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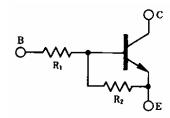


# COMPOUND TRANSISTOR HD1 SERIES

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

#### **FEATURES**

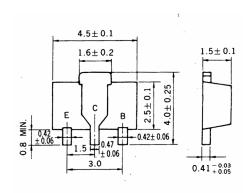
- · High current drives such as IC outputs and actuators available
- · On-chip bias resistor
- · Low power consumption during drive



#### **HD1 SERIES LISTS**

Products	Marking	R <sub>1</sub> (kΩ)	R <sub>2</sub> (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

#### PACKAGE DRAWING (UNIT: mm)



Electrode Connection

E. Emitter

C. Collector

R. Base

#### ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	VcBO	80	V
Collector to emitter voltage	VCEO	60	V
Emitter to base voltage	VEBO	10	V
Collector current (DC)	Ic(DC)	1.0	Α
Collector current (Pulse)	IC(pulse) Note1	2.0	Α
Base current (DC)	I <sub>B(DC)</sub>	0.02	Α
Total power dissipation	PT Note2	2.0	W
Junction temperature	Tj	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

**Notes 1.** PW  $\leq$  10 ms, duty cycle  $\leq$  50 %

2. When  $0.7 \text{ mm} \times 16 \text{ cm}^2$  ceramic board is used

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## HD1A3M ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	80			-
DC current gain	hFE2 Note	Vce = 2.0 V, Ic = 0.5 A	200			_
DC current gain	hFE3 Note	Vce = 2.0 V, Ic = 1.0 A	200			-
Low level output voltage	Vol. Note	V <sub>IN</sub> = 5.0 V, Ic = 0.4 A			0.35	V
Low level input voltage	V <sub>IL</sub> Note	Vcε = 5.0 V, Ic = 100 μA			0.3	V
Input resistance	R <sub>1</sub>		0.7	1.0	1.3	kΩ
E-to-B resistance	R <sub>2</sub>		0.7	1.0	1.3	kΩ

**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

#### HD1F3P

#### **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	Vcb = 60 V, IE = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	200	630		
DC current gain	hFE2 Note	Vce = 2.0 V, Ic = 0.5 A	300	780		ı
DC current gain	hFE3 Note	Vce = 2.0 V, Ic = 1.0 A	200	430		-
Low level output voltage	Vol. Note	V <sub>IN</sub> = 5.0 V, Ic = 0.3 A		0.12	0.3	V
Low level input voltage	V <sub>IL</sub> Note	Vcε = 5.0 V, Ic = 100 μA		0.5	0.3	٧
Input resistance	R <sub>1</sub>		1.54	2.2	2.86	kΩ
E-to-B resistance	R <sub>2</sub>		7	10	13	kΩ

**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

#### HD1L3N

### **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	200			-
DC current gain	hFE2 Note	Vce = 2.0 V, Ic = 0.5 A	300			_
DC current gain	hFE3 Note	Vce = 2.0 V, Ic = 1.0 A	200			-
Low level output voltage	Vol. Note	V <sub>IN</sub> = 5.0 V, Ic = 0.2 A			0.2	V
Low level input voltage	V <sub>IL</sub> Note	Vcε = 5.0 V, Ic = 100 μA			0.3	V
Input resistance	R <sub>1</sub>		3.29	4.7	6.11	kΩ
E-to-B resistance	R <sub>2</sub>		7	10	13	kΩ

**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

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## HD1A4M ELECTRICAL CHARACTERISTICS (TA = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	Vcb = 60 V, IE = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	200			-
DC current gain	hFE2 Note	Vce = 2.0 V, Ic = 0.5 A	300			_
DC current gain	hFE3 Note	Vce = 2.0 V, Ic = 1.0 A	200			-
Low level output voltage	Vol. Note	V <sub>IN</sub> = 5.0 V, Ic = 0.1 A			0.2	V
Low level input voltage	V <sub>IL</sub> Note	Vcε = 5.0 V, lc = 100 μA			0.3	V
Input resistance	R <sub>1</sub>		7	10	13	kΩ
E-to-B resistance	R <sub>2</sub>		7	10	13	kΩ

**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

HD1L2Q ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	Vcb = 60 V, IE = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	200			_
DC current gain	hFE2 Note	Vce = 2.0 V, Ic = 0.5 A	300			-
DC current gain	h <sub>FE3</sub> Note	Vce = 2.0 V, Ic = 1.0 A	200			-
Low level output voltage	Vol. Note	V <sub>IN</sub> = 5.0 V, Ic = 0.8 A			0.5	V
Low level input voltage	V <sub>IL</sub> Note	Vcε = 5.0 V, Ic = 100 μA			0.3	V
Input resistance	R <sub>1</sub>		329	470	611	Ω
E-to-B resistance	R <sub>2</sub>		3.29	4.7	6.11	kΩ

**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

## HD1F2Q ELECTRICAL CHARACTERISTICS (TA = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0			100	nA
DC current gain	hFE1 Note	Vce = 2.0 V, lc = 0.1 A	100			-
DC current gain	h <sub>FE2</sub> Note	$V_{CE} = 2.0 \text{ V}, \text{ Ic} = 0.5 \text{ A}$	300			ı
DC current gain	hfe3 Note	Vce = 2.0 V, lc = 1.0 A	200			-
Low level output voltage	Vol. Note	$V_{IN} = 5.0 \text{ V}, \text{ Ic} = 0.8 \text{ A}$			0.5	V
Low level input voltage	V <sub>IL</sub> Note	$V_{CE} = 5.0 \text{ V}, \text{ Ic} = 100 \ \mu\text{A}$			0.3	V
Input resistance	R <sub>1</sub>		154	220	286	Ω
E-to-B resistance	R <sub>2</sub>		1.54	2.2	2.86	kΩ

 $\textbf{Note} \quad \text{PW} \leq 350 \; \mu \text{s, duty cycle} \leq 2 \; \%$ 

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HD1A4A ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

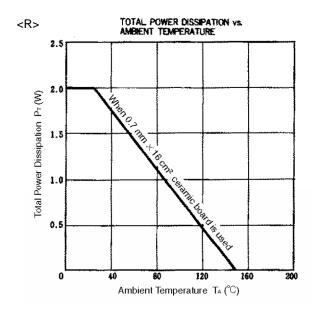
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	Ісво	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0			100	nA
DC current gain	h <sub>FE1</sub> Note	Vce = 2.0 V, Ic = 0.1 A	200	630		-
DC current gain	h <sub>FE2</sub> Note	Vce = 2.0 V, Ic = 0.5 A	300	780		-
DC current gain	h <sub>FE3</sub> Note	Vce = 2.0 V, Ic = 1.0 A	200	430		-
Collector saturation voltage	V <sub>CE(sat)</sub> Note	Ic = 0.7 A, I <sub>B</sub> = 7 mA		0.25	0.4	V
Low level input voltage	V <sub>IL</sub> Note	$V_{CE} = 5.0 \text{ V}, \text{ Ic} = 100 \ \mu\text{A}$		0.5	0.3	V
E-to-B resistance	R <sub>2</sub>		7	10	13	kΩ

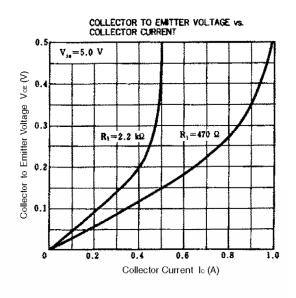
**Note** PW  $\leq$  350  $\mu$ s, duty cycle  $\leq$  2 %

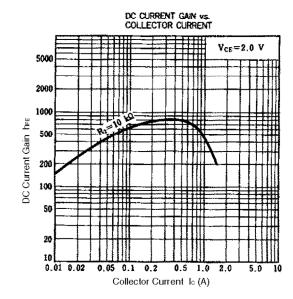
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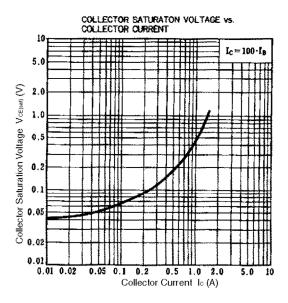


#### TYPICAL CHARACTERISTICS (TA = 25°C)









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