

# Complementary Silicon Power Transistors

... designed for general-purpose switching and amplifier applications.

- DC Current Gain —  $h_{FE} = 20-70 @ I_C = 4 \text{ Adc}$
- Collector-Emitter Saturation Voltage —  
 $V_{CE(sat)} = 1.1 \text{ Vdc (Max) @ } I_C = 4 \text{ Adc}$
- Excellent Safe Operating Area

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	Vdc
Collector-Emitter Voltage	$V_{CER}$	70	Vdc
Collector-Base Voltage	$V_{CB}$	100	Vdc
Emitter-Base Voltage	$V_{EB}$	7	Vdc
Collector Current — Continuous	$I_C$	15	A <sub>dc</sub>
Base Current	$I_B$	7	A <sub>dc</sub>
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	115 0.657	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$

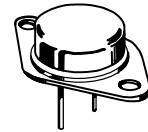
## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.52	$^\circ\text{C/W}$

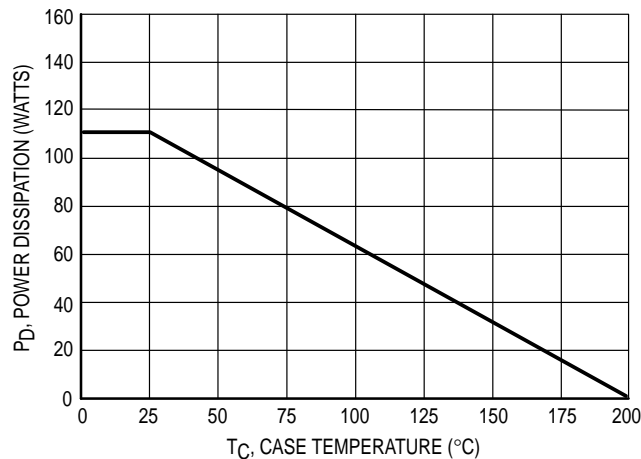
**NPN**  
**2N3055 \***  
**PNP**  
**MJ2955 \***

\*Motorola Preferred Device

**15 AMPERE**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**60 VOLTS**  
**115 WATTS**



**CASE 1-07**  
**TO-204AA**  
**(TO-3)**



**Figure 1. Power Derating**

Preferred devices are Motorola recommended choices for future use and best overall value.

## 2N3055 MJ2955

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

Characteristic	Symbol	Min	Max	Unit
<b>*OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (1) ( $I_C = 200\text{ mA}$ , $I_B = 0$ )	$V_{CEO(sus)}$	60	—	Vdc
Collector–Emitter Sustaining Voltage (1) ( $I_C = 200\text{ mA}$ , $R_{BE} = 100\text{ Ohms}$ )	$V_{CER(sus)}$	70	—	Vdc
Collector Cutoff Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	—	0.7	mA
Collector Cutoff Current ( $V_{CE} = 100\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 100\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	—	1.0 5.0	mA
Emitter Cutoff Current ( $V_{BE} = 7.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	5.0	mA

### \*ON CHARACTERISTICS (1)

DC Current Gain ( $I_C = 4.0\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 10\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$h_{FE}$	20 5.0	70 —	—
Collector–Emitter Saturation Voltage ( $I_C = 4.0\text{ A}$ , $I_B = 400\text{ mA}$ ) ( $I_C = 10\text{ A}$ , $I_B = 3.3\text{ A}$ )	$V_{CE(sat)}$	—	1.1 3.0	Vdc
Base–Emitter On Voltage ( $I_C = 4.0\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$V_{BE(on)}$	—	1.5	Vdc

### SECOND BREAKDOWN

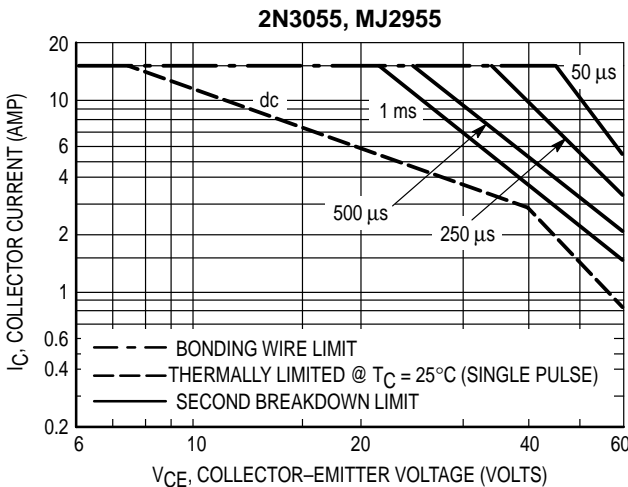
Second Breakdown Collector Current with Base Forward Biased ( $V_{CE} = 40\text{ Vdc}$ , $t = 1.0\text{ s}$ , Nonrepetitive)	$I_{S/b}$	2.87	—	A
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### DYNAMIC CHARACTERISTICS

Current Gain — Bandwidth Product ( $I_C = 0.5\text{ A}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$f_T$	2.5	—	MHz
*Small–Signal Current Gain ( $I_C = 1.0\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	15	120	—
*Small–Signal Current Gain Cutoff Frequency ( $V_{CE} = 4.0\text{ Vdc}$ , $I_C = 1.0\text{ A}$ , $f = 1.0\text{ kHz}$ )	$f_{hfe}$	10	—	kHz

\* Indicates Within JEDEC Registration. (2N3055)

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



**Figure 2. 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 2 is based on  $T_C = 25^\circ\text{C}$ ;  $T_{J(pk)}$  is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated for temperature according to Figure 1.

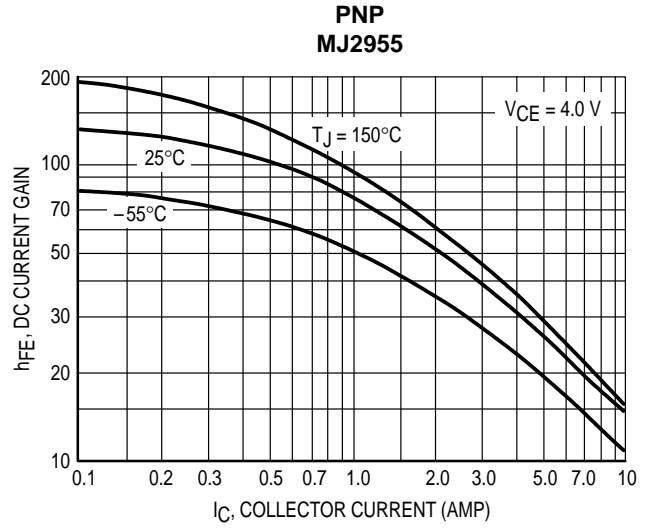
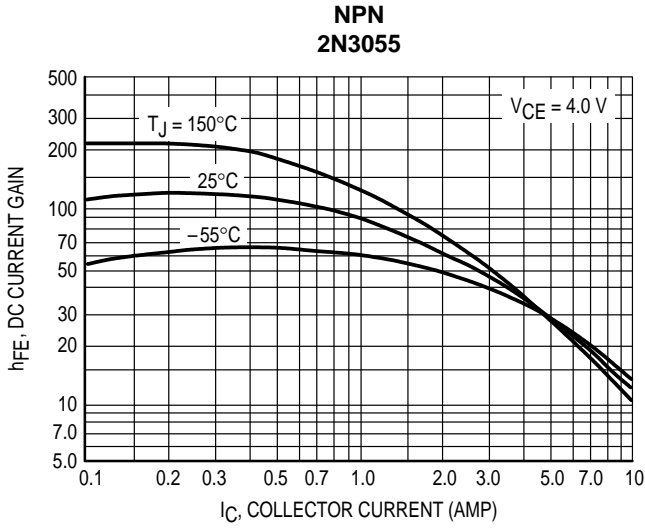


Figure 3. DC Current Gain

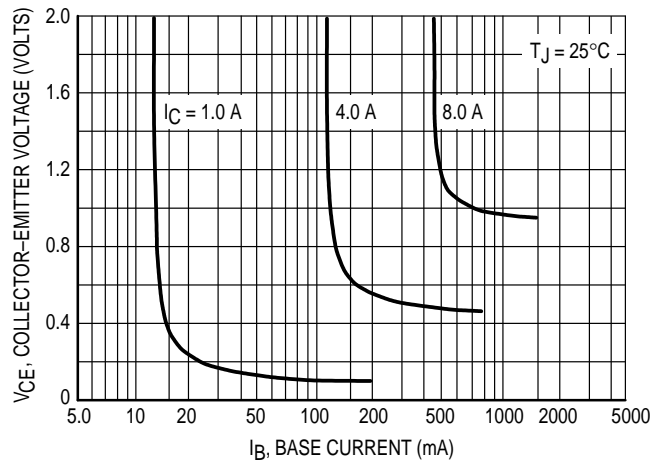
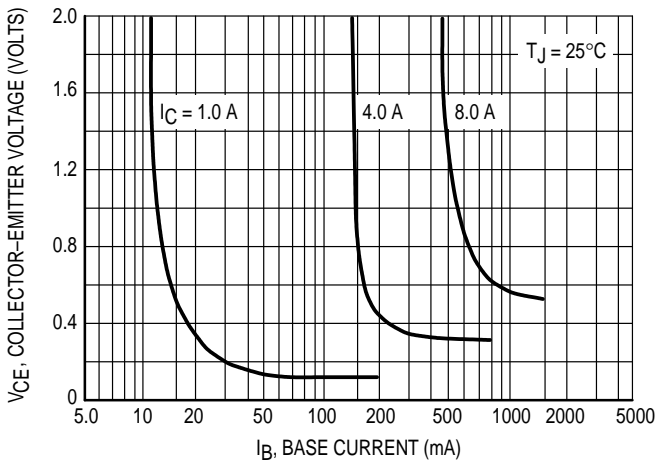


Figure 4. Collector Saturation Region

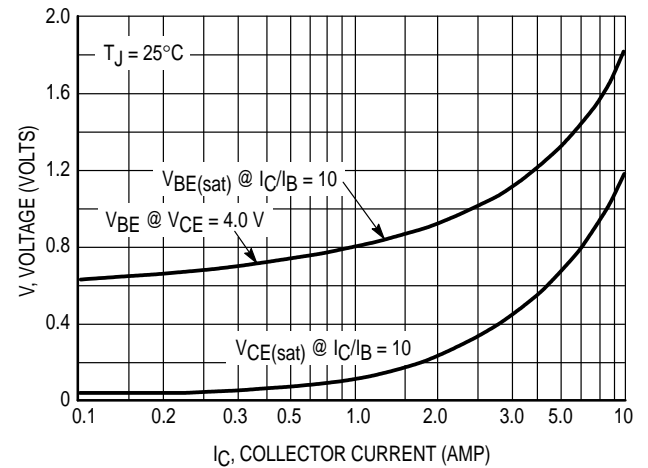
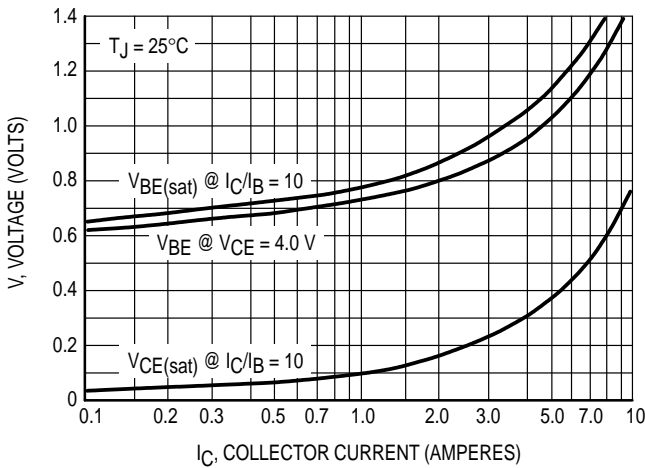
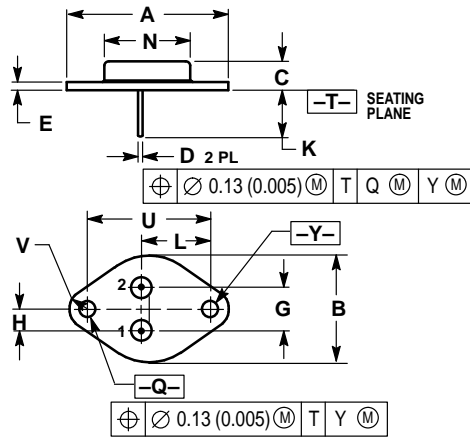


Figure 5. "On" Voltages

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	—	1.050	—	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	—	0.830	—	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:  
 PIN 1: BASE  
 2: EMITTER  
 CASE: COLLECTOR

CASE 1-07  
 TO-204AA (TO-3)  
 ISSUE Z

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