

6367254 MOTOROLA SC (XSTRS/R F)

96D 81811 D

T-29-21

2

MAXIMUM RATINGS

Rating	Symbol	NPN	PNP	Unit
Collector-Emitter Voltage MPS6512, MPS6513 MPS6514, MPS6515 MPS6516 thru MPS6518 MPS6519	V _{CEO}	30 25 — —	— — 40 25	V _{dc}
Collector-Base Voltage MPS6512 thru MPS6515 MPS6516 thru MPS6518 MPS6519	V _{CBO}	40 — —	— 40 25	V _{dc}
Emitter-Base Voltage	V _{EBO}	4.0	4.0	V _{dc}
Collector Current — Continuous	I _C	100	100	mAdc
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	625 5.0		mW mW/°C
Total Device Dissipation @ T _C = 25°C Derate above 25°C	P _D	1.5 12		Watts mW/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-55 to +150		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	83.3	°C/W
Thermal Resistance, Junction to Ambient	R _{θJA}	200	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I _C = 0.5 mAdc, I _B = 0)	V _{(BR)CEO}	30 25	— —	— —	V _{dc}
(I _C = 0.5 mAdc, I _B = 0)		40 25	— —	— —	
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0) (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	4.0 4.0	— —	— —	V _{dc}
Collector Cutoff Current (V _{CB} = 30 Vdc, I _E = 0) (V _{CB} = 30 Vdc, I _E = 0) (V _{CB} = 20 Vdc, I _E = 0)	I _{CBO}	— — —	— — —	0.05 0.05 0.05	μAdc

ON CHARACTERISTICS

DC Current Gain (I _C = 2.0 mAdc, V _{CE} = 10 Vdc)	h _{FE}	50 90 150 250	— — — —	100 180 300 500	—
(I _C = 100 mAdc, V _{CE} = 10 Vdc)(1)		30 60 90 150	— — — —	— — — —	
(I _C = 2.0 mAdc, V _{CE} = 10 Vdc)		50 90 150 250	— — — —	100 180 300 500	
(I _C = 100 mAdc, V _{CE} = 10 Vdc)(1)		30 60 90 150	— — — —	— — — —	
Collector-Emitter Saturation Voltage (I _C = 50 mAdc, I _B = 5.0 mAdc) (I _C = 50 mAdc, I _B = 5.0 mAdc)	V _{CE(sat)}	— —	— —	0.5 0.5	V _{dc}

SMALL-SIGNAL CHARACTERISTICS

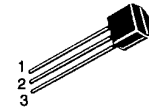
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 100 kHz) (V _{CB} = 10 Vdc, I _E = 0, f = 100 kHz)	C _{obo}	— —	— —	3.5 4.0	pF

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

NPN
MPS6512
thru **MPS6515**

PNP
MPS6516
thru **MPS6519**

CASE 29-04, STYLE 1
TO-92 (TO-226AA)



AMPLIFIER TRANSISTOR

Refer to 2N4125 for graphs.

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 81815 D
7-29-19

2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	45	Vdc
Collector-Base Voltage	V _{CBO}	60	Vdc
Emitter-Base Voltage	V _{EBO}	4.0	Vdc
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	350 2.81	mW mW/°C
Total Device Dissipation @ T _A = 60°C	P _D	210	mW
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-55 to +135	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	R _{θJA}	357	°C/W

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I _C = 1.0 mA _{dc} , I _E = 0)	V _{(BR)CEO}	45	—	Vdc
Collector-Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{(BR)CBO}	60	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0)	V _{(BR)EBO}	4.0	—	Vdc
Collector Cutoff Current (V _{CB} = 35 Vdc, I _E = 0)	I _{CBO}	—	0.5	μA _{dc}
ON CHARACTERISTICS				
DC Current Gain (I _C = 30 mA _{dc} , V _{CE} = 10 Vdc)	h _{FE}	20	—	—
Collector-Emitter Saturation Voltage (I _C = 30 mA _{dc} , I _B = 3.0 mA _{dc})	V _{CE(sat)}	—	0.5	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Common-Emitter Reverse Transfer Capacitance (V _{CB} = 10 Vdc, I _C = 0, f = 100 kHz)	C _{re}	—	0.65	pF
Output Admittance (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, f = 45 MHz)	Y _{oe}	—	0.10	mmhos
Output Voltage (V _{in(RMS)} = 12 mV, f = 45 MHz)	V _{out}	1.0	—	Vdc

MPS6544

CASE 29-04, STYLE 2
TO-92 (TO-226AA)

AMPLIFIER TRANSISTOR

NPN SILICON

Refer to MPSH20 for graphs.

6367254 MOTOROLA SC (XSTRS/R F)

96D 81820 D

T-29-21

MAXIMUM RATINGS

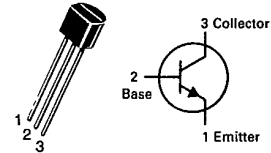
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	45	Vdc
Collector-Base Voltage	V_{CBO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	100	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 12	Watt mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}(1)$	200	$^\circ\text{C/mW}$

(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	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage(2) ($I_C = 1.0 \text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	45	—	Vdc
Collector Cutoff Current ($V_{CB} = 45 \text{ Vdc}, I_E = 0$)	I_{CBO}	—	100	nA dc
Emitter Cutoff Current ($V_{EB} = 4.0 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	100	nA dc
ON CHARACTERISTICS				
DC Current Gain ($I_C = 1.0 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	100	300	—
Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$)	$V_{CE(sat)}$	—	0.5	Vdc
Base-Emitter On Voltage(2) ($I_C = 10 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$)	$V_{BE(on)}$	—	0.8	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Current-Gain — Bandwidth Product(2) ($I_C = 10 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}, f = 100 \text{ kHz}$)	f_T	100	350	MHz
Output Capacitance ($V_{CB} = 12 \text{ Vdc}, I_E = 0, f = 100 \text{ kHz}$)	C_{obo}	—	12	pF

(2) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.**MPS6576**CASE 29-04, STYLE 1
TO-92 (TO-226AA)**AUDIO TRANSISTOR**

NPN SILICON

Refer to MPS3903 for graphs.

6367254 MOTOROLA SC (XSTRS/R F)

96D 81888 D
T-29-21

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	80	Vdc
Emitter-Base Voltage	V _{EBO}	4.0	Vdc
Collector Current — Continuous	I _C	100	mAdc
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	625 5.0	mW mW/°C
Total Device Dissipation @ T _C = 25°C Derate above 25°C	P _D	1.5 12	Watt mW/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-55 to +150	°C

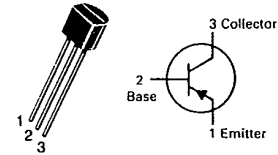
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	83.3	°C/W
Thermal Resistance, Junction to Ambient	R _{θJA} (1)	200	°C/W

(1) R_{θJA} is measured with the device soldered into a typical printed circuit board.

**MPSH54
MPSH55**

CASE 29-04, STYLE 1
TO-92 (TO-226AA)



AMPLIFIER TRANSISTOR

PNP SILICON

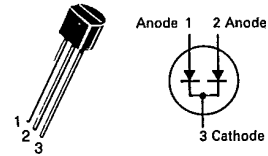
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I _C = 1.0 mAdc, I _B = 0)	V _{(BR)CEO}	80	—	—	Vdc
Collector-Base Breakdown Voltage (I _C = 100 μAdc, I _E = 0)	V _{(BR)CBO}	80	—	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 100 μAdc, I _C = 0)	V _{(BR)EBO}	4.0	—	—	Vdc
Collector Cutoff Current (V _{CB} = 60 Vdc, I _E = 0)	I _{CBO}	—	—	50	nAdc
Emitter Cutoff Current (V _{EB} = 3.0 Vdc, I _C = 0)	I _{EBO}	—	—	50	nAdc
ON CHARACTERISTICS					
DC Current Gain (I _C = 1.5 mAdc, V _{CE} = 10 Vdc)	h _{FE}	30	—	120	—
	MPSH54 MPSH55	30	—	150	—
Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 1.0 mAdc)	V _{CE(sat)}	—	—	0.25	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I _C = 1.5 mAdc, V _{CE} = 10 Vdc, f = 100 MHz)	f _T	80	—	—	MHz
Collector-Base Capacitance (V _{CB} = 10 Vdc, f = 1.0 MHz)	C _{cb}	—	—	1.6	pF
Output Admittance (I _C = 1.5 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz)	h _{oe}	—	—	15	μmhos
Noise Figure (I _C = 1.5 mAdc, V _{CE} = 10 Vdc, R _S = 50 ohms, f = 1.0 MHz)	NF	—	—	2.0	dB
	MPSH54	—	—	—	—

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MSD6100

CASE 29-04, STYLE 3
TO-92 (TO-226AA)



**DUAL SWITCHING DIODE
COMMON CATHODE**

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Reverse Voltage	V_R	100	Vdc
Recurrent Peak Forward Current	I_F	200	mA
Peak Forward Surge Current (Pulse Width = 10 μ sec)	$I_{FM}(\text{surge})$	500	mA
Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	$P_D(1)$	625 5.0	mW mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}(1)$	-55 to +135	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Max	Unit
Breakdown Voltage ($I_{BR} = 100 \mu\text{A dc}$)	$V_{(BR)}$	100	—	Vdc
Reverse Current ($V_R = 100 \text{ Vdc}$) ($V_R = 50 \text{ Vdc}$) ($V_R = 50 \text{ Vdc}, T_A = 125^\circ\text{C}$)	I_R	— — —	5.0 0.1 20	$\mu\text{A dc}$
Forward Voltage ($I_F = 1.0 \text{ mA dc}$) ($I_F = 10 \text{ mA dc}$) ($I_F = 100 \text{ mA dc}$)	V_F	0.55 0.67 0.75	0.7 0.82 1.1	Vdc
Capacitance ($V_R = 0$)	C	—	1.5	pF
Reverse Recovery Time ($I_F = I_R = 10 \text{ mA dc}, V_R = 5.0 \text{ Vdc}, i_{rr} = 1.0 \text{ mA dc}$)	t_{rr}	—	4.0	ns

(1) Continuous package improvements have enhanced these guaranteed Maximum Ratings as follows: $P_D = 1.0 \text{ W}$ @ $T_C = 25^\circ\text{C}$, Derate above 25°C — 8.0 mW/ $^\circ\text{C}$, $T_J = -65$ to $+150^\circ\text{C}$, $\theta_{JC} = 125^\circ\text{C/W}$.

6367254 MOTOROLA SC (XSTRS/R F)

96D 81945 D

T-27-09

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	32	Vdc
Collector-Base Voltage	V _{CBO}	32	Vdc
Emitter-Base Voltage	V _{EBO}	5.0	Vdc
Collector Current — Continuous	I _C	100	mAdc

THERMAL CHARACTERISTICS

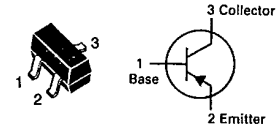
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C	P _D	225	mW
Thermal Resistance Junction to Ambient	R _{θJA}	556	°C/mW
Total Device Dissipation Alumina Substrate,** T _A = 25°C Derate above 25°C	P _D	300	mW
Thermal Resistance Junction to Ambient	R _{θJA}	417	°C/mW
Junction and Storage Temperature	T _J , T _{stg}	150	°C

*FR-5 = 1.0 x 0.75 x 0.62 in.

**Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

DEVICE MARKING

BCW29 = C1; BCW30 = C2

BCW29
BCW30CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

GENERAL PURPOSE TRANSISTOR

PNP SILICON

Refer to 2N5086 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I _C = 2.0 mAdc, I _E = 0)	V _{(BR)CEO}	32	—	Vdc
Collector-Emitter Breakdown Voltage (I _C = 100 μAdc, V _{EB} = 0)	V _{(BR)CES}	32	—	Vdc
Collector-Base Breakdown Voltage (I _C = 10 μAdc, I _C = 0)	V _{(BR)CBO}	32	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	5.0	—	Vdc
Collector Cutoff Current (V _{CB} = 32 Vdc, I _E = 0) (V _{CB} = 32 Vdc, I _E = 0, T _A = 100°C)	I _{CBO}	—	100 10	nAdc μAdc
ON CHARACTERISTICS				
DC Current Gain (I _C = 2.0 mAdc, V _{CE} = 5.0 Vdc)	h _{FE}	120 215	260 500	— —
Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 0.5 mAdc)	V _{CE(sat)}	—	0.3	Vdc
Base-Emitter On Voltage (I _C = 2.0 mAdc, V _{CE} = 5.0 Vdc)	V _{BE(on)}	0.6	0.75	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Output Capacitance (I _E = 0, V _{CE} = 10 Vdc, f = 1.0 MHz)	C _{obo}	—	7.0	pF
Noise Figure (I _C = 0.2 mAdc, V _{CE} = 5.0 Vdc, R _S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	NF	—	10	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 81946 D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE0}	20	Vdc
Collector-Base Voltage	V_{CBO}	30	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	100	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{mW}$
Total Device Dissipation Alumina Substrate,** $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{mW}$
Junction and Storage Temperature	T_J, T_{stg}	150	$^\circ\text{C}$

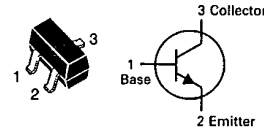
*FR-5 = 1.0 x 0.75 x 0.62 in.

**Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

DEVICE MARKING

BCW31 = D1; BCW33 = D3

T-27-09
BCW31
BCW33

CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

GENERAL PURPOSE TRANSISTOR

NPN SILICON

Refer to MPS3904 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ($I_C = 2.0 \text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	20	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_B = 0$)	$V_{(BR)CBO}$	30	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	5.0	—	Vdc
ON CHARACTERISTICS				
DC Current Gain ($I_C = 2.0 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	110 420	220 800	—
Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 0.5 \text{ mAdc}$)	$V_{CE(sat)}$	—	0.25	Vdc
Base-Emitter On Voltage ($I_C = 2.0 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$)	$V_{BE(on)}$	0.55	0.70	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Output Capacitance ($I_E = 0, V_{CB} = 10 \text{ Vdc}, f = 1.0 \text{ MHz}$)	C_{obo}	—	4.0	pF
Noise Figure ($I_C = 0.2 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}, R_S = 2.0 \text{ k}\Omega,$ $f = 1.0 \text{ kHz}, BW = 200 \text{ Hz}$)	NF	—	10	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS