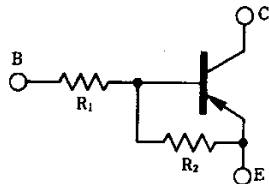


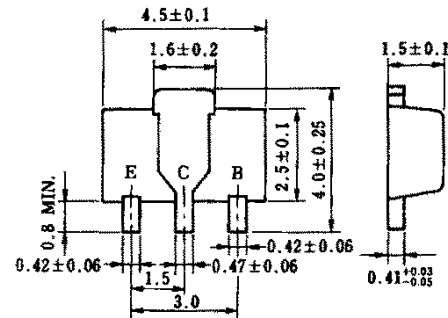
on-chip resistor PNP silicon epitaxial transistor For mid-speed switching

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 cm² 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}	$V_{CB} = -60\text{ V}, I_E = 0$			-100	nA
DC current gain	h_{FE1}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.1\text{ A}$	50			—
DC current gain	h_{FE2}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.5\text{ A}$	100			—
DC current gain	h_{FE3}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -1.0\text{ A}$	50			—
Low level output voltage	V_{OL}^{**}	$V_{IN} = -5.0\text{ V}, I_C = -0.4\text{ A}$			-0.4	V
Low level input voltage	V_{IL}^{**}	$V_{CE} = -5.0\text{ V}, I_C = -100\text{ }\mu\text{A}$			-0.3	V
Input resistance	R_1		0.7	1.0	1.3	k Ω
E-to-B resistance	R_2		0.7	1.0	1.3	k Ω

** PW \leq 350 μs , duty cycle \leq 2 %

HR1F3P

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}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.1\text{ A}$	150			—
DC current gain	h_{FE2}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.5\text{ A}$	100			—
DC current gain	h_{FE3}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -1.0\text{ A}$	50			—
Low level output voltage	V_{OL}^{**}	$V_{IN} = -5.0\text{ V}, I_C = -0.3\text{ A}$			-0.3	V
Low level input voltage	V_{IL}^{**}	$V_{CE} = -5.0\text{ V}, I_C = -100\text{ }\mu\text{A}$			-0.3	V
Input resistance	R_1		1.54	2.2	2.86	k Ω
E-to-B resistance	R_2		7	10	13	k Ω

** PW \leq 350 μs , duty cycle \leq 2 %

HR1L3N

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}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.1\text{ A}$	150			—
DC current gain	h_{FE2}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.5\text{ A}$	100			—
DC current gain	h_{FE3}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -1.0\text{ A}$	50			—
Low level output voltage	V_{OL}^{**}	$V_{IN} = -5.0\text{ V}, I_C = -0.2\text{ A}$			-0.3	V
Low level input voltage	V_{IL}^{**}	$V_{CE} = -5.0\text{ V}, I_C = -100\text{ }\mu\text{A}$			-0.3	V
Input resistance	R_1		3.29	4.7	6.11	k Ω
E-to-B resistance	R_2		7	10	13	k Ω

** PW \leq 350 μs , duty cycle \leq 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 %

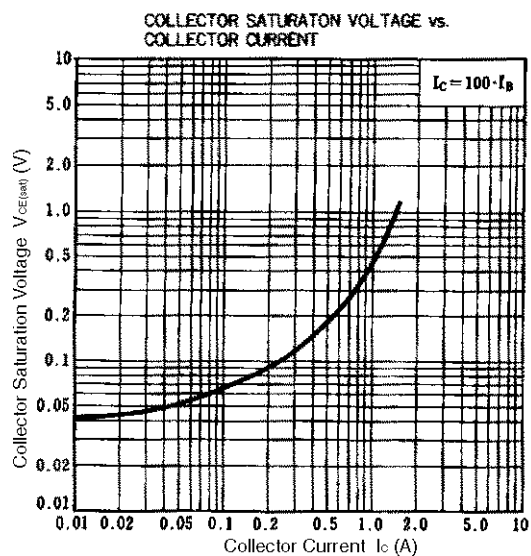
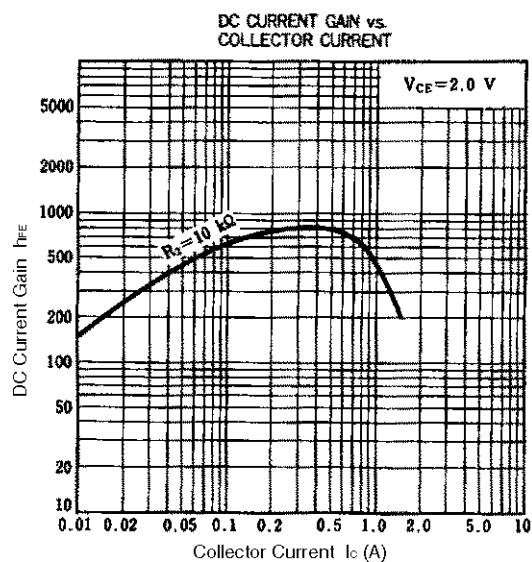
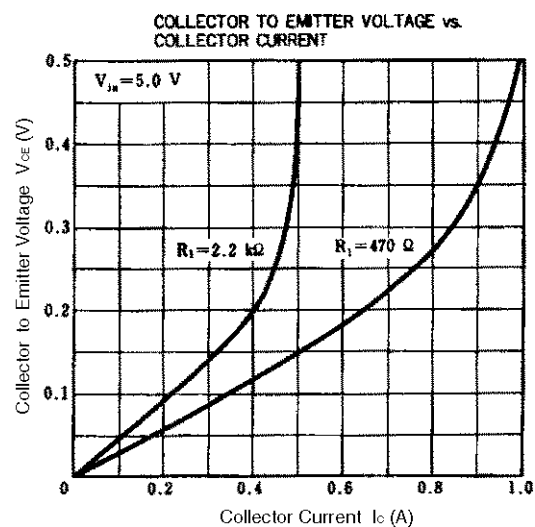
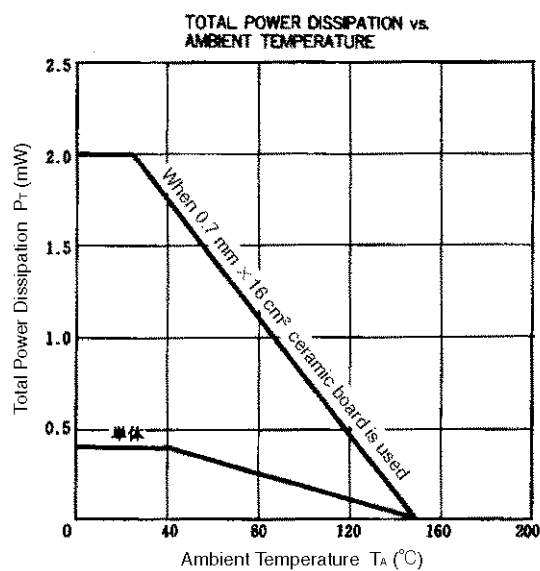
HR1A4A

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	$V_{CB} = -60\text{ V}, I_E = 0$			-100	nA
DC current gain	h_{FE1}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.1\text{ A}$	150			—
DC current gain	h_{FE2}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -0.5\text{ A}$	100			—
DC current gain	h_{FE3}^{**}	$V_{CE} = -2.0\text{ V}, I_C = -1.0\text{ A}$	50			—
Collector saturation voltage	$V_{CE(sat)}^{**}$	$I_C = -500\text{ mA}, I_B = -10\text{ mA}$		0.20	0.35	V
Low level input voltage	V_{IL}^{**}	$V_{CE} = -5.0\text{ V}, I_C = -100\text{ }\mu\text{A}$	-0.3		-1.5	V
Input resistance	R_1		—	—	—	Ω
E-to-B resistance	R_2		7	10	13	k Ω

** PW \leq 350 μ s, duty cycle \leq 2 %

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



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