



2016-2017

RF & Wireless

Semiconductors



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Product Selection Guide

About CEL

CEL (California Eastern Laboratories) is an engineering, sales and marketing company focused on RF Semiconductors, Optical Semiconductors and Wireless Connectivity Solutions.

CEL serves designers, OEMs and contract manufacturers in various RF, Wireless and Optical markets. With over 55 years experience in high frequency design, customer support and fulfillment, CEL is ideally positioned to provide its customers with a stable supply of products to meet their specific needs.

CEL maintains extensive inventories and provides engineering and applications assistance at its technical centers in Santa Clara, CA., Buffalo Grove, IL and Lafayette, CO. The company supports customers through sales offices, sales representatives and distributors in numerous locations.



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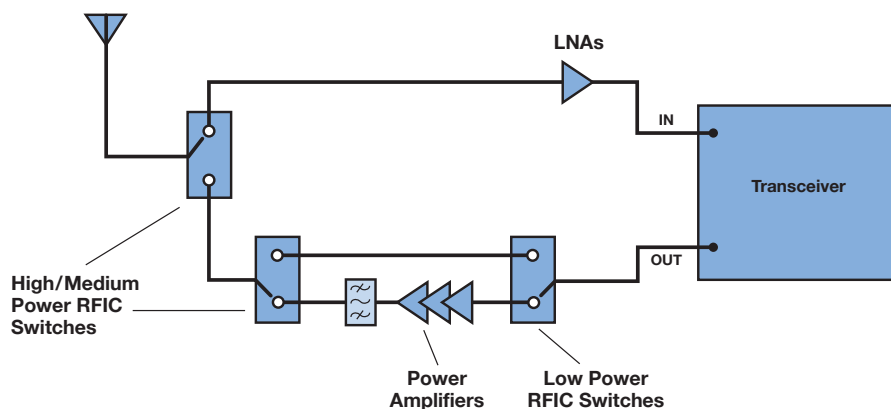
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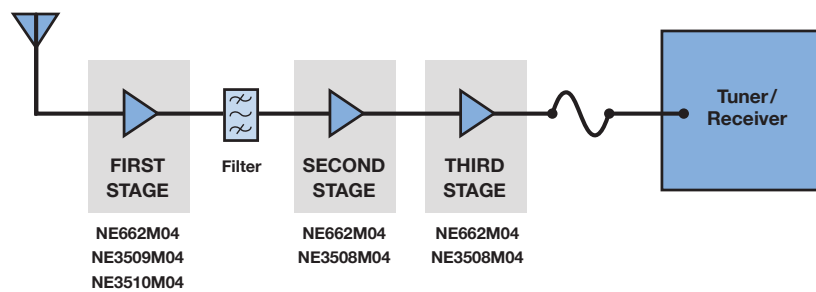
Front End Components Up to 6 GHz Applications

Wi-Fi • Bluetooth • ZigBee • Automated Meter Reading • Mesh & Home Area Networks • ISM Band applications



RFIC Switches (additional P/Ns available, see page 5)		450 MHz	915 MHz	2.4 GHz	6 GHz
UPG2409TB / T6X	SPDT, High power, wide bandwidth, SOT-363 and TSON package options	✓	✓	✓	✓
UPG2408TB / TK	SPDT, Medium power, SOT-363 and smaller package options	✓	✓	✓	
UPG2406TK	SPDT, Medium power, small package (opposite logic vs. UPG2408TX)	✓	✓	✓	
NEW CKRF2185XS02	SPDT, Medium power, wide bandwidth, small package	✓	✓	✓	✓
UPG2164T5N	DPDT, Diversity/Transfer Switch (two selectable RF paths on)	✓	✓	✓	
Power Amplifier Transistors (additional P/Ns available, see page 7 & 9)		450 MHz	915 MHz	2.4 GHz	6 GHz
NE5550979A	+39.5dBm, 9W, 7.5V LD MOSFET	✓	✓		
NE5550234	+33dBm, 2W, 7.5V LDMOS FET	✓	✓		
NE664M04	+26dBm, 3.6V Silicon Discrete	✓	✓	✓	
NE678M04	+18dBm, 3.0 V Silicon Discrete	✓	✓	✓	
NE677M04	+15dBm, 3.0 V Silicon Discrete	✓	✓	✓	
Low Noise Amplifier Transistors		450 MHz	915 MHz	2.4 GHz	6 GHz
NE662M04	Silicon Discrete, NF = 1.1, Ga = 16.0, OIP3 = +22dBm @ 2GHz	✓	✓	✓	
NE3509M04	GaAs FET, NF = 0.40, Ga = 17.5, OIP3 = +22dBm @ 2 GHz			✓	✓
NE3508M04	GaAs FET, NF = 0.45, Ga = 14.0, OIP3 = +31dBm @ 2 GHz			✓	✓

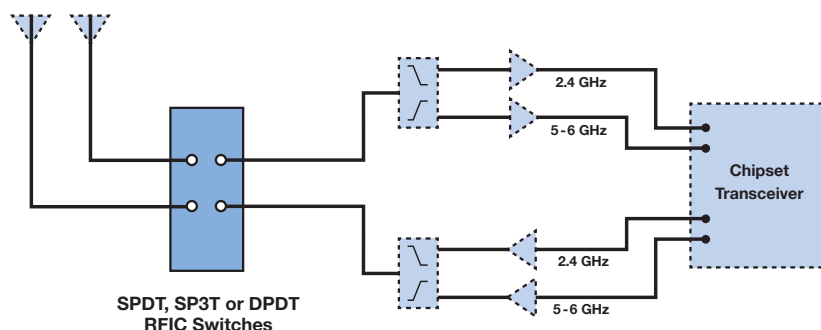
LNAs for 2 to 8GHz Applications



LNA Performance *(see Data Tables for additional specifications)*

Part Number	Description	NF (dB)	Gain (dB)	P1dB (dBm)	Package
NE662M04	Silicon Bipolar Transistor	1.1 @ 2.0GHz	16.0 @ 2.0GHz	+11.0	M04
NE3508M04	GaAs HJ-FET	0.45 @ 2.0GHz	14.0 @ 2.0GHz	+18.0	M04
NE3509M04	GaAs HJ-FET	0.40 @ 2.0GHz	17.5 @ 2.0GHz	+14.0	M04
NE3510M04	GaAs HJ-FET	0.35 @ 2.0GHz	19.0 @ 2.0GHz	+12.0	M04

2.4 & 5.8GHz WLAN & WLAN Infrastructure Devices



GaAs RFIC Switches to 3GHz

UPG2408TB	SPDT, 3V, 0.50dB Insertion Loss, High ESD immunity
UPG2409TB	SPDT 2.0 – 4.0GHz, Insertion Loss: 0.45dB @ 2.5GHz, 0.6dB @ 3.8GHz
UPG2406TK	SPDT, 1.8 or 2.7V control voltage, 0.45dB Insertion Loss @ 2GHz, High ESD immunity

GaAs RFIC Switches to 6GHz

UPG2422TK	SPDT for Dual Band WLAN, 1.8-5.3V control voltage range
UPG2163T5N	SPDT, Insertion Loss: 0.4dB @ 2.4GHz, 0.5dB @ 6GHz, Isolation = 30dB @ 6GHz
UPG2176T5N	SPDT 2.4 – 6GHz, Insertion Loss: 0.5dB @ 2.4GHz, 0.7dB @ 5.5GHz, internal terminations
UPG2415TK / T6X	SPDT for Dual Band WLAN, high power, low insertion loss for Access Point applications
UPG2409T6X	SPDT for Dual Band WLAN, highest power, low insertion loss for Access Point applications
NEW CKRF2185XS02	SPDT for Dual Band WLAN, cost-effective, Insertion Loss: 0.5dB @ 6GHz, small thin package
NEW CKRF2430XS01	SP3T, Insertion Loss: 0.55dB @ 6GHz, Isolation = 25dB @ 6GHz
UPG2164T5N	DPDT, Insertion Loss: 0.7dB @ 6GHz, 17dB Isolation @ 6GHz
UPG2162T5N	DPDT, Insertion Loss: 0.85dB @ 6GHz, 27dB Isolation @ 6GHz

RF Switch ICs

SPDTs (Single Pole Double Throw)

Part Number	TYPICAL ELECTRICAL CHARACTERISTICS (T _A = 25°C)						Pkg. Code ³	Description
	Frequency (GHz, max)	Control Voltages (V)	Insertion Loss (dB)	Isolation (dB)	Input Power @ 0.1 dB compression point (dBm)	Input Power @ 1.0 dB compression point (dBm)		
UPD5713TK ¹	2.5	+1.8, 2.8/0	0.80 @ 2GHz	25 @ 2GHz	+17	+21	TK	Single Control (1.8-V _{dd}), small size package, CMOS
UPG2009TB ¹	3.0	+2.8/0	0.30 @ 2GHz	28 @ 2GHz	+34	–	TB	High power handling, low insertion loss, high isolation
UPG2030TK ¹	3.0	+2.8/0	0.30 @ 2GHz	27 @ 2GHz	+27	+30	TK	Medium power, small size package
UPG2155TB ¹	2.5	+2.6/0	0.40 @ 2GHz	19 @ 2GHz	+37	–	TB	High power handling, low harmonics, lowest cost high power switch
UPG2163T5N ¹	8.0	+3.0/0	0.4 @ 2.5GHz 0.5 @ 6GHz	35 @ 2.5GHz 30 @ 6GHz	–	+35 @ 2.5GHz +29 @ 6GHz	T5N	Highest isolation, great 2.4 and 6GHz performance
UPG2176T5N ¹	6.0	+3.0/0	0.55 @ 3.5GHz	24 @ 3.5GHz	–	+37	T5N	Absorptive, high power and high linearity to 6GHz
UPG2214TB ¹	3.0	+1.8, 3.0/0	0.30 @ 2GHz	27 @ 2GHz	+23	+20 (1.8V), 26(3.0V)	TB	Low insertion loss, high isolation, medium power, 1.8V-5.3V.
UPG2214TK ¹	3.0	+1.8, 3.0/0	0.30 @ 2GHz	27 @ 2GHz	+23	+20 (1.8V), 26(3.0V)	TK	Small size package, low insertion loss, high isolation, medium power, 1.8V-5.3V.
UPG2406TK ¹	3.0	+1.8, 2.7/0	0.45 @ 2GHz	19 @ 2GHz	+29	+25 (1.8V), 30.5 (3.0V)	TK	Small size package, cost effective medium power, 1.8V-5.3V
UPG2408TB ¹	3.0	+3.0/0	0.48 @ 2GHz	19 @ 2GHz	+29	–	TB	Low cost medium power for UHF-3GHz
UPG2408TK ¹	3.0	+3.0/0	0.48 @ 2GHz	19 @ 2GHz	+29	–	TK	Small size package, cost effective medium power
UPG2409TB ¹	3.8	+3.0/0	0.45 @ 2.5GHz 0.60 @ 3.8GHz	26 @ 2.5 GHz 19 @ 3.8GHz	+33.5	+35	TB	Low Cost high power SPDT, for Access Points to 3.8GHz
UPG2409T6X ¹	6.0	+3.0/0	0.45 @ 2.5GHz 0.65 @ 6GHz	30 @ 2.5 GHz 27 @ 6 GHz	+34	+36	T6X	High power, for Access Points to 6GHz, 1.5mm QFN package
UPG2415TK ¹	6.0	+3.0/0	0.45 @ 2.5GHz 0.65 @ 6GHz	28 @ 2.5 GHz 26 @ 6 GHz	+31	+34	TK	High power handling for Access Points to 6GHz, small size package
UPG2415T6X ¹	6.0	+3.0/0	0.45 @ 2.5GHz 0.55 @ 6GHz	28 @ 2.5 GHz 26 @ 6 GHz	+31	+35	T6X	High power handling for Access Points to 6GHz, 1.5mm QFN package
UPG2422TK ¹	6.0	+1.8, 3.0/0	0.35 @ 2.5GHz, 0.55 @ 6GHz	28 @ 2.5GHz 24 @ 6GHz	+28 @ 2-6GHz	+31 @ 6GHz	TK	Low cost 6GHz SPDT, medium power, small size package, low insertion loss, high isolation, 1.8V-5.3V
 CKRF2185XS02 ²	6.0	+1.8, 3.0/0	0.40 @ 2.5GHz 0.5 @ 6GHz	26 @ 2.5GHz 25 @ 6GHz	+29	+30.5	XS02	Low Cost SPDT specified to 6GHz with a small thin package

Notes: 1. Manufactured by Renesas Electronics 2. Manufactured by CDK (Chou Denshi Kogyo) , a longtime manufacturing partner for Renesas Electronics. Contact CEL for production status
3. See Package Dimensions on page 11

RF Switch ICs continued

SP3Ts (Single Pole Triple Throw)

Part Number ¹	TYPICAL ELECTRICAL CHARACTERISTICS (T _A = 25°C)						Package Code ²	Description
	Frequency (GHz, max)	Control Voltages (V)	Insertion Loss (dB)	Isolation (dB)	Input Power @0.1 dB compression point (dBm)	Input Power @1.0 dB compression point (dBm)		
NEW CKRF2430XS01	6.0	+1.8, 3.0/0	0.50 @ 2.5GHz 0.55 @ 6GHz	28 @ 2.5GHz 25 @ 6GHz	+28	+31	XS01	SP3T specified to 6GHz with high isolation

Notes: 1. Manufactured by CDK (Chou Denshi Kogyo) , a longtime manufacturing partner for Renesas Electronics. Contact CEL for production status 2. See Package Dimensions on page 11

DPDTs (Double Pole Double Throw)

Part Number ¹	TYPICAL ELECTRICAL CHARACTERISTICS (T _A = 25°C)						Package Code ²	Description
	Frequency (GHz, max)	Control Voltages (V)	Insertion Loss (dB)	Isolation (dB)	Input Power @0.1 dB compression point (dBm)	Input Power @1.0 dB compression point (dBm)		
UPG2164T5N	6.0	+3.0/0	0.5 @ 2.4GHz 0.7 @ 5.5GHz	25 @ 2.4GHz 17 @ 5.5GHz	–	+31 +29	T5N	Lowest cost, lowest insertion loss DPDT. 6GHz operation.
UPG2162T5N	6.0	+3.0/0	0.6 @ 2.4GHz 0.85 @ 5.5GHz	30 @ 2.4GHz 27 @ 5.5GHz	–	+31 +29	T5N	Best isolation of all DPDTs, up to 6GHz operation
UPD5738T6N	2.5	+2.8/0	0.8 @ 1GHz	22 @ 1GHz	+15	+20	T6N	Only one control pin, low frequency operation, CMOS, 1.5V-3.6V

Notes: 1. Manufactured by Renesas Electronics 2. See Package Dimensions on page 11

GaAs FETs

Low Noise GaAs FETs, 1 to 20GHz Typical Specifications @ T_A = 25°C

Part Number ¹	Gate Length (μm)	Gate Width (μm)	Recommended Frequency Range (GHz)	Test Frequency (GHz)	NF/Ga Bias		NF _{OPT} (dB)	G _A (dB)	Power Bias		P _{1dB} (dBm)	Package Code ²	Package Description
					V _{DS} (V)	I _{DS} (mA)			V _{DS} (V)	I _{DS} (mA)			
NE3210S01	0.2	160	4 to 18	12	2.0	10	0.35	13.5	–	–	–	S01	Plastic SMD
NE3503M04	0.2	160	2 to 18	12	2.0	10	0.55	11.5	–	–	–	M04	Plastic SMD
NE3508M04	0.6	800	1 to 6	2	2.0	10	0.45	14.0	3.0	30	+18.0	M04	Plastic SMD
NE3509M04	0.6	400	1 to 6	2	2.0	10	0.40	17.5	3.0	20	+14.0	M04	Plastic SMD
NE3510M04	0.6	280	1 to 6	2	2.0	10	0.35	19.0	3.0	30	+12.0	M04	Plastic SMD
NE3511S02	0.2	160	4 to 18	12	2.0	10	0.30	13.5	–	–	–	S02	Micro-X Plastic
NE3512S02	0.2	160	4 to 18	12	2.0	10	0.35	13.5	–	–	–	S02	Micro-X Plastic
NE3513M04	0.2	160	10 to 14	12	2.0	6	0.45	13.0	–	–	–	M04	Plastic SMD
NE3514S02	0.2	160	4 to 20	20	2.0	10	0.75	10.0	–	–	–	S02	Micro-X Plastic
NE3515S02	0.2	200	6 to 18	12	2.0	10	0.3	12.5	3.0	25	+14.0	S02	Micro-X Plastic
NE3516S02	0.2	160	6 to 18	12	2.0	10	0.35	14.0	–	–	–	S02	Plastic SMD
NE3517S03	0.2	160	14 to 24	20	2.0	10	0.70	13.5	–	–	–	S03	Micro-X Plastic
NE3520S03	–	160	10 to 26	20	2.0	10	0.65	13.5	–	–	–	S03	Micro-X Plastic
NE3521M04	–	–	10 to 26	20	2.0	10	0.85	11	–	–	–	M04	Plastic SMD
NE4210S01	0.2	160	2 to 18	12	2.0	10	0.50	13.0	–	–	–	S01	Plastic SMD

Notes: 1. Manufactured by Renesas Electronics 2. See Package Dimensions on page 11

Silicon MOSFET Devices

RF Power LD-MOSFETs Typical Specifications @ T_c = 25°C

Part Number ¹	P _{OUT} (dBm) TYP	Linear Gain (dB) TYP	Test Conditions				Package Code ²	Package Description
			Freq (GHz)	P _{IN} (dBm)	V _{DS} (V)	I _{DSO} (mA)		
NE5531079A	+40.0	20.5	0.46	+25	7.5	200	79A	Plastic SMD
NE55410GR	+40.4	25	2.1	+16	28	120	GR	Plastic SMD
NE5550234	+33	23.5	0.46	+15	7.5	40	34	Plastic SMD
	+32.2	18.3	0.90	+17	7.5	40		
NE5550279A	+33	22.5	0.46	+15	7.5	40	79A	Plastic SMD
NE5550779A	+38.5	22	0.46	+25	7.5	140	79A	Plastic SMD
	+37.4	17	0.90	+27	7.5	140		
NE5550979A	+39.5	22	0.46	+25	7.5	200	79A	Plastic SMD
	+38.6	16	0.90	+27	7.5	200		

Notes: 1. Manufactured by Renesas Electronics 2. See Package Dimensions on page 11

MOSFET for Microphone Impedance Conversion

Part Number ¹	Supply Voltage (V)	Circuit Current (μA)	Input Capacitance (pF)	Voltage Gain (dB)	Output Noise Voltage (dBV)	Total Harmonic Distortion (%)	HBM ESD (KV)	Package Code ²
NE5820M53	2	85	1.5	-3	-114	0.1	>8	M53

Notes: 1. Manufactured by Renesas Electronics 2. See Package Dimensions on page 11

Silicon Bipolar Transistors

Single Transistors

Part Number ¹	JEITA ² Part Number	TEST f (GHz)	NF			MAG/MSG			f _T TYP (GHz)	h _{FE} TYP	I _C MAX (mA)	Package Code ³	Package Style
			V _{CE} (V)	I _{CQ} (mA)	TYP (dB)	V _{CE} (V)	I _C (mA)	TYP (dB)					
NE202930	—	1.0	5	5	1.15	5	30	15.5	11	140	100	30	SOT-323
NE46134	2SC4536	1.0	10	50	2.0	10	50	9.0	5.5	100	250	34	SOT-89
NE461M02	2SC5337	1.0	10	50	2.0	10	50	11.0	5.5	120	250	M02	SOT-89
NE46234	2SC4703	1.0	5	50	2.3	5	50	8.3	6	250	150	34	SOT-89
NE462M02	2SC5338	1.0	5	50	2.3	5	50	8.3	6	250	150	M02	SOT-89
NE662M04	2SC5508	2.0	2	5	1.1	2	20	20.0	23	70	35	M04	SOT-343F
NE66219	2SC5606	2.0	2	5	1.5	2	20	14.0	21	80	35	19	SOT-523
NE663M04	2SC5509	2.0	2	10	1.2	2	50	15.0	18	100	100	M04	SOT-343F
NE664M04	2SC5754	1.8	—	—	—	3	100	12.0	20	60	500	M04	SOT-343F
NE67718	2SC5750	1.8	3	5	1.7	3	20	15.0	15	120	50	M04	SOT-343
NE67739	2SC5454	2.0	3	5	1.5	3	20	14.0	14.5	110	50	39	SOT-143
NE677M04	2SC5751	1.8	3	5	1.7	3	20	16.0	15	120	50	M04	SOT-343F
NE67818	2SC5752	1.8	3	5	1.7	3	30	13.0	12	120	100	M04	SOT-343
NE67839	2SC5455	2.0	3	7	1.5	3	30	14.0	12	110	100	39	SOT-143
NE678M04	2SC5753	1.8	3	7	1.7	3	30	13.5	12	120	100	M04	SOT-343F
NE68018	2SC5013	2.0	6	5	1.8	1	1	12.5	10	100	35	18	SOT-343
NE68019	2SC5008	2.0	3	5	1.9	1	1	12.0	8	120	35	19	SOT-523
NE68030	2SC4228	2.0	6	5	1.7	6	10	8.5	10	100	35	30	SOT-323
NE68033	2SC3585	2.0	6	5	1.8	6	10	8.0	10	100	35	33	SOT-23
NE68039	2SC4095	2.0	6	5	1.7	6	10	9.0	10	100	35	39	SOT-143
NE68118	2SC5012	1.0	2.5	3	1.1	2.5	3	16.0	9	100	65	18	SOT-343
NE68119	2SC5007	1.0	2.5	3	1.1	2.5	3	15.5	7	120	65	19	SOT-523
NE68130	2SC4227	1.0	8	7	1.5	8	20	13.0	7	120	65	30	SOT-323
NE68133	2SC3583	1.0	8	7	1.2	8	20	11.0	9	100	65	33	SOT-23
NE68139	2SC4094	1.0	8	7	1.2	8	20	15.0	9	100	65	39	SOT-143
NE68518	2SC5015	2.0	2.5	3	1.5	2.5	3	12.0	12	110	30	18	SOT-343
NE68519	2SC5010	2.0	2.5	3	1.5	2.5	3	11.0	12	110	30	19	SOT-523
NE68539	2SC4957	2.0	—	—	—	3	10	11.0	12	110	30	39	SOT-143
NE85618	2SC5011	1.0	2.5	3	1.4	2.5	3	14.0	6.5	120	100	18	SOT-343
NE85619	2SC5006	1.0	2.5	3	1.5	2.5	3	13.5	4.5	120	100	19	SOT-523
NE85630	2SC4226	1.0	10	7	1.3	10	20	12.0	4.5	110	100	30	SOT-323
NE85633	2SC3356	1.0	10	7	1.4	10	20	11.5	7	120	100	33	SOT-23
NE85634	2SC3357	1.0	10	7	1.1	10	40	11.0	6.5	120	100	34	SOT-89
NE85639	2SC4093	1.0	10	7	1.5	10	20	13.0	7	120	100	39	SOT-143
NE856M02	2SC5336	1.0	10	7	1.1	10	50	14.0	6.5	120	100	M02	SOT-89
NE97733 ⁴	2SA1977	1.0	—8	—3	1.5	—8	—20	12.0	8.5	60	—50	33	SOT-23
NE97833 ⁴	2SA1978	1.0	—10	—3	2.0	—10	—15	10.0	5.5	40	—50	33	SOT-23

Notes: 1. Manufactured by Renesas Electronics 2. JEITA (Japan Electronics and Information Technology Association) equivalent part number 3. See Package Dimensions on page 11
4. PNP type Transistors

Silicon Bipolar Transistors continued

Twin Transistors

Part Number ¹	TEST f (GHz)	NF/GA V _{CE} (V)	NF/GA I _c (mA)	NF TYP (dB)	GA TYP (dB)	MAG TYP (dB)	IS _{21E} I			f _r TYP (GHz)	h _{FE} TYP	I _c MAX (mA)	Die	Pkg. Code ²	Package Style
							V _{CE} (V)	I _c (mA)	TYP (dB)						
UPA800T	2.0	3	5	1.9	9.0	12.0	3	5	7.5	8	120	35	2 each NE680	T	SOT-363
UPA801T	1.0	3	7	1.2	10.0	14.0	3	7	9.0	4.5	120	100	2 each NE856	T	SOT-363
UPA802T	1.0	3	7	1.4	14.0	16.0	3	7	12.0	7.0	100	65	2 each NE681	T	SOT-363
UPA806T	2.0	3	3	1.5	7.5	11.0	3	10	8.5	12.0	110	30	2 each NE685	T	SOT-363
UPA810T	1.0	3	7	1.2	10.0	14.0	3	7	9.0	4.5	120	100	2 each NE856	T	SOT-363
UPA811T	2.0	3	5	1.9	9.0	12.0	3	5	7.5	8	120	35	2 each NE680	T	SOT-363
UPA812T	1.0	3	7	1.7	14	16.0	3	7	12.0	7	100	65	2 each NE681	T	SOT-363

Notes: 1. Manufactured by Renesas Electronics 2. See Package Dimensions on page 11

Silicon RFICs

3V Silicon MMIC Amplifiers

Part Number ¹	Typical Frequency Range @ 3dB down (MHz)	ELECTRICAL CHARACTERISTICS ⁶ (T _A = 25°C)												Package Code ⁷	Package Style
		V _{CC} (V)	I _{CC} (mA)			NF (dB)	Gain (dB)			RL _{IN} (dB)	RL _{OUT} (dB)	P _{1dB} (dBm)	ISOL (dB)		
			MIN	TYP	MAX	TYP	MIN	TYP	MAX	TYP	TYP	TYP	TYP		
UPC2745TB ²	2700	3	5	7.5	10	6.0	9	12	14	11	5.5	-3.0	38	TB	SOT-363
UPC2746TB ²	1500	3	5	7.5	10	4.0	16	19	21	13	8.5	-3.7	45	TB	SOT-363
UPC2748TB ³	1500	3	4.5	6	8	2.8	16	19	21	11.5	8.5	-8.5	40	TB	SOT-363
UPC2749TB ⁴	2900	3	4	6	8	4	13	16	18.5	10	13	-12.5	30	TB	SOT-363
UPC2762TB ⁴	2900	3	–	27	35	7.0	11.5	15.5	17.5	8.5	12	+7	25	TB	SOT-363
UPC2771TB	2200	3	–	36	45	6	19	21	24	14	9	+11.5	30	TB	SOT-363
UPC8178TK ⁴	2700	3	1.4	1.9	2.4	5.5	9.0	11.0	13.5	8	–	-8.0	41	TK	6 pin Recessed Lead
UPC8179TK ⁴	Note 5	3	2.9	4.0	5.4	5.0	13.0	15.5	17.5	7	–	0.5	42	TK	6 pin Recessed Lead

Notes: 1. Manufactured by Renesas Electronics 2. f = 500 MHz test condition 3. f = 900 MHz test condition 4. f = 1900 MHz test condition 5. 100–2400MHz with output port matching 6. Z_L = 50 Ω for all Electrical Characteristics 7. See Package Dimensions on page 11 Manufactured by Renesas Electronics

5V Silicon MMIC Amplifiers

Part Number ¹	Typical Frequency Range @ 3dB down (MHz)	ELECTRICAL CHARACTERISTICS ⁴ (T _A = 25°C)												Package Code ⁵	Package Style
		V _{CC} (V)	I _{CC} (mA)			NF (dB)	Gain (dB)			RL _{IN} (dB)	RL _{OUT} (dB)	P _{1dB} (dBm)	ISOL (dB)		
			MIN	TYP	MAX	TYP	MIN	TYP	MAX	TYP	TYP	TYP	TYP		
UPC2708TB ³	2900	5	20	26	33	6.5	13	15	18.5	11	20	+9.2	23	TB	SOT-363
UPC2709TB ³	2300	5	19	25	32	5.0	21	23	26.5	10	10	+8.7	31	TB	SOT-363
UPC2710TB ²	1000	5	16	22	29	3.5	30	33	36.5	6	12	+10.8	39	TB	SOT-363
UPC3223TB ³	3200	5	15	19	24	4.5	20.5	23	22.5	12	12	+6.5	33	TB	SOT-363
UPC3224TB ³	3200	5	7.0	9.0	12.0	4.3	19	21.5	24	12	17	-3.5	40	TB	SOT-363

Notes: 1. Manufactured by Renesas Electronics 2. f = 500 MHz test condition 3. f = 1000 MHz test condition 4. Z_L = 50 Ω for all Electrical Characteristics
5. See Package Dimensions on page 11

Frequency Upconverters

Part Number ¹	ELECTRICAL CHARACTERISTICS (T _A = 25°C)								Package Code ⁵	Package Style
	IF Input Frequency Range @3 dB Down (MHz)	RF Output Frequency Range (MHz)	V _{CC} (V)	I _{CC} (mA)	Conversion Gain (dB)	P _{SAT} ⁴ (dBm)	Noise Figure (dB)	OIP ₃		
	TYP	TYP		TYP	TYP	TYP	TYP			
UPC8106TB ²	50-400	400-2000	3.0	9.0	10.0	-2.0	8.5	+5.5	TB	SOT-363
UPC8172TB ³	50-400	800-2500	3.0	9.0	8.5	0.0	10.4	+6.0	TB	SOT-363

Notes: 1. Manufactured by Renesas Electronics 2. RF = 900 MHz, LO = 660 MHz, PLO = -5 dBm 3. RF = 1900 MHz, LO = 1660 MHz, PLOIN = -5 dBm 4. PIN = 0 dBm
5. See Package Dimensions on page 11

Frequency Downconverters

Part Number ¹	ELECTRICAL CHARACTERISTICS (T _A = 25°C)								Package Code ³	Package Style
	RF Input Frequency Range @3 dB Down (MHz)	IF Output Frequency Range @3 dB Down (MHz)	V _{CC} (V)	I _{CC} (mA)	Conversion Gain (dB)	P _{SAT} (dBm)	Noise Figure (dB)	Test Condition (Note)		
	TYP	TYP		TYP	TYP	TYP	TYP			
UPC2756TB	100-2000	10-300	3.0	5.9	14	-12	13	3	TB	SOT-363
UPC2757TB ²	100-2000	20-300	3.0	5.6	13	-8	13	4	TB	SOT-363
UPC2758TB ²	100-2000	20-300	3.0	11	17	-4	13	4	TB	SOT-363
UPC8112TB ²	800-2000	100-300	3.0	8.5	13	-3	11.2	5	TB	SOT-363

Note: 1. Manufactured by Renesas Electronics 2. AGC Amp and Mixer Block only 3. See Package Dimensions on page 11

Package Dimensions Units in mm

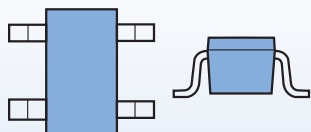
These dimensions are for the package only. For detailed dimensions including leads, please refer to the datasheet.

18 Package

(1.25 x 2.0 x 0.9)

Top View

Side View

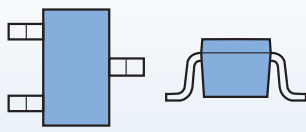


19 Package

(0.8 x 1.6 x 0.75)

Top View

Side View

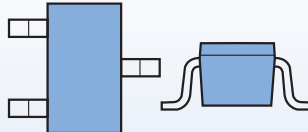


30 Package

(1.25 x 2.0 x 0.9)

Top View

Side View

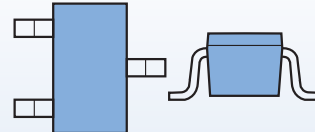


33 Package

(1.5 x 2.9 x 1.4)

Top View

Side View

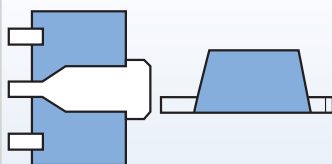


34 Package

(2.5 x 4.5 x 1.5)

Top View

Side View

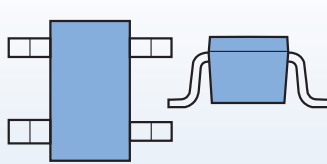


39 Package

(1.5 x 2.9 x 1.1)

Top View

Side View



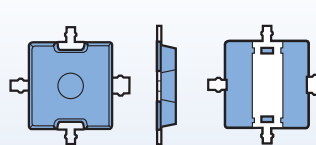
79A Package

(4.2 x 4.4 x 0.9)

Top View

Side View

Bottom View



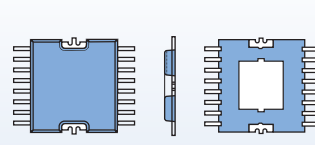
GR Package

(5.2 x 5.5 x 0.9)

Top View

Side View

Bottom View

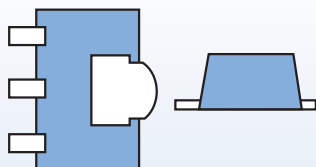


M02 Package

(2.45 x 4.5 x 1.5)

Top View

Side View

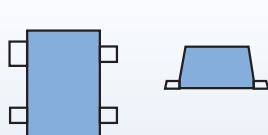


M04 Package

(1.25 x 2.0 x 0.6)

Top View

Side View

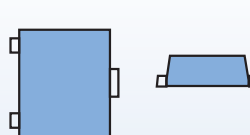


M53 Package

(1.0 x 1.2 x 0.33)

Top View

Side View

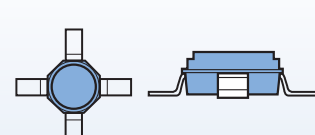


S01 Package

(2.0 x 2.0 x 1.5)

Top View

Side View

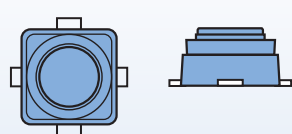


S02 / S03 Package

(2.6 x 2.6 x 1.5)

Top View

Side View



T / TB / MM26 Package

(1.25 x 2.0 x 0.9)

Top View

Side View



TK Package

(1.1 x 1.5 x 0.55)

Top View

Side View

Bottom View



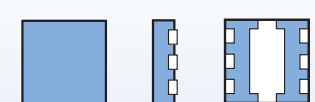
T5N / T6N Package

(1.5 x 1.5 x 0.37)

Top View

Side View

Bottom View



T6X Package

(1.5 x 1.5 x 0.37)

Top View

Side View

Bottom View



XS01 Package

(1.5 x 1.5 x 0.37)

Top View

Side View

Bottom View



XS02 Package

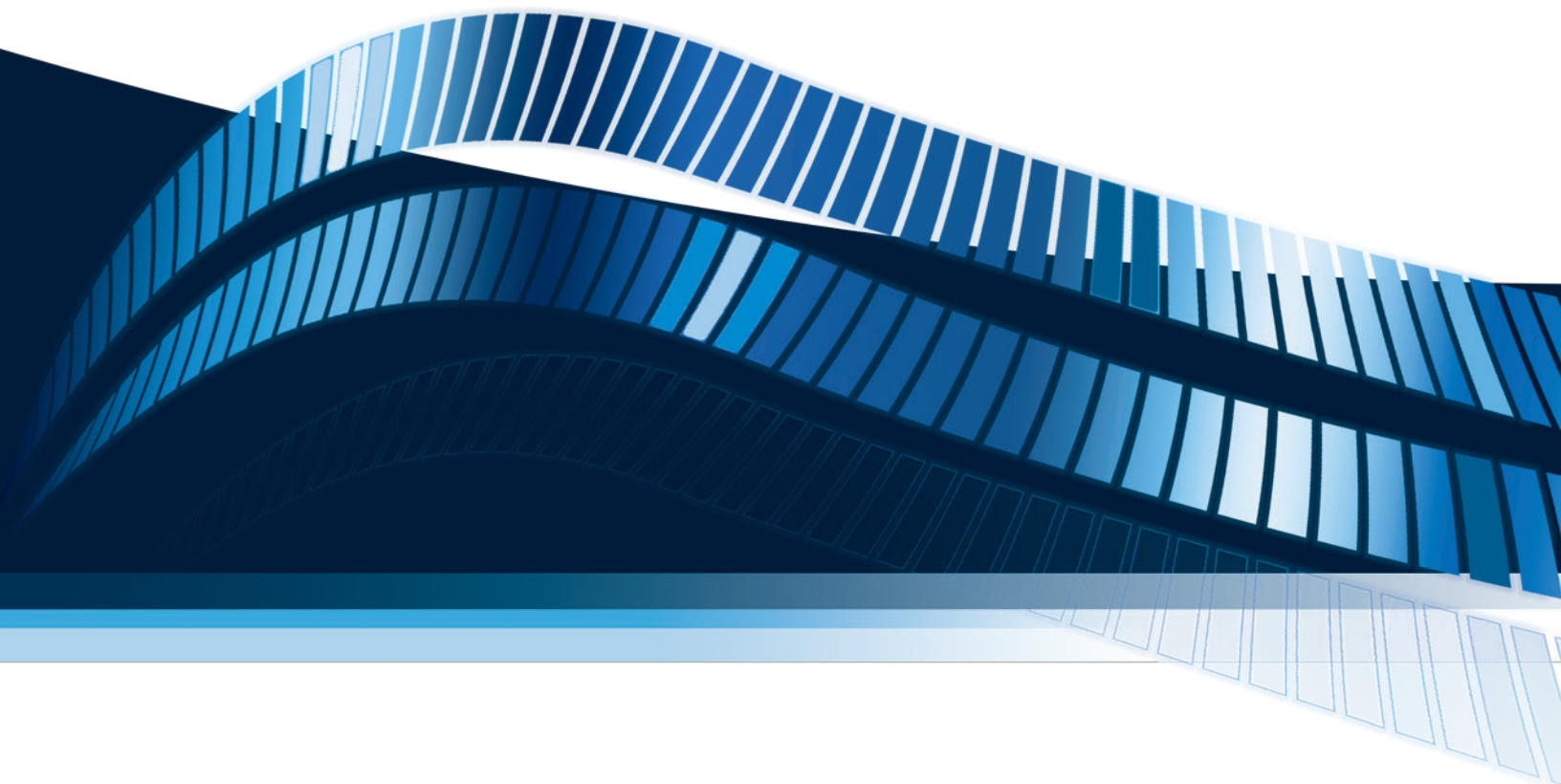
(1.0 x 1.0 x 0.37)

Top View

Side View

Bottom View





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