

Product Scout Automotive

PowerMOSFETs

Series	V _{GS} [V]	R _{DS(on)} [mΩ]		I _{D(on)} [A]	P _D @ T _C = 25°C [W]	R _{th(j-c)} [°C/W]	C _{oss} typ. [nC]	C _{is} typ. [pF]	Package	Part Number
		V _{GS} = 10.0V	V _{GS} = 4.5V							
N-Channel	ANL2	1.05	-	180	348	0.43	200	11500	TO-263-7p	NP180N04TUK
		1.4	-	110	348	0.43	200	11500	TO-263ZP	NP110N04PUK
		1.5	-	160	250	0.60	130	7400	TO-263-7p	NP160N04TUK
		1.75	-	110	250	0.60	130	7400	TO-263ZP	NP109N04PUK
		2.3	-	100	176	0.85	84	4700	TO-263ZP	NP100N04PUK
		2.8	-	90	147	1.02	68	3800	TO-252ZP	NP90N04VUK
		2.85	-	90	176	0.85	84	4700	TO-220M	NP90N04MUK
		2.9	-	90	176	0.85	84	4700	TO-262N	NP90N04NUK
		2.95	-	90	147	1.02	68	3800	TO-263ZP	NP89N04PUK
		3.3	-	90	147	1.02	68	3800	TO-220M	NP89N04MUK
		3.3	-	90	147	1.02	68	3800	TO-262N	NP89N04NUK
		3.3	-	75	138	1.09	61	3440	HSO _N -8	NP75N04YUK
		3.85	-	60	105	1.43	42	2350	TO-252ZP	NP60N04VUK
		4.3	-	60	105	1.43	42	2350	TO-220M	NP60N04MUK
		4.3	-	60	105	1.43	42	2350	TO-262N	NP60N04NUK
		4.8	-	50	97	1.55	38	2160	HSO _N -8	NP50N04YUK
		1.4	-	180	348	0.43	200	11500	TO-263-7p	NP180N055TUK
		1.75	-	110	348	0.43	200	11500	TO-263ZP	NP110N055PUK
		2.1	-	160	250	0.60	130	7400	TO-263-7p	NP160N055TUK
		2.2	-	110	250	0.60	130	7400	TO-263ZP	NP109N055PUK
		3.25	-	100	176	0.85	84	4700	TO-263ZP	NP100N055PUK
		3.8	-	90	176	0.85	84	4700	TO-220M	NP90N055MUK
		3.8	-	90	176	0.85	84	4700	TO-262N	NP90N055NUK
		3.85	-	90	147	1.02	68	3800	TO-252ZP	NP90N055VUK
		4.0	-	90	147	1.02	68	3800	TO-263ZP	NP89N055PUK
		4.4	-	90	147	1.02	68	3800	TO-220M	NP89N055MUK
		4.4	-	90	147	1.02	68	3800	TO-262N	NP89N055NUK
		4.5	-	75	138	1.09	61	3440	HSO _N -8	NP75N055YUK
		5.5	-	60	105	1.43	42	2350	TO-252ZP	NP60N055VUK
		6.0	-	60	105	1.43	42	2350	TO-220M	NP60N055MUK
		6.0	-	60	105	1.43	42	2350	TO-262N	NP60N055NUK
		6.7	-	35	97	1.55	38	2160	HSO _N -8	NP35N055YUK
		1.5	-	180	288	0.43	150	9500	TO-263-7p	NP180N04TUJ
		1.8	-	110	288	0.52	150	9500	TO-263ZP	NP110N04PUJ
		2.0	-	160	220	0.60	115	6900	TO-263-7p	NP160N04TUJ
		2.3	-	110	220	0.68	120	6900	TO-263ZP	NP109N04PUJ
		3.0	-	100	227	0.66	107	5900	TO-262N	NP100N04NUJ
		2.1	-	180	288	0.52	150	9500	TO-263-7p	NP180N055TUJ
		2.4	-	110	288	0.52	150	9500	TO-263ZP	NP110N055PUJ
		3.0	-	160	220	0.60	115	6900	TO-263-7p	NP160N055TUJ
	3.2	-	110	220	0.68	120	6900	TO-263ZP	NP109N055PUJ	
	1.5	-	110	288	0.52	253	16400	TO-263ZP	NP110N03PUG	
	2.4	-	88	200	0.75	165	9000	TO-263ZK	NP88N03KUG	
	2.4	3.9	88	200	0.75	165	9000	TO-263ZK	NP88N03KDG	
	2.8	-	82	143	1.05	106	6050	TO-263ZP	NP82N03PUG	
	3.2	8.0	90	105	1.43	90	5000	TO-252ZP	NP90N03VUG	
	3.2	-	90	105	1.43	90	5000	TO-252ZP	NP90N03VHG	
	3.2	-	90	105	1.43	90	5000	TO-252ZP	NP90N03VUG	
	4.8	-	60	88	1.70	62	3500	TO-263ZK	NP60N03KUG	
	5.0	-	55	77	1.95	62	3500	TO-252ZK	NP55N03SUG	
	1.5	-	180	288	0.52	260	17100	TO-263-7p	NP180N04TUG	
	1.8	-	160	250	0.60	230	13500	TO-263-7p	NP161N04TUG	
	1.8	3.2	110	288	0.52	230	14500	TO-263ZP	NP110N04PDG	
	1.8	-	110	288	0.52	260	17100	TO-263ZP	NP110N04PUG	
	2.0	5.4	160	220	0.68	180	10500	TO-263-7p	NP160N04TDG	
	2.0	-	160	220	0.68	178	10500	TO-263-7p	NP160N04TUG	
	2.3	-	110	220	0.68	180	11500	TO-263ZP	NP109N04PUG	
	2.9	-	88	200	0.75	165	10000	TO-263ZK	NP88N04KUG	
	3.0	-	90	217	0.69	182	11200	TO-220M	NP90N04MUG	
	3.4	-	88	200	0.75	171	9510	TO-262N	NP88N04NUG	
	3.5	8.0	82	143	1.05	100	6000	TO-263ZP	NP82N04PDG	
	3.5	-	82	143	1.05	106	6500	TO-263ZP	NP82N04PUG	
	4.0	8.6	90	105	1.43	90	4900	TO-252ZP	NP90N04VUG	
	4.0	8.6	90	105	1.43	90	4900	TO-252ZP	NP90N04VDG	
	4.0	-	90	105	1.43	90	5000	TO-252ZP	NP90N04VUG	
	4.2	-	82	143	1.05	106	6500	TO-220M	NP82N04MUG	
	4.2	-	82	143	1.05	106	6500	TO-262N	NP82N04NUG	
	4.2	8.5	82	143	1.05	100	6000	TO-220M	NP82N04MLG	
	4.2	8.5	82	143	1.05	100	6000	TO-262N	NP82N04NLG	
	4.2	8.5	82	143	1.05	100	6000	TO-220M	NP82N04MDG	
	4.2	8.5	82	143	1.05	100	6000	TO-262N	NP82N04NDG	
	4.5	-	80	115	1.30	90	4900	TO-263ZP	NP80N04PLG	
	4.5	-	80	115	1.30	90	4900	TO-263ZP	NP80N04PUG	
	4.5	8.7	80	115	1.30	90	4900	TO-263ZP	NP80N04PDG	
	4.8	-	80	115	1.30	90	4900	TO-262N	NP80N04NUG	
	4.8	9.0	80	115	1.30	90	4900	TO-220M	NP80N04MLG	
	4.8	9.0	80	115	1.30	90	4900	TO-262N	NP80N04NLG	
	4.8	9.0	80	115	1.30	90	4900	TO-220M	NP80N04MDG	
	4.8	9.0	80	115	1.30	90	4900	TO-262N	NP80N04NDG	
	5.0	-	70	115	1.30	90	4900	TO-220M	NP70N04MUG	
	4.8	-	75	138	1.09	77	4300	HSO _N -8	NP75N04YUG	
	5.5	-	75	120	1.25	64	3620	HSO _N -8	NP74N04YUG	
	6.1	-	60	88	1.71	63	3400	TO-263ZK	NP60N04KUG	
	6.3	-	60	88	1.70	60	3200	TO-220M	NP60N04MUG	
	6.5	-	55	77	1.95	63	3400	TO-252ZK	NP55N04SUG	
	6.5	15.0	55	77	1.95	57	2700	TO-252ZK	NP55N04SLG	
	9.7	15.0	35	77	1.95	36	1900	HSO _N -8	NP35N04YLG	
	10.0	-	35	77	1.95	34	1900	HSO _N -8	NP35N04YUG	
	25.0	-	16	36	4.20	7	315	HSO _N -8	NP16N04YUG	
	2.4	-	110	288	0.52	251	17100	TO-263ZP	NP110N055PUG	
	3.9	-	88	200	0.75	166	9600	TO-263ZK	NP88N055KUG	
	5.2	-	82	143	1.05	106	6400	TO-263ZP	NP82N055PUG	
	6.0	10.5	90	105	1.43	93	4900	TO-252ZP	NP90N055VDG	
	6.0	-	90	105	1.43	90	5000	TO-252ZP	NP90N055VUG	
	6.0	-	82	143	1.05	105	6400	TO-220M	NP82N055MUG	
	6.0	-	82	143	1.05	105	6400	TO-262N	NP82N055NUG	
	6.6	10.9	80	115	1.30	90	4600	TO-263ZP	NP80N055PDG	
	6.9	11.2	80	115	1.30	90	4600	TO-220M	NP80N055MDG	
	6.9	11.2	80	115	1.30	93	4900	TO-262N	NP80N055NDG	
	9.4	-	60	88	1.70	61	3700	TO-263ZK	NP60N055KUG	
	9.5	12.0	55	77	1.95	64	3200	TO-252ZK	NP55N055SDG	
	10.0	-	55	77	1.95	60	3500	TO-252ZK	NP55N055SUG	
	14.0	-	52	56	2.68	38	2100	TO-252ZK	NP52N055SUG	
	6.7	8.5	82	143	1.05	106	5700	TO-263ZP	NP82N06PLG	
	6.7	8.5	82	143	1.05	106	5700	TO-263ZP	NP82N06PDG	
	7.4	9.7	82	143	1.05	106	5700	TO-220M	NP82N06MLG	
	7.4	9.7	82	143	1.05	106	5700	TO-262N	NP82N06NLG	
	7.8	12.5	90	105	1.43	95	5000	TO-252ZP	NP90N06VUG	
	8.3	13.0	80	115	1.30	85	4600	TO-263ZP	NP80N06PLG	
	8.6	13.3	80	115	1.30	85	4600	TO-220M	NP80N06MLG	
	8.6	13.3	80	115	1.30	85	4600	TO-262N	NP80N06NLG	
	14.0	20.0*	33	97	1.55	52	2600	HSO _N -8	NP33N06YDG	
	17.5	25.0	52	56	2.68	39	2100	TO-252ZK	NP52N06SLG	
	27.0	37.0*	23	60	2.50	27	1200	HSO _N -8	NP23N06YDG	
	28.0	32.0	33	88	1.70	30	1500	HSO _N -8	NP33N075YDF	
	15.0	-	82	150	1.00	64	2900	TO-263ZP	NP82N10PUF	
	20.0	-	70	120	1.25	50	2500	TO-263ZK	NP70N10KUF	
	25.0	36.0	40	120	1.25	47	2100	HSO _N -8	NP40N10YDF	
	26.0	37.0	40	120	1.25	47	2100	TO-252ZP	NP40N10VDF	
	27.0	38.0	40	120	1.25	47	2100	TO-263ZP	NP40N10PDF	
	55.0	68.0*	20	73	2.06	23	1100	HSO _N -8	NP20N10YDF	
	7.0	11.0	80	120	1.25	48	2600	TO-263ZK	NP80N03KLE	
	7.0	11.0	80	120	1.25	48	2600	TO-263ZK	NP80N03KDE	
	7.0	11.0	80	120	1.25	48	2600	TO-220M	NP80N03MLE	
	7.0	11.0	80	120	1.25	48	2600	TO-262N	NP80N03MDE	
	7.0	11.0	80	120	1.25	48	2600	TO-262N	NP80N03NDE	
	4.3	-	88	288	0.52	120	7300	TO-263ZK	NP88N04KHE	
	4.3	-	88	288	0.52	120	7300	TO-220M	NP88N04MHE	
	4.3	-	88	288	0.52	120	7300	TO-262N	NP88N04NHE	
	4.4	-	86	230	0.65	110	5900	TO-263ZK	NP86N04KHE	
	4.4	-	86	230	0.65	110	5900	TO-220M	NP86N04MHE	
	4.4	-	86	230	0.65	110	5900	TO-262N	NP86N04NHE	
	5.2	-	84	200	0.75	87	4410	TO-263ZK	NP84N04KHE	
	5.2	-	84	200	0.75	87	4410	TO-220M	NP84N04MHE	
	8.0	-	80	120	1.25	40	2200	TO-263ZK	NP80N04KHE	
	8.0	-	80	120	1.25	40	2200	TO-220M	NP80N04MHE	
	8.0	-	80	120	1.25	40	2200	TO-262N	NP80N04NHE	
	5.2	6.8	88	288	0.52	160	9700	TO-263ZK	NP88N055KLE	
	5.2	6.8	88	288	0.52	160	9700	TO-220M	NP88N055MLE	
	5.2	6.8	88	288	0.52	1600	9700	TO-262N	NP88N055NLE	
	5.3	-	88	288	0.52	130	7600	TO-263ZK	NP88N055KHE	
	5.3	-	88	288	0.52	130	7600	TO-220M	NP88N055MHE	
	5.3	-	88							

Automotive Body Solutions

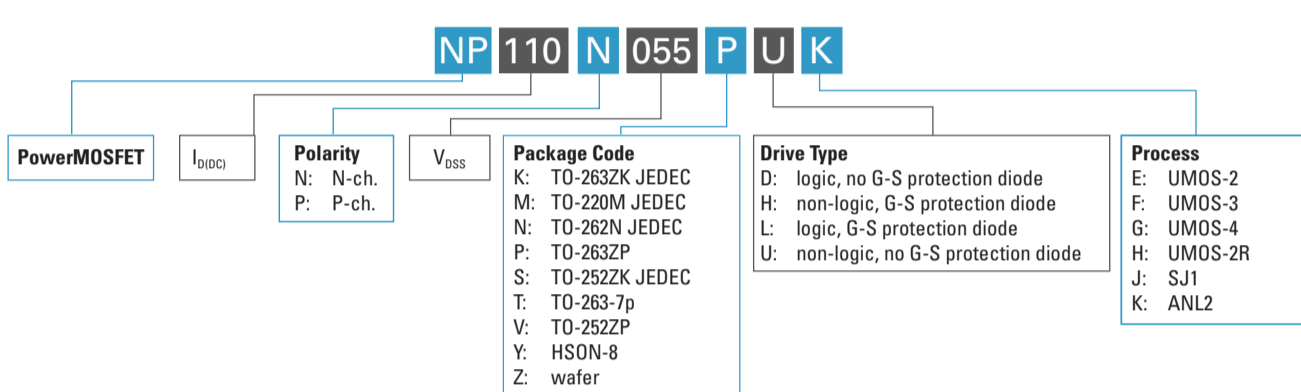
- High-side drivers designed for car lighting, fitting all types of grounded load
- Overcurrent and overtemperature protected

Product Name	Package	Channels	Channel Type	Supply Voltage [V]	$R_{DS(on)}$ [mΩ]	Current Sense	Sense Ratio typ.	Diagnostic	Overtemperature Protection	Overcurrent Protection	Control
1st Generation											
UPD166009	TO-252-5p	1	N	6.0 - 18.0	10	✓	10000	✓	autorestart	latch	current
UPD166010	TO-252-5p										
UPD166020	TO-252-5p										
UPD166021	TO-252-5p										
UPD166017	TO-252-5p										
UPD166019	TO-252-5p	P			6		18800		autorestart		voltage (12.0 V)
UPD166019	TO-252-5p				19	-	n/a				
2nd Generation:											
NHS010A	TO-252-7p	1	N	4.5 - 28.0	10	✓	5000	✓	autorestart	latch and current/power limitation	voltage (3.3 V - 5.0 V)
NHS012A	TO-252-7p				12						
NHS012B	MO-226B-12p				16						
NHD012C	HSSOP-24				25						
NHS016B	MO-226B-12p				50						
NHD016C	HSSOP-24				90						
NHS025B	MO-226B-12p										
NHD025B	MO-226B-12p										
NHS050D	MO-272-12p										
NHD050B	MO-226B-12p										
NHQ050C	HSSOP-24	2									
NHS090D	MO-272-12p	4									
NHD090B	MO-226B-12p										
NHD090D	MO-272-12p										
NHQ090C	HSSOP-24										

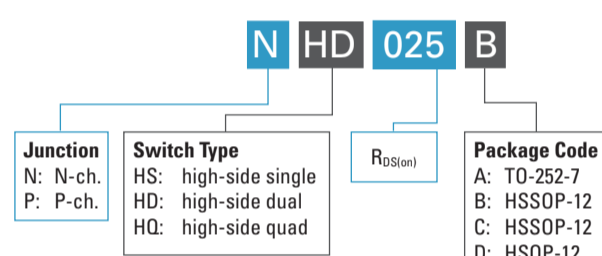
Notes:
 All devices are qualified according to AEC-Q100 and AEC-Q100-012 flow.
 All devices are RoHS compliant.

General Information

Part numbering system for NP-Series PowerMOSFETs



Part numbering system of 2nd generation Intelligent Power Devices



Package Drawings

Table with columns: Series, Nickname/Group, Part number, Flash size [M], RAM [K], Data flash [K], Core, CPU, I/O lines, CS/JART (MHz), CAN, I2C, External bus, Other interfaces, Timer channels, PWMs, Clock speed, Internal oscillator(s), Subclock, A/D converter/D/A converter, Supply voltage, Pin, Packages, T_max [°C], Other features.

Other features: BUR Backup RAM, DRO Direct RAM Output, LCD LCD controller/driver, POC Power-On Clear, SRC Sample Rate Converter, CMP Comparator, DVS Battery Voltage Supervisor, LTR LIN Transceiver, RTC Real-Time Clock, SMC Stepper motor controller, DMA Direct memory access, GFS Graphics engine, I2S I2S interface, LVI Low-voltage indicator, MCT Motor controller timer, MLI Motor multi timer, SMD System management device, DRI Direct RAM input access, GFS Graphics engine, I2S I2S interface, LVI Low-voltage indicator, MCT Motor controller timer, MLI Motor multi timer, SMD System management device, XIP Execute in Place from serial flash

Series	Nickname/Group	Part number	Flash size [B]	RAM [B]	Data flash [B]	Core	FPU	I/O lines	CS/JUART (LIN)	CAN	I2C	External bus	Other interfaces	Timer channels [8-/16-/32-bit]	PWMs	Clock speed [MHz]	Internal oscillator(s)	Subclock [32 kHz]	A/D converter/D/A converter	Supply voltage V	Pins	Packages	T _{max} [°C]	Other features
S Series	V850E2/SJG4-H	μPD70F4013	1 M	96 K	32 K	V850E2	✓	56	4/(5/5)	1	4	✓	4 I ² S, 2 PCM, MLB, IEBUS	-/16/18	18	160	240 kHz & 8 MHz	✓	4 x 10-bit/-	3.0..3.6	100	LQFP	85, 105	BUR, SPF, DMA, RTC, ENC, POC
		μPD70F4014	1.5 M	128 K	32 K	V850E2	✓	98	5/(5/5)	2	4	✓	4 I ² S, 2 PCM, MLB, IEBUS	-/16/18	160	240 kHz & 8 MHz	✓	14 x 10-bit/-	3.0..3.6	144	LQFP	85, 105	BUR, SPF, DMA, RTC, ENC, POC	
		μPD70F4017	1.5 M	128 K	32 K	V850E2	✓	127	5/(5/5)	2	4	✓	6 I ² S, 2 PCM, MLB, IEBUS, MII	-/32/4	33	160	240 kHz & 8 MHz	✓	16 x 10-bit/-	3.0..3.6	176	LQFP	85, 105	BUR, SPF, DMA, RTC, ENC, POC
SH-2A	SH726A	RSS726A0	-	-	-	SH-2A	✓	57	3/(5/0)	2	-	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	5	216	-	✓	6 x 10-bit/-	3.0..3.6	120	PLQP0120KB-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS726A1	1.25 M	-	-	SH-2A	✓	57	3/(5/0)	2	4	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	5	216	-	✓	6 x 10-bit/-	3.0..3.6	120	PLQP0120LA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS726A2	-	-	-	SH-2A	✓	57	3/(5/0)	2	-	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	5	216	-	✓	6 x 10-bit/-	3.0..3.6	120	PLQP0120LA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS726A3	-	-	-	SH-2A	✓	57	3/(5/0)	2	-	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	5	216	-	✓	6 x 10-bit/-	3.0..3.6	120	PLQP0120LA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS726B0	-	1.25 M	-	SH-2A	✓	74	4/(5/0)	-	4	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	5	216	-	✓	8 x 10-bit/-	3.0..3.6	144	PLQP144KA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS726B1	-	1.5 M	-	SH-2A	✓	80	1/(5/0)	-	3	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	7	144	-	✓	6 x 10-bit/-	3.0..3.6	144	PLQP0144KA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS72660	-	1.5 M	-	SH-2A	✓	80	1/(5/0)	-	2	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	7	144	-	✓	6 x 10-bit/-	3.0..3.6	144	PLQP0144KA-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS72661	-	1.5 M	-	SH-2A	✓	104	2/(8/0)	-	3	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	7	144	-	✓	6 x 10-bit/-	3.0..3.6	176	PLQP0176KB-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
		RSS72671	-	2.5 M	-	SH-2A	✓	111	4/(5/0)	-	3	✓	4 I ² S, MMC, SD, SPDIF, 2 SRC, USB FS	-/7/-	7	266	-	✓	6 x 10-bit/-	3.0..3.6	208	PLQP0208KB-A	85	CDROM dec, DMA, RTC, SRC, WDT, XIP
R-CAR	R-CAR L1	tbd	-	-	-	Cortex A9	✓	tbd	3/(8/0)	2	4	✓	Display Unit, 16-bit DDR3, 8 I ² S, MLC, 3 SD, 2 USB HS	-/7/-	4	400	-	-	2 x 12-bit/-	3.0..3.6	429	FPBGA (18x18 mm ² , 0.8 mm p.p.)	85	DMA, SGX531
		μPD35004	-	128 K	-	Cortex A9	✓	tbd	3/(8/0)	2	4	✓	16-bit DDR2/DDR3, Display Unit, Ethernet MAC, 8 I ² S, MLC, 3 SD, 2 USB HS	-/7/-	4	533	-	-	2 x 12-bit/-	3.0..3.6	429	FPBGA (18x18 mm ² , 0.8 mm p.p.)	85	DMA, GPS, SGX531, video dec
		R8A7780	-	512 K	-	SH-4A	✓	155	3/(8/0)	2	4	✓	32-bit DDR2/DDR3, Display Unit, Ethernet MAC, 9 I ² S, MLC, MLC, 3 SD, 2 USB HS	-/7/-	7	800	-	-	3.0..3.6	496	FPBGA (21x21 mm ² , 0.8 mm p.p.)	85	DMA, GPS, Media Engine, secure/crypt engine, SGX540, SRC	
		R8A7781	-	512 K	-	Cortex A9	✓	155	3/(8/0)	2	4	✓	32-bit DDR2/DDR3, Display Unit, Ethernet MAC, 9 I ² S, MLC, MLC, 3 SD, 2 USB HS	-/7/-	7	800	-	-	3.0..3.6	496	FPBGA (21x21 mm ² , 0.8 mm p.p.)	85	DMA, GPS, Media Engine, secure/crypt engine, SGX540, SRC	
		R8A7790	-	768 K	-	4 x Cortex A9	✓	201	3/(8/0)	2	4	✓	2 x 32-bit DDR3, Display Unit, Ethernet MAC, 10 I ² S, MLC, MLC, 4 SD, 3 USB HS	-/7/-	7	1000	-	-	3.0..3.6	832	FPBGA (27x27 mm ² , 0.8 mm p.p.)	85	DMA, GPS, Media Engine, secure/crypt engine, SGX543MP2, SRC	

Other features: BUR: Backup RAM BV5: Battery Voltage Supervisor CMP: Comparator DIV: Hardware divider DMA: Direct memory access DRI: Direct RAM Input DR0: Direct RAM Output DTC: Data transfer controller ENC: Encoder timer for rotary switch GFX: 2D/3D graphics core GPS: GPS baseband controller IMR: Image renderer LBD: LCD bus interface LTR: LIN Transceiver LVI: Low-voltage indicator MCT: Motor control timer MUL: Hardware multiplier LCD controller/driver LCD bus interface LIN Transceiver Low-voltage indicator Motor control timer Hardware multiplier Power-On Reset Real-time clock Resistor interface Real-Time Clock Stepper motor controller Sound generator System protection function Sample Rate Converter Voltage Regulator 3.3V Voltage Regulator 5.0V Window Watchdog Timer Execute in Place from serial flash

Software Tools

IAR Embedded Workbench (78K, R8C, RL78, V850 & SH)

- 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

Green Hills Multi (V850 & SH)

- 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

High-performance Embedded Workshop

- Integrated development environment for C/C++
- Package includes High-performance Embedded Workshop (HEW), compiler, assembler, linker, simulator and debugger
- Supports ELF/DWARF debugging format
- Different license options: locked to PC, dongled (USB), floating
- Order code depends on license type

AUTOSAR

AUTOSAR R3.x/4.0 MCAL software drivers are available for most 32-bit devices. The Renesas MCAL software drivers can be obtained as a stand alone software package or integrated in a complete basic software stack in cooperation with the leading software vendors. Renesas AUTOSAR software is used in mass production at all major OEMs.

Renesas Graphics Library (RGL)

Renesas provides the RGL (Renesas Graphics Library) as a simple Graphics Processing Unit (GPU) programming interface. It is available for all V850E2/Dx4 devices with a graphics sub-system incl. 2D and 3D drawing engine support.

AppliJet

- Peripheral driver code generator for 78K and RL78 devices
- Based on graphical user interface settings the peripheral driver initialization and API function code will be generated

On-Chip Debugging

E1 On-Chip Debugger (78K, R8C, RL78, V850)

- Supports all 78K, R8C, RL78 and V850 target interfaces (JTAG, UART, N-Wire, Single-Pin etc.)
- Fast in-circuit flash programming
- Supports power supply to target
- Package includes IAR Embedded Workbench (size limited), USB interface cable and 14-pin target cable
- Order code: YR0E00010KCE00-A

E10A-USB On-Chip Debugger (SH)

- Supports two target interfaces:
 - 14-pin for basic on-chip debugging without tracing (H-UDI)
 - 38-pin for advanced debugging including tracing (AUD)
- Fast in-circuit flash programming
- Package includes High-performance Embedded Workshop (HEW), USB interface cable and target cables
- Order codes:
 - HS0005KCU01H (H-UDI only)
 - HS0005KCU02H (H-UDI and AUD)
 - HS0005KCU01H (optional cable to connect the HS0005KCU02H to 38-pin Micror connector)

Exchange Adapter for On-Chip Debugger

- 20-pin Exchange Adapter for E1 Debugger
 - To connect E1 debugger to 20-pin MiniCube connector
 - Order code: YADAPTER-F14T20
- 16-pin Exchange Adapter for E1 Debugger
 - To connect E1 debugger to 16-pin MiniCube connector
 - Order code: QB-F14T16-01
- 14-pin Exchange Adapter for MINICUBE Debugger
 - To connect Minicube debugger to 14-pin E1 connector
 - Order code: YADAPTER-F20T14

In-Circuit Emulation

IECUBE In-Circuit Emulator (V850E2 only)

- For V850E2 devices
- Universal main unit, device-dependent emulation probe
- Package includes
 - IAR Embedded Workbench (size limited)
 - USB cable, power supply
- Order code: QB-V850E2-EE (main unit)

IECUBE In-Circuit Emulator (78K, RL78, V850)

- For 78K, RL78 and V850 devices
- Package includes
 - IAR Embedded Workbench (size limited)
 - USB cable, power supply
- Order code depends on target device

E100 In-Circuit Emulator (R8C)

- For R8C devices
- Universal main unit, device-dependent emulation probe
- Package includes
 - High-performance Embedded Workshop (HEW)
 - USB cable, power supply
- Order code:
 - ROE001000EMU00 (main unit)
 - ROE521300MCU00 (R8C/x emulation probe)

Socket System

Socket System I (78K and V850E2)

Diagram showing connections for target device, emulation probe, and various adapters (QB-EP-01S, QB-EA-T, QB-YQ-T, QB-NQ-T).

Socket System II (V850 only)

Diagram showing connections for target device, emulation probe, and various adapters (QB-EP-01S, QB-EA-S, QB-SA-S, QB-TC-S).

Socket System III (R8C)

Diagram showing connections for target device, emulation probe, and various adapters (QB-EP-01S, QB-EA-S, QB-SA-S, QB-TC-S).

Please visit www.renesas.eu/products/mpmucd for socket references and additional tool information.

3rd Party Emulators

ISYSTEM

- Universal emulator and debugger system:
 - On-chip debugging for 78K, V850 and SuperH
 - In-circuit emulation of 78K, R8C and V850
- For more information visit www.isystem.com

Lauterbach

- Universal debugger system TRACE32®
 - For 78K, RL78 and V850 debugging
 - For SuperH debugging incl. tracing
- For more information visit www.lauterbach.com

Flash Programmers

Flash Programmer PG-FP5

- Supports 78K, R8C, RL78, V850 and SH flash microcontrollers
- For development, prototyping and mass production
- Windows™ and terminal interface
- Host-controlled and stand-alone operation
- 16 MB internal memory for up to 8 program codes incl. source data
- USB2.0 and RS-232 interface
- Self-test function
- Order code: PG-FP5-EE

Renesas Flash Programming Software (RFP) for Microsoft Windows™

- Supports 78K, RL78 and V850 flash microcontrollers
- For development and prototyping
- Works with E1 debugger and direct RS-232/JTAG connection
- Graphical user interface
- Available for free at <http://www.renesas.eu/updates?id=536>

Flash Development Toolkit (FDT) for Microsoft Windows™

- Supports R8C and SH flash microcontrollers
- For development and prototyping
- Works with E1/EBA debugger and direct RS-232/JTAG connection
- Available for free at <http://www.renesas.eu/fdt>

Starter Kits

V850E2/Fx4-L Starter Kit

- Equipped with
 - V850E2/Fx4-L device (μPD70F3580)
 - 2 CAN, 1 LIN interfaces
- E1 debugging and programming interface
 - High brightness LED, RGB LED
- Package includes
 - GHS Multi 90-Day Evaluation License
 - KickStart Edition of IAR EW (64 KB)
 - E1 debugger
- No separate power supply necessary incl. source data
- Order code: Y-ASK-V850E2/Fx4-L

V850E2/Px4 Starter Kit

- Equipped with
 - V850E2/Px4 device (μPD70F3506)
 - FlexRay, 2 CAN, 1 LIN interfaces
- E1 debugging and programming interface
 - LCD module
- Package includes
 - GHS Multi 90-Day Evaluation License
 - KickStart Edition of IAR EW (64 KB)
 - E1 debugger
 - Multi-region 12V power supply
- Order code: YASK-V850E2-Px4

Motor Control Application Board 1

- To be used in combination with the V850E2/Px4 Starter Kit
- Designed to drive 12 V three-phase, permanent magnet synchronous machines (PMSM), such as BLDC and PMAC up to 30 A phase current
- Equipped with
 - Gate driver unit ELMOS 910.87
 - Three-phase inverter
- Supports resolver, hall sensor and encoder (resolver-to-digital converter with SPI output, level shifters for hall sensor and encoder signals)
- Current converter for current measurements
- 2 NTC temperature sensors
- Order code: Y-AB-MCI-V1

Evaluation Boards

RL78/F12 Target Board

- For RL78/F12 evaluation
- Equipped with
 - 48-pin RL78/F12 device (RSF109GEAFB)
 - LIN transceiver circuit
 - One switch, two LEDs, breadboard area
- Board dimensions: 70 mm x 55 mm
- Order code: QB-RSF109GE-TB

R8C3x Application Board

- For R8C3x evaluation
- Equipped with
 - R8C3x device
 - CAN, LIN interface
 - two 7-segment LEDs, switches
 - analogue input, I/O expansion headers
- E1 debug connector
- Board dimensions: 120 mm x 80 mm
- Order code depends on target device

78K0R/Fx3 Target Board

- For 78K0R/Fx3 evaluation
- Equipped with
 - 100-pin 78K0R/Fx3 device (μPD70F1845)
 - CAN, 2 LIN interfaces
 - one switch, two LEDs, breadboard area
 - I/O expansion headers
 - 16-pin debug connector
- Board dimensions: 109 mm x 85 mm
- Order code: QB-78K0R-Fx3-TB

Evaluation Boards

V850E2/Fx4 Application Board

- For the first steps with all V850E2/Dx4(-H) devices
- Perfect for early development of 2D graphics applications
- Must be used in combination with a device specific adapter board containing the MCU
- Equipped with
 - FlexRay, CAN, LIN, MLC interfaces
 - LCD interface, video in, video out
 - various controls
- 20-pin JTAG debug and PG-FP5 connector
- Package dimensions: 300 mm x 205 mm
- Package includes quick-start guide
- Order code: AB-050-Fx4-MB-L-Q-DEV-V2

SH72546 Evaluation Board

- For SH72546 evaluation
- Equipped with
 - SH72546 device (RSF72546RKBG or R5E72546RKBG)
 - 3 CAN, RS232C interface
 - LCD module, switches, LEDs, analogue input
 - I/O expansion headers
- E10A-USB debug connector
- Board dimensions: 180 mm x 150 mm
- Package includes
 - power supply, serial cable (null modem)
 - CD with documentation and information
- Order code: YASKSH72546R-WS (RSF72546RKBG) YASKSH72546RFCC-WS (R5E72546RKBG)

SH745x Development Board

- For SH74504/SH74552 evaluation
- Equipped with
 - SH74504 or SH74552 device
 - 2 FlexRay, 5/4 CAN interfaces
 - RS-232C, UART connector
- switches, LEDs, 2 analogue inputs
- E10A-USB debug connector
- Board dimensions:
 - 200 mm x 150 mm (for SH74504)
 - 180 mm x 120 mm (for SH74552)
- Package includes CD with user's manual and sample software
- Order code:
 - RK474504S000BR#ES (for SH74504)
 - RK474552S000BR#ES (for SH74552)

Evaluation Boards

V850E2/Dx4 Application Board

- For the first steps with all V850E2/Dx4(-H) devices
- Perfect for early development of 2D graphics applications
- Must be used in combination with a device specific adapter board containing the MCU
- Equipped with
 - FlexRay, CAN, LIN, MLC interfaces
 - LCD interface, video in, video out
 - various controls
- 20-pin JTAG debug and PG-FP5 connector
- Package dimensions: 300 mm x 225 mm
- Package includes quick-start guide
- Order code: AB-V850E2-Dx4-MAIN (main board) AB-V850E2-D... (adapter boards)

V850E2/Dx4-3D Application Board

- For evaluation and demonstration of the V850E2/Dx4-3D, especially in regard to its video and graphics capabilities
- Equipped with
 - Ethernet, FlexRay, CAN, MLC, PS and other interfaces
 - 2 x video in (digital), 1 x video in (analogue)
 - 2 x video out (digital)
- 20-pin JTAG debug and PG-FP5 connector
- Board dimensions: 350 mm x 350 mm
- Package includes CD with user's manual, schematic and quick-start guide
- Order code: AB-V850E2-DX4-3D

V850E2/Dx4 Add-On QVGA Board

- For the extension of application boards with a touch-controlled TFT to make graphics project development as easy as possible
- Equipped with
 - 3.5" TFT touch-screen
 - touch-screen connector (10-pin)
 - 30-pin interface
- Package includes quick-start guide
- Board dimensions: 105 mm x 85 mm
- Order code: EB-EXT-QVGA-PT

Evaluation Boards

V850E2/PJ4 Application Board

- For V850E2/Px4 evaluation
- Equipped with
 - socket for V850E2/PJ4 device
 - FlexRay, 3 CAN, 3 LIN interfaces
 - E1 debug connector
- PG-FP5 connector
- Board dimensions: 330 mm x 187 mm
- Package includes user's manual and schematic
- Order code: AB-050-PJ4

SH7269 Development Board

- For SH7268 and SH7269 evaluation
- Equipped with
 - SH7269 device
 - 4 MB NOR and 256 MB NAND flash memory
 - 16 MB serial flash memory
 - 16 MB SDRAM and 16 KB E²PROM
 - RS-232C, UART, USB connector
 - switches, LEDs, I/O expansion headers
 - E10A USB debug connector
- Board dimensions: 148 mm x 148 mm
- Package includes CD with user's manual, schematic and sample software
- Order codes:
 - RK572690000BR (SH7269 CPU board)
 - RK572690000BR (VDC4 Option board)
 - M3A-HS84G01 (Audio Option board)
 - M3A-HS84G02 (Graphics Option board)

SH726B Development Board

- For SH726A and SH726B evaluation
- Equipped with
 - SH726B device
 - 2 x 16 MB serial flash memory
 - 16 MB SDRAM
 - RS-232C, UART, USB, LAN, CAN, MLC interfaces
 - switches, LEDs, I/O expansion headers
 - 2 JTAG debug connectors
- Board dimensions: 180 mm x 150 mm
- Package includes CD with user's manual, schematic and sample software
- Order code: RK572680000BR

R-CAR Development Boards

R-CAR M1A Development Board 'MIAN'

- For R-CAR M1A
- Equipped with:
 - R-CAR M1A device
 - 64 MB flash memory
 - 512 MB DDR3-DRAM
 - RS-232C, UART, USB, SD, LAN, CAN, MLC interfaces
 - HDMI input/output (with HDMI to DVI adapter)
 - switches, LEDs, I/O expansion headers
- 2 JTAG debug connectors
- Board dimensions: 165 mm x 120 mm
- Package includes CD with user's manual and schematic
- Order code: Y-R-CAR-M1A-Board

R-CAR H1 Development Board 'MARZEN'

- For R-CAR H1
- Equipped with:
 - R-CAR H1 device
 - 64 MB flash memory and 1 MB serial flash/E²PROM
 - 2 x 512 MB DDR3-DRAM
 - RS-232C, UART, USB, SD, LAN, SATA, PCI, CAN and MLC interfaces
 - Analog RGB with DSUB 15-pin and/or LVDS flat cable connector
 - switches, LEDs, I/O expansion headers
 - ETM and ETM debug/trace connector

Renesas Europe Homepage



www.renesas.eu

Online technical community



Think it. Build it. Post it.

www.renesasrulz.com

3rd Party network



www.renesas.eu/alliance

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