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BC650, S
BC651, S

CASE 29-02, STYLE 1
TO-92 (TO-226AA)

LOW NOISE AUDIO TRANSISTORS

NPN SILICON

Refer to MPSA18 for graphs.

MAXIMUM RATINGS

Rating	Symbol	BC 650,S	BC 651,S	Unit
Collector-Emitter Voltage	V_{CEO}	30	45	Vdc
Collector-Base Voltage	V_{CBO}	30	45	Vdc
Emitter-Base Voltage	V_{EBO}	6.0		Vdc
Collector Current – Continuous	I_C	200		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	$R_{\theta JC}$	83.3	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JC}$	200	°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 mAdc, I_B = 0)	BC650 BC651	$V_{(BR)CEO}$	30 45	—	Vdc
Collector-Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)	BC650 BC651	$V_{(BR)CBO}$	30 45	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)		I_{CBO}	—	0.015	µA
Collector-Emitter Leakage Current (V_{CE} = 60 V)		I_{CES}	—	0.025	µA
Emitter Cutoff Current (V_{EB} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	0.015	µA
ON CHARACTERISTICS					
DC Current Gain (I_C = 2 mAdc, V_{CE} = 5 Vdc)	BC650/BC651 BC650C/BC651C BC650D/BC651D	h_{FE}	380 380 680	1400 820 1400	
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 0.5 mAdc) (I_C = 100 mAdc, I_B = 5.0 mAdc)		$V_{CE(sat)}$	— —	0.2 0.6	Vdc
Base Emitter On Voltage (I_C = 2 mAdc, V_{CE} = 5.0 Vdc)		$V_{BE(on)}$	0.55	0.70	Vdc
SMALL SIGNAL CHARACTERISTICS					
Input Impedance (I_C = 2 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	BC650C/BC651C BC650D/BC651D	h_{ie}	2.0 4.0	20 60	kΩ
Voltage Feedback Ratio (I_C = 2 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	BC650C/BC651C BC650D/BC651D	h_{re}	1.0 2.0	30 60	$x10^{-4}$
Output Admittance (I_C = 2 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	BC650C/BC651C BC650D/BC651D	h_{oe}	10 20	60 120	µmhos
Small Signal Current Gain (I_C = 2 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	BC650/BC651	h_{fe}	380	1600	—
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{ob}	—	3.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)		C_{ib}	—	8.0	pF
Current Gain–Bandwidth Product (I_C = 1.0 mAdc, V_{CE} = 5.0 V, f = 100 MHz)		f_T	100	700	MHz

NOISE FIGURE/TOTAL NOISE VOLTAGE CHARACTERISTICS (V_{CE} = 5.0 V, I_C = 0.2 mA, T_A = 25°C

	NF Max. (1)	VT Max. (1)	NF Max. (2)	VT Max. (2)	NF Max. (3)	VT Max. (3)	Unit	
BC650, BC651, C, D	8	14.4	3.5	8.6	2.8	8	dB	nV
BC650S, BC651S, CS, DS	5	10.2	2.3	7.5	2	7.2	dB	nV

(1) RS = 2 kΩ, BW = 1.0 Hz, f = 10 Hz; (2) RS = 2 kΩ, BW = 1.0 Hz, f = 120 Hz; (3) RS = 2 kΩ, BW = 1.0 Hz, f = 1 KHz