

6367254 MOTOROLA SC (XSTRS/R F)

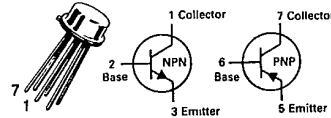
96D 82429 D
T-29-27

MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V _{CEO}	15		V _{dc}
Collector-Base Voltage	V _{CBO}	40		V _{dc}
Emitter-Base Voltage	V _{EBO}	5.0		V _{dc}
Collector Current — Continuous	I _C	200		mAdc
		One Die	Both Die Equal Power	
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	550	600	mW
		3.14	3.42	mW/°C
Total Device Dissipation @ T _C = 25°C Derate above 25°C	P _D	1.4	2.0	Watts
		8.0	11.4	mW/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200		°C

MD986

CASE 654-07, STYLE 5



COMPLEMENTARY DUAL
GENERAL PURPOSE TRANSISTOR
NPN/PNP SILICON

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THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	Both Die Equal Power	Unit
Thermal Resistance, Junction to Case	R _{θJC}	125	87.5	°C/W
Thermal Resistance, Junction to Ambient	R _{θJA} (1)	319	292	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factors		83	40	%

(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}	15	—	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 10 μAdc, I _E = 0)	V _{(BR)CBO}	40	—	—	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} = 20 Vdc, I _E = 0) (V _{CB} = 20 Vdc, I _E = 0, T _A = 150°C)	I _{CBO}	—	—	25 30	nAdc μAdc
ON CHARACTERISTICS					
DC Current Gain (I _C = 10 mAdc, V _{CE} = 10 Vdc)	h _{FE}	25	—	—	—
Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 1.0 mAdc) (I _C = 50 mAdc, I _B = 10 mAdc)	V _{CE(sat)}	—	—	0.3 0.5	V _{dc}
Base-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 1.0 mAdc)	V _{BE(sat)}	—	—	0.9	V _{dc}
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I _C = 20 mAdc, V _{CE} = 20 Vdc, f = 100 MHz)	f _T	200	320	—	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 100 kHz)	C _{obo}	—	—	4.0	pF

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

6367254 MOTOROLA SC (XSTRS/R F)

96D 82430 D

T-29-27

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	30	V _{dc}
Collector-Base Voltage	V _{CBO}	60	V _{dc}
Emitter-Base Voltage	V _{EBO}	5.0	V _{dc}
Collector Current — Continuous	I _C	500	mA _{dc}
		One Die	All Die Equal Power
Total Device Dissipation @ T _A = 25°C MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120	P _D	575 350 400	625 400 600 mW
Derate above 25°C MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120		3.29 2.0 2.28	3.57 2.28 3.42 mW/°C
Total Device Dissipation @ T _C = 25°C MD1120, MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120	P _D	1.8 1.0 0.9	2.5 2.0 3.6 Watts
Derate above 25°C MD1120, MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120		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

MD1120F
MD1121,F
MD1122,F
MQ1120

MD1121, MD1122
CASE 654-07, STYLE 1

MD1120F
CASE 610A-04, STYLE 1

MQ1120
CASE 607-04, STYLE 1

DUAL
AMPLIFIER TRANSISTOR
NPN SILICON

Refer to MD2218,A for graphs.

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THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die	All Die Equal Power	Unit
Thermal Resistance, Junction to Case MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120	R _{θJC}	97 175 195	70 87.5 48.8	°C/W
Thermal Resistance, Junction to Ambient MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120	R _{θJA} (1)	304 500 438	280 438 292	°C/W
		Junction to Ambient	Junction to Case	Unit
Coupling Factors MD1121, MD1122 MD1120F, MD1121F, MD1122F MQ1120 (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 mA _{dc} , I _B = 0)	V _{(BR)CEO}	30	—	—	V _{dc}
Collector-Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{(BR)CBO}	60	—	—	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} = 50 V _{dc} , I _E = 0) (V _{CB} = 50 V _{dc} , I _E = 0, T _A = 150°C)	I _{CBO}	—	—	10 10	nA _{dc} μA _{dc}
Emitter Cutoff Current (V _{EB} = 3.0 V _{dc} , I _C = 0)	I _{EBO}	—	—	10	nA _{dc}

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82431 D

MD1120F, MD1121F, MD1122F, MQ1120

T-29-27

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain(2) ($I_C = 10\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$) ($I_C = 100\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$) ($I_C = 1.0\ \text{mAdc}$, $V_{CE} = 10\ \text{Vdc}$) ($I_C = 10\ \text{mAdc}$, $V_{CE} = 10\ \text{Vdc}$)	h_{FE}	20 30 40 50	40 50 60 65	100 120 160 200	—
Collector-Emitter Saturation Voltage ($I_C = 10\ \text{mAdc}$, $I_B = 1.0\ \text{mAdc}$)	$V_{CE(sat)}$	—	80	100	mVdc
Base-Emitter Saturation Voltage ($I_C = 10\ \text{mAdc}$, $I_B = 1.0\ \text{mAdc}$)	$V_{BE(sat)}$	—	700	850	mVdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product(2) ($I_C = 20\ \text{mAdc}$, $V_{CE} = 20\ \text{Vdc}$, $f = 100\ \text{MHz}$)	f_T	200	250	—	MHz
Output Capacitance ($V_{CB} = 10\ \text{Vdc}$, $I_E = 0$, $f = 100\ \text{kHz}$)	C_{obo}	—	3.5	8.0	pF
MATCHING CHARACTERISTICS					
DC Current Gain Ratio(3) ($I_C = 100\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$) All Devices ($I_C = 1.0\ \text{mAdc}$, $V_{CE} = 10\ \text{Vdc}$) MD1122, MD1122F	h_{FE1}/h_{FE2}	0.8 0.9	— —	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 100\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$) All Devices ($I_C = 1.0\ \text{mAdc}$, $V_{CE} = 10\ \text{Vdc}$) MD1122, MD1122F	$ V_{BE1} - V_{BE2} $	— —	— —	10 5.0	mVdc
Base-Emitter Voltage Differential Change Due to Temperature — MD1121, MD1122 ($I_C = 100\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$, $T_A = -55$ to $+25^\circ\text{C}$) ($I_C = 100\ \mu\text{Adc}$, $V_{CE} = 10\ \text{Vdc}$, $T_A = +25$ 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.

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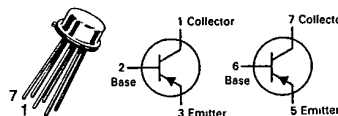
6367254 MOTOROLA SC (XSTRS/R F)

96D 82432 D

T-29-27

**MD1123
MD1130**

CASE 654-07, STYLE 1

**DUAL
AMPLIFIER TRANSISTOR**

PNP SILICON

MAXIMUM RATINGS

MAXIMUM RATINGS				
Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V_{CEO}	40		Vdc
Collector-Base Voltage	V_{CBO}	60		Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	200		mAdc
		One Die	All Die	
Total Device Dissipation @ $T_A = 25^{\circ}\text{C}$ Derate above 25°C	P_D	575	625	mW
		3.29	3.57	mW/°C
Total Device Dissipation @ $T_C = 25^{\circ}\text{C}$ Derate above 25°C	P_D	1.8	2.5	Watts
		10.3	14.3	mW/°C
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	$R_{\theta JC}$	97	70	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}(1)$	304	280	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factors		84	44	%

(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) ($I_C = 10 \text{ mA dc}, I_B = 0$)	$V_{(BR)CEO}$	40	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{A dc}, I_E = 0$)	$V_{(BR)CBO}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{A dc}, I_C = 0$)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 50 \text{ Vdc}, I_E = 0$) ($V_{CB} = 50 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$)	I_{CBO}	—	—	10 10	nA dc $\mu\text{A dc}$
Emitter Cutoff Current ($V_{BE} = 3.0 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	—	10	nA dc
ON CHARACTERISTICS					
DC Current Gain(2) ($I_C = 10 \mu\text{A dc}, V_{CE} = 10 \text{ Vdc}$)	h_{FE}	MD1130	60	100	—
($I_C = 100 \mu\text{A dc}, V_{CE} = 10 \text{ Vdc}$)		MD1123	30	80	120
($I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}$)		MD1130	100	180	—
($I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ Vdc}$)		MD1123	50	75	200
		MD1130	100	150	—

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96D 82433 D

MD1123, MD1130

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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 ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ A}$)	$V_{CE(sat)}$	—	0.18	0.25	Vdc
Base-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$)	$V_{BE(sat)}$	—	0.8	0.9	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 20\text{ mA}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	MD1123 MD1130	f_T	250 200	600 550	— —	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)		C_{obo}	—	3.5	4.0	pF

MATCHING CHARACTERISTICS

DC Current Gain Ratio(3) ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 10\text{ Vdc}$)	MD1123 MD1130	h_{FE1}/h_{FE2}	0.8 0.9	— —	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$)	MD1123 MD1130	$ V_{BE1} - V_{BE2} $	— —	— —	10 5.0	mVdc
Base-Emitter Voltage Differential Change Due to Temperature — MD1121, MD1122 ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 10\text{ Vdc}$, $T_A = +25\text{ to }+125^\circ\text{C}$)	MD1130	$\Delta V_{BE1} - V_{BE2} $	—	—	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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