

2N5655, 2N5657

Plastic NPN Silicon High-Voltage Power Transistors

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

Features

- Excellent DC Current Gain
- High Current-Gain – Bandwidth Product
- These Devices are Pb-Free and are RoHS Compliant*

MAXIMUM RATINGS (Note 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	I_C	0.5		Adc
Collector Current – Peak	I_{CM}	1.0		Adc
Base Current	I_B	1.0		Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	20	0.16	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150		$^\circ\text{C/W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Indicates JEDEC registered data.

THERMAL CHARACTERISTICS

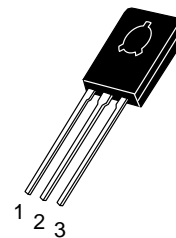
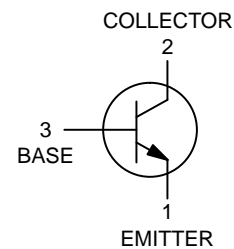
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	6.25	$^\circ\text{C/W}$



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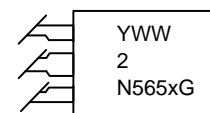
<http://onsemi.com>

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



**TO-225
CASE 77
STYLE 1**

MARKING DIAGRAM



Y = Year
 WW = Work Week
 2N565x = Device Code
 x = 5 or 7
 G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
2N5655G	TO-225 (Pb-Free)	500 Units / Bulk
2N5657G	TO-225 (Pb-Free)	500 Units / Bulk

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (Note 2)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$ (inductive), $L = 50\text{ mH}$) 2N5655 2N5657	$V_{CE(sus)}$	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 ($V_{CE} = 150\text{ Vdc}$, $I_B = 0$) 2N5655 ($V_{CE} = 250\text{ Vdc}$, $I_B = 0$) 2N5657	I_{CEO}	– –	0.1 0.1	mAdc
Collector Cutoff Current ($V_{CE} = 250\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) 2N5655 ($V_{CE} = 350\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) 2N5657 ($V_{CE} = 150\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 100^\circ\text{C}$) 2N5655 ($V_{CE} = 250\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 100^\circ\text{C}$) 2N5657	I_{CEX}	– – – –	0.1 0.1 1.0 1.0	mAdc
Collector Cutoff Current ($V_{CB} = 275\text{ Vdc}$, $I_E = 0$) 2N5655 ($V_{CB} = 375\text{ Vdc}$, $I_E = 0$) 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 (Note 3) ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 250\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	25 30 15 5.0	– 250 – –	–
Collector–Emitter Saturation Voltage (Note 3) ($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$) ($I_C = 250\text{ mAdc}$, $I_B = 25\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 100\text{ mAdc}$)	$V_{CE(sat)}$	– – –	1.0 2.5 10	Vdc
Base–Emitter Voltage ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) (Note 3)	V_{BE}	–	1.0	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 10\text{ MHz}$) (Note 4)	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	–	–

2. Indicates JEDEC registered data for 2N5655 Series.

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

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

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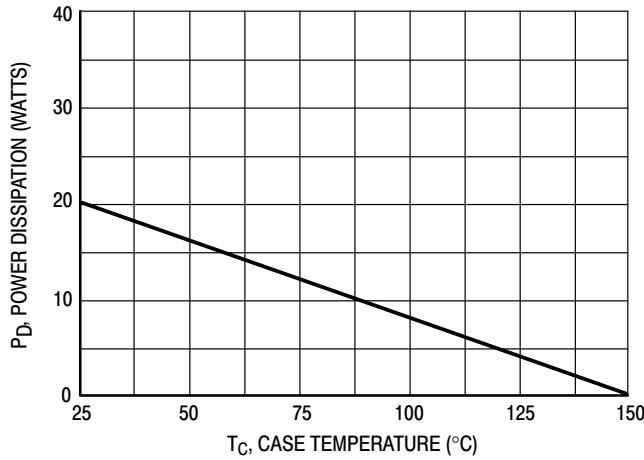


Figure 1. Power Derating

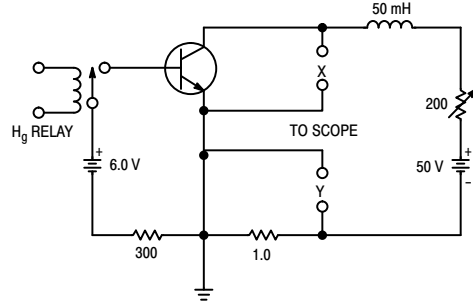


Figure 2. Sustaining Voltage Test Circuit

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

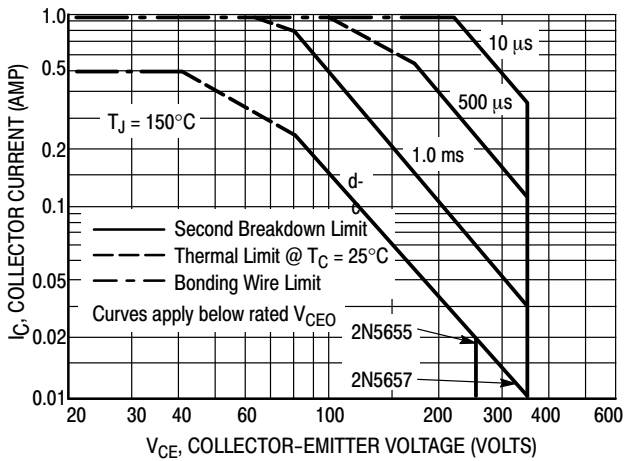


Figure 3. Active-Region Safe Operating Area

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.

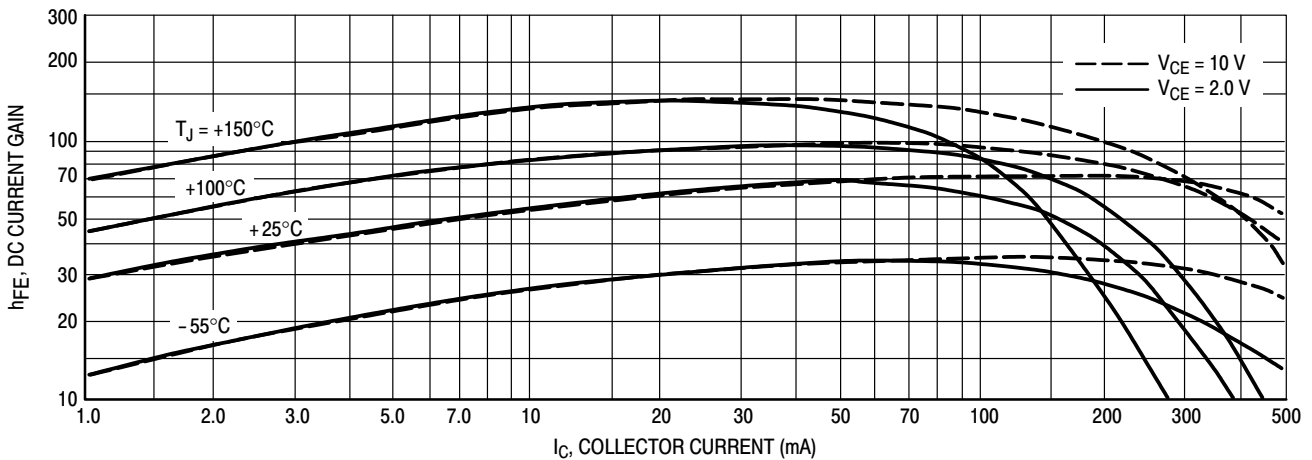


Figure 4. Current Gain

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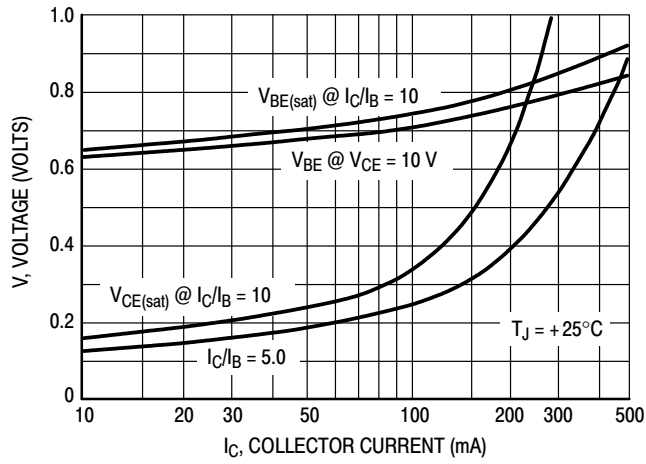


Figure 5. "On" Voltages

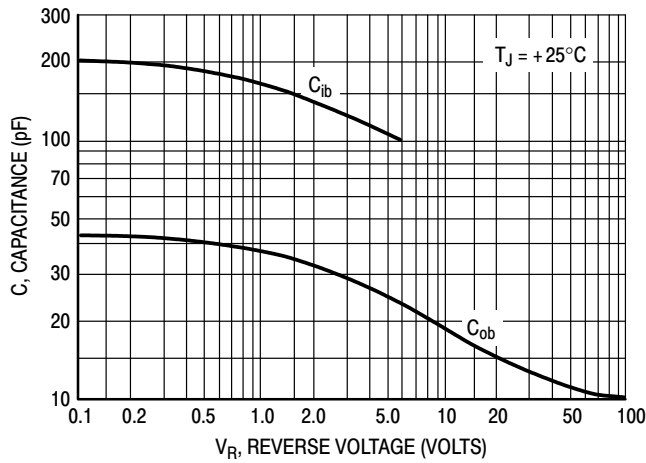


Figure 6. Capacitance

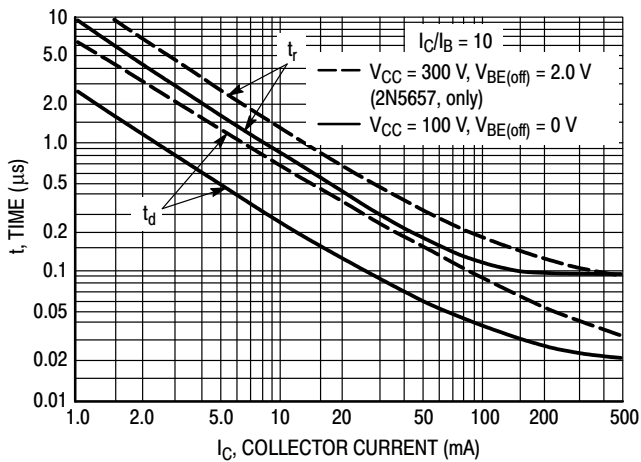


Figure 7. Turn-On Time

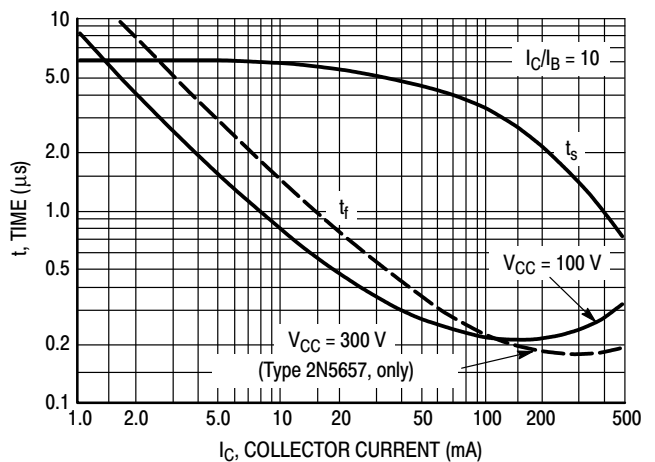
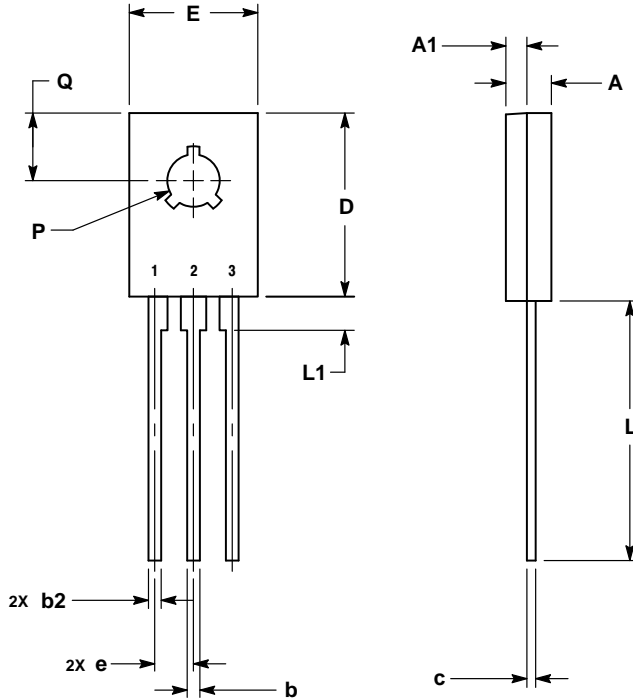


Figure 8. Turn-Off Time

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PACKAGE DIMENSIONS

TO-225
CASE 77-09
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

DIM	MILLIMETERS	
	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

STYLE 1:

- PIN 1. EMITTER
- COLLECTOR
- BASE

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