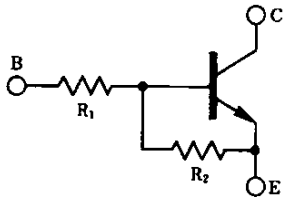
NEC

COMPOUND TRANSISTOR
HD1 SERIES

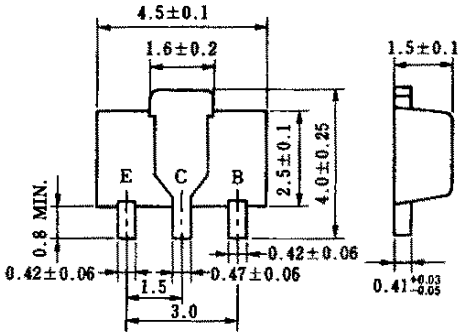
on-chip resistor NPN silicon epitaxial transistor
For mid-speed switching

FEATURES

- High current drives such as IC outputs and actuators available
- On-chip bias resistor
- Low power consumption during drive



PACKAGE DRAWING (UNIT: mm)



Electrode Connection
E:Emitter
C: Collector (Fin)
B: Base

HD1 SERIES LISTS

Products	Marking	R_1 (KΩ)	R_2 (KΩ)
HD1A3M	LP	1.0	1.0
HD1F3P	LQ	2.2	10
HD1L3N	LR	4.7	10
HD1A4M	LS	10	10
HD1L2Q	LT	0.47	4.7
HD1F2Q	LU	0.22	2.2
HD1A4A	LX	–	10

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	80	V
Collector to emitter voltage	V_{CEO}	60	V
Emitter to base voltage	V_{EBO}	10	V
Collector current (DC)	$I_{C(DC)}$	1.0	A
Collector current (Pulse)	$I_{C(pulse)}$ *	2.0	A
Base current (DC)	$I_{B(DC)}$	0.02	A
Total power dissipation	P_T **	2.0	W
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	–55 to +150	°C

* PW ≤ 10 ms, duty cycle ≤ 50 %

** When 0.7 mm × 16 cm^2 ceramic board is used

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HD1A3M
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	80			–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	200			–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200			–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.4 A			0.35	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA			0.3	V
Input resistance	R_1		0.7	1.0	1.3	kΩ
E-to-B resistance	R_2		0.7	1.0	1.3	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

HD1F3P
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	200	630		–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300	780		–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200	430		–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.3 A		0.12	0.3	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA		0.5	0.3	V
Input resistance	R_1		1.54	2.2	2.86	kΩ
E-to-B resistance	R_2		7	10	13	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

HD1L3N
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	200			–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300			–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200			–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.2 A			0.2	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA			0.3	V
Input resistance	R_1		3.29	4.7	6.11	kΩ
E-to-B resistance	R_2		7	10	13	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

HD1A4M
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	200			–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300			–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200			–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.1 A			0.2	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA			0.3	V
Input resistance	R_1		7	10	13	kΩ
E-to-B resistance	R_2		7	10	13	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

HD1L2Q
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	200			–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300			–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200			–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.8 A			0.5	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA			0.3	V
Input resistance	R_1		329	470	611	Ω
E-to-B resistance	R_2		3.29	4.7	6.11	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

HD1F2Q
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	100			–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300			–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200			–
Low level output voltage	V_{OL} **	V_{IN} = 5.0 V, I_C = 0.8 A			0.5	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA			0.3	V
Input resistance	R_1		154	220	286	Ω
E-to-B resistance	R_2		1.54	2.2	2.86	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

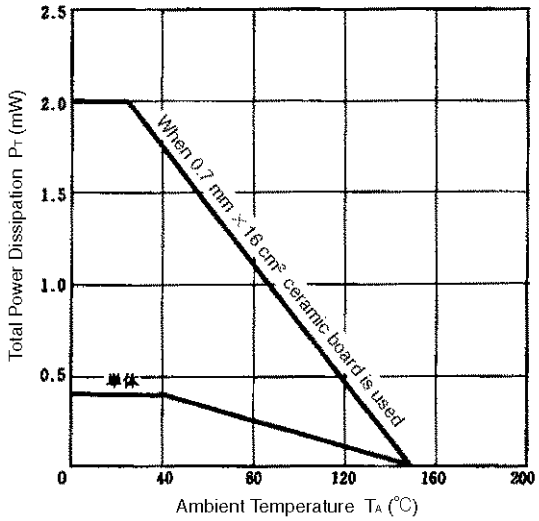
HD1A4A
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 60 V, I_E = 0			100	nA
DC current gain	h_{FE1} **	V_{CE} = 2.0 V, I_C = 0.1 A	200	630		–
DC current gain	h_{FE2} **	V_{CE} = 2.0 V, I_C = 0.5 A	300	780		–
DC current gain	h_{FE3} **	V_{CE} = 2.0 V, I_C = 1.0 A	200	430		–
Collector saturation voltage	$V_{CE(sat)}$ **	I_C = 0.7 A, I_B = 7 mA		0.25	0.4	V
Low level input voltage	V_{IL} **	V_{CE} = 5.0 V, I_C = 100 μA		0.5	0.3	V
Input resistance	R_1		–	–	–	Ω
E-to-B resistance	R_2		7	10	13	kΩ

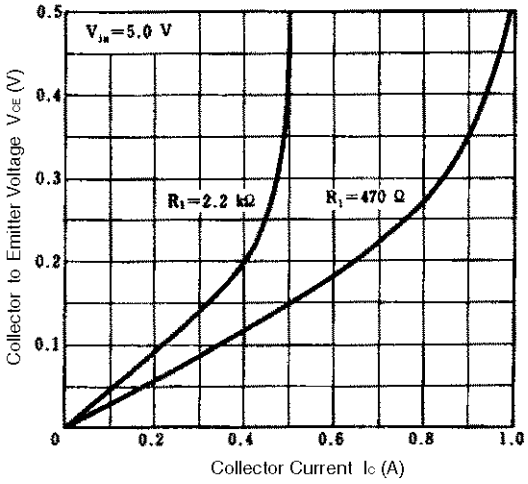
** PW ≤ 350 μs, duty cycle ≤ 2 %

TYPICAL CHARACTERISTICS (T_a = 25°C)

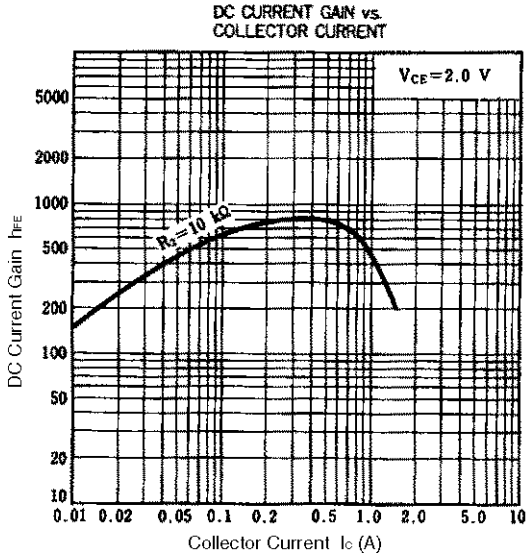
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



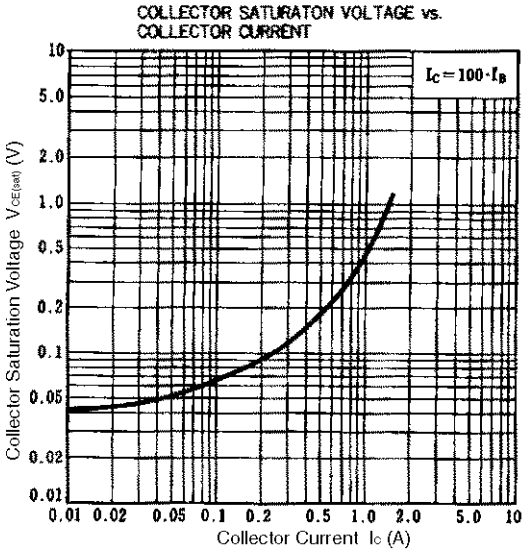
COLLECTOR TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



DC CURRENT GAIN vs. COLLECTOR CURRENT



COLLECTOR SATURATON VOLTAGE vs. COLLECTOR CURRENT



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