

6367254 MOTOROLA SC (XSTRS/R F)

96D 82448 D
T-29-27

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	40	V _{dc}
Collector-Base Voltage	V _{CBO}	50	V _{dc}
Emitter-Base Voltage	V _{EBO}	5.0	V _{dc}
Collector Current — Continuous	I _C	50	mAdc
		One Die	All Die Equal Power
Total Device Dissipation @ T _A = 25°C	P _D	575	625
MD3250,A, MD3251,A		350	400
MD3250,AF, MD3251F,AF		400	600
MQ3251			
Derate above 25°C		3.29	3.57
MD3250,A, MD3251,A		2.0	2.28
MD3250,AF, MD3251F,AF		2.28	3.42
MQ3251			
Total Device Dissipation @ T _C = 25°C	P _D	1.8	2.5
MD3250,A, MD3251,A		1.0	2.0
MD3250,AF, MD3251F,AF		0.9	3.6
MQ3251			
Derate above 25°C		10.3	14.3
MD3250,A, MD3251,A		5.71	11.4
MD3250,AF, MD3251F,AF		5.13	20.5
MQ3251			
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200	°C

MD3250,A,AF
MD3251,A,F,AF
MQ3251

 MD3250,A
 MD3251,A
 CASE 654-07, STYLE 1

 MD3250,AF
 MD3251F,AF
 CASE 610A-04, STYLE 1

 MQ3251
 CASE 607-04, STYLE 1

 DUAL
 AMPLIFIER TRANSISTOR
 PNP SILICON

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THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case MD3251,A, MD3251,A MD3250,AF, MD3251F,AF MQ3251	R _{θJC}	97 175 195	70 87.5 48.8	°C/W
Thermal Resistance, Junction to Ambient MD3250,A, MD3251,A MD3250,AF, MD3251F,AF MQ3251	R _{θJA} (1)	304 500 438	280 438 282	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factors MD3250,A, MD3251,A MD3250,AF, MD3251F,AF MQ3251 (Q1-Q2) (Q1-Q3 or Q1-Q4)		84 75 57 55	44 0 0 0	%

(1) R_{θJA} is measured with the device soldered into a typical printed circuit board.ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(2) (I _C = 10 mAdc, I _B = 0)	V _{(BR)CEO}	40	—	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 10 μAdc, I _E = 0)	V _{(BR)CBO}	50	—	—	V _{dc}
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	5.0	—	—	V _{dc}
Collector Cutoff Current (V _{CB} = 40 Vdc, I _E = 0)	I _{CBO}	—	—	10	nAdc
(V _{CB} = 40 Vdc, I _E = 0, T _A = 150°C)		—	—	10	μAdc
Emitter Cutoff Current (V _{BE} = 3.0 Vdc, I _C = 0)	I _{EBO}	—	—	10	nAdc

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

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MD3250,A,AF, MD3251,A,F,AF, MQ3251

ELECTRICAL CHARACTERISTICS (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(2)					
DC Current Gain ($I_C = 10 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	25	75	—	—
		50	100	—	—
($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$)		50	82	150	—
		80	170	300	—
		80	170	—	—
($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$, $T_A = -55^\circ\text{C}$)		25	35	—	—
		50	75	—	—
($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$)		50	87	150	—
		100	180	300	—
		100	180	—	—
($I_C = 10 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$)		50	92	—	—
		100	190	—	—
		100	190	300	—
($I_C = 50 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$)		15	50	—	—
		30	90	—	—
		30	90	—	—
Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}$, $I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}$, $I_B = 5.0 \text{ mAdc}$)	$V_{CE(sat)}$	—	0.11 0.18	0.25 0.5	Vdc
Base-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}$, $I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}$, $I_B = 5.0 \text{ mAdc}$)	$V_{BE(sat)}$	0.6 —	0.78 0.88	0.9 1.2	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product ($I_C = 10 \text{ mAdc}$, $V_{CE} = 20 \text{ Vdc}$, $f = 100 \text{ MHz}$)	f_T	200	600	—	MHz
		250	600	—	—
		300	600	—	—
Output Capacitance ($V_{CB} = 5.0 \text{ Vdc}$, $I_E = 0$, $f = 100 \text{ kHz}$)	C_{obo}	—	2.5	6.0	pF
Input Capacitance ($V_{BE} = 1.0 \text{ Vdc}$, $I_C = 0$, $f = 100 \text{ kHz}$)	C_{ibo}	—	6.0	8.0	pF
MATCHING CHARACTERISTICS (MD3250,A,AF & MD3251,A,F,AF ONLY)					
DC Current Gain Ratio(3) ($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$)	h_{FE1}/h_{FE2}	0.9 0.9	— —	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 10 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$)	$ V_{BE1} - V_{BE2} $	— — —	— — —	3.0 5.0 5.0	mVdc
Base-Emitter Voltage Differential Change Due to Temperature ($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$, $T_A = -55$ to $+25^\circ\text{C}$) ($I_C = 100 \mu\text{Adc}$, $V_{CE} = 5.0 \text{ Vdc}$, $T_A = +25$ to $+125^\circ\text{C}$)	$\Delta V_{BE1} - V_{BE2} $	— —	— —	0.8 1.0	mVdc

(2) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

6367254 MOTOROLA SC (XSTRS/R F)
MD3250,A,AF, MD3251,A,F,AF, MQ3251

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FIGURE 1 - CAPACITANCE

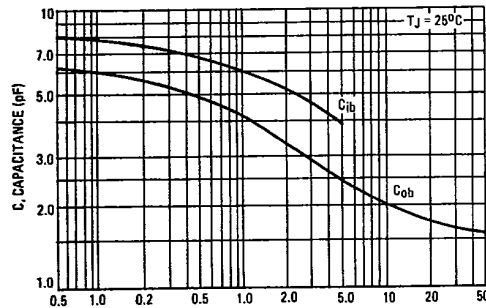
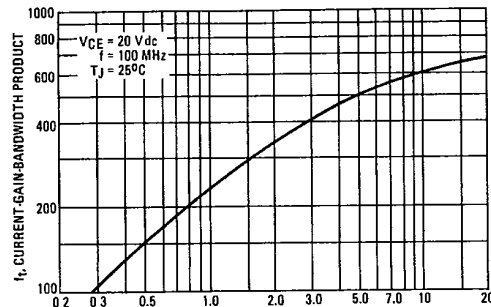


FIGURE 2 - CURRENT-GAIN BANDWIDTH PRODUCT



NOISE FIGURE VARIATIONS

(V_{CE} = 6.0 V, T_A = 25°C)

FIGURE 3 - EFFECTS OF FREQUENCY

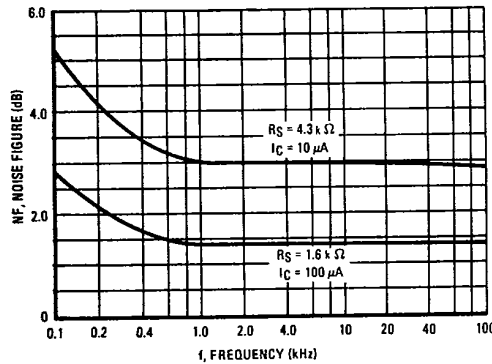


FIGURE 4 - EFFECTS OF SOURCE RESISTANCE

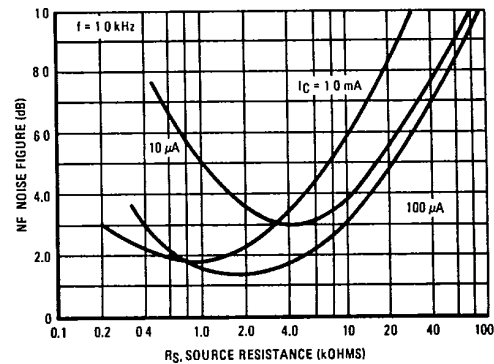
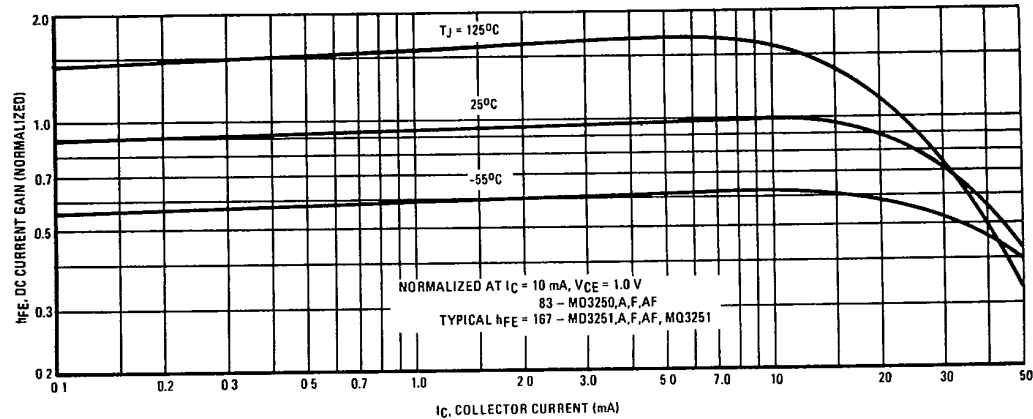


FIGURE 5 - DC CURRENT GAIN



MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	40	V _{dc}
Collector-Base Voltage	V _{CBO}	50	V _{dc}
Emitter-Base Voltage	V _{EBO}	5.0	V _{dc}
Collector Current — Continuous	I _C	50	mA _{dc}
		One Die	All Die Equal Power
Total Device Dissipation @ T _A = 25°C	P _D		mW
MD7003,A,B		550	600
MD7003,AF		350	400
MQ7003		400	600
Derate above 25°C			mW/°C
MD7003,A,B		3.14	3.42
MD7003,AF		2.0	2.28
MQ7003		2.28	3.42
Total Device Dissipation @ T _C = 25°C	P _D		Watts
MD7003,A,B		1.4	2.0
MD7003,AF		0.7	1.4
MQ7003		0.7	2.8
Derate above 25°C			mW/°C
MD7003,A,B		8.0	11.4
MD7003,AF		4.0	8.0
MQ7003		4.0	16
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200	°C

MD7003,A,B,AF
MQ7003MD7003,A,B
CASE 654-07, STYLE 1MD7003,AF
CASE 610A-04, STYLE 1MQ7003
CASE 607-04, STYLE 1DUAL
AMPLIFIER TRANSISTOR

PNP SILICON

Refer to 2N3810 for curves.

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THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case	R _{θJC}	125 250 250	87.5 125 82.6	°C/W
Thermal Resistance, Junction to Ambient	R _{θJA} (1)	319 500 438	292 438 292	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factor		83 75 57 55	40 0 0 0	%
		MD7003,A,B MD7003,AF MQ7003 (Q1-Q2) (Q1-Q3 or Q1-Q4)		

(1) R_{θJA} is measured with the device soldered into a typical printed circuit board.ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(2) (I _C = 10 mA _{dc} , I _B = 0)	V _{(BR)CEO}	40	—	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{(BR)CBO}	50	—	—	V _{dc}
Emitter-Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0)	V _{(BR)EBO}	5.0	—	—	V _{dc}
Collector Cutoff Current (V _{CB} = 30 V _{dc} , I _E = 0)	I _{CBO}	—	—	100	nA _{dc}
ON CHARACTERISTICS					
DC Current Gain(2) (I _C = 100 μA _{dc} , V _{CE} = 10 V _{dc}) (I _C = 10 mA _{dc} , V _{CE} = 10 V _{dc})	h _{FE}	40 50	350 350	— —	—

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

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MD7003,A,B,AF, MQ7003

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ELECTRICAL CHARACTERISTICS (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$)	$V_{CE(sat)}$	—	0.25	0.35	Vdc
Base-Emitter Saturation Voltage ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$)	$V_{BE(sat)}$	—	0.6	1.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 5.0\text{ mAdc}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	200	300	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)	C_{obo}	—	3.0	6.0	pF
Input Capacitance ($V_{BE} = 2.0\text{ Vdc}$, $I_C = 0$, $f = 100\text{ kHz}$)	C_{ibo}	—	2.0	8.0	pF
Noise Figure ($I_C = 100\text{ }\mu\text{Adc}$, $V_{CE} = 10\text{ Vdc}$, $R_S = 3.0\text{ kohms}$, $f = 10\text{ Hz to }15.7\text{ kHz}$)	NF	—	2.0	—	dB

MATCHING CHARACTERISTICS

DC Current Gain Ratio(3) ($I_C = 100\text{ }\mu\text{Adc}$, $V_{CE} = 10\text{ Vdc}$)	MD7003A,AF MD7003B	h_{FE1}/h_{FE2}	0.75 0.85	— —	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 100\text{ }\mu\text{Adc}$, $V_{CE} = 10\text{ Vdc}$)	MD7003A,AF MD7003B	$ V_{BE1} - V_{BE2} $	— —	— —	25 15	mV

(2) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

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6367254 MOTOROLA SC (XSTRS/R F)

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	50	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	200	mA
		One Die	All Die Equal Power
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ MD7007,A,B MD7007F,BF MQ7007	P_D	575 350 400	625 400 600 mW
Derate above 25°C MD7007,A,B MD7007F,BF MQ7007		3.29 2.0 2.28	3.57 2.28 3.42 mW/°C
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ MD7007,A,B MD7007F,BF MQ7007	P_D	1.8 1.0 0.9	2.5 2.0 3.6 Watts
Derate above 25°C MD7007,A,B MD7007F,BF MQ7007		10.3 5.71 5.13	14.3 11.4 20.5 mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

MD7007,A,B,F,BF
MQ7007MD7007,A,B
CASE 654-07, STYLE 1MD7007F,BF
CASE 610A-04, STYLE 1MQ7007
CASE 607-04, STYLE 1DUAL
AMPLIFIER TRANSISTOR

PNP SILICON

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THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case MD7007,A,B MD7007F,BF MQ7007	$R_{\theta JC}$	97 175 195	70 87.5 48.8	°C/W
Thermal Resistance, Junction to Ambient MD7007,A,B MD7007F,BF MQ7007	$R_{\theta JA(1)}$	304 500 438	280 438 292	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factors MD7007,A,B MD7007F,BF MQ7007 (Q1-Q2) MQ7007 (Q1-Q2 or Q1-Q4)		84 75 57 55	44 0 0 0	%

(1) $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(2) ($I_C = 10\text{ mA}$, $I_E = 0$)	$V_{(BR)CEO}$	40	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{A}$, $I_C = 0$)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	100	nA
ON CHARACTERISTICS(2)					
DC Current Gain ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 50\text{ mA}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	30 30 30 15	110 130 75 25	— — — —	—

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)
MD7007,A,B,F,BF, MQ7007

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ELECTRICAL CHARACTERISTICS (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage ($I_C = 50\text{ mAdc}$, $I_B = 5.0\text{ mAdc}$)	$V_{CE(sat)}$	—	0.38	1.0	Vdc
Base-Emitter Saturation Voltage ($I_C = 50\text{ mAdc}$, $I_B = 5.0\text{ mAdc}$)	$V_{BE(sat)}$	—	0.9	1.5	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product(2) ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	300	600	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)	C_{obo}	—	4.0	8.0	pF
Input Capacitance ($V_{BE} = 2.0\text{ Vdc}$, $I_C = 0$, $f = 100\text{ kHz}$)	C_{ibo}	—	3.8	10	pF

MATCHING CHARACTERISTICS

DC Current Gain Ratio(3) ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD7007A MD7007B	h_{FE1}/h_{FE2}	0.75 0.85	— —	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	MD7007A MD7007B	$ V_{BE1} - V_{BE2} $	— —	— —	20 10	mVdc

(2) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

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