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# RF & Wireless

## Semiconductors



# About CEL

California Eastern Laboratories (CEL) 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., Wauconda, IL and Boulder, CO. The company supports customers through sales offices, sales representatives and distributors in numerous locations.



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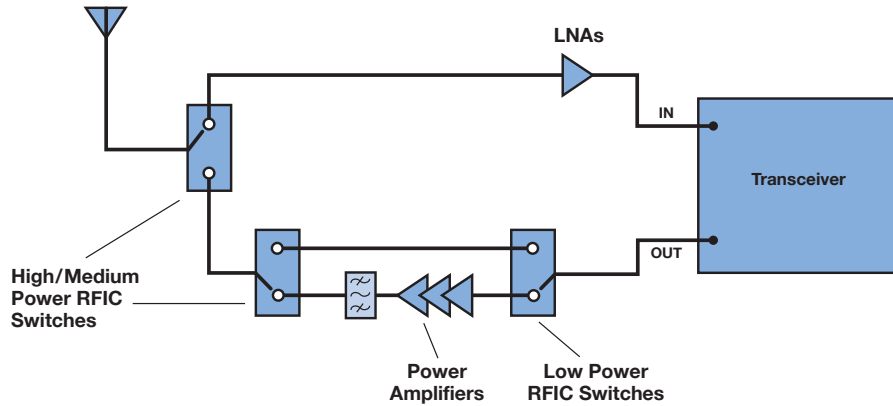
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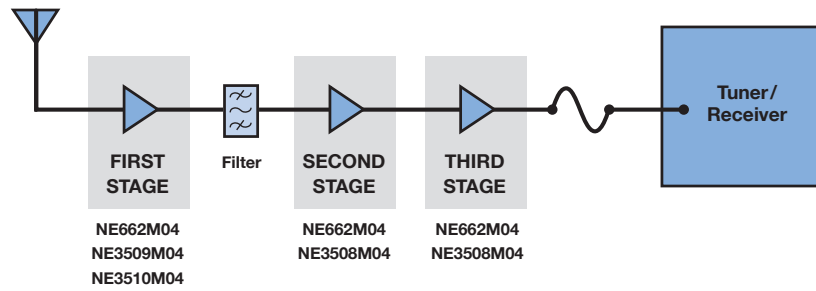
# Front End Components Up to 6 GHz Applications

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)	✓	✓	✓	
<b>NEW</b> CKRF2179MM26	SPDT, Medium Power, SOT-363	✓	✓	✓	
<b>NEW</b> 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			✓	✓

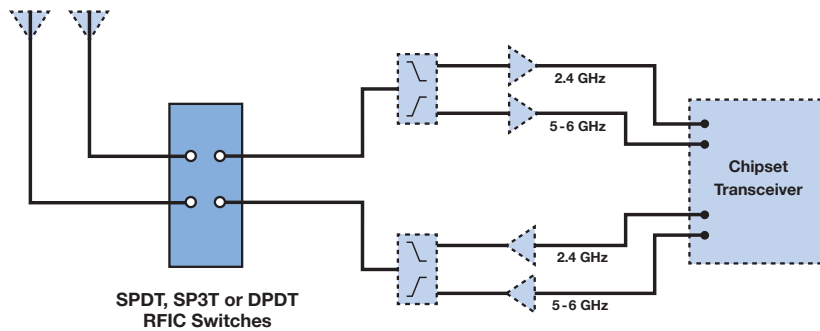
# LNAs for 2 to 8GHz Applications



## 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

<b>UPG2408TB</b>	SPDT, 3V, 0.50dB Insertion Loss, High ESD immunity
<b>UPG2409TB</b>	SPDT 2.0 – 4.0GHz, Insertion Loss: 0.45dB @ 2.5GHz, 0.6dB @ 3.8GHz
<b>UPG2406TK</b>	SPDT, 1.8 or 2.7V control voltage, 0.45dB Insertion Loss @ 2GHz, High ESD immunity
<b>NEW CKRF2406XS02</b>	SPDT, Cost-effective, Lowest Insertion Loss: 0.25dB @ 2.5GHz, small thin package
<b>NEW CKRF2179MM26</b>	SPDT, Medium power, Insertion Loss: 0.30dB @ 2.5GHz
<b>NEW CKRF2413XS01</b>	SP3T, Cost-effective, Insertion Loss: 0.35dB @ 2.5GHz

### GaAs RFIC Switches to 6GHz

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

# RF Switch ICs

## SPDTs (Single Pole Double Throw)

Part Number	PLP <sup>3</sup>	TYPICAL ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)						Pkg. Code <sup>4</sup>	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 <sup>1</sup>	PLP	2.5	+1.8, 2.8/0	0.80 @ 2GHz	25 @ 2GHz	+17	+21	TK	Single Control (1.8-V <sub>dd</sub> ), small size package, CMOS
UPG2009TB <sup>1</sup>	PLP	3.0	+2.8/0	0.30 @ 2GHz	28 @ 2GHz	+34	-	TB	High power handling, low insertion loss, high isolation
UPG2030TK <sup>1</sup>	PLP	3.0	+2.8/0	0.30 @ 2GHz	27 @ 2GHz	+27	+30	TK	Medium power, small size package
UPG2155TB <sup>1</sup>	PLP	2.5	+2.6/0	0.40 @ 2GHz	19 @ 2GHz	+37	-	TB	High power handling, low harmonics, lowest cost high power switch
UPG2163T5N <sup>1</sup>	PLP	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 <sup>1</sup>	PLP	6.0	+3.0/0	0.55 @ 3.5GHz	24 @ 3.5GHz	-	+37	T5N	Absorptive, high power and high linearity to 6GHz
UPG2214TB <sup>1</sup>	PLP	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 <sup>1</sup>	PLP	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 <sup>1</sup>	PLP	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 <sup>1</sup>	PLP	3.0	+3.0/0	0.48 @ 2GHz	19 @ 2GHz	+29	-	TB	Low cost medium power for UHF-3GHz
UPG2408TK <sup>1</sup>	PLP	3.0	+3.0/0	0.48 @ 2GHz	19 @ 2GHz	+29	-	TK	Small size package, cost effective medium power
UPG2409TB <sup>1</sup>	PLP	3.8	+3.0/0	0.45 @ 2.5GHz 0.60 @ 3.8GHz	26 @ 2.5GHz 19 @ 3.8GHz	+33.5	+35	TB	Low Cost high power SPDT, for Access Points to 3.8GHz
UPG2409T6X <sup>1</sup>	PLP	6.0	+3.0/0	0.45 @ 2.5GHz 0.65 @ 6GHz	30 @ 2.5GHz 27 @ 6GHz	+34	+36	T6X	High power, for Access Points to 6GHz, 1.5mm QFN package
UPG2415TK <sup>1</sup>	PLP	6.0	+3.0/0	0.45 @ 2.5GHz 0.65 @ 6GHz	28 @ 2.5GHz 26 @ 6GHz	+31	+34	TK	High power handling for Access Points to 6GHz, small size package
UPG2415T6X <sup>1</sup>	PLP	6.0	+3.0/0	0.45 @ 2.5GHz 0.55 @ 6GHz	28 @ 2.5GHz 26 @ 6GHz	+31	+35	T6X	High power handling for Access Points to 6GHz, 1.5mm QFN package
UPG2422TK <sup>1</sup>	PLP	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
<b>NEW</b> CKRF2159XS02 <sup>2</sup>	-	3.0	+1.8, 3.0/0	0.25 @ 2.5GHz	27 @ 2.5GHz	+22	+25.5	XS02	Low Cost, Lowest Insertion Loss, small thin package
<b>NEW</b> CKRF2185XS02 <sup>2</sup>	-	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
<b>NEW</b> CKRF2406XS02 <sup>2</sup>	-	3.0	+1.8, 3.0/0	0.25 @ 2.5GHz	17 @ 2.5GHz	+29	+30.5	XS02	Low Cost, Lowest Insertion Loss, small thin package
<b>NEW</b> CKRF2179MM26 <sup>2</sup>	-	3.0	+1.8, 3.0/0	0.30 @ 2.5GHz	27 @ 2.5GHz	+28	+31	MM26	Low cost, Low insertion loss, Medium Power SPDT

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 Product Longevity Program details on page 12 4. See Package Dimensions on page 11



## RF Switch ICs continued

### SP3Ts (Single Pole Triple Throw)

Part Number <sup>1</sup>	TYPICAL ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)						Package Code <sup>2</sup>	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)		
<b>NEW</b> CKRF2413XS01	3.0	+1.8, 3.0/0	0.35 @ 2.5GHz	18 @ 2.5GHz	+28	+31	XS01	Lowest Cost SP3T, Low Insertion Loss
<b>NEW</b> 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 <sup>1</sup>	PLP <sup>2</sup>	TYPICAL ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)						Package Code <sup>3</sup>	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	PLP	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	PLP	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	PLP	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 Product Longevity Program details on page 12 3. See Package Dimensions on page 11

## GaAs FETs

### Low Noise GaAs FETs, 1 to 20GHz Typical Specifications @ T<sub>A</sub> = 25°C

Part Number <sup>1</sup>	PLP <sup>2</sup>	Gate Length (μm)	Gate Width (μm)	Recommended Frequency Range (GHz)	Test Frequency (GHz)	NF/GA Bias		NF <sub>OPT</sub> (dB)	G <sub>A</sub> (dB)	Power Bias		P <sub>1dB</sub> (dBm)	Package Code <sup>3</sup>	Package Description
						V <sub>DS</sub> (V)	I <sub>DS</sub> (mA)			V <sub>DS</sub> (V)	I <sub>DS</sub> (mA)			
NE3503M04	PLP	0.2	160	2 to 18	12	2.0	10	0.55	11.5	-	-	-	M04	Plastic SMD
NE3508M04	PLP	0.6	800	1 to 6	2	2.0	10	0.40	14.0	3.0	30	+18.0	M04	Plastic SMD
NE3509M04	PLP	0.6	400	1 to 6	2	2.0	10	0.45	17.5	3.0	20	+14.0	M04	Plastic SMD
NE3510M04	PLP	0.6	280	1 to 6	2	2.0	10	0.35	19.0	3.0	30	+12.0	M04	Plastic SMD
NE3511S02	PLP	0.2	160	4 to 18	12	2.0	10	0.30	13.5	-	-	-	S02	Micro-X Plastic
NE3512S02	PLP	0.2	160	4 to 18	12	2.0	10	0.35	13.5	-	-	-	S02	Micro-X Plastic
NE3513M04	PLP	0.2	160	10 to 14	12	2.0	6	0.45	13.0	-	-	-	M04	Plastic SMD
NE3514S02	PLP	0.2	160	4 to 20	20	2.0	10	0.75	10.0	-	-	-	S02	Micro-X Plastic
NE3515S02	PLP	0.2	200	6 to 18	12	2.0	10	0.3	12.5	3.0	25	+14.0	S02	Micro-X Plastic
NE3516S02	PLP	0.2	160	6 to 18	12	2.0	10	0.35	14.0	-	-	-	S02	Plastic SMD
NE3520S03	PLP	-	160	10 to 26	20	2.0	10	0.65	13.5	-	-	-	S03	Micro-X Plastic
NE3521M04	PLP	-	-	10 to 26	20	2.0	10	0.85	11	-	-	-	M04	Plastic SMD

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11



# Silicon MOSFET Devices

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

Part Number <sup>1</sup>	PLP <sup>2</sup>	P <sub>OUT</sub> (dBm) TYP	Linear Gain (dB) TYP	Test Conditions				Package Code <sup>3</sup>	Package Description
				Freq (GHz)	P <sub>IN</sub> (dBm)	V <sub>DS</sub> (V)	I <sub>DSQ</sub> (mA)		
NE5550234	rd	+33	23.5	0.46	+15	7.5	40	34	Plastic SMD
		+32.2	18.3	0.90	+17	7.5	40		
NE5550279A	rd	+33	22.5	0.46	+15	7.5	40	79A	Plastic SMD
NE5550779A	rd	+38.5	22	0.46	+25	7.5	140	79A	Plastic SMD
		+37.4	17	0.90	+27	7.5	140		
NE5550979A	rd	+39.5	22	0.46	+25	7.5	200	79A	Plastic SMD
		+38.6	16	0.90	+27	7.5	200		
NE5531079A	-	+40.0	20.5	0.46	+25	7.5	200	79A	Plastic SMD

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11

## MOSFET for Microphone Impedance Conversion

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

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11

# Silicon Bipolar Transistors

## Small Signal Silicon Devices

Part Number <sup>1</sup>	Equivalent Part Number	PLP <sup>2</sup>	TEST f (GHz)	NF/GA		NF TYP (dB)	GA TYP (dB)	MAG/MSG			f <sub>T</sub> TYP (GHz)	h <sub>FE</sub> TYP	I <sub>C</sub> MAX (mA)	Package Code <sup>3</sup>	Package Style
				V <sub>CE</sub> (V)	I <sub>CQ</sub> (mA)			V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	TYP (dB)					
NE202930	–	PLP	1.0	5	5	1.15	13.5	5	30	15.5	11	140	100	30	SOT-323
NE662M04	2SC5508	PLP	2.0	2	5	1.1	16	2	20	20	23	70	35	M04	SOT-343F
NE66219	2SC5606	PLP	2.0	2	5	1.5	12.0	2	20	14	21	80	35	19	SC-90
NE68018	2SC5013	PLP	2.0	6	5	1.8	10.0	1	1	12.5	10	100	35	18	SOT-343
NE68019	2SC5008	PLP	2.0	3	5	1.9	9.0	1	1	12.0	8	120	35	19	SC-90
NE68030	2SC4228	PLP	2.0	6	5	1.7	9.5	6	10	8.5	10	100	35	30	SOT-323
NE68033	2SC3585	PLP	2.0	6	5	1.8	9.0	6	10	8.0	10	100	35	33	SOT-23
NE68039	2SC4095	–	2.0	6	5	1.7	11.0	6	10	9.0	10	100	35	39	SOT-143
NE68118	2SC5012	–	1.0	2.5	3	1.1	13.0	2.5	3	16.0	9	100	65	18	SOT-343
NE68119	2SC5007	PLP	1.0	2.5	3	1.1	12.0	2.5	3	15.5	7	120	65	19	SC-90
NE68130	2SC4227	PLP	1.0	8	7	1.5	13.5	8	20	13.0	7	120	65	30	SOT-323
NE68133	2SC3583	PLP	1.0	8	7	1.2	13.0	8	20	11.0	9	100	65	33	SOT-23
NE68139	2SC4094	–	1.0	8	7	1.2	13.5	8	20	15.0	9	100	65	39	SOT-143
NE68518	2SC5015	PLP	2.0	2.5	3	1.5	8.5	2.5	3	12.0	12	110	30	18	SOT-343
NE68519	2SC5010	PLP	2.0	2.5	3	1.5	7.5	2.5	3	11.0	12	110	30	19	SC-90
NE85618	2SC5011	–	1.0	2.5	3	1.4	11.0	2.5	3	14.0	6.5	120	100	18	SOT-343
NE85619	2SC5006	PLP	1.0	2.5	3	1.5	10.0	2.5	3	13.5	4.5	120	100	19	SC-90
NE85630	2SC4226	PLP	1.0	10	7	1.3	12.0	10	20	12.0	4.5	110	100	30	SOT-323
NE85633	2SC3356	PLP	1.0	10	7	1.4	9.0	10	20	11.5	7	120	100	33	SOT-23
NE85639	2SC4093	PLP	1.0	10	7	1.5	13.5	10	20	13.0	7	120	100	39	SOT-143
NE97733	2SA1977	–	1.0	–8	–3	1.5	10.0	–8	–20	12.0	8.5	60	–50	33	SOT-23
NE97833	2SA1978	–	1.0	–10	–3	2.0	7.0	–10	–15	10.0	5.5	40	–50	33	SOT-23
2SA1977	NE97733	–	1.0	–8	–3	1.5	10.0	–8	–20	12.0	8.5	60	–50	33	SOT-23
2SA1978	NE97833	–	1.0	–10	–3	2.0	7.0	–10	–15	10.0	5.5	40	–50	33	SOT-23
2SC3356	NE85633	PLP	1.0	10	7	1.4	9.0	10	20	11.5	7	120	100	33	SOT-23
2SC3583	NE68133	PLP	1.0	8	7	1.2	13.0	8	20	11.0	9	100	65	33	SOT-23
2SC3585	NE68033	PLP	2.0	6	5	1.8	9.0	6	10	8.0	10	100	35	33	SOT-23
2SC4093	NE85639	PLP	1.0	10	7	1.5	13.5	10	20	13.0	7	120	100	39	SOT-143
2SC4094	NE68139	–	1.0	8	7	1.2	13.5	8	20	15.0	9	100	65	39	SOT-143
2SC4095	NE68039	–	2.0	6	5	1.7	11.0	6	10	9.0	10	100	35	39	SOT-143
2SC4226	NE85630	PLP	1.0	10	7	1.3	12.0	10	20	12.0	4.5	110	100	30	SOT-323
2SC4227	NE68130	PLP	1.0	8	7	1.5	13.5	8	20	13.0	7	120	65	30	SOT-323
2SC4228	NE68030	PLP	2.0	6	5	1.7	9.5	6	10	8.5	10	100	35	30	SOT-323
2SC5006	NE85619	PLP	1.0	2.5	3	1.5	10.0	2.5	3	13.5	4.5	120	100	19	SC-90
2SC5007	NE68119	PLP	1.0	2.5	3	1.1	12.0	2.5	3	15.5	7	120	65	19	SC-90
2SC5008	NE68019	PLP	2.0	3	5	1.9	9.0	1	1	12.0	8	120	35	19	SC-90
2SC5010	NE68519	PLP	2.0	2.5	3	1.5	7.5	2.5	3	11.0	12	110	30	19	SC-90
2SC5011	NE85618	–	1.0	2.5	3	1.4	11.0	2.5	3	14.0	6.5	120	100	18	SOT-343
2SC5012	NE68118	–	1.0	2.5	3	1.1	13.0	2.5	3	16.0	9	100	65	18	SOT-343
2SC5013	NE68018	PLP	2.0	6	5	1.8	10.0	1	1	12.5	10	100	35	18	SOT-343
2SC5015	NE68518	PLP	2.0	2.5	3	1.5	8.5	2.5	3	12.0	12	110	30	18	SOT-343
2SC5508	NE662M04	PLP	2.0	2	5	1.1	16	2	20	20	23	70	35	M04	SOT-343F
2SC5606	NE66219	PLP	2.0	2	5	1.5	12.0	2	20	14	21	80	35	19	SC-90

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11

# Silicon Bipolar Transistors continued

## Medium Power Transistors

Part Number <sup>1</sup>	Equivalent Part Number	PLP <sup>2</sup>	TEST f (GHz)	P <sub>1dB</sub>			MAG / MSG			f <sub>T</sub> TYP (GHz)	h <sub>FE</sub> TYP	I <sub>C</sub> MAX (mA)	Package Code <sup>3</sup>	Package Style
				V <sub>CE</sub> (V)	I <sub>CQ</sub> (mA)	TYP (dBm)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	TYP (dB)					
NE46134	2SC4536	PLP	1.0	12.5	100	27.5	10	50	9	5.5	100	250	34	SOT-89
NE461M02	2SC5337	PLP	1.0	12.5	100	27.5	10	50	11	5.5	120	250	M02	SOT-89
NE663M04	2SC5509	-	2.0	2	50	16	2	50	15	18	100	100	M04	SOT-343F
NE664M04	2SC5754	PLP	1.8	3.6	200	26	3	100	12	20	60	500	M04	SOT-343F
NE677M04	2SC5751	-	1.8	2.8	23	15	3	20	16	15	120	50	M04	SOT-343F
NE678M04	2SC5753	PLP	1.8	2.8	40	18	3	30	13.5	12	120	100	M04	SOT-343F
NE85634	2SC3357	PLP	1.0	10	40	22	10	40	11	6.5	120	100	34	SOT-89
NE856M02	2SC5336	PLP	1.0	10	40	22	10	50	14	6.5	120	100	M02	SOT-89
2SC3357	NE85634	PLP	1.0	10	40	22	10	40	11	6.5	120	100	34	SOT-89
2SC4536	NE46134	PLP	1.0	12.5	100	27.5	10	50	9	5.5	100	250	34	SOT-89
2SC5336	NE856M02	PLP	1.0	10	40	22	10	50	14	6.5	120	100	M02	SOT-89
2SC5337	NE461M02	PLP	1.0	12.5	100	27.5	10	50	11	5.5	120	250	M02	SOT-89
2SC5509	NE663M04	-	2.0	2	50	16	2	50	15	18	100	100	M04	SOT-343F
2SC5751	NE677M04	-	1.8	2.8	23	15	3	20	16	15	120	50	M04	SOT-343F
2SC5753	NE678M04	PLP	1.8	2.8	40	18	3	30	13.5	12	120	100	M04	SOT-343F
2SC5754	NE664M04	PLP	1.8	3.6	200	26	3	100	12	20	60	500	M04	SOT-343F

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11

## Twin Transistors

Part Number <sup>1</sup>	PLP <sup>2</sup>	TEST f (GHz)	NF/GA V <sub>CE</sub> (V)	NF/GA I <sub>C</sub> (mA)	NF TYP (dB)	G <sub>A</sub> TYP (dB)	MAG (dB)	IS <sub>21E</sub> I			f <sub>T</sub> TYP (GHz)	h <sub>FE</sub> TYP	I <sub>C</sub> MAX (mA)	Die	Pkg. Code <sup>3</sup>	Package Style
								V <sub>CE</sub> (V)	I <sub>C</sub> (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	PLP	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	PLP	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

Notes: 1. Manufactured by Renesas Electronics 2. See Product Longevity Program details on page 12 3. See Package Dimensions on page 11

## 3V Silicon MMIC Amplifiers

Part Number <sup>6</sup>	PLP <sup>7</sup>	Typical Frequency Range @ 3dB down (MHz)	ELECTRICAL CHARACTERISTICS <sup>1</sup> (T <sub>A</sub> = 25°C)											Package Code <sup>8</sup>	Package Style	
			V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)			NF (dB)	Gain (dB)			RL <sub>IN</sub> (dB)	RL <sub>OUT</sub> (dB)	P <sub>1dB</sub> (dBm)			ISOL (dB)
				MIN	TYP	MAX	TYP	MIN	TYP	MAX	TYP	TYP	TYP			TYP
UPC2745TB <sup>2</sup>	Ⓢ	2700	3	5	7.5	10	6.0	9	12	14	11	5.5	-3.0	38	TB	SOT-363
UPC2746TB <sup>2</sup>	Ⓢ	1500	3	5	7.5	10	4.0	16	19	21	13	8.5	-3.7	45	TB	SOT-363
UPC2748TB <sup>3</sup>	Ⓢ	1500	3	4.5	6	8	2.8	16	19	21	11.5	8.5	-8.5	40	TB	SOT-363
UPC2749TB <sup>4</sup>	Ⓢ	2900	3	4	6	8	4	13	16	18.5	10	13	-12.5	30	TB	SOT-363
UPC2762TB <sup>4</sup>	Ⓢ	2900	3	-	27	35	7.0	11.5	15.5	17.5	8.5	12	+7	25	TB	SOT-363
UPC8178TK <sup>4</sup>	Ⓢ	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 <sup>4</sup>	Ⓢ	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. Z<sub>L</sub> = 50 Ω for all Electrical Characteristics 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. Manufactured by Renesas Electronics 7. See Product Longevity Program details on page 12  
 8. See Package Dimensions on page 11

## 5V Silicon MMIC Amplifiers

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

Notes: 1. Z<sub>L</sub> = 50 Ω for all Electrical Characteristics 2. f = 500 MHz test condition 3. f = 1000 MHz test condition 4. Manufactured by Renesas Electronics  
 5. See Product Longevity Program details on page 12 6. See Package Dimensions on page 11

## Frequency Upconverters

Part Number <sup>4</sup>	PLP <sup>5</sup>	ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)							Package Code <sup>6</sup>	Package Style	
		IF Input Frequency Range @3 dB Down (MHz)	RF Output Frequency Range (MHz)	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	Conversion Gain (dB)	Psat <sup>1</sup> (dBm)	Noise Figure (dB)			OIP <sub>3</sub>
		TYP	TYP		TYP	TYP	TYP	TYP			
UPC8106TB <sup>2</sup>	Ⓢ	50-400	400-2000	3.0	9.0	10.0	-2.0	8.5	+5.5	TB	SOT-363
UPC8172TB <sup>3</sup>	Ⓢ	50-400	800-2500	3.0	9.0	8.5	0.0	10.4	+6.0	TB	SOT-363

Notes: 1. PIN = 0 dBm 2. RF = 900 MHz, LO = 660 MHz, PLO = -5 dBm 3. RF = 1900 MHz, LO = 1660 MHz, PLOIN = -5 dBm 4. Manufactured by Renesas Electronics  
 5. See Product Longevity Program details on page 12 6. See Package Dimensions on page 11

## Frequency Downconverters

Part Number <sup>2</sup>	PLP <sup>3</sup>	ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)							Package Code <sup>4</sup>	Package Style	
		RF Input Frequency Range @3 dB Down (MHz)	IF Output Frequency Range @3 dB Down (MHz)	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	Conversion Gain (dB)	Psat (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 <sup>1</sup>	Ⓢ	100-2000	20-300	3.0	5.6	13	-8	13	4	TB	SOT-363
UPC2758TB <sup>1</sup>	Ⓢ	100-2000	20-300	3.0	11	17	-4	13	4	TB	SOT-363
UPC8112TB <sup>1</sup>	Ⓢ	800-2000	100-300	3.0	8.5	13	-3	11.2	5	TB	SOT-363

Notes: 1. AGC Amp and Mixer Block only 2. Manufactured by Renesas Electronics 3. See Product Longevity Program details on page 12 4. 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.

<p><b>18 Package</b> (1.25 x 2.0 x 0.9)</p> <p>Top View Side View</p>	<p><b>19 Package</b> (0.8 x 1.6 x 0.75)</p> <p>Top View Side View</p>	<p><b>30 Package</b> (1.25 x 2.0 x 0.9)</p> <p>Top View Side View</p>	<p><b>33 Package</b> (1.5 x 2.9 x 1.4)</p> <p>Top View Side View</p>
<p><b>34 Package</b> (2.5 x 4.5 x 1.5)</p> <p>Top View Side View</p>	<p><b>39 Package</b> (1.5 x 2.9 x 1.1)</p> <p>Top View Side View</p>	<p><b>79A Package</b> (4.2 x 4.4 x 0.9)</p> <p>Top View Side View Bottom View</p>	<p><b>M02 Package</b> (2.45 x 4.5 x 1.5)</p> <p>Top View Side View</p>
<p><b>M04 Package</b> (1.25 x 2.0 x 0.6)</p> <p>Top View Side View</p>	<p><b>M53 Package</b> (1.0 x 1.2 x 0.33)</p> <p>Top View Side View</p>	<p><b>S02 / S03 Package</b> (2.6 x 2.6 x 1.5)</p> <p>Top View Side View</p>	<p><b>T / TB / MM26 Package</b> (1.25 x 2.0 x 0.9)</p> <p>Top View Side View</p>
<p><b>TK Package</b> (1.1 x 1.5 x 0.55)</p> <p>Top View Side View Bottom View</p>	<p><b>T5N / T6N Package</b> (1.5 x 1.5 x 0.37)</p> <p>Top View Side View Bottom View</p>	<p><b>T6X Package</b> (1.5 x 1.5 x 0.37)</p> <p>Top View Side View Bottom View</p>	<p><b>XS01 Package</b> (1.5 x 1.5 x 0.37)</p> <p>Top View Side View Bottom View</p>
<p><b>XS02 Package</b> (1.0 x 1.0 x 0.37)</p> <p>Top View Side View Bottom View</p>			

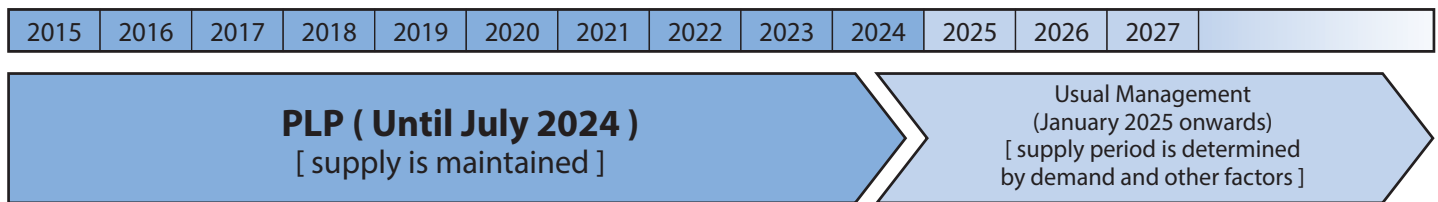
# Product Longevity Program




## Program Overview

California Eastern Laboratories, Inc. is pleased to announce the Product Longevity Program to our customers purchasing Renesas Electronics products. The parts selected for participation in this program are planned to have a long production life cycle.

## Planned Life Cycle for PLP Products

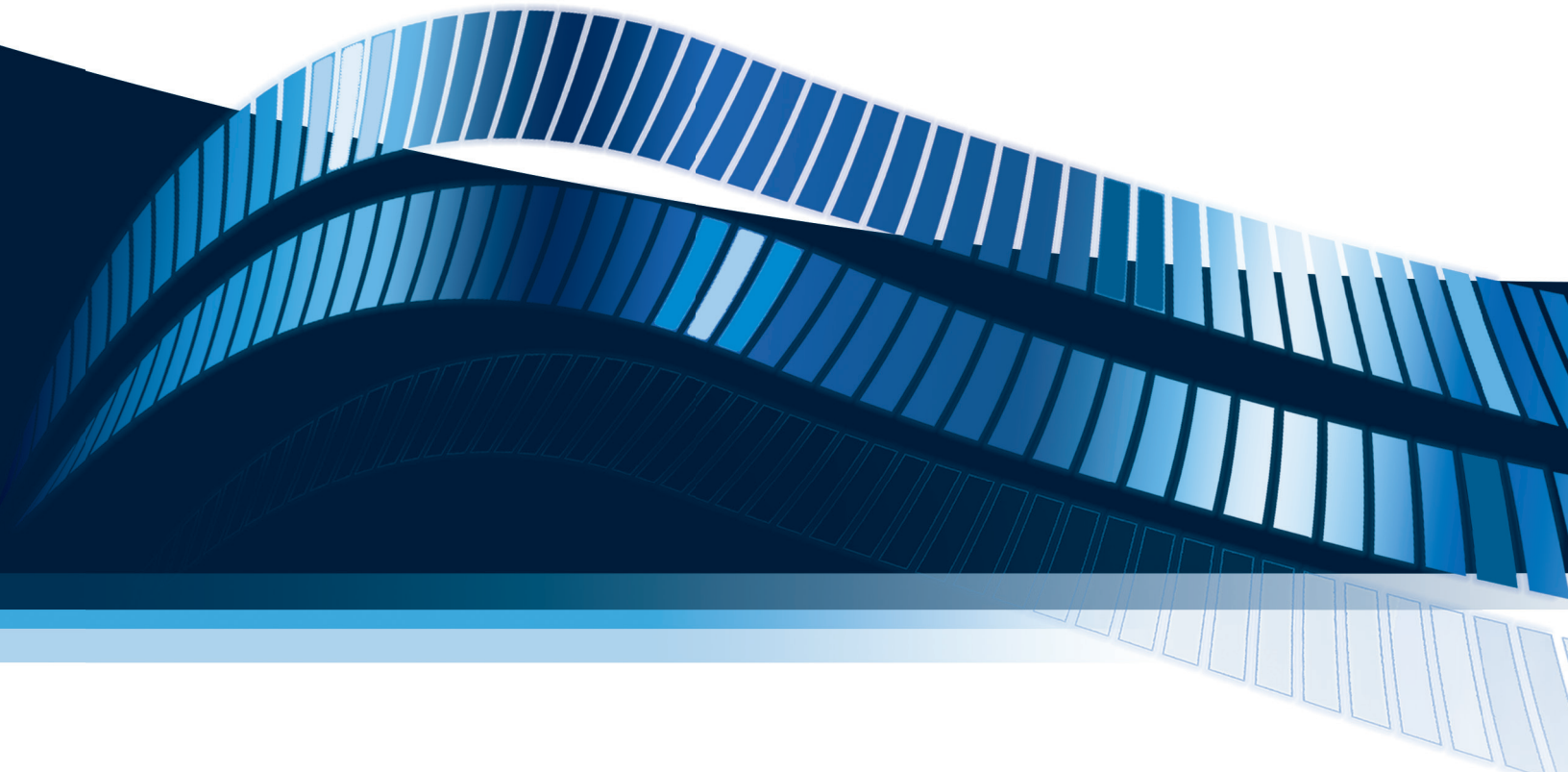


## Program Details

1. Products participating in this program are expected to have a long product life.
2. A list of the products participating in this program is provided via the link below.
3. The products in this program are clearly identified with the PLP icon .
4. Due to various circumstances, in some cases a PLP product may be replaced by an equivalent product that is also in the PLP.
5. PCN (Product Change Notices) for changes in product specifications, manufacturing facilities, or materials may be issued due to circumstances beyond our control even while this program is in effect.
6. The date of PLP termination is the date that was planned at the point in time when it was officially announced. It is subject to change.

For complete PLP Part List and up to date information  
Please visit us at:

[www.cel.com/plp](http://www.cel.com/plp)



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