

# NPN SILICON DARLINGTON TRANSISTOR 2SD1939

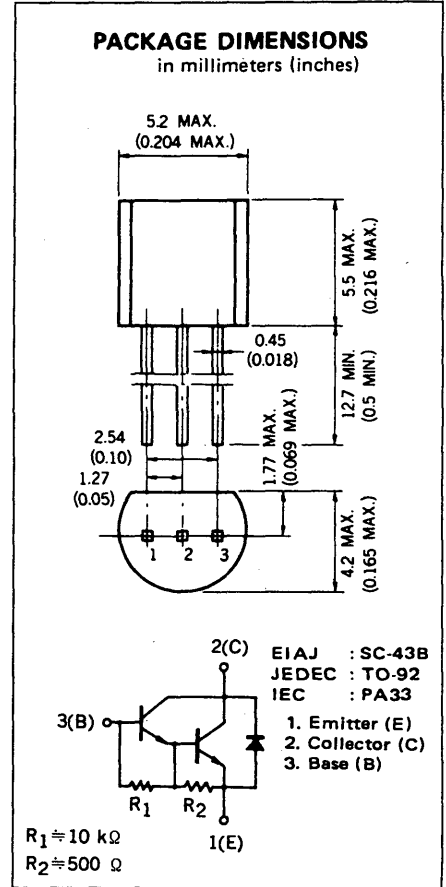
**DESCRIPTION** The 2SD1939 is a darlington transistor including a dumper diode at E-C.  
It is suitable for general driving use, such as hammer, solenoid, lamp or motor.

- FEATURES**
- High DC current gain.
  - High current capability, wide ASO and low collector saturation voltage.
  - Includes a dumper diode at E-C.

**ABSOLUTE MAXIMUM RATINGS**

Maximum Temperatures	
Storage Temperature	-55 to +150 °C
Junction Temperature	150 °C Maximum
Maximum Power Dissipation (T <sub>a</sub> = 25 °C)	
Total Power Dissipation	0.75 W
Maximum Voltages and Currents (T <sub>a</sub> = 25 °C)	
V <sub>CBO</sub> Collector to Base Voltage	150 V
V <sub>CEO</sub> Collector to Emitter Voltage	80 V
V <sub>EBO</sub> Emitter to Base Voltage	8.0 V
I <sub>C</sub> Collector Current (DC)	±1.5 A
I <sub>C</sub> Collector Current (Pulse)*	±3.0 A
I <sub>B</sub> Base Current (DC)	0.15 A

\*PW ≤ 300 μs, Duty Cycle ≤ 10 %



**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**

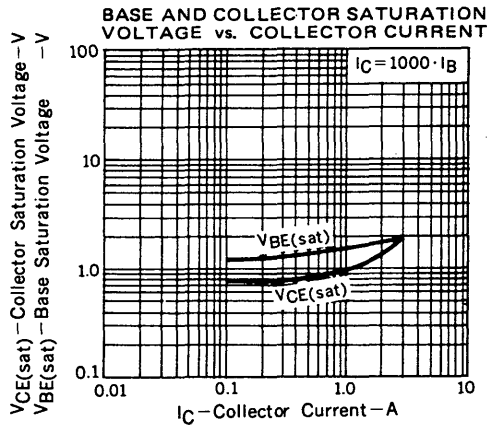
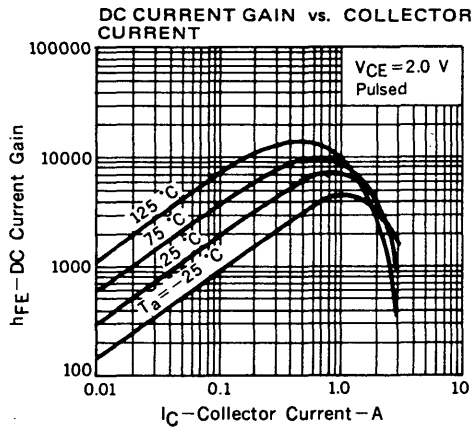
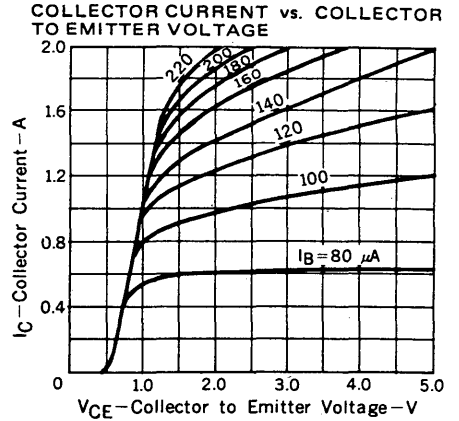
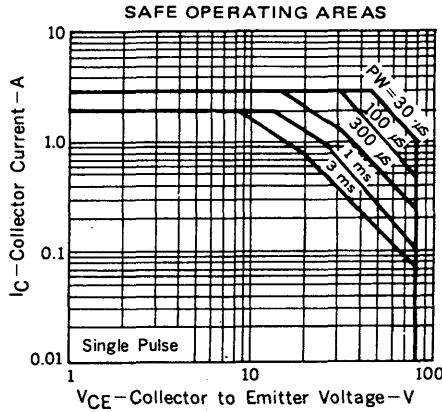
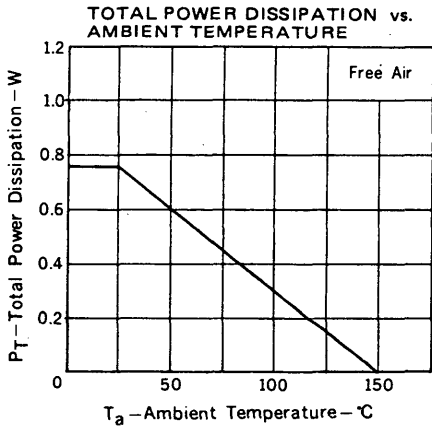
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
h <sub>FE1</sub>	DC Current Gain	1000			—	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 0.5 A
h <sub>FE2</sub>	DC Current Gain	2000		30000	—	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 1.0 A
t <sub>on</sub>	Turn-On Time		0.5		μs	(I <sub>C</sub> = 1.0 A, R <sub>L</sub> = 50 Ω I <sub>B1</sub> = -I <sub>B2</sub> = 1.0 mA, V <sub>CC</sub> = 50 V) See Test Circuit
t <sub>stg</sub>	Storage Time		1.0		μs	
t <sub>f</sub>	Fall Time		1.0		μs	
I <sub>CBO</sub>	Collector Cutoff Current			10	μA	V <sub>CB</sub> = 80 V, I <sub>E</sub> = 0
I <sub>CER</sub>	Collector Cutoff Current			1.0	mA	V <sub>CE</sub> = 80 V, R <sub>BE</sub> = 51 Ω, T <sub>a</sub> = 125 °C
I <sub>CEX1</sub>	Collector Cutoff Current			10	μA	V <sub>CE</sub> = 80 V, V <sub>BE(off)</sub> = -1.5 V
I <sub>CEX2</sub>	Collector Cutoff Current			1.0	mA	V <sub>CE</sub> = 80 V, V <sub>BE(off)</sub> = -15 V, T <sub>a</sub> = 125 °C
I <sub>EBO</sub>	Emitter Cutoff Current			1.0	mA	V <sub>EB</sub> = 5.0 V, I <sub>C</sub> = 0
V <sub>CE(sat)</sub>	Collector Saturation Voltage			1.5	V	I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 1.0 mA
V <sub>BE(sat)</sub>	Base Saturation Voltage			2.0	V	
f <sub>T</sub>	Gain Bandwidth Product		60		MHz	V <sub>CE</sub> = 10 V, I <sub>E</sub> = -1.0 A

**Classification of h<sub>FE2</sub>**

Rank	M	L	K
Range	2000 to 5000	4000 to 10000	8000 to 30000

Test Conditions: V<sub>CE</sub> = 2.0 V, I<sub>C</sub> = 1.0 A

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



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

