NEC

SILICON POWER TRANSISTOR
2SB1431

PNP SILICON EPITAXIAL TRANSISTOR (DARLINGTON CONNECTION) FOR LOW-FREQUENCY POWER AMPLIFIERS AND LOW-SPEED SWITCHING

The 2SB1431 is a Darlington power transistor that can directly drive from the IC output. This transistor is ideal for motor drivers and solenoid drivers in such as OA and FA equipment.

In addition, a small resin-molded insulation type package contributes to high-density mounting and reduction of mounting cost.

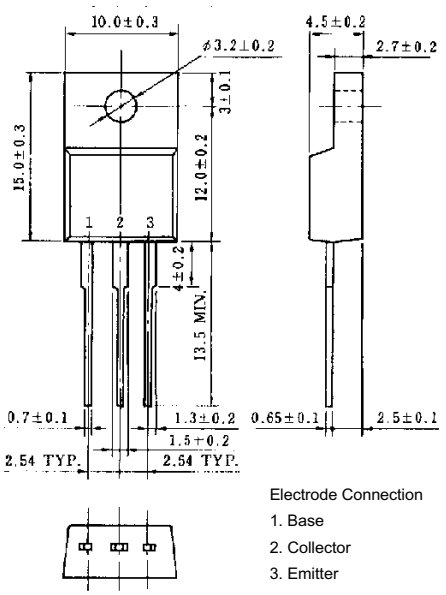
FEATURES

- High h_{FE} due to Darlington connection:
  $h_{FE} \geq 2{,}000$ ($V_{CE} = -2$ V, $I_C = -3$ A)
- Mold package that does not require an insulating board or insulation bushing

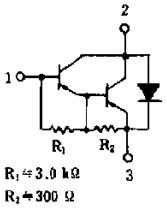
QUALITY GRADES

- Standard
  Please refer to “Quality Grades on NEC Semiconductor Devices” (Document No. C11531E) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

PACKAGE DRAWING (UNIT: mm)



EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	−100	V
Collector to emitter voltage	V_{CEO}	−100	V
Emitter to base voltage	V_{EBO}	−7.0	V
Collector current (DC)	$I_{C(DC)}$	−8.0	A
Collector current (pulse)	$I_{C(pulse)}$*	−12	A
Base current (DC)	$I_{B(DC)}$	−0.8	A
Total power dissipation	P_T (Tc = 25°C)	25	W
Total power dissipation	P_T (Ta = 25°C)	2.0	W
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	−55 to +150	°C

* PW ≤ 10 ms, duty cycle ≤ 50%

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ELECTRICAL CHARACTERISTICS (Ta = 25°C)

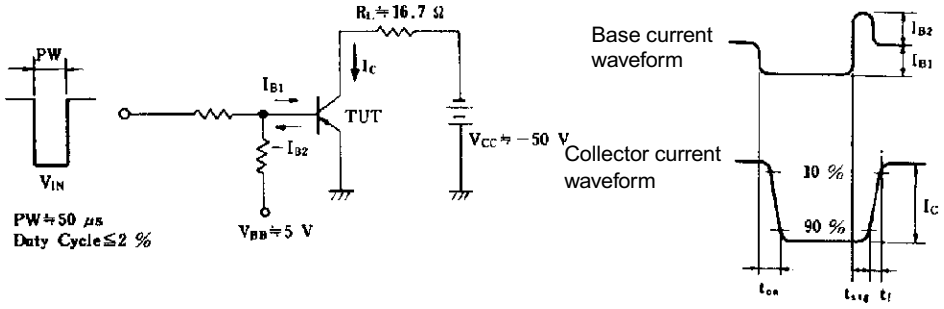
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I_{CBO}	V_{CB} = –100 V, I_E = 0			–1.0	μA
DC current gain	h_{FE1}*	V_{CE} = –2.0 V, I_C = –3.0 A	2,000		15,000	
DC current gain	h_{FE2}*	V_{CE} = –2.0 V, I_C = –5.0 A	500			
Collector saturation voltage	$V_{CE(sat)}$*	I_C = –3.0 A, I_B = –3.0 mA		–0.9	–1.5	V
Base saturation voltage	$V_{BE(sat)}$*	I_C = –3.0 A, I_B = –3.0 mA		–1.6	–2.0	V
Gain bandwidth product	f_T	V_{CE} = –5.0 V, I_C = –0.8 A		80		MHz
Collector capacitance	C_{ob}	V_{CB} = –10 V, I_E = 0, f = 1.0 MHz		80		pF
Turn-on time	t_{on}	I_C = –3.0 A, I_{B1} = $-I_{B2}$ = –3.0 mA, R_L = 16.7 Ω, V_{CC} ≅ –50 V Refer to the test circuit.		0.5		μs
Storage time	t_{stg}			1.0		μs
Fall time	t_f			1.0		μs

* Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

h_{FE} CLASSIFICATION

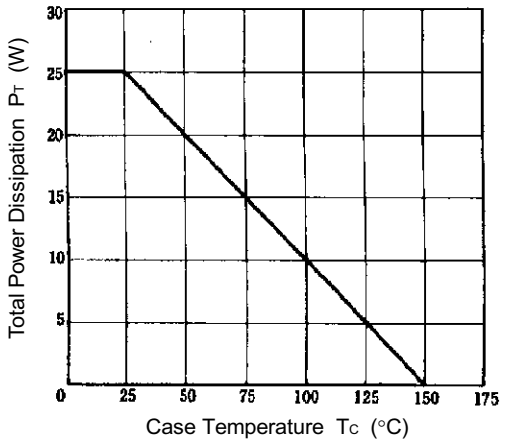
Marking	M	L	K
h_{FE1}	2,000 to 5,000	3,000 to 7,000	5,000 to 15,000

SWITCHING TIME (t_{on}, t_{stg}, t_f) TEST CIRCUIT

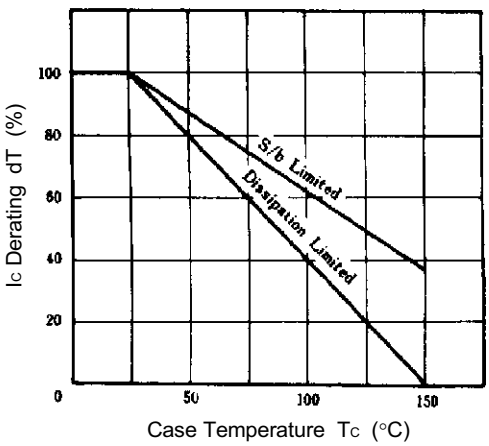


TYPICAL CHARACTERISTICS (Ta = 25°C)

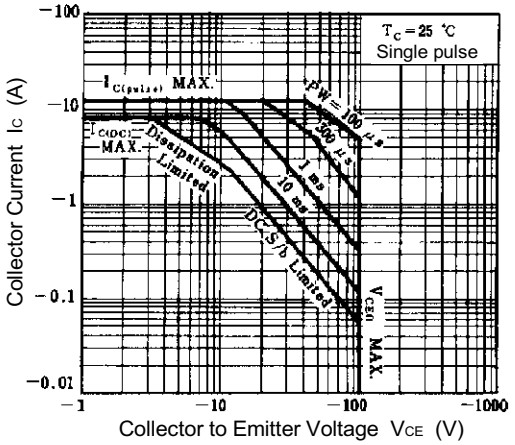
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



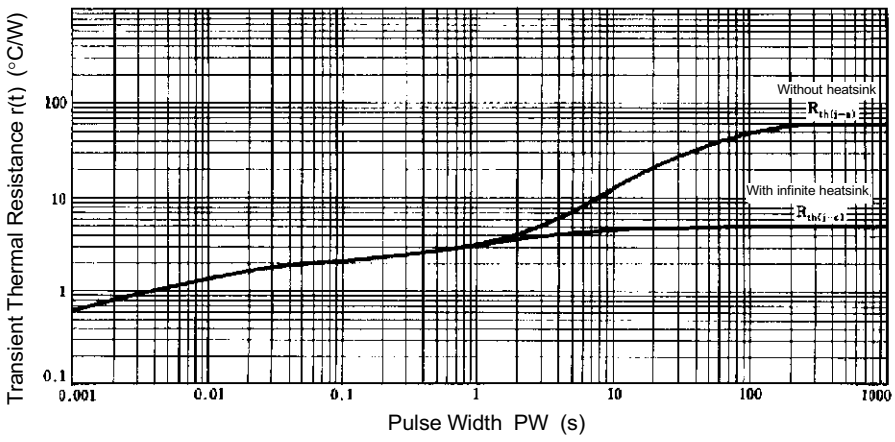
DERATING CURVE OF SAFE OPERATING AREA



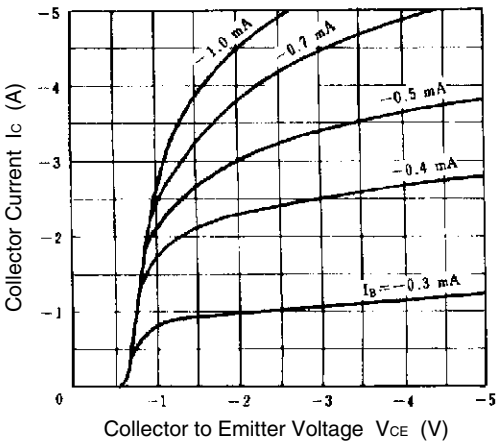
FORWARD BIAS SAFE OPERATING AREA



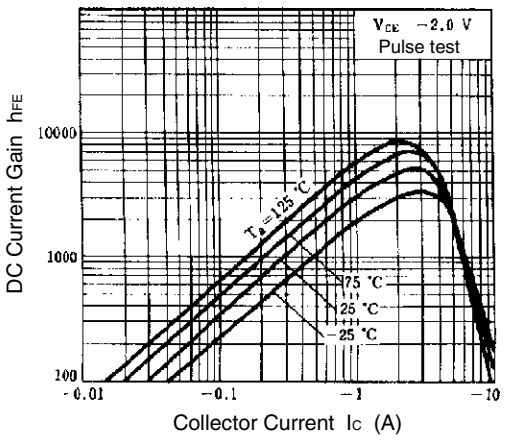
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



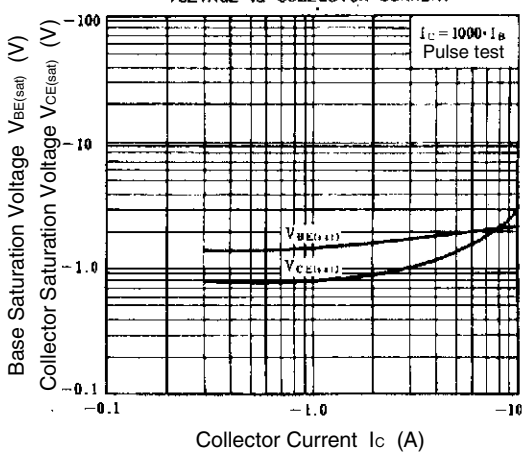
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



DC CURRENT GAIN vs. COLLECTOR CURRENT



COLLECTOR AND BASE SATURATION
VOLTAGE vs. COLLECTOR CURRENT



[MEMO]

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