Micro Power Systems

MP310/311/312A

NPN Dual Monolithic Silicon Nitrox Transistors

FEATURES

- **High Gain: $h_{FE} \geq 150$ @ 10μA – 1mA**
- **VBE Matching: $\mid V_{BE1} - V_{BE2} \mid$ = .4mV typ.**
- **High f_T: 250 MHz typ. @ 1 mA**
- **TO-52 Metal Can Package Available**

GENERAL DESCRIPTION

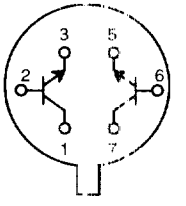
The MP310/311/312A are dual monolithic NPN matched transistors built for high performance input stages of differential amplifiers. Their excellent matching characteristics of base emitter voltage, base current, and DC current gain over temperature allow for accurate and stable amplification of critical differential input stages. High gain instrumentation amplifiers, quality audio amplifier and precision current mirror designs will all benefit with the use of these devices.

Specified for operation over the military (–55 to +125°C) temperature range, the MP310/311/312A are available in the TO-52 Metal Can packages.

ORDERING INFORMATION

Package Type	Temperature Range	Part No.	VBE Match (mV)	hFE Match (%)
TO-52	–55 to +125°C	MP310	3.0	10
TO-52	–55 to +125°C	MP311	1.0	5
TO-52	–55 to +125°C	MP312A	0.5	5

PIN CONFIGURATION



TO-52 (Metal Can)
(Bottom View)

MAXIMUM VOLTAGE AND CURRENT FOR EACH TRANSISTOR

Description	MP310	MP311	MP312A	Units
V_{CBO} Collector to Base Voltage	25	45	45	V
V_{CEO} Collector to Emitter Voltage	25	45	45	V
V_{EBO} Emitter to Base Voltage (1)	6.5	7	7	V
V_{CCO} Collector to Collector Voltage	30	100	100	V
Collector Current	20	20	20	mA

NOTES:

(1) The reverse base-to-emitter voltage must never exceed 7.0 volts and the reverse base-to-emitter current must never exceed 10μA.

ELECTRICAL CHARACTERISTICS
(@ 25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions/Comments
ELECTRICAL CHARACTERISTICS						
DC Current Gain	h_{FE}					No max at 1 mA
MP310, MP311		150				I_C = 10µA, V_{CE} = 5 V
MP312A		200				I_C = 100µA, V_{CE} = 5 V
DC Current Gain (–55°C)	h_{FE}					I_C = 10µA, V_{CE} = 5 V
MP310, MP311		50				
MP312A		175				
Emitter Base "ON" Voltage	V_{BE} (ON)			0.7	V	I_C = 10µA, V_{CE} = 5 V
Collector Saturation Voltage	V_{CE} (SAT)			0.25	V	I_C = 1mA, I_B = 0.1mA
Collector Cutoff Current (3)	I_{CBO}			0.2	nA	I_E = 0, V_{CB} = (1)
+150°C				0.2	µA	
Emitter Cutoff Current	I_{EBO}			0.2	nA	I_C = 0, V_{EB} = 5 V
Output Capacitance (3)	C_{OBO}			2	pF	I_E = 0, V_{CB} = 5 V
Emitter Transition Capacitance (3)	C_{TE}			2	pF	I_C = 0, V_{EB} = 0.5 V
Collector to Collector Capacitance (3)	CC1 C2			2	pF	V_{CC} = 0
Collector to Collector Leakage Current	IC1 C2			0.5	nA	V_{CE} = (2)
Current Gain Bandwidth Product (3)	f_T	100			MHz	I_C = 200µA, V_{CE} = 5 V
				200		I_C = 1mA, V_{CE} = 5 V
Narrow Band Noise Figure	NF				dB	I_C = 100µA, V_{CE} = 5 V
MP310, MP311				3		BW = 200 Hz, FG = 10kΩ
MP312A				2		
Collector Base Breakdown Voltage	BV_{CBO}				V	I_C = 10µA, I_E = 0
MP310		25				
MP311, MP312A		45				
Emitter Base Breakdown Voltage	BV_{EBO}				V	I_E = 10µA, I_C = 0
(all)		6.5				
Collector-to-Emitter Breakdown Voltage	BV_{CEO}				V	I_B = 0, I_C = 100µA
MP310		25				
MP311, MP312A		45				
Collector-Emitter Sustaining Voltage (3)	V_{CEO}				V	I_B = 0, I_C = 100µA
MP310		25				
MP311, MP312A		45				

NOTES:

(1) For MP310 V_{CB} = 20 V; for MP311 & MP312 V_{CB} = 30 V.

(2) For MP310 & MP311 V_{CE} = +45 V; for MP312 V_{CE} = 100 V.

(3) Guaranteed but not production tested.

Specifications are subject to change without notice

MATCHING CHARACTERISTICS
(@ 25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions/Comments
MATCHING CHARACTERISTICS						
Base Emitter Voltage Differential	$\lvert V_{BE1}-V_{BE2}\rvert$				mV	I_C = 10µA, V_{CE} = 5 V
MP310			1.0	3.0		
MP311			0.4	1.0		
MP312A			0.2	0.5		
Base Emitter Voltage Differential (5)	$\Delta\lvert(V_{BE1}-V_{BE2})\rvert$/°C				µV/°C	I_C = 10µA, V_{CE} = 5 V
Change with Temperature						T_A = –55°C to +125°C
MP310			2.0	15.0		
MP311			1.0	5.0		
MP312A			0.5	2.0		
Base Current Differential	$I_{B1}-I_{B2}$				nA	I_C = 10µA V_{CE} = 5 V
MP311				10		
MP312A				5		
Base Current Differential (5)	$\Delta\lvert(I_{B1}-I_{B2})\rvert$/°C				nA/°C	I_C = 10µA V_{CE} = 5 V
Change with Temperature						T_A = –55°C to +125°C
MP311				0.5		
MP312A				0.3		
DC Current Gain Differential	h_{FE1}/h_{FE2}				%	I_C = 10µA V_{CE} = 5 V
MP310			10			
MP311, MP312A,			5			

NOTES:

(1) These ratings are limiting values which the serviceability of any semiconductor may be impaired.

(2) The reverse base-to-emitter voltage must never exceed 7.0 volts and the reverse base-to-emitter current must never exceed 10µA.

(3) For MP310 V_{CB} = 20 V; for MP311 & MP312 V_{CB} = 30 V.

(4) For MP310 & MP311 V_{CE} = +45 V; for MP312 V_{CE} = 100 V.

(5) Guaranteed but not tested.

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Specifications are subject to change without notice

ABSOLUTE MAXIMUM RATINGS (1) (T_A = +25°C unless otherwise noted)

Storage Temperature ..... –65°C to +200°C
Operating Junction Temperature ..... +150°C
Lead Temperature (Soldering, 10 seconds) ..... +260°C
Maximum Power Dissipation Rating

Device Dissipation in Free Air
One Side 250mW
Both Sides 500mW

Linear Derating Factor
One Side ..... 2.3mW/°C
Both Sides ..... 4.3mW/°C

NOTES:

(1) Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation at or above this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.