

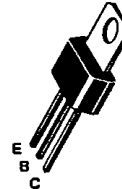
**NOT RECOMMENDED
 FOR NEW DESIGNS**

**NPN SILICON DARLINGTON
 AMPLIFIER TRANSISTOR**

... designed for amplifier and driver applications.

- High DC Current Gain –
 $h_{FE} = 25,000$ (Min) @ $I_C = 200$ mA
 $15,000$ (Min) @ $I_C = 500$ mA
- Collector-Emitter Breakdown Voltage –
 $V_{(BR)CES} = 40$ Vdc (Min) @ $I_C = 100$ μ A
- Low Collector-Emitter Saturation Voltage –
 $V_{CE(sat)} = 1.5$ Vdc @ $I_C = 1.0$ A
- Monolithic Construction for High Reliability
- Complement to PNP MPS-U95

**NPN SILICON
 DARLINGTON
 TRANSISTOR**



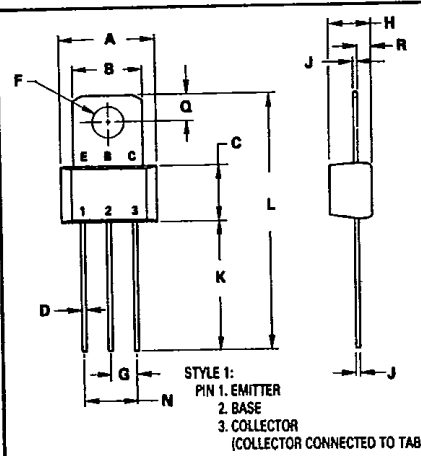
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO(1)}$	40	Vdc
Collector-Emitter Voltage	V_{CES}	40	Vdc
Collector-Base Voltage	V_{CB}	50	Vdc
Emitter-Base Voltage	V_{EB}	12	Vdc
Collector Current	I_C	2.0	A
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.0 8.0	Watt mW/ $^\circ\text{C}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	10 80	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	12.5	$^\circ\text{C}/\text{W}$

(1) Due to the monolithic construction of this device, breakdown voltages of both transistor elements are identical. $V_{(BR)CES}$ is tested in lieu of $V_{(BR)CEO}$ in order to avoid errors caused by noise pickup. The voltage measured during the $V_{(BR)CES}$ test is the $V_{(BR)CEO}$ of the output transistor.



NOTE:
 1. LEADS WITHIN 0.15 mm(0.006) TOTAL OF TRUE POSITION AT CASE, AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.14	9.53	0.360	0.375
B	6.60	7.24	0.260	0.286
C	5.41	5.66	0.213	0.223
D	0.38	0.53	0.015	0.021
F	3.18	3.33	0.125	0.131
G	2.64 BSC		0.100 BSC	
H	3.94	4.19	0.155	0.165
J	0.36	0.41	0.014	0.016
K	11.63	12.70	0.458	0.500
L	24.58	25.53	0.969	1.005
N	5.08 BSC		0.200 BSC	
Q	2.39	2.59	0.094	0.106
R	1.14	1.40	0.045	0.055

CASE 152-02



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 100 \mu\text{A}$, $V_{BE} = 0$)	$V_{(BR)CES}$	40	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 100 \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{A}$, $I_C = 0$)	$V_{(BR)EBO}$	12	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30 \text{Vdc}$, $I_E = 0$)	I_{CBO}	—	—	100	nA
Emitter Cutoff Current ($V_{EB} = 10 \text{Vdc}$, $I_C = 0$)	I_{EBO}	—	—	100	nA

ON CHARACTERISTICS(1)

DC Current Gain ($I_C = 200 \text{mA}$, $V_{CE} = 5.0 \text{Vdc}$) ($I_C = 500 \text{mA}$, $V_{CE} = 5.0 \text{Vdc}$) ($I_C = 1.0 \text{A}$, $V_{CE} = 5.0 \text{Vdc}$)	h_{FE}	25,000 15,000 4,000	65,000 35,000 12,000	150,000 — —	—
Collector-Emitter Saturation Voltage ($I_C = 1.0 \text{A}$, $I_B = 2.0 \text{mA}$)	$V_{CE(sat)}$	—	1.2	1.5	Vdc
Base-Emitter Saturation Voltage ($I_C = 1.0 \text{A}$, $I_B = 2.0 \text{mA}$)	$V_{BE(sat)}$	—	1.85	2.0	Vdc
Base-Emitter On Voltage ($I_C = 1.0 \text{A}$, $V_{CE} = 5.0 \text{Vdc}$)	$V_{BE(on)}$	—	1.7	2.0	Vdc

DYNAMIC CHARACTERISTICS

Small-Signal Current Gain (1) ($I_C = 200 \text{mA}$, $V_{CE} = 5.0 \text{Vdc}$, $f = 100 \text{MHz}$)	$ h_{fe} $	1.0	3.2	—	—
Collector Base Capacitance ($V_{CB} = 10 \text{Vdc}$, $I_E = 0$, $f = 1.0 \text{MHz}$)	C_{cb}	—	2.5	6.0	pF

(1) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Unijunction transistors can be used in any number of low power applications, such as relay drivers, motor control and as general purpose amplifiers. As an audio amplifier these devices, when used as a complementary pair, can drive 3.5 watts into a 3.2 ohm speaker using a 14 volt supply with less than one per cent distortion. Because of the high gain the base drive requirement is as low as 1 mA in this application. They are also useful as power drivers for high current application such as voltage regulators.

FIGURE 1 - DC CURRENT GAIN

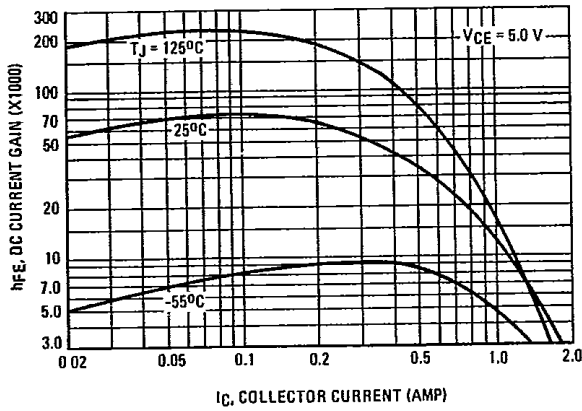


FIGURE 2 - SMALL-SIGNAL CURRENT GAIN

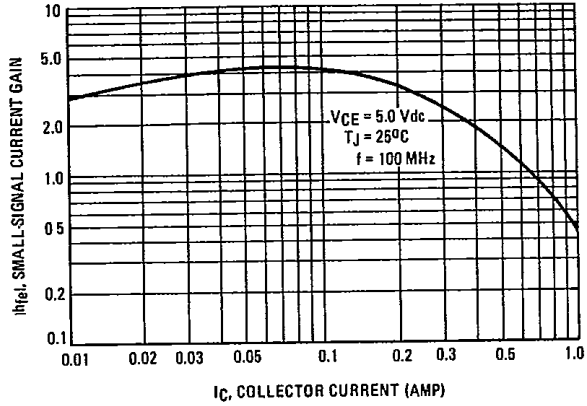


FIGURE 3 - "ON" VOLTAGES

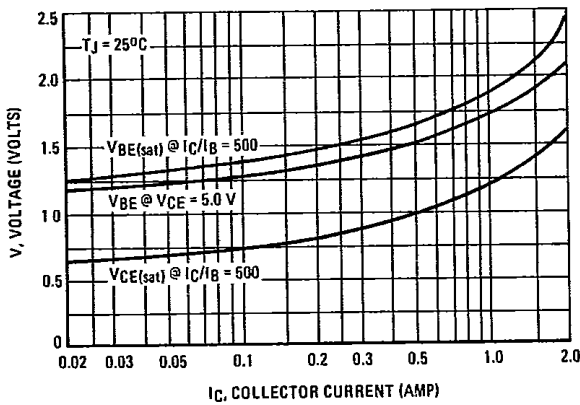


FIGURE 4 - TEMPERATURE COEFFICIENT

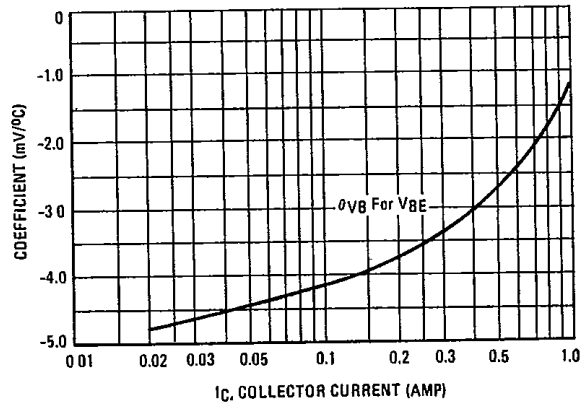
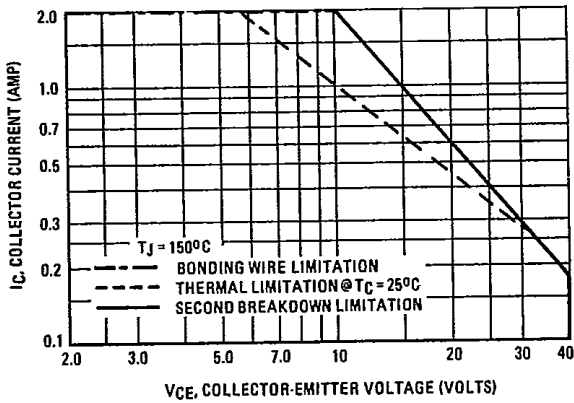


FIGURE 5 - DC SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.