Product Scout Automotive

Renesas Electronics
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Series	V_{DSS} [V]	$R_{DS(on)}$ [mΩ] typ. V_{GS} = 10.0 V	$R_{DS(on)}$ [mΩ] typ. V_{GS} = 4.5 V	I_{DA} [A]	P_D @T_C = 25°C [W]	$R_{th(ch-c)}$ [°C/W]	Q_{g} typ. [nC]	C_{iss} typ. [pF]	Package	Part Number
ANL2	40	1.05	–	180	348	0.43	200	11500	TO-263-7p	NP180N04TUK
		1.4	–	110	348	0.43	200	11500	TO-263Z	NP110N04PUK
		1.5	–	160	250	0.60	130	7400	TO-263-7p	NP160N04TUK
		1.75	–	110	250	0.60	130	7400	TO-263Z	NP109N04PUK
		2.3	–	100	176	0.85	84	4700	TO-263Z	NP100N04PUK
		2.8	–	90	147	1.02	68	3800	TO-252Z	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-263Z	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	HSON-8	NP75N04YUK
		3.85	–	60	105	1.43	42	2350	TO-252Z	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	HSON-8	NP50N04YUK
	55	1.4	–	180	348	0.43	200	11500	TO-263-7p	NP180N055TUK
		1.75	–	110	348	0.43	200	11500	TO-263Z	NP110N055PUK
		2.1	–	160	250	0.60	130	7400	TO-263-7p	NP160N055TUK
		2.2	–	110	250	0.60	130	7400	TO-263Z	NP109N055PUK
		3.25	–	100	176	0.85	84	4700	TO-263Z	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-252Z	NP90N055VUK
		4.0	–	90	147	1.02	68	3800	TO-263Z	NP90N055PUK
		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	HSON-8	NP75N055YUK
		5.5	–	60	105	1.43	42	2350	TO-252Z	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	HSON-8	NP35N055YUK
SJ1	40	1.5	–	180	288	0.43	150	9500	TO-263-7p	NP180N04TUJ
		1.8	–	110	288	0.52	150	9500	TO-263Z	NP110N04PUJ
		2.0	–	160	220	0.60	115	6900	TO-263-7p	NP160N04TUJ
		2.3	–	110	220	0.68	120	6900	TO-263Z	NP109N04PUJ
		3.0	–	100	227	0.66	107	5900	TO-262N	NP100N04NUJ
	55	2.1	–	180	288	0.52	150	9500	TO-263-7p	NP180N055TUJ
		2.4	–	110	288	0.52	150	9500	TO-263Z	NP110N055PUJ
		3.0	–	160	220	0.60	115	6900	TO-263-7p	NP160N055TUJ
		3.2	–	110	220	0.68	120	6900	TO-263Z	NP109N055PUJ
UMOS-4	30	1.5	–	110	288	0.52	253	16400	TO-263Z	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-263Z	NP82N03PUG
		3.2	8.0	90	105	1.43	90	5000	TO-252Z	NP90N03VLG
		3.2	–	90	105	1.43	90	5000	TO-252Z	NP90N03VHG
		3.2	–	90	105	1.43	90	5000	TO-252Z	NP90N03VUG
		4.8	–	60	88	1.70	62	3500	TO-263ZK	NP60N03KUG
		5.0	–	55	77	1.95	62	3500	TO-252ZK	NP55N03SUG
	40	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-263Z	NP110N04PDG
		2.0	–	110	288	0.52	260	17100	TO-263Z	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-263Z	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-263Z	NP82N04PDG
		3.5	–	82	143	1.05	106	6500	TO-263Z	NP82N04PUG
		4.0	8.6	90	105	1.43	90	4900	TO-252Z	NP90N04VLG
		4.0	8.6	90	105	1.43	90	4900	TO-252Z	NP90N04VDG
		4.0	–	90	105	1.43	90	5000	TO-252Z	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	8.7	80	115	1.30	90	4900	TO-263Z	NP80N04PLG
		4.5	–	80	115	1.30	90	4900	TO-263Z	NP80N04PUG
		4.5	8.7	80	115	1.30	90	4900	TO-263Z	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	–	75	115	1.30	90	4900	TO-220M	NP70N04MUG
		4.8	–	75	138	1.09	77	4300	HSON-8	NP75N04YUG
		5.5	–	75	120	1.25	64	3620	HSON-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	HSON-8	NP35N04YLG
		10.0	–	35	77	1.95	34	1900	HSON-8	NP35N04YUG
		25.0	–	16	36	4.20	7	315	HSON-8	NP16N04YUG
N-Channel	55	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-267N	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
	60	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	NP90N06VLG
		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	HSON-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	HSON-8	NP23N06YDG
UMOS-3	75	28.0	32.0	33	88	1.70	30	1500	HSON-8	NP33N075YDF
	100	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	HSON-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	22	1100	HSON-8	NP20N10YDF
UMOS-2	30	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-220M	NP80N03MDE
		7.0	11.0	80	120	1.25	48	2600	TO-262N	NP80N03NLE
		7.0	11.0	80	120	1.25	48	2600	TO-262N	NP80N03NDE
	40	4.3	–	88	288	0.52	120	7200	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	–	88	230	0.65	110	5900	TO-263ZK	NP86N04KHE
		4.4	–	88	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
		5.2	–	84	200	0.75	87	4410	TO-262N	NP84N04NHE
		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
	55	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	288	0.52	130	7600	TO-262N	NP88N055NHE
		7.0	9.4	84	200	0.75	120	6130	TO-263ZK	NP84N055KLE
		7.0	9.4	84	200	0.75	120	6130	TO-220M	NP84N055MLE
		7.0	9.4	84	200	0.75	120	6130	TO-262N	NP84N055NLE
		7.3	–	84	200	0.75	88	4540	TO-263ZK	NP84N055KHE
		7.3	–	84	200	0.75	88	4540	TO-220M	NP84N055MHE
		7.3	–	84	200	0.75	88	4540	TO-262N	NP84N055NHE
		8.4	12.0	82	163	0.92	80	4400	TO-263ZK	NP82N055KLE
		8.4	12.0	82	163	0.92	80	4400	TO-220M	NP82N055MLE
		8.4	12.0	82	163	0.92	80	4400	TO-262N	NP82N055NLE
		8.6	–	82	163	0.92	65	3500	TO-263ZK	NP82N055KHE
		8.6	–	82	163	0.92	65	3500	TO-220M	NP82N055MHE
		8.6	–	82	163	0.92	65	3500	TO-262N	NP82N055NHE
		11.0	15.0	80	120	1.25	50	2900	TO-263ZK	NP80N055KLE
		11.0	15.0	80	120	1.25	50	2900	TO-220M	NP80N055MLE
		11.0	15.0	80	120	1.25	50	2900	TO-262N	NP80N055NLE
		11.0	–	80	120	1.25	40	2400	TO-263ZK	NP80N055KHE
		11.0	–	80	120	1.25	40	2400	TO-220M	NP80N055MHE
		11.0	–	80	120	1.25	40	2400	TO-262N	NP80N055NHE
		17.0	24.0	48	85	1.76	40	1970	TO-263ZK	NP48N055KLE
		17.0	24.0	48	85	1.76	40	1970	TO-220M	NP48N055MLE
		17.0	24.0	48	85	1.76	40	1970	TO-262N	NP48N055NLE
		17.0	–	48	85	1.76	33	1600	TO-263ZK	NP48N055KHE
		17.0	–	48	85	1.76	33	1600	TO-220M	NP48N055MHE
		17.0	–	48	85	1.76	33	1600	TO-262N	NP48N055NHE
		23.0	32.0	40	66	2.27	27	1300	TO-263ZK	NP40N055KLE
		23.0	32.0	40	66	2.27	27	1300	TO-220M	NP40N055MLE
		23.0	32.0	40	66	2.27	27	1300	TO-262N	NP40N055NLE
		23.0	–	40	66	2.27	23	1070	TO-263ZK	NP40N055KHE
		23.0	–	40	66	2.27	23	1070	TO-220M	NP40N055MHE
		23.0	–	40	66	2.27	23	1070	TO-262N	NP40N055NHE
		13.0	18.0	36	120	1.25	53	2900	TO-263ZK	NP36N055SLE
		14.0	–	36	120	1.25	44	2300	TO-252ZK	NP36N055SHE
		18.0	24.0	34	88	1.70	41	2000	TO-252ZK	NP34N055SLE
		19.0	–	34	88	1.70	30	1600	TO-252ZK	NP34N055SHE
		24.0	33.0	32	66	2.27	27	1300	TO-252ZK	NP32N055SDE
		24.0	33.0	32	66	2.27	27	1300	TO-252ZK	NP32N055SLE
		25.0	–	32	66	2.27	21	1100	TO-252ZK	NP32N055SHE
		37.0	45.0	22	45	3.33	15	730	TO-252ZK	NP22N055SLE
		39.0	–	22	45	3.33	12	590	TO-252ZK	NP22N055SHE
UMOS-2R	75	8.5	–	88	288	0.52	150	8200	TO-263ZK	NP88N075KUE
		8.5	–	88	288	0.52	150	8200	TO-220M	NP88N075MUE
		8.5	–	88	288	0.52	150	8200	TO-267N	NP88N075NUE
		12.5	–	84	200	0.75	100	5600	TO-263ZK	NP84N075KUE
		12.5	–	84	200	0.75	100	5600	TO-220M	NP84N075MUE
		12.5	–	84	200	0.75	100	5600	TO-267N	NP84N075NUE
	100	33.0	39.0	36	120	1.25	72	3500	TO-252ZK	NP36N10SDE
		52.0	59.0	28	88	1.70	49	2200	TO-252ZK	NP28N10SDE
UMOS-4	40	2.9	4.3	100	288	0.52	165	8700	TO-263ZP	NP100N04PDH
		3.1	–	100	288	0.52	110	6800	TO-263ZP	NP100N04PUH
		3.3	4.7	100	288	0.52	165	8700	TO-220M	NP100N04MDH
		3.3	4.7	100	288	0.52	165	8700	TO-262N	NP100N04NDH
		3.4	6.0	90	230	0.65	130	7500	TO-263ZP	NP90N04PDH
		3.5	–	100	288	0.52	110	6800	TO-220M	NP100N04MUH
		3.5	–	100	288	0.52	110	6800	TO-262N	NP100N04NUH
		3.8	–	90	230	0.65	90	5500	TO-263ZP	NP90N04PUH
		3.8	6.4	90	230	0.65	130	7500	TO-220M	NP90N04MDH
		3.8	6.4	90	230	0.65	130	7500	TO-262N	NP90N04NDH
		4.1	–	90	230	0.65	90	5500	TO-220M	NP90N04MUH
		4.1	–	90	230	0.65	90	5500	TO-262N	NP90N04NUH
	55	4.4	6.2	100	288	0.52	170	9500	TO-263ZP	NP100N055PDH
		4.5	–	100	288	0.52	115	7000	TO-263ZP	NP100N055PUH
		4.8	6.6	100	288	0.52	170	9500	TO-220M	NP100N055MDH
		4.8	6.6	100	288	0.52	170	9500	TO-262N	NP100N055NDH
		4.9	–	100	288	0.52	115	7000	TO-220M	NP100N055MUH
		4.9	–	100	288	0.52	115	7000	TO-267N	NP100N055NUH
		5.1	7.6	90	230	0.65	135	7800	TO-263ZP	NP90N055PDH
		5.4	–	90	230	0.65	100	6200	TO-263ZP	NP90N055PUH
		5.5	8.0	90	230	0.65	135	7800	TO-220M	NP90N055MDH
		5.5	8.0	90	230	0.65	135	7800	TO-262N	NP90N055NDH
		5.8	–	90	230	0.65	100	6200	TO-220M	NP90N055MUH
		5.8	–	90	230	0.65	100	6200	TO-262N	NP90N055NUH
	-30	6.2	10.2*	75	138	1.09	94	3200	HSON-8	NP75P03YDG
		9.0	15.0	50	102	1.47	64	2300	HSON-8	NP50P03YDG
	-40	3.5	5.1	100	200	0.75	320	15100	TO-263ZP	NP100P04PDG
		3.7	5.1	100	200	0.75	320	15100	TO-263ZP	NP100P04PLG
		5.3	8.0	83	150	1.00	200	9820	TO-263ZP	NP83P04PDG
		9.6	15.0	50	90	1.78	100	5100	TO-252ZK	NP50P04SDG
		10.0	15.0	50	90	1.67	100	5100	TO-263ZK	NP50P04KDG
		10.7	13.0*	75	138	1.09	91	3200	HSON-8	NP75P04YLG
		17.0	23.5	36	56	2.68	55	2800	TO-263ZK	NP36P04KDG
		17.0	23.5	36	56	2.68	55	2800	TO-252ZK	NP36P04SDG
		25.0	38.0	20	38	3.90	34	1650	TO-252ZK	NP20P04SLG
		40.0	60.0	15	30	5.00	23	1100	TO-252ZK	NP15P04SLG
	-60	6.0	7.8	100	200	0.75	300	15000	TO-263ZP	NP100P06PLG
		6.0	7.8	100	200	0.75	300	15000	TO-263ZP	NP100P06PDG
		8.8	12.0	83	150	1.00	190	10100	TO-263ZP	NP83P06PDG
		16.5	23.5	50	90	1.78	100	5000	TO-252ZK	NP50P06SDG
		17.0	23.0	50	90	1.67	95	5000	TO-263ZK	NP50P06KDG
		29.5	37.5	36	56	2.68	54	3100	TO-263ZK	NP36P06KDG
		30.0	40.0	36	56	2.68	52	3200	TO-252ZK	NP36P06SLG
		48.0	64.0	20	45	3.90	34	1700	TO-252ZK	NP20P06SLG
		49.0	64.0	20	67	2.24	34	1600	HSON-8	NP20P06YLG
		70.0	95.0	15	30	5.00	23	1100	TO-252ZK	NP15P06SLG

Notes: All devices are qualified according to AEC-Q101. All devices are RoHS compliant. 200 °C tested for UMOS-2R devices for 250 hours in addition to 175 °C rating. *: @ VGS = 5 V

Intelligent Power Devices

Edition March 2012

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								latch		
UPD166021	TO-252-5p				6		18800		autorestart		
UPD166017	TO-252-5p		P		19	-	n/a				voltage (12.0 V)
UPD166019	TO-252-5p										
2nd Generation:											
NHS010A	TO-252-7p	1	N	4.5 - 28.0	10	√	7500	√	autorestart	latch and current/power limitation	voltage (3.3 V - 5.0 V)
NHS012A	TO-252-7p				12		6250				
NHS012B	MO-226B-12p										
NHD012C	HSSOP-24	2									
NHS016B	MO-226B-12p	1			16		5800				
NHD016C	HSSOP-24	2									
NHS025B	MO-226B-12p	1			25		5000				
NHD025B	MO-226B-12p	2									
NHS050D	MO-272-12p	1			50		3400				
NHD050B	MO-226B-12p	2									
NHQ050C	HSSOP-24	4									
NHS090D	MO-272-12p	1			90		1400				
NHD090B	MO-226B-12p	2									
NHD090D	MO-272-12p										
NHQ090C	HSSOP-24	4									

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

NP 110 N 055 P U K

PowerMOSFET

I_{DSS}

Polarity
N: N-ch.
P: P-ch.

V_{BSS}

Package Code
K: TO-263ZK JEDEC
M: TO-220M JEDEC
N: TO-262N JEDEC
P: TO-263ZP
S: TO-252ZK JEDEC
T: TO-263-7p
V: TO-252ZP
Y: HSON-8
Z: wafer

Drive Type
D: logic, no G-S protection diode
H: non-logic, G-S protection diode
L: logic, G-S protection diode
U: non-logic, no G-S protection diode

Process
E: UMOS-2
F: UMOS-3
G: UMOS-4
H: UMOS-2R
J: SJ1
K: ANL2

Part numbering system of 2nd generation Intelligent Power Devices

N HD 025 B

Junction
N: N-ch.
P: P-ch.

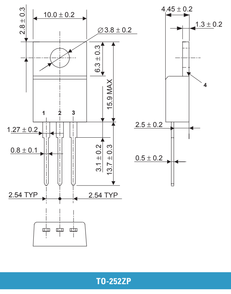
Switch Type
HS: high-side single
HD: high-side dual
HQ: high-side quad

$R_{DS(on)}$

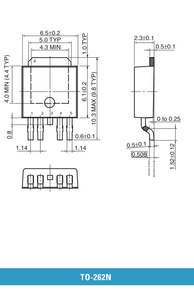
Package Code
A: TO-252-7
B: HSSOP-12
C: HSSOP-12
D: HSOP-12

Package Drawings

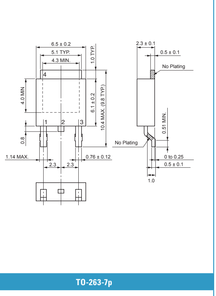
TO-220M



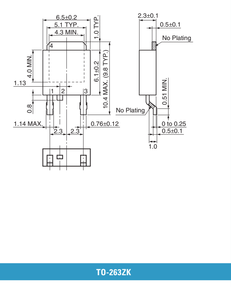
TO-252-5p



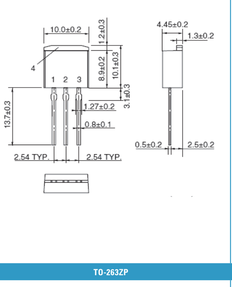
TO-252ZK



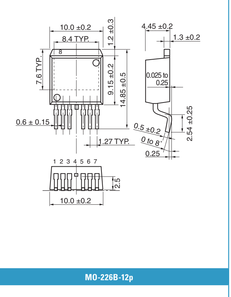
TO-252ZP



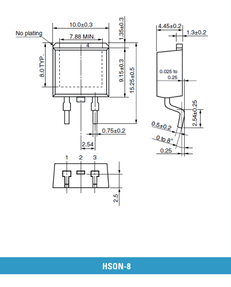
TO-262N



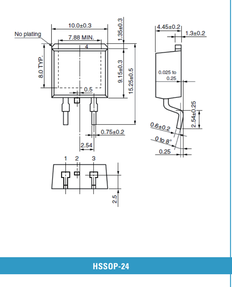
TO-263-7p



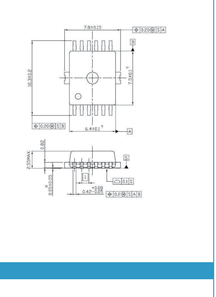
TO-263ZK



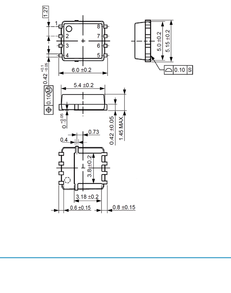
TO-263ZP



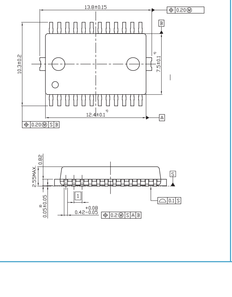
MO-226B-12p



HSON-8



HSSOP-24



Automotive Microcontrollers

Edition March 2012

Series	Nickname/ Group	Part number	Flash size [B]	RAM [B]	Data flash [B]	Core	FPU	I/O lines	CSI/UART (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 (I/O) [V]	Pins	Packages	$T_{a,max}$ [°C]	Other features
R8C/3x	R8C/32G	R5F21324G	16 K	1.5 K	4 K	R8C	–	16	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	4 x 10-bit/-	2.7...5.5	20	PLSP0020JB-A	85, 125	DTC, MCT, CMP
		R5F21326G	32 K	2.5 K																				
	R8C/32H	R5F21324H	16 K	1.5 K	–	R8C	–	16	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	4 x 10-bit/-	2.7...5.5	20	PLSP0020JB-A	85, 125	DTC, MCT, CMP
		R5F21326H	32 K	2.5 K																				
	R8C/33G	R5F21334G	16 K	1.5 K	4 K	R8C	–	28	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/ 2 x 8-bit	2.7...5.5	32	PLQP0032GB-A	85, 125	DTC, MCT, CMP
		R5F21336G	32 K	2.5 K																				
	R8C/33H	R5F21334H	16 K	1.5 K	–	R8C	–	28	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/ 2 x 8-bit	2.7...5.5	32	PLQP0032GB-A	85, 125	DTC, MCT, CMP
		R5F21336H	32 K	2.5 K																				
	R8C/34P	R5F21344P	16 K	1.5 K	4 K	R8C	–	44	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/ 2 x 8-bit	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT, CMP
		R5F21346P	32 K	2.5 K																				
	R8C/34R	R5F21344R	16 K	1.5 K	–	R8C	–	44	3/2(1)	–	1	–	IEBus	2/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/ 2 x 8-bit	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT, CMP
		R5F21346R	32 K	2.5 K																				
	R8C/34W	R5F21346W	32 K	2.5 K	4 K	R8C	–	44	3/2(1)	1	1	–	IEBus	3/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/-	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT
		R5F21347W	48 K	4 K																				
		R5F21348W	64 K	6 K																				
		R5F2134AW	96 K	8 K																				
		R5F2134CW	128 K	10 K																				
	R8C/34X	R5F21346X	32 K	2.5 K	–	R8C	–	44	3/2(1)	1	1	–	IEBus	3/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/-	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT
		R5F21347X	48 K	4 K																				
		R5F21348X	64 K	6 K																				
		R5F2134AX	96 K	8 K																				
		R5F2134CX	128 K	10 K																				
	R8C/34Y	R5F21346Y	32 K	2.5 K	4 K	R8C	–	44	3/2(1)	–	1	–	IEBus	3/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/-	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT
		R5F21347Y	48 K	4 K																				
		R5F21348Y	64 K	6 K																				
		R5F2134AY	96 K	8 K																				
		R5F2134CY	128 K	10 K																				
	R8C/34Z	R5F21346Z	32 K	2.5 K	–	R8C	–	44	3/2(1)	–	1	–	IEBus	3/3/–	10	20	128 kHz & 40 MHz	–	12 x 10-bit/-	2.7...5.5	48	PLQP0048KB-A	85, 125	DTC, MCT
		R5F21347Z	48 K	4 K																				
		R5F21348Z	64 K	6 K																				
		R5F2134AZ	96 K	8 K																				
		R5F2134CZ	128 K	10 K																				
	R8C/36W	R5F21368W	64 K	6 K	4 K	R8C	–	60	4/3(2)	1	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	16 x 10-bit/-	2.7...5.5	64	PLQP0064KB-A	85, 125	DTC, MCT
		R5F2136AW	96 K	8 K																				
		R5F2136CW	128 K	10 K																				
	R8C/36X	R5F21368X	64 K	6 K	–	R8C	–	60	4/3(2)	1	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	16 x 10-bit/-	2.7...5.5	64	PLQP0064KB-A	85, 125	DTC, MCT
		R5F2136AX	96 K	8 K																				
		R5F2136CX	128 K	10 K																				
	R8C/36Y	R5F21368Y	64 K	6 K	4 K	R8C	–	60	4/3(2)	–	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	16 x 10-bit/-	2.7...5.5	64	PLQP0064KB-A	85, 125	DTC, MCT
		R5F2136AY	96 K	8 K																				
		R5F2136CY	128 K	10 K																				
	R8C/36Z	R5F21368Z	64 K	6 K	–	R8C	–	60	4/3(2)	–	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	16 x 10-bit/-	2.7...5.5	64	PLQP0064KB-A	85, 125	DTC, MCT
		R5F2136AZ	96 K	8 K																				
		R5F2136CZ	128 K	10 K																				
	R8C/38W	R5F21388W	64 K	6 K	4 K	R8C	–	76	4/3(2)	1	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	20 x 10-bit/-	2.7...5.5	80	PLQP0080KB-A	85, 125	DTC, MCT
		R5F2138AW	96 K	8 K																				
		R5F2138CW	128 K	10 K																				
	R8C/38X	R5F21388X	64 K	6 K	–	R8C	–	76	4/3(2)	1	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	20 x 10-bit/-	2.7...5.5	80	PLQP0080KB-A	85, 125	DTC, MCT
		R5F2138AX	96 K	8 K																				
		R5F2138CX	128 K	10 K																				
	R8C/38Y	R5F21388Y	64 K	6 K	4 K	R8C	–	76	4/3(2)	–	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	20 x 10-bit/-	2.7...5.5	80	PLQP0080KB-A	85, 125	DTC, MCT
		R5F2138AY	96 K	8 K																				
		R5F2138CY	128 K	10 K																				
	R8C/38Z	R5F21388Z	64 K	6 K	–	R8C	–	76	4/3(2)	–	1	–	IEBus	4/5/–	11	20	128 kHz & 40 MHz	–	20 x 10-bit/-	2.7...5.5	80	PLQP0080KB-A	85, 125	DTC, MCT
		R5F2138AZ	96 K	8 K																				
		R5F2138CZ	128 K	10 K																				
F Series	78K0/FY2-L	µPD78F0854	4 K	384	–	78K0	–	11	0/1(1)	–	1	–	–	2/2/–	2	20	30 kHz & 8 MHz	–	4 x 10-bit/-	1.8...5.5, 2.7...5.5	16	MA-FAA-G	85, 125	POC, LVI, MUL
		µPD78F0855	8 K	512																				
		µPD78F0856	16 K	768																				
	78K0/FA2-L	µPD78F0857	4 K	384	–	78K0	–	15	0/1(1)	–	1	–	–	2/2/–	4	20	30 kHz & 8 MHz	–	6 x 10-bit/-	1.8...5.5, 2.7...5.5	20	MC-CAA-G	85, 125	POC, LVI, MCT, MUL
		µPD78F0858	8 K	512																				
		µPD78F0859	16 K	768																				
	78K0/FB2-L	µPD78F0864	8 K	512	–	78K0	–	24	1/1(1)	–	1	–	–	2/3/–	6	20	30 kHz & 8 MHz	–	9 x 10-bit/-	1.8...5.5, 2.7...5.5	30	MC-CAB-G	85, 125	POC, LVI, MCT, MUL
		µPD78F0865	16 K	768																				
	78K0R/FB3	µPD78F1804	24 K	1.5 K	16 K	78K0R	–	23, 25	2/2(2)	–	0, 1	–	–	–/13/–	11	24	30 kHz & 8 MHz	–	6-8 x 10-bit/-	2.7...5.5	30 - 32	MC-CAB-G, K8-3B4-G	85, 125, 140	POC, LVI, DMA, MUL, DIV
		µPD78F1805	32 K	2 K																				
		µPD78F1806	48 K	3 K																				
		µPD78F1807	64 K	4 K																				
	78K0R/FC3	µPD78F1808	24 K	1.5 K	16 K	78K0R	–	33	2/2(2)	–	1	–	–	–/16/–	14	24	30 kHz & 8 MHz	–	8 x 10-bit/-	2.7...5.5	40	K8-4B4-G	85, 125, 140	POC, LVI, DMA, MUL, DIV
		µPD78F1809	32 K	2 K																				
		µPD78F1810	48 K	3 K																				
		µPD78F1811	64 K	4 K																				
		µPD78F1812	24 K	1.5 K				41											11 x 10-bit/-		48	GA-GAM-G, K8-5B4-G		
		µPD78F1813	32 K	2 K																				
		µPD78F1814	48 K	3 K																				
		µPD78F1815	64 K	4 K																				
		µPD78F1816	96 K	6 K																				
		µPD78F1817	128 K	8 K																				
		µPD78F1826	64 K	4 K						1														
		µPD78F1827	96 K	6 K																				
		µPD78F1828	128 K	8 K																				
		µPD78F1829	192 K	12 K																				
		µPD78F1830	256 K	16 K																				
	78K0R/FE3	µPD78F1818	32 K	2 K	16 K	78K0R	–	55	3/2(2)	–	1	–	–	–/20/–	17	24	30 kHz & 8 MHz	–	15 x 10-bit/-	2.7...5.5	64	GB-GAH-G	85, 125, 140	POC, LVI, DMA, MUL, DIV
		µPD78F1819	48 K	3 K																				
		µPD78F1820	64 K	4 K																				
		µPD78F1821	96 K	6 K							2													
		µPD78F1822	128 K	8 K																				
		µPD78F1831	64 K	4 K						1														
		µPD78F1832	96 K	6 K																				
		µPD78F1833	128 K	8 K																				
		µPD78F1834	192 K	12 K																				
		µPD78F1835	256 K	16 K																				
	78K0R/FF3	µPD78F1823	64 K	4 K	16 K	78K0R	–	71	3/3(2)	–	2	–	–	–/20/–	17	24	30 kHz & 8 MHz	–	16 x 10-bit/-	2.7...5.5	80	GK-GAK-G	85, 125, 140	POC, LVI, DMA, MUL, DIV
		µPD78F1824	96 K	6 K																				
		µPD78F1825	128 K	8 K																				
		µPD78F1836	64 K	4 K						1														
		µPD78F1837	96 K	6 K																				
		µPD78F1838	128 K	8 K																				
		µPD78F1839	192 K	12 K																				
		µPD78F1840	256 K	16 K																				
	78K0R/FG3	µPD78F1841	64 K	4 K	16 K	78K0R	–	89	4/3(2)	1	2	–	–	–/24/–	21	24	30 kHz & 8 MHz	–	24 x 10-bit/-	2.7...5.5	100	GC-UEU-G	85, 125, 140	POC, LVI, DMA, MUL, DIV
		µPD78F1842	96 K	6 K																				
		µPD78F1843	128 K	8 K																				
		µPD78F1844	192 K	12 K																				
		µPD78F1845	256 K	16 K																				
	RL78/F12	R5F10968	8 K	0.5 K	4 K	RL78	-	16	2/3 (1)	-	-	-	-	-/9/-	3	32	32 MHz	-	4 x 10-bit/-	1.6...5.5	20	MC-CAA-G	85, 125, 150	DMA, LVI, POC
		R5F1096A	16 K	1 K																				
		R5F1096B	24 K	1.5 K																				
		R5F1096C	32 K	2 K																				
		R5F1096D	48 K	3 K																				
		R5F1096E	64 K	4 K																				
		R5F109AA	16 K	1 K	4 K	RL78	-	26	4/4 (1)	-	1	-	-	-/9/-	3	32	32 MHz	-	8 x 10-bit/-	1.6...5.5	30	MC-CAB-G	85, 125, 150	DMA, LVI, POC
		R5F109AB	24 K	1.5 K																				
		R5F109AC	32 K	2 K																				
		R5F109AD	48 K	3 K																				
		R5F109AE	64 K	4 K																				
		R5F109BA	16 K	1 K	4 K	RL78	-	28	4/4 (1)	-	1	-	-	-/9/-	3	32	32 MHz	-	8 x 10-bit/-	1.6...5.5	32	K8-3B4-G	85, 125, 150	DMA, LVI, POC
		R5F109BB	24 K	1.5 K																				
		R5F109BC	32 K	2 K																				
		R5F109BD	48 K	3 K																				
		R5F109BE	64 K	4 K																				
		R5F109GA	16 K	1 K	4 K	RL78	-	44	6/5 (1)	-	1	-	-	-/9/-	4	32	32 MHz	✓	10 x 10-bit/-	1.6...5.5	48	K8-5B4-G, GA-GAM-G	85, 125, 150	DMA, LVI, POC
		R5F109GB	24 K	1.5 K																				
		R5F109GC	32 K	2 K																				
		R5F109GD	48 K	3 K																				
		R5F109GE	64 K	4 K																				
		R5F109LA	16 K	1 K	4 K	RL78	-	58	7/6 (1)	-	1	-	-	-/9/-	7	32	32 MHz	✓	12 x 10-bit/-	1.6...5.5	64	GB-GAH-G	85, 125, 150	DMA, LVI, POC
		R5F109LB	24 K	1.5 K																				
		R5F109LC	32 K	2 K																				
		R5F109LD	48 K	3 K																				
		R5F109LE	64 K	4 K																				
	RL78/F13	R5F10A68	8 K	0.5 K	4 K	RL78	-	16	2/2 (1)	-	2	-	-	-/17/-	8	32	32 MHz	-	4 x 10-bit/-	2.7...5.5	20	MC-CAA-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10A6A	16 K	1 K																				
		R5F10A6B	24 K	1.5 K																				
		R5F10A6C	32 K	2 K																				
		R5F10A6D	48 K	3 K																				
		R5F10A6E	64 K	4 K																				
		R5F10AAA	16 K	1 K	4 K	RL78	-	26	2/2 (1)	-	2	-	-	-/17/-	8	32	32 MHz	-	10 x 10-bit/-	2.7...5.5	30	MC-CAB-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10AAB	24 K	1.5 K																				
		R5F10AAC	32 K	2 K																				
		R5F10AAD	48 K	3 K																				
		R5F10AAE	64 K	4 K																				
		R5F10ABA	16 K	1 K	4 K	RL78	-	28	2/2 (1)	-	2	-	-	-/17/-	8	32	32 MHz	-	8 x 10-bit/-	2.7...5.5	32	K8-3B4-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10ABB	24 K	1.5 K																				
		R5F10ABC	32 K	32 K																				
		R5F10ABD	48 K	3 K																				
		R5F10ABE	64 K	4 K																				
		R5F10AGA	16 K	1 K	4 K	RL78	-	44	2/2 (1)	-	2	-	-	-/17/-	8	32	32 MHz	✓	12 x 10-bit/-	2.7...5.5	48	K8-5B4-G, GA-GAM-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10AGB	24 K	1.5 K																				
		R5F10AGC	32 K	2 K																				
		R5F10AGD	48 K	3 K																				
		R5F10AGE	64 K	4 K																				
		R5F10AGF	96 K	6 K							5			-/21/-	11				15 x 10-bit/-					
		R5F10AGG	128 K	8 K																				
		R5F10ALB	24 K	1.5 K	4 K	RL78	-	58	2/2 (1)	-	2	-	-	-/17/-	8	32	32 MHz	✓	12 x 10-bit/-	2.7...5.5	64	GB-GAH-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10ALC	32 K	2 K																				
		R5F10ALD	48 K	3 K																				
		R5F10ALE	64 K	4 K																				
		R5F10ALF	96 K	6 K							5			-/21/-	11				19 x 10-bit/-					
		R5F10ALG	128 K	8 K																				
		R5F10AME	64 K	4 K	4 K	RL78	-	74	4/3 (1)	-	2	-	-	-/21/-	11	32	32 MHz	✓	20 x 10-bit/-	2.7...5.5	80	GK-GAK-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10AMF	96 K	6 K							5													
		R5F10AMG	128 K	8 K																				
		R5F10BAC	32 K	2 K	4 K	RL78	-	26	3/3 (1)	1	3	-	-	-/21/-	11	32	32 MHz	-	12 x 10-bit/-	2.7...5.5	30	MC-CAB-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10BAD	48 K	3 K																				
		R5F10BAE	64 K	4 K																				
		R5F10BAF	96 K	6 K																				
		R5F10BAG	128 K	8 K																				
		R5F10BBC	32 K	2 K	4 K	RL78	-	28	3/3 (1)	1	4	-	-	-/21/-	11	32	32 MHz	-	10 x 10-bit/-	2.7...5.5	32	K8-3B4-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10BBD	48 K	3 K																				
		R5F10BBE	64 K	4 K																				
		R5F10BBF	96 K	6 K																				
		R5F10BBG	128 K	8 K																				
		R5F10BGC	32 K	2 K	4 K	RL78	-	44	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	15 x 10-bit/-	2.7...5.5	48	K8-5B4-G, GA-GAM-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10BGD	48 K	3 K																				
		R5F10BGE	64 K	4 K																				
		R5F10BGF	96 K	6 K																				
		R5F10BGG	128 K	8 K																				
		R5F10BLC	32 K	2 K	4 K	RL78	-	58	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	19 x 10-bit/-	2.7...5.5	64	GB-GAH-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10BLD	48 K	3 K																				
		R5F10BLE	64 K	4 K																				
		R5F10BLF	96 K	6 K																				
		R5F10BLG	128 K	8 K																				
		R5F10BME	64 K	4 K	4 K	RL78	-	74	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	20 x 10-bit/-	2.7...5.5	80	GK-GAK-G	105, 125, 150	DTC, LVI, MCT, POC
		R5F10BMF	96 K	6 K																				
		R5F10BMG	128 K	8 K																				
	RL78/F14	R5F10PAD	48 K	4 K	4 K	RL78	-	26	3/3 (1)	1	3	-	-	-/21/-	11	32	32 MHz	-	12 x 10-bit/ 1 x 8-bit	2.7...5.5	30	MC-CAB-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PAE	64 K	6 K																				
		R5F10PBD	48 K	4 K	4 K	RL78	-	28	3/3 (1)	1	4	-	-	-/21/-	11	32	32 MHz	-	10 x 10-bit/ 1 x 8-bit	2.7...5.5	32	K8-3B4-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PBE	64 K	6 K																				
		R5F10PED	48 K	4 K	4 K	RL78	-	36	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	-	12 x 10-bit/ 1 x 8-bit	2.7...5.5	40	K8-4B4-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PEE	64 K	6 K																				
		R5F10PGD	48 K	4 K	4 K	RL78	-	44	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	15 x 10-bit/ 1 x 8-bit	2.7...5.5	48	K8-5B4-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PGE	64 K	6 K																		K8-5B4-G, GA-GAM-G		
		R5F10PGF	96 K	8 K																				
		R5F10PGG	128 K	10 K																				
		R5F10PGH	192 K	16 K	8 K				4/4 (2)					-/25/-	15				18 x 10-bit/ 1 x 8-bit					
		R5F10PGJ	256 K	20 K																				
		R5F10PLE	64 K	6 K	4 K	RL78	-	58	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	19 x 10-bit/ 1 x 8-bit	2.7...5.5	64	GB-GAH-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PLF	96 K	8 K																				
		R5F10PLG	128 K	10 K																				
		R5F10PLH	192 K	16 K	8 K				4/4 (2)					-/25/-	15				20 x 10-bit/ 1 x 8-bit					
		R5F10PLJ	256 K	20 K																				
		R5F10PME	64 K	6 K	4 K	RL78	-	74	4/3 (1)	1	5	-	-	-/21/-	11	32	32 MHz	✓	20 x 10-bit/ 1 x 8-bit	2.7...5.5	80	GK-GAK-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PMF	96 K	8 K																				
		R5F10PMG	128 K	10 K																				
		R5F10PMH	192 K	16 K	8 K				4/4 (2)					-/25/-	15				26 x 10-bit/ 1 x 8-bit					
		R5F10PMJ	256 K	20 K																				
		R5F10PPE	64 K	6 K	4 K	RL78	-	92	4/4 (2)	1	5	-	-	-/25/-	15	32	32 MHz	✓	31 x 10-bit/ 1 x 8-bit	2.7...5.5	100	GC-UEU-G	105, 125, 150	CMP, DTC, LVI, MCT, POC
		R5F10PPF	96 K	8 K																				
		R5F10PPG	128 K	10 K																				
		R5F10PPH	192 K	16 K	8 K																			
		R5F10PPJ	256 K	20 K																				
LIN MCP	R5F10L	R5F10LGA	16 K	1 K	4 K	RL78	-	26	2/4 (2)	-	2	-	-	-/8/-	7	32	15 kHz & 32 MHz	-	8 x 10-bit/-	6...28	48	K8-5B4-G	85, 125	POC, MUL, DIV, DMA; analogue: VR5, LTR, WDT, BVS
		R5F10LGC	32 K	2 K																				
		R5F10LGD	48 K	3 K																				
		R5F10LGE	64 K	4 K																				
	R5F10U	R5F10UGA	16 K	1 K	4 K	RL78	-	26	2/4 (2)	-	2	-	-	-/8/-	7	32	15 kHz & 32 MHz	-	8 x 10-bit/-	6...28	48	K8-5B4-G	85, 125	POC, MUL, DIV, DMA; analogue: VR3, LTR, WDT, BVS
		R5F10UGC	32 K	2 K																				
		R5F10UGD	48 K	3 K																				
		R5F10UGE	64 K	4 K																				
F Series	V850E2/FE4-L	µPD70F3570	256 K	24 K	32 K	V850E2	–	43	2/2(2)	1	1	–	–	–/16/4	15	48	240 kHz & 8 MHz	–	12 x 10-bit/-	4.5...5.5	64	GB-GAH-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3571	384 K	28 K																				
		µPD70F3572	512 K	32 K																				
	V850E2/FF4-L	µPD70F3573	256 K	24 K	32 K	V850E2	–	57	2/2(2)	1	1	–	–	–/16/4	18	48	240 kHz & 8 MHz	–	14 x 10-bit/-	4.5...5.5	80	GK-GAK-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3574	384 K	28 K																				
		µPD70F3575	512 K	32 K																				
	V850E2/FG4-L	µPD70F3576	256 K	24 K	32 K	V850E2	–	76	3/3(3)	2	1	–	–	–/16/4	18	48	240 kHz & 8 MHz	–	20 x 10-bit/-	4.5...5.5	100	GC-UEU-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3577	384 K	28 K																				
		µPD70F3578	512 K	32 K																				
		µPD70F3579	768 K	48 K												64								
		µPD70F3580	1 M	64 K																				
	V850E2/FJ4-L	µPD70F3581	256	24 K	32 K	V850E2	–	116	3/3(3)	2	1	–	–	–/32/4	30	48	240 kHz & 8 MHz	–	24 x 10-bit/-	4.5...5.5	144	GJ-GAE-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3582	384 K	28 K																				
		µPD70F3583	512 K	32 K																				
		µPD70F3584	768 K	48 K					3/5(5)							64								
		µPD70F3585	1 M	64 K																				
		µPD70F3586	1.5 M	96 K																				
	V850E2/FK4-L	µPD70F3587	768 K	48 K	32	V850E2	–	141	4/5(5)	2	1	–	–	–/32/4	31	64	240 kHz & 8 MHz	–	24 x 10-bit/-	4.5...5.5	176	GM-GAR-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3588	1 M	64 K																				
		µPD70F3589	1.5 M	96 K																				
	V850E2/FG4	µPD70F3548	512 K	48 K	32 K	V850E2	–	72	3/5(5)	2	1	–	–	–/32/8	36	80	240 kHz & 8 MHz	–	20 x 12-bit/-	3.0...5.5	100	GC-UEU-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3549	768 K	64 K																				
		µPD70F3550	1 M	80 K																				
		µPD70F4000	512 K	48 K									FlexRay											
		µPD70F4001	768 K	64 K																				
		µPD70F4002	1 M	80 K																				
	V850E2/FJ4	µPD70F3551	512 K	48 K	32 K	V850E2	–	112	4/6(6)	3	1	–	–	–/32/8	65	80	240 kHz & 8 MHz	✓	24 x 12-bit/-	3.0...5.5	144	GJ-GBG-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3552	768 K	64 K																				
		µPD70F3553	1 M	80 K																				
		µPD70F3554	1.5 M	112 K	64 K		✓																	
		µPD70F4003	512 K	48 K	32 K		–						FlexRay											
		µPD70F4004	768 K	64 K																				
		µPD70F4005	1 M	80 K																				
		µPD70F4006	1.5 M	112 K	64 K		✓																	
	V850E2/FK4	µPD70F3555	768 K	64 K	32 K	V850E2	–	136	5/8(8)	4	1	✓	–	–/32/8	68	80	240 kHz & 8 MHz	✓	40 x 12-bit/-	3.0...5.5	176	GM-GBK-G	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3556	1 M	80 K																				
		µPD70F3557	1.5 M	112 K	64 K		✓																	
		µPD70F3558	2 M	144 K																				
		µPD70F4007	768 K	64 K	32 K		–						FlexRay											
		µPD70F4008	1 M	80 K																				
		µPD70F4009	1.5 M	112 K	64 K		✓																	
		µPD70F4010	2 M	144 K																				
	V850E2/FL4	µPD70F3559	1.5 M	112 K	64 K	V850E2	✓	164	5/12 (12)	5	1	✓	–	–/32/8	84	80	240 kHz & 8 MHz	✓	48 x 12-bit/-	3.0...5.5	208, 272	GD-FAD-G, F1-JN1-A	85, 110, 125	BUR, DMA, POC, SPF
		µPD70F3560	2 M	144 K																				
		µPD70F4011	1.5 M	112 K									FlexRay											
		µPD70F4012	2 M	144 K																				
	V850E2/FK4-H	µPD70F3561	2 M	144 K	64 K	V850E2	✓	131	5/12 (12)	5	1	✓	FlexRay, Ethernet	–/48/8	67	160	240 kHz & 8 MHz	✓	40 x 12-bit/-	3.0...5.5	176	GM-GBK-G	85, 110, 125	BUR, DMA, POC, SPF
	V850E2/FL4-H	µPD70F3564	2 M	144 K	64 K	V850E2	✓	161	6/12 (12)	6	1	✓	FlexRay, Ethernet	–/48/8	84	160	240 kHz & 8 MHz	✓	48 x 12-bit/-	3.0...5.5	272	F1-JN1-A	85, 110, 125	BUR, DMA, POC, SPF
	V850E2/FKG4	µPD70F3592	1 M	128 K	32 K	V850E2	✓	136	3/5(5)	6	1	–	FlexRay	–/32/8	68	80	240 kHz & 8 MHz	✓	36 x 12-bit/-	3.0...5.5	176	GM-GBK-G	85, 110, 125	BUR, DMA, POC, SPF
SH-2A	SH7253	R5F72531	1.25 M	64 K	32 K	SH2A	✓	102	2/3(0)	2	–	–	–	–/98/5	20	120	120 MHz	–	32 x 12-bit/-	3.0...3.6, 4.5...5.5	176	PLQP0176KB-A	125	DMA
		R5F72531D																						
		R5F72533	2 M	96 K												160	160 MHz							
	SH7254R	R5F72543R	2 M	128 K	128 K	SH2A	✓	144	3/5(0)	3	–	✓	–	–/114/7	24	200	200 MHz	–	37 x 12-bit/-	3.0...3.6, 4.5...5.5	272	PRBG0272FA-A	125	DMA
		R5F72544R	2.5 M																					
		R5F72546R	3.75 M	256 K																				
	SH7256R	R5F72567R	4 M	256 K	128 K	SH2A	✓	144	3/5(0)	4	–	✓	FlexRay	–/114/7	24	200	200 MHz	–	37 x 12-bit/-	3.0...3.6, 4.5...5.5	272	PRBG0272FA-A	125	DMA
SH-4A	SH7450/51	R5F74504	2 M	512 K	–	SH4A	✓ (vector)	166	3/4(0)	5	1	✓	FlexRay	–/58/12	40	240	–	–	24 x 12-bit/-	3.0...5.5	292	PRBG0292GB-A	125	DMA, DRO, DRI
		R5F74513											–											
	SH7455/56	R5F74552	1 M	256 K	–	SH4A	✓ (vector)	108	3/4(0)	4	1	–	FlexRay	–/55/10	40	160	–	–	16 x 12-bit/-	3.0...5.5	176	PRBG0176GA-A	125	DMA, DRO, DRI
		R5F74562											–											
D Series	RL78/D1A	R5F10CGB	24 K	2 K	8 K	RL78	-	38	2/1 (1)	-	1	-	-	-/24/-	15	32	32 MHz	-	5 x 10-bit/-	2.7...5.5	48	GA-GAM-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10CGC	32 K																					
		R5F10CGD	48 K	3 K																				
		R5F10CLD	48 K	3 K	8 K	RL78	-	54	2/2 (2)	-	1	-	-	-/24/-	18	32	32 MHz	-	5 x 10-bit/-	2.7...5.5	64	GB-GAH-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10CMD	48 K	3 K	8 K	RL78	-	68	2/2 (2)	-	1	-	-	-/24/-	21	32	32 MHz	-	8 x 10-bit/-	2.7...5.5	80	GK-GAK-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10CME	64 K	4 K																				
		R5F10DGC	32 K	2 K	8 K	RL78	-	38	2/1 (1)	1	1	-	-	-/24/-	15	32	32 MHz	-	5 x 10-bit/-	2.7...5.5	48	GA-GAM-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10DGD	48 K	3 K																				
		R5F10DGE	64 K	4 K																				
		R5F10DLD	48 K	3 K	8 K	RL78	-	54	2/2 (2)	1	1	-	-	-/24/-	18	32	32 MHz	-	5 x 10-bit/-	2.7...5.5	64	GB-GAH-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10DLE	64 K	4 K																				
		R5F10DMD	48 K	3 K	8 K	RL78	-	68	2/2 (2)	1	1	-	-	-/24/-	21	32	32 MHz	-	8 x 10-bit/-	2.7...5.5	80	GK-GAK-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10DME	64 K	4 K																				
		R5F10DMF	96 K	6 K	8 K	RL78	-	68	2/2 (2)	1	1	-	-	-/24/-	21	32	32 MHz	-	8 x 10-bit/-	2.7...5.5	80	GK-GAK-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10DMG	128 K	8 K																				
		R5F10DMJ	256 K	16 K																				
		R5F10DPE	64 K	4 K	8 K	RL78	-	84	3/2 (2)	1	1	-	-	-/24/-	21	32	32 MHz	-	9 x 10-bit/-	2.7...5.5	100	GC-UEU-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10DPF	96 K	6 K																				
		R5F10DPG	128 K	8 K																				
		R5F10DPJ	256 K	16 K																				
		R5F10TPJ	256 K	16 K	8 K	RL78	-	84	3/2 (2)	2	1	-	-	-/24/-	21	32	32 MHz	-	9 x 10-bit/-	2.7...5.5	100	GC-UEU-G	85, 105	DMA, LCD, POC, RTC, SMC, SND
		R5F10TPK	384 K	20 K																				
		R5F10TPL	512 K	24 K																				
		R5F10TSK	384 K	20 K	8 K	RL78	-	96	3/2 (2)	2	1	-	-	-/24/-	21	32	32 MHz	-	11 x 10-bit/-	2.7...5.5	128	GF-GAT-G	85, 105	DMA, LCD, LBI, POC, RTC, SMC, SND
		R5F10TSL	512 K	24 K																				
	V850E2/DJ4	µPD70F3522	256 K	24 K	32 K	V850E2	–	105	3/2(2)	3	2	–	–	–/80/12	56	80	240 kHz & 8 MHz	✓	16 x 12-bit/-	2.7...5.5	144	GJ-GAE-G	85, 105	POC, DMA, SMC, LCD, BUR, SPF
		µPD70F3523	512 K	48 K																				
		µPD70F3524	1 M	96 K									I²S			120						GJ-GAE-G, GJ-GBG-G		
		µPD70F3525	2 M	192 K																				
		µPD70F3526	3 M	256 K																				
	V850E2/DK4-H	µPD70F3529	2 M	96 K	32 K	V850E2	–	127	2/2(2)	3	2	–	I²S	–/48/4	20	80	240 kHz & 8 MHz	✓	12 x 12-bit/-	2.7...5.5	176	GM-GBK-G	85, 105	BUR, DMA, GFX, POC, SMC, SND, SPF
	V850E2/DN4-H	µPD70F3532	3 M	256 K	32 K	V850E2	✓	222	3/4(4)	3	2	✓	I²S, FlexRay	–/80/12	69	160	240 kHz & 8 MHz	✓	16 x 12-bit/-	2.7...5.5	352	F1-KN7-A	85, 105	DMA, SPF, BUR, POC, SMC, SND, GFX
	V850E2/DP4-H	µPD70F3535	3 M	256 K	32 K	V850E2	✓	165	3/4(4)	3	2	✓	I²S, FlexRay	–/80/12	69	160	240 kHz & 8 MHz	✓	16 x 12-bit/-	2.7...5.5	408	F1-MNM-A	85, 105	DMA, SPF, BUR, POC, SMC, SND, GFX
		µPD70F3536																						
		µPD70F3537																						
	V850E2/DR4-3D	µPD70F3539	2 M	96 K	–	V850E2	✓	77	2/2(2)	3	1	✓	I²S, FlexRay, Ethernet, MLB	–/32/1	37	400	16 MHz	–	-/-	3.0...3.6	672	F5-PN7-A	85	DMA, SPF, GFX
P Series	V850E2/PF4-L	µPD70F4152/53	384 K	24 K	16 K	2 x V850E2	-	28	2/2 (2)	1	-	-	–	-/17/2	23	80	–	–	14 x 12-bit/-	4.5...5.5	80	GK-GAK-G	125	DMA, LVI, MCT, POC, SPF
	V850E2/PG4-L	µPD70F4154/55	384 K	24 K	16 K	2 x V850E2	-	42	2/2 (2)	2	-	-	–	-/17/6	26	80	–	–	14 x 12-bit/-	3.0...5.5	100	GC-UEU-G	125	DMA, LVI, ENC, MCT, POC, SPF
		µPD70F4156																						
		µPD70F4157	512 K	48 K				35		3				-/25/2	31				22 x 12-bit/-					
	V850E2/PH4-L	µPD70F4158	512 K	48 K	16 K	2 x V850E2	-	66	2/2 (2)	3	-	-	–	-/25/2	31	80	–	–	24 x 12-bit/-	3.0...5.5	128	GF-GAT-G	125	DMA, LVI, ENC, MCT, POC, SPF
	V850E2/PJ4	µPD70F3504	384 K	24 K	32 K	2 x V850E2	✓	73	5/3 (3)	2	–	–	–	-/44/8	52	80	–	–	22 x 10-bit/-	3.0 ... 3.6	144	GJ-GBG-G	85, 125	LVI, POC, DMA, ENC, MCT, SPF
		µPD70F3506	512 K	40 K									FlexRay						22 x 12-bit/-	4.5 ... 5.5				
		µPD70F3507																						
		µPD70F3508	1 M	80 K												160			22 x 10-bit/-	3.0 ... 3.6				
		µPD70F3509																	22 x 12-bit/-	4.5 ... 5.5				
	V850E2/PJ4-E	µPD70F3598	1 M	80 K	32 K	2 x V850E2	✓	63	4/3 (3)	3	–	–	–	-/32/6	38	128	–	–	32 x 12-bit/-	4.5 ... 5.5	144	GJ-GBG-G	85, 125	LVI, POC, DMA, ENC, MCT, SPF, RIF
S Series	V850ES/SG3	µPD70F3333	256 K	24 K	–	V850ES	–	84	5/3(3)	–	3	✓	–	–/8/–	9	32	220 kHz	✓	12 x 10-bit/ 2 x 8-bit	2.8...3.6	100	GC-UEU-AX	85	LVI, DMA
		µPD70F3334	384 K	32 K																				
		µPD70F3335	256 K	24 K						1														
		µPD70F3336	384 K	32 K																				
		µPD70F3340	512 K	40 K						–														
		µPD70F3341	640 K	48 K																				
		µPD70F3342	768 K	60 K																				
		µPD70F3343	1 M																					
		µPD70F3350	512 K	40 K						1														
		µPD70F3351	640 K	48 K																				
		µPD70F3352	768 K	60 K																				
		µPD70F3353	1 M																					
	V850ES/SJ3	µPD70F3344	384 K	32 K	–	V850ES	–	128	6/4(4)	–	3	✓	–	–/11/–	12	32	220 kHz	✓	16 x 10-bit/ 2 x 8-bit	2.8...3.6	144	GJ-GAE-AX	85	LVI, DMA
		µPD70F3345	512 K	40 K																				
		µPD70F3346	640 K	48 K																				
		µPD70F3347	768 K	60 K																				
		µPD70F3348	1 M																					
		µPD70F3354	384 K	32 K						1														
		µPD70F3355	512 K	40 K																				
		µPD70F3356	640 K	48 K																				
		µPD70F3357	768 K	60 K																				
		µPD70F3358	1 M																					
		µPD70F3364	384 K	32 K						2														
		µPD70F3365	512 K	40 K																				
		µPD70F3366	640 K	48 K																				
		µPD70F3367	768 K	60 K																				
		µPD70F3368	1 M																					
	V850E/SJ3-H	µPD70F3474	1.25 M	92 K	–	V850E	–	128	8/8(6)	–	6	✓	–	–/13/–	12	48	220 kHz	✓	16 x 10-bit/ 2 x 8-bit	2.8...3.6	144	GJ-GAE-G	85	LVI, DMA
		µPD70F3475								1														
		µPD70F3476	1.5 M							2														
		µPD70F3477								–														
		µPD70F3478								1														
		µPD70F3479								2														
		µPD70F3931B	512 K	60 K					6/8(6)	–	4													
		µPD70F3932B								1														
		µPD70F3933B								2														
		µPD70F3934B	768 K	76 K					8/8(6)	–	6													
		µPD70F3935B								1														
		µPD70F3936B								2														
		µPD70F3937B	1 M							–														
		µPD70F3938B								1														
		µPD70F3939B								2														
	V850E/SK3-H	µPD70F3480	1.5 M	92 K	–	V850E	–	156	8/8(6)	–	6	✓	–	–/13/–	12	48	220 kHz	✓	16 x 10-bit/ 2 x 8-bit	2.8...3.6	176	GM-GAR-G	85	LVI, DMA
		µPD70F3481								1														
		µPD70F3482								2														
		µPD70F3486	1.25 M							–														
		µPD70F3487								1														
		µPD70F3488								2														
		µPD70F3925	1 M	76 K						–														
		µPD70F3926								1														
		µPD70F3927								2														

Other features:
BUR Backup RAM
BVS Battery Voltage Supervision
CMP Comparator(s)
DIV Hardware divider
DMA Direct memory access
DRI Direct RAM Input
DRO Direct RAM Output
DTC Data transfer controller
ENC Encoder timer for rotary switch
GFX 2D/3D graphics engine
GPS GPS baseband controller
IMR Image renderer
LCD LCD controller/driver
LBI LCD bus interface
LTR LIN Transceiver
LVI Low-voltage indicator
MCT Motor control timer
MUL Hardware multiplier
POC Power-On Clear
RIF Resolver interface
RTC Real-Time Clock
SMC Stepper motor controller
SND Sound generator
SPF System protection function
SRC Sample Rate Converter
VR3 Voltage Regulator 3.3 V
VR5 Voltage Regulator 5.0 V
WDT Window Watchdog Timer
XIP Execute in Place from serial flash

Automotive Microcontrollers

Edition March 2012

Series	Nickname/ Group	Part number	Flash size [B]	RAM [B]	Data flash [B]	Core	FPU	I/O lines	CSI/UART (LIN)	CAN	I^2C	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 (I/O) [V]	Pins	Packages	$T_{a,max}$ [°C]	Other features
S Series	V850E2/SG4-H	μPD70F4013	1 M	96 K	32 K	V850E2	✓	56	4/5(5)	1	4	✓	4 I^2S, PCM, MLB, IEBus	–/16/4	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																				
	V850E2/SJ4-H	μPD70F4015	1 M	96 K	32 K	V850E2	✓	98	5/5(5)	2	4	✓	4 I^2S, 2 PCM, MLB, IEBus	–/16/4	18	160	240 kHz & 8 MHz	✓	14 x 10-bit/-	3.0...3.6	144	LQFP	85, 105	BUR, SPF, DMA, RTC, ENC, POC
		μPD70F4016	1.5 M	128 K																				
	V850E2/SK4-H	μPD70F4017	1.5 M	128 K	32 K	V850E2	✓	127	5/5(5)	2	4	✓	6 I^2S, 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
		μPD70F4018	2 M	192 K																				
SH-2A	SH726A	R5S726A0	-	1.25 M	-	SH-2A	✓	57	3/5 (0)	-	4	✓	4 I^2S, 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
		R5S726A1								2														
		R5S726A2								-												PLQP0120LA-A		
		R5S726A3								2														
	SH726B	R5S726B0	-	1.25 M	-	SH-2A	✓	74	4/5 (0)	-	4	✓	4 I^2S, 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
		R5S726B1								2														
	SH7266	R5S72660	-	1.5 M	-	SH-2A	✓	80	1/5 (0)	-	3	✓	Display Unit, 3 I^2S, SD, SPDIF, 2 SRC, USB HS	-/7/-	7	144	–	✓	6 x 10-bit/-	3.0..3.6	144	PLQP0144KA-A	85	CDROM dec, RTC, 2 SRC, WDT
		R5S72661								2														
	SH7267	R5S72670	-	1.5 M	-	SH-2A	✓	104	2/8 (0)	-	3	✓	Display Unit, 4 I^2S, SD, SPDIF, 2 SRC, USB HS	-/7/-	7	144	–	✓	6 x 10-bit/-	3.0..3.6	176	PLQP0176KB-A	85	CDROM dec, RTC, 2 SRC, WDT
		R5S72671								2														
	SH7268	R5S72680	-	2.5 M	-	SH-2A	✓	111	4/5 (0)	-	2	✓	Display Unit, 4 I^2S, MMC, USB HS, SD, SPDIF, 3 SRC	-/7/-	7	266	–	✓	6 x 10-bit/-	3.0..3.6	208	PLQP0208KB-A	85	CDROM dec, DMA, GFX, IMR, JPEG dec, RTC, 3 SRC, video dec, WDT, XIP
		R5S72681								3														
	SH7269	R5S72690	-	2.5 M	-	SH-2A	✓	148	4/8 (0)	-	4	✓	Display Unit, 6 I^2S, MMC, 2 SD, SPDIF, 3 SRC, USB HS	-/7/-	7	266	–	✓	8 x 10-bit/-	3.0..3.6	256, 272	PLQP0256LB-A, PLBG0272GA-A	85	CDROM dec, DMA, GFX, IMR, JPEG dec, RTC, 3 SRC, video dec, WDT, XIP
		R5S72691								3														
R-CAR	R-CAR L1	tbd	–	-	–	Cortex A9	✓	tbd	3/8 (0)	2	4	✓	Display Unit, 16-bit DDR3, 8 I^2S, MLB, 3 SD, 2 USB HS	-/-/9	4	400	-	–	2 x 12-bit/-	3.0...3.6	429	FPBGA (18x18 mm^2, 0.8 mm p.p.)	85	DMA, SGX531
	R-CAR E1	μPD35004	–	128 K	–	Cortex A9	✓	tbd	3/8 (0)	2	4	✓	16-bit DDR2/DDR3, Display Unit, Ethernet MAC, 8 I^2S, MLB, PATA, 3 SD, 2 USB HS	-/-/9	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
	R-CAR M1S	R8A77780	–	512 K	–	SH-4A	✓	155	3/8 (0)	2	4	✓	32-bit DDR2/DDR3, Display Unit, Ethernet MAC, 9 I^2S, MLB, MMC, PATA, 3 SD, 2 USB HS	-/-/9	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
	R-CAR M1A	R8A77781	–	512 K	–	Cortex A9	✓	155	3/8 (0)	2	4	✓	32-bit DDR2/DDR3, Display Unit, Ethernet MAC, 9 I^2S, MLB, MMC, PATA, 3 SD, 2 USB HS	-/-/9	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
	R-CAR H1	R8A77790	–	768 K	–	4 x Cortex A9	✓	201	3/8 (0)	2	4	✓	2 x 32-bit DDR3, Display Unit, Ethernet MAC, 10 I^2S, MLB, MMC, PATA, PCIe, SATA, 4 SD, 3 USB HS	-/-/9	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; BVS Battery Voltage Supervision; CMP Comparator(s); DIV Hardware divider; DMA Direct memory access; DRI Direct RAM Input; DRO Direct RAM Output; DTC Data transfer controller; ENC Encoder timer for rotary switch; GFX 2D/3D graphics engine; GPS GPS baseband controller; IMR Image renderer; LCD LCD controller/driver; LBI LCD bus interface; LTR LIN Transceiver; LVI Low-voltage indicator; MCT Motor control timer; MUL Hardware multiplier; POC Power-On Clear; RIF Resolver interface; RTC Real-Time Clock; SMC Stepper motor controller; SND Sound generator; SPF System protection function; SRC Sample Rate Converter; VR3 Voltage Regulator 3.3 V; VR5 Voltage Regulator 5.0 V; WDT Window Watchdog Timer; XIP Execute in Place from serial flash

Tools

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

Renesas C/C++ Compiler Package (SH)

- 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.

Applilet

- 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: YR0E000010KCE00-A

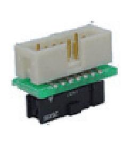
E10A-USB On-Chip Debugger (SH)

- Supports two target interfaces:
  - 14-pin for basic on-chip debugging without tracing (H-UDI)
  - 36-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)
  HS0005ECK01H (optional cable to connect the HS0005KCU02H to 38-pin Mictor 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 MiniCube2 connector
  - Order code: QB-F14T16-01



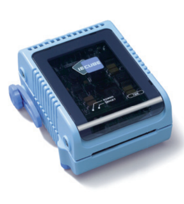
- 14-pin Exchange Adapter for MINICUBE Debugger
  - To connect MiniCube debugger to 14-pin E1 connector
  - Order code: YADAPTER-F20T14

In-Circuit Emulation

IECUBE2 In-Circuit Emulator (V850E2 only)

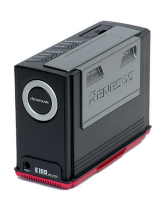
- For V850E2 devices
- Universal main unit, device-dependent emulation probe
- Package includes
  - IAR Embedded Workbench (size limited)
  - USB cable, power supply
- Order code: QB-V850E2-EE (main unit)

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



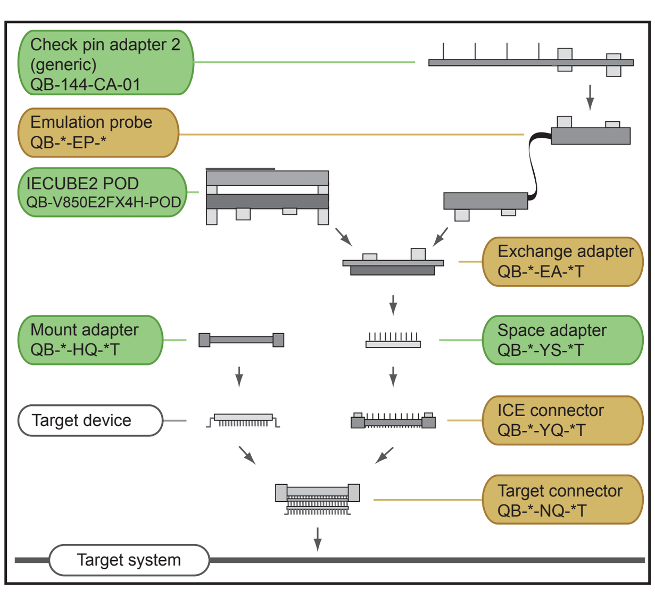
- For 78K, RL78 and V850 devices
- Package includes
  - IAR Embedded Workbench (size limited)
  - USB cable, power supply
- Order code depends on target device

E100 In-Circuit Emulator (R8C)

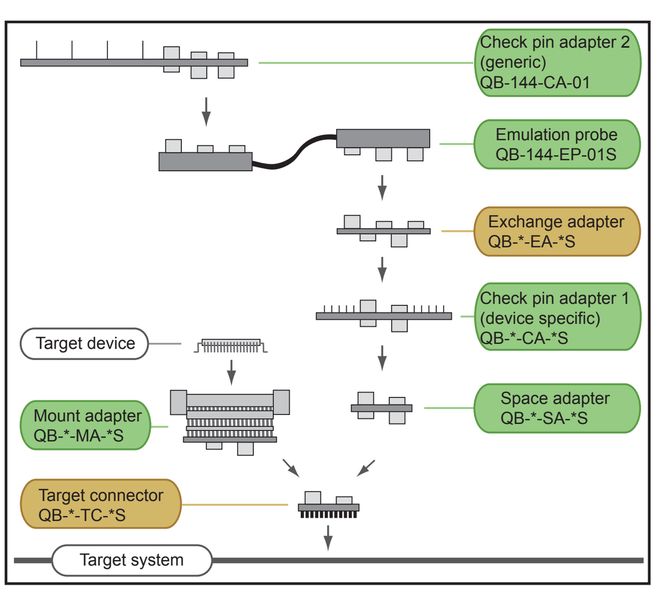


- For R8C devices
- Universal main unit, device-dependent emulation probe
- Package includes
  - High-performance Embedded Workshop (HEW)
  - USB cable, power supply
- Order code: R0E001000EMU00 (main unit)
  R0E521300MCU00 (R8C/3x emulation probe)

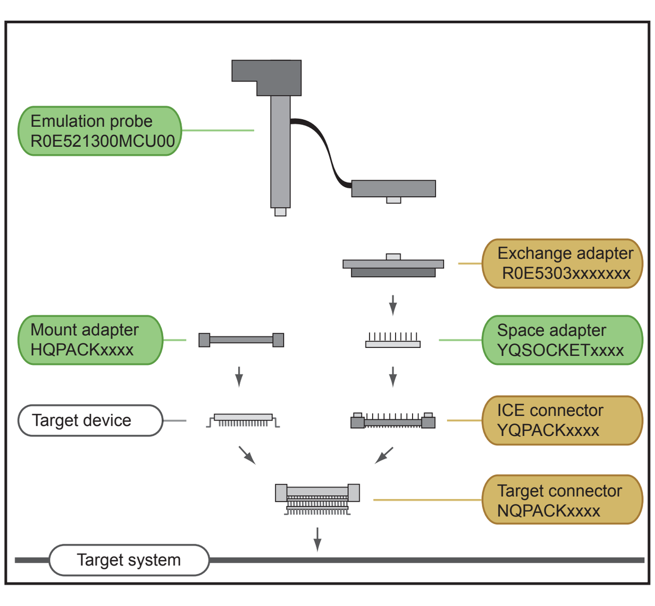
Socket System I (78K and V850E2)



Socket System II (V850 only)



Socket System III (R8C)



Please visit www.renesas.eu/products/mpumcu 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 78K0R, 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. setup 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/UART connection
- Graphical user interface
- Available for free at http://www.renesas.eu/updates?id=396

Flash Development Toolkit (FDT) for Microsoft Windows™

- Supports R8C and SH flash microcontrollers
- For development and prototyping
- Works with E1/E8a debugger and direct RS-232/UART connection
- Available for free at http://www.renesas.eu/fdt

Starter Kits

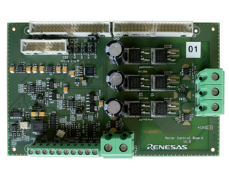
V850E2/Fx4-L Starter Kit

- Equipped with
  - V850E2/FG4-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
- Order code: Y-ASK-V850E2/FG4-L

V850E2/Px4 Starter Kit

- Equipped with
  - V850E2/PJ4 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

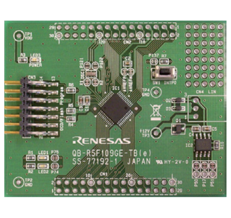
Motor Control Application Board 1



- 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-MC1-V1

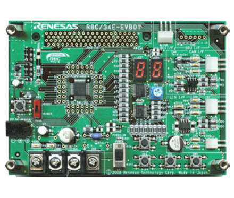
Evaluation Boards

RL78/F12 Target Board



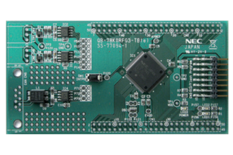
- For RL78/F12 evaluation
- Equipped with
  - 48-pin RL78/F12 device (R5F109GEAFB)
  - E1 debugging and programming interface
  - LIN transceiver circuit
  - One switch, two LEDs, breadboard area
- Board dimensions: 70 mm x 55 mm
- Order code: QB-R5F109GE-TB

R8C/3x Application Board



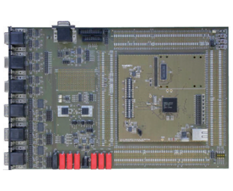
- For R8C/3x evaluation
- Equipped with
  - R8C/3x device
  - CAN, LIN interface
  - two 7-segment LEDs, switches
  - analogue input, I/O expansion headers
  - E1 debug connector
- Board dimensions: 120 mm x 80 mm
- Order code depends on target device

78K0R/Fx3 Target Board



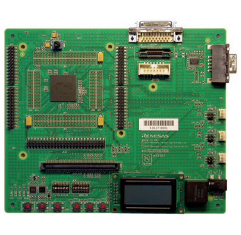
- For 78K0R/Fx3 evaluation
- Equipped with
  - 100-pin 78K0R/FG3 device (μPD70F1845)
  - CAN, 2 LIN interfaces
  - one switch, two LEDs, breadboard area
  - I/O expansion headers
  - 16-pin debug connector
- Board dimensions: 109 mm x 55 mm
- Order code: QB-78K0RFG3-TB

V850E2/Fx4 Application Board



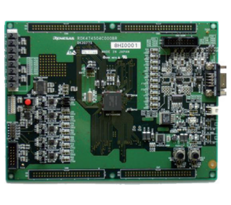
- For V850E2/Fx4(-H) evaluation and programming
- Equipped with
  - 208-pin V850E2/FL4 device (μPD70F4012)
  - FlexRay, CAN, UART interface
  - 20-pin JTAG debug connector
  - PG-FP5 connector
- Board dimensions: 300 mm x 205 mm
- Package includes quick-start guide
- Order code: AB-050-FX4-MB-L-Q-DEV-V2

SH72546 Development Board



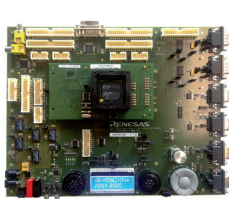
- For SH72546 evaluation
- Equipped with
  - SH72546 device (R5F72546RKBG or R5E72546RKBG)
  - 3 CAN, RS232C interface
  - LCD module, switches, LEDs, analogue input
  - I/O expansion headers
  - E10A-USB debug connector
- Board dimensions: 180 mm x 150 mm
- Package includes
  - power supply, serial cable (null modem)
  - CD with documentation and information
- Order code: YASKSH72546R-WS (R5F72546RKBG)
  YASKSH72546RFCC-ES (R5E72546RKBG)

SH745x Development Board



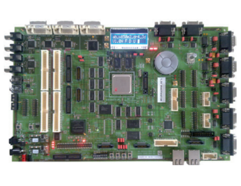
- For SH74504/SH74552 evaluation
- Equipped with
  - SH74504 or SH74552 device
  - 2 FlexRay, 5/4 CAN interfaces
  - RS-232C, UART connector
  - switches, LEDs, 2 analogue inputs
  - I/O expansion headers
  - E10A-USB debug connector
- Board dimensions:
  200 mm x 150 mm (for SH74504)
  180 mm x 120 mm (for SH74552)
- Package includes CD with user's manual and sample software
- Order code: R0K474504S000BR#ES (for SH74504)
  R0K474552S000BR#ES (for SH74552)

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, MLB interfaces
  - LCD interface, video in, video out
  - various controls
  - 20-pin JTAG debug and PG-FP5 connector
- Board 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

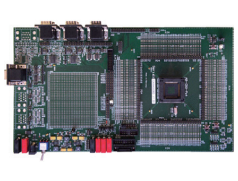


- For evaluation and demonstration of the V850E2/DR4-3D, especially in regard to its video and graphics capabilities
- Equipped with
  - Ethernet, FlexRay, CAN, MLB, I^2S and other interfaces
  - 2 x video in (digital), 1 x video in (analog)
  - 2 x video out (digital)
  - 20-pin JTAG debug and PG-FP5 connector
- Board dimensions: 350 mm x 350 mm
- Package includes power supply and quick-start guide
- Order code: AB-V850E2-DX4-3D

V850E2/Dx4 Add-On QVGA Board

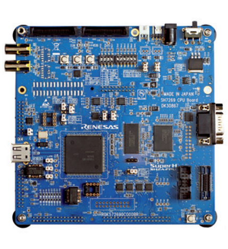
- For the extension of application boards with a touch-controlled TFT to make graphics project development as easy as possible
- Equipped with
  - 3.5" TFT touch-screen
  - touch-screen connector (10-pin)
  - 30-pin interface
- Package includes quick-start guide
- Board dimensions: 105 mm x 85 mm
- Order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

V850E2/PJ4 Application Board



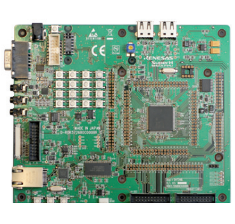
- For V850E2/Px4 evaluation
- Equipped with
  - socket for V850E2/PJ4 device
  - FlexRay, 3 CAN, 3 LIN interfaces
  - E1 debug connector
  - PG-FP5 connector
- Board dimensions: 330 mm x 187 mm
- Package includes user's manual and schematic
- Order code: AB-050-PJ4

SH7269 Development Board



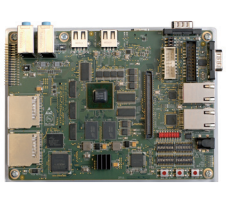
- For SH7268 and SH7269 evaluation
- Equipped with
  - SH7269 device
  - 4 MB NOR and 256 MB NAND flash memory
  - 2 MB serial flash memory
  - 16 MB SDRAM and 16 KB E^2PROM
  - RS-232C, UART, USB connector
  - switches, LEDs, I/O expansion headers
  - E10A USB debug connector
- Board dimensions: 148 mm x 148 mm
- Package includes CD with user's manual, schematic and sample software
- Order codes: R0K572690C000BR (SH7269 CPU board)
  R0K572690B000BR (VDC4 Option Board)
  M3A-HS64G01 (Audio Option board)
  M3A-HS64G02 (Graphics Option Board)

SH726B Development Board



- For SH726A and S726B evaluation
- Equipped with
  - SH726B device
  - 2 x 16 MB serial flash memory
  - 16 MB SDRAM
  - RS-232C, UART, USB, LAN, CAN interface
  - switches, LEDs, I/O expansion headers
  - E10A USB debug connector
- Board dimensions: 180 mm x 150 mm
- Package includes CD with user's manual, schematic and sample software
- Order code: R0K5726B0C000BR

R-CAR M1A Development Board 'MILAN'



- 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, MLB interfaces
  - HDMI display out (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/E^2PROM
  - 2 x 512 MB DDR3-DRAM
  - RS-232C, UART, USB, SD, LAN, SATA, PCI , CAN and MLB interfaces
  - Analog RGB with DSUB 15-pin and/or LVDS flat cable connector
  - switches, LEDs, I/O expansion headers
  - JTAG and ETM debug/trace connector
- Board dimensions: 200 mm x 150 mm
- Package includes CD with user's manual, schematic and boot software
- Order code: R0P7779A00010S

Package Dimensions

Pincount	Code	Plating	Type	Body Size [mm^2]	Pin Pitch [mm]
16	MA-FAA-G	Ni/Pd/Au	SSOP	5.2 x 5.0	0.65
20	MC-CAA-G	Ni/Pd/Au	SSOP	6.5 x 6.1	0.65
	PLSP0020JB-A	SnCu		6.5 x 4.4	
30	MC-CAB-G	Ni/Pd/Au	SSOP	9.7 x 6.1	0.65
32	K8-3B4-G	Ni/Pd/Au	QFN	5 x 5	0.5
	PLQP0032GB-A	SnCu	QFP	7 x 7	0.8
40	K8-4B4-G	Ni/Pd/Au	QFN	6 x 6	0.5
48	GA-GAM-G	Ni/Pd/Au	QFP	7 x 7	0.5
	K8-5B4-G		QFN		
	PLQP0048KB-A	SnCu	QFP		
64	GB-GAH-G	Ni/Pd/Au	QFP	10 x 10	0.5
	PLQP0064KB-A	SnCu			
80	GK-GAK-G	Ni/Pd/Au	QFP	12 x 12	0.5
	PLQP0080KB-A	SnCu			
100	GC-UEU-G, GC-UEU-AX	Ni/Pd/Au	QFP	14 x 14	0.5
120	PLQP0120LA-A	SnCu	QFP	14 x 14	0.4
	PLQP0120KB-A				
128	GF-GAT-G	Ni/Pd/Au	QFP	14 x 20	0.5

Pincount	Code	Plating	Type	Body Size [mm^2]	Pin Pitch [mm]
144	GJ-GAE-G, GJ-GAE-AX	Ni/Pd/Au	QFP	20 x 20	0.5
	GJ-GBG-G				
	PLQP0144KA-A	SnCu			
176	GM-GAR-G	Ni/Pd/Au	QFP	24 x 24	0.5
	GM-GBK-G				
	PLQP0176KB-A				
	PRBG0176GA-A	SnAgCu	BGA	13 x 13	0.8
208	GD-FAD-G	Ni/Pd/Au	QFP	28 x 28	0.5
	PLQP0208KB-A	SnCu			
256	PLQP0256LB-A	SnCu	QFP	28 x 28	0.4
272	F1-JN1-A	SnAgCu	BGA	21 x 21	1.0
	PRBG0272FA-A				
	PLBG0272GA-A				
292	PRBG0292GB-A	SnAgCu	BGA	17 x 17	0.8
352	F1-KN7-A	SnAgCu	BGA	23 x 23	1.0
408	F1-MNM-A	SnAgCu	BGA	23 x 23	1.0
429	tbd	SnAgCu	BGA	18 x 18	0.8
496	tbd	SnAgCu	BGA	21 x 21	0.8
672	F5-PN7-A	SnAgCu	BGA	30 x 30	1.0
832	tbd	SnAgCu	BGA	27 x 27	0.8

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