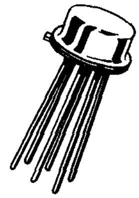
MD8001 (SILICON)
MD8002
MD8003

MULTIPLE SILICON ANNULAR TRANSISTORS

. . . designed for use as differential amplifiers, dual general-purpose amplifiers, front-end detectors and temperature compensation applications.

- Excellent Audio Amplifier Direct Coupled Input Devices.
- Collector-Emitter Breakdown Voltage —
  BV_{CEO} = 40 Vdc (Min) – MD8001
  50 Vdc (Min) – MD8002
  60 Vdc (Min) – MD8003

NPN SILICON MULTIPLE TRANSISTORS



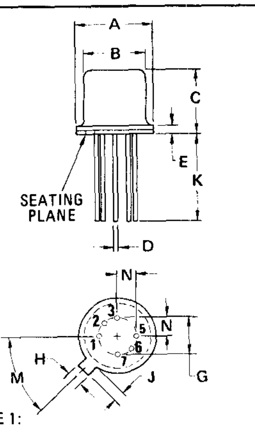
MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Collector-Emitter Voltage MD8001 MD8002 MD8003	V_{CEO}	 40 50 60		Vdc
Collector Current – Continuous	I_C	30		mAdc
		One Die	Both Die Equal Power	
Total Power Dissipation @ $T_A = 25^oC$ Derate above 25^oC	P_D	575 3.29	625 3.57	mW mW/°C
Total Power Dissipation @ $T_C = 25^oC$ Derate above 25^oC	P_D	1.8 10.3	2.5 14.3	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	One Die Max	Both Die Equal Power Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$(1)	304	280	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	97	70	°C/W
		Junction to Ambient	Junction to Case	
Coupling Factor		84	44	%

(1) $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.



STYLE 1:
PIN 1. COLLECTOR
2. BASE
3. EMITTER
4. OMITTED
5. EMITTER
6. BASE
7. COLLECTOR
8. OMITTED

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.51	9.40	0.335	0.370
B	7.75	8.51	0.305	0.335
C	3.81	4.70	0.150	0.185
D	0.41	0.53	0.016	0.021
G	5.08 BSC		0.200 BSC	
H	0.71	0.86	0.028	0.034
J	0.74	1.14	0.029	0.045
K	12.70	–	0.500	–
M	45° BSC		45° BSC	
N	2.54 BSC		0.100 BSC	

CASE 654-07

THERMAL COUPLING AND EFFECTIVE THERMAL RESISTANCE

In multiple chip devices, coupling of heat between die occurs. The junction temperature can be calculated as follows:

(1) $\Delta T_{J1} = R_{\theta 1} P_{D1} + R_{\theta 2} K_{\theta 2} P_{D2}$

Where ΔT_{J1} is the change in junction temperature of die 1
$R_{\theta 1}$ and $R_{\theta 2}$ is the thermal resistance of die 1 and die 2
P_{D1} and P_{D2} is the power dissipated in die 1 and die 2
$k_{\theta 2}$ is the thermal coupling between die 1 and die 2

An effective package thermal resistance can be defined as follows:

(2) $R_{\theta(EFF)} = \Delta T_{J1}/P_{DT}$

where: P_{DT} is the total package power dissipation.

Assuming equal thermal resistance for each die, equation (1) simplifies to

(3) $\Delta T_{J1} = R_{\theta 1} (P_{D1} + K_{\theta 2} P_{D2})$

For the conditions where $P_{D1} = P_{D2}$, $P_{DT} = 2P_D$, equation (3) can be further simplified and by substituting into equation (2) results in

(4) $R_{\theta(EFF)} = R_{\theta 1} (1 + K_{\theta 2})/2$

Values for the coupling factors when either the case or the ambient is used as a reference are given in the table on page 1

ELECTRICAL CHARACTERISTICS ($T_A = 25^oC$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (1) (I_C = 10 mAdc, I_B = 0) MD8001	BV_{CEO}	40	–	–	Vdc
MD8002		50	–	–	
MD8003		60	–	–	
Collector Cutoff Current (V_{CB} = 40 Vdc, I_E = 0)	I_{CBO}	–	–	50	nAdc
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)	I_{EBO}	–	–	50	nAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	h_{FE}	100	200	–	–
DYNAMIC CHARACTERISTICS					
Current-Gain-Bandwidth Product (1) (I_C = 5.0 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	f_T	–	260	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)	C_{ob}	–	2.6	–	pF
Input Capacitance (V_{BE} = 2.0 Vdc, I_C = 0, f = 100 kHz)	C_{ib}	–	2.3	–	pF
MATCHING CHARACTERISTICS					
Base Voltage Differential (I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	$\|V_{BE1}-V_{BE2}\|$	–	–	15	mVdc

(1) Pulse Test: Pulse Width $\leqslant$300 μs, Duty Cycle $\leqslant$2.0%.