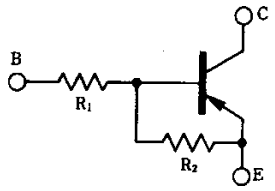
NEC

COMPOUND TRANSISTOR
HR1 SERIES

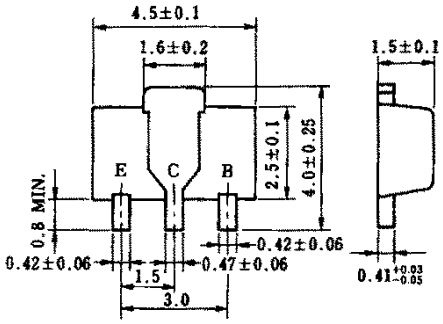
on-chip resistor PNP silicon epitaxial transistor
For mid-speed switching

FEATURES

- Up to 2A 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

HR1 SERIES LISTS

Products	Marking	R_1 (KΩ)	R_2 (KΩ)
HR1A3M	MP	1.0	1.0
HR1F3P	MQ	2.2	10
HR1L3N	MR	4.7	10
HR1A4,	MS	10	10
HR1L2Q	MT	0.47	4.7
HR1F2Q	MU	0.22	2.2
HR1A4A	MX	–	10

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	−60	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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HR1A3M
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	50			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Low level output voltage	V_{OL} **	V_{IN} = –5.0 V, I_C = –0.4 A			–0.4	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 %

HR1F3P
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	150			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Low level output voltage	V_{OL} **	V_{IN} = –5.0 V, I_C = –0.3 A			–0.3	V
Low level input voltage	V_{IL} **	V_{CE} = –5.0 V, I_C = –100 μA			–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 %

HR1L3N
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	150			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Low level output voltage	V_{OL} **	V_{IN} = –5.0 V, I_C = –0.2 A			–0.3	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 %

HR1A4M
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	150			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
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 %

HR1L2Q
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	150			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Low level output voltage	V_{OL} **	V_{IN} = –5.0 V, I_C = –0.5 A			–0.55	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 %

HR1F2Q
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	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Low level output voltage	V_{OL} **	V_{IN} = –5.0 V, I_C = –0.5 A			–0.55	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	kΩ
E-to-B resistance	R_2		1.54	2.2	2.86	kΩ

** PW ≤ 350 μs, duty cycle ≤ 2 %

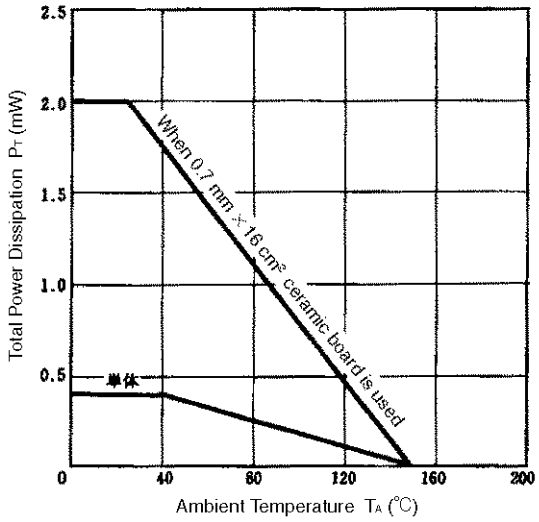
HR1A4A
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

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	150			–
DC current gain	h_{FE2} **	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE3} **	V_{CE} = –2.0 V, I_C = –1.0 A	50			–
Collector saturation voltage	$V_{CE(sat)}$ **	I_C = –500 mA, I_B = –10 mA		0.20	0.35	V
Low level input voltage	V_{IL} **	V_{CE} = –5.0 V, I_C = –100 μA	–0.3		–1.5	V
Input resistance	R_1		–	–	–	Ω
E-to-B resistance	R_2		7	10	13	kΩ

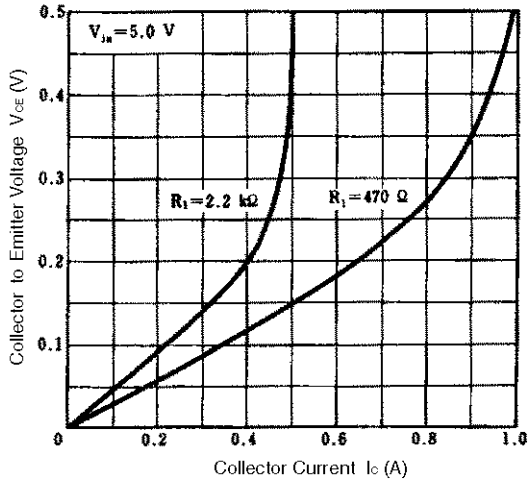
** PW ≤ 350 μs, duty cycle ≤ 2 %

TYPICAL CHARACTERISTICS (T_a = 25°C)

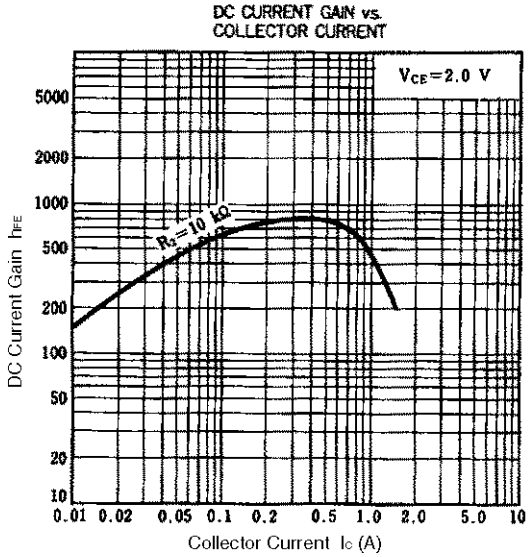
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



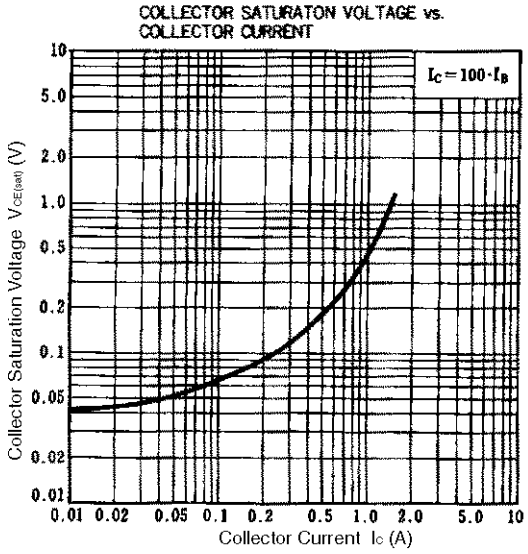
COLLECTOR TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



DC CURRENT GAIN vs. COLLECTOR CURRENT



COLLECTOR SATURATON VOLTAGE vs. COLLECTOR CURRENT



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