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BC413
BC414

CASE 29-02, STYLE 17
TO-92 (TO-226AA)

LOW NOISE TRANSISTORS

NPN SILICON

Refer to BC549 for graphs.

MAXIMUM RATINGS

Rating	Symbol	BC 413	BC 414	Unit
Collector-Emitter Voltage	V_{CEO}	30	45	Vdc
Collector-Base Voltage	V_{CBO}	45	50	Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current – Continuous	I_C	100		mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	350 2.8		mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.0 8.0		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	$R_{\theta JC}$	125	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JC}$	357	°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 = 10 mAdc, I_B = 0) BC413 BC414	$V_{(BR)CEO}$	 30 45			Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0) BC413 BC414	$V_{(BR)CBO}$	 45 50			Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	 5			Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0) (V_{CB} = 30 Vdc, I_E = 0, T_A = + 125 °C)	I_{CBO}			 15 5	 nAdc μAdc
Emitter Cutoff Current (V_{EB} = 4 Vdc, I_C = 0)	I_{EBO}			 15	 nAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 10 μAdc, V_{CE} = 5 Vdc) BC413B/BC414B BC413C/BC414C (I_C = 2 mAdc, V_{CE} = 5 Vdc) BC413B/BC414B BC413C/BC414C BC413/BC414	h_{FE}	 100 100 180 380 180	 150 270 290 500 350	 460 800 800	
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 0.5 mAdc) (I_C = 10 mAdc, I_B = see note 1) (I_C = 100 mAdc, I_B = 5 mAdc, see note 2)	$V_{CE(sat)}$		 0.075 0.3 0.25	 0.25 0.6 0.6	Vdc
Base-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 5 mAdc)	$V_{BE(sat)}$		 1.1		Vdc
Base-Emitter On Voltage (I_C = 10 μAdc, V_{CE} = 5 Vdc) (I_C = 100 μAdc, V_{CE} = 5 Vdc) (I_C = 2 mAdc, V_{CE} = 5 Vdc)	$V_{BE(on)}$	 0.55	 0.52 0.55 0.62	 0.75	Vdc
SMALL SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product (I_C = 10 mAdc, V_{CE} = 5 Vdc, f = 100 MHz)	f_T		 250		MHz
Collector-Base Capacitance (V_{CE} = 10 Vdc, I_E = 0, f = 1 MHz)	C_{cbo}		 2.5		pF

Note 1: I_B is value for which I_C = 11 mA at V_{CE} = 1 V

Note 2: Pulse test = 300 μs – Duty cycle = 2%

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

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Input Impedance (I_C = 2 mA, V_{CE} = 5 V, f = 1 KHz) BC413B/BC414B	h_{ie}	3.2	6.0	8.5	KΩ
BC413C/BC414C		6.0	8.7	15.0	
Voltage Feedback Ratio (I_C = 2 mA, V_{CE} = 5 V, f = 1 KHz) BC413B/BC414B	h_{re}		2.		10^{-4}
BC413C/BC414C			3.		
Small Signal Current Gain (I_C = 2 mA, V_{CE} = 5 V, f = 1 KHz) BC413B/BC414B	h_{fe}	240	330	500	
BC413C/BC414C		450	600	900	
Output Admittance (I_C = 2 mA, V_{CE} = 5 V, f = 1 KHz) BC413B/BC414B	h_{oe}		10	60	μmhos
BC413C/BC414C			12	110	
Noise Figure (I_C = 200 μAdc, V_{CE} = 5 Vdc, R_S = 2 KΩ, f = 30 Hz – 15 KHz)	NF		0.6	2.5	dB
Equivalent Input Noise Voltage (I_C = 200 μAdc, V_{CE} = 5 V, R_S = 2 kΩ, f = 120 Hz)	V_T		8.0	12	$nV/\sqrt{Hz}$
Equivalent Input Noise Voltage (I_C = 200 μAdc, V_{CE} = 5 V, R_S = 2 KΩ, f = 10 Hz – 50 Hz)	V_T		74	135	$nV/\sqrt{Hz}$