

# Medium-Power Complementary Silicon Transistors

... for use as output devices in complementary general purpose amplifier applications.

- High DC Current Gain —  $h_{FE} = 4000$  (Typ) @  $I_C = 5.0$  Adc
- Monolithic Construction with Built-in Base-Emitter Shunt Resistors

## MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	$V_{CEO}$	80	Vdc
Collector-Base Voltage	$V_{CB}$	80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current	$I_C$	10	Adc
Base Current	$I_B$	0.2	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 0.857	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +200	$^\circ\text{C}$

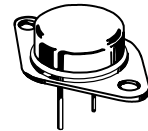
## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	1.17	$^\circ\text{C/W}$

**PNP**  
**MJ2501**  
**NPN**  
**MJ3001**

Motorola Preferred Devices

**10 AMPERE**  
**DARLINGTON**  
**POWER TRANSISTOR**  
**COMPLEMENTARY**  
**SILICON**  
**80 VOLTS**  
**150 WATTS**



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

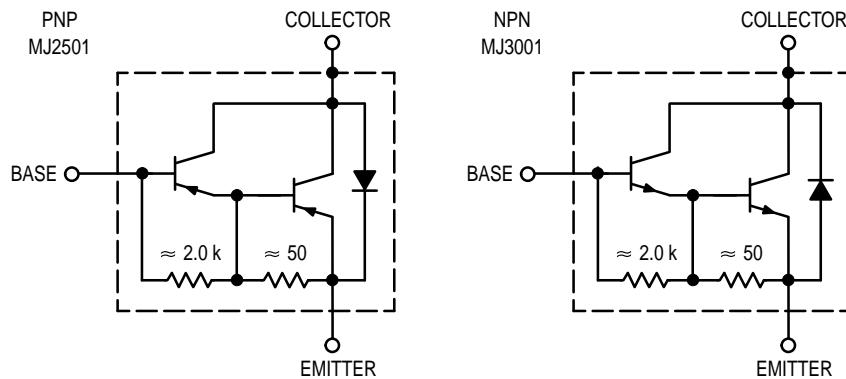


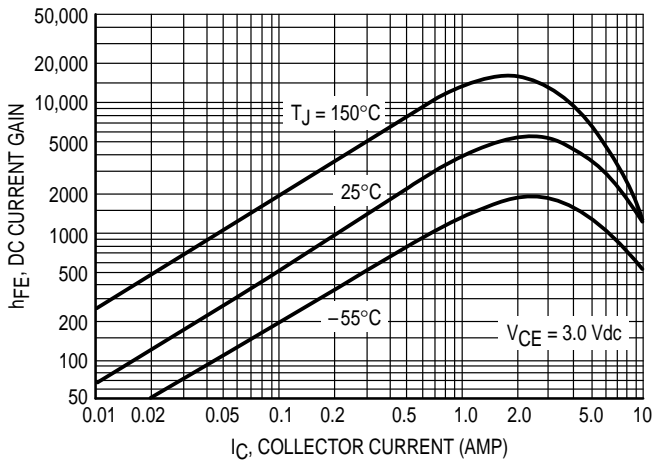
Figure 1. Darlington Circuit Schematic

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

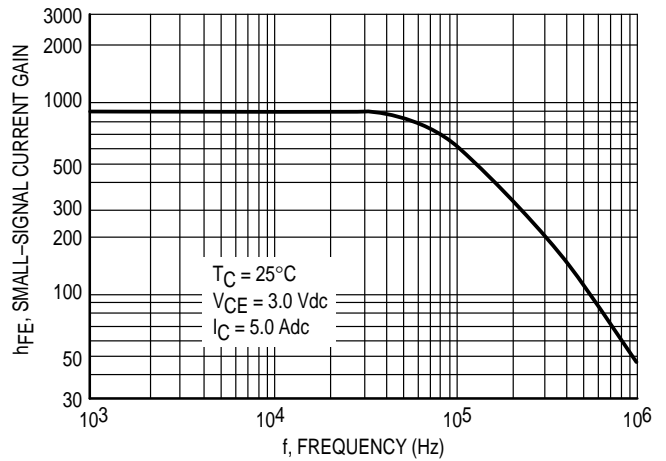
**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector Emitter Breakdown Voltage <sup>(1)</sup> ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	80	—	Vdc
Collector–Emitter Leakage Current ( $V_{EB} = 80\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ ) ( $V_{EB} = 80\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_C = 150^\circ\text{C}$ )	$I_{CER}$	—	1.0 5.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	2.0	mAdc
Collector Emitter Leakage Current ( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	—	1.0	mAdc
<b>ON CHARACTERISTICS<sup>(1)</sup></b>				
DC Current Gain ( $I_C = 5.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$h_{FE}$	1000	—	—
Collector–Emitter Saturation Voltage ( $I_C = 5.0\text{ Adc}$ , $I_B = 20\text{ mAdc}$ ) ( $I_C = 10\text{ Adc}$ , $I_B = 50\text{ mAdc}$ )	$V_{CE(sat)}$	—	2.0 4.0	Vdc
Base Emitter Voltage ( $I_C = 5.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$V_{BE(on)}$	—	3.0	Vdc

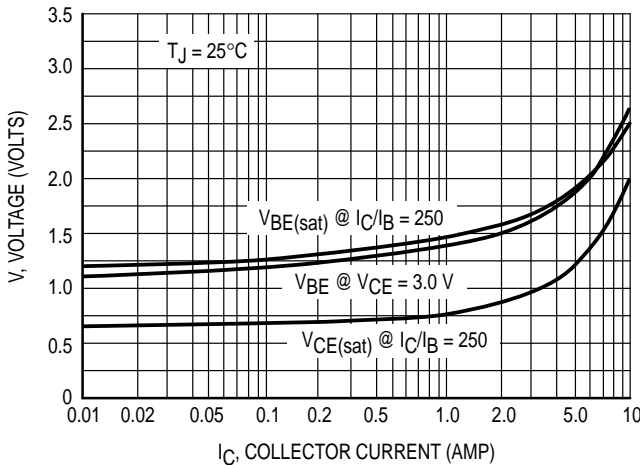
(1)Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



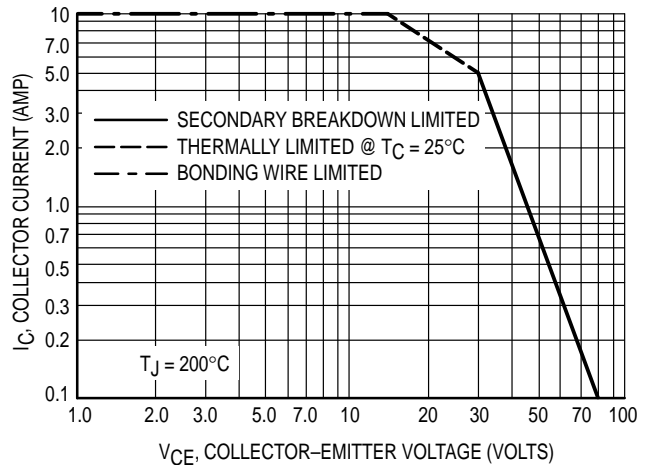
**Figure 2. DC Current Gain**



**Figure 3. Small-Signal Current Gain**



**Figure 4. "On" Voltages**



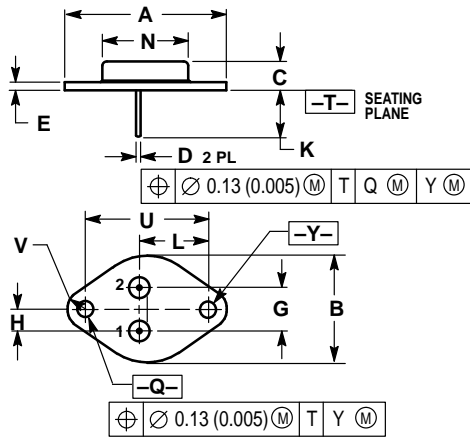
**Figure 5. DC Safe Operating Area**

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

than the curves indicate.

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

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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