



CASE TO-92F

THE BC413, BC414, BC415, BC416 ARE SILICON PLANAR EPITAXIAL TRANSISTORS FOR AF LOW NOISE PREAMPLIFIER APPLICATIONS. THE BC413, BC414 ARE NPN AND ARE COMPLEMENTARY TO THE PNP BC415, BC416 RESPECTIVELY.



CEB

ABSOLUTE MAXIMUM RATINGS

For p-n-p devices, voltage and current values are negative.

		BC413 (NPN)	BC414 (NPN)	BC415 (PNP)	BC416 (PNP)
Collector-Base Voltage	VCBO	45V	50V	45V	50V
Collector-Emitter Voltage	VCEO	30V	45V	35V	45V
Emitter-Base Voltage	VEBO		5V		
Collector Current	IC		100mA		
Total Power Dissipation @ TA ≤ 25°C	Ptot		300mW		
			derate 2.4mW/°C above 25°C		
Operating Junction & Storage Temperature	Tj, Tstg		-55 to 150°C		

ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITIONS	
Collector-Base Breakdown Voltage	BVCEO					IC=10µA IE=0	
		BC413	45				V
		BC414	50				V
		BC415	45				V
Collector-Emitter Breakdown Voltage	LVCEO					IC=10mA (Pulsed) IB=0	
		BC413	30				V
		BC414	45				V
		BC415	35				V
Collector-Emitter Breakdown Voltage	LVCEO					IC=10mA (Pulsed) IB=0	
		BC416	45				V
Emitter-Base Breakdown Voltage	BVEBO	5			V	IE=10µA IC=0	
Collector Cutoff Current	ICBO			15	nA	VCB=30V IE=0 VCB=30V IE=0 TA=150°C	
				5	µA		
Emitter Cutoff Current	IEBO			15	nA	VEB=4V IC=0	
Collector-Emitter Saturation Voltage	VCE(sat)		0.08	0.25	V	IC=10mA IB=0.5mA IC=100mA IB=5mA (Pulsed)	
			0.25	0.6	V		

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PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITIONS
Collector-Emitter Knee Voltage	$V_{CEK}$		0.3	0.6	V	$I_C=10mA$ , $I_B$ =value at which $I_C=11mA$ $V_{CE}=1V$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.92		V	$I_C=100mA$ $I_B=5mA$ (Pulsed)
Base-Emitter Voltage	$V_{BE}$	0.55	0.64	0.75	V	$I_C=2mA$ $V_{CE}=5V$
			0.57			V
Current Gain-Bandwidth Product	$f_T$		200		MHz	$I_C=10mA$ $V_{CE}=5V$
Collector-Base Capacitance BC413, BC414 BC415, BC416	$C_{ob}$		2.7		pF	$V_{CB}=10V$ $I_E=0$ $f=1MHz$
			3.2		pF	
Noise Figure BC413, BC414 BC415, BC416	NF		1.2	2.5	dB	$I_C=0.2mA$ $V_{CE}=5V$ $R_G=2K\Omega$ $f=30Hz-15KHz$
			1.2	2.0	dB	
Flicker Noise Voltage Referred to Base BC413, BC414 BC415, BC416	$\bar{E}_n$				$\mu V$	$I_C=0.2mA$ $V_{CE}=5V$ $R_G=2K\Omega$ $f=10Hz-50Hz$
					0.11	$\mu V$

D.C. CURRENT GAIN (HFE) AT  $V_{CE}=5V$   $T_A=25^\circ C$

@ $I_C$	HFE GROUP A			HFE GROUP B			HFE GROUP C		
	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
0.01mA	40	100		100	170		100	290	
2mA	120	170	220	180	300	460	380	520	800
100mA		100			160			270	

h - PARAMETERS AT  $I_C=2mA$   $V_{CE}=5V$   $f=1kHz$   $T_A=25^\circ C$

h - PARAMETER	SYMBOL	HFE GROUP A			HFE GROUP B			HFE GROUP C			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Input Impedance	$h_{ie}$	1.6	2.7	4.5	3.2	4.5	8.5	6	8.7	15	$K\Omega$
Voltage Feedback Ratio	$h_{re}$		1.5			2			3		$\times 10^{-4}$
Small Signal Current Gain	$h_{fe}$	125	190	260	240	330	500	450	580	900	
Output Admittance	$h_{oe}$		18	30		30	60		60	110	$\mu S$