



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:

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

1.2.3 Case Outline.

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

1.3 Absolute Maximum Ratings. ($T_A = 25^\circ\text{C}$, 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 $\leq 40^\circ\text{C}$ (Note 2)	1.8W
Ambient Temperature $\leq 70^\circ\text{C}$ (Note 3)	500mW
Operating Ambient Temperature Range	-55°C to $+125^\circ\text{C}$
Operating Junction Temperature Range	-55°C to $+125^\circ\text{C}$
Storage Temperature Range	-65°C to $+150^\circ\text{C}$
Lead Temperature (Soldering, 60 sec)	$+300^\circ\text{C}$
DICE Junction Temperature Range (T_J)	-65°C to $+150^\circ\text{C}$

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 $18.4\text{mW}/^\circ\text{C}$ for case temperatures above 40°C .
3. Rating applies to applications not using heat sinking; device in free air only. Derate linearly at $6.3\text{mW}/^\circ\text{C}$ for ambient temperatures above 70°C .

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**1.5 Thermal Characteristics:**

Thermal Resistance, TO-78 (H) package:

Junction-to-Case (θ_{JC}) = 45°C/W MAXJunction-to-Ambient (θ_{JA}) = 150°C/W MAX

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Rev. B**PMI****TABLE 1** $V_{CB} = 15V$; $I_C = 10\mu A$; $T_A = 25^\circ C$ unless otherwise specified.

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Characteristics	Symbol	Special Conditions	LIMITS A		LIMITS G		Units
			Min	Max	Min	Max	
Breakdown Voltage	BV_{CEO}	$I_C = 100\mu A$	45	—	45	—	V
Offset Voltage	V_{OS}		—	0.1	—	0.5	mV
		$-55^{\circ}C \leq T_A \leq +125^{\circ}C$	—	0.15	—	0.7	mV
Offset Current	I_{OS}		—	0.6	—	3.2	nA
		$-55^{\circ}C \leq T_A \leq +125^{\circ}C$	—	8.0	—	15.0	nA
Bias Current	I_B		—	20	—	40	nA
		$-55^{\circ}C \leq T_A \leq +125^{\circ}C$	—	60	—	130	nA
Current Gain Match	Δh_{FE}		—	3	—	8	%
Offset Voltage Change	$\Delta V_{OS}/\Delta V_{CB}$	$V_{CB} = 0V \text{ to } 30V$	—	3	—	8	$\mu V/V$
Offset Current Change	$\Delta I_{OS}/\Delta V_{CB}$	$V_{CB} = 0V \text{ to } 30V$	—	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	—	
		$-55^{\circ}C \leq T_A \leq +125^{\circ}C$	167	—	77	—	
Collector-Base Leakage Current	I_{CBO}	$V_{CB} = 30V, I_E = 0$	—	50	—	200	pA
		$V_{CB} = 30V, I_E = 0$	—	80	—	200	nA
		$T_A = +125^{\circ}C$					
Average Offset Voltage Drift (Note 2)	TCV_{OS}	$-55^{\circ}C \leq T_A \leq +125^{\circ}C$	—	0.5	—	1.8	$\mu V/^{\circ}C$

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Rev. B**PMI****TABLE 1 (Continued)** $V_{CB} = 15V$; $I_C = 10\mu A$; $T_A = 25^\circ C$ unless otherwise specified.

Characteristics	Symbol	Special Conditions	LIMITS A		LIMITS X		Units
			Min	Max	Min	Max	
Collector-Emitter Leakage Current (Note 3)	I_{CES}	$V_{CE} = 30V, V_{BE} = 0V$	—	200	—	400	pA
		$V_{CE} = 30V, V_{BE} = 0V$	—	300	—	400	nA
		$T_A = +125^\circ C$					
Collector-Collector Leakage Current (Note 3)	I_{CC}	$V_{CC} = 30V$	—	200	—	400	pA
		$V_{CC} = 30V$	—	200	—	400	nA
		$T_A = +125^\circ C$					
Average Offset Current Drift (Note 4)	TCI_{OS}	$-55^\circ C \leq T_A \leq +125^\circ C$	—	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:

- h_{FE} is verified by I_B test $\left(h_{FE} = \frac{I_C}{I_B}\right)$ where $I_C = 10\mu A$.
- TCV_{OS} is guaranteed by measurement of V_{OS} $\left(\frac{\Delta V_{OS}}{\Delta T} \approx \frac{V_{OS}}{T} \text{ for } V_{OS} \ll V_{BE}\right)$ where T is in °K.
- I_{CC} and I_{CES} are guaranteed by measurement of I_{CBO} .
- TCI_{OS} is verified by I_{OS} measurement at temperature extremes (guardbanded endpoints).
- Sample tested.

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Rev. B**PMI****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.

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DUAL TRANSISTORSpec. #D0042-01E
Rev. B**TABLE 3****Group A Inspection** $V_{CB} = 15V$; $I_C = 10\mu A$ unless otherwise specified.

Subgroup	Symbol	Special Conditions	MAT-01/883 LIMITS A		LIMITS X		Units
			Min	Max	Min	Max	
Subgroup 1 $T_A = +25^\circ C$	BV_{CEO}	$I_C = 100\mu A$	45	—	45	—	V
	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	$\mu V/V$
	$\Delta I_{OS}/\Delta V_{CB}$	$V_{CB} = 0V, 30V$	—	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 $T_A = +125^\circ C$	V_{OS}		—	0.15	—	0.7	mV
	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

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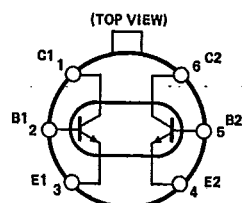
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TABLE 3**Group A Inspection (Continued)** $V_{CB} = 15V$; $I_C = 10\mu A$ unless otherwise specified.

Subgroup	Symbol	Special Conditions	MAT-01/883 LIMITS A		LIMITS X		Units
			Min	Max	Min	Max	
Subgroup 2 $T_A = +125^\circ C$	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 $T_A = -55^\circ C$	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 $T_A = +25^\circ C$	e_{np-p}	0.1Hz, 10Hz	—	0.4	—	0.4	μV_{p-p}
	e_n	$f_O = 10Hz$	—	12	—	12	nV/ $\sqrt{Hz}$
		$f_O = 100Hz$	—	9	—	9	nV/ $\sqrt{Hz}$
		$f_O = 1000Hz$	—	9	—	9	nV/ $\sqrt{Hz}$

NOTES:

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

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Rev. B**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.**