GX6650 D/AVE-HD	600 266	2x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS HDMI	2x Digital 2x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	7	1022	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car H3e-2G	R8A779M1	4x Cortex A57 4x Cortex A53 Cortex R7	✓	2000 1200 800	PowerVR - GX6650 D/AVE-HD	600	4x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS 2x HDMI	2x Digital 3x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 4x 2.0	3-pin MOST50	4	11	7	1384	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car M3e	R8A779M2	2x Cortex A57 4x Cortex A53 Cortex R7	✓	1800 1300 800	PowerVR - GX6250 D/AVE-HD	700 266	2x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS HDMI	2x Digital 2x MIPI- CSI2	✓	2x PCIe	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	7	1022	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car M3e-2G	R8A779M3	4x Cortex A57 4x Cortex A53 Cortex R7	✓	2000 1300 800	PowerVR - GX6250 D/AVE-HD	700 266	2x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS HDMI	2x Digital 2x MIPI- CSI2	✓	2x PCIe	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	7	1022	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car M3Ne	R8A779M4	2x Cortex A57 Cortex R7	✓	1800 800	PowerVR - GE7800 D/AVE-HD	700 400	1x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS HDMI	2x Digital 2x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	7	1022	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car M3Ne-2G	R8A779M5	2x Cortex A57 Cortex R7	✓	2000 800	PowerVR - GE7800 D/AVE-HD	700 400	1x 32-bit LPDDR4-3200	Parallel Serial Flash Raw NAND 2x eMMC 4x SDIO	Digital Out LVDS HDMI	2x Digital 2x MIPI- CSI2	✓	2x PCIe SATA	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	7	1022	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car E3e	R8A779M6	2x Cortex A53 Cortex R7	✓	1200 800	PowerVR - GE8300 D/AVE-HD	600 400	2x 16-bit DDR3(L)-1866	Parallel Serial Flash Raw NAND 1x eMMC 3x SDIO	Dig. Out / LVDS LVDS	2x Digital MIPI-CSI2	✓	PCIe	2/2	-/1	3.0 2x 2.0	3-pin MOST50	4	11	8	552	BGA	125	Audio DSP, Security, Safety, Video HW codec, Image Processor, Timers, WDT, PWMs
	R-Car D3e	R8A779M7	1x Cortex A53	✓	1000	PowerVR - GE8300 D/AVE-HD	600 400	1x 16-bit DDR3(L)-1866	Raw NAND Serial Flash 1x eMMC	Dig. Out / LVDS LVDS	1x Digital	–	–	2/2	-/1	2.0	3-pin MOST50	4	8	4	401	BGA	125	Security, Safety, Image Processor, Timers, WDT, PWMs

Series	Nickname/ Group	Part number	CPU system	Clock Speed [MHz]	SRAM [MB]	Memory I/F	High Speed Interface	CAN FD	Ethernet 100 Mbit/2.5 Gbit	FlexRay	LIN	UART	I ² C	ASIL level	Package	Other features
R-Car Gen4	R-Car S4-8	R8A779FxAx0BG (part name depends on application core lock-step configuration)	8x Cortex A55 1x Cortex R52 2x RH850 G4MH	1200 1000 400	8	LPDDR4x-3200 (ECC corrected) 32bit (=> 12.8 GB/s) 2x QSPI 1x Hyperflash Serial NOR Flash I/F (OCTAL FLASH) eMMC 5.01	2x PCIe V4.0 (2 lanes)	16	1 AVB/3x Gbit TSN + swit	1	16	4	7	D	FCBGA 780 0.8mm pitch	HSM, crypto core Communication IP H/W acceleration Enhanced power management features LV PMIC RAA271005 HV PMIC RAA271041 Timing IC RC21212 JTAG debug I/F
	R-Car S4N-8	R8A779FxAx0BG (part name depends on application core lock-step configuration)	8x Cortex A55 1x Cortex R52 2x RH850 G4MH	1200 1000 400	8	LPDDR4x-3200 (ECC corrected) 32bit (=> 12.8 GB/s) 2x QSPI 1x Hyperflash Serial NOR Flash I/F (OCTAL FLASH) eMMC 5.01	2x PCIe V4.0 (2 lanes)	16	1 AVB/3x Gbit TSN + swit	-	16	4	5	D	FCBGA 780 0.65mm pitch	HSM, crypto core Communication IP H/W acceleration Enhanced power management features LV PMIC RAA271006 HV PMIC RAA271041 Timing IC RC21212 JTAG debug I/F
	R-Car S4-4	R8A779FxAx0BG (part name depends on application core lock-step configuration)	4x Cortex A55 1x Cortex R52 2x RH850 G4MH	1200 1000 400	8	LPDDR4x-3200 (ECC corrected) 32bit (=> 12.8 GB/s) 2x QSPI 1x Hyperflash Serial NOR Flash I/F (OCTAL FLASH) eMMC 5.01	2x PCIe V4.0 (2 lanes)	16	1 AVB/3x Gbit TSN + swit	-	16	4	5	D	FCBGA 780 0.8mm pitch	HSM, crypto core Communication IP H/W acceleration Enhanced power management features LV PMIC RAA271005 HV PMIC RAA271041 Timing IC RC21212 JTAG debug I/F
	R-Car S4N-4	R8A779FxAx0BG (part name depends on application core lock-step configuration)	4x Cortex A55 1x Cortex R52 2x RH850 G4MH	1200 1000 400	8	LPDDR4x-3200 (ECC corrected) 32bit (=> 12.8 GB/s) 2x QSPI 1x Hyperflash Serial NOR Flash I/F (OCTAL FLASH) eMMC 5.01	2x PCIe V4.0 (2 lanes)	16	1 AVB/3x Gbit TSN + swit	-	16	4	5	D	FCBGA 780 0.65mm pitch	HSM, crypto core Communication IP H/W acceleration Enhanced power management features LV PMIC RAA271006 HV PMIC RAA271041 Timing IC RC21212 JTAG debug I/F

Series	Nickname	Part number	Real Time Core Freq / KDMIPS	Application Core	GPU / Frequency	Computer Vision / Frequency	Deep Learning (TOPS)	Other Accel.	Video Codec	Audio Codec	DDR Interface	Flash Interface	Video Input	Video Output	High Speed Interface	Auto I/F	Ethernet 100MBit/1GBit	ASIL	Pins / Package	Other Features
R-Car V3x	R-Car V3M	R8A77970	CR7 Lockstep 800MHz/2kDMIPS	2x CA53 800MHz/ 3.6k DMIPS	No	2CvE / 400MHz	0.3 TOPs	1x ISP, 4x IMR	H264 Enc	No	32bit DDR3L-1600	2x QSPI	1x MIPI-CSI2 (4L) 2x Digital Vin TTL	1x DU 1x LVDS (OpenLDI) 1x Digital Vout TTL	No	2x CAN 2.0B/FD, FlexRay	1x Gbit AVB	Up to ASIL B	FCBGA 0.8mm 419 balls	4x UART 4x SPI 5x I ² C Security JTAG
	R-Car V3H	R8A77980A	CR7 Lockstep 800MHz/2k DMIPS	4x CA53 1GHz/9,2k DMIPS	No	5CvE / 533MHz	3.7 TOPs	2x ISP, 5x IMR, 1x DOF, 1x STF, 5x ACF	H264 Enc	No	32bit LPDDR4-3200	2x QSPI 1x eMMC	2x MIPI-CSI2 (4L) 2x Digital Vin TTL	1x DU 1x LVDS (OpenLDI) 1x Digital Vout TTL	1x PCIe 2.0	3x CAN 2.0B/FD, FlexRay	1x Gbit AVB 1x Gbit Std port	Up to ASIL C	FCBGA 0.8mm 538 balls	4x UART 6x SPI 7x I ² C Security JTAG

Series	Nickname	Part number	Real Time Core Freq / KDMIPS	Application Core	GPU / Frequency	Computer Vision / Frequency	Deep Learning (TOPS)	Other Accel.	Video Codec	Audio Codec	DDR Interface	Flash Interface	Video Input	Video Output	High Speed Interface	Auto I/F	Ethernet 100MBit/1GBit	ASIL	Pins / Package	Other Features
R-Car V4x	R-Car V4H	R8A779G0	CR52 Lockstep 1,4GHz/3k DMIPS	4x CA76 1,8GHz / 24,5k DMIPS	AXM- 8256 600MHz	4x CvE / 640MHz 4x SP500 DSP / 800MHz 1x DOF / 640MHz 1x SMD / 320MHz	1x CNN IP 22TOPs	2x ISP, 5x IMR, 1x SMD, 1x DOF, 4x DSP	H.264 Enc./ H.264 Codec	No	64-bit LPDDR5-6400	2x QSPI 1x eMMC	2x MIPI-CSI2	2x DU 2x MIPI CSI2/ DSI-output	2x PCIe 4.0	8x CAN 2.0/FD, Flexray	3GBit AVB, 1Gbit TSN	Up to ASIL-D	FCBGA 0.65mm/ 1135 Pins	4x UART 6x SPI 7x I ² C Security JTAG

Other features:	CvE DOF	Computer Vision Engine Dense Optical Flow	DU IMR	Display Unit Image Rectifier	ISP SMD	Image Signal Processor Simple Instruction Multiple Data	STV WDT	Stereo Vision Window Watchdog Timer
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R-Car e² Studio

- e² Studio is a complete, state of the art development environment supporting Renesas R-Car V series based on an Open Source Eclipse CDT
- Complete environment available to download, included in the R-Car SDK package.
- Supports R-Car V3x, R-Car V4H and the corresponding Evaluation boards and starter kits running embedded linux.
- Includes:
 - » HSSTP high speed Trace for ARM cores
 - » ADAS plug-ins: "Debug Trace Agent" for computer vision hardware accelerators, Bus Traffic Monitoring, image Viewer, Pin configurator.
 - » Support the Computer Vision simulators
- For more information refer to: <https://www.renesas.com/software-tool/e-studio-r-car>



R-Car CNN toolchain

- Network conversion from Caffe or ONNX model to binary for efficient execution on R-Car Gen3 CNN architecture
- Easy to use through single line command & GUI support
- Support for various R-Car V3x architectures through single click option
- Manual & automatic execution optimisation features to maximise efficiency
- Support for programmable layers on Renesas Cve architecture for flexibility
- Seamless integration with ONNX Runtime on ARM CPUs for wide ONNX networks execution
- Built-in 16-bit & 8-bit quantization capabilities
- Support for SIL & HIL
- Windows & Linux support
- Integrated within R-Car SDK

R-Car SDK

R-Car Software Development Kit: Easy to start, easy to access, easy to use, easy to develop. It includes:

- » Development tools, Simulation platform
- » Target libraries
- » Sample code and Documentation

Multiple variants of the R-Car SDK are available:

- R-Car SDK Linux reference package:
 - » Available under ELA on [renesas.com](https://www.renesas.com) for R-Car V3x and S4, V4H
- R-Car SDK certified:
 - » ASIL Target Libraries are compiled with certified compiler.
 - » OS dependent package. Please contact Renesas for more information.

Autosar MCAL



- Standard Peripheral Abstraction Layer (SPAL) drivers, communication drivers and test drivers
- For AUTOSAR AR4.X based MCAL for Cortex R
- Worldwide support infrastructure with interface for 1st and 2nd level support in Europe
- Cooperation with various BSW/OS vendors and integrators
- Flexible mass-production licenses
- Free-of-charge development licenses for up to 500 prototypes

Security Software

Renesas provides a variety of software for implementing strong security functions, such as:

- secure boot functions that prevent modifications to programs;
- security level management functions that correspond to the product lifetime; and trusted execution environments.
- enables OTA updating, which allows application and OS upgrades without the driver having to return to the car dealer.
- Renesas plans to sequentially roll out a variety of security software packages to respond to system structures and needs, and to support the hypervisor.

CR7 SDK

R-Car CR7 Software Development Kit: reference solution for Easy To Start on CR7. It includes:

- FreeRTOS CR7 SW:
 - » BSP
 - » 2D Gfx libraries
 - » Video decoders
- Virtio based inter-processor communication driver (Linux on CA5x).

Please contact Renesas for more information.

Renesas is working closely with multiple partners in order to extend the software offer and support customer requirements. From OS vendors to system integration. For more information refer to the Renesas consortium WebPage: [R-Car Consortium Partners | Renesas](#)

iSYSTEM

- Universal emulator and debugger system:
 - » On-chip debugging for RL78, RH850 and R-Car
 - » In-Circuit Emulation of RL78
 - » On-Chip and Off-Chip Trace (Parallel and AURORA) for RH850
 - » Off-Chip HSSTP Trace for R-Car
 - » Support for common compiler platforms
 - » Software API for 3rd party tools and test automation
 - » For more information visit www.isystem.com



Lauterbach

- Universal debugger system TRACE32™
 - » On-chip debugging for RL78, RH850 and R-Car
 - » On-Chip and Off-Chip Trace (Parallel and AURORA) for RH850
 - » Off-Chip HSSTP Trace for R-Car
 - » Support for common compiler platforms
 - » Software API for 3rd party tools and test automation
- For more information visit www.lauterbach.com



R-Car Starter Kit Premier (R-Car H3)

- Equipped with
 - » 1384-pin R-Car H3 device on SIP module
 - » 8 GB LPDDR4-3200 SDRAM
 - » 64 MB QSPI flash
 - » 128 GB eMMC
 - » Ethernet, Micro SD, USB, Micro HDMI display out
 - » Add. interfaces & SOC signals via COM Express connector (440-pin)
 - » JTAG interface
- Package includes
 - » Starter Kit
 - » Power supply
 - » USB and HDMI cable
- Software
 - » Linux BSP / MMP / Graphics Libraries available
- Order codes: Y-ASK-RCAR-H3-8GB-WS30 / RTP0RC77951SKBX010SA03
Y-SICA20I2P (JTAG Debug Adapter)



R-Car Starter Kit Pro (R-Car M3)

- Equipped with
 - » 1384-pin R-Car M3 device on SIP module
 - » 8 GB LPDDR4-3200 SDRAM
 - » 64 MB QSPI flash
 - » 128 GB eMMC
 - » Ethernet, Micro SD, USB, Micro HDMI display out
 - » Add. interfaces & SOC signals via COM Express connector (440-pin)
 - » JTAG interface
- Package includes
 - » Starter Kit
 - » Power supply
 - » USB and HDMI cable
- Software
 - » Linux BSP / MMP / Graphics Libraries available
- Order codes: Y-ASK-RCAR-M3W-8GB-WS30 / RTP8J77961ASKB0SK0SA05A
Y-SICA20I2P (JTAG Debug Adapter)



Kingfisher Expansion Board (R-Car H3/M3)

- For R-Car H3/M3 evaluation
- Expansion board to be used in combination with the R-Car H3/M3 starter kit board
- Equipped with
 - » Wireless & Automotive network connectivity [Wi-Fi, Bluetooth, 2x CAN-FD]
 - » 2ch display output (1x HDMI, 1x LVDS)
 - » SD Card, USB2.0/3.0, Mini PCIe
 - » 7.1 Audio output, Video input, CSI camera I/F, FM/AM radio
 - » JTAG debug connector
- Software
 - » Linux BSP / MMP / Graphics Libraries available
- Board dimensions: 180 mm x 198 mm
- Order codes: Y-SBEV-RCAR-KF-M06 (Kingfisher Advanced Carrier Board)
Y-SBEV-RCAR-KF-GMSL02
(4 port GMSL camera input option-board)



R-Car V3M Starter Kit

- Equipped with :
 - » R-Car V3M
 - » 2 Gbytes DDR3L-1600
 - » 64 Mbytes Hyper Flash
 - » 64 Mbytes QSPI Flash
 - » 16GBytes eMMC
 - » HDMI, RGB, LVDS, MipiCSI2,
 - » EthernetAVB, Can-FD, I²C,
 - » JTAG, Debug Interface
 - » On board Connector with SOC signals
- Package include
 - » Starter Kit
 - » Power Supply
 - » USB& HDMI Cable
- Software
 - » Linux BSP (Linux.Org)
 - » Configuration tools
 - » Mimi Monitor
- Order codes: Y-ASK-RCAR-V3M-WS20 (with Rohm PMIC)
Y-ASK-RCAR-V3M-WS20-REV2 (with Renesas PMIC)



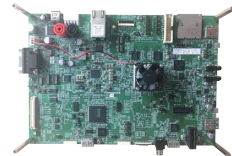
R-Car V3H Starter Kit

- Equipped with :
 - » R-Car V3H
 - » 2 Gbytes DDR3L-1600
 - » 64 Mbytes Hyper Flash
 - » 64 Mbytes QSPI Flash
 - » 16GBytes eMMC
 - » HDMI, RGB, LVDS, MipiCSI2
 - » EthernetAVB, B-Ethernet, Can-FD, I²C
 - » JTAG, Debug Interface
 - » On board Connector with SOC signals
- Package include
 - » Starter Kit
 - » Power Supply
 - » USB& HDMI Cable
- Software
 - » Linux BSP (Linux.Org)
 - » Configuration tools
 - » Mimi Monitor
- Order codes: Y-ASK-RCAR-V3H-WS11 (with Rohm PMIC)
Y-ASK-RCAR-V3H-WS21 (with Renesas PMIC)



R-Car E3 Development Board 'EBISU'

- For R-Car E3
- Equipped with:
 - » R-Car E3
 - » 64 MB NOR Flash Memory
 - » 2GB DDR3L-DRAM-1866
 - » 32GB eMMC
 - » USB 3.0/2.0, LAN
 - » 2ch display output (1x HDMI, 1-2x LVDS, 1x Analog RGB)
 - » HDMI and CVBS video input
 - » Audio Output and Microphone Input
 - » JTAG debug/trace connector
- Board dimensions: 230mm x 160mm
- Package includes CD with user's manual, schematic and boot software
- Order code: Y-R-CAR-E3-BOARD-DEV-WS11 / RTP0RC77990SEB0020SA00



R-Car D3 Development Board 'DRAAK'

- For R-Car D3
- Equipped with:
 - » R-Car D3
 - » 64 MB NOR Flash Memory
 - » 512MB DDR3L-SDRAM-1856
 - » 16GB eMMC
 - » USB 2.0, LAN
 - » 2ch display output (1x HDMI, 1-2x LVDS, 1x Analog RGB)
 - » HDMI and CVBS video input
 - » JTAG debug/trace connector
- Board dimensions: 210mm x 160mm
- Package includes CD with user's manual, schematic and boot software
- Order code: Y-R-CAR-D3-BOARD-DEV-WS11 / RTP0RC77995SEB0010S



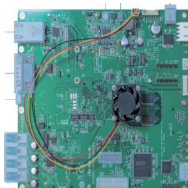
R-Car H3/M3/M3N Development Board 'SALVATOR-XS'

- For R-Car H3, M3 and M3N
- Equipped with:
 - » R-Car H3/M3/M3N SIP
 - » 64 MB NOR Flash Memory
 - » 8GB LPDDR4-DRAM-3200 [H3 and M3] or 2GB LPDDR4-DRAM-3200 [M3N]
 - » 32GB eMMC
 - » USB 3.0/2.0, SD, LAN, SATA, PCIe
 - » 3-4ch Display output (1-2x HDMI, 1x LVDS, 1x Analog RGB)
 - » JTAG debug/trace connector
- Board dimensions: 210mm x 160mm
- Package includes CD with user's manual, schematic and boot software
- Order codes:
 - Y-R-CAR-M3N-SIP-BOARD-SKT-ES20 / RTP0RC77965SIPB012S-S
 - Y-R-CAR-M3W-8GB-BOARD-SKT-WS30 / RTP0RC7796SIPB0012SS5A
 - Y-R-CAR-H3-8GB-BOARD-SKT-WS30 / RTP0RC7795SIPB0012S-S03



R-Car V3M Development Board "EAGLE"

- Equipped with:
- NOR flash memory
 - » Two serial NOR flash memory devices for QSPI0
 - » Serial NOR flash memory device for QSPI1
 - SDRAM :
 - » LPDDR3-SDRAM for DBSC4
 - Display interfaces :
 - » HDMI output connector for LVDS
 - Video input interfaces :
 - » 4 camera input connectors for CSI2 channel 0
 - Network interfaces:
 - » Gigabit Ethernet (GbE) connector for EthernetAVB
 - » CAN connector for CANFD0
 - Peripheral interfaces:
 - » "Debug Serial" connector for SCIF0
 - Debugger interfaces:
 - » 20-pin JTAG connector
 - » HSSTP connector for LVDS
 - Peripheral connectors:
 - » Four EXIO connectors for DPAD, VIN0, MMC, and other modules
 - Power supply: 12.0-V DC input
 - Operating temperature : +25 degrees C at ambient temperature
 - Order Code: Y-R-CAR-V3M-BOARD-DEV-ES20 / RTP8A77970ASKB0EG0SA001#WS



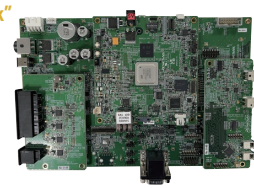
R-Car V3H Development Board "CONDOR-I"

- Equipped with:
- NOR flash memory:
 - » Two serial NOR flash memory devices for QSPI0,
 - » Serial NOR flash memory for QSPI1
 - SDRAM:
 - » LPDDR4-SDRAM for DBSC4
 - Display interface:
 - » HDMI output connector for LVDS
 - Video input interfaces :
 - » camera input connectors for CSI2 channel 0
 - » camera input connectors for CSI2 channel 2
 - Storage interface:
 - » eMMC memory for MMC
 - Network interfaces:
 - » PCIe x 4 connectors (2 lanes) for PCIe
 - » Ethernet AVB PHY connector for EthernetAVB
 - » Gigabit Ethernet (GbE) connector for GETHER
 - » CAN connector for CANFD0_A
 - Peripheral interfaces:
 - » "Debug Serial" connector for SCIF0 or HSCIF0_B
 - Debugger interfaces:
 - » 20-pin JTAG connector for JTAG1
 - » 20-pin JTAG connector for JTAG2
 - » HSSTP connector through LVDS
 - » HSSTP connector through PCIe0
 - Peripheral connectors:
 - » Three EXIO connectors for DPAD, GETHER (RMII), Flex Ray, VIN0, and other modules
 - Power supply: 12.0-V DC input
 - Operating temperature: +25 degrees C at ambient
 - Package includes CD with User's Manual, Schematic and boot software
 - Order Code: Y-RCAR-V3H-CONDOR-I-BRD-WS20 / RTP8A77980ASKB0CW0SA001#WS



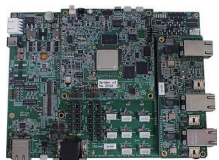
R-Car V4H Development Board "White Hawk"

- Equipped with:
- NOR flash memory:
 - » Serial NOR flash memory (64 MB) device for QSPI0
 - » HYPERFLASH™ memory device (64 MB) for QSPI0 and QSPI1
 - SDRAM:
 - » LDDR5 – 6400, 8 GB, 64-bit, 1 module
 - Display interface:
 - » 2x eDP (mini display port connector) for DSIO and DSII
 - » 2x GMSL2 output (FAKRA) for DSIO and DSII
 - Video input interfaces:
 - » 2x GMSL2 input (Quad HFM FAKRA) for CSIO-1 via C-PHY
 - Storage interfaces: eMMC memory (32GB)
 - Network interfaces:
 - » OcuLink connector for PCIe0 and PCIe1 (4 lanes)
 - » Gigabit Ethernet (GbE) connector for Ether AVB0
 - » 3x Ethernet AVB + 1x Ethernet TSN ports (MATEnet) for EtherAVBx and EtherTSN0
 - » 2 FlexRay connectors for FlexRay A and FlexRay B
 - Peripheral interfaces: Debug serial connector for SCIF0/HSCIF0
 - Debugger interfaces: 20-pins JTAG connector for JTAGx
 - Peripheral connectors:
 - » EX-SPI connector for QSPI0
 - » 2 break-out board connected (EXIO connectors A and B)
 - » Ethernet sub-board connector
 - » CSI and DSI sub-board connector
 - » Mode switch-board connector
 - Power supply: 12.0-V DC inputs for mother board or 5V for CPU board only
 - Operating temperature: +25 degrees C at ambient
 - Package includes CD with User's Manual, Schematic and boot software
 - Order Code: Y-RCAR-V4H-WHITEHAWK-BRD-WS10 / RTP8A779G0ASKB0FS0SA000#WS



R-Car S4 Reference Board "Spider"

- Features
- Reduces the board size and BoM costs through MCU core integration into R-Car SoC, and use a single board to control both MCU domain and application SoC domain, which previously required separately.
 - The reference board consists of a CPU board with core SoC, power management IC (PMIC) and memory, and an interface board, enabling support for a variety of networks.
 - Supports 16 channels of CAN FD (can be used as 16 channels of LIN and 8 channels of SENT by multi-function), 2 channels of FlexRay, 2 channels of PCIe V4.0 x2 lanes, and 3 channels of 5G-USXGMII for Ethernet.
 - The core system is realized by installing the R-Car S4, LPDDR4x-3200 memory and HyperFlash™ memory on the CPU board, which contributes to shortening the time to market by simplifying the design.
 - The combination of pre-regulators and PMICs developed for R-Car S4 can provide various supply voltages to meet functional safety requirements up to ASIL D in accordance with ISO 26262.
 - Order Code: RTP8A779F0ASKB0SP2S



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Power Management ICs (PMIC)

Product Name	Function	Input Voltage [V]	Linear Output	Digital Output Pins	Can Sample	Switching Regulators	Switching Frequency [MHz]	LDOs	GPIOs [f]	Comm. Interface	Temp. Range	Package
RAA270000	PMIC for Automotive RH850 E1x, C1x MCUs	6.3 - 18.5	yes	MUXOUT, FSOUT, EXCNT, (INTOUT, RSTB)	yes	Buck/Buck	2.1/2.1	4LDOs, 2Trackers	0	SPI	-40 to +125	64pin HTBFP 12x12mm
RAA270005	PMIC for Automotive RH850 P1x MCUs	2.2 - 18.5	yes	MUXOUT, EXCNT1, EXCNT2, (INTOUT, RSTB)	yes	Boost/Buck	0.42/2.1	2LDOs, 2Tracker	0	SPI	-40 to +125	40pin HLDFP 9x9mm

Product Name	Automotive Platform	Automotive Application	Description	V _{in}	F _{sw} [MHz]	Bucks	LDOs	FuSa Features	Grade	Temp	OTP	Comms	Package	Notes
DA9062-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, Integrated cockpit, Clusters, Telematics.	System PMIC - 4 Bucks, 4 LDOs, GPIO, RTC, System Supervision	2.8V to 5.5V	3	1 x 2.5A 1 x 2.0A 2 x 1.5A	4 x 300mA	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	40 lead, 6 x 6mm QFN, 0.5mm pitch	Configurable through FC or SPI interface; Programmable power sequence; Supports R-Car SoC sequence of activation; Thermal protection system
DA9063-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Integrated cockpit, Clusters.	System PMIC - 8 Bucks, 11 LDOs, ADC, GPIO, RTC, System Supervision	2.8V to 5.5V	3	3 x 2.5/5A 2 x 1.5A 1 x 1.5A	11 x 300mA	ASIL C with monitor	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	100 ball BGA, 0.8mm pitch	Configurable through FC or SPI interface; Programmable power sequence; Supports R-Car SoC sequence of activation; Thermal protection system; 10-bit ADC with nine channels
DA9063L-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Integrated cockpit, Clusters.	System PMIC - 6 Bucks, 5 LDOs, ADC, GPIO, System Supervision	2.8V to 5.5V	3	3 x 2.5/5A 2 x 1.5A 1 x 1.5A	5 x 300mA	ASIL C with monitor	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	100 ball BGA, 0.8mm pitch	Configurable through FC or SPI interface; Programmable power sequence; Supports R-Car SoC sequence of activation; Thermal protection system
RAA271001	R-Car 3 Other SoCs	ADAS, Camera Systems, Central Compute, Driver Monitor Camera, Gateway, Integrated Cockpit	Safe System PMIC - 5 Bucks, 2 LDOs, ADC, FuSa	1.7V to 5.5V	2.2, 3, 4	1 x 6A 4 x 2A	2 x 300mA	Up to ASIL-D, OBA WDT, Dual Temp Monitors; Error Pin Monitors; Secondary Shut-down Path; Safety State Machine	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C	Yes	FC SPI	60 ball BGA, 0.8mm pitch	Configurable through FC or SPI interface; Programmable power sequence; Supports R-Car SoC sequence of activation; 12-bit ADC with up to 16 channels
RAA271000	R-Car 3 Other SoCs	ADAS, Camera Systems, Central Compute, Driver Monitor Camera, Gateway, Integrated Cockpit	Safe System PMIC - 5 Bucks, 2 LDOs, ADC, FuSa, GPIO	2.7V to 5.5V	2.2, 3, 4	1 x 15A 2 x 4A 2 x 2A	2 x 300mA	Up to ASIL-D, OBA WDT, Dual Temp Monitors; Error Pin Monitors; Secondary Shut-down Path; Safety State Machine	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C	Yes	FC SPI	60 ball BGA, 0.8mm pitch	Configurable through FC or SPI interface; Programmable power sequence; Supports R-Car SoC sequence of activation; 12-bit ADC with up to 16 channels
RAA271005	R-Car 4 Other SoCs	Connected Gateway, ADAS, Camera Systems, Central Compute, Driver Monitor Camera, Integrated Cockpit	Safe System PMIC - 5 Bucks, 6 LDOs, ADC, FuSa, GPIO	2.7V to 5.5V	2.2, 4	1 x 12A 4 x 60mA	2 x 500mA	Up to ASIL-D, OBA WDT, Dual Temp Monitors; Error Pin Monitors; Secondary Shut-down Path; Safety State Machine	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C	Yes	FC SPI	66 ball BGA, 0.65mm pitch	Configurable through FC or SPI interface; Advanced Power Saving Modes; Supports R-Car SoC sequence of activation; 12-bit ADC with up to 16 channels
P91E0A	Intel Apollo Lake Intel Anderson Lake	IVI and Navigation, Integrated cockpit, Clusters.	System PMIC - 5 Bucks, 2 Controllers, 8 LDOs, ADC, GPIO, SVID Interface	3.135V to 5.25V	2.1	3 x 5A 2 x 2.3A 2 x Ext DPU	1 x 550mA 3 x 400mA 2 x 100mA 2 x 50mA	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 125°C	Yes	FC	100 lead VFQFN, 8 x 5mm; 100 ball BGA, 0.65mm pitch	Configurable through FC or SPI interface; Programmable power sequence; 12 GPIO/Sequence Outputs, 10-bit ADC with 3 channels
DA9213-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Integrated cockpit, Clusters.	Sub PMIC - Multiphase 20 A Output Current	2.8V to 5.5V	3	1 x 20A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	66pin VF8GA, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9214-A, -AT*	R-Car 2 R-Car 3 Other SoCs	Infotainment, ADAS, Navigation, Integrated cockpit, Instrument clusters	Sub PMIC - Multiphase 2 x 10 A Output Current	2.8V to 5.5V	3	2 x 10A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	66pin VF8GA, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9215-A, -AT*	R-Car 2 R-Car 3 Other SoCs	Infotainment, ADAS, Navigation, Integrated cockpit, Instrument clusters	Sub PMIC - Multiphase 1 x 15 A + 1 x 5 A Output Current	2.8V to 5.5V	3	1 x 15A 1 x 5A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	66pin VF8GA, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9223-A, -AT*	R-Car 2 R-Car 3 Other SoCs	Infotainment, ADAS, Navigation, Integrated cockpit, Instrument clusters	Sub PMIC - Multiphase 16 A Output Current	2.8V to 5.5V	3	1 x 16A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	66pin TF8GA, 0.8mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9224-A, -AT*	R-Car 2 R-Car 3 Other SoCs	Infotainment, ADAS, Navigation, Integrated cockpit, Instrument clusters	Sub PMIC - Multiphase 2 x 8 A Output Current	2.8V to 5.5V	3	2 x 8A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 150°C†	Yes	FC SPI	66pin TF8GA, 0.8mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9130-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Cluster, Telematics, Central Compute.	Sub PMIC - Dual Phase, Single output, 10A	2.8V to 5.5V	4	1 x 10A	–	–	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C†	Yes	FC	24pin FC-WFQFN, 4.8 x 3.3mm, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9131-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Cluster, Telematics, Central Compute.	Sub PMIC - Dual Phase, Dual Channel 5A-per output	2.8V to 5.5V	4	2 x 5A	–	–	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C†	Yes	FC	24pin FC-WFQFN, 4.8 x 3.3mm, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9132-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, ADAS, Cluster, Telematics, Central Compute.	Sub PMIC - Dual Phase, Dual Channel 3A-per output	2.8V to 5.5V	4	2 x 3A	–	–	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C†	Yes	FC	24pin FC-WFQFN, 4.8 x 3.3mm, 0.5mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9141-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI & Navigation, Telematics, AI engines, ADAS, SiP modules, Central Compute.	Sub PMIC - Single output 25A/40A pk 4 phase DC-DC Auto Grade	2.8V to 5.5V	4	1 x 40A	–	–	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C†	Yes	FC SPI	60pin FC8GA, 4.5 x 7.0mm, 0.65mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
DA9142-A, -AT*	R-Car 2 R-Car 3 Other SoCs	IVI and Navigation, Telematics, AI engines, ADAS, SiP modules, Central Compute.	Sub PMIC - Single output 13A/20A pk 2 phase DC-DC Auto Grade	2.8V to 5.5V	4	1 x 20A	–	–	Grade 1	Ta: -40 to 125°C Tj: -40 to 150°C†	Yes	FC SPI	60pin FC8GA, 4.5 x 7.0mm, 0.65mm pitch	Configurable through FC or SPI interface; Adjustable soft start; Dynamic Voltage Control (DVC)
P9149W	Intel Apollo Lake Intel Anderson Lake	IVI and Navigation, Integrated cockpit, Clusters.	6.6A Distributed Power Unit for P91E0A PMIC	4.0V to 5.5V	2.1	1 x 6.6A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 125°C	No	2-wire DIFM	12 lead WFQFN, 3 x 4mm, 0.5mm pitch	5A DC, up to 6.6A pulsed; Two-wire Gen-1 DIFM bus interface to host PMIC; Automatic DPU Multiphasing, up to 4-phases
P9149VW	Intel Apollo Lake Intel Anderson Lake	IVI and Navigation, Integrated cockpit, Clusters.	7A Distributed Power Unit for P91E0A PMIC	2.97V to 3.63V	2.1	1 x 7.0A	–	–	Grade 2	Ta: -40 to 105°C Tj: -40 to 125°C	No	2-wire DIFM	12 lead WFQFN, 3 x 4mm, 0.5mm pitch	5A DC, up to 7A pulsed; Two-wire Gen-1 DIFM bus interface to host PMIC; Automatic DPU Multiphasing, up to 4-phases

* All DA numbered automotive parts are available in two temp variants, room temp automotive and room plus high temp automotive
Automotive level parts are qualified to AEC-Q100 as designated by “-A” or “-AT” suffix on the part number
- A parts are tested at room temperature only during final test. High and low temperature is guaranteed by Design & Characterization
- AT parts are tested at room temperature and high temperature during final test. Low temperature is guaranteed by Design & Characterization

Camera PMIC

Product Name	Function	Input Voltage	# of Outputs	LDO	DCDC	Switching Frequency	Temp. Range	Package
ISL78083	PMIC for satellite cameras with power good pins	4.5 - 42V	4	300 mA	3 x 750 mA	2.2 MHz	-40 to +125°C	24 Ld SCQFN

Multiphase Synchronous Controllers

Product Name	Function	Topology	Input Voltage	# of Outputs	# of Phases	Output Voltage	Bias Voltage	Digital Interface	Temp. Range	Package
ISL78224	48/12V bidirectional DCDC	buck and boost	65V / 45V	1	4	48V / 12V	5V	FC/PMBus	-40 to +125°C	64 Ld TQFP
ISL78226	48/12V bidirectional DCDC	buck and boost	65V / 45V	1	6	48V / 12V	5V	FC/PMBus	-40 to +125°C	65 Ld TQFP
ISL78225	multiphase DCDC controller	buck or boost	45V	1	4	ext. FET driver	5V	no	-40 to +125°C	44 Ld TQFP
ISL78220	multiphase DCDC controller	buck or boost	45V	1	6	ext. FET driver	5V	no	-40 to +125°C	44 Ld TQFP
ISL78227	multiphase Boost w. integrated drivers	boost	60V	1	2	55V	5V	no	-40 to +125°C	32 Ld WFQFN
ISL78229	multiphase Boost w. integrated drivers	boost	60V	1	2	55V	5V	FC/PMBus	-40 to +125°C	40 Ld WFQFN

Laser Driver

Product Name	Function	Supply Voltage	Rise/Fall Time	# of Channels	Pulse Frequency	Output Current	Digital Interfaces	Temp. Range	Package
ISL78365	quad channel laser driver for HUD w. speckle reduction	3.3V	1.5 ns	4	150 MHz	750 mA	10 Bit video interface and SPI	-40 to +125°C	40 Ld WFQFN

DISCRETE POWER PRODUCTS

PowerMOSFET

Series		Part Number	V _{DS} [V]	R _{DS(on)} max [mΩ]		I _{DDQ} [A]	P _{T @ T_C = 25 °C} [W]	R _{DS(on)} [°C/W]	Q _g typ. [nC]	C _{iss} typ. [pF]	Package		
				V _{GS} = 10.0 V	V _{GS} = 4.5 V *V _{GS} = 4.0 V								
N-Channel	ANL3	RBA250N04HPF-4UA01	40	0.85	–	250	348	0.43	245	12900	TO-263-7p-SHL		
		RBAl80N04HPF-4UA01		1.25	–	160	250	0.60	157	8800	TO-263-7p-SHL		
		NP180N04TUK		1.05	–	180	348	0.43	198	10500	TO-263-7p		
		NP179N04TUK		1.25	–	180	288	0.52	160	8900	TO-263-7p		
		NP110N04PUK		1.4	–	110	348	0.43	198	10500	TO-263PZ		
		NP109N04PUK		1.75	–	110	250	0.60	126	7200	TO-263PZ		
		NP100N04PUK		2.3	–	100	176	0.85	80	4700	TO-263PZ		
		NP90N04VUK		2.8	–	90	147	1.02	68	3900	TO-252PZ		
		NP90N04VDK		2.8	6.0	90	147	1.02	68	3900	TO-252PZ		
		NP90N04VLK		2.8	6.0	90	147	1.02	68	3800	TO-252PZ		
	ANL2	NP89N04PDK	40	2.95	6.2	90	147	1.02	68	3900	TO-263PZ		
		NP89N04PUK		2.95	–	90	147	1.02	68	3900	TO-263PZ		
		NP75N04VUK		3.3	–	75	138	1.09	58	3400	HS0N-8		
		NP60N04VUK		3.85	–	60	105	1.43	42	2450	TO-252PZ		
		NP60N04VDK		3.85	8.6	60	105	1.43	42	2450	TO-252PZ		
		NP60N04VLK		3.90	8.6	60	105	1.43	42	2450	TO-252PZ		
		NP50N04VUK		4.8	–	50	97	1.55	38	2100	HS0N-8		
		NP75N04VUK		5.7	–	75	75	2.00	30	1630	TO-252PZ		
		NP75N04VDK		5.7	12.8	75	75	2.00	27	1630	TO-252PZ		
		NP30N04QUK		8.0	–	30	59	2.54	27	1600	HS0N-8 Dual		
		NP29N04QUK		10.1	–	30	44	3.37	19	1000	HS0N-8 Dual		
		NP180N055TUK		55	1.4	–	180	348	0.43	196	10700	TO-263-7p	
		NP179N055TUK			1.75	–	180	288	0.52	160	9300	TO-263-7p	
		NP110N055PUK			1.75	–	110	348	0.43	196	10700	TO-263PZ	
		NP160N055TUK			2.1	–	160	250	0.60	126	7500	TO-263-7p	
		NP109N055PUK			2.2	–	110	250	0.60	126	7500	TO-263PZ	
		NP100N055PUK			3.25	–	100	176	0.85	80	4900	TO-263PZ	
		NP90N055VUK			3.85	–	90	147	1.02	68	4000	TO-252PZ	
		NP89N055PUK			4.0	–	90	147	1.02	68	4000	TO-263PZ	
		NP75N055YUK			4.5	–	75	138	1.09	55	3500	HS0N-8	
		NP60N055VUK			5.5	–	60	105	1.43	42	2500	TO-252PZ	
		NP35N055YUK			6.7	–	35	97	1.55	38	2240	HS0N-8	
		NP90N06VOK			60	5.3	8.2	90	147	1.02	63	4000	TO-252PZ
		NP90N06VLK				5.3	8.2	90	147	1.02	63	4000	TO-252PZ
		NP89N06PDK				5.3	8.2	90	147	1.02	63	4000	TO-263PZ
		NP60N06VDK				7.9	12.0	60	105	1.43	37	2400	TO-252PZ
		NP60N06VLK				7.9	12.0	60	105	1.43	37	2400	TO-252PZ
		NP45N06PUK				9.6	–	45	75	2.00	30	1690	TO-263PZ
		NP45N06VUK				9.6	–	45	75	2.00	30	1690	TO-252PZ
		NP45N06VDK				11.6	19.6	45	75	2.00	25	1530	TO-252PZ
		NP30N06DQK				14.0	21.0	30	59	2.54	25	1500	HS0N-8 Dual
		NP29N06DQK				20.0	30.0	30	44	3.37	16	1000	HS0N-8 Dual
		NP25N06QUK				21.0	–	30	44	3.37	20	1000	HS0N-8 Dual
		NP16N08YLL				35	55	16	27.3	5.49	12	400	HS0N-8
		NP16N08ULK				39.0	60.0	16	25	5.95	11	500	HS0N-8 Dual
	ANM2	RBA250N10CHPF-4UA02	100			2.4	–	250	348	0.43	190	9500	TO-263-7p SHL
		NP75N04YLK		4.8		8.3	75	138	1.09	77	4300	HS0N-8	
NP75N04YUG		4.8		–		75	138	1.09	77	4300	HS0N-8		
NP74N04YUG		5.5		–		75	120	1.25	64	3620	HS0N-8		
NP35N04YLK		9.7		–		35	77	1.95	34	1900	HS0N-8		
NP35N04YUG		10.0		–		35	77	1.95	36	1900	HS0N-8		
NP33N06YDG		14.0		–		33	97	1.55	52	2600	HS0N-8		
NP23N06YDG		27.0		–	23	60	2.50	27	1200	HS0N-8			
UMOS4		NP50P03YDG		-30.0	8.4	–	-50	102	1.47	64	2300	HS0N-8	
		NP75P03YDG			6.2	–	-75	138	1.09	94	3200	HS0N-8	
	NP15P04SLG	40.0	60.0*		-15	30	5	23	1100	TO-252ZK			
	NP20P04SLG	25.0	38.0*		-20	38	3.95	34	1650	TO-252ZK			
	NP36P04SDG	17.0	23.5*		-36	56	2.68	55	2800	TO-252ZK			
	NP36P04KDG	17.0	23.5*		-36	56	2.68	55	2800	TO-263ZK			
	NP50P04SLG	9.6	15.0*		-50	84	1.79	100	3800	TO-252ZK			
	NP50P04SDG	9.6	15.0*		-50	84	1.79	100	5000	TO-252ZK			
	NP50P04KDG	9.6	15.0*		-50	90	1.67	100	5100	TO-263ZK			
	NP75P04YLK	9.7	–		-75	138	1.09	91	3200	HS0N-8			
P-Channel	UMOS4	NP83P04PDG	-60.0	5.3	8.0*	-83	150	1	200	9820	TO-263PZ		
		NP100P04PDG		3.5	5.1*	-100	200	0.75	320	15100	TO-263PZ		
		NP100P04PLG		3.7	5.1*	-100	200	0.75	320	15100	TO-263PZ		
		NP15P06SLG		70.0	95.0*	-15	30	5	23	1100	TO-252ZK		
		NP20P06YLK		47.0	70.0*	-20	57	2.63	34	1605	HS0N-8		
		NP20P06SLG		48.0	64.0*	-20	38	3.95	34	1650	TO-252ZK		
		NP36P06KDG		29.5	37.5*	-36	56	2.68	54	3100	TO-263ZK		
		NP36P06SLG		30.0	40.0*	-36	56	2.68	52	3200	TO-252ZK		
		NP50P06SDG		16.5	23.0*	-50	84	1.79	100	5000	TO-252ZK		
		NP50P06KDG		17.0	23.0*	-50	90	1.67	95	5000	TO-263ZK		
		NP83P06PDG		8.8	12.0*	-83	150	1	190	10100	TO-263PZ		
		NP100P06PLG		6.0	7.8*	-100	200	0.75	300	15000	TO-263PZ		
		NP100P06PDG		6.0	7.8*	-100	200	0.75	300	15000	TO-263PZ		

HAPTICS DRIVER

Product Name	Function	Features	V _{in}	Idle Current Consumption	Output Driver	External Components	Waveform Memory	Low Latency GPI	Temperature Range	Package	Tools
DA7280-A	Low power, wide-bandwidth ERM/LRA/VCA Haptic Driver	Auto-resonance free tracking, Rapid start/stop, GPI trigger, Configurable ERC	2.8V - 5.5V	0.36µA	500mA Current Drive with continuous sensing	1	Up to 15 shapes and sequences	3	-40 to 85°C	12-QFN (Wettable Flank)	User friendly GUI dev tools

AUTOMOTIVE SENSOR SOLUTIONS

Sensor Signal Conditioning (SSC)

Product	Delivery Options	Optimized for	Interface Options (Analog / Digital) DAC Resolution	Maximum Sensor Offset Compensation	Adjustable Gain Values	ADC [Bit]	Sample Rate [kHz]	Supply Voltage [V]	Supply Current [mA]	HTOL [h]	Temp. Sources	Maximum Calibration Points	Calibration DLL	Digital ReadOut during NOM (Normal Operation Mode)	Diagnostic / Features / Additional Functions											
															SSC / SCC	ROM Check	EEPROM Check	Temp. Output	BIST Digital	BIST AFE	BIST Voltages	CMV	User Data	Broken Chip Chk	Memory Lock	
ZSC31150	DFN14 (5x4) SSOPI4 (6.2x5.3) bare dies	Piezo-resistive Metal thin-film Strain-gauge Magneto-resistive Non laser trimmed ceramic membrane	Ratiometric Voltage (12.4 Bit DAC)	3000%	3 to 420	13 to 16	< 7.8		5.5	1000 5000	Internal Ext. Diode PTC Bridge TC	4P + 3T	RBIC1.dll	BR	X	X	X	-	-	-	-	X	3	-	X	
ZSSC3154	POFN32 (5x5) bare die	Piezo-resistive Metal thin-film Strain-gauge Magneto-resistive Laser trimmed ceramic membrane	Dual Ratiometric Voltage (12 Bit DAC)	400%	3 to 420	14	< 1.0	4.5 to 5.5	10	1000	Internal Ext. Diode PTC	4P + 3T		BR + Temp	X	X	X	X	-	X	-	X	2	X	X	
ZSSC4151 Rev. A	POFN24 (4x4) bare die		Ratiometric Voltage (12 Bit DAC)	1000%	2 to 200	14 to 18	< 2.4		7	3000	Internal Ext. Diode PTC	4P + 4T	zsscCalbRT.dll	BR + Intermediates	X	X	X	-	X	X	-	X	14	X	-	
ZSSC4151 Rev. C	POFN24 (4x4) TSSOP18 (5x4.4) bare die		Ratiometric Voltage (12 Bit DAC) Switch Output				< 3.4		7	1000 5000	Internal Ext. Diode PTC Bridge TC	4P + 4T		BR + Intermediates	X	X	X	-	X	X	-	X	14	X	X	
ZSSC3170 Rev. F	SSOP20 (7.2x5.3) bare die		PWM (12 Bit) LIN (1.3 / 2.0 / 2.1)	400%	3 to 420	14	< 0.43	7 to 18	7		Internal Ext. Diode PTC	4P + 3T	RBIC1.dll	BR + Temp	X	X	X	X	X	-	-	X	4	X	X	
ZSSC4132	POFN24 (4x4) bare die		LIN (1.3 / 2.0 / 2.1 / 2.2A)	1000%	3 to 200	12 to 18	< 0.5	6 to 18	7		Internal Ext. Diode PTC NTC Bridge TC	4P + 4T		BR + Temp + Intermediates	X	X	X	X	X	-	X	-	22	X	-	
ZSSC4161 (Config. D-01)	POFN24 (4x4) bare die		I ² C	1000%	2 to 200	14 to 18	< 1.0	4.5 to 5.5	10		Internal Ext. Diode	4P + 3T		BR + Temp + Intermediates results of Conditioning		X	X	X	X	X	X	-	X	128	X	X
ZSSC4161 (Config. D-03) ASIL-B	POFN24 (4x4) bare die			1000%	2 to 200	14 to 18	< 1.0		10		Internal Ext. Diode	4P + 3T				X	X	X	X	X	X	X	X	128	X	X
ZSSC4162 (Config. D-01)	POFN24 (4x4) bare die			1000%	2 to 200	14 to 18	< 1.0		10	1000	Internal Ext. Diode PTC / NTC	4P + 3T				X	X	X	X	X	X	-	128	X	X	
ZSSC4165 (Config. D-01) (Dual Bridge)	POFN24 (4x4) TSSOP18 (5x4.4) bare die		SENT (SAE J2716 JAN2010 and APR2016)	1000%	2 to 200	14 to 18	< 0.88	4.75 to 5.25	10		Internal 2 Ext. Diodes	4P + 3T				X	X	X	X	X	-	X	-	128	X	X
ZSSC4165 (Config. D-06) (Dual Bridge)	POFN24 (4x4) TSSOP16 (5x4.4) bare die			1000%	2 to 200	14 to 18	< 0.66		10		Internal PTC	4P + 3T				X	X	X	X	X	X	-	128	X	X	
ZSSC4169 (Config. D-14) ASIL-C	POFN24 (4x4) TSSOP16 (5x4) bare die		Piezo-resistive Metal thin-film Strain-gauge Magneto-resistive	100%	2 to 200	11 to 14	< 0.66		10		Internal Ext. Diode	4P + 3T				X	X	X	X	X	X	X	X	128	X	X
ZSSC4175 (Config. D-01) (Dual Thermocouple)	POFN24 (4x4) bare die	N-Type Thermocouple		Not applicable	12.6	15	< 0.33	4.5 to 5.5	11		Internal	n.a.				X	X	X	X	X	-	-	-	128	X	X
RAA2S4251B	POFN24 (4x4) bare die	Non laser trimmed ceramic membrane Piezo-resistive Metal thin-film Strain-gauge Magneto-resistive									Internal Ext. Diode PTC Bridge TC	4P + 4T		BR + Intermediates		X	X	X	-	X	-	-	-	>15	X	X
RAA2S4252B	SOIC8 (4.9x3.9) bare die		Ratiometric Voltage (12 Bit DAC)	100000%	3 to 912	13 to 18	< 10	4.5 to 5.5	7		Internal Ext. Diode PTC Bridge TC	4P + 4T				X	X	X	-	X	X	X	X	>4	X	X
RAA2S4253B ASIL-B	POFN24 (4x4) bare die										Internal Ext. Diode PTC Bridge TC	4P + 4T				X	X	X	-	X	X	X	X	>4	X	X

Ambient Light Sensors (ALS)

Product Name	Function	Peak Spectral Sensitivity	Supply Voltage	Supply Current @ EV=100lx	Lux Range	Package Type	Temp. Range
ISL76671	analog output ambient light sensor	550 nm	1.8V to 3.3V	23 µA	0.01 to 100 lx	6 ld ODFN	-40 to 105 °C
ISL76683	digital output ambient light sensor with I ² C and interrupt	540 nm	2.25 to 3.3 V	290µA	0.01 to 64000 lx	7 ld ODFN	-40 to 105 °C

Battery Management ICs (BMIC)

Product Name	Function	# Series Cells	Comm. Interface	Implementation	Cell Balancing	Pack Voltage [V]	Absolute Cell Voltage Measurement Accuracy	Integrated Charge/Discharge FET Drive	Integrated Current Sense Detection	Integrated Temperature Sense	I _s (max)	SHDN I _{cc}	Integrated Penable Output/Reference Output	Special Features	Package
ISL76714	Battery Management	up to 14 cells	SPI and Proprietary Asynchronous	Pack	External (Built-In FET Drivers) or Internal	up to 70V per device	±2.0mV Max (-20 to 85 °C)	no	no	yes	(typ) 5.6mA	(typ) 19 uA	3.3V / 2.5V	*Daisy Chain up to 30 devices (420 Cells) *Robust Hot Plug Performance *Provides Diagnostic Information *Fast Scan Rate of 20µs/cell	64Ld TQFP (10x10mm)
ISL78600	Battery Management	up to 12 cells	SPI and Proprietary Asynchronous	Pack	External (Built-In FET Drivers) or Internal	up to 63V per device	±10mV Max (-20 to 60 °C)	no	no	yes	(typ) 5.6mA	(typ) 15 uA	3.3V / 2.5V	*Daisy Chain up to 14 devices (168 Cells) *Robust Hot Plug Performance *Provides Diagnostic Information *Fast Scan Rate of 20µs/cell	64Ld TQFP (10x10mm)
ISL78610	Battery Management	up to 12 cells	SPI and Proprietary Asynchronous	Pack	External (Built-In FET Drivers) or Internal	up to 63V per device	±2.0mV Max (-20 to 60 °C)	no	no	yes	(typ) 5.6mA	(typ) 15 uA	3.3V / 2.5V	*Daisy Chain up to 14 devices (168 Cells) *Robust Hot Plug Performance *Provides Diagnostic Information *Fast Scan Rate of 20µs/cell	64Ld TQFP (10x10mm)

Inductive Position Sensor

Part Number	Function	Resolution	Supply Voltage	Output Interface	Programming Interface	Maximum Electrical Speed	Temperature Range	IS026262	Package
IFS2550DEIR	High-Speed Inductive Position Sensor for Motor Commutation	n.a.	3.0V - 3.6V 4.5V - 5.5V	Sine/Cos	I ² C	600,000 rpm	-40°C + 160°C	Can support Functional Safety requirements up to ASIL-C single	TSSOP16

WIRELESS POWER PRODUCTS

Product Name	Function	Coils	Wireless Power Standard	Input Voltage [V]	Output Voltage [V]	Output Power max [W]	Package	Temperature Range
P8260	Wireless Power Transmitter	MPA13 - 1 coils	WPC Qi 1.2.4	4.25V to 21V	NA	15	48 pin VFQFPN 7 x 7mm	-40 to +105
P8261	Wireless Power Transmitter	MPA13 - 3 coils	WPC Qi 1.2.4	4.25V to 21V	NA	15	48 pin VFQFPN 7 x 7mm	-40 to +105

CLOCKS & TIMING SOLUTIONS

Product Name	Function	Outputs [#]	Output Type	Output Freq [MHz]	Input Freq [MHz]	Inputs [#]	Input Type	Core Voltage [V]	Output Voltage [V]	Output Banks [#]	Phase Jitter Typ RMS [ps] ¹	C-C Jitter Type P-P (ps)	C-C Jitter Max P-P (ps)	Package Type	Temp. Range [°C]
5P35021	Programmable VersaClock® Clock Generator	2 pairs +1	LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 500 + 32.768 kHz	8 - 40 (Crystal) 1 - 125 (Clock)	1	Crystal, LP-HCSL, LVCMOS, LVDS, LVPECL	3.3	1.8, 2.5, 3.3	3	1.5	20	-	3x3 mm 20 QFN	-40 to 105
5P35023	Programmable VersaClock® Clock Generator	2 pairs +3	LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 500 + 32.768 kHz	8 - 40 (Crystal) 1 - 125 (Clock)	1	Crystal, LP-HCSL, LVCMOS, LVDS, LVPECL	3.3	1.8, 2.5, 3.3	5	1.5	20	-	4x4 mm 24 QFN Wettable	-40 to 105
5P49V60	VersaClock® EE Programmable Clock Generator for Automotive	4 pairs +1	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	8 - 40 (Crystal) 1 - 350 (Clock)	2	Crystal, HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	1.8, 2.5, 3.3	4	0.5	25	35	4x4 mm 24 QFN Wettable	-40 to 105
5PB1104	1.8 V to 3.3 V 1.4 LVCMOS High Performance Clock Buffer	4	LVCMOS	0 - 200	0-200	1	LVCMOS	1.8, 2.5, 3.3	1.8, 2.5, 3.3	1	35fs (additive)	-	-	8 QFN Wettable	-40 to 125
5PB1110	1.8 V to 3.3 V 1.1 LVCMOS High Performance Clock Buffer	10	LVCMOS	0 - 200	0-200	1	LVCMOS	1.8, 2.5, 3.3	1.8, 2.5, 3.3	1	35fs (additive)	-	-	20 QFN Wettable	-40 to 105
9FGV0841	8-output 1.8 V PCIe Gen1-4 Clock Generator with Zo=100 ohms	8	LP-HCSL	100	25	1	Crystal	1.8	1.05V - 1.8V	1	0.37 (PCIe Gen4)	14	50	6x6 mm 48 QFN Wettable	-40 to 105
XA	Oscillator	1	HCMOS, LVDS, LVPECL	0.75 - 1350	-	-	-	2.5, 3.3	2.5, 3.3	1	1	-	-	-	-40 to 105

Note: ¹ Integration range 12 kHz - 20 MHz

VIDEO & DISPLAY CONTROLLER

Video Signal Processing (VSP)

Product Name	Function	CVBS Input	S-Video Input	YPbPr Input	Analog RGB Input	ADC Input Frequency [MHz]	Digital RGB/Y CbCr Input	LVDS Input	Comb Filter	Max Output Resolution	Color Enhancement	PIP	OSD Type	External OSD	OSD Colors	TCOIN Output	LVDS Output	TTL Output	Memory Support	MCU	Additional Output	Touch-screen Controller	Temperature Range	Package Type
TW9809	RGB to BT656 format converter	Yes (differential)	No	No	No	27	24-bit	No	2D	SVGA	Yes	No	Font	No	16 Colors / 16-bit Palette	No	No	No	No	External	BT.656	No	-40 to +105	56pin-WFOFN
TW9819	LCD Display Controllers	Yes (differential)	No	No	No	27	No	No	2D	WXGA	Yes	No	Font	No	16 Colors / 16-bit Palette	Digital	No	Yes	No	External	No	No	-40 to +105	48pin-WFOFN
TW9823	LCD Display Controllers	Yes	Yes	Yes	Yes	108	2 Ports	No	3D / 2D	WXGA	Yes	Yes	Graphic (16 bit)	Analog Digital 18-bit G-PIP overlay	65K Color/ 24-bit Palette	Digital & Analog	Yes	Yes	DDR	Integrated	No	Yes	-40 to +85	216pin-LOFP
TW9824	LCD Display Controllers	Yes (differential)	No	No	No	27	24-bit	No	2D	WXGA	Yes	No	Font	No	16 Colors / 16-bit Palette	Digital	Yes	Yes	No	External	BT.656	No	-40 to +105	100pin-TOFP
TW9832S	LCD Display Controllers	Yes	Yes	Yes	Yes	60	BT.656 Only	No	2D	SVGA	No	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	Digital	No	Yes	No	External	BT.656	No	-40 to +85	80pin-LOFP
TW9834	LCD Display Controllers	Yes (differential)	No	No	No	27	24-bit	Yes	2D	WXGA	Yes	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	Digital	Yes	Yes	No	External	BT.656	No	-40 to +105	100pin-TOFP
TW9836	LCD Display Controllers	Yes (differential)	Yes	Yes	Yes	148	24-bit	Yes	2D	WXGA (1366x768)	Yes	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	Digital	Yes	Yes	No	Integrated	BT.656	Yes	-40 to +105	128pin-LOFP
TW9846	LCD Display Controllers	Yes (differential)	No	No	No	27	2 x 24-bit (up to 1080p)	Yes (2CH)	2D	1080p (1920x1080)	Yes (10 bit/color)	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	Digital	Yes (2CH)	Yes	No	External	MIPI-CS12	No	-40 to +105	156pin-LOFP
TW9847	LCD Display Controllers	Yes (differential)	No	No	No	27	2 x 24-bit (up to 1080p)	Yes (2CH)	2D	1080p (1920x1080)	Yes (10 bit/color)	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	Digital	Yes (2CH)	Yes	No	External	BT.656	No	-40 to +105	156pin-LOFP
RAA278842	LCD Display Controllers	Yes (differential)	No	No	No	27	24-bit + 8 bit	Yes (2CH)	2D	1080p (1920x1080)	Yes (10 bit/color)	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	No	Yes (2CH)	No	No	External	MIPI-CS12	No	-40 to +105	128pin-LOFP
RAA278843	LCD Display Controllers	Yes (differential)	No	No	No	27	24-bit + 8 bit	Yes (2CH)	2D	1080p (1920x1080)	Yes (10 bit/color)	No	Font / SPI bitmap	No	16 Colors / 16-bit Palette	No	Yes (2CH)	No	No	External	BT.656	No	-40 to +105	128pin-LOFP

Video Decoder

Product Name	Function	# of Inputs	# of Channels/ Device	Resolution	Comb Filter	Bus/Output Interface	Analog Output	Temperature Range	Package Type
TW9990	Video Decoder	4	1	D1	2D	BT.656, BT.601	No	-40 to +105	32pin-WFOFN
TW9992	Video Decoder	8	1	D1	2D	MIPI-CS12 v1.1	No	-40 to +105	32pin-WFOFN
ISL79987	Video Decoder	8	4	D1	2D	MIPI-CS12 v1.1	No	-40 to +105	48pin-QFN
ISL79988	Video Decoder	8	4	D1	2D	BT.656	No	-40 to +105	48pin-QFN

Automotive High-Definition Link (AHL)

Product Name	Function	# of Channels/ Device	Input	Output	Resolution	Temperature Range	Package
RAA279971	AHL Video Encoder	1	MIPI-CS12 BT.656 DVP	AHL HD CVBS	720p/60 1080p/30 (max)	-40 to +105	32pin-SCQFN
RAA279972	AHL Video Decoder	1	AHL HD CVBS	MIPI-CS12 BT.656 DVP	720p/60 1080p/30 (max)	-40 to +105	48pin-SCQFN

Laser Driver

Product Name	Function	Supply Voltage	Rise/Fall Time	# of Channels	Pixel Frequency	Output Current	Digital Interfaces	Temp. Range	Package
ISL78365	quad channel laser driver for HUD w. speckle reduction	3.3V	1.5 ns	4	150 MHz	750 mA	10 Bit video interface and SPI	-40 to +125°C	40 Ld WFOFN

OPTOCOUPLER

High-Speed Communication (Digital)

Product Name	Function	Package	Creepage Distance [mm]	Isolation Voltage [kVrms]	Supply Voltage [V]	Temp. Range [°C]	Threshold Input Current I _{TH} Max [mA]	Propagation Delay Time t _{PHZ} /t _{LH} max [ns]	Pulse Width Distortion PWD max [µs]	Common Mode Rejection CMRR min [kV/µs]	Output Type	Logic
RV1SS1940	1Mbps High speed optocoupler	SO-5	4.2	3.75	4.5 to 20	-40 to 135	3.5	700	500	15	Open Collector	Active Low

Transistor Output

Product Name	Function	Package	Creepage Distance [mm]	Isolation Voltage [kVrms]	Collector to Emitter Voltage V _{CE0} [V]	Temp. Range [°C]	Current Transfer Ratio CTR [%]	Turn-on Time t _{on} Max [µs]	Turn-off Time t _{off} Max [µs]
RV1SZ7520	Single transistor output optocoupler	SO-4	4.2	3.75	40	-40 to 135	200 to 850	100	300

GENERAL INFORMATION



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