

6367254 MOTOROLA SC (XSTRS/R F)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	VCEO	32	Vdc
Collector-Base Voltage	VCBO	60	Vdc
Emitter-Base Voltage	VEBO	5.0	Vdc
Collector Current — Continuous	I _C	800	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* T _A = 25°C	P _D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance Junction to Ambient	R _{θJA}	556	°C/mW
Total Device Dissipation Alumina Substrate,** T _A = 26°C	P _D	300	mW
Derate above 26°C		2.4	mW/°C
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

BCW65A = EA

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage (I _C = 10 mAdc, I _B = 0)	V _{(BR)CEO}	32	—	—	Vdc
Collector-Emitter Breakdown Voltage (I _C = 10 μAdc, V _{EB} = 0)	V _{(BR)CES}	60	—	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	5.0	—	—	Vdc
Collector Cutoff Current (V _{CE} = 32 Vdc, I _E = 0) (V _{CE} = 32 Vdc, I _E = 0, T _A = 150°C)	I _{CES}	—	—	20	nAdc μAdc
Emitter Cutoff Current (V _{EB} = 4.0 Vdc, I _C = 0)	I _{EBO}	—	—	20	nAdc

ON CHARACTERISTICS

DC Current Gain (I _C = 100 μAdc, V _{CE} = 10 Vdc) (I _C = 10 mAdc, V _{CE} = 1.0 Vdc) (I _C = 100 mAdc, V _{CE} = 1.0 Vdc) (I _C = 500 mAdc, V _{CE} = 2.0 Vdc)	h _{FE}	35	—	—	—
		75	—	—	220
		100	—	—	250
		35	—	—	—
Collector-Emitter Saturation Voltage (I _C = 500 mAdc, I _E = 50 mAdc) (I _C = 100 mAdc, I _E = 10 mAdc)	V _{CE(sat)}	—	0.7	—	Vdc
		—	0.3	—	—
Base-Emitter Saturation Voltage (I _C = 500 mAdc, I _B = 50 mAdc)	V _{BE(sat)}	—	—	2.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product (I _C = 20 mAdc, V _{CE} = 10 Vdc, f = 100 MHz)	f _T	100	—	—	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz)	C _{obo}	—	—	12	pF
Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _{iob}	—	—	80	pF
Noise Figure (I _C = 0.2 mAdc, V _{CE} = 5.0 Vdc, R _S = 1.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	NF	—	—	10	dB

SWITCHING CHARACTERISTICS

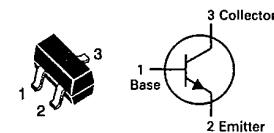
Turn-On Time (I _{B1} = I _{B2} = 15 mAdc)	t _{on}	—	—	100	ns
Turn-Off Time (I _C = 150 mAdc, R _L = 150 Ω)	t _{off}	—	—	400	ns

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

96 81951 D

T-27-09

BCW65A

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

GENERAL PURPOSE TRANSISTOR

NPN SILICON

6367254 MOTOROLA SC (XSTRS/R F)

96D 81953 D

MAXIMUM RATINGS

Rating	Symbol	BCW67	BCW68	Unit
Collector-Emitter Voltage	V_{CEO}	32	45	Vdc
Collector-Base Voltage	V_{CBO}	45	60	Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	800		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 1.8	mW mW/ $^\circ\text{C}$
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 2.4	mW mW/ $^\circ\text{C}$
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 = $1.0 \times 0.75 \times 0.62$ in.**Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

DEVICE MARKING

BCW67 = DD; BCW68 = DP; BCW67A = DA; BCW67B = DB; BCW67C = DC; BCW68F = DF; BCW68G = DH
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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 10$ mA, $I_B = 0$)	$V_{(BR)CEO}$	32 45	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 10$ μ A, $V_{EB} = 0$)	$V_{(BR)CES}$	45 60	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10$ μ A, $I_C = 0$)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 32$ Vdc, $I_E = 0$) ($V_{CE} = 45$ Vdc, $I_E = 0$) ($V_{CE} = 32$ Vdc, $I_B = 0$, $T_A = 150^\circ\text{C}$) ($V_{CE} = 45$ Vdc, $I_B = 0$, $T_A = 150^\circ\text{C}$)	I_{CES}	— — — —	— — 20 20	20 10 10	nAdc μ Adc
Emitter Cutoff Current ($V_{EB} = 4.0$ Vdc, $I_C = 0$)	I_{EBO}	—	—	20	nAdc
ON CHARACTERISTICS					
DC Current Gain ($I_C = 10$ mA, $V_{CE} = 1.0$ Vdc)	h_{FE}	75 120 180	—	—	—
($I_C = 100$ mA, $V_{CE} = 1.0$ Vdc)		100 160 250	—	250 400 630	
($I_C = 300$ mA, $V_{CE} = 1.0$ Vdc)		35 60 100	—	—	
Collector-Emitter Saturation Voltage ($I_C = 300$ mA, $I_B = 30$ mA)	$V_{CE(sat)}$	—	—	1.5	Vdc
Base-Emitter Saturation Voltage ($I_C = 500$ mA, $I_B = 50$ mA)	$V_{BE(sat)}$	—	—	2.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 20$ mA, $V_{CE} = 10$ Vdc, $f = 100$ MHz)	f_T	100	—	—	MHz
Output Capacitance ($V_{CB} = 10$ Vdc, $I_E = 0$, $f = 1.0$ MHz)	C_{obo}	—	—	18	pF
Input Capacitance ($V_{EB} = 0.5$ Vdc, $I_C = 0$, $f = 1.0$ MHz)	C_{ibo}	—	—	105	pF
Noise Figure ($I_C = 0.2$ mA, $V_{CE} = 5.0$ Vdc, $R_S = 1.0$ k Ω , $f = 1.0$ kHz, $BW = 200$ Hz)	NF	—	—	10	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC {XSTRS/R F}

96D 81954 D

T-27-09

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	100	mAdc

THERMAL CHARACTERISTICS

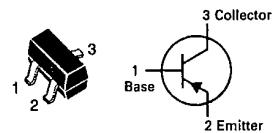
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{mW}$
Total Device Dissipation Alumina Substrate,** $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW/ $^\circ\text{C}$
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

BCW69 = H1; BCW70 = H2

**BCW69
BCW70**CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)**GENERAL PURPOSE TRANSISTOR**

PNP SILICON

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ($I_C = 2.0 \mu\text{Adc}, I_B = 0$)	$V_{(BR)CEO}$	45	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 100 \mu\text{Adc}, V_{EB} = 0$)	$V_{(BR)CES}$	50	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current ($V_{CB} = 20 \text{ Vdc}, I_E = 0$) ($V_{CB} = 20 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$)	I_{CBO}	— —	100 10	nAdc μAdc
ON CHARACTERISTICS				
DC Current Gain ($I_C = 2.0 \mu\text{Adc}, V_{CE} = 5.0 \text{ Vdc}$)	h_{FE} BCW69 BCW70	120 215	260 500	—
Collector-Emitter Saturation Voltage ($I_C = 10 \mu\text{Adc}, I_B = 0.5 \mu\text{Adc}$)	$V_{CE(\text{sat})}$	—	0.3	Vdc
Base-Emitter On Voltage ($I_C = 2.0 \mu\text{Adc}, V_{CE} = 5.0 \text{ Vdc}$)	$V_{BE(\text{on})}$	0.6	0.75	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Output Capacitance ($I_E = 0, V_{CB} = 10 \text{ Vdc}, f = 1.0 \text{ MHz}$)	C_{obo}	—	7.0	pF
Noise Figure ($I_C = 0.2 \mu\text{Adc}, V_{CE} = 5.0 \text{ Vdc}, R_S = 2.0 \text{ k}\Omega$, $f = 1.0 \text{ kHz}, BW = 200 \text{ Hz}$)	NF	—	10	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 81955 D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage*	V_{CEO}	45	Vdc
Collector-Base Voltage	V_{CBO}	50	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	100	mAdc

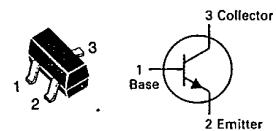
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
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 2.4	mW mW/ $^\circ\text{C}$
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 = $1.0 \times 0.75 \times 0.62$ in.**Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

DEVICE MARKING

BCW71 = K1; BCW72 = AH

BCW71
BCW72CASE 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	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 2.0$ mAdc, $V_{EB} = 0$)	$V_{(BR)CEO}$	45	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 2.0$ mAdc, $V_{EB} = 0$)	$V_{(BR)CES}$	45	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10$ μ Adc, $I_E = 0$)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10$ μ Adc, $I_C = 0$)	$V_{(BR)EBO}$	5.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 20$ Vdc, $I_E = 0$) ($V_{CB} = 20$ Vdc, $I_E = 0$, $T_A = 100^\circ\text{C}$)	I_{CBO}	— —	— —	100 10	nAdc μ Adc

ON CHARACTERISTICS

DC Current Gain ($I_C = 2.0$ mAdc, $V_{CE} = 5.0$ Vdc)	h_{FE} BCW71 BCW72	110 200	— —	220 450	—
Collector-Emitter Saturation Voltage ($I_C = 10$ mAdc, $I_B = 0.5$ mAdc) ($I_C = 50$ mAdc, $I_B = 2.5$ mAdc)	$V_{CE(sat)}$	— —	— 0.21	0.25 —	Vdc
Base-Emitter Saturation Voltage ($I_C = 50$ mAdc, $I_B = 2.5$ mAdc)	$V_{BE(sat)}$	—	0.85	—	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

Current-Gain — Bandwidth Product ($I_C = 10$ mAdc, $V_{CE} = 5.0$ Vdc, $f = 35$ MHz)	f_T	—	300	—	MHz
Output Capacitance ($I_E = 0$, $V_{CE} = 10$ Vdc, $f = 1.0$ MHz)	C_{obo}	—	—	4.0	pF
Input Capacitance ($I_C = 0$, $V_{EB} = 0.5$ Vdc, $f = 1.0$ MHz)	C_{ibo}	—	9.0	—	pF
Noise Figure ($I_C = 0.2$ mAdc, $V_{CE} = 5.0$ Vdc, $R_S = 2.0$ k Ω , $f = 1.0$ kHz, $BW = 200$ Hz)	NF	—	—	10	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

MAXIMUM RATINGS

Rating	Symbol	Value		Unit
		BCX17 BCX19	BCX18 BCX20	
Collector-Emitter Voltage	V_{CEO}	45	25	Vdc
Collector-Base Voltage	V_{CBO}	50	30	Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	500		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
		1.8	$\text{mW}/^\circ\text{C}$
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
		2.4	$\text{mW}/^\circ\text{C}$
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 = $1.0 \times 0.75 \times 0.62$ in.**Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

DEVICE MARKING

BCX17 = T1; BCX18 = T2; BCX19 = U1; BCX20 = U2

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 10$ mAdc, $I_B = 0$)	$V_{(BR)CEO}$	45 25	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 10$ μ Adc, $I_B = 0$)	$V_{(BR)CES}$	50 30	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 20$ Vdc, $I_E = 0$) ($V_{CB} = 20$ Vdc, $I_E = 0$, $T_A = 150^\circ\text{C}$)	I_{CBO}	— —	— —	100 5.0	nAdc μ Adc
Emitter Cutoff Current ($V_{BE} = 5.0$ Vdc, $I_C = 0$)	I_{EBO}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain ($I_C = 100$ mAdc, $V_{CE} = 1.0$ Vdc) ($I_C = 300$ mAdc, $V_{CE} = 1.0$ Vdc) ($I_C = 500$ mAdc, $V_{CE} = 1.0$ Vdc)	h_{FE}	100 70 40	— — —	600	—
Collector-Emitter Saturation Voltage ($I_C = 500$ mAdc, $I_B = 50$ mAdc)	$V_{CE(sat)}$	—	—	0.62	Vdc
Base-Emitter On Voltage ($I_C = 500$ mAdc, $V_{CE} = 1.0$ Vdc)	$V_{BE(on)}$	—	—	1.2	Vdc

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS