MP350/351/352A

PNP Dual Monolithic
Silicon Nitrox
Transistors

Micro Power Systems

T-29-27

FEATURES

- **High Gain: $h_{FE} \geq 200$ @ 10μA – 1mA**
- **Tight V_{BE} Matching: $|V_{BE1} - V_{BE2}| = .2mV$ typ.**
- **High f_T: 275 MHz typ. @ 1 mA**

GENERAL DESCRIPTION

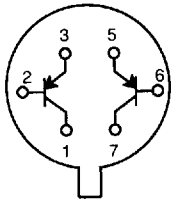
The MP350/351/352A are dual monolithic PNP matched transistors built for high performance input stages of differential amplifiers. Their excellent matching characteristics of base emitter voltage, base current, and DC current gain over temperature allow for accurate and stable amplification of critical 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 MP350/351/352A are available in the TO-52 Metal Can package.

ORDERING INFORMATION

Package Type	Temperature Range	Part No.	VBE Match (mV)	hFE Match (%)
TO-52	–55 to +125°C	MP350	5 0	10
TO-52	–55 to +125°C	MP351	1.0	5
TO-52	–55 to +125°C	MP352A	0.5	5

PIN CONFIGURATION



TO-52 (Metal Can)
(Bottom View)

MAXIMUM VOLTAGE AND CURRENT FOR EACH TRANSISTOR

Description	MP350	MP351	MP352A	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	6	6	V
V_{CCO} Collector to Collector Voltage	30	60	100	V
I_C 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.

MP350/351/352A

Micro Power Systems

ELECTRICAL CHARACTERISTICS
(@ 25°C unless otherwise noted) (2)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions/Comments
ELECTRICAL CHARACTERISTICS						
DC Current Gain (4)	h_{FE}					
MP350		100				I_C = 10μA, V_{CE} = 5 V,
MP351		150		600		I_C = 100μA, V_{CE} = 5 V,
MP352A		200		600		I_C = 1mA, V_{CE} = 5 V
DC Current Gain (–55°C)	h_{FE}					I_C = 10μA, V_{CE} = 5 V
MP350		30				
MP351		50				
MP352A		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 5	V	I_C = 1mA, I_B = 0.1mA
Collector Cutoff Current	I_{CBO}			0.2	nA	I_E = 0, V_{CB} (Note 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} (Note 3)
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
MP350, MP351				3		BW = 200 Hz, RG = 10kΩ
MP352A				2		f = 1 KHz
Collector Base Breakdown Voltage	BV_{CBO}				V	I_C = 10μA, I_E = 0
MP350		25				
MP351, MP352A		45				
Emitter Base Breakdown Voltage	BV_{EBO}				V	I_E = 10μA, I_C = 0
MP350		6				
MP351		6.5				
MP352A		45				
Collector to Emitter Voltage	BV_{CEO}				V	I_B = 0, I_C = 100μA
MP350		25				
MP351, MP352A		45				
Collector-Emitter Sustaining Voltage (3)	V_{CEO}				V	I_B = 0, I_C = 100μA
MP350		25				
MP351, MP352A		45				

NOTES:

(1) For MP350 V_{CB} = 20 V; for MP351 & MP352A V_{CB} = 30 V.
(2) For MP351 & MP352A V_{CC} = +45 V, for MP350 V_{CC} = +25 V.
(3) Guaranteed but not production tested
(4) No Max for 1 mA.

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	$I_C = 10\mu A$, $V_{CE} = 5$ V
MP350			1	5		
MP351			0.4	1		
MP352A			0.2	0.5		
Base Emitter Voltage Differential Change with Temperature	$\Delta\lvert(V_{BE1}-V_{BE2})\rvert/°C$				µV/°C	$I_C = 10\mu A$, $V_{CE} = 5$ V, $T_A = 55°C$ to $+125°C$
MP350			2	20		
MP351			1	10		
MP352A			0.5	2		
Base Current Differential	$I_{B1}-I_{B2}$				nA	$I_C = 10\mu A$, $V_{CE} = 5$ V
MP351				5		
MP352A				5		
Base Current Differential Change with Temperature	$\Delta\lvert(I_{B1}-I_{B2})\rvert/°C$				nA/°C	$I_C = 10\mu A$, $V_{CE} = 5$ V, $T_A = 55°C$ to $+125°C$
MP351				0.5		
MP352A				0.3		
DC Current Gain Differential	h_{FE1}/h_{FE2}				%	$I_C = 10\mu A$, $V_{CE} = 5$ V
MP350			10			
MP351, MP352A			5			

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.
(2) For MP350 $V_{CB} = 20$ V, for MP351 & MP352A $V_{CB} = 30$ V.
(3) For MP350 $V_{EB} = 4$ V; for for MP351, MP352A $V_{EB} = 5$ V
(4) For MP351 & MP352A $V_{CC} = +45$ V; for MP350 $V_{CC} = +25$ V

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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.