

Plastic NPN Silicon High-Voltage Power Transistor

... designed for use in line-operated equipment such as audio output amplifiers; low-current, high-voltage converters; and AC line relays.

- Excellent DC Current Gain – $h_{FE} = 30-250 @ I_C = 100 \text{ mAdc}$
- Current-Gain – Bandwidth Product – $f_T = 10 \text{ MHz (Min) @ } I_C = 50 \text{ mAdc}$

MAXIMUM RATINGS (1)

Rating	Symbol	2N5655	2N5657	Unit
Collector-Emitter Voltage	V_{CEO}	250	350	Vdc
Collector-Base Voltage	V_{CB}	275	375	Vdc
Emitter-Base Voltage	V_{EB}	6.0		Vdc
Collector Current – Continuous Peak	I_C	0.5 1.0		Adc
Base Current	I_B	0.25		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	20 0.16		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150		$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	6.25	$^\circ\text{C/W}$

(1) Indicates JEDEC Registered Data.

**2N5655
2N5657**

**0.5 AMPERE
POWER TRANSISTORS
NPN SILICON
250-350 VOLTS
20 WATTS**

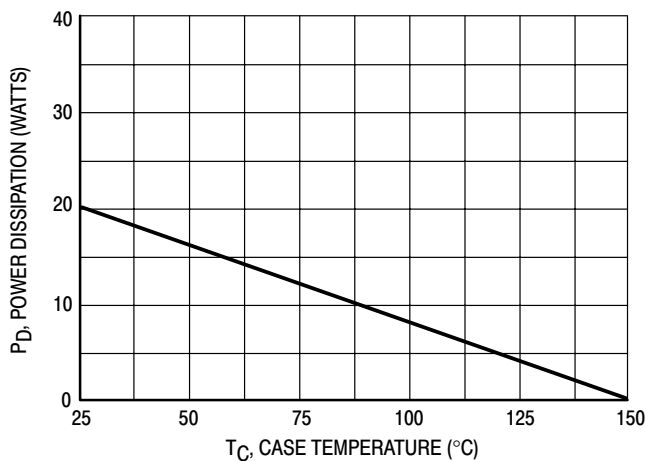
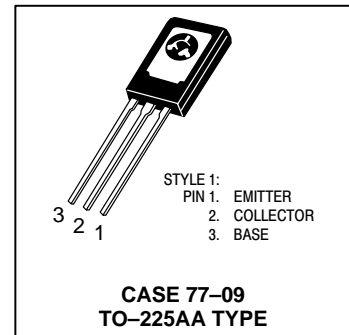


Figure 1. Power Derating

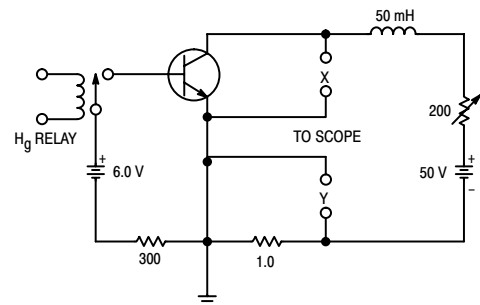


Figure 2. Sustaining Voltage Test Circuit

Safe Area Limits are indicated by Figures 3 and 4. Both limits are applicable and must be observed.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$ (inductive), $L = 50\text{ mH}$)	2N5655 2N5657	$V_{CEO(sus)}$	250 350	– –	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 1.0\text{ mAdc}$, $I_B = 0$)	2N5655 2N5657	$V_{(BR)CEO}$	250 350	– –	Vdc
Collector Cutoff Current ($V_{CE} = 150\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 250\text{ Vdc}$, $I_B = 0$)	2N5655 2N5657	I_{CEO}	– –	0.1 0.1	mAdc
Collector Cutoff Current ($V_{CE} = 250\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 350\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 150\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 100^\circ\text{C}$) ($V_{CE} = 250\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 100^\circ\text{C}$)	2N5655 2N5657 2N5655 2N5657	I_{CEX}	– – – –	0.1 0.1 1.0 1.0	mAdc
Collector Cutoff Current ($V_{CB} = 275\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 375\text{ Vdc}$, $I_E = 0$)	2N5655 2N5657	I_{CBO}	– –	10 10	μAdc
Emitter Cutoff Current ($V_{EB} = 6.0\text{ Vdc}$, $I_C = 0$)		I_{EBO}	–	10	μAdc

ON CHARACTERISTICS

DC Current Gain (1) ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 250\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)		h_{FE}	25 30 15 5.0	– 250 – –	–
Collector–Emitter Saturation Voltage (1) ($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$) ($I_C = 250\text{ mAdc}$, $I_B = 25\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 100\text{ mAdc}$)		$V_{CE(sat)}$	– – –	1.0 2.5 10	Vdc
Base–Emitter Voltage (1) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)		V_{BE}	–	1.0	Vdc

DYNAMIC CHARACTERISTICS

Current–Gain – Bandwidth Product (2) ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 10\text{ MHz}$)		f_T	10	–	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 100\text{ kHz}$)		C_{ob}	–	25	pF
Small–Signal Current Gain ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{fe}	20	–	–

*Indicates JEDEC Registered Data for 2N5655 Series.

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

(2) f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

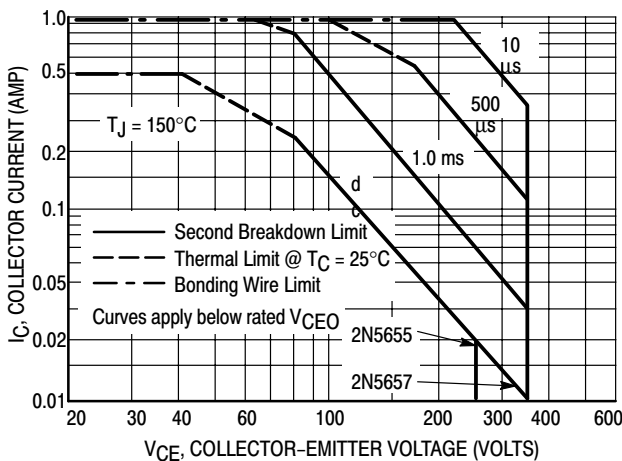


Figure 3. Active–Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average 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 3 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^\circ\text{C}$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

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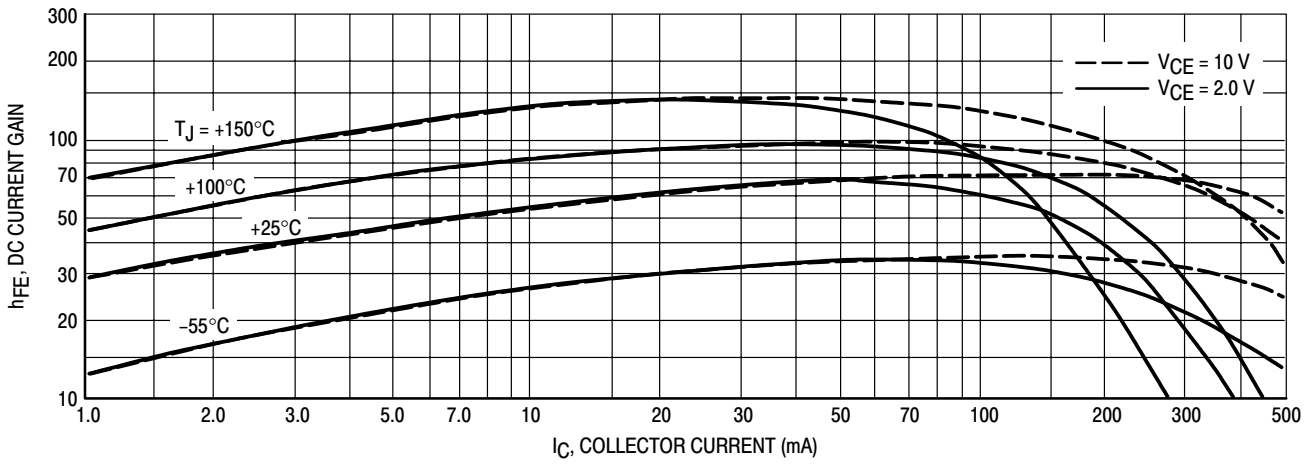


Figure 4. Current Gain

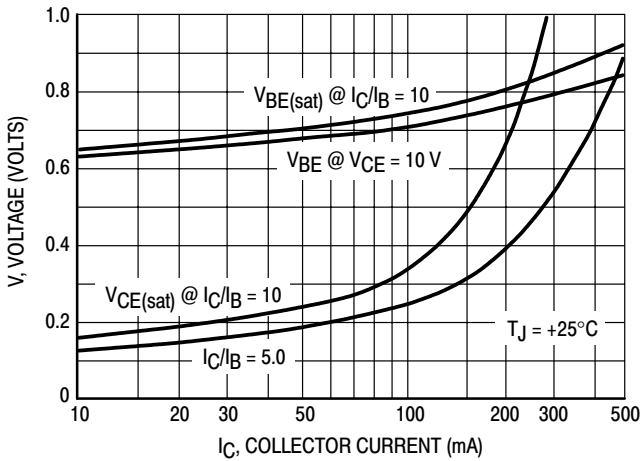


Figure 5. "On" Voltages

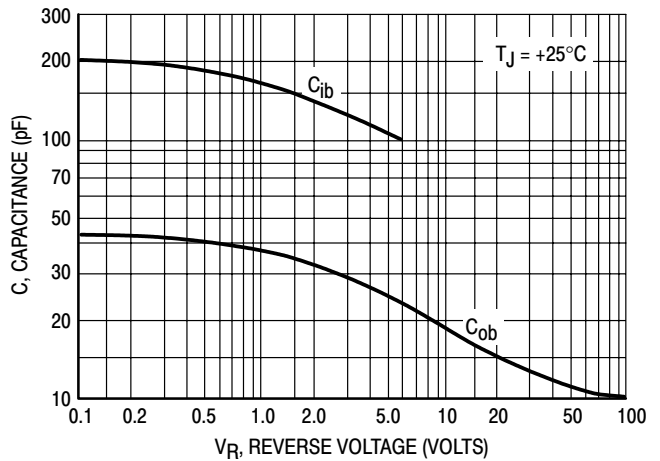


Figure 6. Capacitance

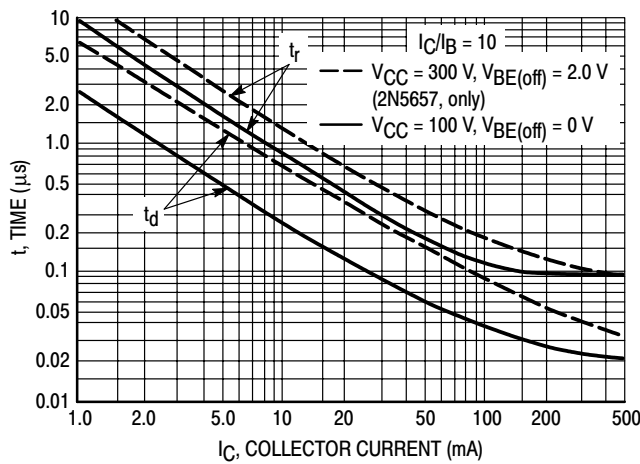


Figure 7. Turn-On Time

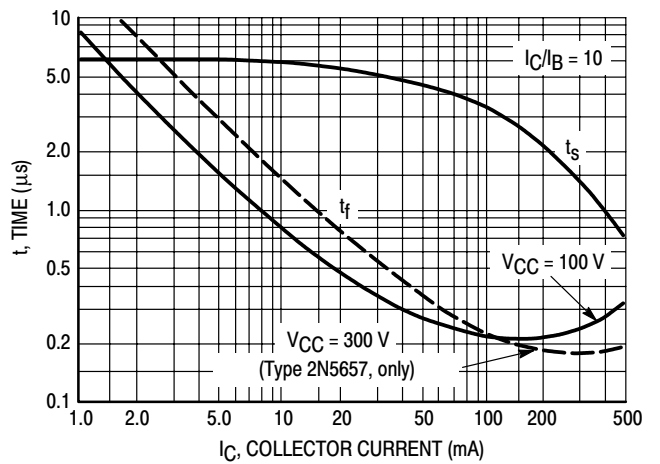
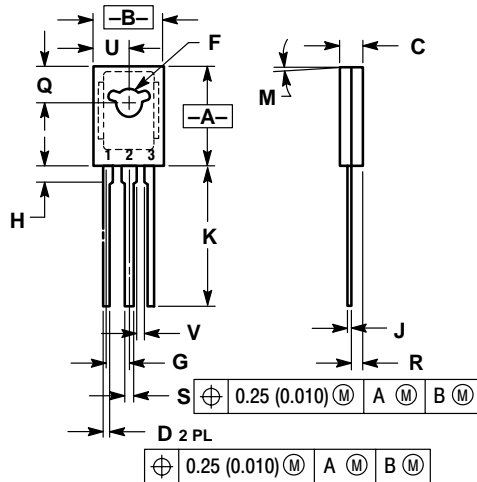


Figure 8. Turn-Off Time

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PACKAGE DIMENSIONS


TO-225AA CASE 77-09 ISSUE W



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.425	0.435	10.80	11.04
B	0.295	0.305	7.50	7.74
C	0.095	0.105	2.42	2.66
D	0.020	0.026	0.51	0.66
F	0.115	0.130	2.93	3.30
G	0.094 BSC		2.39 BSC	
H	0.050	0.095	1.27	2.41
J	0.015	0.025	0.39	0.63
K	0.575	0.655	14.61	16.63
M	5° TYP		5° TYP	
Q	0.148	0.158	3.76	4.01
R	0.045	0.065	1.15	1.65
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	---	1.02	---

- STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. BASE

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