NEC NPN SILICON DARLINGTON TRANSISTOR

2SD1693

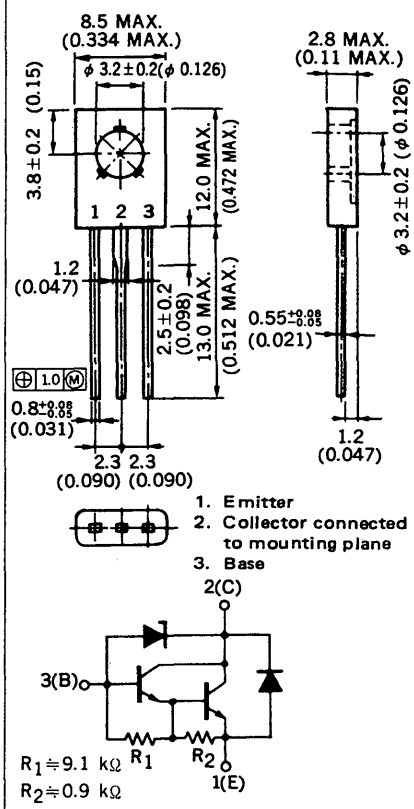
DESCRIPTION The 2SD1693 is a darlington transistor built-in a zener diode at B-C and a dumper diode at E-C.

It is suitable for use to operate from IC without predriver, such as hammer driver.

FEATURES

- High DC Current Gain.
- Built-in a Zener Diode at B-C and a Dumper Diode at E-C.
- Low Collector Saturation Voltage.
- High Power Dissipation: P_T = 1.3 W (at T_a = 25 °C)

PACKAGE DIMENSIONS
in millimeters (inches)



ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature . . . . . −55 to +150 °C

Junction Temperature . . . . . 150 °C Maximum

Maximum Power Dissipations

Total Power Dissipation (T_a = 25 °C) . . . . . 1.3 W

Total Power Dissipation (T_c = 25 °C) . . . . . 15 W

Maximum Voltages and Currents (T_a = 25 °C)

V_{CBO}	Collector to Base Voltage	60±10	V
V_{CEO}	Collector to Emitter Voltage	60±10	V
V_{EBO}	Emitter to Base Voltage	8.0	V
$I_{C(DC)}$	Collector Current	±3.0	A
$I_{C(pulse)}$*	Collector Current	±5.0	A

* PW ≦ 10 ms, Duty Cycle ≦ 50 %

ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
h_{FE1}**	DC Current Gain	2000		20000	–	V_{CE} = 2.0 V, I_C = 1.5 A
h_{FE2}**	DC Current Gain	1000			–	V_{CE} = 2.0 V, I_C = 3.0 A
V_{CBO}	Collector to Base Voltage	50	60	70	V	I_C = 1.0 mA, I_E = 0
V_{CEO}	Collector to Emitter Voltage	50	60	70	V	I_C = 10 mA, R_{BE} = ∞
t_{on}	Turn On Time		0.5		μs	(I_C = 1.5 A, R_L = 27 Ω, I_{B1} = −I_{B2} = 1.5 mA, V_{CC} ≒ 40 V)
t_{stg}	Storage Time		2.0		μs	
t_f	Fall Time		1.0		μs	
I_{CBO}	Collector Cutoff Current			10	μA	V_{CB} = 40 V, I_E = 0
I_{EBO}	Emitter Cutoff Current			1.0	mA	V_{EB} = 5.0 V, I_C = 0
$V_{CE(sat)}$**	Collector Saturation Voltage		0.9	1.2	V	I_C = 1.5 A, I_B = 1.5 mA
$V_{BE(sat)}$**	Base Saturation Voltage		1.5	2.0	V	I_C = 1.5 A, I_B = 1.5 mA

** Pulsed / PW ≦ 350 μs, Duty Cycle ≦ 2 %

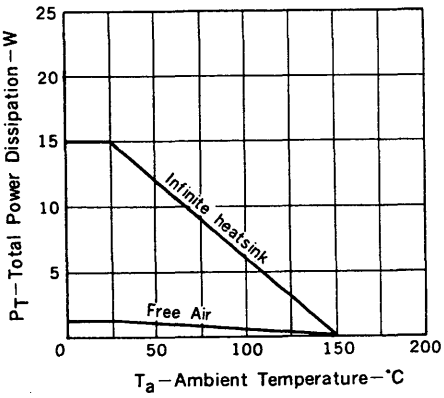
Classification of h_{FE1}

Rank	M	L	K
Range	2000 to 5000	4000 to 10000	8000 to 20000

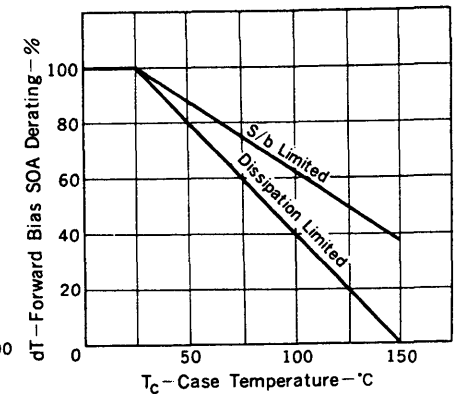
Test Conditions: V_{CE} = 2.0 V, I_C = 1.5 A

TYPICAL CHARACTERISTICS (T_a = 25 °C)

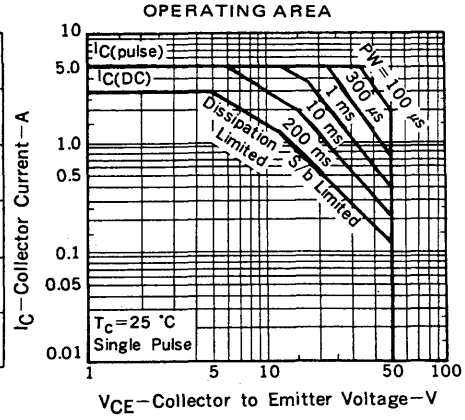
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



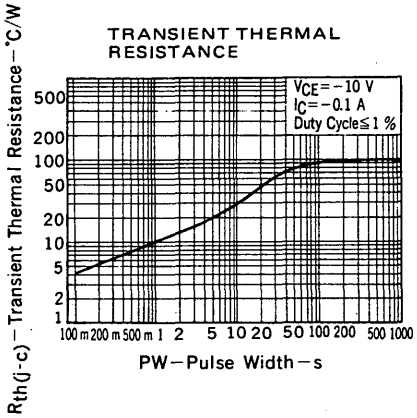
DERATING CURVE OF SAFE OPERATING AREA



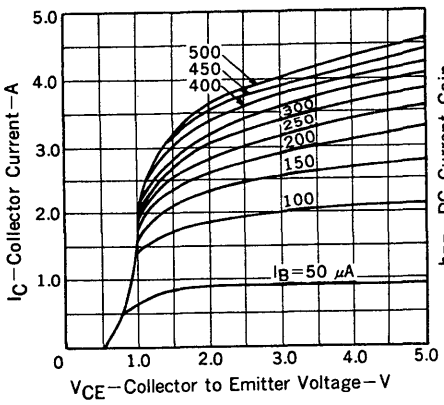
FORWARD BIAS SAFE OPERATING AREA



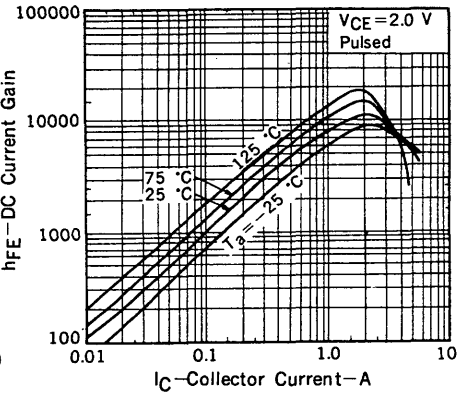
TRANSIENT THERMAL RESISTANCE



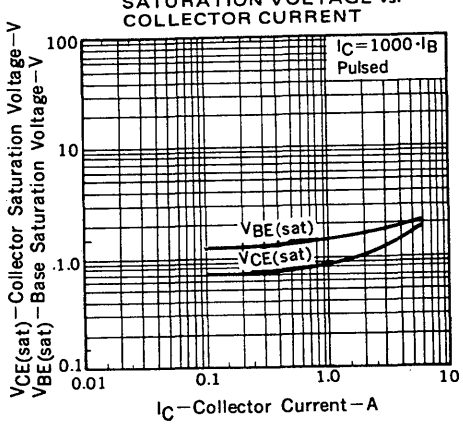
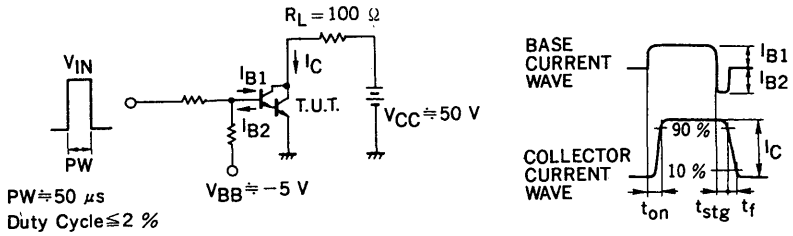
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



DC CURRENT GAIN vs. COLLECTOR CURRENT



BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



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