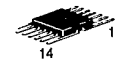
MD3250,A,AF
MD3251,A,F,AF
MQ3251

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

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	50		mAdc
		One Die	All Die Equal Power	
Total Device Dissipation @ T_A = 25°C	P_D			mW
MD3250,A, MD3251,A		575	625	
MD3250,AF, MD3251F,AF		350	400	
MQ3251		400	600	
Derate above 25°C				mW/°C
MD3250,A, MD3251,A		3.29	3.57	
MD3250,AF, MD3251F,AF		2.0	2.28	
MQ3251		2.28	3.42	
Total Device Dissipation @ T_C = 25°C	P_D			Watts
MD3250,A, MD3251,A		1.8	2.5	
MD3250,AF, MD3251F,AF		1.0	2.0	
MQ3251		0.9	3.6	
Derate above 25°C				mW/°C
MD3250,A, MD3251,A		10.3	14.3	
MD3250,AF, MD3251F,AF		5.71	11.4	
MQ3251		5.13	20.5	
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200		°C

THERMAL CHARACTERISTICS

Characteristic		Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case		$R_{\theta JC}$			°C/W
	MD3251,A, MD3251,A		97	70	
	MD3250,AF, MD3251F,AF		175	87.5	
	MQ3251		195	48.8	
Thermal Resistance, Junction to Ambient		$R_{\theta JA}$(1)			°C/W
	MD3250,A, MD3251,A		304	280	
	MD3250,AF, MD3251F,AF		500	438	
	MQ3251		438	292	
			Junction to Ambient	Junction to Case	
Coupling Factors					%
	MD3250,A, MD3251,A		84	44	
	MD3250,AF, MD3251F,AF		75	0	
	MQ3251 (Q1-Q2)		57	0	
	(Q1-Q3 or Q1-Q4)		55	0	

(1) $R_{\theta JA}$ 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	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current	I_{CBO}				
(V_{CB} = 40 Vdc, I_E = 0)		—	—	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

ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(2)						
DC Current Gain		h_{FE}				—
(I_C = 10 μAdc, V_{CE} = 5.0 Vdc)	MD3250,A,AF		25	75	—	
	MD3251,A,F,AF		50	100	—	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)	MD3250,A,AF		50	82	150	
	MD3251,A,F,AF		80	170	300	
	MQ3251		80	170	—	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = −55°C)	MD3250,A,AF		25	35	—	
	MD3251,A,F,AF		50	75	—	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	MD3250,A,AF		50	87	150	
	MD3251,A,F,AF		100	180	300	
	MQ3251		100	180	—	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)	MD3250,A,AF		50	92	—	
	MD3251,A,F,AF		100	190	—	
	MQ3251		100	190	300	
(I_C = 50 mAdc, V_{CE} = 5.0 Vdc)	MD3250,A,AF		15	50	—	
	MD3251,A,F,AF		30	90	—	
	MQ3251		30	90	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			—	0.11	0.25	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			—	0.18	0.5	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$				Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			0.6	0.78	0.9	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			—	0.88	1.2	
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product		f_T				MHz
(I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	MD3250,A,AF		200	600	—	
	MD3251,A,F,AF		250	600	—	
	MQ3251		300	600	—	
Output Capacitance		C_{obo}	—	2.5	6.0	pF
(V_{CB} = 5.0 Vdc, I_E = 0, f = 100 kHz)						
Input Capacitance		C_{ibo}	—	6.0	8.0	pF
(V_{BE} = 1.0 Vdc, I_C = 0, f = 100 kHz)						
MATCHING CHARACTERISTICS (MD3250,A,AF & MD3251,A,F,AF ONLY)						
DC Current Gain Ratio(3)		h_{FE1}/h_{FE2}				—
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)			0.9	—	1.0	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)			0.9	—	1.0	
Base-Emitter Voltage Differential		$\lvert V_{BE1}-V_{BE2}\rvert$				mVdc
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)			—	—	3.0	
(I_C = 10 μAdc, V_{CE} = 5.0 Vdc)			—	—	5.0	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)			—	—	5.0	
Base-Emitter Voltage Differential Change Due to Temperature		$\Delta\lvert V_{BE1}/V_{BE2}\rvert$				mVdc
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = −55 to +25°C)			—	—	0.8	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = +25 to +125°C)			—	—	1.0	

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

FIGURE 1 – CAPACITANCE

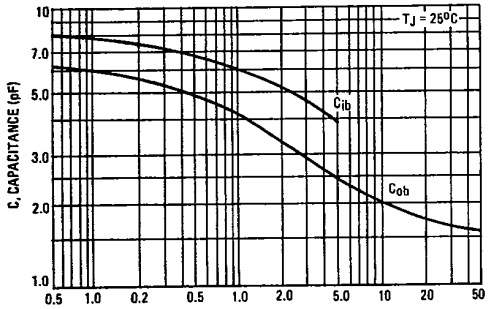
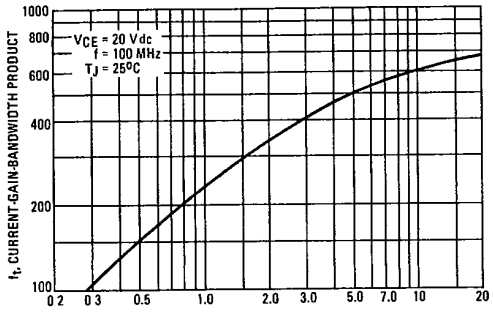


FIGURE 2 – CURRENT-GAIN BANDWIDTH PRODUCT



NOISE FIGURE VARIATIONS

(V_{CE} = 6.0 V, T_A = 25°C)

FIGURE 3 – EFFECTS OF FREQUENCY

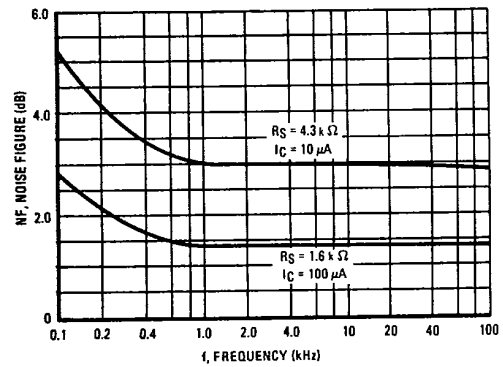


FIGURE 4 – EFFECTS OF SOURCE RESISTANCE

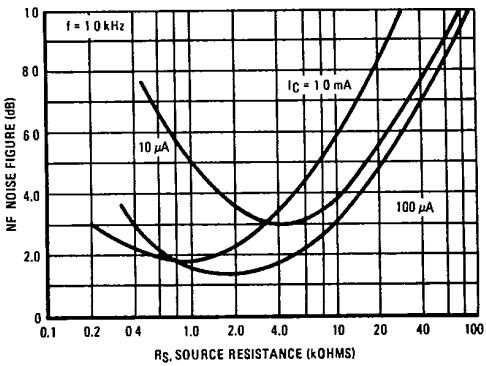
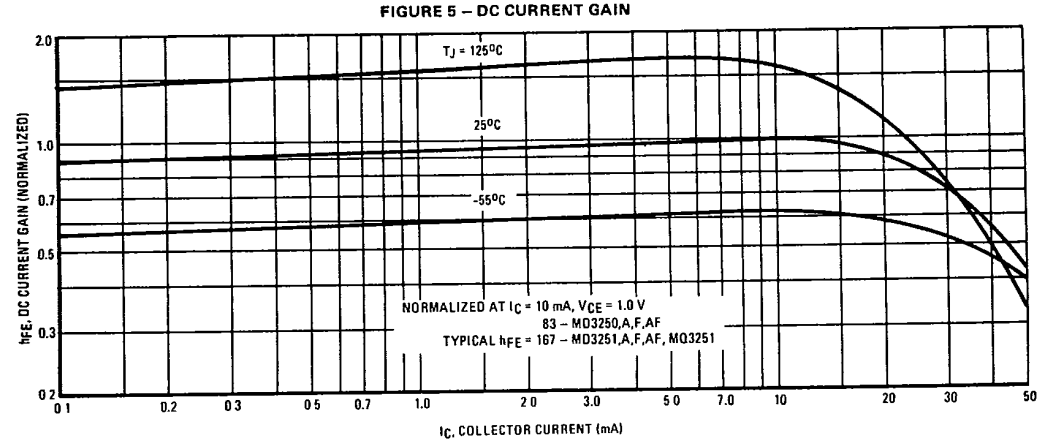


FIGURE 5 – DC CURRENT GAIN



MD7003,A,B,AF
MQ7003

MD7003,A,B
CASE 654-07, STYLE 1

MD7003,AF
CASE 610A-04, STYLE 1

MQ7003
CASE 607-04, STYLE 1

DUAL
AMPLIFIER TRANSISTOR

PNP SILICON

Refer to 2N3810 for curves.

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	50		mAdc
		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

THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$			°C/W
MD7003,A,B		125	87.5	
MD7003,AF		250	125	
MQ7003		250	62.6	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$(1)			°C/W
MD7003,A,B		319	292	
MD7003,AF		500	438	
MQ7003		438	292	
		Junction to Ambient	Junction to Case	
Coupling Factor				%
MD7003,A,B		83	40	
MD7003,AF		75	0	
MQ7003 (Q1-Q2)		57	0	
(Q1-Q3 or Q1-Q4)		55	0	

(1) $R_{\theta JA}$ 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	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	—	—	100	nAdc
ON CHARACTERISTICS					
DC Current Gain(2)	h_{FE}				—
(I_C = 100 μAdc, V_{CE} = 10 Vdc)		40	350	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		50	350	—	

ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

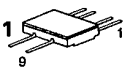
Characteristic		Symbol	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)		$V_{CE(sat)}$	—	0.25	0.35	Vdc
Base-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)		$V_{BE(sat)}$	—	0.6	1.0	Vdc
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product (I_C = 5.0 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)		f_T	200	300	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E =0, f = 100 kHz)		C_{obo}	—	3.0	6.0	pF
Input Capacitance (V_{BE} = 2.0 Vdc, I_C = 0, f = 100 kHz)		C_{ibo}	—	2.0	8.0	pF
Noise Figure (I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 3.0 kohms, f = 10 Hz to 15.7 kHz)		NF	—	2.0	—	dB
MATCHING CHARACTERISTICS						
DC Current Gain Ratio(3) (I_C = 100 μAdc, V_{CE} = 10 Vdc)	MD7003A,AF MD7003B	h_{FE1}/h_{FE2}	0.75 0.85	— —	1.0 1.0	—
Base-Emitter Voltage Differential (I_C = 100 μAdc, V_{CE} = 10 Vdc)	MD7003A,AF MD7003B	$\lvert V_{BE1}-V_{BE2}\rvert$	— —	— —	25 15	mV

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

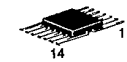
MD7007,A,B,F,BF
MQ7007

MD7007,A,B
CASE 654-07, STYLE 1

MD7007F,BF
CASE 610A-04, STYLE 1



MQ7007
CASE 607-04, STYLE 1



DUAL
AMPLIFIER TRANSISTOR

PNP SILICON

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		mAdc
		One Die	All Die Equal Power	
Total Device Dissipation @ T_A = 25°C	P_D			mW
MD7007,A,B		575	625	
MD7007F,BF		350	400	
MQ7007		400	600	
Derate above 25°C				mW/°C
MD7007,A,B		3.29	3.57	
MD7007F,BF		2.0	2.28	
MQ7007		2.28	3.42	
Total Device Dissipation @ T_C = 25°C	P_D			Watts
MD7007,A,B		1.8	2.5	
MD7007F,BF		1.0	2.0	
MQ7007		0.9	3.6	
Derate above 25°C				mW/°C
MD7007,A,B		10.3	14.3	
MD7007F,BF		5.71	11.4	
MQ7007		5.13	20.5	
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200		°C

THERMAL CHARACTERISTICS

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

(1) $R_{\theta JA}$ 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	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	—	—	100	nAdc
ON CHARACTERISTICS(2)					
DC Current Gain	h_{FE}				—
(I_C = 100 μAdc, V_{CE} = 10 Vdc)		30	110	—	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		30	130	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		30	75	—	
(I_C = 50 mAdc, V_{CE} = 10 Vdc)		15	25	—	

ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
Collector-Emitter Saturation Voltage (I_C = 50 mAdc, I_B = 5.0 mAdc)		$V_{CE(sat)}$	—	0.38	1.0	Vdc
Base-Emitter Saturation Voltage (I_C = 50 mAdc, I_B = 5.0 mAdc)		$V_{BE(sat)}$	—	0.9	1.5	Vdc
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product(2) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)		f_T	300	600	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)		C_{obo}	—	4.0	8.0	pF
Input Capacitance (V_{BE} = 2.0 Vdc, I_C = 0, f = 100 kHz)		C_{ibo}	—	3.8	10	pF
MATCHING CHARACTERISTICS						
DC Current Gain Ratio(3) (I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	MD7007A MD7007B	h_{FE1}/h_{FE2}	 0.75 0.85	 — —	 1.0 1.0	—
Base-Emitter Voltage Differential (I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	MD7007A MD7007B	$\lvert V_{BE1}-V_{BE2}\rvert$	 — —	 — —	 20 10	mVdc

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(3) The lowest h_{FE} reading is taken as h_{FE1} for this ratio.