

# Medium-Power Complementary Silicon Transistors

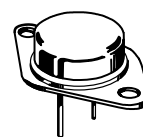
... for use as output devices in complementary general purpose amplifier applications.

- High DC Current Gain —  $h_{FE} = 6000$  (Typ) @  $I_C = 3.0$  Adc
- Monolithic Construction with Built-in Base-Emitter Shunt Resistors

**NPN**  
**MJ1000**  
**MJ1001\***

\*Motorola Preferred Device

**10 AMPERE**  
**DARLINGTON**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**60-80 VOLTS**  
**90 WATTS**



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

## MAXIMUM RATINGS

Rating	Symbol	MJ1000	MJ1001	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	80	Vdc
Collector-Base Voltage	$V_{CB}$	60	80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0		Vdc
Collector Current	$I_C$	10		Adc
Base Current	$I_B$	0.1		Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	90		Watts
		0.515		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	$R_{\theta JC}$	1.94	$^\circ\text{C/W}$

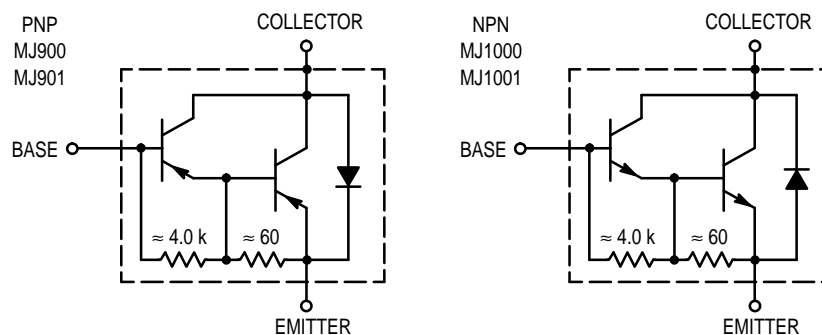


Figure 1. Darlington Circuit Schematic

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

REV 7

# MJ1000 MJ1001

## 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> ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	MJ1000 MJ1001	$V_{(BR)CEO}$	60 80	— —	Vdc
Collector Emitter Leakage Current ( $V_{CB} = 60\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ ) ( $V_{CB} = 80\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ ) ( $V_{CB} = 60\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_C = 150^\circ\text{C}$ ) ( $V_{CB} = 80\text{ Vdc}$ , $R_{BE} = 1.0\text{ k ohm}$ , $T_C = 150^\circ\text{C}$ )	MJ1000 MJ1001 MJ1000 MJ1001	$I_{CER}$	— — — —	1.0 1.0 5.0 5.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	—	2.0	mAdc
Collector Emitter Leakage Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )	MJ1000 MJ1001	$I_{CEO}$	— —	500 500	$\mu\text{Adc}$

## ON CHARACTERISTICS

DC Current Gain <sup>(1)</sup> ( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 4.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$h_{FE}$	1000 750	— —	—
Collector Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = 30\text{ Adc}$ , $I_B = 12\text{ mAdc}$ ) ( $I_C = 8.0\text{ Adc}$ , $I_B = 40\text{ mAdc}$ )	$V_{CE(sat)}$	— —	2.0 4.0	Vdc
Base Emitter Voltage <sup>(1)</sup> ( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$V_{BE(on)}$	—	2.5	Vdc

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

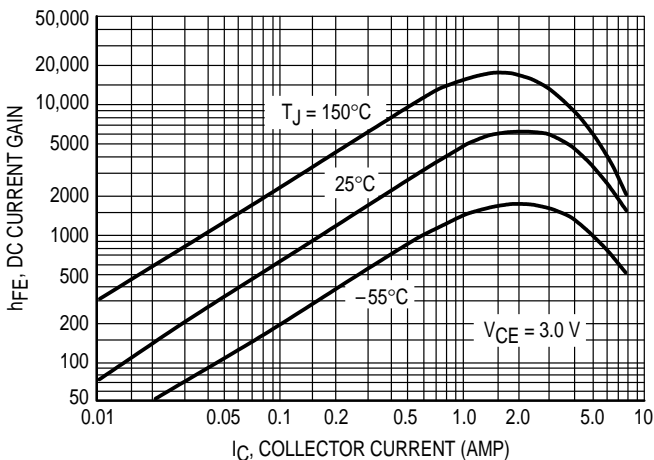


Figure 2. DC Current Gain

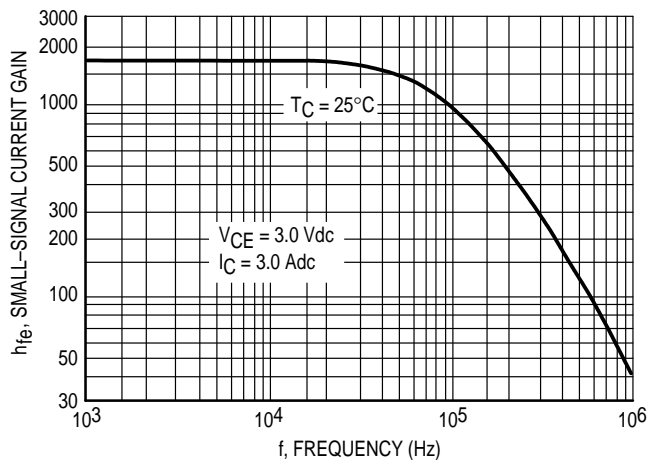


Figure 3. Small-Signal Current Gain

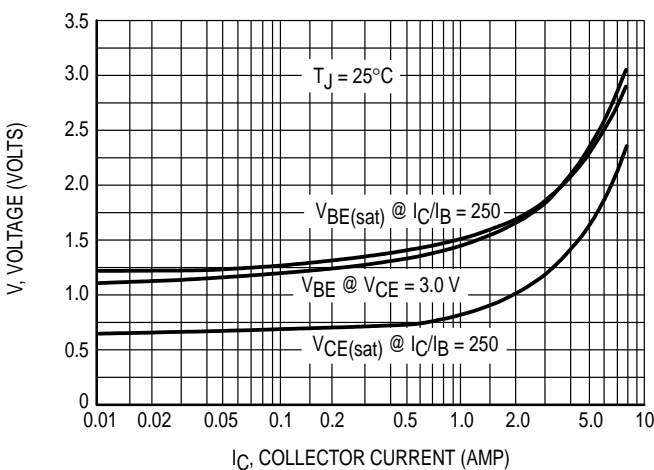


Figure 4. "On" Voltages

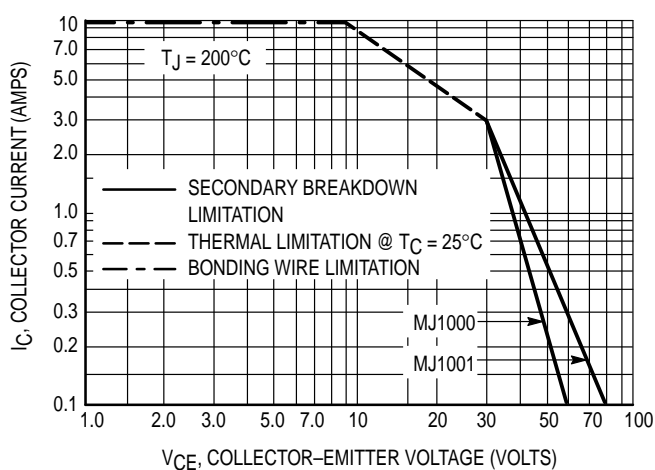


Figure 5. DC Safe Operating Area

There are two limitations on the power handling ability of a transistor: average 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.



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