PMI

MAT-01/883

MATCHED MONOLITHIC DUAL TRANSISTOR

Precision Monolithics Inc.

T-43-25

1.0 SCOPE

This specification covers the detail requirements for a dual matched transistor.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace spec control drawings.

1.2 Part Number. The complete part numbers per Table I of this specification follow:

Device	Part Number	Package
A	MAT-01AH/883	H
G	MAT-01GH/883	H

1.2.3 Case Outline.

Letter	Case Outline (Lead finish per MIL-M-38510)
H	6-lead metal can (TO-78)

1.3 Absolute Maximum Ratings. (T_A = 25°C, unless otherwise noted)

Collector-Base Voltage (BV_{CBO}) 45V
Collector-Emitter Voltage (BV_{CEO}) 45V
Collector-Collector Voltage (BV_{CC}) 45V
Emitter-Emitter Voltage (BV_{EE}) 45V
Emitter-Base Voltage (BV_{EBO}) (Note 1) 5V
Collector Current (I_C) 25mA
Emitter Current (I_E) 25mA
Total Power Dissipation:
Case Temperature ≤40°C (Note 2) 1.8W
Ambient Temperature ≤70°C (Note 3) 500mW
Operating Ambient Temperature Range ..... -55°C to +125°C
Operating Junction Temperature Range ..... -55°C to +125°C
Storage Temperature Range ..... -65°C to +150°C
Lead Temperature (Soldering, 60 sec) ..... +300°C
DICE Junction Temperature Range (T_J) ..... -65°C to +150°C

NOTES:

1. Application of reverse bias voltages in excess of rating shown can result in degradation of h_{FE} and h_{FE} matching characteristics. Do not attempt to measure BV_{EBO} greater than the 5V rating shown.
2. Rating applies to applications using heat sinking to control case temperature. Derate linearly at 16.4mW/°C for case temperatures above 40°C.
3. Rating applies to applications not using heat sinking; device in free air only. Derate linearly at 6.3mW/°C for ambient temperatures above 70°C.

January 1988

MAT-01/883 MATCHED MONOLITHIC DUAL TRANSISTOR

PMI

1.5 Thermal Characteristics:

Thermal Resistance, TO-78 (H) package:

Junction-to-Case (Θ_{JC}) = 45°C/W MAX

Junction-to-Ambient (Θ_{JA}) = 150°C/W MAX

January 1988

MAT-01/883 MATCHED MONOLITHIC DUAL TRANSISTOR

Spec. #D0042-01E
Rev. B

PMI

TABLE 1

V_{CB} = 15V; I_C = 10μA; T_A = 25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	MAT-01/883 LIMITS A Min	LIMITS A Max	LIMITS G Min	LIMITS G Max	Units
Breakdown Voltage	BV_{CEO}	I_C = 100μA	45	–	45	–	V
Offset Voltage	V_{OS}		–	0.1	–	0.5	mV
		-55°C ≤ T_A ≤ +125°C	–	0.15	–	0.7	mV
Offset Current	I_{OS}		–	0.6	–	3.2	nA
		-55°C ≤ T_A ≤ +125°C	–	8.0	–	15.0	nA
Bias Current	I_B		–	20	–	40	nA
		-55°C ≤ T_A ≤ +125°C	–	60	–	130	nA
Current Gain Match	Δh_{FE}		–	3	–	8	%
Offset Voltage Change	$\Delta V_{OS}/\Delta V_{CB}$	V_{CB} = 0V to 30V	–	3	–	8	μV/V
Offset Current Change	$\Delta I_{OS}/\Delta V_{CB}$	V_{CB} = 0V to 30V	-	15	–	70	pA/V
Collector Saturation Voltage	$V_{CE}SAT$	I_B = 0.1mA, I_C = 1mA	–	0.2	–	0.25	V
Current Gain (Note 1)	h_{FE}		500	–	250	–	
		-55°C ≤ T_A ≤ +125°C	167	–	77	–	
Collector-Base Leakage Current	I_{CBO}	V_{CB} = 30V, I_E = 0	–	50	–	200	pA
		V_{CB} = 30V, I_E = 0 T_A = +125°C	–	80	–	200	nA
Average Offset Voltage Drift (Note 2)	TCV_{OS}	-55°C ≤ T_A ≤ +125°C	–	0.5	–	1.8	μV/°C

TABLE 1 (Continued)

V_{CB} = 15V; I_C = 10μA; T_A = 25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	MAT-01/883 LIMITS A Min	LIMITS A Max	LIMITS X Min	LIMITS X Max	Units
Collector-Emitter Leakage Current (Note 3)	I_{CES}	V_{CE} = 30V, V_{BE} = 0V	–	200	–	400	pA
		V_{CE} = 30V, V_{BE} = 0V T_A = +125°C	–	300	–	400	nA
Collector-Collector Leakage Current (Note 3)	I_{CC}	V_{CC} = 30V	–	200	–	400	pA
		V_{CC} = 30V T_A = +125°C	–	200	–	400	nA
Average Offset Current Drift (Note 4)	TCI_{OS}	-55°C ≤ T_A ≤ +125°C	–	90	–	150	pA/°C
Noise Voltage Density (Note 5)	e_n	f_O = 10Hz	–	12	–	12	nV/√Hz
		f_O = 100Hz	–	9	–	9	nV/√Hz
		f_O = 1000Hz	–	9	–	9	nV/√Hz
Low Frequency Noise Voltage (Note 5)	e_{np-p}	0.1Hz to 10Hz	–	0.4	–	0.4	μVp-p

NOTES:

1. h_{FE} is verified by I_B test $\left(h_{FE} = \frac{I_C}{I_B}\right)$ where I_C = 10μA.
2. TCV_{OS} is guaranteed by measurement of V_{OS} $\left(\frac{\Delta V_{OS}}{\Delta T} \simeq \frac{V_{OS}}{T} \text{ for } V_{OS} << V_{BE}\right)$ where T is in °k.
3. I_{CC} and I_{CES} are guaranteed by measurement of I_{CBO}.
4. TCI_{OS} is verified by I_{OS} measurement at temperature extremes (guardbanded endpoints).
5. Sample tested.

TABLE 2

MAT-01/883

Electrical Test Requirements For Class B Devices

MIL-STD-883 Test Requirements	Subgroups (see Table 3)
Interim Electrical Parameters (pre Burn-In)	1
Final Electrical Test Parameters	1*, 2, 3
Group A Test Requirements	1, 2, 3, 7

* PDA applies to Subgroup 1 only.
No other Subgroups are included in PDA.

TABLE 3

Group A Inspection

V_{CB} = 15V; I_C = 10μA unless otherwise specified.

Subgroup	Symbol	Special Conditions	MAT-01/883 LIMITS A Min	LIMITS A Max	LIMITS X Min	LIMITS X Max	Units
Subgroup 1	BV_{CEO}	I_C = 100μA	45	–	45	–	V
T_A = +25°C	V_{OS}		–	0.1	–	0.5	mV
	I_{OS}		–	0.6	–	3.2	nA
	I_B		–	20	–	40	nA
	Δh_{FE}		–	3	–	8	%
	$\Delta V_{OS}/\Delta V_{CB}$	V_{CB} = 0V, 30V	–	3	–	8	μV/V
	$\Delta I_{OS}/\Delta V_{CB}$	V_{CB} = 0V, 30V	–	15	–	70	pA/V
	$V_{CE}SAT$	I_B = 0.1mA, I_C = 1mA	–	0.2	–	0.25	V
	h_{FE}	(Note 1)	500	–	250	–	
	I_{CBO}	V_{CB} = 30V, I_E = 0	–	50	–	200	pA
	I_{CES}	V_{CE} = 30V, V_{BE} = 0V (Note 2)	–	200	–	400	pA
	I_{CC}	V_{CC} = 30V (Note 2)	–	200	–	400	pA
Subgroup 2	V_{OS}		–	0.15	–	0.7	mV
T_A = +125°C	I_{OS}		–	8	–	15	nA
	I_B		–	60	–	130	nA
	h_{FE}	(Note 1)	167	–	77	–	
	I_{CBO}	V_{CB} = 30V, I_E = 0	–	80	–	200	nA

TABLE 3

Group A Inspection (Continued)

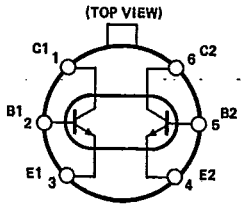
V_{CB} = 15V; I_C = 10μA unless otherwise specified.

Subgroup	Symbol	Special Conditions	MAT-01/883 LIMITS A Min	LIMITS A Max	LIMITS X Min	LIMITS X Max	Units
Subgroup 2 T_A = +125°C	I_{CES}	V_{CE} = 30V, V_{BE} = 0V (Note 2)	–	300	–	400	nA
(Continued)	I_{CC}	V_{CC} = 30V (Note 2)	–	200	–	400	nA
Subgroup 3 T_A = -55°C	All Tests, Limits and Conditions are the same as for Subgroup 2, with the exclusion of I_{CBO}, I_{CES} and I_{CC} tests.						
Subgroup 7	e_{np-p}	0.1Hz, 10Hz	–	0.4	–	0.4	μVp-p
T_A = +25°C	e_n	f_O = 10Hz	–	12	–	12	nV/√Hz
		f_O = 100Hz	–	9	–	9	nV/√Hz
		f_O = 1000Hz	–	9	–	9	nV/√Hz

NOTES:

1. h_{FE} is verified by I_B test $\left(h_{FE} = \frac{I_C}{I_B}\right)$ where I_C = 10μA.
2. I_{CC} and I_{CES} are guaranteed by measurement of I_{CBO}.

3.2.1 Pin Connections.



TO-78
(H-Suffix)

NOTE:
Substrate is connected to case.

3.2.4 Microcircuit Group Assignment. This microcircuit is covered by microcircuit group 49.

4.2 Life Test/Burn-In Circuit.