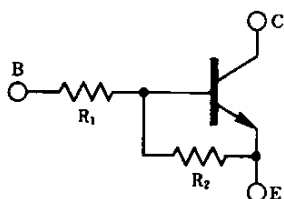


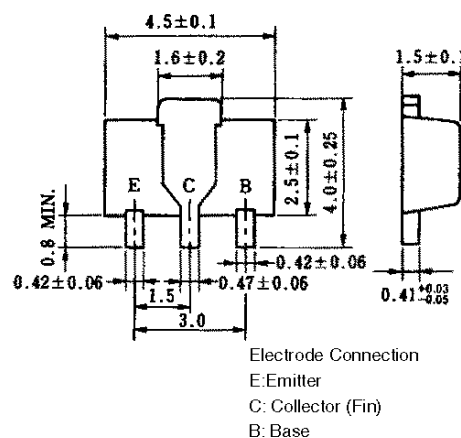
on-chip resistor NPN silicon epitaxial transistor
For mid-speed switching

FEATURES

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



PACKAGE DRAWING (UNIT: mm)



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 cm² 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 _{CB0}	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 _{CB0}	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 _{CB0}	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 %

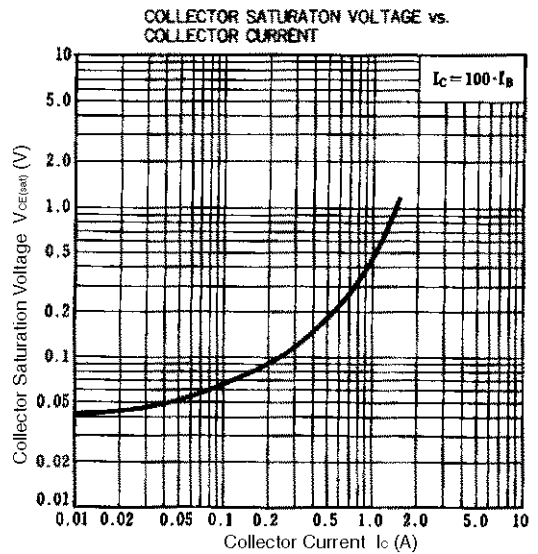
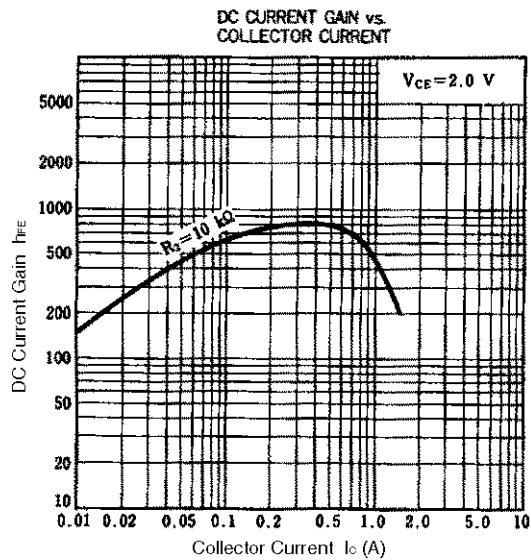
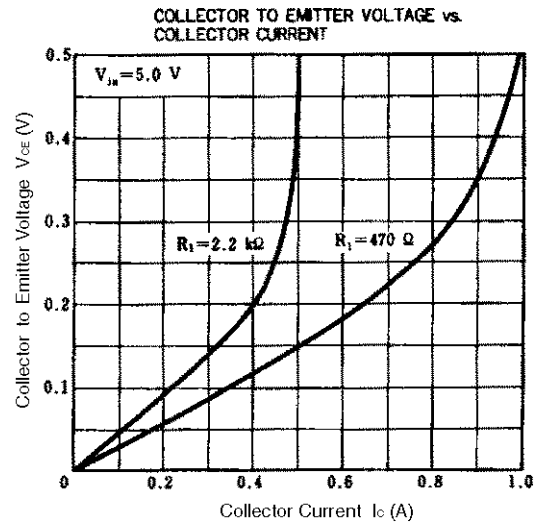
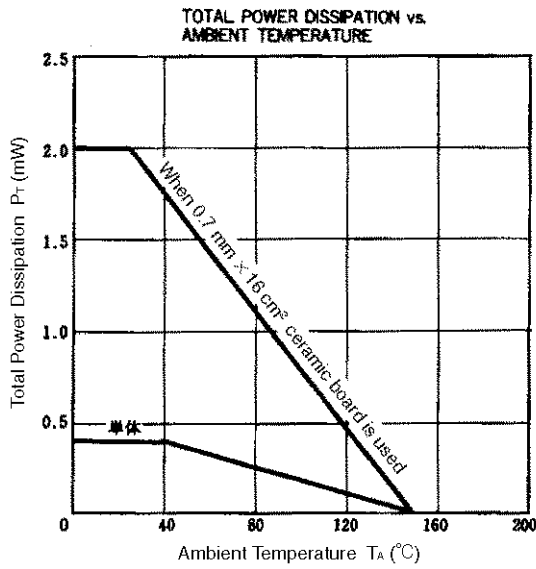
HD1A4A

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

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

** $PW \leq 350\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)



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