MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

LT4217
LT4239
CD6150

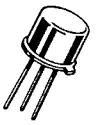
2

The RF Line
NPN Silicon High Frequency Transistors

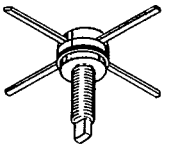
I_C = 400 mA
HIGH FREQUENCY TRANSISTORS
NPN SILICON

... designed for use in high frequency, high current applications requiring low distortion.

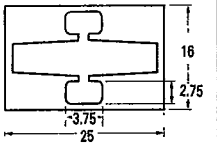
- High Gain — $|S_{21}|^2$ = 15 dB Typ @ f = 500 MHz
- High Cutoff Frequency — f_T die = 6 GHz Typ
- Diffused Ballast Resistors
- Gold Metallization
- Ion Implantation
- Available in Chip Only — Order CD6150



TO-39
CASE 79-04, STYLE 1
LT4239



TO-117A
CASE 244D-01, STYLE 1
LT4217



(DIMENSIONS IN MILS)
CHIP OUTLINE
CD6150

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CBO}	20	Vdc
Emitter-Base Voltage	V_{EBO}	3	Vdc
Collector Current — Continuous	I_C	0.4	Adc
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	−65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 5 mA, I_B = 0)	$V_{(BR)CEO}$	20	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 1 mA, I_E = 0)	$V_{(BR)CBO}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.1 mA, I_C = 0)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current (V_{CB} = 10 V, I_E = 0)	I_{CBO}	—	—	100	μAdc
Collector Cutoff Current (V_{CE} = 9 V, I_B = 0)	I_{CEO}	—	—	500	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 50 mA, V_{CE} = 5 V)	h_{FE}	70	150	300	—
DYNAMIC CHARACTERISTICS					
Collector-Base Capacitance (V_{CB} = 10 V, I_E = 0, f = 1 MHz) LT4217, LT4239 / CD6150	C_{cb}	— / —	— / —	2.5 / 2	pF
Emitter Resistance (I_E = 100 mA)	R_E	—	1.4	—	Ω

(continued)

LT4217, LT4239, CD6150

ELECTRICAL CHARACTERISTICS — continued (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS						
Noise Figure, Optimum (V_{CE} = 8 V, I_C = 50 mA, f = 500 MHz)		$NF_{OPT.}$	—	2.5	—	dB
Cutoff Frequency (V_{CE} = 8 V, I_C = 90 mA, f = 500 MHz)	LT4217	f_T	—	5.5	—	GHz
	LT4239		—	5	—	
	CD6150		—	6	—	
Insertion Gain (V_{CE} = 8 V, I_C = 90 mA, f = 500 MHz)	LT4217	$\|S_{21}\|^2$	—	15	—	dB
	LT4239		—	14	—	
	CD6150		—	18	—	

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TYPICAL CHARACTERISTICS

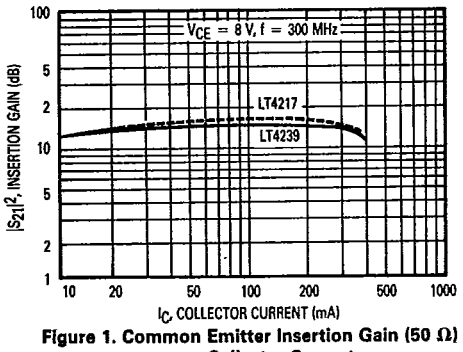

Figure 1. Common Emitter Insertion Gain (50 Ω) versus Collector Current

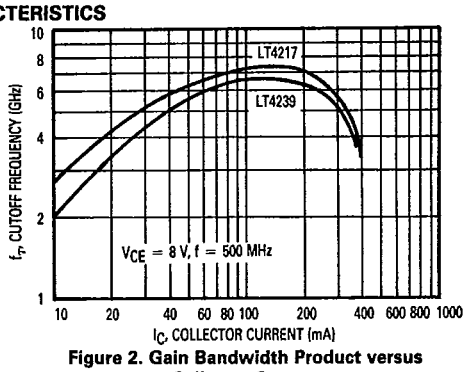

Figure 2. Gain Bandwidth Product versus Collector Current

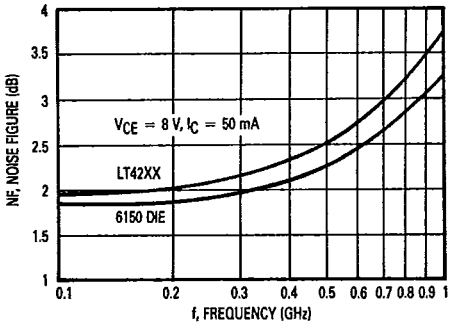

Figure 3. Noise Figure versus Frequency

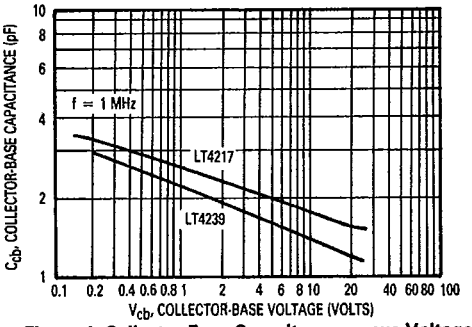

Figure 4. Collector-Base Capacitance versus Voltage

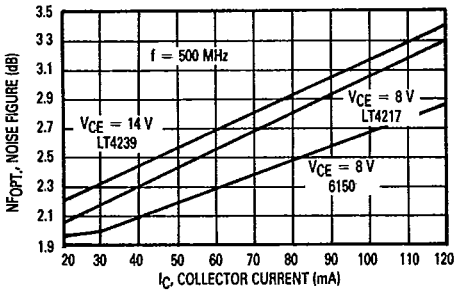

Figure 5. Noise Figure versus Collector Current

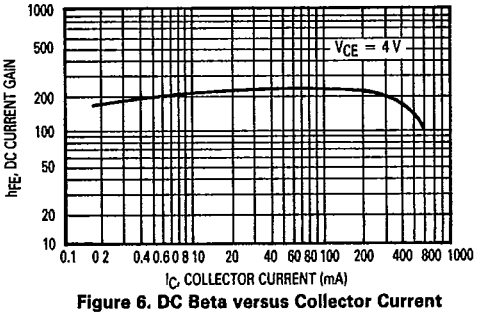

Figure 6. DC Beta versus Collector Current

Frequency (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
	dB	Ang	dB	Ang	dB	Ang	dB	Ang
V_{CE} = 8 V, I_C = 50 mA								
200	−7.78	−161.1	−23.35	62.3	19.21	92.1	−10.66	−116.6
300	−7.73	−177.8	−20.64	64.7	15.86	83.2	−11.37	−129.6
400	−7.59	171.4	−18.55	66.1	13.62	76.2	−11.49	−137.2
500	−7.41	163.1	−16.87	66.9	11.73	71.5	−11.09	−142.9
600	−7.28	155.8	−15.33	66.0	10.29	66.2	−10.78	−145.7
700	−7.22	149.5	−14.17	64.3	9.06	60.1	−10.35	−150.6
800	−7.12	143.5	−13.03	63.8	7.97	56.0	− 9.90	−152.7
900	−7.10	138.2	−12.23	61.9	7.08	52.0	− 9.50	−156.4
1000	−7.08	132.8	−11.39	60.5	6.27	47.4	− 8.97	−159.2
1100	−7.10	126.4	−11.07	58.8	5.59	44.1	− 8.35	−161.3
1200	−7.10	120.0	−10.24	58.5	5.12	39.1	− 8.06	−165.3
1300	−7.10	114.6	− 9.72	56.6	4.33	36.7	− 7.84	−168.9
1400	−7.16	108.2	− 9.14	55.0	4.00	33.2	− 7.61	−172.2
1500	−7.19	102.1	− 8.41	53.5	3.51	28.7	− 7.35	−175.7
1600	−7.18	95.7	− 7.88	51.6	3.05	28.1	− 7.02	−179.3
1700	−7.14	88.8	− 7.43	49.3	2.89	22.6	− 6.88	177.4
1800	−6.94	82.2	− 6.94	46.9	2.37	20.2	− 6.67	173.3
1900	−6.67	76.5	− 6.39	45.5	2.42	19.1	− 6.64	169.6
2000	−6.51	71.5	− 5.87	42.0	2.01	13.0	− 6.52	164.7
V_{CE} = 14 V, I_C = 90 mA								
200	−9.03	−162.7	−23.74	61.7	19.99	94.8	−13.45	−120.5
300	−8.84	−179.4	−20.90	64.6	16.70	85.4	−13.54	−132.0
400	−8.62	169.9	−18.70	66.1	14.46	78.4	−13.34	−138.4
500	−8.43	161.7	−17.03	66.8	12.57	73.9	−12.67	−142.9
600	−8.28	154.5	−15.49	65.7	11.14	68.4	−12.25	−145.0
700	−8.18	148.2	−14.32	63.9	9.91	62.5	−11.70	−149.2
800	−8.06	142.5	−13.19	63.2	8.83	58.3	−11.15	−150.8
900	−8.07	137.3	−12.40	61.4	7.90	54.4	−10.67	−154.2
1000	−8.04	131.8	−11.59	59.8	7.09	49.9	−10.07	−156.6
1100	−8.04	125.8	−11.27	58.2	6.42	46.8	− 9.35	−158.9
1200	−8.05	119.4	−10.53	58.0	5.90	42.3	− 9.01	−163.0
1300	−8.07	114.1	− 9.93	55.8	5.22	39.2	− 8.87	−165.7
1400	−8.15	107.6	− 9.41	54.4	4.83	35.9	− 8.60	−168.8
1500	−8.17	101.4	− 8.72	52.8	4.34	31.4	− 8.30	−172.1
1600	−8.18	94.9	− 8.20	51.0	3.85	30.5	− 7.95	−175.4
1700	−8.10	88.1	− 7.78	48.9	3.70	25.3	− 7.78	−178.4
1800	−7.88	81.4	− 7.31	46.8	3.17	22.6	− 7.54	172.0
1900	−7.57	76.0	− 6.77	45.4	3.17	21.5	− 7.50	174.7
2000	−7.38	71.0	− 6.28	42.3	2.82	15.3	− 7.40	170.2

Figure 7. LT4217 Common Emitter S-Parameters

Frequency (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
	dB	Ang	dB	Ang	dB	Ang	dB	Ang
V_{CE} = 8 V, I_C = 50 mA								
200	−11.60	−144.8	−20.45	68.0	17.41	89.4	−12.42	−105.7
300	−13.07	−166.2	−17.54	69.0	14.16	82.1	−12.68	−118.1
400	−13.54	173.2	−15.40	68.3	11.93	74.2	−12.21	−121.9
500	−12.87	157.7	−13.64	68.0	10.18	70.4	−11.80	−122.6
600	−12.28	150.0	−12.27	66.3	8.73	63.4	−11.70	−123.6
700	−12.24	145.2	−11.01	64.9	7.71	59.1	−11.61	−126.7
800	−12.92	140.1	−10.15	63.3	6.77	54.1	−11.43	−131.4
900	−13.83	128.6	− 9.18	61.1	6.13	50.0	−10.83	−136.3
1000	−13.78	112.9	− 8.51	59.3	5.41	46.4	−10.08	−139.8
1100	−12.91	104.2	− 8.09	55.0	4.81	40.5	− 8.44	−140.2
1200	−12.03	99.8	− 7.48	53.3	4.27	36.8	− 7.96	−141.2
1300	−11.82	99.7	− 7.00	51.1	3.66	33.1	− 7.79	−142.0
1400	−12.19	98.6	− 6.49	49.6	3.35	29.6	− 7.63	−143.8
1500	−13.10	94.6	− 6.09	47.7	3.03	26.3	− 7.43	−147.1
1600	−14.04	83.3	− 5.74	46.5	2.78	22.7	− 7.18	−149.8
1700	−13.92	72.7	− 5.32	44.0	2.61	20.3	− 6.84	−152.4
1800	−13.47	65.5	− 4.98	43.1	2.26	18.2	− 6.64	−154.0
1900	−13.26	62.5	− 4.62	40.3	2.08	15.5	− 6.26	−154.9
2000	−13.61	60.7	− 4.19	39.9	1.87	13.1	− 6.28	−156.3
V_{CE} = 14 V, I_C = 90 mA								
200	−12.86	−141.3	−20.72	67.8	17.84	90.1	−13.31	− 99.5
300	−14.72	−163.9	−17.71	69.2	14.62	82.8	−13.54	−112.0
400	−15.30	172.9	−15.59	68.3	12.36	75.0	−12.90	−115.6
500	−14.45	155.4	−13.80	67.9	10.61	71.2	−12.33	−116.2
600	−13.70	147.5	−12.49	66.2	9.15	64.3	−12.15	−116.9
700	−13.68	143.2	−11.20	64.6	8.13	60.0	−12.01	−119.9
800	−14.47	137.7	−10.39	63.0	7.15	55.1	−11.85	−124.6
900	−15.58	125.0	− 9.42	60.7	6.51	50.8	−11.20	−129.7
1000	−15.33	106.9	− 8.77	59.1	5.76	47.3	−10.39	−133.6
1100	−14.18	96.9	− 8.34	54.9	5.18	41.6	− 8.68	−135.1
1200	−13.13	93.5	− 7.70	53.0	4.62	37.8	− 8.15	−136.1
1300	−12.96	94.2	− 7.32	51.3	4.00	34.0	− 7.91	−136.9
1400	−13.40	93.1	− 6.81	49.8	3.68	30.5	− 7.72	−138.6
1500	−14.46	89.3	− 6.42	48.0	3.36	27.2	− 7.48	−141.9
1600	−15.39	76.4	− 6.09	47.0	3.07	23.4	− 7.21	−144.6
1700	−15.08	65.2	− 5.67	44.6	2.88	21.1	− 6.83	−147.3
1800	−14.47	58.5	− 5.35	43.9	2.47	18.8	− 6.48	−148.9
1900	−14.21	56.0	− 4.99	41.3	2.27	16.0	− 6.15	−149.7
2000	−14.54	54.5	− 4.58	41.2	2.05	13.5	− 6.12	−151.0

Figure 8. LT4239 Common Emitter S-Parameters

2

Frequency (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
	dB	Ang	dB	Ang	dB	Ang	dB	Ang
V_{CE} = 14 V, I_C = 30 mA								
100	−2.30	−114.0	−28.21	36.0	27.35	118.7	−4.84	− 76.7
200	−2.40	−143.8	−27.16	27.7	22.62	102.0	−7.85	−105.7
300	−2.41	−156.1	−26.64	26.3	19.48	93.6	−9.18	−119.9
400	−2.42	−163.1	−26.57	27.9	17.18	87.3	−9.69	−127.7
500	−2.25	−166.2	−26.13	28.8	15.17	82.9	−9.97	−130.4
550	−2.23	−167.6	−26.00	30.3	14.44	81.3	−9.97	−131.7
600	−2.21	−169.0	−25.81	30.5	13.70	79.6	−9.97	−132.5
650	−2.18	−170.2	−25.67	32.8	13.02	77.5	−9.95	−133.3
700	−2.17	−171.3	−25.62	33.5	12.44	75.6	−9.90	−134.4
750	−2.14	−172.2	−25.35	34.7	11.81	74.1	−9.70	−135.4
800	−2.15	−173.2	−25.27	36.3	11.30	72.4	−9.58	−135.3
850	−2.14	−174.0	−25.10	37.7	10.74	70.8	−9.47	−135.6
900	−2.11	−174.8	−24.96	36.7	10.27	69.1	−9.26	−135.3
950	−2.08	−175.6	−24.08	40.0	9.75	67.9	−9.17	−135.0
1000	−2.11	−177.3	−24.70	42.1	9.16	63.2	−9.10	−135.0
1100	−2.10	−178.7	−24.35	44.3	8.46	61.9	−8.81	−130.6
1200	−2.10	180.0	−24.03	46.9	7.54	59.1	−8.46	−136.5
1300	−2.13	178.9	−23.70	48.8	6.81	56.2	−7.99	−136.3
1400	−2.15	178.1	−23.28	51.6	6.10	53.6	−7.82	−135.4
1500	−2.16	177.0	−23.19	53.9	5.35	51.4	−7.40	−136.1
1600	−2.19	176.2	−22.78	54.9	4.50	47.9	−7.06	−136.3
1700	−2.18	175.6	−22.39	55.7	4.05	44.6	−6.63	−135.8
1800	−2.18	174.9	−21.97	57.5	3.42	42.1	−6.40	−138.6
1900	−2.19	174.4	−21.62	59.6	2.93	40.7	−6.05	−136.8
2000	−2.17	173.0	−21.34	69.9	2.34	39.2	−5.75	−136.8
V_{CE} = 14 V, I_C = 100 mA								
100	−2.65	−125.7	−30.13	36.1	28.61	115.1	−5.35	− 95.4
200	−2.48	−151.5	−28.82	29.2	23.82	100.4	−7.35	−125.7
300	−2.42	−161.6	−28.27	29.6	20.42	93.0	−8.07	−139.9
400	−2.40	−167.3	−27.69	33.5	18.10	87.4	−8.28	−146.9
500	−2.21	−169.8	−27.21	35.8	16.13	83.1	−8.41	−150.0
550	−2.19	−171.0	−26.00	37.6	15.46	81.0	−8.48	−152.5
600	−2.18	−172.1	−26.58	38.8	14.72	81.0	−8.48	−152.5
650	−2.16	−173.1	−26.32	40.7	14.06	79.1	−8.58	−153.0
700	−2.14	−174.1	−26.14	41.8	13.47	77.6	−8.56	−154.7
750	−2.12	−175.0	−25.76	43.1	12.85	76.3	−8.40	−155.2
800	−2.12	−175.7	−25.59	45.0	12.33	74.8	−8.43	−155.0
850	−2.11	−176.4	−25.26	46.0	11.78	73.4	−8.38	−155.2
900	−2.11	−177.1	−25.17	46.2	11.31	72.0	−8.29	−154.7
950	−2.07	−177.8	−24.87	47.6	10.78	70.1	−8.29	−154.6
1000	−2.10	−179.4	−24.74	49.8	10.20	66.6	−8.28	−153.6
1100	−2.09	179.4	−24.21	51.4	9.49	65.5	−8.15	−154.8
1200	−2.10	178.2	−23.81	53.4	8.59	63.1	−7.97	−154.3
1300	−2.12	177.2	−23.34	54.6	7.89	60.5	−7.69	−153.2
1400	−2.14	176.5	−22.87	56.8	7.20	58.6	−7.72	−152.0
1500	−2.16	175.5	−22.59	58.6	6.46	56.6	−7.46	−151.8
1600	−2.18	174.7	−22.28	59.2	5.73	53.6	−7.24	−151.1
1700	−2.18	174.2	−21.84	59.4	5.21	56.2	−6.95	−149.8
1800	−2.19	173.6	−21.38	60.4	4.62	48.2	−8.78	−149.7
1900	−2.20	173.1	−21.02	62.0	4.17	47.0	−6.52	−149.3
2000	−2.19	172.7	−20.74	62.8	3.61	45.6	−6.32	−148.2

Figure 9. CD6150 Common Emitter S-Parameters